

**ENGINE2 SECTION**

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.

This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.

Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

**FUEL INJECTION (FUEL SYSTEMS) FU(SOHCw/oOBD)**

**EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES) EC(SOHCw/oOBD)**

**EXHAUST EX(SOHCw/oOBD)**

**IGNITION IG(SOHCw/oOBD)**

**ENGINE (DIAGNOSTICS) EN(SOHCw/oOBD)**

**FUEL INJECTION (FUEL SYSTEMS) FU(DOHC TURBO)**

**EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES) EC(DOHC TURBO)**

**INTAKE (INDUCTION) IN(DOHC TURBO)**

**MECHANICAL ME(DOHC TURBO)**

**EXHAUST EX(DOHC TURBO)**

**IGNITION IG(DOHC TURBO)**

**ENGINE (DIAGNOSTICS) EN(DOHC TURBO)**

**IGNITION**

***IG(SOHCw/oOBD)***

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# GENERAL DESCRIPTION

Ignition

## 1. General Description S161001

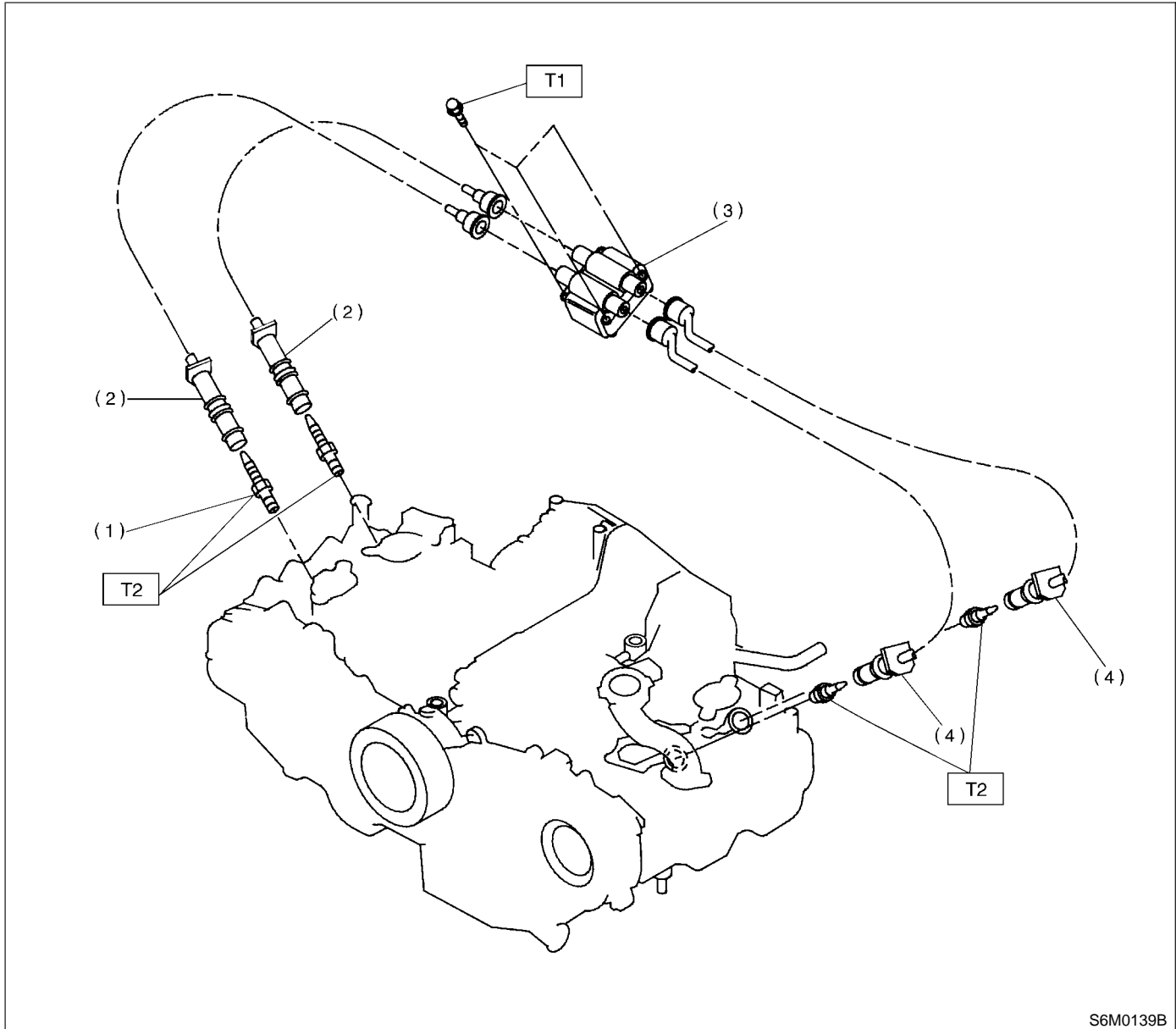
### A: SPECIFICATIONS S161001E49

Item		Designation
Ignition coil and ignitor assembly	Model	CM12-100B
	Manufacturer	HITACHI
	Primary coil resistance	0.7 $\Omega$ ±10%
	Secondary coil resistance	13.0 k $\Omega$ ±20%
Insulation resistance between primary terminal and case		More than 10 M $\Omega$
Spark plug	Type and manufacturer	BKR6E* ..... NGK RC10YC4** ..... CHAMPION BKR5E-11** ..... NGK (Alternate)
	Thread size	mm 14, P = 1.25
