

IGNITION SYSTEM

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IG-2

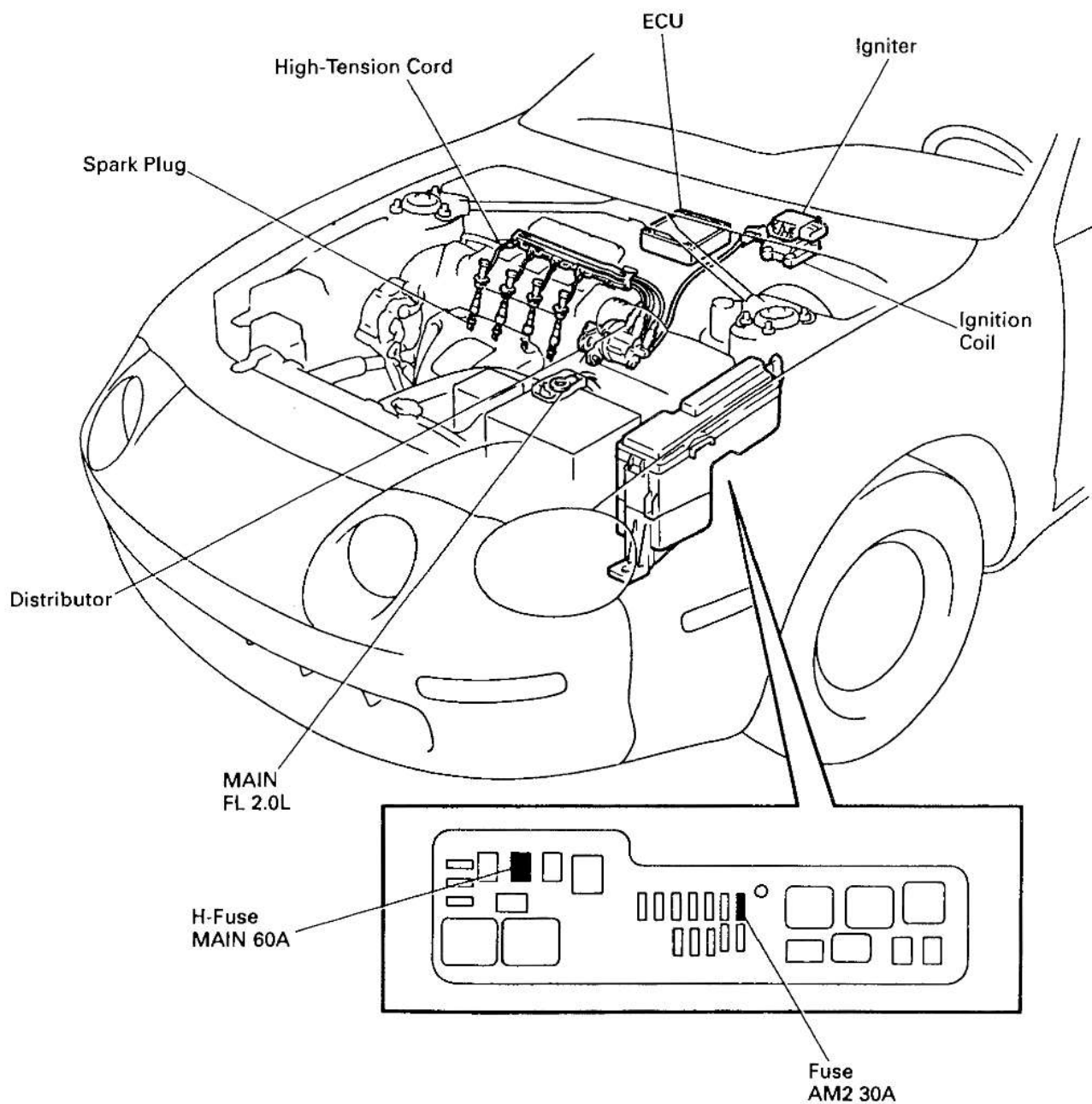
IGNITION SYSTEM — DESCRIPTION

DESCRIPTION

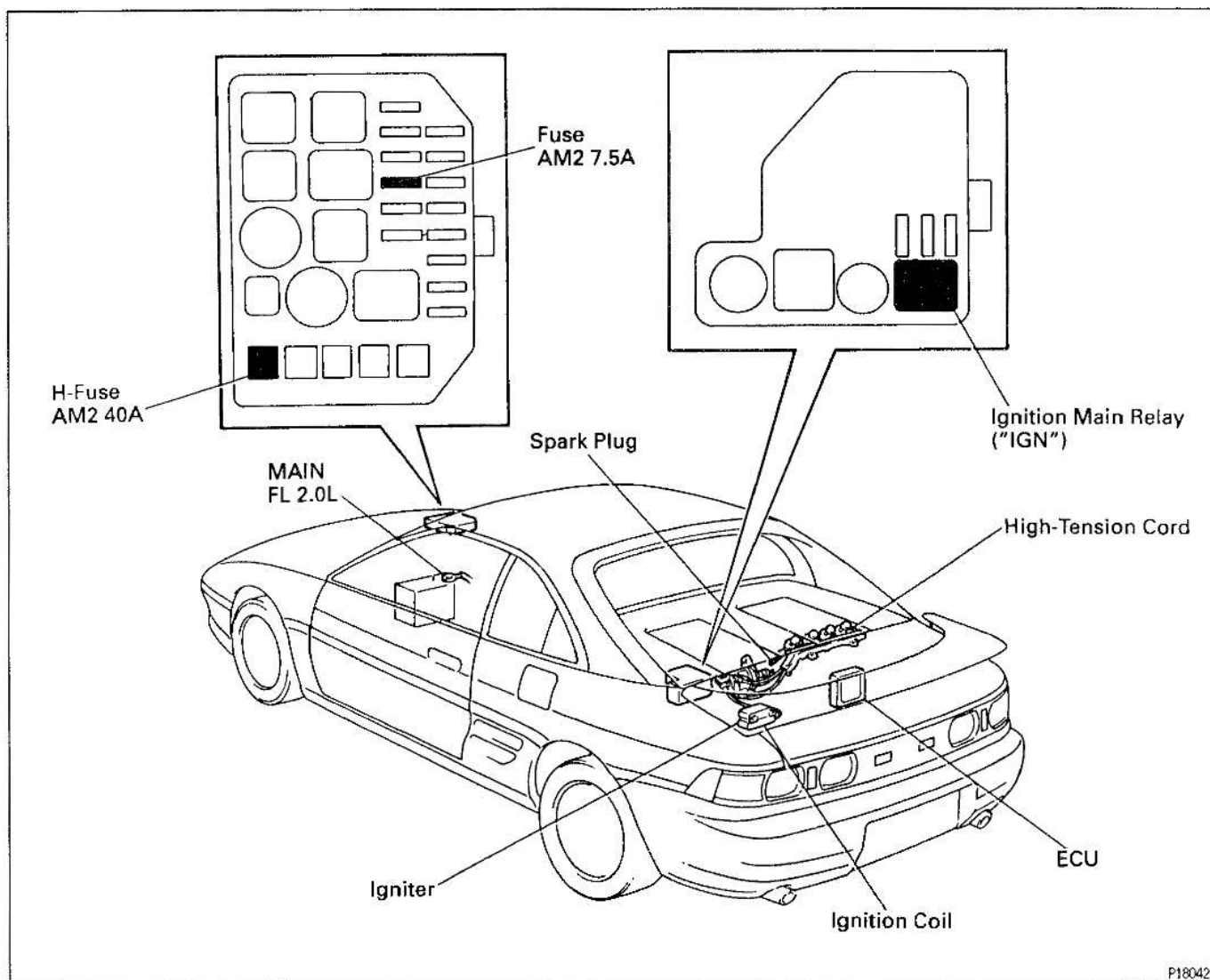
The ECU is programmed with data for optimum ignition timing under all operating conditions. Using data provided by sensors which monitor various engine functions (rpm, intake air volume, engine temperature, etc.), the microcomputer (ECU) triggers the spark at precisely the right instant. IG080-01

IG

ST202



P18012

IGNITION SYSTEM — DESCRIPTION

IG

P18042

The ECU monitors the engine condition by signals from each sensor, calculates the ignition timing and sends an ignition signal to the igniter. High voltage from the ignition is distributed to each spark plug in the appropriate order to generate a spark between the electrodes, which ignites the air—fuel mixture.

