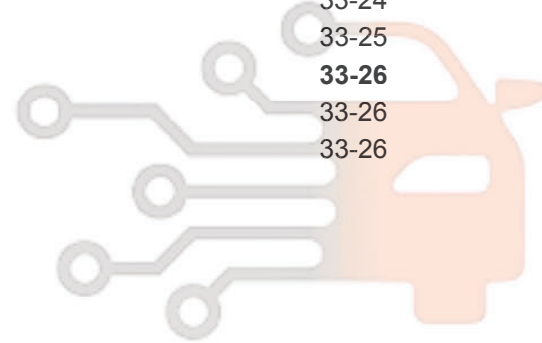


ENGINE IMMOBILIZER

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GENERAL INFORMATION

Description

Immobilizer system consists of key assembly (including transponder), immobilizer coil, BCM and engine control module (ECM). BCM is the main body, which realizes communication with transponder and engine management system. When key is inserted into ignition switch, if BCM and transponder are certificated successfully at specified time, engine control module sends a signal to engine so as to start vehicle.

Components Introduction

1. Body Control Module

- Main function of immobilizer control is realized in BCM, only engine immobilizer function of BCM is described in this section for convenience of narrative. IMMO is used to refer to immobilizer function, and hardware of IMMO is BCM. This is an electronic control module which includes microprocessor and various semiconductor elements; it stores authentication algorithm with transponder and ECM as well as necessary date for normal system operation and after-sale diagnostic service, such as key information, match information and trouble codes, etc. It controls realization mechanism of immobilizer function, works with each component in harmony and transfers command and data.

2. Transponder and immobilizer coil

- Transponder exists in each key of vehicle, and it is a passive device, that is, no batteries are needed. During system operation, this component completes crypto certification of IMMO together with immobilizer coil. Effective transmission distance for transponder information is 2 cm to 3 cm.
- Immobilizer coil is installed on ignition switch and connects with BCM through wire harness, to provide energy for signal transmission between BCM and transponder.

3. Engine Control Module (ECM)

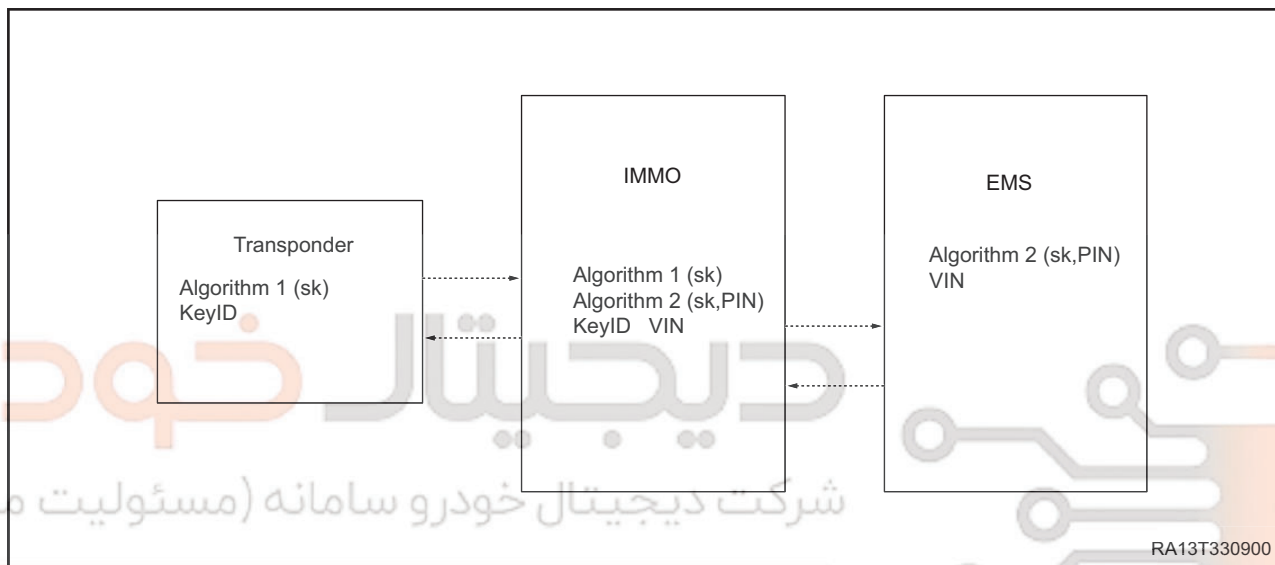
- Engine control module is service supplier of system, realizes authentication algorithm with IMMO, stores matching information, and sends certification request when power is on.

33 - ENGINE IMMOBILIZER

Operation

1. After key is inserted into ignition switch and turned from OFF to ON, IMMO enters wireless certification status and outputs energy and data to transponder through immobilizer coil, ECM also sends certification request to IMMO.
2. IMMO may not response immediately after receiving certification request from ECM, but response to ECM until IMMO and transponder certification completes.
3. After receiving correct wireless signal, transponder performs crypto certification with IMMO. If certification is successful, IMMO will response crypto certification from ECM; if certification fails, it will response nothing.
4. After receiving response from IMMO, ECM performs crypto certification again, if certification is successful, ECM allows to ignite; if certification fails, ECM does not start engine.

33



Specifications

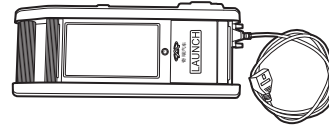
Torque Specifications

Description	Torque (N·m)
Instrument Panel Relay Box Fixing Bolt	0.7 ± 0.2
BCM Fixing Bolt	0.7 ± 0.2
Wireless Key Coupling Screw	0.7 ± 0.2

Tools

Special Tool

X-431 3G Diagnostic Tester

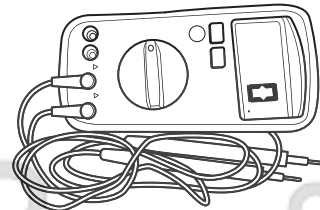


RCH0000001

General Tools

33

Digital Multimeter



RCH0000002

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33 - ENGINE IMMOBILIZER

Engine Immobilizer System Match

 CAUTION

- Never reset any control module during operation (unless under guidance of after-sale service department). If version of PC diagnostic tester must be 3.31 or higher, version of X-431 must be 56.80 or higher. When wrong security codes are input continuously, turn ignition switch to ON and input it again after waiting for a specified time.
- It is necessary to turn on ignition switch and wait for 10 seconds to enter again when entering wrong security code twice continuously. If wrong security code is entered again after 10 seconds, wrong numbers cannot be accumulated.

