IGNITION SYSTEM

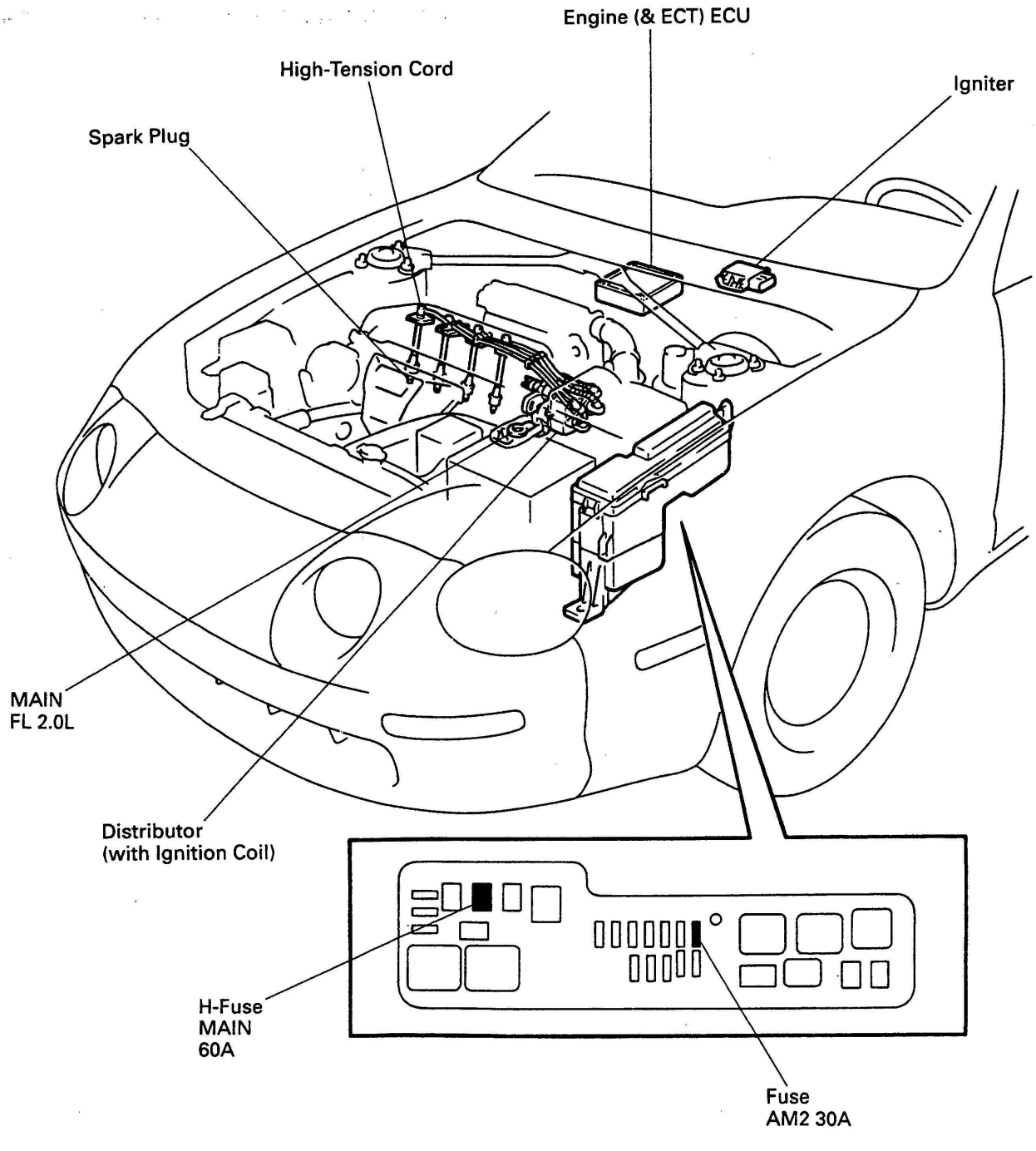
DESCRIPTION ..... IG– 2
PRECAUTION ..... IG– 4
SYSTEM CIRCUIT ..... IG– 5
OPERATION ..... IG– 5
PREPARATION ..... IG– 6
ON–VEHICLE INSPECTION ..... IG– 7
DISTRIBUTOR ..... IG– 12
SERVICE SPECIFICATIONS ..... IG– 18

DESCRIPTION

IG082-01
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.