	Spark gap	mm (in) 0.7 — 0.8 mm (0.028 — 0.031 in)* 1.0 — 1.1 mm (0.039 — 0.043 in)**

\*: Without catalytic converter

\*\* : With catalytic converter

**B: COMPONENT** S161001A05



- (1) Spark plug
- (2) Spark plug cord (#1, #3)
- (3) Ignition coil and ignitor ASSY
- (4) Spark plug cord (#2, #4)

**Tightening torque: N·m (kgf·m, ft·lb)**

**T1: 6.4 (0.65, 4.7)**

**T2: 21 (2.1, 15)**

**C: CAUTION** S161001A03

- Wear working clothing, including a cap, protective goggles, and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust or dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary

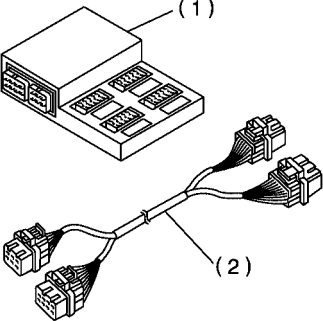
removal, installation, disassembly, and replacement.

- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or safety stands at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect negative terminal from battery.

# GENERAL DESCRIPTION

Ignition

## D: PREPARATION TOOL S161001A17

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>(1)</p> <p>(2)</p> <p>S2M2137A</p>	498307600	CHECK BOARD KIT	Troubleshooting for engine electrical systems (1) CHECK BOARD: 498307610 (2) CHECK BOARD ADAPTER: 498307620

## 2. Spark Plug S161003

### A: REMOVAL S161003A18

#### CAUTION:

All spark plugs installed on an engine, must be of the same heat range.

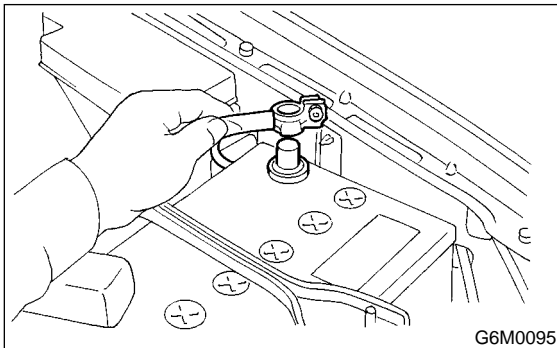
#### Spark plug:

*With catalyst model: CHAMPION RC10YC4*

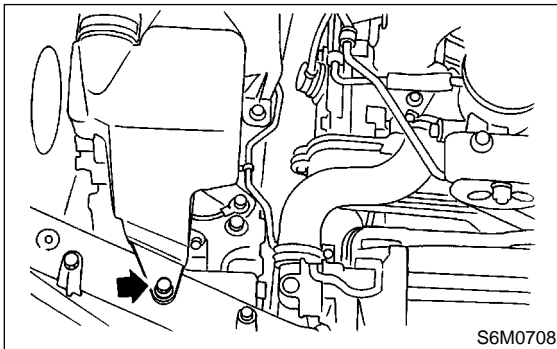
*Without catalyst model: NGK BKR6E*

### 1. RH SIDE S161003A1805

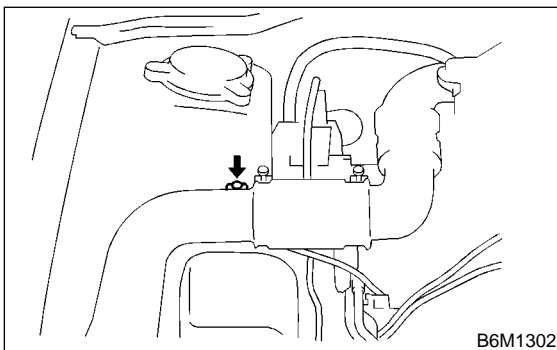
- 1) Disconnect battery ground cable.



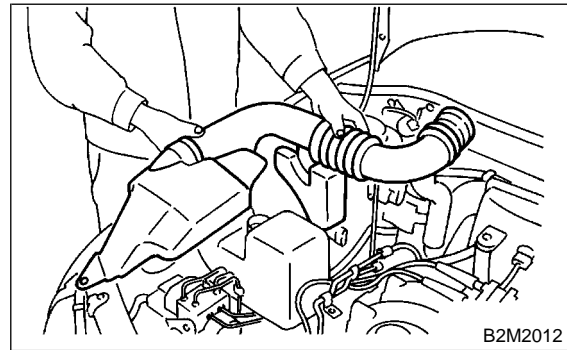
- 2) Remove air intake duct and resonator chamber.
  - (1) Remove bolt which installs air intake duct on the front side of body.



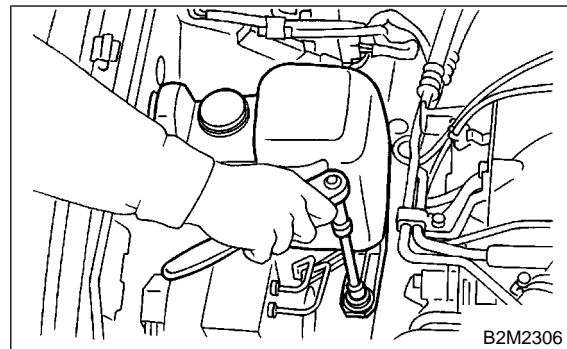
- (2) Remove bolt which installs air intake duct on body.



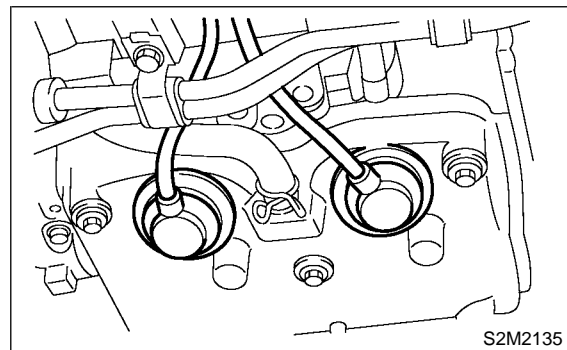
- (3) Remove air intake duct as a unit.



