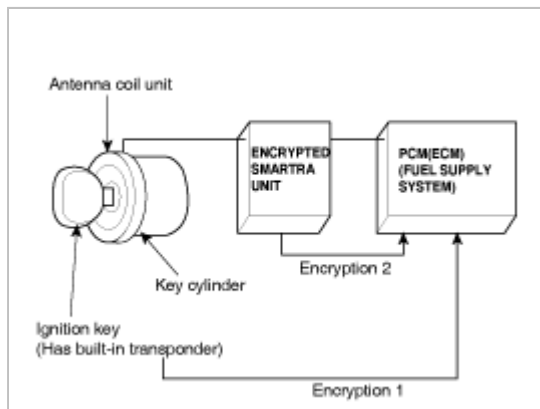


Description

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.

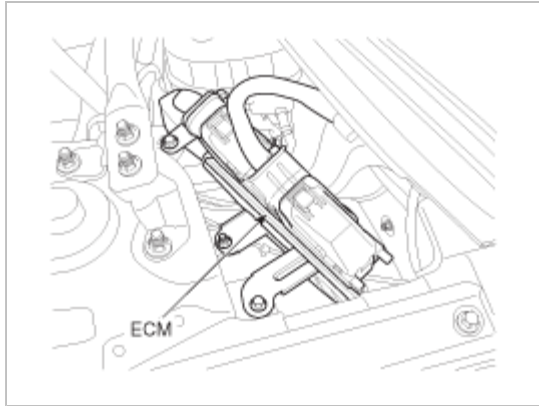
1. Encrypted SMARTRA type immobilizer
 - A. The SMARTRA system consists of a passive challenge - response (mutual authentication) transponder located in the ignition key, an antenna coil, an encoded SMARTRA unit, an indicator light and the PCM(ECM).
 - B. The SMARTRA communicates to the PCM(ECM) (Engine Control Module) 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 SMARTRA.
 - C. 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 SMARTRA unit to the PCM(ECM).
 - D. If the proper key has been used, the PCM(ECM) will energize the fuel supply system. The immobilizer indicator light in the cluster will simultaneously come on for more than five seconds, indicating that the SMARTRA unit has recognized the code sent by the transponder.
 - E. If the wrong key has been used and the code was not received or recognized by the PCM(ECM) the indicator light will continue blinking for about five seconds until the ignition switch is turned OFF.
 - F. If it is necessary to rewrite the PCM(ECM) to learn a new key, the dealer needs the customer's vehicle, all its keys and the Hi-scan (pro) equipped with an immobilizer program card. Any key that is not learned during rewriting will no longer start the engine.
 - G. The immobilizer system can store up to eight key codes.
 - H. If the customer has lost his key, and cannot start the engine, contact Hyundai motor service station.



Components Operations

PCM (Power Train Control Module)

1. 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 Random Number) value between EMS and encrypted smartra unit is checked and the validity of coded key is decided by EMS.

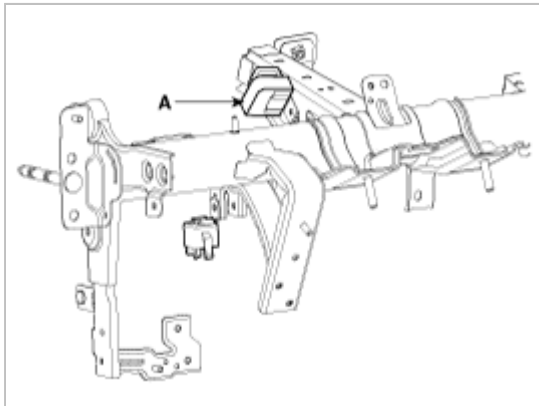


ENCRYPTED SMARTRA unit (A)

The SMARTRA carries out communication with the built-in transponder in the ignition key. This wireless communication runs on RF (Radio frequency of 125 kHz). The SMARTRA is mounted behind of the crash pad close to center cross bar.

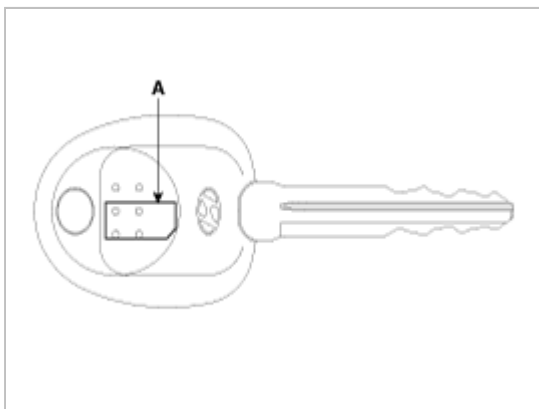
The RF signal from the transponder, received by the antenna coil, is converted into messages for serial communication by the SMARTRA device. And, the received messages from the PCM(ECM) are converted into an RF signal, which is transmitted to the transponder by the antenna.

The SMARTRA 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 PCM(ECM) and vice versa.



TRANSPONDER (Built-in keys)

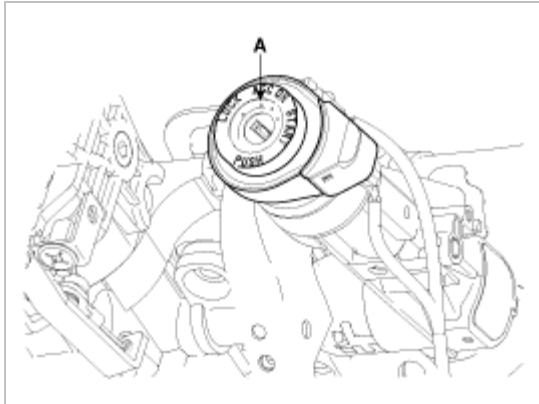
The transponder (A) has an advanced encryption algorithm. During the key teaching procedure, the transponder will be programmed with vehicle specific data. The vehicle specific data are written into the transponder memory. The write procedure is once only; therefore, the contents of the transponder can never be modified or changed.



Antenna coil

The antenna coil (A) has the following functions.

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



Replacement

Problems And Replacement Parts:

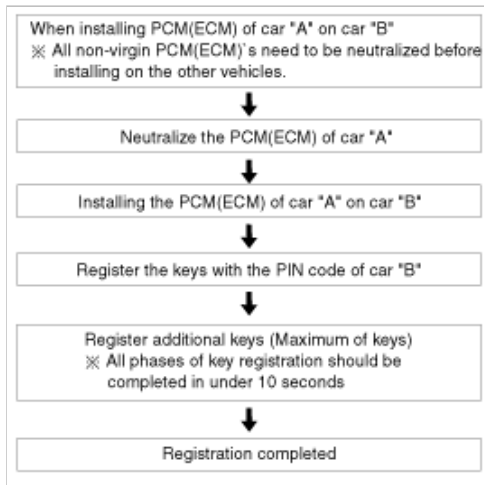
Problem	Part set	Scan tool required?
All keys have been lost	Blank key (4)	YES
Antenna coil unit does not work	Antenna coil unit	NO
ECM does not work	PCM(ECM)	YES
Ignition switch does not work	Ignition switch with Antenna coil unit	YES
Unidentified vehicle specific data occurs	Key, PCM(ECM)	YES
SMARTRA unit does not work	SMARTRA unit	YES

Replacement Of Ecm And Smartra

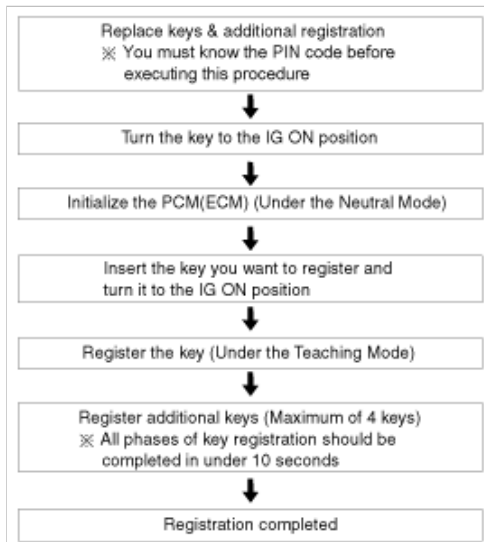
In case of a defective ECM, the unit has to be replaced with a "virgin" or "neutral" ECM. All keys have to be taught to the new ECM. Keys, which are not taught to the ECM, are invalid for the new ECM (Refer to key teaching procedure). The vehicle specific data have to be left unchanged due to the unique programming of transponder.

In case of a defective SMARTRA, it needs teaching the smartra. A new SMARTRA device replaces the old one and smartra need teaching.

1. Things to remember before a replacement (PCM(ECM))



2. Things to remember before a replacement (Keys & Additional registration)



NOTE

1. 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.
2. 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)
3. 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.
4. When you inspect the immobilizer system, refer to the above paragraphs 1, 2 and 3.
Always remember the 10 seconds zone.
5. If the pin code & password are entered incorrectly on three consecutive inputs, the system will be locked for one hour.
6. Be cautious not to overlap the transponder areas.
7. Problems can occur at key registration or vehicle starting if the transponders should overlap.

Neutralizing Of ECM

The PCM(ECM) can be set to the "neutral" status by a tester.

A valid ignition key is inserted and after ignition on is recorded, the PCM(ECM) requests the vehicle specific data from the tester. The communication messages are described at "Neutral Mode" After successfully receiving the data, the PCM(ECM) is neutralized.

The ECM remains locked. Neither the limp home mode nor the "twice ignition on" function, is accepted by the PCM(ECM).

The teaching of keys follows the procedure described for the virgin PCM(ECM). The vehicle specific data have to be unchanged due to the unique programming of the transponder. If data should be changed, new keys with a virgin transponder are requested.

This function is for neutralizing the PCM(ECM) and Key. Ex) when lost key, Neutralize the PCM(ECM) then teach keys.

(Refer to the Things to do when Key & PIN Code the PCM(ECM) can be set to the "neutral" status by a scanner. If wrong vehicle specific data have been sent to SMATRA three times continuously or intermittently, the SMATRA will reject the request to enter neutral mode for one hour. Disconnecting the battery or other manipulation cannot reduce this time. After connecting the battery the timer starts again for one hour.

NOTE

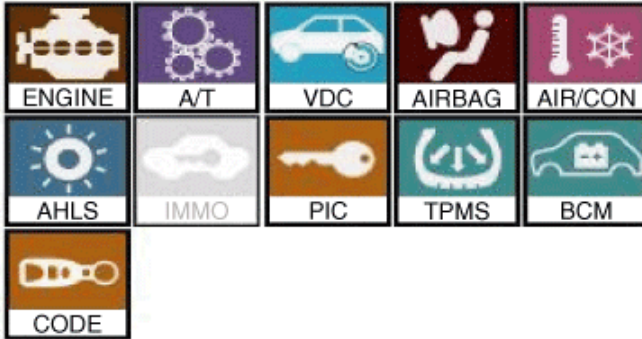
- Neutralizing setting condition
 - In case of PCM(ECM) status "Learnt" regardless of user password "Virgin or Learnt"
 - Input correct PIN code by scanner.
 - Neutralizing meaning
 - : PIN code (6) & user password (4) deletion.
 - : Locking of ECM (except key teaching permission)
- Neutralizing meaning: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

Fault Code Searching On

Previous Vehicle

Select System



Selected



Immobilizer(IMMO)

ID Register

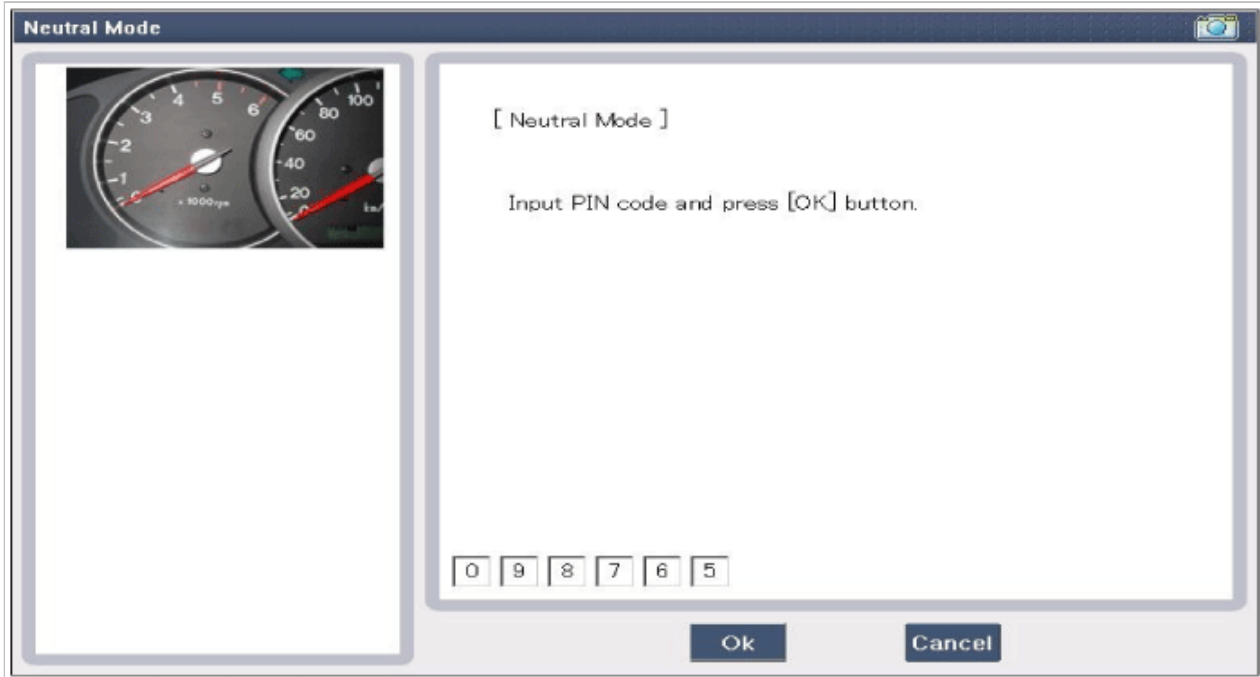
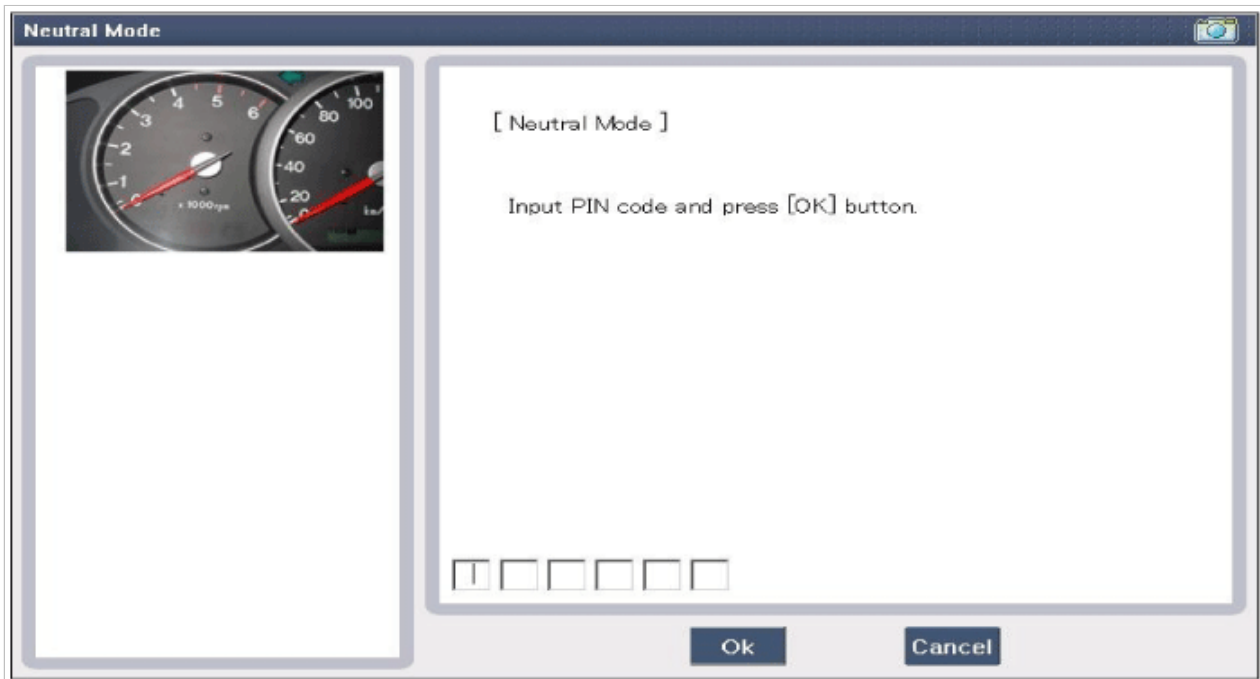
→ Password Teaching/Changing

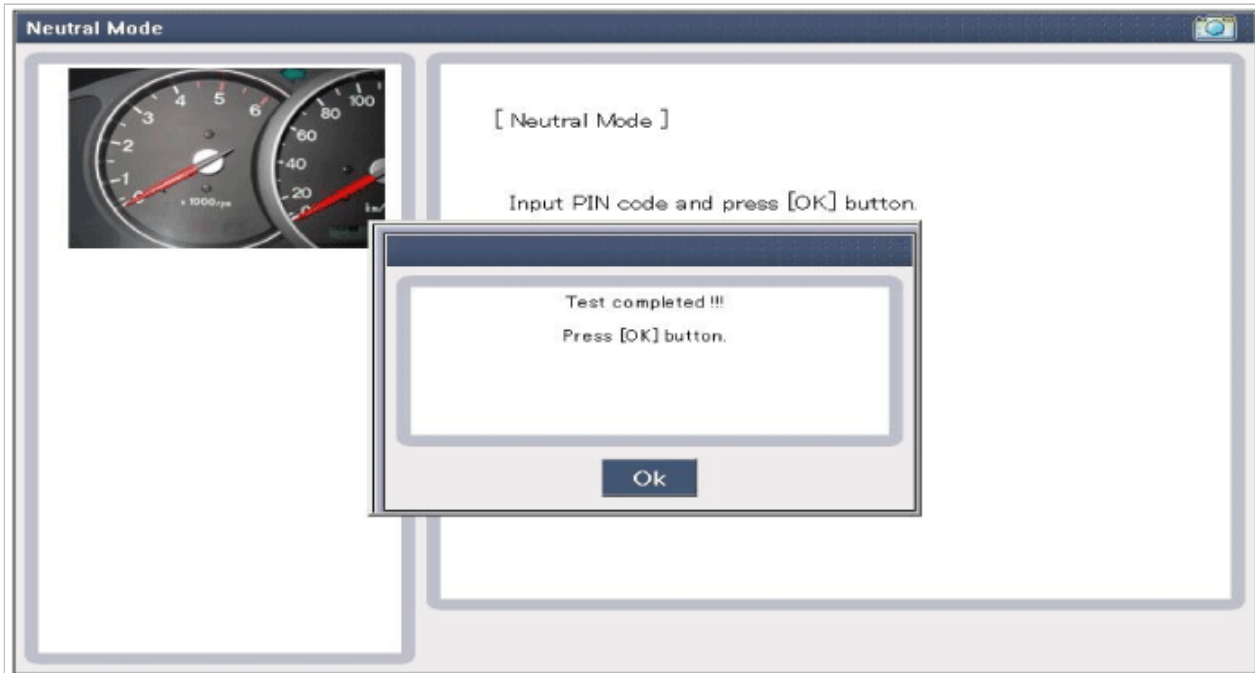
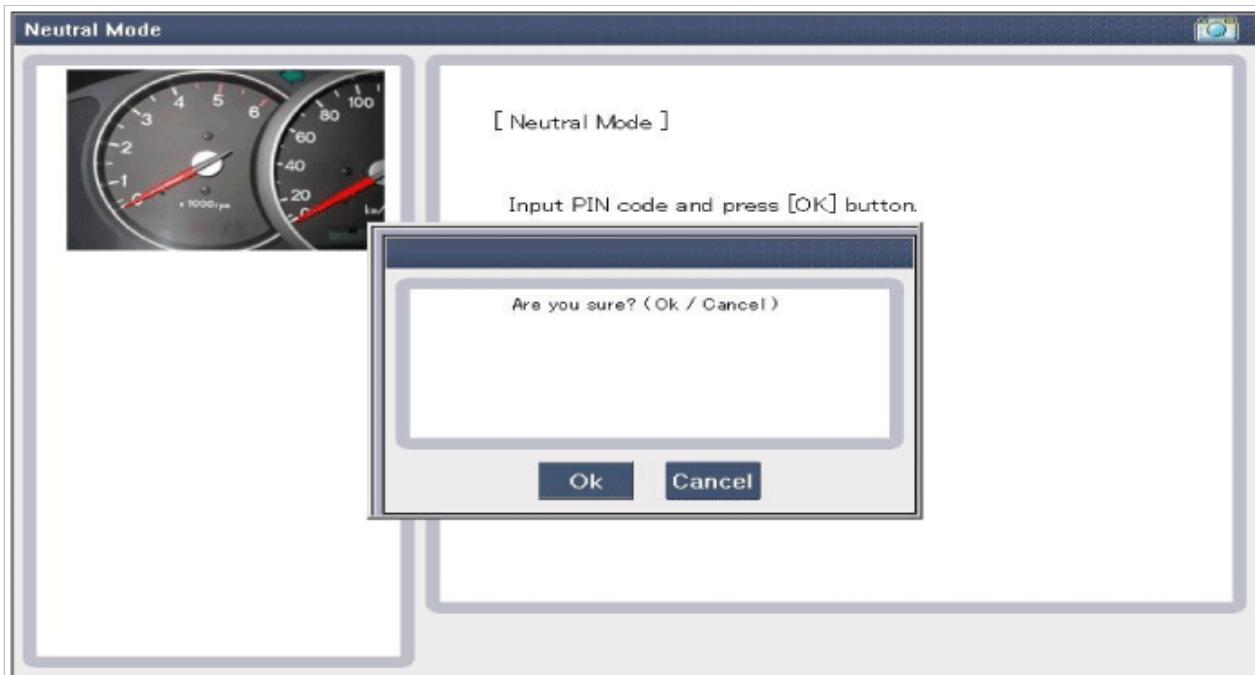
→ Neutral Mode

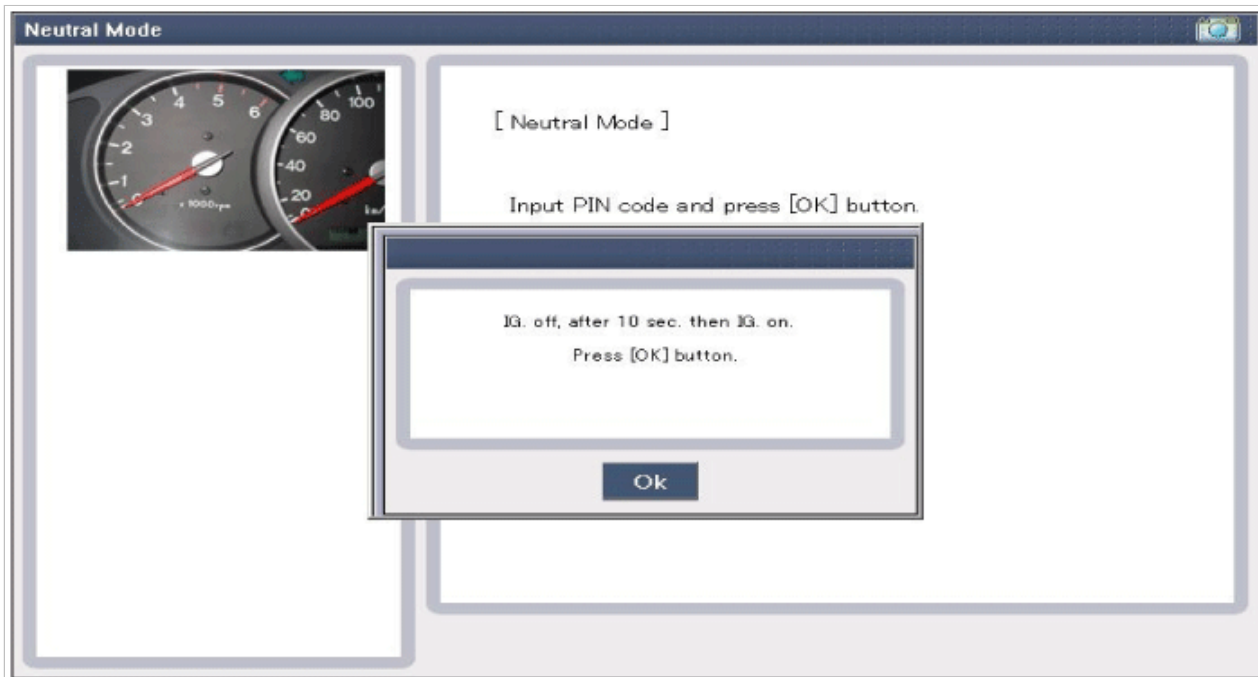
→ Limp Home Mode

→ Smatra Neutral Mode

→ Teaching







Current Data 1/4

Selective Display Full List Graph Items List Reset Min/Max Record Stop

Sensor Name	Value	Unit
<input type="checkbox"/> Number of Learnt Keys	0	-
<input checked="" type="checkbox"/> ECU Status	NEUTRAL	-
<input type="checkbox"/> Key Status	LEARNT	-
<input type="checkbox"/> Smartra3 Status	NEUTRAL	-

Neutralizing Of SMARTRA

The EMS can be set to the status "neutral" by tester

Ignition key (regardless of key status) is inserted and after IGN ON. If receiving the correct vehicle password from GST, SMARTRA can be neutralized. The neutralization of SMARTRA is possible if DPN is same as the value inputted by GST.