For example: if entering wrong security code twice continuously, but wrong security code is entered again after 10 seconds, internal counter will not record the current number and keep original number. If turning off ignition switch without waiting specified time, waiting time will be reset to 0 and recount, so be sure to wait and turn ignition switch to ON.

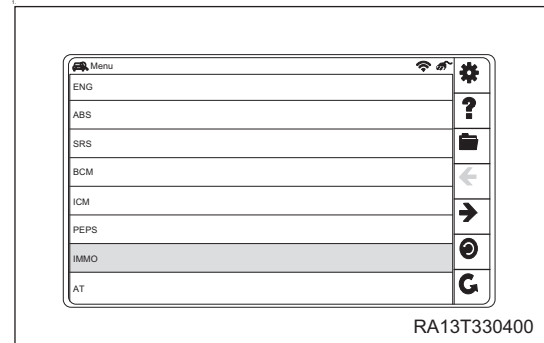
Waiting Time for Continuously Inputting Wrong Code

Number for Inputting Wrong Code	Number for Inputting Wrong Code	Waiting Time
0	0	0 s
1	1	10 s
2	2	10 min
3	3	20 min
4	4	40 min
5	5	80 min
6	6	160 min
7	7	320 min
8	8	640 min
9	9	1280 min
10	10	1280 min
> 10	10	1280 min

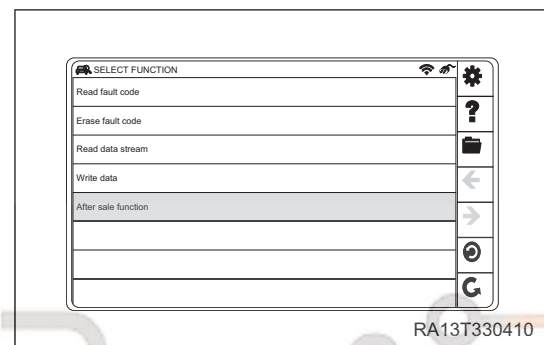
Engine Immobilizer System Match

Match engine immobilizer system after ECM replacement

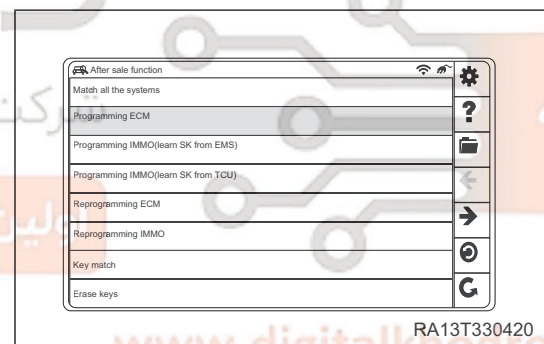
1. Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC), and make it communicate with vehicle electronic module through data network. Then select corresponding model (A13T) from X-431 3G diagnostic tester (the latest software) to enter the system and select "IMMO" system.



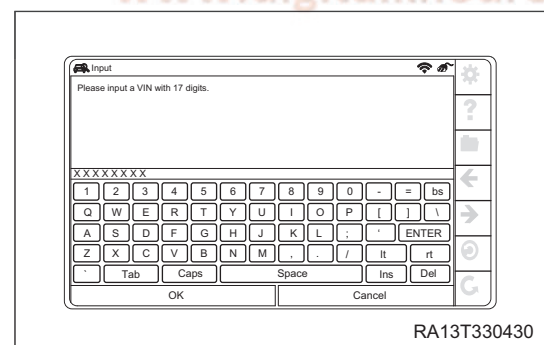
- a. Please select [After sale function] on SELECT FUNCTION screen



- b. Please select [Programming ECM] on After sale function screen

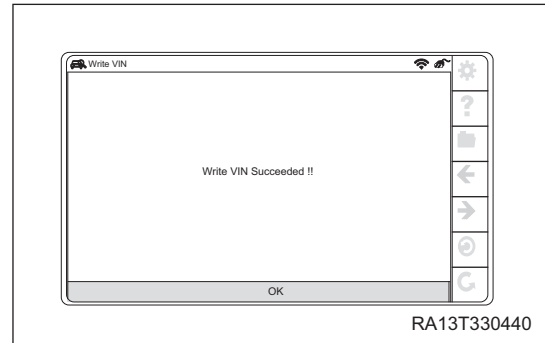


- c. Please input a VIN with 17 digits

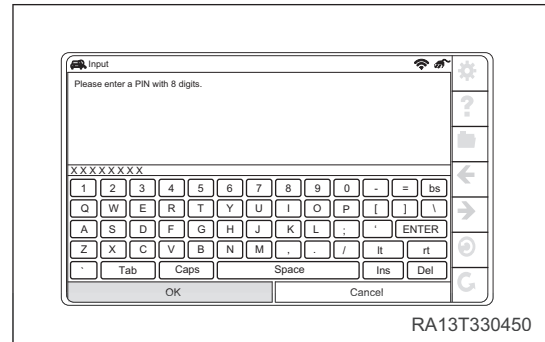


33 - ENGINE IMMOBILIZER

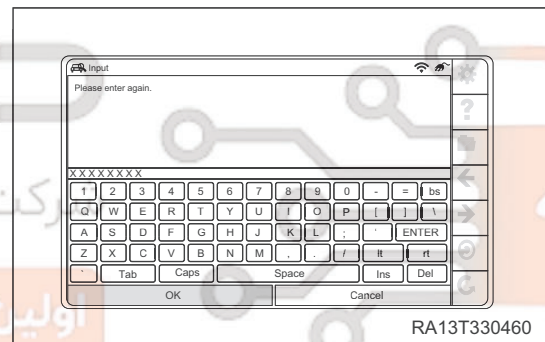
- d. Please select [Write VIN succeeded] on Write VIN screen



- e. When "Please enter a PIN with 8 digits" is displayed on Input screen, input PIN code and click "OK"

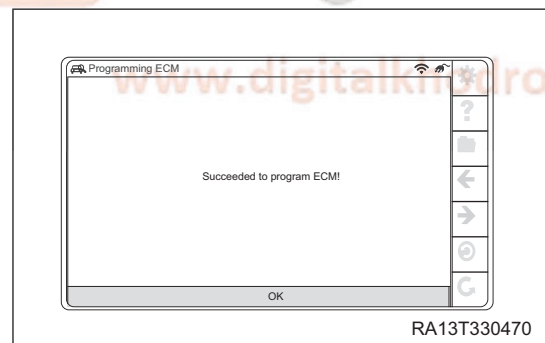


- f. When "Please enter again" is displayed on Input screen, input PIN code and click "OK".