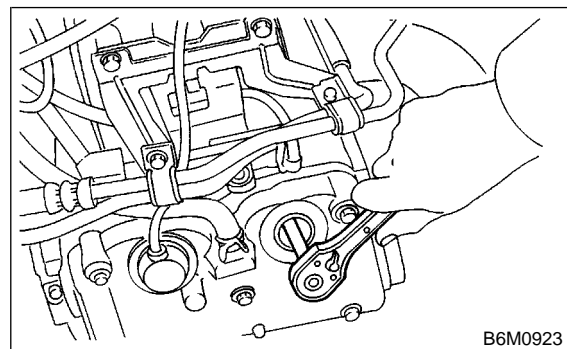
- (4) Remove resonator chamber.



- 3) Remove spark plug cords by pulling boot, not cord itself.



- 4) Remove spark plugs with the spark plug socket.

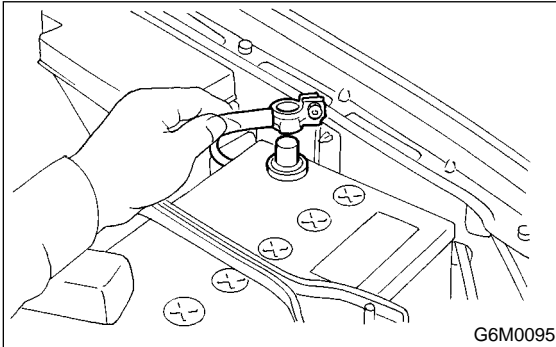


# SPARK PLUG

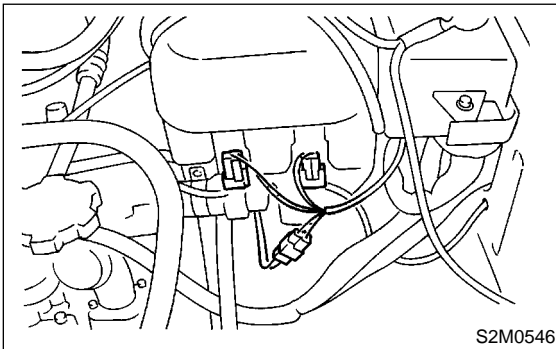
Ignition

## 2. LH SIDE S161003A1806

1) Disconnect battery ground cable.

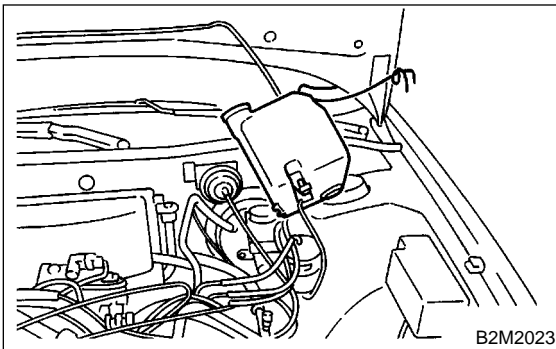


2) Disconnect washer motor connector.

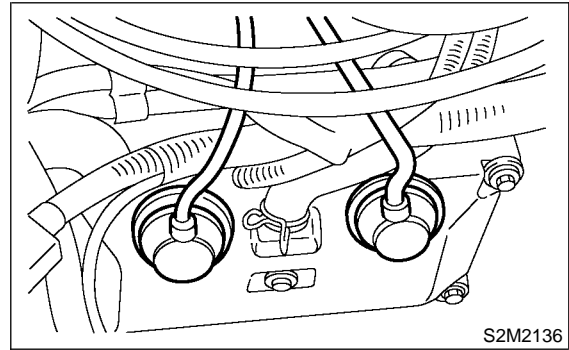


3) Disconnect rear window glass washer hose from washer motor, then plug connection with a suitable cap.

