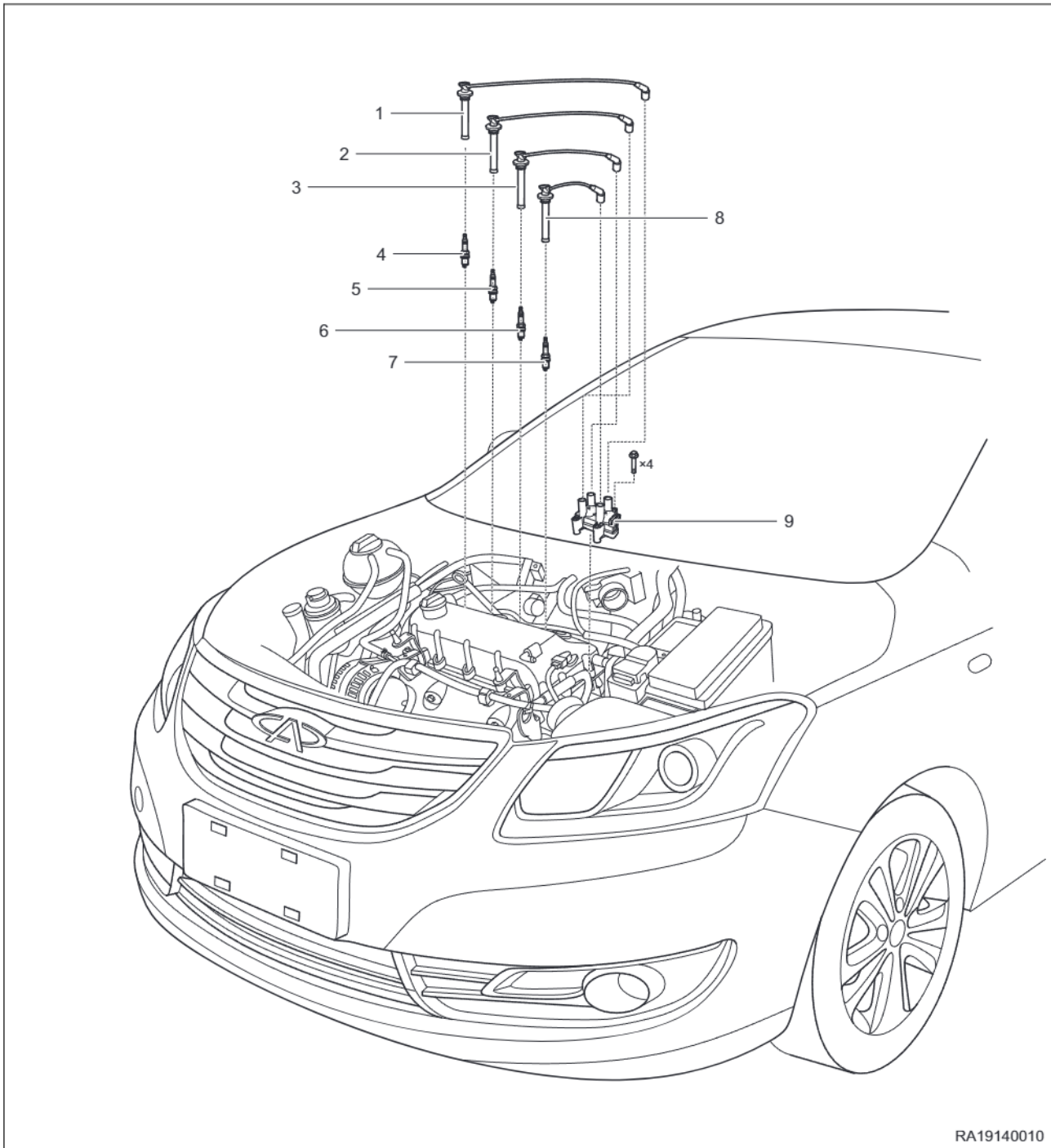

SQR477F IGNITION SYSTEM

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GENERAL INFORMATION

Description



RA19140010

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1 - Cylinder 1 High-voltage Cable Assembly	2 - Cylinder 2 High-voltage Cable Assembly
3 - Cylinder 3 High-voltage Cable Assembly	4 - Cylinder 1 Spark Plug
5 - Cylinder 2 Spark Plug	6 - Cylinder 3 Spark Plug
7 - Cylinder 4 Spark Plug	8 - Cylinder 4 High-voltage Cable Assembly
9 - Ignition Coil	

Operation

This model uses the distributorless ignition system which mainly consists of ignition coils, spark plugs, etc. Ignition advance angle is controlled by Engine Control Module (ECM) directly.

