Specification

Smart Key Unit

Items	Specification
Rated voltage	DC 12V
Operating voltage	DC 9 ~ 16V
Operating temperature	-30°C ~ 75°C (-22°F ~ 167°F)
Load	Max. 2mA

RF Receiver

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

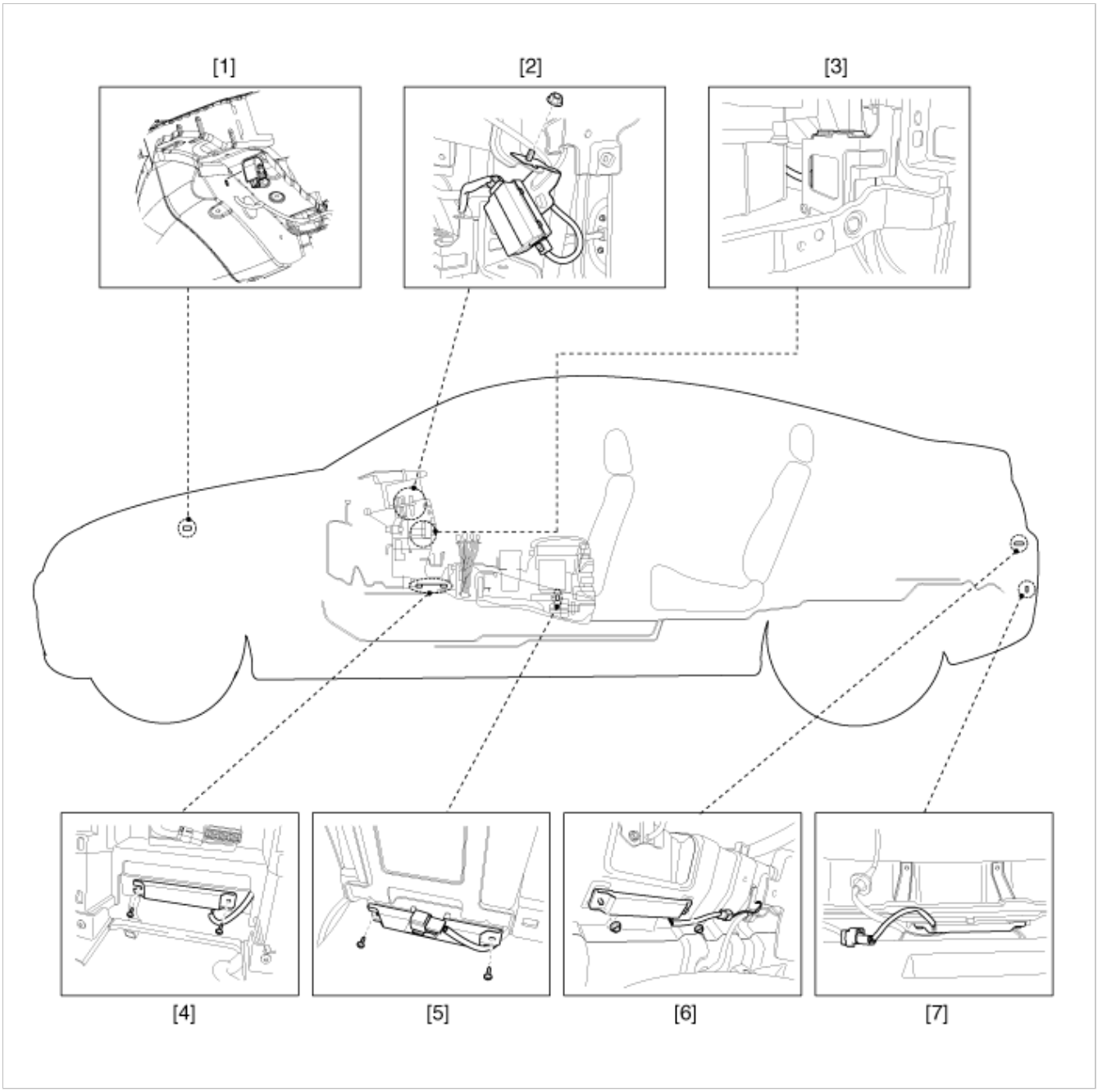
Smart Key FOB

Items	Specification
Battery	Lithium battery 3V 1EA
Distance	30m
Battery life	More than 2years (10 times / a day)
Push buttons	Door lock / unlock, Trunk lid
Frequency(Rx)	125 kHz
Frequency(Tx)	315 MHz
Numbers	2EA

Antenna

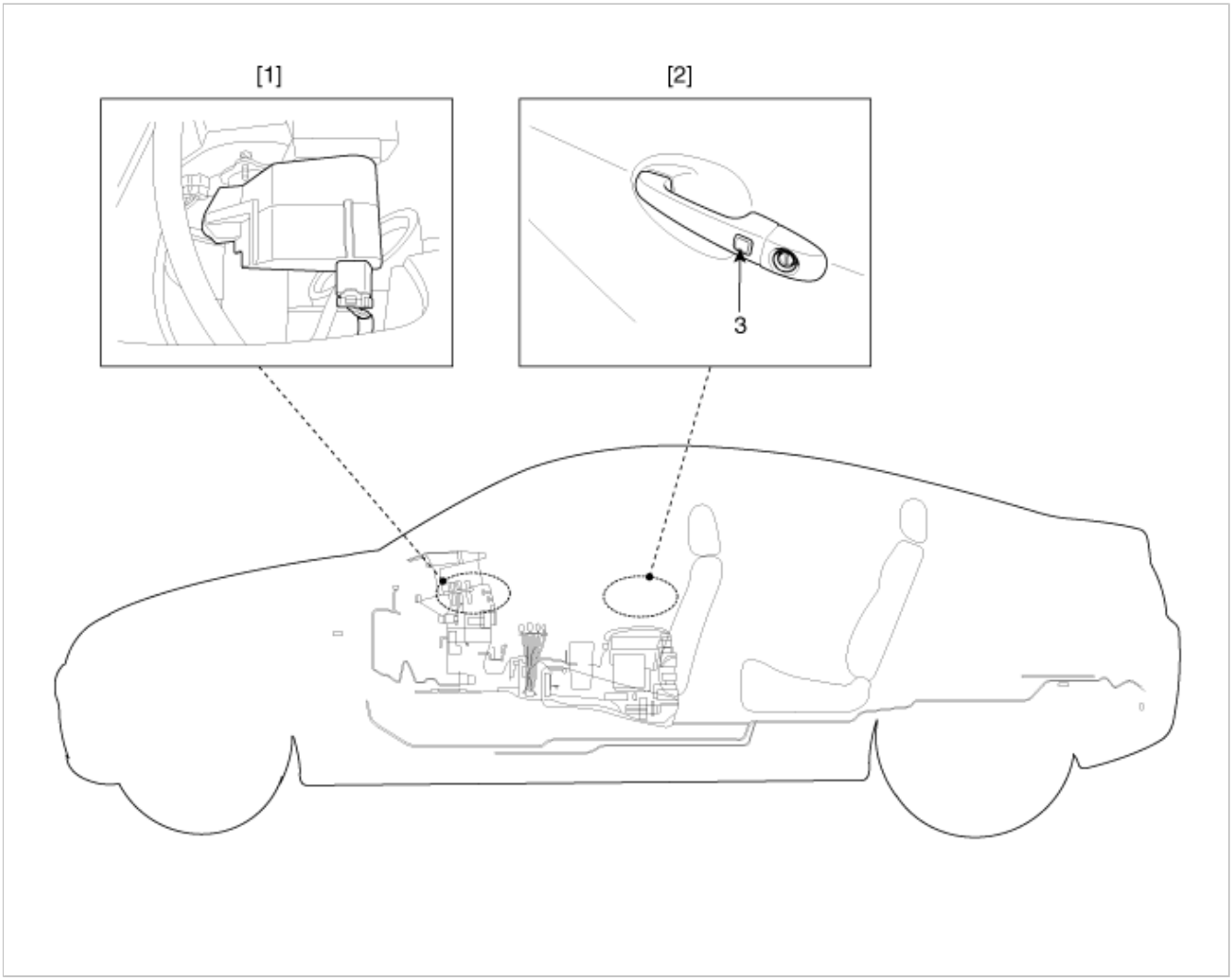
Items	Specification
Rated voltage	DC 12V
Operating voltage	DC 9 ~ 16V
Operating temperature	-30°C ~ 75°C (-22°F ~ 167°F)
Frequency	125kHz
Numbers	Interior(3EA), Door(2EA), Bumper(1EA)

Component Location (1)



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

Component Location (2)



1. Electronic Steering Column Lock (ESCL) 2. Door outside handle	3. Door outside handle button

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.
In a similar manner the vehicle's Electrical Steering Column Lock (ESCL) is released. 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 door driver side and passenger side
- Passive locking via door driver side and passenger side
- Passive start
- Max. 2 fobs can be handled by the system
- Immobilizer backup antenna driver integrated into FOB-HOLDER 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. This feature could be different depending on platform as follows:
   A. Pressing Push button in door handle
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 release ESCL and 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 inserting the key into the FOB HOLDER.

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), P(A/T) or N(M/T) position Switch), controls the outputs (e.g. exterior and interior antennas), and communicates via the CAN/LIN (depends on the vehicle) as well as a single line interface to further devices of the car.
It reads the inputs (Push button in door handle, Start Stop Button (SSB), P(A/T) or N(M/T) 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 125 kHz 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

• LIN communication with other unit (depending on platform)

The LF antenna amplifier/driver generates a 125 kHz 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 6 push buttons.
- Transponder-functionality in case of a flat battery or a disturbed communication.
- LED for operation feedback and battery monitoring.

> NOTE
>
> The FOB's LED indicator may continue to light even with a low transmitter battery.
> If the performance or range of the FOB is less than expected, check the transmitter battery.

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 kHz magnetic field, which is the carrier for the SMART KEY challenge.
   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.
   Two antennas cover the vehicle’s exterior: two antennas in the Door Handles (DS and PS) cover the area around the doors.
   Up to three antennas cover the vehicle’s interior and the trunk interior: two in the passenger compartment and one in the 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. External Receiver
   The SMART KEY FOB’s response is received via the external RF receiver, which is connected to the SMK ECU via a serial communication Line.
   The SMK ECU provides a connector pin for the serial communication Line.

Door Handle

The front door handles of the two doors (driver door / passenger door) are equipped with emitting LF-antennas to emit the 125 kHz 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.

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 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)

Pressing one of the push buttons in the door handles 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 Trunk Warning

Whenever the trunk is closed, SMK ECU uses a suitable search strategy to avoid trunk buzzer warning by a fob outside the vehicle. Then SMK searches for a SMART KEY FOB in the interior of the trunk. If a valid SMART KEY FOB is found in the trunk, the SMK ECU activates SMK external buzzer to inform the user that the trunk has been closed with a fob inside the trunk.

SMK will send the trunk open command to BCM for trunk reopening if Trunk 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.

NOTE

- A blind spot in the trunk similar to any RF disturbance may lead to no trunk warning. Due to the penetration of the bumper antenna into the trunk area the lid may open without an Identification Device outside.
- A blind spot in the trunk similar to any RF disturbance may lead to no trunk warning

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:
   A. 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
   B. IF FOB-IN ACTIVE
      SMK sends request toward PDM to 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:
   All terminals OFF & any door (including trunk) 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 trunk 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:
   A. 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)
   B. IF FOB-IN ACTIVE
      SMK sends request toward PDM to 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. Preconditions:
   While (at least one door knob is unlocked) & (ACC ON or IGN ON) & (No FOB-IN) :
   A. (All doors are closed) & (trunk closed)
2. Event:
   A. User presses the push button in door handle or trunk
3. SMK actions:
   SMK performs a search for the fobs outside of the vehicle; the same LF-strategy has to be used as it is defined for "Scenario Access with I/O Distinction".

Door Lock Warning 2

1. Preconditions:
   Same as passive locking precondition but with at least one door open.
2. Event:
   User presses the door handle Push button .
3. SMK actions:
   SMK performs a search for the fobs outside of the vehicle; the same LF-strategy has to be used as it is defined for "Scenario Access with I/O Distinction".
   If no fob has been found, no action is required.
   If the preconditions are no longer valid during buzzer active time (3 seconds), the SMK ECU stops the buzzer immediately.

Door Lock Warning 3

1. Preconditions:
   Same as passive locking precondition
2. User action:
   A. User presses the door handle Push button
3. SMK ECU actions:
   A. If ATWS(Anti Theft Warning System) is in DISARM status, SMK ECU performs a search for the fob inside of the vehicle (use "Door Lock Warning 3" scenario)

If no fob has been found, the passive locking is performed.
If any valid fob has been found, SMK ECU activates the external buzzer.
If the activity timer elapsed or ACC ON or IGN1 ON or NOT All door closed or FOB-IN, the SMK ECU stops the buzzer immediately.
After searching of inside fob, SMK ECU also performs a search for fobs outside of the vehicle.

Smart Key Lamp Warning

1. SMK actions:
   As long as the preconditions are valid, the SMK ECU performs a periodical search for the fobs in the interior of the vehicle; the same LF-strategy has to be used as it is defined for the ID out warning (registering only, no authentication); periodical means, the search is done every 3 seconds.
   If no fob has been found, the SMK ECU starts Key out indicator lamp activation as all preconditions are valid and will perform another search 3 seconds later.

If any valid fob has been found, the SMK ECU stops the Key out indicator lamp and will (if one door is open) perform another search 3 seconds later; if no door is open then it’s only at the next When the preconditions are still valid, the search resumes by opening of one door.

Failsafe Functions (Backup For Limp Home)

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

- Unlocking / locking of doors or trunk (or tailgate depending of the vehicle configuration): use of mechanical key

User Information Functions

ID OUT Warning

1. Preconditions:

A. (ACC or IGN1) & (any door open or trunk open)

2. Event:
   The last opened door is closed
3. SMK action:
   SMK searches for a SMART KEY FOB in the interior.
   A. If no valid SMART KEY FOB is found, the SMK activates external buzzer and also sends ID OUT WNG via CAN (exterior buzzer warning and internal buzzer warning).
   B. 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.

> NOTE
>
> 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.

Immobilizer Lamp

Removing the PIF from the MSL and reinserting the PIF and pushing the MSL Knob will switch the lamp on again.

Fob Battery Low Voltage Detection

To detect 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.
If the fob has detected a low battery voltage, the LED will not be switched on at button press.

Learning Description

In this chapter, the learning procedure for SMK, PDM, ESCL and FOBs is described.
For the learning of the SMK, PDM, ESCL 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 PDM and/or ESCL 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, PDM and ESCL and SMART FOB are already learnt with same PIN code
- PDM replacement: PDM is not learnt, SMK and ESCL and SMART FOB are already learnt with same PIN code
- ESCL replacement: ESCL is not learnt, SMK and PDM and SMART FOB are already learnt with same PIN code
- Additional or new keys teaching: SMK and PDM and ESCL are already learnt with same PIN code

Smart key teaching

Insert smart key #1 to key holder
↓
SMK start to learn
↓
Input the PIN code
↓
PDM start to learn
↓
ESCL start to learn
↓
Smart key #1 learnt
↓
SMK/PDM/ESCL learnt
↓
Pull out smart key #1
↓
Insert smart key #2 to holder
↓
Smart key #2 learnt

- Smart key system is learnt **transponder and smart key** by once at same time.

<Smart key neutralization mode>

- Neutralization mode is for replacing Smart key unit, ESCL, PDM ECM easily.
- It is possible that smart key is learnt again, after neutralizing Smart key system.
- Virgin start (twice ignition) is impossible in neutralized condition

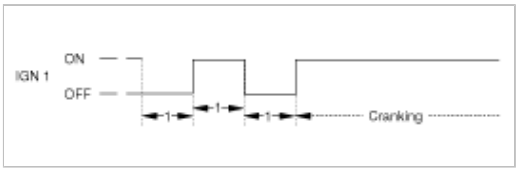
<Lock by timer>

- If PIN code is inputted over 3 times, it is impossible to learnt and neutralization during 1 hour.

Starting After Replacing (Virgin Start)

Starting is possible by following process after replacing new smart key unit , PDM, FOB key or ESCL.

- It is for starting at virgin condition
- All related parts are virgin condition (Smart key, IPM, PDM, ESCL ECM)
- ESCL is always unlock at virgin
- When virgin smart key is inserted in smart key holder, possible to start, IG ON and ACC position
- Press brake pedal in P or N range
- After inserting virgin smart key to holder, push start button once.



Inspection

Self Diagnosis With Scan Tool

It will be able to diagnose defects of SMART KEY system with GDS quickly. GDS can operates actuator forcefully, input/output value monitoring and self diagnosis.
The following three features will be major problem in SMART KEY system.

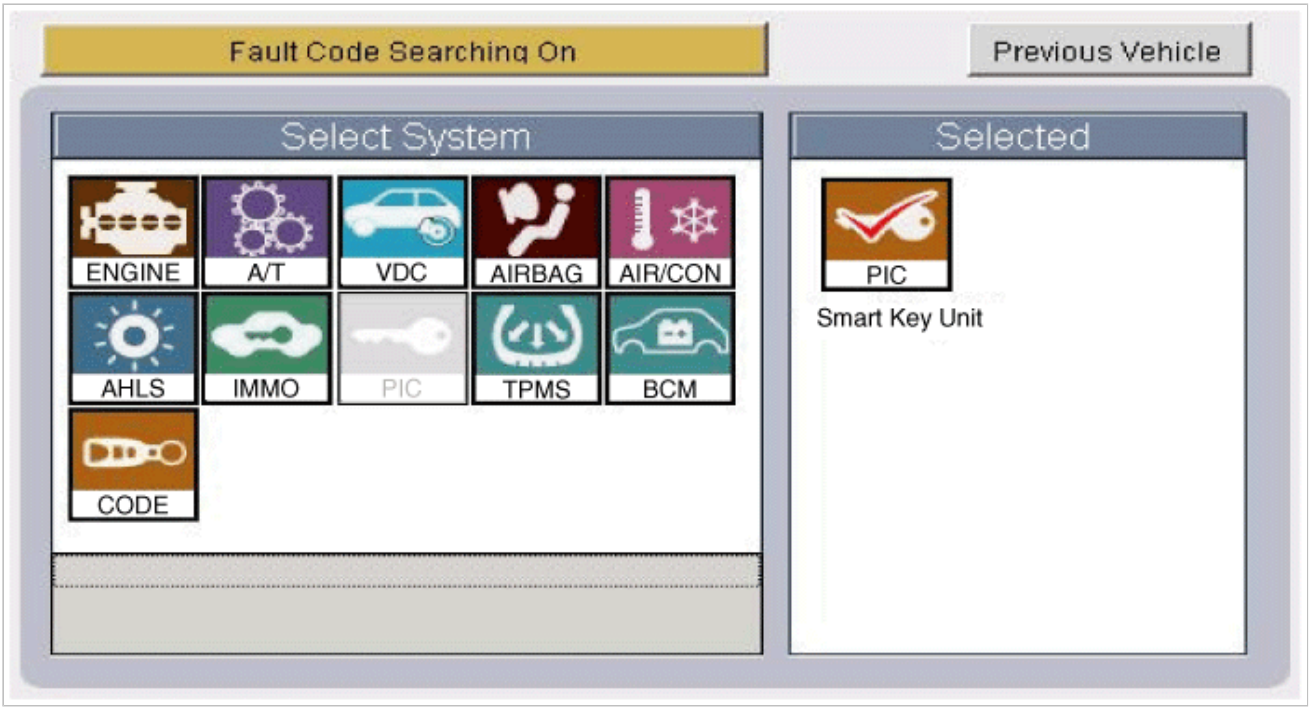
1. Problem in SMART KEY unit input.
2. Problem in SMART KEY unit.
3. Problem in SMART KEY unit output.

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

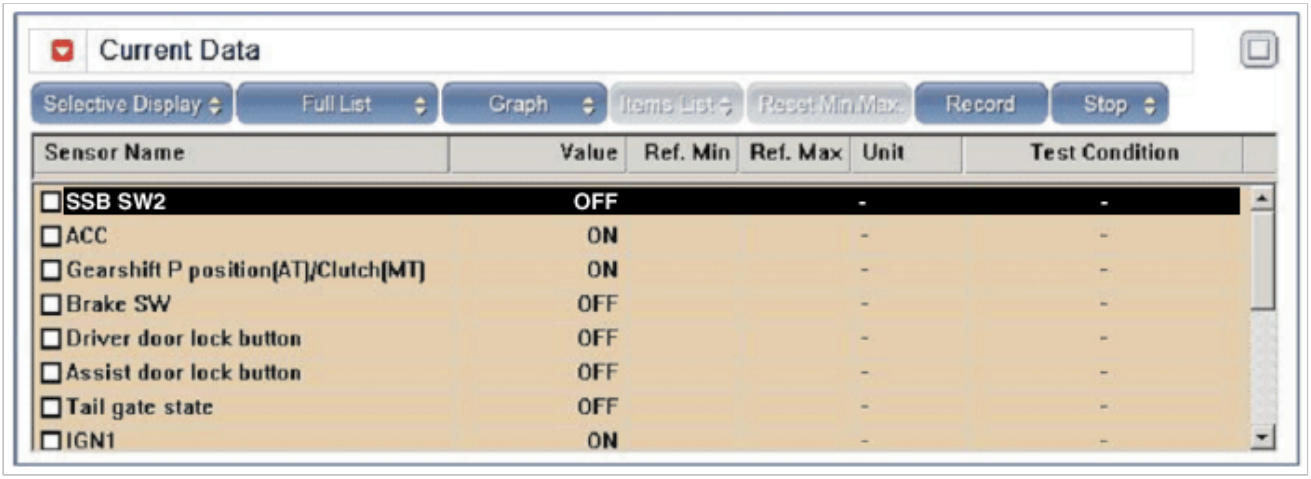
1. SMART KEY unit Input problem : switch diagnosis
2. SMART KEY unit problem : communication diagnosis
3. SMART KEY unit Output problem : antenna and switch output diagnosis

Switch Diagnosis

1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel, turn the power on GDS.
2. Select the vehicle model and then SMART KEY system.



3. Select the "SMART KEY unit".
4. After IG ON, select the "Current data".



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

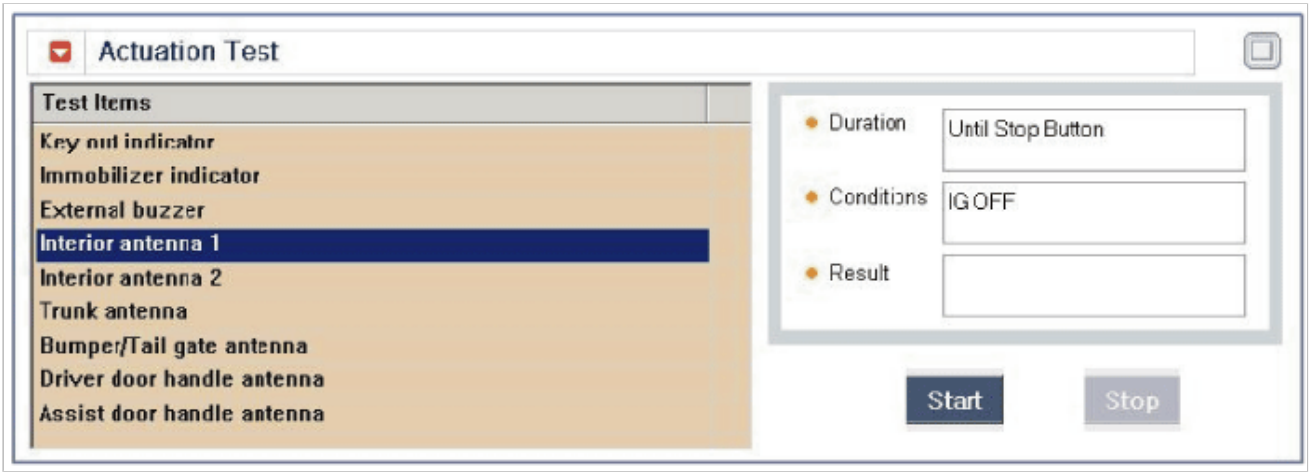
Display	Description
FL Toggle SW	ON : Push button is ON in the driver door handle.
FR Toggle SW	ON : Push button is ON in the assist door handle.
Trunk SW	ON : Trunk button is ON.
Gear P Position	ON : Shift lever is P position.
IGN 1	ON : IGN switch is IG position.
ACC	ON : IGN switch is ACC position.
Push Knob SW	ON : Push knob switch is ON.
External Buzzer	ON : Buzzer is ON.

Communication Diagnosis With GDS (Self Diagnosis)

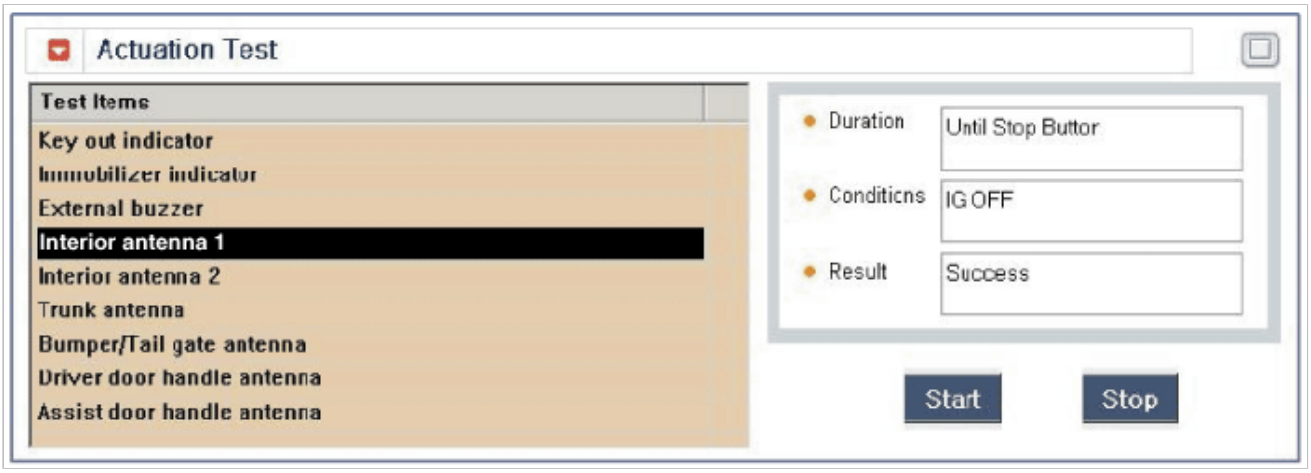
1. Communication diagnosis checks that the each linked components operates normal.
2. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.
3. After IG ON, select the "DTC".

