02- Engine

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Ignition System

Technical specifications

Components

Name	Specification
Standard clearance between spark plug electrodes	About 0.7~0.9mm

Torque Specifications

Name	Torque range	
	Metric(Nm)	British(lb-ft)
Ignition coil fixing bolt	11	8
Spark plug	30	22

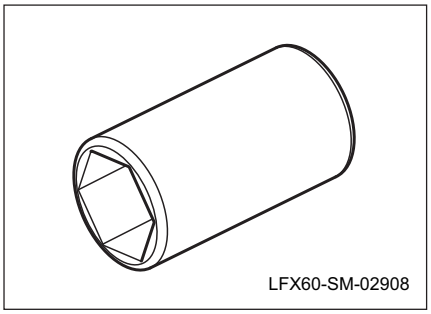
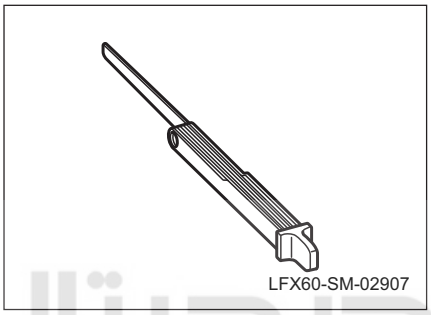
Precautions

Precautions

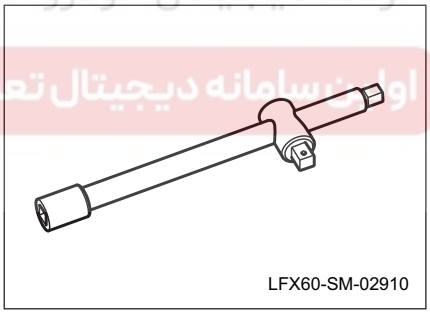
1. Do not damage the spark plug thread when removing the spark plug.
2. Do not drop or knock the spark plug electrode.
3. Do not exceed 2s for spark plug firing test.

Preparation

Special maintenance tools

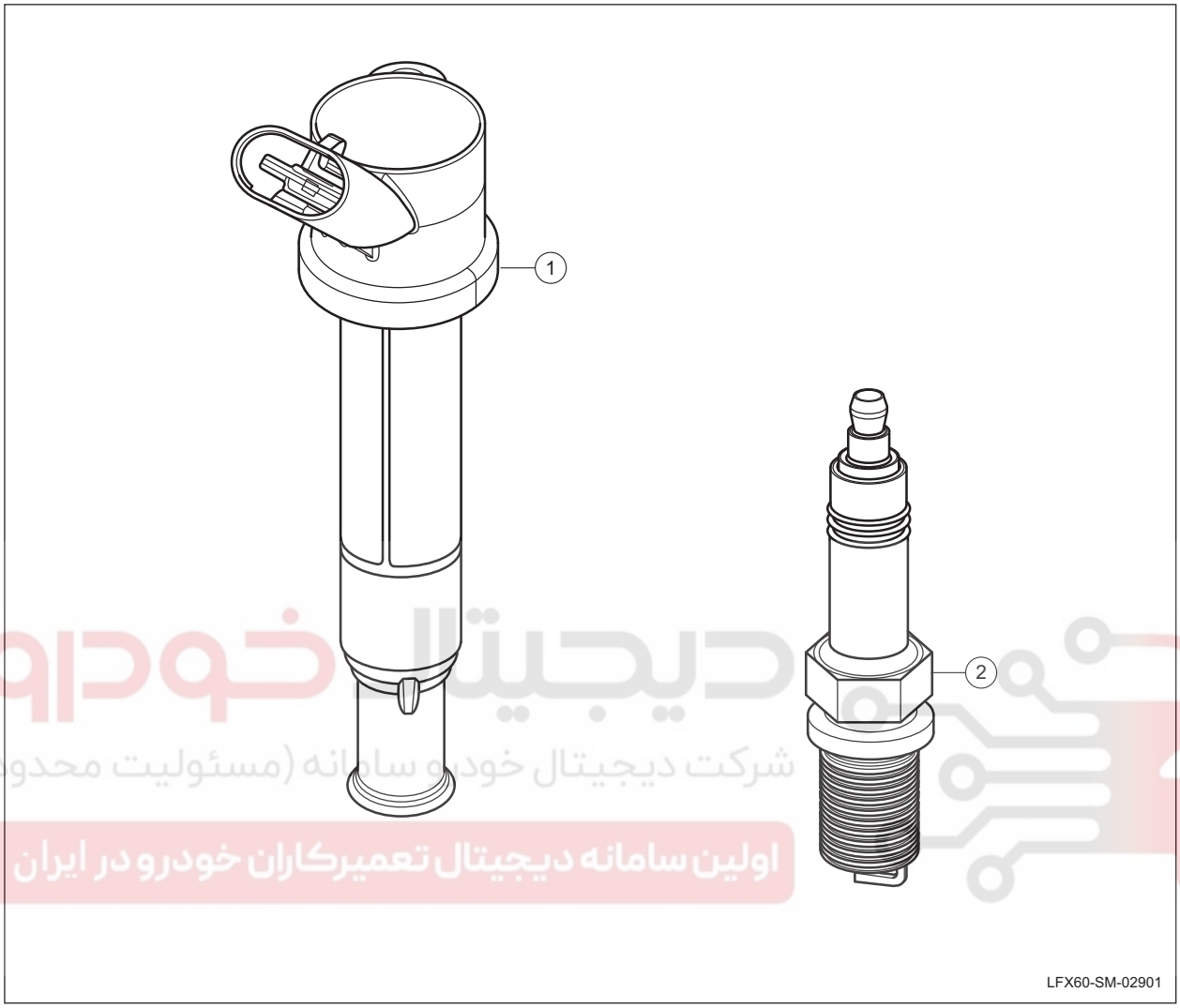
No.	Tool name	Tool figure	Tool code	Remarks
1	Sleeve	 LFX60-SM-02908	-	Remove the spark plug
2	Thickness gauge	 LFX60-SM-02907	-	Measure the spark plug clearance