Ignition coil consists of two primary windings, two secondary windings, iron core and housing. When the primary winding is connected to ground, it is charged. Once ECM cuts off the primary winding circuit, charging stops, and at the same time, a high voltage is induced in the secondary winding to enable the spark plug to discharge. The difference from the ignition coil with distributor is that a spark plug is connected to the ignition coil secondary winding at each end, which makes the 2 spark plugs ignite simultaneously. Two primary windings turn on/off alternately, and two secondary windings alternately discharge accordingly.

Specifications

Torque Specifications

Description	Torque (N·m)
Spark Plug	30 ± 3
Ignition Coil Fixing Bolt	8 - 11
Rear Left Bracket Assembly Fixing Bolt	7 ± 1
Worm Clamp	2.5 ± 0.5

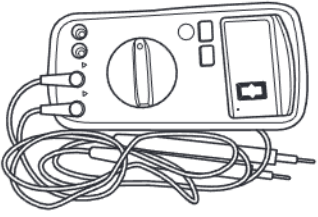
Spark Plug Specifications

Engine Type	SQR477F
Spark Plug Type	FR7DTC
Spark Plug Gap (mm)	0.8 - 0.9

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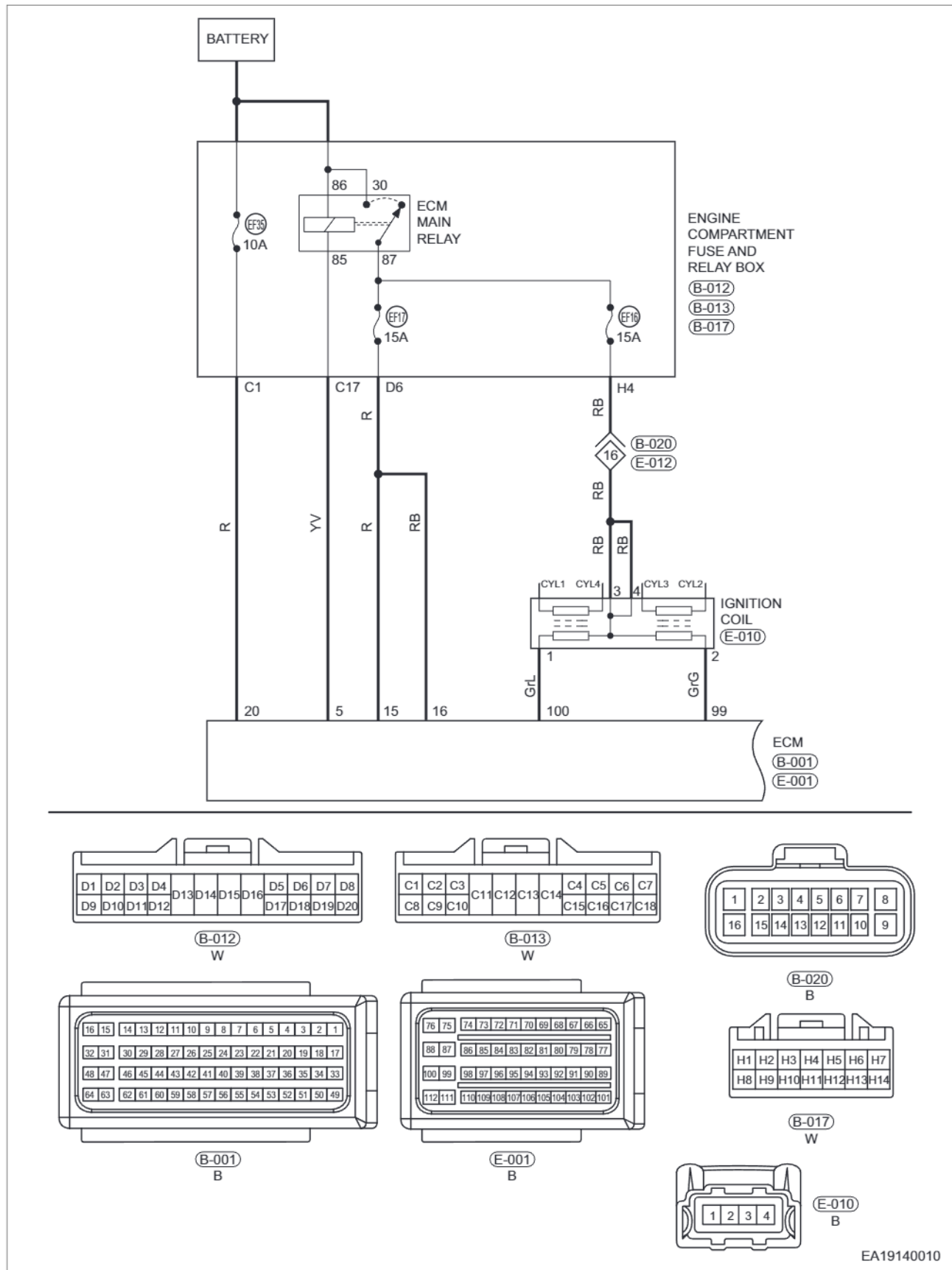
Tool

