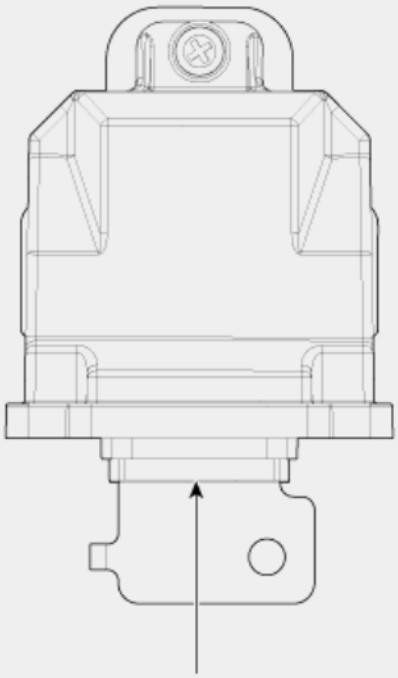
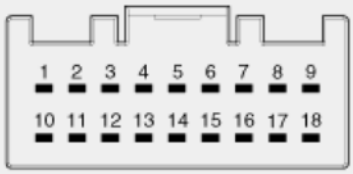
Components



Connector A

Connector A	No.	Description	No.	Description
	1	IGN1	10	-
	2	Rear height sensor (5V)	11	-
	3	Rear height sensor (Signal)	12	-
	4	Rear height sensor (Ground)	13	-
	5	Ground	14	-
	6	-	15	-
	7	C-CAN (Low)	16	-
	8	C-CAN (High)	17	-
	9	-	18	LIN (AFS)

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Description

AFS Unit (ECU)

AFS located in Cockpit Module is provided information of vehicle (steering wheel signal, vehicle speed, inclination of vehicle).
Based on provided information, it calculates algorithm and adjust Low beam of H/Lamp.
It transmits driving information by using LIN protocol, it is operated in Fail-safe reaction mode In case system failure occurred.

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Removal

NOTICE

- When prying with a flat-tip screwdriver or use a prying trim tool, wrap it with protective tape, and apply protective tape around the related parts, to prevent damage.
- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Take care not to bend or scratch the trim and panels.

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad passenger side panel.
   (Refer to Body - "Crash Pad Center Panel")
3. Remove the side airvent duct [RH] (A) after loosening the mounting screw.

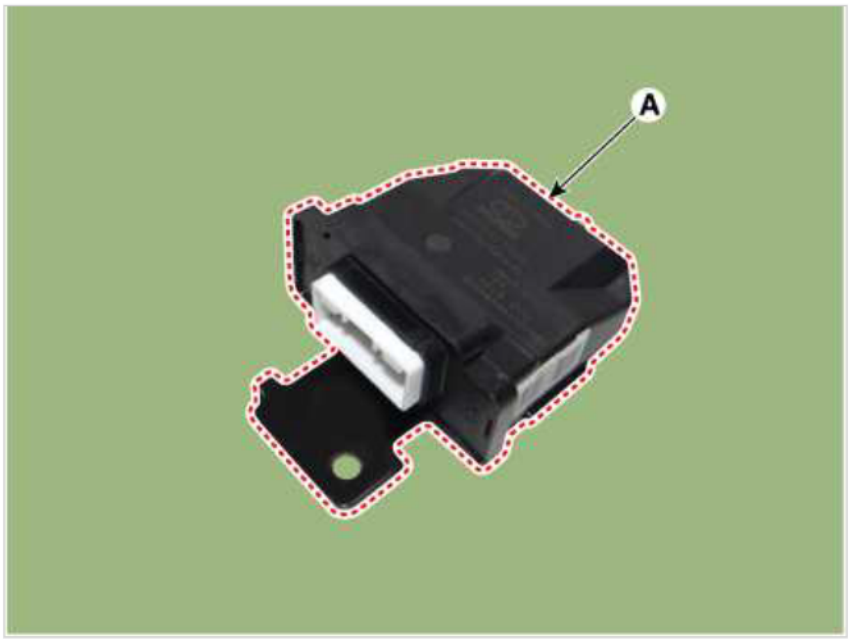


4. Disconnect AFS unit connector (A) after loosening the mounting bolt.



5. Remove the AFS unit (A).

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Installation

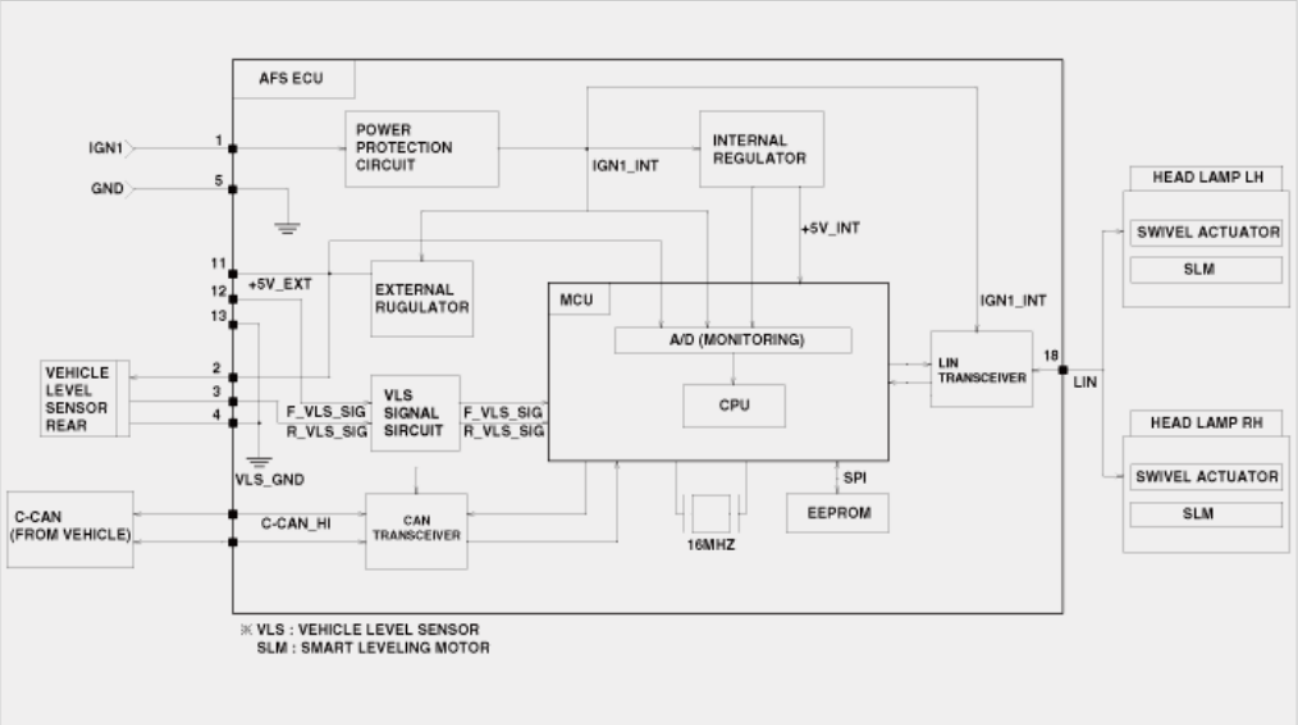
1. Install the AFS unit.
2. Connect the AFS unit connector.
3. Install the side airvent duct [RH].
4. Install the crash pad passenger side panel.
5. Connect the negative (-) battery terminal.

NOTICE

Make sure that the connectors are plugged in properly.

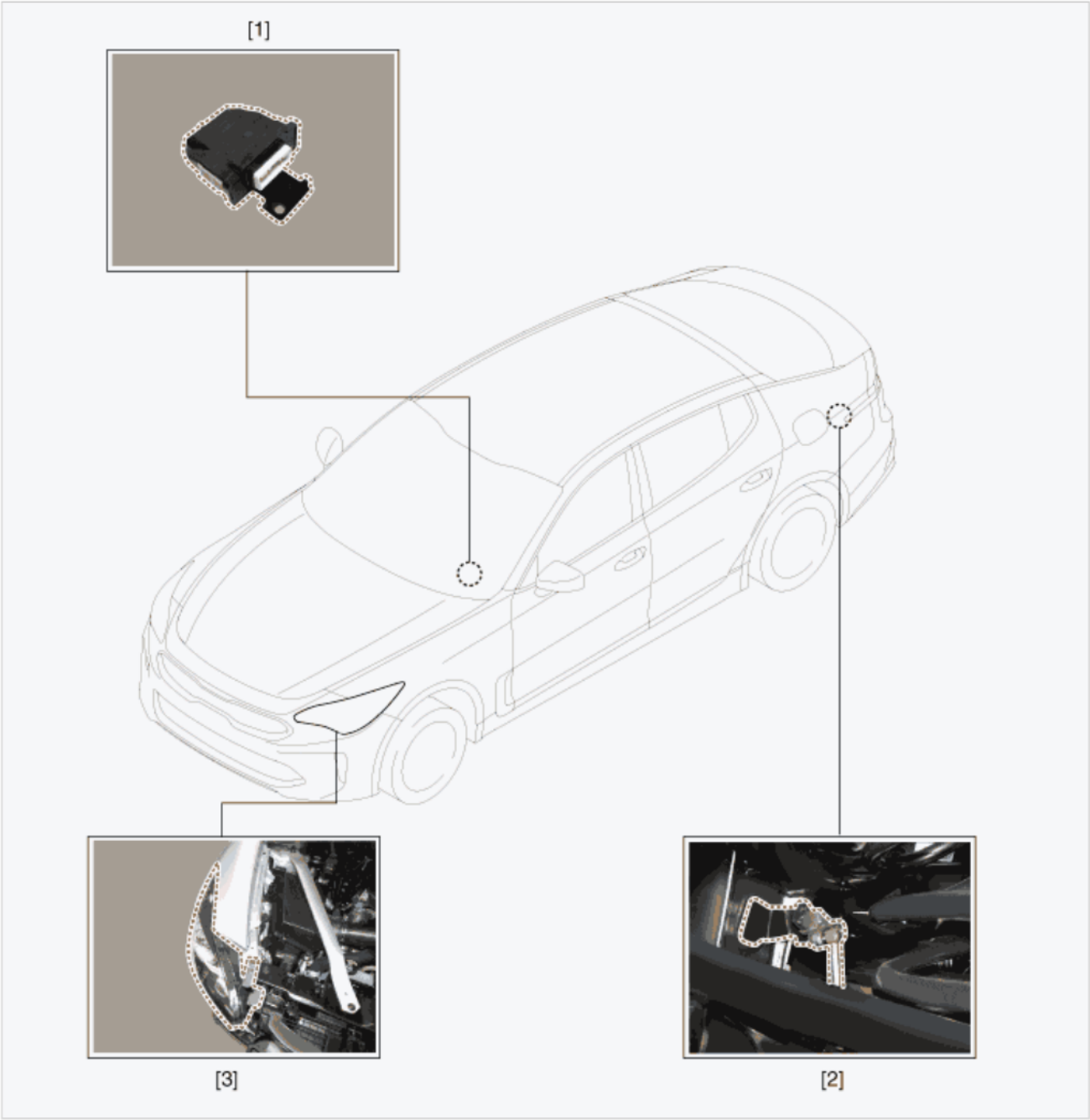
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Schematic Diagrams



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Components



1. Adaptive front-lighting system (AFS) unit
2. Rear height sensor
3. Headlamp (Swiveling, Leveling)

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Description

Adaptive Front-Lighting System (AFS)

AFS (Adaptive Front-Lighting System) is a headlamp orientation control system that takes into account both steering angle and vehicle speed to orient the headlamps to an angle that provides better nighttime visibility.
Variable conditions make beam pattern of running vehicle kaleidoscope.

Component of AFS

1. Input part : It is provided that information of speed sensor, height sensor and so on related to condition of vehicle.
2. Control part (AFS Unit) : It controls Output part by analyzing/judging Input signal.
3. Output part : It drive Low beam of H/Lamp to upper/lower and left/right side optimum beam pattern according to output control signal of AFS Unit.

Main function of AFS

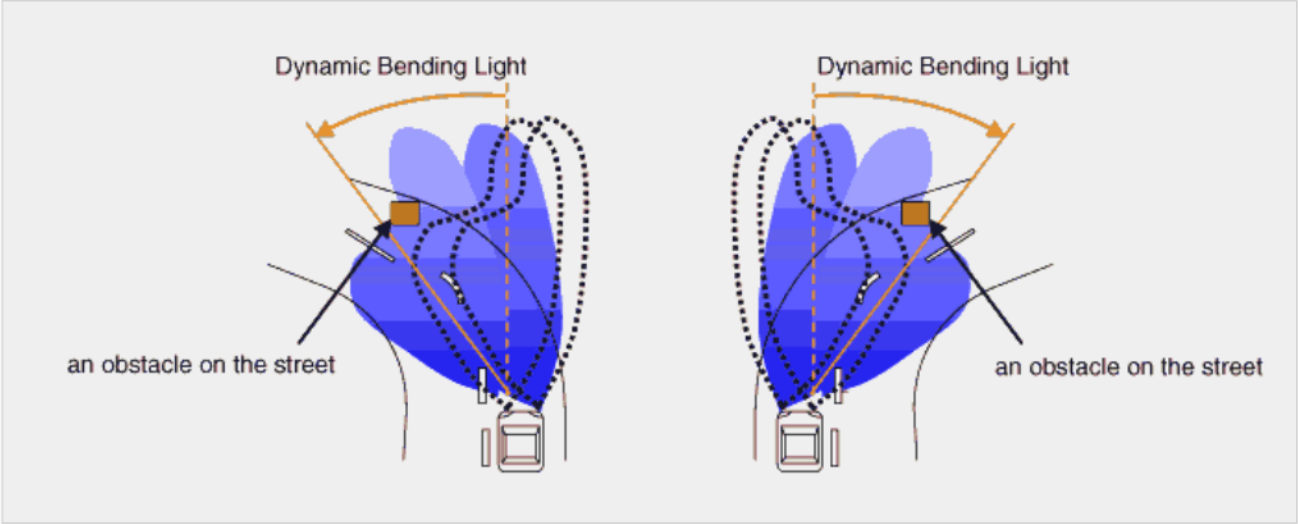
	Content	Description
1	Dynamic Bending (Swivelling)	• Providing optimum beam pattern in the curve road 1) Enhanced visibility in the curve road 2) Drive Low beam to left / right side
2	Automatic Leveling (Leveling)	• Compensating Low beam according to inclination of vehicle 1) Compensation according to static condition (Load) 2) Compensation according to dynamic condtion (Quick start, Sudden stop)
3	Fail-safe	• Fail-safe reaction while detecting system failure and malfunction 1) Detecting signal / communication error for Swivelling 2) Detecting signal /communication error for Leveling 3) Detecting system failure

Advantage of AFS

	Content	Description
1	Enhanced stability	• Visibility Guarantee In case of curve road • According to vehicle Speed/Steering angle, speed/angle of Swivel actuator is automatically controlled to provide optimum beam pattern • Fail-safe reaction application for Driver on opposite side road →In case error communication,automatically return initial position of Swivel actuator
2	Enhanced convenience	• AFS operating application by driver"s selection(AFS Off switch) • Providing Diagnostic function for detecting system failure and malfunction and check up data information (by using Diagnostic equipment) • Reduced wiring-harness by Applying CAN/LIN communication in vehicle • Fun Drving Function : Swivelling of Low beam → Increasing driver"s pride

Block Diagram

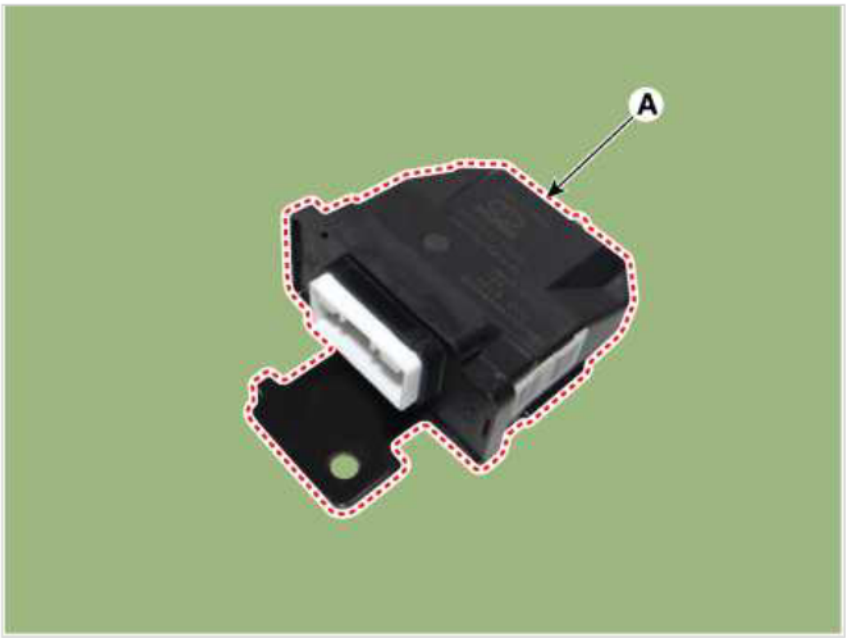
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Operation

Component

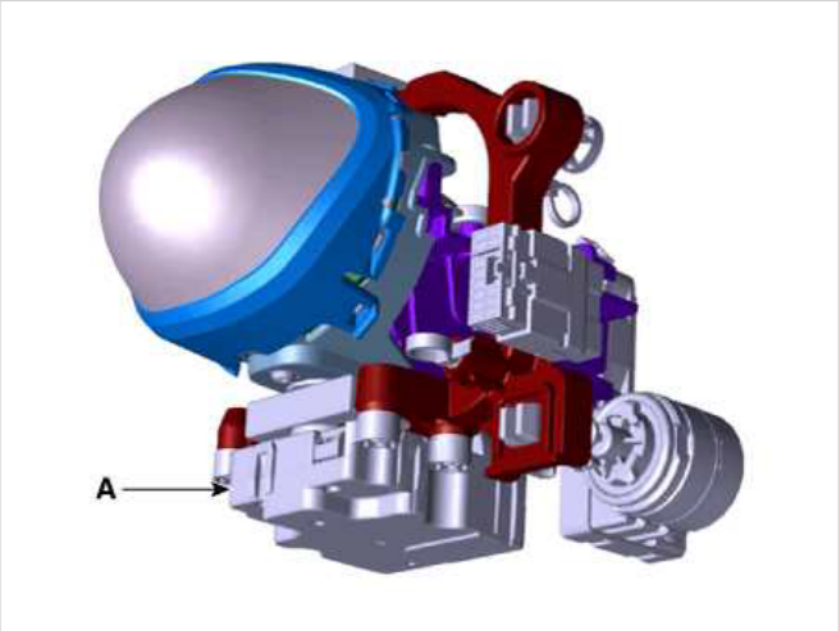
AFS Unit (A)



1. General
   System initialization, In case of input Engine signal (AFS ECU, Levelling /Swivelling motor)
   Adaptation of AFS OFF switch
   AFS operate normally, only under turning low beam switch on.
   Providing Tell-tale function of AFS (display 'AFS' on dashboard).
   In case of system failure, display light on 'AFS' on dashboard
2. Main function
   Swivelling function
   Levelling function
   Processing signal of Height sensor
   Control the shield drum to change the beam pattern
   Control the static bending light

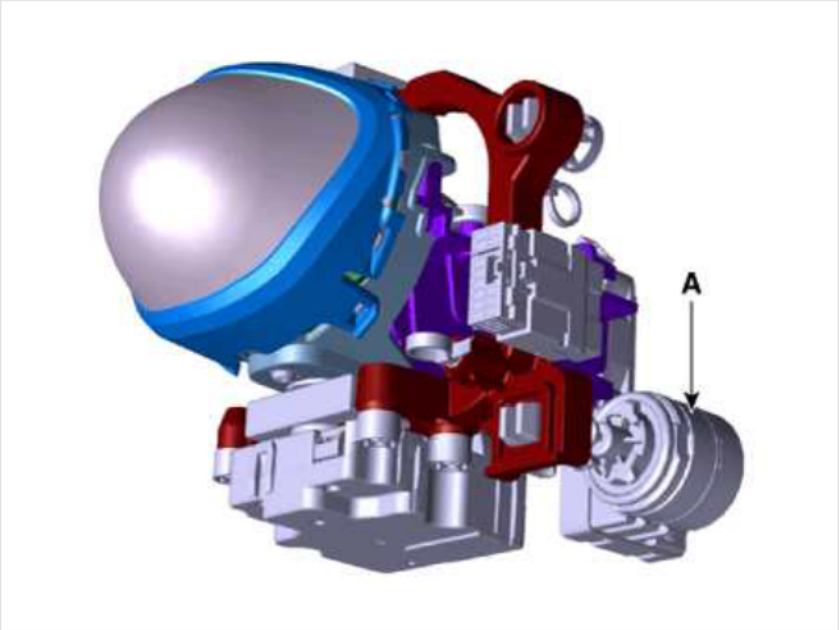
Swivelling Motor (A)

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1. General
   communicate AFS Unit through LIN protocol
   Robust control to Disturbance
   Doesn"t work out of rated voltage range.
2. Main function & Rating
   Drive Low beam to left / right side
   Fail-safe function : In case of detecting malfunction or system failure , drive to secure position

Levelling Motor (A)



1. Main spec
   communicate AFS Unit through LIN protocol
   Robust control to Disturbance
   Doesn"t work out of rated voltage range.
2. Main function & Rating
   Drive Low beam to upper / lower
   Fail-safe function : In case of detecting malfunction or system failure , drive to secure position

Height Sensor

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1. General
   Height Sensor connecting body & suspension measures inclination information from load condition.
   Vehicle having the Steel-suspension system transmits inclination signal to AFS ECU by using Hard-wire.
2. Rating
   Rated Voltage : 5V ± 5%

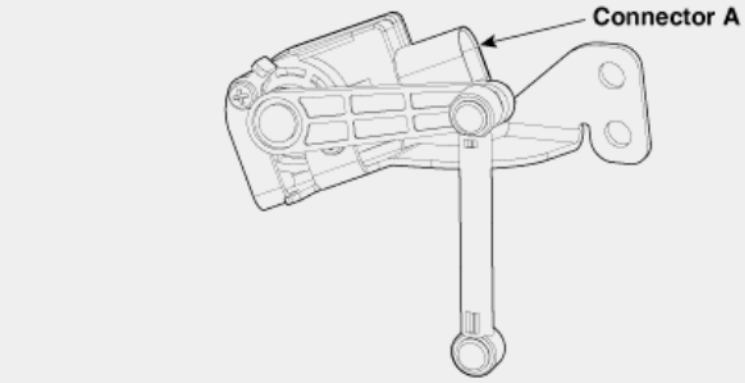
LED Head lamp, LDM (A)

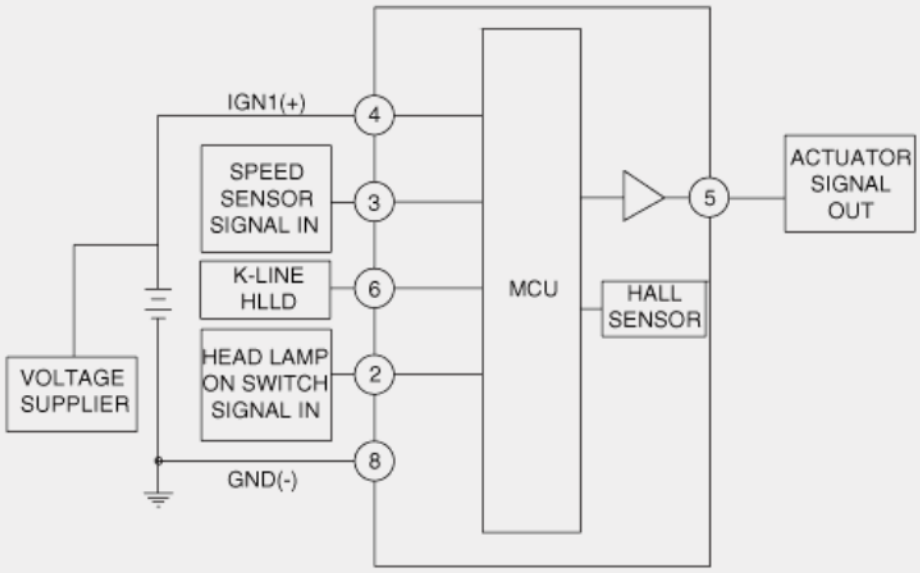


1. LDM system description.
   LED (Light Emitting Diode) BEAM is largely composed of LED module, cooling fan and LDM (LED Driver Module).
   LED module is composed of four units and each unit is composed of three LEDs.The cooling fan cools down the heat generated by LEDs.
   The fan fails, it sends the fail signal to LDM.
   LDM is a module that drives LEDs. It turns on or makes the warning lamp of the cluster flickering, if the fan or LED fails.

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Components





Connector A	No.	Description	No.	Description
	1	-	5	Actuator signal
	2	Headlamp ON switch signal	6	K-Line
	3	Vehicle speed signal	7	-
	4	IGN1	8	Ground

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Description

Height sensor sense a change of vehicle height and send this signal to AFS ECU. Height sensor is comprised of rotor/stator, PCB coil and sensor lever.

Sensor check the lever angle value which is calculated by the magnetic field of stator.

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Removal

1. Disconnect the negative (-) battery terminal.
2. Disconnect height sensor connector (A).



3. Remove the height sensor link (A).



4. Remove the height sensor (A) after loosening the mounting bolt.

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Installation

1. Install the height sensor and link.
2. Connect the height sensor connector.
3. Connect the negative (-) battery terminal.

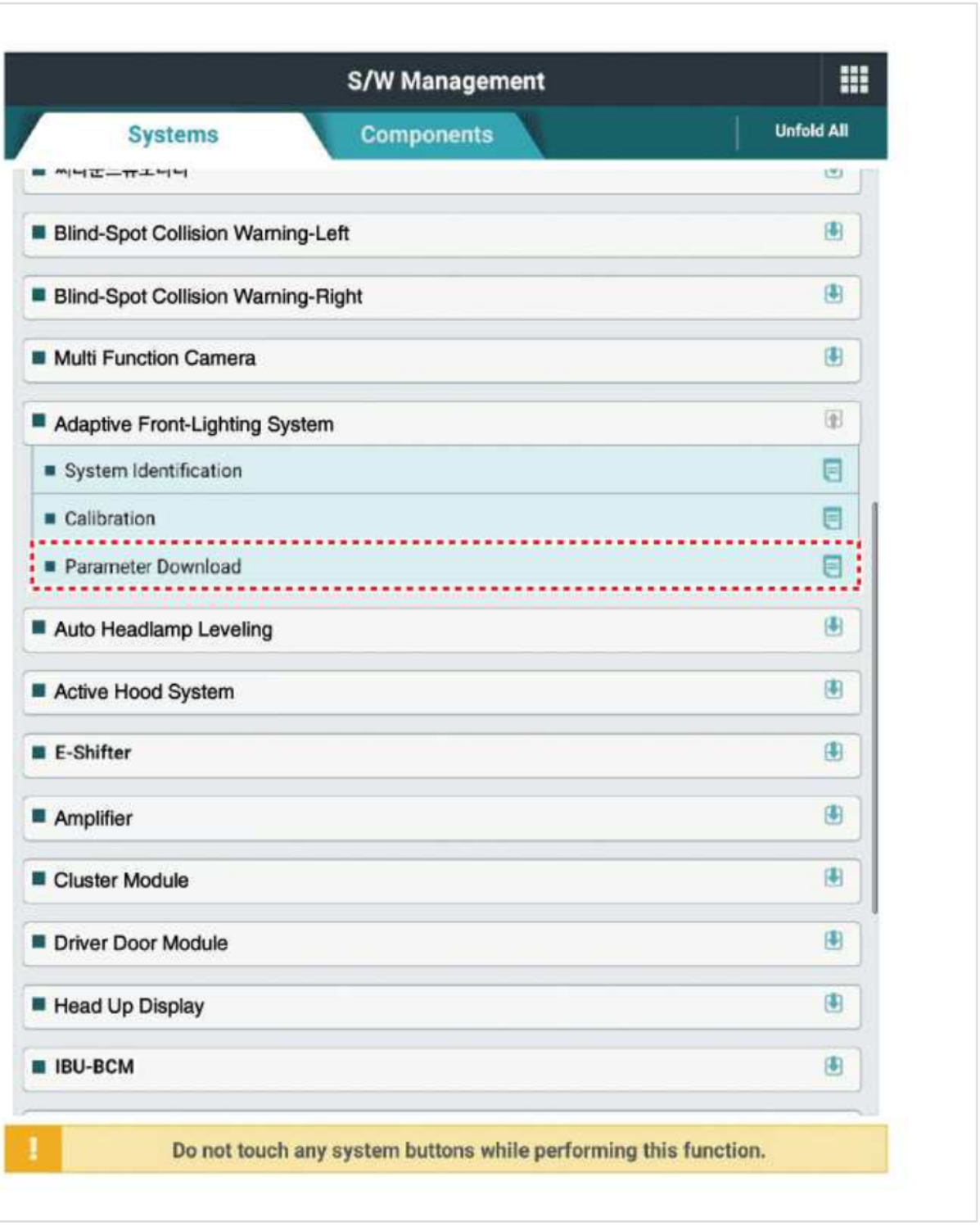
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Inspection

Initialization and diagnosis sequence by using diagnostic equipment
Below content summarize the procedure for A/S using Diagnostic equipment

Download Parameter

1. Select "AFS" menu after selecting a vehicle.
2. Select "Parameter download" menu for define a characteristc of vehicle.



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S/W Management

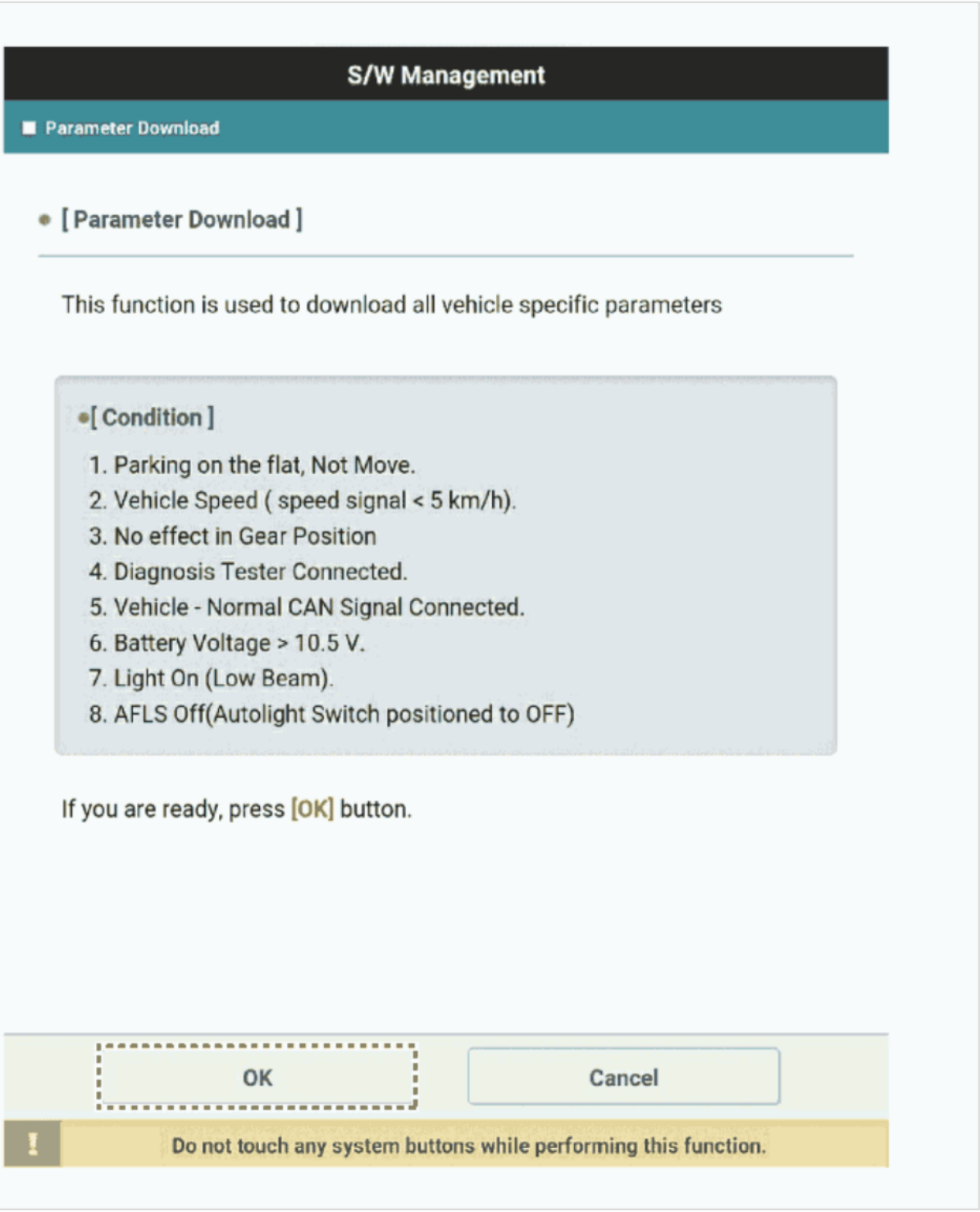
• **Parameter Download**

Purpose	To download all vehicle specific parameters.
Enable Condition	1. Parking on flat, no moving 2. No effect gear position 3. Normal battery 4. Light On(LOW) 5. AFLS Off 6. Diagnosis Tester Connected 7. Vehicle : Normal CAN Signal Connected
Concerned Component	Adaptive Front Lighting System(AFLS) ECU, Headlamps, Height Sensors
Concerned DTC	B1661XX
Fail Safe	Set DTC, Unable to operate system properly
Etc	-

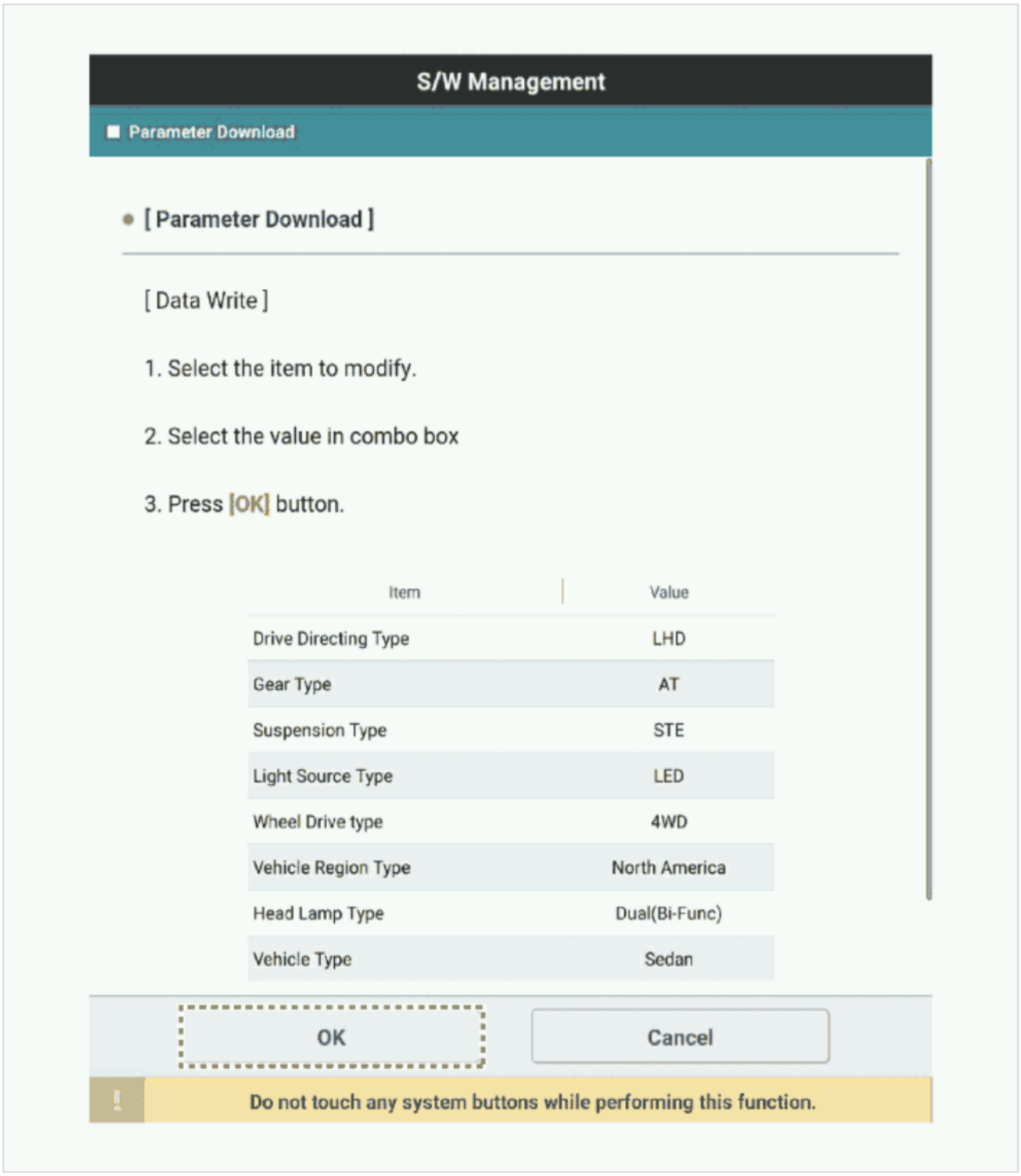
OK

Do not touch any system buttons while performing this function.

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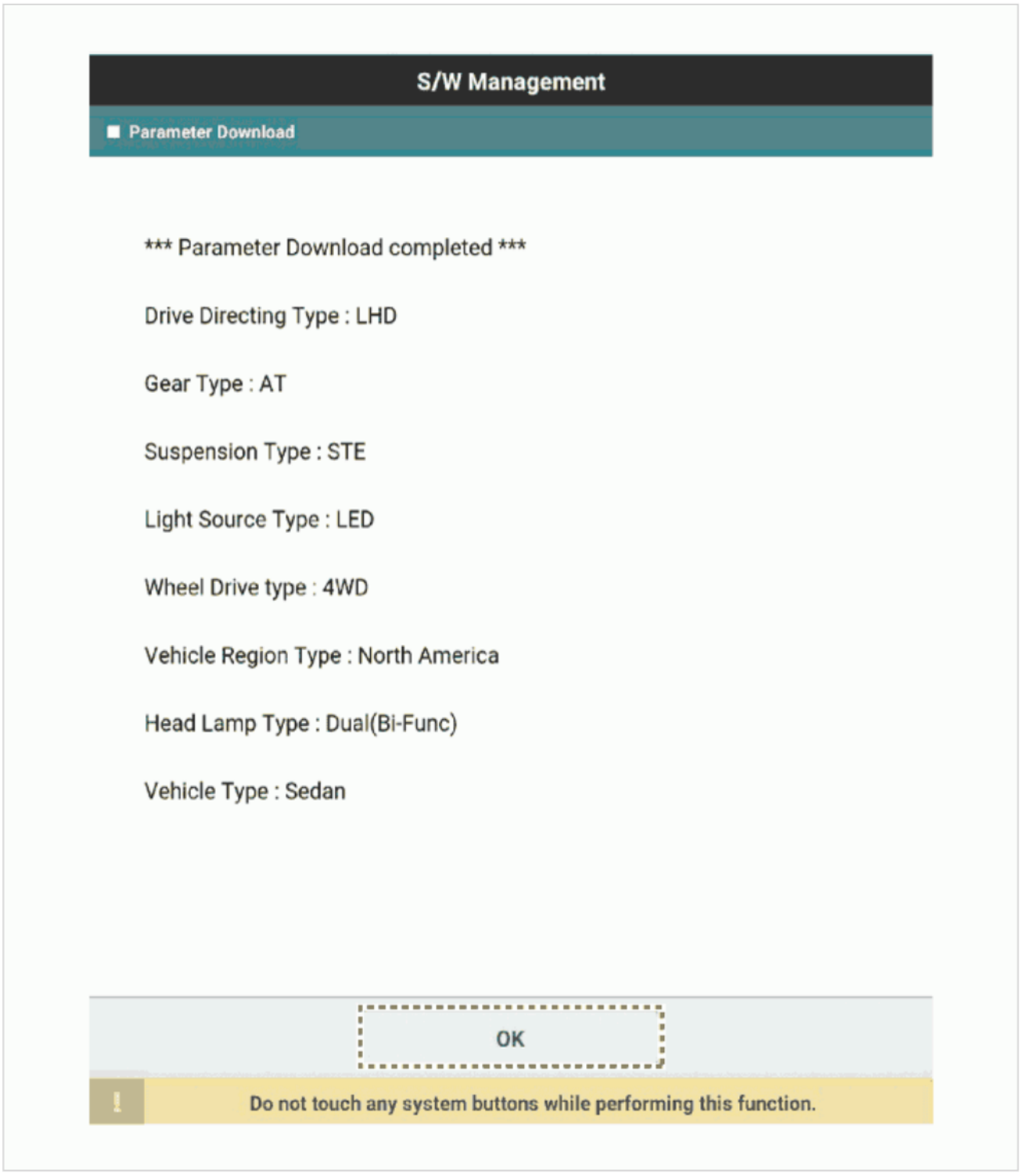


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3. When "Parameter download" is done,display belows.

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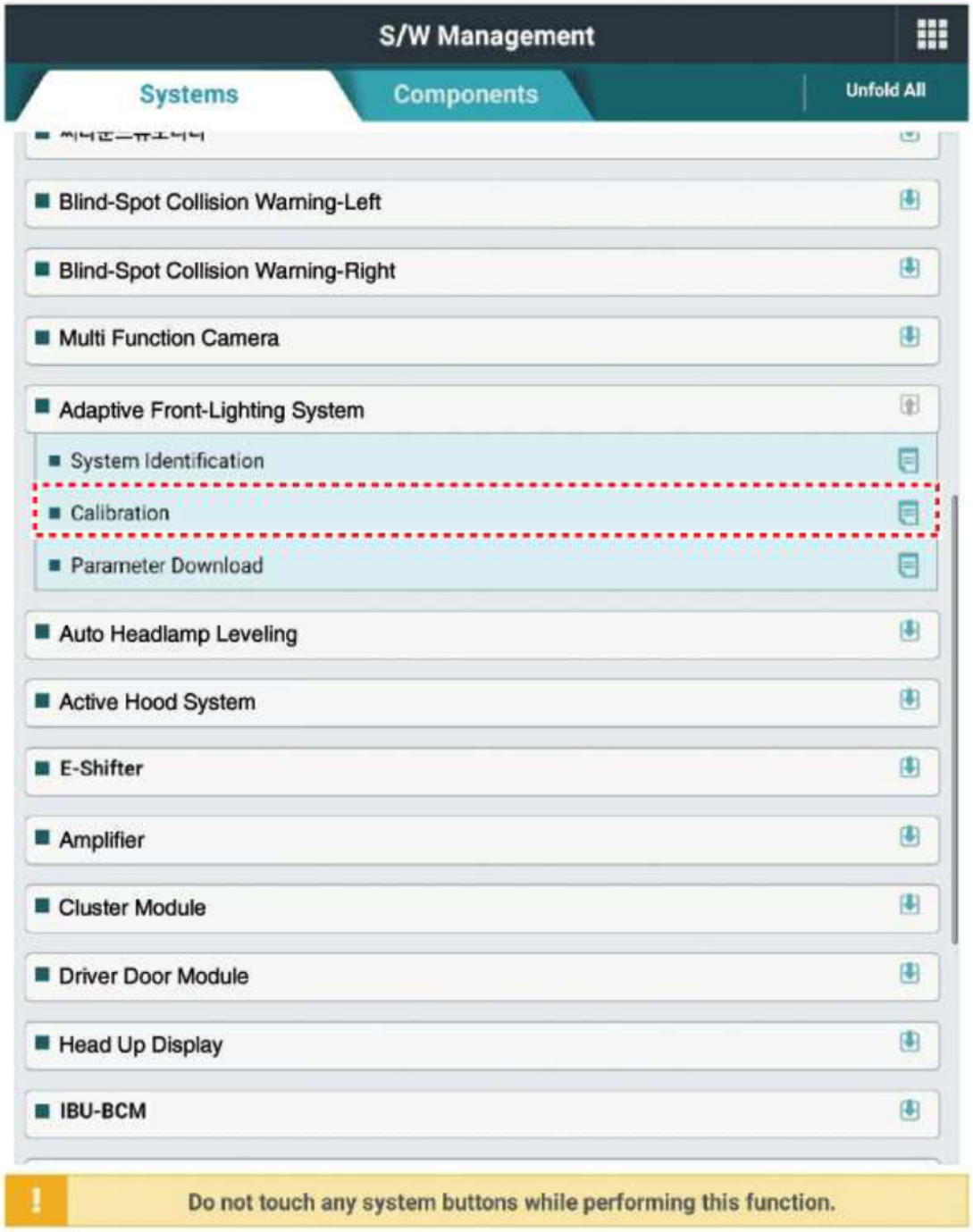


System Calibration

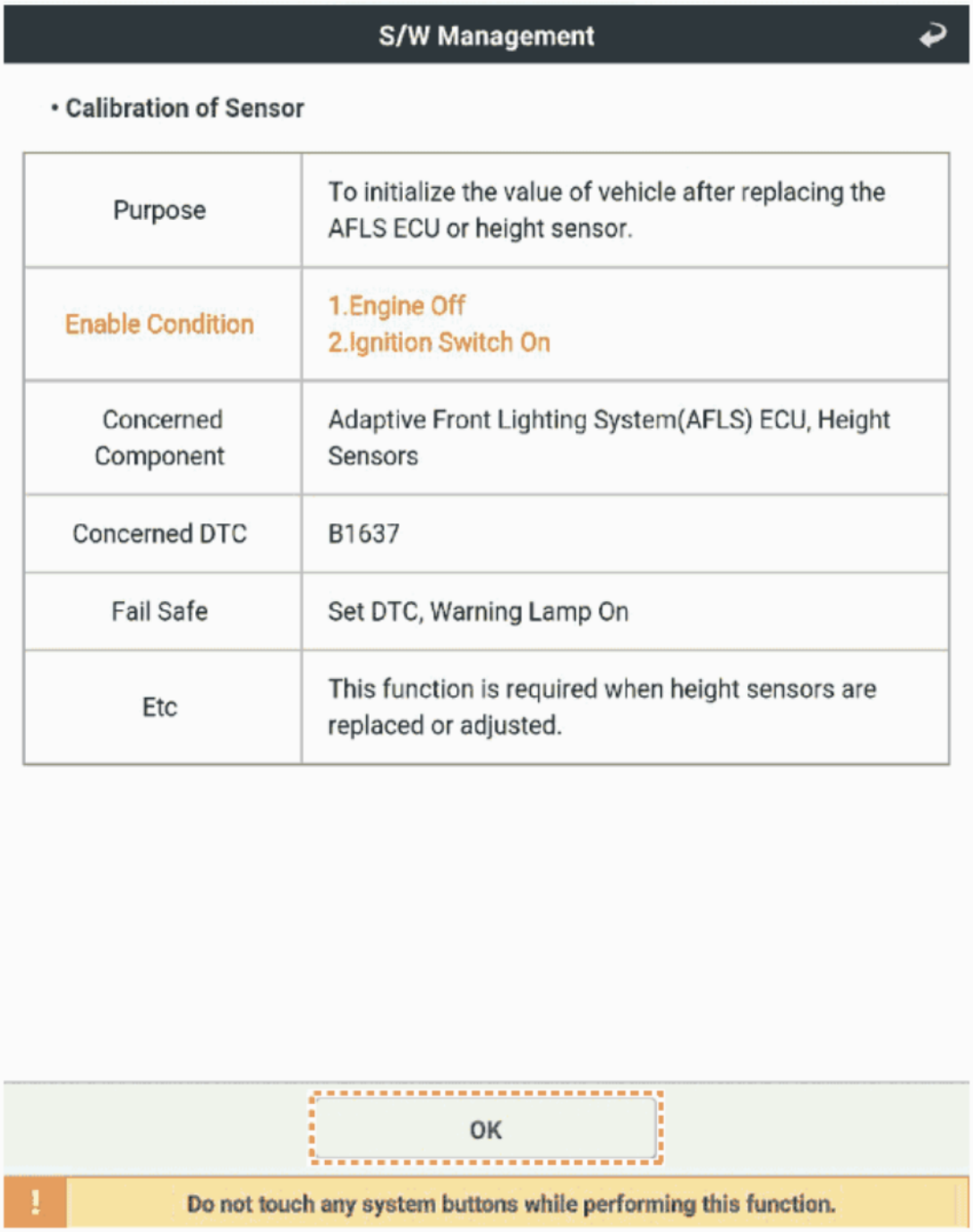
⚠ CAUTION
This menu is applied only if vehicle has a Steel suspension

1. Select "AFS" menu after selecting a vehicle.
2. The KDS will show the AFS calibration function steps.

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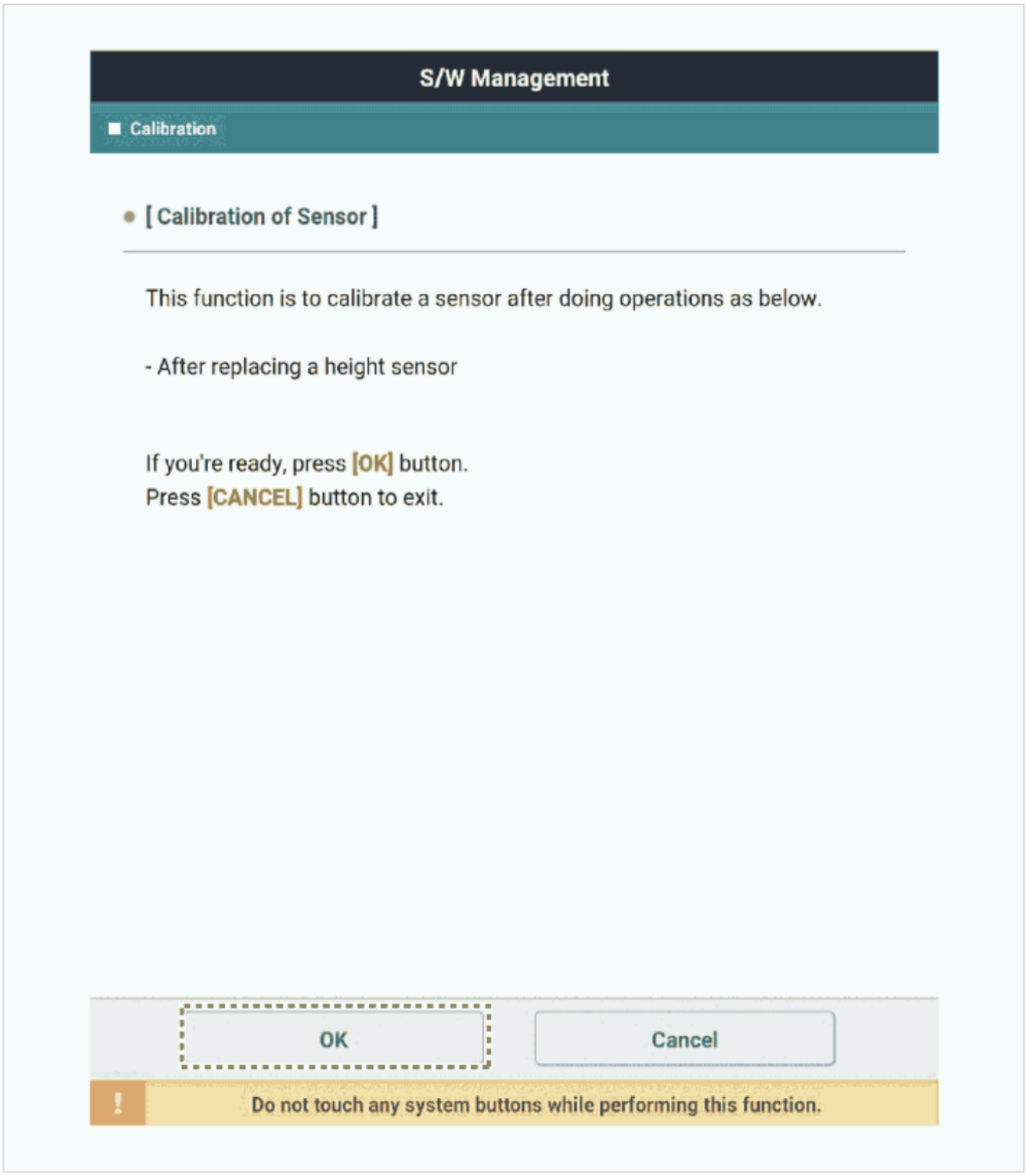


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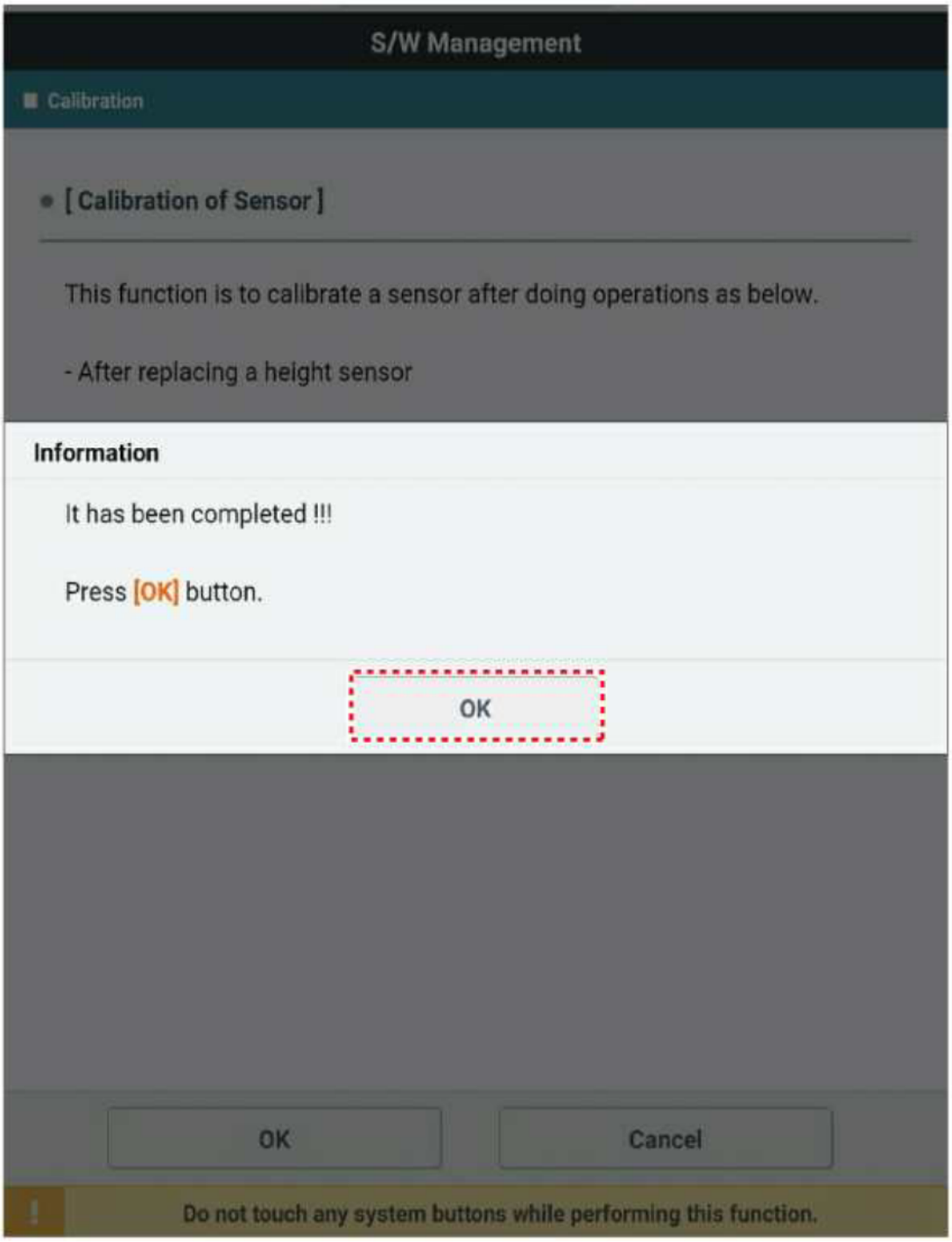


3. When "System calibration" is done,display belows.

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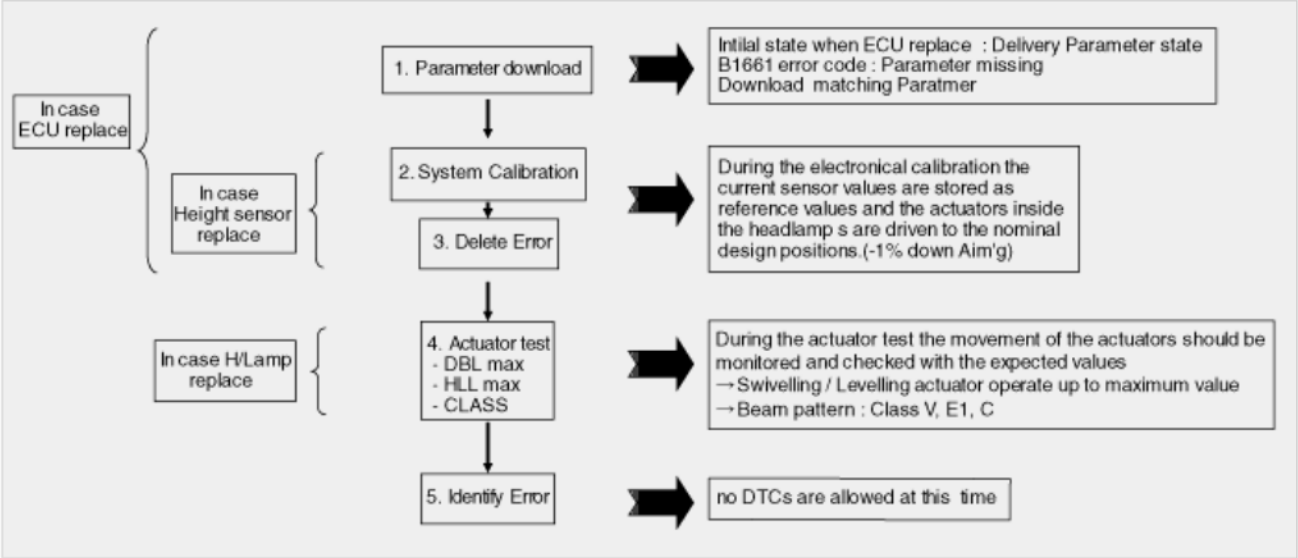
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AFS Setting Procedure

When it replace AFS ECU or H/Lamp Unit or Height sensor, it operates in setting procedure by using Diagnostic equipment following belows.
When AFS setting procedure operate, necessarily confirm suspension type and then download parameter.

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※ DTC : Diagnostic Trouble Code
DBL : Dynamic bending Light
HLL : Head Lamp Leveling

Vehicle Condition While AFS Setting

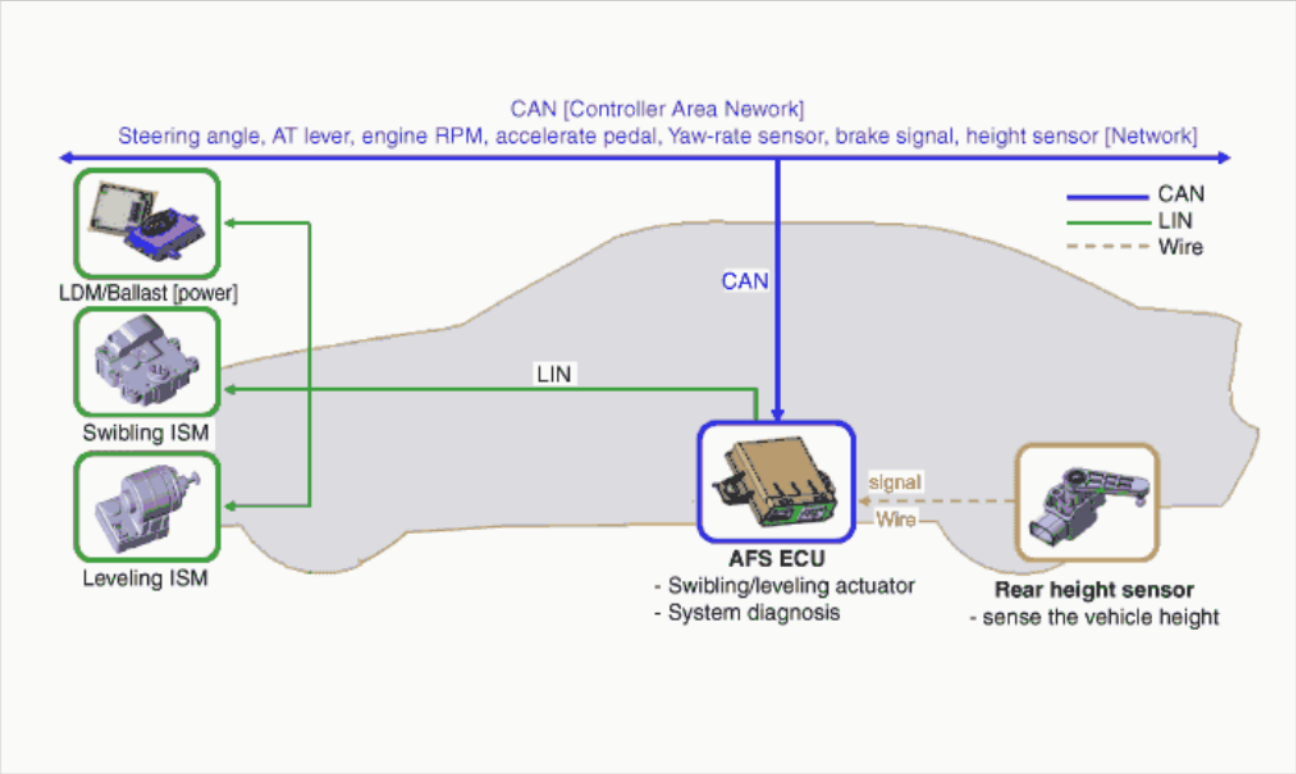
1. Vehicle on an even surface
2. No vehicle movement
3. Gear position in P & N
4. Ignition switched on & Engine RPM >500 RPM
5. Diagnostic equipment connected
6. ALL ECUs on CAN mounted and activated
7. Battery voltage > 10.5 V (ECU supply to be ensured)
8. Light switched
9. AFS ON or OFF

Action In Case Of Download Wrong Parameter

1. Download Delivery Parameter
2. Check up B1661 (Parameter missing)
3. Ignition OFF
4. Ignition ON & Engine RPM > 500 RPM
5. Download matching Paratmer

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Circuit Diagram



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Specifications

Content		Value
AFS	Nominal Voltage	DC 13.5V
	Max Voltage	DC 16.5V
	Rated Voltage	DC 9.5 - 16V
	Operating Temperature	-22 to 167°F (-30 to 75°)
	Operating Current	MAX. 200mA

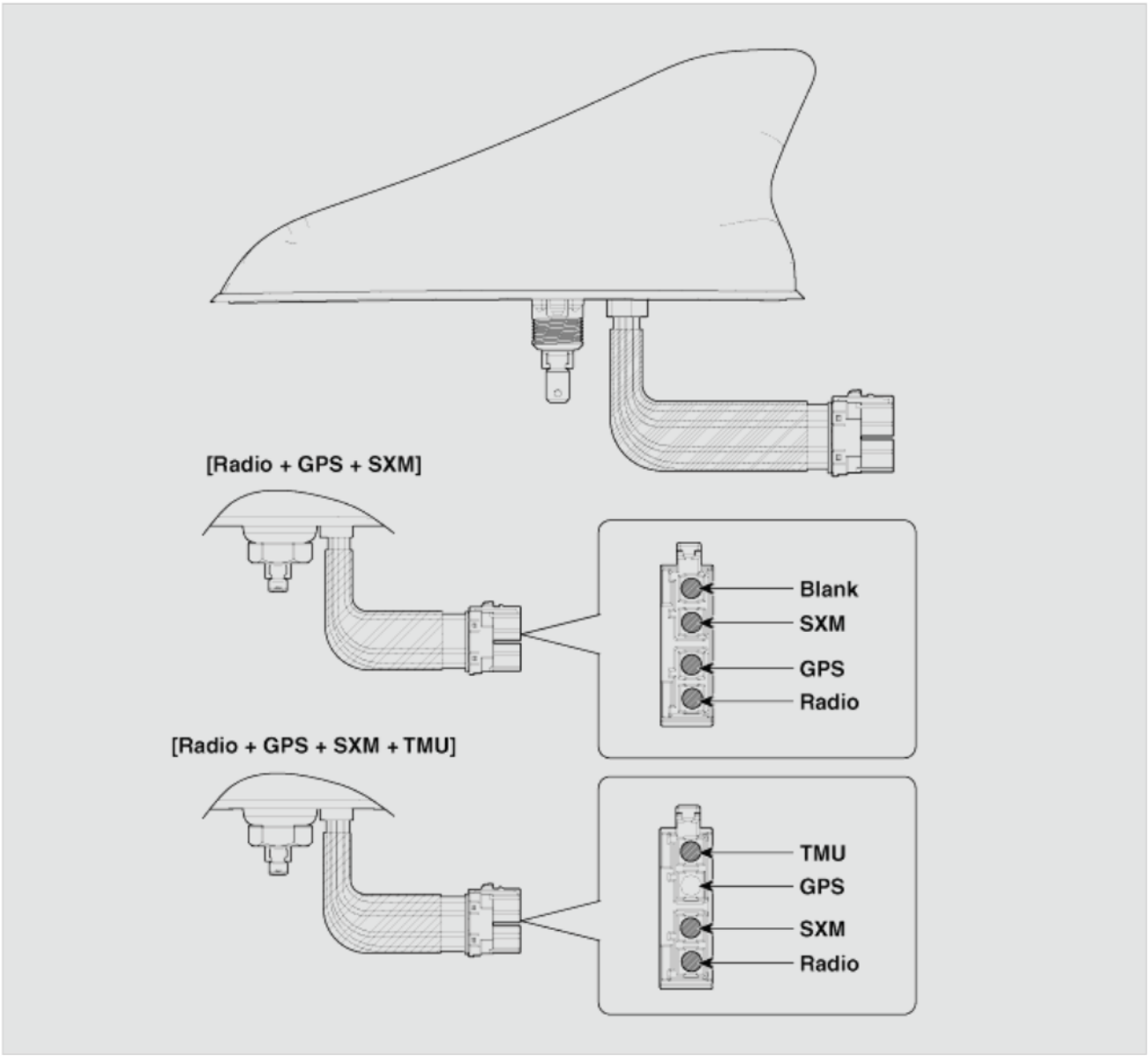
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Specifications

Items	Specifications
Model	Radio /MP3 /Bluetooth
Power supply	DC 14.4 V
Parasitic current	Max. 1mA (Head unit only)
Antenna	80PF 75Ω
Tuning type	PLL SYNTHESIZED TUNING

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Components

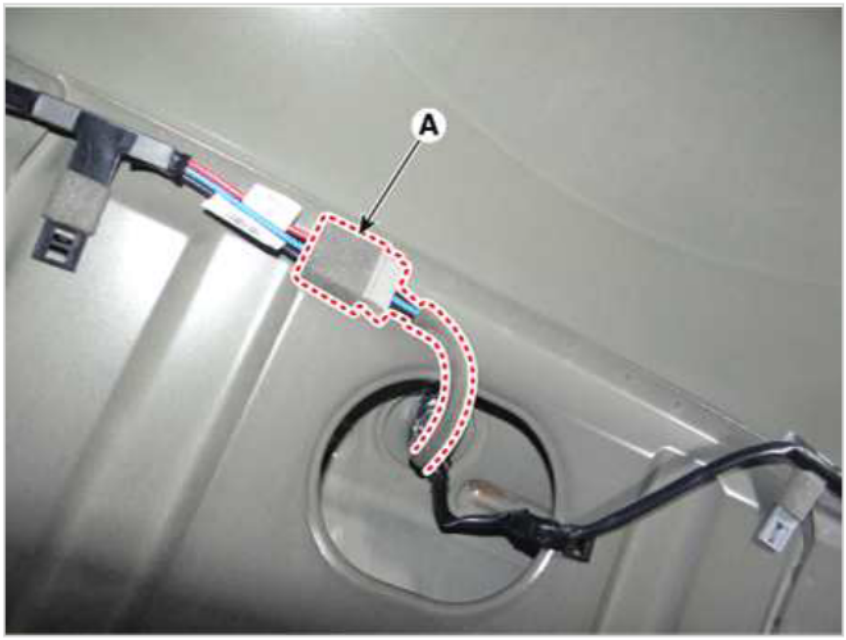


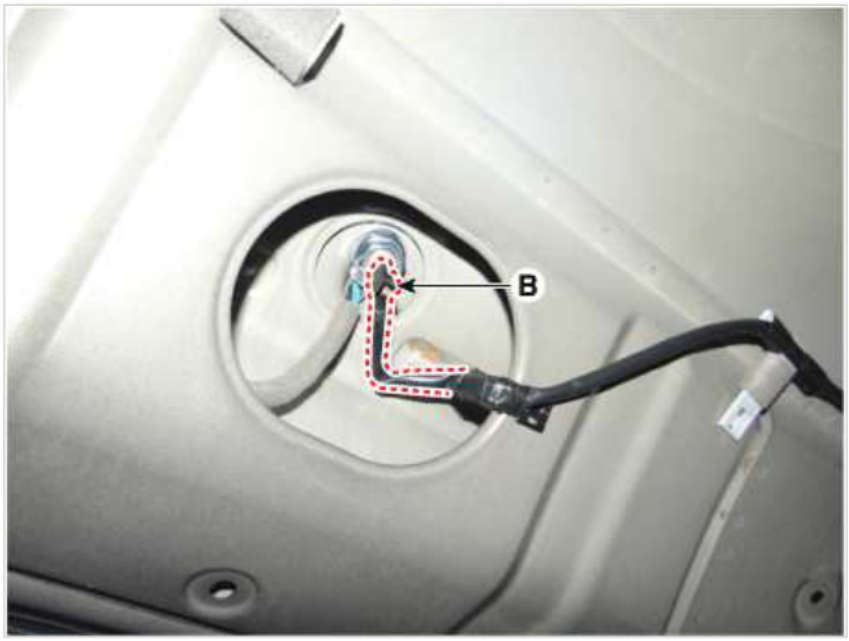
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Removal

Roof antenna

1. Disconnect the negative (-) battery terminal.
2. Remove the roof trim assembly.
   (Refer to Body - "Roof Trim Assembly")
3. Disconnect the roof antenna main connector (A) and roof antenna power connector (B).

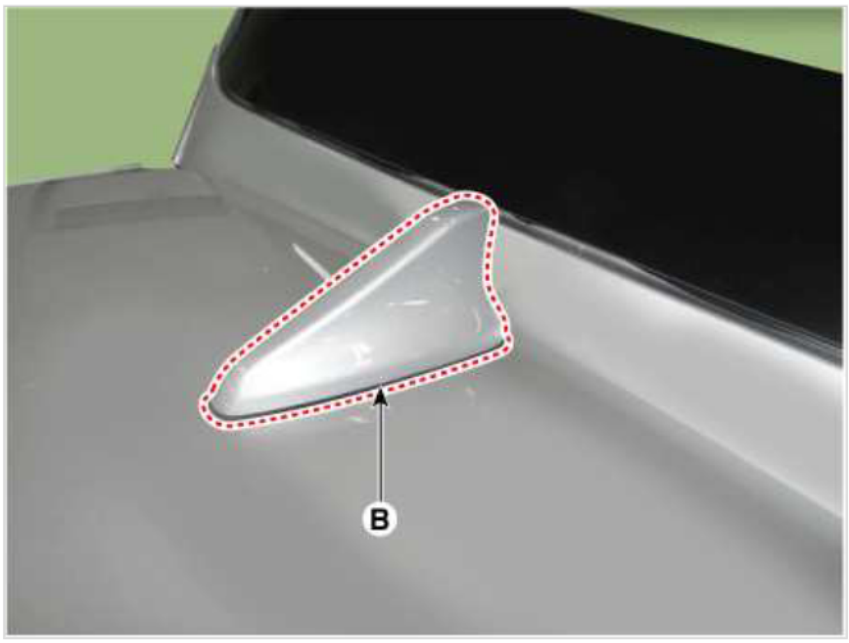




4. Remove the roof antenna (B) after loosening a nut (A).

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Installation

Roof anenna

1. Install the roof antenna.
2. Connect the roof antenna main connector and roof antenna power connecter.
3. Install the roof trim assembly.
4. Connect the negative (-) battery terminal.

NOTICE

- Make sure that the cable and connector are plugged in properly.
- Check the audio system for normal operation.

Inspection

Antenna Cable

1. Check for continuity between the center poles of antenna cable.
2. Check for continuity between the outer poles of antenna cable. There should be continuity.

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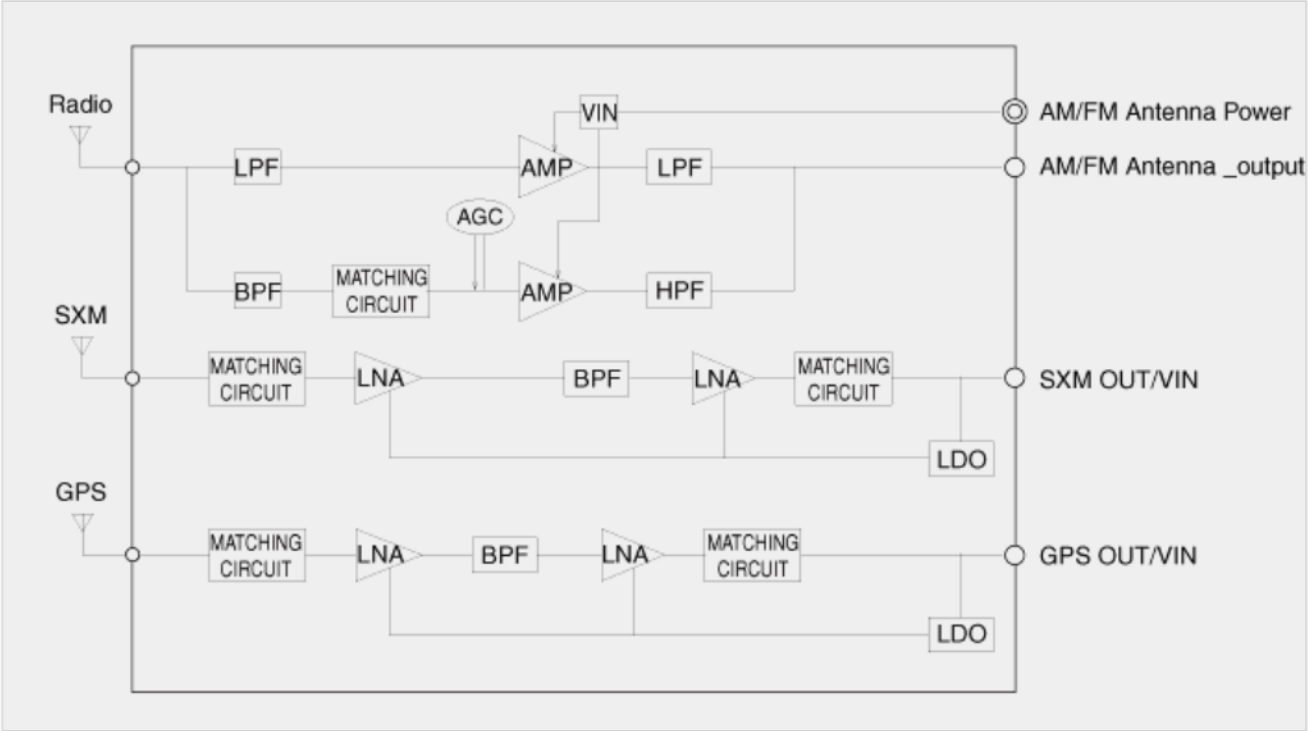
3. If there is no continuity, replace the antenna cable.
4. Check for continuity between the center pole (A) and outer pole (B) of antenna cable. There should be no continuity.
5. If there is continuity, replace the antenna cable.



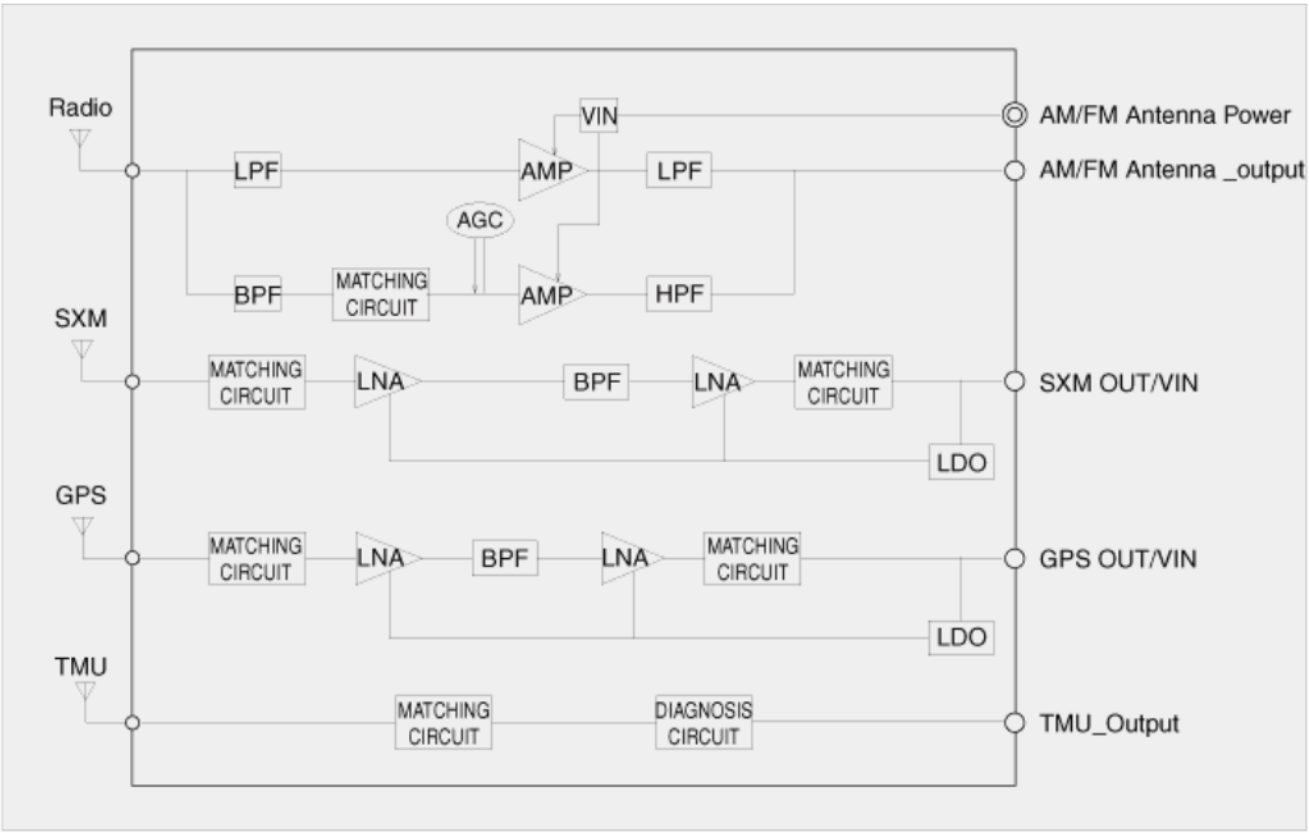
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Circuit Diagram

[Radio + GPS + SXM]

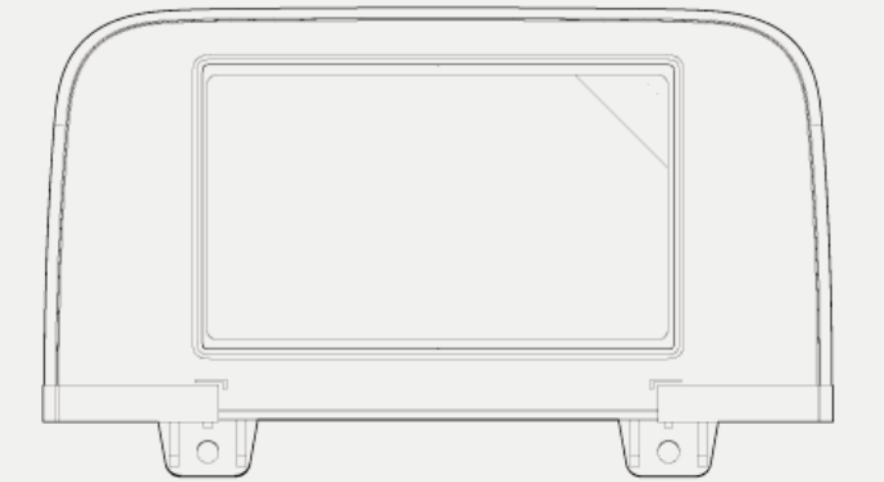


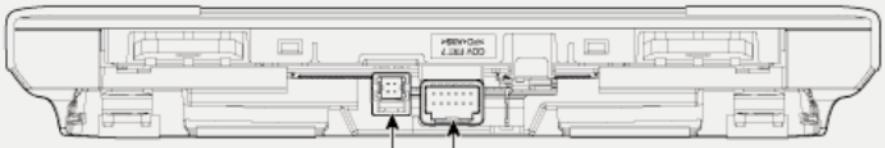
[Radio + GPS + SXM + TMU]



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Components





Connector B Connector A

Connector A	No.	Description	No.	Description
	1	-	7	-
	2	Ground	8	Monitor board _Enable
	3	Ground	9	-
	4	LCD Ground	10	Display_Mute
	5	-	11	-
	6	-	12	LCD Battery

Connector B	No.	Description	No.	Description
	1	Monitor touch_Interrupt	3	Monitor touch_Enable
	2	Monitor LVDS_(Low)	4	Monitor LVDS_(High)

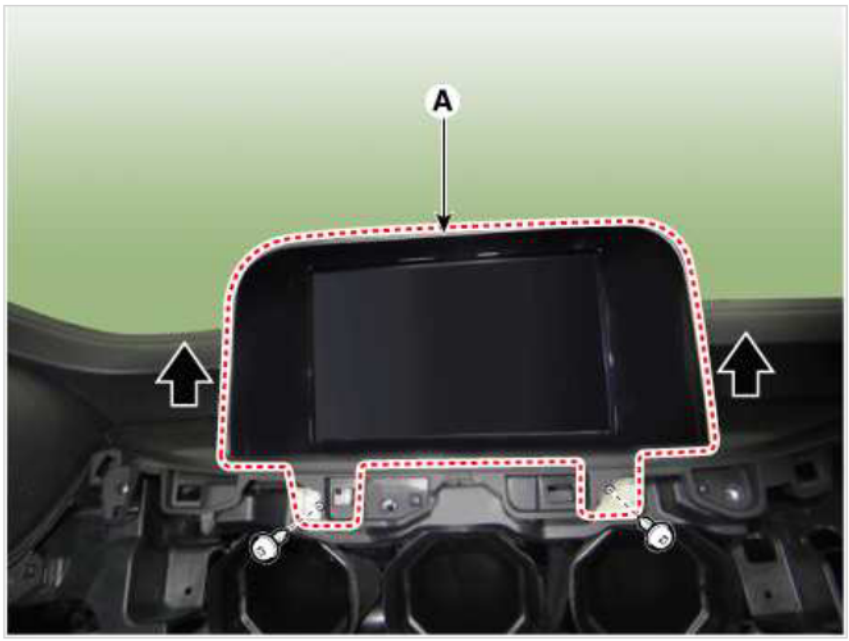
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Removal

⚠ CAUTION

- When removing with a flat-tip screwdriver or remover, wrap protective tape around the tools to prevent damage to components.
- When removing the interior trim pieces, use a plastic panel removal tool not to damage the surface.
- Be careful to store and handle the crash pad when removing/installing because lubricant and oil can leave a stain on the trim.

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad passenger side panel.
   (Refer to Body - "Crash Pad Center Panel")
3. Remove the audio front monitor (A) after loosening the mounting screws.



4. Disconnect the audio front monitor connectors (A).



Installation

1. Connect the audio front monitor connectors.
2. Install the audio front monitor.

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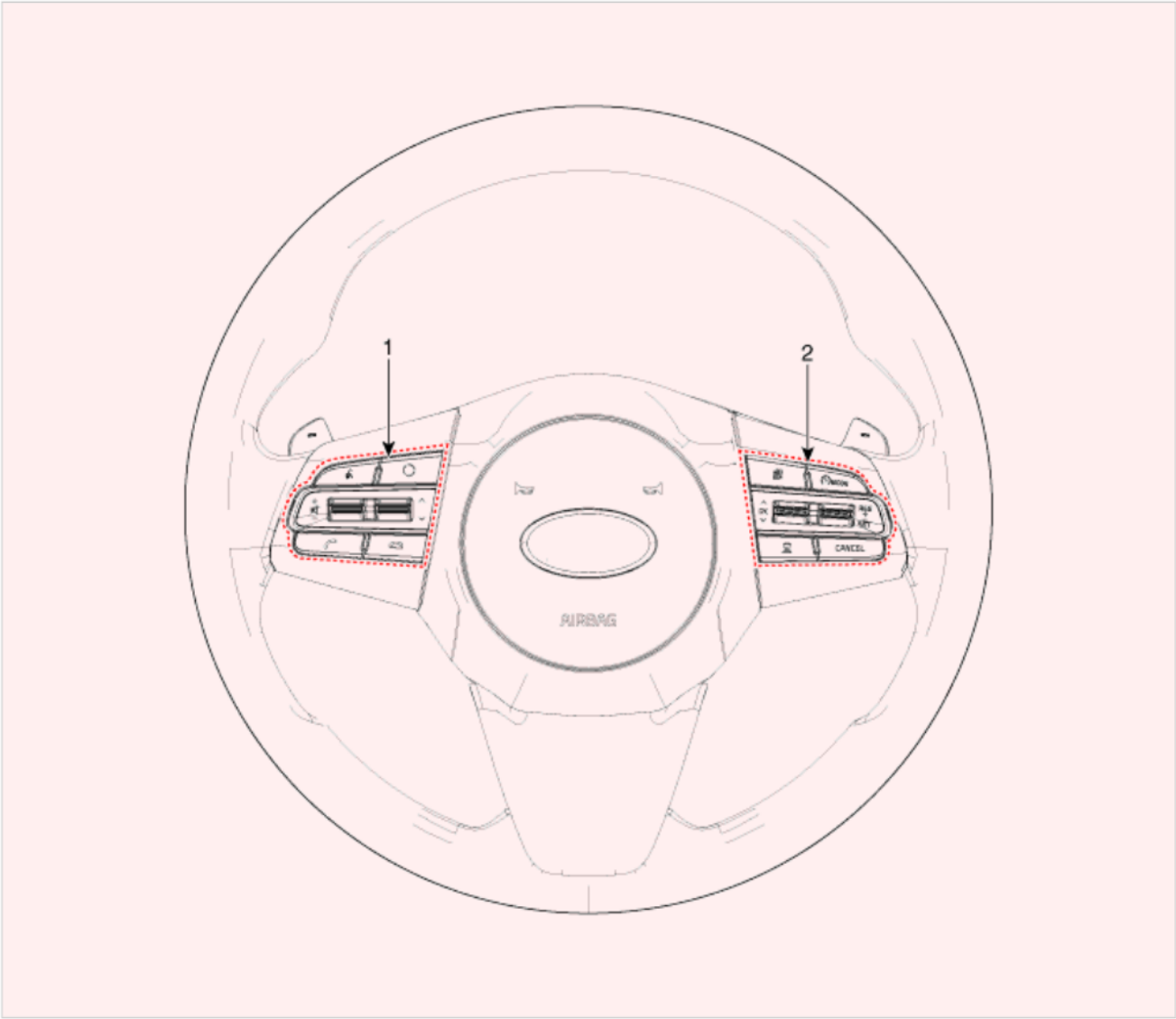
3. Install the crash pad passenger side panel.
4. Connect the negative (-) battery terminal.

NOTICE

- Make sure that the connectors are connected properly.
- Check the audio system.

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Components



1. Left Remote Control Switch
(Audio + Bluetooth + Voice)

2. Right Remote Control Switch
(Trip Computer + ACC + SCC)

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Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the steering wheel assembly.
   (Refer to Steering System - "Steering Wheel")
3. Remove the paddle shift switch (A) after loosening the mounting screws.

[LH]





[RH]

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4. Disconnect the paddle shift switch connector (A).

[LH]

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[RH]



5. Remove the steering front cover (A) after loosening the mounting screws.

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6. Remove the steering rear cover (A) after loosening the mounting screws.



7. Remove the steering back cover (A) after loosening the mounting screws.

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8. Disconnect the steering wheel remote control connector (A).

[LH]



[RH]

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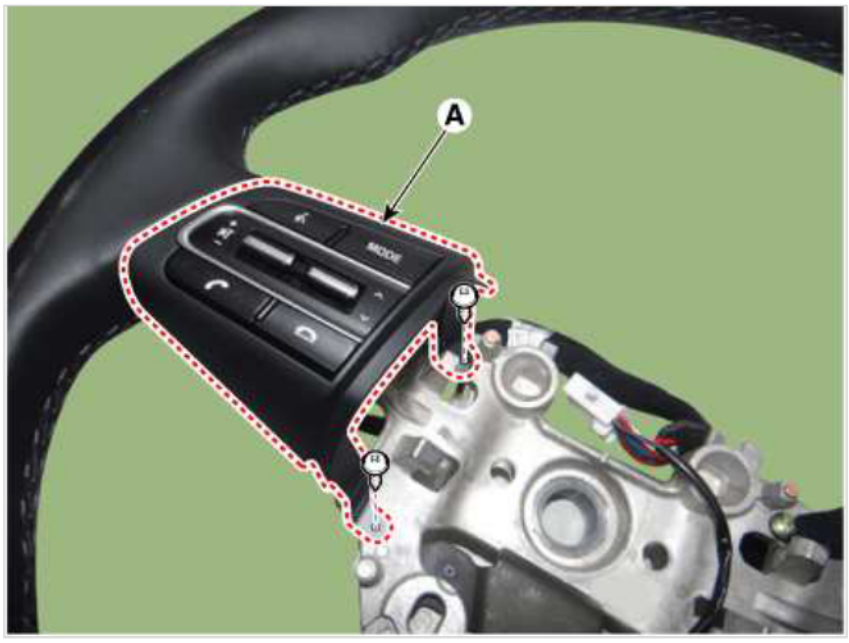


9. Remove the steering wheel remote control (A) after loosening the mounting screws.

[LH]



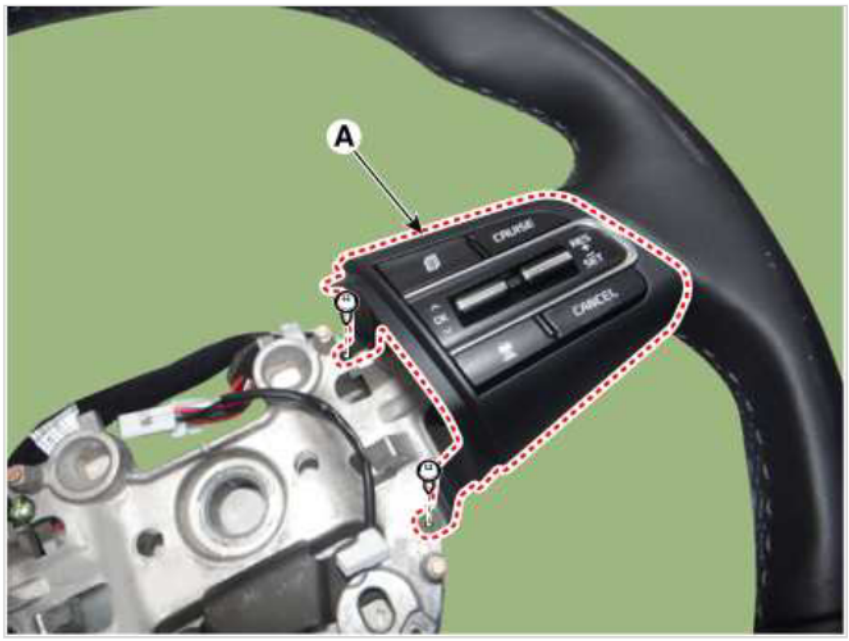
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[RH]



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Installation

1. Install the steering wheel remote control.
2. Connect the steering remote control connector.
3. Install the steering back cover.
4. Install the steering rear cover.
5. Install the steering front cover.
6. Connect the paddle shift switch connector.
7. Install the paddle shift switch.
8. Install the steering wheel assembly.
9. Connect the negative (-) battery terminal.

Inspection

1. Check for resistance between terminals in each switch position (LH).

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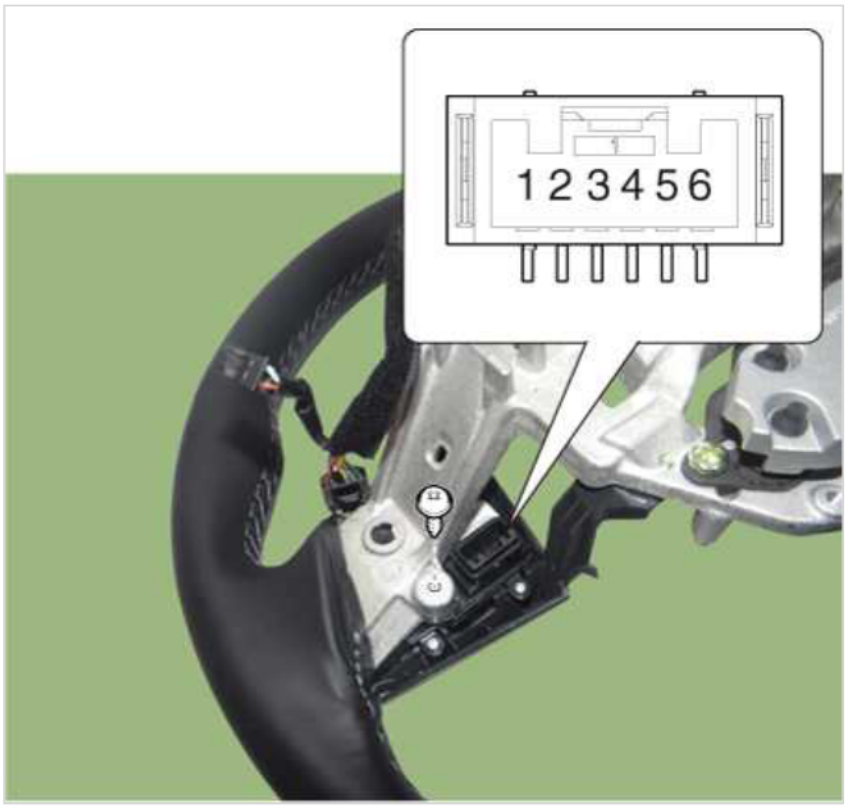


[LH : Audio + Bluetooth + Voice]

Switch	Connector terminal	Resistance (±3%)
SEEK Up	1-6	430 Ω
SEEK Down		1.11 kΩ
MODE		2.11 kΩ
MUTE		3.11 kΩ
Volume (+)		4.61 kΩ
Volume (-)		6.81 kΩ
Voice		10.71 kΩ
END		18.91 kΩ
SEND		40.91 kΩ

2. Check for resistance between terminals in each switch position (RH).

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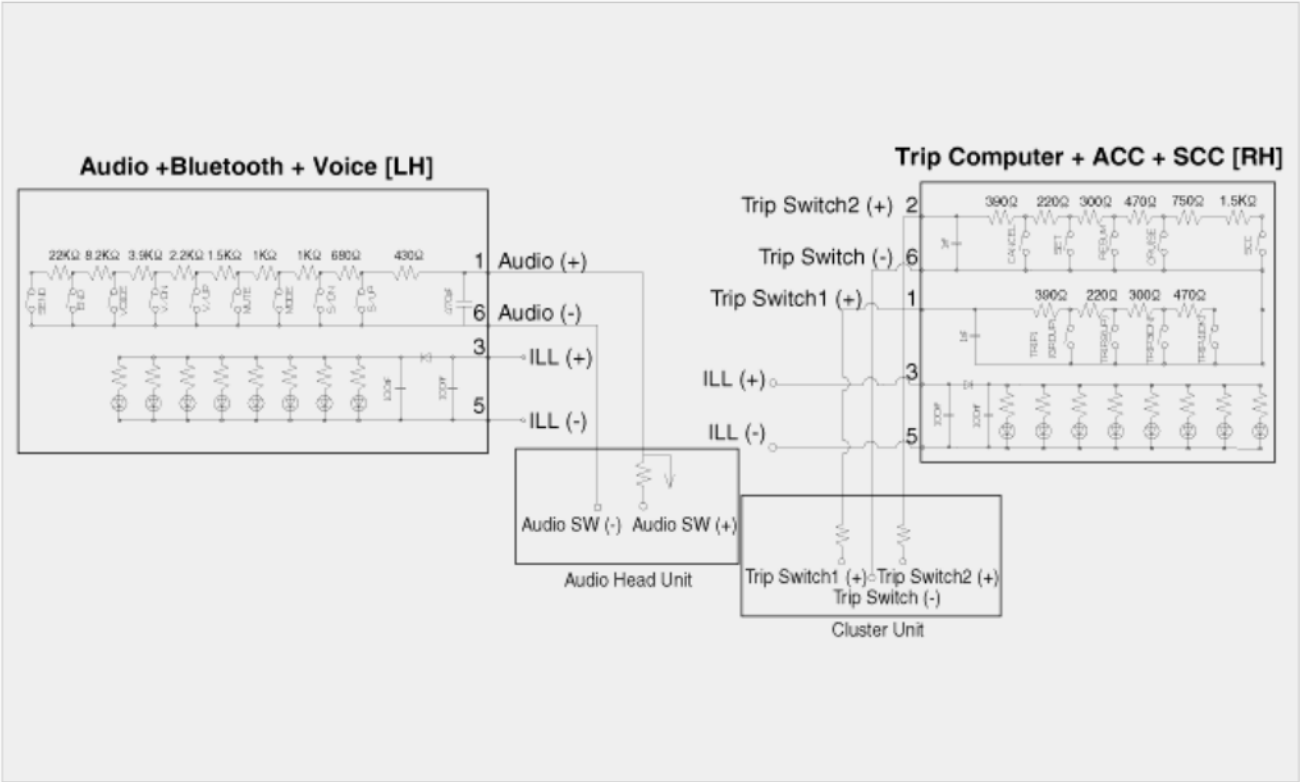


[RH : Trip + ACC + SCC]

Switch	Connector terminal	Resistance (±3%)
Cancel	2-6	390 Ω
SET -		610 Ω
RES +		910 Ω
Cruise ON/OFF		1.38 kΩ
Cruise & Speed Limit ON/OFF		2.13 kΩ
SCC (Following distance control)		3.63 kΩ
Group	1-6	390 Ω
Trip Up		610 Ω
Trip Down		910 Ω
ENTER		1.38 kΩ

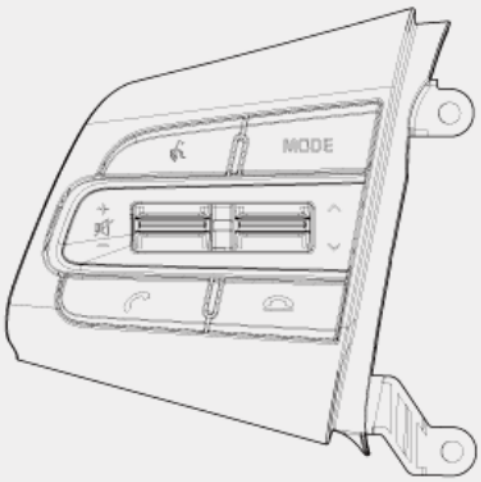
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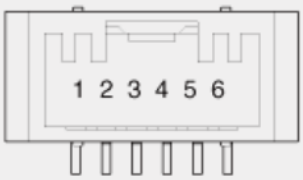
Circuit Diagram



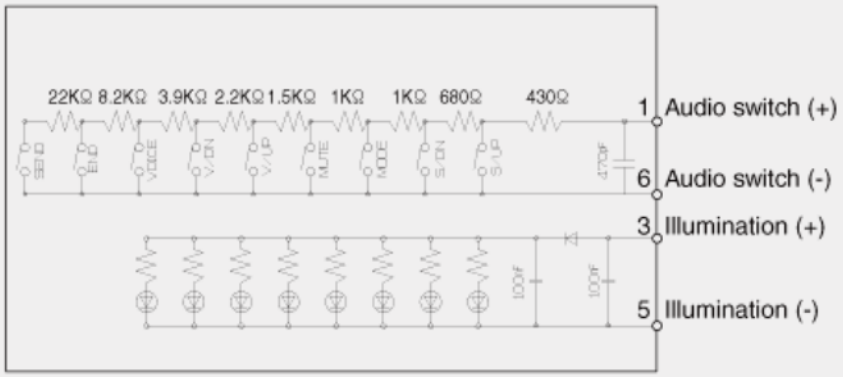
[Audio + Bluetooth + Voice]

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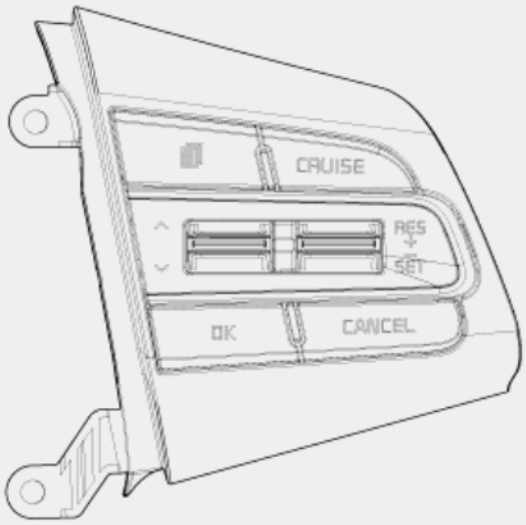
Connector


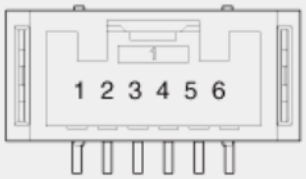
No.	Description
1	Audio switch (+)
2	-
3	Illumination (+)
4	-
5	Illumination (-)
6	Audio switch (-)

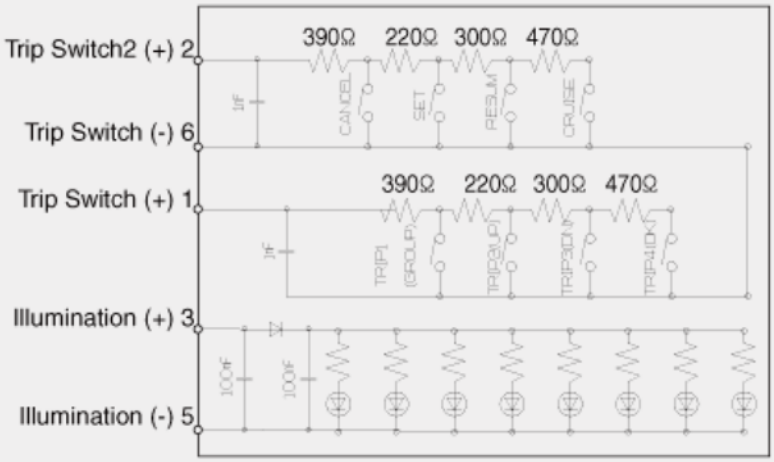


[Trip + ACC]

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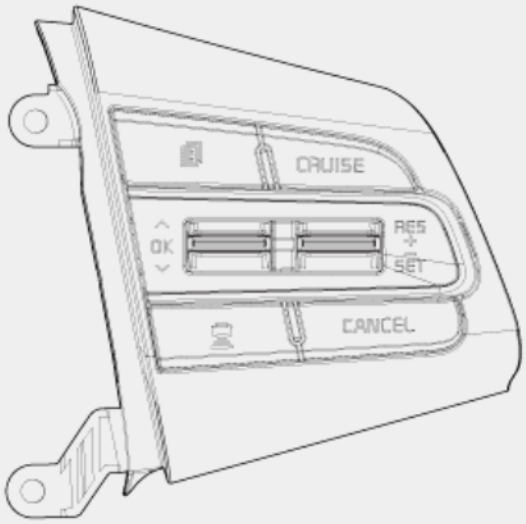


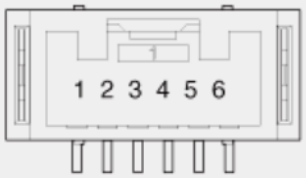
Connector	
	
No.	**Description**
1	Trip switch (+)
2	Trip switch2 (+)
3	Illumination (+)
4	-
5	Illumination (-)
6	Trip switch (-)

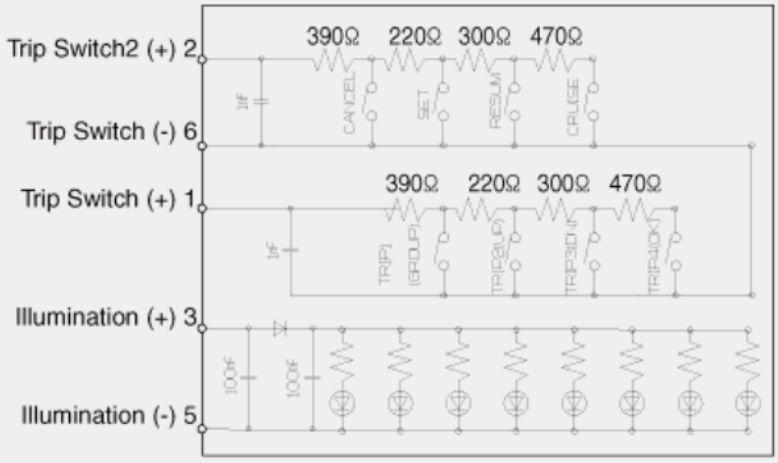


[Trip + ACC + SCC]

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Connector	
	
No.	**Description**
1	Trip switch (+)
2	Trip switch2 (+)
3	Illumination (+)
4	-
5	Illumination (-)
6	Trip switch (-)



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Components

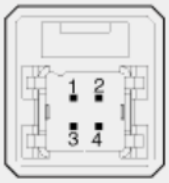
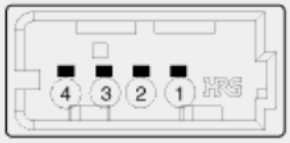
Click to see large image...

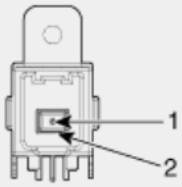
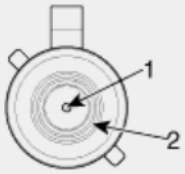
Connector Pin Information

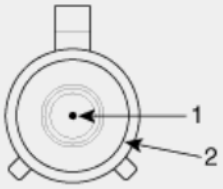
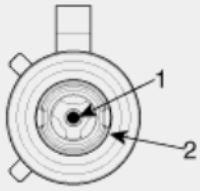
No.	Connector A	Connector B	Connector C	Connector D
1	Rear door left speaker (+)	-	-	Ground
2	Rear door left speaker (-)	MIC (+)	-	-
3	-	-	-	Hazard switch input
4	-	-	-	Passienger seat belt reminder
5	-	Antenna power	-	-
6	RVM Camera : power SVM Camera : -	Illumination (+)	-	PAB Off
7	RVM Camera : Video SVM Camera : Video (Y)	Multmedia-CAN (High)	-	IGN1
8	RVM Camera : - SVM Camera : Video (C)	Monitor keyboard_Enable	-	PAB On
9	-	-	-	Rear left seat belt reminder
10	AUX Right input	Battery (+)	-	Rear center seat belt reminder
11	AUX Detect	Battery (+)	-	Rear right seat belt reminder
12	Steering wheel remote controller	Ground	-	Hazard switch output
13	Front door left speaker (+)	Ground	-	
14	Front door left speaker (-)	Mic Ground	-	
15	Front door right speaker (-)	MIC (-)	-	
16	Front door right speaker (+)	RVM Camera : - SVM Camera : Detect	-	
17	-	-	-	
18	-	-	-	
19	-	Illumination (-)	-	
20	RVM Camera : Power ground SVM Camera : -	Multmedia-CAN (Low)	- -	
21	RVM Camera : Video ground SVM Camera : Video (Y) ground	Display_Mute	- -	
22	RVM Camera : - SVM Camera : Video (C) ground	ACC	- -	
23	-	-	-	
24	AUX Left input	LCD Battery	-	
25	AUX Ground	-	-	
26	Steering wheel remote controller (Ground)	-	-	
27	Rear door right speaker (-)	-	-	
28	Rear door right speaker (+)	-	-	
29	-	-	-	
30	-	-	-	
31	-	-	-	
32	RVM Camera : -	-	-	

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	SVM Camera : Detect		-	
33	RVM Camera : -	IGN1	-	
	SVM Camera : Video (Y) shield		-	
34	RVM Camera : -	-	-	
	SVM Camera : Video (C) shield		-	
35	-	LCD Ground	-	
36	-		-	
37	-		-	
38	Vehicle Speed		-	

View		
NO.	**LVDS Connector**	**USB Connector**
1	Monitor LVDS_(Low)	USB Ground
2	Monitor touch_Interrupt	USB Data (+)
3	Monitor LVDS_(High)	USB Data (-)
4	Monitor touch_Enable	USB_VCC

View		
NO.	**Radio antenna**	**GPS Antenna**
1	AM/FM	GPS
2	Ground	Ground

View		
NO.	**SXM Antenna**	**Modem antenna**
1	Siganl	Signal
2	Ground	Ground

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Removal

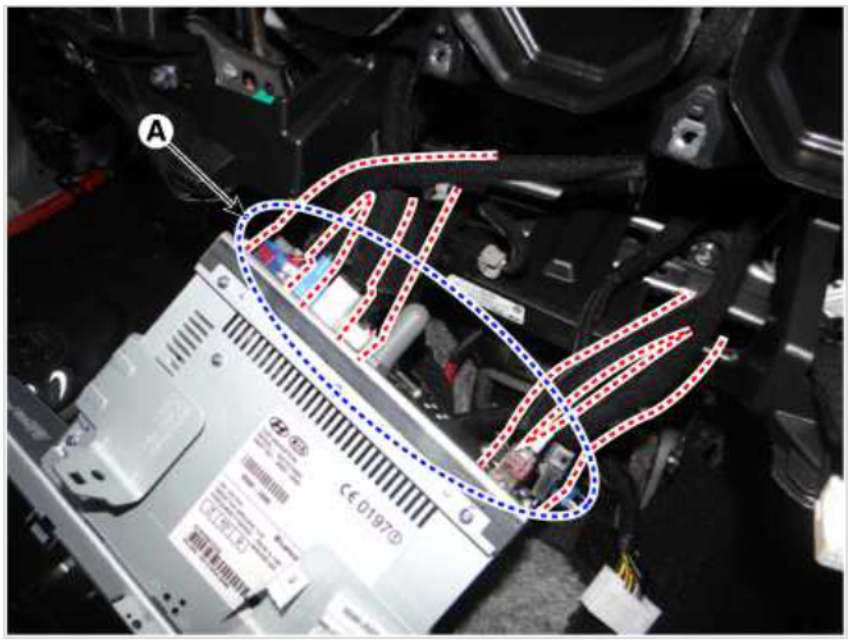
⚠ CAUTION

- When removing with a flat-tip screwdriver or remover, wrap protective tape around the tools to prevent damage to components.
- When removing the interior trim pieces, use a plastic panel removal tool not to damage the surface.
- Be careful to store and handle the crash pad when removing/installing because lubricant and oil can leave a stain on the trim.

1. Disconnect the negative (-) battery terminal.
2. Remove the heater and air conditioner control unit.
   (Refer to Heating, Ventilation and Air Conditioning - "Heater & A/C Control Unit (DATC)")
3. Remove the crash pad passenger side panel.
   (Refer to Body - "Crash Pad Center Panel")
4. Remove the audio head unit (A) after loosening the mounting screws.



5. Remove the audio head unit after disconnecting the connectors and antenna cable (A).



Installation

1. Connect the audio unit connectors and antenna cable.

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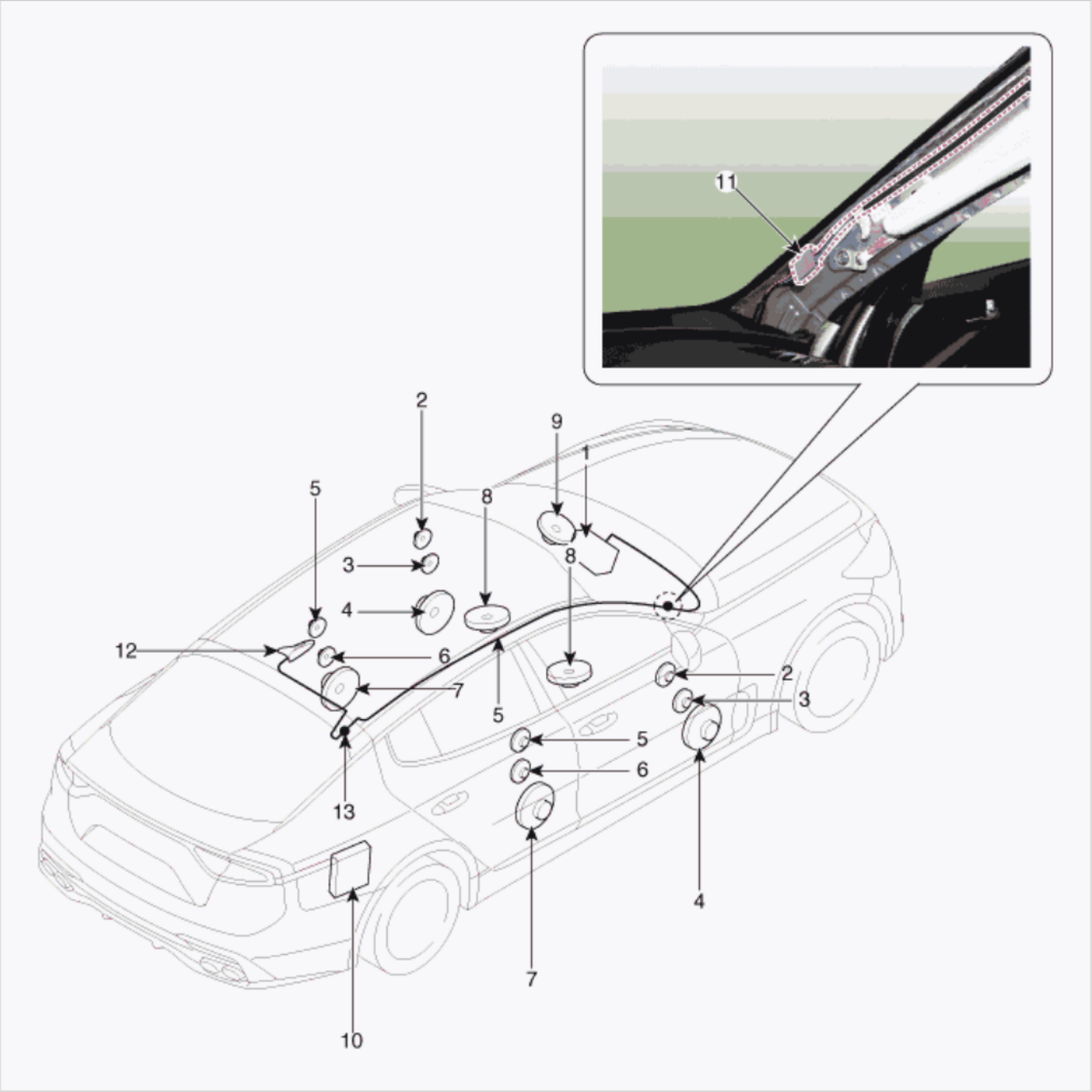
2. Install the audio head unit.
3. Install the crash pad passenger side panel.
4. Install the heater and air conditioner control unit.
5. Connect the negative (-) battery terminal.

NOTICE

- Make sure the connector are connected in properly.
- Check the audio system.

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Component Location

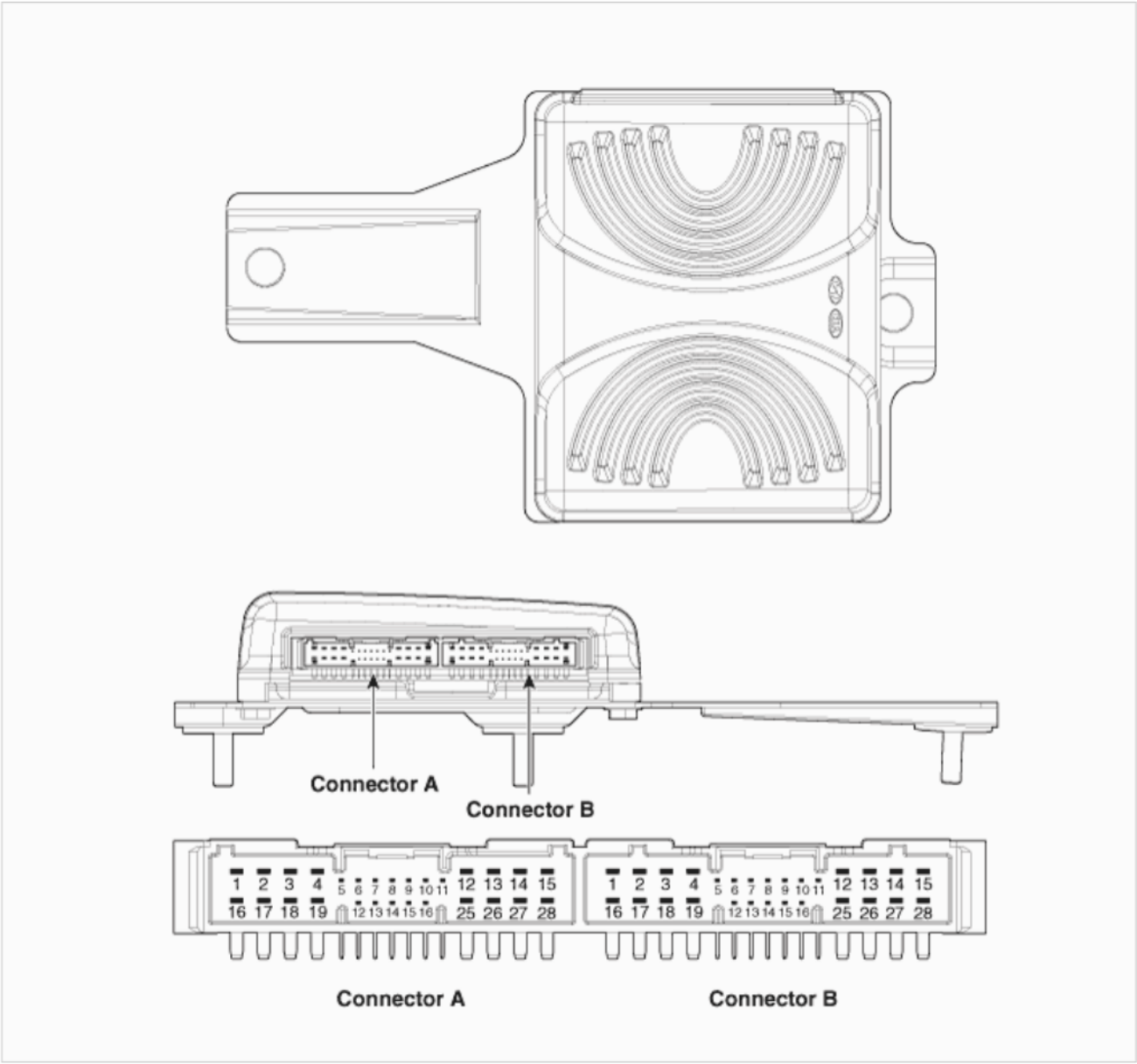


1. Audio unit
2. Front tweeter speaker
3. Front mid range speaker
4. Front door speaker
5. Rear tweeter speaker
6. Rear mid range speaker
7. Rear door speaker
8. Sub woofer speaker
9. Crash pad center speaker
10. External amplifier
11. Antenna feeder cable
12. Roof antenna (AM/FM)
13. Extension Connetor

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Components

[Mobis]



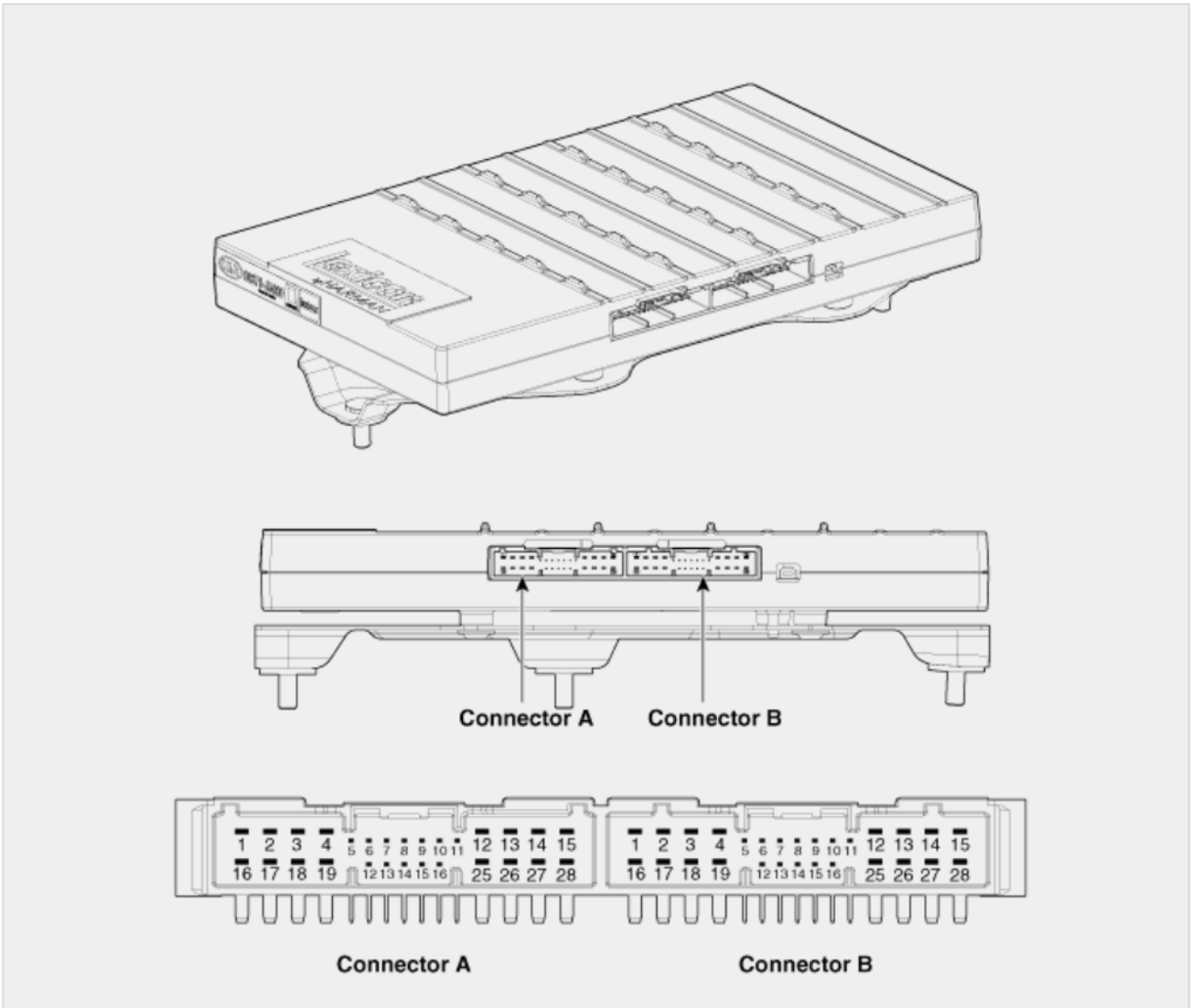
Connector Pin Information

No.	Connector A	Connector B
1	Battery (+)	Rear door left speaker (+)
2	Battery (+)	Rear door left speaker (-)
3	Battery (+)	Rear door right speaker (+)
4	Battery (+)	Rear door right speaker (-)
5	-	-
6	Multimedia-CAN (High)	-
7	Multimedia-CAN (Low)	-
8	ACC	-
9	Navigation voice (+)	-
10	-	-
11	-	-

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12	Front door left speaker (+)	-
13	Front door left speaker (-)	-
14	Front door left speaker (+)	-
15	Front door left speaker (-)	-
16	Ground	Sub woofer speaker 1 (+)
17	Ground	Sub woofer speaker 1 (-)
18	Ground	Sub woofer speaker 2 (+)
19	Ground	Sub woofer speaker 2 (-)
20	SPDIF (+)	-
21	SPDIF (-)	-
22	SPDIF (Ground)	-
23	Navigation voice (-)	-
24	IGN1	-
25	Crash pad center speaker (+)	-
26	Crash pad center speaker (-)	-
27	-	-
28	-	-

[Harman]



No.	Connector A	Connector B

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1	Battery (+)	Subwoofer speaker 2 (+)
2	Battery (+)	Subwoofer speaker 1 (+)
3	Battery (+)	Front door right speaker (+)
4	Battery (+)	Front door left speaker (+)
5	-	-
6	Multimedia-CAN (High)	-
7	Multimedia-CAN (Low)	-
8	ACC	-
9	Amplifier navigation voice (+)	-
10	-	-
11	-	-
12	-	Rear door right speaker (+)
13	Front door center speaker (+)	Rear door left speaker (+)
14	Front door right tweeter speaker (+)	Surround right speaker (+)
15	Front door left tweeter speaker (+)	Surround left speaker (+)
16	Ground	Subwoofer speaker 2 (-)
17	Ground	Subwoofer speaker 1 (-)
18	Ground	Front door right speaker (-)
19	Ground	Front door left speaker (-)
20	Amplifier SPDIF (High)	-
21	Amplifier SPDIF (Low)	-
22	Amplifier SPDIF (Ground)	-
23	Amplifier navigation voice (-)	-
24	IGN1	-
25	-	Rear door right speaker (-)
26	Front door center speaker (-)	Rear door left speaker (-)
27	Front door right tweeter speaker (-)	Surround right speaker (-)
28	Front door left tweeter speaker (-)	Surround left speaker (-)

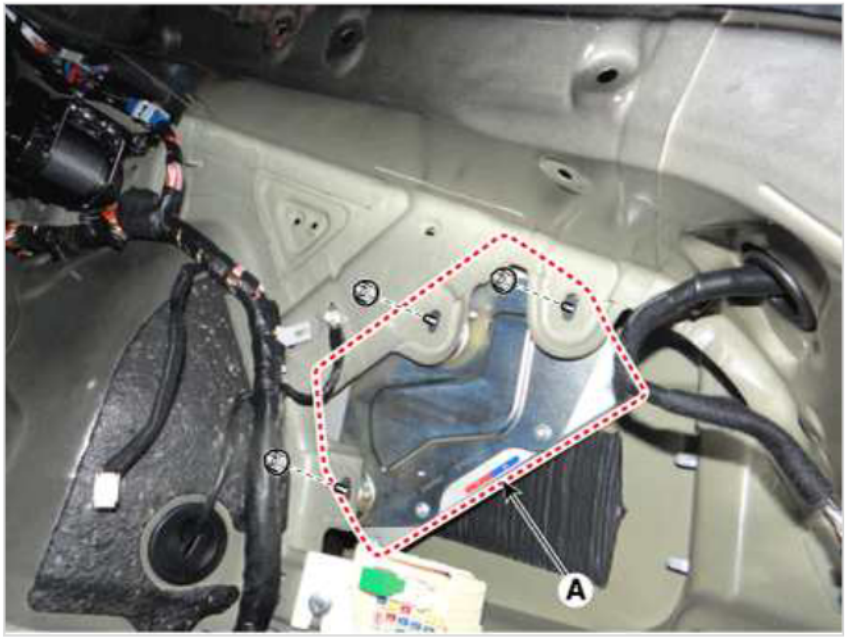
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Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the luggage side trim [RH].
   (Refer to Body - "Luggage Side Trim")
3. Disconnect the external amplifier connectors (A).



4. Remove the external amplifier (A) after loosening the mounting nuts.



Installation

1. Install the external amplifier after connecting the connectors.
2. Install the luggage side trim [RH].
3. Connect the negative (-) battery terminal.

NOTICE

- Make sure that the external amplifier connectors are plugged in properly.
- Check the AVN system for normal operation.

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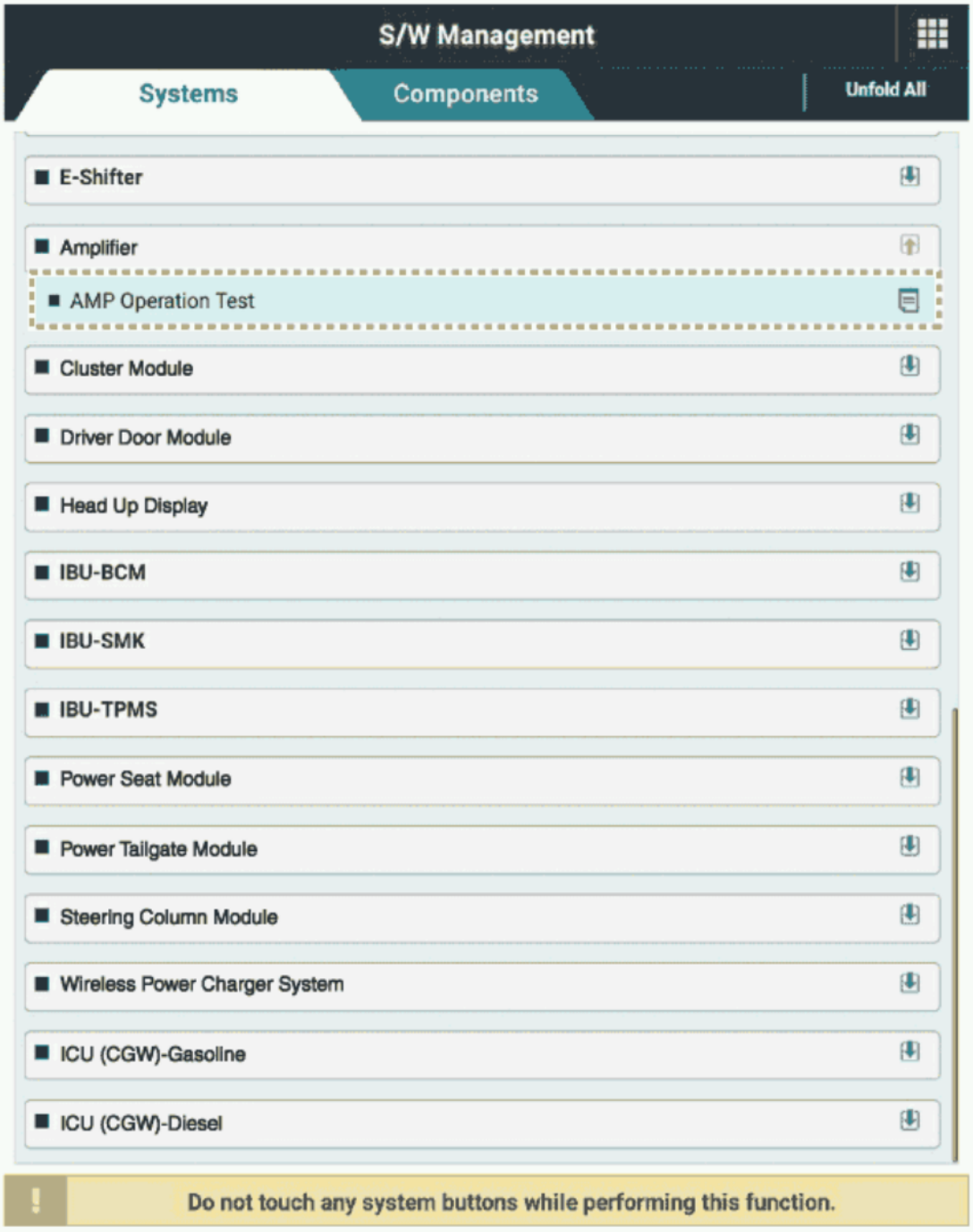
Inspection

NOTICE

- Warning and guide sounds regarding engine start and driving are generated by the external amplifier. Please refer to the following: (Instrument Cluster and Gauge - Refer to "Instrument Cluster")
- When the external amplifier or speakers are replaced with other products, a failure may occur in the amplifier and warning and guide sounds. (excluding the ETCS guide sound) may not be generated.
- Virtual engine sound inside the vehicle (occurs in Sport mode) is generated by the external amplifier. Therefore, if the external amplifier or speakers are replaced with other products, a failure may occur in the amplifier and virtual engine sound may not be generated properly.

1. In the body electrical system, failure can be quickly diagnosed by using the vehicle diagnostic system (KDS).
   The diagnostic system (KDS) provides the following information.
   (1) Self diagnosis : Checking failure and code number (DCT).
   (2) Current data : Checking the system input/output data state.
   (3) Actuation test : Checking the system operation condition.
   (4) Additional function : Controlling other features including system option setting and zero point adjustment.
2. Select the "Car model" and the system to be checked in order to check the vehicle with the tester.
3. Select the "Amplifier" to check the Audio.
4. Select the "Current data" menu to search the current state of the input/output data.
   The input/output data for the sensors corresponding to the Audio can be checked.

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S/W Management

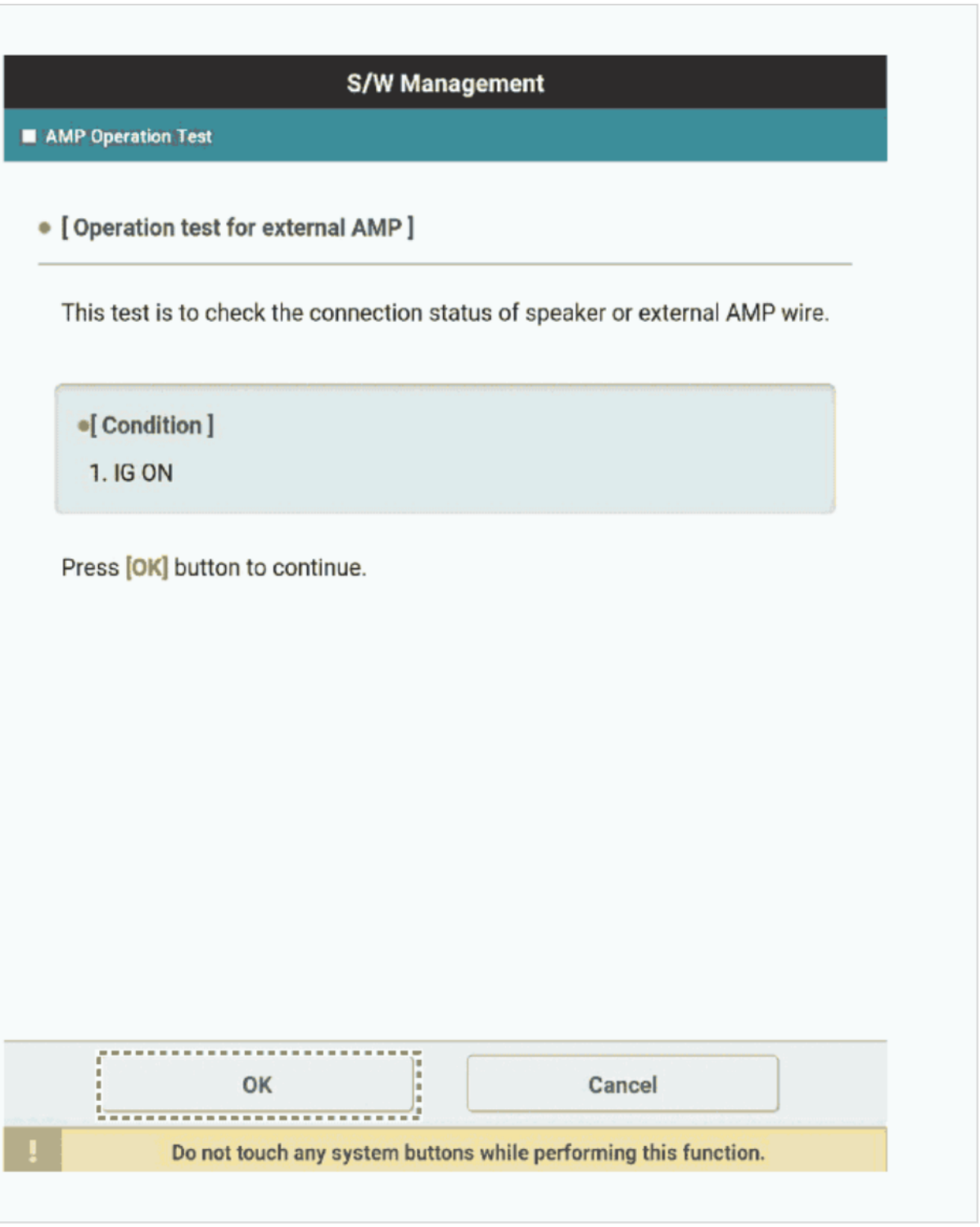
• **AMP Operation Test**

Purpose	To check the connection status of speaker or external AMP wire.
Enable Condition	1. Engine Off 2. Ignition Switch On
Concerned Component	Speaker, Amp
Concerned DTC	-
Fail Safe	-
Etc	-

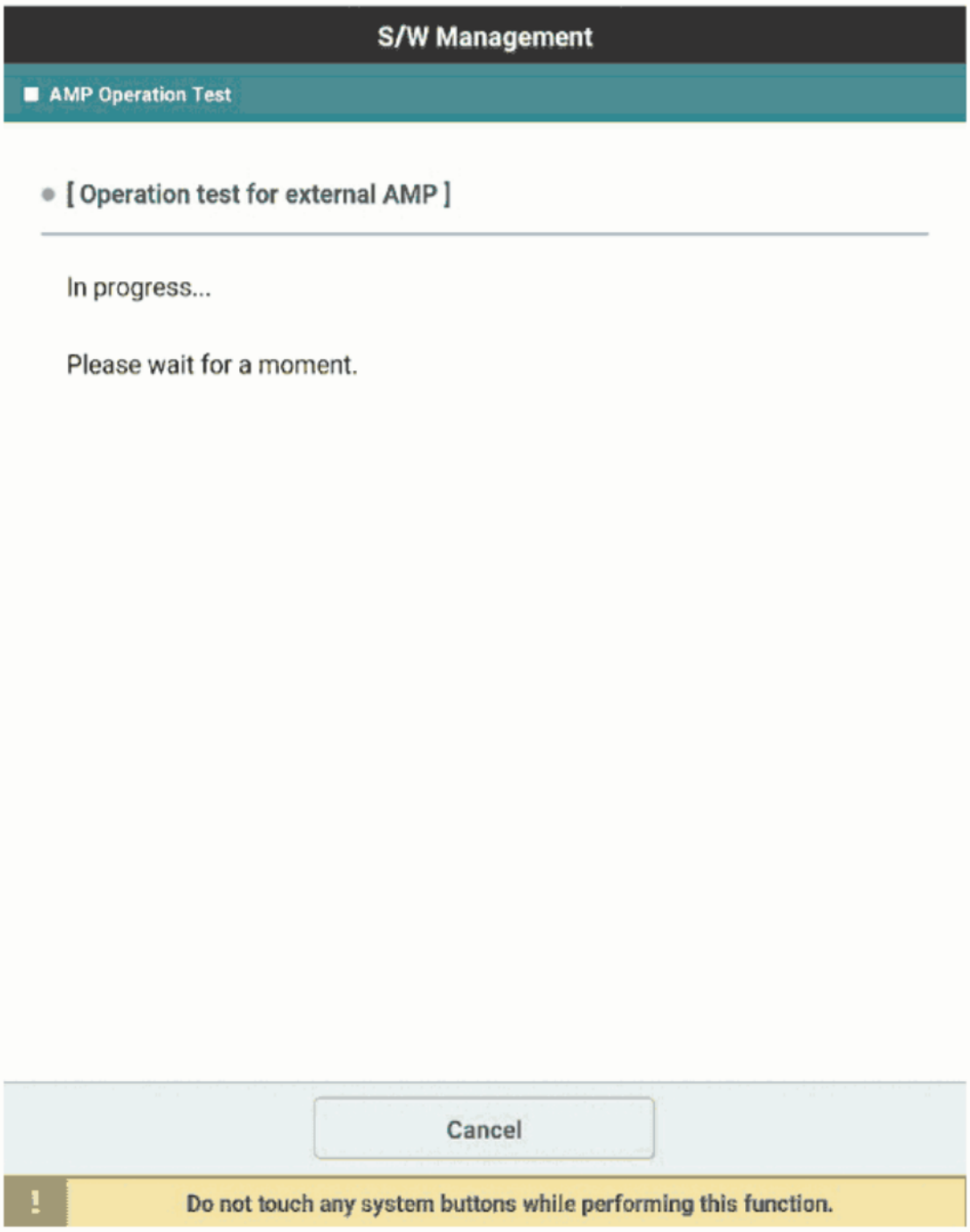
OK

! Do not touch any system buttons while performing this function.

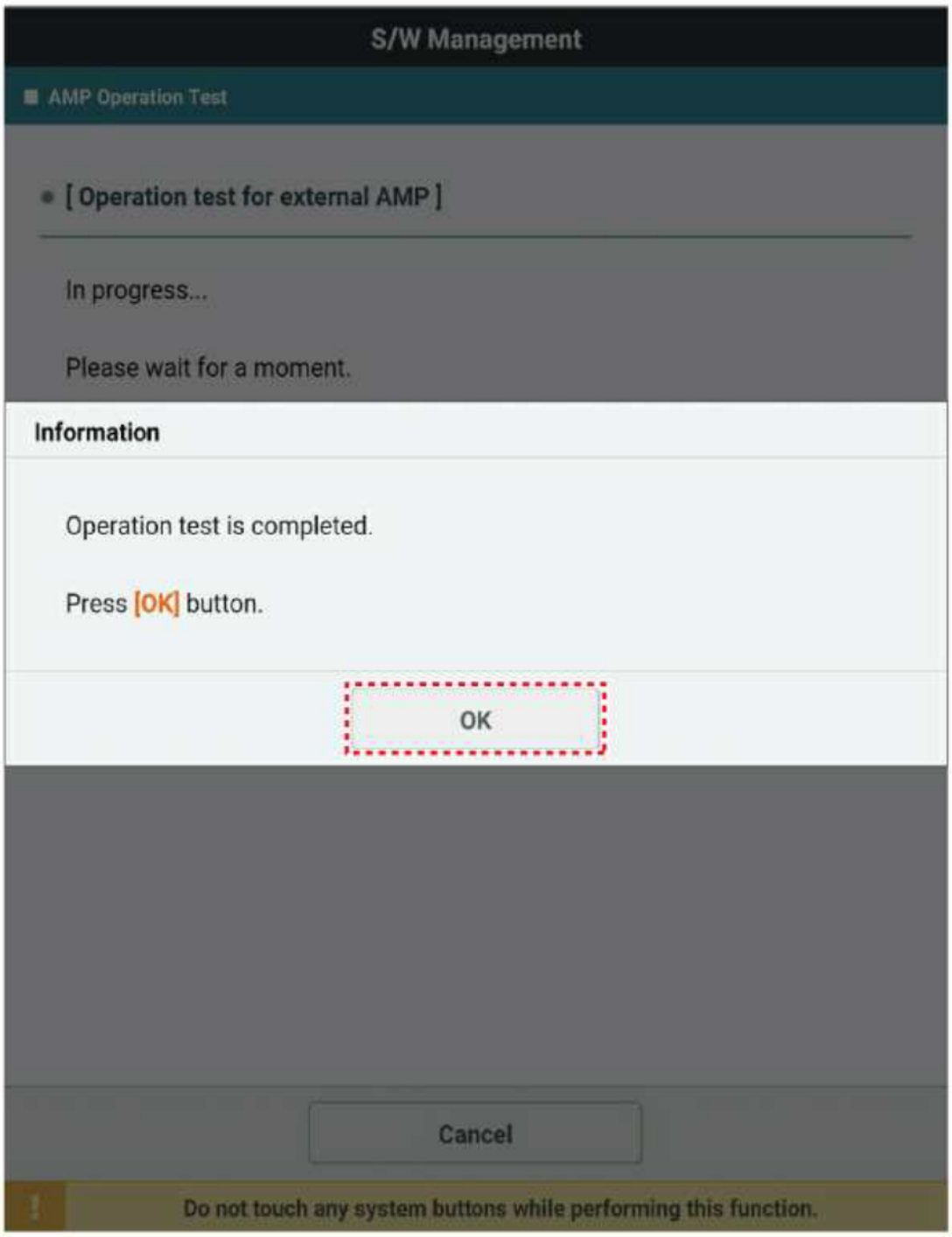
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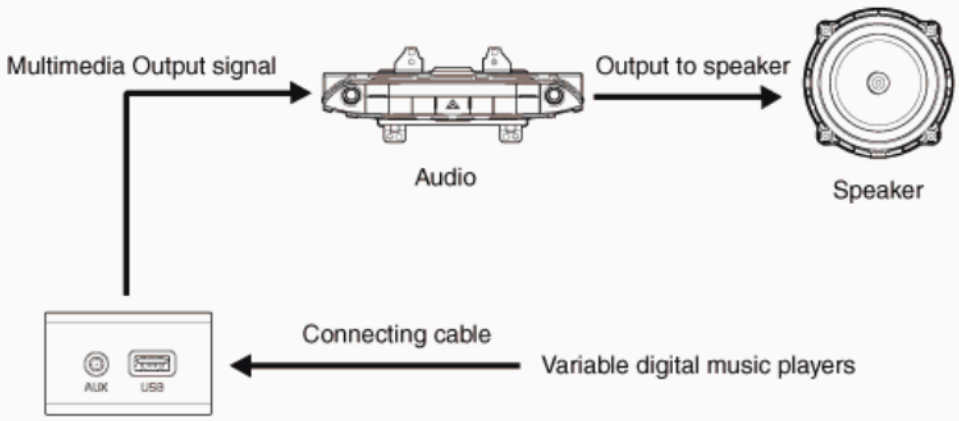


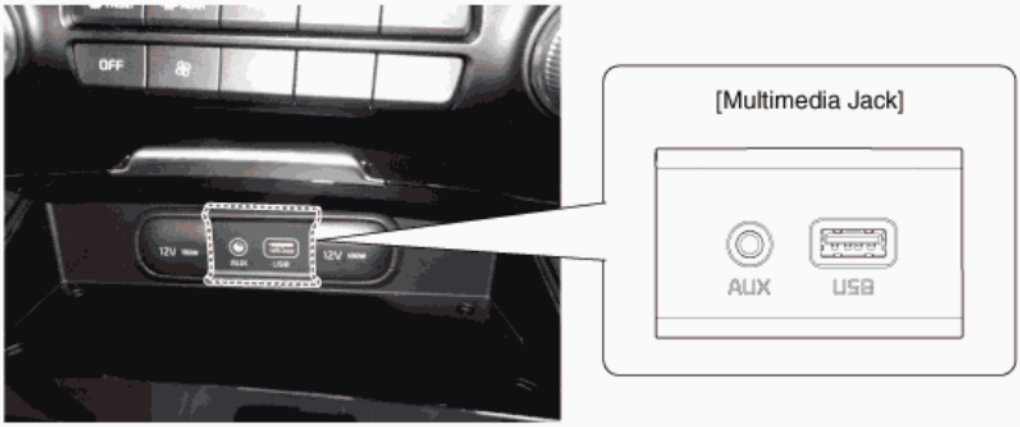
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Description

The multimedia jack on the console upper cover is for customers who like to listen to external portable music players like the MP3 etc., through the vehicle"s sound system when it is linked to this jack. The customer has this added option.

In case of distorted sound coming from the AUX-linked external music players, the audio unit may not be defective but the output level of the player does not match the specification of the AUX.





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Removal

Multimedia Jack

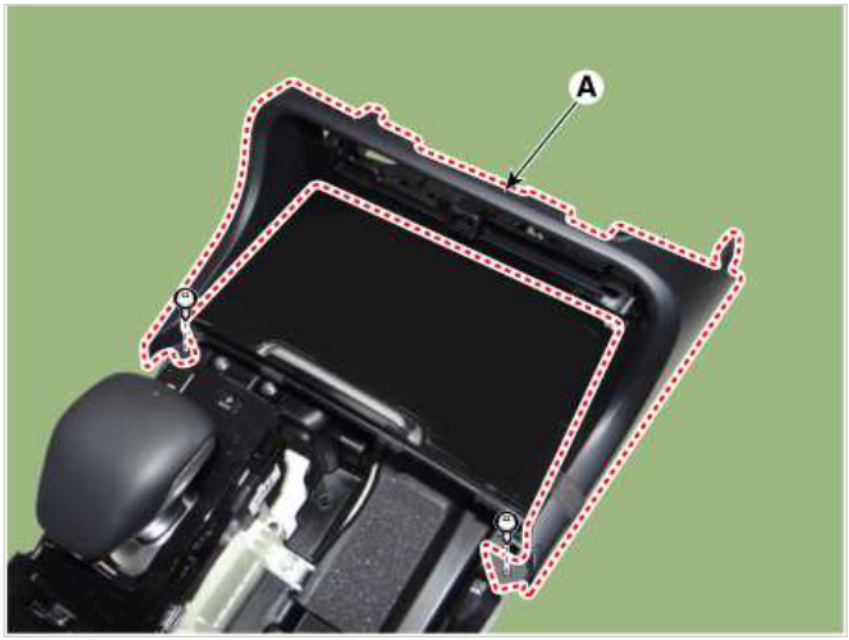
⚠ CAUTION

Put on gloves to protect your hands.

NOTICE

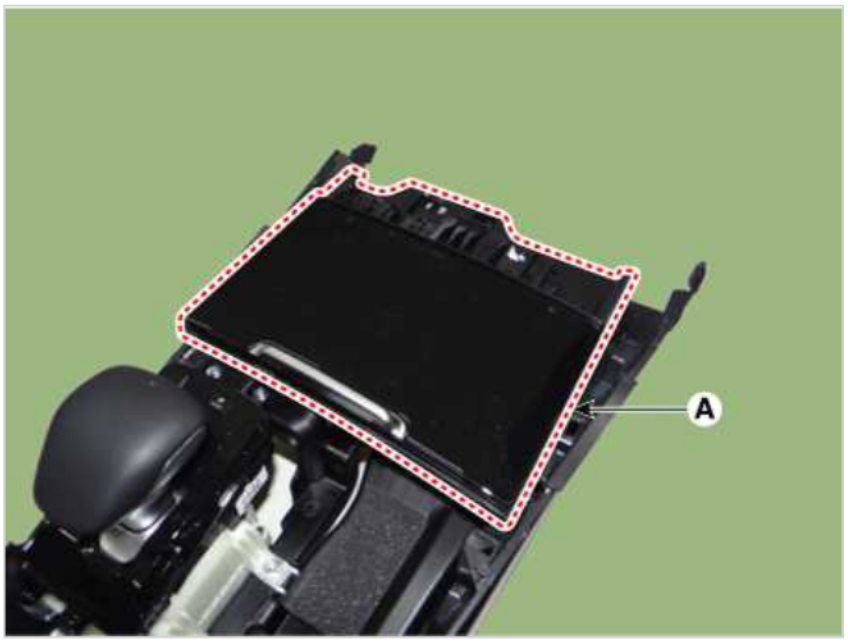
- When prying with a flat-tip screwdriver or use a prying trim tool, wrap it with protective tape, and apply protective tape around the related parts, to prevent damage.
- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Take care not to bend or scratch the trim and panels.

1. Disconnect the negative (-) battery terminal.
2. Remove the console complete assembly.
   (Refer to Body - "Floor Console Assembly")
3. Remove the front cover (A) after loosening the mounting screws.



4. Remove the floor console tray (A).

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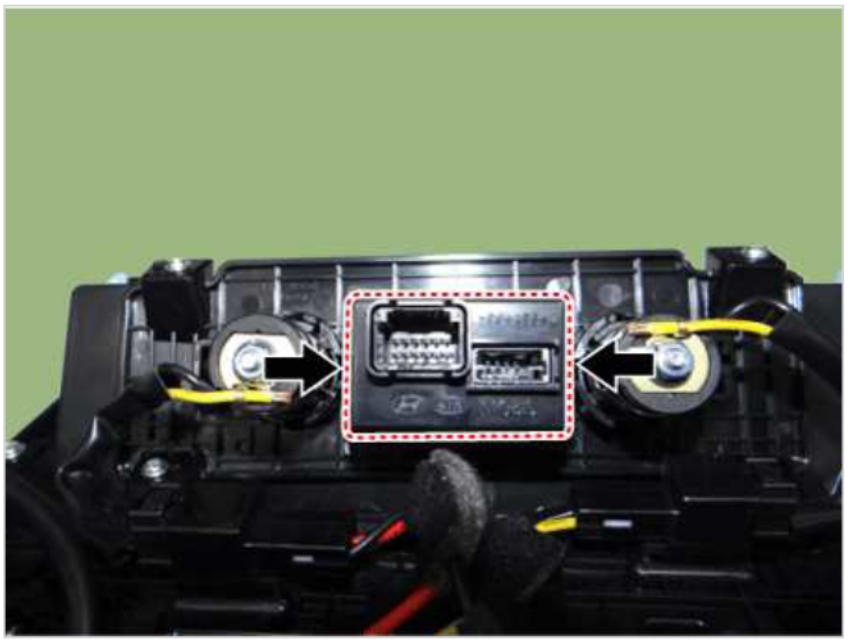


5. Disconnect the multimedia jack connectors (A).



6. Remove the multimedia jack (A) after releasing the fixed hooks.

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USB Charger

1. Disconnect the negative (-) battery terminal.
2. Remove the rear console cover.
   (Refer to Body - "Rear Console Cover")
3. Disconnect the USB charger connector (A).

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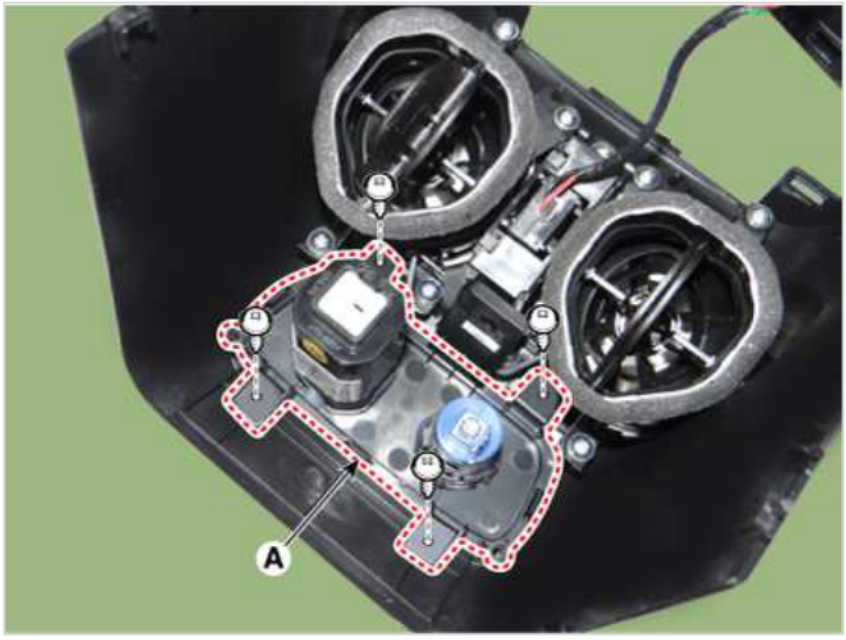


4. Disconnect the rear heater&A/C control unit connector (A).



5. Remove the USB charger (A) after loosening the mounting screws.

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Installation

Multimedia Jack

1. Install the multimedia jack.
2. Connect the multimedia jack connector.
3. Install the floor console tray.
4. Install the front cover.
5. Install the console complete assembly.
6. Connect the negative (-) battery terminal.

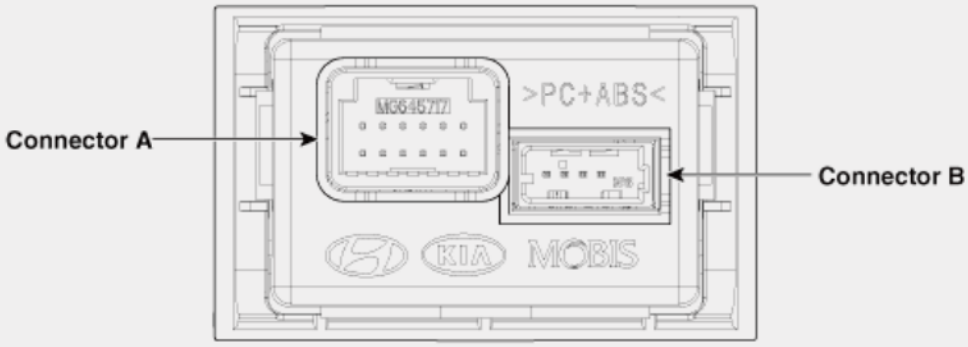
USB Charger

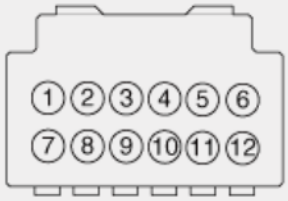
1. Install the USB charger.
2. Connect the rear heater&A/C control unit connector.
3. Connect the USB charger connector.
4. Install the rear console cover.
5. Connect the negative (-) battery terminal.

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Circuit Diagram





Connector A	No.	Description	No.	Description
	1	AUX_Input (Left)	7	AUX_Ground
	2	AUX_Input (Right)	8	-
	3	AUX_Detect	9	-
	4	Illumination (+)	10	-
	5	-	11	Ground
	6	Illumination (-)	12	-

Connector B	No.	Description
	1	USB VCC
	2	USB Data (Low)
	3	USB Data (High)
	4	USB

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Inspection

Troubleshooting of the speakers

⚠ CAUTION

When handling the speakers :

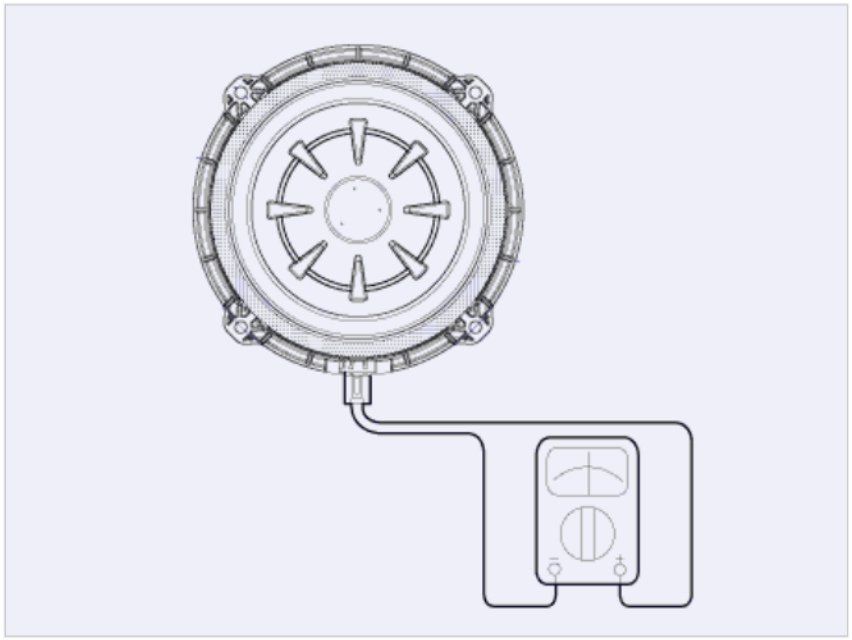
- Do not cause shock to the speakers by dropping or throwing them.
- Be careful not to drop water and oil on the speakers.
- Use caution to handle the speaker because diaphragm made of paper is easily torn by impact or external force.
- Audio system tuning may cause damage to the speakers. The modified speakers are not covered by the manufacturer's warranty.

1. Basic inspection
   Loosen the screws to rule out the interference from the body trims and surrounding parts and then remove the speaker.
   After removing the speaker, check the sound quality of the speaker with the connector plugged in.
2. Inspection for each cause
   (1) Abnormal vibration
   – Make sure the mounting screws are properly tightened before replacing the speaker.
   – Reinstall the speaker and check that the symptom is resolved.
   – If the symptom does not disappear, replace the speaker with a new one.

   (2) Noise
   – Check that the speaker connector is properly connected and reinstall the connector if necessary.
   – If noises occur in the radio mode, turn to the CD player mode.
   – If noises occur in both modes, replace the speaker with a new one.

   NOTICE
   If noises occur only in the radio mode, the poor radio reception is the cause so do not replace the speaker.

   (3) Poor working
   – Check the plus (+) and negative (-) speaker terminals using an ohmmeter.
   – If resistance is measured at the specified value shown below, the speaker operation is normal.
   – If the measured resistance is different from the specified value, replace the speaker.



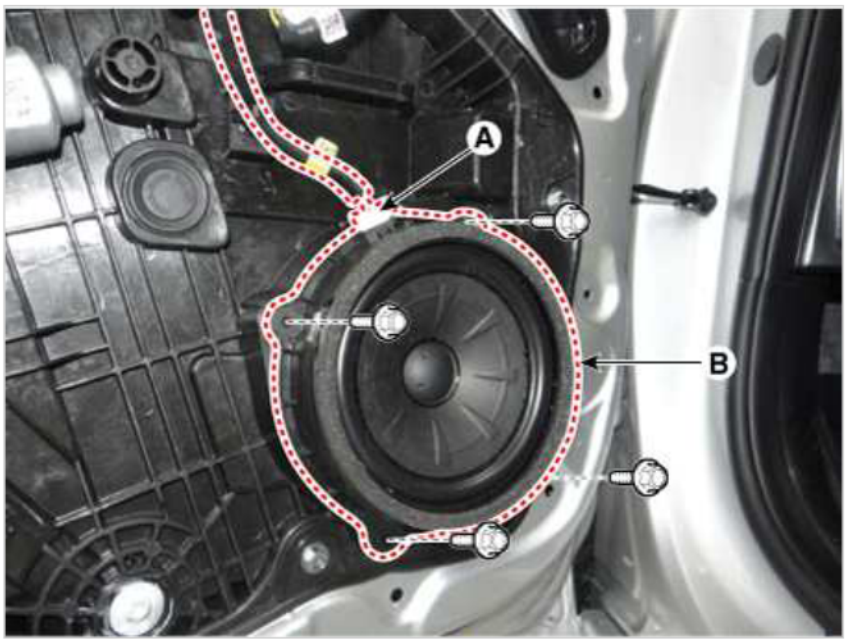
Removal

Front Door Speaker

1. Disconnect the negative (-) battery terminal.

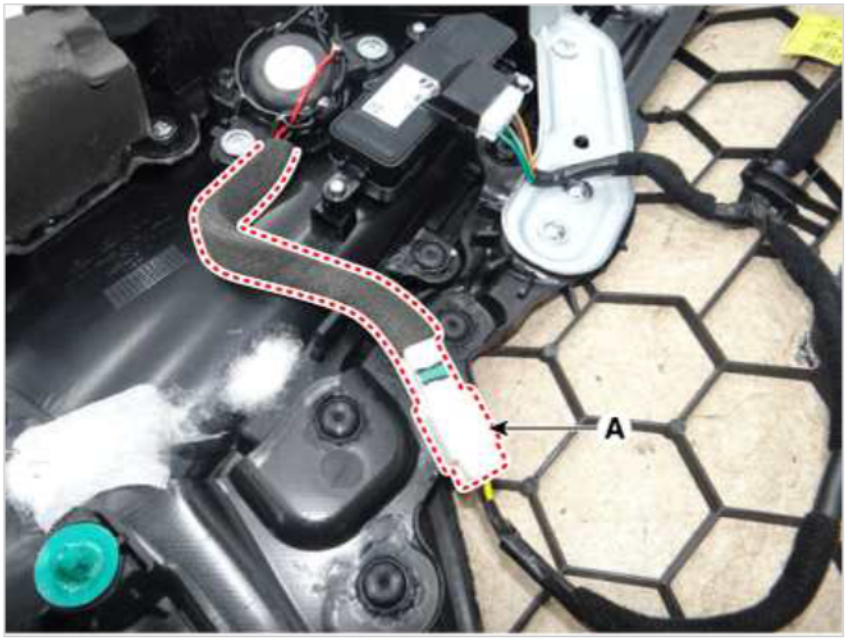
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2. Remove the front door trim.
   (Refer to Body - "Front Door Trim")
3. Remove the front door speaker (B) after disconnecting the connector (A) and loosening the bolts.



Front Tweeter Speaker

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim.
   (Refer to Body - "Front Door Trim")
3. Disconnect the front tweeter speaker connector (A).



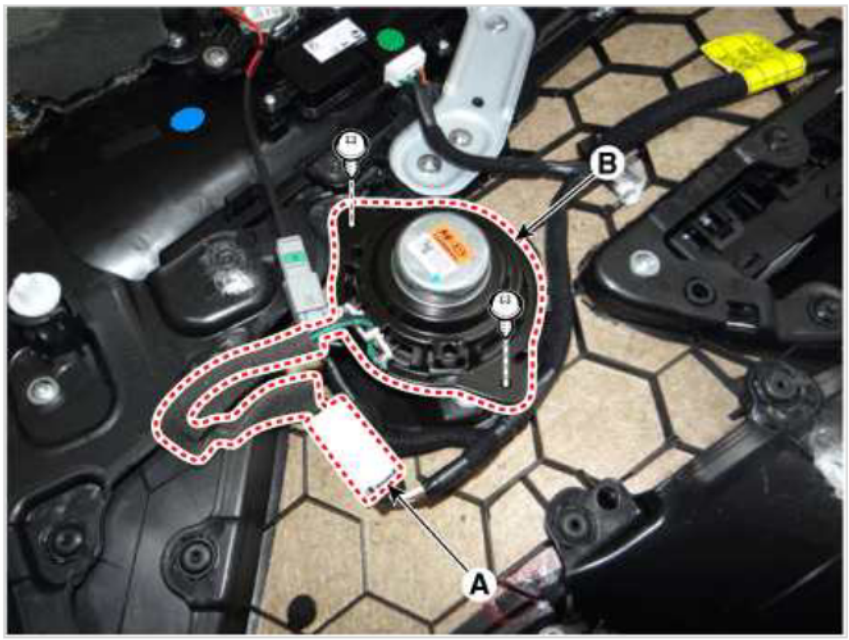
4. Remove the front tweeter speaker (A) after loosening the mounting screws.

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Front Midrange Speaker

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim.
   (Refer to Body - "Front Door Trim")
3. Remove the front midrange speaker (B) after disconnecting the connector (A) and loosening the mounting screws.



Rear Door Speaker

1. Disconnect the negative (-) battery terminal.
2. Remove the rear door trim.
   (Refer to Body - "Rear Door Trim")
3. Remove the rear door speaker (B) after disconnecting the connector (A) and loosening the mounting bolts.

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Rear Tweeter Speaker

1. Disconnect the negative (-) battery terminal.
2. Remove the rear door trim.
   (Refer to Body - "Rear Door Trim")
3. Remove the rear tweeter speaker (B) after disconnecting the connector (A) and loosening the mounting screws.



Rear Midrange Speaker

1. Disconnect the negative (-) battery terminal.
2. Remove the rear door trim.
   (Refer to Body - "Rear Door Trim")
3. Remove the rear midrange speaker (B) after disconnecting the connector (A) and loosening the mounting screws.

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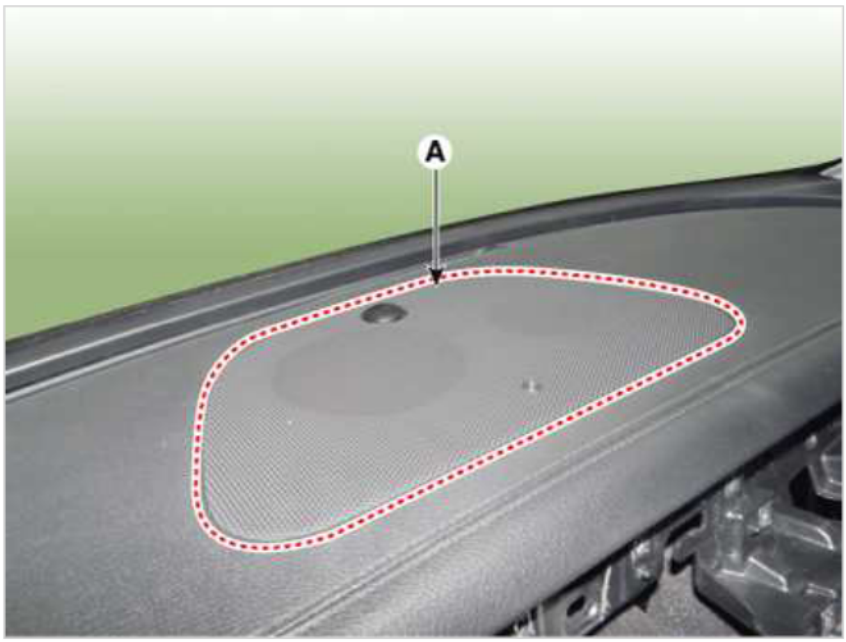


Crash Pad Center Speaker

NOTICE

Be careful not to scratch the crash pad and related parts

1. Disconnect the negative (-) battery terminal.
2. Using a scraper or remover, remove the crash pad center speaker grille (A).



3. Disconnect the security connector (A) and auto light & photo sensor connector (B).

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



5. Disconnect the crash pad center speaker connector (A).

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Sub Woofer Speaker

1. Disconnect the negative (-) battery terminal.
2. Remove the floor carpet.
   (Refer to Body - "Floor Carpet")
3. Remove the sub woofer speaker (B) after disconnecting the connector (A) and loosening the mounting bolts.



Installation

Front Door Speaker

1. Install the front door speaker.
2. Install the front door trim.
3. Connect the negative (-) battery terminal.

Front Tweeter Speaker

1. Install the front tweeter speaker.
2. Install the front door trim.

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3. Connect the negative (-) battery terminal.

Front Midrange Speaker

1. Install the front midrange speaker.
2. Install the front door trim.
3. Connect the negative (-) battery terminal.

Rear Door Speaker

1. Install the rear door speaker.
2. Install the rear door trim.
3. Connect the negative (-) battery terminal.

Rear Tweeter Speaker

1. Install the rear tweeter speaker.
2. Install the rear door trim.
3. Connect the negative (-) battery terminal.

Rear Midrange Speaker

1. Install the rear Midrange speaker.
2. Install the rear door trim.
3. Connect the negative (-) battery terminal.

Crash Pad Center Speaker

1. Install the crash pad center speaker.
2. Connect the security connector and auto light & photo sensor connector.
3. Install the crash pad center speaker grille.
4. Connect the negative (-) battery terminal.

Sub Woofer Speaker

1. Install the sub woofer speaker.
2. Install the floor carpet.
3. Connect the negative (-) battery terminal.

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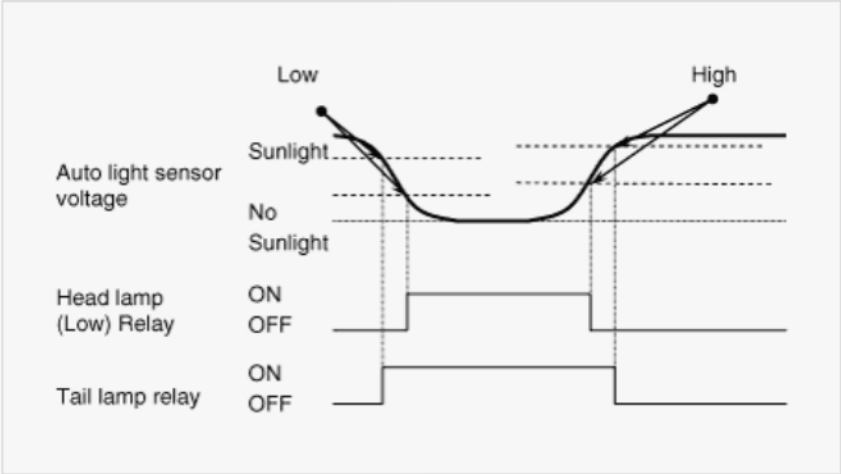
Inspection

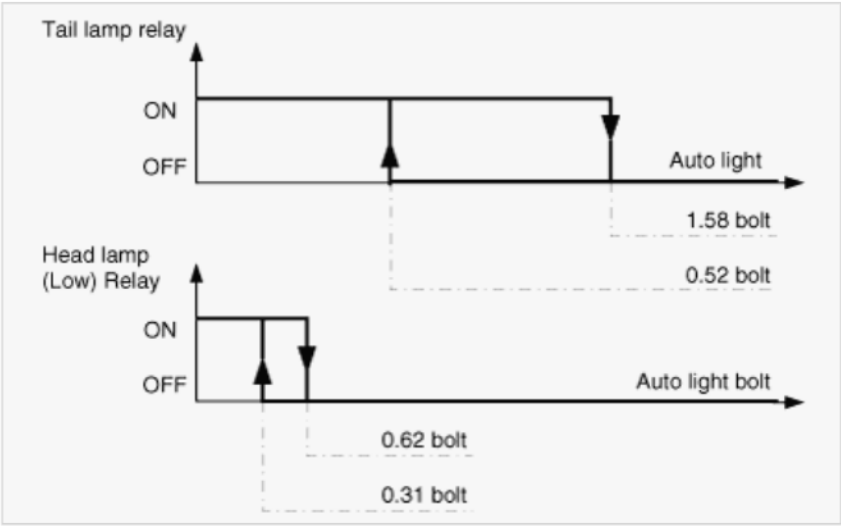
Check if the auto light control operates like a timing chart shown below. Tail lamp output and head lamp (Low) output is controlled based on the auto light sensor"s input (illumination intensity) when the Auto Light Switch in Multi-Function Switch is turned ON, and the vehicle is in IGN1 or IGN2 ON Mode. If IGN1 = ON, BCM detects this voltage, and if the voltage exceeds rated voltage, then auto light failure occurs. (below 4V or above 6V)

NOTICE

Failure Occurrence: If auto light failure occurs, the head lamp must be turned ON regardless of sun light level. This is to prevent the head lamp from being turned OFF in case of auto light failure during night time.

In the state of IGN1 ON, when multi function switch module detects auto light switch on, tail lamp relay output and head lamp low relay output are controlled according to auto light sensor"s input.The auto light control doesn"t work if the pin sunlight supply (5V regulated power from Ignition 1 power to sunlight sensor) is in short circuit with the ground.If IGN1 ON, The BCM monitors the range of this supply and raises up a failure as soon as the supply's voltage is out of range. Then this failure occurs and as long as this is present, the head lamp must be turned on without taking care about the sunlight level provided by the sensor.This is designed to prevent any head lamp cut off when the failure occurs during the night.



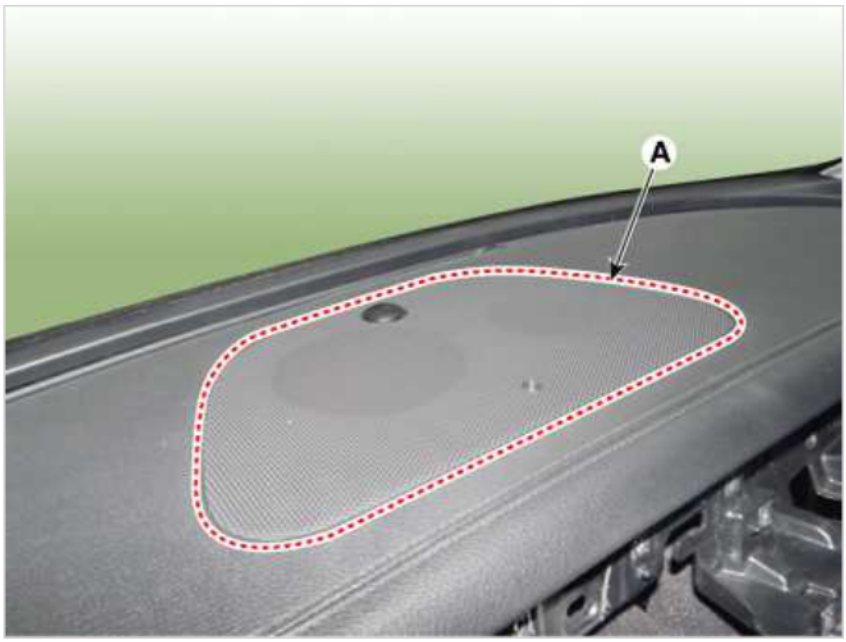


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Removal

1. Disconnect the negative (-) battery terminal.
2. Using a scraper or remover, remove the crash pad center speaker grille (A).



3. Disconnect the security connector (A) and auto light & Photo sensor connector (B).

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4. Remove the auto light sensor (A) after releasing the fixed hooks.



Installation

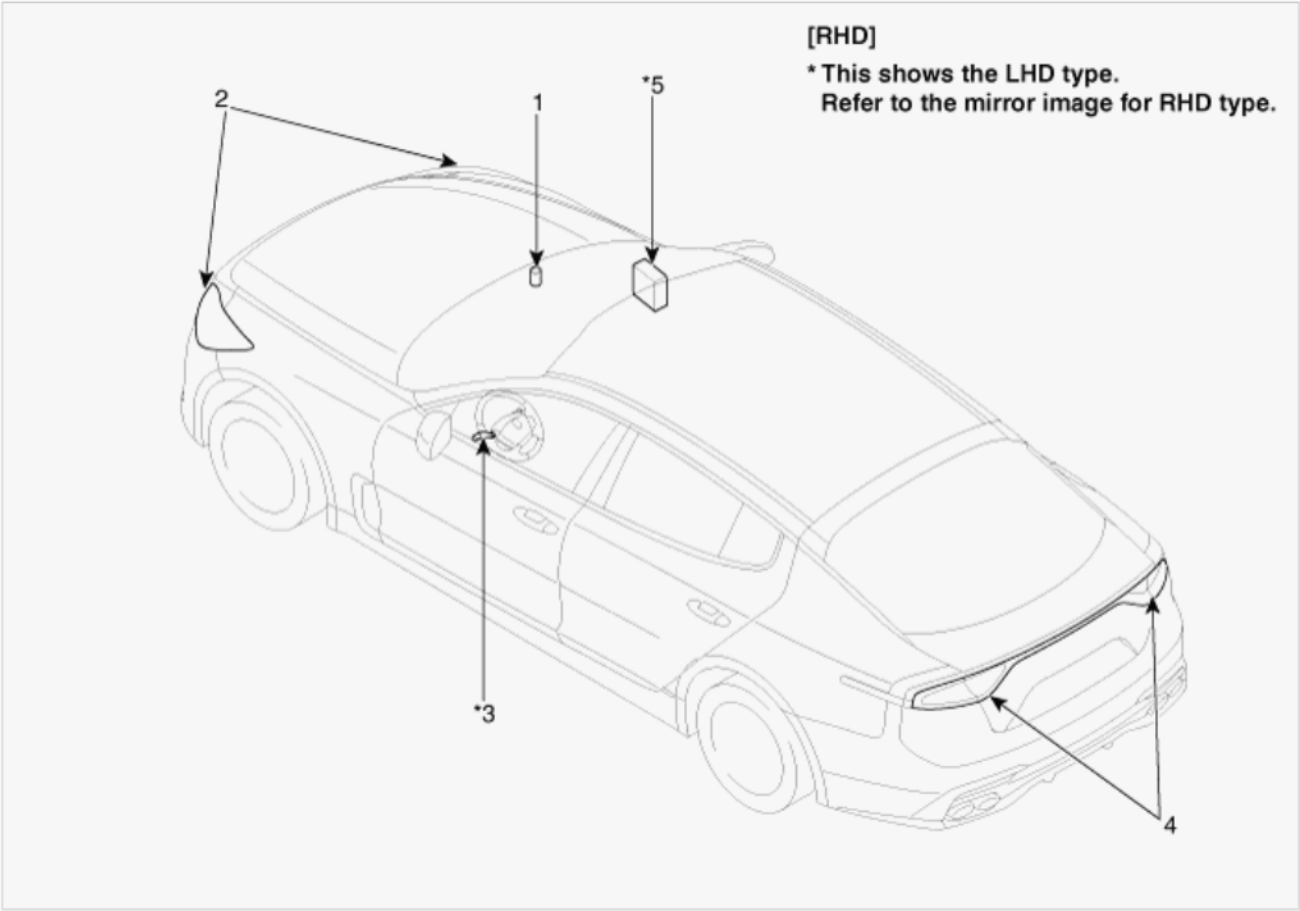
1. Install the auto light sensor.
2. Connect the security connector and auto light & photo sensor connector.
3. Install the center speaker grille.
4. Connect the negative (-) battery terminal.

NOTICE

Make sure the connector is plugged in properly.

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Component Location



1. Auto light sensor
2. Headlamps
3. Lighting switch (Auto)
4. Rear combination lamp
5. Integrated body control unit (IBU)

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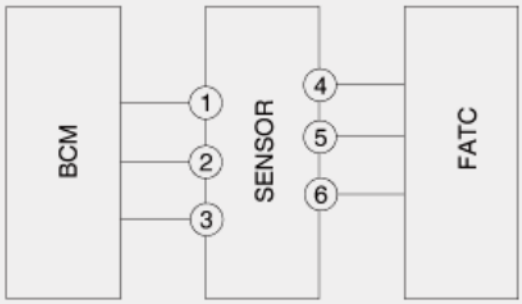
Description

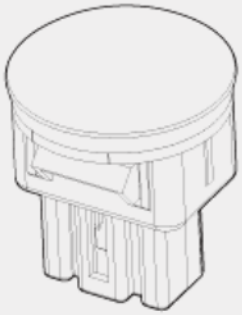
It"s a system that uses illumination sensor to automatically turn ON the tail lamp and head lamp based on the change in surrounding environment"s illumination condition. It activates when the vehicle enters/exits tunnel, or when the illumination condition in surrounding environment changes due to rain, snow, or fog. Precautions corresponding to the use of this system are as follows.

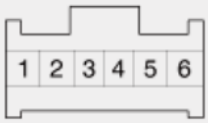
1. Do not add another device on top of this device.
2. Be sure to switch to manual during poor visibility climate, such as fog, heavy rain, or cloudy weather.
3. Illumination intensity in an actual vehicle is not always constant, and lamp ON/OFF time may very depending on the climate, season, and surrounding environment.
4. Use this system only during sunrise and sunset period, and manually control lamp ON/OFF for general conditions.
5. Error may occur if light block coating that may change interior illumination is applied.

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Circuit Diagram







[Photo sensor & Auto light sensor Connector]

No.	Description
1	Auto light sensor ground
2	Auto light sensor power
3	Auto light sensor signal
4	Passenger photo sensor
5	Photo sensor power
6	Driver photo sensor

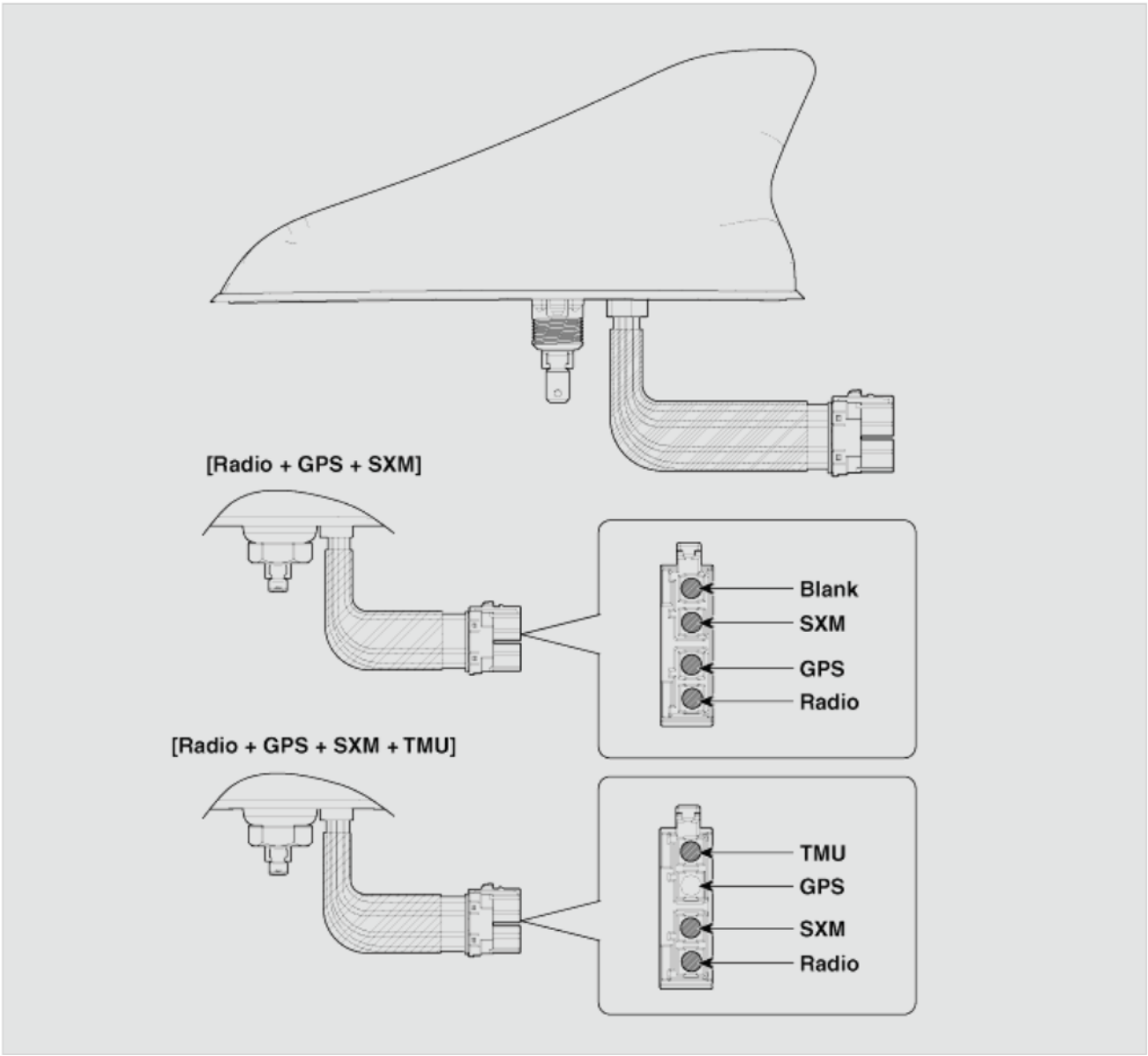
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Specifications

Items		Specifications
Rated voltage		5V
Load		Max. 1mA (Relay load)
Illuminations (LUX)	50	0.98 ± 0.2 V
	150	1.74 ± 0.38 V

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Components

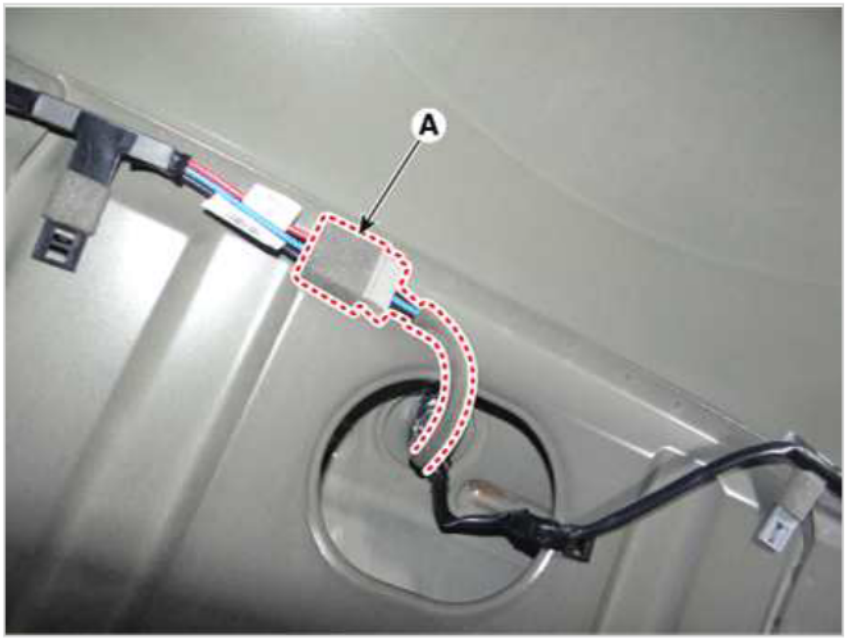


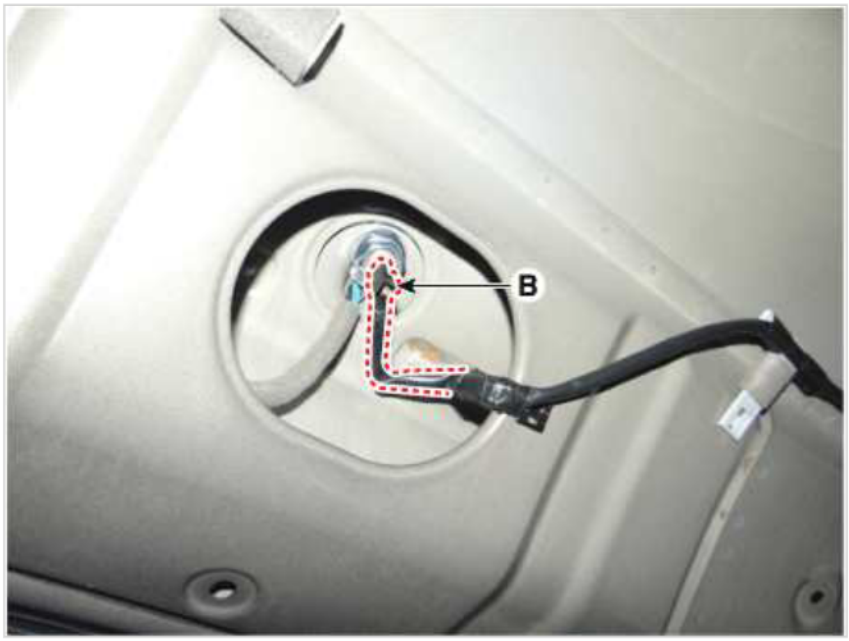
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Removal

AVN antenna

1. Disconnect the negative (-) battery terminal.
2. Remove the roof trim assembly.
   (Refer to Body - "Roof Trim Assembly")
3. Disconnect the roof antenna main connector (A) and roof antenna power connector (B).

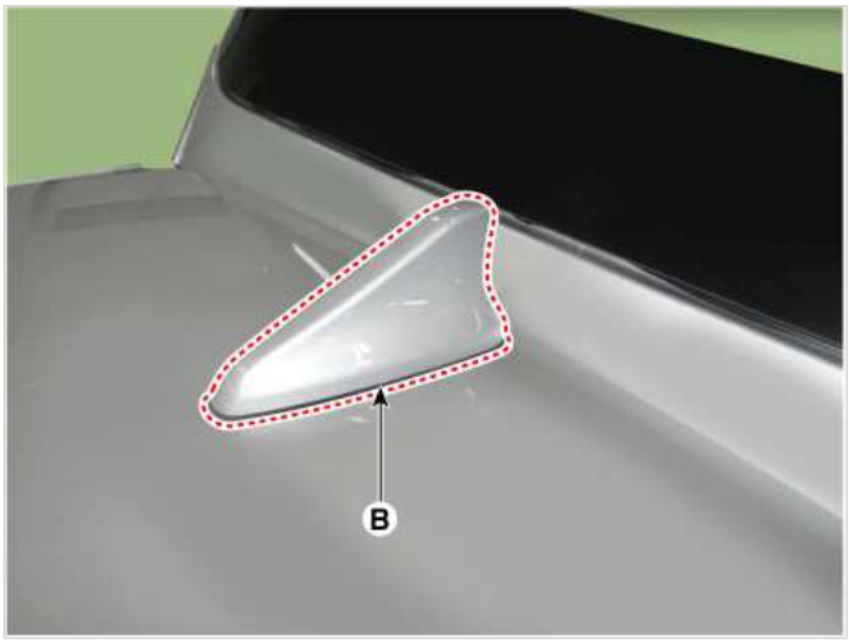




4. Remove the roof antenna (B) after loosening a nut (A).

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Installation

AVN antenna

1. Install the roof antenna.
2. Connect the roof antenna main connector and roof antenna power connecter.
3. Install the roof trim assembly.
4. Connect the negative (-) battery terminal.

NOTICE

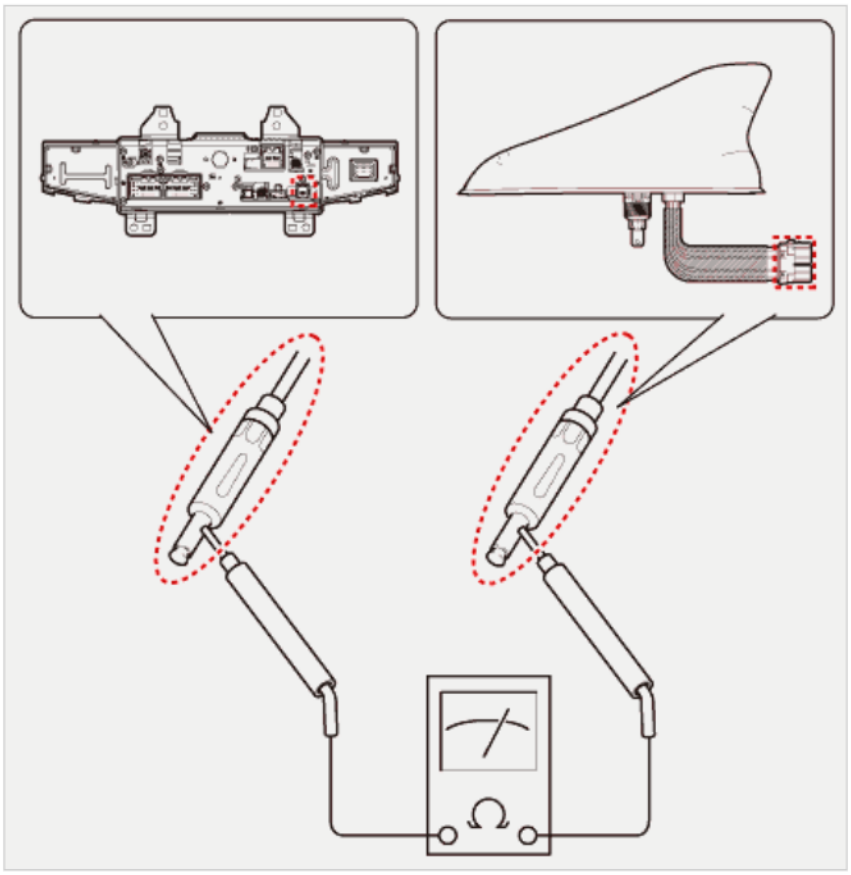
- Make sure that the cable and connector are plugged in properly.
- Check the AVN system for normal operation.

Inspection

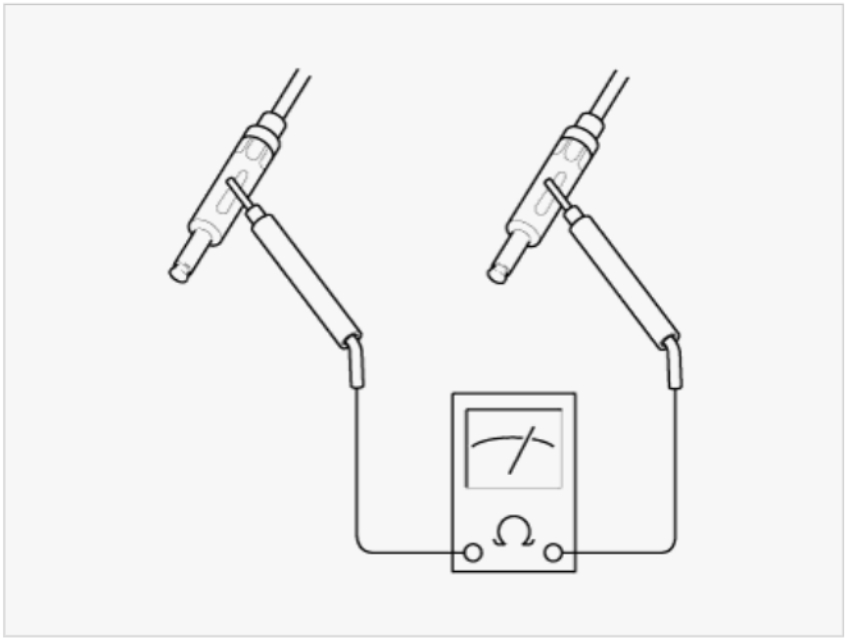
Antenna Cable

1. Check for continuity between the center poles of antenna cable.

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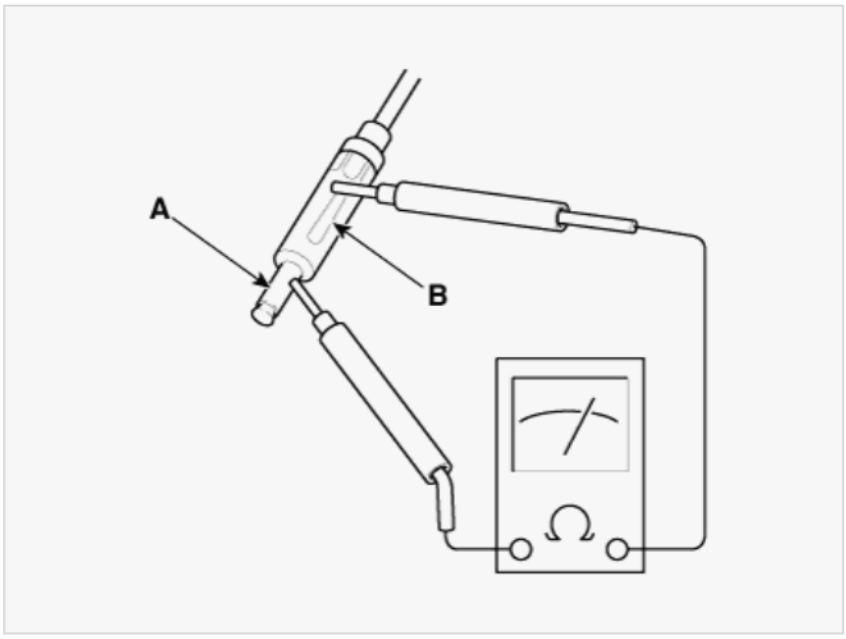


2. Check for continuity between the outer poles of antenna cable. There should be continuity.



3. If there is no continuity, replace the antenna cable.
4. Check for continuity between the center pole (A) and outer pole (B) of antenna cable. There should be no continuity.

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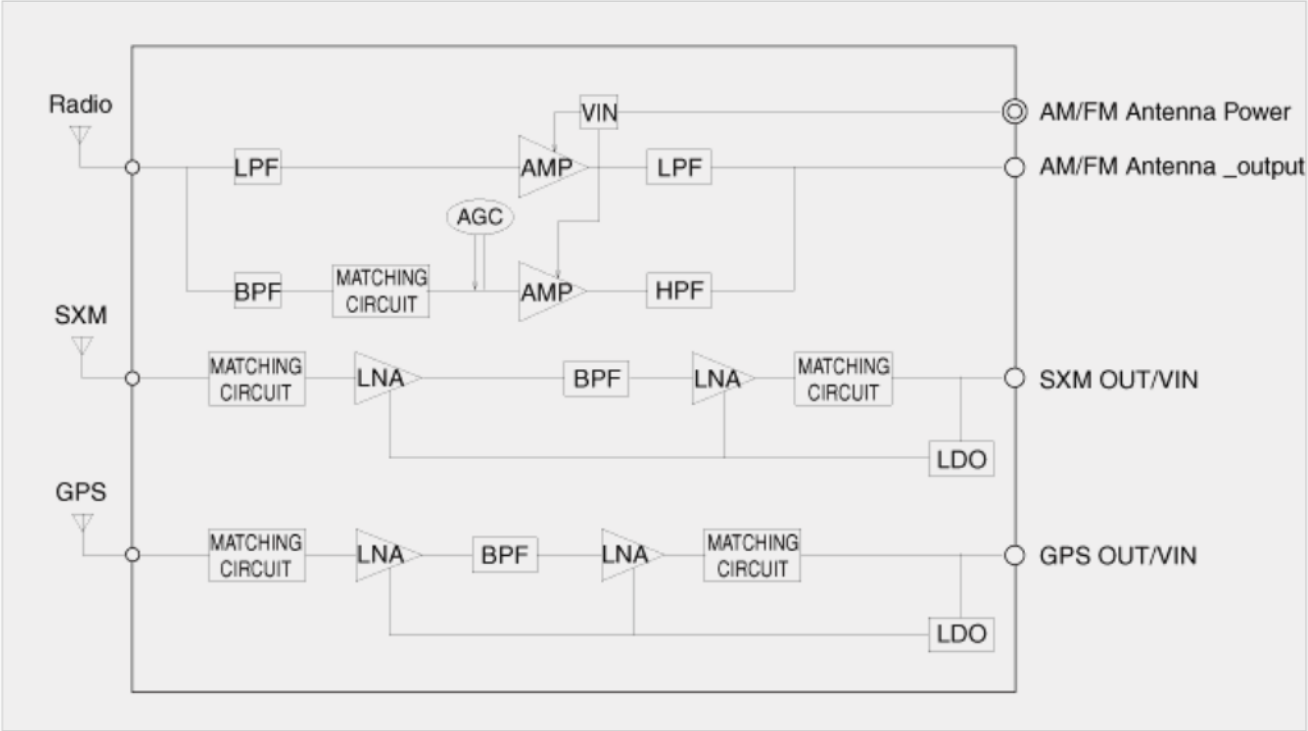


5. If there is continuity, replace the antenna cable.

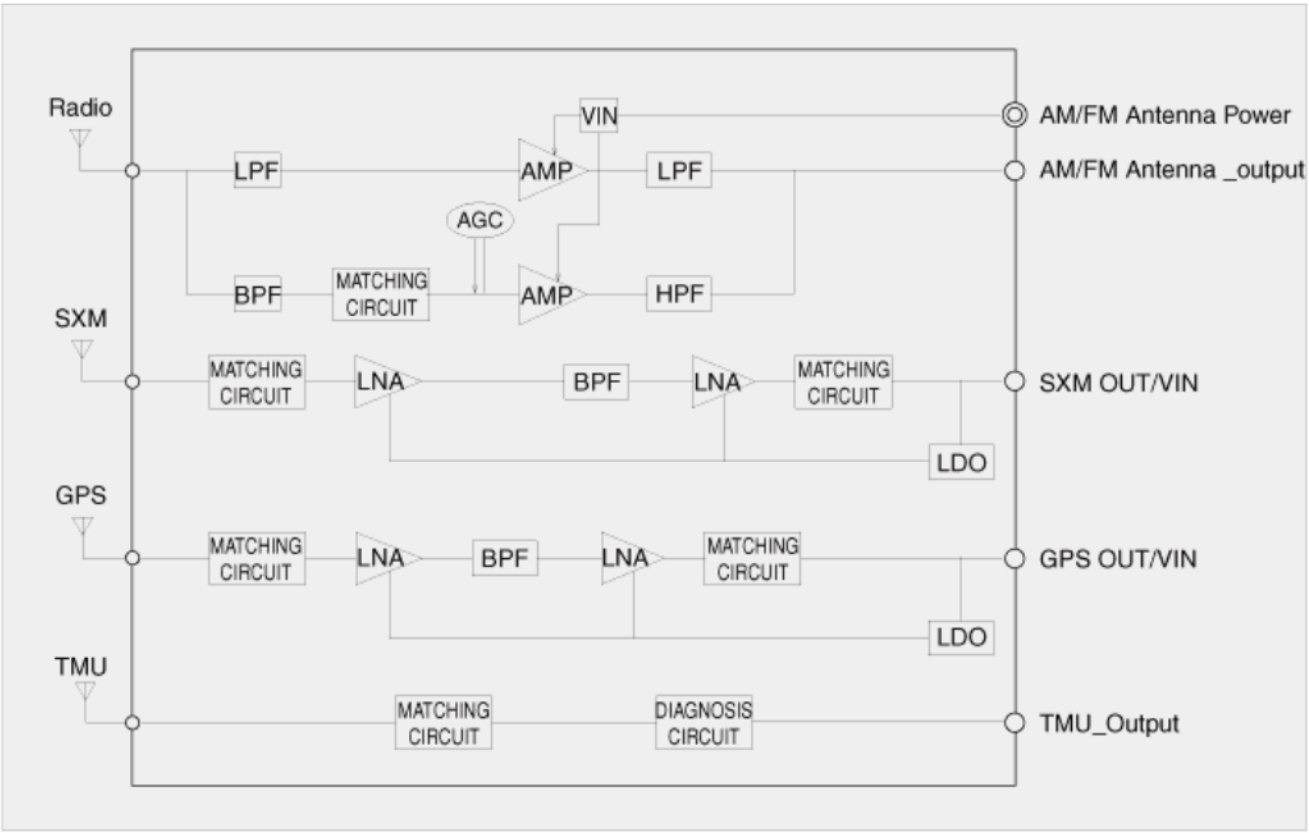
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Circuit Diagram

[Radio + GPS + SXM]

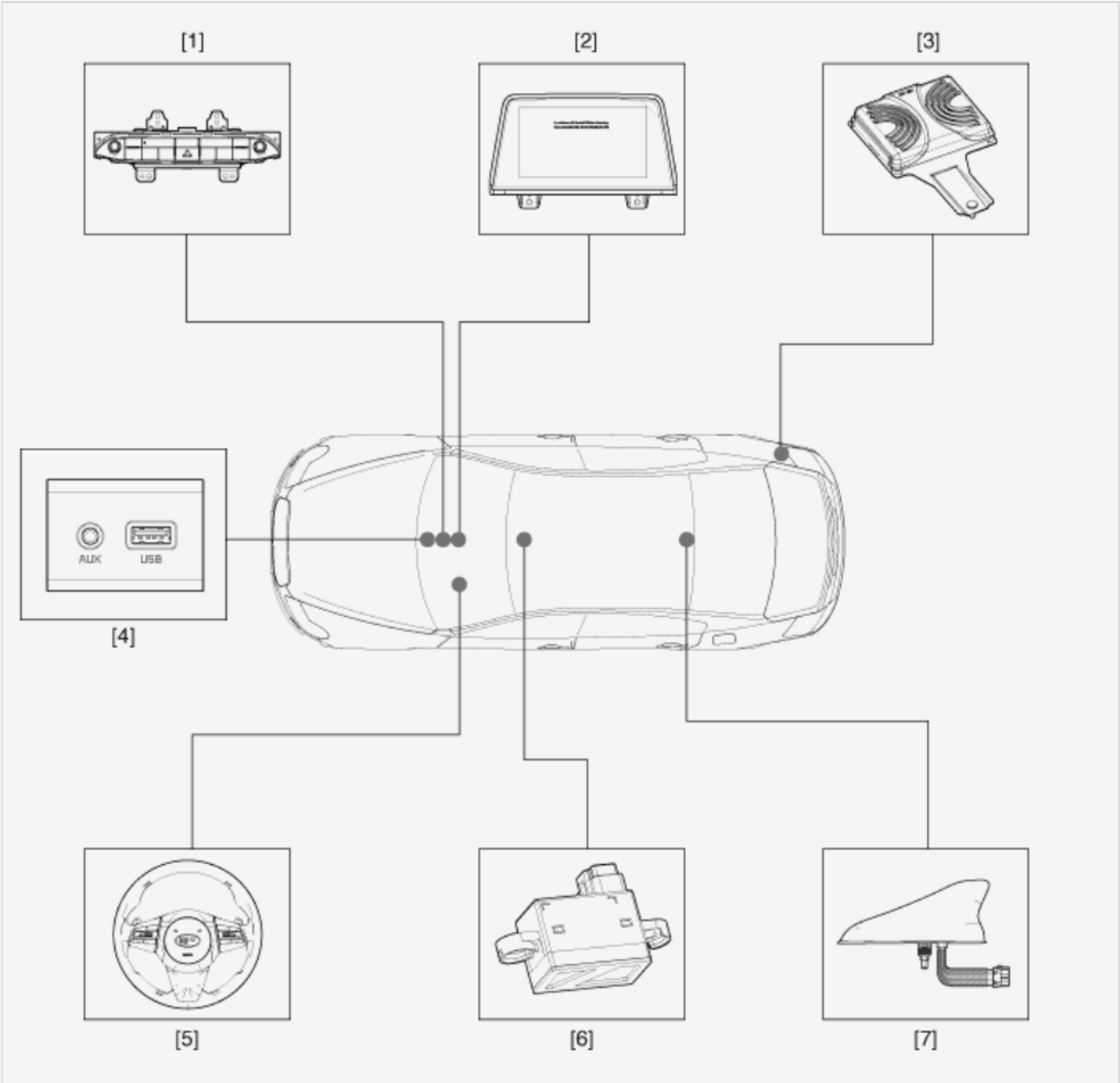


[Radio + GPS + SXM + TMU]



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Component Location



1 . AVN head unit
2. AVN front monitor
3. External amplifier
4. Multimedia jack
5 . Steering wheel remote control(SWRC)
6 . Hands-free mic
7 . Roof antenna(Radio + GPS + SXM)

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Description

AVN system

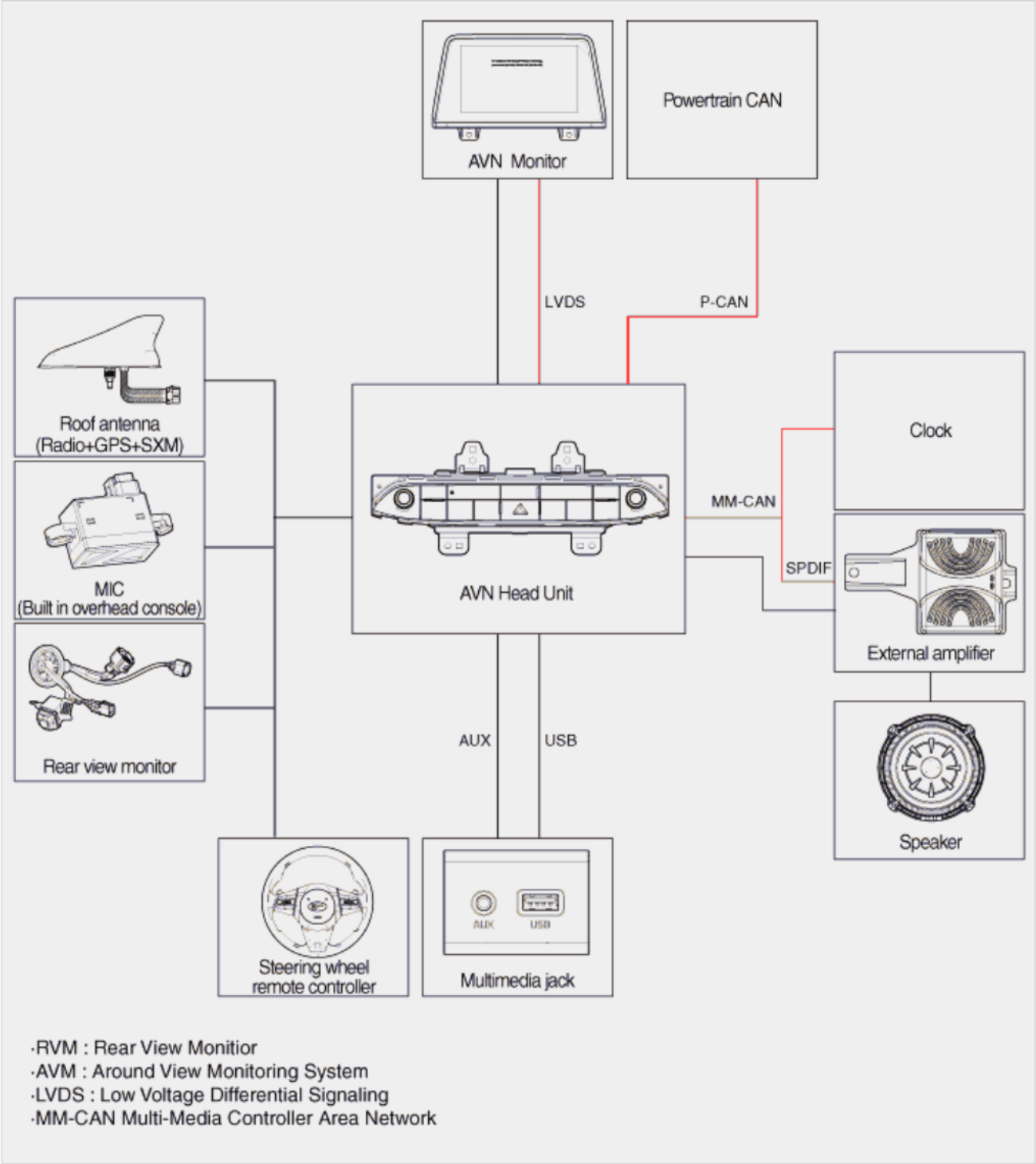
The AVN system simplifies system manipulation and by unifying the vehicle information and user information displays, improves information search and operation experience.

The system is basically composed of a keyboard for the operation of combined function, LCD monitor, a head unit with Bluetooth handsfree calling, voice recognition and navigation, music amplifier and the media unit that connects with other external devices.

1. Simplification of user interface : the multimedia and car information are displayed on the monitor.
2. Networked electronic parts : Efficient information transmission through CAN communications.
3. Up-to-date technologies integrated :
   - Voice recognition : This function recognizes the user"s voice commands to manipulate the system. The user can issue voice commands to operate AV system, Bluetooth phone and navigation.
   - Bluetooth hands-free calling : This is compliant with the international wireless communication standards and uses bluetooth technology adopted in most currently launched mobile phones. Once connected, the driver is automatically connected every time he/she gets in the car.
   - USB connectivity : External music player devices such as USB memory stick or MP3 can be connected and played by the car speakers.

System Block Diagram

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- B-CAN : Body Controller Area Network
- MM-CAN : Multi-Media Controller Area Network

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 an object is placed on or near the GPS antenna or when travelling in the following environment:

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

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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 in the following location or driving condition. In this case, drive for a short period of time to automatically correct vehicle location according to map matching or GPS information. (It may take several minutes in certain cases.)
   - When driving on a sharp Y-shaped road, the current position may be displayed in the opposite direction.
   - If the vehicle is loaded onto a car transport vehicle, the current position mark may be stalled on the last position prior to loading.
   - When driving on a spiral-shaped road.
   - When driving in mountainous regions with sharp turns or sudden brakes.
   - When entering a road after exiting from an underground parking structure, building parking structure, or turntable with multiple rotations.
   - When the tires have recently been replaced (Especially upon use of spare or studless tires)
   - If the battery terminal is removed.
   - When driving in city streets, the current position may be displayed on the opposite side or on an off-road position.
   - 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.
   - When driving in heavy traffic with frequent stops or intersections.
   - When driving under slippery conditions, such as heavy sand, snow, etc.
   - When driving with tire chains installed.
   - When using a tire with an incorrect size specification.
   - When the tire pressures of all 4 tires are different from each other.
   - When the replacement tire is a worn or used tire (especially studless tire that has passed 2nd season, etc.).
   - When driving near high-rise buildings
   - If a roof carrier has been installed
   - When driving in high speeds or after having calculated a long distance route.

Route Guidance

Suitable route guidance may not occur due to search conditions or driving position.

