Component Procedures: Antitheft and Alarm Systems

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Component Procedures: Antitheft and Alarm Systems

Parts and Labor (itype_189)

Parts

Qualifier	Part #	Name	Price	Note
Anti-Theft Components	96630F2000	Horn	111.19	

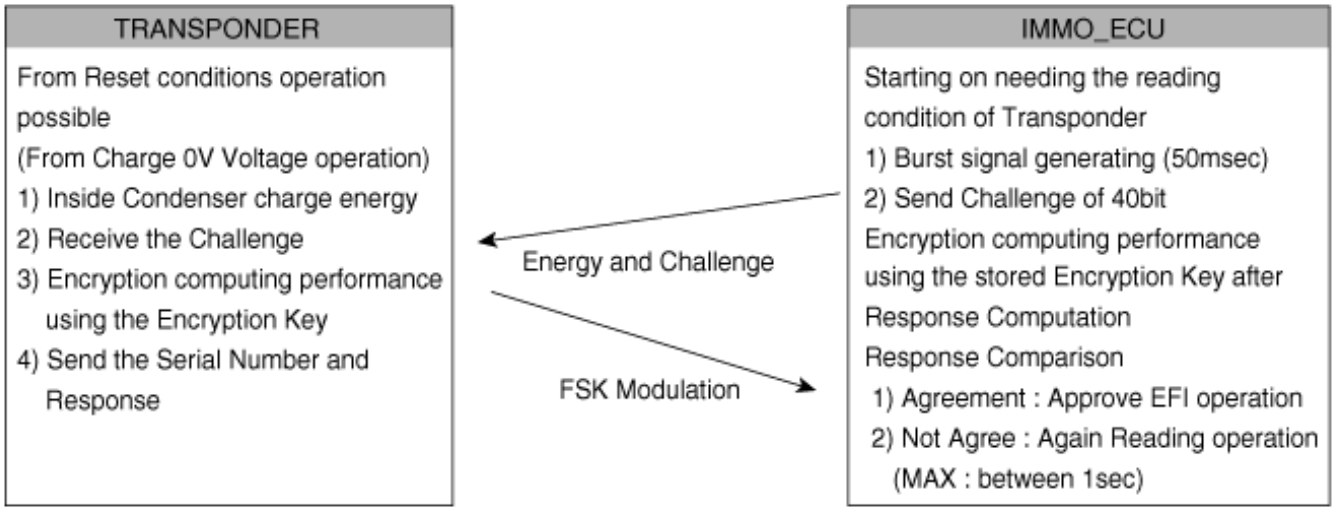
Labor

Operation	Qualifier Path	Skill	Std Hrs	Wty Hrs
Remove & Replace	Anti-Theft Components > Hood Switch, R&R	B	0.2	0.0
Remove & Replace	Anti-Theft Components > Horn, R&R	B	0.6	0.0

Immobilizer System - Description and Operation (Article 44706)

- Description

- Transponder (TP) – IMMO ECU Communication TP Read Protocol IMMO_ECU after IGN on(or CPU Reset cancellation) is sent Challenge to TP and confirmed Serial Number and Signature. When response of input transponder is not correct, input is retry. When response of input transponder is correct, The data that calculate Encryption operation in the EEPROM program compared with received data from TP. When Codes is same, input is finished. If the codes are not same, input are continued until when codes are same. If IMMO_ECU EEPROM code is not programming, when correct transponder is inputted (CRC Check OK), input is finished. After IGN1 on(CPU Reset cancellation), IMMO_ECU is reading the maximum 5times Transponder Code In the IGN1 ON&EMS_state=Lock state, when received ANKNOWLEDGE, TP is re-authenticated



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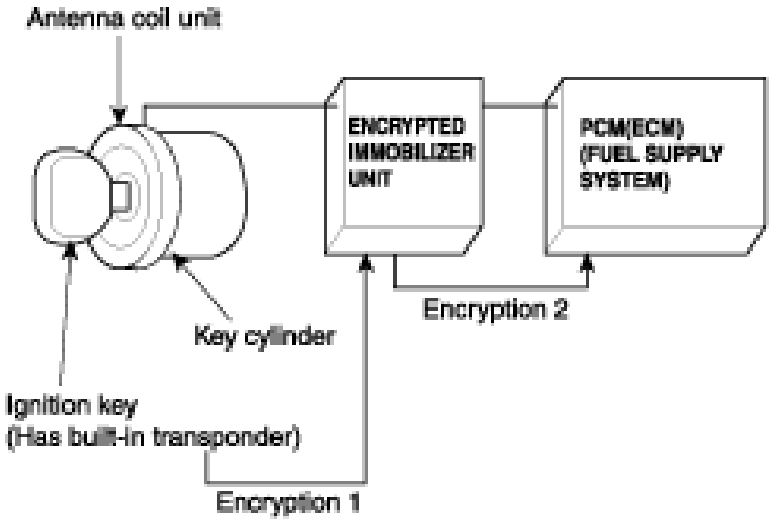
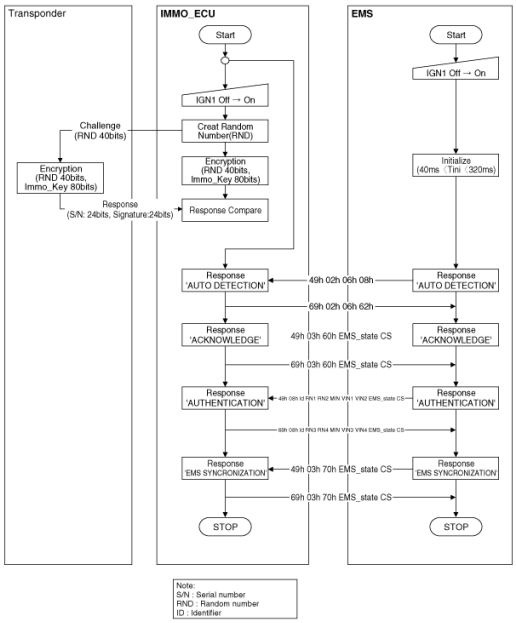


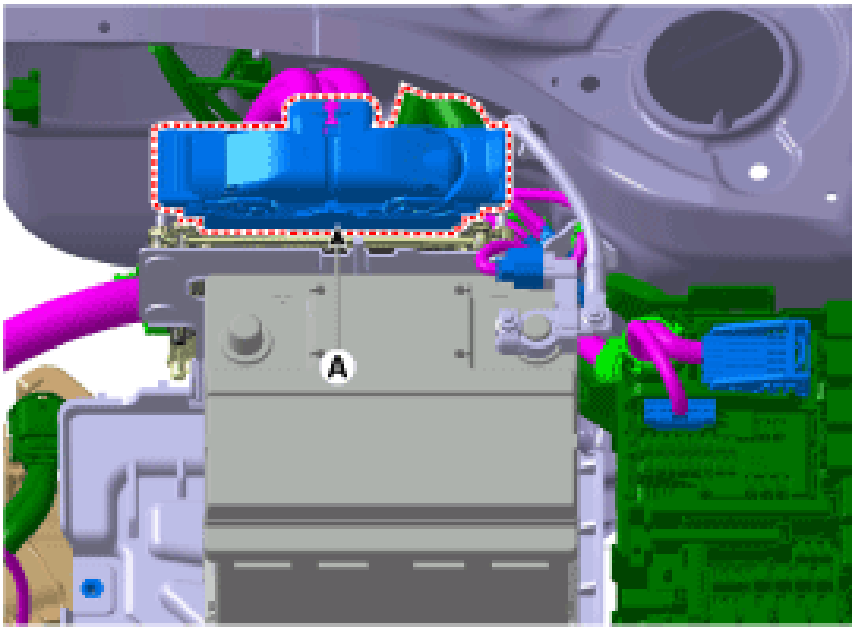
- Transponder / IMMO ECU / EMS authentication



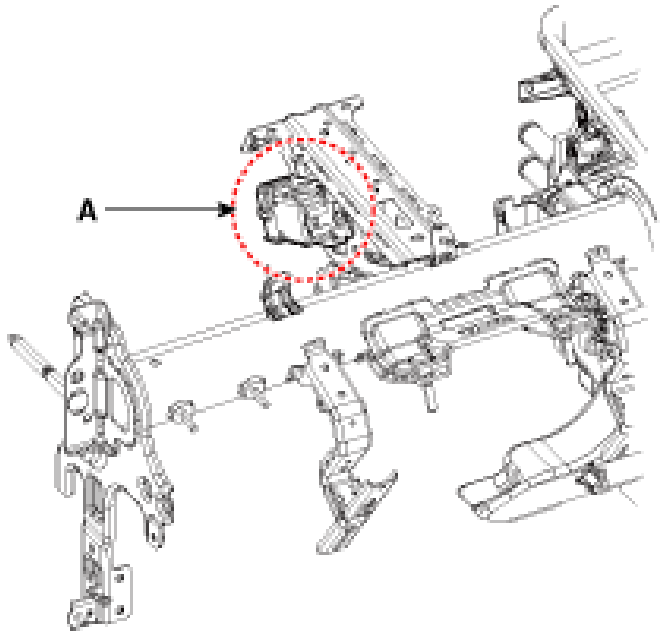
- Components Operations

PCM (Power Train Control Module)

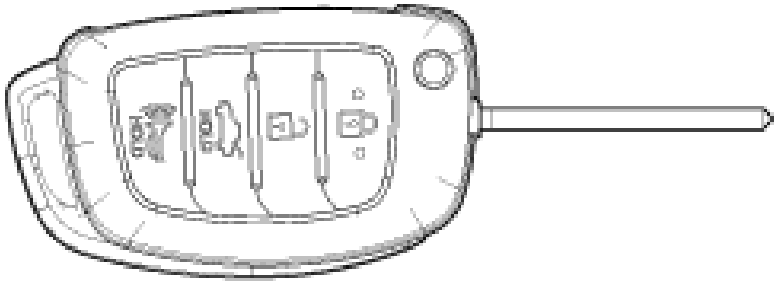
- The PCM (ECM) (A) carries out a check of the ignition key using a special encryption algorithm, which is programmed into the transponder as well as the PCM (ECM) simultaneously. Only if the results are equal, the engine can be started. The data of all transponders, which are valid for the vehicle,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



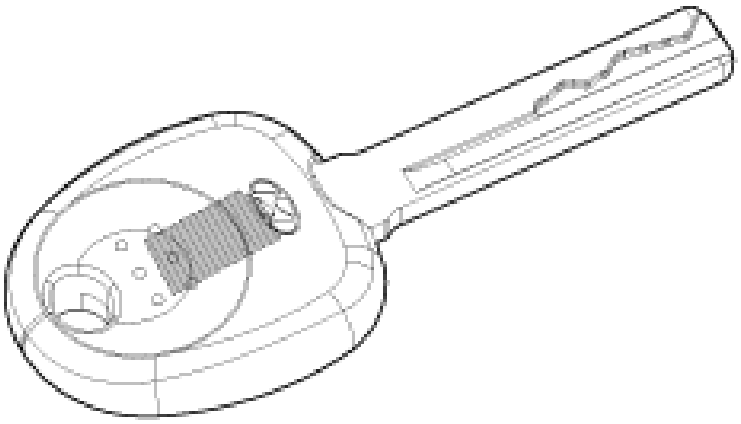
Encrypted Immobilizer Unit (A)



Transponder (Built-in Keys)
[Master Folding Key]

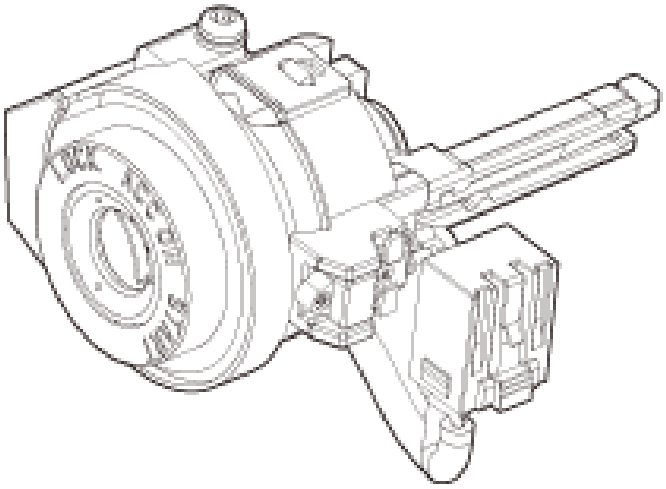


[Assistant Master Key]

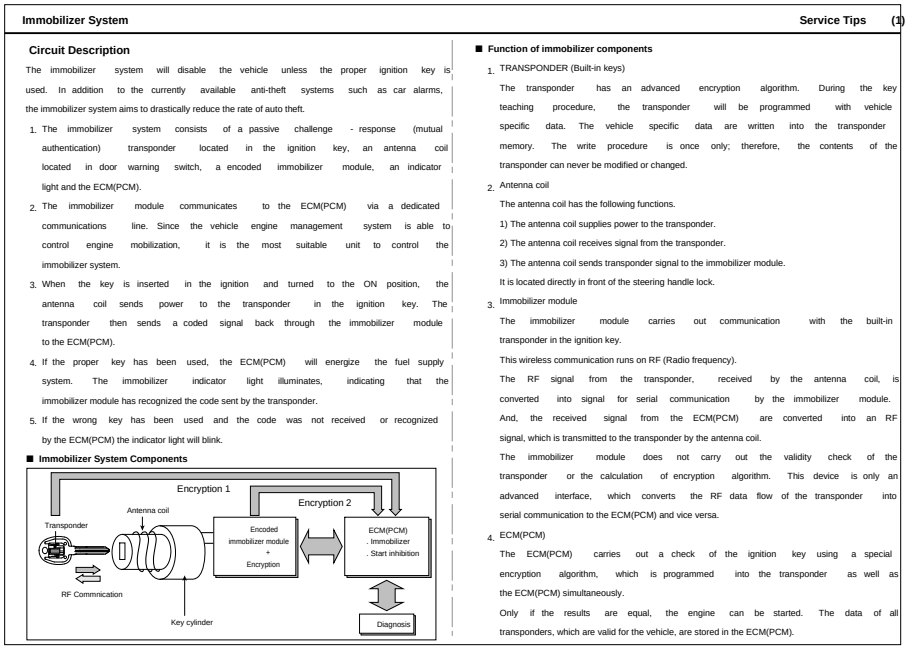


Antenna Coil

- The antenna coil supplies energy to the transponder.
- The antenna coil receives signal from the transponder.
- The antenna coil sends transponder signal to the IMMOBILIZER. It is located directly in front of the steering handle lock.



Immobilizer System - Service Tips (Article 42503)



Immobilizer System **Service Tips (1)**

Circuit Description

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

1. The immobilizer system consists of a passive challenge - response (mutual authentication) transponder located in the ignition key, an antenna coil located in door warning switch, a encoded immobilizer module, an indicator light and the ECM(PCM).
2. The immobilizer module communicates to the ECM(PCM) via a dedicated communications line. Since the vehicle engine management system is able to control engine mobilization, it is the most suitable unit to control the immobilizer system.
3. When the key is inserted in the ignition and turned to the ON position, the antenna coil sends power to the transponder in the ignition key. The transponder then sends a coded signal back through the immobilizer module to the ECM(PCM).
4. If the proper key has been used, the ECM(PCM) will energize the fuel supply system. The immobilizer indicator light illuminates, indicating that the immobilizer module has recognized the code sent by the transponder.
5. If the wrong key has been used and the code was not received or recognized by the ECM(PCM) the indicator light will blink.

■ **Immobilizer System Components**

■ **Function of immobilizer components**

1. TRANSPONDER (Built-in keys)
   The transponder has an advanced encryption algorithm. During the key teaching procedure, the transponder will be programmed with vehicle specific data. The vehicle specific data are written into the transponder memory. The write procedure is once only; therefore, the contents of the transponder can never be modified or changed.
2. Antenna coil
   The antenna coil has the following functions.
   1) The antenna coil supplies power to the transponder.
   2) The antenna coil receives signal from the transponder.
   3) The antenna coil sends transponder signal to the immobilizer module.
   It is located directly in front of the steering handle lock.
3. Immobilizer module
   The immobilizer module carries out communication with the built-in transponder in the ignition key.
   This wireless communication runs on RF (Radio frequency).
   The RF signal from the transponder, received by the antenna coil, is converted into signal for serial communication by the immobilizer module. And, the received signal from the ECM(PCM) are converted into an RF signal, which is transmitted to the transponder by the antenna coil.
   The immobilizer module does not carry out the validity check of the transponder or the calculation of encryption algorithm. This device is only an advanced interface, which converts the RF data flow of the transponder into serial communication to the ECM(PCM) and vice versa.
4. ECM(PCM)
   The ECM(PCM) carries out a check of the ignition key using a special encryption algorithm, which is programmed into the transponder as well as the ECM(PCM) simultaneously.
   Only if the results are equal, the engine can be started. The data of all transponders, which are valid for the vehicle, are stored in the ECM(PCM).

Keyless Entry and Burglar Alarm - Description and Operation (Article 44799)

- Description

Burglar Alarm State [B/A State]

B/A State Description

DISARM In "DISARM" state, no vehicle start inhibition. So, when door, hood, or Tailgate is opened, there is no alarm sound and flashing. If the battery is disconnected while the state is not "ARM/ARMWAIT/ALARM/REARM", B/A state is set to "DISARM" state. In “DISARM” state, security indicator keeps blinking.

- In "DISARM" state, no vehicle start inhibition. So, when door, hood, or Tailgate is opened, there is no alarm sound and flashing.
- If the battery is disconnected while the state is not "ARM/ARMWAIT/ALARM/REARM", B/A state is set to "DISARM" state.
- In “DISARM” state, security indicator keeps blinking.

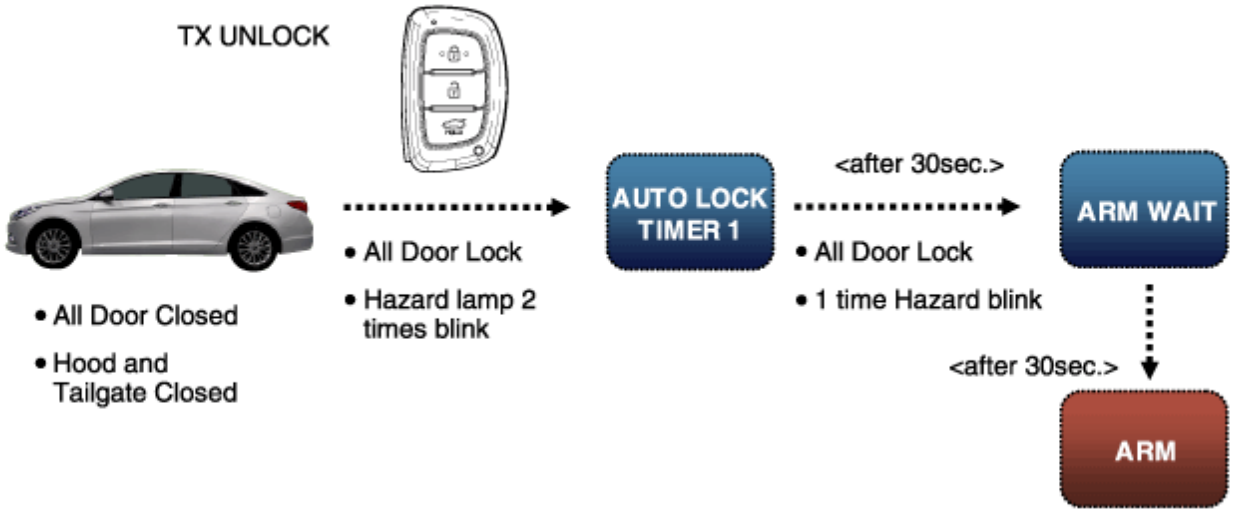
ARMWAIT In "ARMWAIT" state, when timer “30sec." is running, if this timer reaches “30sec”, state transits to "ARM" state. If the battery is disconnected while the state is "ARMWAIT", B/A state is set to "ARMWAIT" state and timer "30sec" is restarted. In “ARMWAIT” state, security indicator keeps on.

- In "ARMWAIT" state, when timer “30sec." is running, if this timer reaches “30sec”, state transits to "ARM" state.
- If the battery is disconnected while the state is "ARMWAIT", B/A state is set to "ARMWAIT" state and timer "30sec" is restarted.
- In “ARMWAIT” state, security indicator keeps on.

[ARM WAIT Procedure]

AUTO LOCK TIMER 1 In "AUTOLOCKTIMER1" state, timer “30sec."is running. If this timer expired, the auto lock command is generated “Lock command”. When “Lock command” operated, All Door changed lock and closed then B/A state changes “AUTOLOCKTIMER1” to “ARMWAIT In "AUTOLOCKTIMER1" state, Security Indicator keeps blinking. In "AUTOLOCKTIMER1" state, timer “30sec."is running. If this timer expired, the auto lock command is generated “Lock command”. When “Lock command” operated, All Door changed lock and closed then B/A state changes “AUTOLOCKTIMER1” to “ARMWAIT
- In "AUTOLOCKTIMER1" state, timer “30sec."is running. If this timer expired, the auto lock command is generated “Lock command”.
- When “Lock command” operated, All Door changed lock and closed then B/A state changes “AUTOLOCKTIMER1” to “ARMWAIT
- In "AUTOLOCKTIMER1" state, Security Indicator keeps blinking. In "AUTOLOCKTIMER1" state, timer “30sec."is running. If this timer expired, the auto lock command is generated “Lock command”. When “Lock command” operated, All Door changed lock and closed then B/A state changes “AUTOLOCKTIMER1” to “ARMWAIT

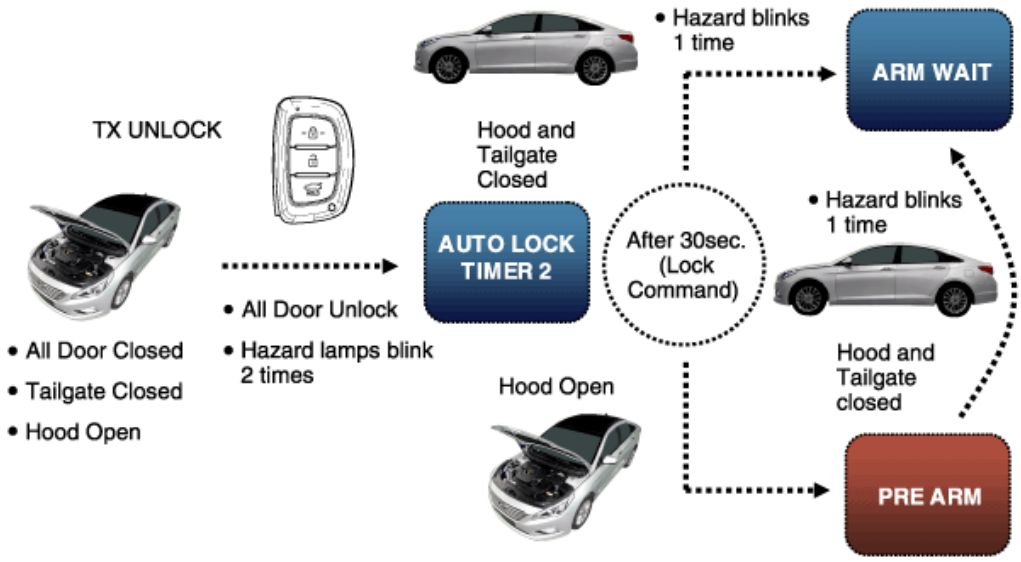
[AUTO LOCK TIMER 1 Procedure]



AUTO LOCK TIMER 2 In "AUTOLOCKTIMER2" state, when timer “30sec."is running, if this timer expired, the auto lock command is generated “Lock command”. All doors are Locked, Hood is closed and Tailgate is closed when “Lock command” operated, then B/A state changes to“AUTOLOCKTIMER2” when “Lock Command” generated with Hood open. When “Unlock command” operated on the condition of All Door closed and Hood open, B/A state changes to “AUTOLOCKTIMER2”. In "AUTOLOCKTIMER2" state, Security Indicator keeps blinking.

- In "AUTOLOCKTIMER2" state, when timer “30sec."is running, if this timer expired, the auto lock command is generated “Lock command”.
- All doors are Locked, Hood is closed and Tailgate is closed when “Lock command” operated, then B/A state changes to“AUTOLOCKTIMER2” when “Lock Command” generated with Hood open.
- When “Unlock command” operated on the condition of All Door closed and Hood open, B/A state changes to “AUTOLOCKTIMER2”.
- In "AUTOLOCKTIMER2" state, Security Indicator keeps blinking.

[AUTO LOCK TIMER 2 Procedure]



PRE ARM The "PREARM" state is when user try to change to arm but pre-condition are not satisfied (door open, tailgate open, or hood open). B/A state changes to “PREARM” when TX Lock command occurs with any door Open, Hood or Tailgate Open. B/A state changes to “PREARM” when “30sec.” timer expired in“AUTOLOCKTIMER2”with Hood or Tailgate Open The “PREAMR” state changes to “ARM” when all doors closed, All doors locked and Hood and Tailgate closed. The “PREAMR” state changes to “DISARM” when Any Door Unlock In this state, Security indicator keeps blinking.

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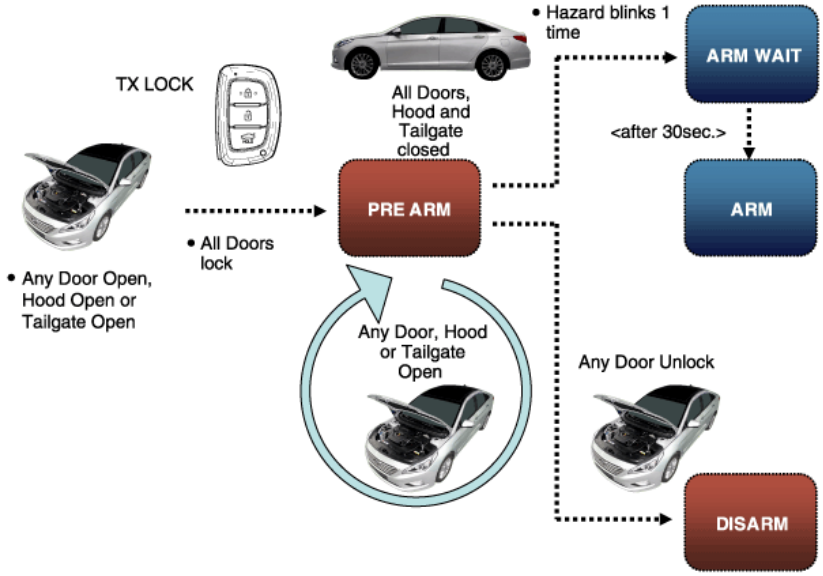
- B/A state changes to “PREARM” when TX Lock command occurs with any door Open, Hood or Tailgate Open.
- B/A state changes to “PREARM” when “30sec.” timer expired in“AUTOLOCKTIMER2”with Hood or Tailgate Open
- The “PREAMR” state changes to “ARM” when all doors closed, All doors locked and Hood and Tailgate closed.
- The “PREAMR” state changes to “DISARM” when Any Door Unlock
- In this state, Security indicator keeps blinking.

[PRE ARM Procedure]



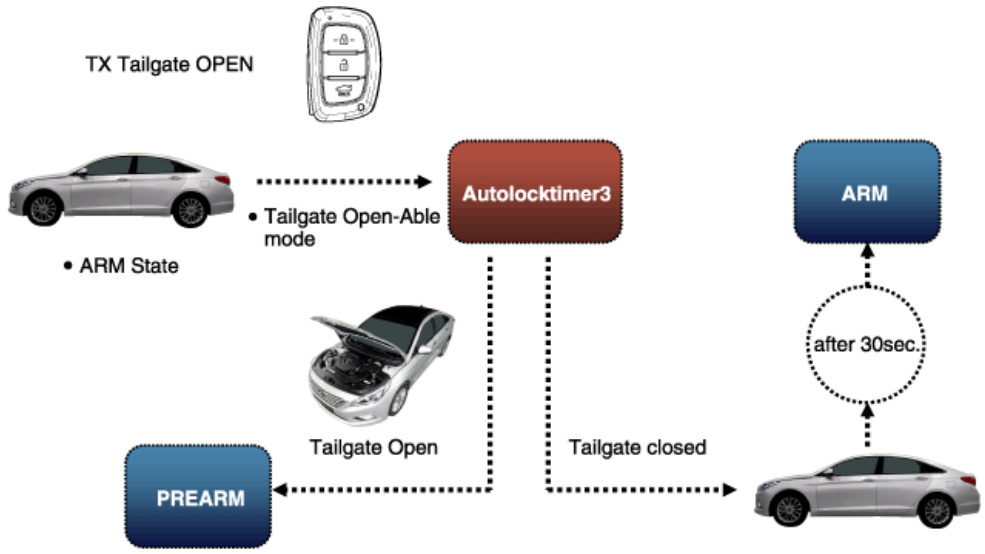
RE ARM In "REARM" state, if the vehicle intrusion is detected, flashing and sound is restarted, again and state transits to "ALARM" state. B/A state changes to “REARM” after the timer “27sec.” expires in “ALARM” state with All doors closed and lock. Security Indicator keeps blinking.

- In "REARM" state, if the vehicle intrusion is detected, flashing and sound is restarted, again and state transits to "ALARM" state.
- B/A state changes to “REARM” after the timer “27sec.” expires in “ALARM” state with All doors closed and lock.
- Security Indicator keeps blinking.