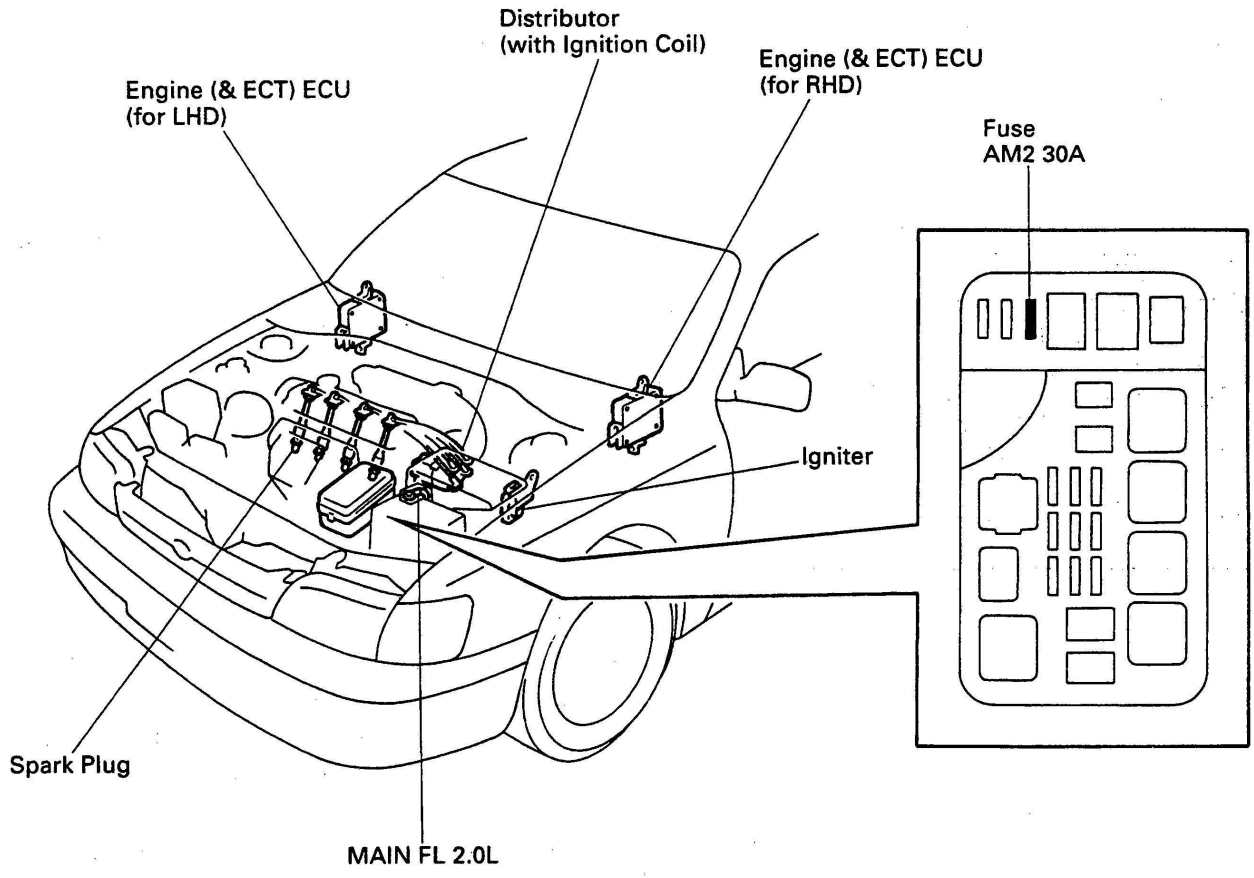
IG

ST202



P17194

ST191



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.

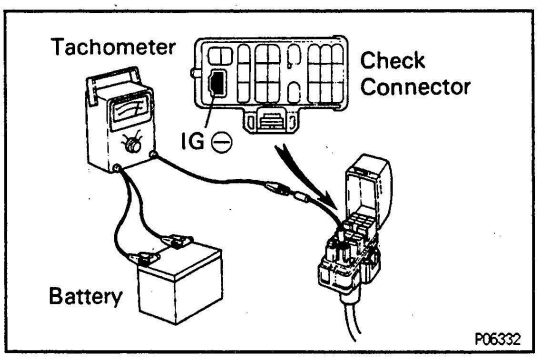
PICKUP COILS

The NE coil detects the crankshaft angle, and the G coil detects camshaft angle.