- Guidance to go straight may be given while driving on a straight road.
- Guidance may not be given after turning at an intersection.
- Proper guidance may not be given at certain intersections.
- A route guidance signaling entrance into a no entry zone may occur (No entry zone, road under construction, etc.).
- Guidance may be given to a location near the actual destination if roads to the actual destination do not exist or are too narrow.
- Wrong voice guidance may be given if the vehicle deviates from the designated route (e.g. If it turned at an intersection wherein the navigation guided to go straight.).
- The route guidance may not be provided in case of missing or incorrect map data.

Route Re-calculation

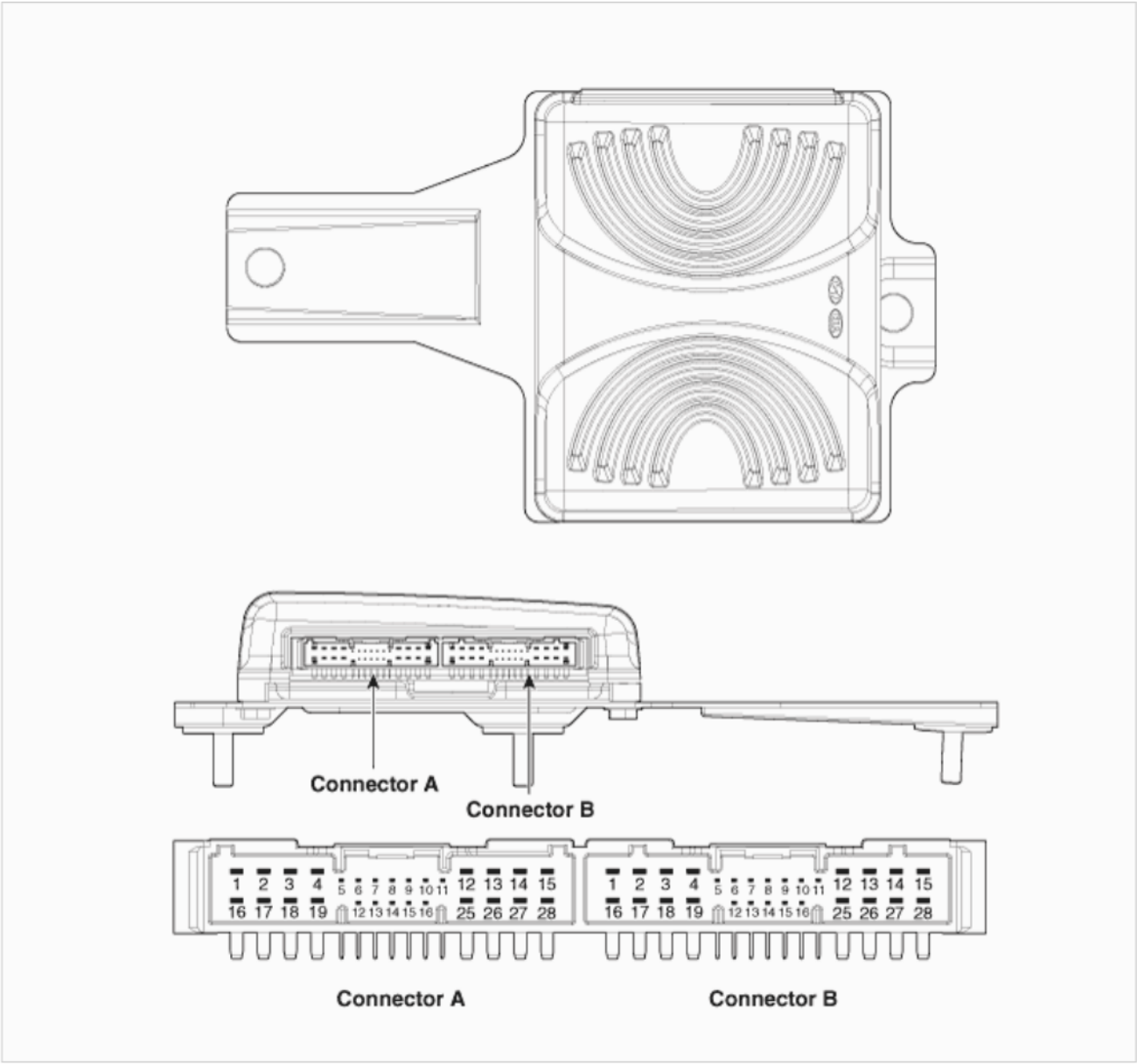
The following phenomena may occur after conducting route recalculation.

- Guidance may be given to a different position from the current position if the vehicle was turning at an intersection.
- Route recalculation may take longer when driving under high speeds.
- A route guidance signaling for a U-Turn in a No U-Turn zone may occur.
- In some cases, a route guidance may signal the driver to enter a no entry zone (No entry zone, road under construction, etc.).
- Guidance may be given to a location near the actual destination if roads to the actual destination do not exist or are too narrow.
- Wrong voice guidance may be given if the vehicle deviates from the designated route (e.g. If it turns at an intersection wherein the navigation guided to go straight.).

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Components

[Mobis]



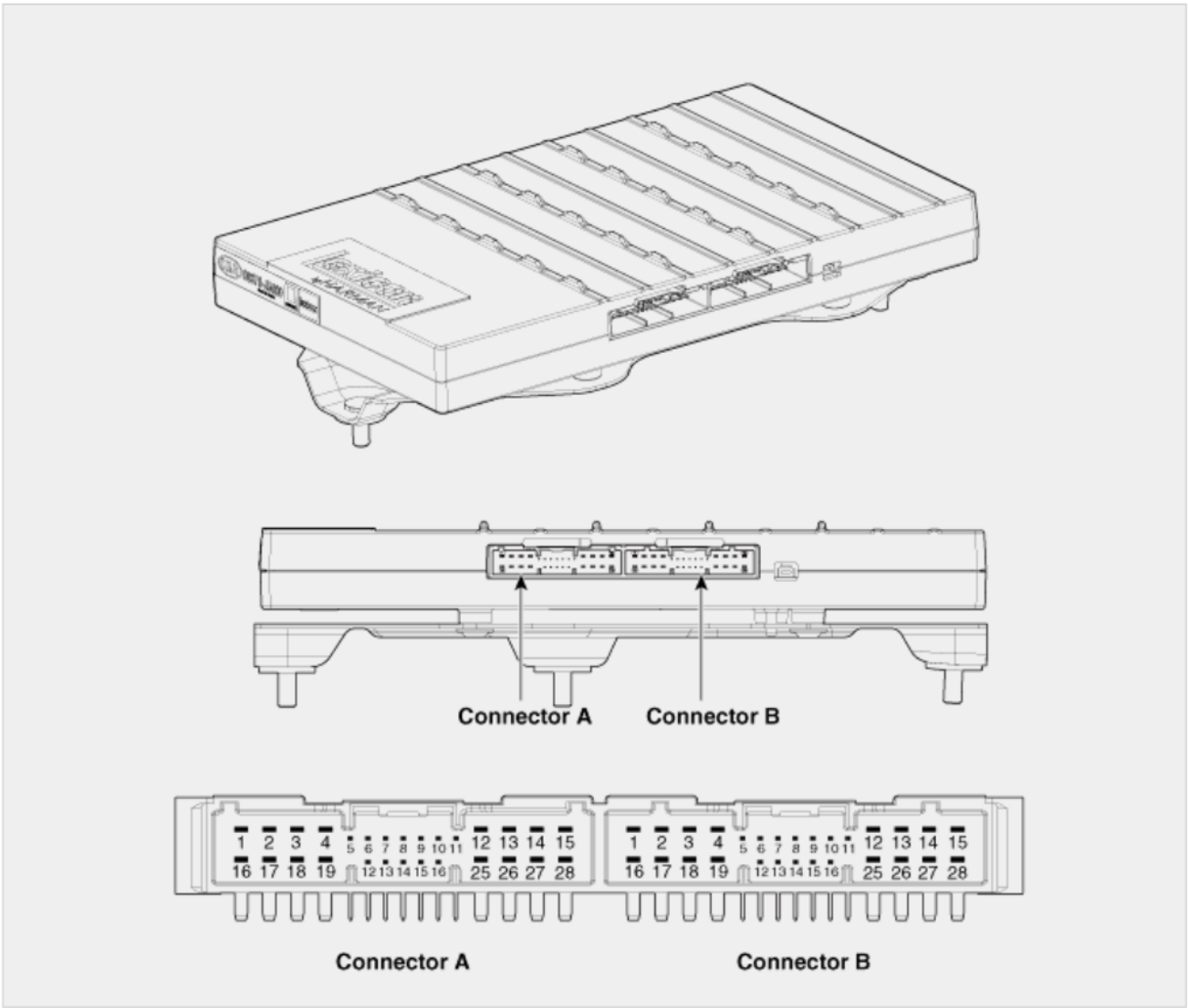
Connector Pin Information

No.	Connector A	Connector B
1	Battery (+)	Rear door left speaker (+)
2	Battery (+)	Rear door left speaker (-)
3	Battery (+)	Rear door right speaker (+)
4	Battery (+)	Rear door right speaker (-)
5	-	Reserved
6	Multimedia-CAN (High)	-
7	Multimedia-CAN (Low)	-
8	ACC	-
9	Amplifier navigation voice (+)	-
10	-	-
11	-	-

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12	Front door left speaker (+)	-
13	Front door left speaker (-)	-
14	Front door right speaker (+)	-
15	Front door left speaker (-)	-
16	Ground	Subwoofer speaker 1 (+)
17	Ground	Subwoofer speaker 1 (-)
18	Ground	Subwoofer speaker 2 (+)
19	Ground	Subwoofer speaker 2 (-)
20	Amplifier SPDIF (High)	-
21	Amplifier SPDIF (Low)	-
22	Amplifier SPDIF (Ground)	-
23	Amplifier navigation voice (-)	-
24	IGN1	-
25	Front center speaker (+)	-
26	Front center speaker (-)	-
27	-	-
28	-	-

[Harman]



No.	Connector A	Connector B
1	Battery (+)	Subwoofer speaker 2 (+)

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2	Battery (+)	Subwoofer speaker 1 (+)
3	Battery (+)	Front door right speaker (+)
4	Battery (+)	Front door left speaker (+)
5	-	-
6	Multimedia-CAN (High)	-
7	Multimedia-CAN (Low)	-
8	ACC	-
9	Amplifier navigation voice (+)	-
10	-	-
11	-	-
12	-	Rear door right speaker (+)
13	Front door center speaker (+)	Rear door left speaker (+)
14	Front door right tweeter speaker (+)	Surround right speaker (+)
15	Front door left tweeter speaker (+)	Surround left speaker (+)
16	Ground	Subwoofer speaker 2 (-)
17	Ground	Subwoofer speaker 1 (-)
18	Ground	Front door right speaker (-)
19	Ground	Front door left speaker (-)
20	Amplifier SPDIF (High)	-
21	Amplifier SPDIF (Low)	-
22	Amplifier SPDIF (Ground)	-
23	Amplifier navigation voice (-)	-
24	IGN1	-
25	-	Rear door right speaker (-)
26	Front door center speaker (-)	Rear door left speaker (-)
27	Front door right tweeter speaker (-)	Surround right speaker (-)
28	Front door left tweeter speaker (-)	Surround left speaker (-)

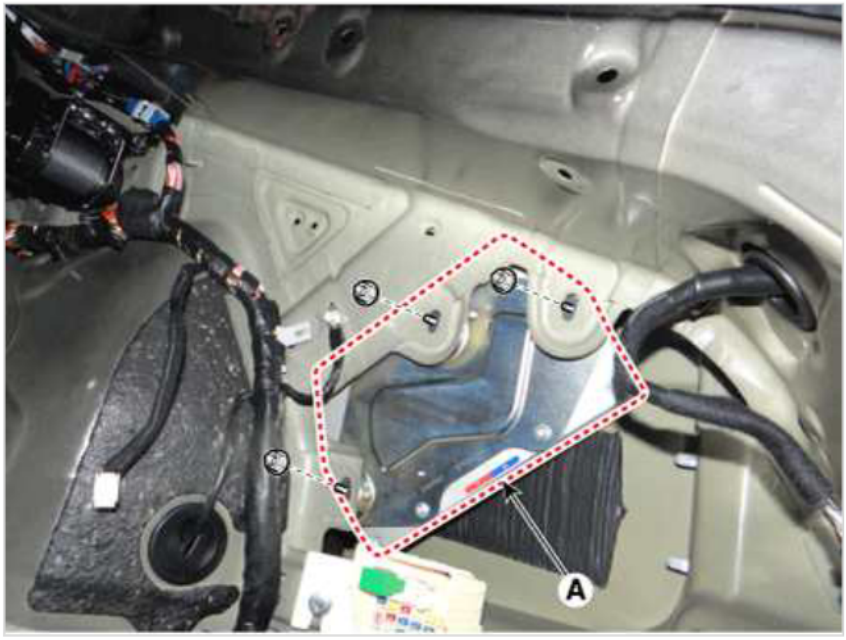
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Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the luggage side trim [RH].
   (Refer to Body - "Luggage Side Trim")
3. Disconnect the external amplifier connectors (A).



4. Remove the external amplifier (A) after loosening the mounting nuts.



Installation

1. Install the external amplifier after connecting the connectors.
2. Install the luggage side trim [RH].
3. Connect the negative (-) battery terminal.

NOTICE

- Make sure that the external amplifier connectors are plugged in properly.
- Check the AVN system for normal operation.

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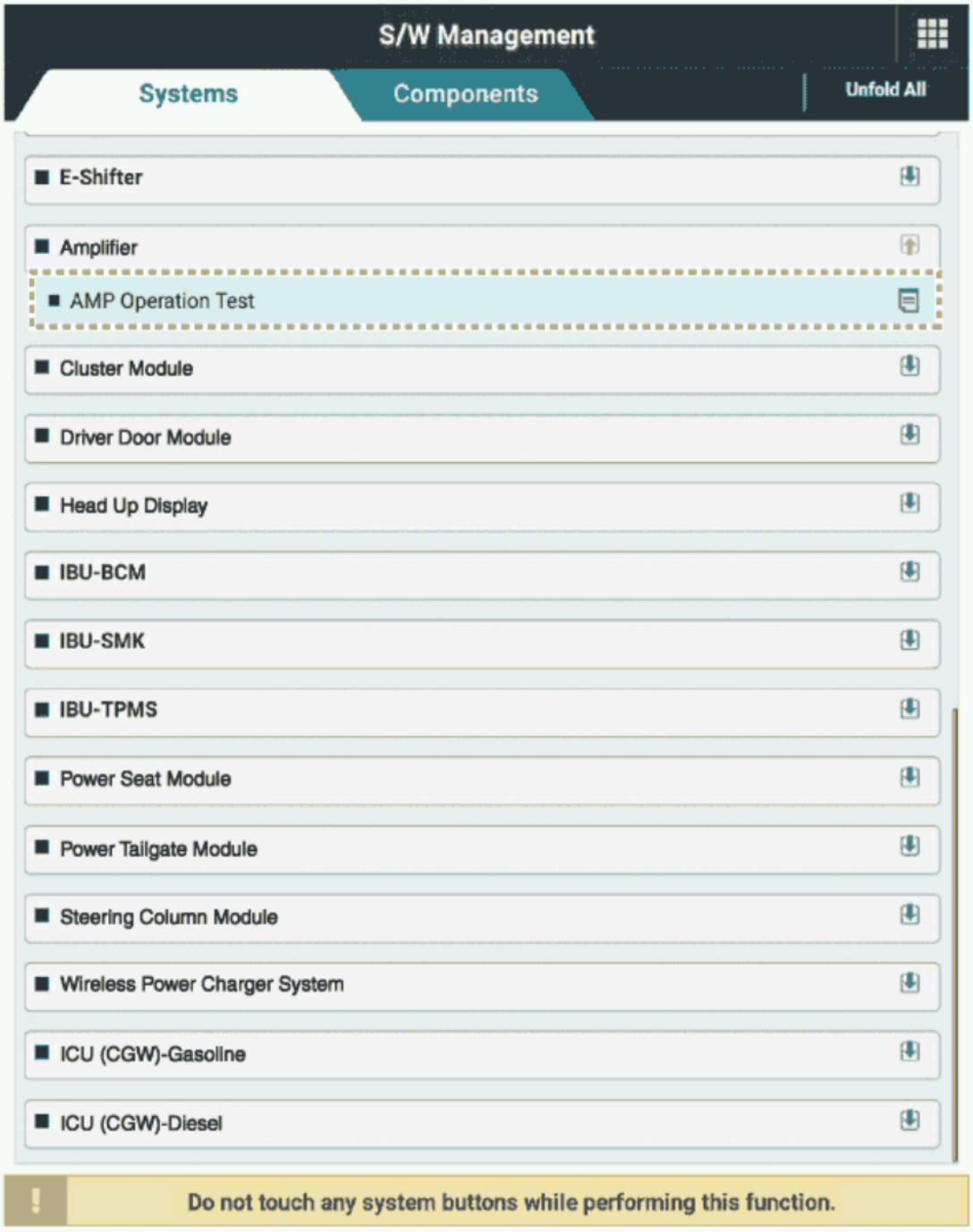
Inspection

NOTICE

- Warning and guide sounds regarding engine start and driving are generated by the external amplifier. Please refer to the following: (Instrument Cluster and Gauge - Refer to "Instrument Cluster")
- When the external amplifier or speakers are replaced with other products, a failure may occur in the amplifier and warning and guide sounds (excluding the ETCS guide sound) may not be generated.
- Virtual engine sound inside the vehicle (occurs in Sport mode) is generated by the external amplifier. Therefore, if the external amplifier or speakers are replaced with other products, a failure may occur in the amplifier and virtual engine sound may not be generated properly.

1. In the body electrical system, failure can be quickly diagnosed by using the vehicle diagnostic system (KDS).
   (1) Self diagnosis : Checking failure and code number (DCT).
   (2) Current data : Checking the system input/output data state.
   (3) Actuation test : Checking the system operation condition.
   (4) Additional function : Controlling other features including system option setting and zero point adjustment
2. Select the "Car model" and the system to be checked in order to check the vehicle with the tester.
3. Select the "Amplifier" to check the AVN.
4. Select the "Current data" menu to search the current state of the input/output data.
   The input/output data for the sensors corresponding to the Amplifier can be checked.

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S/W Management

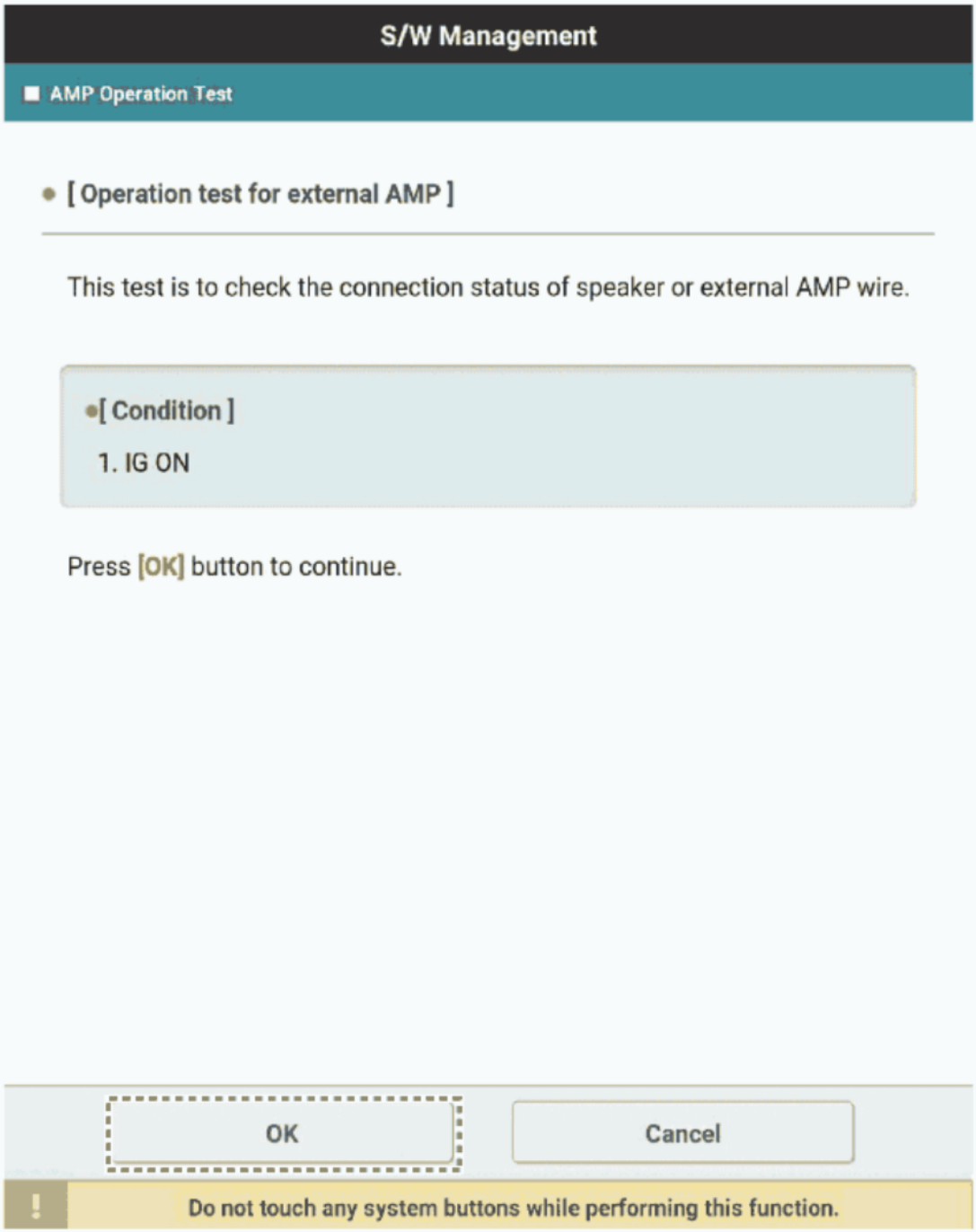
• **AMP Operation Test**

Purpose	To check the connection status of speaker or external AMP wire.
Enable Condition	1. Engine Off 2. Ignition Switch On
Concerned Component	Speaker, Amp
Concerned DTC	-
Fail Safe	-
Etc	-

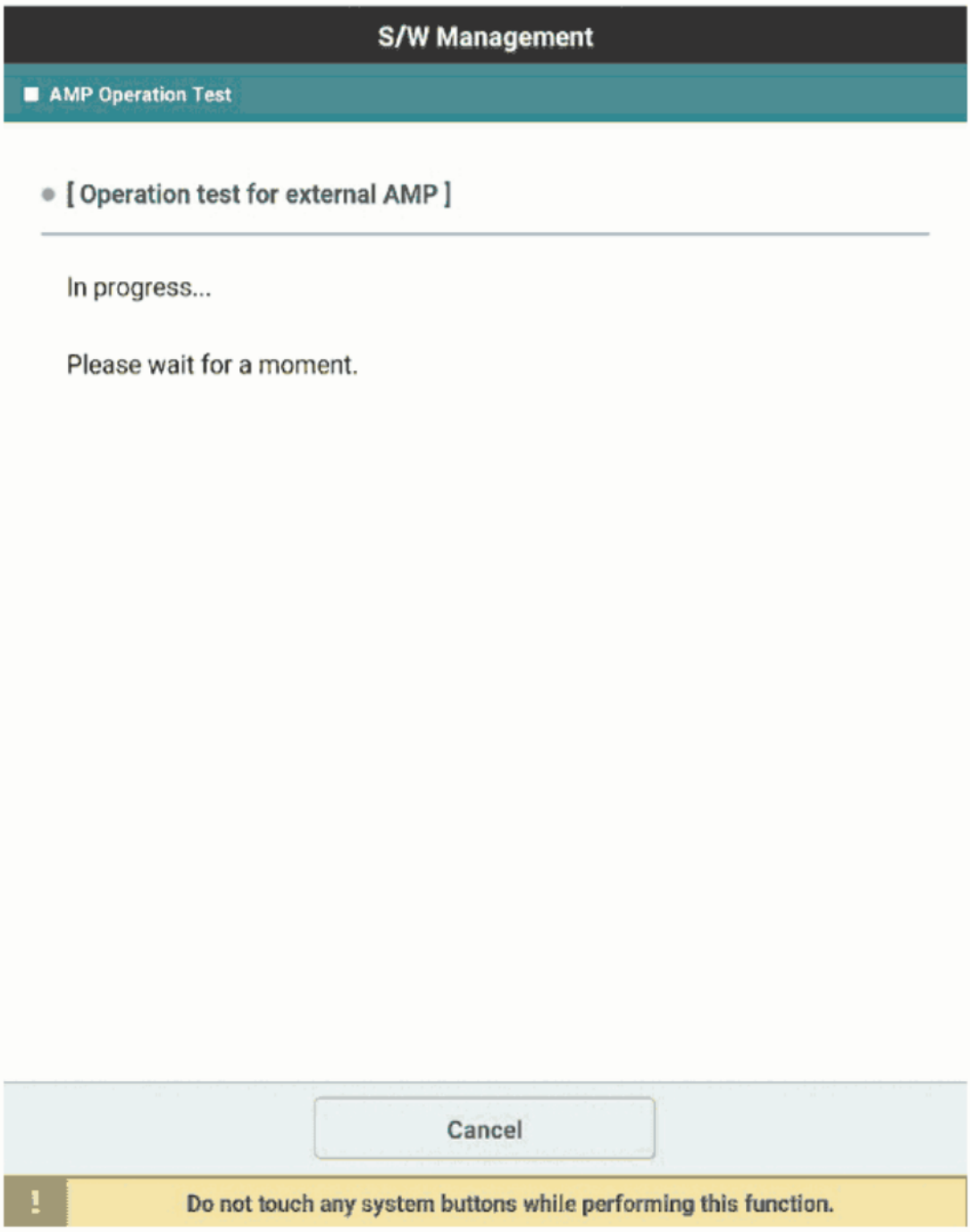
OK

! Do not touch any system buttons while performing this function.

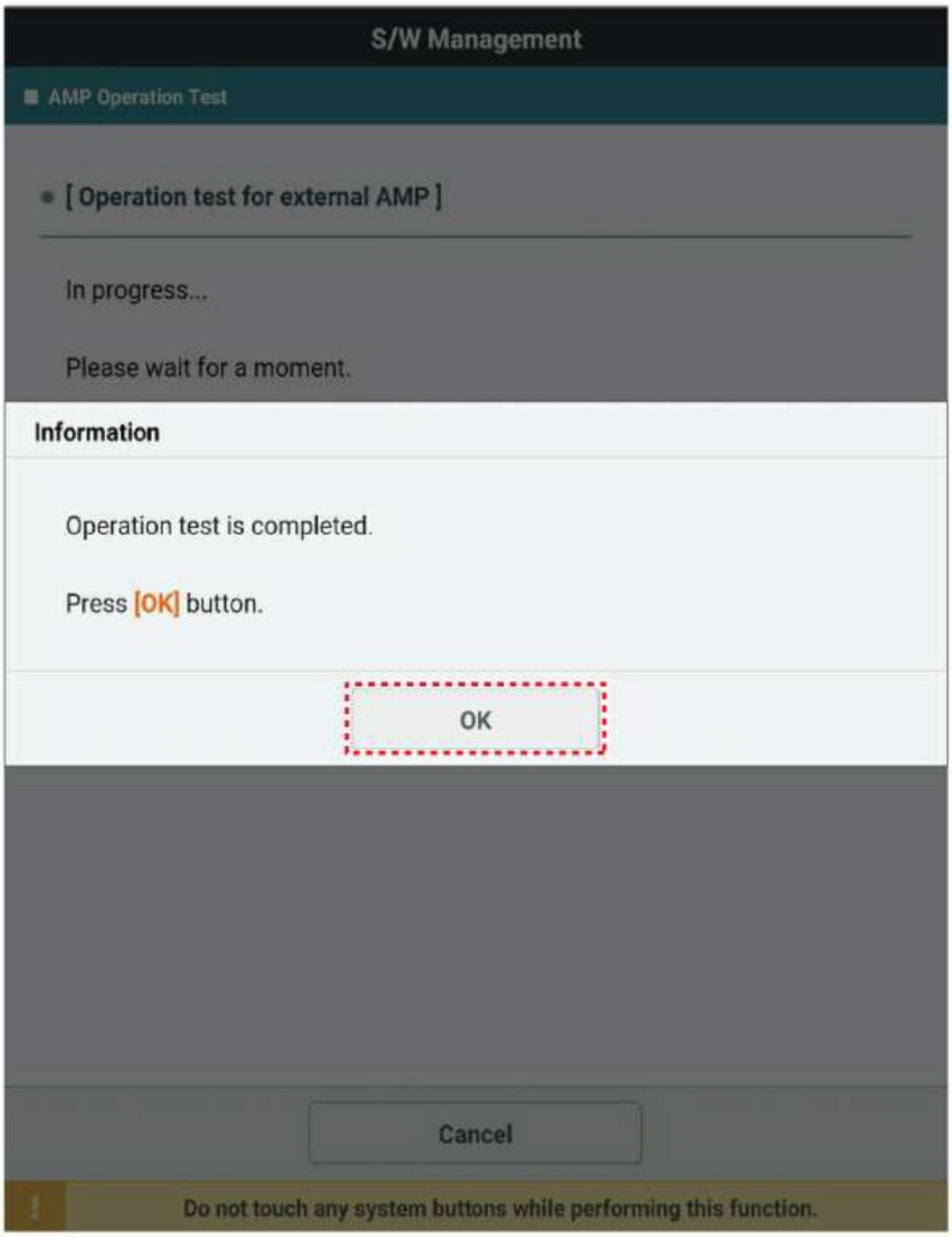
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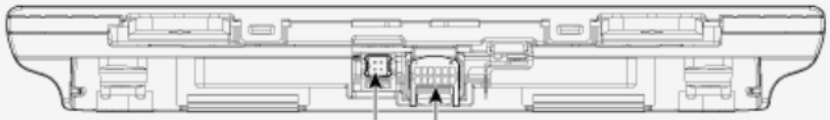
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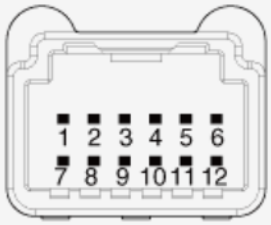
Components

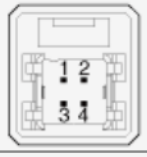




Connector B

Connector A

Connector A	No.	Description	No.	Description
	1	-	7	-
	2	Ground	8	Monitor board enable
	3	Ground	9	-
	4	Monitor_ground	10	Front monitor display mute
	5	-	11	-
	6	-	12	Monitor power

Connector B	No.	Description	No.	Description
	1	Monitor touch enable	3	Monitor_LVDS (High)
	2	Monitor_LVDS (Low)	4	Monitor touch_interrupt

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Removal

⚠ CAUTION

- When removing with a flat-tip screwdriver or remover, wrap protective tape around the tools to prevent damage to components.
- When removing the interior trim pieces, use a plastic panel removal tool to prevent damaging the surface.

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad passenger side panel.
   (Refer to Body - "Crash Pad Center Panel")
3. Remove the AVN front monitor (A) after loosening the mounting screws.



4. Disconnect the AVN front monitor connectors (A).



Installation

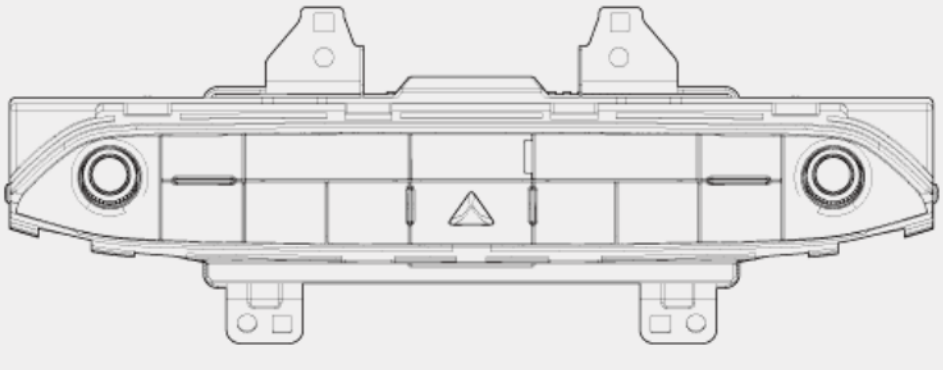
1. Connect the AVN front monitor connectors.
2. Install the AVN front monitor.
3. Install the crash pad passenger side panel.

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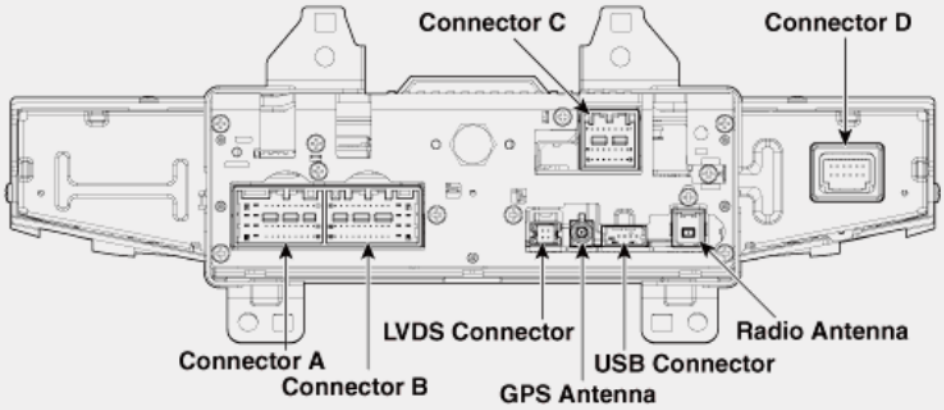
4. Connect the negative (-) battery terminal.

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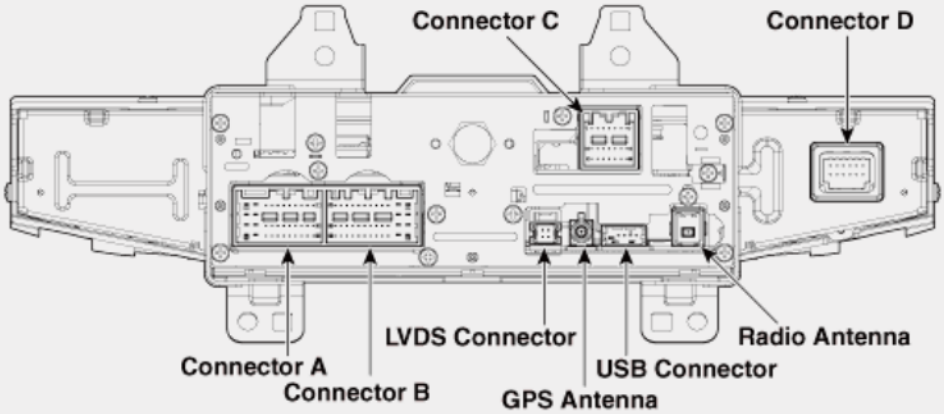
Components



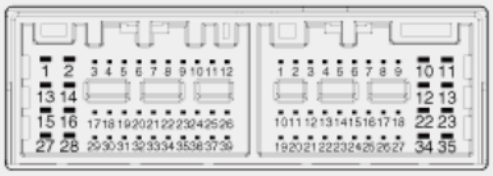
[Internal Amplifier Type]



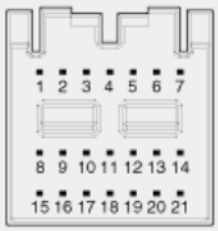
[External Amplifier Type]



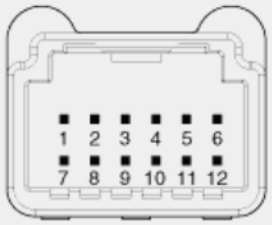
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Connector A Connector B



Connector C



Connector D

Connector Pin Information

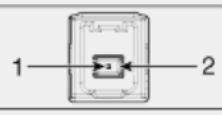
No.	Connector A		Connector B	Connector C	Connector D
	Internal Amplifier	External Amplifier			
1	Rear door left speaker (+)	-	-	-	Ground
2	Rear door left speaker (-)	-	MIC (+)	-	-
3	-	Amplifier navigation voice (+)	-	-	Hazard switch
4	-	Amplifier_SPDIF (High)	-	-	Passenger seat belt reminder
5	-		Antenna power	-	-
6	RVM Camera : Power SVM Camera : -		Illumination (+)	-	Telltale/PAB Off
7	RVM Camera : Video SVM Camera : Video (Y)		Multimedia-CAN (High)	-	IGN1
8	RVM Camera : - SVM Camera : Video (C)		Monitor board_enable	-	PAB On
9	-		-	-	-
10	AUX Audio right_input		Battery (+)	-	-
11	AUX_Detect		Battery (+)	-	-
12	Steering wheel key		Ground	-	Hazard lamp
13	Front door left speaker (+)	-	Ground	-	
14	Front door left speaker (-)	-	MIC Ground	-	
15	Front door right speaker (-)	-	MIC (-)	-	
16	Front door right speaker (+)	-	RVM Camera : -	-	
			SVM Camera : Equipment_Detect	-	
17	-	Amplifier navigation voice (-)	-	-	
18	-	Amplifier SPDIF (Low)	-	-	
19	-	Amplifier SPDIF (Ground)	Illumination (-)	-	
20	RVM Camera : Power ground SVM Camera : -		Multimedia-CAN (Low)	- -	
21	RVM Camera : Video ground SVM Camera : Video (Y) ground		Display_Mute	-	

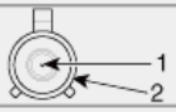
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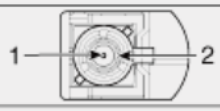
22	RVM Camera : -		ACC		
	SVM Camera : Video (C) ground				
23	-		-		
24	AUX Audio left_input		LCD Battery		
25	AUX Audio ground		-		
26	Steering wheel remote controller (Ground)		-		
27	Rear door right speaker (-)	-	-		
28	Rear door right speaker (+)	-	-		
29	-		-		
30	-		-		
31	-		-		
32	RVM Camera : -		-		
	SVM Camera : Equipment_Detect		-		
33	RVM Camera : -		IGN1		
	SVM Camera : Video (Y) shield				
34	RVM Camera : -		-		
	SVM Camera : Video (C) shield				
35	-		LCD Ground		
36	-				
37	-				
38	Vehicle Speed				

USB Connector	No.	Description	No.	Description
	1	USB VCC	3	USB Data (High)
	2	USB Data (Low)	4	USB Ground

LVDS Connector	No.	Description	No.	Description
	1	Monitor_LVDS (Low)	3	-
	2	Monitor ON/OFF	4	Monitor_LVDS (High)

Radio Antenna	No.	Description	No.	Description
	1	AM/FM	2	Ground

SXM Antenna	No.	Description	No.	Description
	1	Signal	2	Ground

GPS Antenna	No.	Description	No.	Description
	1	Signal	2	Ground

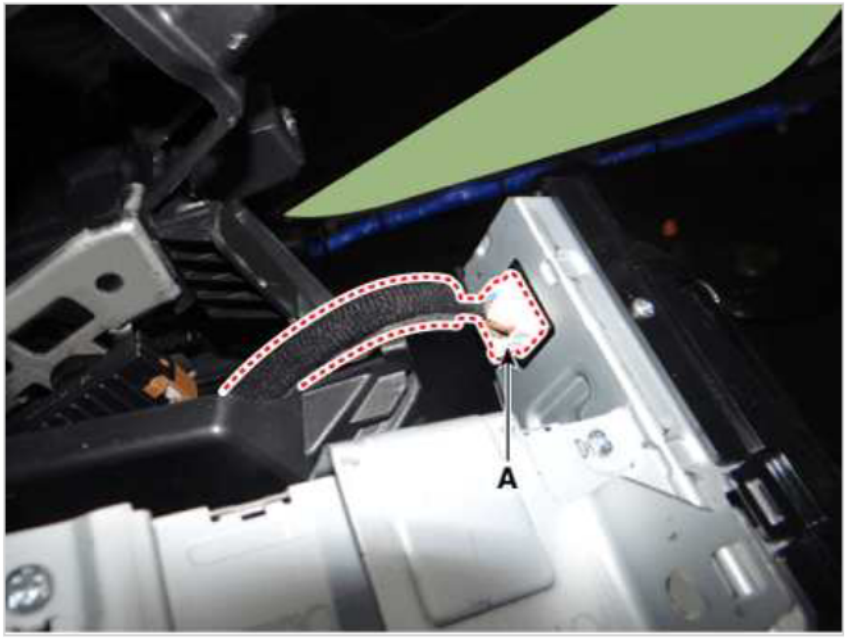
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Removal

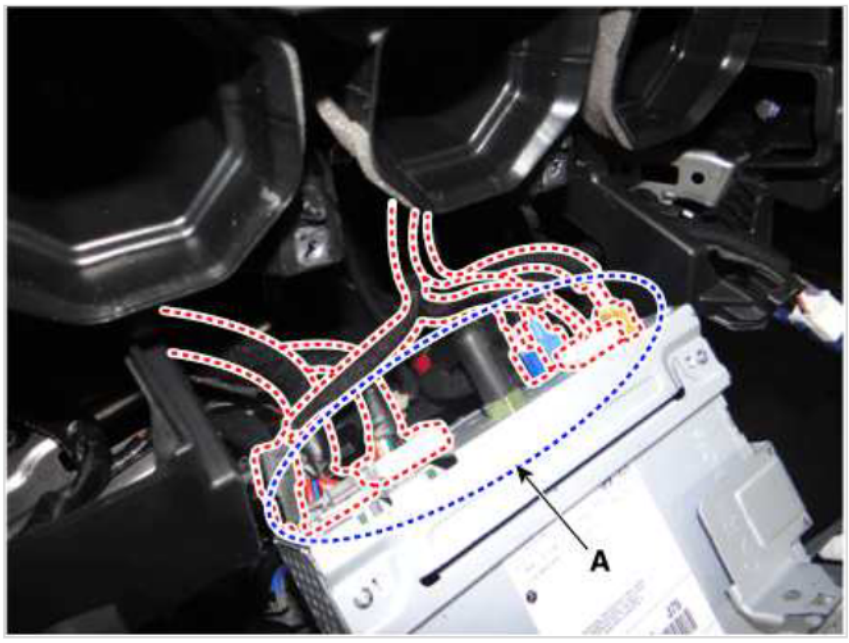
1. Disconnect the negative (-) battery terminal.
2. Remove the heater & A/C control unit.
   (Refer to Heating,Ventilation And Air Conditioning - "Heater & A/C Control Unit (DATC)")
3. Remove the crash pad passenger side panel.
   (Refer to Body - "Crash Pad Center Panel")
4. Remove the AVN head unit (A) after loosening the mounting screws.



5. Remove the AVN head unit after disconnecting the connectors and antenna cable (A).



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Installation

1. Install the AVN head unit after connecting the AVN head unit connectors and cable.
2. Install the crash pad passenger side panel.
3. Connect the negative (-) battery terminal.

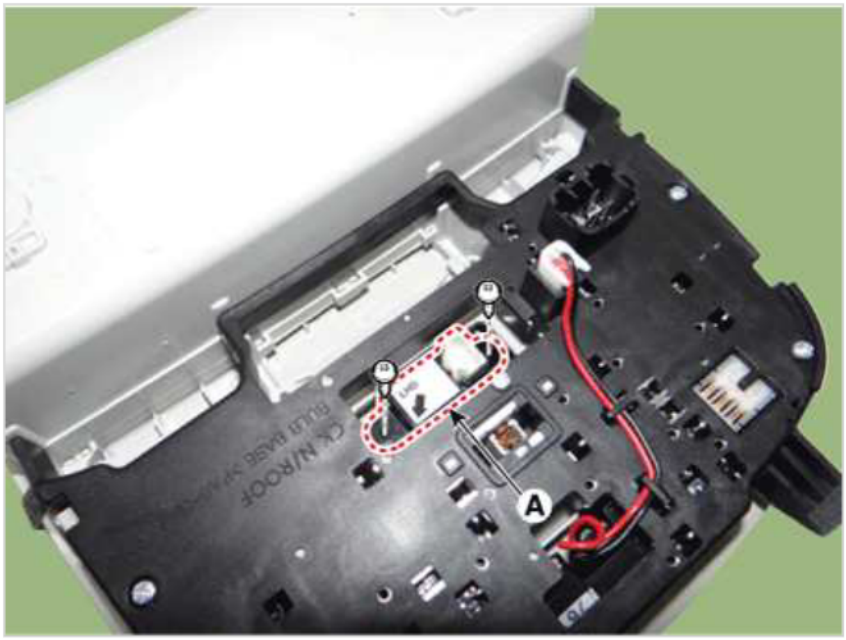
NOTICE

- Make sure the connector are connected in properly.
- Check the AVN system for normal operation.

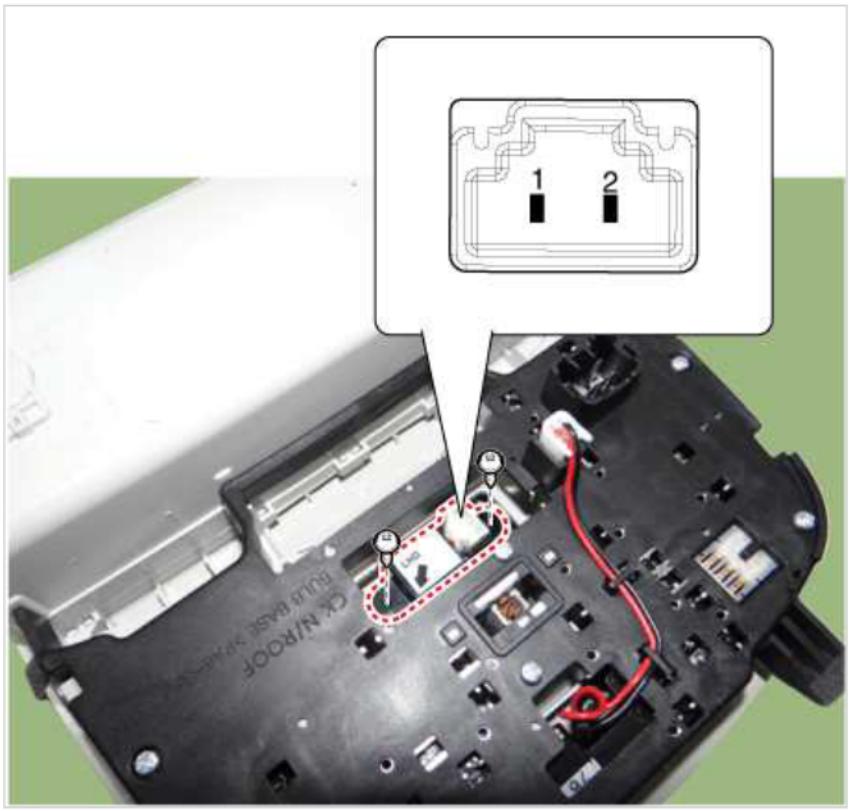
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Inspection

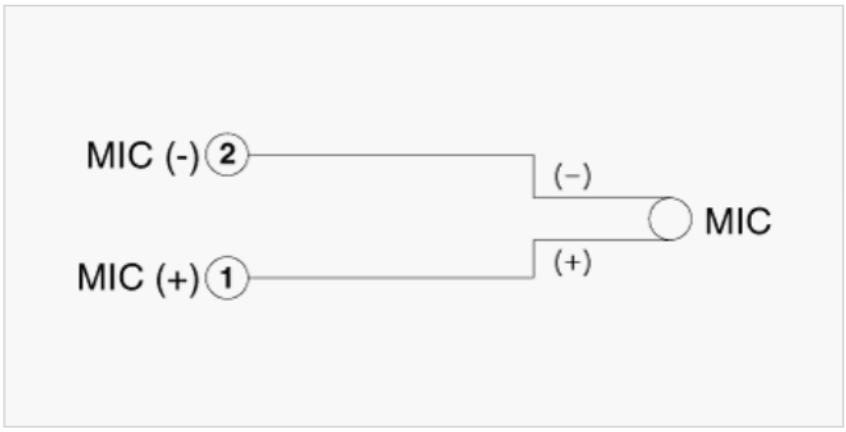
1. Disconnector the negative (-) battery terminal.
2. Remove the overhead console lamp.
   (Refer to Lighting System - "Overhead Console Lamp")
3. Remove the hands free mic (A) after loosening the mounting screws.



4. Check tshe continuity of between terminals.



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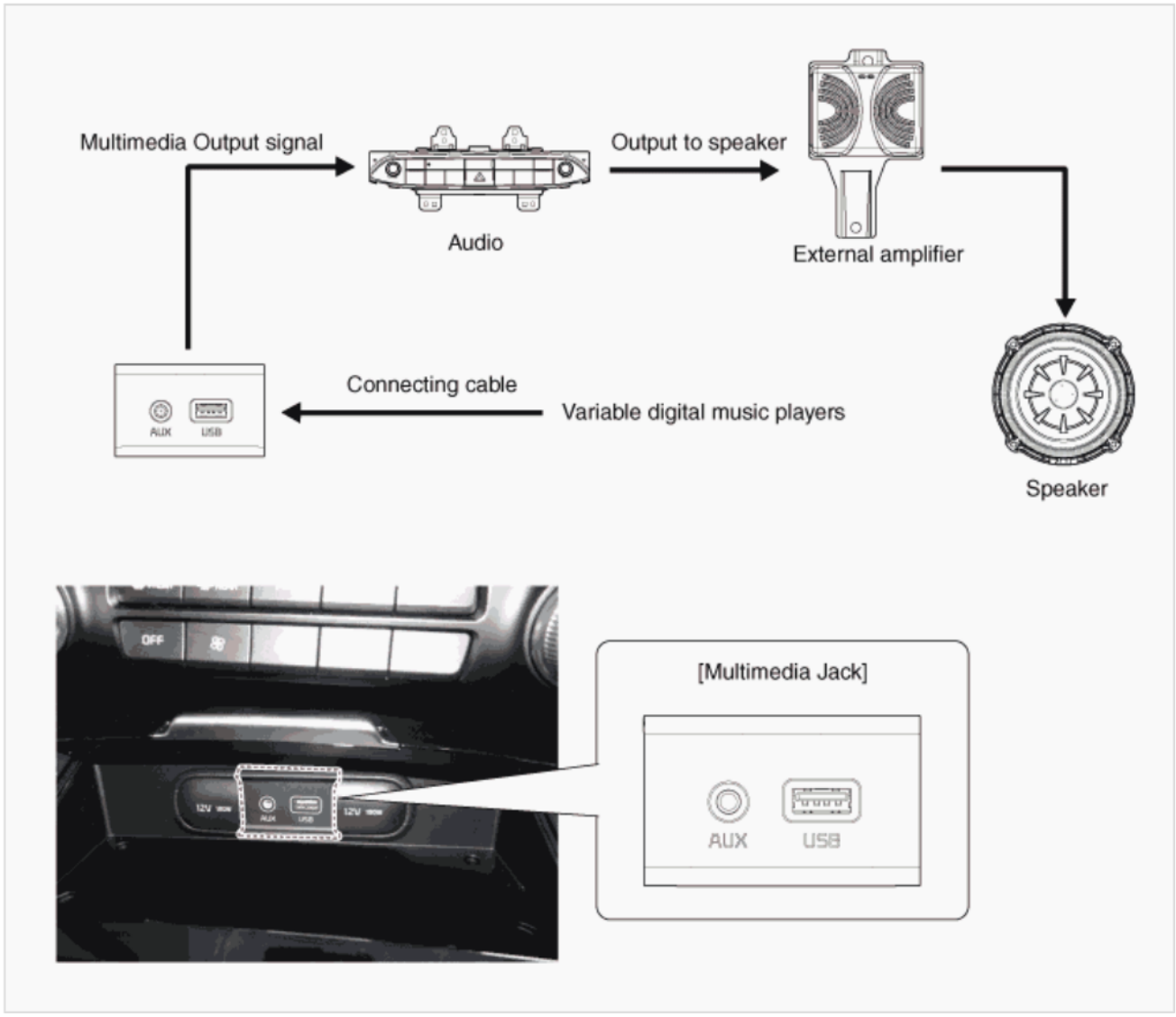


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Description

The multimedia jack on the console upper cover is for customers who like to listen to external portable music players like the MP3 etc., through the vehicle"s sound system when it is linked to this jack. The customer has this added option.

In case of distorted sound coming from the AUX-linked external music players, the audio unit may not be defective but the output level of the player does not match the specification of the AUX.



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Removal

Multimedia Jack

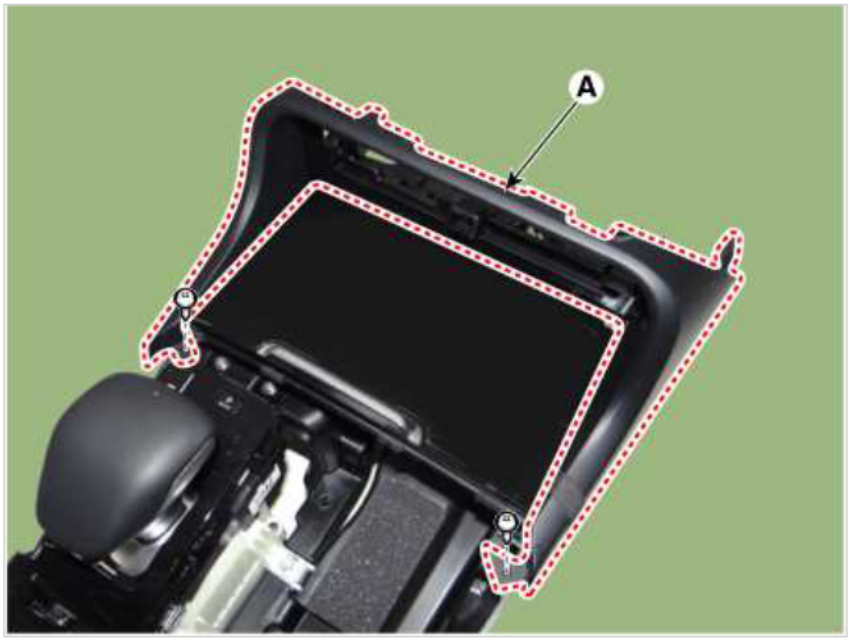
⚠ CAUTION

Put on gloves to protect your hands.

NOTICE

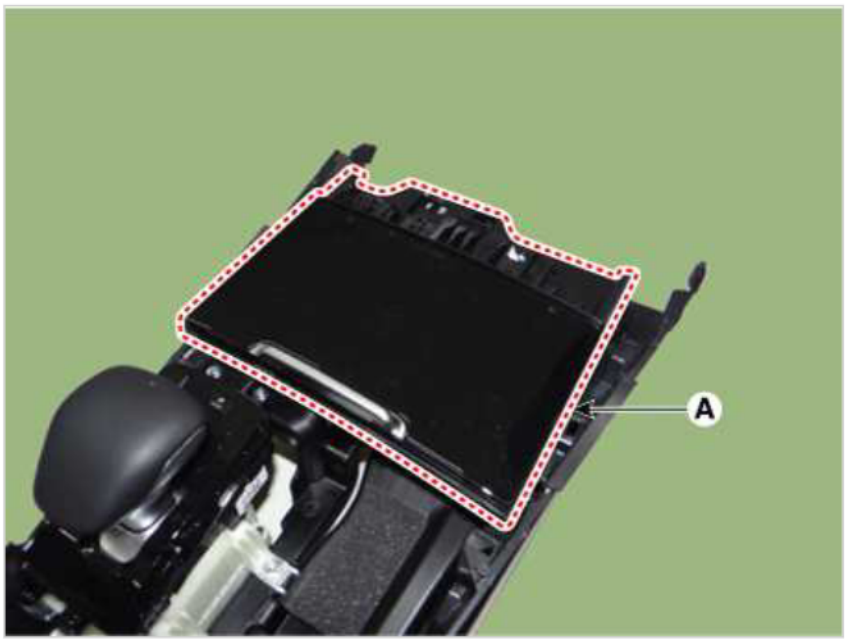
- When prying with a flat-tip screwdriver or use a prying trim tool, wrap it with protective tape, and apply protective tape around the related parts, to prevent damage.
- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Take care not to bend or scratch the trim and panels.

1. Disconnect the negative (-) battery terminal.
2. Remove the console complete assembly.
   (Refer to Body - "Floor Console Assembly")
3. Remove the front cover (A) after loosening the mounting screws.



4. Remove the floor console tray (A).

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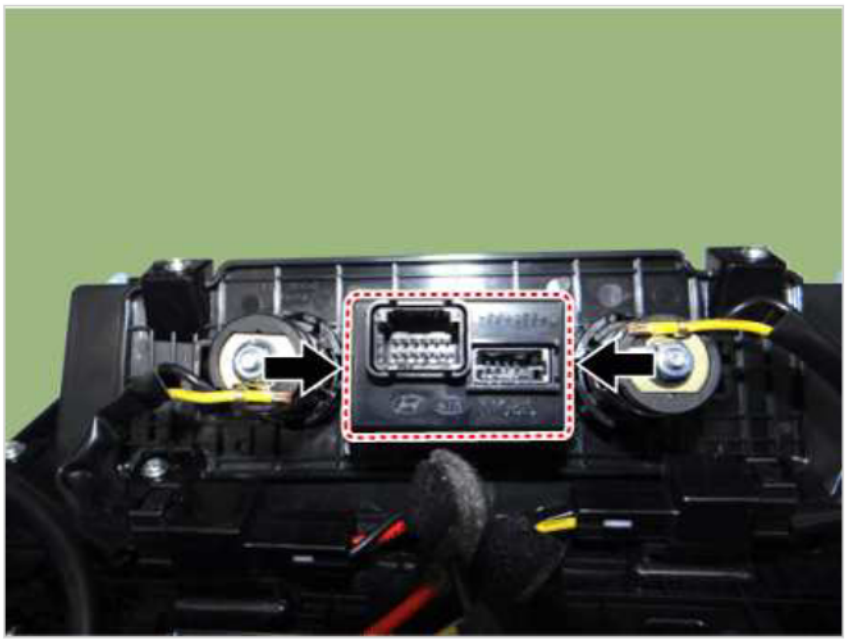


5. Disconnect the multimedia jack connectors (A).



6. Remove the multimedia jack (A) after releasing the fixed hooks.

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USB Charger

1. Disconnect the negative (-) battery terminal.
2. Remove the rear console cover.
   (Refer to Body - "Rear Console Cover")
3. Disconnect the USB charger connector (A).

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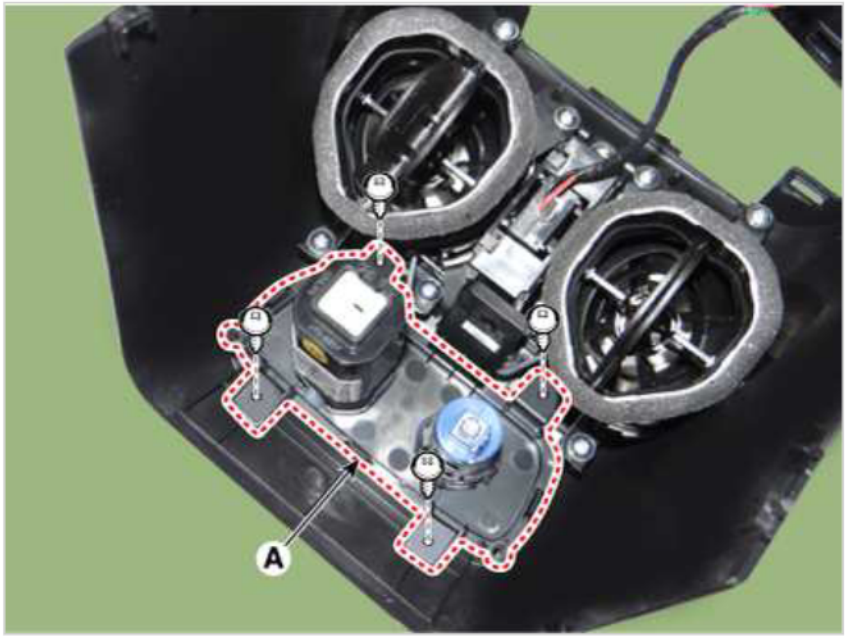


4. Disconnect the rear heater & A/C control unit connector (A).



5. Remove the USB charger (A) after loosening the mounting screws.

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Installation

Multimedia Jack

1. Install the multimedia jack.
2. Connect the multimedia jack connector.
3. Install the floor console tray.
4. Install the front cover.
5. Install the console complete assembly.
6. Connect the negative (-) battery terminal.

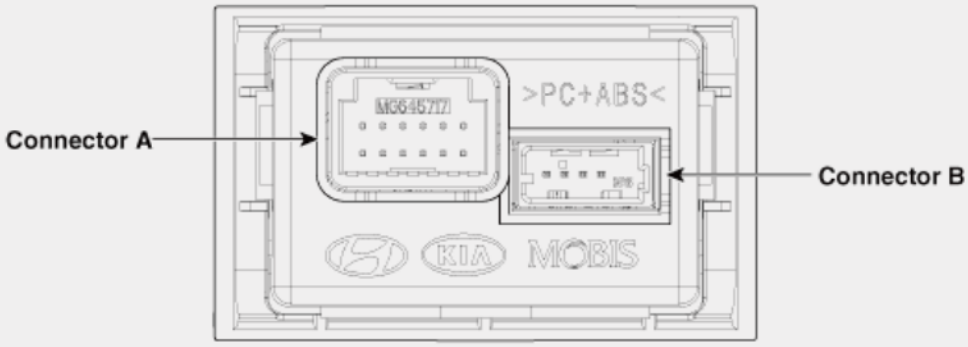
USB Charger

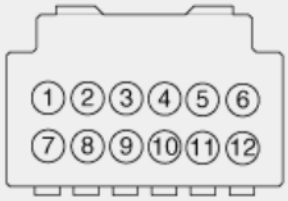
1. Install the USB charger.
2. Connect the rear heater & A/C control unit connector.
3. Connect the USB charger connector.
4. Install the rear console cover.
5. Connect the negative (-) battery terminal.

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Circuit Diagram



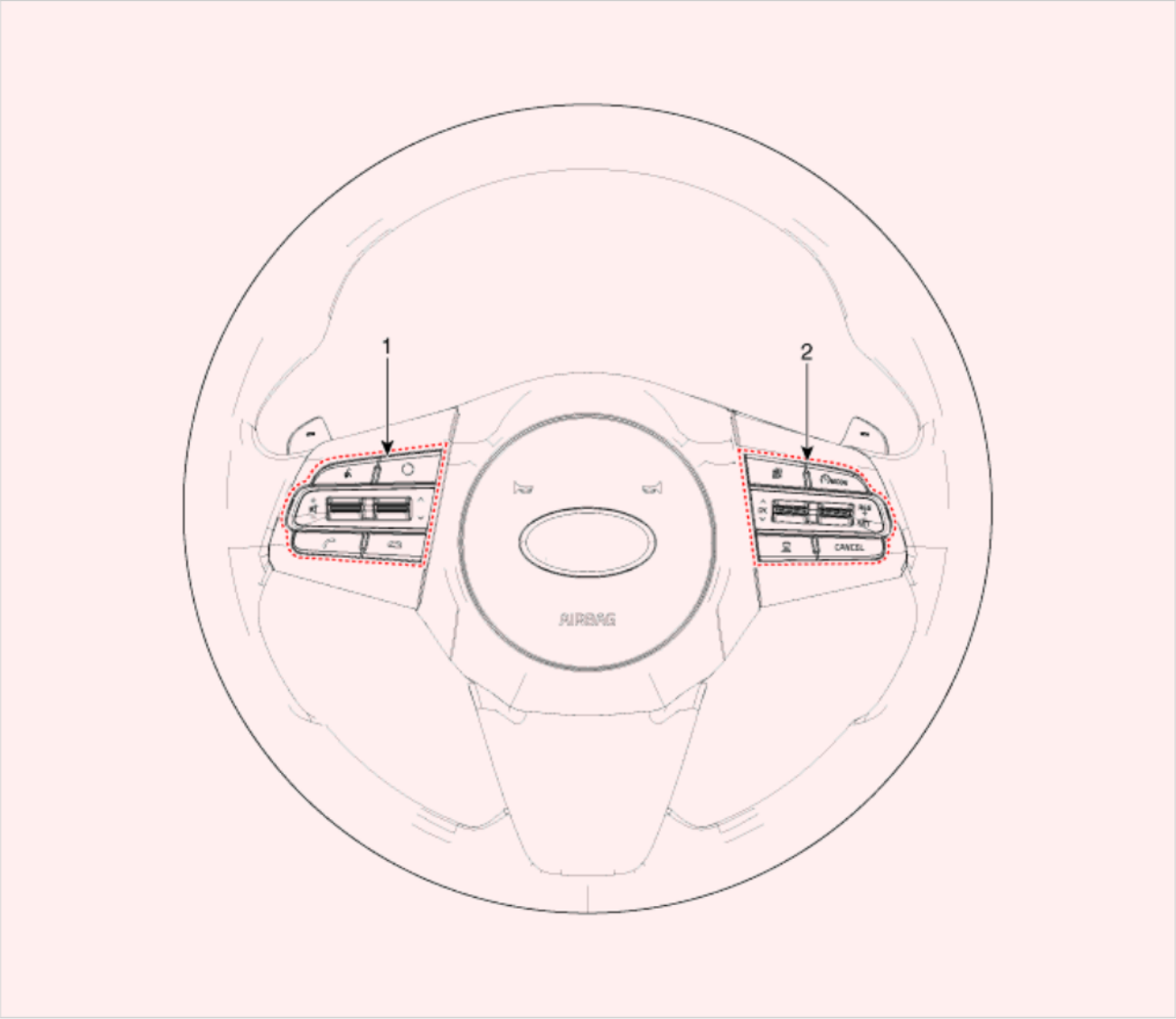


Connector A	No.	Description	No.	Description
	1	AUX_Input (Left)	7	AUX_Ground
	2	AUX_Input (Right)	8	-
	3	AUX_Detect	9	-
	4	Illumination (+)	10	-
	5	-	11	Ground
	6	Illumination (-)	12	-

Connector B	No.	Description
	1	USB VCC
	2	USB Data (Low)
	3	USB Data (High)
	4	USB

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Components



1. Left Remote Control Switch
(Audio + Bluetooth + Voice)

2. Right Remote Control Switch
(Trip Computer + ACC + SCC)

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Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the steering wheel assembly.
   (Refer to Steering System - "Steering Wheel")
3. Remove the paddle shift switch (A) after loosening the mounting screws.

[LH]





[RH]

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4. Disconnect the paddle shift switch connector (A).

[LH]

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[RH]



5. Remove the steering front cover (A) after loosening the mounting screws.

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6. Remove the steering rear cover (A) after loosening the mounting screws.



7. Remove the steering back cover (A) after loosening the mounting screws.

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8. Disconnect the steering wheel remote control connector (A).

[LH]



[RH]

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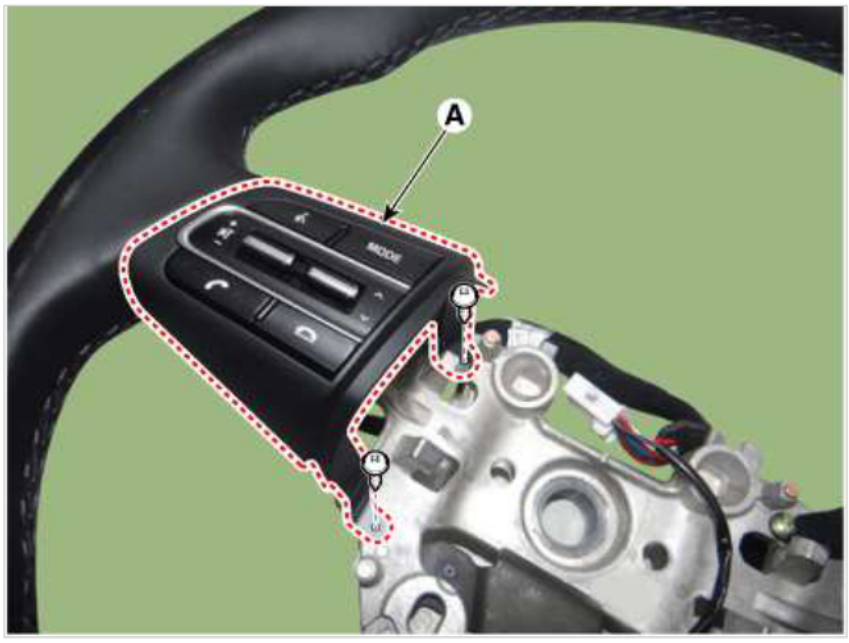


9. Remove the steering wheel remote control (A) after loosening the mounting screws.

[LH]



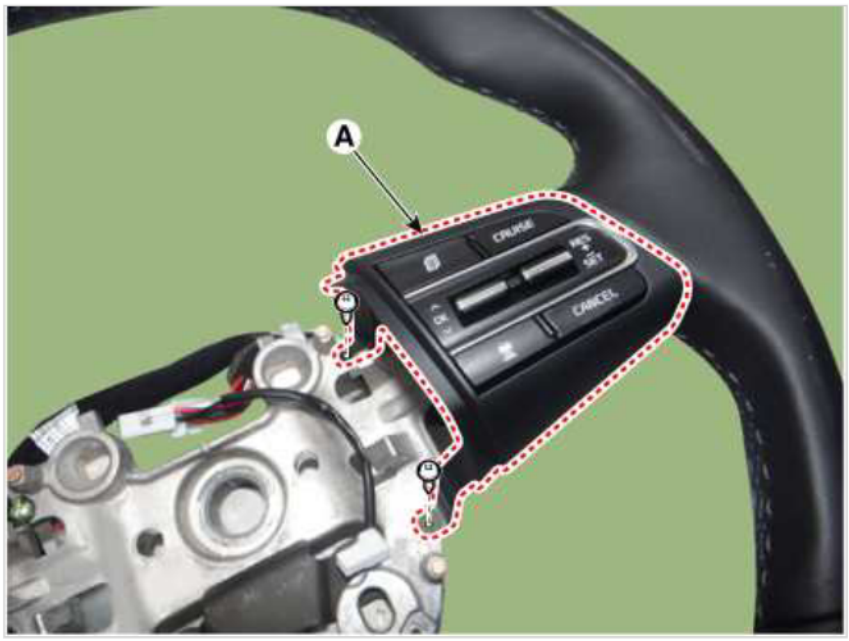
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[RH]



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Installation

1. Install the steering wheel remote control.
2. Connect the steering remote control connector.
3. Install the steering back cover.
4. Install the steering rear cover.
5. Install the steering front cover.
6. Connect the paddle shift switch connector.
7. Install the paddle shift switch.
8. Install the steering wheel assembly.
9. Connect the negative (-) battery terminal.

Inspection

1. Check for resistance between terminals in each switch position (LH).

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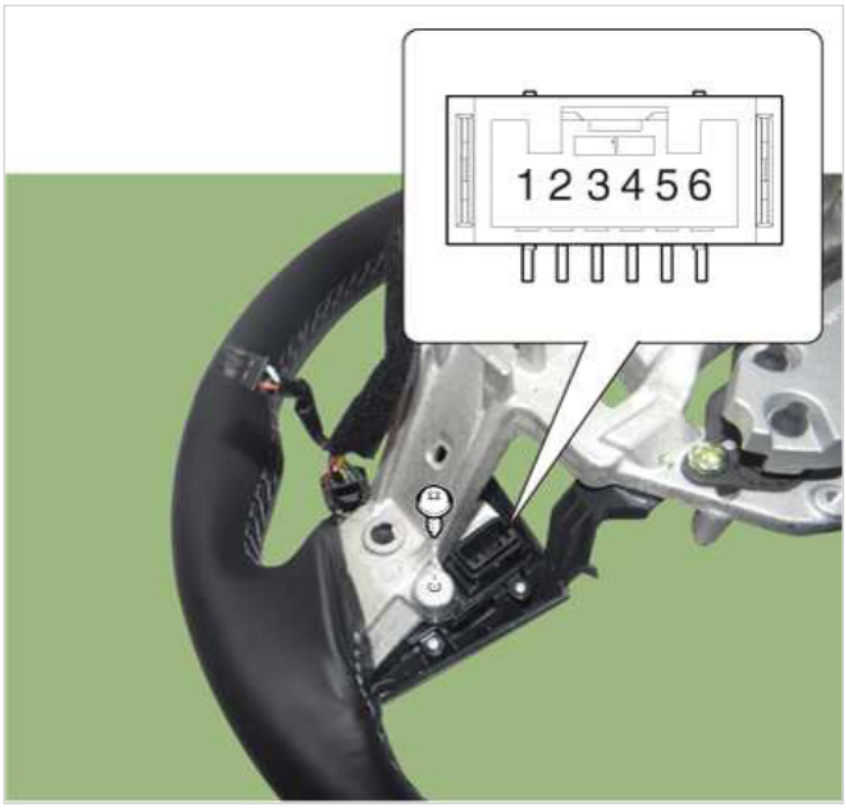


[LH : Audio + Bluetooth + Voice]

Switch	Connector terminal	Resistance (±3%)
SEEK Up	1-6	430 Ω
SEEK Down		1.11 kΩ
MODE		2.11 kΩ
MUTE		3.11 kΩ
Volume (+)		4.61 kΩ
Volume (-)		6.81 kΩ
Voice		10.71 kΩ
END		18.91 kΩ
SEND		40.91 kΩ

2. Check for resistance between terminals in each switch position (RH).

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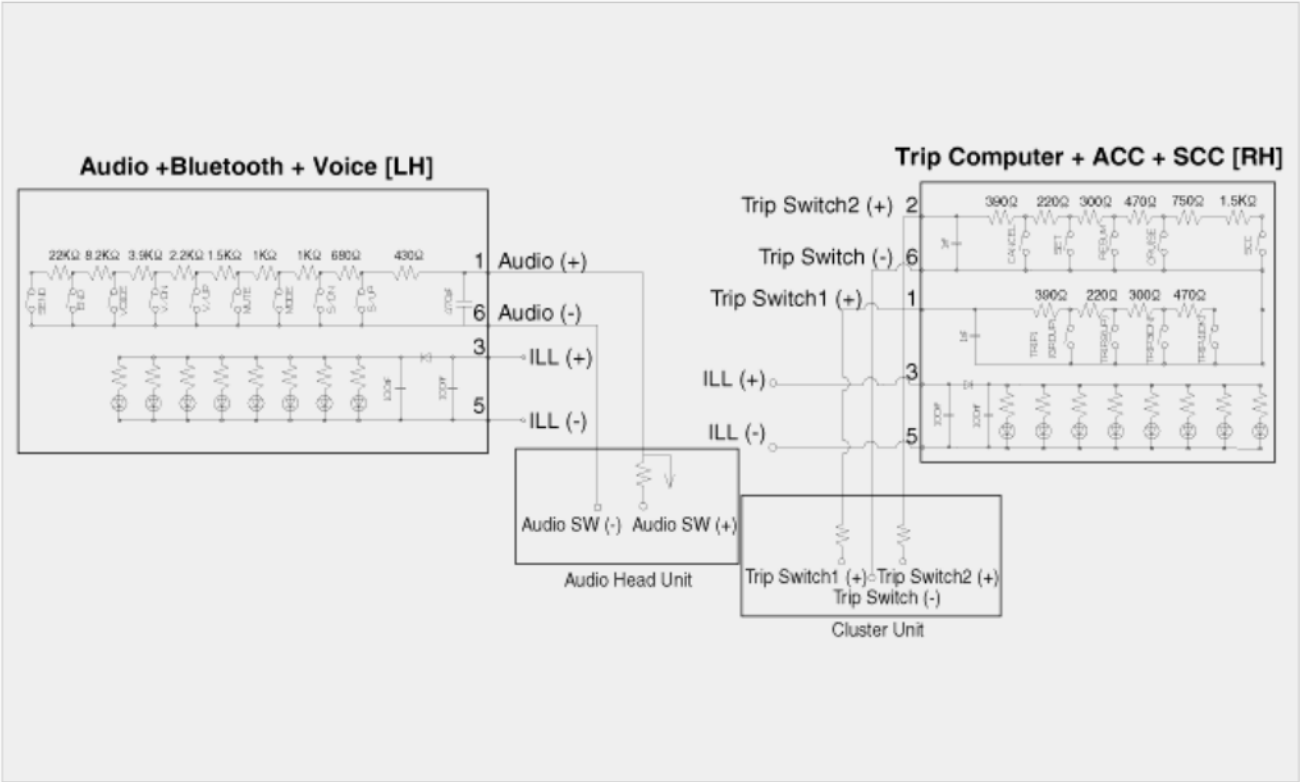


[RH : Trip + ACC + SCC]

Switch	Connector terminal	Resistance (±3%)
Cancel	2-6	390 Ω
SET -		610 Ω
RES +		910 Ω
Cruise ON/OFF		1.38 kΩ
Cruise & Speed Limit ON/OFF		2.13 kΩ
SCC (Following distance control)		3.63 kΩ
Group	1-6	390 Ω
Trip Up		610 Ω
Trip Down		910 Ω
ENTER		1.38 kΩ

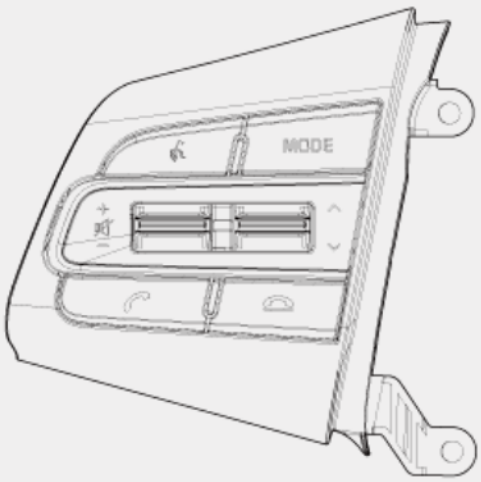
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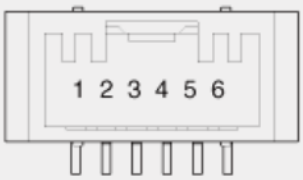
Circuit Diagram



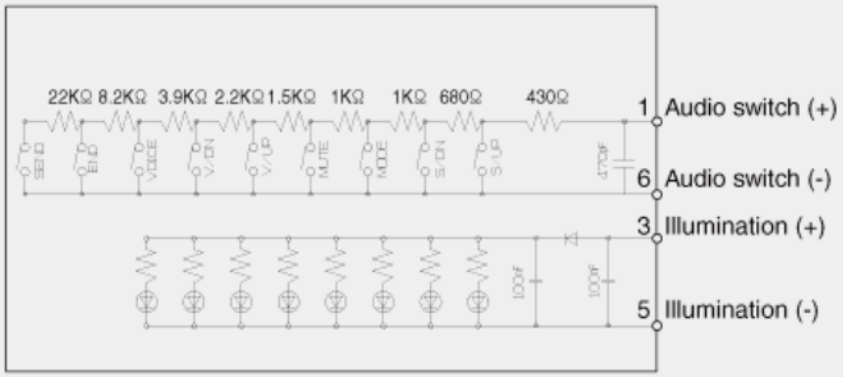
[Audio + Bluetooth + Voice]

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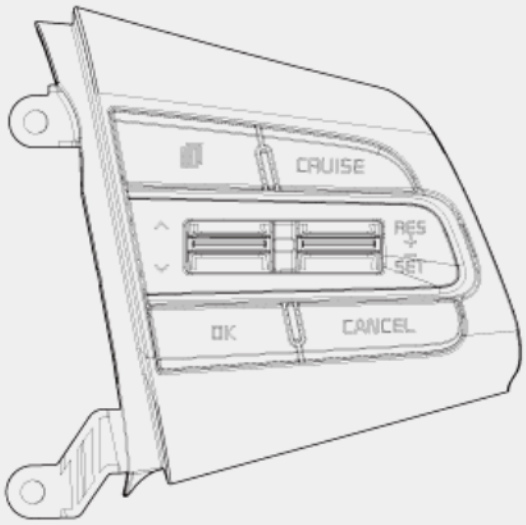
Connector


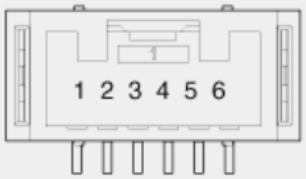
No.	Description
1	Audio switch (+)
2	-
3	Illumination (+)
4	-
5	Illumination (-)
6	Audio switch (-)

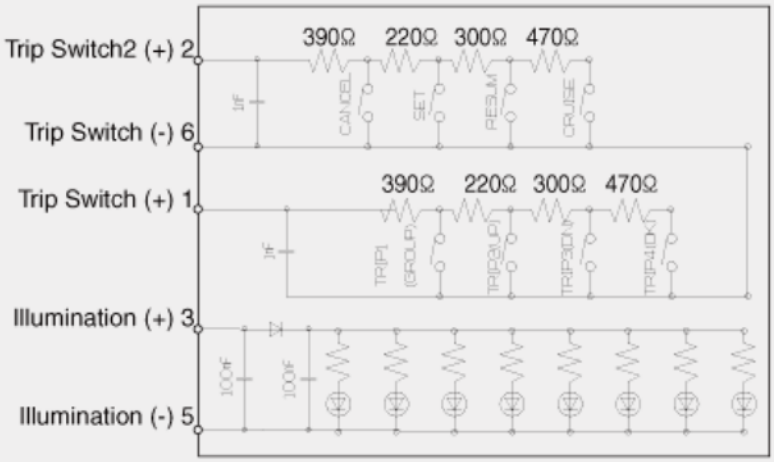


[Trip + ACC]

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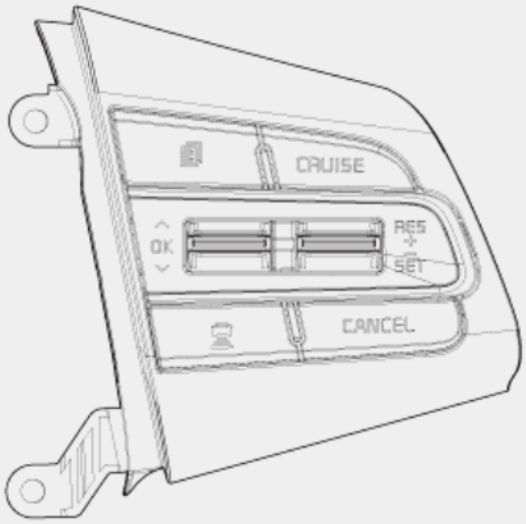


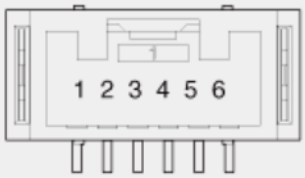
Connector	
	
No.	**Description**
1	Trip switch (+)
2	Trip switch2 (+)
3	Illumination (+)
4	-
5	Illumination (-)
6	Trip switch (-)

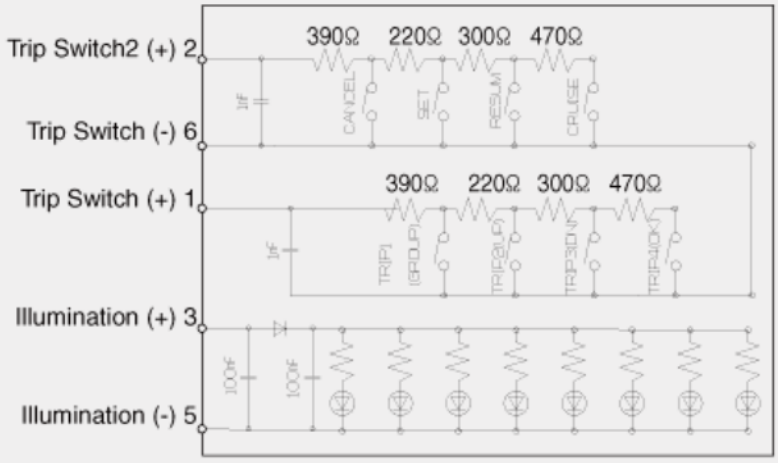


[Trip + ACC + SCC]

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Connector	
	
No.	**Description**
1	Trip switch (+)
2	Trip switch2 (+)
3	Illumination (+)
4	-
5	Illumination (-)
6	Trip switch (-)



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Inspection

Troubleshooting of the speakers

⚠ CAUTION

When handling the speakers :

- Do not cause shock to the speakers by dropping or throwing them.
- Be careful not to drop water and oil on the speakers.
- Use caution to handle the speaker because diaphragm made of paper is easily torn by impact or external force.
- Audio system tuning may cause damage to the speakers. The modified speakers are not covered by the manufacturer's warranty.

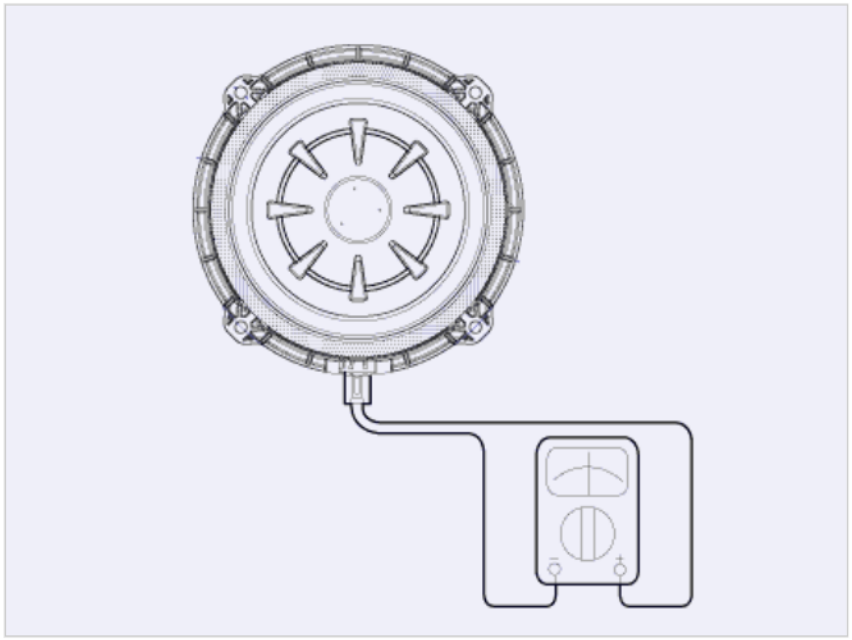
1. Basic inspection
   Loosen the screws to rule out the interference from the body trims and surrounding parts and then remove the speaker.
   After removing the speaker, check the sound quality of the speaker with the connector plugged in.
2. Inspection for each cause
   (1) Abnormal vibration
   – Make sure the mounting screws are properly tightened before replacing the speaker.
   – Reinstall the speaker and check that the symptom is resolved.
   – If the symptom does not disappear, replace the speaker with a new one.

   (2) Noise
   – Check that the speaker connector is properly connected and reinstall the connector if necessary.
   – If noises occur in the radio mode, turn to the CD player mode.
   – If noises occur in both modes, replace the speaker with a new one.

   NOTICE

   If noises occur only in the radio mode, the poor radio reception is the cause so do not replace the speaker.

   (3) Poor working
   – Check the plus (+) and negative (-) speaker terminals using an ohmmeter.
   – If resistance is measured at the specified value shown below, the speaker operation is normal.
   – If the measured resistance is different from the specified value, replace the speaker.



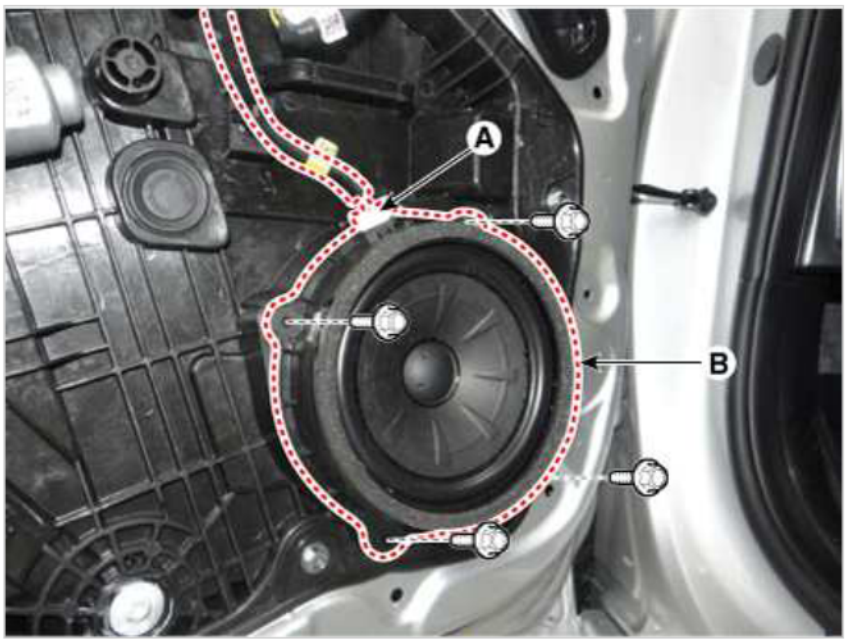
Removal

Front Door Speaker

1. Disconnect the negative (-) battery terminal.

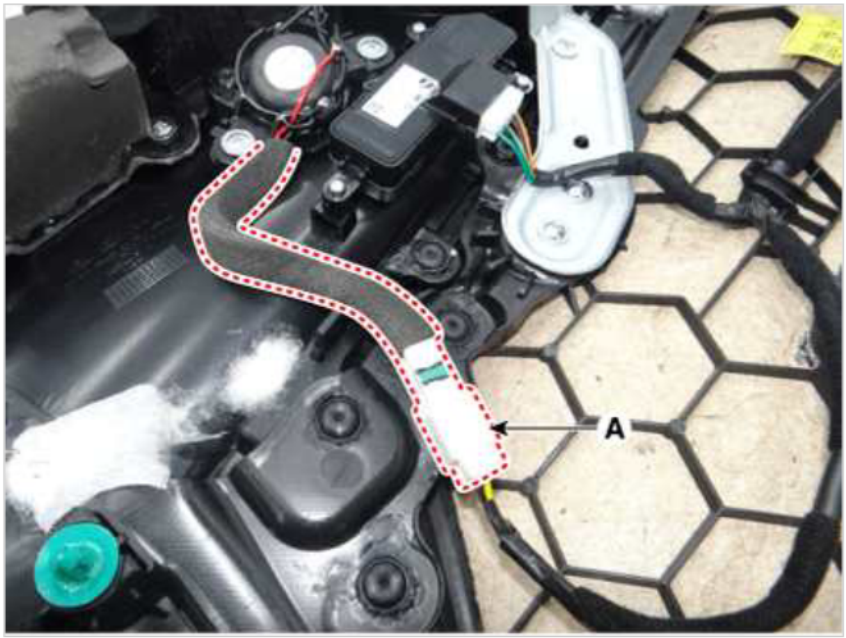
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2. Remove the front door trim.
   (Refer to Body - "Front Door Trim")
3. Remove the front door speaker (B) after disconnecting the connector (A) and loosening the bolts.



Front Tweeter Speaker

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim.
   (Refer to Body - "Front Door Trim")
3. Disconnect the front tweeter speaker connector (A).



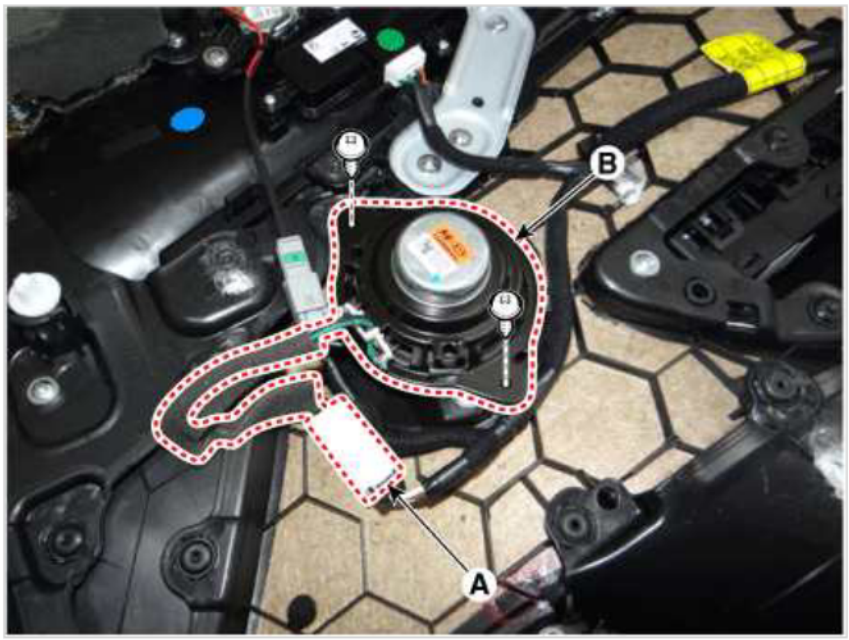
4. Remove the front tweeter speaker (A) after loosening the mounting screws.

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Front Midrange Speaker

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim.
   (Refer to Body - "Front Door Trim")
3. Remove the front midrange speaker (B) after disconnecting the connector (A) and loosening the mounting screws.



Rear Door Speaker

1. Disconnect the negative (-) battery terminal.
2. Remove the rear door trim.
   (Refer to Body - "Rear Door Trim")
3. Remove the rear door speaker (B) after disconnecting the connector (A) and loosening the mounting bolts.

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Rear Tweeter Speaker

1. Disconnect the negative (-) battery terminal.
2. Remove the rear door trim.
   (Refer to Body - "Rear Door Trim")
3. Remove the rear tweeter speaker (B) after disconnecting the connector (A) and loosening the mounting screws.



Rear Midrange Speaker

1. Disconnect the negative (-) battery terminal.
2. Remove the rear door trim.
   (Refer to Body - "Rear Door Trim")
3. Remove the rear midrange speaker (B) after disconnecting the connector (A) and loosening the mounting screws.

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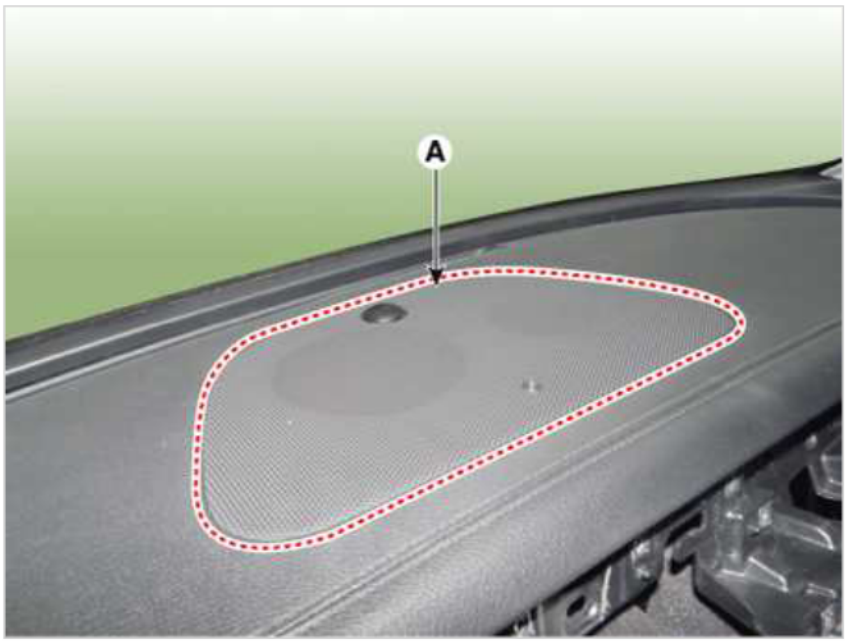


Crash Pad Center Speaker

NOTICE

Be careful not to scratch the crash pad and related parts

1. Disconnect the negative (-) battery terminal.
2. Using a scraper or remover, remove the crash pad center speaker grille (A).



3. Disconnect the security connector (A) and auto light & photo sensor connector (B).

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



5. Disconnect the crash pad center speaker connector (A).

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Sub Woofer Speaker

1. Disconnect the negative (-) battery terminal.
2. Remove the floor carpet.
   (Refer to Body - "Floor Carpet")
3. Remove the sub woofer speaker (B) after disconnecting the connector (A) and loosening the mounting bolts.



Installation

Front Door Speaker

1. Install the front door speaker.
2. Install the front door trim.
3. Connect the negative (-) battery terminal.

Front Tweeter Speaker

1. Install the front tweeter speaker.
2. Install the front door trim.

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3. Connect the negative (-) battery terminal.

Front Midrange Speaker

1. Install the front midrange speaker.
2. Install the front door trim.
3. Connect the negative (-) battery terminal.

Rear Door Speaker

1. Install the rear door speaker.
2. Install the rear door trim.
3. Connect the negative (-) battery terminal.

Rear Tweeter Speaker

1. Install the rear tweeter speaker.
2. Install the rear door trim.
3. Connect the negative (-) battery terminal.

Rear Midrange Speaker

1. Install the rear Midrange speaker.
2. Install the rear door trim.
3. Connect the negative (-) battery terminal.

Crash Pad Center Speaker

1. Install the crash pad center speaker.
2. Connect the security connector and auto light & photo sensor connector.
3. Install the crash pad center speaker grille.
4. Connect the negative (-) battery terminal.

Sub Woofer Speaker

1. Install the sub woofer speaker.
2. Install the floor carpet.
3. Connect the negative (-) battery terminal.

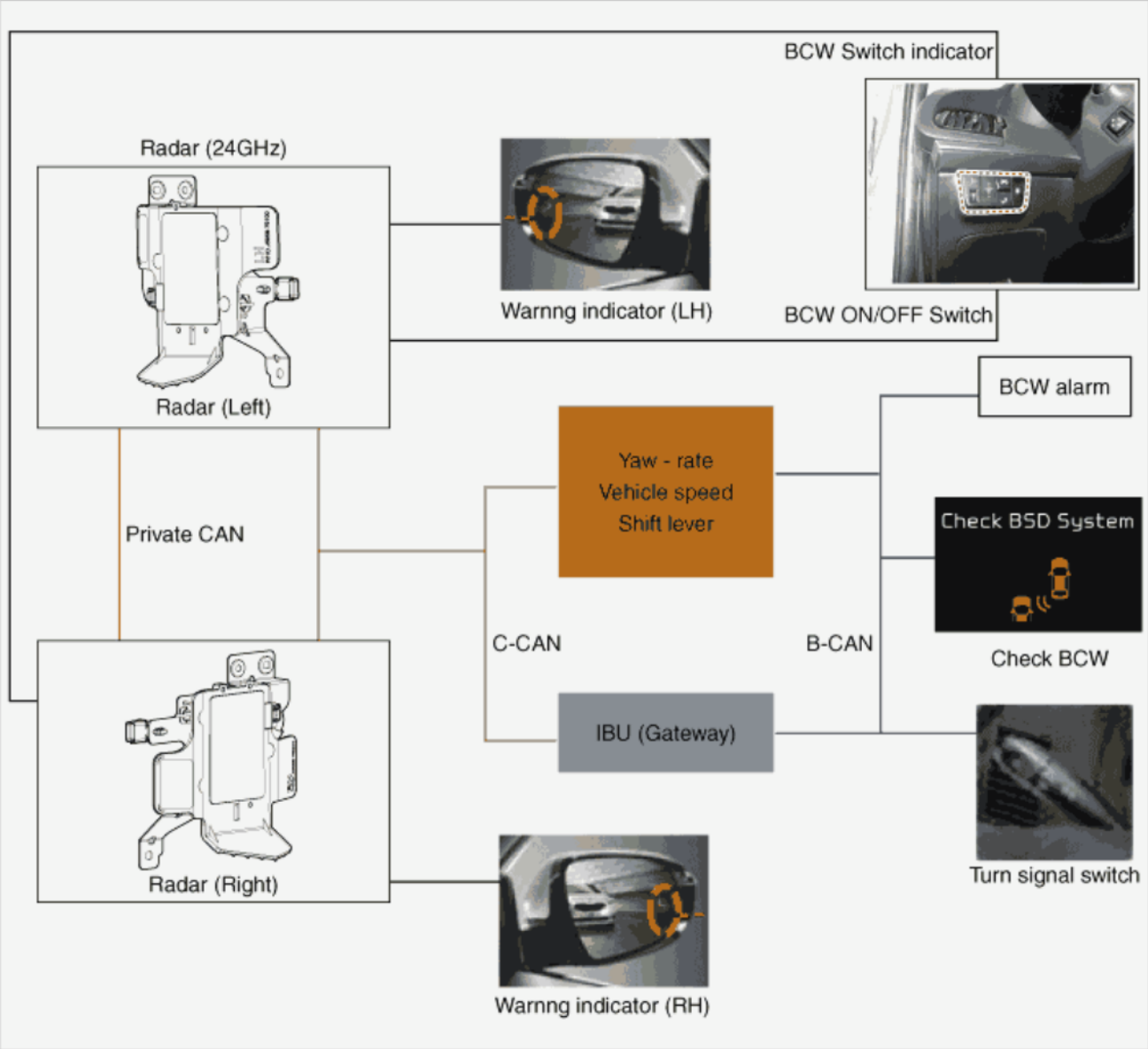
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Specifications

Items	Specification
Rated voltage	DC 12 V
Operating voltage	9 - 16 V
Operating speed	30 - 255 km/h
Sensing distance	30 m (Sedan)
Curvature radius	Start : Equal to or greater than 125 m Stop : Less than 125 m
Frequency	24 GHz
Quantity	2 EA (Master 1EA, Slave 1EA)

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Description



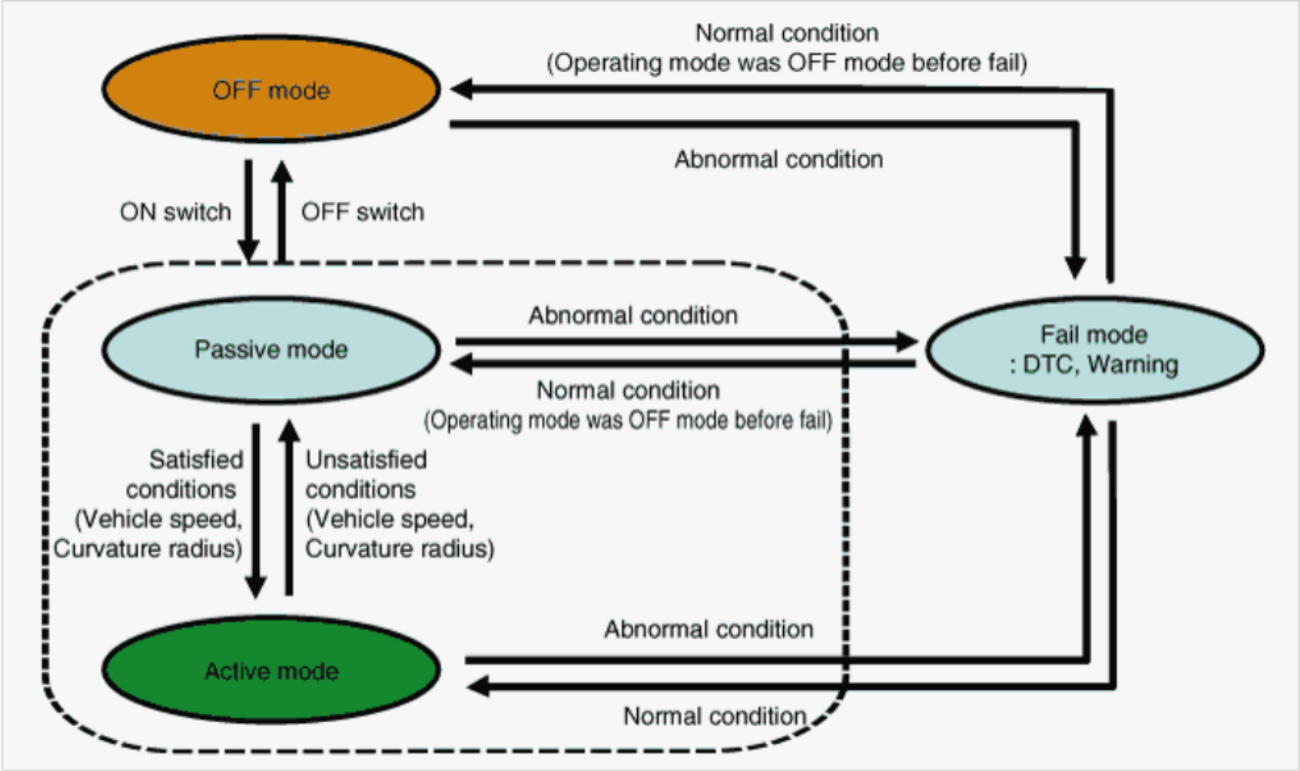
BCW is a system that uses two magnetic wave radar sensors attached on the rear panel to measure the distance from the vehicle in the back and senses and sets off (visual and auditory) alarms for any vehicle coming into the blind spot.

- Blind-Spot Collision Warning (BCW) System : Detects other vehicles in the rear blind spot area and warns the driver by indicating on outside rearview mirror.
- Lane Change Assist (LCA) System : Detects high speed vehicles approaching from rear lateral directions and warns the driver.
- Rear Cross-Traffic Collision Warning (RCCW) System : Sets off warning for vehicles approaching from rear lateral direction when reversing.

Blind-Spot Collision Warning (BCW)	Lane Change Assist (LCA)	Rear Cross-Traffic Collision Warning (RCCW)
		

System Operating Mode

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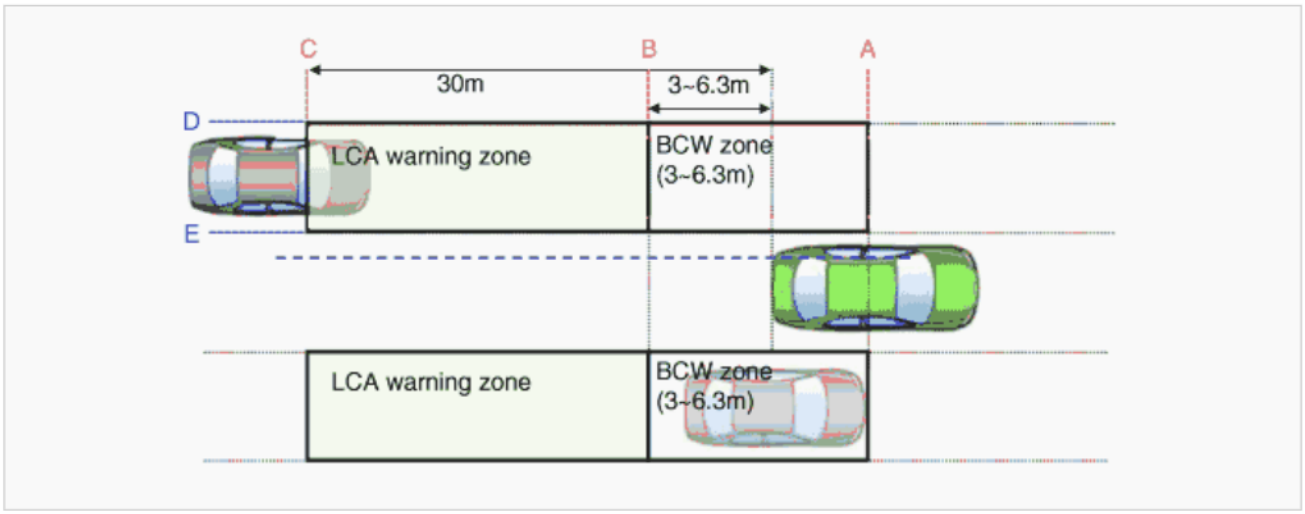


1. When starting the engine with the switch off, OFF mode is on.
2. When pressing ON switch in OFF mode, Passive mode is on.
3. If starting the engine with the switch ON, Passive mode is on.
   ※During IGN ON, the switch is in the initial state: The last position is kept.
   – If IGN OFF → ON with the switch ON, the switch is ON.
   – If IGN OFF → ON with the switch OFF, the switch is OFF.
4. If you start the engine with BCW switch ON, or if you turn on BCW with BCW switch OFF, the warning lamp of the door mirror flickers for 2 to 3 seconds.
   This is to inform the driver that the BCW system is ready. (provided that if the system is in Fail mode, there is no flickering.)
5. If the activation conditions (speed and curvature radius) are met while driving, Active mode is on (warning issued).
6. If the activation conditions (speed and curvature radius) are not met while driving, Passive mode is on (warning removed).
7. If BCW & LCA operation fails in any mode, Fail mode is on.
8. If BCW & LCA operation operates normally in Fail mode, System Operating mode changes as belows
   – If Operating mode was OFF mode before fail : goes to Off mode
   – If Operating mode was ON mode before fail : goes to On mode
9. If pressing OFF switch while BCW & LCA function is operating (Active/Passive), OFF mode is on.

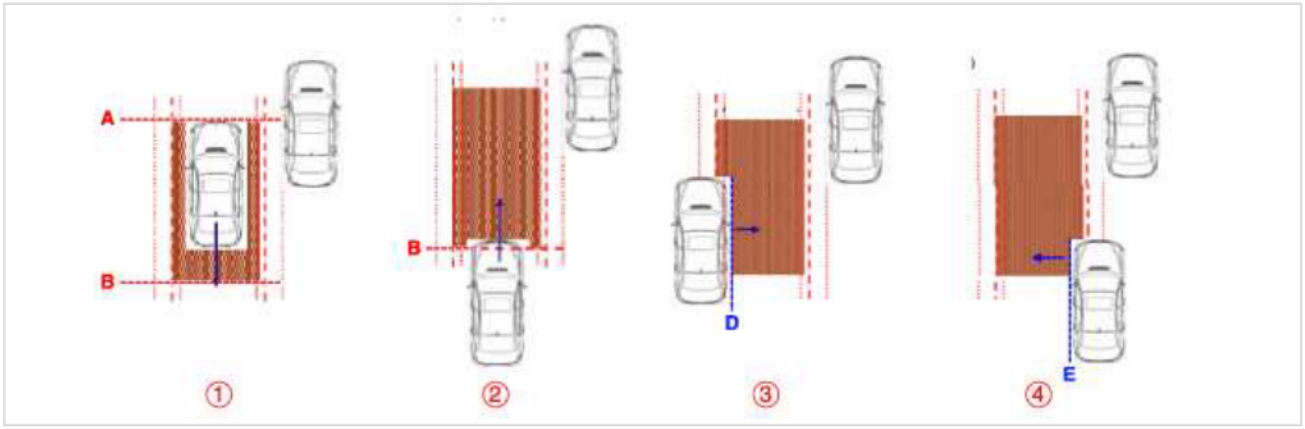
Warning Condition

1. Warning zone

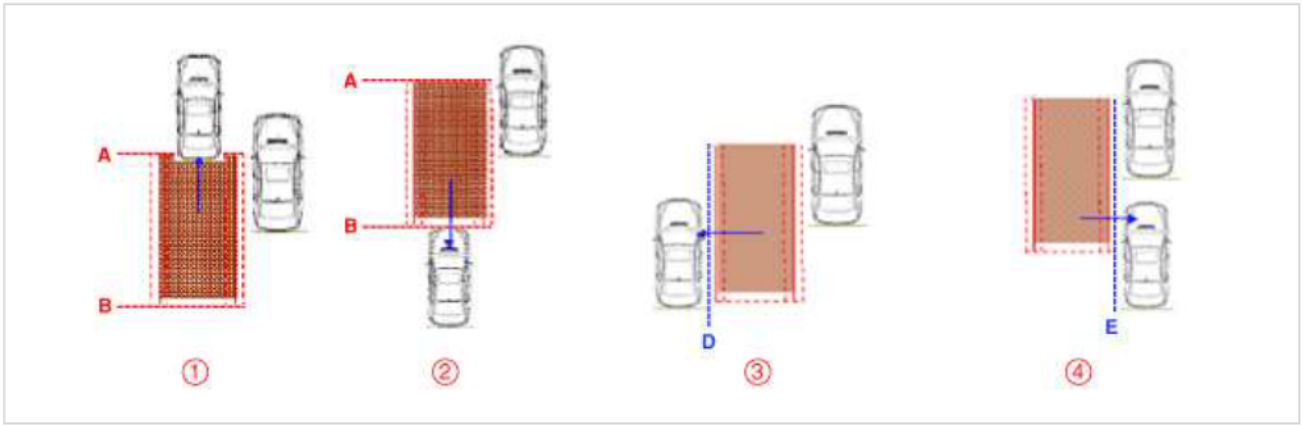
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2. Conditions for BCW warning ON
   ① The entire body of the target vehicle is located behind the line A.
   ② Any part of the target vehicle passes the line B.
   ③ Any part of the target vehicle passes the line D and Hysteresis In.
   ④ The entire part of the target vehicle passes the line E and Hysteresis In.

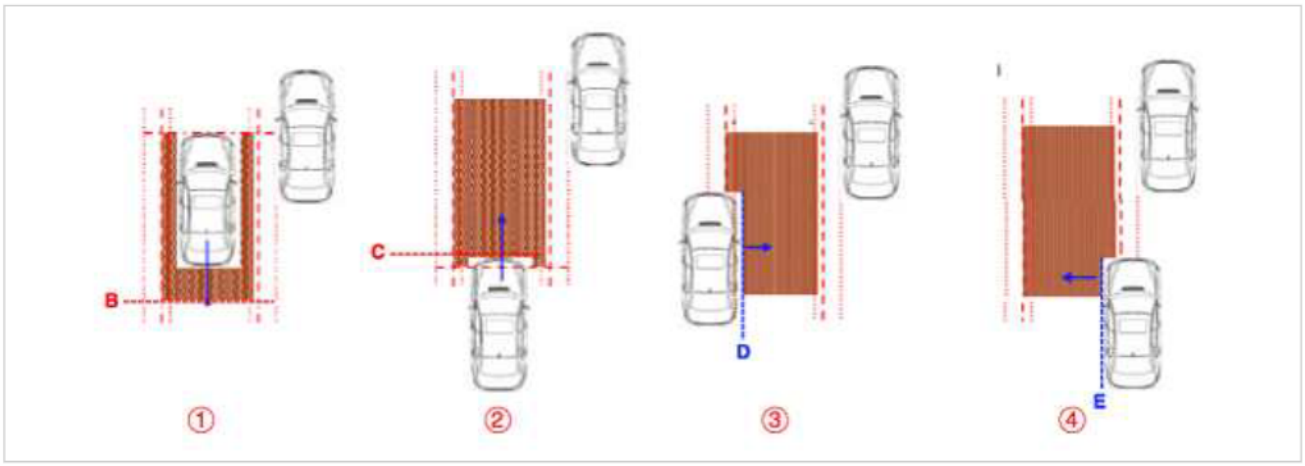


3. Conditions for BCW warning OFF
   ① The entire body of the target vehicle moves before the line A.
   ② The entire body of the target vehicle moves behind the line B.
   ③ The entire body of the target vehicle passes the line D and Hysteresis Out.
   ④ The entire part of the target vehicle passes the line E and Hysteresis Out.

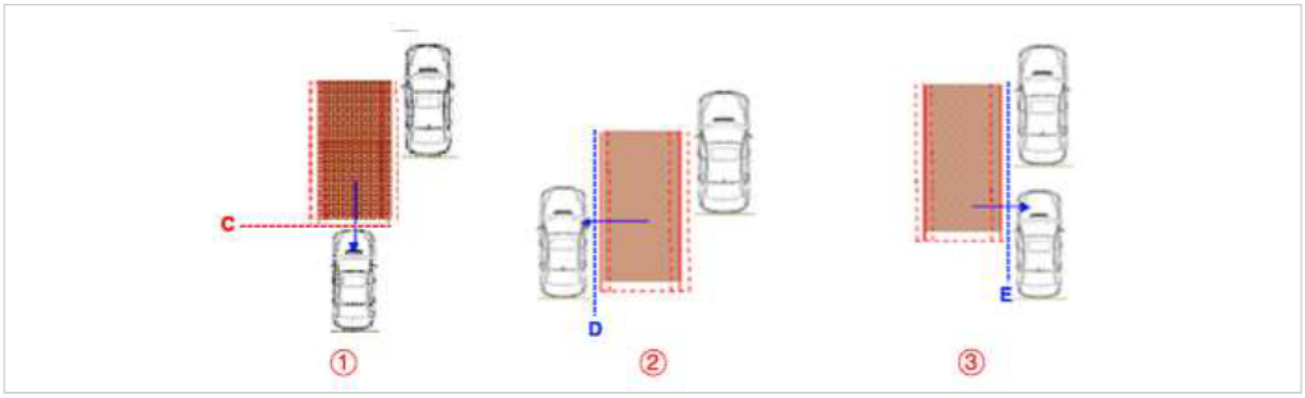


4. Conditions for LCA warning ON
   ① The entire body of the target vehicle is located behind the line B.
   ② Any part of the target vehicle passes the line C.
   ③ Any part of the target vehicle passes the line D and Hysteresis In.
   ④ The entire part of the target vehicle passes the line E and Hysteresis In.
   ⑤ In the all above conditions, TTC (Time to Collision) is less than 3 seconds.

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5. Conditions for LCA warning OFF
   ① The entire body of the target vehicle passes the line C.
   ② The entire body of the target vehicle passes the line D and Hysteresis Out.
   ③ The entire body of the target vehicle passes the line E and Hysteresis Out.
   ④ TTC (Time to Collision) is more than 3 seconds.



6. Sensor activation conditions
   ① BCW & LCA switch (indicated by the switch LED) is on.
   ② Vehicle Speed : 30 km/h or faster
   ③ Curvature radius : 125 m or more
   ④ Relative car speed : -10 to 255 km/h
   (Negative value refers to overtaking the vehicle ahead.)

7. Sensor deactivation conditions
   ① BCW & LCA switch (indicated by the switch LED) is off.
   ② Vehicle Speed : 27 km/h or slower
   ③ Curvature radius : Less than 125 m
   ④ Relative car speed : All except -10 to 255 km/h
   (Negative value refers to overtaking the vehicle ahead.)

8. System control prohibition
   ① The radar is covered by debris : System conditions - Blockage message is outputted

> **Information**
> Contamination of sensors on rear bumper by snow, mud or stickers may result in degradation in sensor detection performance.

   ② The radar installation is distorted due to external impact: Send the error code
   ③ BCW & LCA system fails : Send the error code

> **CAUTION**
> - If the surrounding area of rear bumper is contaminated by foreign materials that may interfere radar, error message can be set off although BCW system is normal.

9. Rear Cross-Traffic Collision Warning (RCCW) System

Item	Specification	Remarks

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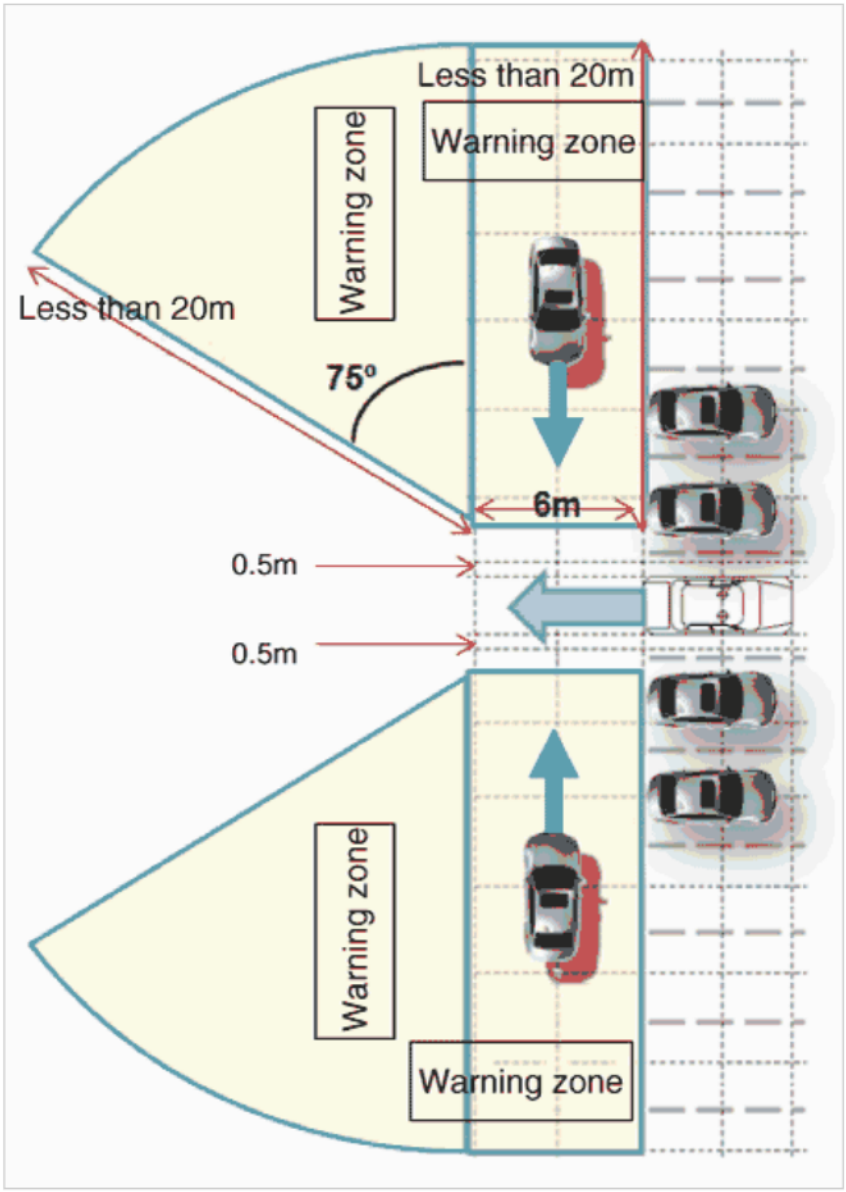
Vehicle speed	0 to -10 km/h	R" position
Relative speed	4 - 60 km/h	+ : closing
Operating range	0.5 - 20 m	Vehicle : 20 m Bike : 15 m

① This function helps the driver to detect an approaching vehicle from the rear and side that cannot be visually identified when the driver reverses to pull the vehicle out from a parking spot.
② A warning is generated for the target vehicle if it is within 2 seconds based on TTC (Time to Collision). Pedestrians are not considered as approaching targets when warning the driver. (Warning may not be generated.)

Information

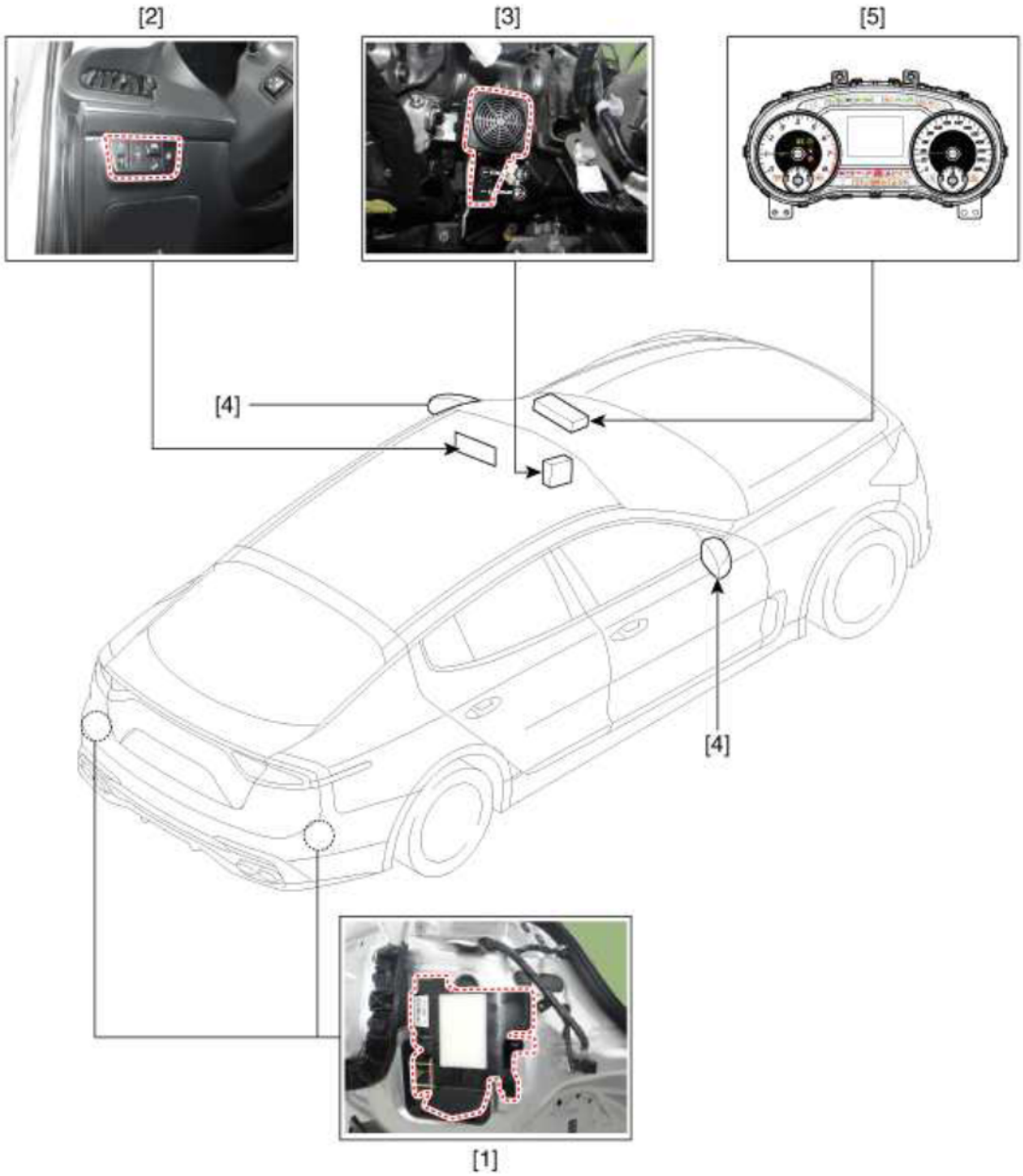
Time to Collision (TTC) : If the predicted time to collision calculated by taking into consideration the relative distance and relative speed to the target vehicle is within 2 - 3.5 seconds, the warning alarm will be set off. (It changes depending on the relative speed of the approaching vehicle.)

③ Warning zone



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Components



1. Blind-Spot Collision Warning (BCW) Unit
2. Blind-Spot Collision Warning (BCW) Switch
3. Speaker
4. Blind-Spot Collision Warning (BCW) Warning Lamp
5. Cluster

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Inspection

Correction Overview

Need to calibrate the mounting angle of the BCW when a vehicle has a rear or a side collision with BCW system even just replacing a BCW bracket or BCW components.

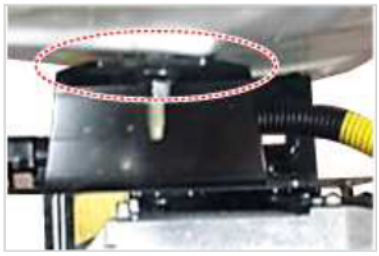
Check before Correction

1. When a failure code [C2702 (Master)] or [C2703 (Slave)] occurs, check the following before performing correction.
2. Check the vehicle condition and whether the BCW unit or bracket is deformed (mounting angle, twisted vehicle body, etc.).

Checking the Vehicle	
Normal	Abnormal (deformation of the bracket or bolted area)
	

Checking the Vehicle	
Normal	Abnormal (deformation of the bracket or bolted area)
	

3. Check the nut tightening. Check if there is any foreign substance.

Checking the Vehicle	
Normal	Abnormal (deformation of the bracket or bolted area)
	

NOTICE

- If you found any problem in the BCW unit, bracket, or nut tightening, correct the problem or replace the component. If there is no problem, mount the bumper back and perform BCW.
- If a failure code is displayed or a warning lamp turns on even after performing BCW radar correction 5 times, replace the BCW unit.

Correcting the blind-spot radar angle

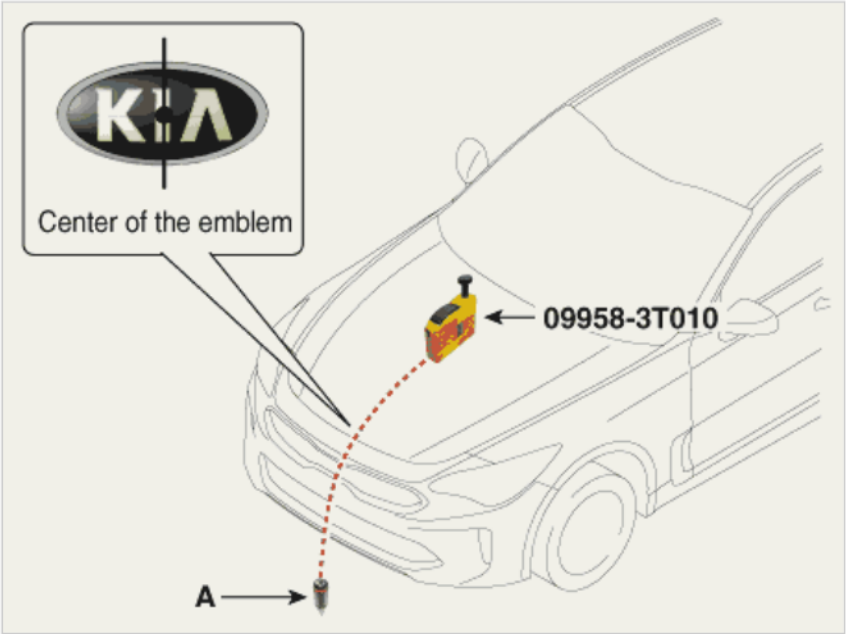
NOTICE

- Perform the task on a level place.

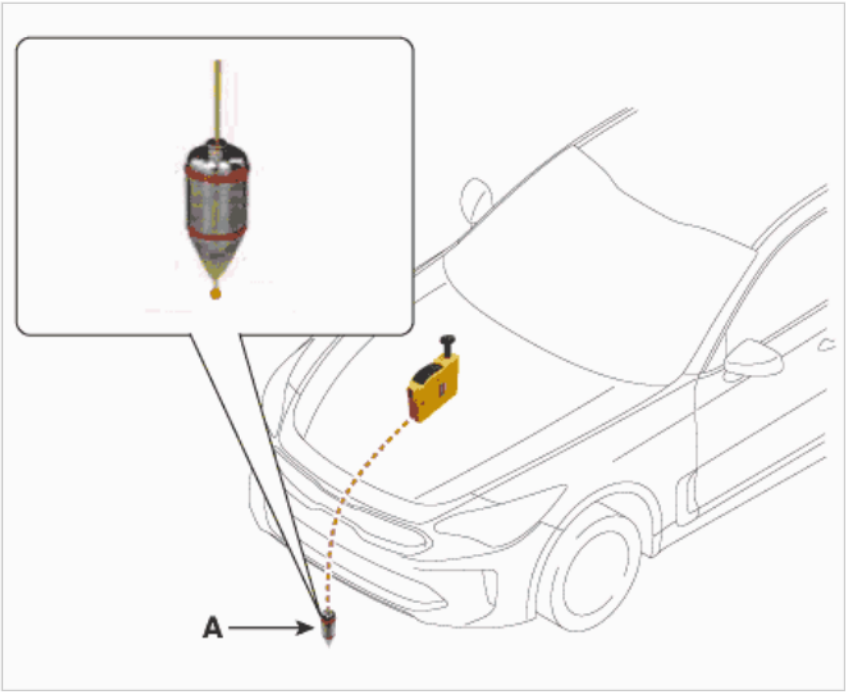
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• Perform the task after checking the tire pressure.

1. Remove the rear bumper assembly.
   (Refer to Body - "Rear Bumper Assembly")
2. Create the center line of vehicle by using the blind-spot radar unit correction tool set (09958-3T500).
   (1) Attach a vertical plumb (09958-3T010) on the hood, and lower the plumb (A) to the ground so that it passes through the center of the emblem.

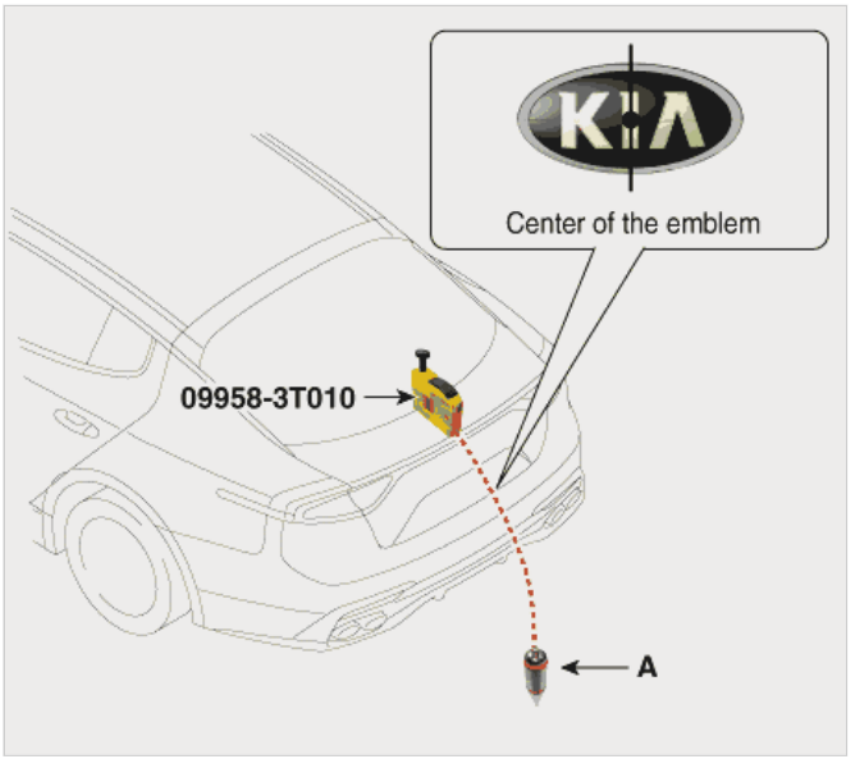


   (2) Mark the center point below the plumb (A).

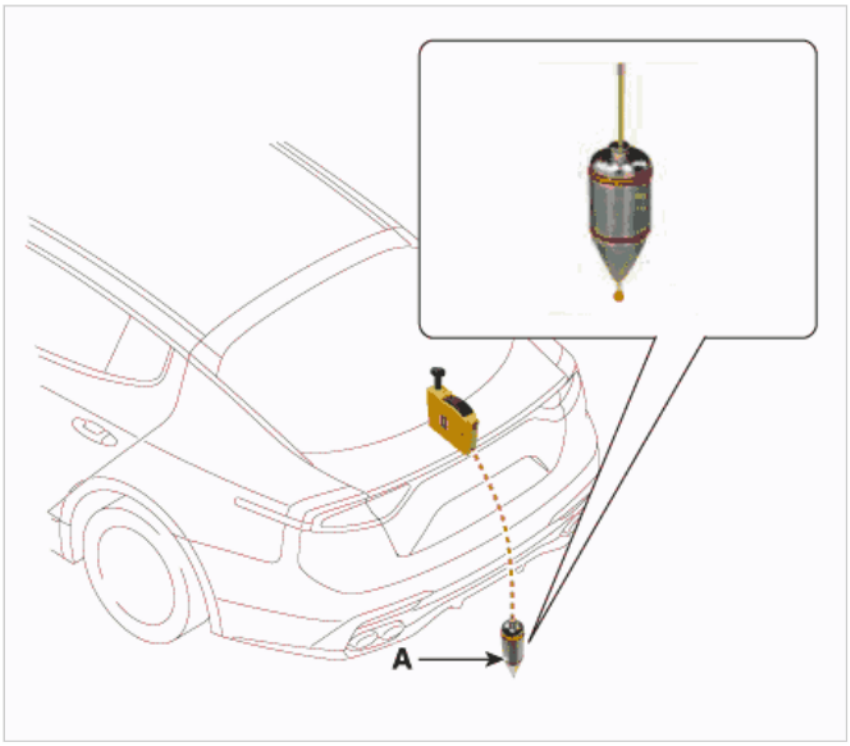


   (3) Attach a vertical plumb (09958-3T010) on the trunk, and lower the plumb (A) to the ground so that it passes through the center of the emblem.

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(4) Mark the center point below the plumb (A).



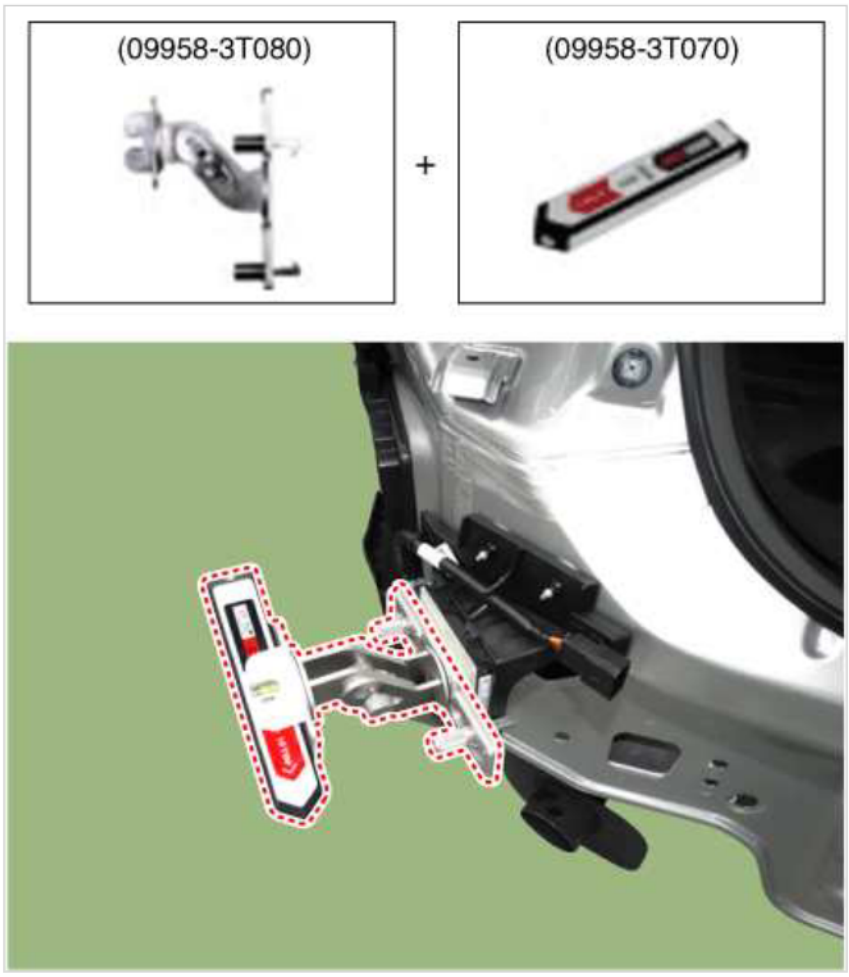
(5) Pass the string through the bottom of the vehicle from the rear of the vehicle to the front and fix the string to the center point (A) of the front of the vehicle.

(6) Fix the string to the point (C) about 1.5 - 2m from the back of the vehicle so that it passes the rear center point (B).

Click to see large image...

3. Mount the fixing adaptor (09958-3T080) on the radar unit and fix the level laser (09958-3T070).

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4. Measure the horizontal angle.

Specified angle :37 ± 2°

(1) Measure the angle (C) between the center line (A) of the angle measuring plate and the horizontal laser beam (B) using a digital protractor (09958-3T090).

Click to see large image...

5. Measure the vertical angle of the blind-spot radar unit by using the digital inclinometer (09958-3T100).

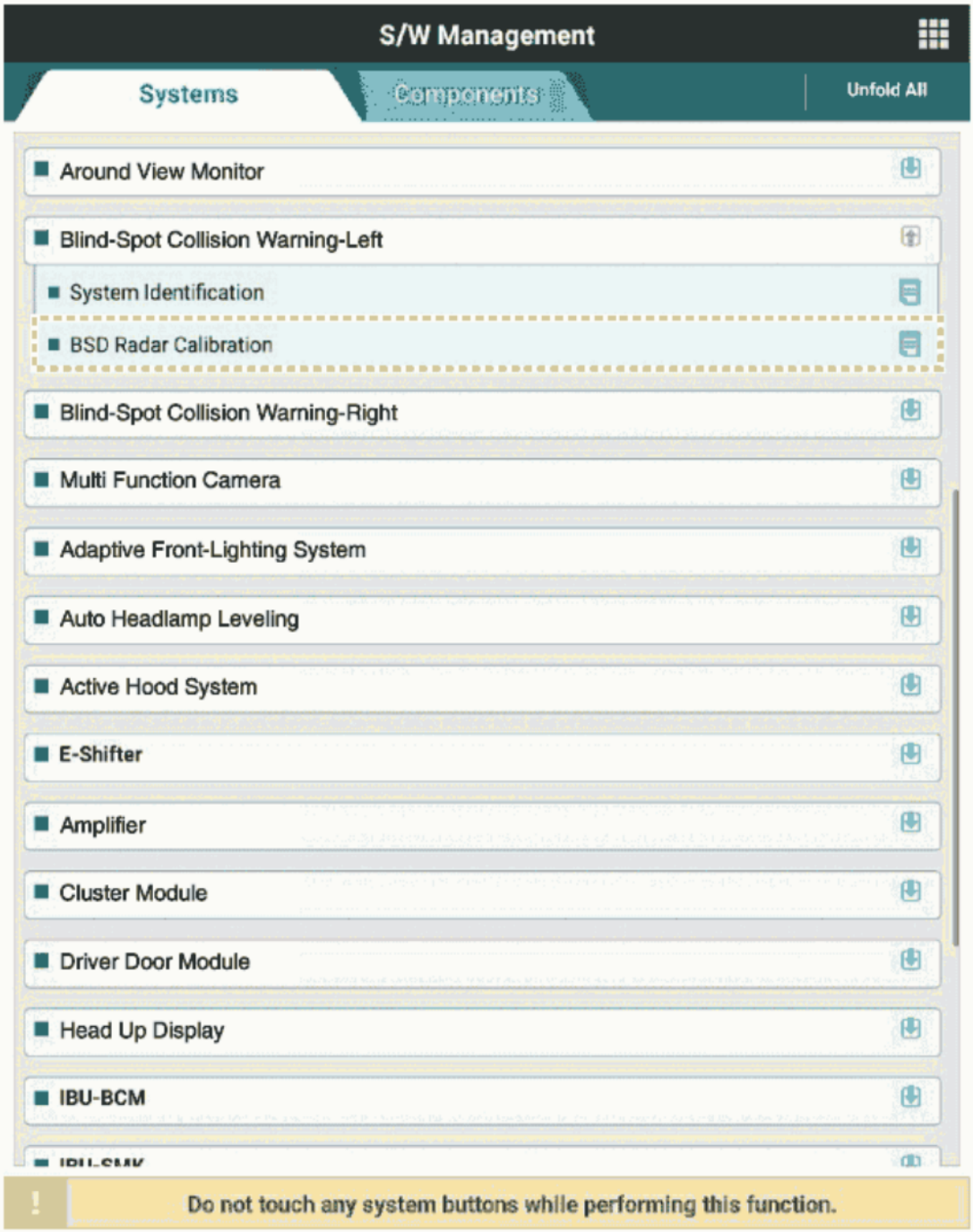
Specified angle :90 ± 1°

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6. If the measured values deviate from the specified values, insert a washer (A) between the bracket of the BCW unit.
7. Install the rear bumper assembly.
   (Refer to Body - "Rear Bumper Assembly")
8. After checking and correcting the blind-spot radar unit angle, perform the radar calibration procedure using the KDS.

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S/W Management

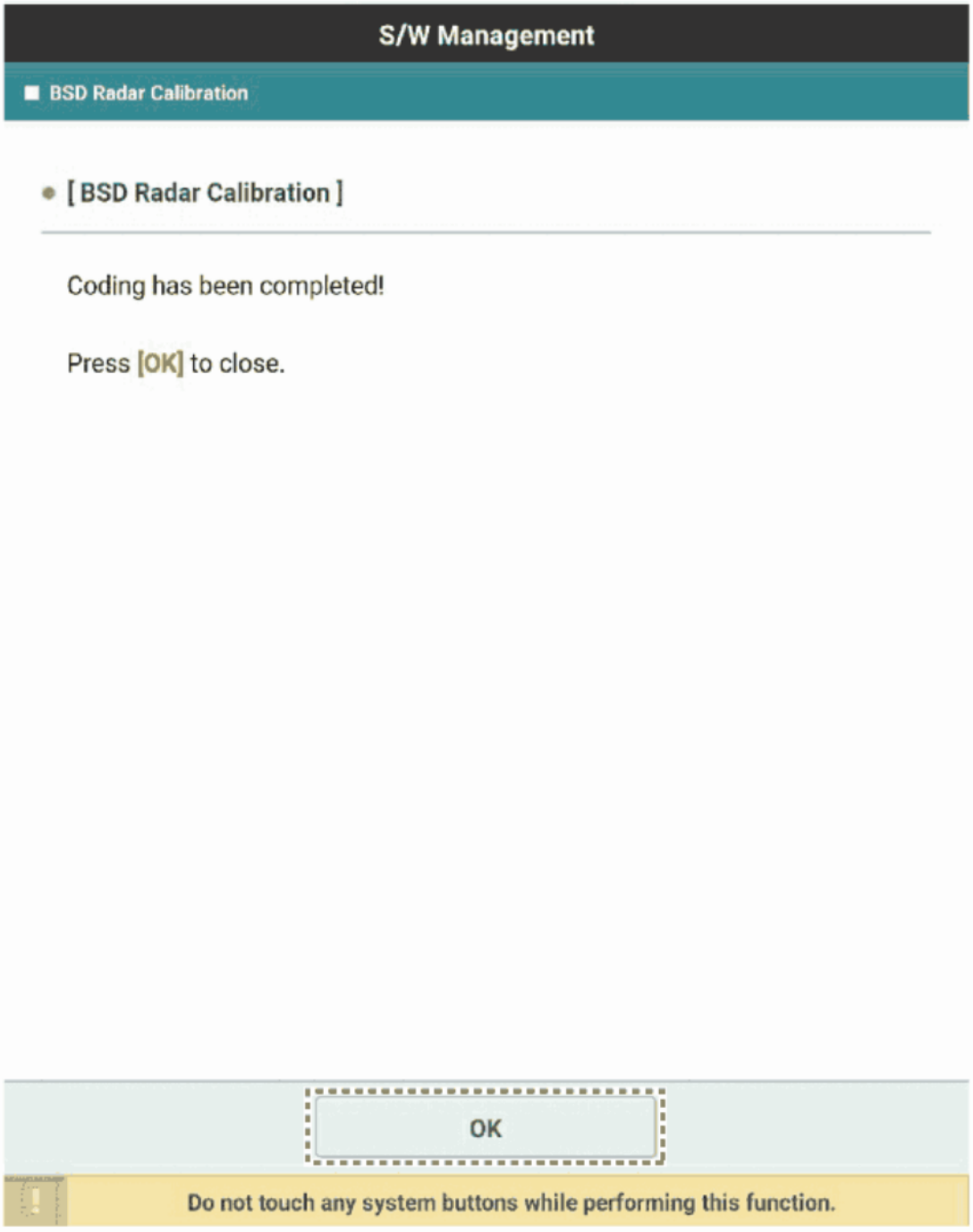
• **BSD Radar Calibration**

Purpose	To calibrate Blind Spot Detection(BSD) radar sensor after works are done on the system.
Enable Condition	1.Engine Off 2.Ignition Switch On
Concerned Component	Blind Spot Detection(BSD) Radar
Concerned DTC	C2702XX, C2703
Fail Safe	Warning Lamp On
Etc	-

OK

! Do not touch any system buttons while performing this function.

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Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel.
   (Refer to Body - "Crash Pad Lower Panel")
3. Remove the crash pad garnish [LH] (A) after loosening the mounting screw.

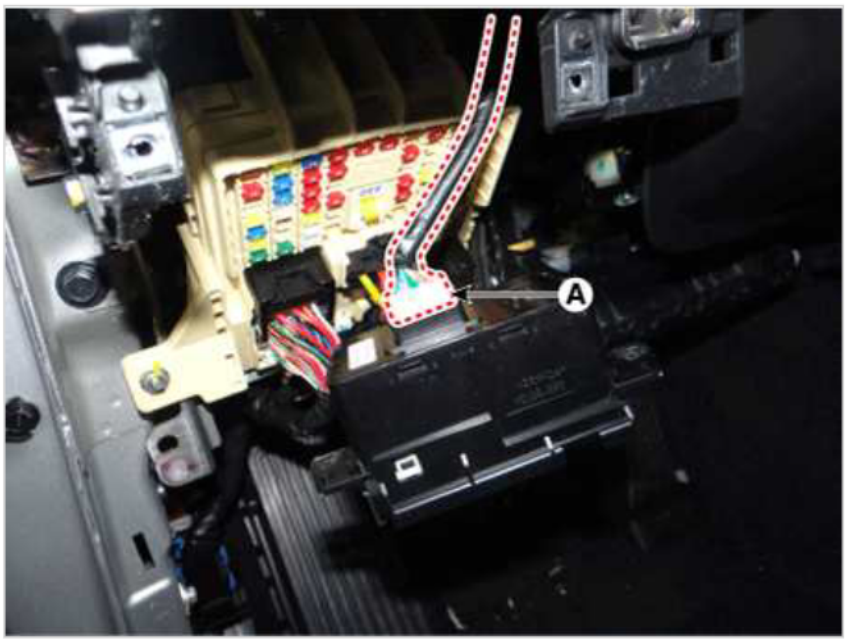


4. Remove the side crash pad switch (A) after loosening the mounting screws.



5. Disconnect the side crash pad switch connector (A).

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Installation

1. Connect the side crash pad switch connector.
2. Install the side crash pad switch.
3. Install the crash pad garnish [LH].
4. Install the crash pad lower panel.
5. Connect the negative (-) battery terminal.

Inspection

1. Disconnect the BCW switch connector from the side crash pad switch.



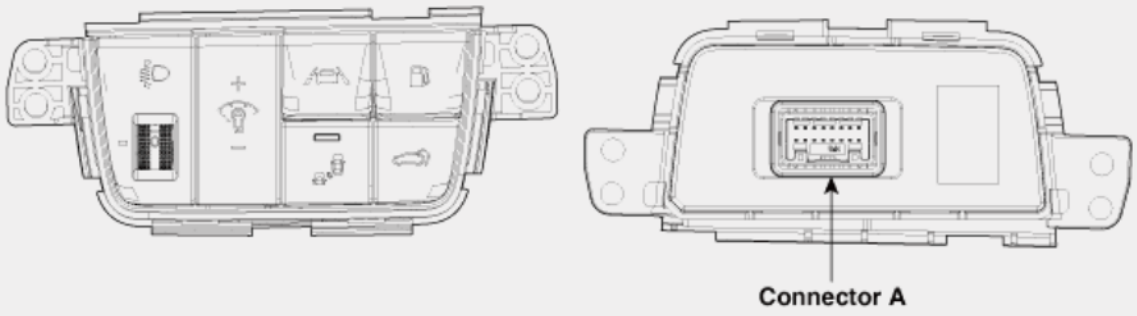
2. Operate the BCW switch, then check for continuity between terminals and BCW switch connector.

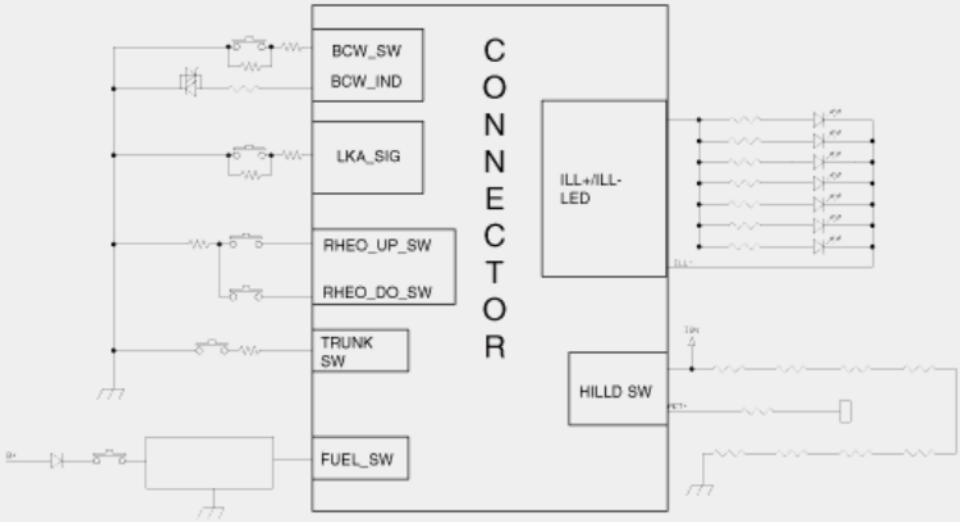
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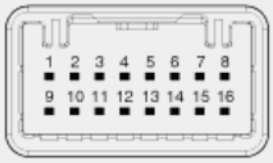
Position / Terminal	OFF	ON	Remarks
15			Ground
16			BCW Switch

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Circuit Diagram

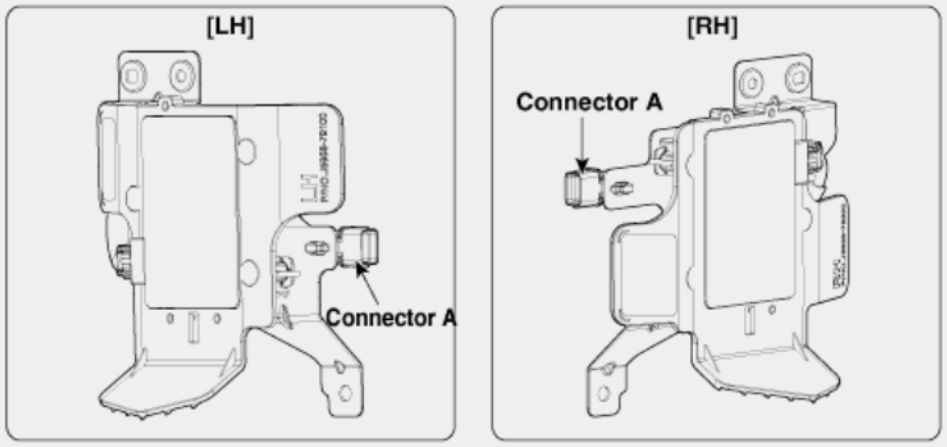


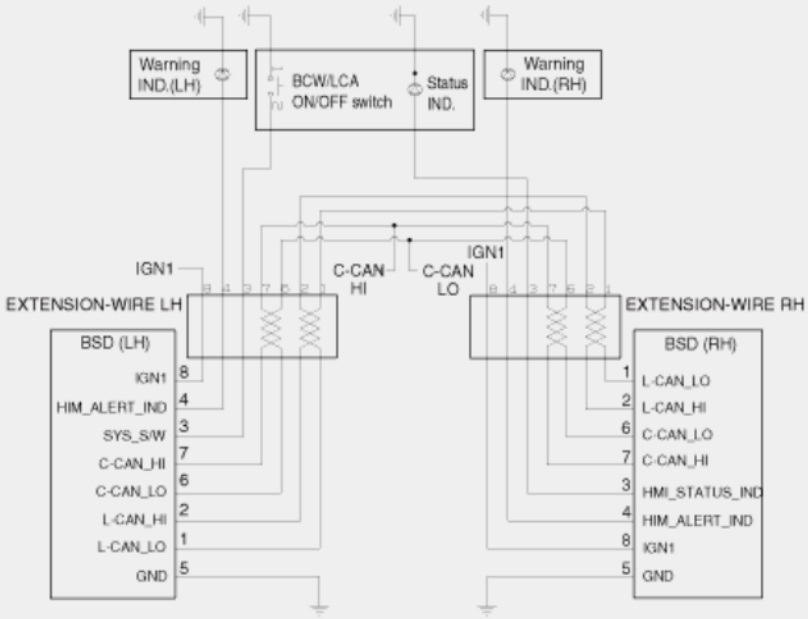


Connector A	No.	Description	No.	Description
	1	Battery (+)	13	Illumination (+)
	2	IGN	14	-
	3	-	15	Illumination (-)
	4	HLLD Actuator (+)	16	BCW Indicator
	5	Rheostat (Up)	17	PTG Swtich
	6	Rheostat (Down)	18	LKA Switch
	7	-	19	BCW Switch
	8	Fuel door open switch	20	Ground

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Components





Connector A	No.	Description (Left)	Description (Right)
	1	L-CAN (Low)	L-CAN (Low)
	2	L-CAN (High)	L-CAN (High)
	3	BCW Switch	BCW switch indicator
	4	Door mirror indicator (Left)	Door mirror indicator (Right)
	5	Ground	Ground
	6	C-CAN (Low)	C-CAN (Low)
	7	C-CAN (High)	C-CAN (High)
	8	IGN1	IGN1

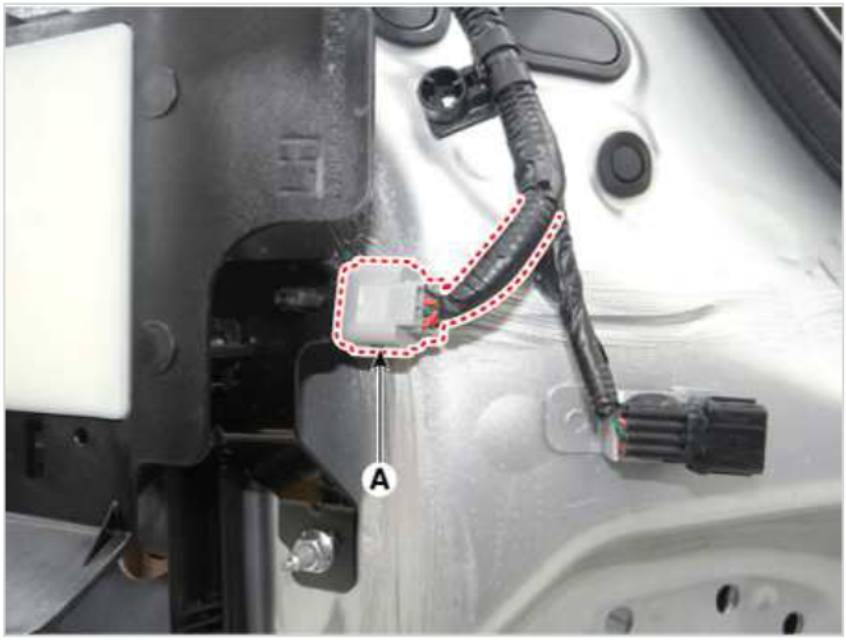
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Removal

NOTICE

If replacement of the bracket or extension wire of BCW unit is required, it is recommended to surely replace the defective part only with a new one, not the whole BCW unit.

1. Disconnect the negative (-) battery terminal.
2. Remove the rear bumper assembly.
   (Refer to Body - "Rear Bumper Assembly")
3. Disconnect the BCW unit connector (A).

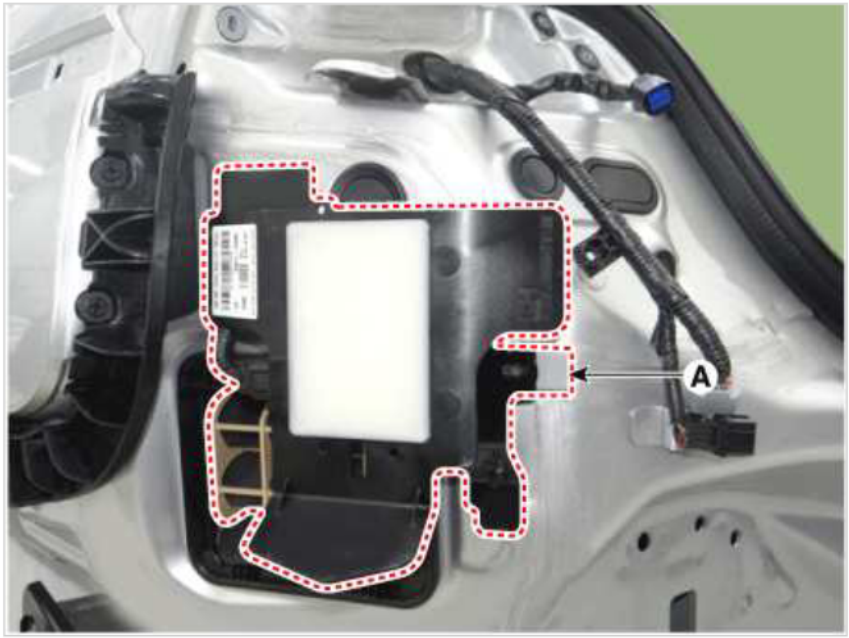


4. Remove the BCW unit (A) after loosening the mounting nuts.

Tightening torque :
8.8 - 13.7 N·m (0.9 - 1.4 kgf·m, 6.5 - 10.1 lb·ft)

NOTICE

Be careful not to damage the bracket when removing the BCW unit.

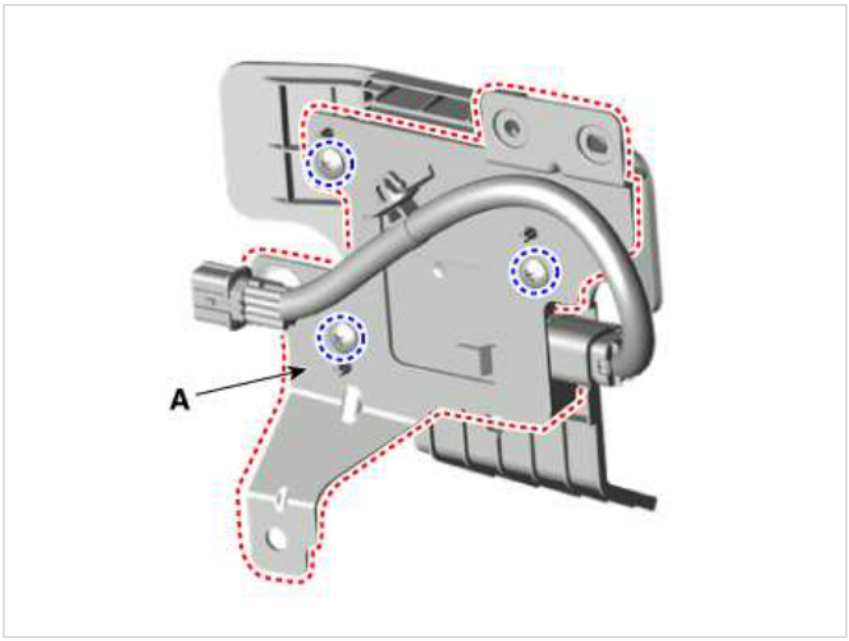


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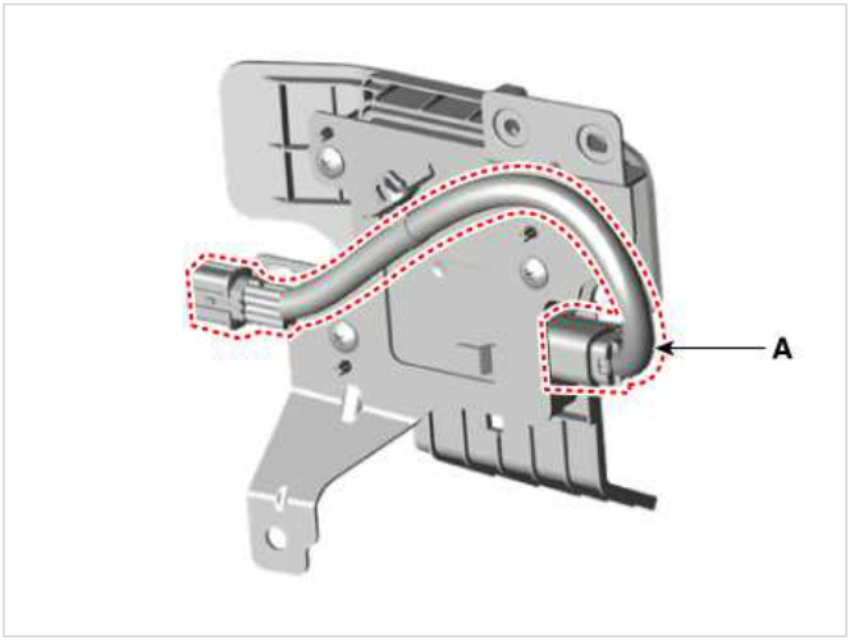
Information

In the following cases, replace the extension wire or bracket.

1) If the bracket is physically deformed or damaged.
-Remove the bracket (A) from the BCW unit by loosening the screws.



2) If the connector or wire is damaged.
-Remove the extension wire (A) after separating the mounting clip.



Installation

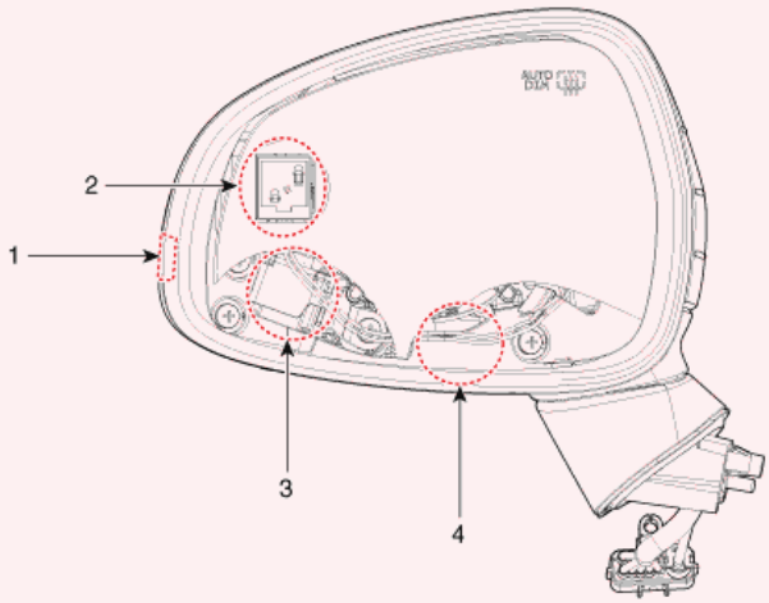
1. Install in the reverse order of removal.

NOTICE

- The shapes of the LH and RH blind-spot collision warning units are different. Therefore, take notice when installing the blind-spot collision warning units.
- After the replacement of BCW unit or bracket or wire, perform the radar calibration procedures. (If do not calibrate the sensor angle, it can cause the malfunction of BCW system.)
  (Refer to Blind-Spot Collision Warning - "Blind-Spot Collision Warning Radar Calibration")

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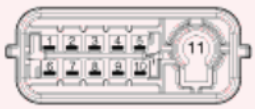
Components



[Standard Type]

Connector A	No.	Description	No.	Description
	1	Mirror motor (Vertical)	7	Mirror unfolding
	2	Mirror motor (COM)	8	Side repeater lamp (+)
	3	Mirror motor (Horizontal)	9	Puddle lamp (+)
	4	Mirror heater (+)	10	Puddle lamp (-)
	5	Mirror heater (-) & Side repeater lamp (-)	11	BCW Indicator (-)
	6	Mirror folding	12	BCW Indicator (+)

[IMS + AVM Type]

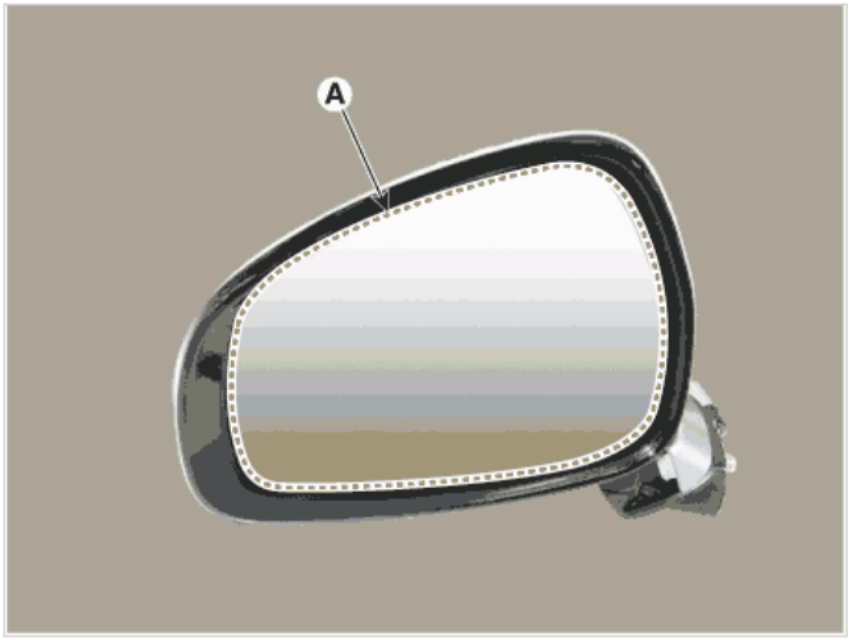
Connector A	No.	Description	No.	Description
	1	Control unit (LIN)	7	BCW Indicator (+)
	2	Control unit (Power)	8	Side repeater lamp (+)
	3	Control unit (Ground)	9	SVM Camera (Ground)
	4	ECM mirror glass (-)	10	SVM Camera (Power)
	5	Side repeater lamp (-) & BCW Indicator (-)	11	SVM Camera video_Output
	6	ECM mirror glass (+)		

1. Side repeater lamp
2. BCW Indicator
3. SVM Camera
4. Puddle lamp

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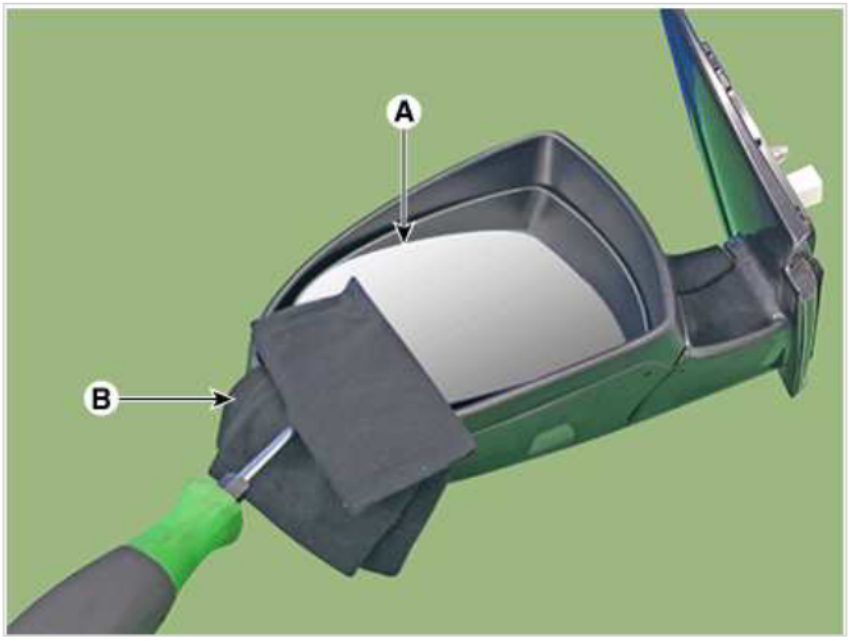
Removal

1. Disconnect the negative (-) battery terminal.
2. Remove mirror (A) to the direction as shown in the picture using (-) screw driver.



⚠ CAUTION

- Protect mirror from removing tool with cloth (B) wrapped.
- Be careful not to damage mirror and mirror housing during removing process.
- Apply force around the center of mirror because to apply force the end of mirror will break it.



NOTICE

Be careful not to damage the fixing clips (A).

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3. Disconnect the heater connectors (B) and BCW indicator connector (A) from the mirror.



4. Remove the BCW indicator (A) from the mirror.

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Installation

1. Install the BCW indicator.
2. Connect the heater connectors and BCW indicator connector.
3. Install the mirror.
4. Connect the negative (-) battery terminal.

Inspection

1. Remove the outside rear view mirror.
   (Refer to Body - "Outside Rear View Mirror")
2. Verify that the mirror operates properly as shown in the below table.



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Terminal / Position	11	12
ON	⊖	⊕

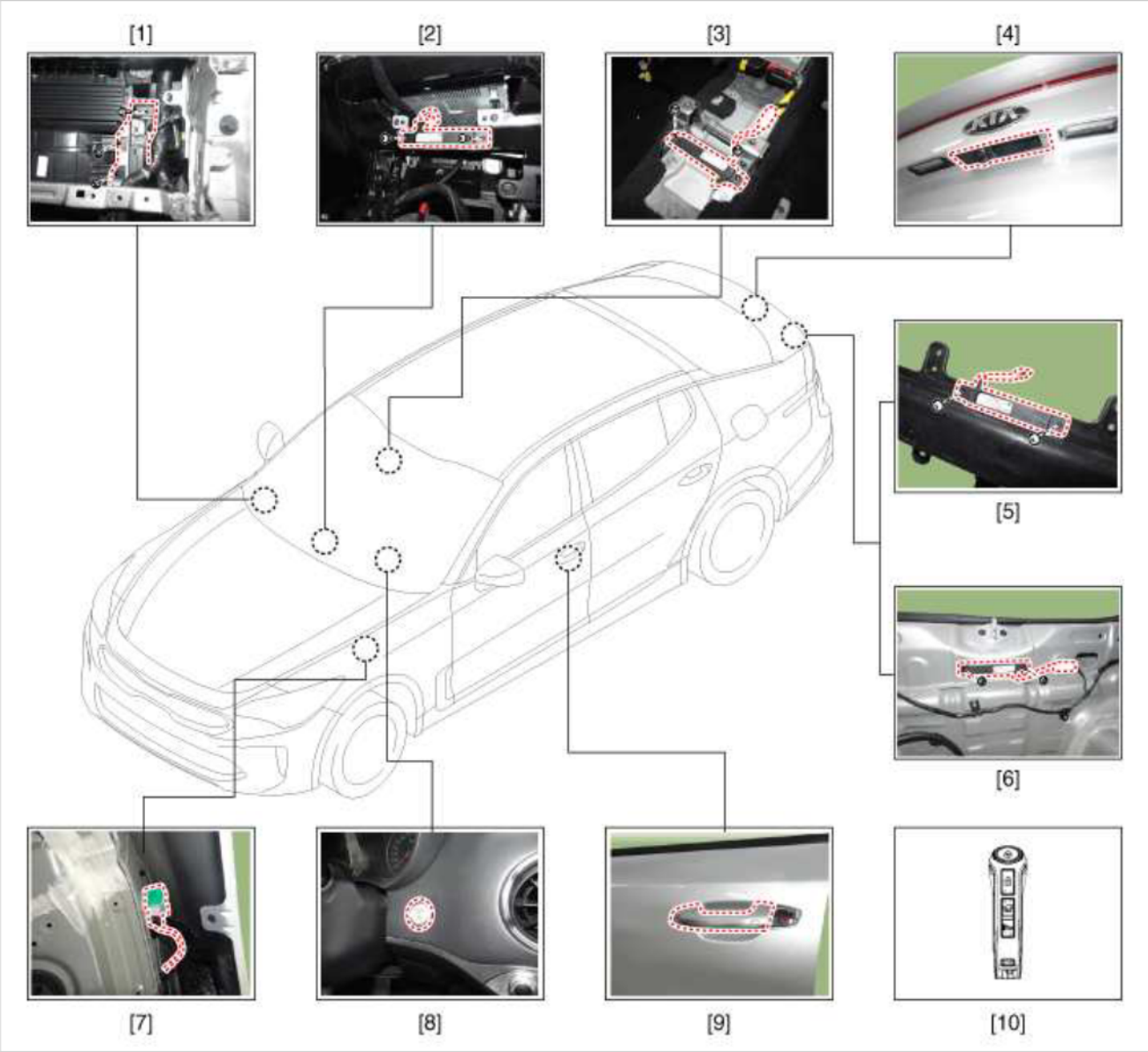
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Diagnosis With KDS

1. BCW system defects can be quickly diagnosed with the KDS operates actuator quickly to monitor, input/output value and self diagnosis.
2. Connect the cable of KDS to the data link connector in driver side crash pad lower panel, and turn on the KDS.
3. Select the vehicle model and then BCW system.
4. Select "Input/output monitoring", if you want to check current data of BCW system.
5. If you want to check each module operation forcefully, select "Actuation test".

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Component Location



1. Integrated body control unit (IBU)
2. Interior antenna 1
3. Interior antenna 2
4. Liftgate open switch
5. Bumper antenna
6. Liftgate antenna
7. Buzzer
8. Start Stop Button (SSB)
9. Door handle & door antenna
10. FOB key

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Description

System Overview

The System offers the following features:

– Changing the state of engine ignition and power by using the start button.
– Controlling external relays for ACC / IGN1 / IGN2 terminal switching and STARTER, without use of mechanical ignition switch.
– Indicating the vehicle status on display by using LED or explicit messages.
– Immobilizer function by LF transponder communication between fob and fob holder.
– Redundant architecture for high system dependability .
– Interface with Low Speed CAN vehicle communication network.
– Interface with LIN vehicle communication network depending on platform .

The RKE and SMART KEY functions are not considered part of this Button Engine Start system and are specified in a separate system.

System Main Function

– Switching of ACC / IGN1 / IGN2 terminals.
– Control of the STARTER relay BAT line (high side) based on communication with EMS ECU.
– Management of the Immobilizer function.
– Management of BES warning function.

Button Engine Start System

The Button Start System allows the driver to operate the vehicle by simply pressing a button (called as SSB) instead of using a standard mechanical key.

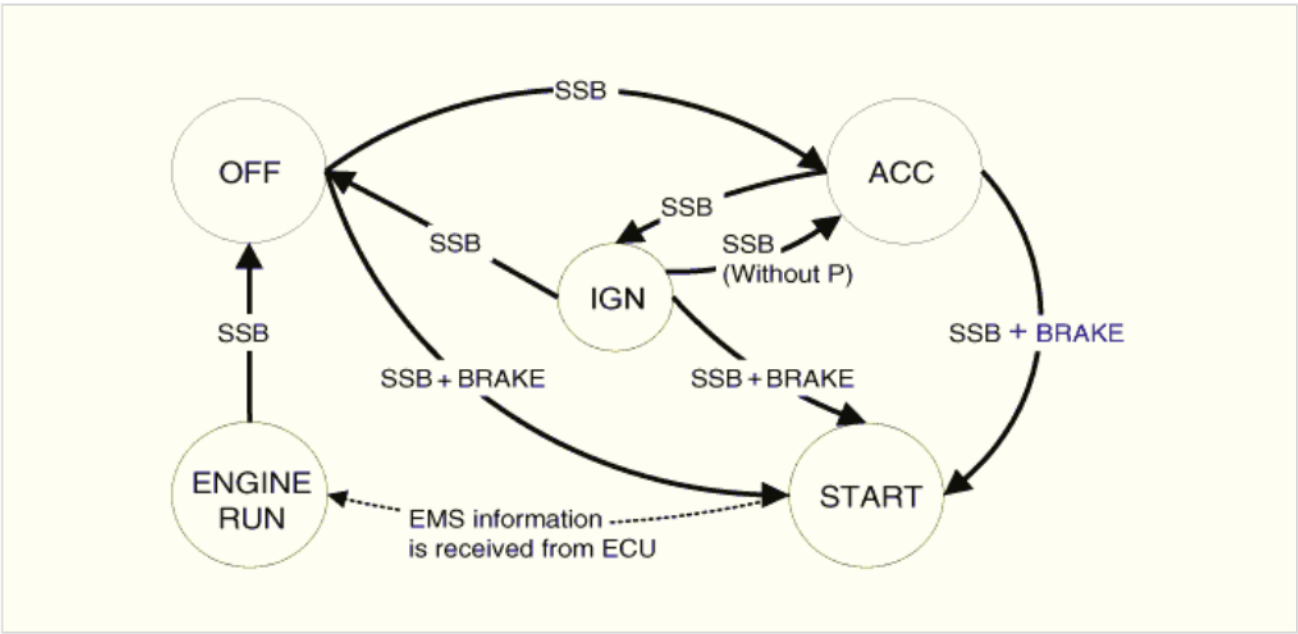
If the driver presses the SSB while prerequisites on brakes, fob authentication and transmission status are satisfied, the BES System will proceed with the locking/unlocking of the steering column, the control of the terminal, and the cranking of the engine.

The driver can release the SSB as soon as this sequence is initiated. After positive response from immobilizer interrogation, the system will activate the starter motor and communicate with the EMS to check the engine running status for starter release.

The driver will be able to stop the engine by a short push on the SSB if the vehicle is already in standstill. Emergency engine stop will be possible by a long press of the SSB or 3 consecutive presses in case the vehicle is in ENGINE RUNNING.

If the conditions for engine cranking are not satisfied while a push on the SSB is detected and a valid fob authenticated, the system will unlock the steering column and switch the terminals to IGN. Another push on the SSB will be necessary to start the engine.

In case of a vehicle equipped with SMART KEY system, fob authentication will not require any action from the driver. For limp home start or in case of vehicle without SMART KEY, the driver will have to insert the fob into the fob holder.



• Control Ignition and engine ON/OFF by Sending signal to IPM.
• Display status by LED Lamp ON/OFF. (Amber or Green)

Indicator ON/OFF Condition At Ignition Key Off Condition

No	Character lamp	Conditions

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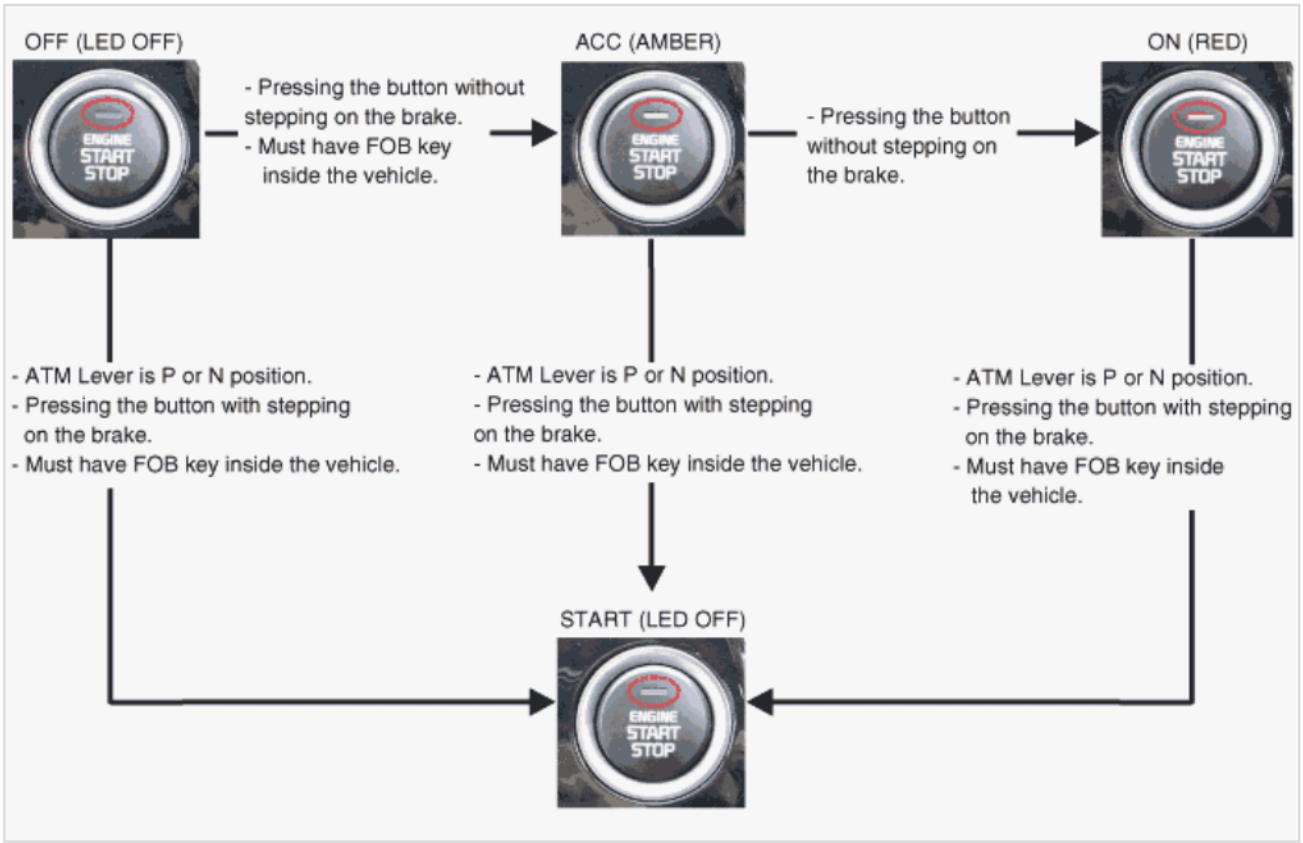
1	Indicator Lamp ON	Door open, Tail lamp ON, ACC, IG ON
2	Indicator Lamp 30sec ON → Lamp OFF	Door close, Tail lamp OFF, IG OFF
3	Indicator Lamp OFF	Remote LOCK, Passive LOCK
4	Rheostat at tail lamp ON (Illumination lamp)	

Indicator ON/OFF Condition According To Ignition Key"s Position

No	Ignition conditions	Start Button LED status
1	IG OFF	White color LED ON
2	IG ACC	Amber color LED ON
3	IG ON (Engine OFF)	Green color LED ON
4	Cranking	Maintain LED status before cranking
5	Engine running	LED OFF

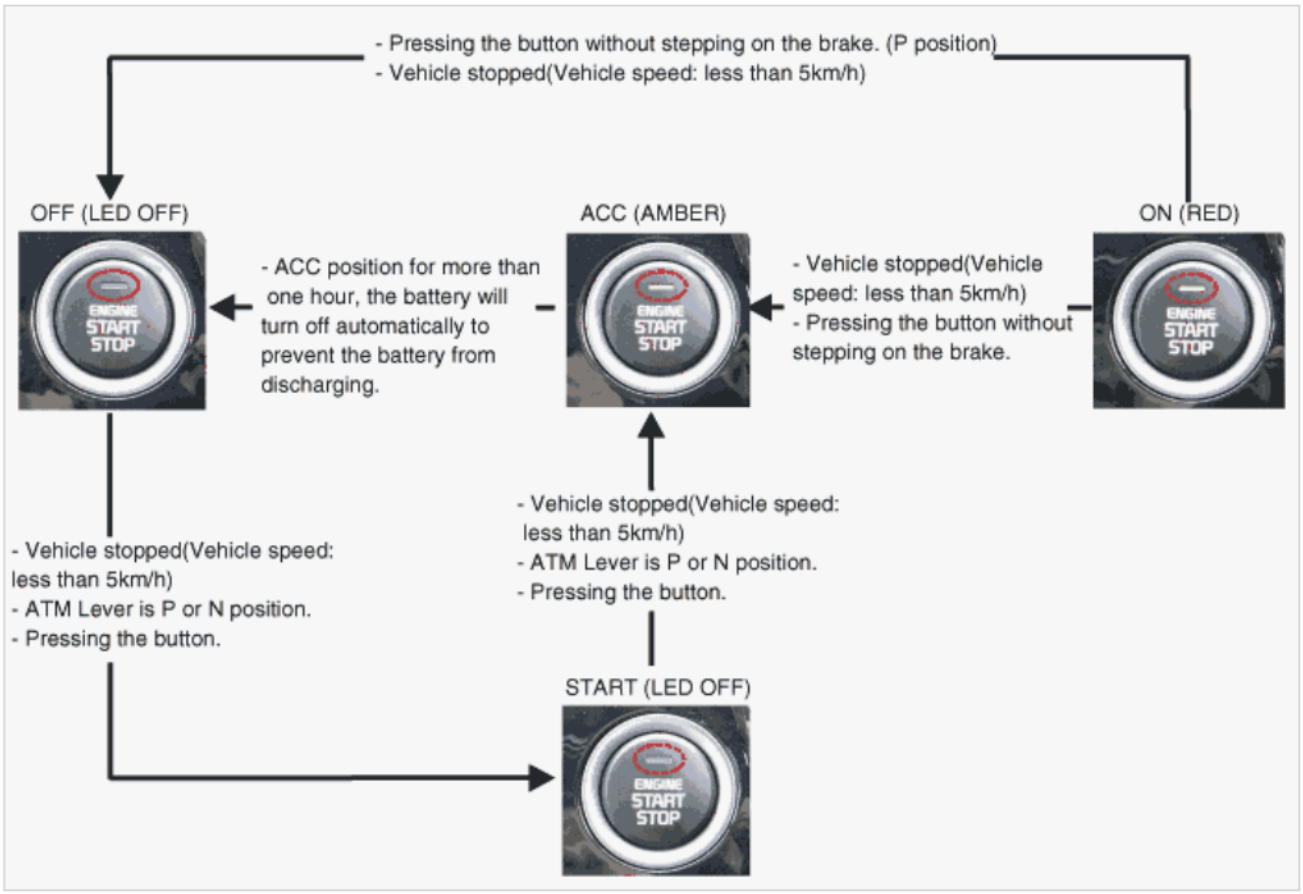
Operation for each function of button starting

1. Electric power ON / Ignition ON
   – The electric power state changes within the range of OFF →ACC→IGN→OFF by pressing the button without stepping on the brake (Or with stepping on the brake) inside the car with FOB key (However, When the gear is not in P, the power repeatedly changes between ACC and IGN. Converting to OFF is impossible.)
   – The ignition is on when the button is pressed with stepping on the brake at P/N position with FOB key.

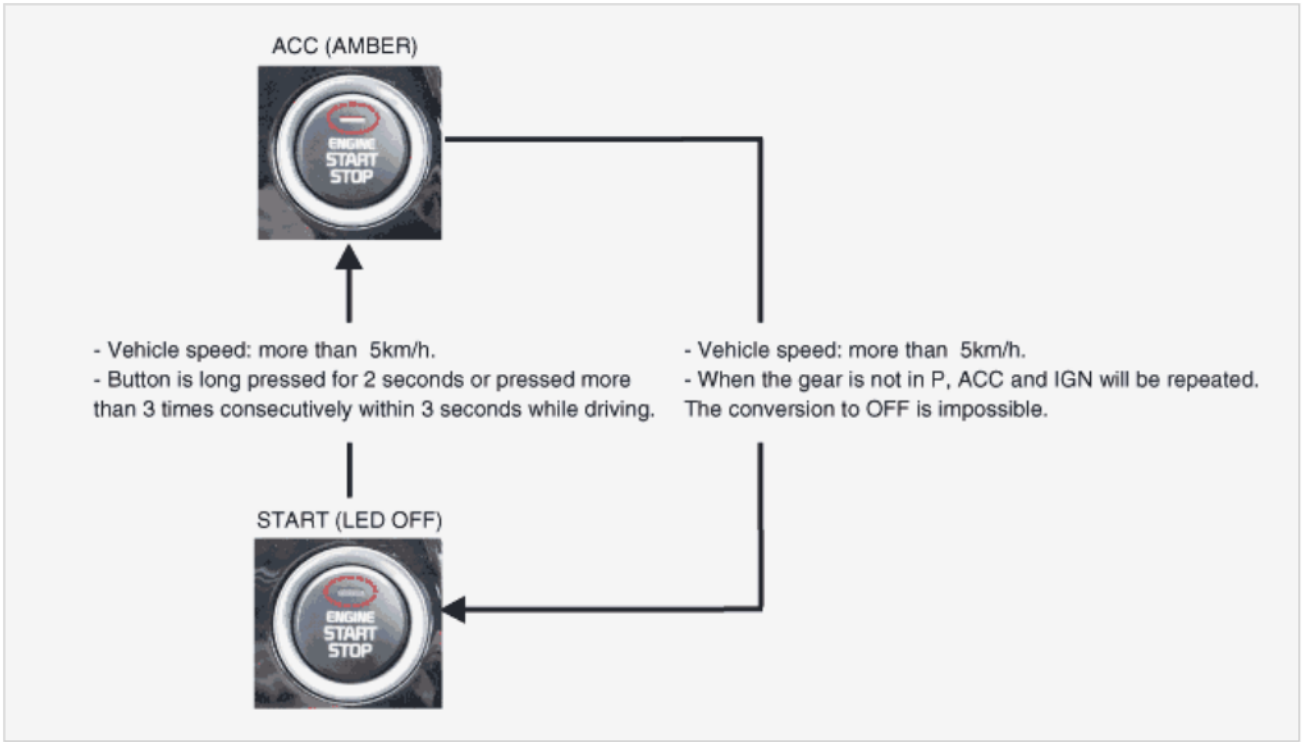


2. Electric power OFF/ Ignition OFF
   – The ignition OFF is possible in the state of vehicle stop. (The ignition OFF state is possible regardless of the ATM lever position.)
   – The lever shall be shifted for parking in gear N by pressing the ATM lever release button after electric power off in P.

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3. How to off the ignition forcibly and to restart during driving
   - It is a method of forcibly turning off ignition in case of fuel leakage when the vehicle is overturned or of emergency (e.g. failure in accelerator pedal return)
   - The engine is off and returned to the ACC state when the button is pressed for 2 seconds and more than 3 times successively within 3 seconds during driving. The restarting is available for next 30 seconds regardless of FOB key and the electric power is changed through OFF → ACC→IGN→OFF by pressing the button without stepping on the brake (or with stepping on the brake) inside the car with FOB key. (However, when it is not in P position, ACC↔IGN is repeated. The conversion to OFF is impossible.)

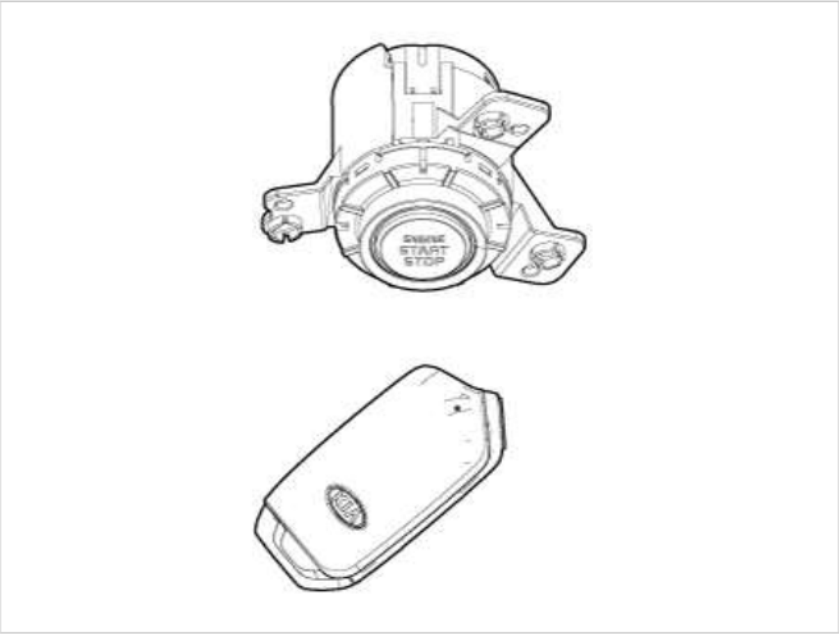


4. Function of 0.5 second delay for brake switch input.
   The starting is available when the brake pedal is stepped on within 0.5 second after pressing the start button in engine OFF state.

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5. State of start button indicator (LED) ON depending on the electric power state.
   – Electric power OFF : LED OFF
   – Electric power ACC state : Yellow LED ON
   – Electric power ON : Blue LED ON
   – During cranking : Maintaining the previous LED ON state before cranking
   – Starting ON state : LED OFF

Limp home mode



– In case of no input signal for the brake (AT specification), the ACC mode shall move to “START” by pressing SSM for more than 10 seconds.
– In case of problems with communication between EMS and CAN (the EMS state).
the “START” state moved to the “ENGINE RUN” based on RPM input.
– In case that one out of two SSM input lines is disconnected,
The electric power cycling is available when SSB is pressed twice within 10 seconds (SSB LIMP HOME PRESS)
The buzzer rings when the button is pressed in the first time.
The electric power cycling is available and buzzer stops when the button is pressed twice within 10 seconds.

Integrated body control unit (IBU)



The SMK manages all function related to:
• "Start Stop Button (SSB) monitoring",

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- "Immobilizer communication" (with Engine Management System unit for immobilizer release),
- "Authentication server" (Validity of Transponder and in case of Smart Key option Passive Fob authentication),
- "System consistency monitoring",
- "System diagnosis",
- Control of display message / warning buzzer .

The smart key unit masters the entire button engine start system.

In case of SMART KEY application, for example "Passive Access", "Passive Locking" and "Passive Authorization are integrated for Terminal switching Operations".

It collects information about vehicle status from other modules (vehicle speed, alarm status, driver door open...), reads the inputs (e.g. SSB, Capacitive Sensor / Lock Button, PARK position Switch), controls the outputs (e.g. exterior and interior antennas), and communicates with others devices via the CAN network as well as a single-line interfaces.

The diagnosis and learning of the components of the BES System are also handled by the SMK.

The SMK manages the functions related to the "terminal control" by activating external relays for ACC, IGN1 and IGN2. This unit is also responsible for the control of the STARTER relay.

The SMK is also controlling the illumination of the SSB as well as the "system status indicator", which consists of 2 LEDs of different color. The illumination of the fob holder is also managed by the SMK.

The SMK reads the inputs (Engine fob in, vehicle speed, relays contact status), controls the outputs (Engine relay output drive), and communicates with others devices via the CAN.

The internal architecture of the SMK is defined in a way that the control of the terminal is secured even in case of failure of one of the two microcontrollers, system inconsistency or interruption of communication on the CAN network.

In case of failure of one of the two controllers, the remaining controller shall disable the starter relay. The IGN1 and IGN2 terminals relays shall be maintained in the state previously memorized before the failure and the driver shall be able to switch those IGN terminals off by pressing the SSB with EMERGENCY_STOP pressing sequence. However, engine restart will not be allowed. The state of the ACC relay will depend on the type of failure.

The main functions of the SMK are:

- Control of Terminal relays
- Monitoring of the Vehicle speed received from sensor or ABS/ESP ECU.
- Control of SSB LEDs (illumination, clamp state).
- Control of the base station located in SSB through direct serial interface.
- System consistency monitoring to diagnose SMK failure and to switch to relevant limp home mode.
- Providing vehicle speed information
- Start Stop Button (SSB) monitoring
- Starter power control

Start/Stop Button (SSB)

A single stage push button is used for the driver to operate the vehicle. Pressing this button allows:

- To activate the power modes ‘Off’, ’Accessory’, ‘Ignition’ and "Start" by switching the corresponding terminals
- To start the engine
- To stop the engine

The contact will be insured by a micro-switch and a backlighting is provided to highlight the marking of the button whenever necessary.

Three (3) LED colors are located in the outside ring of the switch assy. They display the status of the system.

They are OFF(White) / ACC(Amber) / ON(Green).



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BES(Button Engine Start) System State Chart

System STATES in LEARNING MODE

In learning mode, the BES System can be set in 6 different states, depending on the status of the terminals and Engine status:

System State	Terminal Status	Engine status
1. OFF - Locked	OFF	Stopped
2. OFF - Unlocked	OFF	Stopped
3. ACC	ACC	Stopped
4. IGN	IGN1, IGN2, ACC	Stopped
5. Start	IGN1, Start	Cranking
6. IGN - Engine	IGN1, IGN2, ACC	Running (means "self-running")

Referring to the terminals, the system states described in the table above are the same as those found in a system based on a mechanical ignition switch.

One of the features distinctive from the Mechanical Ignition Switch-based system is that the BES system allows specific transition from [OFF] to [START] without going through [ACC] and [IGN] states.

System STATES IN VIRGIN MODE

The BES System can be set in 5 different states (OFF LOCKED is not available in virgin mode), depending on the status of the terminals and Engine status :

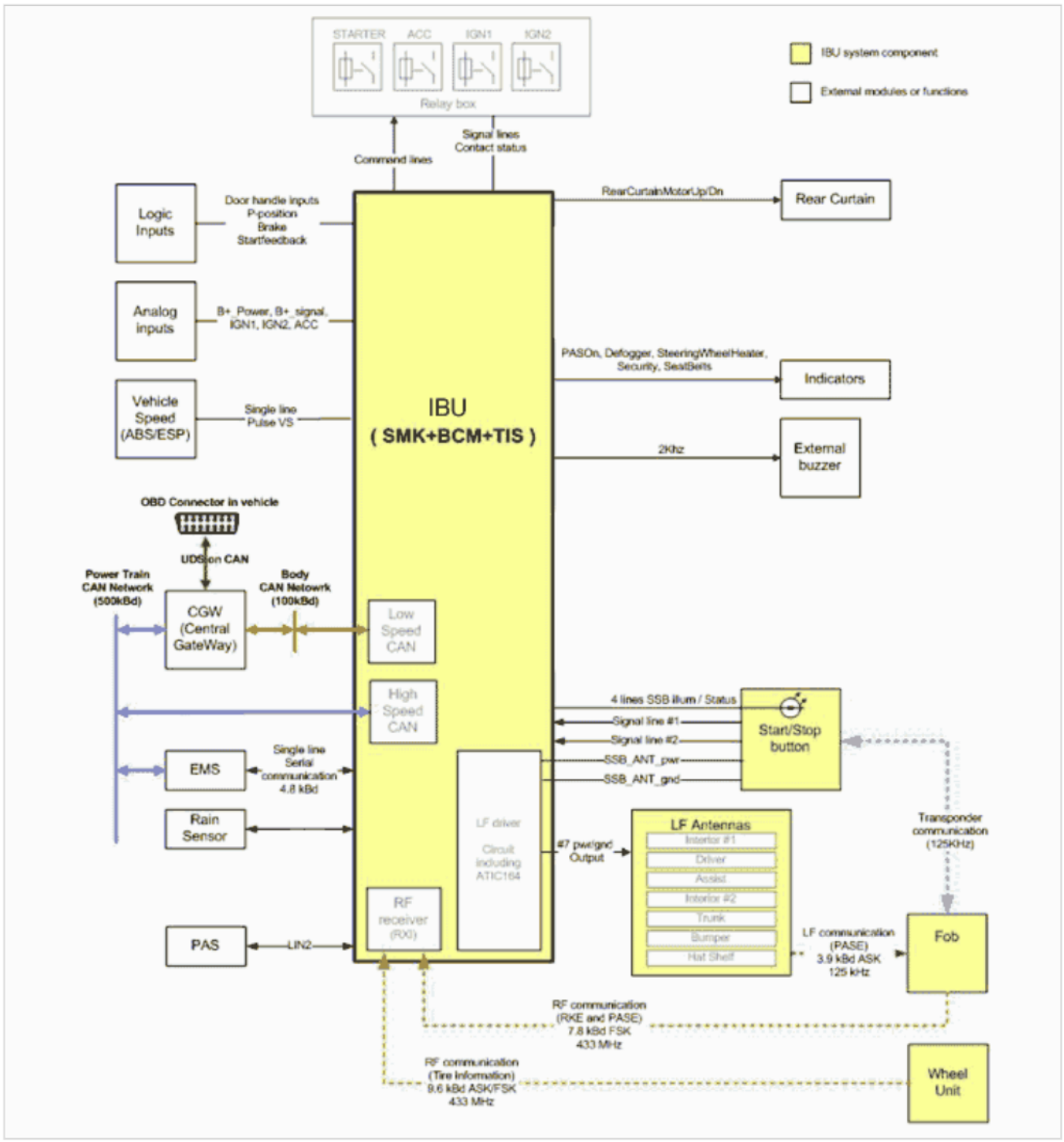
System State	Terminal Status	Engine status
1. OFF - UNLOCKED	OFF	Stopped
2. ACC	ACC	Stopped
3. IGN	IGN1, IGN2, ACC	Stopped
4. Start	IGN1, START with special pattern of activation	Cranking
5. IGN - Engine	IGN1, IGN2, ACC	Running (means "self-running")

Referring to the terminals, the system states described in the table above are the same as those found in a system based on a mechanical ignition switch.

One of the features distinctive from the Mechanical Ignition Switch-based system is that the BES system allows specific transition from [OFF] to [START] without going through [ACC] and [IGN] states.

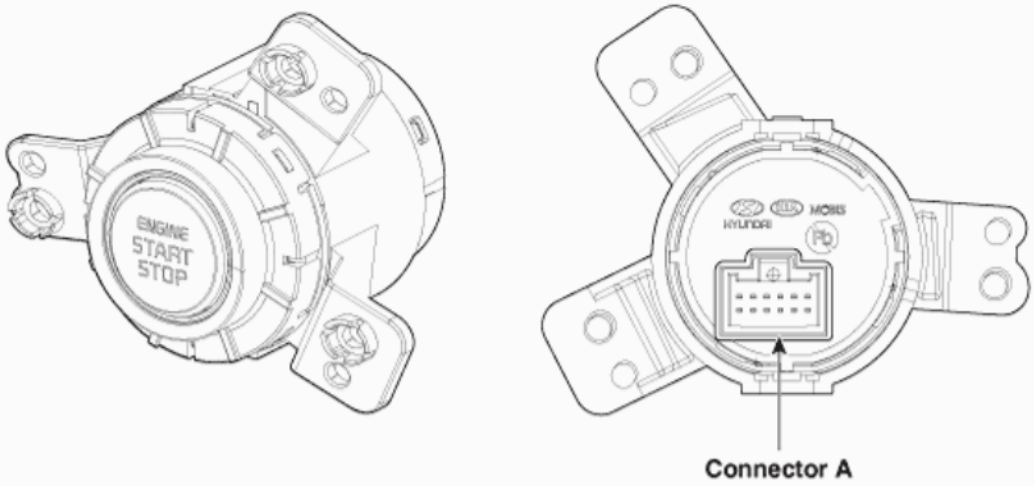
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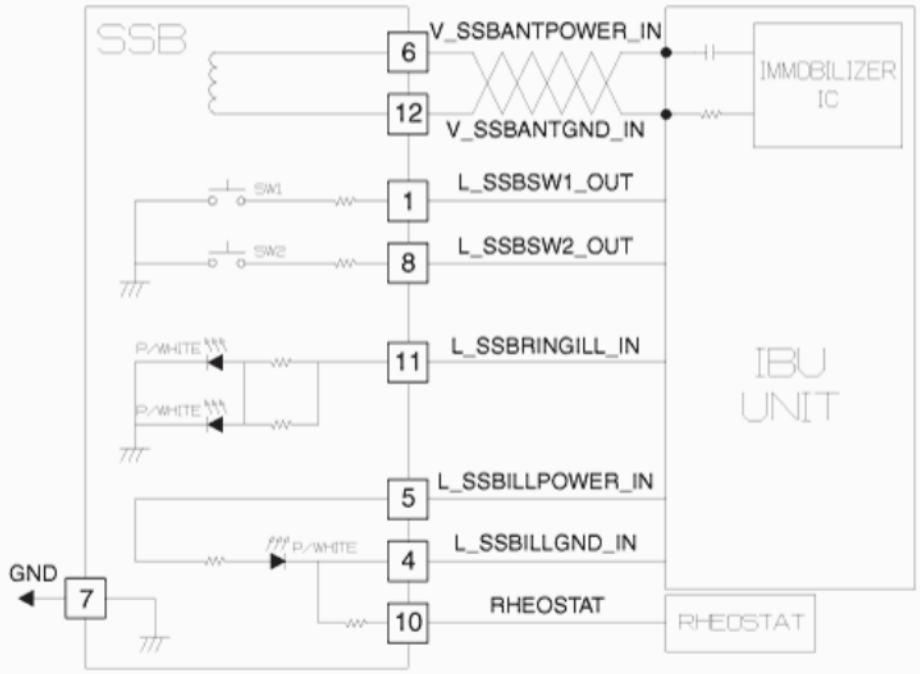
Circuit Diagram



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Components





Connector A	No.	Description	No.	Description
	1	SSB Switch 1	7	Ground
	2	-	8	SSB Switch 2
	3	-	9	-
	4	SSB Illumination (-)	10	Rheostat
	5	SSB Illumination (+)	11	Keyhole illumination
	6	Immobilizer antenna (+)	12	Immobilizer antenna (-)

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Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad passenger side panal.
   (Refer to Body - "Crash Pad Center Panel")
3. Remove the start/stop button (A) after loosening the mounting screws.

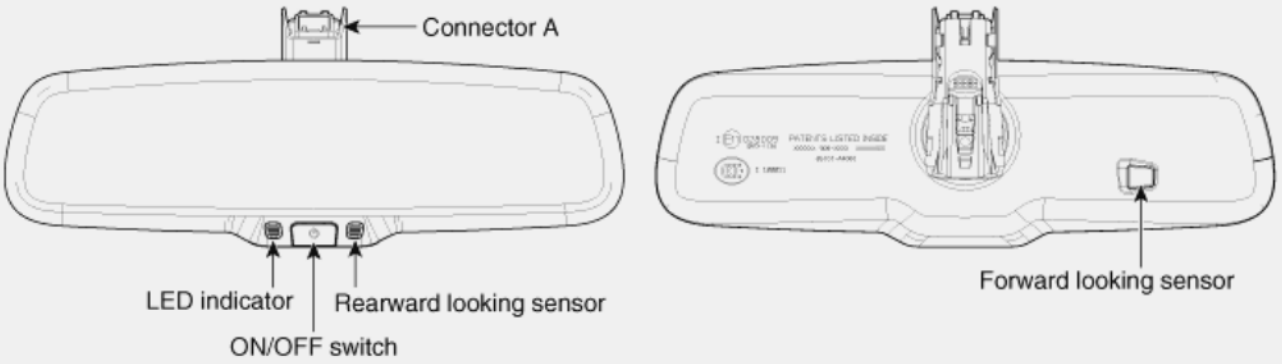


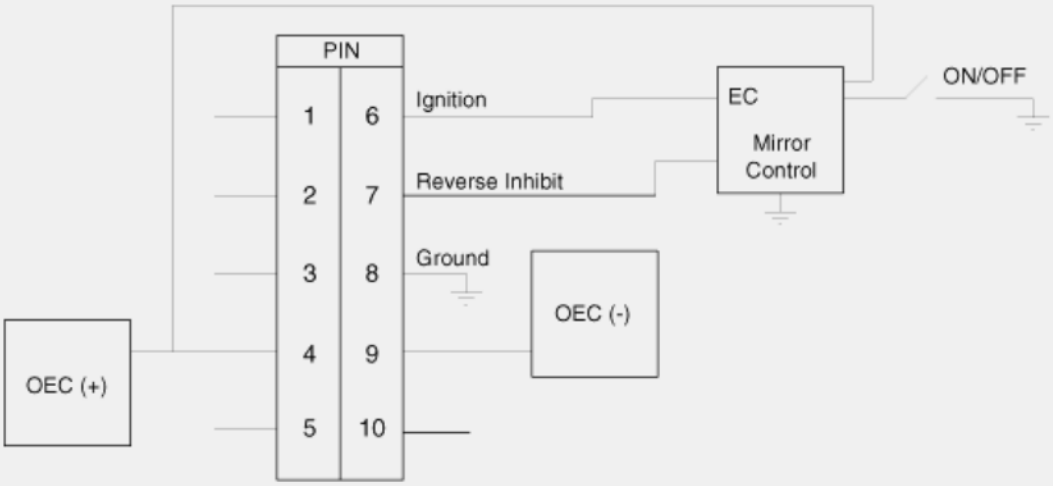
Installation

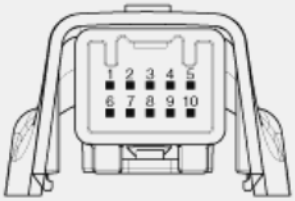
1. Install the start/stop button.
2. Install the crash pad passenger side panal.
3. Connect the negative (-) battery terminal.

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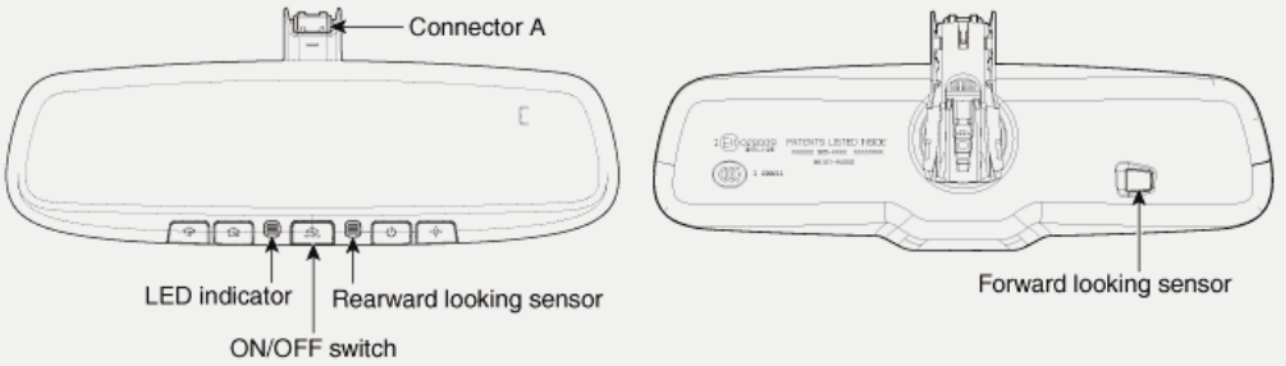
Components

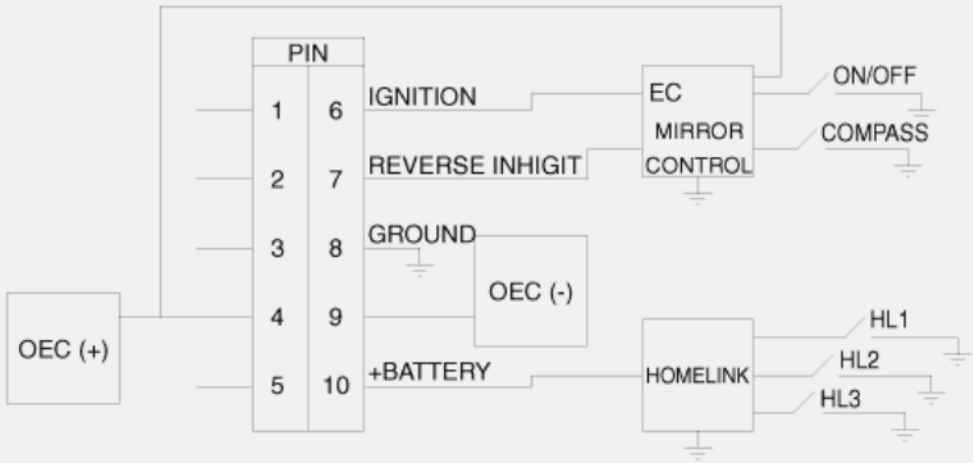


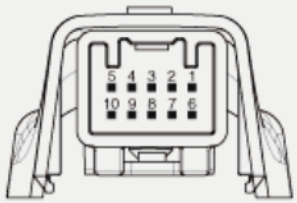


Connector A	No.	Description
	1	-
	2	-
	3	-
	4	OEC (+)
	5	-
	6	Ignition
	7	Reverse inhibiter
	8	Ground
	9	OEC (-)
	10	-

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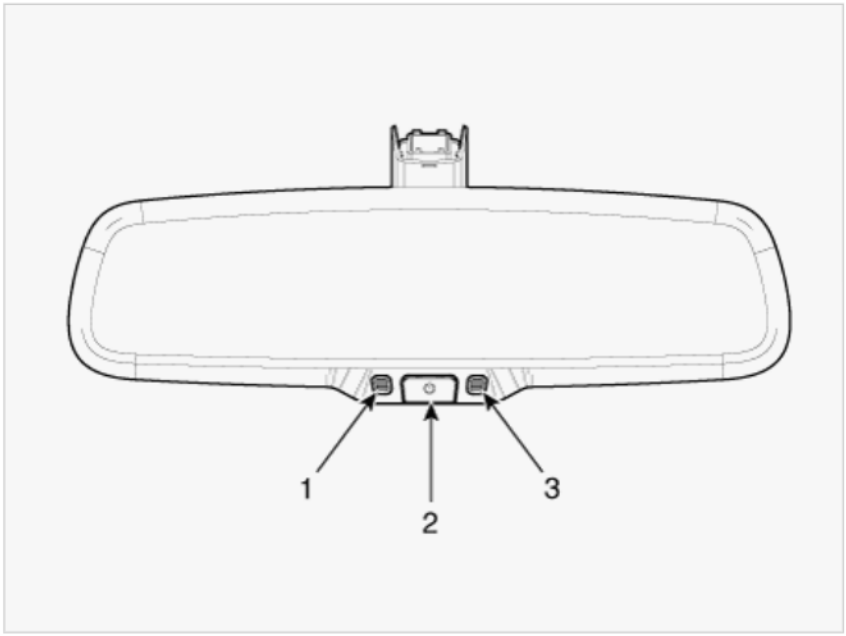
Pin	Description
1	-
2	-
3	-
4	OEC (+)
5	-
6	Ignition
7	Reverse inhibiter
8	Ground
9	OEC (-)
10	Battery (+)

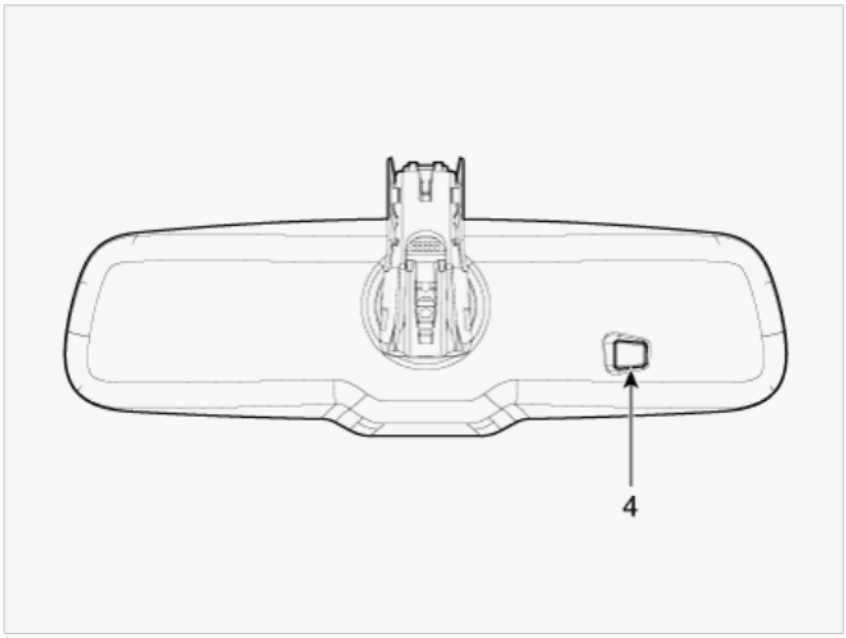
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Description

The ECM (Electro Chromatic inside rear view Mirror) is one that automatically dims to protect the driver's eyes when it senses light reflecting from the car behind. The sensor in the mirror detects the brightness and if the headlight from the car behind is reflected on the mirror, the chemical layer inside the mirror reacts to glare and adjusts the reflectivity from 10 to 70%. When switching to the reverse gear, the mirror becomes bright regardless of the surrounding. The ECM receives voltage, ground and reverse gear signals, and uses two sensors to measure the intensity of glaring.