In case that the SMARTRA status is neutral, the EMS keeps the lock state. And the start is not possible by "twice ignition".

In case of changing the vehicle password, new virgin transponder must be only used. And in case of virgin key, after Learning the key of vehicle password, it can be used.

If wrong vehicle specific data have been sent to SMARTRA three times continuously or intermittently, the SMARTRA will reject the request to enter neutral mode for one hour. Disconnecting the battery or other manipulation cannot reduce this time. After connecting the battery the timer starts again for one hour.

NOTE

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

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

ID Register

→ Password Teaching/Changing


→ Neutral Mode

→ Limp Home Mode

→ Smatra Neutral Mode

→ Teaching

Smatra Neutral Mode



[Neutral Mode]

Input PIN code and press [OK] button.

4

5

5

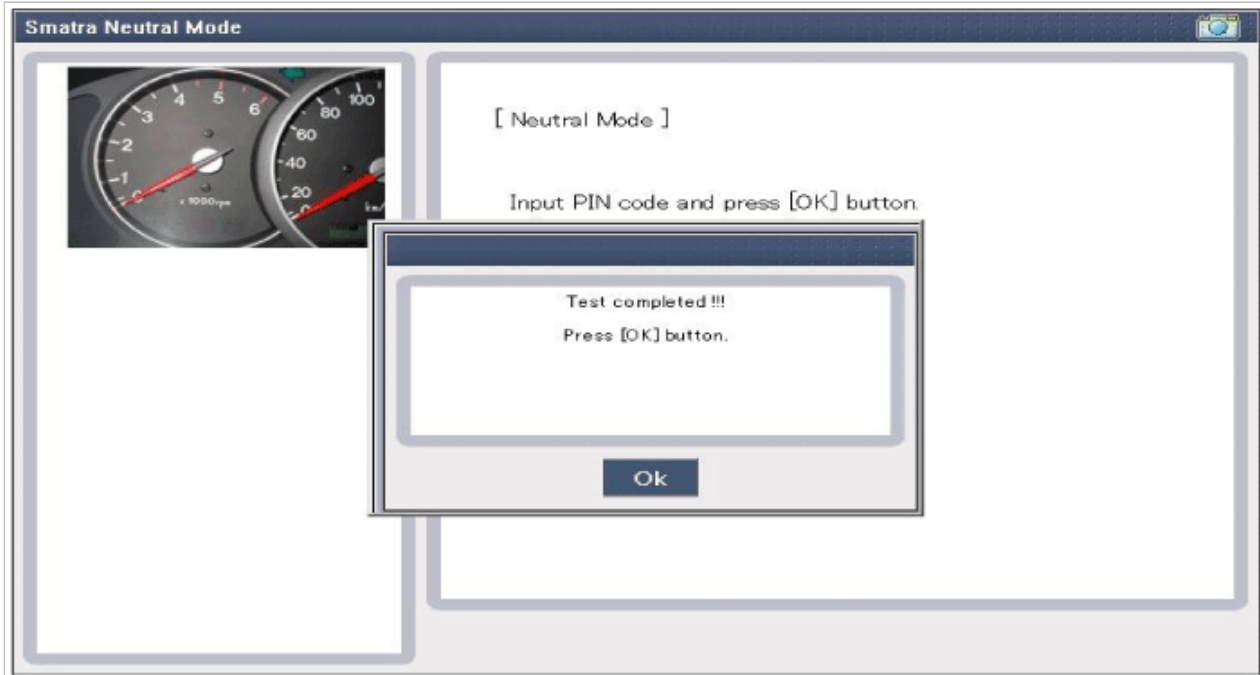
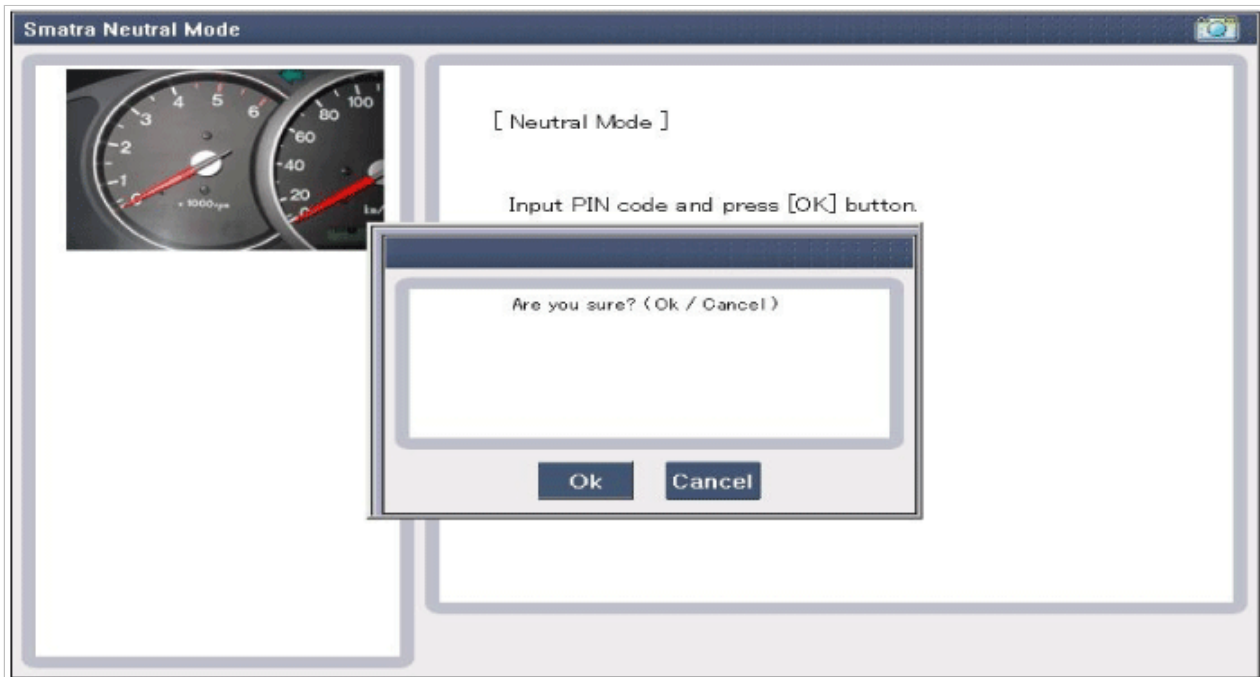
0

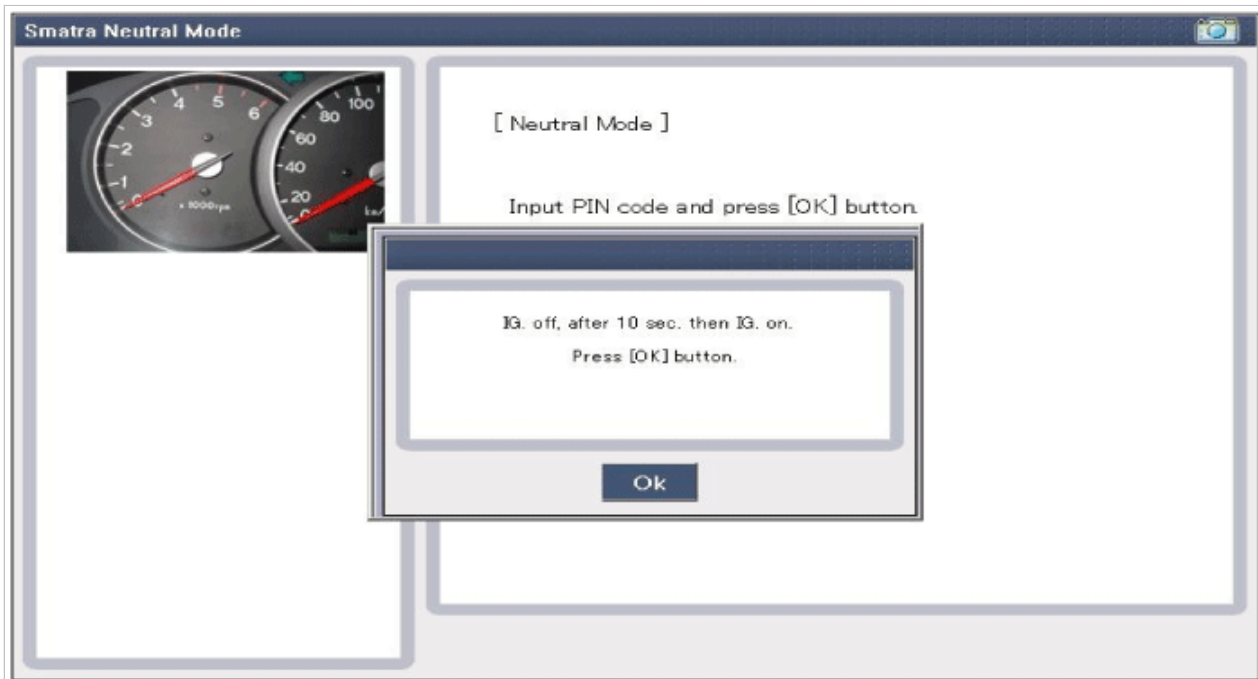
7

2

Ok

Cancel





Current Data 1/4

Selective Display Full List Graph Items List Reset Min/Max Record Stop

Sensor Name	Value	Unit
<input type="checkbox"/> Number of Learnt Keys	0	-
<input type="checkbox"/> ECU Status	NEUTRAL	-
<input type="checkbox"/> Key Status	LEARNT	-
<input type="checkbox"/> Smartra3 Status	NEUTRAL	-

Teaching Procedures

1. 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 8

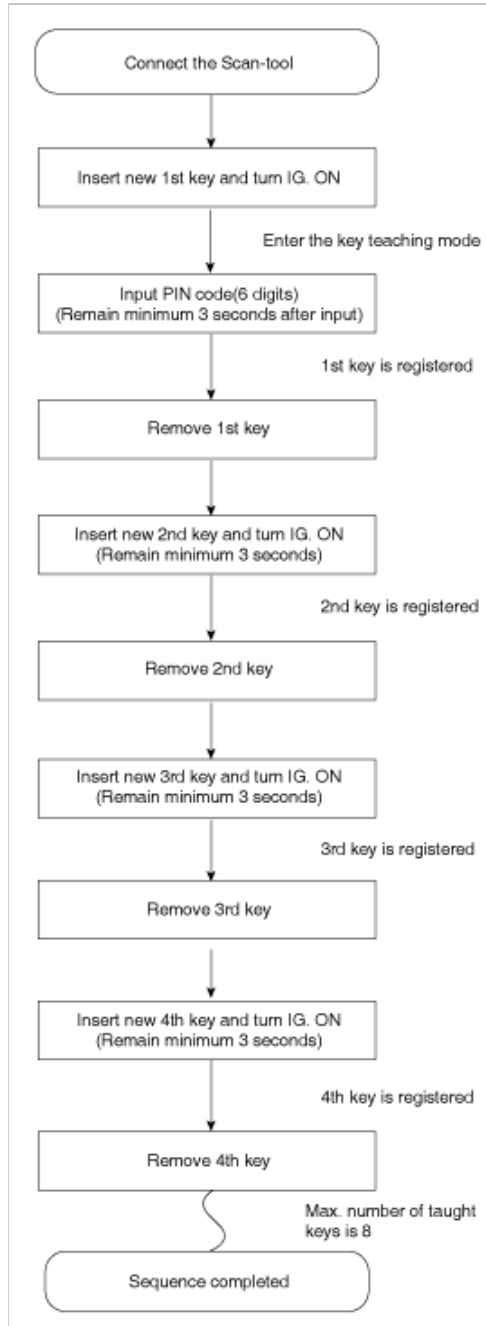
If an error occurs during the Immobilizer Service Menu, the PCM(ECM) status remains unchanged and a specific fault code is stored.

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).

NOTE

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














(1) PCM(ECM) learnt status.

Fault Code Searching On

Previous Vehicle

Select System

 ENGINE	 AT	 VDC	 AIRBAG	 AIR/CON
 AHLS	 IMMO	 PIC	 TPMS	 BCM
 CODE				

Selected



Immobilizer(IMMO)

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

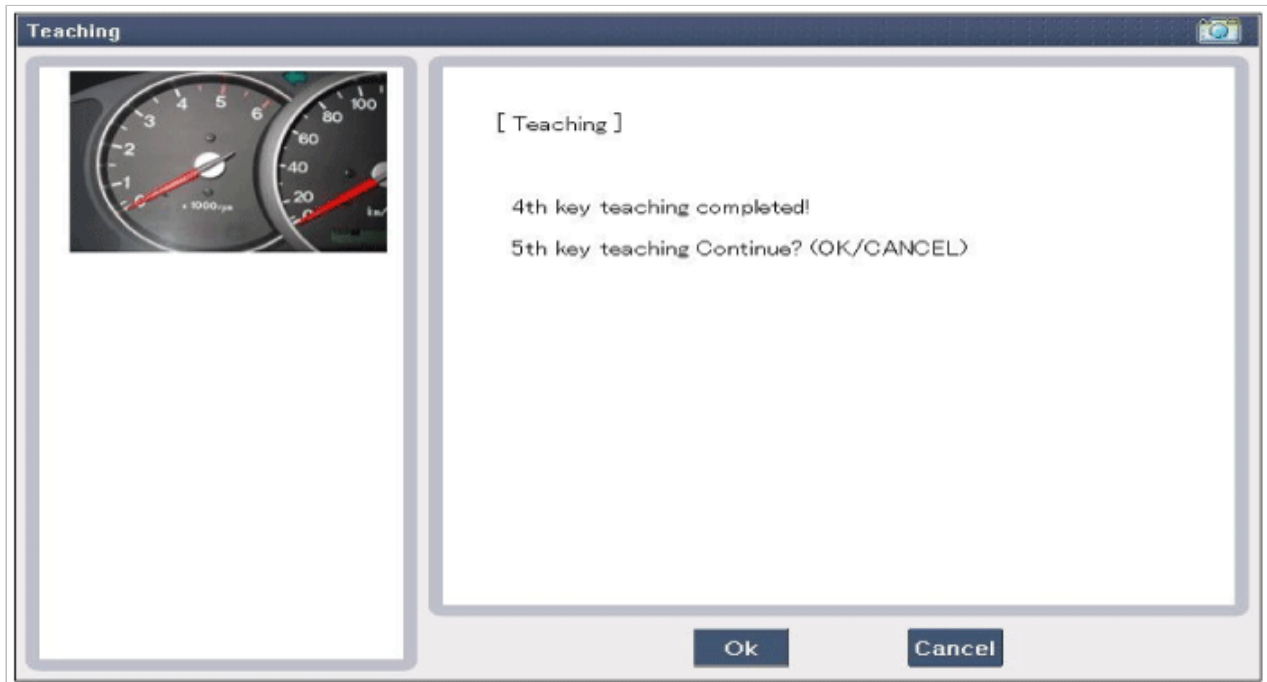
Teaching 



[Teaching]

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

Ok



(2) PCM(ECM) virgin status.

After replacing new "PCM(ECM)" scan tool displays that PCM(ECM) is virgin status in Key Teaching mode. "VIRGIN" status means that PCM(ECM) has not matched any PIN code before.

Password Teaching/changing

1. 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.

2. User password teaching

ID Register

→ Password Teaching/Changing

→ Neutral Mode

→ Limp Home Mode

→ Smatra Neutral Mode

→ Teaching

Password Teaching/Changing



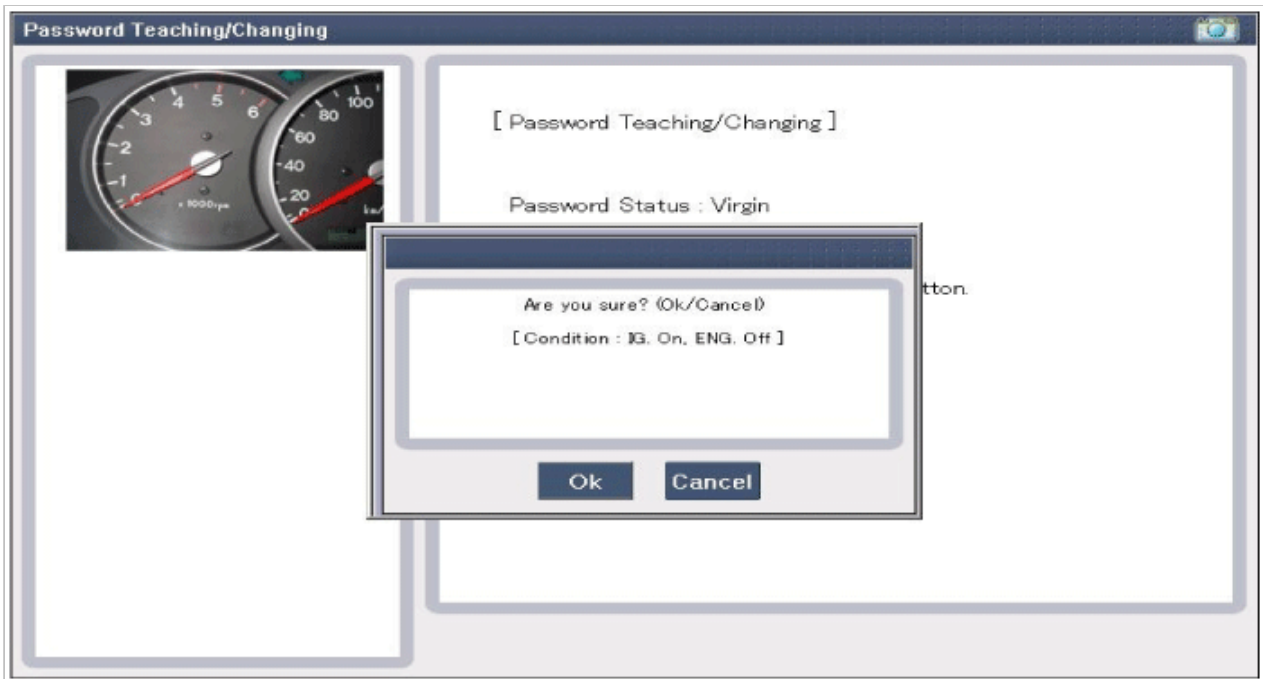
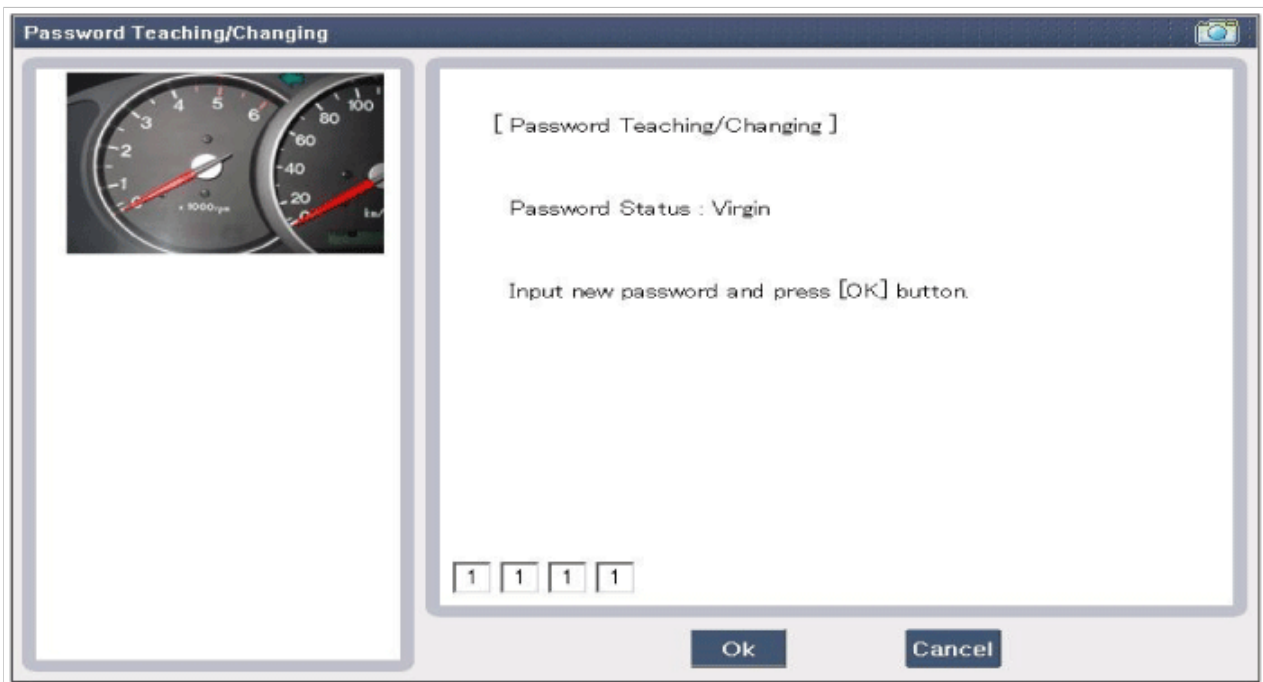
[Password Teaching/Changing]

