SKM

8510-08/8610-11/8610-18/8712-01/8712-03/8712-05/

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SMART KEY MODULE

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SMART KEY MODULE 8712-03

GENERAL INFORMATION

1. SPECIFICATIONS

▶ **Smart key module**

Component	Item	Specifications
SKM unit (Electric)	Rated voltage	12.0 V
	Operating voltage	9.0 V to 16.0 V (CAN: 7.0 V to 18.0 V)
	Operation temperature	−30℃ to 80℃
	Max. operating humidity	95%
	Dark current	5.5 mA
	Voltage drop	1.0 V or less
SKM unit (wireless)	Receive frequency	433.920 MHz ± 0.0125 kHz/PWM
	Frequency bandwidth	12 kHz ± 2 kHz or less
	Modulation type	FSK (Frequency Shift Keying)
	Receive distance	RF: 10 m or more (without obstacles) LF: 1.0 m (without obstacles)

▶ **Smart key**

Component	Item	Specifications	
Smart key (Electric)	Operating voltage	2.7 V to 3.3 V	
	Operation temperature	−20℃ to 60℃	
	Battery type	CR2032	
Smart key (wireless)		**RF (Radio Frequency) (transmission)**	**LF (Low Frequency) (receiving)**
	Sending/receiving frequency	433.92 ± 0.0125 MHz	133.3 kHz ± 0.2 kHz
	Modulation type	FSK (Frequency Shift Keying)	

Modification basis	
Application basis	
Affected VIN	

▶ **LF (Low Frequency) antenna**

Component	Item	Specifications
Smart key antenna	Frequency	134.2 ± 1.5 kHz
	Current consumption	Max. 1.2 A
	Operating temperature range	−30℃ to 80℃
Door handle switch	Rated voltage	5.0 V
	Voltage range	6.0 V to 16.0 V
	Rated current	5 to 20 mA
	Operating temperature range	−30℃ to 80℃

▶ **External buzzer (SKM buzzer)**

Component	Item	Specifications
External buzzer (SKM buzzer)	Operating voltage	7.5 V to 14.5 V
	Operation temperature	−30℃ to 80℃
	Sound pressure level	83 dB

2. CODING ITEMS FOR ELECTRICAL UNITS REPLACEMENT

Category	EMS registration	Variant coding	Smart key & transponder coding	Remarks
When replacing ECU	carried out under SKM menu	-	-	
When replacing BCM	-	carried out under BCM menu	-	
When replacing smart key	-	-	carried out under SKM menu	The smart key is inserted into the slot.
When replacing SKM	carried out under SKM menu	-	carried out under SKM menu	

Modification basis	
Application basis	
Affected VIN	

3. MAJOR CHANGES

▶ SKM unit

SKM unit	
Old 	New 
− RF antenna type changed for improving receiving sensitivity of SKM unit (built−in → external) − Smart key LF verification method changed (search for smart key used last → all smart keys registered) - Approach (puddle) lamp control method changed (approach (puddle) lamp ON when valid smart key is in vehicle → approach (puddle) lamp OFF when valid smart key is in vehicle)	

▶ Door handle switch & antenna

Door handle switch & antenna

Old

Pin No.	Function
1	Antenna (+)
2	-
3	Ground
4	Switch signal
5	Antenna (-)

New

Pin No.	Function
1	Switch signal
2	-
3	Ground
4	Antenna (-)
5	Antenna (+)

- Door handle switch and antenna pin map changed
− Door handle switch's material changed (rubber → plastic)

Modification basis	
Application basis	
Affected VIN	

▶ **Smart key**

Smart key

Old

Mode	LED color
LOCK	Red LED
UNLOCK	Green LED

Signal

New

Mode	LED color
LOCK	Red LED
UNLOCK	Red LED

Signal

LED color changed when pressing smart key unlock button (green→red)

Smart key operation	Old	New
Door lock	Press for 1.5 sec. or less	Press for 0.03 sec. or longer
Door unlock	Press for 1.0 sec. or longer	Press for 0.03 sec. or longer
Tailgate open	Press for 1.0 sec. or longer	←
Panic	Press for 1.0 sec. or longer	←

Modification basis	
Application basis	
Affected VIN	

Memo

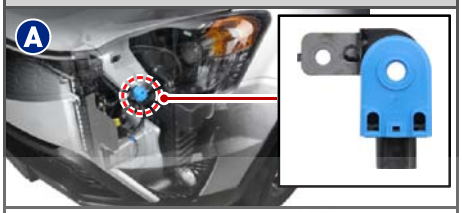
OVERVIEW AND OPERATING PROCESS

1. OVERVIEW

The SKM (Smart Key Module) system is equipped to only the vehicles with smart key and is to prevent theft and enhance the driver experience. When the driver presses a door handle switch carrying a smart key, this system checks the smart key information and driver door status and locks/unlocks the doors (passive function). The vehicle can be started when the driver enters the vehicle and presses the START/STOP switch (passive start function).

2. COMPONENTS

External buzzer (SKM buzzer)



Sounds a warning related to SKM system

Smart key indicator

Smart key undetected warning/ verification fail indicator

SKM

Wireless communication with other modules through B-CAN, P-CAN, hard wire to control SKM system

BCM

Communicates with SKM through B-CAN to control the vehicle components

START/STOP switch

- Supplies power to the vehicle with a button (ACC, IGN1, IGN2)
- Indicates vehicle status with LED illumination and flashing

Emergency slot

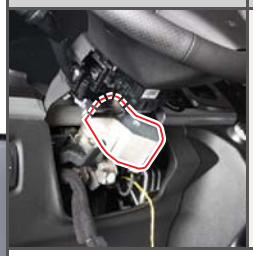
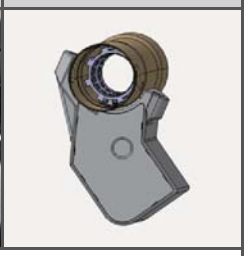
For emergency use to start the engine when the smart key battery has been discharged.

Smart key

Wireless communication with SKM system by receiving LF (Low frequency) and transmitting RF (Radio frequency)

Modification basis	
Application basis	
Affected VIN	

ESCL

Mounting location	Component
	

The ESCL (Electric Steering Column Lock) is a device which locks the steering handle with an electrical signal.

Interior (center) antenna

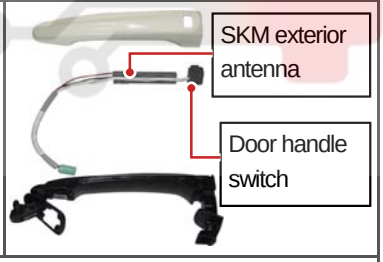
Mounting location	Component
	

Interior (rear) antenna

Mounting location	Component
	

LF transmission for valid smart key searching inside vehicle (passive start and KEY IN/OUT)

Door handle switch & antenna

Mounting location	Component
	

LF transmission for valid smart key searching outside vehicle (passive entry and KEY IN/OUT)

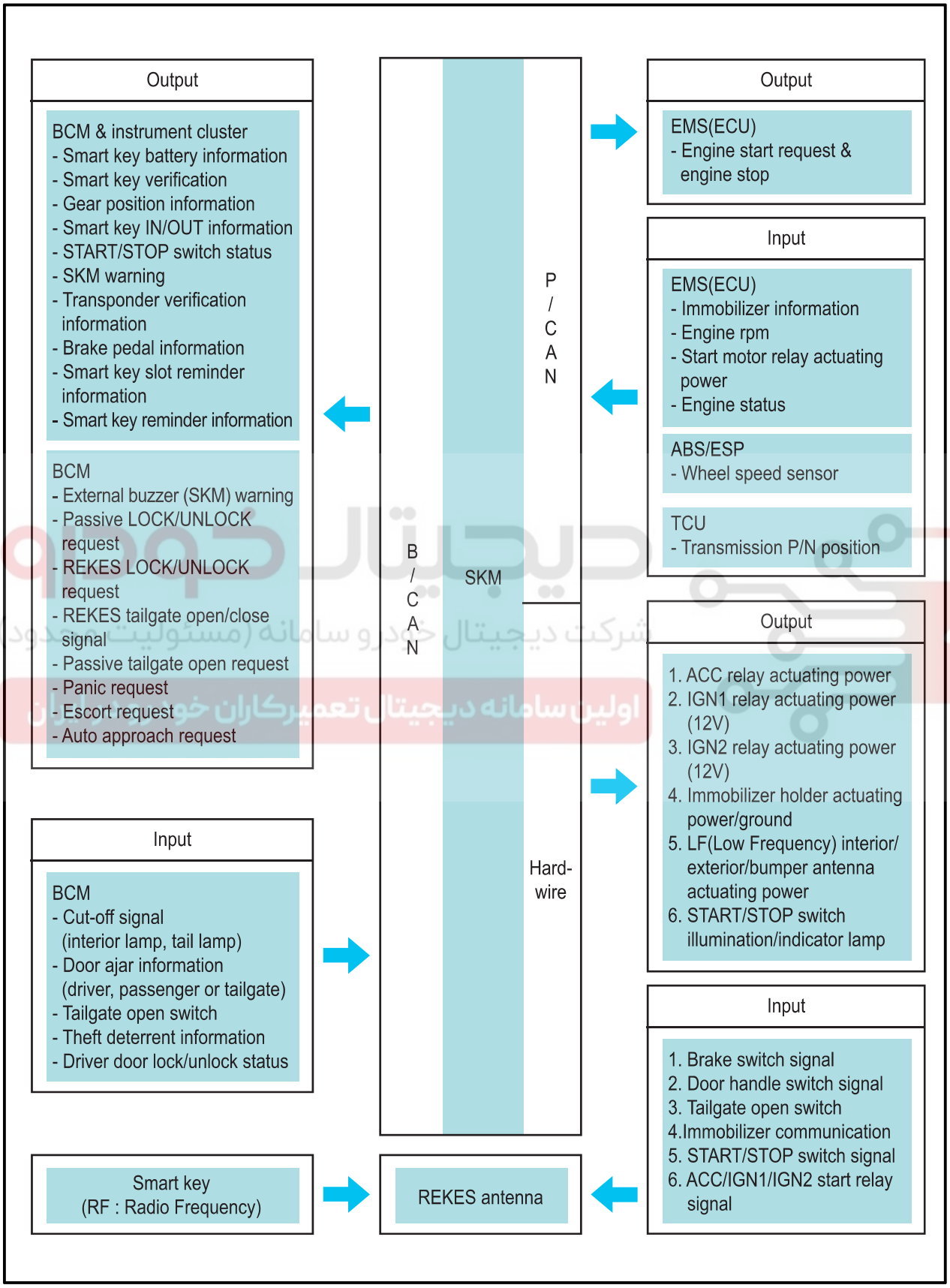
Exterior (bumper) antenna

Mounting location	Component
	

LF transmission for valid smart key searching outside area of rear bumper when tailgate open switch signal input

Modification basis	
Application basis	
Affected VIN	

3. INPUT/OUTPUT DIAGRAM



Modification basis	
Application basis	
Affected VIN	

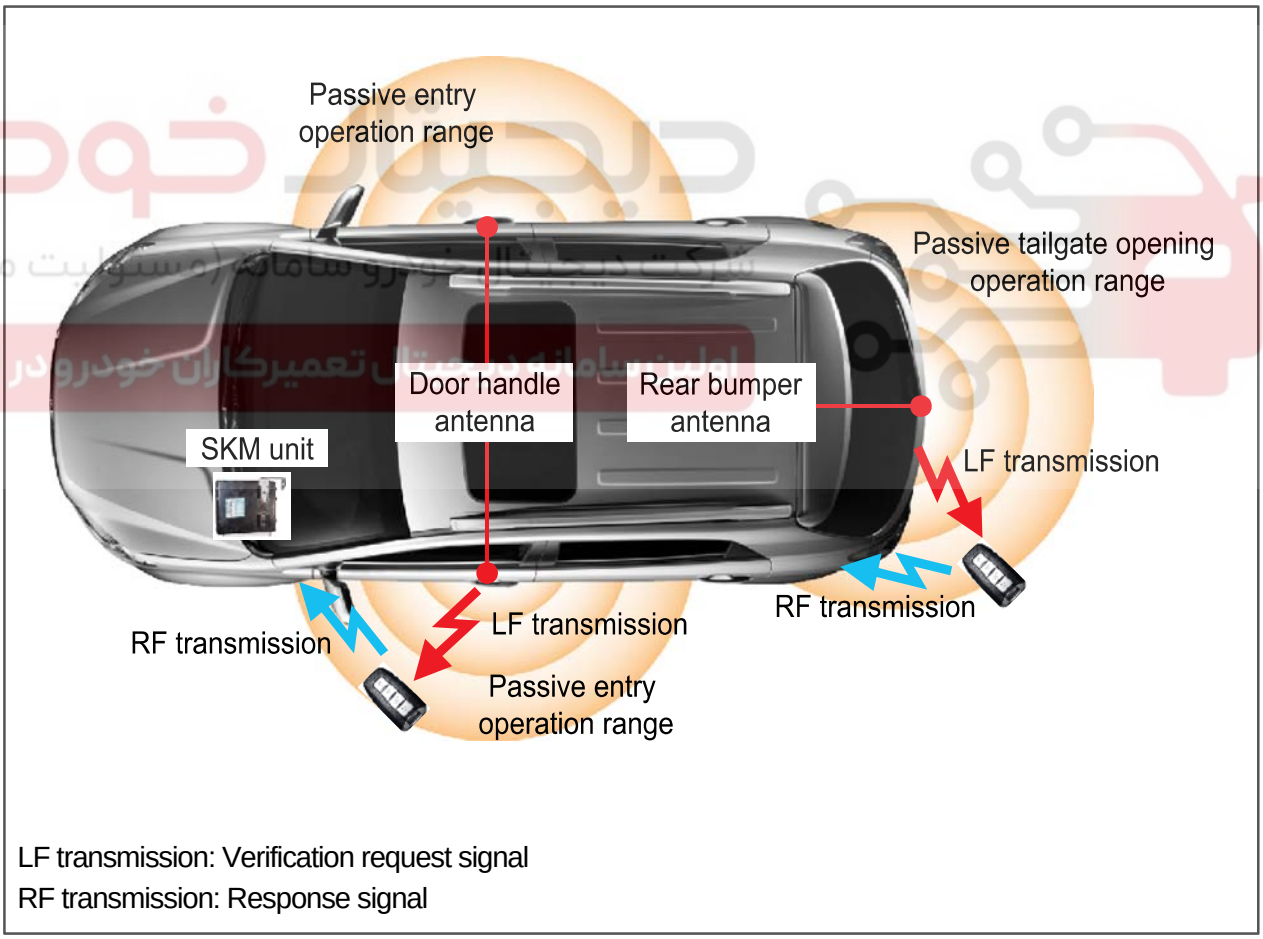
4. PASSIVE ENTRY MANAGEMENT

- Searching for a smart key signal from the outside the vehicle is prioritized in the theft deterrent mode when the passive entry signal is input. Searching for a smart key signal from the inside is prioritized when the theft deterrent mode is deactivated.
- The system searches a smart key only in the actuation area of a switch, which the signal is input (driver/passenger door handle switches and tailgate open switch).

1) Passive Function

(1) Passive entry actuation area

- The passive entry actuation area refers to the area where passive LOCK/UNLOCK can be performed by pressing the switch on the driver or passenger door handle with a smart key carried by the driver.
- The passive tailgate open actuation area refers to the area where the tailgate can be opened by pressing the tailgate switch with a smart key carried by the driver.



LF transmission: Verification request signal
RF transmission: Response signal

NOTE

- Passive entry function actuation area: Within 1.2 m from the door handle antenna
- Passive tailgate open actuation area: Within 1.2 m from the center of the bumper

Modification basis	
Application basis	
Affected VIN	

(2) Passive start actuation area

- Starting the engine by pressing the START/STOP switch with the gear selector lever in "P" or "N" position and the brake pedal depressed (START/STOP switch LED: green) after the driver has entered the vehicle carrying a smart key.

- Passive start actuation area: Vehicle interior

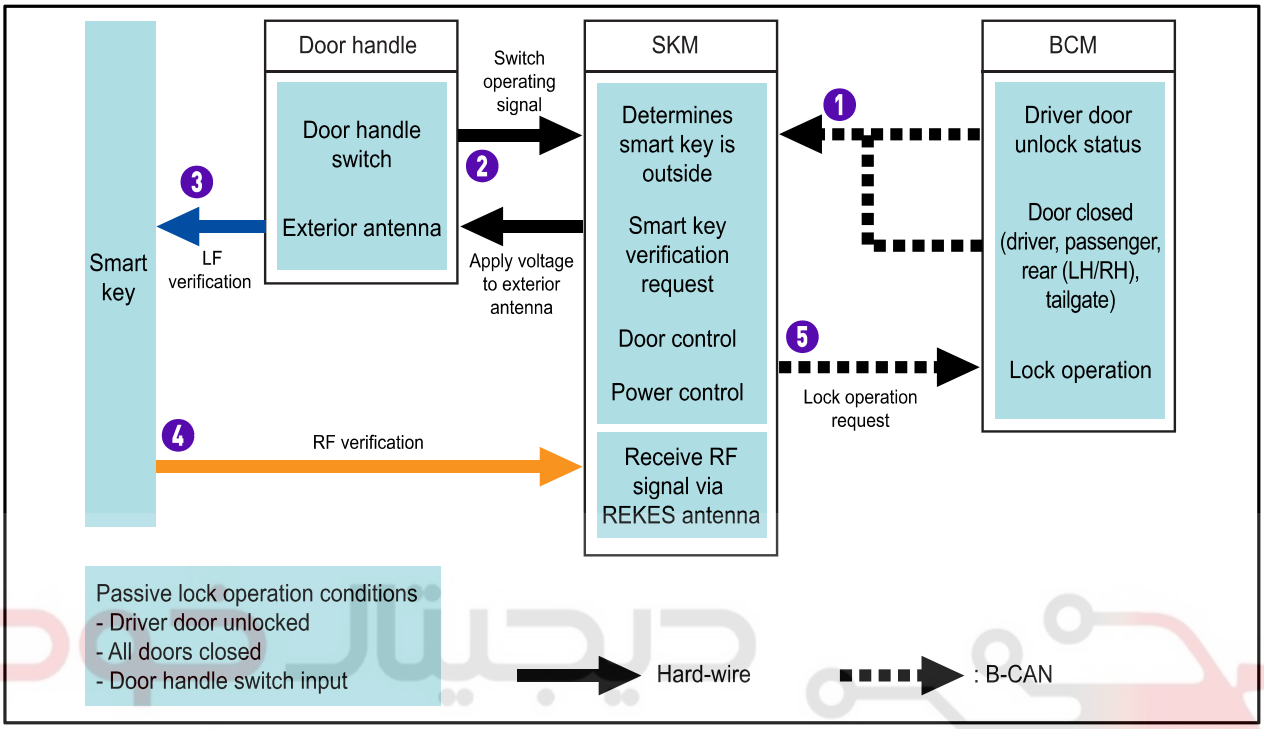
CAUTION

- The smart key verification many not possible in an area where the communication is poor, such as the seat cushion that the seat heated wire is operated, around the pedals and the on the floor. The smart key system malfunctions may occur when generating radio waves around the smart key
- or vehicle, or attaching a electronic device which generates radio waves on the smart key or vehicle.

Modification basis	
Application basis	
Affected VIN	

(3) Passive LOCK

The passive LOCK (door LOCK) is activated by the door handle switch with a valid smart key present within the passive entry actuation area.



▶ **Passive LOCK and verification by door handle switch**

- The ignition is turned OFF or ACC is turned ON.

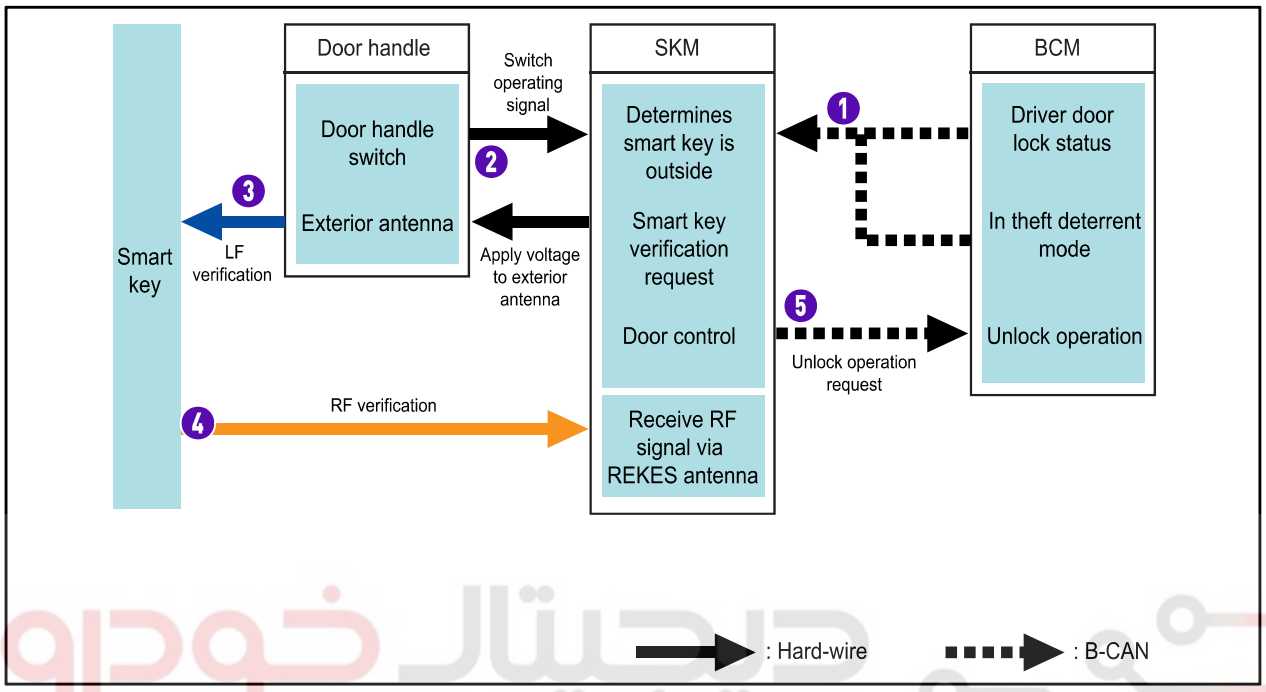
1. All doors are closed and the driver door is unlocked.
2. The door handle switch on the driver or passenger door is pressed briefly.
3. The SKM verifies if a smart key is outside the vehicle using the door handle antenna (LF verification) (The SKM searches the last smart key used first. Searching for a smart key signal from the outside the vehicle is followed by searching from the inside the vehicle).
4. The verification signal (RF verification) from the smart key is sent to the REKES antenna of the SKM. The SKM sends the Passive LOCK signal to the BCM through the B-CAN if the verified smart key is
5. found outside the vehicle.
   The BCM receives the signal from the SKM and controls the door LOCK actuator and turn signal
6. lamp. (The buzzer sounds once and hazard warning lamp flashes twice when the system enters the theft deterrent mode)

NOTE

- If no smart key is identified as being outside the vehicle, the passive LOCK process is stopped and restarted when the next signal is received from the door handle switch.
- When the door handle switch is pressed with ACC ON and driver door unlocked, the SKM changes the ignition status to OFF and sends the passive LOCK signal to the BCM through the B-CAN to lock the door. The BCM ignores the signal if the ignition is turned ON.

(4) Passive UNLOCK

The passive UNLOCK (door UNLOCK) is activated by the door handle switch with a valid smart key present within the passive entry actuation area.



▶ Passive UNLOCK and verification by door handle switch

1. The driver door is locked and the system in the theft deterrent mode.
2. The door handle switch on the driver or passenger door is pressed briefly.
3. The SKM verifies if a smart key is outside the vehicle using the door handle antenna (LF verification) (The SKM searches the last smart key used first).
4. The verification signal (RF verification) from the smart key is sent to the REKES antenna of the SKM.
   The SKM sends the Passive UNLOCK signal to the BCM through the B-CAN if the verified smart key
5. is found outside the vehicle.
   The BCM receives the signal from the SKM and controls the door UNLOCK actuator and turn signal
6. lamp. (The buzzer sounds twice and hazard warning lamp flashes once when the theft deterrent mode is deactivated)

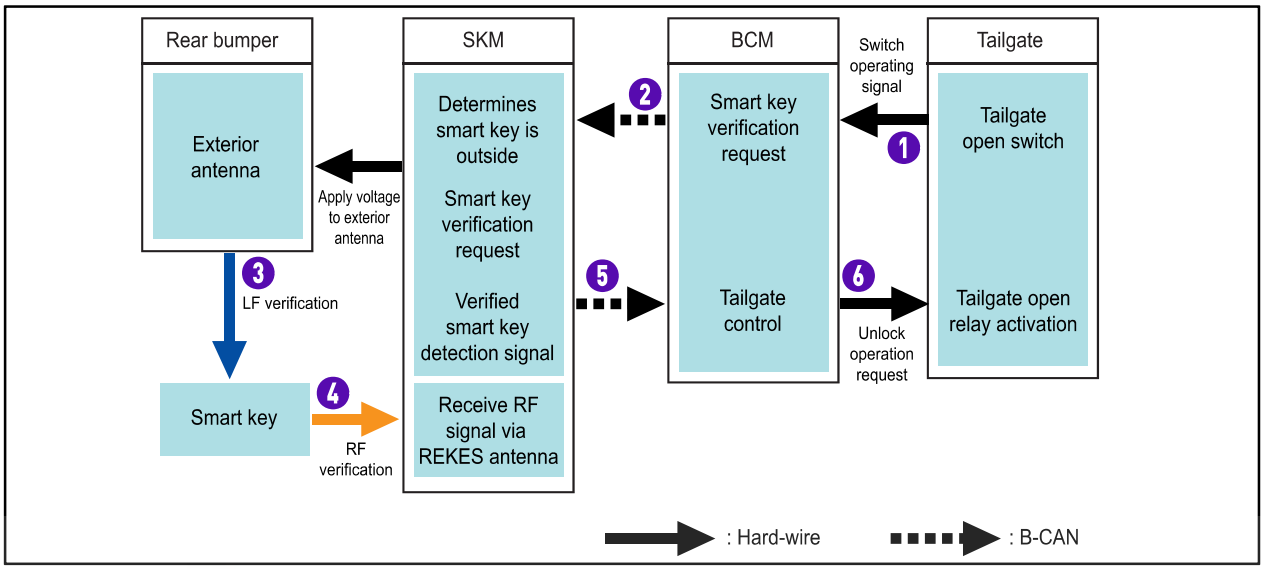
NOTE

- If no smart key is identified as being outside the vehicle, the passive UNLOCK process is stopped and restarted when the next signal is received from the door handle switch.
- When the driver door is locked with ACC ON, the SKM sends the Passive UNLOCK signal to the BCM through the B-CAN to unlock the door without changing the ignition status to OFF. (The vehicle power is turned OFF when the door is opened.)
- Smart key searching
  * Theft deterrent mode: deactivated after searching the outside vehicle
  * Theft deterrent mode deactivated: outside searching after inside searching

Modification basis	
Application basis	
Affected VIN	

(5) Passive tailgate open

The tailgate open control is activated by the tailgate open switch with a valid smart key present within the passive entry actuation area.