1. The forward facing sensor determines whether the surrounding space is dark enough to activate the function.
2. The rearward facing sensor detects the glare on the mirror. If the glare is detected, the sensor transmits the signal for the mirror to dim
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. LED indicator, 2. ON/OFF Switch, 3. Rearward looking sensor, 4. Forward looking sensor)





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.

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NOTICE

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

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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 forward facing sensor.
3. Head a light to the rearward-facing sensor.
4. The ECM shall dim as soon as the rearward-facing sensor detects a certain level of brightness.

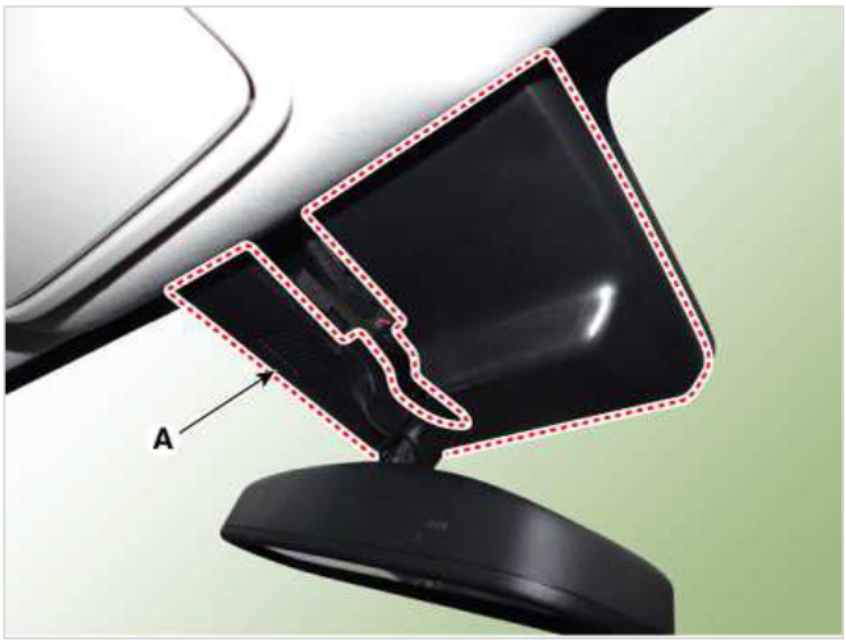
> **NOTICE**
> If this test is performed in daytime, the ECM may be darkened as soon as the forward facing sensor is covered.

5. In the reverse gear, the ECM shall not dim.
   When directing light to both the forward-facing and rearward-facing sensors, the ECM shall not dim.

Removal

1. Remove the mirror wiring cover (A).





2. Disconnect the inside rearview mirror connector (A).

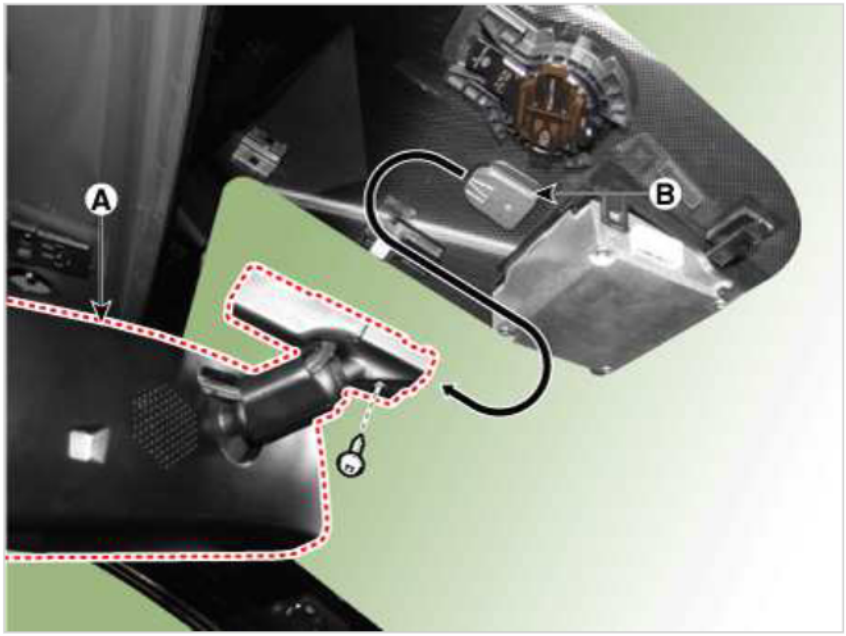
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3. Remove the inside rearview mirror (A) by pulling it up in the direction of the arrow.

NOTICE

Be careful not to damage the mounting bracket (B) when removing the mirror.

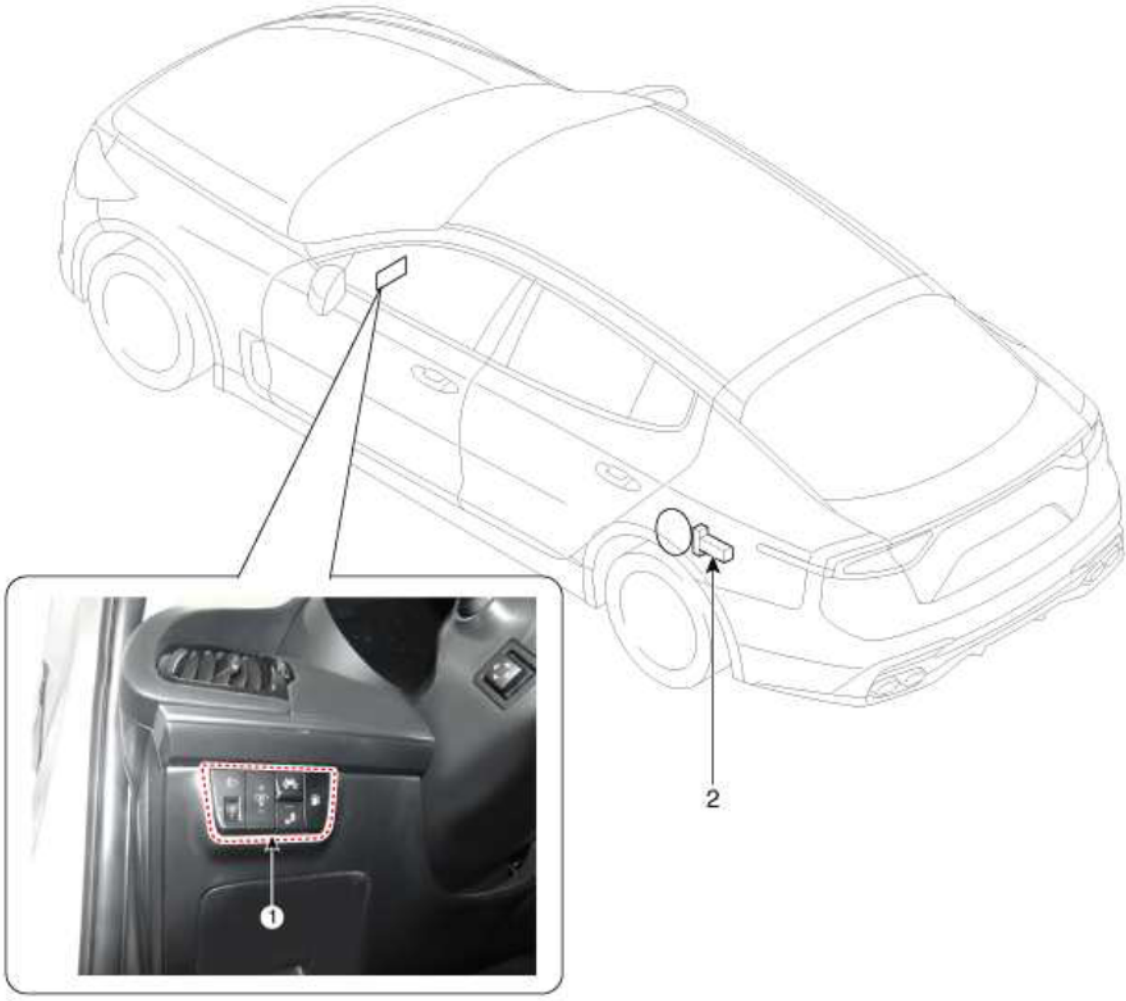


Installation

1. Install the mirror being careful not to damage the mounting bracket.
2. Install the mirror wiring cover after reconnecting the connector and tightening the screw.

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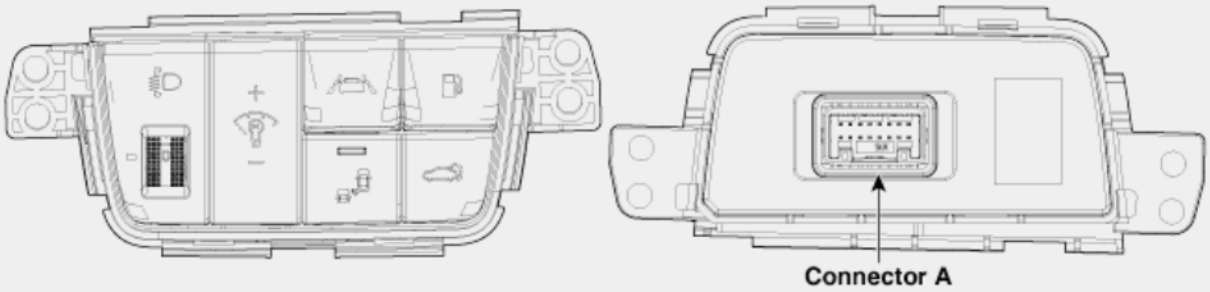
Component Location

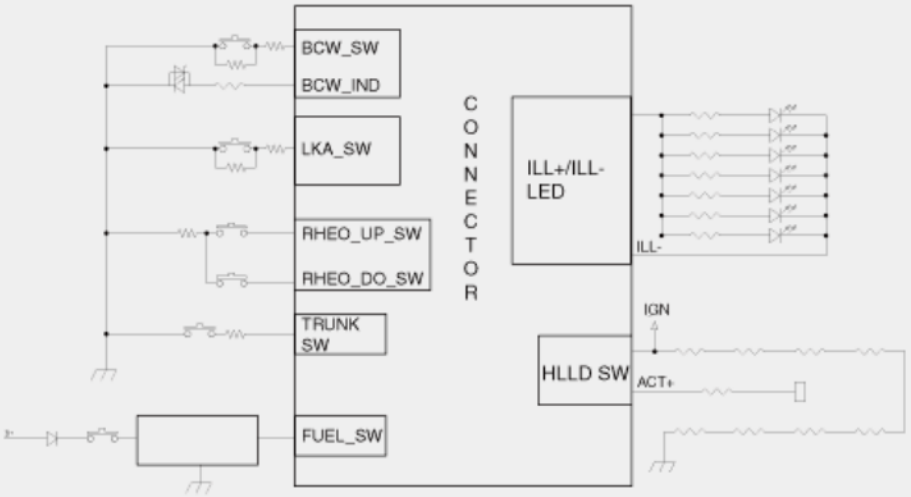


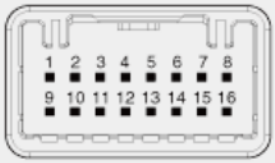
1. Fuel filler door open switch
2. Fuel filler door release actuator

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Components





Connector A	No.	Description	No.	Description
	1	Battery (+)	9	Illumination (+)
	2	IGN	10	-
	3	-	11	Illumination (-)
	4	HLLD Actuator (+)	12	BCW Indicator
	5	Rheostat (Up)	13	PTG Swtich
	6	Rheostat (Down)	14	LKA Switch
	7	-	15	BCW Switch
	8	Fuel door open switch	16	Ground

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Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel.
   (Refer to Body - "Crash Pad Lower Panel")
3. Remove the crash pad garnish [LH] (A) after loosening the mounting screw.

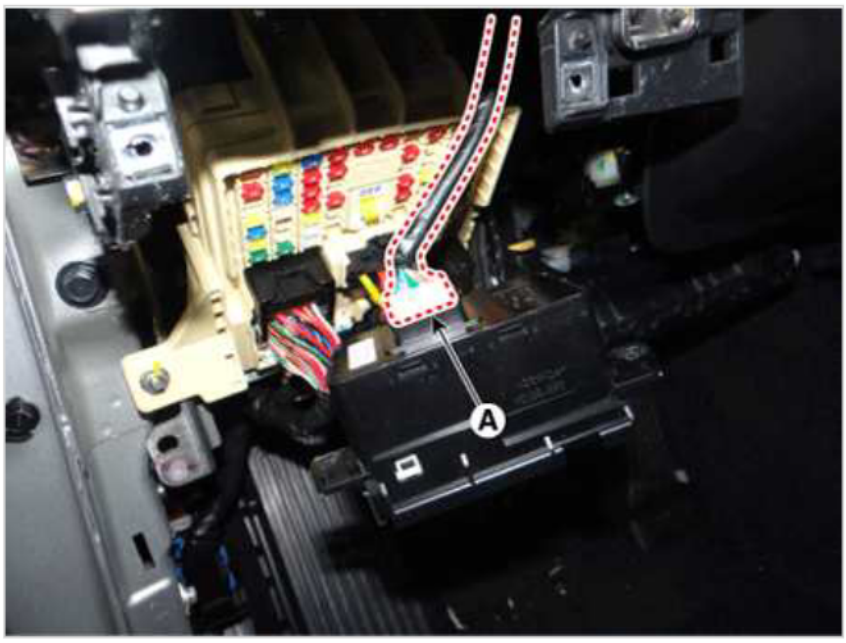


4. Remove the side crash pad switch (A) after loosening the mounting screws.



5. Disconnect the side crash pad switch connector (A).

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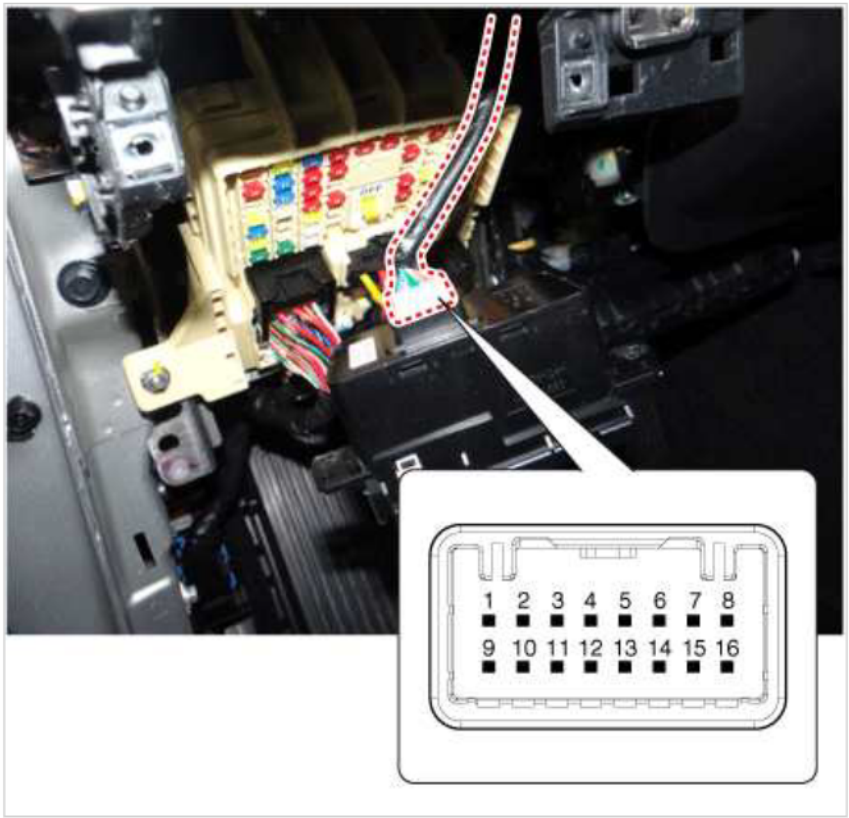


Installation

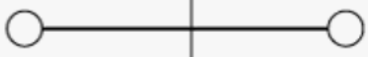
1. Connect the side crash pad switch connector.
2. Install the side crash pad switch.
3. Install the crash pad garnish [LH].
4. Install the crash pad lower panel.
5. Connect the negative (-) battery terminal.

Inspection

1. Check for continuity between the terminals. If there is an abnormality, replace the switch.



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Terminal / Switch	8	16
ON		
OFF		

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Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the luggage side trim [LH].
   (Refer to Body - "Luggage Side Trim")
3. Disconnect the fuel filler door release actuator connector (A).



4. Remove the fuel filler door housing.
   (Refer to Body - "Fuel Filler Door")
5. Remove the fuel filler door release actuator (A) after loosening the mounting bolts.



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Installation

1. Install the fuel filler door release actuator.
2. Install the fuel filler door housing.
3. Connect the fuel filler door release actuator connector.
4. Install the luggage side trim [LH].
5. Connect the negative (-) battery terminal.

Inspection

1. Check for continuity between terminals No. 1 and No. 2. If there is no continuity, replace the fuel filler door release actuator.



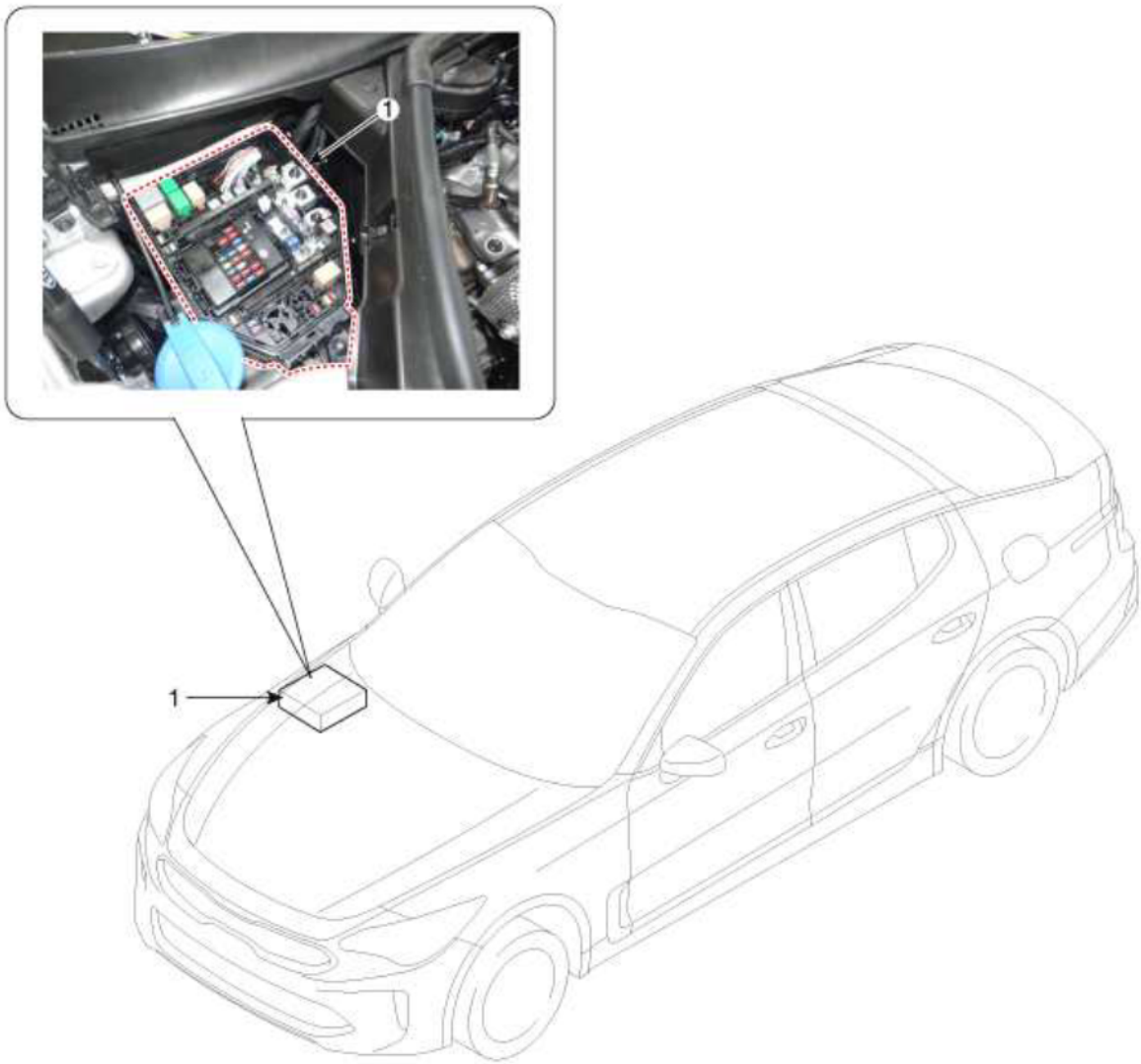
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Terminal / Operation	1	2
Lock	⊖	⊕
Unlock	⊕	⊖

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Component Location

[Engine Room]



1. Engine room junction block

[Interior Fuse & Relay]

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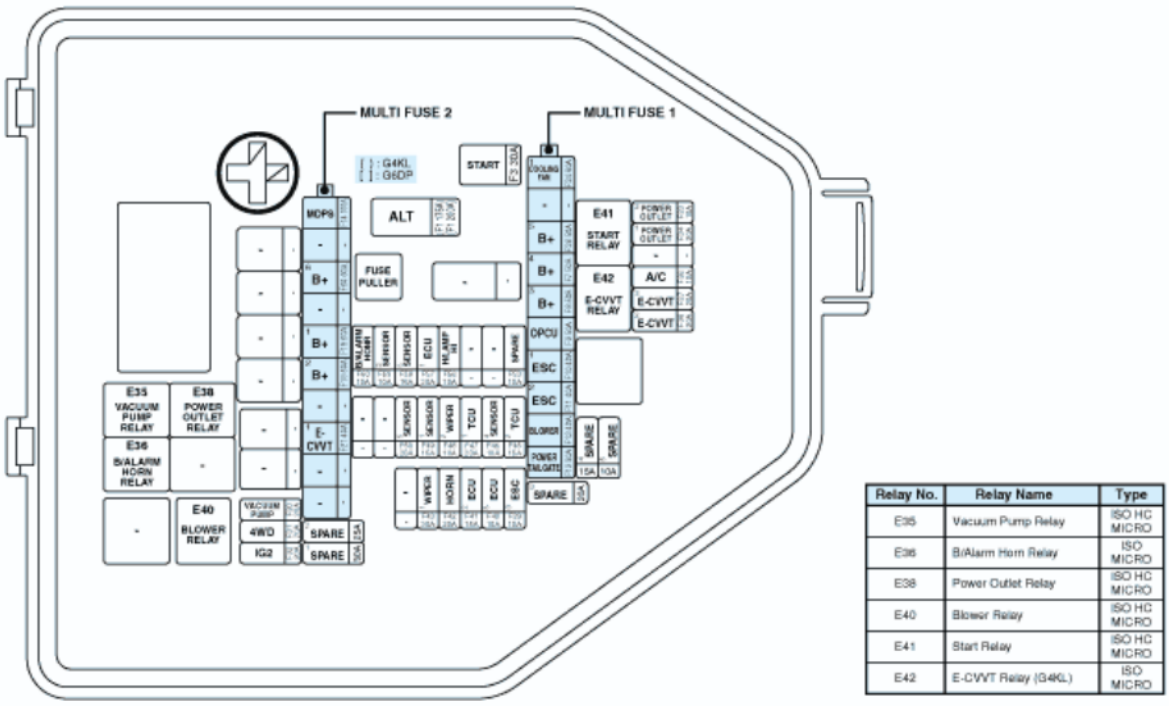


1. Integrated central control unit (ICU)
2. Rear sub junction block (RSJB)

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Component Location

E/R Junction Block



Relay No.	Relay Name	Type
E35	Vacuum Pump Relay	ISO HC MICRO
E36	B/Alarm Horn Relay	ISO MICRO
E38	Power Outlet Relay	ISO HC MICRO
E40	Blower Relay	ISO HC MICRO
E41	Start Relay	ISO HC MICRO
E42	E-CVVT Relay (G4KL)	ISO MICRO

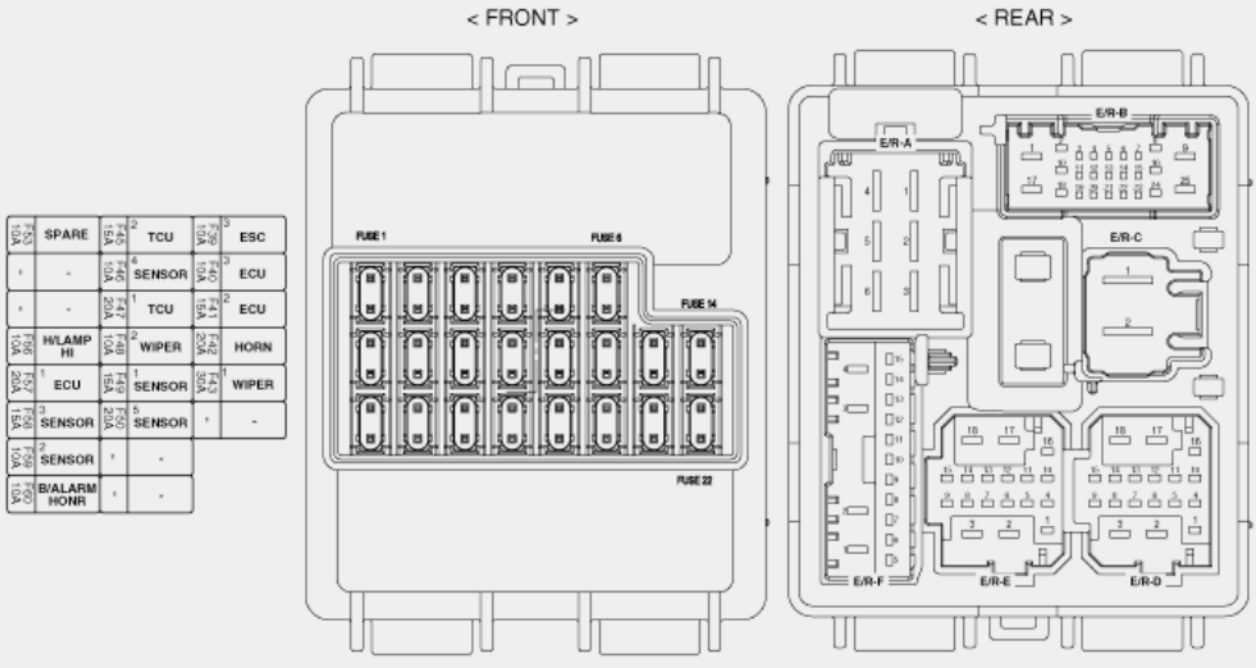
Circuit (E/R Junction Block)

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Fuse Name	(A)	Circuit Protected
ALT	175A 200A	Alternator, Multi Fuse 1 - Power Tailgate/Cooling Fan/ESC1/ESC2/B+3/B+4/B+5/OPCU/Blower
START	30A	Start Relay
COOLING FAN	80A	[BLDC Motor] Cooling Fan Controller
B+5	50A	ICU Junction Block (Fuse - STOP SW, Leak Current Autocut Device Fuse)
B+4	50A	ICU Junction Block (Fuse - DOOR LOCK/SUNROOF/POWER HANDLE/P/SEAT (DRV)/P/SEAT (PASS))
B+3	50A	ICU Junction Block (Fuse - S/HEATER FRT/MODULE9/P/WINDOW LH/P/WINDOW RH/TAIL GATE)
OPCU	50A	Electric Oil Pump Inverter
ESC1	40A	ESC Module
ESC2	40A	ESC Module, Multipurpose Check Connector
BLOWER	40A	Blower Relay
POWER TAIL GATE	30A	Power Tail Gate Module
MDPS	100A	MDPS Unit
B+6	60A	PCB Block (Engine Control Relay, Fuse - HORN/B/ALARM HORN/WIPER1/H/LAMP HI)
B+1	60A	ICU Junction Block (IPS5/IPS6/IPS7/IPS8/IPS10, Fuse - IBU1/IBU2)
B+2	50A	ICU Junction Block (IPS1/IPS2, Fuse - E-SHIFTER1/MODULE1)
E-CVVT1	40A	[G4KL] E-CVVT Relay
VACUUM PUMP	20A	Vacuum Pump Relay
4WD	40A	4WD ECM
IG2	20A	PCB Block (IG2 Relay)
POWER OUTLET2	10A	Front Power Outlet #2, Front USB Charger, Rear USB Charger
POWER OUTLET1	20A	Front Power Outlet #1
A/C	10A	A/C Control Module
E-CVVT3	20A	[G4KL] ECM
E-CVVT2	20A	[G4KL] ECM

※USE THE DESIGNATED FUSE AND RELAY ONLY

PCB Block



※USE THE DESIGNATED FUSE AND RELAY ONLY

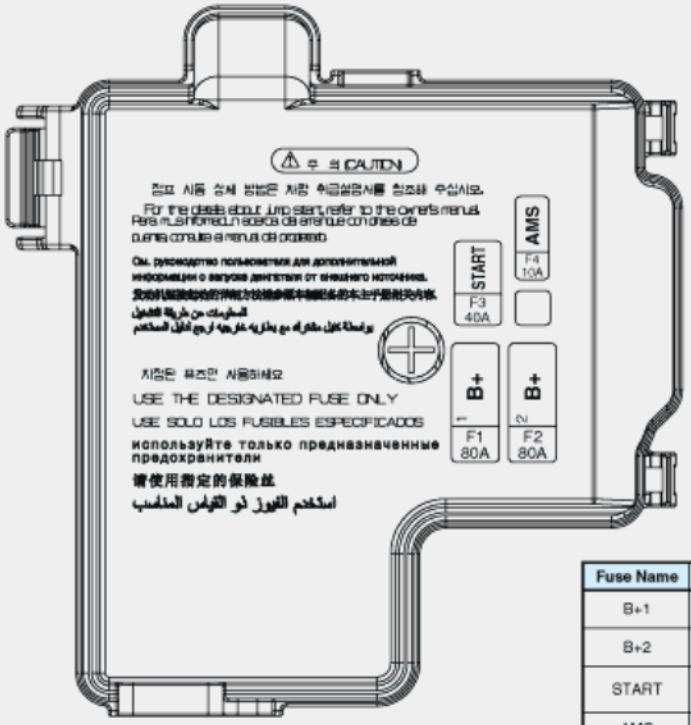
Circuit (PCB Block)

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Fuse Name	(A)	Circuit Protected
ESC3	10A	ESP Control Module, Multipurpose Check Connector
ECU3	10A	ECM
ECU2	15A	ECM
HORN	20A	Horn Relay
WIPER1	30A	Wiper Power Relay
TCU2	15A	TCM, Rear Sub Junction Block (P/N Relay)
SENSOR4	10A	Brake Vacuum Switch, Electric Oil Pump Inverter, E/R Junction Block (Vacuum Pump Relay)
TCU1	20A	TCM
WIPER2	10A	IBU, ECM
SENSOR1	15A	Rear Sub Junction Block (Fuel Pump Relay)
SENSOR5	20A	[G4KL] Ignition Coil #1/#2/#3/#4 [G6DP] Ignition Coil #1/#2/#3/#4/#5/#6
H/LAMP HI	10A	Head Lamp (High) Relay
ECU1	20A	ECM
SENSOR3	15A	[G4KL] Oxygen Sensor (Up/Down) [G6DP] Oxygen Sensor #1/#2/#3/#4
SENSOR2	10A	[G4KL] Electronic Thermostat, Oil Control Valve, Purge Control Solenoid Valve, Recirculation Valve Control Solenoid Valve, Canister Close Valve [G6DP] Electronic Thermostat, Oil Pressure Solenoid Valve, Oil Control Valve #1/#2/#3/#4 (Intake/Exhaust), Canister Close Valve, Recirculation Valve Control Solenoid Valve, Purge Control Solenoid Valve
B/ALARM HORN	10A	E/R Junction Block (Burglar Alarm Horn Relay)

※USE THE DESIGNATED FUSE AND RELAY ONLY

Battery Junction Block



Fuse Name	(A)	Circuit Protected
B+1	80A	Rear Sub Junction Block (Fuse - REAR HEATED/FUEL PUMP/AMP1)
B+2	80A	Rear Sub Junction Block (Fuse - S/HEATER REAR/IG1/ECS)
START	40A	E/R Junction Block ((Power Outlet Relay), Fuse - START) PCB Block (Fuse - ECU2/TCU1)
AMS	10A	Battery Sensor

※USE THE DESIGNATED FUSE AND RELAY ONLY

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Inspection

1. Disconnect the negative (-) battery terminal.
2. Pull out the relay from the engine compartment relay block.

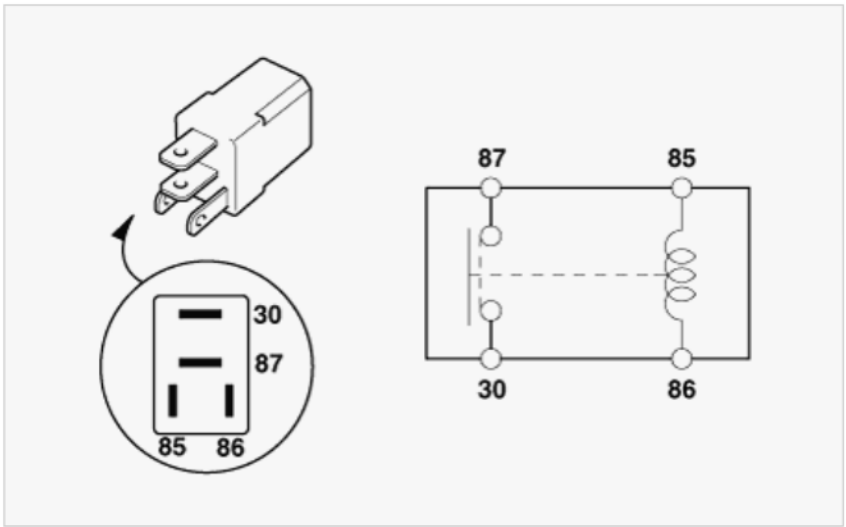
Power Relay (Type A)

Check for continuity between the terminals.

1. After supplying power to between No. 85 and 86 power relay terminals, check that there is continuity between No. 30 and 87 terminals.
2. After disconnecting power between No. 85 and 86 power relay terminals, check that there is no continuity between No. 30 and 87 terminals.

Engine Room Relay Block





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

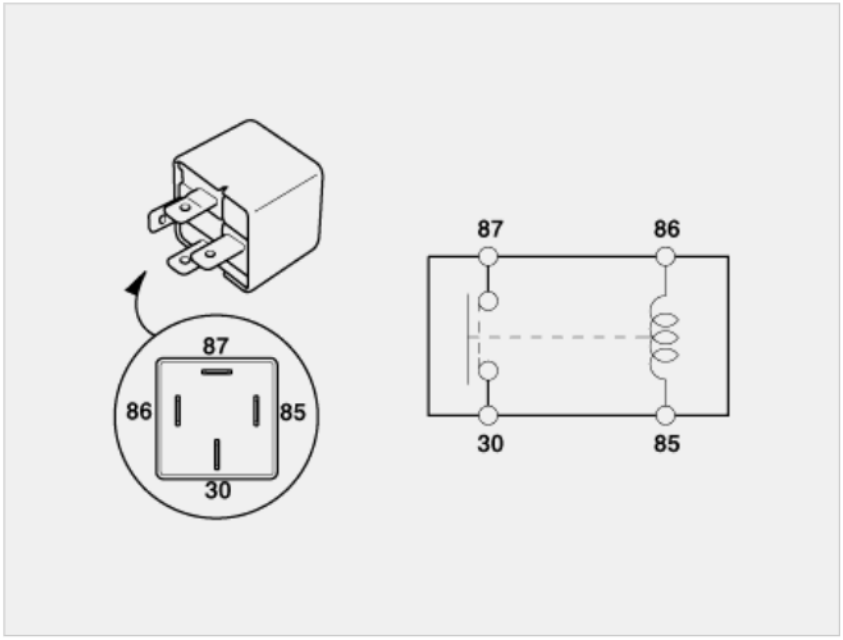
Power Relay (Type B)

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Check for continuity between the terminals.

1. After supplying power to between No. 85 and 86 power relay terminals, check that there is continuity between No. 30 and 87 terminals.
2. After disconnecting power between No. 85 and 86 power relay terminals, check that there is no continuity between No. 30 and 87 terminals.



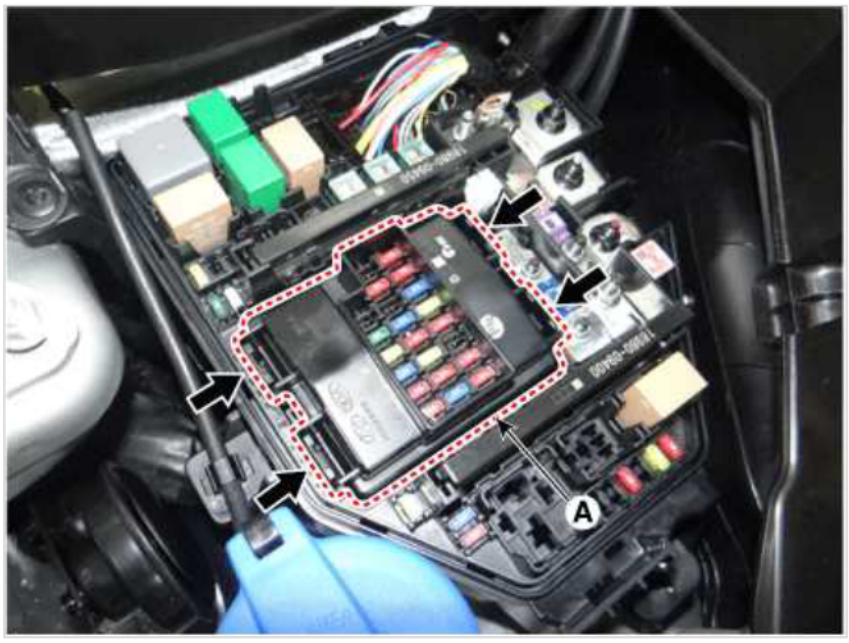


Terminal / Position	86	85	87	30
Disconnected	○	○		
Connected	⊖	⊕	○	○

Metal Core PCB Block

1. Disconnect the negative (-) battery terminal.
2. Push the four hooks in the direction of the arrow and lift up the metal core PCB block (A).
3. Remove the metal core PCB block by disconnecting the connectors.

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Fuse

1. Check that the fuse holders are loosely held and that the fuses are securely fixed by the holders.
2. Check that each fuse circuit has the exact fuse capacity.
3. Check the fuses for any damage.

NOTICE

- If a fuse is to be replaced, be sure to use a new fuse of the same capacity. Always identify the cause of the blown fuse and completely eliminate the problem before installing a new fuse.

Multi Fuse

1. Disconnect the negative (-) battery terminal.
2. Remove the multi fuse (A) after loosening the mounting nut.



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3. Install in the reverse order of removal.

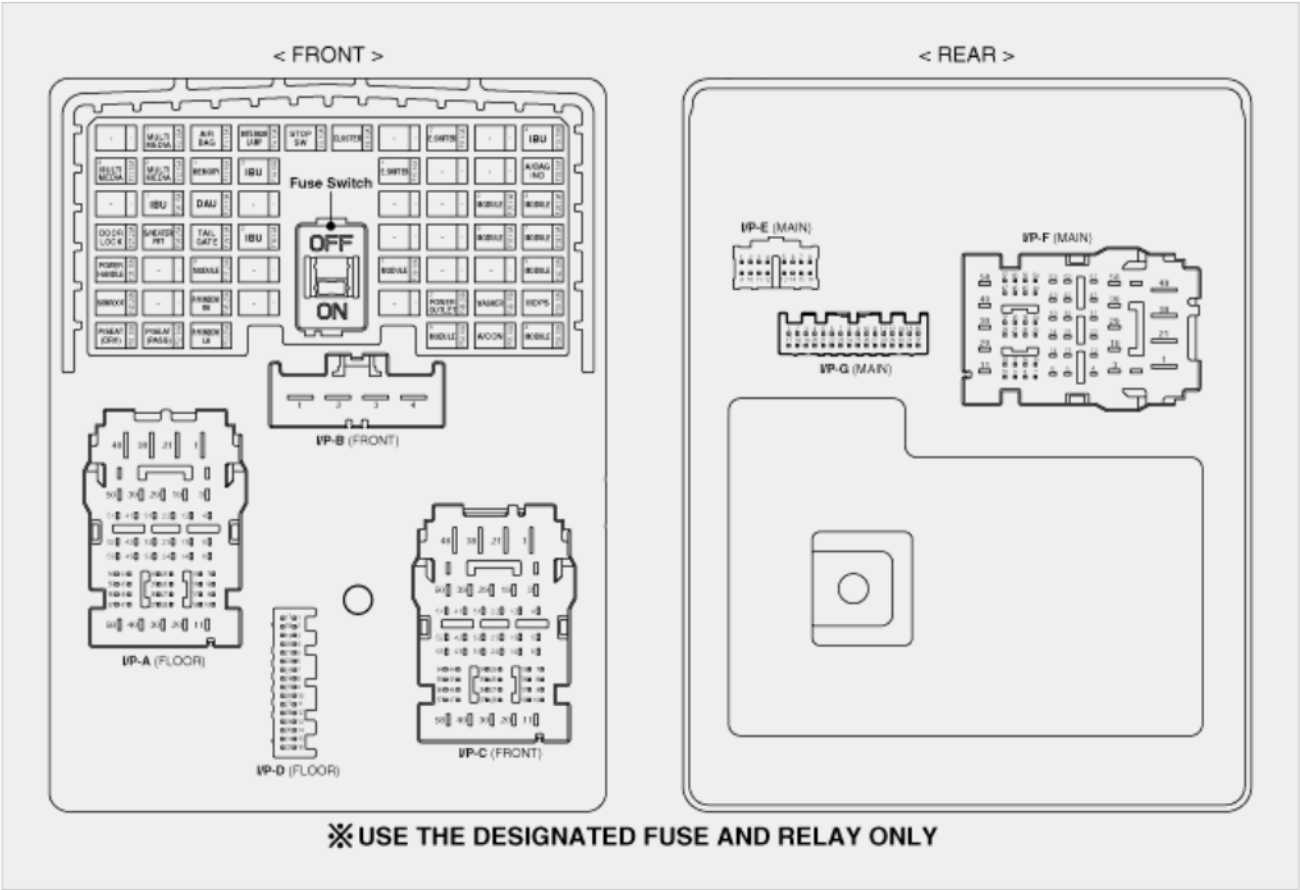
Information

- The entire multi fuse (A) has to be replaced even if only one fuse is damaged.
- When replacing it, refer to “the Engine compartment- component location” diagram to check fuse capacities and circuit arrangement.
- Use the multi fuse of the exact fuse capacity for each circuit.

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Component Location

ICU (Integrated Central Control Unit) Junction Block



Circuit (ICU Junction Block)

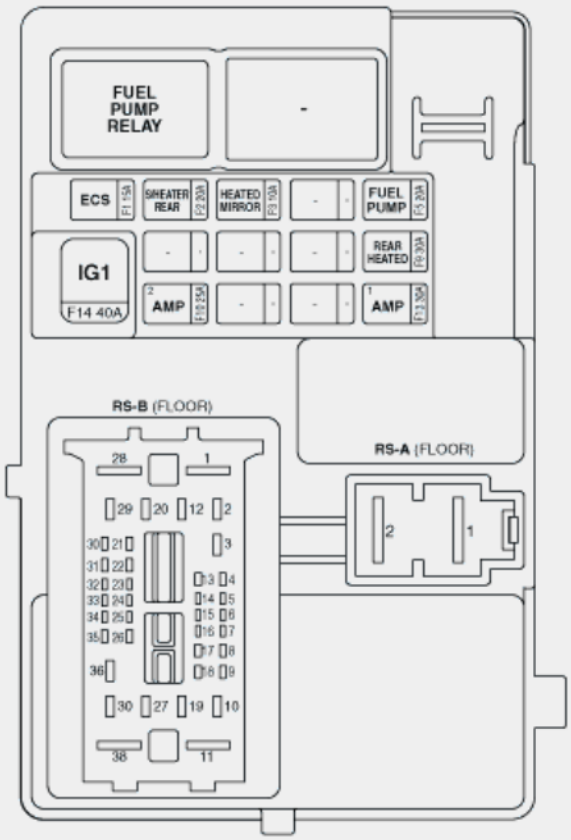
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Fuse Name	(A)	Circuit Protected
MULTI MEDIA1	25A	Low DC-DC Converter (Audio)
AIR BAG	15A	SRS Control Module
INTERIOR LAMP	10A	Overhead Console Lamp, Center Room Lamp, Room Lamp, Vanity Lamp Switch LH/RH, Luggage Lamp LH/RH, Glove Box Lamp, Driver/Passenger Door Mood Lamp, Driver/Passenger Door Lamp, Driver/Passenger Foot Lamp, Mood Lamp
STOP SW	10A	IBU, Stop Lamp Switch
CLUSTER	10A	Instrument Cluster, Head-Up Display
E-SHIFTER2	10A	Electronic ATM Shift Lever (IG1)
IBU4	10A	IBU (IG1)
MULTI MEDIA3	10A	Instrument Cluster, Head-Up Display, A/C Switch, Wireless Charger
MULTI MEDIA2	15A	Audio
MEMORY1	10A	A/C Control Module, A/C Switch, Security Indicator ,Head-Up Display
IBU3	10A	IBU (B+)
E-SHIFTER1	10A	Electronic ATM Shift Lever (B+)
A/BAG IND	10A	Instrument Cluster, Hazard Switch
IBU1	15A	IBU (B+)
DAU	10A	Driver Door Module, Driver/Passenger Power Outside Mirror
MODULE2	10A	IBU (IG2)
MODULE3	10A	ATM Shift Lever Switch, Driver Door Module, Stop Lamp Switch
DOOR LOCK	20A	Door Lock Relay, Door Unlock Relay, T/Turn Unlock Relay
S/HEATER FRT	25A	Front Air Ventilation Seat Control Module, Front Seat Warmer Control Module
TAIL GATE	10A	Tail Gate Lid Relay, Fuel Lid Relay, Crash Pad Switch
IBU2	10A	Rain Sensor

Fuse Name	(A)	Circuit Protected
MODULE8	10A	Cooling Fan Controller (BLDC Motor), Around View Monitor, Front Air Ventilation Seat Control Module, Front/Rear Seat Warmer Control Module
MODULE7	10A	IBU, ECS Unit, 4WD ECM, Smart Cruise Control Module, Multi-Function Camera Unit, Steering Angle Sensor, ATM Shift Lever Indicator, Console Switch (Front/Upper), Crash Pad Switch, Blind-Spot Collision Warning Unit LH/RH, Steering Tilt & Telescopic Module
POWER HANDLE	15A	Steering Tilt & Telescopic Module
MODULE9	10A	Driver Air Lumbar Control Unit
MODULE1	10A	Data Link Connector, Console Switch (Upper), Mood Lamp Unit
MODULE5	10A	A/C Control Module, A/C Switch, Audio, Head Lamp LH/RH, Low DC-DC Converter (Audio/AMP), Electro Chromic Mirror, AMP, Driver IMS Control Module, Front Air Ventilation Seat Control Module, Front/Rear Seat Warmer Control Module
SUNROOF	20A	Sunroof Control Unit (Glass)
P/WINDOW RH	25A	Passenger Power Window Module, Rear Power Window Module RH
POWER OUTLET2	20A	Rear Power Outlet
WASHER	15A	Multifunction Switch
MDPS	10A	MDPS Unit (R-MDPS)
P/SEAT (DRV)	30A	Driver IMS Control Module, Driver Seat Manual Switch
P/SEAT (PASS)	30A	Passenger Seat Manual Switch
P/WINDOW LH	25A	Driver Power Window Module, Rear Power Window Module LH
MODULE6	10A	IBU, Low DC-DC Converter (Audio/AMP), Wireless Charger, Electronic ATM Shift Lever (SBW), E/R Junction Block (Power Outlet Relay)
A/CON	10A	A/C Control Module, A/C Switch, E/R Junction Block (Blower Relay)
MODULE4	10A	Head Lamp LH/RH, AFS Control Unit, Auto Head Lamp Leveling Device Module

※USE THE DESIGNATED FUSE AND RELAY ONLY

Rear Sub Junction Block



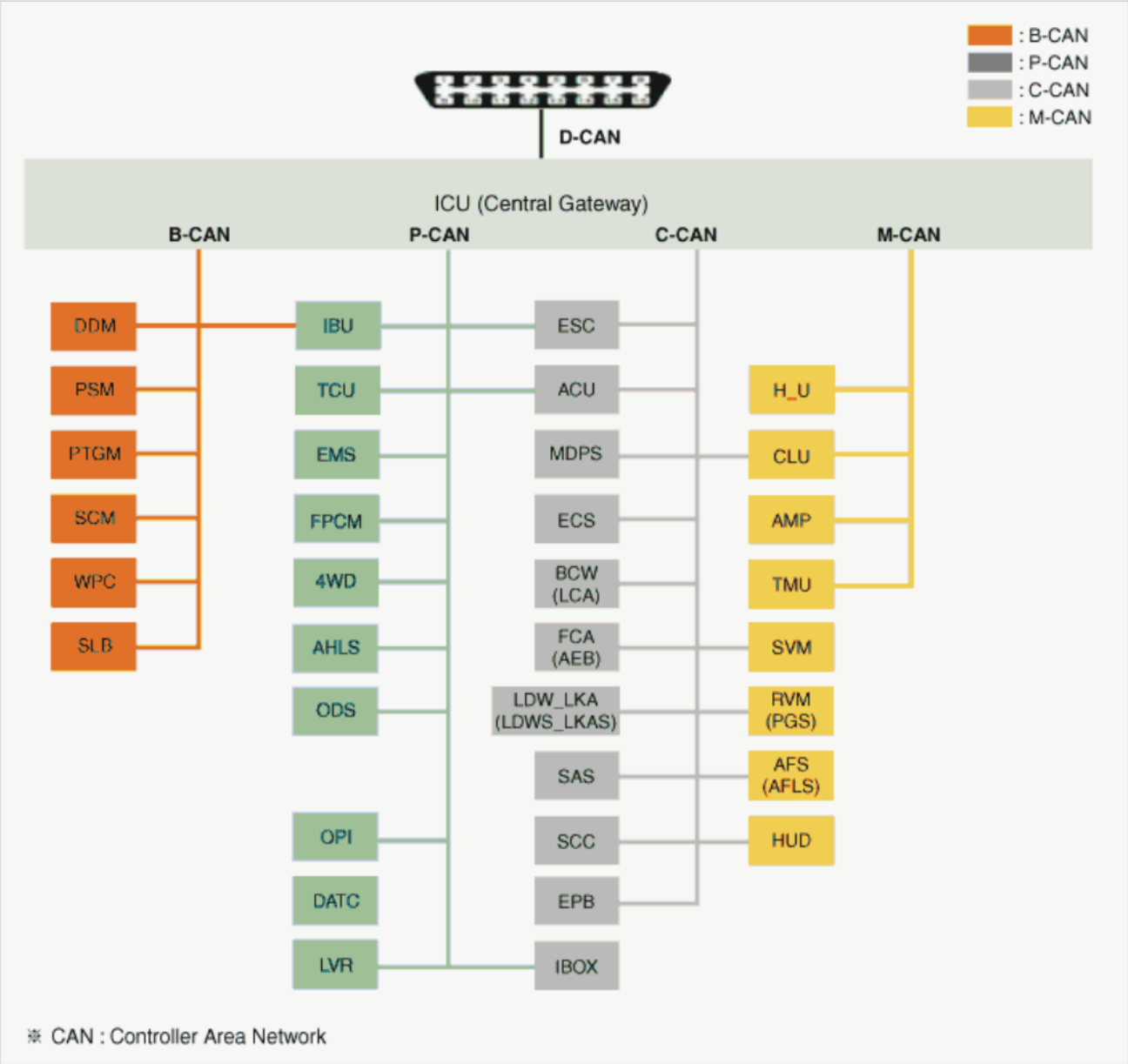
Fuse Name	(A)	Circuit Protected
ECS	15A	ECS Unit
S/HEATER REAR	20A	Rear Seat Warmer Control Module
HEATED MIRROR	10A	A/C Switch, Driver/Passenger Power Outside Mirror
FUEL PUMP	20A	Fuel Pump Relay
REAR HEATED	30A	RR HTD Relay
AMP2	25A	AMP (MOBIS/PREMIUM)
AMP1	30A	Low DC-DC Converter (AMP)
IG1	40A	PCB Block (IG1/ACC Relay)

※USE THE DESIGNATED FUSE AND RELAY ONLY

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Description

Communication Network Diagram



Abbreviation	Explanation
ACU	Airbag Control Unit
AFL	Adaptive Front-Lighting System
AMP	Amplifier
AUDIO	Audio Head Unit
SVM	Surround View Monitor
B_CAN	Body Controller Area Network
BCW	Blind-Spot Collision Warning
C_CAN	Chassis Controller Area Network
CDP	Compact Disk Player
CLU	Cluster Module
DATC	Dual Automatic Temp Control
DDM	Driver Door Module

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ECM	Engine Control Module
F_PUMP	Fuel Pump Control Module
HUD	Head Up Display
IBU	Integrated Body Control Unit
ICU	Integrated Central Control Unit
IFB	Interface Box
IMS	Integrated Memory System
LDW	Lane Departure Warning
LKA	Land Keeping Assist
M_CAN	Multi media Controller Area Network
MDPS	Motor Driven Power Steering
MFC	Multi Function Camera
MTC	Manual Temp Control
ODS	Occupant Detection System
P_CAN	Powertrain Controller Area Network
PCM	Powertrain control module
PTG	Power Liftgate Module
RVM	Rear View Monitor
SCC	Smart Cruise Control
SCM	Steering Column Module
TCM	Transmission Control Module
VDC	Vehicle Dynamic Control
WPC	Wireless Power Charger

Integrated Central Control Unit (ICU)

ICU (Integrated Central Control Unit) is an integrated model of smart junction block and central gateway.
It performs the function of conventional "Smart junction block" and the function of communication medium of "Central Gateway".



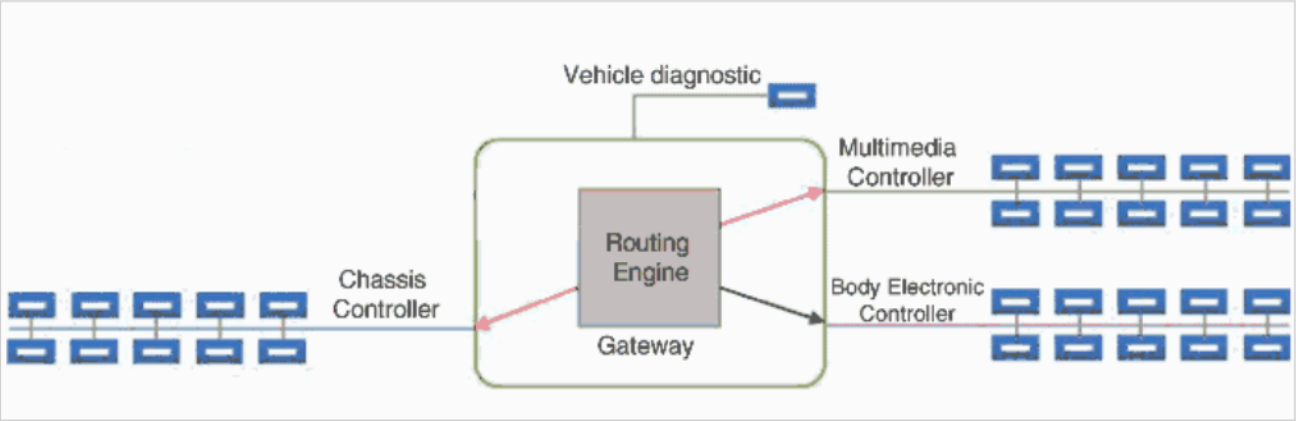
Central Gateway (CGW)

CGW is a controller enabling communication among the controllers connected to the different networks.
There are five CAN networks connected to CGW. B-CAN and M-CAN are connected to the low-speed CAN, C-CAN and P-CAN to the high-speed CAN while D-CAN is connected for inspection.

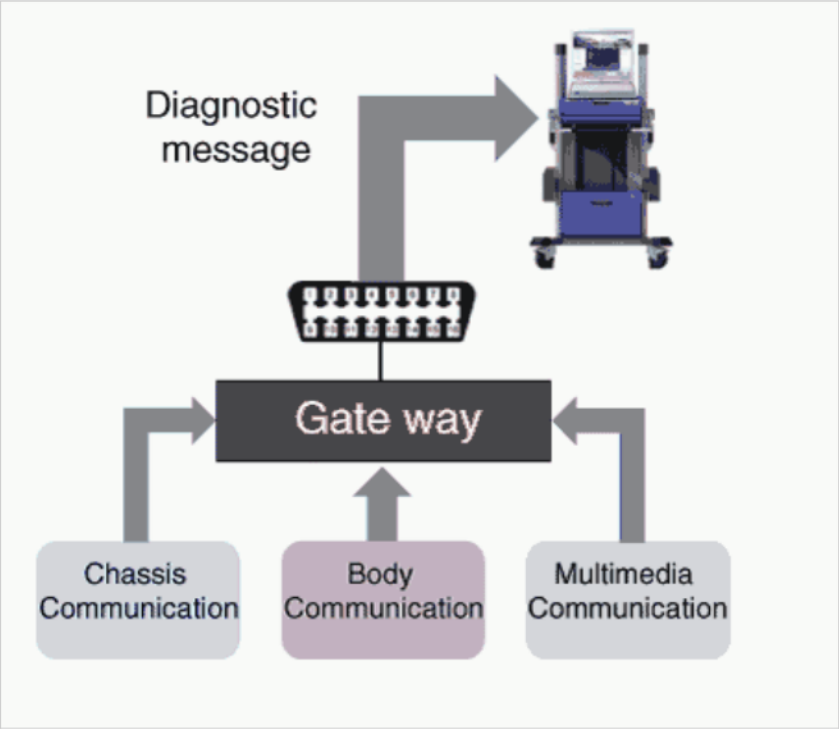
1. CGW Main Features

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(1) Routing : Information exchange among different in-vehicle communication networks.



(2) Network security control : It only allows inspection communication (D-CAN) to connect in-vehicle communication network in order to prevent



(3) Additional functions

- If alarm light is ON, carry out remote diagnosis of Chassis system (C-CAN) through I-Box and gateway

> **Information**
> I-Box remote diagnosis (C-CAN) function via gateway shall be suspended.

- Dark current measurement: After sending forced electronic parts sleep message to each network from the diagnosis equipment, gateway also enters sleep mode.
- Operation current check: Check problem through operation of electronic parts

(4) Fault diagnosis on CAN signal transmission failure by communication control defect
(CGW records DTC for the controller with transmission failure.)

2. How to check CGW

(1) Although "No CGW CAN signal (TIMEOUT)" record appears when checking the DTC of the faulty electronic component, never determine it as the CGW failure. CGW is a controller that intermediates in-vehicle transmitting/receiving controllers. If one of the following two cases arises : (1) the transmitting controller fails to send a message to CGW, leading to CGW failing to send it to the receiving controller; (2) CGW sends the pre-determined value (Timeout Value), the corresponding receiver records the DTC of the failure of message transmission. Thus, to finally determine the controller that fails to send CAN signal, the DTC of CGW shall be checked. CGW records DTC only when it fails to receive the signal for more than 10 seconds with KEY ON. To identify the cause of no CAN signal transmission, the CGW DTC shall be checked after waiting for more than 20 seconds with KEY ON.

(2) If the CAN communication control unit is not reinstalled after being removed from the vehicle, CGW records the DTC of "No CAN signal" for the unit.

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NOTICE

For example, the failure code of "DDM CAN signal is not out" is created when the removed DDM is not reinstalled.

If a DTC remains after replacing electronic components and the failure code is not erased, check whether the connector of the electronic component is properly connected, and whether the controller"s CAN wiring operates normally. In case that the removed electronic component cannot be reinstalled, ‘Erase Expected Network Config" service shall be performed. Refer to the DTC inspection guide for each failure code for the service execution method.

Otherwise, the DTC of "No CAN Signal" on the corresponding controller may not be deleted.

NOTICE

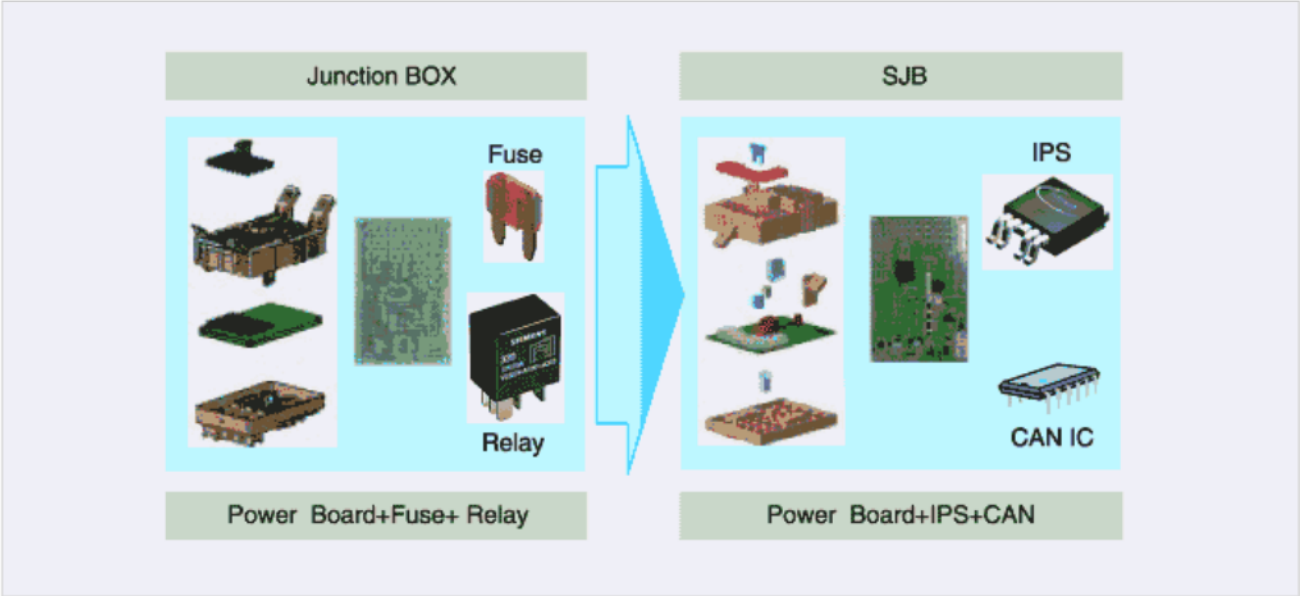
Perform the "Additional function" > "Network setting initialization" in examining device (GDS) by referring to DTC guide.

(3) IGN2 of SJB is ON when MCU is out of order (State of non-operation due to the external physical or electrical shock). The safety of the driver is secured by forcible lighting on the head lamp low, external and internal tail lamps when the headlamp low switch is ON.

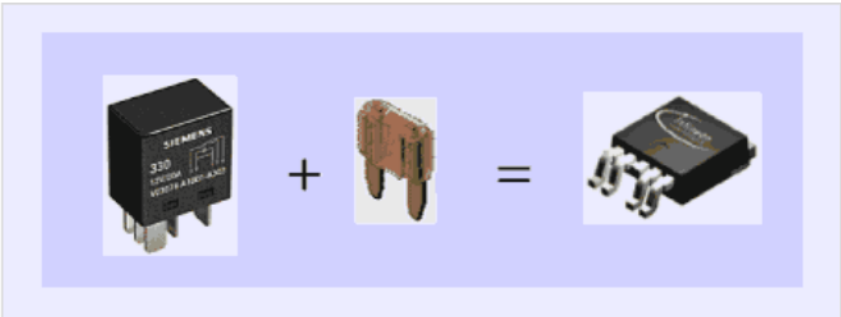
(4) IGN2 is ON when the data transmitting/receiving is impossible by the failure on the CAN communication line (Both of high/low cables are shorted, BAT short in high/low, GND short in high/low) in case of failure on CAN communication line connected to SJB module. When the headlamp low switch is ON, the headlamp low and internal/external tail lamps are lighted forcibly.

Smart Junction Block(SJB)

Smart Junction Block (SJB) is a module that performs the function of conventional Junction Box and some functions of BCM.
It controls various components including lamps by using CAN communication and IPS (replacing the function of fuse and relay) or ARISU.



IPS stands for Intelligent Power Switch, which uses the semiconductor technology to replace the current role of fuse and relay.
The IPS chip has two functions :
1) the high current-based component control;
2) component protection from overcurrent.



NOTICE

The advantages of IPS are as follows:

– Reduce relay and consequently decrease weight and volume
– Remove the relay operation noise
– No need to replace fuses and increase the product life

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– Capable to diagnose faulty parts

SJB control entry

1. Switch signal input
   (1) Assist seat belt switch
   Assist seat belt reminder switch
   Assist the door switch
   Driver"s seat belt switch
   Driver"s seat belt switch
   Rear left seats door switch
   Rear right seats door switch
   Rear Safety seat belt switch Left
   Rear Safety seat belt switch Right
   Rear Center seat safety belt switch
   IGN1 switch
   IGN2 switch
   Brake fluid sensor
   Trunk open switch
   Trunk lid handle switch
   HID head lamp option
   ADV HID head lamp option
   Emergency switch
   Headlight low beams switch
   Hood switch
   Dark disconnect switch
   Left front / rear turn signal switch
   Right front / rear turn signal switch

   (2) IPS&ARISU
   Left Headlight low beams
   Right Headlight low beams
   Right Headlight high beams
   Right Headlight high beams
   Front left / right fog lamp
   Room Taillight
   Outdoor Left taillight
   Outdoor Light taillight
   Left front / rear turn signals
   Right front / rear turn signals
   Static bending left lamps
   Static bending right lamp
   DRL Left lamp
   DRL right lamp
   Trunk room lamp
   Body resistance Cut control
   Front left turn signal output
   Front right turn signal output

   (3) Relay Control
   Rear glass heat rays relay
   Anti-theft alarm horn relay
   Trunk lid relay
   Room lamp relay
   Front glass heat rays relay
   Rear fog lamp relay
   Headlight high beams relay

2. SJB protection
   (1) PCL (Programmable Current Limit) functions
   – PCL replaces the junction box function of protecting wires.
   – How to operate : If the lamp current exceeds the standard level, cut off the current to protect the lamp.
   – Lamp cut off time : 300ms or less.

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– Applied components : all lamp components controlled by SJB

– Output the error code according to the error detection conditions.

(2) OCL (Open Current Limit)

– OCL detects the lamp open state and informs the user of it.

– How to operate : Detect the current of the lamp and if it is below the standard level, change the lamp operation.

– Applied components : 4 turn signal lamps

– Output the error code according to the error detection conditions.

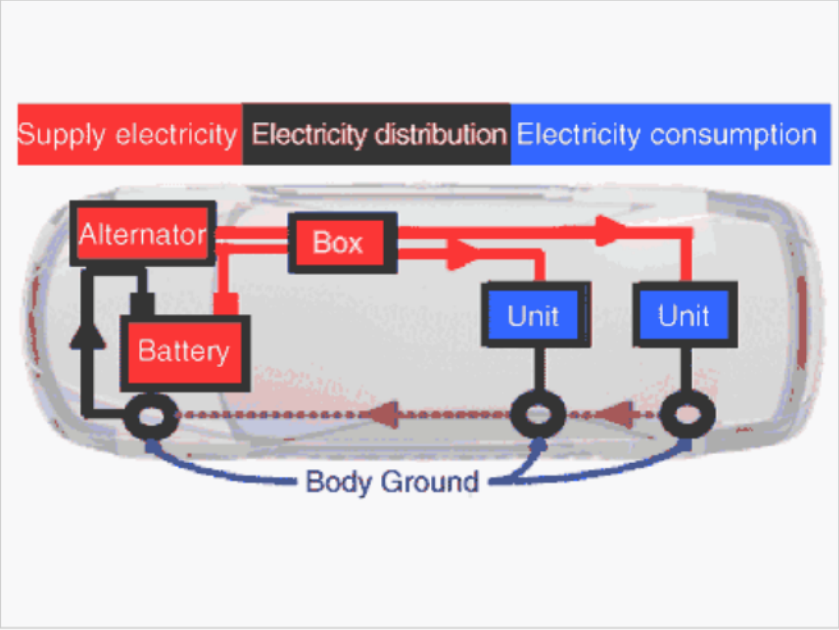
3. SJB fail safe function

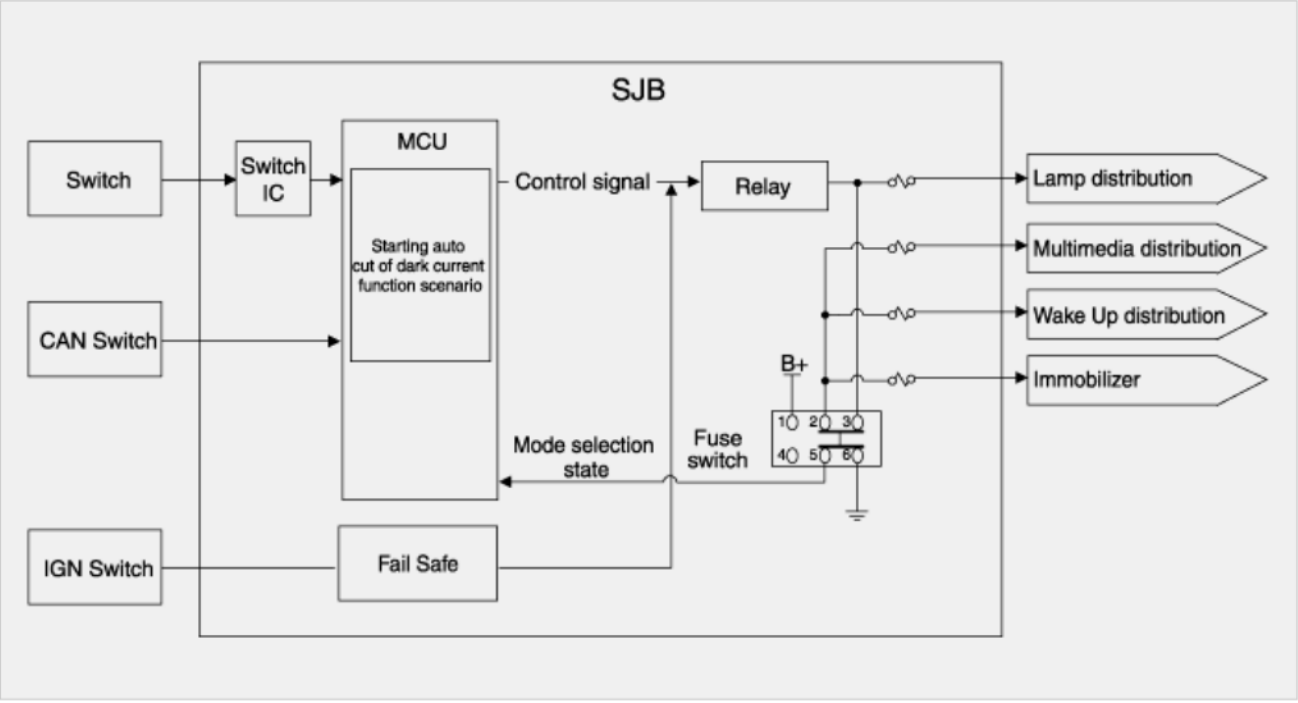
(1) When the MCU is out of order (not operating due to a physical or electrical shock from the outside), and IGN2 and head lamp low switch are on, SJB forces the head lamp low and exterior/interior lamps to turn on in order to secure the driver's safety.

(2) When the data transmission/reception fails due to a failed CAN communication line connected with SJB module (disconnection of both high and low line, high/low BAT short, high/low GND short), the head lamp low and interior/exterior tail lamps are forced to turn on if IGN2 is on and the head lamp low switch is on.

4. Auto Cut System of Dark Current

(1) Description : It cuts automatically power to be provided with components for reducing useless dark current according to vehicle state.



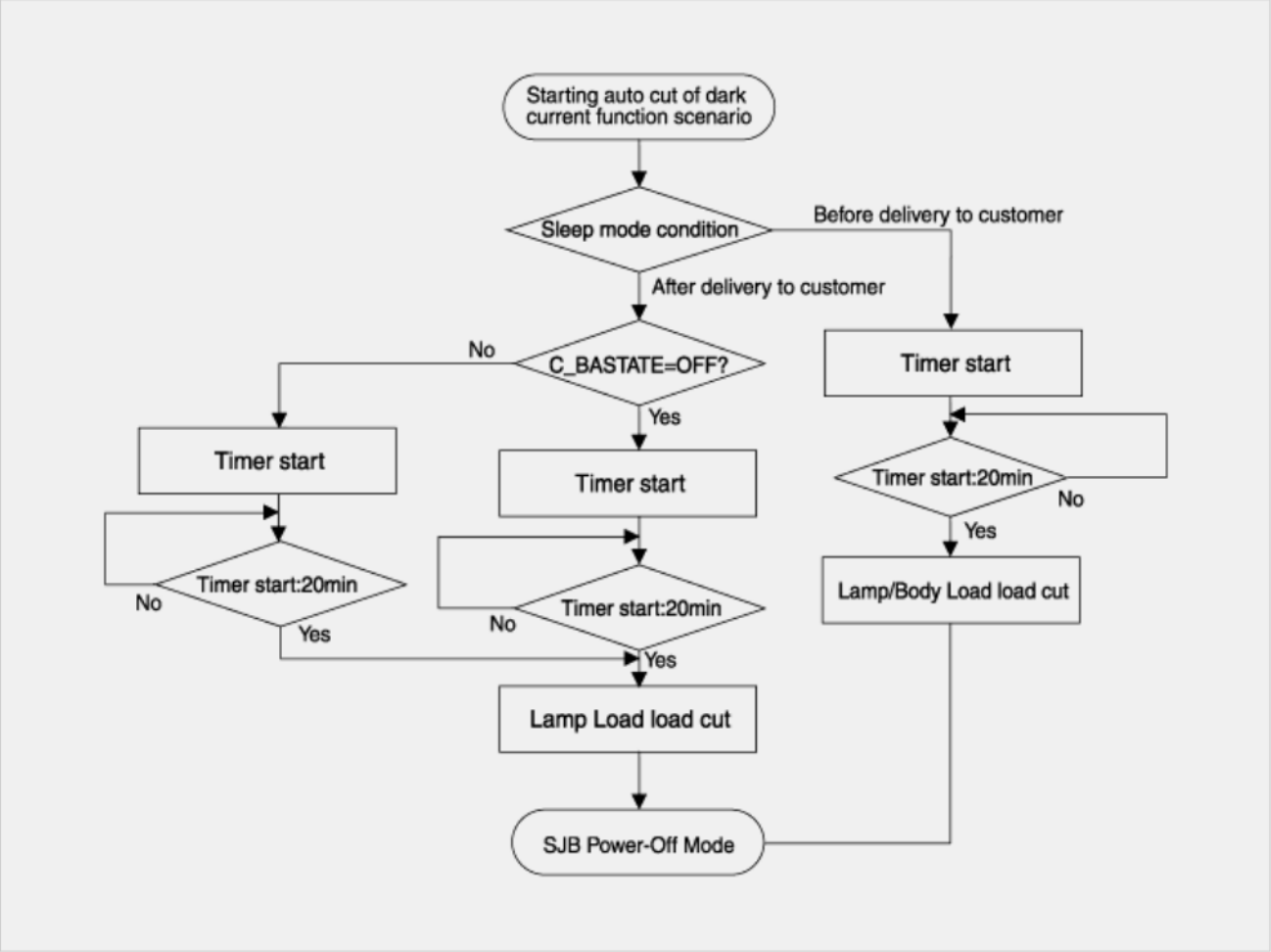


(2) SJB had 3 modes, "Normal Mode", "Sleep Mode", "Power Off Mode". Auto cut of dark current practice in "Sleep Mode".

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– "Sleep" condition : IG OFF, constant input switch, CAN network doesn"t activate.
– "Sleep" resolutive condition : Any switch inputs, CAN network activates, KEY ON, IGN ON
– "Power OFF" condition : The setting time of timer which is used by cutting a load power expires.
– "Normal Mode" : SJB function normally activates.
– "Sleep Mode" : It is low power mode and activates for reducing electricity consumption of SJB or IPM. Auto cut of dark current function activates.
– "Power OFF Mode" : Power of MCU and circumferential circuit is cut for minimizing electricity consumption. Operation stops.

(3) The explanation - The auto cut of dark current



Before delivering to customer	Fuse switch OFF
• All door close & RKE door lock or Constant switch state (Auto cut of dark current scenario starts.) – After "sleep" state is for 20 min. – SJB power down(SJB dark current : 200 μA) and cutting power of Lamp /Body Load/Wake up	

After delivering to customer	Fuse switch ON
• All door close & Constant switch state : C_BAState=OFF (Auto cut of dark current scenario starts.) – After "sleep" state is for 20 min. – SJB power down(SJB dark current : 200 μA) and cutting power of Lamp Load • In case RKE door lock : C_BAState=ON & Trunk SW=CLOSE	

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(Auto cut of dark current scenario starts.)

– After "Sleep" state 35s-65s (Waiting time of other unit : 30-60s + SJB sleep counts 5s)

– SJB Powerdown(SJB dark current : 200 μA) and cutting power of Lamp Load



(4) Problem when fuse switch setting is wrong

: If a fuse switch is set to OFF(Before delivering to customer) by a customer or technician and auto cut function of dark current activates, the following problems may occur.

Symptom	Related part
• Door lock/unlock, trunk open don"t activate by RKE. (Wakeup of each module don"t activate.)	IBU
• Digital clock is reset.(Memory is reset.)	Digital clock
• Audio setting values (volume, frequency setting) are reset. (Memory is reset.)	Audio

* If fuse switch OFF(before delivering to customer) is set, power of IBU, Digital clock and audio is shut off.

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Fuse Inspection

1. Check that the fuse holders are loosely held and that the fuses are securely fixed by the holders.
2. Check that each fuse circuit has the exact fuse capacity.
3. Check the fuses for any damage.

> **NOTICE**
> If a fuse is to be replaced, be sure to use a new fuse of the same capacity. Always identify the cause of the blown fuse and completely eliminate the problem before installing a new fuse.

Diagnosis with KDS

1. In the body electrical system, failure can be quickly diagnosed by using the vehicle diagnostic system (KDS).
   The diagnostic system (KDS) provides the following information.
   (1) Self diagnosis : Checking failure and code number (DTC)
   (2) Current data : Checking the system input/output data state
   (3) Actuation test : Checking the system operation condition
   (4) Additional function : Controlling other features including system option setting and zero point adjustment
2. Select the "Car model" and the "Integrated Body Control Unit (IBU)" to be checked in order to check the vehicle with the tester.
3. Select the "Current Data" menu to search the current state of the input/output data.
4. To forcibly actuate the input value of the module to be checked, select option "Actuation Test"
5. If you want to change user option, select "user option".

Removal

Integrated Central Control Unit (ICU)

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel.
   (Refer to Body - "Crash Pad Lower Panel")
3. Remove the crash pad garnish [LH] (A) after loosening the mounting screw.

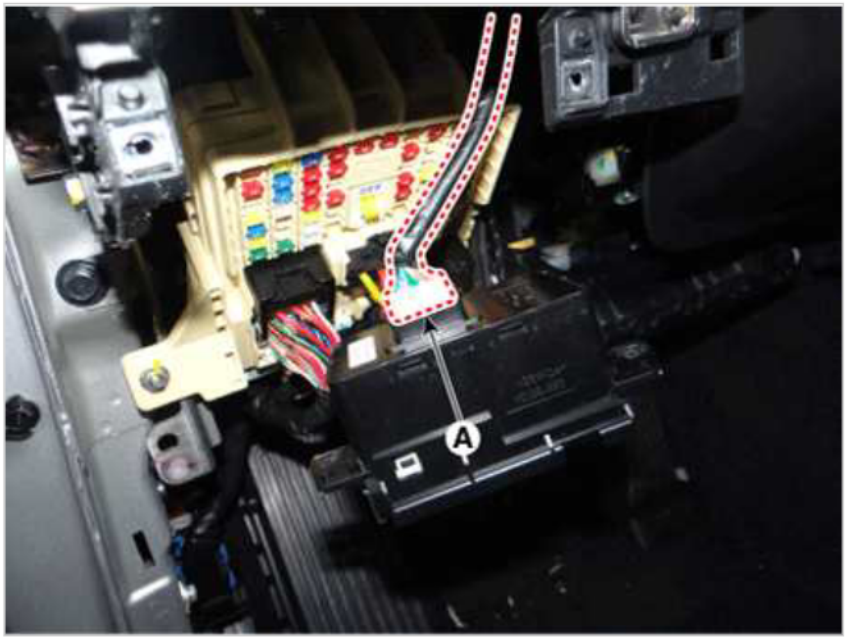


4. Remove the side crash pad switch (A) after loosening the mounting screws.

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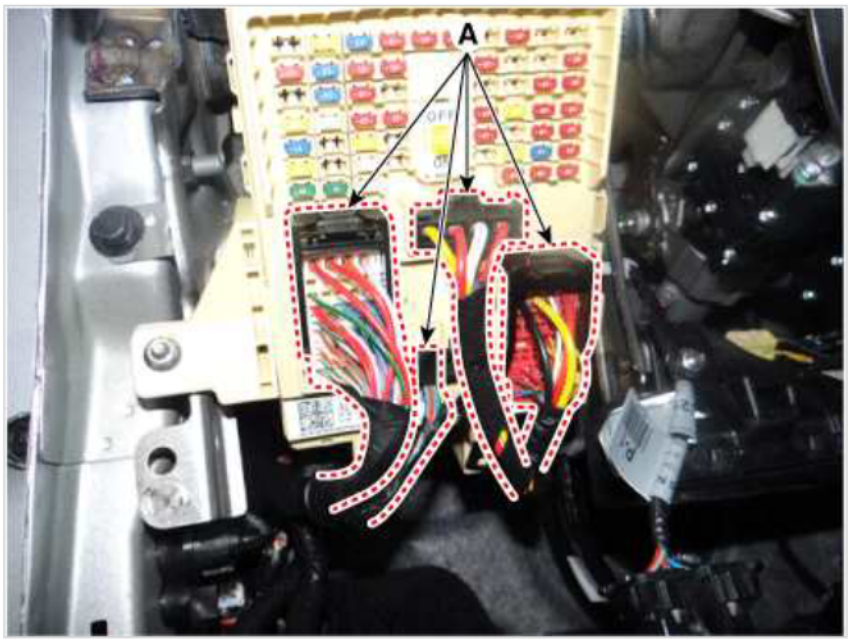


5. Disconnect the side crash pad switch connector (A).

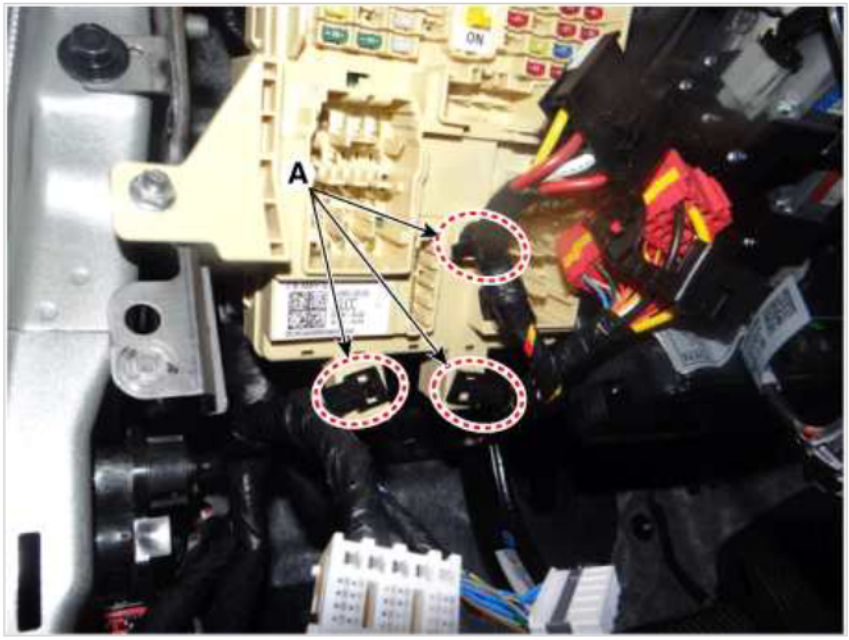


6. Disconnect the connectors (A) from the fuse side of the integrated central control unit (ICU).

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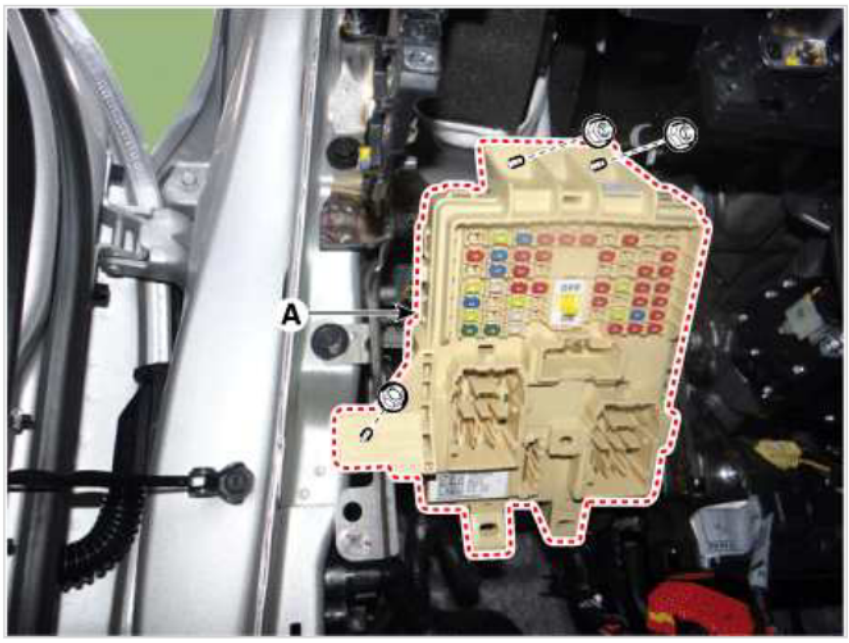


7. Remove the mounting clips (A) from the integrated central control unit (ICU).

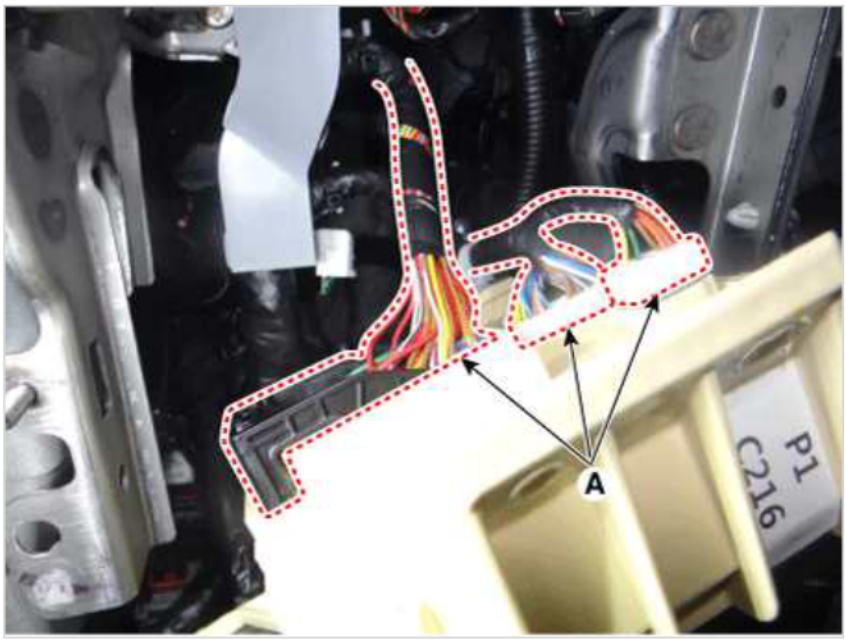


8. Remove the integrated central control unit (ICU) (A) after loosening the mounting nuts.

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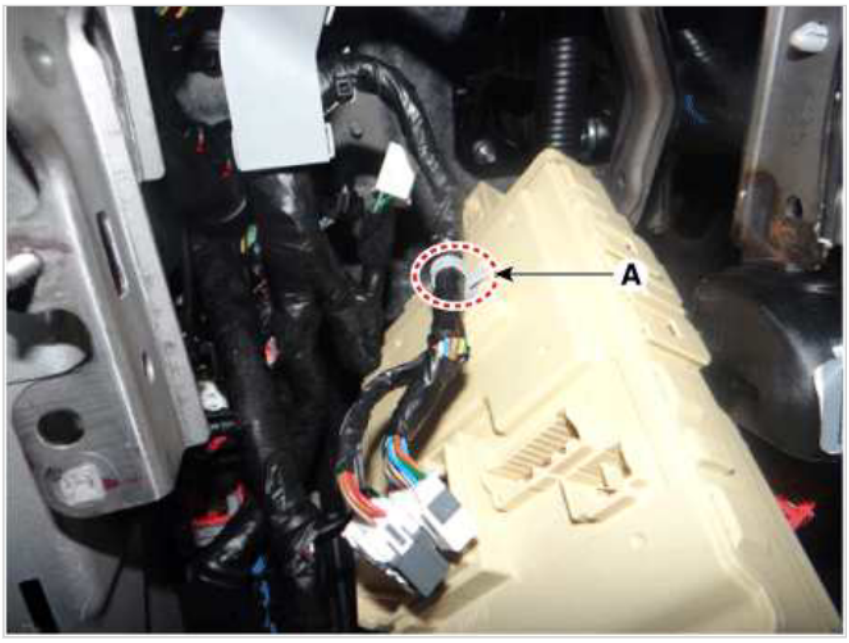


9. Disconnect the connectors (A) from the back of the integrated central control unit (ICU).



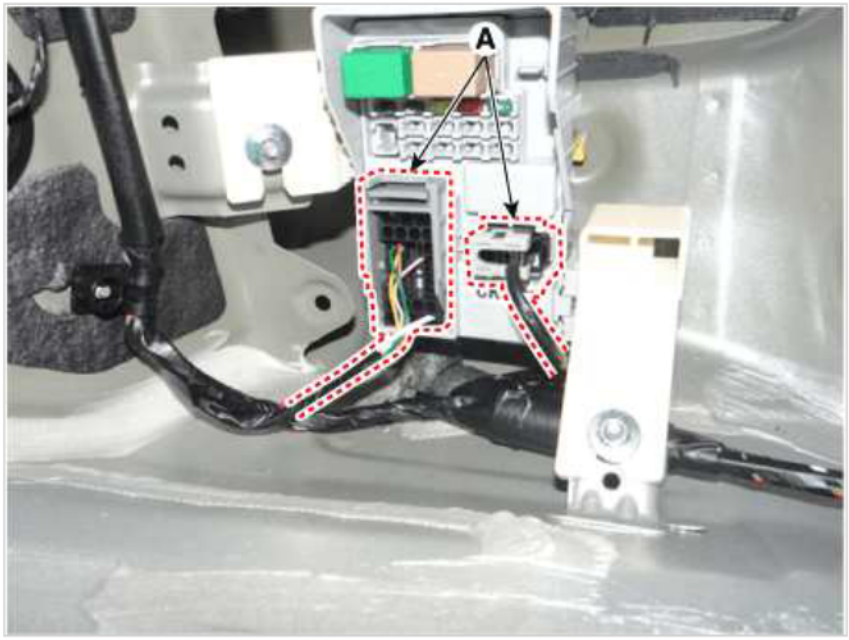
10. Remove the mounting clip (A) from the integrated central control unit (ICU).

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Rear Sub Junction Block (RSJB)

1. Disconnect the negative (-) battery terminal.
2. Remove the luggage side trim [RH].
   (Refer to Body - "Luggage Side Trim")
3. Disconnect the rear sub junction block (RSJB) connectors (A)



4. Remove the rear sub junction block (RSJB) (A) after loosening the mounting nuts.

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Installation

Integrated Central Control Unit (ICU)

1. Install the mounting clip from the integrated central control unit (ICU).
2. Connect the integrated central control unit (ICU) connectors.
3. Install the integrated central control unit (ICU).
4. Install the mounting clip from the integrated central control unit (ICU).
5. Connect the integrated central control unit (ICU) connectors.
6. Connect the side crash pad switch connector.
7. Install the side crash pad switch.
8. Install the crash pad garnish [LH].
9. Install the crash pad lower panel.
10. Connect the negative (-) battery terminal.

Rear Sub Junction Block (RSJB)

1. Install the rear sub junction block (RSJB).
2. Connect the rear sub junction block (RSJB) connectors.
3. Install the luggage side trim [RH].
4. Connect the negative (-) battery terminal.

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General Troubleshooting Information

Before Troubleshooting

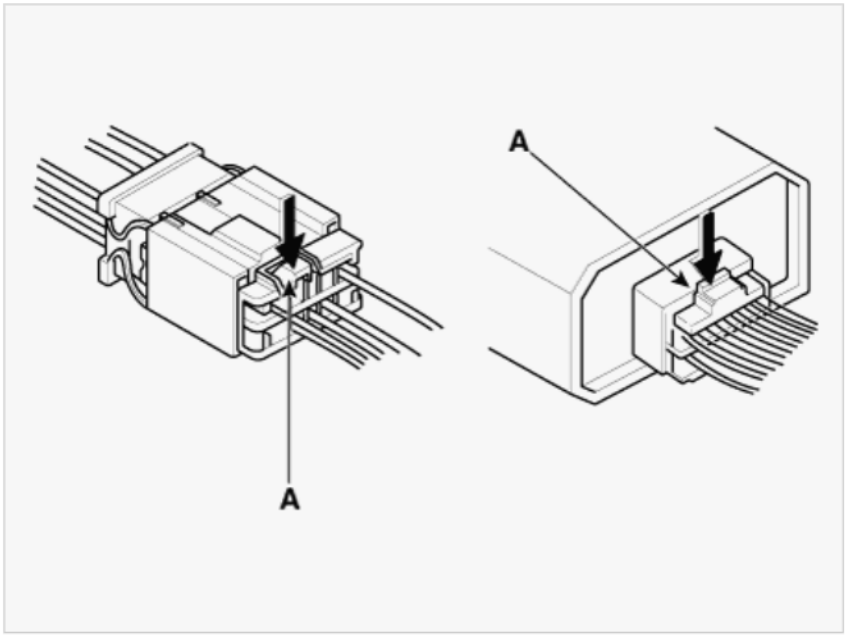
1. Check applicable fuses in the appropriate fuse/relay box.
2. Check the battery for damage, state of charge, cleanliness and tight connections.
   G 2.0 T-GDI THETA II (Refer to Engine Electrical System - "Charging System")
   G 3.3 T-GDI LAMBDA II (Refer to Engine Electrical System - "Charging System")

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

3. Check the alternator belt tension.

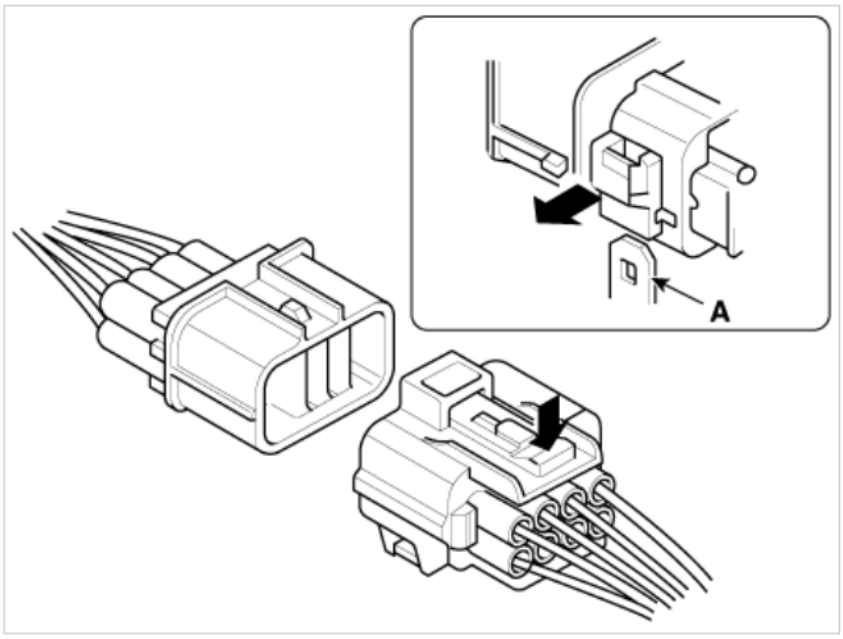
Handling Connectors

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

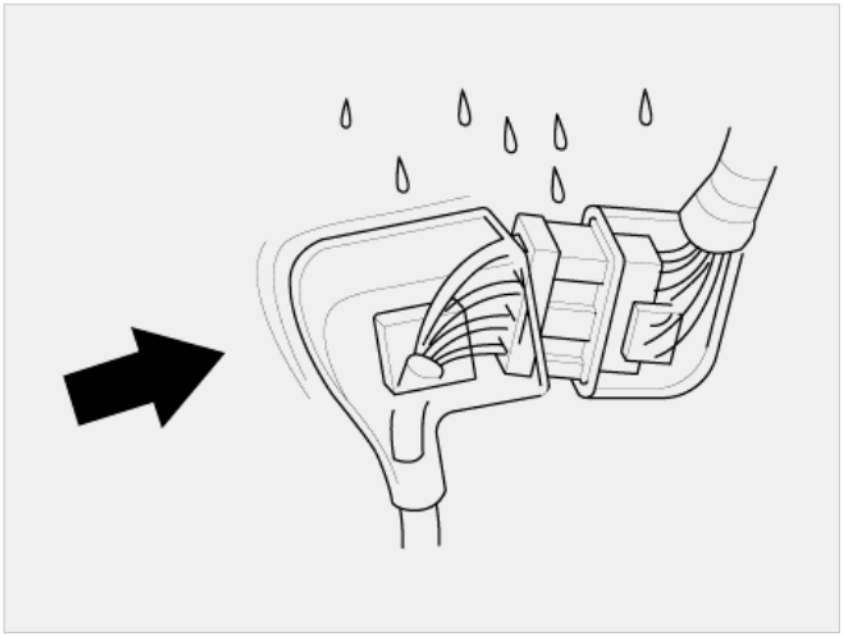


4. Some connectors have a clip on their side used to attach them to a mount bracket on the body or on another component. This clip has a pull type lock.
5. Some mounted connectors cannot be disconnected unless you first release the lock and remove the connector from its mounting bracket (A).

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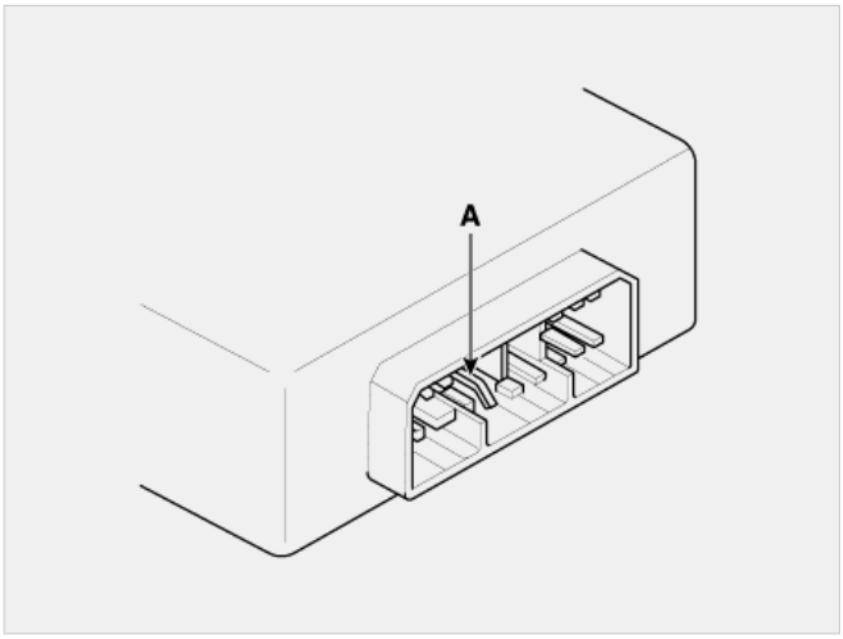


6. Never try to disconnect connectors by pulling on their wires; pull on the connector halves instead.
7. Always reinstall plastic covers.

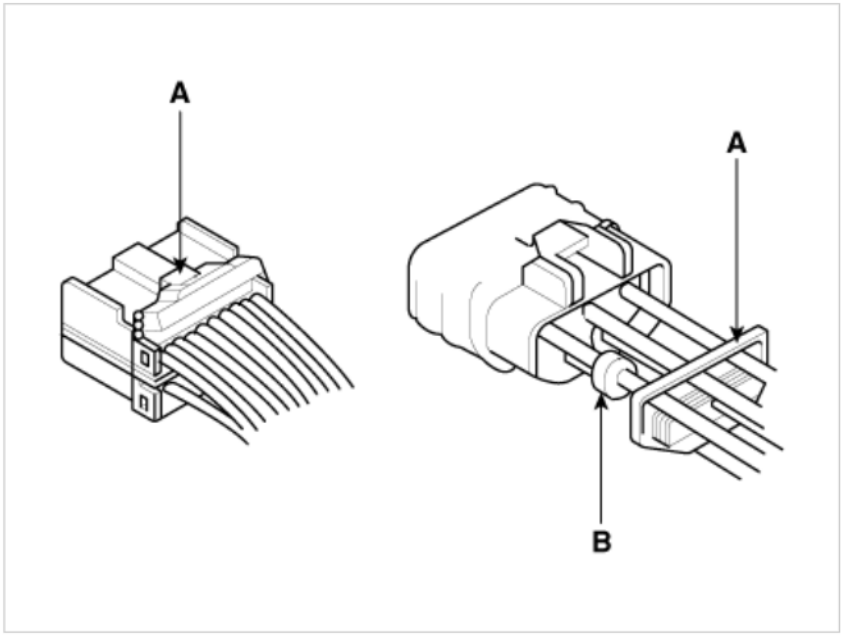


8. Before connecting connectors, make sure the terminals (A) are in place and not bent.

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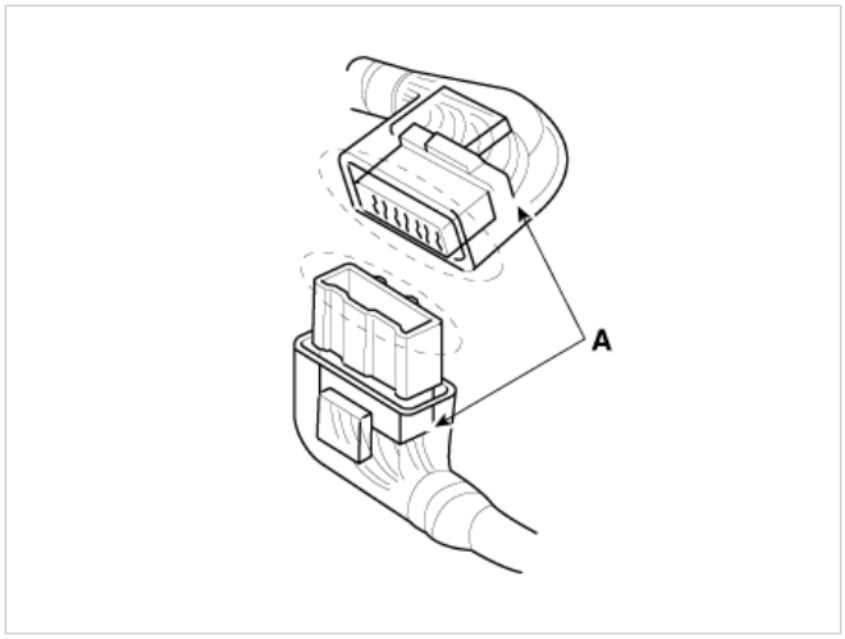


9. Check for loose retainer (A) and rubber seals (B).

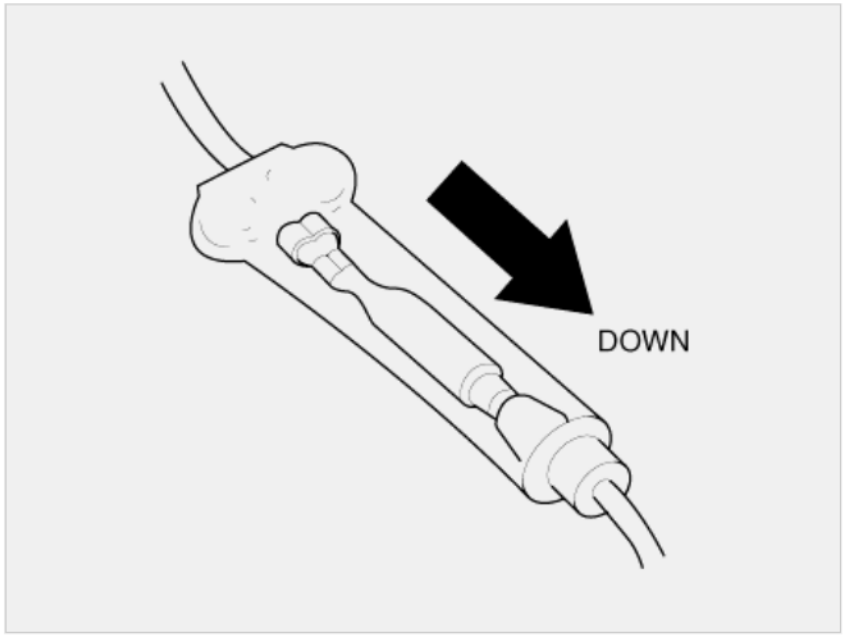


10. The backs of some connectors are packed with grease. Add grease if necessary. If the grease (A) is contaminated, replace it.

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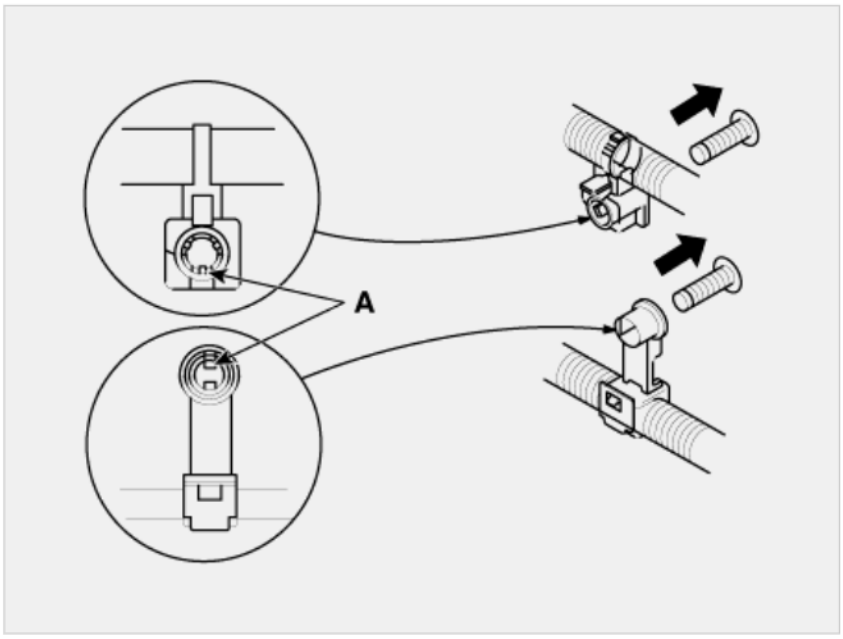
11. Insert the connector all the way and make sure it is securely locked.
12. Position wires so that the open end of the cover faces down.



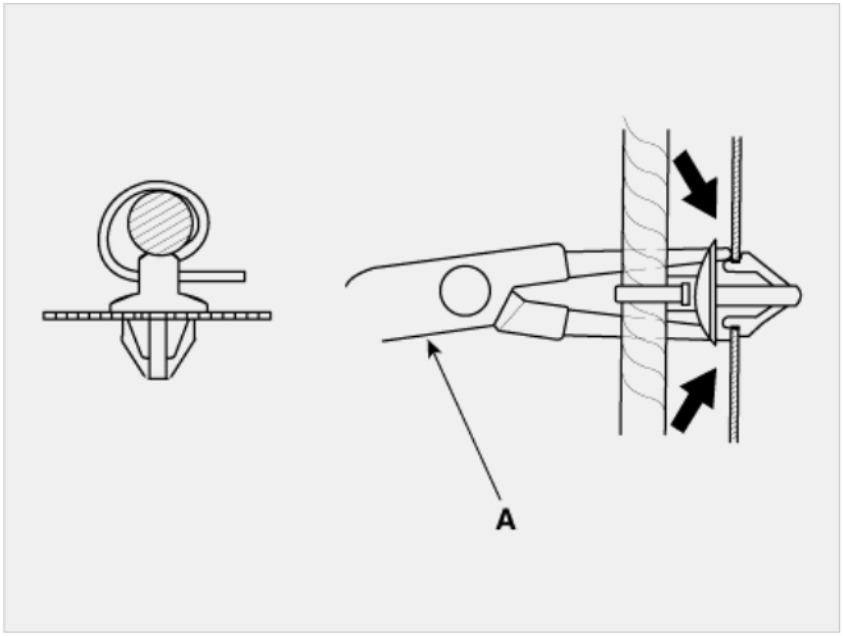
Handling Wires And Harnesses

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).

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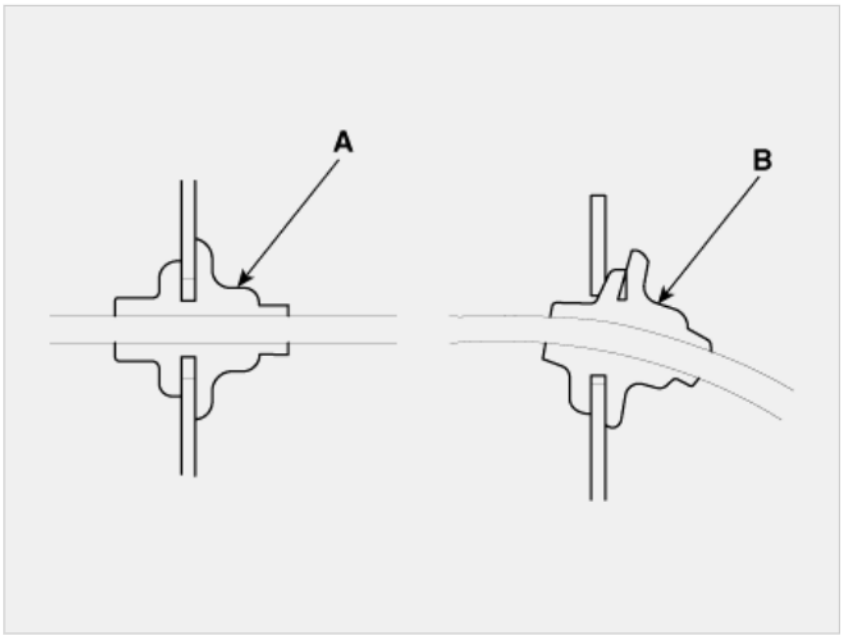


3. Slip pliers (A) under the clip base and through the hole at an angle, and then squeeze the expansion tabs to release the clip.



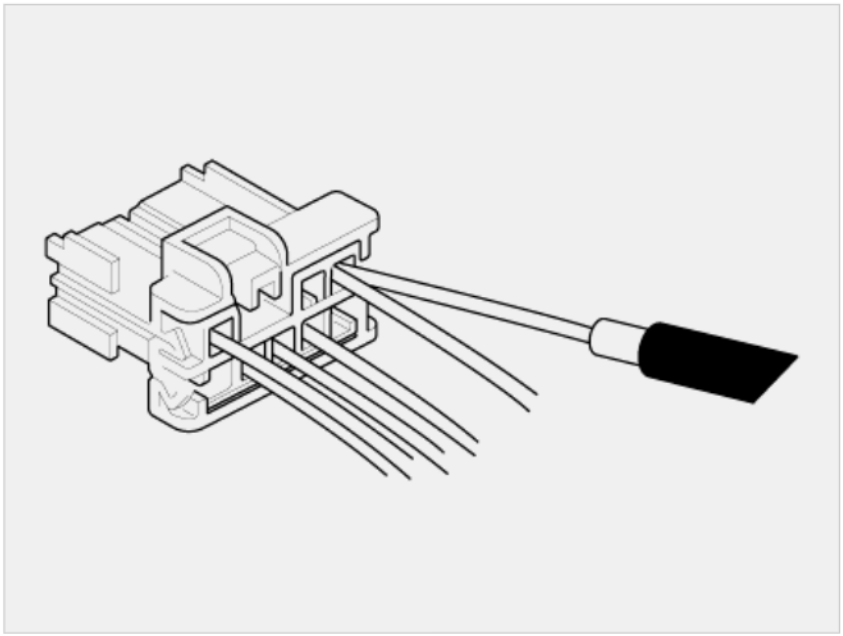
4. After installing harness clips, make sure the harness doesn"t interfere with any moving parts.
5. Keep wire harnesses away from exhaust pipes and other hot parts, from sharp edges of brackets and holes, and from exposed screws and bolts.
6. Seat grommets in their grooves properly (A). Do not leave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

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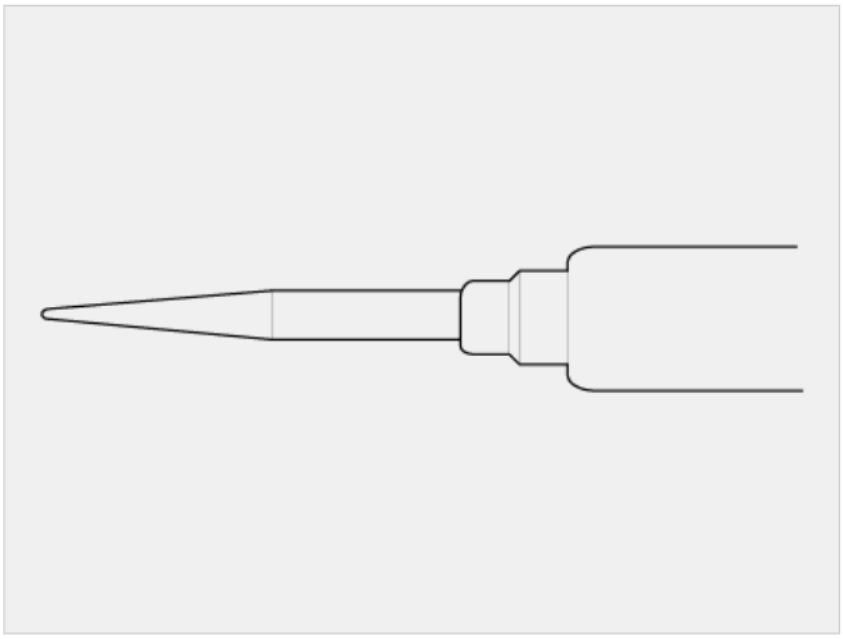
Testing and Repairing

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.)

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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 disassembling 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.

Installation of the transmitting device.

Electronically controlled computers are designed not to be interrupted by other radio signals, but it can be affected by a remote control of even less than 25 W output if the antenna or cable of a remote control is wired near the computer. To prevent this, follow the below directions.

1. Install the antenna on the roof or rear bumper.
2. Keep the antenna cables at least 200 mm away from the computer or wiring as they transmit radio signals.
3. Decrease the standing-wave ratio by using proper antennas and cables.
4. Do not install remote control with high output.
5. After installing the remote control, check the engine by generating radio signals while idling the engine.

NOTICE

- The standing-wave ratio : When connected to cables and antennas of different impedence, the input impedence Zi changes based on the length of cable and frequency of remote control, and the voltage range also changes based on position.
- This rate of the maximum and the minimum voltage is called the standing-wave ratio, and also refers to the rate of the antenna impedance and cable impedance.
- The volume of radio signals from cables is proportional to the standing-wave ratio volume, hence the influence to electronic parts increases.

Power Window and Sunroof Reset

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If negative (-) battery cable was removed or fuse was replaced while opening/closing the power window or sunroof, perform initialization again as the default value of motor is erased.

System	Resetting
Auto up/down window	**Information** Reset the window motor to its default settings in the following cases: • In case battery power connected to power window is not supplied due to battery replacement, discharged battery or fuse replacement while opening/closing the power window Whenever the battery is disconnected or discharged, or the related fuse is replaced or reinstalled, reset the Auto up/down window system according to the procedure below. 1) Turn the ignition switch "ON". 2) Pull up the power window switch until the window is fully closed and keep pulling it up for about 1 second.
Wide sunroof	Perform initialization when the battery power supply has been disconnected from the wide sunroof motor due to battery replacement, discharged battery, fuse replacement or using emergency handle to operate wide sunroof while the fuction of opening/closing the wide sunroof. **Information** In the following cases, perform initialization as the initial value of wide sunroof motor has been erased. • If battery power supply is disconnected from the wide sunroof motor due to battery replacement, discharged battery or fuse replacement while opening/closing the wide sunroof. • If the automatic opening/closing of the wide sunroof, a one-touch feature, does not function properly. • If the wide sunroof reverses during automatic closing even though there is no object caught in the wide sunroof (safety feature). 1. Close the glass and the roller blind completely by using Glass close switch after IG is on. **Information** **Initializing Glass motor** Initialize in following order below when the glass can not be closed completely cause of motor problem. 1) Detatch the Glass Motor. 2) Push the Glass backward manually. (Maximum opened Glass condition) 3) Connect the Glass motor connector. 4) Press the Glass open switch until the Glass motor is stopped after IG is on. 5) Install the Glass motor. 2. Release the Glass close switch after the Glass and the Roller blind are completely closed. And then be hold to press the Glass close switch again (about 10 seconds) until moving roller blind shoe 4~5 times and ticking sound. 3. Wide sunroof initializing would be completed after opening/closing the Glass and Roller blind in order below by releasing and holding to press the Glass closs switch again. (Roller blind open → Glass open -> Glass close -> Roller blind close) ***NOTICE*** Initialization would not be done and you would have to restart the initialization from the first step if the operation is stopped while initializing cause of the Glass close switch has released.

Trip computer, Clock and Audio Reset

When reconnecting the battery cable after disconnecting, recharging battery after discharged or installing the memory fuse located on the driver"s side panel after removing, be sure to reset systems mentioned on the below table.

In addition, when replacing or reinstalling the fuses after removing, reset according to the below table.

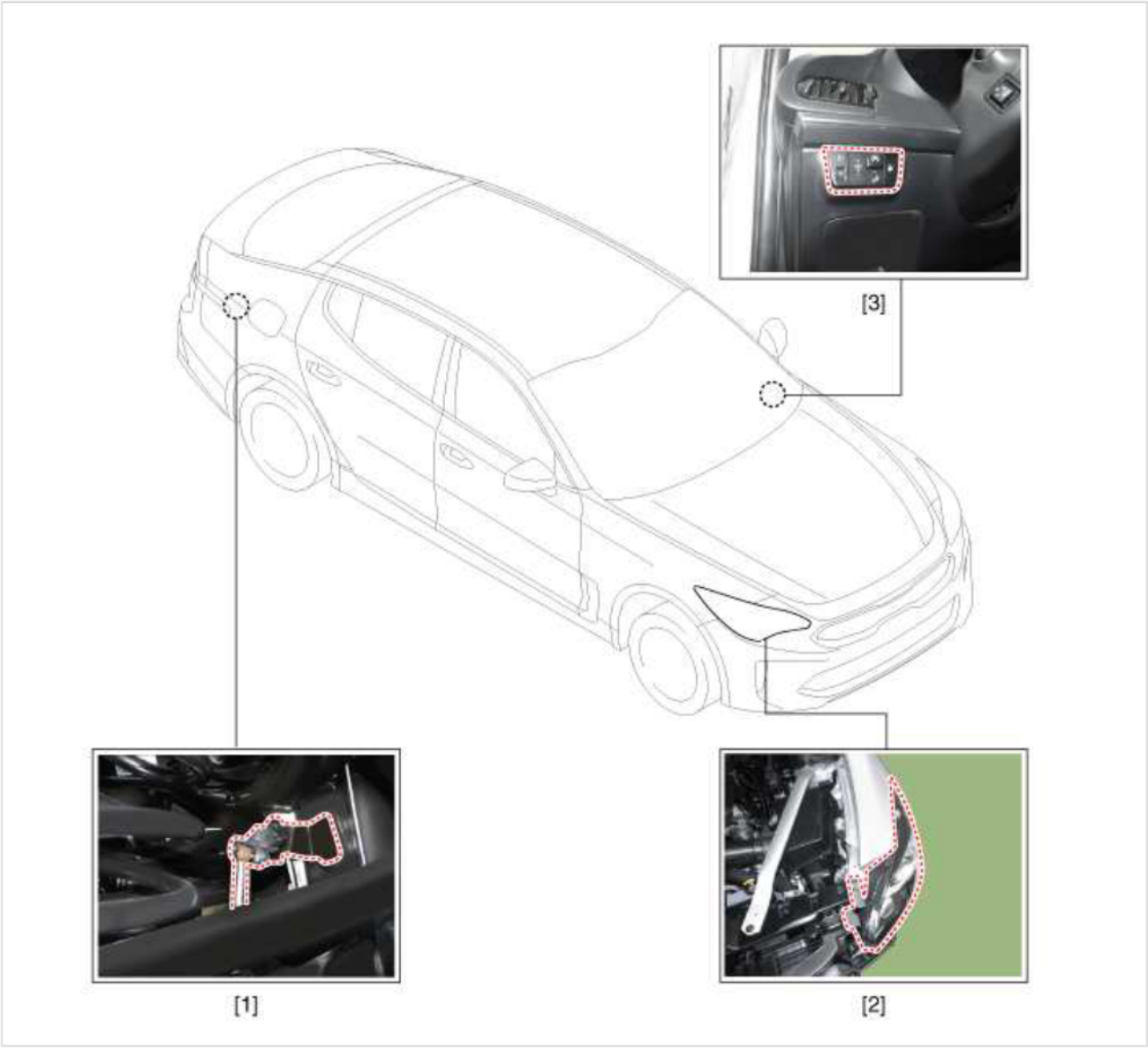
System	Resetting
Trip computer	If the battery is reconnected after being disconnected, the configuration on trip computer will be initialized. Explain this to the customer.
Clock	If the battery terminals or related fuses have been disconnected, you must reset the time in the audio head unit. (Refer to "Audio" in owner"s manual.)
Audio	

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	If the battery has been reconnected after being disconnected, the customer"s preset radio stations will be initialized. Record the customer"s preset radio stations prior to servicing, and set the customer"s preset radio stations into the audio after service.

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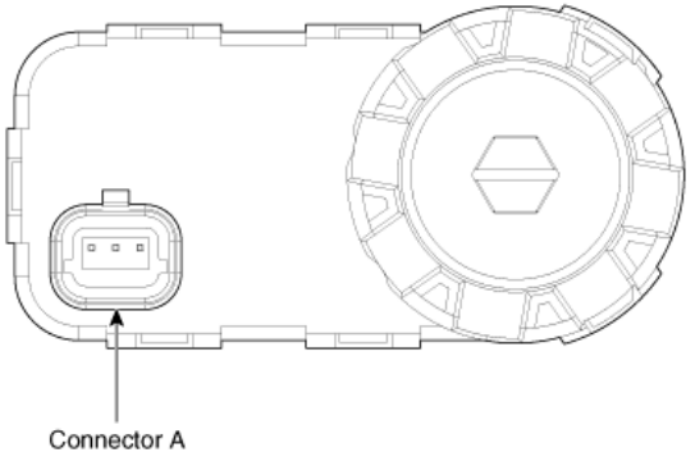
Component Location



1. Headlamp leveling unit (Auto)
2. Headlamp leveling actuator (Built in leveling actuator)
3. Headlamp leveling switch (Manual)

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Circuit Diagram



Connector A	No.	Description
	1	Ground
	2	Signal
	3	Battery (+)

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Removal

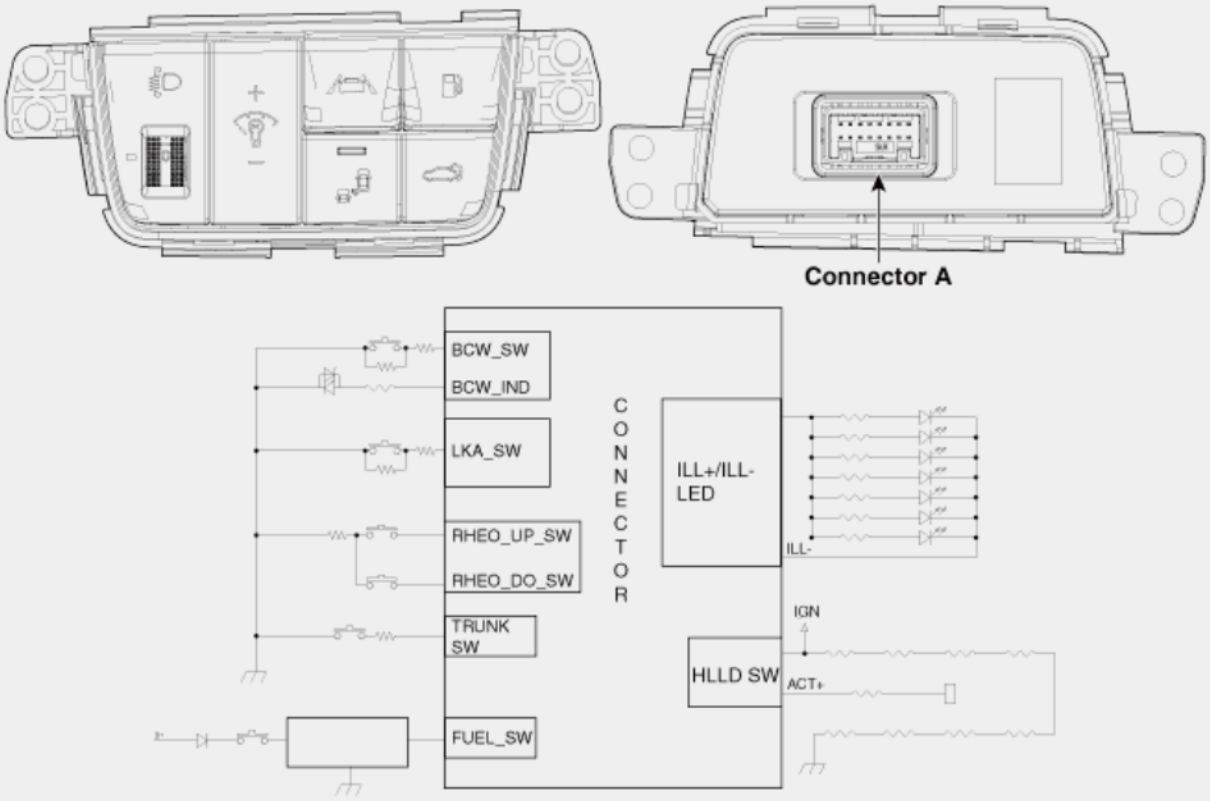
1. Disconnect the negative (-) battery terminal.
2. Remove the headlamp assembly.
   (Refer to Lighting System - "Headlamps")

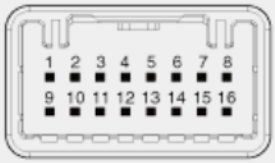
Installation

1. Install the headlamp assembly.
2. Connect the negative (-) battery terminal.
3. Adjust the headlamp in accordance with the headlamp aiming instructions.

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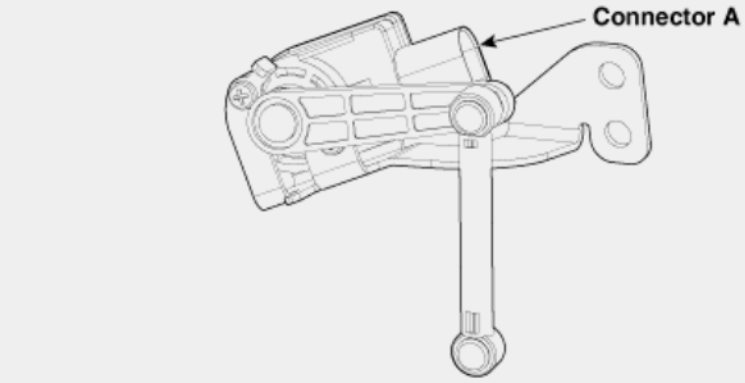
Circuit Diagram

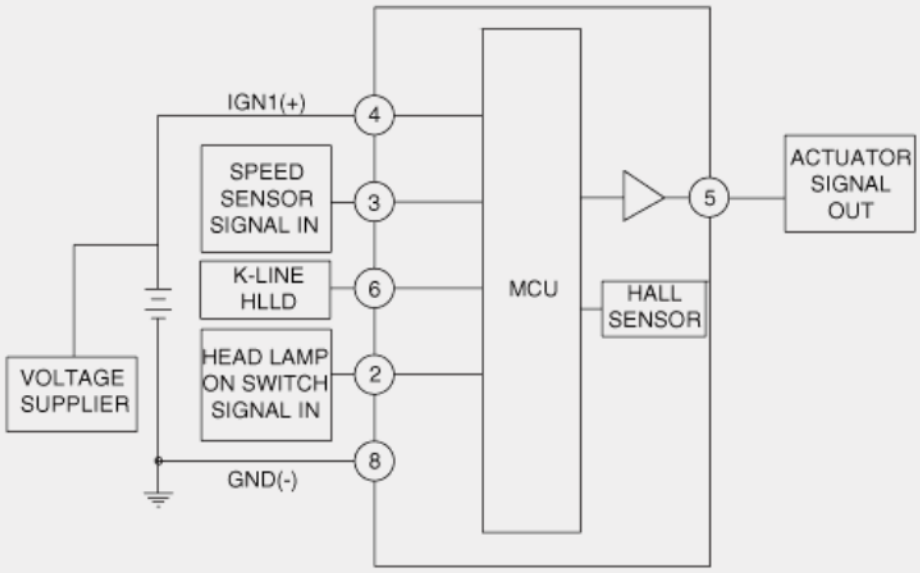


Connector A	No.	Description	No.	Description
	1	Battery (+)	9	Illumination (+)
	2	IGN	10	-
	3	-	11	Illumination (-)
	4	HLLD Actuator (+)	12	BCW Indicator
	5	Rheostat (Up)	13	PTG Swtich
	6	Rheostat (Down)	14	LKA Switch
	7	-	15	BCW Switch
	8	Fuel door open switch	16	Ground

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Circuit Diagram





Connector A	No.	Description	No.	Description
	1	-	5	Actuator signal
	2	Headlamp ON switch signal	6	Diagnosis k-line
	3	Vehicle speed	7	-
	4	IGN1	8	Ground

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Description

According to driving environment and loading state of vehicle, headlamp lighting direction is changed to keep the driver"s visibility range and to protect the driver"s vision from glare, aiming at safety driving.

Sensor integrated ECU mounted on the rear center arm drives the actuator mounted on the headlamp after sensing the input signal for the static change of vehicle.

Headlamp beam is automatically operated by chassis tilt.

Operation

Operating Procedure

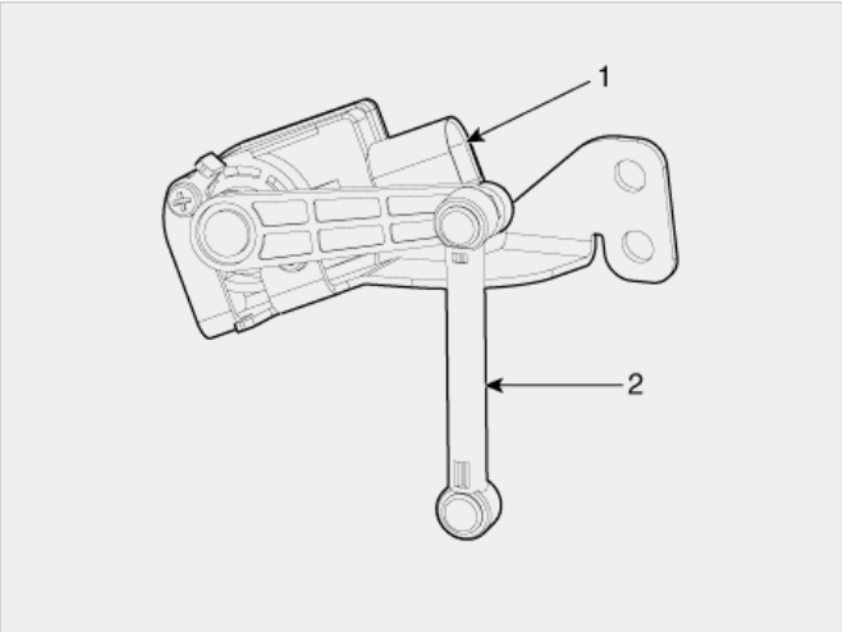
1. Suspension angle change resulted from vehicle"s load change.
2. Sensor angle change.
3. Microprocessor calculates necessary headlamp angle change amount.
4. Sending a proper signal to headlamp leveling device and driving actuator.

Operating Condition

1. Ignition on
2. Low beam on
3. On stop : If sensor lever change is 0.3° and above, headlamps are operated after max. 1.5 seconds.
4. On driving : If vehicle velocity is over 4 km/h (2.48 mph), velocity change is not over 0.8 - 1.6 km/h (0.5 - 1.0 mph) per second, and loading condition is changed, then headlamps are operated.

Components

1. Auto headlamp leveling unit
   (1) Leveling unit & sensor
   (2) Sensor mounting bracket
   (3) Sensor linkage



- Using a micro-processor, detect the operation level"s change in mechanical angle and speed signal.
- A device mounted on the rear center arm controls the actuator via internal control program.

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Inspection

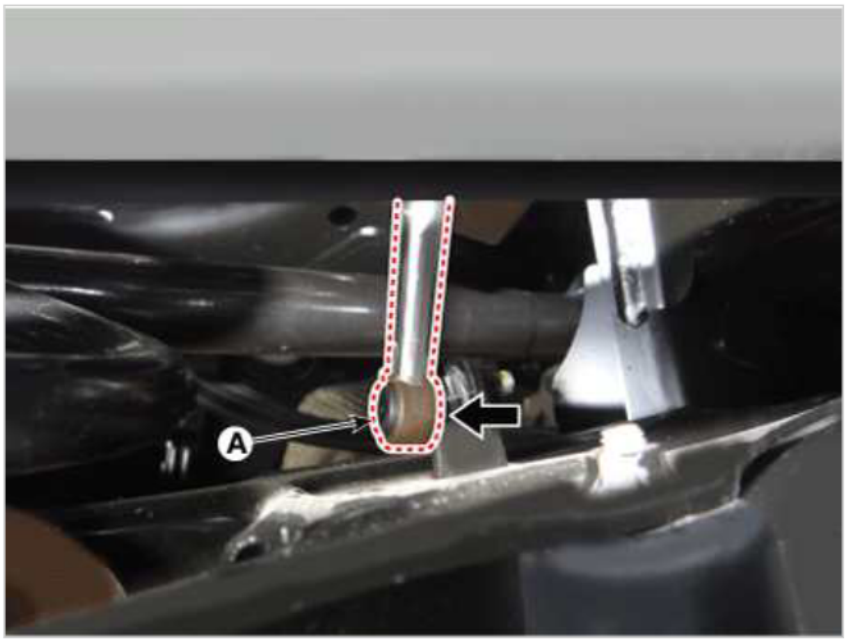
1. Ignition "ON".
2. Turn on the headlamp switch.
3. Check for operation. The aim of the headlamps should change smoothly when the headlamp leveling switch is operated.
4. If the operation does not work well, inspect the connector and terminals to be sure they are all making good contact.
   If the terminals are bent, loose or corroded, repair them as necessary, and recheck the system.
   If the terminals look OK, go to step 5.
5. Substitute with a known-good headlamp assembly and check for proper operation.

Removal

1. Disconnect the negative (-) battery terminal.
2. Disconnect the headlamp leveling unit connector (A).



3. Remove the headlamp leveling unit mounting link (A).



4. Remove the headlamp leveling unit (A) after loosening the mounting bolts.

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Installation

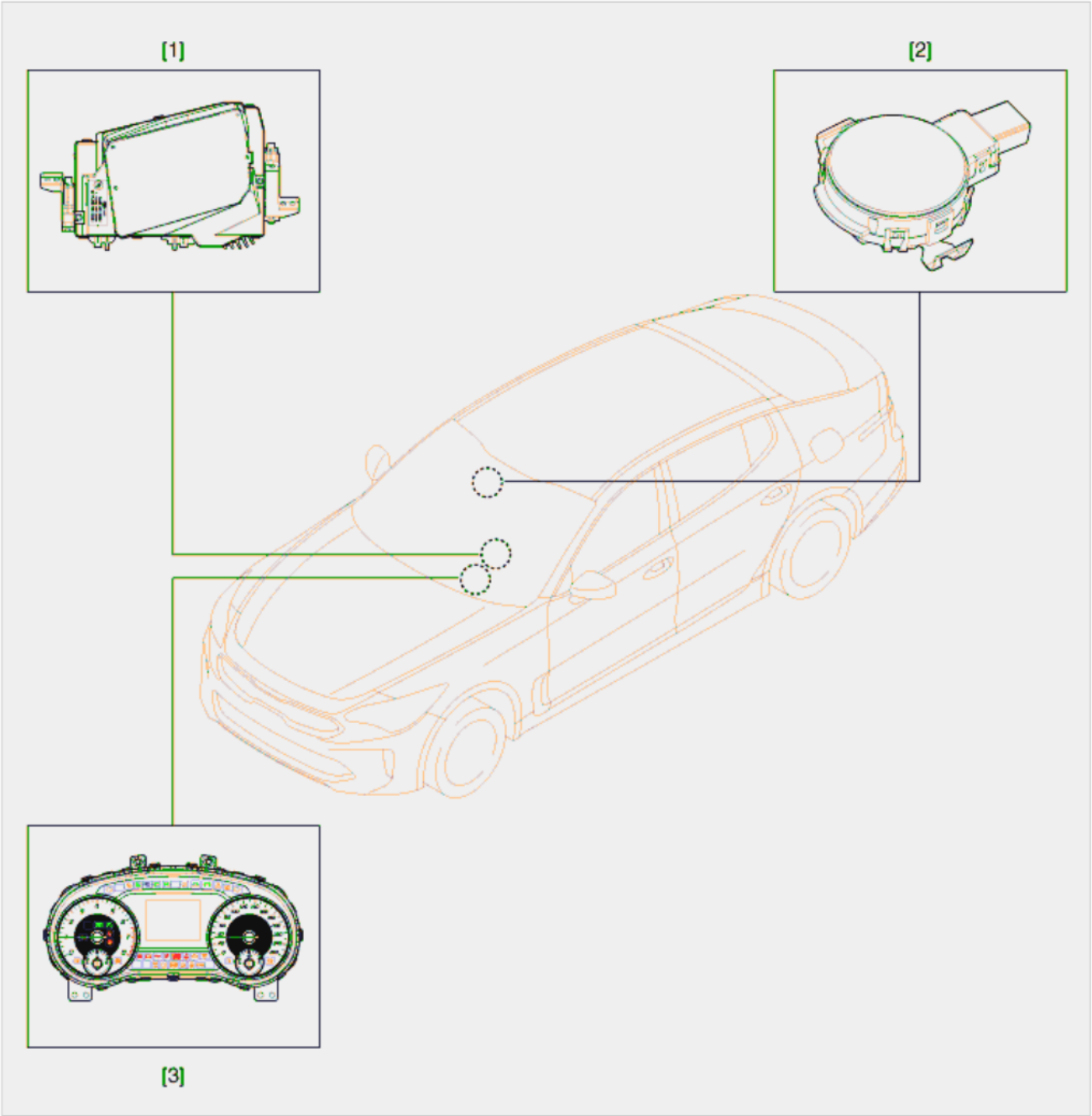
1. Install the headlamp leveling unit.

   Tightening torque :
   7 - 11 N·m (0.7 - 1.1 kgf·m, 5.1 - 8.1 lb·ft)

2. Install the headlamp leveling unit mounting link.
3. Connect the headlamp leveling unit connector.
4. Connect the negative (-) battery terminal.

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Components Location

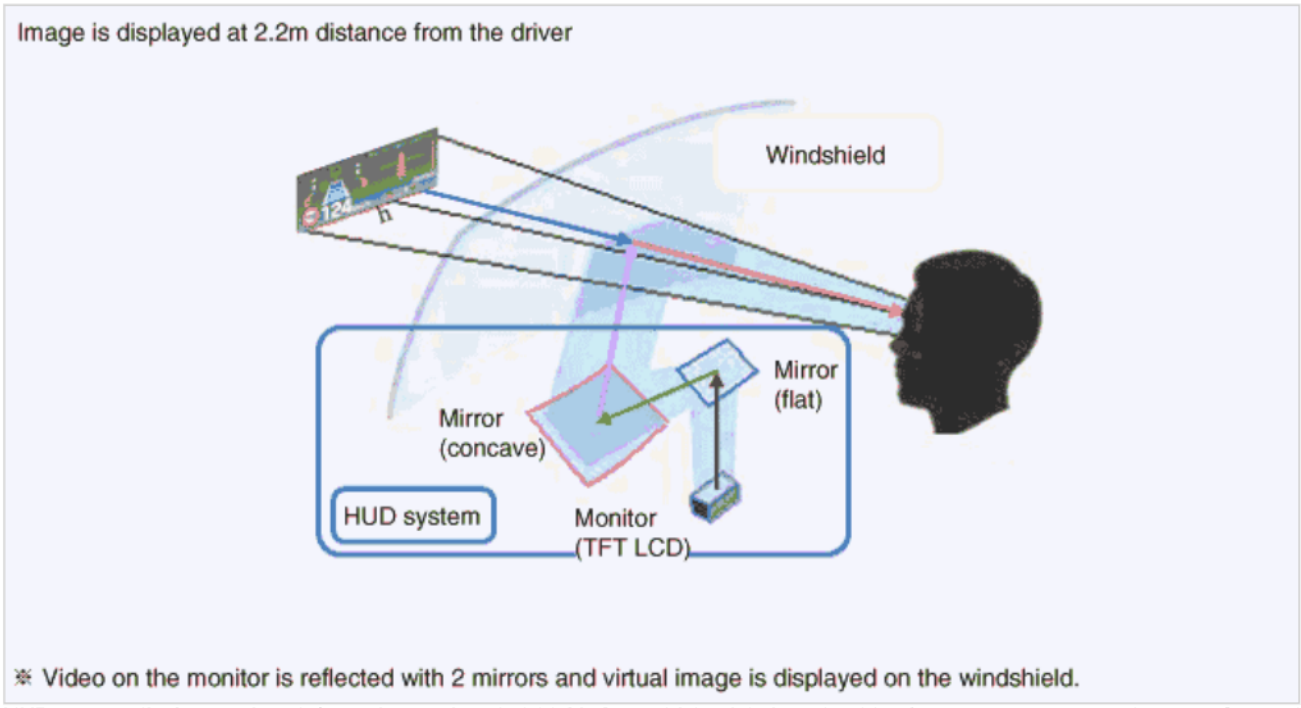


1. Head Up Display (HUD)
2. Ambient light sensor
3. Cluster (User setting menu ON/OFF, Display brightness)

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Description

1. System operation



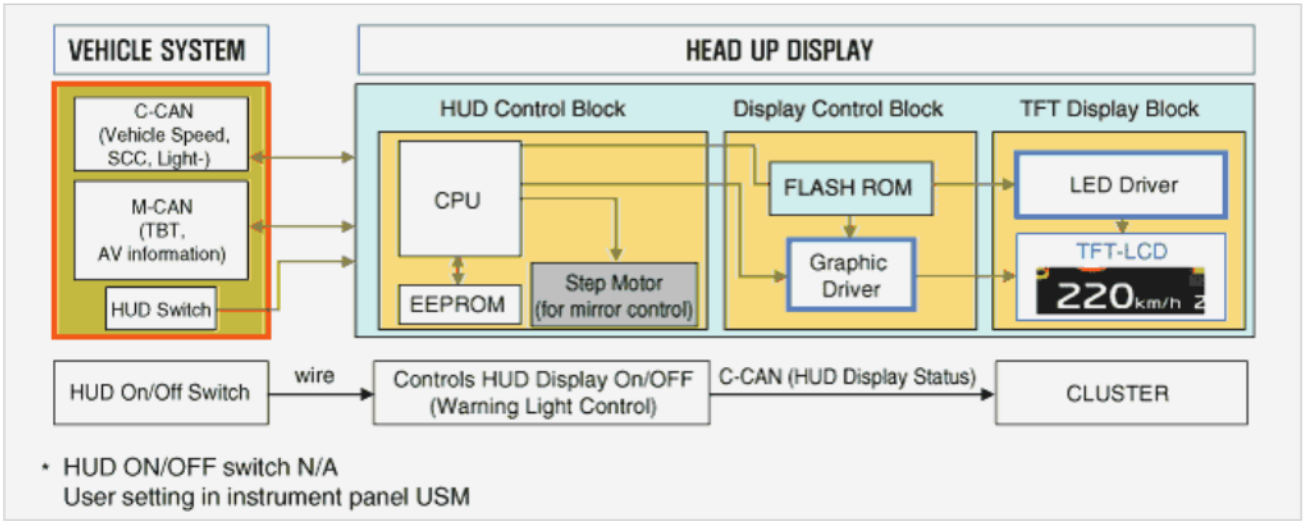
HUD system displays various information on the windshield glass which minimizes the driver's eye movement to enhance safety and convenience.
The Head Up Display reflects the TFT LCD images to two mirrors (flat/concave) and displays them 2.2m ahead from the driver"s eye.
Information provided by HUD ;

(1) Vehicle speed

(2) Integrated (DIS) information TBT (Turn by Turn) navigation information, road signage

(3) Safety warning lamp: SCC, LKAS, LFW, Blind Spot Warning

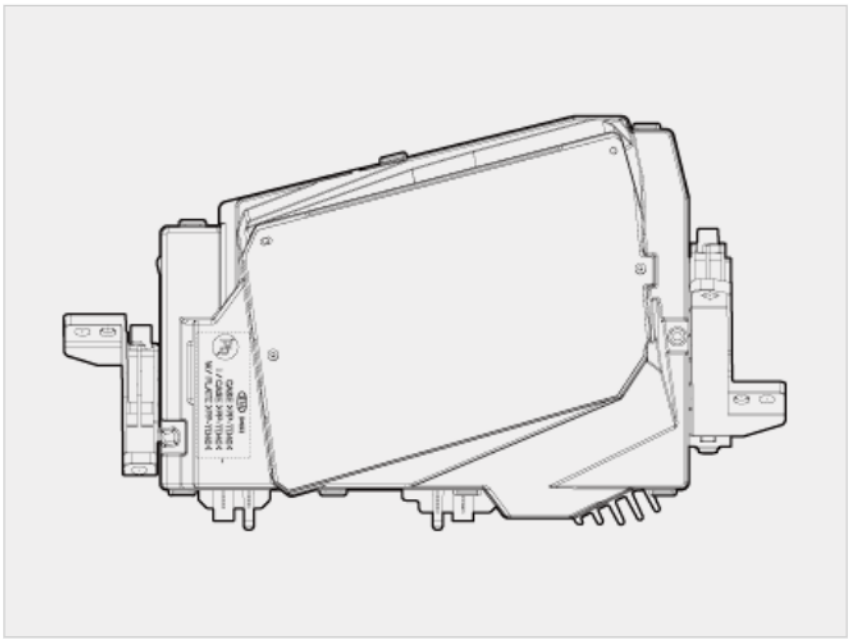
2. HUD Display Contents



3. HUD Unit

Head Up Display : Output various vehicle system information on windshield glass via CAN

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4. Cluster : Select display function in content setting in [Head Up Display] menu.

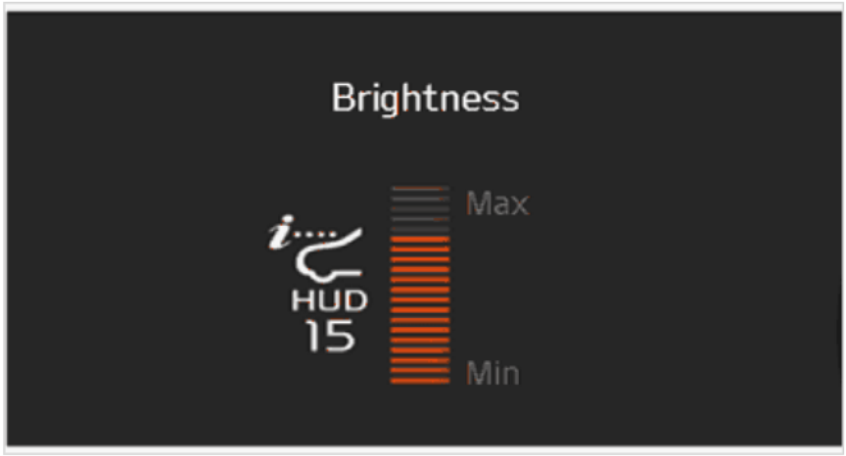
[ON/OFF Setting]



Information

There is no ON/OFF switch for Head Up Display. Enable/disable in user option in instrument panel.

[Display brightness]

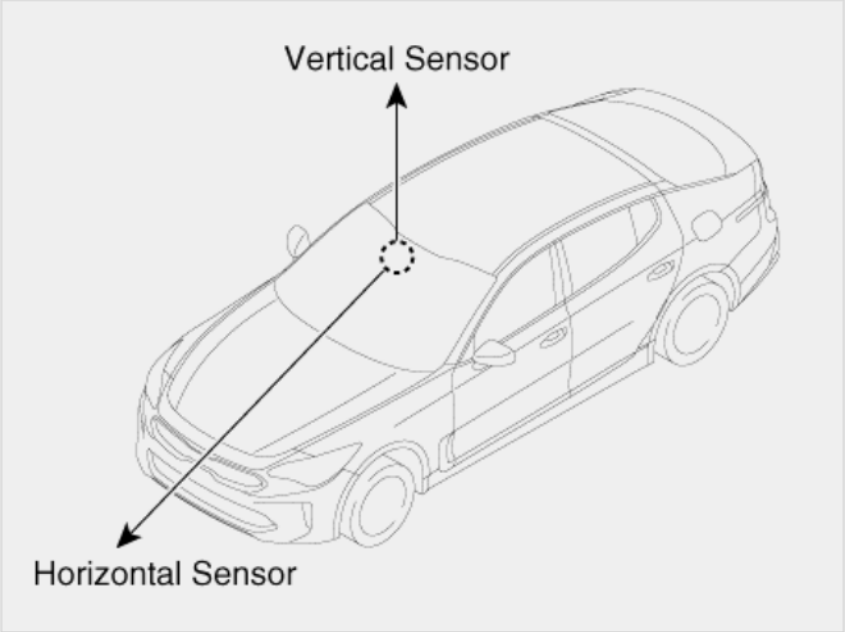


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Information

Brightness of Head Up Display can be set up in instrument panel.

5. Illumination Sensor : It is equipped with bidirectional (vertical and horizontal) sensor. HUD brightness is controlled depending on horizontal measurement (ambient brightness).
   – Built-in bidirectional illumination sensor



Information

If illumination sensor measurement could not be detected, HUD will not be displayed. Check for normal operation of illumination sensor before inspecting HUD.

6. Windshield glass : Windshield glass exclusive for Head Up Display is built in with double image removal film.

Information

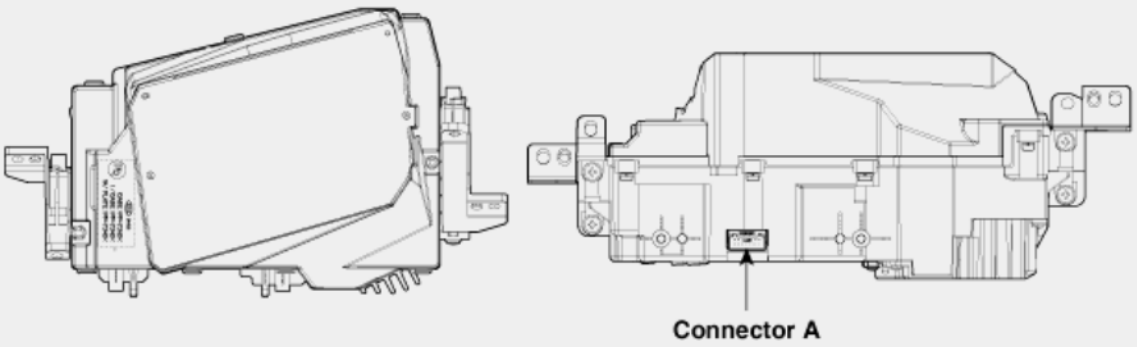
- Use of window tinting film on windshield glass may decrease image quality.
- Image may be distorted or seem dark if driver wears polarized sunglasses.

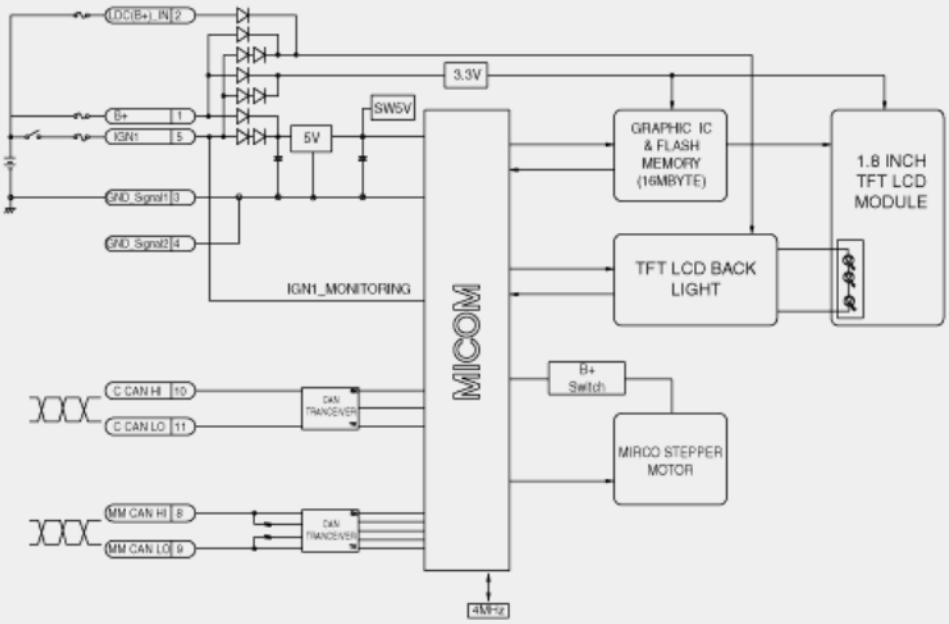
CAUTION

When replacing front windshield glass, always replace with exclusive windshield glass for Head Up Display. Otherwise, the Head Up Display images may overlap.

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Component





Connector A	No.	Description	No.	Description
	1	Battery (+)	7	-
	2	LCD (B+)_Input	8	MM-CAN (High)
	3	Ground	9	MM-CAN (Low)
	4	Ground	10	C-CAN (High)
	5	IGN1	11	C-CAN (Low)
	6	-	12	-

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Removal

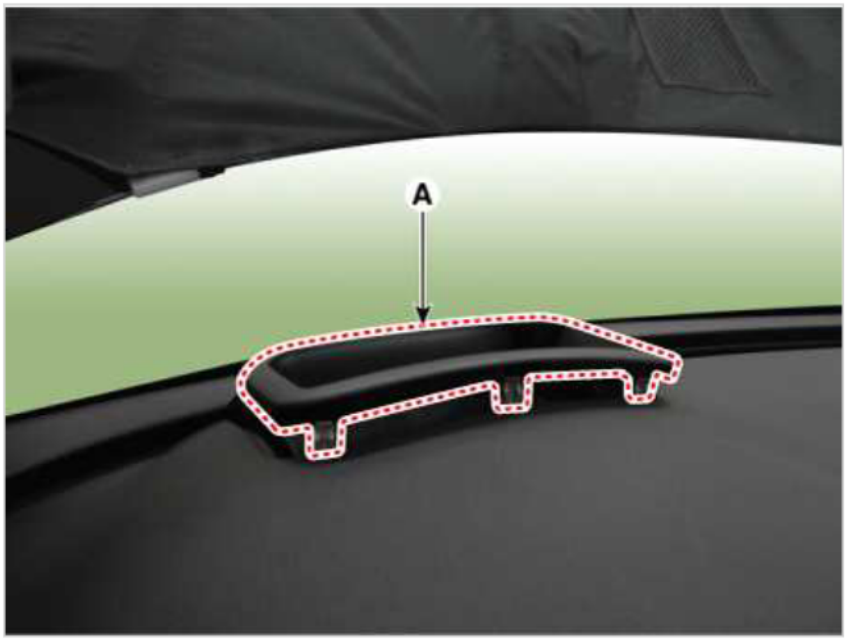
⚠ CAUTION

Put on gloves to prevent hand injuries.

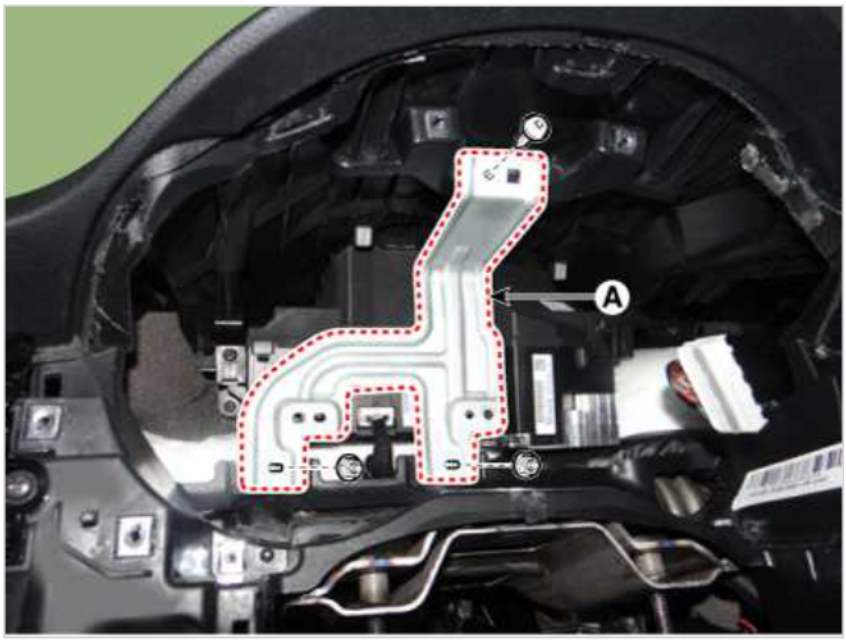
Information

- Use a plastic panel removal tool to remove interior trim pieces without marring the surface.
- Take care not to bend or scratch the trim and panels.

1. Disconnect the negative (-) battery terminal.
2. Remove the head up display bezel (A) by using a remover.

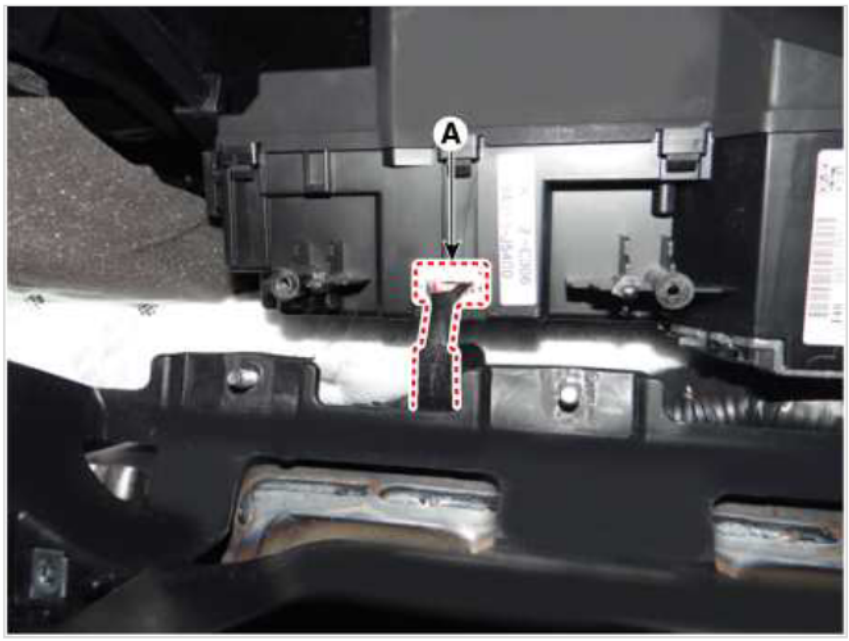


3. Remove the instrument cluster.
   (Refer to Indicators And Gauges - "Instrument Cluster")
4. Remove the head up display unit bracket (A) after loosening the mounting screw and nuts.

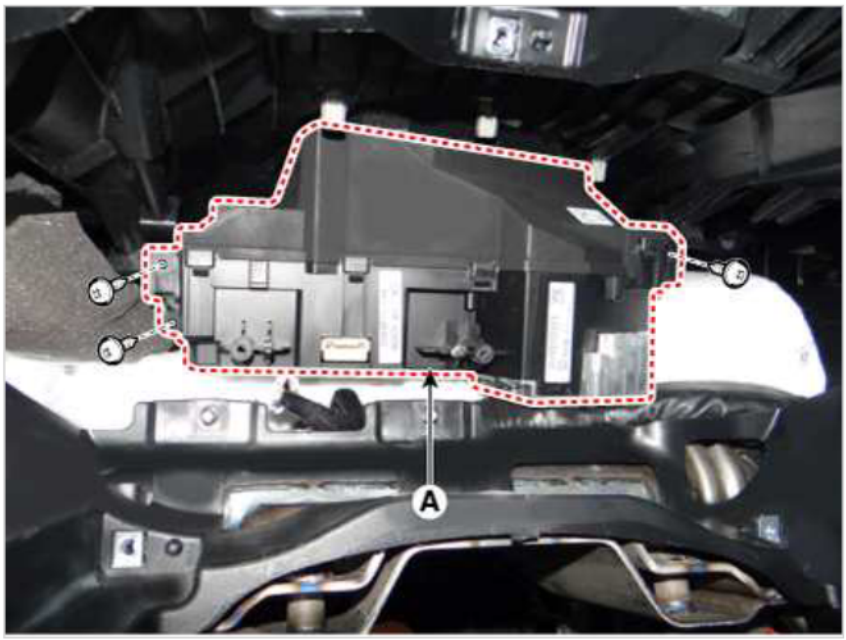


5. Disconnect the head up display unit connector (A).

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6. Remove the head up display unit (A) after loosening the mounting screws.



Installation

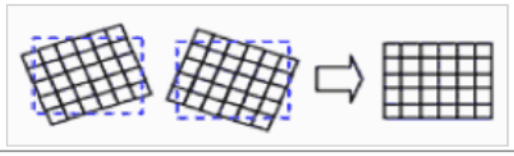
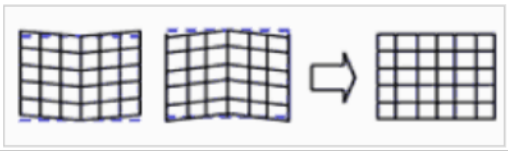
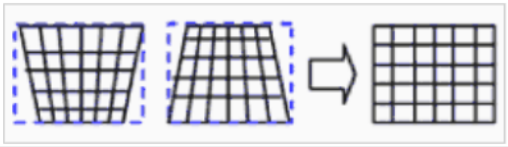
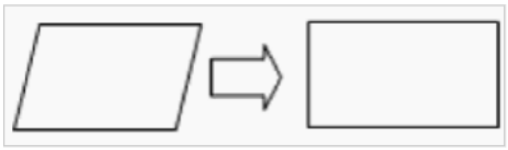
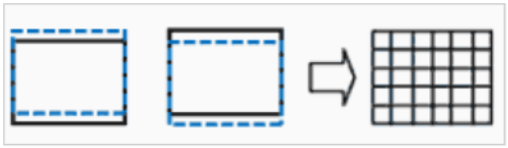
1. Connect the connector after installing the head up display unit.
2. Install the head up display unit bracket.
3. Install the instrument cluster.
4. Install the head up display bezel.
5. Connect the negative (-) battery terminal.

Inspection

If a part of the head up display footage is distorted or it is not at eye level with the driver a Global Diagnostic System (KDS) can be used to carry out calibration.

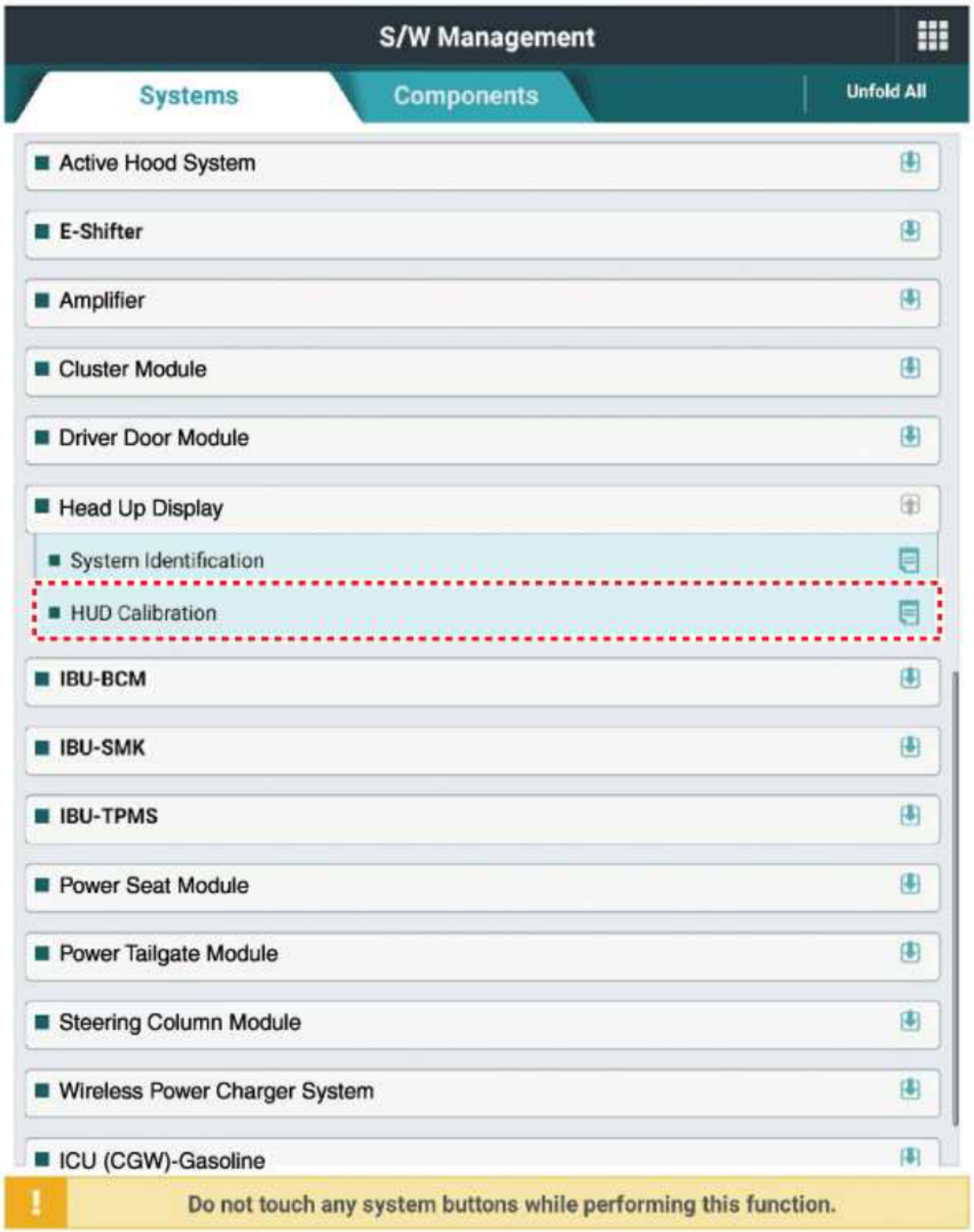
1. Calibration is required:
   - After replacing the head-up display unit
   - When the footage is distorted after replacing the windshield (double vision removal film built-in glass)
   - When the HUD mounted main crashpad is removed/installed or replaced.
   - When the image setting location of the HUD unit is not at eye level of the driver resulting in out of focus image.
2. Calibration items

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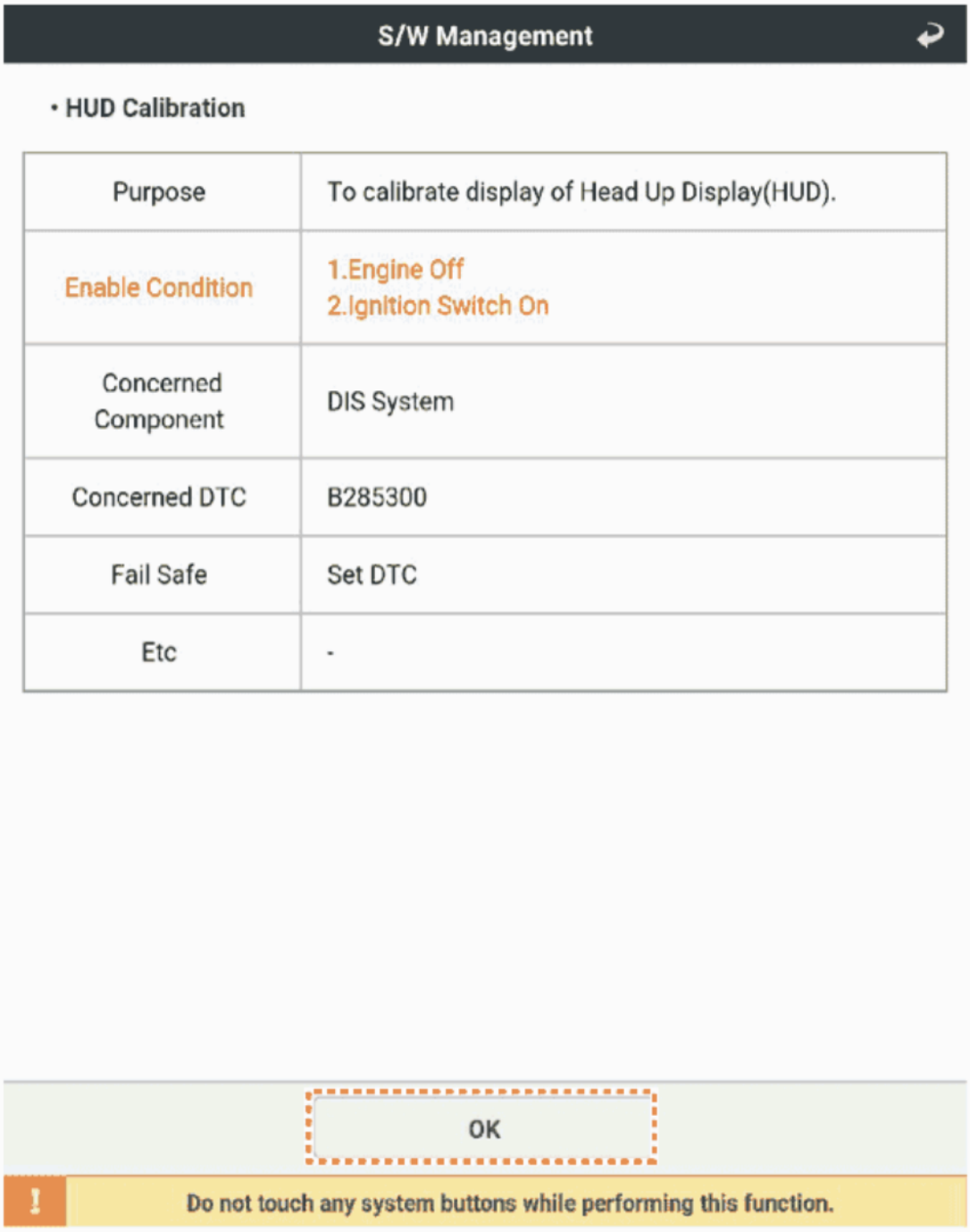
No	Footage calibration functions	Calibration cases
1	Rotation: Calibrate in counterclockwise/clockwise direction at the center.	
2	Smile: Calibrate vertically at the center.	
3	Slanted (up/down): Calibrate along a vertical inclination.	
4	Slanted (left/right): Calibrate along a horizontal inclination.	
5	Parallel compensation	
6	Up/down movement of indicated location: Calibrate to user eye level.	
7	Initialization: Return to previous status before calibration.	

3. Process of calibration
   (1) Locate the vehicle on a flat plane for accurate adjustment.
   (2) Make sure that there are no foreign materials on the windshield.
   (3) Connect the Global Diagnostic System to the vehicle, and select vehicle type and HUD system additional functions.
   (4) Under additional functions select "HUD calibration".

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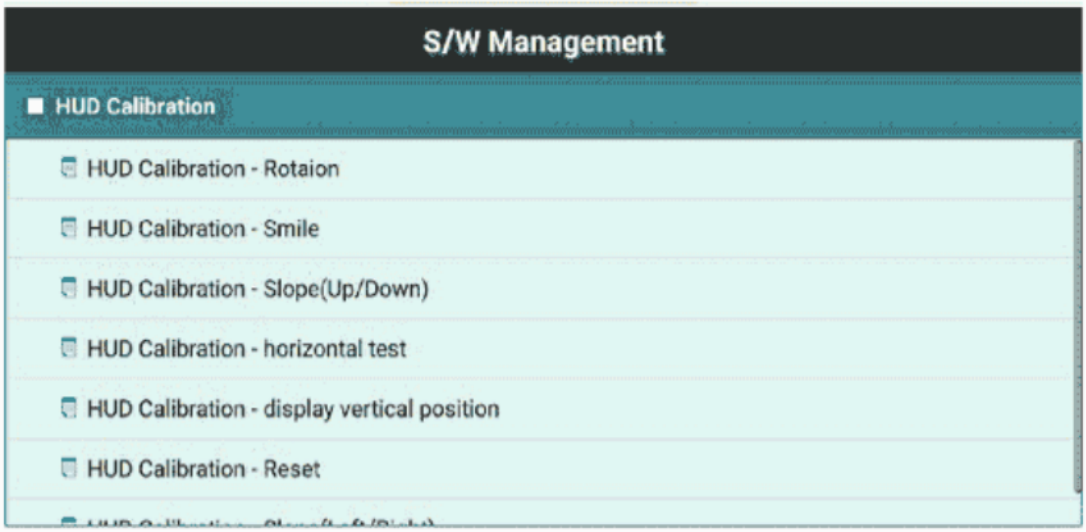


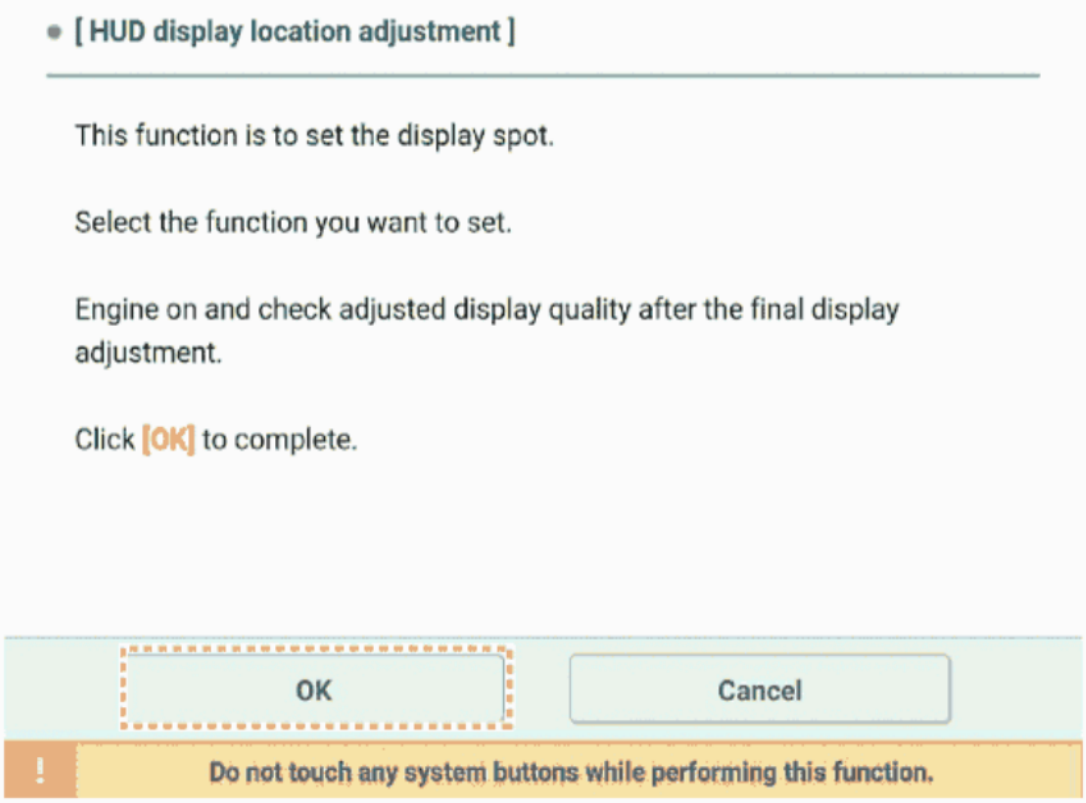
(5) Before "calibration", carry out "HUD calibration - initialization".

NOTICE

"HUD calibration - initialization" must be performed prior to "calibration".

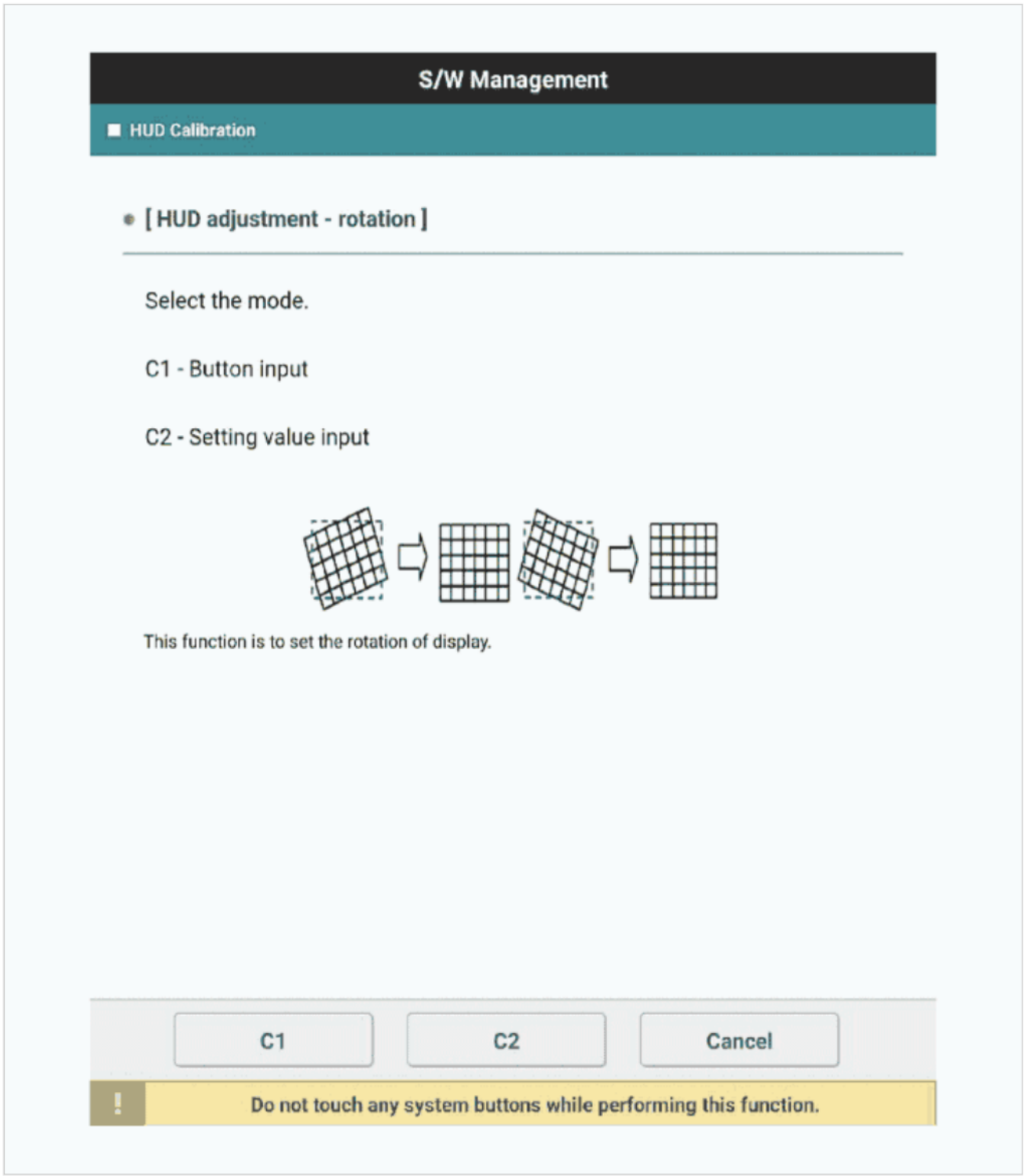
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(6) Select the necessary calibration items and carry out "HUD calibration".

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(7) When calibration is completed, start and cut off the engine and check that the footage calibration is completed.

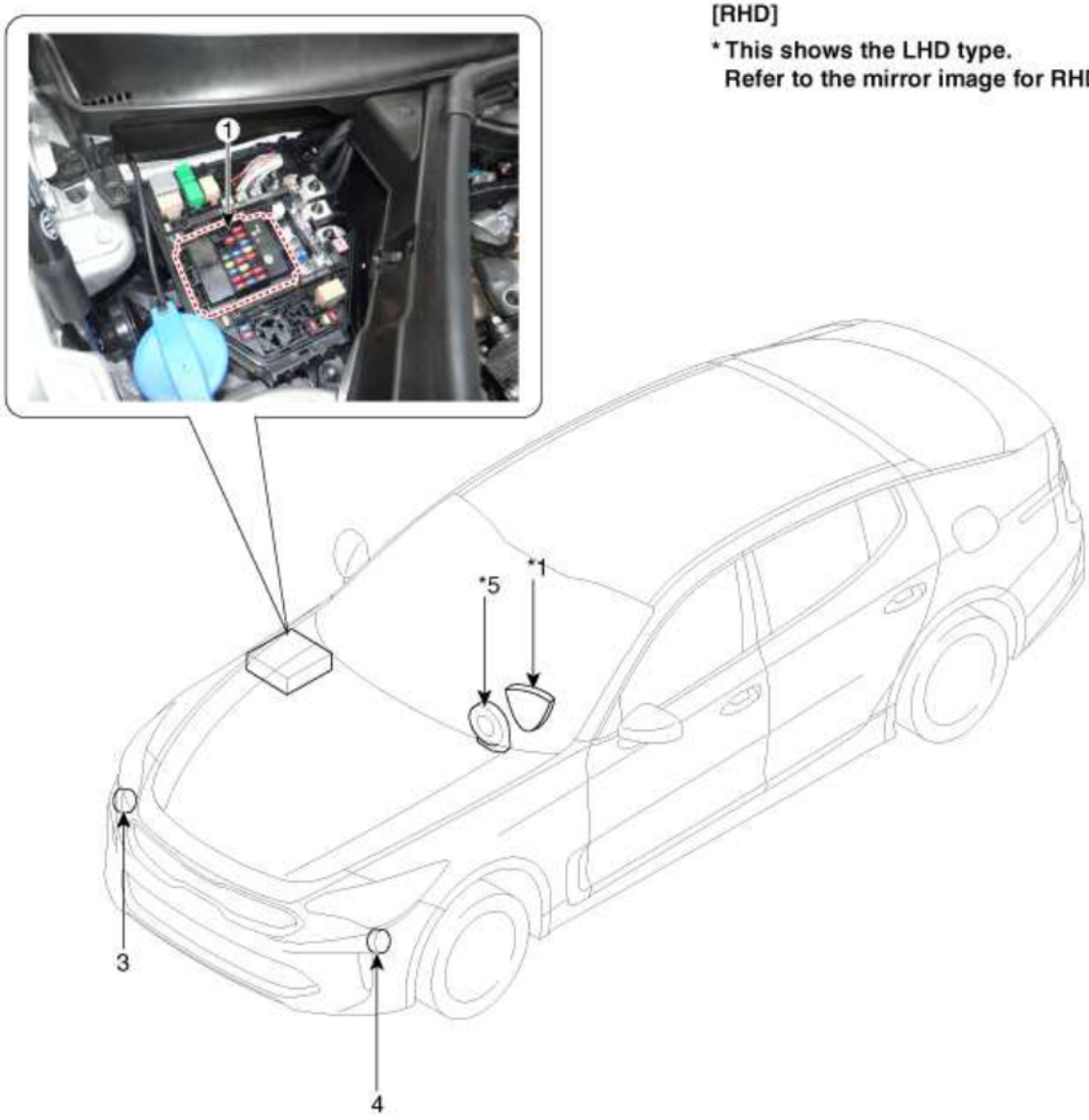
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Troubleshooting

Category	Error symptoms	Inspection item	Detailed inspection item	Related parts
Lighting	• HUD not working • Lighting brightness not automatically controlled (no difference between day and night)	• Check the lighting control • Check the ambient light sensor operation • Check the CAN communication	• Check the lighting control in the cluster USM → If working, HUD has no problem. • Check the ambient light sensor operation → If the ambient light sensor works, check the communications (CGW ↔ HUD)	Light sensor CGW Cluster
Adjustment function	• Display position not adjusted	• Check the mirror movement when IG is on or off (parking position)	• If the step motor does not work when IG is on or off, → The step motor in HUD fails. • If the step motor in HUD works when IG is on or off, → Check the CAN communications (cluster ↔ HUD)	HUD Cluster

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Component Location

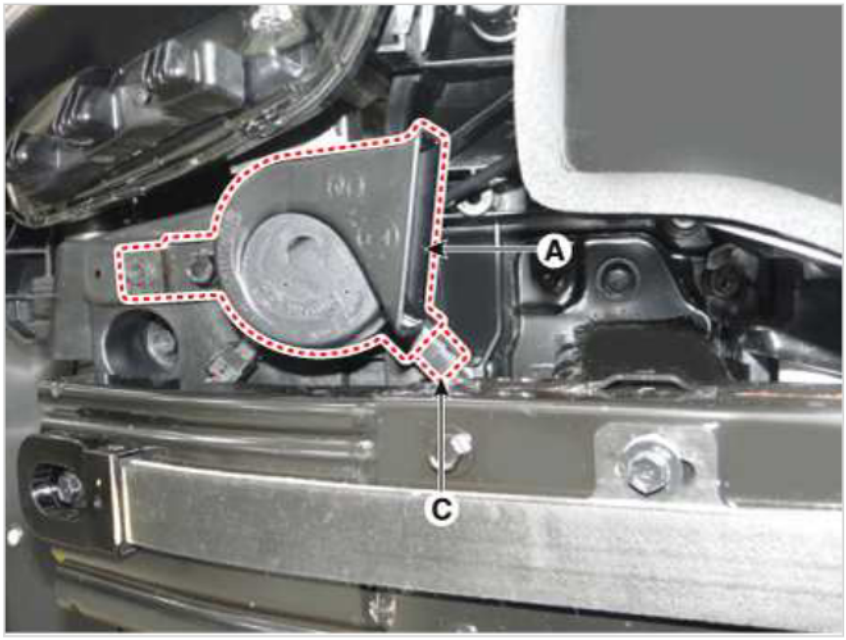


1. Horn switch
2. Horn relay (Built - in Metal Core Block PCB)
3. Horn (Low pitch)
4. Horn (High pitch)
5. Clock spring

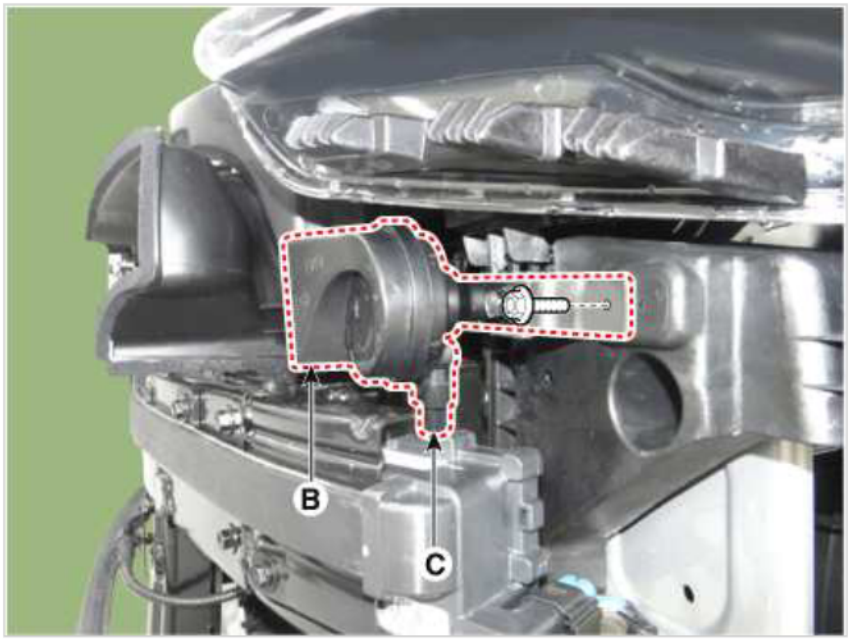
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Removal

1. Remove the front bumper assembly.
   (Refer to Body - "Front Bumper Assembly")
2. After loosening each mounting bolt of the low-pitch horn (A) and high-pitch horn (B), detach the connector (C) and remove the horn.
   [Low - Pitch Horn]



[High - Pitch Horn]



Installation

1. After connecting the horn connectors, install both high-pitch and low-pitch horns.
2. Install the front bumper assembly.

Inspection

1. The relay on the horn of this vehicle is implanted into the metal core block PCB of the engine room relay block.

Information

The semi-conductor type relay inserted in the PCB is impossible to replace. If the relay needs to be replaced, replace the metal core box and conduct a test on it.

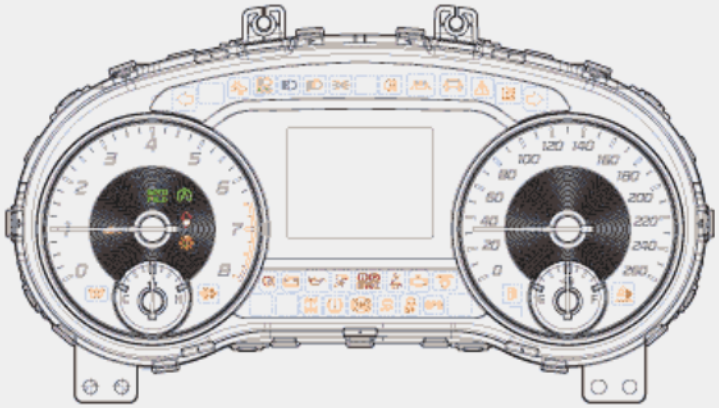
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Components

Standard Type ("3.5" inch)

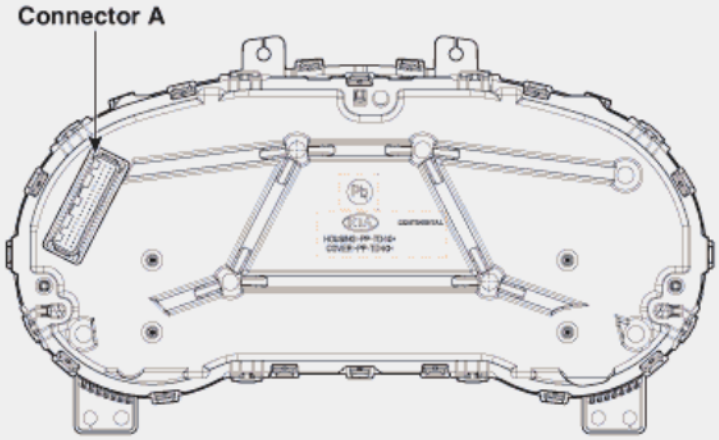
[Front]





Speedometer (MPH)

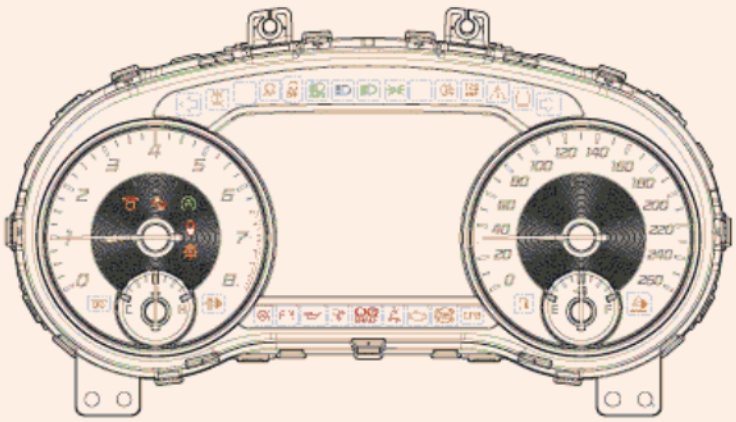
[Rear]

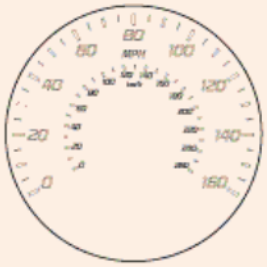


Super Vision Type ("7" inch)

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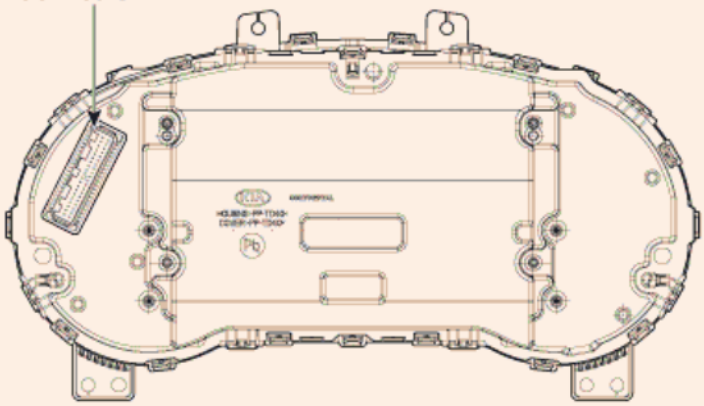
[Front]

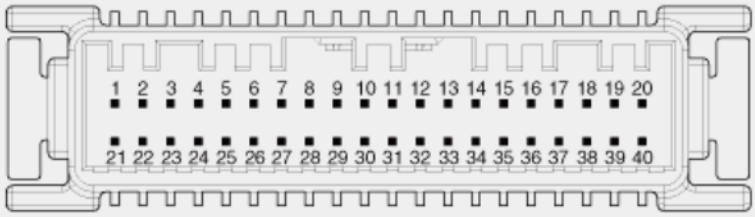




Speedometer (MPH)

[Rear] Connector A





Connector A

Connector Pin Information

No.	Description	No.	Description
1	Ground (Signal3)	21	Trip switch (-)

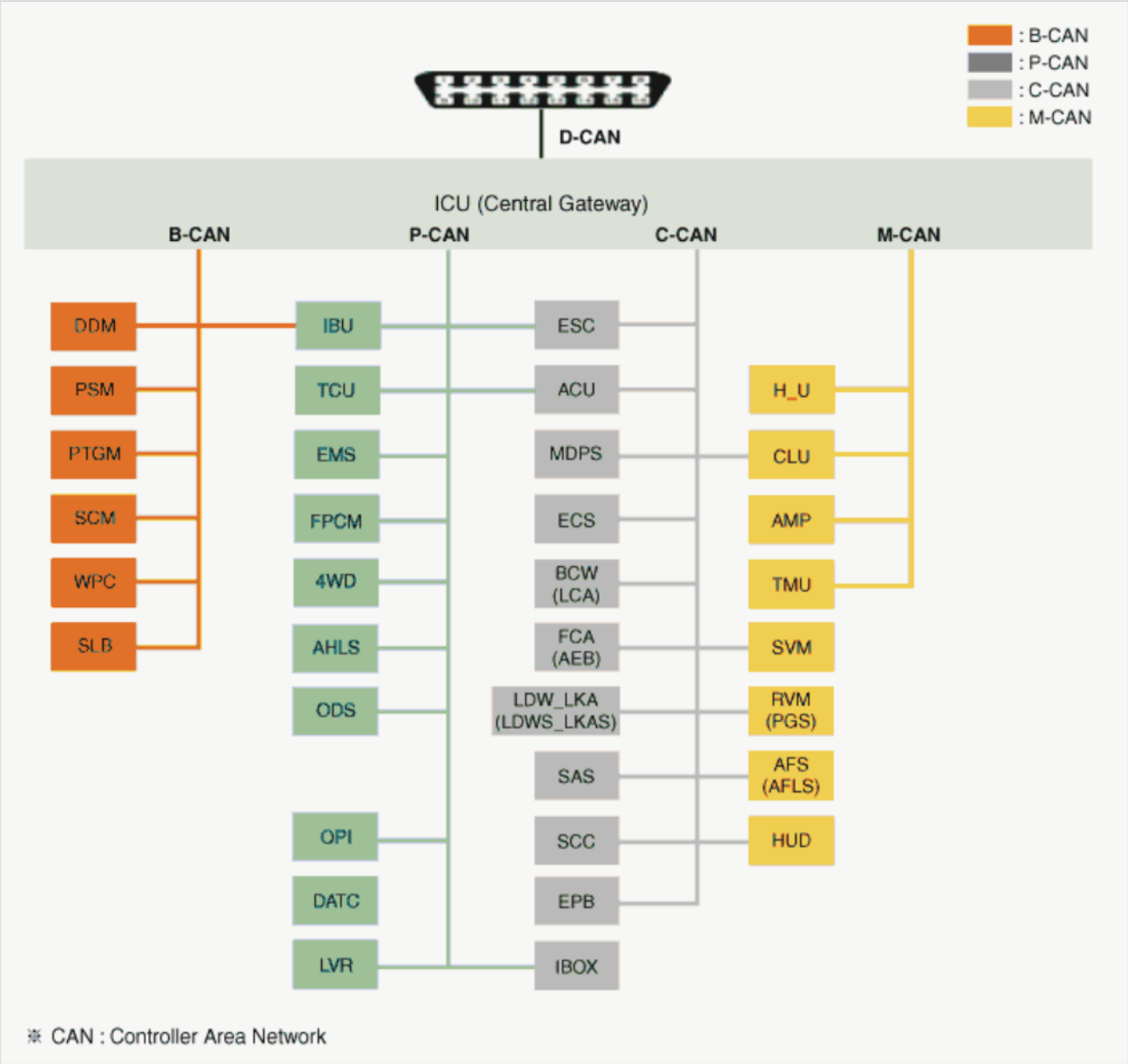
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2	Illumination (-)	22	Trip switch 1 (+)
3	Rheostat switch (Down)_Input	23	Trip switch 2 (+)
4	Rheostat switch (Up)_Input	24	Driver mode switch (CW)_Input
5	Dentent	25	Driver mode switch(CCW)_Input
6	AT ("P" Position)	26	Cluster speaker (+)
7	AT ("R" Position)	27	Cluster speaker (-)
8	AT ("N" Position)	28	-
9	AT ("D" Position)	29	Multimedia-CAN (Low)
10	AT ("S" Position)	30	Multimedia-CAN (High)
11	-	31	Engine run state_Output
12	Vehicle speed_Output	32	Chassis-CAN (High)
13	-	33	Chassis-CAN (Low)
14	Fuel sender (+)_Input	34	-
15	Water separator_Input (Diesel only)	35	-
16	Fuel sender (-)_Input	36	-
17	Water separator_Input (Diesel only)	37	Ground (Signal1)
18	AIR BAG (+)_Input	38	-
19	Oil press switch_Input (Gasoline only)	39	IGN 1
20	-	40	Battery (+)

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Description

Communication Network Diagram



Abbreviation	Explanation
ACU	Airbag Control Unit
AFL	Adaptive Front-Lighting System
AMP	Amplifier
AUDIO	Audio Head Unit
SVM	Surround View Monitor
B_CAN	Body Controller Area Network
BCW	Blind-Spot Collision Warning
C_CAN	Chassis Controller Area Network
CDP	Compact Disk Player
CLU	Cluster Module
DATC	Dual Automatic Temp Control
DDM	Driver Door Module

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ECM	Engine Control Module
F_PUMP	Fuel Pump Control Module
HUD	Head Up Display
IBU	Integrated Body Control Unit
ICU	Integrated Central Control Unit
IFB	Interface Box
IMS	Integrated Memory System
LDW	Lane Departure Warning
LKA	Land Keeping Assist
M_CAN	Multi media Controller Area Network
MDPS	Motor Driven Power Steering
MFC	Multi Function Camera
MTC	Manual Temp Control
ODS	Occupant Detection System
P_CAN	Powertrain Controller Area Network
PCM	Powertrain control module
PTG	Power Liftgate Module
RVM	Rear View Monitor
SCC	Smart Cruise Control
SCM	Steering Column Module
TCM	Transmission Control Module
VDC	Vehicle Dynamic Control
WPC	Wireless Power Charger

Cluster Variant Coding

As we have more options (ESC, MDPS etc.) in the car, the dashboard now has more information to display depending on the chosen options.
For this reason, we need to learn which options the vehicle has when replacing the dashboard.
To address this issue, a course of learning based on the option required for the vehicle when replacing the dashboard should be carried out.
This is called Variant Coding.

Function

1. High speed CAN communication (C-CAN)
   – Custom Function : car seats linked to getting on/off motion, Welcome Light
   – LDW : Lane Departure Warning
   – LKA : Lene Keeping Assist
   – PA : Parking Assist
   – PDW : Parking Distance Warning
2. Low speed CAN communication (M-CAN)
   – AV : Audio / Video Multimedia information Display
   – TBT : Turn By Turn Navigation Information Display
3. Various source control
   Various alarms and sound effects are issued through the external speakers connected to the instrument cluster.

Sound	Description and function (CAN data receiver)
Welcome	Welcome (Key out and door open/closed state checked by IBU
Goodbye	Goodbye (Cluster)
Door Open warning	Key reminder warning (IBU), Vehicle speed is 5km/h or below & IGN switch is ACC or IGN or engine start & when vehicle speed is below 5 km/h or when the driver side door is opened
Seat belt warning	Driver seat belt warning (IBU)
PDW System warning	PDW sensor fault warning (IBU)
Gear R	PDW warning when shift gear R (IBU and PA)

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Parking Brake	Parking brake warning (IBU)
Start button	SSB button warning (IBU)
Rheostat light information	Rheostat warning when select the max or min degree (Cluster)
Smart Key departure	Smart key out warning (IBU)
Smart Cruise	Change from the conventional cruise to the smart cruise (SCC)
Smart cruise driving information	Smart cruise function cancel (SCC)
Conventional cruise	Change from the smart cruise to the conventional cruise (SCC)
Turn signal lamp (Tick)	Turn signal lamp warning (IBU)
Turn signal lamp (Tock)	Turn signal lamp warning (IBU)
Smart key battery low voltage	Warning when driver push the SSB button with low voltage battery smart key (IBU)
EPB warning	Warning when change from Auto Hold to EPB lock (EPB)
Coolant temperature alarm	When the engine temperature is over 120 °C (EMS)

4. User Setting Mode (USM)

   Setting can be changed by using the haptic switch menu, and CW, CCW, OK buttons (or the UP, Down, Left, Right and OK button of the generic switch). There are total of 24 items (for example, In/Out Seat Synchronization, In/Out Steering Wheel Synchronization, Auto Door Lock, Auto Door Lock Deactivate, Head Lamp Escort, Welcome Light, Welcome Sound, Triple Turn Signal, Average Fuel Consumption Auto Reset, HUD Height Adjustment, Brightness, and Content Setup) that can be set and customized. The signal flow during setting is as follows.

   (1) USM settings are set, they are transmitted to IBU.

   (2) IBU transmits the settings via B-CAN to the relevant modules.

   (3) The module completes setting and transmits the modified setting to IBU.

   (4) IBU transmits the final settings via C-CAN to the cluster.

   Information

   The cluster communicates directly with C-CAN units.

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Removal

⚠ CAUTION

- Put on gloves to protect your hands.
- When removing with a flat-tip screwdriver or remover, wrap protective tape around the tools to prevent damage to components.

Instrument Cluster

1. Disconnect the negative (-) battery terminal.
2. Remove the cluster fascia panel.
   (Refer to Body - "Cluster Fascia Panel")
3. Separate the instrument cluster (A) after loosening the mounting screws.



4. Remover the instrument cluster after disconnecting the cluster connector (A).

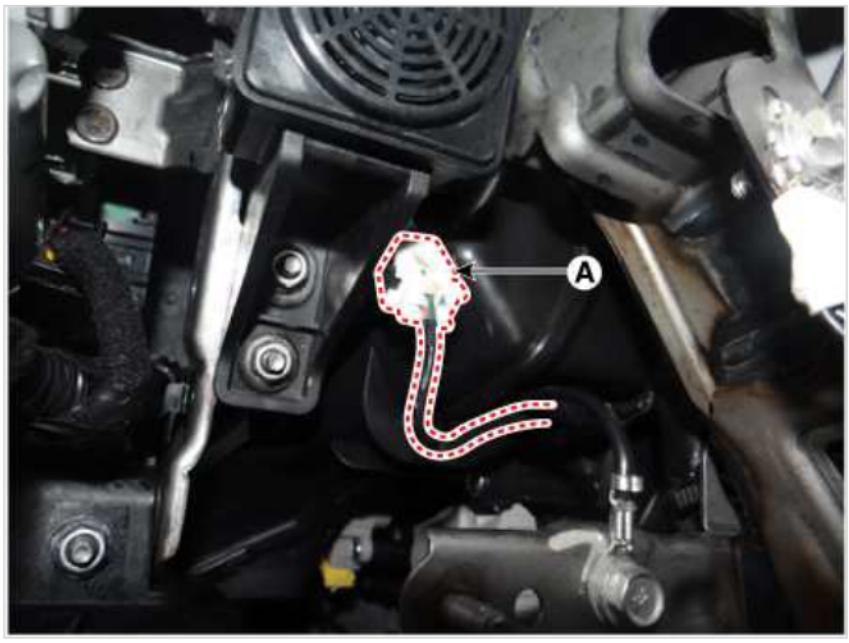


Instrument Cluster Speaker

1. Disconnect the negative (-) battery terminal.

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2. Remove the crash pad lower panel.
   (Refer to Body - "Crash Pad Lower Panel")
3. Disconnect the instrument cluster speaker connector (A).



4. Remove the instrument cluster speaker (A) after loosening the mounting nuts.



Installation

Instrument Cluster

1. Install the cluster after connect the cluster connectors.
2. Install the cluster fascia panel.
3. Connect the negative (-) battery terminal.

> **Information**
> Perform variant coding after exchanging the instrument cluster.

Instrument Cluster Speaker

1. Install the instrument cluster speaker.

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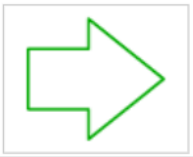
2. Connect the instrument cluster speaker connector.
3. Install the crash pad lower panel.
4. Connect the negative (-) battery terminal.

Inspection

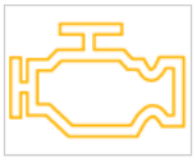
1. Check point (Warning indicator)

NOTICE

- Fault conditions and normal operating conditions, refer to the owner"s manual.

NO	Ref Symbol	Name	Color	Signal Input	Signal Control	Check Point
1		Turnsignal (Left)	Green	CAN	ICU (Gateway)	1) Multifunction Switch 2) IBU 3) ICU 4) CAN Failure
2		Turnsignal (Right)	Green	CAN	ICU (Gateway)	1) Multifunction Switch 2) IBU 3) ICU 4) CAN Failure
3		Tail Lamp	Green	CAN	ICU (Gateway)	1) Multifunction Switch 2) IBU 3) ICU 4) CAN Failure
4		Low Beam	Green	CAN	ICU (Gateway)	1) Multifunction Switch 2) IBU 3) ICU 4) CAN Failure
5		HBA	Green	CAN	MFC	1) MFC System 2) CAN Failure
6		High Beam	Blue	CAN	ICU (Gateway)	1) Multifunction Switch 2) IBU 3) ICU 4) CAN Failure
7		Warning	Yellow	CAN + Hard-wired	BCW	1) BCW System 2) CAN Failure
					PSB	1) PSB System 2) ICU 3) CAN Failure
					SCC ECS	1) SCC System 2) FCA System 3) LDW System 4) AFS System 5) TPMS System 6) HSWS System 7) CAN Failure
					Low Washer	1) Whasher fluid lever sensor 2) Wiring Failure

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					Digital Input	Reminders when service checks
8		Battery Charge	Red	Hard-wired	Alternator	1) Alternator 2) Wiring Failure 3) Battery
9		Oil Pressure	Red	Hard-wired	ECM	1) Oil Pressure Sensor 2) Wiring Failure 3) ECM 4) CAN Failure
10		Check Engine	Yellow	CAN	ECM	1) ECM 2) CAN Failure
11		Immobilizer	Yellow	CAN + Hard-wired	ICU (Gateway)	1) SMK System 2) ICU 3) CAN Failure 4) Hard-wired
12		Parking Brake Brake Fluid EBD EPB	Red	CAN	ICU (Gateway) EBD EPB	1) ICU 2) VDC System 3) EPB System 4) CAN Failure 5) Parking Brake Switch 6) Brake Oil Lever Sensor
13		ABS	Yellow	CAN	ABS	1) TCS System 2) CAN Failure
14		LED Headlamp	Yellow	CAN	AFS	1) AFS System 2) CAN Failure
15		LBA-D	Yellow	CAN	AFS	1) AFS System 2) CAN Failure
16		ESC	Yellow	CAN	TCS	1) TCS System 2) CAN Failure
17		ESC Off	Yellow	CAN	TCS	1) TCS System 2) CAN Failure
18		EPB	Yellow	CAN	EPB	1) EPB System 2) CAN Failure

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19		Auto Hold	White Yellow Green	CAN	VDC	1) TCS System 2) CAN Failure
20		Seat Belt	Red	CAN	ICU (Gateway)	1) ICU 2) CAN Failure
21		Airbag	Red	CAN	SRSCM	1) SRSCM System 2) CAN Failure
22		EPS (MDPS)	Red	CAN	MDPS	1) MDPS Unit System 2) MDPS Motor 3) CAN Failure
23		TPMS	Yellow	CAN	TPMS	1) TPMS System 2) TPMS Sensor 3) CAN Failure
24		LKA	Green Yellow White	CAN	MFC	1) MFC System 2) CAN Failure
25		Fuel Warning	Yellow	Direct (Micom)	Fuel Segment	1) Fuel Sendar Failure 2) Wiring Failure
26		ECO	Green	CAN	ECO mode	1) Drive Mode Switch 2) CAN Failure
27		SPORT	Yellow	CAN	SPORT Mode	1) Drive Mode Switch 2) ECM 3) TCU
28		Smart Shift	Green White Yellow	CAN	TCU	1) Drive Mode Switch 2) TCU System 3) CAN Failure
29		CRUISE	Green	CAN	ECM	1) ECM System 2) CAN Failure

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30		AUTO STOP	Green Yellow	CAN	ECM	1) ECM 2) CAN Failure
31		AEB	Yellow	CAN	AEB	1) SCC System 2) CAN Failure
32		4WD	Yellow	CAN	4WD ECU	1) 4WD ECU 2) CAN Failure
33		4WD Lock	Yellow	CAN	4WD ECU	1) 4WD System 2) CAN Failure
34		Urea	Yellow	CAN	ECM	1) DPF System 2) CAN Failure

2. Check point (Gauge)

NO	Name	Signal Input	Signal Control (Unit/Sensor)	Check Point
1	Speedometer	C-CAN	ABS/ESC	1. ABS System 2. CAN Line failure
2	Tachometer	C-CAN	ECM	1. ECM 2. CAN Line failure
3	Cooling water temperature	C-CAN	ECM	1. ECM 2. CAN Line failure
4	Fuel	Hardwire	Fuel Sander	1. Fuel sender failure 2. Wiring failure

Diagnosis with KDS

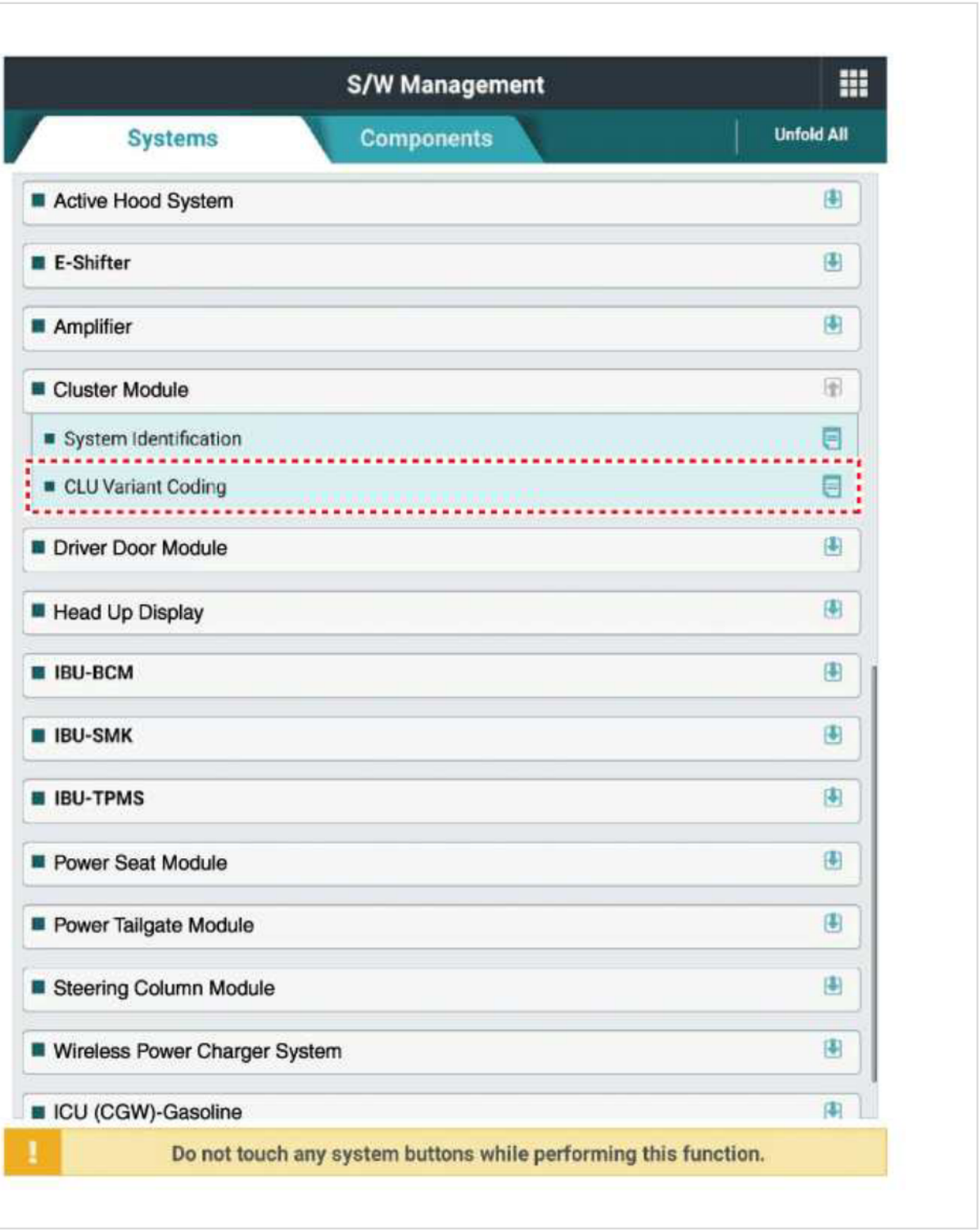
1. In the body electrical system, failure can be quickly diagnosed by using the vehicle diagnostic system (KDS).
   The diagnostic system (KDS) provides the following information.
   (1) Self diagnosis : Checking failure and code number (DTC)
   (2) Current data : Checking the system input/output data state
   (3) Actuation test : Checking the system operation condition
   (4) Additional function : Controlling other features including system option setting and zero point adjustment
2. Select the "Car model" and the "Cluster Module (CLU)" to be checked in order to check the vehicle with the tester
3. Select the "Current Data" menu to search the current state of the input/output data.
4. To forcibly actuate the input value of the module to be checked, select option "Actuation Test"

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CLU Variant Coding

After replacing the cluster with a new one, must be performed the “Variant Coding” procedure.