General Tool

Digital Multimeter	 RCH0000002
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Circuit Diagram

Ignition System



DIAGNOSIS & TESTING

Problem Symptoms Table

HINT:

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

Symptom	Suspected Area	See page
Stall	Ignition coil	14-10
	Spark plug	14-12
	Camshaft position sensor	06-201
	Wire harness	-
Knock	Ignition coil	14-10
	Knock sensor	06-198
	ECM	06-209
Difficult to start	Battery	16-7
	Ignition coil	14-10
	Spark plug	14-12
Engine hesitation, power drop, unstable performance	Spark plug	14-12
	Engine speed sensor	06-202
	Camshaft position sensor	06-201
	ECM	06-209
Rough, unstable idling or stall	Spark plug	14-12
	Ignition coil	14-10
	ECM	06-209

Service Precautions

Visual inspection can reduce the unnecessary test and diagnostic time, so pay attention to the inspection of the following items:

1. Check the line and hose for obvious looseness, and if they are disconnected or routed improperly.
2. Make sure that the battery connections are clean and firm.
3. Check if the generator wire and belt are installed correctly and securely.
4. Confirm that the ignition coils are installed securely.
5. Check if the engine wire harness connectors are inserted fully.
6. Check if all the electrical connectors are installed correctly and securely.
7. Check the following electrical connections:
 - a. Engine speed sensor;
 - b. Oxygen sensor;
 - c. Intake pressure/temperature sensor;
 - d. Oil pressure switch;
 - e. Ignition coil;
 - f. Canister solenoid valve;

- g. Throttle wire and main wire harness;
 - h. Electronic throttle valve;
 - i. Fuel injector.
8. Check the routing of all vacuum hoses.
9. Confirm that the following vacuum hoses are connected securely without any leakage:
- a. Canister solenoid valve;
 - b. Charcoal canister;
 - c. PCV valve;
 - d. Warm damper vacuum system;
 - e. Brake booster.
10. Check the fuel pump hose and wire connection to make sure that they are connected securely.

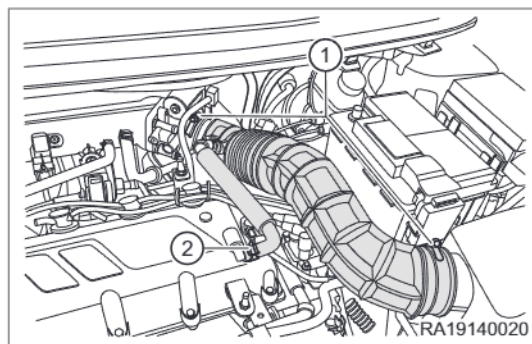
ON-VEHICLE SERVICE

High-voltage Cable

Removal

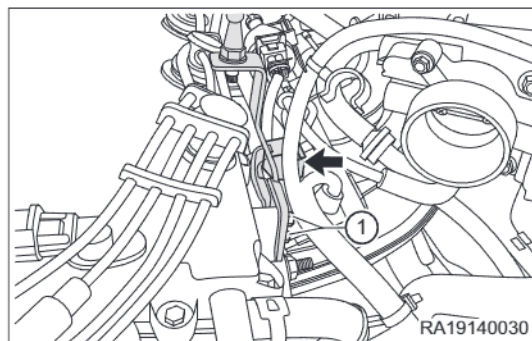
1. Turn off all the electrical equipment and ignition switch.
2. Disconnect the negative battery cable.
3. Remove the engine trim cover.
4. Remove the intake hose with crankcase ventilation hose assembly.