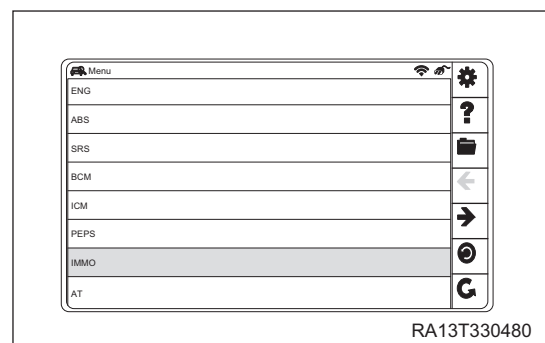
- g. When "Succeeded to program ECM" is displayed on Programing ECM screen, click "OK".

- h. ECM programing is complete.



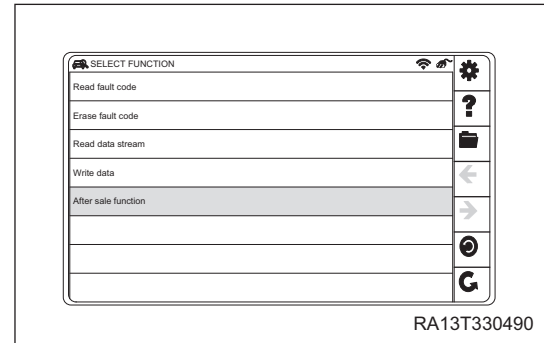
2. Replacement of BCM matching immobilizer system

Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC), and make it communicate with vehicle electronic module through data network. Then select corresponding model (A13T) from X-431 3G diagnostic tester (the latest software) to enter the system and select "IMMO" system

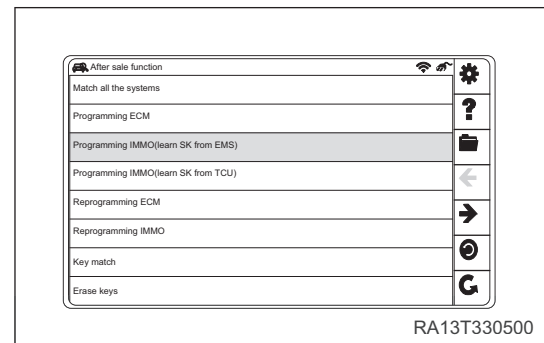


33 - ENGINE IMMOBILIZER

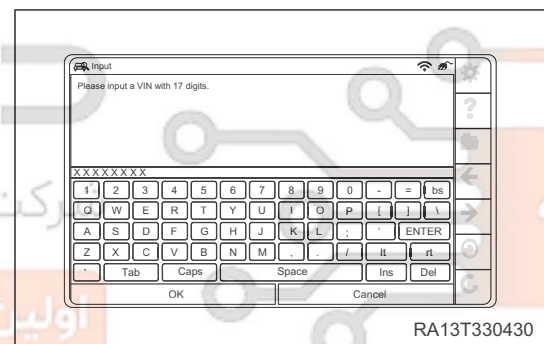
- a. Please select [After sale function] on SELECT FUNCTION screen



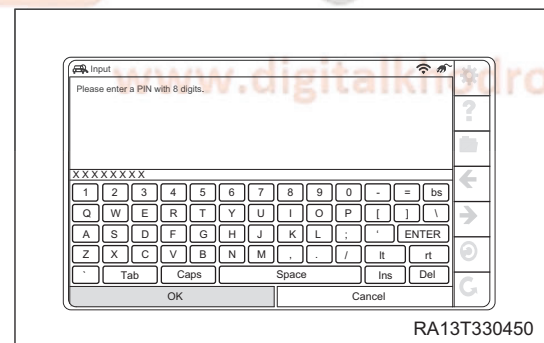
- b. Please select [Programming IMMO (learn SK from EMS)] on After sale function screen



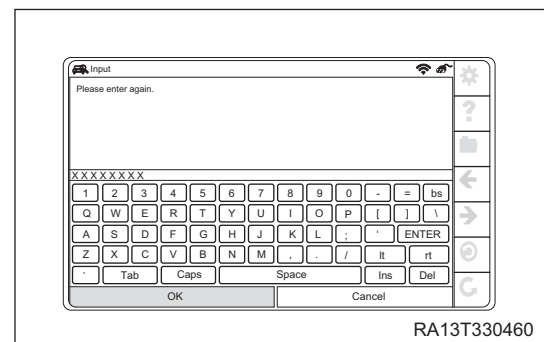
- c. Please input a VIN with 17 digits.



- d. When "Please enter a PIN with 8 digits" is displayed on Input screen, input PIN code and click "OK".

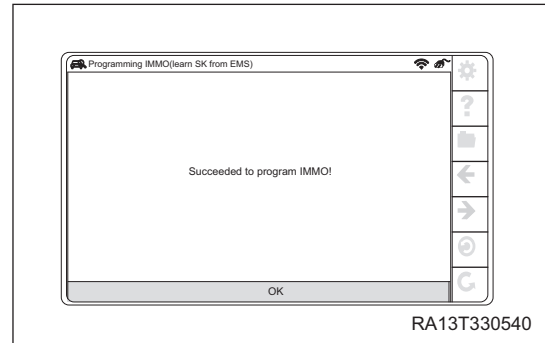


- e. When "Please enter again" is displayed on Input screen, input PIN code and click "OK".



33 - ENGINE IMMOBILIZER

- f. When "Succeeded to program IMMO" is displayed on Programming IMMO (learn SK from EMS) screen, click "OK".