AUTOLOCK TIMER3 B/A state changes to “AUTOLockTIMER3”, when TX-Tailgate command operated. B/A state changes “AUTOLOCKTIMER3” to “ARMWAIT”, when the “30sec.” timer expires with all doors lock and closed. B/A state changes “AUTOLOCKTIMER3” to “DISARM”, when any door open. In "AUTOLOCKTIMER3" state, timer “30sec.“ timer is running. If this timer expired, state transits to "PREARM" state with Tailgate Open. In this state, Security indicator keeps blinking

- B/A state changes to “AUTOLockTIMER3”, when TX-Tailgate command operated.
- B/A state changes “AUTOLOCKTIMER3” to “ARMWAIT”, when the “30sec.” timer expires with all doors lock and closed.
- B/A state changes “AUTOLOCKTIMER3” to “DISARM”, when any door open.
- In "AUTOLOCKTIMER3" state, timer “30sec.“ timer is running. If this timer expired, state transits to "PREARM" state with Tailgate Open.
- In this state, Security indicator keeps blinking

[AUTOLOCKTIMER 3 Procedure]



ARM HOLD (Alarm hold : Trunk) ■Non-PTL option The ARM HOLD mode is similar to the trunk alarm hold mode for current cars. If the trunk is opened by a remote controller (including the smart key) in the ARM mode, the Hold mode will be turned on, in which the theft alarm is held for the trunk. As long as the trunk is opened, ARM HOLD mode continues. When the trunk is closed, the 30-second timer is activated. Since the ARM HOLD mode is on for 30 seconds, the theft alarm is not issued even though the trunk is opened. ARM mode is on as soon as 30 seconds after the trunk is closed. Even in ARM HOLD mode, the door and hood are in the ARM mode. They issue alarms normally when a theft occurs. The security indicator keeps flickering during ARM HOLD time.

- The ARM HOLD mode is similar to the trunk alarm hold mode for current cars.
- If the trunk is opened by a remote controller (including the smart key) in the ARM mode, the Hold mode will be turned on, in which the theft alarm is held for the trunk.
- As long as the trunk is opened, ARM HOLD mode continues.
- When the trunk is closed, the 30-second timer is activated. Since the ARM HOLD mode is on for 30 seconds, the theft alarm is not issued even though the trunk is opened.
- ARM mode is on as soon as 30 seconds after the trunk is closed.
- Even in ARM HOLD mode, the door and hood are in the ARM mode. They issue alarms normally when a theft occurs.
- The security indicator keeps flickering during ARM HOLD time.

RE ARM (ARM mode is on again) If the door, hood and trunk are all closed after the termination of ALARM mode, it means that the ARM mode is on again. 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). The security indicator keeps flickering during this mode.

- If the door, hood and trunk are all closed after the termination of ALARM mode, it means that the ARM mode is on again.
- 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).
- The security indicator keeps flickering during this mode.

RESET When the battery is removed in ALARM or RE ARM mode, RESET mode is on. When the battery is installed after RESET, the theft alarm operation resumes. (instead of remained output, 27 seconds ON/10 seconds OFF output in three times

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- When the battery is installed after RESET, the theft alarm operation resumes. (instead of remained output, 27 seconds ON/10 seconds OFF output in three times

KEY ON 30 second deactivation (Non-Smart Key option) For non-smart cars, a 30-second standby with the ignition key on during ALARM mode will deactivate the theft alarm status. 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 start proposition control: The immobilizer system is applied by default and the engine start by the registered immobilizer key is allowed though during alarming.) ■In a smart key vehicle, the alarm is deactivated instantly after the smart key authentication.

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When ARM mode is on, the trunk OPEN and central door unlock are not allowed. From the moment that the remote controller or smart key based all door lock is activated and ARM standby mode (ARM WAIT) is on, the central door unlock switch of the indoor trunk unlock switch or DDM & ADM (driver seat power window switch & passenger seat power window switch) is disabled. (theft prevention) ■This function works in the same in ARM WAIT, ARM, ALARM and RE ARM modes.
- From the moment that the remote controller or smart key based all door lock is activated and ARM standby mode (ARM WAIT) is on, the central door unlock switch of the indoor trunk unlock switch or DDM & ADM (driver seat power window switch & passenger seat power window switch) is disabled. (theft prevention) ■This function works in the same in ARM WAIT, ARM, ALARM and RE ARM modes.

Smart Key Module System - Service Tips (Article 42554)

Smart Key Module System **Service Tips (1)**

Circuit Description

The SMART KEY system allows the driver 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 driver carries a SMART KEY FOB which does not require any conscious actions by the driver (e.g. operate a RKE button). The SMART KEY system is triggered by pressing a push button in the door handle.

■ Role of Main Components

1. Smart Key Control Module :
   1) Controls Power Supply Relay (ACC, IG1, IG2, Start).
   2) Transmits Passive Lock/Unlock signal to BCM via B-CAN.
   3) Transmits Authorization information through serial communication with ECM/PCM (Engine Start Permission).
   4) Antenna operation & Smart Key Authorization.
   5) Diagnosis Function (Communicate with Diagnosis Tool through K-Line).
   6) Sets Engine status & Transmission specification automatically using C-CAN information.
   7) Verifies Immobilizer communication data and Authorize.
2. Smart Key Outside Handle :
   1) Detects Smart Key on the outside of door area (LF Antenna Built-in).
   2) Passive Lock / Unlock (Button Type).
3. Smart Key Bumper Antenna : Detects Smart Key on the outside of trunk area (LF Antenna Built-in).
4. Instrument Cluster : Immobilizer Indicator, Warning Buzzer Output, Warning Message.
5. Smart Key Antenna (Interior) : Detects Smart Key in interior area.
6. Smart Key Trunk Antenna : Detects Smart Key in trunk area.
7. Start Stop Button (SSB) : is used for the Engine Start Stop and Power transfer.
8. Power Distribution Relay : SMK's power distribution control relay (ACC, IG1, IG2, Start).
9. Smart Key : It transmits Unique ID and Remote Control Signal in wireless.
10. External Buzzer : It generates various warning alerts or confirmation alerts when passive lock / unlock operate.
11. ECM/PCM :
    1) It transmits Information (Engine OFF/ Cranking/ Engine Start/ ETC..) of Engine Status via C-CAN.
    2) It communicates Engine Start Authorization related information with Smart Key Control Module.
12. Trunk Lid Handle Switch : It inputs Switch Signal for Passive Trunk Open Control.

Smart Key System - Description and Operation (Article 44774)

- Description
- Passive unlock via 4 doors
- Passive locking via4 doors
- Passive start
- Passive access trunk via the trunk lid switch at the trunk
- 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
- Passive unlock The system allows the user to access (unlock) the vehicle without performing any actions with the SMART KEY FOB.
- Passive locking The system allows the user to lock the vehicle by pushing a button on door handle with the SMART KEY FOB.
- 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.
- 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)

- 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

Smart Key FOB

- Passive functionality: receives LF-challenge and sends automatically RF response.
- Classic RKE function by action up to 4 push buttons.
- Transponder-functionality in case of a flat battery or a disturbed communication.

Antennas

- 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. 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 tailgate. Up to three antennas cover the vehicle's interior and the trunk or tailgate interior: two in the passenger compartment and one in the tailgate room or trunk.
- 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).
- Receiver The SMART KEY FOB's response is received via the RF receiver.

Door Handle

Push Button

- Operation

Passive Functions

Operating Range

Passive Access (Passive Entry)

Passive Locking (Exit)

- 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

Passive Trunk Warning (Sedan Only)

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

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- A blind spot in the trunk similar to any RF disturbance may lead to no trunk warning

Smart Trunk

Function is set through the User Setting Mode (USM) in the Cluster.

- Rear bumper antenna detects valid Smart Key in the vicinity.
- When a valid Smart Key enters the rear bumper antenna range, alert buzzer and hazard lamp is activated 1 time to acknowledge detection. 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.

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- 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.
- 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 trunk is opened.

Smart Key Reminder 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.
- Event: At least 1 door knob status changed from unlock to lock.
- 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.
- 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

Smart Key Reminder 2

- 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)
- Vehicle action : Closing last door or trunk with knobs locked state, or with a locking in progress
- 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.
- 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)

Smart Key Door Lock Warning

Door Lock Warning 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.
- If no valid Fob is found no action is required, but if a valid Fob is found then a Buzzer warning shall be started.
- If "b_Trunk Option == On" and "b_Trunk LockUnlockOption == On" are fullfilled, Lock warning is including tailgate as a door and tailgate lockunlock knob as a door unlock switch.

Door Lock Warning 2

- 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.

Door Lock Warning 3

- 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;
- 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.

Smartkey Lamp Warning

- 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.
- 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)

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

User Information Functions

ID OUT Warning

- Preconditions : (ACC or IGN1) & (any door open or trunk open)
- (ACC or IGN1) & (any door open or trunk open)
- Event: The last opened door is closed
- SMK action: SMK searches for a SMART KEY FOB in the interior. 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.
- 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.
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.
- 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

Learning Description

Learning MODE

Teaching MODE

Teaching MODE Procedure Description (Step By Step)

- 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

Smart key teaching

Push the smart key #1 to SSB
↓
SMK start to learn
↓
Input the PIN code
↓
Smart key #1 learnt
↓
SMK learnt
↓
Pull out smart key #1
↓
Push the smart key #2 to SSB
↓
Smart key #2 learnt

- Smart key and transponder are programmed simultaneously.

<Smart key neutralization mode>

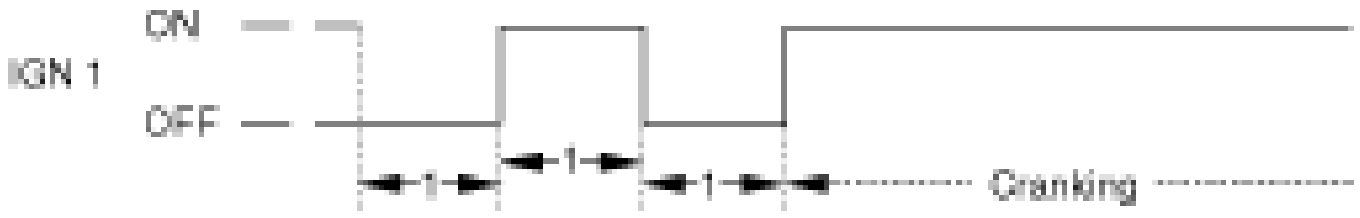
- Neutralization mode is for replacing Smart key unit, ECM easily.
- It is possible that smart key is learnt again, after neutralizing Smart key system.
- Virgin start (twice ignition) is impossible in neutralized condition

<Lock by timer>

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

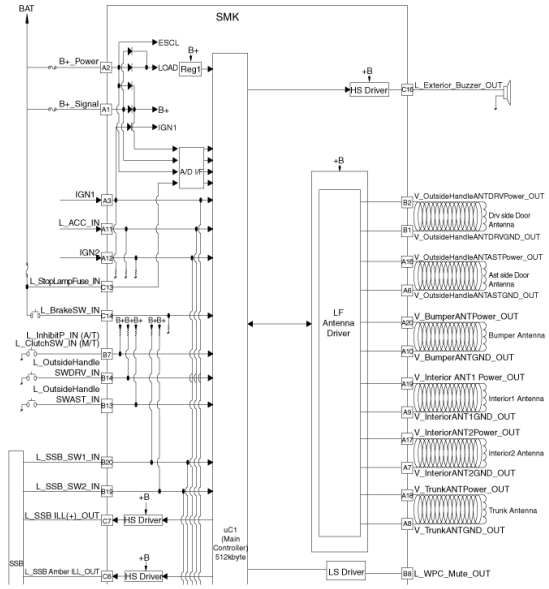
Starting After Replacing (Virgin Start)

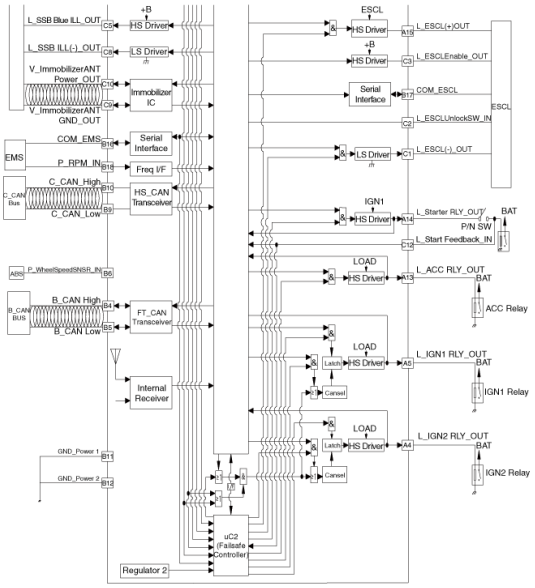
- It is for starting at virgin condition
- All related parts are virgin condition (Smart key, ECM)
- Press brake pedal in P or N range
- Push the start button once with virgin smart key.



Smart Key Unit - Schematic Diagrams (Article 44783)

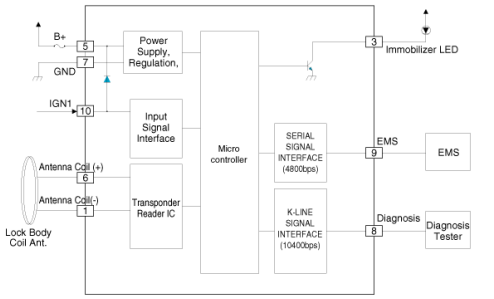
- Circuit Diagram

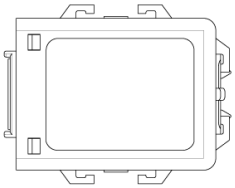




Immobilizer System - Schematic Diagrams (Article 44704)

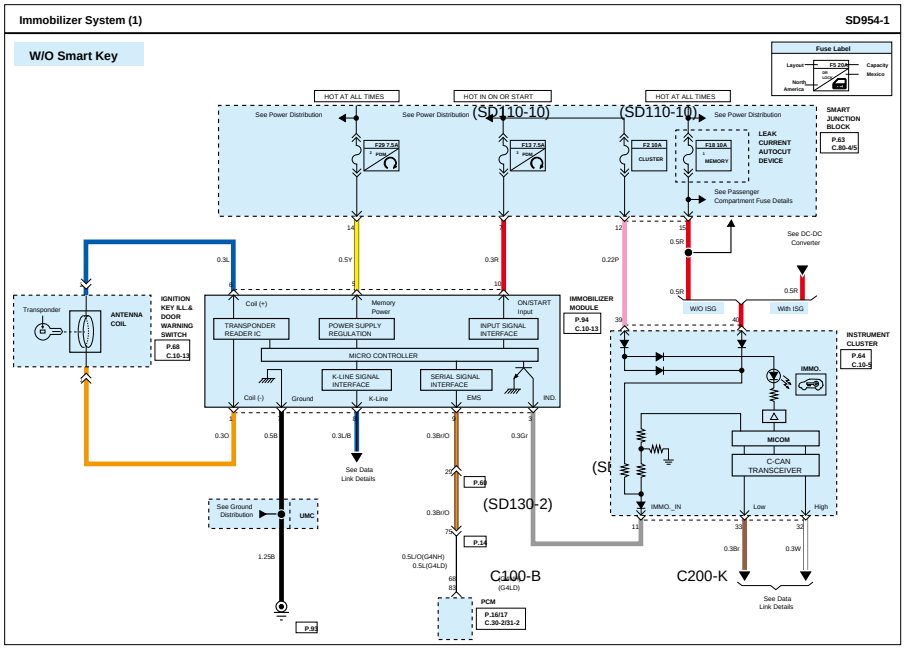
- Circuit Diaram





NO	Description
1	Coil (-)
2	-
3	Immobilizer_LED
4	-
5	Battery
6	Coil (+)
7	GND
8	Diagnostic taster
9	EMS
10	IGN1

Immobilizer System - Schematic Diagrams (Article 42502)

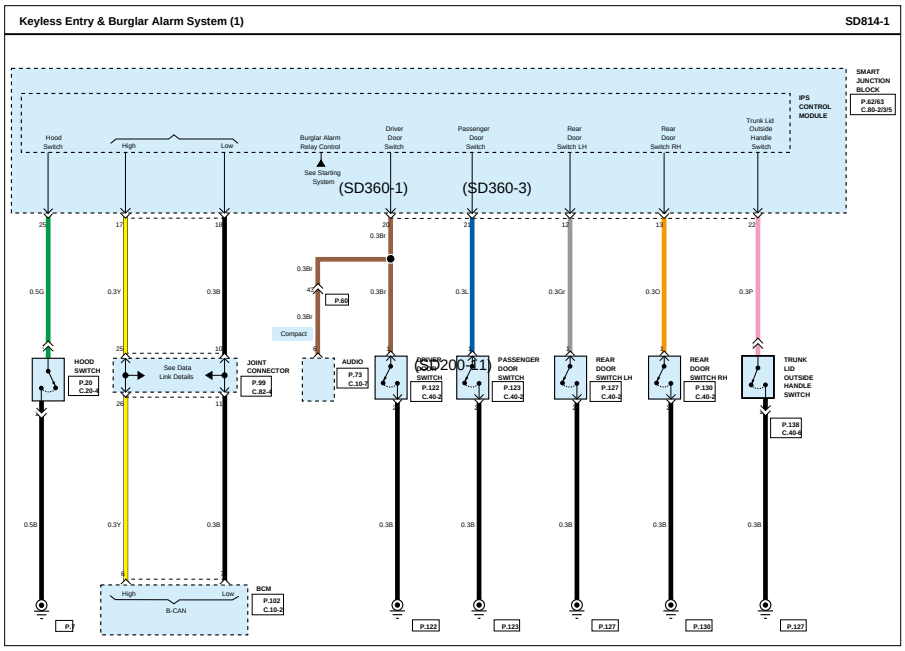


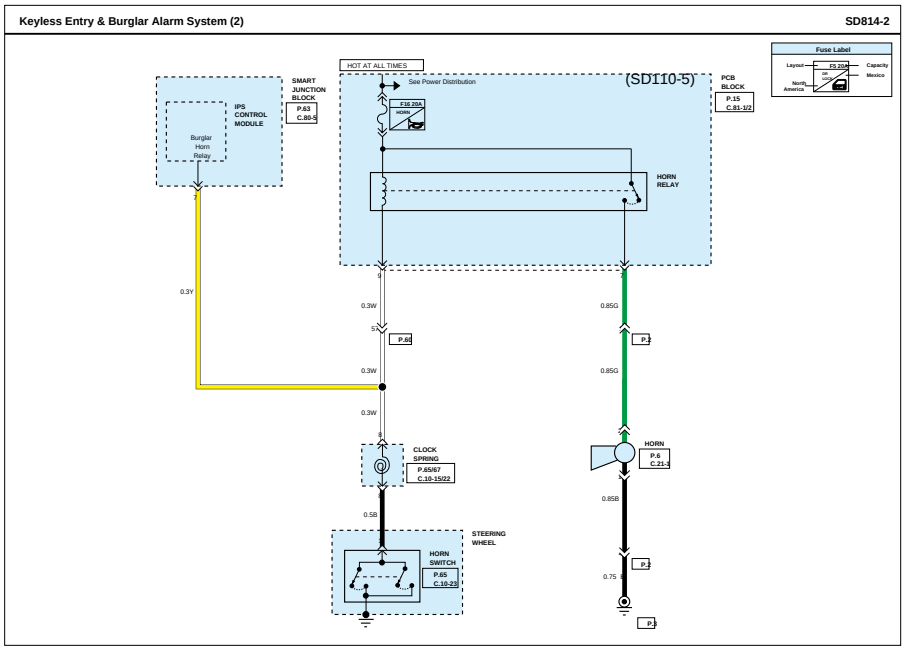
(SD120-10)

(SD953-1) (SD953-2)

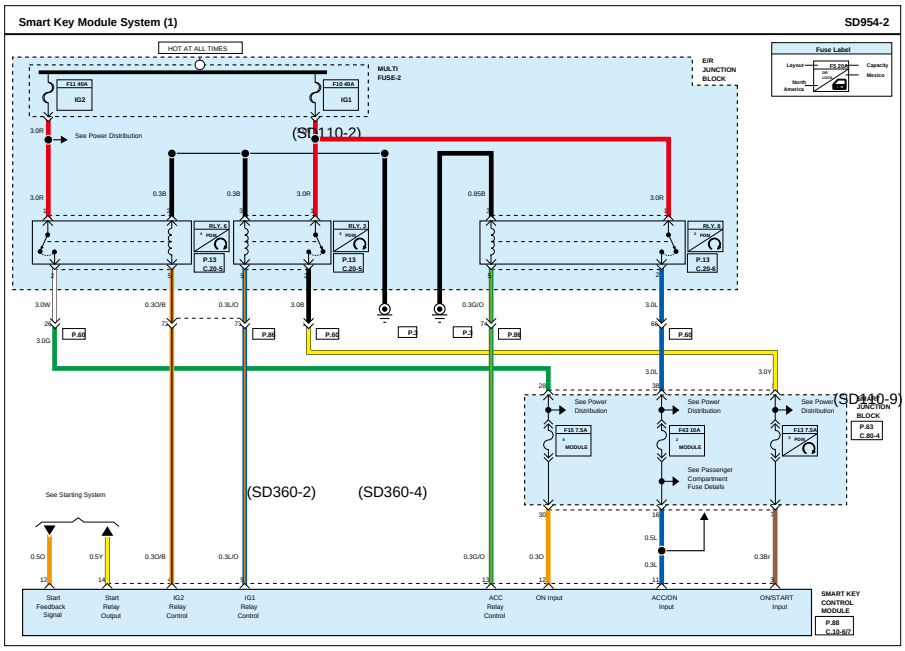
(SD200-8)

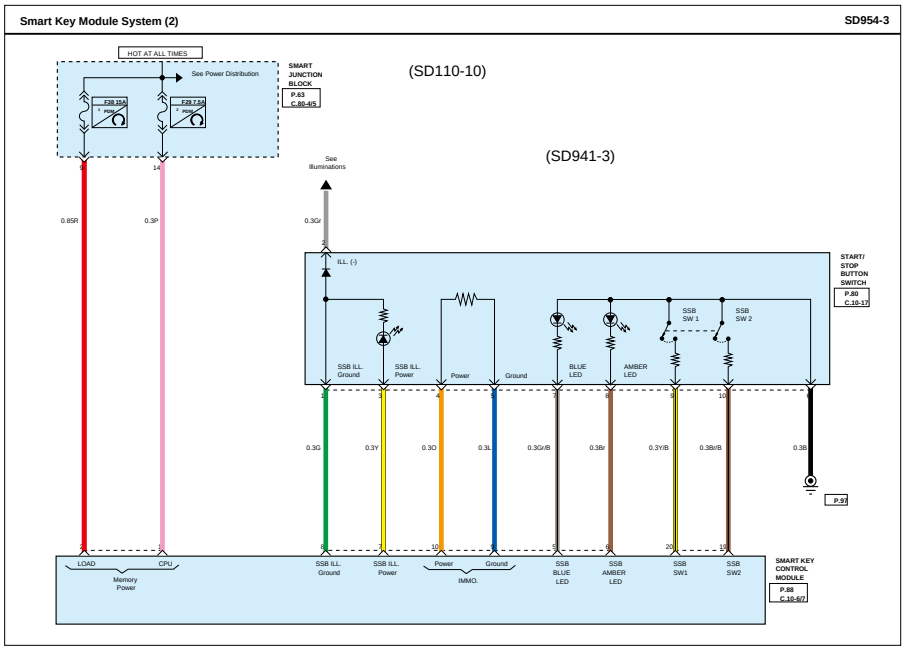
Keyless Entry & Burglar Alarm System - Schematic Diagrams (Article 42518)

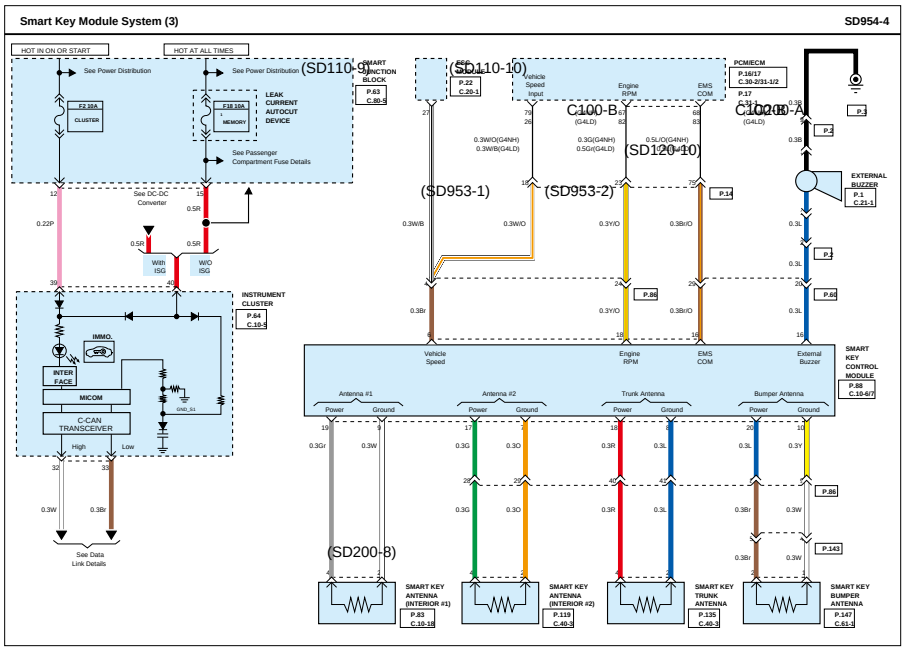


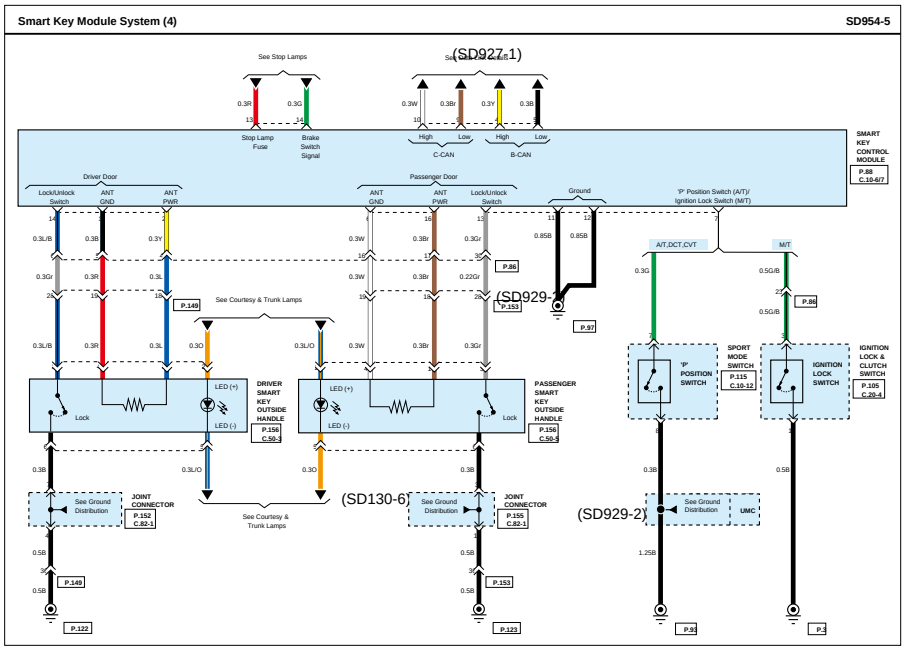


Smart Key Module System - Schematic Diagrams (Article 42547)

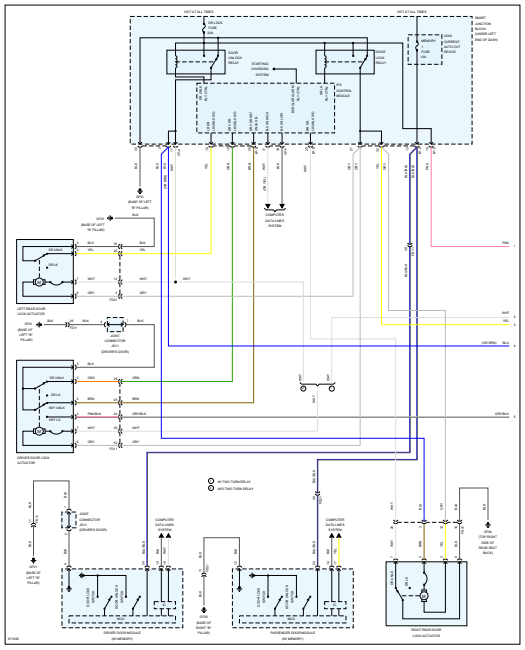

Smart Key Module System (1)
SD954-2
HOT AT ALL TIMES
MULTI FUSE-2
F11 40A
IG2
F10 40A
IG1
E/R JUNCTION BLOCK
Fuse Label
See Power Distribution
(SD110-2)
RLY 6
RLY 5
P.13 C.20-5
P.13 C.20-6
P.60
P.86
P.3
(SD110-9)
(SD110-9)
(SD110-9)
F15 7.5A
MODULE
F43 10A
F13 7.5A
P.63 C.80-4
See Passenger Compartment Fuse Details
(SD120-1)
See Starting System
(SD360-2)
(SD360-4)
Start Feedback Signal
Start Relay Output
IG2 Relay Control
IG1 Relay Control
ACC Relay Control
ON Input
ACC/ON Input
ON/START Input
SMART KEY CONTROL MODULE
P.88 C.10-6/7


Smart Key Module System (2)
SD954-3
HOT AT ALL TIMES
See Power Distribution
SMART JUNCTION BLOCK
P.63 C.80-4/5
(SD110-10)
(SD941-3)
See Illuminations
ILL. (-)
START/ STOP BUTTON SWITCH
P.80 C.10-17
SSB SW 1
SSB SW 2
SSB ILL. Ground
SSB ILL. Power
Power
Ground
BLUE LED
AMBER LED
P.97
LOAD
CPU
Memory Power
IMMO.
SMART KEY CONTROL MODULE
P.88 C.10-6/7