- a. Loosen the worm clamps (1) on both ends of intake hose, and disconnect the intake hose.
(Tightening torque: 2.5 ± 0.5 N·m)
- b. Loosen the spring clamp (2), and disconnect the crankcase ventilation hose from the valve chamber cover.



- c. Remove the intake hose with crankcase ventilation hose assembly.
5. Remove the high-voltage cable.

- a. Remove the wire harness clamp (arrow) and 2 fixing bolts (1) from the rear left bracket assembly and remove it.
(Tightening torque: 7 ± 1 N·m)

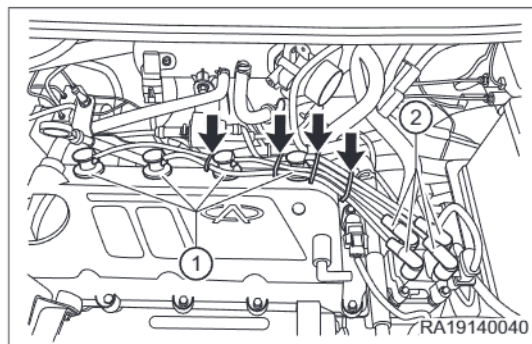


- b. Remove 4 high-voltage cable clips (arrow).
- c. Loosen the high-voltage cables (1) in order and pull them out from the spark plug sockets.

HINT:

Move the oil scale pipe to one side when pulling upward the cylinder 1 high-voltage cable.

- d. Disconnect the high-voltage cables (2) for each cylinder in order from the ignition coil.



- e. Remove the high-voltage cables.

CAUTION

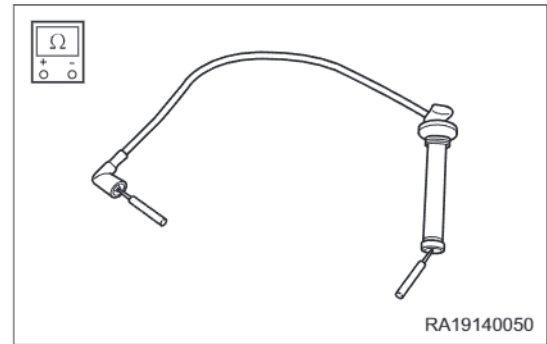
- Be careful not to damage the high-voltage cables when pulling it upward.

Inspection

Turn the digital multimeter to ohm band, and measure the resistance of high-voltage cables in the method shown in the illustration.

If the result is not as specified, replace the high-voltage cables.

Measurement Item	Condition	Specification (k Ω)
Cylinder 1 High-voltage Cable	Normal temperature	7.5 - 11.2
Cylinder 2 High-voltage Cable	Normal temperature	5.8 - 8.3
Cylinder 3 High-voltage Cable	Normal temperature	4.2 - 6.7
Cylinder 4 High-voltage Cable	Normal temperature	4 - 6.5



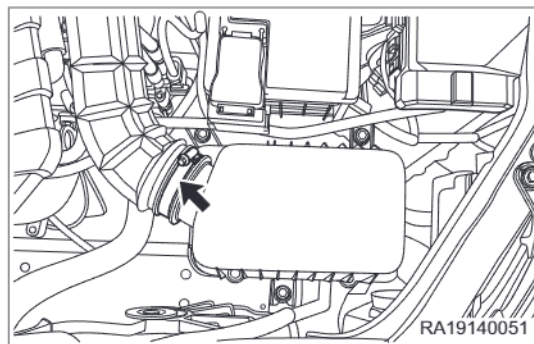
Installation

Installation is in the reverse order of removal.