▶ **Passive tailgate open by tailgate open switch**

- The driver door is locked and the system in the theft deterrent mode.

1. The tailgate open switch signal is received.
2. The BCM sends the valid smart key verification request signal to the SKM.
3. The SKM verifies if a smart key is outside the vehicle using the corresponding rear bumper antenna (LF verification) (The SKM searches the last smart key used first. If a valid smart key searching is completed, searching for a key in the luggage compartment and inside the vehicle is started). The verification signal (RF verification) from the smart key is sent to the REKES antenna of the SKM.
4. The SKM sends the Passive tailgate open signal to the BCM through the B-CAN if the verified smart key is found outside the vehicle.
5. The BCM activates the tailgate open relay according to the signal received from the SKM. (Only the theft deterrent mode for tailgate is deactivated.)
6.

NOTE

- When the tailgate is closed with all doors closed, the system enters the theft deterrent mode after checking a valid smart key inside the vehicle. When a valid smart key is found inside the vehicle, the external buzzer and smart key detected warning indicator is operated for 10 seconds.
  If no smart key is identified as being outside the vehicle, the passive gate open process is stopped
- and restarted when the next signal is received from the tailgate open switch.
  Smart key searching
- * Theft deterrent mode: deactivated after searching the outside vehicle
  * Theft deterrent mode deactivated: outside searching after inside searching

(6) Puddle (approach) lamp control

The SKM sends the AUTO approach (puddle) lamp ON signal and UNLOCK signal to the BCM through the B-CAN with AUTO approach (puddle) lamp ON, smart key UNLOCK and Passive entry UNLOCK.

▶ Operating conditions

- The SKM starts to search a smart key 30 seconds after the vehicle has entered the theft deterrent mode.
- When the driver approaches the vehicle in theft deterrent mode (within 1 m), the SKM sends the puddle lamp operation signal through the B-CAN if a smart key is identified.

▶ Continuous operation

- When a smart key is identified within 1 m from the vehicle in theft deterrent mode, the SKM sends the puddle lamp operation signal (10 minutes timer activated) through the B-CAN. If a smart key is continuously found within 10 minutes the SKM sends the puddle lamp signal again for continuous operation (up to 2 times within 10 minutes)
- The SKM starts to search a smart key 30 seconds after sending the 1st puddle lamp operation signal. If a smart key is found, the SKM sends the 2nd operation signal.

▶ Reset conditions

- 10 minutes timer terminated
- Re-entering theft deterrent mode after deactivation

▶ Standby mode operation

	Duration	Function	Time (sec)
1st	within 5 days	Normal monitoring time	1.25
2nd	within 5 to 14 days	Increasing monitoring time	1.5
3rd	14 days or more	Stop	

▶ Stop/Standby operation reset condition

Door LOCK/UNLOCK by a smart key or passive

▶ Approach (puddle) lamp ON by smart key UNLOCK and passive entry UNLOCK.

The SKM sends the smart key UNLOCK and passive UNLOCK signals to the BCM through the B-CAN in the theft deterrent mode to control the approach (puddle) lamp ON.

Modification basis	
Application basis	
Affected VIN	

5. REKES CONTROL FUNCTION

▶ REKES LOCK operation

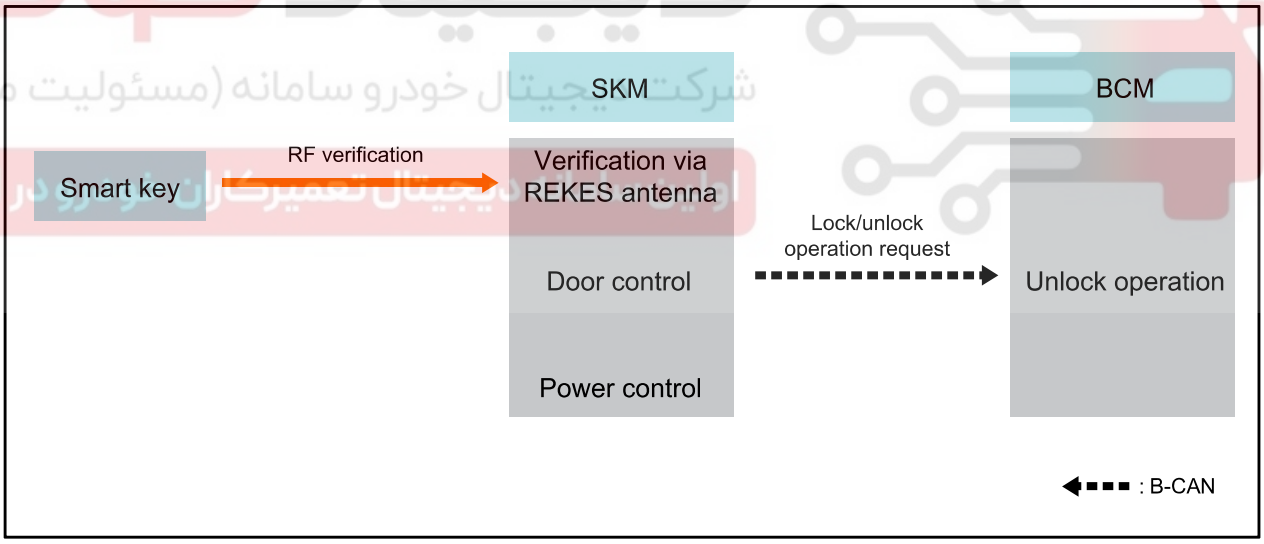
1. The REKES LOCK signal is sent when the LOCK button on the smart key is pressed briefly (0.1 sec. to 1.5 sec.).
2. The SKM receives the REKES LOCK signal and sends the REKES LOCK request signal to the BCM through B-CAN.
3. The BCM outputs the door LOCK signal according to the signal received from the SKM.

NOTE

When the REKES LOCK signal is received with the ACC ON, the ACC is turned OFF and the REKES LOCK signal is sent.

▶ REKES UNLOCK operation

1. The REKES UNLOCK signal is sent when the UNLOCK button on the smart key is pressed briefly (0.1 sec. or more).
2. The SKM receives the REKES UNLOCK signal and sends the REKES UNLOCK request signal to the BCM through B-CAN.
3. The BCM outputs the door UNLOCK signal according to the signal received from the SKM.



▶ Tailgate open operation

1. The ignition is turned OFF, ON, or ACC is turned ON.
2. The tailgate open signal is sent when the tailgate open button on the smart key is pressed 1 second or more.
3. The SKM receives the tailgate open signal and sends the tailgate open request signal to the BCM through B-CAN.
4. The BCM activates the tailgate open relay when the tailgate open switch is pressed.

▶ **REKES panic**

1. The ignition is turned OFF, ON, or ACC is turned ON.
2. The panic signal is sent when the panic button on the smart key is pressed 1 second or more.
3. The SKM receives the panic signal and sends the panic request signal to the BCM through B-CAN. The BCM controls the panic alarm and hazard warning lamp.
4.

NOTE

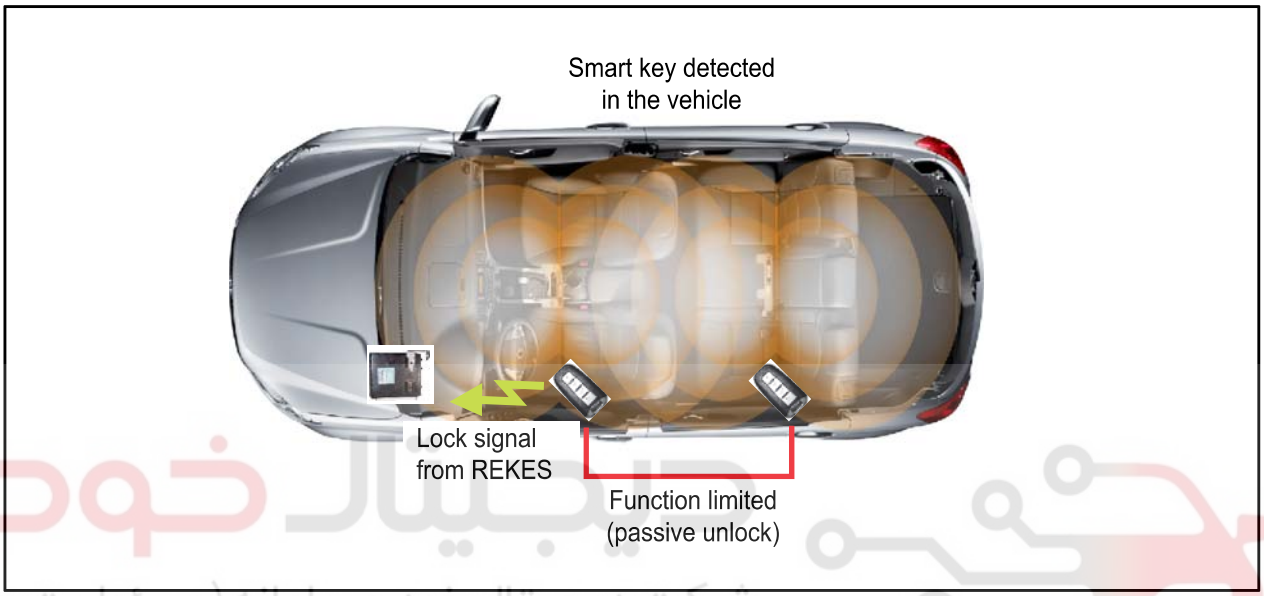
- When the panic button on the smart key is pressed again during the panic alarm operation, the SKM sends the panic operation command to the BCM to stop the panic alarm.
- When the theft deterrent activation command is received from the BCM, the panic alarm is stopped and the theft deterrent siren is activated.

Modification basis	
Application basis	
Affected VIN	

6. SMART KEY FUNCTION LIMITATION (SILENT) /DEACTIVATION

▶ **Silent smart key**

Limits the passive UNLOCK function when searching for the smart key which activated the REKES LOCK inside the vehicle (including external/internal antenna overlapping area), to prevent the break-in.



Silent activation conditions **- All doors closed (B-CAN)** **- Theft deterrent mode activated (B-CAN)** **- Smart key search**	Silent: The passive UNLOCK is unavailable when REKES LOCK is carried out with a smart key inside the vehicle.

- **Silent smart key activation**

1. The REKES LOCK (theft deterrent mode activation) request signal is sent by a smart key inside the vehicle.
2. The smart key activated REKES LOCK is found in the vehicle.
3. All smart keys in the vehicle including the one that output the REKES LOCK are memorized as silent smart keys, and the passive UNLOCK is not available with these keys.

- **Silent smart key function**

1. Passive UNLOCK not available
2. Passive start & power control available
3. REKES function available

- **Cancellation of silent smart key**

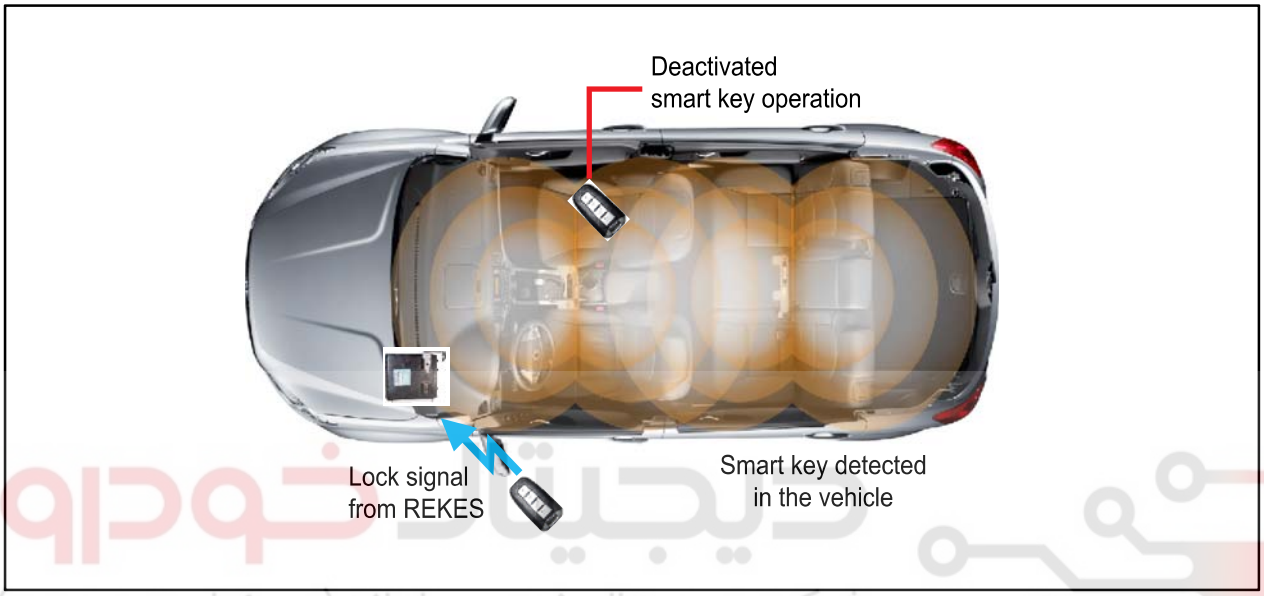
1. When the theft deterrent mode is deactivated, the silent smart key functions are available.

▶ Smart key deactivation

This function prevents the operation by the smart key inside the vehicle even if the driver breaks in the vehicle in the theft deterrent mode.

NOTE

In theft deterrent mode, the smart key(s) inside the vehicle is deactivated to prevent theft.



Deactivation conditions **- All doors closed (B-CAN)** **- Theft deterrent mode activated (B-CAN)** **- Smart key search**	FOB deactivation: The smart key inside the vehicle is deactivated when the passive LOCK/REKES LOCK signal is input by a smart key from the outside.

- **Smart key deactivation**

1. The REKES LOCK/passive LOCK (theft deterrent mode activation) request signal is sent by a smart key outside the vehicle.
2. The smart key activated door LOCK is not found in the vehicle.
3. The system memorizes all smart keys found inside the vehicle as deactivated ones.

- **Smart key deactivation actuation area**

1. Passive entry not available
2. Passive starting & power control not available
3. REKES function not available

- **Cancellation of smart key deactivation**

1. When the theft deterrent mode is deactivated using a smart key outside the vehicle, the deactivated smart key functions returns to be available.

Modification basis	
Application basis	
Affected VIN	

7. SMART KEY VERIFICATION TIME CONTROL

The smart key verification time control consists of pre-verification timer and immobilizer verification timer, and no verification process is required for 30 seconds after the each verification process has been completed.

- Pre-verification timer: Time for performing start & power mode function that controls the vehicle power.
- Immobilizer verification timer: Time for which the start with a smart key is possible after the SKM and EMS (ECU) verify the immobilizer.

Item	Pre-verification timer	Immobilizer verification timer
Operating power	Power OFF, ACC, IGN ON	IGN ON after pre-verification (ACC)
Function	Time for which the power control can be carried out under the verified conditions (30 seconds after the verification)	Time for which the start request can be carried out without a smart key under the verified conditions (30 seconds after the verification)
Input conditions	1. All doors closed (including tailgate) 2. START/STOP switch input 3. Brake switch signal input 4. Smart key inserted into emergency slot 5. Smart key searching completed 6. Engine start ON to OFF	1. Brake switch signal input 2. START/STOP switch input
Verification conditions	Smart key searching completed after the following conditions are met: 1. Close signal input after any door opened 2. Brake switch signal input 3. START/STOP switch signal input 4. After emergency slot inserted 5. After IGN OFF	1. Power changed to IGN ON after valid pre-verification 2. Power changed to IGN ON by smart key verification after pre-verification timer completed 3. Smart key verification succeeded by brake switch input after immobilizer verification timer completed with IGN ON 4. Smart key verification succeeded after immobilizer verification timer completed with IGN ON, immobilizer verification and brake switch input

Component	Pre-verification timer	Immobilizer verification timer
Deactivation conditions	1. 30 seconds has been passed after the pre-verification timer 2. Door handle switch ON 3. IGN ON 4. Theft deterrent mode activation/deactivation 5. Door status changed (open/closed)	1. 30 seconds has been passed after the immobilizer verification timer IGN1 OFF 2. No smart key is found inside the 3. vehicle with all doors closed after any door has been opened and then closed.
If any condition for pre-verification timer and immobilizer verification timer is met, no verification process is required for 30 seconds after the each verification process has been completed.		

NOTE

Operation before pre-verification timer

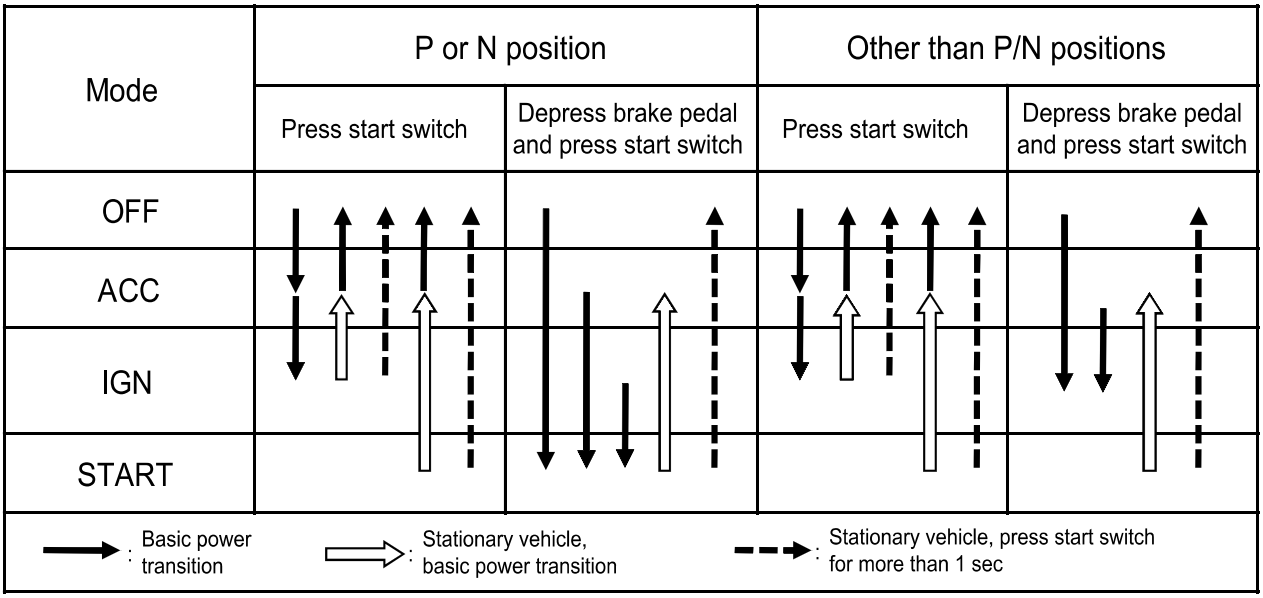
- Passive LOCK/UNLOCK
- REKES LOCK/UNLOCK

Ignition status after immobilizer verification

- The immobilizer verification has been completed when the engine starts.
- The immobilizer verification is not deactivated until the ignition is turned to ON, OFF or ACC ON.
- The immobilizer is not deactivated when the key out warning condition is met while the engine is running.

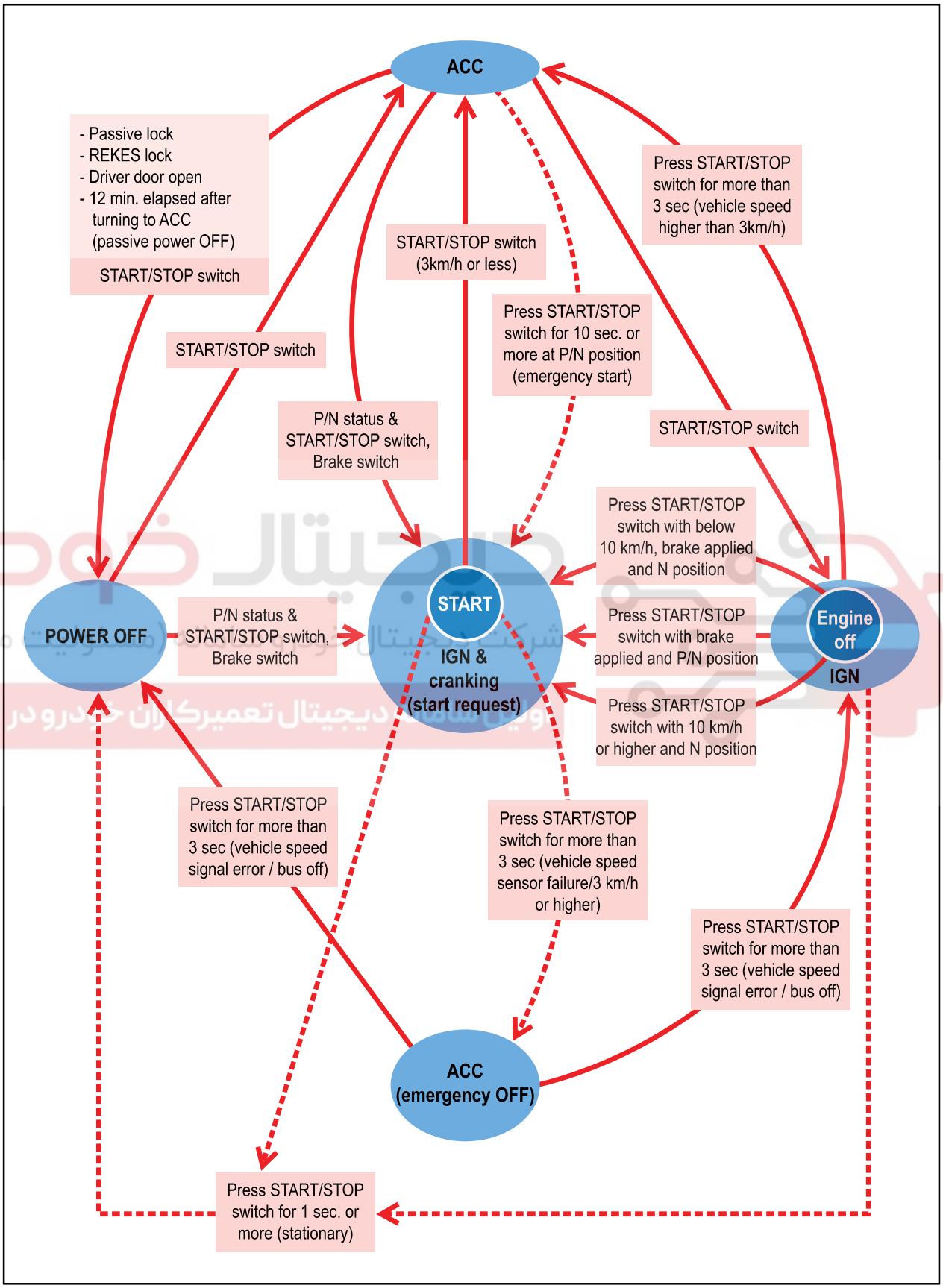
8. START & POWER MODE CONTROL

The ignition status is changed to OFF, ACC ON, IGN ON and engine cranking by one START/STOP switch.



Modification basis	
Application basis	
Affected VIN	

▶ Power control and engine start diagram



Modification basis	
Application basis	
Affected VIN	

▶ Engine starting

1. When the START/STOP button is pressed with the brake pedal applied and gear selector lever in P or N position, the SKM performs the immobilizer verification and sends the engine START request signal to the EMS if a normal coded smart key is found.
2. When the .engine start request signal from the START/STOP switch is received, the SKM sends the start request signal through the P-CAN and the vehicle power status signal to the BCM through the B-CAN.
3. The SKM cuts the power for IGN2 and ACC relays while the engine is cranking as cutting the electric load is necessary.
4. The SKM receives the engine start status signal from the EMS (ECU) through the P-CAN.

EMS (ECU)	Engine rpm, engine cranking/stop/running/loaded
TCU	Gear selector lever position: P, N
ABS/ESP	Vehicle speed signal (wheel speed sensor on each wheel)

5. The SKM turns on the ACC/IGN2 relays after the engine cranking and sends the signal for IGN after starting to the BCM through the B-CAN.
6. When the START/STOP button is pressed and engine cranking request1 signal is sent, the EMS (ECU) cranks the engine after checking the engine warming up. If the engine cranking request2 signal is sent, the EMS cranks the engine without checking the engine warming up.