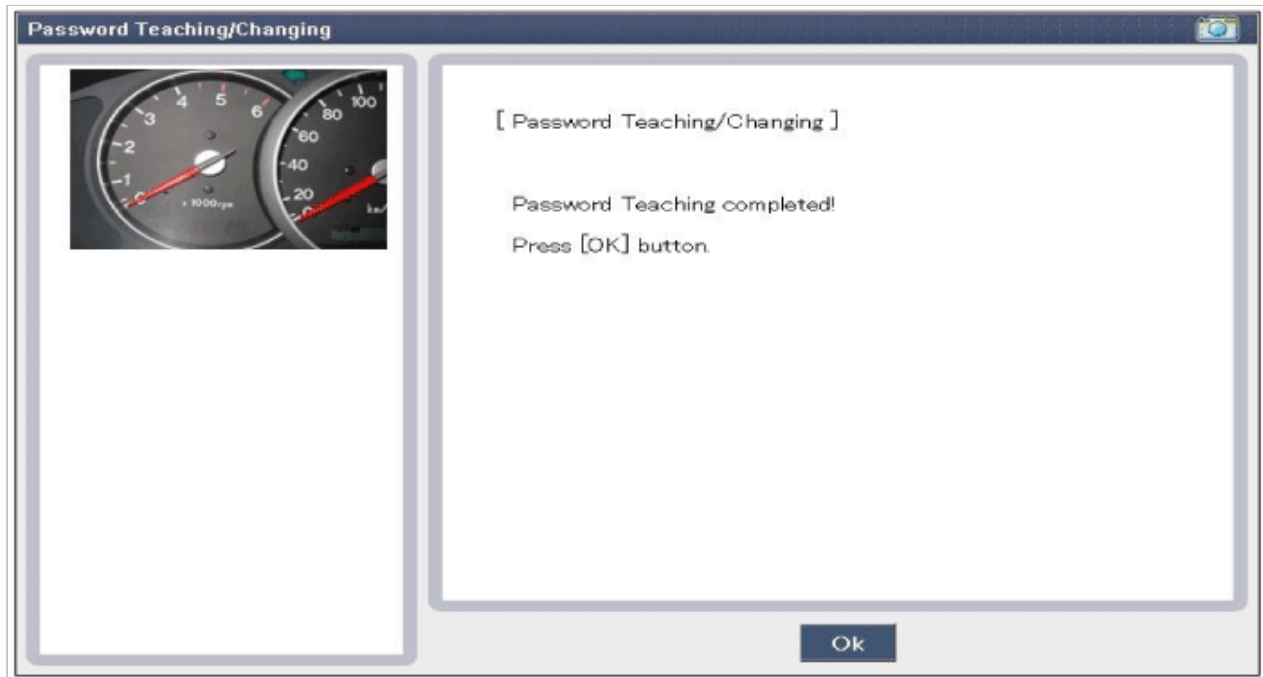
Password Status : Virgin

Input new password and press [OK] button.

Ok

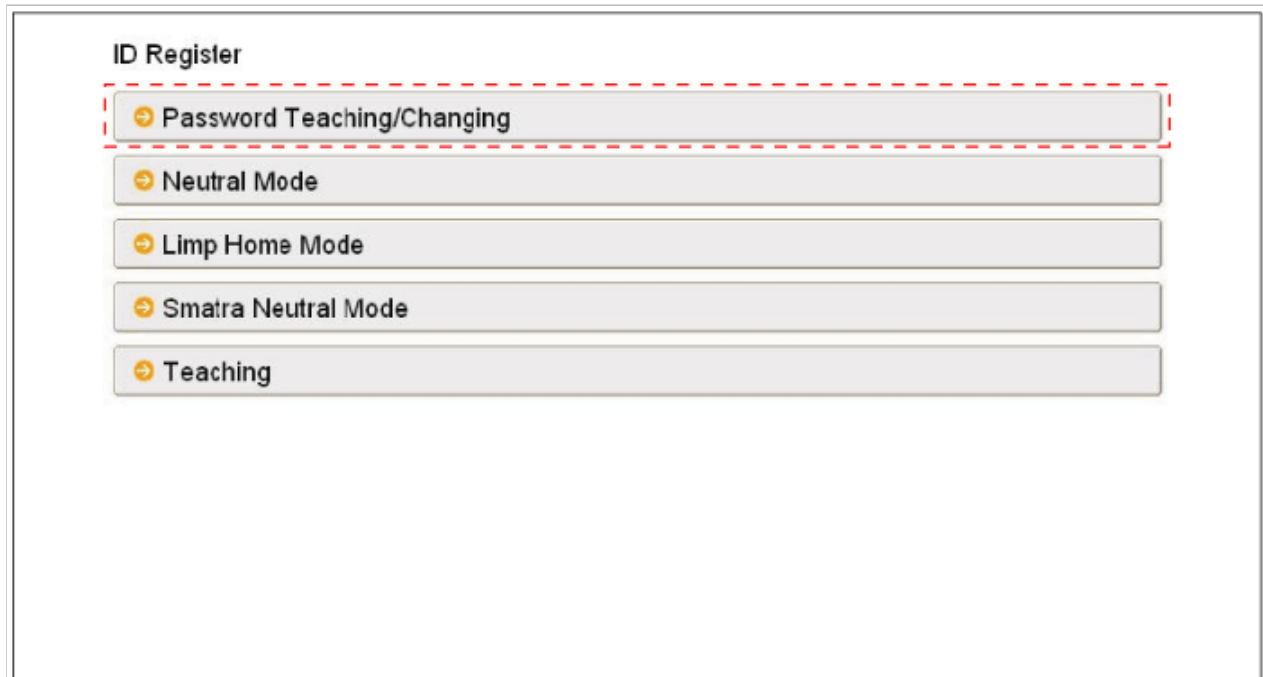
Cancel






※ In case of putting wrong password, retry from first step after 10 seconds.

3. User password changing



Password Teaching/Changing




[Password Teaching/Changing]

Password Status : Learnt

Input old password and press [OK] button.

Ok Cancel

Password Teaching/Changing

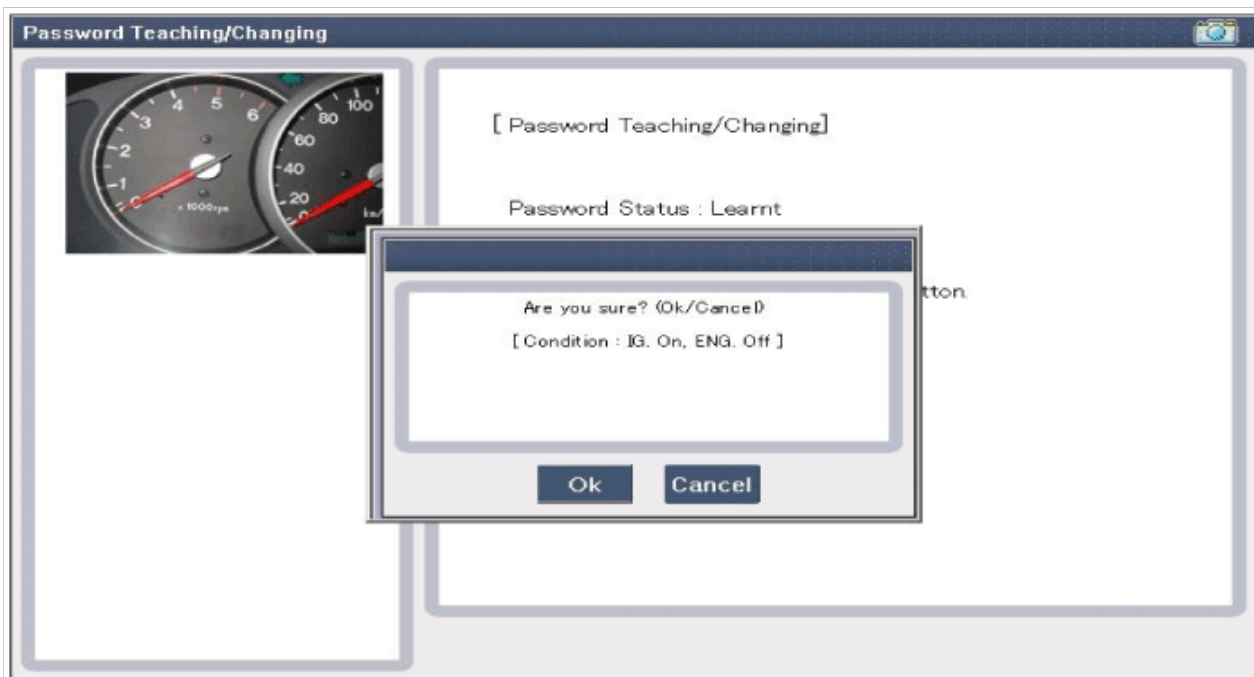
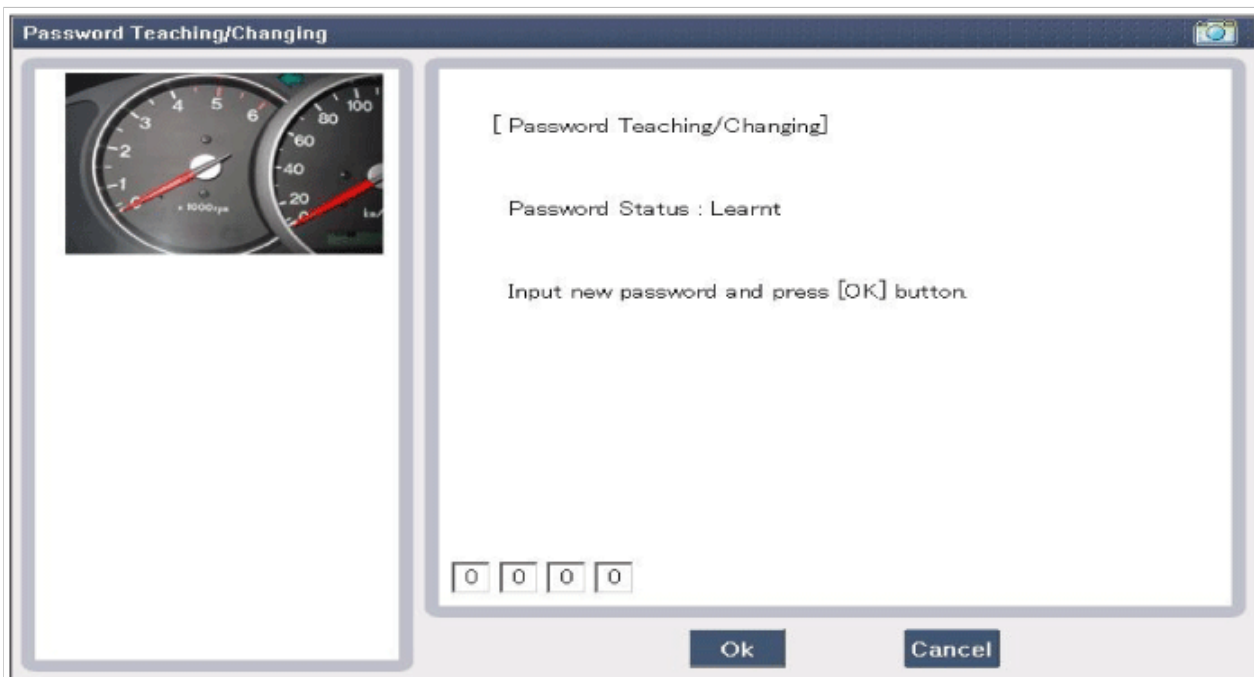


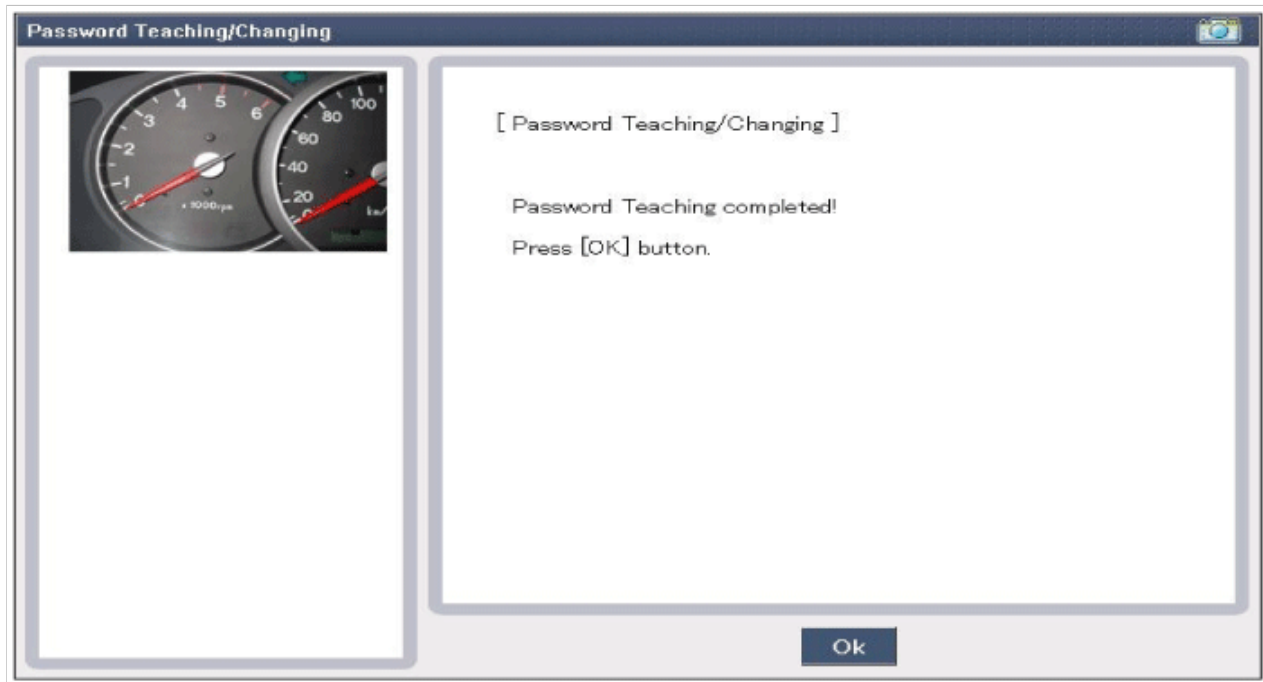
[Password Teaching/Changing]

Password Status : Learnt

Input old password and press [OK] button.

Ok Cancel





Limp Home Function

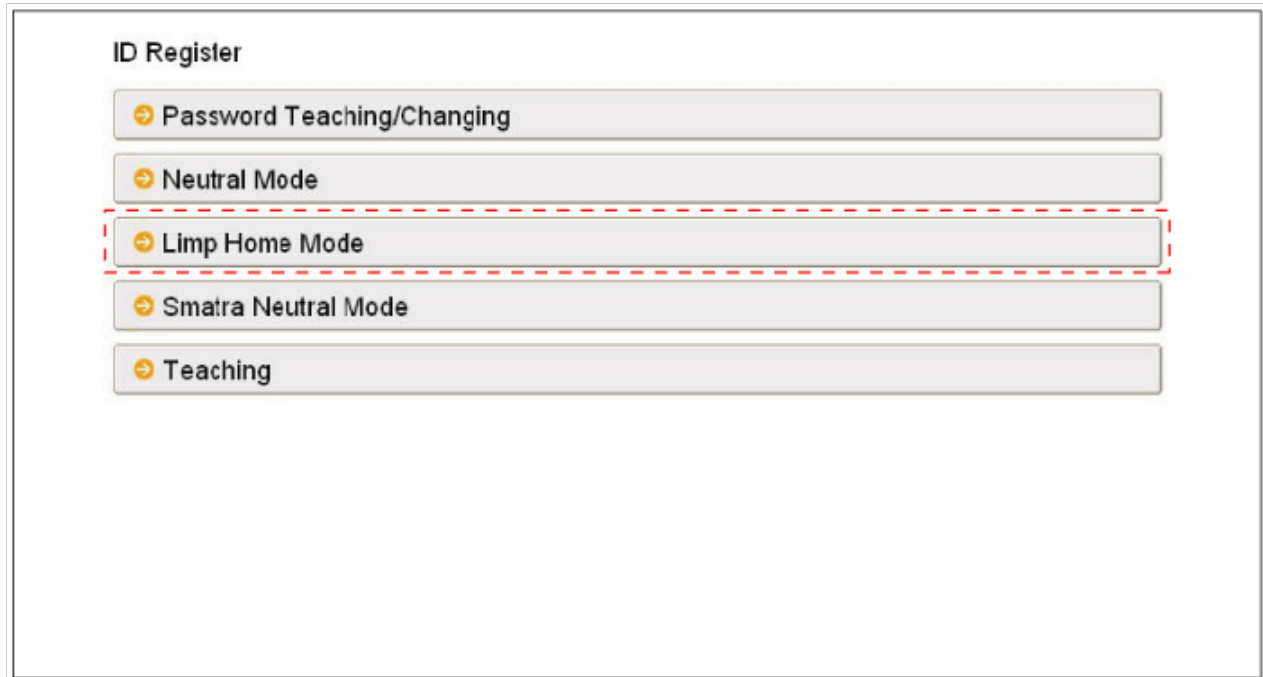
1. Limp Home By Tester

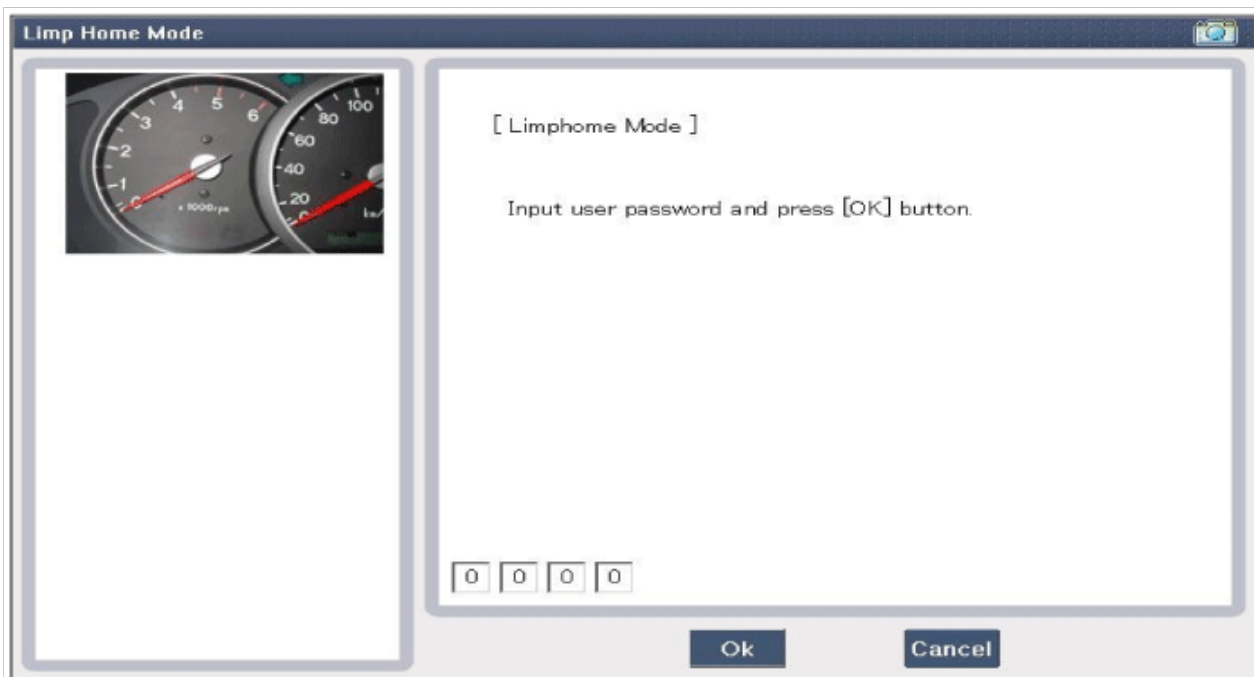
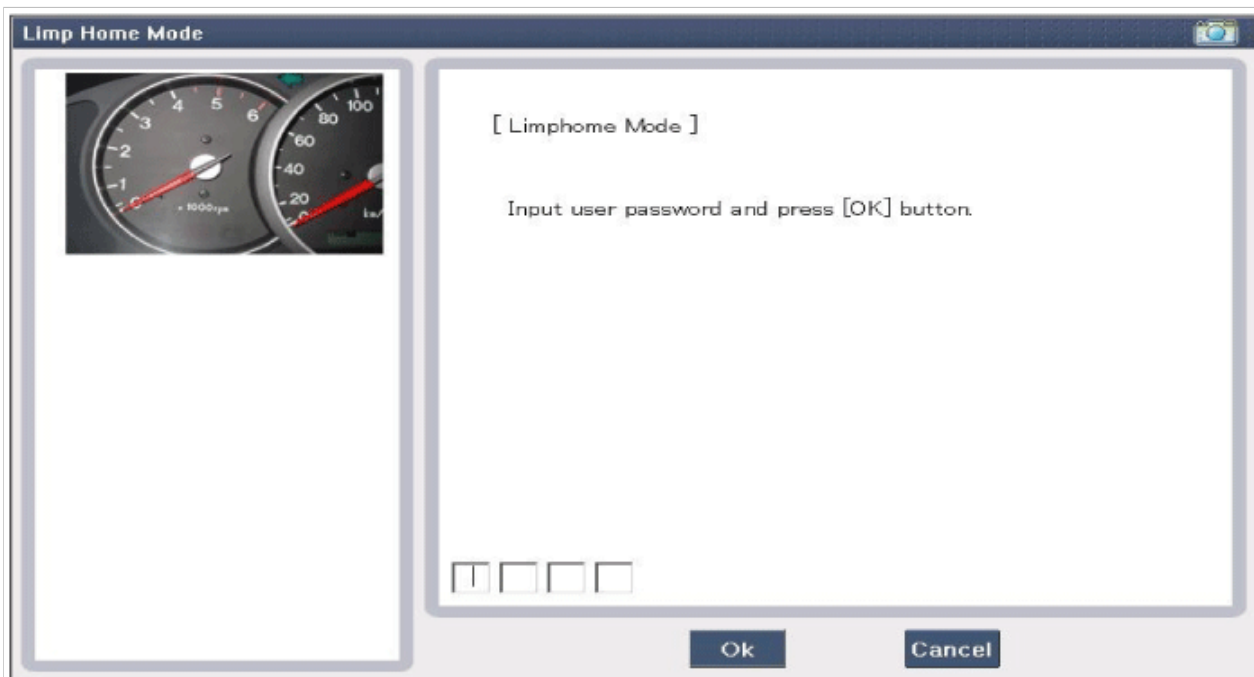
If the PCM(ECM) detects the fault of the SMARTRA or transponder, the PCM(ECM) will allow limp home function of the immobilizer. Limp home is only possible if the user password (4 digits) has been given to the PCM(ECM) before. This password can be selected by the vehicle owner and is programmed at the service station.