Antenna Actuation Diagnosis

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



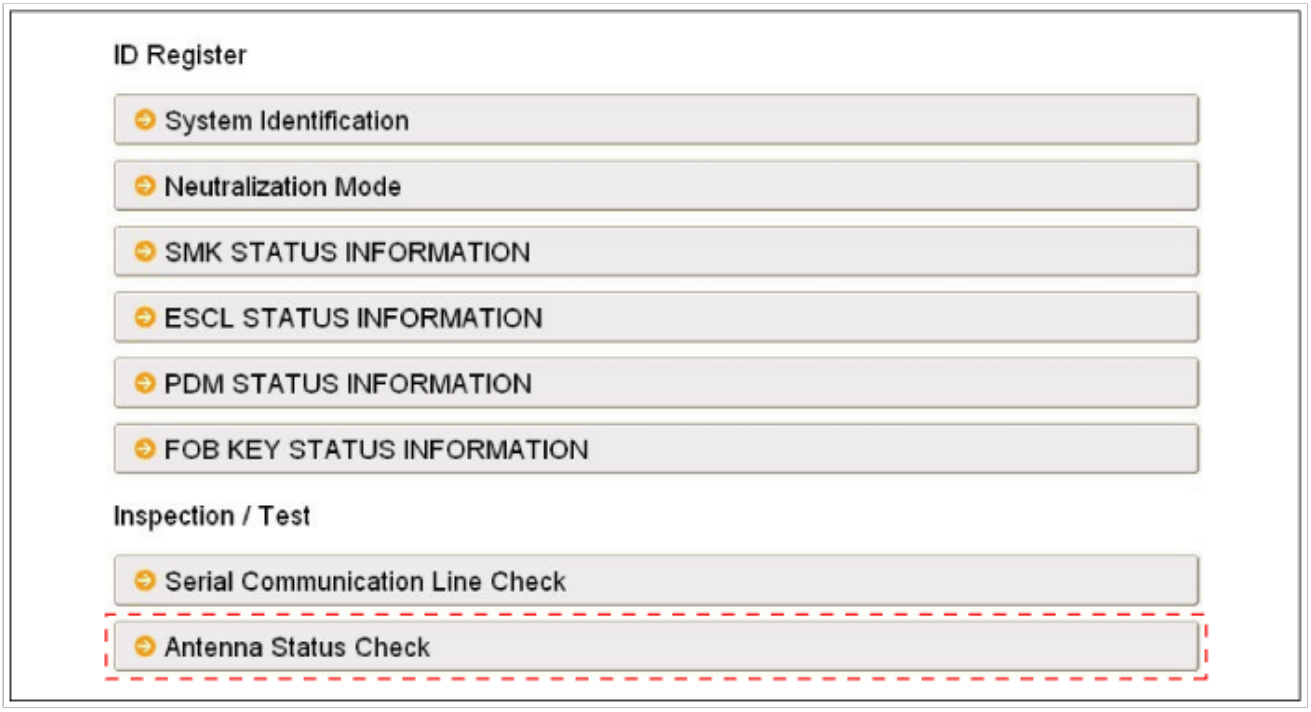
3. Set the smart key near the related antenna and operate it with a GDS.



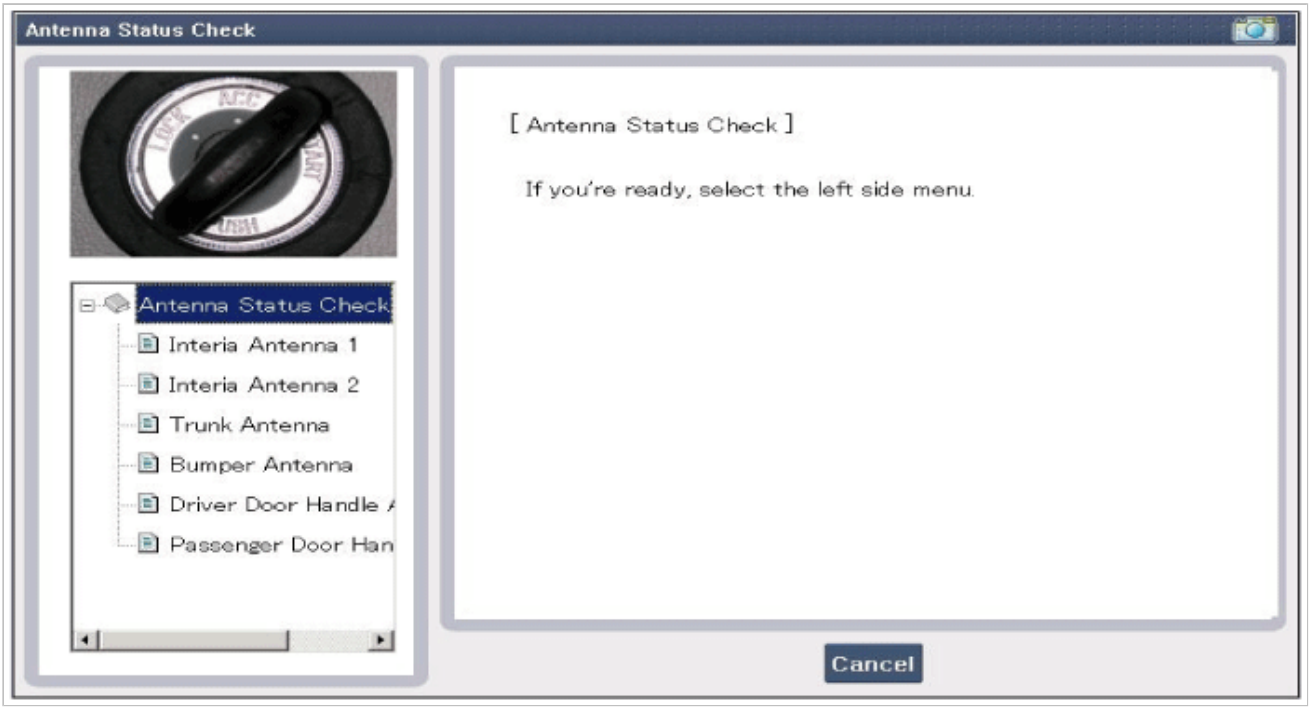
4. If the LED of smart key is blinking, the smart key is normal.
5. If the LED of smart key is not blinking, check the voltage of smart key battery.
6. Antenna actuation
   A. INTERIOR Antenna 1
   B. INTERIOR Antenna 2
   C. Trunk antenna
   D. BUMPER/ Trunk Antenna
   E. DRV_DR Antenna
   F. AST_DR Antenna

Antenna Status Check

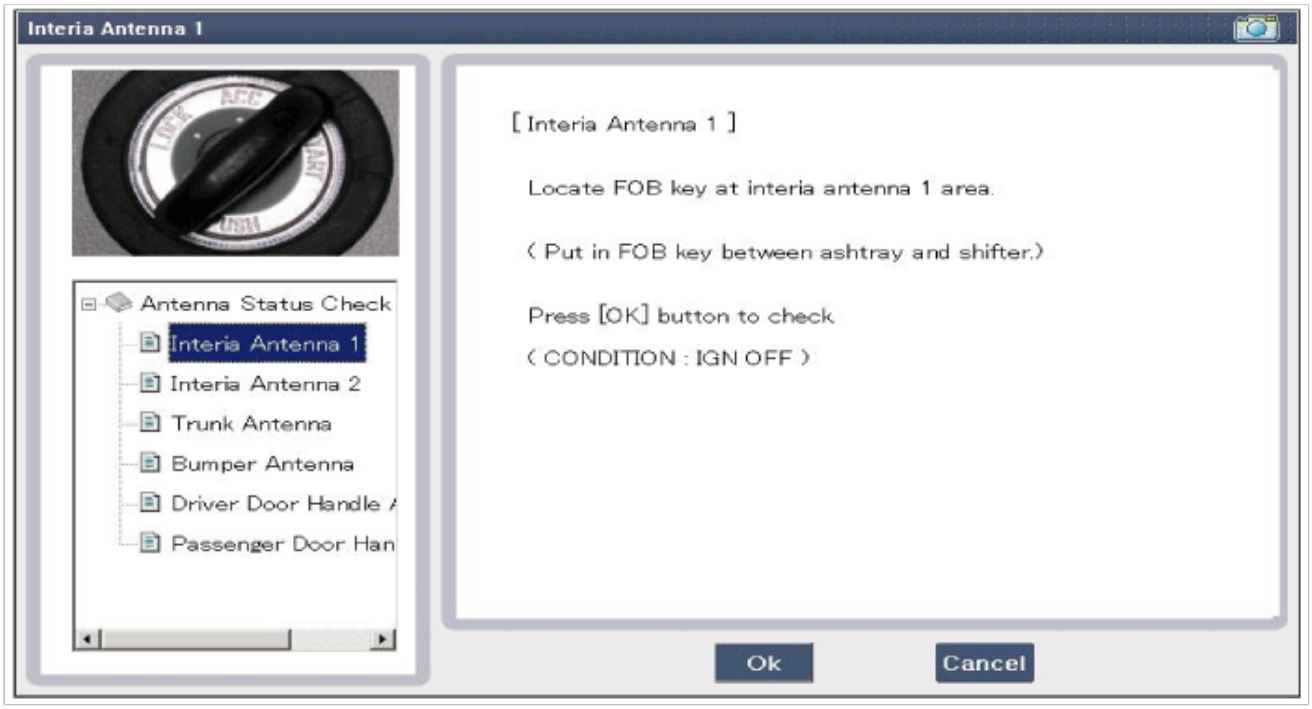
1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.
2. Select the "Antenna Status Check".

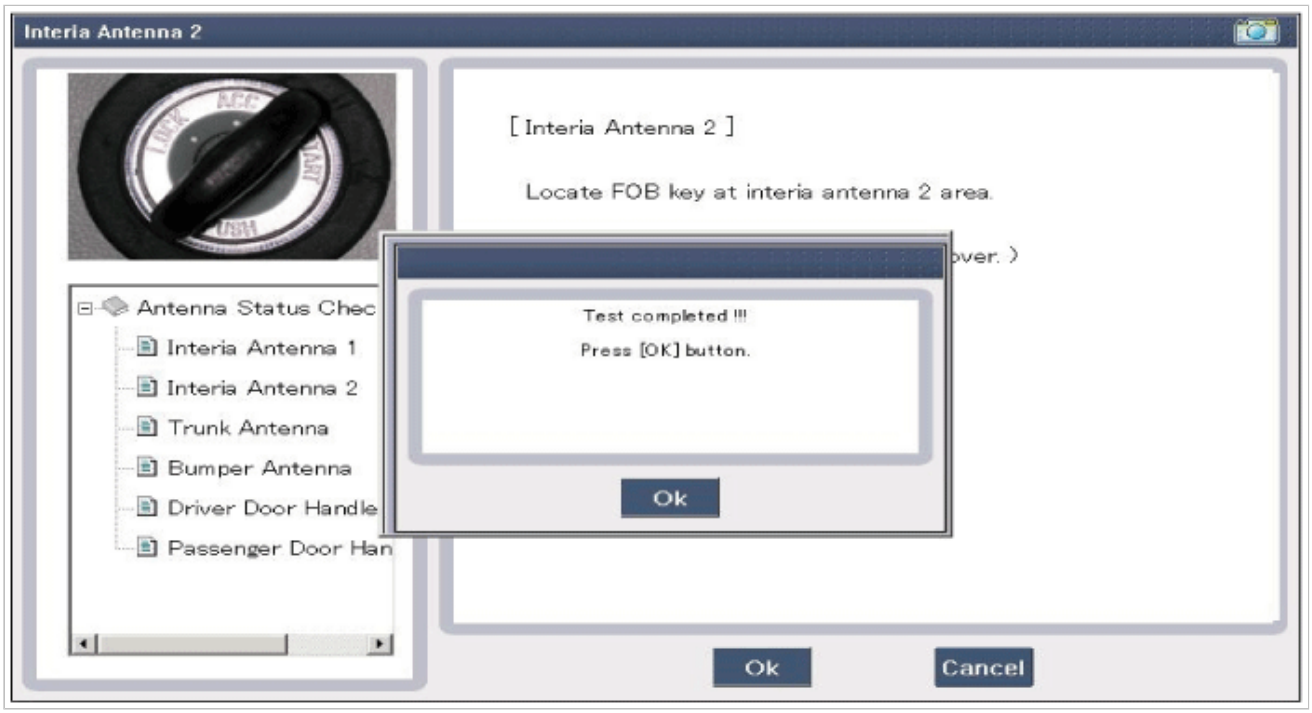


3. After IG ON, select the "Antenna Status Check".



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

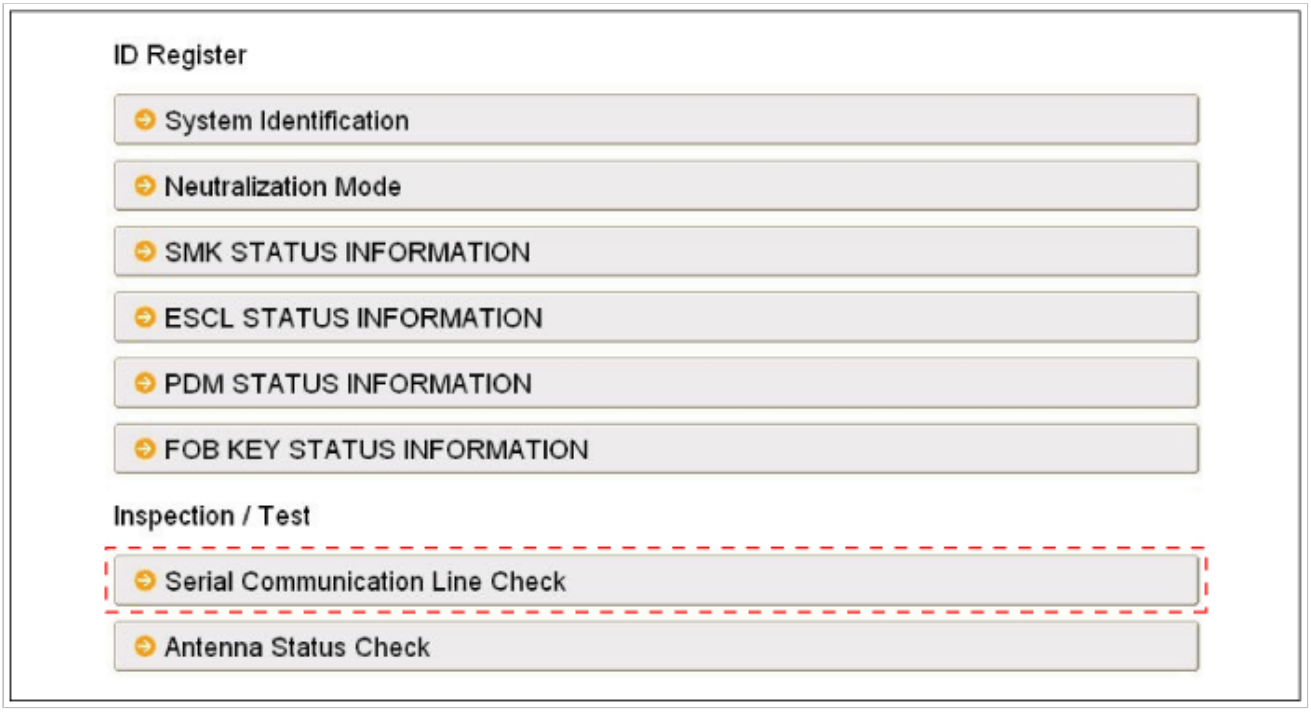




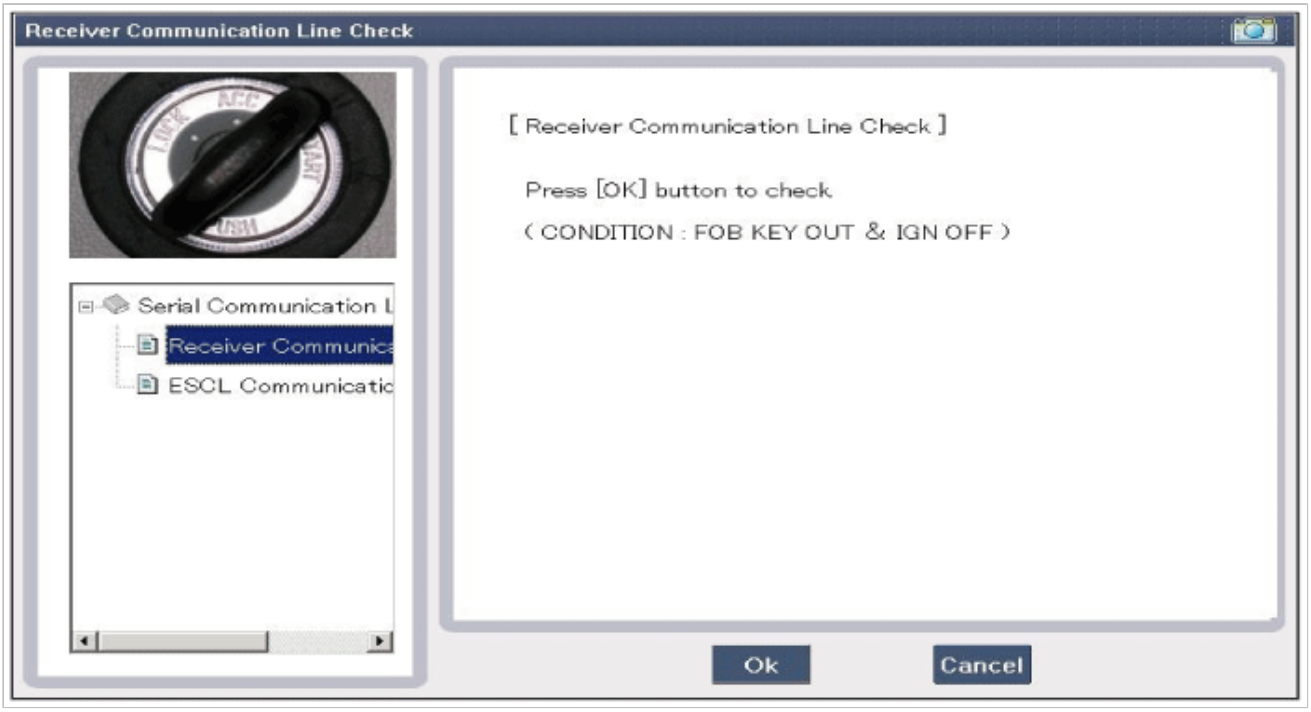
5. If the smart key runs normal , the related antenna, smart key(transmission, reception) and exterior receiver are normal.
6. Antenna status
   A. INTERIOR Antenna 1
   B. INTERIOR Antenna 2
   C. Trunk antenna
   D. BUMPER/ Trunk Antenna
   E. DRV_DR Antenna
   F. AST_DR Antenna

Serial Communication Status Check

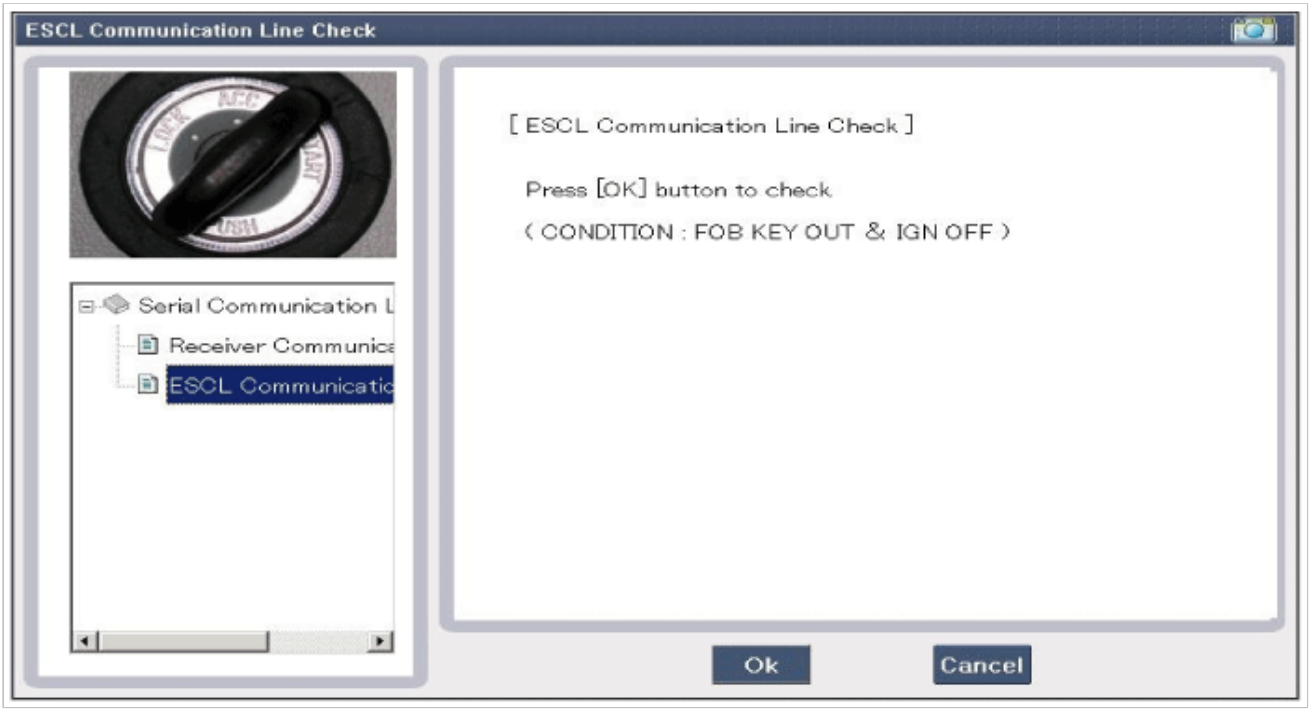
1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.
2. Select the "Serial Communication Line Check".



3. After IG ON, select the "Receiver Communication Line Check".



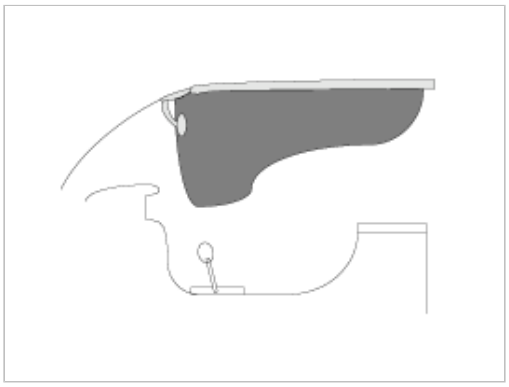
4. Check the serial communication line with a GDS.
5. If the receiver communication line runs normal, check the "ESCL Communication Line Check".



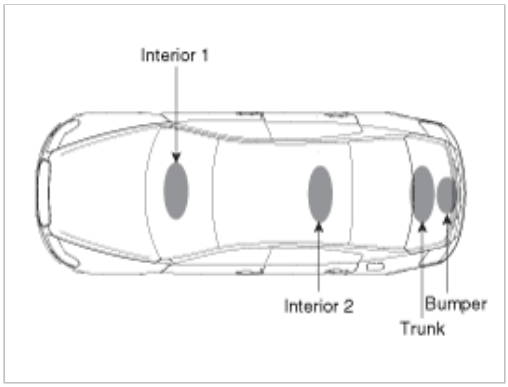
6. If the smart key runs normal, the communication of smart key unit, exterior receiver and ESCL are normal.
7. If the smart key runs abnormal, check the following items.
   A. Disconnection or no response of the exterior receiver communication line.
   B. The exterior receiver communication line disconnection and ground connection.
   C. The ESCL disconnection or no response
   D. The ESCL disconnection and ground connection

Interior Antenna Actuation Check

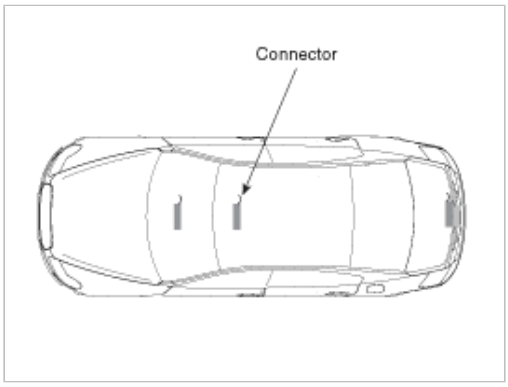
1. Set the smart key in the following shade area and check the IG ON.



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

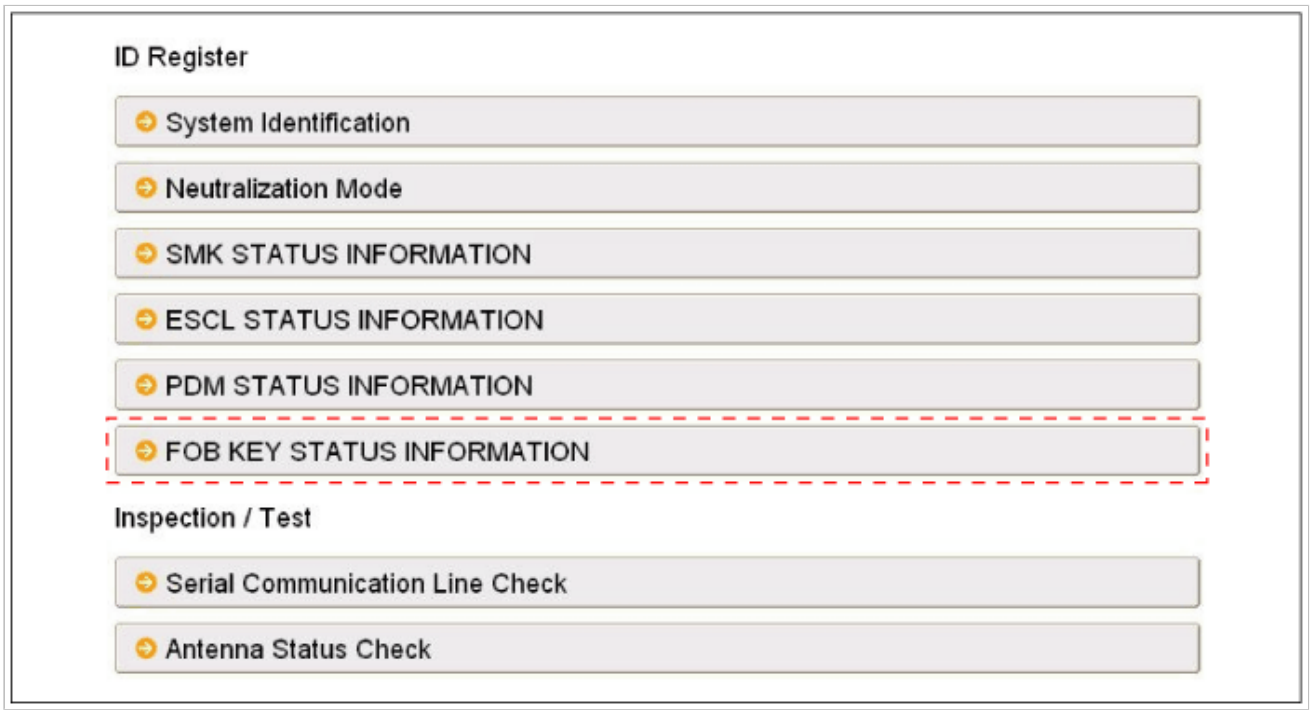


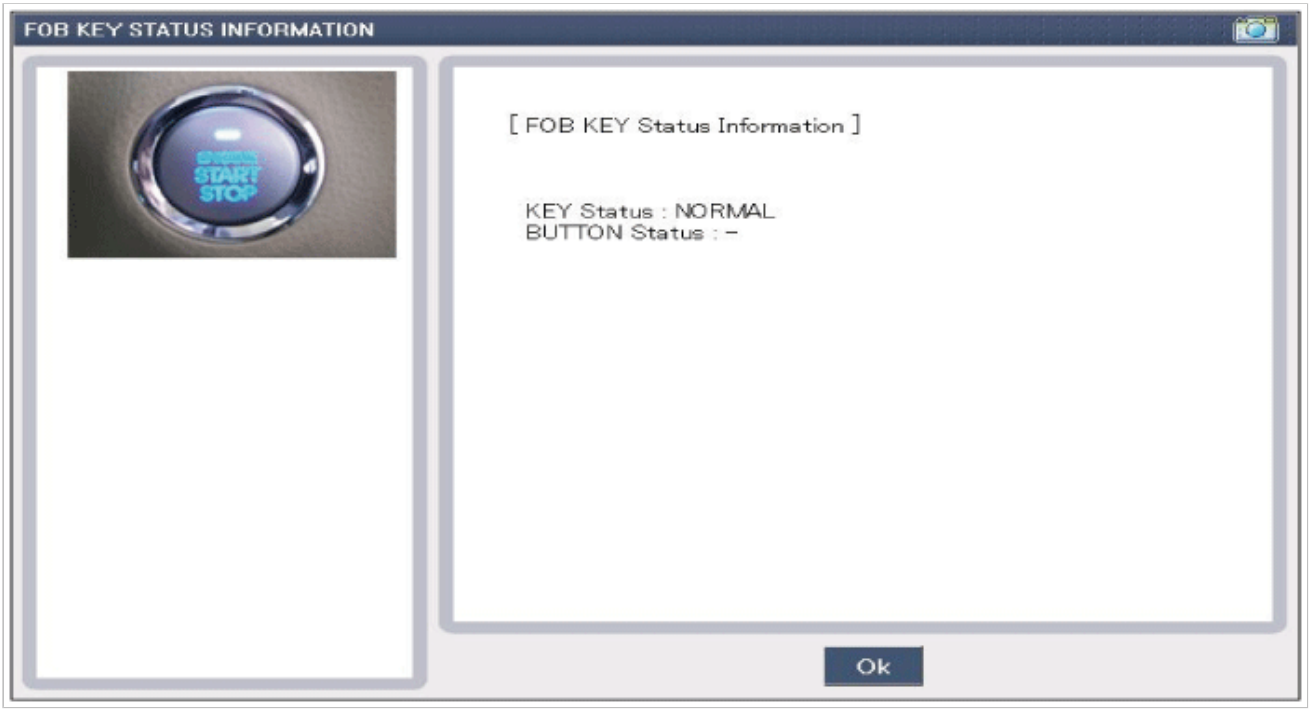
5. If the LED of smart key is not blinking, check the antenna in shade area.