PRECAUTION

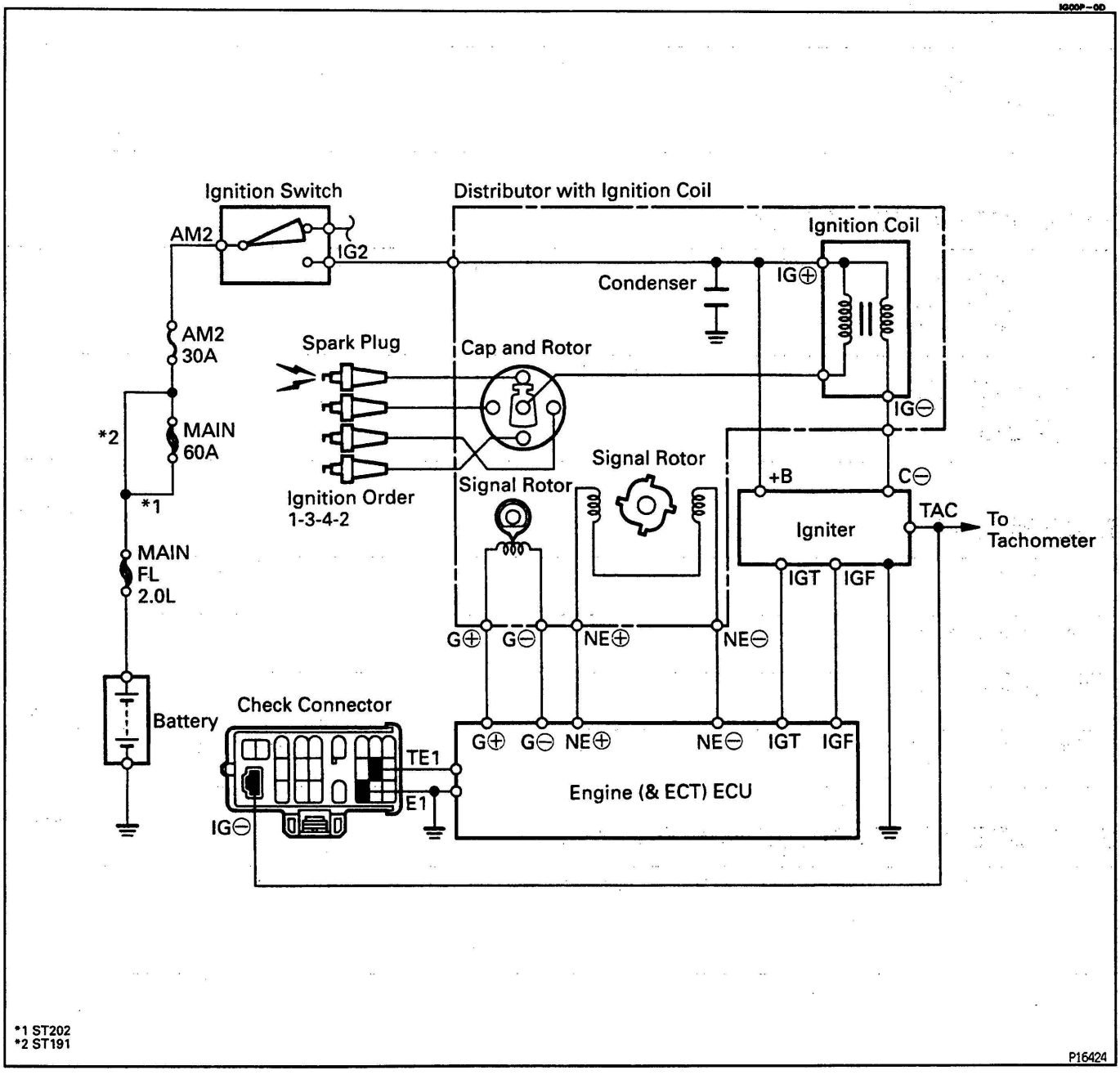
1. Do not leave the ignition switch ON for more than 10 minutes if the engine does not start. IG08Y-02

IG



2. With a tachometer connected to the system, connect the tester probe of the tachometer to terminal IG⊖ of the check connector.
3. As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.
4. Never allow the tachometer terminals to touch ground as it could result in damage to the igniter and/or ignition coil.
5. Do not disconnect the battery while the engine is running.
6. Check that the igniter is properly grounded to the body.

SYSTEM CIRCUIT



OPERATION

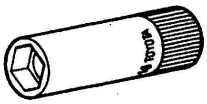
IG00Q-06

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.

PREPARATION

SST (SPECIAL SERVICE TOOLS)

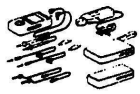
IG00R-06

	09155–16100 Spark Plug Wrench	
	09843–18020 Diagnosis Check Wire	

IG

RECOMMENDED TOOLS

IG00S-05

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

EQUIPMENT

IG00T-06

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

SSM (SPECIAL SERVICE MATERIALS)

IG00U-03

08826–00080 Seal packing or equivalent	Ignition coil

ON—VEHICLE INSPECTION

SPARK TEST

10038-03

CHECK THAT SPARK OCCURS

(a) Disconnect the high—tension cords from the spark plugs.
(b) Remove the spark plugs.
(c) Install the spark plugs to the each high—tension cord.
(d) Ground the spark plug.
(e) Check 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 a time.
If the spark does not occur, perform the test as follows:

SPARK TEST

↓ NO

CHECK CONNECTION OF DISTRIBUTOR AND IGNITER CONNECTORS → BAD → Connect securely.

↓ OK

CHECK RESISTANCE OF HIGH-TENSION CORD
(See page IG-8)
Maximum resistance: 25 kΩ per cord → BAD → Replace the cord(s).

↓ OK

CHECK POWER SUPPLY TO IGNITION COIL
1. Turn ignition switch ON.
2. Check that there is battery voltage at ignition coil positive (+) terminal.

→ BAD → Check the wiring between ignition switch and ignition coil.