General maintenance tools

No.	Tool name	Tool figure	Tool code	Remarks
1	Extension bar	 LFX60-SM-02910	-	Remove the spark plug

Structure and installation location

Part exploded view



No.	Part Name
1	Ignition coil

No.	Part Name
2	Spark plug

General Inspection

Ignition spark test

⚠Warning:

- **Testing flashover directly with ignition coil may cause personal injury and module damage.Do not use ignition coil directly for ignition spark test.**
- **The engine temperature is very high under operation, any burn should be avoided when working on the engine just shut down.**

1. Push the shift lever to "N", and apply the parking brake reliably.
2. Turn the ignition switch to "LOCK" and disconnect the injector plug.

⚠Warning:

The connection of the fuel injector may cause a fire.

3. Disconnect the ignition coil assembly, and remove the spark plug.
4. Connect the ignition coil assembly with the spark plug, and ground the spark plug at the reliable engine grounding point.
5. Start the engine and observe the spark plug status.
6. After the engine stops, turn the ignition switch to "LOCK".
7. Install spark plug and ignition coil.
8. Connection the fuel injector plug.

Operating Principle

System Overview

The engine adopts the non-distributor direct ignition system. The system is mainly composed of ECU, ignition coil, spark plug, crankshaft position sensor, camshaft position sensor and knock sensor.

With no distributor ignition system, ECU can control the optimal ignition timing based on various engine load conditions, to ensure that the engine output power, acceleration, economy and exhaust emissions are reach the ideal status, and the voltage on the ignition system will not be decreased with the increase of the speed. Since there is no mechanical component, there is no mechanical error.

Ignition coil can not be repaired and must be replaced as a whole.

Diagnostic Information and Procedures

Diagnosis Instructions

Before starting to diagnose a fault in the ignition system, familiarize yourself with the operating principle of the ignition system, and then start the system diagnostics, which helps to determine the correct troubleshooting steps in the event of a failure. More importantly, this also helps to determine whether the customer's situation

Any troubleshooting of the ignition system should begin with the ignition system check, so as to instruct the service personnel to take the next logical step to troubleshoot. Comprehend and correctly use the diagnostic flow chart to shorten the diagnosis time and avoid the misjudgement.