FOB Status Check

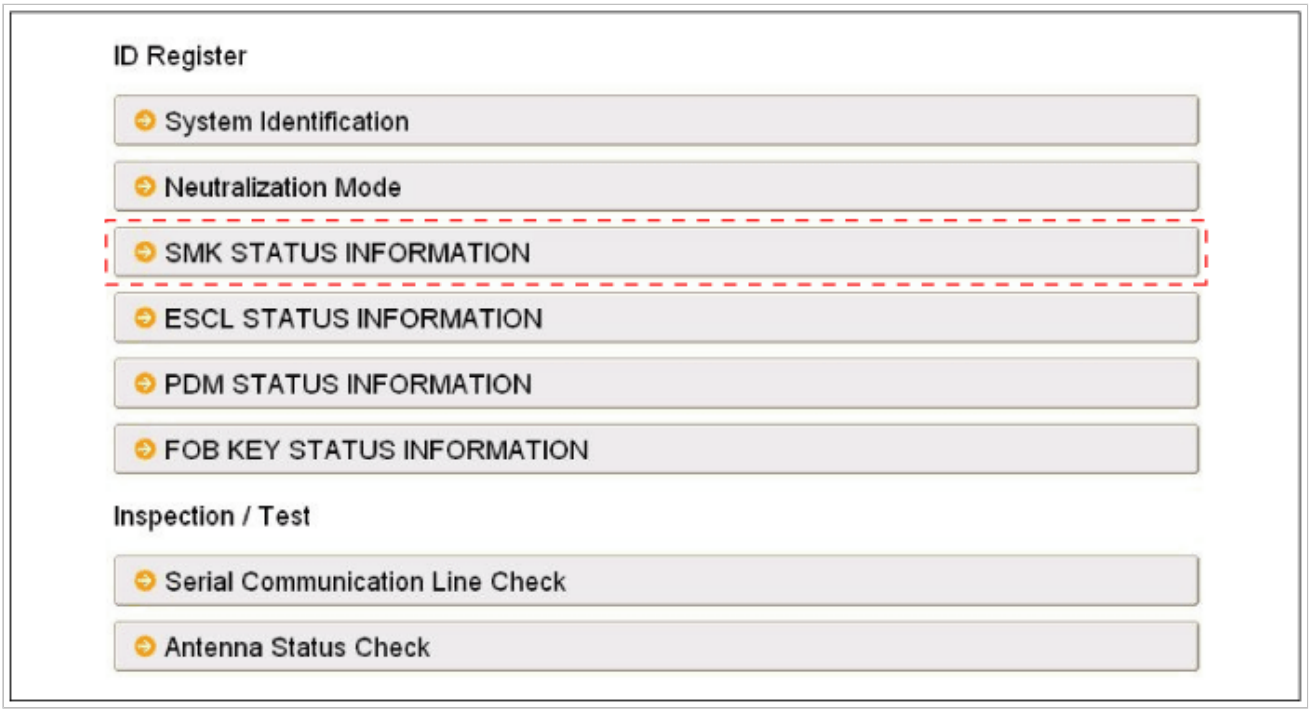
1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.
2. After IG ON, select the "FOB KEY STATUS INFO".

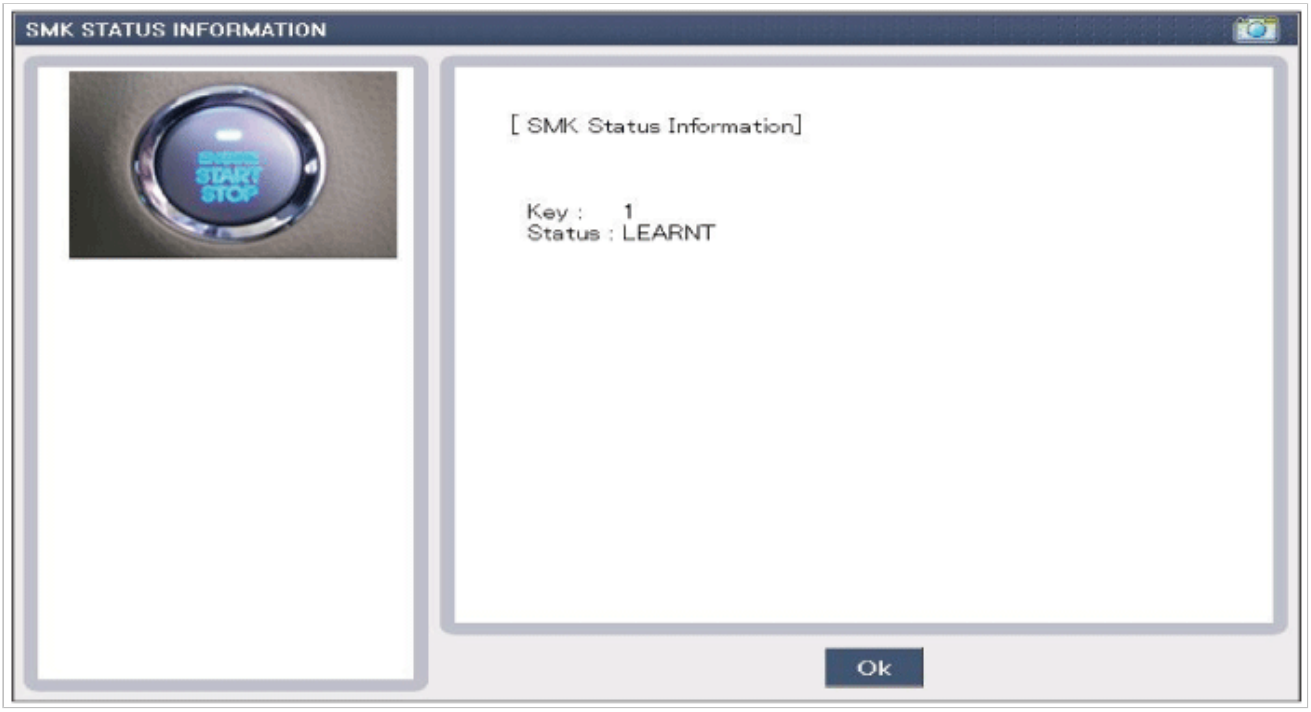




Smart Key Status Check

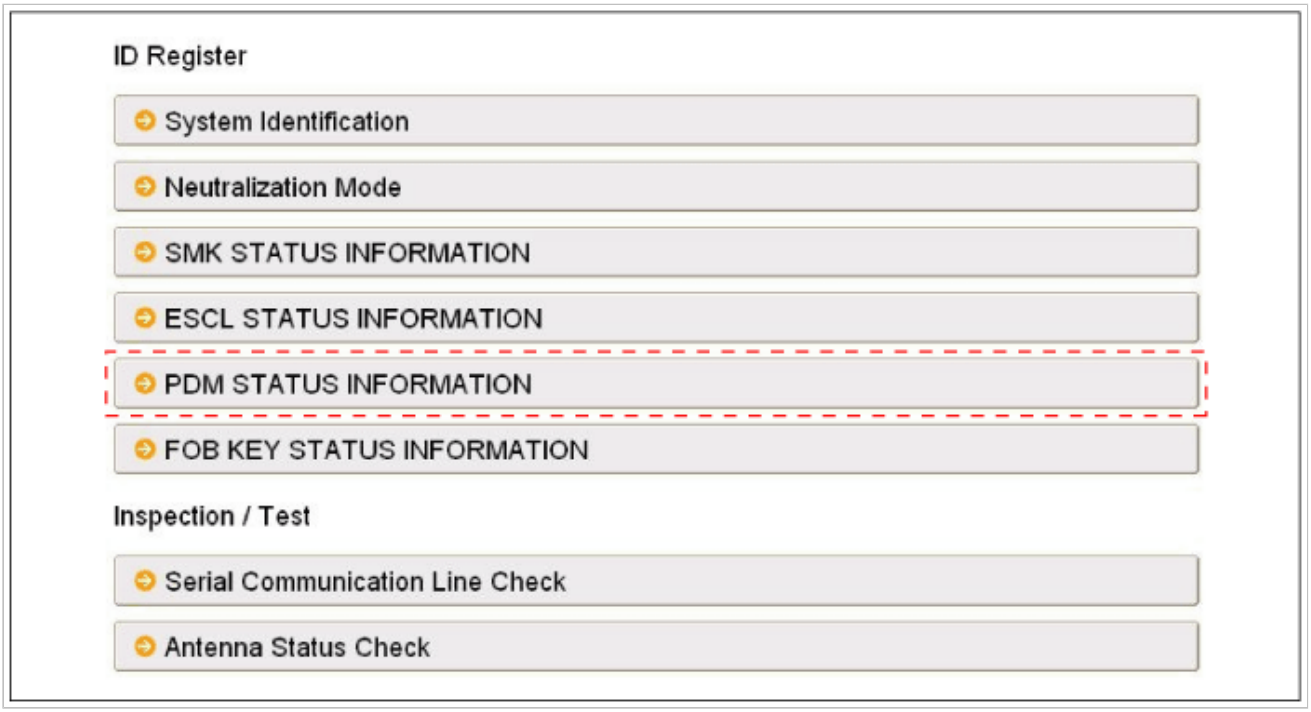
1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.
2. After IG ON, select the "SMK STATUS INFO".

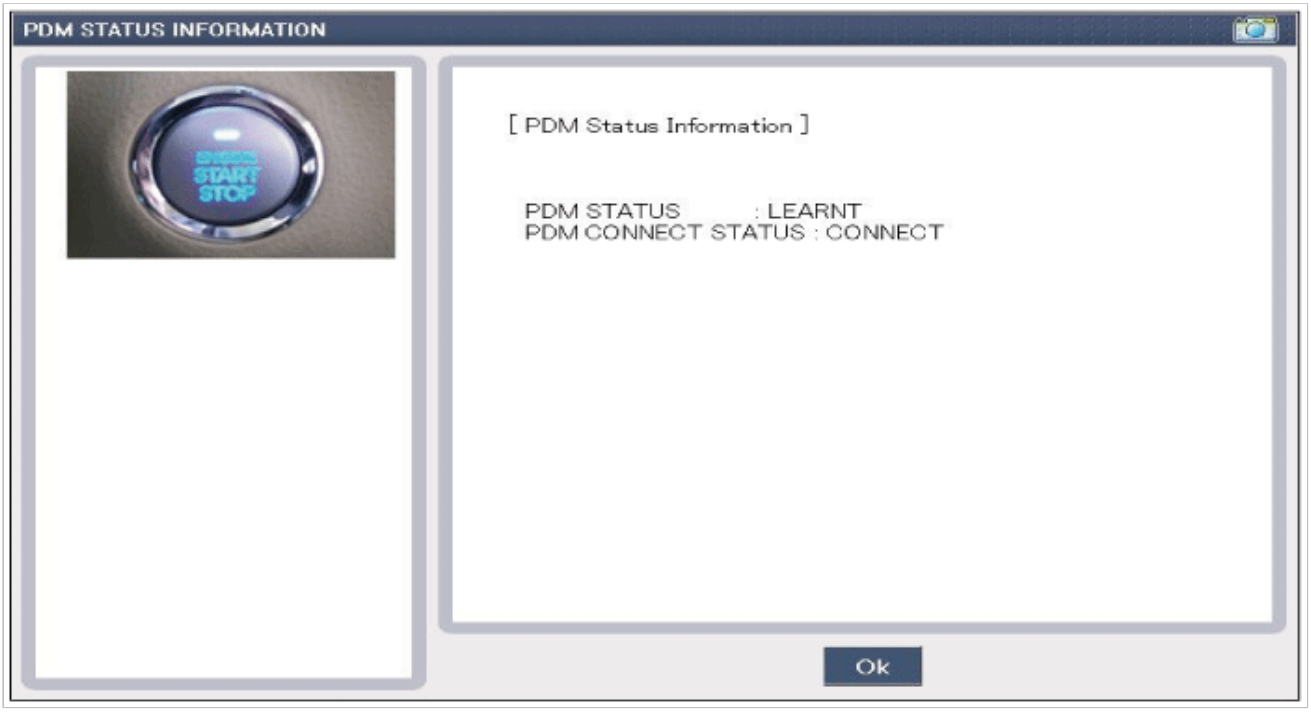




PDM Status Check

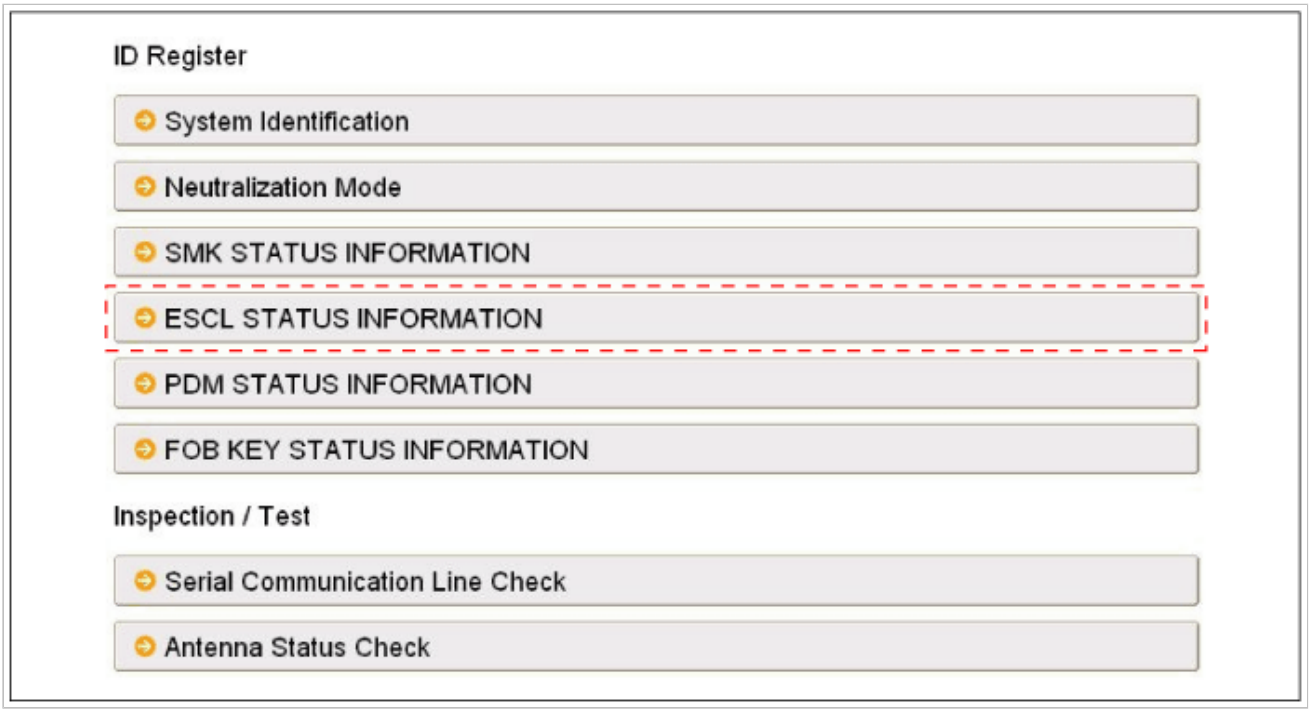
1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.
2. After IG ON, select the "PDM STATUS INFO".

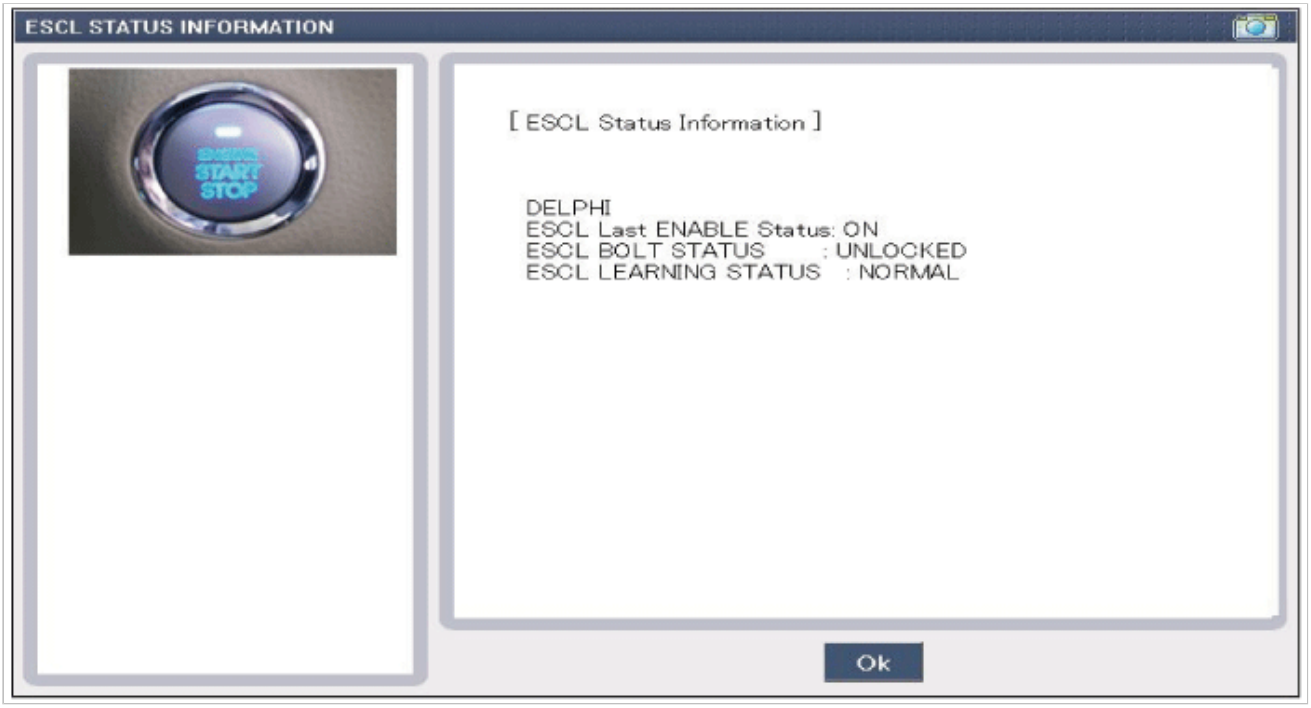




ESCL Status Check

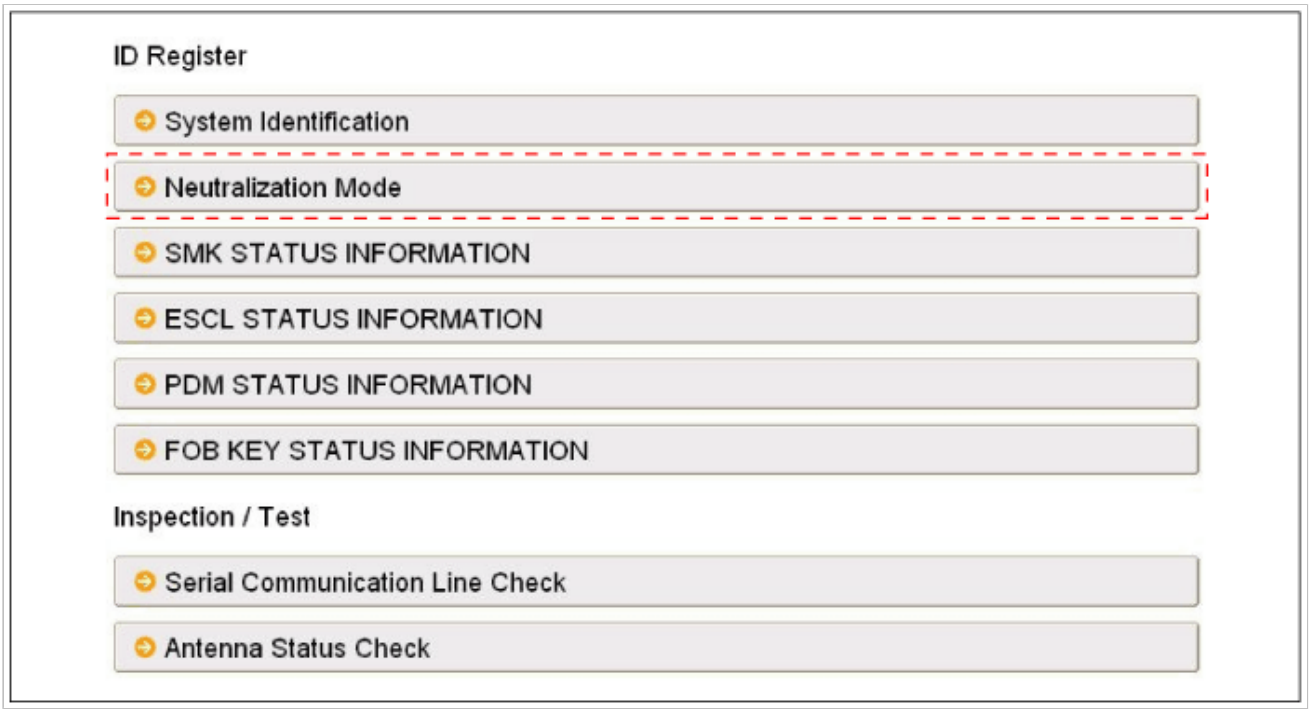
1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.
2. After IG ON, select the "ESCL STATUS INFO".