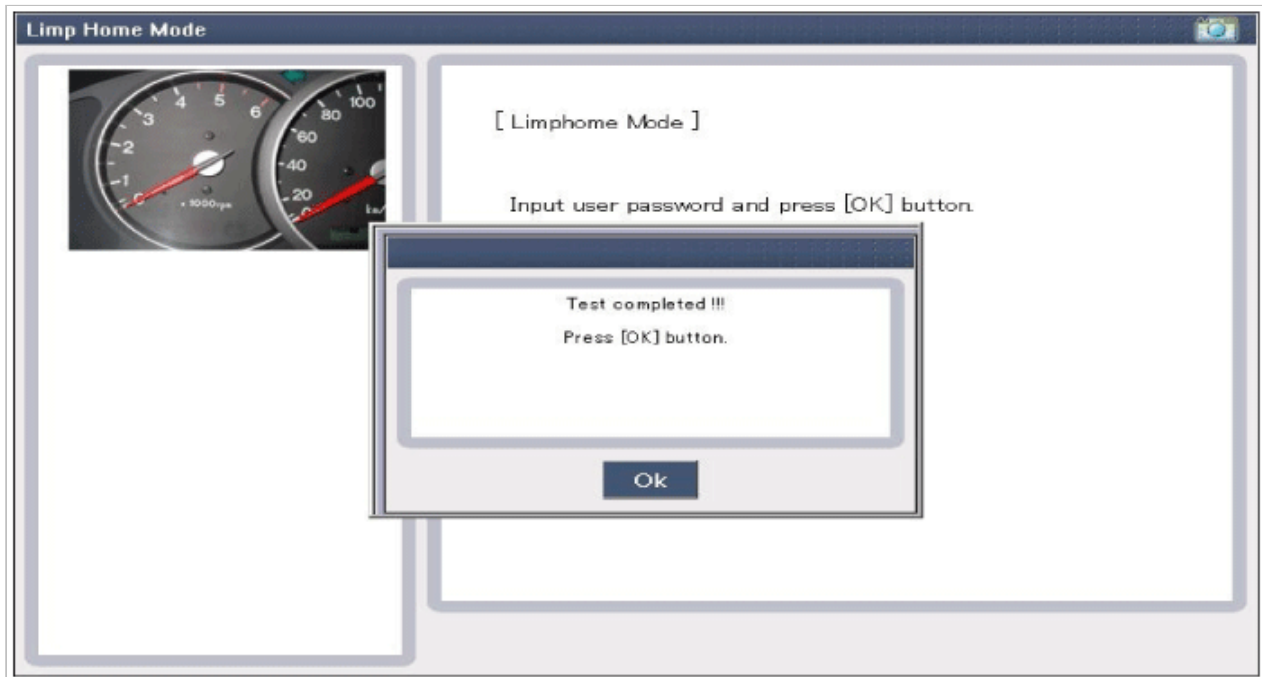
The user password can be sent to the PCM(ECM) via the special tester menu.

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.







2. Limp Home By Ignition Key

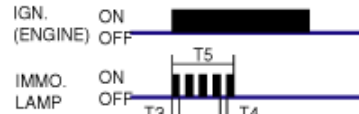
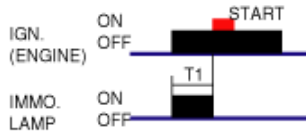
The limp home can be activated also by the ignition key. The user password can be input to the PCM(ECM) by a special sequence of ignition on/off.

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.

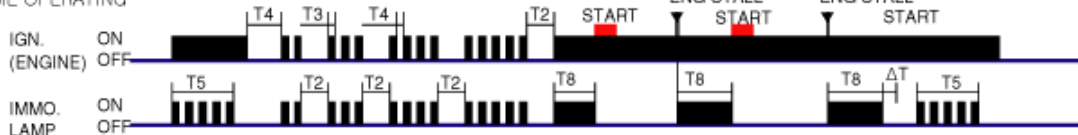
After ignition off, the PCM(ECM) is locked if the timer has elapsed 8 seconds. For the next start, the input of the user password is requested again.

1. NORMAL CONDITION(NO FAILURE)

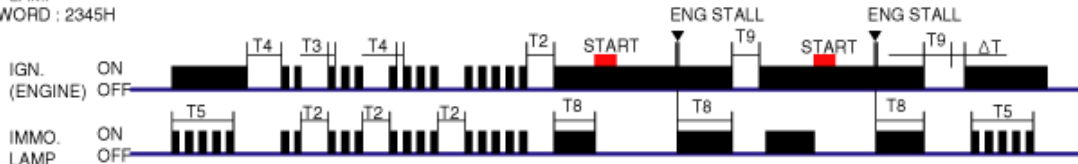
2. IN CASE OF FAILRE(LIMP HOME)



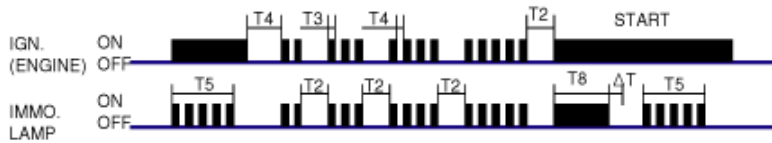
3. LIMP HOME OPERATING



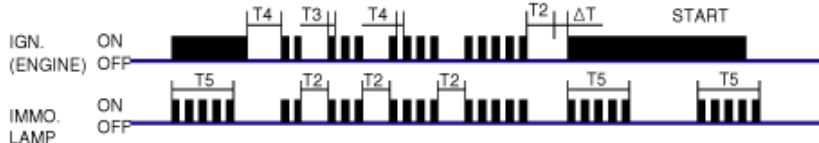
USER PASSWORD : 2345H



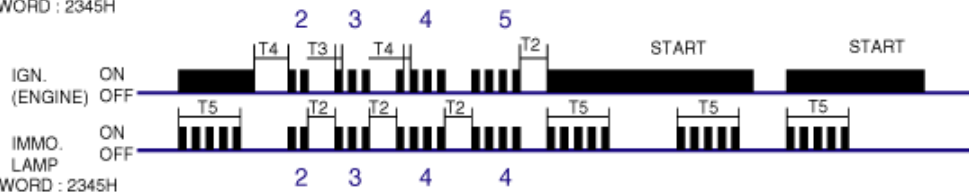
USER PASSWORD : 2345H



USER PASSWORD : 2345H



USER PASSWORD : 2345H



USER PASSWORD : 2345H

NOTE :

- T1 > 5sec
- 3sec < T2 < 10sec
- 0.2sec < T3 < 5 sec
- 0.2sec < T4 < 3sec
- T5 = 5sec
- T6 < 30sec
- T9 = 8sec
- T8 = 30sec
- CODE "0" = IG.ON 10 TIMES

Diagnosis Of Immobilizer Faults

- Communication between the ECM and the SMARTRA.
- Function of the SMARTRA and the transponder.
- Data (stored in the ECM related to the immobilizer function).

The following table shows the assignment of immobilizer related faults to each type:

Immobilizer Related Faults	Fault types	Diagnostic codes
PCM(ECM) fault	1. Non-Immobilizer-EMS connected to an Immobilizer	P1610
Transponder key fault	1. Transponder not in password mode 2. Transponder transport data has been changed.	P1674 (Transponder status error)
Transponder key fault	1. Transponder programming error	P1675 (Transponder programming error)
SMARTRA fault	1. Invalid message from SMARTRA to PCM(ECM)	P1676 (SMARTRA message error)
SMARTRA fault	1. Virgin SMARTRA at learnt EMS 2. Neutral SMARTRA at learnt EMS 3. Incorrect the Authentication of EMS and SMARTRA 4. Locking of SMARTRA	P169A (SMARTRA Authentication fail)
SMARTRA fault	1. No response from SMARTRA 2. Antenna coil error 3. Communication line error (Open/Short etc.) 4. Invalid message from SMARTRA to PCM(ECM)	P1690 (SMARTRA no response)
Antenna coil fault	1. Antenna coil open/short circuit	P1691 (Antenna coil error)
Immobilizer indicator lamp fault	1. Immobilizer indicator lamp error (Cluster)	P1692 (Immobilizer lamp error)
Transponder key fault	1. Corrupted data from transponder 2. More than one transponder in the magnetic field (Antenna coil) 3. No transponder (Key without transponder) in the magnetic field (Antenna coil)	P1693 (Transponder no response error/invalid response)
PCM(ECM) fault	1. Request from PCM(ECM) is invalid (Protocol layer violation- Invalid request, check sum error etc.)	P1694 (PCM(ECM) message error)
PCM(ECM) internal permanent memory (EEPROM) fault	1. PCM(ECM) internal permanent memory (EEPROM) fault 2. Invalid write operation to permanent memory (EEPROM)	P1695 (PCM(ECM) memory error)
Locked by timer	1. Exceeding the maximum limit of Twice IGN ON (≧ 32 times)	P1699 (Twice IG ON over trial)

Troubleshooting

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NO	DTC code	Description
1	P1610	Non-Immobilizer-EMS Connected to an Immobilizer
2	P1674	Immobilizer-Transponder status Error
3	P1675	Immobilizer-Transponder Programming Error
4	P1676	Immobilizer-Smartra Message Error
5	P169A	Immobilizer-SMARTRA Authentication Fail
6	P1690	Immobilizer-Smartra No Response
7	P1691	Immobilizer-Antenna Coil Error
8	P1692	Immobilizer Indicator Lamp Error
9	P1693	Immobilizer-Transponder Error
10	P1694	Immobilizer-EMS Message Error
11	P1695	Immobilizer-EMS Memory Error
12	P1696	Immobilizer-Authentication Fail
13	P1699	Immobilizer-Twice Overtrial

GENESIS COUPE(BK) >2010 > G 2.0 DOHC > Body Electrical System > Immobilizer System > P1610 Non-Immobilizer-EMS Connected to an Immobilizer

General Description

The immobilizer system consists of a passive challenge-response (mutual authentication) transponder inside the key head, the encoded SMARTRA3 unit /key and the EMS can decode the secret code stored in the SMARTRA3.

The EMS carries out the immobilizer function, the SMATRA3 management and the key management. The immobilizer function is the unlocking of EMS only after detection of a valid ignition key /the SMATRA3 and the locking of EMS after switching off the engine. The EMS communicates the encoded messages to the SMARTRA3 via a dedicated communication line and confirms the key with the SMARTRA3.

The EMS related to immobilizer has the 3 kinds of software. At the first IGN on, the EMS concludes the software of each option (smart key, non-encoded SMARTRA3, encoded SMARTRA3) by communication. It is called "The autodection for EMS"

The EMS keeps the previous option before being neutral when it is setted to each option.

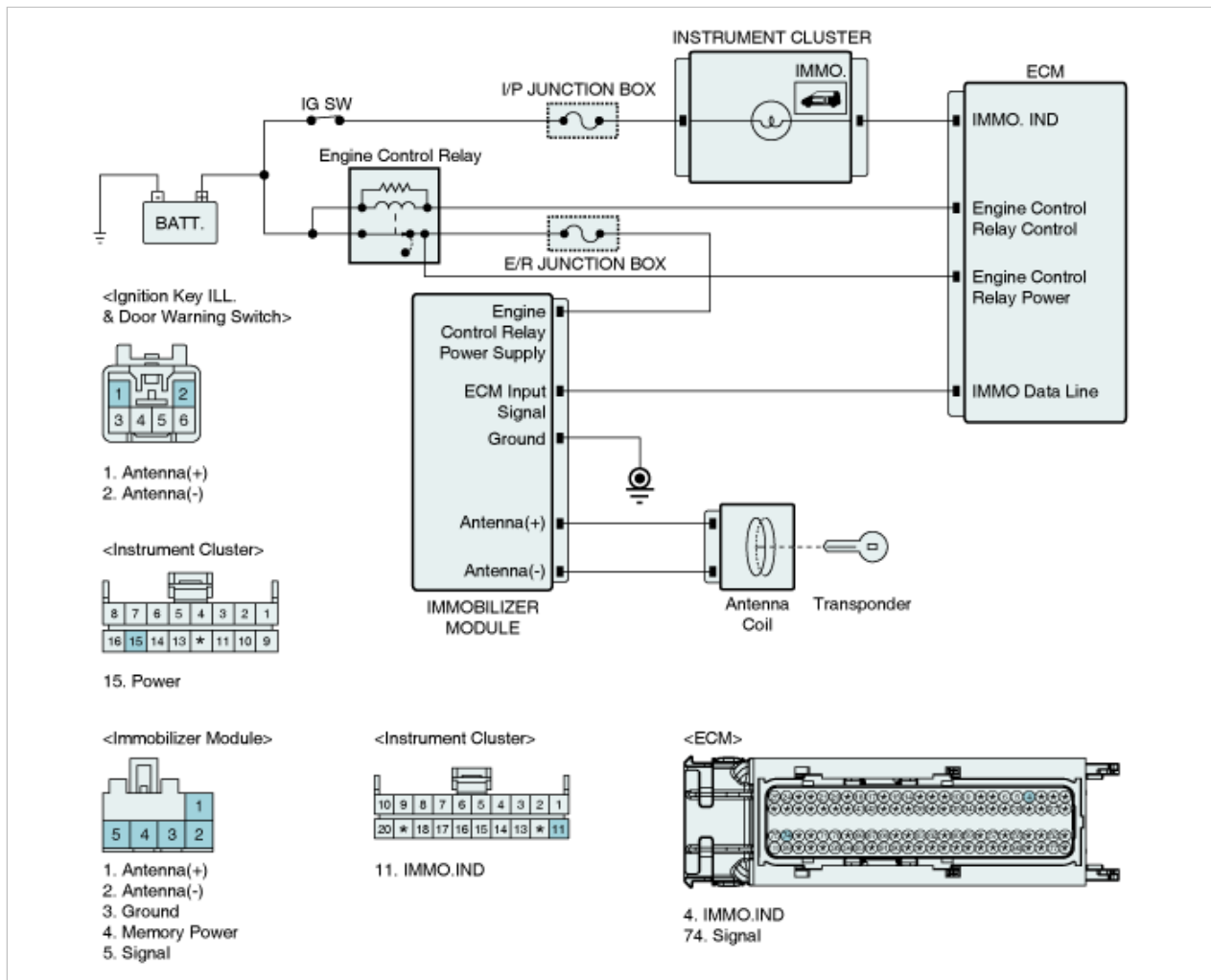
DTC Description

The PCM/ECM sets DTC P1610 if Non Immobilizer EMS is installed on vehicle equipped with Immobilizer.

DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• -	• Invalid PCM/ECM
Enable Conditions	• IG ON	
Threshold value	• Non Immobilizer PCM/ECM connected	
Detecting time	• Immediately	
FAIL SAFE	• -	

Diagnostic Circuit Diagram



Monitor Scantool Data

1. Check status
 - (1) IGN "ON" & Engine "OFF"
 - (2) Monitor the "ECM Status" Parameter on the Scantool.

Specification : 'LEARNT'

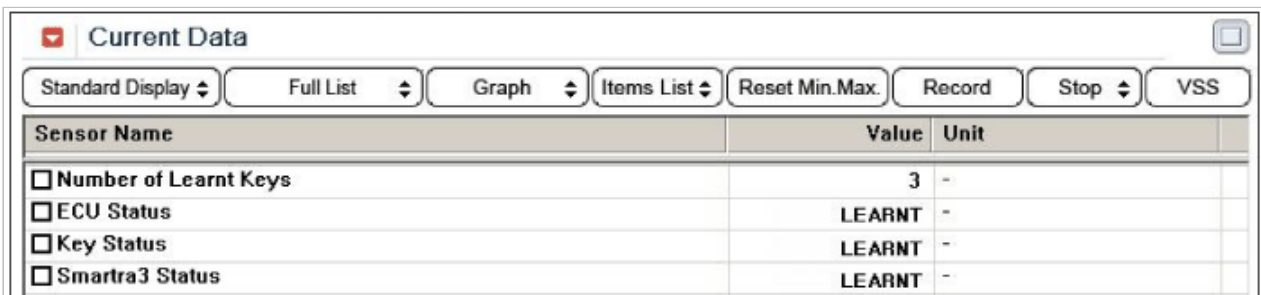


Fig.1

Fig.1) This data show that 3 keys have been taught, ECU has been learnt, Key in key cylinder has been learnt and SMARTRA3 has been learnt

- (3) Has the ECM been learnt ?

YES	► Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	► Substitute with a ECM equipped with Immobilizer and perform the Key teaching procedure with scantool and check for proper operation.

If the problem is corrected, replace ECM and then go to "Verification of Vehicle Repair" procedure.

NOTE

If the EMS is only replaced using an existing key and SMARTRA3, after replacing the "virgin" or "neutral" EMS, reteaching is possible by key Learning mode of scanner.
When the same PIN used in existing vehicle is only inputted, the SMARTRA3 Learning and key Learnings are possible.

Verification of Vehicle Repair

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

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

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

**GENESIS COUPE(BK) >2010 > G 2.0 DOHC > Body Electrical System > Immobilizer System > P1674
 Immobilizer-Transponder status Error**

General Description

The vehicle immobilizer system consists of the ECM, the SMARTRA3 and ignition keys with built-in transponder. The ECM carries out the check of ignition key by special encryption algorithm with SMARTRA3 and Transponder. The encryption algorithm (between ECM and SMARTRA3) is the one offered from BOSCH. The encryption algorithm (between ECM and Transponder) is Hitag type 2 which is a high level system. With IGN On, the ECM executes the key Authentication after SMARTRA3 authentication. The Engine can be started when the key authentication is confirmed by the SMARTRA3.

The Key teaching procedure starts with ECM request of PIN from Scanner. The "virgin"ECM stores the PIN and the key Learning can be started. The "learnt"ECM compares the PIN from tester with the vehicle password in Transponder. If the data are correct, the key Learning can be started.

Scanner requests the Learning of the first key, the SMARTRA3 is registered at first and then the first key is registered by ECM. If the SMARTRA3 status is learnt and PIN number is different, the SMARTRA3 will return the incorrect PIN data to the ECM. In this case, The ECM can't excute the key learning process.

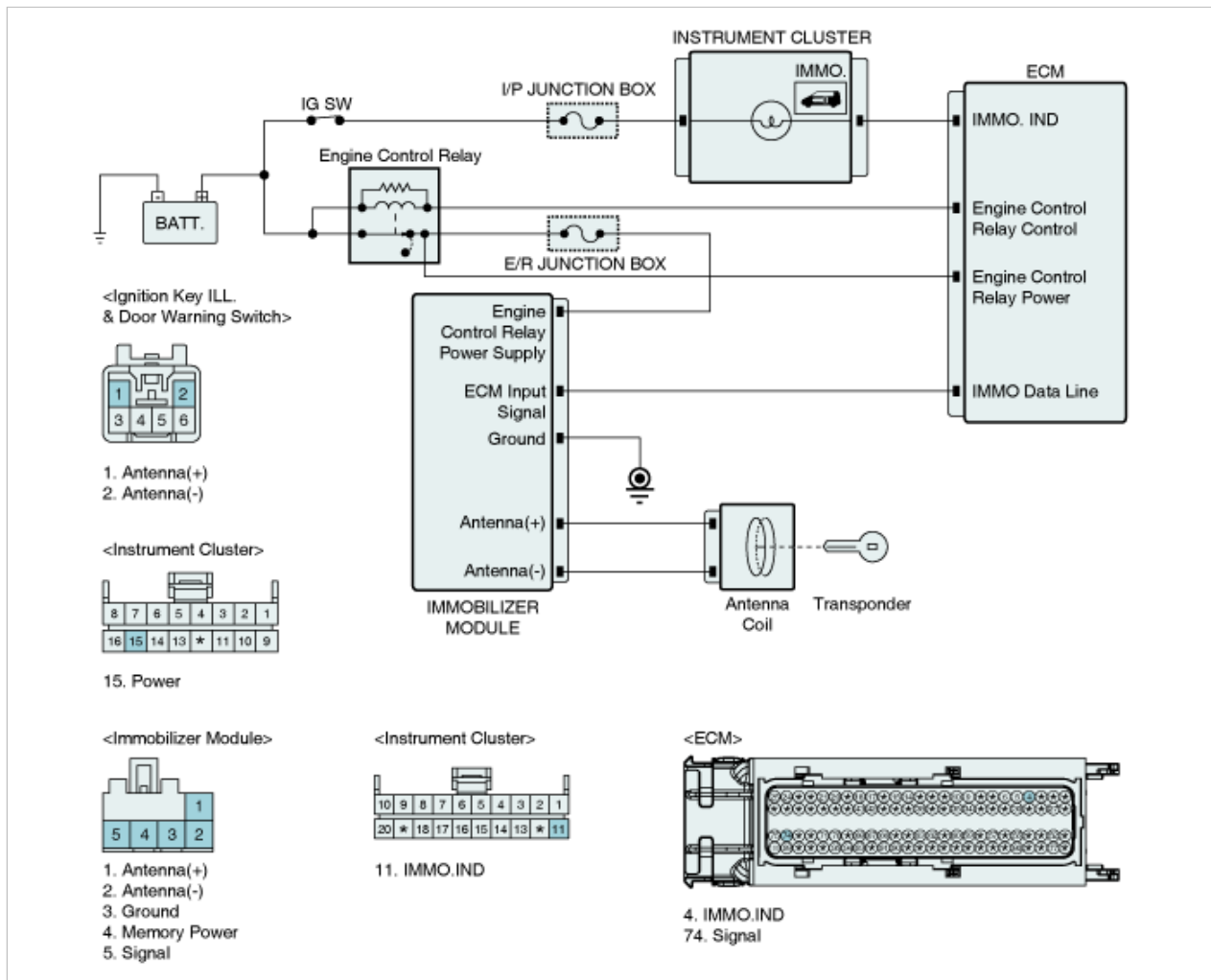
DTC Description

The ECM sets DTC P1674 if transponder key that can't be register(Transponder not in the password mode or whose transport data has been changed) is inserted for registration procedure.

DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• -	• Invalid transponder. ※ Key not in 'VIRGIN' Status or with invalid ID code
Enable Conditions	• IG ON (On Registering TP Procedure)	
Threshold value	• Key not in 'VIRGIN' Status or with invalid ID code	
Detecting time	• Immediately	
FAIL SAFE	• -	

Diagnostic Circuit Diagram



Monitor Scantool Data

1. Check status
 - (1) IGN "ON" & Engine "OFF"
 - (2) Monitor the "ECM, Key and Smartra Status" Parameter on the Scantool.

Specification : 'LEARNT'

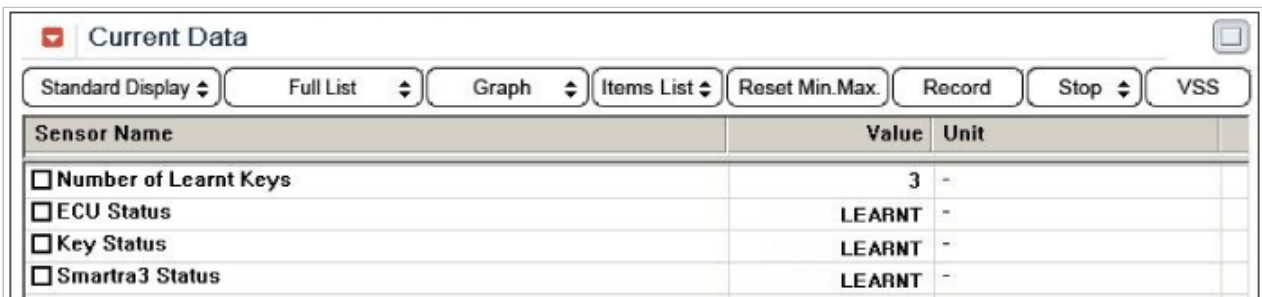


Fig.1

Fig.1) This data show that 3 keys have been taught, ECU has been learnt, Key in key cylinder has been learnt and SMARTRA3 has been learnt

- (3) Have both the ECM and KEY status been learnt ?

YES	▶ Substitute with known good "virgin" transponder and go to "Component Inspection" Procedure.
NO	▶ Go to "Component Inspection" Procedure.

Component Inspection

1. Check transponder
 - (1) IGN "ON" & Engine "OFF"
 - (2) Neutralize ECM and Register transponder key by scantool.

NOTE

Pin code is required to Neutralize ECM and to Register transponder key

- (3) Are Neutralizing and Registering completed normally ?

YES	▶ Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	▶ Substitute with a known-good transponder and perform key teaching procedure with scanner. If the problem is corrected, replace transponder and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

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

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

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

General Description

The vehicle immobilizer system consists of the ECM, the SMARTRA3 and ignition keys with built-in transponder. The ECM carries out the check of ignition key by special encryption algorithm with SMARTRA3 and Transponder. The encryption algorithm (between ECM and SMARTRA3) is the one offered from BOSCH. The encryption algorithm (between ECM and Transponder) is Hitag type 2 which is a high level system. With IGN On, the ECM executes the key Authentication after SMARTRA3 authentication. The Engine can be started when the key authentication is confirmed by the SMARTRA3.

The Key teaching procedure starts with ECM request of PIN from Scanner. The "virgin"ECM stores the PIN and the key Learning can be started. The "learnt"ECM compares the PIN from tester with the vehicle password in Transponder. If the data are correct, the key Learning can be started.

Scanner requests the Learning of the first key, the SMARTRA3 is registered at first and then the first key is registered by ECM. If the SMARTRA3 status is learnt and PIN number is different, the SMARTRA3 will return the incorrect PIN data to the ECM. In this case, The ECM can't excute the key learning process.

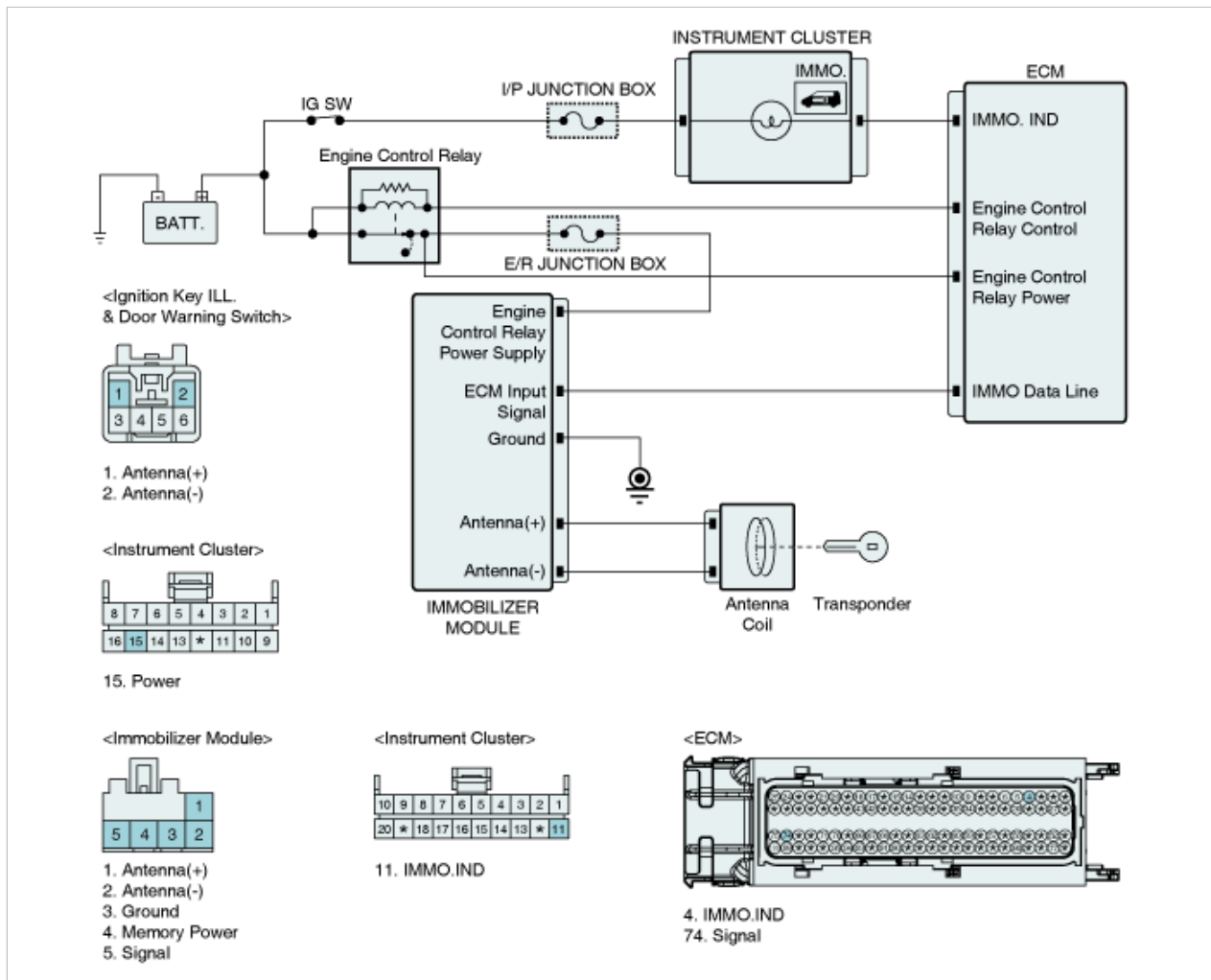
DTC Description

The ECM sets DTC P1675 if characteristic data of transponder doesn't coincide with that of ECM owing to transponder programming error.

DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• -	• Invalid transponder. ※ Invalid characteristic data ※ No transponder or more than two transponder is detected by coil antenna
Enable Conditions	• IG ON(During the authentication)	
Threshold value	• Invalid characteristic data • No transponder or more than two transponder is detected by coil antenna	
Detecting time	• Immediately	
FAIL SAFE	• -	

Diagnostic Circuit Diagram



Monitor Scantool Data

1. Check status
 - (1) IGN "ON" & Engine "OFF"
 - (2) Monitor the "ECM, Key and Smartra Status" Parameter on the Scantool.

Specification : 'LEARNT'

Current Data		
Standard Display	Full List	Graph
Items List	Reset Min.Max.	Record
Stop	VSS	
Sensor Name	Value	Unit
<input type="checkbox"/> Number of Learnt Keys	3	-
<input type="checkbox"/> ECU Status	LEARNT	-
<input type="checkbox"/> Key Status	LEARNT	-
<input type="checkbox"/> Smartra3 Status	LEARNT	-

Fig.1

Fig.1) This data show that 3 keys have been taught, ECU has been learnt, Key in key cylinder has been learnt and SMARTRA3 has been learnt.

- (3) Are "KEY STATUS", "SMARTRA STATUS" and "ECU STATUS" Parameter within specifications?

YES	► Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, damage on the ECM or SMARTRA. And This DTC has not erased in previous repair. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	► Go to "Component Inspection" Procedure.

Component Inspection

1. Check transponder
 - (1) IGN "ON" & Engine "OFF"
 - (2) Neutralize ECM and Register transponder key by scantool.

NOTE

Pin code is required to Neutralize ECM and to Register transponder key

- (3) Are Neutralizing and Registering completed normally ?

YES	▶ Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	▶ Substitute with a known-good transponder and perform the key teaching procedure with scanner. If the problem is corrected, replace transponder and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

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

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

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

General Description

1. The sequences of the PIN code storage are as follows.
 - (1) Input the PIN code into the scanner when key teaching process.
 he scanner transmits the Encrypted Code to the ECM after converting the PIN code into Encrypted Code.
 - (2) When the ECM gets the first key learning command, it transmits the SMARTRA3 learnt command and Encrypted Code to the SMARTRA3
 - (3) If the SMARTRA3 statue is virgin/neutral, the SMARTRA3 stores Encrypted Code in EEPROM and transmits the success message of the Encrypted Code storage.
 (If the SMARTRA3 is learnt, the SMARTRA3 compares Encrypted Code transmitted by the ECM with Encrypted Code stored in EEPROM and transmits the (in)correct Encrypted Code message to ECM)
 - (4) If the SMARTRA3 is learnt normally or the Encrypted Code of the registered SMARTRA3 is the same as the ECM, the ECM begins operation the Transponder Learning.
 - (5) If the learning of the first transponder, the ECM stores the Encrypted Code in its EEPROM and converts state into learnt state.

2. The SMARTRA3 learning :
 - (1) starts with EMS request of PIN from scanner through the key teaching procedure.
 - (2) is possible in case that the status of SMARTAR is "virgin" or "neutral".
 - (3) In case that the SMARTRA3 is "learnt", the SMARTRA3 will transmits the information if PIN inputted from scanner is same as the PIN in SMARTRA3.
 - (4) is possible regardless of key status.

3. The sequence of the SMARTRA3 confirms are as follows.
 - (1) After communication with the SMARTRA3, the ECM transmits the random number with requirement of the TP ID information.
 - (2) The SMARTRA3 encryptes the random number and transmits the result(Encrypted Random Number) to the ECM with TP ID information.
 - (3) The ECM compares the result transmitted from the SMARTRA3 with the result calculated by ECM.
 And If result are coincided with each other; the ECS concludes the valid confirmation of the SMARTRA3.

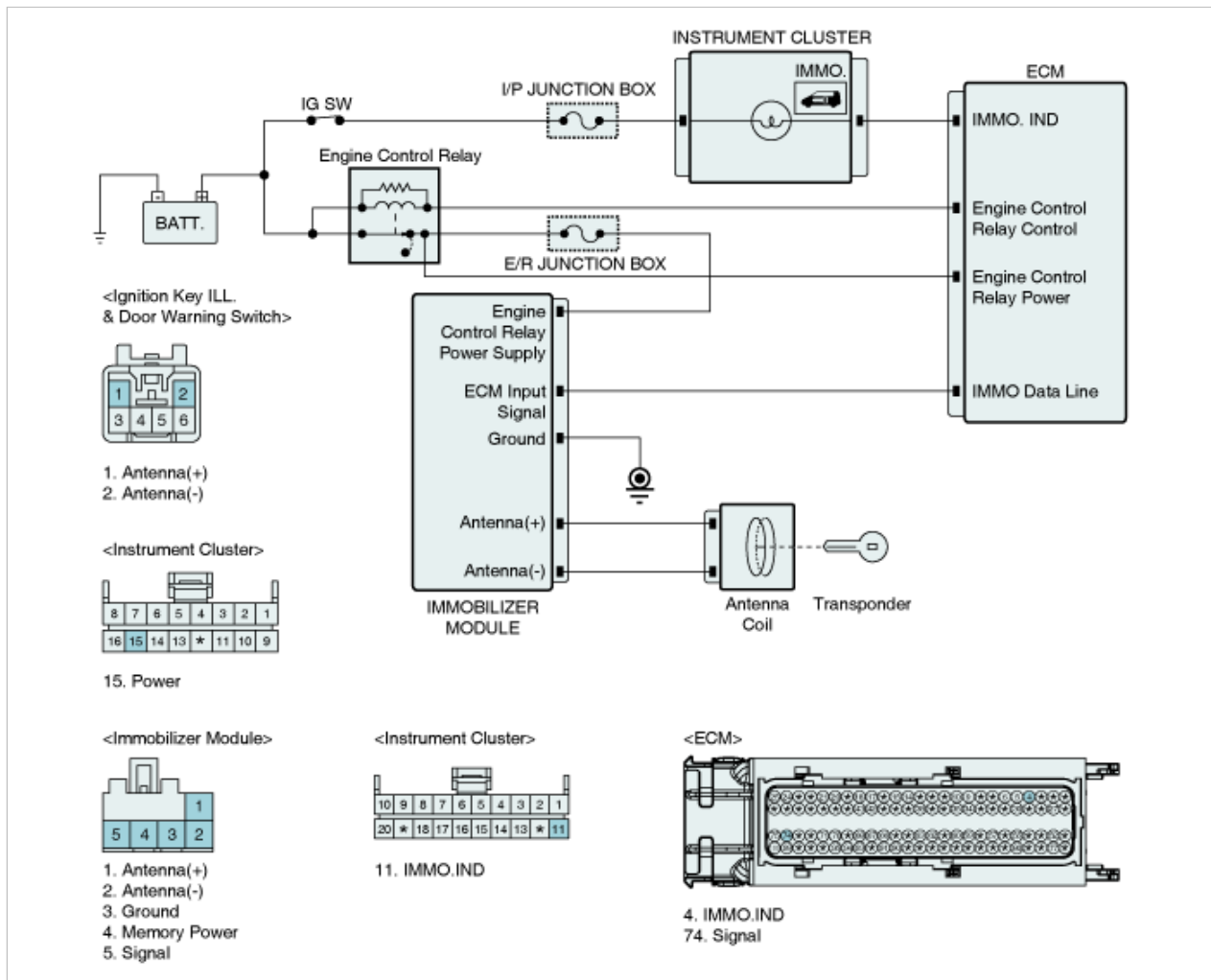
DTC Description

The ECM sets DTC P1676 if there's any fault in message from SMARTRA to ECU

DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	• -	• Faulty SMARTRA
Enable Conditions	• IG ON	
Threshold value	• SMARTRA Message error	
Detecting time	• Immediately	
FAIL SAFE	• -	

Diagnostic Circuit Diagram



Monitor Scantool Data

1. Check transponder and ECU status
 - (1) IGN "ON" & Engine "OFF"
 - (2) Monitor the "ECM, Key and Smartra Status" Parameter on the Scantool.

Specification : 'LEARNT'

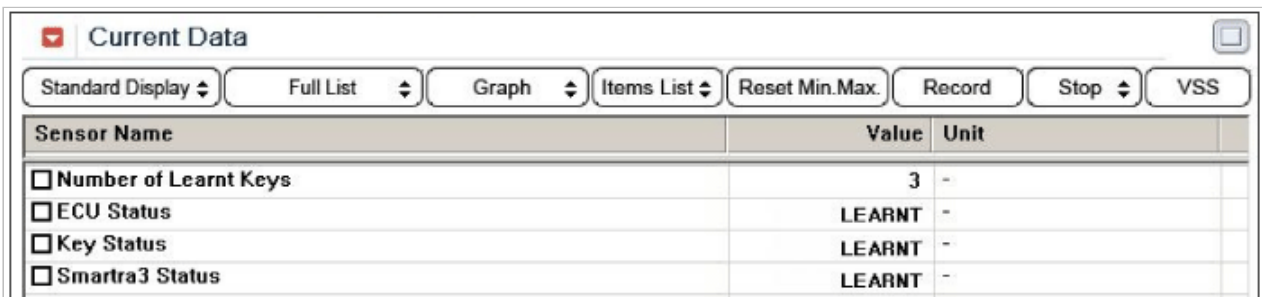


Fig.1

Fig.1) This data show that 3 keys have been taught, ECU has been learnt, the Key in key cylinder has been learnt and SMARTRA3 has been learnt

- (3) Has the "Smartra STATUS" been learnt ?

YES	► Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, damage on the ECM or SMARTRA. And this DTC has not erased in previous repair. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	► Go to "Component Inspection" Procedure.

Component Inspection

1. Check SMARTRA
 - (1) IGN "ON" & Engine "OFF"
 - (2) Neutralize SMARTRA with scantool.
 - (3) Neutralize ECM and Register transponder key by scantool.

NOTE

Pin code is required to Neutralize SMARTRA & ECM and to Register transponder key

- (4) Are Neutralizing and Registering Key completed normally ?

YES	<p>► Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, damage on the ECM or SMARTRA. Or It has not erased this DTC in previous repair. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.</p>
NO	<p>► Substitute with a known-good SMARTRA and perform the Key teaching. If the problem is corrected, replace SMARTRA and then go to "Verification of Vehicle Repair" procedure.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p style="text-align: center;">NOTE</p> <p>If the SMARTRA3 is only replaced using an existing key and ECM, after replacing the "virgin" or "neutral" SMARTRA3, reteaching is possible by key Learning mode of GDS. In this case, all existing key must be retaught. If SMATRA3 is replaced to another one (used at other vehicle), it can only recycle its neutralized first before replacing.</p> </div>

Verification of Vehicle Repair

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

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

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

General Description

1. The sequences of the PIN code storage are as follows.
 - (1) Input the PIN code into the scanner when key teaching process.
 The scanner transmits the Encrypted Code to the ECM after converting the PIN code into Encrypted Code.
 - (2) When the ECM gets the first key learning command,
 it transmits the SMARTRA3 learnt command and Encrypted Code to the SMARTRA3
 - (3) If the SMARTRA3 status is virgin/neutral, the SMARTRA3 stores Encrypted Code in EEPROM and transmits the success message of the Encrypted Code storage.
 (If the SMARTRA3 is learnt, the SMARTRA3 compares Encrypted Code transmitted by the ECM with Encrypted Code stored in EEPROM and transmits the (in)correct Encrypted Code message to ECM)
 - (4) If the SMARTRA3 is learnt normally or the Encrypted Code of the registered SMARTRA3 is the same as the ECM,
 the ECM begins operation the Transponder Learning.
 - (5) If the learning of the first transponder, the ECM stores the Encrypted Code in its EEPROM and converts state into learnt state.

2. The SMARTRA3 learning :
 - (1) starts with EMS request of PIN from scanner through the key teaching procedure.
 - (2) is possible in case that the status of SMARTAR is "virgin" or "neutral ".
 - (3) In case that the SMARTRA3 is "learnt", the SMARTRA3 will transmits the information if PIN inputted from scanner is same as the PIN in SMARTRA3.
 - (4) is possible regardless of key status.

3. The sequence of the SMARTRA3 confirms are as follows.
 - (1) After communication with the SMARTRA3, the ECM transmits the random number with requirement of the TP ID information.
 - (2) The SMARTRA3 encryptes the random number and transmits the result(Encrypted Random Number) to the ECM with TP ID information.
 - (3) The ECM compares the result transmitted from the SMARTRA3 with the result calculated by ECM.
 And If result are coincided with each other; the ECS concludes the valid confirmation of the SMARTRA3.