General equipment

Digital universal meter
Thickness gauge
Ignition timing gun
Diagnostic equipment of vehicle

Visual Inspection

1. Confirm the problem of the customer.
2. Visually check whether there is any obvious mechanical or electrical damage sign.

Visual inspection table

Electrical
• Fuse • Harness or plug • Spark plug • Ignition coils • ECM

3. If the observed or proposed problem is obvious and its cause is identified, rectify the cause before proceeding with next step.
4. If for the problem, there are no obvious findings, then confirm the fault and refer to the symptom table.

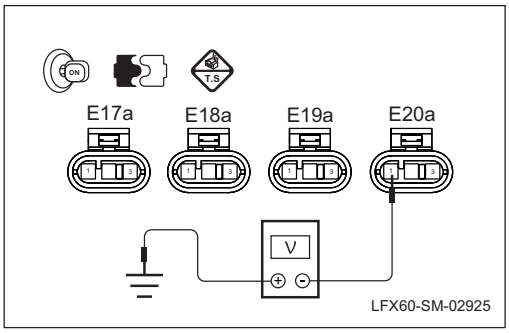
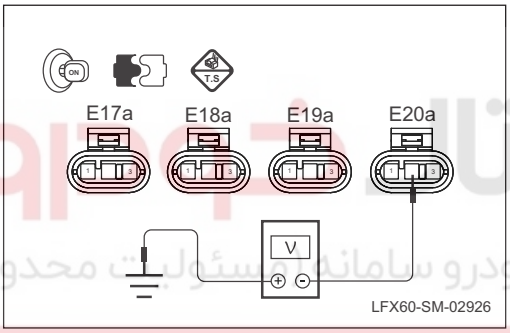
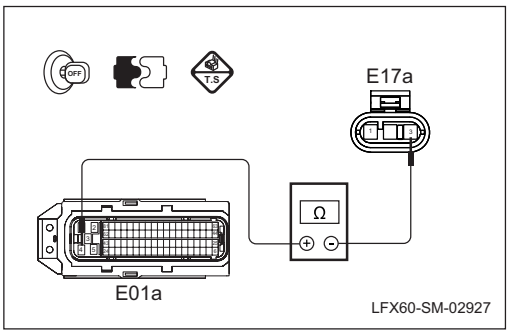
List of fault symptoms

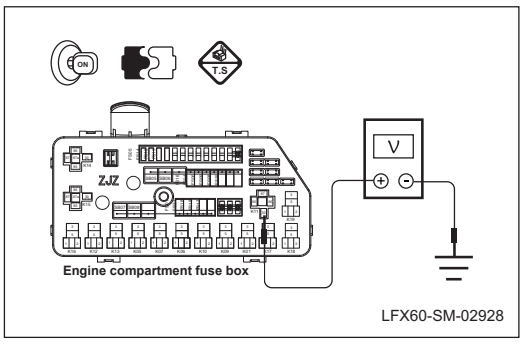
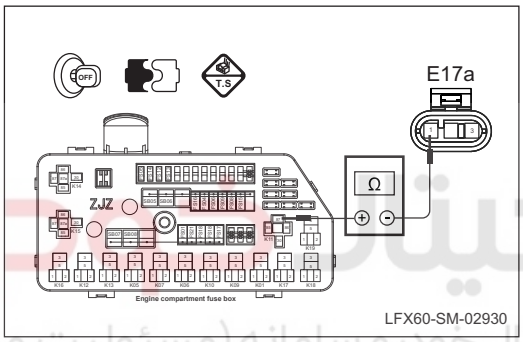
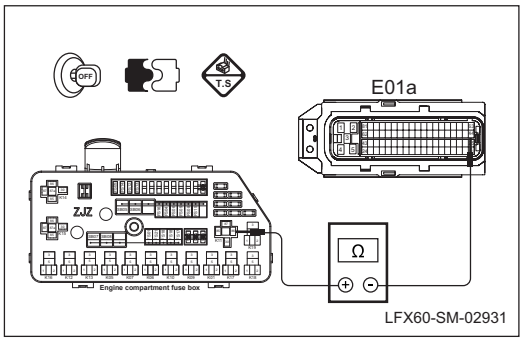
If the vehicle fails, no trouble code is detected by the engine control module (ECM), and no significant fault location is found after visual inspection and general inspection, it is recommended that troubleshooting should be carried out according to diagnostic ideas and processes of the table below.