↓ OK

CHECK RESISTANCE OF IGNITION COIL
(See page IG-10)

Resistance:	Cold	Hot
Primary	0.36 – 0.55 Ω	0.45 – 0.65 Ω
Secondary	9.0 – 15.4 kΩ	11.4 – 18.1 kΩ

→ BAD → Replace the ignition coil.

↓ OK

CHECK RESISTANCE OF SIGNAL GENERATOR (PICKUP COIL)
(See page IG-11)

Resistance:	Cold	Hot
G⊕ and G⊖	185 – 275 Ω	240 – 325 Ω
NE⊕ and NE⊖	370 – 550 Ω	475 – 650 Ω

→ BAD → Replace the distributor housing assembly.

↓ OK

CHECK AIR GAP OF DISTRIBUTOR
(See page IG-10)
Air gap: 0.2 – 0.4 mm (0.008 – 0.016 in.) → BAD → Replace the distributor housing assembly.

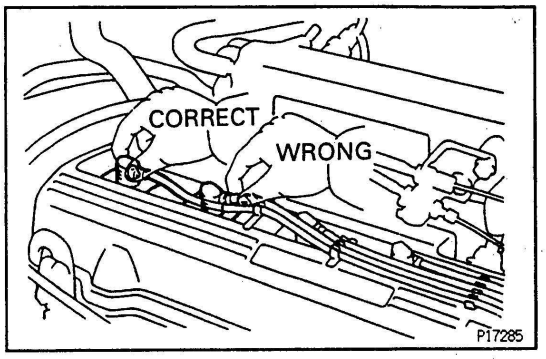
↓ OK

CHECK IGT SIGNAL FROM ECU
(See page EG-191) → BAD → Check the wiring between ECU , distributor and igniter, and then try another ECU.

↓ OK

TRY ANOTHER IGNITER

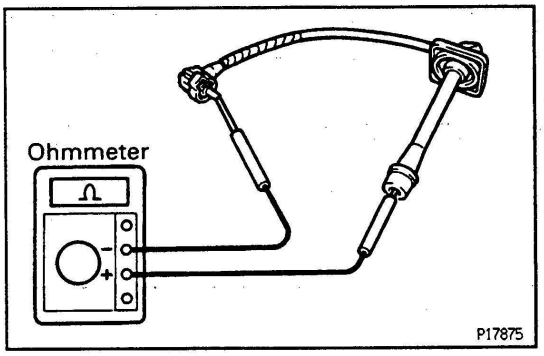
V05116



HIGH–TENSION CORDS INSPECTION

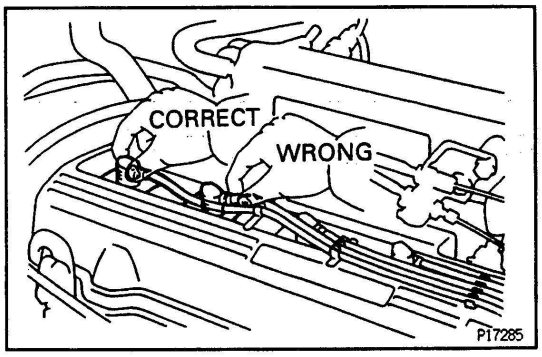
I30A1–02

1. **REMOVE HIGH–TENSION CORDS**
Disconnect the high – tension cords at the rubber boot. Do not pull on the 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 kΩ per cord
If the resistance is greater than maximum, replace the high–tension cord.

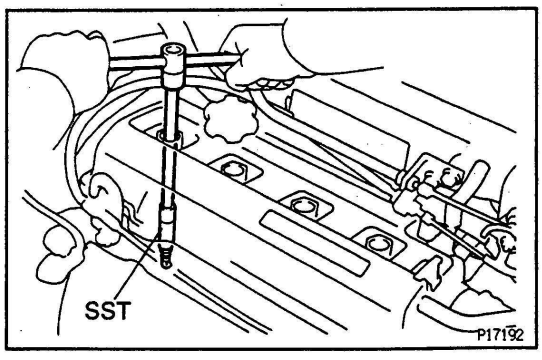
3. **REINSTALL HIGH–TENSION CORDS**



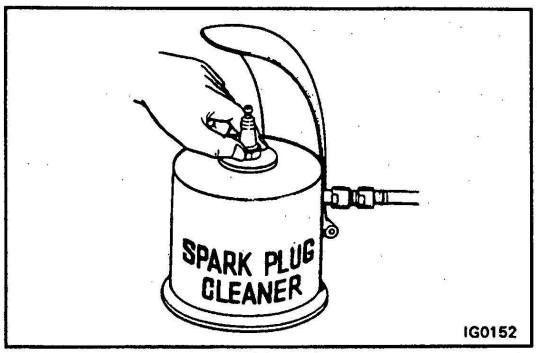
SPARK PLUGS INSPECTION

I30B3–01

1. **DISCONNECT HIGH – TENSION CORDS FROM SPARK PLUGS**
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.