IGNITER

The igniter temporarily interrupts the primary current with the ignition signal (IGT signal) from the ECU and generates sparks at the spark plug. Also, as a fail—safe measure, when ignition occurs an ignition confirmation signal (IGF signal) is sent to the ECU.

IGNITION COIL

The ignition coil uses a closed core coil with the primary coil wrapped around the core and the secondary coil wrapped around the primary coil. This allows the generation of a high voltage sufficient to cause a spark to jump across the spark plug gap.

DISTRIBUTOR

This correctly distributes high voltage to the spark plug of each cylinder in the specified ignition order.

PICKUP COILS

The NE coil detects the crankshaft angle, and the G1 and G2 coils detect the camshaft angle.

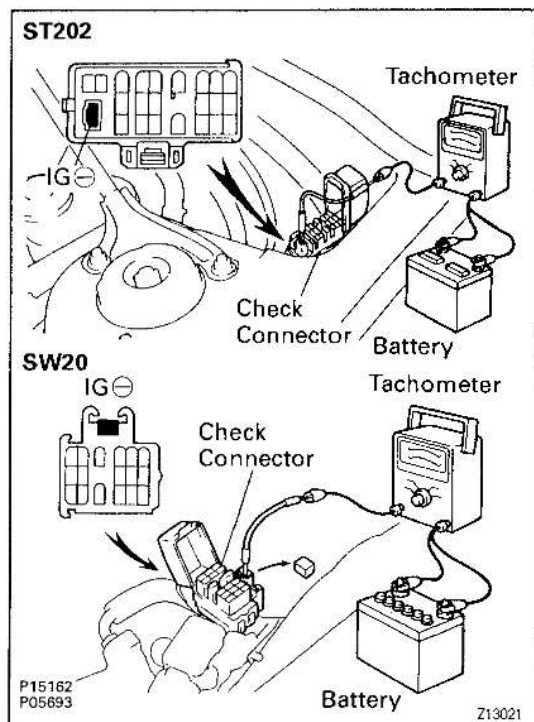
IG-4

IGNITION SYSTEM — PRECAUTION

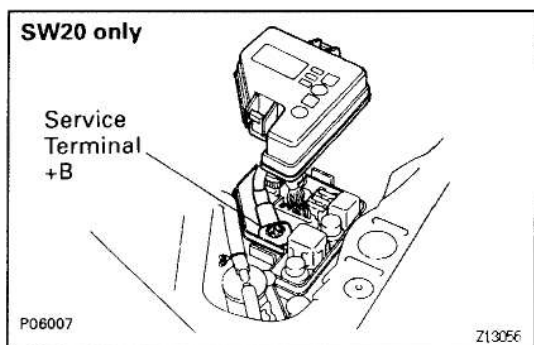
PRECAUTION

1. Do not leave the ignition switch ON for more than 10 minutes if the engine does not start. IG08Y-03

IG



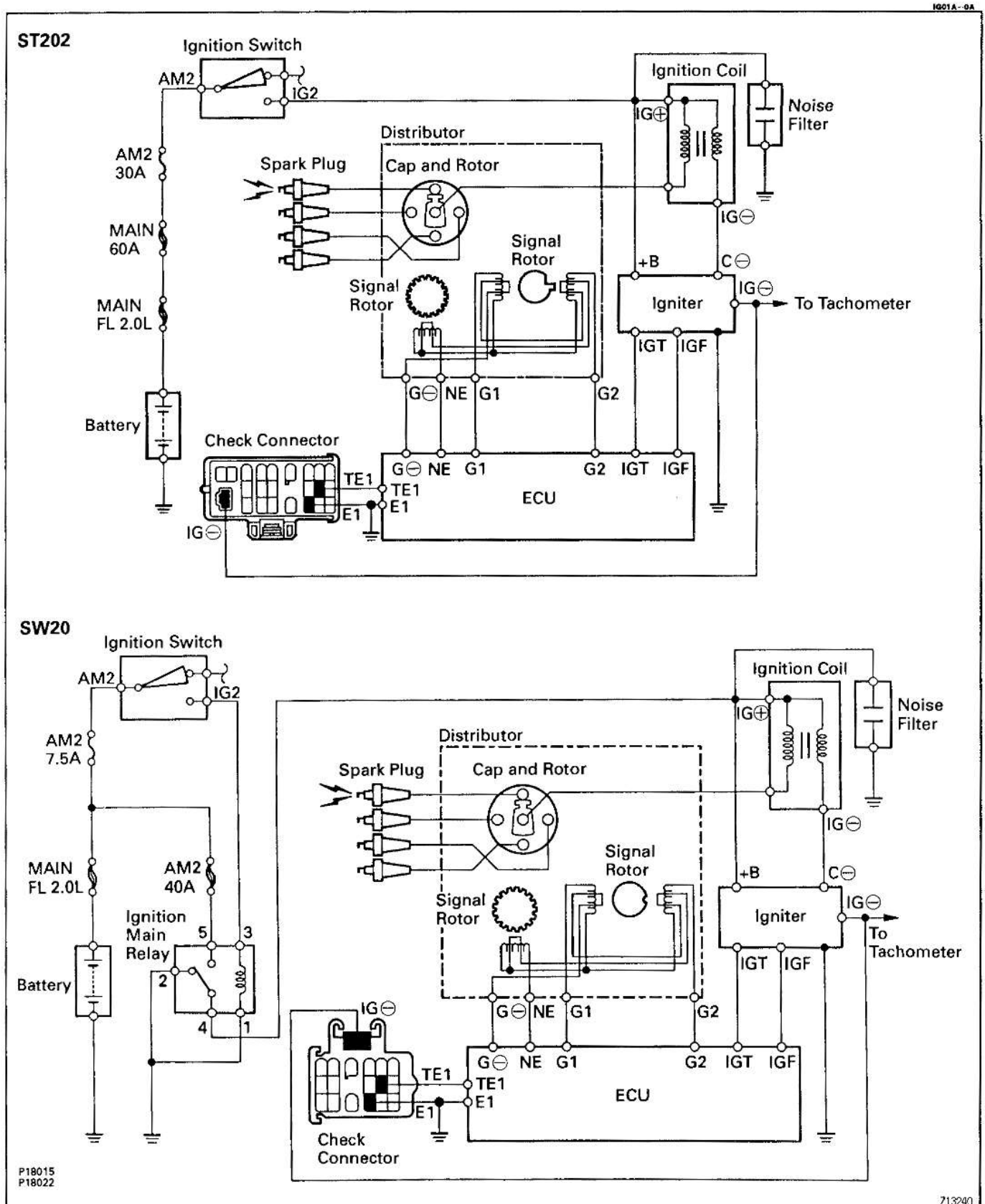
2. With a tachometer connected to the system, connect the tester probe of the tachometer to terminal IG- of the check connector.