1. Connect the cable of KDS to the data link connector in driver side crash pad lower panel, turn the power on KDS.
2. Select model and "IBU".
3. Select Variant coding mode to perform.



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S/W Management

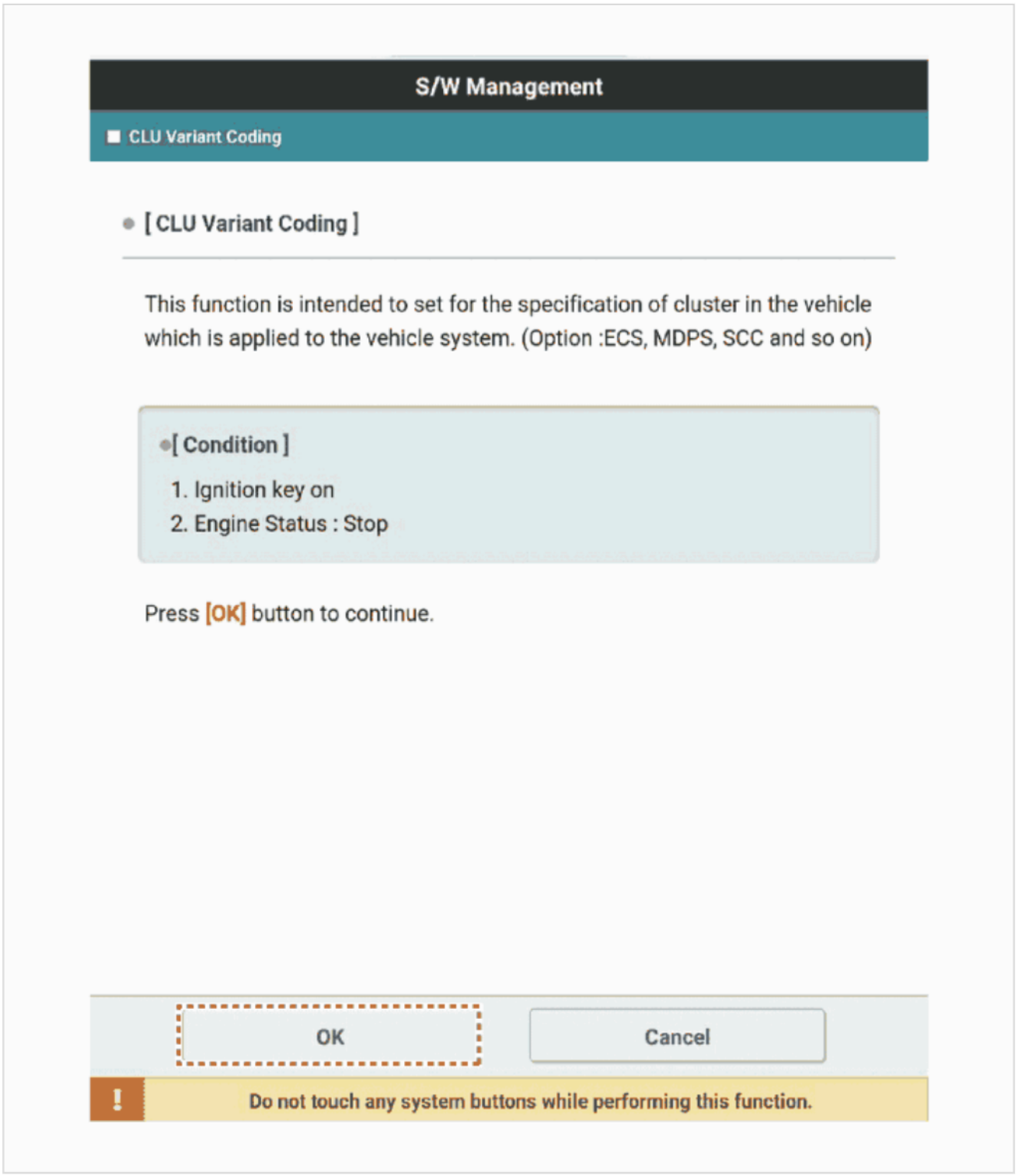
• **CLU Variant Coding**

Purpose	To set the specification of cluster in the vehicle which is applied to the vehicle CAN communication controller(ESP, MDPS, TPMS, EPB, SCC and so on).
Enable Condition	1.Engine Off 2.Ignition Switch On
Concerned Component	Cluster
Concerned DTC	B100051, B100155, B100255, B100455, B100855, B101055, B102055, B104055, B108055
Fail Safe	Set DTC, Warning message is displayed on instrument cluster
Etc	Input CLU coding code from web site.

OK

! Do not touch any system buttons while performing this function.

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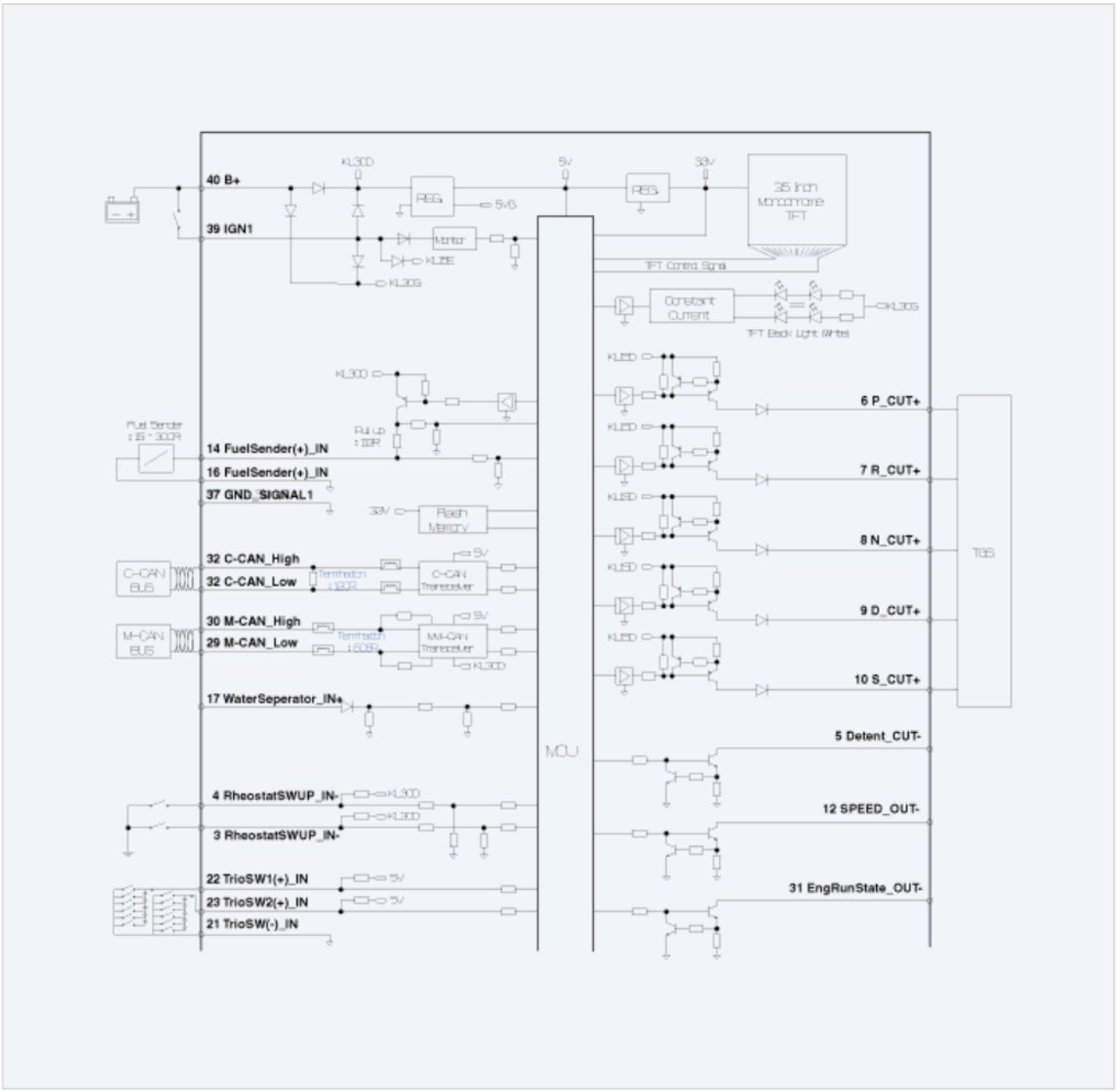


4. If the trouble codes occurred when performing variant coding, try the CLU variant coding again after checking the installation status of CLU system.

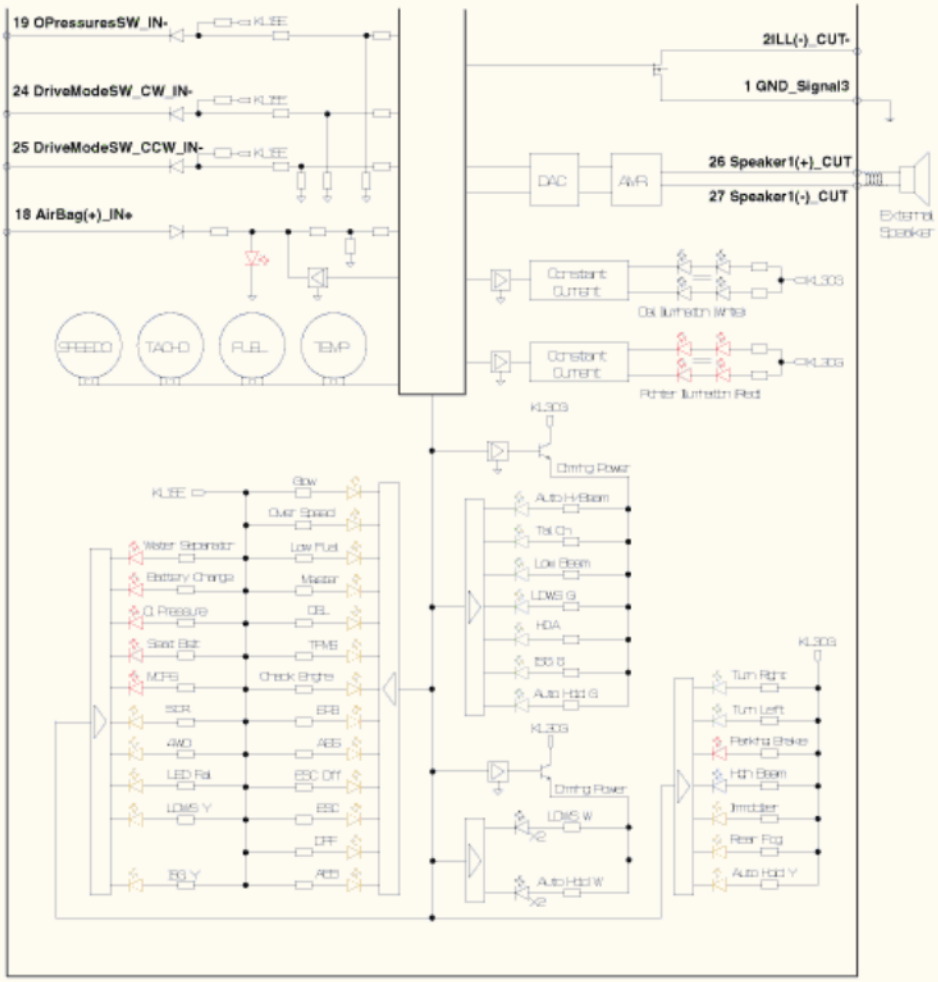
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Circuit Diagram

Standard Type ("3.5" inch)

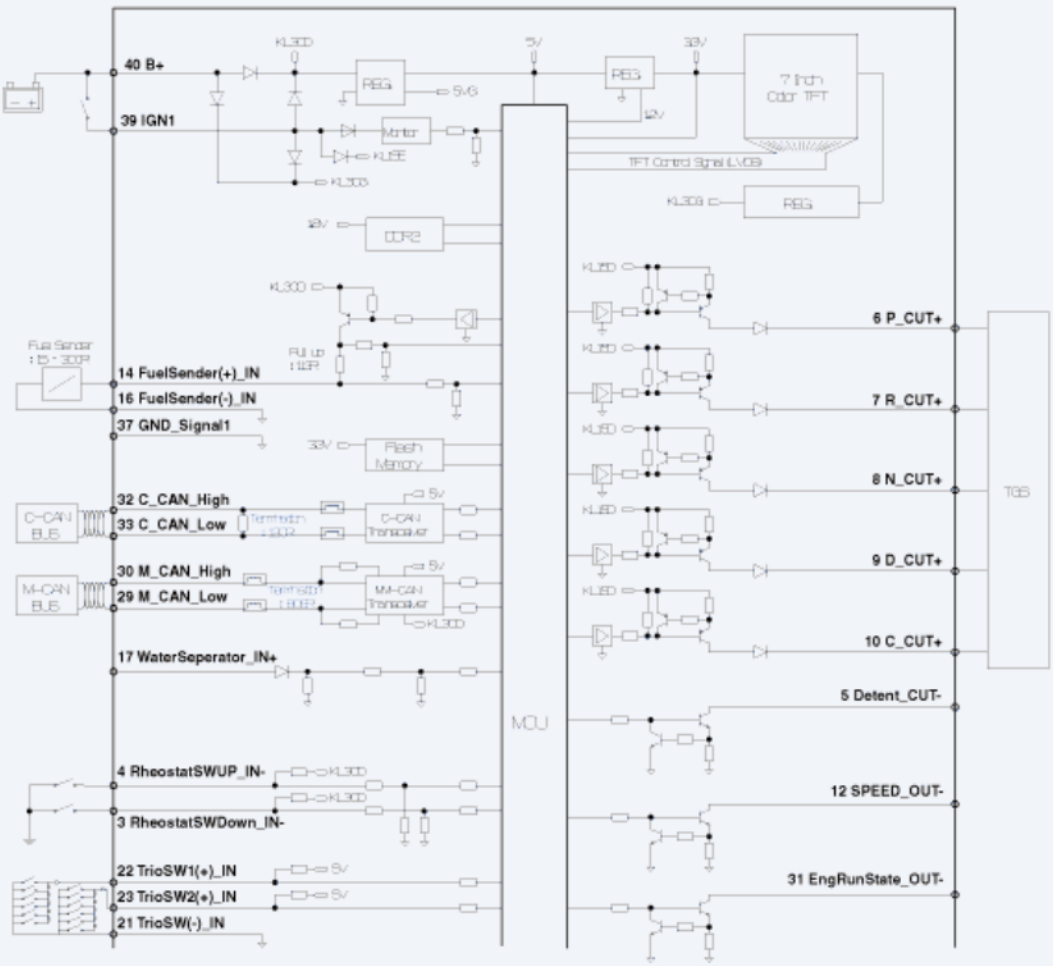


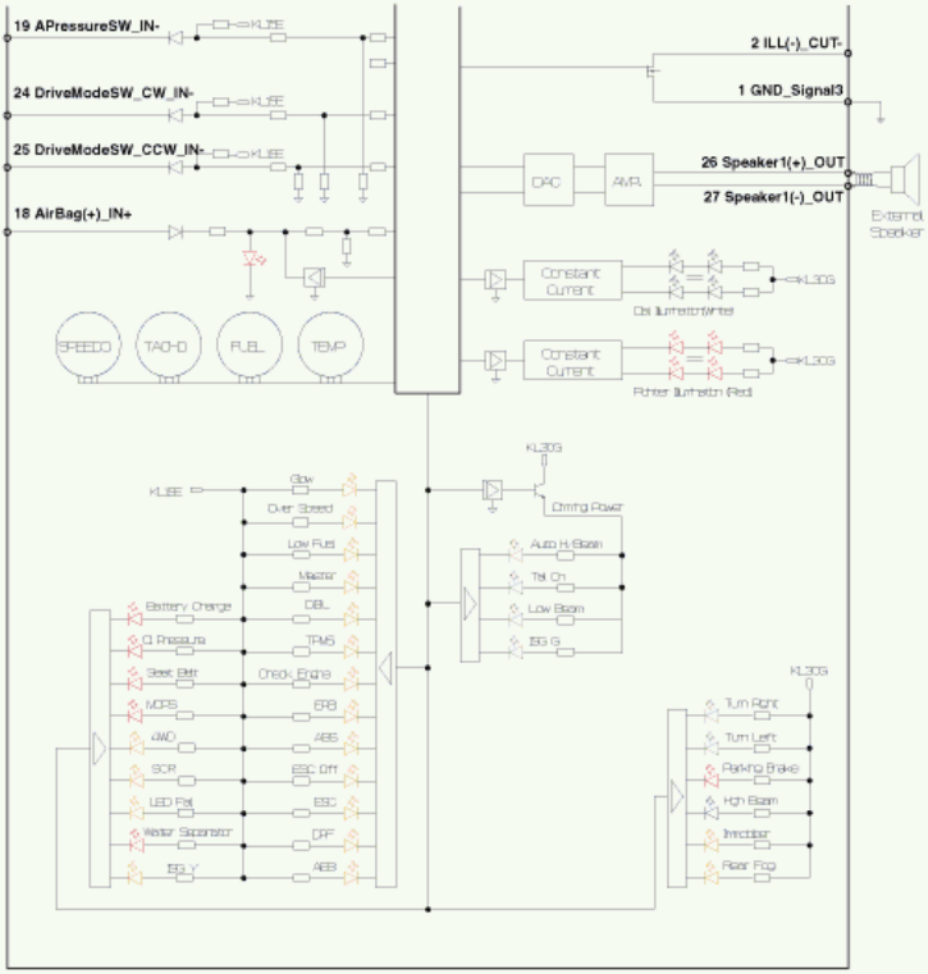
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Super Vision Type ("7" inch)

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40 B+
39 IGN1
KL30
REG
5V
3.3V
7 Inch
Color TFT
Meter
KL15
KL30G
TFT Control Signal (LVDS)
KL30B
REG
DDR2
KL30
KL30
KL30



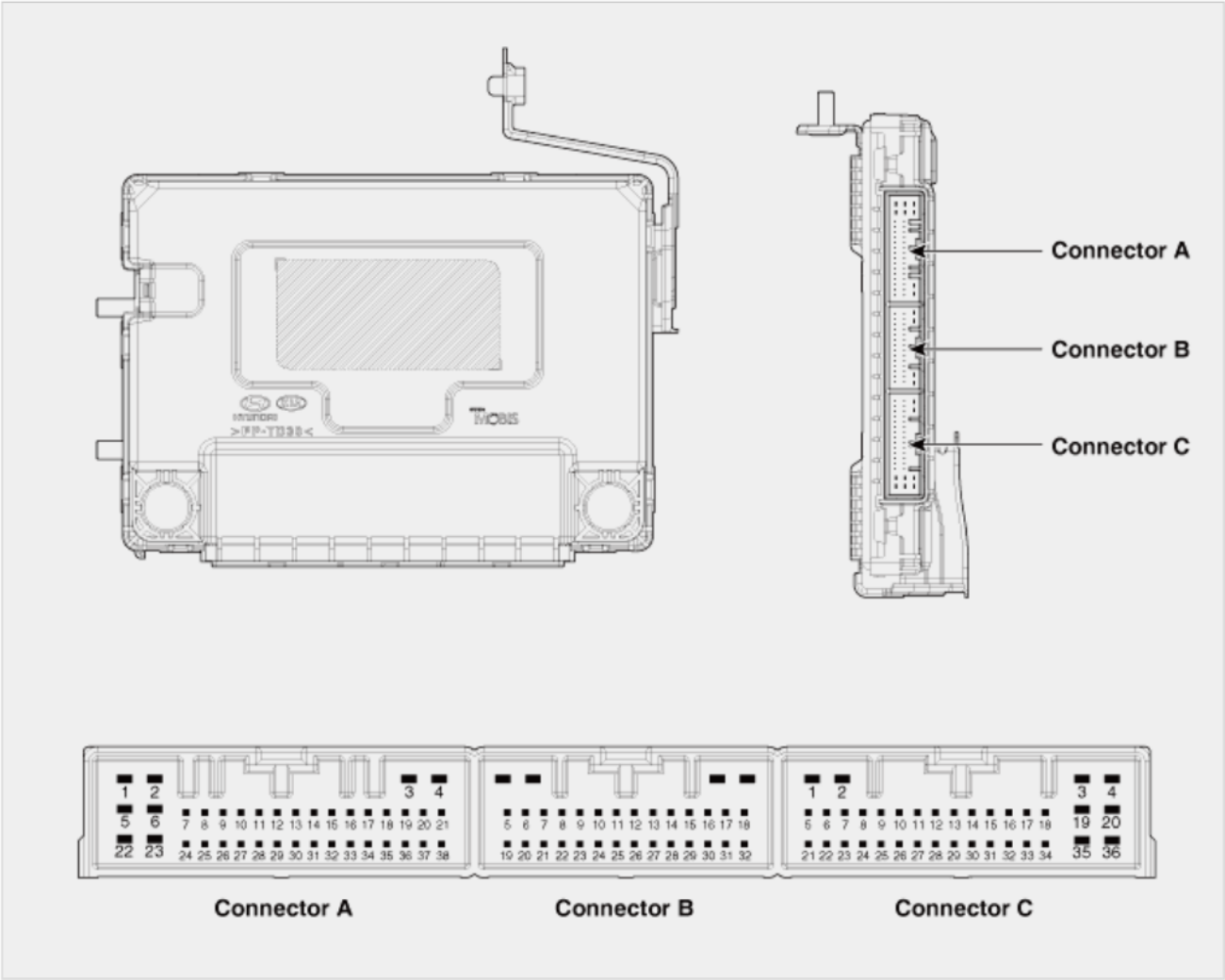
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Troubleshooting

Error Item	Failure symptom	Inspection items	Detailed inspections	Relevant Parts/ Components
Screen display	LCD screen does not turn on	1) Connector attachments 2) Components	1) Check the connector attachments 2) Check B+, IGN and GND wiring 3) Check the components	Connectors, wiring, fuses, dashboard
Warning light	Airbag warning lamp malfunction	1) Connector attachments 2) C-CAN 3) Components	1) Check airbag + signal (connectors) 2) Check C-CAN (ACU4) signal 3) Check the FPC attachment inside the dashboard	ACU Connectors, wiring, fuses, dashboard
Mode conversion	Integrated driving mode malfunction	1) Connector attachments 2) Switch 3) Components	1) Check the switch input (connector) 2) Check the switch signal input (disconnection or shorting) 3) Check conversion with dashboard component	Switch connector, wiring dashboard
Illumination	Interior light brightness cannot be controlled.	1) Connector attachments 2) Switch 3) Components	1) Check if the light switch"s input signal reaches the connector 2) Check ILL- and DETENT signals 3) Check the TAIL+ signal input	Switch connector, wiring dashboard
Warning Sound	No dashboard alarm	1) Connector attachments 2) Car speakers 3) Components	1) Check the speaker output connector 2) Check the car speakers	Speaker connectors, wiring dashboard
Fuel indicator	Faulty fuel gauge indication	1) Connector attachments 2) Fuel sender 3) Components	1) Check fuel input and GND connectors (open, short or input resistance values) 2) Check fuel sender	Fuel sender connector, wiring dashboard

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Components



Connector Pin Information

No.	Connector A	Connector B	Connector C
1	-	B-CAN (Low)	Front wiper low bus switch_Input
2	Mirror power_Input	B-CAN (High)	Ground (Power)
3	P-CAN (Low)	PDW-F_Power_Output	Battery (Power)
4	P-CAN (High)	PDW-R_Power_Output	Battery (ECU)
5	-	Ground (ECU)	Driver outside handle switch_Input
6	Right mirror unfold_Output	PDW Switch_Input	Position_Input(A/T Option) IGN Lock switch_Input (M/T Option)
7	Right mirror horizontal_Output	PDW (Option)_Input	Interior antenna1 (-)_Output
8	Immobilizer power_Output	-	Bumper antenna (-)_Output
9	Immobilizer ground_Output	-	Interior antenna2 (-)_Output
10	Brake switch_Input	-	Assist outside handle antenna (-)_Output
11	ESCL Enable_Output	Front wiper high relay_Output	Trunk interior antenna3 (-)_Output
12	Brake switch fuse_Input	Rear left seat belt indicator_Output	Driver outside handle anntenna (-)_Output
13	Fog switch_Input	Assist seat belt indicator_Output	-
14	Light switch_Input	-	COM (ESCL)
15	Front wiper volume switch_Input	LF Searching_Output	Auto light sensor power_Output
16	PDW Switch indicator_Output	-	ACC_Input

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17	SSB Ring illumination_Output	SSB Switch1_Input	IGN1 Relay_Output
18	LIN CAN (PDW)	PDW_Power_Input	ACC Relay_Output
19	-	Security indicator_Output	ESCL (-)_Output
20	Engine RPM_Input	Sunroof status_Input	ESCL (+)_Output
21	Wheel speed sensor_Input	Rain sensor (Option)_Input	Assist outside handle switch_Input
22	-	Wiper parking switch_Input	-
23	Right mirror fold_Output	Wiper power relay_Output	Interior antenna1 (+)_Output
24	Right mirror vertical_Output	Front wiper low relay_Output	Bumper antenna (+)_Output
25	-	-	Interior antenna2 (+)_Output
26	Puddle pocket lamp_Output	-	Assist outside handle antenna (+)_Output
27	Start feedback_Input	Rear center seat belt indicator_Output	Trunk interior antenna3 (+)_Output
28	-	-	Driver outside handle anntenna (+)_Output
29	Starter relay_Output	SSB Symbo illumination (-)_Output	COM (EMS)
30	Headlamp high switch	Rear right seat belt indicator_Output	Auto light sensor ground_Output
31	Front wiper switch	SSB Switch2_Input	Auto light sensor signal_Input
32	-	ESCL Unlock switch_Input	IGN1_Input
33	Multifunction switch ground_Input		IGN2_Input
34	External buzzer_Output		IGN2 Relay_Output
35	SSB Symbo illumination (+)_Output		Front washer switch_Input
36	LIN CAN (Rain sensor)		Battery (+)_ESCL
37	-		
38	ATM Solenoin_Output		

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Description

Integrated Body Control Unit (IBU)

Integrated body control unit has integrated several functions including body control module (IBU), smart key unit (SMK), and tire pressure monitoring system (TPMS).

1. Body Control Module (IBU) Functions

Burglar Alarm	Liftgate Burglar Alarm	Issues an alarm depending on the liftgate operation.
	Panic Alarm	Generates warning sound and displays flasher lamp (horn & flasher) depending on the panic signal.
	Security Lamp Control	Controls security lamp in vehicle alert status.
Heating Wire	Door Mirror Heating Wire	The defogger and deicer function prevents and removes fog and frost from the mirror and window using the rear window heating wire switch (defogger switch).
	Rear Window Heating Wire Control	
External Lamp	Tail Lamp	Turns on / off the tail lamp automatically. It also turns off the tail lamp automatically when the driver forgot to turn off the lamp switch.
	Auto Light	Turns on/off the tail lamp and head lamp automatically depending on whether it is day or night when the head lamp switch is placed at Auto.
	Welcome Light	The welcome light function turns on the head lamp and tail lamp for 15 seconds when an unlock signal is detected while vehicle door is locked.
	Escort Function	Turns on the escort lamp when the power is turned off while the head lamp is on. – It turns on the head lamp and maintains the state for 20 minutes if ignition is turned off while the head lamp is on. – The head lamp remains on only for 30 seconds when the driver seat door is opened and closed during the 20-minute period. – The head lamp turns off when remote control lock button is pressed twice while the head lamp is on.
	Head Lamp (Low Beam / High Beam)	Controls high beam / low beam depending on the head lamp switch (multi-functional switch).
	Daytime Driving Light Control	Controls the daytime driving light lamp depending on the conditions at the time of vehicle start.
Internal Lamp	Engine Start Maintenance Button Lamp	Turns on/off the SSB lamp depending on vehicle power conditions, door open / closed status, and alert mode.
	Room Lamp	Turns on/off the interior lamp depending on vehicle power conditions and door open / closed status.
	Rheostat	Controls the brightness of interior electrical lamps (instrument cluster, HUD, AVN, etc.) depending on rheostat switch input.
Steering Wheel Heating Wire	Steering Wheel Heating Wire Control	Controls steering wheel heating wire based on steering wheel heating wire switch.
Liftgate	Liftgate Release Control	Releases the liftgate lock and issues a warning depending on the liftgate switch input.
Front / Rear Parking Assist	PAS Display	Receives a signal from parking assist sensor through LIN communication and displays it on the instrument cluster.
	PAS Warning	Detects obstacles in front and rear sides using the parking assist sensor (PAS sensor) in the case of gear input (R or D) and issues a warning if there is an obstacle.
Warning	Seat Belt Reminder and Indicator Lamp	Issues a warning if the seat belt is not fastened, and prevents pattern activation if the vehicle is driven while the seat belt is not fastened.
	Key Reminder Warning	Issues a warning if the driver seat door is open while ACC is on.
	Parking Brake Warning	Generates a warning sound if vehicle speed exceeds 5 km/h while IGN is on and parking brake is on.
	Sunroof Open Warning	Issues a warning if the key is removed and the driver leaves the vehicle while the sunroof is open.
Wiper and Washer		

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	Wiper (Low / High / Mist / Auto)	IBU receives wiper switch signal via B-CAN and sends the data to wiper motor (embedded) via LIN communication.
	Front Washer	IBU sends the washer switch signal to front washer motor.

2. Smart Key Unit (SMK) Functions

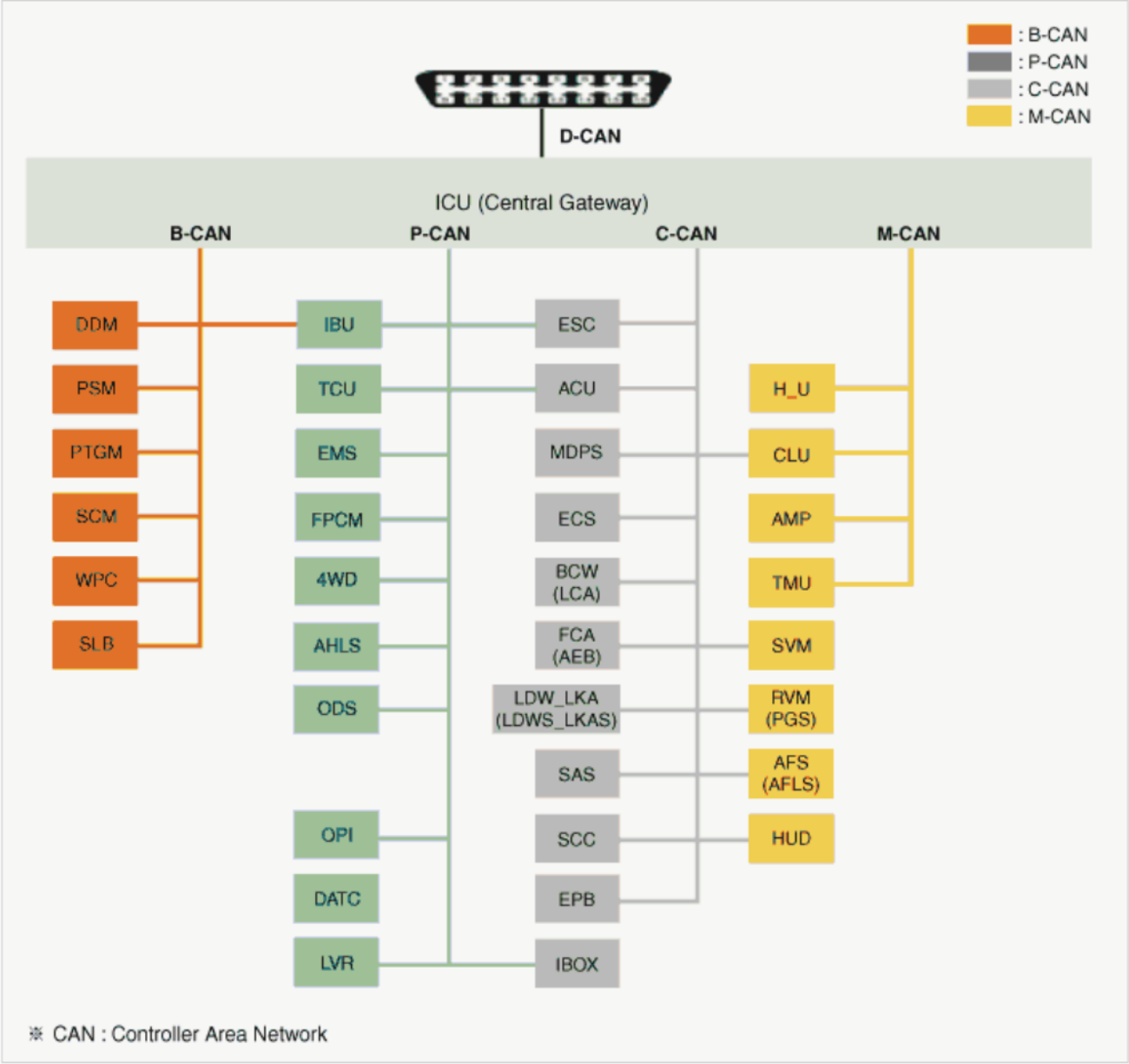
SMK	Door Lock and Unlock	Locks/Unlocks the door based on the door unlock signal and the signal from push buttons on the driver seat / passenger seat outside handles.
	SMK Welcome Light	Controls door mirror and puddle lamp after smart key authentication when the driver with smart key approaches the vehicle.
	Smart Trunk	Opens the trunk if the driver with valid smart key stays in front of the rear bumper (within LF antenna range) for 3 seconds or more.
SMK Warning	Key Reminder 1	When the driver attempts to lock the door, it checks if there is a smart key inside the vehicle and unlocks the door if there is one.
	Key Reminder 2	Checks the door lock status for 0.5 seconds after the vehicle door is closed and unlocks the door and generates a warning sound using the external buzzer if the door is locked.
	Door Lock Warning 1	Generates a warning sound with the external buzzer if the driver tries to leave the vehicle while ACC or IGN is on.
	Door Lock Warning 2	Generates a warning sound with the external buzzer if the driver tries to lock the door and leave the vehicle while one or more doors are open.
	Door Lock Warning 3	Searches for a smart key inside the vehicle when the driver tries to lock the door, and issues a warning and does not lock the door if there is a smart key inside.
	Key Out Lamp Warning	If the vehicle moves at 3 km/h or less while ACC or IGN is on and the door is open, it searches for the smart key every 3 seconds and blinks the warning lamp if there is no smart key.
SMK RKE (Remote Keyless Entry)	Door Lock / Unlock	Locks/Unlocks the door based on the door unlock signal and the signal from push buttons on the driver seat / passenger seat outside handles.
	Panic	Performs vehicle panic and panic stop functions based on the panic button signal.
	Window Open	Opens/Closes vehicle window based on the smart key signal.
Engine Start		Start Stop Button (SSB), Immobilizer, Start Relay Power Control, SSB Lamp Control

3. Tire Pressure Monitoring System (TPMS) Functions

Tire pressure monitoring system continuously monitors pressure and temperature inside the tire in order to warn the driver of the changes in tire pressure that may have influence on vehicle driving conditions. TPMS control module analyzes the data from the WE (Wheel Electronic) sensor attached inside each wheel and determines the tire conditions and generates a signal that is necessary for warning lamp control.

Communication Network Diagram

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Abbreviation	Explanation
ACU	Airbag Control Unit
AFL	Adaptive Front-Lighting System
AMP	Amplifier
AUDIO	Audio Head Unit
SVM	Surround View Monitor
B_CAN	Body Controller Area Network
BCW	Blind-Spot Collision Warning
C_CAN	Chassis Controller Area Network
CDP	Compact Disk Player
CLU	Cluster Module
DATC	Dual Automatic Temp Control
DDM	Driver Door Module
ECM	Engine Control Module
F_PUMP	Fuel Pump Control Module
HUD	Head Up Display
IBU	Integrated Body Control Unit

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ICU	Integrated Central Control Unit
IFB	Interface Box
IMS	Integrated Memory System
LDW	Lane Departure Warning
LKA	Land Keeping Assist
M_CAN	Multi media Controller Area Network
MDPS	Motor Driven Power Steering
MFC	Multi Function Camera
MTC	Manual Temp Control
ODS	Occupant Detection System
P_CAN	Powertrain Controller Area Network
PCM	Powertrain control module
PTG	Power Liftgate Module
RVM	Rear View Monitor
SCC	Smart Cruise Control
SCM	Steering Column Module
TCM	Transmission Control Module
VDC	Vehicle Dynamic Control
WPC	Wireless Power Charger

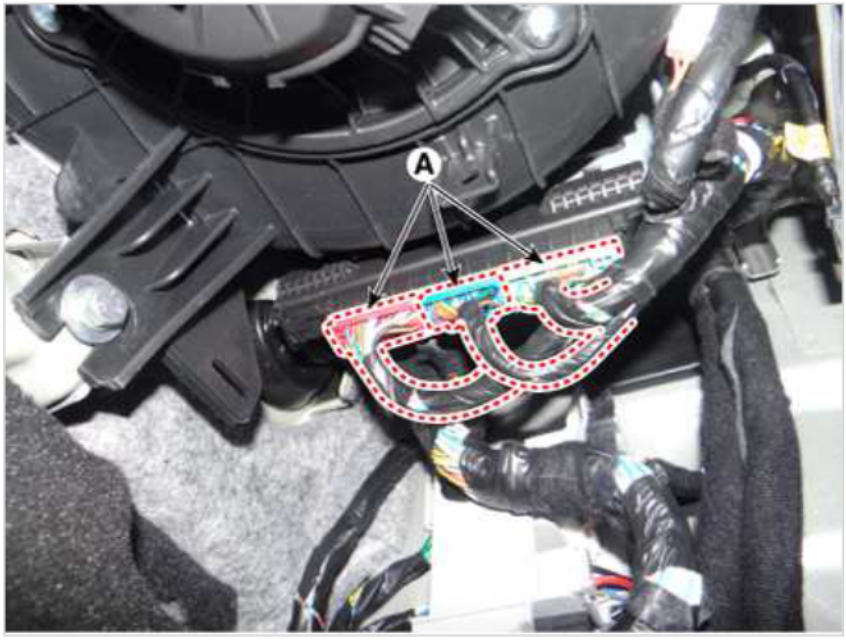
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Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the glove box housing.
   (Refer to Body - "Glove Box Housing")
3. Disconnect the blower motor connector (A) after removing the mounting clip (B).



4. Disconnect the integrated body control unit connectors (A).



5. Remove the integrated body control unit (A) after loosening the mounting nuts and bolt.

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6. Remove the wiring harness mounting clip (A) from the integrated body control unit.



Installation

1. Install the wiring harness mounting clip from the integrated body control unit.
2. Install the integrated body control unit.
3. Connect the integrated body control unit connectors.
4. Connect the blower motor connector and clip.
5. Install the glove box housing.
6. Connect the negative (-) battery terminal.

BCM Diagnosis With KDS

1. In the body electrical system, failure can be quickly diagnosed by using the vehicle diagnostic system (KDS).
   The diagnostic system (KDS) provides the following information.
   (1) Self diagnosis : Checking failure and code number (DTC)
   (2) Current data : Checking the system input/output data state
   (3) Actuation test : Checking the system operation condition
   (4) Additional function : Controlling other features including system option setting and zero point adjustment

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2. Select the "Car model" and the "Integrated body control unit (IBU)" to be checked in order to check the vehicle with the tester.
3. Select the "Current Data" menu to search the current state of the input/output data.
4. To forcibly actuate the input value of the module to be checked, select option "Actuation Test".
5. If you want to change user option, select "User Option".



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S/W Management

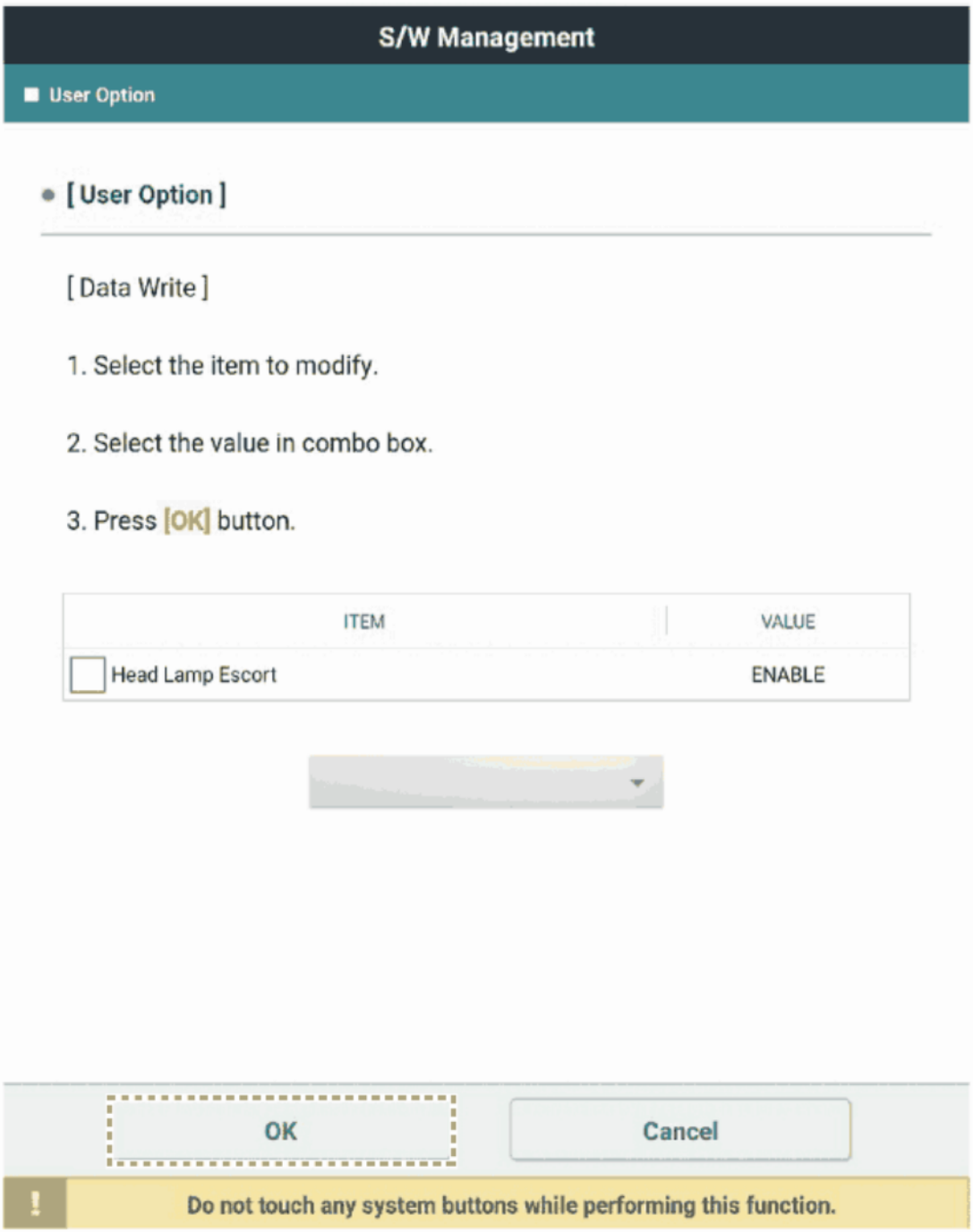
• User Option

Purpose	To check and allow users to configure the system.
Enable Condition	1.Engine Off 2.Ignition Switch On
Concerned Component	Body Electronic Control Modules (BCM, PSM, SCM, DDM, SJB, PSD)
Concerned DTC	-
Fail Safe	-
Etc	User can set the supported convenience function of vehicle.

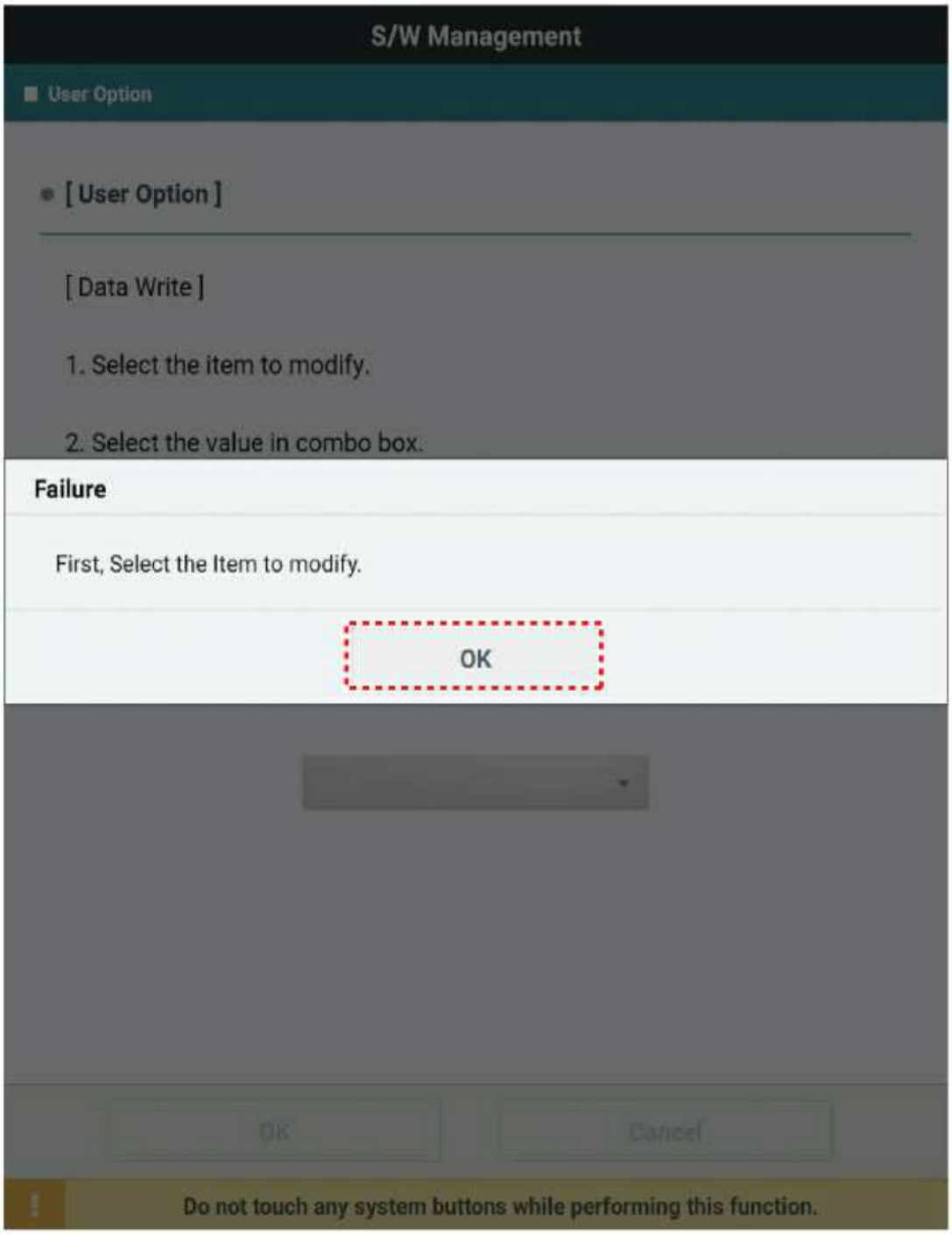
OK

! Do not touch any system buttons while performing this function.

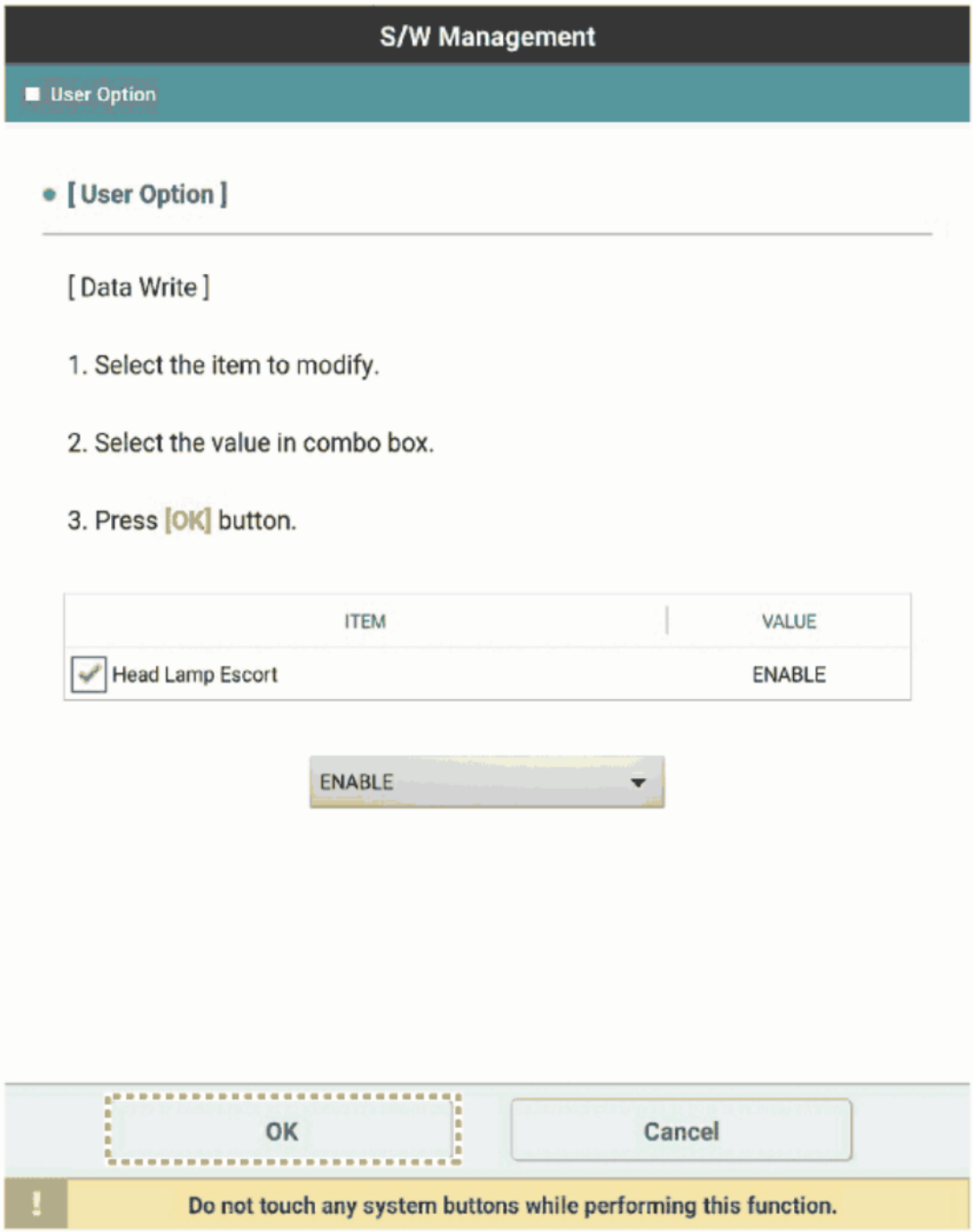
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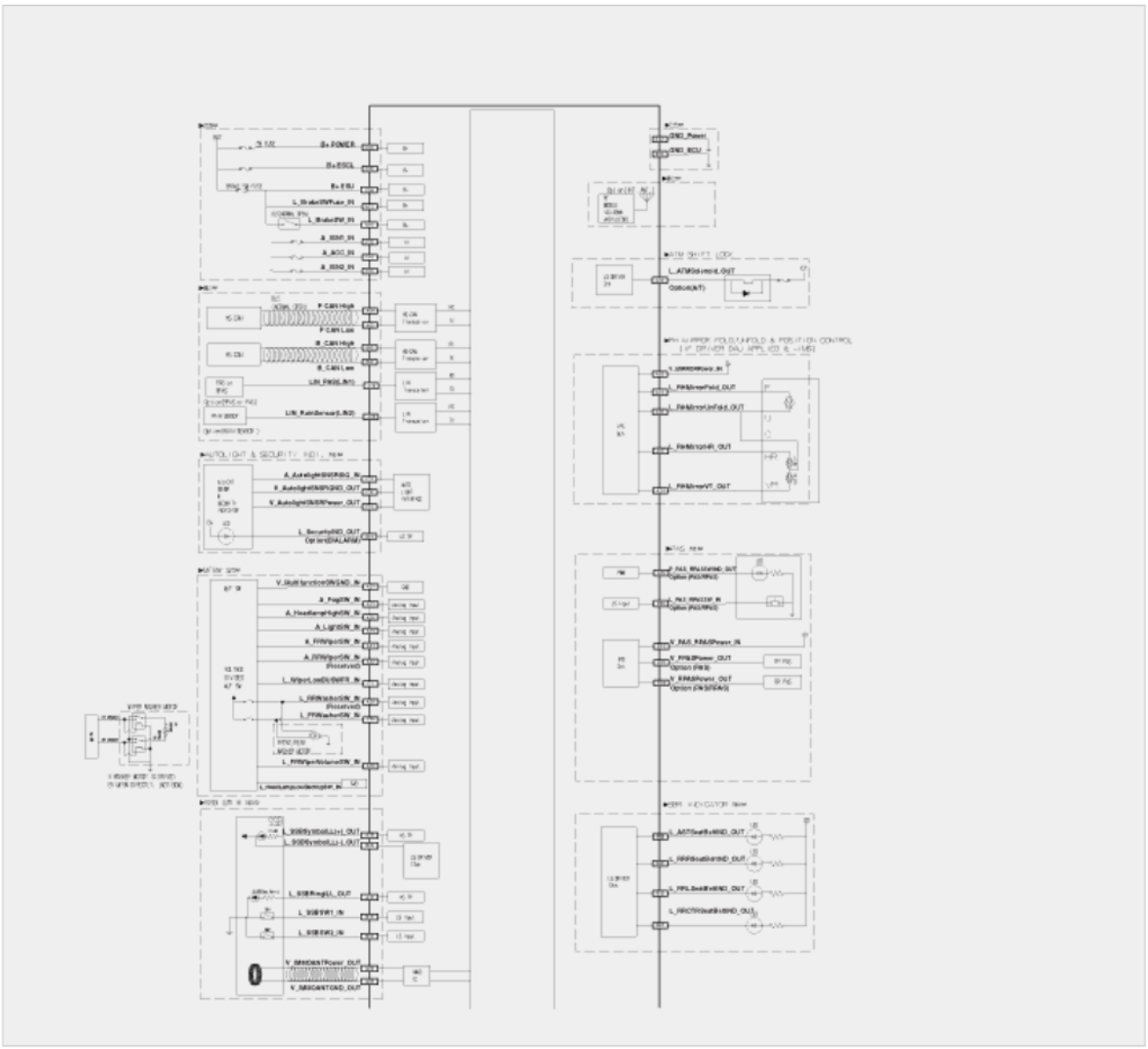


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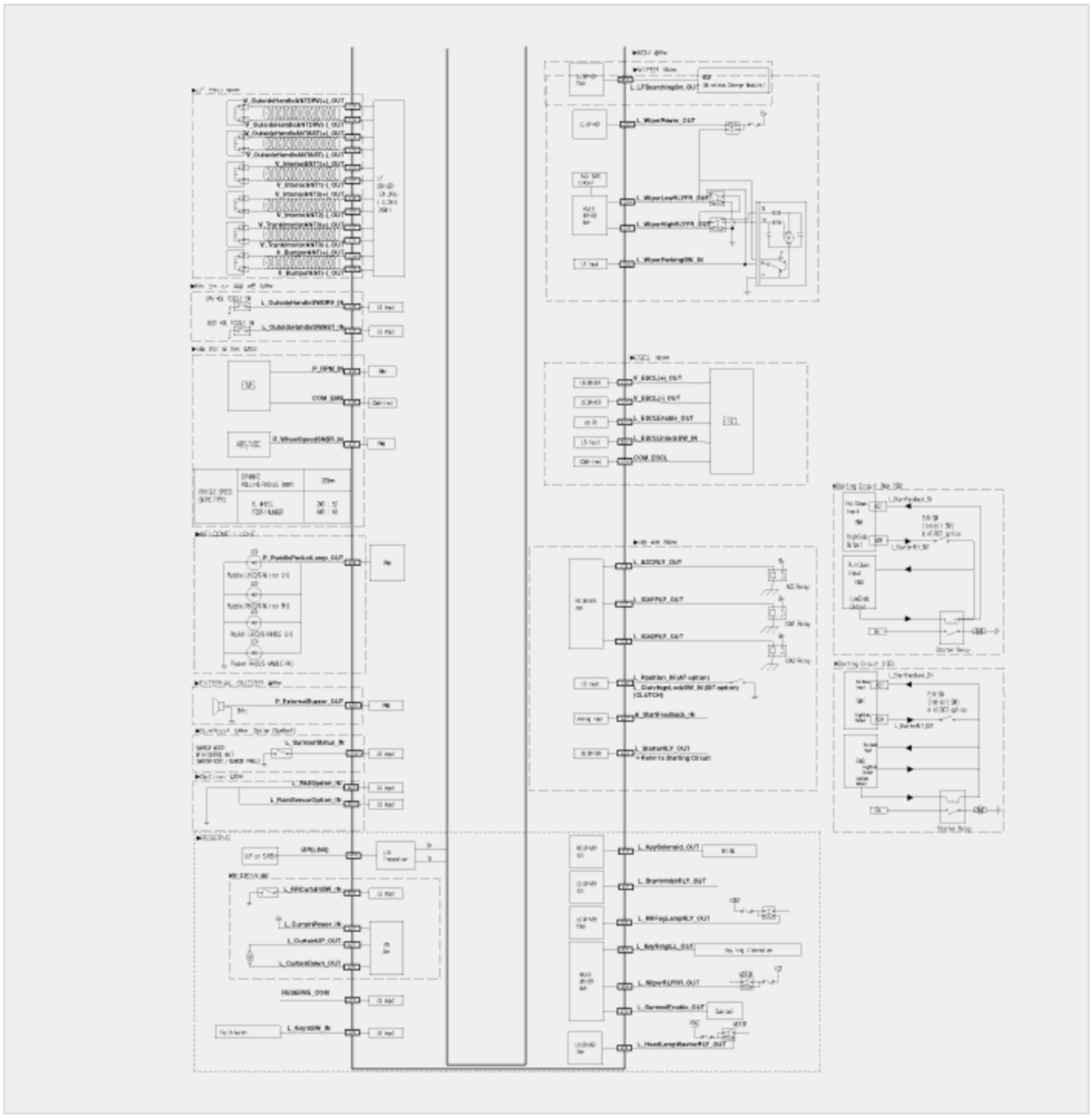


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Circuit Diagram



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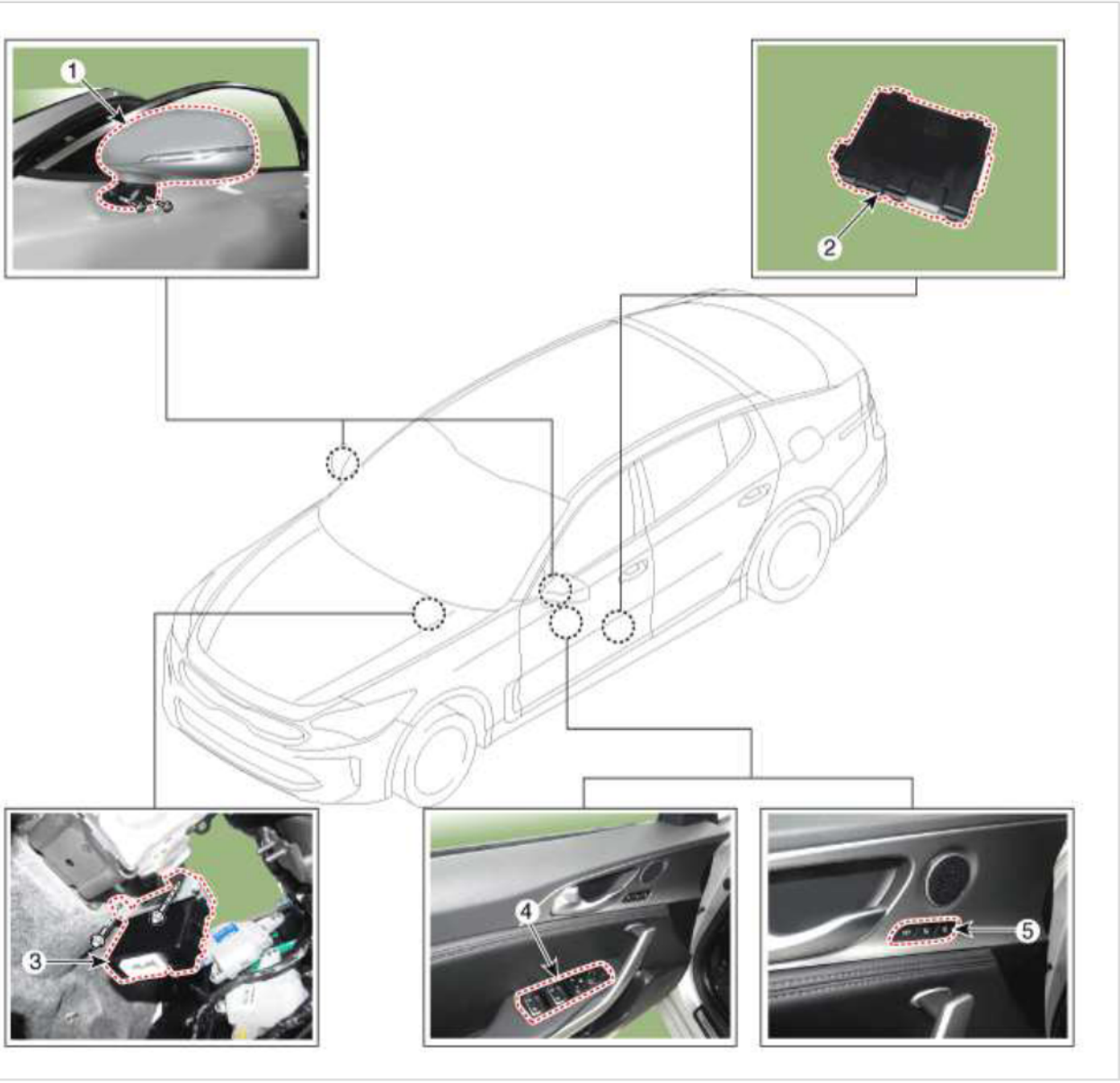
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Specifications

Items	Specifications
Rated voltage	DC 12 V
Operating voltage	DC 9 - 16 V
Operating temperature	-40 - 176°F (-40 - 80°C)
Dark current	Max. 4.0 mA

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Components



1. Outside rearview mirror
2. Memory power seat module (PSM)
3. Steering control module (SCM)
4. Driver door module (DDM)
5. IMS Mirror control (Driver power window switch)

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Description

The optimal seat position set by the driver is memorized into the power seat unit by using IMS switch. In case of the position change, the seat can restore its preset position by IMS switch.

It has safety functions of restoring process prohibition during driving and of emergency stop of the linked motion.

The main functions are as follows.

1. Manual operation : Motor control with the seat manual switch.
   (1) The position of the seat is changed by operating the motor when the signal is input with manual switch for the seat (Slide, recline, front tilt, rear height adjusting cushion extension)

2. Memory function : Available for memorizing/reproducing the data for two persons with IMS switch.
   (1) The memorized motion for the optimal seat position set by the driver based on the CAN data with 『DDM → IMS module』 with IMS switch.
   (2) Reproduction by the CAN data received from DDM during IMS switch controlling.

3. Motion linked to getting on/off
   (1) This function links motion depending on the state of ON/OFF the engine.
   (2) Use of IMS CAN data communcation.
   (3) Condition for operating getting on : When the electric power is in ACC.

Operation

Reproducing Motion

1. If the reproduction CAN data is received from DDM, the buzzer is issued one time and the seat is automatically moved to the memorized position.
2. The CAN data not memorized does not perform reproduction function.
3. If CAN data is newly received during previous data reproduction, the final data takes precedence.
4. If the reproduction CAN data is received by pressing button 1 or 2 during reproduction, the seat stops the reproduction process.
5. If the memorized CAN data is received by pressing SET button during reproduction, the seat stops the reproduction process.

> **NOTICE**
> Press the SET button once more to store the position of stop.

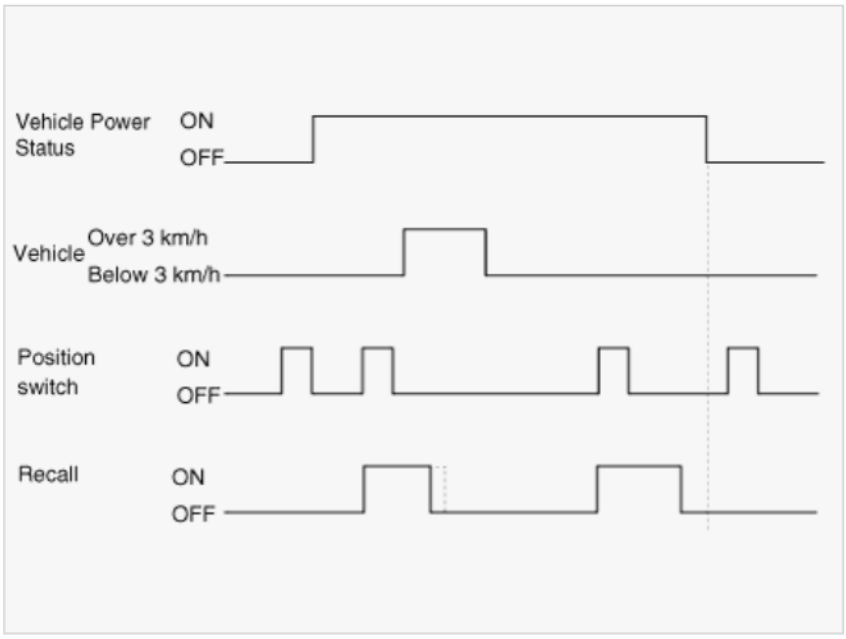
6. Automatically stop when remart switch is OFF during reproduction.
7. Do not operate the motor when the difference between the memorized position for reproduction and current position is less than 4 pulses.

Conditions for Prohibiting the Reproduction

In case any of the following conditions is met, the reproduction is prohibited and the controlling stops during reproduction.

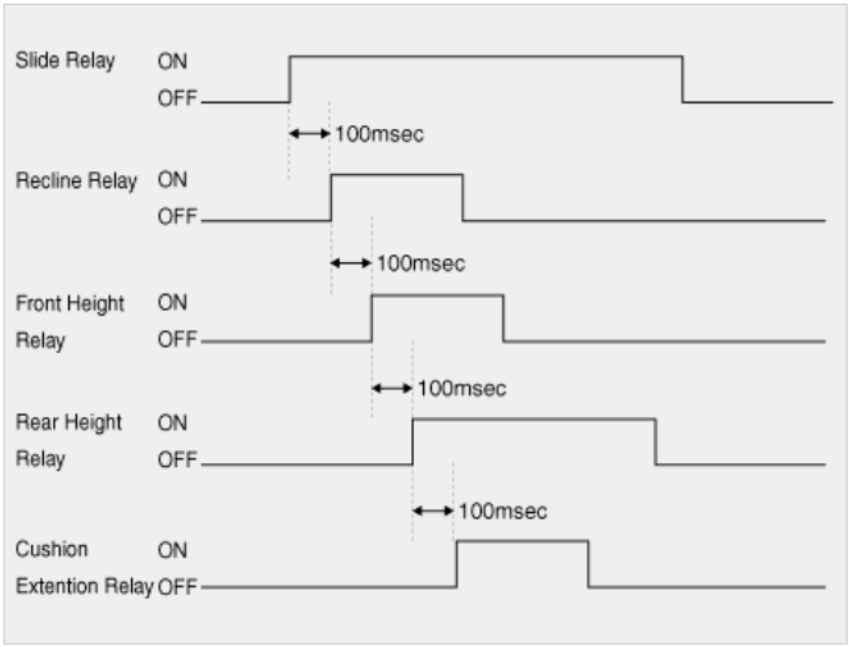
1. IGN2 OFF (Excluding within 30 seconds after door opening or closing.)
2. Higher than 3km/h of vehicle speed
3. When the switch is controlled manually
4. Operation time chart

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Decision on the Operation Priority

1. For automatic control, the motor operation shall be delayed by 100±10m sec to prevent the overlapping of inrush circuit and in this case the priority shall be given as follows.
   Slide > Backrest adjustment >Front height adjustment >Rear height adjustment > Cushion extension adjustment
   Operation time chart

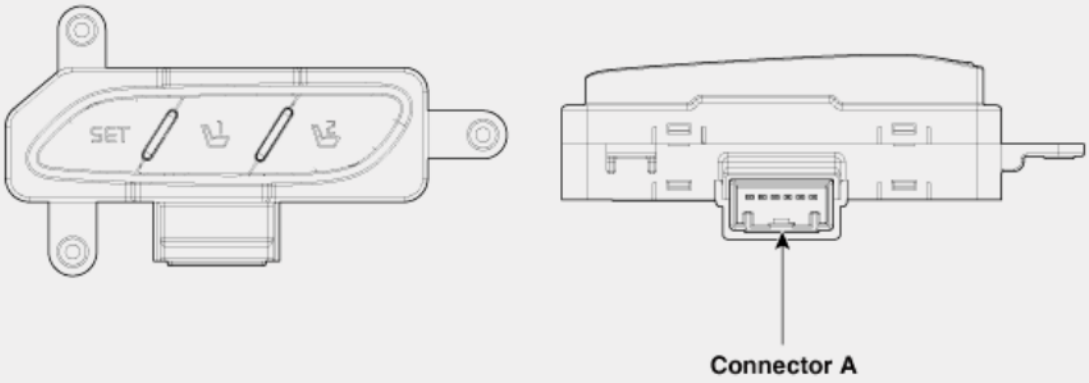


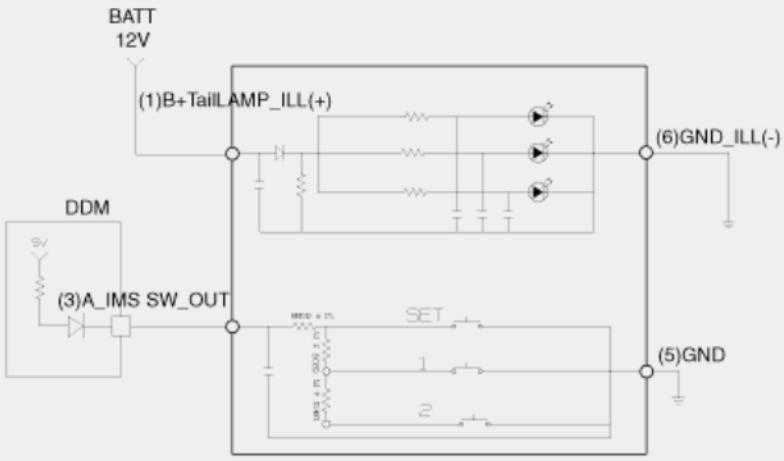
Operation Linked with Getting On/ Getting Off

1. Returning motion to backwards during getting off and to forwards during getting on (applied only to slide).
2. It is available when the automatic SET message transmitted from the driver seat power window switch (DDM) is ON.
3. Operation starts when the engine is off and driver seat door is opened.
4. Moving to the targeted position of ACC ON.
5. Conditions for prohibiting operation.
   – Vehicle speed is 3km/h or more.
   – Power seat manual control switch is operated.
   – Reproduction command is received while getting on the vehicle.
   – Driver settings menu (USM) is OFF.

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Components





Connector A	No.	Description	No.	Description
	1	Illumination (+)	4	-
	2	-	5	Ground
	3	IMS Switch	6	Illumination (-)

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Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the driver front door trim.
   (Refer to Body - "Front Door Trim")
3. Disconnect the intergrated memory seat switch connector (A).



4. Remove the intergrated memory seat switch (A) after loosening the mounting screws.



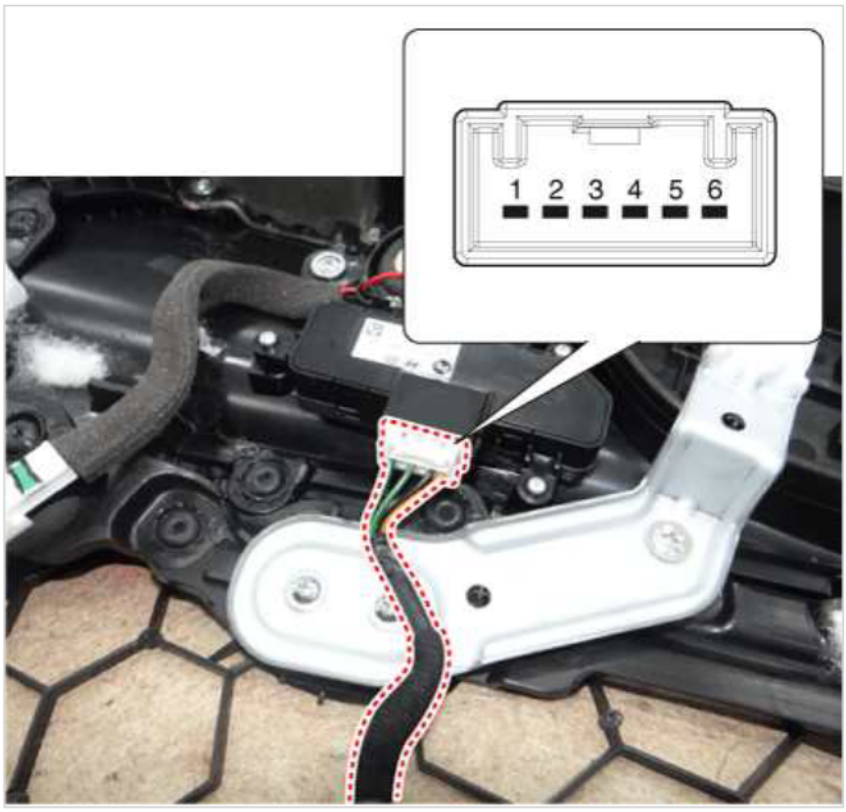
Installation

1. Install the intergrated memory seat switch.
2. Connect the inegrated memory seat switch connector.
3. Install the driver front door trim.
4. Connect the negative (-) battery terminal.

Inspection

1. Remove the intergrated memory seat switch connector.

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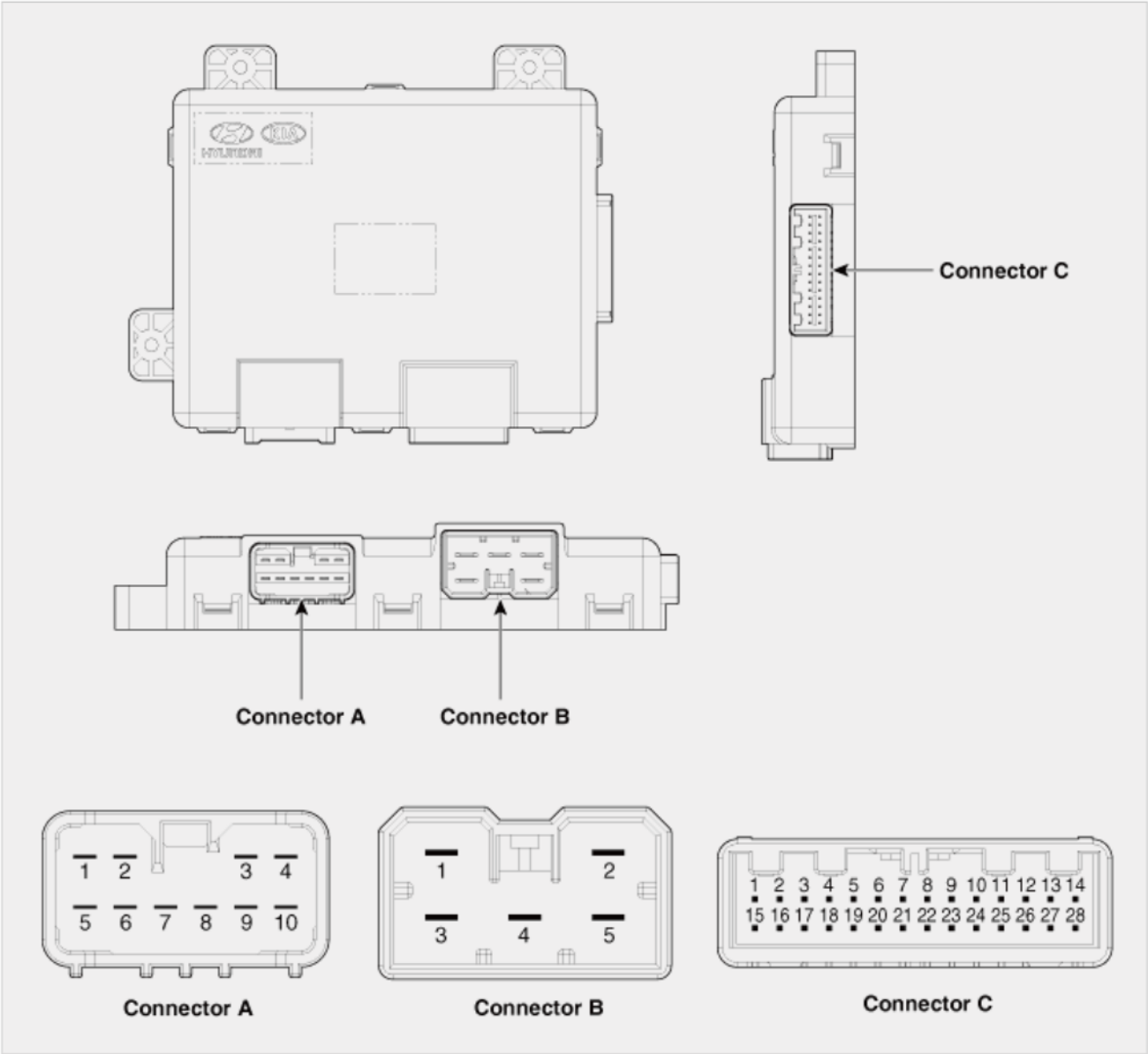


2. When each switch is pressed, check the electricity flow between intergrated memory seat switch connector and grounding, and if the electricity does not match the specification, replace the switch.

Switch	Connector Terminal	Resistance
SET	3-5	680Ω
Memory 1		1.5 kΩ
Memory 2		3.3 kΩ

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Components



Connector Pin Information

No	Connector A	Connector B	Connector C
1	Cushion extension motor (Front)	Battery (+)	Slide switch (Front)
2	Recline motor (Front)	Ground	Recline switch (Front)
3	Rear height motor (Up)	Battery (+)	Frout tilt switch (Up)
4	Slide motor (Front)	-	Rear height switch (Up)
5	Cushion extension motor (Rear)	Ground	Cushion extension switch (Front)
6	Recline motor (Rear)		B-CAN (High)
7	Front tilt motor (Up)		B-CAN (Low)
8	Front tilt motor (Down)		-
9	Rear height motor (Down)		-
10	Slide motor (Rear)		Slide hall sensor
11			Front tilt hall sensor
12			-
13			Seat position sensor power

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14			IGN1
15			Slide switch (Rear)
16			Recline switch (Rear)
17			Front tilt switch (Down)
18			Rear height switch (Down)
19			Cushion extension switch (Rear)
20			Ground
21			-
22			-
23			-
24			Recline hall sensor
25			Rear height hall sensor
26			Cushion extension hall sensor
27			-
28			Battery (+)

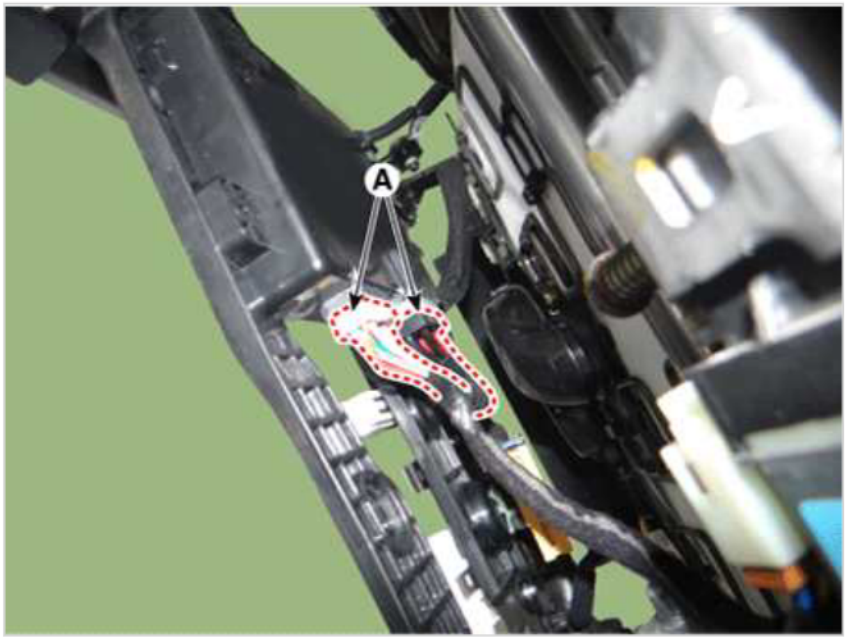
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Removal

1. Before removing the driver side seat assembly, pull it upward to the maximum by pushing the front seat height adjusting switch (A).



2. Disconnect the negative (-) battery terminal
3. Remove the driver front seat assembly.
   (Refer to Body - "Front Seat Assembly")
4. Disconnect the integrated memory seat unit connectors (A).



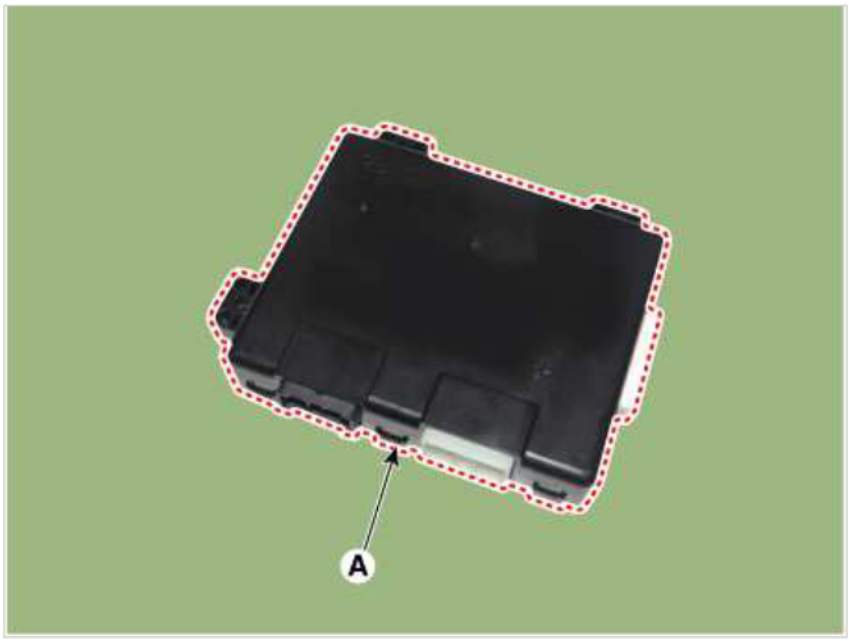
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5. Remove the integrated memory seat unit (A) after loosening the mounting screws.



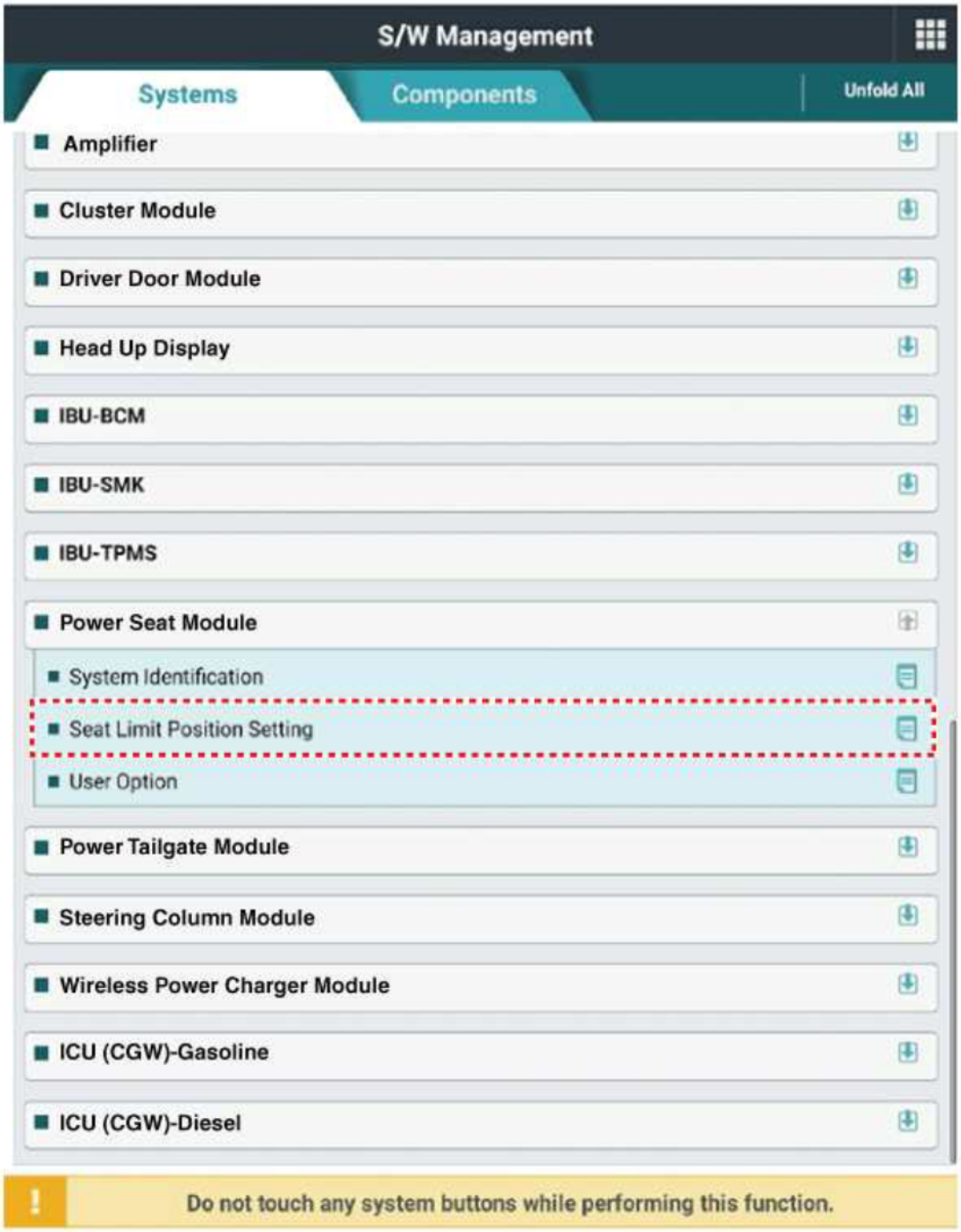
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Installation

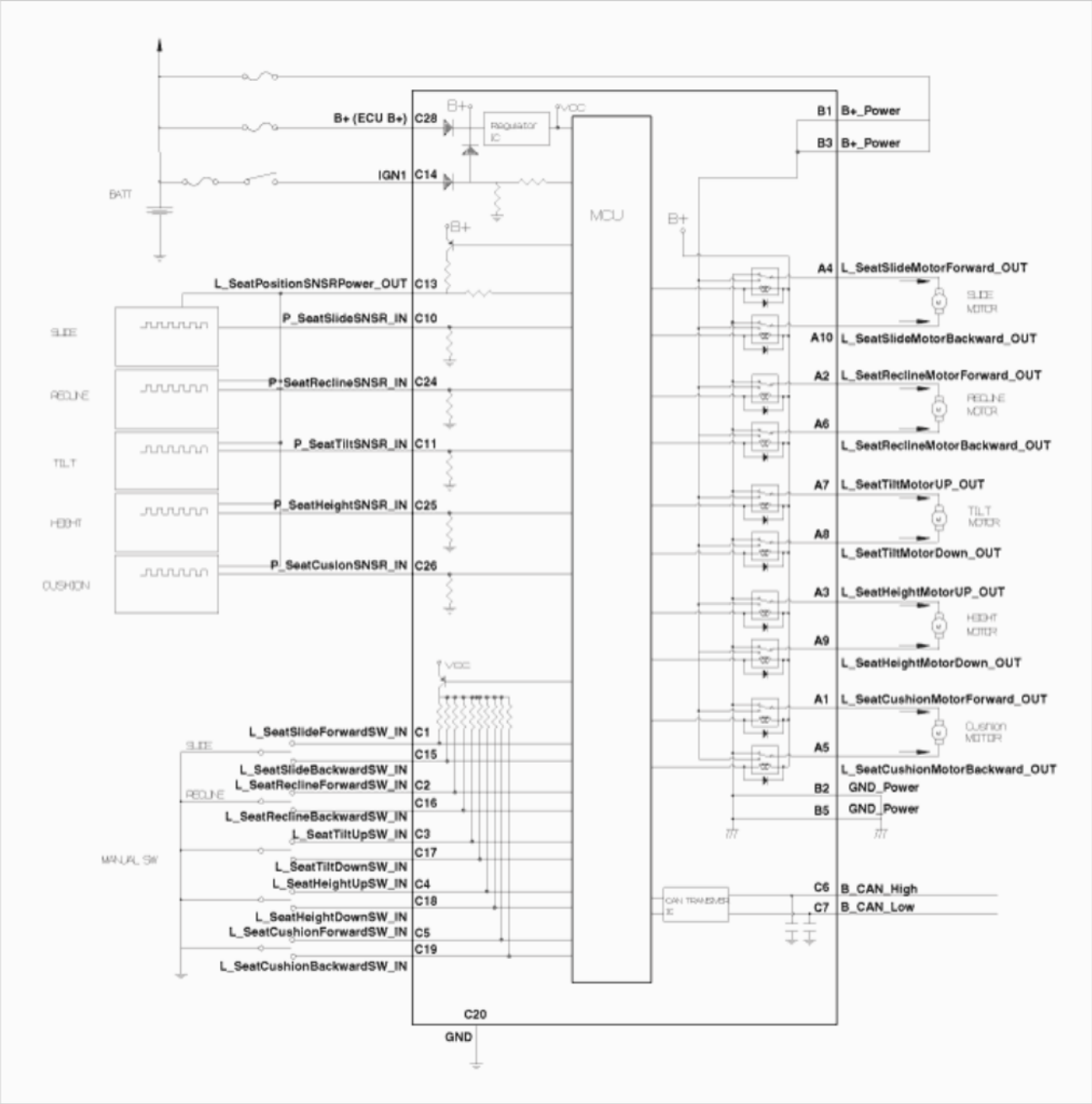
1. Install the integrated memory seat unit.
2. Connect the integrated memory seat unit connectors.
3. Install the driver front seat assembly.
4. Connect the negative (-) battery terminal.
5. Perform the seat limit position setting using the KDS.

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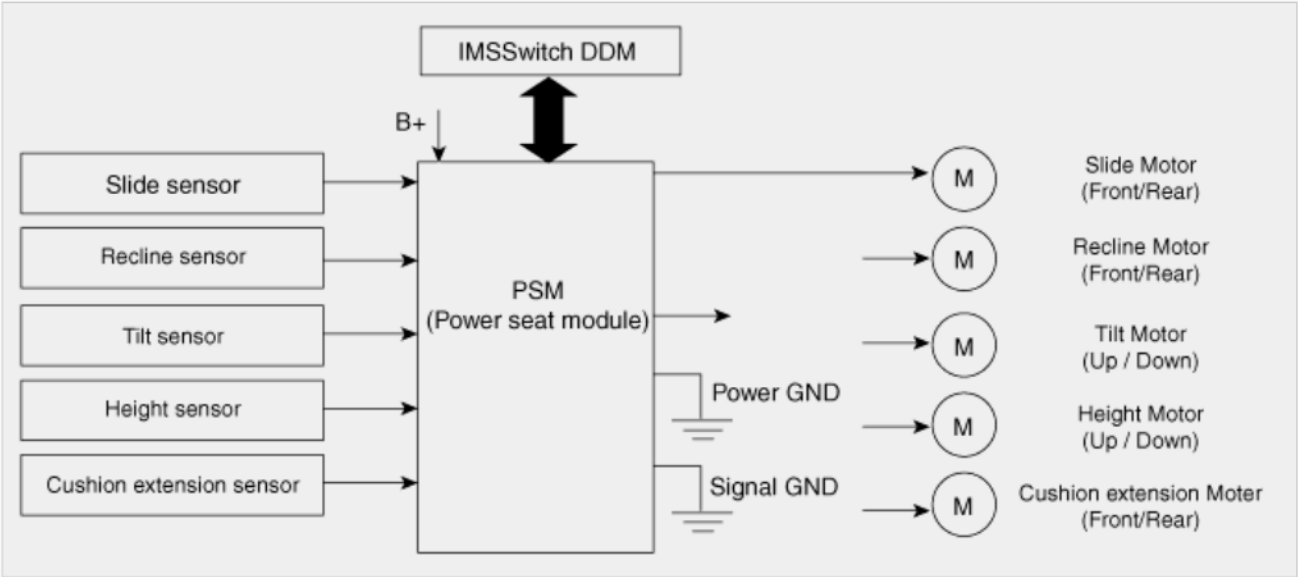
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Circuit Diagram



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Components



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Specifications

Memory Power Seat Unit

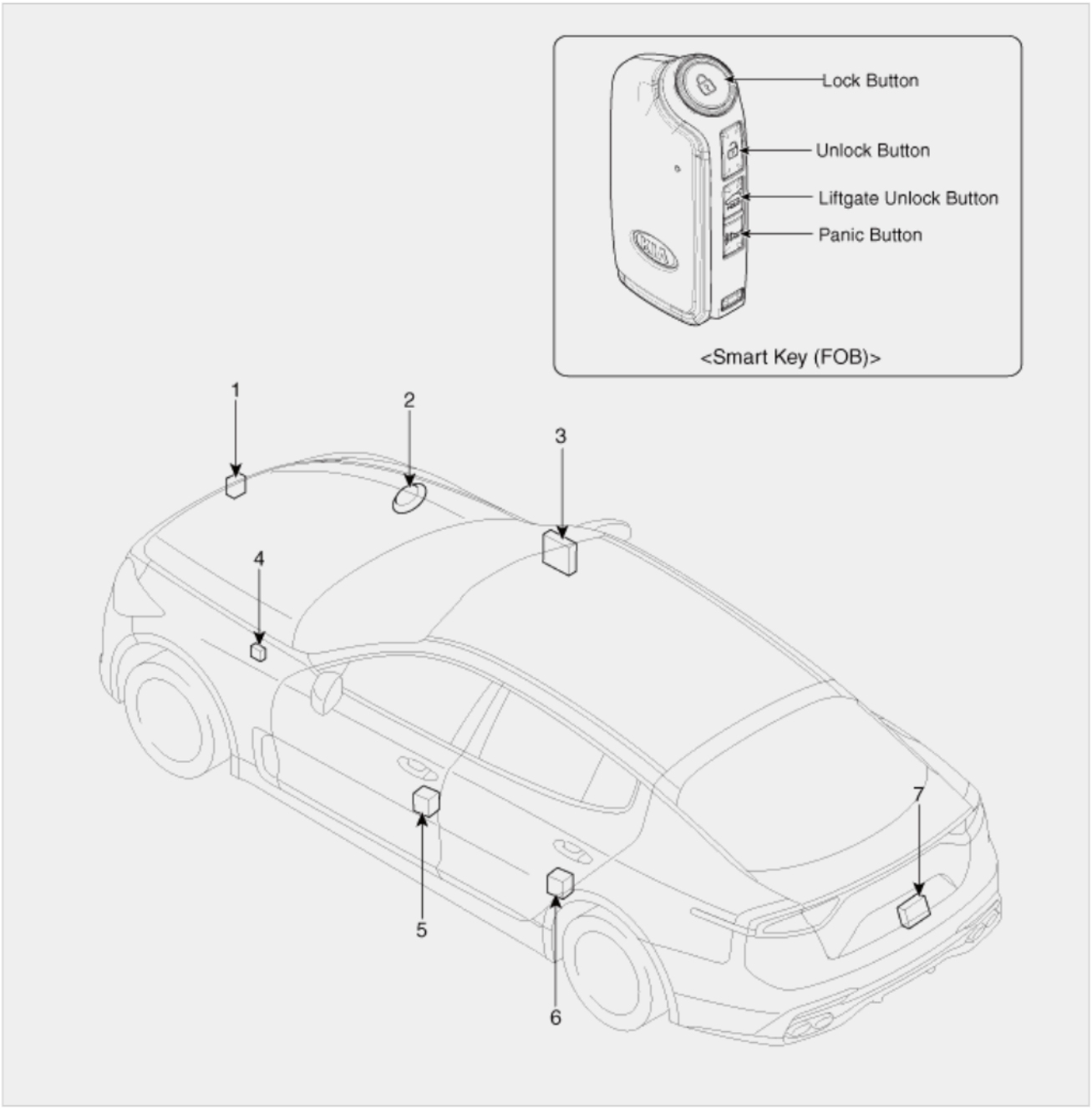
Item	Specifications
Rated voltage	DC 12 V
Operating voltage	DC 9 - 16 V
Operating temperature range	-22 - 167°F (-30 - 75°C)
Dark current	Max. 1.2 mA

Memory Power Seat Switch

Item	Specifications
Rated voltage	DC 12 V
Type	Soft Feeling Tact type
Operating temperature range	-22 - 176°F (-30 - 80°C)

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Component Location



1. Hood switch
2. Burglar horn
3. Integrated body control unit (IBU)
4. Door lock / unlock buzzer
5. Front door actuator & switch
6. Rear door actuator & switch
7. Liftgate actuator & switch

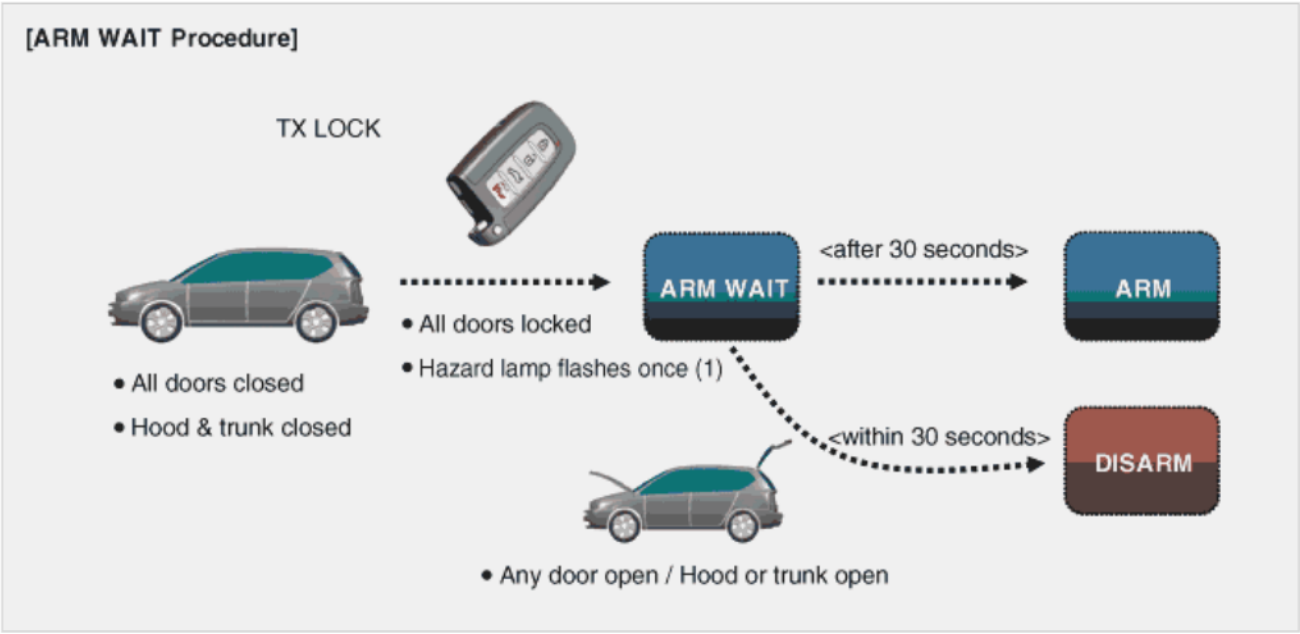
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Description

Burglar Alarm State [B/A State]

B/A State	Description
DISARM	1) This is the state when "ARM" mode is off. 2) If all doors or hood or liftgate are opened, there is no alarm sound. 3) Security indicator keeps blinking in IGN OFF while it lights out in ACC ON.
ARMWAIT	1) If the BCM receives locking signals from remote control or Passive lock (specification of Smart Key) or driver's seat door key lock with the conditions for "ARM WAIT" satisfied, the BCM waits for 30 seconds after outputting "All Door Lock" signal before entering "ARM WAIT" mode. 2) For 30 seconds of "ARM WAIT" mode, there is no alarm sound and "ARM" mode turns off even if a burglary occurs. 3) Under any conditions, it is impossible to directly enter "ARM" mode without passing through "ARM WAIT" mode. 4) Security indicator remains on for 30 seconds of "ARM WAIT" mode.

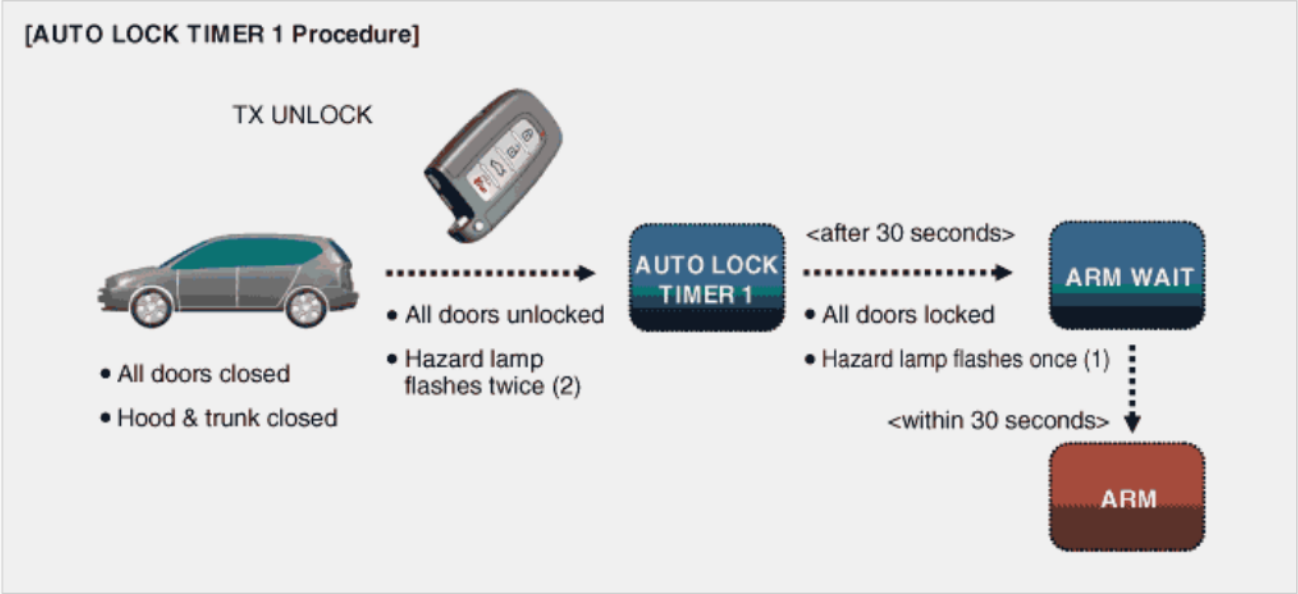
[ARM WAIT Procedure]



※ Remark: For a vehicle equipped with Smart Key system, the same process is applied to Passive door lock function.

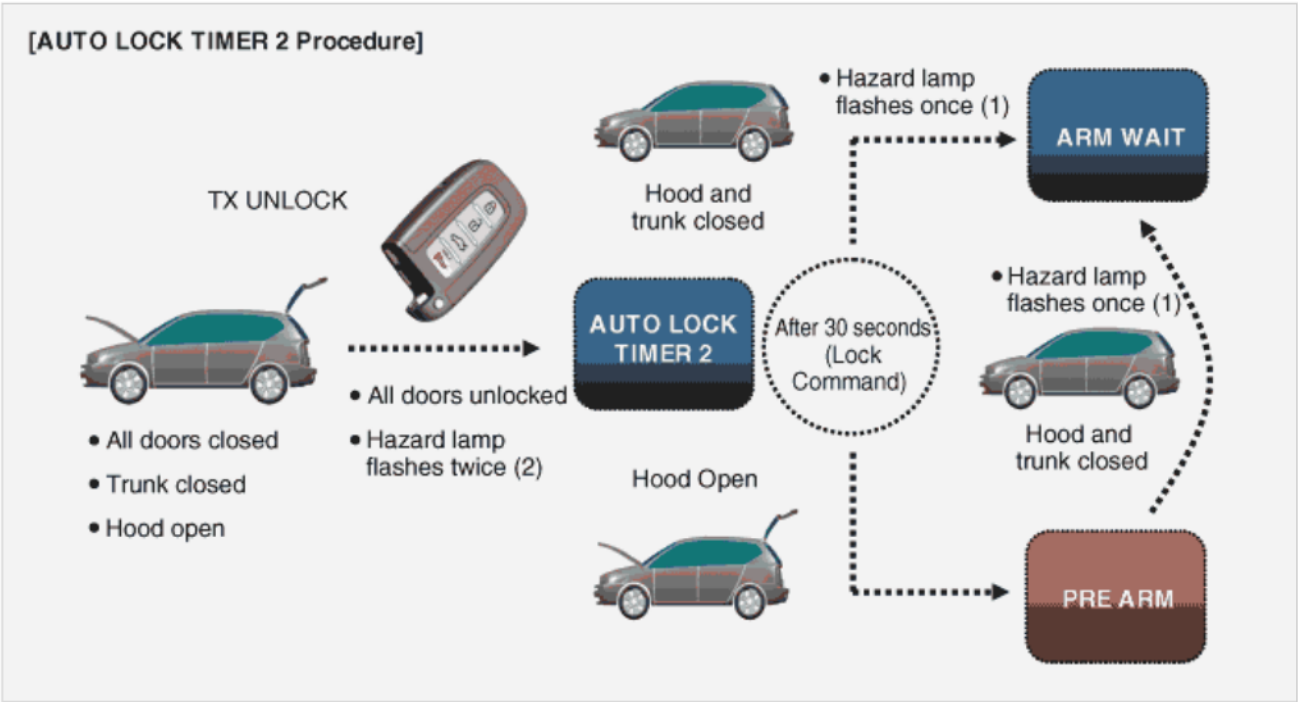
B/A State	Description
AUTO LOCK TIMER 1	1) This is a similar function to RELOCK (automatic locking system after 30 seconds). 2) If UNLOCK button in remote control is pressed with "ARM WAIT" conditions satisfied, or in "ARM" mode, all doors are unlocked and then timer set for 30 seconds starts running. 3) After the 30 seconds the BCM automatically outputs all door lock signal and enters "ARM WAIT" mode. 4) After AUTO LOCK TIMER 1 (30 seconds) runs out, the BCM automatically enters "ARM" mode via "ARM WAIT" mode (30 seconds). 5) In case that the driver presses UNLOCK button by mistake, this safety function lets the vehicle enter "ARM" mode after 60 seconds. 6) Security indicator keeps blinking throughout AUTO LOCK TIMER1 process.

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※ Remark: For a vehicle equipped with Smart Key system, the same process is applied to Passive door lock function.

B/A State	Description
AUTO LOCK TIMER 2	1) This shares the same purpose with AUTO LOCK TIMER 1 but operation conditions are different. 2) This function operates if UNLOCK button in the remote control is pressed when all doors are closed except hood or liftgate. After 30 seconds, the vehicle automatically enters door lock mode. 3) But after the 30 seconds, it is impossible to move to "ARM WAIT" mode because hood or liftgate is open ("PRE ARM" mode is maintained). 4) As soon as hood or liftgate is closed, the vehicle automatically moves to "ARM" mode via "ARM WAIT". 5) During AUTO LOCK TIMER 2, security indicator keeps blinking.

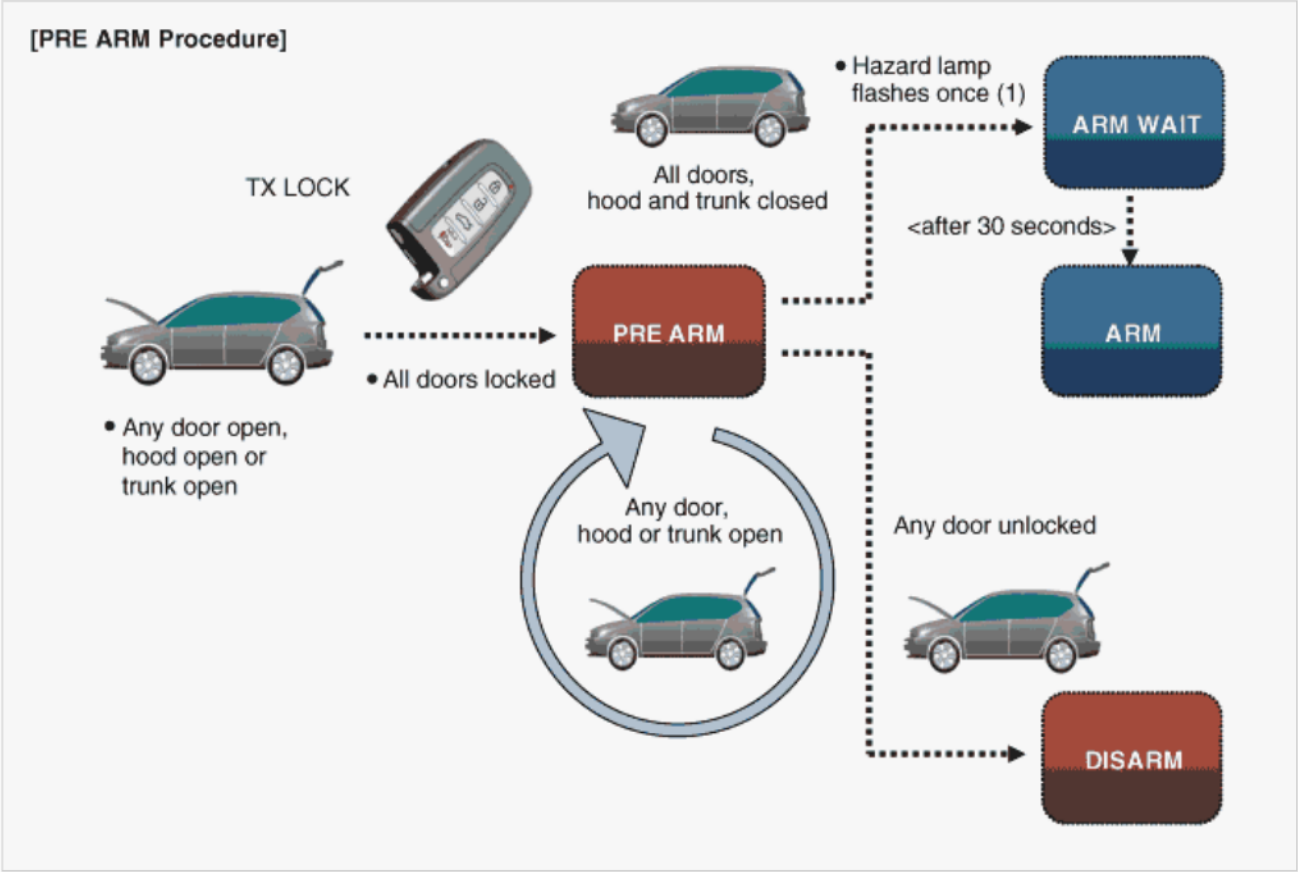


※ Remark: For a vehicle equipped with Smart Key system, the same process is applied to Passive door lock function.

B/A State	Description
PRE ARM	1-1. This is the state right before entering "ARM" mode after AUTO LOCK Timer 2 is completed and all doors are closed. 1-2. If the driver closes hood or liftgate, hazard lamp blinks one time and then the vehicle automatically enters "ARM" mode via "ARM WAIT" mode. 2-1. If LOCK button is pressed while at least one of all doors, hood and liftgate is open, "PRE ARM" mode turns on.

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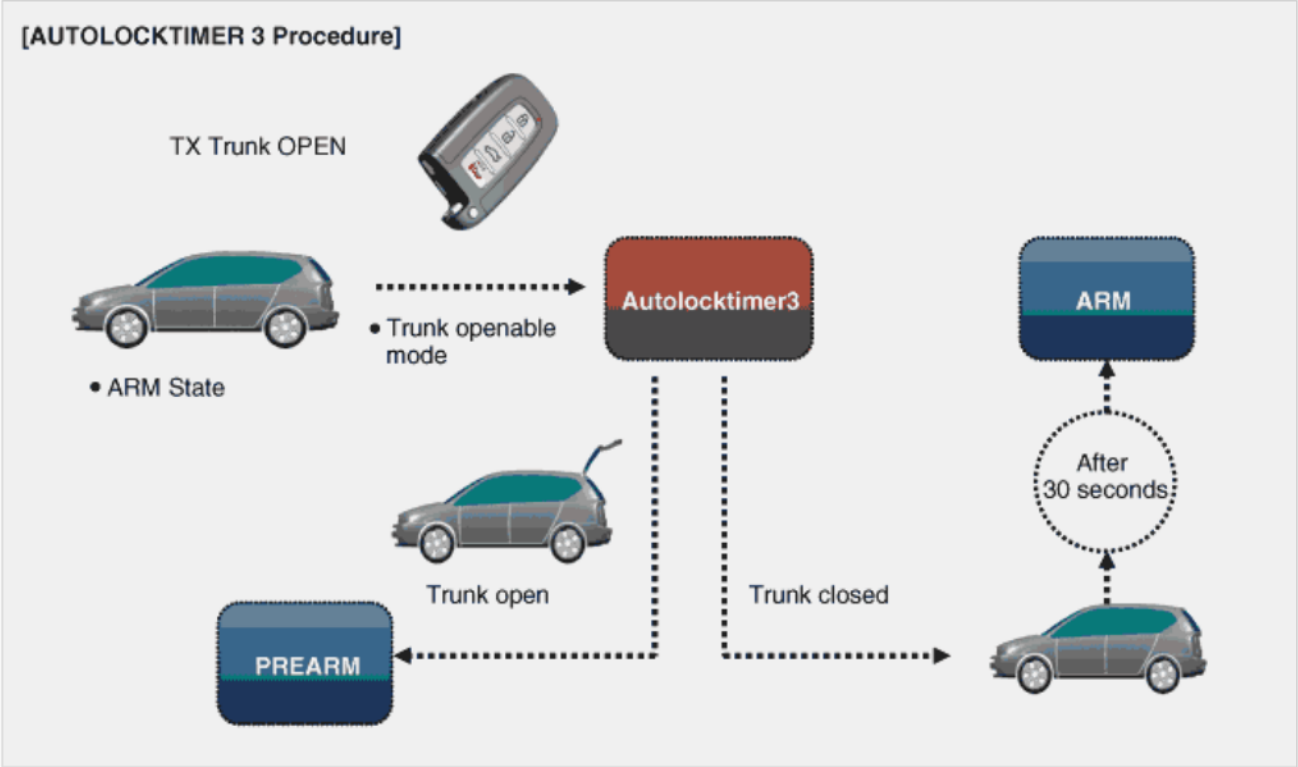
	2-2. Because all doors locking signal is issued but the conditions for "ARM WAIT" are not satisfied, the vehicle remains in standby mode and enters ARM mode via ARM WAIT mode as soon as the door being open is closed. 2-3. In case intrusion is detected in PRE ARM mode, the vehicle turns into DISARM mode. 2-4. Security indicator keeps blinking in PRE ARM mode.



B/A State	Description
RE ARM	1) In "REARM" state, if the vehicle intrusion is detected, flashing and alarm sound are activated again and the state changes to ALARM mode. 2) Burglar Alarm state moves to RE ARM mode after the timer of 27 seconds is completed. 3) Security Indicator keeps blinking.

B/A State	Description
AUTOLOCK TIMER3	1) B/A state changes to "AUTOLockTIMER3", when TX-Liftgate command operated. 2) B/A state changes "AUTOLOCKTIMER3" to "ARMWAIT", when the "30sec." timer expires with all doors lock and closed. 3) B/A state changes "AUTOLOCKTIMER3" to "DISARM", when any door open. 4) In "AUTOLOCKTIMER3" state, timer "30sec." timer is running. If this timer expired, state transits to "PREARM" state with Liftgate Open. 5) In this state, Security indicator keeps blinking

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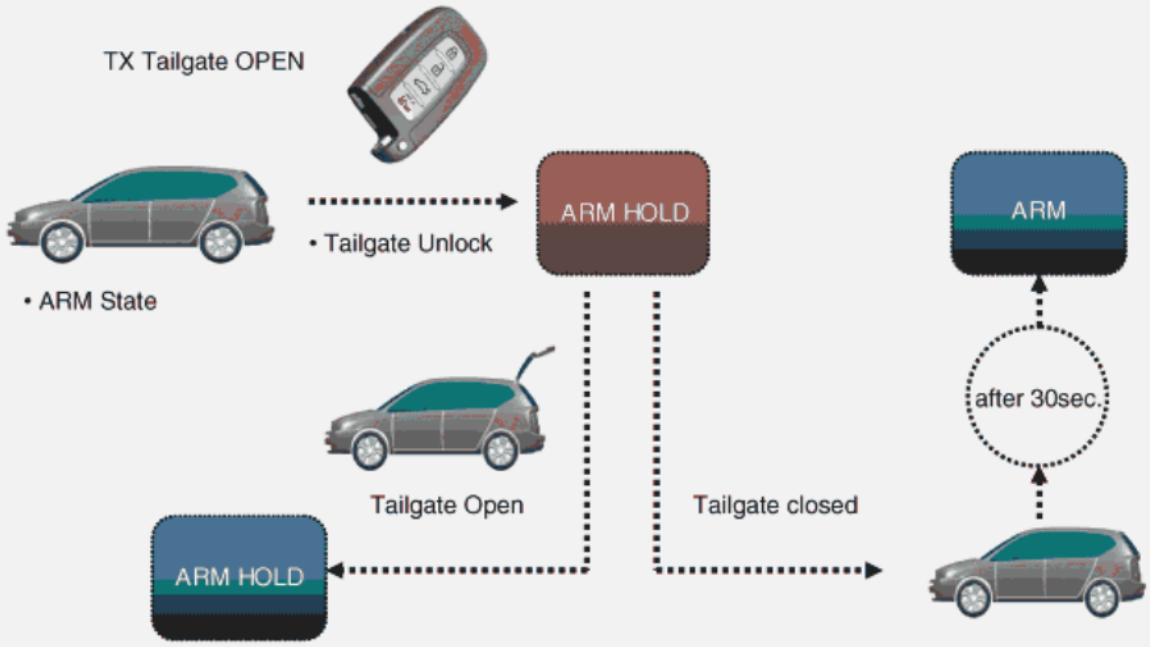


B/A State	Description
ARM HOLD (Alarm hold : Liftgate) ※Non-PTL option	1) "ARM HOLD" mode is similar to the existing liftgate alarm hold mode. 2) If liftgate is opened by a remote control (including smart key) in ARM mode, the vehicle enters ARM HOLD mode which holds off the burglar alarm only for the open liftgate. 3) As long as liftgate is closed, ARM HOLD mode keeps on without break. 4) When the opened liftgate is shut down, timer set for 30 seconds starts running. For the 30 seconds of ARM HOLD mode, burglar alarm does not go off if liftgate is opened. 5) When 30 seconds pass after liftgate is closed, the vehicle immediately enters ARM mode. 6) During ARM HOLD more, ARM mode is maintained for doors and hood so if intrusion through any door or hood is detected, burglar alarm normally goes off. 7) Security indicator keeps blinking during ARM HOLD mode.

Note 1: ARM HOLD is a mode that defers activation of ARM mode only for liftgate. During ARM HOLD mode, ARM mode is applied to doors and hood.
Note 2: When using the ignition key to open the liftgate, the ARM HOLD function works in the same way, provided that the "Door Key Burglar Alarm" function should be enabled. if this is disabled, the key-based ARM HOLD is off and using the key to opening the liftgate is determined as a theft and the alarm is issued.

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[ARM HOLD Procedure]



B/A State	Description
RE ARM (ARM mode is on again)	1) If the door, hood and liftgate are all closed after the termination of ALARM mode, it means that the ARM mode is on again. 2) At this time the actuator state (door lock/unlock) is neglected and ARM mode is kept until the remote control signal is received (normal ARM mode). 3) The security indicator keeps flickering during this mode.
RESET	1) When the battery is removed in ALARM or RE ARM mode, RESET mode is on. 2) When the battery is installed after RESET, the theft alarm operation resumes.(instead of remained output, the cycle of 27 seconds ON/10 seconds OFF repeats three times)

B/A State	Description
KEY ON 30 second deactivation (Non-Smart Key option)	1) For a vehicle without smart key option, if it waits for 30 seconds with the ignition key on during ALARM mode, the vehicle enters DISARM mode. 2) Even before 3O seconds pass, if the engine starts (Alternator "L" terminal voltage is HI: sent from the cluster module to CAN data), the theft alarm is instantly deactivated. (No ignition inhibition: The immobilizer system is applied as a basic function so the ignition system is normally operated by the registered immobilizer key during alarming) ※ For a smart key-based vehicle, the alarm is deactivated instantly after the smart key authentication.
When ARM mode is on, the liftgate OPEN and central door unlock are not allowed.	1) From the moment that a vehicle enters ARM WAIT mode by activating all door lock using the remote control or smart key, the central door unlock switch of the indoor liftgate unlock switch or DDM & ADM (power window switch of driver and passenger seat) is disabled. (theft prevention) ※ The function is equally applied to ARM WAIT/ARM/ALARM/RE ARM modes.

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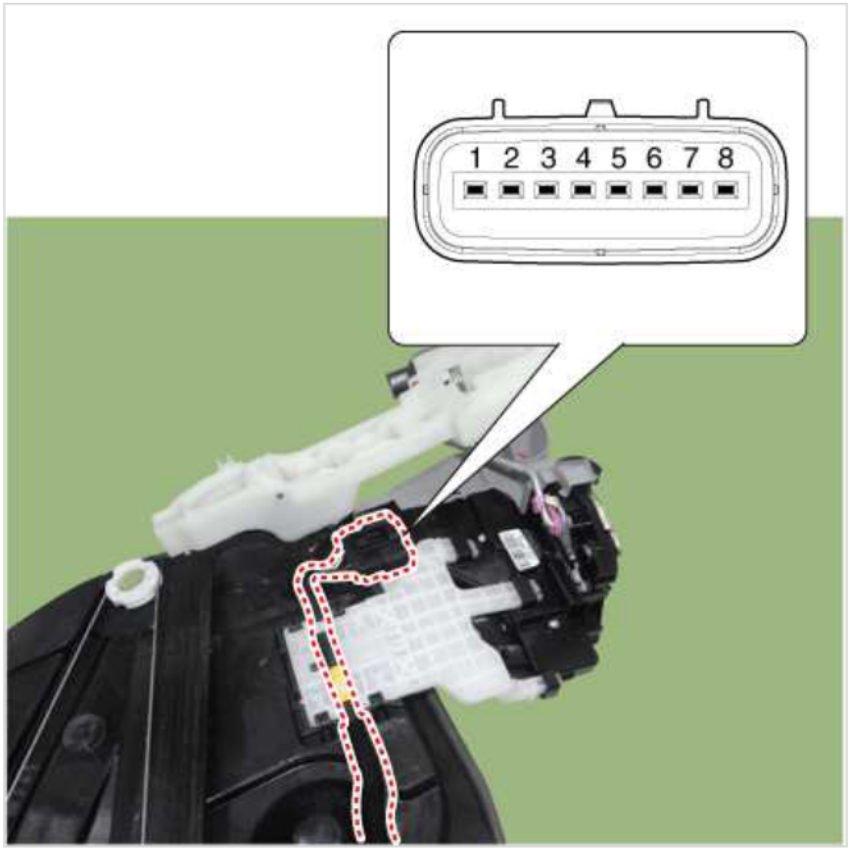
Inspection

⚠ CAUTION

- When removing with a flat-tip screwdriver or remover, wrap protective tape around the tools to prevent damage to components.
- When removing the interior trim pieces, use a plastic panel removal tool not to damage the surface.
- Be careful to store and handle the trim when removing/installing because lubricant and oil can leave a stain on the trim.

Front Door Lock Module Inspection

1. Remove the front door trim.
   (Refer to Body - "Front Door Trim")
2. Remove the front door module.
   (Refer to Body - "Front Door Module")
3. Disconnect the connector from the actuator.



[Central Lock]

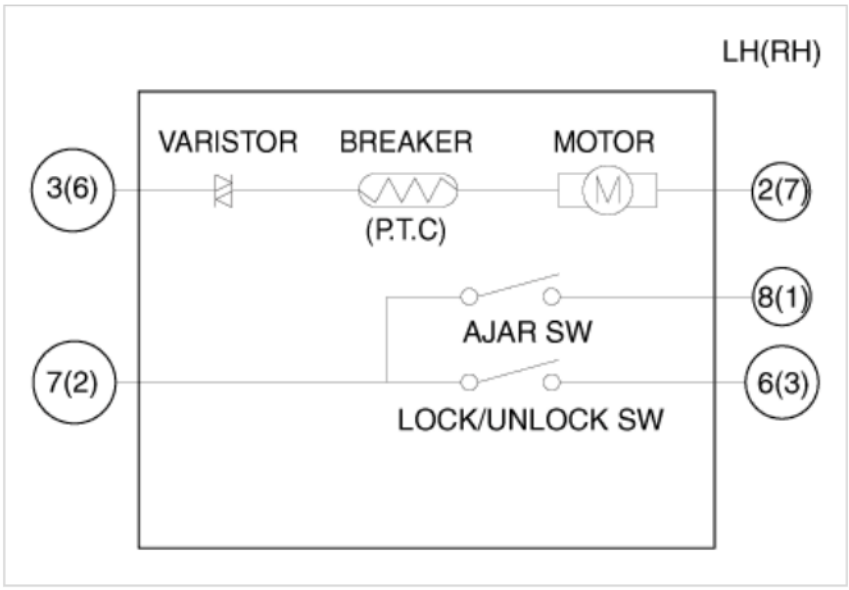
No.	Pin Information	
	LH	RH
1	-	AJAR switch
2	Motor 1	COM
3	Motor 2	Lock / Unlock switch
4	-	-
5	-	-
6	Lock / Unlock switch	Motor 2
7	COM	Motor 1
8	AJAR switch	-

4.

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Check actuator operation by connecting power and ground as shown below. To prevent damage to the actuator, apply battery voltage only momentarily.

[Central Lock (Without key switch)]



[Central Lock]

LH(RH)

Operation / Terminal	Central Lock	Central Unock
2(7)	+ (-)	- (+)
3(6)	- (+)	+ (-)
6(2) & 7(3)	ON → OFF	OFF → ON
7(1) & 8(2)	Door open & Half-latching (1st detent) = ON Full-latching (2nd close) = OFF	

Rear Door Lock Module Inspection

1. Remove the rear door trim.
   (Refer to Body - "Rear Door Trim")
2. Remove the rear door module.
   (Refer to Body - "Rear Door Module")
3. Disconnect the connector from the actuator.

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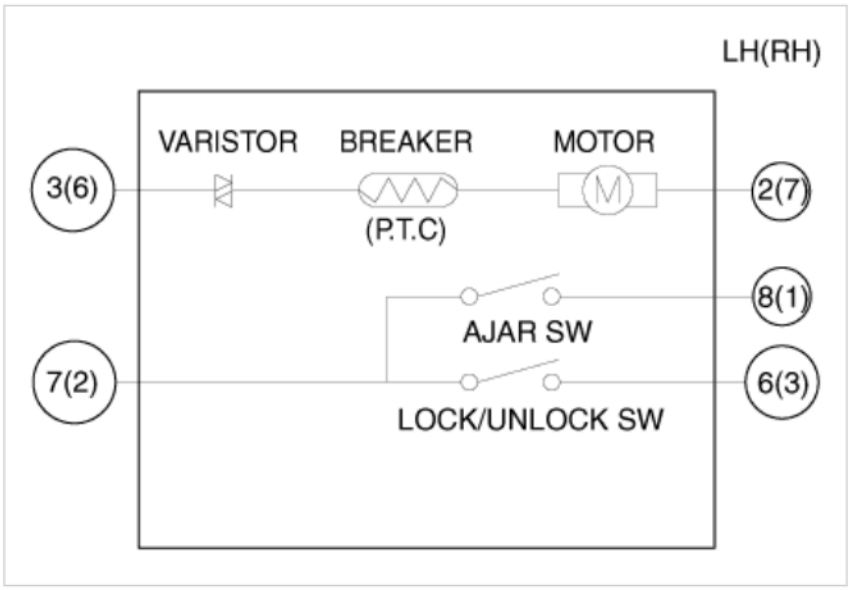
[Central Lock]

No.	Pin Information	
	LH	RH
1	-	AJAR switch
2	Motor 1	COM
3	Motor 2	Lock / Unlock switch
4	-	-
5	-	-
6	Lock / Unlock switch	Motor 2
7	COM	Motor 1
8	AJAR switch	-

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

[Central Lock (Without key switch)]

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[Central Lock]

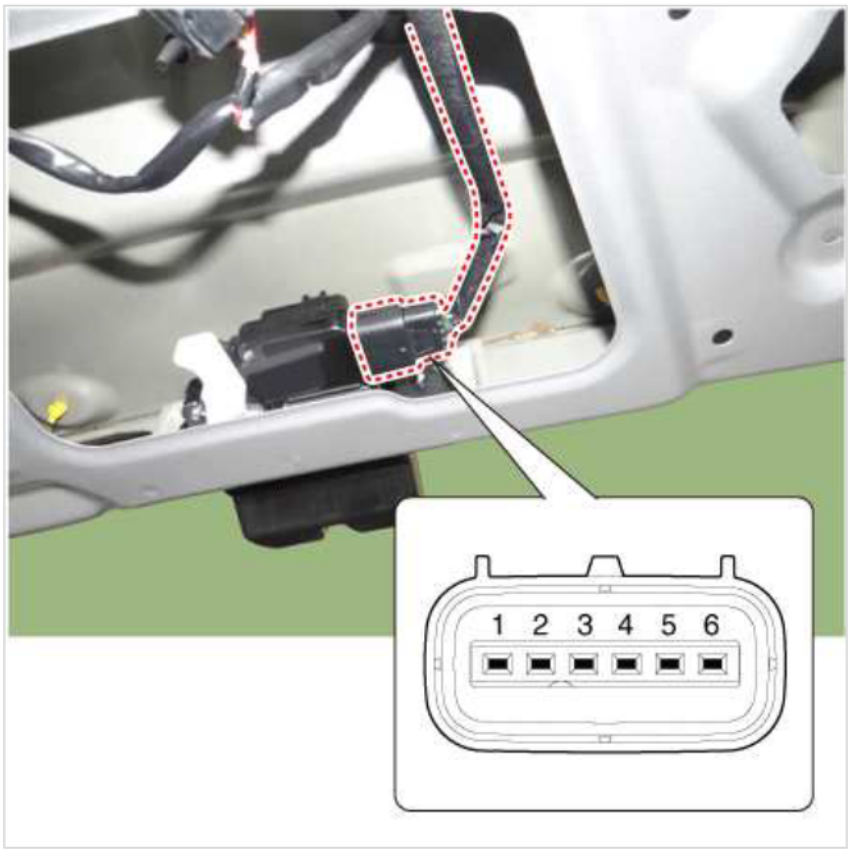
LH(RH)

Operation / Terminal	Central Lock	Central Unock
2(7)	+ (-)	- (+)
3(6)	- (+)	+ (-)
6(2) & 7(3)	ON → OFF	OFF → ON
7(1) & 8(2)	Door open & Half-latching (1st detent) = ON Full-latching (2nd close) = OFF	

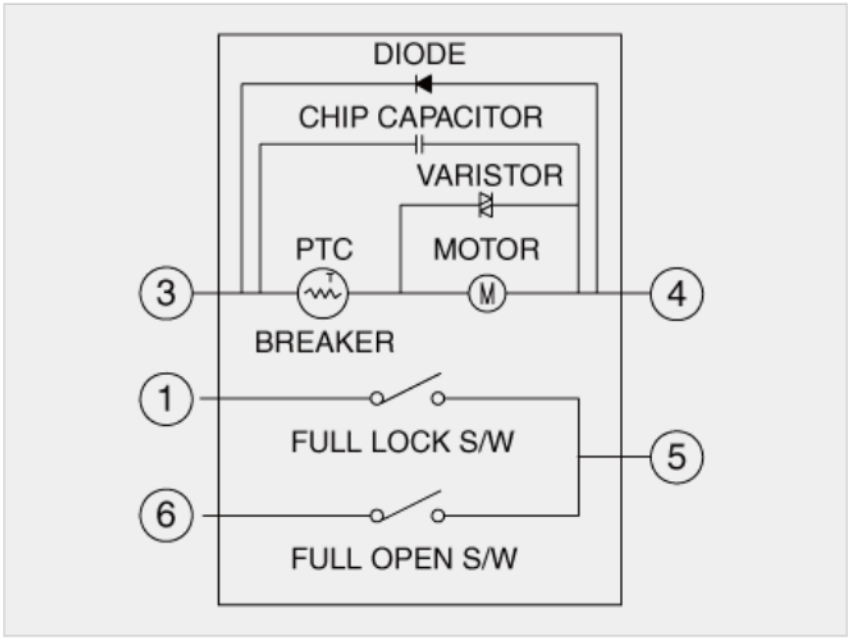
Liftgate Lock Module Inspection

1. Remove the liftgate trim.
   (Refer to Body - "Liftgate Trim")
2. Disconnect the connectors from the actuator.

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



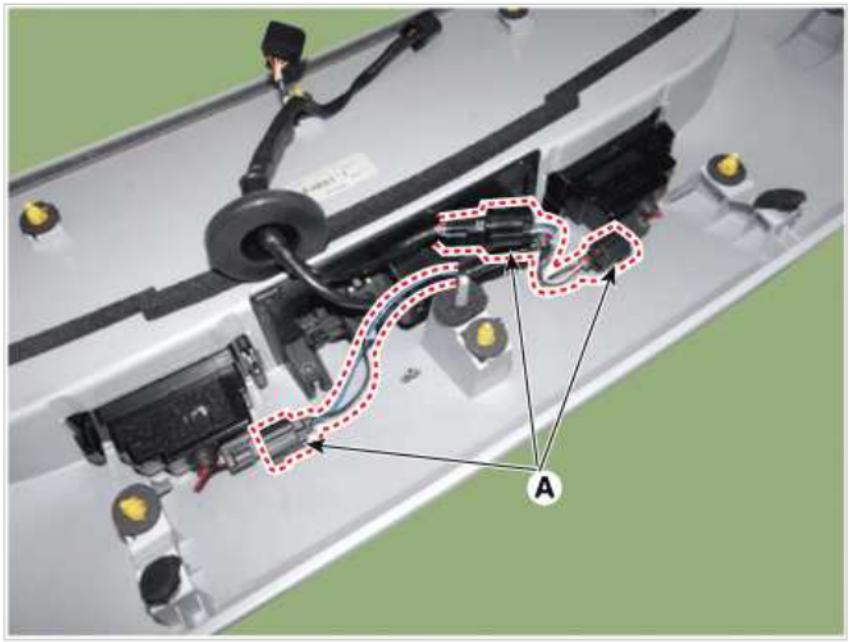
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Operation / Terminal	Lock → Unlock	Unlock → Lock
③	+	X
④	-	
⑤&①	OFF → ON	ON → OFF
⑤&⑥	OFF → ON	ON → OFF

4. Checking the liftgate of the vehicle power option power refers to the liftgate module.

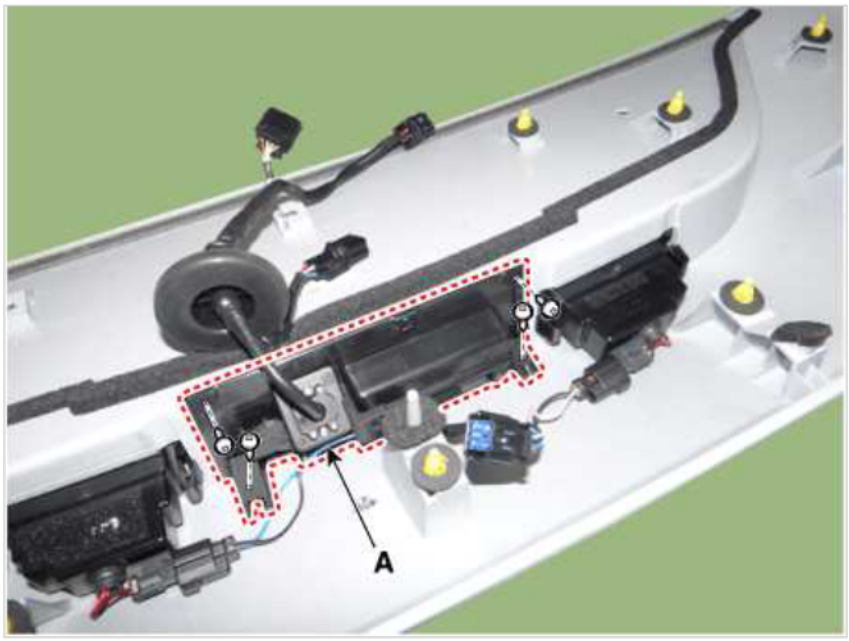
Liftgate Open Switch Inspection

1. Disconnect the negative (-) battery terminals.
2. Remove the liftgate back panel.
   (Refer to Body - "Liftgate Back Panel")
3. Disconnect the license lamp connectors (A).



4. Remove the liftgate outside handle assembly (A) after loosening the mountiong screws.

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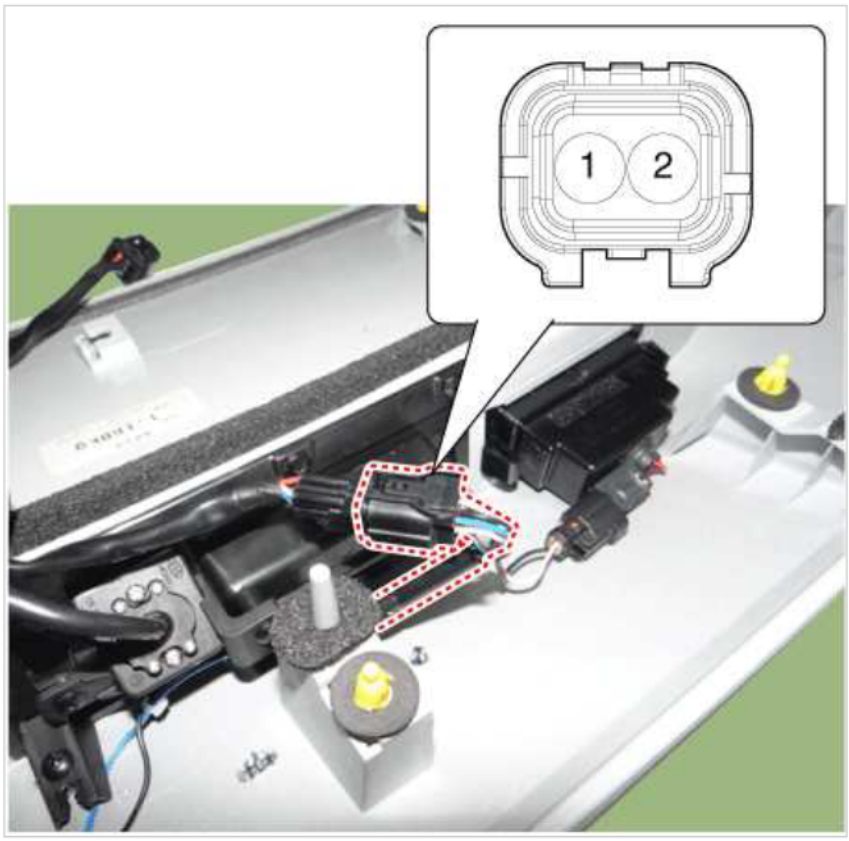


5. Remove the liftgate open switch (A) after loosening the mountiong screws.



6. Disconnect the liftgate open switch connector (A).

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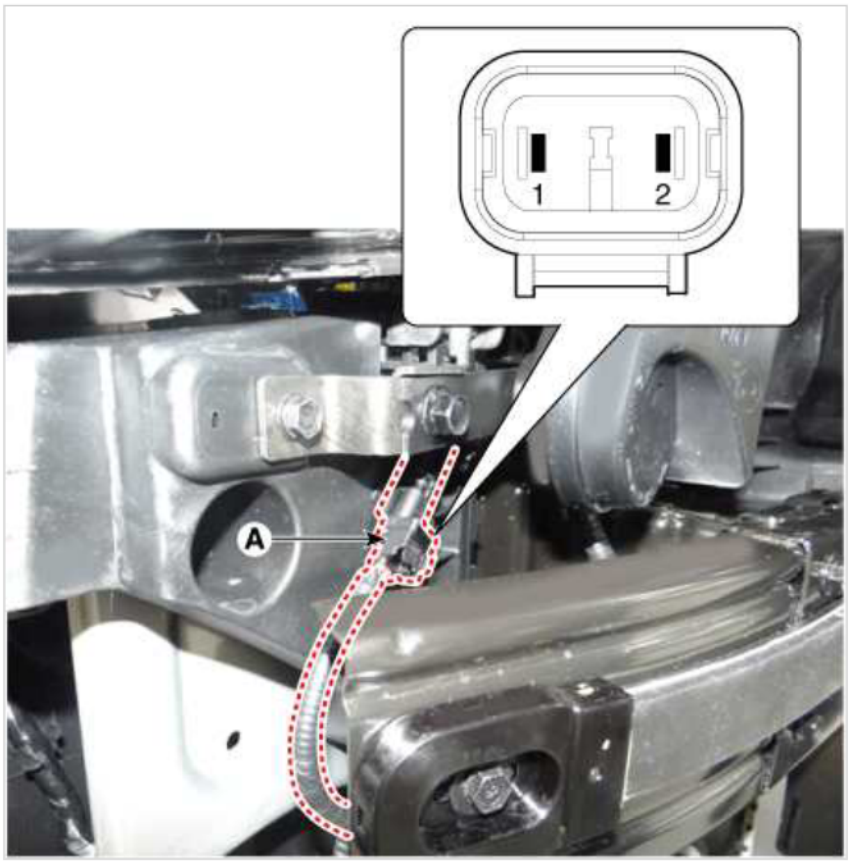
7. Check for continuity between terminals in half latching condition as shown below.

Operation / Terminal	OFF	ON(PUSH)
1		○
2		○

Hood Switch Inspection

1. Remove the front bumper assembly.
   (Refer to Body - "Front Bumper Assembly")
2. Disconnect the hood switch connector (A).

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3. Check for continuity between the terminals and ground as shown below.
(Refer to Body - "Hood Latch")

Terminal / Position	1	2
Open hood(Free)	○	○
Close hood(Push)		

Burglar Horn Inspection

1. Remove the washer inlet assembly (A) after loosening the mounting bolt.

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2. Remove the burglar horn (A) after loosening the mounting nut.

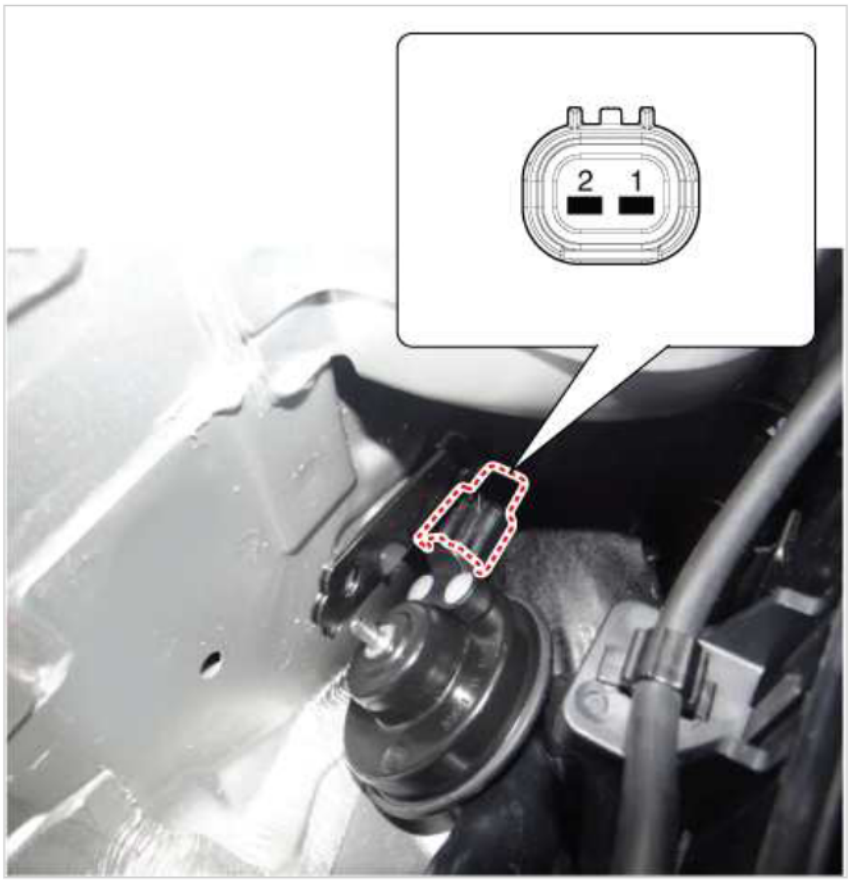


3. Disconnect the burglar horn connector (A).

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4. Test the burglar horn by connecting battery power to the terminal 2 and ground the terminal 1.



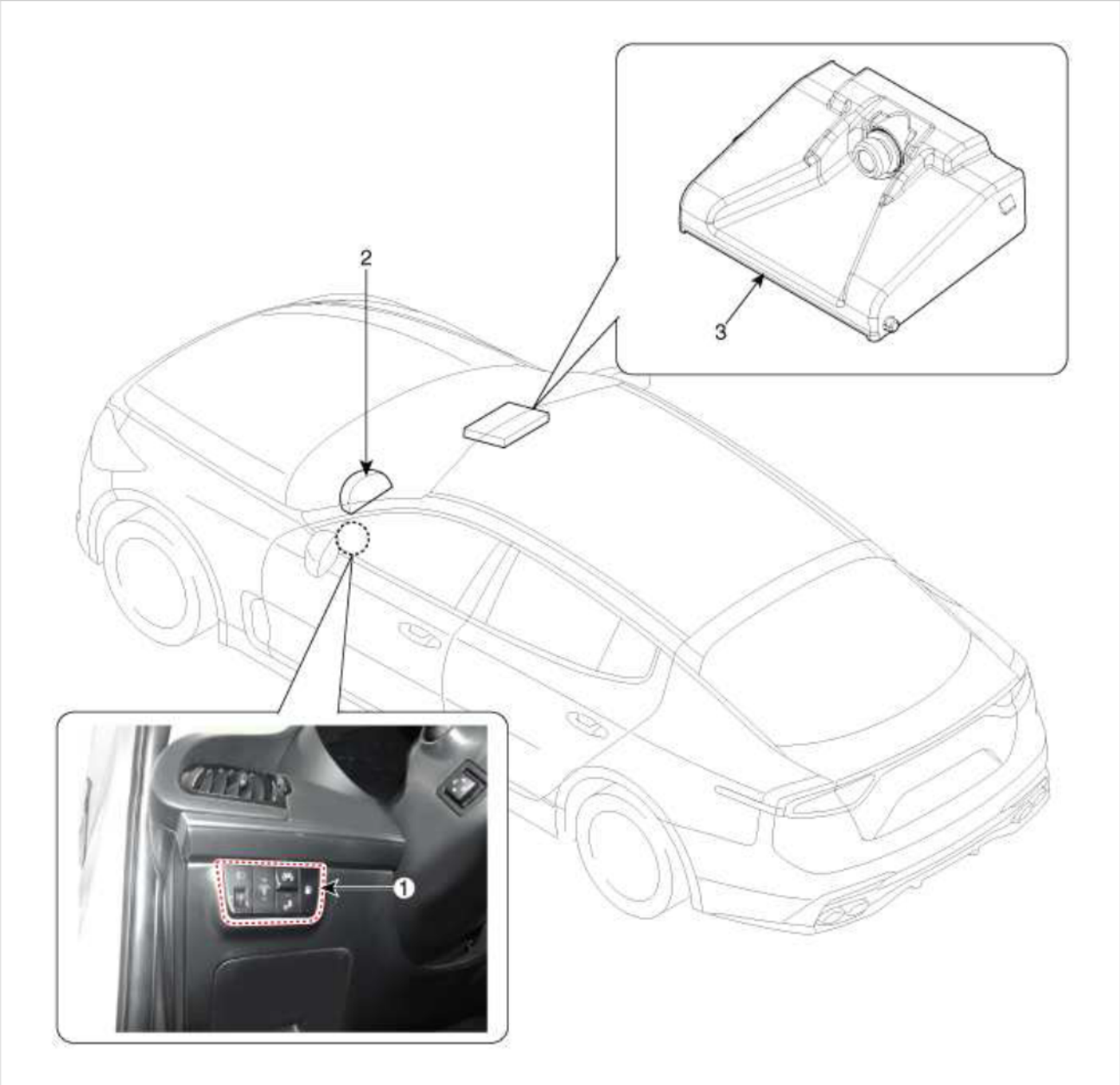
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Specification

Item	Specification
Power source	3 V
Operating temperature	14 - 140°F (-10 - 60°C)
RF Modulation	FSK
LF Modulation	ASK
RF frequency	433.92 MHz
Button number	3
Function	Door lock
	Door unlock
	Liftgate unlock

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Components



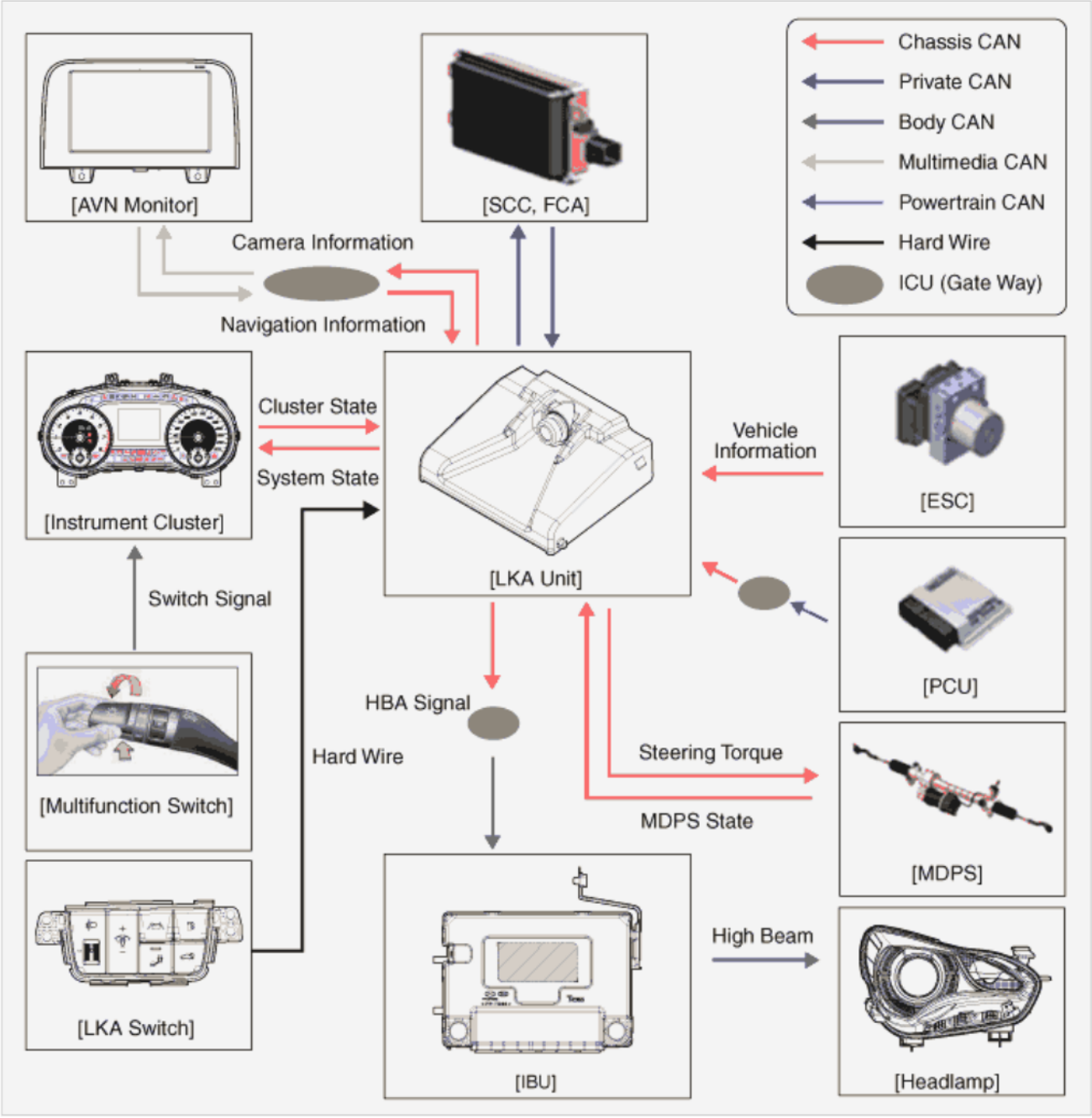
1. LKA ON/OFF switch
2. Instrument cluster
3. LKA Unit (MFC)

* MFC : Multi Function Camera
  – Function : LKA,HBA,ISLW,FCW,SCC

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Description

System block diagram



System function

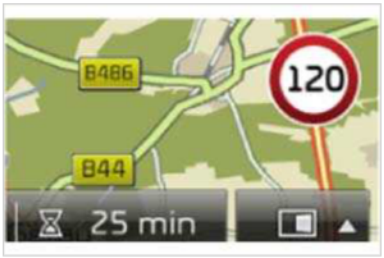
Camera unit of the LKA processes below function with the video signal inputted

1. LKA (Lane Keeping Assist) : The system is designed to help recognize the lane ahead and to give off a lane departure warning when the vehicle starts moving out of the lane by using the camera image and vehicle signal information.
2. High Beam Assist (HBA) : Detects head lamp and tail lamp lights of vehicle ahead and turns the high beam ON/OFF.
3. Intelligent Speed Limit Warning (ISLW) : Detects traffic signs by using the camera and displays the speed limit by using the map data from navigation.
4. It supports Forward Collision-Avoidance Assist (FCA) systems.

Lane Keeping Assist (LKA)	High Beam Assist (HBA)

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Lane Keeping Assist	When detecting light from vehicle in front

Intelligent Speed Limit Warning (ISLW)	Forward Collision-Avoidance Assist (FCA)
	
Speed Limit Information	Vehicle and pedestrian detection

System Activation Conditions

LKA Controller Typical Operating Conditions

Note that operating conditions are tuned to meet the customer requirements .

- Vehicle speed within 60 kph – 175 kph
- A lane is clearly visible.
- Driver is not overriding the system – applying a large steering torque
- Directional (including hazard) signals are off.
- The lane width is within 2.8m to 4.3m
- The driver's hands are on the steering wheel.
- The absolute steering angle is < a given value (e.g 90 degrees).
- The maximum allowable time for maximum torque application has not been exceeded. (90 seconds)
- Reverse or EPS city mode is not engaged.
- No fault is present in the system.

Activation conditions for HBA are as follows:

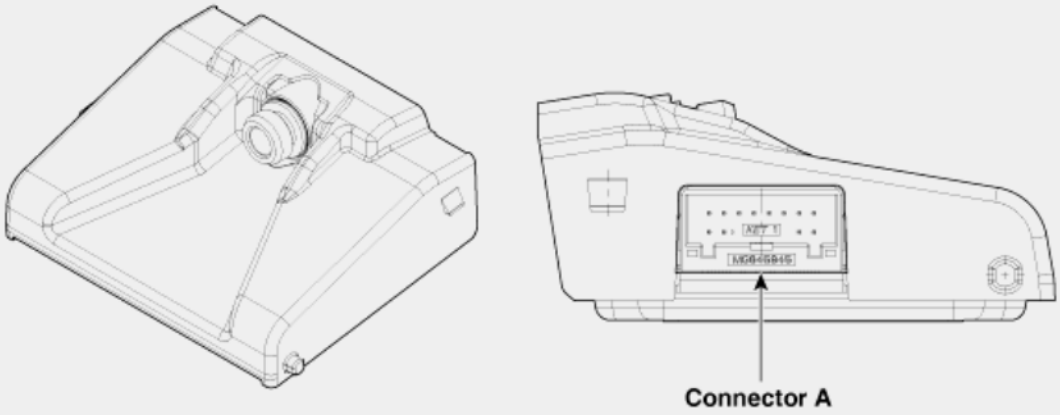
- HBA is activated when the light switch is at "AUTO" and the high beam switch is ON (push).
- HBA is activated when the function is enabled and the vehicle speed is 45 km/h or higher, and automatically deactivated when the vehicle speed is 35 km/h or less.
- HBA is not activated in daytime even if the activation conditions are satisfied.
- In nighttime, HBA detects the preceding vehicle"s lamp light and automatically turns the high beam on or off.

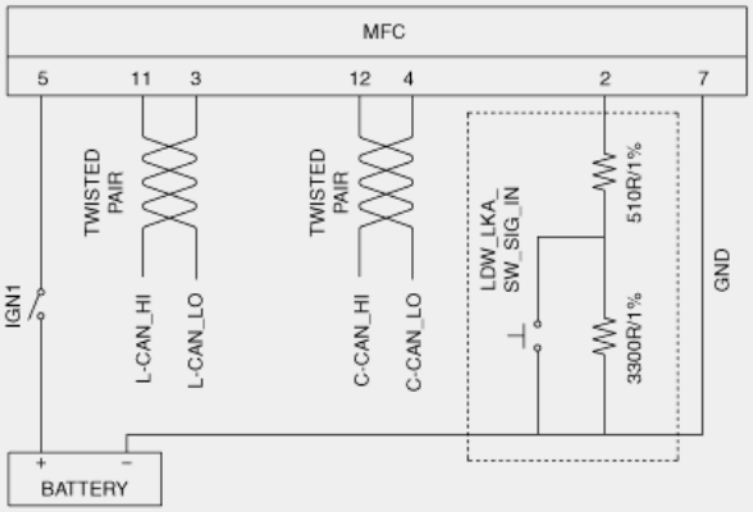
Activation conditions for DAA are as follows:

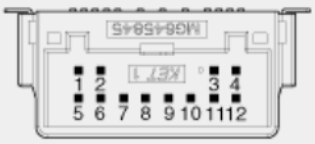
- The function should be enabled on the User Setting Menu (USM) of the cluster.
- The function should be enabled and the vehicle speed should be 60 km/h - 175 km/h.

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Components





Connector A	No.	Description	No.	Description
	1	-	7	Ground
	2	LKA Switch signal	8	-
	3	L-CAN (Low)	9	-
	4	C-CAN (Low)	10	-
	5	IGN1	11	L-CAN (High)
	6	-	12	C-CAN (High)

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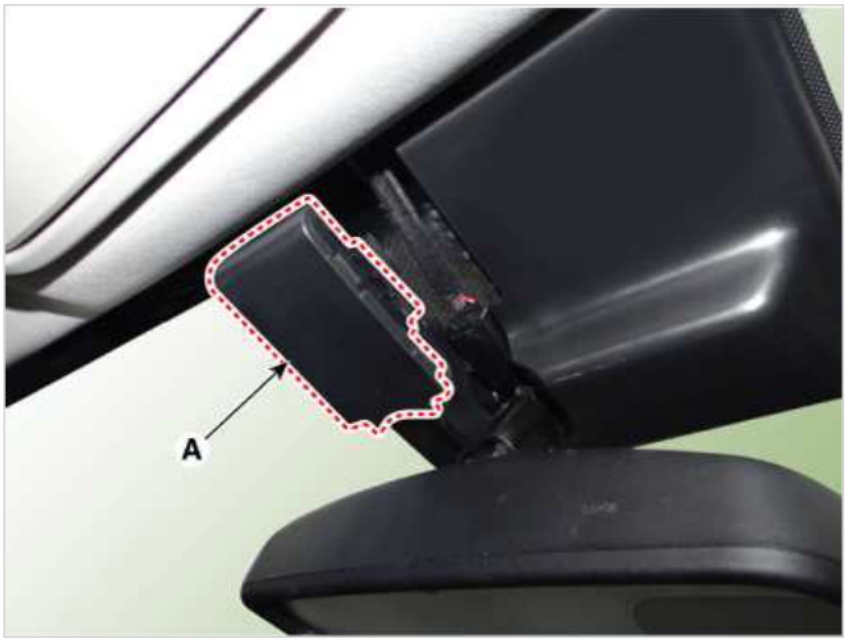
Removal

Information

When replacing the LKA switch, check that the symbol mark in the cluster operates normally by pressing the ON/OFF switch.



1. Disconnect the negative (-) battery terminal.
2. Using a screwdriver or remover, remove the mirror wiring cover (A).





3. Disconnect the LKA unit connector (A).

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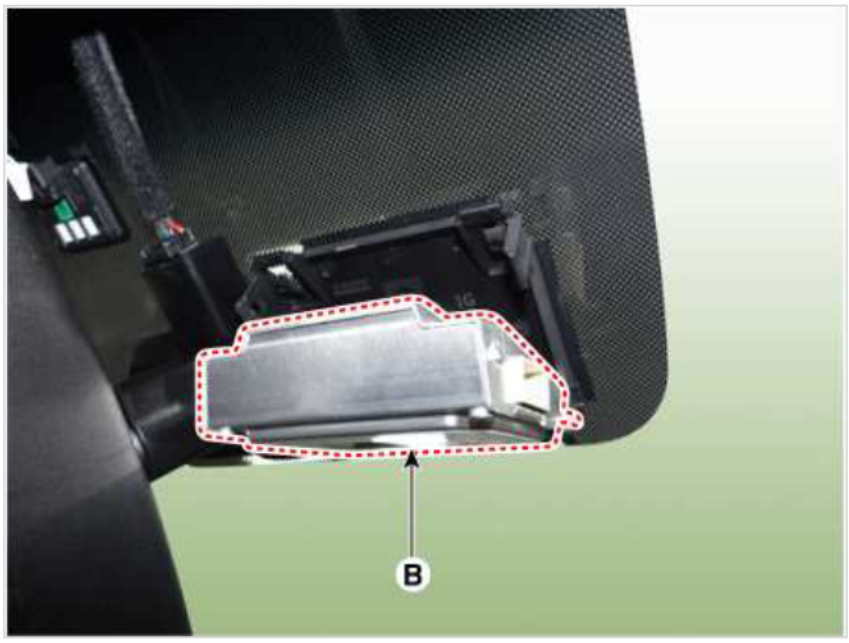
4. Remove the LKA unit (B) by pulling out lock pins (A).

NOTICE

When separate the fixed points, be careful not to damage it.

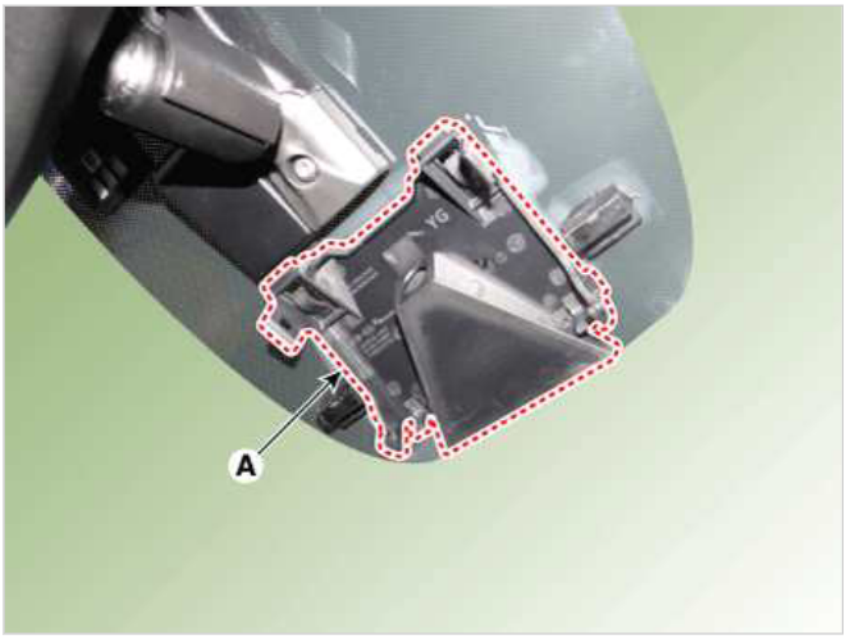


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NOTICE

When pulling out the mounting bracket, be careful not to damage it.



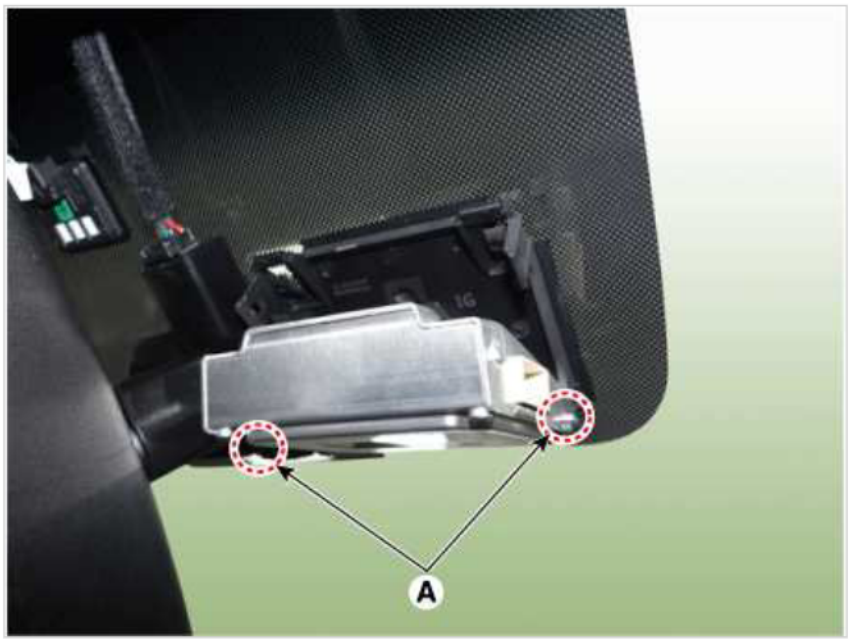
Installation

When you need calibration

- Replace LKA with a new one
- LKA is removed and mounted
- Windshield glass changed
- LKA coupler of the windshield glass is deformed

1. Align the reference point at alignment point(A) and align LKA .

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2. Apply force to lock position (B) to complete mounting.



NOTICE

Fully assembly so that you can hear a"clicking" sound when assembling.

3. Connect the LKA unit connector.
4. Install the mirror wiring cover.
5. Connect the negative(-) battery terminal.

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Service Point Target Auto Calibration (SPTAC)

This procedure provides a way to calibrate the camera by having the service technician align the car to a well lit simulated straight road target; preferably wall mounted.

The LKA camera will have a "System Out of Calibration" DTC set if not operating within specified tolerances.

The LKA will be supplied for field service replacement with the "System Calibration Required / Variant Coding Error" DTC set if it is a replacement part delivered directly from supplier manufacturing.

1. Guidelines for Selecting a Suitable Target

   In order for LKA Service Calibration-Static routine to complete successfully, the following conditions are required:

   – Target (SST : 09890-3V100) surface is perpendicular to the camera in both horizontal and vertical orientations to maintain maximum of 1° roll.

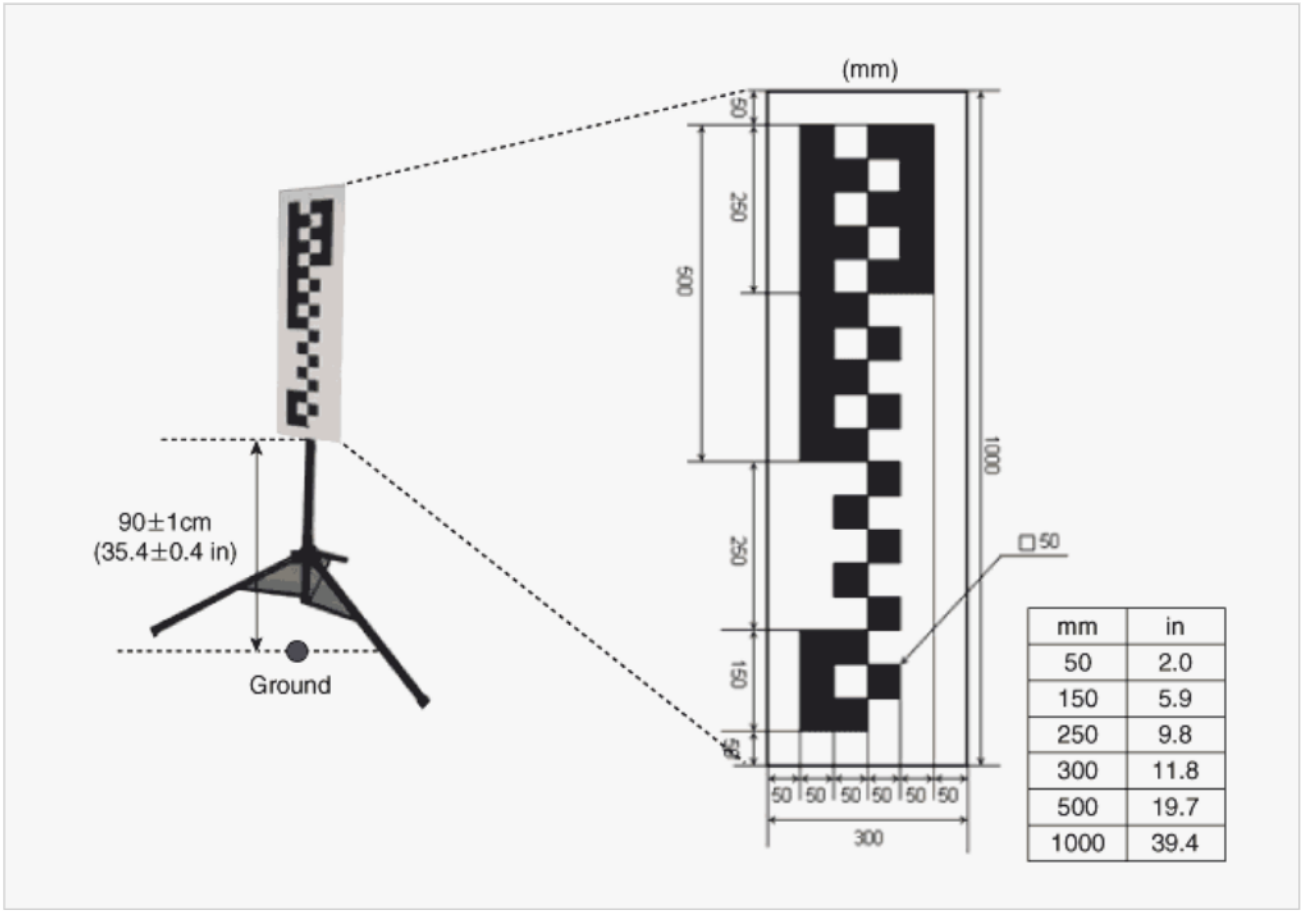
   – Target to be mounted to rigid backer material to maintain flatness requirements.

   – Target has reflective (not faded or poorly painted) markings that are unlike from lane features.

   – Target is 30 cm wide and 100 cm tall.

   – Mounting area must NOT have cross hatch patterns or textual markings near the target.

   – Target should be well lit for optimal performance using non-fluctuating illumination. There shall be no continuous shadows cast on the target.



mm	in
50	2.0
150	5.9
250	9.8
300	11.8
500	19.7
1000	39.4

2. Service Point Target Auto Calibration Procedure

   (1) It is recommended to check vehicle toe-in and tire pressure levels to ensure proper alignment of the camera to the "world" before proceeding with calibration. The vehicle to run the calibration routine is to be at nominal production loading capacity.

   (2) Windshield must be clean and silk-screen checked so that there is no blockage of the camera.

   (3) Service technician connects the diagnostic connector and starts the vehicle. The camera module should not be activated by pressing the switch.

   (4) The service calibration routine may not run correctly if any system level fault is active.

   (5) If working with a replacement ECU: the service technician initiates the SPTAC Reset configuration.

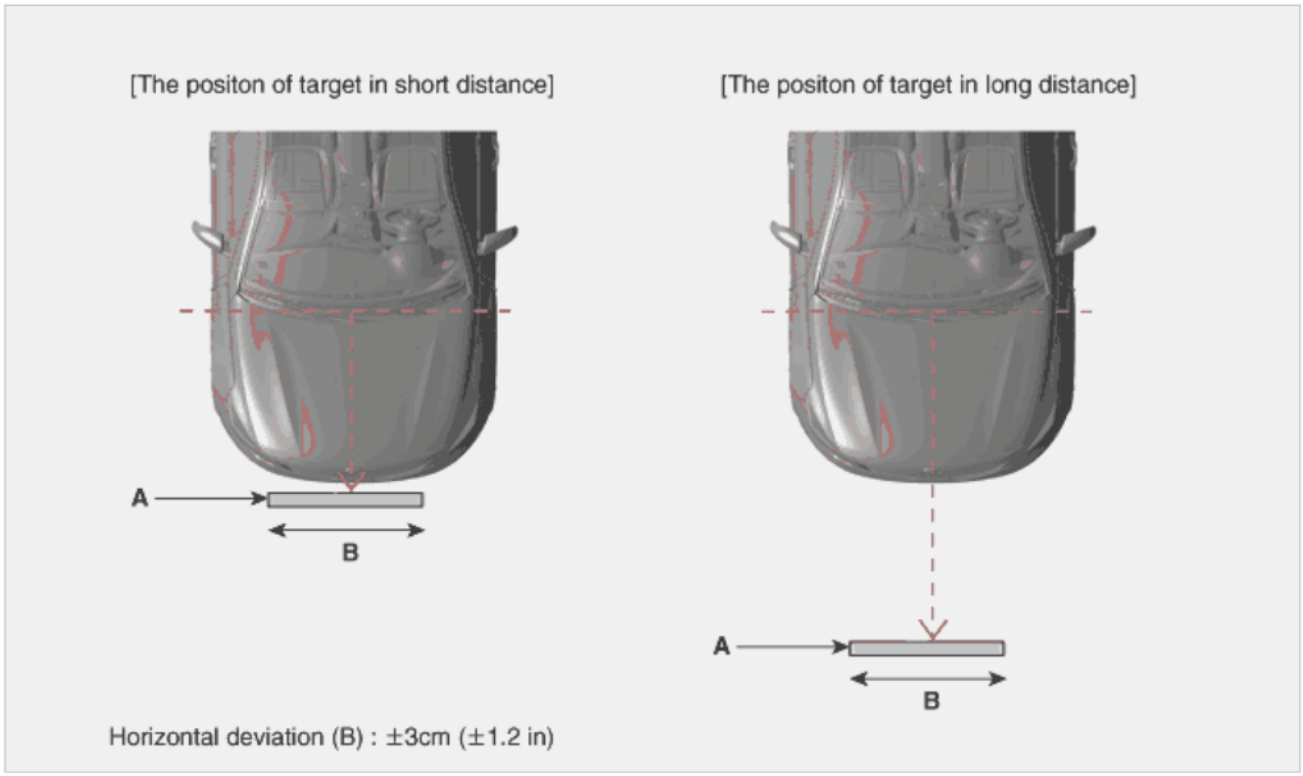
   (6) Service technician either aligns the vehicle to the target or the target to the vehicle.

   a. Bottom of the target is 90 ± 1 cm (35.4 ± 0.4 in.) from the ground and aligned with the camera lens horizontal axis.

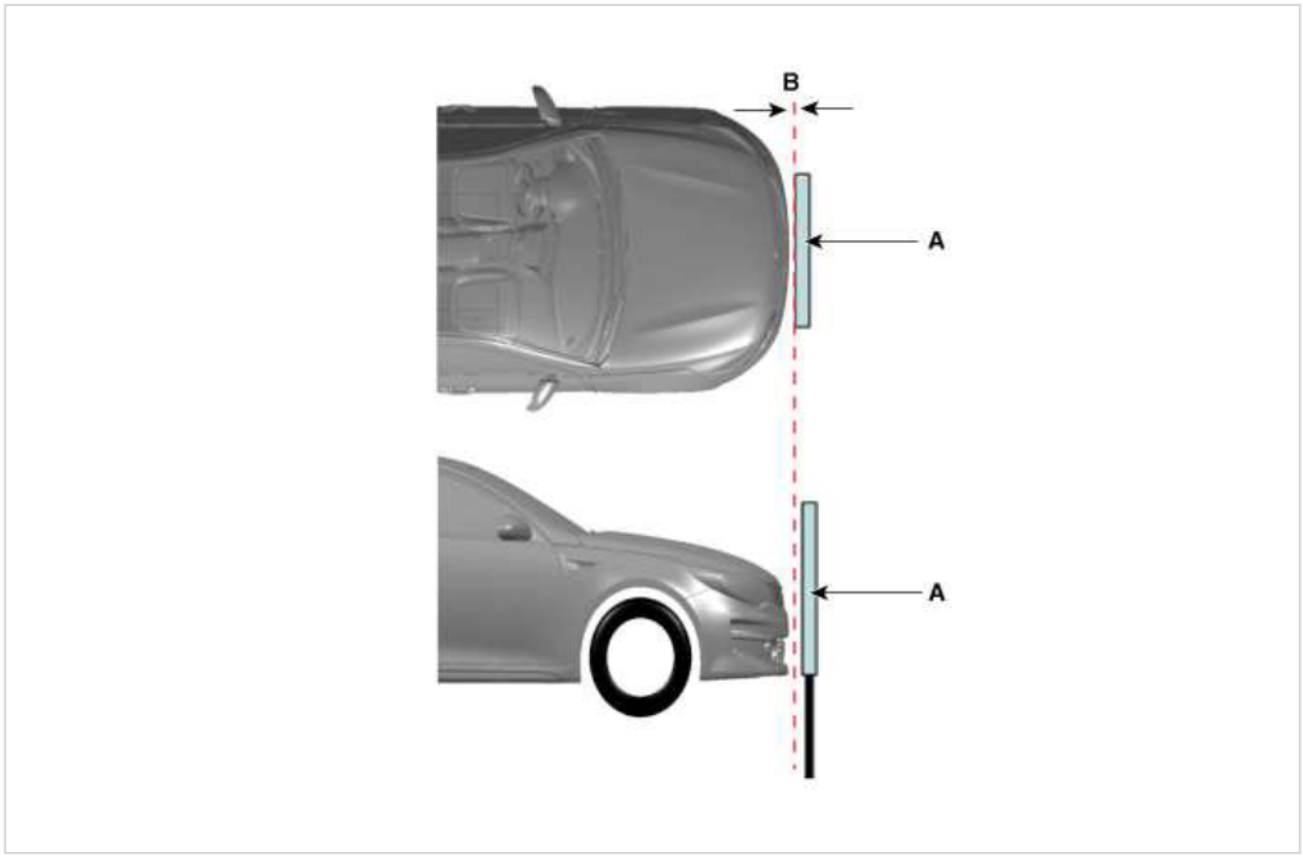
Information

- The target (A) is placed along the vehicle's longitudinal axis (centerline) within ±3 cm (±1.2 in.) of target center. (Horizontal deviation (B) : ±3 cm (±1.2 in.))

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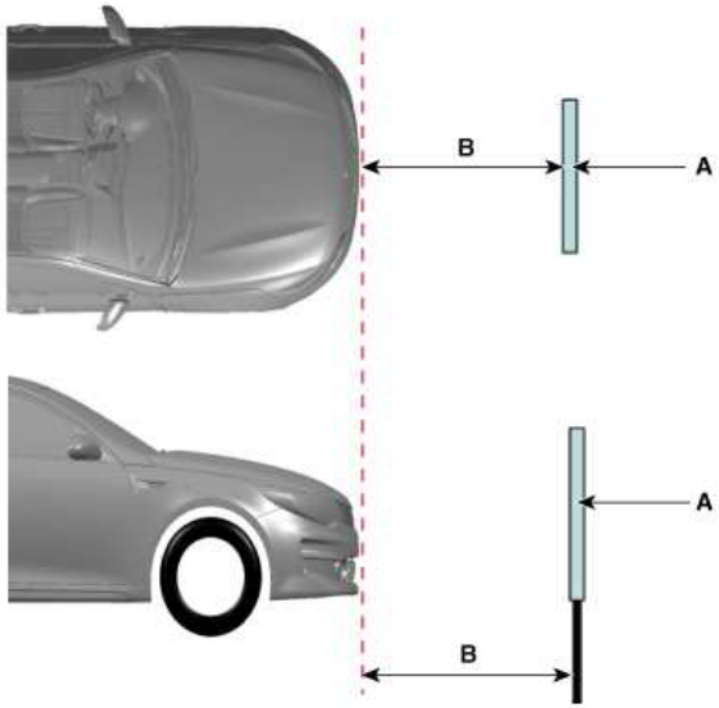


b. The positon of target (A) in short distance is 0 ± 5 cm (0 ± 2 in.) (B) in front of front bumper.



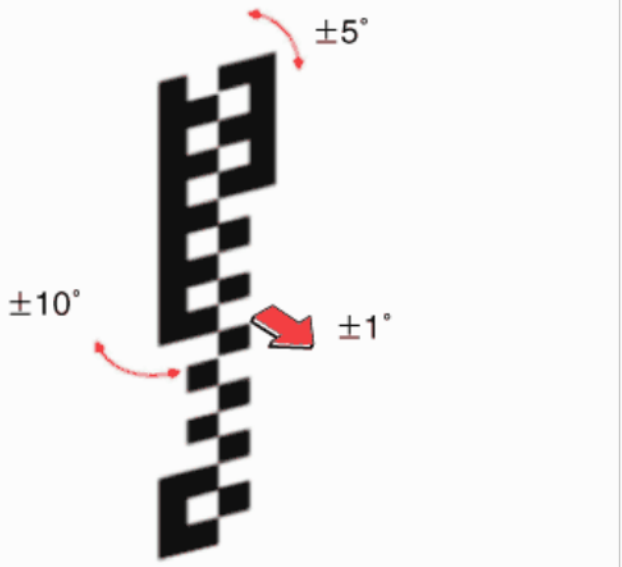
c. The positon of target (A) in long distance is 100 ± 5 cm (39.4 ± 2 in.) (B) in front of front bumper.

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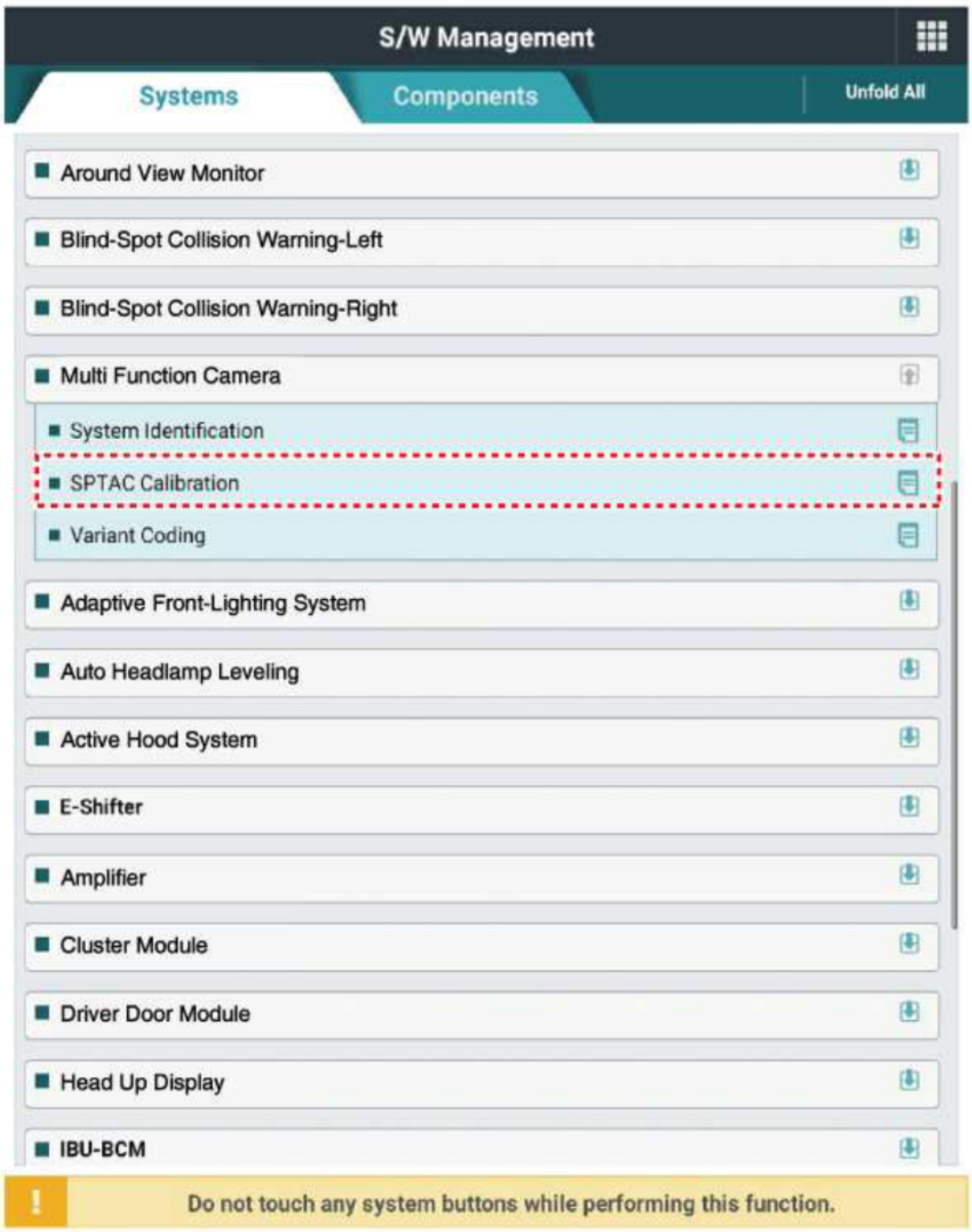
Information

- The tolerance angle of target in horizontal direction is ± 10°.
- The tolerance angle of target in vertical direction is ± 5°.
- The tolerance angle of target in facade center is ±1°.



<Tolerance angle of target in horizontal / vertical direction>

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S/W Management

• **SPTAC Calibration**

Purpose	To calibrate the camera focal point.
Enable Condition	1.Engine Off 2.Ignition Switch On 3.Stand a referring panel in front of vehicle
Concerned Component	Lane Departure Warning System(LDWS) ECU
Concerned DTC	C2720XX, C2721XX, C2722XX
Fail Safe	Warning Lamp On
Etc	C1 : Inline Calibration C2 : A/S Calibration

OK

Do not touch any system buttons while performing this function.

Test Drive

NOTICE

The LKA may not activate properly in the following conditions.

- In case lane is not visible due to glare or heavy rain.
- In case the road is covered with snow.
- In case puddle on the road surface reflects street light or head light from oncoming vehicle.
- In case there is blocking object such as sidewalk on the side of the road.
- In case there is trace of more than one lane due to road repair.
- In case the distance with vehicle in front is very short.
- Be sure to perform test drive to check for normal operation after performing optical angle test.

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– Drive on straight road (of longer than 500 m) with 2 white or yellow lane marks at speed of over 64 km/h (40 mph), and check for the alert as you intentionally steer close to the lane mark.
– LKA operates properly if the lane mark segment space is less than 8 m.
– LKA activates at vehicle speed above 64 km/h (40 mph).
– Perform test drive on car-only road or on a highway.

NOTICE

The lane keeping assist (LKA) may not operate in the following conditions:

– Lane lines are not visible due to rain, snow, dust, puddles, wet road surface or debris.
– The brightness outside the vehicle suddenly changes, for example, when entering a tunnel.
– The head lamp is not used or the light is too weak at night or while in a tunnel.
– The lane lines are not distinguishable from the road.
– The vehicle is on the bus lane or on the lane next to the bus lane.
– The road is curved too sharply or the slope of the road is too steep.
– Sunlight, street light, or lamp light of the on-coming vehicle is reflected on the wet road surface.
– The windshield or the camera lens is contaminated due to dust or debris.
– The visibility is poor due to bad weather such as fog, heavy rain, or heavy snow.
– The temperature around the rear view mirror is too high due to direct sunlight.
– The road lane is too narrow or wide.
– The lane lines are faint or damaged.
– Condensation on the windshield is not completely removed.
– A shadow of median strip covers the road lanes.
– The lane lines are not distinguishable from the road due to dust on the road.
– There are tracks or marks near the lane lines.
– A shadow of median strip, guardrail, sound-absorbing walls, or trees covers the road lanes.
– There is a line structure such as pavements.
– The distance from the preceding vehicle is too short or the preceding vehicle is on the lane lines.
– The vehicle is shaking intensely.
– Objects are on the crash pad.
– Backlight is lit in the direction of movement.
– The lane lines are too complex or are replaced by an alternate structure due to construction.
– The visibility is too poor to see the lane lines.
– There are two or more lane lines.
– The lane lines inside a tunnel are contaminated by dust or oil.
– There are road markings such as crosswalk or road signs on the road surface.
– The lane lines disappear or are not visible, for example, in a cross-section.
– The number of road lanes increases/decreases or the road lanes cross each other complicatedly.
– (Tollgate entrances/exits or divided/joined roads)

⚠ CAUTION

The lane keeping assist (LKA) prevents lane departures and helps the driver with steering, but the driver must not rely on the LKA, make a decision for safety on their own, and take necessary measures.

– This system warns the driver about unintended lane departures and assists the driver in case of any lane departure.
– Drivers are responsible for controlling their vehicle in order to drive safely.
– Do not turn the steering wheel too rapidly when the system sounds the alarm.
– This system is not activated when the vehicle speed is 60 km/h or less or the system fails to detect the lane lines.
– Do not tint or put stickers or accessories on the windshield around the rear view mirror.
– Keep the installation part of LKA dry.
– Do not remove or give an impact on LKA parts.
– Do not place reflective materials such as white paper or a mirror on the dashboard. They may cause malfunction due to reflected sunlight.
– Excessive noises may prevent the driver from hearing the LKA alarm sound.

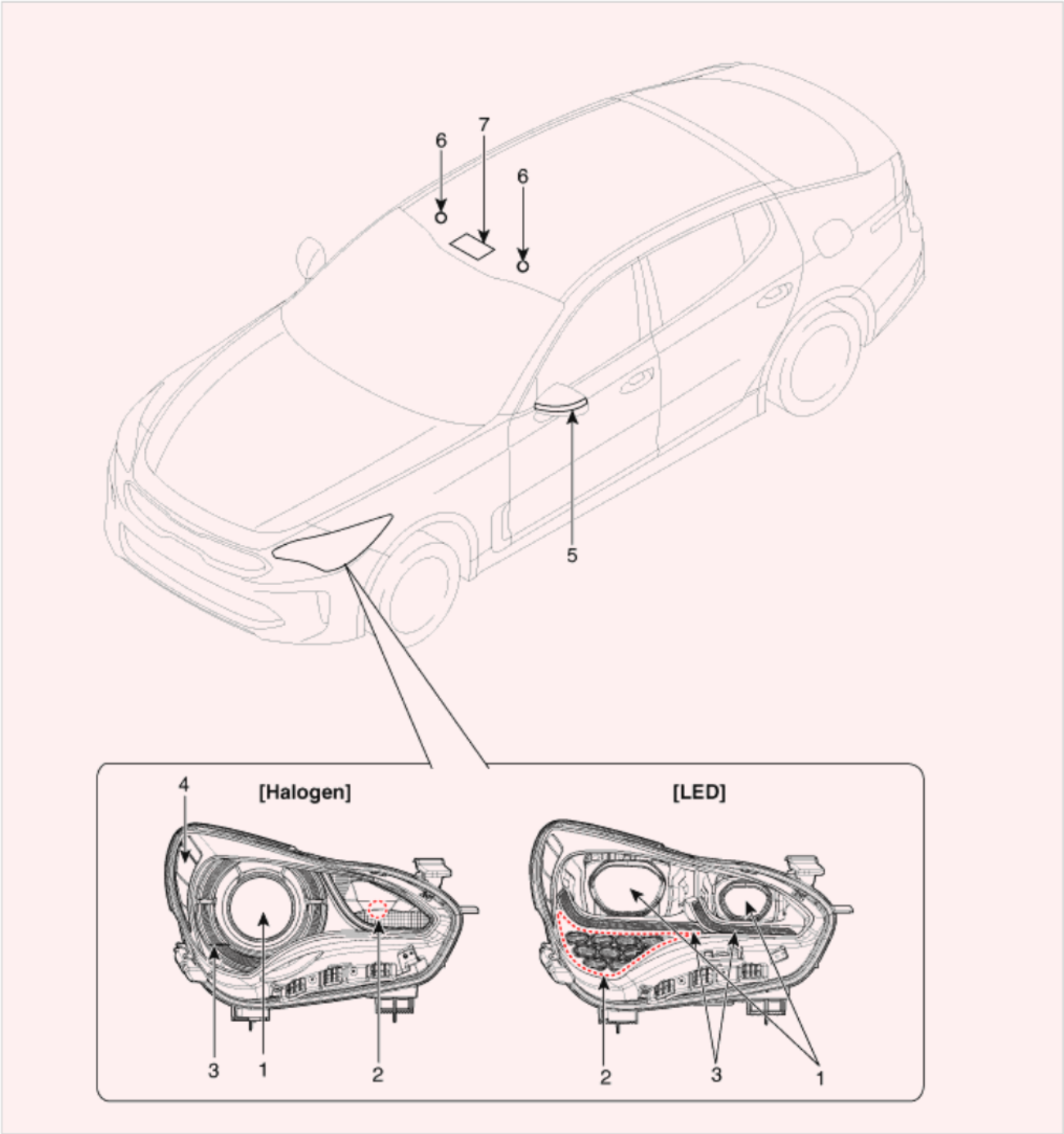
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Specification

Item				Type	Bulb Watt (W)
Front	Headlamp	Halogen type	Low/High	HB3 HL+	60
			Front turn signal lamp	PY28/8 LL	28
			Position lamp	LED	LED
			Side marker lamp	W5W LL	5
		LED type	Low/High	LED	LED
			Front turn signal lamp	LED	LED
			Position lamp	LED	LED
	Side repeater lamp (Outside mirror)			LED	LED
Rear	Rear combinationlamp	LED A type	Tail lamp	LED	LED
			Tail / Stop lamp	LED	LED
			Turn signal lamp	PY21W	21
			Back up lamp	W16W	16
			Side marker lamp	LED	LED
		LED B type	Tail lamp	LED	LED
			Tail / Stop lamp	LED	LED
			Turn signal lamp	LED	LED
	Back up lamp (Only B type)			1156NA	27
	High mounted stop lamp			LED	LED
	License plate lamp			LED	LED
Interior	Map lamp			LED	LED
	Room lamp			LED	LED
	Personal lamp			LED	LED
	Luggage lamp			LED	LED
	Glove box lamp			FESTOON	5
	Foot lamp			FESTOON	5

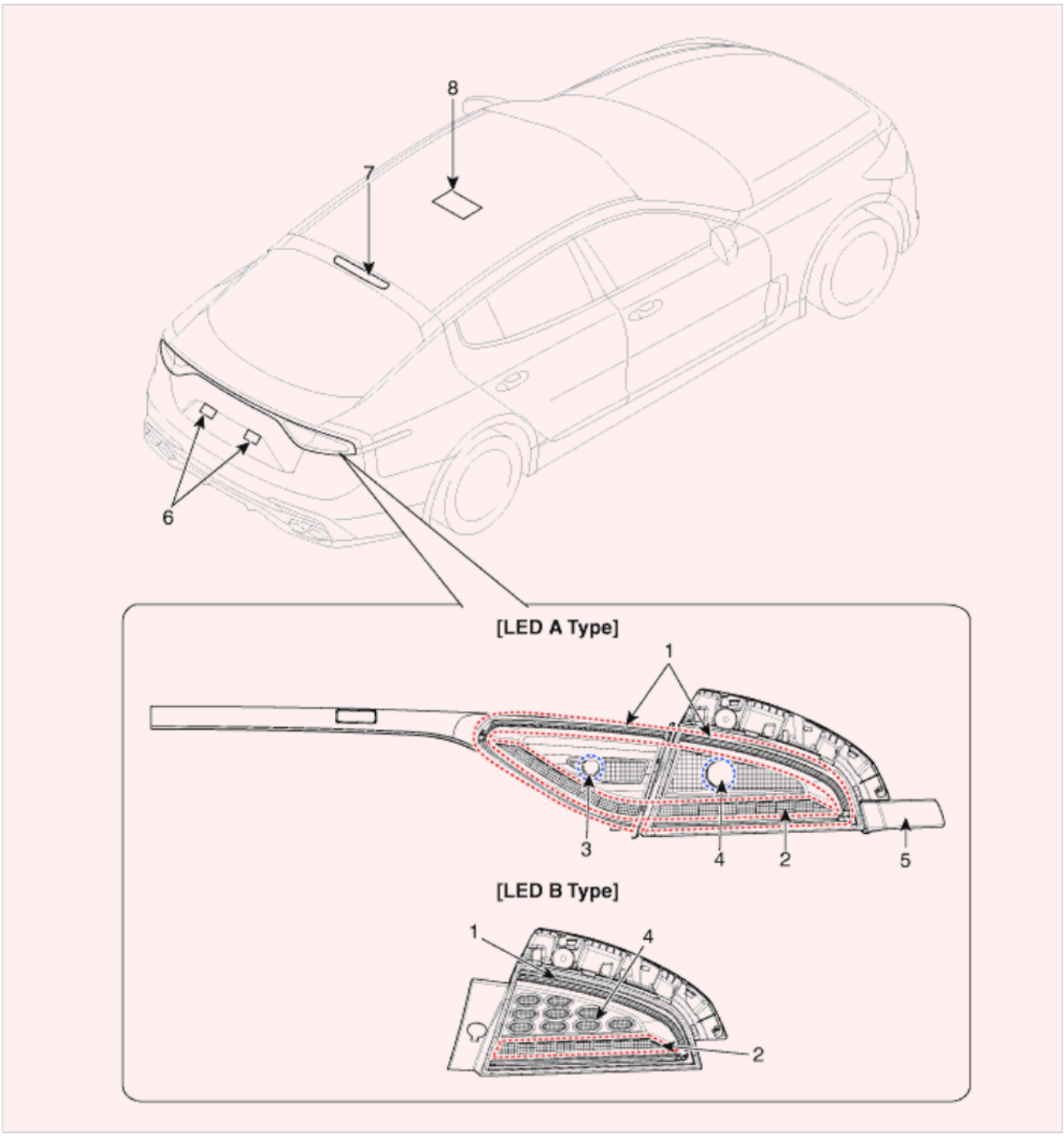
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Component Location



1. Headlamp (Low/High)
2. Turn signal lamp
3. Daytime Running Light (DRL) / Position lamp
4. Side Marker Lamp
5. Turn signal lamp (Door mirror / Side)
6. Vanity lamp
7. Map lamp

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1 .Stop / Tail lamp
2. Stop lamp
3. Back up lamp
4.Turn signal lamp
5. Side marker lamp
6. License lamp
7. High mounted stop lamp
8. Room lamp

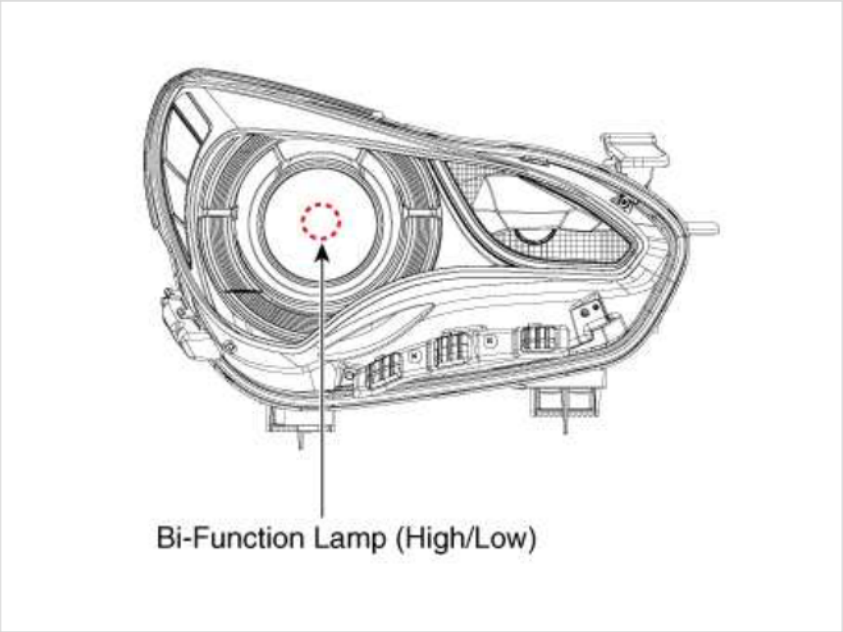
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Description

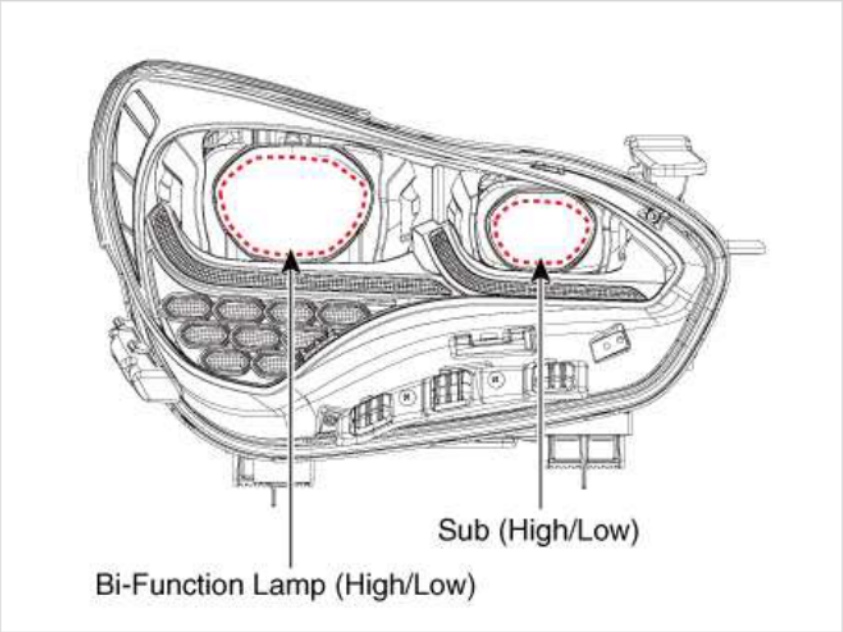
BI-FUNCTION

1. Definition
   – A headlamp with integrated functions of high and low beam
   – The light is controlled by rotating the shield inserted to the lens. (A solenoid is adopted.)

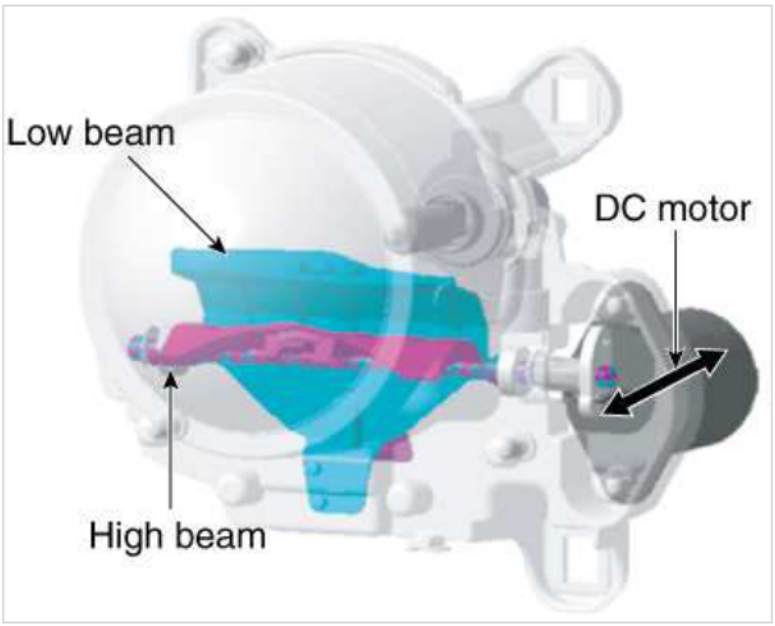
[Halogen Type]



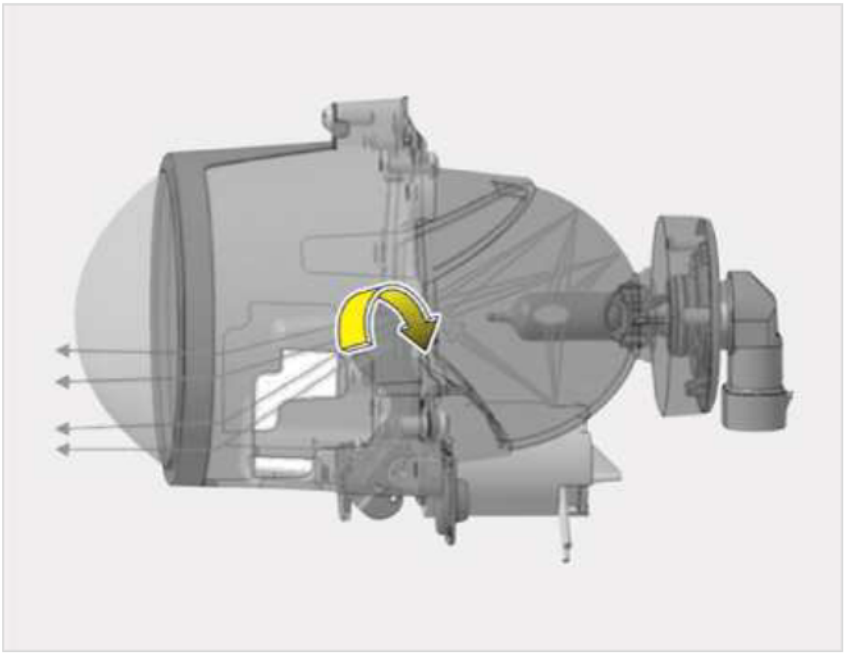
[LED Type]



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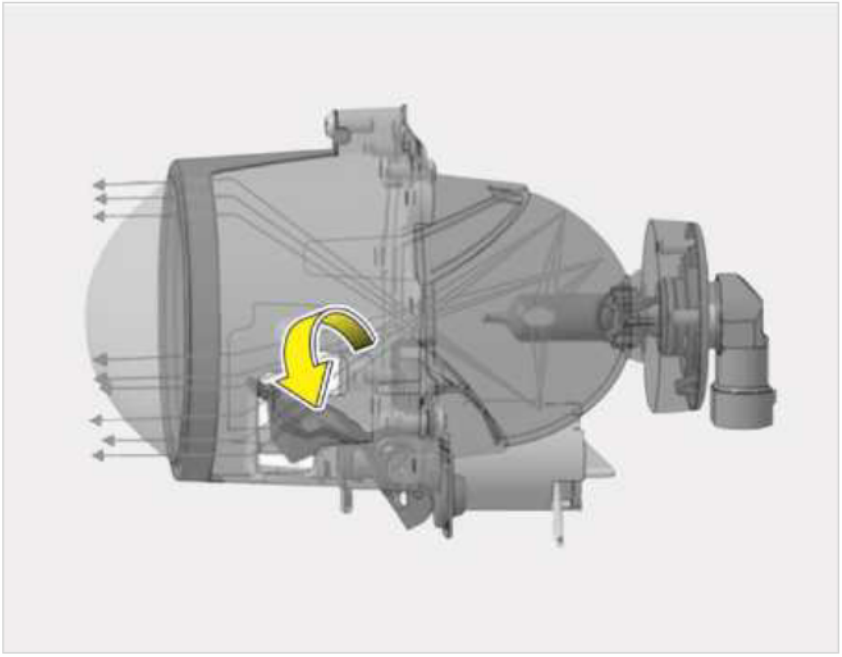


2. Structure and mechanism
   – When working as a low beam
   : The light illuminates to the restricted area of low beam by blocking the light with the stopped shield.



   – When working as a high beam
   : The light is not blocked by the open shield and the light illuminates to the area of high beam.

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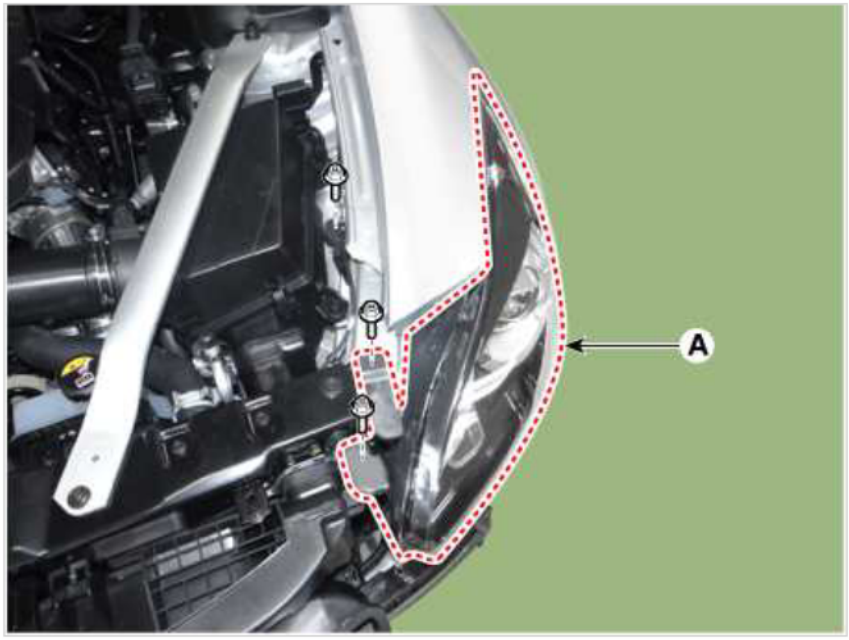
Inspection

Check the below instruction procedure when the headlamps are fogged.

Click to see large image...

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the front bumper assembly.
   (Refer to Body - "Front Bumper Assembly")
3. Remove the headlamp (A) after loosening the mounting bolts.



NOTICE

Be careful not to damage the retaining clips (A).