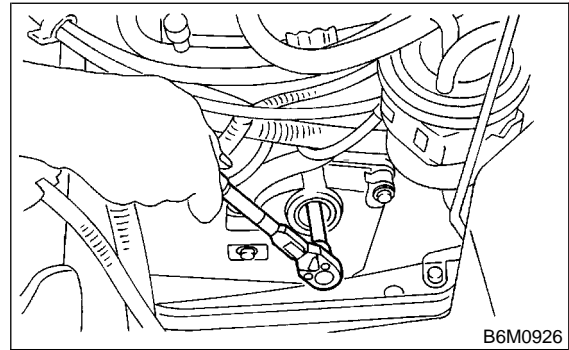
4) Remove the two bolts which hold the washer tank, then take the tank away from the working area.



5) Remove spark plugs cord by pulling boot, not cord itself.



6) Remove spark plug with the spark plug socket.



## B: INSTALLATION S161003A11

### 1. RH SIDE S161003A1105

Install in the reverse order of removal.

**Tightening torque (Spark plug):**  
**21 N-m (2.1 kgf-m, 15 ft-lb)**

#### CAUTION:

The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approximately 1/3 of the specified torque in order to avoid over-stressing.

**Tightening torque (Resonator chamber):**  
**32 N-m (3.3 kgf-m, 24 ft-lb)**

### 2. LH SIDE S161003A1106

Install in the reverse order of removal.

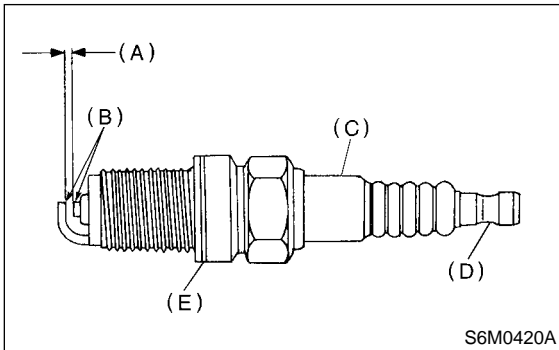
**Tightening torque (Spark plug):**  
**21 N-m (2.1 kgf-m, 15 ft-lb)**

#### CAUTION:

The above torque should be only applied to new spark plugs without oil on their threads. In case their threads are lubricated, the torque should be reduced by approximately 1/3 of the specified torque in order to avoid over-stressing.

## C: INSPECTION S161003A10

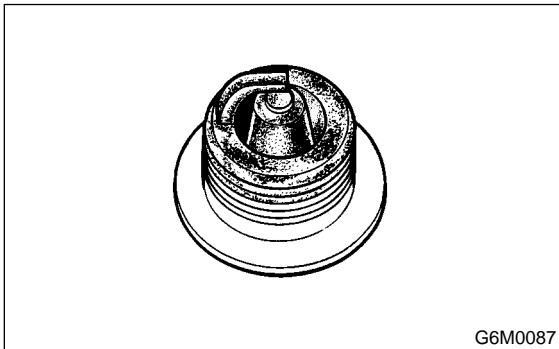
Check electrodes and inner and outer porcelain of plugs, noting the type of deposits and the degree of electrode erosion.



- (A) Electrode gap
- (B) Carbon accumulation or wear
- (C) Cracks
- (D) Damage
- (E) Damaged gasket

### 1) Normal

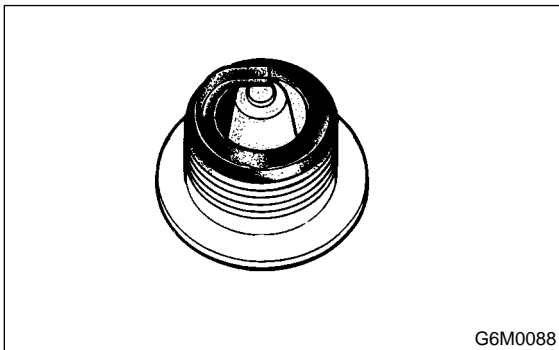
Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.