3. **SW20 only:**
With a tachometer connected to the system, connect the power source probe of the tachometer to service terminal +B of the engine compartment relay box.
4. As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.
5. Never allow the tachometer terminals to touch ground as it could result in damage to the igniter and/or ignition coil.
6. Do not disconnect the battery while the engine is running.
7. Check that the igniter is properly grounded to the body.

IGNITION SYSTEM – SYSTEM CIRCUIT

SYSTEM CIRCUIT



IG-6

IGNITION SYSTEM — PREPARATION

OPERATION

To maintain the most appropriate ignition timing, the ECU sends a control signal so that the igniter sends current to the ignition coil and the spark plugs produce a spark.

IG01B-0A

PREPARATION

SST (SPECIAL SERVICE TOOLS)

IG01C-06

IG

	09155-16100 Spark Plug Wrench	
	09240-00020 Wire Gauge Set	Air gap
	09843-18020 Diagnosis Check Wire	

RECOMMENDED TOOLS

IG01D-04

	09082-00050 TOYOTA Electrical Tester Set	
	09200-00010 Engine Adjust Kit	

EQUIPMENT

IG00T-01

Megger insulation resistance meter	Insulation resistance meter
Spark plug cleaner	
Tachometer	
Timing light	Ignition timing

IGNITION SYSTEM — ON—VEHICLE INSPECTION

IG-7

ON—VEHICLE INSPECTION
SPARK TEST

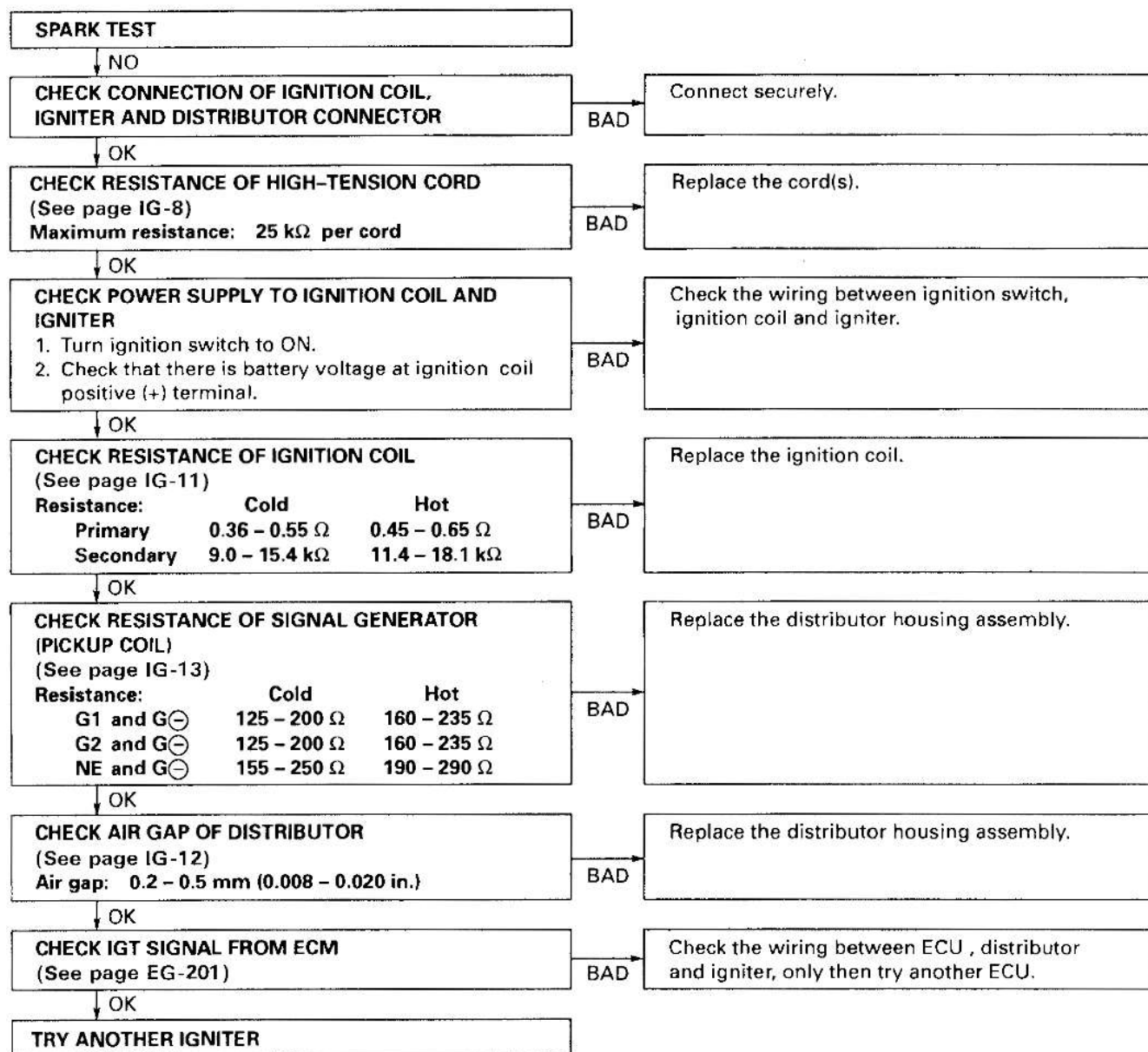
IG01R-08

CHECK THAT SPARK OCCURS

- Disconnect the high—tension cord (from the ignition coil) from the distributor cap.
 - Hold the end approx. 12.5 mm (0.50 in.) from the body ground.
 - See if spark occurs while engine is being cranked.
- HINT: To prevent gasoline from being injected from injectors during this test, crank the engine for no more than 1 — 2 seconds at time.

IG

If the spark does not occur, perform the test as follows:

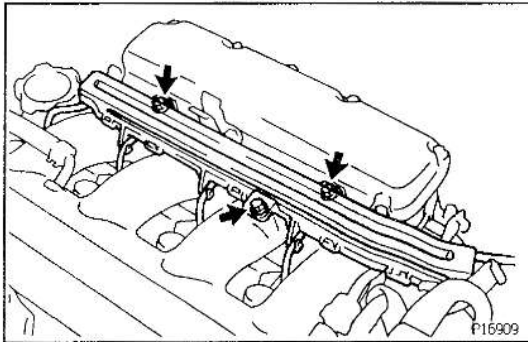


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IG-8

IGNITION SYSTEM — ON—VEHICLE INSPECTION

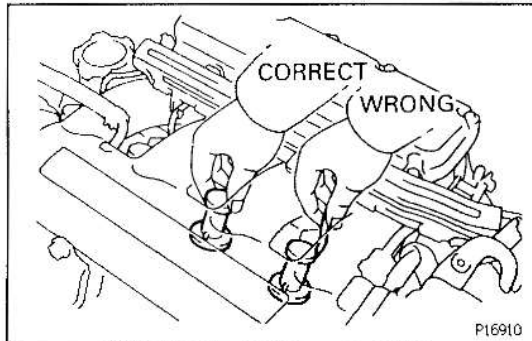
IG08R-01



HIGH—TENSION CORDS INSPECTION

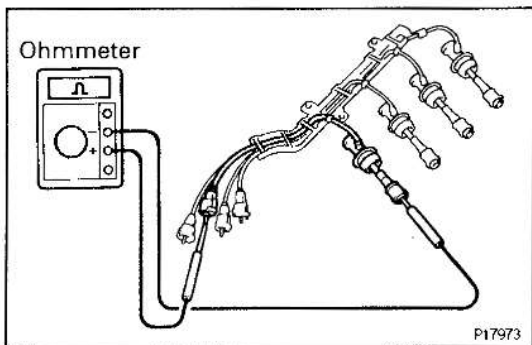
1. REMOVE HIGH—TENSION CORDS

- (a) Remove the 3 bolts, and disconnect the high—tension cord clamp from the ACIS valve.