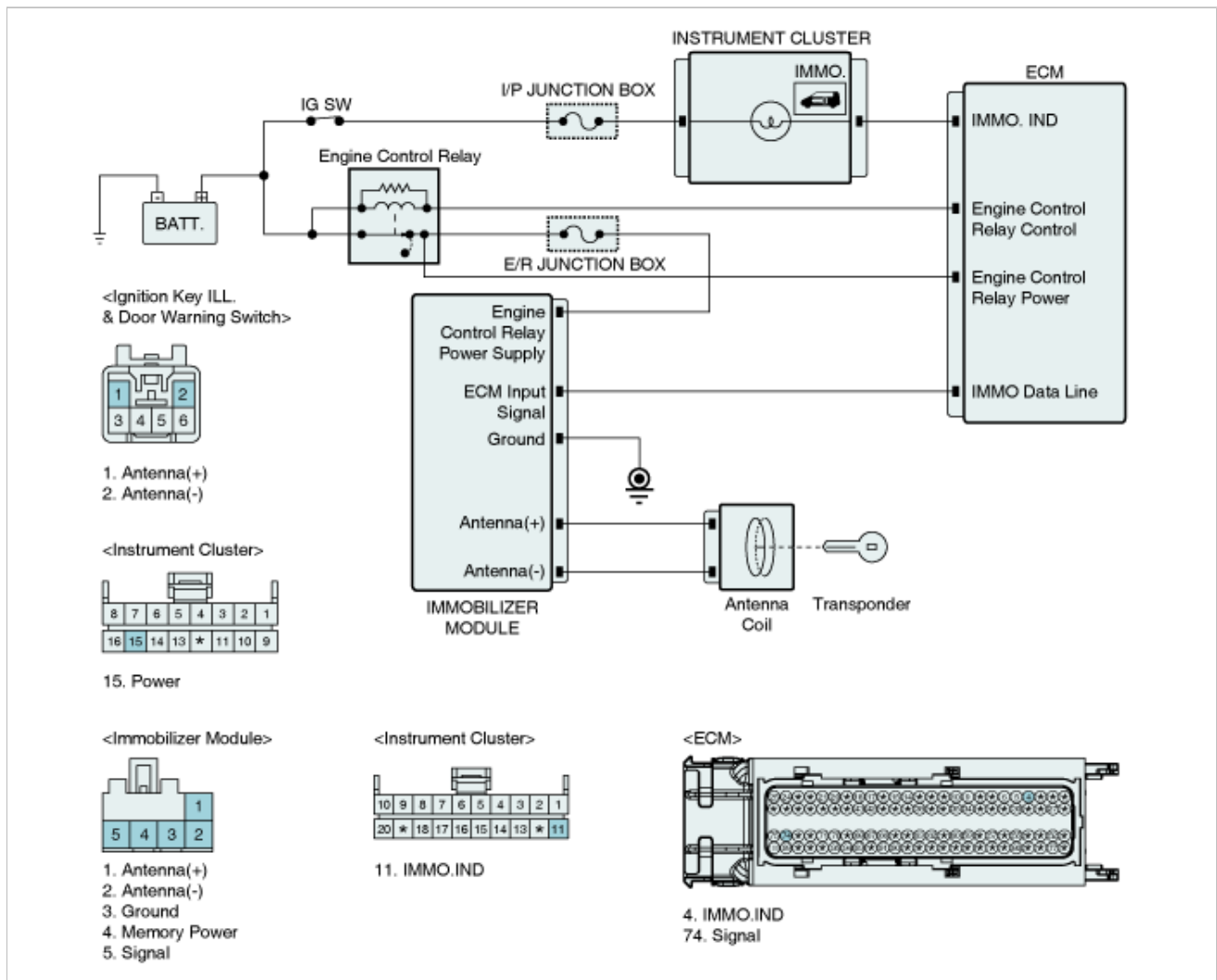
DTC Description

The PCM/ECM sets DTC P169A if authentication between PCM/ECM and SMARTRA has failed

DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	•	• Locking of SMARTRA
Enable Conditions	• IG ON	
Threshold value	• Virgin SMARTRA at Learnt EMS • Neutral SMARTRA at Learnt EMS • Incorect the Authetication of EMS and SMARTRA • Locking of SMARTRA	
Detecting time	• -	

Diagnostic Circuit Diagram



Monitor Scantool data

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON" & Engine "OFF"
3. Monitor the "KEY STATUS", "SMARTRA STATUS" and "ECU STATUS' Parameter on the Scantool.

Specification : 'LEARNT'

Current Data		
Sensor Name	Value	Unit
<input checked="" type="checkbox"/> Number of Learnt Keys	3	-
<input checked="" type="checkbox"/> ECU Status	LEARNT	-
<input checked="" type="checkbox"/> Key Status	LEARNT	-
<input checked="" type="checkbox"/> Smartra3 Status	LEARNT	-

Fig.1

Fig.1) This data show that 3 keys have been taught, ECU has been learnt, Key in key cylinder has been learnt and SMARTRA3 has been learnt.

4. Has the "SMARTRA STATUS' been learnt ?

YES	► Keep "KEY ON" status for 1 hours to withdraw "Locked by Timer" status. Then register transponder and go to "Verification of Vehicle Repair" procedure.
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NO

▶ Go to 'Component Inspection' procedure.

Component Inspection

1. Check SMARTRA

(1) IG "ON" & Engine "OFF"

(2) Neutralize Both "SMARTRA" and "ECM" and Register transponder key by scantool.

NOTE

Pin code is required to Neutralize SMARTRA and to Register transponder key

(3) Are Neutralizing and Registering completed normally ?

YES	▶ Perform all the key teaching procedure with scantool. (All the keys must be retaught) and then, go to "Verification of Vehicle Repair" Procedure.
NO	▶ Substitute with a known-good SMARTRA and Perform Key teaching procedure. ▶ If the problem is corrected, replace SMARTRA and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

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

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC

2. Operate the vehicle and monitor the DTC on the scantool

3. Are any DTCs present?

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

General Description

1. The sequences of the PIN code storage are as follows.
 - (1) Input the PIN code into the scanner when key teaching process.
 The scanner transmits the Encrypted Code to the ECM after converting the PIN code into Encrypted Code.
 - (2) When the ECM gets the first key learning command,
 it transmits the SMARTRA3 learnt command and Encrypted Code to the SMARTRA3
 - (3) If the SMARTRA3 status is virgin/neutral, the SMARTRA3 stores Encrypted Code in EEPROM and transmits the success message of the Encrypted Code storage.
 (If the SMARTRA3 is learnt, the SMARTRA3 compares Encrypted Code transmitted by the ECM with Encrypted Code stored in EEPROM and transmits the (in)correct Encrypted Code message to ECM)
 - (4) If the SMARTRA3 is learnt normally or the Encrypted Code of the registered SMARTRA3 is the same as the ECM,
 the ECM begins operation the Transponder Learning.
 - (5) If the learning of the first transponder,
 the ECM stores the Encrypted Code in its EEPROM and converts state into learnt state.

2. The SMARTRA3 learning :
 - (1) starts with EMS request of PIN from scanner through the key teaching procedure.
 - (2) is possible in case that the status of SMARTAR is "virgin" or "neutral".
 - (3) In case that the SMARTRA3 is "learnt", the SMARTRA3 will transmits the information if PIN inputted from scanner is same as the PIN in SMARTRA3.
 - (4) is possible regardless of key status.

3. The sequence of the SMARTRA3 confirms are as follows.
 - (1) After communication with the SMARTRA3, the ECM transmits the random number with requirement of the TP ID information.
 - (2) The SMARTRA3 encryptes the random number and transmits the result(Encrypted Random Number) to the ECM with TP ID information.
 - (3) The ECM compares the result transmitted from the SMARTRA3 with the result calculated by ECM.
 And If result are coincided with each other; the ECS concludes the valid confirmation of the SMARTRA3.

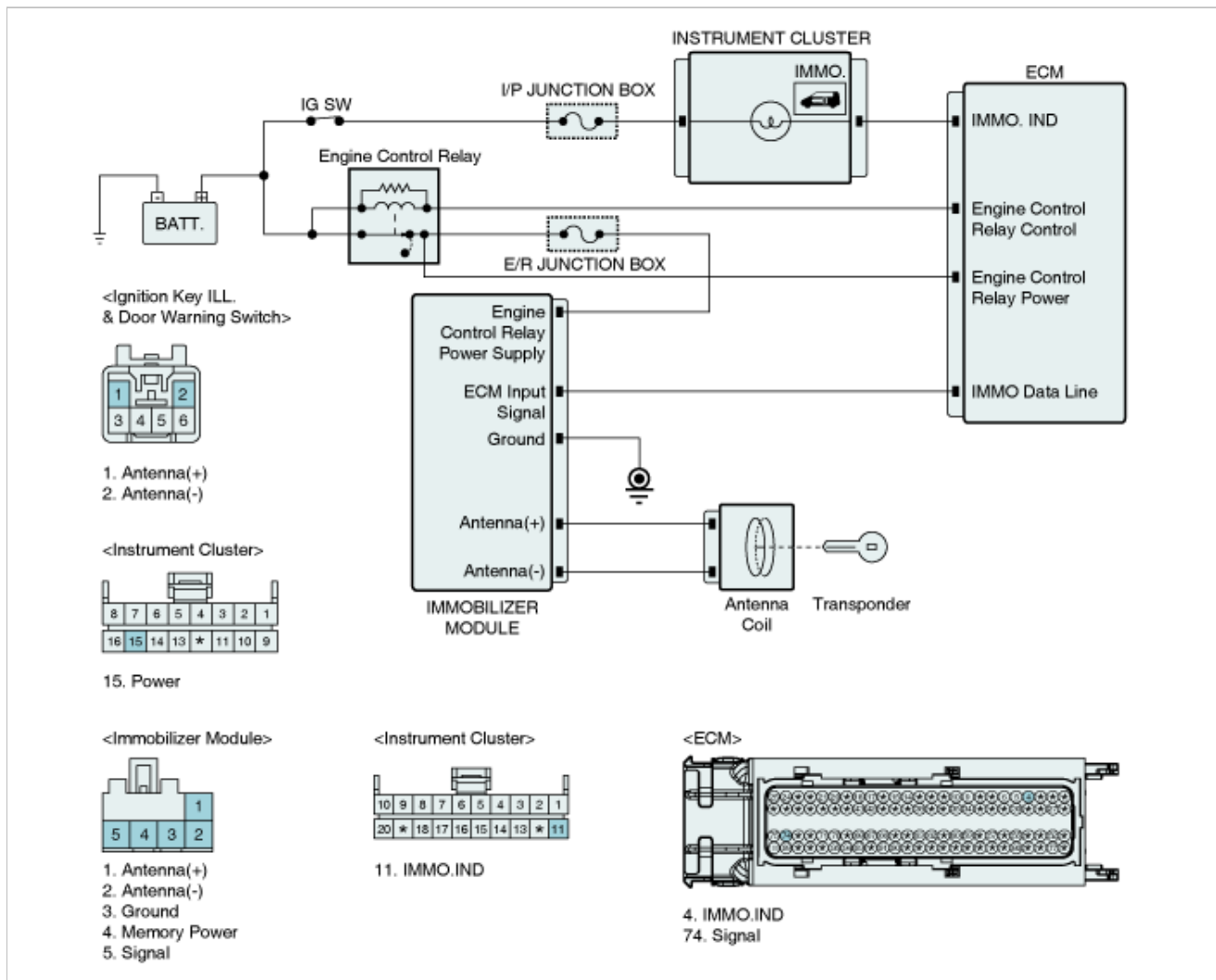
DTC Description

The ECM sets DTC P1690 if there's No Response from SMARTRA.

DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	•	<ul style="list-style-type: none"> • Open Circuit in signal harness • Short Circuit in signal harness • Faulty SMARTRA
Enable Conditions	• IG ON	
Threshold value	• No signal from SMARTRA	
Detecting time	• -	
FAIL SAFE	• -	

Diagnostic Circuit Diagram



Monitor Scantool Data

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON" & Engine "OFF"
3. Monitor the "ECU, KEY and Smartra STATUS' Parameter on the Scantool.

Specification : 'LEARNT'

Current Data		
Sensor Name	Value	Unit
<input checked="" type="checkbox"/> Number of Learnt Keys	3	-
<input type="checkbox"/> ECU Status	LEARNT	-
<input type="checkbox"/> Key Status	LEARNT	-
<input type="checkbox"/> Smartra3 Status	LEARNT	-

Fig.1

Fig.1) This data show that 3 keys have been taught, ECU has been learnt, Key in key cylinder has been learnt and SMARTRA3 has been learnt.

4. Has the "Smartra STATUS' been learnt ?

YES

► Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, damage on the ECM or SMARTRA. And this DTC has not erased in previous repair. Repair or replace as

	necessary and then go to "Verification of Vehicle Repair" procedure.
NO	▶ Go to "Inspection & Repair" procedure

Terminal and Connector Inspection

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

YES	▶ Repair as necessary and go to "Verification Vehicle Repair" procedure
NO	▶ Go to "W/Harness Inspection" procedure.

Power Circuit Inspection

1. Check for open in harness
 - (1) Ignition "OFF"
 - (2) Disconnect SMARTRA Connector.
 - (3) Ignition "ON" & Engine "OFF"
 - (4) Measure voltage between Engine Control Relay Power of SMARTRA harness connector and chassis ground.

Specification : 9~16V

- (5) Is the measured voltage within specifications?

YES	▶ Go to "Signal circuit Inspection" procedure
NO	▶ Check for open or short in harness. Repair as necessary and go to "Verification of Vehicle Repair" procedure.

- (6)

Signal Circuit Inspection

1. Check for open in harness
 - (1) Ignition "OFF"
 - (2) Disconnect SMARTRA connector.
 - (3) Measure resistance between signal terminal of smartra harness connector and ECM/PCM harens connector

Specification : 1 Ω or less

- (4) Is the measured resistance within specifications?

YES	▶ Go to "Check for short in harness" procedure.
NO	▶ Check for open in harness. Repair as necessary and go to "Verification of Vehicle Repair" procedure.

2. Check for short in harness
 - (1) Ignition "OFF"
 - (2) Disconnect SMARTRA connector.
 - (3) Ignition "ON" & Engine "OFF"
 - (4) Measure voltage between signal terminal of SMARTRA harness connector and chassis ground.

Specification : Approx. 5.48V

(5) Is the measured voltage within specifications?

YES	▶ Go to "Signal circuit Inspection" procedure
NO	▶ Check for open in harness. Repair as necessary and go to "Verification of Vehicle Repair" procedure.

Ground Circuit Inspection

1. Check for open in ground harness

(1) Ignition "OFF"

(2) Disconnect SMARTRA connector.

(3) Measure resistance between ground terminal of SMARTRA harness and chassis ground.

Specification : 1 Ω or less

(4) Is the measured resistance within specifications?

YES	▶ Go to "Component Inspection" procedure.
NO	▶ Check for open in harness. Repair as necessary and go to "Verification of Vehicle Repair" procedure.

Component Inspection

1. Check SMARTRA

(1) IG"ON" & Engine "OFF"

(2) Neutralize Both "SMARTRA" and "ECM" and Register transponder key by scantool.

NOTE
Pin code is required to Neutralize SMARTRA and to Register transponder key

(3) Are Neutralizing and Registering completed normally ?

YES	▶ Perform all the key teaching procedure with scantool. (All the keys must be retaught) and then, go to "Verification of Vehicle Repair" Procedure.
NO	▶ Substitute with a known-good SMARTRA and Perform Key teaching procedure. ▶ If the problem is corrected, replace SMARTRA and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

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

1. Connect scantool and select "Diagnostic Trouble Codes(DTCs)" mode and then clear DTC

2. Operate the vehicle and monitor the DTC on the scantool

3. Are any DTCs present?

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

**GENESIS COUPE(BK) >2010 > G 2.0 DOHC > Body Electrical System > Immobilizer System > P1691
Immobilizer-Antenna Coil Error**

General Description

This wireless communication runs on RF (Radio frequency of 125 kHz). The antenna coil is mounted on the top of ignition lock for RF transmission and receiving. The RF signal from the transponder received by the antenna coil is converted into messages for serial communication by the SMARTRA device. And the received messages from the ECM are converted into an RF signal, which is transmitted, to the transponder by the antenna.

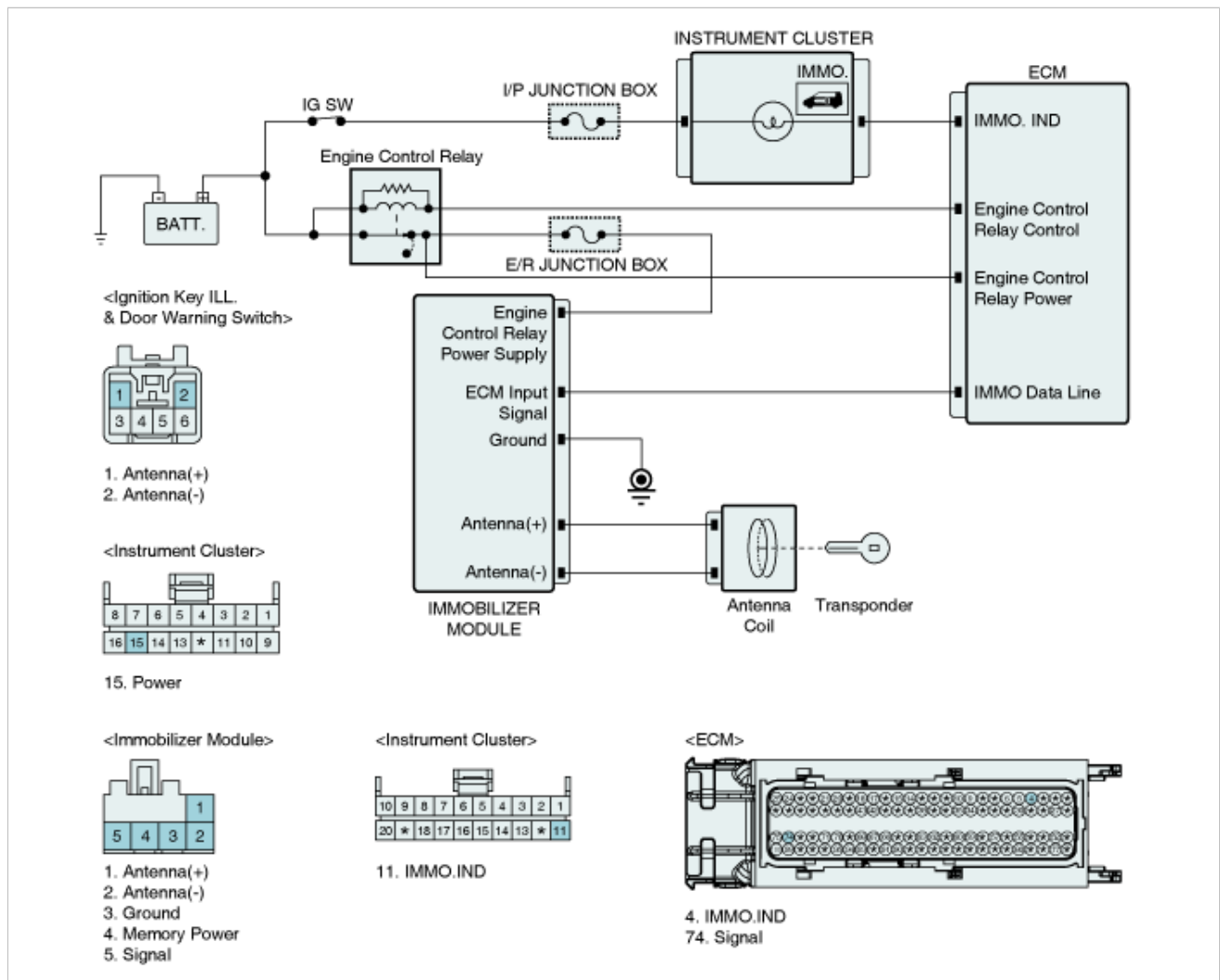
DTC Description

The ECM sets DTC P1691 if there's any fault in immobilizer antenna coil.

DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	•	<ul style="list-style-type: none"> • Open Circuit in antenna coil • Short Circuit in antenna coil • Faulty antenna coil
Enable Conditions	• IG ON	
Threshold value	• Error in antenna coil signal	
Detecting time	• -	
FAIL SAFE	• -	

Diagnostic Circuit Diagram



Monitor Scantool Data

1. Connect scantool to Data Link Connector(DLC).
2. IG "ON" & Engine "OFF"
3. Monitor the "ECU, KEY and Smartra STATUS' Parameter on the Scantool.

Specification : 'LEARNT'

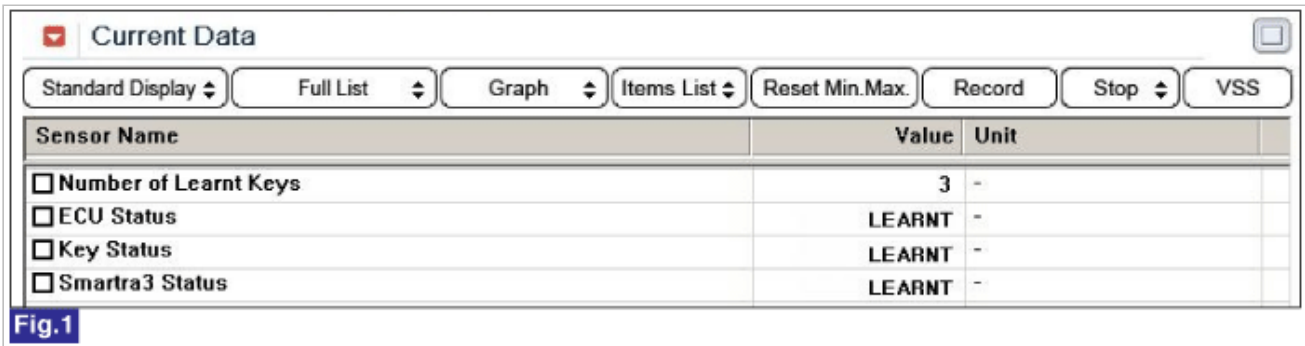


Fig.1

Fig.1) This data show that 3 keys have been taught, ECU has been learnt, Key in key cylinder has been learnt and SMARTRA3 has been learnt.

4. Have the both "ECM, KEY and Smartra STATUS' been learnt ?

YES	▶ Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, damage on the ECM or SMARTRA. And this DTC has not erased in previous repair. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	▶ Go to "Component Inspection" procedure

Component Inspection

1. Check coil antenna.
 - (1) Ignition "OFF"
 - (2) Disconnect SMARTRA connector .
 - (3) Measure resistance between antenna coil(+) and (-) terminal of SMARTRA harness connector.

Specification : Approx 8.5 Ω

- (4) Is the measured resistance within specifications?

YES	▶ Go to "Check SMARTRA" procedure
NO	▶ Check for open or short in antenna coil. Repair as necessary and go to "Verification of Vehicle Repair" procedure.

2. Check SMARTRA
 - (1) IG "ON" & Engine "OFF"
 - (2) Neutralize Both "SMARTRA" and "ECM" and Register transponder key by scantool.

NOTE

Pin code is required to Neutralize SMARTRA and to Register transponder key

- (3) Are Neutralizing and Registering completed normally ?