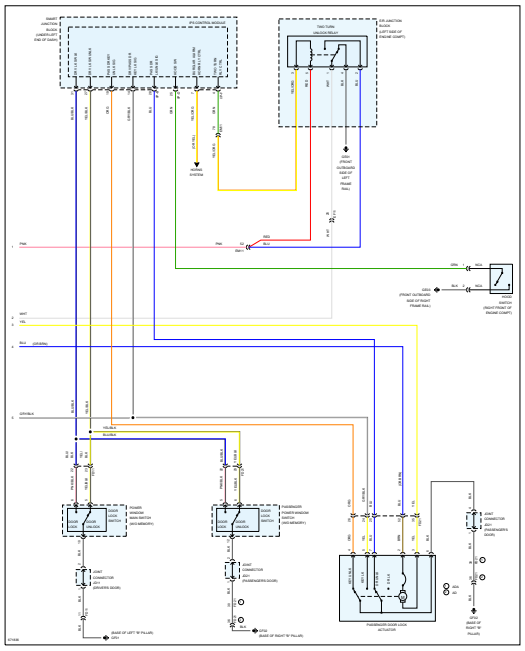




Anti-Theft - Forced Entry Circuit (Article 11732)



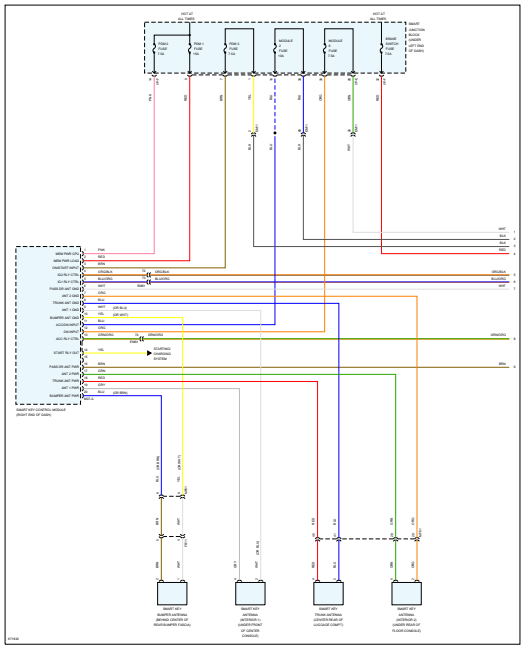
Page 2 of 2



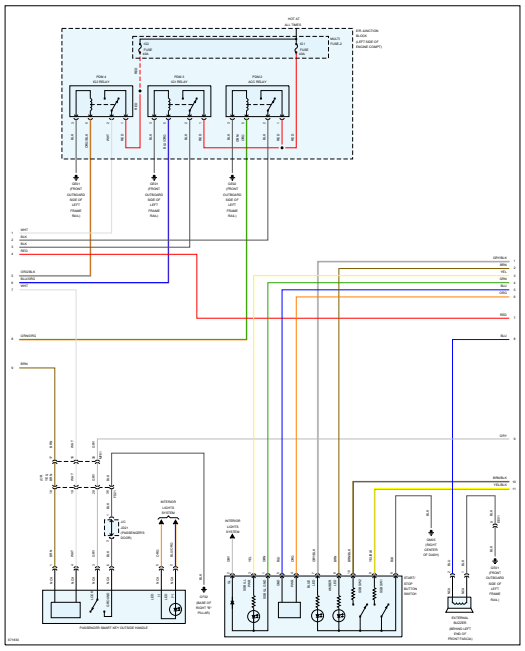
Anti-Theft - Immobilizer Circuit (W/ Smart Key System) (Article 11724)

Anti-Theft - Immobilizer Circuit (W/ Smart Key System)

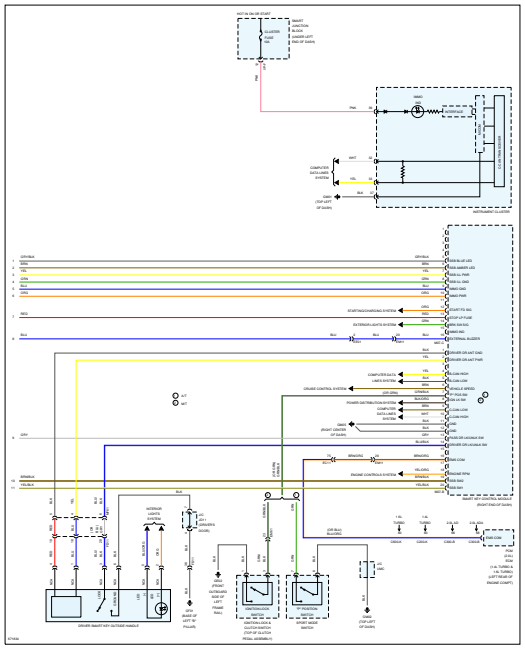
Page 1 of 3



Page 2 of 3

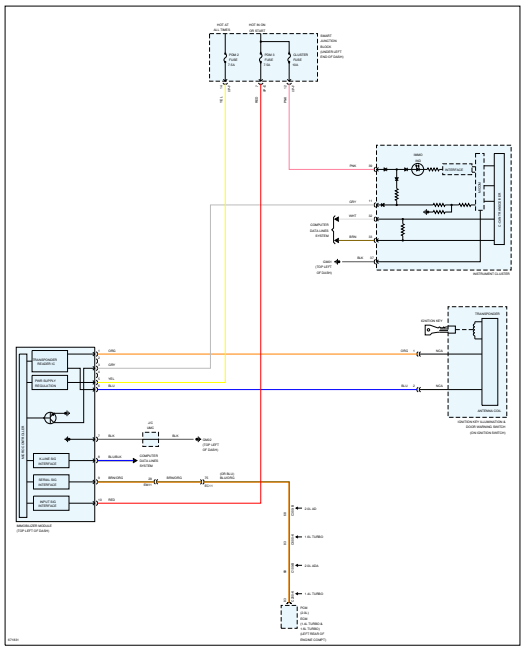


Page 3 of 3



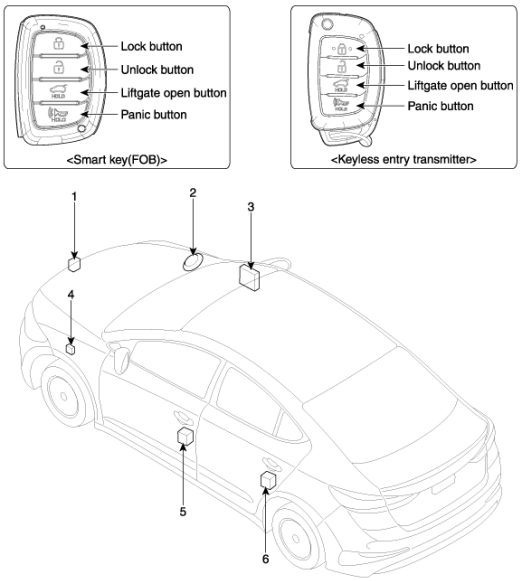
Anti-Theft - Immobilizer Circuit (W/O Smart Key System) (Article 11651)

Anti-Theft - Immobilizer Circuit (W/O Smart Key System)



Keyless Entry and Burglar Alarm - Components and Components Location (Article 44797)

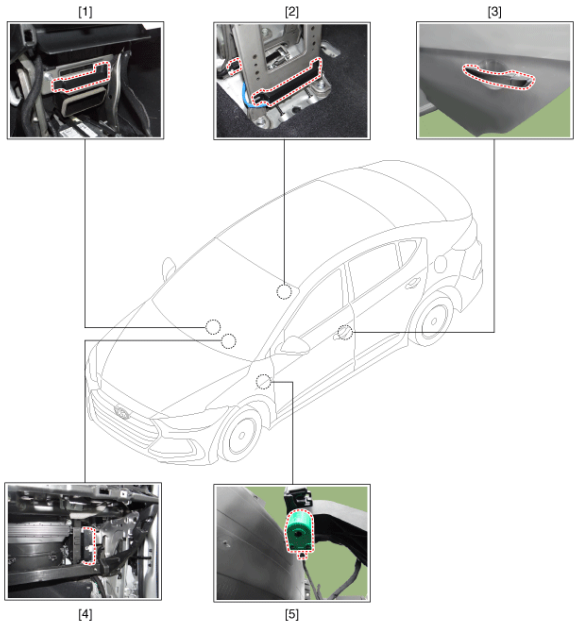
- Component Location



1. Hood switch 2. Burglar horn 3. BCM 4. Door lock / unlock buzzer 5. Front door switch 6. Rear door switch

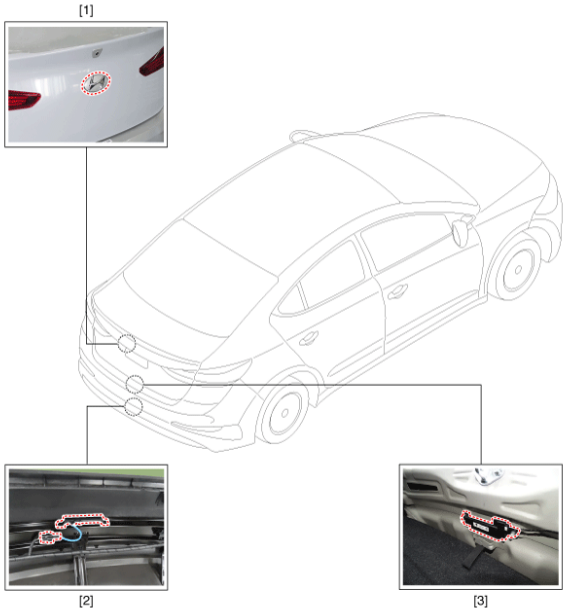
Smart Key System - Components and Components Location (Article 44771)

- Component Location (1)



1. Interior antenna 1 2. Interior antenna 2 3. Door outside handle 4. Smart key unit (SMK) 5. Buzzer

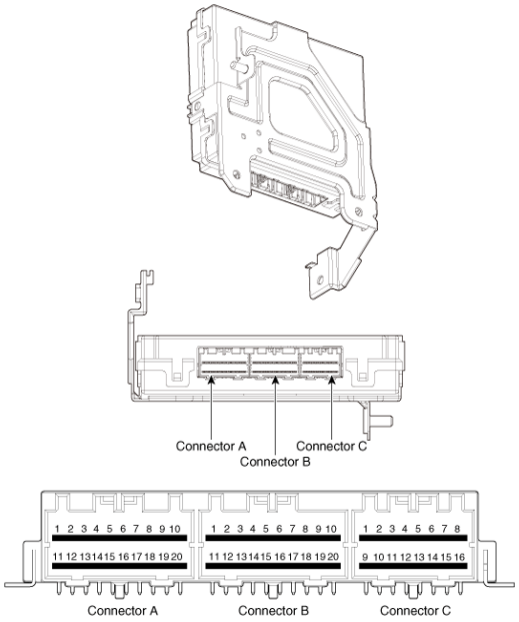
- Component Location (2)



1. Trunk open switch 2. Bumper antenna 3. Trunk atenna

Smart Key Unit - Components and Components Location (Article 44780)

- Components (1)



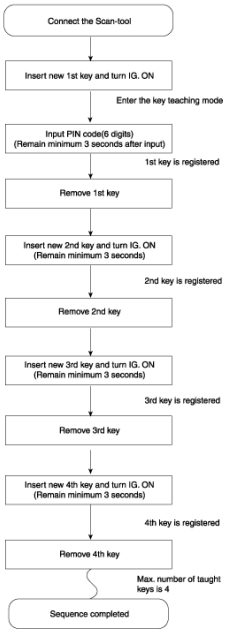
No Connector A Connector B Connector C
1 BAT (+)_Signal Driver's door antenna _GND -
2 BAT (+)_Power Driver's door antenna_Power -
3 IGN 1 - -
4 IGN 2_Relay output B-CAN (High) -
5 IGN 1_Relay output B-CAN (Low) SSB LED (Blue)
6 Assist door antenna_GND Wheel speed sensor SSB LED (Amber)
7 Interior antenna 2_GND AT : 'P' signal input MT : Clutch switch signal input SSB Illumination (+)
8 Trunk antenna_GND WPC Mute SSB Illumination (-)
9 Interior antenna 1_GND C-CAN (Low) Immoblizer antenna_GND
10 Bumpper antenna_GND C-CAN (High) Immoblizer antenna_Power
11 ACC GND 1 -
12 IGN2 GND 2 Start signal feedback
13 ACC_Relay output Assist door switch_signal Stop lamp fuse

14 Starter_Relay output Driver's door switch_signal Brake switch
15 - - -
16 Assist door antenna_Power EMS CAN Exterior buzzer
17 Interior antenna 2_Power -
18 Trunk antenna_Power RPM_Input
19 Interior antenna 1_Power SSB switch2
20 Bumpper antenna_Power SSB switch1

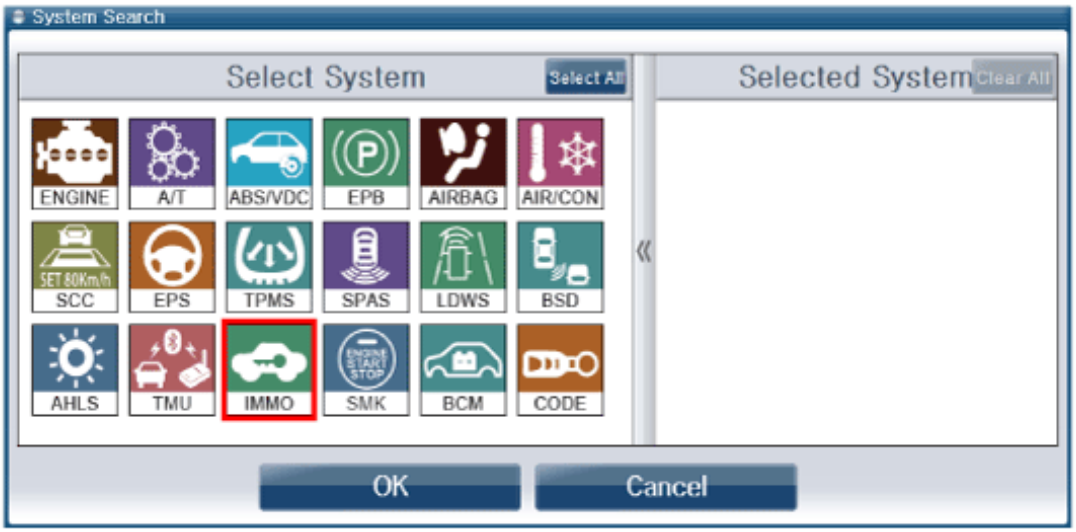
Immobilizer System - Repair Procedures (Article 44707)

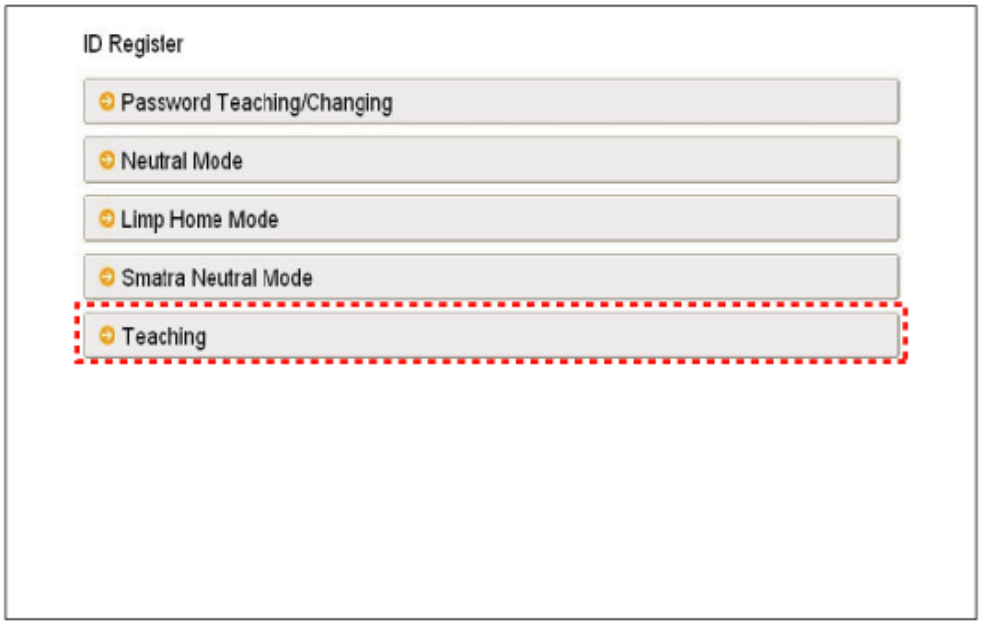
- Teaching Procedures
- Key Teaching Procedure Key teaching must be done after replacing a defective PCM (ECM) or when providing additional keys to the vehicle owner. The procedure starts with an PCM (ECM) request for vehicle specific data (PIN code : 6digits) from the tester. The "virgin" PCM (ECM) stores the vehicle specific data and the key teaching can be started. The "learnt" PCM (ECM) compares the vehicle specific data from the tester with the stored data. If the data are correct, the teaching can proceed. If incorrect vehicle specific data have been sent to the PCM (ECM) three times, the PCM (ECM) will reject the request of key teaching for one hour. This time cannot be reduced by disconnecting the battery or any other manipulation. After reconnecting the battery, the timer starts again for one hour. The key teaching is done by ignition on with the key and additional tester commands. The PCM (ECM) stores the relevant data in the EEPROM and in the transponder. Then the PCM (ECM) runs the authentication required for confirmation of the teaching process. The successful programming is then confirmed by a message to the tester. If the key is already known to the PCM (ECM) from a previous teaching, the authentication will be accepted and the EEPROM data are updated. There is no changed transponder content (this is impossible for a learnt transponder). The attempt to repeatedly teach a key, which has been taught already during the same teaching cycle, is recognized by the PCM (ECM). This rejects the key and a message is sent to the tester. The PCM (ECM) rejects invalid keys, which are presented for teaching. A message is sent to the tester. The key can be invalid due to faults in the transponder or other reasons, which result from unsuccessful programming of data. If the PCM (ECM) detects different authenticators of a transponder and an PCM (ECM), the key is considered to be invalid. The maximum number of taught keys is 4. If an error occurs during the Immobilizer Service Menu, the PCM (ECM) status remains unchanged and a specific fault code is stored. If the PCM (ECM) status and the key status do not match for teaching of keys, the tester procedure will be stopped and a specific fault code will be stored at PCM (ECM). When teaching the 1st key, Smartra regists at the same time. PCM (ECM) learnt status. PCM (ECM) virgin status. After replacing new "PCM (ECM)" GDS displays that PCM (ECM) is virgin status in Key Teaching mode. "VIRGIN" status means that PCM (ECM) has not matched any PIN code before.
When teaching the 1st key, Smartra regists at the same time.

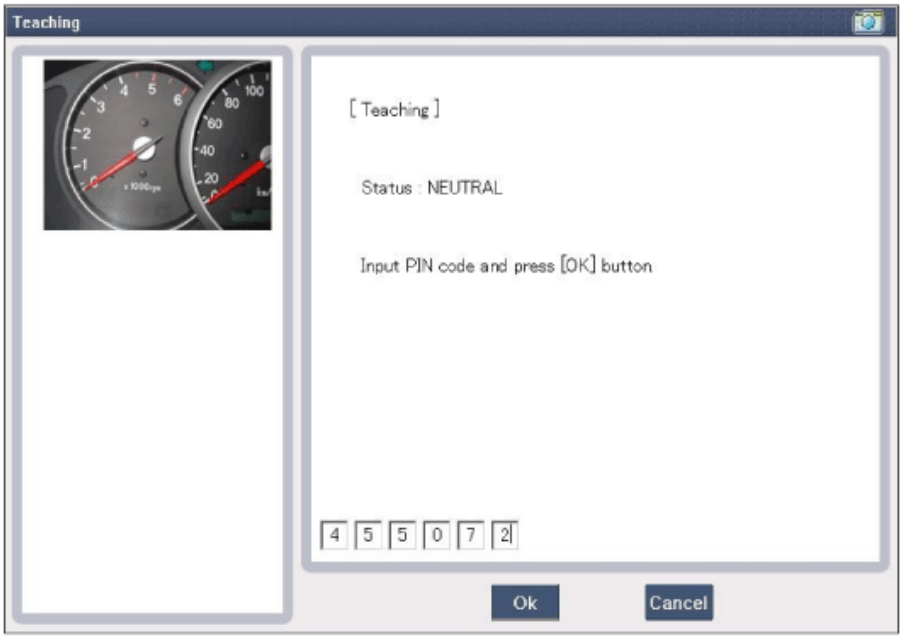
- When teaching the 1st key, Smartra regists at the same time.

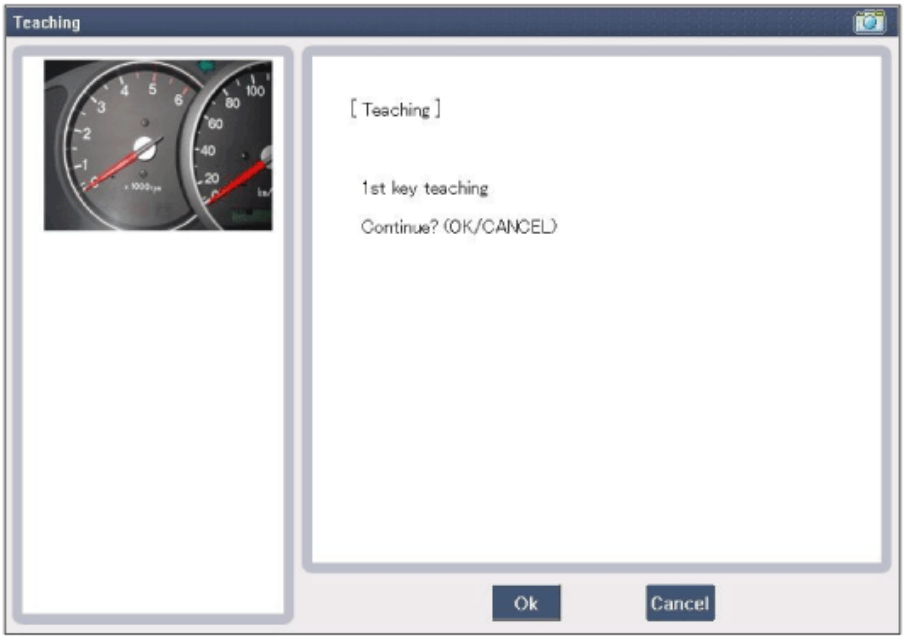


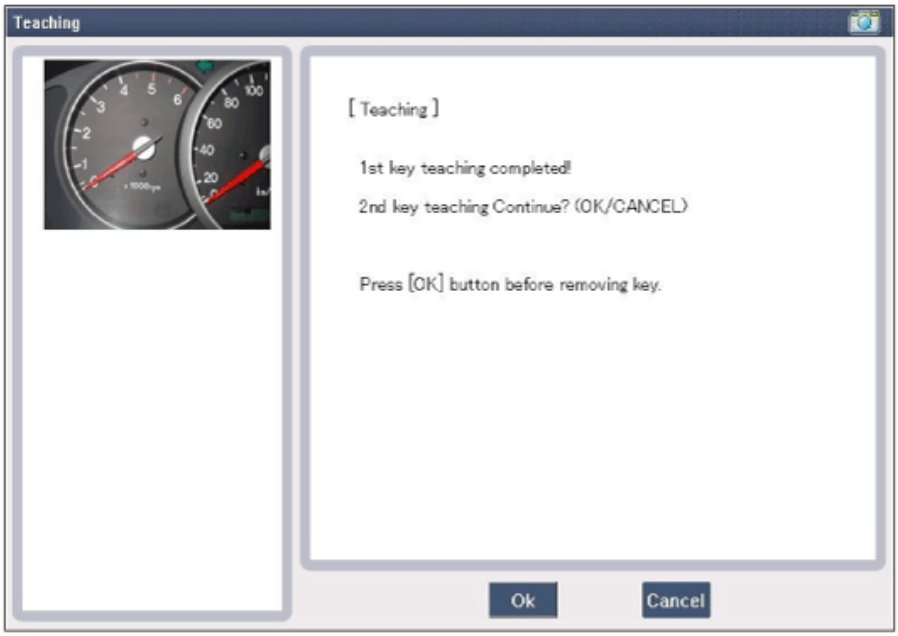
- PCM (ECM) learnt status.

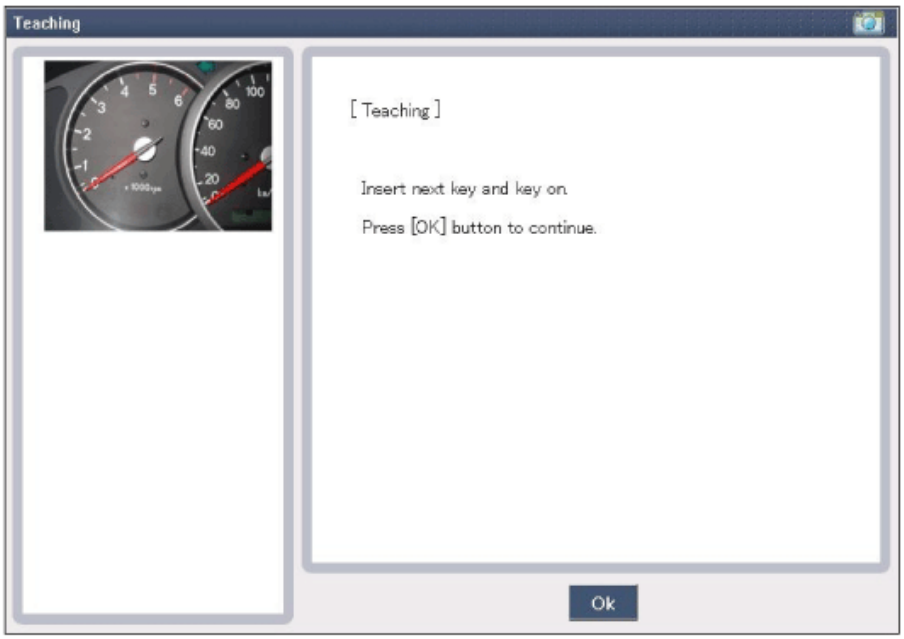


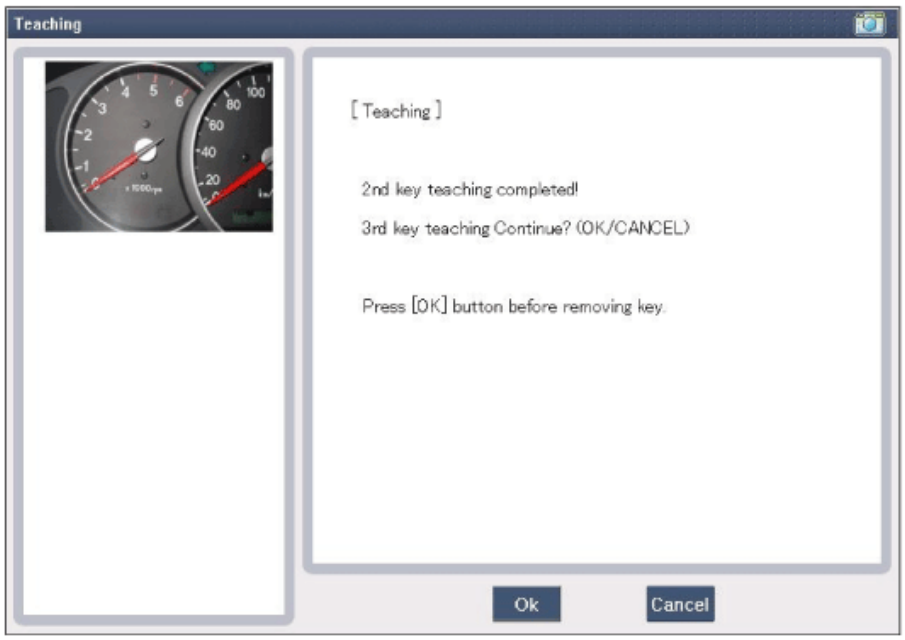

ID Register
Password Teaching/Changing
Neutral Mode
Limp Home Mode
Smatra Neutral Mode
Teaching

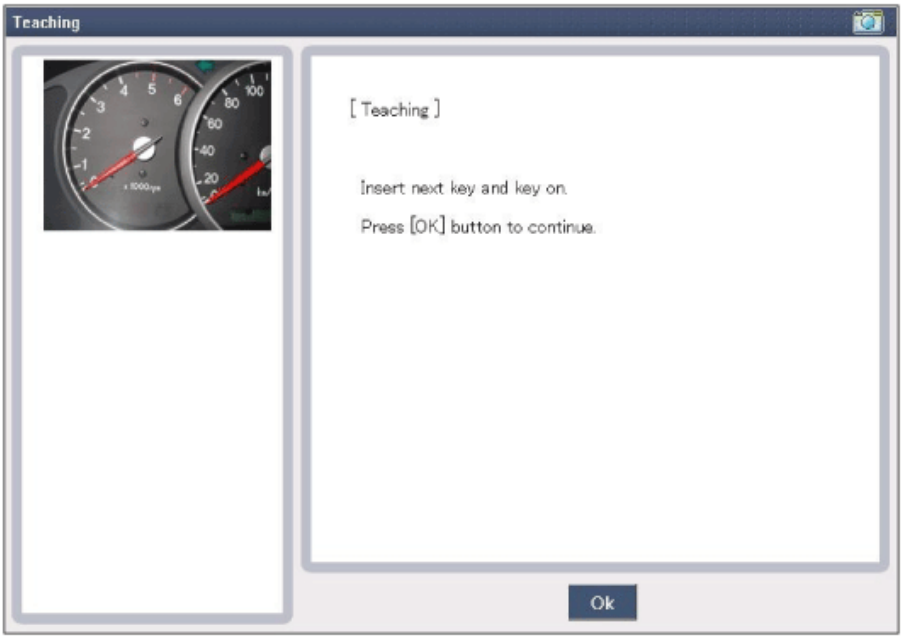

Teaching
[Teaching]
Status : NEUTRAL
Input PIN code and press [OK] button
4 5 5 0 7 2
Ok
Cancel