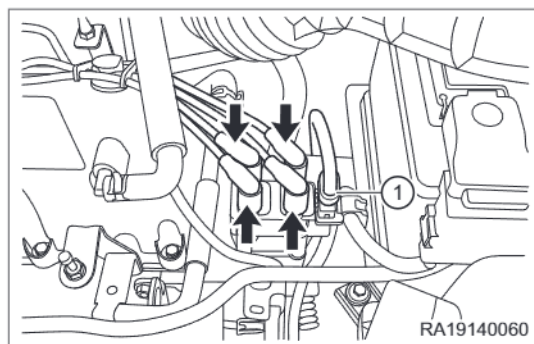
Ignition Coil

Removal

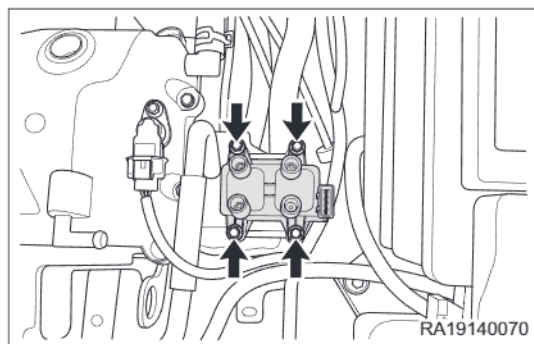
1. Turn off all the electrical equipment and ignition switch.
2. Disconnect the negative battery cable.
3. Remove the engine trim cover.
4. Remove the ignition coil.
 - a. Loosen the worm clamp (arrow) to disconnect the intake hose from the air filter, and move the intake hose to one side.
(Tightening torque: $2.5 \pm 0.5 \text{ N}\cdot\text{m}$)



- b. Disconnect the ignition coil connector (1).
 - c. Disconnect the high-voltage cables (arrow) for each cylinder, and put them aside.



- d. Loosen and remove 4 fixing bolts (arrow) from the ignition coil assembly.
(Tightening torque: $8 - 11 \text{ N}\cdot\text{m}$)



- e. Remove the ignition coil.

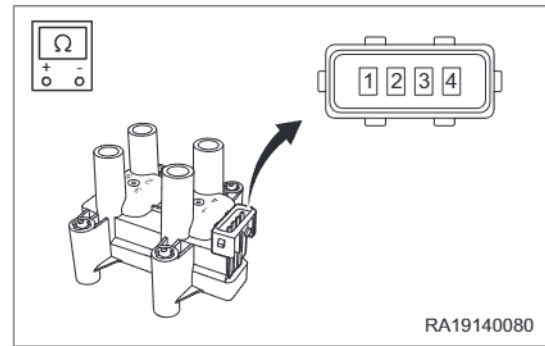
Inspection

1. Inspect the resistance of ignition coil primary winding.

Turn the digital multimeter to ohm band, and check the resistance between terminals 1 and 3, 2 and 3.

If the result is not as specified, replace the ignition coil.

Multimeter Connection	Condition	Specification (Ω)
Terminal 1 - Terminal 3	Normal temperature	0.50 - 0.64
Terminal 2 - Terminal 3	Normal temperature	0.50 - 0.64

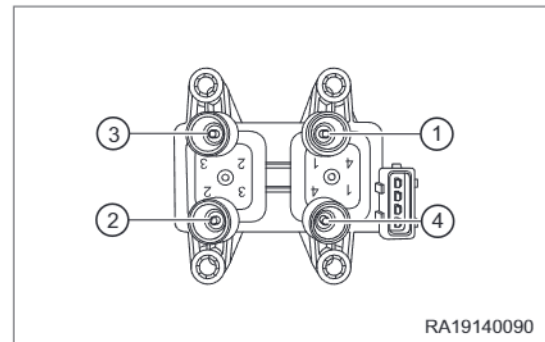


2. Inspect the resistance of ignition coil secondary winding.

Turn the digital multimeter to ohm band, and check the resistance between the high-voltage posts 1 and 4, 2 and 3 of ignition coil secondary winding.

If the result is not as specified, replace the ignition coil.

Multimeter Connection	Condition	Specification (k Ω)
Post 1 - Post 4	Normal temperature	8.36 - 10.64
Post 2 - Post 3	Normal temperature	8.36 - 10.64



Installation

Installation is in the reverse order of removal.

CAUTION

- Make sure the connection between the high-voltage cable and the ignition coil high-voltage terminal, spark plug is reliable, or it may cause the high-voltage leakage, resulting in poor ignition.

Spark Plug

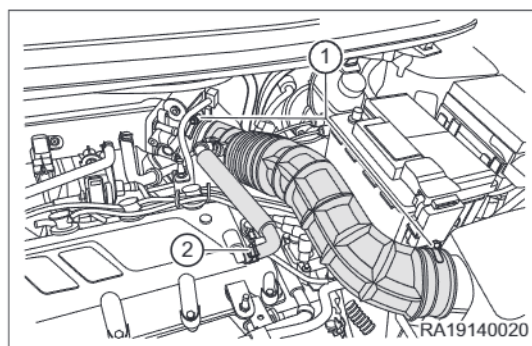
Removal

CAUTION

- DO NOT remove the spark plugs when the engine is hot; failure to do this may cause damage to the spark plug thread holes on the cylinder head.
- Before removal, remove the dirt and foreign matter around the spark plug holes to prevent them from dropping into the cylinders.