YES	▶ Perform all the key teaching procedure with scantool. (All the keys must be retaught) and then, go to "Verification of Vehicle Repair" Procedure.
NO	▶ Substitute with a known-good SMARTRA and Perform Key teaching procedure. ▶ If the problem is corrected, replace SMARTRA and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

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

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

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

**GENESIS COUPE(BK) >2010 > G 2.0 DOHC > Body Electrical System > Immobilizer System > P1692
Immobilizer Indicator Lamp Error**

General Description

When driver inserts key and IGN "ON", Immobilizer informs status of system and result of Authentication by blinking of immobilizer lamp on instrument cluster. through Authentication procedure immobilizer lamp keep lighting up till engine starts. In normal status. Immobilizer lamp lights up for 30sec Right after ignition "ON". If there's any fault in immobilizer system or in Authentication, lamp blinks 5 times after ignition "ON"

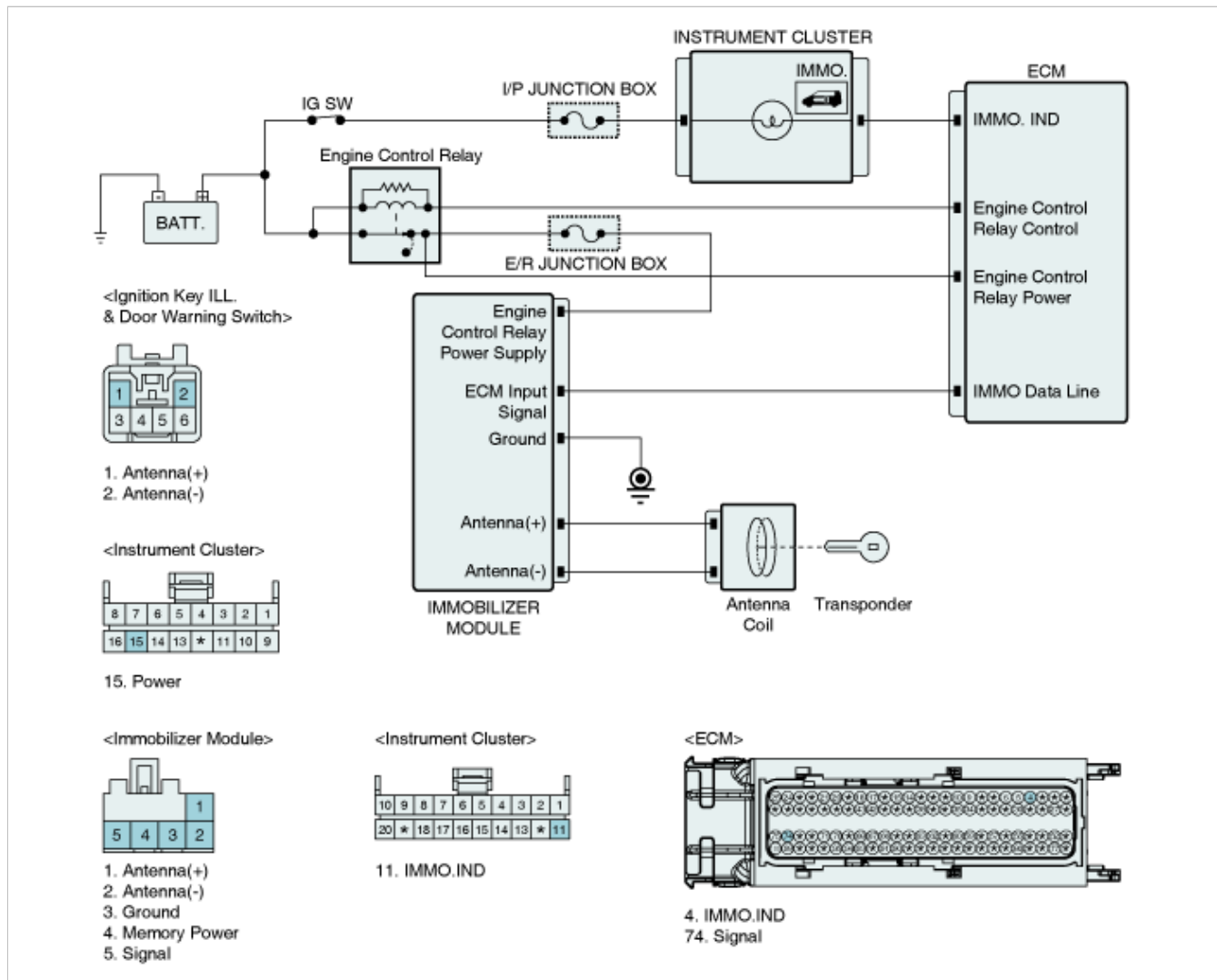
DTC Description

The ECM sets DTC P1692 if there's short circuit in immobilizer lamp circuit.

DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	•	<ul style="list-style-type: none"> • Short Circuit in immobilizer lamp circuit. • Open/Short in control harness • Faulty PCM/ECM
Enable Conditions	• IG ON	
Threshold value	• Short to GND, Wiring open	
Detecting time	• -	
FAIL SAFE	• -	

Diagnostic Circuit Diagram



Terminal and Connector Inspection

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

YES	▶ Repair as necessary and go to "Verification Vehicle Repair" procedure
NO	▶ Go to "W/Harness Inspection" procedure

Control circuit inspection

■ Check for open in harness

1. IG KEY OFF.
2. Connect SMARTRA connector and disconnect PCM connector .
3. IG KEY ON & Engine "OFF".
4. Measure voltage between indicator terminal of PCM harness connector and chassis ground.

Specification : Batt.

5. Is the measured voltage within specifications?

YES	▶ Go to "Component Inspection" procedure
NO	▶ Check for open or short in harness. Repair as necessary and go to "Verification of Vehicle Repair" procedure.

Visual/Physical Inspection

■ Check immobilizer lamp circuit

1. Ignition "ON" & Engine "OFF"
2. Check if immobilizer lamp operates properly.

NOTE

Right after ignition "ON", Immobilizer lamp lights up for 30sec.
If lamp blinks 5 times after ignition "ON", a fault exists in immobilizer system.

3. Is the immobilizer lamp operating properly?

YES	▶ Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	▶ Go to "Component Inspection" procedure.

Component Inspection

■ Check immobilizer lamp.

1. IG KEY OFF
2. Connect SMARTRA connector and disconnect PCM connector
3. Ground indicator terminal of PCM harness connector with wire
4. IG KEY ON & Engine "OFF"

Specification : Immobilizer lamp "ON"

5. Is the Immobilizer lamp "ON"?

YES	<ul style="list-style-type: none">▶ Substitute with a known-good ECM and check for proper operation.▶ If the problem is corrected, replace ECM and then go to "Verification of Vehicle Repair" procedure.		
<table border="1"><tr><td data-bbox="383 296 521 327">NOTE</td></tr><tr><td data-bbox="383 348 1382 411">ECM substituted for old one must be in "Virgin" or "Neutral" status and Pin code is required to Neutralize ECM and to Register transponder key</td></tr></table>		NOTE	ECM substituted for old one must be in "Virgin" or "Neutral" status and Pin code is required to Neutralize ECM and to Register transponder key
NOTE			
ECM substituted for old one must be in "Virgin" or "Neutral" status and Pin code is required to Neutralize ECM and to Register transponder key			
NO	<ul style="list-style-type: none">▶ Check that fuse has blown off and harness between ECM connector and Battery is in normal condition. And check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.		

Verification of Vehicle Repair

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

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

YES	<ul style="list-style-type: none">▶ Go to the applicable troubleshooting procedure.
NO	<ul style="list-style-type: none">▶ System is performing to specification at this time.

General Description

The vehicle immobilizer system consists of the ECM, the SMARTRA3 and ignition keys with built-in transponder. The ECM carries out the check of ignition key by special encryption algorithm with SMARTRA3 and Transponder. The encryption algorithm (between ECM and SMARTRA3) is the one offered from BOSCH. The encryption algorithm (between ECM and Transponder) is Hitag type 2 which is a high level system. With IGN On, the ECM executes the key Authentication after SMARTRA3 authentication. The Engine can be started when the key authentication is confirmed by the SMARTRA3.

The Key teaching procedure starts with ECM request of PIN from Scanner. The "virgin"ECM stores the PIN and the key Learning can be started. The "learnt"ECM compares the PIN from tester with the vehicle password in Transponder. If the data are correct, the key Learning can be started.

Scanner requests the Learning of the first key, the SMARTRA3 is registered at first and then the first key is registered by ECM. If the SMARTRA3 status is learnt and PIN number is different, the SMARTRA3 will return the incorrect PIN data to the ECM. In this case, The ECM can't excute the key learning process.

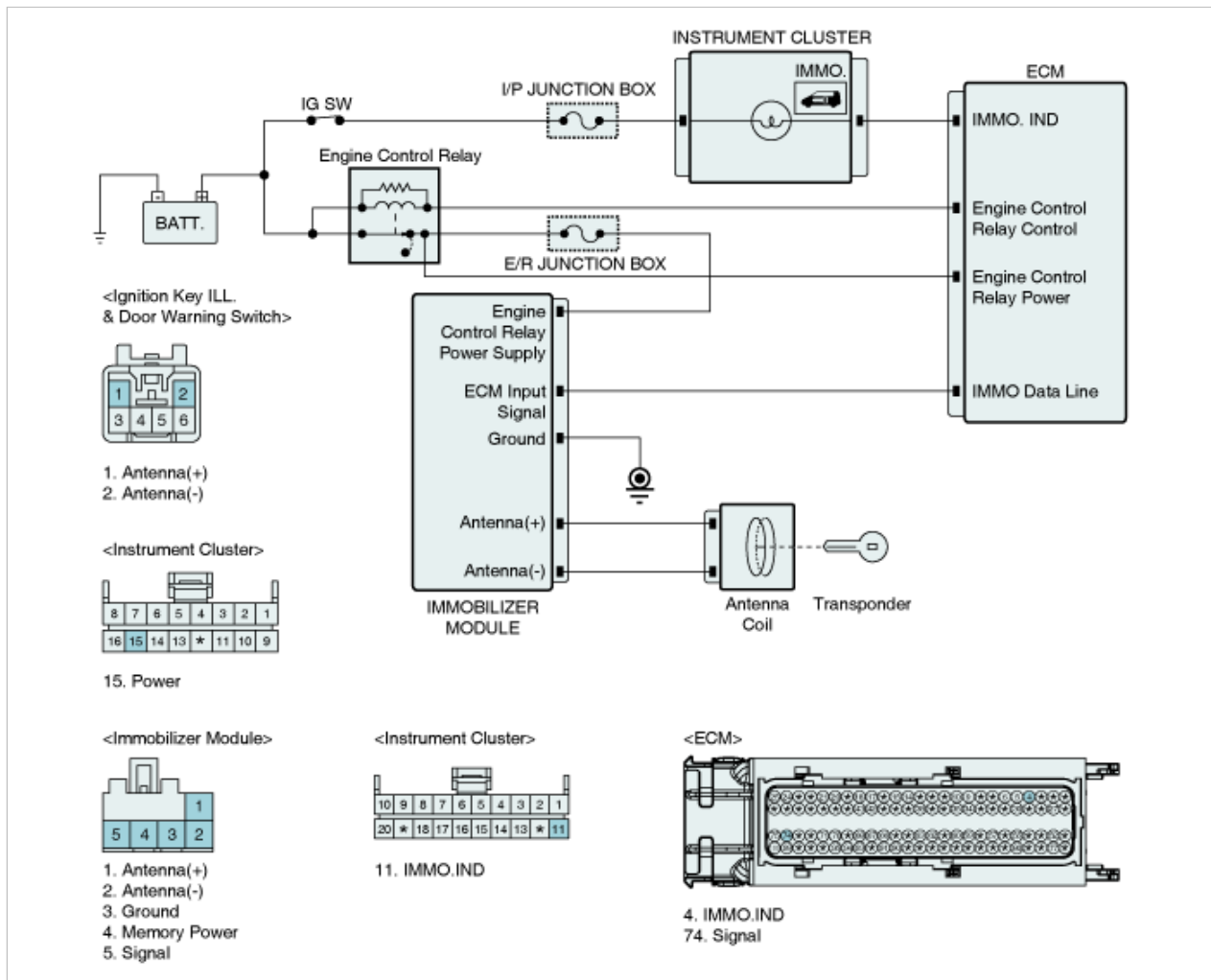
DTC Description

The ECM sets DTC P1693 if there's abnormal response from transponder.

DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	•	<ul style="list-style-type: none"> • Corrupted data from Transponder • More than one TP in the magnetic field • No TP(Key without TP) in the magnetic field
Enable Conditions	• IG ON	
Threshold value	<ul style="list-style-type: none"> • Corrupted data from Transponder • More than one TP in the magnetic field • No TP(Key without TP) in the magnetic field 	
Detecting time	• -	
FAIL SAFE	• -	

Diagnostic Circuit Diagram



Monitor Scantool Data

1. Check transponder and ECU status
 - (1) IG "ON" & Engine "OFF"
 - (2) Monitor the "ECU, KEY and Smartra STATUS' Parameter on the Scantool.

Specification : 'LEARNT'

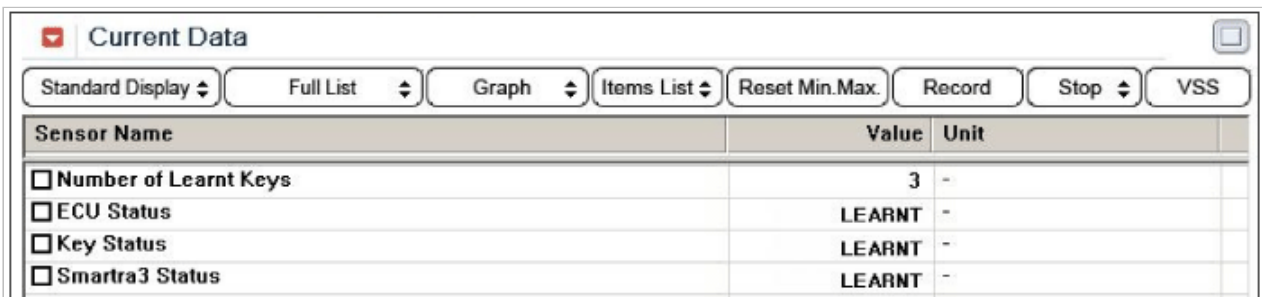


Fig.1

Fig.1) This data show that 3 keys have been taught, ECU has been learnt, Key in key cylinder has been learnt and SMARTRA3 has been learnt

- (3) Have both the ECM and KEY status been learnt ?

YES	▶ Substitute with known good "virgin" transponder and go to "Component Inspection" Procedure.
NO	▶ Go to "Component Inspection" Procedure.

Component Inspection

1. Check transponder
 - (1) IG "ON" & Engine "OFF"
 - (2) Neutralize ECM and Register transponder key by scantool.

NOTE

Pin code is required to Neutralize ECM and to Register transponder key

- (3) Are Neutralizing and Registering completed normally ?

YES	▶ Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	▶ Substitute with a known-good transponder and perform the key teaching procedure. ▶ If the problem is corrected, replace transponder and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

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

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

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

General Description

The ECM and the SMARTRA communicate by dedicated line. During this communication of ECM and SMARTRA the K line of ECM cannot be used for communication. The ECM controls the communication either to SMARTRA or to other devices(e.g. scanner) on K line by switching of a multiplexer and specific communication procedures. The multiplexer is a part of ECM H/W.

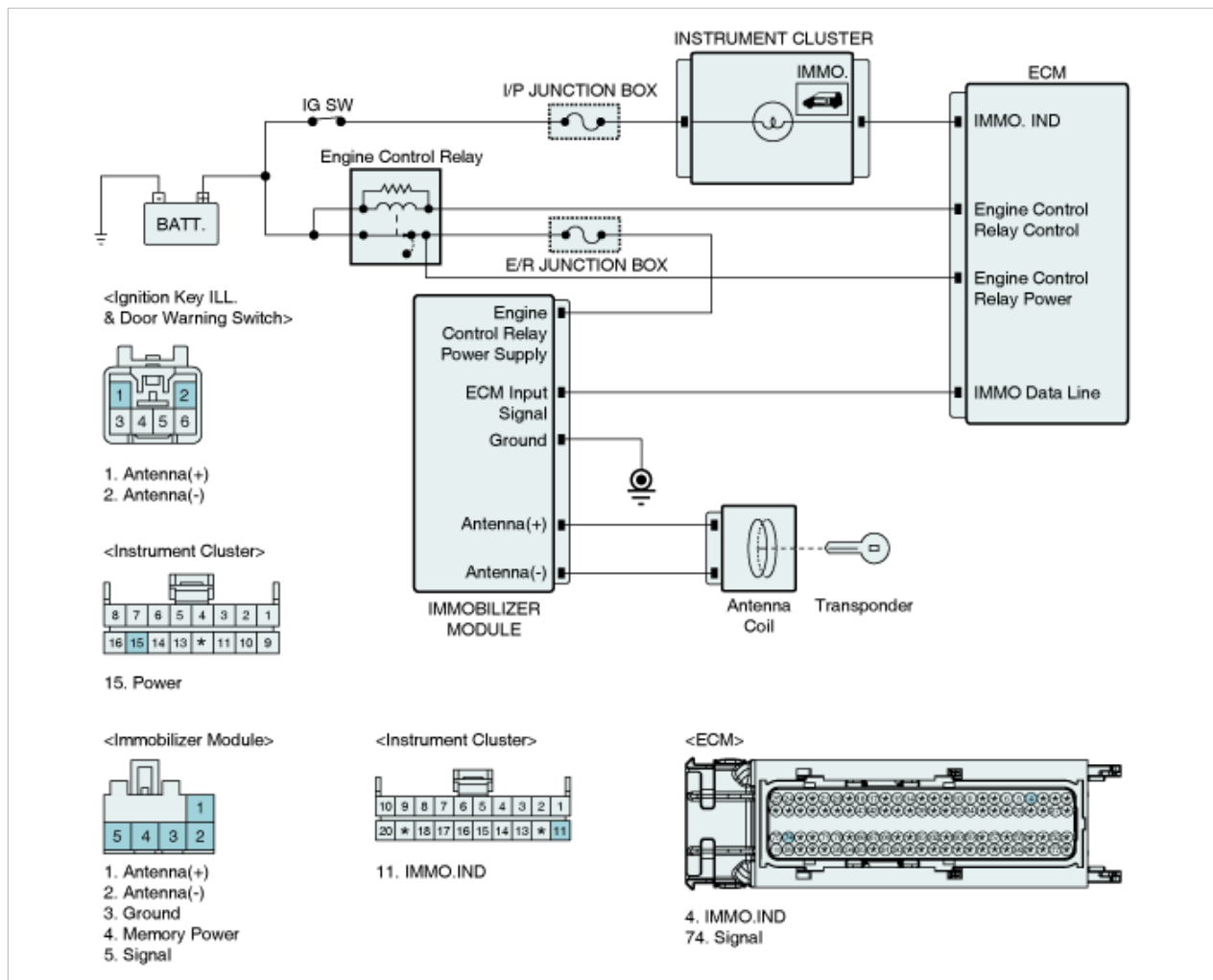
DTC Description

The ECM sets DTC P1694 if Request from EMS is invalid.

DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	•	• Faulty EMS ※ Protocol layer violation - Invalid request - Check sum error
Enable Conditions	• IG ON	
Threshold value	• Protocol layer violation - Invalid request - Check sum error	
Detecting time	• -	
FAIL SAFE	• -	

Diagnostic Circuit Diagram



Monitor Scantool Data

1. Check status

- (1) IG "ON" & Engine "OFF"
- (2) Monitor the "ECU, KEY and Smartra STATUS' Parameter on the Scantool.

Specification : 'LEARNT'

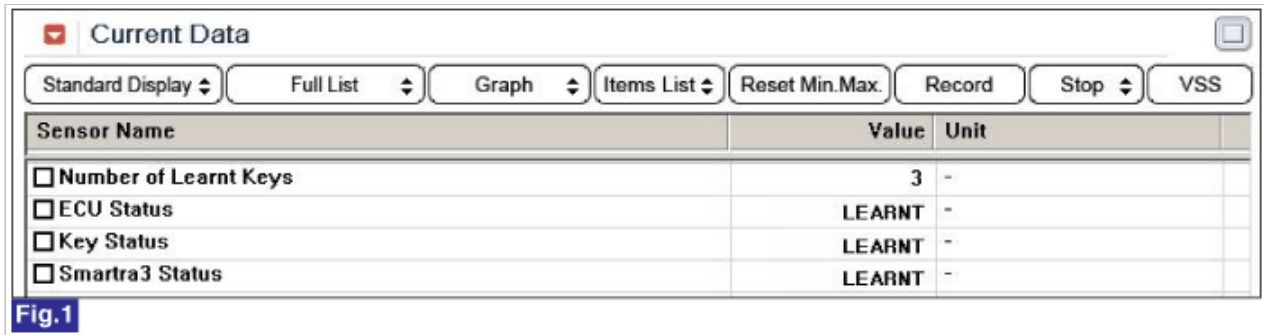


Fig.1

Fig.1) This data show that 3 keys have been taught, ECU has been learnt, Key in key cylinder has been learnt and SMARTRA3 has been learnt

- (3) Are "KEY STATUS", "SMARTRA STATUS" and" ECU STATUS' Parameter within specifications?

YES	▶ Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, damage on the ECM or SMARTRA. And this DTC has not erased in previous repair. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	▶ Go to "Component Inspection" procedure.

Component Inspection

- 1. Check ECM
 - (1) IG "ON" & Engine "OFF"
 - (2) Neutralize ECM and Register transponder key by scantool.

NOTE

Pin code is required to Neutralize ECM and to Register transponder key

- (3) Are Neutralizing and Registering completed normally ?

YES	▶ Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	<p>▶ Substitute with a known-good transponder and perform key teaching procedure with scanner.</p> <p>▶ If the problem is corrected, replace transponder and then go to "Verification of Vehicle Repair" procedure.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p style="background-color: #008000; color: white; padding: 2px; display: inline-block;">NOTE</p> <p>ECM substituted for old one must be in "Virgin" or "Neutral" status and Pin code is required to Neutralize ECM and to Register transponder key</p> </div>

Verification of Vehicle Repair

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

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

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

General Description

The relevant data for the immobilizer function are stored at permanent memory (EEPROM or Flash etc.).

The immobilizer data are stored by three independent entries.

The data from EEPROM are evaluated by "2 of 3 decision". That means all three entries are read and the content is compared before authentication process.

If the contents of all entries are equal, the authentication will run without additional measures.

If only the contents of two entries are equal, the authentication will run and fault code "EEPROM defective" is stored at ECM.

If the contents of all three entries are different from each other, no authentication will be possible and the fault code "EEPROM defective" will be stored. The limp home function cannot be activated. The ECM shall be replaced if the EEPROM related fault occurs again after new teaching of all keys.