CAUTION

33

After matching is complete, it is necessary to turn off ignition switch, disconnect diagnostic tester and wait for about 10 seconds, turn on ignition switch and wait for about 10 seconds and then turn on ignition switch and wait for about 10 seconds to ensure that system is certificated successfully. After ECM is replaced, it is necessary to perform "Add the old keys" and "Key learning" for original key.

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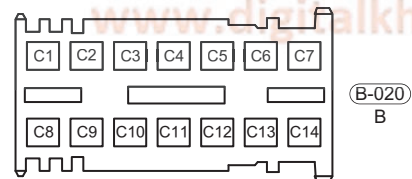
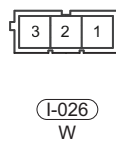
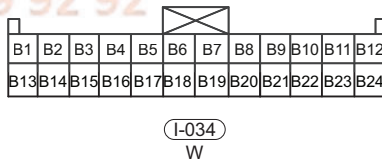
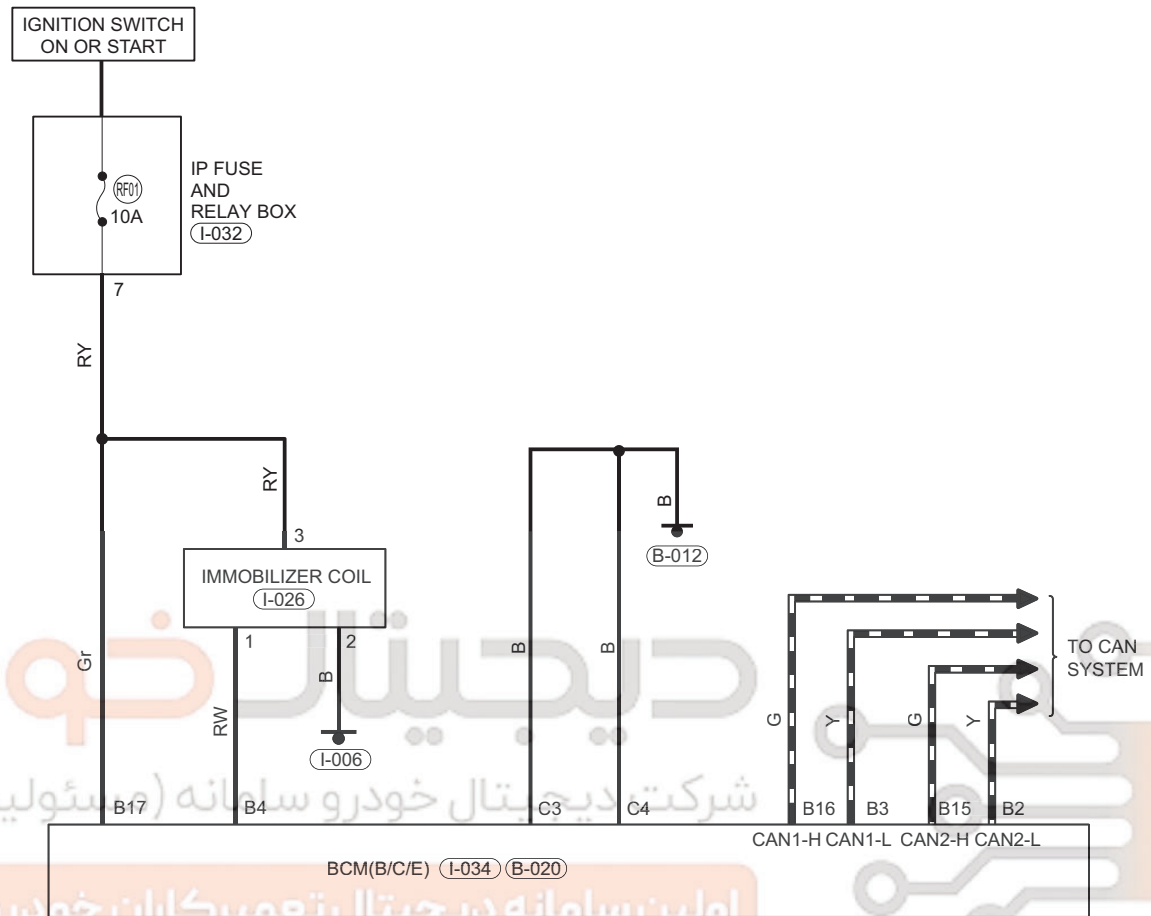


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Circuit Diagram

33



EA13T330010

33 - ENGINE IMMOBILIZER

DIAGNOSIS & TESTING**Problem Symptoms Table****HINT:**

Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair or adjust faulty components, or replace as necessary.

Symptom	Suspected Area	See page
Engine has been started	Wire harness or connector	55-35
	Anti-theft Coil	55-44
	ECM	16-9
	Key transponder	33-22
	IMMO (BCM)	46-18
Diagnostic tester cannot communicate with immobilizer system	Wire harness or connector	55-35
	Diagnostic Interface	-
	IMMO (BCM)	46-18
Diagnostic tester cannot communicate with immobilizer system	Wire harness or connector	55-35
	Diagnostic Interface	-
	ECM	16-9
Key cannot be matched	Wire harness or connector	55-35
	Anti-theft Coil	55-44
	Key assembly	33-22
	IMMO (BCM)	46-18

Diagnosis Tools**X-431 3G Diagnostic Tester**

When connecting X-431 3G diagnostic tester:

- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC) for communication with vehicle.
- DLC is located at the driver side instrument panel crossmember.
- DLC uses a trapezoidal design which can hold 16 terminals.

Digital Multimeter

When using digital multimeter:

- Troubleshoot electrical malfunctions and wire harness system.
- Look for basic fault.
- Measure voltage, current and resistance.

Diagnostic Help

1. Connect X-431 3G Diagnostic tester (the latest software) to Data Link Connector (DLC), and make it communicate with vehicle electronic module through data network.
2. Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
3. If DTC cannot be deleted, the malfunction is current.
4. Only use a digital multimeter to measure the voltage of electronic system.
5. Refer to any Technical Bulletin that may apply to the malfunction.
6. Visually check related wire harness.
7. Check and clean all immobilizer system grounds related to the latest DTC.
8. If multiple trouble codes were set, use circuit diagrams and look for any common ground circuit or power supply circuit applied to the DTC.