- (b) Disconnect the high—tension cords at the rubber boot. Do not pull on the high—tension cords.

NOTICE: Pulling on or bending the cords may damage the conductor inside.



2. INSPECT HIGH—TENSION CORD RESISTANCE

Using an ohmmeter, measure the resistance.

Maximum resistance:

25 k Ω per cord

If the resistance is greater than maximum, replace the high—tension cord.

3. REINSTALL HIGH—TENSION CORDS

IGNITION SYSTEM — ON—VEHICLE INSPECTION

IG-9

IG088-01

SPARK PLUGS INSPECTION

NOTICE:

- Never use a wire brush for cleaning.
- Never attempt to adjust the electrode gap on a used spark plug.
- Spark plugs should be replaced every 100,000 km (60,000 miles).

1. DISCONNECT HIGH—TENSION CORDS FROM SPARK PLUGS

2. INSPECT ELECTRODE

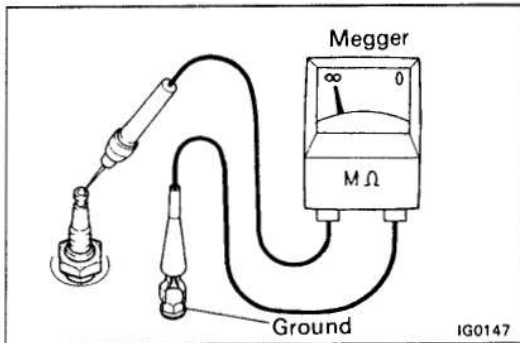
Using a megger (insulation resistance meter), measure the insulation resistance.

Standard correct insulation resistance:

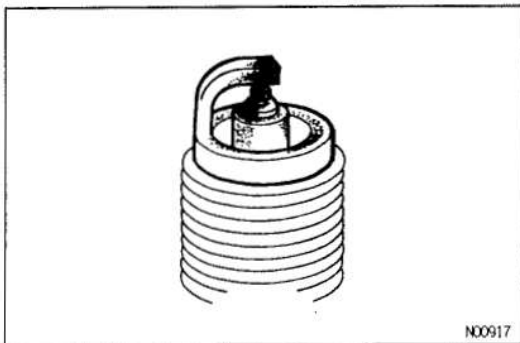
10 MΩ or more

If the resistance is less than specified, proceed to step 3.

HINT: If a megger is not available, the following simple method of inspection provides fairly accurate results.



IG0147



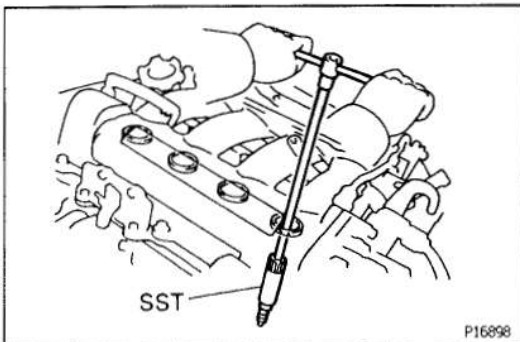
N00917

Simple Method:

- Quickly race the engine to 4,000 rpm 5 times.
- Remove the spark plug. (See step 3)
- Visually check the spark plug.
If the electrode is dry ... OK
If the electrode is wet ... Proceed to step 4
- Reinstall the spark plug. (See step 7)

3. REMOVE SPARK PLUGS

Using SST, remove the 4 spark plugs.
SST 09155—16100



P16898

4. VISUALLY INSPECT SPARK PLUGS

Check the spark plug for thread damage and insulator damage.

If abnormal, replace the spark plug.

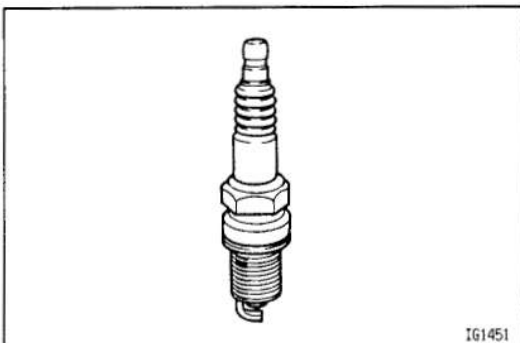
Recommended spark plug:

ND

PK20R8

NGK

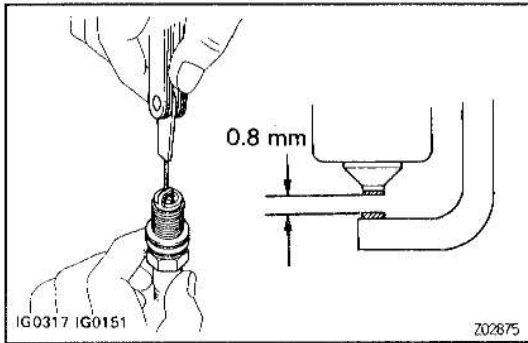
BKR6EP—8



IG1451

IG-10

IGNITION SYSTEM — ON-VEHICLE INSPECTION

**5. INSPECT ELECTRODE GAP**

Maximum electrode gap for used spark plug:

1.0 mm (0.039 in.)

If the gap is greater than maximum, replace the spark plug.

Correct electrode gap for new spark plug:

0.8 mm (0.031 in.)

NOTICE: If adjusting the gap of a new spark plug, bend only the base of the ground electrode. Do not touch the tip. Never attempt to adjust the gap on the used plug.

6. CLEAN SPARK PLUGS

If the electrode has traces of wet carbon, allow it to dry and then clean with a spark plug cleaner.

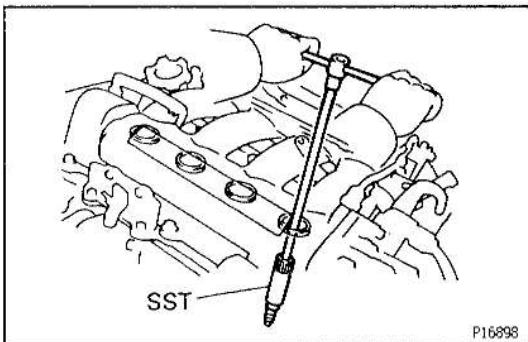
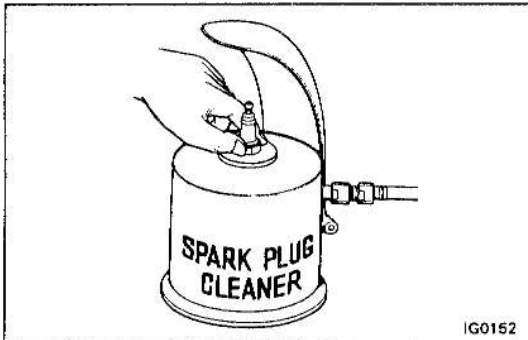
Air pressure:

Below 588 kPa (6 kgf/cm², 85 psi)

Duration:

20 seconds or less

HINT: If there are traces of oil, remove it with gasoline before using the spark plug cleaner.