Engine cranking request1 (engine start after warming up)	When the START/STOP button is pressed briefly under the start conditions, the vehicle starts to warming up and then the engine is started after a certain amount of time (warming up indicator ON to OFF). **NOTE** It can be delayed by several seconds according to the engine coolant temperature.
Engine cranking request2 (engine start without warming up)	When the START/STOP switch is pressed once again while the engine cranking request1 signal is sent, the engine is started (regardless of warming up indicator)

7. Starting engine while driving

- The engine start request signal is sent when the START/STOP switch is pressed, provided that the vehicle speed is less than 10 Km/h or no vehicle speed signal is input, the gear selector lever is in N position and the brake switch is ON with IGN ON (30 sec. verification is not required).
  The engine start request signal is sent regardless of the brake signal when the START/STOP
- switch is pressed, provided that the vehicle speed is 10 Km/h or more and the gear selector lever is in N position with IGN ON (30 sec. verification is not required).

8. Condition for starting request transmission

   - ACC ON: Gear selector lever (P/N), Brake switch ON, START/STOP switch signal
   - IGN ON: Vehicle in stationary, Gear selector lever (P/N), Brake switch ON, START/STOP switch ON

9. Condition for canceling starting request

   - At engine starting completed

▶ No engine operation

1. When the START/STOP button is pressed at the vehicle speed of 3 km/h or less, the SKM turns off the IGN relay to stop the engine.
2. When the vehicle speed is 3 km/h or more or no speed signal is input, the SKM performs the following functions:

Vehicle status	Conditions
3 km/h or faster	- When the START/STOP switch is pressed for 3 seconds or more, the ignition status is changed from IGN to ACC. - If the engine START/STOP switch is pressed again, the ignition status is changed from ACC to IGN.
Abnormal vehicle speed (No or abnormal CAN signal)	- When the START/STOP switch is pressed for 3 seconds or more, the ignition status is changed from IGN to ACC. - If the engine START/STOP switch is pressed again, the ignition status is changed from ACC to Power OFF. (DTC set)

3. When the START/STOP button is pressed and held with IGN ON, the ignition status is changed to OFF. When the START/STOP button is pressed briefly, the ignition status is changed to ACC ON.

▶ ACC ON to Power OFF

The SKM changes the ignition status to OFF from ACC ON when:

1. the engine START/STOP button is pressed with the brake pedal released after the ignition status is changed from IGN ON to ACC ON.
2. the REKES LOCK or passive LOCK signal is input with ACC ON.
3. the driver door is opened with ACC ON.
   (Driver door open signal input through B-CAN)
4. 12 minutes have passed with ACC ON.

9. ESCL CONTROL

- ESCL lock/unlock is not performed at ESCL virgin mode.
- The SKM does not carry out the ESCL LOCK control if the engine is running with IGN ON or the vehicle speed is 3 km/h or higher.
- All the ESCL functions including START/STOP switch is disabled during anti-scanning flag bit set.

1) ESCL LOCK Control

When the ESCL is unlocked and the followings are met at normal condition:

- If the driver door is open or closed with ignition key OFF, the electric steering motor performs the steering column lock.
- If the theft deterrent mode is activated by the LOCK signal from the passive or REKES key when turning the ignition key from "ON" position to "OFF" position, the ESCL LOCK is performed. The ESCL LOCK is performed after 60 seconds since the ignition key is turned to B+ from
- "ON" or "ACC" position.

2) ESCL UNLOCL Control

When the ESCL is locked and the followings are met at normal condition:

- If the smart key is pressed with power off, the electric steering motor performs the steering column unlock. In some cases, power transition is carried out to ACC or IGN ON.
- If the power transition and start is not possible after retry to LOCK or UNLOCK operation, the power transition and start is not still possible after automatic retry and the warning lamp comes on.

Modification basis	
Application basis	
Affected VIN	

3) ESCL Retry Control

1. ESCL operation is not possible if Bolt is “Failure”.
2. When the UNLOCK retry occurs after ESCL LOCK command, the ESCL LOCK is performed.
   - The UNLOCK retry is possible up to 2 times automatically. If the UNLOCK retry occurs 3 times in succession, the ESCL NOT LOCKED warning is triggered.
   - Reactivates when the ESCL LOCK conditions are met.
3. When the LOCK retry occurs after ESCL LOCK command, the command will be overridden without retry.
   - ESCL NOT LOCKED warning is triggered.
   - Reactivates when the UNLOCK conditions are met by pressing the START/STOP switch.
4. When the LOCK retry occurs after ESCL UNLOCK command, the ESCL UNLOCK is performed.
   - The LOCK retry is possible up to 2 times automatically. If the LOCK retry occurs 3 times in succession, the ESCL JAM warning is triggered.
   - Reactivates when the ESCL UNLOCK conditions are met by pressing the START/STOP switch.
5. When the UNLOCK retry occurs after ESCL UNLOCK command, the command will be overridden without retry.
   - After the command is overridden, the ESCL JAM warning is triggered.
   - Reactivates when the UNLOCK conditions are met by pressing the START/STOP switch after ESCL LOCK.

10. START/STOP SWITCH CONTROL

1) Power Status

▶ **Ignition status indicator on START switch**

Status	Turning-ON conditions
OFF	IGN OFF, IGN ON & engine ON
Green	Engine can be started by START/STOP switch operation/Engine is cranking (IGN OFF & brake switch ON, ACC ON & brake switch ON, IGN ON & brake switch ON)
Amber	ACC ON
Red	IGN ON & engine OFF, error

▶ **START switch indicator output**

Powerstatus	Power OFF		ACC ON	IGN ON	Engine start status	Engine can be started	Error	Remarks
	Door closed	Door open						
Figure								
Indicator status	OFF	OFF	Amber	Red	OFF	Green	Red Flash	
Illumination control	OFF	TIME	Controlled by SKM					LED

- The indicator flashes 5 times at intervals of 0.5 sec. ON/0.5 sec. OFF when an error occurs.
- When all the doors are closed with B+, the indicator does not flash.

▶ **START/STOP switch indicator control**

START/STOP switch indicator	
ON	**OFF**
	

- **Door coupled function**

1) When the driver door is opened, the indicator comes on (the indicator remains on while the door is open). When the room lamp is turned off, the indicator goes
2) out immediately.
The indicator goes out 10 seconds after the driver door
3) is closed.
The indicator is reset when the driver door is opened.
4) **Tail lamp coupled function**

-

Modification basis	
Application basis	
Affected VIN	

11. SKM WARNING CONTROL

(1) Smart Key Not Detected Warning

▶ With ACC ON

1. Any door except the driver door is opened and then closed.
2. The SKM starts to identify a smart key by using the interior antenna after confirming that all the doors are closed through CAN communication with the BCM.
3. When no smart key is found, the SKM sends the smart key not detected warning signal to the BCM and instrument cluster through B-CAN.
4. The BCM activates the buzzer for up to 10 seconds at intervals of 0.5 sec. ON/0.5 sec. OFF and turns on the smart key warning indicator on the instrument cluster.
5. If a smart key is found, no operation is performed.

NOTE

Smart key not detected warning deactivation conditions

- ACC OFF, IGN1 ON, Smart key detected

▶ IGN ON and engine running

1. Any door except the driver door is opened and then closed.
2. The smart key not detected warning is not activated.
   – Smart key searching using the interior antenna → No smart key found → The SKM sends the smart key not detected warning signal to the BCM and instrument cluster through B-CAN.
3. The smart key not detected warning is activated.
   - Smart key searching at intervals of 3 seconds using the interior antenna.

NOTE

Smart key not detected warning deactivation conditions

- IGN1 OFF, Smart key detected, Door open

(2) Smart Key Detected Warning (Smart Key Found Inside Vehicle)

▶ **Smart key deactivation warning**

1. The ignition is turned OFF or ACC is turned ON.
2. A verified smart key found in the vehicle with all doors (including tailgate) closed.
3. The REKES LOCK or passive LOCK signal is input with a valid smart key from the outside the vehicle.
4. The SKM sends the theft deterrent mode signal to the BCM through B-CAN and the verified smart key is found inside the vehicle.
5. The SKM sends the smart key detected warning to the BCM and instrument cluster through B-CAN. The BCM activates the buzzer for up to 10 seconds at intervals of 0.5 sec. ON/0.5 sec. OFF and
6. turns on the smart key detected warning indicator on the instrument cluster.

NOTE

Smart key detected warning deactivation conditions

- The theft deterrent mode is deactivated.

▶ **Smart key inside vehicle warning**

1. The ignition is turned ON or OFF, or the ACC is turned ON.
2. A verified smart key found only in the vehicle (including emergency slot) with all doors (including tailgate) closed.
3. The passive LOCK signal is input without a valid smart key from the outside the vehicle.
4. The SKM sends the theft deterrent mode signal to the BCM through B-CAN and the verified smart key is found inside the vehicle.
5. The SKM sends the smart key detected warning to the BCM and instrument cluster through B-CAN. The BCM activates the buzzer for up to 10 seconds at intervals of 0.5 sec. ON/0.5 sec. OFF and
6. turns on the smart key detected warning indicator on the instrument cluster.

NOTE

Smart key detected warning deactivation conditions

- No smart key is found inside the vehicle when a door is opened and then closed.

Modification basis	
Application basis	
Affected VIN	

(3) Smart key verification fail warning

When the verification is requested for ignition status change or engine starting and no verified smart key is in the vehicle, the SKM sends the "smart key verification status" signal, which indicates that the verification has failed, for up to 10 sec. until the verification fail conditions are deactivated. for up to 10 seconds. until the verification fail conditions are deactivated.

- Normally, the smart key verification warning is one of the smart key fail conditions.

▶ **Verification fail detection and transmission conditions**

- When the ignition status is changed after a smart key is verified by the START/STOP switch ON input, the SKM sends the verification status for 10 sec.

* Ignition status change
(OFF -> ACC) / (OFF -> IGN)/(ACC -> IGN) / (IGN -> engine ON)

- If above conditions are met again, the SKM re-verifies a smart key and sends the verification status for another 10 seconds.
- When the ignition status is changed by the transponder verification while the smart key status is sent through the B-CAN, the SKM sends the smart key verification signal and also sends the transponder verification signal for 10 seconds.

(4) Smart key battery discharge warning

If low smart key battery is detected during the verification process for ignition status change or engine start, the SKM sends the signal for "smart key battery low voltage warning" to the BCM and instrument cluster through the B-CAN for up to 10 sec. until the warning condition is deactivated.

▶ **Smart key battery discharge confirmation and deactivation**

- If the smart key battery low voltage is confirmed, the SKM sends the smart key battery low voltage warning signal.
- If the smart key battery is in normal condition, the SKM sends the smart key battery low voltage warning deactivation signal.

* The smart key is the last used key.

(5) Transponder verification fail warning

If a verified smart key is not found by the key verification process, the SKM sends the information that indicates the key is not verified to the instrument cluster through the B-CAN for up to 10 seconds until the warning condition is deactivated.

- The SKM sends the transponder verification warning when the verification has failed with the smart key inserted into the immobilizer holder.

▶ **Transponder verification fail detection and transmission conditions**

- When the ignition status is changed after the transponder is verified by the START/STOP switch ON input, the SKM sends the transponder verification status for 10 sec.

* Ignition status change
  (OFF → ACC) / (OFF → IGN)/(ACC → IGN) / (IGN → engine ON)

- If above conditions are met again, the SKM re-verifies the transponder and sends the verification status for another 10 sec.
- When the ignition status is changed by a smart key verification while the transponder verification is processed, the SKM sends the signal for [transponder verification fail], and sends the smart key verification status for 10 sec.

(6) Transmission position warning

When the gear selector lever is in a position other than P or N with IGN ON and engine started, the SKM sends the [gear position warning] signal to the instrument cluster through the BCAN for up to 10 sec. until the operating conditions are deactivated.

▶ **Transmission position warning deactivation**

- When re-attempting to start with IGN1 ON and transmission in P or N

(7) ESCL JAM warning

The SKM transmits the warning active command to the BCAN through the BCAN signals such as ESCL NOT LOCKED warning signal or ESCL JAM warning signal within 10 seconds or until the active command deactivation conditions will be met, if jam is occurred when the electric steering motor is locked/unlocked.

▶ **Failure Detecting Conditions**

1. When the UNLOCK retry occurs after ESCL LOCK command, the ESCL LOCK is performed.
   - The UNLOCK retry is possible up to 2 times automatically. If the UNLOCK retry occurs 3 times in succession, the ESCL NOT LOCKED warning is triggered.
   - Reactivates when the ESCL LOCK conditions are met.
2. When the LOCK retry occurs after ESCL LOCK command, the command will be overridden without retry.
   - After the command is overridden, the ESCL NOT LOCKED warning is triggered.
   - Reactivates when the LOCK conditions are met by pressing the START/STOP switch after ESCL UNLOCK.
3. When the LOCK retry occurs after ESCL UNLOCK command, the ESCL UNLOCK is performed.
   - The LOCK retry is possible up to 2 times automatically. If the LOCK retry occurs 3 times in succession, the ESCL JAM warning is triggered.
   - Reactivates when the ESCL UNLOCK conditions are met by pressing the START/STOP switch.
4. When the UNLOCK retry occurs after ESCL UNLOCK command, the command will be overridden without retry.
   - After the command is overridden, the ESCL JAM warning is triggered.
   - Reactivates when the UNLOCK conditions are met by pressing the START/STOP switch after ESCL LOCK.

Modification basis	
Application basis	
Affected VIN	

▶ **ESCL JAM Warning Deactivation**

The ESCL JAM FAILURE warning will be deactivated as soon as the signal "ESCL UNIT STATUS OK" is received by the ESCL restart when the ESCL UNLOCK (or LOCK) activation conditions are met again by pressing the START/STOP switch to change the ignition status within 10 seconds or after 10 seconds triggering the warning.

(8) ESCL FAIL warning

The SKM monitors the ESCL and transmits the warning active command to the BCAN for 10 seconds through the BCAN signal "ESCLFailWarnCmd" if there is an error with operation.

▶ **Failure Transmitting Conditions**

1. ESCL bolt status failure
   - Bolt status "FAILURE" signal received once through LIN communication
2. ESCL no response error
   - No response or incorrect response from ESCL 3 times in succession
3. Status mismatch
   - Mismatch between ESCL bolt status and micro switch status
4. ESCL anti-scanning error
   - Verification fails 2 times in succession

(9) SKM error alert

The SKM sends the SKM error alert signal to the instrument cluster through the B-CAN for up to 10 sec. when an in ignition status related error or passive entry system error occurs.

▶ **SKM error transmission conditions**

When any of the following errors is detected and a DTC is set, the SKM sends the error alert signal for 10 sec.

1. B+ (power) low voltage
2. B+ (logic) low voltage
3. ACC ON fail
4. ACC OFF fail
5. IGN1 ON fail
6. IGN1 OFF fail
7. IGN2 ON fail
8. IGN2 OFF fail
9. START/STOP switch short circuit

(10) Brake not working alert

The SKM sends the brake not working alert signal for 10 sec. every time the ignition status is changed after the 1st cycle (OFF-ACC-IGN-ACC-OFF)
while the brake is not operated.

▶ **Warning deactivation conditions**

- when the brake pedal is depressed, the system is reset and alert deactivation signal is sent.
- when the 10 min. timer is terminated

(11) Smart key slot detection alert

▶ **Warning transmission conditions**

- The SKM sends the smart key slot detection alert signal for 10 sec. when a smart key inserted into the slot is detected with IGN OFF and the driver's door open.

▶ **Warning deactivation conditions**

- when the smart key is removed, the alert deactivation signal is sent.
- when the 10 min. timer is terminated

(12) SKM alert priority

1	Smart key out alarm	Outside	1
2	Smart key reminder alarm	Outside	
3	Smart key verification failure alarm	Inside	2
4	Transponder verification fail alert	Inside	
5	Smart key battery low voltage alert	Inside	
6	Transmission position alert	Inside	
7	SKM error alert	Inside	
8	Brake alert	Inside	
9	Clutch alert	Inside	
10	Smart key slot reminder alarm	Inside	1

Modification basis	
Application basis	
Affected VIN	

12. SKM IMMOBILIZER SYSTEM

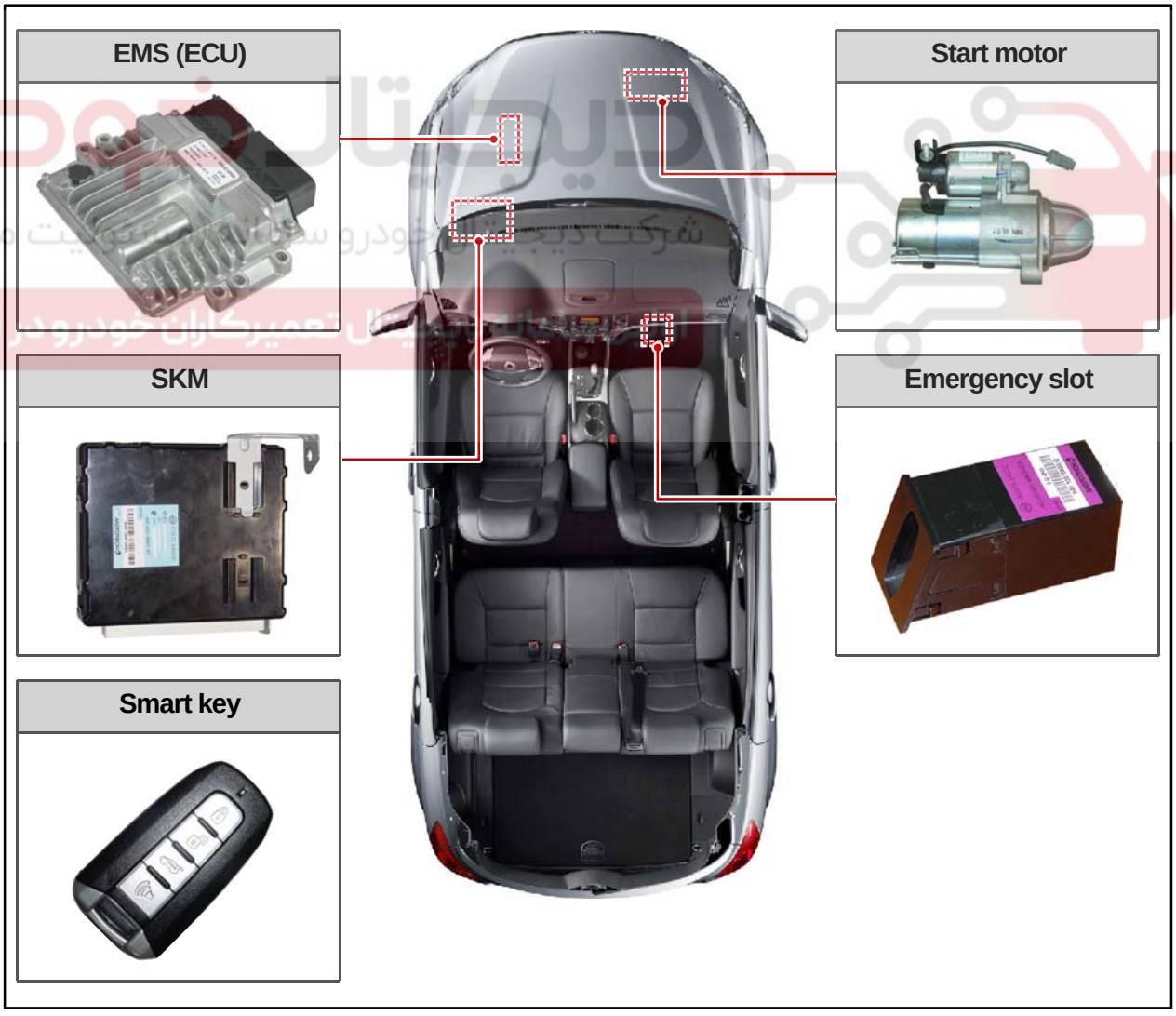
1) System Description

The immobilizer system prevents the vehicle theft by allowing only the authorized key to start the engine. The transponder inside the key communicates with the SKM (immobilizer slot) and EMS (ECU) through P-CAN communication, and the system permits the engine to start after confirming the encrypted coding.

When the START/STOP switch is pressed with the smart key inserted into the immobilizer slot because of the smart key battery discharge, the SKM communicates with the EMS (ECU) through P-CAN, and the ECU starts to control the engine only the signal is valid.

A valid key verification time is provided for 10 seconds and the engine can be started during this time. If pressing the START/STOP switch again after this 10 seconds, the key verification process is performed again.

2) Configuration

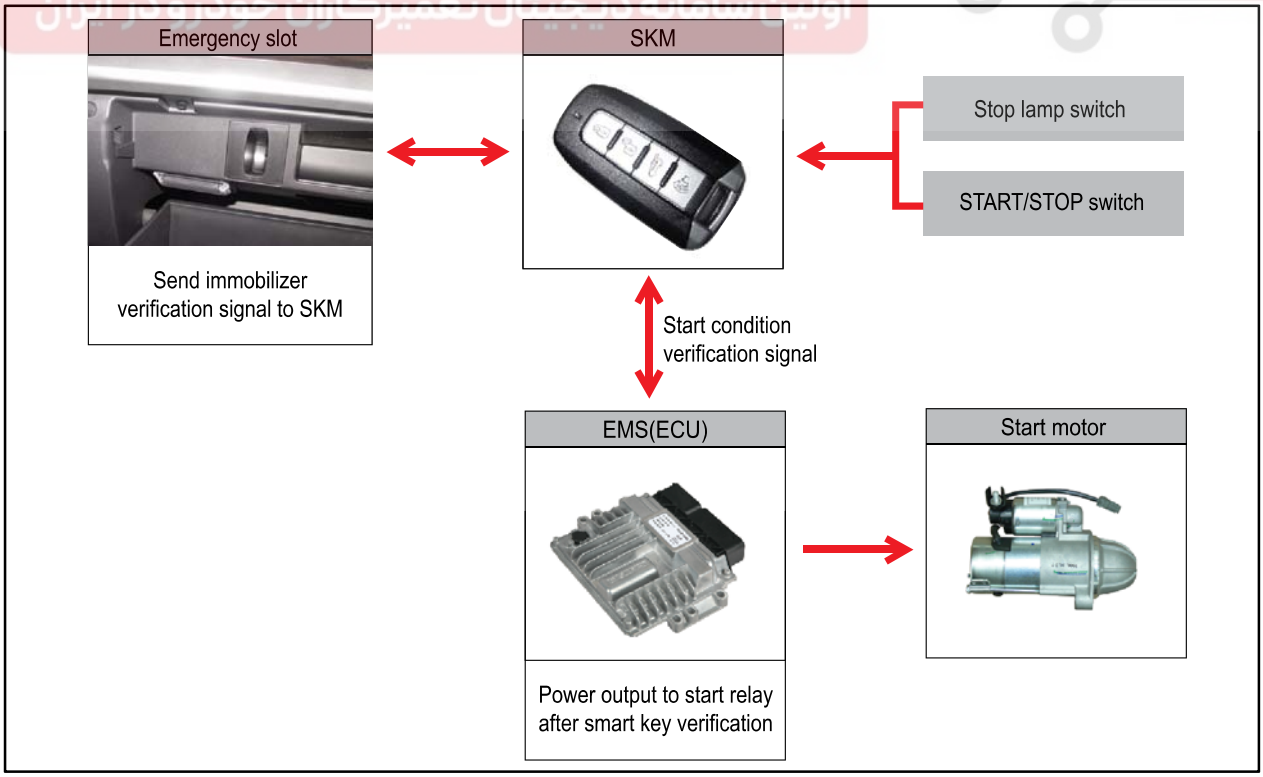


Modification basis	
Application basis	
Affected VIN	

3) Operating Process

Key verification can be divided into two types, immobilizer key verification and smart key verification. The immobilizer verification is applied for the SKM system, and verifies the transponder built in the smart key. When the smart key is inserted into the slot, the verification is carried out, overriding the RF signal from the smart key.
The power is supplied to the slot when the START/STOP switch is pressed with the smart key inserted into the slot, and the smart key transponder verification is carried out by the transponder communication. Once the key is verified, a valid key verification time is provided for 10 seconds and the engine can be started by pressing the START/STOP switch during this time. If pressing the START/STOP switch after this 10 seconds, the key verification process is performed again.

1. When the ignition is turned ON, the EMS (ECU) sends the challenge message to the SKM through the P-CAN. (This is to verify whether the transponder of the smart key is valid. If the verification fails, it transmits the re-verification signals 3 times for 2 seconds. If 3rd re-verification fails, the verification is deactivated for 10 seconds and re-activated after that.)
2. The immobilizer slot of the SKM system sends the encrypted cod to the transponder, and the transponder re-sends the encrypted code to the immobilizer slot.
3. The encrypted sent to the immobilizer slot is re-sent to the SKM.
4. The SKM compares this code with the encrypted code randomly transmitted by the internal logic. (System compares the signal from transponder and encrypted signal from the immobilizer control unit)
5. Only when the two signals are identical, it recognizes the key as the verified one and transmits the positive message to the ECU.
6. The ECU enables the engine to be started.