Intermittent DTC Troubleshooting

33

If malfunction is intermittent, perform the followings:

- Check if connectors are loose.
- Check if wire harnesses are worn, pierced, pinched or partially broken.
- Wiggle related wire harnesses and connectors and observe if related circuit signal is interrupted.
- Look for the data that has changed or the DTC to reset during the wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Inspect the mounting areas of Engine Control Module (ECM), Body Control Module (BCM) wire harness or wire harness connector and so on for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and grounding parts related to the current DTC.

Ground Inspection

Groundings are very important to entire circuit system, which are normal or not can seriously affect the entire circuit system. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) and oxidation may increase load resistance. This situation will seriously affect the normal operation of circuit. Check the ground points as follows:

1. Remove ground bolt or nut.
2. Check all contact surfaces for tarnish, dirt and rust, etc.
3. Clean as necessary to ensure that contacting is in good condition.
4. Reinstall the ground bolt or nut securely.
5. Check if add-on accessories interfere with ground circuit.
6. If several wire harnesses are crimped into one ground eyelet terminal, check if they are installed correctly. Make sure all wire harnesses are clean, securely fastened and providing a good ground path.

33 - ENGINE IMMOBILIZER

Diagnosis Procedure

HINT:

Use following procedures to troubleshoot the constant speed cruise system.

1	1 Vehicle brought to workshop
----------	--------------------------------------

NEXT

2	Check battery voltage
----------	------------------------------

Standard voltage: 11 to 14 V

If voltage is below 11 V, recharge or replace battery before proceeding to next step.

NEXT

3	Customer problem analysis
----------	----------------------------------

NEXT

4	Check for DTCs (current DTC and history DTC)
----------	---

DTC
occurs

For current DTC, go to step 6

No DTC

For history DTC, go to step 7

NEXT

5	Problem repair (no DTC), then go to step8
----------	--

NEXT

6	Troubleshoot according to Diagnostic TroubleCode (DTC) chart, then go to step 8
----------	--

NEXT

7	Troubleshoot according to Problem SymptomsTable, then go to step 8
----------	---

NEXT

33 - ENGINE IMMOBILIZER

8	Adjust, repair or replace
---	---------------------------

NEXT

9	Conduct test and confirm malfunction has been repaired
---	--

NEXT

10	End
----	-----

Diagnostic Trouble Code (DTC) Chart

33

DTC Code	DTC Definition
B1300	Internal Control Module EEPROM Error
B1301	Immobilizer and ECM Authentication Failed
B1302	VIN Not Programmed
B1303	The Antenna Communication is Disturbed
B1304	None Transponder was Detected
B1305	Immobilizer has None Key was Storage
B1306	Security Code was not Programmed
U0100	Lost Communication With ECM Authentication Frame
U0101	Lost Communication With TCU Authentication Frame
U0073	Control Module Communication Bus Off
B1307	Immobilizer and Transponder Authentication Failed

33 - ENGINE IMMOBILIZER

DTC	B1300	Internal Control Module EEPROM Error
DTC	B1301	Immobilizer and ECM Authentication Failed
DTC	B1302	VIN Not Programmed
DTC	B1303	The Antenna Communication is Disturbed
DTC	B1304	None Transponder was Detected
DTC	B1305	Immobilizer has None Key was Storage
DTC	B1306	Security Code was not Programmed
DTC	U0100	Lost Communication With ECM Authentication Frame
DTC	U0101	Lost Communication With TCU Authentication Frame
DTC	B1307	Immobilizer and Transponder Authentication Failed
DTC	U0073	Control Module Communication Bus Off

DTC	DTC Definition	DTC Detection Condition	Possible Cause
B1300	Internal Control Module EEPROM Error	Ignition switch ON	IMMO, key assembly, IMMO
B1301	Immobilizer and ECM Authentication Failed	Ignition switch ON	Wire harness connector, immobilizer coil, key assembly, ECM, IMMO, CAN
B1302	VIN Not Programmed	Ignition switch ON	Wire harness connector, immobilizer coil, key assembly, ECM, IMMO, CAN
B1303	The Antenna Communication is Disturbed	Ignition switch ON	Wire harness connector, CAN, IMMO
B1304	None Transponder was Detected	Ignition switch ON	Wireless key assembly, wire harness connector, immobilizer coil, IMMO, CAN
B1305	Immobilizer has None Key was Storage	Ignition switch ON	Wireless key assembly, wire harness connector, immobilizer coil, IMMO
B1306	Security Code was not Programmed	Ignition switch ON	Immobilizer coil, wireless key assembly, meter, IMMO
U0100	Lost Communication With ECM Authentication Frame	Ignition switch ON	Immobilizer coil, wire harness connector, ECM, IMMO, CAN

33 - ENGINE IMMOBILIZER

DTC	DTC Definition	DTC Detection Condition	Possible Cause
U0101	Lost Communication With TCU Authentication Frame	Ignition switch ON	Immobilizer coil, wire harness connector, TCU, IMMO, CAN
U0073	Control Module Communication Bus Off	Ignition switch ON	Wire harness connector, IMMO, CAN
B1307	Immobilizer and Transponder Authentication Failed	Ignition switch ON	Wire harness connector, IMMO, CAN, Immobilizer coil

DTC Confirmation Procedure

Confirm that battery voltage is between 11 V and 14 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester to Data Link Connector (DLC) - the latest software.
- Turn ignition switch to ON.
- Using diagnostic tester, select Read Datastream.
- If datastream is not detected, the malfunction is current. Go to diagnosis procedure - Step 1.
- If datastream is detected, the malfunction is current.

33

CAUTION

When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Diagnosis Procedure**1 Check key assembly**

- Check key assembly (a) Connect diagnostic tester to malfunctioning vehicle, turn ignition switch to ON and read key status using diagnostic tester. Read transponder programming status and transponder ID position in engine immobilizer system.
- If response status of transponder is "unprogrammed", enter "Add new keys" operation procedure;
- If response status of transponder is "programmed" and transponder ID is not in engine immobilizer system, enter "Add the old keys" operation procedure;
- If response status of transponder is "programmed" and transponder ID is in engine immobilizer system, and SK in key is different from SK in IMMO, replace transponder and enter "Add new keys" operation procedure.
- If response status of transponder is "unprogrammed" and transponder ID is in engine immobilizer system, and SK in key is same as SK in IMMO, continue to troubleshoot.