**7. REINSTALL SPARK PLUGS**

Using SST, install the 4 spark plugs.

SST 09155-16100

Torque: 18 N·m (180 kgf·cm, 13 ft·lbf)

8. RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS

IGNITION SYSTEM — ON—VEHICLE INSPECTION

IG-11

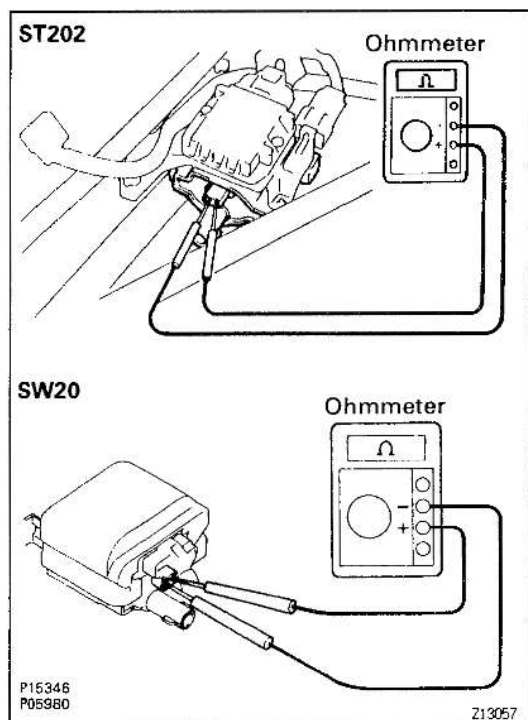
IGBT-01

IGNITION COIL INSPECTION

NOTICE: "Cold" and "Hot" in the following sentences express the temperature of the coils themselves. "Cold" is from -10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

1. **DISCONNECT IGNITION COIL CONNECTOR**
2. **DISCONNECT HIGH—TENSION CORD FROM IGNITION COIL**

IG

3. **INSPECT PRIMARY COIL RESISTANCE**

Using an ohmmeter, measure the resistance between the positive (+) and negative (–) terminals.

Primary coil resistance:

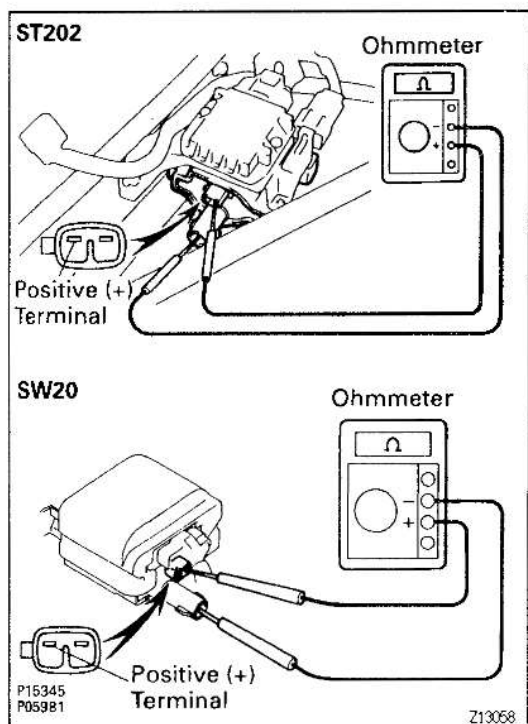
Cold

0.36 – 0.55 Ω

Hot

0.45 – 0.65 Ω

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

4. **INSPECT SECONDARY COIL RESISTANCE**

Using an ohmmeter, measure the resistance between the positive (+) and high—tension terminals.

Secondary coil resistance:

Cold

9.0 – 15.4 k Ω

Hot

11.4 – 18.1 k Ω

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

5. **RECONNECT HIGH—TENSION CORD TO IGNITION COIL**
6. **RECONNECT IGNITION COIL CONNECTOR**

IG-12

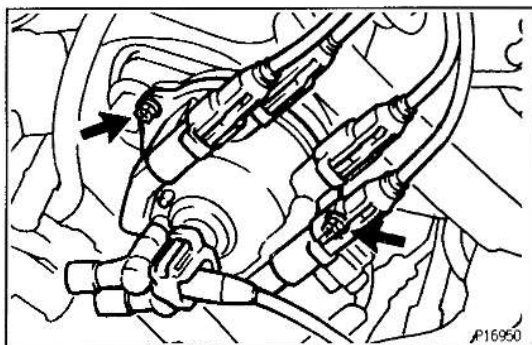
IGNITION SYSTEM — ON—VEHICLE INSPECTION

K00AN—02

DISTRIBUTOR INSPECTION

NOTICE: "Cold" and "Hot" in the following sentences express the temperature of the coils themselves. "Cold" is from -10°C (14°F) to 50°C (122°F) and "Hot" is from 50°C (122°F) to 100°C (212°F).

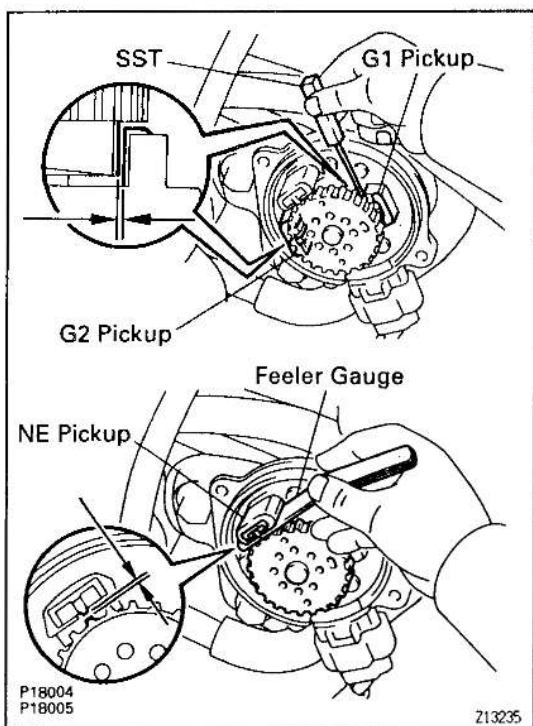
IG



1. REMOVE DISTRIBUTOR CAP

Remove the 2 bolts, and disconnect the distributor cap from the distributor housing.

2. REMOVE ROTOR



3. INSPECT AIR GAP

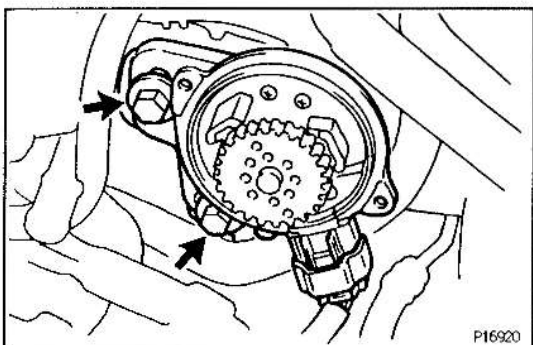
Using SST (G1 and G2 pickups) and a feeler gauge (NE pickup), measure the air gap between the signal rotor and pickup coil projection.