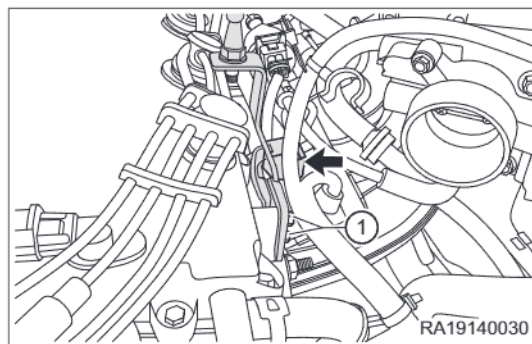
1. Turn off all the electrical equipment and ignition switch. Wait until the engine cools down.
2. Disconnect the negative battery cable.
3. Remove the engine trim cover.
4. Remove the intake hose with crankcase ventilation hose assembly.

- a. Loosen the worm clamps (1) on both ends of intake hose, and disconnect the intake hose.
(Tightening torque: 2.5 ± 0.5 N·m)
- b. Loosen the spring clamp (2), and disconnect the crankcase ventilation hose from the valve chamber cover.



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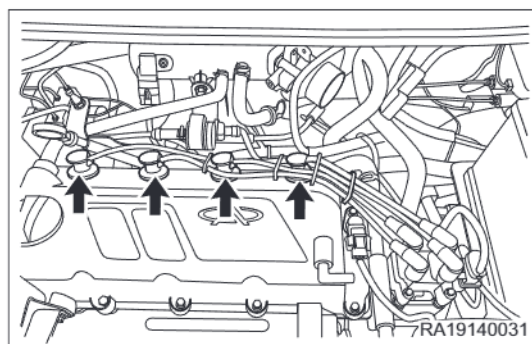
- c. Remove the intake hose with crankcase ventilation hose assembly.
5. Move the high-voltage cables for each cylinder to one side.
 - a. Remove the wire harness clamp (1) and 2 fixing bolts (arrow) from the rear left bracket assembly and remove it.



- b. Loosen and pull up the high-voltage cables (arrow) for each cylinder in order, and put them aside.

HINT:

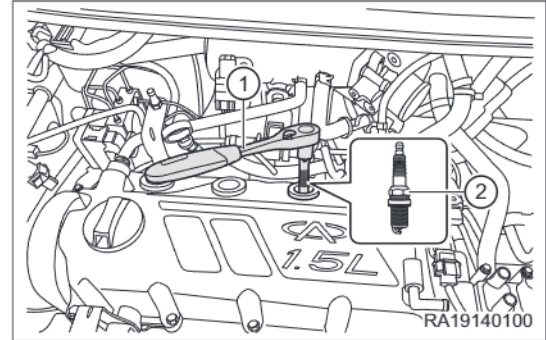
Move the oil scale pipe to one side when pulling upward the cylinder 1 high-voltage cable.



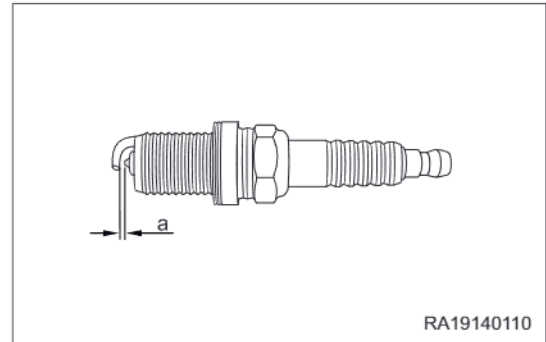
CAUTION

- Be careful not to damage the high-voltage cables when pulling it upward.

6. Remove the spark plug.
 - a. Using a special spark plug socket wrench (1), loosen the spark plug.
 - b. Remove the spark plug (2).

**Inspection**

Check the spark plug gap a: 0.8 - 0.9 mm.

**14****Installation****CAUTION**

- Check the spark plug type to confirm if it is suitable.
- Please install the spark plug with the special spark plug socket wrench, and never touch the spark plug socket. DO NOT damage the normal spark plug gap.

1. Install 4 spark plugs respectively into the cylinder head mounting holes for pre-tightening, and then retighten the spark plugs with a torque wrench.
(Tightening torque: $30 \pm 3 \text{ N}\cdot\text{m}$)

Other procedures are in the reverse order of removal.