NG

Replace key assembly

OK

33 - ENGINE IMMOBILIZER

2**Reconfirm DTCs**

- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester (the latest software) to record and clear DTCs stored in engine immobilizer system.
- Turn ignition switch to LOCK and wait for a few seconds.
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester (the latest software) to read DTCs stored in engine immobilizer system again.
- Read DTCs.

33

Result	Proceed to
B1300 B1301 B1302 B1303 B1304 B1305 B1306 U0100 U0101 U0073 B1307	NG
No DTC is output	OK

NG

Go to step 3

OK

System is normal

NEXT

3**Check immobilizer coil**

- Check coil appearance for obvious damage.
- Remove immobilizer coil from malfunctioning vehicle, then install it to a new vehicle and perform test.
- Check the system operation.

NG

Replace immobilizer coil

OK

4**Check IMMO**

- Turn ignition switch to ON. Connect X-431 to enter diagnostic IMMO status of engine immobilizer system.
- Read IMMO electronic tag, trouble code, data flow, and print these information using diagnostic tester; if communication cannot be established, fill information such as trouble description etc. into trouble feedback table, and then proceed to CAN network troubleshooting.

NG

Replace IMMO and BCM with new ones
and rematch with diagnostic tester

OK

33 - ENGINE IMMOBILIZER

5 Check engine control module

- Turn ignition switch to ON. Connect X-431 to enter diagnostic ECM status of engine management system.
- Read ECM electronic tag, trouble codes, data flow, and print these information using diagnostic tester. If communication cannot be established, fill information such as trouble description etc. into trouble feedback table, and then proceed to CAN network troubleshooting.

NG

Replace ECM with a new one and rematch it with diagnostic tester

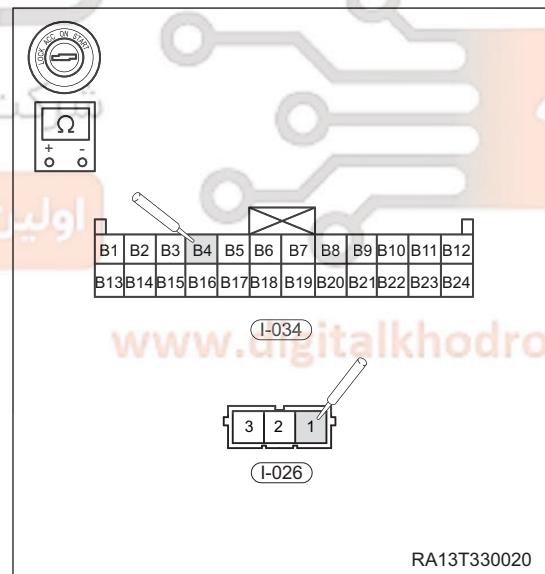
OK**6 Check wire harness connectors of entire vehicle****33**

- Turn ignition switch to LOCK.
- Disconnect the negative battery cable.
- Disconnect BCM connector I-034 and immobilizer coil connector I-026.
- Using a digital multimeter, check for continuity between BCM connector I-034 and immobilizer coil connector I-026 according to the table below.

Normal Condition

Multimeter Connection	Condition	Specified Condition
I-034 (B4) - I-026(1)	Always	Continuity

- Check engagement and disengagement between immobilizer coil I-026 (2) and ground

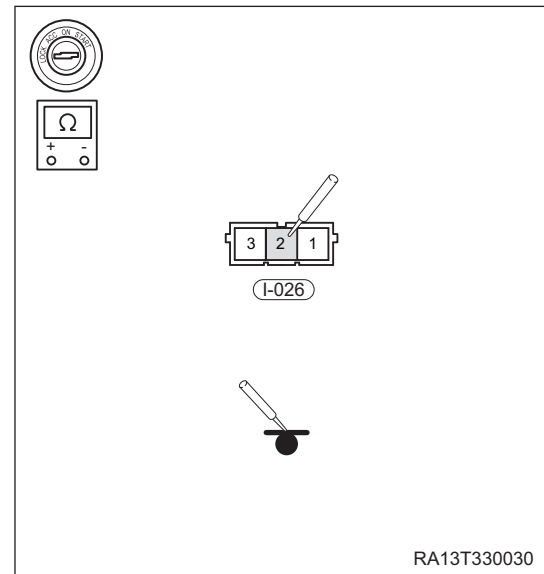


33 - ENGINE IMMOBILIZER

Normal Condition

Digital Multimeter	Condition	Specified Condition
I-026(2) - Ground	Always	No continuity

- f. Check CAN network for problems.
g. Using a digital multimeter, measure the resistance of IMMO connector CAN network according to table below.

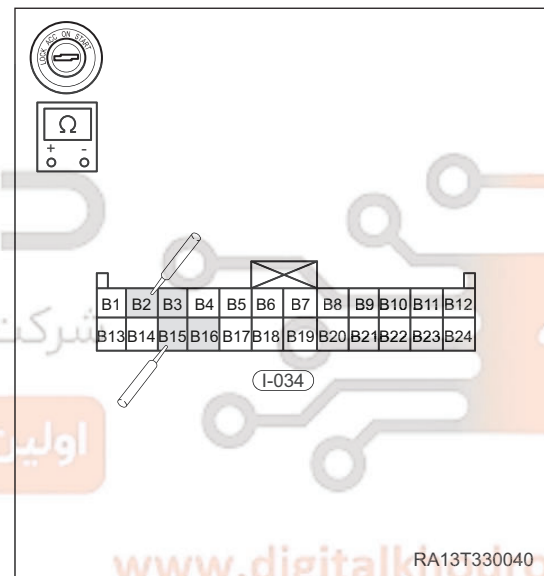


33

Normal Condition

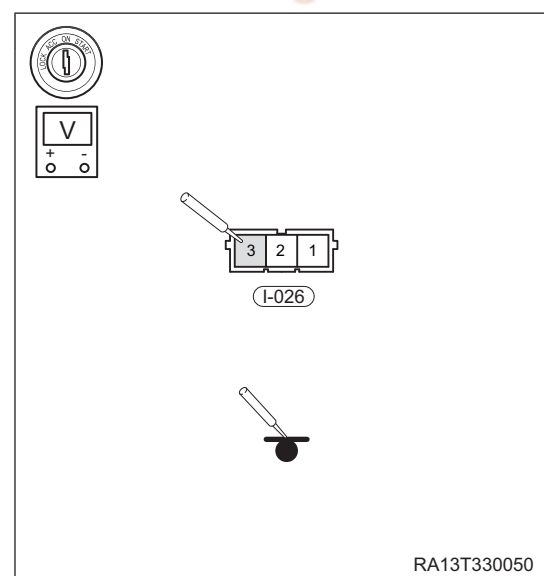
Digital Multimeter	Condition	Specified Condition
I-034 (B15) - I-034(B2)	Always	60 Ω
I-034 (B16) - I-034(B3)	Always	60 Ω

- h. Check power supply voltage
i. Using a digital multimeter, measure voltage between immobilizer coil connector I-026(3) and body ground.