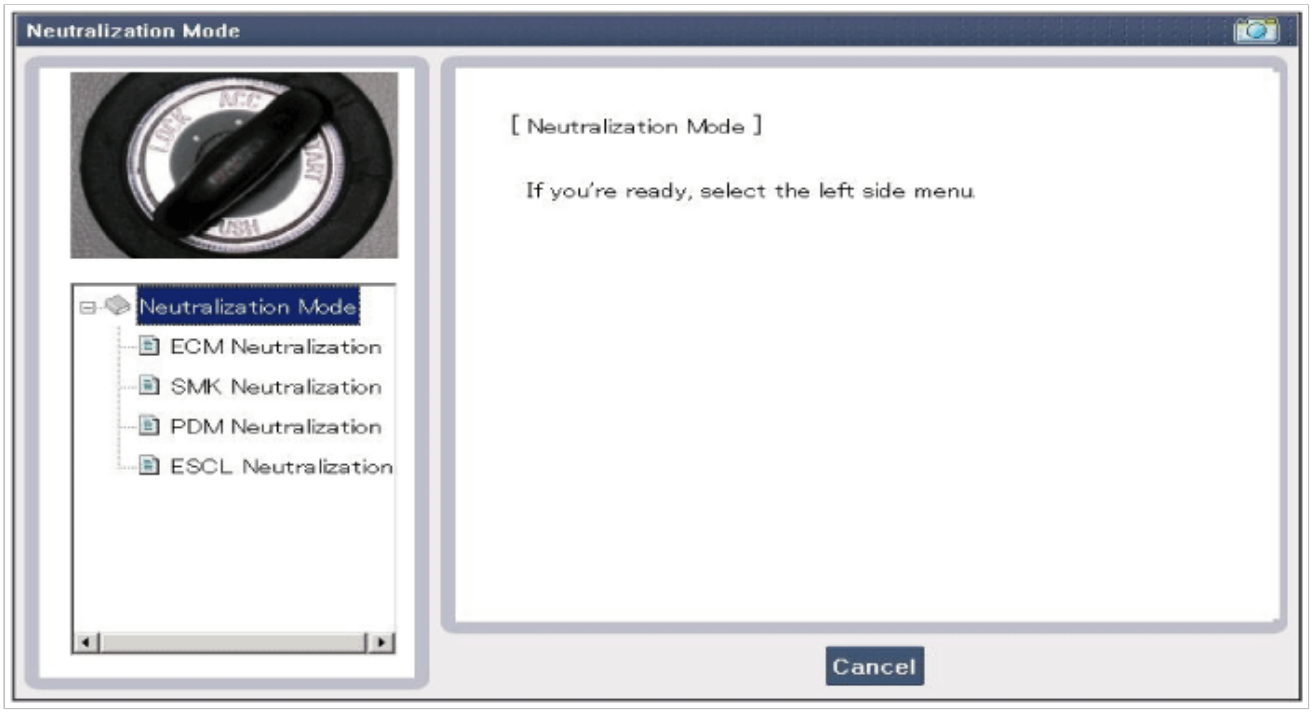


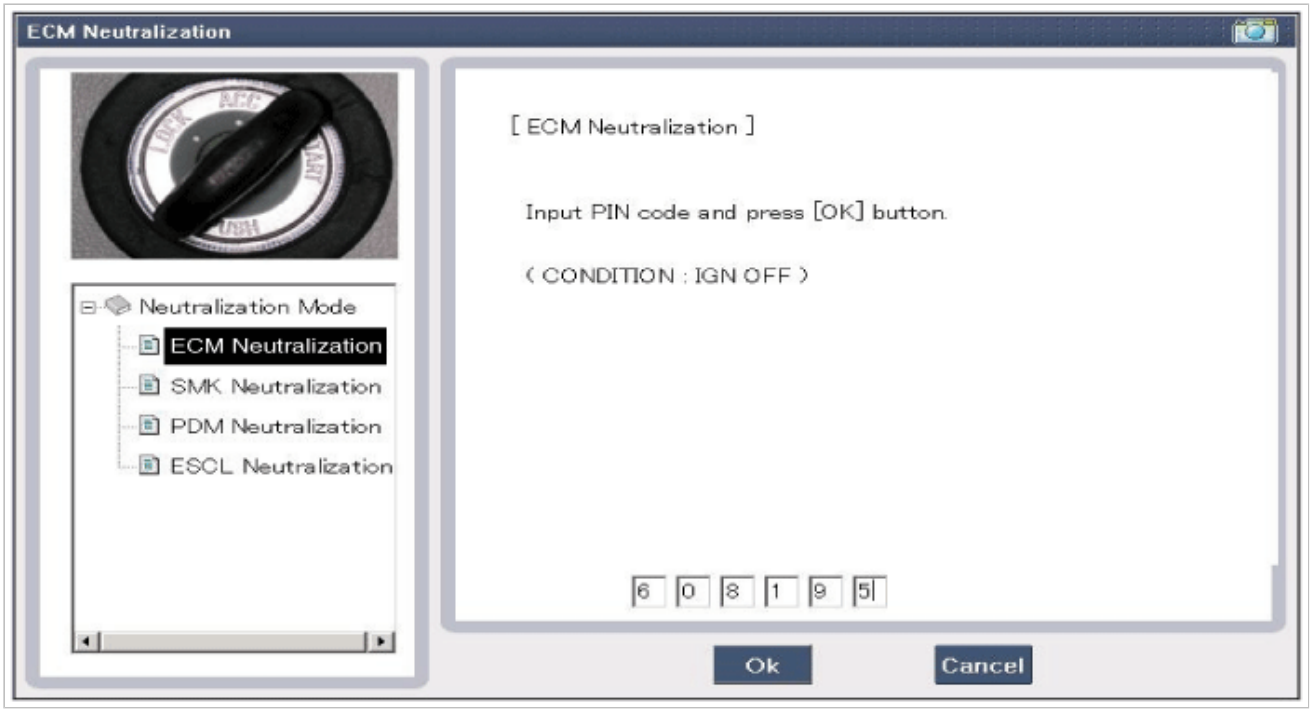


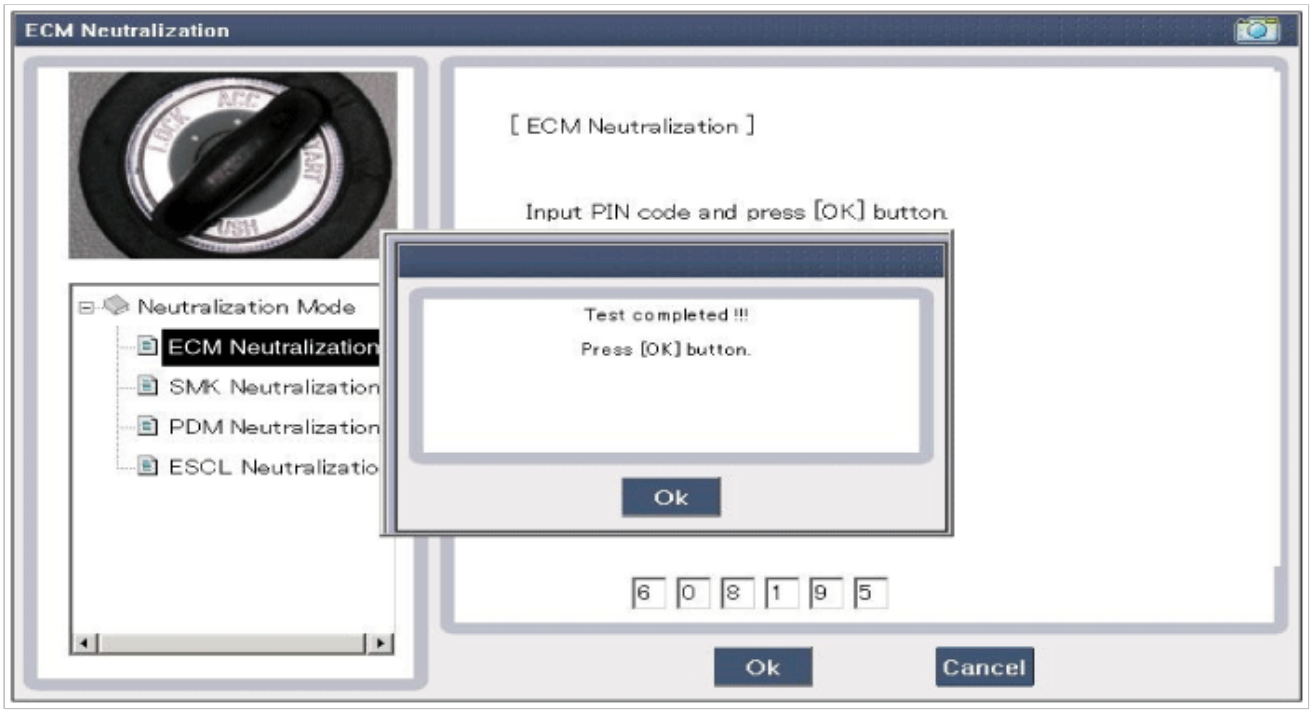
Neutralization Status Check

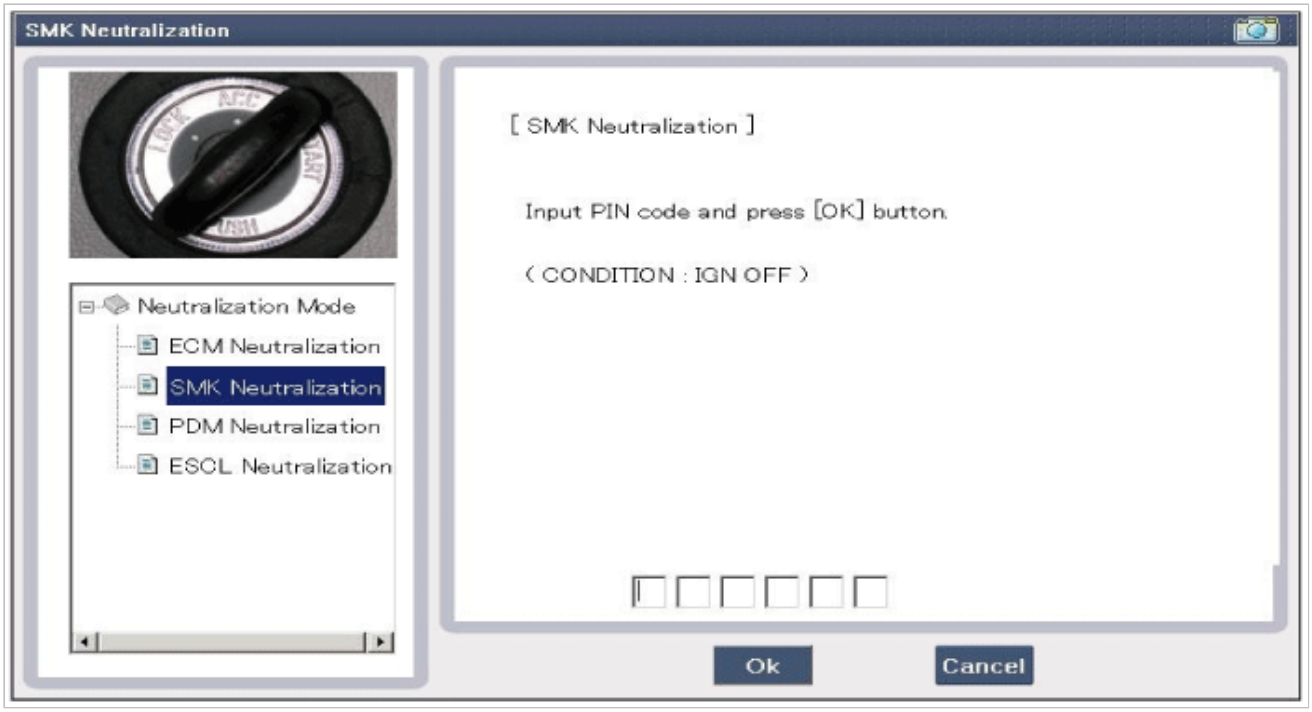
1. Connect the cable of GDS to the data link connector in driver side crash pad lower panel.
2. After IG ON, select the "Neutralization mode".

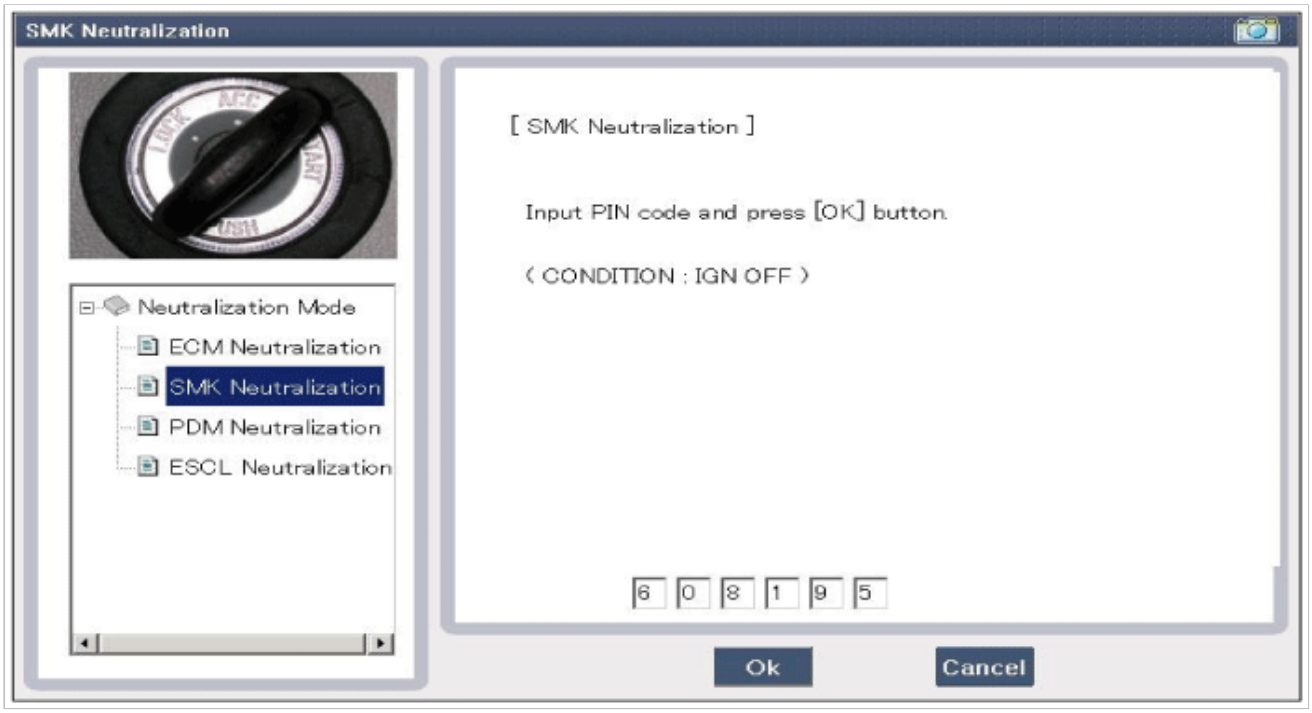


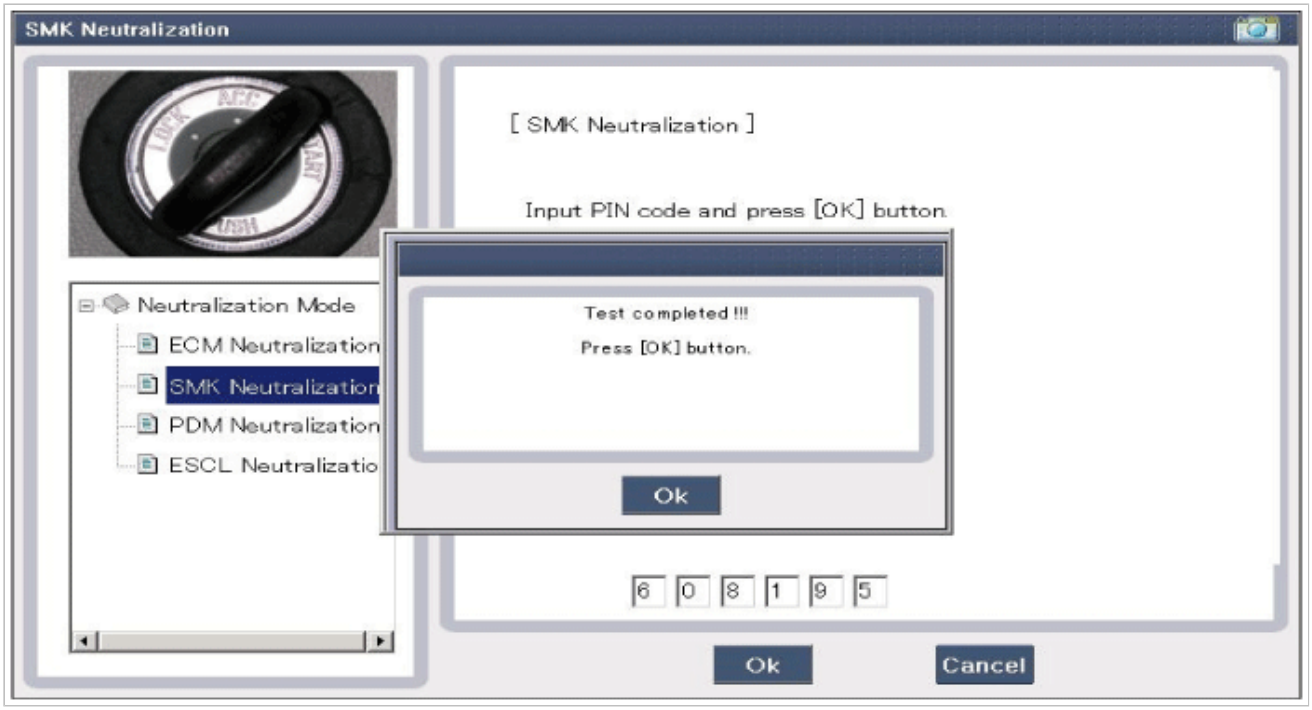

Neutralization Mode
[Neutralization Mode]
If you're ready, select the left side menu.
Neutralization Mode
ECM Neutralization
SMK Neutralization
PDM Neutralization
ESCL Neutralization
Cancel

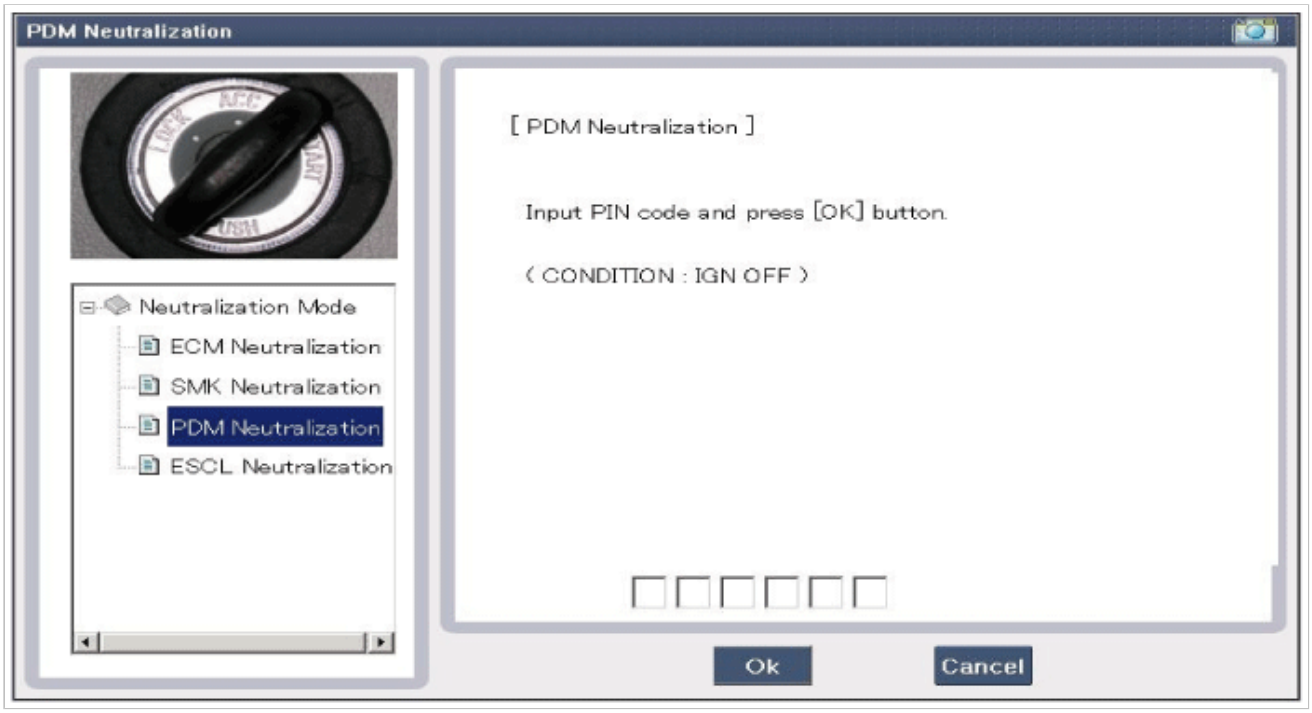

ECM Neutralization
[ECM Neutralization]
Input PIN code and press [OK] button.
(CONDITION : IGN OFF)
Neutralization Mode
ECM Neutralization
SMK Neutralization
PDM Neutralization
ESCL Neutralization
6 0 8 1 9 5
Ok
Cancel

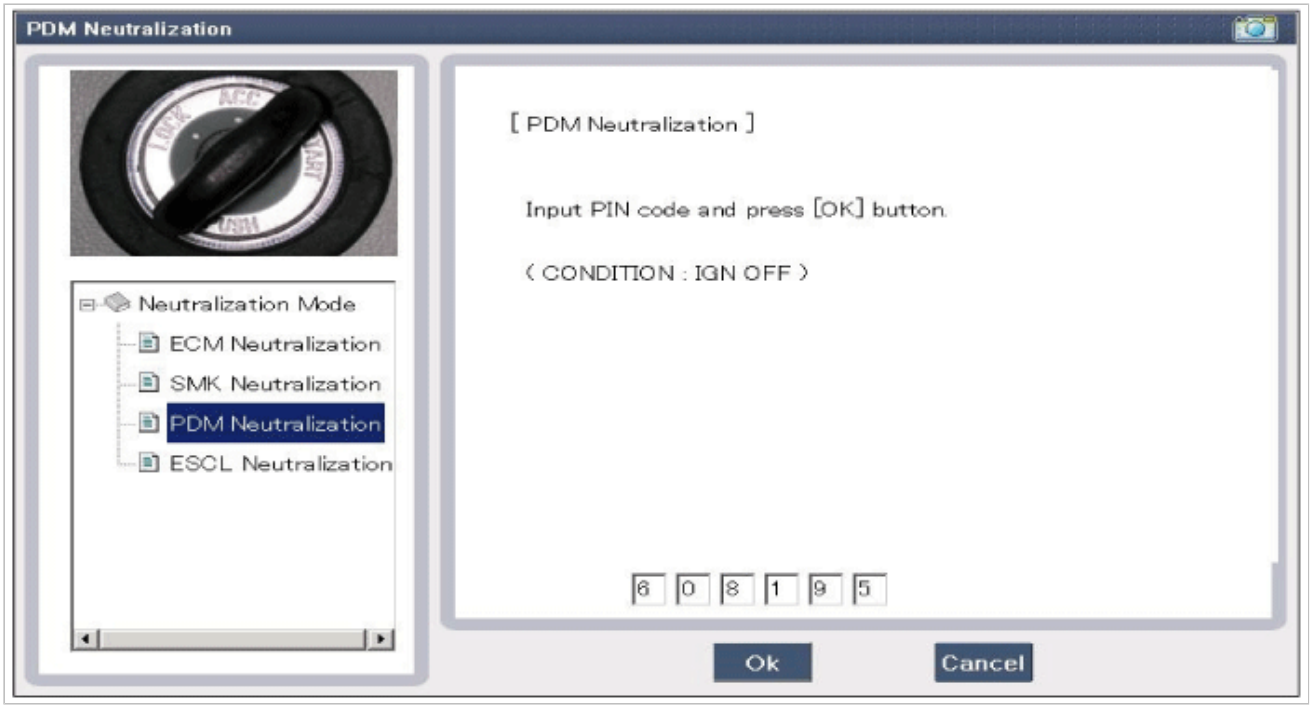

ECM Neutralization
[ECM Neutralization]
Input PIN code and press [OK] button.
Neutralization Mode
ECM Neutralization
SMK Neutralization
PDM Neutralization
ESCL Neutralizatio
Test completed !!!
Press [OK] button.
Ok
6 0 8 1 9 5
Ok
Cancel

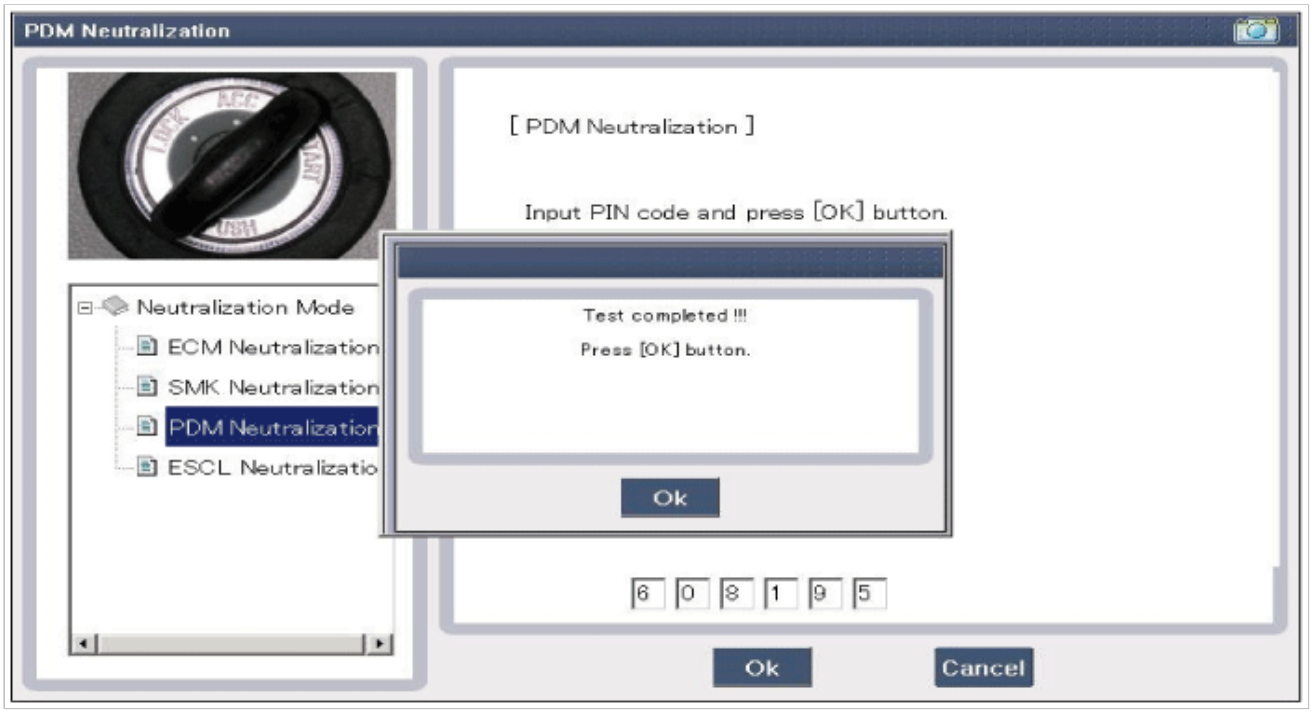

SMK Neutralization
[SMK Neutralization]
Input PIN code and press [OK] button.
(CONDITION : IGN OFF)
Neutralization Mode
ECM Neutralization
SMK Neutralization
PDM Neutralization
ESCL Neutralization
Ok
Cancel

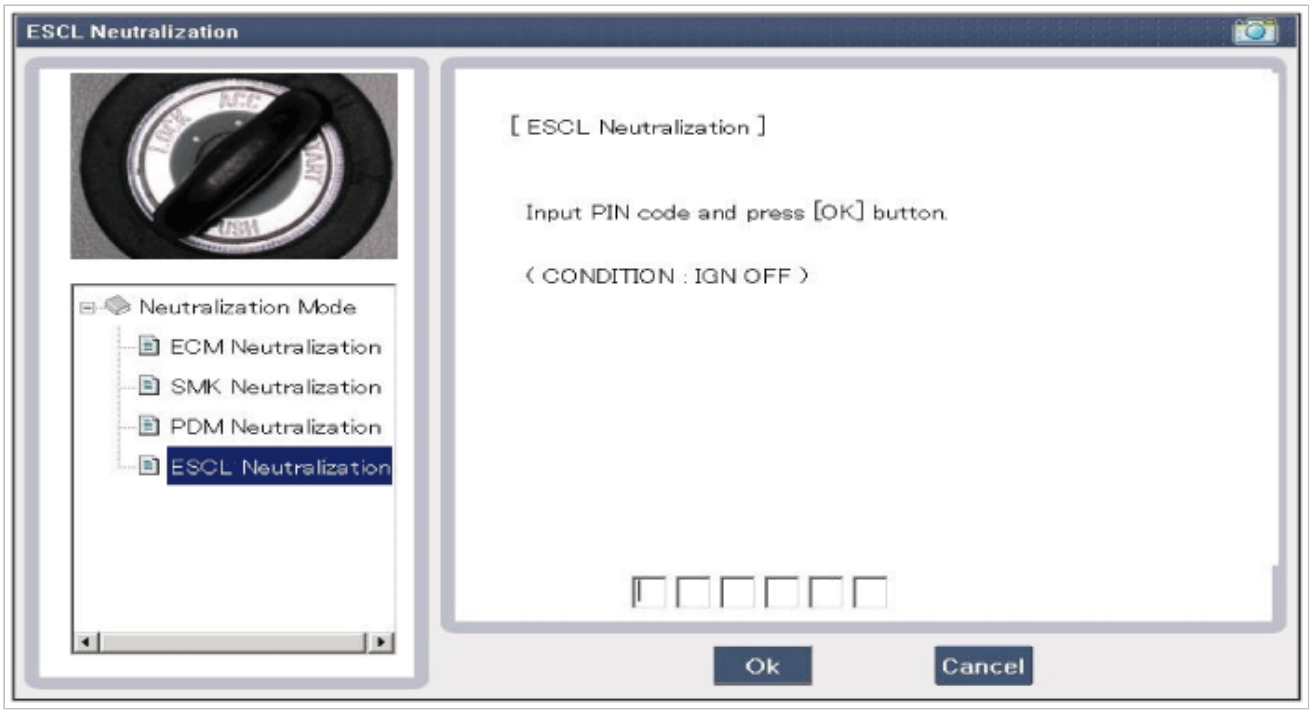

SMK Neutralization
[SMK Neutralization]
Input PIN code and press [OK] button.
(CONDITION : IGN OFF)
Neutralization Mode
ECM Neutralization
SMK Neutralization
PDM Neutralization
ESCL Neutralization
6 0 8 1 9 5
Ok
Cancel

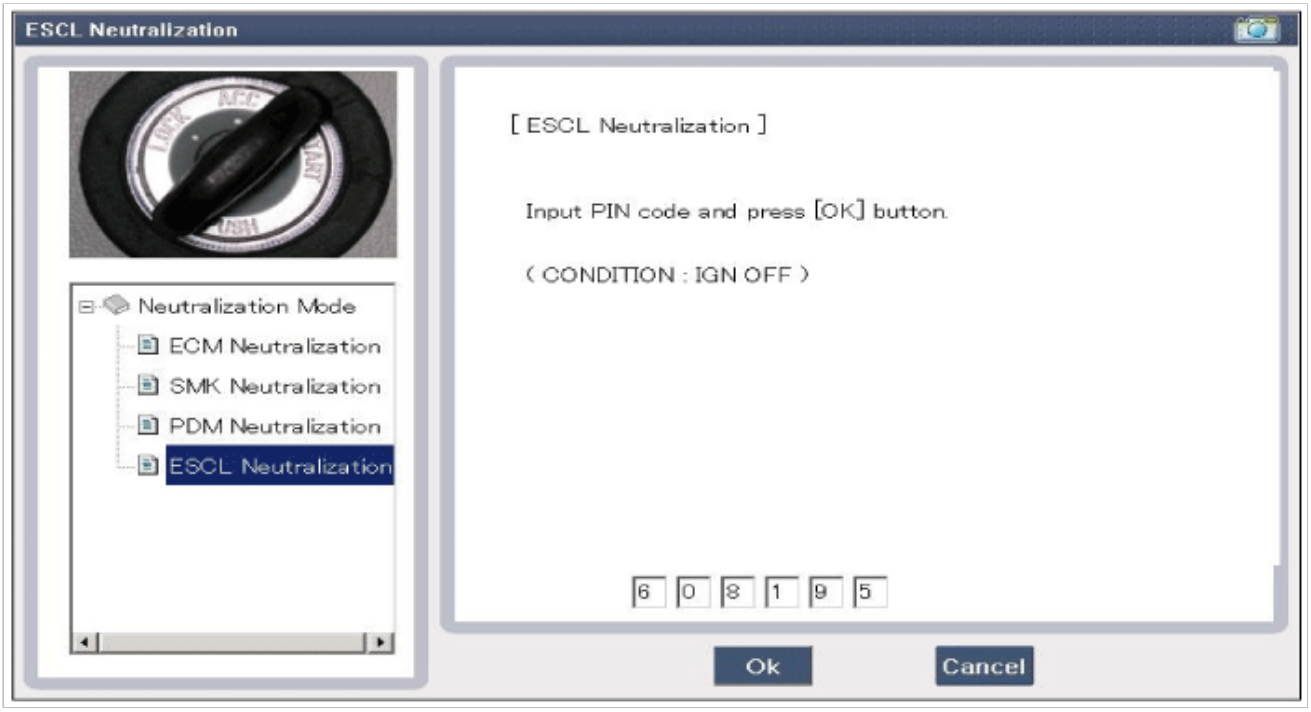

SMK Neutralization
[SMK Neutralization]
Input PIN code and press [OK] button.
Test completed !!!
Press [OK] button.
Ok
Neutralization Mode
ECM Neutralization
SMK Neutralization
PDM Neutralization
ESCL Neutralizatio
6 0 8 1 9 5
Ok
Cancel