Symptom	Possible point of failure	Recommended Measures
The engine is shaken	• Spark plugs	• Spark plug test
	• Ignition coils	• Check the ignition coil (replace, if necessary)
	• Engine suspension device	• Check the engine and transmission suspension (replace, if necessary)
The spark plug is not fired	• Fuse	**Refer to: Diagnostic process for spark plug failure in jump spark**
	• Ignition control line	
	• Spark plugs	
	• Ignition coils	
	• Crankshaft position sensor	
	• ECM	**Refer to:Diagnosis process for engine power shortage**
Insufficient engine power	• Ignition coils	
	• Spark plugs	
	• ECM	

Diagnostic process for spark plug failure in jump spark

Test condition	Details/results/measures
1. Check the engine DTC.	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and check the engine system. Is there DTC related to the ignition control? →**Yes** **Refer to: Diagnostic trouble code (DTC) list. Perform DTC diagnostic procedure.** →**No** To step 2.
2. Check the fuse.	
	A. Operate the ignition switch to turn the power to OFF state. B. Check fuses FS15 and FS14 in the electrical box of engine compartment. **Fuse rated capacity: 25A(FS15), 15A(FS14)** Is it OK after checking? →**Yes** To step 3. →**No** Replace the fuse.
3. Check the spark plug.	
	A. Remove the spark plug. B. Spark plug test. **Refer to: Spark plug test** Is the spark plug normal? →**Yes** To step 4. →**No** Replace the spark plug. **Refer to: Spark plug replacement**
4. Check the ignition coil.	
	A. Execute ignition coil test program. Is the ignition coil normal? →**Yes** To step 5. →**No** Replace the ignition coil. **Refer to: Ignition coil replacement**

Test condition	Details/results/measures
5. Check the ignition coil input voltage.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ignition coil harness plug E17a, E18a, E19a, E20a. D. Connect the battery negative terminal. E. Operate the ignition switch to turn the power to ON state. F. Use a multimeter to measure the voltage between the terminal 1 of E17a/E18a/E19a/E20a and the reliable ground point. **Standard value:11 ~ 14V** Is the voltage normal? →**Yes** To step 6. →**No** To step 8.
6. Check the ignition coil ground line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ignition coil harness plug E17a, E18a, E19a, E20a. D. Use a multimeter to measure the resistance between the terminal 2 of E17a/E18a/E19a/E20a and the ground point. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 7. →**No** Repair the ignition coil ground circuit fault and replace the harness if necessary.
7. Check the ignition drive signal line.	
	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Disconnect the ignition coil harness plug E17a, E18a, E19a, E20a. D. Disconnect the EMC harness plug E01a. E. Use a multimeter to measure the resistance between the terminal 3 of E17a/E18a/E19a/E20a and the points 4, 81, 1 and 62 of ECM harness plug E01a, respectively. **Standard value: Less than 5Ω** Is the resistance normal? →**Yes** To step 8. →**No** Check the ignition drive signal line for fault; and replace, if necessary.