Modification basis	
Application basis	
Affected VIN	

CONFIGURATION AND FUNCTIONS

S.G.N. 8712-03 SKM UNIT ASSEMBLY

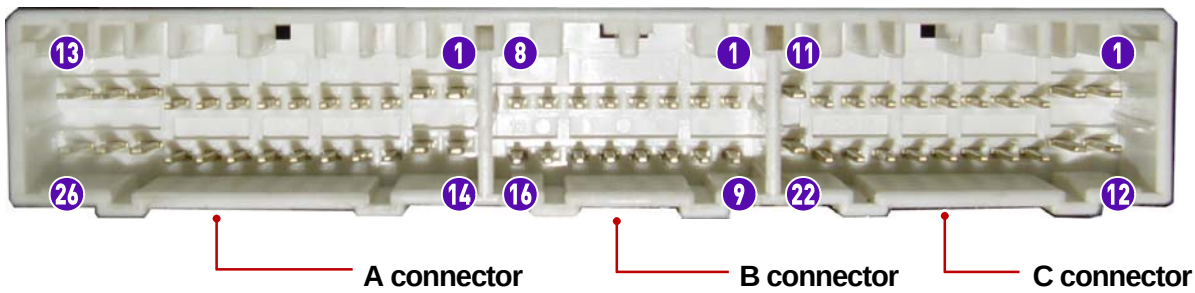
1) Mounting Location

2) Major Functions

- Passive LOCK/UNLOCK by door handle switch
- Passive tailgate open by tail gate switch
- Passive start by START/STOP switch
- Emergency mode start by immobilizer communication
- Power supply (ACC, IGN1, IGN2) by START/STOP switch
- P-CAN (high speed) communication with EMS (ECU), TCU, ABS/ESP
- B-CAN (low speed) communication with BCM and instrument cluster
- Data sending/receiving and diagnosis by CAN communication
- LF (Low frequency) and RF (Radio frequency) communication for passive entry management
- RF (Radio Frequency) communication for REKES
- Smart key system warning
- Smart key registration (up to 3 keys)

Modification basis	
Application basis	
Affected VIN	

3) Connector Pin Description



▶ **Connector A**

Pin No.	Functions (A)	I/O	Remark
1	IGN2 relay	Output	Relay + supply
2	IGN1 relay	Output	Relay + supply
3	ACC relay	Output	Relay + supply
4	-	-	-
5	Passenger door handle switch	Input	-
6	Driver door handle switch	Input	-
7	Stop lamp signal	Input	Brake signal
8	-	-	-
9	IGN2 relay operating signal	Input	Relay operation monitoring
10	ACC relay operating signal	Input	Relay operation monitoring
11	-	-	-
12	-	-	-
13	Power (B+)	Power	SIGNAL power
14	B-CAN High	CAN	-
15	B-CAN Low	CAN	-
16	P-CAN High	CAN	-
17	P-CAN Low	CAN	-
18	-	-	-
19	-	-	-

Modification basis	
Application basis	
Affected VIN	

Pin No.	Functions (A)	I/O	Remark
20	-	-	-
21	-	-	-
22	-	-	-
23	IGN1 relay operating signal	Input	Relay operation monitoring
24	-	-	-
25	Inhibitor switch (A/T)	Input	Gear selector lever position
26	Ground	Ground	Signal ground

▶ **Connector B**

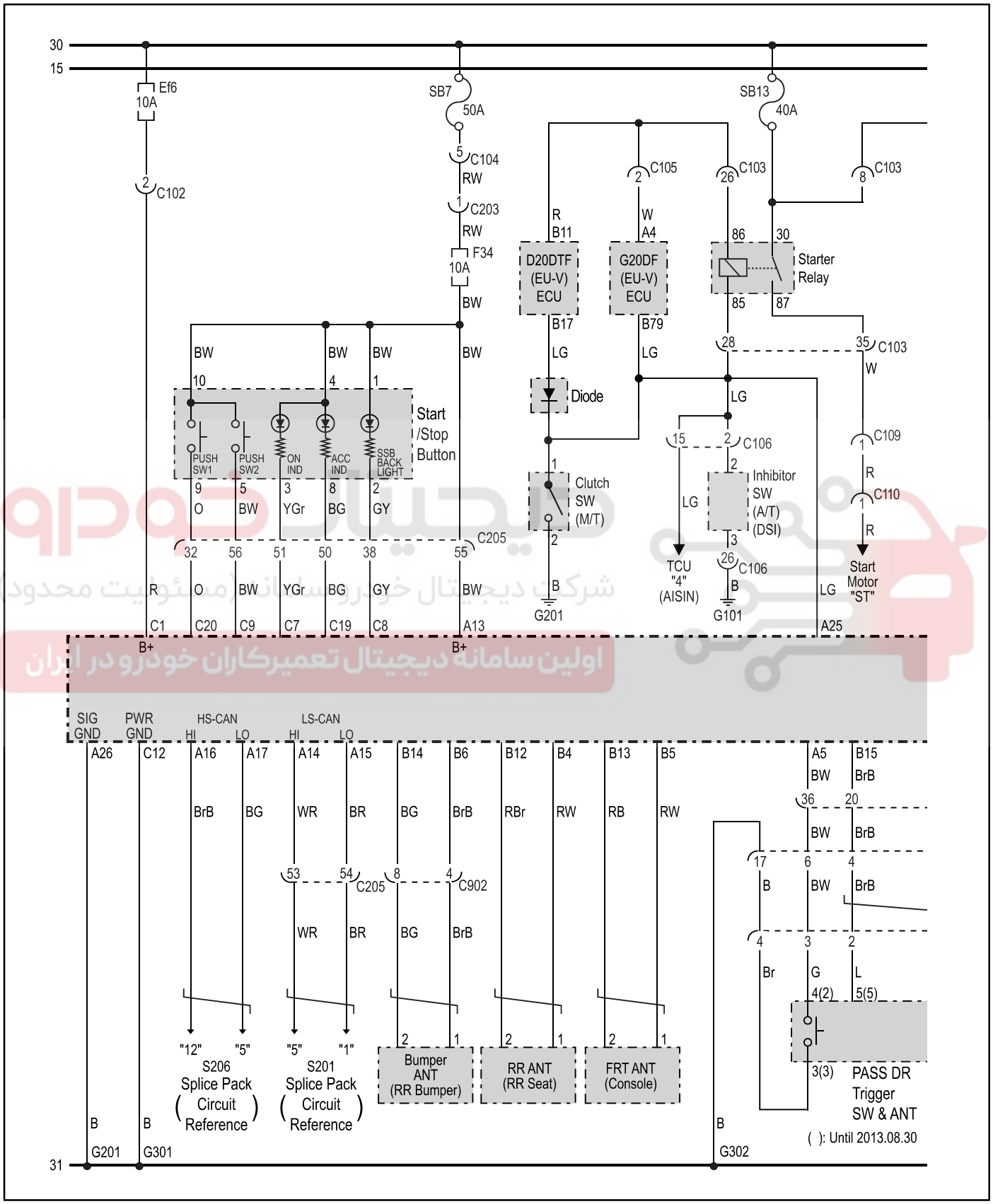
Pin No.	Functions (A)	I/O	Remark
1	-	-	-
2	-	-	-
3	-	-	-
4	Rear smart interior antenna (+)	Output	For LF antenna
5	Front smart interior antenna (+)	Output	For LF antenna
6	Bumper smart exterior antenna (+)	Output	For LF antenna
7	Passenger smart exterior antenna (+)	Output	For LF antenna
8	Driver smart exterior antenna (+)	Output	For LF antenna
9	-	-	-
10	-	-	-
11	-	-	-
12	Rear smart interior antenna (-)	Output	For LF antenna
13	Front smart interior antenna (-)	Output	For LF antenna
14	Bumper smart exterior antenna (-)	Output	For LF antenna
15	Passenger smart exterior antenna (+)	Output	For LF antenna
16	Driver smart exterior antenna (-)	Output	For LF antenna

▶ **C connector**

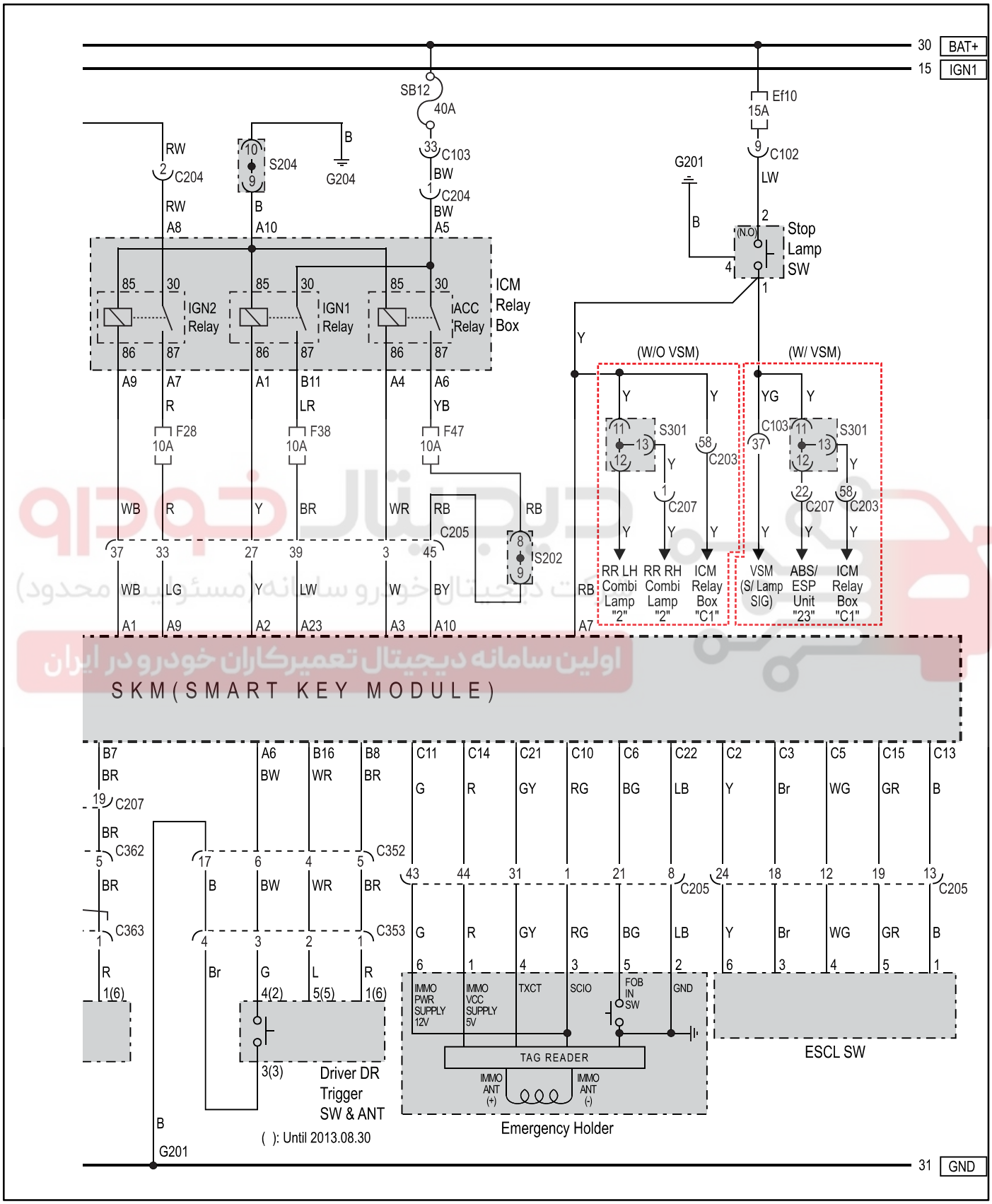
Pin No.	Functions (A)	I/O	Remark
1	Power (B+)	Power	Load power
2	ESCL power	Power	Output 12 V
3	ESCL LIN	COM	LIN
4	-	-	-
5	ESCL unlock	Input	-
6	Smart key in slot detection switch	Input	Smart key identification
7	START/STOP switch ON indicator	Output	-
8	START/STOP switch indicator	Output	-
9	START/STOP switch #1	Input	-
10	Immobilizer input signal	Input	Communication with IMMO unit
11	Immobilizer power 12 V	Power	Output 12 V
12	Ground	Ground	Ground
13	ESCL ground	Ground	Ground
14	Emergency slot power 5 V	-	Output 5 V
15	ESCL enable	Output	Output 12 V
16	-	-	-
17	-	-	-
18	-	-	-
19	START/STOP switch ACC indicator	Output	-
20	START/STOP switch #2	Input	
21	Immobilizer communication	Output	Communication with immobilizer unit
22	Immobilizer ground	Ground	Immobilizer ground

Memo

5) Circuit Diagram



Modification basis	
Application basis	
Affected VIN	



Modification basis	
Application basis	
Affected VIN	

SKM

KORANDO 2015.01

S.G.N. 8712-01

SMART KEY TRANSMITTER ASSEMBLY

1) Overview

The smart key has additional passive entry and passive start functions other than the REKES functions (door LOCK/UNLOCK remote controller). This key enhances the user experience and security because door LOCK/UNLOCK and engine ON/OFF operations are possible with only carrying a smart key.

2) Functions

- LF (Low frequency) receiving and RF (Radio frequency) transmission
- Built-in buttons for REKES functions (door LOCK/UNLOCK/panic/escort)
- Mechanical emergency key included
- Smart key ↔ immobilizer slot (Emergency holder) and transponder communication
- One built-in battery (CR 2032, 245 mA), low voltage check
- Service life of the battery is 18 months if used 10 times a day.

3) Configuration

Modification basis	
Application basis	
Affected VIN	

▶ Door LOCK/escort

	Button operating time	Vehicle operation
	less than 0.1 sec.	- All doors (including tailgate) LOCK - Theft deterrent mode activated after hazard warning lamp flashes twice and external buzzer (SKM buzzer) sounds once

▶ Door UNLOCK

	Button operating time	Vehicle operation
	less than 0.1 sec.	- All doors (including tailgate) UNLOCK - External buzzer (SKM buzzer) sounds twice/Hazard warning lamp flashes once

▶ Tailgate open

	Button operating time	Vehicle operation
	1.0 sec. or more	Tailgate is unlocked

▶ **Panic**

	Button operating time	Vehicle operation
	1.0 sec. or more	Hazard warning lamp flashes Warning buzzer sounds for 30 sec.

* To deactivate
  - Press the door LOCK/panic button.

▶ **Secondary key (emergency key)**

※ Pull out the emergency key in the direction of the arrow (2) while pressing the holder button (1).

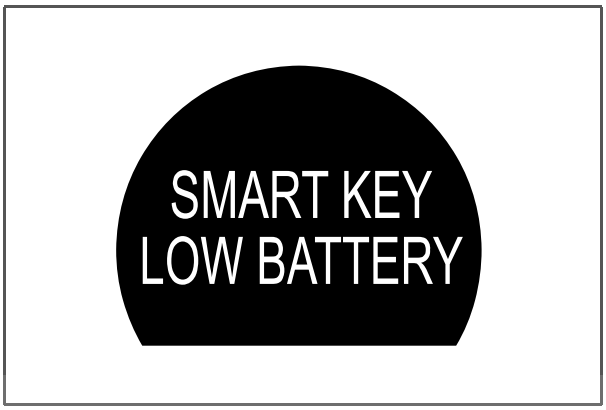
The emergency key can be used when: opening or locking the doors if the battery for the remote controller or vehicle battery is discharged or system is faulty.

Modification basis	
Application basis	
Affected VIN	

4) Changing Battery

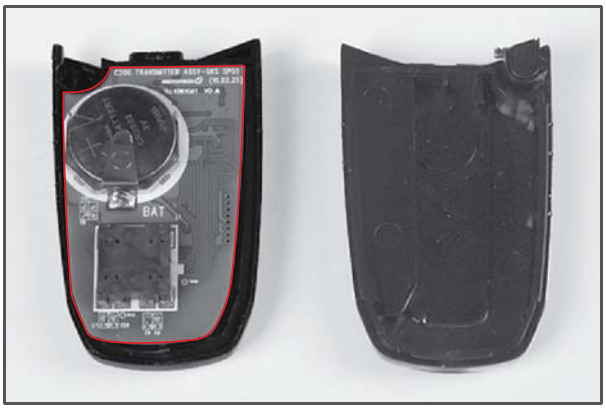
Replace the battery of smart key when battery low message is displayed on the LCD display of instrument cluster (Supervision), the actuation distance between the smart key and vehicle is decreased noticeably or when there is a failure of operation.

▶ **Battery low display (Instrument cluster [Supervision type])**



▶ **How to replace**

1. Pull out the emergency key from the smart key by pressing and holding the holder button.
2. Remove the front cover from the smart key body with a small flat-bladed screwdriver.



3. Remove the PCB making sure that the PCB is not damaged.

NOTE

The transponder of the smart key is not removable.

Modification basis	
Application basis	
Affected VIN	

4. Replace the discharged battery with a new one which has the same specification.
5. Install in the reverse order of removal.

Specification	CR2032

CAUTION

- Use only the specified battery. The smart key may not work properly when using a non-matching battery which has different size or thickness due to improper contact. Do not mistake the polarity.
- Used batteries should be disposed of in
- compliance with local regulations.

S.G.N.
8610-11 EMERGENCY SLOT ASSEMBLY

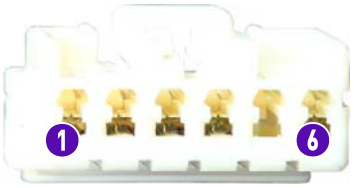
1) Overview

This assembly is an emergency unit to communicate with the immobilizer when the passive start is not possible because of the smart key battery discharge.

2) Mounting Location

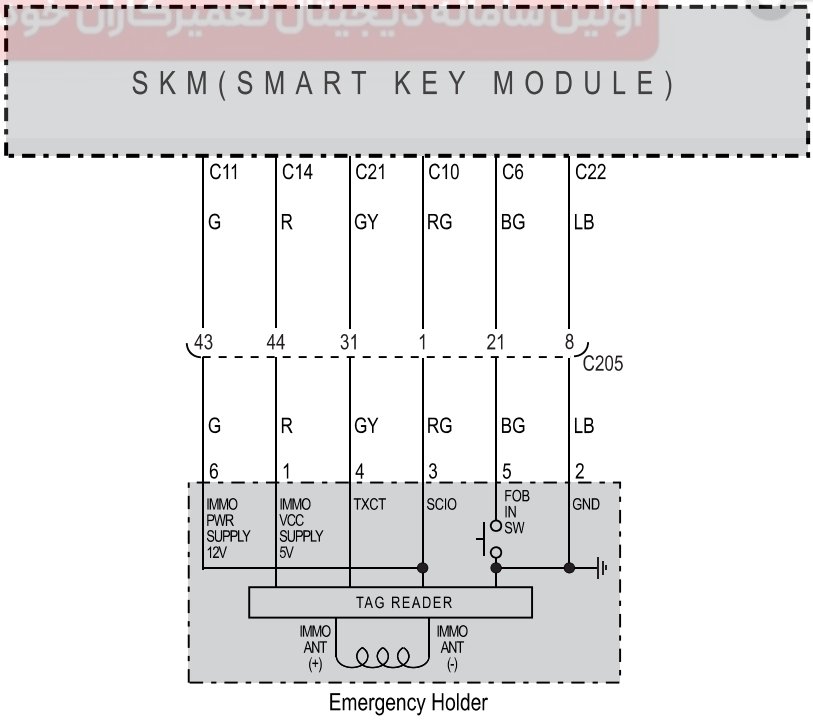
Modification basis	
Application basis	
Affected VIN	

3) Connector Pin Description

To emergency slot	To wiring
	

Pin No.	Function
1	Emergency slot power 5 V
2	Immobilizer ground
3	Immobilizer input signal
4	Immobilizer output signal
5	Smart key detection switch
6	Immobilizer coil power 12 V

4) Circuit Diagram



Modification basis	
Application basis	
Affected VIN	

S.G.N. 8712-05

DOOR HANDLE SWITCH ANTENNA

1) Overview

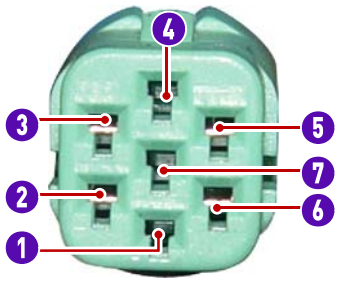
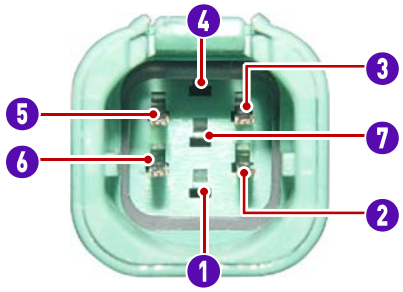
The exterior antennas (Low frequency transmission) and door handle switches are integrated into the front door handles (LH and RH) to operate the passive entry function.

2) Mounting Location

The SKM exterior antenna and door handle switch are integrated into the door outside handle and used for passive entry.

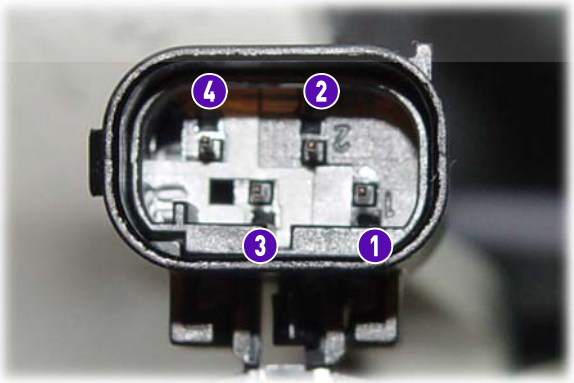
Modification basis	
Application basis	
Affected VIN	

3) Connector Pin Description

To antenna	To wiring
	

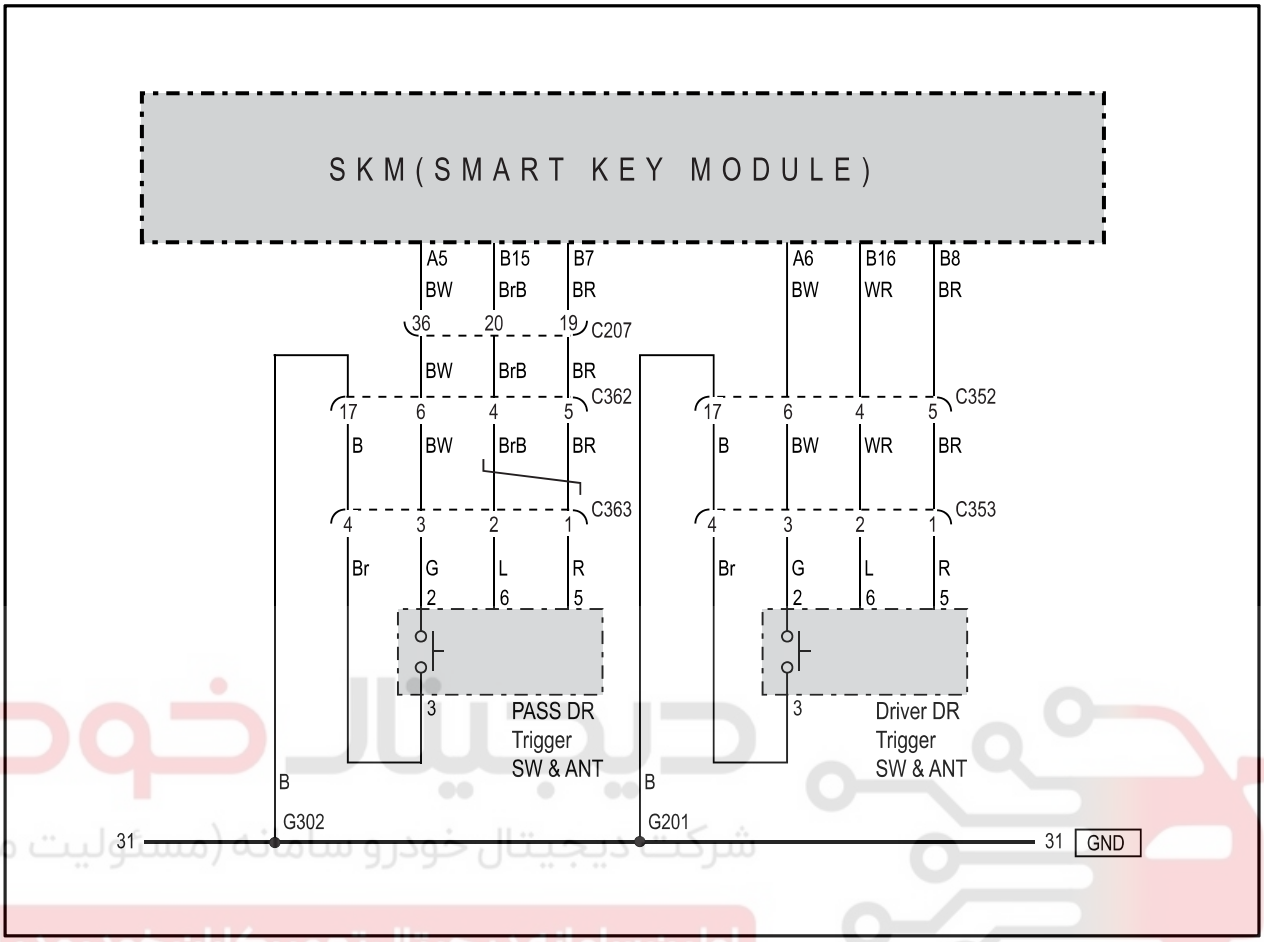
Pin No.	Function
1	-
2	Switch signal
3	Ground
4	Antenna (-)
5	Antenna (+)
6	-

4) Extension Connector Pin Description

To wiring


Pin No.	Function
1	Antenna (+)
2	Antenna (-)
3	Switch signal
4	Ground

5) Circuit Diagram



Modification basis	
Application basis	
Affected VIN	

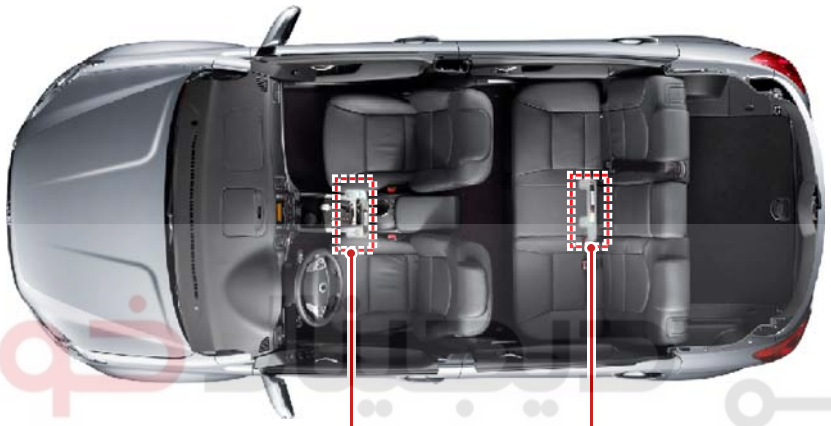
S.G.N. 8712-05

INTERIOR SMART KEY ANTENNA ASSEMBLY

1) Overview

There are 2 smart key antennas inside the vehicle (center/rear). When the SKM sends the information request signal through these low frequency antennas, the smart key receives this signal in the passive actuation area and then sends the smart key information to the SKM to enable the passive start operation.