### 2) Carbon fouled

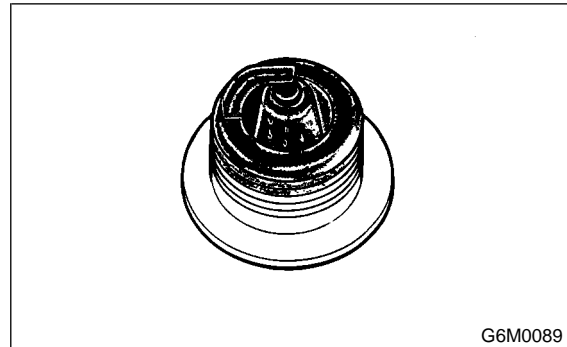
Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.

It is advisable to replace with plugs having hotter heat range.



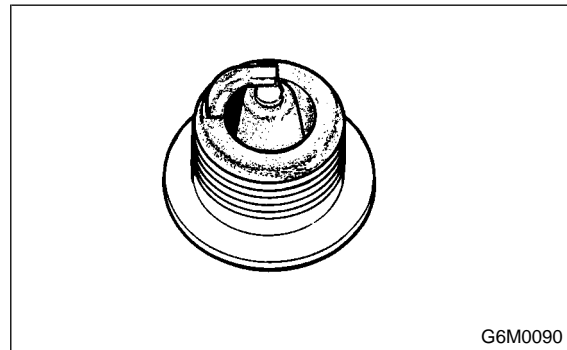
### 3) Oil fouled

Wet black deposits show excessive oil entrance into combustion chamber through worn rings and pistons or excessive clearance between valve guides and stems. If same condition remains after repair, use a hotter plug.



### 4) Overheating

White or light gray insulator with black or gray brown spots and bluish burnt electrodes indicate engine overheating. Moreover, the appearance results from incorrect ignition timing, loose spark plugs, wrong selection of fuel, hotter range plug, etc. It is advisable to replace with plugs having colder heat range.



## D: CLEANING S161003E56

Clean spark plugs in a sand blast type cleaner. Avoid excessive blasting. Clean and remove carbon or oxide deposits, but do not wear away porcelain.

If deposits are too stubborn, replace plugs.



# SPARK PLUG

Ignition

## E: ADJUSTMENT S161003A01

Correct it if the spark plug gap is measured with a gap gauge, and it is necessary.

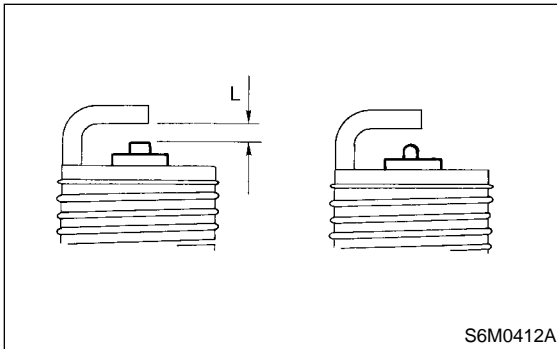
### **Spark plug gap: L**

#### **With catalyst:**

**1.0 — 1.1 mm (0.039 — 0.043 in)**

#### **Without catalyst:**

**0.7 — 0.8 mm (0.028 — 0.031 in)**



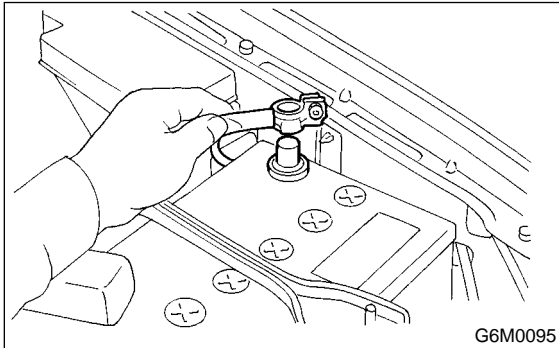
### NOTE:

Replace with new spark plug if this area is worn to “ball” shape.