4. Disconnect the headlamp connector (A).

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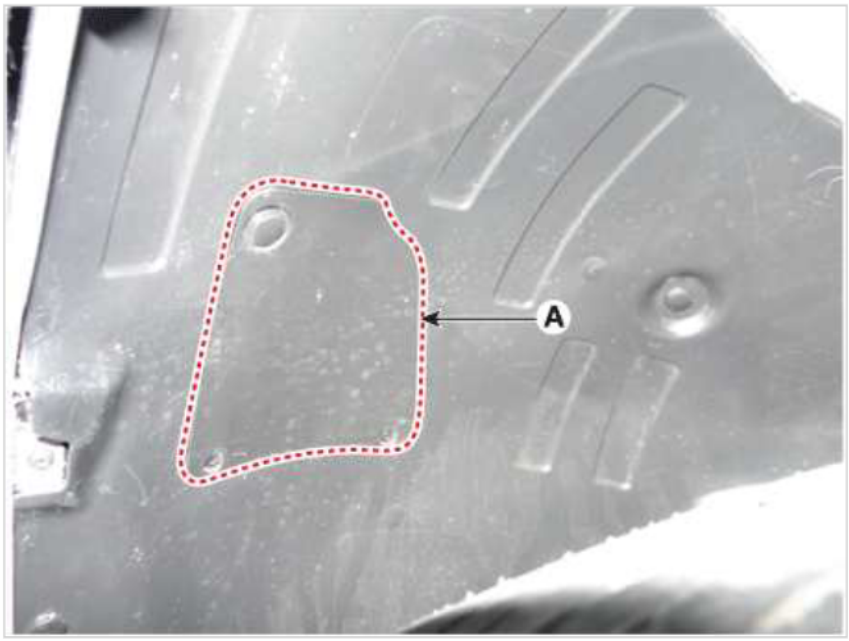
Installation

1. Install in the reverse order of removal.

Replacement

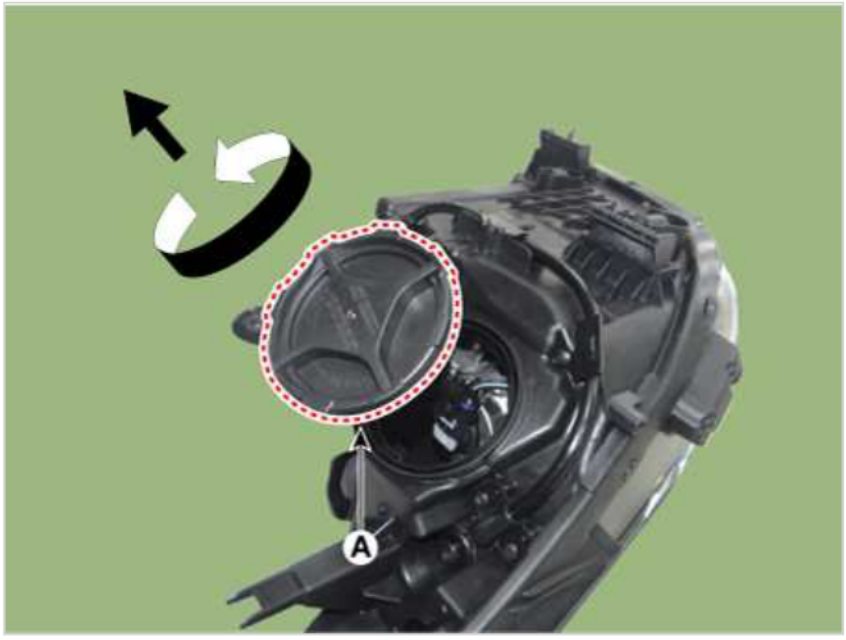
Bulb (high/low)

1. Turn the headlamp switch off.
2. Remove the headlamp service cover (A).



3. Remove the dust caps (A) from the headlamp assembly after turning in the counterclockwise direction.

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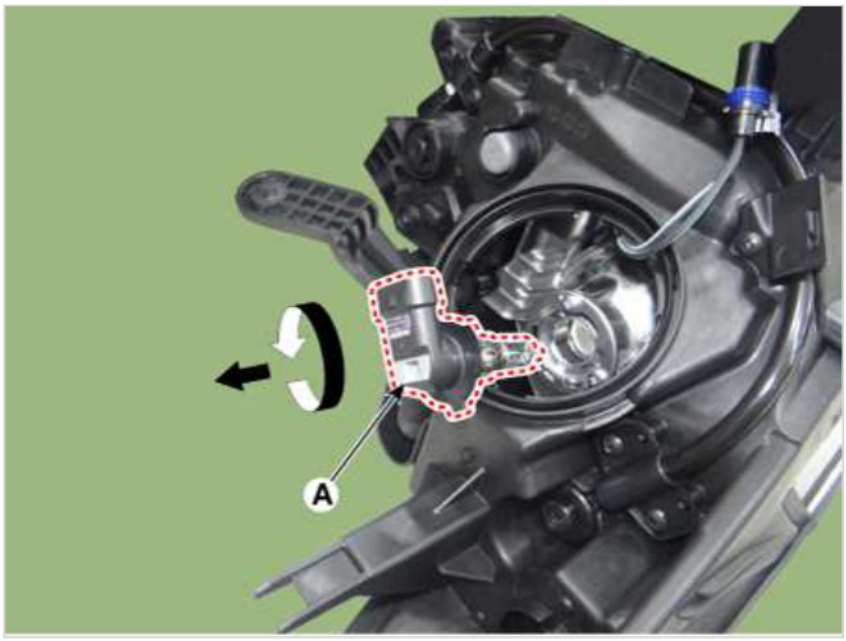


4. Disconnect the headlamp high/low beam bulb connector.



5. Remove the headlamp high/low beam bulb after removing the socket (A) from the headlamp assembly.

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6. Install in the reverse order of removal.

NOTICE

- The headlamp bulb should not be removed from the headlamp assembly until just before installing a new bulb.
- Contaminants may enter the headlamp assembly where they can settle on the lens and reflector.
- Never turn on the headlamps with the bulb removed from the headlamp assembly.

Turn Signal Lamp

1. Turn the headlamp switch off.
2. Remove the headlamp.
   (Refer to Headlamp - "Removal")
3. Remove the bulb socket (A) and bulb (B) from the headlamp assembly.

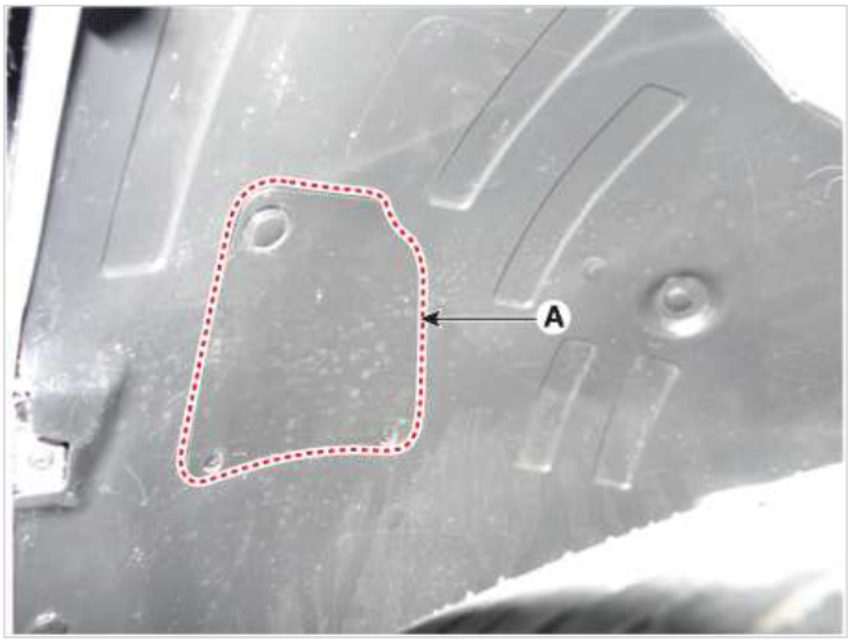


4. Install in the reverse order of removal.

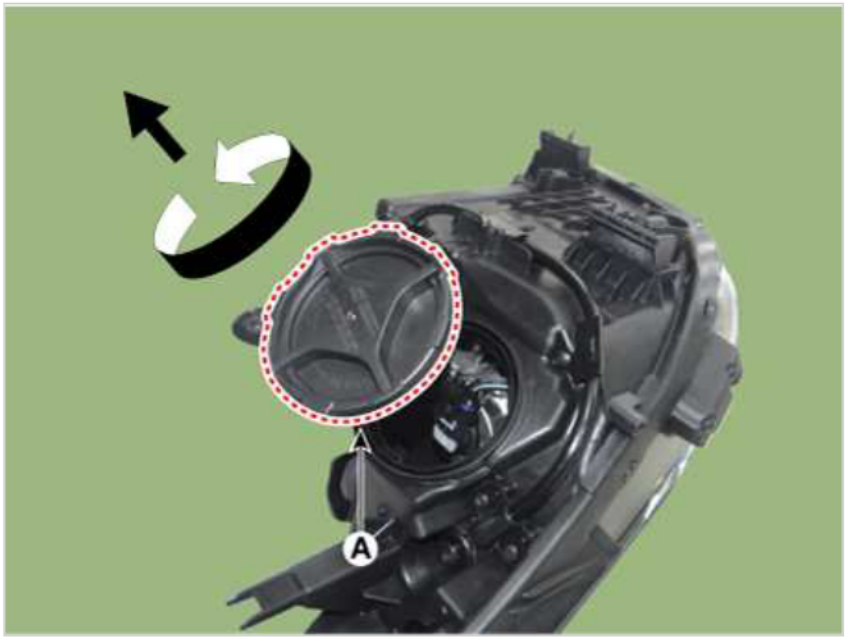
Moisture absorbent

1. Turn the headlamp switch off.
2. Remove the headlamp service cover (A).

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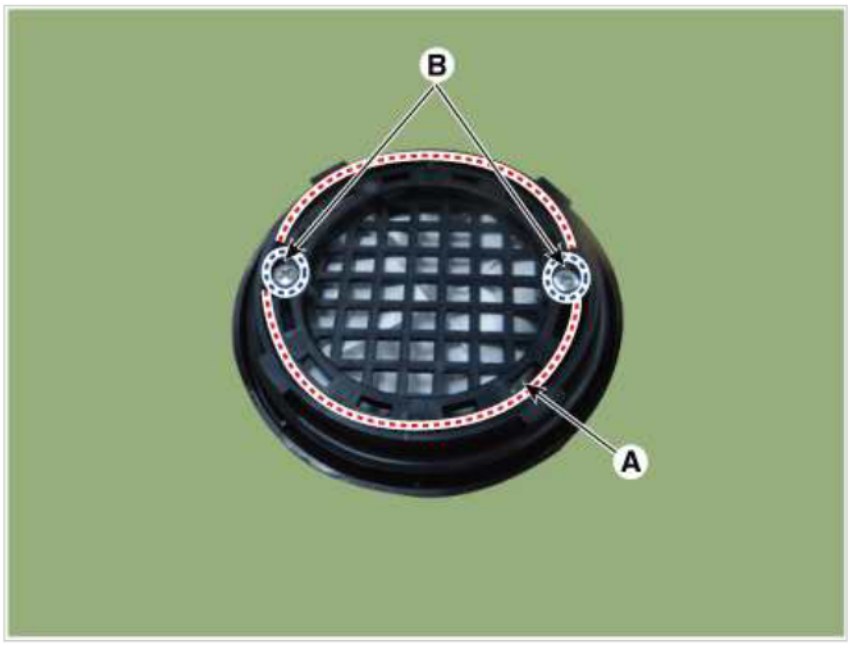


3. Remove the dust caps (A) from the headlamp assembly after turning in the counterclockwise direction.

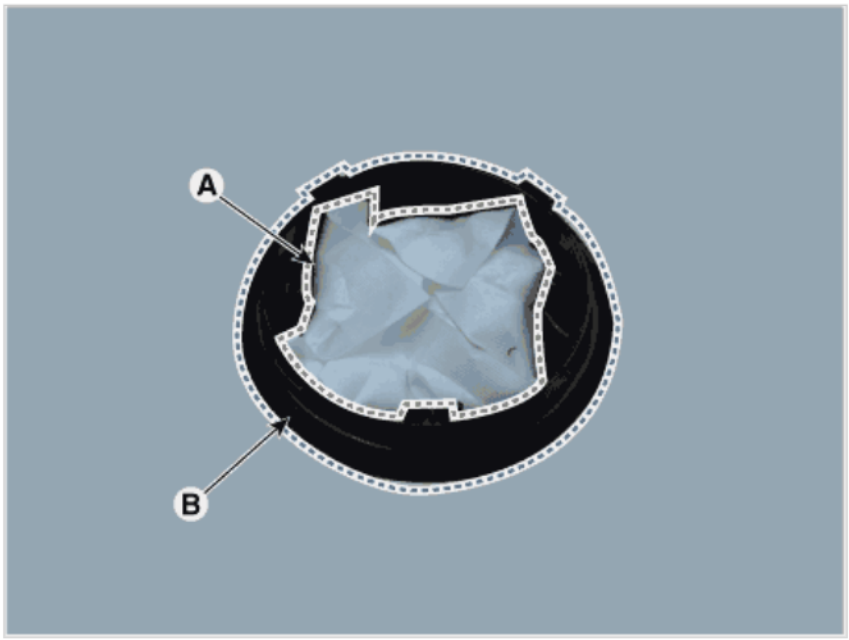


4. Remove the moisture absorbent brakcet (A) from the dust cover after loosening the mounting screws (B).

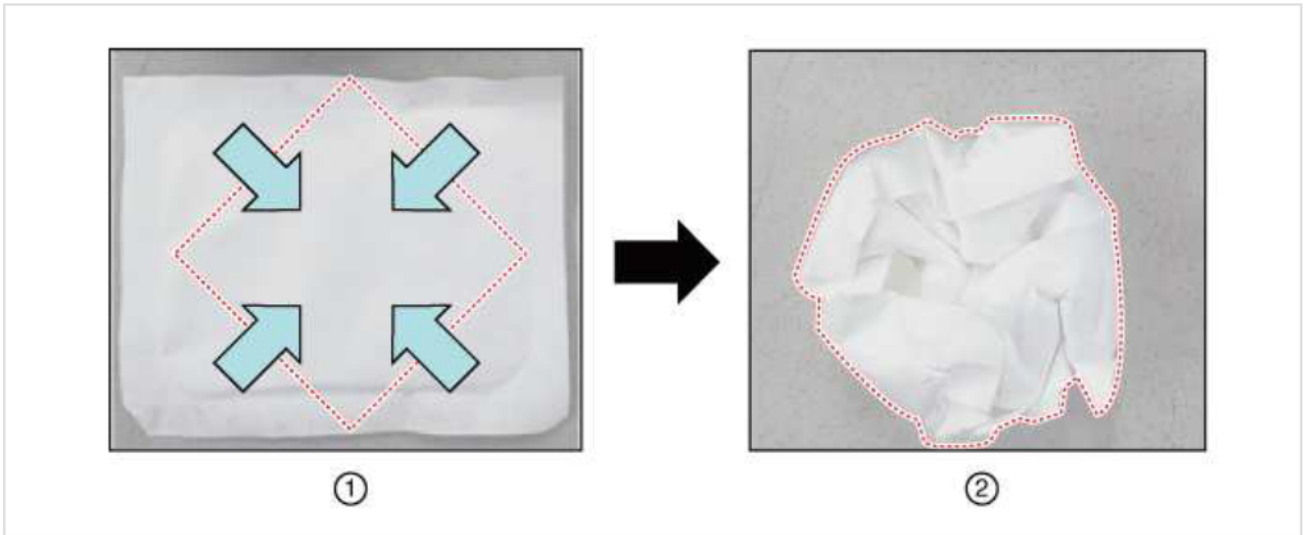
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5. Remove the moisutre absorbent (A) from the dust cap (B).

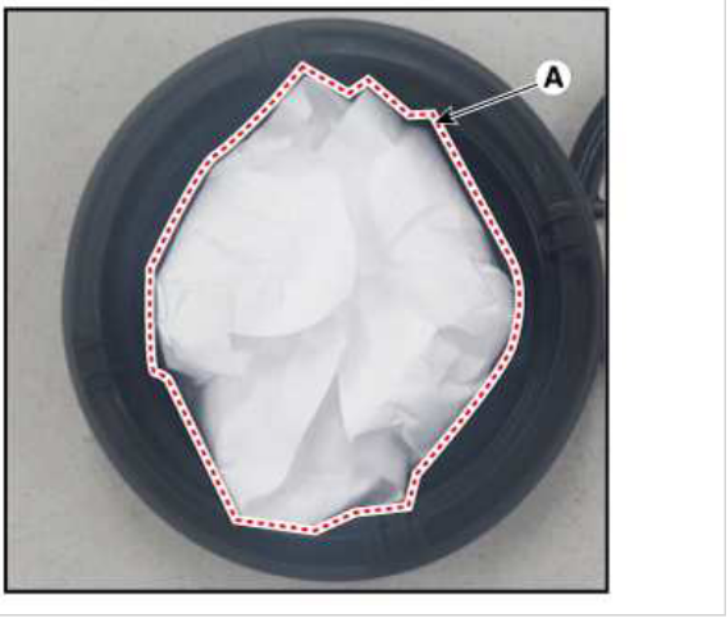


6. fold an new absorbent material as the picture below.

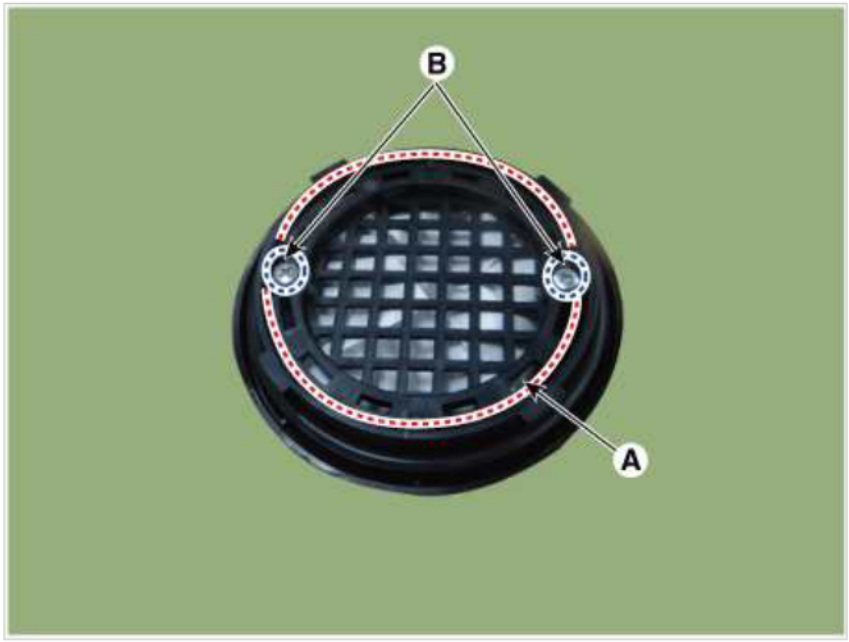


7. Insert the moisture absorbent (A) with the folded sides up.

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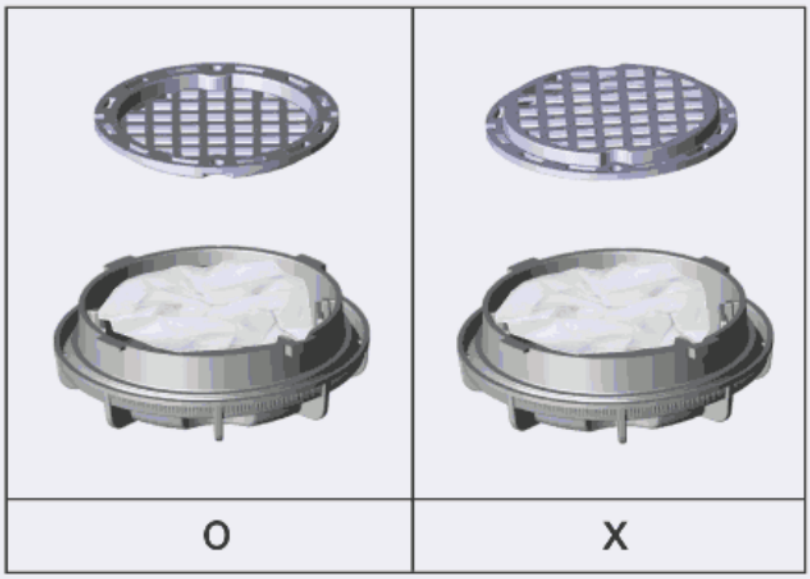
8. Tighten the mounting screws (B), after installing the miosture absorbent bracket (A).



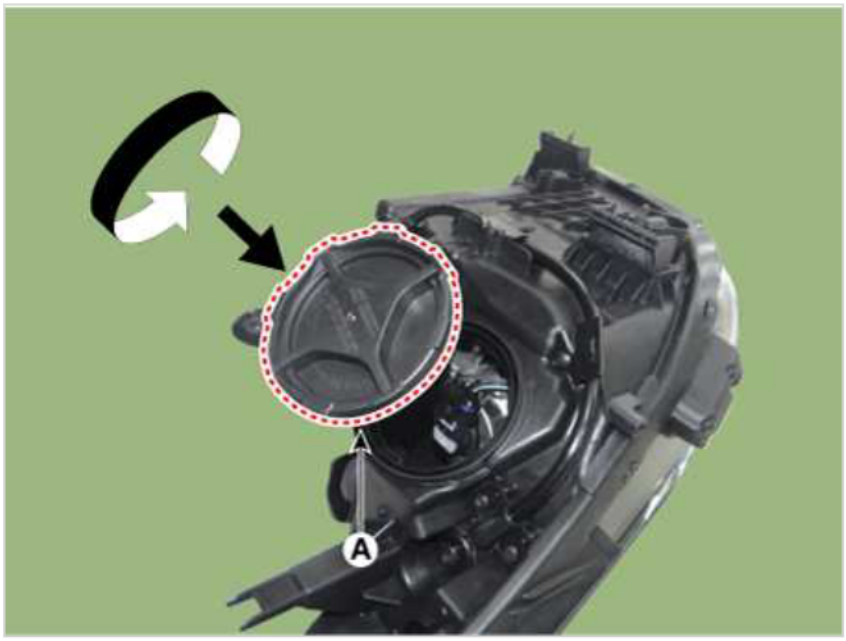
NOTICE

Be careful of the installation direction of the moisture absorbent bracket.

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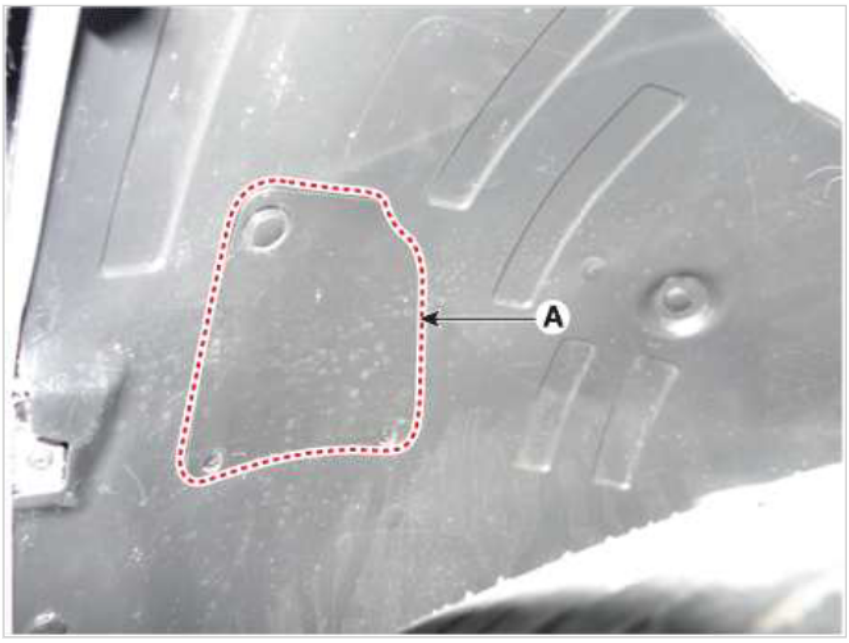


9. Install the dust caps (A) from the headlamp assembly after turning in the clockwise direction.



10. Install the headlamp service cover (A).

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Side marker lamp

1. Turn the headlamp switch off.
2. Remove the headlamp.
3. Remove the bulb socket (A) and bulb (B) from the headlamp assembly.

Click to see large image...

Ballast

1. Remove the headlamp.
   (Refer to Headlamp - "Removal")
2. Remove the ballast (A) after loosening the mounting screws.



3. Disconnect the connectors (A) from the ballast.

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4. Install in the reverse order of removal.

Adjustment

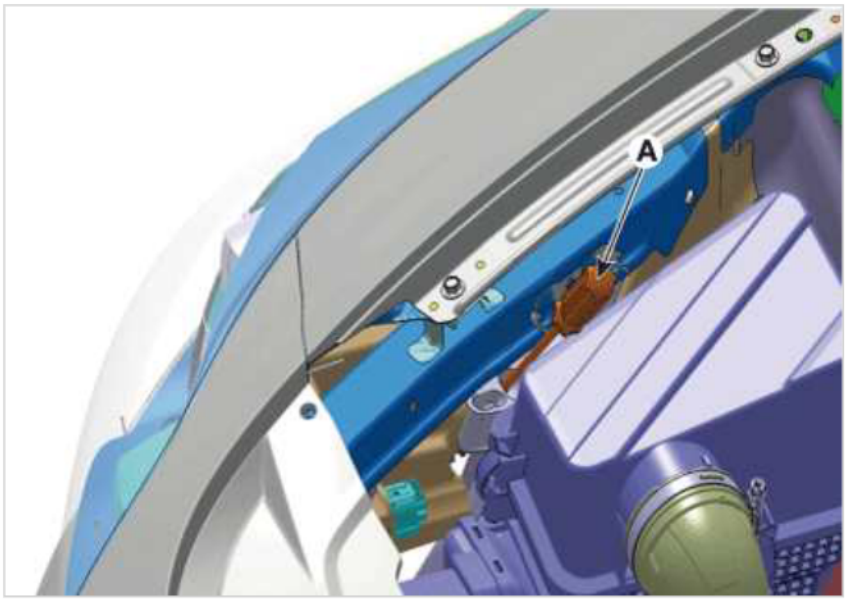
[Mechanical aiming]

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

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

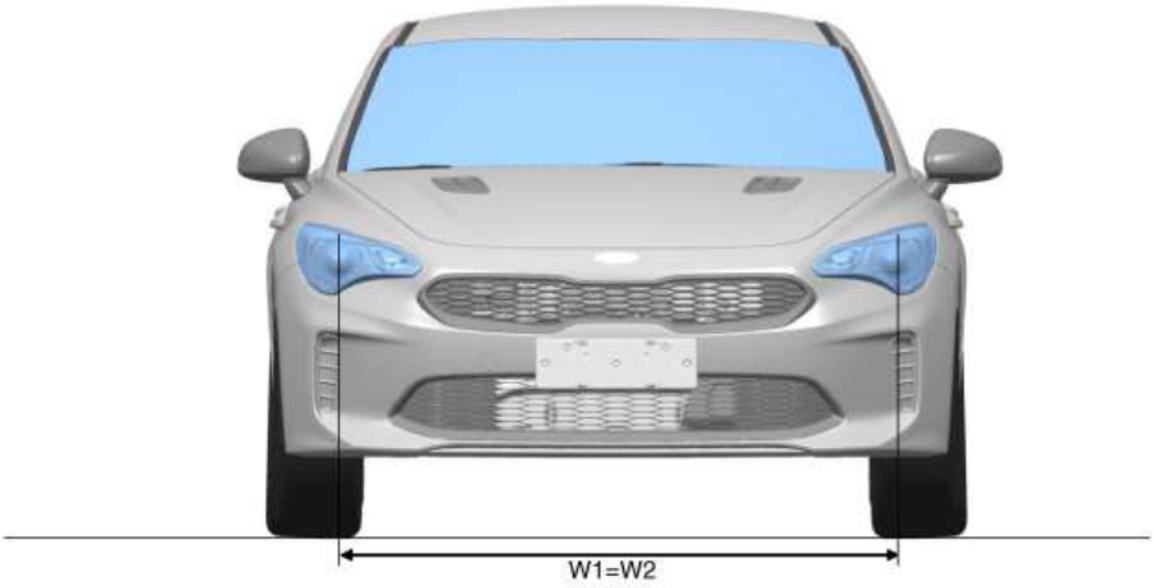
Alternatively, turn the adjusting gear to adjust the headlamp aiming. If beam-setting equipment is not available, proceed as follows :

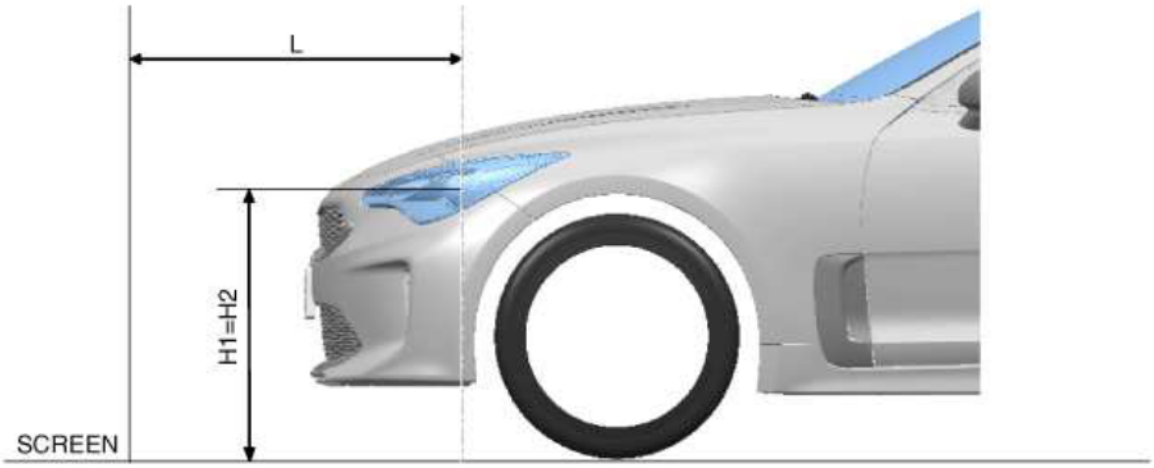
1. Inflate the tires to the specified pressure and remove any loads from the vehicle except the driver, spare tire, and tools.
2. The vehicle should be placed on a flat floor.
3. Draw vertical lines (passing through respective headlamp centers) and a horizontal line (passing through center of headlamps)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



Headlamp and Fog Lamp Aiming Point

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H1 : Height Between the Head Lamp Low Beam Bulb Center and the Ground
H2 : Height Between the Head Lamp High Beam Bulb Center and the Ground
W1 : Distance Between the Head Lamp Low Beam Bulb Center
W2 : Distance Between the Head Lamp High Beam Bulb Center
L : Distance Between the head lamp bulb center and screen

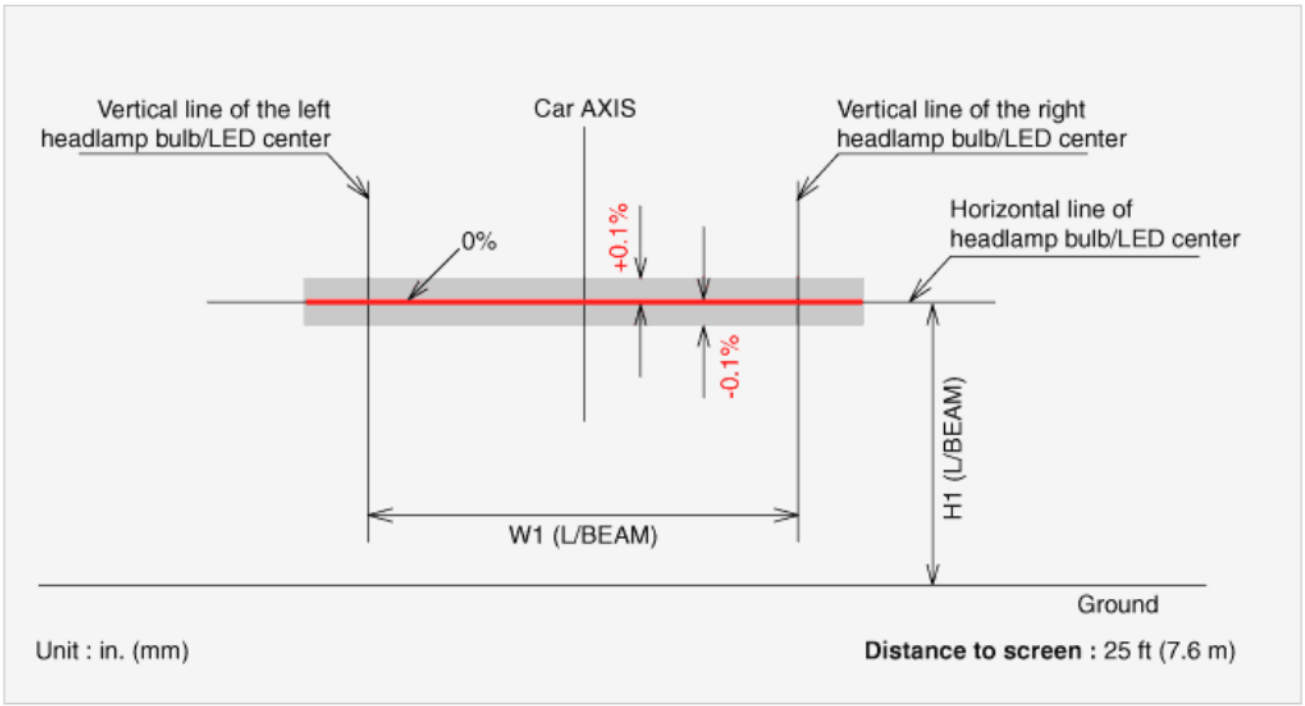
Headlamp

Unit : in.(mm)

Type	Vehicle condition	H1	H2	W1	W2	L
Halogen	Without driver	27.4 (697)		58.3 (1,482)		Refer to aiming condition
	With driver	27.2 (692)				
LED	Without driver	28.3 (720)		58.5 (1,486)		
	With driver	28.1 (715)				

1. Headlamp (Low beam)
   – Turn the low beam on without driver aboard.
   – The cut-off line should be projected in the cut-off line shown in the picture.
   – If headlamp leveling device is equipped, adjust the headlamp leveling device switch with 0 positions.

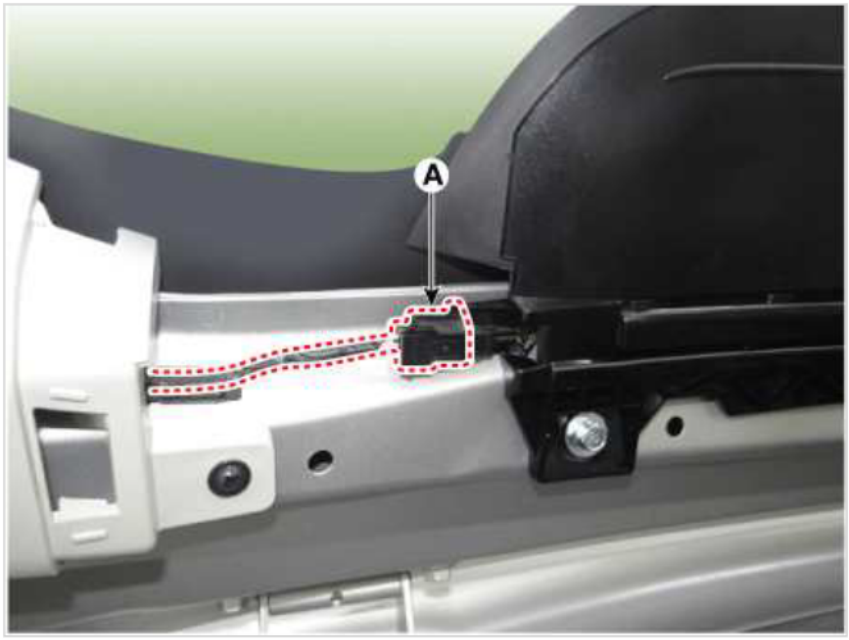
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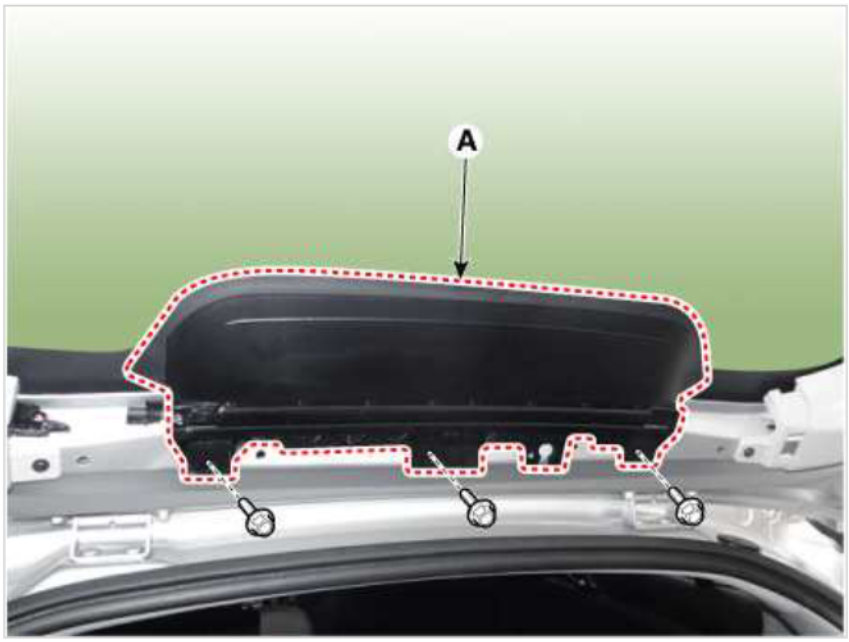
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Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the liftgate upper trim.
   (Refer to Body - "Liftgate Trim")
3. Disconnect the high mounted stop lamp connector (A).



4. Remove the high mounted stop lamp (A) after loosening the mounting bolts.



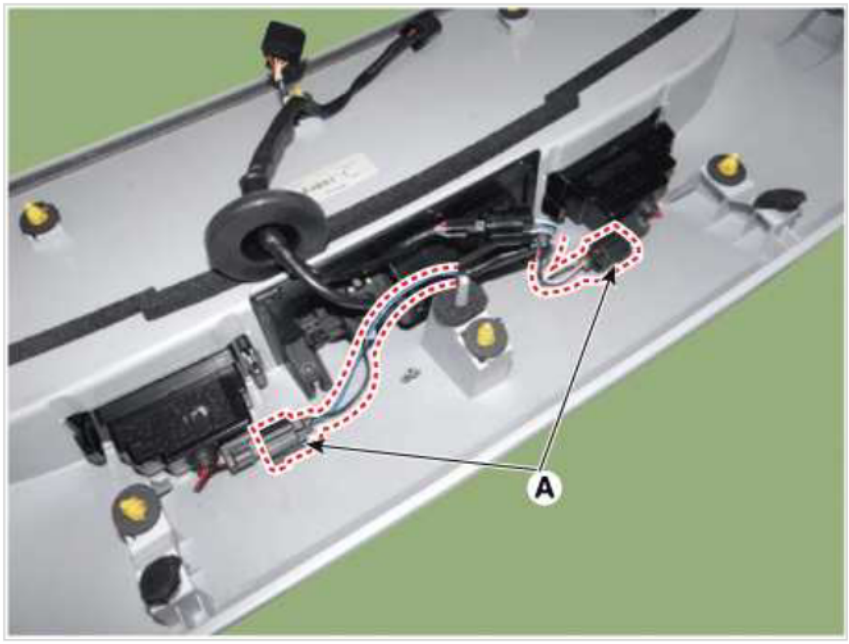
Installation

1. Install the high mounted stop lamp.
2. Connect the high mounted stop lamp connector.
3. Install the liftgate upper trim.
4. Connect the negative (-) battery terminal.

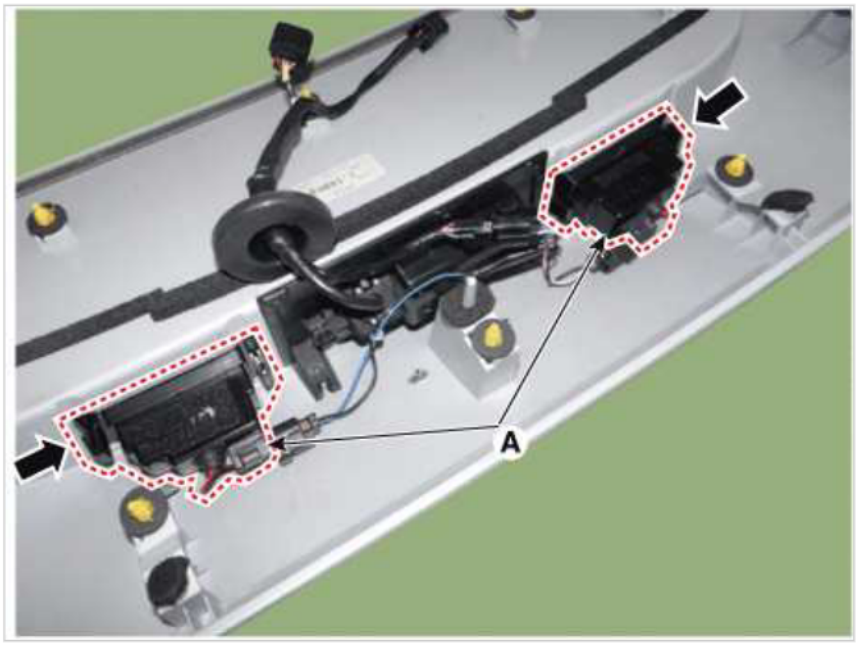
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Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the liftgate back panel.
   (Refer to Body - "Liftgate Back Panel")
3. Disconnect the license lamp connectors (A).



4. Remove the license lamp (A) after pressing the locking pin.



Installation

1. Install the license lamp.
2. Connect the license lamp connector.
3. Install the liftgate back panel.
4. Connect the negative (-) battery terminal.

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Removal

1. Disconnect the negative (-) battery terminal.
2. Using a screwdriver or remover, separate the luggage room lamp (A).



3. Disconnect the luggage room lamp connector (A).



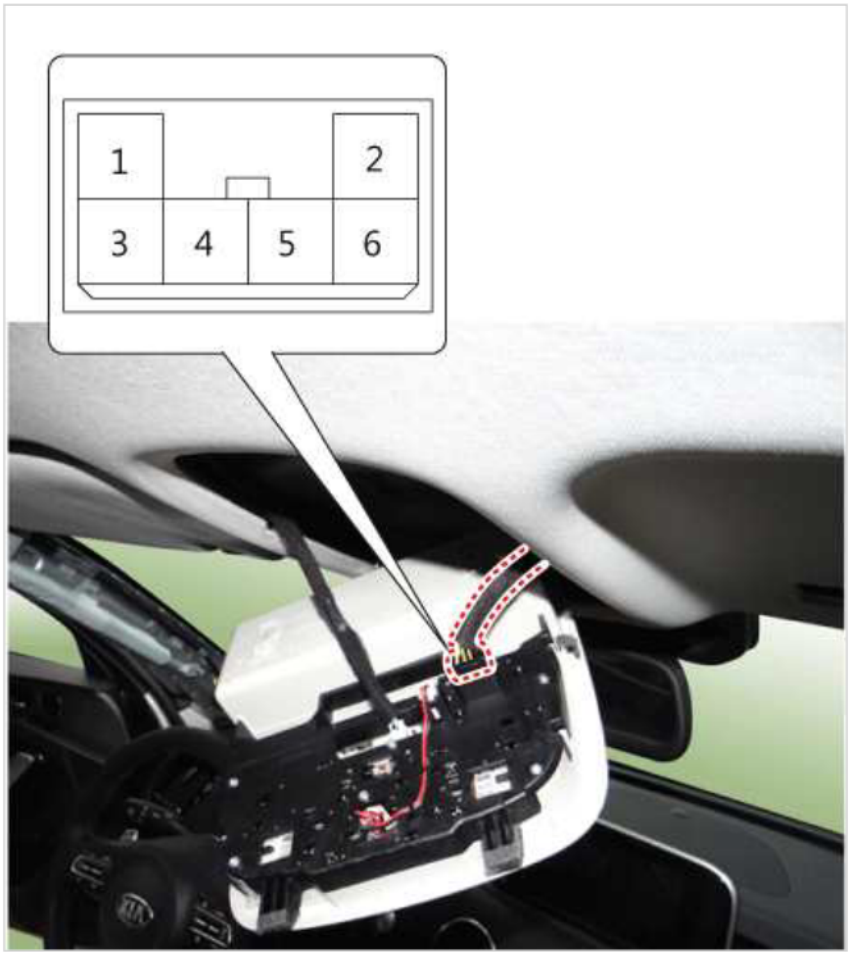
Installation

1. Connect the luggage room lamp connector.
2. Install the luggage room lamp.
3. Connect the negative (-) battery terminal.

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Inspection

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

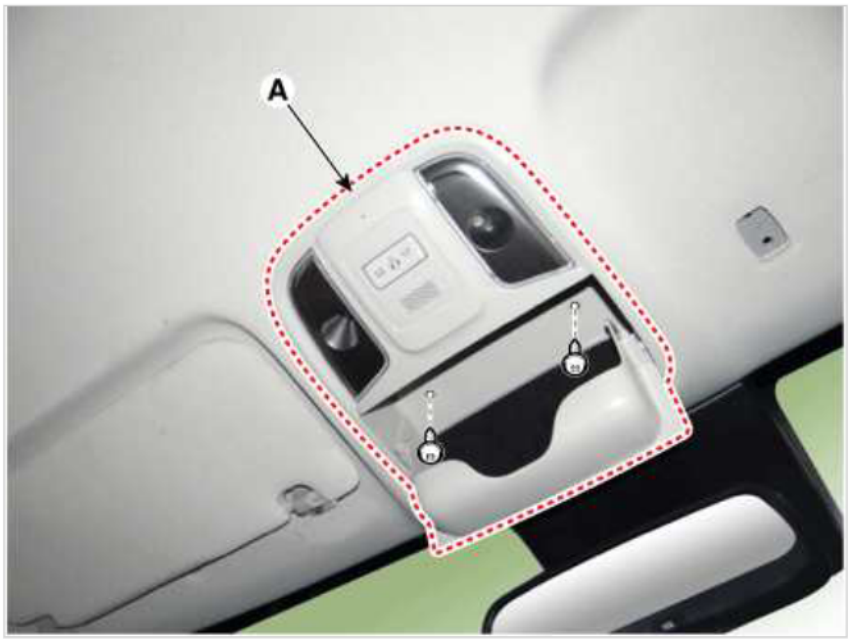


Item / Position / Terminal	Map lamp switch			
	Left		Right	
	ON	OFF	ON	OFF
4	○—●		○—●	
6	●—○		●—○	

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the two mounting screws.
   And then remove the overhead console lamp (A).

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3. Remove the overhead console lamp after disconnecting the connectors (A).



Installation

1. Connect the overhead console lamp connector.
2. Install the overhead console lamp.
3. Connect the negative (-) battery terminal.

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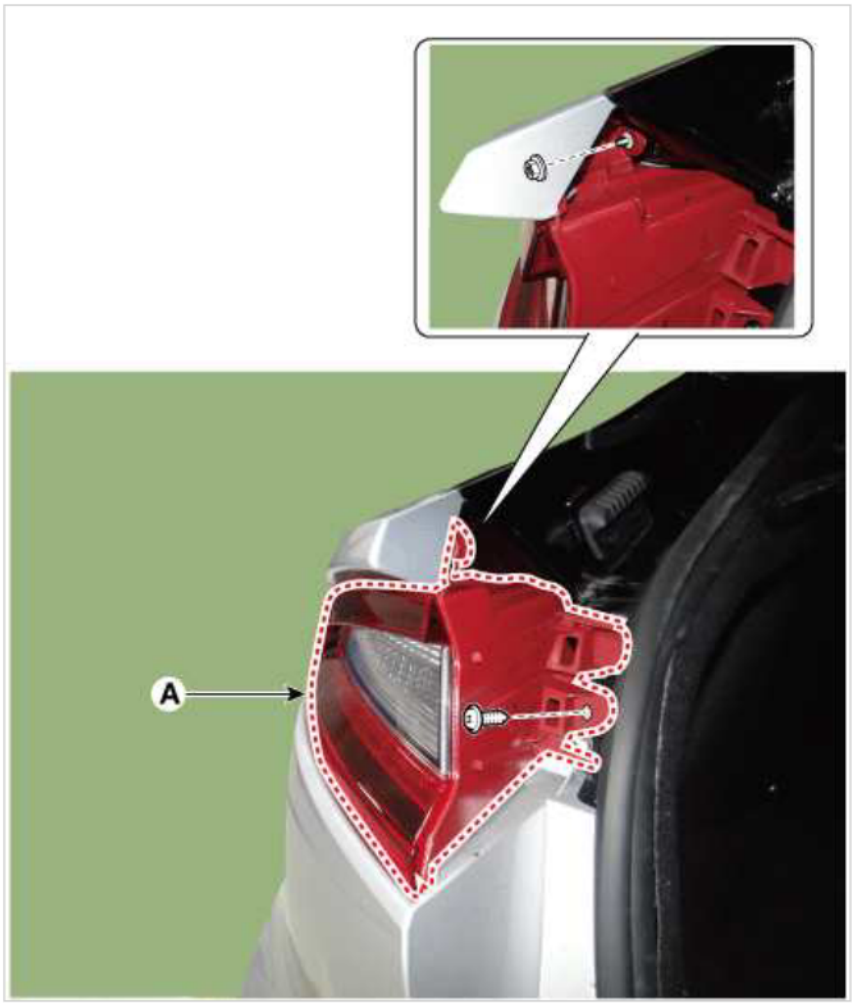
Removal

Rear Combination Lamp (Outside)

1. Disconnect the negative (-) battery terminal.
2. Using a screwdriver or remover, remove the rear combination lamp cover (A).



3. Remove the rear combination lamp (A) after loosening the mounting screw and nut.



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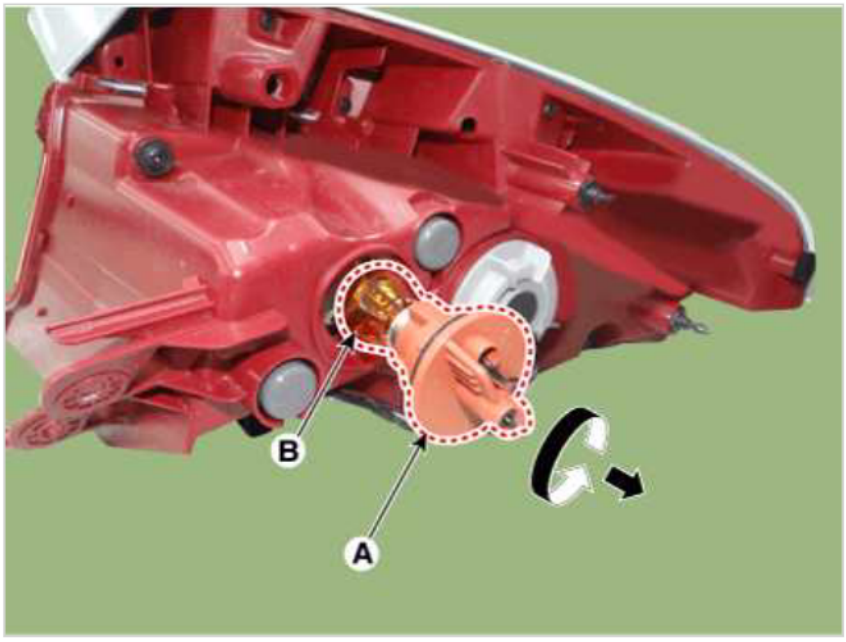
4. Disconnect the rear combination lamp connector (A).



Bulb Replacement

Turn signal lamp

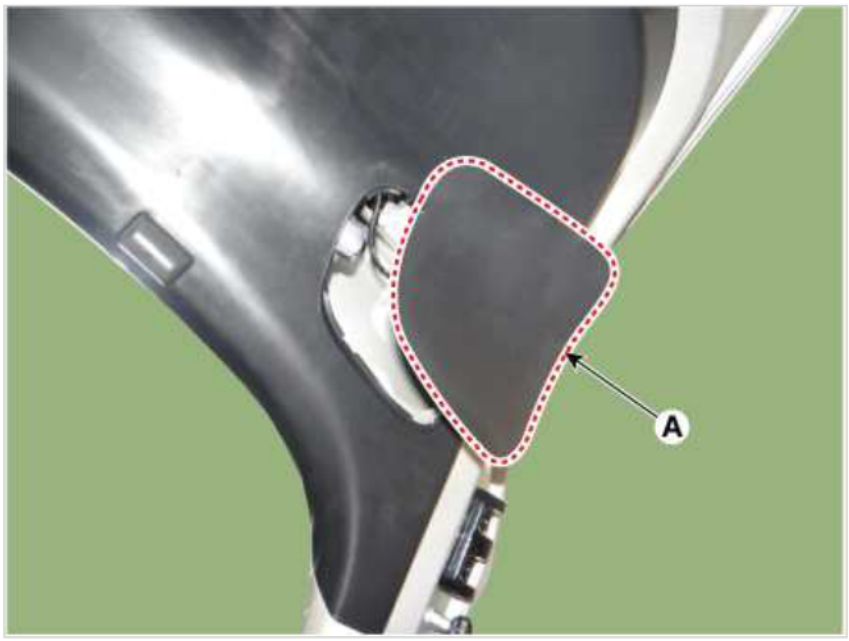
1. Turn the headlamp switch off.
2. Remove the rear combination lamp (outside).
3. Remove the turn signal lamp bulb (B) by turning the socket (A) counterclockwise.



Rear Combination Lamp (Inside)

1. Disconnect the negative (-) battery terminal.
2. Using a screwdriver or remover, remove the rear combination lamp cover (A).

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3. Disconnect the connector (B) and then remove the rear combination lamp (A) after loosening the nuts.



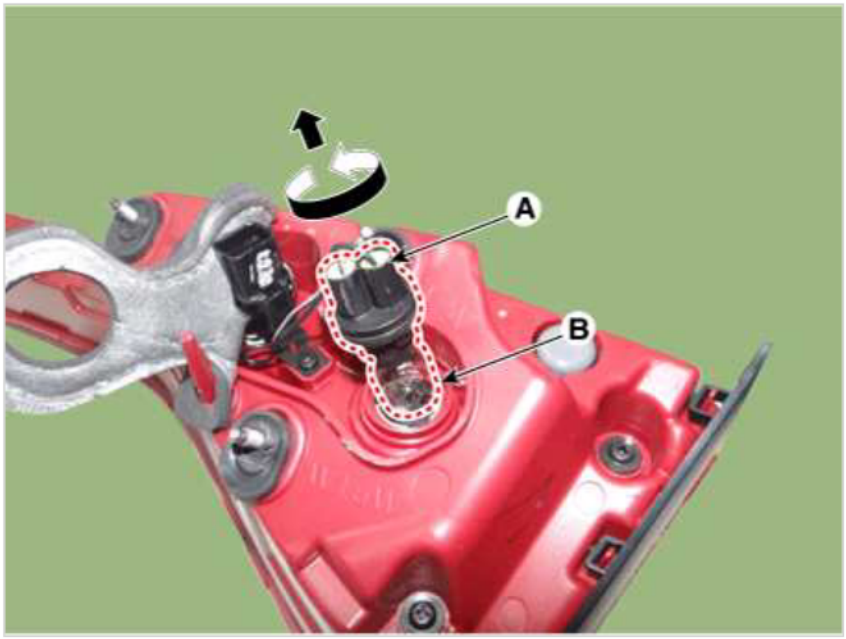
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Bulb Replacement

Back up lamp

1. Remove the rear combination lamp. (Inside)
2. Remove the back up lamp bulb (B) by turning the socket (A) counterclockwise.



Installation

Rear Combination Lamp (Outside)

1. Connect the rear combination lamp connector.
2. Install the rear combination lamp.
3. Install the rear combination lamp cover.
4. Connect the negative (-) battery terminal.

Rear Combination Lamp (Inside)

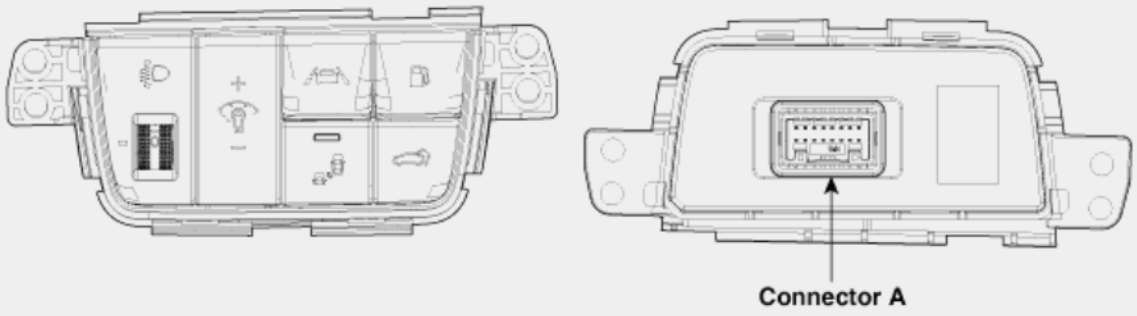
1. Install the rear combination lamp.
2. Connect the rear combination lamp connector.

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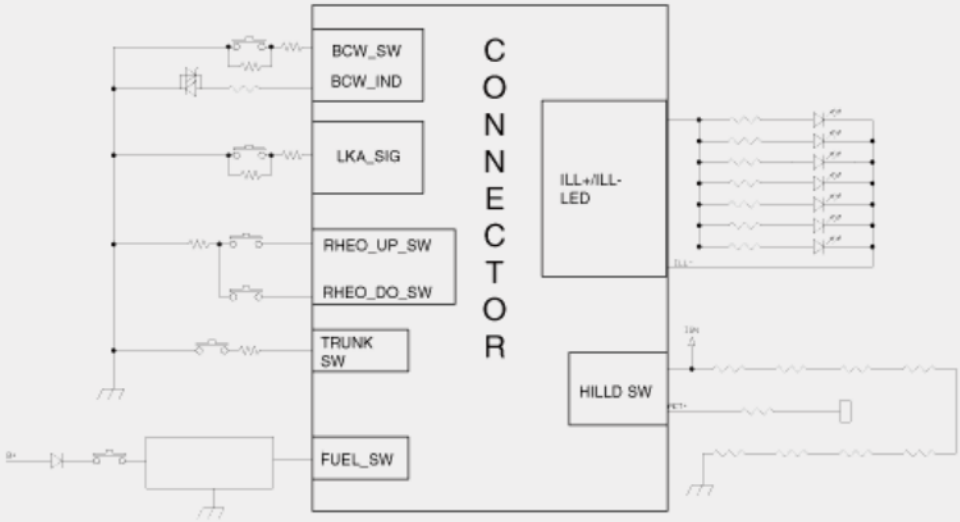
3. Install the rear combination lamp cover.
4. Connect the negative (-) battery terminal.

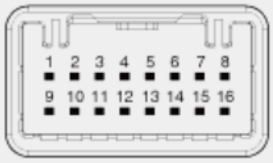
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Components



Connector A



Connector A	No.	Description	No.	Description
	1	Battery (+)	13	Illumination (+)
	2	IGN	14	-
	3	-	15	Illumination (-)
	4	HLLD Actuator (+)	16	BCW Indicator
	5	Rheostat (Up)	17	PTG Swtich
	6	Rheostat (Down)	18	LKA Switch
	7	-	19	BCW Switch
	8	Fuel door open switch	20	Ground

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Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel.
   (Refer to Body - "Crash Pad Lower Panel")
3. Remove the crash pad garnish [LH] (A) after loosening the mounting screw.

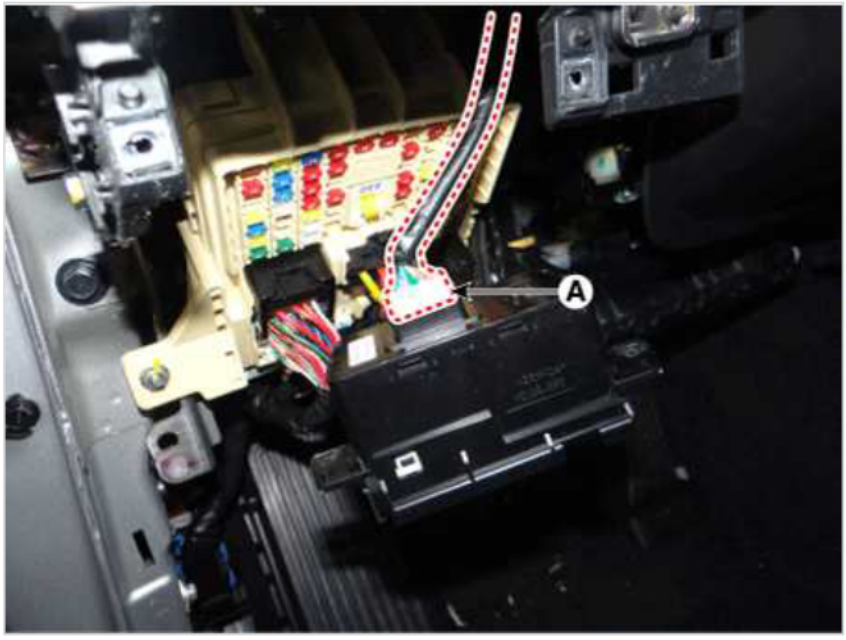


4. Remove the side crash pad switch (A) after loosening the mounting screws.



5. Disconnect the side crash pad switch connector (A).

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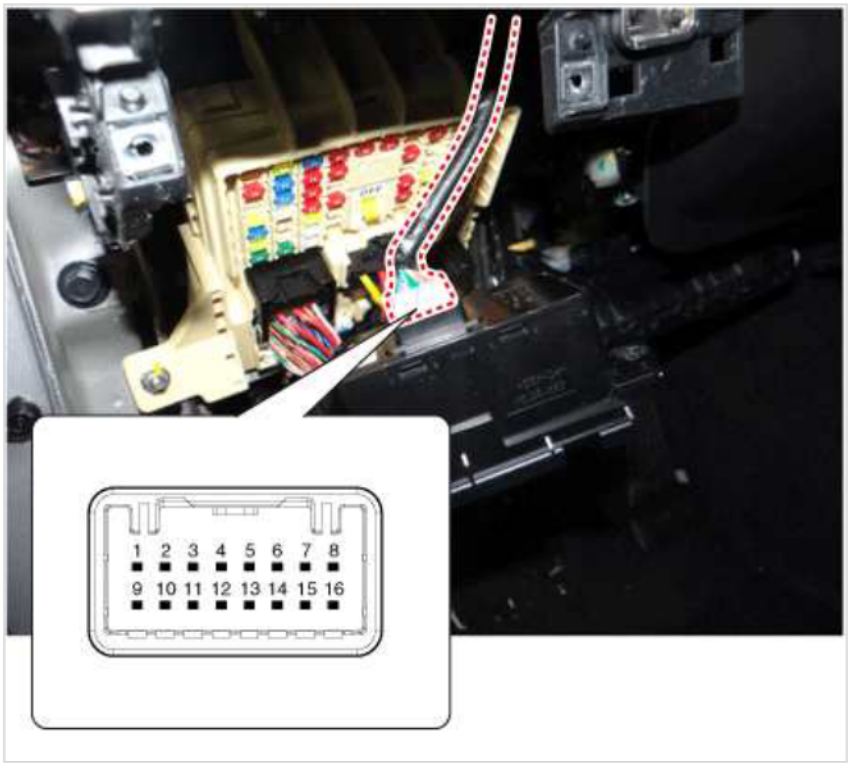


Installation

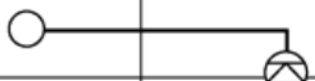
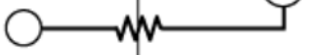
1. Connect the side crash pad switch connector.
2. Install the side crash pad switch.
3. Install the crash pad garnish [LH].
4. Install the crash pad lower panel.
5. Connect the negative (-) battery terminal.

Inspection

1. 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.



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Position / Terminal	UP (+)	DOWN (-)	Description
6			Down
20			GND
5			Up
15			Illumination (-)
13			Illumination (+)

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Removal

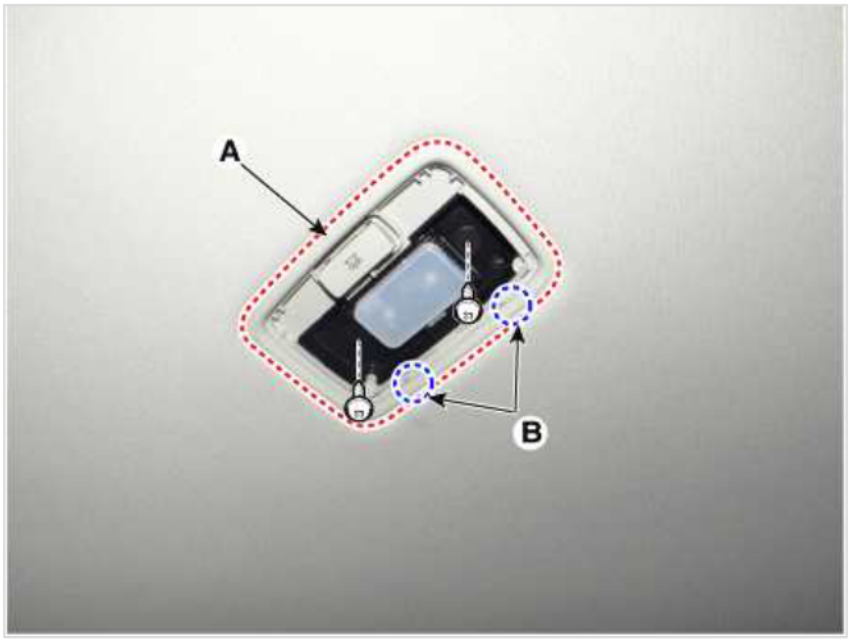
⚠ CAUTION

- Put on gloves to prevent hand injuries.
- When removing with a flat-tip screwdriver or remover, wrap protective tape around the tools to prevent damage to components.

1. Disconnect the negative (-) battery terminal.
2. Using a screwdriver or remover, separate the room lamp (A) from the room lamp.



3. Remove the room lamp (A) after loosening the mounting screws.



NOTICE

- When removing the room lamp, be careful of the direction in which the tool is inserted (B).
- When inserting the tool in the opposite direction, take caution as the room lamp may be damaged.

4. Remove the room lamp assembly after disconnecting the room lamp connector (A).

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Installation

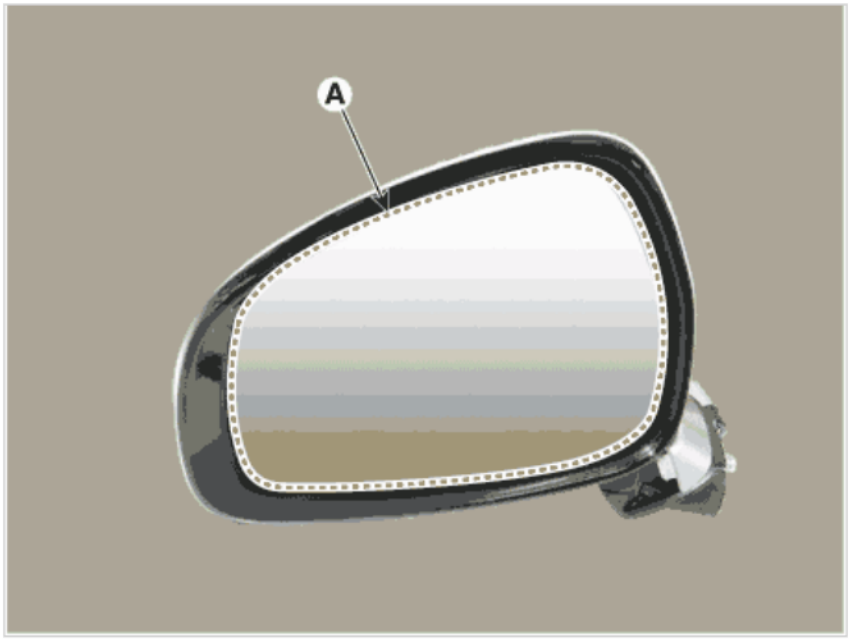
1. Connect the room lamp connector.
2. Install the room lamp.
3. Install the room lamp lens.
4. Connect the negative (-) battery terminal.

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Removal

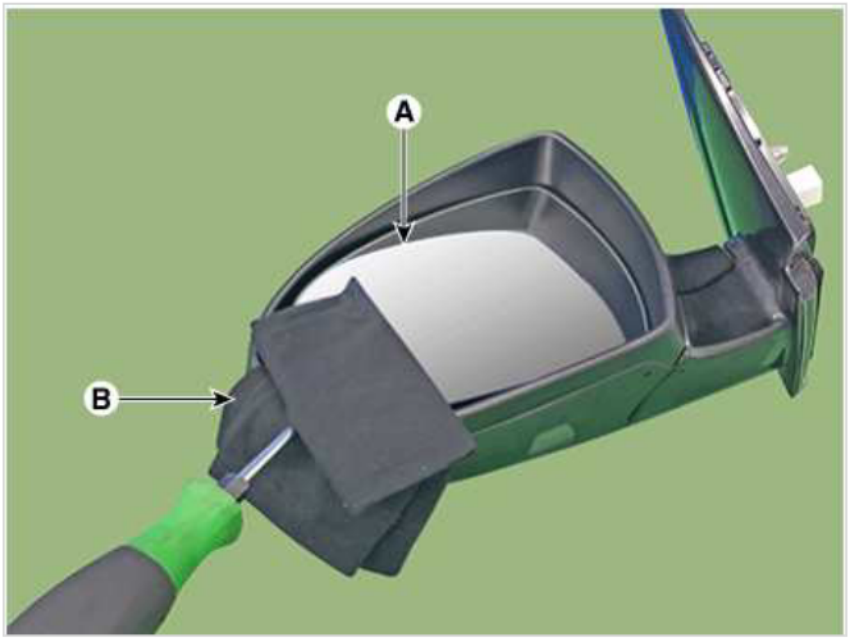
Door Mirror Turn Signal Lamp

1. Disconnect the negative (-) battery terminal.
2. Remove the outside rear view mirror.
   (Refer to Body - "Outside Rear View Mirror")
3. Remove mirror (A) to the direction as shown in the picture using (-) screw driver.



⚠ CAUTION

- Protect mirror from removing tool with cloth (B) wrapped.
- Be careful not to damage mirror and mirror housing during removing process.
- Apply force around the center of mirror because to apply force the end of mirror will break it.



NOTICE

Be careful not to damage the fixing clips (A).

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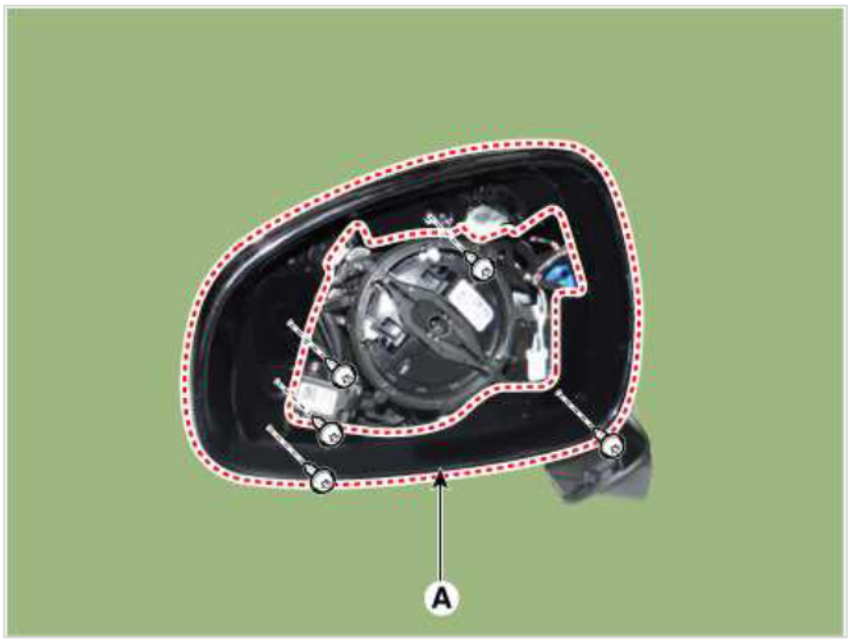


4. Disconnect the heater connectors (B) and BCW indicator connector (A) from the mirror.

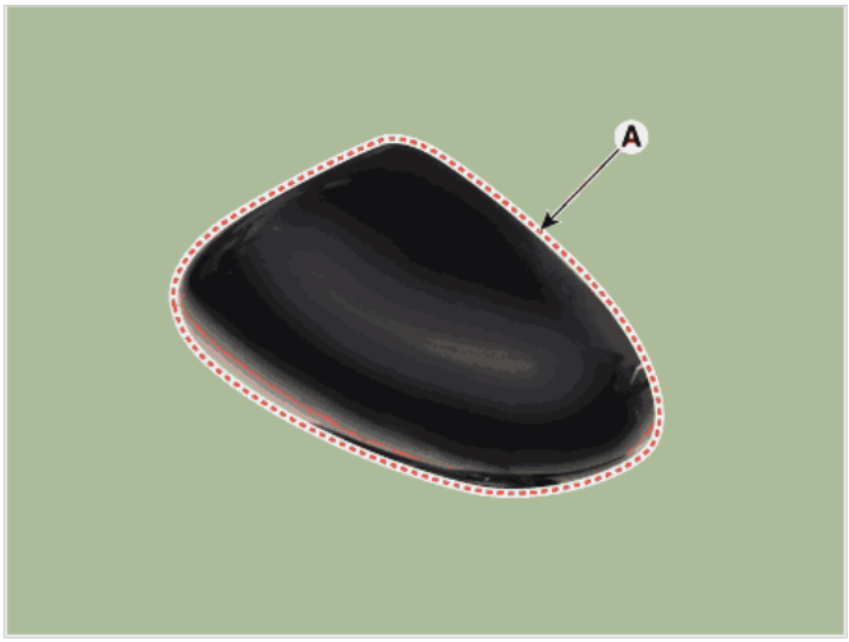


5. Remove the door mirror housing (A) after loosening the mounting screws.

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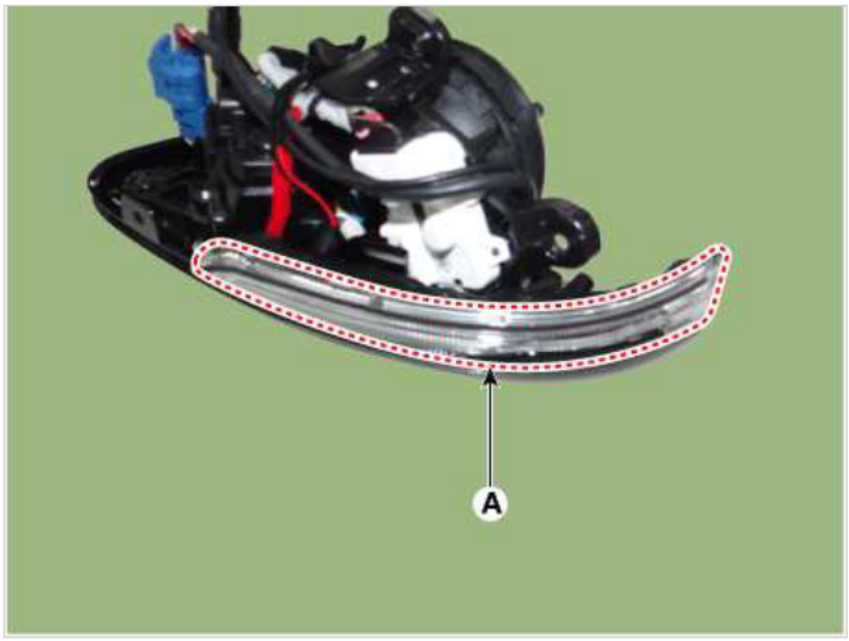


6. Remove the door mirror back cover (A).



7. Remove the door mirror turn signal lamp (A).

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8. Disconnect the connector (A) from the door mirror turn signal lamp.



Installation

Door Mirror Turn Signal Lamp

1. Install the door mirror turn signal lamp after connecting the connector.
2. Install the door mirror back cover.
3. Install the door mirror hoursing.
4. Connect the heating connectors and BCW indicator connector.
5. Install the mirror.
6. Install the outside rear view mirror.
7. Connect the negative (-) battery terminal.

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Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the vanity lamp (A) using a flat-tip screwdriver.



3. Disconnect the vanity lamp connector (A).



Installation

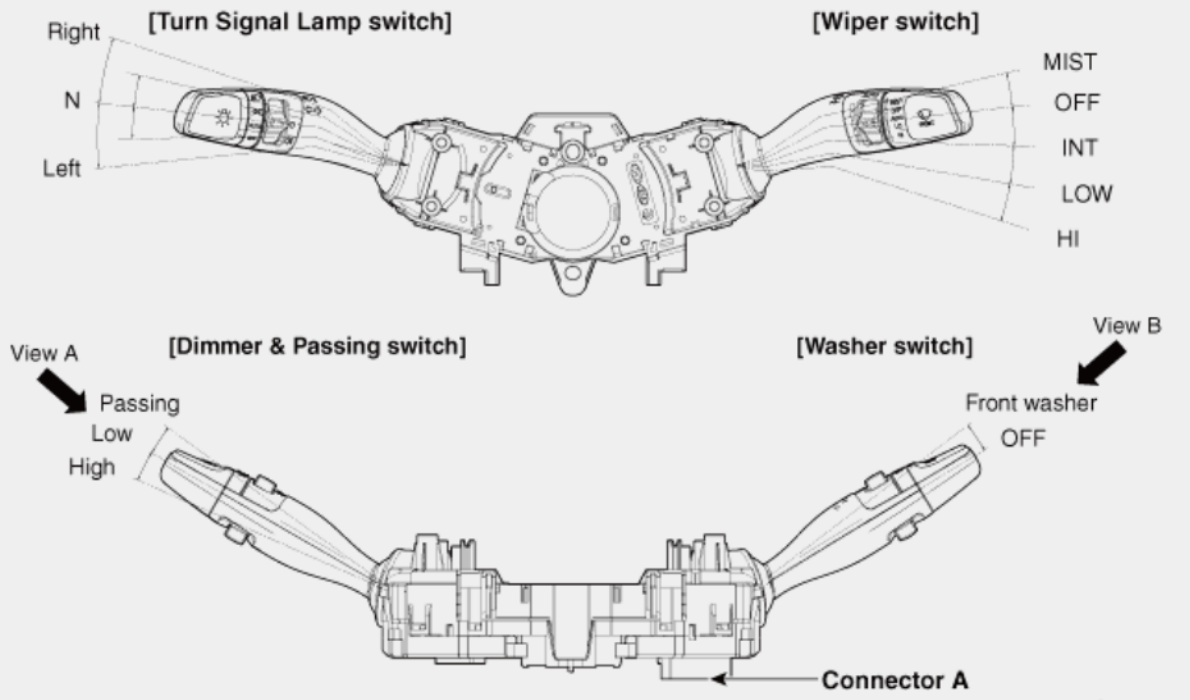
1. Connect the vanity lamp connector.
2. Install the vanity lamp.
3. Connect the negative (-) battery terminal.

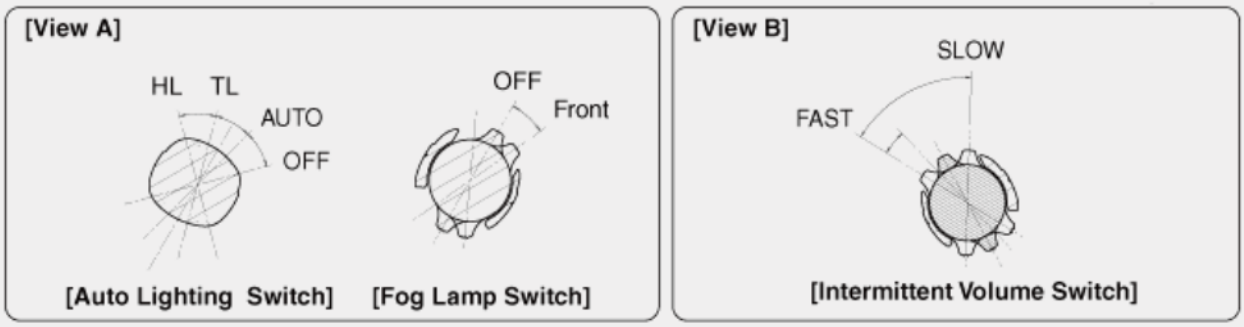
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Components

Click to see large image...

1 . Steering column shaft
2 . Lighting switch
3 . Wiper/Washer switch
4. Screws
5. Clock spring
6. Clock spring connectors
7. Steering angle sensor connector
8. Multifunction connector





Connector A	No.	Description	No.	Description
	1	Front wiper switch	9	Ground
	2	Front wiper low backup switch	10	Fog lamp switch
	3	-	11	Ground
	4	-	12	Turn signal lamp switch
	5	-	13	Dimmer & passing switch
	6	Front washer motor switch	14	Light switch
	7	Front wiper intermittent volume switch	15	Headlamp low backup switch
	8	IGN2	16	-

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Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the steering wheel.
   (Refer to Steering System - "Steering Wheel")
3. Remove the steering column upper and lower shrouds after loosening the screws.
   (Refer to Body - "Steering Column Shroud Panal")
4. Remove the clock spring.
   (Refer to Restraint - "Driver Airbag (DAB) Module and Clock Spring")

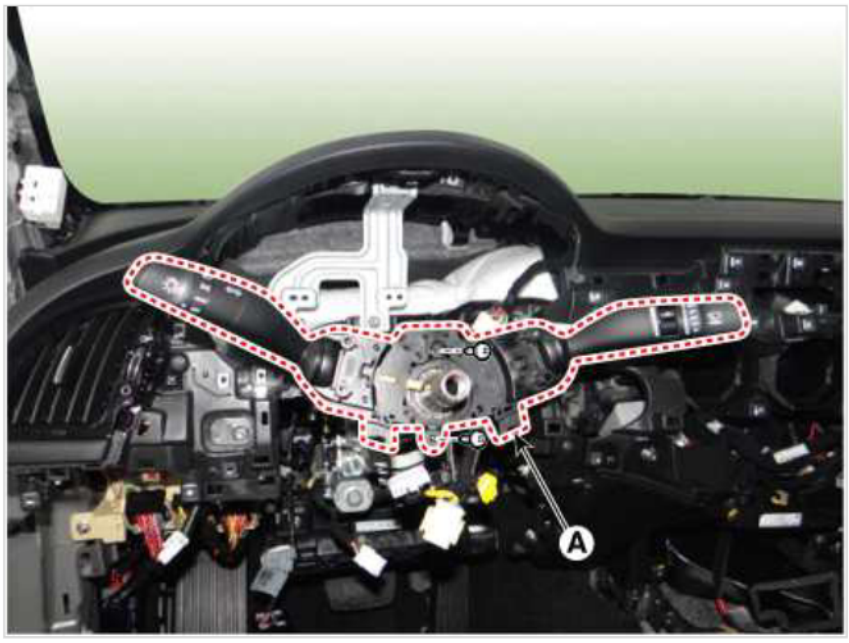


5. Disconnect the multifunction switch connector (A).



6. Remove the multifunction switch assembly (A) after loosening the screws.

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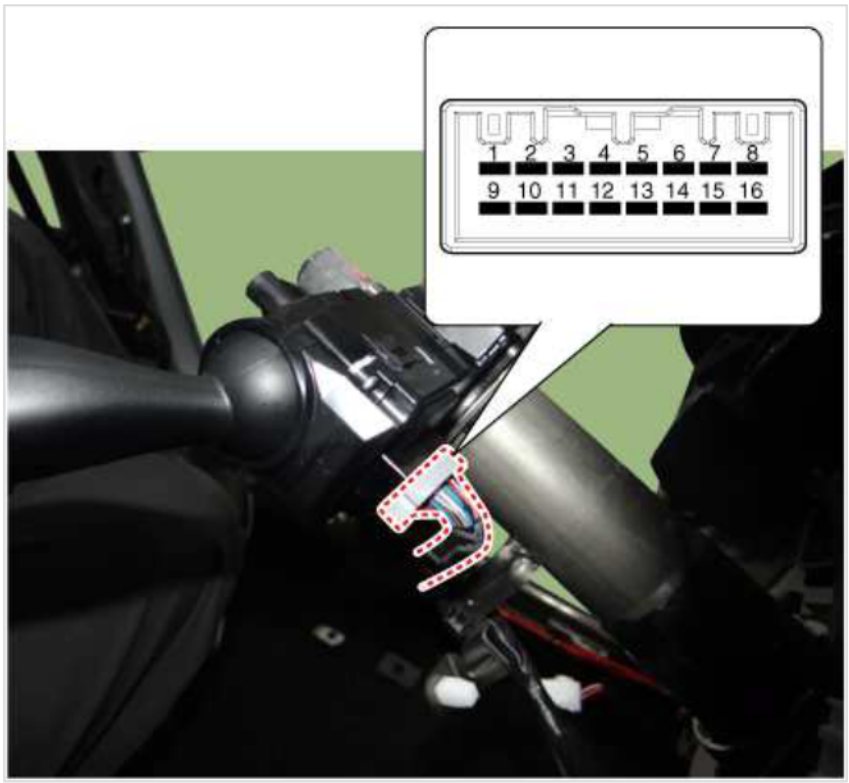
Installation

1. Install the multifunction switch.
2. Install the clock spring.
3. Install the steering column upper and lower shrouds.
4. Install the steering wheel.
5. Connect the negative (-) battery terminal.

Inspection

Multifunction Switch Inspection

1. Check for continuity between the terminals in each switch position as shown below.



[Left Handle Drive]

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Switch	Switch position	Switch terminal	Resistance (Ω, ±3.5%)
Front wiper switch	MIST	1-9	330
	OFF		∞
	Intermittent (AUTO)		800
	LOW		1,800
	HIGH		5,700
Wiper intermittent volume	Volume 1	7-9	330
	Volume 2		690
	Volume 3		1,310
	Volume 4		2,610
	Volume 5		7,310
Fog lamp switch	OFF	9-10	∞
	ON		910
Turn signal switch	OFF	9-12	∞
	Left		910
	Right		2,910
Dimmer & Passing switch	OFF	9-13	∞
	Passing		910
	Dimmer		2,910
Light switch	OFF	9-14	680
	AUTO / DRL		∞
	Tail lamp		1,680
	Low beam		5,580

Inspection (With KDS)

1. In the body electrical system, failure can be quickly diagnosed by using the vehicle diagnostic system (KDS).
   The diagnostic system(KDS) provides the following information.
   (1) Self diagnosis : Checking failure and code number (DTC)
   (2) Current data : Checking the system input/output data state
   (3) Actuation test : Checking the system operation condition
   (4) Additional function : Controlling other features including system option setting and zero point adjustment
2. Select the "Car model" and the "Integrated body control unit (IBU)" to be checked in order to check the vehicle with the tester.
3. Select the "Current Data" menu to search the current state of the input/output data.

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Specifications

Items		Specifications
Rated voltage		DC 12 V
Operating temperature range		-22 - 176°F (-30 - 80°C)
Rated load	Washer	Washer : 6A (Motor load)

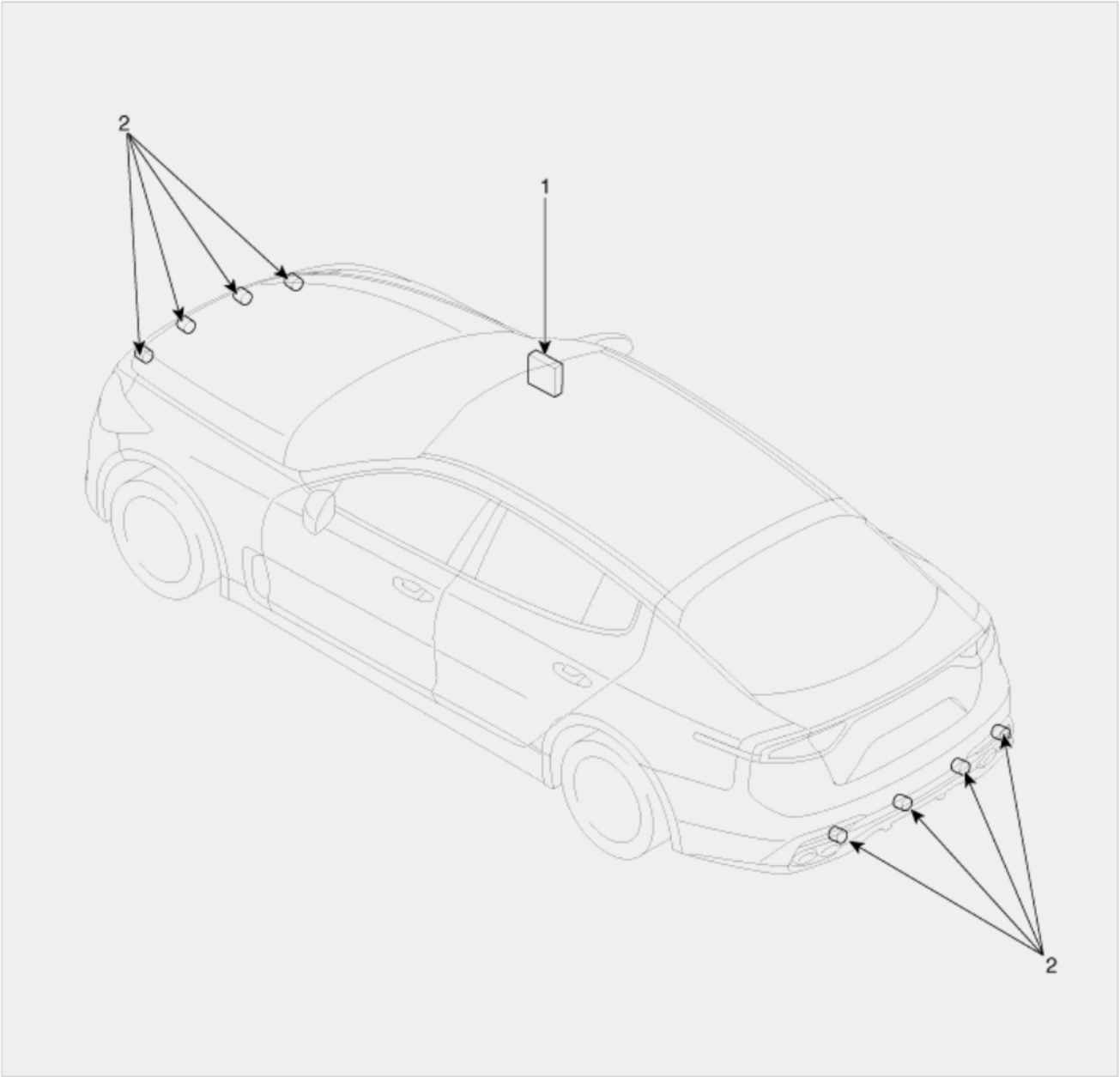
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Specification

Item		Specification
Ultrasonic sensor	Voltage rating	DC 12 V
	Detecting range	11.8 - 47.2 in. (30 - 120 cm)
	Operation voltage	DC 9 - 16 V
	Operation current	MAX 80 mA
	Operation temperature	-40 - 185°F (-40 - 85°C)
	Operation frequency	52 ± 2 KHz
	Number of sensors	8EA

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Component Location



1. Integrated body control unit (IBU)
2. Parking distance warning sensor

Information

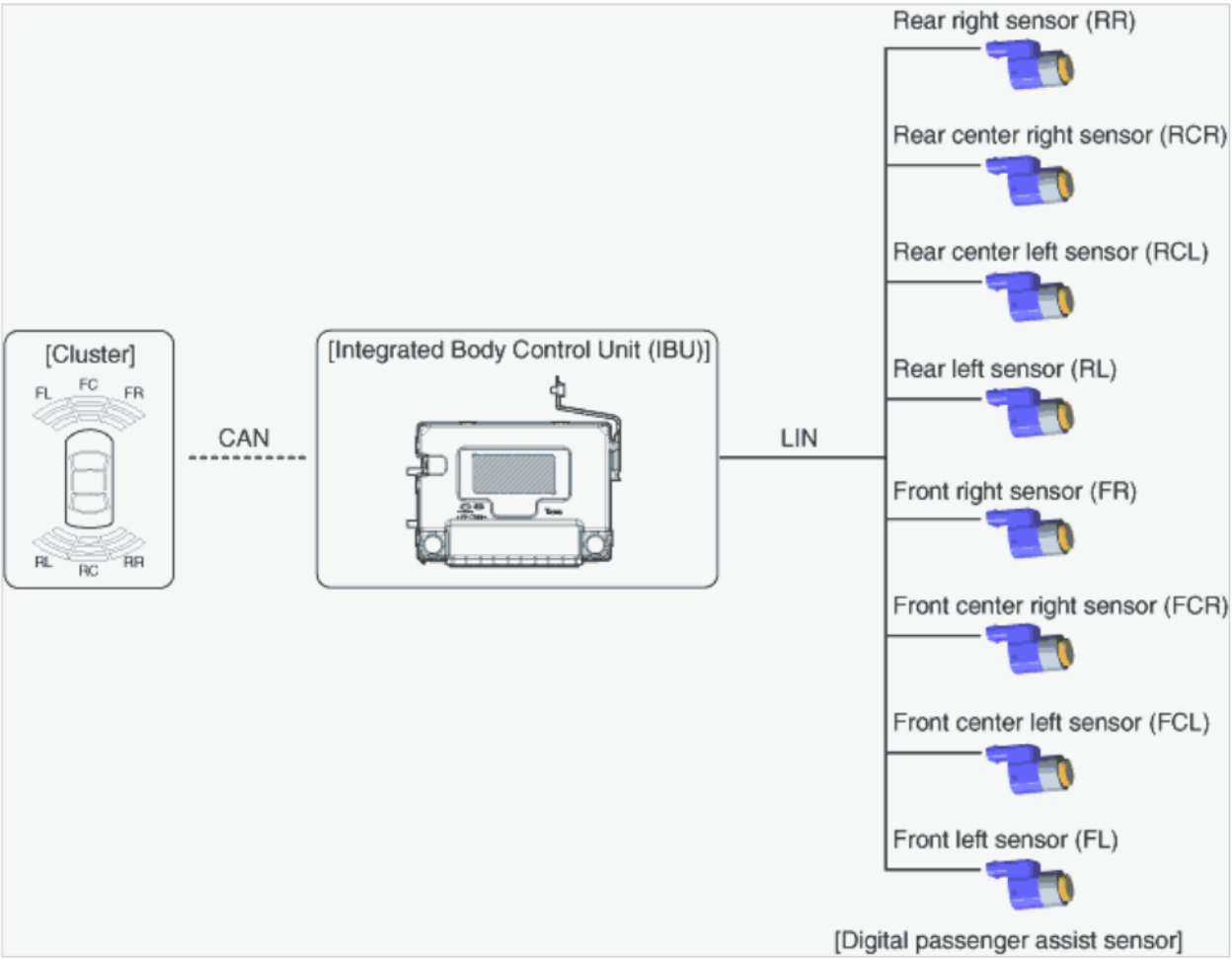
Front/rear parking distance warning control unit function is built into the Integrated body control unit (IBU).

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System Configuration

PDW consists of 8 sensors (4 in the front and 4 in the rear) that are used to detect obstacles and transmit the result in three separate warning levels, the first, second and third to IPM (IBU) via LIN communication. IPM (IBU) decides the alarm level by the transmitted communication message from the slave sensors, then operates the buzzer or transmits the data for display.

Block Diagram



System Operation Specification

1. Initial mode - Front sensor
   (1) System initializing time is 500ms after IGN1+ initial D Gear + below 10 Km/h .
   (2) PDW recognizes LID and sets the sensor ID up during initialization.
   (3) PDW activates each sensor and then executes the diagnosis after finishing initialization of IPM(IBU).
   (4) PDW Starting buzzer" is normally worked, when sensor does not send an error message and after finishing error diagnosis.
   (5) If any failure is received from the any sensors, PDW Starting Buzzer" does not work but the failure alarm is operated for a moment.
   If you have display option, warning sign is also shown on it.
   (6) Buzzer for sensor failure is operated once, but display is shown continuously until it is repaired completely.
   (7) IPM(IBU) memorizes the completed initializing status of front sensor until IGN 1 is OFF. It doesn"t activate initializing when next D gear input.
   (8) In case of PDW SW OFF, system initializing does not be activated.
   (9) If PDW switch is ON like as below status, it activates initializing.
   – PDW switch OFF when IGN1 is On.
   – PDW switch ON when vehicle speed is below 10 km/h
   (10) Initializing has nothing to do with parking brake operation.
2. Initial mode - Rear sensor
   (1) System initializing time is 500ms after IGN1+ initial R Gear.

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(2) PDW recognizes LID and sets the sensor ID up during initialization.

(3) PDW activates each sensor and then executes the diagnosis after finishing initialization of IPM(IBU).

(4) PDW Starting buzzer" is normally worked, when sensor does not send an error message and after finishing error diagnosis.

(5) If any failure is received from the any sensors, PDW Starting Buzzer" does not work but the failure alarm is operated for a moment.
If you have display option, warning sign is also shown on it.

(6) Buzzer for sensor failure is operated once, but display is shown continuously until it is repaired completely.

(7) IPM(IBU) memorizes the completed initializing status of rear sensor until IGN 1 is OFF. It doesn"t activate initializing when next R gear input.

(8) Initializing has nothing to do with parking brake operation.

3. Normal mode - Front sensor
   (1) Lin communication starts and keeps the routine after IGN1 ON+D gear + below 10 km/h.

   (2) After initializing, the routine starts at once without PDW starting warning sound.

   (3) Alarms of obstacle consists of 3 level 1,2,3 step and 1,2 alarm sounds intermittently and 3 alarm sounds continuously. 1 level alarm doesn"t exist in the front ultrasonic sensor.
   – Type with display
   • 2 level alarm : Display is only operated without alarm.
   • 3 level alarm : Alarm + Display
   – Type without display : Alarm only

   (4) In display, the data of each sensor is sent from IPM(IBU) to display, for example cluster. CAN communication is used for transmission and maximum gateway time is 50ms.

   (5) The efficient vehicle speed of RPDW operation is under 10Km/h.

   (6) It doesn"t work at PDW SW OFF.

   (7) It has nothing to do with parking brake operation.

   (8) Operation doesn"t start or stops at gear N, P.

4. Normal mode - Rear sensor
   (1) Lin communication starts and keeps the routine after IGN1 ON+R gear

   (2) IBU send a message once to each sensor for operating request to check the initial status of the system and four sensors response at a time. At this time, if there is no problem, the alarm starts after 500ms of R gear shifting at 300ms intervals.

   (3) After initialization, normal mode starts 100ms later after finishing alarm output.

   (4) Alarm for obstacles is divided into 3 levels.
   The first and second are intermittent sound, and the third alarms continuously

   (5) In display, the data of each sensor is sent from IBU to display, for example Cluster.
   CAN communication is used for transmission and maximum gateway time is 50ms.

   (6) It has nothing to do with vehicle speed.

   (7) When PDW SW is OFF, if gear R signal is inputted, PDW SW is changed to ON.

   (8) It has nothing to do with parking brake operation.

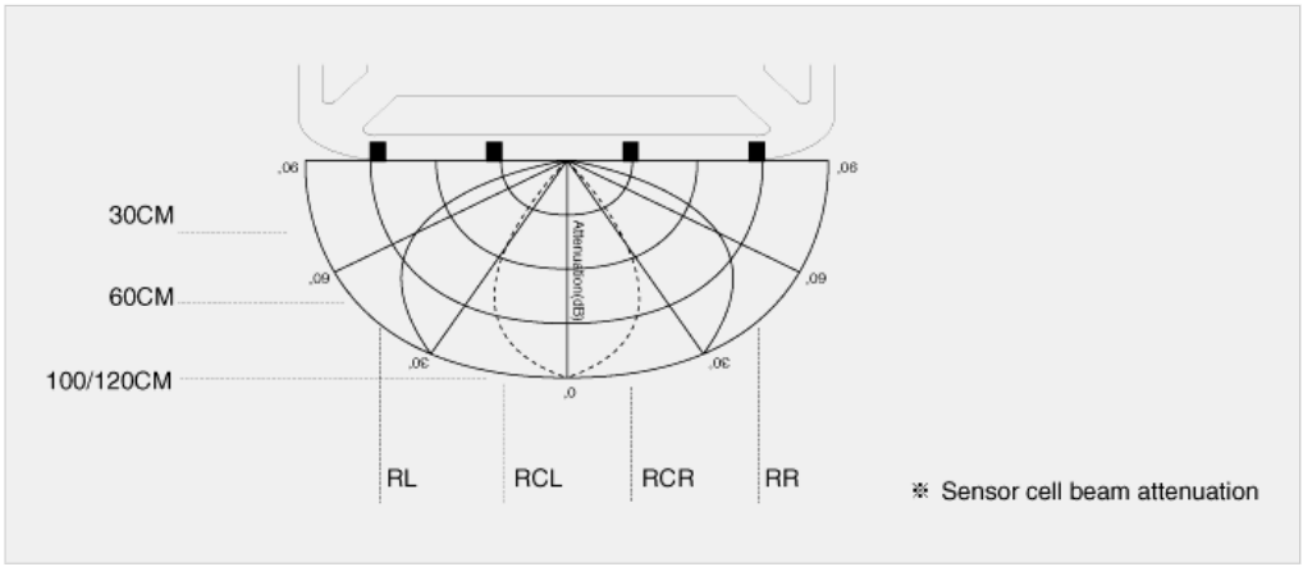
   (9) Operation doesn"t start or stops at gear N, P.

Sensing Area

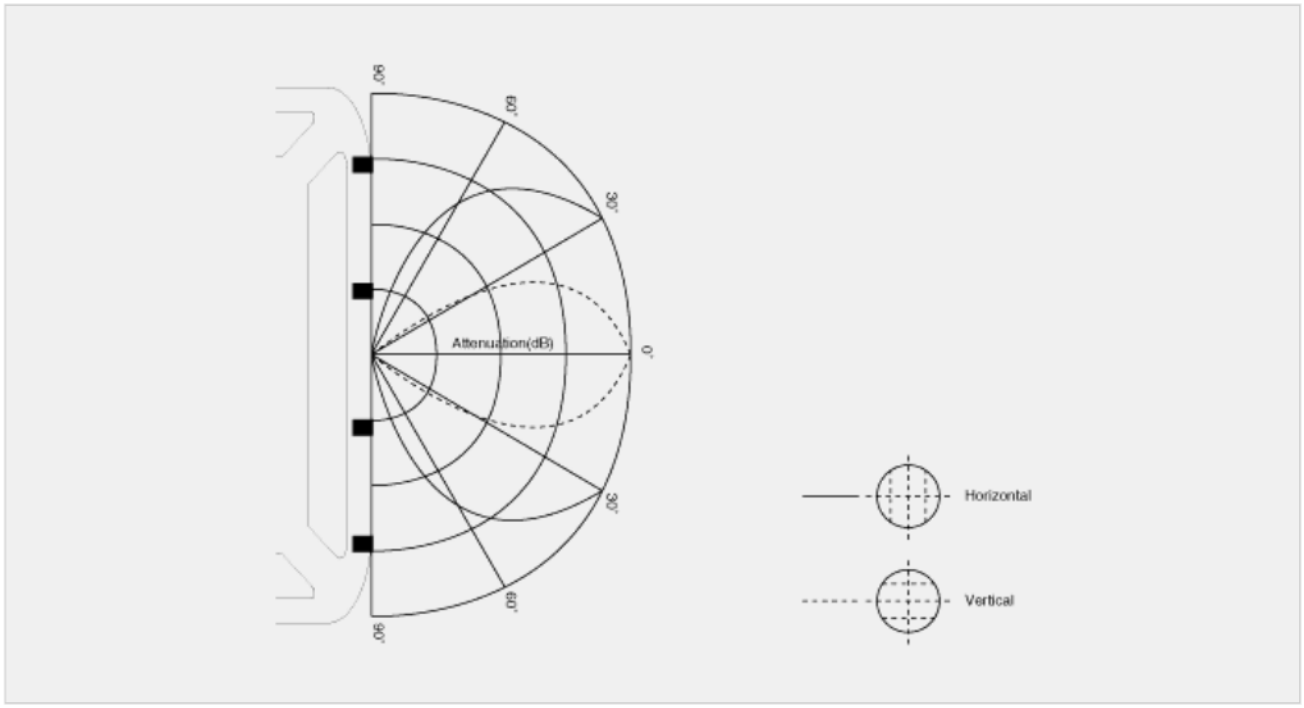
1. Measurement condition – PVC pole (diameter 75 mm, length 3 m), normal temperature
2. Distance range detected objects (Measured directly in front of sensor)
   • Front sensor
   61 cm (24 in) - 10 cm (39.4 in) : ±15 cm (5.9 in)
   31 cm (12.2 in) - 60 cm (23.6 in): ±15 cm (5.9 in)
   Less than 20 cm (7.9 in) : ± 10 cm (3.9 in)
   • Rear sensor
   61 cm (24.0 in) - 120 cm (47.2 in) : ± 15 cm (5.9 in)
   31 cm (12.2 in) - 60 cm (23.6 in): ± 15 cm (5.9 in)
   Less than 30 cm (11.8 in) : ± 10 cm (3.9 in)

Horizontal Sensing Area

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Vertical Sensing Area

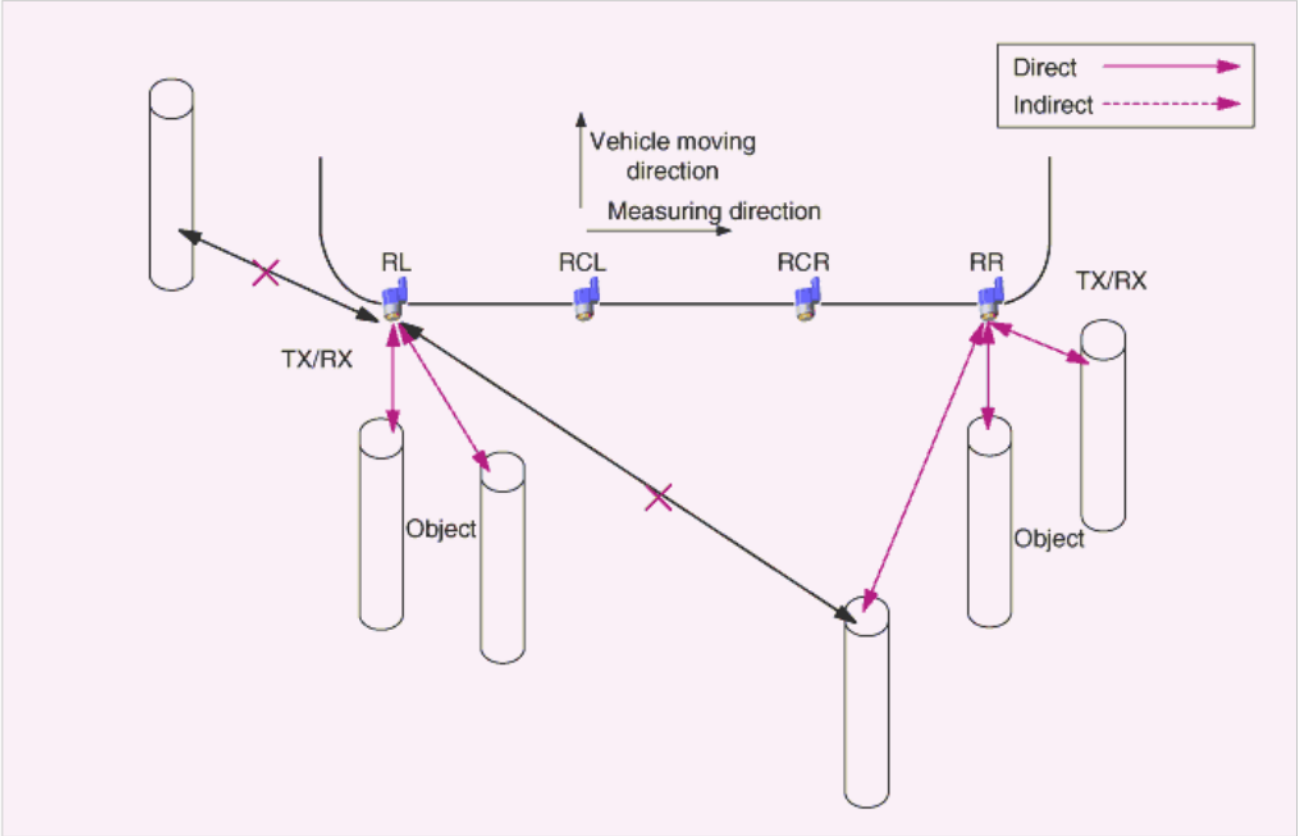


Distance Measurement

Direct Measurement

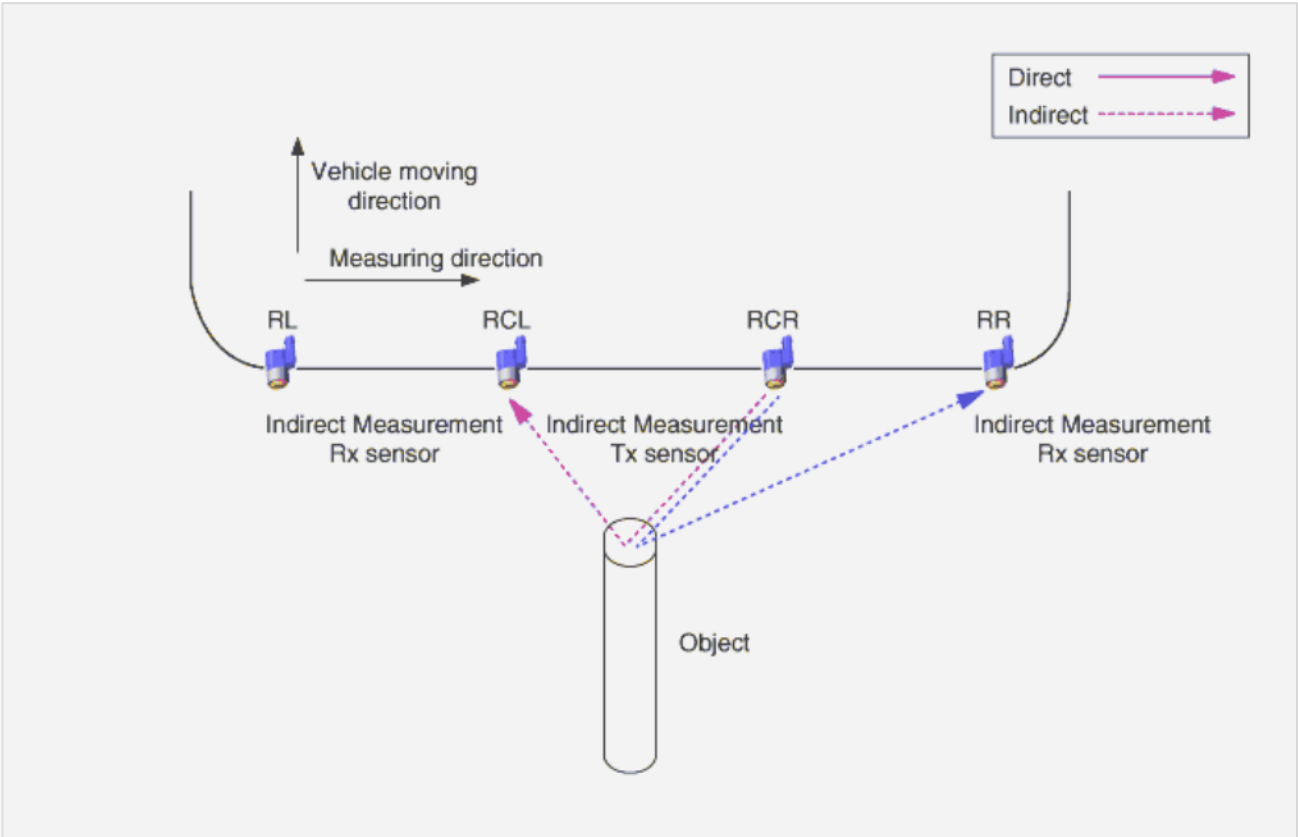
Transmission and Reception are executed with one sensor
(FL, FCL, FCR, FR, RL, RCL, RCR, RR each sensor execution)

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Indirect Measurement

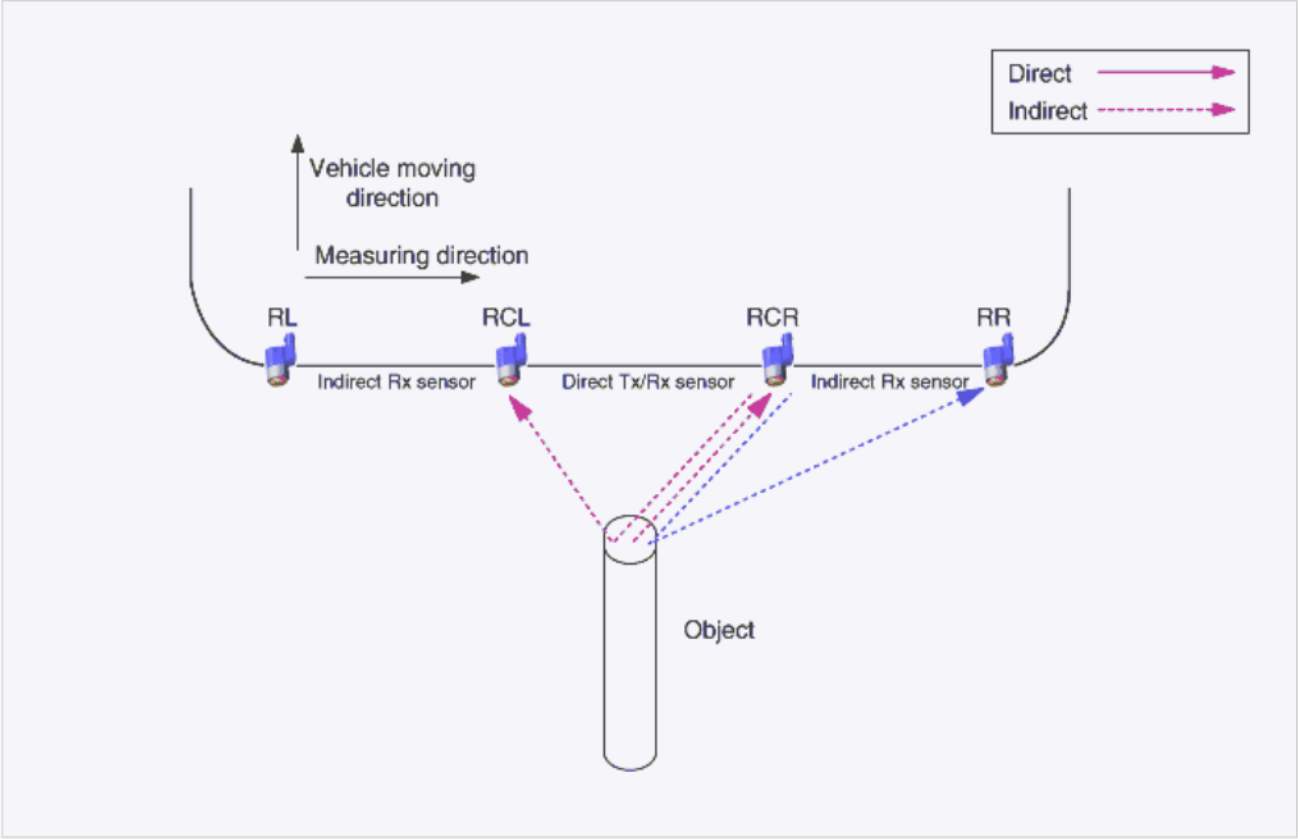
(FCL → FL, FCL → FCR, FCR → FCL, FCR → FR, RCL → RL, RCL → RCR, RCR → RCL, RCR → RR Execution in order)
With two or three sensors, one of them sends the transmission and the others get the reception.



Direct and Indirect Measurement at once

With two or three sensors, the one sensor performs both transmission and reception, and the others perform only reception.

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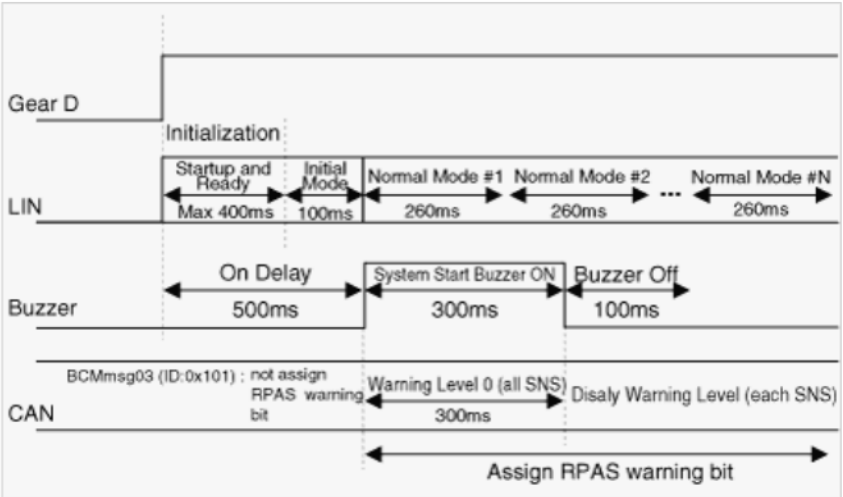
PDW-R alarm system

When the PDW-R sensor detects the object, warning is operated by audible alarm device as like buzzer. PDW-R sensor sends data to IBU with LIN communication and IBU implements audible warning for each PDW-R SENSOR by priority. And it performs a role of gateway only when it sends visible alarm device such as Cluster.

– Sensor buzzer/display information processing method of IBU In case of RL/RR sensor information, the IBU handles each sensor information directly about Display and buzzer output function. Buzzer output of CL/CR sensor, IBU handles center combination information by priority both sensor, Otherwise, about fail display information,IBU send that to cluster each sensor information.

System operation Spec - Front sensor

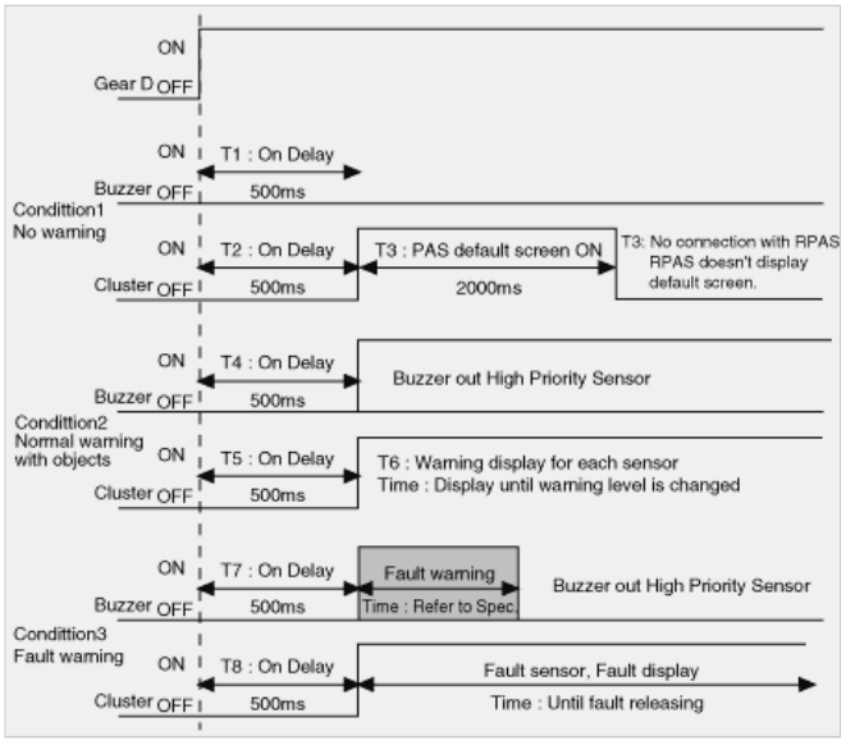
When the system has the power (after IGN ON and D gear), MICOM checks every sensor channel. In case it is not find any error, it sounds 500ms afterward. But it finds any error even a sensor, it sounds buzzer corresponding fault sensor instead of initial starting alarm. If PDW ON switch in OFF, system doesn"t work. Function for normal mode entrance is as below.



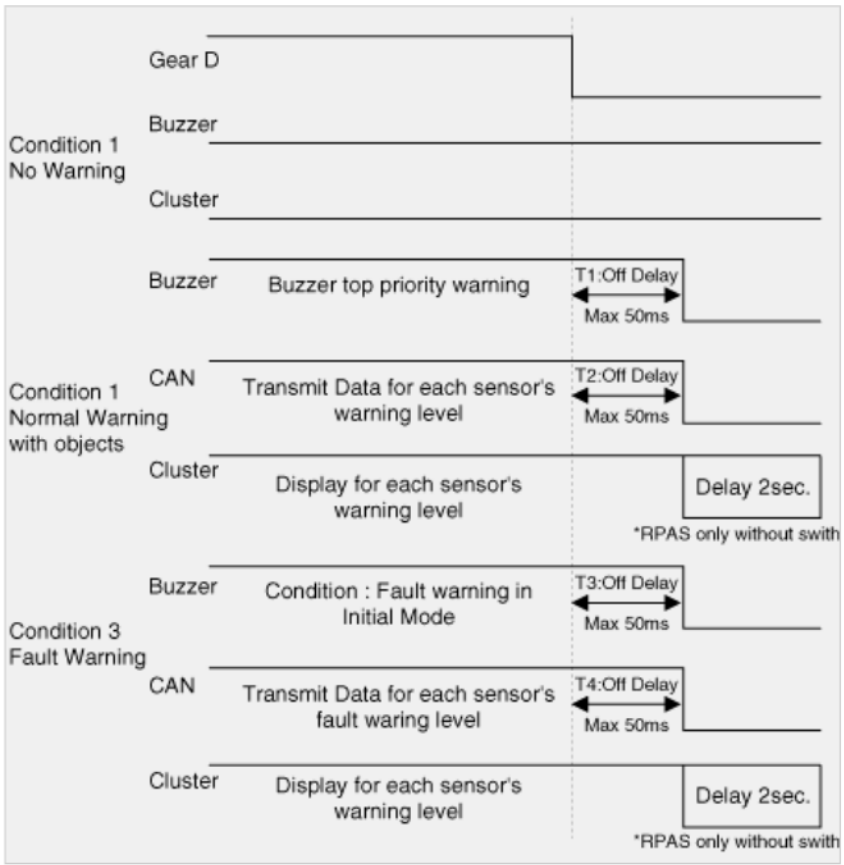
* In the initial mode, IPM (IBU) judges only sensor fail.

With D gear, system function is as below.

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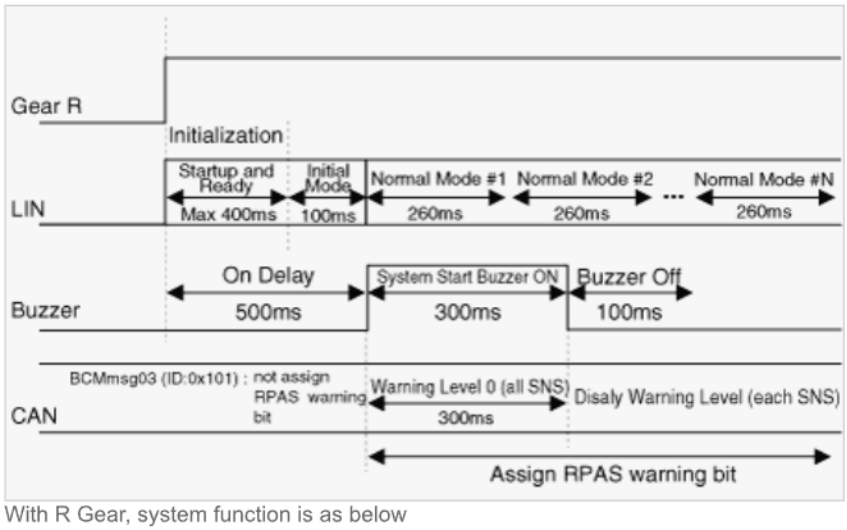
With D gear releasing, system function is as below



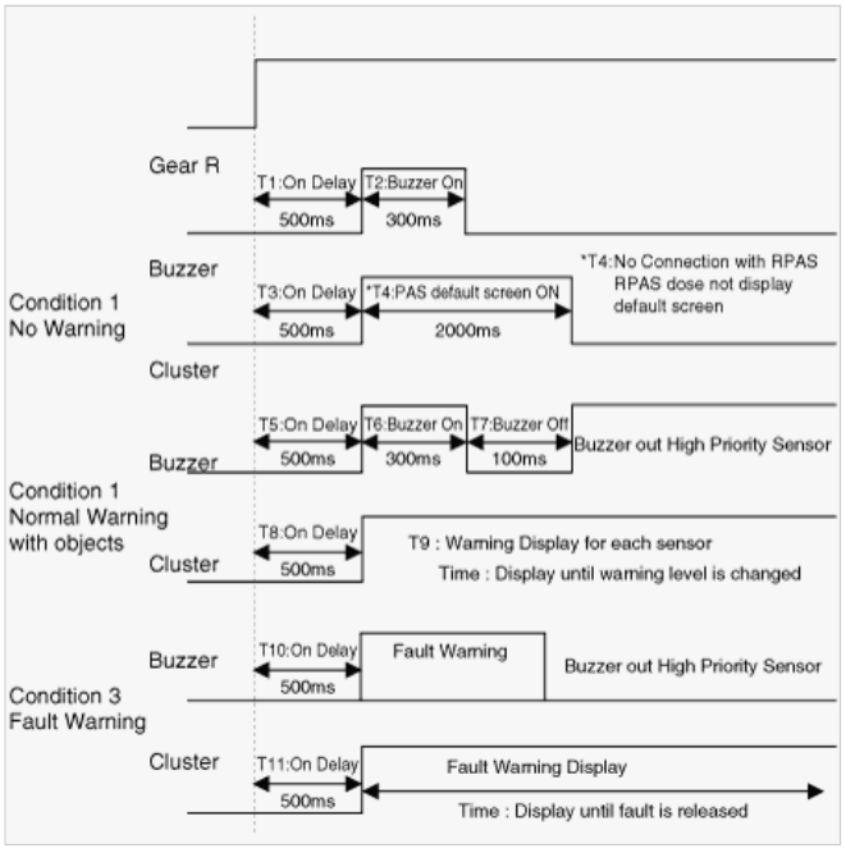
System Operation Spec - Rear sensor

When the system has the power (after IGN ON and R gear), MICOM checks every sensor channel.In case it is not find any error, it sounds 300ms buzzer 500ms afterward.But it finds any error even a sensor, it sounds buzzer corresponding fault sensor instead of initial starting alarm. Function for normal mode entrance is as below

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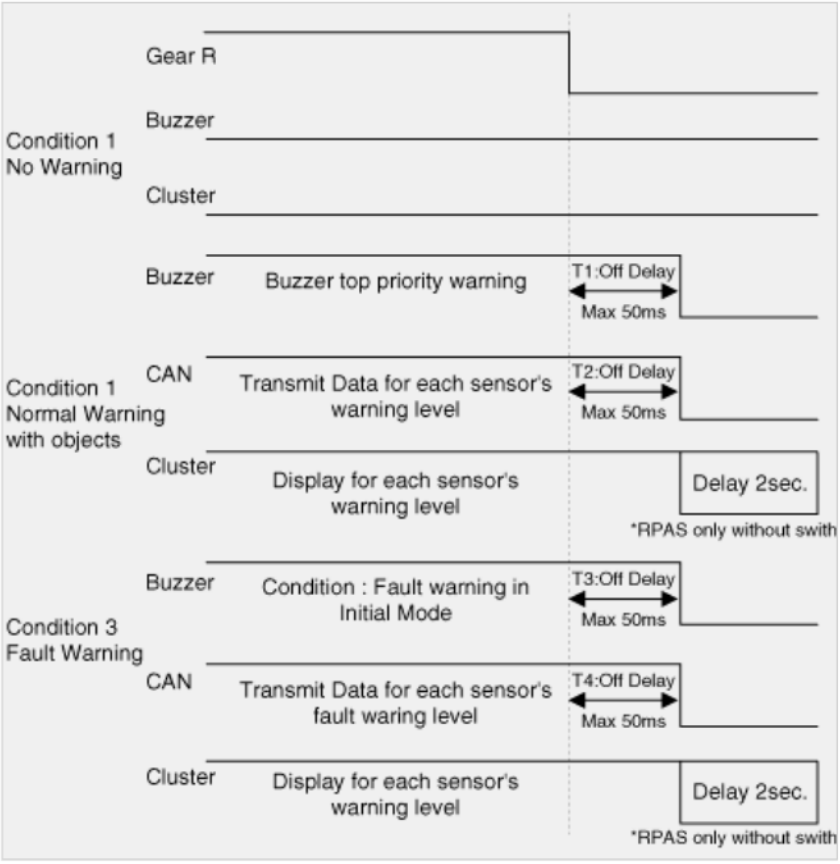


With R Gear, system function is as below



With R gear releasing, system function is as below

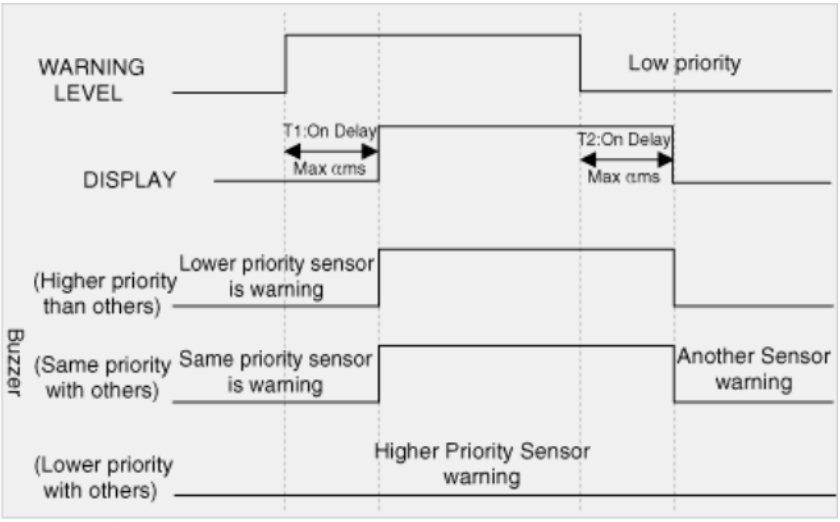
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※acceptable error range on waveform ±10%

Alarm Output Specification classified by distance between sensors

Condition logic according to priority of alarm level is as below. (the identical sensor)



*α value definition

1. low priority sensor off : α = 0ms
2. low priority sensor is 1st warning level : α < 340ms
3. low priority sensor is 2nd warning level : α < 170ms

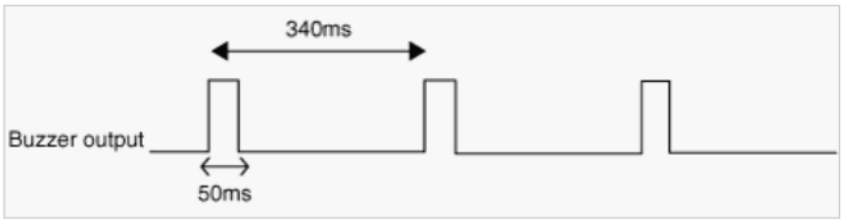
*β value definition

1. low priority sensor is 1st warning level : β = 1700ms
2. low priority sensor is 2nd warning level : β = 1700ms
3. low priority sensor is 3rd warning level : β = 700ms

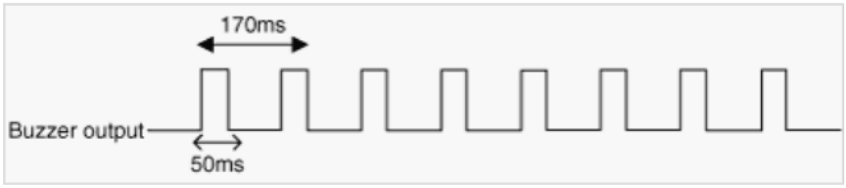
Alarm control by sensing distance is as below

1. First warning area (Front: 61 cm (24 in) - 100 cm (39.4 in), Rear: 61 cm (24 in) - 120 cm (47.2 in))

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2. Second warning area (Front/Rear: 31 cm (12.2 in) - 60 cm (23.6 in))



3. Third warning area (Front/Rear: less than 30 cm (12.2 in))



Visible Alarm Indicator Specification

1. Alarm level per distance - Front, Rear sensor

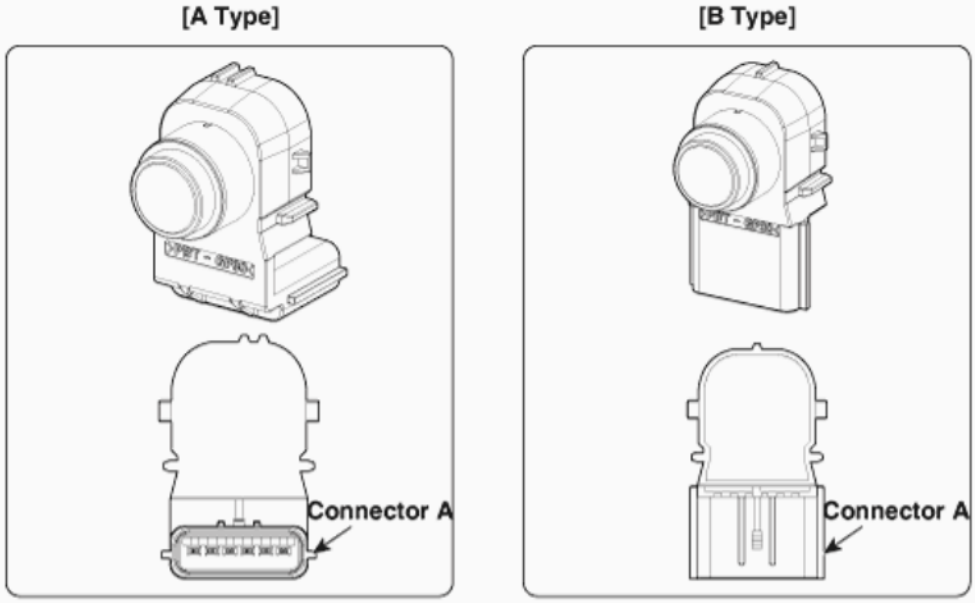
   When the gear is applied to R, cluster lights the indicator as below figure.When the system finds an object, it lights indicator immediately. During sensing an object, if there is no object, it lights indicator that is no alarm status for two seconds and then turns out afterward detecting an object. (But when it turns third step alarm to No alarm status, it lights third step alarm for two second and turns out.)

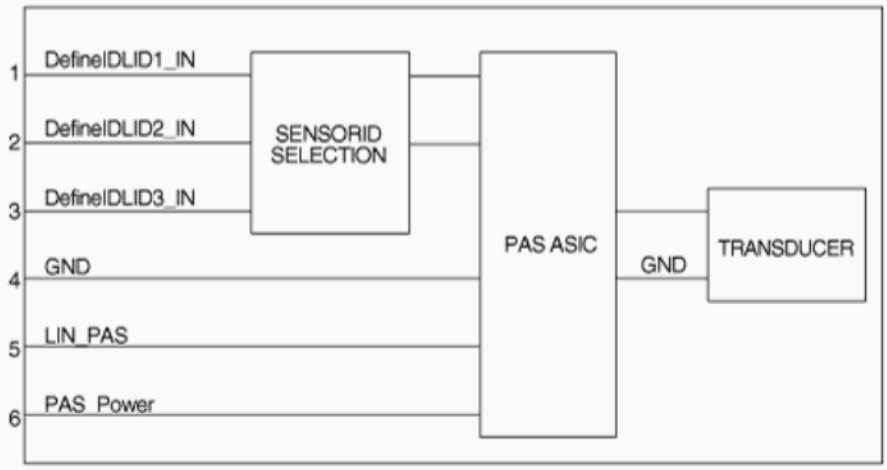
Warning level	system check	1st (61Cm ~ 100Cm)	2nd (31Cm ~ 60Cm)	3rd (0Cm ~ 30Cm)
Indicator display				

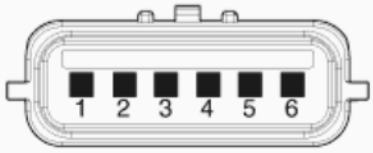
* It only displays the position of detected obstacle.
* Indicator flickers every 1 second at third step alarm.
* Integrated display (FCL/FCR, RCL/RCR).

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Components





Connector A	No.	Description
	1	LID 1
	2	LID 2
	3	LID 3
	4	Ground
	5	PDW LIN Signal
	6	Power

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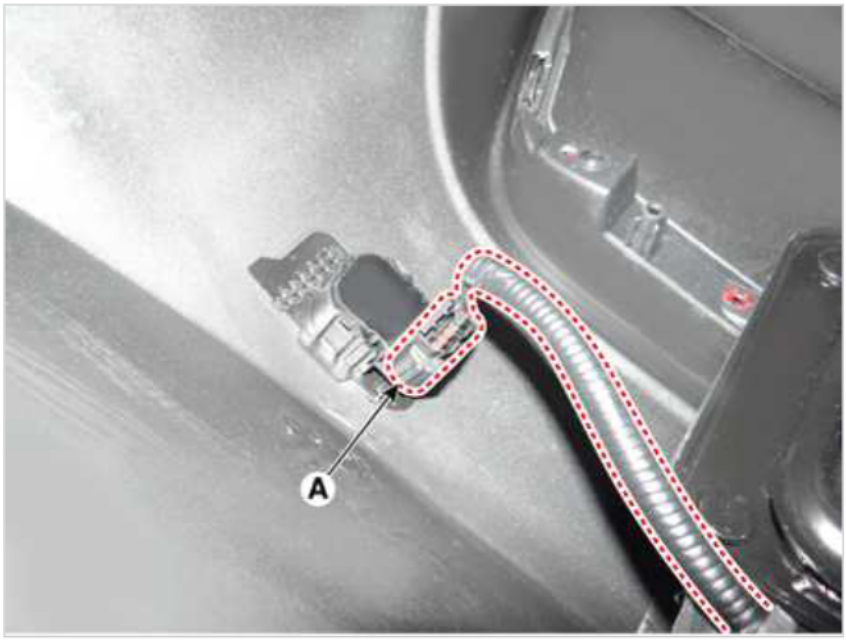
Removal

Parking Distance Warning-Forward (PDW-F) Sensor

1. Disconnect the negative (-) battery terminal.
2. Remove the front bumper assembly.
   (Refer to Body - "Front Bumper Assembly")
3. Remove the front bumper energy absorber (A).

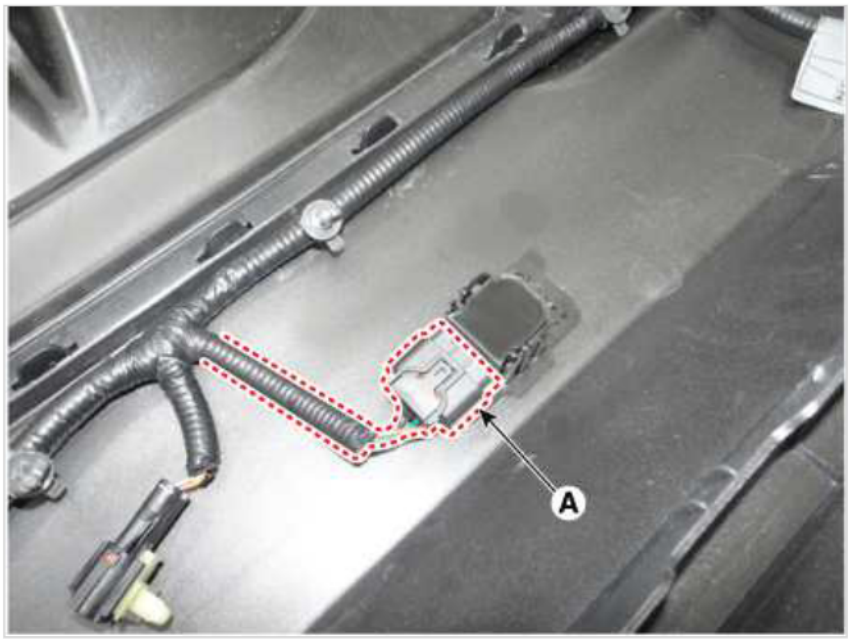


4. Disconnect the connector (A) from the PDW-F sensor.
   [A Type]

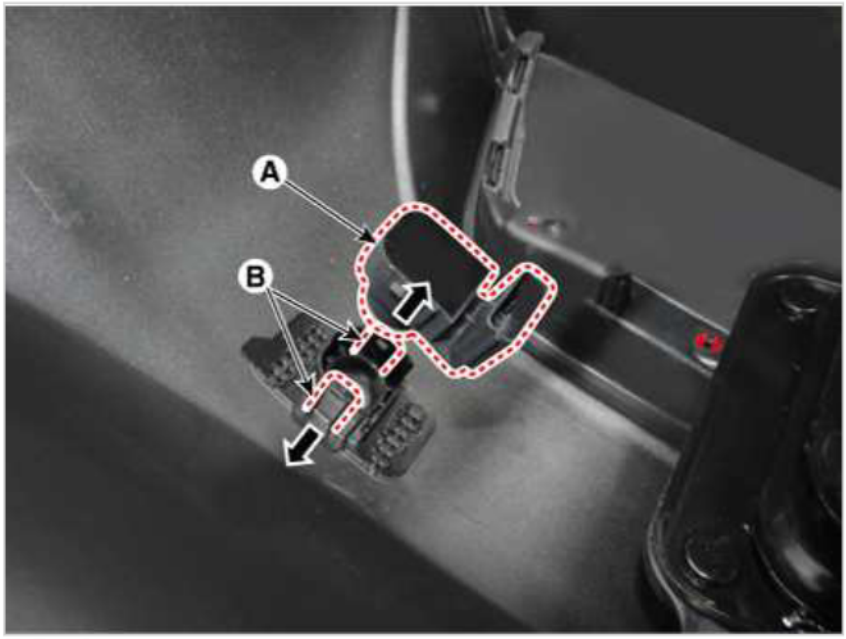


[B Type]

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5. Pull out ths PDW-F sensor (A) after opening the sensor holder (B).
[A Type]



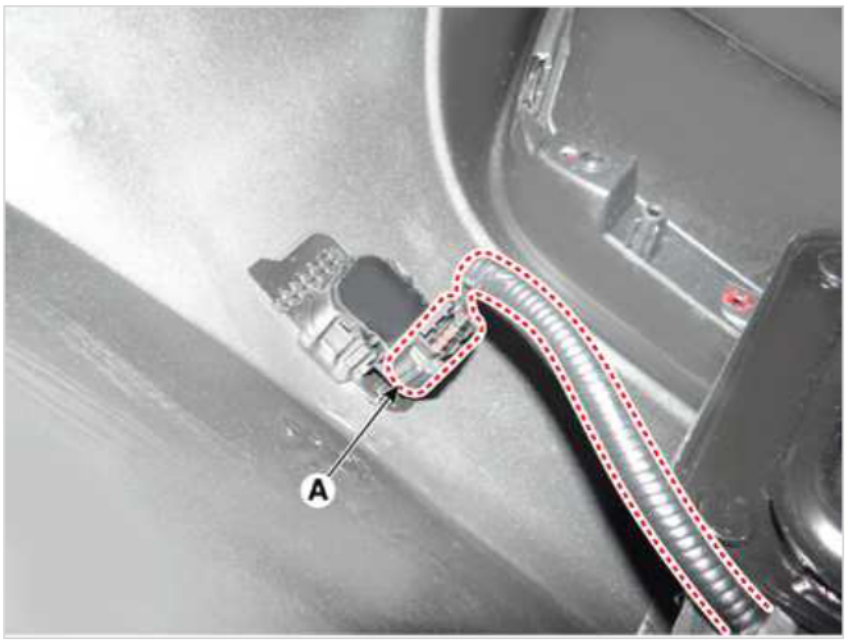
[B Type]

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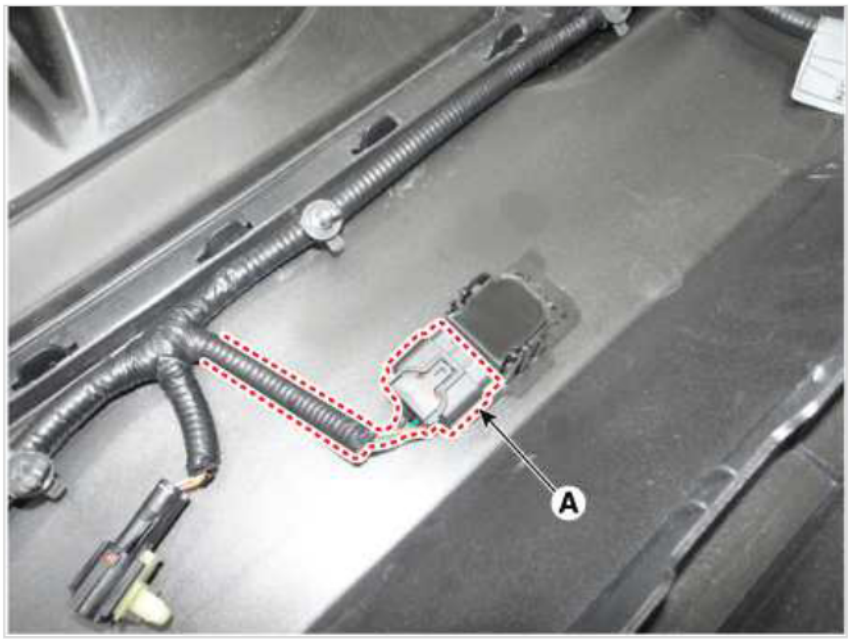
Parking Distance Warning-Reverse (PDW-R) Sensor

1. Disconnect the negative (-) battery terminal.
2. Remove the rear bumper beam assembly.
   (Refer to Body - "Rear Bumper Beam Assembly")
3. Disconnect the connector (A) from the PDW-R sensor.
   [A Type]

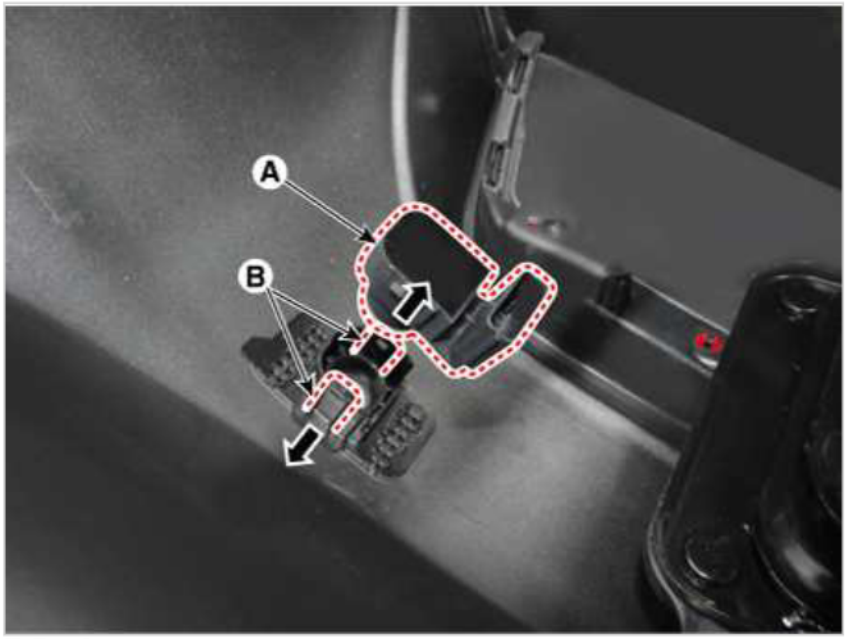


[B Type]

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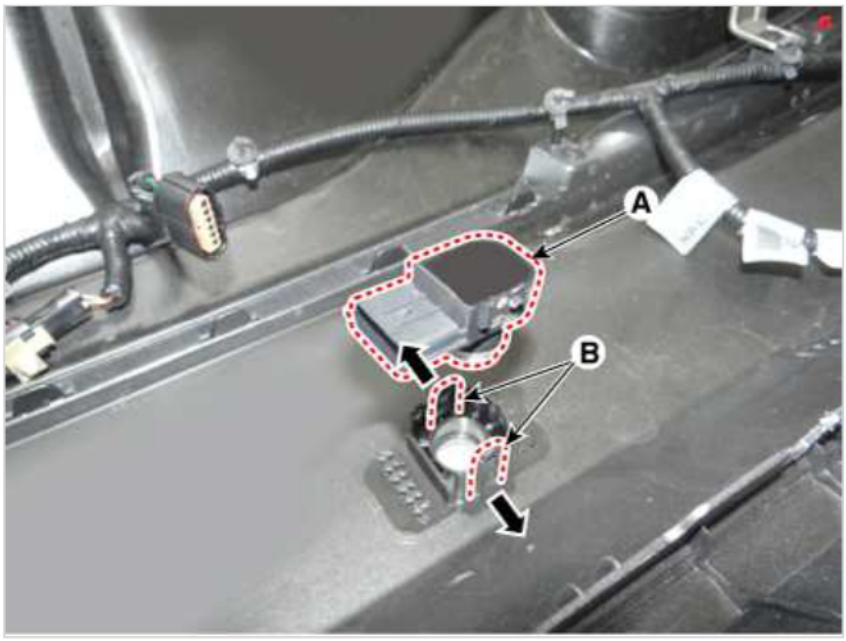


4. Pull out ths PDW-R sensor (A) after opening the sensor holder (B).
[A Type]



[B Type]

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Installation

Parking Distance Warning-Forward (PDW-F) Sensor

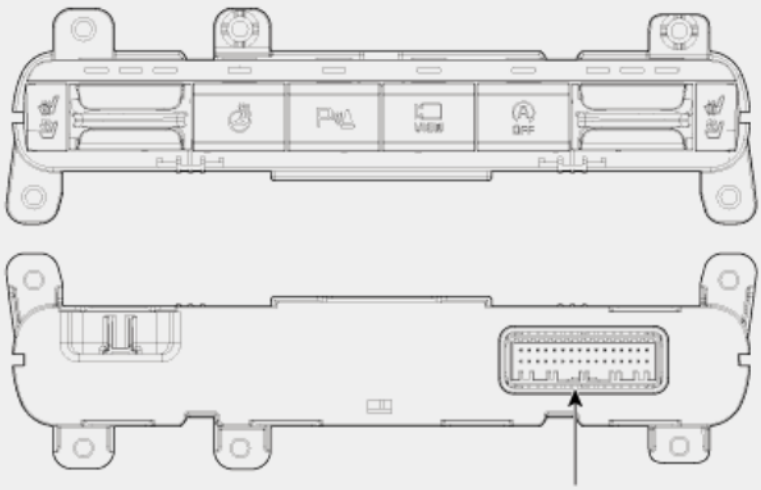
1. Install the PDW-F sensor after connecting the connector.
2. Install the front bumper energy absorber.
3. Install the front bumper assembly.
4. Connect the negative (-) battery terminal.

Parking Distance Warning-Reverse (PDW-R) Sensor

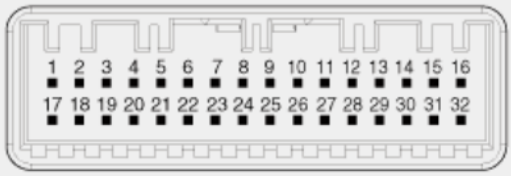
1. Install the PDW-R sensor after connecting the connector.
2. Install the rear bumper beam assembly.
3. Connect the negative (-) battery terminal.

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Components



Connector A



No.	Description	No.	Description
1	RH Heater mode signal	17	IGN
2	RH Ventilation mode signal	18	Illumination (+)
3	RH Heater indicator (Max)	19	-
4	RH Heater indicator (Mid)	20	Illumination (-)
5	RH Heater indicator (Min)	21	-
6	RH Ventilation indicator (Max)	22	Steering wheel heater switch indicator
7	RH Ventilation indicator (Mid)	23	PDW Switch indicator
8	RH Ventilation indicator (Min)	24	AVM Switch indicator
9	LH Ventilation indicator (Max)	25	Steering wheel heater switch signal
10	LH Ventilation indicator (Mid)	26	PDW Switch signal
11	LH Ventilation indicator (Min)	27	AVM Switch signal
12	LH Heater indicator (Max)	28	ISG Swtich signal
13	LH Heater indicator (Mid)	29	ISG Switch indicator
14	LH Heater indicator (Min)	30	Detent
15	LH Ventilation mode signal	31	-
16	LH Heater mode signal	32	Ground

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Removal

⚠ CAUTION

Put on gloves to protect your hands.

NOTICE

- When prying with a flat-tip screwdriver or use a prying trim tool, wrap it with protective tape, and apply protective tape around the related parts, to prevent damage.
- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Take care not to bend or scratch the trim and panels.

1. Disconnect the negative (-) battery terminal.
2. Remvoe the console upper complete (A) by using a remover.



3. Disconnect the connectors (A) from the console upper complete.

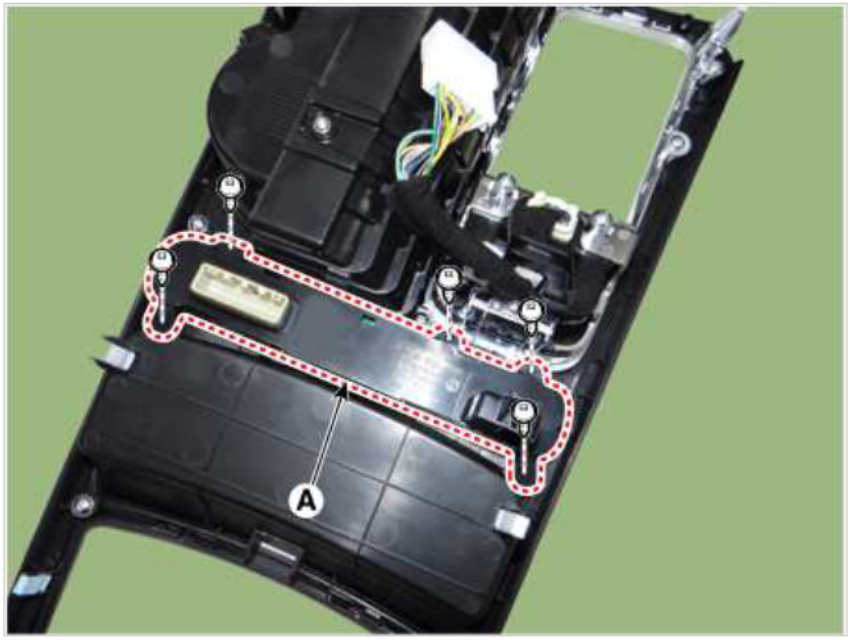


4. Remove the connector (A) from the console floor switch complete.

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5. Remove the console floor switch complete (A) after loosening the mounting screws.



Installation

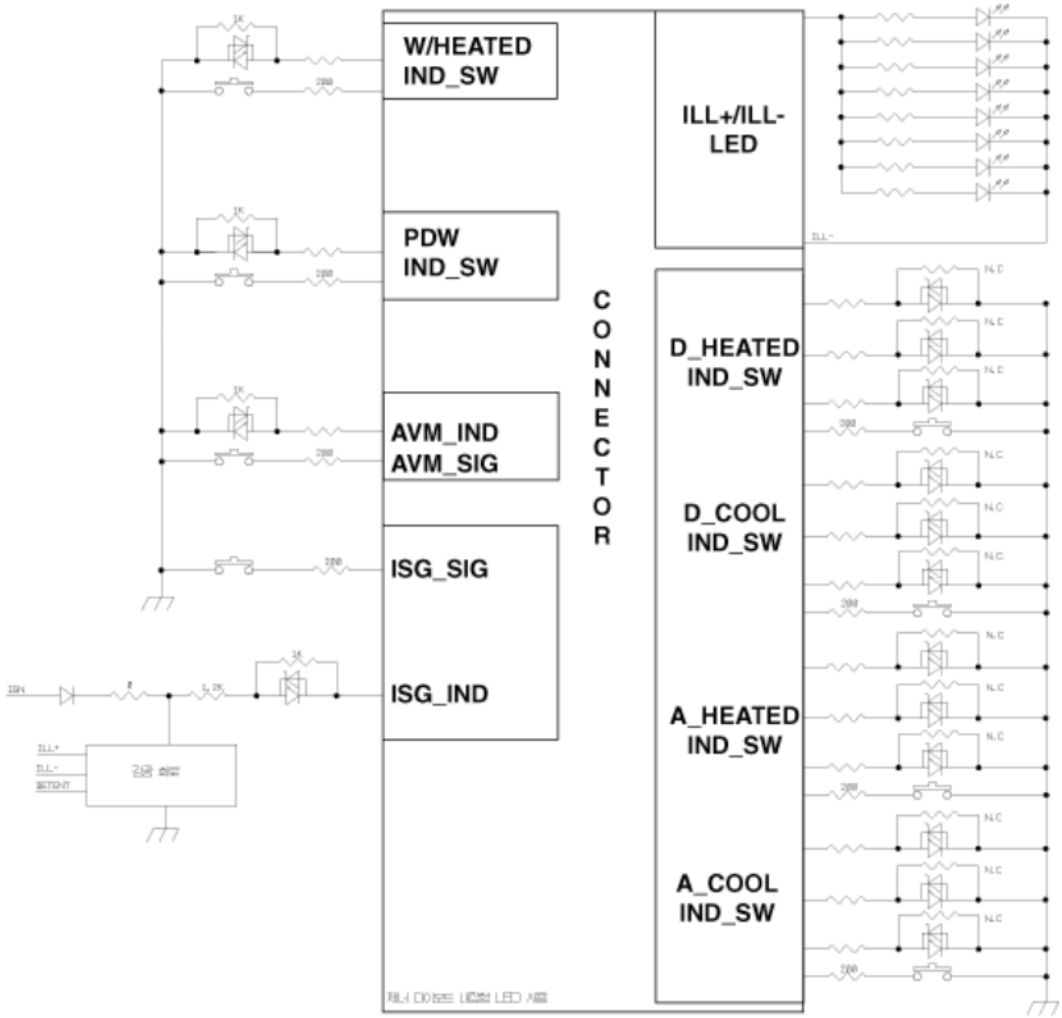
1. Install the console floor switch complete.
2. Install the connector from the console floor switch complete.
3. Connect the connectors from the console upper complete.
4. Install the console upper complete.
5. Connect the negative (-) battery terminal.

NOTICE

- Make sure that the connectors are plugged in properly.
- Check the PDW system for normal operation.

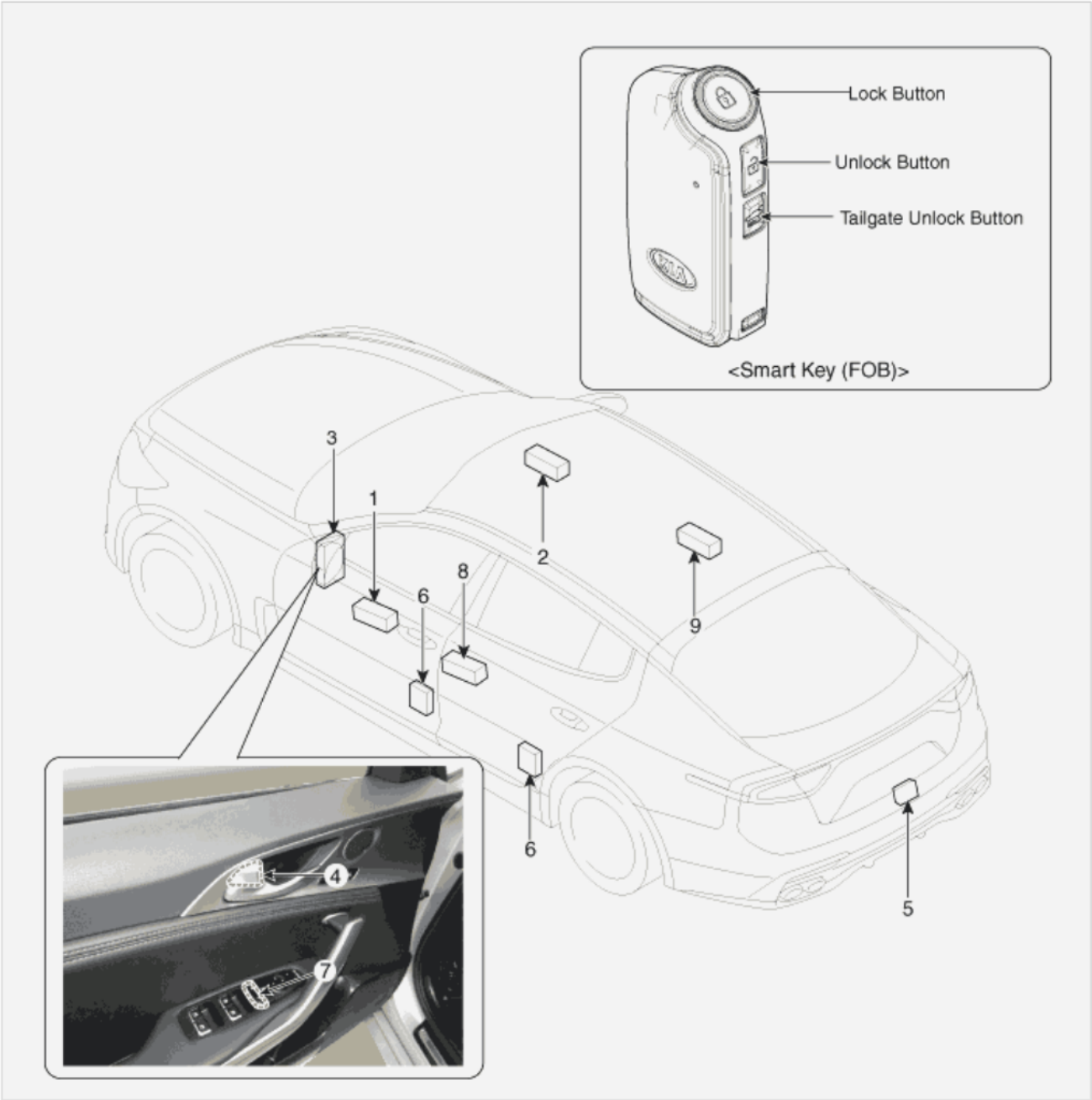
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Circuit Diagram



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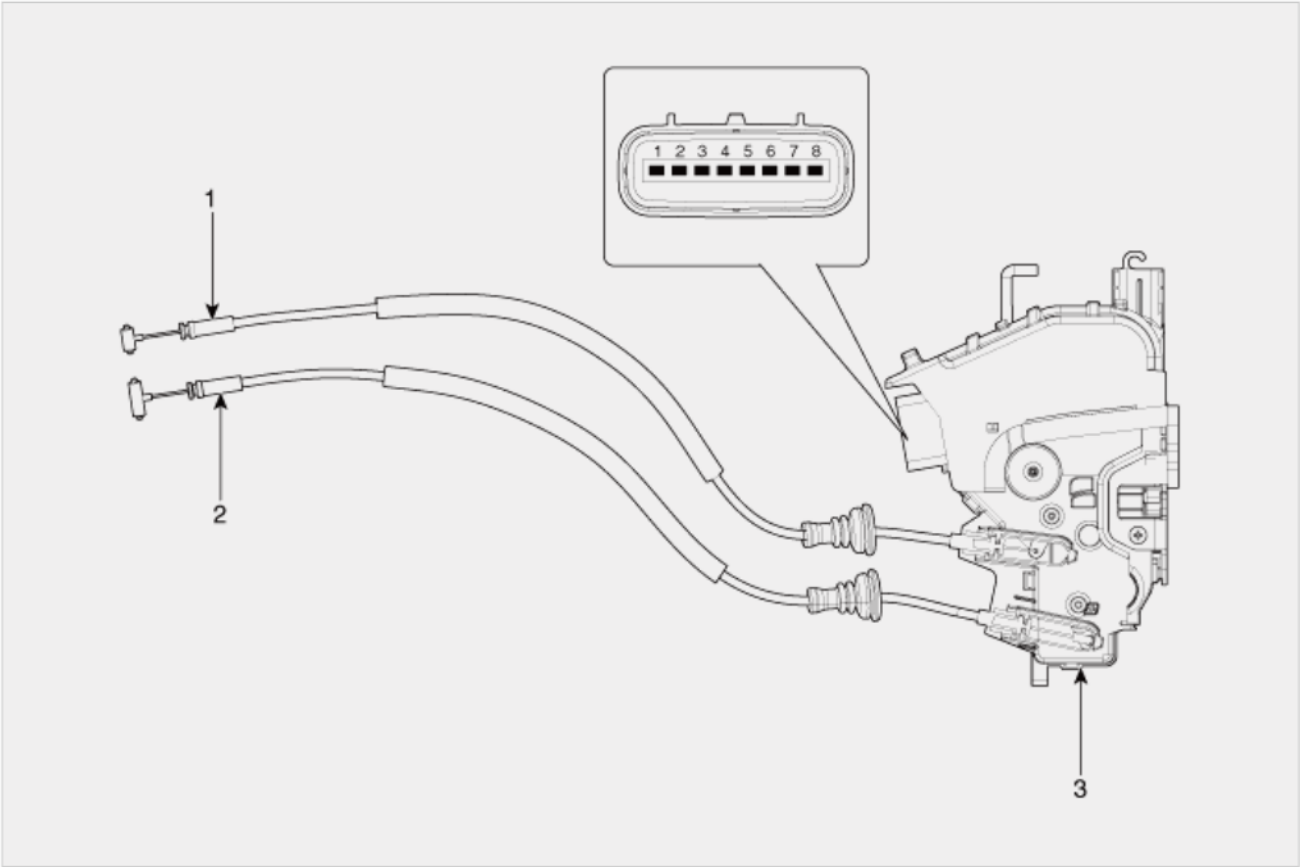
Component Location



1. Driver power window switch
2. Assist power window switch
3 . Integrated central control unit (ICU)
4 . Door lock knob
5 . Liftgate actuator
6. Door latch assembly
7 . Door lock/unlock switch
8 . Rear left power window switch
9 . Rear right power window switch

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Components



1. Door lock/unlock knob cable
2. Door inside handle cable
3. Door latch assembly

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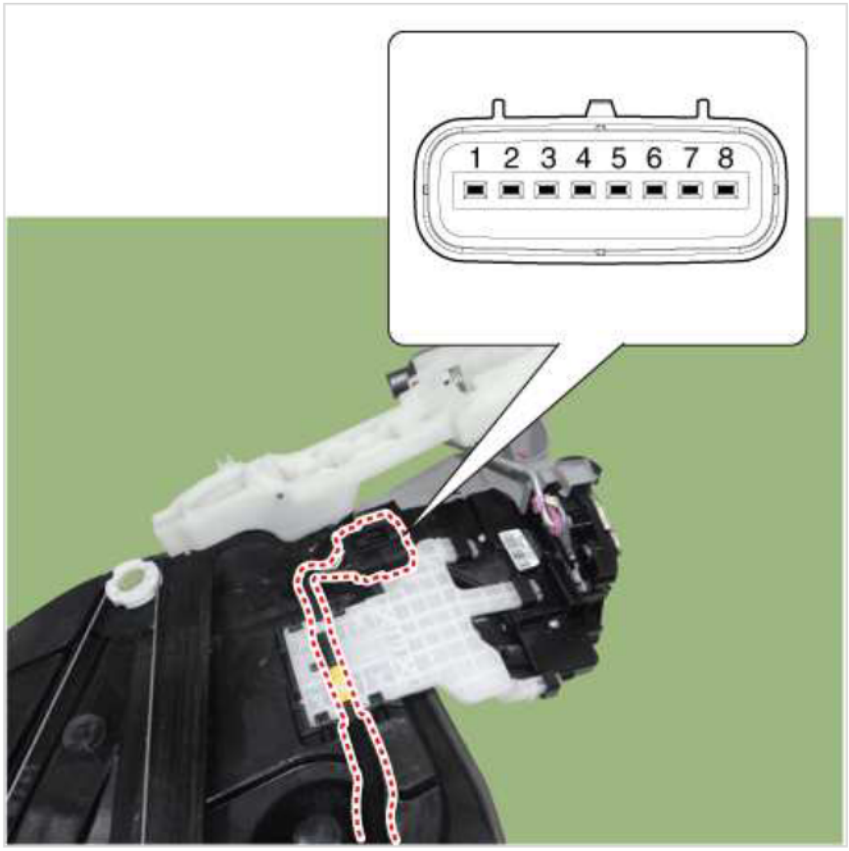
Inspection

⚠ CAUTION

- When removing with a flat-tip screwdriver or remover, wrap protective tape around the tools to prevent damage to components.
- When removing the interior trim pieces, use a plastic panel removal tool not to damage the surface.
- Be careful to store and handle the trim when removing/installing because lubricant and oil can leave a stain on the trim.

Front Door Lock Module Inspection

1. Remove the front door trim.
   (Refer to Body - "Front Door Trim")
2. Remove the front door module.
   (Refer to Body - "Front Door Module")
3. Disconnect the connector from the actuator.



[Central Lock]

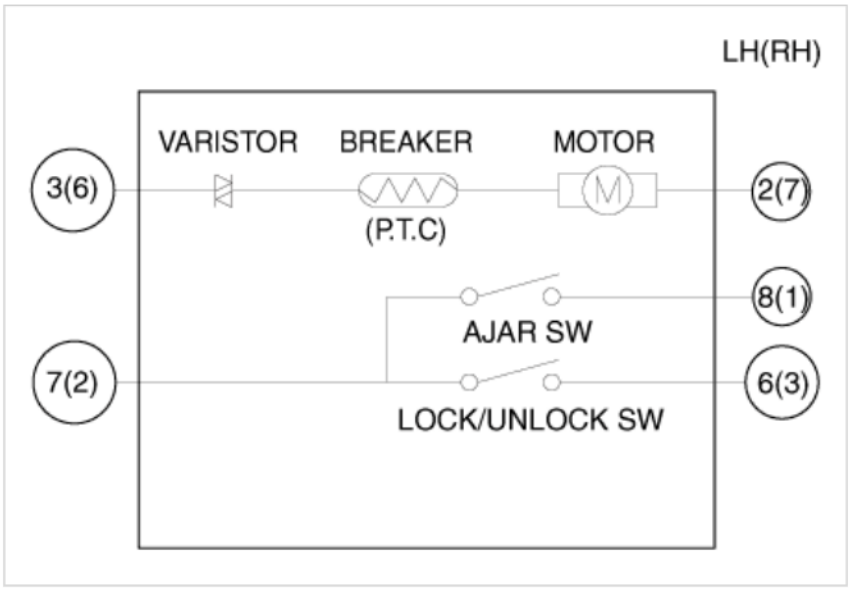
No.	Pin Information	
	LH	RH
1	-	AJAR switch
2	Motor 1	COM
3	Motor 2	Lock / Unlock switch
4	-	-
5	-	-
6	Lock / Unlock switch	Motor 2
7	COM	Motor 1
8	AJAR switch	-

4.

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Check actuator operation by connecting power and ground as shown below. To prevent damage to the actuator, apply battery voltage only momentarily.

[Central Lock (Without key switch)]



[Central Lock]

LH(RH)

Operation / Terminal	Central Lock	Central Unock
2(7)	+ (-)	- (+)
3(6)	- (+)	+ (-)
6(2) & 7(3)	ON → OFF	OFF → ON
7(1) & 8(2)	Door open & Half-latching (1st detent) = ON Full-latching (2nd close) = OFF	

Rear Door Lock Module Inspection

1. Remove the rear door trim.
   (Refer to Body - "Rear Door Trim")
2. Remove the rear door module.
   (Refer to Body - "Rear Door Module")
3. Disconnect the connector from the actuator.

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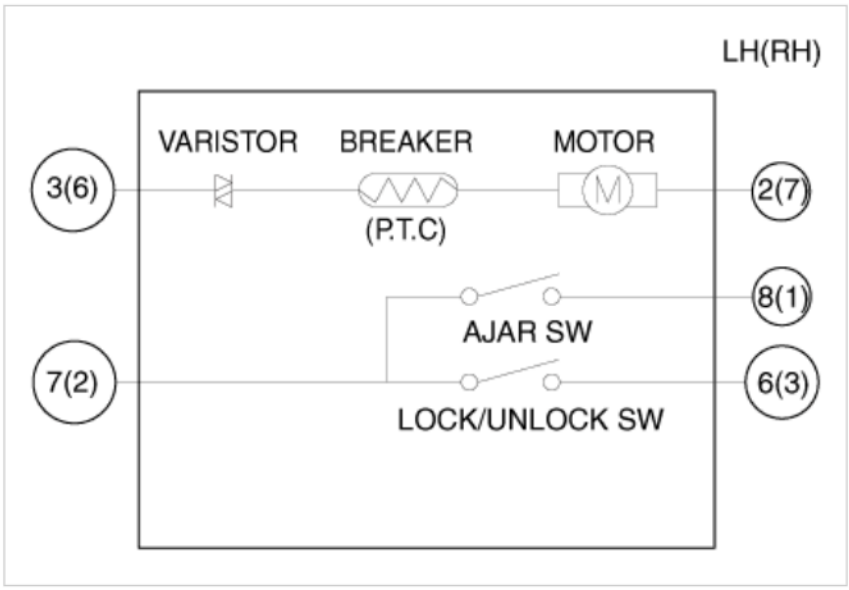
[Central Lock]

No.	Pin Information	
	LH	RH
1	-	AJAR switch
2	Motor 1	COM
3	Motor 2	Lock / Unlock switch
4	-	-
5	-	-
6	Lock / Unlock switch	Motor 2
7	COM	Motor 1
8	AJAR switch	-

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

[Central Lock (Without key switch)]

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[Central Lock]

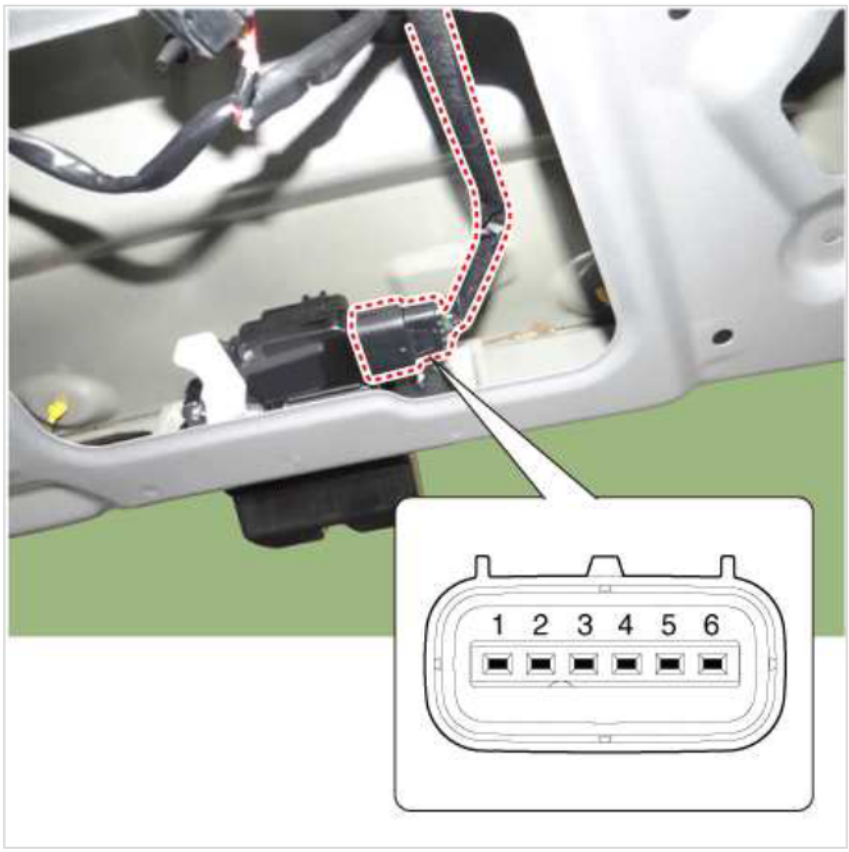
LH(RH)

Operation / Terminal	Central Lock	Central Unock
2(7)	+ (-)	- (+)
3(6)	- (+)	+ (-)
6(2) & 7(3)	ON → OFF	OFF → ON
7(1) & 8(2)	Door open & Half-latching (1st detent) = ON Full-latching (2nd close) = OFF	

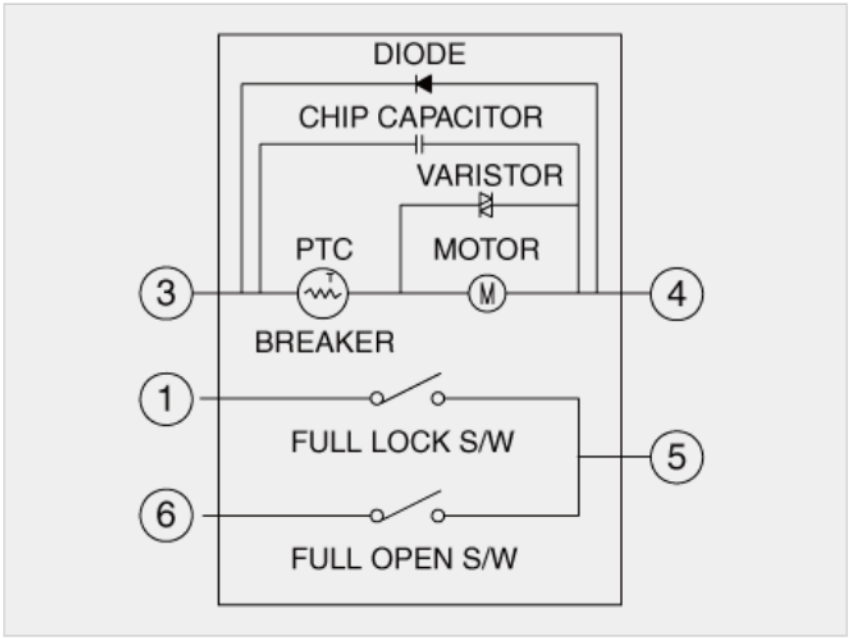
Liftgate Lock Module Inspection

1. Remove the liftgate trim.
   (Refer to Body - "Liftgate Trim")
2. Disconnect the connectors from the actuator.

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



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Operation / Terminal	Lock → Unlock	Unlock → Lock
③	+	X
④	-	
⑤&①	OFF → ON	ON → OFF
⑤&⑥	OFF → ON	ON → OFF

4. Checking the liftgate of the vehicle power option power refers to the liftgate module.

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Inspection

Diagnosis With KDS

1. The body electrical system can be quickly diagnosed for failed parts by using vehicle diagnostic system (KDS).
   The diagnostic system (KDS) provides the following information.
   (1) Self diagnosis : Checks and displays the failure code (DTC)
   (2) Current data : Checks the system input/output data state
   (3) Actuation test : Checks the system operating condition
   (4) Additional function : Other controls such as the system option and zero point
2. Select the "Car model" and the system to be checked in order to check the vehicle with the tester.
3. Select the "Driver seat or Assistant seat door module (DDM/ADM)" to check the driver seat or assistant door module (DDM/ADM).
4. Select the "Current Data" menu to check the current state of the input/output data.
   The input/output data for the sensors corresponding to the driver seat or assist door module (DDM/ADM) can be checked.
5. If you will check the power door lock operation forcefully, select "Actuation test".

Removal

⚠ CAUTION

- When removing with a flat-tip screwdriver or remover, wrap protective tape around the tools to prevent damage to components.
- When removing the interior trim pieces, use a plastic panel removal tool not to damage the surface.
- Be careful to store and handle the trim when removing/installing because lubricant and oil can leave a stain on the trim.

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim.
   (Refer to Body - "Front Door Trim")
3. Disconnect the power window switch connector (A).



4. Remove the power window switch (A) after loosening the mounting screws.

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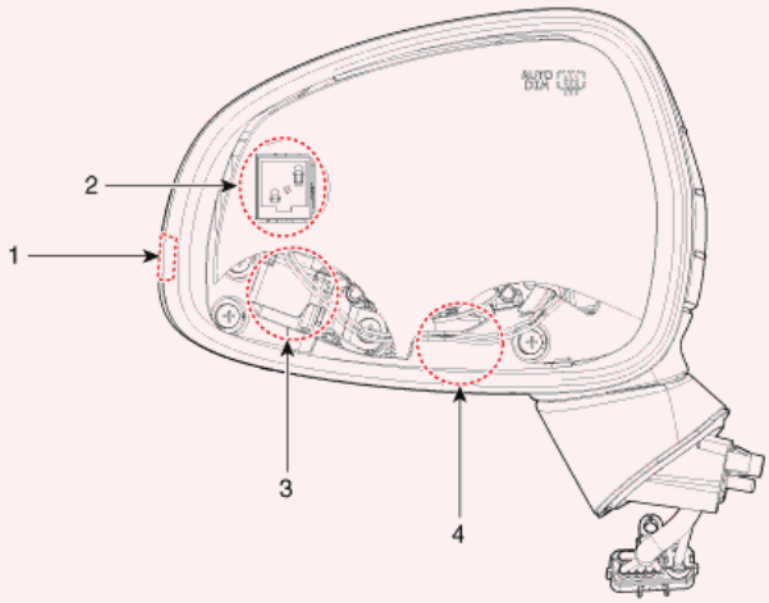


Installation

1. Install the power window switch.
2. Connect the power window switch connector.
3. Install the front door trim.
4. Connect the negative (-) battery terminal.

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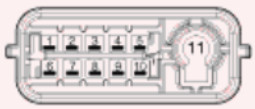
Components



[Standard Type]

Connector A	No.	Description	No.	Description
	1	Mirror motor (Vertical)	7	Mirror unfolding
	2	Mirror motor (COM)	8	Side repeater lamp (+)
	3	Mirror motor (Horizontal)	9	Puddle lamp (+)
	4	Mirror heater (+)	10	Puddle lamp (-)
	5	Mirror heater (-) & Side repeater lamp (-)	11	BCW Indicator (-)
	6	Mirror folding	12	BCW Indicator (+)

[IMS + AVM Type]

Connector A	No.	Description	No.	Description
	1	Control unit (LIN)	7	BCW Indicator (+)
	2	Control unit (Power)	8	Side repeater lamp (+)
	3	Control unit (Ground)	9	SVM Camera (Ground)
	4	ECM mirror glass (-)	10	SVM Camera (Power)
	5	Side repeater lamp (-) & BCW Indicator (-)	11	SVM Camera video_Output
	6	ECM mirror glass (+)		

1. Side repeater lamp
2. BCW Indicator
3. SVM Camera
4. Puddle lamp

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Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the outside mirror assembly.
3. Disconnect the power door mirror connector (A) from the harness.



4. Apply battery voltage to each terminal as shown in the table and verify that the mirror operates properly.

[Mirror Control (LH/RT)]

Terminal / Position	1	2	3
Up	⊖	⊕	⊕
Down	⊕	⊖	⊖
Left	⊖	⊖	⊕
Right	⊕	⊕	⊖

[BCW Indicator]

Terminal / Position	11	12
ON	⊖	⊕

[Mirror Heater]

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Terminal / Position	4	5
ON	⊕	⊖

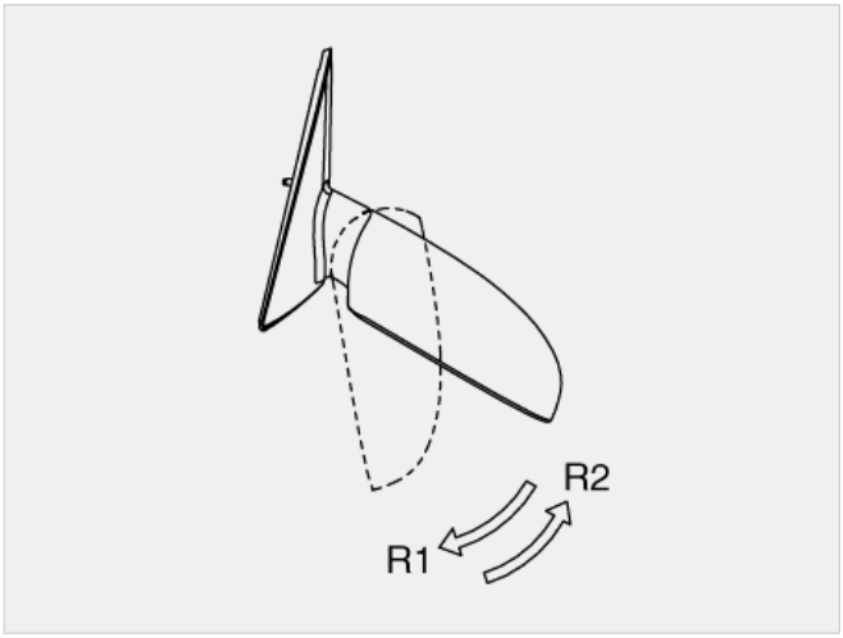
[Side Repeater Lamp]

Terminal / Position	8	5
ON	⊕	⊖

[Puddle Lamp]

Terminal / Position	9	10
ON	⊕	⊖

[Folding Mirror]



Terminal / Position	B(+)	GND(-)	6	7
Folding(R1)	○		○	
		○		○
Unfolding(R2)	○			○
		○	○	

Diagnosis With KDS

1. In the body electrical system, failure can be quickly diagnosed by using the vehicle diagnostic system (KDS).
   1) Self diagnosis : Checking failure and code number (DTC)
   2)

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Current data : Checking the system input/output data state

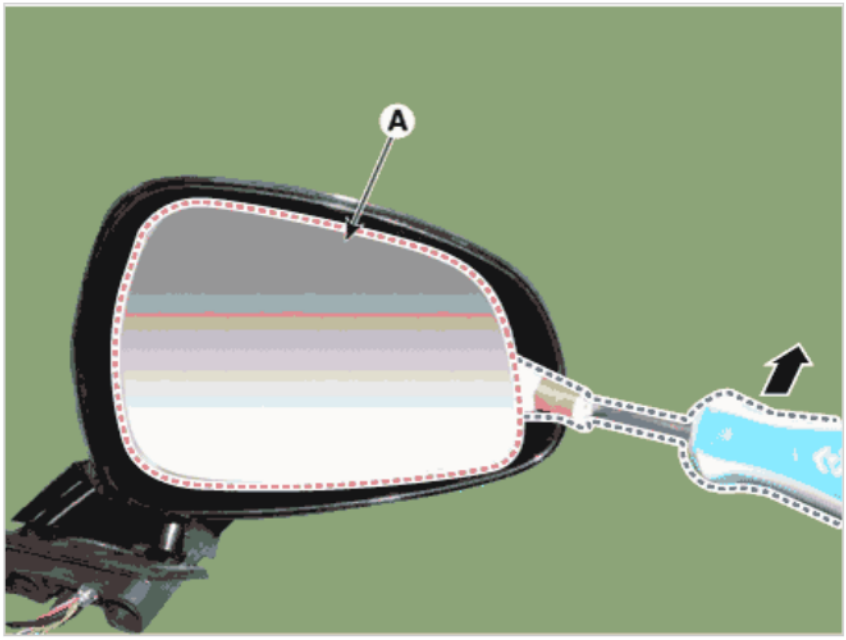
3) Actuation test : Checking the system operation condition

4) Additional function : Controlling other features including system option setting and zero point adjustment

2. Select the "Car model" and the system to be checked in order to check the vehicle with the tester.
3. Select the "Driver seat or Assistant seat door module (DDM/ADM)" to check the driver seat or assistant door module (DDM/ADM).
4. Select the "Current Data" menu to search the current state of the input/output data.
   The input/output data for the sensors corresponding to the driver seat or assistant door module(DDM/ADM) can be checked.
5. If you will check the power door lock operation forcefully, select "Actuation test".

Removal

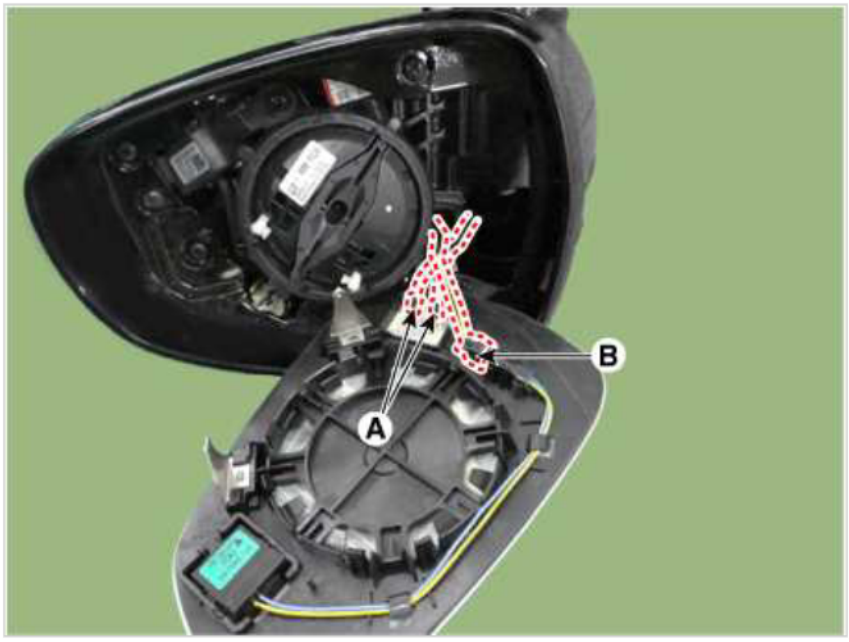
1. After inserting the flat-bladed screwdriver or remover as shown in the illustration below, remove the mirror (A) by applying a momentary force.



NOTICE

- Wrap the tool with protective tape or cloth to prevent damage to the parts.
- Do not insert the tool too deeply.

2. Disconnect the heater connectors (A) and rear corner radar indicator connector (B).



3. Remove the mirror actuator (A) by using flat-bladed screwdriver or remover after loosening the screw.

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4. Disconnect the mirror actuator connector (A).

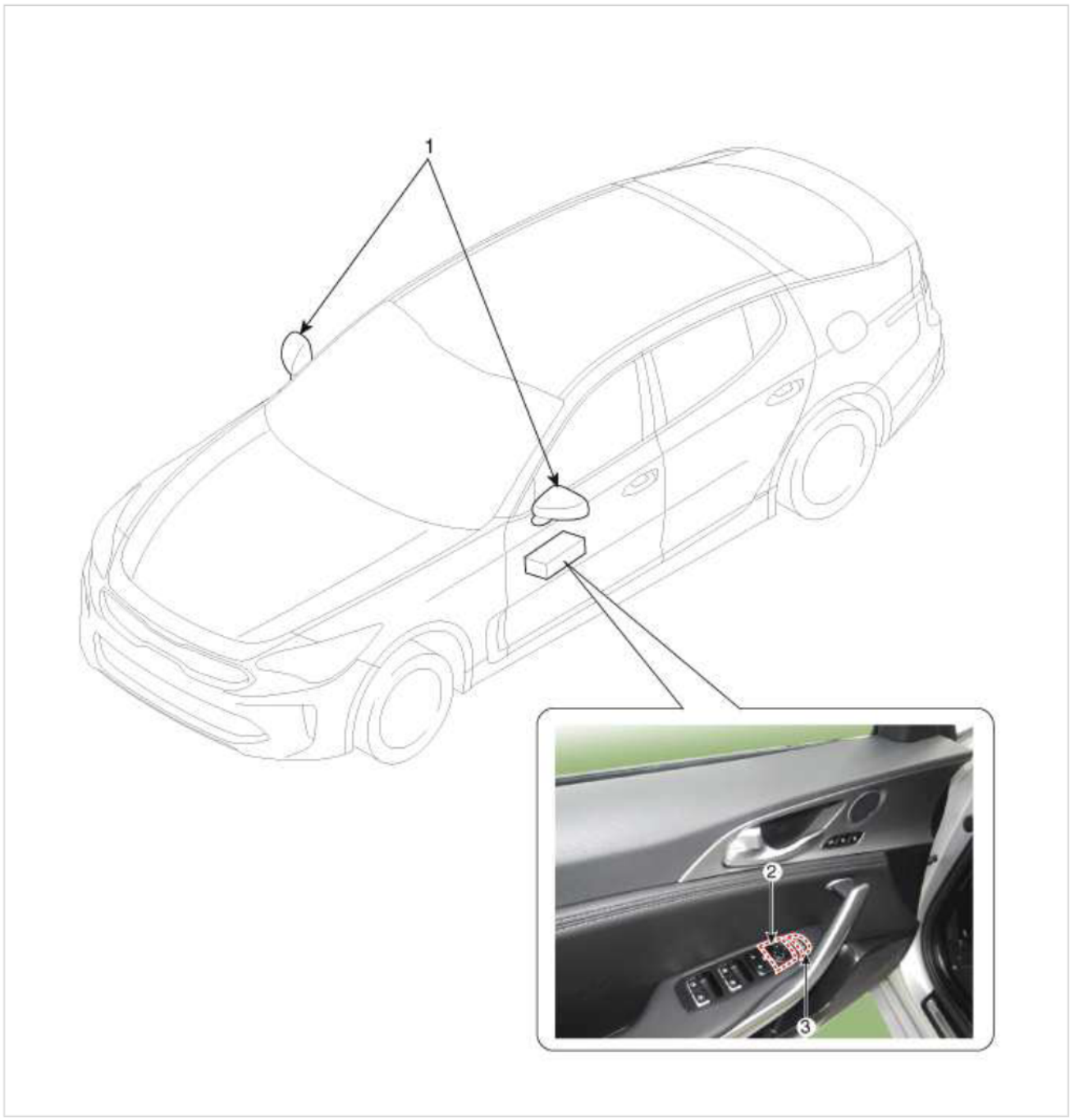


Installation

1. Install in the reverse order of removal.

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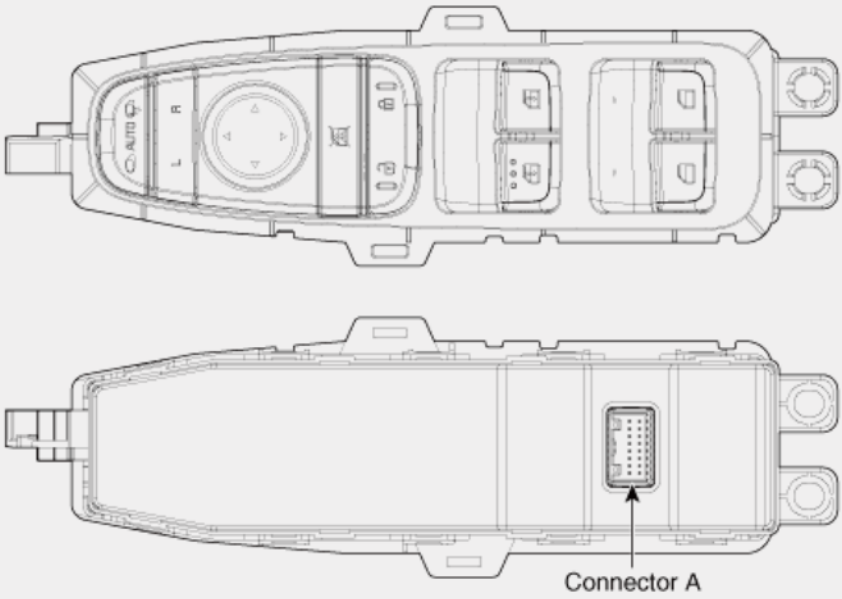
Component Location

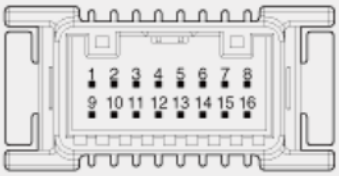


1. Power door mirror
2. Power door mirror switch
3. Power folding mirror switch

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Components



Connector A	No.	Front Safety + IMS	Front Safety + Non-IMS
	1	Driver door unlock switch_input	Driver door unlock switch_input
	2	B-CAN (Low)	B-CAN (Low)
	3	B-CAN (High)	B-CAN (High)
	4	Ground	Ground
	5	LIN CAN	-
	6	-	-
	7	Assist safety power window motor	Assist safety power window motor
	8	Battery (+)	Battery (+)
	9	Ground	Ground
	10	-	Door mirror folding motor
	11	-	Door mirror unfolding motor
	12	IMS Switch_input	-
	13	-	Door mirror switch (LH/RH)
	14	-	Door mirror switch (Up/Down)
	15	Driver safety power window motor	Driver safety power window motor
	16	IGN 1	IGN 1

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Inspection

Diagnosis With KDS

1. The body electrical system can be quickly diagnosed for failed parts by using vehicle diagnostic system (KDS).
   The diagnostic system (KDS) provides the following information.
   (1) Self diagnosis : Checks and displays the failure code (DTC)
   (2) Current data : Checks the system input/output data state
   (3) Actuation test : Checks the system operating condition
   (4) Additional function : Other controls such as the system option and zero point
2. Select the "Car model" and the system to be checked in order to check the vehicle with the tester.
3. Select the "Driver seat or Assistant seat door module (DDM/ADM)" to check the driver seat or assistant door module (DDM/ADM).
4. Select the "Current Data" menu to check the current state of the input/output data.
   The input/output data for the sensors corresponding to the driver seat or assist door module (DDM/ADM) can be checked.
5. If you will check the power door mirror operation forcefully, select "Actuation test".

Removal

⚠ CAUTION

- When removing with a flat-tip screwdriver or remover, wrap protective tape around the tools to prevent damage to components.
- When removing the interior trim pieces, use a plastic panel removal tool not to damage the surface.
- Be careful to store and handle the trim when removing/installing because lubricant and oil can leave a stain on the trim.

1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim.
   (Refer to Body - "Front Door Trim")
3. Disconnect the power window switch connector (A).



4. Remove the power window switch (A) after loosening the mounting screws.

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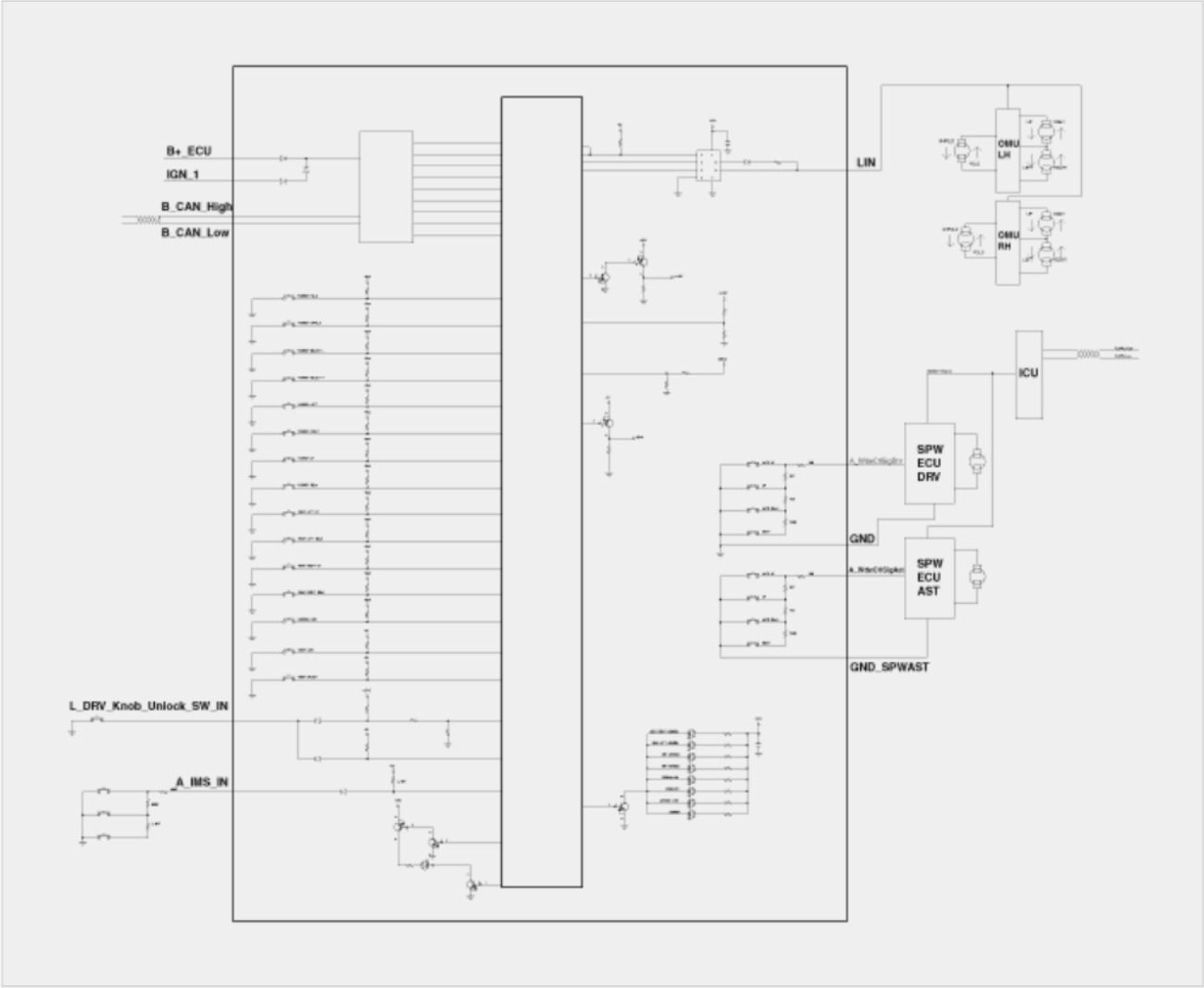
Installation

1. Install the power window switch.
2. Connect the power window switch connector.
3. Install the front door trim.
4. Connect the negative (-) battery terminal.

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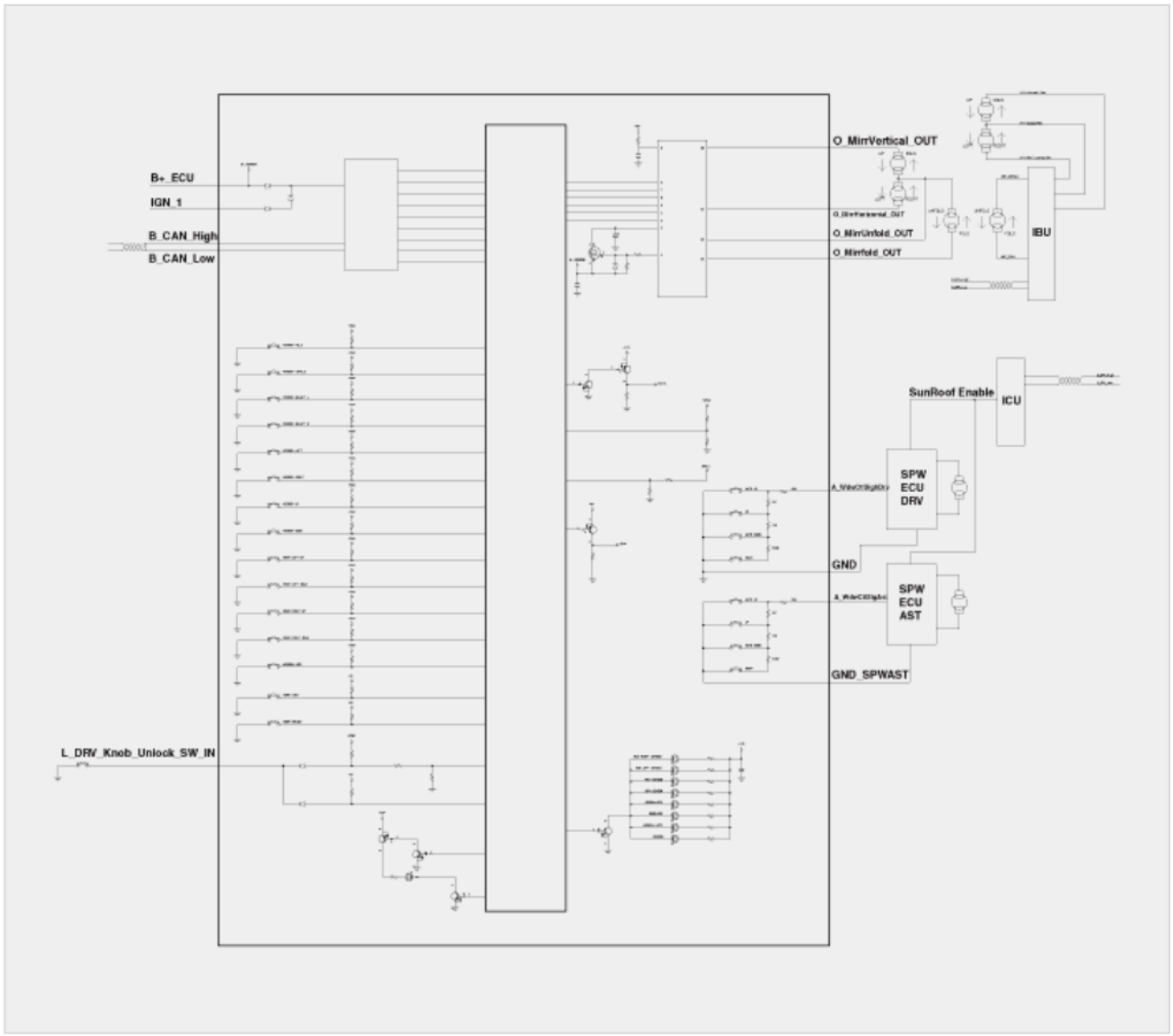
Circuit Diagram

Front Safety + IMS Type



Front Safety + Non-IMS Type

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Description

Power Liftgate system is an electro-mechanical system that can open and close the liftgate automatically, by using local switch (push button switch inside of the liftgate, and outside handle switch), and wireless remote key (FOB), or can halt the liftgate. The Power Liftgate module (PTGM) sends and receives the vehicle's information via BCM, instrument panel, SJB and CAN communication, so that it can decide the opening/closing of the liftgate and self diagnosis.

There's a safety function to reverse its direction, when an obstacle is detected during the operation.

If power mode is disabled due to discharged battery or disabled Power Tail Gate Module (PTGM), manual opening/closing is possible by using the emergency lever on the liftgate latch after unlocking the liftgate.

Location and Direction of the Liftgate

PTG system measures the location of the liftgate through the total hall sensor inside of the spindle unit motor.

Also, the direction of the liftgate can be confirmed by analyzing the direction of spindle operation.

The signal counting (location confirmation) of the hall sensor is valid both in power operation mode and general operation mode.

PTG automatic operation mode can be changed to Manual operation mode by changing the cluster settings.

Components

1. Power Liftgate Module (PTGM)



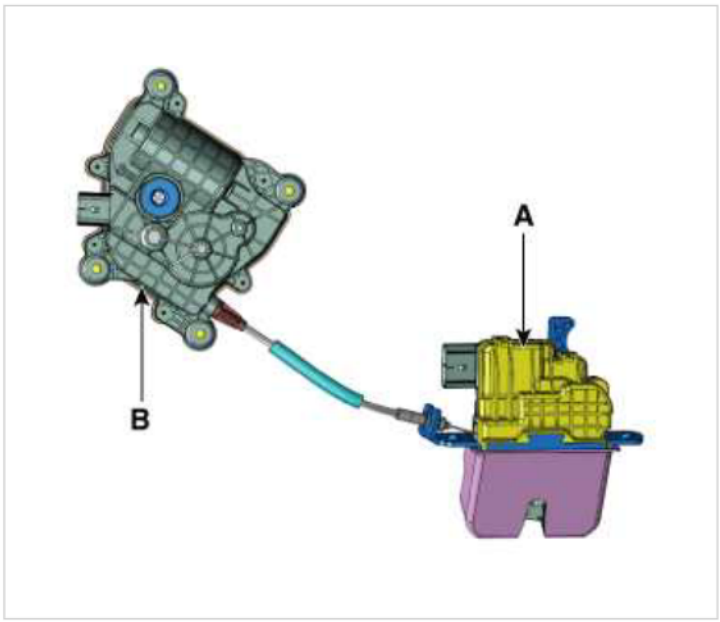
PTGM is installed inside the right-hand side luggage side trim in the back.

PTGM operates two spindle drive motors.

It also controls the anti-pinching function by analyzing anti-pinch sensor and the hall sensor in the spindle.

2. PTG Latch Assembly

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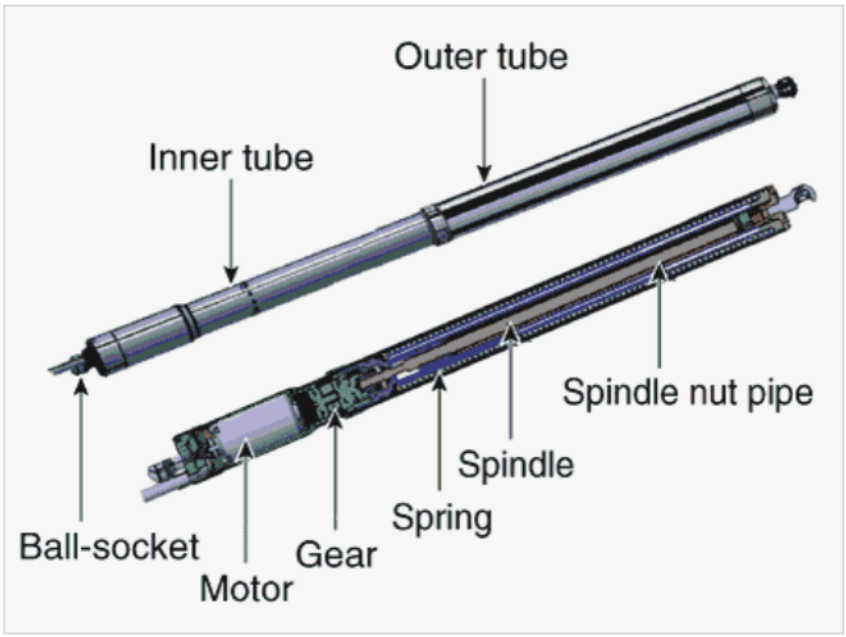


PTG latch assembly consists of power latch (A) and power closing unit (B).
PTG latch assembly is installed at the end of the liftgate and operates power lock/unlock mode under the PTGM control.

3. PTG Spindle



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PTG spindle controls the liftgate’s opening and closing using the torque of the motor inside.

Recognize the liftgate"s driving direction by sending motor"s revolving direction signal inside of spindle to PTGM.

4. Anti-pinch Strip



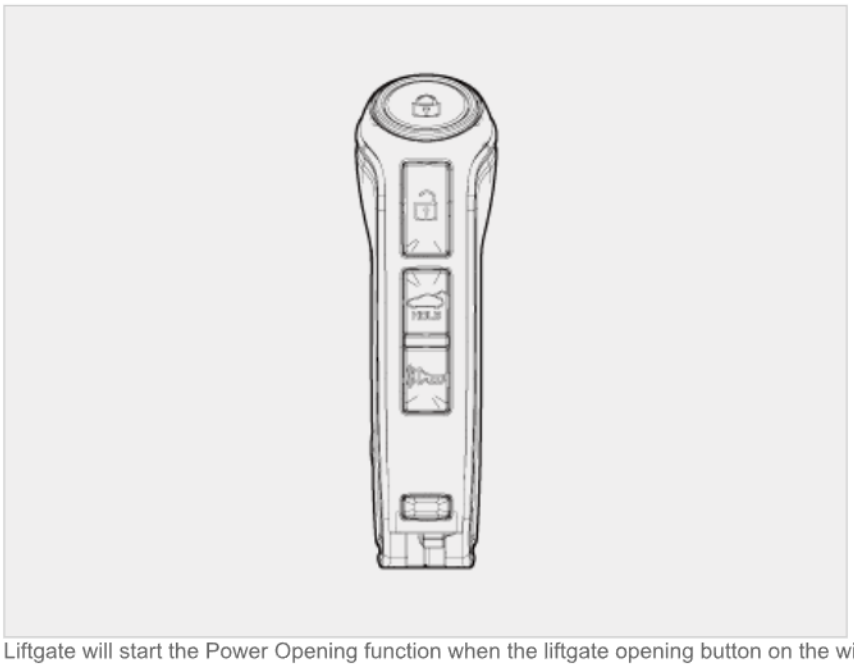
APS(Anti-pinch strip) is installed on the left and righthand sides of the liftgate and detects jamming of an object during Power Liftgate closing operation.

When jamming is detected, PTGM will immediately reverse liftgate to full open status.

Antipinch strip does not operate when liftgate is fully closed or fully open, is stationary or while opening.

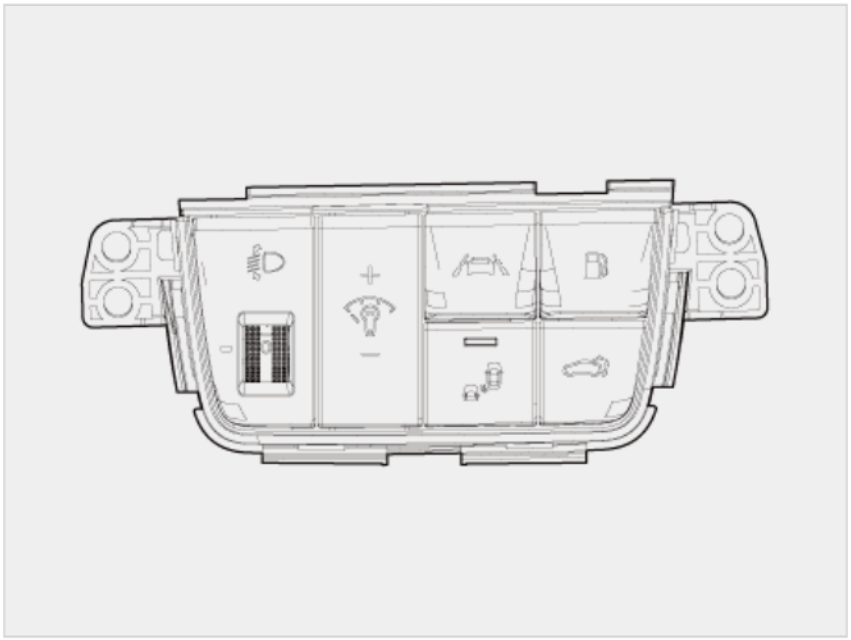
5. Wireless Transmitter

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Liftgate will start the Power Opening function when the liftgate opening button on the wireless transmitter is pressed for more than 1.0 second.
If the button is pressed shortly while the power liftgate is opening or closing, the power liftgate will stop its movement.
If the button is pressed for 1.0 second while the power liftgate is opening or closing, the power liftgate will reverse its direction.

6. Side Crash Pad Switch



If the side crash pad switch is pushed for 1.0 second, the liftgate will operate power opening or closing function.
If the side crash pad switch is pressed shortly while the power liftgate is opening or closing, the power liftgate will stop its movement.
If the side crash pad switch is pressed for 1.0 second while the power liftgate is opening or closing, the power liftgate will reverse its direction.

7. Power Liftgate Inner Switch

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If the switch inside of the liftgate is pushed, the liftgate will start the power closing function.