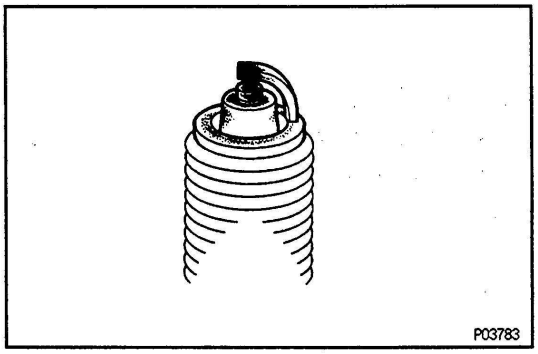


2. **REMOVE SPARK PLUGS**
Using SST, remove the 4 spark plugs.
SST 09155–16100



3. CLEAN SPARK PLUGS

Using a spark plug cleaner or wire brush, clean the spark plug.



4. VISUALLY INSPECT SPARK PLUGS

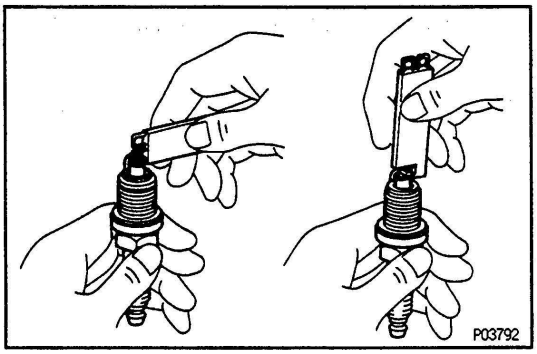
Check the spark plug for electrode wear, thread damage and insulator damage.

If abnormal, replace the spark plug.

Recommended spark plug:

K20R–U11 for ND

BKR6EYA11 for NGK

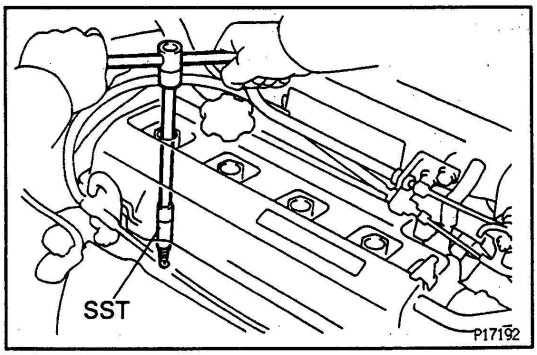


5. ADJUST ELECTRODE GAP

Carefully bend the outer electrode to obtain the correct electrode gap.

Electrode gap:

1.1 mm (0.043 in.)



6. REINSTALL SPARK PLUGS

Using SST, install the 4 spark plugs.

SST 09155–16100

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

7. RECONNECT HIGH–TENSION CORDS TO SPARK PLUGS

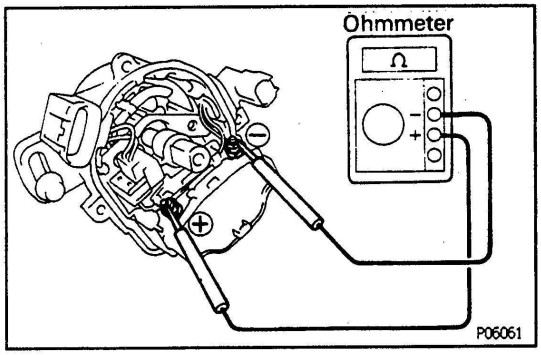
IG003U–04

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).

1. **DISCONNECT DISTRIBUTOR CONNECTORS**
2. **REMOVE DISTRIBUTOR CAP**
3. **REMOVE ROTOR**
4. **REMOVE IGNITION COIL DUST COVER**

Ignition Coil



5. **INSPECT PRIMARY COIL RESISTANCE**

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

Primary coil resistance:

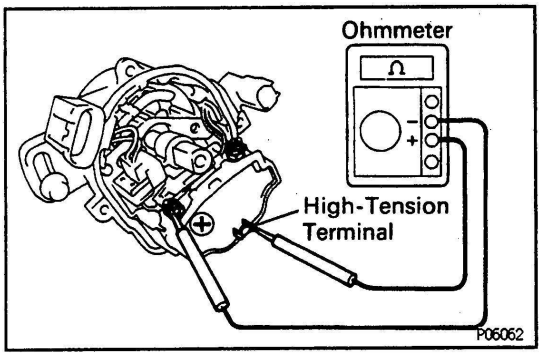
Cold

0.36 – 0.55 Ω

Hot

0.45 – 0.65 Ω

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



6. **INSPECT SECONDARY COIL RESISTANCE**

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

Secondary coil resistance:

Cold

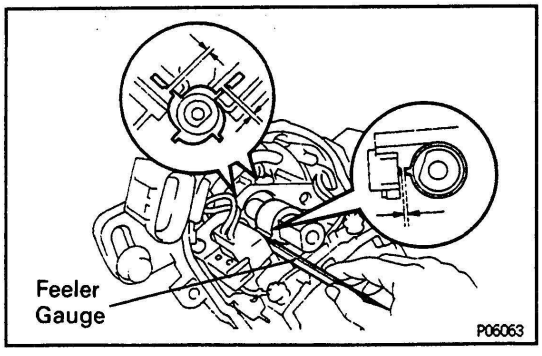
9.0 – 15.4 kΩ

Hot

11.4 – 18.1 kΩ

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

Distributor



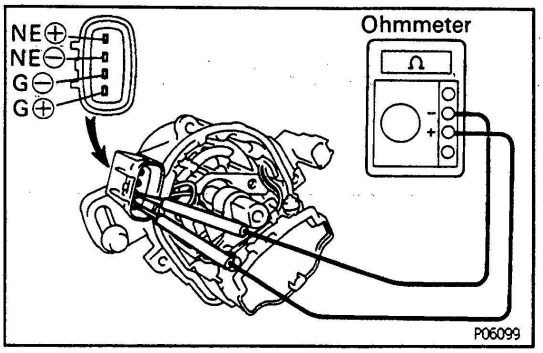
7. **INSPECT AIR GAP**

Using a feeler gauge, measure the air gap between the signal rotor and pickup coil projection.

Air gap:

0.2 – 0.4 mm (0.008 – 0.016 in.)

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



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

Using an ohmmeter, measure the resistance between the terminals.

Pickup coil resistance:

Cold

G⊕ and G⊖

185 – 275 Ω

NE⊕ and NE⊖

370 – 550 Ω

Hot

G⊕ and G⊖

240 – 325 Ω

NE⊕ and NE⊖

475 – 650 Ω

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

9. **REINSTALL IGNITION COIL DUST COVER**
10. **REINSTALL ROTOR**
11. **REINSTALL DISTRIBUTOR CAP**
12. **RECONNECT DISTRIBUTOR CONNECTORS**