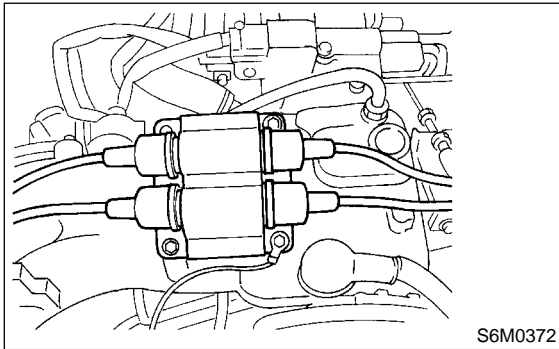
## 3. Ignition Coil and Ignitor Assembly S161015

### A: REMOVAL S161015A18

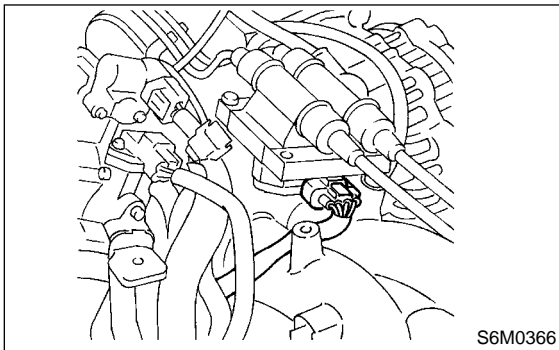
- 1) Disconnect battery ground cable.



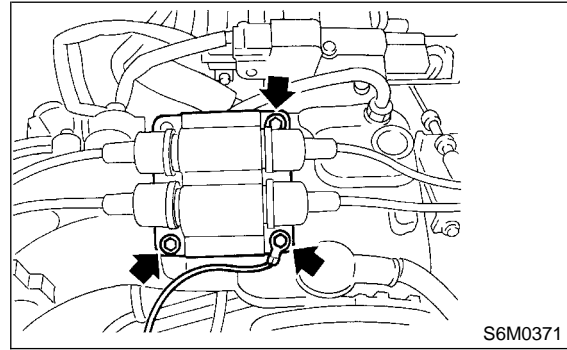
- 2) Disconnect spark plug cords from ignition coil and ignitor assembly.



- 3) Disconnect connector from ignition coil and ignitor assembly.



- 4) Remove ignition coil and ignitor assembly.



### B: INSTALLATION S161015A11

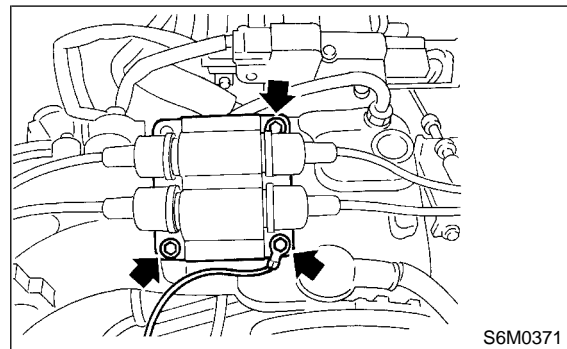
Install in the reverse order of removal.

**Tightening torque:**

**6.4 N·m (0.65 kgf-m, 4.7 ft-lb)**

**CAUTION:**

**Be sure to connect wires to their proper positions. Failure to do so will damage unit.**



# IGNITION COIL AND IGNITOR ASSEMBLY

Ignition

## C: INSPECTION S161015A10

Using oscilloscope and accurate tester, inspect the following items, and replace if defective.