8. Power Liftgate Buzzer



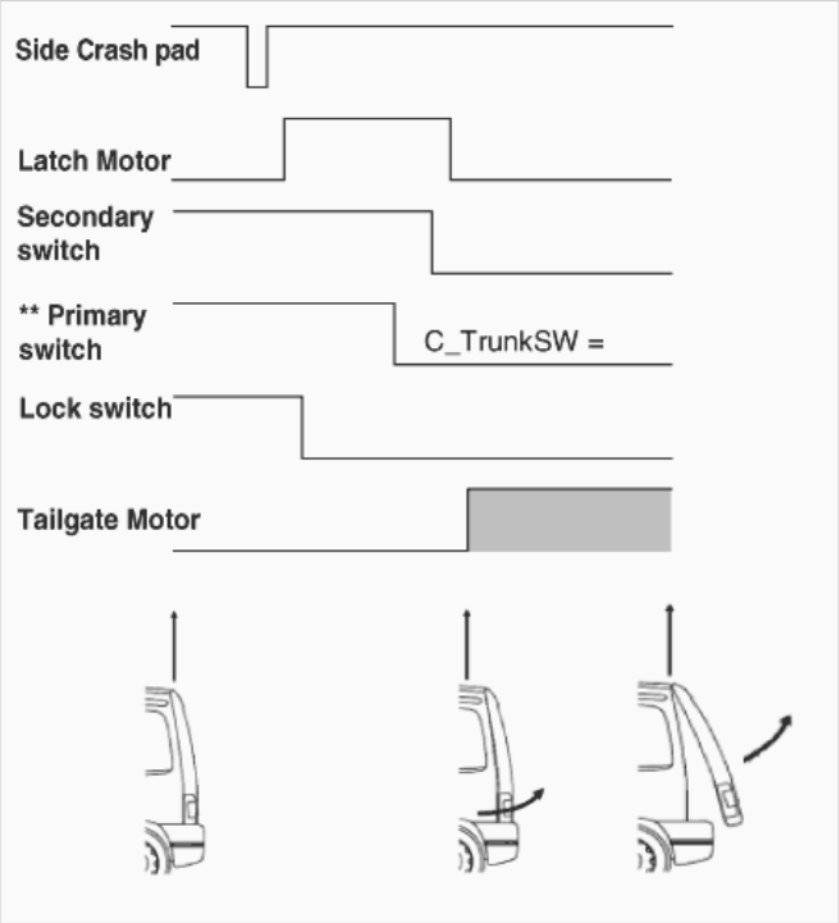
When an obstacle is detected or power function is not performed properly in accordance to the user"s order, the alarming buzzer will sound for 3 times.

And when power function is performed properly, the alarming buzzer will sound twice.

Operating Principle

Opening of the Power Liftgate

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Primary switch signal is sent to PTGM via CAN communication. (sent by SJB)

Power Liftgate Opening Process

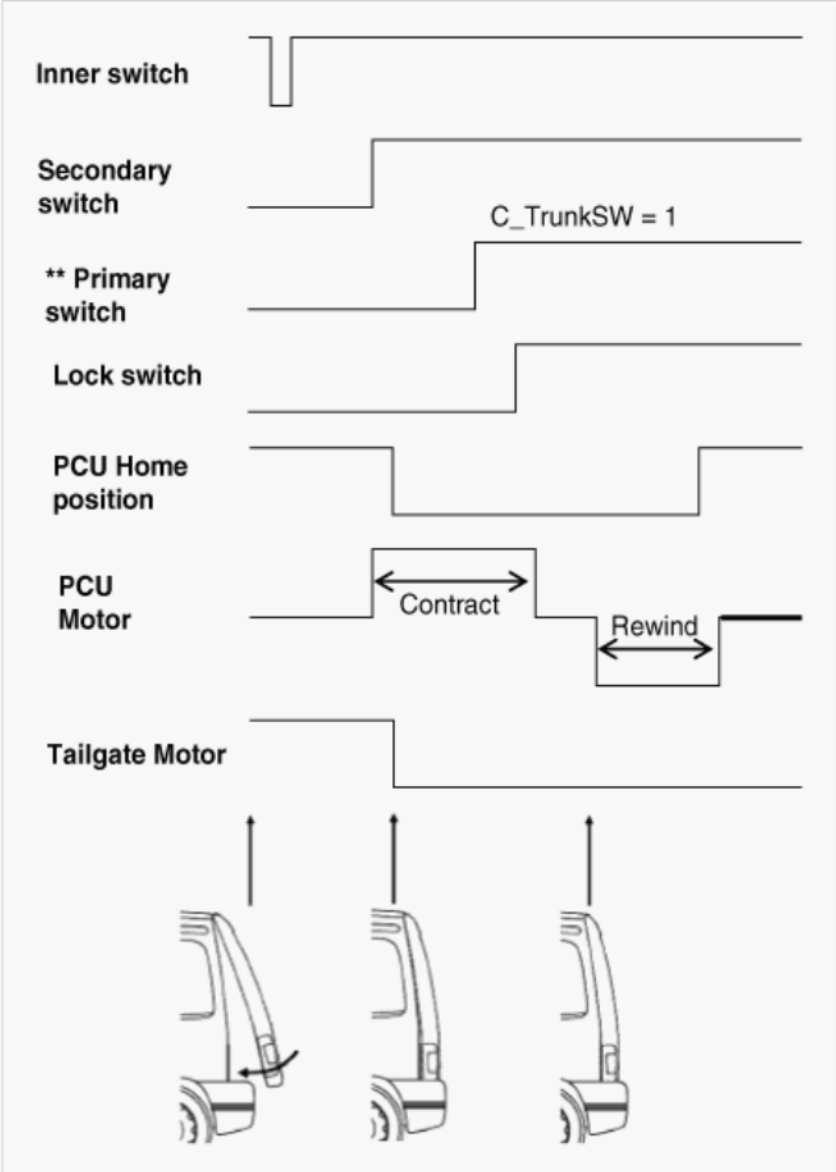
1. Opening will start after signals from crash pad lower switch, liftgate handle switch, or wireless remote key(FOB) are received.
2. The latch motor will unlatch the liftgate by releasing the striker (via the SJB).
3. To open the liftgate, the PTG module will activate the liftgate spindle motors.
4. The speed of the spindle motors is monitored via a hall sensor in the motor.
5. Opening angle of the liftgate will be calculated from the number of pulses of the hall sensor.

⚠ CAUTION

- When the motor's movement is restricted PTGM will sense it as an obstacle and either reverse in opposite direction or halt the motor movement.

Power Liftgate closing

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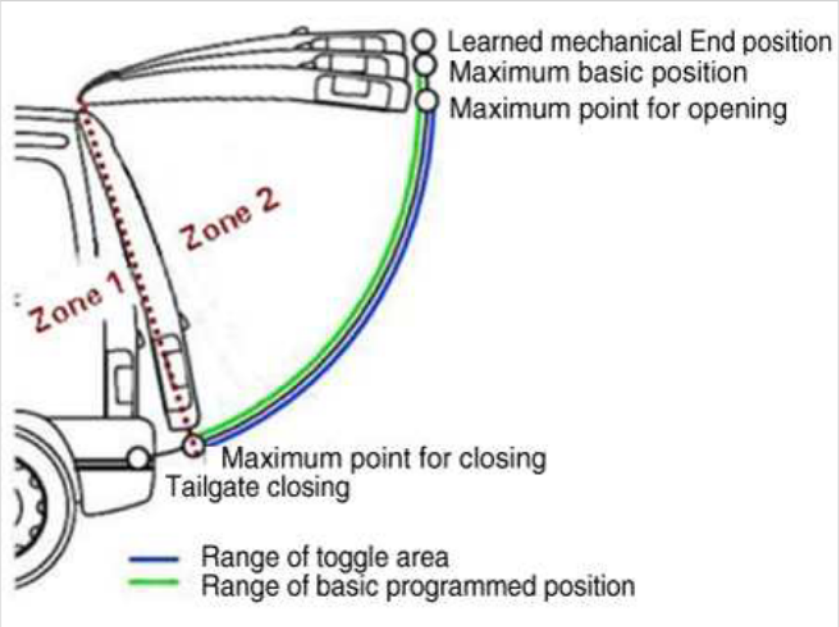


Power Liftgate Procedure :

1. Closing will start after signals from crash pad switch, liftgate inner switch, or wireless remote key(FOB) are received.
2. To close the liftgate, the PTGM will operate the Spindle motors.
3. The PTGM monitors the Closing angle of the liftgate by counting the pulses from the hall sensors.
4. The liftgate latch is put on the striker, and if the seal force is not too weak the latch will be on the Half Lock position. (latch full open → latch half lock)
5. After the Half Lock switch signal from the latch is received, PTGM will stop the liftgate spindle motor operation.
6. PTGM will engage voltage to PCU and the PCU will start cinching operation until PTGM receives Full Lock signal from the latch.
7. The liftgate is fully closed, and the latch is fully locked.

Learning/Calculation/Program Location

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1. Maximum Point for Opening
   The movement of opening direction beyond this position will make the liftgate to reach the maximum basic position, and overload the mechanical system(hinge).
   So, opening movement beyond this position is impossible.
   But, if the movement started from lower position, the liftgate will move beyond this point.
2. Learned Mechanical End Position
   Mechanical End Position is the mechanical limited position, and is regarded as 100% opened.
   This position is being Learnt in the process of the first opening of the liftgate.
   After the learning, the liftgate will not go beyond the maximum basic position that is defined as soft stop.
   All of the positions will be defined by parameters that are designated by ECU.

Open maximum Programming (Garage Position)

1. After mechanical End Position is learned, the basic position defined by user will be regarded as same as the maximum basic position.
   – The user may shift the learned basic position to any position. (within the range between Maximum position For Closing and Maximum Basic Position)
   – If the user wishes to move the new basic position lower than the old basic position, he or she has to move the liftgate to the new position automatically or manually and push the internal switch of the liftgate for five seconds. (Time may differ in accordance with parameters.)
   – If the user wishes to set the liftgate position above the maximum basic position, ECU will set the basic position as the maximum basic position.

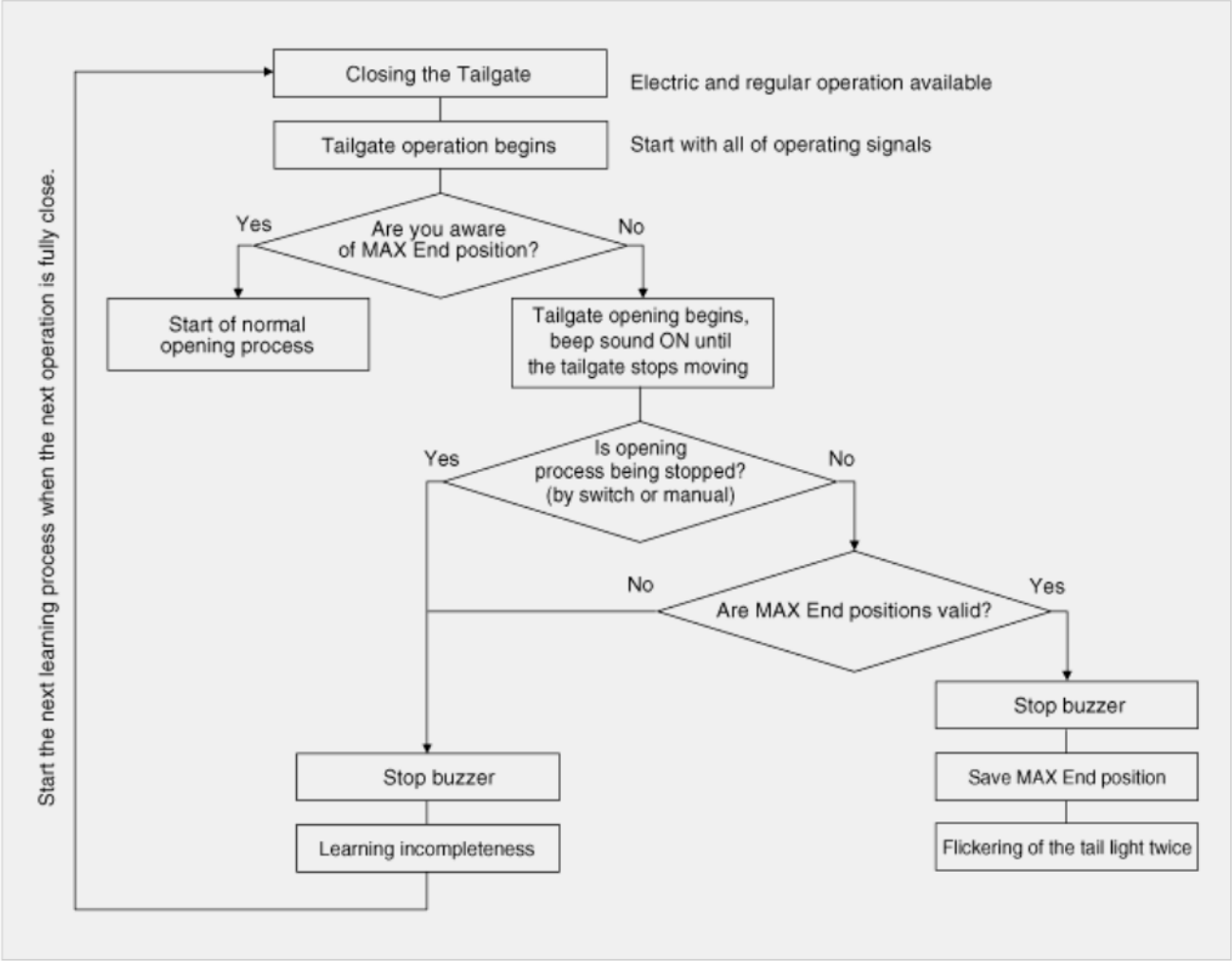
System Parameter

Before the normal operation is guaranteed, mechanical tolerance and adjustment at vehicle production line and the maximum movement range correction by Power Liftgate assembling are required.

From the end point that is limited by mechanical binding when the liftgate is fully closed (latch locked), the maximum movement range of the liftgate in operation is expressed by the number of the hall pulse signal of spindle speed and location sensor that are sent by ECU.

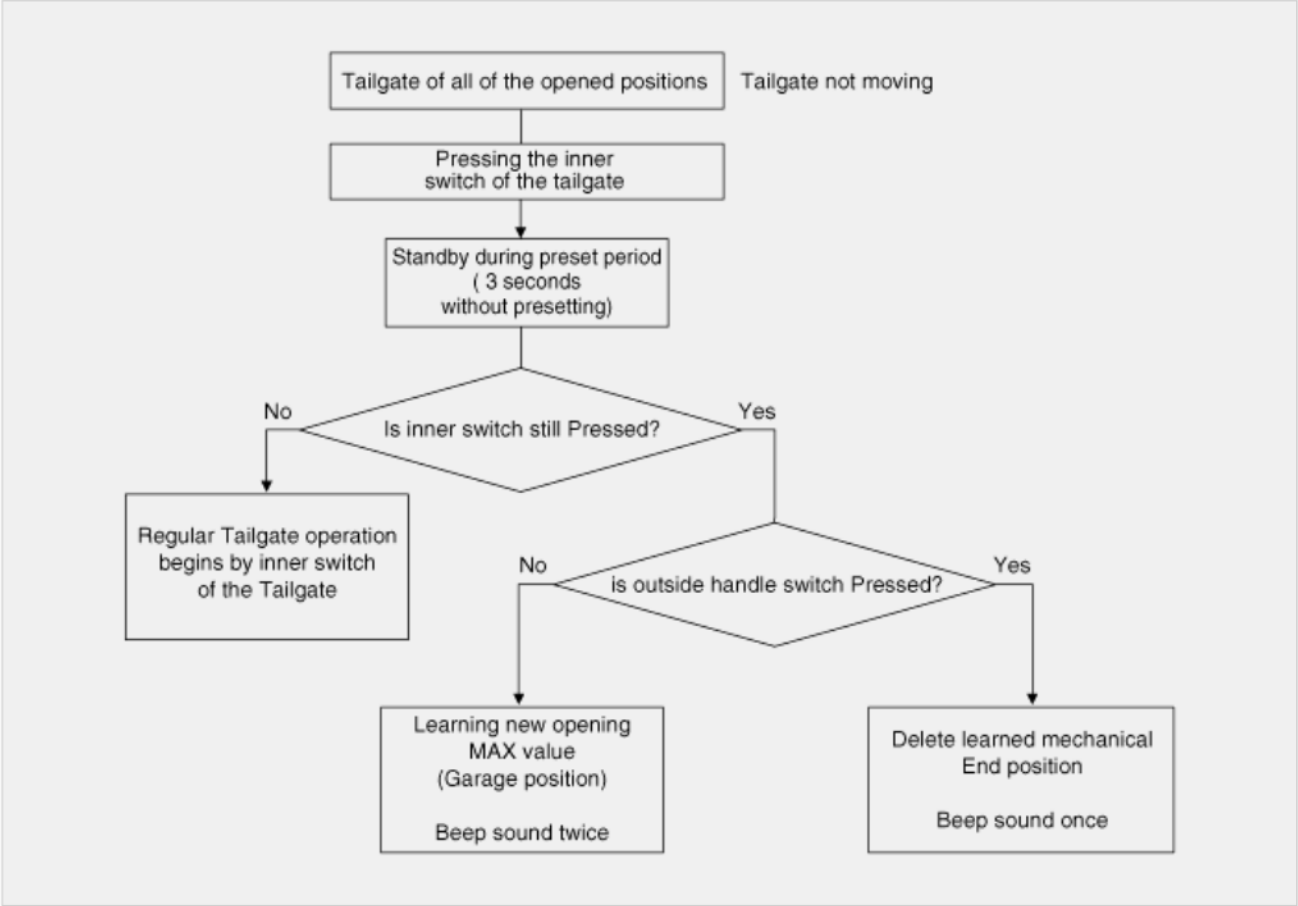
Calibration Mode

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Manual De-calibration Mode

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Buzzer Operation Mode

Operation	Request source	Number of buzzer cycles	Number of hazard cycles	Comment
Start opening	Outside Switch	2	2	Delay start of liftgate until first cycle is over
	Inner Switch			
	Console Switch			
	Remote Key			
	Smart Key			
Start closing	Outside Switch	2	2	
	Inner Switch			
	Console Switch			
	Remote Key			
	Smart Key			
Direct direction change (Open -> Close) (Area : Closed - Maximum end point for closing)	Outside Switch	2	2	No delay (Reversing and buzzing at the same time) - Only delay due to mechnical system
	Inner Switch			
	Console Switch			
	Remote Key			
	Smart Key			
Obstacle detection (Reverse operation start)	-	3	-	-
Vehicle speeds when liftgate is open	-	10	-	Stop condition 1. Complete 10 times. 2. Liftgate full lock.
Adjust height	Inner Switch	2	-	-
Initialization	Inner Switch & Outside Switch	1	-	-

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(Deleting end position and basic position)				
Initialization (Learning end point)	-	-	2	-
Initialization (During calibration)	-	Continuous	-	-
Liftgate not closed	-	10	10	Liftgate closed but lock switch not off (Still open)
Error detect	-	3	-	- APS error - Spindle error - Hall sensor error - System error (EEPROM error) - Voltage error (Over/Under) - PCU error - Latch position error - Stuck switches. (Switch pressed more than 30 sec) - Thermal protection

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Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the liftgate trim.
   (Refer to Body - "Liftgate Trim")
3. Disconnect the anti-pinch strip connector (A).



4. Remove the anti-pinch strip (A) after removing the mounting clips.



Installation

1. Install the anti-pinch strip.
2. Disconnect the anti-pinch strip connector.
3. Install the liftgate trim.
4. Connect the negative (-) battery terminal.

Inspection

Inspection of the Anti-Pinch Strip

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Refer to Power Liftgate System - "Troubleshooting"

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Components



1. Anti pinch strip (2EA)
2. Power liftgate spindle (2EA)
3. Power liftgate buzzer
4. Side crash pad switch
5. Outside handle switch
6. Cluster (USM)
7. Power liftgate module (PTGM)
8. Power liftgate latch & power closing unit assembly
9. Power liftgate inner switch

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Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the liftgate trim.
   (Refer to Body - "Liftgate Trim")
3. Disconnect the power liftgate latch connector (A) and power closing unit connector (B).





4. Loosen the power liftgate latch (A) mounting bolts.

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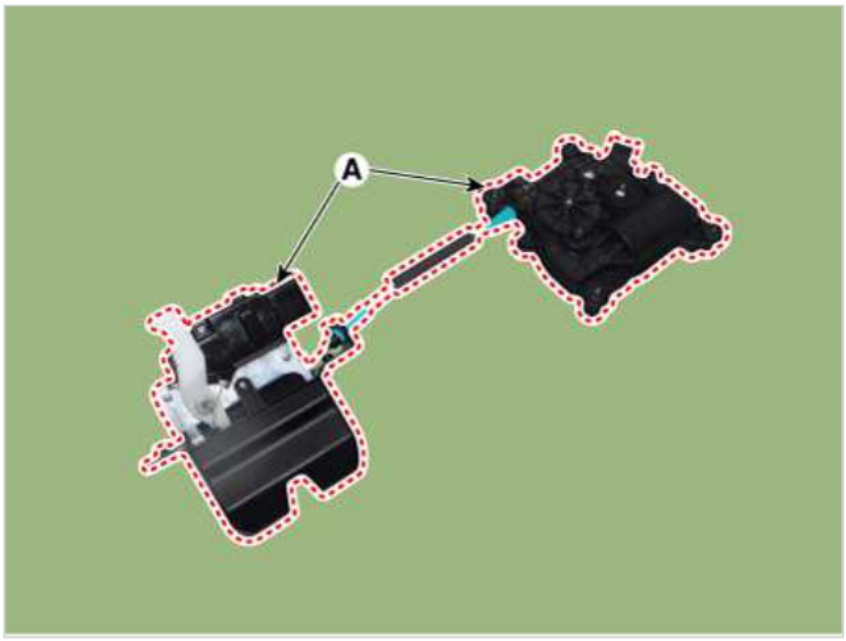


5. Loosen the power closing unit (A) mounting nuts.



6. Remove the power liftgate latch & power closing unit (A).

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Installation

1. Install the power liftgate latch and power closing unit.
2. Connect the power liftgate latch and power closing unit connector.
3. Install the liftgate trim.
4. Connect the negative (-) battery terminal.

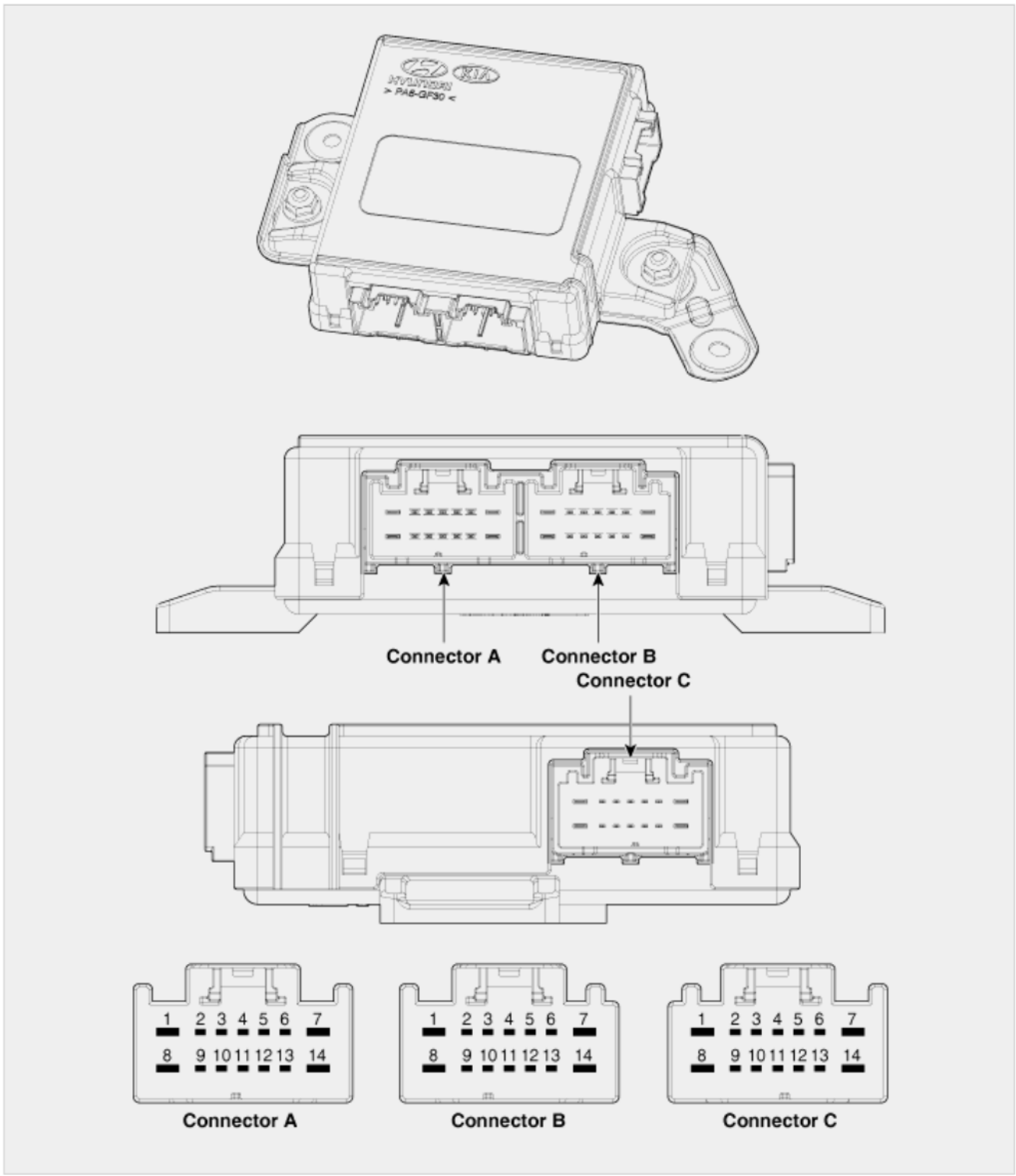
Inspection

Inspection of the Power Liftgate Latch

Refer to Power Liftgate System - "Troubleshooting"

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Components



No.	Connector A	Connector B	Connector C
1	Power supply	Cinching motor (+)	Spindle motor (RH)_Close (-)
2	Illumination (Liftgate inner switch)	Liftgate full open switch	Hall sensor (RH)_Power
3	-	Liftgate full lock switch	Spindle (LH) shild_Ground
4	B-CAN (High)	Liftgate half lock switch	Hall sensor (RH)_Ground
5	B-CAN (Low)	Home position switch_Ground	Spindle (RH) shild_Ground
6	Buzzer	Liftgate latch switch _Ground	Hall sensor (LH)_Power
7	-	System ground	Spindle motor (LH)_Close (+)

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8	Liftgate motor	Cinching motor (-)	Spindle motor (RH)_Close (+)
9	-	Liftgate open/close switch	Hall sensor 1 (RH)
10	Gear "N" Position	Liftgate inner switch	Hall sensor 2 (RH)
11	-	Home position switch	Hall sensor (LH)_Ground
12	Antipinch strip (LH)_Power	Antipinch strip (LH)_Ground	Hall sensor 1 (LH)
13	Antipinch strip (RH)_Power	Antipinch strip (RH)_Ground	Hall sensor 2 (LH)
14	-	Power ground	Spindle motor (LH)_Close (-)

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Removal

⚠ CAUTION

a. After replacing with a new power liftgate module, check for DTC code at all times.
If DTC code B24B0 exists, perform power liftgate mode change.
(Refer to Power Liftgate System - "Troubleshooting")

b. After replacing with a new power liftgate module, perform the system initialization.
(Refer to Power Liftgate System - "Troubleshooting")

c. Before delivery to customer, operate the power liftgate to be sure that there is no warning sound.

1. Disconnect the negative (-) battery terminal.
2. Remove the luggage side trim [LH].
(Refer to Body - "Luggage Side Trim")
3. Disconnect the power liftgate module connectors (A).



4. Remove the power liftgate module (A) after loosening the mounting nuts.



Installation

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1. Install the power liftgate module.
2. Connect the power liftgate module connectors.
3. Install the luggage side trim [LH].
4. Connect the negative (-) battery terminal.

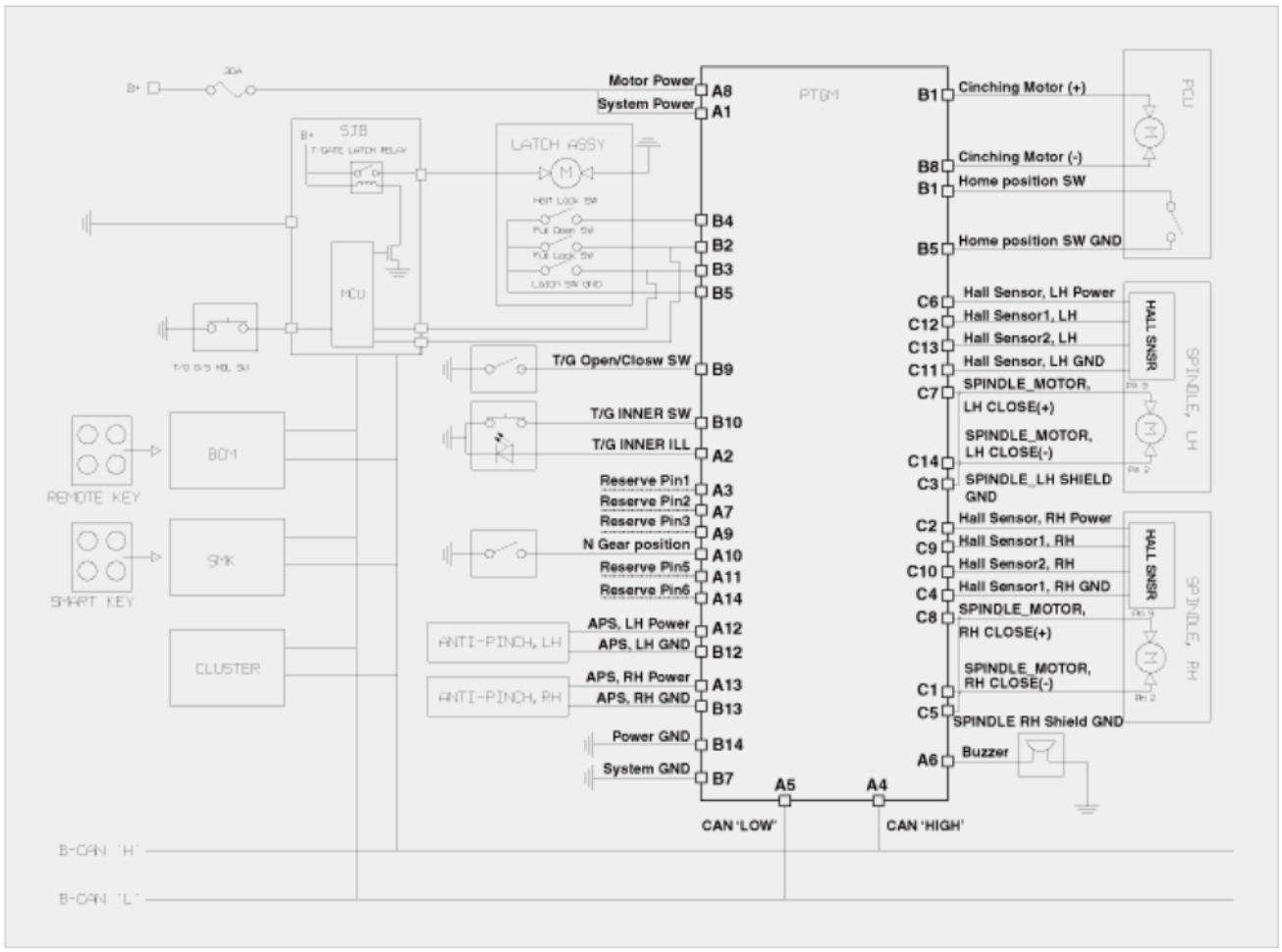
Inspection

Inspection of the Power Liftgate Module

Refer to Power Liftgate System - "Troubleshooting"

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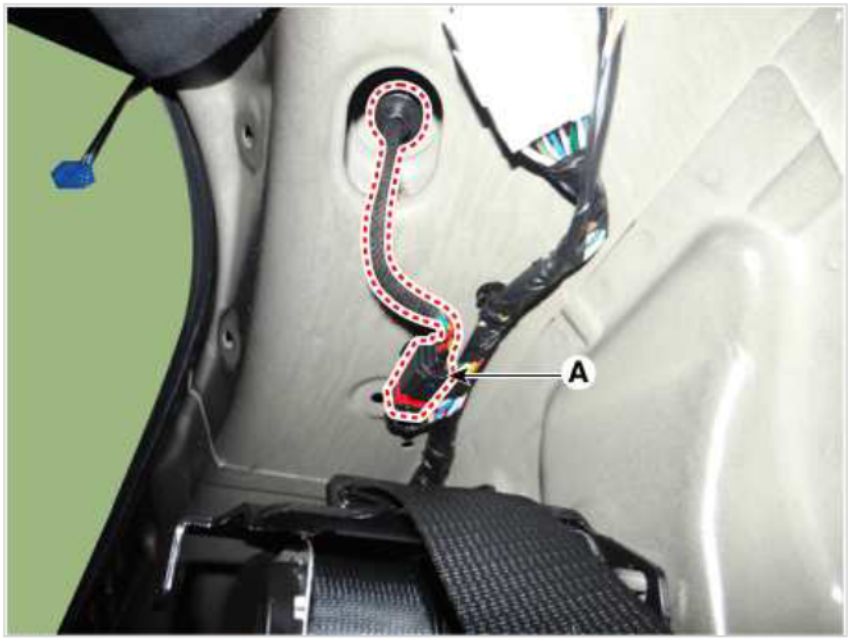
Circuit Diagram



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Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the rear pillar trim.
   (Refer to Body - "Rear Pillar Trim")
3. Disconnect the power liftgate spindle connector (A).



4. Using a screwdriver, lift the socket clips (A) up slightly.
5. Remove the power liftgate spindle assembly (B).



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CAUTION

- Work in a group of two or more when removing and installing the PTG spindle.
- Take care not to close the tail gate while the PTG spindle is being removed.
- Do not reuse the PTG spindle drive if it is dropped on the ground. Discard any dropped PTG spindles.
- When carefully removing the socket clip, take extra care not to lose the socket clip as it may pop out.
- When carefully removing the socket clip, take care not to scratch the clip surface as scratches may cause corrosions in the future.

Installation

1. Install the power liftgate spindle assembly.
2. Connect the power liftgate spindle connector.
3. Install the rear pillar trim.
4. Connect the negative (-) battery terminal.

CAUTION

- When assembling the PTG spindle drive to the ball socket, listen for a "click" sound to make sure that it is firmly assembled.
- After assembling the PTG Spindle drive to the ball socket, check the socket clip if it is firmly assembled or not. (the clip should not protrude from the socket.)
- After assembling the PTG Spindle drive, make sure that the grommet on the body side is firmly assembled.

Inspection

Inspection of the PTG Spindle

Refer to Power Liftgate System - "Troubleshooting"

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Failure Inspection

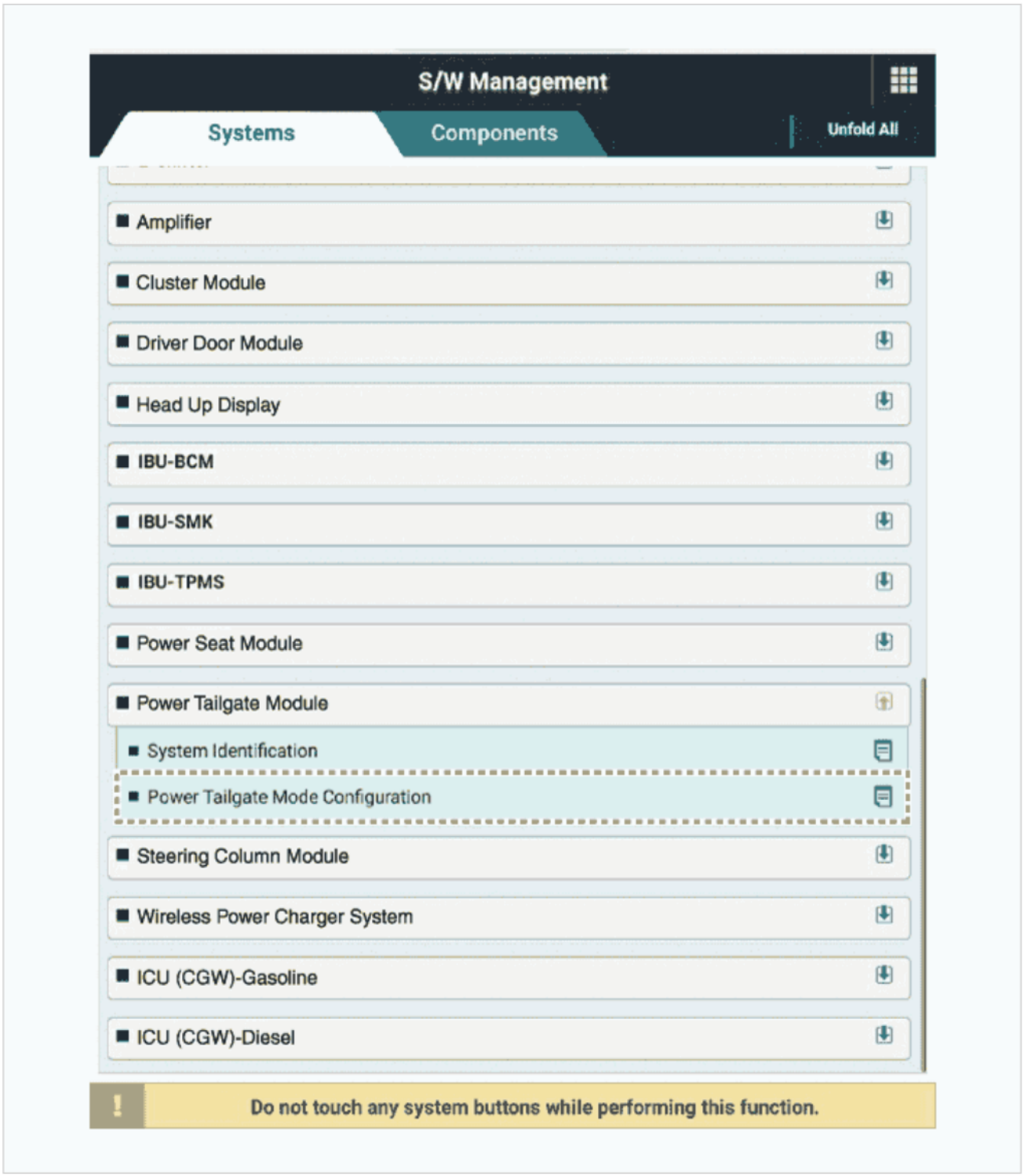
Diagnosis With KDS

1. In the body electrical system, failure can be quickly diagnosed by using the vehicle diagnostic system (KDS).
   The diagnostic system (KDS) provides the following information.
   (1) Self diagnosis : Checking failure and code number (DTC)
   (2) Current data : Checking the system input/output data state
   (3) Actuation test : Checking the system operation condition
   (4) Additional function : Controlling other features including system option setting and zero point adjustment
2. Select the "Car model" and the "Power liftgate Module" to be checked in order to check the vehicle with the tester.
3. Select the "Current Data" menu to search the current state of the input/output data.
4. To forcibly actuate the input value of the module to be checked, select option "Actuation Test"

Mode Change (Power Liftgate System)

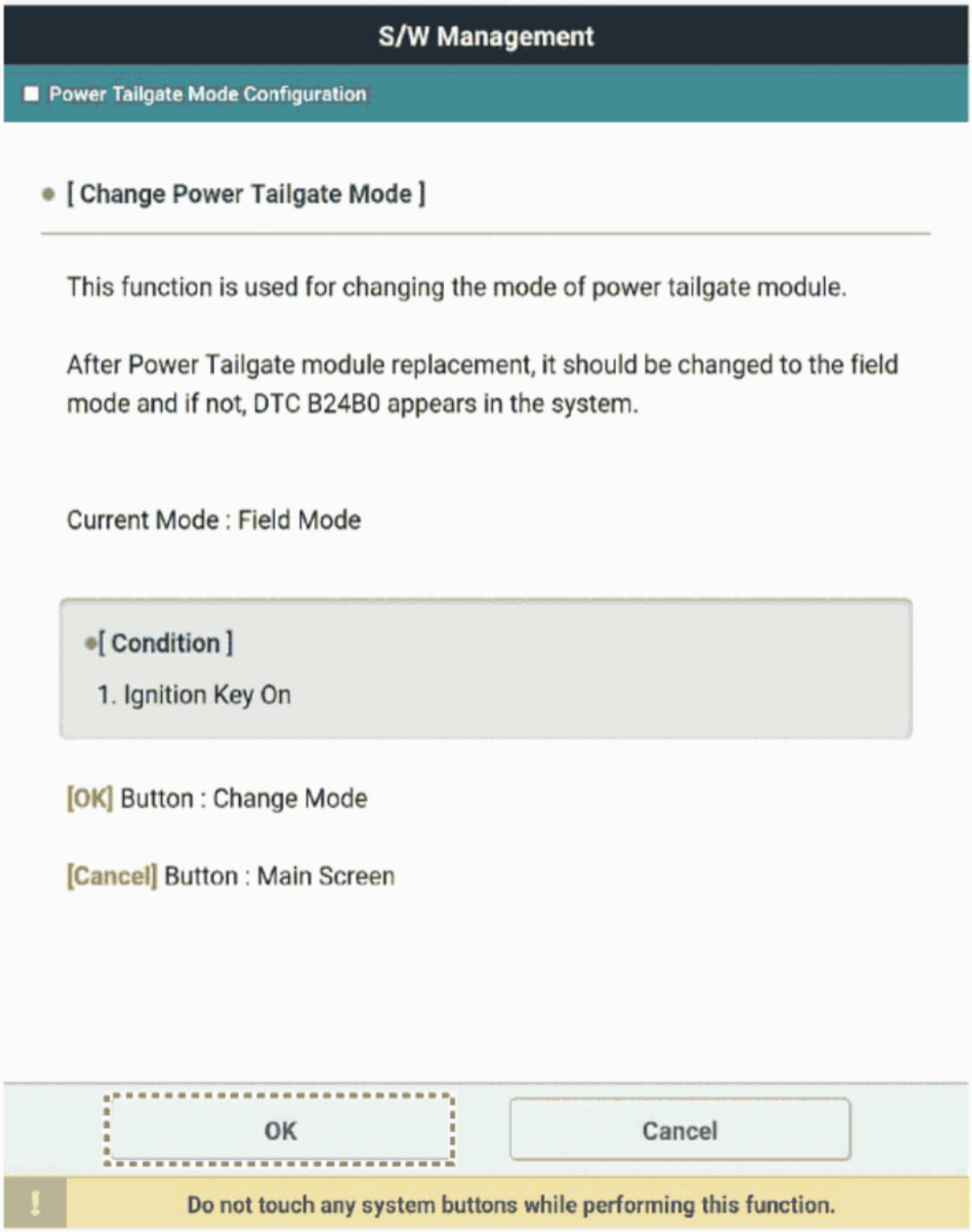
1. After replacing with a new power liftgate module, check for DTC code at all times.
   If DTC code B24B0 exists, perform power liftgate mode change.
2. After connecting the KDS, select the "Power Liftgate Mode Change" procedure.

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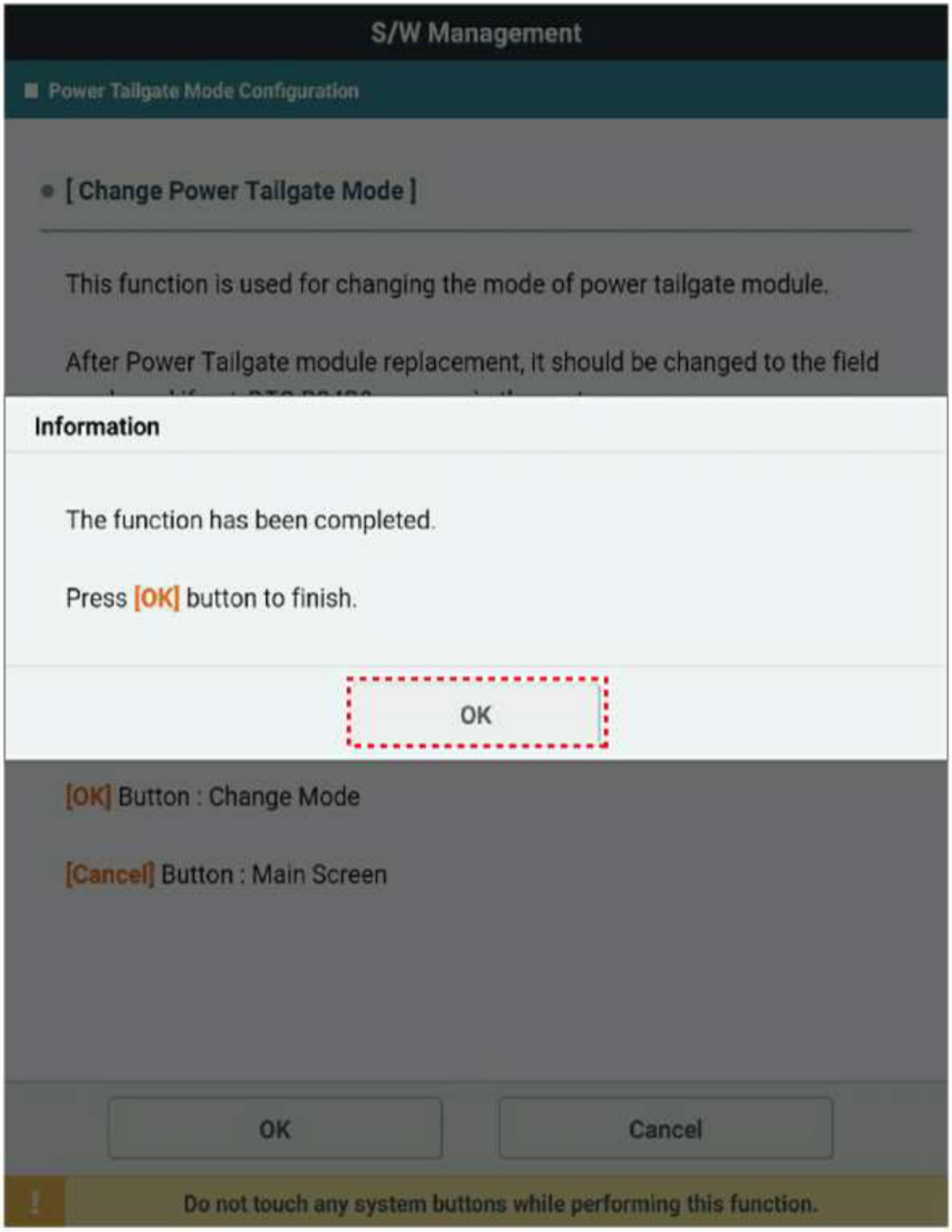


3. Perform the liftgate mode change procedure according to displayed messages on KDS.

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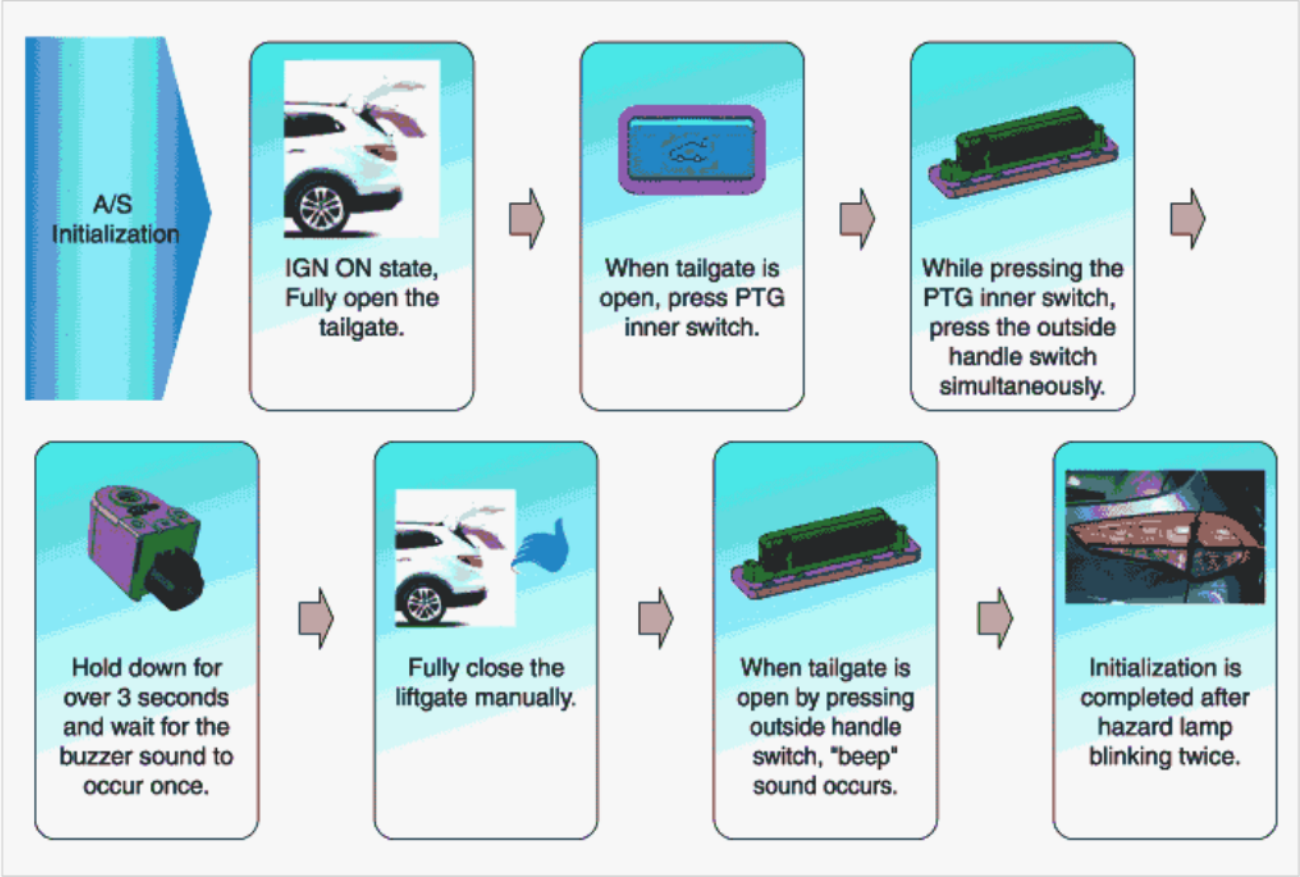
⚠ CAUTION

- If power liftgate system is operated with factory mode, it makes the abnormal warning sound.

System Initialization

System initialization is needed to recognize the closing position of the liftgate to power liftgate module.
The initialization process after battery power reset, system initialization is needed to recognize the maximum opening and closing liftgate position exactly.
The power liftgate operates normally after system initialization is completed.
Procedure :

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Inspection and Test - Power Liftgate System

Power Liftgate system is a complex system that consists of several components. To get an accurate test result, the control module of the Power Liftgate must be inspected.

The most trustworthy, effective and accurate method is using KDS required by power liftgate.

KDS helps technicians when inspecting a disabled switch, and enables to check the current status record of the switch ofPower Liftgate control module.

The battery must be fully charged before conducting all of the test on power liftgate, and all of the interfering elements of the system must be shown and understood. (refer to the explanation of smart liftgate) Refer to the analysis reference table when inspecting and testing the smart liftgate.

Status	Cause	Solution
Sudden opening of liftgate	Activation by mistake or malfunction of open/close switch	Check for short or malfunction of short circuit of switch
	Latch assembly failure	Check for wiring connection
		Check for failure code, and replace the latch if needed
	Failure of Smart Liftgate or the body control module	Reset the module fuse or reconnect the battery. If it does not operate properly, check the wiring connection and analyze manual.
Unable to power open and close the liftgate	False indication, or not parked status	Check a switch status using analyzing device
	Low voltage of the Power Liftgate module battery	Check for proper voltage of the Power Liftgate
		Battery charged
	Swelling of the fuse	Check if the fuse is swollen
	Malfunction of PTG spindle	Check for PTG spindle status
	Critical code failure at IBU/liftgate control module	Check for code status using KDS
	Latch assembly failure	Check if the wiring connection of fuse are swollen.
		Check if there"s any alien object interfering with the operation of latch assembly.
Unable to open and close of the tailegate	Failure in motor assembly	Check for motor assembly
	Interference of the consisting components	Replace the needed parts or reset the affected position.
	Wiring problem (system or vehicle)	Resolve the problem using the wiring map.
		Refer to wiring diagram.

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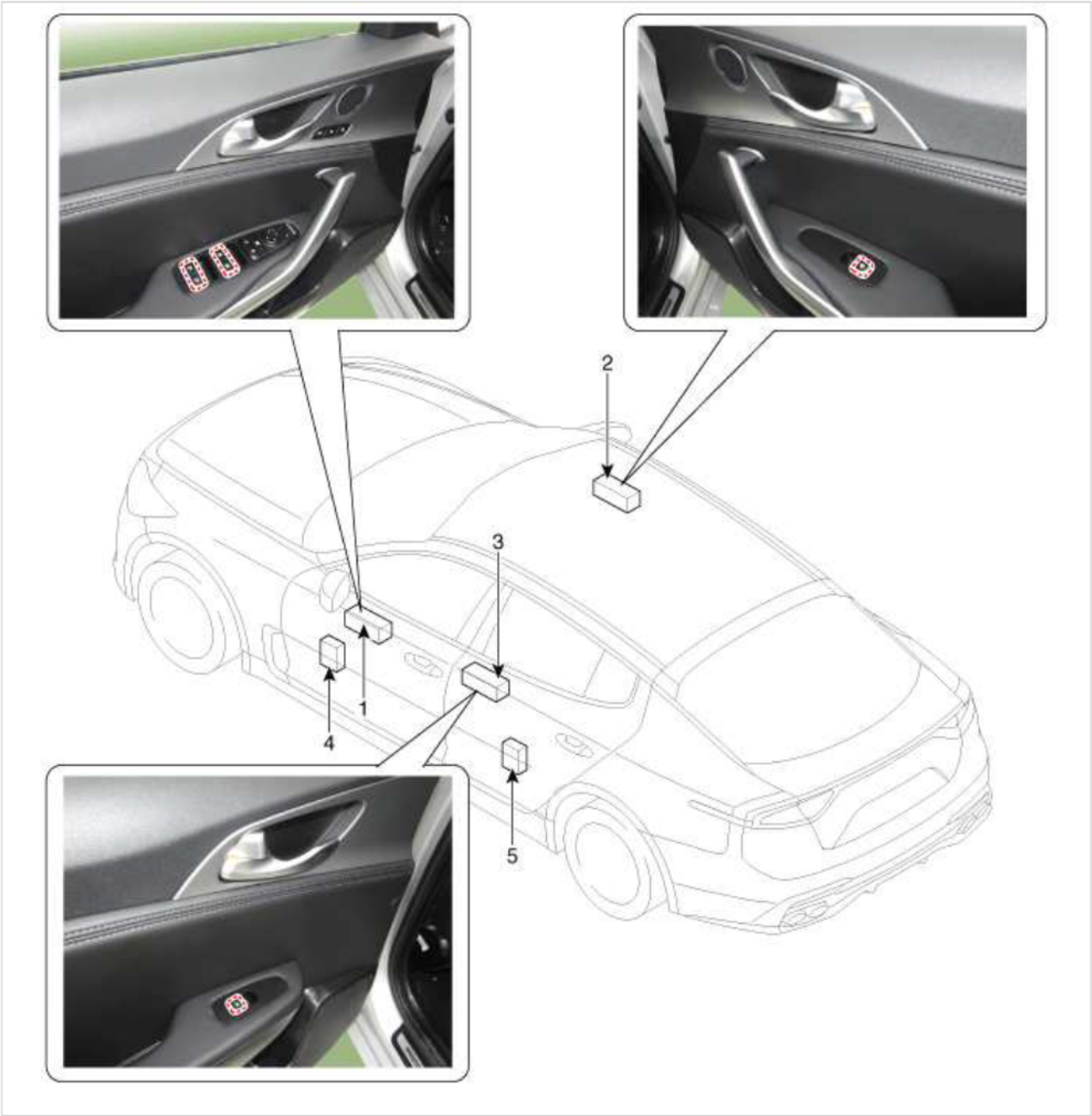
Loss of electricity during the liftgate operation	Wiring problem (system or vehicle)	Resolve the problem using the wiring map.
		Refer to wiring diagram.
	Low voltage of vehicle battery	Check for proper voltage of PTGM.
		Charge the battery
	Failure in Power Liftgate or IBU	Check for failure code using analyzing device
	Failure in motor assembly	Test the motor assembly
Power latching unable at Primary/Secondary position	Latch assembly failure	Check if the wiring connection of fuse are swollen.
		Check for failure code using analyzing device
		Resolve the problem using a vehicle analyzing manual.
		Replace the latch assembly if needed.
	Interference of the consisting components	Replace the needed parts or reset the affected position.
	Failure in Power Liftgate or IBU	Check for failure code using analyzing device
	Excessive sealing force of the liftgate	Check for shock on sealing, assembly failure, alien object or other possible factors.
	Failure in motor assembly	Check the motor assembly
Unable to unlock the latch at Primary position	False indication, or not parked status	Check switch status using analyzing device
	Low voltage of the Power Liftgate module battery	Check for proper voltage of the Power Liftgate
		Battery charged
	Swelling of the fuse	Check if the fuse is swollen
	Latch assembly failure	Check switch status using analyzing device
		Check for alien object interfering with the latch assembly operation or shock on components.
		Resolve the problem using a vehicle analyzing manual.
		Remove the latch assembly if needed.
	Failure in outside handle connection	Check for handle joint and wiring connection.
	Failure of Power Liftgate or the body control module	Check for the failure code or cycle using analyzing device.
	Interference of the consisting components	Replace the needed parts or reset the affected position.
Liftgate operation using pop/console switch unavailable.	Swelling of the fuse	Check if the fuse is swollen
	Low voltage of PTGM	Check for proper voltage of PTGM.
		Charge the battery
Unable to unlock the electric lock	Failure on the latch assembly	Check for alien object interfering with the latch assembly operation or shock on components.
		Check for the failure code or cycle using analyzing device.
		Check for pole/latch switch using analyzing device.
		Resolve the problem using the vehicle inspection manual
Unable to unlock the electric lock	Failure of Power Liftgate module	Resolve the problem using the vehicle inspection manual
	Failure of Integrated body control unit (IBU	Resolve the problem using the vehicle inspection manual
		Replace IBU if needed
	Malfunctioning of wireless remote control key	Rewrite the wireless remote control key program
		Replace the wireless remote control key
	Malfunctioning of the liftgate motor assembly	Check for alien object interfering with the motor assembly operation.
		Check for wiring connection
		Change the assembly if motor clutch is not operable
		Replace the switch if the full opening switch is not working
		Resolve the problem using the vehicle inspection manual
		Replace the motor if needed
Unable to maintain opened status of the liftgate	Failure on PTG spindle	Replace PTG spindle
		Check if attached objects are damaged

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Excessive operating force when opening and closing	Failure on PTG spindle	Replace PTG spindle
		Check if attached objects are damaged
	Interference of the consisting components	Replace the needed parts or reset the affected position.
When liftgate keeps cinching lock mode	Failure on the latch assembly	Check if wiring connection and fuse are swollen
		Check the switch with analyzing device
When liftgate keeps electric lock mode	Failure on the latch assembly	Check for wiring connection
		Check for any alien object
		Resolve the problem using the vehicle inspection manual
	Malfunctioning of the control module	Check for failure code using analyzing device
	Wiring problem (system or vehicle)	Resolve the problem, referring an electric circuit
		Refer to wiring diagram.
		Check for the vehicle inspection manual for detailed process
	Failure of the motor assembly	Check for operating environments constantly
	Wiring problem (system or vehicle)	Resolve the problem, referring an electric circuit
		Refer to wiring diagram.
Very slow opening of the liftgate	Vehicle battery voltage too low	Check for proper voltage of PTGM.
		Charge the battery
	Malfunctioning of the liftgate PTG spindle	Replace the liftgate PTG spindle if needed
	Interference of the consisting components	Replace the needed parts or reset the affected position.
	Vehicle angle too steep for electric operation	Operate the liftgate manually
	Malfunctioning of the liftgate motor assembly	Replace the motor assembly if needed
Rattling or squeaky sound	Alien object jammed in liftgate components	Remove the alien object
	Excessive tightening or loosening of the components	Resolve the excessive tightness or looseness

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Component Location



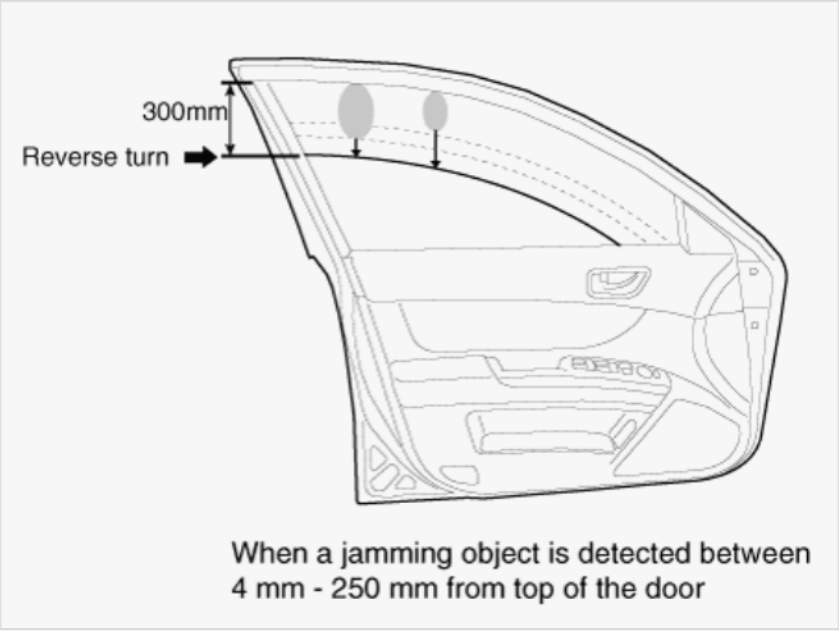
1. Driver power window switch
2. Assist power window switch
3. Rear power window switch
4. Front window motor
5. Rear window motor

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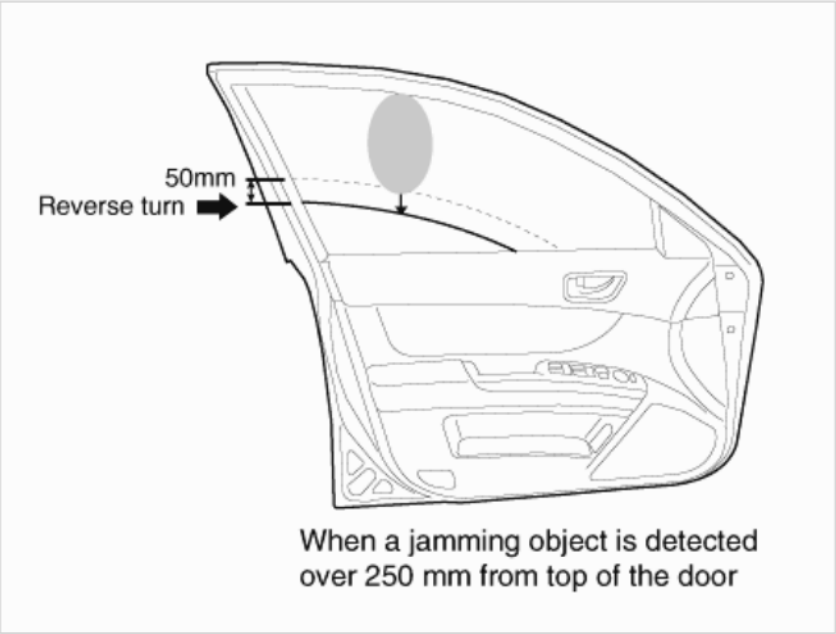
Safety Function of Power Window

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

1. Safety function condition
   When the force of 100N (using the 10N/mm spring) is detected while the window is rising, the window is pulled down.
2. Length of window reversing (except holding the auto-up switch)
   – When jamming is detected within the range between 4mm and 250mm from the top of the B pillar
   → the window is pulled down to 300mm from the top of the B pillar.

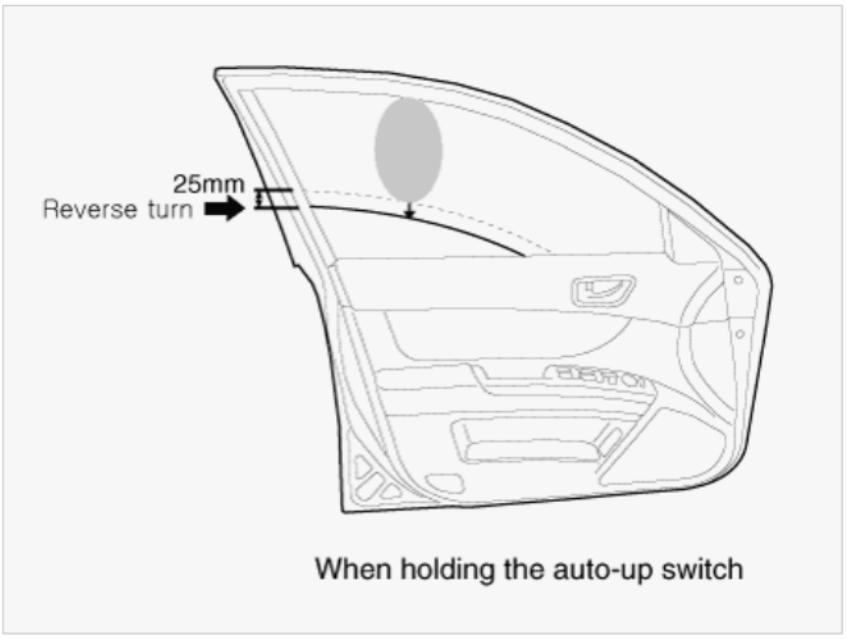


   – When jamming is detected within the range of over 250mm from the top of the B pillar.
   → the window is pulled down to the lowest position if the total length of jammed object plus 50mm is below the window's lowest position.



3. The length of window moving downward (holding the auto-up switch)
   – When jamming is detected while pulling the auto-up switch.
   → Window moves downward by 25mm from jamming position
   – Auto-up function is not available for 5 seconds after the above operation.
   → When pulling the auto-up switch, the manual-up function is activated (no safety function).

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When holding the auto-up switch

4. The area with the safety function not applied
   Safety function is not available within the 4mm range from the top of the window frame.

How to initialize the safety power window

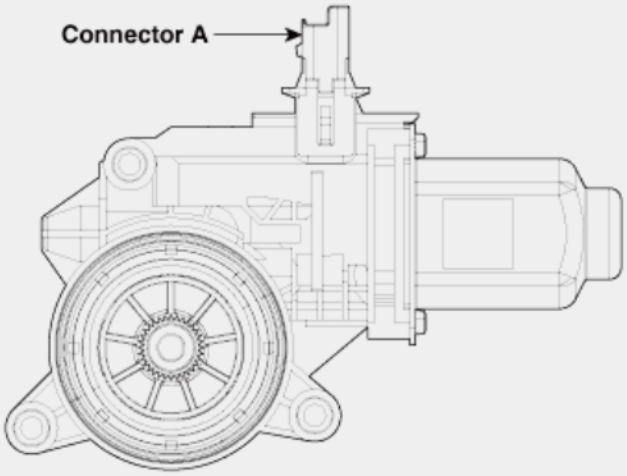
1. Initializing of Battery Connection
   When the battery power is removed for over 5 minutes, safety power window switch needs the initializing.
   (1) Power window operation before initializing
   – Manual-Up/Down function is available
   – Auto-Up/Down function is not available
   (If the Auto-up/down switch is being pushed, the manual up/down function is operated.)
   (2) Initialization
   Close the window in window open position, and holding the switch in window full close position over the 0.2 second.
   (If start the closing the window in window full close position, initializing could be failed.)
   (3) If initialize the safety power window in jamming status, could occur below conditions.
   – Safety function is not available
   (4) Window position memorizing hall sensor is used to identify the window position and motor operation direction. ECU detects the uppermost position of the window and sets the position as '0'
   (5) Deinitialization
   ECU is deinitialized if the following conditions are met. After deinitialization process, Auto-up and safety function are not activated.
   Deinitialization conditions
   a. Repeating window downward movement 15 times in a row.
   b. Power supply is suspended while the motor is in operation.
   c. Driver seat door opens, IGN Off with the window glass positioned in Hard Stop -> IGN On within 2 seconds -> within 5 seconds with IGN On, entering manual down switch signal 3 times -> Deinitialization completed (if power is not on in 2 seconds, or the operation to be performed in 5 seconds, the deinitialization process shall be repeated from the beginning.)

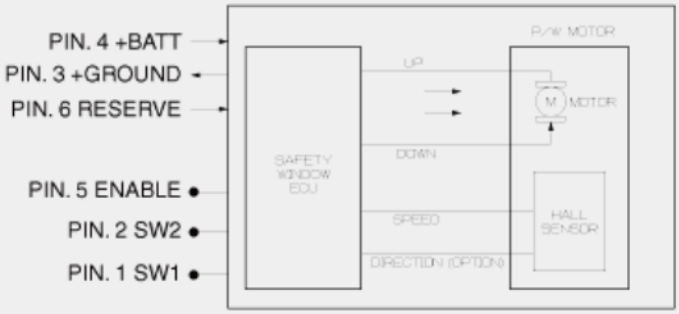
2. Initializing of fail safe mode
   Prevention of overheated motorSoftware overheating prevention function is used to prevent the motor from overheating (but, EEPROM data shall be saved in ECU).
   (1) If the window moved by compulsion and motor have a problem, power window switch could be entering the fail safe mode for user's safety.
   (2) Power window operation in fail mode
   – Auto/Manual-Down function is available
   – Auto/Manual-Up function is not available
   (When Auto/Manual-up is operated, window is rising by 20mm and stops moving.)

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Components

[Safety Window Motor]

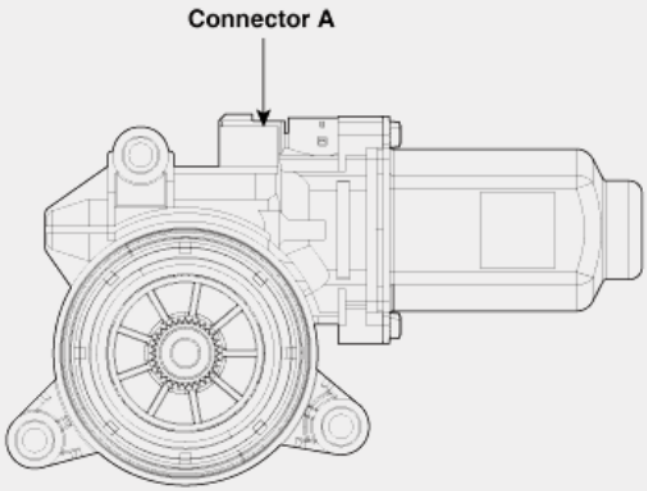


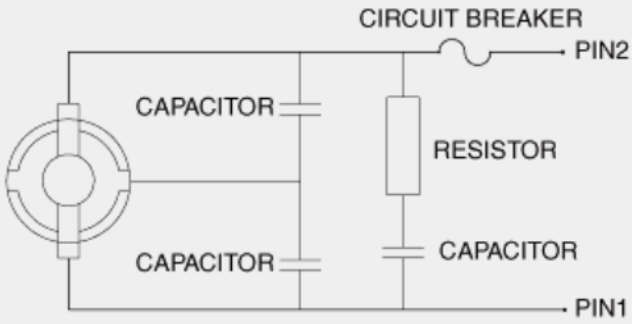


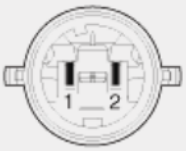
Connector A	No.	Description	No.	Description
	1	Switch 1	4	Battery (+)
	2	Switch 2	5	Enable
	3	Ground	6	Reserve

[Standard Window Motor]

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Connector A	
	
No.	**Description**
1	Up
2	Down

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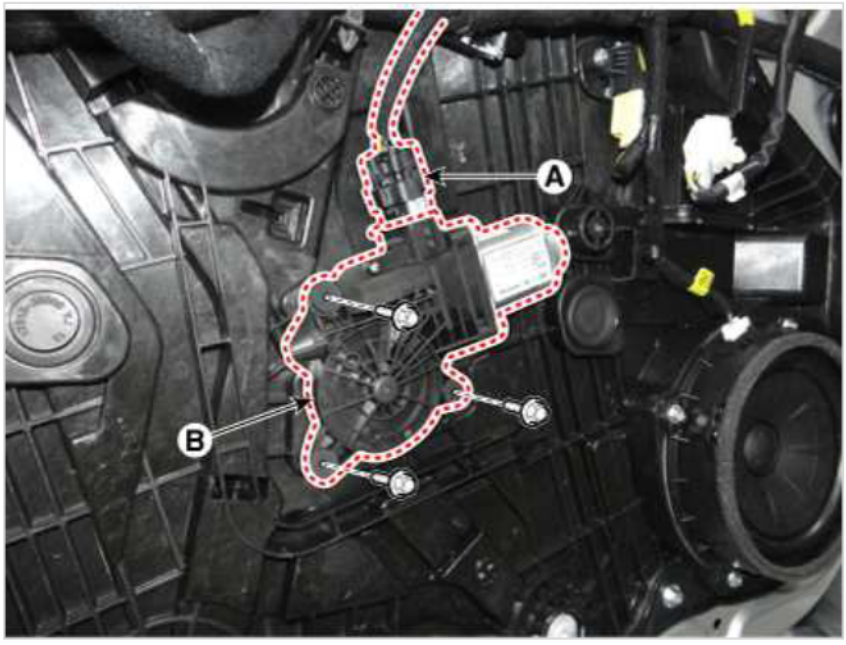
Removal

⚠ CAUTION

- When removing with a flat-tip screwdriver or remover, wrap protective tape around the tools to prevent damage to components.
- When removing the interior trim pieces, use a plastic panel removal tool not to damage the surface.
- Be careful to store and handle the trim when removing/installing because lubricant and oil can leave a stain on the trim.

Front Power Window Motor

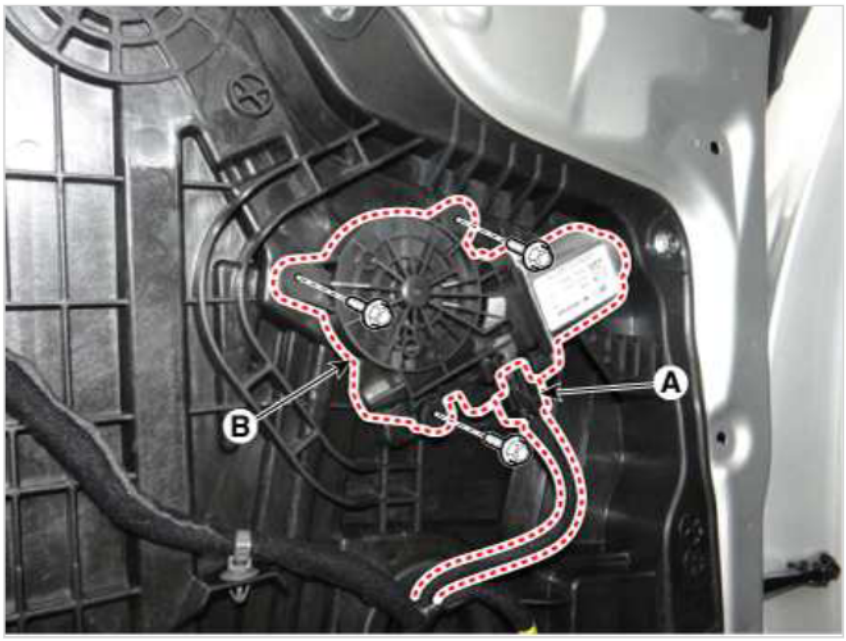
1. Disconnect the negative (-) battery terminal.
2. Remove the front door trim.
   (Refer to Body - "Front Door Trim")
3. Disconnect the front power window motor connector (A).
4. Remove the front power window motor (B) after loosening the mounting bolts.



Rear Power Window Motor

1. Disconnect the negative (-) battery terminal.
2. Remove the rear door trim.
   (Refer to Body - "Rear Door Trim")
3. Disconnect the rear power window motor connector (A).
4. Remove the rear power window motor (B) after loosening the mounting bolts.

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Installation

Front Power Window Motor

1. Install the front power window motor.
2. Connect the front power window motor connector.
3. Install the front door trim.
4. Connect the negative (-) battery terminal.

Rear Power Window Motor

1. Install the rear power window motor.
2. Connect the rear power window motor connector.
3. Install the rear door trim.
4. Connect the negative (-) battery terminal.

Inspection

[Safety Window Motor]

Diagnosis With KDS

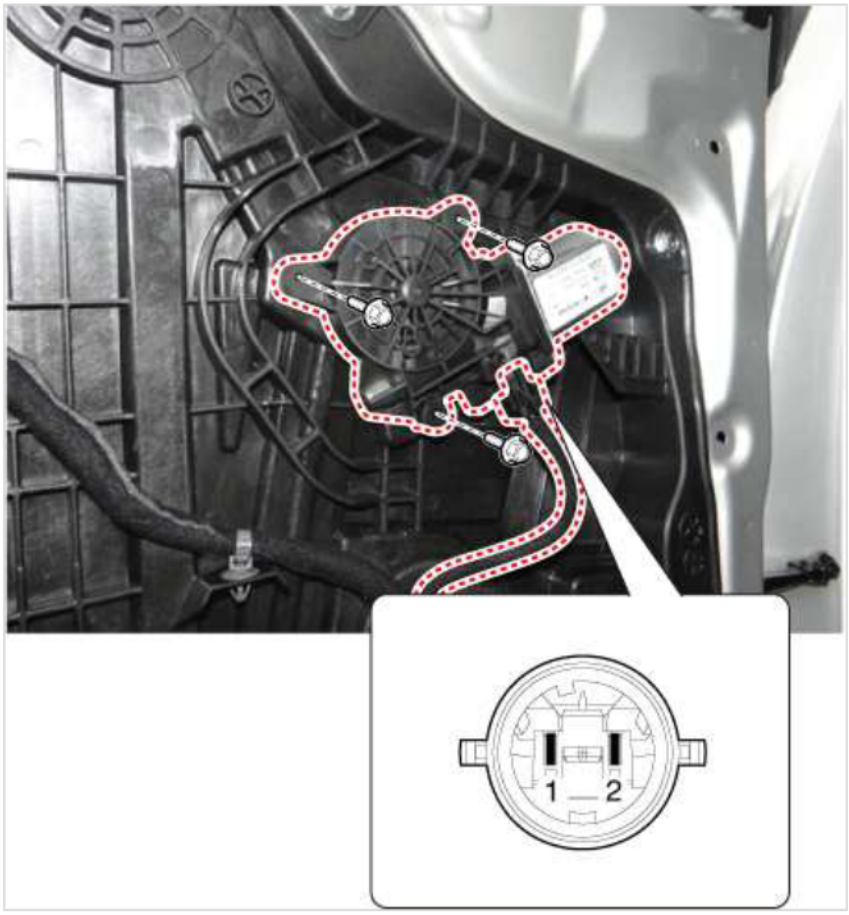
1. In the body electrical system, failure can be quickly diagnosed by using the vehicle diagnostic system (KDS).
   (1) Self diagnosis : Checking failure and code number (DTC)
   (2) Current data : Checking the system input/output data state
   (3) Actuation test : Checking the system operation condition
   (4) Additional function : Controlling other features including system option setting and zero point adjustment
2. Select the "Car model" and the system to be checked in order to check the vehicle with the tester.
3. Select the "Driver seat or Assistant seat door module (DDM/ADM)" to check the driver seat or assistant door module (DDM/ADM).
4. Select the "Current Data" menu to search the current state of the input/output data.
   The input/output data for the sensors corresponding to the driver seat or assistant door module(DDM/ADM) can be checked.
5. To check the power window motor operation by force, select "Actuation test".

[Standard Window Motor]

1. Disconnect the negative (-) battery terminal.
2. Remove the rear door trim.
   (Refer to Body - "Rear Door Trim")

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3. Disconnect the motor connector (A) 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.

Position \ Terminal			1	2
Left	Up	Clockwise	⊕	⊖
	Down	Counter-clockwise	⊖	⊕
Right	Up	Counter-clockwise	⊕	⊖
	Down	Clockwise	⊖	⊕

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Inspection

Diagnosis With KDS

1. The body electrical system can be quickly diagnosed for failed parts by using vehicle diagnostic system (KDS).
   The diagnostic system (KDS) provides the following information.
   (1) Self diagnosis : Checks and displays the failure code (DTC)
   (2) Current data : Checks the system input/output data state
   (3) Actuation test : Checks the system operating condition
   (4) Additional function : Other controls such as the system option and zero point
2. Select the "Car model" and the system to be checked in order to check the vehicle with the tester.
3. Select the "Driver seat or Assistant seat door module (DDM/ADM)" to check the driver seat or assistant door module (DDM/ADM).
4. Select the "Current Data" menu to search the current state of the input/output data.
   The input/output data for the sensors corresponding to the driver seat or assistant door module(DDM/ADM) can be checked.
5. If you will check the power door lock operation forcefully, select "Actuation test".

Removal

Driver Power Window Switch

⚠ CAUTION

- When removing with a flat-tip screwdriver or remover, wrap protective tape around the tools to prevent damage to components.
- When removing the interior trim pieces, use a plastic panel removal tool not to damage the surface.
- Be careful to store and handle the trim when removing/installing because lubricant and oil can leave a stain on the trim.

1. Disconnect the negative (-) battery terminal.
2. Remove the driver front door trim.
   (Refer to Body - "Front Door Trim")
3. Disconnect the power window switch connector (A).



4. Remove the power window switch (A) after loosening the mounting screws.

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Assist Power Window Switch

⚠ CAUTION

- When removing with a flat-tip screwdriver or remover, wrap protective tape around the tools to prevent damage to components.
- When removing the interior trim pieces, use a plastic panel removal tool not to damage the surface.
- Be careful to store and handle the trim when removing/installing because lubricant and oil can leave a stain on the trim.

1. Disconnect the negative (-) battery terminal.
2. Remove the assist front door trim.
   (Refer to Body - "Front Door Trim")
3. Disconnect the power window switch connector (A).

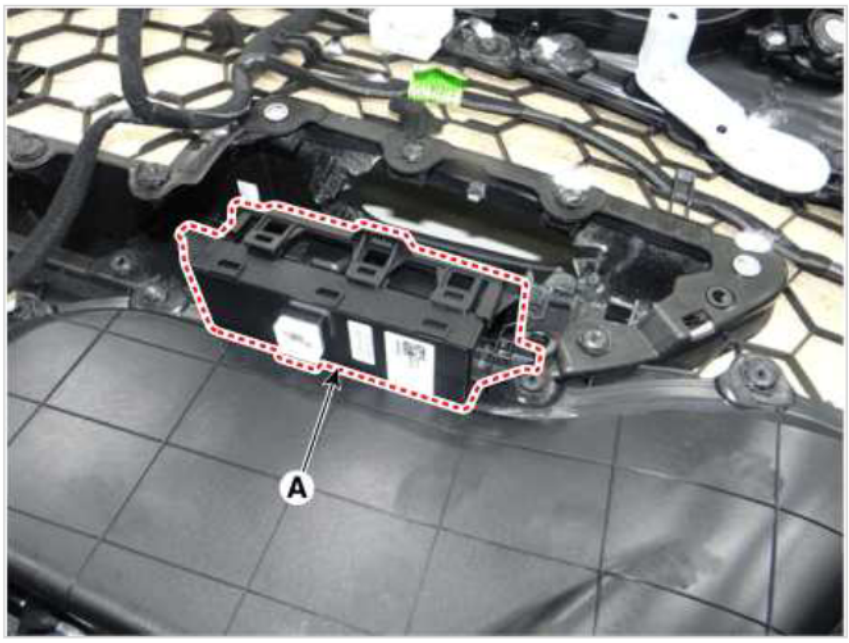
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4. Remove the power window switch (A) after loosening the mounting screws.



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Rear Power Window Switch

⚠ CAUTION

- When removing with a flat-tip screwdriver or remover, wrap protective tape around the tools to prevent damage to components.
- When removing the interior trim pieces, use a plastic panel removal tool not to damage the surface.
- Be careful to store and handle the trim when removing/installing because lubricant and oil can leave a stain on the trim.

1. Disconnect the negative (-) battery terminal.
2. Remove the rear door trim.
   (Refer to Body - "Rear Door Trim")
3. Disconnect the power window switch connector (A).



4. Remove the power window switch (A) after loosening the mounting screws.

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Installation

Driver Power Window Switch

1. Install the power window switch.
2. Connect the power window switch connector.
3. Install the driver front door trim after connecting the connector.
4. Connect the negative (-) battery terminal.

Assist Power Window Switch

1. Install the power window switch.
2. Connect the power window switch connector.
3. Install the assist front door trim after connecting the connector.
4. Connect the negative (-) battery terminal.

Rear Power Window Switch

1. Install the power window switch.

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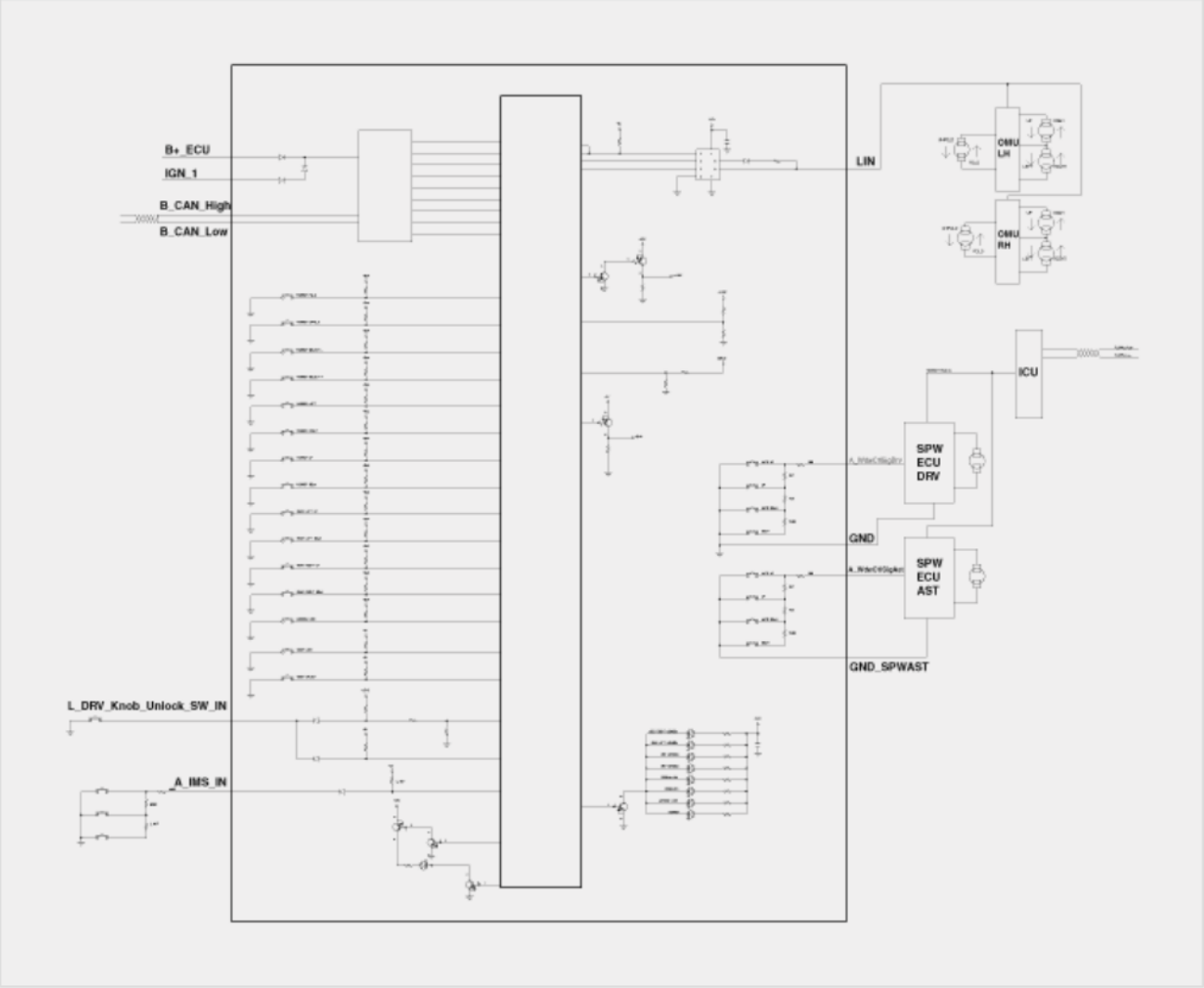
2. Connect the power window switch connector.
3. Install the rear door trim after connecting the connector.
4. Connect the negative (-) battery terminal.

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Circuit Diagram

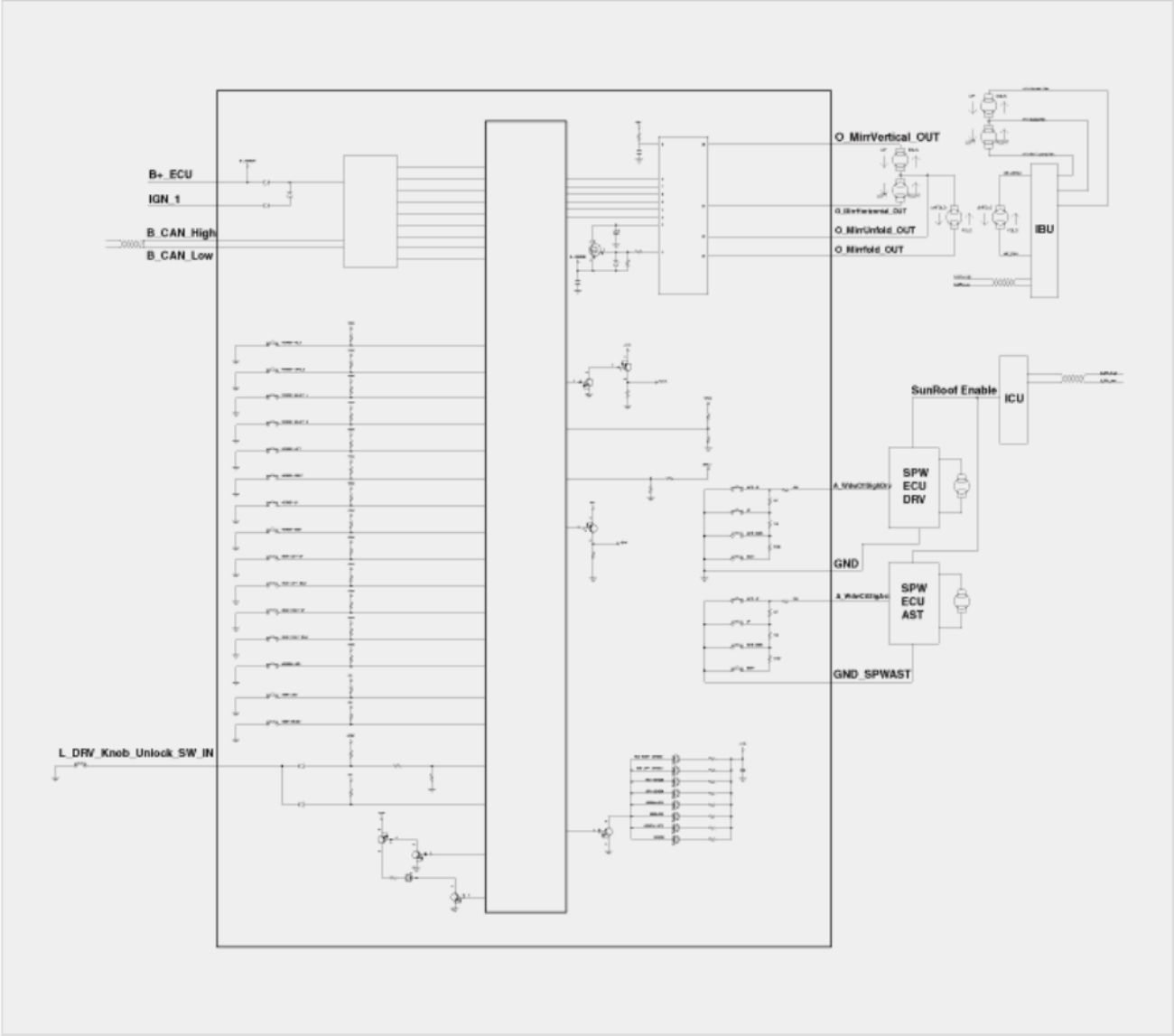
Driver Power Window Switch

[Front Safety + IMS Type]



[Front Safety + Non-IMS Type]

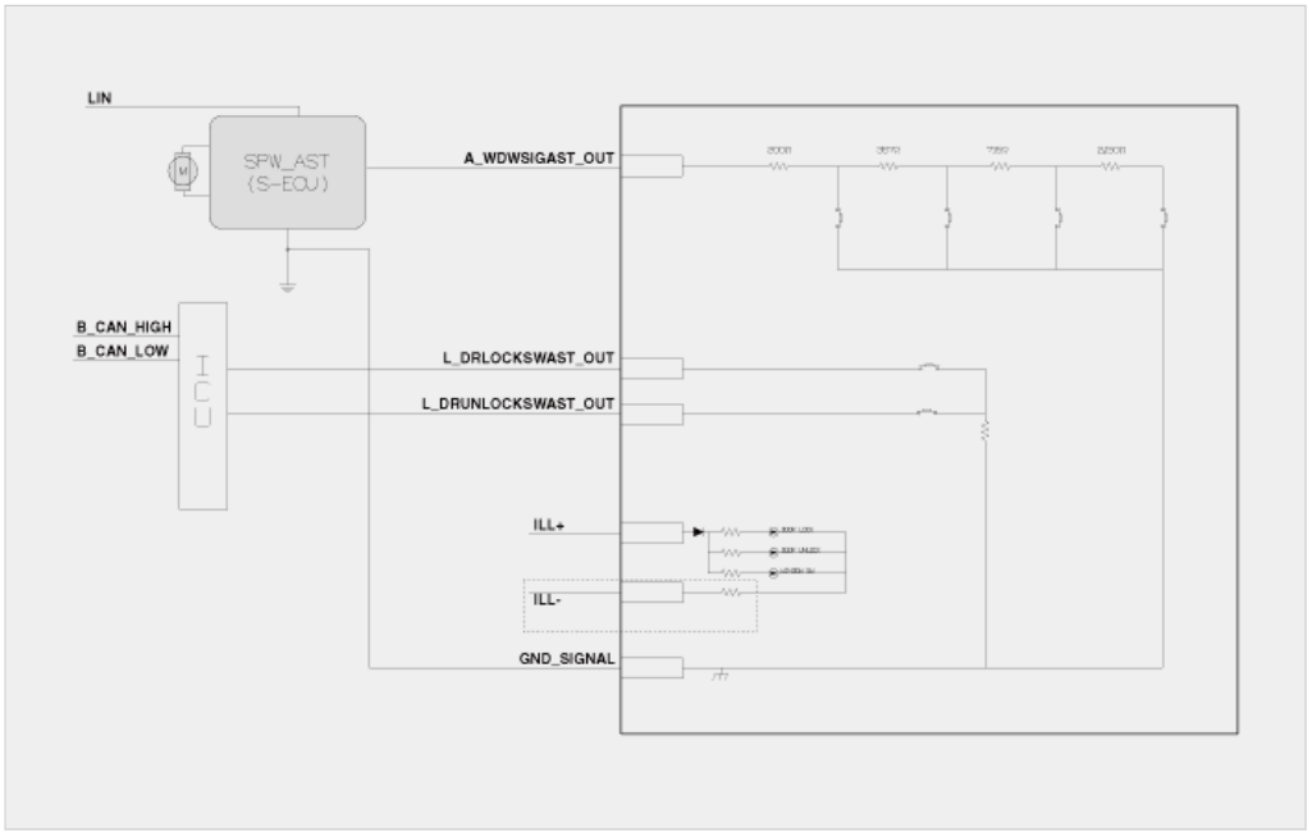
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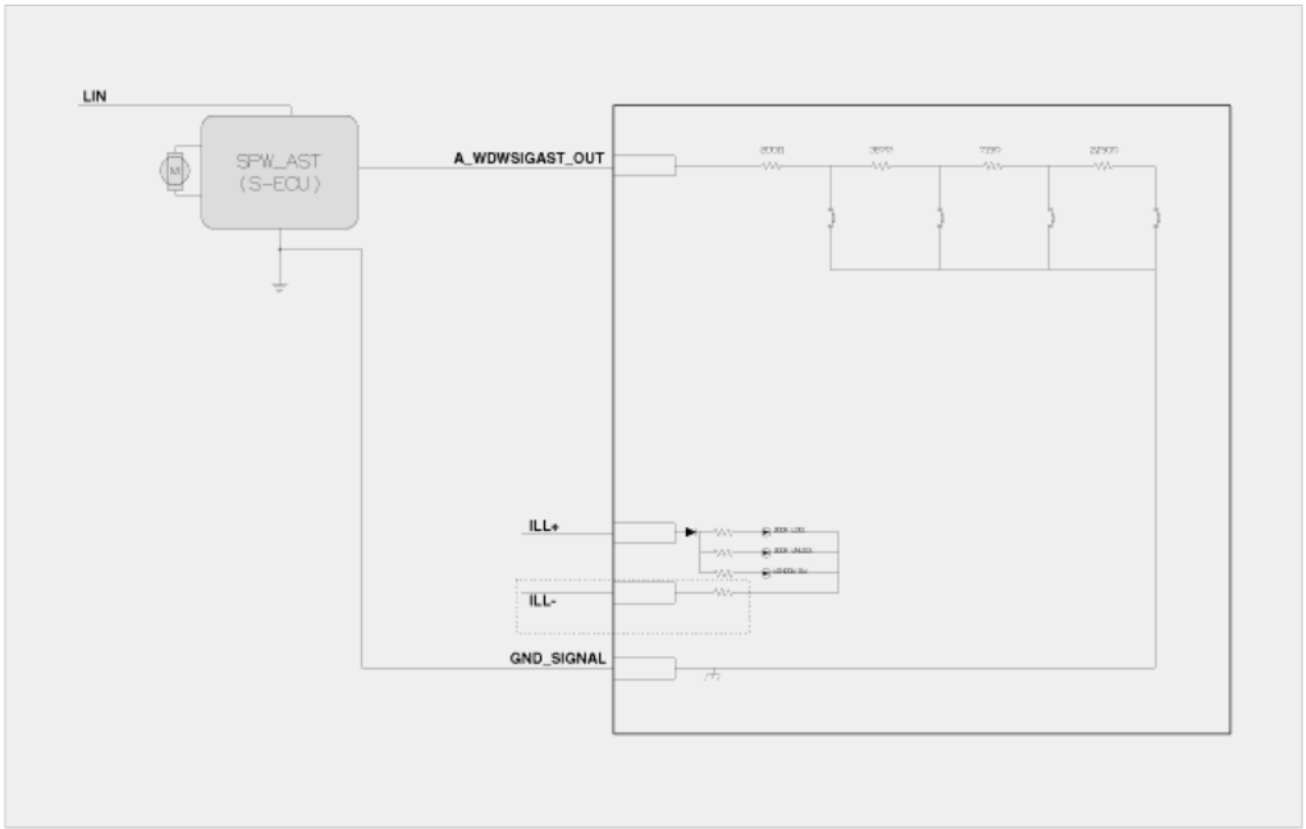
Assist Power Window Switch

[Door Lock Type]

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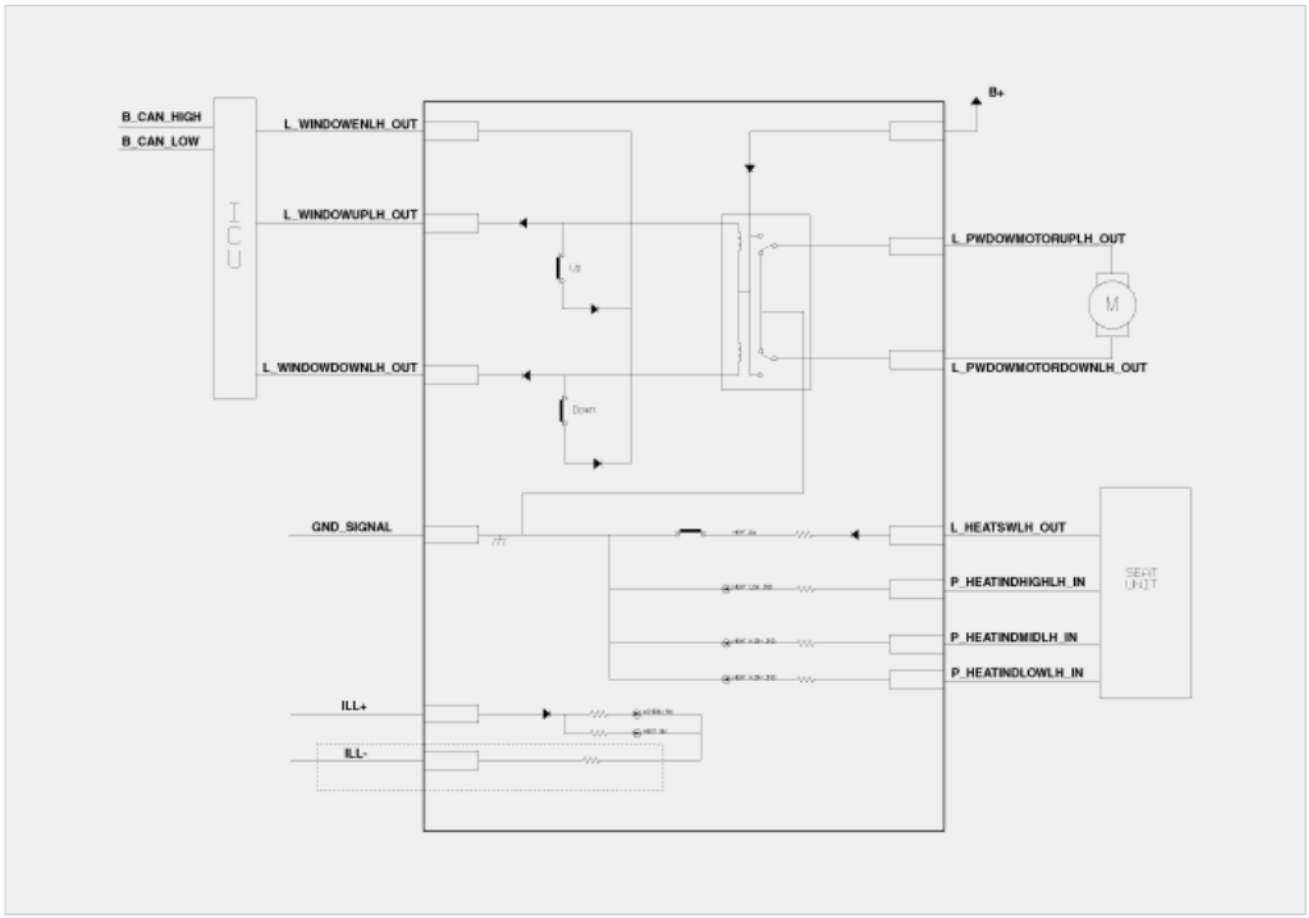
[Non-Door Lock Type]



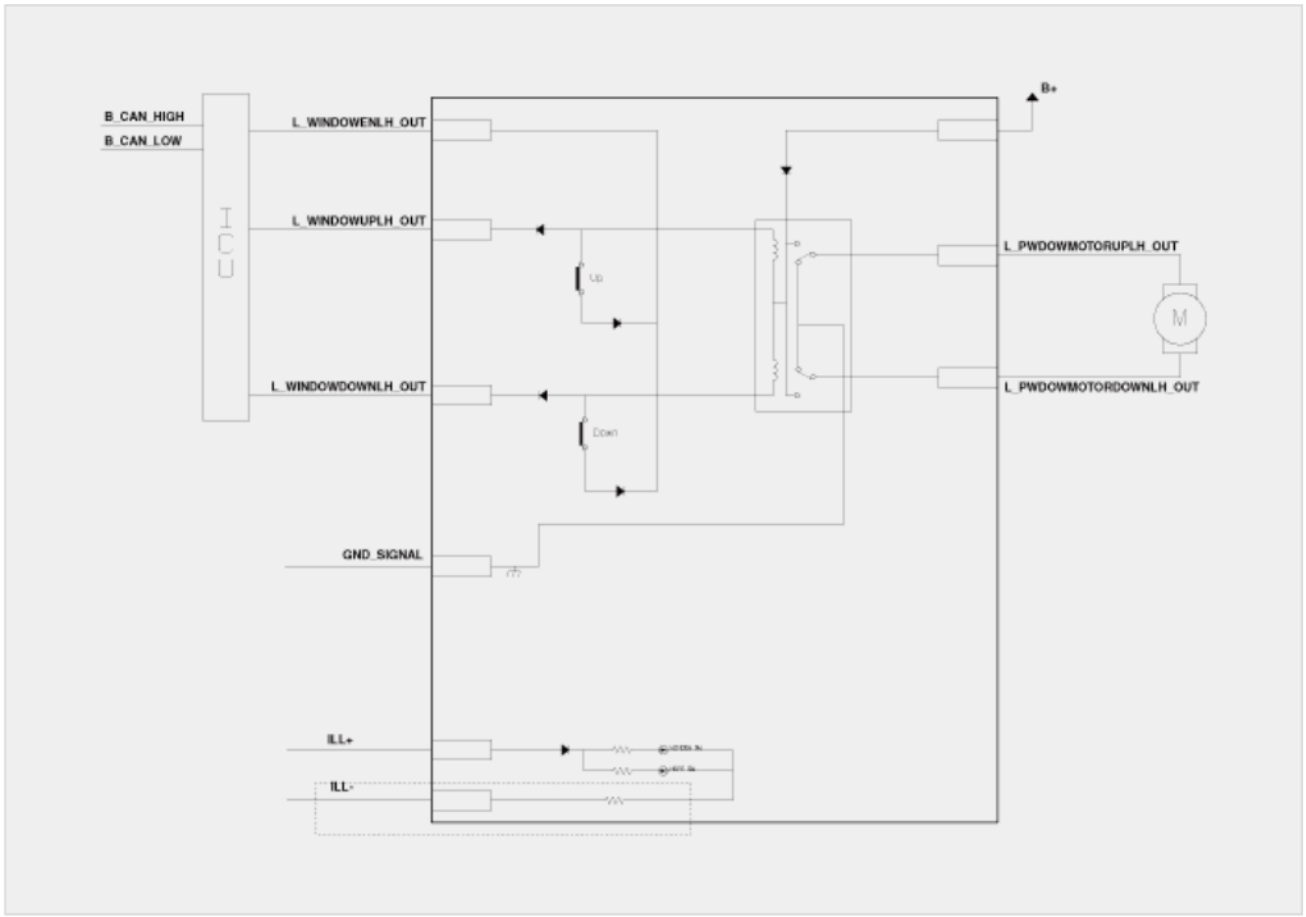
Rear Power Window Switch

[Seat Warmer Type]

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[Non-Seat Warmer Type]



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Component Location



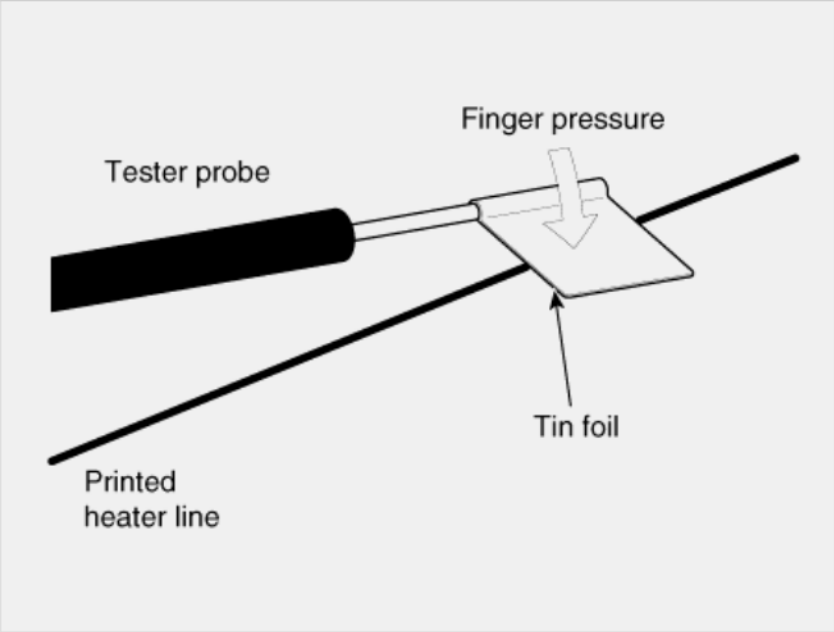
1. Integrated body control unit (IBU)
2. Rear glass defogger
3. Rear glass defogger switch

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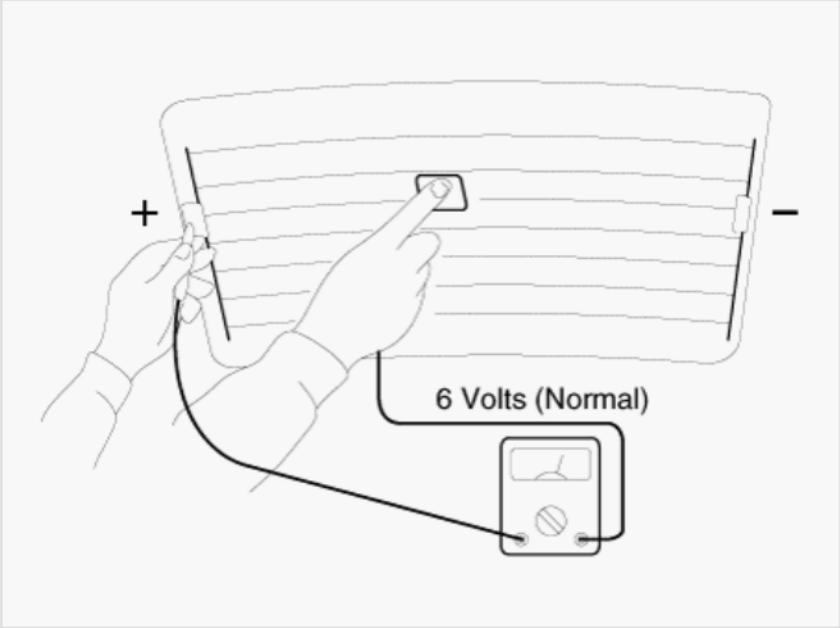
Inspection

⚠ CAUTION

- Wrap tin foil around the end of the voltmeter test lead to prevent damaging the heater line. Apply pressure on the tin foil with hand and move the tin foil along the grid line to check for open circuits.

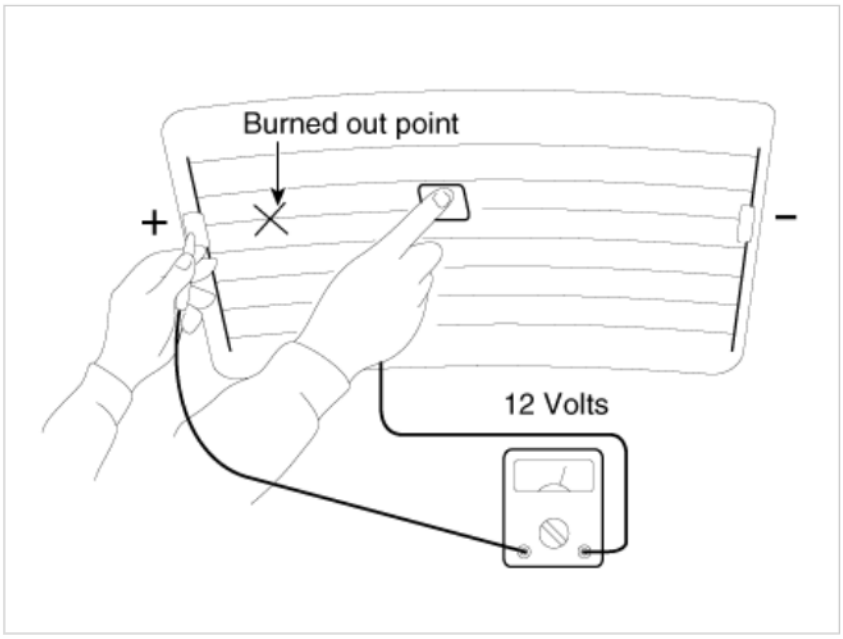


1. Turn on the defogger switch and use a voltmeter to measure the voltage of each heater line in the central part of the glass. If the voltmeter indicates 6V for a conductive line, the line of the rear window is considered to be in good condition.

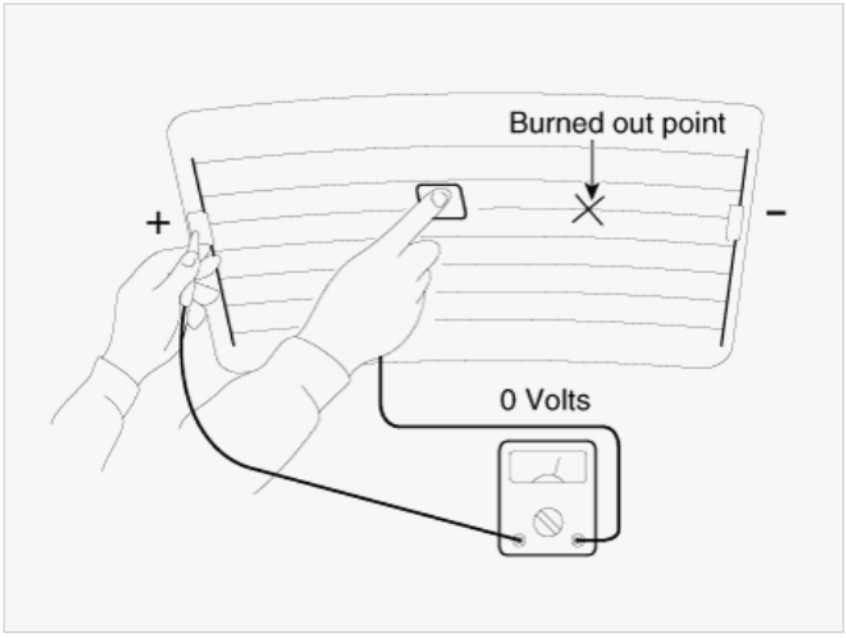


2. If a conductive line is burned out within the area between the central part and (+) terminal, the voltmeter will indicate12V.

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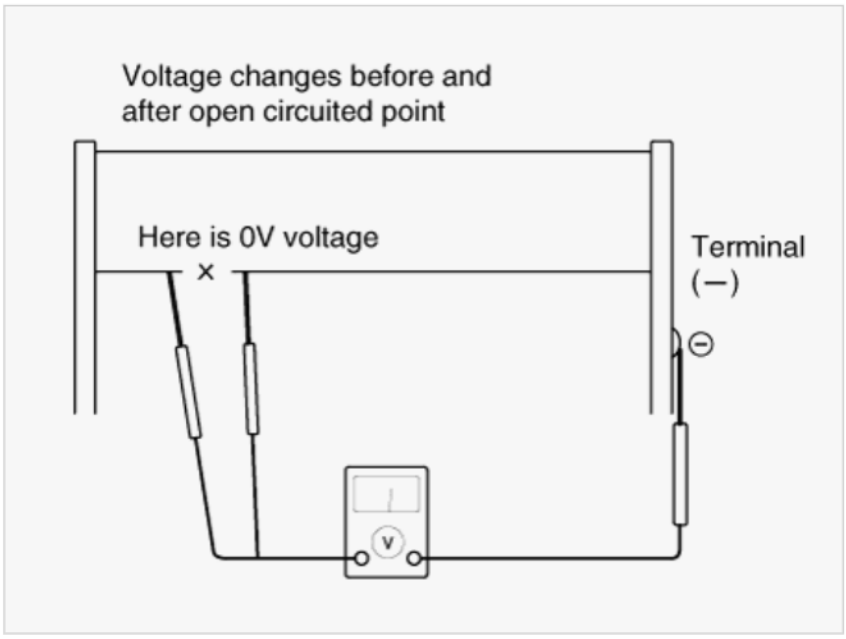


3. If a conductive line is burned out within the area between the central part and (-) terminal, the voltmeter will indicate 0V.

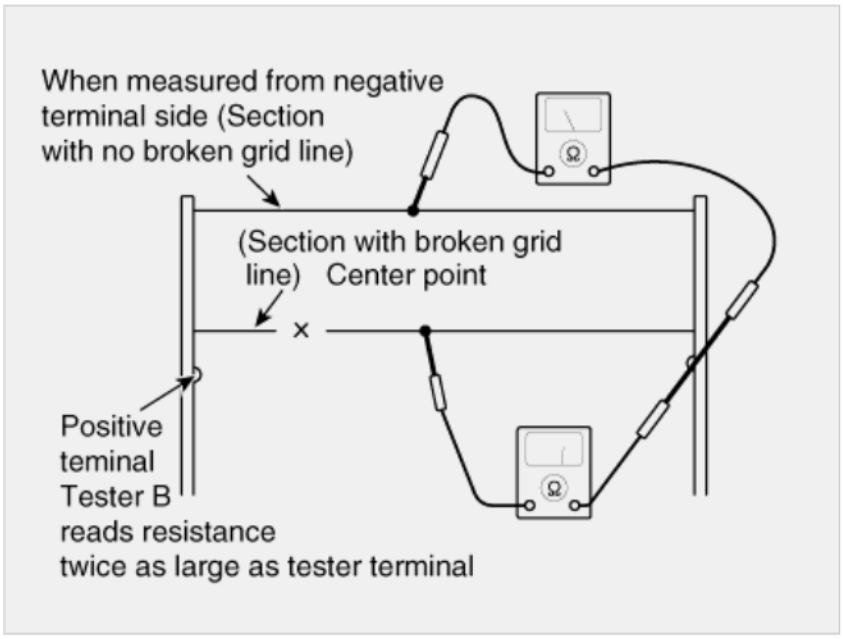


4. To check for open circuits, Slowly move the test lead toward the section where open circuits seem to exist. Try to find a point where the voltage turns to 0V. The point where the voltage has changed is the open-circuit point.

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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 that in other sections. In the affected section, move the test lead to a position where the resistance sharply changes.

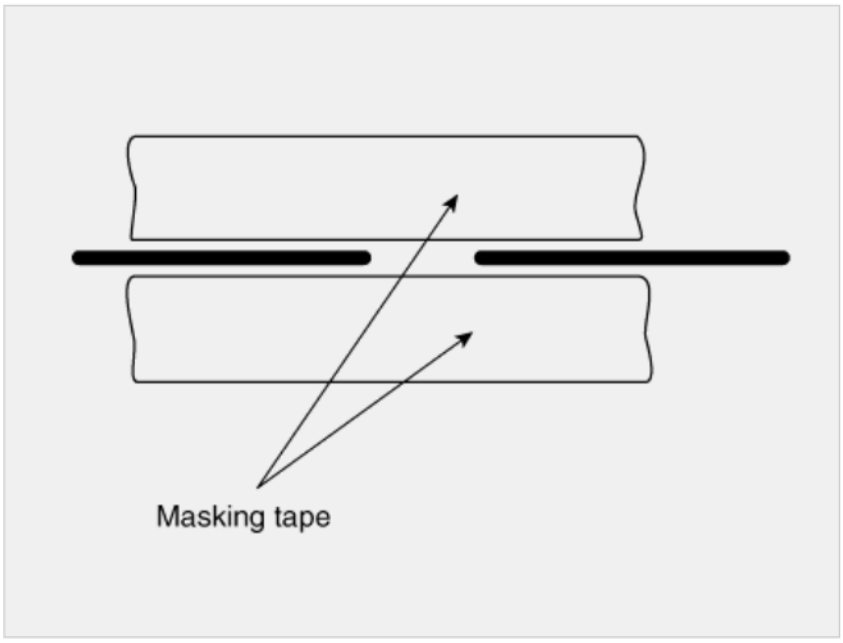


Repair Of Broken Heater Line

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 paint with a knife after the paint has completely dried. (Allow 24 hours).

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Inspection

1. In the body electrical system, failure can be quickly diagnosed by using the vehicle diagnostic system (KDS).
   The diagnostic system (KDS) provides the following information.
   (1) Self diagnosis : Checking failure and code number (DTC)
   (2) Current data : Checking the system input/output data state
   (3) Actuation test : Checking the system operation condition
   (4) Additional function : Controlling other features including system option setting and zero point adjustment
2. Select the "Car model" and the "Integrated body control unit (IBU)" to be checked in order to check the vehicle with the tester.
3. Select the "Current Data" menu to search the current state of the input/output data.
4. To forcibly actuate the input value of the module to be checked, select option "Actuation Test"

Removal

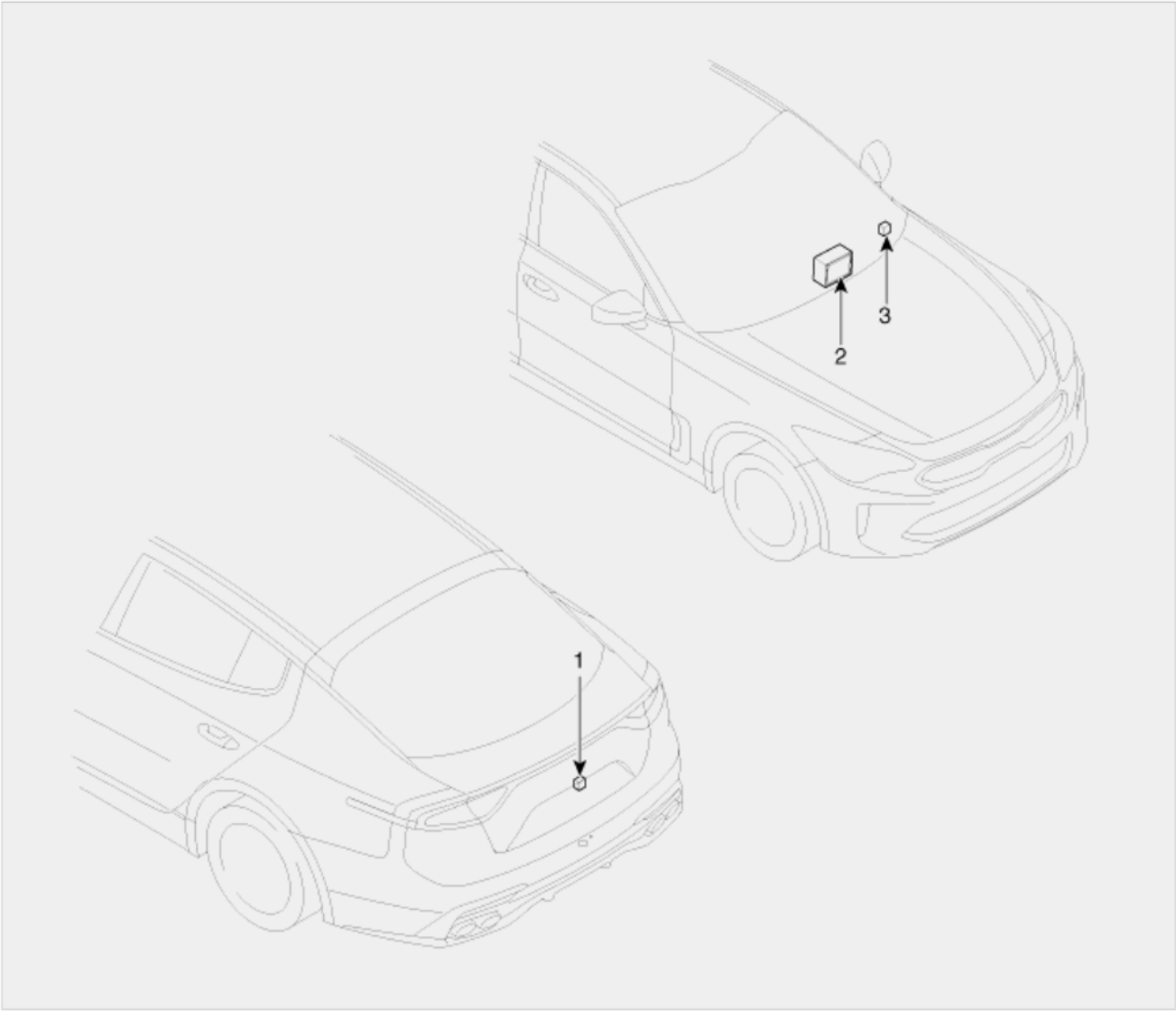
1. Disconnect the negative (-) battery terminal.
2. Remove the heater and A/C controll unit.
   (Refer to Heating, Ventilation, Air conditioning - "Heater & A/C Control Unit")

Installation

1. Install the heater and A/C control unit.
2. Connect the negative (-) battery terminal.

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Component Location



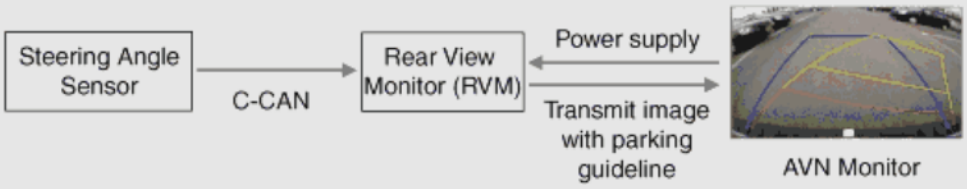
1. Rear view monitor (RVM)
2. AVN Monitor
3. Steering angle sensor

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Description

1. To display back of the vehicle to assist the driver, it receives vehicle rearside image signal from the rear view monitor and displays it on AVN monitor or LHS of inside rearview mirror.
2. Rear view monitor is a supplementary device that displays dead zone on monitor screen that automatically operates when the gear stays in "R" for over 3 seconds.
3. It displays the estimated trajectory with parking guideline in accordance with the operating angle of steering wheel. (There is no separate unit.)

System Structure (Rear view monitor operated by steering)



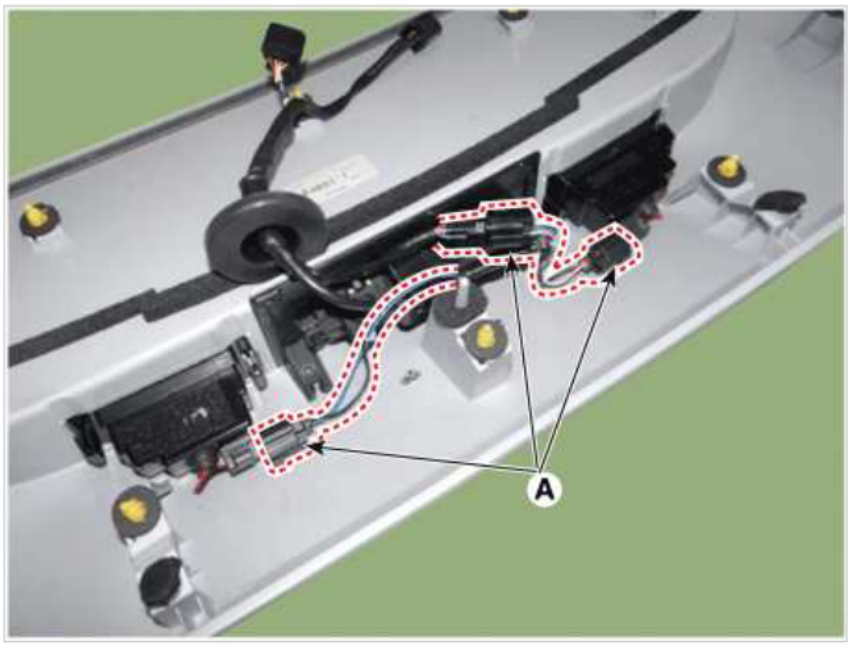
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Removal

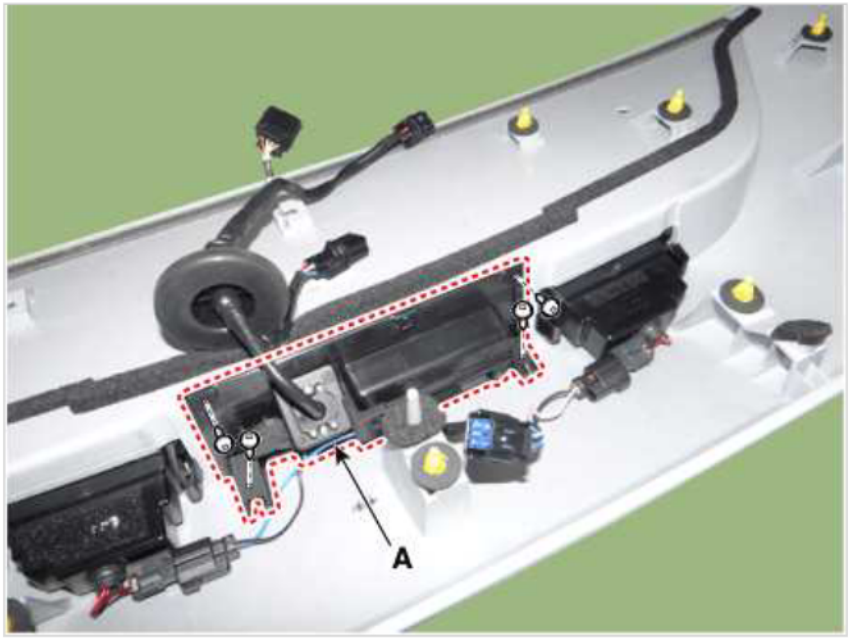
Information

In case of bad quality or poor focus, be sure to check the camera lense surface condition and foreign materials.

1. Disconnect the negative (-) battery terminal.
2. Remove the liftgate back panel.
   (Refer to Body - "Liftgate Back Panel")
3. Disconnect the license lamp connectors (A).

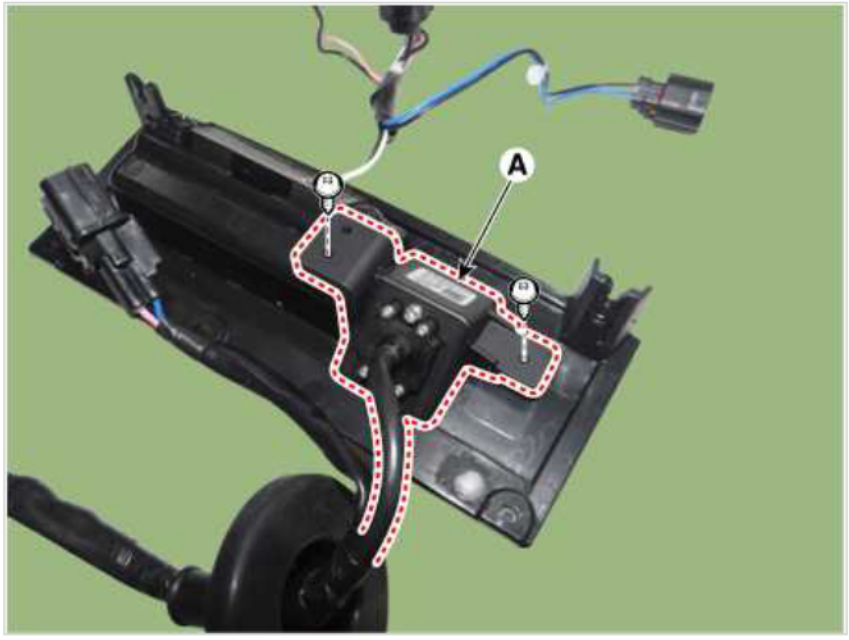


4. Remove the liftgate outside handle assembly (A) after loosening the mounting screws.



5. Remove the rear view camera (A) after loosening the mounting screws.

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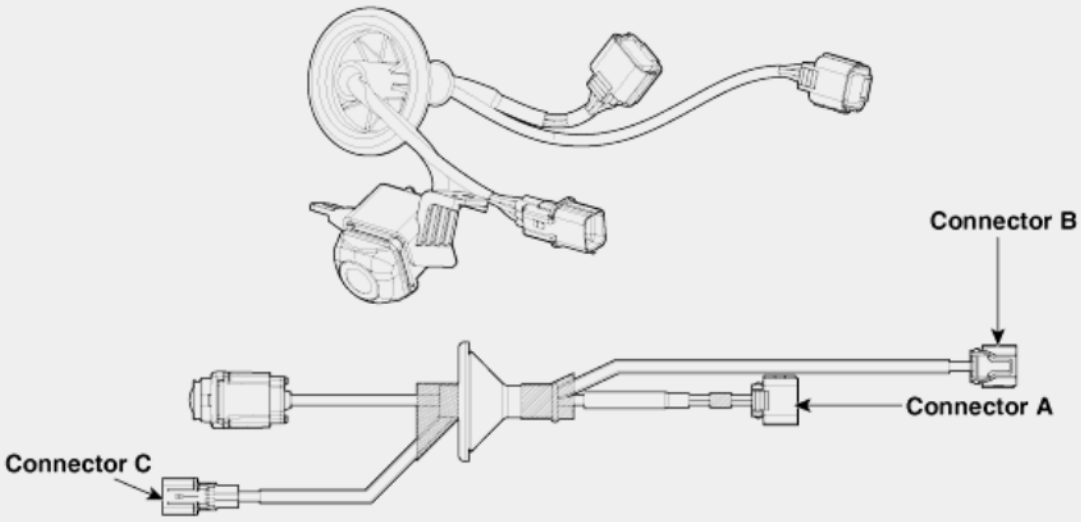


Installation

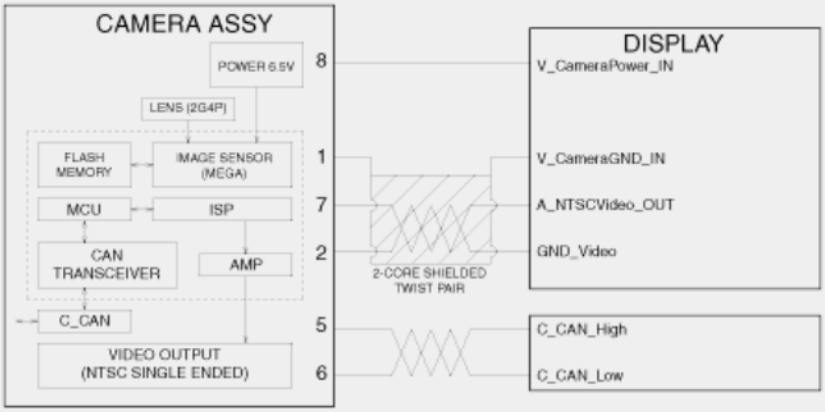
1. Install the rear view camera.
2. Install the liftgate outside handle assembly.
3. Connect the license lamp connectors.
4. Install the liftgate back panel.
5. Connect the negative (-) battery terminal.

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Circuit Diagram



Connector A		Connector B	Connector C
			
No.	**Description**	**Description**	**Description**
1	Camera ground	Left license lamp (+)	Left license lamp (+)
2	Camera video (-)	-	-
3	-	Outside handle (+)	Outside handle (+)
4	-	Right license lamp (+)	Right license lamp (+)
5	C-CAN (High)	License lamp earth (-)	License lamp earth (-)
6	C-CAN (Low)	Door earth (-)	Door earth (-)
7	Camera video (+)		
8	Camera power		



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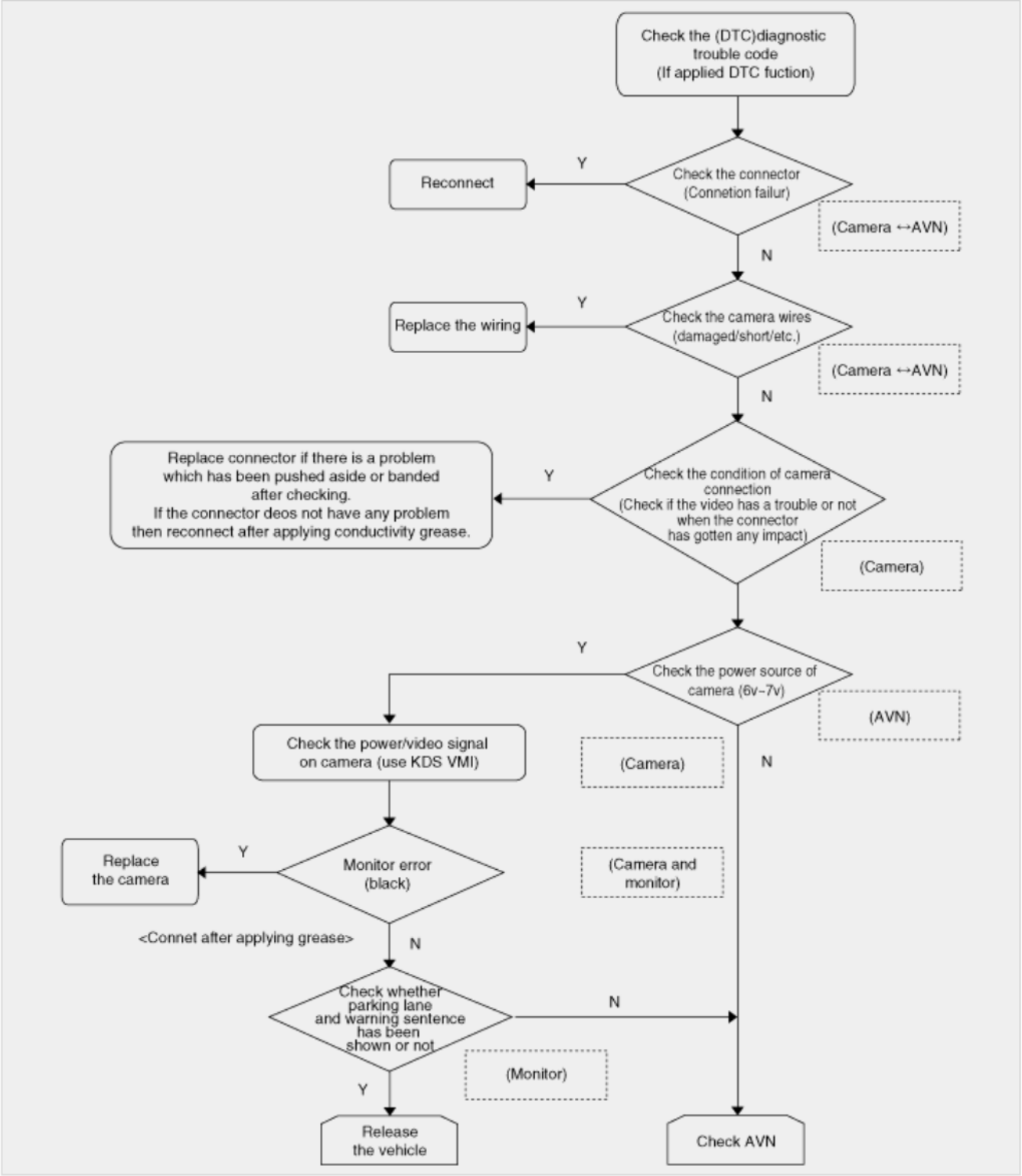
Troubleshooting

Diagnosis procedure of each symptom

No.	Symptom	Repairment
1	AVN monitor turns to black/blue	R-1, R-2, R-3
	Parking guide line and notification word have not shown	
2	Vehicle has been slanted/leaned during parking	R-4, R-5
	Trouble on the shown angle	
	Difference of right/left bumper visible sight	
	Parking guidence line has been leaned (left/right deviation happened)	
	Vehicle has been slanted during parking	
3	Inflow of water in lens	R-6
	Blurred video	
	Damaged of lens coating	
	Showed red colored video	

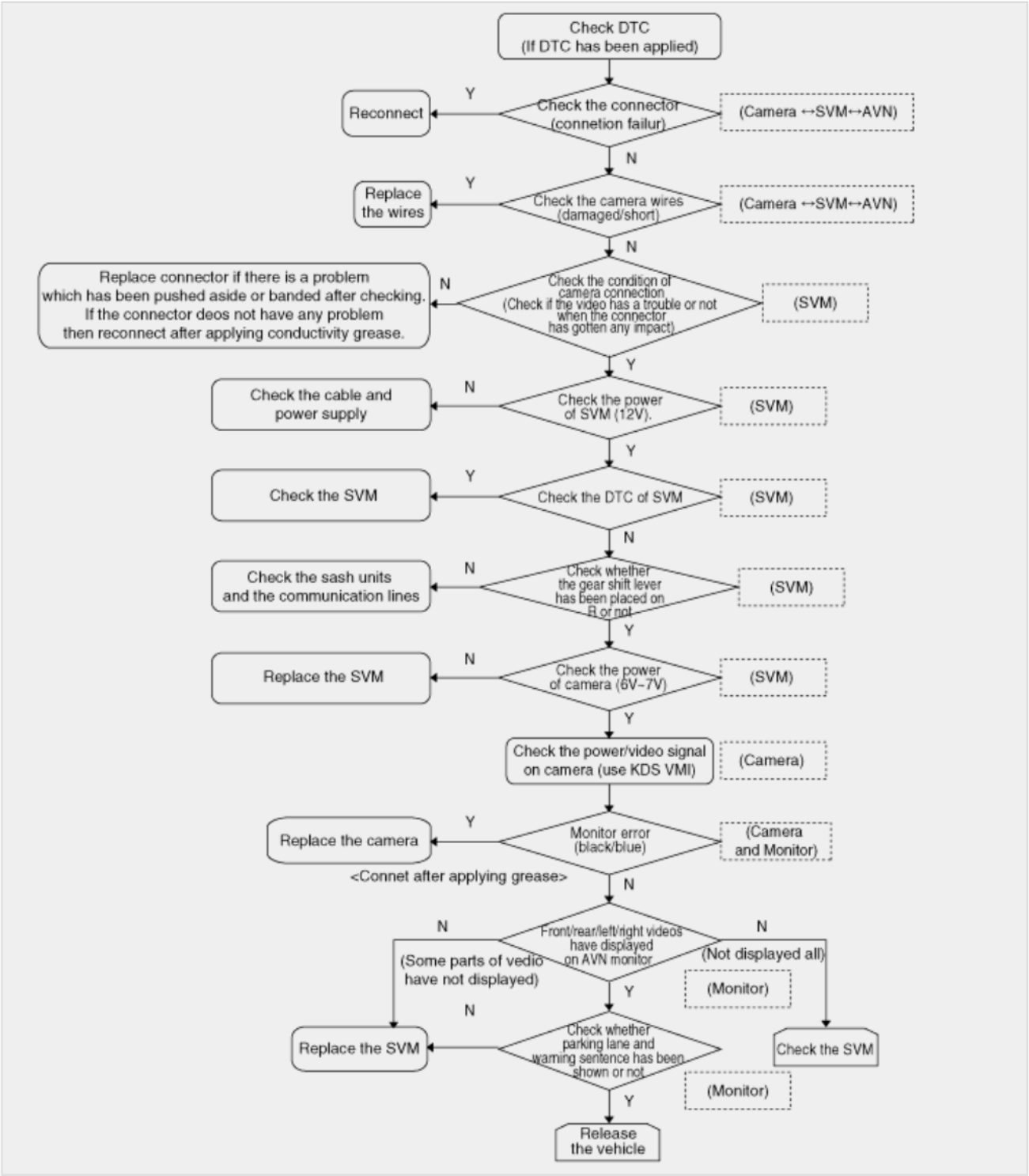
R-1. Inspect in following order when black screen has been occurred(camera - AVN direct connection specification)

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R-2. Inspect in following order when the screen turns to black/blue (camera - PGS/SVM - AVN specification)

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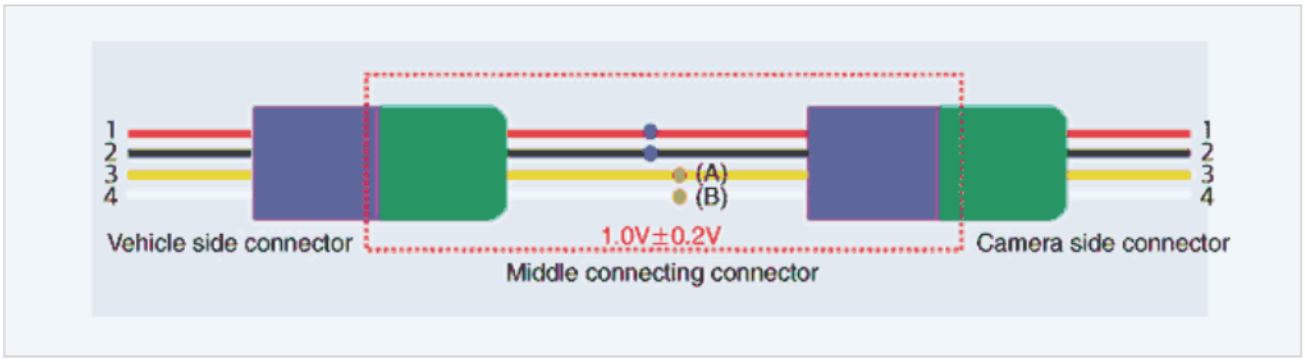


R-3. Check the camera

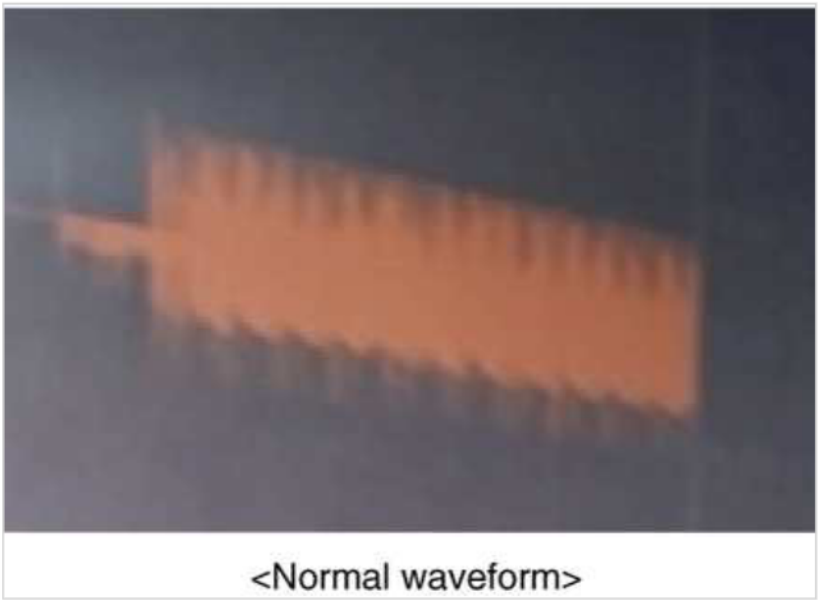
Connector	No.	Option	Description	Color
	1	Standard (4pins)	Power of camera supply (+)	Red
	2		Power of camera grounding (-)	Black
	3		Video display output (+)	Yellow
	4		Video display grounding (-)	White
	5	Steering (6pins)	C_CAN HIGH	Orange
	6		C_CAN LOW	Gray

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1. Measure the vedio display waveform and output voltage of rear camera (using KDS VMI).
   Connect connector 3 - connector 4.

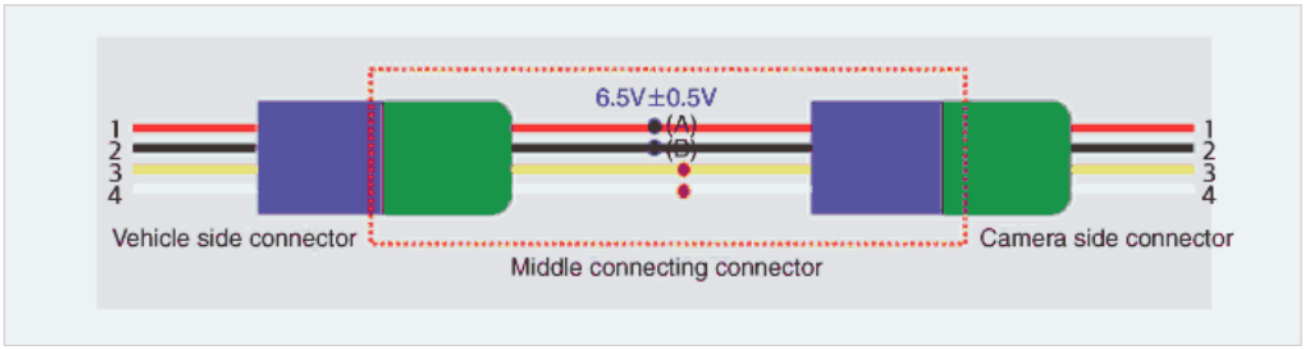


– Spec : 0.8V ~ 1.2V



<Normal waveform>

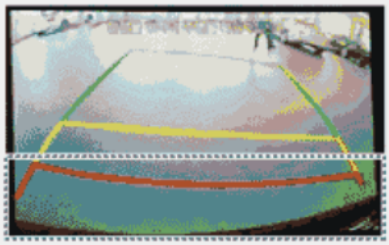
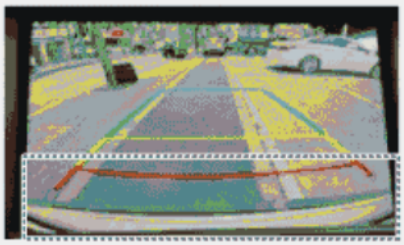
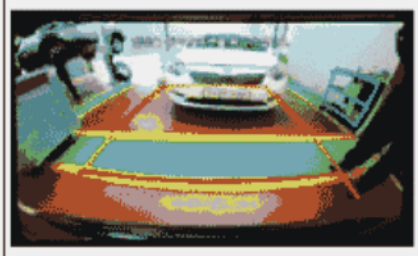
2. Measure the output voltage of rear camera power source.
   Connect connector1-connector2.



– Spec : 6.0V ~ 7.0V

R-4. Check the symptom related to place of camera installation

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Install the camera on left side	Install the camera on left side of tail gate switch in center	Install the camera on the center
		
		
Visible camera angle and parking line have been slanted	Difference on amount of visiable bumper and length of parking line	equal amount of visiable left/right side
Normal	Normal	Normal

R-5. Slanted/leaned during parking

1. Check the condition of installing camera.

OK	Camera has been operating normally.
NG	Check number 2.

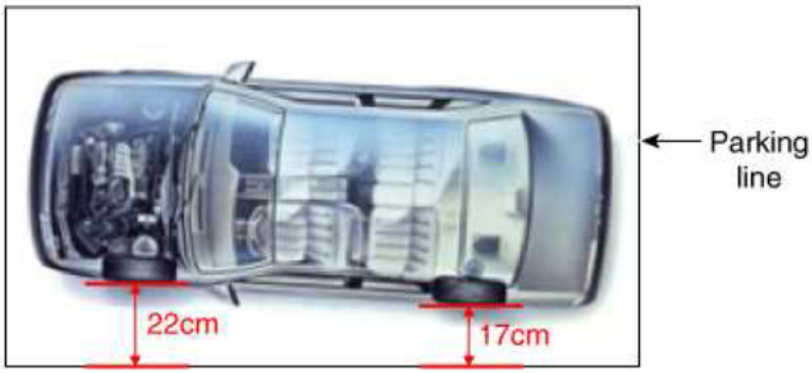
2. Measure the deviation of slanted/leaned druing parking.
   - SPEC : ± 10㎝ (Front Wheel-Rear Wheel)

OK	Camera is operating normally.
NG	Replace the camera.

Information

- Check the different distance between front/rear wheel and parking line.

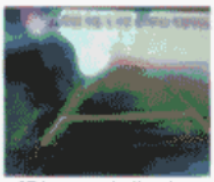
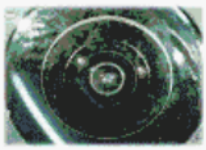
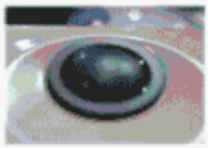
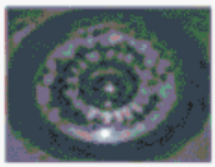
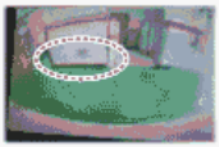
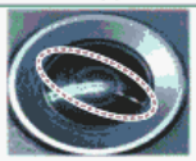
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It is normal range that front wheel/ rear wheel have been slanted in 5cm.

• Being slanted and leaned can be happened depending on driver.

R-6. Check monitor quality

Symptom	Cause		
	Something on the lens	Damaged lens	Airtightness failure
 [Blur and display quality trouble]	 [Exterior stain]	 [Lens coating peeled] Clean with strongly acid cleaner	 [Inflow of water in lens]
 [Any object or line on monitor]		 [Lens crack] Impacted by pebble and etc. during driving	 [Crack and inflow of water]
Countermeasure	· Clean the exterior of lens ; Clean the exterior of lens with water or clean cloth (fabric)	· Replace camera	· Replace camera

⚠ CAUTION

- Check the vehicle has installed genuine camera because the monitor output quality could be bad or have functioning problem if the vehicle has installed customizing camera.
- Not available to use warranty repair on replacement of camera caused by careless using(cleaned with unathuorized cleaner and damaged from foreign object) or installing customized goods.

Information

- Must use water or clean cloth to clean the exterior of camera lens.
- Check whether the same problem has been occurred or not after checking the condition on surface of camera lens and get rid of foreign object

– The phenomenon that the camera lens coating has peeled out can be happened If the vehicle has cleaned with strong acidity cleaner.

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– The phenomenon that the camera lens crack can be happened if the vehicle has gotten damaged from foreign object such as pebble.

Information

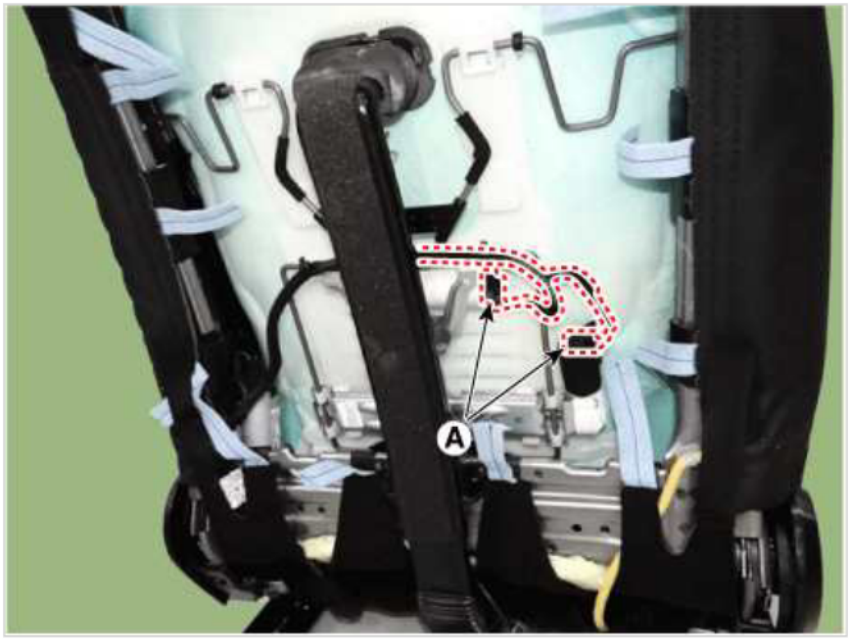
• Red light has been displayed caused of applying rear tail lamp luminous surface led design.

– It can be happened because of the red light that comes out of rear tail lamp and break light flows into rear camera in sealed space at night.

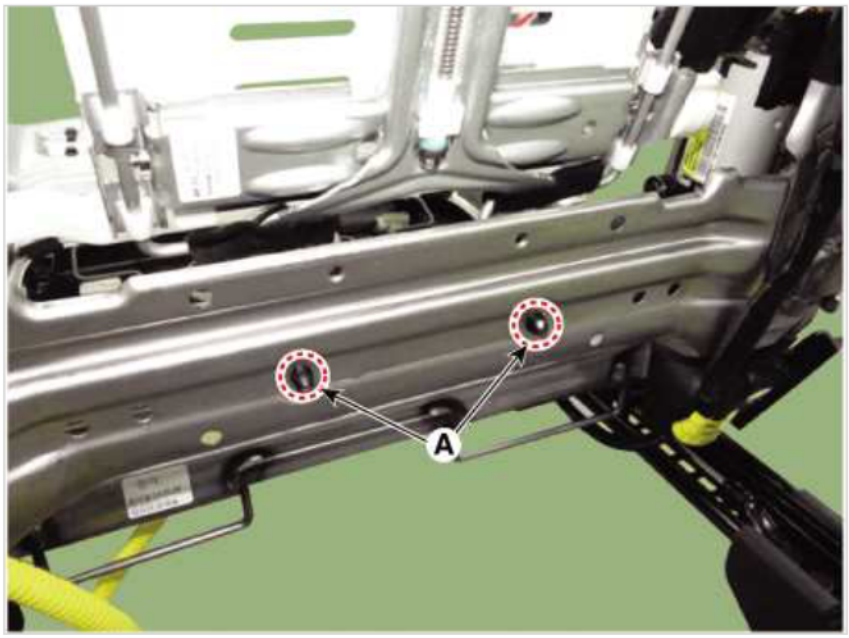
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Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the front seat back cover.
   (Refer to Body - "Front Seat Back Cover")
3. Disconnect the lumbar support motor connectors (A).

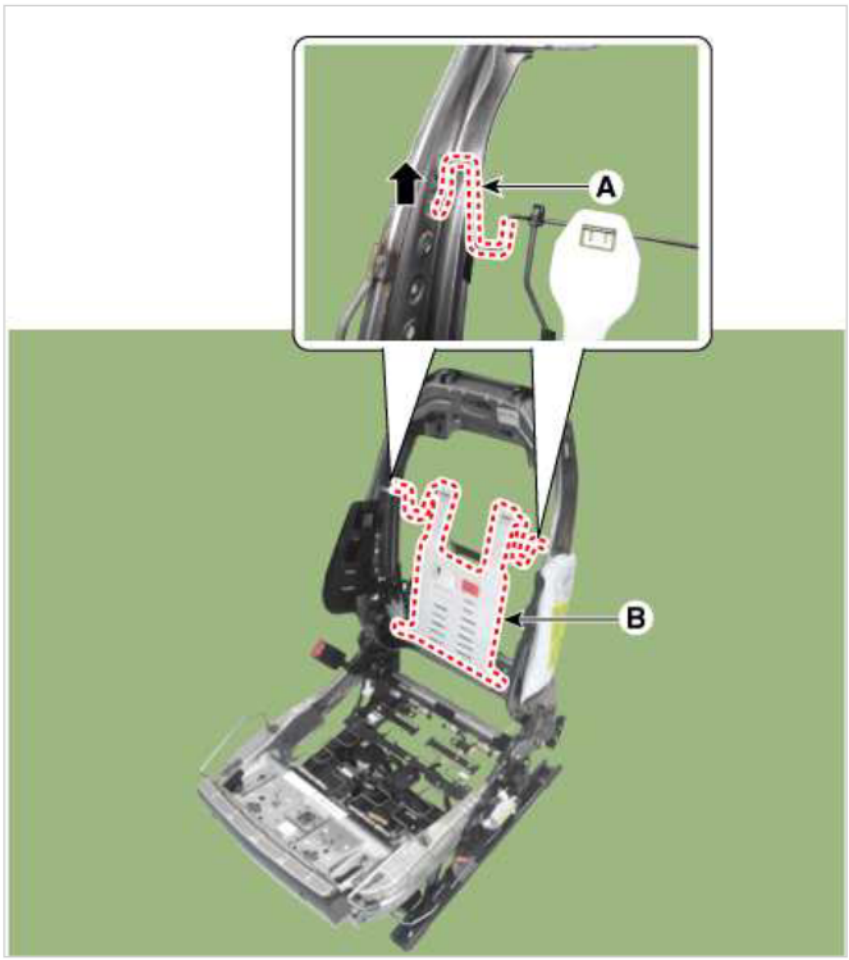


4. Separate the retaining clips (A) from the seat frame.



5. Remove the lumbar support assembly (B) after disengaging mounting clip (A).

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Installation

1. Install the lumbar support assembly.
2. Install the front seat back cover.
3. Install the front seat assembly.

> **CAUTION**
> - Make sure that the connectors are plugged in properly.
> - Check the lumbar support system.

Inspection

Lumbar Support Motor

1. Disconnect the connectors for motor.

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2. When the battery power is supplied to the motor connector, check the motor for smooth operation.
3. Reverse the connections and check that the motor turns in reverse.
4. If the motor runs abnormally, replace it.

Position \ Terminal		1	2	3	4	5
Lumber support motor (Up/Down)	Up		⊖		⊕	
	Down		⊕		⊖	
Lumber support motor (Forward/Backward)	Forward		⊖		⊕	
	Back-ward		⊕		⊖	

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Inspection

Diagnosis With KDS

1. The body electrical system can be quickly diagnosed for failed parts by using the vehicle diagnostic system (KDS).
   The diagnostic system (KDS) provides the following information.
   (1) Self diagnosis : Checks and displays the failure code (DTC).
   (2) Current data : Checks the system input/output data state.
   (3) Actuator test : Checks the system operating condition.
   (4) Additional function : Other controls such as the system option and zero point adjustment.
2. Select the "Car model" and the system to be checked in order to check the vehicle with the tester.
3. Select the "Power seat module (PSM)" to check the power seat module (PSM).
4. Select the "Current data" menu to check the current state of the input/output data.
   The input/output data for the sensors corresponding to the power seat module (PSM) can be checked.

Seat Control Switch

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.



Driver"s Seat / IMS Type

[16Way (EXT + Bolster) Type]

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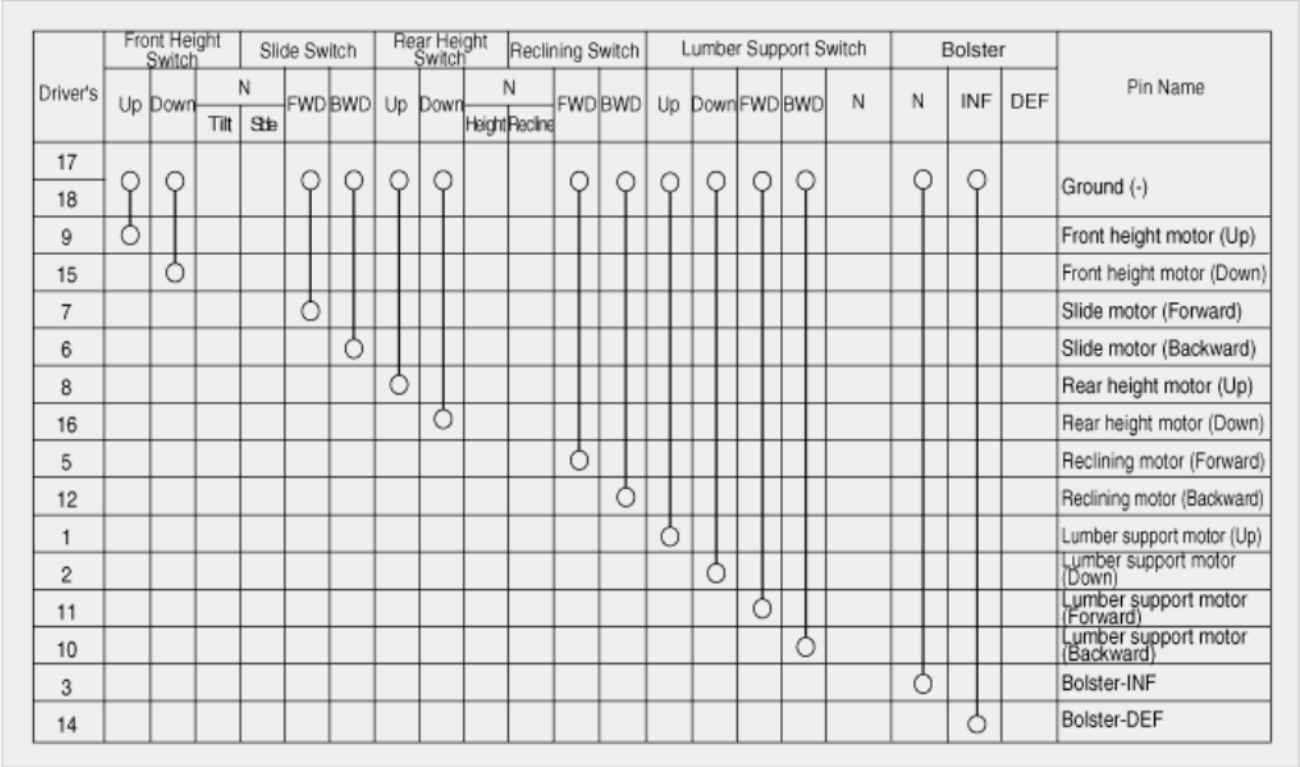
Driver's	Cushion Extension Switch			Front Height Switch				Slide Switch		Rear Height Switch				Reclining Switch		Lumber Support Switch					Bolster			Pin Name
	Up	Down	N	Up	Down	N		FWD	BWD	Up	Down	N		FWD	BWD	Up	Down	FWD	BWD	N	N	INF	DEF	
						Tilt	Side					Height	Recline											
17	○	○		○	○			○	○	○	○			○	○	○	○	○	○			○	○	Ground (-)
18																								
20	○																							Cushion extension motor (Up)
19		○																						Cushion extension motor (Down)
9				○																				Front height motor (Up)
15					○																			Front height motor (Down)
7								○																Slide motor (Forward)
6									○															Slide motor (Backward)
8										○														Rear height motor (Up)
16											○													Rear height motor (Down)
5														○										Reclining motor (Forward)
12															○									Reclining motor (Backward)
1																○								Lumber support motor (Up)
2																	○							Lumber support motor (Down)
11																		○						Lumber support motor (Forward)
10																			○					Lumber support motor (Backward)
3																						○		Bolster - INF
14																							○	Bolster - DEF

[14Way (EXT) Type]

Driver's	Cushion Extension Switch			Front Height Switch				Slide Switch		Rear Height Switch				Reclining Switch		Lumber Support Switch					Pin Name
	Up	Down	N	Up	Down	N		FWD	BWD	Up	Down	N		FWD	BWD	Up	Down	FWD	BWD	N	
						Tilt	Side					Height	Recline								
13																○	○	○	○		Battery (+)
4																					
17	○	○		○	○			○	○	○	○			○	○					○	Ground (-)
18																				○	
20	○																				Cushion extension motor (Up)
19		○																			Cushion extension motor (Down)
9				○																	Front height motor (Up)
15					○																Front height motor (Down)
7								○													Slide motor (Forward)
6									○												Slide motor (Backward)
8										○											Rear height motor (Up)
16											○										Rear height motor (Down)
5														○							Reclining motor (Forward)
12															○						Reclining motor (Backward)
1																○				○	Lumber support motor (Up)
2																	○			○	Lumber support motor (Down)
11																		○		○	Lumber support motor (Forward)
10																			○	○	Lumber support motor (Backward)

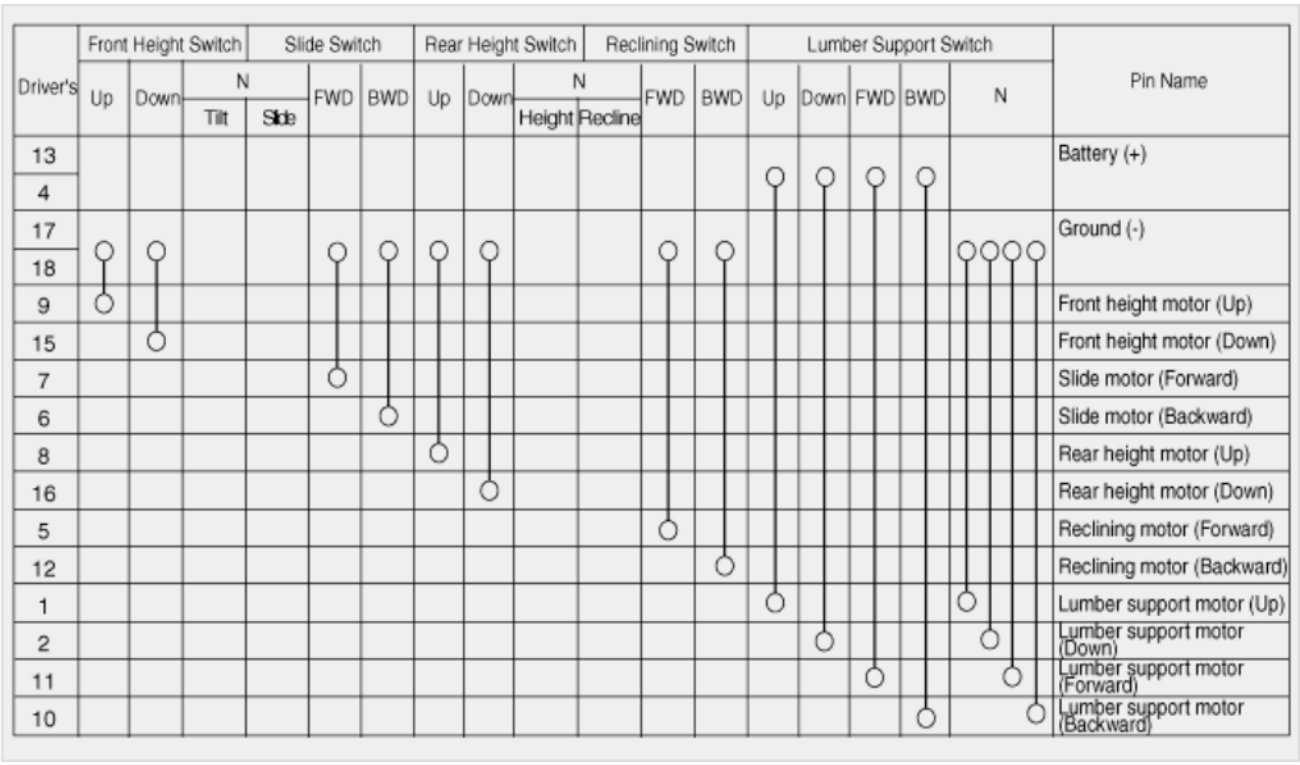
[14Way (SLB) Type]

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Driver's	Front Height Switch			Slide Switch			Rear Height Switch			Reclining Switch			Lumber Support Switch					Bolster			Pin Name
	Up	Down	N		FWD	BWD	Up	Down	N		FWD	BWD	Up	Down	FWD	BWD	N	N	INF	DEF	
			Tilt	Slide					Height	Recline											
17																					
18	○	○			○	○	○	○			○	○	○	○	○	○		○	○		Ground (-)
9	○																				Front height motor (Up)
15		○																			Front height motor (Down)
7					○																Slide motor (Forward)
6						○															Slide motor (Backward)
8							○														Rear height motor (Up)
16								○													Rear height motor (Down)
5											○										Reclining motor (Forward)
12												○									Reclining motor (Backward)
1													○								Lumber support motor (Up)
2														○							Lumber support motor (Down)
11															○						Lumber support motor (Forward)
10																○					Lumber support motor (Backward)
3																		○			Bolster-INF
14																			○		Bolster-DEF

[12Way Type]



Driver's	Front Height Switch			Slide Switch			Rear Height Switch			Reclining Switch			Lumber Support Switch					Pin Name
	Up	Down	N		FWD	BWD	Up	Down	N		FWD	BWD	Up	Down	FWD	BWD	N	
			Tilt	Slide					Height	Recline								
13													○	○	○	○		Battery (+)
4																		
17	○	○			○	○	○	○			○	○					○	Ground (-)
18																	○	
9	○																	Front height motor (Up)
15		○																Front height motor (Down)
7					○													Slide motor (Forward)
6						○												Slide motor (Backward)
8							○											Rear height motor (Up)
16								○										Rear height motor (Down)
5											○							Reclining motor (Forward)
12												○						Reclining motor (Backward)
1													○				○	Lumber support motor (Up)
2														○			○	Lumber support motor (Down)
11															○		○	Lumber support motor (Forward)
10																○	○	Lumber support motor (Backward)

[8Way Type]

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Driver's	Front Height Switch				Slide Switch		Rear Height Switch				Reclining Switch		Pin Name
	Up	Down	N		FWD	BWD	Up	Down	N		FWD	BWD	
			Tilt	Slide					Height	Recline			
17	○	○			○	○	○	○			○	○	Ground (-)
18	○	○			○	○	○	○			○	○	Ground (-)
9	○												Front height motor (Up)
15		○											Front height motor (Down)
7					○								Slide motor (Forward)
6						○							Slide motor (Backward)
8							○						Rear height motor (Up)
16								○					Rear height motor (Down)
5											○		Reclining motor (Forward)
12												○	Reclining motor (Backward)

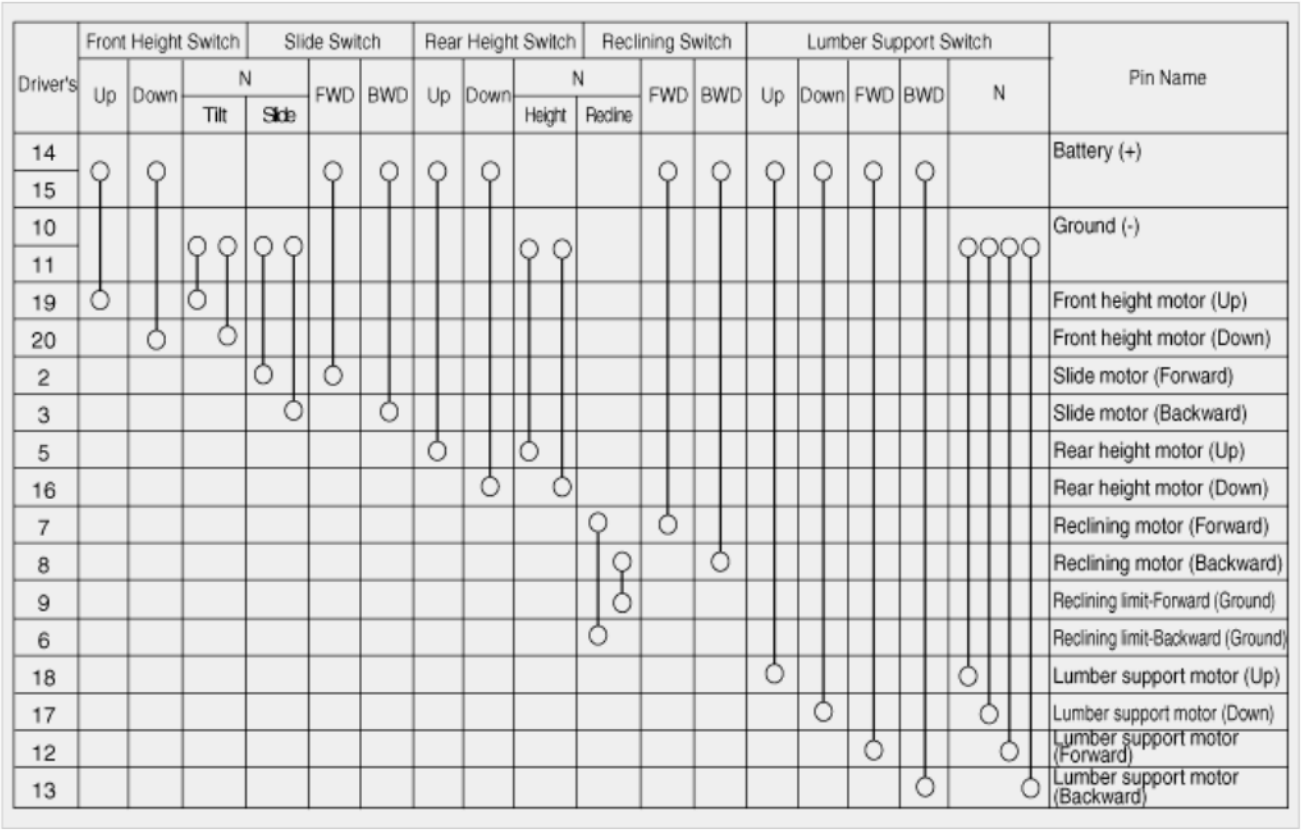
Driver''s Seat / Non-IMS Type

[14Way (EXT) Type]

Driver's	Cushion Extension Switch			Front Height Switch				Slide Switch		Rear Height Switch				Reclining Switch		Lumber Support Switch					Pin Name
	Up	Down	N	Up	Down	N		FWD	BWD	Up	Down	N		FWD	BWD	Up	Down	FWD	BWD	N	
						Tilt	Slide					Height	Recline								
14	○	○		○	○			○	○	○	○			○	○	○	○	○	○		Battery (+)
15	○	○		○	○			○	○	○	○			○	○	○	○	○	○		Battery (+)
10		○	○			○	○	○	○			○	○							○	Ground (-)
11		○	○			○	○	○	○			○	○							○	Ground (-)
4	○		○																		Cushion extension motor (Up)
1		○	○																		Cushion extension motor (Down)
19				○		○															Front height motor (Up)
20					○	○															Front height motor (Down)
2							○	○													Slide motor (Forward)
3							○		○												Slide motor (Backward)
5										○		○									Rear height motor (Up)
16											○	○									Rear height motor (Down)
7													○	○							Reclining motor (Forward)
8													○		○						Reclining motor (Backward)
9													○								Reclining limit-Forward (Ground)
6													○								Reclining limit-Backward (Ground)
18																○				○	Lumber support motor (Up)
17																	○			○	Lumber support motor (Down)
12																		○		○	Lumber support motor (Forward)
13																			○	○	Lumber support motor (Backward)

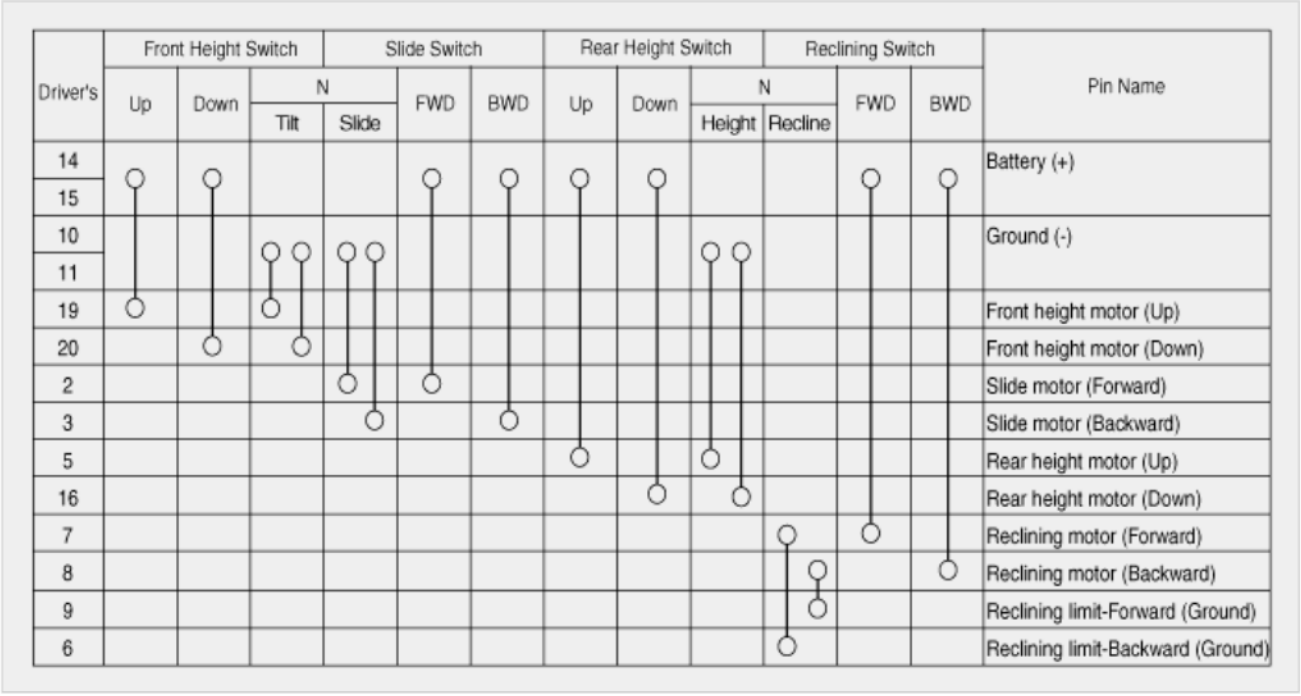
[12Way Type]

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Driver's	Front Height Switch				Slide Switch		Rear Height Switch			Reclining Switch			Lumber Support Switch					Pin Name
	Up	Down	N		FWD	BWD	Up	Down	N		FWD	BWD	Up	Down	FWD	BWD	N	
			Tilt	Slide					Height	Recline								
14																		Battery (+)
15																		
10																		Ground (-)
11																		
19																		Front height motor (Up)
20																		Front height motor (Down)
2																		Slide motor (Forward)
3																		Slide motor (Backward)
5																		Rear height motor (Up)
16																		Rear height motor (Down)
7																		Reclining motor (Forward)
8																		Reclining motor (Backward)
9																		Reclining limit-Forward (Ground)
6																		Reclining limit-Backward (Ground)
18																		Lumber support motor (Up)
17																		Lumber support motor (Down)
12																		Lumber support motor (Forward)
13																		Lumber support motor (Backward)

[8Way Type]



Driver's	Front Height Switch				Slide Switch		Rear Height Switch			Reclining Switch			Pin Name
	Up	Down	N		FWD	BWD	Up	Down	N		FWD	BWD	
			Tilt	Slide					Height	Recline			
14													Battery (+)
15													
10													Ground (-)
11													
19													Front height motor (Up)
20													Front height motor (Down)
2													Slide motor (Forward)
3													Slide motor (Backward)
5													Rear height motor (Up)
16													Rear height motor (Down)
7													Reclining motor (Forward)
8													Reclining motor (Backward)
9													Reclining limit-Forward (Ground)
6													Reclining limit-Backward (Ground)

Assist"s Seat / Non-IMS Type

[12Way (Walk-In) Type]

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Assist's	Front Height Switch				Slide Switch		Rear Height Switch				Reclining Switch		Lumber Support Switch					Pin Name
	Up	Down	N		FWD	BWD	Up	Down	N		FWD	BWD	Up	Down	FWD	BWD	N	
			Tilt	Slide					Height	Recline								
8	○	○					○	○					○	○	○	○		Battery (+)
9																		
17			○	○		○			○	○		○					○	Ground (-)
18					○						○							
11	○		○															Front height motor (Up)
10		○		○														Front height motor (Down)
3					○													Slide motor (Forward)
4						○												Slide motor (Backward)
2							○		○									Rear height motor (Up)
1								○		○								Rear height motor (Down)
13											○							Reclining motor (Forward)
14												○						Reclining motor (Backward)
19													○				○	Lumber support motor (Up)
5														○			○	Lumber support motor (Down)
20															○		○	Lumber support motor (Forward)
6																○	○	Lumber support motor (Backward)

[12Way Type]

Assist's	Front Height Switch				Slide Switch		Rear Height Switch				Reclining Switch		Lumber Support Switch					Pin Name
	Up	Down	N		FWD	BWD	Up	Down	N		FWD	BWD	Up	Down	FWD	BWD	N	
			Tilt	Slide					Height	Recline								
14	○	○			○	○	○	○			○	○	○	○	○	○		Battery (+)
15																		
10			○	○	○	○			○	○							○	Ground (-)
11																		
19	○		○															Front height motor (Up)
20		○		○														Front height motor (Down)
2				○	○													Slide motor (Forward)
3						○												Slide motor (Backward)
5							○		○									Rear height motor (Up)
16								○		○								Rear height motor (Down)
7											○							Reclining motor (Forward)
8												○						Reclining motor (Backward)
9																		Reclining limit-Forward (Ground)
6																		Reclining limit-Backward (Ground)
18													○				○	Lumber support motor (Up)
17														○			○	Lumber support motor (Down)
12															○		○	Lumber support motor (Forward)
13																○	○	Lumber support motor (Backward)

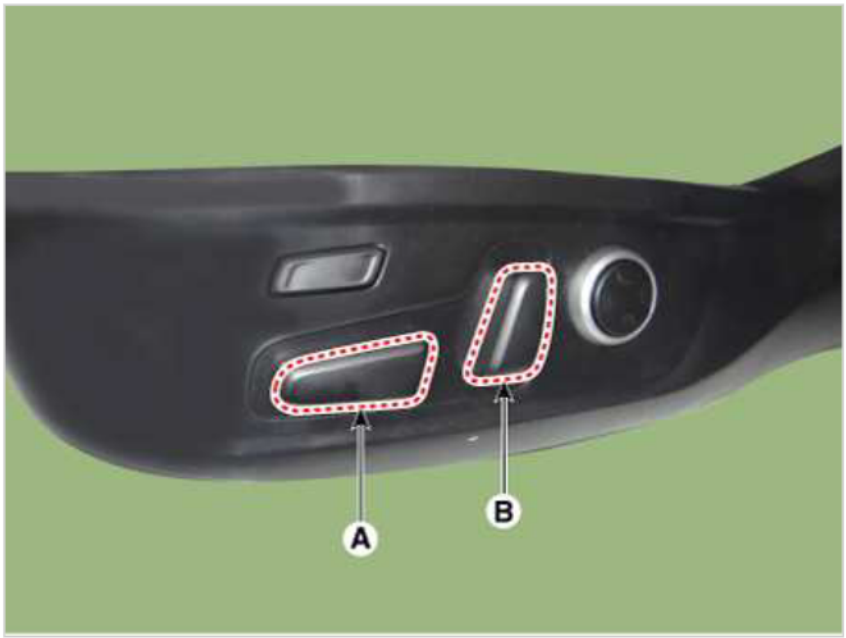
[8Way Type]

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Assist's	Front Height Switch				Slide Switch		Rear Height Switch				Reclining Switch		Pin Name
	Up	Down	N		FWD	BWD	Up	Down	N		FWD	BWD	
			Tilt	Slide					Height	Recline			
14	○	○			○	○	○	○			○	○	Battery (+)
15													
10			○	○	○	○			○	○			Ground (-)
11													
19	○		○										Front height motor (Up)
20		○		○									Front height motor (Down)
2				○	○								Slide motor (Forward)
3						○							Slide motor (Backward)
5							○		○				Rear height motor (Up)
16								○	○				Rear height motor (Down)
7										○	○		Reclining motor (Forward)
8										○		○	Reclining motor (Backward)
9										○			Reclining limit-Forward (Ground)
6										○			Reclining limit-Backward (Ground)

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the front seat outer shield cover.
   (Refer to Body - "Front Seat Outer Shield Cover")
3. Remove the slide knob (A) and reclining knob (B).



4. Remove the power seat control switch (A) after loosening the mounting screws.

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Installation

1. Install the power seat control switch.
2. Install the slide knob and reclining knob.
3. Install the front seat outer shield cover.
4. Connect the negative (-) battery terminal.

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Component Location



1. Slide motor
2. Reclining motor
3. Lumber support motor
4. Front height motor
5. Cushion extension motor
6. Rear height motor

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Description

Power seat motor is driven by a motor in the following.

1. Slide motor
2. Front height motor
3. Rear height motor
4. Reclining motor
5. Cushion extension motor

NOTICE

- The power seat motor (IMS specification) mounted in this vehicle uses the hole sensor to calculate the maximum operation distance, so it does not require limit switch.
- But the driver/passenger seats with non-IMS specification have the limit switch in the backrest motor.

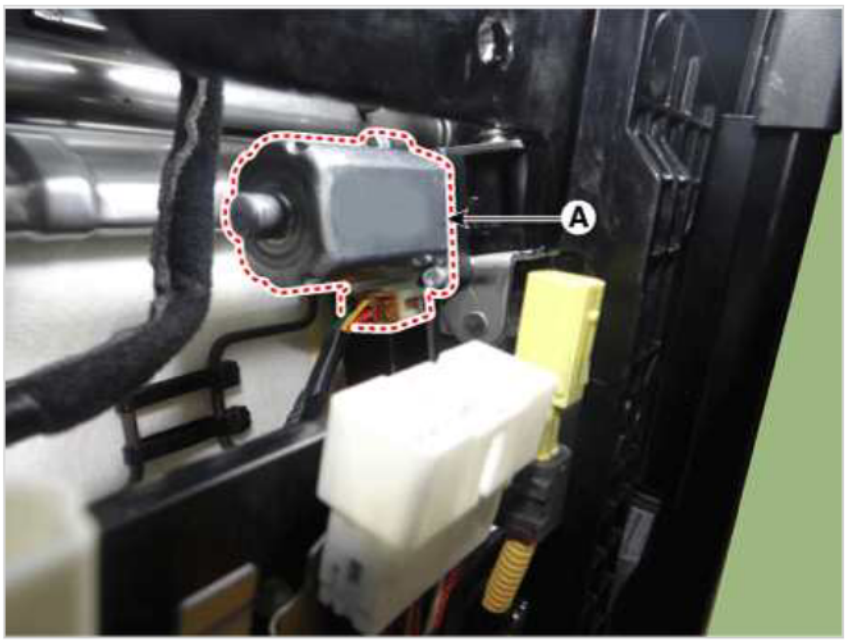
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Inspection

Power Seat Motor

1. Disconnect the negative (-) battery terminal.
2. Disconnect the connectors for each motor.

A : Front height motor



B : Slide motor

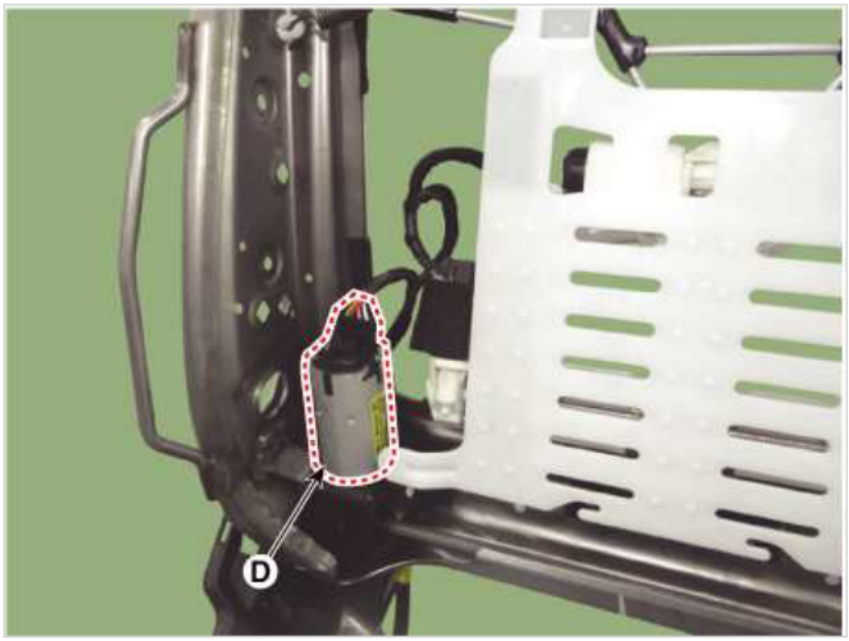


C : Rear height motor

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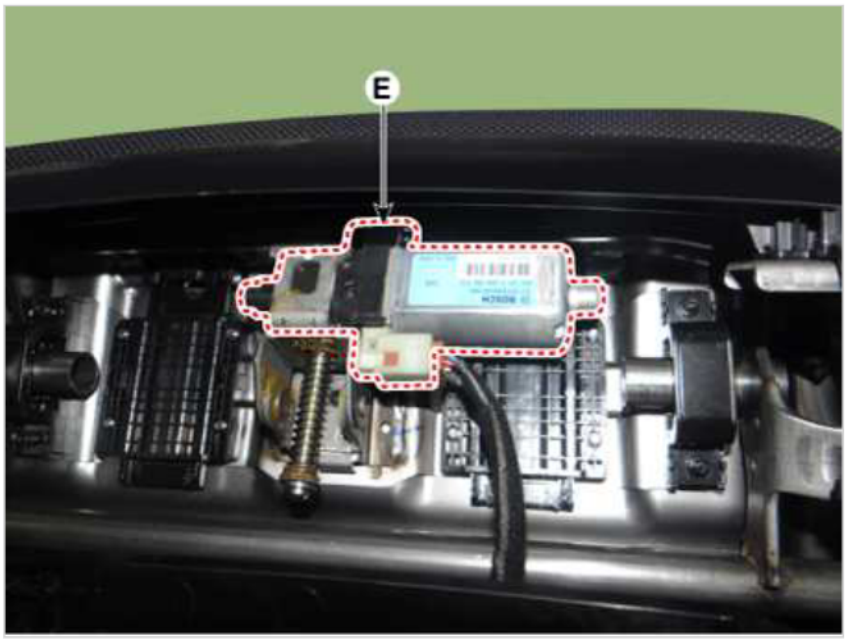


D : Reclining motor

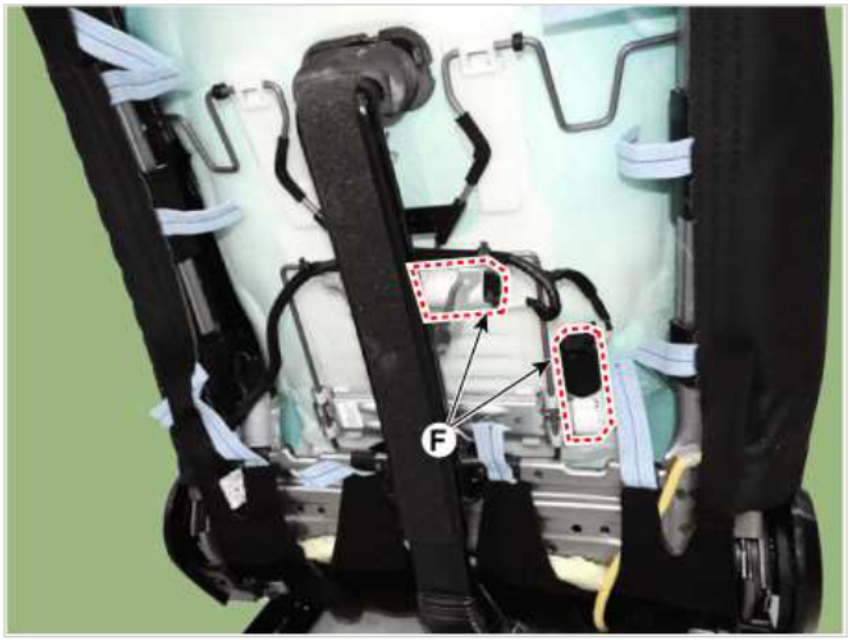


E : Cushion extension motor

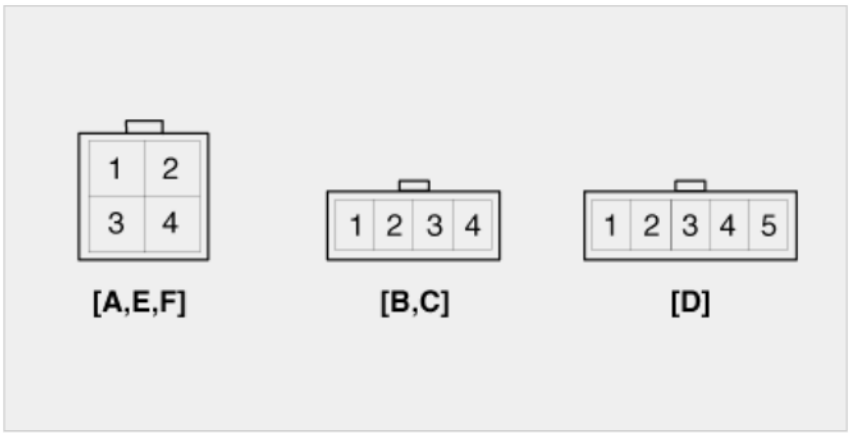
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F : Lumber support motor



3. When the battery power is supplied to the motor connector, check the motor for smooth operation.
4. Reverse the connections and check that the motor turns in reverse.
5. If the motor runs abnormally, replace it.



[Driver]

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Position \ Terminal		1	2	3	4	5
Front height motor (A)	Up	⊖		⊕		
	Down	⊕		⊖		
Slide motor (B)	Forward	⊖			⊕	
	Backward	⊕			⊖	
Rear height motor (C)	Up	⊕			⊖	
	Down	⊖			⊕	
Reclining motor (D)	Forward	⊖				⊕
	Backward	⊕				⊖
Cushion extension motor (E)	Forward	⊖		⊕		
	Backward	⊕		⊖		
Lumber support motor (F) (Vertical)	Up		⊖		⊕	
	Down		⊕		⊖	
Lumber support motor (F) (Horizontal)	Forward		⊖		⊕	
	Backward		⊕		⊖	

[Assist]

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Position \ Terminal		1	2	3	4	5
Front height motor (A)	Up	⊖		⊕		
	Down	⊕		⊖		
Slide motor (B)	Forward	⊖			⊕	
	Backward	⊕			⊖	
Rear height motor (C)	Up	⊕			⊖	
	Down	⊖			⊕	
Reclining motor (D)	Forward	⊖				⊕
	Backward	⊕				⊖
Lumber support motor (F) (Horizontal)	Forward		⊖		⊕	
	Backward		⊕		⊖	

Remove

Front Seat

1. Disconnect the negative (-) battery terminal.
2. Remove the front seat assembly.
   (Refer to Body - "Front Seat Assembly")

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Components

Front Seat Switch



1. Driver side seat heater switch
2. Passenger side seat heater switch

Rear Seat Switch



1. Rear seat heater switch (LH/RH)

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Description

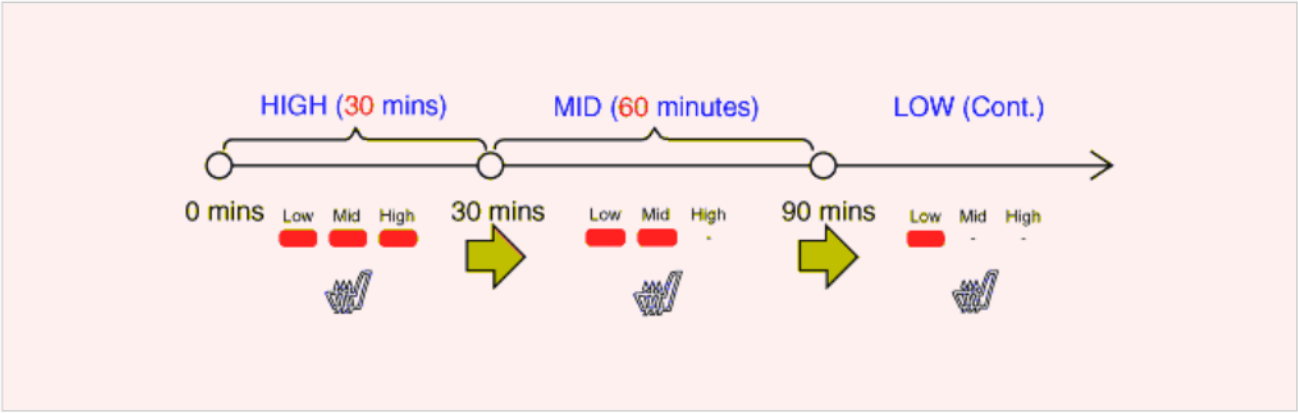
Heater Seat Smart Control Technology

- To prevent low temperature burn, seat heater temperature will automatically be lowered after a certain period of time.
  (Low temperature burn condition: Over 30 minutes at 50°C)

Heater Seat Smart Control Operation

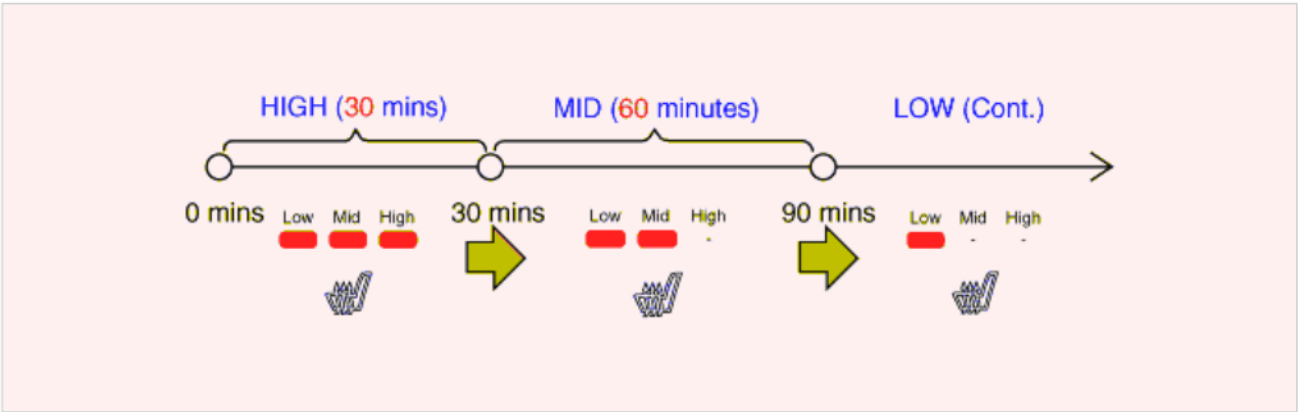
[1st Row Seat]

- Change to "MID" after 30 minutes in "HIGH", then "LOW" after 60 minutes in "MID"
- Change to "LOW" after 60 minutes in "MID"



[2nd Row Seat]

- Change to "MID" after 30 minutes in "HIGH", then "LOW" after 60 minutes in "MID"
- Change to "LOW" after 60 minutes in "MID"



Information

- If temperature is raised manually within certain period of time after the temperature was lowered automatically, it will be lowered again soon to prevent overheating or low temperature burn.
- This is normal operating condition as a safety device.

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Removal

⚠ CAUTION

Put on gloves to protect your hands.

NOTICE

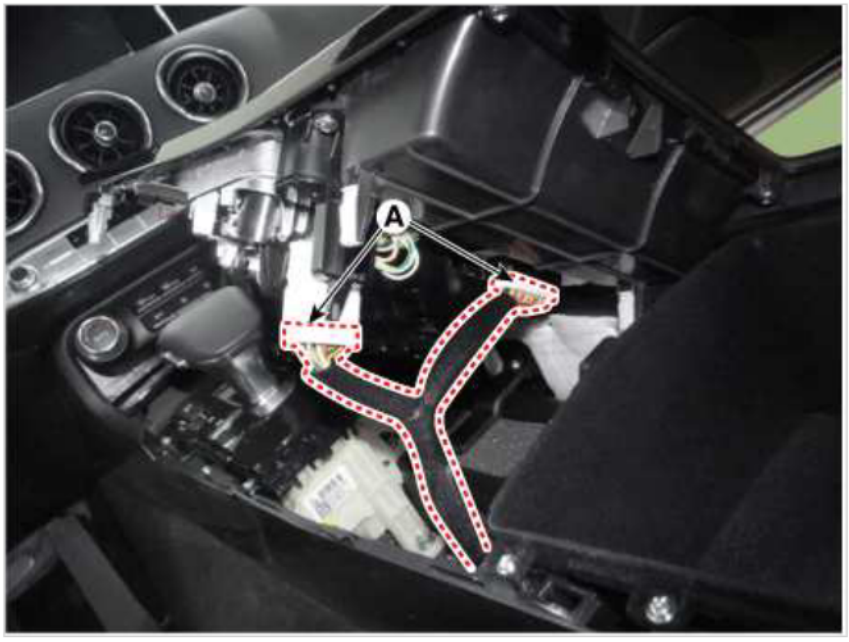
- When prying with a flat-tip screwdriver or use a prying trim tool, wrap it with protective tape, and apply protective tape around the related parts, to prevent damage.
- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Take care not to bend or scratch the trim and panels.

Front Seat Heater Swtich

1. Disconnect the negative (-) battery terminal.
2. Remvoe the console upper complete (A) by using a remover.



3. Disconnect the connectors (A) from the console upper complete.

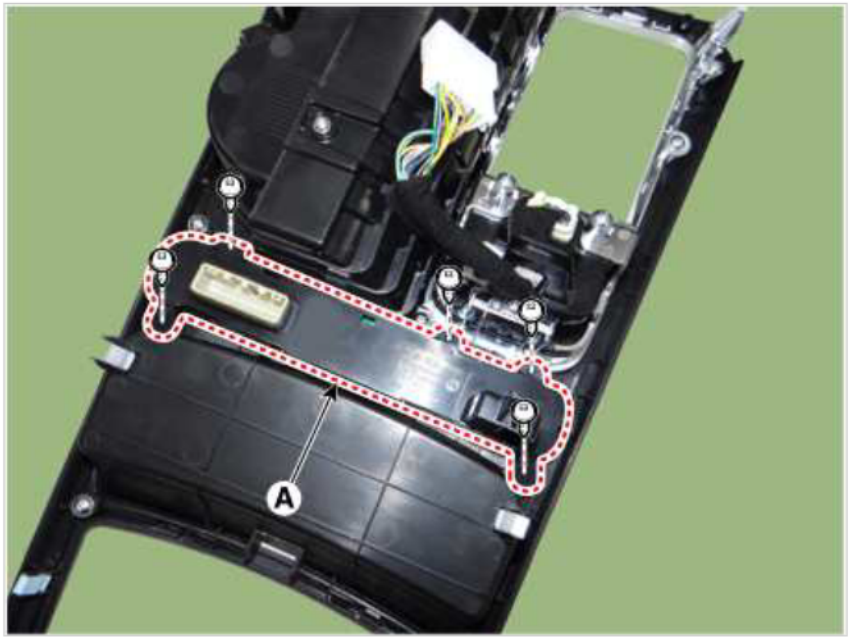


4. Remove the connector (A) from the console floor switch complete.

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5. Remove the console floor switch complete (A) after loosening the mounting screws.



Rear Seat Heater Swtich

1. Disconnect the negative (-) battery terminal.
2. Remove the rear door trim.
   (Refer to Body - "Rear Door Trim")
3. Disconnect the power window switch connector (A).

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4. Remove the power window switch (A) after loosening the mounting screws.



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Installation

Front Seat Heater Swtich

1. Install the console floor switch complete.
2. Install the connector from the console floor switch complete.
3. Connect the connectors from the console upper complete.
4. Install the console upper complete.
5. Connect the negative (-) battery terminal.

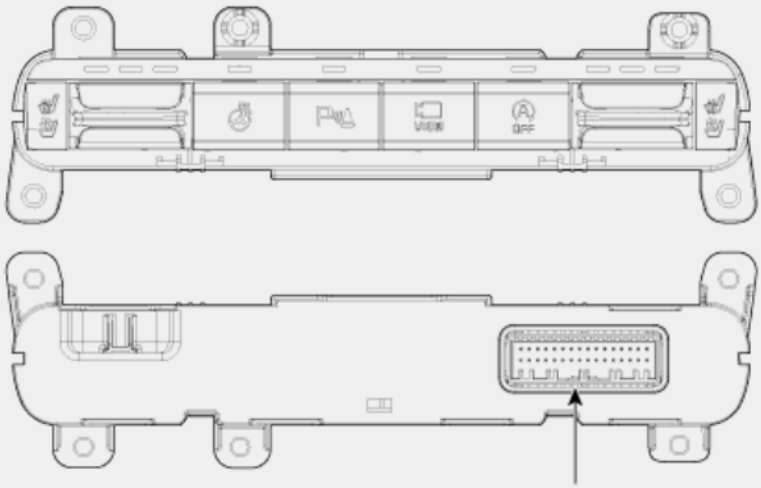
Rear Seat Heater Swtich

1. Install the power window switch.
2. Connect the power window switch connector.
3. Install the rear door trim after connecting the connector.
4. Connect the negative (-) battery terminal.

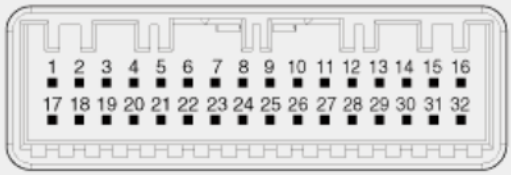
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Circuit Diagram

Front Seat Heater Swtich

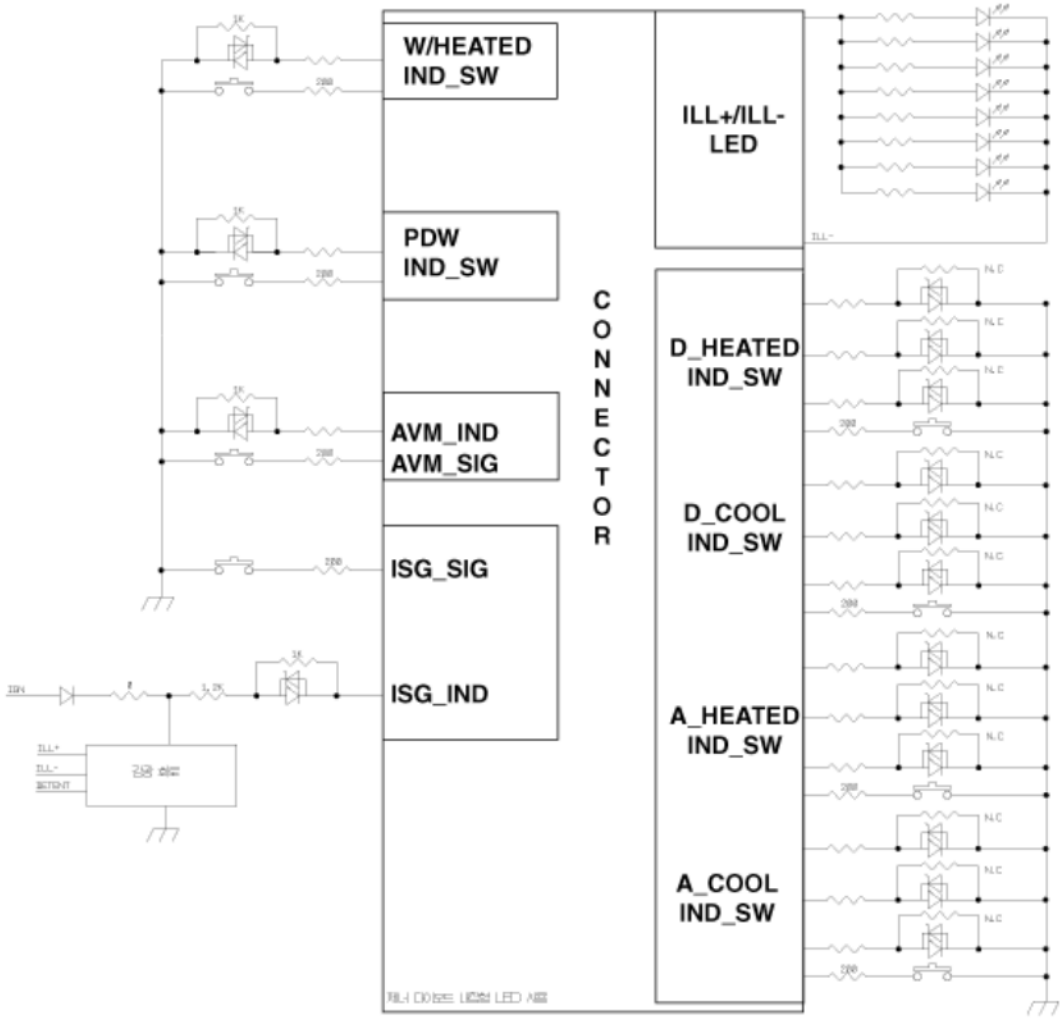


Connector A



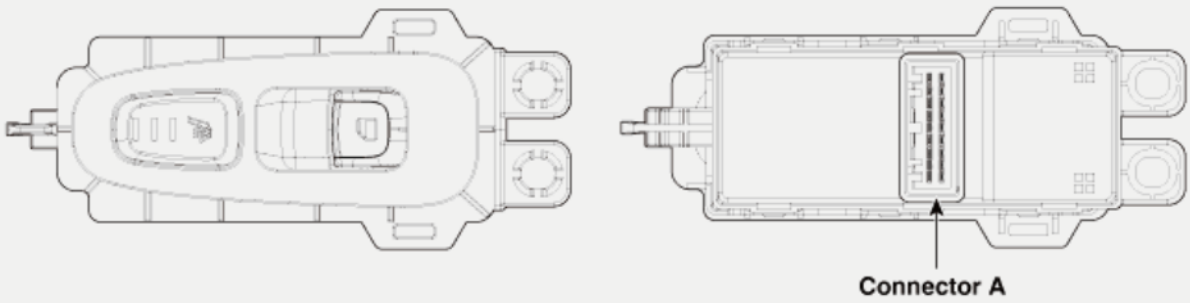
No.	Description	No.	Description
1	RH seat heater mode signal	17	IGN
2	RH seat ventilation mode signal	18	Illumination (+)
3	RH seat heater indicator (Max)	19	-
4	RH seat heater indicator (Mid)	20	Illumination (-)
5	RH seat heater indicator (Min)	21	-
6	RH seat ventilation indicator (Max)	22	Steering wheel heater indicator
7	RH seat ventilation indicator (Mid)	23	PDW Indicator
8	RH seat ventilation indicator (Min)	24	AVM Indicator
9	LH seat ventilation indicator (Max)	25	Steering wheel heater signal
10	LH seat ventilation indicator (Mid)	26	PDW Signal
11	LH seat ventilation indicator (Min)	27	AVM Signal
12	LH seat heater indicator (Max)	28	ISG Signal
13	LH seat heater indicator (Mid)	29	ISG Indicator
14	LH seat heater indicator (Min)	30	Detent
15	LH seat ventilation mode signal	31	-
16	LH seat heater mode signal	32	Ground

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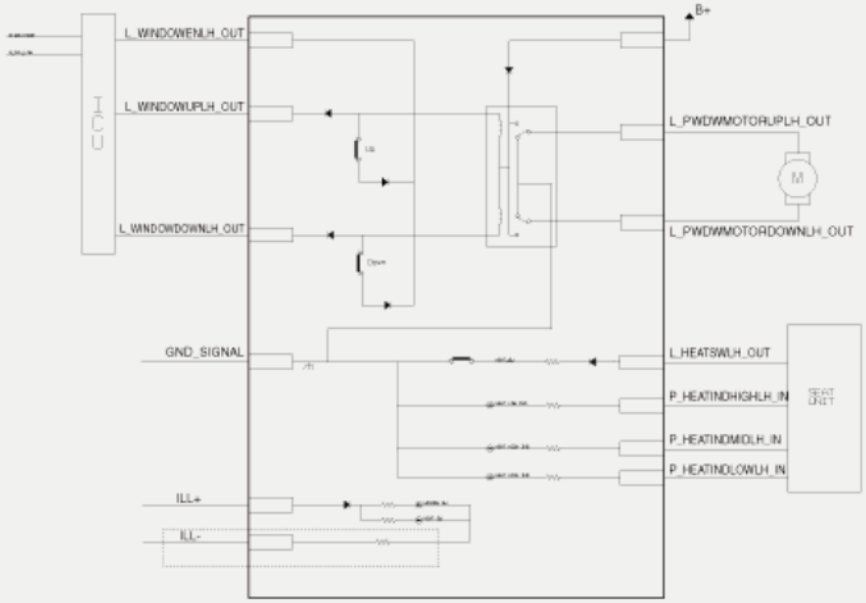


Rear Seat Heater Swtich

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Connector A



Connector A	No.	Description	No.	Description
	1	-	10	Battery (+)
	2	Seat warmer indicator (High)	11	Enable
	3	Seat warmer indicator (Mid)	12	Driver power window (Up)
	4	Seat warmer indicator (Low)	13	Power window motor (Up)
	5	Seat warmer switch	14	-
	6	Illumination (+)	15	Power window motor (Down)
	7	-	16	Driver power window (Down)
	8	Illumination (-)	17	-
	9	-	18	Ground

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Component Location

Front Seat Heater



1. Front seat heater unit (Assist seat only)
2. Front seat heater (Back)
3. Front seat heater (Cushion)

Front Seat Heater (Air Ventilation)

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1. Air ventilation seat unit (Assist seat only)
2. Front seat heater (Back)
3. Front seat heater (Cushion)

Rear Seat Heater

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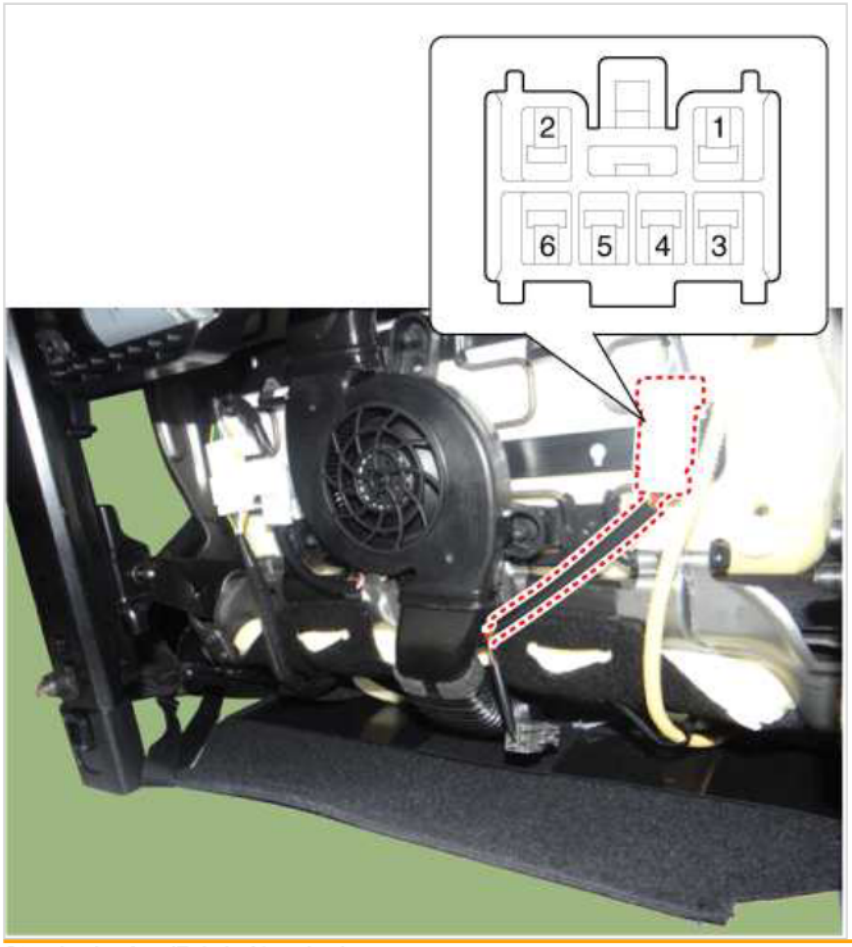
1. Rear seat heater unit
2. Rear seat heater (Cushion)

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Inspection

Front Seat Heater

1. Check for continuity and measure the resistance between terminals No 3 and No 6.



Standard value (Fabric / Leather)
Driver/Assist (Cushion) : 2.98Ω±10% / 22°C
Driver/Assist (Back) : 3.80Ω±10% / 22°C
Driver/Assist (Cushion+Back) : 1.67Ω±10% / 22°C

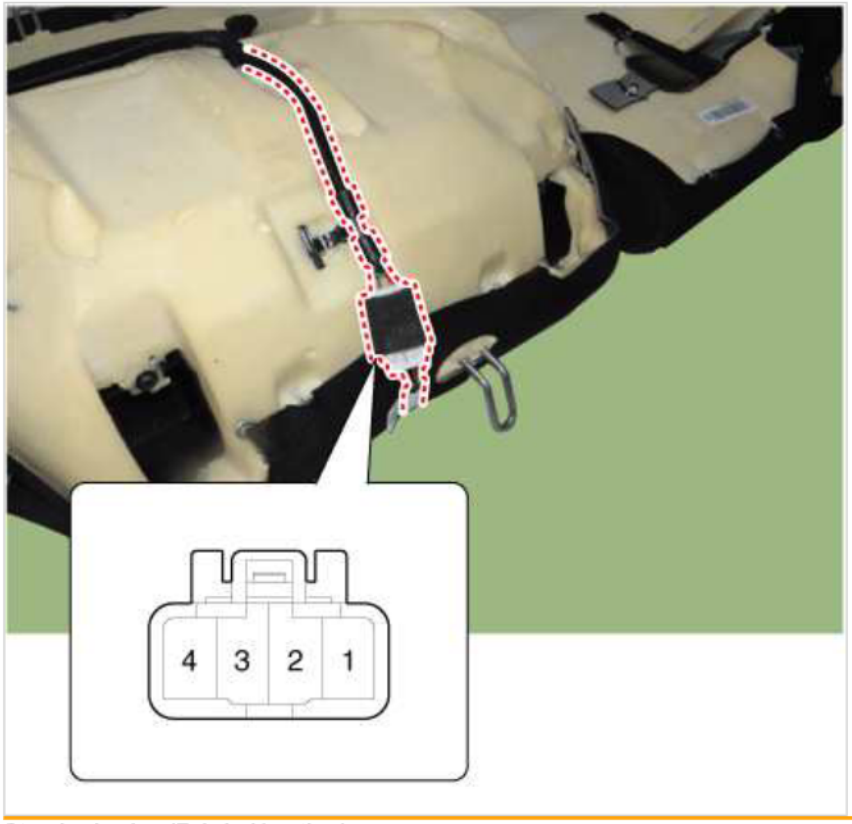
2. Operate the seat heater after connecting the connector, and then check the thermostat by measuring the temperature of seat surface.