2) Mounting Location

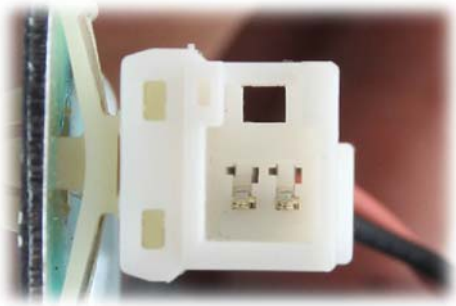
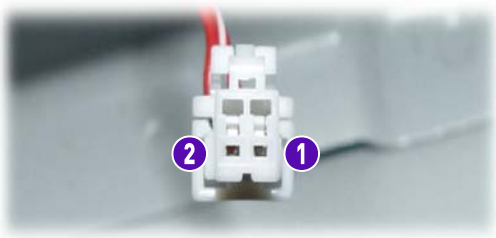


Interior (front) antenna	
Component	Mounted
	

Interior (center) antenna	
Component	Mounted
	

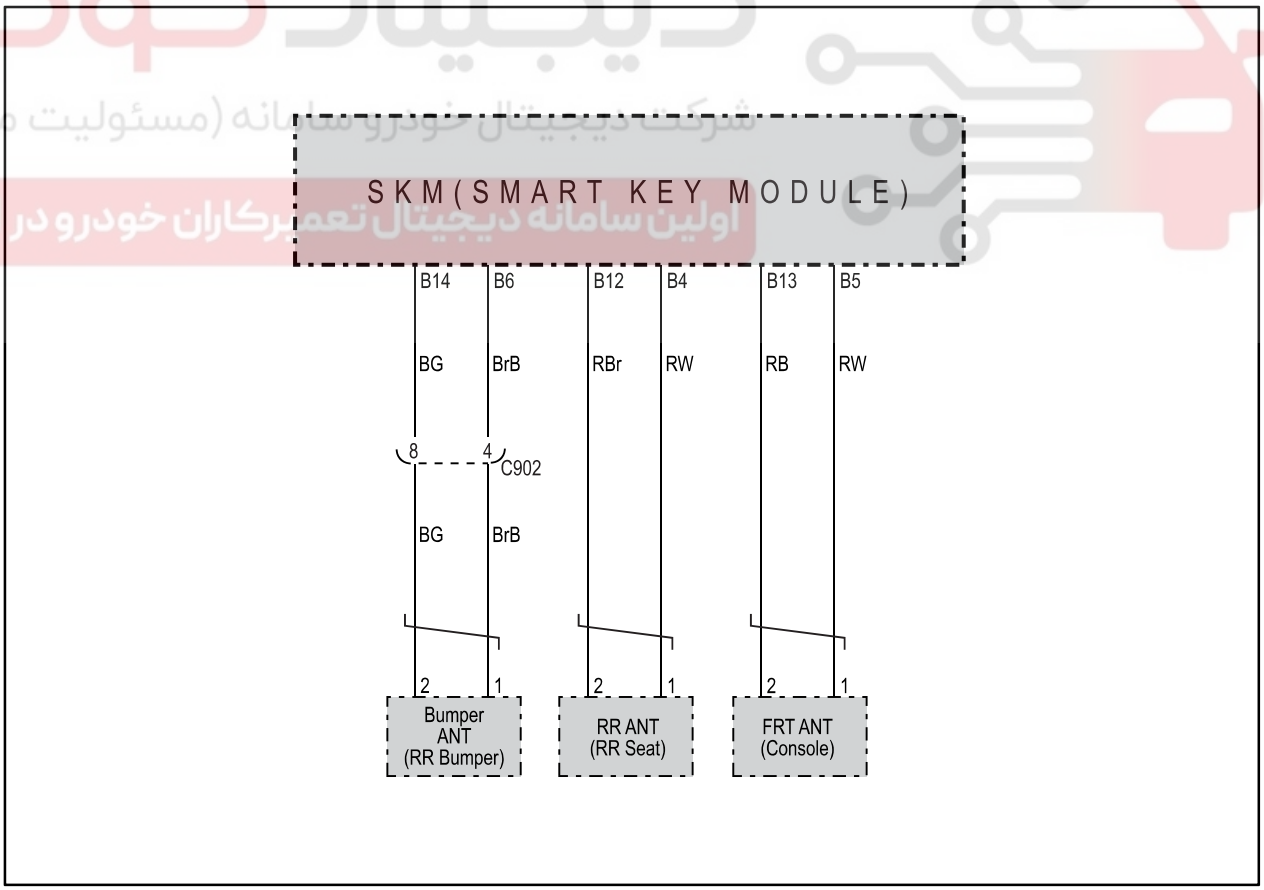
Modification basis	
Application basis	
Affected VIN	

3) Connector Pin Description

To antenna	To wiring
	

Pin No.	Function
1	Antenna (+)
2	Antenna (-)

4) Circuit Diagram



Modification basis	
Application basis	
Affected VIN	

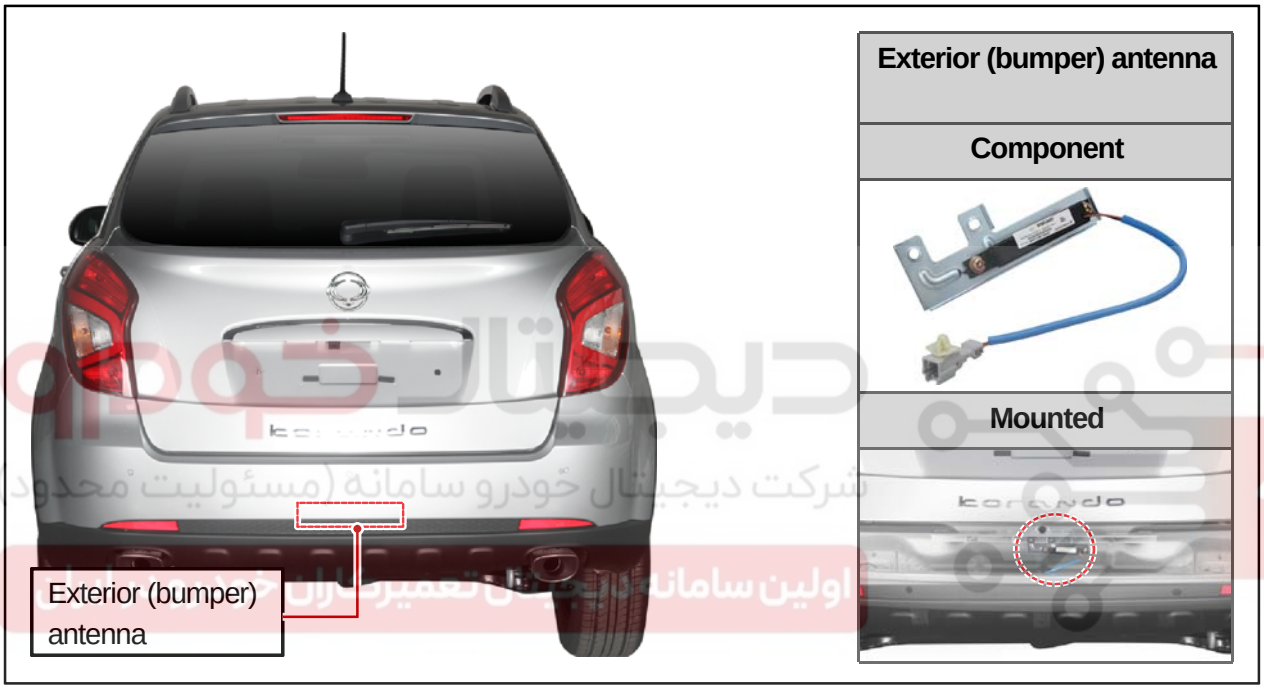
S.G.N. 8712-05

EXTERIOR (BUMPER) SMART KEY ANTENNA ASSEMBLY

1) Overview

There is a smart key antenna on the center of the rear bumper. When the SKM sends the information request signal through this low frequency antenna, the smart key receives this signal in the passive tailgate open actuation area and then sends the smart key information to the SKM to enable the passive tailgate open operation.

2) Mounting Location



3) Connector Pin Description

To antenna	To wiring
	

Pin No.	Function
1	Antenna (+)
2	Antenna (-)

Modification basis	
Application basis	
Affected VIN	

S.G.N. 8510-08

START/STOP SWITCH ASSEMBLY

1) Mounting Location

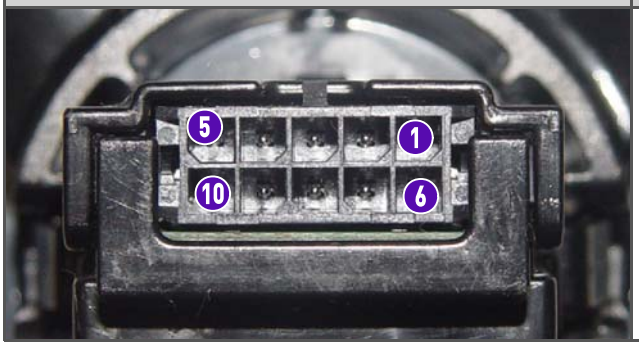
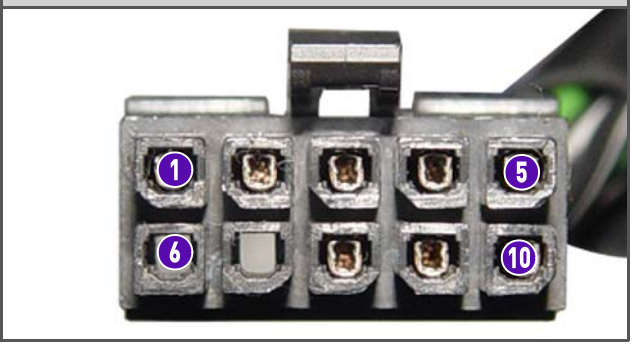
2) Functions

Configuration	Major functions
START/STOP switch 	- Displays ignition status - 2-point contact type - Operation mode OFF → ACC ON → ON (IGN) → Start position OFF: LED OFF ACC ON: LED amber ON IGN ON: LED red ON Engine can be started: LED green ON

Status	Turning-ON conditions
OFF	IGN OFF, IGN ON & engine ON
Green	Engine start possible with START/STOP switch operation - Brake switch input & (IGN OFF / ACC ON / IGN ON)
Amber	ACC ON
Red	IGN ON & engine OFF, error

Modification basis	
Application basis	
Affected VIN	

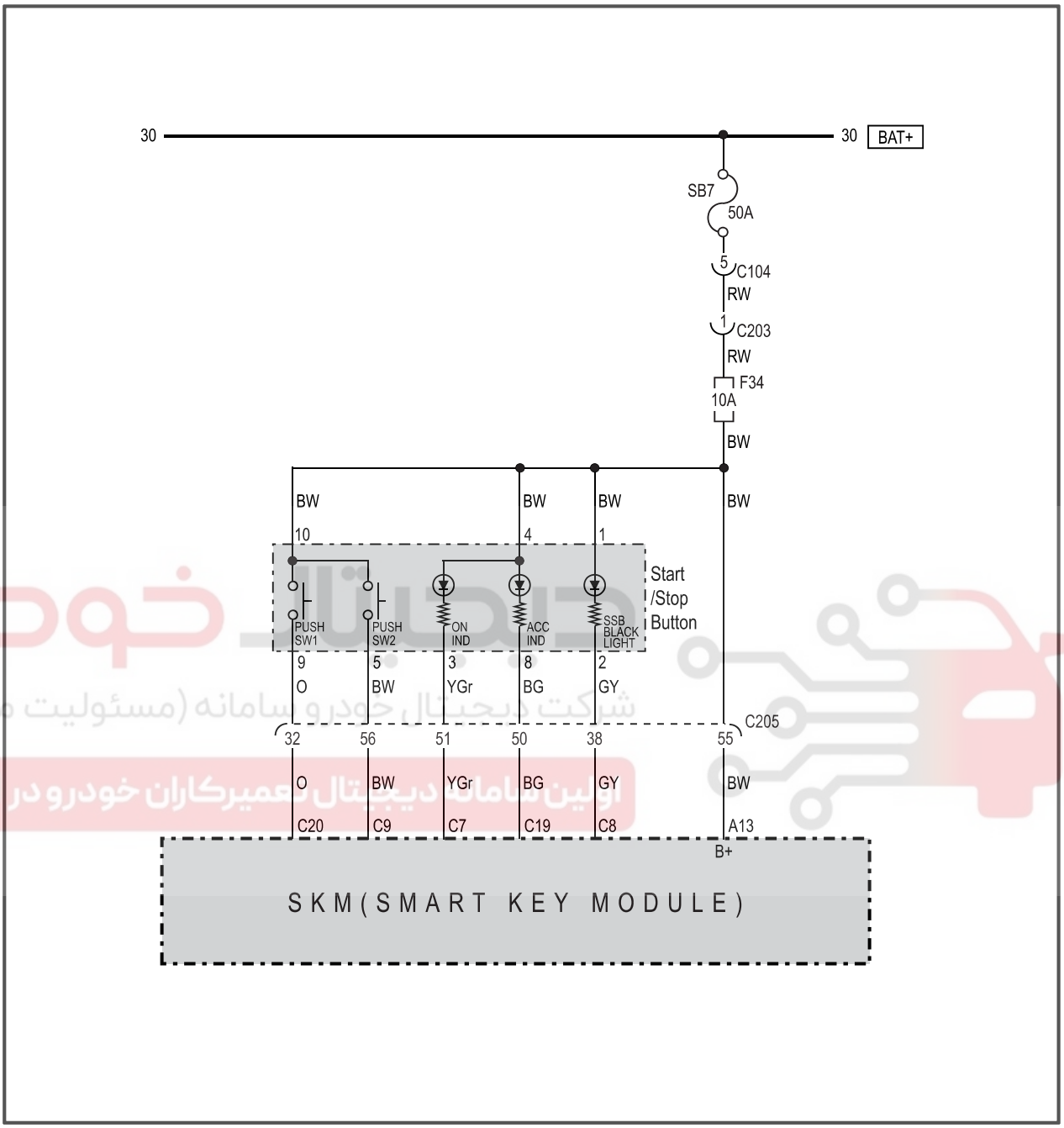
3) Connector Pin Description

To switch	To wiring
	

Pin No.	Function
1	START/STOP switch indicator power
2	START/STOP switch indicator ground (SKM)
3	IGN ON LED ground (SKM)
4	START/STOP switch LED power
5	START/STOP START switch2 ground (SKM)
6	-
7	-
8	ACC LED ground (SKM)
9	START/STOP START switch1 ground (SKM)
10	START/STOP switch power

Modification basis	
Application basis	
Affected VIN	

4) Circuit Diagram



Modification basis	
Application basis	
Affected VIN	

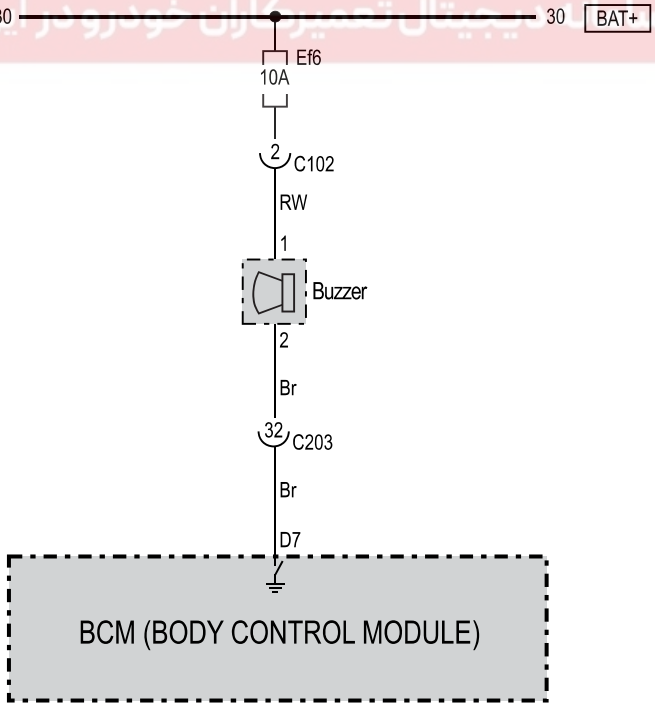
S.G.N. 8610-18

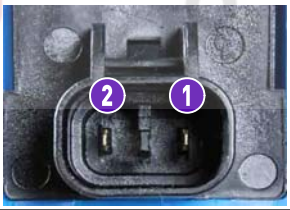
EXTERNAL BUZZER (SKM BUZZER)

1) Mounting Location

External buzzer (SKM buzzer)


2) Wiring Diagram



Connector to external buzzer

Connector to wiring

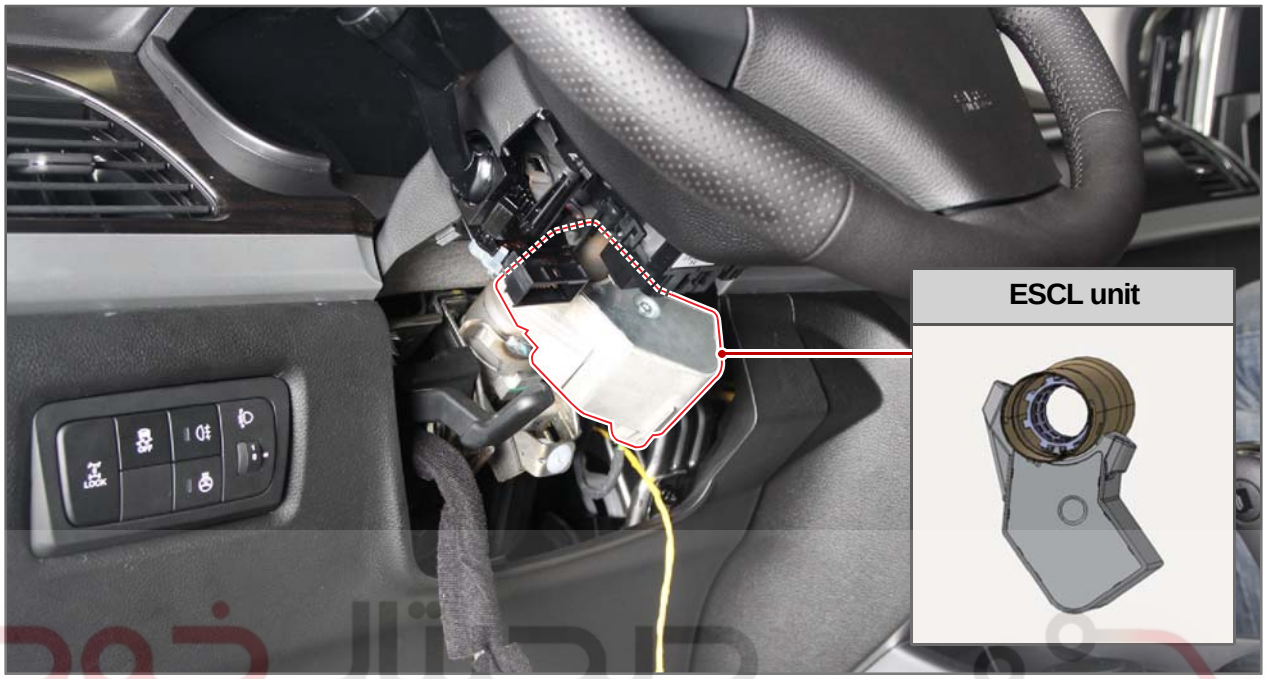

Pin No.	Function
1	12 V B+
2	External buzzer control BCM (Pin_D7)

Modification basis	
Application basis	
Affected VIN	

S.G.N. 8712-03

ESCL

1) Mounting Location

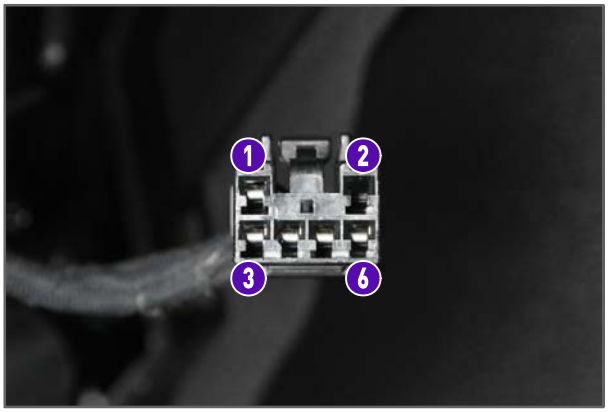


2) Specifications

Item	Specification
Rated voltage	DC 12V
Operating voltage range	DC 9V - 16V
Operating temperature range	−30°C ~ +80°C
Storage temperature range	−40°C ~ +85°C
Maximum humidity	95%
High resisting voltage	24V
Voltage drop	Below 1.0V

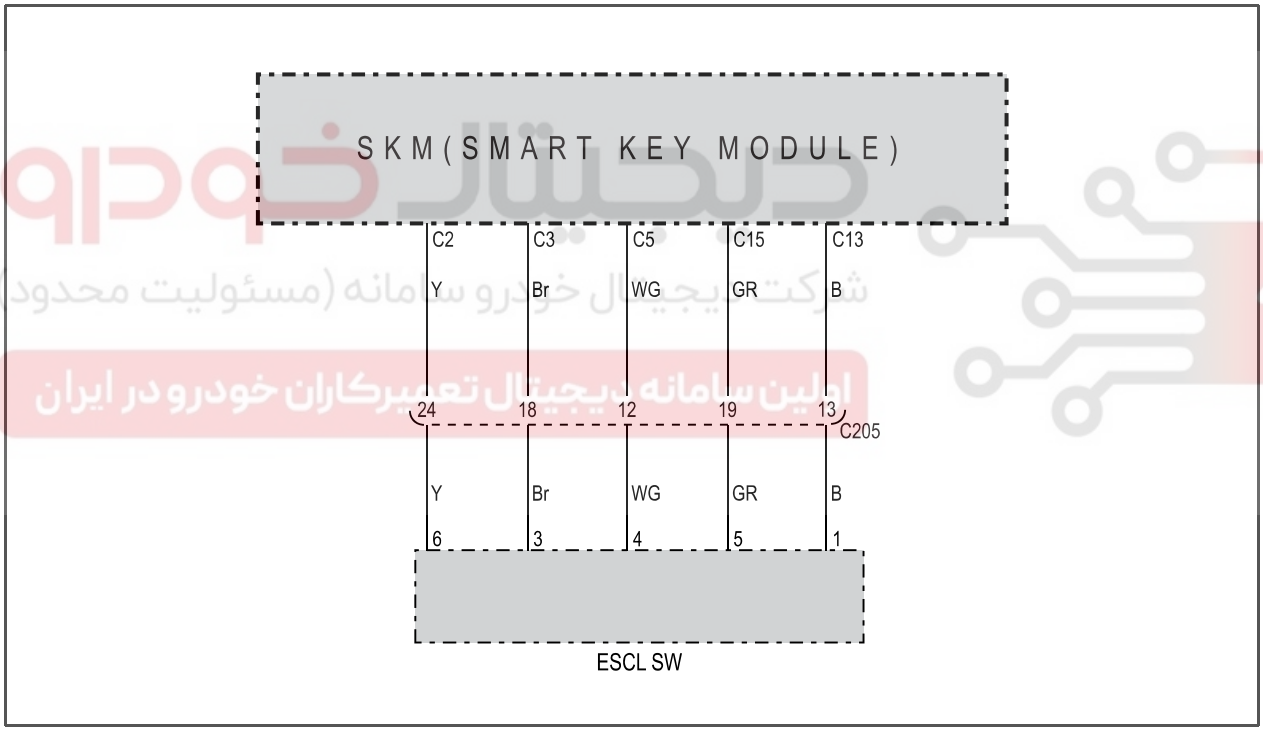
Modification basis	
Application basis	
Affected VIN	

3) Functions



Pin No.	Function
1	GND
2	-
3	LIN
4	ESCL unlock
5	ESCL unable
6	ESCL power

4) Circuit Diagram



Modification basis	
Application basis	
Affected VIN	

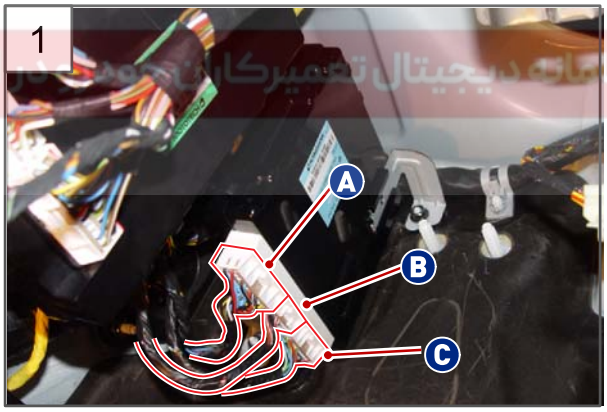
REMOVAL AND INSTALLATION

S.G.N. 8712-03

SKM UNIT ASSEMBLY

Preceding work - Disconnect the negative battery cable.