Normal Condition

Digital Multimeter	Condition	Specified Condition
I-026 (3) - Ground	Ignition switch ON	11 V or higher



NG	Repair or replace fuse, wire harness connector
OK	System is normal

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ON-VEHICLE SERVICE

Transponder

HINT:

As transponder in key is an electronic part of high accuracy, pay attention to followings during service:

- Do not throw or hit key, which may cause severe impact;
- Do not put key in high temperature (90°C or more) for a long time;
- Do not put key in water or other fluid;
- Do not put key in strong magnetic field or electromagnetic field.

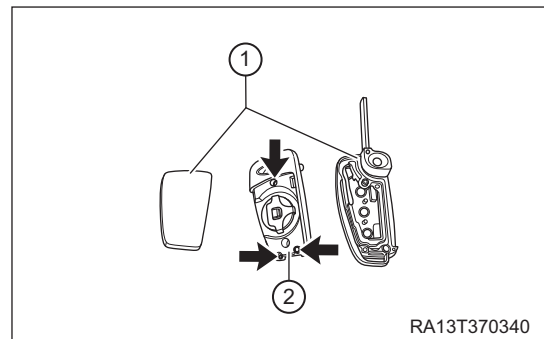
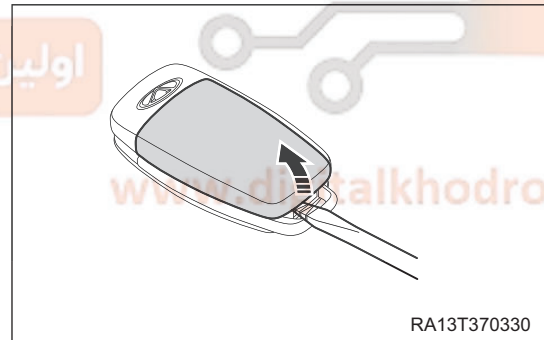
CAUTION

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- DO NOT push the terminals with your hands, when removing wireless key.
- Make sure battery positive and negative are installed correctly, when removing wireless key cover.
- DO NOT pry up battery forcibly, after removing wireless key cover. Otherwise, terminals may be damaged.
- DO NOT touch battery with wet hands, after removing wireless key cover. Otherwise, water may cause rust.
- DO NOT touch or move any components inside transmitter, after removing wireless key cover. Failure to do so may interfere with proper operation.

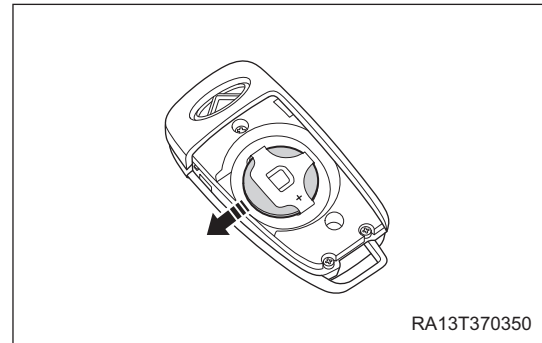
Removal

1. Remove the transponder.
 - a. Using a screwdriver wrapped with protective tape, pry off the wireless key cover as shown in illustration.
- b. Remove 3 screws (arrow), separate wireless key covers (1) and chip (2).
(Tightening torque: $0.7 \pm 0.3 \text{ N}\cdot\text{m}$)

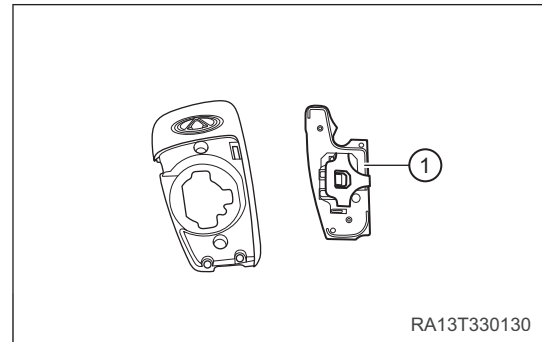


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- c. Disengage claw from battery holder, and remove the battery in direction of arrow.



- d. Remove the transponder (1).



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Installation

Installation is in the reverse order of removal.

CAUTION

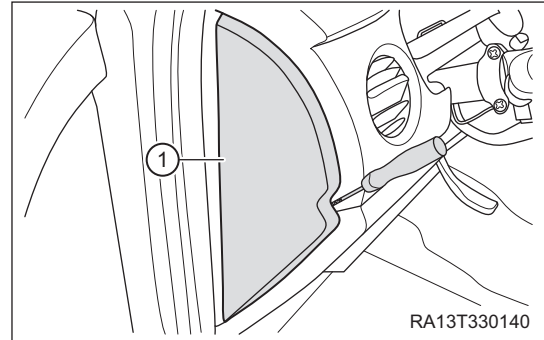
- Check that wireless key and transponder can operate properly, after installing transponder.