Standard value (Fabric / Leather)
1st : cushion : 36±2°C, back : 40±2°C
2st : cushion : 39±2°C, back : 45±2°C
3st : cushion : 42±2°C, back : 50±2°C

Rear Seat Heater

1. Check for continuity and measure the resistance between terminals No 1 and No 4.

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Standard value (Fabric / Leather)

Rear seat (Cushion only) : 3.74Ω±10% / 22°C

2. Operate the seat heater after connecting the connector, and then check the thermostat by measuring the temperature of seat surface.

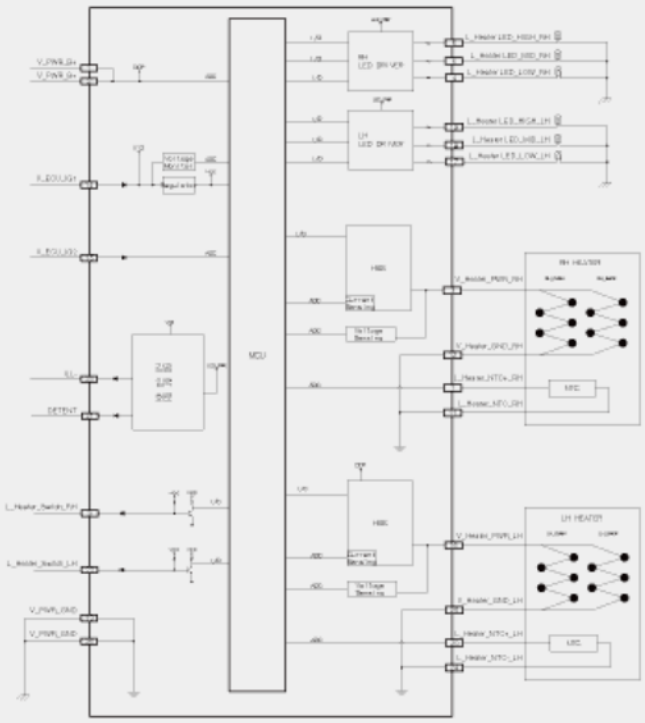
Standard value (Fabric / Leather)

1st - cushion : 38 ± 2°C
2st - cushion : 42 ± 2°C
3st - cushion : 46 ± 2°C

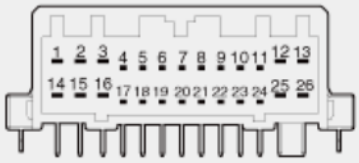
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Circuit Diagram

Front Seat Heater

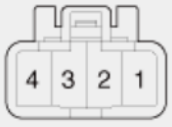


Seat Heater Unit



No.	Description	No.	Description
1	Battery (+)	14	IGN1
2	Battery (+)	15	IGN2
3	RH seat heater (+)	16	LH seat heater (+)
4	RH seat heater indicator (Low)	17	LH seat heater indicator (Low)
5	RH seat heater indicator (Mid)	18	LH seat heater indicator (Mid)
6	RH seat heater indicator (High)	19	LH seat heater indicator (High)
7	RH seat NTC (+)	20	LH seat NTC (+)
8	-	21	Detent
9	RH seat heater switch	22	LH seat heater switch
10	-	23	Illumination (-)
11	RH seat NTC (-)	24	LH seat NTC (-)
12	RH seat heater (-)	25	LH seat heater (-)
13	Ground	26	Ground

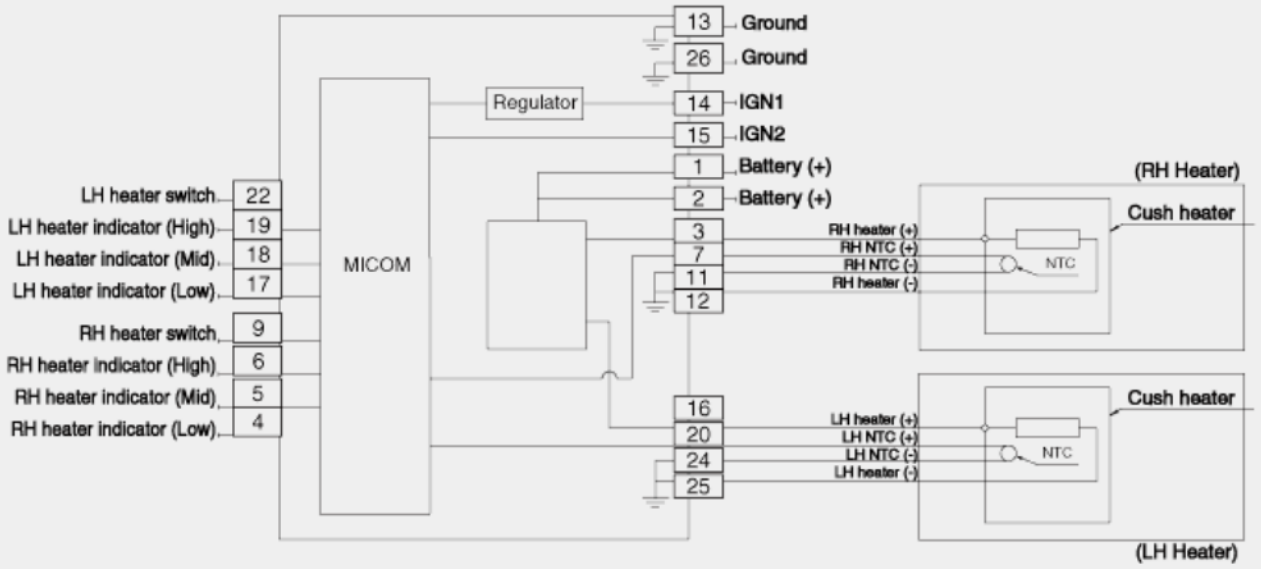
Heater Pad Connector



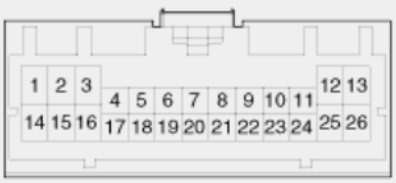
No.	Description
B1	Seat heater (+)
B2	NTC (+)
B3	NTC (-)
B4	Seat heater (-)

Rear Seat Heater

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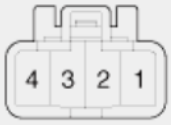


Seat Heater Unit



No.	Description	No.	Description
1	Battery (+)	14	IGN1
2	Battery (+)	15	IGN2
3	RH seat heater (+)	16	LH seat heater (+)
4	RH seat heater indicator (Low)	17	LH seat heater indicator (Low)
5	RH seat heater indicator (Mid)	18	LH seat heater indicator (Mid)
6	RH seat heater indicator (High)	19	LH seat heater indicator (High)
7	RH seat NTC (+)	20	LH seat NTC (+)
8	IGN1	21	Detent
9	RH seat heater switch	22	LH seat heater switch
10	-	23	-
11	RH seat NTC (-)	24	LH seat NTC (-)
12	RH seat heater (-)	25	LH seat heater (-)
13	Ground	26	Ground

Heater Pad Connector



No.	Description
B1	Seat heater (+)
B2	NTC (+)
B3	NTC (-)
B4	Seat heater (-)

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Component Location



1. Seat ventilation blower
2. Seat ventilation unit (Assist seat only)

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Removal

Seat Ventilation Unit

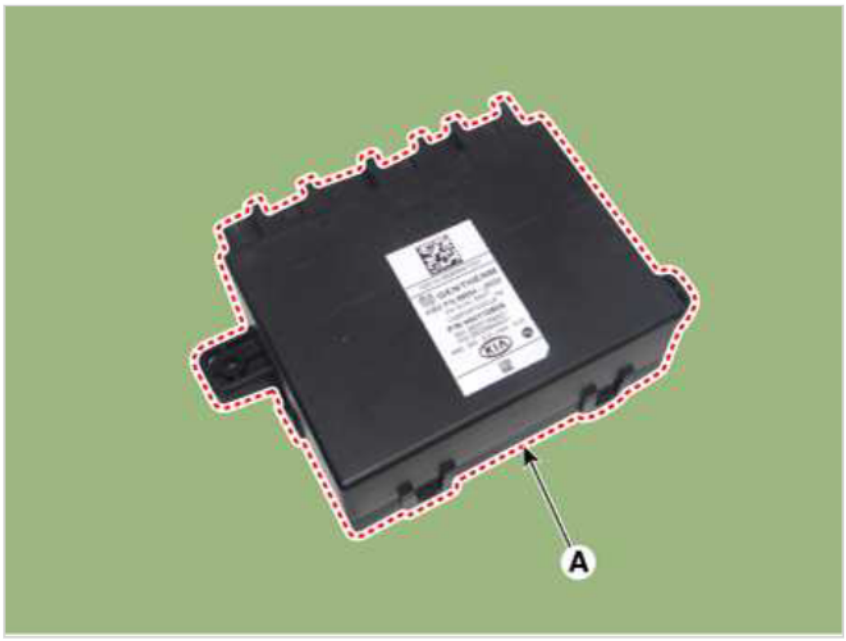
1. Disconnect the negative (-) battery terminal.
2. Remove the front seat assembly [RH].
   (Refer to Body - "Front Seat Assembly")
3. Disconnect the seat ventilation unit connectors (A).



4. Remove the seat ventilation unit (A) after loosening the mounting screws.

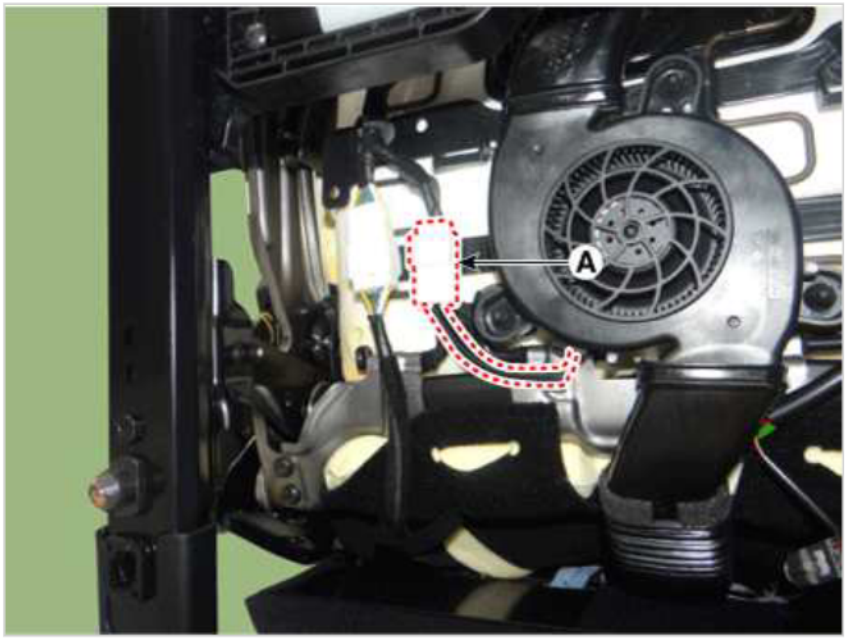


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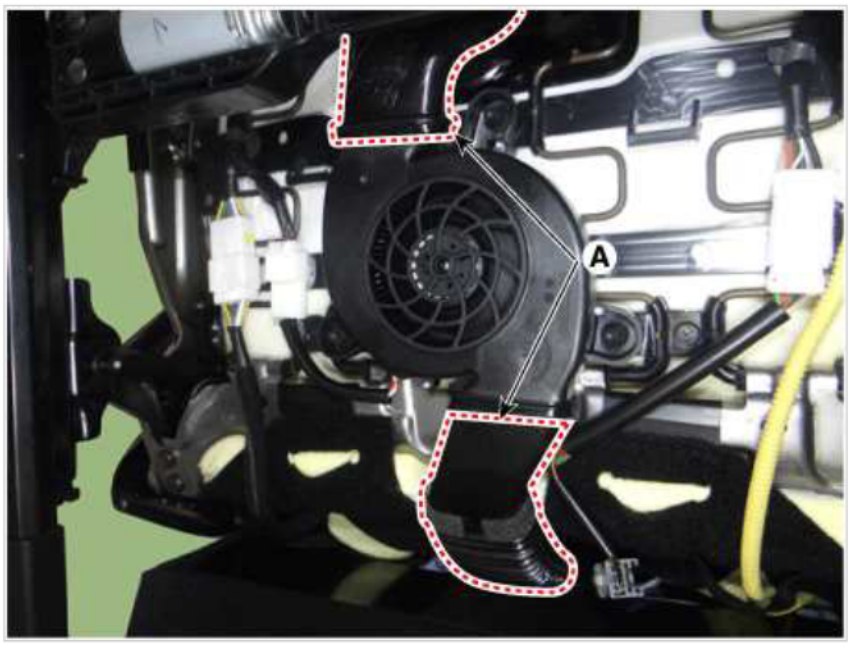
Seat Ventilation Blower

1. Disconnect the negative (-) battery terminal.
2. Remove the front seat assembly [LH/RH].
   (Refer to Body - "Front Seat Assembly")
3. Disconnect the seat ventilation blower connector (A).

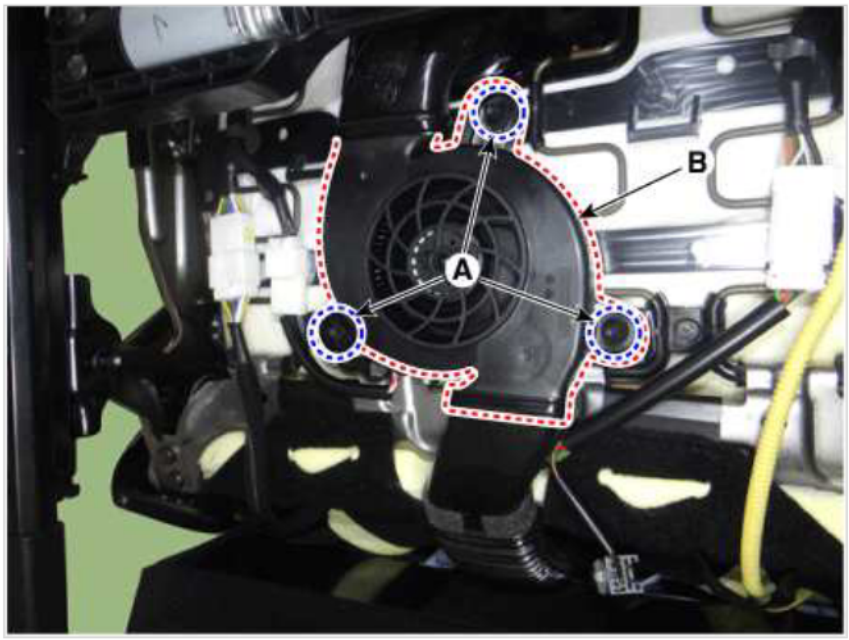


4. Remove the seat ventilation blower ducts (A).

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5. Remove the seat ventilation blower (B) after removing the mounting packing (A).



Installation

Seat Ventilation Unit

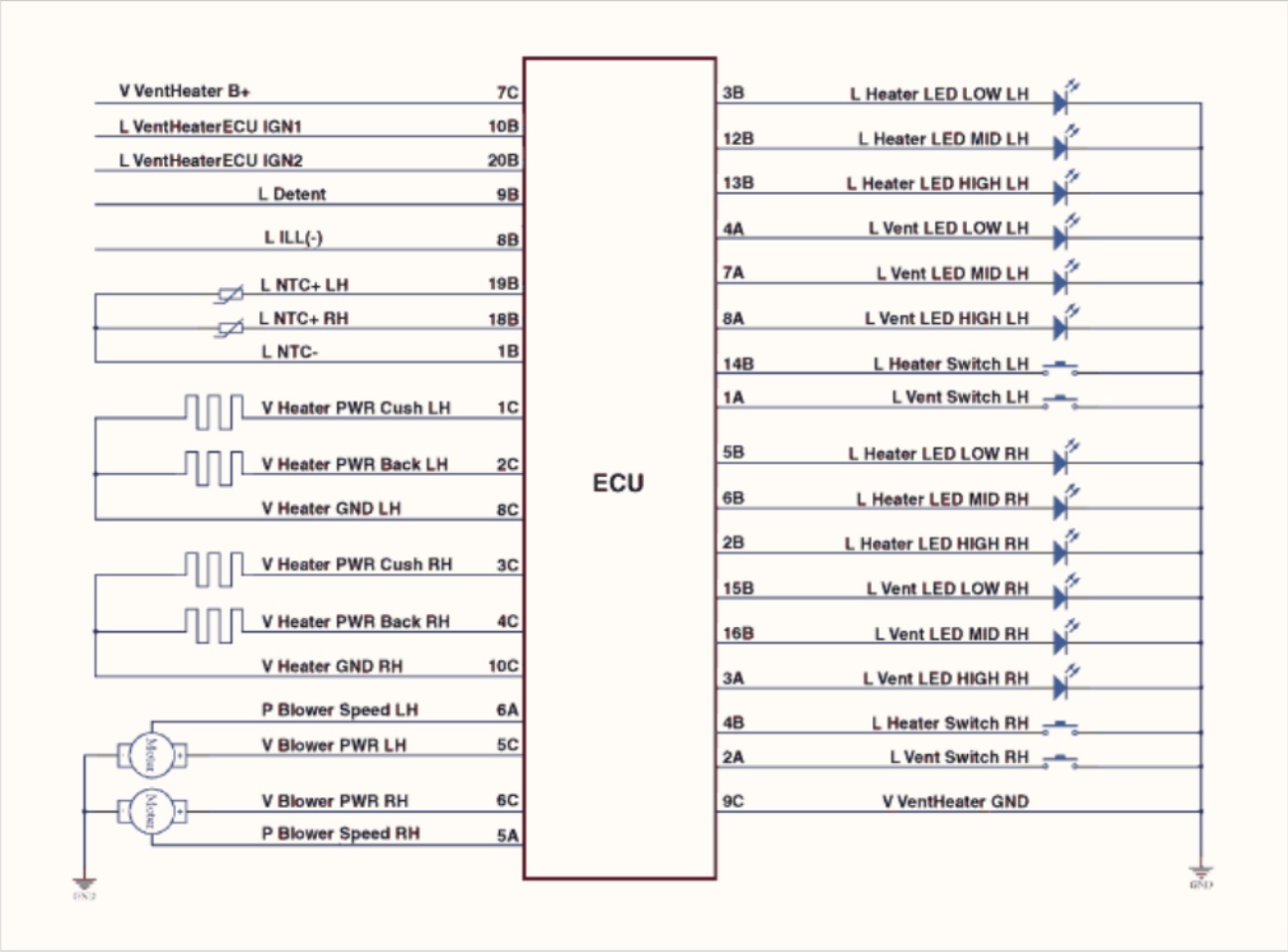
1. Install the seat ventilation unit after connecting the connector.
2. Install the front seat assembly [RH].
3. Connect the negative (-) battery terminal.

Seat Ventilation Blower

1. Install the seat ventilation blower.
2. Install the seat ventilation blower ducts.
3. Connect the seat ventilation blower connector.
4. Install the front seat assembly [LH/RH].
5. Connect the negative (-) battery terminal.

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Circuit Diagram



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Specifications

Smart Key Unit

Items	Specification
Rated voltage	DC 12 V
Operating voltage	DC 9 - 16 V
Operating temperature	-40 - 176°F (-40 - 80°C)
Load	Max. 4mA (When welcome light function "OFF")

RF Receiver

Items	Specification
Frequency	433.92 Mhz
Antenna type	FSK (Frequency Shift Keying)

Smart Key Fob

Items	Specification
Battery	Lithium battery 3V 1EA
Distance	- The distance over which RF(Radio Frequency) Receiver can receive a FOB transmission signal : 30m - The distance over which LF(Low Frequency) antenna(Outer Handle/ Trunk/ Liftgate) can detect FOB : 0.7m
Battery life	More than 2 years (10 times / a day) **⚠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.
Push buttons	3 (Door lock / unlock, Liftgate)
Frequency(Rx)	125 kHz
Frequency(Tx)	433.92 MHz
Numbers	2EA

Antenna

Items	Specification
Rated voltage	DC 12 V
Operating voltage	DC 9 - 16 V
Operating temperature	-22 - 167°F (-30 - 75°C)
Frequency	125kHz
Numbers	Interior (3EA), Door (2EA), Bumper (1EA)

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Description

The SMART KEY system is a system that allows the user to access and operate a vehicle in a very convenient way. To access the vehicle, no traditional key or remote control unit is needed.

The user carries a SMART KEY FOB which does not require any conscious actions by the user (e.g. operate a RKE button). The SMART KEY system is triggered by pressing a push button in the door handle.

After being triggered the vehicle sends out a request in a limited range. If the SMART KEY FOB receives this request, it automatically sends a response to the vehicle. Then the system decides whether to perform a particular action (unlocking, locking…) or remain inactive.

Again, a communication between the vehicle and the SMART KEY FOB is needed before any actions will be performed.

The System offers the following features :

- Passive unlock via 4 doors
- Passive locking via4 doors
- Passive start
- Passive access liftgate via the liftgate lid switch at the liftgate
- Max. 2 fobs can be handled by the system
- Immobilizer backup antenna driver integrated into SSB for TP authentication (i.e. limp home mode)
- Communication with engine management system
- Communication with SRX
- LF-RF communication

1. Passive unlock
   The system allows the user to access (unlock) the vehicle without performing any actions with the SMART KEY FOB.
2. Passive locking
   The system allows the user to lock the vehicle by pushing a button on door handle with the SMART KEY FOB.
3. Button start
   The system allows the user to switch the power modes (Off, Accessory, Ignition), as well as to start and stop the vehicle's engine without performing any actions with the SMART KEY FOB. See Button Engine Start system specification.
4. LIMP HOME Mode
   Additionally, the system offers so called "limp home mode", which is the user can operate all vehicle functions by pushing the key into the SSB.

Smart Key ECU (SMK ECU)

The SMK ECU manages all functions related to "Passive Unlock", "Passive Lock" and "Passive Authorization for Engine Start Operation".

It reads the inputs (Push button in door handle, Start Stop Button (SSB), PARK position Switch), controls the outputs (e.g. exterior and interior antennas), and communicates via the CAN as well as a single line interface to further devices of the car.

For communication with the SMART KEY FOB, SMK ECU generates a request (challenge) as an encoded and modulated 125kHz signal at the inductive antenna outputs and receives the SMART KEY FOB's response via the external RF receiver.

The main functional blocks of the SMK ECU are :

- Power supply
- Microcontroller with FLASH Memory
- Single Line Interface to SRX
- Single Line Interface to EMS
- Input stage
- LF antenna amplifier/driver
- CAN communication with BCM

The LF antenna amplifier/driver generates a 125kHz sinusoidal carrier signal which is distributed to the different antennas.

Smart Key FOB

The system supports up to 2 SMART KEY FOBs.

The main functions of the SMART KEY FOB are :

- Passive functionality: receives LF-challenge and sends automatically RF response.
- Classic RKE function by action up to 3 push buttons.
- Transponder-functionality in case of a flat battery or a disturbed communication.

Antennas

1. Emitting LF Antennas :
   Inductive antennas in and at the vehicle are used to transform the current, driven by the SMK ECU antenna driver, into a 125 (or 134.2) kHz magnetic field, which is the carrier for the SMART KEY challenge.

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Three antennas cover the vehicle's exterior: two antennas in the Door Handles (DS and PS) cover the area around the doors; one antenna in the rear bumper covers the area around the trunk or liftgate.

Up to three antennas cover the vehicle's interior and the trunk or liftgate interior: two in the passenger compartment and one in the trunk room or trunk.

2. Bidirectional Immobilizer Antenna (for Limp Home):
   The Immobilizer Backup Antenna is used for sending and receiving data: it emits a magnetic field (125 - 135 kHz challenge) and receives changes in the field strength (response of Transponder).
3. Receiver
   The SMART KEY FOB's response is received via the RF receiver.

Door Handle

The front door handles of the two doors (driver door / passenger door) are equipped with emitting LF-antennas to emit the 125kHz signals. The front door handles are also equipped with a push button.

Push Button

The push button in door handle serves as a trigger to indicate the user's intent to unlock or lock the vehicle.

The push buttons are installed at front doors, integrated into the door handles.

Another button is installed at the trunk or liftgate lid.

Operation

Passive Functions

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

Operating Range

The SMART KEY FOB receives and interprets a challenge sent from the vehicle via the exterior antennas in a free space range of min. 0.7m measured around the exterior antennas which are integrated in the door handles; refer to the below given picture. The trunk or liftgate access range is also min. 0.7m measured from the antenna position.

The SMART KEY FOB receives and interprets a challenge sent from the vehicle via the exterior antennas in a free space range of min. 0.7m measured around the exterior antennas which are integrated in the door handles; refer to the below given picture

Passive Access (Passive Entry)

Push the door handle button when all doors locked indicates the operator's intent to access the vehicle and thus triggers the system for unlock

Passive Locking (Exit)

Pressing one of the push buttons in the door handles when one of the following condition is fulfilled:

- At least one door is unlocked and two_steps timer is not running or
- Two_steps timer is running and one of the push button except Front Left side is triggered

indicates the operator's intent to lock the vehicle and thus triggers the system for a lock.

Passive liftgate Warning (Sedan only)

Whenever the liftgate is closed, SMK ECU uses a suitable search strategy to avoid liftgate buzzer warning by a fob outside the vehicle. Then SMK searches for a SMART KEY FOB in the interior of the liftgate. If a valid SMART KEY FOB is found in the liftgate, the SMK ECU activates SMK external buzzer (TBD) to inform the user that the liftgate has been closed with a fob inside the liftgate.

SMK will send the liftgate open command to BCM for liftgate reopening if liftgate reopening bit is set(BK)For this functionality, a "valid" SMART KEY FOB means any SMART KEY FOB that belongs to the vehicle, even if it's DEACTIVATED.

NOTICE

- A blind spot in the liftgate similar to any RF disturbance may lead to no liftgate warning. Due to the penetration of the bumper antenna into the liftgate area the lid may open without an Identification Device outside.
- A blind spot in the liftgate similar to any RF disturbance may lead to no liftgate warning

Smart Liftgate

When a user with a valid Smart Key in possession stands in the vicinity of the rear bumper (within LF antenna range) for over 3 seconds, the liftgate is opened.

NOTICE

- Function is set through the User Setting Mode (USM) in the Cluster.

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1. Rear bumper antenna detects valid Smart Key in the vicinity.
2. When a valid Smart Key enters the rear bumper antenna range, alert buzzer and hazard lamp is activated 1 time to acknowledge detection.

> **NOTICE**
> - Smart Key Unit can detect a Smart Key within 0.7 - 1 m of the rear bumper.
> - If the Smart Key stays inside the detection range, alert buzzer and hazard lamp is activated 1 time every second throughout the duration of the Smart Key remaining in the detection range.

3. If the Smart Key remains in the rear bumper detection range (antenna range) for over 3 seconds, alert buzzer and hazard lamp is activated 2 times and the liftgate is opened.

Welcome Light

When a driver holding a smart key approaches the vehicle, the door mirrors and puddle lamps are controlled by smart key authentication.

1. Access to welcome light search mode (Mode that regularly searches for smart key to prevent discharge of vehicle battery)
   – Vehicle converts to armed state by RKE locking or passive locking by the driver.
   – Smart key (SMK) unit searches for deactivation by operating the interior antennas.
   – If smart key is not found inside the vehicle, the smart key (SMK) unit will operate door handle antenna to search for driver approaching the vehicle.
   – Smart key (SMK) unit searches for 3 seconds 3 times by operating the door handle antenna, and if the key is not found for all 3 times, it will enter welcome light search mode.
   – If the door mirror connection mode is activated, the mirror folding operation will be engaged.
2. Welcome light ON
   – In welcome light search mode, smart key is detected when the driver approaches the vehicle.
   – Smart key (SMK) unit sends welcome light ON signal to DDM for 15 seconds via CAN.
   – DDM activates the puddle lamp on the door mirror for 15 seconds. (If the door mirror is connected, mirror unfolding operation will be engaged.)

Remote Starting With Smart Key (only for Middle East Asia)

Start engine by pressing remote start button on smart key in some distance.
(improve convenience for users by activating air conditioning system before boarding vehicle.)

1. Receiving signal distance : MIN 30m (one way signal)
2. Operation time : 10min maximum
3. Operating method
   (1) start engine : in 4seconds press remote engine starting button longer than 2seconds after door has been locked.
   (2) stop engine : press remote engine starting button once.
4. Check starting : able to check engine starting through see blinks of emergency light.
5. For security measure : engine would be stopped when the registered smart key is not in the vehicle with driver during remote starting activated.

Smart Key Reminder 1

1. Preconditions :
   All terminals OFF & at least one door open & locking status is not locked checked by SMK periodically every 100ms, as long as CAN/LIN active.
2. Event:
   At least 1 door knob status changed from unlock to lock.
3. SMK actions :
   - IF NO FOB-IN ACTIVE
     SMK performs a search for the fobs in the interior of the vehicle. The same LF-strategy has to be used as it is defined for the ID out warning (registering only, no authentication
   - IF FOB-IN ACTIVE
     SMK search valid TP

   If no fob or no TP has been found, no action is required.
   If any valid fob or valid TP has been found, SMK unlocks the vehicle by sending a CAN Key Reminder unlock message with the fob number.
   If any valid fob has been found, SMK unlocks the vehicle by sending a CAN/LIN Key Reminder unlock message with the fob number.

Smart Key Reminder 2

1. Preconditions :

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All terminals OFF & any door (including liftgate) open & no FOB-IN & no locking status (checked by SMK periodically every 100ms, as long as CAN/LIN active)

2. Vehicle action :
   Closing last door or liftgate with knobs locked state, or with a locking in progress
3. SMK actions :
   Before elapsing 500ms after the closing if all doors are locked then :
   - IF NO FOB-IN ACTIVE
     SMK performs a search for the fobs in the interior of the vehicle.
     The same LF-strategy has to be used as it is defined for the ID out warning (registering only, no authentication)
   - IF FOB-IN ACTIVE
     SMK search valid TP

   If no fob has been found, no action is required.
   If any valid fob or valid TP has been found, SMK sends unlock command via CAN and activates ext. buzzer warning.
   If any valid fob has been found, SMK sends unlock command via CAN/LIN and activates ext. buzzer warning.

Smart Key Door Lock Warning

Door Lock Warning 1

1. If terminal state is ACC or IGN and all doors are closed and that user triggers a SMK lock, a search is started at the exterior of the vehicle from the side of the trigger.
2. If no valid Fob is found no action is required, but if a valid Fob is found then a Buzzer warning shall be started.
3. If "liftgate Option == On" and "liftgate LockUnlockOption == On" are fullfilled, Lock warning is including liftgate as a door and liftgate lockunlock knob as a door unlock switch.

Door Lock Warning 2

1. If terminal state is OFF and not all doors are closed and that user triggers a SMK lock, a search is started at the exterior of the vehicle from the side of the trigger.
2. If no valid Fob is found no action is required, but if a valid Fob is found then a Buzzer warning shall be started.
3. If "liftgate Option == On" and "liftgate LockUnlockOption == On" are fullfilled, Lock warning is including liftgate as a door and liftgate lockunlock knob as a door unlock switch.

Door Lock Warning 3

1. If terminal state is OFF and ATWS is considered as Disarmed and all doors are closed and that user triggers a SMK lock, a search is started at the Interior of the vehicle;
2. if no valid Fob is found the search for SMK locking will be started, but if a valid Fob is found then a Buzzer warning shall be started.
3. If "liftgate Option == On" and "liftgate LockUnlockOption == On" are fullfilled, Lock warning is including liftgate as a door and liftgate lockunlock knob as a door unlock switch.

Smartkey Lamp Warning

1. If terminal state is ACC or IGN and vehicle speed is less than 3km/h, a periodic search (every 3s) is done at the interior of the vehicle to check that the valid fob is still in the in the vehicle.
2. If no valid Fob is found a Warning is started, but if a valid Fob is found then no action is started.

Failsafe Functions (Backup For Limp Home)

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

- Unlocking / locking of doors or trunk (or liftgate depending of the vehicle configuration): use of mechanical key

User Information Functions

ID OUT Warning

1. Preconditions :
   - (ACC or IGN1) & (any door open or liftgate open)
2. Event:
   The last opened door is closed
3. SMK action :
   SMK searches for a SMART KEY FOB in the interior.

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- If no valid SMART KEY FOB is found, the SMK activates external buzzer and also sends ID OUT warning via CAN (exterior buzzer warning and internal buzzer warning).
- If a door is opened and closed again during terminals on and inside valid fob, SMK re-enables the authentication and stops the warning. If the terminal is in ACC, SMK shall turn on immobilizer lamp.

NOTICE

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

Fob Battery Low Voltage Detection

To detect fob low battery condition, certain battery voltage measurement and low voltage detection strategy are implemented into fob. The measurement of the battery voltage will be done if fob button is pressed or if a LF measurement command is received.

Learning Description

In this chapter, the learning procedure for SMK and FOBs is described.
For the learning of the SMK and FOBs, it"s necessary to have a connection to the diagnostic tool.

Learning MODE

Whatever the mode, the learning procedures are managed by the SMK.
Prior to start learning service, Fob-In signal must be active and the vehicle secret code (called as PIN code) should be known.

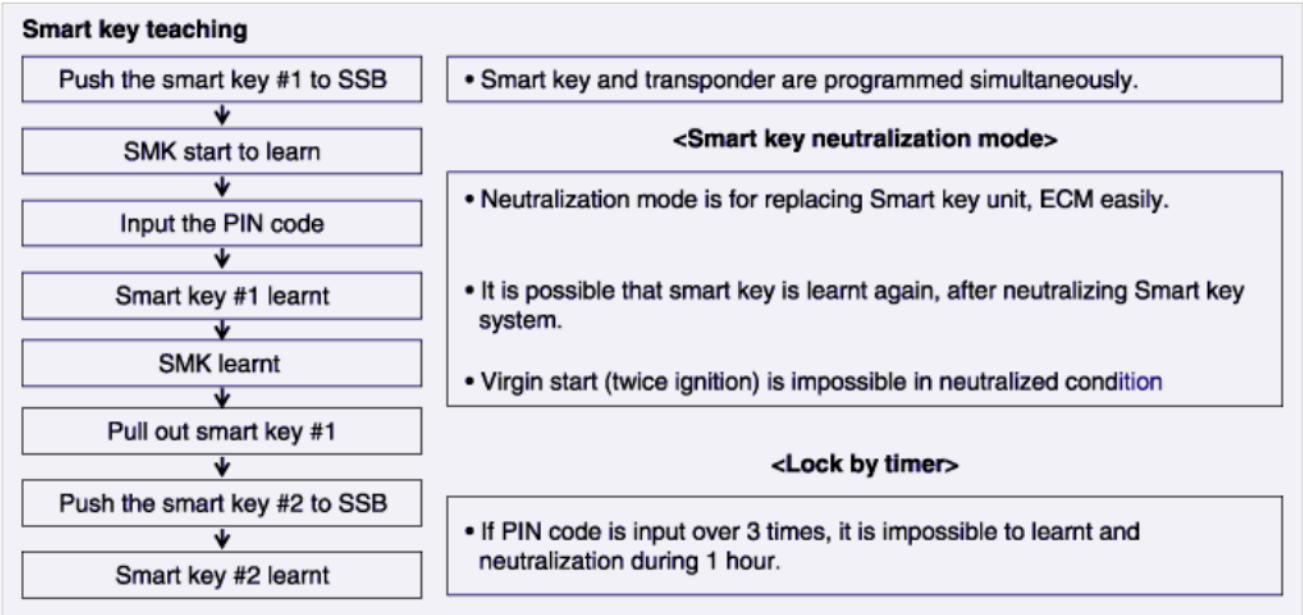
Teaching MODE

This mode is used by the dealers in order to replace SMK and/or the set of keys, or to register additional keys for an existing system. That means the system already has been learnt with certain PIN Code. The PIN Code is fixed for the life time of the vehicle, therefore the same PIN Code must be used in this mode. Otherwise learning will be failed

Teaching MODE Procedure Description (Step By Step)

Objective : Key teaching procedure at service station
Initial state :

– SMK replacement : SMK is not learnt and SMART FOB are already learnt with same PIN code
– Additional or new keys teaching: SMK are already learnt with same PIN code

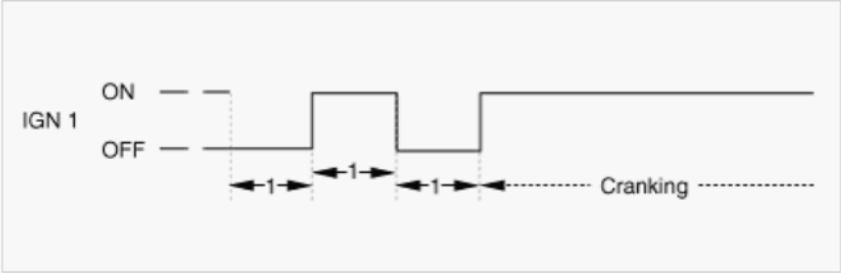


Starting After Replacing (Virgin Start)

Starting is possible by following process after replacing new smart key unit, FOB key.

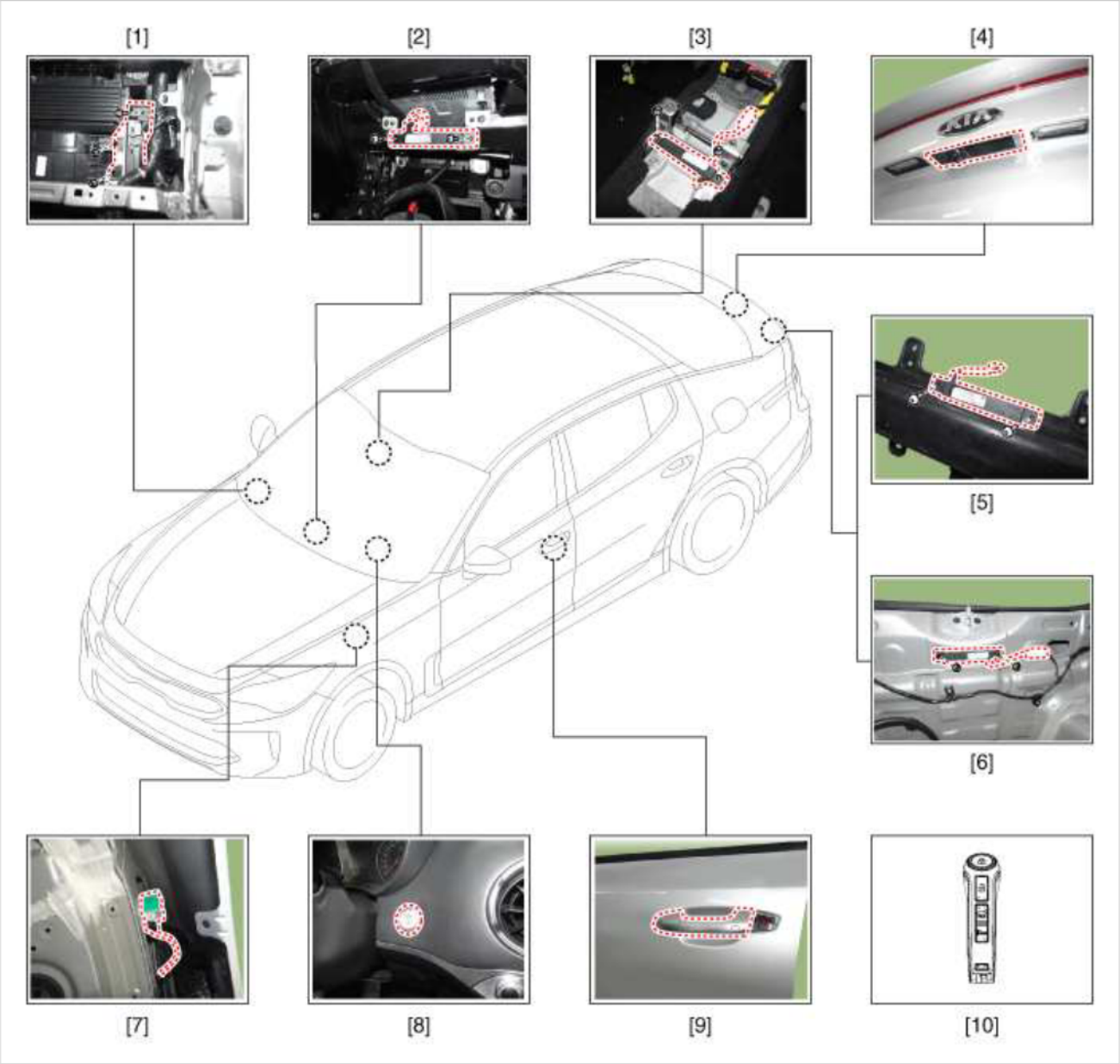
- It is for starting at virgin condition
- All related parts are virgin condition (Smart key, ECM)
- Press brake pedal in P or N range
- Push the start button once with virgin smart key.

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Component Location



1. Integrated body control unit (IBU)
2. Interior antenna 1
3. Interior antenna 2
4. Liftgate open switch
5. Bumper antenna
6. Liftgate antenna
7. Buzzer
8. Start Stop Button (SSB)
9. Door handle & door antenna
10. FOB key

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Inspection

1. In the body electrical system, failure can be quickly diagnosed by using the vehicle diagnostic system (KDS).
   The diagnostic system (KDS) provides the following information.
   (1) Self diagnosis : Checking failure and code number (DTC).
   (2) Current data : Checking the system input/output data state.
   (3) Actuation test : Checking the system operation condition.
   (4) Additional function : Controlling other features including system option setting and zero point adjustment
2. Select the "Car model" and the "IBU-SMK" to be checked in order to check the vehicle with the tester.
3. Select the "Current Data" menu to search the current state of the input/output data.
4. If you want to check each module operation forcefully, select "Actuation test".

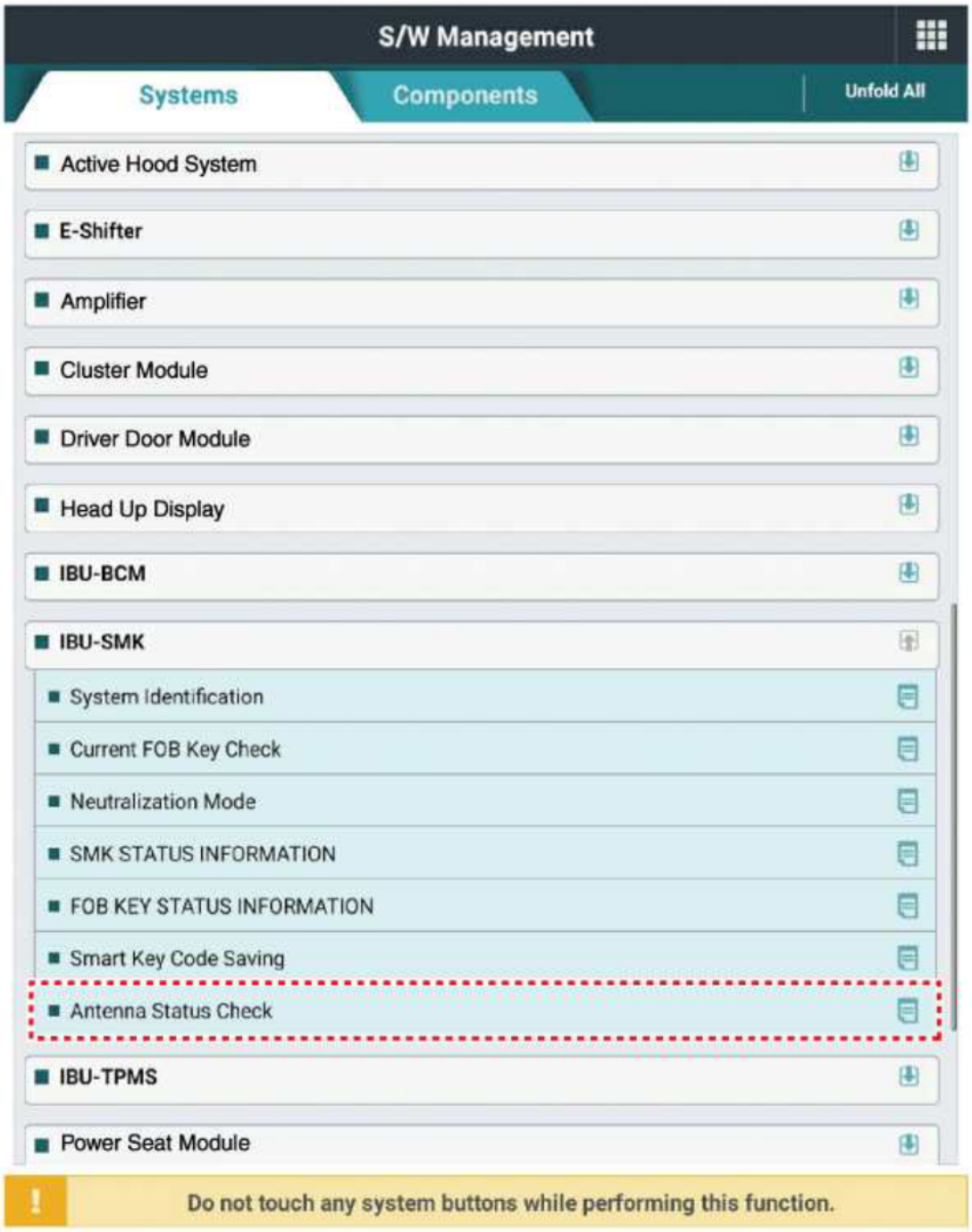
Antenna Actuation Diagnosis

1. Connect the cable of KDS to the data link connector in driver side crash pad lower panel.
2. After IG ON, select the "Actation Test".
3. Set the smart key near the related antenna and operate it with a KDS.
4. If the LED of smart key is blinking, the smart key is normal.
5. If the LED of smart key is not blinking, check the voltage of smart key battery.
6. Antenna actuation
   – Interior Antenna 1
   – Interior Antenna 2
   – Liftgate Antenna
   – Bumper Antenna
   – Driver Door Antenna
   – Assist Door Antenna

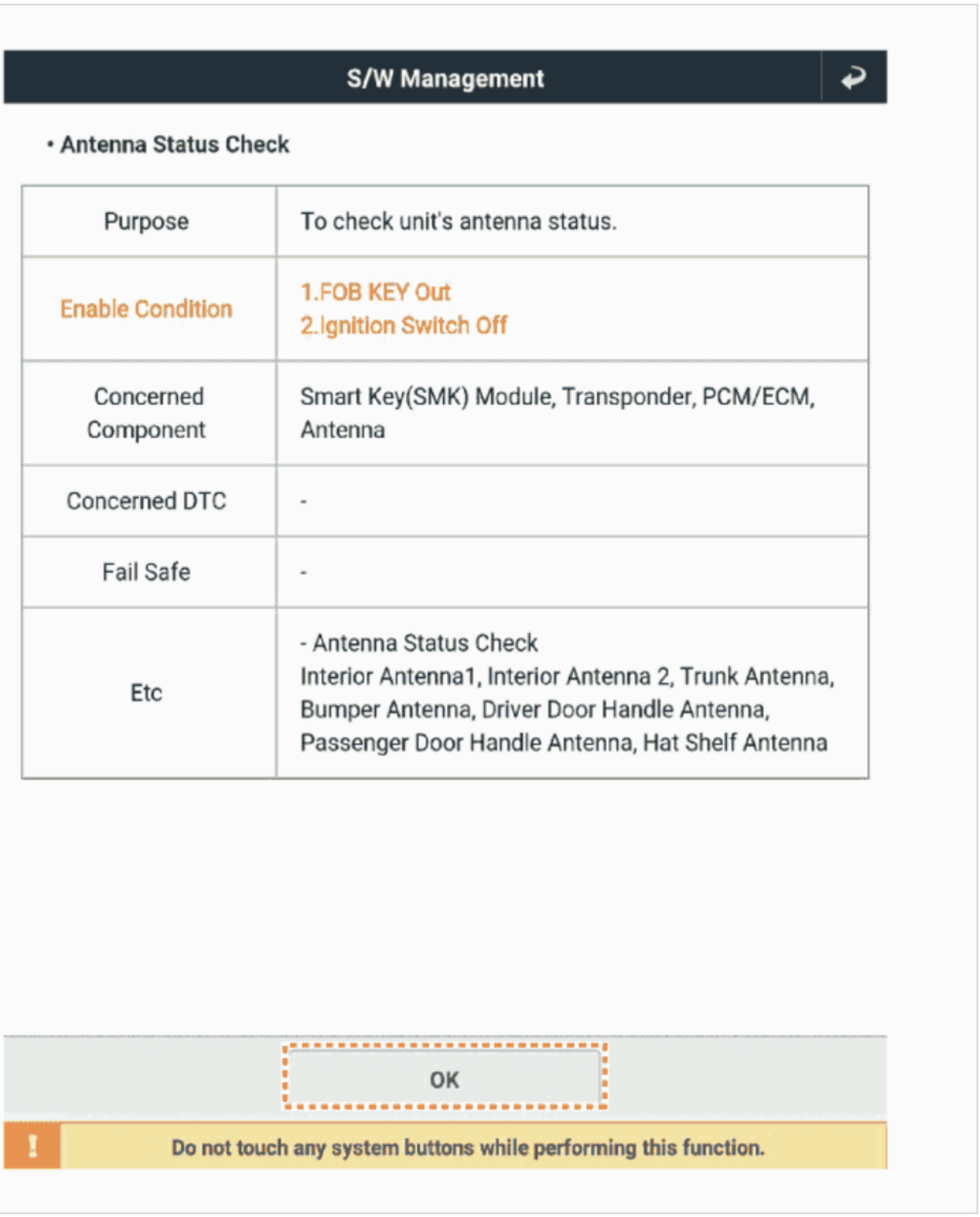
Antenna Status Check

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

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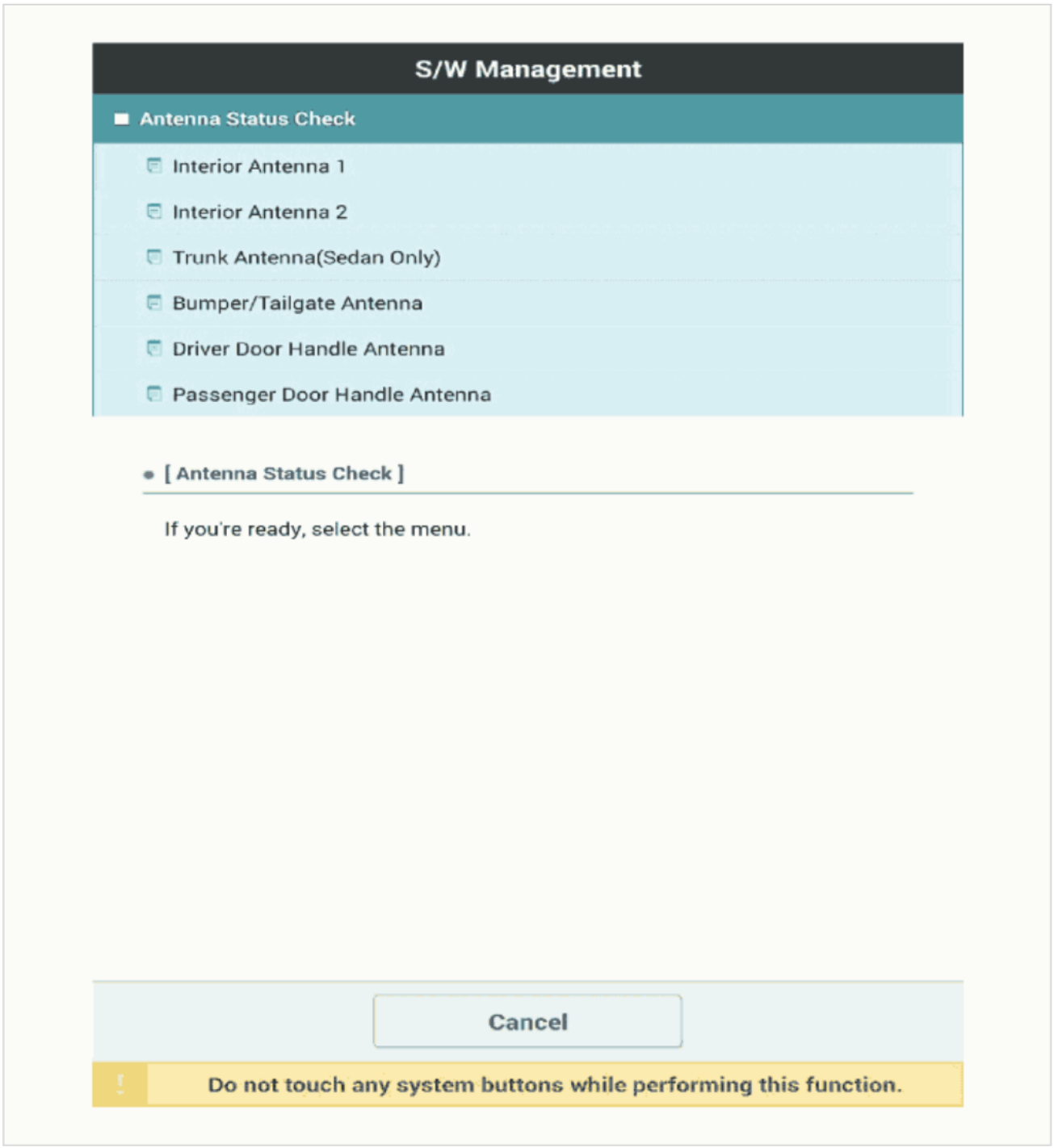


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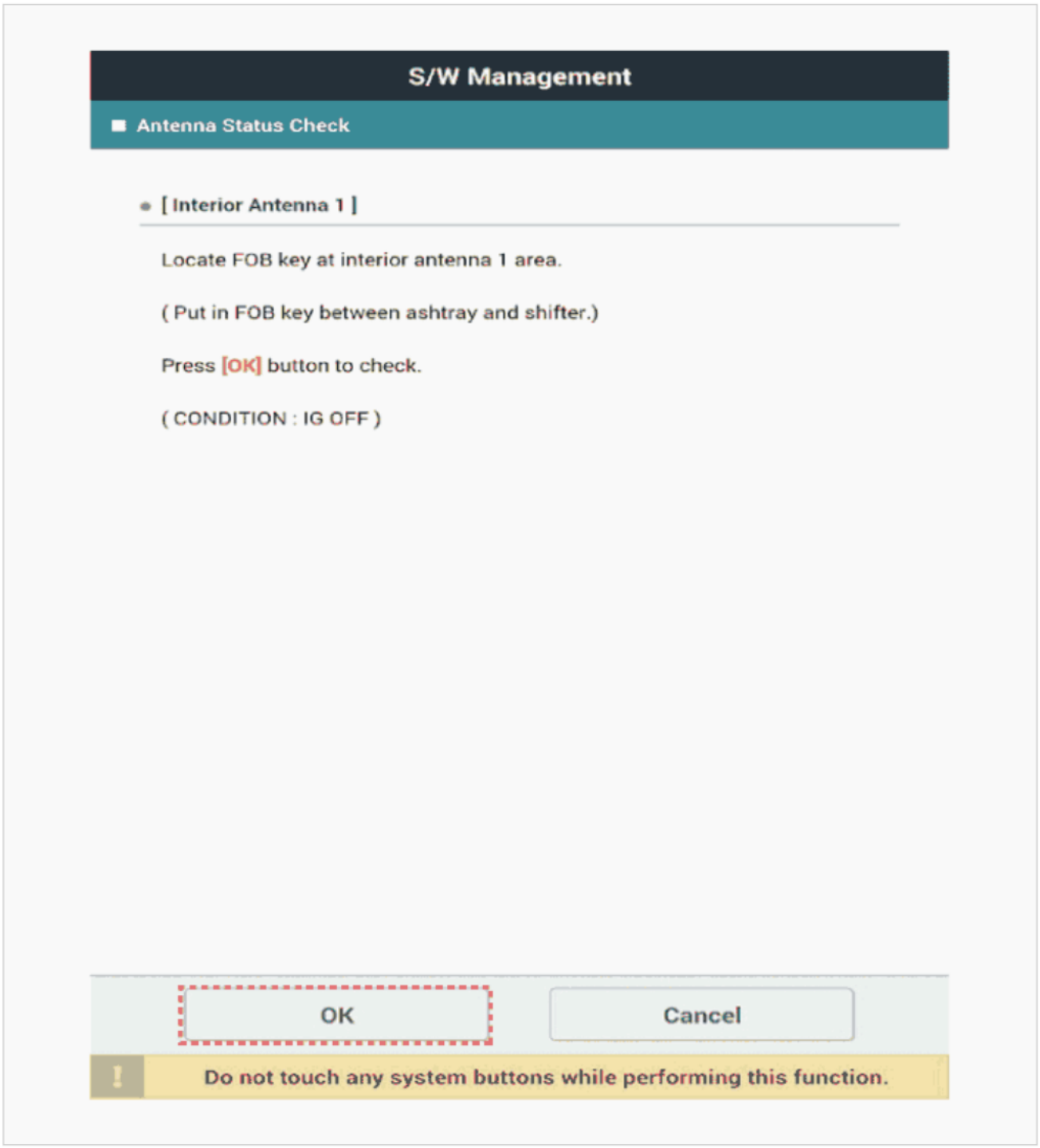
3. After IG ON, select the "Antenna Status Check".

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

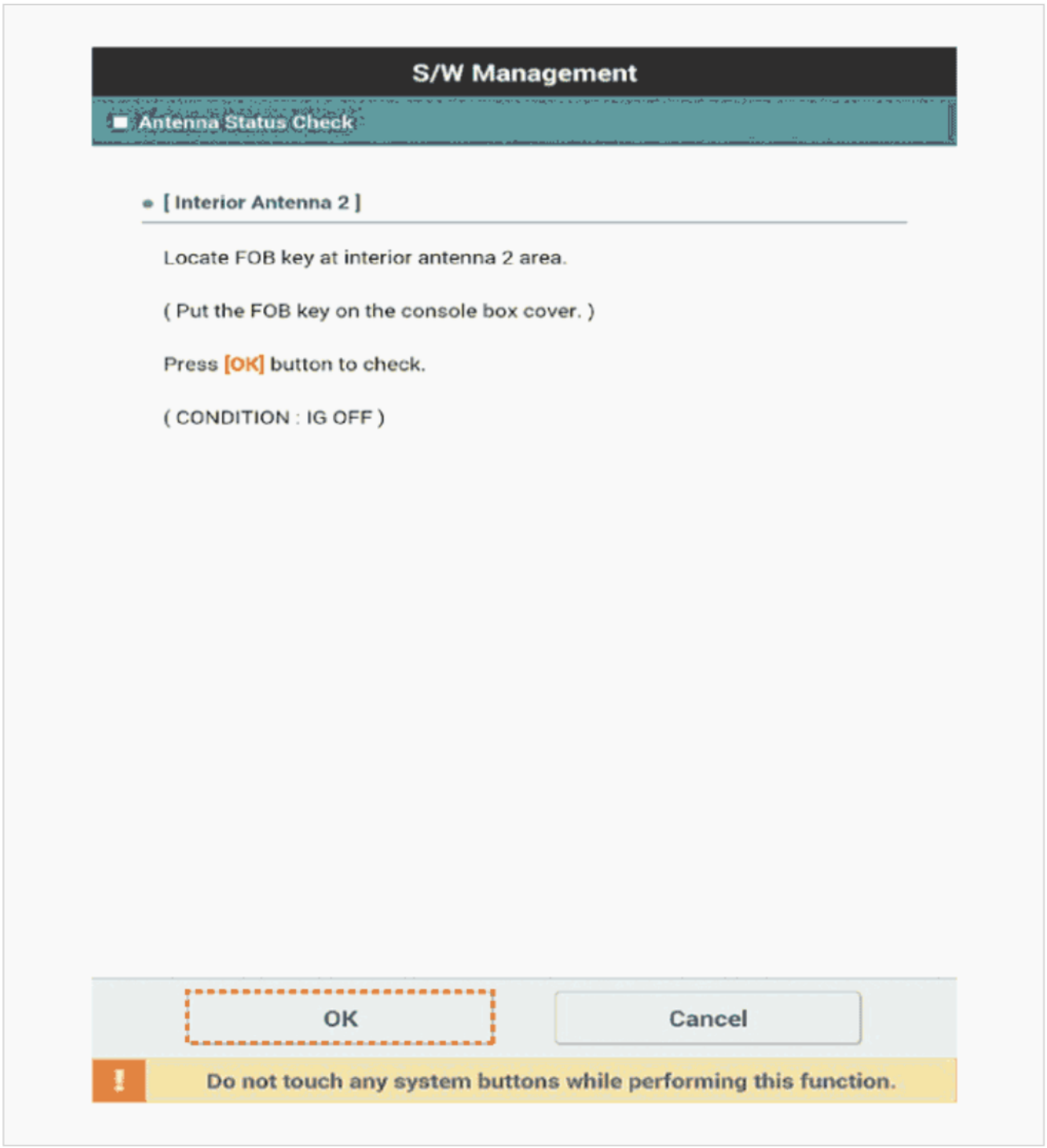
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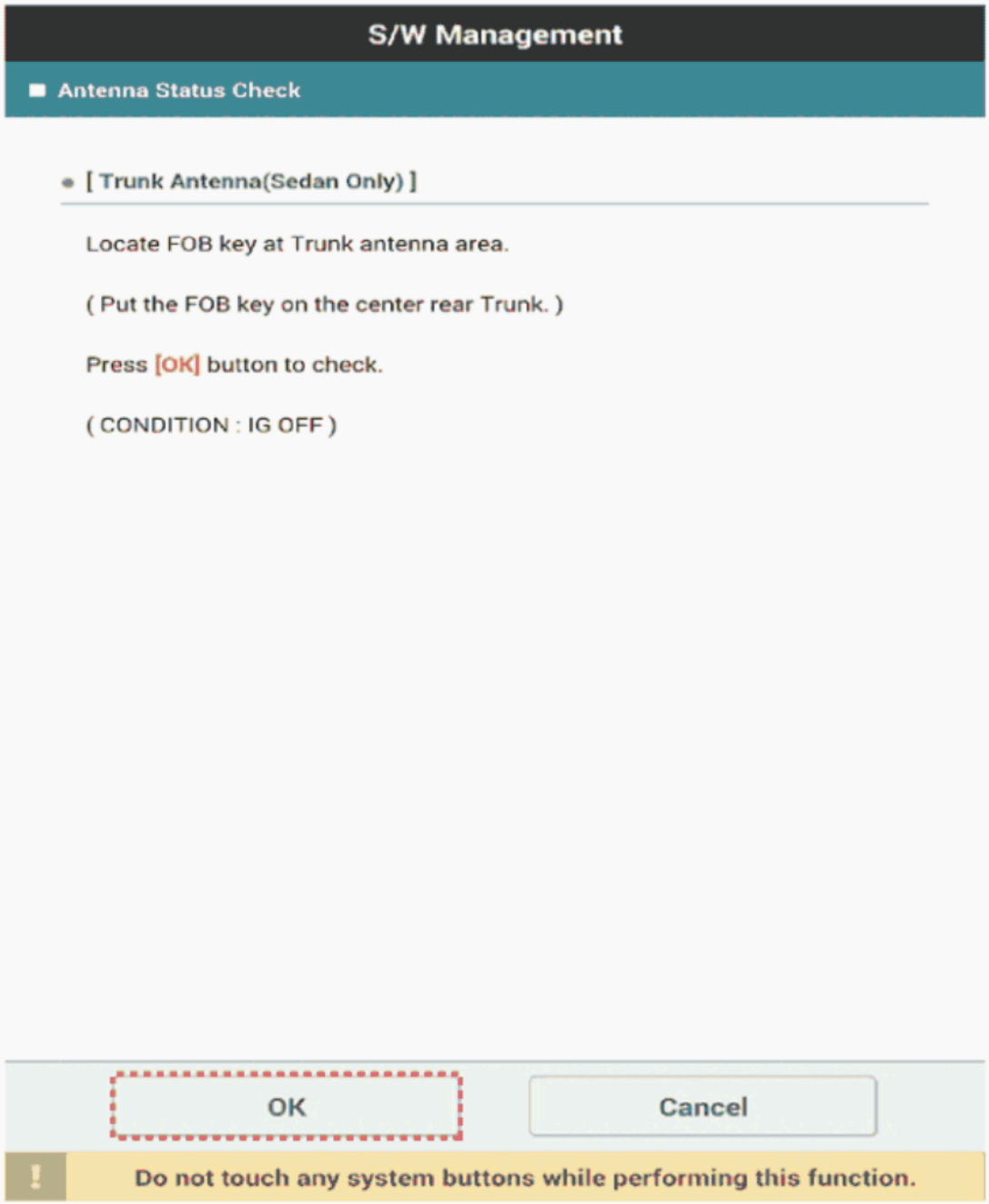
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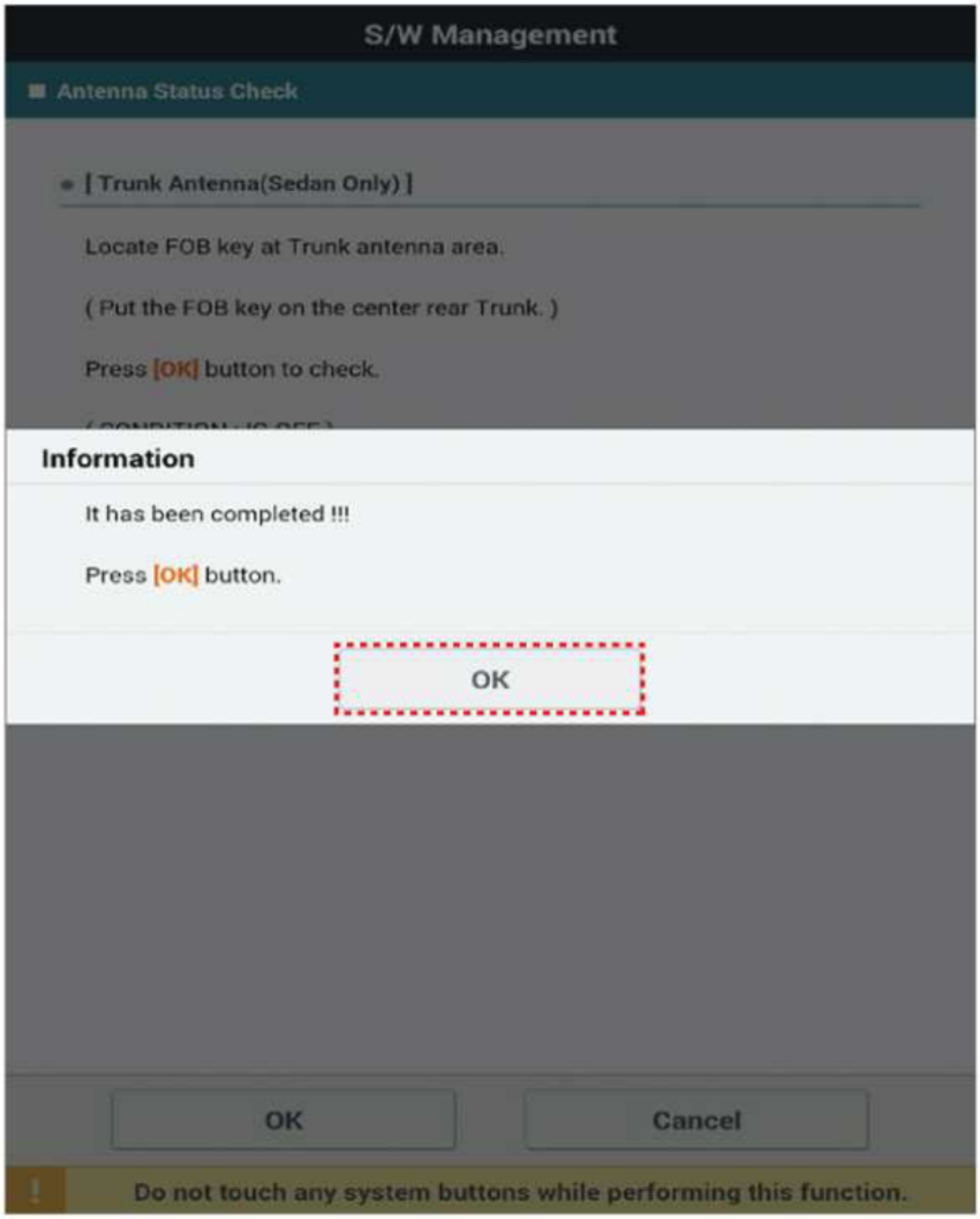
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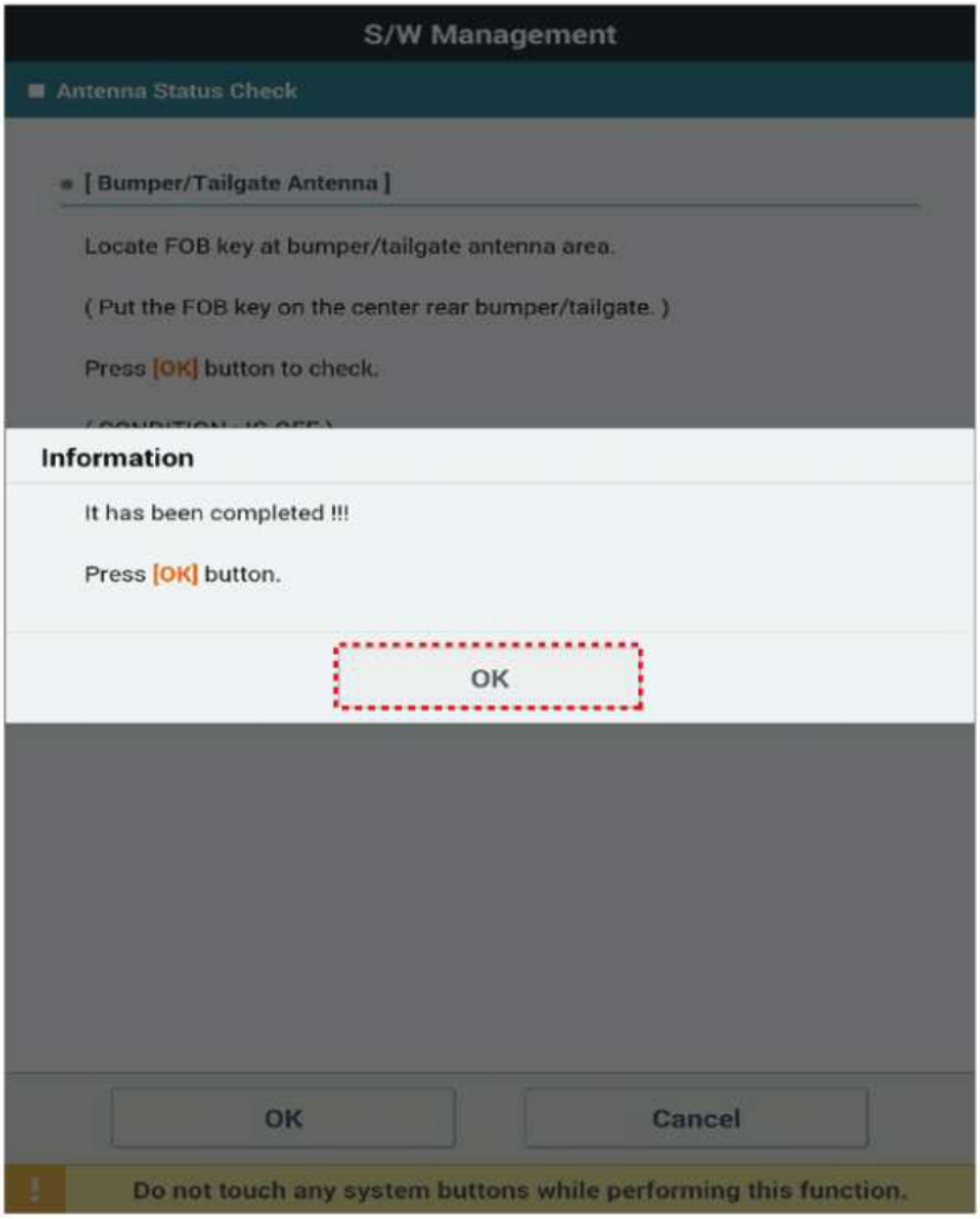
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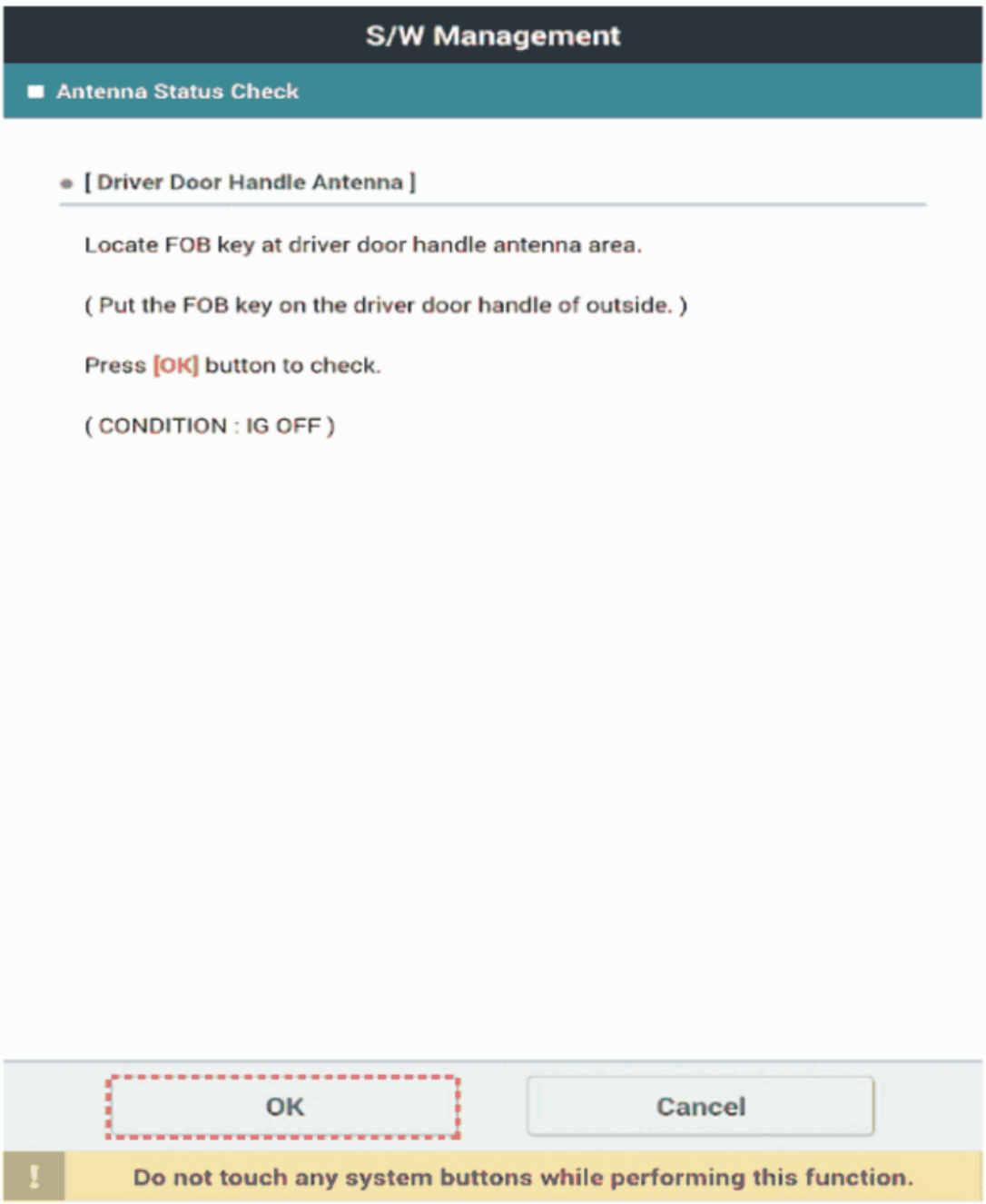
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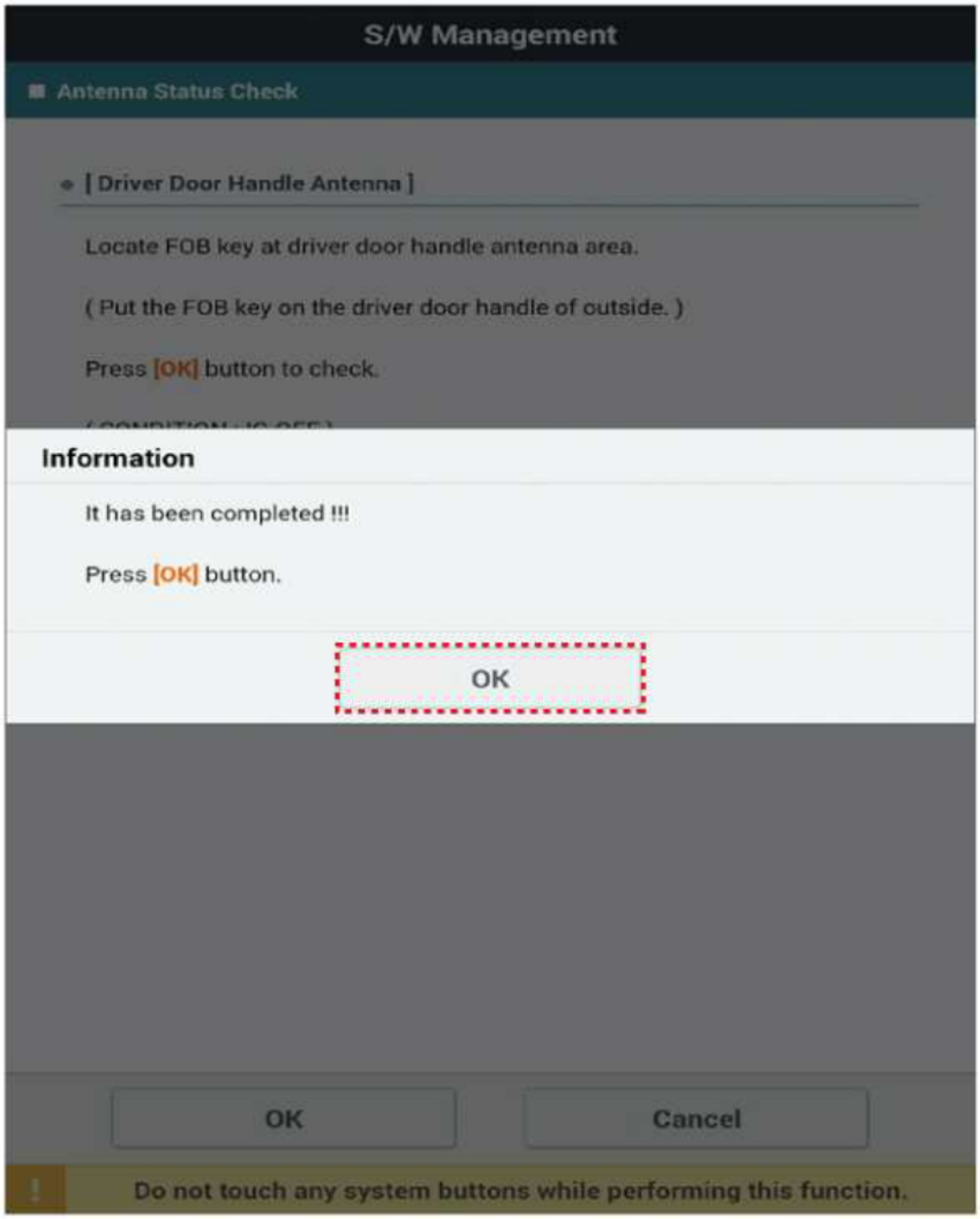
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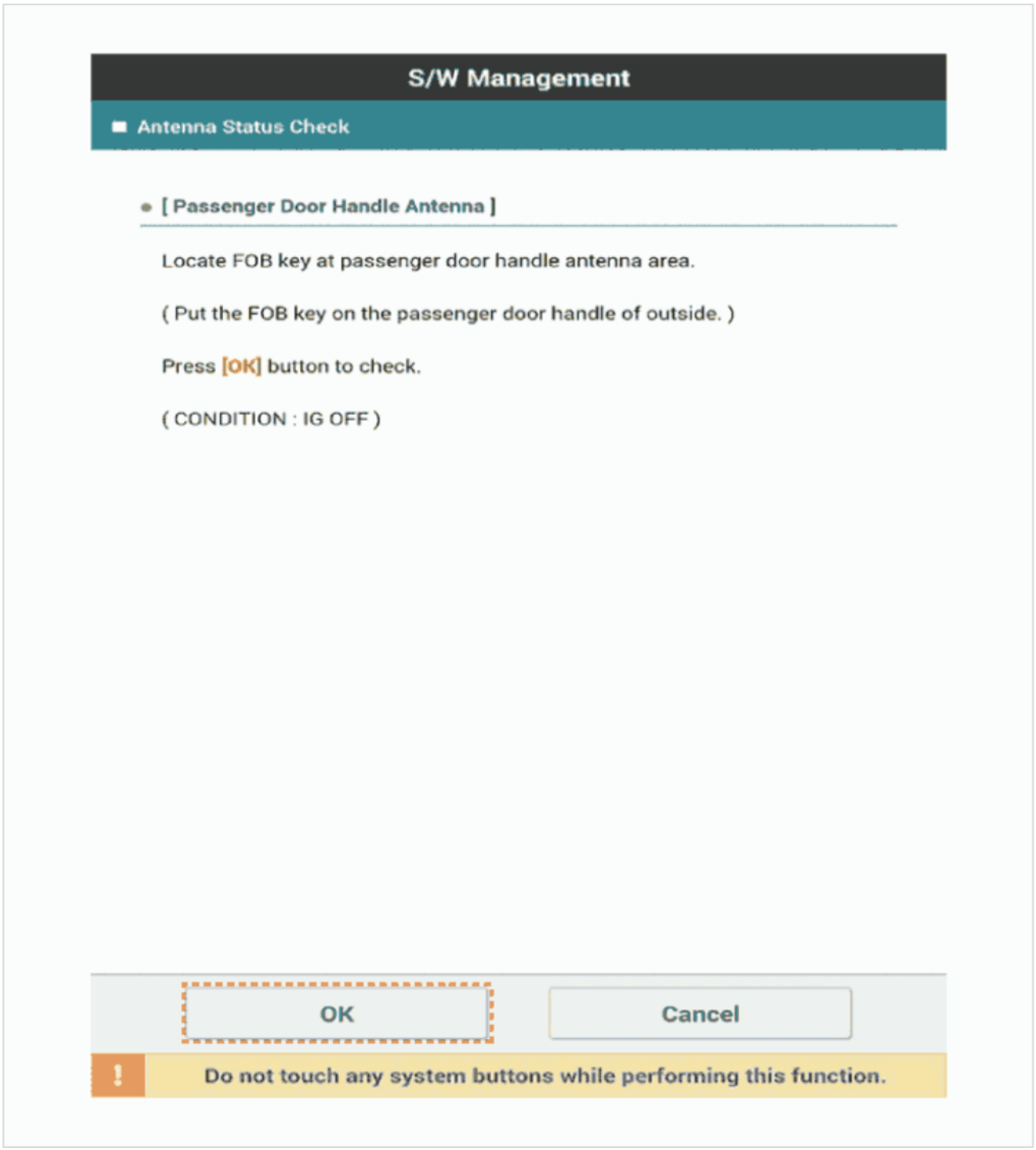
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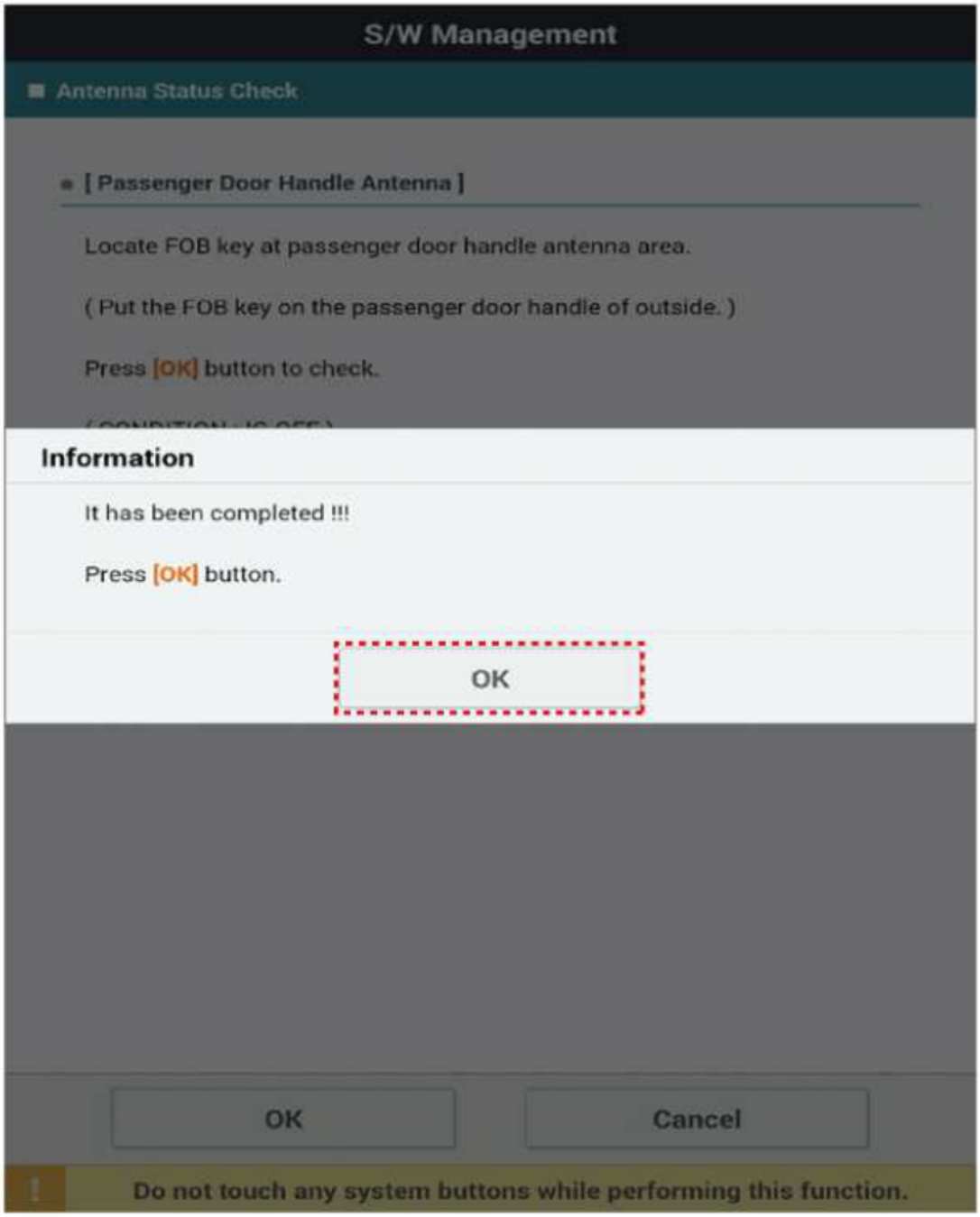
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5. If the smart key runs normal , the related antenna, smart key(transmission, reception) and exterior receiver are normal.
6. Antenna status
   - Interior Antenna 1
   - Interior Antenna 2
   - Liftgate Antenna
   - Bumper Antenna
   - Driver Door Antenna
   - Assist Door Antenna

FOB Status Check

1. Connect the cable of KDS to the data link connector in driver side crash pad lower panel.
2. After IG ON, select the "FOB KEY STATUS INFO".

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S/W Management

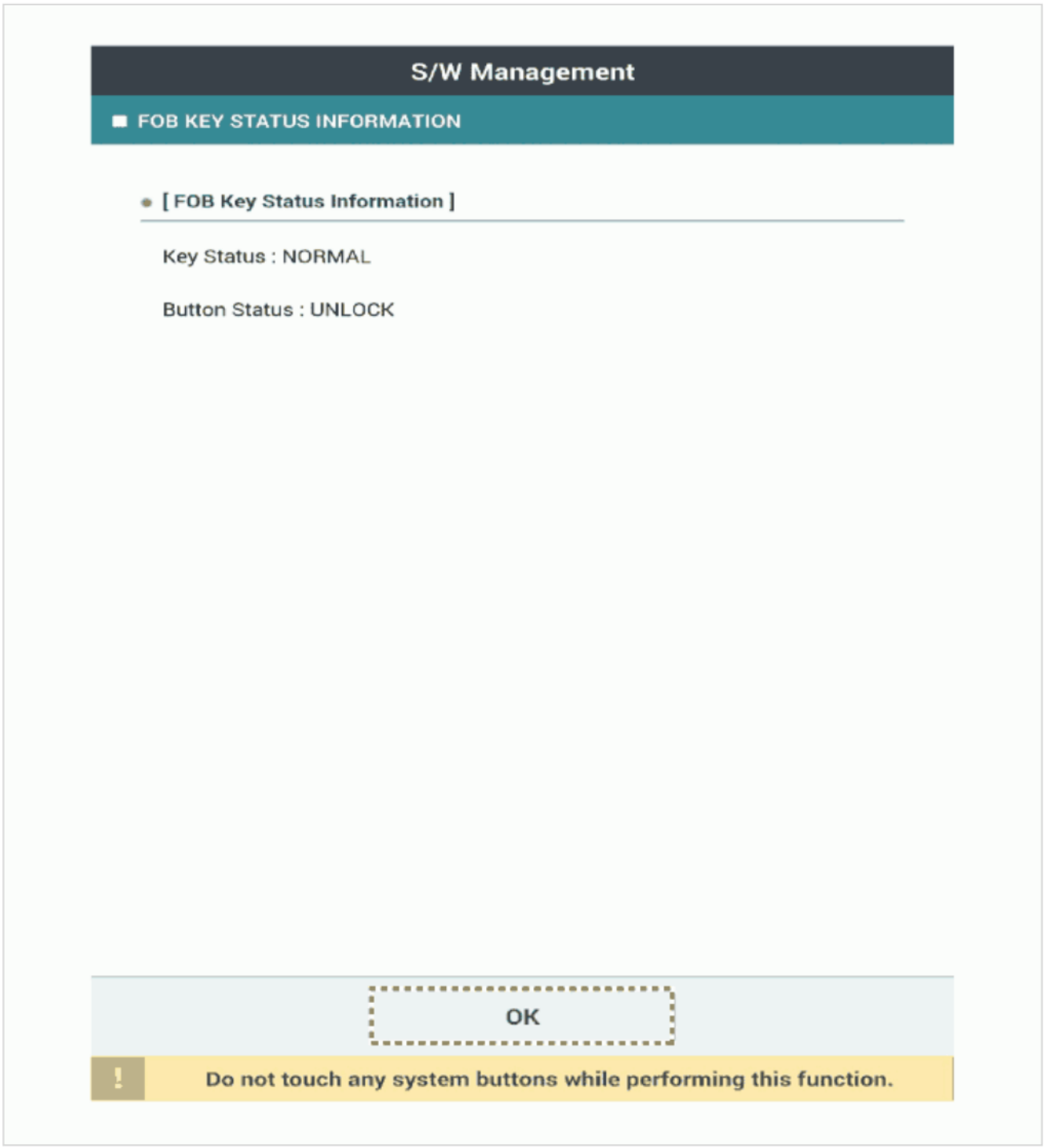
• FOB KEY Status Information

Purpose	To check unit's status.
Enable Condition	1.Engine Off 2.Ignition Switch On
Concerned Component	Smart Key(SMK) Module
Concerned DTC	-
Fail Safe	-
Etc	KEY Status : NORMAL Button Status : UNLOCK

OK

Do not touch any system buttons while performing this function.

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Smart Key Status Check

1. Connect the cable of KDS to the data link connector in driver side crash pad lower panel.
2. After IG ON, select the "SMK STATUS INFO".

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S/W Management

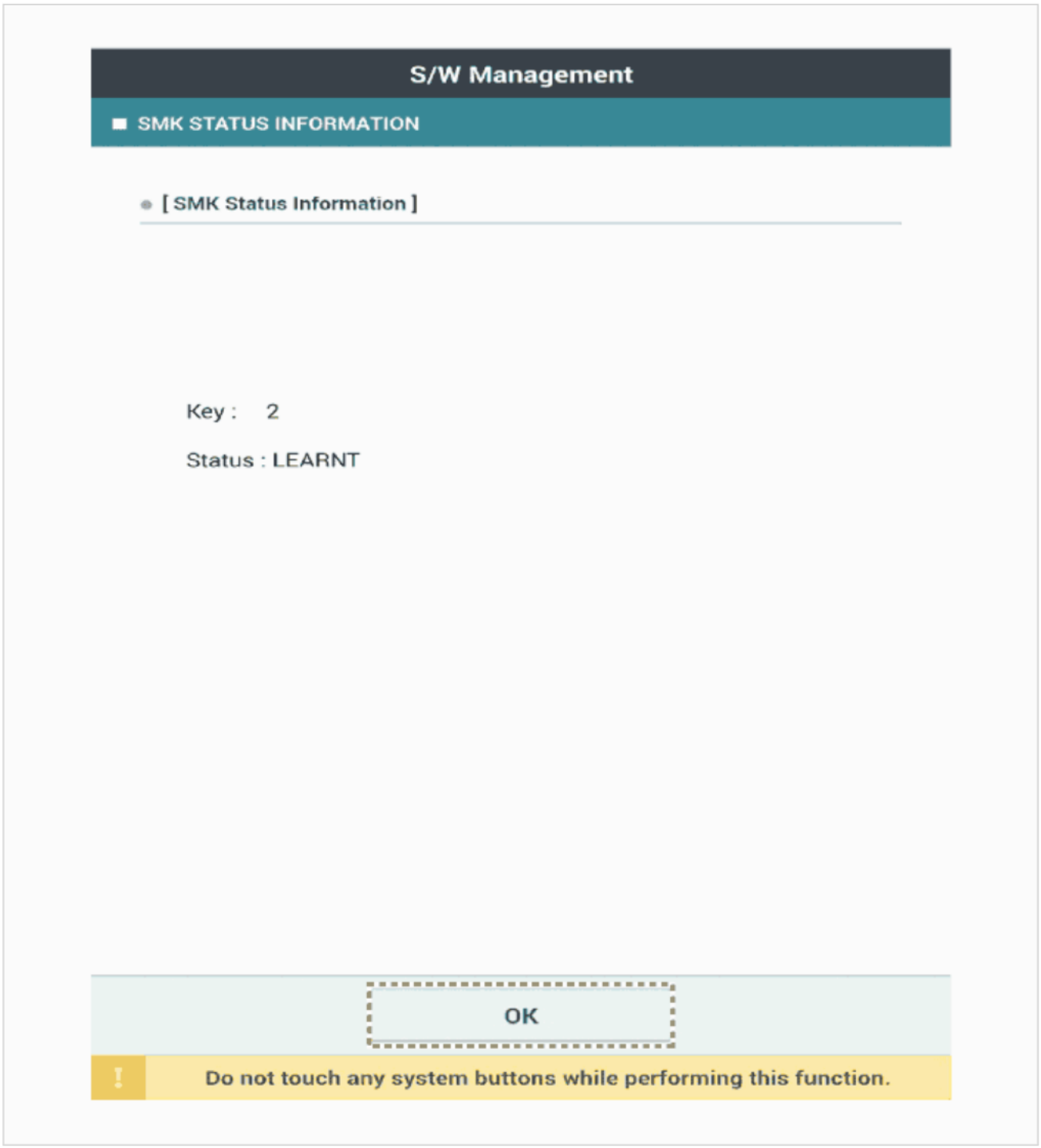
• SMK STATUS INFORMATION

Purpose	To check smart key status.
Enable Condition	1. Engine Off 2. Ignition Switch On
Concerned Component	Smart Key(SMK) Module
Concerned DTC	-
Fail Safe	-
Etc	-

OK

! Do not touch any system buttons while performing this function.

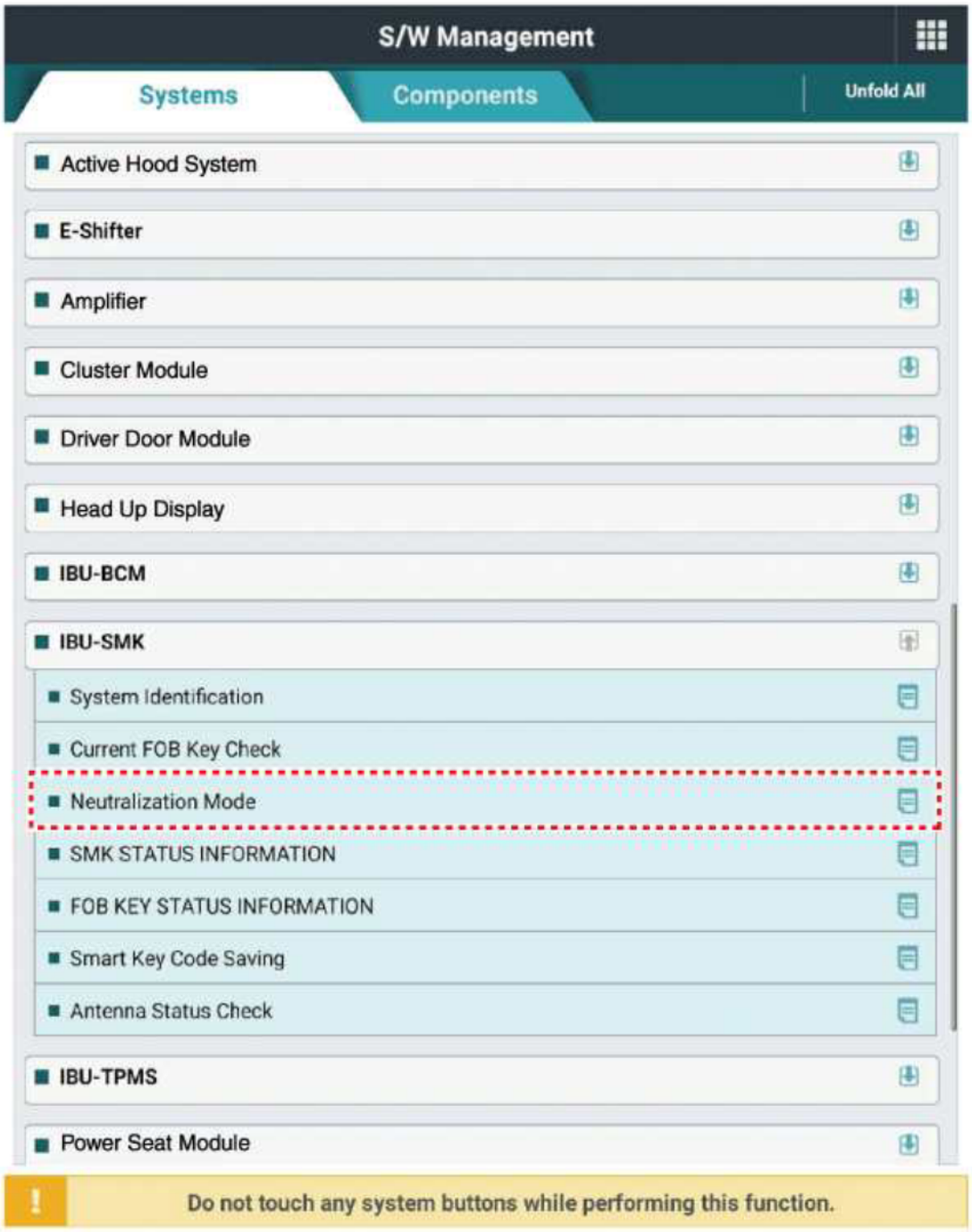
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Neutralization Status Check

1. Connect the cable of KDS to the data link connector in driver side crash pad lower panel.
2. After IG ON, select the "Neutralization mode".

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S/W Management

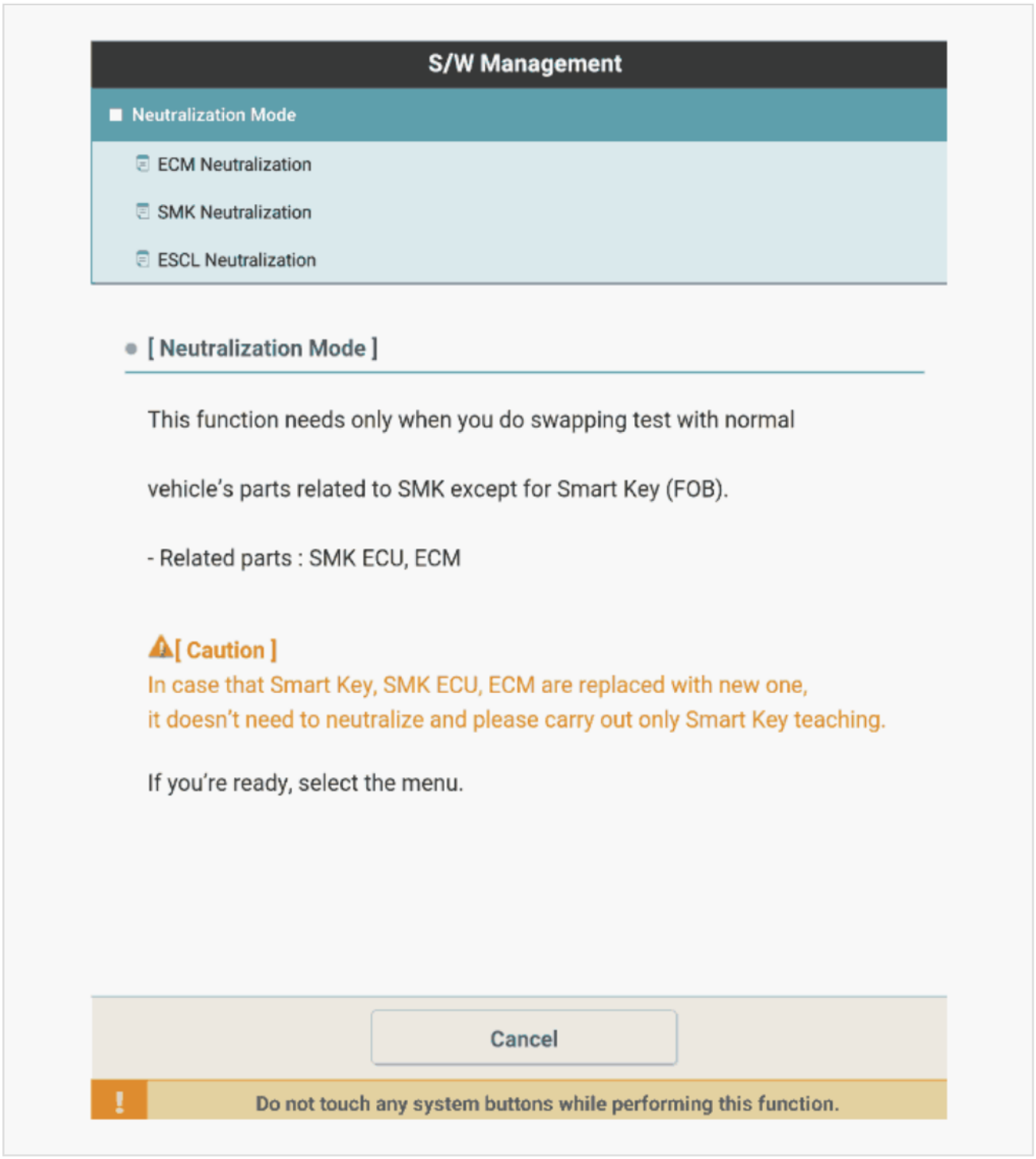
• **Neutralization Mode**

Purpose	To initialize the units that related to SMK.
Enable Condition	1.Engine Off 2.Ignition Switch On
Concerned Component	ECM, Intelligent Power Module(IPM), Power Distribution Module(PDM), Electronic Steering Column Lock(ESCL)
Concerned DTC	-
Fail Safe	-
Etc	- Neutralization Mode ECM Neutralization, IPM Neutralization, PDM Neutralization, ESCL Neutralization

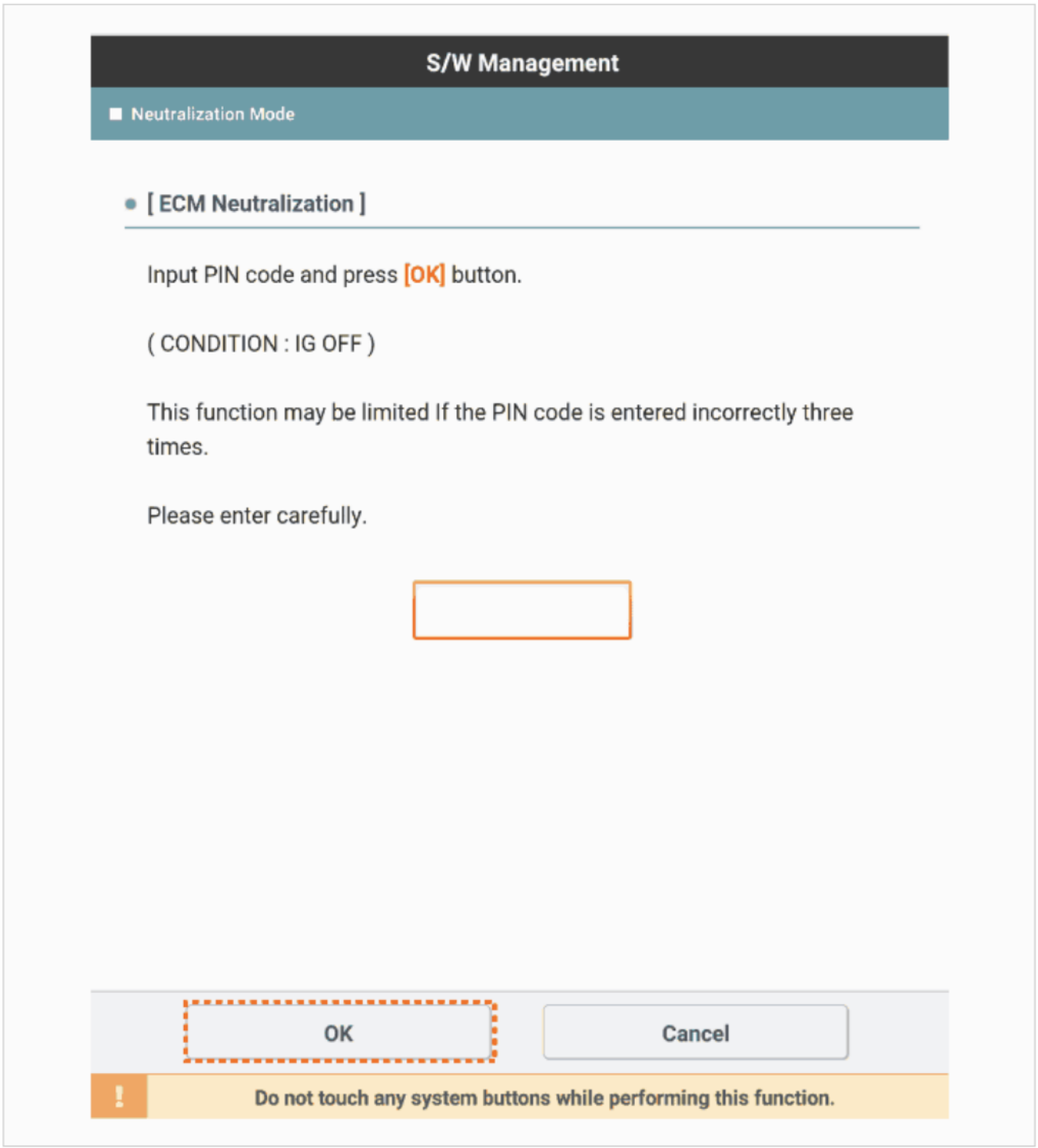
OK

Do not touch any system buttons while performing this function.

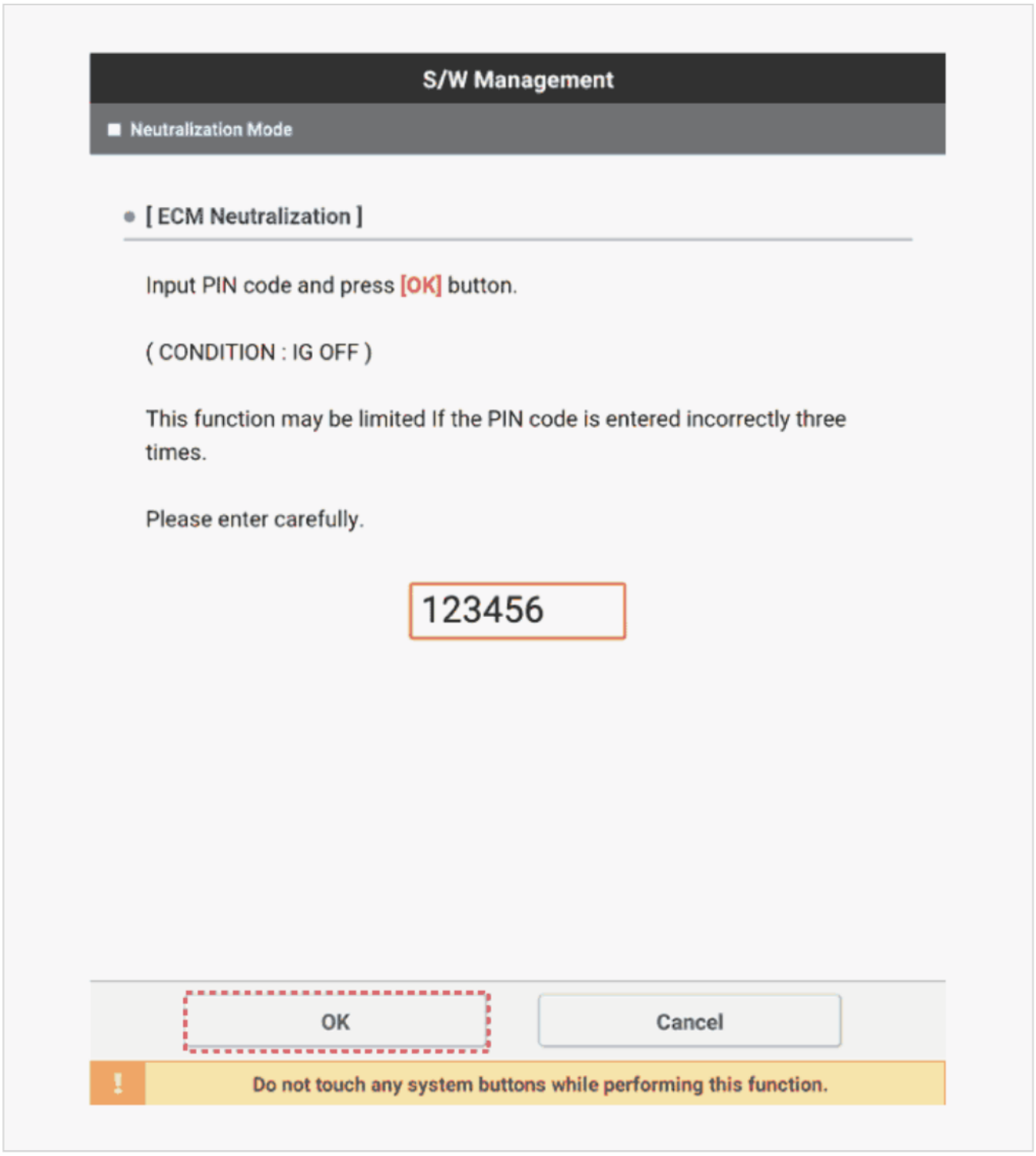
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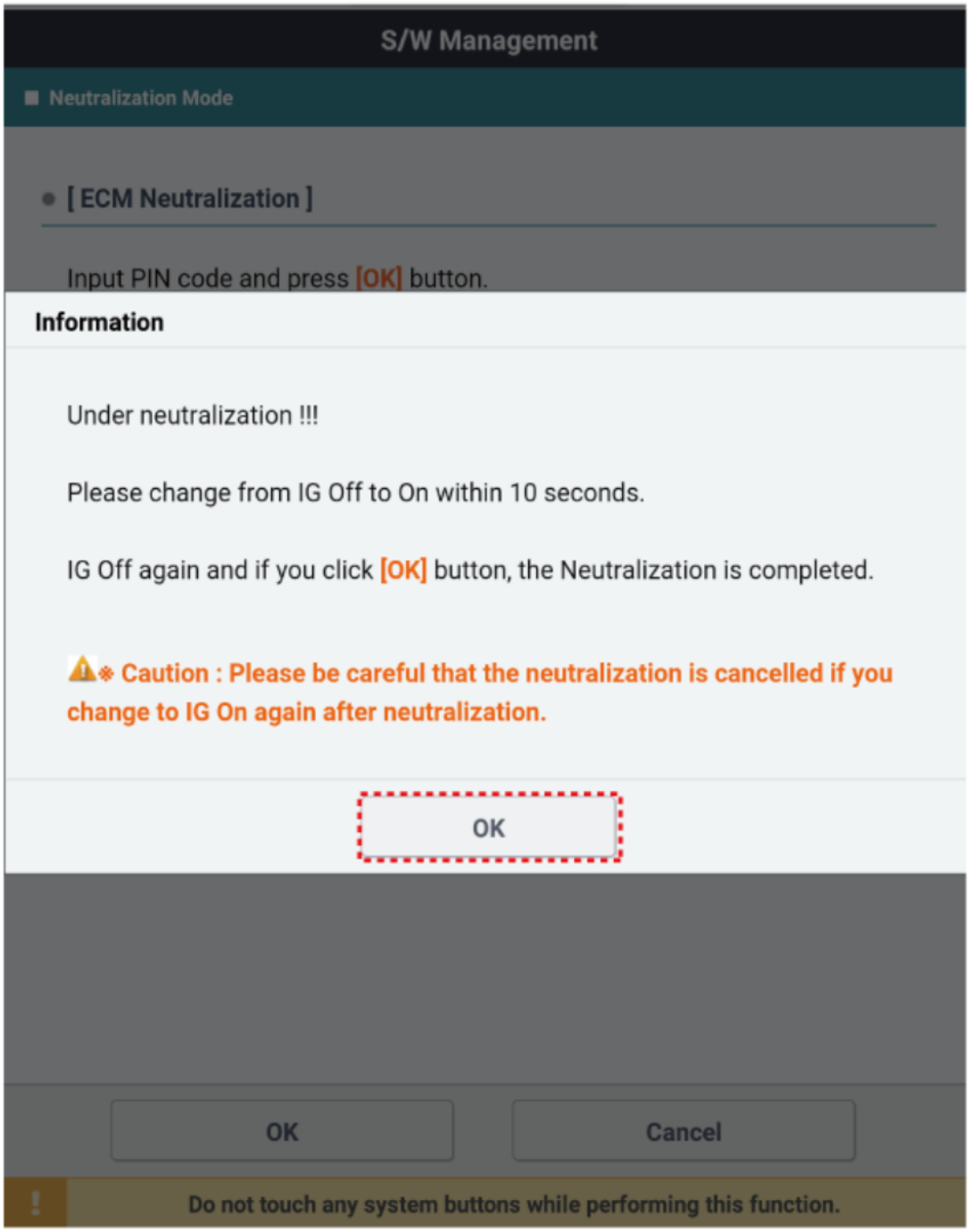
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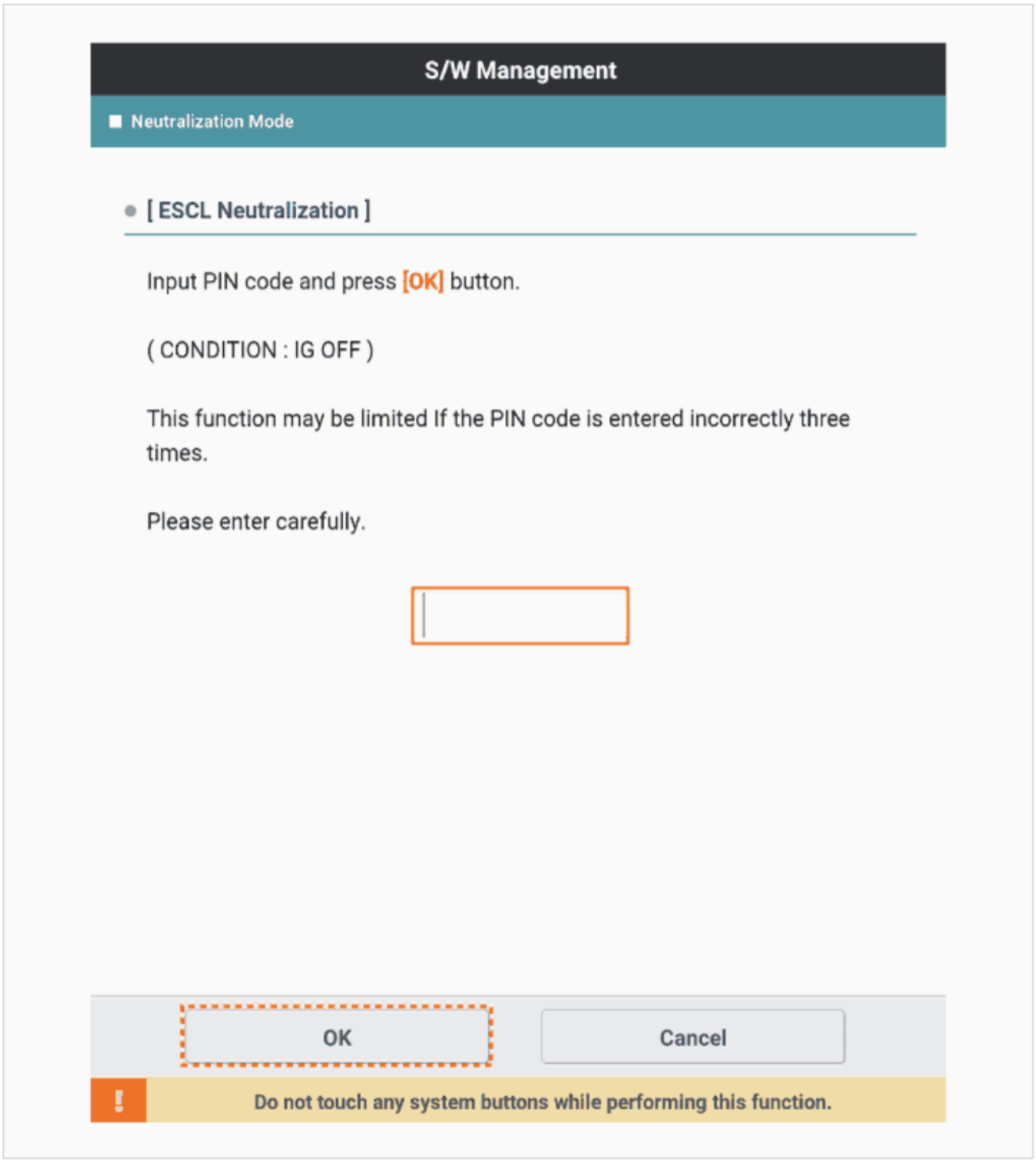
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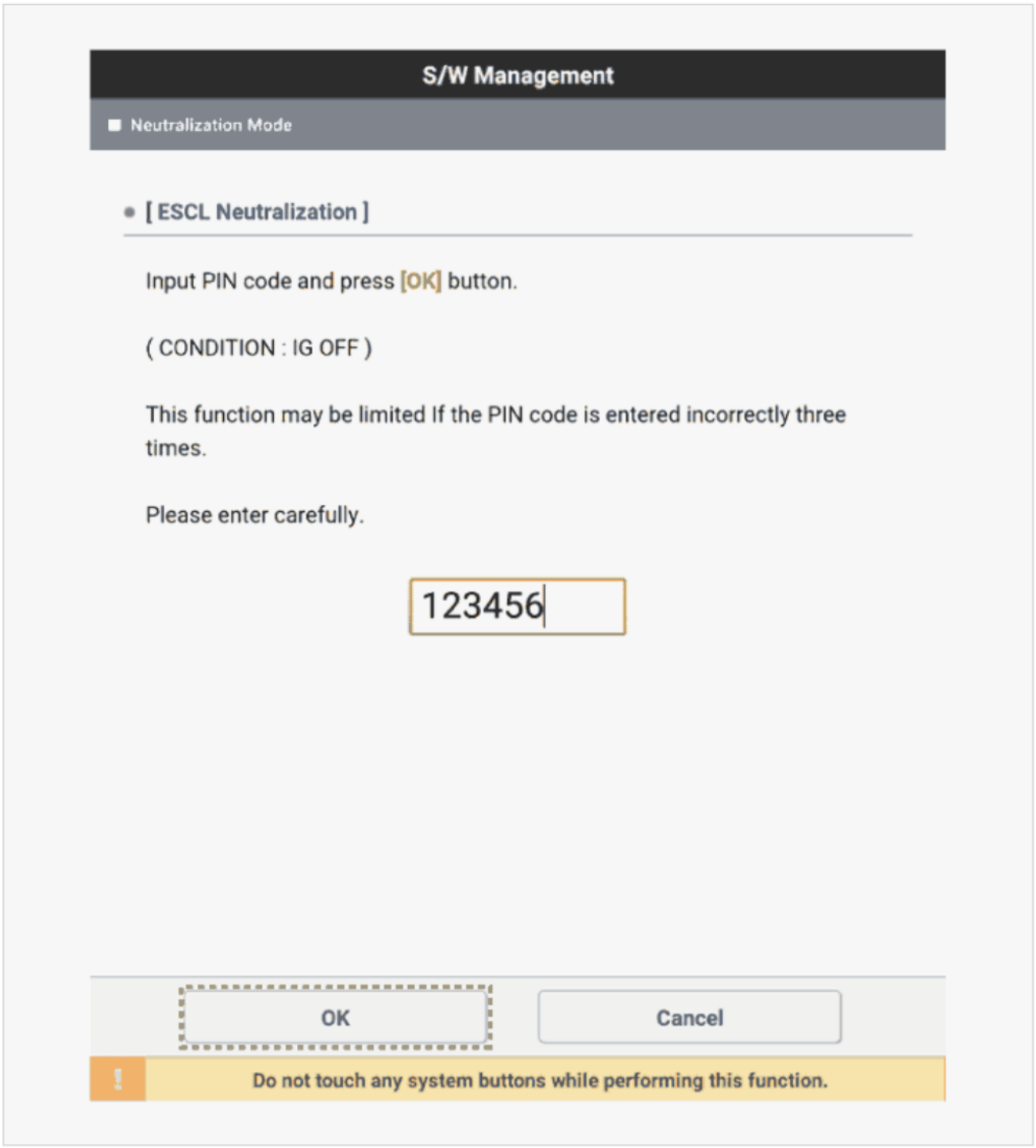
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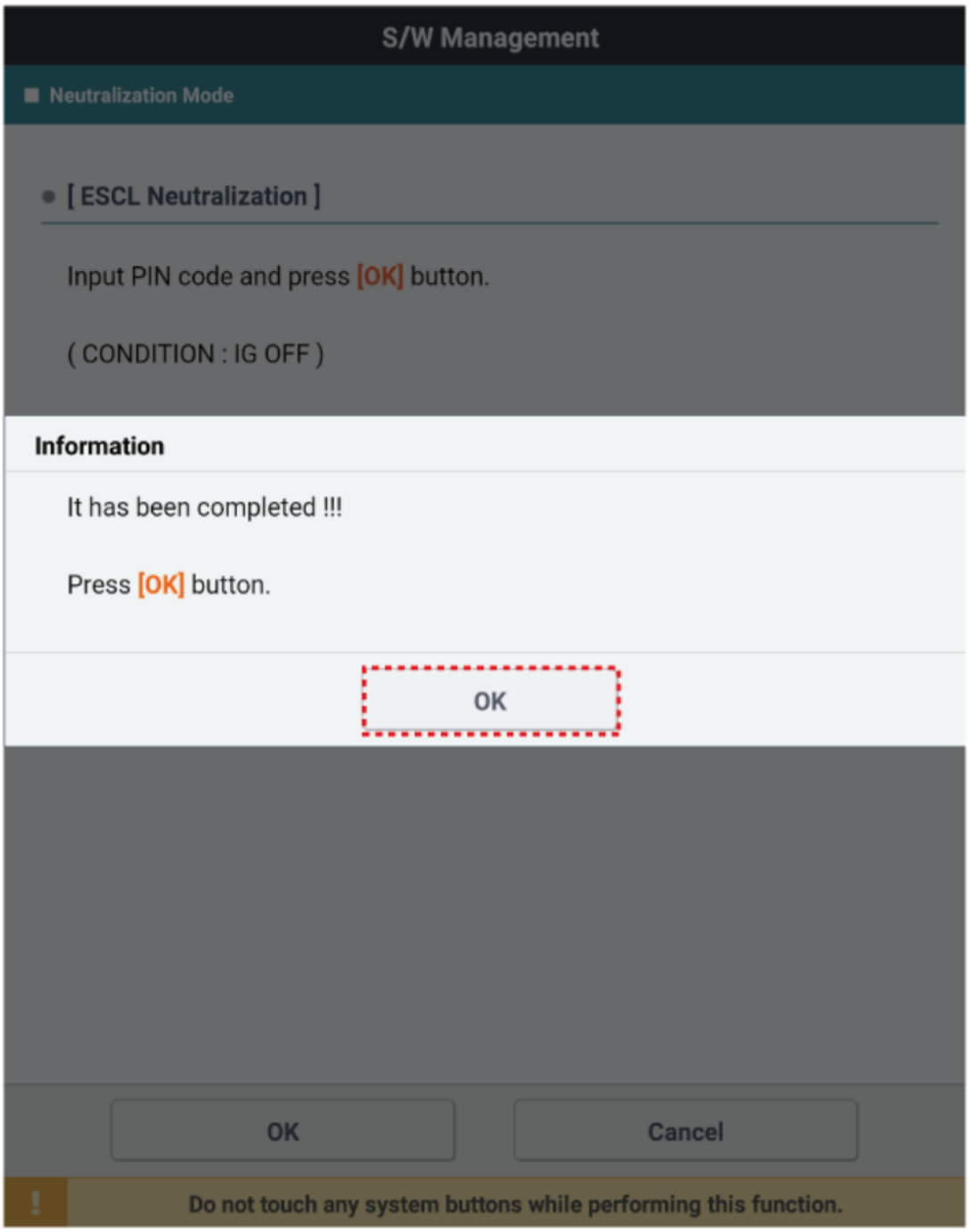
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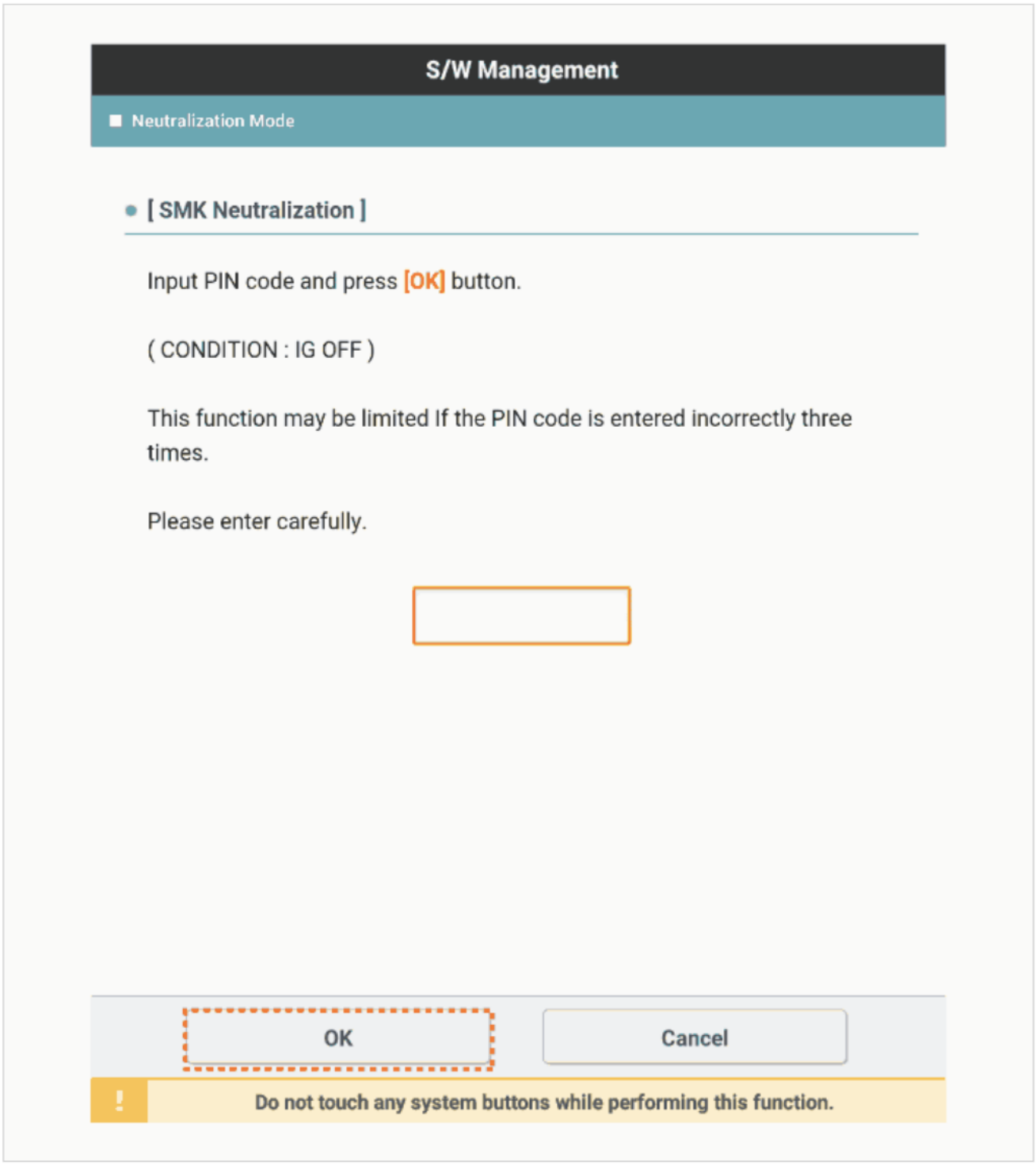
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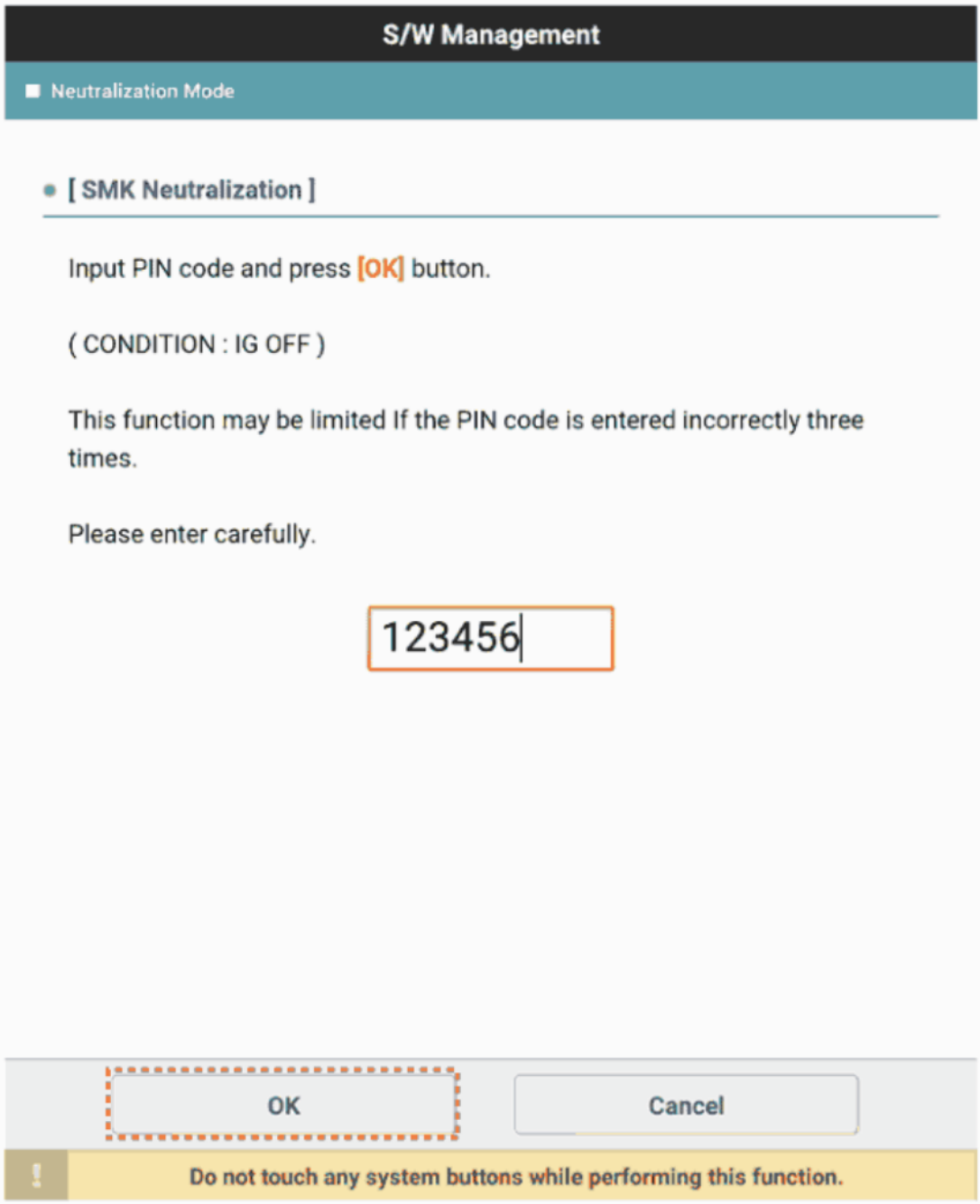
cardiagn.com



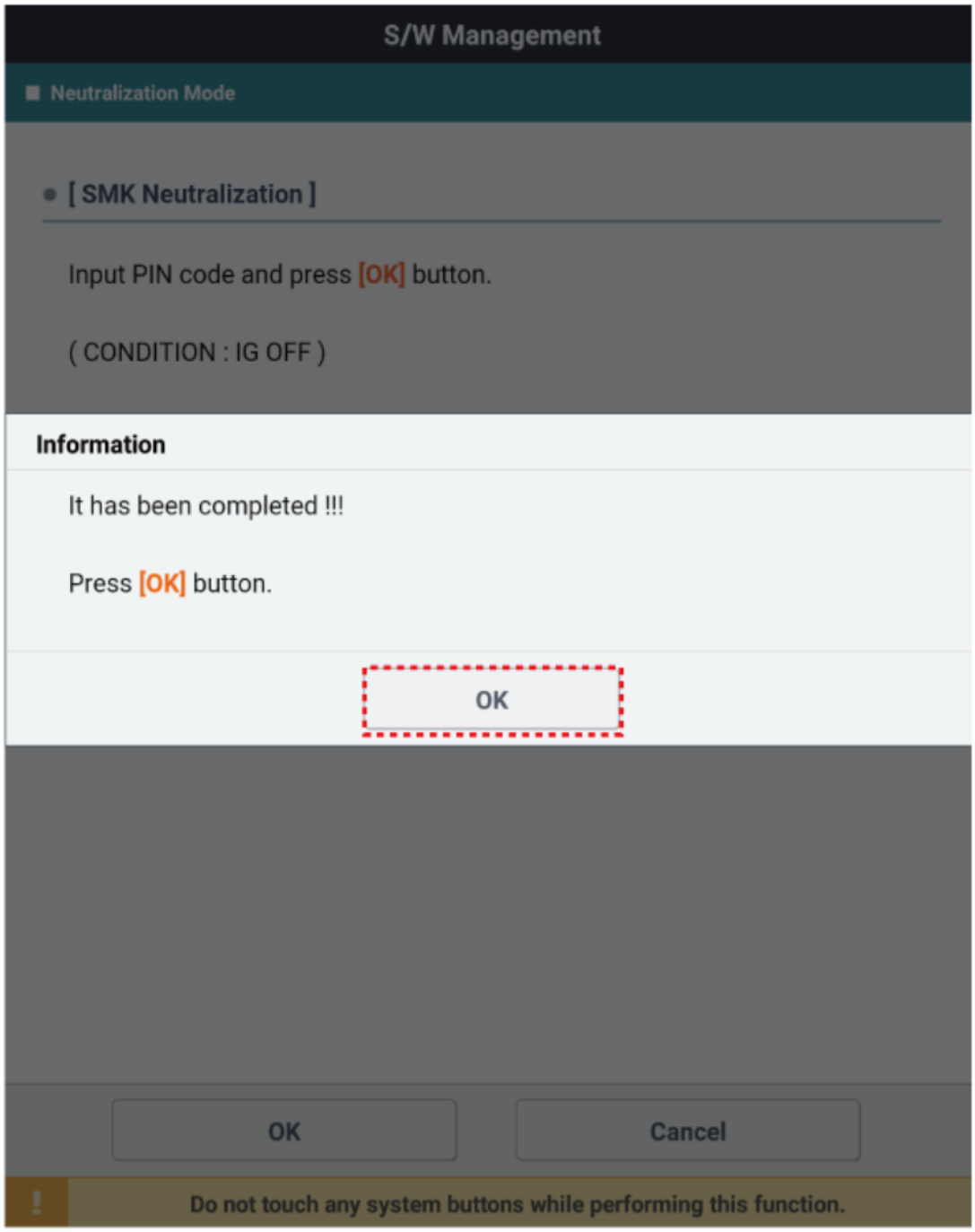
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Smart Key

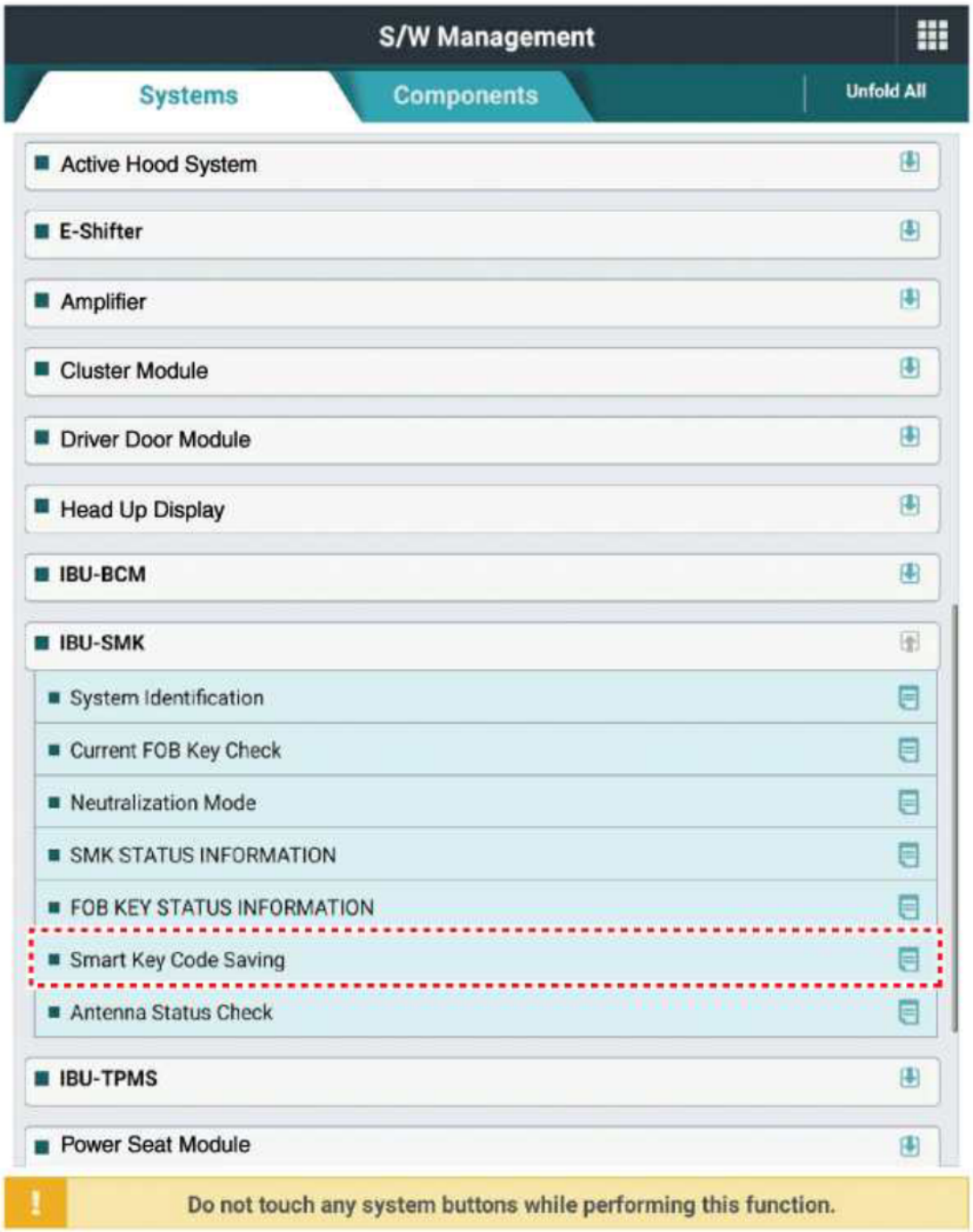
Smart Key Code Saving

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

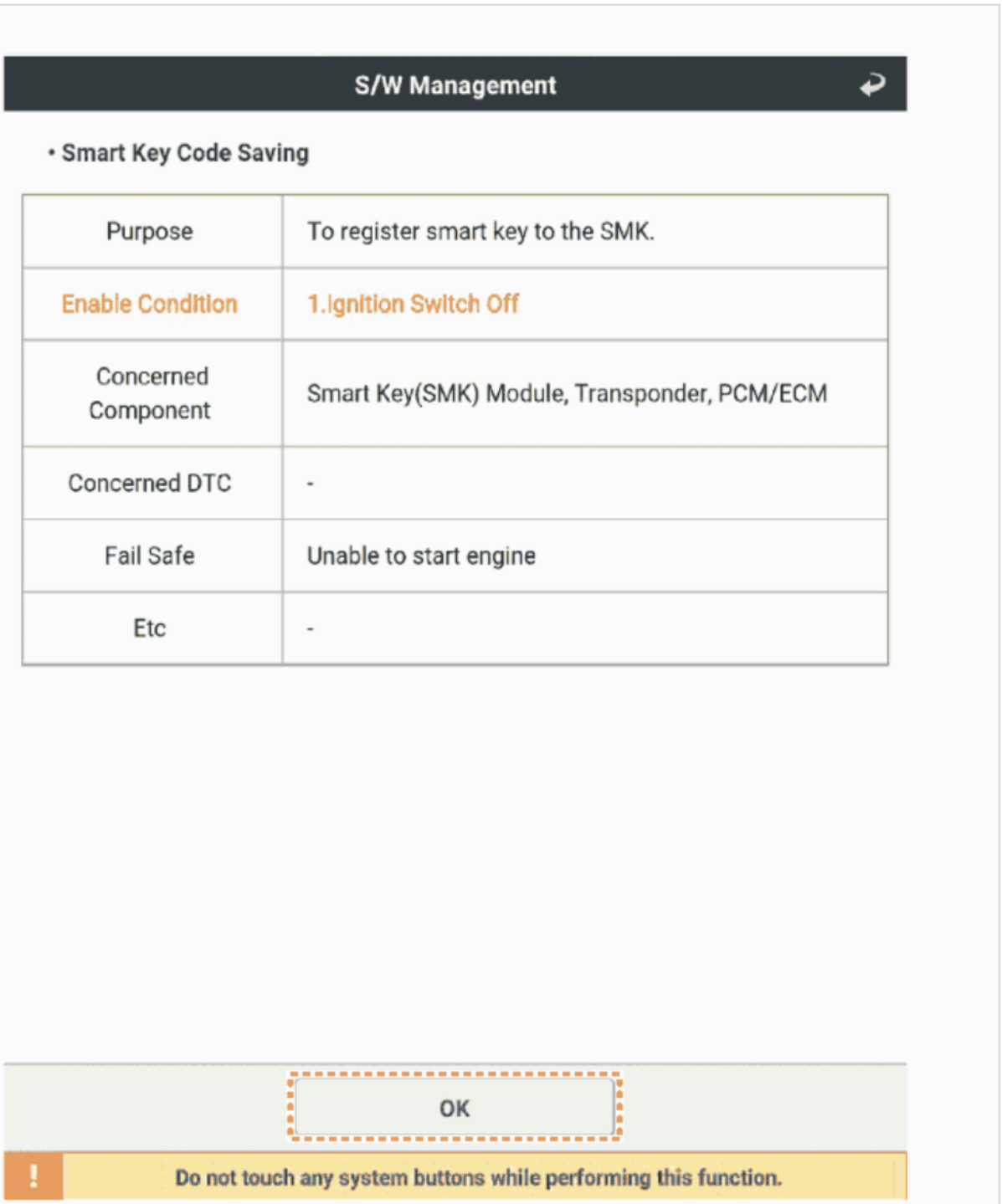


2. Select the vehicle model and then do "Smart key code saving".

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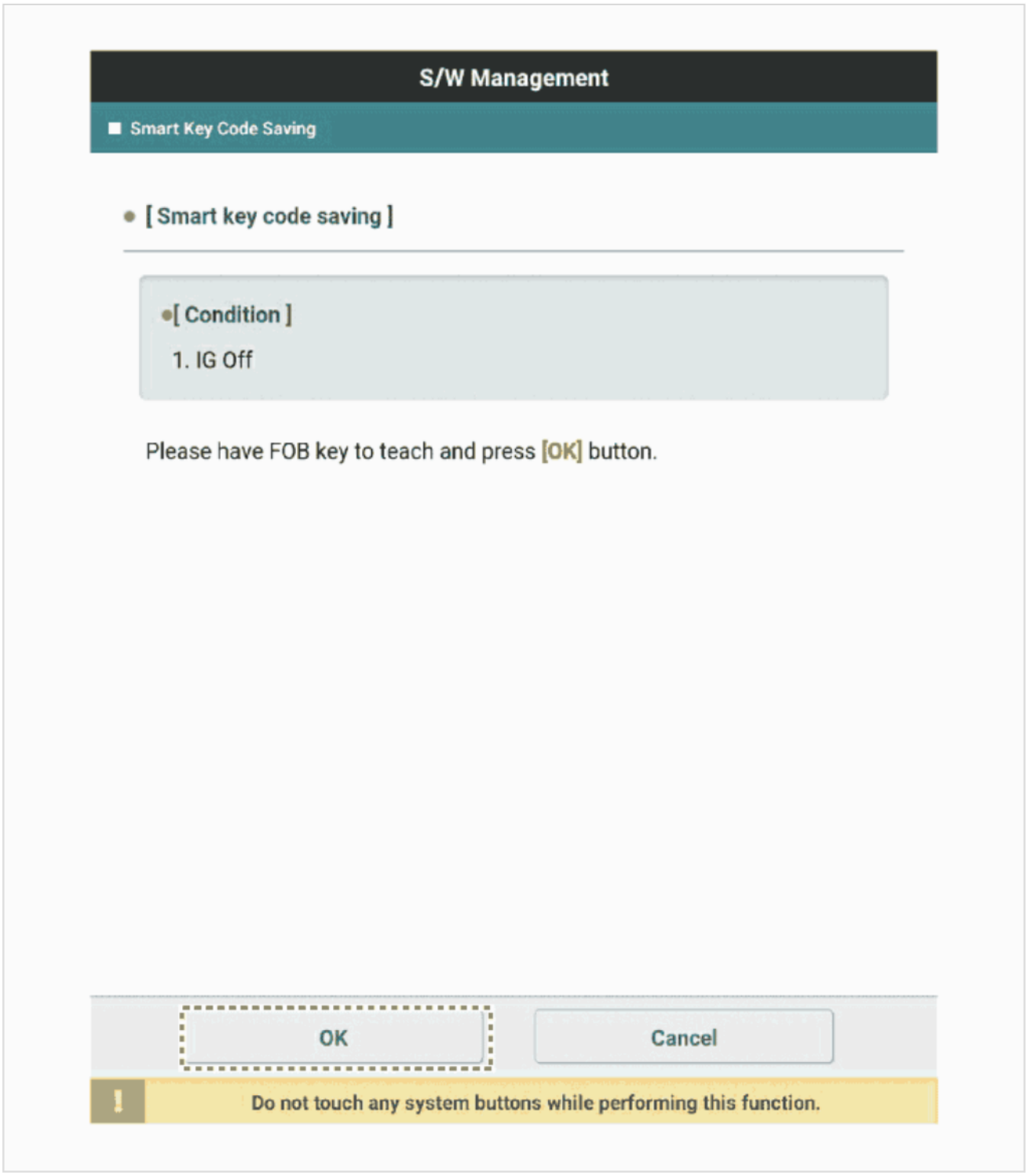


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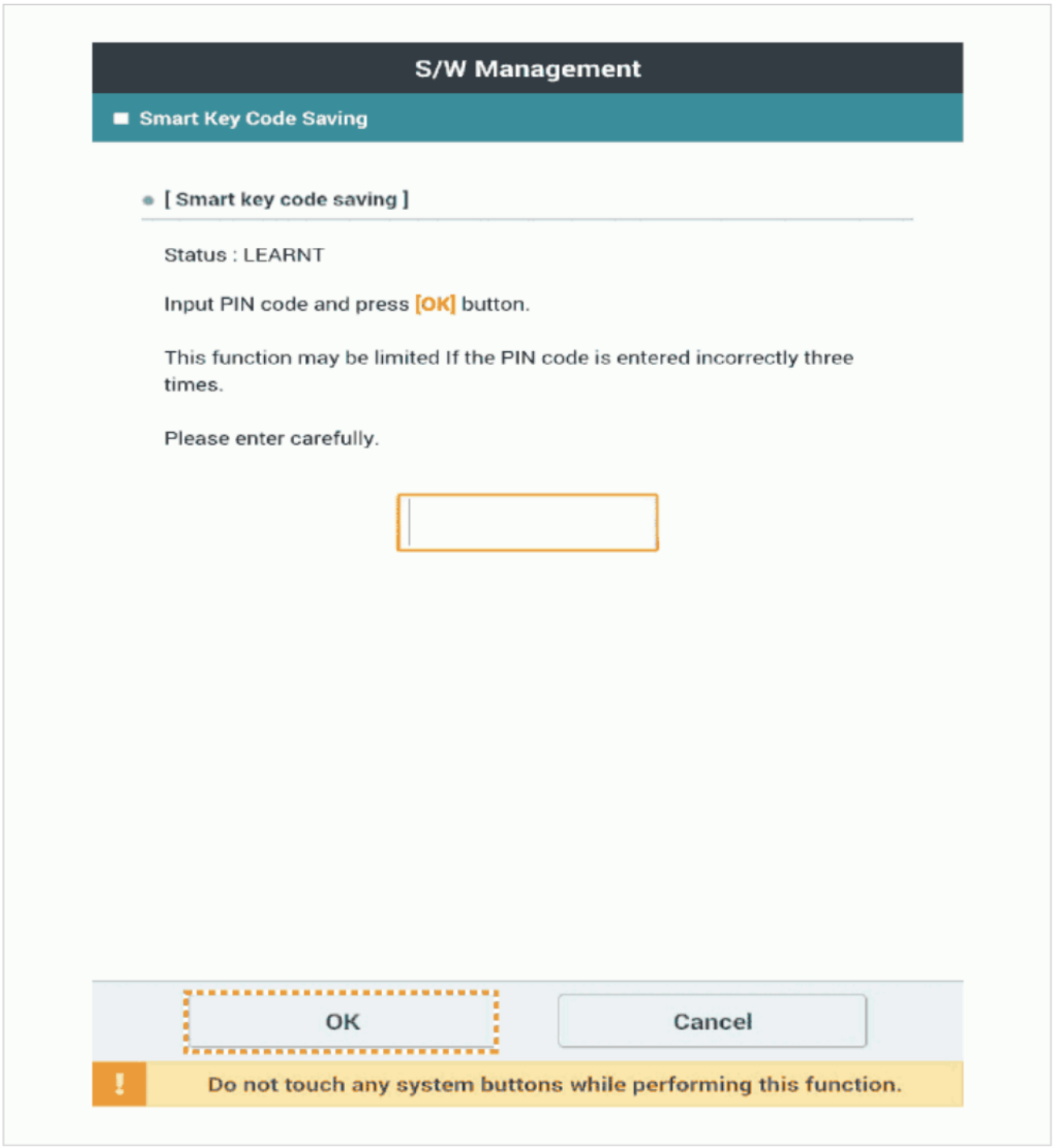
3. After selecting "Smart key teaching" menu, push "Enter" key, then the screen will be shown as below.

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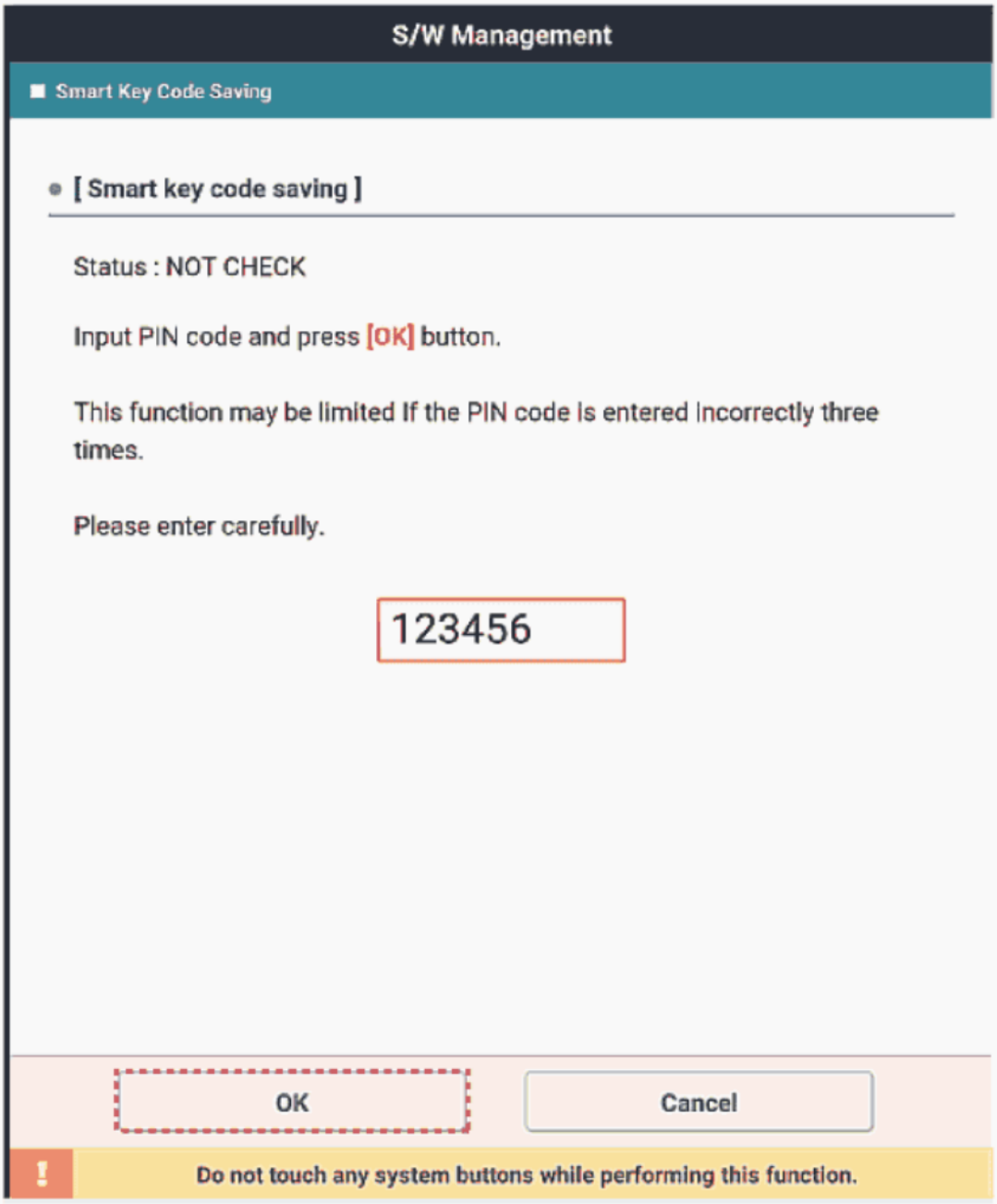


4. After having the teaching smart key, push "ENTER" key.
5. Input the "Pin code" for first key teaching.

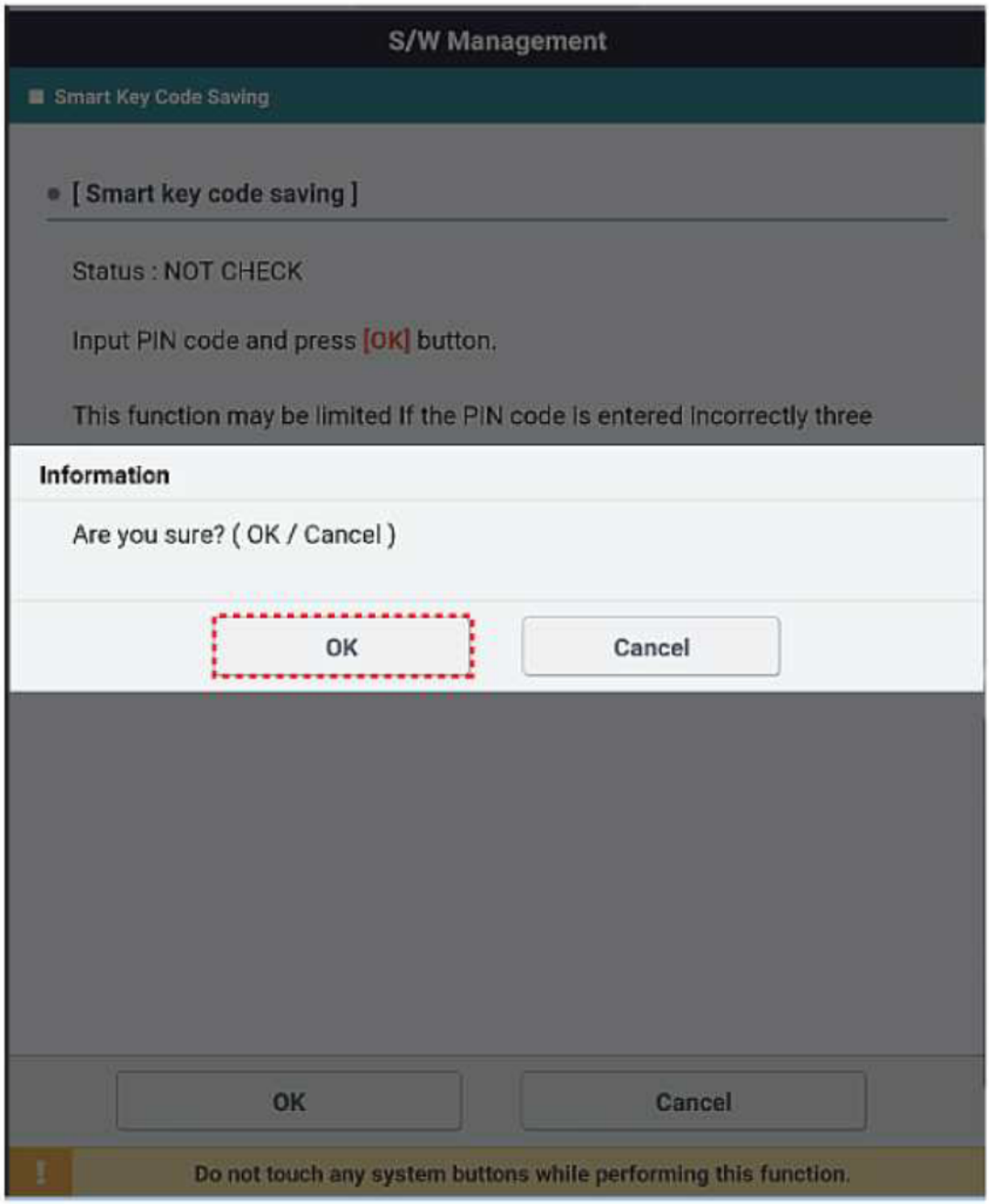
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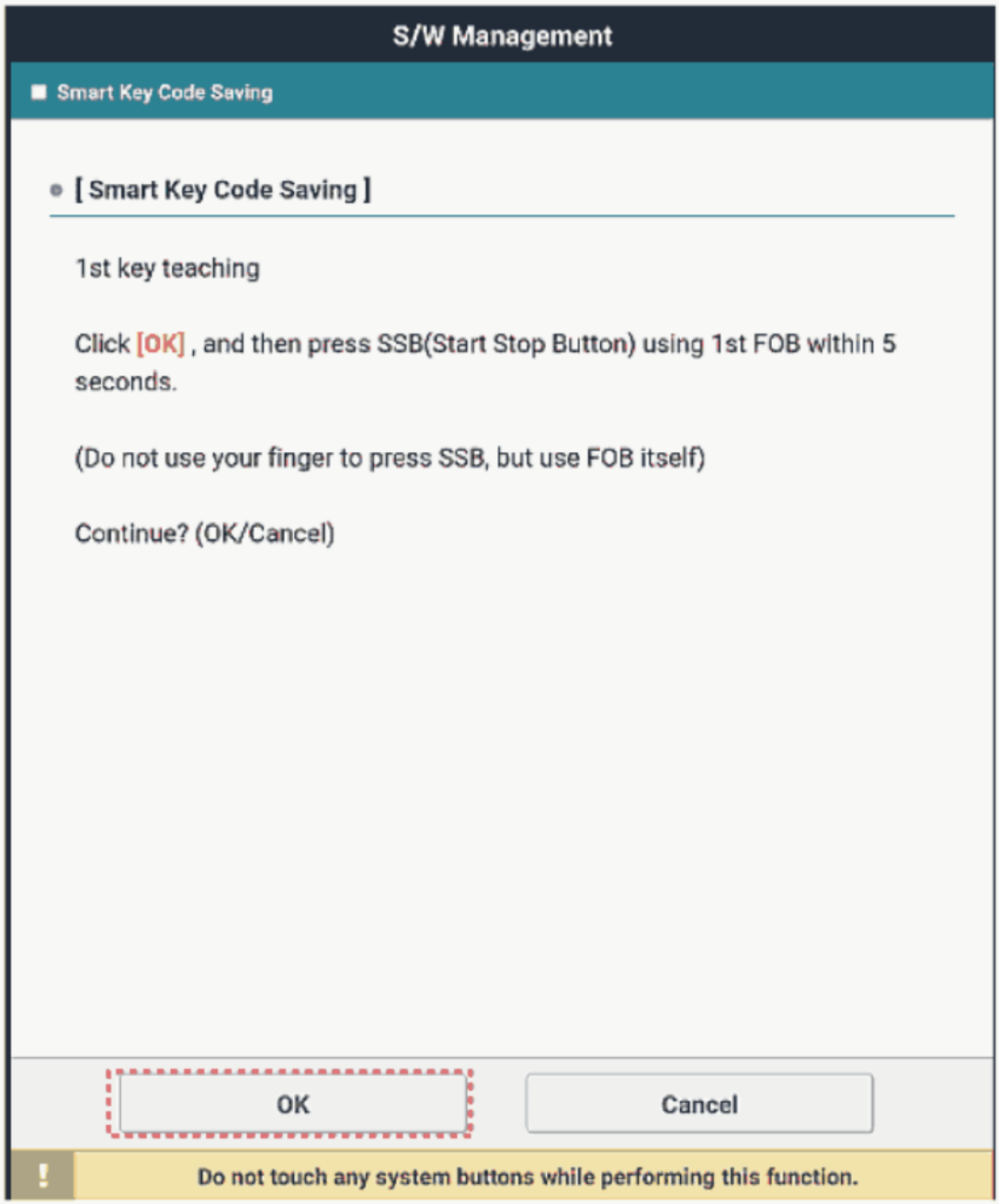


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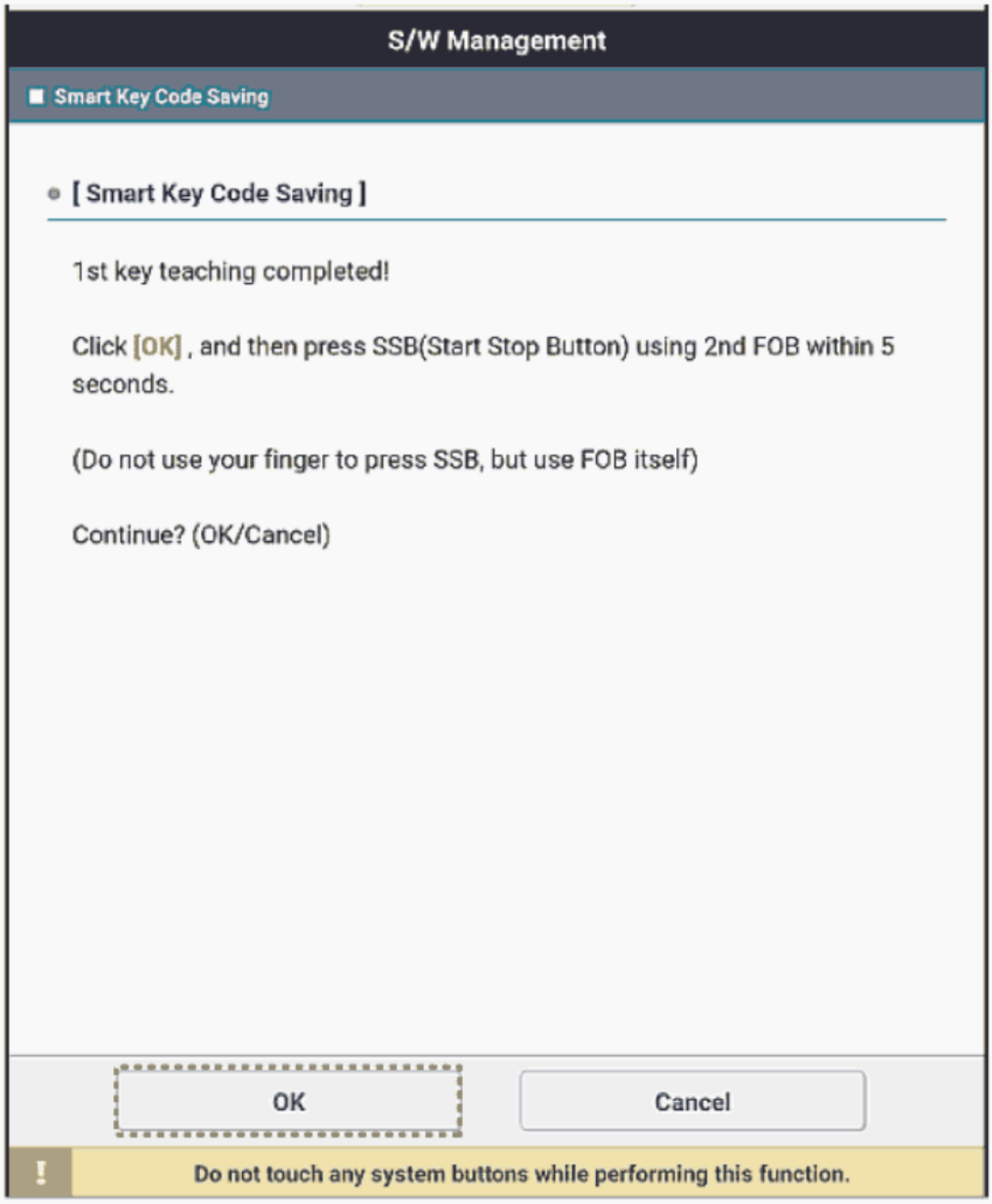
6. Confirm the message "First key teaching completed".

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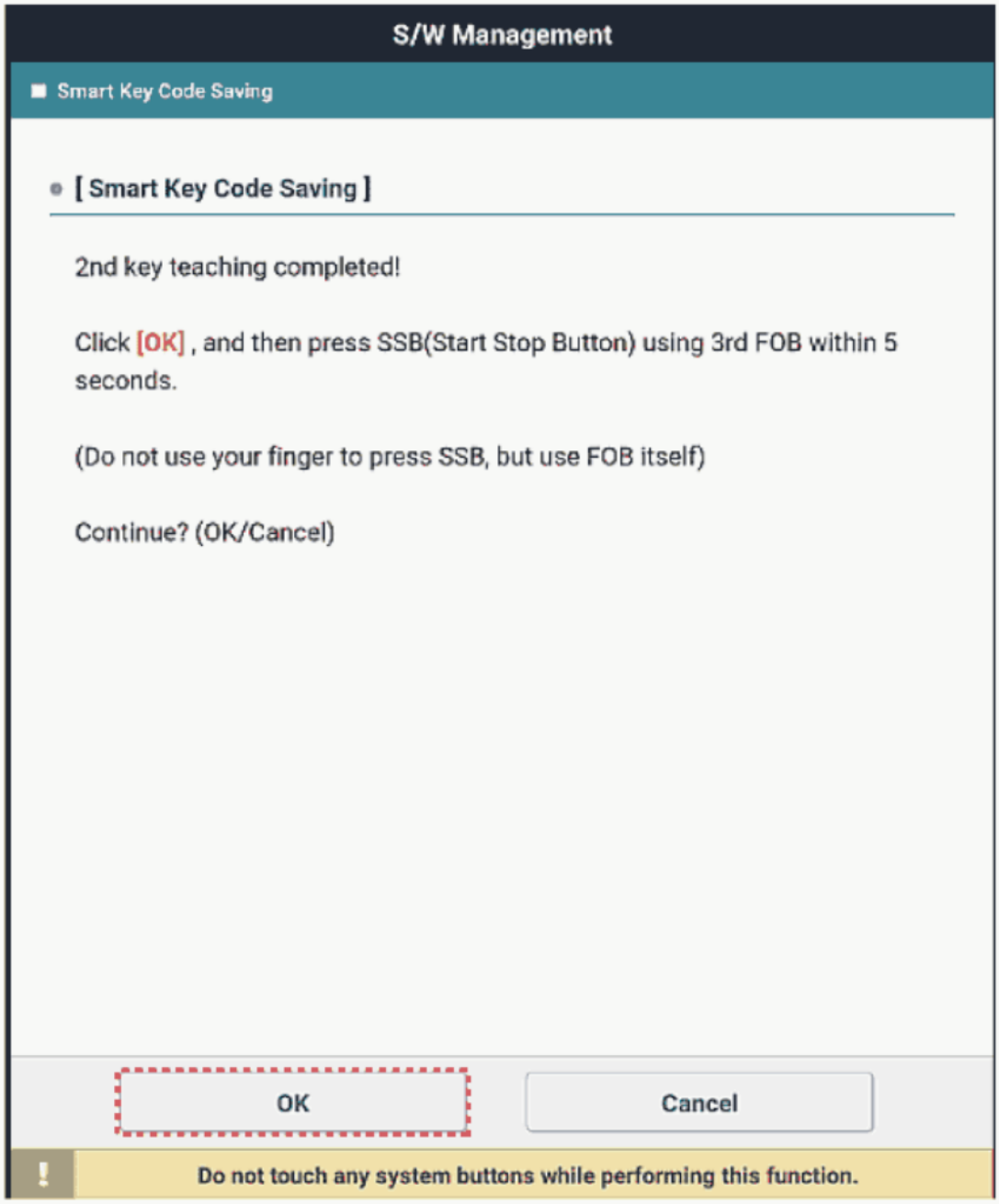
7. Press the SSB with smart key within 5 sec after pressing "OK".

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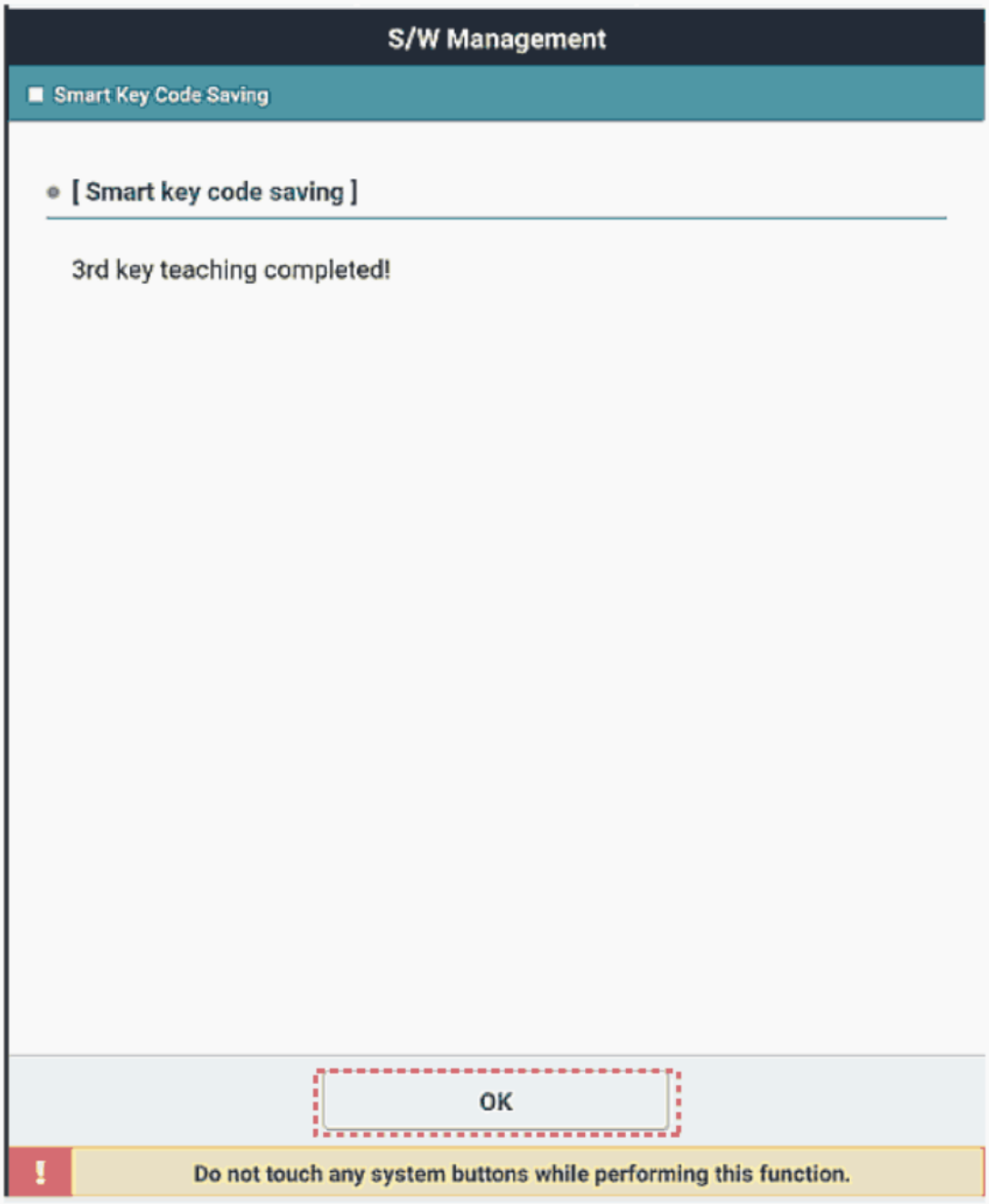


8. Confirm the message "Second key teaching completed".

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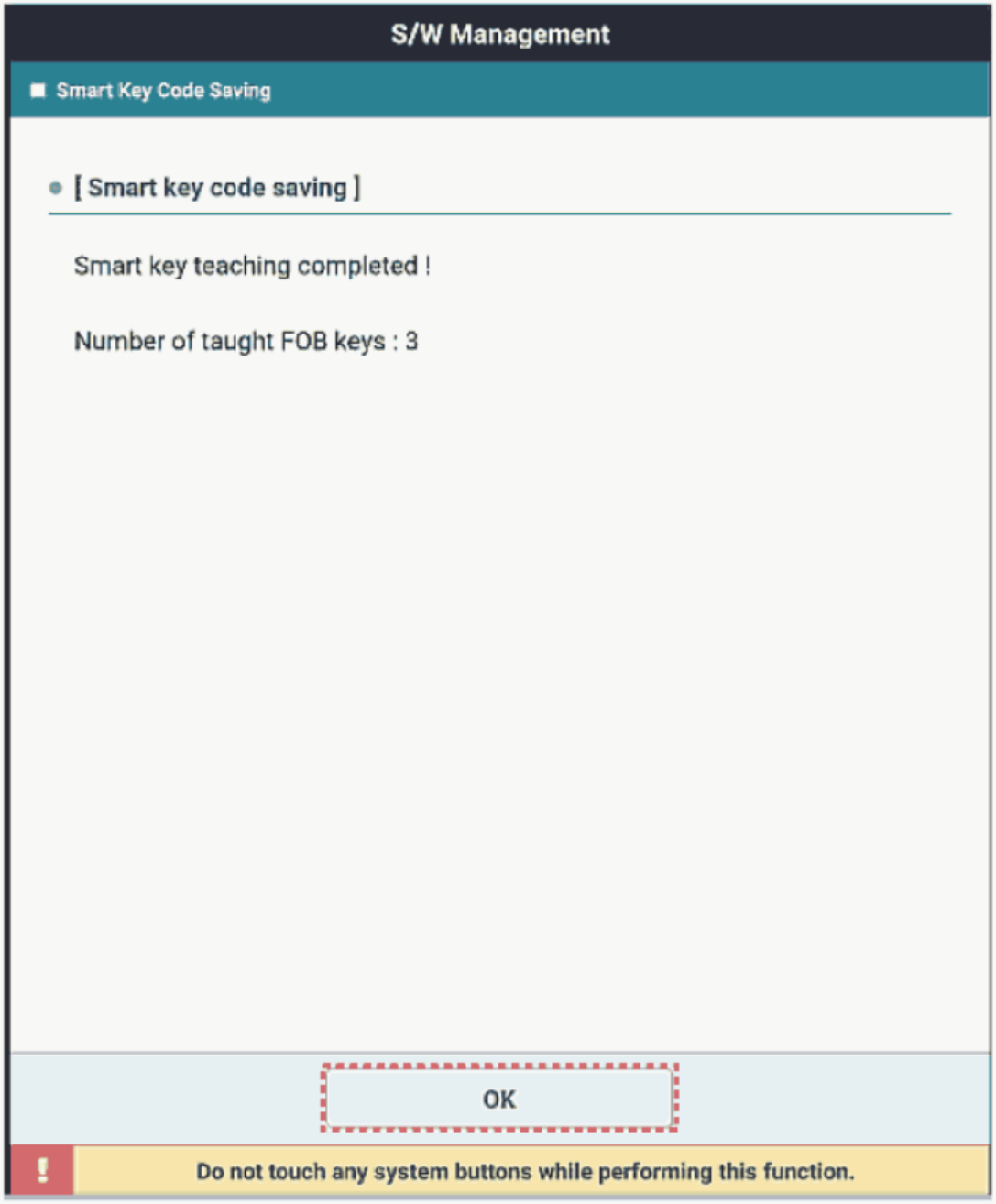


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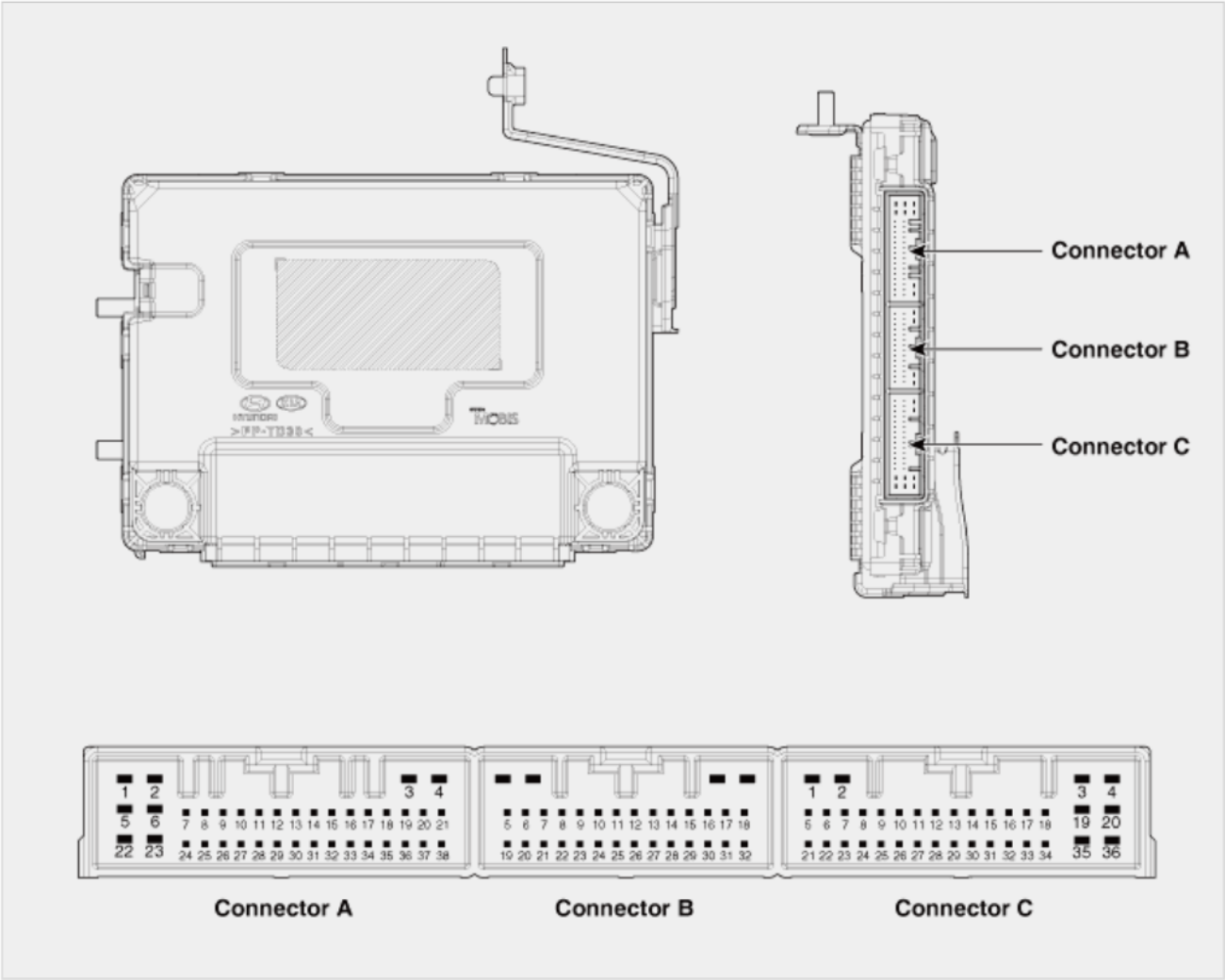
9. Then the screen will be shown as below when key teaching process is completed.

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Components



Connector Pin Information

No.	Connector A	Connector B	Connector C
1	-	B-CAN (Low)	Front wiper low bus switch_Input
2	Mirror power_Input	B-CAN (High)	Ground (Power)
3	P-CAN (Low)	PDW-F_Power_Output	Battery (Power)
4	P-CAN (High)	PDW-R_Power_Output	Battery (ECU)
5	-	Ground (ECU)	Driver outside handle switch_Input
6	Right mirror unfold_Output	PDW Switch_Input	Position_Input(A/T Option) IGN Lock switch_Input (M/T Option)
7	Right mirror horizontal_Output	PDW (Option)_Input	Interior antenna1 (-)_Output
8	Immobilizer power_Output	-	Bumper antenna (-)_Output
9	Immobilizer ground_Output	-	Interior antenna2 (-)_Output
10	Brake switch_Input	-	Assist outside handle antenna (-)_Output
11	ESCL Enable_Output	Front wiper high relay_Output	Trunk interior antenna3 (-)_Output
12	Brake switch fuse_Input	Rear left seat belt indicator_Output	Driver outside handle anntenna (-)_Output
13	Fog switch_Input	Assist seat belt indicator_Output	-
14	Light switch_Input	-	COM (ESCL)
15	Front wiper volume switch_Input	LF Searching_Output	Auto light sensor power_Output
16	PDW Switch indicator_Output	-	ACC_Input

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17	SSB Ring illumination_Output	SSB Switch1_Input	IGN1 Relay_Output
18	LIN CAN (PDW)	PDW_Power_Input	ACC Relay_Output
19	-	Security indicator_Output	ESCL (-)_Output
20	Engine RPM_Input	Sunroof status_Input	ESCL (+)_Output
21	Wheel speed sensor_Input	Rain sensor (Option)_Input	Assist outside handle switch_Input
22	-	Wiper parking switch_Input	-
23	Right mirror fold_Output	Wiper power relay_Output	Interior antenna1 (+)_Output
24	Right mirror vertical_Output	Front wiper low relay_Output	Bumper antenna (+)_Output
25	-	-	Interior antenna2 (+)_Output
26	Puddle pocket lamp_Output	-	Assist outside handle antenna (+)_Output
27	Start feedback_Input	Rear center seat belt indicator_Output	Trunk interior antenna3 (+)_Output
28	-	-	Driver outside handle anntenna (+)_Output
29	Starter relay_Output	SSB Symbo illumination (-)_Output	COM (EMS)
30	Headlamp high switch	Rear right seat belt indicator_Output	Auto light sensor ground_Output
31	Front wiper switch	SSB Switch2_Input	Auto light sensor signal_Input
32	-	ESCL Unlock switch_Input	IGN1_Input
33	Multifunction switch ground_Input		IGN2_Input
34	External buzzer_Output		IGN2 Relay_Output
35	SSB Symbo illumination (+)_Output		Front washer switch_Input
36	LIN CAN (Rain sensor)		Battery (+)_ESCL
37	-		
38	ATM Solenoin_Output		

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Removal

⚠ CAUTION

Put on gloves to prevent hand injuries.

Information

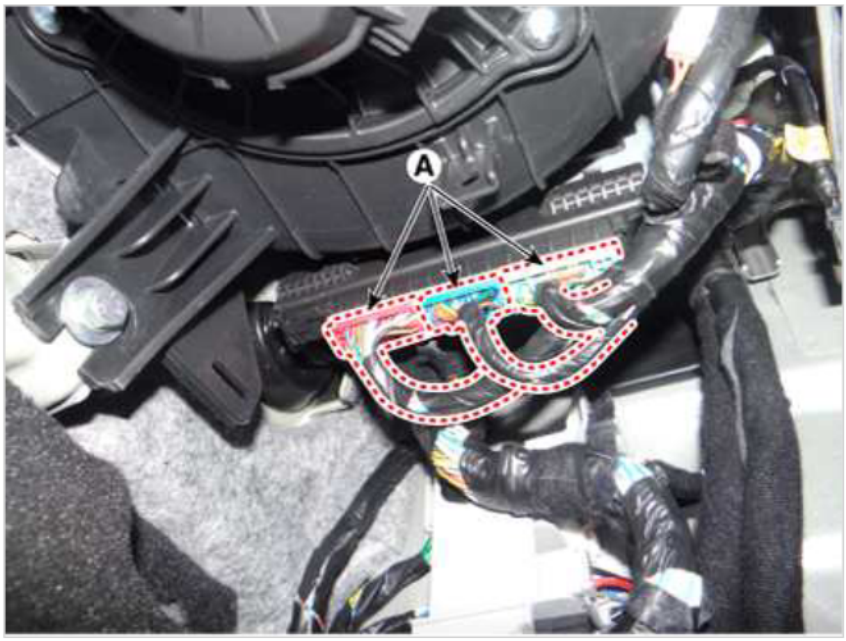
- Use a plastic panel removal tool to remove interior trim pieces without marring the surface.
- Take care not to bend or scratch the trim and panels.

Integrated Body control Unit (IBU)

1. Disconnect the negative (-) battery terminal.
2. Remove the glove box housing.
   (Refer to Body - "Glove Box Housing")
3. Disconnect the blower motor connector (A) after removing the mounting clip (B).



4. Disconnect the integrated body control unit connectors (A).



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5. Remove the integrated body control unit (A) after loosening the mounting nuts and bolt.



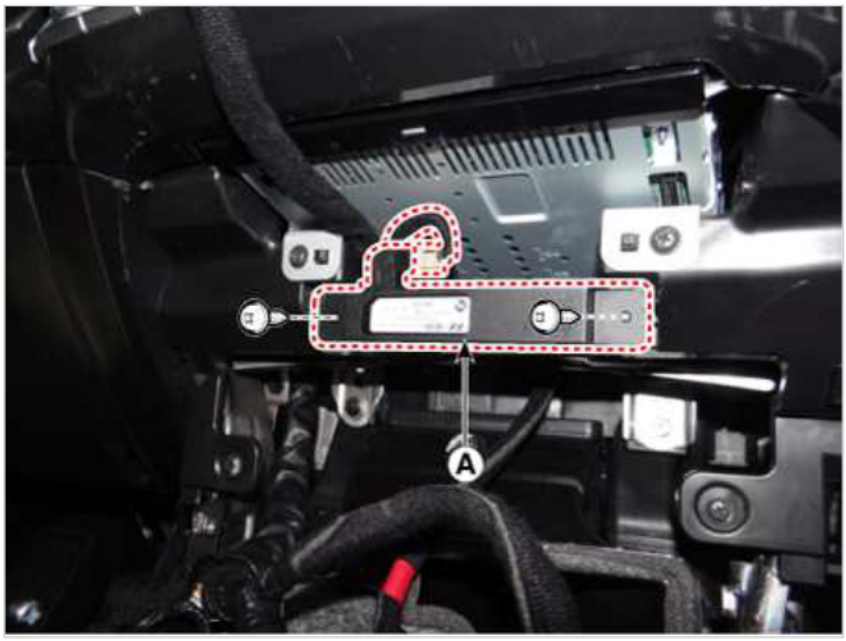
6. Remove the wiring harness mounting clip (A) from the integrated body control unit.



Interior 1 Antenna

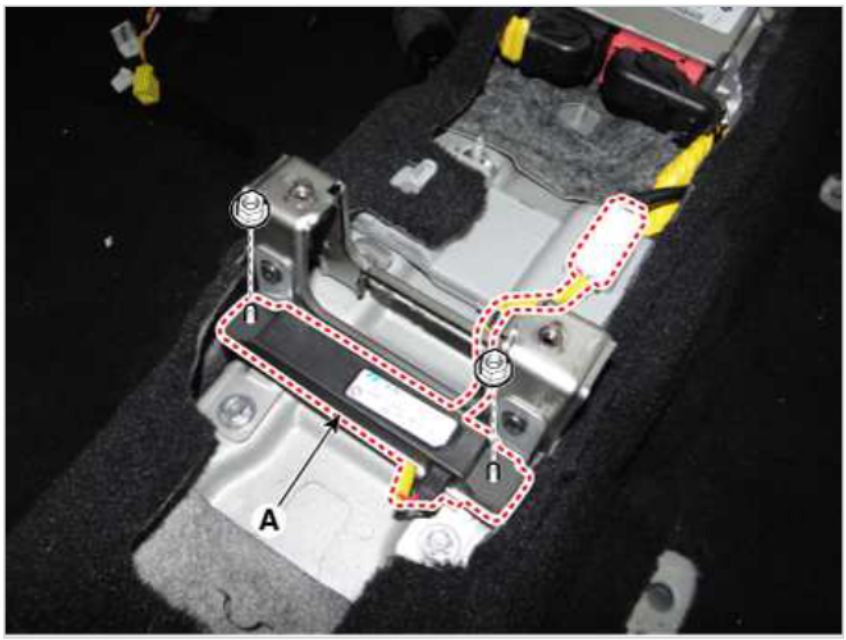
1. Disconnect the negative (-) battery terminal.
2. Remove the floor console assembly.
   (Refer to Body - "Floor Console Assembly")
3. Remove the interior 1 antenna (A) after disconnecting the connector and loosening the mounting screws.

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Interior 2 Antenna

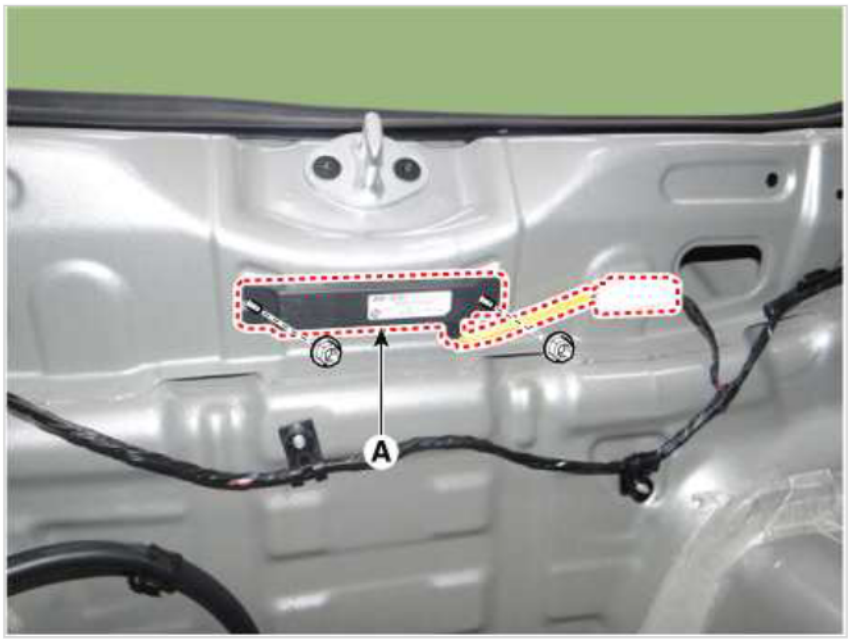
1. Disconnect the negative (-) battery terminal.
2. Remove the floor console assembly.
   (Refer to Body - "Floor Console Assembly")
3. Remove the interior 2 antenna (A) after disconnecting the connector and loosening the mounting nuts.



Liftgate Antenna

1. Disconnect the negative (-) battery terminal.
2. Remove the rear transverse trim.
   (Reger to Body - " Rear Transverse Trim")
3. Remove the liftgate antenna (A) after disconnecting the connector and loosening the mounting nuts.

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Rear Bumper Antenna

1. Disconnect the negative (-) battery terminal.
2. Remove the rear bumper beam assembly.
   (Refer to Body - "Rear Bumper Beam Assembly")
3. Remove the rear bumper antenna (A) after loosening the mounting screws.



Buzzer

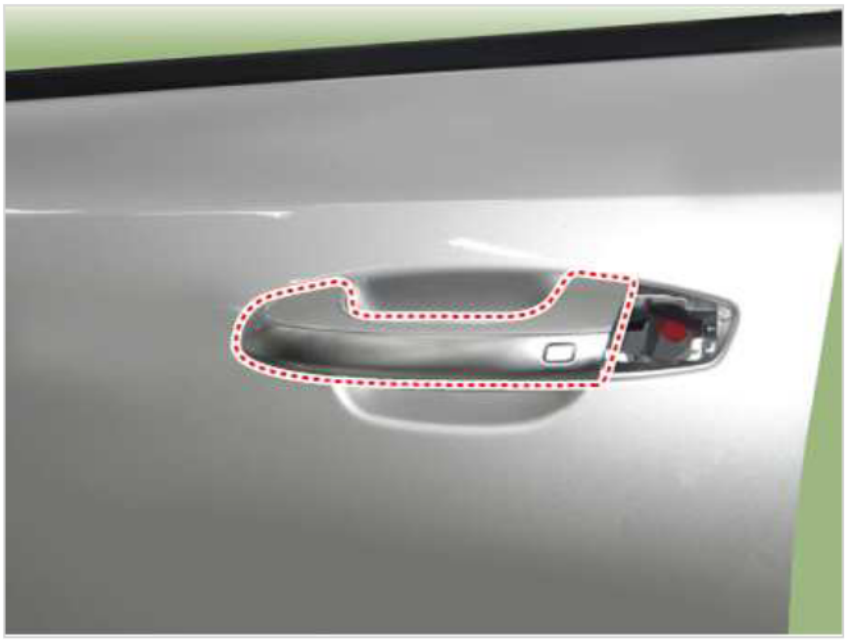
1. Disconnect the negative (-) battery terminal.
2. Remove the front wheel guard [LH].
   (Refer to Body - "Front Wheel Guard")
3. Remove the buzzer (A) after disconnecting the connector.

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Door Outside Handle

1. Disconnect the negative (-) battery terminal.
2. Remove the front door outside handle.
   (Refer to Body - "Front Door Outside Handle")

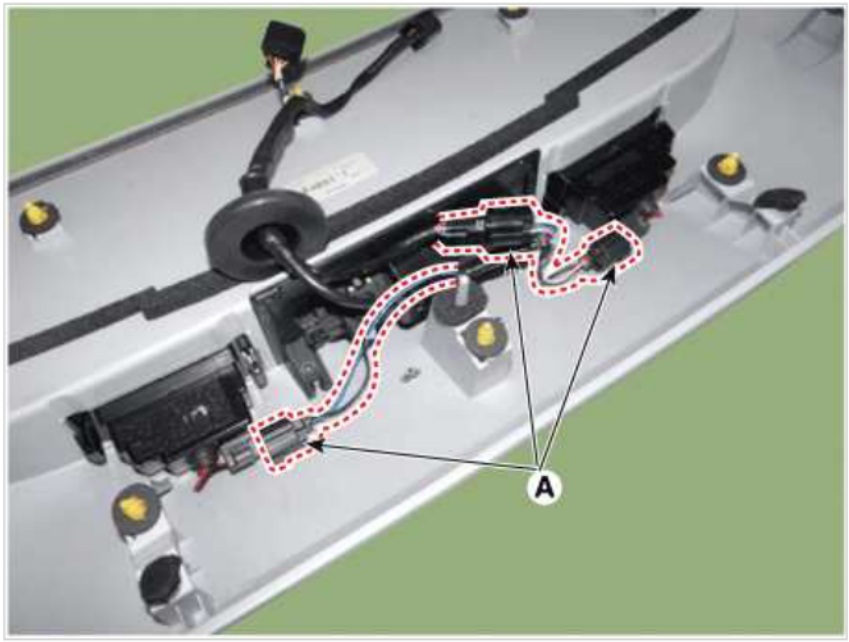


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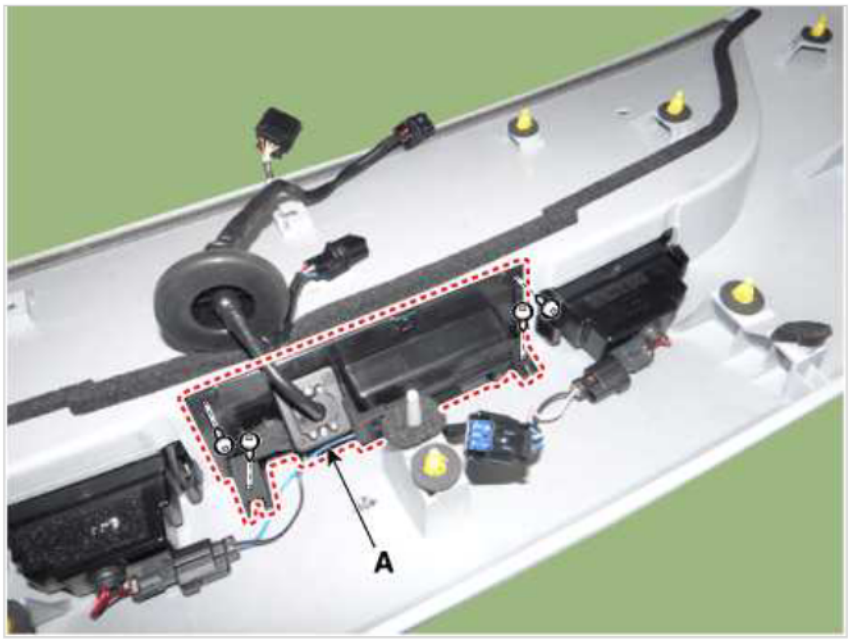
Liftgate Open Switch

1. Disconnect the negative (-) battery terminal.
2. Remove the liftgate back panel.
   (Refer to Body - "Liftgate Back Panel")
3. Disconnect the license lamp connectors (A).



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

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5. Remove the liftgate open switch (A) after loosening the mounting screws.



Inspection

Smart Key Unit

(Refer to Smart Key System - "Smart Key Diagnostic")

Smart Key Switch

(Refer to Smart Key System - "Smart Key Diagnostic")

Antenna

(Refer to Smart Key System - "Smart Key Diagnostic")

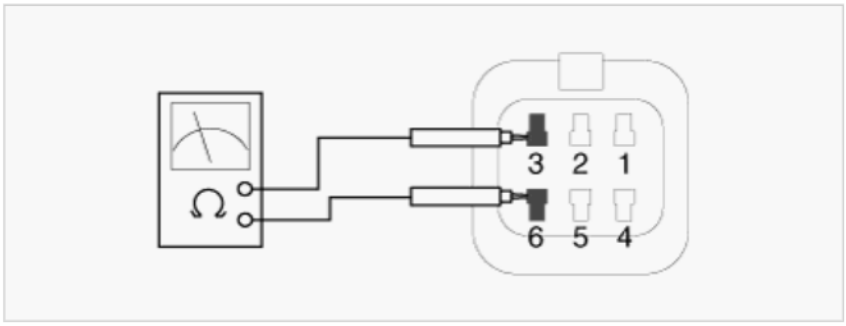
Door Outside Handle

1. Disconnect the front door outside handle connector (A).

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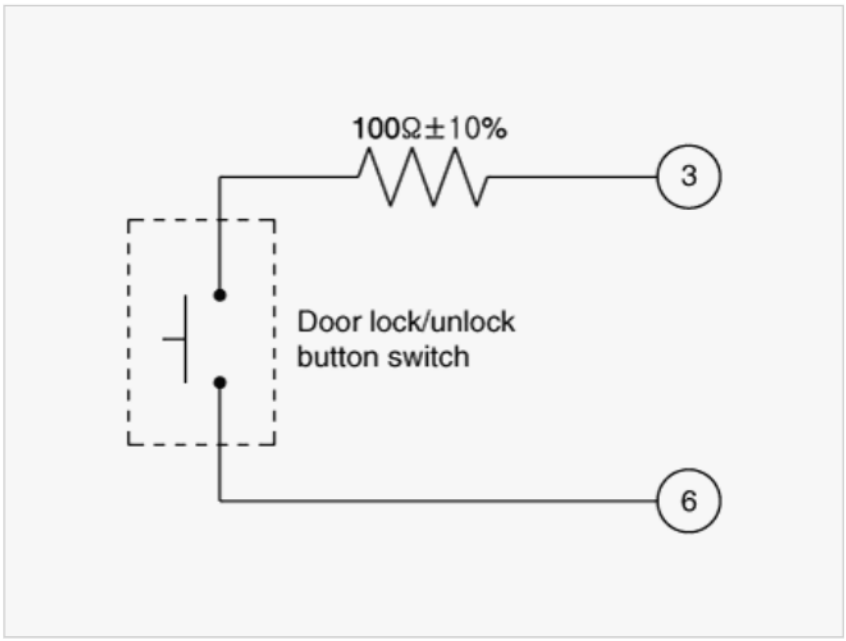


2. Check for continuity between terminals No 3 and No 6.



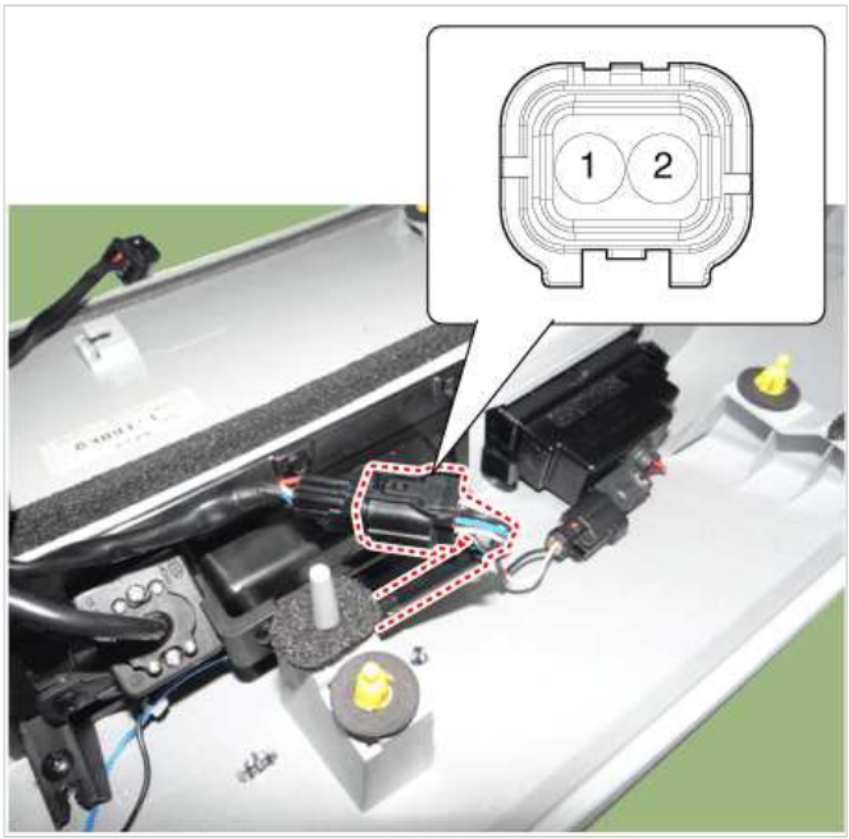
No	Description
1	Door antenna (+)
2	Pocket lamp LED (+)
3	Door lock/unlock button switch
4	Door antenna (-)
5	Pocket lamp LED (-)
6	Door lock/unlock button switch ground

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Liftgate Open Switch

1. Check for continuity between the liftgate open switch terminals.



2. If continuity is not specified, inspect the switch.

Position / Terminal	OFF	ON(PUSH)
1		○
2		○

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Installation

Integrated Body control Unit (IBU)

1. Install the wiring harness mounting clip from the integrated body control unit.
2. Install the integrated body control unit.
3. Connect the integrated body control unit connectors.
4. Connect the blower motor connector and clip.
5. Install the glove box housing.
6. Connect the negative (-) battery terminal and check the smart key system.

Interior 1 Antenna

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

Interior 2 Antenna

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

Liftgate Antenna

1. Install the liftgate antenna after connecting the connector.
2. Install the rear transverse trim.
3. Connect the negative (-) battery terminal and check the smart key system.

Rear Bumper Antenna

1. Install the rear bumper antenna after connecting the connector.
2. Install the rear bumper beam assembly.
3. Connect the negative (-) battery terminal and check the smart key system.

Buzzer

1. Install the buzzer after connecting the connector.
2. Install the front wheel guard [LH].
3. Connect the negative (-) battery terminal and check the smart key system.

Door Outside Handle

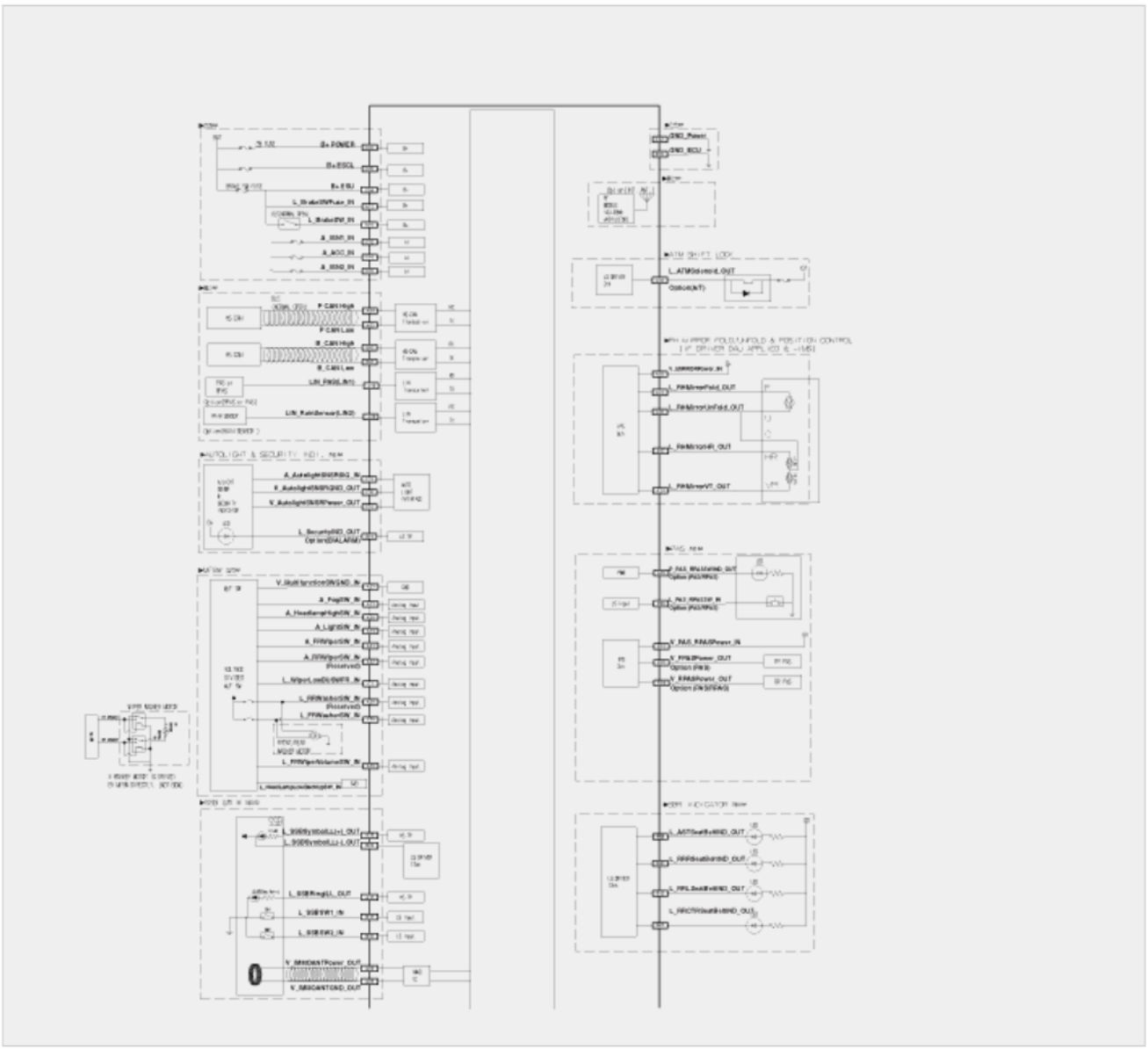
1. Install the front door outside handle.
2. Connect the negative (-) battery terminal and check the smart key system.