1



1. Disconnect the SKM unit connectors (A), (B) and (C) at the bottom of the lower main panel.

2

2. Unscrew the 2 mounting nuts (10 mm) for the SKM unit.

Modification basis	
Application basis	
Affected VIN	

3

3. Remove the SKM unit.

4

4. Install in the reverse order of removal.

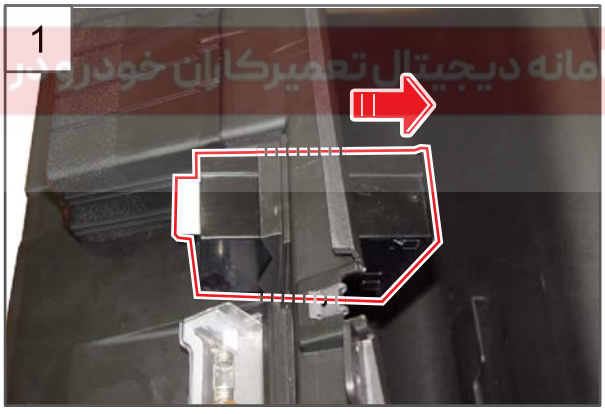
CAUTION

Perform the smart key coding and EMS (ECU) registration after replacing the SKM unit.

Modification basis	
Application basis	
Affected VIN	

S.G.N.
8610-11 EMERGENBY SLOT ASSEMBLY

Preceding work
- Disconnect the negative cable from the battery.
- Remove the glove box.



1. Remove the emergency slot by pushing it in the direction of the arrow as shown in the picture, from the removed glove box.

2. Install in the reverse order of removal.

Modification basis	
Application basis	
Affected VIN	

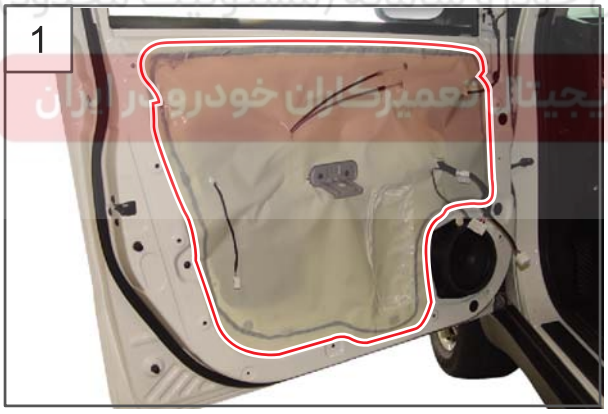
S.G.N. 8712-05

DOOR HANDLE SWITCH ANTENNA

Preceding work

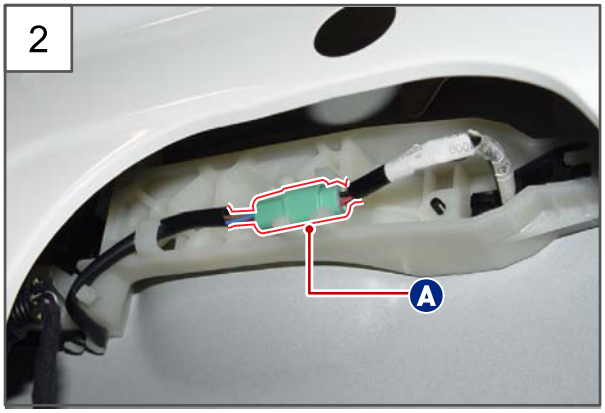
- Disconnect the negative cable from the battery.
- Remove the door trim.

1



1. Remove the door trim seal.

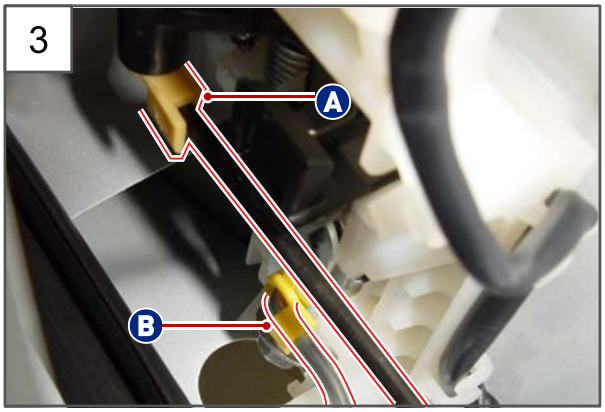
2



2. Disconnect the connector (A) between the door handle switch and antenna.

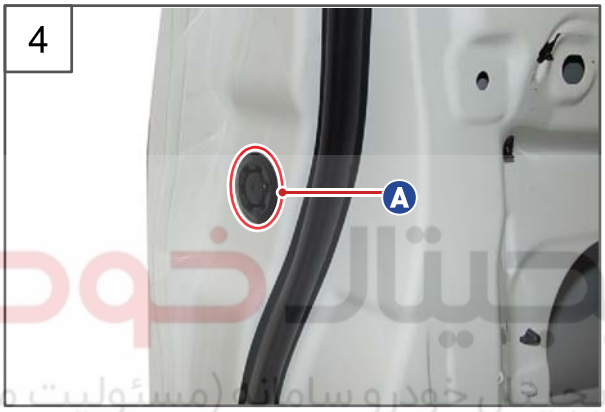
Modification basis	
Application basis	
Affected VIN	

3



3. Remove the outside handle rod (A) and key cylinder rod (B).

4

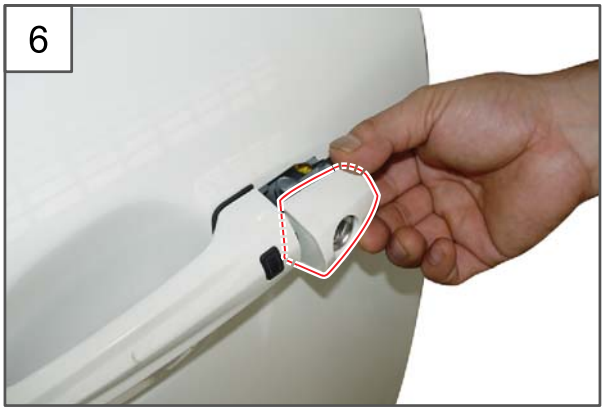


4. Remove the key cylinder mounting cover (A).

5

5. Unscrew the key cylinder mounting bolt (10 mm).

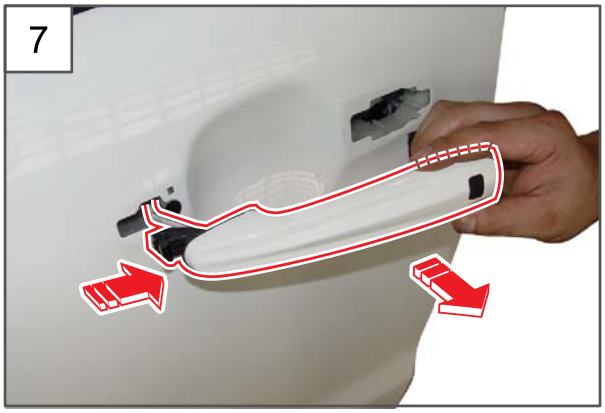
6



6. Remove the key cylinder.

Modification basis	
Application basis	
Affected VIN	

7



7. Remove the outside handle.

8

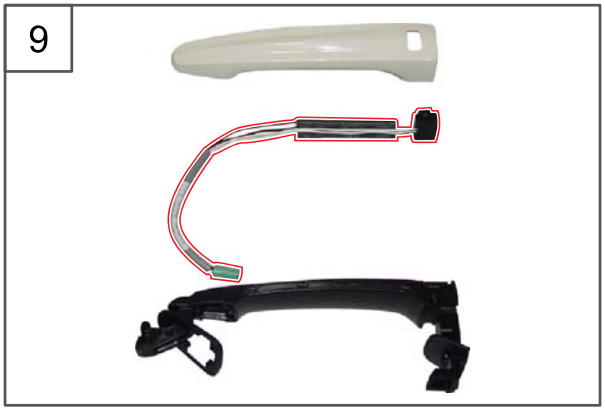
8. Remove the outside handle cover (A) and door handle switch assembly (B).

CAUTION

Make sure that the cover is not damaged when removing.

9. Remove the switch from the door handle switch assembly.

9

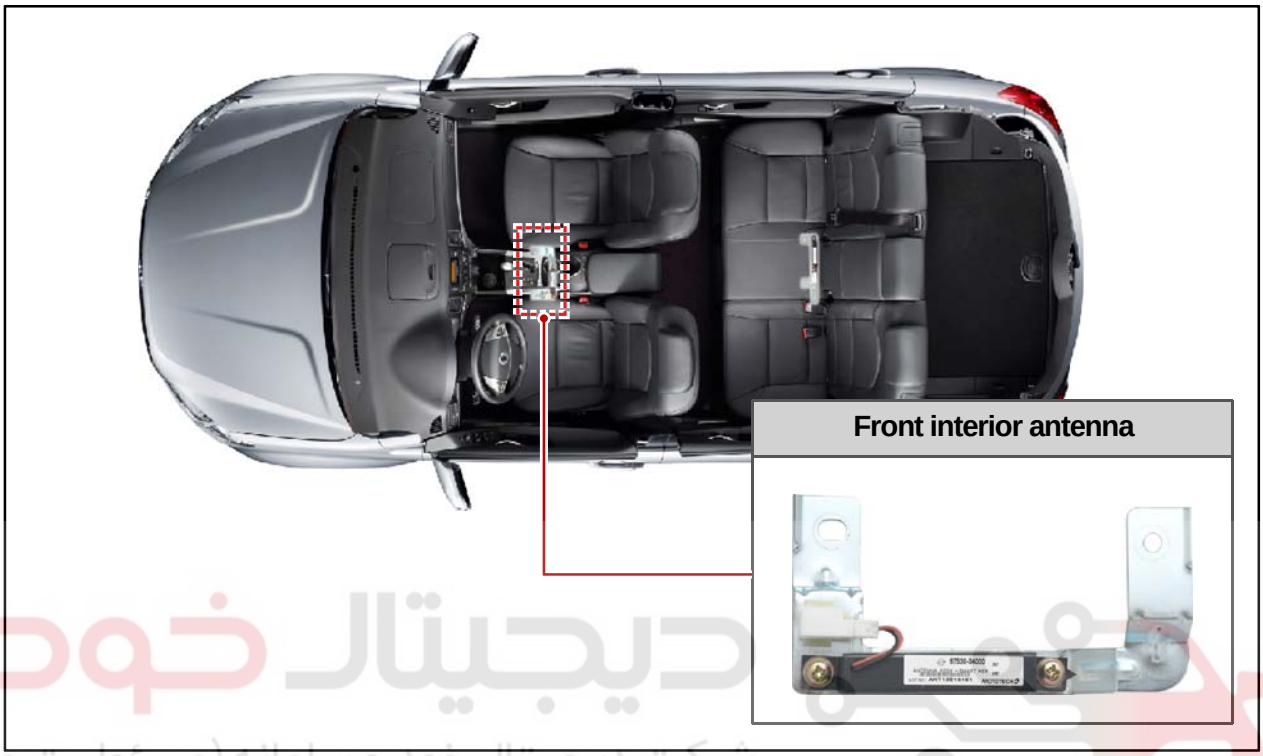


10.Install in the reverse order of removal.

Modification basis	
Application basis	
Affected VIN	

S.G.N.
8712-05 FRONT INTERIOR ANTENNA

Preceding work - Disconnect the negative battery cable.

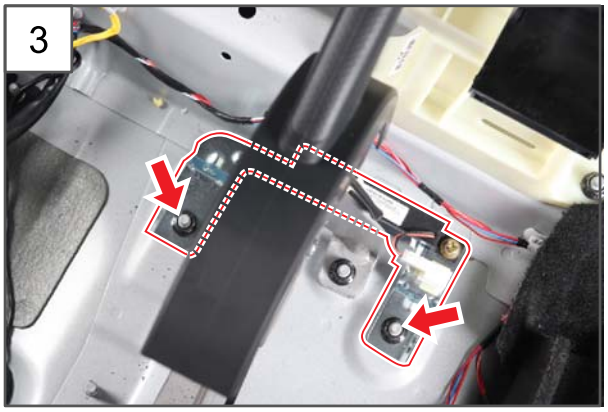


1. Remove the front console.

NOTE
Refer to "Removal and installation, Front console" section of "Body Interior".

2. Disconnect the front interior antenna connector.

Modification basis	
Application basis	
Affected VIN	



3. Unscrew the 2 mounting bolts (10 mm) for the front interior antenna.

4. Remove the front interior antenna assembly.

5. Install in the reverse order of removal.

CAUTION

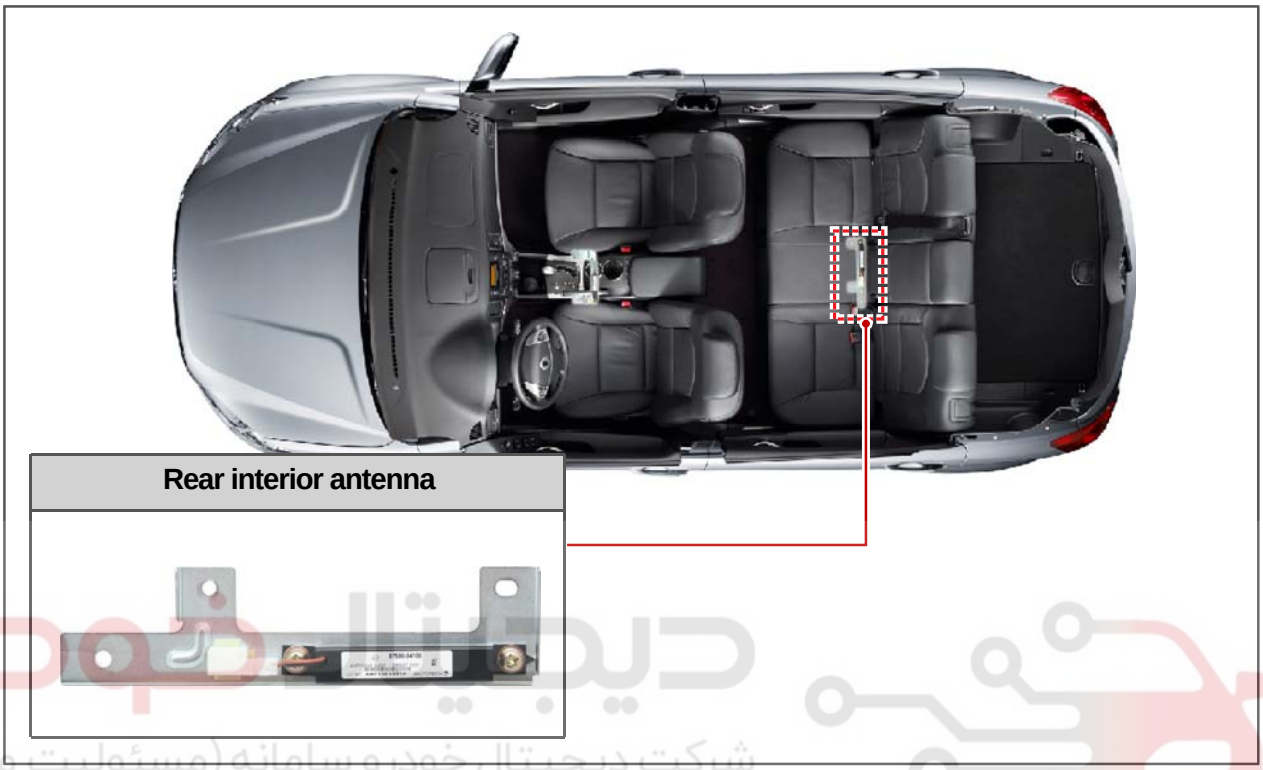
Make sure "INT FRT" is written on the antenna when installing the front interior antenna.

Modification basis	
Application basis	
Affected VIN	

S.G.N. 8712-05

REAR INTERIOR ANTENNA

Preceding work - Disconnect the negative battery cable.



1. Remove the rear seats (LH/RH).

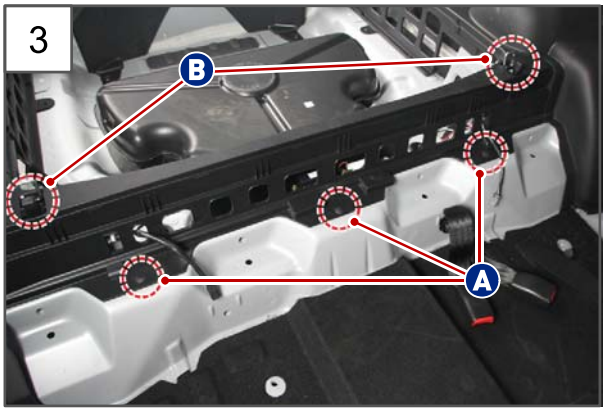
NOTE

Refer to "Removal and installation, Rear LH/RH seat" section of "Body, Seat".

2. Remove mounting screws securing the luggage tray (4 on each side) to remove the luggage tray.

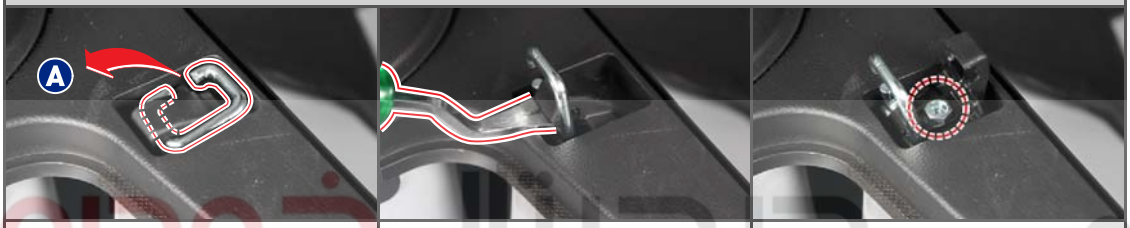
Modification basis	
Application basis	
Affected VIN	

3



3. Unscrew the 3 mounting screw rivets (A) for the luggage front trim assembly and two mounting bolts (B, 10 mm) for the cover tether anchor to remove the luggage front trim.

B. Cover tether anchor mounting bolt



Move the hook (A) to the upright position (direction of the arrow).	Remove the cover using a hand remover.	Unscrew the mounting bolt (10 mm).

4

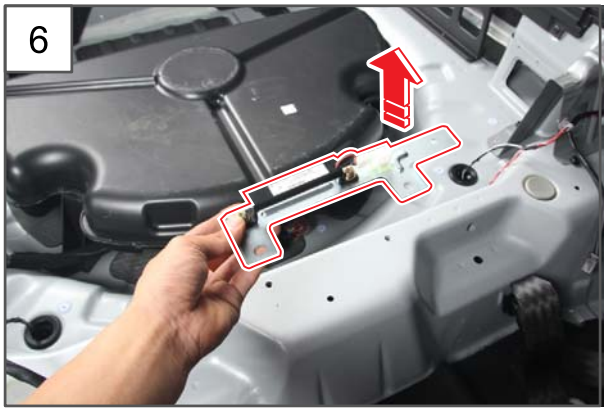
4. Disconnect the rear interior antenna connector (A).

5

5. Unscrew the 2 mounting nuts for the rear interior antenna.

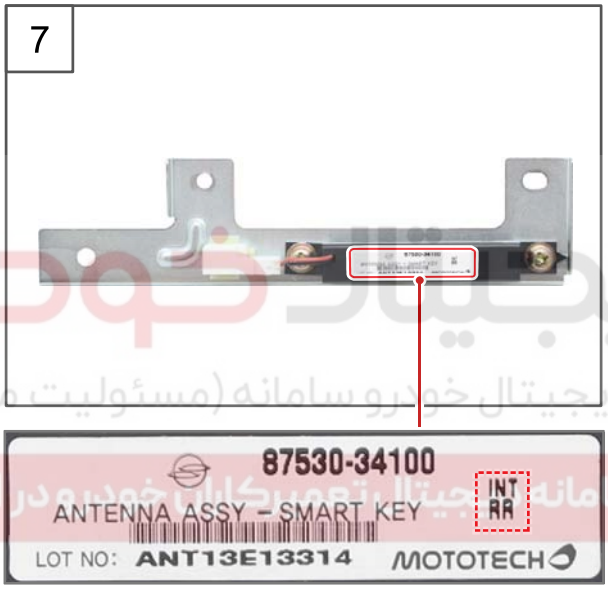
Modification basis	
Application basis	
Affected VIN	

6



6. Remove the rear interior antenna.

7



7. Install in the reverse order of removal.

CAUTION

Make sure "INT RR" is written on the antenna when installing the rear interior antenna.

Modification basis	
Application basis	
Affected VIN	

S.G.N. 8712-05

EXTERIOR (BUMPER) ANTENNA

Preceding work - Disconnect the negative cable from the battery.

1

1. Remove the rear bumper assembly.

NOTE

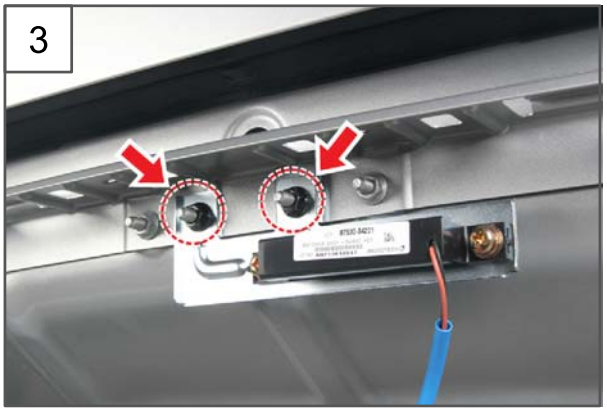
Refer to "Removal and installation, Rear bumper assembly" section of "Body Exterior".

2

2. Disconnect the exterior (bumper) antenna connector fitted in the rear end member assembly.

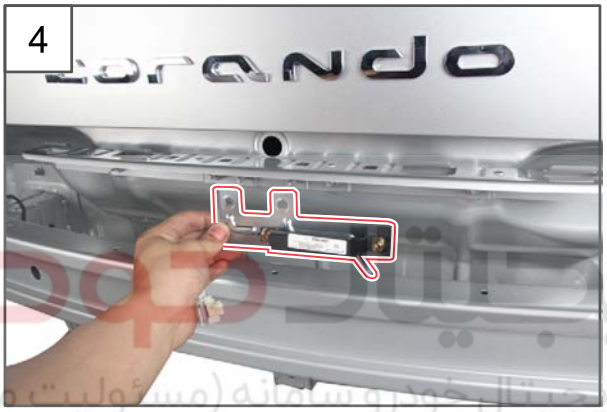
Modification basis	
Application basis	
Affected VIN	

3



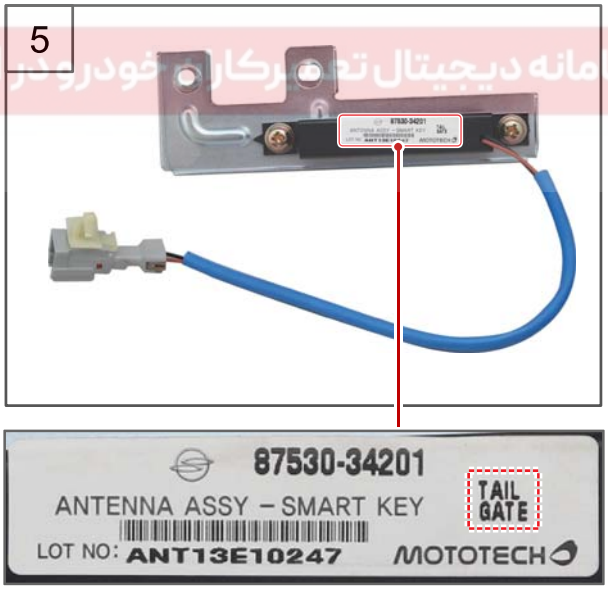
3. Unscrew the 2 mounting nuts (10 mm) for the exterior (bumper) antenna.

4



4. Remove the exterior (bumper) antenna.

5



5. Install in the reverse order of removal.

CAUTION

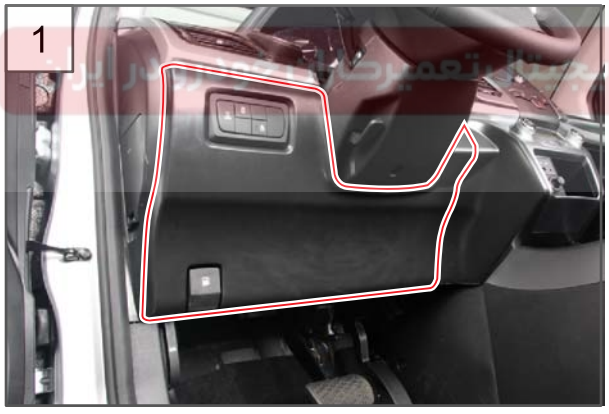
Make sure "TAIL GATE" is written on the antenna when installing the exterior (bumper) antenna.

Modification basis	
Application basis	
Affected VIN	

S.G.N. 8510-08 START/STOP SWITCH ASSEMBLY

Preceding work - Disconnect the negative battery cable.

1

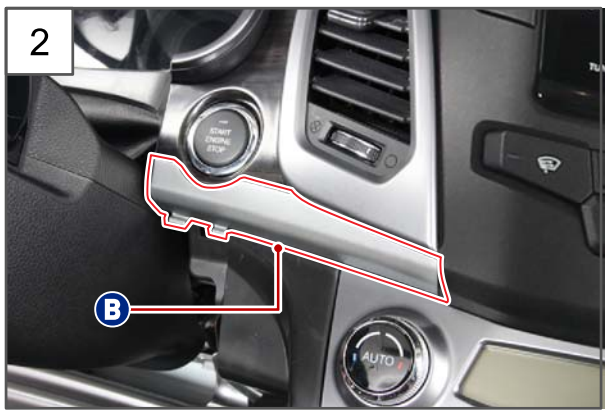


1. Remove the lower main panel assembly.

NOTE

Refer to "Removal and Installation, Lower main panel" section of "Body Interior".

2



2. Remove the center fascia panel molding (A).

Center fascia panel molding mountings

Modification basis	
Application basis	
Affected VIN	

3

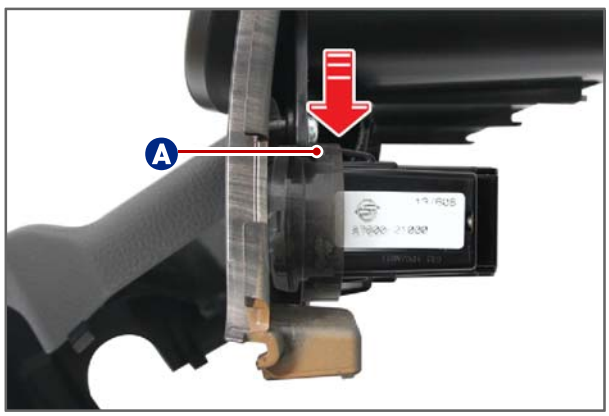
3. Unscrew the LH side fascia panel mounting screw.