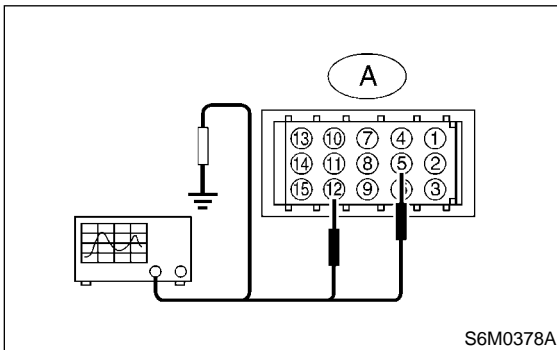
- Ignitor input signal
- Secondary coil resistance
- Poor contact in ignition coil and ignitor assembly connector

- 1) Turn ignition switch to OFF.
- 2) Disconnect connector from ECM, then connect ST. <Ref. to EN(SOHCw/oOBD)-23, HOW TO CHECK I/O SIGNAL FOR ECM, Engine Control Module (ECM) I/O Signal.> ST 498307600 CHECK BOARD KIT
- 3) Turn ignition switch to ON.
- 4) Measure voltage between ignition coil and ignition assembly and body.

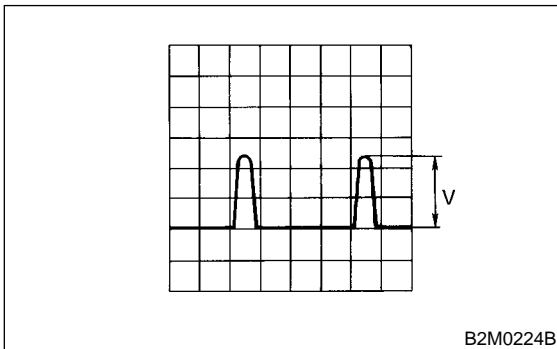
### Connector & terminal:

(A) No. 5 — Engine ground

(A) No. 12 — Engine ground



### Specified voltage: 3 — 4 V



- 5) Turn ignition switch to OFF.
- 6) Disconnect connector from ignition coil and ignitor assembly.
- 7) Remove spark plug cords.
- 8) Measure resistance between spark plug cord contact portions to check secondary coil.

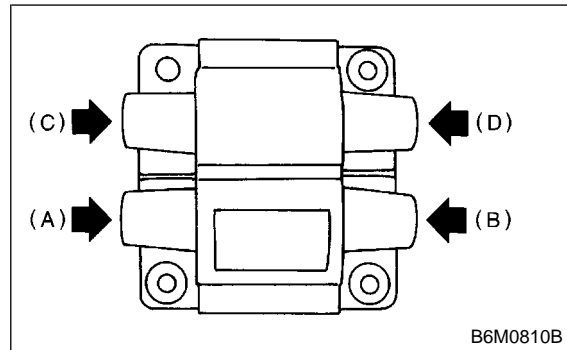
### Terminals / Specified resistance:

(A) — (B) /  $13.0 \pm 2.6 \text{ k}\Omega$

(C) — (D) /  $13.0 \pm 2.6 \text{ k}\Omega$

### CAUTION:

If the resistance is extremely low, this indicates the presence of a ground short circuit.



- 9) Check poor contact in ignition coil and ignitor assembly connector.

## 4. Spark Plug Cord S161014

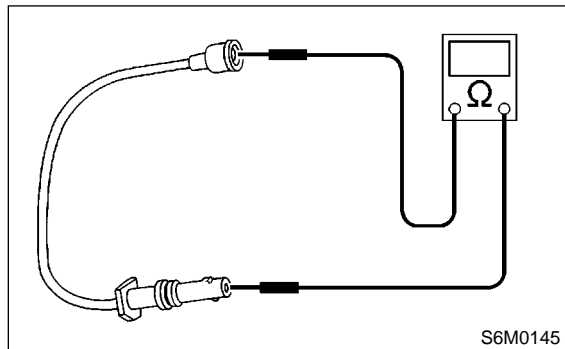
### A: INSPECTION S161014A10

Check for:

- 1) Damage to cords, deformation, burning or rust formation of terminals
- 2) Resistance values of cords

**Resistance value:**

**5.24 — 12.23 k $\Omega$**



# SPARK PLUG CORD

Ignition

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# SPARK PLUG CORD

Ignition

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**MEMO:**

# SPARK PLUG CORD

Ignition

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