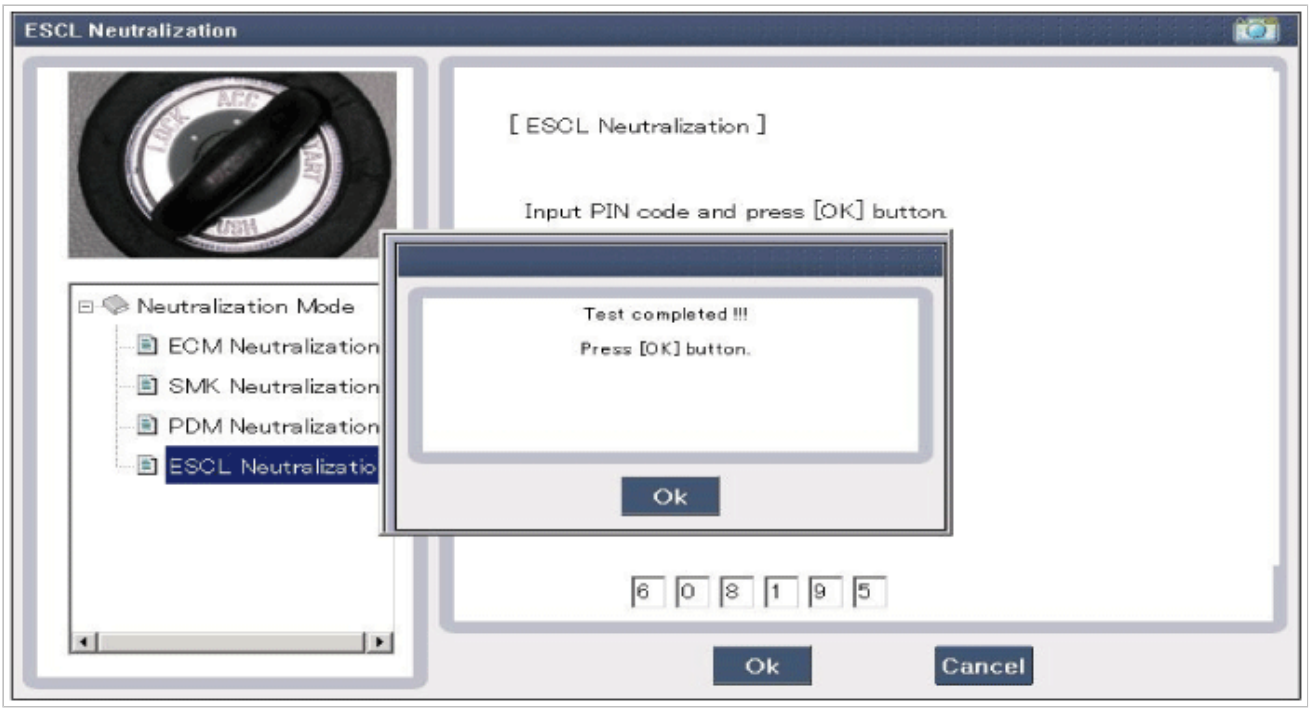

PDM Neutralization
Neutralization Mode
ECM Neutralization
SMK Neutralization
PDM Neutralization
ESCL Neutralization
[PDM Neutralization]
Input PIN code and press [OK] button.
(CONDITION : IGN OFF)
Ok
Cancel


PDM Neutralization
Neutralization Mode
ECM Neutralization
SMK Neutralization
PDM Neutralization
ESCL Neutralization
[PDM Neutralization]
Input PIN code and press [OK] button.
(CONDITION : IGN OFF)
6 0 8 1 9 5
Ok
Cancel


PDM Neutralization
[PDM Neutralization]
Input PIN code and press [OK] button.
Neutralization Mode
ECM Neutralization
SMK Neutralization
PDM Neutralization
ESCL Neutralizatio
Test completed !!!
Press [OK] button.
Ok
6 0 8 1 9 5
Ok
Cancel


ESCL Neutralization
[ESCL Neutralization]
Input PIN code and press [OK] button.
(CONDITION : IGN OFF)
Neutralization Mode
ECM Neutralization
SMK Neutralization
PDM Neutralization
ESCL Neutralization
Ok
Cancel





Input Switch List

No	Item name	Unit
1	SSB SW2	-
2	ACC	-
3	IGN1	-
4	Gear 'P' Position	-
5	Brake SW	-
6	FL Door Lock Button	-
7	FR Door Lock Button	-
8	Trunk Lid SW	-

9	Battery Voltage	-
10	Alternator Voltage	-
11	KEY out Indicator Lamp	-
12	Immobilizer Lamp	-
13	External Buzzer	-
14	ESCL Enable	-

Actuator List

No.	Item name	Condition
1	**KEY out Indicator Lamp**	**Ignition switch ON Engine off**
2	Immo.indicator Lamp	Ignition switch ON Engine off
3	External Buzzer	Ignition switch ON Engine off
4	Interior Antenna 1 Active	Ignition switch ON Engine off
5	Interior Antenna 2 Active	Ignition switch ON Engine off
6	Interior Antenna 3 Active	Ignition switch ON Engine off
7	Bumper/trunk Antenna Active	Ignition switch ON Engine off
8	DRV_DR Antenna Active	Ignition switch ON Engine off
9	AST_DR Antenna Active	Ignition switch ON Engine off

Troubleshooting

SMK DTC List

NO	DTC code	Description
1	B1602	CAN Error
2	B1603	CAN Bus off
3	B1625	ECM Communication Data failure
4	B1689	CAN Time-out PDM
5	B1971	Parking Position Input Error
6	B1978	Electric Steering Column Lock Failure

GENESIS COUPE(BK) >2010 > G 2.0 DOHC > Body Electrical System > Smart key System > B1602 CAN Error

General Description

CAN Communication is a circuit, consists of CAN LOW and CAN HIGH, in order to communicate among control units. Control Modules are respectively communicating via CAN line in order to control Body Electrical.

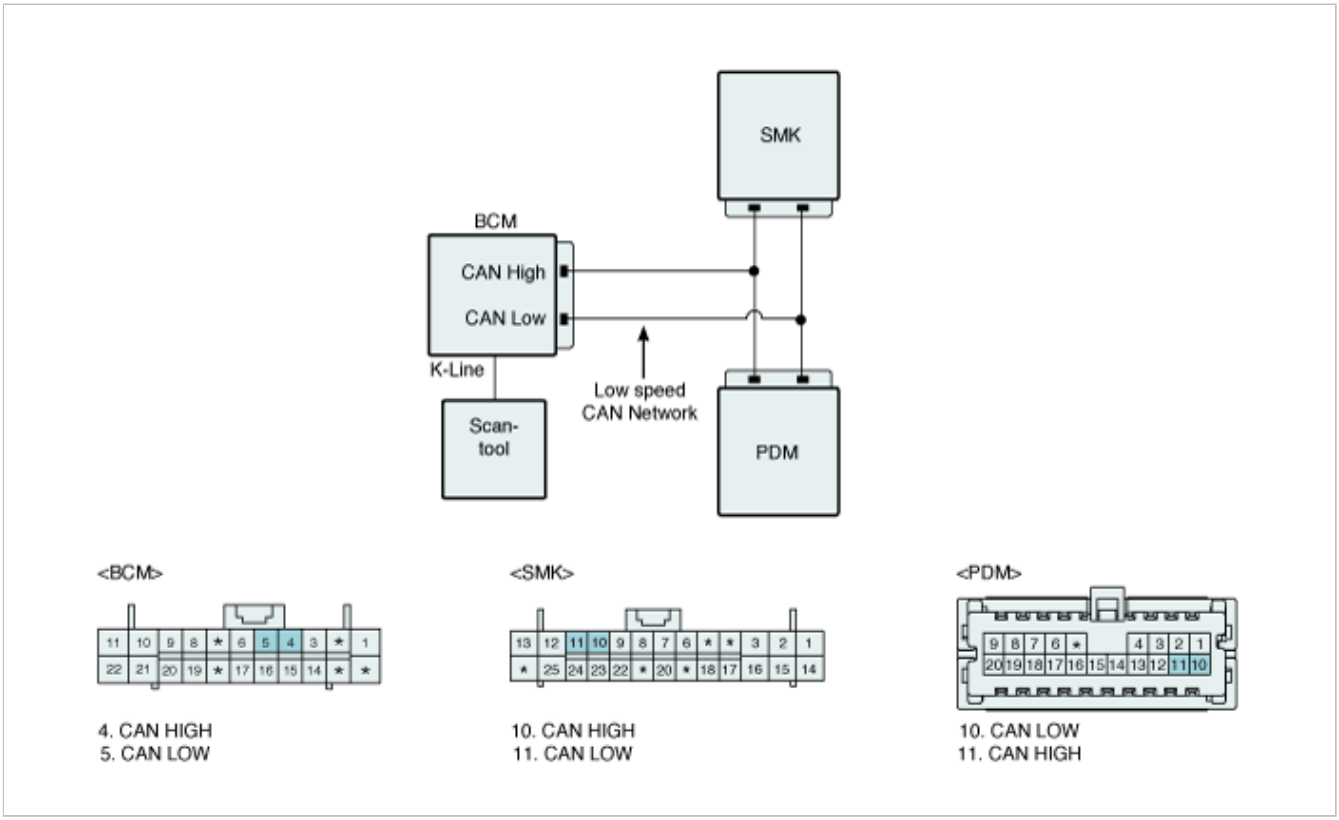
DTC Description

DTC B1602 is set if Smartkey Module detects that CAN HIGH or CAN LOW is short to battery, short to ground, open and short between CAN High and CAN Low each other.

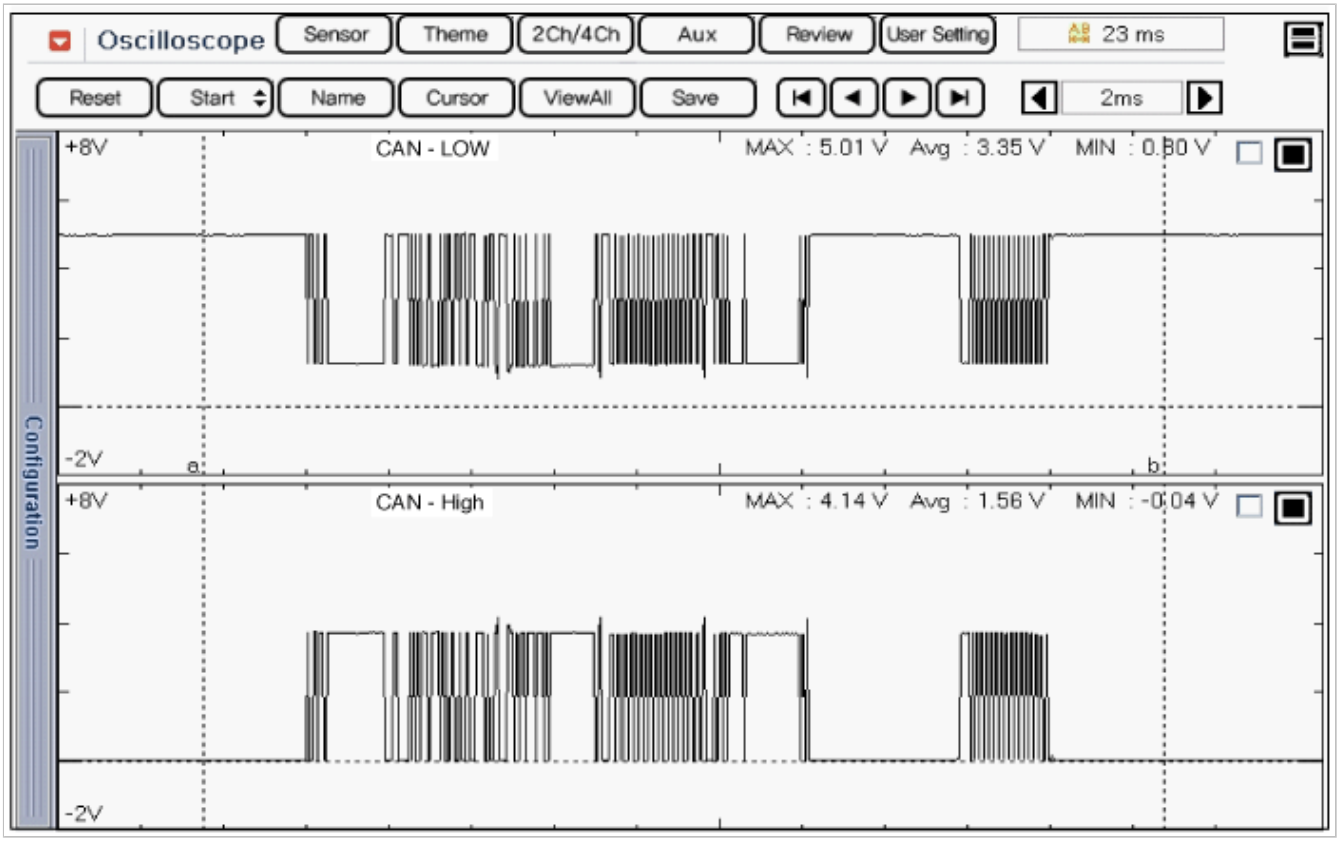
DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• CAN Signal Check	• Poor Connection • Power source to Smart Key module • Short to battery in CAN communication • Short to ground in CAN communication • Short between CAN high and CAN low each other • Faulty Smartkey Module • Faulty each modules
Enable Conditions	• IG ON	
Threshold value	• CAN communication error for 2 sec.	
Failsafe	• Lamp OFF	

Diagnostic Circuit Diagram



Signal Waveform & Data



Monitor Scantool data

■ **Check DTC**

1. Check DTC with scantool.
2. Check DTC related CAN communication is set on Smartkey Module and every modules.
3. If there is DTC related Module Check the DTC according to troubleshooting guide.
4. Repair and erase the DTC with Scantool.
5. Is the DTC erased ?

YES	▸ Check poor connection between harness connector and Smartkey Module or ECM : Thoroughly check the looseness, poor connection, bent, corrison, contamination, deformation or damage of connector. Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.
NO	▸ Go to next procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals.
   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration,or damage.
3. Has a problem been found?

YES	▸ Repair as necessary and go to "Verification of Vehicle Repair" procedure.
NO	▸ Go to 'Check CAN communication Line" procedure.

CAN communication Line Inspection

■ Check CAN communication

1. Connect all of control module connector.
2. IG KEY ON.
3. Make CAN communication is wake up status (Ex. . ON/OFF Door SW)
4. Measure signal waveform of B-CAN-HIGH terminal of Diagnostic connector and chassis ground.
5. Measure signal waveform of B-CAN-LOW terminal of Diagnostic connector and chassis ground.

Specification : Refer to Signal waveform and Data

6. Is the measrured signal waveform normal ?

YES	▸ Check poor connection between harness connector and Smartkey Module or ECM : Thoroughly check the looseness, poor connection, bent, corrison, contamination, deformation or damage of connector. Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure. ▸ Disconnect SMK ECU, IPM, DDM, FAM, Tilt ECU, PDM, ADM, RAM and IMS one by one and then, check that DTC is erased with scantool. ▸ Substitute with a known-good module and check for proper operation. If the problem is corrected, replace module and then go to "Verification of Vehicle Repair" procedure.
NO	▸ If the measured value is battery voltage, check short to battery in CAN line. Repair or replace as necessary. And then, go to "Verification of Vehicle Repair" procedure. In case that Communication is in sleep mode, 12V will be measured. Therefore, check that communication is in Wake up status. ▸ If 0V is detected, Check short to ground, short between CAN high and low each other or open in CAN high or CAN low harness. Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and selet "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES	▸ Go to the applicable troubleshooting procedure.
NO	▸ System is performing to specification at this time.

GENESIS COUPE(BK) >2010 > G 2.0 DOHC > Body Electrical System > Smart key System > B1603
CAN Bus Off

General Description

CAN Communication is a circuit, consists of CAN LOW and CAN HIGH, in order to communicate among control units. Control Modules are respectively communicating via CAN line in order to control Body Electrical.

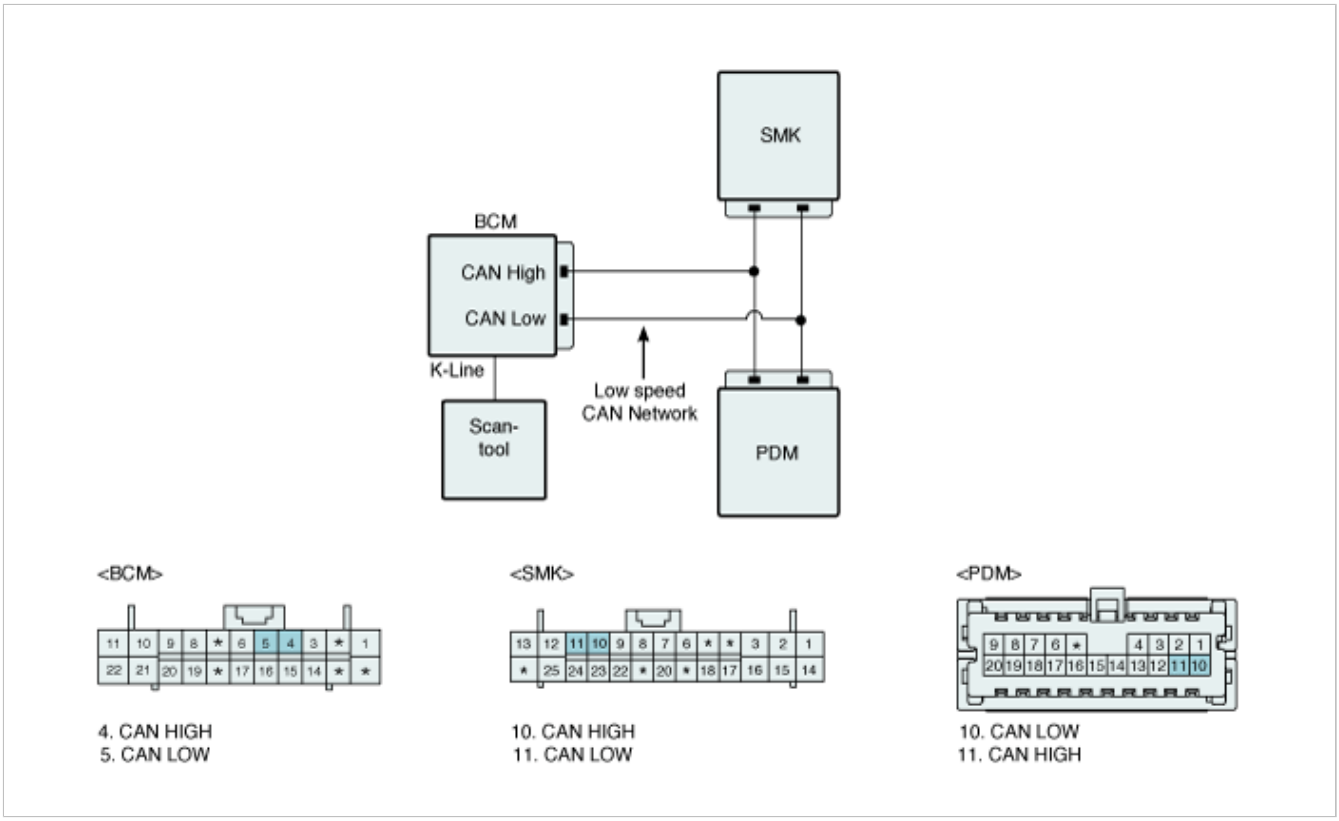
DTC Description

Smartkey Module sets DTC B1603 if smart key module detects short to battery, short to ground in CAN HIGH and CAN low simultaneously.
This DTC means that both CAN HIGH and CAN LOW line are error. Therefore, CAN communication is not available.

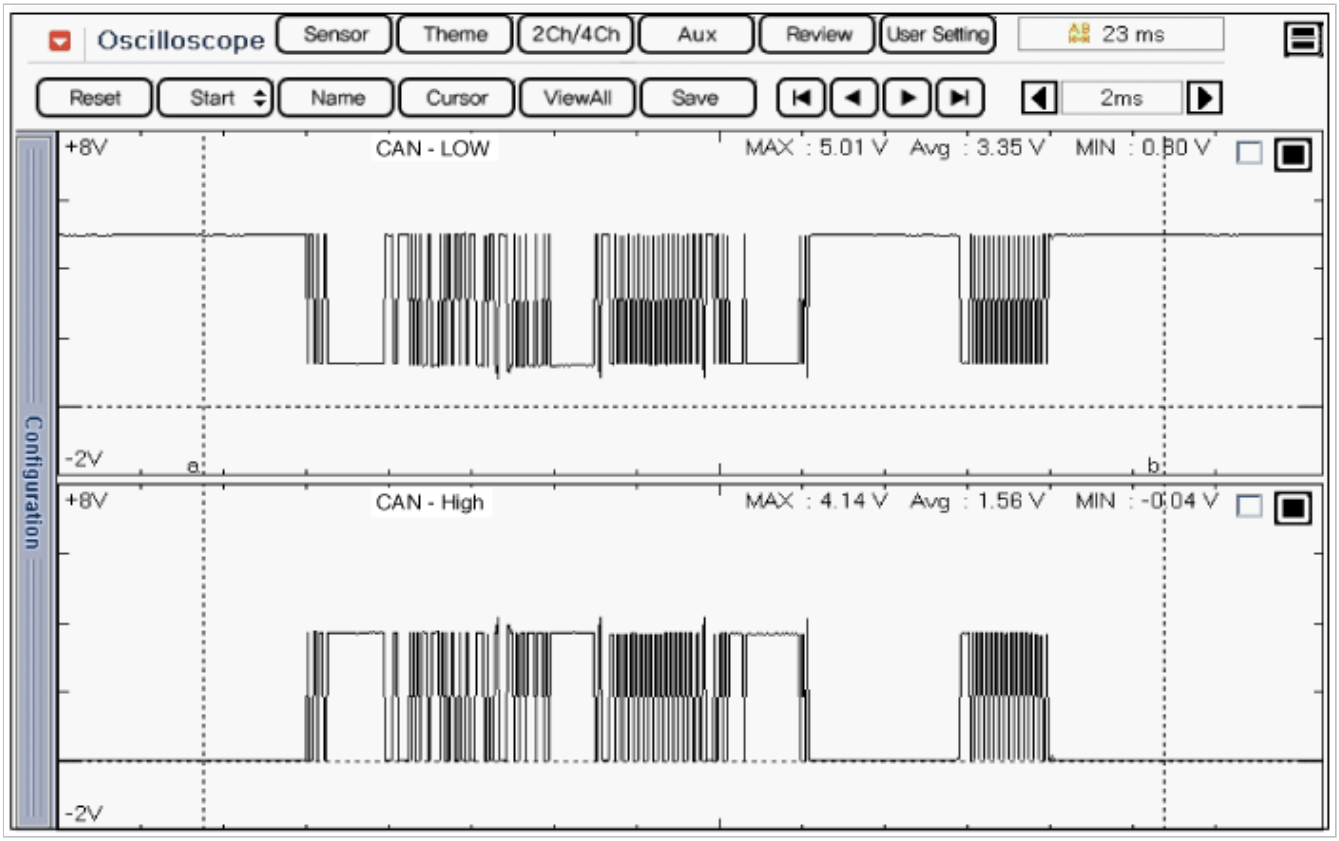
DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• CAN Signal Check	• Poor Connection • Power Source to smart key module • Short to battery in CAN HIGH LOW or ground simultaneously. • Faulty Smartkey Module
Enable Conditions	• IG ON	
Threshold value	• CAN communication Error for 2 sec.	
Failsafe	• -	

Diagnostic Circuit Diagram



Signal Waveform & Data



Monitor Scantool data

■ **Check DTC**

1. Check DTC with scantool.
2. Check DTC related CAN communication is set on Smartkey Module and every modules.
3. If there is DTC related Module Check the DTC according to troubleshooting guide.
4. Repair and erase the DTC with Scantool.
5. Is the DTC erased ?

YES	▸ Check poor connection between harness connector and Smartkey Module or ECM : Thoroughly check the looseness, poor connection, bent, corrison, contamination, deformation or damage of connector. Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.
NO	▸ Go to next procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals.
   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration,or damage.
3. Has a problem been found?

YES	▸ Repair as necessary and go to "Verification of Vehicle Repair" procedure.
NO	▸ Go to 'Check CAN communication Line" procedure.

CAN communication Line Inspection

■ Check CAN communication

1. Connect all of control module connector.
2. IG KEY ON.
3. Make CAN communication is wake up status (Ex. . ON/OFF Door SW)
4. Measure signal waveform of B-CAN-HIGH terminal of Diagnostic connector and chassis ground.
5. Measure signal waveform of B-CAN-LOW terminal of Diagnostic connector and chassis ground.

Specification : Refer to Signal waveform and Data

6. Is the measrured signal waveform normal ?

YES	▸ Check poor connection between harness connector and Smartkey Module or ECM : Thoroughly check the looseness, poor connection, bent, corrison, contamination, deformation or damage of connector. Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure. ▸ Disconnect SMK ECU, IPM, DDM, FAM, Tilt ECU, PDM, ADM, RAM and IMS one by one and then, check that DTC is erased with scantool. ▸ Substitute with a known-good module and check for proper operation. If the problem is corrected, replace module and then go to "Verification of Vehicle Repair" procedure.
NO	▸ If the measured value is battery voltage, check short to battery in CAN line. Repair or replace as necessary. And then, go to "Verification of Vehicle Repair" procedure. In case that Communication is in sleep mode, 12V will be measured. Therefore, check that communication is in Wake up status. ▸ If 0V is detected, Check short to ground, short between CAN high and low each other or open in CAN high or CAN low harness. Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and selet "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES	▸ Go to the applicable troubleshooting procedure.
NO	▸ System is performing to specification at this time.

GENESIS COUPE(BK) >2010 > G 2.0 DOHC > Body Electrical System > Smart key System > B1625 ECM Communication Data Failure

General Description

Smartkey Module communicates with ECM through the serial communication line.
If ECM requests authetication from Smartkey Module after IG ON, Smartkey Module check authentication with transponder then, sends this signal to ECM whether authentication is O.K or not.