IG

IGNITER INSPECTION

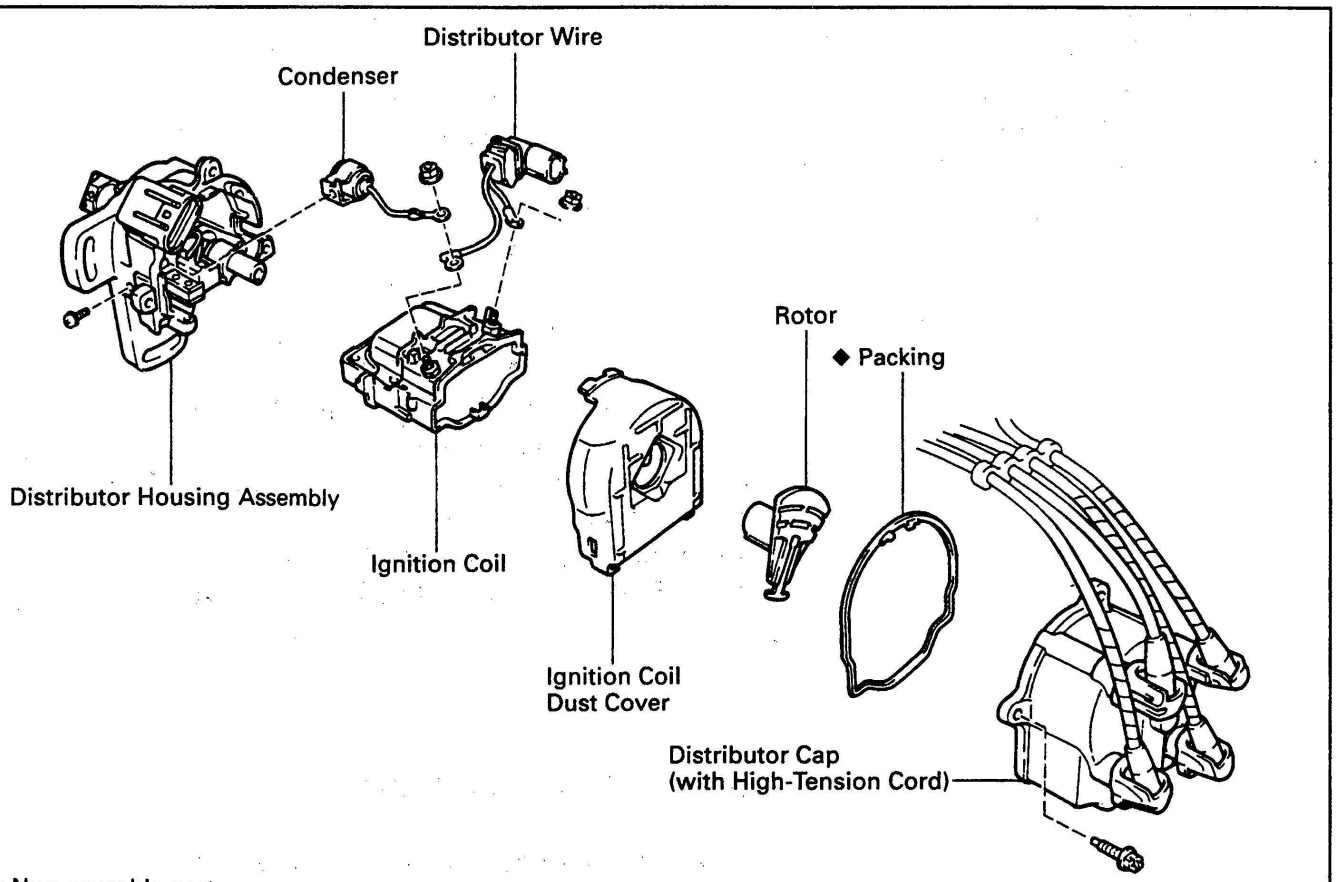
IG00Z–07

(See procedure Spark Test on page IG–7)

DISTRIBUTOR

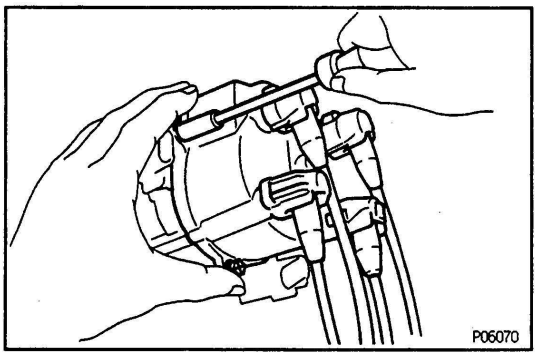
COMPONENTS FOR DISASSEMBLY AND ASSEMBLY

IG011-08



IG03W-03

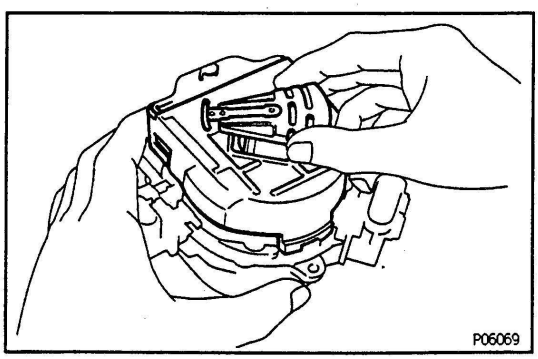
DISTRIBUTOR DISASSEMBLY



(See Components for Disassembly and Assembly)

1. REMOVE DISTRIBUTOR CAP

Remove the 3 bolts and distributor cap.

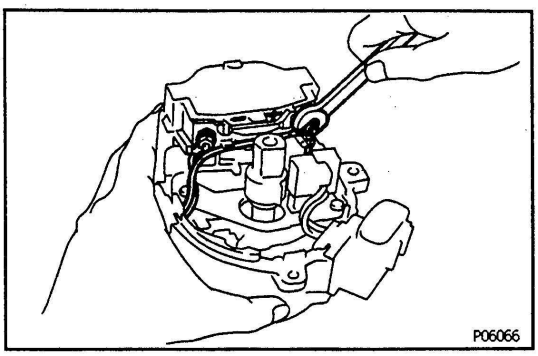


2. REMOVE ROTOR

3. REMOVE IGNITION COIL DUST COVER

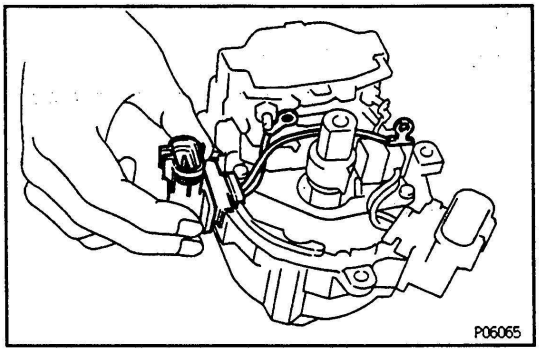
(a) Remove the dust cover.

(b) Remove the packing.

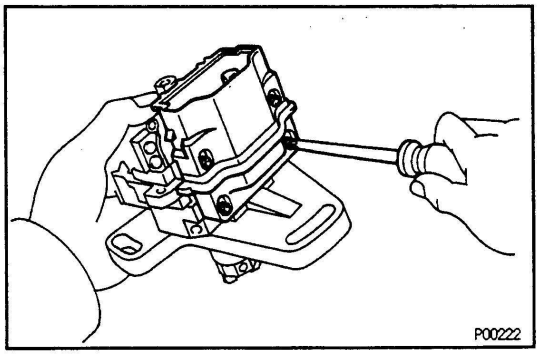


4. REMOVE DISTRIBUTOR WIRE

(a) Remove the 2 nuts, and disconnect the 3 wires from the ignition coil terminals.