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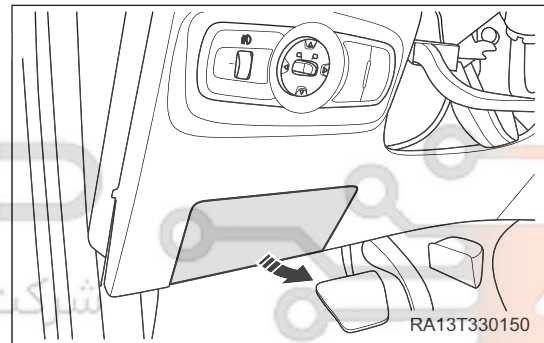
Immobilizer Control Module (BCM)

Removal

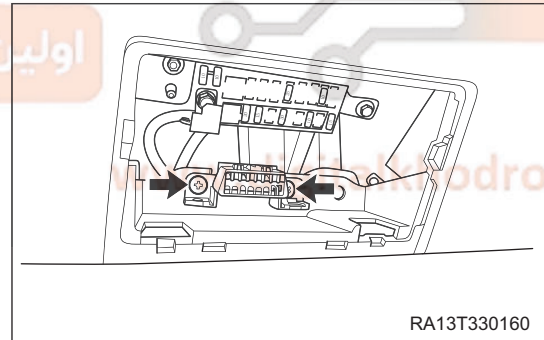
1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the BCM assembly.
 - a. Using a screwdriver wrapped with protective tape, pry off clips from instrument panel left end cover assembly, and remove instrument panel left end cover assembly (1).



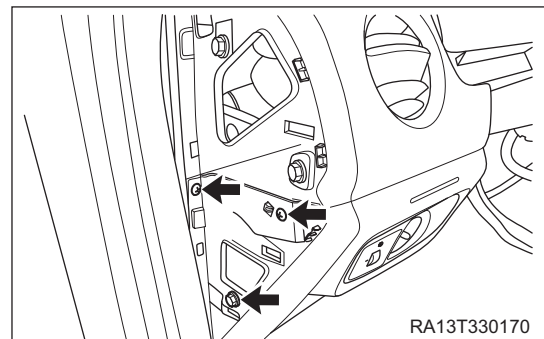
- b. Open small cover plate on instrument panel lower left storage box assembly in the direction of arrow as shown in the illustration.



- c. Remove 2 screws (arrow) on diagnostic connector, loosen diagnostic connector.

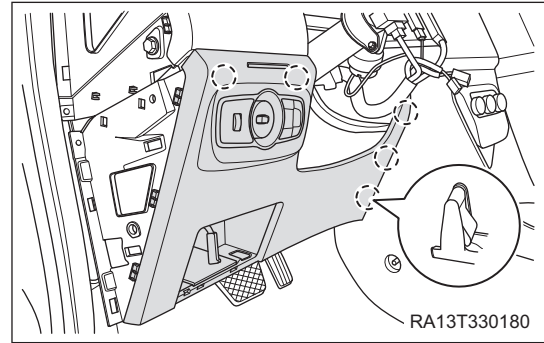


- d. Remove 2 screws (arrow) on left protector and bolt (arrow)



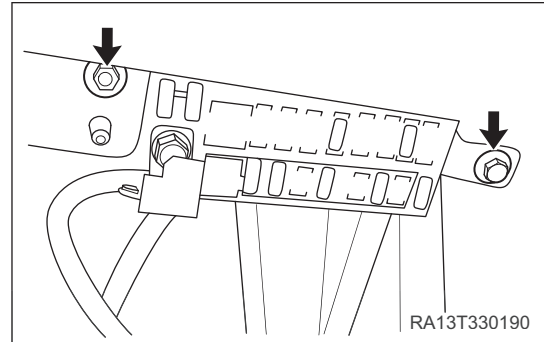
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- e. Using a screwdriver wrapped with protective tape, pry off clips from instrument panel lower left protector assembly, and remove instrument panel lower left protector assembly.



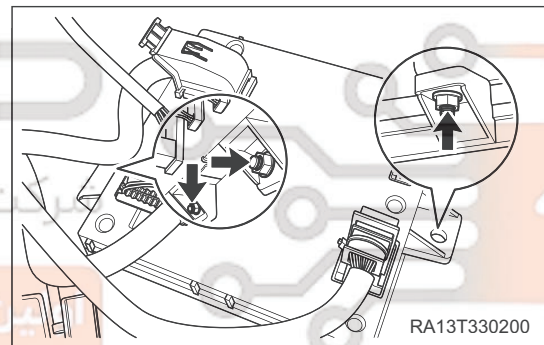
- f. Remove 2 bolts (arrow) and move away fuse relay box.

(Tightening torque: $1 \pm 0.5 \text{ N}\cdot\text{m}$)



- g. Disconnect all connectors from BCM and remove 3 bolts (arrow).

(Tightening torque: $1 \pm 0.5 \text{ N}\cdot\text{m}$)



- h. Remove the BCM.

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Installation

Installation is in the reverse order of removal.

HINT:

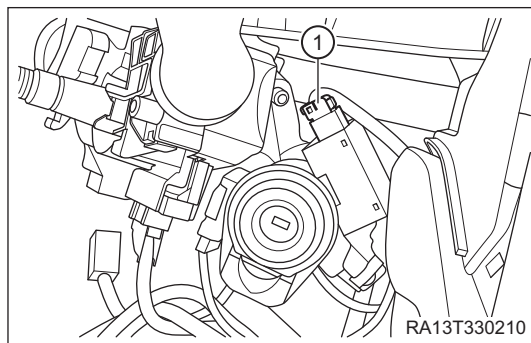
Be sure to perform match operation so that replaced BCM can operate properly on original vehicle. Make sure input VIN code and PIN code are correct during operation. After replacing BCM, perform "Add the old keys" operation for original key, then it can be available.

33 - ENGINE IMMOBILIZER

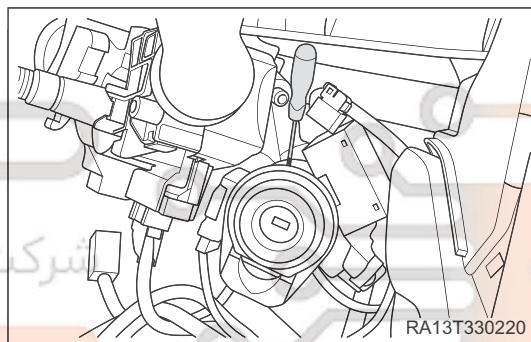
Anti-theft Coil

Removal

1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the combination switch cover (See page 28-11).
4. Remove the immobilizer coil.
 - a. Disconnect the immobilizer coil connector (1).



- b. Using a screwdriver wrapped with protective tape, pry off connection between immobilizer coil and ignition switch.



Installation

Installation is in the reverse order of removal.