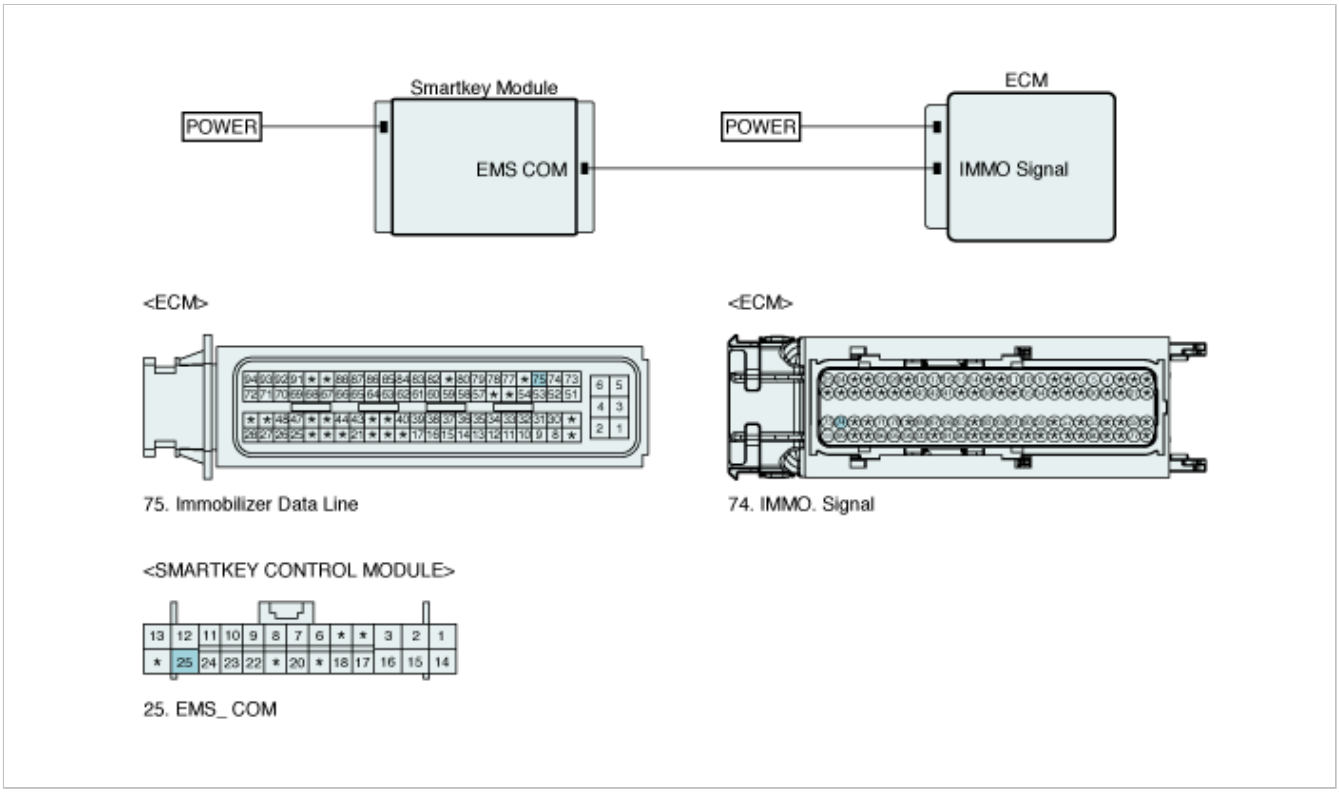
DTC Description

Smartkey Module sets DTC B1625 if Data from ECM is error such as check sum error, Data Frame error, ID Unknown error, Data length error and Time out error.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Check received Data Status from ECM	• Poor Connection in Harness • Input Power to Smartkey Module • Open or short in EMS communication line. • Faulty Smartkey Module • Faulty ECM
Enable Conditions	• Data that Smartkey Module received from ECM is error after IGN OFF to IGN ON	
Threshold value	• Received data error from ECM	
Failsafe	• -	

Diagnostic Circuit Diagram



Monitor Scantool data

■ Check DTC status

1. Check DTC on the ECM with Scantool.
2. Check that there is any DTC related ECM.
3. Perform Troubleshooting the DTC from ECM with appropriate DTC Troubleshooting Guide first.
4. Repair or replace as necessary after erasing DTC with Scantool.

5. Check DTC on SMK Module side and erase the DTC with scantool.
6. Has the DTC gone after erasing with scantool ?

YES	▸ Check poor connection between harness connector and Smartkey Module or ECM : Thoroughly check the looseness, poor connection, bent, corrison, contamination, deformation or damage of connector. Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.
NO	▸ Go to " Inspection & Repair " procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals.
   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration,or damage.
3. Has a problem been found?

YES	▸ Repair as necessary and go to "Verification of Vehicle Repair" procedure.
NO	▸ Go to " Check serial commuication Cricuti Inspection" as follow.

Serial Communicatin Circuit Inspection

■ Check short in serial communication line

1. "IG KEY OFF"
2. Disconnect Smartkey Module connector and ECM connector.
3. Measure resistance between serial communication signal terminal of ECM harness connector and chassis ground.

Specificatin : Infinite (∞)

4. Is the measured resistance within specification ?

YES	▸ Go to open in harness as follow
NO	▸ Check short to ground in harness. And then, repair or replace as necessary. Finally, go to "Verification of Vehicle Repair" procedure.

■ Check open in harness

1. IG KEY OFF.
2. Disconnect Smartkey Module connector and ECM connector.
3. Measure resistance between signal terminal of Smartkey Module harness connector and signal terminal of ECM harness connector.

Specification : About below 1Ω

4. Is the measured resistance within specification ?

YES	▸ Check poor connection between harness connector and Smartkey Module or ECM : Thoroughly check the looseness, poor connection, bent, corrison, contamination, deformation or damage of connector. Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.
NO	▸ Check open in signal harness. And, repair or replace as necessary then, go to "Verification of Vehicle Repair " procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and selet "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES	▸ Go to the applicable troubleshooting procedure.
NO	▸ System is performing to specification at this time.

GENESIS COUPE(BK) >2010 > G 2.0 DOHC > Body Electrical System > Smart key System > B1689 CAN Time-out PDM

General Description

CAN Communication is a circuit, consists of CAN LOW and CAN HIGH, in order to communicate among control units. Control Modules are respectively communicating via CAN line in order to control Body Electrical.

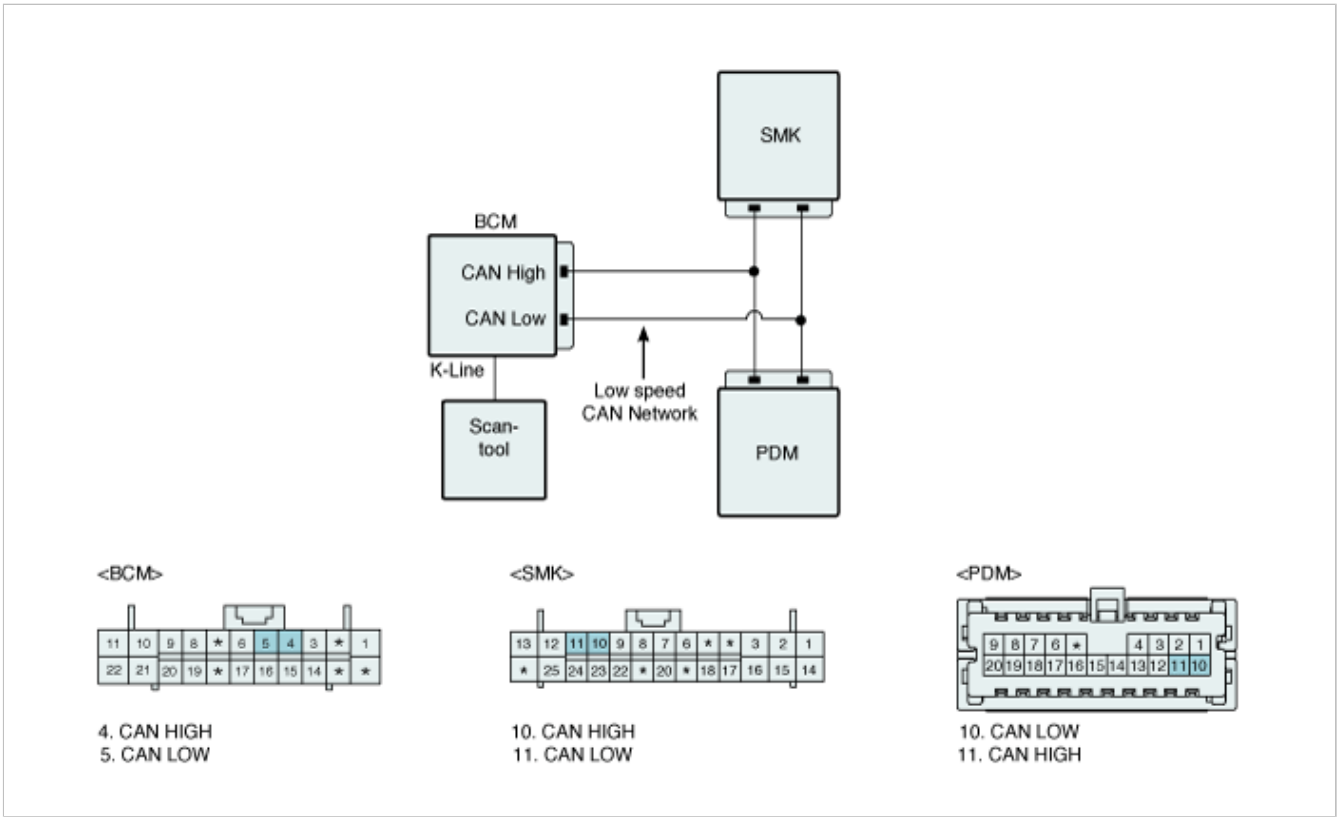
DTC Description

Smart Key module sets DTC B1689 if Smartkey Module have not received CAN signal from PDM for 3 sec.

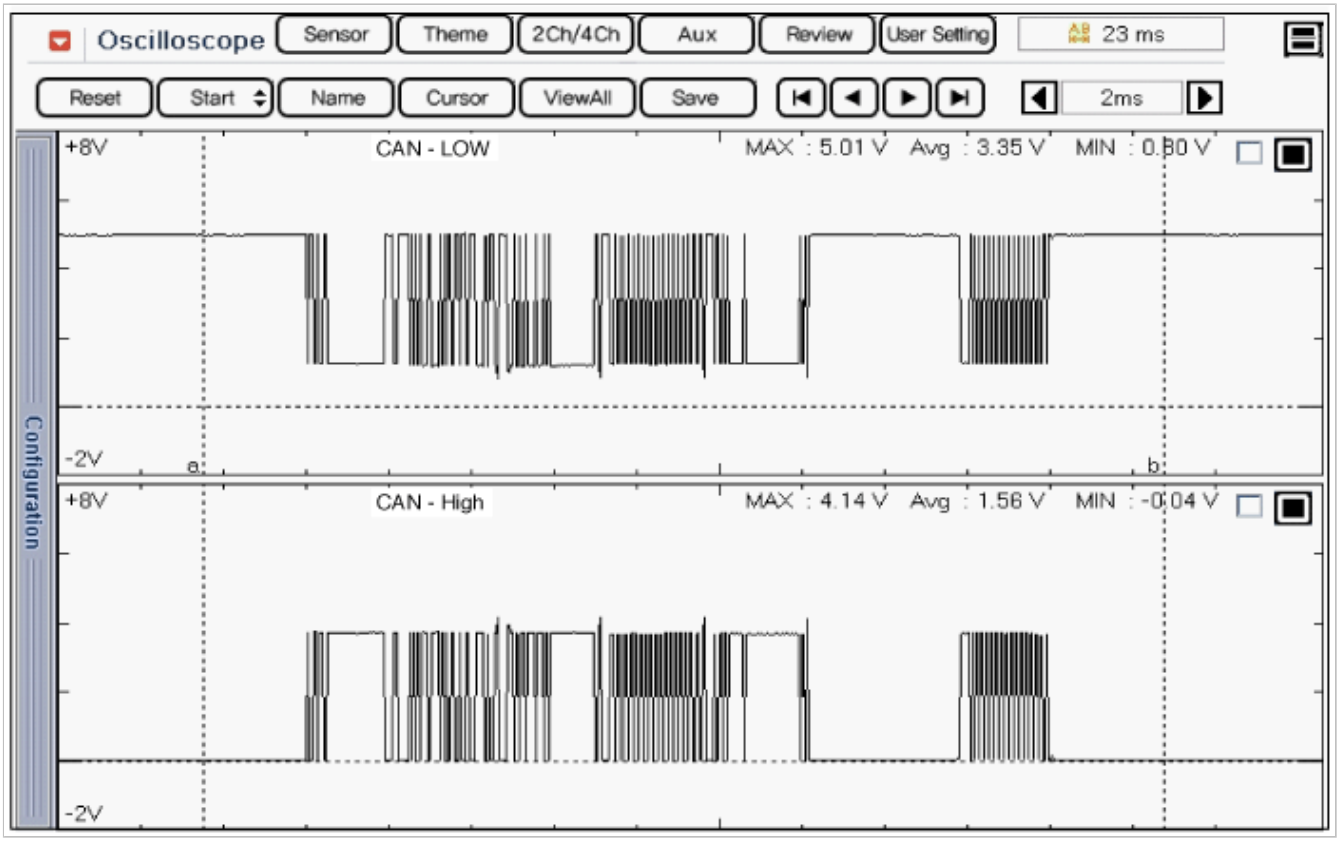
DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• CAN signal check	• Poor Connection • Power source to Smart Key module • Power source to PDM • Short to battery in CAN communication line • Short to ground in CAN communication line • Short between CAN HIGH AND LOW communication line each other • Faulty Smartkey Module • Faulty PDM
Enable Conditions	• IG ON	
Threshold value	• No can signal message from PDM for 3 sec.	
Failsafe	• -	

Diagnostic Circuit Diagram



Signal Waveform & Data



Monitor Scantool data

■ **Check DTC**

1. Check DTC with scantool.
2. Check DTC related CAN communication is set on PDM.
3. If there is DTC related PDM, Check the DTC according to troubleshooting guide
4. Repair and erase the DTC with Scantool.
5. Is the DTC erased ?

YES	▸ Check poor connection between harness connector and each module : Thoroughly check the looseness, poor connection, bent, corrison, contamination, deformation or damage of connector. Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.
NO	▸ Go to next procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals.
   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration,or damage.
3. Has a problem been found?

YES	▸ Repair as necessary and go to "Verification of Vehicle Repair" procedure.
NO	▸ Go to "Check CAN communication Line" procedure.

CAN communication Line Inspection

■ Check CAN communication

1. Connect all of control module connector.
2. IG KEY ON.
3. Make CAN communication is wake up status (Ex. ON/OFF Door SW)
4. Measure signal waveform of B-CAN-HIGH terminal of Smartkey Module connector and chassis ground.
5. Measure signal waveform of B-CAN-LOW terminal of Smartkey Module connector and chassis ground.

Specification : Refer to Signal waveform and Data

6. Is the measrured signal waveform normal ?

YES	▸ Check poor connection between harness connector and Smartkey Module or ECM : Thoroughly check the looseness, poor connection, bent, corrison, contamination, deformation or damage of connector. Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure. ▸ Disconnect SMK ECU, IPM, DDM, FAM, Tilt ECU, PDM, ADM, RAM and IMS one by one and then, check that DTC is erased with scantool. ▸ Substitute with a known-good module and check for proper operation. If the problem is corrected, replace module and then go to "Verification of Vehicle Repair" procedure.
NO	▸ If the measured value is battery voltage, check short to battery in CAN line. Repair or replace as necessary. And then, go to "Verification of Vehicle Repair" procedure. In case that Communication is in sleep mode, 12V will be measured. Therefore, check that communication is in Wake up status. ▸ If 0V is detected, Check short to ground, short between CAN high and low each other or open in CAN high or CAN low harness. Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

■ Check open in CAN communication line

1. IG KEY OFF.
2. Disconnect smart key module and PDM connector.
3. Measure resistance between communication line terminal of Smartkey Module connector and communication line of PDM harness connector.

Specification : About below 1Ω

4. Is the measured resistance within specification ?

YES	▸ Check poor connection between harness connector and Smartkey Module or PDM : Thoroughly check the looseness, poor connection, bent, corrison, contamination, deformation or damage of connector. Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.
NO	▸ Repair or replace open in CAN communication line and go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and selet "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES	▸ Go to the applicable troubleshooting procedure.
NO	▸ System is performing to specification at this time.

GENESIS COUPE(BK) >2010 > G 2.0 DOHC > Body Electrical System > Smart key System > B1971 Parking Position Input Error

General Description

Parking Position Switch indicates that Shift Lever is in P range or not.
Smartkey Module decides that engine starting is enable after receiving Parking Position Switch signal.

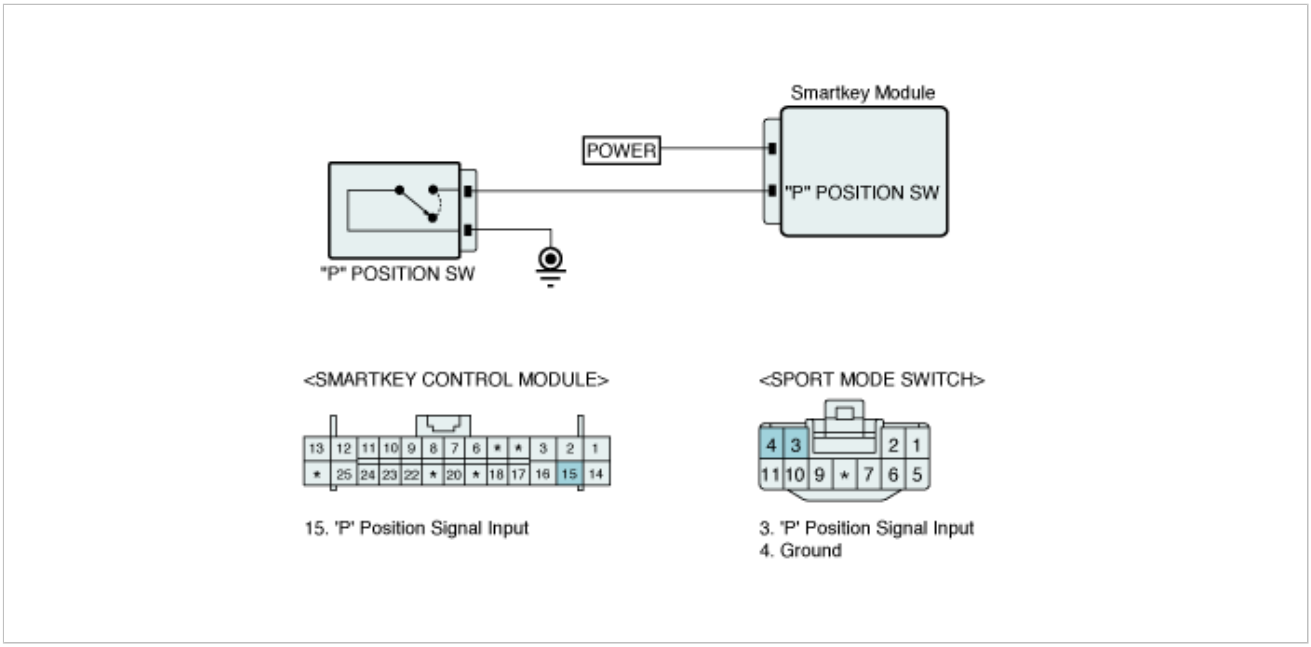
DTC Description

SMARTKEY Module sets DTC B1971 if vehicle speed is over 3km/h while parking switch signal is ON.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Check Voltage	• Poor Connection in harness • Faulty Parking Switch • Faulty Smartkey Module
Enable Conditions	• After battery Voltage is energized to Smartkey Module	
Threshold value	• After IGN ON, Vehicle speed is over 3km/h with brake switch ON for 10 seconds.	
Failsafe	• -	

Diagnostic Circuit Diagram



Monitor Scantool data

■ Check parking position switch status.

1. Connect scantool with diagnostic connector.
2. Check current data with scantool.
3. Check "Shift lever P position" parameter on current data.
4. Check that data is appropriately changeable according to the shift lever position in P or others.

Specification : P position : ON, Not in P position : OFF.

5. Is the shift lever P position normal ?

YES	▸ Check poor connection between harness connector and Parking Postion switch or Smartkey Module : Thoroughly check the looseness, poor connection, bent, corrison, contamination, deformation or damage of connector. Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.
NO	▸ Go to " Inspection & Repair " procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals.
   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration,or damage.
3. Has a problem been found?

YES	▸ Repair as necessary and go to "Verification of Vehicle Repair" procedure.
NO	▸ Go to check "signal circuit Inspection" procedure.

Signal Circuit Inspection

■ Check Signal Circuit

1. IG KEY OFF.
2. Disconnect parking position switch connector.
3. IG KEY ON.
4. Measure voltage between signal terminal of parking position switch harness connector and chassis ground.

Specification : Battery Voltage

5. Is the measured voltage within specification ?

YES	▸ Check open in ground harness. And then, repair or replace as necessary, Finally go to "Verification of Vehicle Repair " procedure.
NO	▸ Check open or short to ground in signal harness. And then, repair or replace as necessary finally go to "Verification of Vehicle Repair " procedure.

Component Inspection

■ Check Parking Position Switch

1. IG KEY OFF.
2. Disconnect Parking Position switch connector.
3. Measure resistance between one and the other connector when parking postion switch ON and OFF.

Specification : Measurement 1 : Infinite (∞), Measurement 2 : About below 1Ω

4. Is the measured resistance within specification ?

YES	▸ Check poor connection between harness connector and Parking Postion switch or Smartkey Module : Thoroughly check the looseness, poor connection, bent, corrison, contamination, deformation or damage of connector. Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.
NO	▸ Substitute with a known-good parking position switch and check for proper operation. If the problem is corrected, replace parking postion switch and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

1. Connect scantool and selet "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES	▸ Go to the applicable troubleshooting procedure.
NO	▸ System is performing to specification at this time.

GENESIS COUPE(BK) >2010 > G 2.0 DOHC > Body Electrical System > Smart key System > B1978
Electric Steering Column Lock Failure

General Description

ESCL(Electronic Steering Column Lock) is a system to control the lock or unlock of the Steering Column.
It is installed on steering column and Smartkey Module is located inside of instrument panel, left knee of driver side.
It consists of ESCL control Module, Smartkey Module, PDM and SSB(engine Start Stop Button)
It is operating as follows
1.Pushing SSB → 2. Switch 1 signal goes to PDM, Switch 2 signal goes to Smartkey Module → 3.PDM supplies power supply to ESCL → 4.SMARTKEY Module sends ENABLE signal and operation signal to ESCL → 5.ESCL controls bolt to lock or unlock ESCL → 6.PDM detects ESCL Unlock signal.

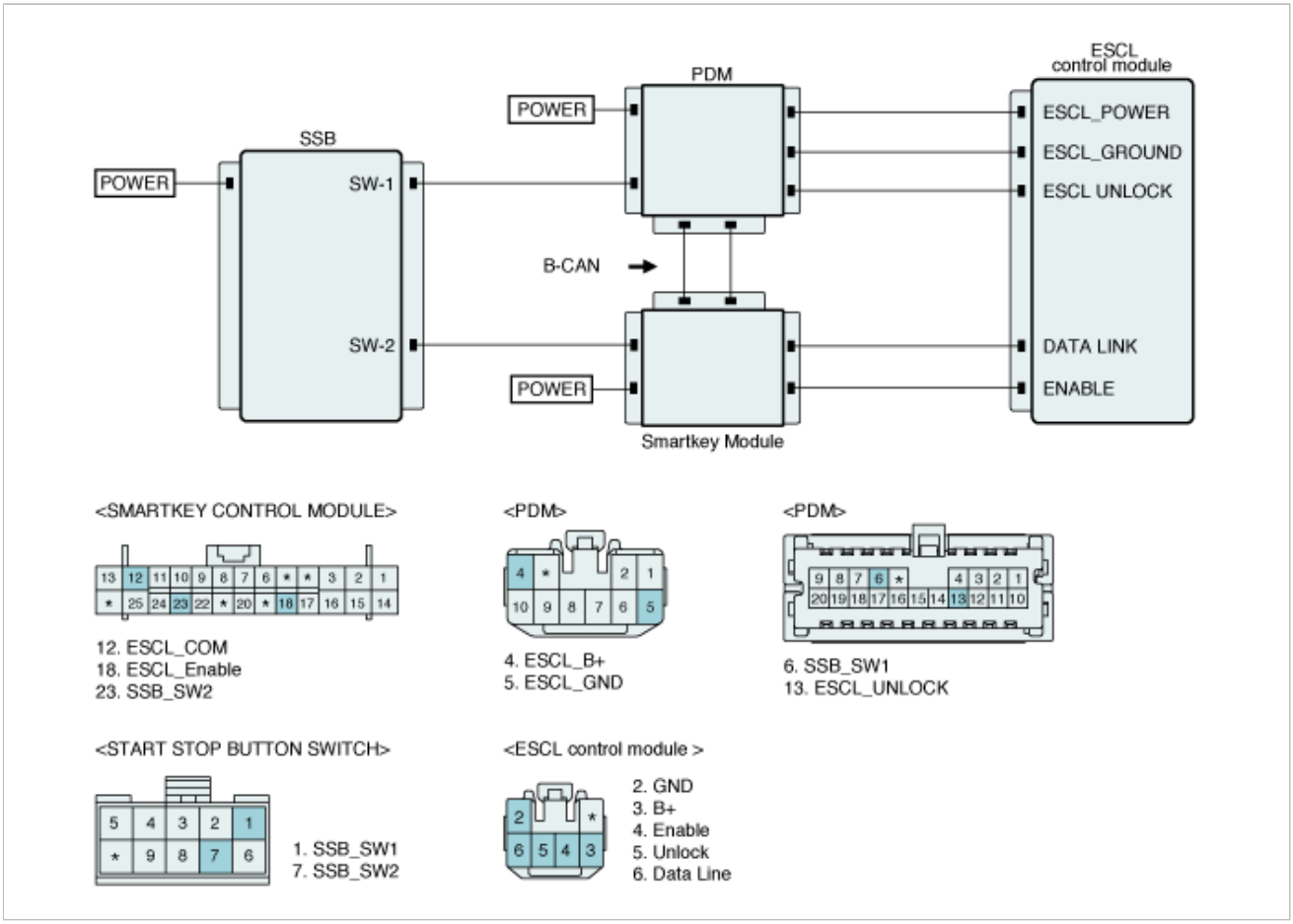
DTC Description

Smartkey Module receives ESCL lock or unlock stuatus signal from ESCL and PDM(via CAN). And then, Smartkey Module compares PDM is lock or unlock signal with ESCL is lock or unlock signal.
If the both signals are unmathing, Smartkey Module sets DTC B1971.

DTC Detecting Condition

Item	Detecting Condition	Possible cause
DTC Strategy	• Check voltage and Data	• Poor connection in harness or connector. • After battery voltage is supplied to Smartkey Module - If IPM detects pins related ESCL are failed 1. Faulty ESCL control Module 2. Open or short in battery / ground curcuit of ESCL 3. Open or short to battery / ground in communicantion circuit of ESCL 4. Open in O_ESCL Enable circuit from Smartkey Module 5. Open or short in ESCL_Unlock circuit to PDM - DTC is set although it is not ESCL fault 6. No battery voltage to PDM 7. Short to battery in power relay on the PDM line such as ACC, IGN1, IGN2, Starter Rly 8. When actuation test for PDM9. It is leant status but not with same PIN code for all Smartkey Module/PDM/ESCL • Faulty Smartkey Module • Faulty PDM • Faulty ESCL control Module
Enable Conditions	• After battery voltage is suppiled to Smartkey Module	
Threshold value	• When both signal from ESCL lock or unlock status and PDM lock or unlock stuatus are unmatching	
Failsafe	• -	

Diagnostic Circuit Diagram



Monitor Scantool data

■ Check DTC status

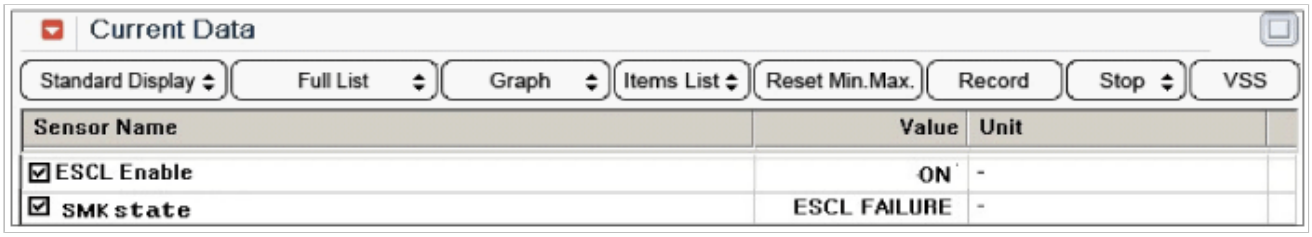
1. Check DTC on PDM side with scantool.
2. Check that there is any DTC on PDM side or ESCL side.
3. Inspect DTC related ESCL first if there is any DTC on the PDM side according to DTC troubleshooting guide.
4. After inspetion and repair, erase DTC related ESCL.
5. Erase DTC B1971 ESCL failure on Smartkey Module side.
6. Has the DTC gone after erasing DTC with scantool ?