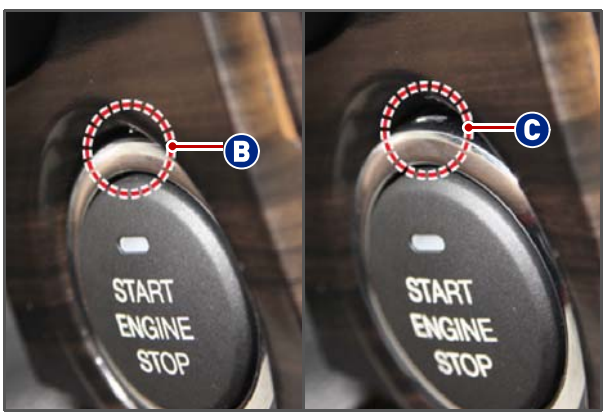
4

4. Remove the LH side fascia panel using a hand remover.

5

5. Press the upper mounting (A) of the START/STOP switch to separate the upper part of the switch as shown in the picture (B) → (C).





Modification basis	
Application basis	
Affected VIN	

6

6. Press the lower mounting (A) of the START/STOP switch to separate the switch.

7

7. Disconnect the START/STOP switch connector.

8

8. Remove the START/STOP switch.

Modification basis	
Application basis	
Affected VIN	

9

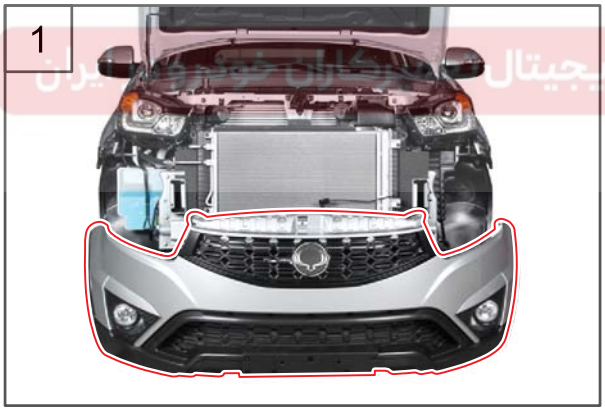
9. Install in the reverse order of removal.

Modification basis	
Application basis	
Affected VIN	

S.G.N.
8610-18 EXTERNAL BUZZER (SKM BUZZER)

Preceding work - Disconnect the negative battery cable.

1

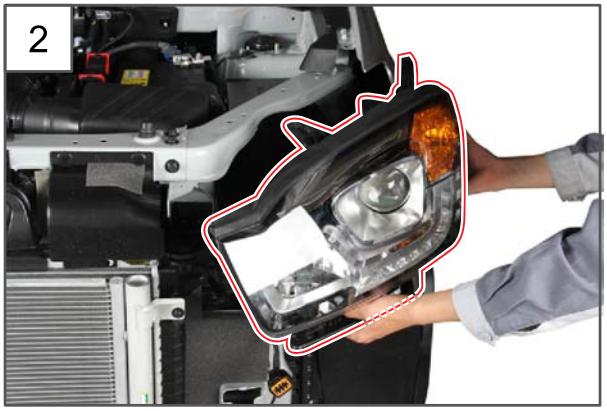


1. Remove the front bumper assembly.

NOTE

Refer to "Removal and installation, Front bumper assembly" section of "Body, Body Exterior".

2



2. Remove the driver side headlamp assembly.

NOTE

Refer to "Removal and installation, Headlamp" section of "Electronic, Lamp"

Modification basis	
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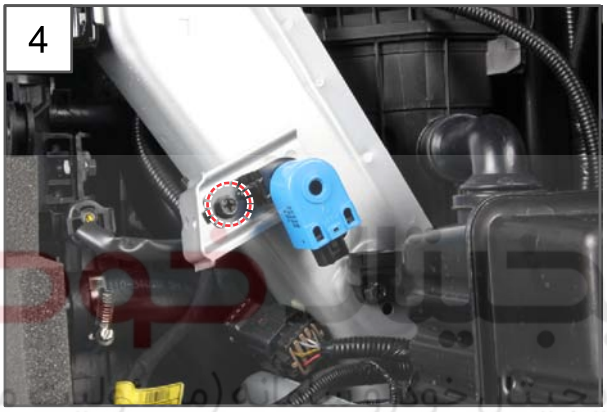
3

3. Disconnect the external buzzer (SKM buzzer) connector.

4



4. Unscrew the mounting nut (10 mm) for the external buzzer (SKM buzzer).

5

5. Remove the external buzzer (SKM buzzer).

6

6. Install in the reverse order of removal.

Modification basis	
Application basis	
Affected VIN	

CODING PROCESS

1. FUNCTIONS AVAILABLE BY SKM SYSTEM CODING

1) Operation with/without smart key/EMS (ECU) registration

Function / Registered	Passive entry	Power control	Engine starting
SKM (Virgin*) + EMS (ECU) (smart key unregistered)	-	0	Up to 10 times
Smart key coding + SKM coding (EMS (ECU) unregistered)	0	0	-
Smart key + SKM +EMS (ECU) unregistered	-	-	-
Smart key + SKM +EMS (ECU) registered (coding completed)	0	0	0

* Virgin: No smart key has been registered to the SKM.

NOTE

- If all smart keys have been lost, the vehicle power control is not available at all as shown in the table. Therefore, turn the ignition ON by performing the limp-home power control with a SIW diagnostic device to code new smart keys.
- Turn the ignition switch to the "ON" position and start the engine by performing the limp-home power control with a SIW diagnostic device since the engine can't be started in the event of the ESCL LOCK/UNLOCK fault.

2) Coding when replacing system

	Smart key coding	ESCL cnding	EMS (ECU) registration
Replacing smart key	O	-	O
Replacing SKM	O	O	O
Replacing ESCL	-	O	-
Replacing ECS (ECU)	-	-	O

NOTE

Perform the coding after turning the ignition on using the limp home control function when replacing the smart key and ESCL.

Modification basis	
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3) Virgin Power Control

If the SKM is not coded at all, the power control is performed as follows:

▶ **Power control**

The coding is available only when the ignition status is IGN ON.

▶ **ESCL lock/unlock**

If both the SKM and the ESCU ECU are virgin, the ESCL LOCK/UNLOCK doesn't work.

▶ **Engine start**

If the SKM is in Virgin* condition, the engine cranking can be performed up to 10 times.

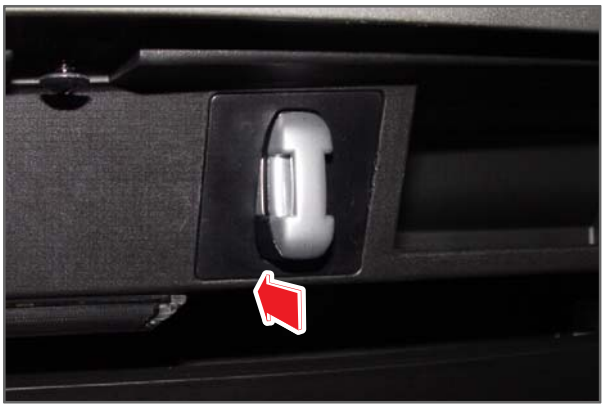
▶ **Control without variant code**

If there is no variant code value from the EMS (ECU) and no value is stored in the inactive memory area after the ignition status is changed to IGN ON, the START signal is not sent.

- No variant code in memory: IGN ON → Check variant code → START/STOP switch operation → Check ignition conditions → Request START
- Variant code stored in memory: Normal operation

2. SMAKRT KEY CODING

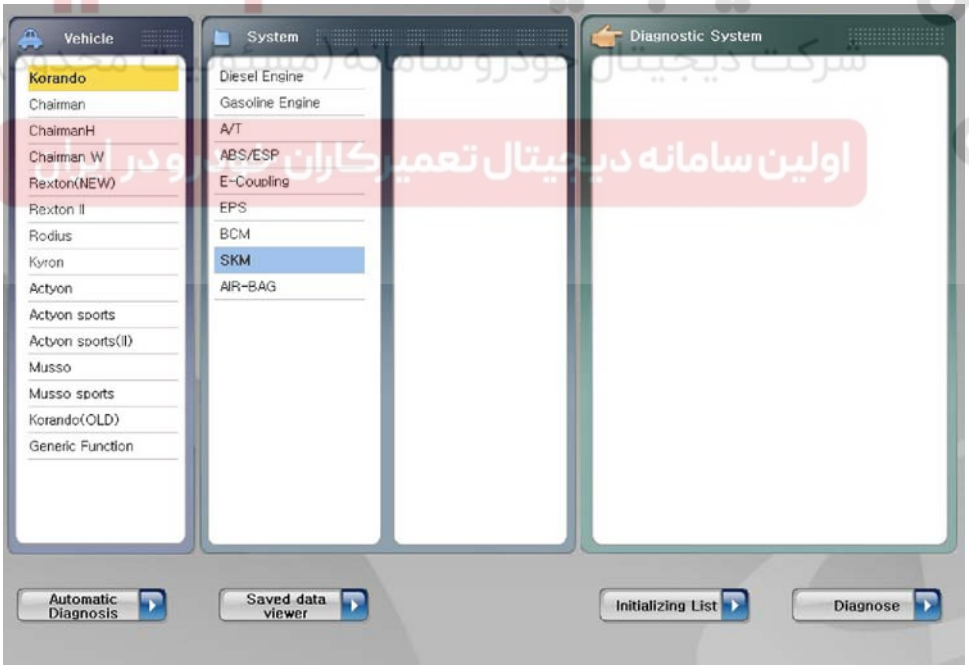
1. Insert the smart key into the immobilizer holder in the glove box, and turn the ignition on.



NOTE

When the smart key is lost, start coding after performing LIMPHOME IGN CONTROL.

2. Start diagnosis of the system by selecting the vehicle model and system (SKM) in the diagnostic program.



Modification basis	
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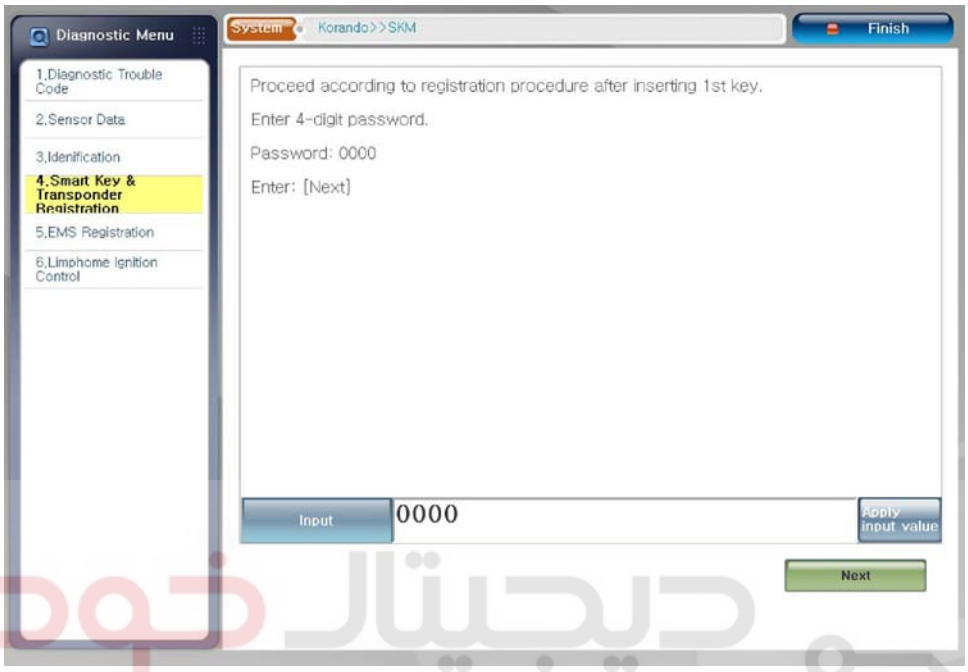
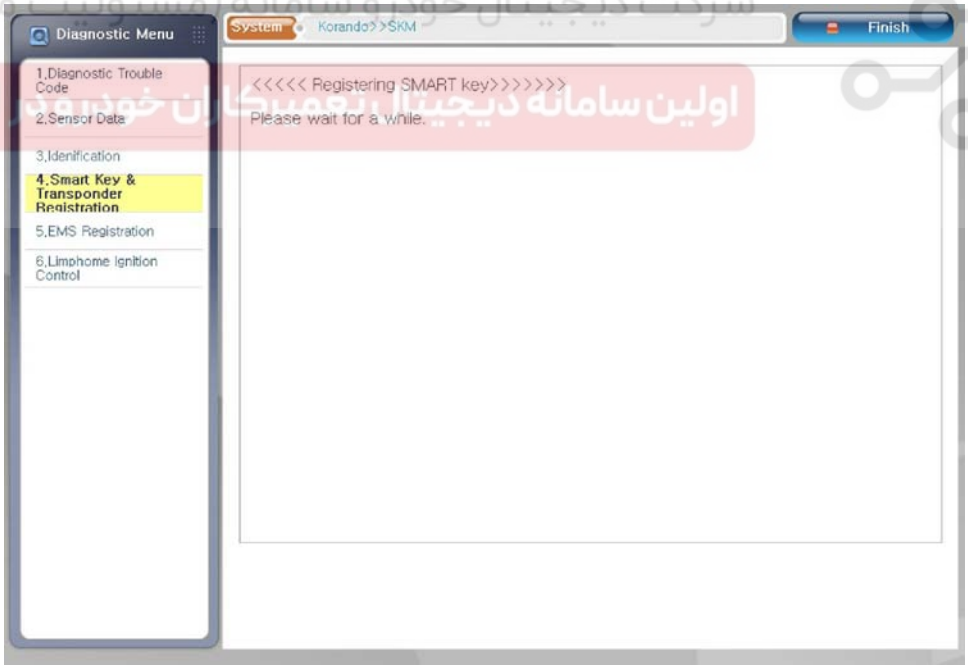
Affected VIN	

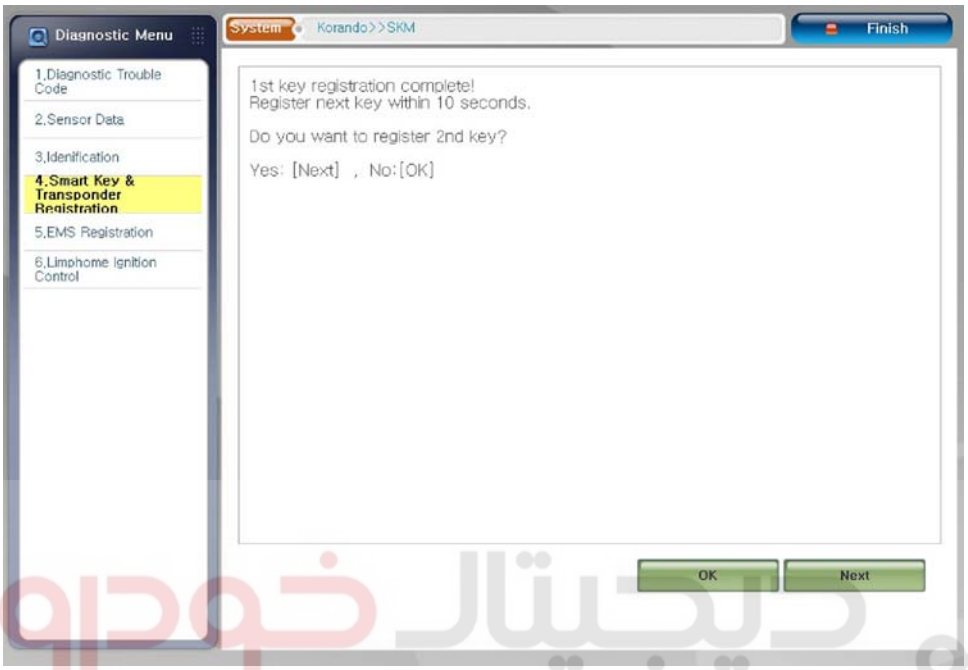
3. Select "Smart key & Transponder coding" from the diagnosis menu and then enter the password. The initial password is "0000". Click "Next".

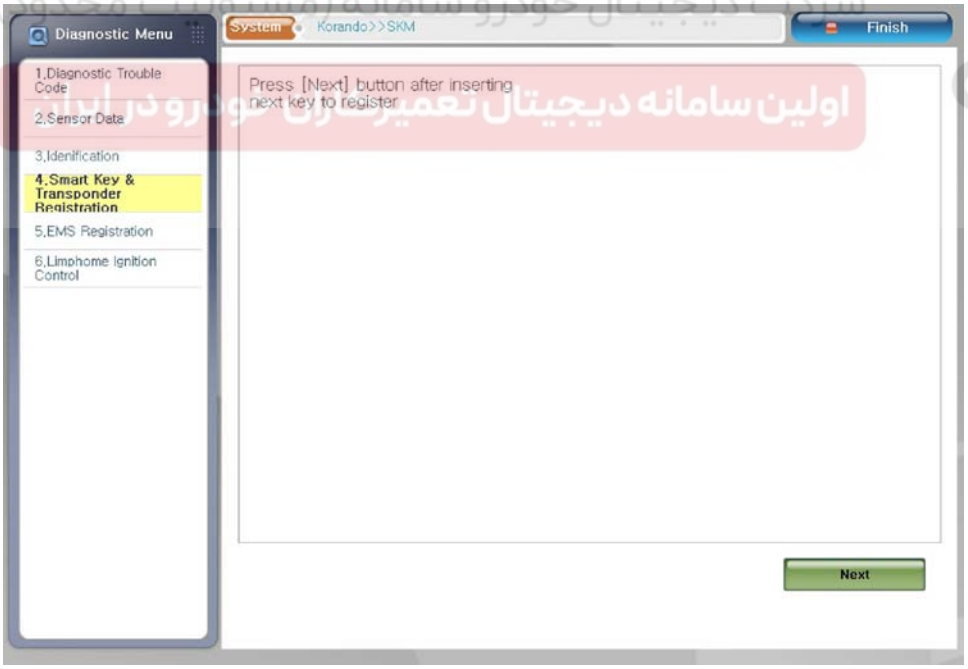




Modification basis	
Application basis	
Affected VIN	

4. When the smart key is registered to the system, insert the next smart key into the immobilizer holder within 10 sec., and click "Next".





Modification basis	
Application basis	
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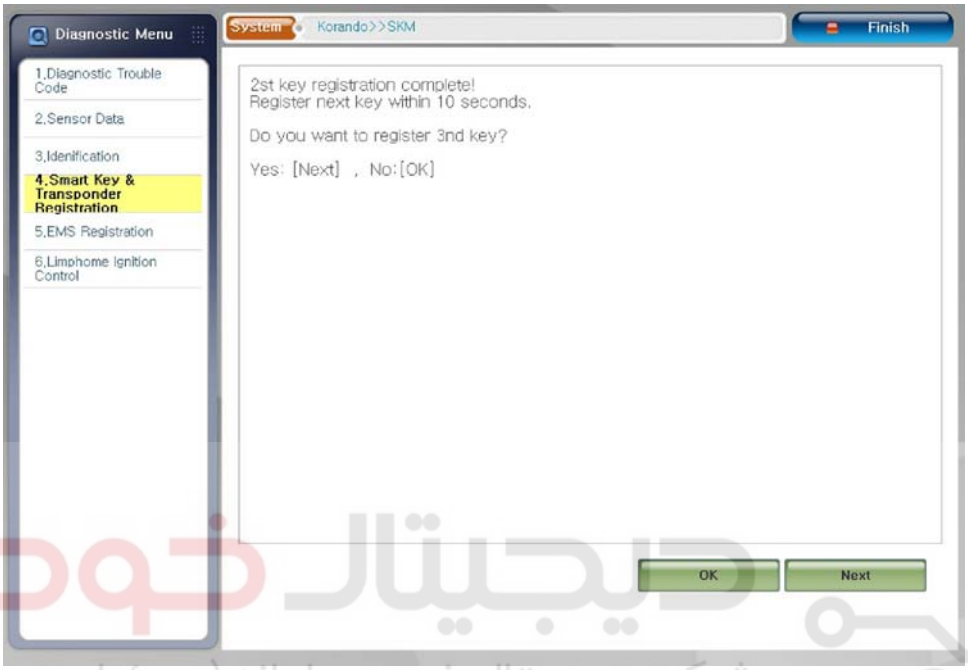
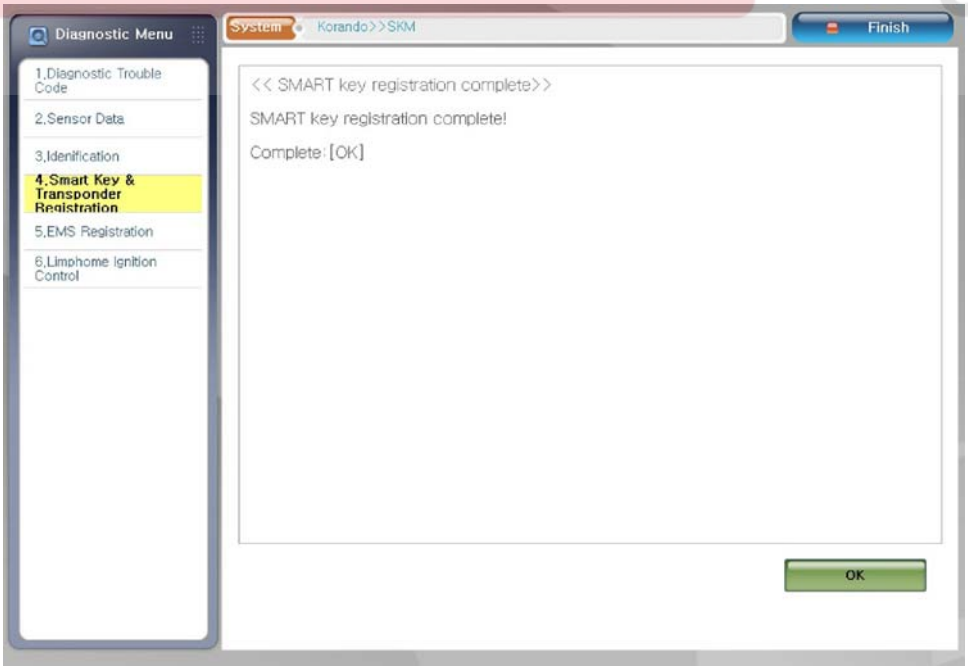
5. To register additional keys after completing the second registration, insert another smart key into the immobilizer holder within 10 sec., and click "Next". To finish registration, click "Done".
   * Smart key registration (up to 3 keys)

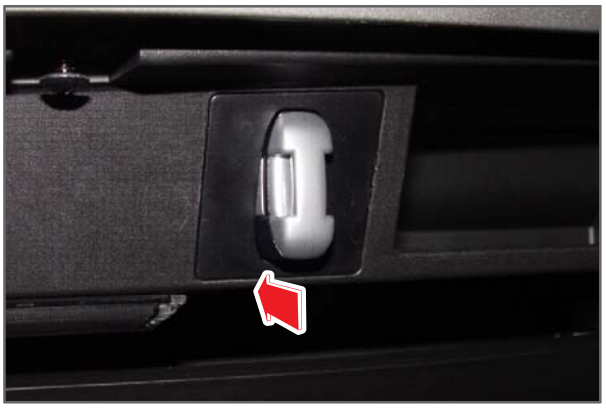


6. When the registration is completed, click "OK" button.



3. ESCL REGISTRATION

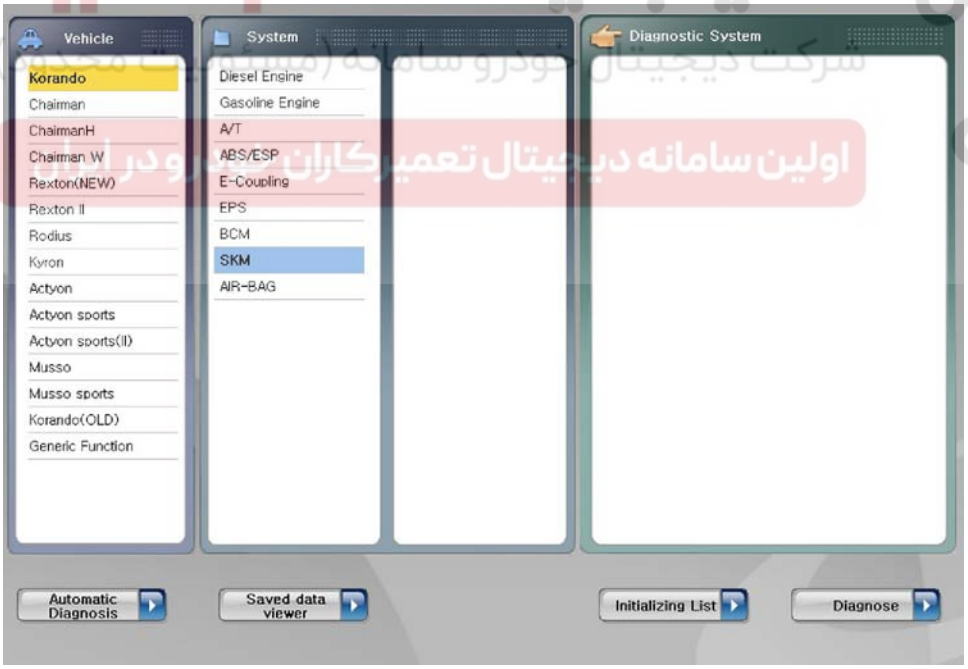
1. Insert the smart key into the immobilizer holder in the glove box, and turn the ignition on.