Test condition	Details/results/measures
8. Check the power circuit of K11 main relay.	
 LFX60-SM-02928	A. Operate the ignition switch to turn the power to OFF state. B. Remove the K11 main relay in the engine compartment electrical box. C. Use a multimeter to measure the voltage between the terminals 30 and 85 of K11 main relay in the engine compartment electrical box and the reliable ground point. **Standard value:11 ~ 14V** Is the voltage normal? **→Yes** To step 9. **→No** Repair the K11 main relay power line; if necessary, replace the harness.
9. Check the ignition coil input voltage line.	
 LFX60-SM-02930	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the engine compartment fuse box K11 main relay. D. Disconnect the ignition coil harness plugs E17a, E18a, E19a, and E20a. E. Use a multimeter to measure the resistance between the terminal 87 of the main relay k11 in the engine compartment electrical box and terminal 1 of ignition coil harness plugs E17a, E18a, E19a, and E20a. **Standard value: Less than 5Ω** Is the resistance normal? **→Yes** To step 10. **→No** Check the ignition coil input voltage line for fault; and replace the harness, if necessary.
10. Check the control circuit of K11 main relay.	
 LFX60-SM-02931	A. Operate the ignition switch to turn the power to OFF state. B. Disconnect the battery negative connector. C. Remove the engine compartment fuse box K11 main relay. D. Disconnect the EMC harness plug E01a. E. Use a multimeter to measure the resistance between the terminal 86 of k11 main relay in the engine compartment electrical box and the terminal 44 of ECM harness plug E01a. **Standard value: Less than 5Ω** Is the resistance normal? **→Yes** To step 11. **→No** Repair the control power line of K11 main relay; if necessary, replace the harness.

Test condition	Details/results/measures
11. Check ECM.	
	A. Replace ECM. **Refer to: Replacement of ECM** Confirm the fault is eliminated

Diagnosis procedure about lack of engine power

Note:

Make sure the engine cylinder pressure is normal, the ignition timing mark is error free, the engine has no mechanical system failure, and the other systems of the engine are all normal.

Test condition	Details/results/measures
1. Check the engine DTC.	
	A. Operate the ignition switch to turn the power to OFF and connect the diagnostic meter. B. Operate the ignition switch to turn the power to ON state. C. Turn on the diagnostic meter and check the engine system. Is there DTC related to the ignition control? →**Yes** **Refer to: Diagnostic trouble code (DTC) list. Perform DTC diagnostic procedure.** →**No** To step 2.
2. Check the spark plug	
	A. Perform the spark plug test procedure. Is the spark plug normal? →**Yes** To step 3. →**No** Replace the spark plug.
3. Check the ignition coil	
	A. Execute ignition coil test program. Is the ignition coil normal? →**Yes** To step 4. →**No** Replace the ignition coil. **Refer to: Ignition coil replacement**
4. Check ECM.	
	A. Replace ECM. **Refer to: REPLACE THE ECM** Confirm that the fault has been ruled out.

Removal and Installation

Replacement of ignition switch components

Removal

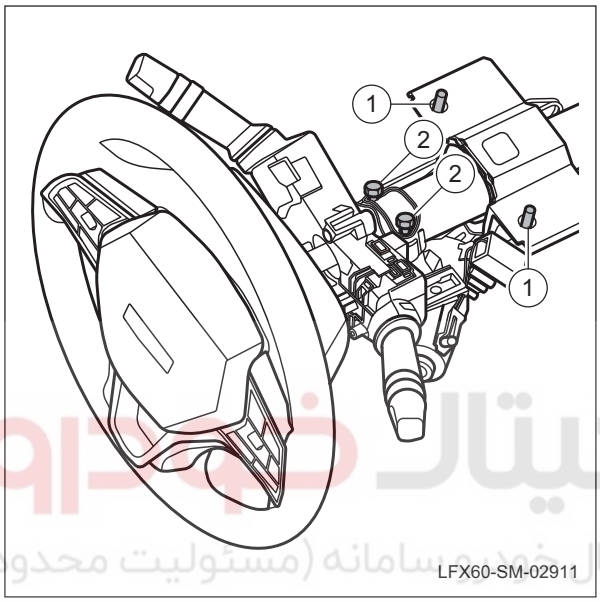
1. Remove the ignition switch components

(a). Disconnect the battery negative connector.

(b). Remove the dashboard lower left panel assembly. **Refer to the replacement of dashboard assembly.**

(c). Adjust the steering column regulating mechanism and then adjust the steering column to the proper position.

(d). Remove the steering column hood. **Refer to the replacement of steering column hood.**



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(e). Disconnect the ignition switch, the anti-theft recognition coil and the harness plug of key insertion reminder switch.

(f). Remove the steering column fixing bolt1.