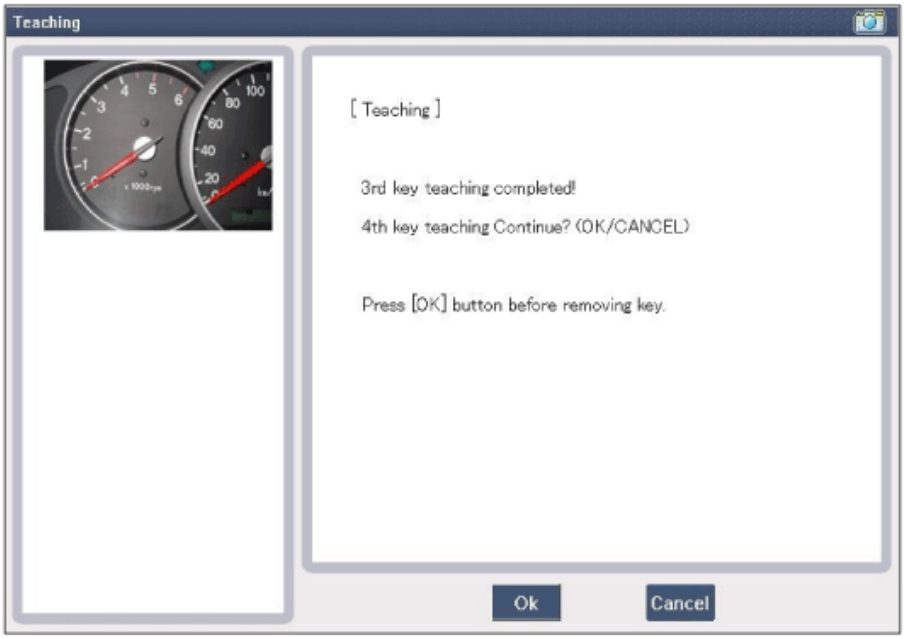

Teaching
[Teaching]
1st key teaching
Continue? (OK/CANCEL)
Ok
Cancel

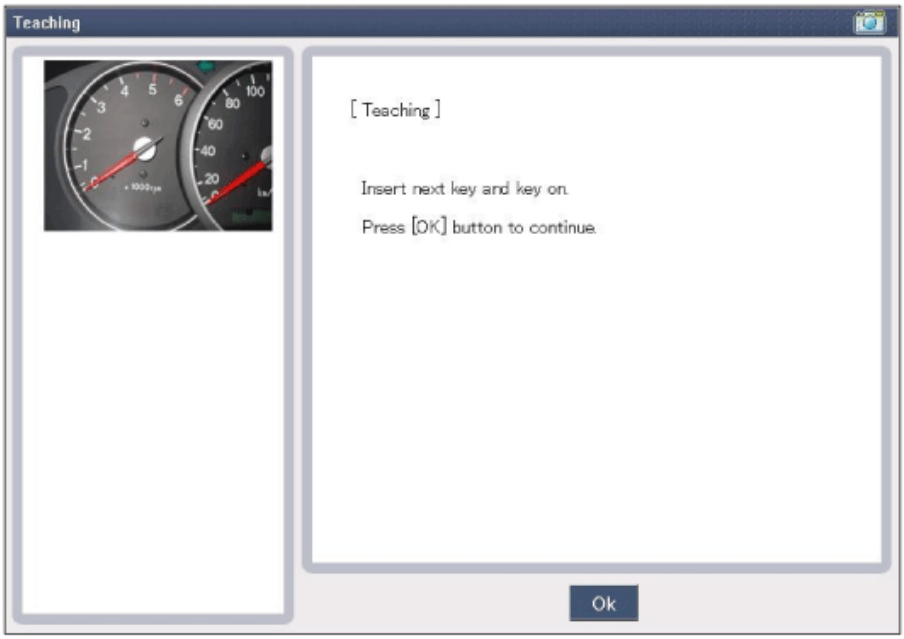

Teaching
[Teaching]
1st key teaching completed!
2nd key teaching Continue? (OK/CANCEL)
Press [OK] button before removing key.
Ok
Cancel

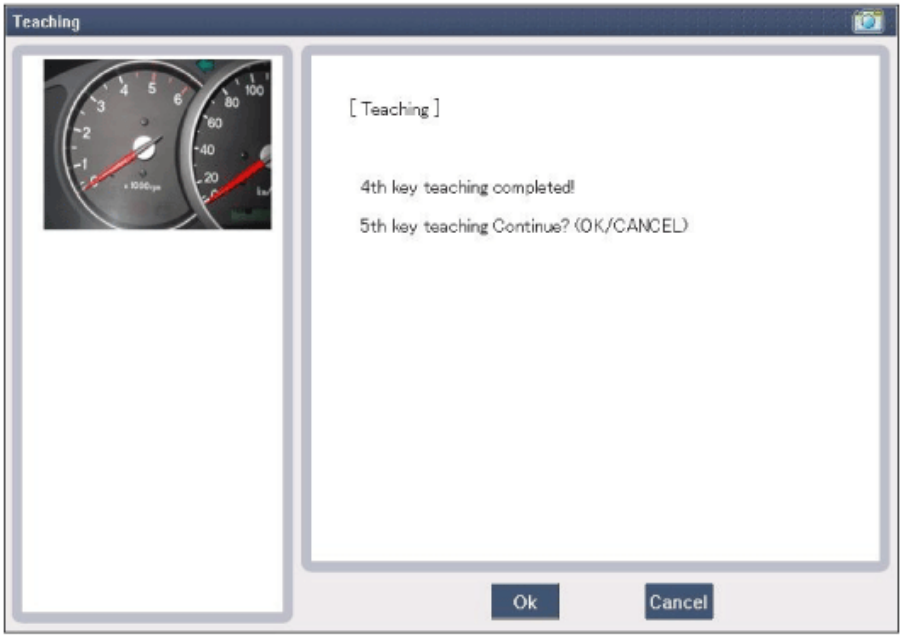

Teaching
[Teaching]
Insert next key and key on.
Press [OK] button to continue.
Ok


Teaching
[Teaching]
2nd key teaching completed!
3rd key teaching Continue? (OK/CANCEL)
Press [OK] button before removing key.
Ok
Cancel

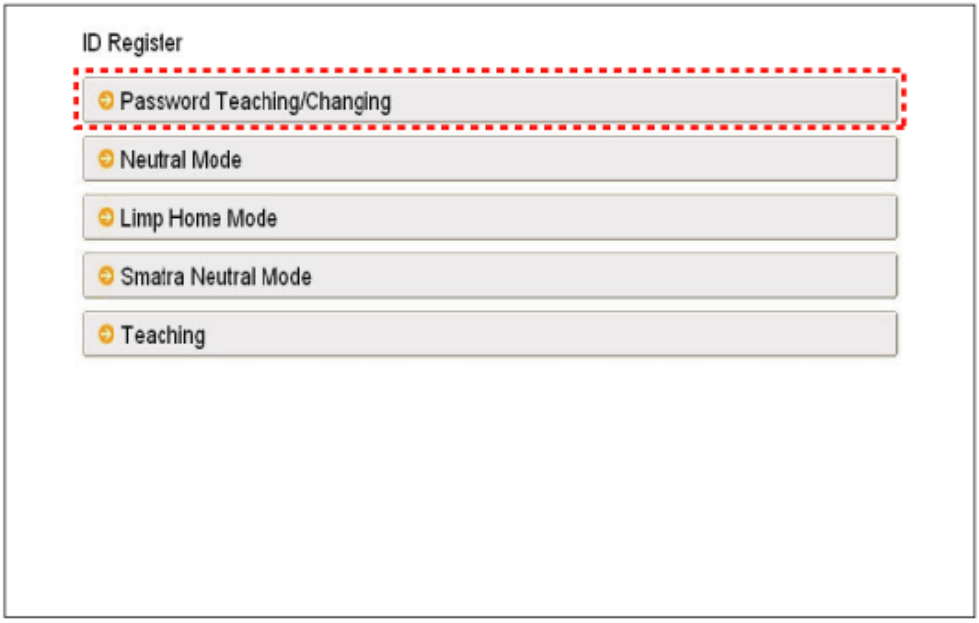

Teaching
[Teaching]
Insert next key and key on.
Press [OK] button to continue.
Ok

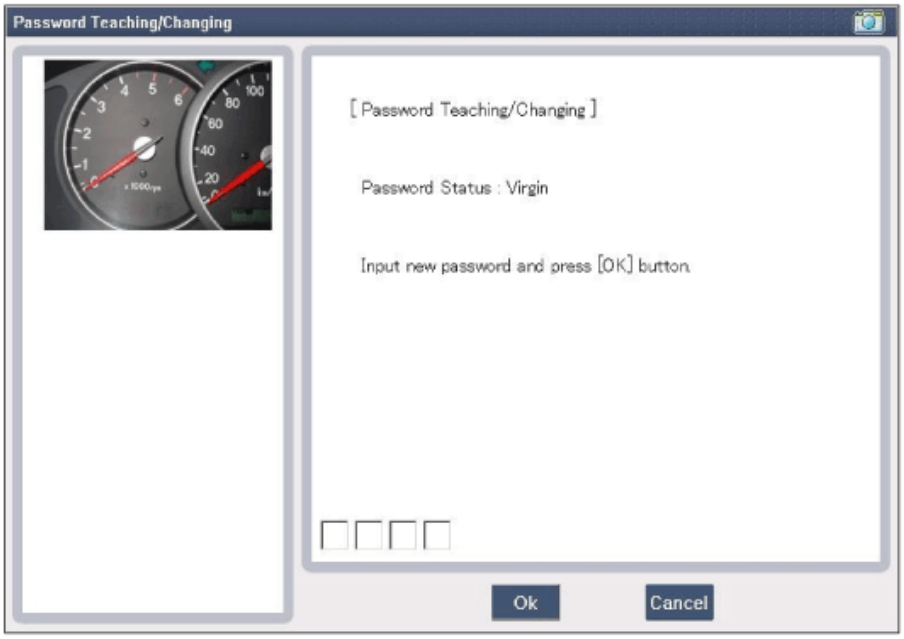

Teaching
[Teaching]
3rd key teaching completed!
4th key teaching Continue? (OK/CANCEL)
Press [OK] button before removing key.
Ok
Cancel

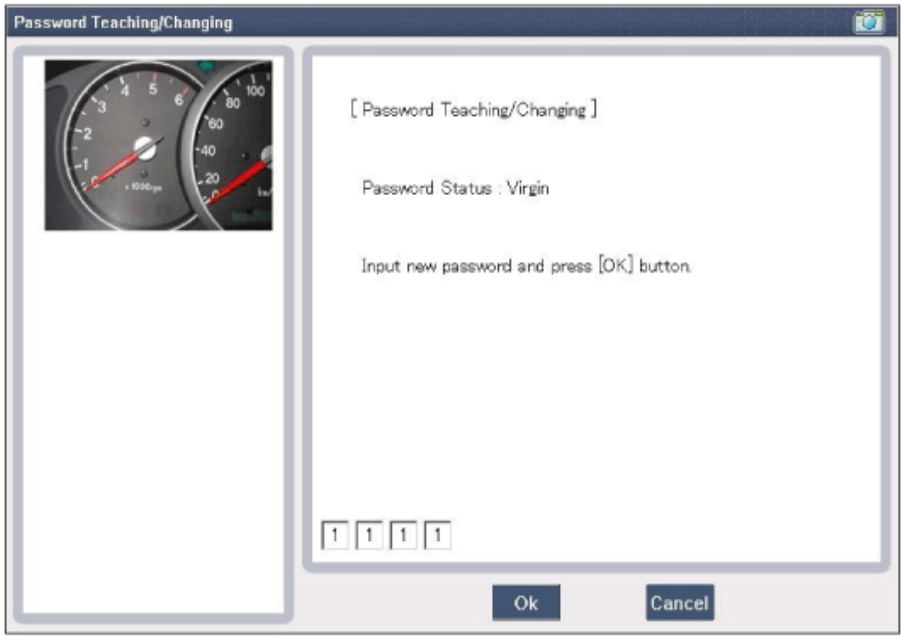


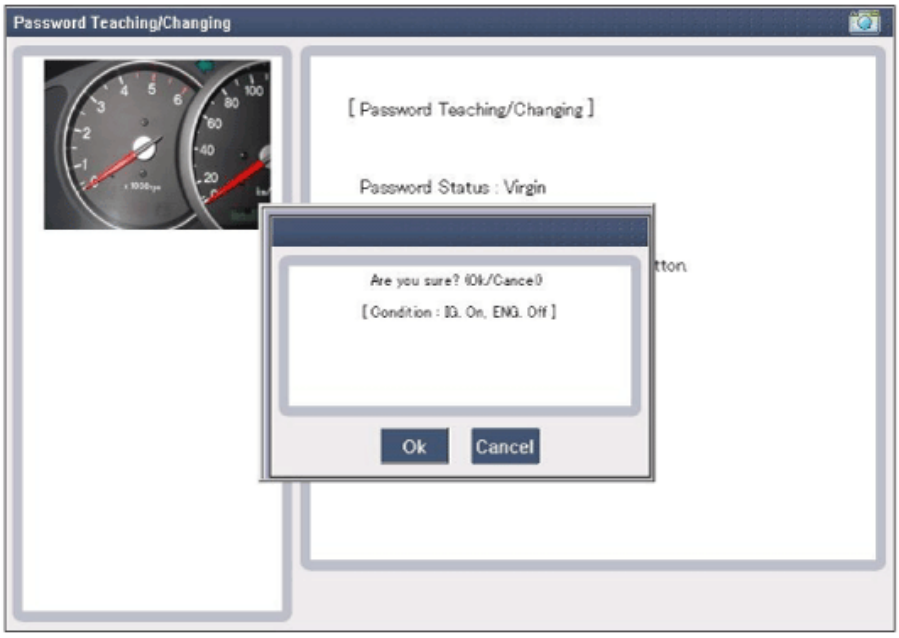


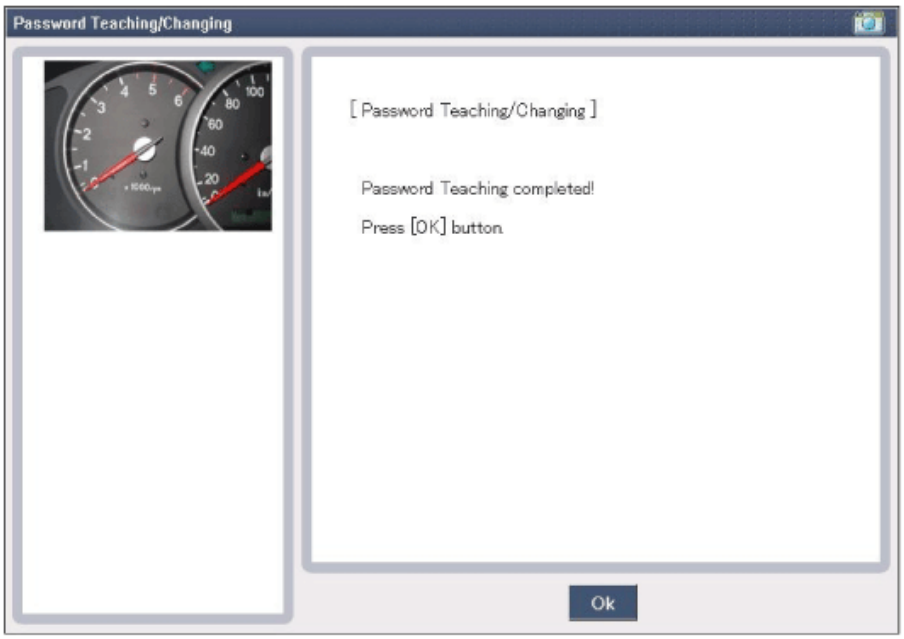
- PCM (ECM) virgin status. After replacing new "PCM (ECM)" GDS displays that PCM (ECM) is virgin status in Key Teaching mode. "VIRGIN" status means that PCM (ECM) has not matched any PIN code before.
- User Password Teaching Procedure The user password for limp home is taught at the service station. The owner of the vehicle can select a number with four digits. The user password teaching is only accepted by a "learnt" PCM (ECM). Before first teaching of user password to an PCM (ECM), the status of the password is "virgin" No limp home function is possible. The teaching is started by ignition on, with a valid key(learnt key) and sending the user password by tester. After successful teaching, the status of the user password changes from "virgin" to "learnt" The learnt user password can also be changed. This can be done if the user password status is "learnt" and the tester sends authorization of access, either the old user password or the vehicle specific data. After correct authorization, the PCM (ECM) requests the new user password. The status remains "learnt" and the new user password will be valid for the next limp home mode. If wrong user passwords or wrong vehicle specific data have been sent to the PCM (ECM) three times continuously or intermittently, the PCM (ECM) will reject the request to change the password for one hour. This time cannot be reduced by disconnecting the battery or any other actions. After reconnecting the battery, the timer starts again for one hour. User password teaching ■ In case of putting wrong password, retry from first step after 10 seconds. User password changing
- User password teaching ■ In case of putting wrong password, retry from first step after 10 seconds.


ID Register
Password Teaching/Changing
Neutral Mode
Limp Home Mode
Smatra Neutral Mode
Teaching

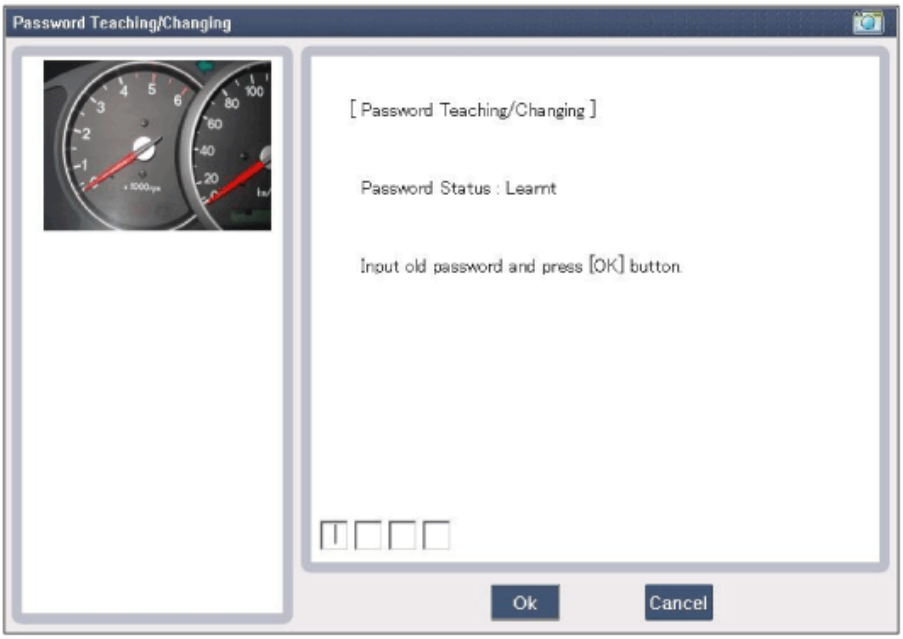

Password Teaching/Changing
[Password Teaching/Changing]
Password Status : Virgin
Input new password and press [OK] button
Ok
Cancel

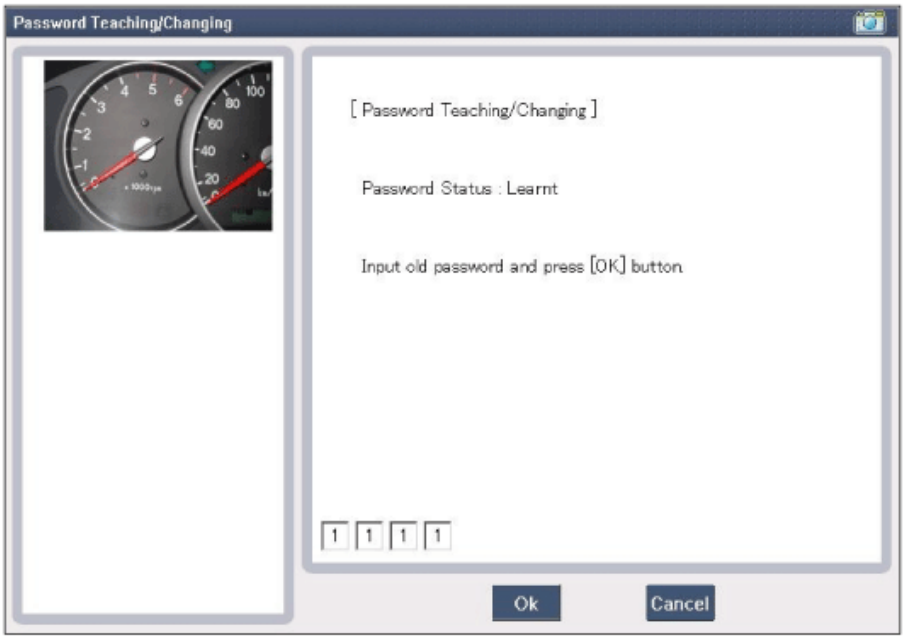

Password Teaching/Changing
[Password Teaching/Changing]
Password Status : Virgin
Input new password and press [OK] button
1 1 1 1
Ok
Cancel

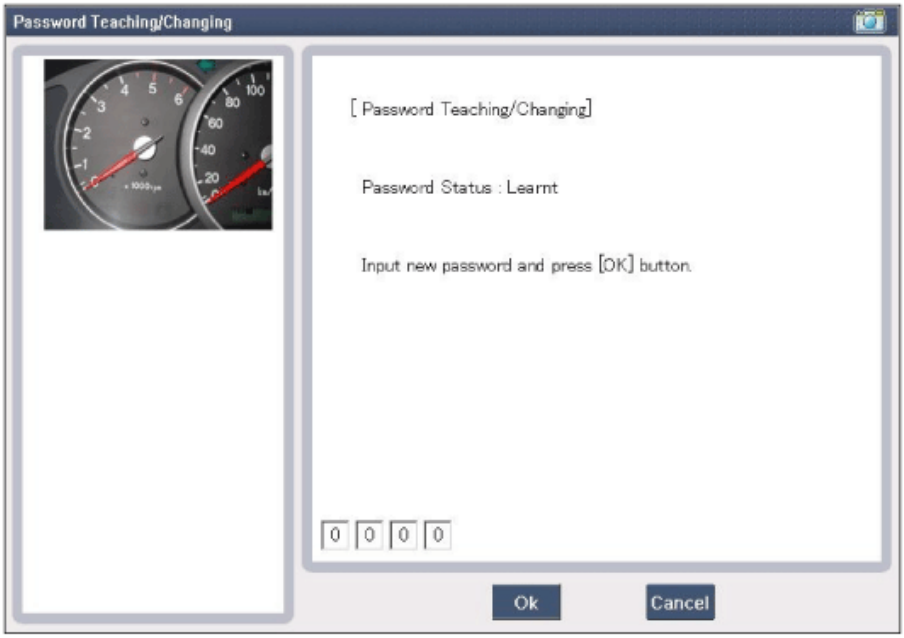

Password Teaching/Changing
[Password Teaching/Changing]
Password Status : Virgin
Are you sure? (Ok/Cancel)
[Condition : IG. On, ENG. Off]
Ok
Cancel

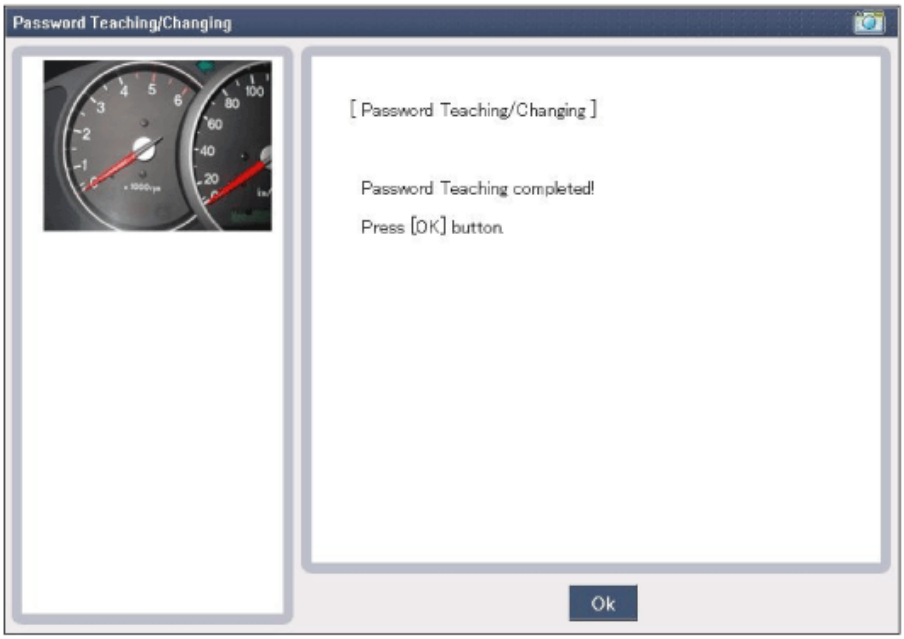


- User password changing



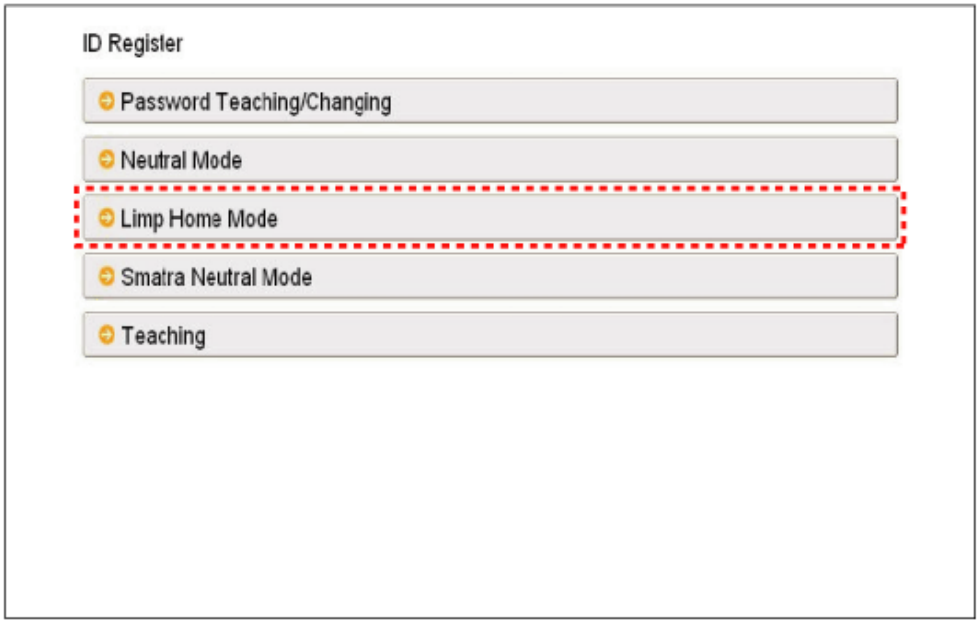

Password Teaching/Changing
[Password Teaching/Changing]
Password Status : Learnt
Input old password and press [OK] button.
1 1 1 1
Ok
Cancel

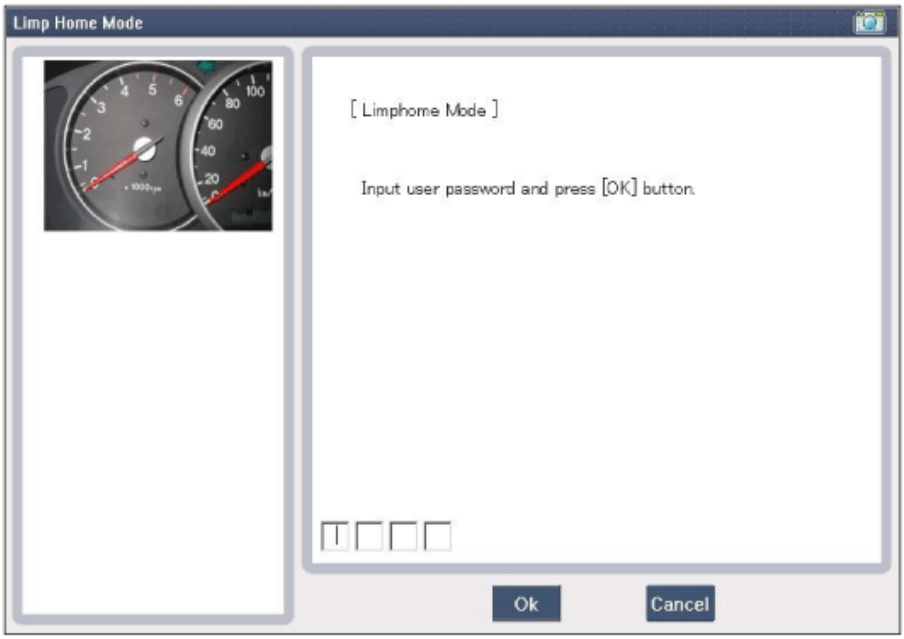

Password Teaching/Changing
[Password Teaching/Changing]
Password Status : Learnt
Input new password and press [OK] button.
0 0 0 0
Ok
Cancel

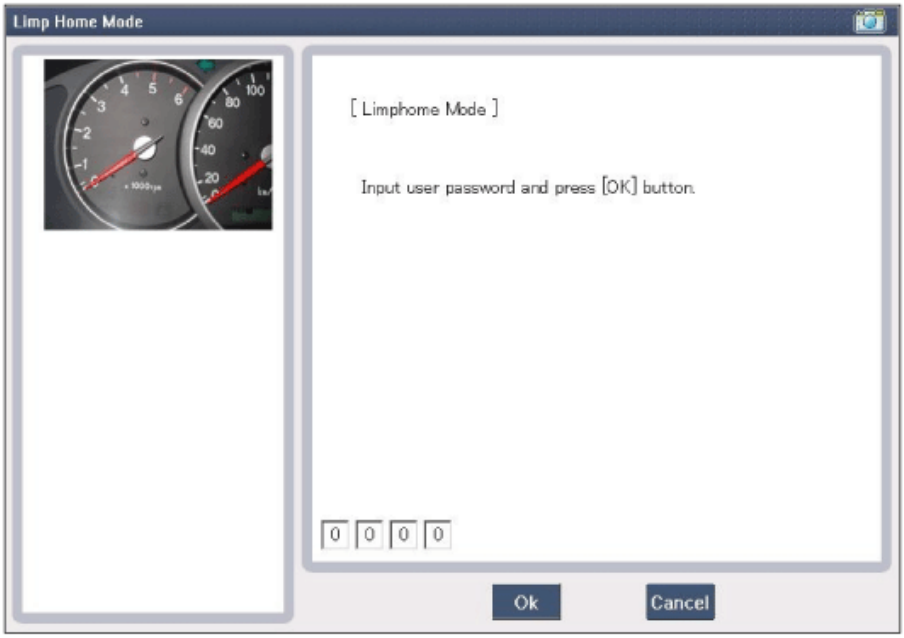


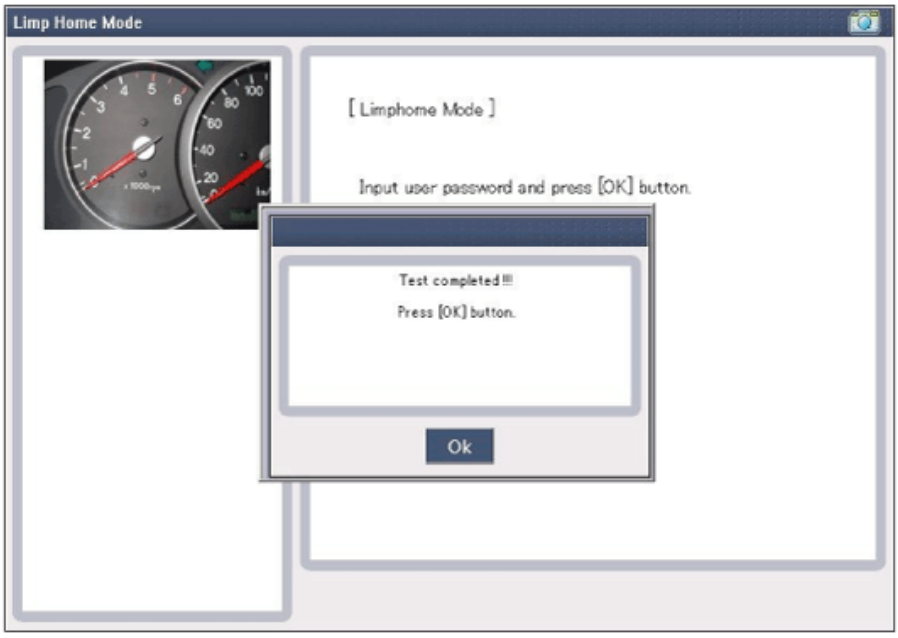
- Limp Home Function

- Limp Home By Tester If the PCM (ECM) detects the fault of the SMARTRA or transponder, the PCM (ECM) will allow limp home function of the immobilizer. Limp home is only possible if the user password (4 digits) has been given to the PCM(ECM) before. This password can be selected by the vehicle owner and is programmed at the service station. The user password can be sent to the PCM(ECM) via the special tester menu. Only if the PCM(ECM) is in status "learnt" and the user password status is "learnt" and the user password is correct, the PCM (ECM) will be unlocked for a period of time (30 sec.). The engine can only be started during this time. After the time has elapsed, engine start is not possible. If the wrong user password is sent, the PCM (ECM) will reject the request of limp home for one hour. Disconnecting the battery or any other action cannot reduce this time. After connecting the battery to the PCM(ECM), the timer starts again for one hour.