YES	▸ Check poor connection between harness connector and ESCL, PDM or Smartkey Module : Thoroughly check the looseness, poor connection, bent, corrison, contamination, deformation or damage of connector. Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.
NO	▸ Go to check current dat as follows if there is DTC B1971 ESCL failure.

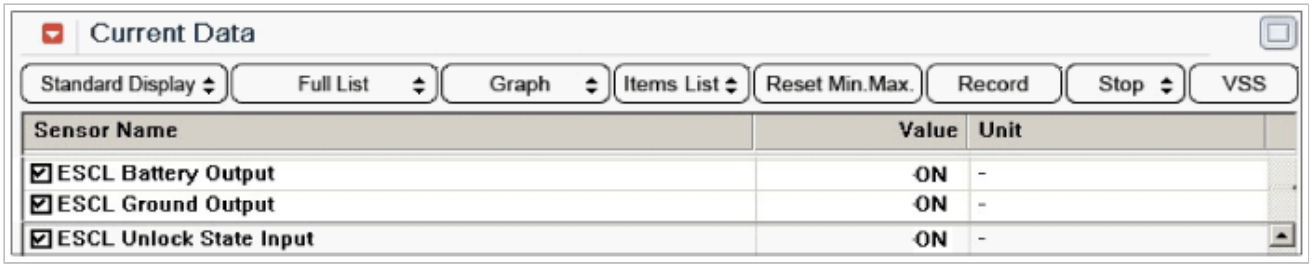
■ Check current Data

1. Select current data parameters related Smartkey Module with scantool.
2. Monitor "ESCL ENABLE" and "SMK State" are normal.
3. Select current data parameter related PDM.
4. Monitor "ESCL BATTERY OUTPUT" , "ESCL GND OUTPUT" and "ESCL UNLOCK STATE INPUT" are normal.

Specification : - Current Data parameter related Smartkey Module -
1.ESCL ENABLE : It is ON, if IPM sends enable signal to ESCL
2.SMK State : It shows ESCL current status. It shows ESCL FAULURE if there is a failure



Specification : - Current Data parameter related PDM -
1.ESCL BATTERY OUTPUT : It will be changed form OFF to ON when PDM supplies operation voltage with PDM.
2.ESCL GND OUTPUT : It will be changed form OFF to ON when PDM supplies operation voltage with PDM.
3.ESCL UNLOCK STATE INPUT : In case that ESCL bolts is unlock, it will be ON.



5. Are all parameters related ESCL funtioning normally ?

YES	▸ Check poor connection between harness connector and ESCL, PDM or Smartkey Module : Thoroughly check the looseness, poor connection, bent, corrison, contamination, deformation or damage of connector. Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.
NO	▸ Check harness and system related ESCL if "SMK STATE" is shown ESCL FAILURE ▸ If there is any parameter on the system or harness displayed abnormal, check harness and system. ▸ Go to "Inspection & Repair " procedure.

Terminal and Connector Inspection

1. Many malfunctions in the electrical system are caused by poor harness and terminals.
   Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration,or damage.
3. Has a problem been found?

YES	▸ Repair as necessary and go to "Verification of Vehicle Repair" procedure.
NO	▸ Go to "Check ESCL Circuit " procedure.

Check ESCL circuit

■ Check short to ground in ESCL circuit.

1. IG KEY OFF
2. Disconnect ESCL control Module, PDM and Smartkey Module connector.
3. Measure resistance between all the terminals of ESCL harness connector and chassis ground.

Specification : Infinite

4. Is the measured resistance within specification ?

YES	▸ Go to "Check short to battery in ESCL harness " procedure.

NO	▸ Repair or replace as necessary and then, go to "Verification of Vehicle Repair"procedure.

■ Check short to battery in ESCL harness

1. IG KEY OFF.
2. Disconnect ESCL control Module, PDM and SMARTKEY Module connector.
3. Measure resistance between each terminal of ESCL control Module harness connector and chassis ground.

Specification : About 0V

4. Is the measured voltage within specification ?

YES	▸ Go to "check open in ESCL harness " as follows
NO	▸ Repair or replace the short to battery as necessary and then, go to 'Verification of Vehicle Repair" procedure.

■ Check open in ESCL harness

1. IG KEY OFF.
2. Disconnect ESCL control Module, PDM and Smartkey Module connector.
3. Measure resistance between one and the other terminal of ESCL control module harness connector or IPM harness connector.

Specification : About below 1Ω

4. Is the measured resistance within specification ?

YES	▸ Check poor connection between harness connector and ESCL Control Module, PDM or Smartkey Module : Thoroughly check the looseness, poor connection, bent, corrison, contamination, deformation or damage of connector. Repair or replace as necessary and then, go to "Verification of Vehicle Repair" procedure. ▸ After replacing ESCL control module or Smartkey Module, perform Key teaching procedure with scantool.
NO	▸ Repair open in harness or replace as necessary and then, go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

After a repair, it is essential to verify that the fault has been corrected.

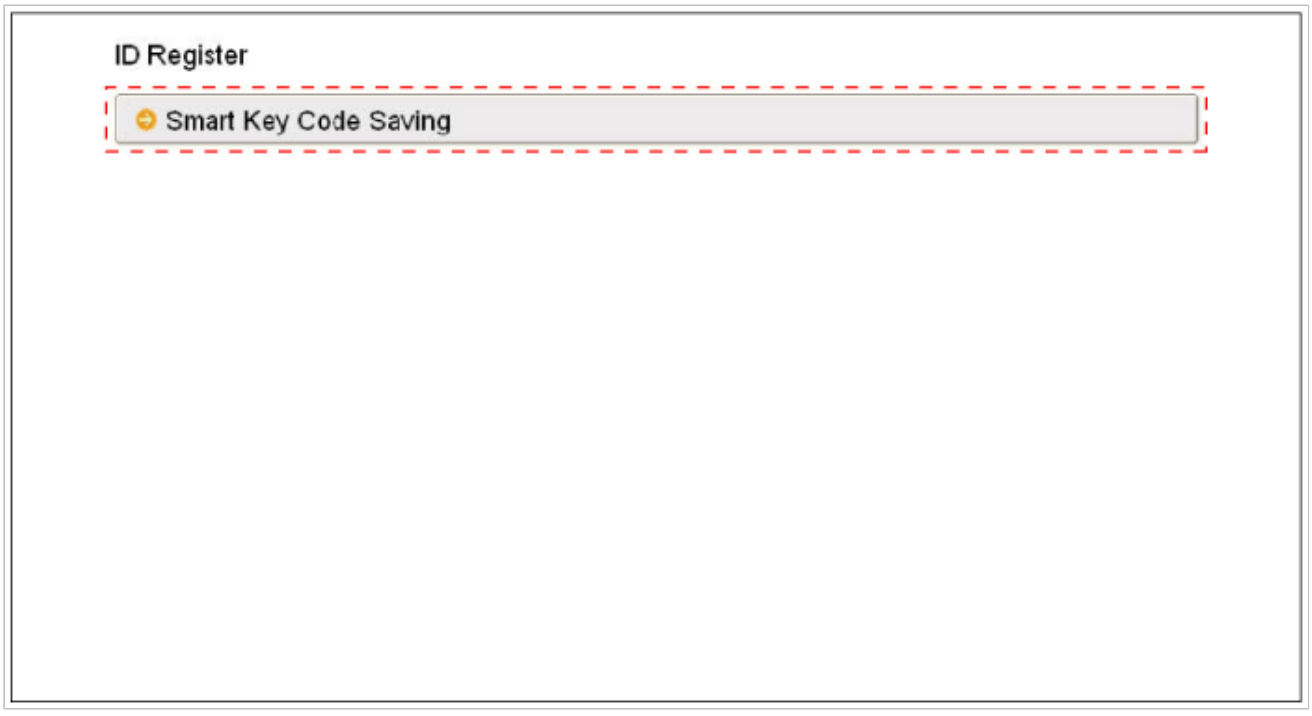
1. Connect scantool and selet "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC.
2. Operate the vehicle and monitor the DTC on the scantool.
3. Are any DTCs present?

YES	▸ Go to the applicable troubleshooting procedure.
NO	▸ System is performing to specification at this time.

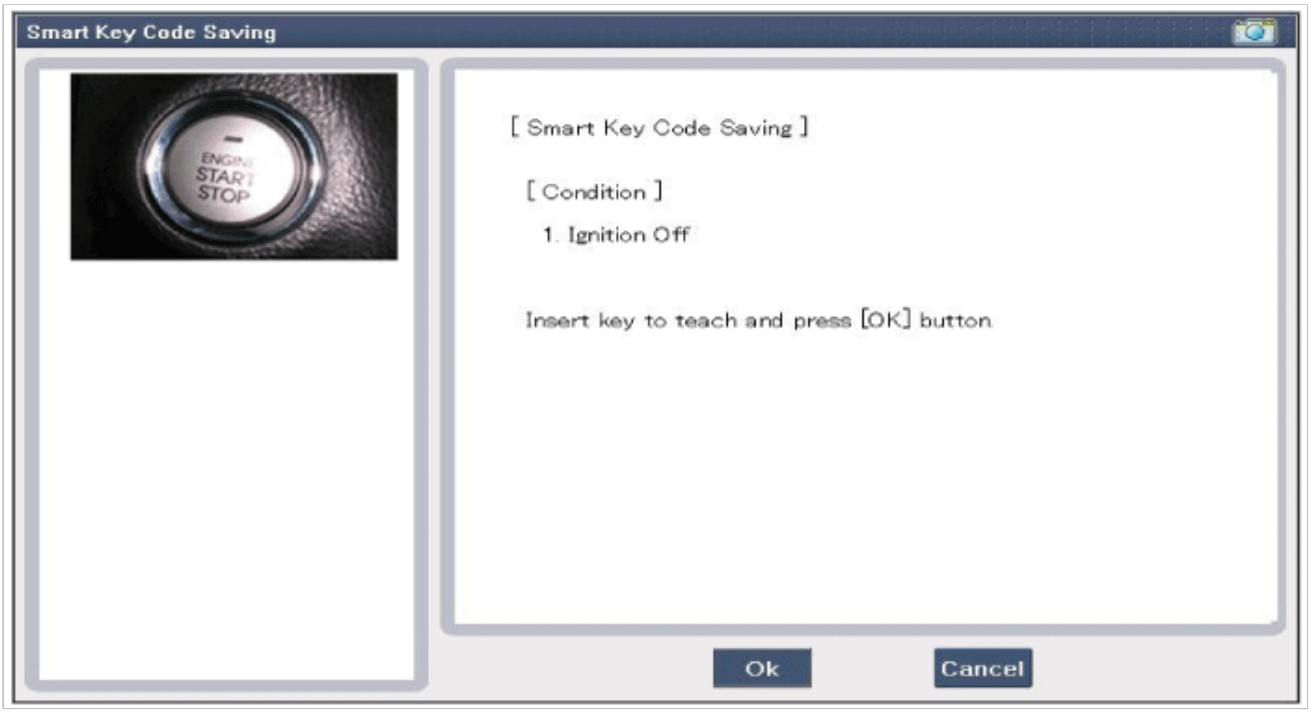
Smart Key

Smart Key Code Saving

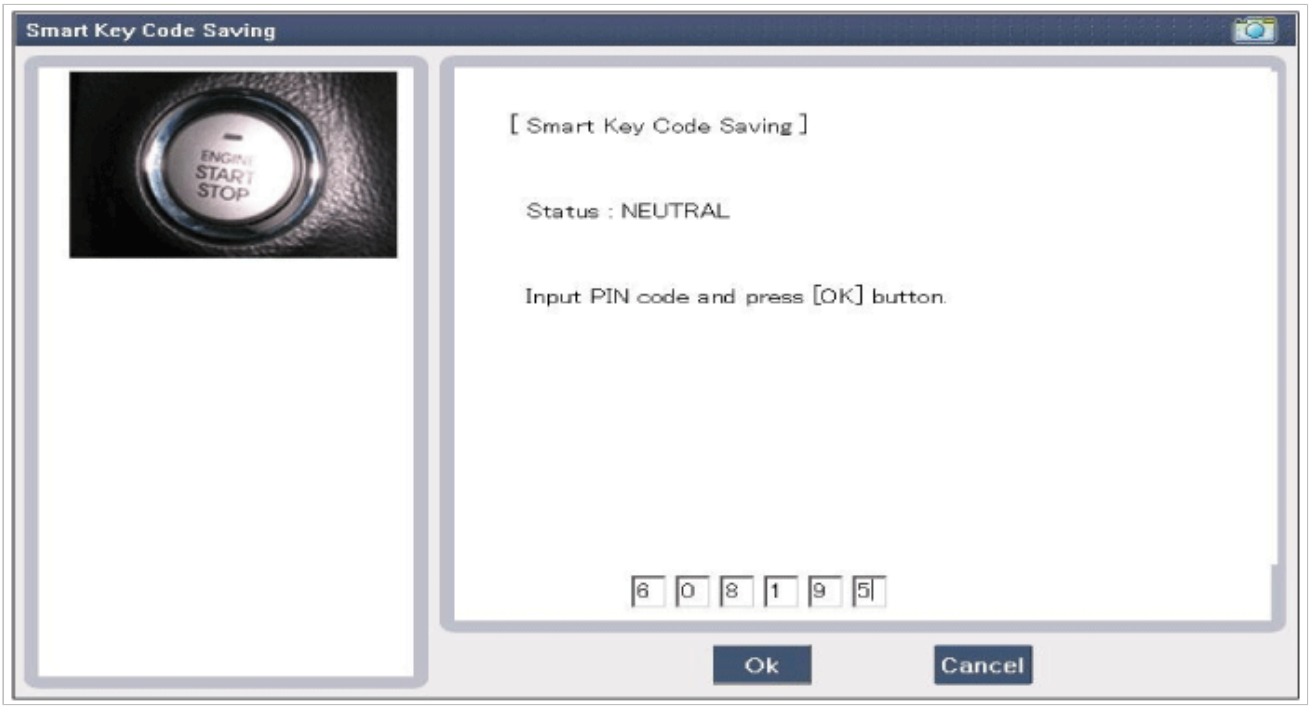
1. Connect the DLC cable of GDS to the data link connector (16 pins) in driver side crash pad lower panel, turn the power on GDS.
2. Select the vehicle model and then do "Smart key code saving".

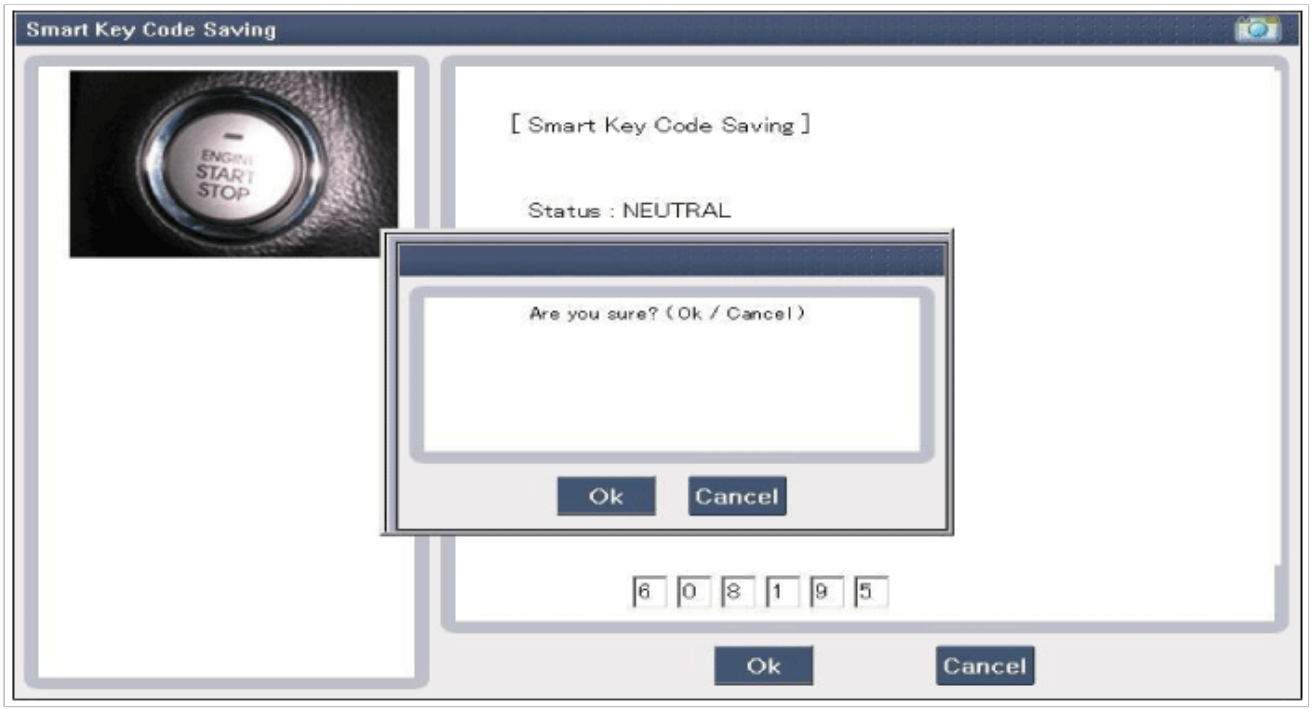


3. After selecting "Smart key teaching" menu, push "Enter" key, then the screen will be shown as below.

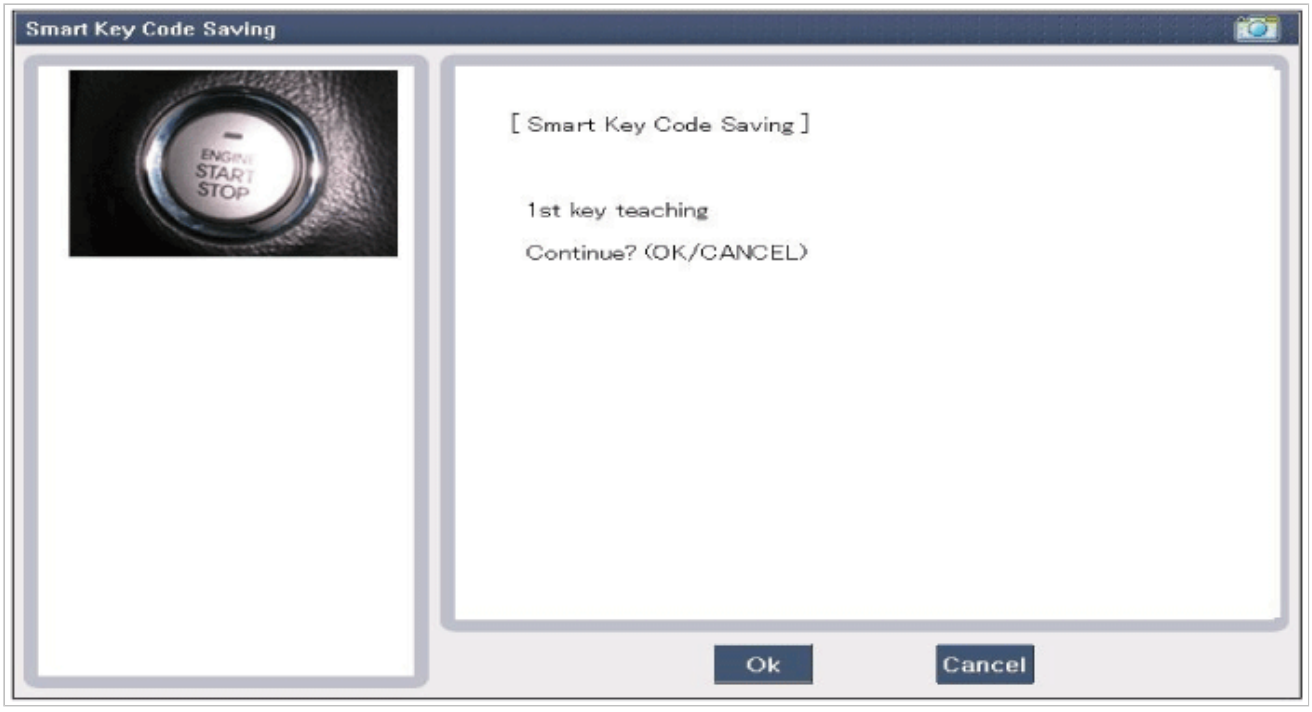


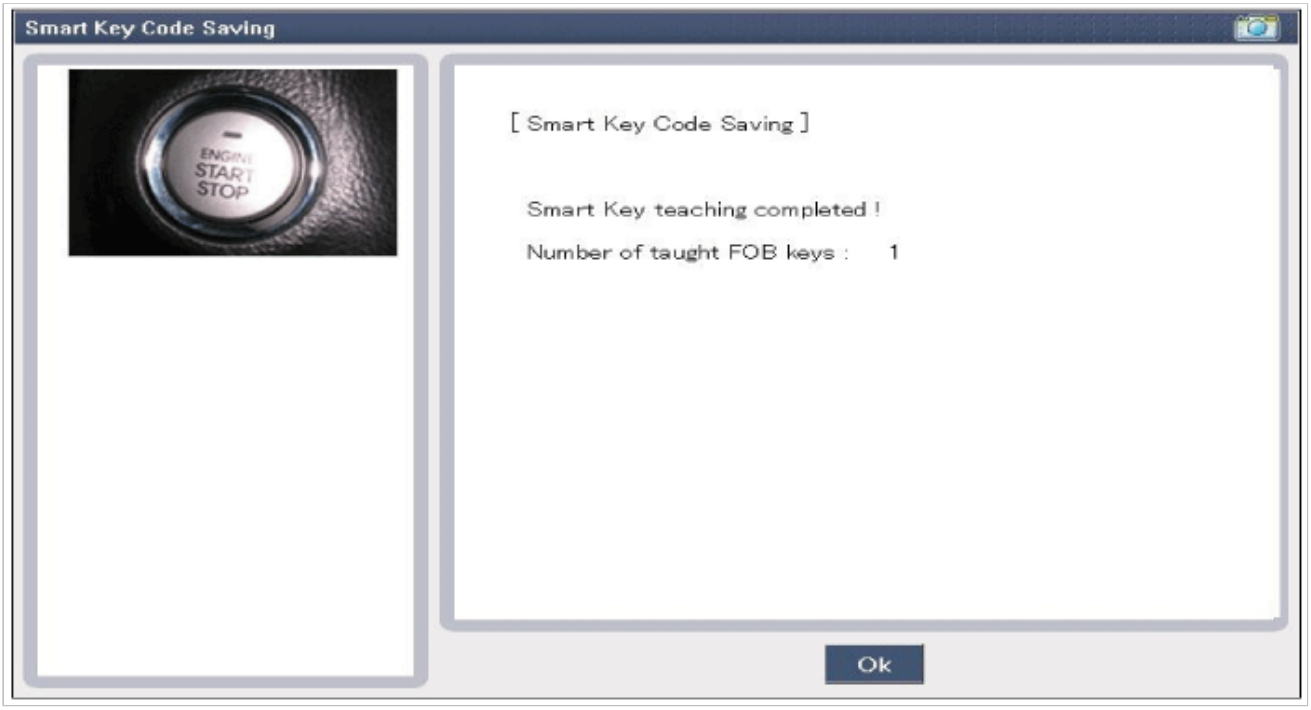
4. After inserting the teaching key, push "ENTER" key.
5. Input the "Pin code" for first key teaching.



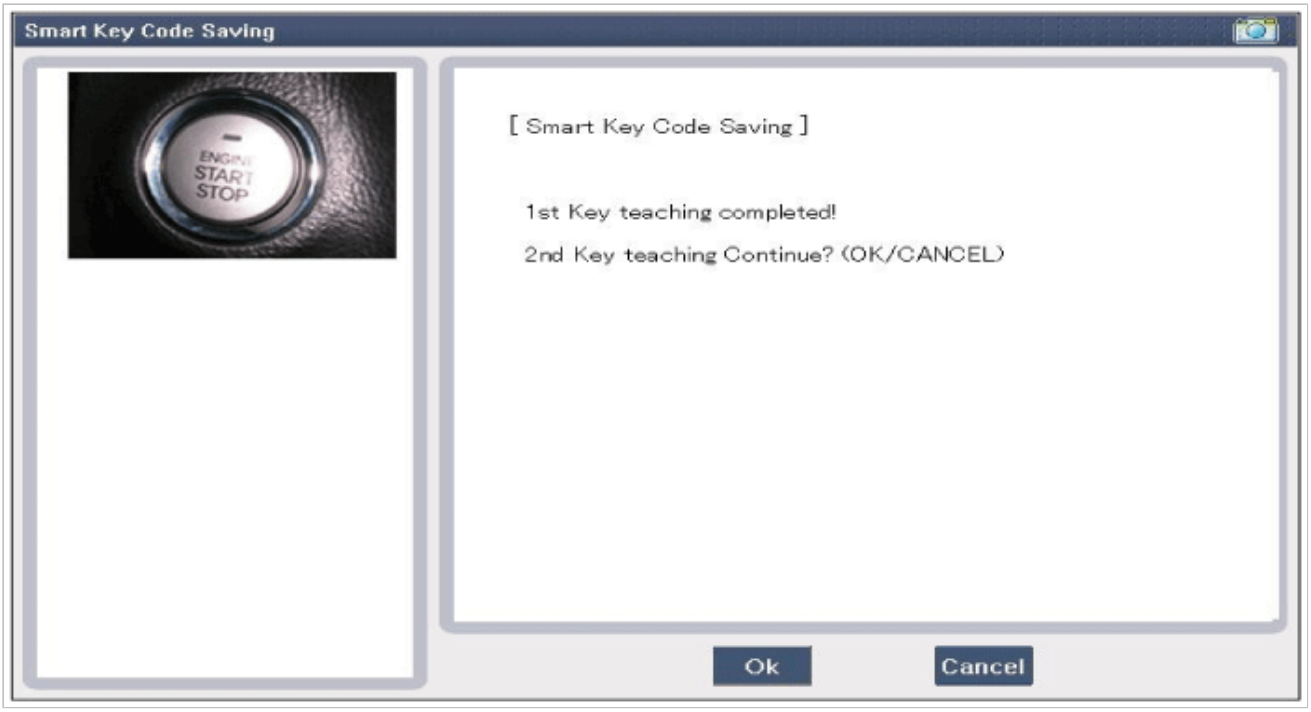


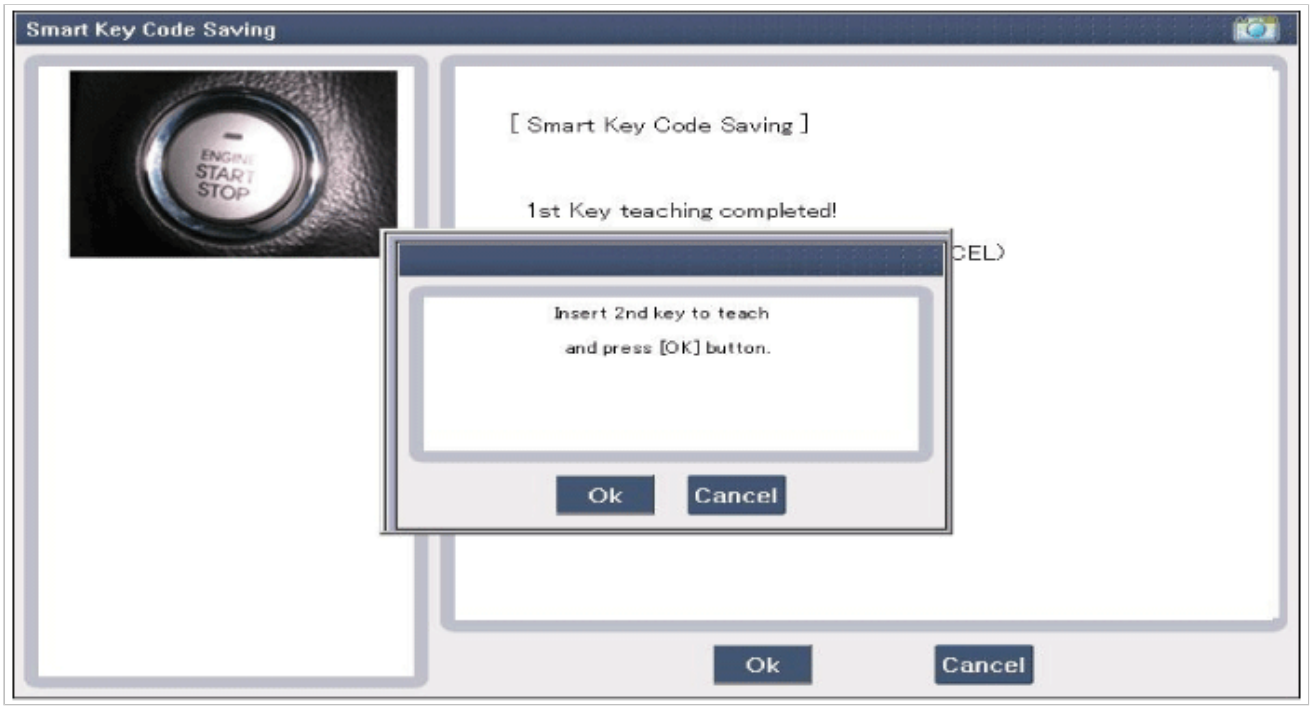
6. Confirm the message "First key teaching completed".