NOTE

When the smart key is lost, start coding after performing LIMPHOME IGN CONTROL.

2. Start diagnosis of the system by selecting the vehicle model and system (SKM) in the diagnostic program.



Modification basis	
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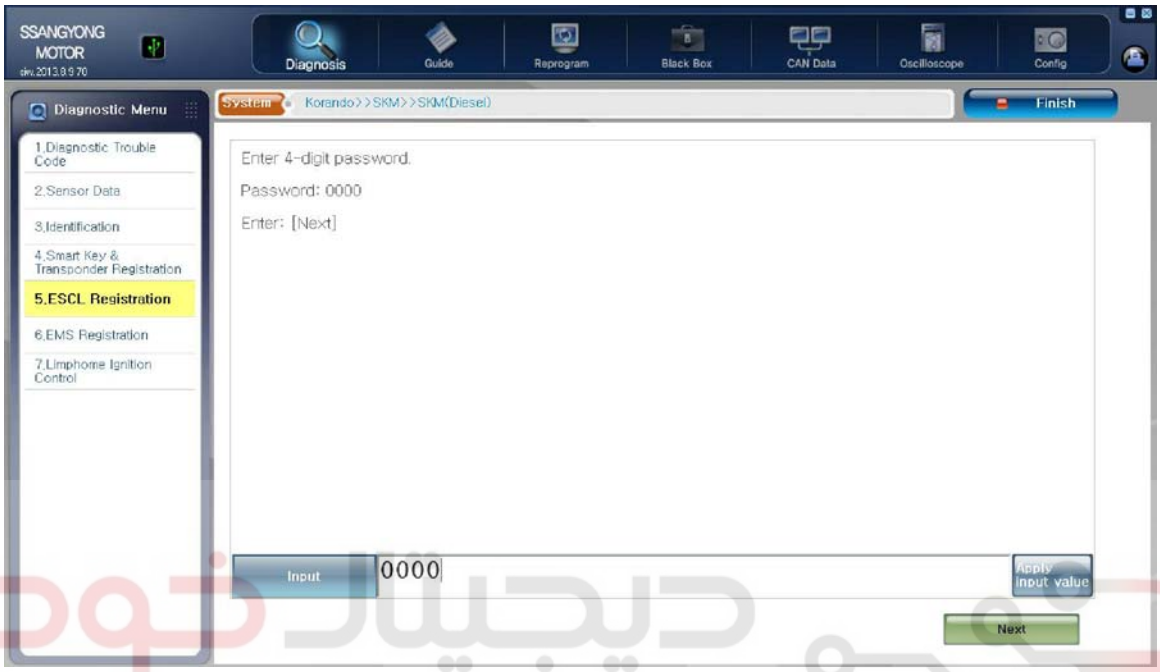
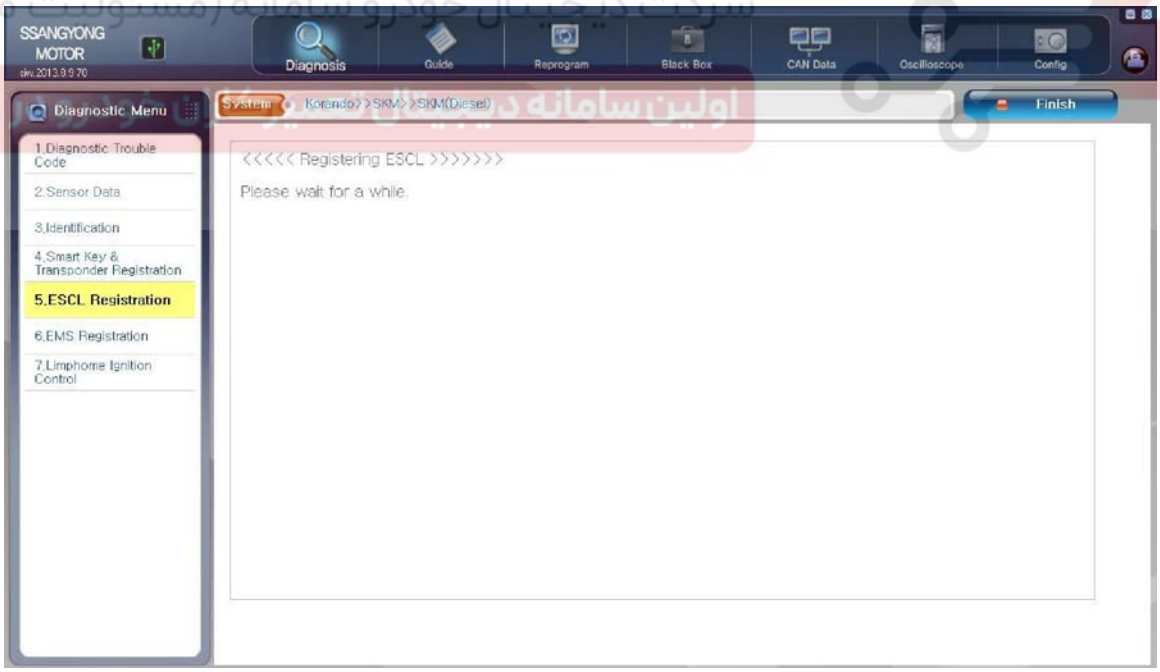
3. Select "ESCL Registration" menu and enter the password. (default value is 0000).
   Press the 'Next'.





Modification basis	
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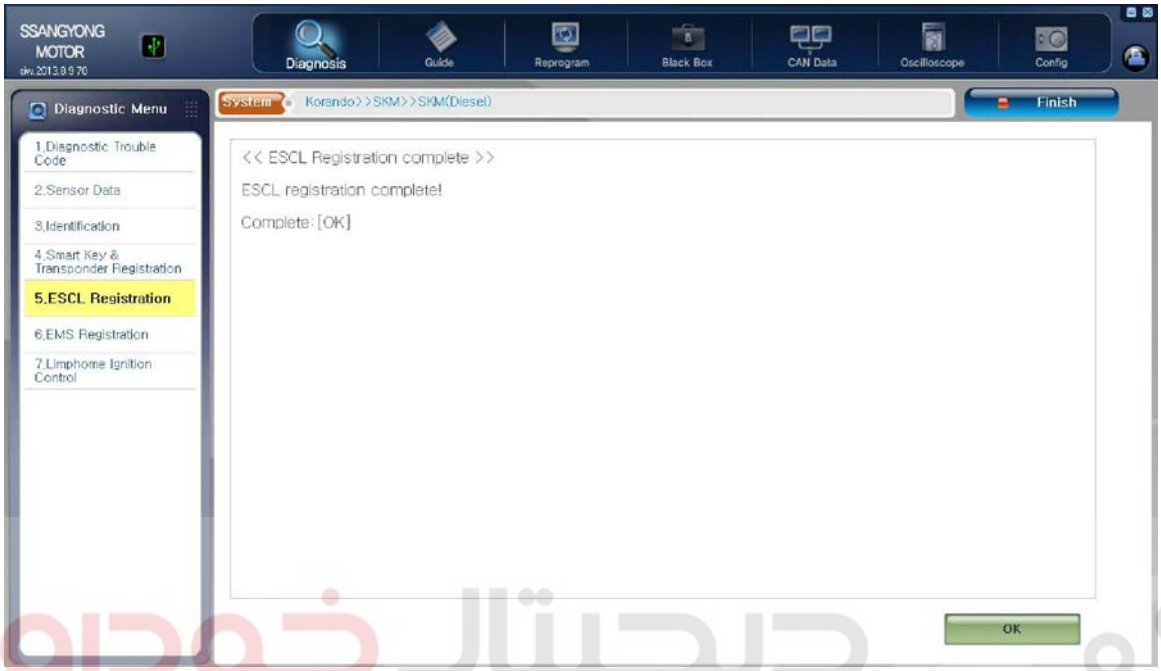
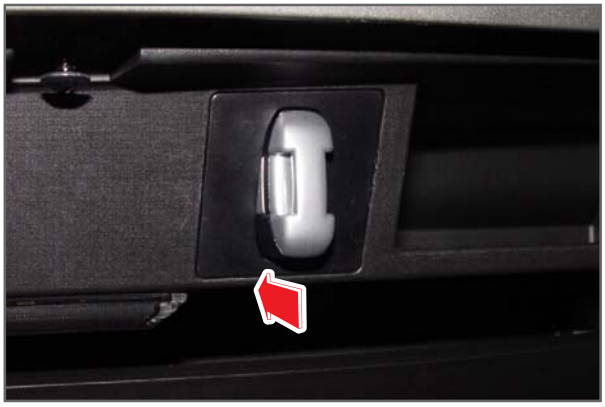
Affected VIN	

4. If the ESCL registration is completed, press the 'OK'.



4. EMS REGISTRATION

1. Insert the smart key into the immobilizer holder in the glove box, and turn the ignition on.



2. Start diagnosis of the system by selecting the vehicle model and system (SKM) in the diagnostic program.

Modification basis	
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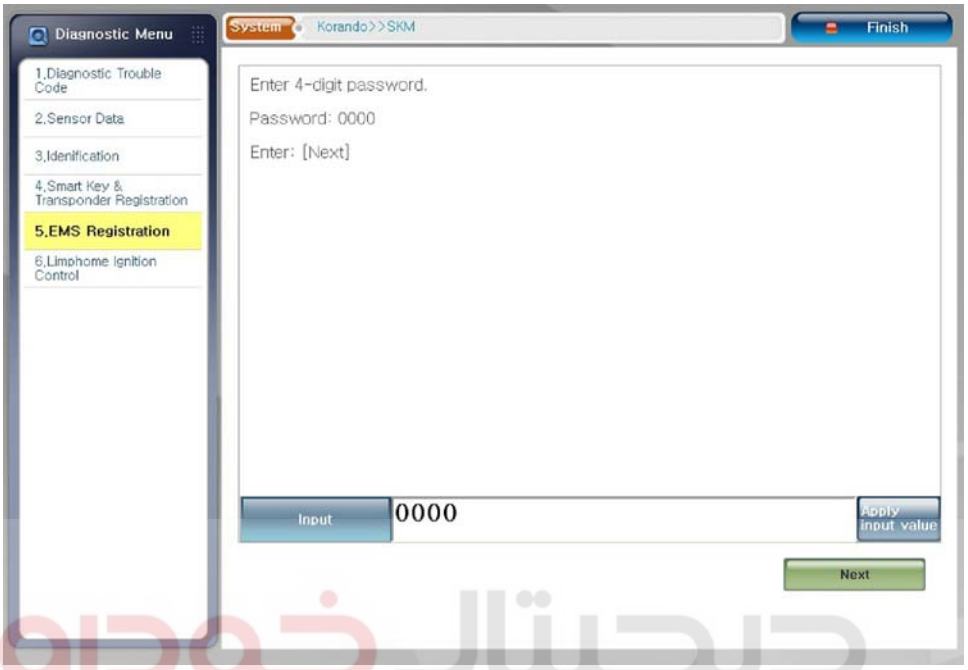
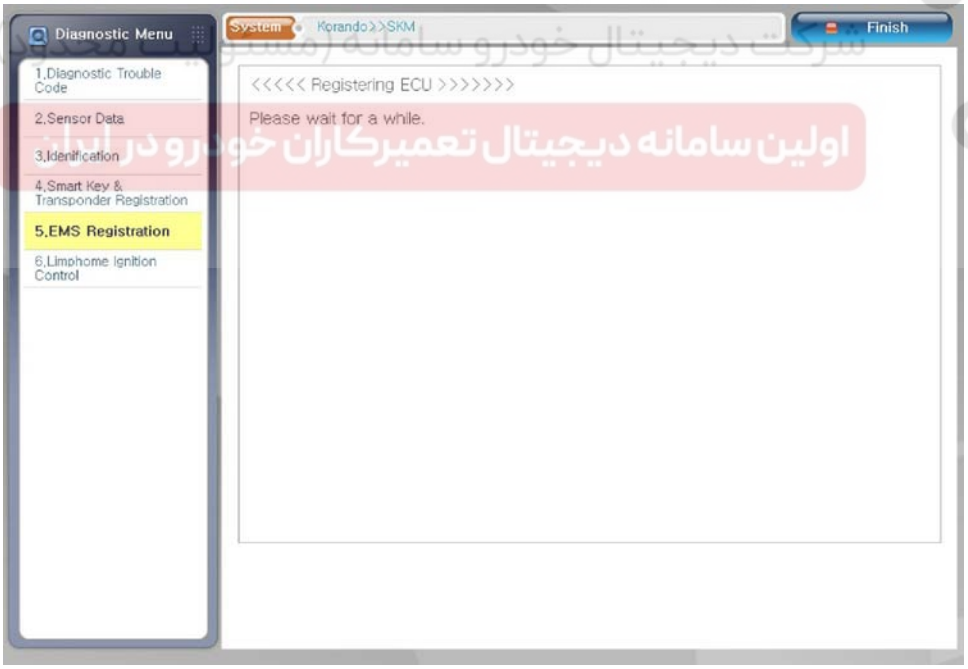
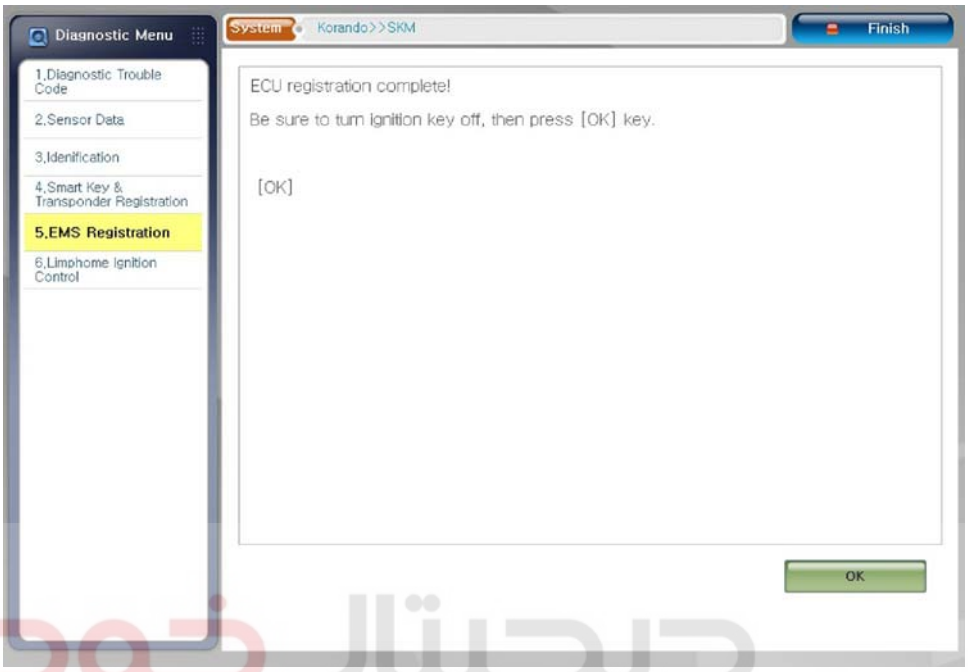
3. Select "EMS registration" menu and enter the password. (default value: "0000"). Click "Next".



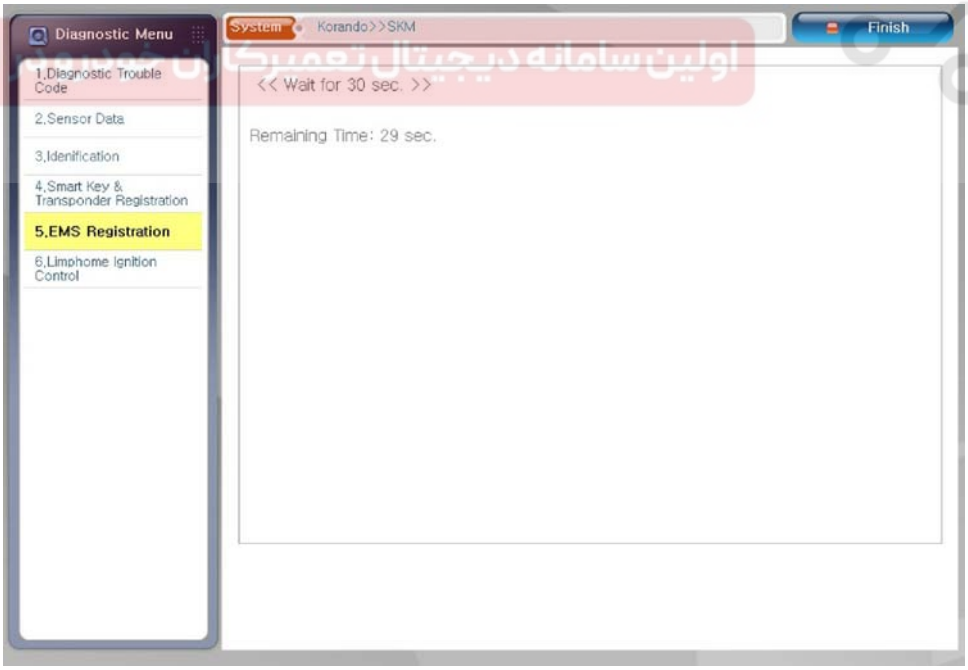


Modification basis	
Application basis	
Affected VIN	

4. When the registration is completed, turn the ignition OFF and then click "OK" button.



5. Wait for about 30 sec.



Modification basis	
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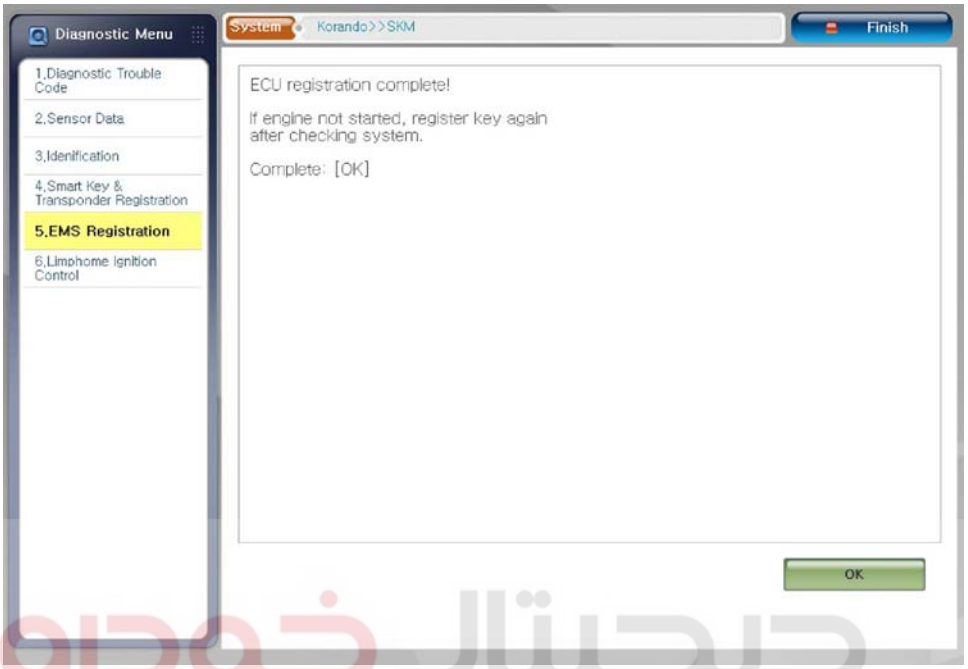
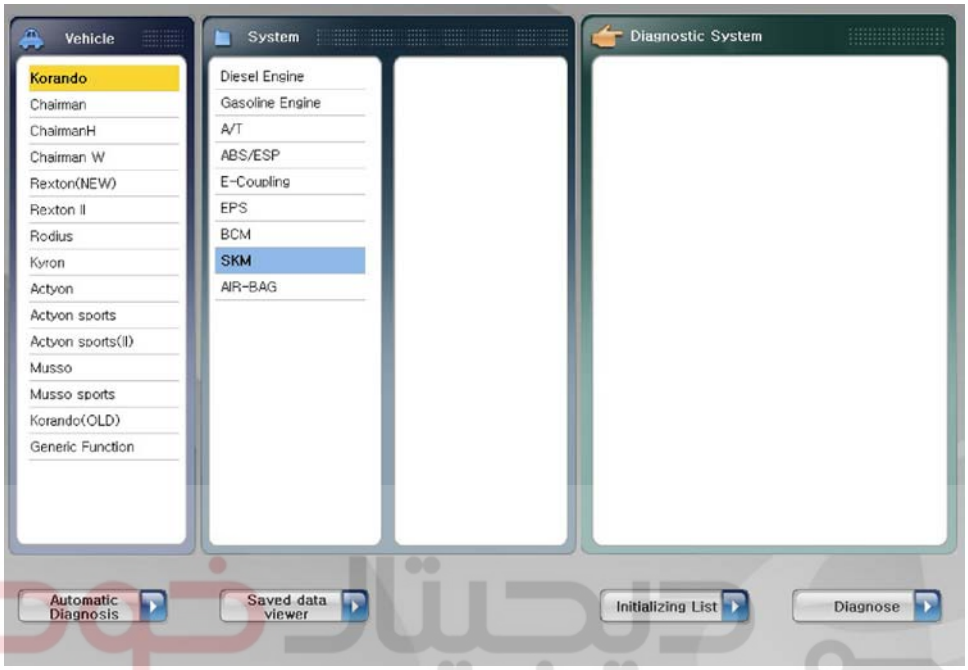
6. When the registration is completed, click "OK" button.



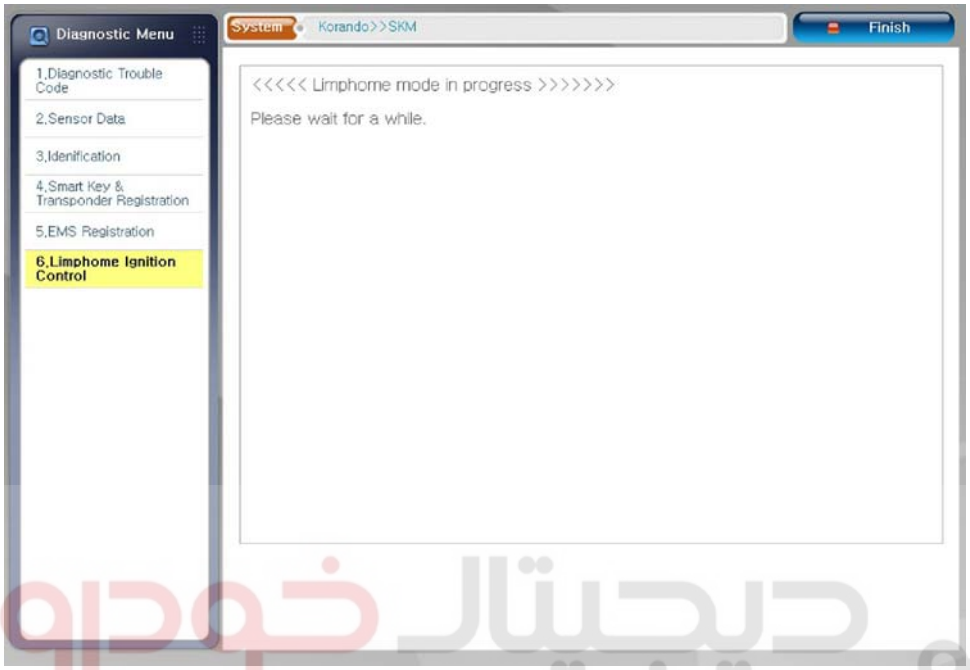
Modification basis	
Application basis	
Affected VIN	

5. LIMPHOME IGN CONTROL

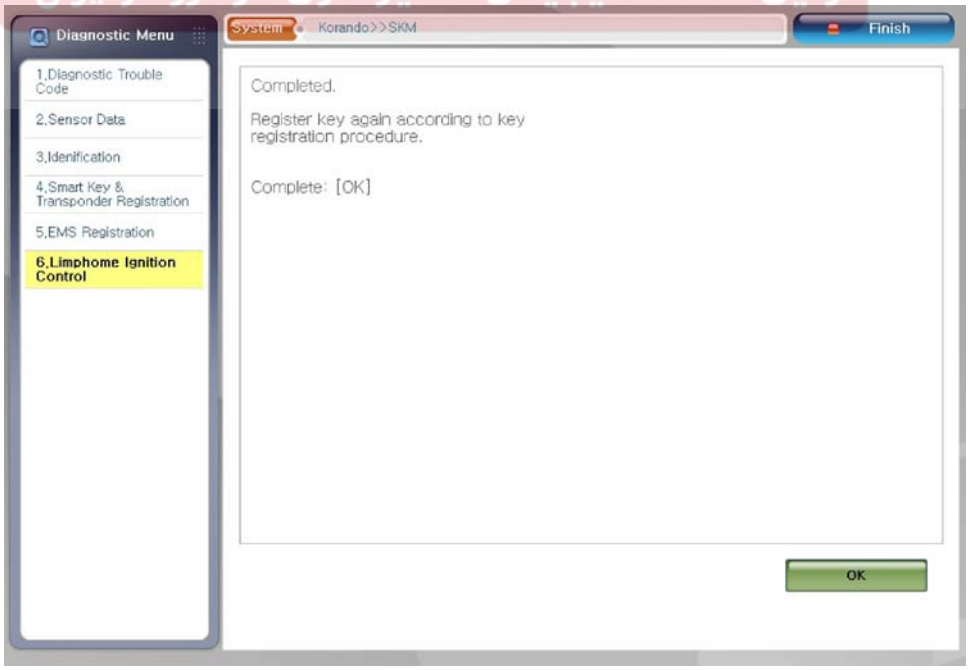
1. Start diagnosis of the system by selecting the vehicle model and system (SKM) in the diagnostic program.



2. Click "Next" button.



3. When the LIMPHOME IGN CONTROL process is completed, click "OK" button and then register the smart keys by following the procedure.



Modification basis	
Application basis	
Affected VIN	