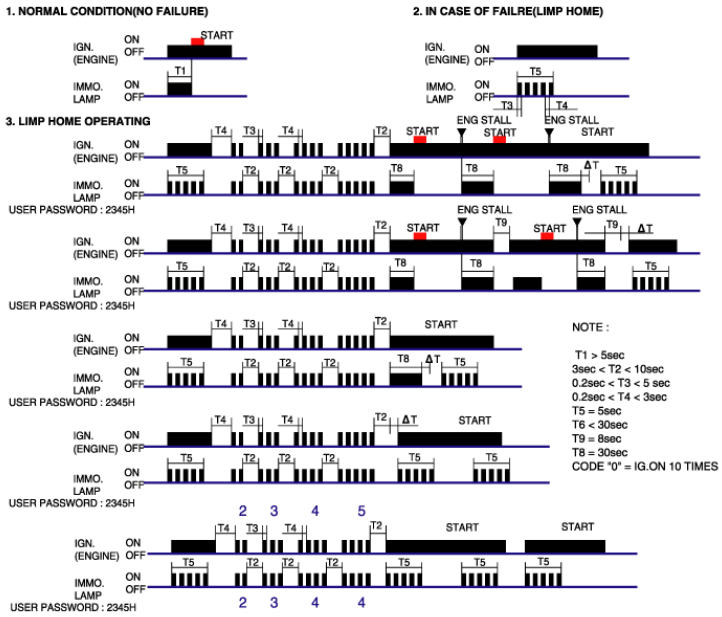



Limp Home Mode
[Limphome Mode]
Input user password and press [OK] button.
Ok
Cancel


Limp Home Mode
[Limphome Mode]
Input user password and press [OK] button.
0 0 0 0
Ok
Cancel



- Limp Home By Ignition Key The limp home can be activated also by the ignition key. The user password can be input to the PCM (ECM) by a special sequence of ignition on/off. Only if the PCM (ECM) is in status "learnt" and the user password status is "learnt" and the user password is correct, the PCM (ECM) will be unlocked for a period of time (30 sec.). The engine can be started during this time. After the time has elapsed, engine start is not possible. After a new password has been input, the timer (30 sec.) will start again. After ignition off, the PCM (ECM) is locked if the timer has elapsed 8 seconds. For the next start, the input of the user password is requested again.



- Replacement

Problems And Replacement Parts :

Problem Part Set GDS Required

All keys have been lost Blank key (4) YES

Antenna coil unit does not work Antenna coil unit NO

ECM does not work PCM (ECM) YES

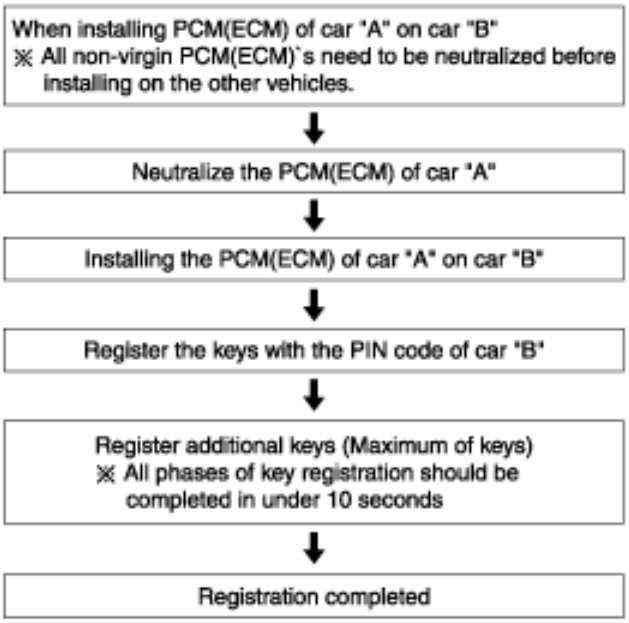
Ignition switch does not work Ignition switch with Antenna coil unit YES

Unidentified vehicle specific data occurs Key, PCM (ECM) YES

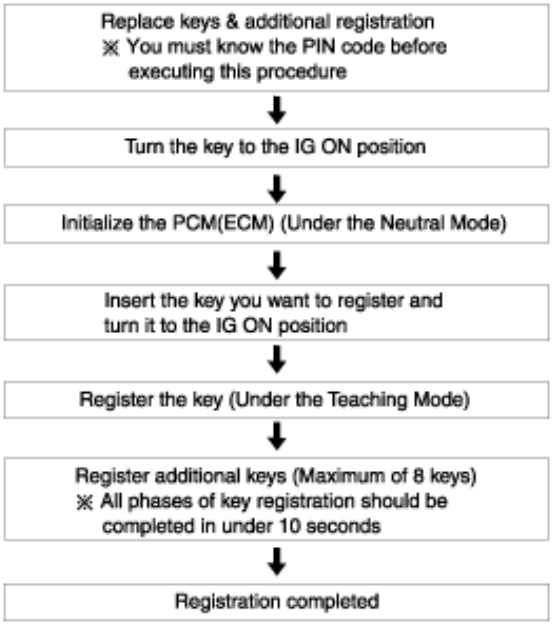
SMARTRA unit does not work SMARTRA unit YES

Replacement Of ECM and Smartra

- Things to remember before a replacement (PCM (ECM))



- Things to remember before a replacement (Keys & Additional registration) When there is only one key registered and you wish to register another key, you need to re-register the key which was already registered. When the key #1 is registered and master key #2 is not registered, Put the key #1 in the IG/ON or the start position and remove it. The engine can be started with the unregistered key #2. (Note that key #2 must be used within 10 seconds of removing key #1) When the key #1 is registered and key #2 is not registered, put the unregistered master key #2 in the IG/ON or the start position. The engine cannot be started even with the registered key #1. When you inspect the immobilizer system, refer to the above paragraphs 1, 2 and 3. Always remember the 10 seconds zone. If the pin code & password are entered incorrectly on three consecutive inputs, the system will be locked for one hour. Be cautious not to overlap the transponder areas. Problems can occur at key registration or vehicle starting if the transponders should overlap.



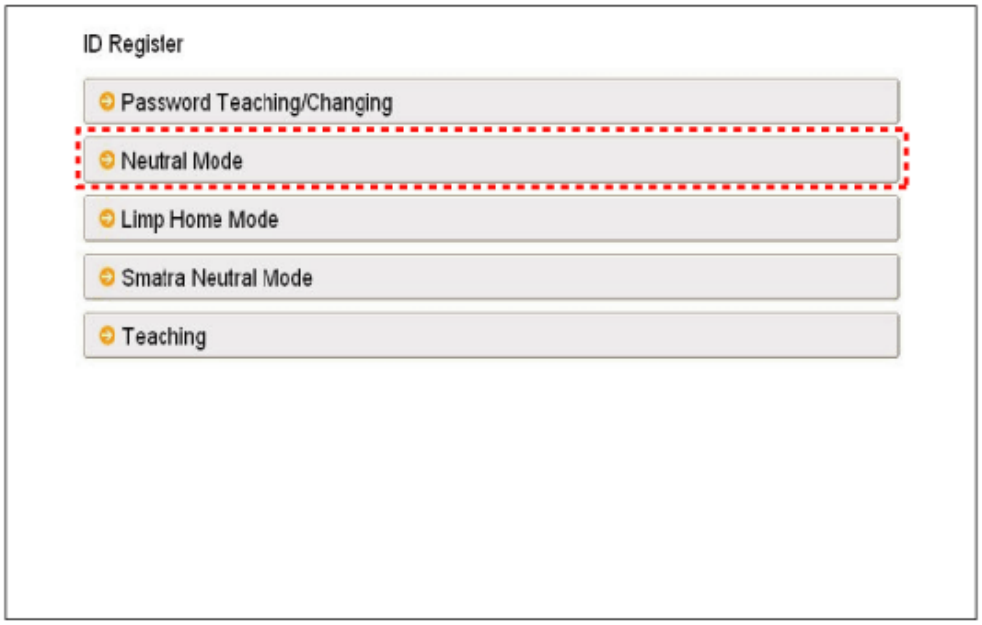
When there is only one key registered and you wish to register another key, you need to re-register the key which was already registered. When the key #1 is registered and master key #2 is not registered, Put the key #1 in the IG/ON or the start position and remove it. The engine can be started with the unregistered key #2. (Note that key #2 must be used within 10 seconds of removing key #1) When the key #1 is registered and key #2 is not registered, put the unregistered master key #2 in the IG/ON or the start position. The engine cannot be started even with the registered key #1. When you inspect the immobilizer system, refer to the above paragraphs 1, 2 and 3. Always remember the 10 seconds zone. If the pin code & password are entered incorrectly on three consecutive inputs, the system will be locked for one hour. Be cautious not to overlap the

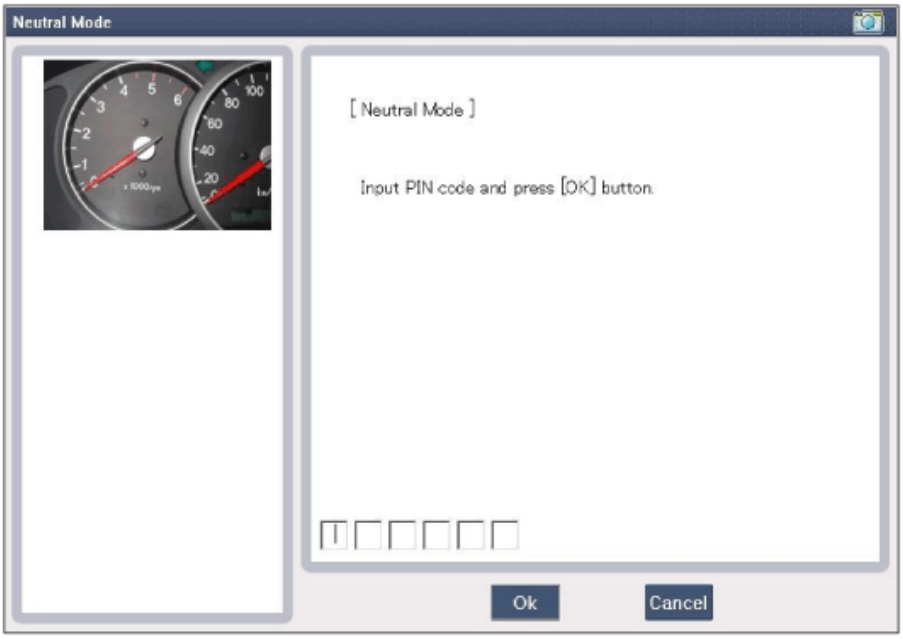
transponder areas. Problems can occur at key registration or vehicle starting if the transponders should overlap.
- When there is only one key registered and you wish to register another key, you need to re-register the key which was already registered.
- When the key #1 is registered and master key #2 is not registered, Put the key #1 in the IG/ON or the start position and remove it. The engine can be started with the unregistered key #2. (Note that key #2 must be used within 10 seconds of removing key #1)
- When the key #1 is registered and key #2 is not registered, put the unregistered master key #2 in the IG/ON or the start position. The engine cannot be started even with the registered key #1.
- When you inspect the immobilizer system, refer to the above paragraphs 1, 2 and 3. Always remember the 10 seconds zone.
- If the pin code & password are entered incorrectly on three consecutive inputs, the system will be locked for one hour.
- Be cautious not to overlap the transponder areas.
- Problems can occur at key registration or vehicle starting if the transponders should overlap.

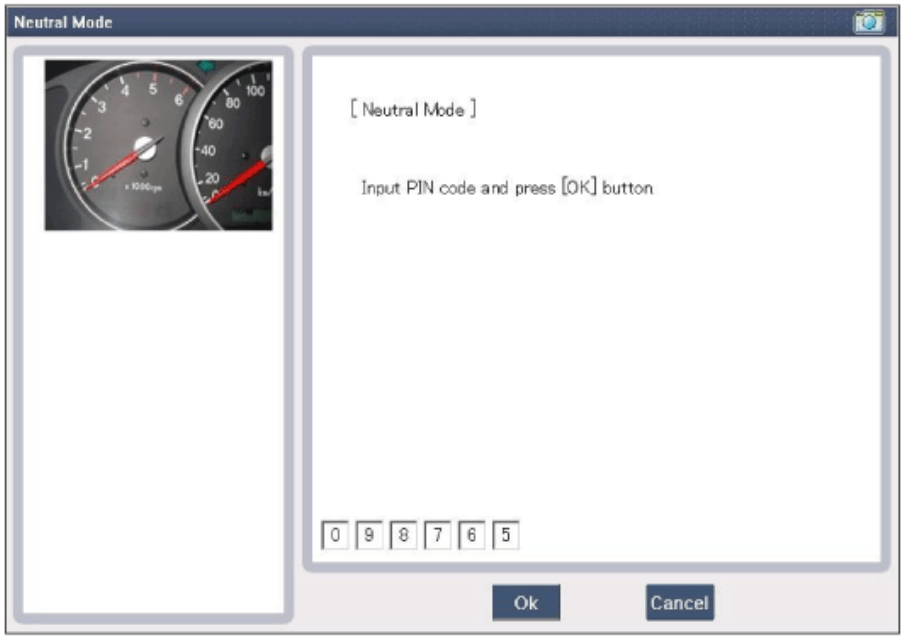
Neutralizing Of ECM

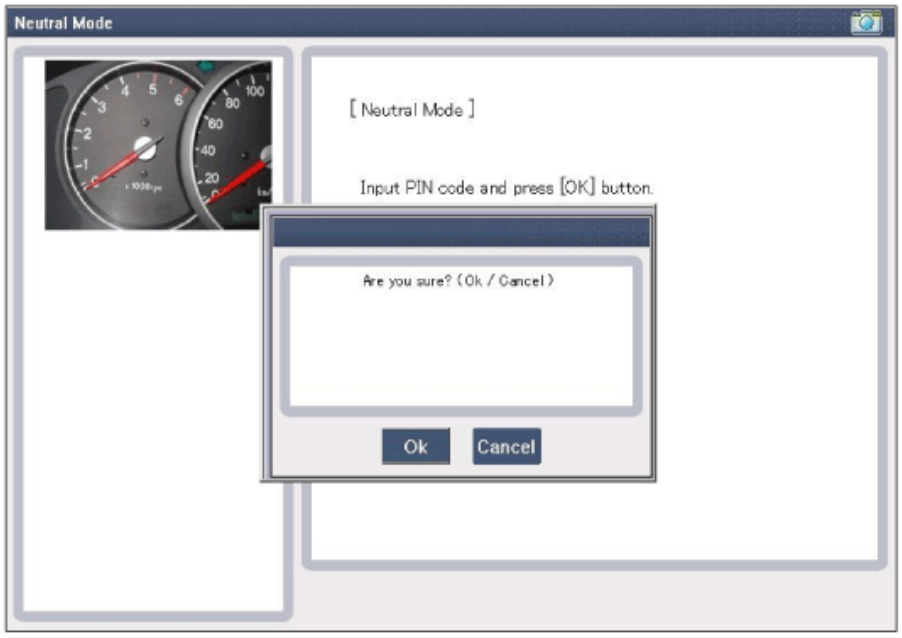
Neutralizing setting condition In case of PCM (ECM) status "Learnt" regardless of user password "Virgin or Learnt" Input correct PIN code by scanner. Neutralizing meaning . : PIN code (6) & user password (4) deletion. : Locking of ECM (except key teaching permission) Neutralizing meaning : PIN Code (6)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

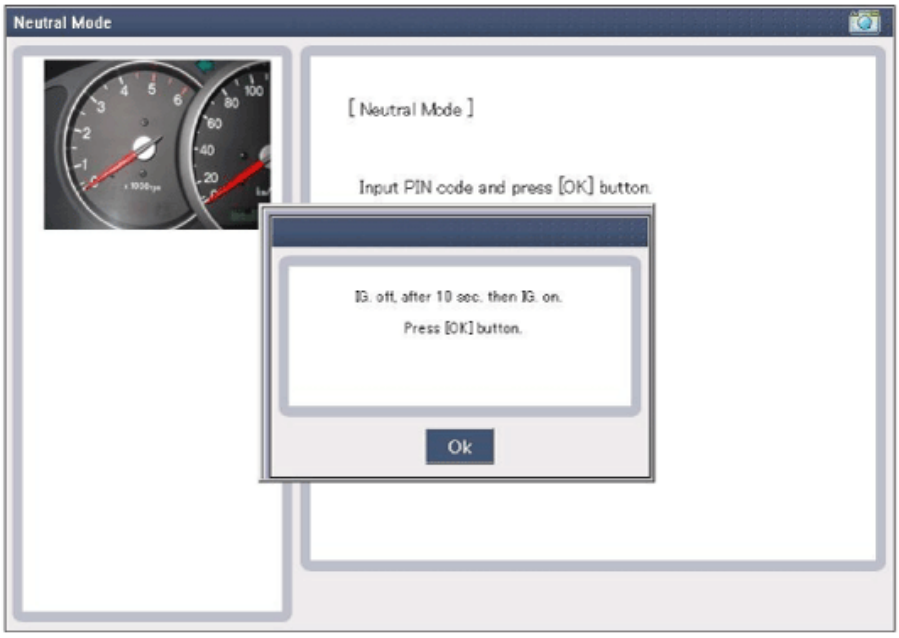
Function / EMS	Engine Running			Learning	
	Learnt Key	Limp home	Twice Ignition	Key	User Password
Neutral	No	No	No	Yes	No

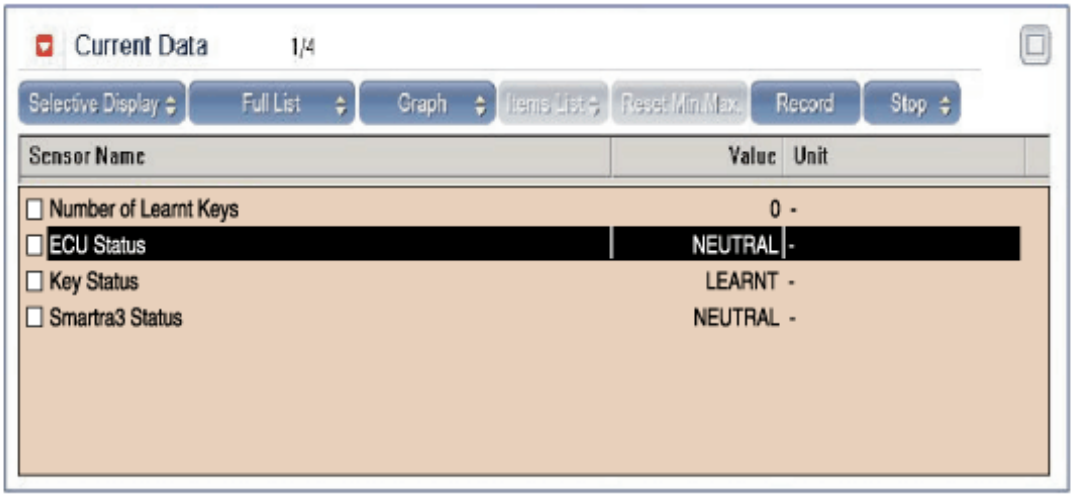

ID Register
Password Teaching/Changing
Neutral Mode
Limp Home Mode
Smatra Neutral Mode
Teaching


Neutral Mode
[Neutral Mode]
Input PIN code and press [OK] button.
Ok
Cancel


Neutral Mode
[Neutral Mode]
Input PIN code and press [OK] button.
0 9 8 7 6 5
Ok
Cancel


Neutral Mode
[Neutral Mode]
Input PIN code and press [OK] button.
Are you sure? (Ok / Cancel)
Ok
Cancel



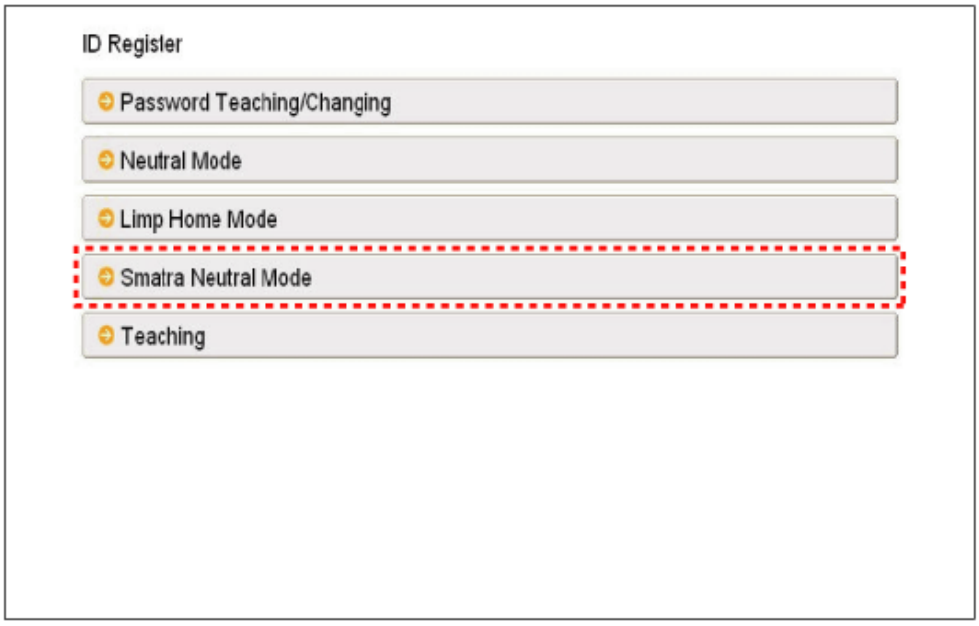


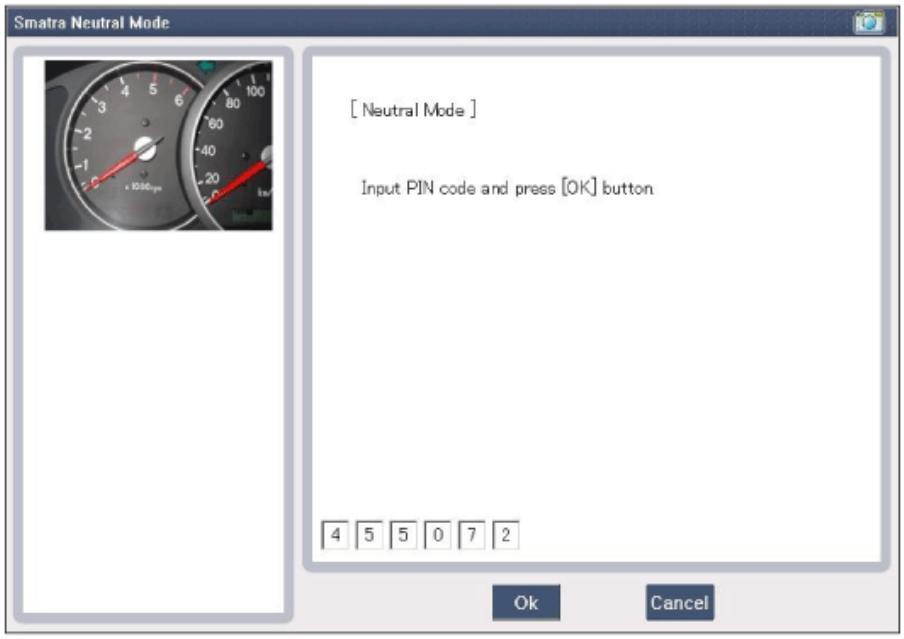
Neutralizing of SMARTRA

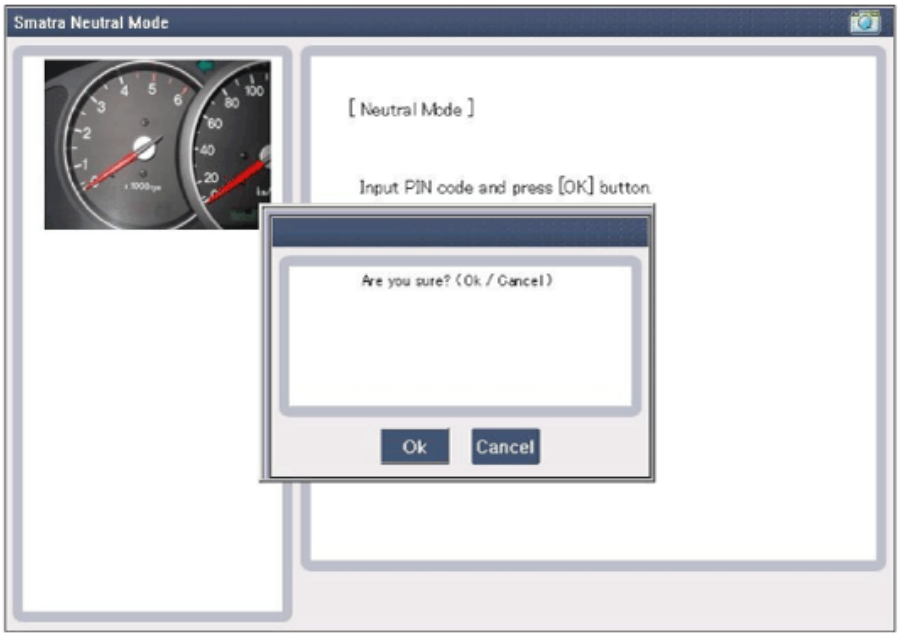
Neutralizing Setting condition : In case of "SMARTRA status", "Learned" Input correct Pin code by tester

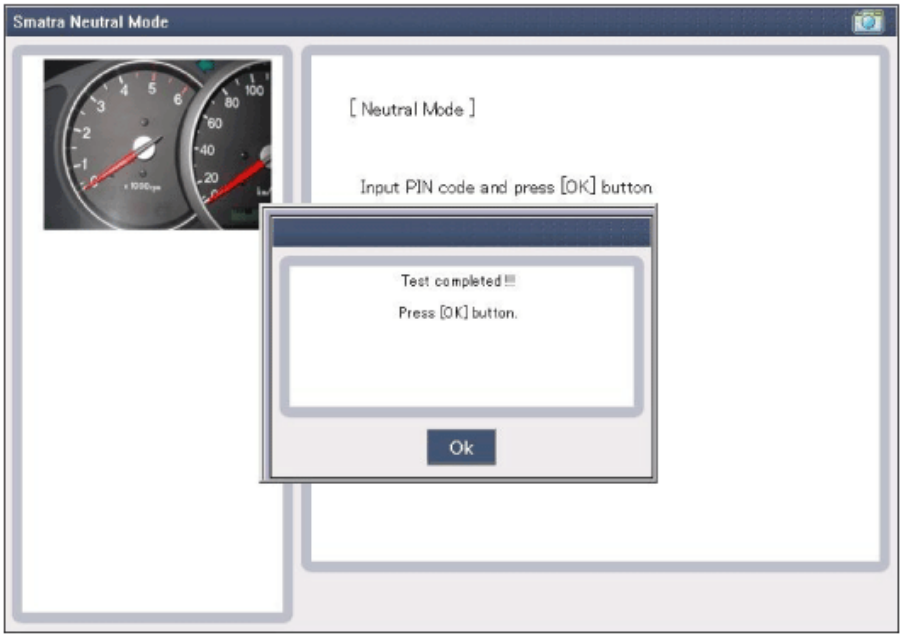
Neutralizing meaning : Vehicle password(DPN Code) & SEK Code deletion. Permission of New DPN Learning.
- Neutralizing Setting condition :
- In case of "SMARTRA status", "Learned"
- Input correct Pin code by tester
- Vehicle password(DPN Code) & SEK Code deletion.
- Permission of New DPN Learning.