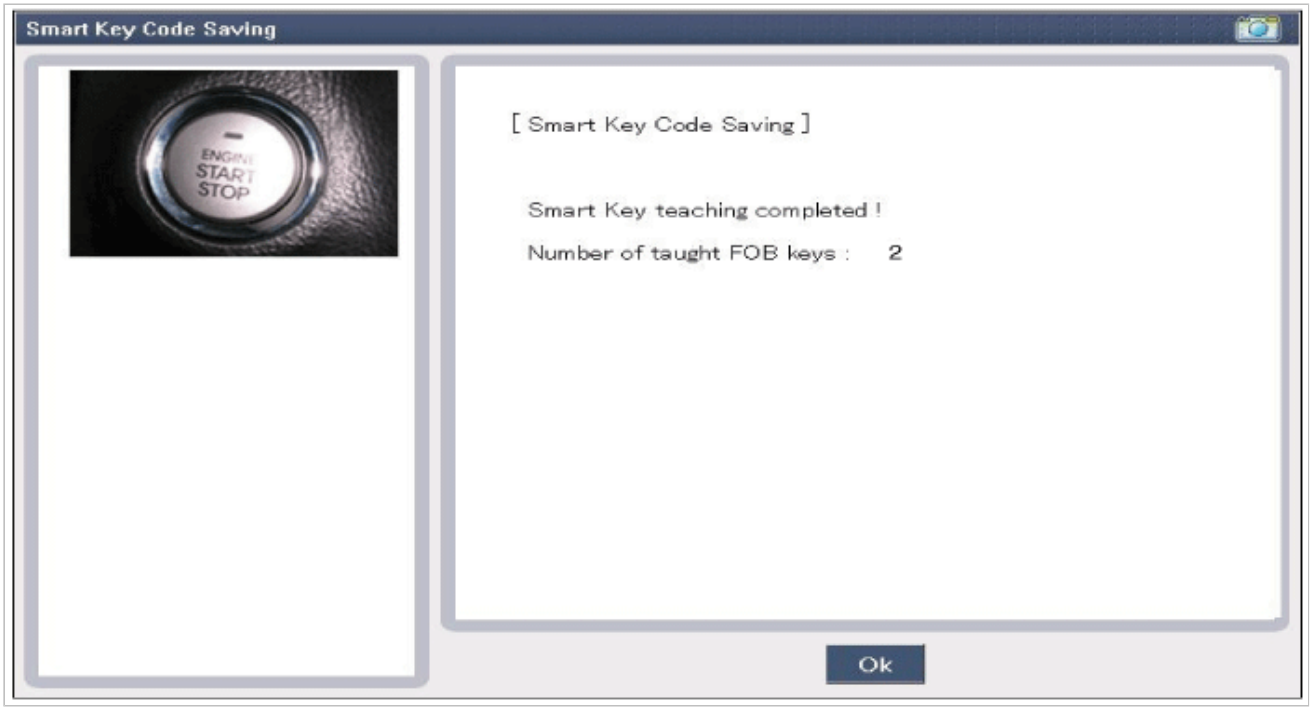


7. Input the "Pin code" for second key teaching.



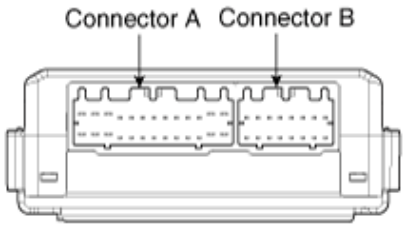


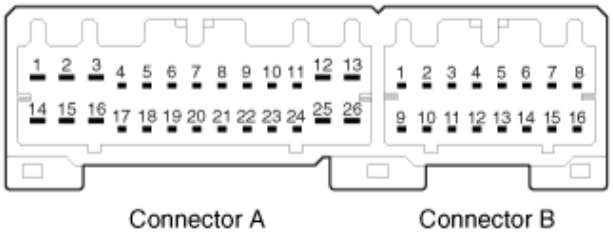
8. Confirm the message "Second key teaching completed".



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

Component (1)



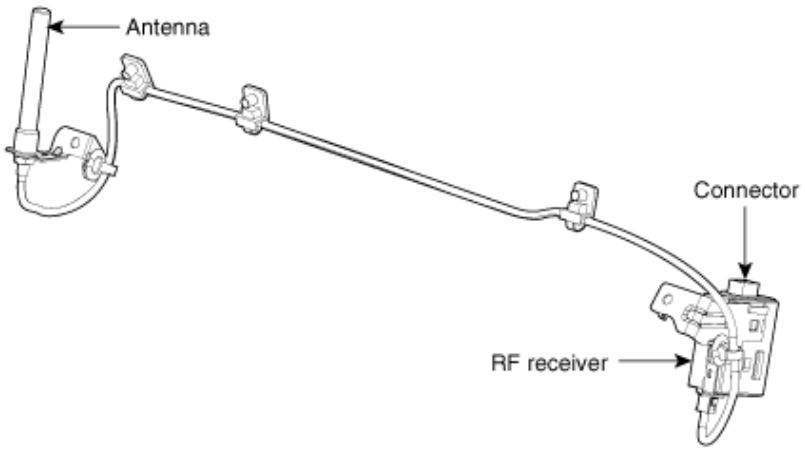


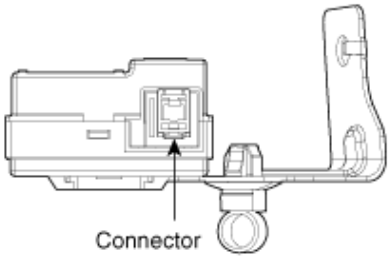
Connector Pin Information

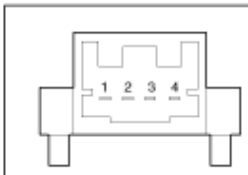
Pin	Connector A	Pin	Connector B
1	Battery	1	Interior 2 antenna 2
2	Immobilizer Indicator	2	Interior 1 antenna 2
3	GND 1	3	-
4	-	4	-
5	Trunk lid	5	Interior 3 antenna 1
6	Front left door lock / unlock	6	Trunk antenna 1
7	External buzzer	7	Front right side antenna 1

8	ALT L	8	Front left side antenna 1
9	ACC	9	Interior 2 antenna 1
10	CAN high	10	Interior 1 antenna 1
11	CAN low	11	-
12	ESCL Communication	12	-
13	RF Communication	13	Interior 1 antenna 2
14	IGN 1	14	Trunk antenna 2
15	P position	15	Front right side antenna 2
16	GND 2	16	Front left side antenna 2
17	Key out indicator		
18	ESCL Enable		
19	-		
20	Front right door lock / unlock		
21	-		
22	Diagnosis		
23	SSB switch		
24	Brake		
25	EMS COM		
26	-		

Component (2)

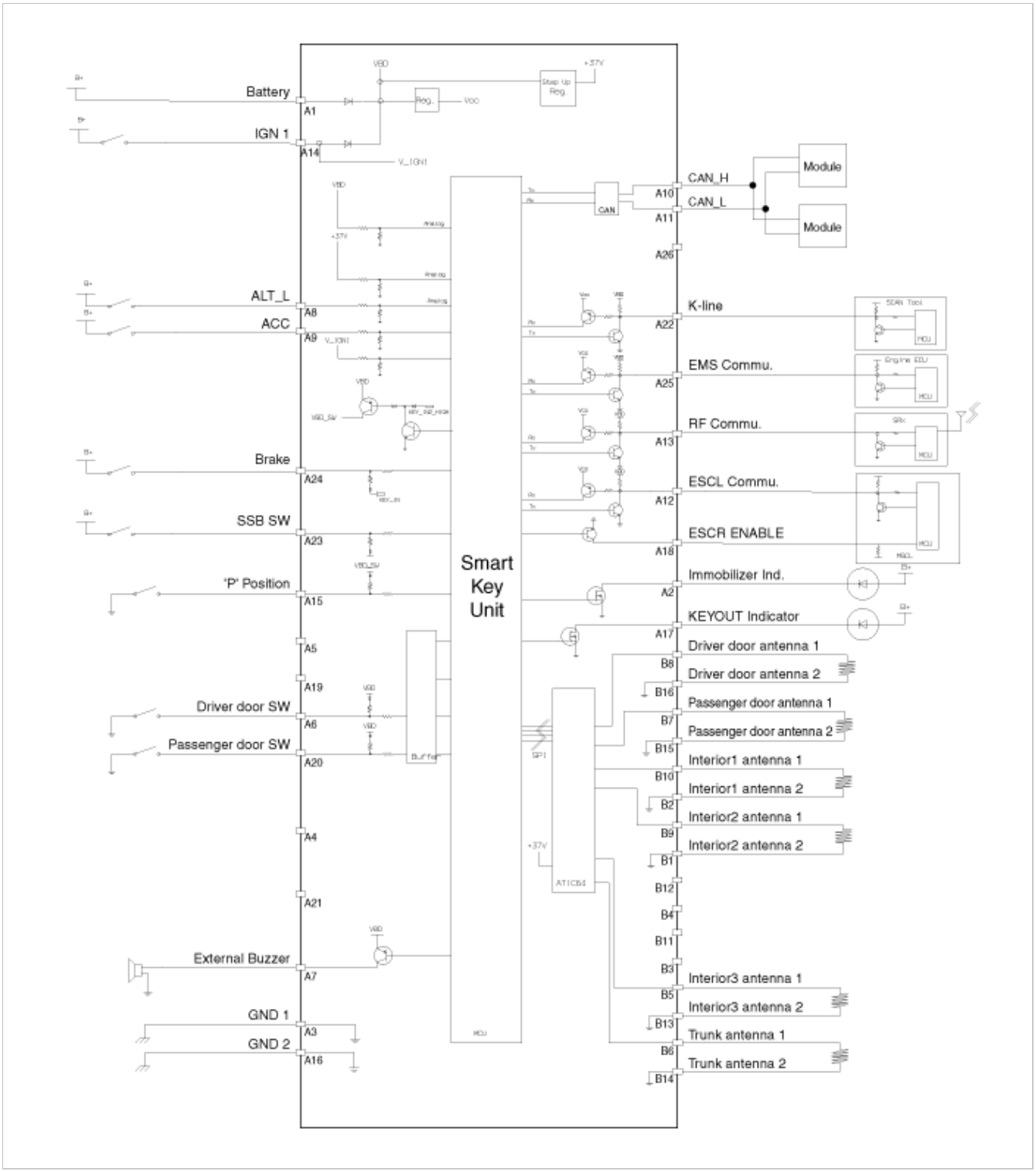






No.	Name
1	Data
2	-
3	Power
4	Ground

Circuit Diagram



Inspection

Smart Key Unit

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

Smart Key Switch

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

Antenna

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

Trunk Lid Open Switch

1. Remove the trunk trim.
   (Refer to BD group - "Trunk trim")
2. Check for continuity between the Trunk actuator terminals.

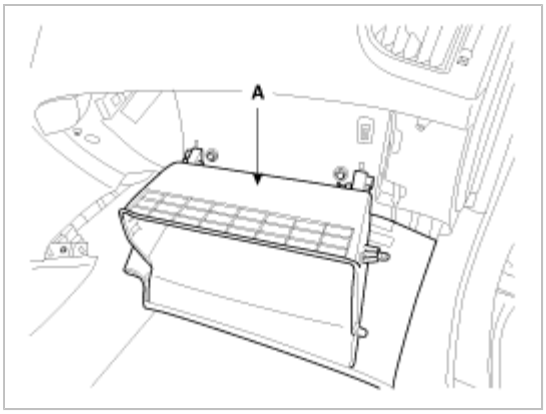
3. If continuity is not specified, inspect the switch

Terminal / Position	1	3
Unlock		
Lock	○	○

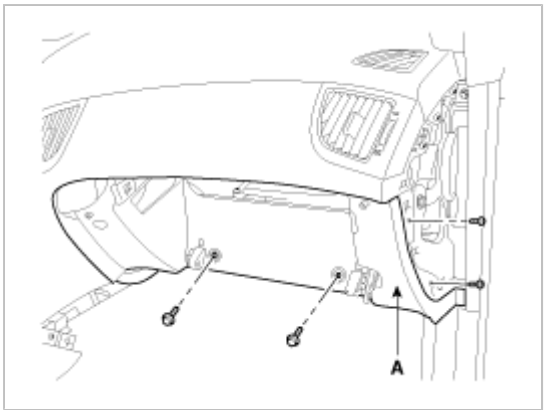
Removal

Smart key unit

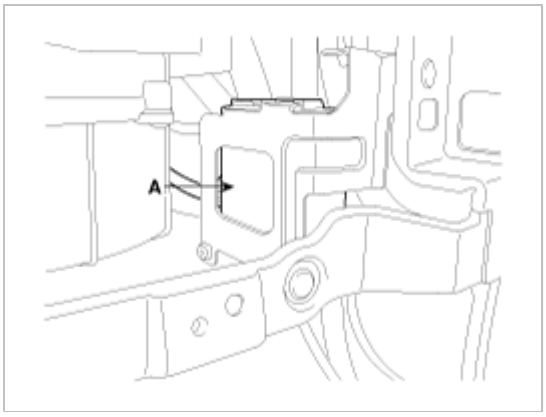
1. Disconnect the negative(-) battery terminal.
2. Remove the glove box(A).
   (Refer to BD group - "Crash pad")



3. Remove the glove box housing(A) after loosening the mounting screws.

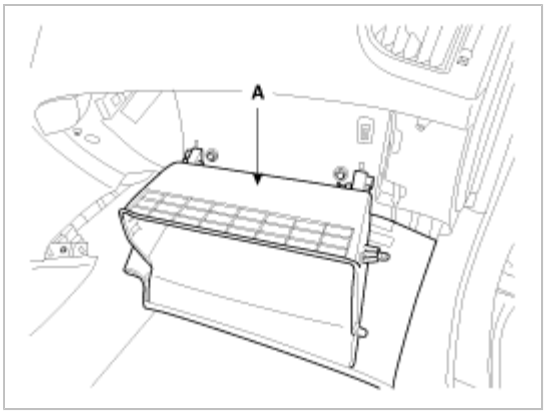


4. Loosen the nuts(2EA) from the smart key unit(A) after disconnecting the connector.

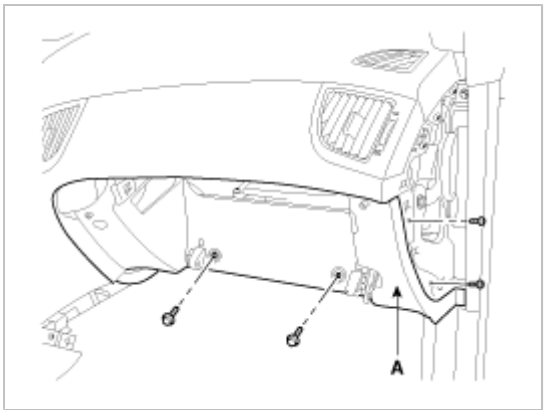


RF Receiver

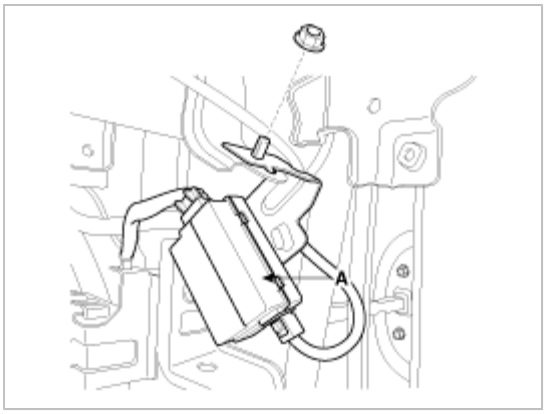
1. Disconnect the negative(-) battery terminal.
2. Remove the glove box(A).
   (Refer to BD group - "Crash pad")



3. Remove the glove box housing(A) after loosening the mounting screws.

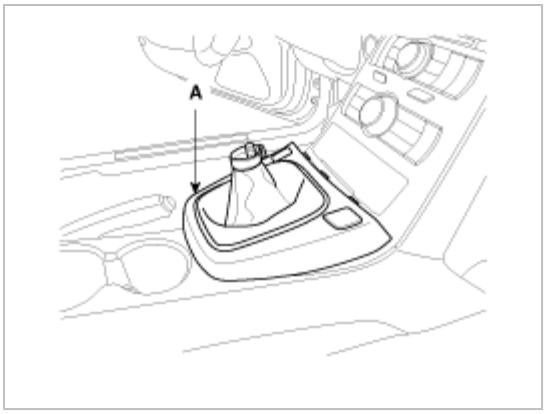


4. Disconnect the connector after loosening the RF receiver(A) nut(1EA).

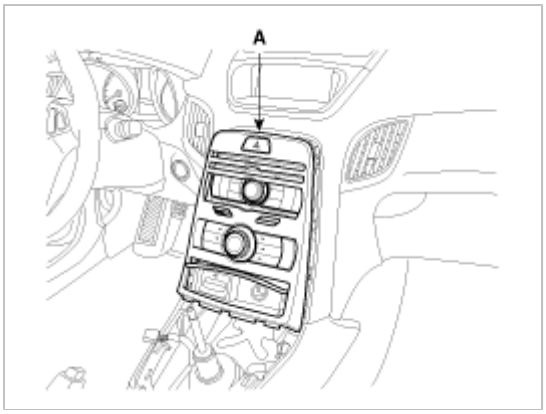


Interior 1 Antenna

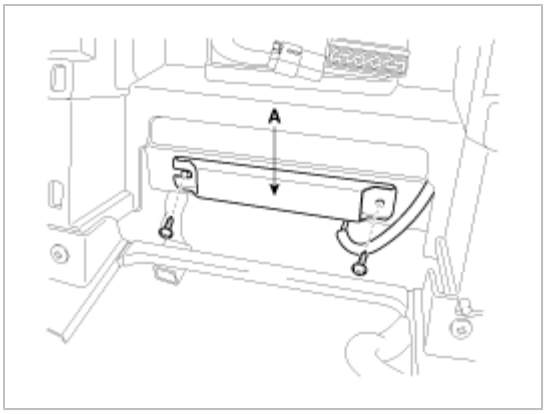
1. Disconnect the negative(-) battery terminal.
2. Remove the console upper cover(A).
   (Refer to BD group - "Console")



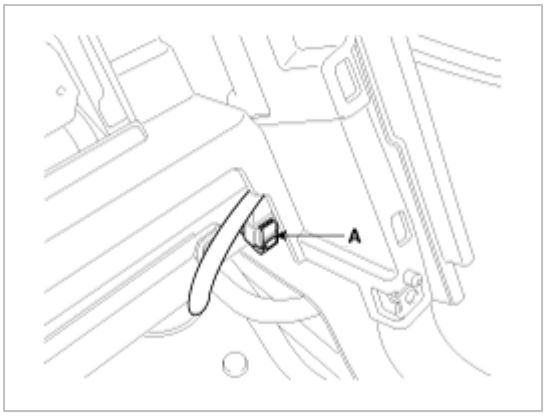
3. Remove the center fascia lower panel(A).



4. Loosen the interior 1 antenna(A) screws(2EA) located in front of the console.

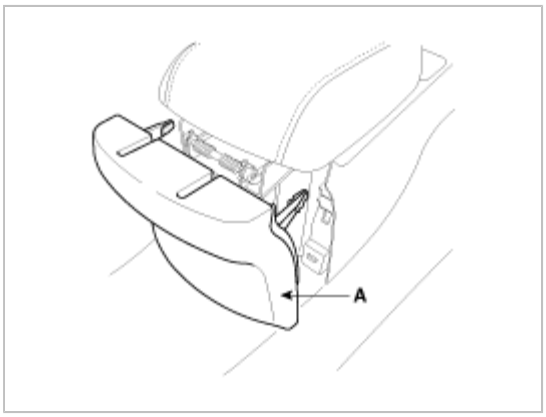


5. Remove the interior 1 antenna(A) after disconnect the connector.

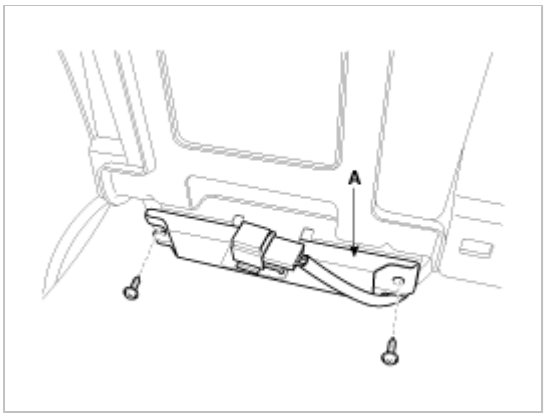


Interior 2 Antenna

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

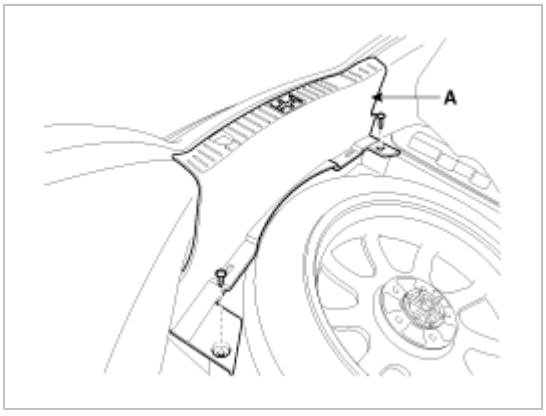


3. Disconnect the interior 2 antenna connector located at the console rear side, then remove the interior 2 antenna (A) after loosening screws(2EA).

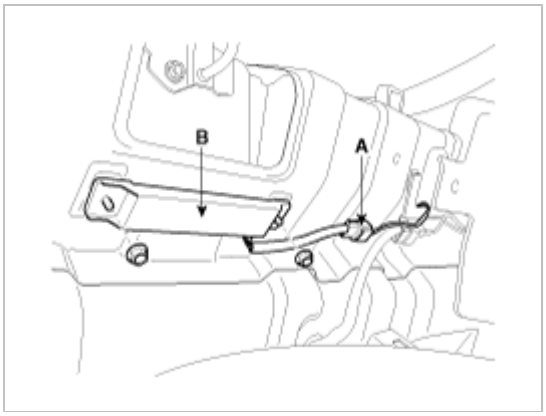


Interior 3 Antenna

1. Disconnect the negative(-) battery terminal.
2. Remove the trunk panel(A) after loosening the mounting screws.

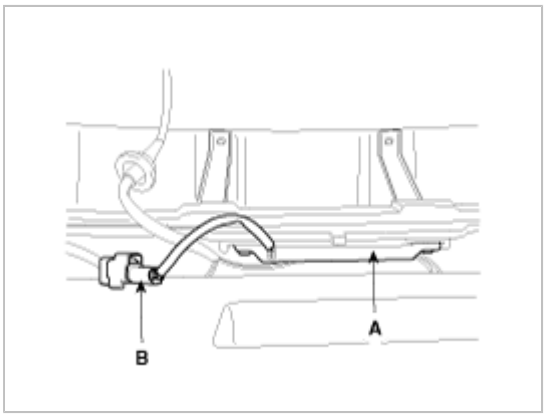


3. Disconnect the interior 2 antenna connector(A) and remove the interior 3 antenna(B) after loosening nut(2EA).



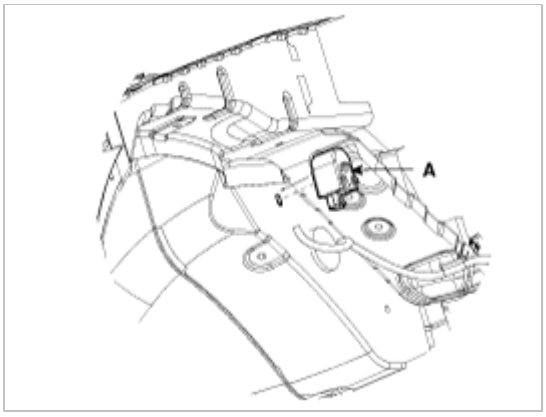
Exterior Bumper Antenna

1. Disconnect the negative(-) battery terminal.
2. Remove the rear bumper.
   (Refer to BD group - "Rear bumper")
3. Disconnect the antenna connector(B) and remove the exterior bumper antenna(A) after loosening the nuts(2EA).



Buzzer

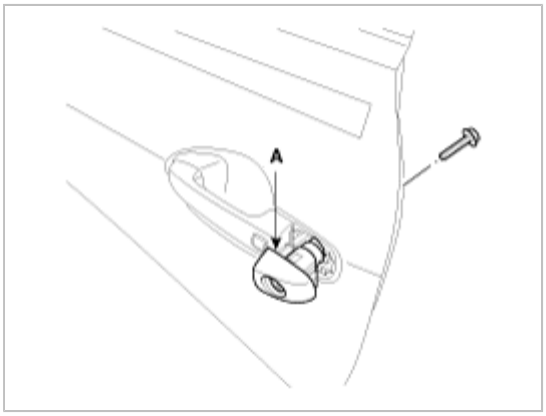
1. Disconnect the negative(-) battery terminal.
2. Remove the left side fender.
   (Refer to BD group - "Fender")
3. Remove the external buzzer(A).



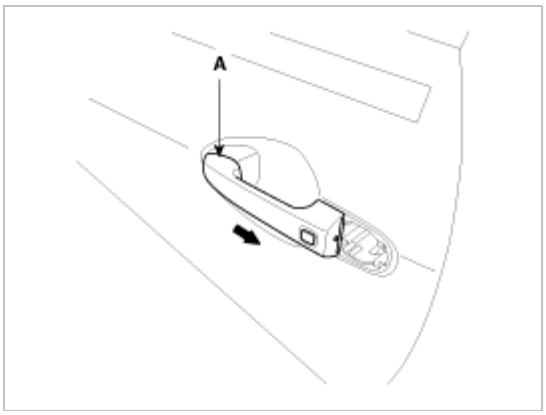
Door Outside Handle

1. Disconnect the negative (-) battery terminal.
2. Disconnect the connector after removing the door trim.
   (Refer to the Body group - "Front door")

3. After loosening the mounting bolt, then remove the key holder (A).



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



Installation

Smart Key Unit

1. Install the smart key unit.
2. Install the smart key unit mounting nut and connector.
3. Install the glove box housing.
4. Install the glove box.
5. Install the negative (-) battery terminal and check the smart key system.

RF Receiver

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

Interior 1 Antenna

1. Install the interior 1 antenna.
2. Install the center fascia lower panel.
3. Install the console upper cover.
4. Install the negative (-) battery terminal and check the smart key system.

Interior 2 Antenna

1. Install the interior 2 antenna.
2. Install the console rear cover after connecting the connector.

3. Install the negative (-) battery terminal and check the smart key system.

Interior 3 Antenna

1. Install the interior 3 antenna.
2. Install the trunk panel.
3. Install the negative (-) battery terminal and check the smart key system.

Exterior Bumper Antenna

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

Buzzer

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

Door Outside Handle

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