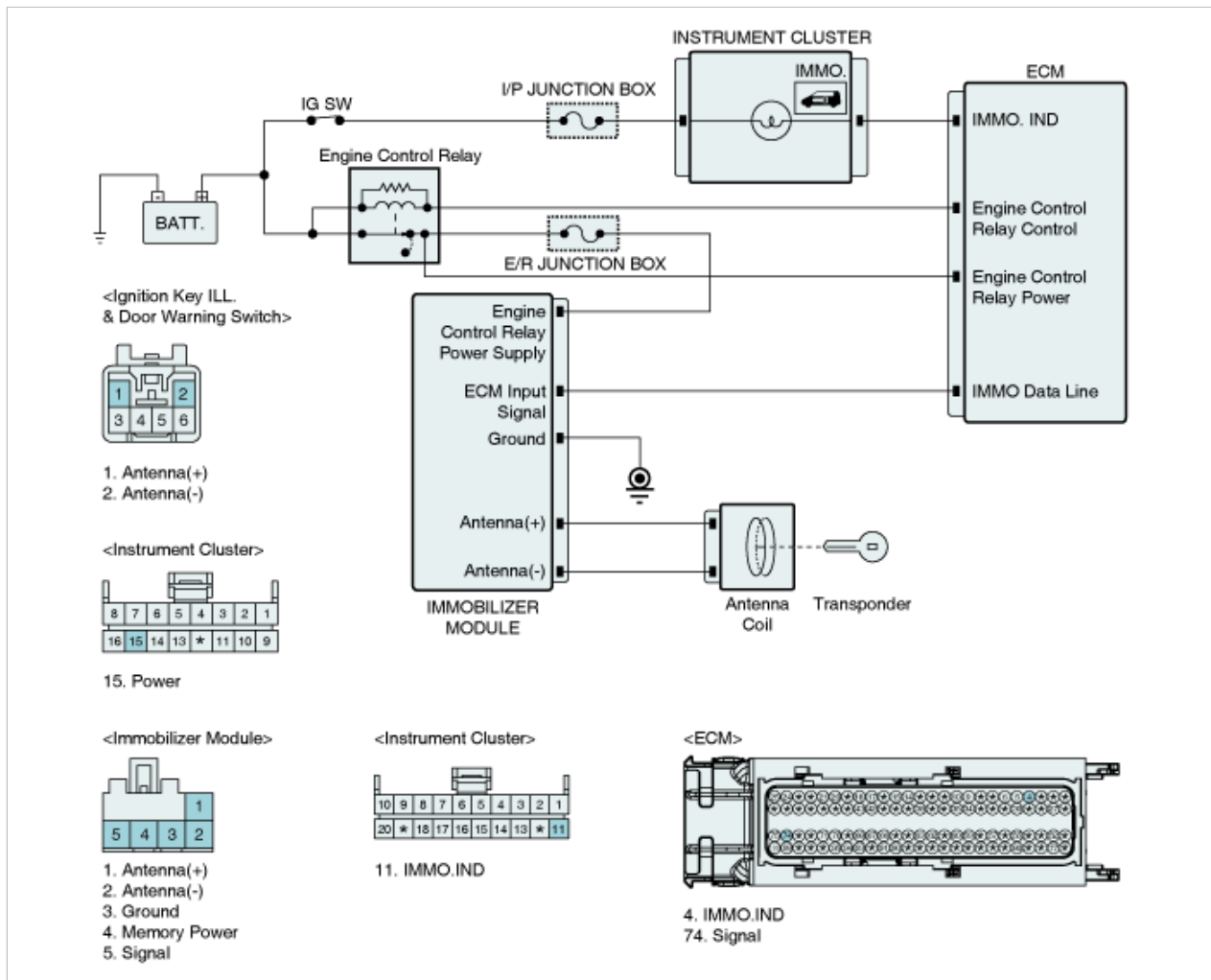
DTC Description

The ECM sets DTC P1695 if there's any fault in EMS internal permanent memory(EEPROM or Flash etc.)

DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	•	• Faulty EMS
Enable Conditions	• IG ON	
Threshold value	• Inconsistent data of EEPROM • Invalid write operation to EEPROM	
Detecting time	• -	
FAIL SAFE	• -	

Diagnostic Circuit Diagram



Monitor Scantool Data

1. Check status

(1) IG "ON" & Engine "OFF"

(2) Monitor the "KEY STATUS", "SMARTRA STATUS" and "ECU STATUS" Parameter on the Scantool.

Specification : 'LEARNT'

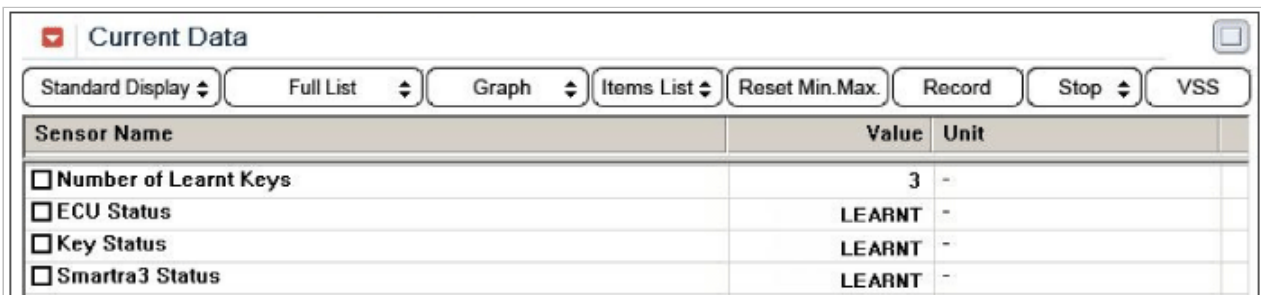


Fig.1

Fig.1) This data show that 3 keys have been taught, ECU has been learnt, Key in key cylinder has been learnt and SMARTRA3 has been learnt

(3) Are "KEY STATUS", "SMARTRA STATUS" and "ECU STATUS" Parameter within specifications?

YES	► Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, damage on the ECM or SMARTRA. And this DTC has not erased in previous repair. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	► Go to "Component Inspection" procedure

Component Inspection

1. Check ECM
 - (1) IG "ON" & Engine "OFF"
 - (2) Neutralize ECM and Register transponder key by scantool.

NOTE

Pin code is required to Neutralize ECM and to Register transponder key

- (3) Are Neutralizing and Registering completed normally ?

YES	<ul style="list-style-type: none"> ▶ Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	<ul style="list-style-type: none"> ▶ Substitute with a known-good transponder and perform key teaching procedure with scanner. ▶ If the problem is corrected, replace transponder and then go to "Verification of Vehicle Repair" procedure. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p style="text-align: center;">NOTE</p> <p>ECM substituted for old one must be in "Virgin" or "Neutral" status and Pin code is required to Neutralize ECM and to Register transponder key</p> </div>

Verification of Vehicle Repair

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

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

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

**GENESIS COUPE(BK) >2010 > G 2.0 DOHC > Body Electrical System > Immobilizer System > P1696
 Immobilizer-Authentication Fail**

General Description

The vehicle immobilizer system consists of the ECM, the SMARTRA3 and ignition keys with built-in transponder. The ECM carries out the check of ignition key by special encryption algorithm with SMARTRA3 and Transponder. The encryption algorithm (between ECM and SMARTRA3) is the one offered from BOSCH. The encryption algorithm (between ECM and Transponder) is Hitag type 2 which is a high level system. With IGN On, the ECM executes the key Authentication after SMARTRA3 authentication. The Engine can be started when the key authentication is confirmed by the SMARTRA3.

The Key teaching procedure starts with ECM request of PIN from Scanner. The "virgin"ECM stores the PIN and the key Learning can be started. The "learnt"ECM compares the PIN from tester with the vehicle password in Transponder. If the data are correct, the key Learning can be started.

Scanner requests the Learning of the first key, the SMARTRA3 is registered at first and then the first key is registered by ECM. If the SMARTRA3 status is learnt and PIN number is different, the SMARTRA3 will return the incorrect PIN data to the ECM. In this case, The ECM can't excute the key learning process.

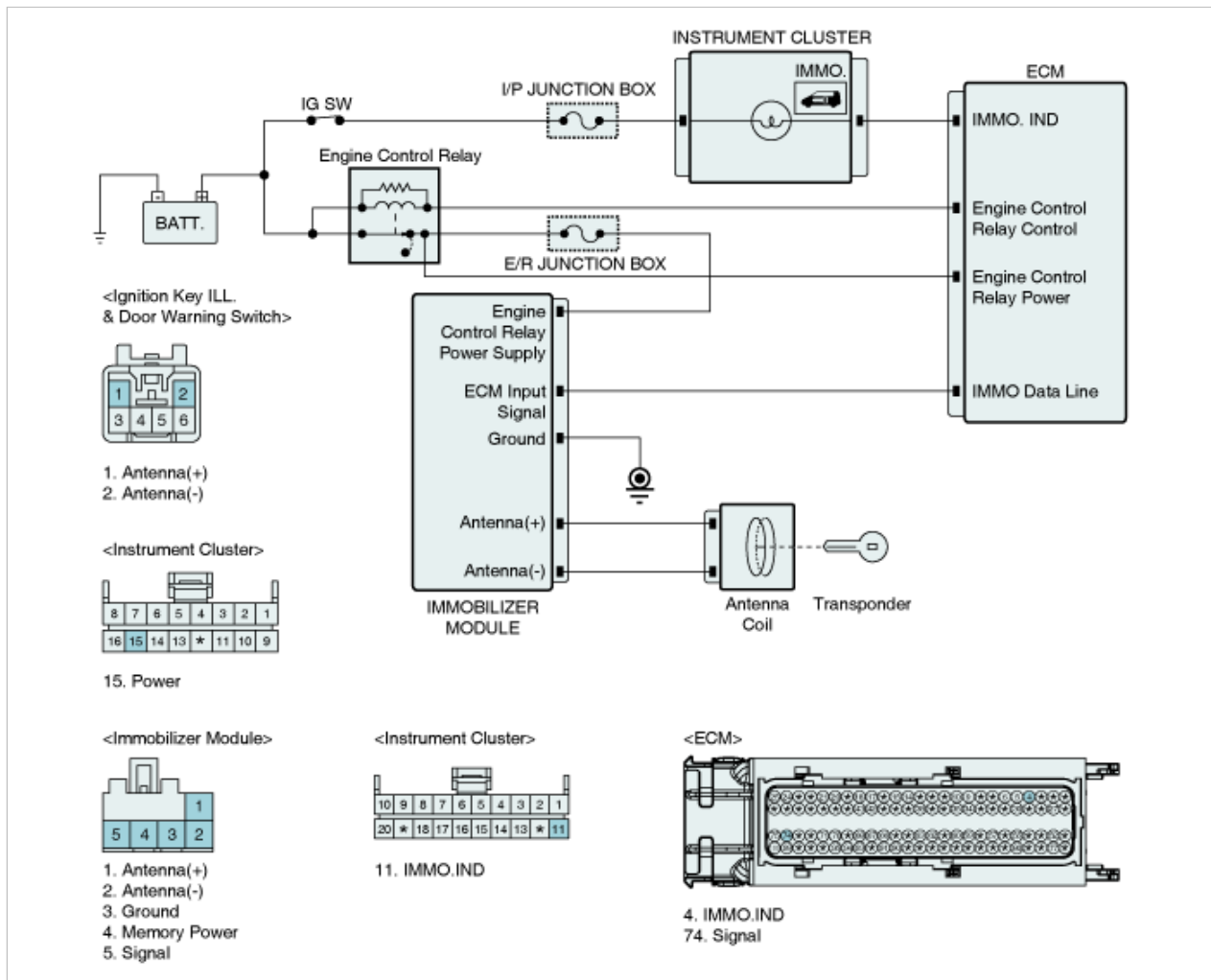
DTC Description

The ECM sets DTC P1696 if invaild key is inserted into key hole for Authentication

DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	•	• Invalid transponder.
Enable Conditions	• IG ON	
Threshold value	• Virgin TP at PCM/ECM status "Learnt" • Learnt(Invalid) TP at PCM/ECM status "Learnt"	
Detecting time	• Immediately	
FAIL SAFE	• -	

Diagnostic Circuit Diagram



Monitor Scantool Data

1. Check status
 - (1) IG "ON" & Engine "OFF"
 - (2) Monitor the "ECM, Key and Smartra Status" Parameter on the Scantool.

Specification : 'LEARNT'

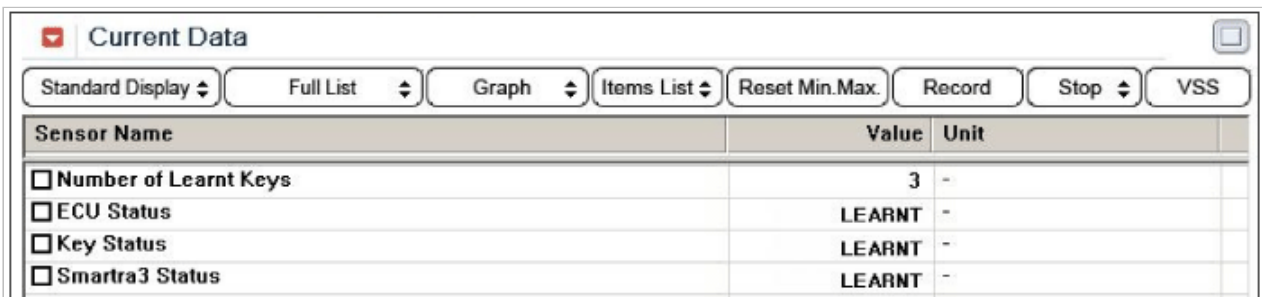


Fig.1

Fig.1) This data show that 3 keys have been taught, ECU has been learnt, Key in key cylinder has been learnt and SMARTRA3 has been learnt

- (3) Have both the ECM and KEY status been learnt ?

YES	▶ Substitute with known good "virgin" transponder and go to "Component Inspection" Procedure.
NO	▶ Go to "Component Inspection" Procedure.

Component Inspection

1. Check transponder
 - (1) IG "ON" & Engine "OFF"
 - (2) Neutralize ECM and Register transponder key by scantool.

NOTE

Pin code is required to Neutralize ECM and to Register transponder key

- (3) Are Neutralizing and Registering completed normally ?

YES	▶ Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.
NO	▶ Substitute with a known-good transponder and perform key teaching procedure with scanner. ▶ If the problem is corrected, replace transponder and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

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

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

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

General Description

This is a special function for engine start by vehicle manufacturer. The engine can be started for moving from the production line to an area where the key teaching is conducted.

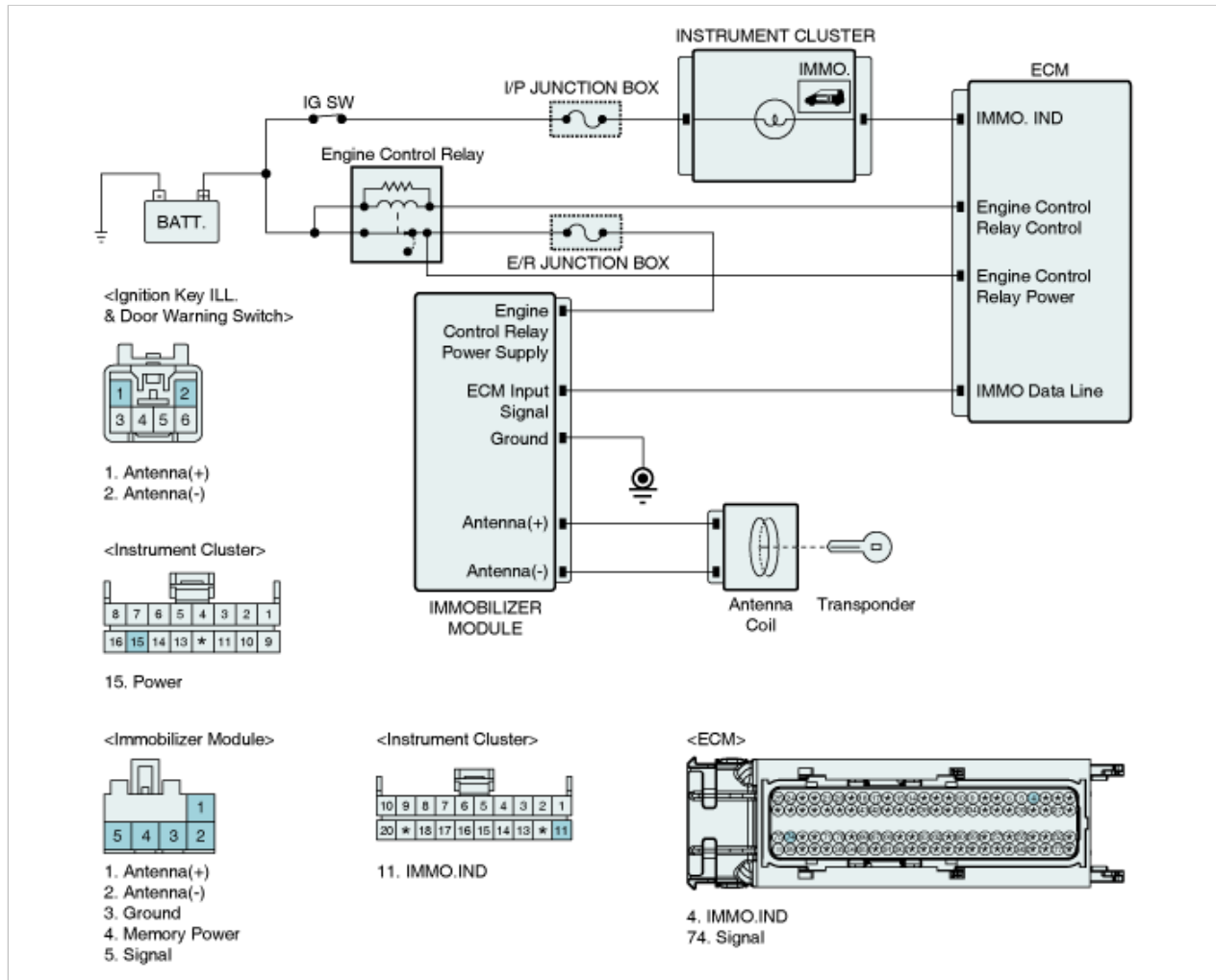
DTC Description

The ECM sets DTC P1699 if the maximum limit of Twice IGN is Exceeded.

DTC Detecting Condition

Item	Detecting Condition	Possible Cause
DTC Strategy	•	• Over time trial of Twice IGN
Enable Conditions	• IG ON	
Threshold value	• Twice IGN ≥ 32 times	
Detecting time	• -	
FAIL SAFE	• -	

Diagnostic Circuit Diagram



Monitor Scantool Data

- Check status
 - (1) IG "ON" & Engine "OFF"
 - (2) Monitor the "ECM, Key and Smartra Status" Parameter on the Scantool.

Specification : 'LEARNT'

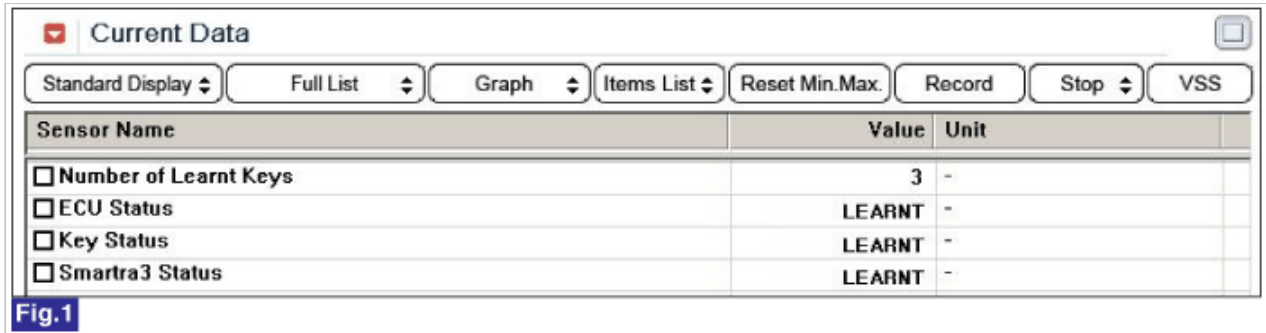


Fig.1

Fig.1) This data show that 3 keys have been taught, ECU has been learnt, Key in key cylinder has been learnt and SMARTRA3 has been learnt.

(3) Is the "ECU STATUS' Parameter "Locked"?

YES	►Keep "KEY ON" status for 1 hours to withdraw "Locked by Timer" status. Then turn the key OFF for 10seconds. Next register transponder and go to "Verification of Vehicle Repair" procedure.
NO	► Check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, damage on the ECM or SMARTRA. And this DTC has not erased in previous repair. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

Verification of Vehicle Repair

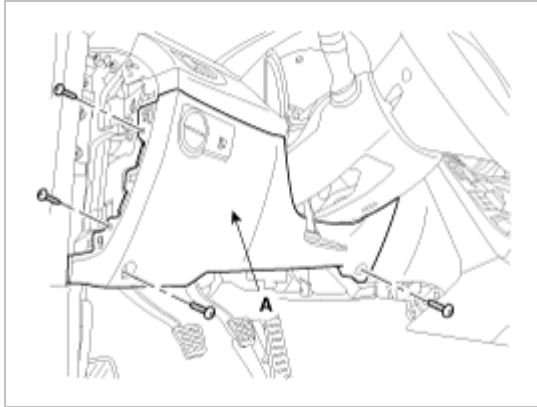
After a repair, it is essential to verify that the fault has been corrected.

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

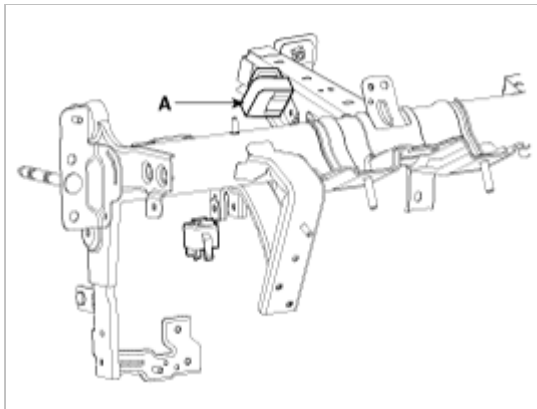
YES	► Go to the applicable troubleshooting procedure.
NO	► System is performing to specification at this time.

Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel (A).



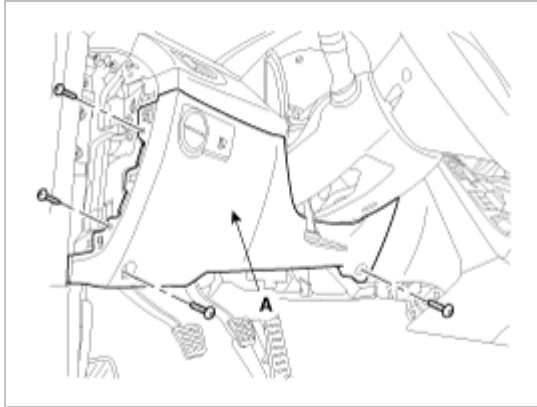
3. Disconnect the 5P connector of the SMARTRA unit and then remove the SMARTRA unit (A) after loosening the screw.



4. Installation is the reverse of removal procedure.

Replacement

1. Disconnect the negative (-) battery terminal.
2. Remove the crash pad lower panel (A).



3. Remove the steering column shaft (Refer to the ST group).
4. Disconnect the 6P connector of the coil antenna and then remove the coil antenna after loosening the screw.
5. Installation is the reverse of removal procedure.