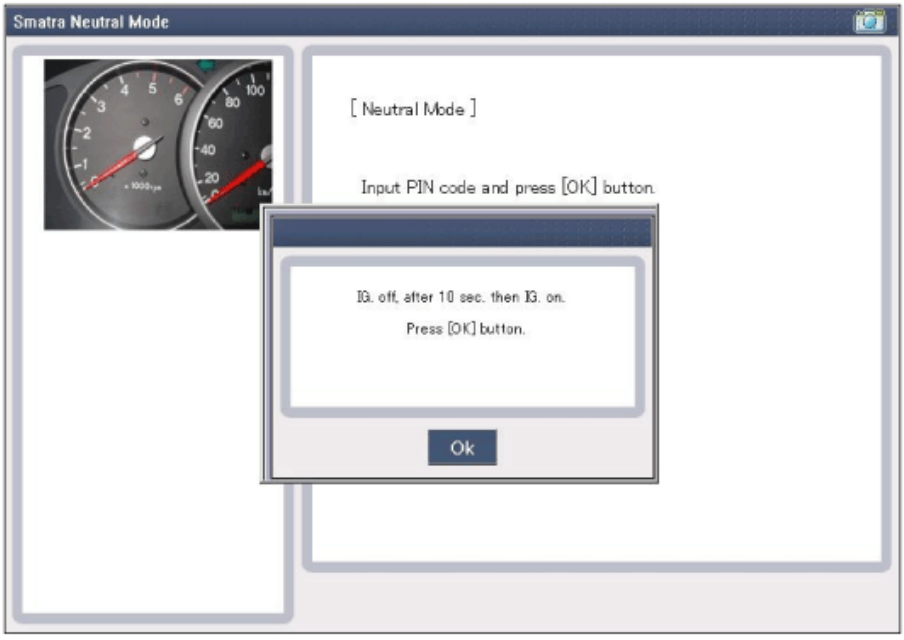
Function / SMARTRA	Engine Running			Learning	
	Learnt Key	Limp home	Twice Ignition	Key	User Password
Neutral	No	Yes (EMS learnt)	No	Yes	No

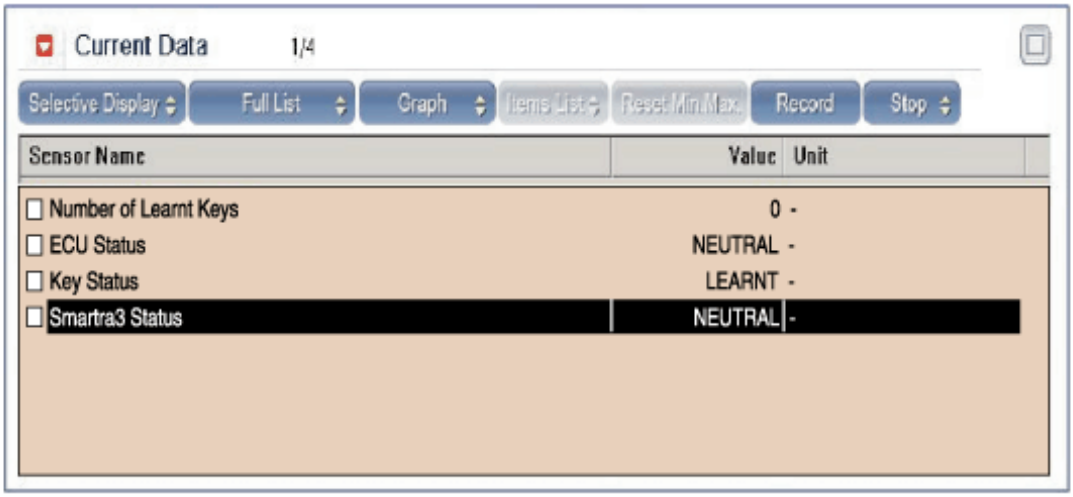



Smatra Neutral Mode
[Neutral Mode]
Input PIN code and press [OK] button
4 5 5 0 7 2
Ok
Cancel


Smatra Neutral Mode
[Neutral Mode]
Input PIN code and press [OK] button
Are you sure? (Ok / Cancel)
Ok
Cancel


Smatra Neutral Mode
[Neutral Mode]
Input PIN code and press [OK] button.
Test completed
Press [OK] button.
Ok

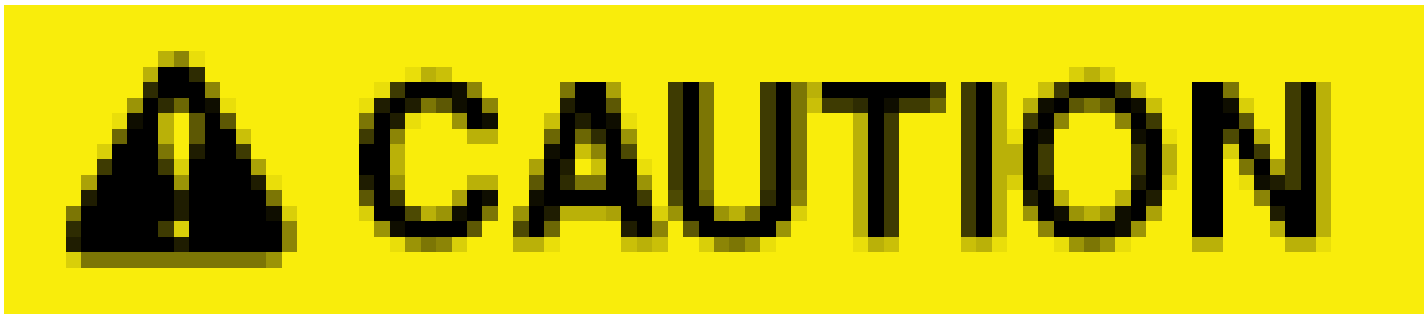

Smatra Neutral Mode
[Neutral Mode]
Input PIN code and press [OK] button.
IG. off, after 10 sec. then IG. on.
Press [OK] button.
Ok


Current Data 1/4
Selective Display
Full List
Graph
Items List
Reset Min/Max.
Record
Stop
Sensor Name
Value
Unit
Number of Learnt Keys 0 -
ECU Status NEUTRAL -
Key Status LEARNT -
Smartra3 Status NEUTRAL -

Keyless Entry and Burglar Alarm - Repair Procedures (Article 44801)

- Inspection

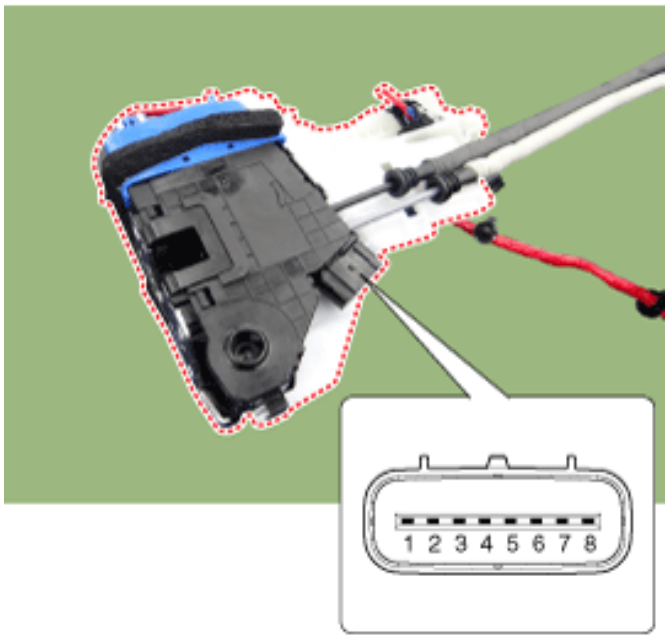
Wrap the protective tape on the tool to disassemble with the screwdriver or remover. Use caution in keeping and handling during disassembling/assembling because it is easily contaminated with lubricant and oil.



- Wrap the protective tape on the tool to disassemble with the screwdriver or remover.
- Use caution in keeping and handling during disassembling/assembling because it is easily contaminated with lubricant and oil.

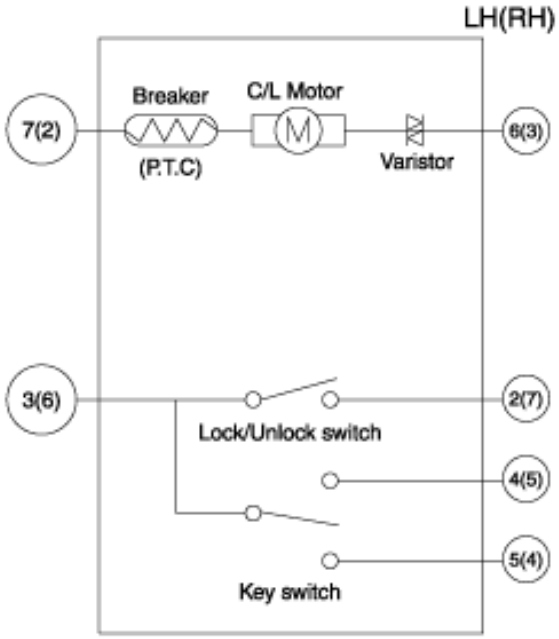
Front Door Lock Module Inspection

- Remove the front door trim.
- Remove the front door module. (Refer to Body - "Front Door Module")
- Disconnect the connector from the actuator. No Pin Information LH RH 1 - - 2 Lock / Unlock switch Motor 2 3 COM Motor 3 4 Key Lock switch Key Unlock switch 5 Key Unlock switch Key Lock switch 6 Motor 3 COM 7 Motor 2 Lock / Unlock switch 8 - -



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

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

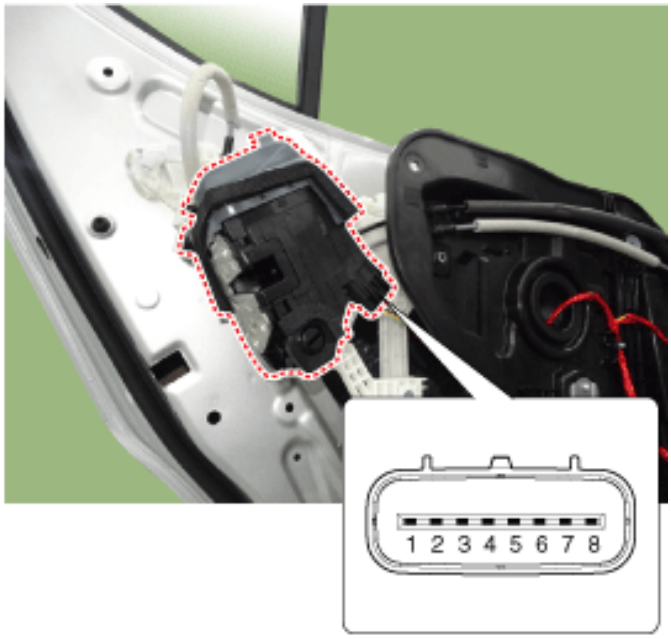


LH(RH)

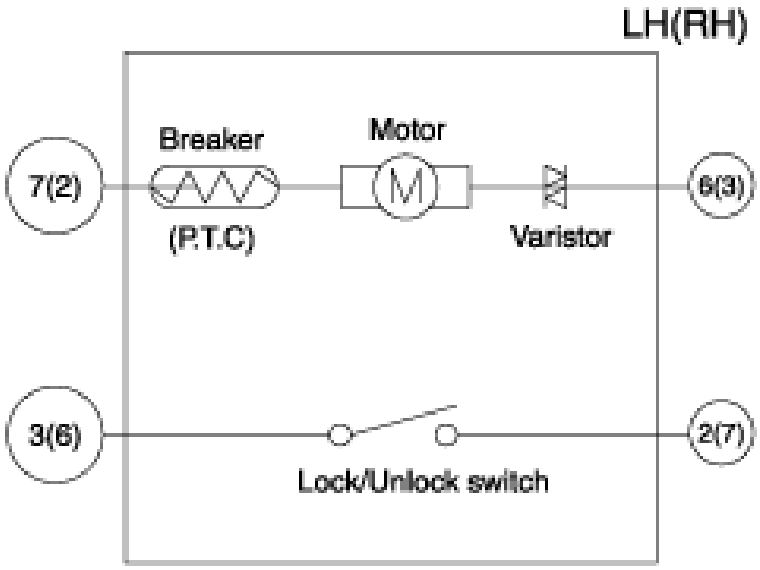
Operation / Terminal	Central Lock	Central Unlock
7(2)	-	+
6(3)	+	-
3(6) & 2(7)	ON → OFF	OFF → ON

Rear Door Lock Module Inspection

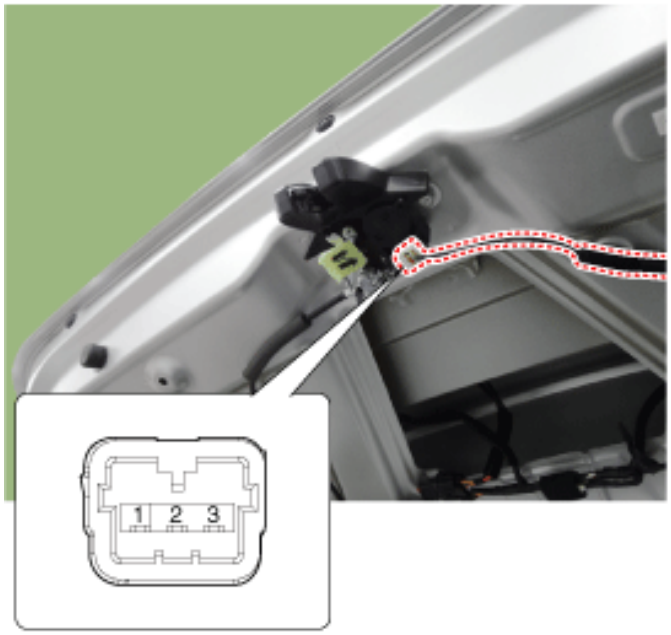
- Remove the rear door trim.
- Remove the rear door module. (Refer to Body - "Rear Door Module")
- Disconnect the connectors from the actuator. No Pin information LH RH 1 - - 2 Lock / Unlock switch Motor 2 3 COM Motor 3 4 - - 5 - - 6 Motor 3 COM 7 Motor 2 Lock / Unlock switch 8 - -

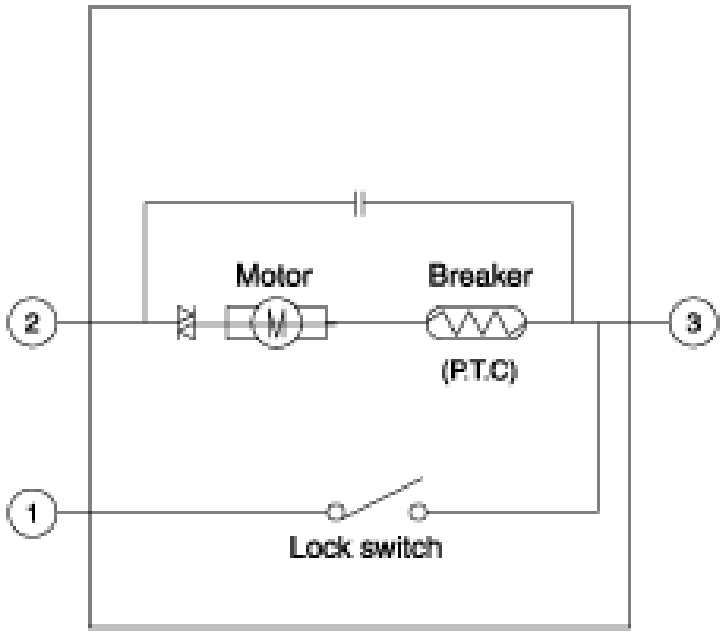


No Pin information
4 - -
5 - -



Tailgate Lock Module Inspection
- Remove the trunk lid trim.
- Disconnect the connector from the actuator



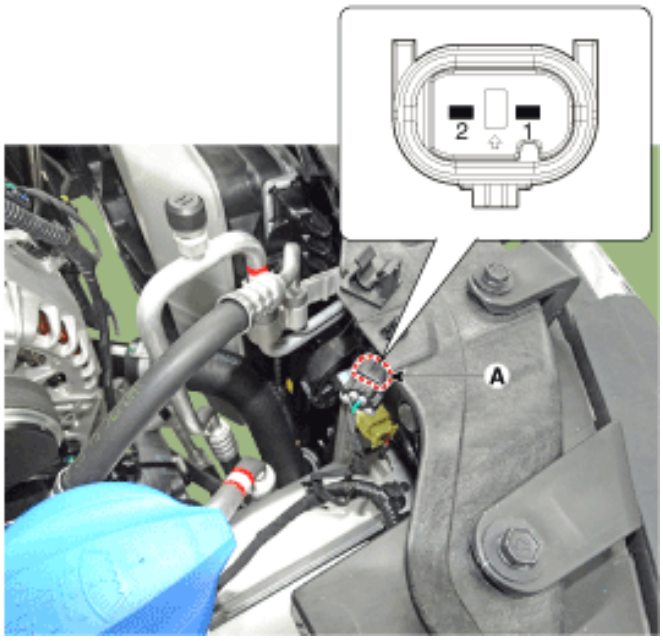


Terminal / Position	2	3
Unlock	⊕	⊖
Lock	-	-

- Checking the trunk of the vehicle power option power refers to the trunk module.

Hood Switch

- Disconnect the connector (A).

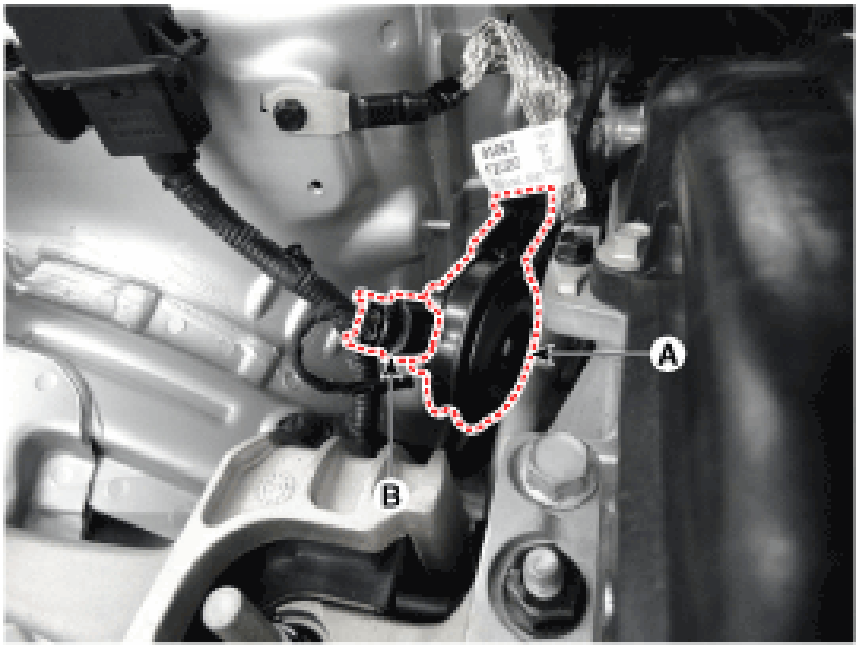


- Check for continuity between the terminals and ground according to the table (Refer to Body - "Hood Latch")

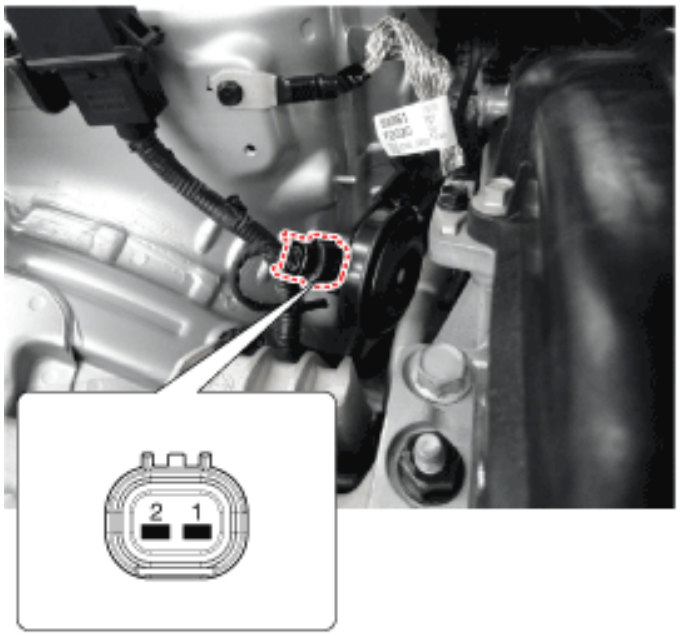
Terminal / Position	1	2
Open hood(Free)	○	○
Close hood(Push)		

Burglar Horn Inspection

- Remove the burglar horn (A) after loosening the mounting bolts and disconnecting the connector (B).



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



Smart Key Diagnostic - Repair Procedures (Article 44792)

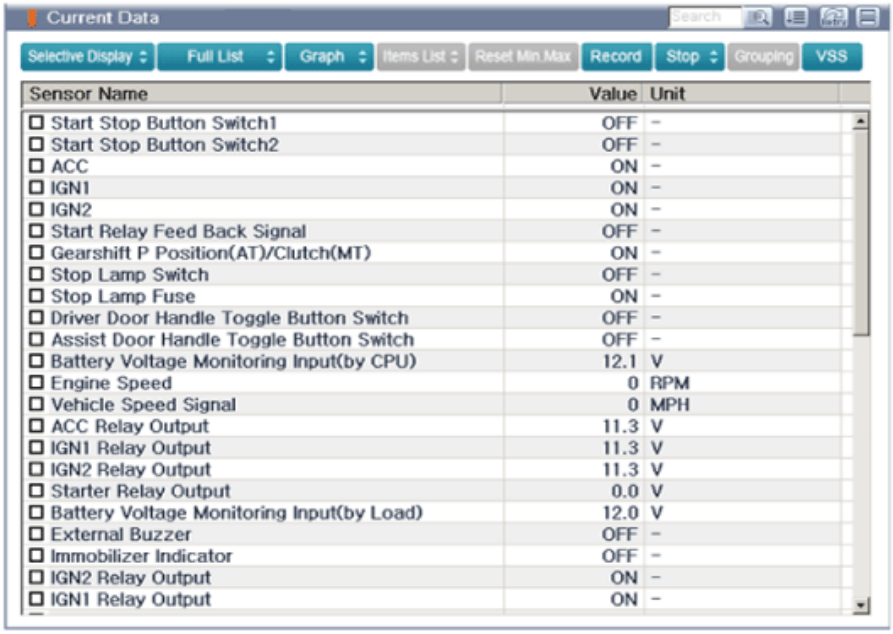
- Inspection

Self Diagnosis with Scan Tool

- Problem in SMART KEY unit input.
- Problem in SMART KEY unit.
- Problem in SMART KEY unit output.
- SMART KEY unit Input problem : switch diagnosis
- SMART KEY unit problem : communication diagnosis
- SMART KEY unit Output problem : antenna and switch output diagnosis

Switch Diagnosis

- Connect the cable of GDS to the data link connector in driver side crash pad lower panel, turn the power on GDS.
- Select the vehicle model and then SMART KEY system.
- Select the "SMART KEY Unit".
- After IG ON, select the "Current Data".



- 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. Tailgate open SW ON : Tailgate button is ON. Gear P Position ON : Shift lever is P position. IGN 1 ON : IGN switch is IG position. ACC ON : IGN switch is ACC position. Brake SW ON : Brake switch is ON.

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.

Tailgate open SW ON : Tailgate button is ON.

Gear P Position ON : Shift lever is P position.

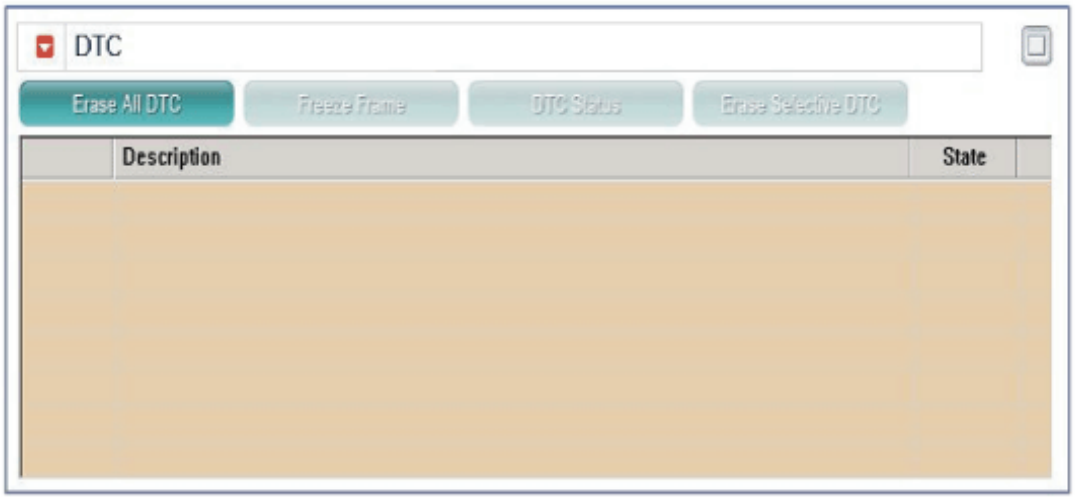
IGN 1 ON : IGN switch is IG position.

ACC ON : IGN switch is ACC position.

Brake SW ON : Brake switch is ON.

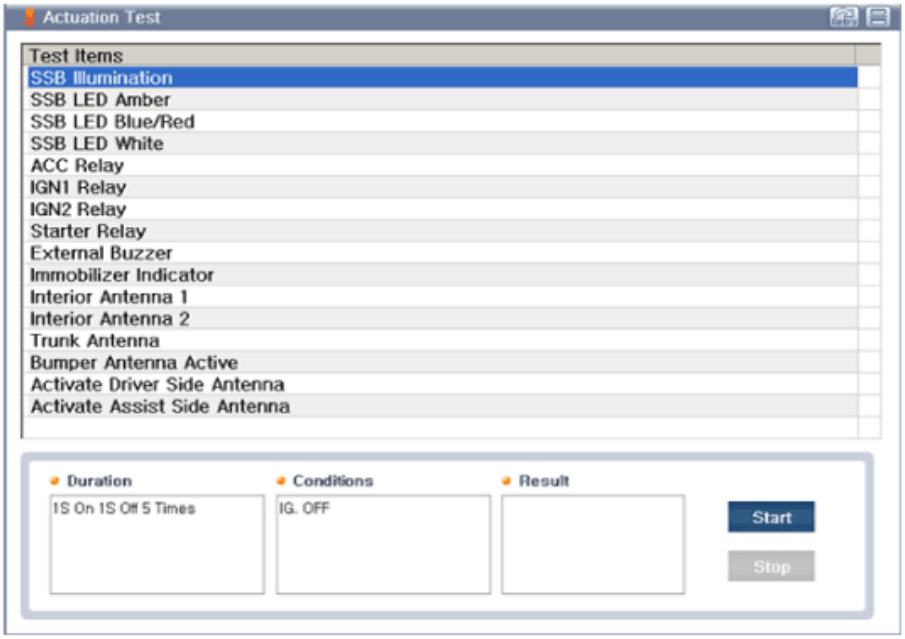
Communication Diagnosis with GDS (Self Diagnosis)

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



Antenna Actuation Diagnosis

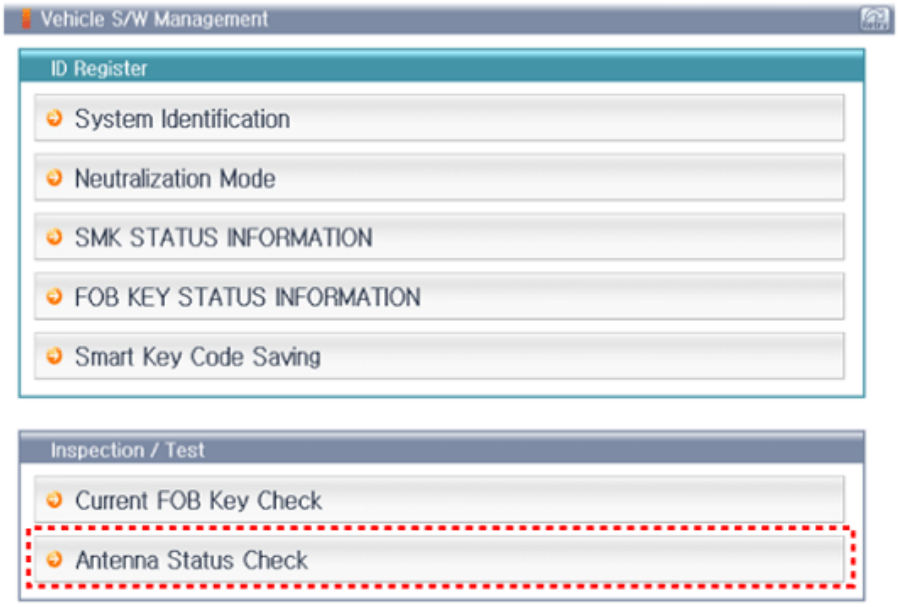
- After IG ON, select the "Actation Test".