Liftgate Open Switch

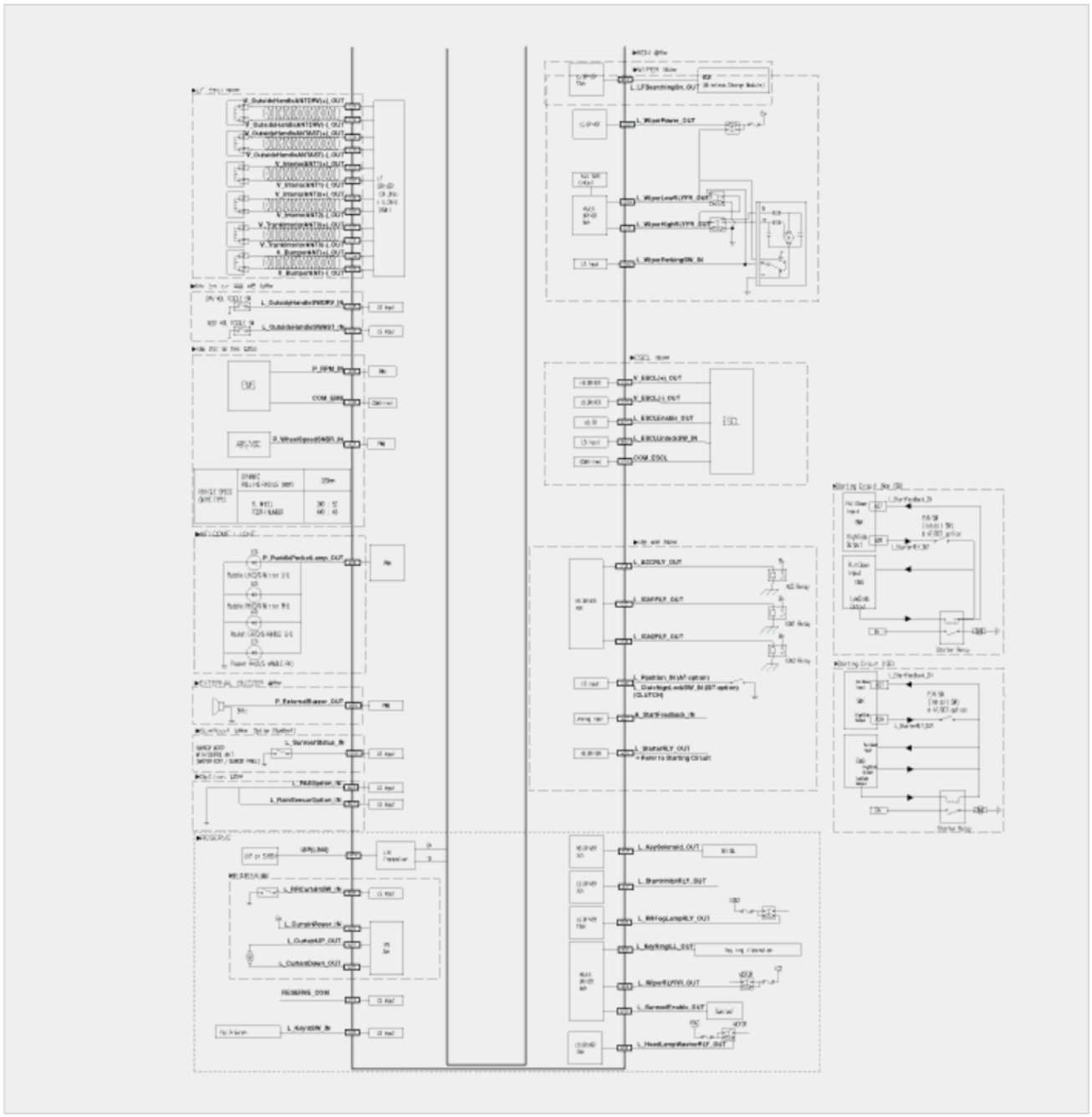
1. Install the liftgate open switch.
2. Install the liftgate outside handle assembly.
3. Connect the license lamp connectors.
4. Install the liftgate back panel.
5. Connect the negative (-) battery terminal and check the smart key system.

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Circuit Diagram



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Special Service Tools

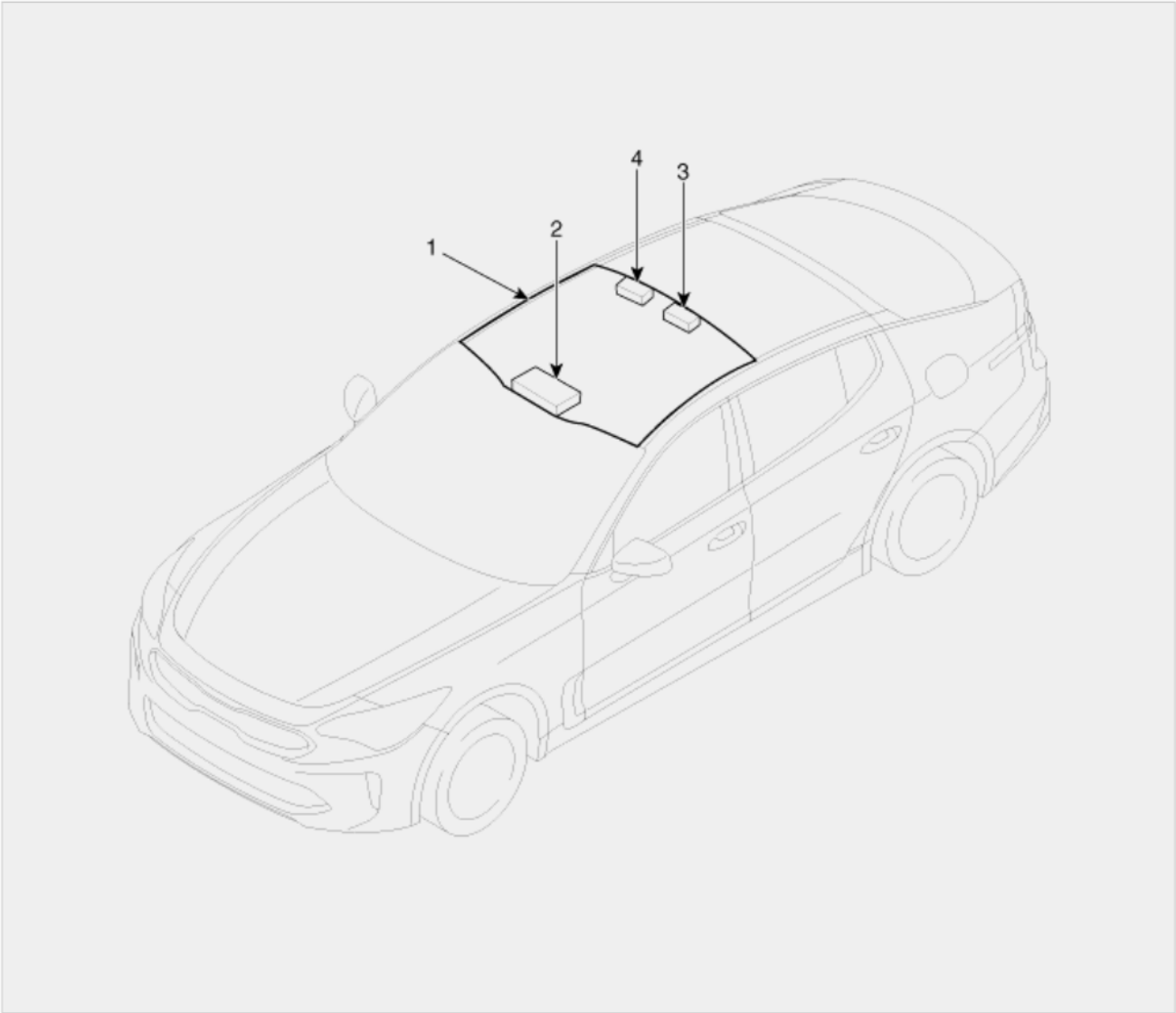
Tool Name / Number	Illustration	Description
RKE Battery Checker (09954-2P100)		Measuring the RKE battery voltage
Calibration jig for LDW or LKA (09890-3V100)		Calibration of LDW (Lane Departure Warning) or LKA (Lane Keeping Assist)
SCC SETTING BEAM (09964-C1200)		Calibration of LDW (Lane Departure Warning) or LKA (Lane Keeping Assist)
BCW Unit Correction Tool Set (09958-3T500)		Used to correct the BCW unit.
Case, Manual, String (09958-3T120)		Used to correct the BCW unit.Used to create a center line.
Vertical Plumb (09958-3T010)		Used to correct the BCW unit.Used to create a center line.
Spirit Level (09958-3T070)		Used to correct the BCW unit.Used to measure the horizontal angle.
BCW Unit Fixing Adaptor (09958-3T080)		Used to correct the BCW unit.Used to measure the horizontal angle.

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Digital Protractor (09958-3T090)		Used to correct the BCW unit.Used to measure the horizontal angle.
Digital Inclinometer (09958-3T100)		Used to correct the BCW unit.Used to measure the vertical angle.

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Component Location



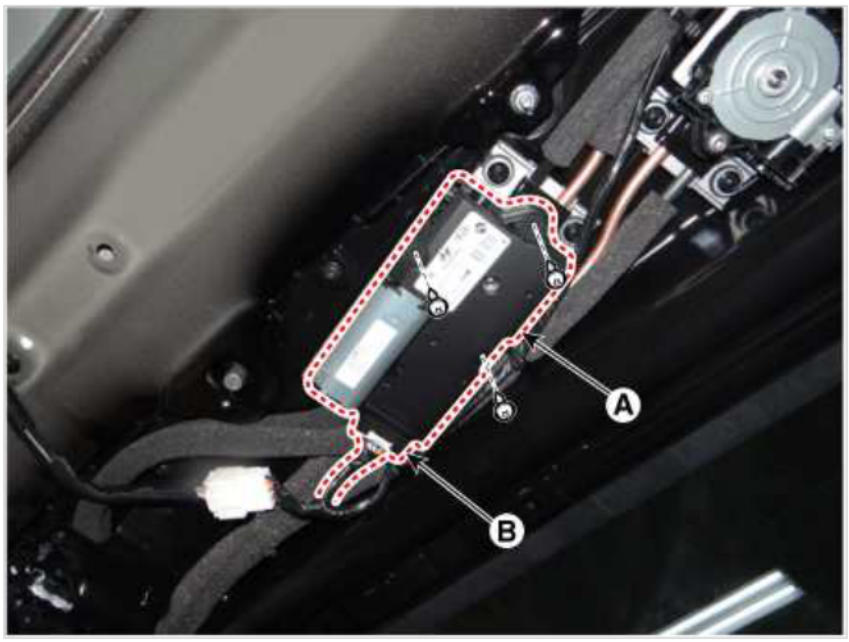
1. Wide sunroof
2. Wide sunroof switch
3. Roller blind motor & slave controller
4. Glass motor & controller

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Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the roof trim assembly.
   (Refer to Body - "Roof Trim Assembly")
3. Remove the glass motor (A) after loosening the screws and disconnecting the connector.

[Glass Motor]



4. Remove the roller blind motor (A) after loosening the screws and disconnecting the connector.

[Roller Blind Motor]



Inspection

[Glass motor / Blind motor Inspection]

1. Disconnect the negative (-) battery terminal.
2. Remove the roof trim assembly.
   (Refer to Body - "Roof Trim Assembly")

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3. Disconnect the wide sunroof wiring connector .



4. Ground the terminals as below table, and check that the panorama sunroof unit operates.

Terminal / Switch position	1	11	12	6	3	5	10	4	9
	GND 1	GND 2	Batt 2	Batt 1	IG	Open	Close	Tilt	Express
Glass or Blind (Open)	-	-	+	+	+	-			
Glass or Blind (Close)	-	-	+	+	+		-		
Tilt (Up)	-	-	+	+	+			-	
Tilt (Down)	-	-	+	+	+		-		
Auto (Open)	-	-	+	+	+	-			-
Auto (Close)	-	-	+	+	+		-		-

Adjustment

1. Turn the ignition switch to the ON position or start the engine.

> **NOTICE**
> We recommned resetting the sunroof while the engine is running.

2. Close the sunroof glass and roller blind completely if opend.
3. Release the sunroof switch.
4. Push the sunroof switch forward in the direction of close (about 10 seconds) until the sunroof glass and roller blind slightly move. (You can hear 2 times of clack sound in this time.)
   Then release the sunroof switch.
5. Within 5 seconds after release the sunroof switch, push the sunroof switch forward in the direction of close, until the sunroof operates as follow again :
   Roller blind open → Glass open → Glass close → Roller blind close

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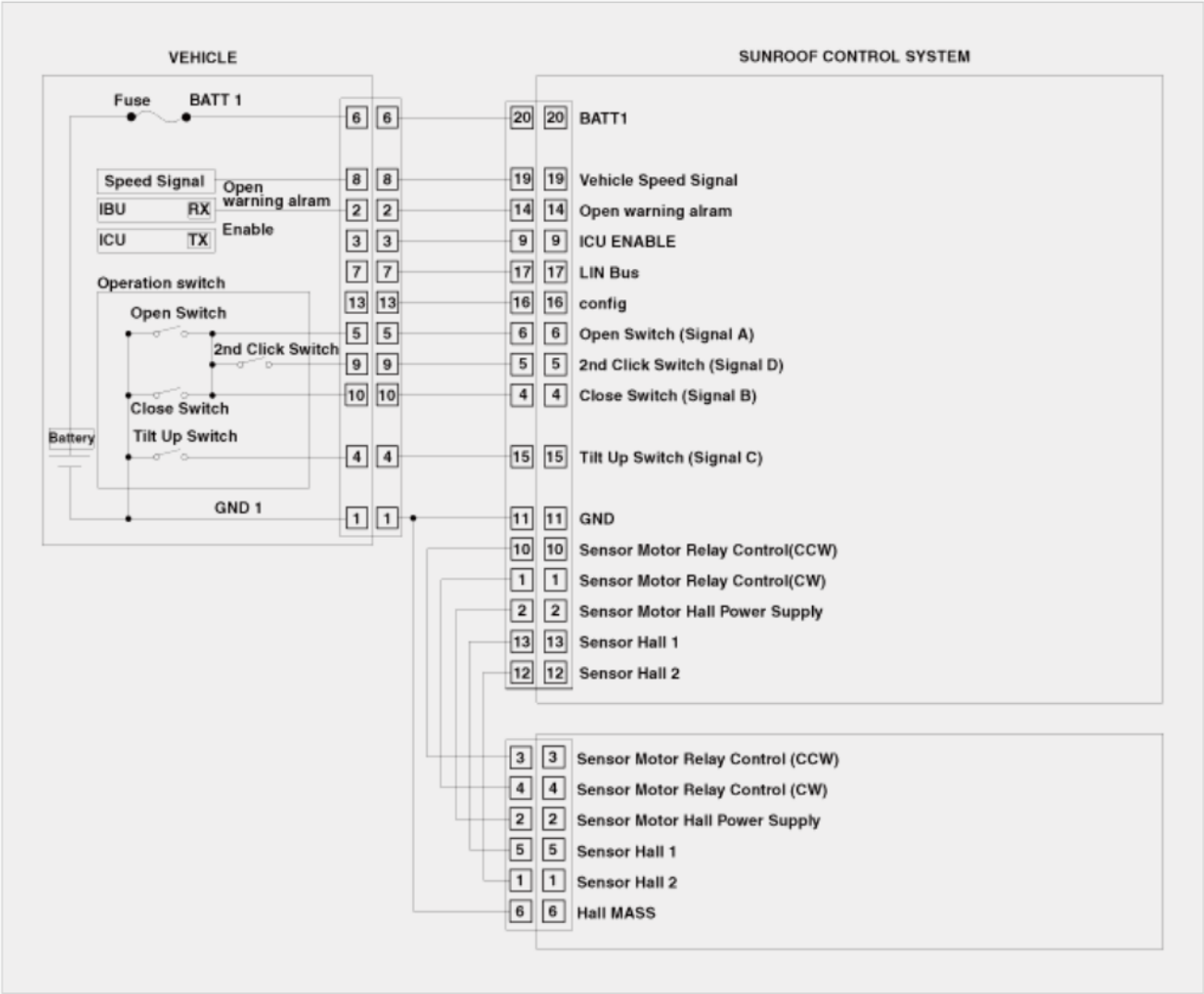
NOTICE

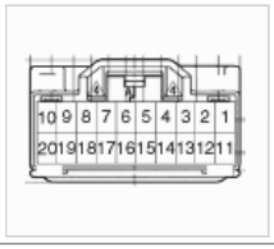
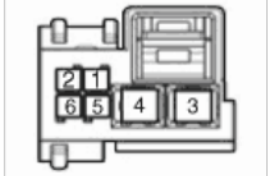
Do not release the sunroof switch until the operation is completed. If you release the sunroof switch during operation, try again from step 2.

6. Release the sunroof switch after all operation has completed. (The sunroof system has been reset.)
7. Check if the Sunroof operated with one touch.

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Circuit Diagram



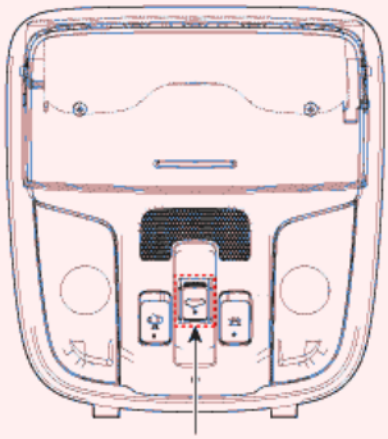
No.	Sunroof wiring connector (Vehicle side)	Glass motor (Master)	Blind motor (Slave)
			
1	Ground 1	Sensor motor relay control (CCW)	Sensor motor relay control (CCW)
2	Open warning alram	ICU Enable	Sensor motor relay control (CW)
3	ICU Enable	-	Sensor hall 1
4	Tilt up switch	-	Sensor mass
5	Open swtich	Open switch	Sensor hall 2
6	Battery 1	2nd click switch	Sensor motor hall power supply
7	-	Close switch	
8	Vehicle speed signal	-	
9	2nd click switch	Sensor motor hall power supply	
10	Close click switch	Sensor moter relay control (CW)	

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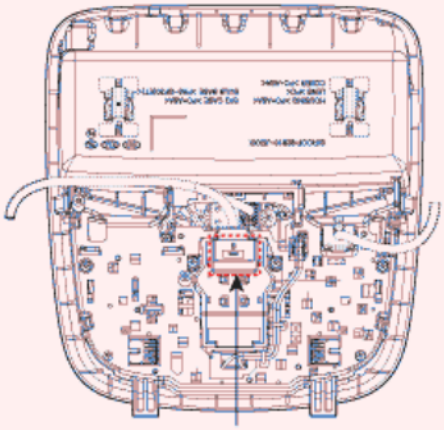
11	-	Battery	
12	-	Vehicle speed signal	
13	-	-	
14	-	LIN Bus	
15		Config	
16		Tilt up switch	
17		Open warning alram	
18		Sensor hall 1	
19		Sensor hall 2	
20		Ground	

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Components



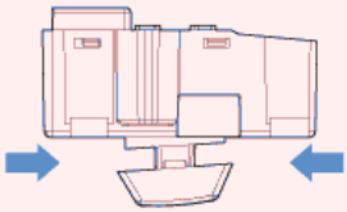
Sunroof Switch



Connector A

<Open Switch>

Switch	Sunroof
1st	Blind open
2nd	Blind / Glass open

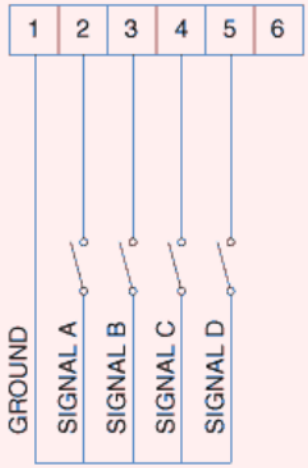


<Close Switch>

Switch	Sunroof
1st	Blind / Tilt close
2nd	Blind / Glass close

<Tilt Switch>

Switch	Sunroof
Push	Tilt up



No.	Description	Description				
		Blind open	Blind / Glass open	Blind / Tilt Close	Blind / Glass Close	Tilt up
1	Ground					
2	Signal A	ON	ON			
3	Signal B			ON	ON	
4	Signal C					ON
5	Signal D		ON		ON	
6	Illumination (-)					
7	-					
8	Illumination (+)					

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Inspection

1. Disconnect the negative (-) battery terminal.
2. Remove the overhead console lamp (A) after loosening the mounting screws.

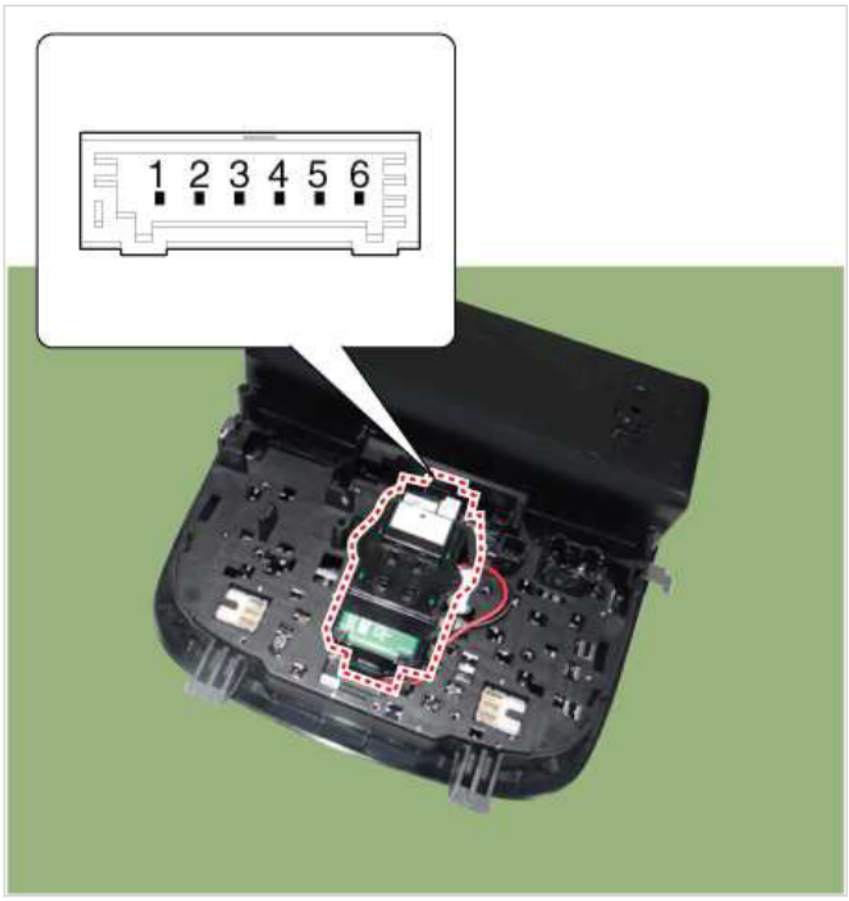


3. Disconnect the overhead console lamp connectors (A).



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

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Operation / Terminal	1	2	3	4	5	6
Manual open	○	○				
Auto open	○	○			○	
Manual close	○		○			
Auto close	○		○		○	
Tilt up	○			○		

Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the overhead console lamp (A) after loosening the mounting screws.

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3. Disconnect the overhead console lamp connectors (A).



4. Remove the wide sunroof switch knob (A).

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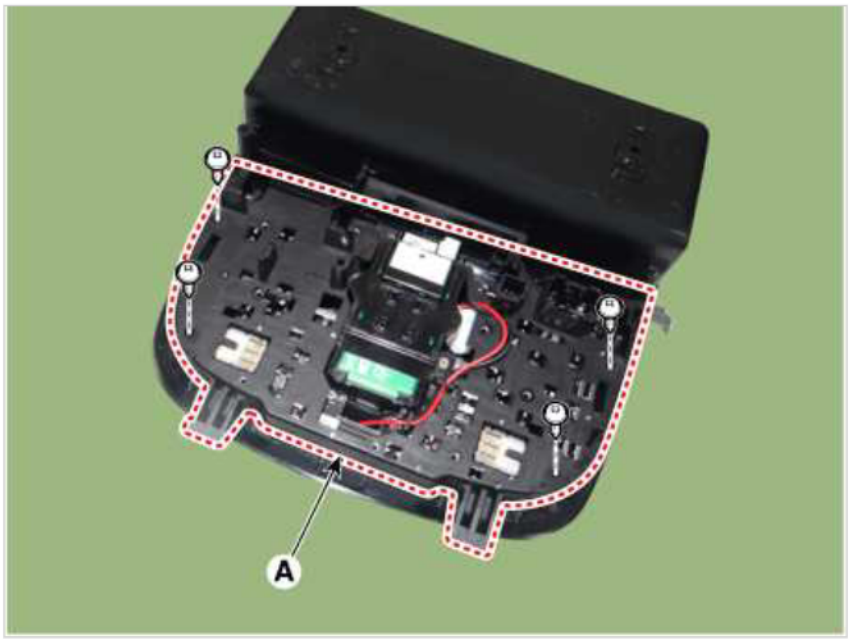


5. Disconnect the overhead console lamp connector (A).



6. Remove the overhead console lamp cover (A) after loosening the mounting screws.

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7. Remove the wide sunroof switch (A) after loosening the mounting screws.

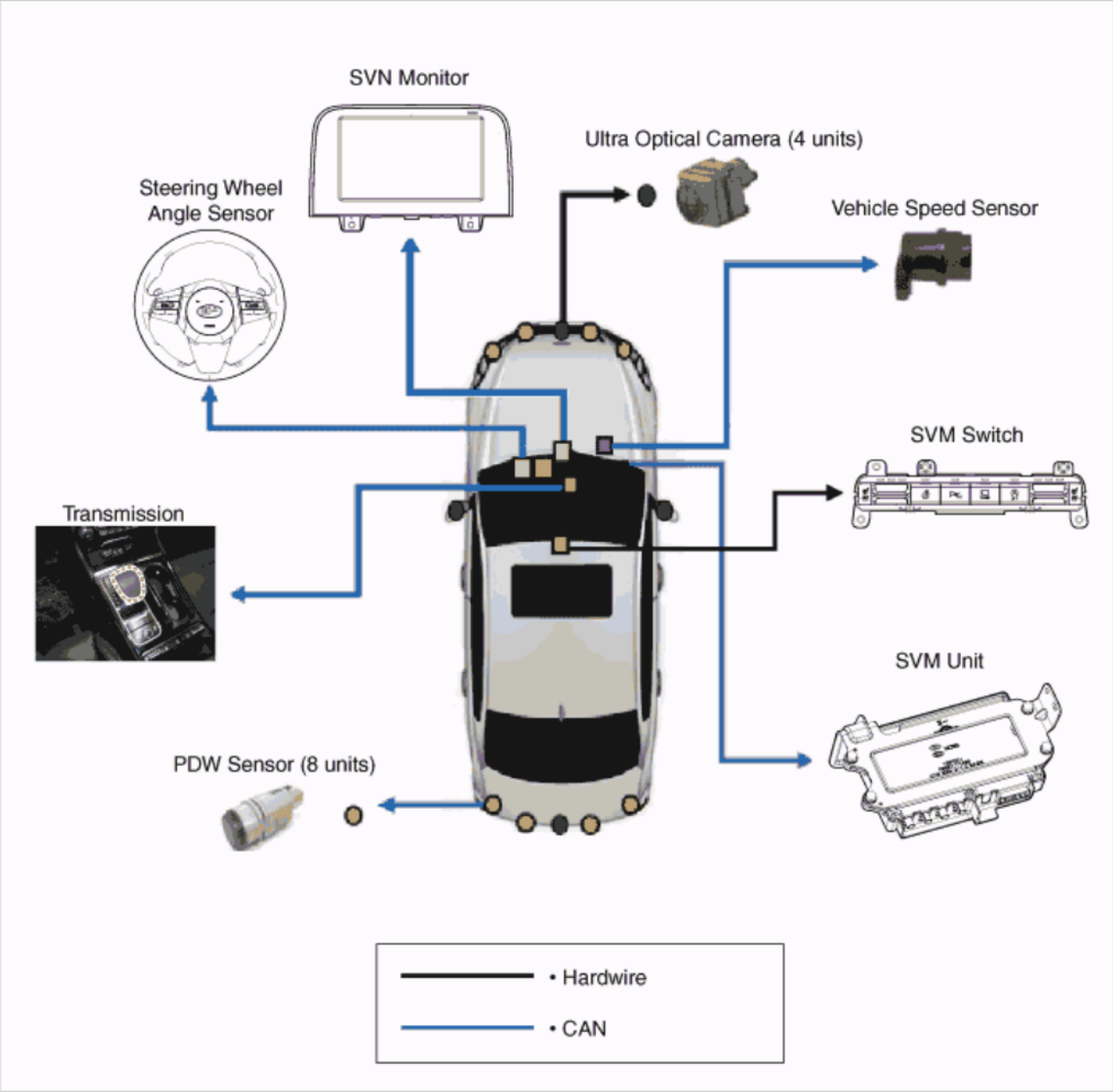


Installation

1. Install the wide sunroof switch.
2. Install the overhead console lamp cover.
3. Connect the overhead console lamp connector.
4. Install the wide sunroof switch knob.
5. Connect the overhead console lamp connectors.
6. Install the overhead console lamp.
7. Connect the negative (-) battery terminal.

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Components



Information

1) SVM unit basically transmits data via C-CAN only.
- Steering wheel angle sensor : C-CAN
- Vehicle speed sensor : C-CAN

2) It functions as a gateway of C-CAN ↔ MM-CAN in cluster.

e.g. The signal of unit using MM-CAN is transmitted after converting to C-CAN in cluster.
- User menu option : Cluster (SVN monitor, MM-CAN)
- Transmission : TCU
- PDW sensor : IBU

Component Functions

No.	Components	Quantity	Major Role
1	SVM Unit	1	– Input video information from 4 channel cameras and process display – Vehicle communication (CAN) and system control –

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			Screen output in 8 view modes
2	Ultra optical camera (190 degrees)	4	– Record vehicle"s surrounding area
3	SVN Head Unit	1	– Provide driver with video via SVM ECM output – Send user input data to SVM ECU
4	SVM Switch	1	– Input video feed in Front Mode

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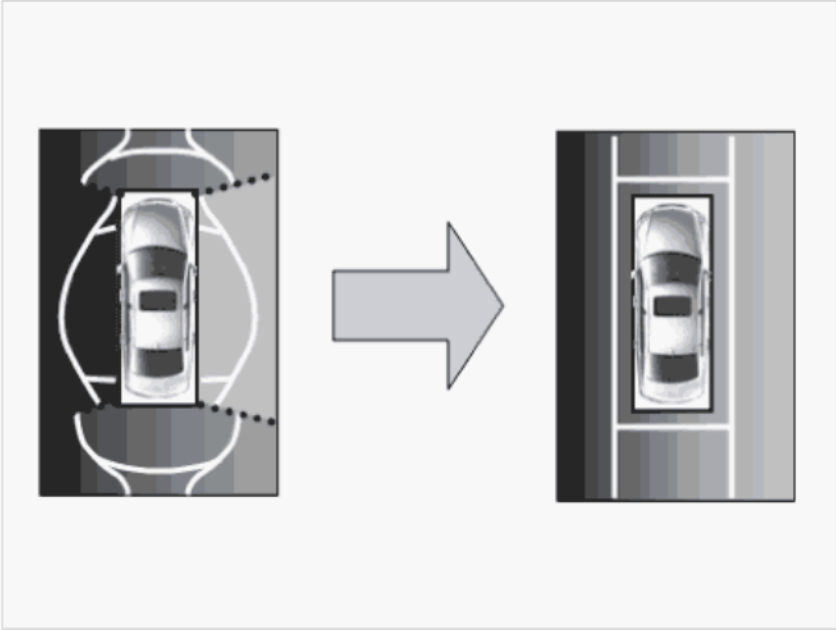
Description

Surround View Monitor (SVM) allows video monitoring of 360 degrees around the vehicle. The system consists of 4 ultra optical cameras mounted around the vehicle (front, both sides and rear).

The video images from these cameras are applied with distortion compensation, time point conversion, and video merging technologies to provide sky-view image of the vehicle"s surrounding area, as well as various other view modes.

The SVM System provides video feed of the vehicle"s surrounding area while parking or during low speed driving to the driver to enhance safety and driver"s convenience.

Also, it features steering wheel synchronized guide line indication, front and rear object warning, and A/S (including In-Line) tolerance compensation.



This system displays the video images from ultra optical cameras mounted on 4 sides of the vehicle, on the Head Unit Screen. It shows 360 degrees sky-view image of the vehicle"s arounding area, as well as various other view modes.

Major Features

1. Display Surrounding Area of Vehicle in Video
   The surrounding area video display function displays 360 degrees video image captured from four cameras on the Head Unit Screen while the vehicle is moving at low speed or reversing. The SVM System displays total 8 video modes for displaying surrounding video based on the vehicle driving state and the driver"s selection.
2. Guide Line Indication & Steering Wheel Synchronized Feature
   The Guide Line Indication & Steering Wheel Synchronized Feature is the function that assists the driver in parking by synchronizing the steering wheel with the rear view video display marked with a guide line to help anticipate the direction of the reversing vehicle.
3. Front/Rear Object Warning (Obstacle Detection Feature)
   The system receives obstacle warning signal from the PDW or PA sensors mounted on the front/rear of the vehicle and displays the obstacle location on the AVN Head Unit Screen.
4. Tolerance Compensation (including A/S)
   Manual Tolerance Compensation Software is embedded in the SVM ECM to compensate the SVM deviation that may occur due to assembly line installation tolerance. You must first setup proper work environment in order to perform correct tolerance compensation.

Main Features

No.	Main Features	Detailed Description	Notes
1	8 Display View Modes	• 4 Front & 4 Rear Display View Modes	Merged Video Display of 8 Modes
2	Front Assist Mode Selection Feature	• Display only the Front Mode by using the Front Mode Selection Switch	Same as the PDW SVM Switch
3	Rear Steering Synchronized Parking Guide Line Display	• Displays Parking Guide Line by synchronizing with the steering wheel when going reverse.	Display over the Rear Video
4	PDW Obstacle Indication	• Display obstacle warning from rear and front PDW	Display both on the Cluster and the Head Unit
5	User Setting Option	• Select Steering Wheel Synchronized Guide Line Indication • Select Front/Rear Obstacle Indication	Provides additional screen settings

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		• Select Initial Front/Rear View Screen	
6	Assembly Line & A/S Tolerance Compensation Feature	• Compensation - Tolerance Compensation for camera installation deviation and assembly line tolerance is required	Compensation function recognition logic applied

SVM Mode Entry Conditions

The vehicle information is accessed regularly, even after entering SVM mode. When the conditions are met, conversion from front mode to rear mode is available, and vice versa.

When the mode is converted, the view displayed on the screen can be the initial view or the previous view depending on the conditions.

If the mode for conversion is the initial entry, the default view is selected based on the front or rear. If a continuous front-rear conversion mode occurs as forward and backward movement are repeated for parking, the previous view is recalled and displayed.

– Initial Entry : When the rear and front view modes in SVM mode are displayed on the screen for the first time.

– Re-entry: When switching from SVM mode to another mode, without turning off SVM, and returning to the previous mode (e.g. Rear → Front → Rear: Re-enter rear mode / Front → Rear → Front: Re-enter front mode)

Switch mode	Vehicle speed	Gear	SVM Switch	Display view
Rear → Front	Below 20 km/h	R Range or P Range excluded	ON	Initial Entry: Front view set in the initial view mode option
				Re-entry: The last view mode displayed in the previous front mode
Front → Rear	Irrelevant	Reverse Gear	Irrelevant	Initial Entry: Rear view set in the initial view mode option
				Re-entry: The last view mode displayed in the previous rear mode

SVM Mode Disengagement

If the conditions below are satisfied while in SVM mode, the SVM is turned OFF and no video is displayed.

OFF Mode	Vehicle speed	Gear	SVM Switch	Notes
Front mode	Over 20 km/h	R Range or P Range	OFF	If any of the three conditions is satisfied
Rear mode	Irrelevant	Except R gear	Irrelevant	If any of the two conditions is satisfied

SVM Options

Considering the user"s convenience, the SVM provides three options for the user to select from.

The window for changing options (parking guide settings) is displayed on the AVN. Only the changed options are forwarded to the SVM unit through M_CAN.

These three options are applied as soon as they are selected by the user. Based on the conditions, the initial views displayed are as follows.

Option	Function	Default setting
Guideline steering interlocking	Interlocks with steering to display the driving direction of the vehicle during parking.	Classification code
Close range warning indicator	Indicates front and rear obstacle detection	Classification code
Initial view mode setting	Default view displayed when entering SVM mode	Front + Surround view
		Rear + Surround view

Operations for Guideline Steering Interlocking Indications

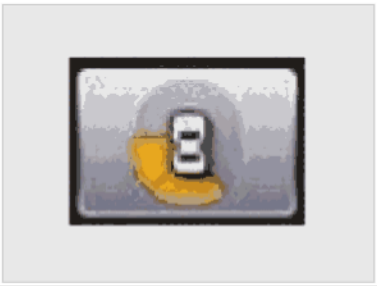
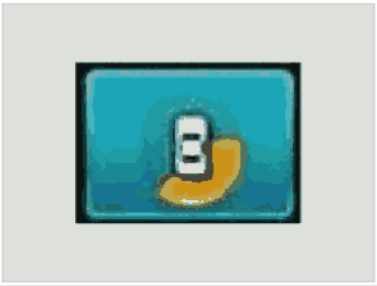
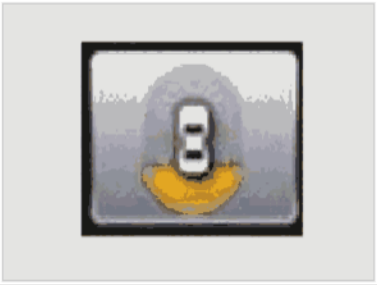
The guideline for steering interlocking trace is indicated by using the value of steering wheel angle periodically received by SVM unit via C-CAN.

A combination of the rear area that displays 130 degree image of the rear mode (two-split mode) and the expected car movement trace displayed on the wide view is displayed.

1. View modes for guideline steering interlocking indications

Mode	View	Applied area	Notes
Rear	Surround view + rear	Rear image (two-split mode)	

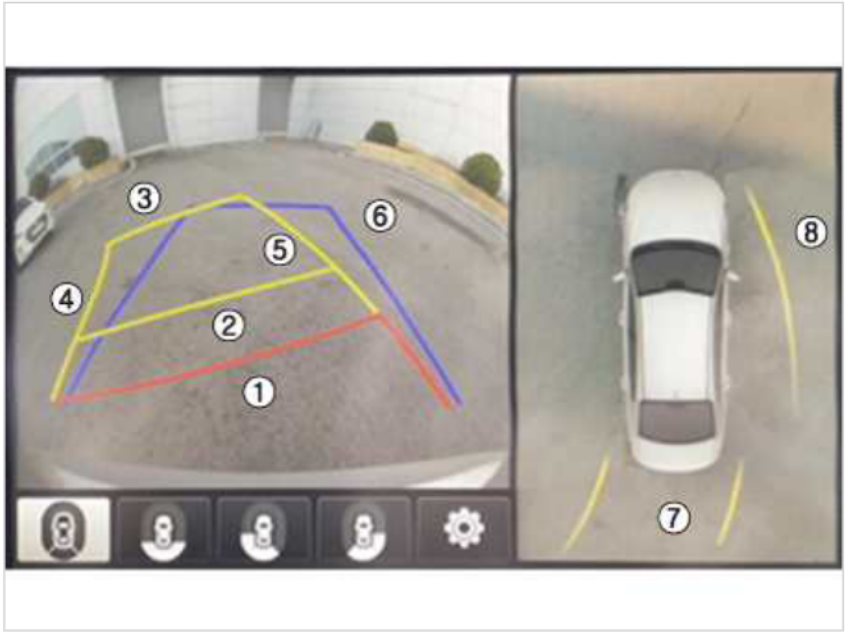
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	Left rear + rear	Rear image (two-split mode)	
	Right rear + rear	Rear image (two-split mode)	
	Rear wide view	Wide view image	

2. Specifications for guideline steering interlocking trace lines

Description	Number	Distance	Color
Steering wheel interlocking trace lines	①	0.5 m	Red
	②	1.0 m	Yellow
	③	3.0 m	Yellow
	④	Vehicle left side end + 0.3 m	Red + Yellow
	⑤	Vehicle right side end + 0.3 m	Red + Yellow
Neutral trace line	⑥	3.0 m	Blue
Surround views mode trace lines	⑦	Surround View + 0.3 m	Yellow
	⑧		Yellow

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SVM System Input/Output

1. Camera input

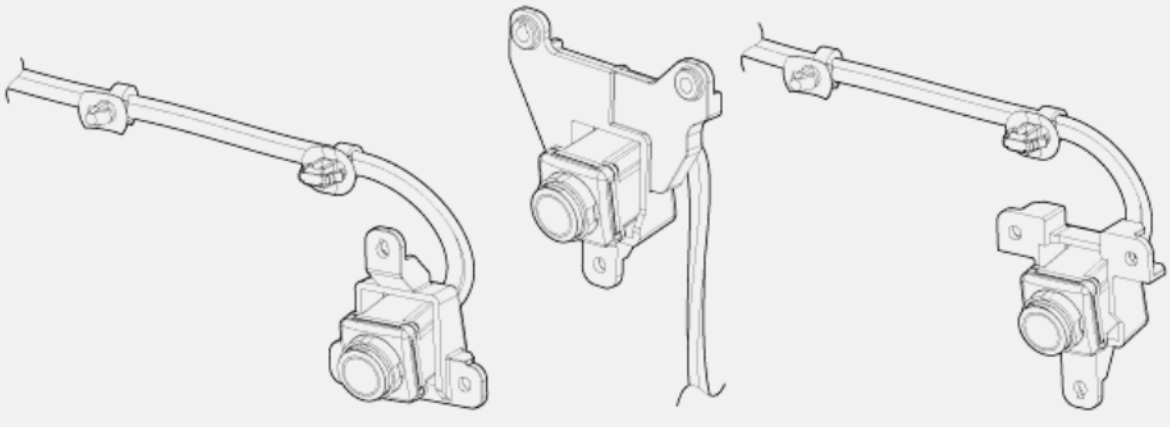
Item		Specification
Lens angle of view		190 degrees
Angle of view	Horizontal	186 degrees
	Vertical	135 degrees
Function		Provides the original image of the wide angle image (no additional function)
Application location		Same camera applied to the front, rear, left and right

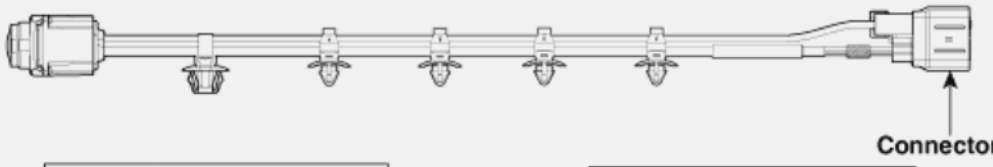
2. SVM image output
   The SVM unit carries out distortion compensation and video merging on the image from 4 cameras installed around the vehicle, indicates steering interlocking guidelines and others, and sends the output in analog.
3. SVM switch
   When the switch is ON, this is used as a control input signal that operates the front view mode.
4. Ignition input
   The SVM unit displays images only when IGN2 ON. With IGN2 OFF, it is in SVM OFF state, and limits image output.
   SVM unit uses signal input from IGN pin or M_CAN communication to determine whether IGN2 is ON or OFF.
5. Output switch indicator lamp
   SVM units sends output power in PWM waves from the LED located in the SVM switch to show the user that the switch is pressed.
6. Input chassis CAN (C_CAN)
   The SVM unit uses C_CAN to receive information about the vehicle"s condition and to decide whether to carry out main SVM operations.
7. Multimedia CAN input/output (M_CAN)
   M-CAN signal is changed to C-CAN signal by IGPM (routing function or central gateway) and then SVM unit can use this C-CAN signal.
   M_CAN is used to communicate with ICU to send and receive the following information.
   - Send SVM mode conversion requests for SVM output images (e.g. Navi mode→SVM mode)
   - Send requests for user SVM view conversion
   - Send compensation coordinates for tolerance compensation
   - Send warning messages to be displayed on the AVN
   - Send any user option changes

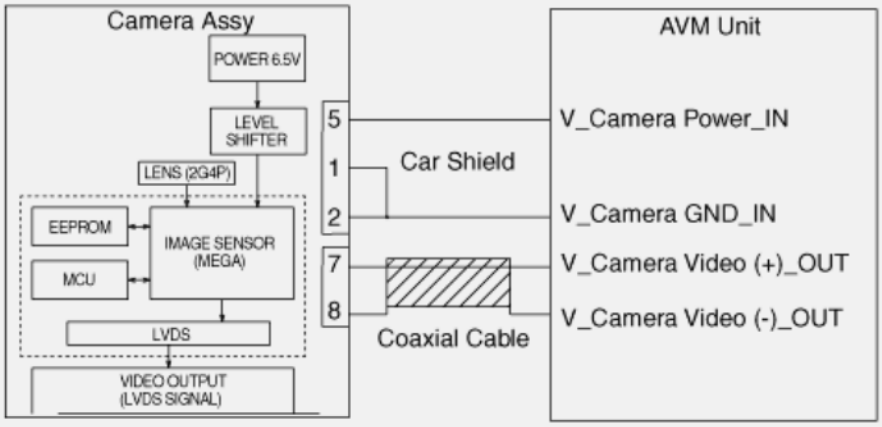
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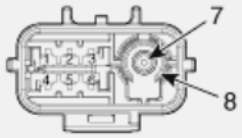
Components

Front View Camera



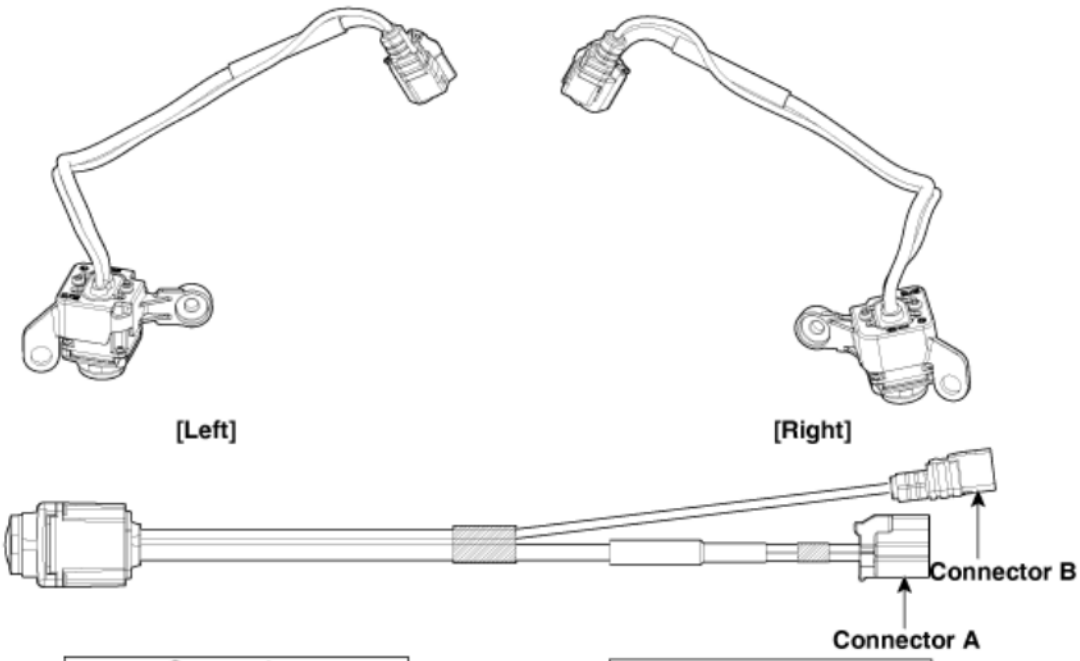


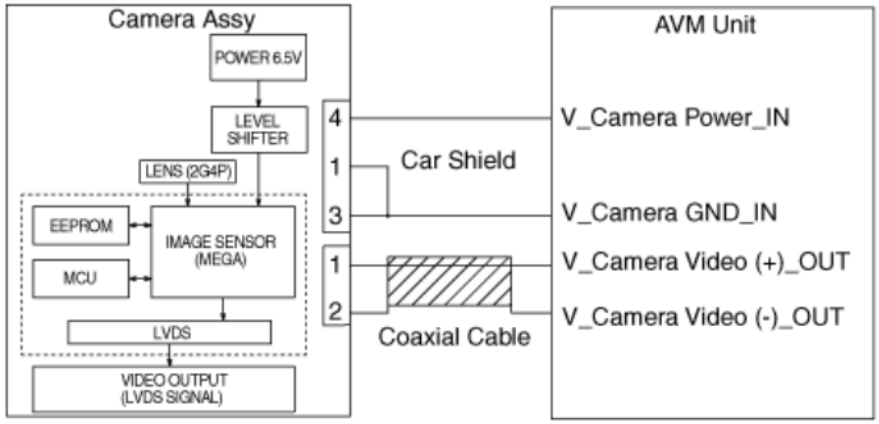


Connector A	No.	Description	No.	Description
	1	Shield ground	5	Camera power
	2	Camera ground	6	-
	3	-	7	Camera video (+)
	4	-	8	Camera video (-)

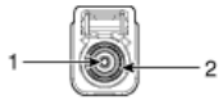
Side View Camera

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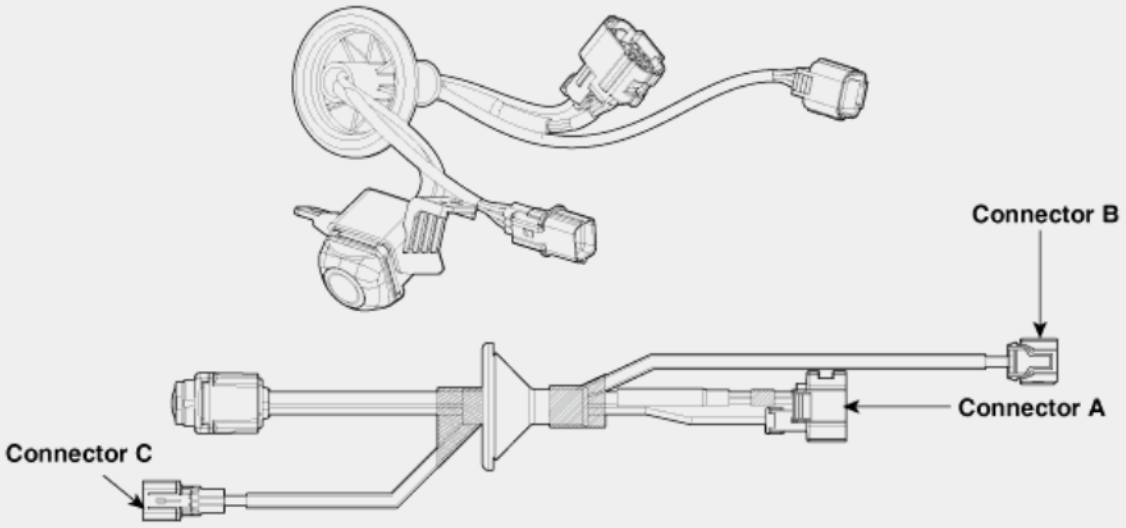


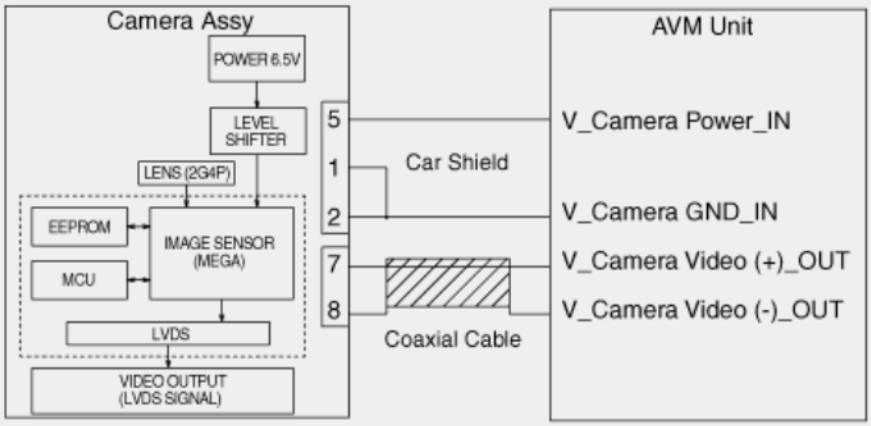
Connector A	No.	Description
	1	Shield ground
	2	-
	3	Camera ground
	4	Camera power

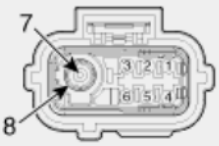
Connector B	No.	Description
	1	Camera video (+)
	2	Camera video (-)

Rear View Camera

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Connector A		Connector B	Connector C
			
No.	**Description**	**Description**	**Description**
1	Shield ground	Left license lamp (+)	Left license lamp (+)
2	Camera ground	-	-
3	-	Outside handle (+)	Outside handle (+)
4	-	Right license lamp (+)	Right license lamp (+)
5	Camera power	License lamp earth (-)	License lamp earth (-)
6	-	Door earth (-)	Door earth (-)
7	Camera video (+)		
8	Camera video (-)		

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Removal

Information

In case of bad quality or poor focus, be sure to check the camera lense surface condition and foreign materials.

Front View Camera

1. Disconnect the negative (-) battery terminal.
2. Remove the front bumper assembly.
   (Refer to Body - "Front Bumper Assembly")
3. Disconnect the front view camera connector (A).



4. Remove the front view camera (A) after loosening the mounting screws.

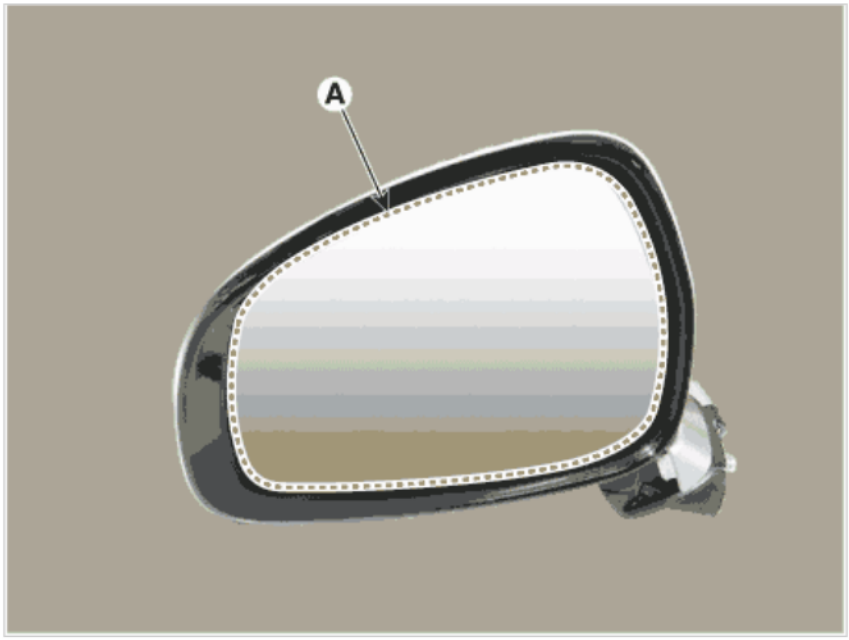


Side View Camera

1. Disconnect the negative (-) battery terminal.
2. Remove the outside rear view mirror.
   (Refer to Body - "Outside Rear View Mirror")

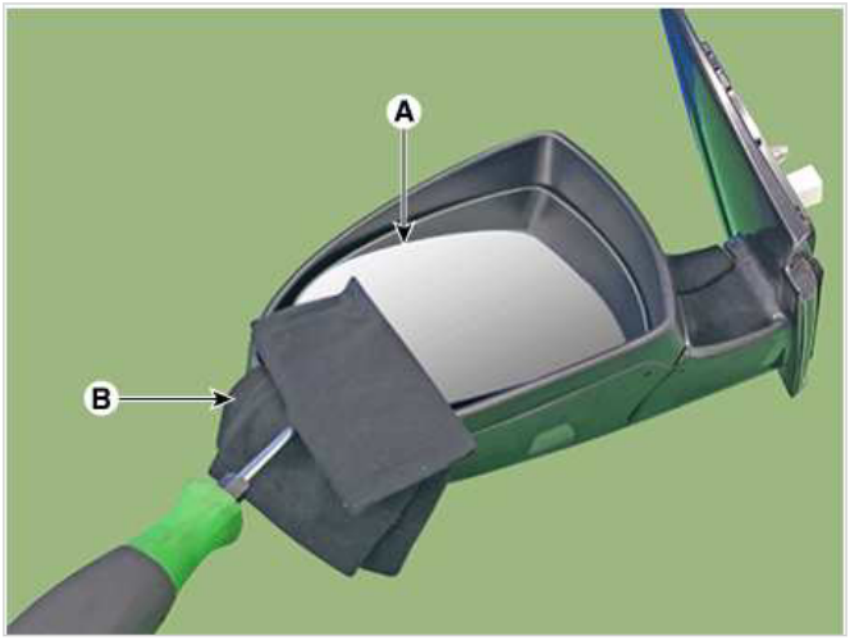
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3. Remove mirror (A) to the direction as shown in the picture using (-) screw driver.



⚠ CAUTION

- Protect mirror from removing tool with cloth (B) wrapped.
- Be careful not to damage mirror and mirror housing during removing process.
- Apply force around the center of mirror because to apply force the end of mirror will break it.



NOTICE

Be careful not to damage the fixing clips (A).

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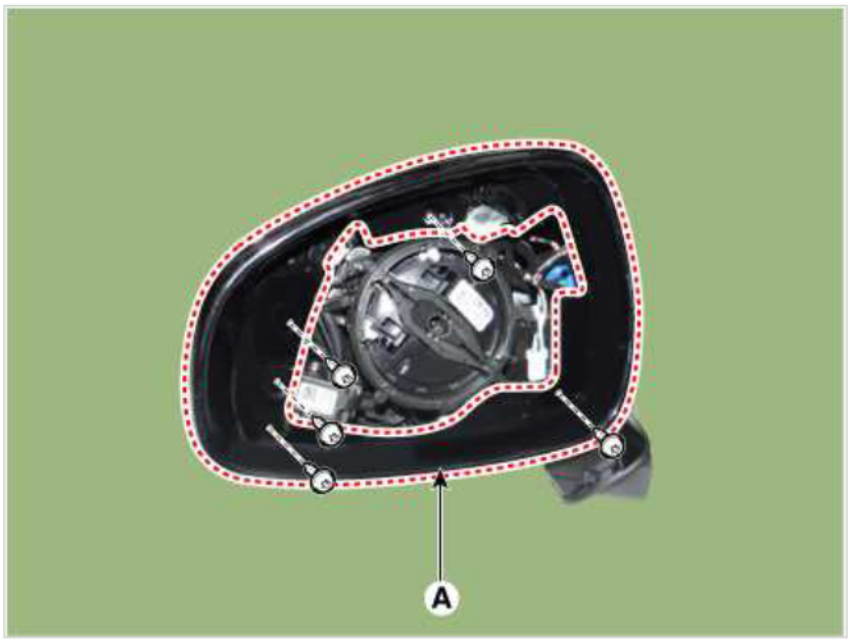


4. Disconnect the heater connectors (B) and BCW indicator connector (A) from the mirror.

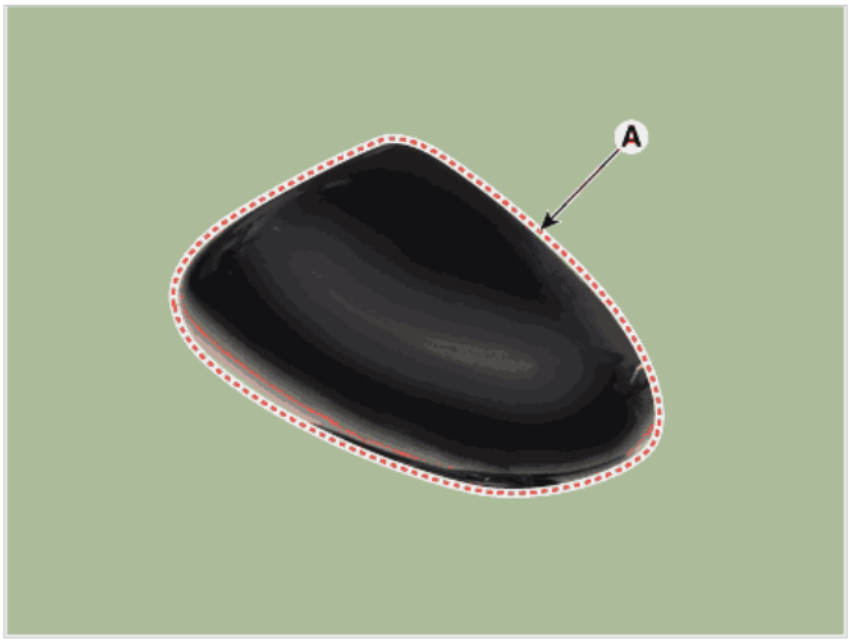


5. Remove the door mirror housing (A) after loosening the mounting screws.

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6. Remove the door mirror back cover (A).



7. Disconnect the side view camera connectors (A).

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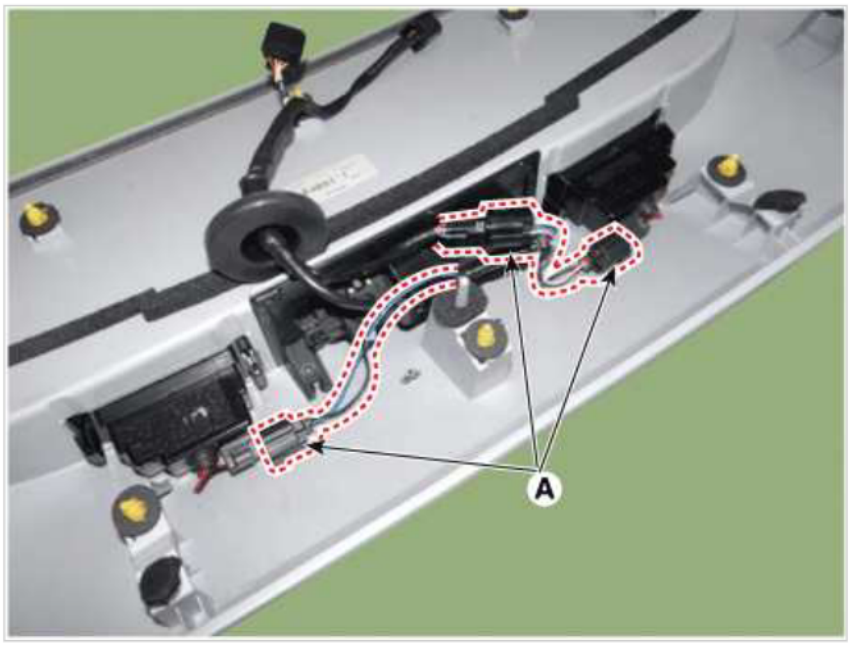
8. Remove the side view camera (A) after loosening the mounting screw.



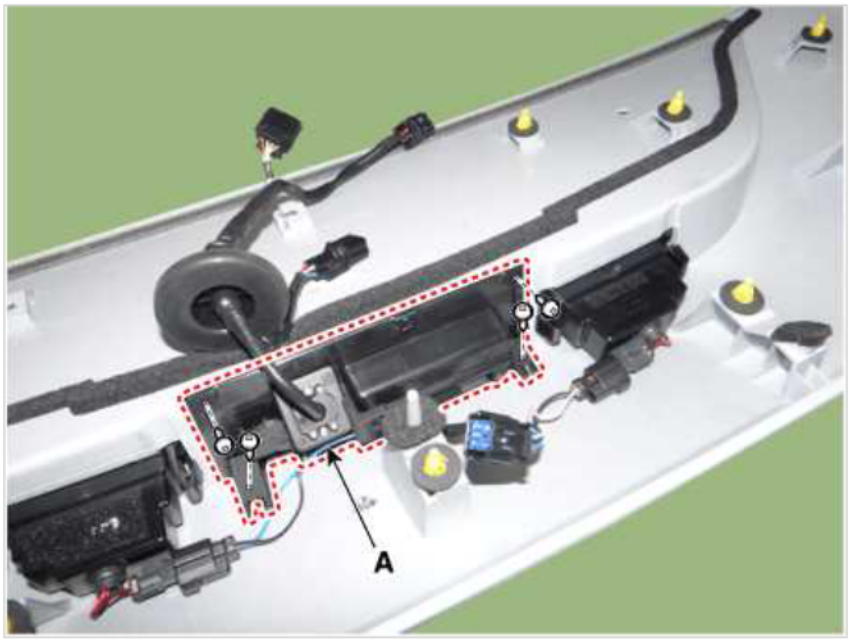
Rear View Camera

1. Disconnect the negative (-) battery terminal.
2. Remove the Liftgate back panel.
   (Refer to Body - "Liftgate Back Panel")
3. Disconnect the license lamp connectors (A).

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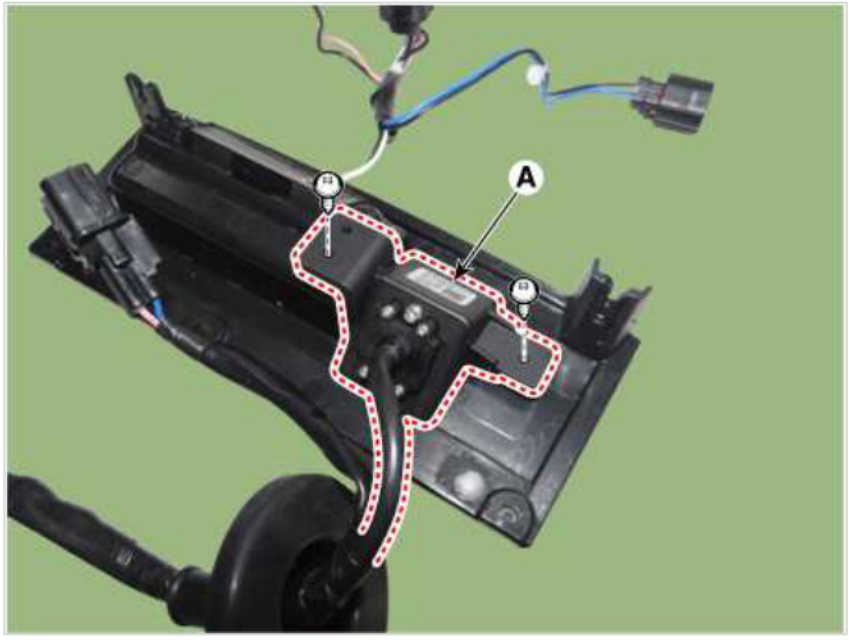


4. Remove the liftgate outside handle assembly (A) after loosening the mounting screws.



5. Remove the rear view camera (A) after loosening the mounting screws.

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Installation

Front View Camera

1. Install the front view camera after connecting the connector.
2. Install the front bumper assembly.
3. Connect the negative (-) battery terminal.

Side View Camera

1. Install the side view camera after connecting the connector.
2. Install the door mirror back cover.
3. Install the door mirror housing.
4. Connect the heater connectors and BCW indicator connector.
5. Install the mirror.
6. Install the outside rear view mirror.
7. Connect the negative (-) battery terminal.

Rear View Camera

1. Install the rear view camera.
2. Install the liftgate outside handle assembly.
3. Connect the license lamp connectors.
4. Install the liftgate back panel.
5. Connect the negative (-) battery terminal.

Information

Be sure to perform the compensation calibration after replacing the camera.
(Refer to Surround View Monitor (SVM) - "Repair procedures")

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Inspection

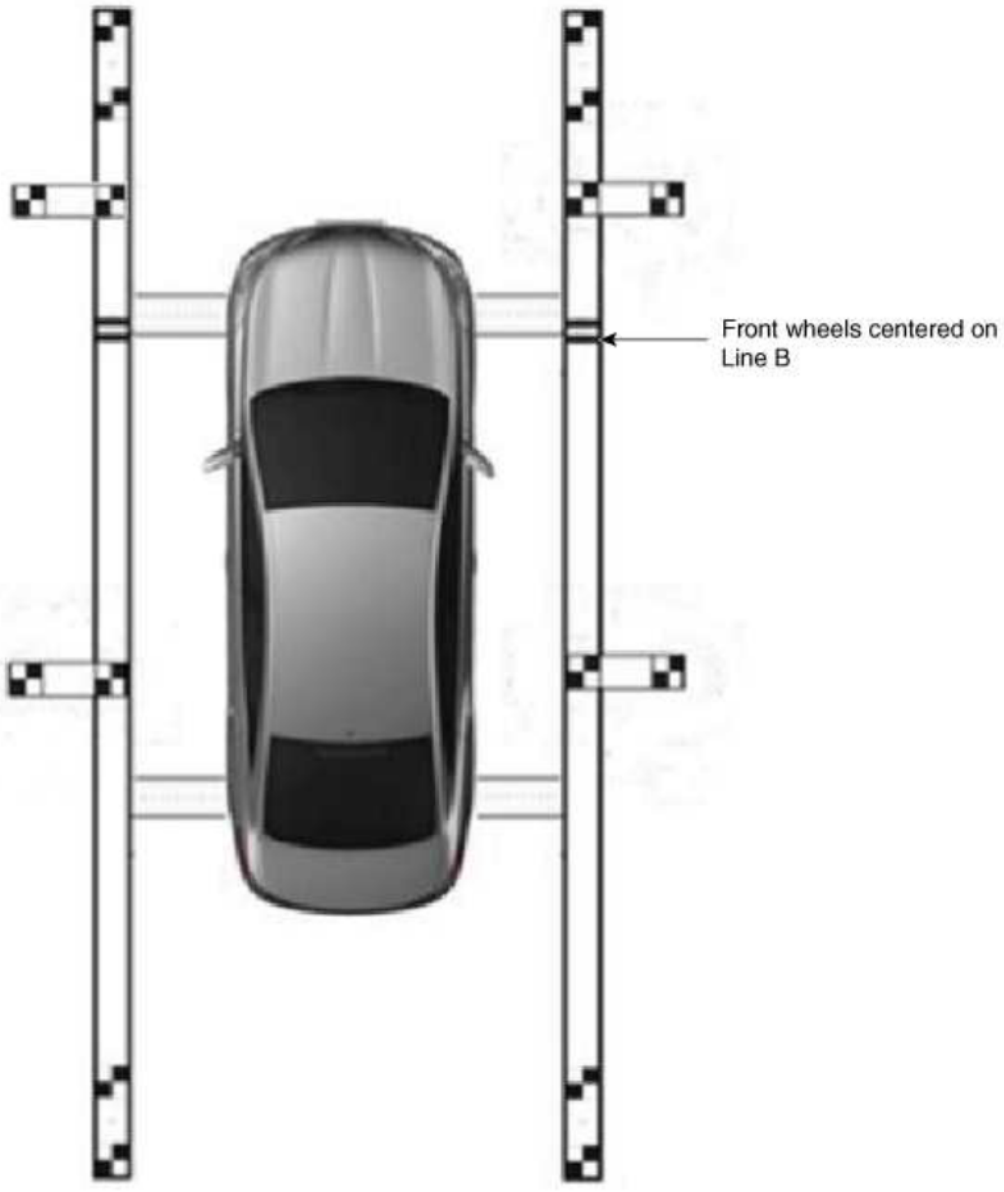
Tolerance Compensation

Tolerance compensation compensates for the error margins of Surround view video that occur due to the installation tolerance when the four cameras that comprise the SVM system are installed.

Tolerance compensation must be carried out when the following actions are performed:

- When removing and installing a wide camera.
- When conducting a body task such as the trunk task that causes the focus of the wide camera to change.
- When replacing the door mirror with a wide camera.
- When replacing the Surround view monitor unit.

Tolerance Compensation Environments



NOTICE

- There are two types of tolerance compensations: [manual tolerance compensation] and [automatic tolerance compensation].
- The service center with the SVM exclusive workshop performs [automatic tolerance compensation].
- The maintenance environment lacking an SVM exclusive workshop performs [manual tolerance compensation].

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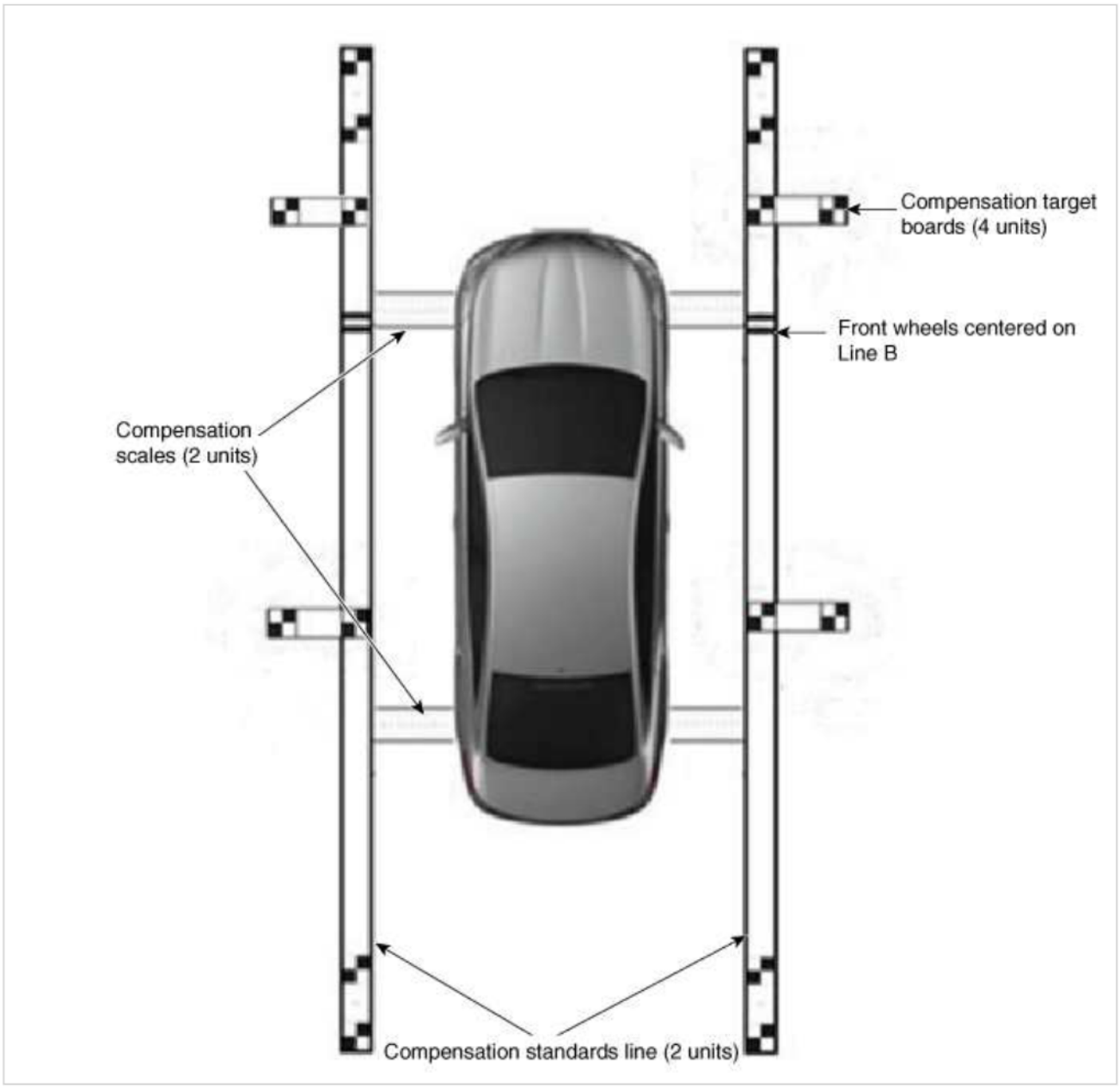
The Procedure of Manual Tolerance Compensation

1. Prepare in advance as below.
   – Confirm that the car hood, trunk and doors are closed.
   – Close the door after getting in on the driver side.
   – Switch the ignition to "IGN".
   – Unfold all side mirrors.
   – Shift the gear to N.
   – Check the flashing state of LED indicator lamp in the SVM switch.
   – During the advance preparation, do not install exhaust inhaler or other equipment that may block the view of rearview cameras.
   – Also, as exhaust fume may block the rearview image, blow off the smoke by using a fan before performing tolerance compensation with IGN ON.
   – Engage foot brake or electronic parking brake (EPB) to hold vehicle in place.
2. Before entering tolerance compensation mode, to check normal operation of SVM ECU and cameras, perform the following.
   – Check that initial setting screen of SVM is displayed. (Front view image + surround view image when shifted to N)
   – Check that front, rear, left and right images of surround view monitor are properly displayed.
   – If images are properly displayed, enter tolerance compensation mode. Otherwise, if images are abnormally displayed or are not displayed, replace relevant part.
3. Install two compensation scales, two compensation reference line boards, and four compensation target boards around the vehicle by referring to the manual provided with the tools.

⚠ CAUTION

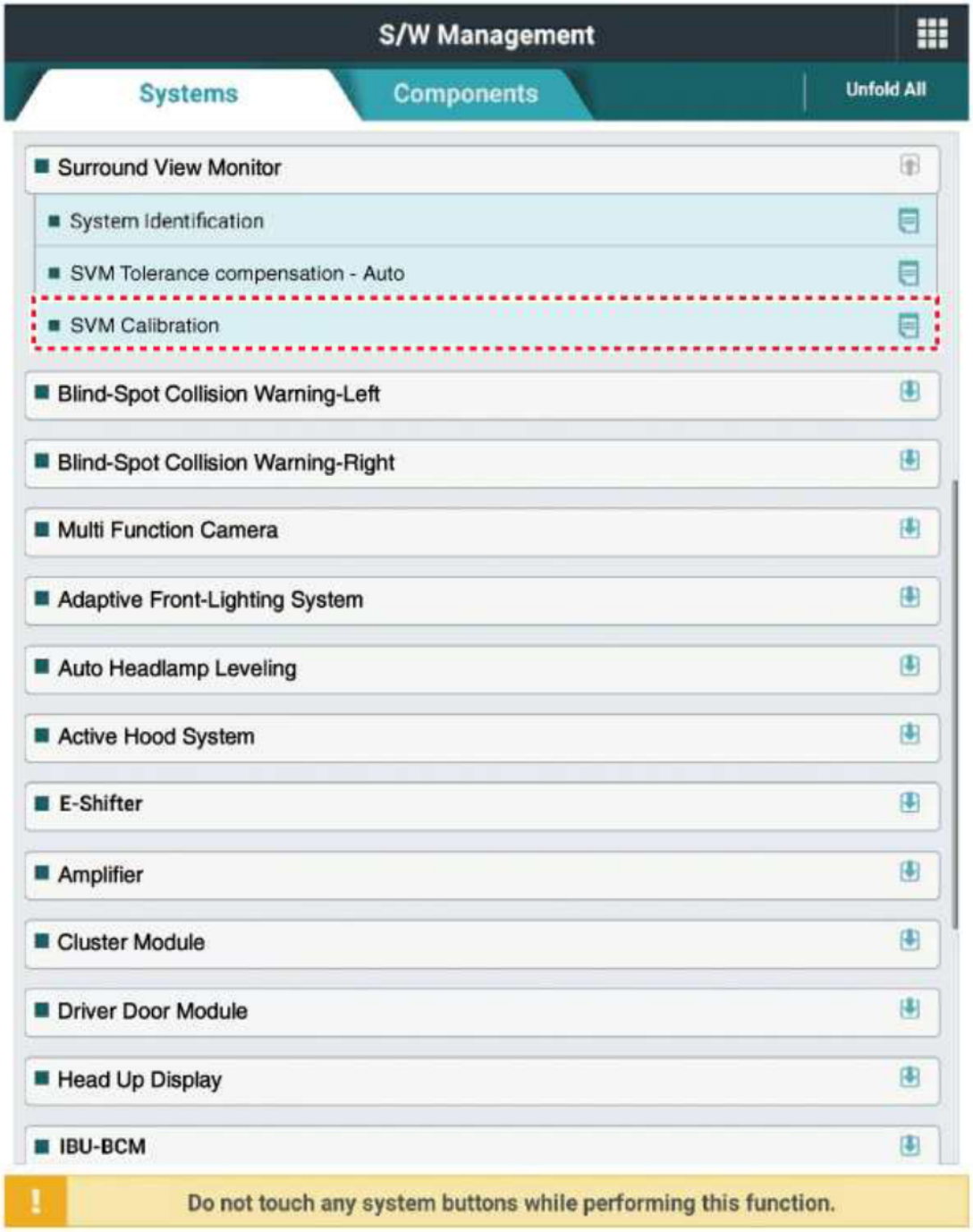
- Align centers of front wheels to "B-type" on the compensation reference line board.
- Accurately set the location (distance/angle) of the center of white and black compensation board as this is the reference point.
- Front/rear and left/right alignment error margin should be below 3 cm.
- Rotation error margin when aligning vehicle should be within 1° to left/right.

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4. Maintain ignition "ON" with vehicle stopped, check that the gear is in P, and engage parking brake even on flat ground.
5. Perform work with SVM switched "ON".
6. Connect the KDS to vehicle.
7. Select vehicle model and system.
8. Enter additional function in KDS.
9. Perform SVM manual tolerance compensation as shown on KDS diagnostic device.

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S/W Management

• SVM Calibration

Purpose	To calibrate image tolerance when module or cameras are replaced.
Enable Condition	1. Engine Off 2. Ignition Switch On 3. Gear Position N, Parking Brake On 4. Bonnet Closed / Trunk Closed / Door Closed / Side View Mirror Open 5. SVM switch Lamp On
Concerned Component	Sround View Monitoring(SVM) Module, Ultra-optical cameras
Concerned DTC	B103000, B1030XX
Fail Safe	SVM LED Indicator blinking, set DTC
Etc	- Do not change the status of the power / gear / SVM switch until this function is completed. - Tolerance correction target is required.

OK

! Do not touch any system buttons while performing this function.

Information

When "SVM tolerance compensation - Manual" is clicked on the KDS diagnostic device screen, the SVM switch indicator lamp will flash.

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S/W Management

■ SVM Calibration

● [SVM Calibration]

This function is to calibrate the image tolerance in SVM system when SVM control unit or the cameras(front, rear, left, right) on the vehicle is replaced.

●[Condition]

1. Check engine hood/trunk/doors closed and outside mirrors unfolded.
2. Engine stop, IG ON, Gear position 'N', Parking Brake ON.
3. SVM system button 'ON'.
4. Install the AVM calibration target. (Refer to Shop Manual)

If this function is not performed when SVM control unit is replaced, SVM switch lamp will blink and DTC(B103000 : No Camera Tolerance Correction) will be set.

Click [OK] to proceed to next step.

OK Cancel

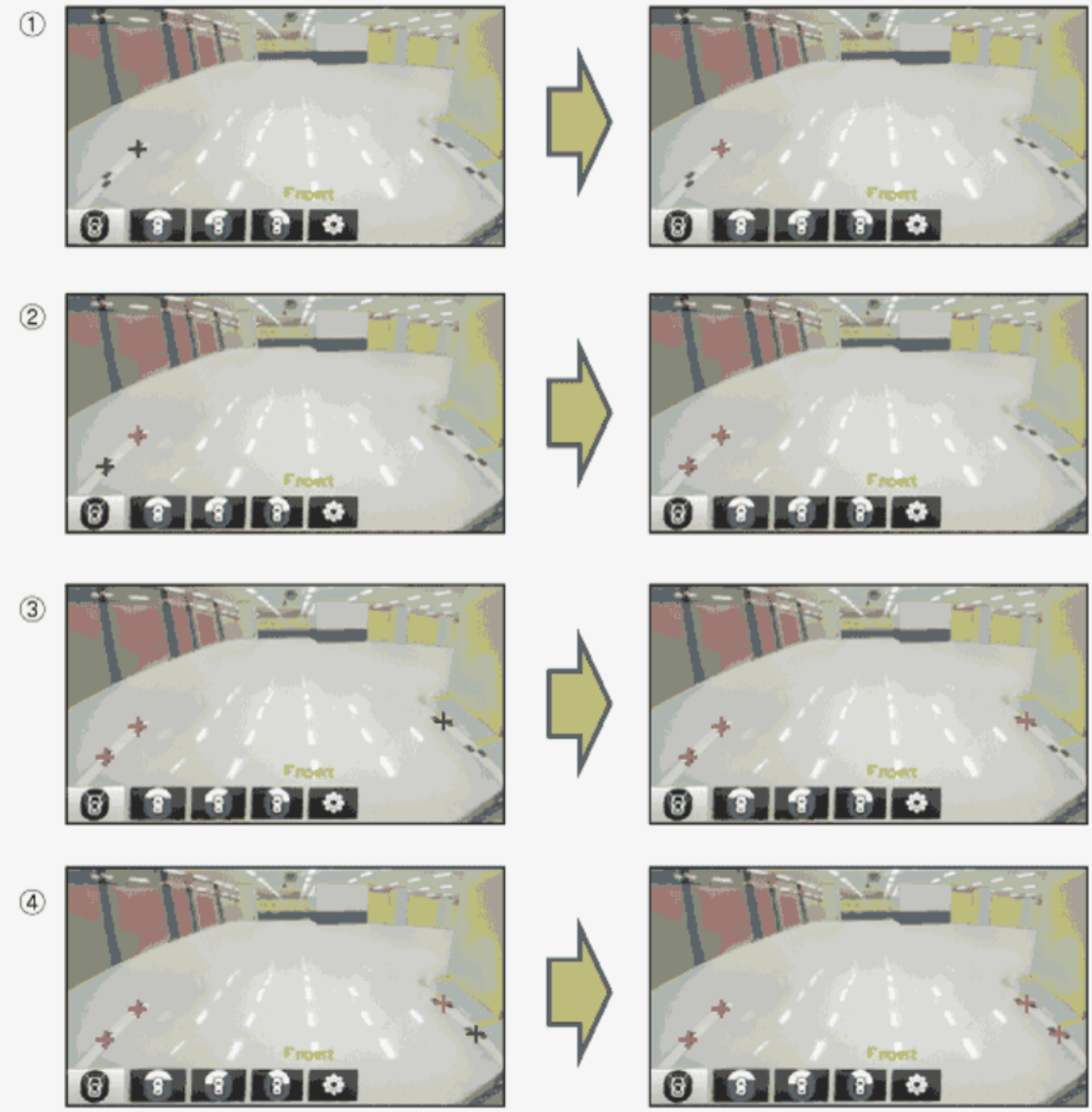
! Do not touch any system buttons while performing this function.

Click to see large image...

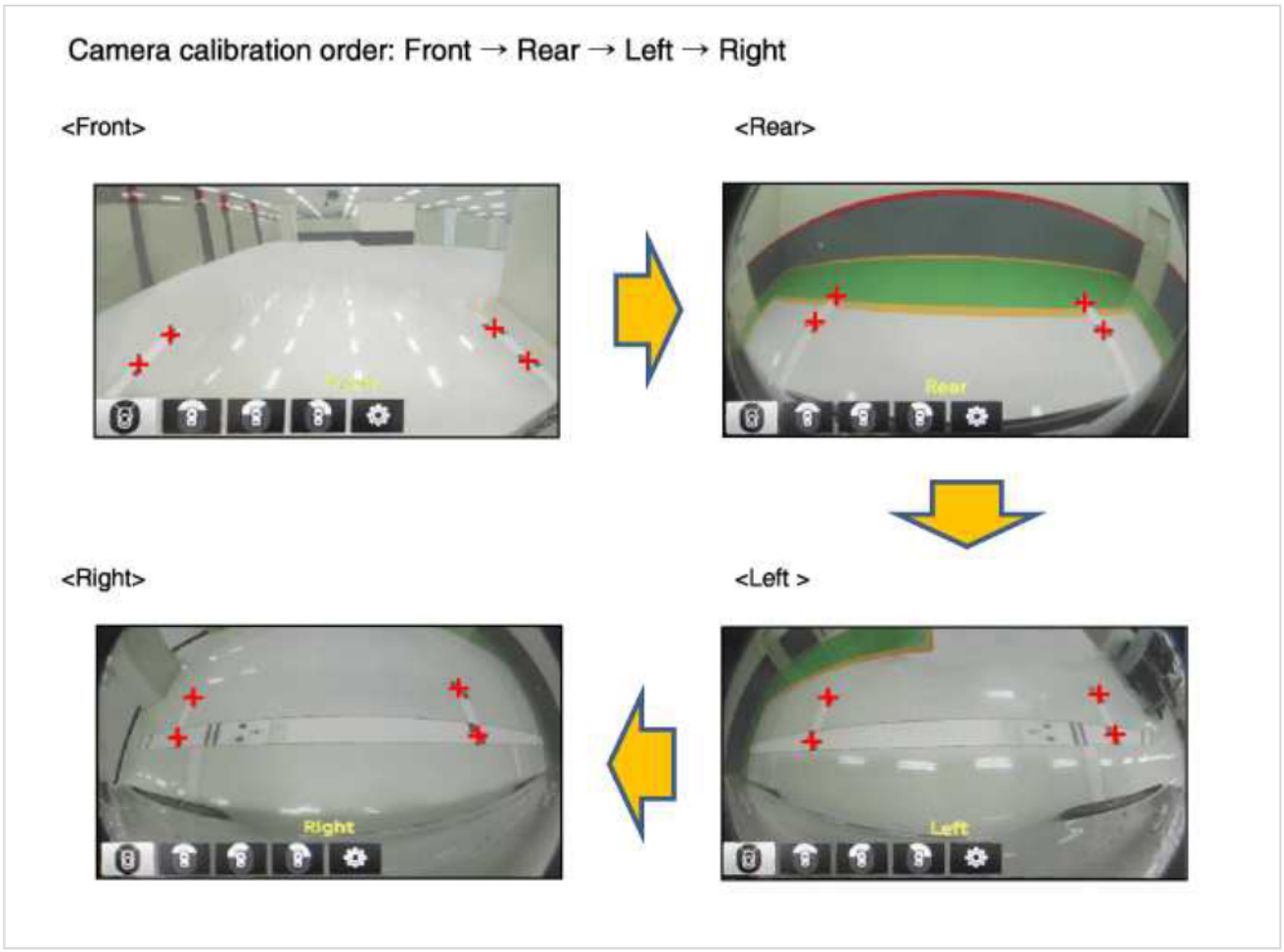
Information

- Before matching calibration points: "+" green light flashes
- When clicking [OK] after matching calibration points: "+" red light ON
- Match four frontal calibration points, and then perform calibration in the order from rear → left → right.

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10. To confirm completion of calibration, check the vehicle and calibration line on AVN monitor and click [OK].
    If calibration has not been properly performed, click [Cancel] and reenter calibration points.

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Removal

⚠ CAUTION

Put on gloves to protect your hands.

NOTICE

- When prying with a flat-tip screwdriver or use a prying trim tool, wrap it with protective tape, and apply protective tape around the related parts, to prevent damage.
- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Take care not to bend or scratch the trim and panels.

1. Disconnect the negative (-) battery terminal.
2. Remvoe the console upper complete (A) by using a remover.



3. Disconnect the connectors (A) from the console upper complete.

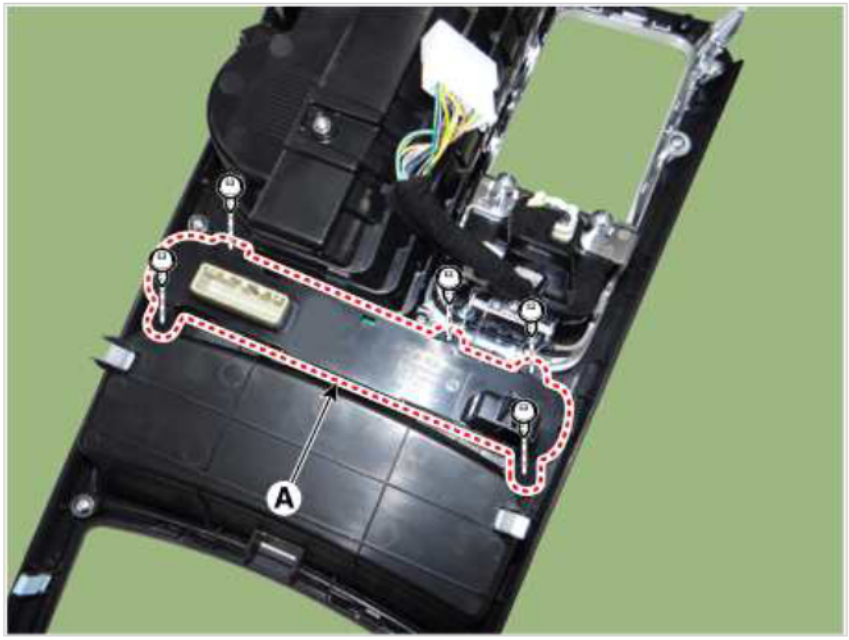


4. Remove the connector (A) from the console floor switch complete.

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5. Remove the console floor switch complete (A) after loosening the mounting screws.



Installation

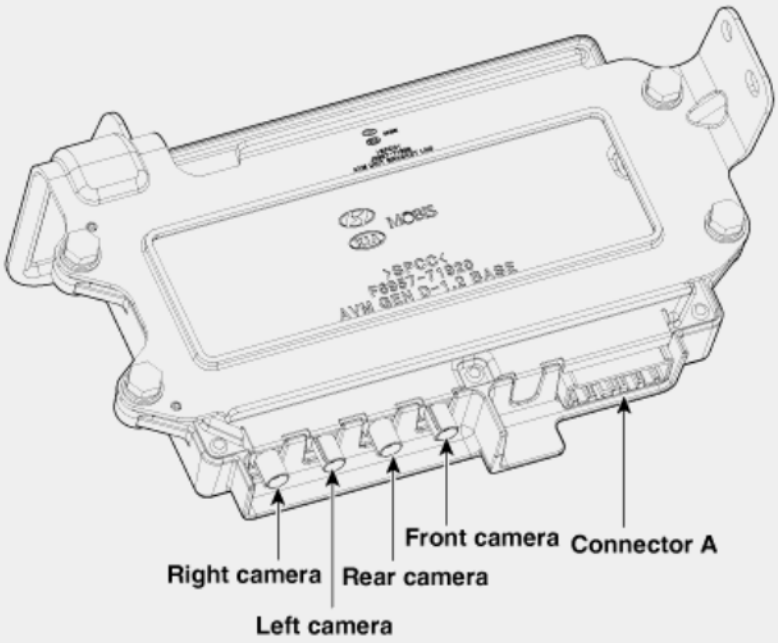
1. Install the console floor switch complete.
2. Install the connector from the console floor switch complete.
3. Connect the connectors from the console upper complete.
4. Install the console upper complete.
5. Connect the negative (-) battery terminal.

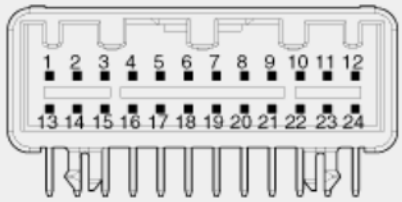
NOTICE

- Make sure that the connectors are plugged in properly.
- Check the SVM system for normal operation.

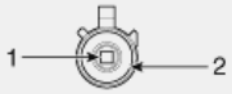
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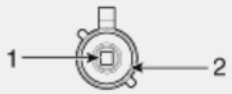
Components

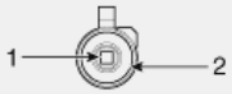


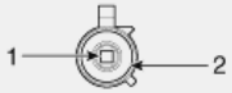
Connector A	No.	Description	No.	Description
	1	ACC	13	IGN2
	2	SVM Switch (LED Indicator)	14	SVM Switch
	3	Ground	15	-
	4	SVM Video (Y Shield)	16	SVM Video (C Shield)
	5	-	17	-
	6	C-CAN (Low)	18	C-CAN (High)
	7	SVM Video (Y Ground)	19	SVM Video (C Ground)
	8	SVM Video (Y)	20	SVM Video (C)
	9	Front camera_video (+)	21	Front camera_video (-)
	10	Rear camera_video (+)	22	Rear camera_video (-)
	11	Left side camera_video (+)	23	Left side camera_video (-)
	12	Right side camera_video (+)	24	Right side camera_video (-)

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Front camera (White)	No.	Description	No.	Description
	1	Camera video input	2	Camera video ground

Rear camera (Blue)	No.	Description	No.	Description
	1	Camera video input	2	Camera video ground

Left camera (Green)	No.	Description	No.	Description
	1	Camera video input	2	Camera video ground

Right camera (Brown)	No.	Description	No.	Description
	1	Camera video input	2	Camera video ground

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Removal

⚠ CAUTION

Put on gloves to protect your hands.

NOTICE

- When prying with a flat-tip screwdriver or use a prying trim tool, wrap it with protective tape, and apply protective tape around the related parts, to prevent damage.
- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Take care not to bend or scratch the trim and panels.

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel.
   (Refer to Body - "Crash Pad Lower Panel")
3. Remove the knee airbag (KAB) module.
   (Refer to Restraint - "Knee Airbag (KAB) Module")
4. Disconnect the SVM unit connectors (A).



5. Remove the SVM unit (A) after loosening the mounting nuts.

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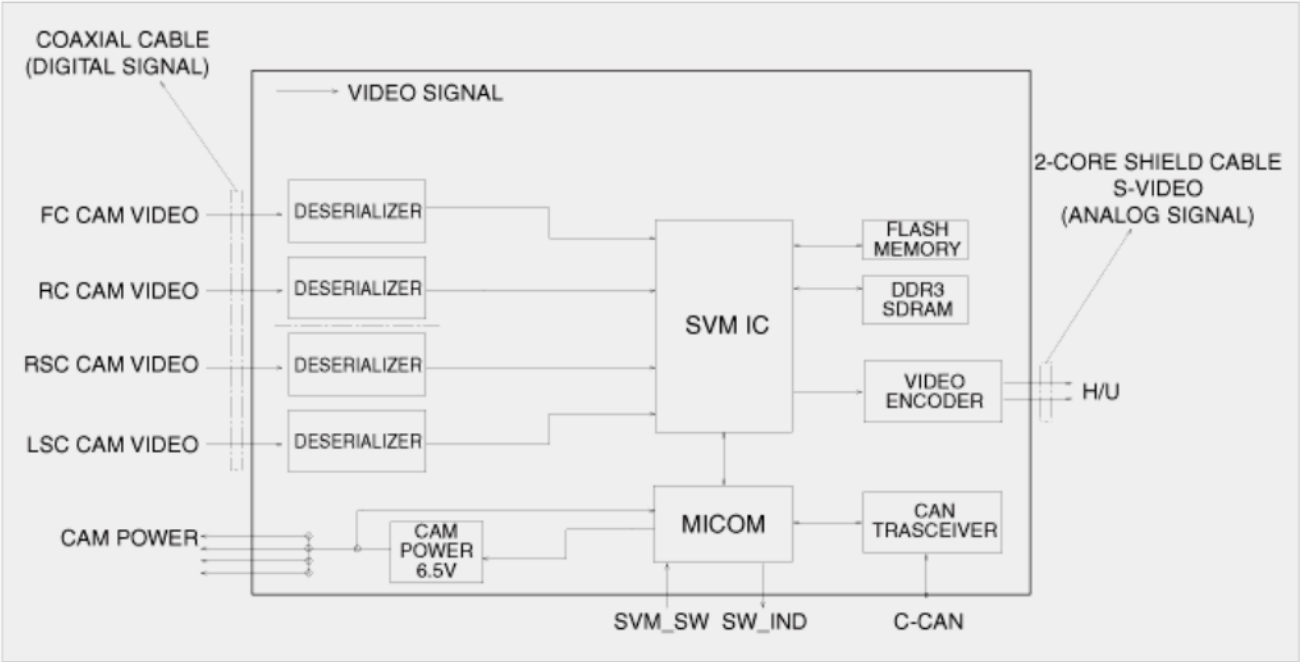


Installation

1. Install the SVM unit.
2. Connect the SVM unit connectors.
3. Install the knee airbag (KAB) module.
4. Install the crash pad lower panel.
5. Connect the negative (-) battery terminal.

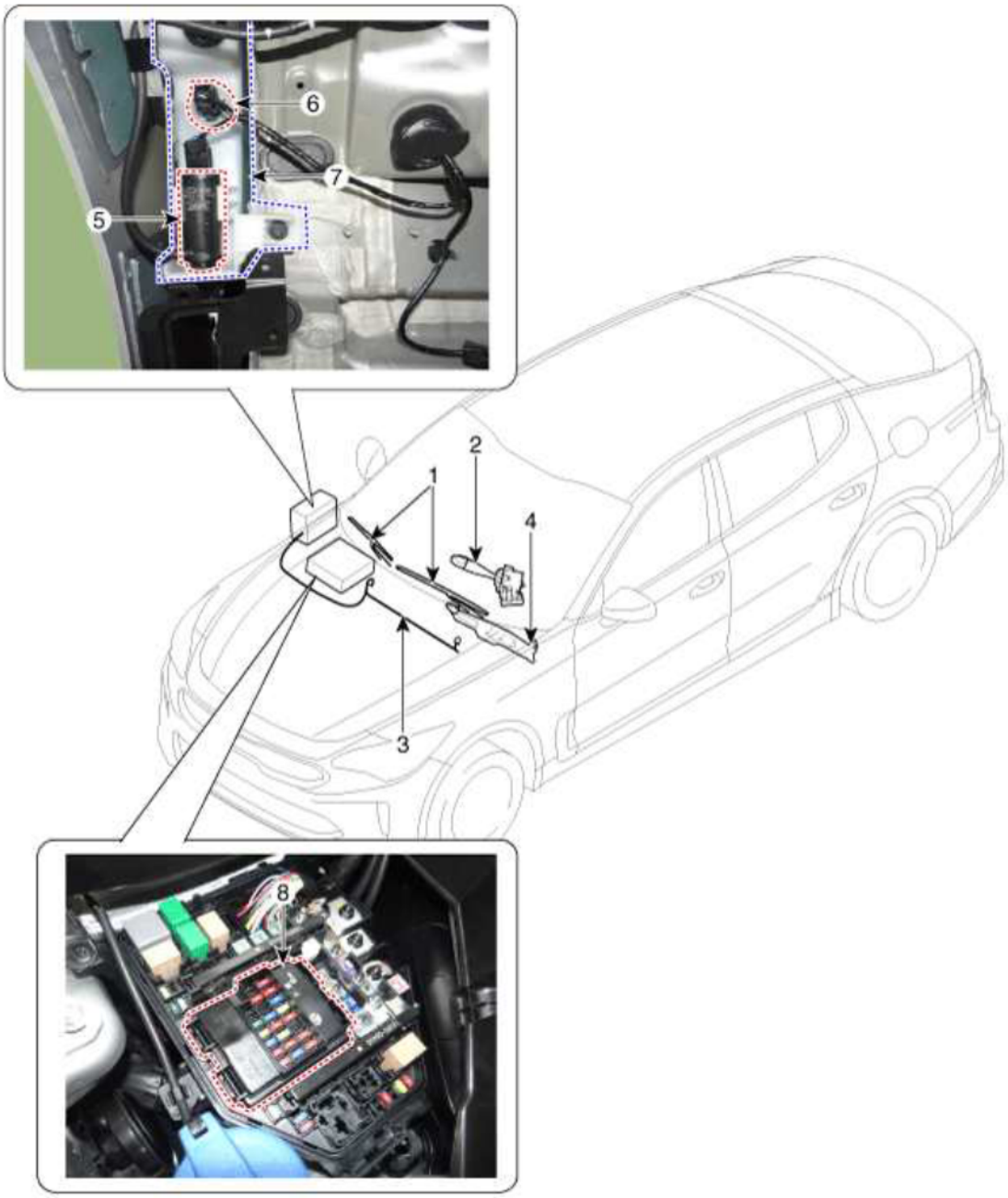
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Circuit Diagram



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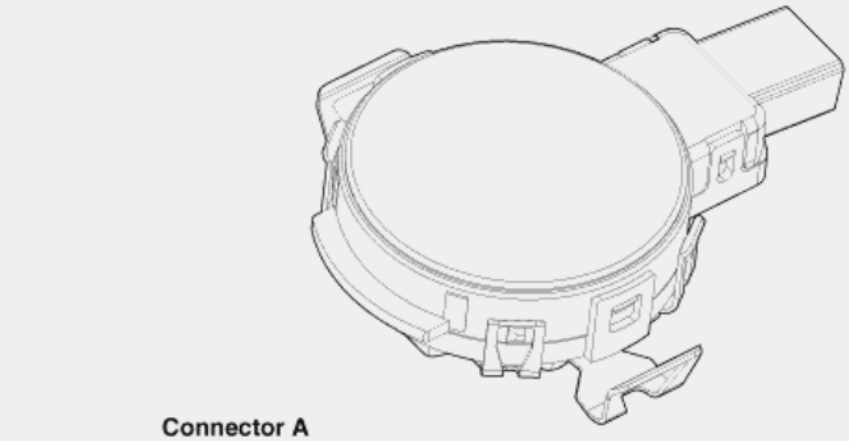
Component Location

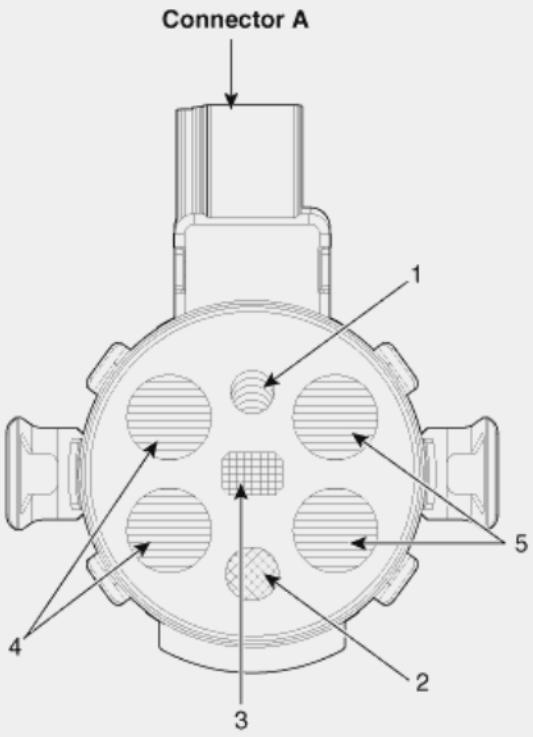


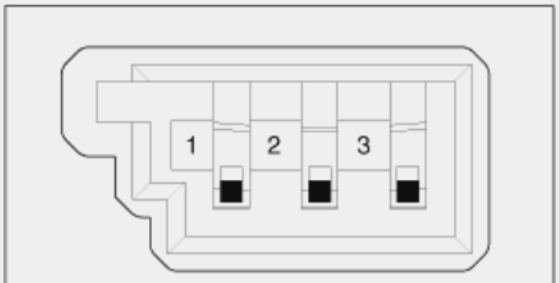
1. Windshield wiper arm & blade
2. Wiper & washer switch
3. Windshield washer hose & nozzle
4. Wiper motor & linkage assembly
5. Washer motor
6. Washer fluid level sensor
7. Washer reservoir tank
8. Wiper/Washer relay (Built-in Metal core block PCB)

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Components and Components Location







No.	Connector A
1	Battery (+)
2	Ground
3	LIN

1. Horizontal light sensor
2. Vertical light sensor
3. Solar load sensor
4. Rain sensor (Left)
5. Rain sensor (Right)

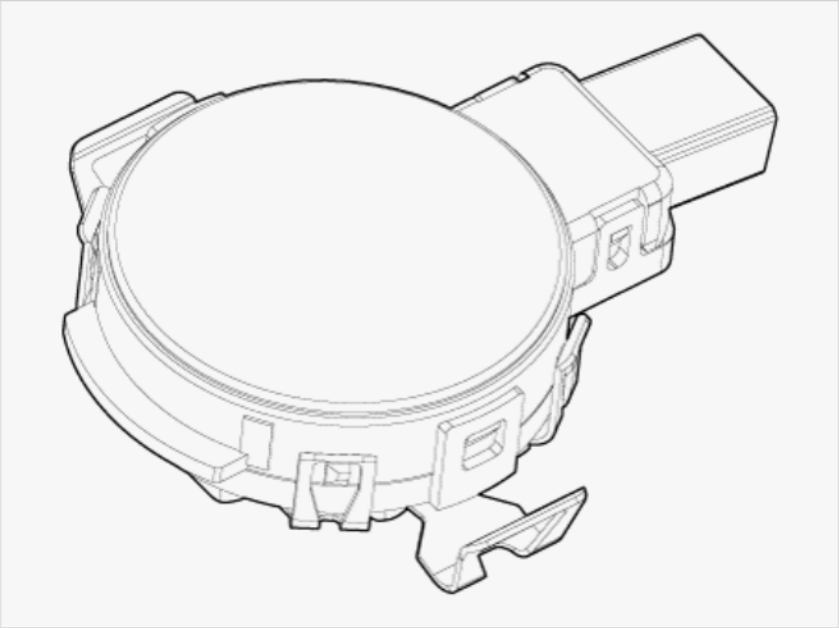
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Description

Integrated Rain Sensor

Integrated rain sensor (A) controls three systems: front wiper, auto-light, and central air conditioner.

1. Wiper Control System
   When "AUTO" switch signal is received from the multi-function switch on the right, the integrated rain sensor detects the amount of rainfall. The sensor is installed inside the upper part of the front window for wiper motor control.
   This system automatically controls the operation duration and speed of the wiper depending on the measured amount of rainfall even if the driver does not operate the wiper switch.
2. Auto Light Control System
   When "AUTO" signal is received from the multi-function switch on the left, the integrated rain sensor installed on the front window detects the brightness of the light and controls the operation of the head lamp and screen brightness of the internal multimedia.
   This system automatically controls the brightness of the head lamp and the internal multimedia screen depending on the measured brightness even if the driver does not operate the lamp switch.
3. Central Air Conditioning System
   When "AUTO" signal is received from the central air conditioner switch, the integrated rain sensor detects the amount of sunshine depending on the direction of the sunlight.
   This system automatically controls the cooling system depending on the measured amount of sunshine even if the driver does not operate the air conditioner switch.



Functions and Operating Principles

Basic Principle

1. Detecting the amount of rainfall
   The light (beam) emitted from light emitting diodes (LED) is totally reflected on the external surface of the windshield and comes back to the photo diodes. When there is water on the external surface of the windshield, the light is optically separated and reflected partially and the remaining brightness is measured by the photo diodes. Water remaining on the windshield results in the light being not totally reflected. The loss of brightness due to this indicates how much the glass surface is wet.
2. Detecting light
   Brightness of light is measured by the diodes using the infrared light. The brightness of the outside of the vehicle is measured in two directions: (a) the upper direction and (b) the front direction. The measured amount of light is used to determine whether it is day or night.
3. Detecting the amount of sunshine
   The system measures the amount of sunshine from the left and right sides and operates the air conditioner on the driver side or the passenger side.

NOTICE

Integrated rain sensor is composed of 2 LEDs and 2 photo diodes to detect rainfall, 2 photo diodes to detect light, 1 photo diode to detect the amount of sunshine, and bracket.

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Operation Control

1. When "AUTO" signal is received from the multi-function switch on the right, the integrated rain sensor detects the rainfall and controls the wiper motor.
2. When “AUTO” signal is received from the multi-function switch on the left, the integrated rain sensor detects the brightness and controls the head lamp and internal multimedia brightness.
3. When “AUTO” signal is received from the central air conditioner switch, the integrated rain sensor detects the amount of sunshine and controls the air conditioning system.

Interference

Integrated rain sensor might malfunction due to the interferences listed below.

1. Dust on the measuring surface and other surfaces on the light path (surface of light emitting diodes and photo diodes, fiber optics, bracket, and glass surface of windshield joint area) weakens the received light.
2. Movement of windshield and bracket
3. Movement of bracket due to vibration
4. Damaged wiper blade
5. Damaged head lamp
6. Damaged multimedia device
7. Damaged air conditioning system

NOTICE

When the integrated rain sensor does not operate or malfunctions, the driver should operate the wiper switch manually.
When the integrated rain sensor does not operate or malfunctions, the driver should operate the head lamp switch manually.
When the integrated rain sensor does not operate or malfunctions, the driver should operate the air conditioner switch manually.

Automatic Operation

1. Operational status of rain sensor

Operation Mode	Operation
Direct Mode	It is the normal operational status of the integrated rain sensor when the wiper switch is in "Auto" and the sensor detected dry windshield. Based on this state, integrated rain sensor determines the operation mode of wiper depending on the rainfall and its duration.
Intermittent Mode	Integrated rain sensor activates the intermittent mode when wiper operation is done successively more than twice with a pause of 0.5 - 5 seconds.
Low Speed	The wiper operates continuously in low speed
High Speed	The wiper operates continuously in high speed

2. Operational status of light sensor

Operation Mode	Operation
Auto Mode	It is the normal operational status of the integrated rain sensor when the head lamp switch is in "Auto" and the sensor detected the brightness of the light. Based on this state, the Integrated rain sensor determines the operation mode of head lamp and internal multimedia depending on the amount of light measured.
Low beam ON	The lamp and multimedia turn on at medium brightness.
High beam ON	The lamp and multimedia turn on at maximum brightness.

3. Operational status of solar load sensor

Operation Mode	Operation
Auto Mode	It is the normal operational status of the integrated rain sensor when the air conditioner switch is in "Auto" and the sensor detected the amount of sunshine. Based on this state, the integrated rain sensor determines the operation mode of air conditioning system depending on the amount of sunshine measured.
Manual Mode	The cooling intensity is controlled manually.

Safety Function High

1. When there is ice or foreign substance in the detecting area, integrated rain sensor cannot recognize the condition for operation correctly.

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Detecting Special Conditions

1. Rain sensor

Special Condition	Operation based on special conditions detecting
Splash	When integrated rain sensor detects a high level of water (splash) in Direct or Intermittent mode, the system switches from Park to High speed. Then, wiping is done once in High speed and once more in Low speed. If the condition of rainfall does not change after wiping, it returns to the original condition (Direct or Intermittent).
Smearing	Smearing is a thin oil film that has dried fast and occurs when a small amount of raindrops is wiped by a dirty or worn-out wiper blade. Operational signal should not be issued when smearing occurs in Direct or Intermittent mode.
Dirt	When no change is detected after wiping, integrated rain sensor determines that the windshield is dirty. In this state, operational signal should not be issued. If the windshield becomes clean (for example, by washer fluid), the integrated rain sensor returns to the normal condition.
Automatic change of sensitivity between day and night	Integrated rain sensor automatically adjusts the sensitivity between day and night using a day & night sensor.
Compensating for the level of illumination in the surrounding area	The system operates normally by compensating for the interference due to illumination in the surrounding area.
Washer fluid	Integrated rain sensor does not respond to the washer fluid during the Washer mode. In other words, wiping speed does not change even if the washer fluid is sprayed (automatic operation of the washer pump is not reflected in the functioning of integrated rain sensor).

2. Light sensor

Special Condition	Operation based on special conditions
Pedestrian overpasses / high rise buildings / street trees	Integrated rain sensor prevents the head lamp from blinking when it detects lightness while passing by the pedestrian overpasses, high rise buildings, or street trees during the day. However, head lamp might turn on when the sensor determines it as night time while passing by the places mentioned above.
Tunnels	Integrated rain sensor recognizes a tunnel when the vehicle passes by it during the day. When entering the tunnel, the integrated rain sensor recognizes the tunnel and turns on the head lamp immediately and turns off the head lamp several seconds after escaping the tunnel.

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Removal

⚠ CAUTION

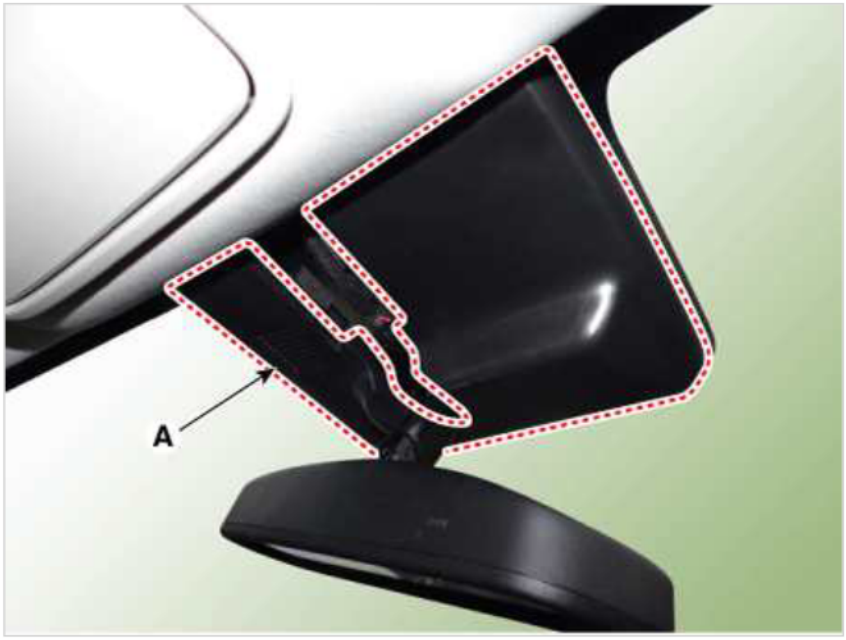
The dust or foreign substance on the rain sensor has a bad effect upon the rain sensor capability,so protect the sensor surface with protection cover until installing the rain sensor to bracket for accurate function.

The coupling pad on the rain sensor surface has adhesive strength, so the coupling pad could stick to the windshield by environment condition during the using time.

If the rain sensor is removed by force, it could be damaged. So make sure to separate the rain sensor from the windshield carefully.

1. Remove the mirror wiring cover (A).



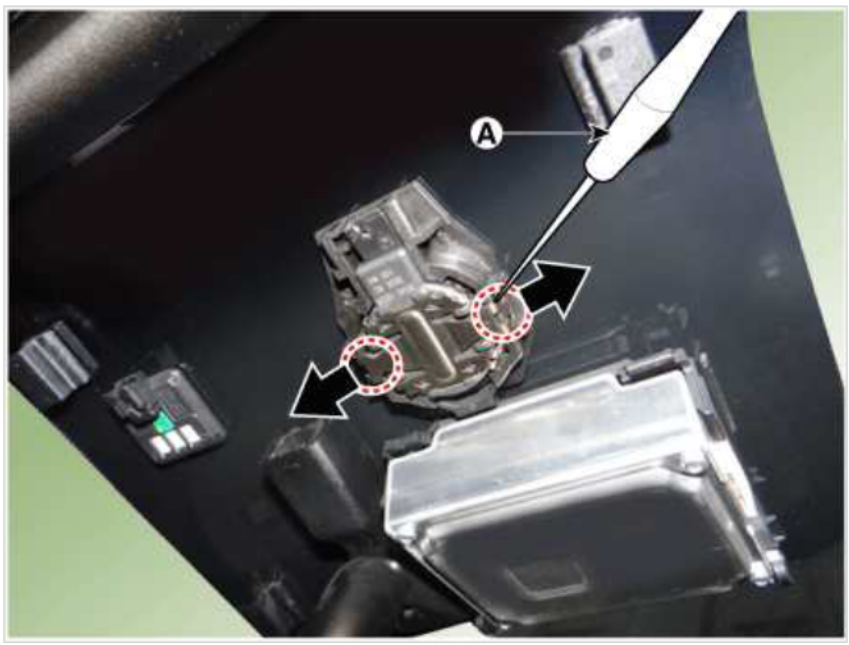


2. Disconnect the rain sensor connector (A).

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3. Be careful not to damage the cover latch by applying excessive force. To remove the bracket, pull the holes of the bracket outside using a small flat-head screwdriver (A).



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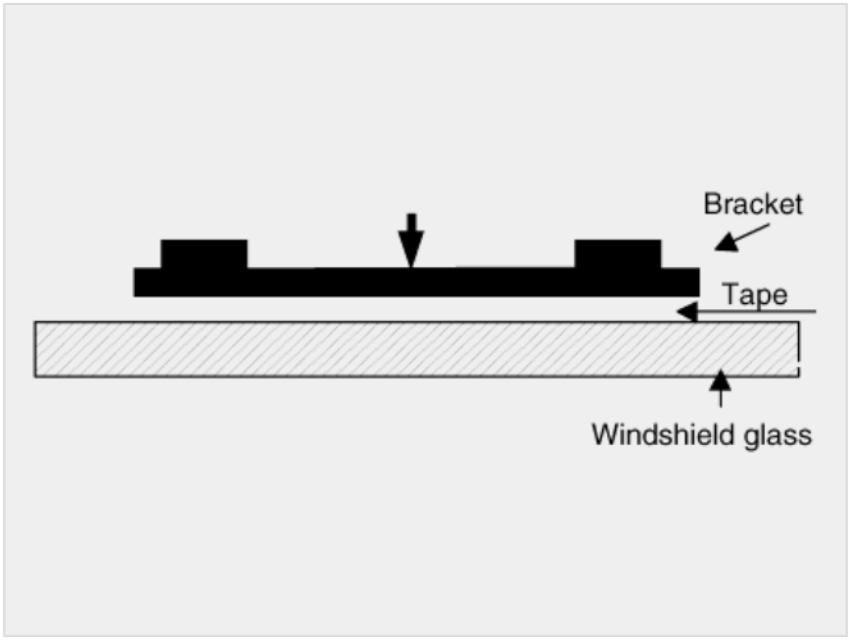
4. Rain sensor module is attached to the front windshield by glue. When replacing the front windshield, remove the rains sensor module form the existing front windshield and install it on the new front windshield.

Installation

NOTICE

- If the windshield has the reflection layer which reflects the infrared rays in the sensing field, the integrated rain sensor shall be installed in the field with no reflection layer.
- Install the rain sensor after some time and make sure that dust does not settle after installation.

1. Install the rainsensor bracket to the windshield glass using the tape.



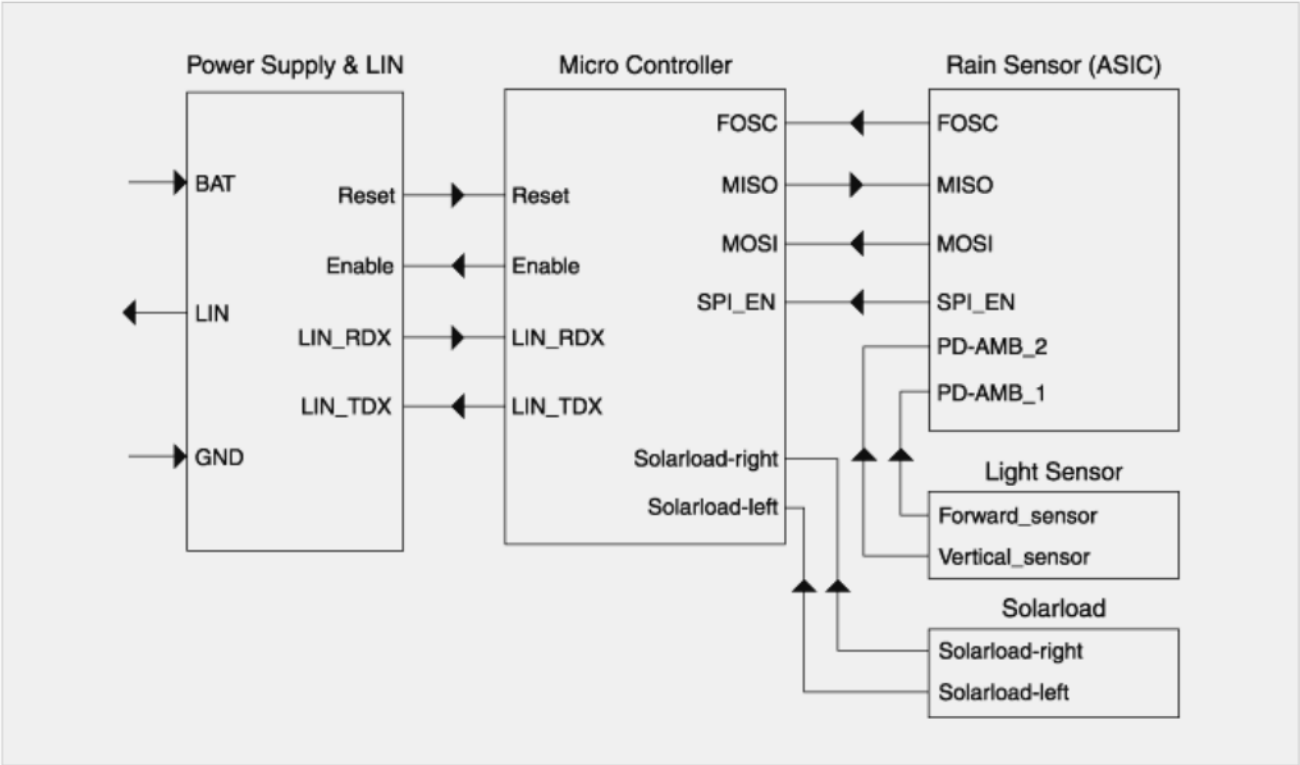
⚠ CAUTION

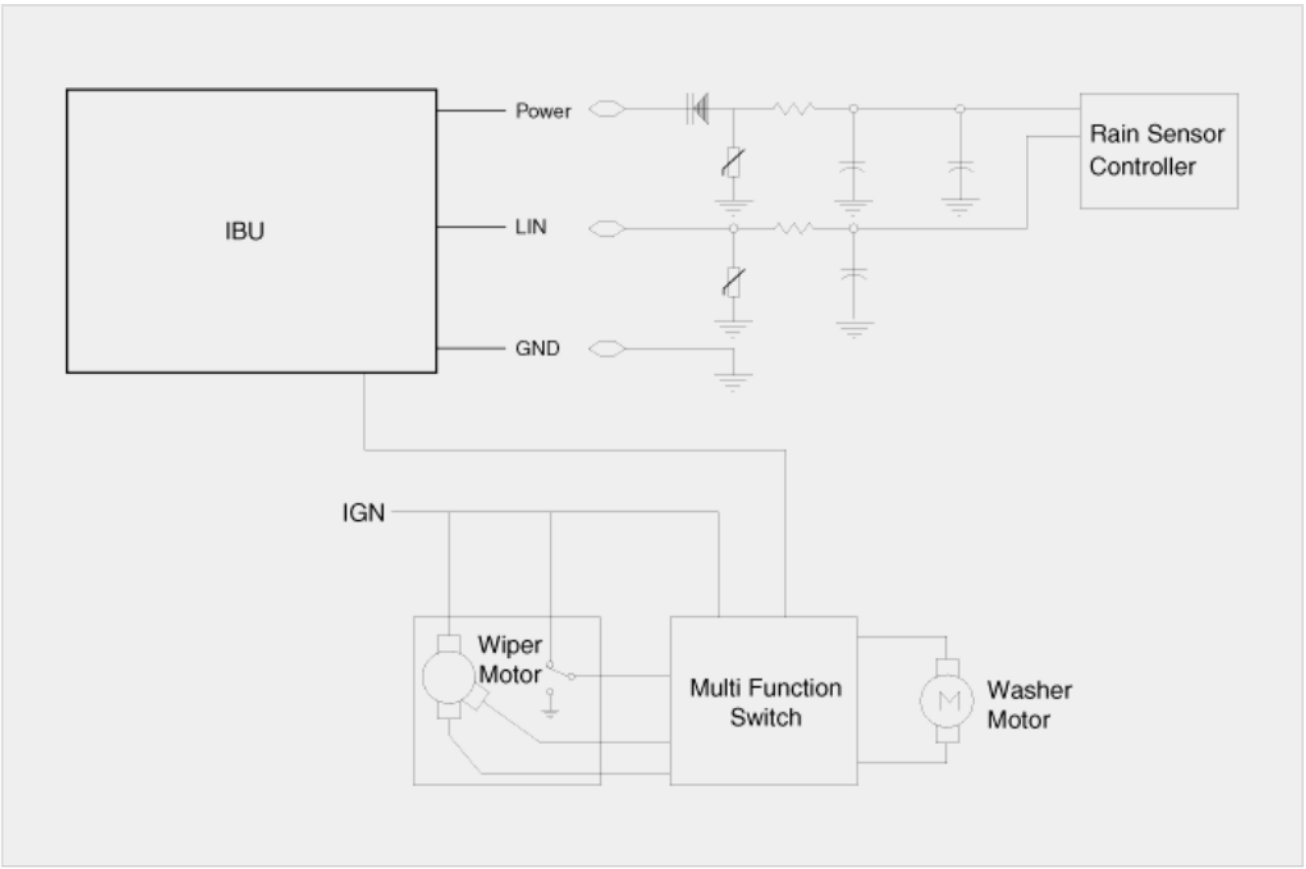
It is very important that the coupling pad pushes the windshield completely to stick to each other without bubbles.

2. Connect the rainsensor connector, and then install the sensor cover.

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Circuit Diagram





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Removal

1. Disconnect the negative (-) battery terminal.
2. Remove the steering wheel.
   (Refer to Steering System - "Steering Wheel")
3. Remove the steering column upper and lower shrouds after loosening the screws.
   (Refer to Body - "Steering Column Shroud Panel")
4. Remove the clock spring.
   (Refer to Restraint - "Driver Airbag (DAB) Module and Clock Spring")

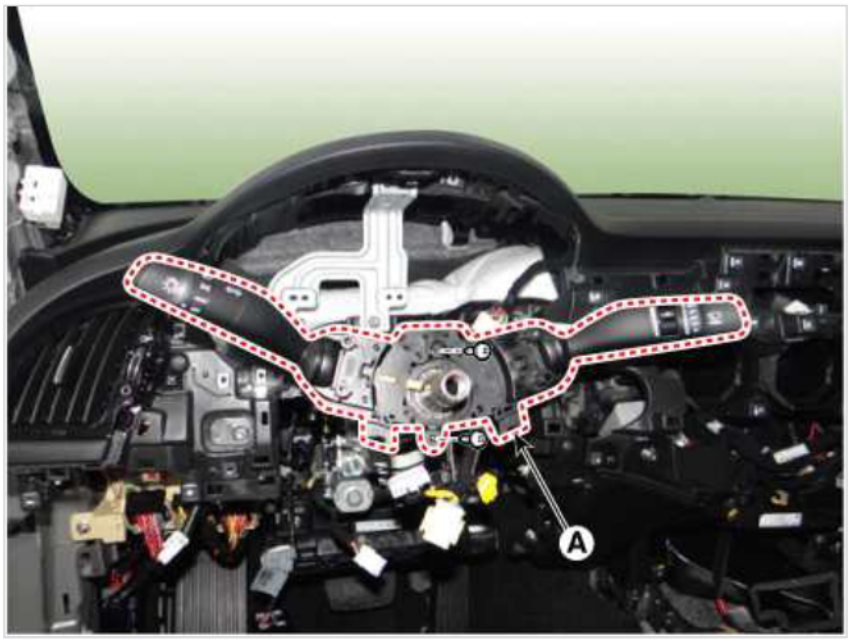


5. Disconnect the multifunction switch connector (A).



6. Remove the multifunction switch assembly (A) after loosening the mounting screws.

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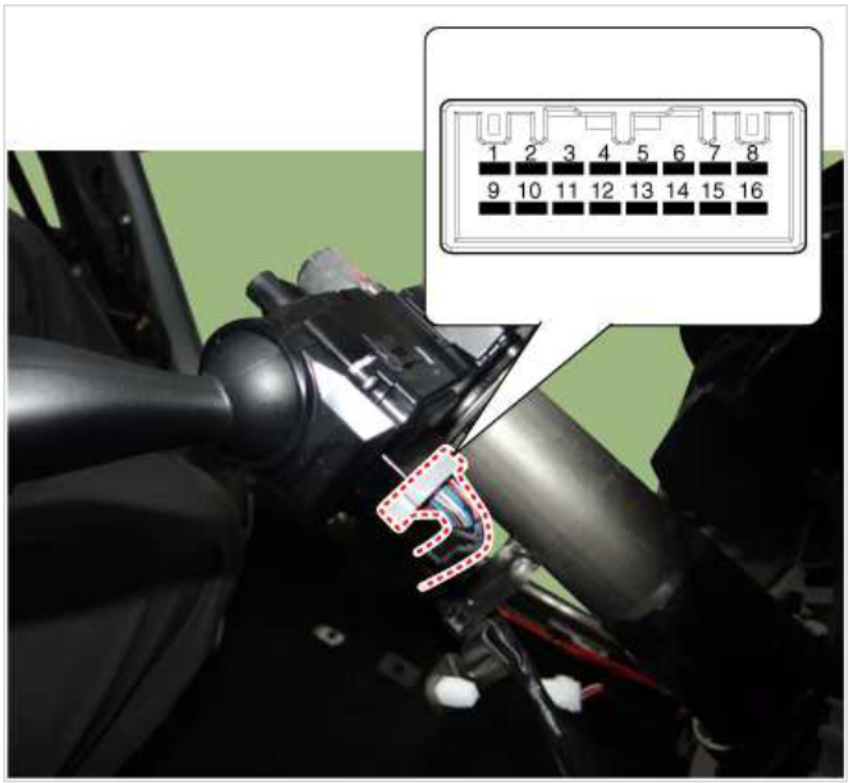
Installation

1. Install the multifunction switch.
2. Install the clock spring.
3. Install the steering column upper and lower shrouds.
4. Install the steering wheel.
5. Connect the negative (-) battery terminal.

Inspection

Multifunction Switch Inspection

1. Check for continuity between the terminals in each switch position as shown below.



Switch	Switch position	Switch terminal	Resistance (Ω, ±3%)
Front wiper switch	MIST	1-9	330

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	OFF		∞
	Intermittent (AUTO)		800
	LOW		1800
	HIGH		5700

Inspection (With KDS)

1. In the body electrical system, failure can be quickly diagnosed by using the vehicle diagnostic system (KDS).
   The diagnostic system(KDS) provides the following information.
   (1) Self diagnosis : Checking failure and code number (DTC)
   (2) Current data : Checking the system input/output data state
   (3) Actuation test : Checking the system operation condition
   (4) Additional function : Controlling other features including system option setting and zero point adjustment
2. Select the "Car model" and the "Intergrated body control unit (IBU)" to be checked in order to check the vehicle with the tester.
3. Select the "Current Data" menu to search the current state of the input/output data.

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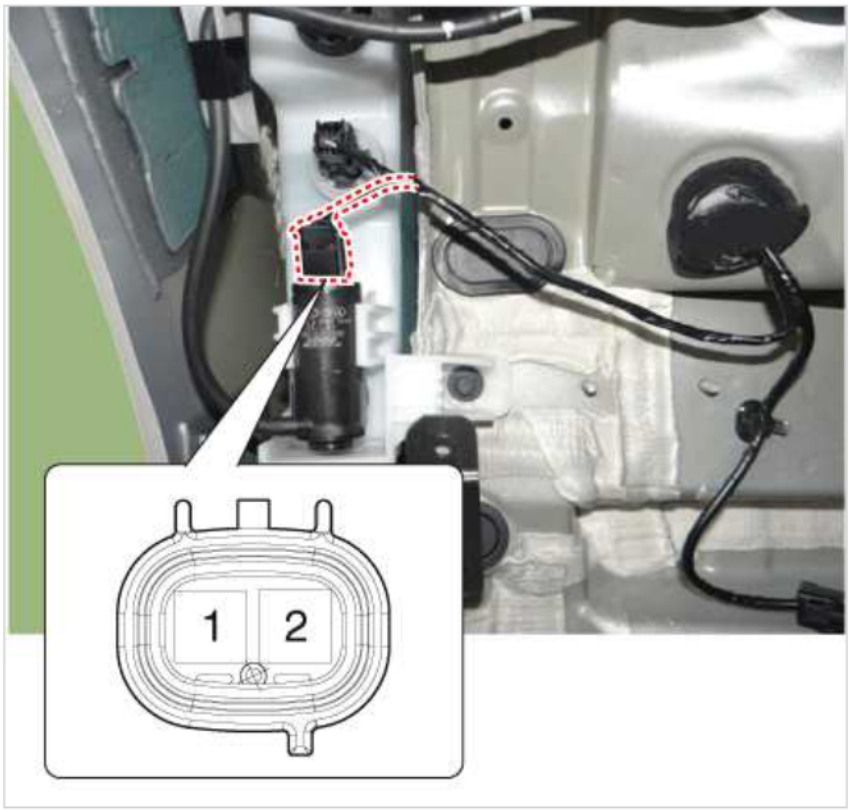
Inspection

Front Washer Motor

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

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

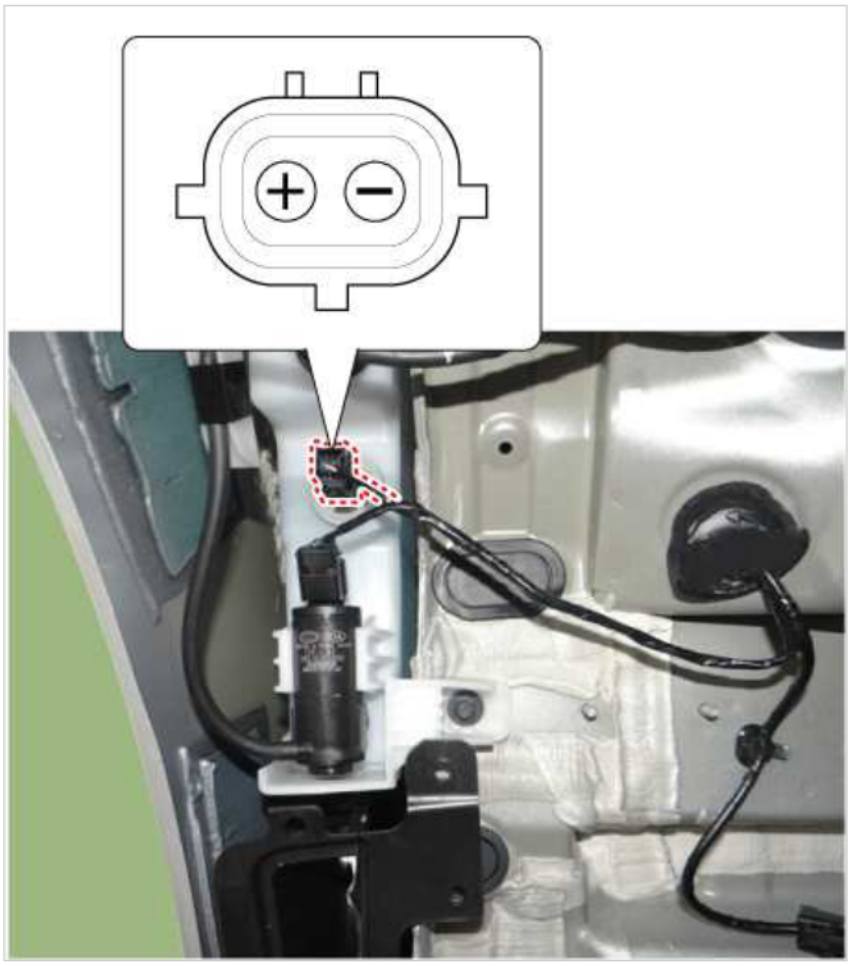
2. Connect positive (+) battery cables to terminal 2 and negative (-) battery cables to terminal 1 respectively.
3. Check that the motor operates normally and the washer motor runs and water sprays from the front nozzles.
4. If they are abnormal, replace the washer motor.



Washer Fluid Level Sensor Switch

1. Disconnect the negative (-) battery terminal.
2. Drain the washer fluid less than 650 cc.
3. Check for continuity between the No. 1 and No.2 terminal in each float position.
   There should be continuity when the float is down.
   There should be no continuity when the float is up.
4. If the continuity is not as specified, replace the washer fluid level switch

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Terminal / Position	1	2
Over 650cc		
Under 650cc	○	○

(Tolerance : -50cc ~ +100cc)

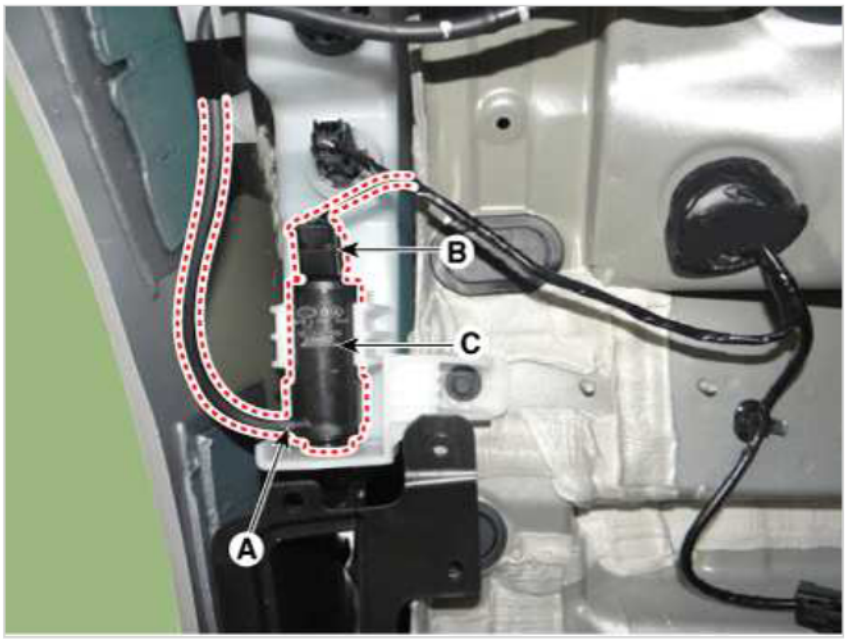
5. If the continuity is not as specified, replace the washer fluid level switch.

Removal

Front Washer Motor

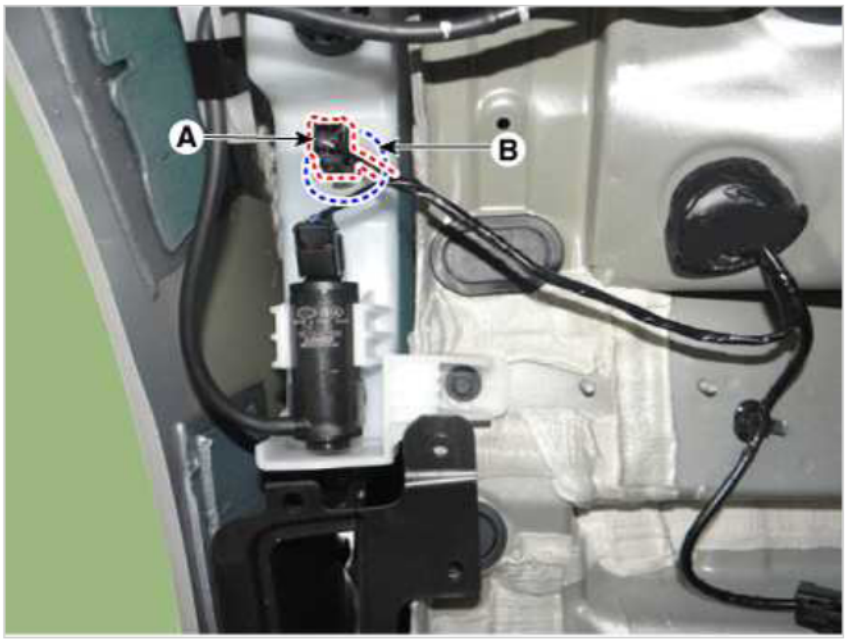
1. Disconnect the negative (-) battery terminal.
2. Remove the engine room under cover.
   G 2.0 T-GDI THETA II (Refer to Engine Mechanical System - "Engine Room Under Cover")
   G 3.3 T-GDI LAMBDA II (Refer to Engine Mechanical System - "Engine Room Under Cover")
3. Remove the front wheel guard [RH].
   (Refer to Body - "Front Wheel Guard")
4. Drain the washer fluid to less than 650 cc.
5. Disconnect the washer hose (A) and washer motor connector (B).
6. Remove the front washer motor (C).

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Washer Fluid Level Sensor Switch

1. Disconnect the negative (-) battery terminal.
2. Remove the engine room under cover.
   G 2.0 T-GDI THETA II (Refer to Engine Mechanical System - "Engine Room Under Cover")
   G 3.3 T-GDI LAMBDA II (Refer to Engine Mechanical System - "Engine Room Under Cover")
3. Remove the front wheel guard [RH].
   (Refer to Body - "Front Wheel Guard")
4. Drain the washer fluid to less than 650 cc.
5. Remove the washer fluid level sensor switch (B) after disconnecting the connector (A).

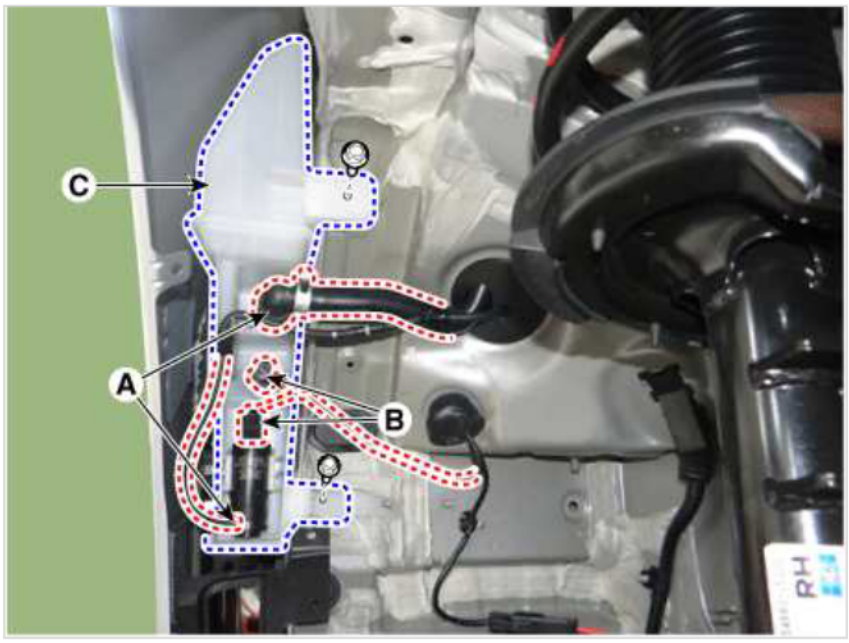


Reservoir Tank

1. Disconnect the negative (-) battery terminal.
2. Remove the front bumper assembly.
   (Refer to Body - "Front Bumper Assembly")
3. Remove the front wheel guard [RH].
   (Refer to Body - "Front Wheel Guard")

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4. Drain the washer fluid to less than 650 cc.
5. Disconnect the washer hoses (A) and connector (B).
6. Remove the reservoir tank (C) after loosening the bolts.



Installation

Front Washer Motor

1. If necessary, clean the washer motor filter.

> **NOTICE**
> Before installing the pump motor, check the filter for any foreign material or contamination. If necessary, clean the filter in the pump motor.

2. Install the front washer motor.
3. Connect the front washer motor connector.
4. Install the front wheel guard [RH].
5. Install the engine room under cover.
6. Connect the negative (-) battery terminal.

Washer Fluid Level Sensor Switch

1. If necessary, clean the washer motor filter.

> **NOTICE**
> Before installing the pump motor, check the filter for any foreign material or contamination. If necessary, clean the filter in the pump motor.

2. Install the washer fluid level sensor switch.
3. Connect the washer fluid level sensor switch connector.
4. Install the front wheel guard [RH].
5. Install the engine room under cover.
6. Connect the negative (-) battery terminal.

Reservoir Tank

1. If necessary, clean the washer motor filter.

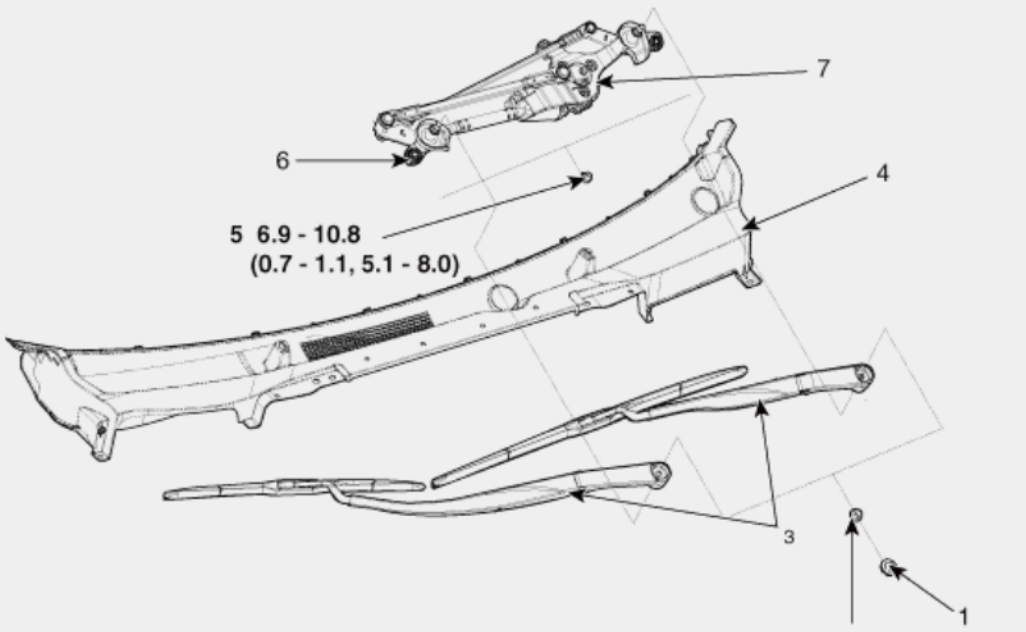
> **NOTICE**
> Before installing the pump motor, check the filter for any foreign material or contamination. If necessary, clean the filter in the pump motor.

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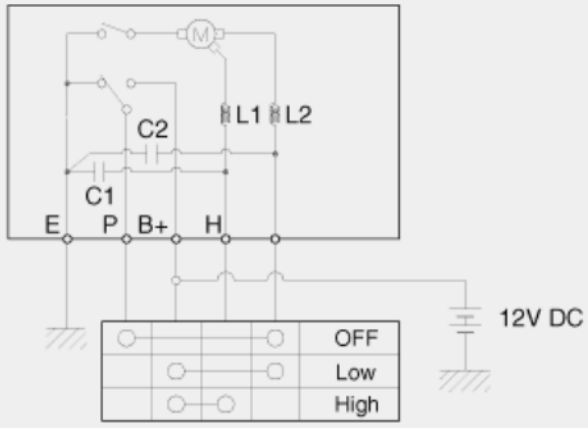
2. Install the reservoir tank.
3. Install the washer motor hose and connectors.
4. Install the front wheel guard [RH].
5. Install the front bumper assembly.
6. Connect the negative (-) battery terminal.

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Component Location



Connector	
	
No.	**Description**
1	-
2	Battery (+)
3	Wiper motor (Parikng)
4	Wiper motor (High)
5	Ground
6	Wiper motor (Low)



Torque : N·m (kgf·m, lb·ft)

1. Cap
2. Nut
3. Wiper arm & blade
4. Cowl top cover
5. Bolt / Nut
6. Wiper motor & linkage assembly
7. Wiper motor connector

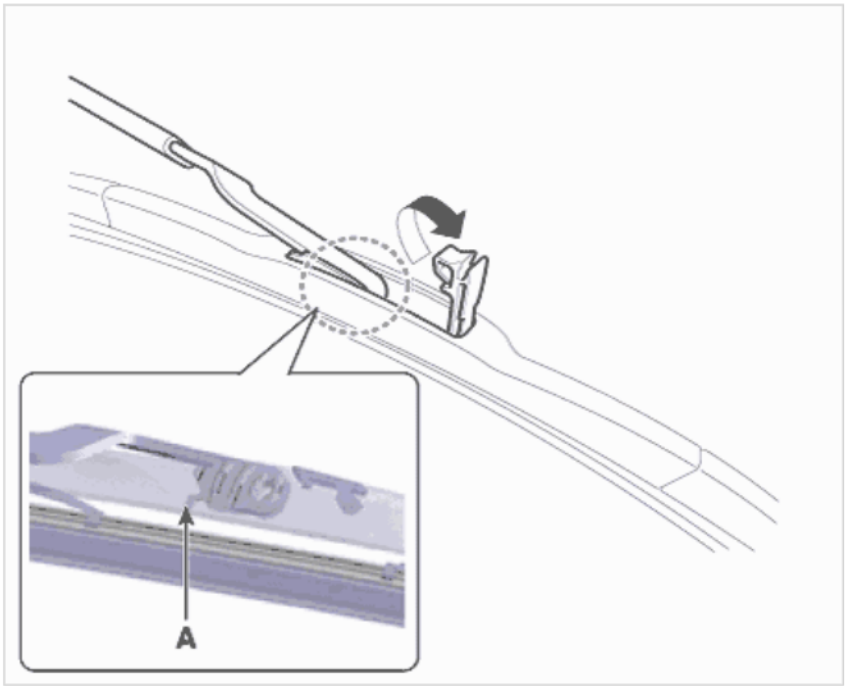
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Removal

1. Disconnect the negative (-) battery terminal.
2. If necessary, release the wiper blade fixing clip by pulling up and remove the wiper blade from the inside radius (A) of wiper arm.

Information

- Move the windshield glass wiper blades to the service position as follows;
  After turning off the engine, move the wiper switch to the single wiping (MIST) position within 20 seconds and hold the switch more than 2 seconds until the wiper blade is in the service position.
- After turning ignition to the ON position, move the wiper switch to the single wiping (MIST) and wiper arms will return to the normal operating position.



3. Remove the cowl top cover.
   (Refer to Body - "Cowl Top Cover")
4. Disconnect the wiper motor connector (A).

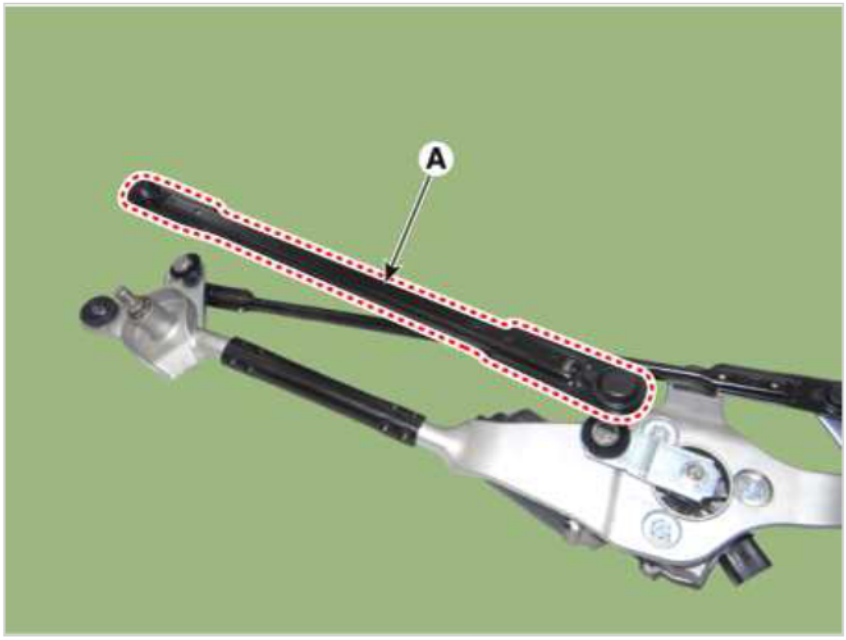


5. Remove the wiper motor & linkage assembly (A) after loosening the mounting bolts and nut.

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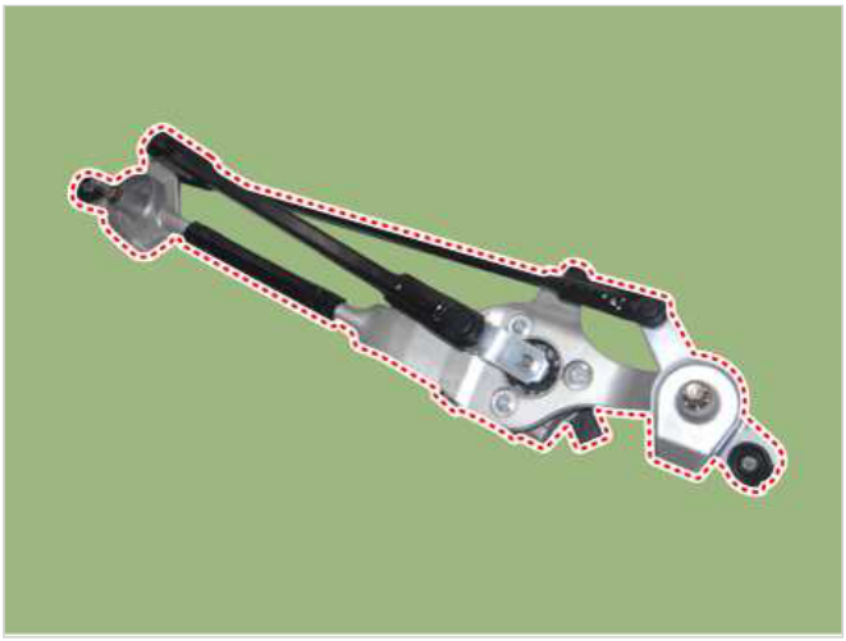
6. Hold the wiper motor crank arm and remove the upper linkage (A).



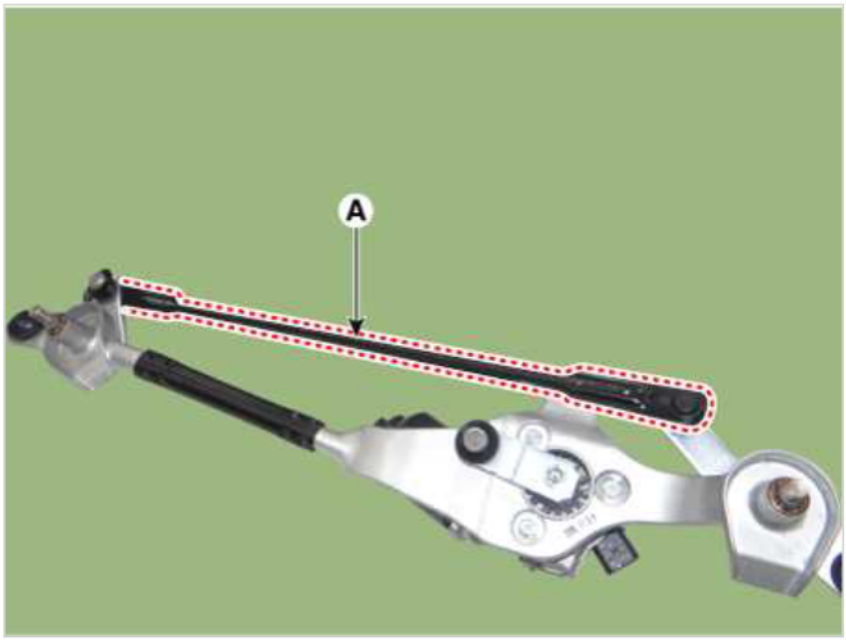
⚠ CAUTION

- Before removing the wiper motor and linkage assembly, make sure that the linkage is stopped at auto stop position.
- To correctly install the wiper motor crank arm, check that the linkage is aligned with the crank arm in straight line and check the angle of each linkage.
- Be careful not to bend the linkage.

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7. Remove the lower linkage (A) from the wiper motor crank arm.

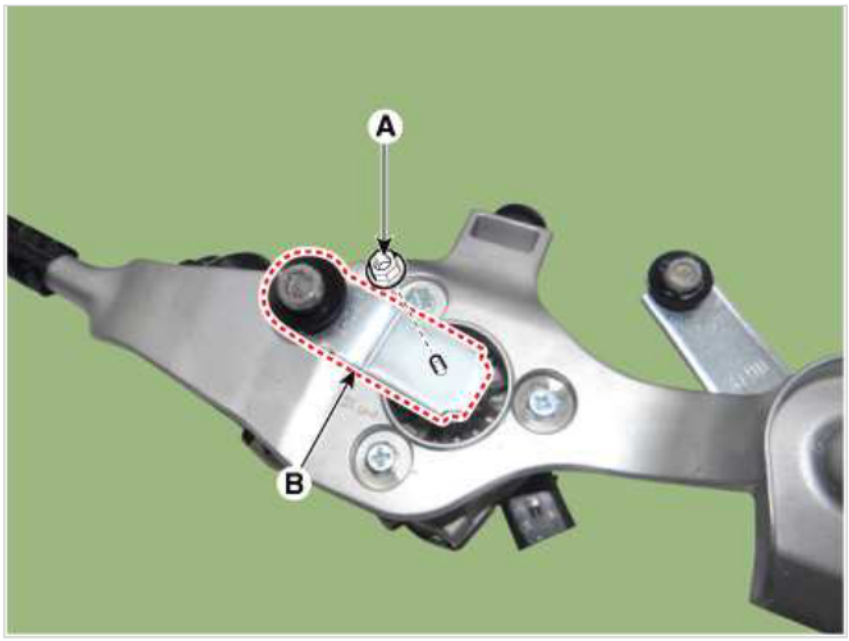


CAUTION

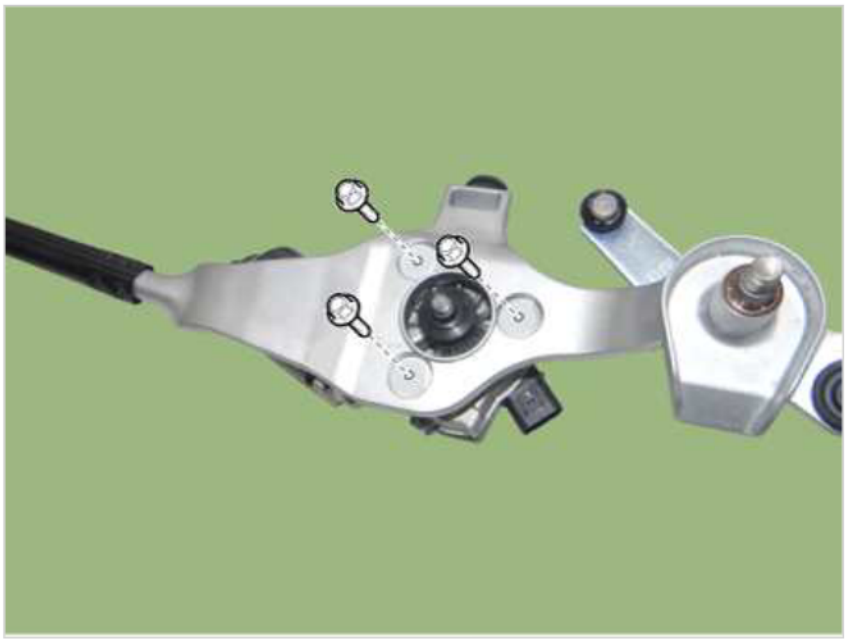
- To correctly install the wiper motor crank arm, check that the linkage is aligned with the crank arm in straight line and check the angle of each linkage.
- Be careful not to bend the linkage.

8. Remove the crank arm (B) after loosening a nut (A).

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9. Remove the wiper motor (A) after loosening the mounting bolts.



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Installation

1. Install the wiper motor.
2. Install the crank arm.

Tightening torque :
14.7 - 19.6 N·m (1.5 - 2.0 kgf·m, 10.8 - 14.5 lb·ft)

> **⚠ CAUTION**
> To install the wiper motor crank arm, make sure that the linkage is aligned with the crank arm in straight line and set the angle of each linkages exactly.

3. Install the lower and upper linkage to the wiper motor crank arm.
4. Install the wiper motor and linkage assembly and then connect the wiper motor connector.

Tightening torque :
6.9 - 10.8 N·m (0.7 - 1.1 kgf·m, 5.1 - 8.0 lb·ft)

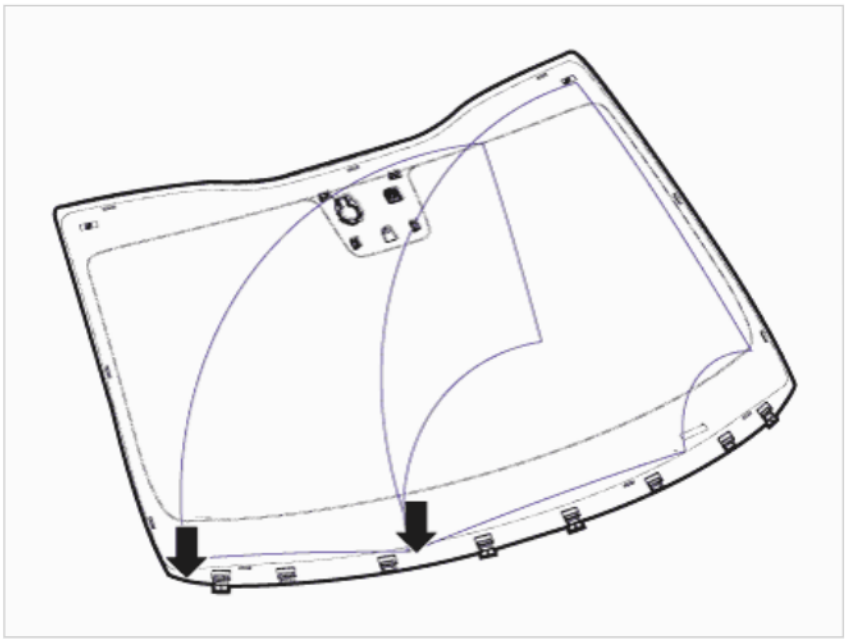
5. Install the cowl top cover.
6. Install the windshield wiper arm and blade.

Tightening torque :
22.5 - 26.5 N·m (2.3 - 2.7 kgf·m, 16.6 - 19.5 lb·ft)

> ***NOTICE***
> The windshield wiper motor must be cycled to make sure that it is in the park position.
> If necessary, adjust the wiper arm and blade.

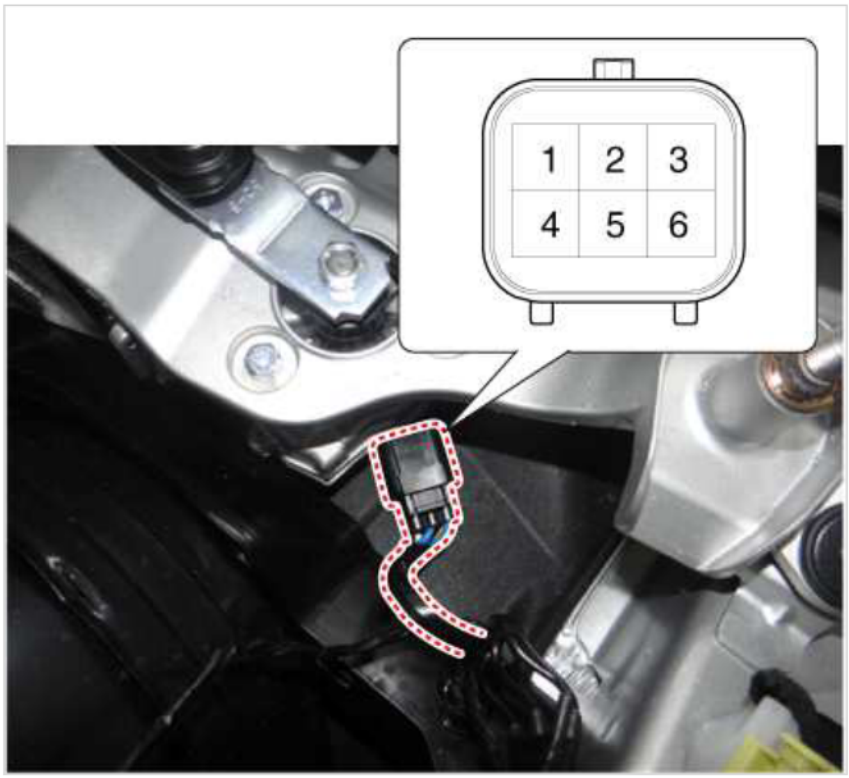
7. Install the wiper arm and blade to the specified position.
   Auto stop position (Blade)

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Inspection

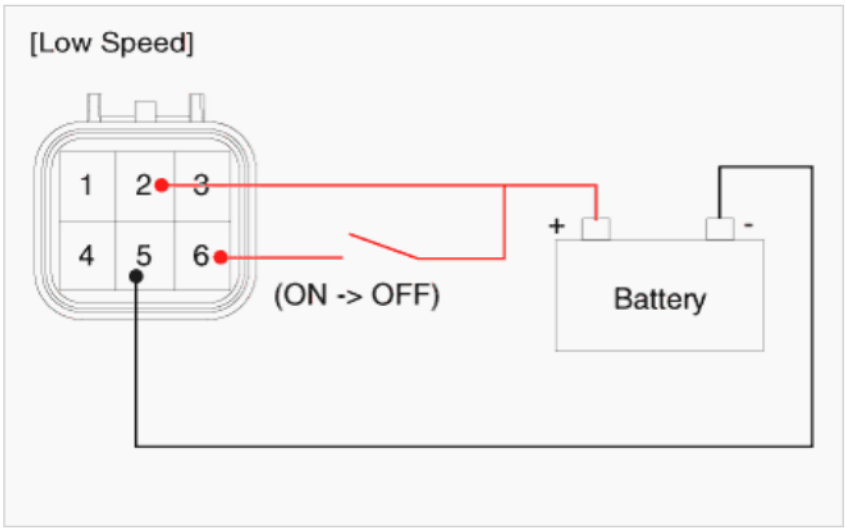
1. Remove the connector from the wiper motor.

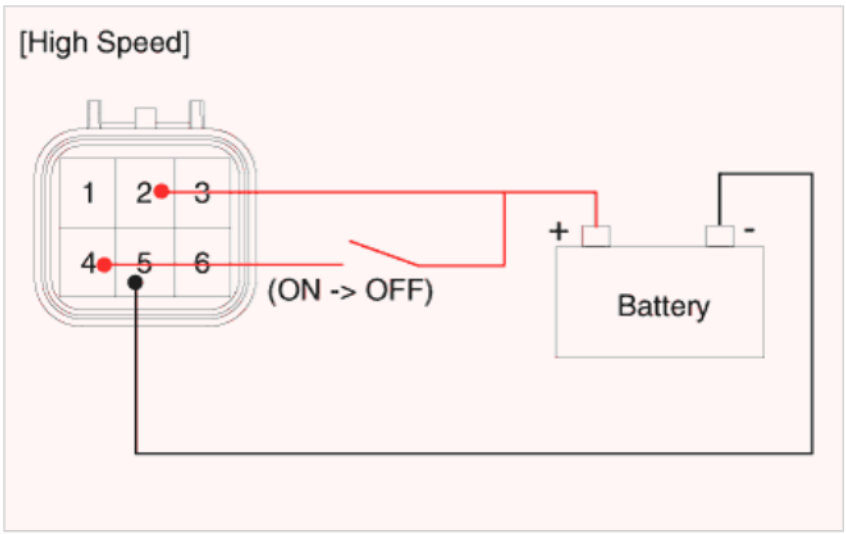


No.	Description
1	-
2	IGN2
3	Wiper motor (Parking)
4	Wiper motor (High)
5	Ground
6	Wiper motor (Low)

2. Attach the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 5.

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Inspection (With KDS)

1. In the body electrical system, failure can be quickly diagnosed by using the vehicle diagnostic system (KDS).
   The diagnostic system(KDS) provides the following information.
   (1) Self diagnosis : Checking failure and code number (DTC)
   (2) Current data : Checking the system input/output data state
   (3) Actuation test : Checking the system operation condition
   (4) Additional function : Controlling other features including system option setting and zero point adjustment
2. Select the "Car model" and the "Intergrated body control unit (IBU)" to be checked in order to check the vehicle with the tester.
3. Select the "Current Data" menu to search the current state of the input/output data.

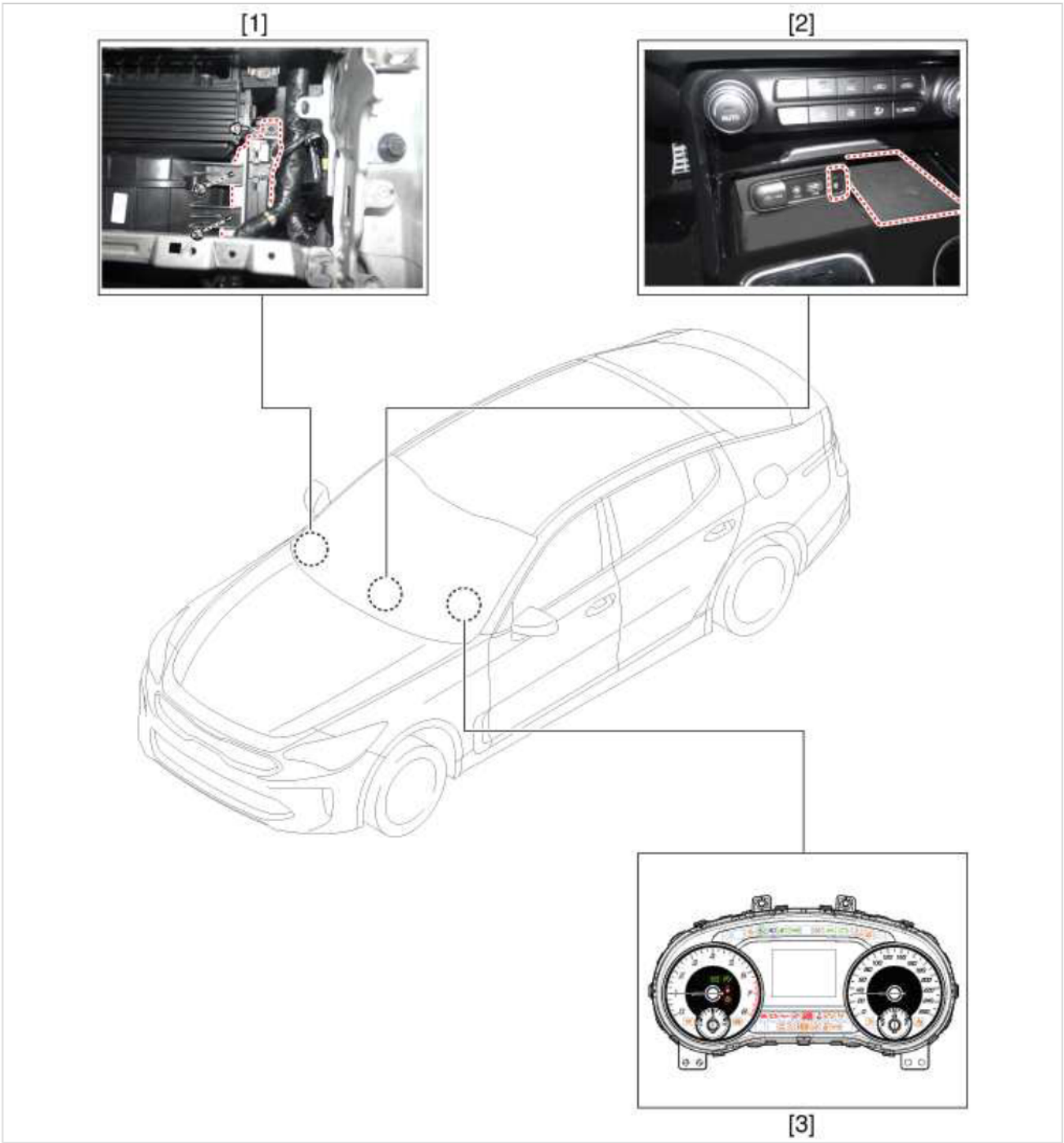
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Specifications

Item	Specification
Rated voltage	DC 12 V
Operating voltage	DC 9.0 - 16.0
Operating temperature	-86 - 167°F (-30 - 75°C)
Dark current	Max. 1 mA
Output power	5 W
Output frequency	110 ± 5 kHz

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Components



1. Integrated body control unit (IBU)
2. Wireless power charging unit
3. Instrument cluster

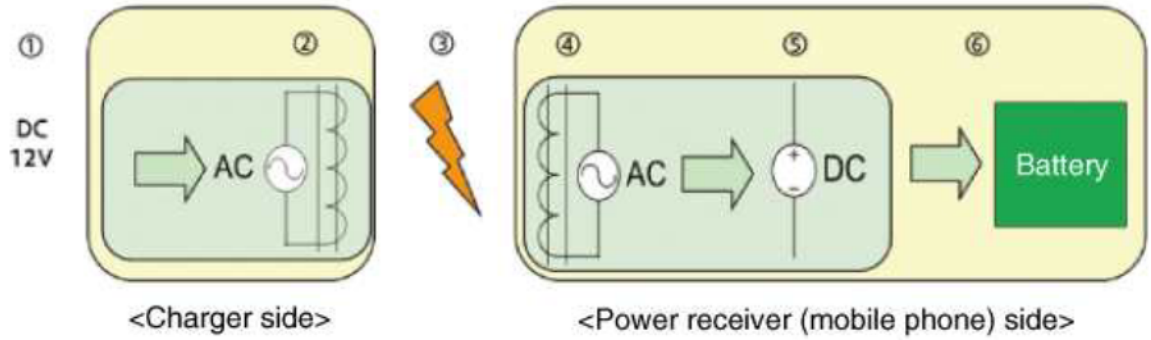
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Description and Operation

Wireless Power Charger System

During ACC or IG ON, battery voltage is supplied to the wireless power charger system to transmit an output of 5 W to mobile phone.
Mobile phones certified with the wireless charging standard WPC (Qi 1.2.2) or equipped with an exclusive wireless charging case can be used.

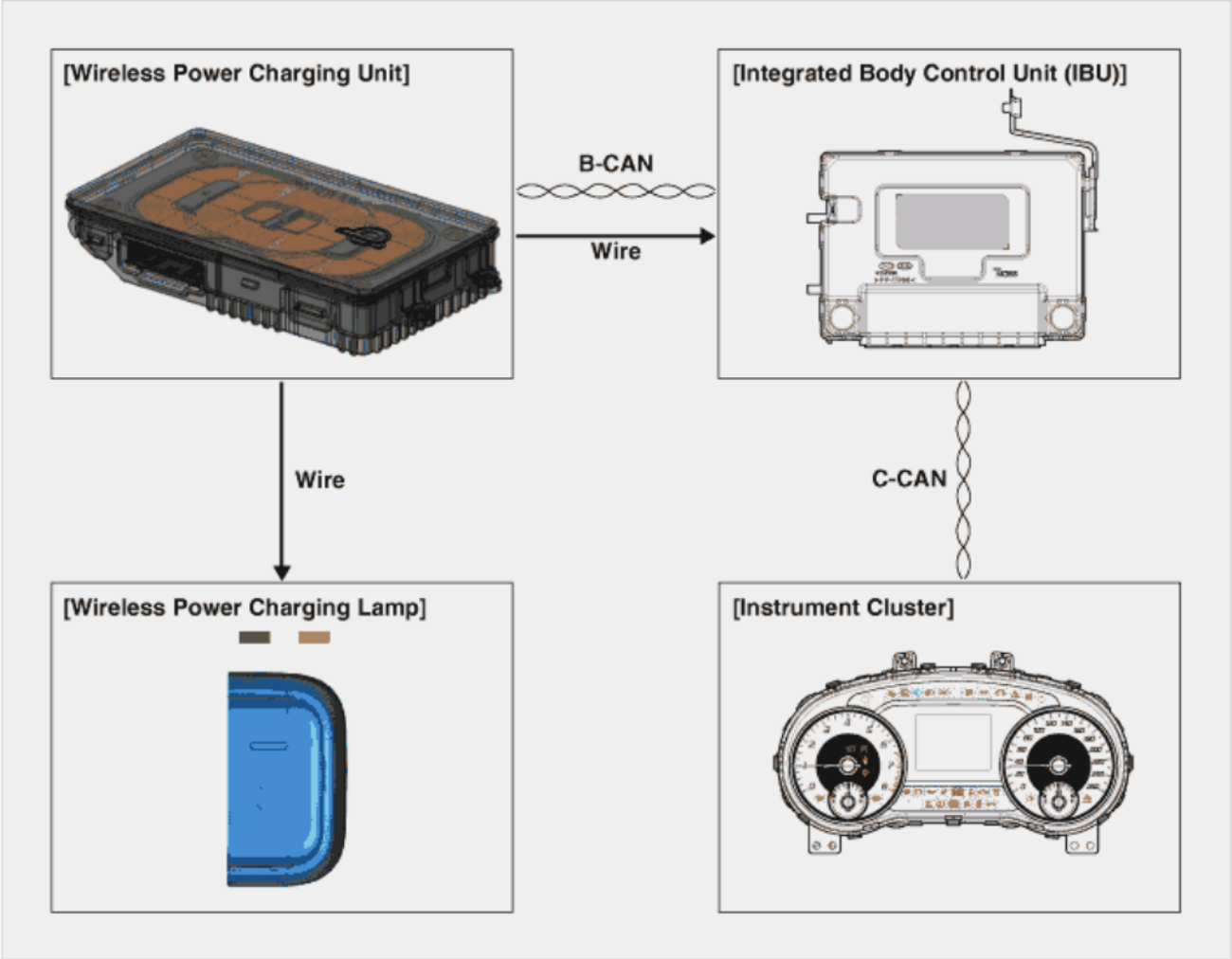
Wireless Power Charging System Flow Chart



1. Supply vehicle power.
2. Convert to AC. Generate electromagnetic field in 1st coil.
3. Generate induced current in power receiver from electromagnetic induction.
4. Generate AC in 2nd coil.
5. Convert to DC.
6. Charge battery.

System Configuration Diagram

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1. Instrument cluster : Alerts about contact with mobile phone.
2. Wireless charging lamp : Displays the charging status.
3. Integrated body control unit (IBU) :
   (1) Determines contact with mobile phone.
   (2) Stops charging during the activation of LF.

Major Functions of Wireless Power Charger System

1. Charging Function
   (1) Activation method
      a. Close all doors of the car.
      b. Switch vehicle power to ACC or IG ON.
      c. Place the wireless charging-enabled mobile phone on the tray.
   (2) Charging status display

Mode	Charging LED display		Remarks
Stand by for charging	LED turned OFF		
Charging in process	Amber LED turned ON		

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Charging completed	Green LED turned ON		
Charging error	Amber LED blinks		– Blinks 10 times for 10 seconds, then LED is turned off for 50 seconds (total 60 seconds)

2. Alert for contact with mobile phone
   (1) If you leave the smart phone on the charging pad when the vehicle ignition is in OFF, the vehicle will alert you through warning messages.



3. Overheating prevention
   (1) Activation method
      a. If the thermistor temperature inside the wireless charging module rises above a certain level (158 °F (70 °C)), charging will stop to protect the mobile phone battery.

> **Information**
> The amber LED of the charging display lamp blinks 10 times for 10 seconds.

      b. If the thermistor temperature falls below a certain level (149 °F (65 °C)), charging will restart.

> **Information**
> When the charging function is restarted, the amber LED of the charging display lamp will be turned on.

4. Foreign matter detection
   (1) Charging will be stopped if there is a coin or other metallic object between the wireless charging unit and the mobile phone.

[Foreign matter]

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Information

- Foreign matter : All metallic objects such as coins, clips, and precious metals
- The amber LED of the charging display lamp blinks 10 times for 10 seconds, and then it is turned off for 50 seconds (total 60 seconds).
- The process is repeated for every 60 seconds.

CAUTION

Be careful as touching the foreign matter by hand may cause burns.

(2) When system has detected foreign matter and stopped charging the mobile phone, the wireless charging fucntion will resume immediately after removing the foreign matter.

Information

When the charging function is restarted, the amber LED of the charging display lamp will be turned on.

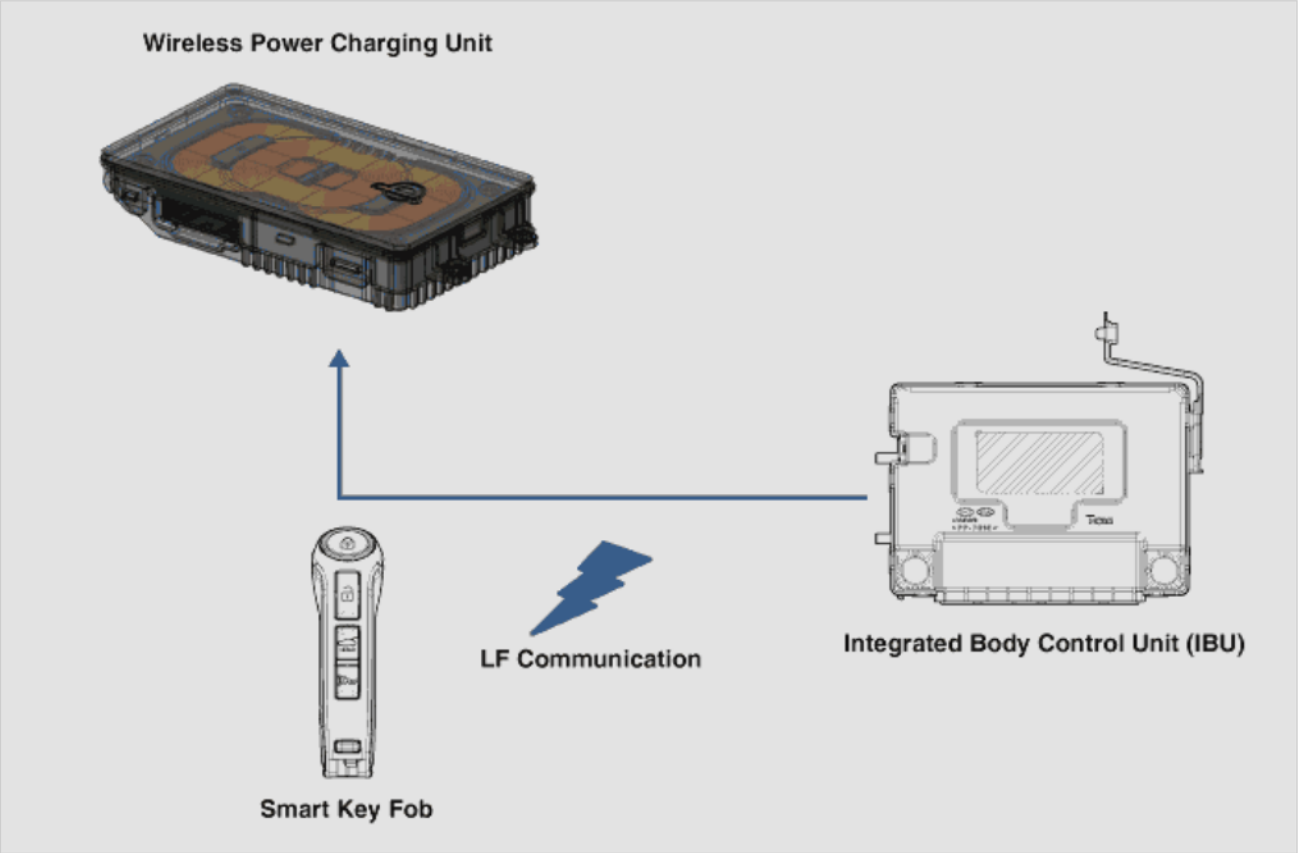
5. IBU unit LF frequency interference prevention

This function prevents interference between the wireless charging frequency and smart key unit frequency band.

(1) Wireless charging is stopped when the door is open or the IBU unit is in LF mode (searching for smart key).

e.g. Wireless charging function is stopped if the driver carries the smart key out of the vehicle during IG ON.

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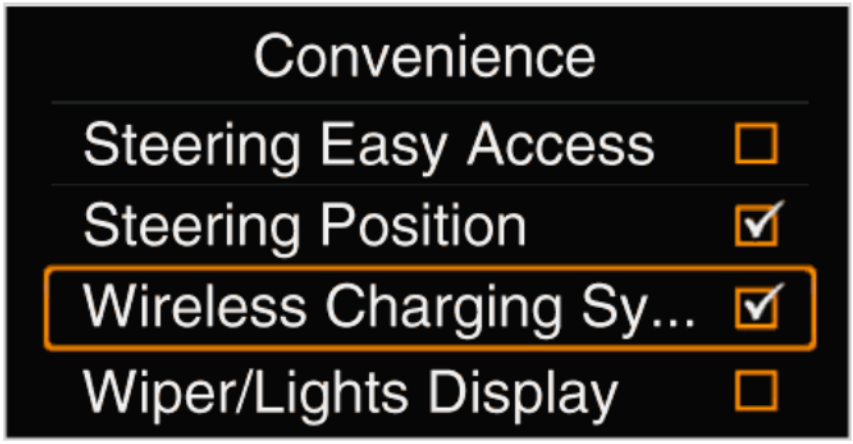


Information

Charging will stop and the amber LED of the charging display lamp will turn off.

(2) It will return to normal operating status when the LF mode of the IBU unit is completed.

6. Turn the wireless charging function ON/OFF with USM.



※ Liftgate applies to RV vehicle models.

Protection of Wireless Power Charger System

Item	Condition	Status
Protects against low/high voltage	Protects and stops charging under 8.5 V and over 16.5 V	LED OFF (Stops operation)
	Charges over 9.0 V and under 16.0 V	
Protects against reverse voltage	Protects and stops charging in case of reverse voltage	LED OFF (Stops operation)
Protects against overcurrent	Protects and stops charging in case of detecting 4.5 A	Amber LED blinks
Protects against overheating	Protects and stops charging in case of detecting 158°F (70°C) by internal temperature sensor of wireless charging module	Amber LED blinks

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	Resumes under 149°F (65°C)	
Foreign matter (Coins, clips, precious metals, etc.)	Protects and stops charging in case of detecting foreign matter (overheating prevention)	Amber LED blinks
Prevents frequency interference	Protects and stops charging by activating SMK in case door or liftgate is open	LED OFF (Stops operation)
	Resumes in 3.5 seconds after all doors and liftgate are closed and SMK operation is completed	
Alert for contact with mobile phone	In case of smart phone on the charging pad when opening the door after ignition OFF	Displays warning message on the instrument panel (for about 4-5 seconds)

※ Liftgate applies to RV vehicle models.

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Troubleshooting

Wireless Power Charger System Troubleshooting

Trouble status	Inspection item	Inspection
Not charged	Check the mobile phone status	R-1
Amber LED blinks	Overcurrent	R-2
	Overheating	R-2
	Foreign matter	R-2

R-1. Check the wireless power charger system operation

1. If the placement of a mobile phone is not detected
   (1) If the internal temperature of the mobile phone battery is high, the mobile phone itself turns "OFF" the power.

   Information
   The temperature at which the power is automatically turned "OFF" differs by mobile phone model.

   (2) If the mobile phone was placed outside the charging range

   (3) If the mobile phone was placed by its LCD side on the charging pad surface (if the phone was placed upside down)

   (4) If the mobile phone was turned 180°

2. Check that the amber LED of the wireless charging lamp turns on when the mobile phone is in normal condition and is correctly placed.

R-2. Check for overcurrent, overheating and foreign matter

1. Overcurrent : Charging stops in overcurrent of over 4.5 A
   (1) The overcurrent error status will be reset when the current falls under 4.5 A or when ACC is turned off and on.

2. Overheating : The unit will be automatically turned "OFF" when the internal temperature of the wireless charging unit is over 158°F (70°C).
   (1) The error status will be reset when the internal temperature of the wirelss charging unit falls under 149°F (65°C).

3. Foreign matter : When metallic objects such as coins, clips and precious metals are detected, charging will be stopped to prevent overheating.
   (1) Error status will be reset when foreign matter is removed.

Information
- The amber LED of the charging display lamp blinks 10 times for 10 seconds, and then it is turned off for 50 seconds (total 60 seconds).
- The process is repeated for every 60 seconds.
- Turning ACC OFF/ON resets the error status and returns to normal operation.

Cases of charging problem

NOTICE
In case of malfunction on cell phone charging system, check the contents as below when the interference condition of smartkey signal and "OFF" status of charging indicate.

No.	Cause	Countermeasure	Remarks
1	Using the cell phone that can not be charged without wire	Check if the wireless power charger has been applied	
2	Off condition of wireless charging system in USM on cluster	Change the setting to ON in USM	
3	Door opened(interference of smartkey signal)	Door or trunk/tail gate closed	
4	Cell phone has been out of center position on charger pad	Change the position of cell phone onto the center of wireless power charger pad	
5	Thick accessary cover	Get rid of the accessary cover and charge.	

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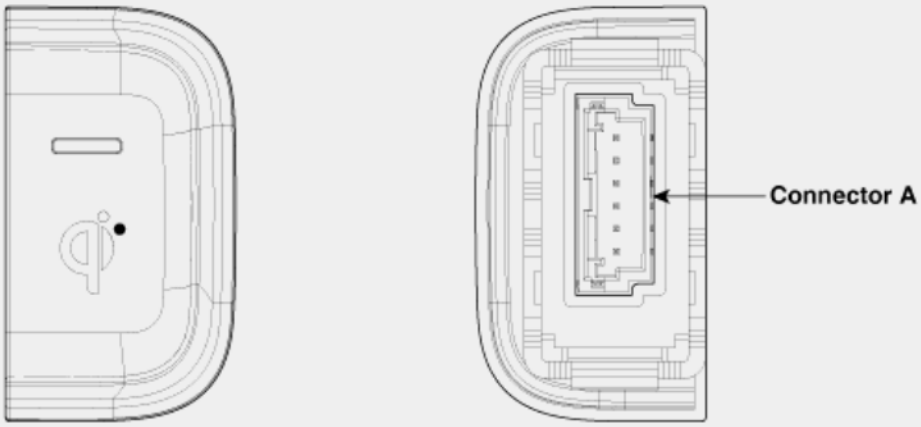
6	Long term using of game, navigation and etc (wireless charging system would be stopped cause of the temperature of cell phone receiver gets higher.)	Turn off the application which has been used	
7	Main board of cell phone has been broken	Replace the main board of cell phone	Campare condition of charging to the other cell phone
8	Metalic object on the wireless power charge pad(coins, clip, etc.)	Get rid of the metalic object, then try charging.	

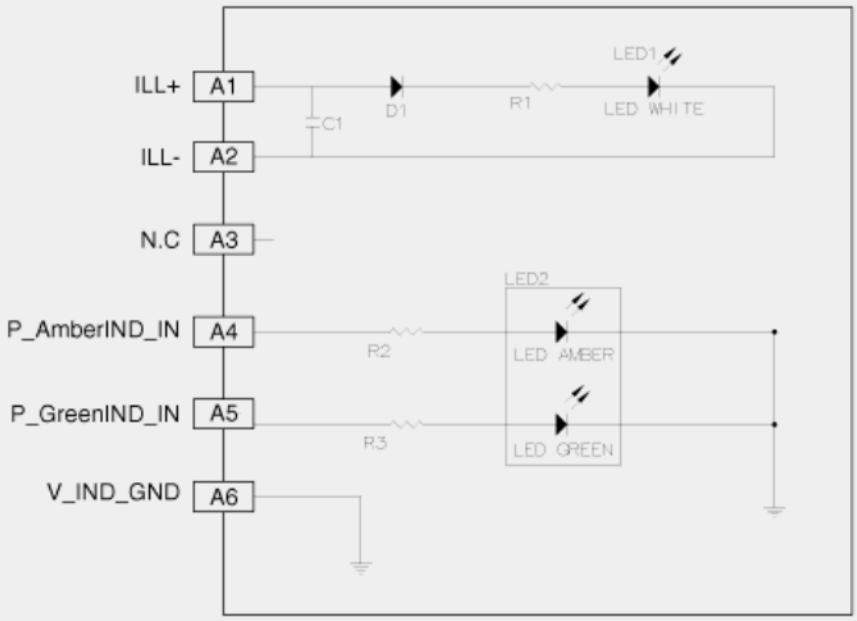
⚠ CAUTION

If the cell phone can not be charged cause of charging trouble cases as mentioned above, solve the problem followed by countermeasure.(not allowed to change parts)

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Components





Connector A	No.	Description	No.	Description
	1	Illumination (+)	4	Charging LED (Amber)
	2	Illumination (-)	5	Charging LED (Green)
	3	-	6	Ground

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Removal

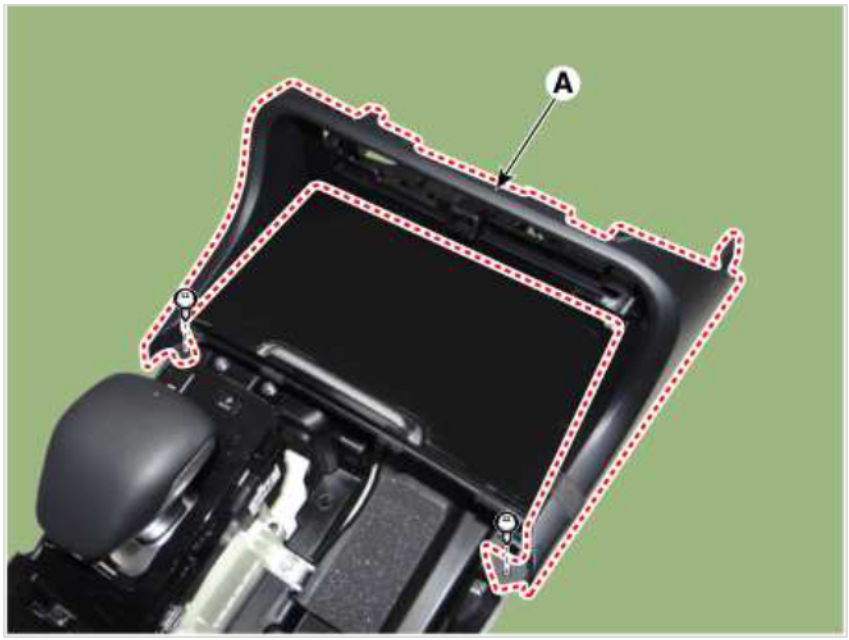
⚠ CAUTION

- Handling wireless charging system parts by wet hands may cause electric shock.
- Put on gloves to protect your hands.

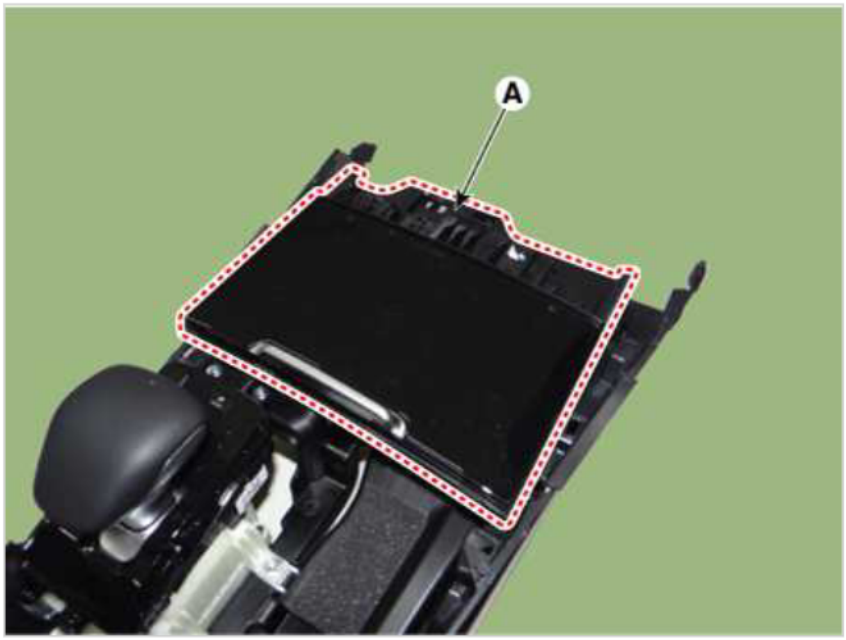
NOTICE

- When prying with a flat-tip screwdriver or use a prying trim tool, wrap it with protective tape, and apply protective tape around the related parts, to prevent damage.
- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Take care not to bend or scratch the trim and panels.

1. Disconnect the negative (-) battery terminal.
2. Remove the console complete assembly.
   (Refer to Body - "Floor Console Assembly")
3. Remove the front cover (A) after loosening the mounting screws.



4. Remove the floor console tray (A) by using a remover.

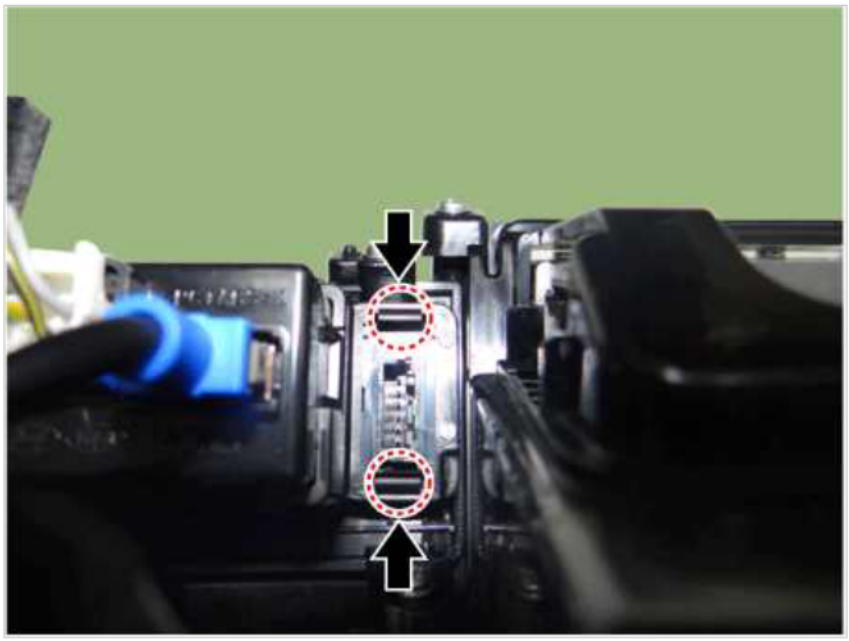


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5. Disconnect the wireless power charging lamp connector (A).



6. Remove the wireless power charging lamp (A) by pressing the fixing hooks.



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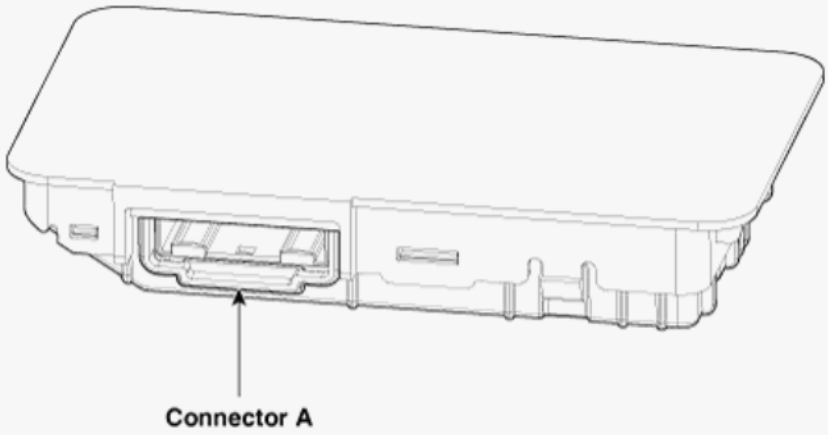


Installation

1. Install the wireless power charging lamp.
2. Connect the wireless power charging lamp connector.
3. Install the floor console tray.
4. Install the front cover.
5. Install the console complete assembly.
6. Connect the negative (-) battery terminal.

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Components



Connector A

Connector A	No.	Description	No.	Description
	1	B-CAN (High)	7	LF Searching ON input
	2	B-CAN (Low)	8	-
	3	-	9	Ground
	4	Charging LED (Amber)	10	-
	5	Charging LED (Green)	11	ACC_input
	6	Ground	12	Battery (+)

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Removal

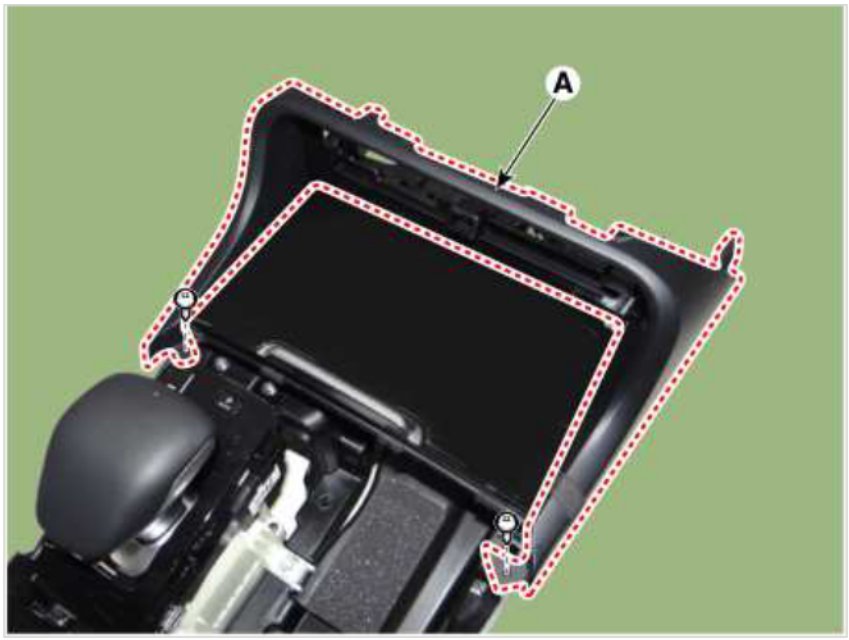
⚠ CAUTION

- Handling wireless charging system parts by wet hands may cause electric shock.
- Put on gloves to protect your hands.

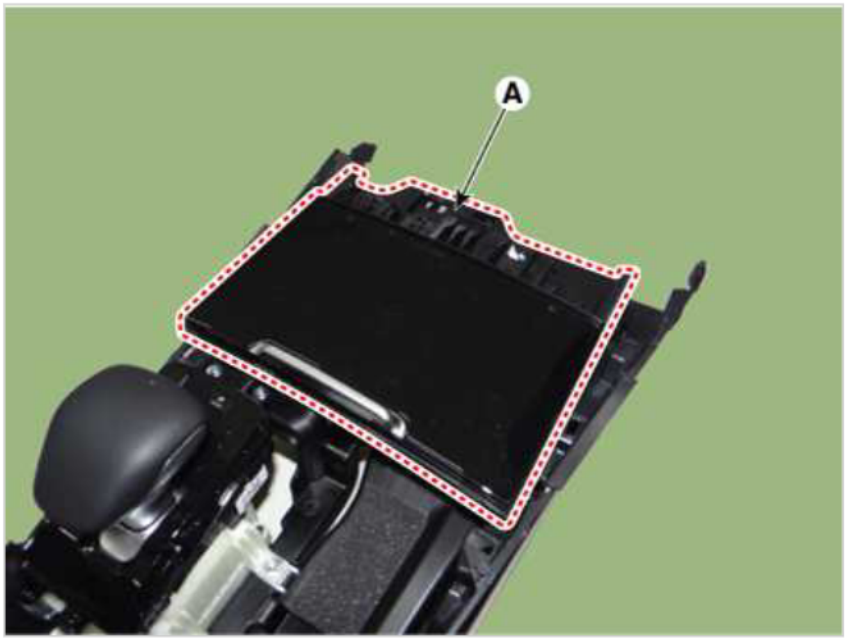
NOTICE

- When prying with a flat-tip screwdriver or use a prying trim tool, wrap it with protective tape, and apply protective tape around the related parts, to prevent damage.
- Use a plastic panel removal tool to remove interior trim pieces to protect from marring the surface.
- Take care not to bend or scratch the trim and panels.

1. Disconnect the negative (-) battery terminal.
2. Remove the console complete assembly.
   (Refer to Body - "Floor Console Assembly")
3. Remove the front cover (A) after loosening the mounting screws.

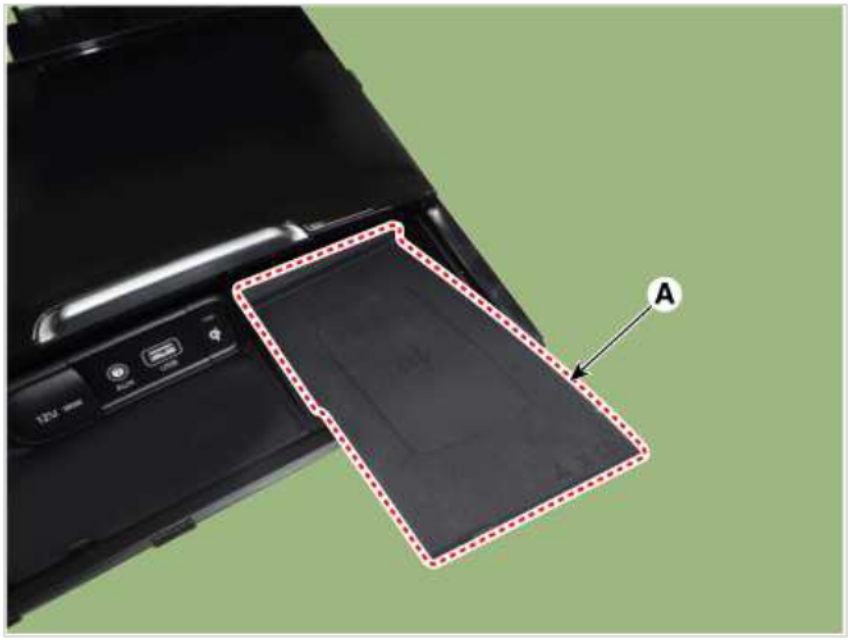


4. Remove the floor console tray (A) by using a remover.



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5. Remove the wireless charging pad (A).



6. Disconnect the wireless power charging unit connector (A).



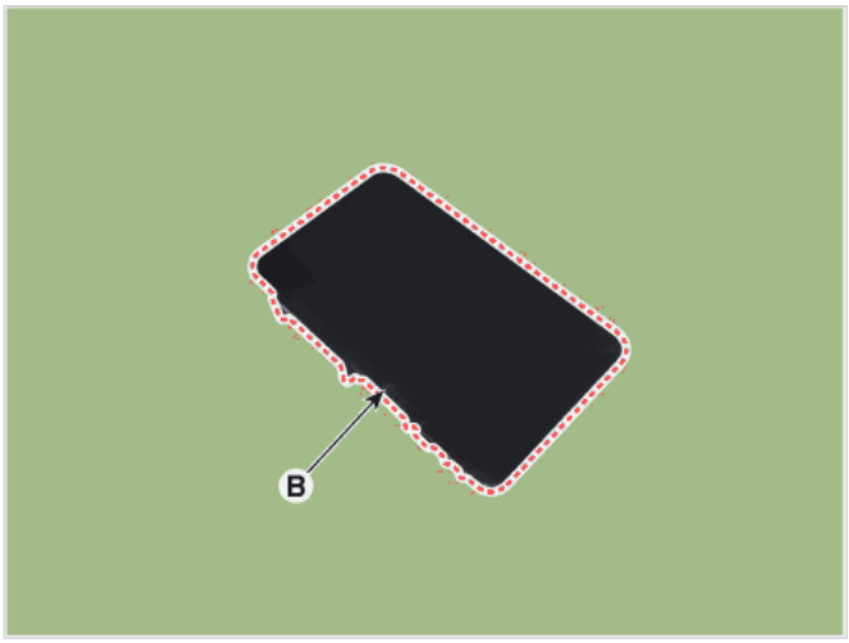
7. Remove the wireless power charging unit (B) by pressing the fixing hooks (A).

⚠ CAUTION

Be careful not to damage the fixing hooks.

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Installation

1. Install the wireless power charging unit.
2. Connect the wireless power charging unit connector.
3. Install the wireless charging pad.
4. Install the floor console tray.
5. Install the front cover.
6. Install the console complete assembly.
7. Connect the negative (-) battery terminal.

[Diagnosis With KDS]

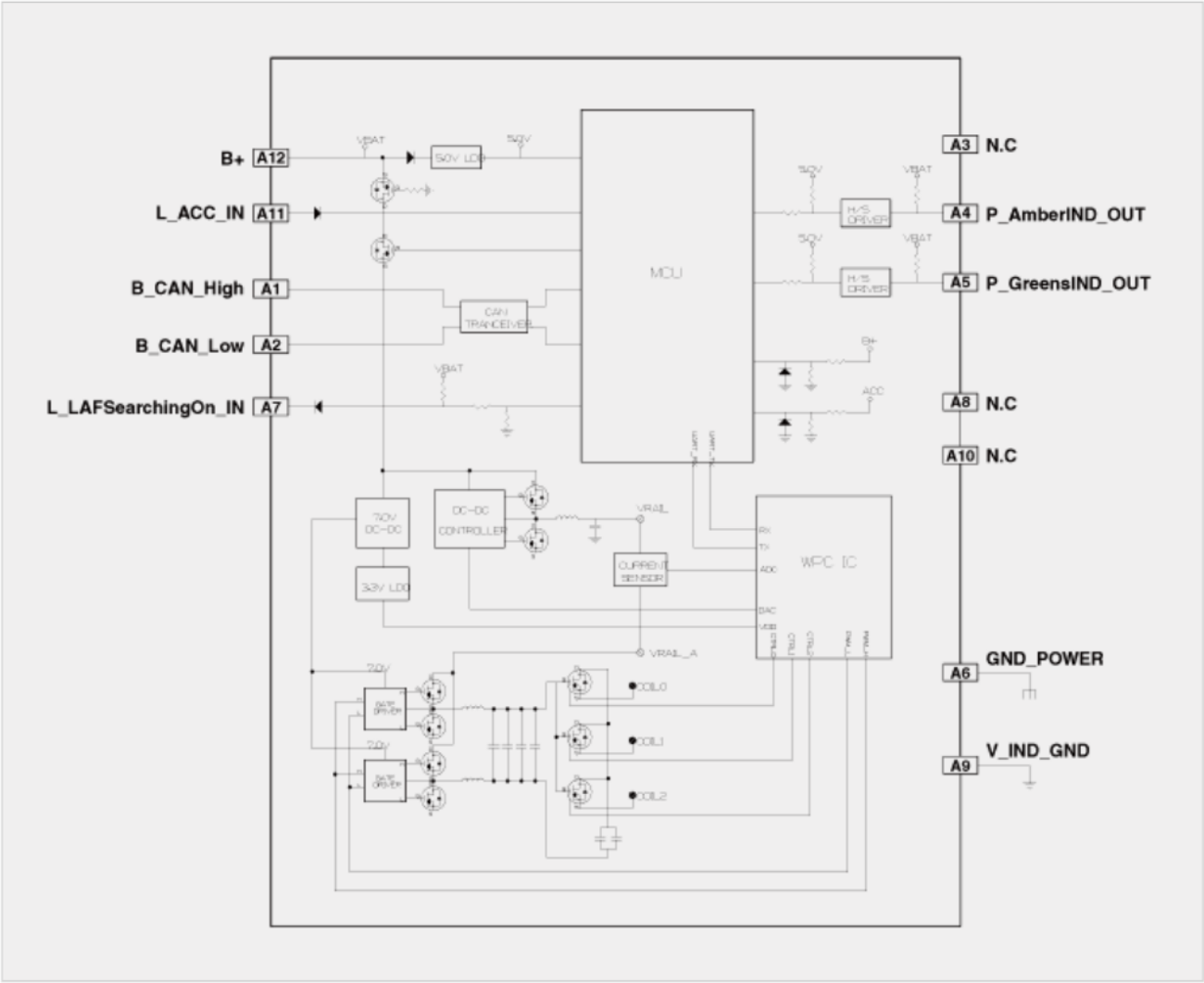
1. The body electrical system can be more quickly diagnosed for troubles by using the vehicle diagnostic system (KDS).
   KDS provides the following information.
   (1) Self diagnosis : Inspects and displays diagnostic trouble code (DTC)
   (2) Sensor data : Checks the system input/output value status
   (3) Forced operation : Checks the system operating status
   (4) Additional function : Controls system options, zero point adjustment and other functions

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2. To diagnose the vehicle by using the diagnostic equipment, select "vehicle model" and "wireless power charger system" to be inspected.
3. To inquire the current status of input/output values, select the "Sensor Data" menu
   The input/output values of the sensors corresponding to the selected module can be checked.
4. To perform forced operation of the selected module input, select "Actuation Test".
5. To inquire the cause of trouble for each module by self diagnosis, select "Diagnostic Trouble Code".

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Circuit Diagram



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