SST 09240—00020 for G1 and G2 pickups

Air gap:

0.2 — 0.5 mm (0.008 — 0.020 in.)

If the air gap is not as specified, replace the distributor housing assembly.



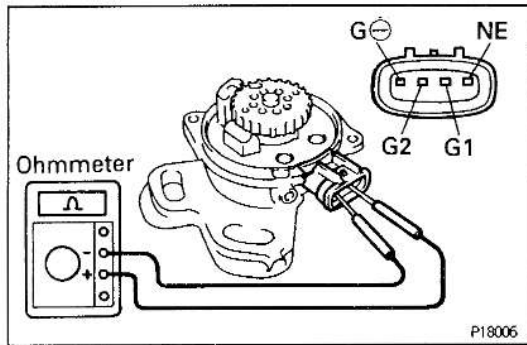
4. DISCONNECT DISTRIBUTOR CONNECTOR

5. REMOVE DISTRIBUTOR HOUSING ASSEMBLY

Remove the bolt, and pull out the distributor housing.

IGNITION SYSTEM — ON—VEHICLE INSPECTION

IG-13

**6. INSPECT SIGNAL GENERATOR (PICKUP COIL) RESISTANCE**

Using an ohmmeter, measure the resistance between terminals.

Pickup coil resistance:

Cold

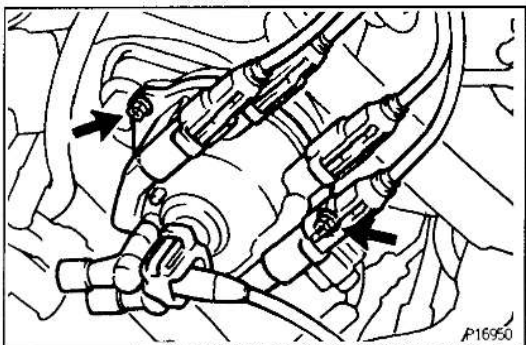
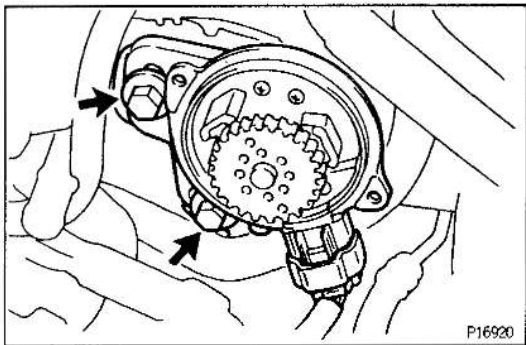
- G1 and G $\ominus$
125 — 200 Ω
- G2 and G $\ominus$
125 — 200 Ω
- NE and G $\ominus$
155 — 250 Ω

Hot

- G1 and G $\ominus$
160 — 235 Ω
- G2 and G $\ominus$
160 — 235 Ω
- NE and G $\ominus$
190 — 290 Ω

If the resistance is not as specified, replace the distributor housing assembly.

- 7. REINSTALL DISTRIBUTOR HOUSING ASSEMBLY**
(See page IG—16)
- 8. RECONNECT DISTRIBUTOR CONNECTOR**
- 9. REINSTALL ROTOR**



- 10. REINSTALL DISTRIBUTOR CAP**
Install a new packing and distributor cap with the 2 bolts.
- 11. ADJUST IGNITION TIMING**
(See page EG—39)

IGNITER INSPECTION

IG018-08

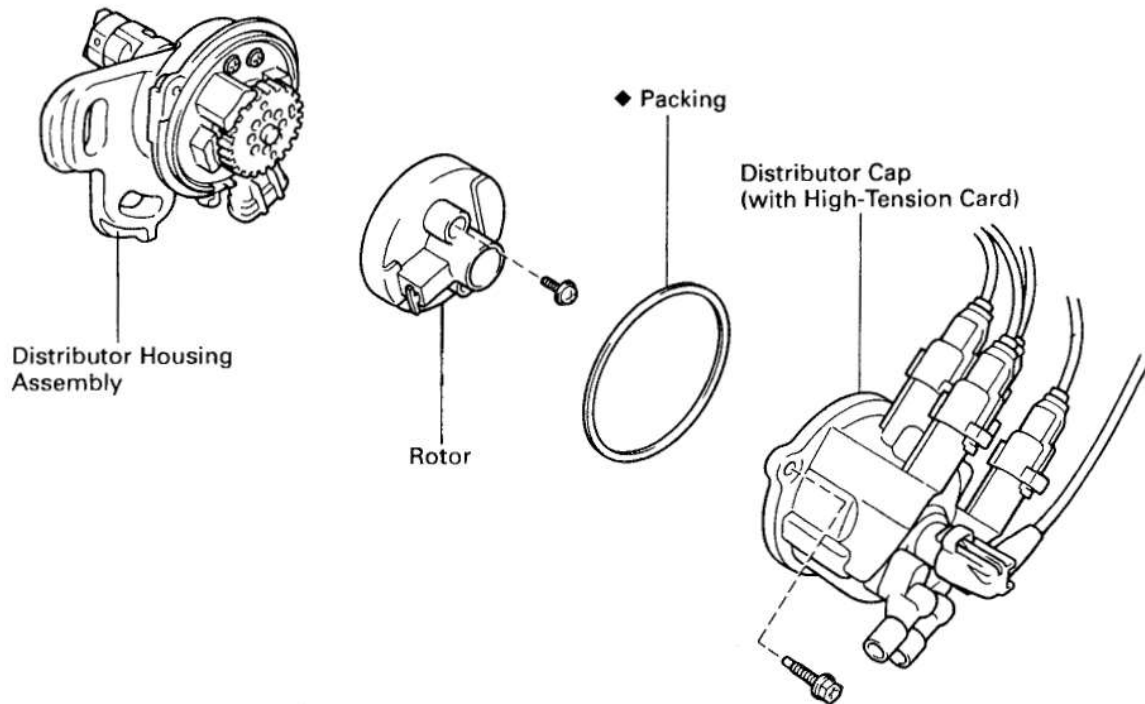
(See procedure Spark Test on page IG—7)

IG-14

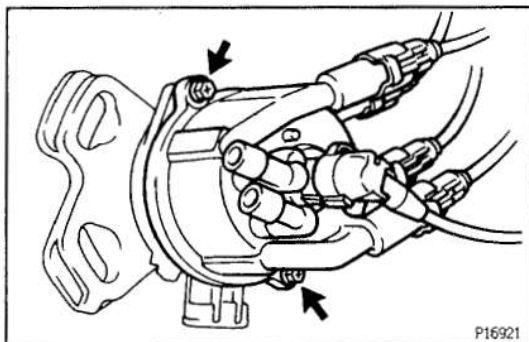
IGNITION SYSTEM — DISTRIBUTOR

DISTRIBUTOR COMPONENTS FOR DISASSEMBLY AND ASSEMBLY

1001K-00



P16824

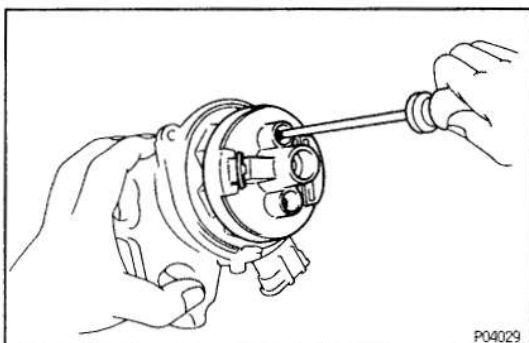


DISTRIBUTOR DISASSEMBLY

(See Components for Disassembly and Assembly)

1. REMOVE DISTRIBUTOR CAP

Remove the 2 bolts, distributor cap and packing.