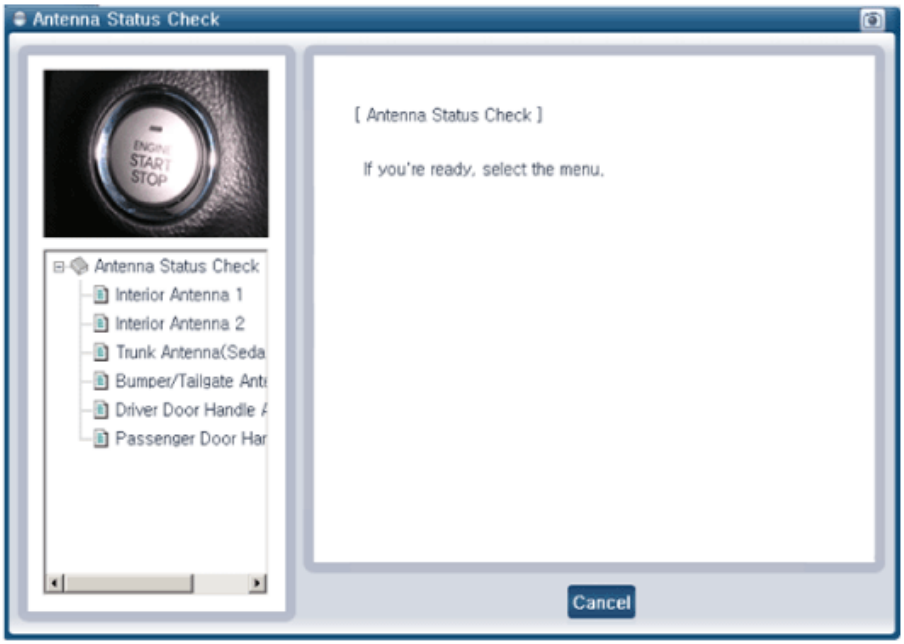
- Set the smart key near the related antenna and operate it with a GDS.
- If the LED of smart key is blinking, the smart key is normal.
- If the LED of smart key is not blinking, check the voltage of smart key battery.
- Antenna actuation INTERIOR Antenna 1 INTERIOR Antenna 2 Trunk antenna BUMPER/ Trunk Antenna DRV_DR Antenna

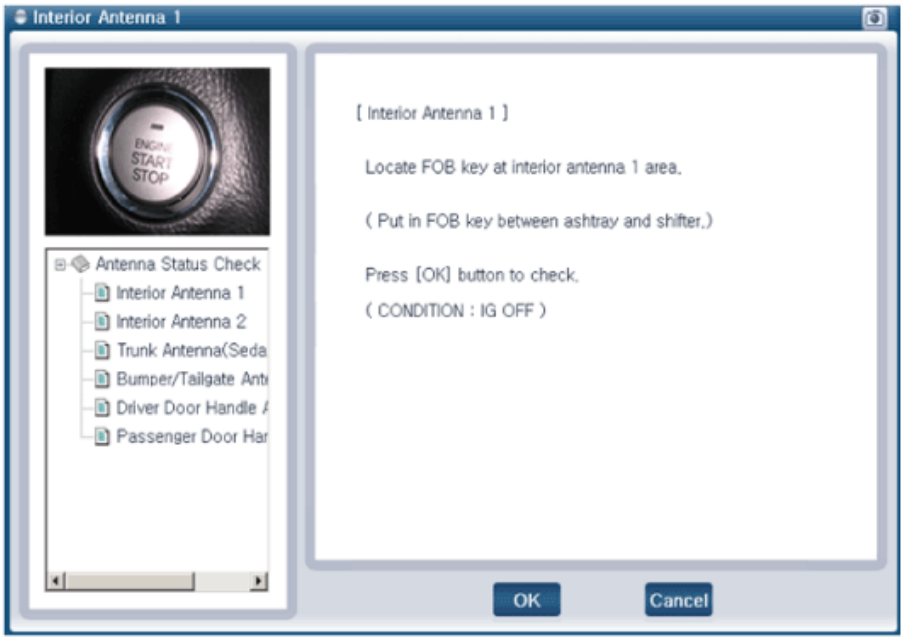
AST_DR Antenna
- INTERIOR Antenna 1
- INTERIOR Antenna 2
- Trunk antenna
- BUMPER/ Trunk Antenna
- DRV_DR Antenna
- AST_DR Antenna

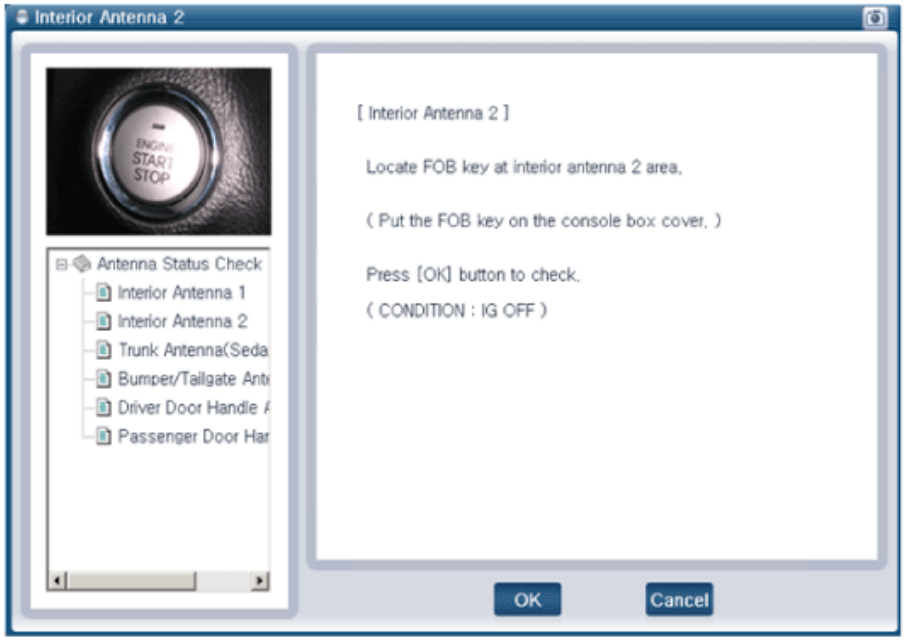
Antenna Status Check
- Select the "Antenna Status Check".



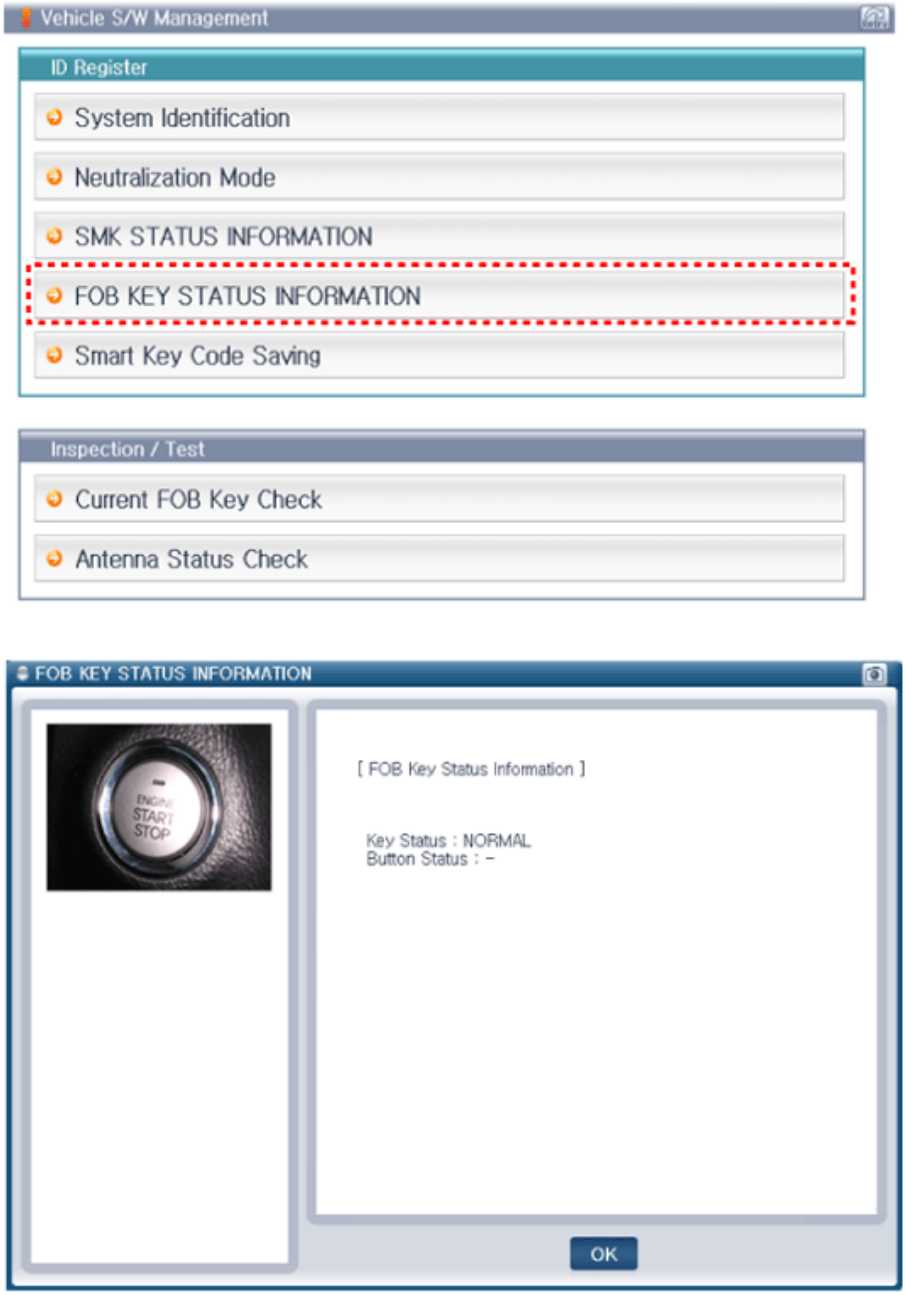
- After IG ON, select the "Antenna Status Check".





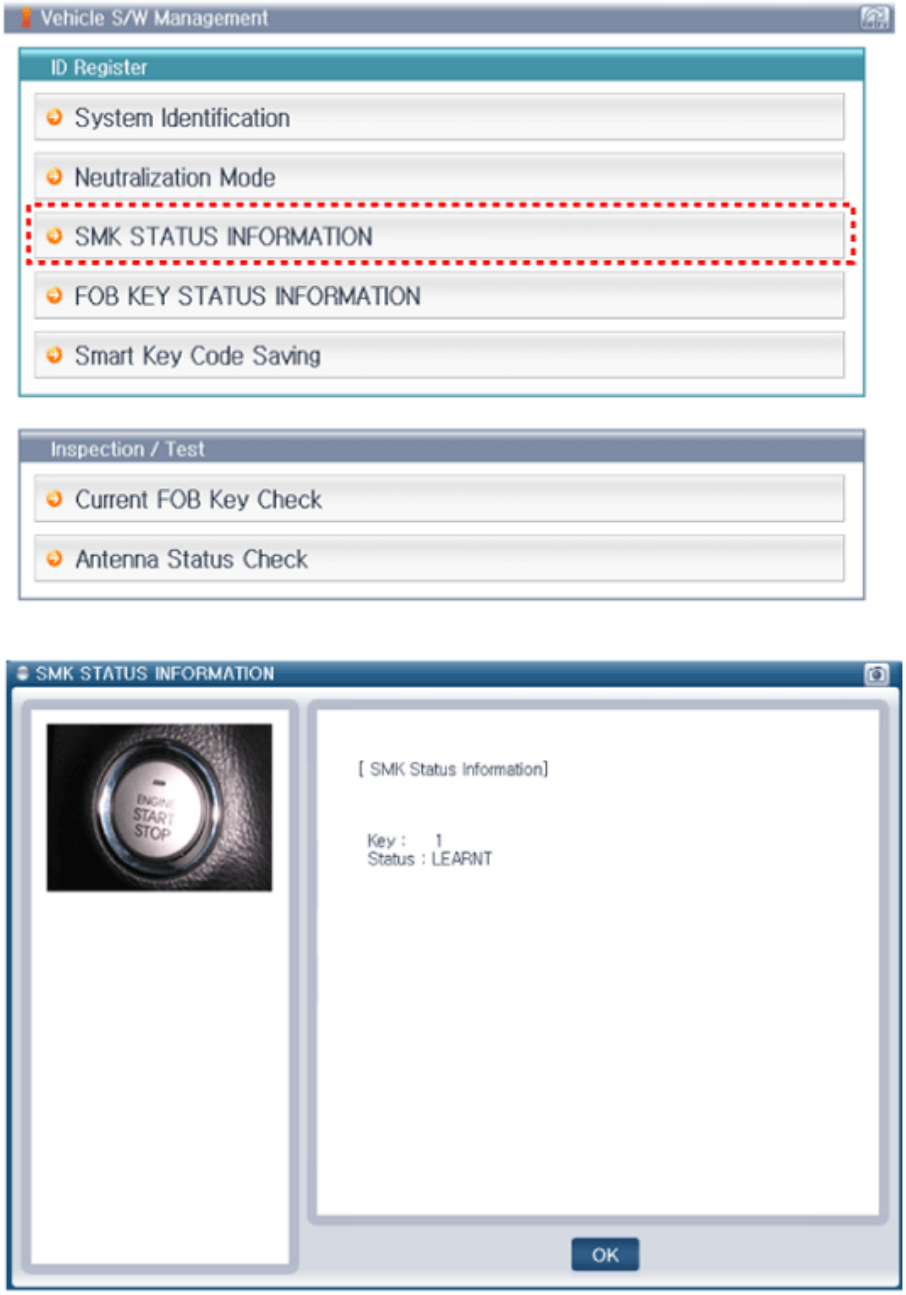


- If the smart key runs normal , the related antenna, smart key(transmission, reception) and exterior receiver are normal.
- Antenna status INTERIOR Antenna 1 INTERIOR Antenna 2 BUMPER/ Trunk Antenna DRV_DR Antenna AST_DR Antenna FOB Status Check
- After IG ON, select the "FOB KEY STATUS INFO".



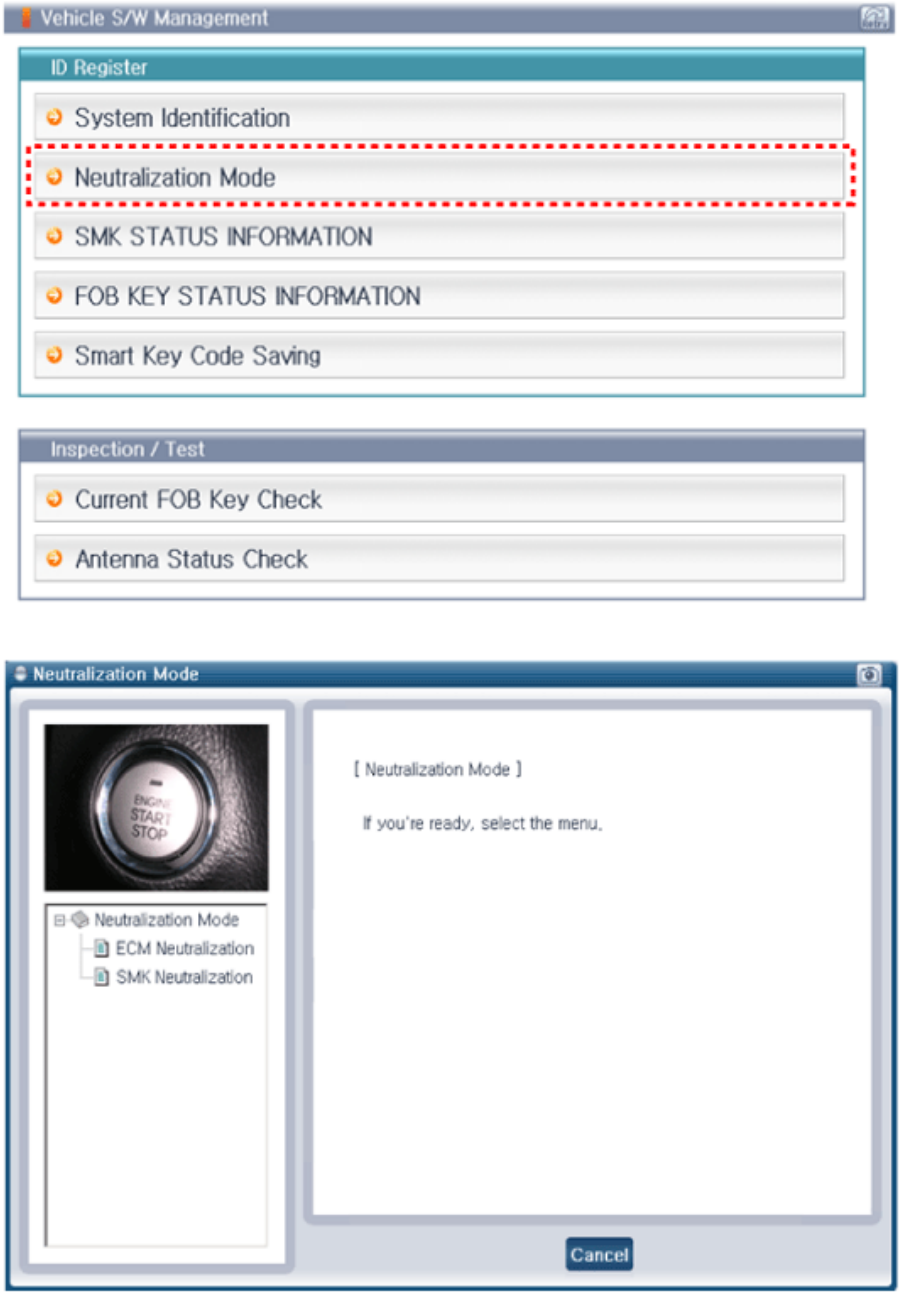
Smart Key Status Check

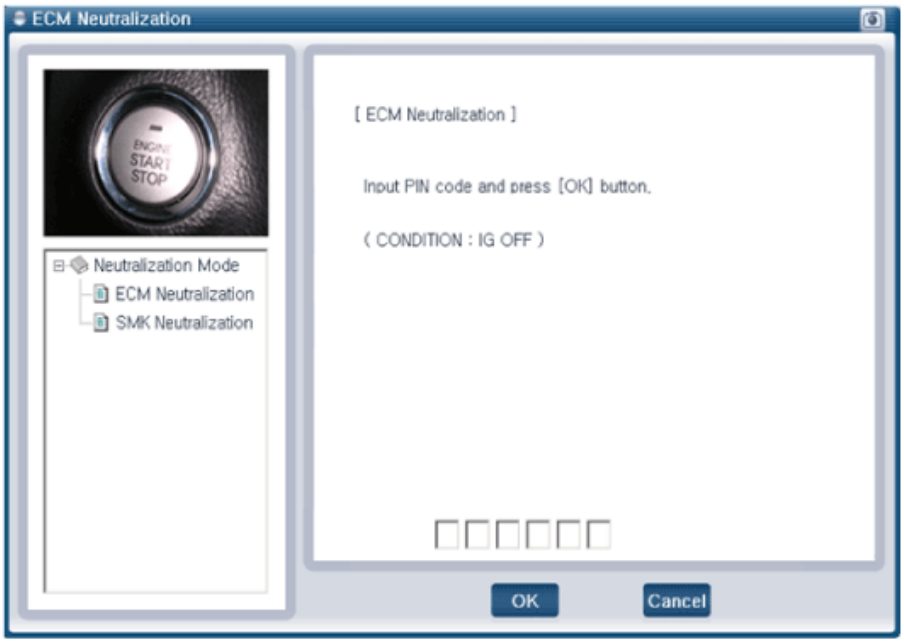
- After IG ON, select the "SMK STATUS INFO".



Neutralization Status Check

- After IG ON, select the "Neutralization mode".


Vehicle S/W Management
ID Register
System Identification
Neutralization Mode
SMK STATUS INFORMATION
FOB KEY STATUS INFORMATION
Smart Key Code Saving
Inspection / Test
Current FOB Key Check
Antenna Status Check
Neutralization Mode
ENGINE START STOP
Neutralization Mode
ECM Neutralization
SMK Neutralization
[Neutralization Mode]
If you're ready, select the menu.
Cancel



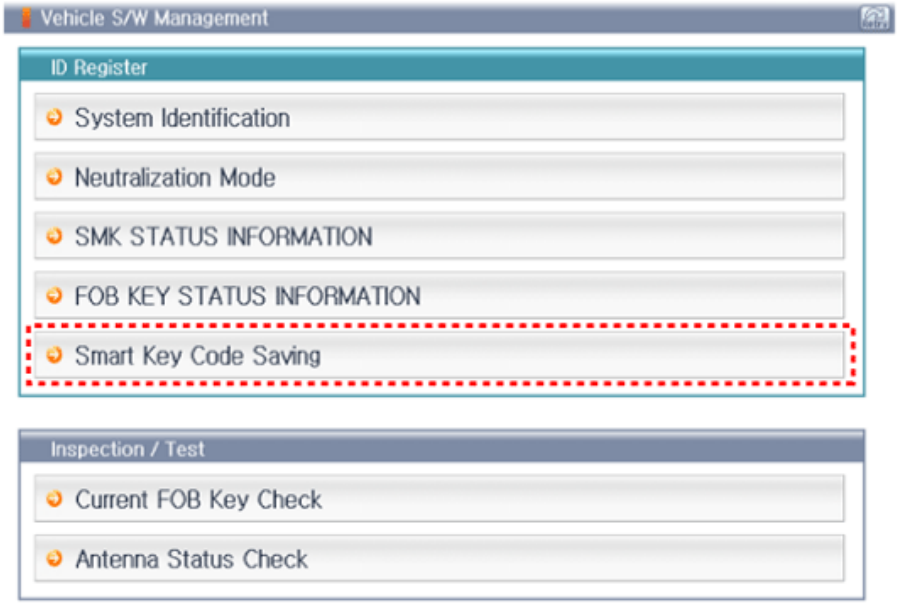
Smart Key System - Repair Procedures (Article 44777)

- Smart Key

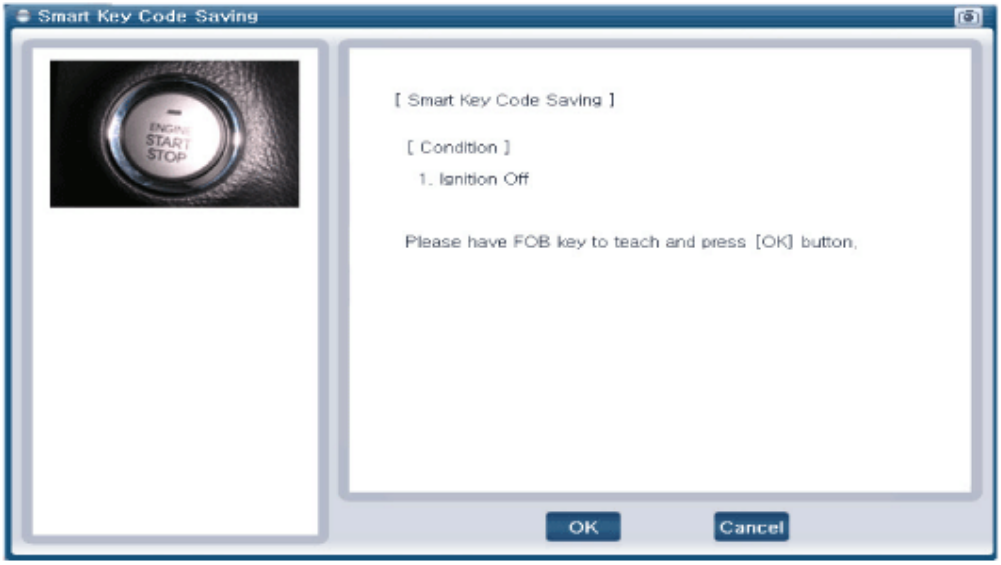
Smart Key Code Saving

- 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.

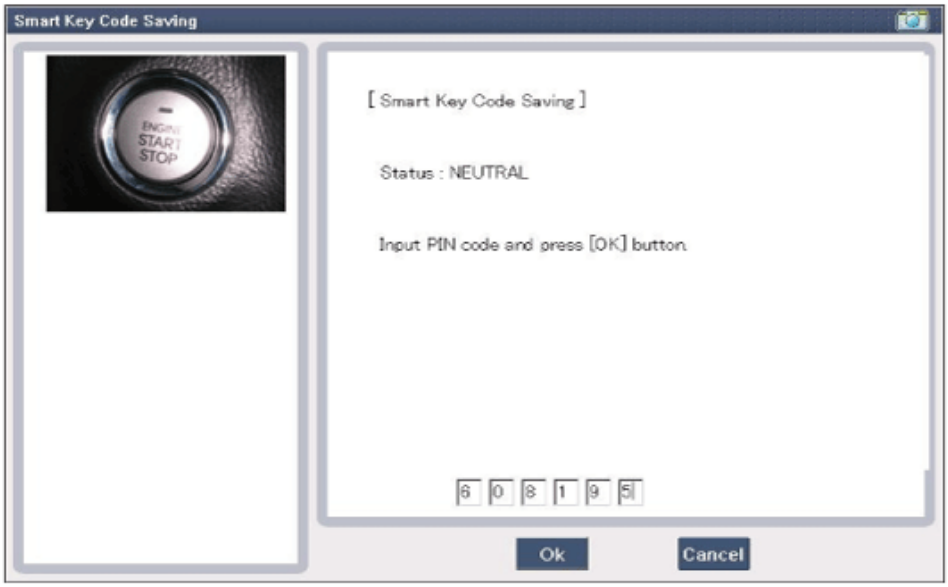
- Select the vehicle model and then do "Smart Key Code Saving".

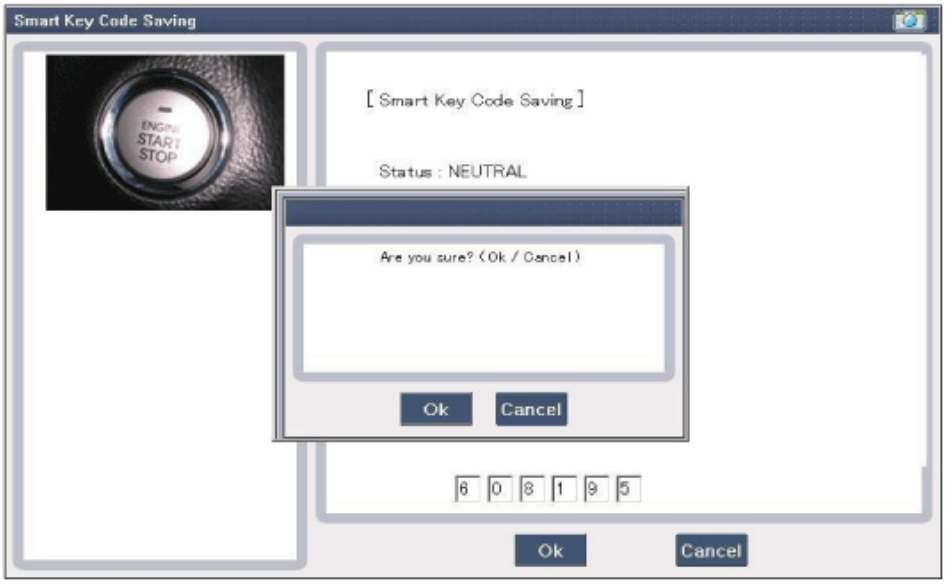


- After selecting "Smart Key Teaching" menu, push "Enter" key, then the screen will be shown as below.

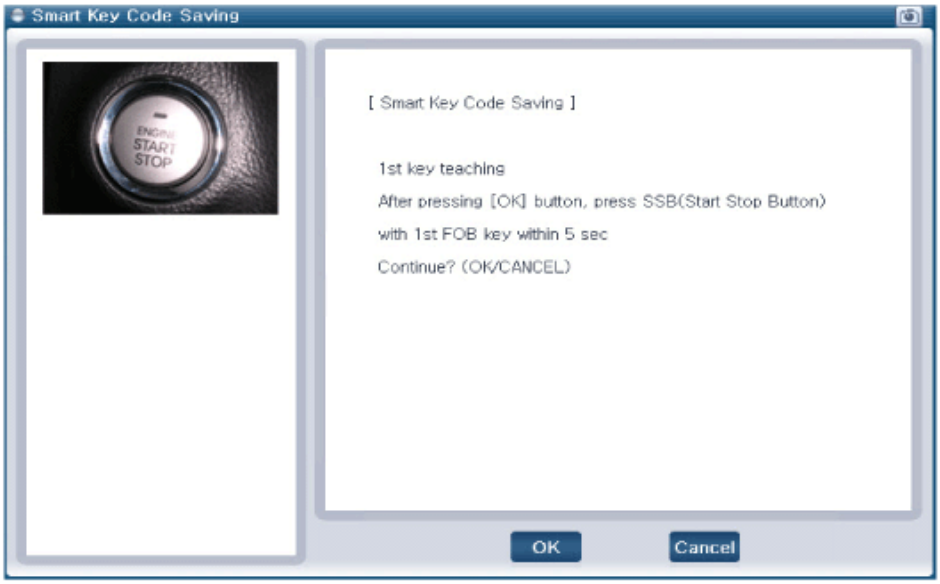


- After having the teaching smart key, push "Enter" key.
- Input the "Pin Code" for first key teaching.