(g). Remove the ignition switch fixing bolt 2.

(h). Remove the ignition switch components.

Installation

1. Install the ignition switch components.

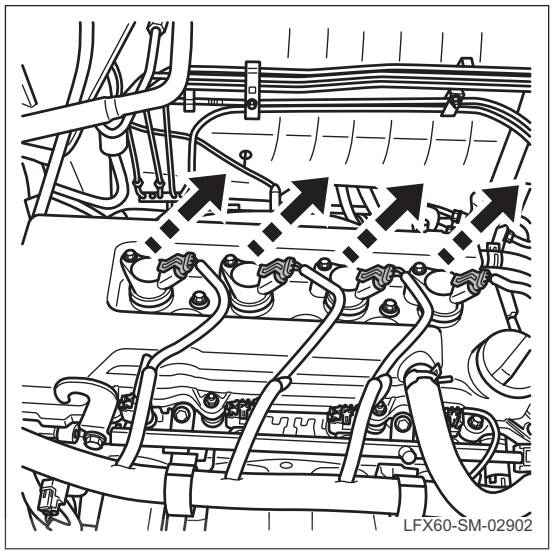
(a) The installation sequence is the reverse of the disassembly order.

Replacement of ignition coil

Removal

1. Remove the ignition coil.

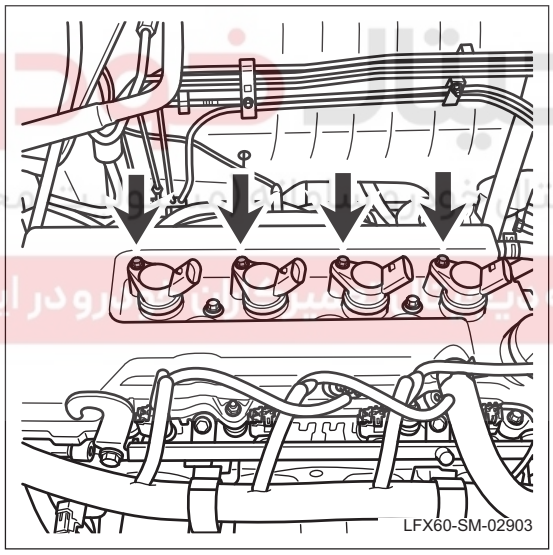
(a). Disconnect the battery negative connector.



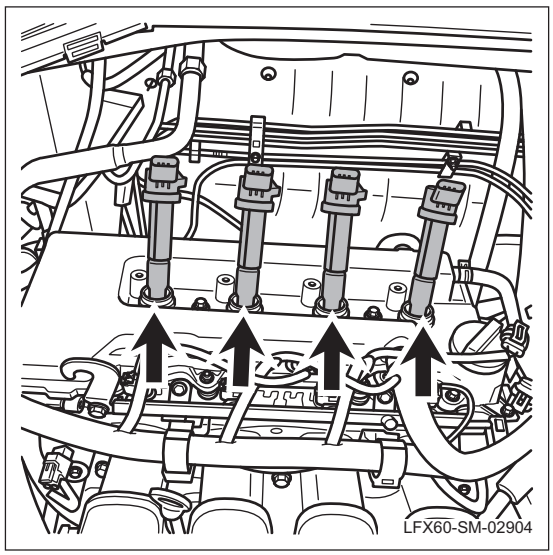
(b). Disconnect the ignition coil harness plugs.

Note:

When the engine is operated or started, do not contact or pull out the ignition coil assembly. The wire on the ignition device (ignition coil assembly and measurement gauge wire) can be connected or disconnected only when the ignition switch is turned off. To drive the engine using the starter motor without starting the engine (e.g. in a compression pressure test), just unplug the ignition coil connector and the injector plug. After operation, query the fault memory and delete the fault record. The engine can be cleaned only when the ignition switch is turned off. Only when the ignition switch is turned off, the batteries can be connected or disconnected; otherwise it may damage ECU.



(c). Remove the ignition coil fixing bolts.



(d). Remove the ignition coil.

Installation

1. Install the ignition coil.

(a). The installation sequence is the reverse of the disassembly order.