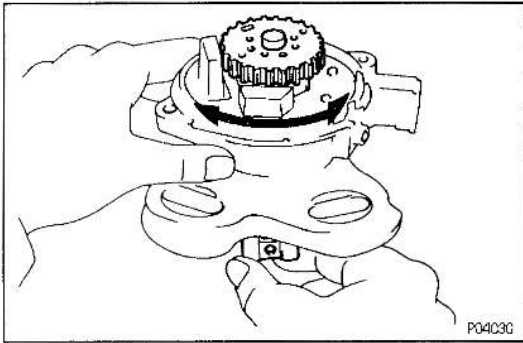
2. REMOVE ROTOR

Remove the 2 screws and rotor.

1003N-04

IGNITION SYSTEM – DISTRIBUTOR

IG-15

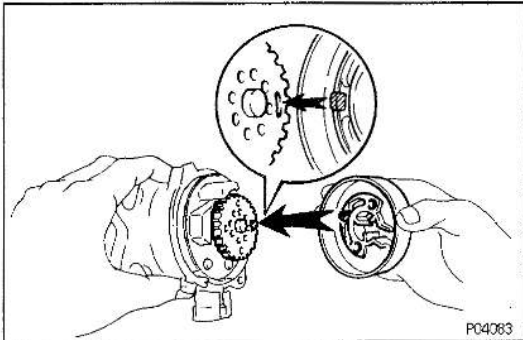


DISTRIBUTOR INSPECTION

IG015-02

INSPECT SHAFT

Turn the shaft and check that it is not rough or worn. If it feels rough or worn, replace the distributor housing assembly.



DISTRIBUTOR ASSEMBLY

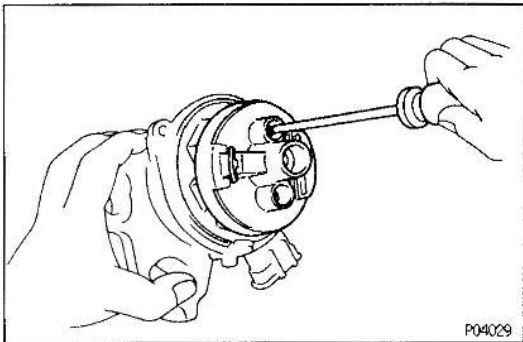
IG015-07

IG

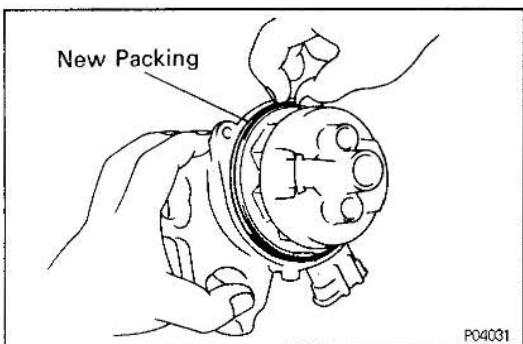
(See Components for Disassembly and Assembly)

1. INSTALL ROTOR

- (a) Align the hollow of the signal rotor with the protrusion of the rotor.

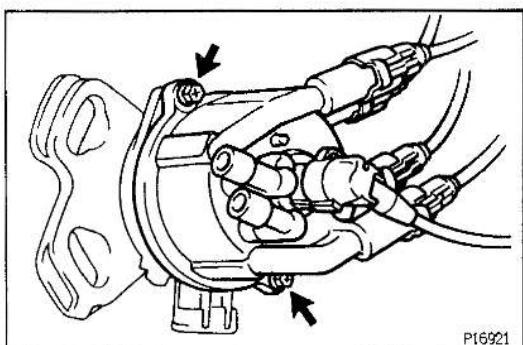


- (b) Install the rotor with the 2 screws.



2. INSTALL DISTRIBUTOR CAP

- (a) Install a new packing to the distributor housing.



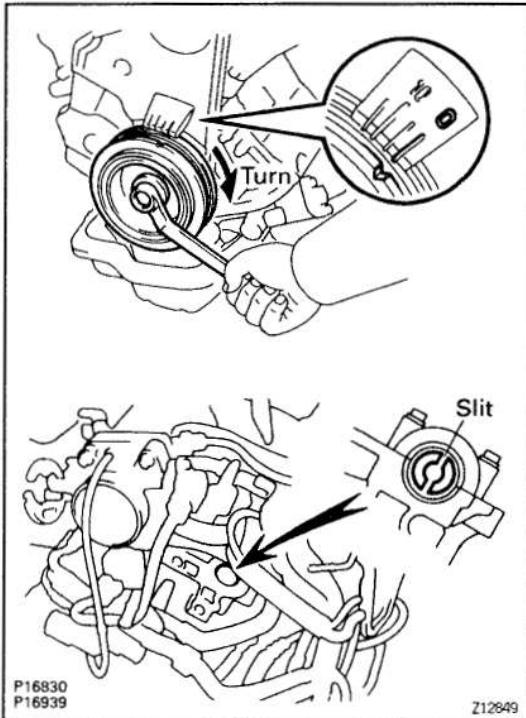
- (b) Install the distributor cap with the 2 bolts.

IG-16**IGNITION SYSTEM — DISTRIBUTOR**

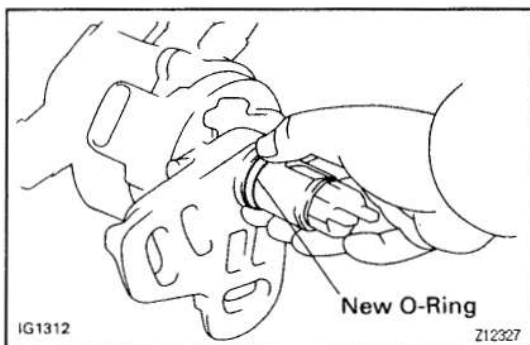
908U-01

DISTRIBUTOR INSTALLATION**(See Components for Removal and Installation)****1. SET NO.1 CYLINDER TO TDC/COMPRESSION**

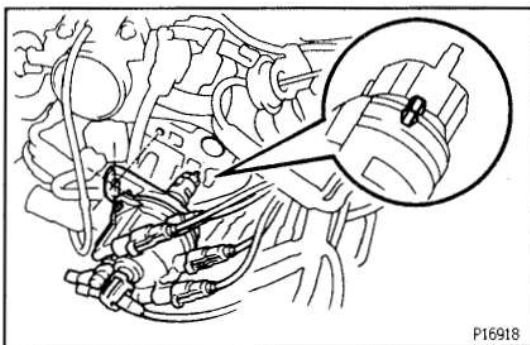
Turn the crankshaft clockwise, and position the slit of the intake camshaft as shown in the illustration.