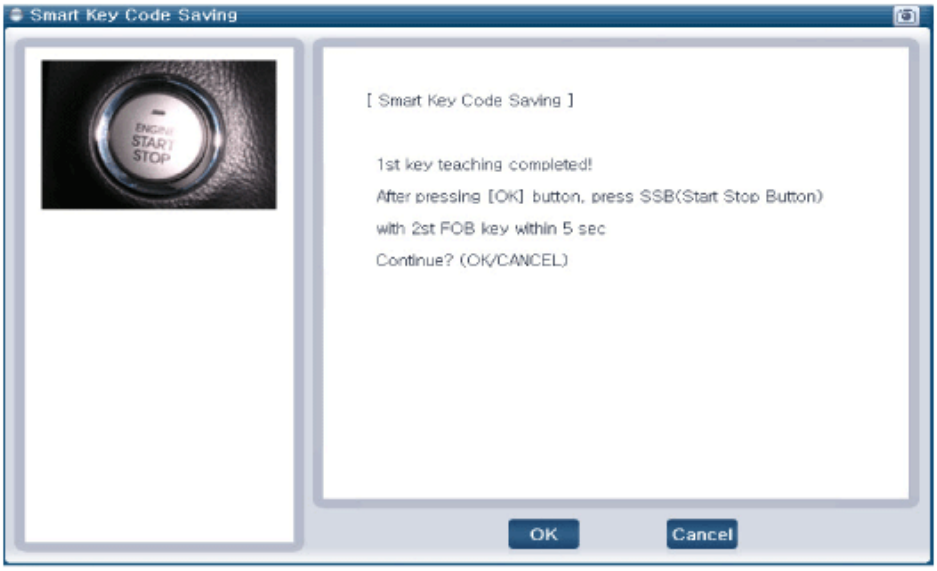




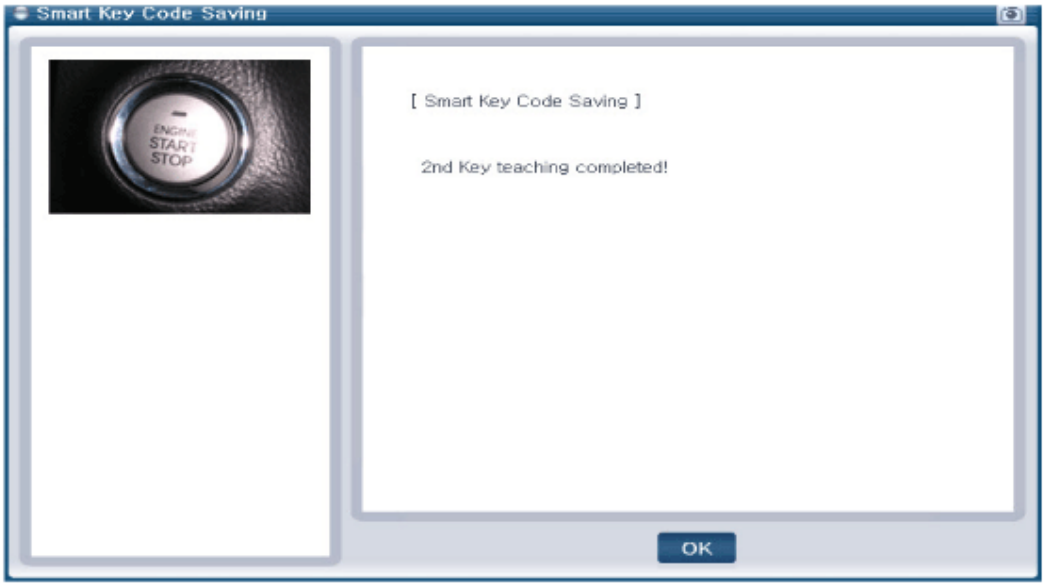
- Press the SSB with smart key within 5 sec after pressing "OK".



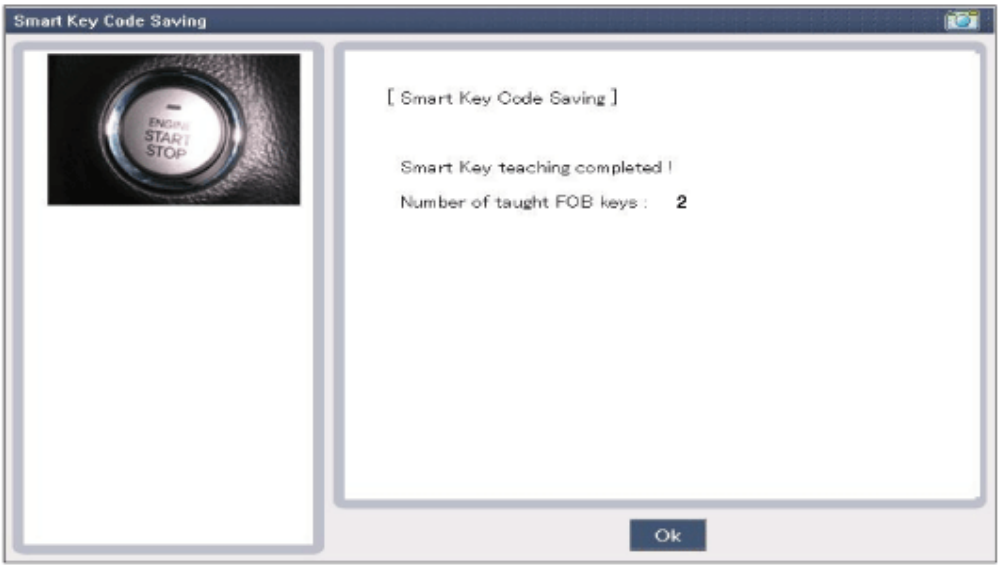
- Confirm the message "First key teaching completed".



- Confirm the message "Second key teaching completed".



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

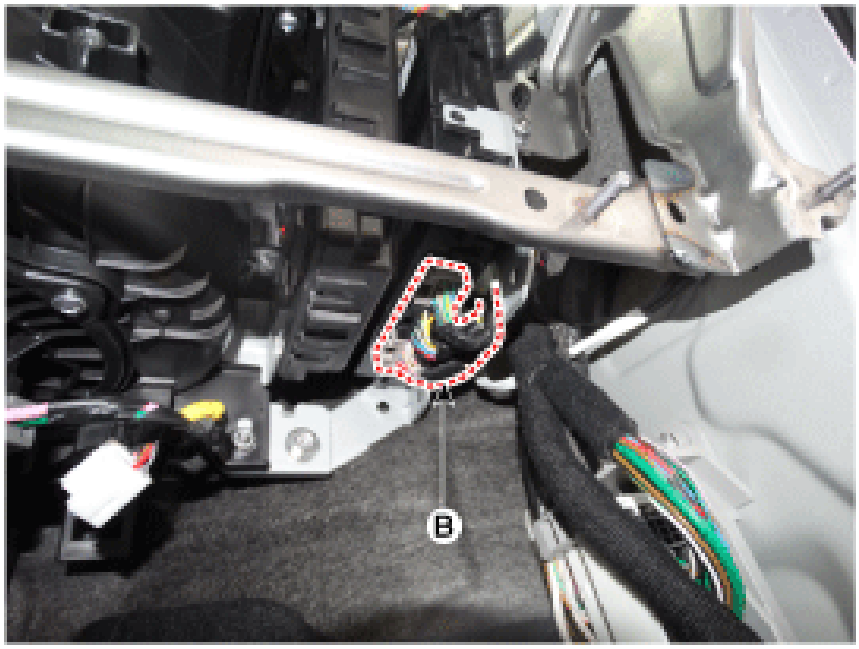


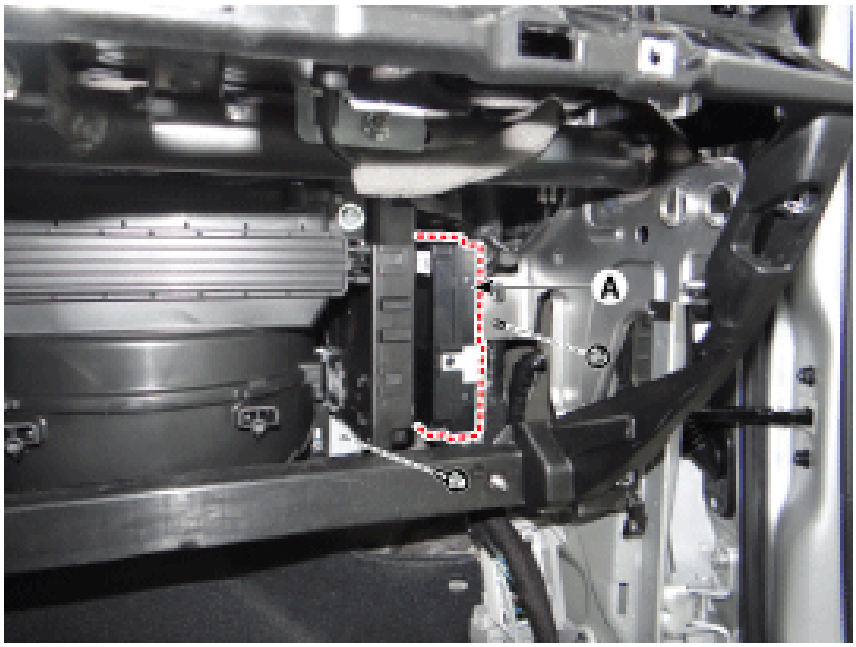
Smart Key Unit - Repair Procedures (Article 44789)

- Removal

Smart Key Unit

- Disconnect the negative (-) battery terminal.
- Remove the glove box. (Refer to Body - "Glove Box Upper Cover Assembly")
- Remove the smart key unit (A) after disconnecting the connectors (B) and loosening the bolt and nut.



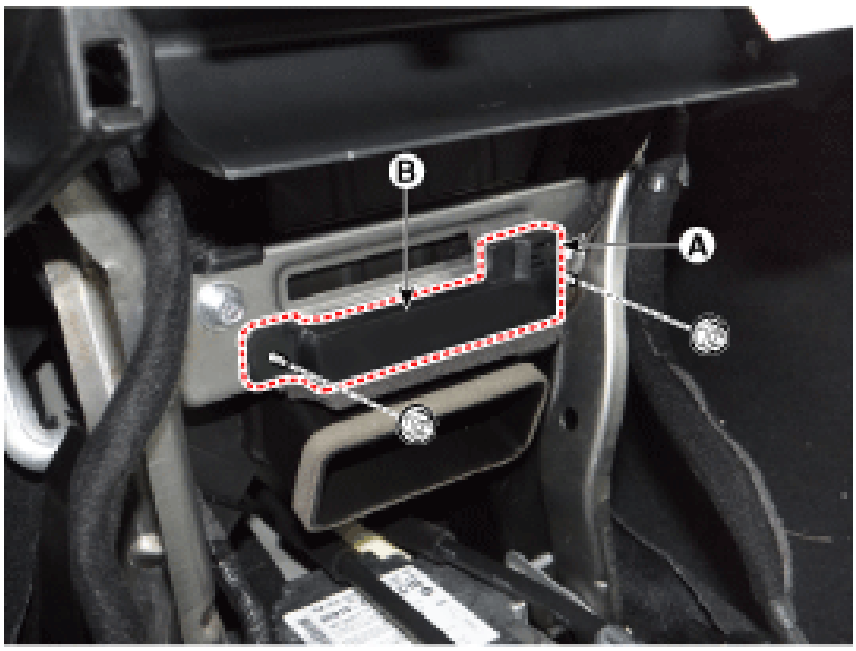


Interior 1 Antenna

Take care not to scratch the crash pad and related parts.

NOTICE

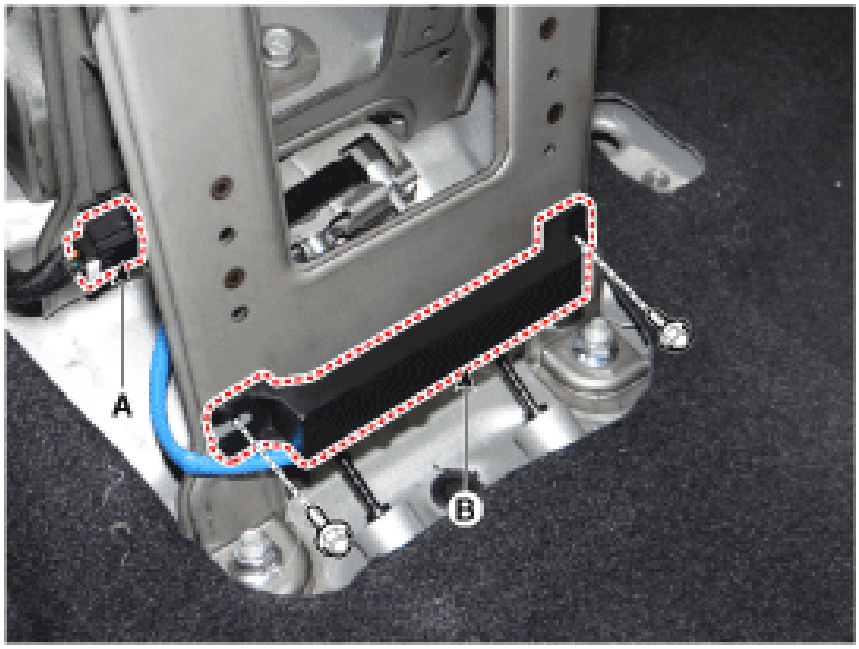
- Take care not to scratch the crash pad and related parts.
- Remove the console upper cover. (Refer to Body - "Floor Console Assembly")
- Remove the interior 1 antenna (B) after loosening the mounting nuts and disconnect the connector (A).



Interior 2 Antenna

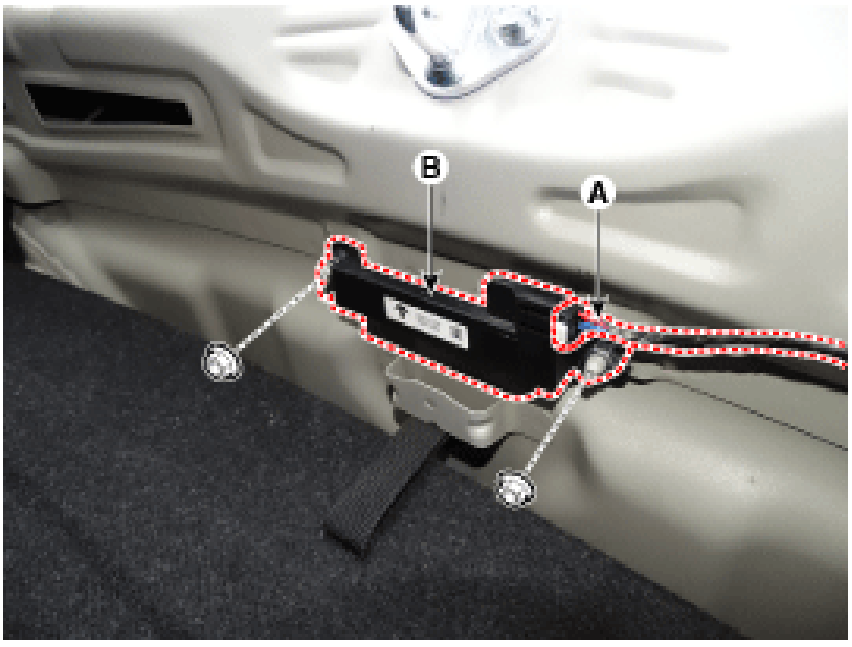
- Remove the console upper cover (Refer to Body - "Floor Console Assembly")
- Remove the interior 2 antenna (B) after loosening the mounting nuts (2EA) and disconnecting the connector

(A).



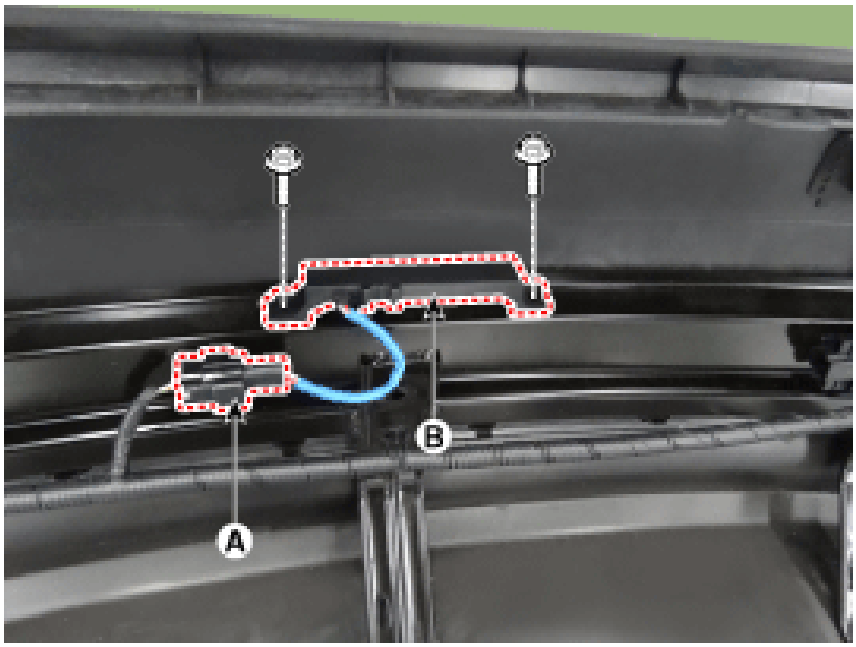
Trunk Antenna

- Disconnect the negative (-) battery terminal
- Remove the rear transverse trim.
- Remove the trunk antenna (B) after disconnect the connector (A) and loosening the mounting nuts.



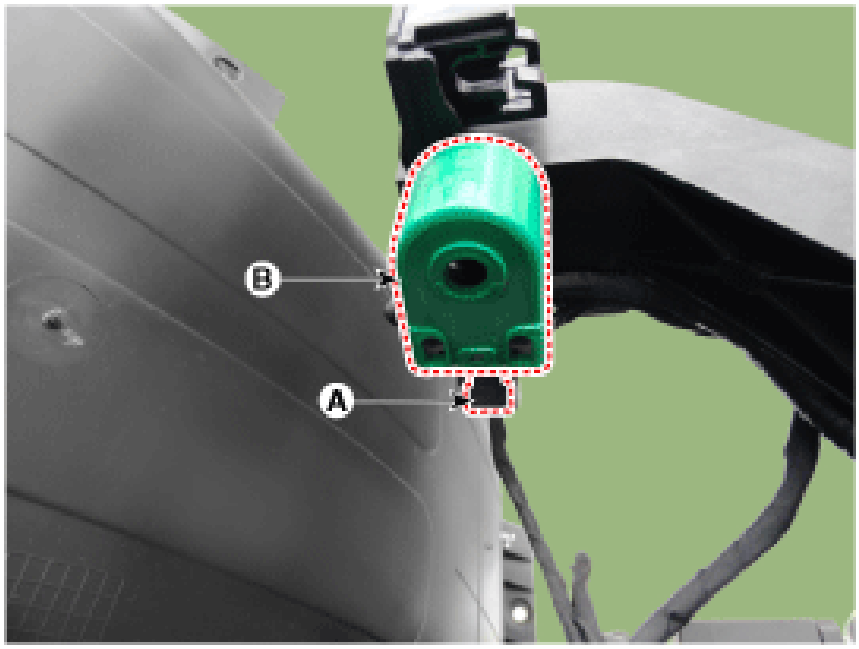
Rear Bumper Antenna

- Remove the rear bumper cover. (Refer to Body - "Rear Bumper Cover")
- Remove the rear bumper antenna (B) after disconnect the connector (A) and loosening the mounting nuts.



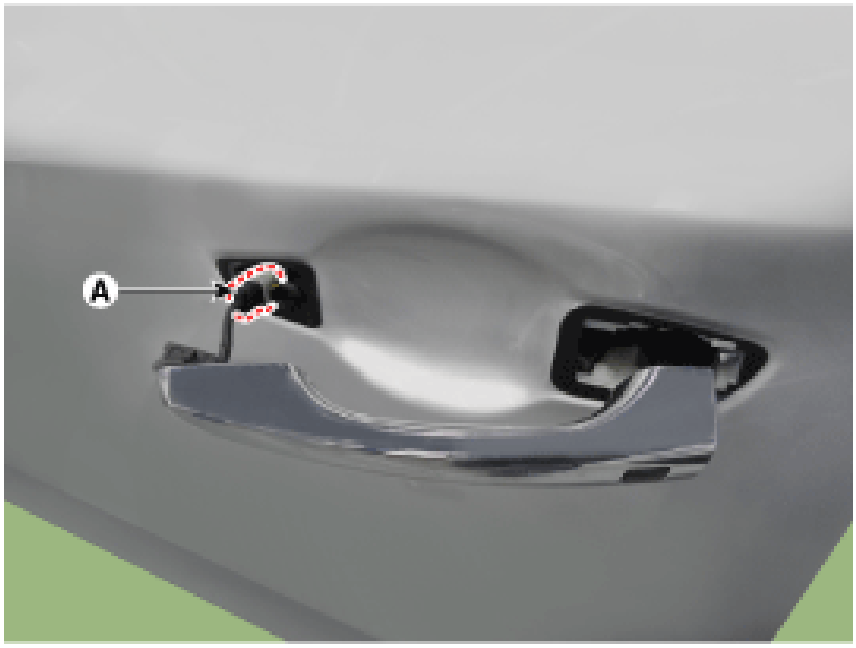
Buzzer

- Remove the front left wheel guide. (Refer to Body - "Front Wheel Guard")
- Remove the buzzer (B) after disconnect the connector (A)

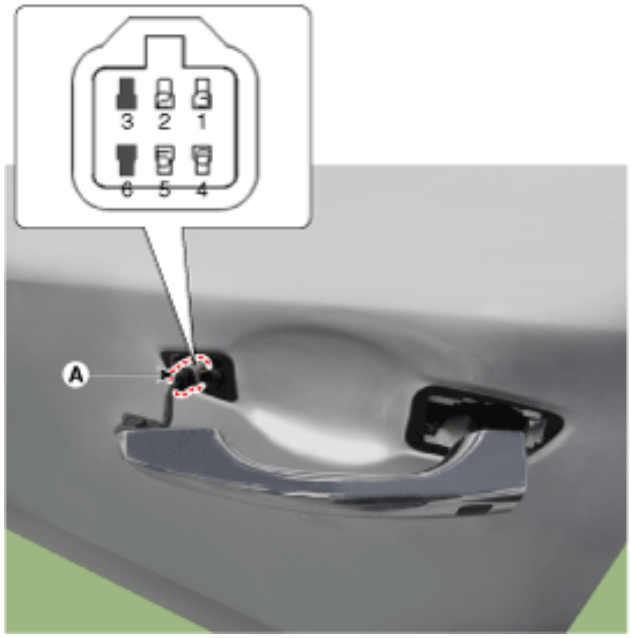


Door Outside Handle

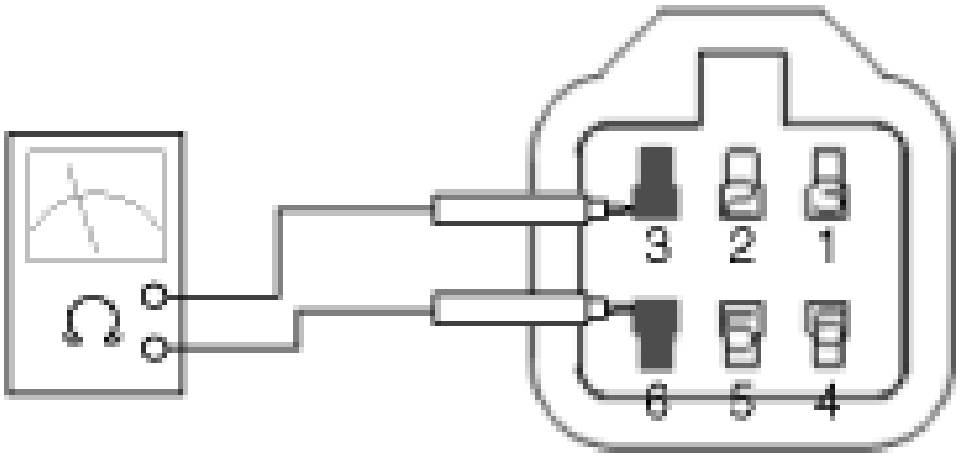
- Remove the front outside door handle. (Refer to Body - "Front Door Outside Handle")



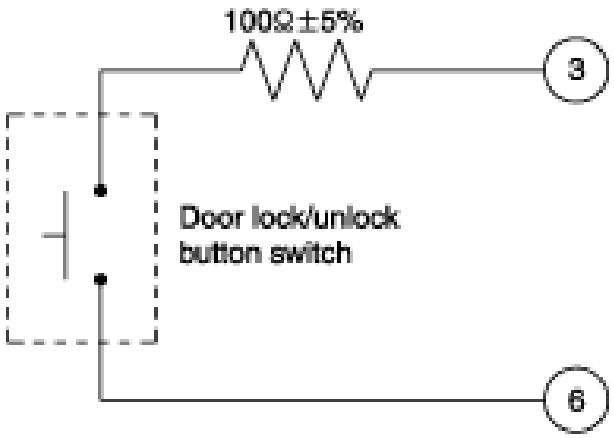
- Inspection
Smart Key Switch
Antenna
- Disconnect the front door outside handle connector (A).



- 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



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



- Installation
- Install the smart key unit.
- Install the smart key unit mounting bolts and connect the connector.
- Install the glove box.
- Install the negative (-) battery terminal and check the smart key system.
- Install the interior 1 antenna.
- Install the crash pad center panel.
- Install the interior 2 antenna.
- Install the console rear complete assembly.
- Trunk mounted antenna.
- Install the rear transverse trim.
- Install the rear bumper antenna.
- Install the rear bumper cover.
- Install the negative (-) battery terminal and check the smart key system

- Install the outside handle.
- Install the front outside door handle.

Keyless Entry and Burglar Alarm - Specifications (Article 44795)

- Specification

Item Specification
Power source 3V
Operating temperature -30°C to +75°C (-22°F to +167°F)
RF Modulation FSK
LF Modulation ASK
RF frequency 433.92 MHz
Button number 4
Function Door lock
Door unlock
Tailgate unlock

Smart Key System - Specifications (Article 44768)

- Specifications

Smart Key Unit
Items Specification
Rated voltage DC 12V
Operating voltage DC 9 - 16V
Operating temperature -22°F - 167°F (-30°C - 75°C)
Load Max. 4mA (When welcome light function off)
RF Receiver
Frequency 433.92 Mhz
Antenna type FSK (Frequency Shift Keying)
Smart Key Fob
Battery Lithium battery 3V 1EA
Distance 30m from vehicle, RF : 30m, Passive (LF) : 0.7m
Battery life More than 2 years (10 times / a day) An inappropriately disposed battery can be harmful to the environment and human health. Dispose the battery according to your local law(s) or regulation.
An inappropriately disposed battery can be harmful to the environment and human health. Dispose the battery according to your local law(s) or regulation.

- 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 4 (Door lock / unlock, Liftgate, Panic)
Frequency(Rx) 125 kHz
Frequency(Tx) 433.92 MHz
Numbers 2EA
Antenna
Frequency 125kHz
Numbers Interior (2EA), Door (2EA), Bumper (1EA), Trunk (1EA)

All New Technical Service Bulletins (itype_432)

Tsbs

- ANTI-THEFT IGNITION CYLINDER PROTECTOR & DECAL INSTALLATION (CUSTOMER SATISFACTION CAMPAIGN P33) (25-01-089H, 2025/12/16)
- IBU/BCM ANTI-THEFT SOFTWARE UPGRADE AND DECAL APPLICATION (SERVICE CAMPAIGN 993) (24-01-009H-1,

2024/05/09)

All Technical Service Bulletins (itype_100)

Tsbs
- IAU/IBU/BLE LEARNING AFTER PARTS REPLACEMENT (22-BE-004H, 2022/07/08)
- ANTI-THEFT IGNITION CYLINDER PROTECTOR & DECAL INSTALLATION (CUSTOMER SATISFACTION CAMPAIGN P33) (25-01-089H, 2025/12/16)
- IBU/BCM ANTI-THEFT SOFTWARE UPGRADE AND DECAL APPLICATION (SERVICE CAMPAIGN 993) (24-01-009H-1, 2024/05/09)
- KEY FOB CODE SAVING/PROGRAMMING INFORMATION (19-BE-006H, 2019/03/25)
- OEM GENUINE HYUNDAI REMOTE START MODULE SOFTWARE UPDATE (23-BE-010H, 2023/08/17)

OEM Policies and Procedures (itype_120)

Tsbs
- IAU/IBU/BLE LEARNING AFTER PARTS REPLACEMENT (22-BE-004H, 2022/07/08)
- KEY FOB CODE SAVING/PROGRAMMING INFORMATION (19-BE-006H, 2019/03/25)