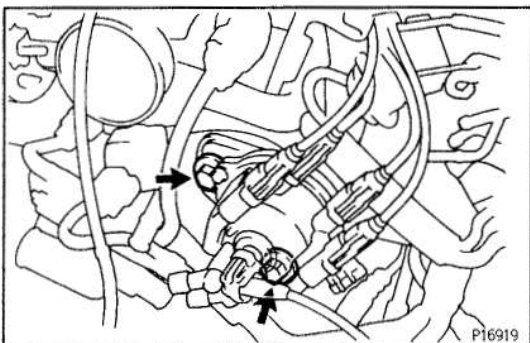
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**2. INSTALL DISTRIBUTOR**

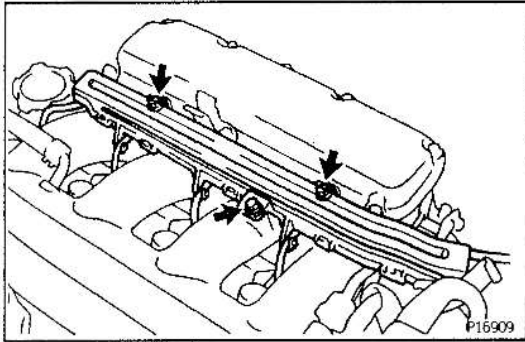
- (a) Install a new O—ring to the distributor housing.
- (b) Apply a light coat of engine oil on the O—ring.



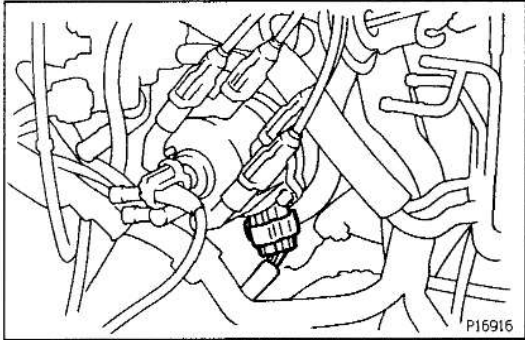
- (c) Align the cutout portion of the coupling with the groove of the housing.
- (d) Insert the distributor, aligning the center of the flange with that of the bolt hole on the cylinder head.



- (e) Lightly tighten the 2 bolts.

IGNITION SYSTEM — DISTRIBUTOR

- (f) Connect the 5 high—tension cords to the spark plugs and ignition coil.
- (g) Install the high—tension cord clamp with the 3 bolts.



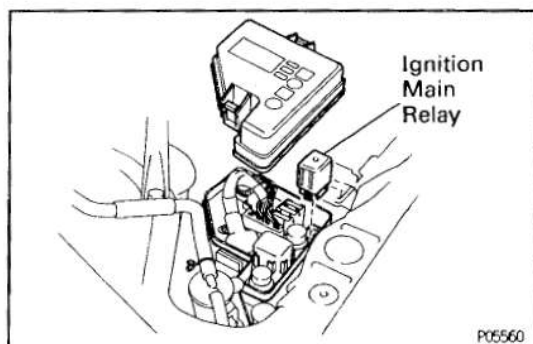
- (h) Connect the distributor connector.

IG

3. ADJUST IGNITION TIMING
(See page EG — 39)

IG-18

IGNITION SYSTEM – IGNITION MAIN RELAY(SW20)



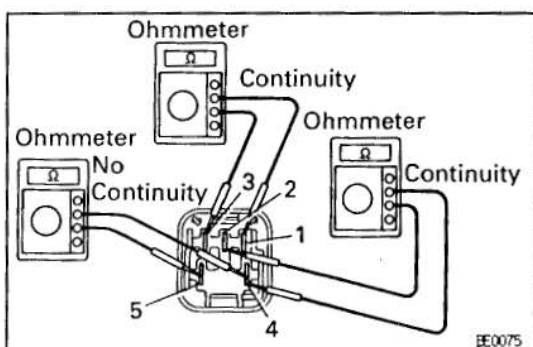
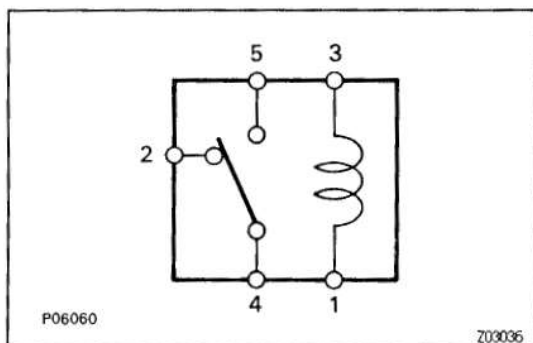
IGNITION MAIN RELAY (SW20)

IGNITION MAIN RELAY ("IGN") INSPECTION

K030-01

1. REMOVE IGNITION MAIN RELAY

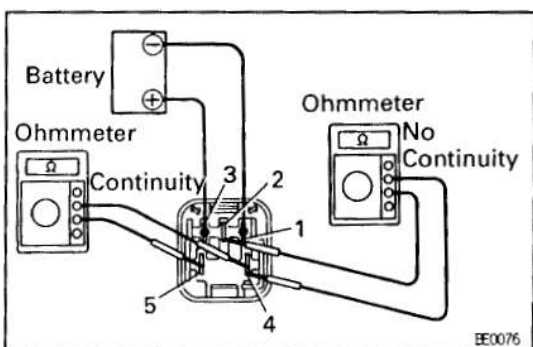
2. INSPECT IGNITION MAIN RELAY



A. Inspect relay continuity

- Using an ohmmeter, check that there is continuity between terminals 1 and 3.
- Check that there is continuity between terminals 2 and 4.
- Check that there is no continuity between terminals 4 and 5.

If continuity is not as specified, replace the relay.



B. Inspect relay operation

- Apply battery voltage across terminals 1 and 3.
- Using an ohmmeter, check that there is continuity between the 2 and 4.
- Check that there is continuity between terminals 4 and 5.

If operation is not as specified, replace the relay.

3. REINSTALL IGNITION MAIN RELAY

IGNITION SYSTEM — SERVICE SPECIFICATIONS**IG-19****SERVICE SPECIFICATIONS
SERVICE DATA**

IG01P-0C

Ignition timing	—	10° BTDC @ idle (w/ Terminals TE1 and E1 of check connector connected)
Firing order	—	1 — 3 — 4 — 2
High — tension cord	Resistance Limit	25 kΩ per cord
Spark plug	Recommended spark plug Correct electrode gap for new plug Maximum electrode gap for used plug	ND NGK PK20R8 BKR6EP—8 0.8 mm (0.031 in.) 1.0 mm (0.039 in.)
Ignition coil	Primary coil resistance Secondary coil resistance	at cold at hot at cold at hot 0.36 — 0.55 Ω 0.45 — 0.65 Ω 9.0 — 15.4 kΩ 11.4 — 18.1 kΩ
Distributor	Air gap Pickup coil resistance	0.2 — 0.5 mm (0.008 — 0.020 in.) at cold G1 — G⊖ 125 — 200 Ω G2 — G⊖ 125 — 200 Ω NE — G⊖ 155 — 250 Ω at hot G1 — G⊖ 160 — 235 Ω G2 — G⊖ 160 — 235 Ω NE — G⊖ 190 — 290 Ω

IG**TORQUE SPECIFICATIONS**

IG017-08

Part tightened	N·m	kgf·cm	ft·lbf
Spark plug x Cylinder head	18	180	13

IG-20

IGNITION SYSTEM — SERVICE SPECIFICATIONS

— MEMO —