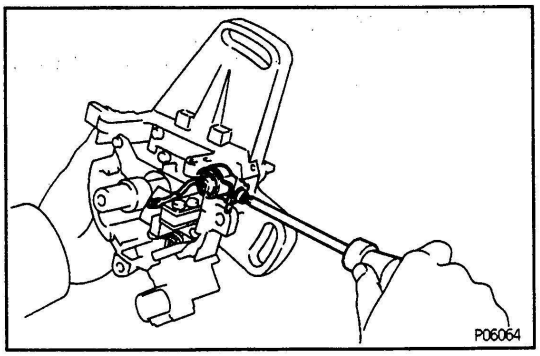


(b) Remove the distributor wire from the distributor housing.



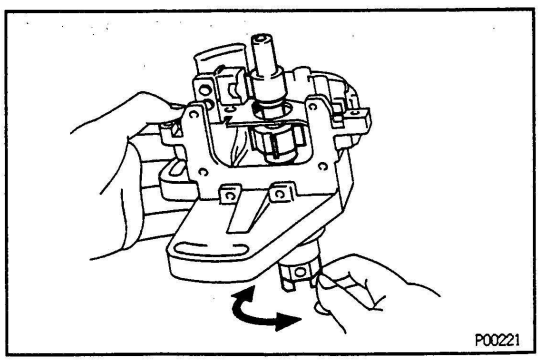
5. REMOVE IGNITION COIL

Remove the 4 screws and ignition coil.



6. REMOVE CONDENSER

Remove the screw and condenser.



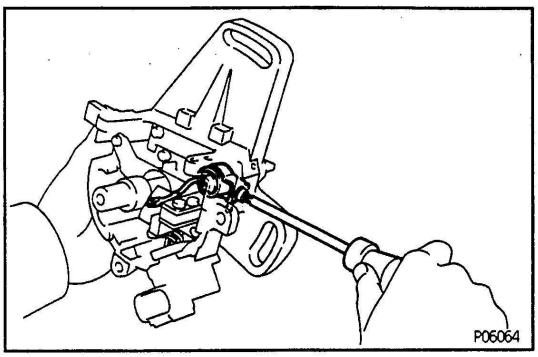
DISTRIBUTOR INSPECTION

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.

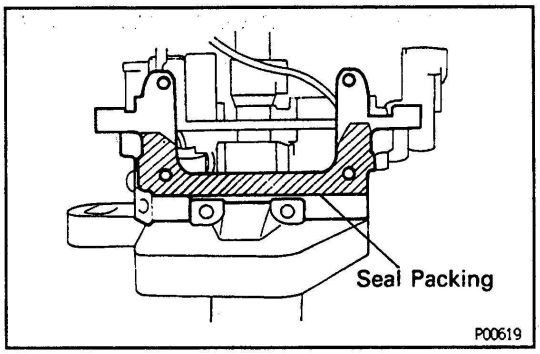
IG03X-04

DISTRIBUTOR ASSEMBLY

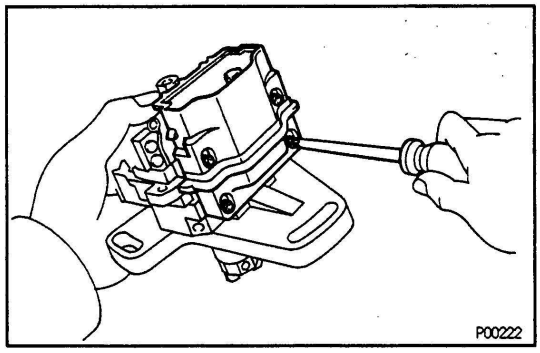


(See Components for Disassembly and Assembly)

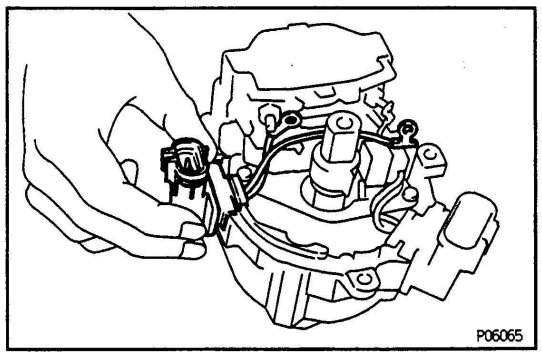
1. **INSTALL CONDENSER**
   Install the condenser with the screw.



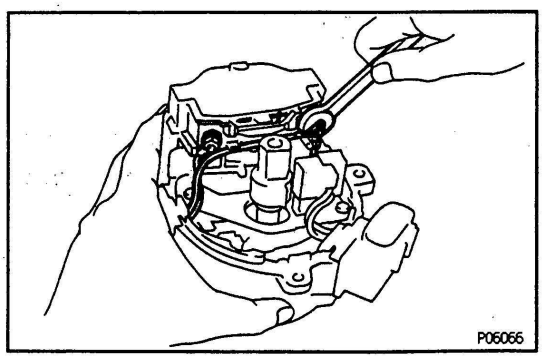
2. **INSTALL IGNITION COIL**
   (a) Remove any old packing (FIPG) material.
   (b) Apply seal packing to the ignition coil installing surface of the housing.
   Seal packing:
   Part No. 08826–00080 or equivalent



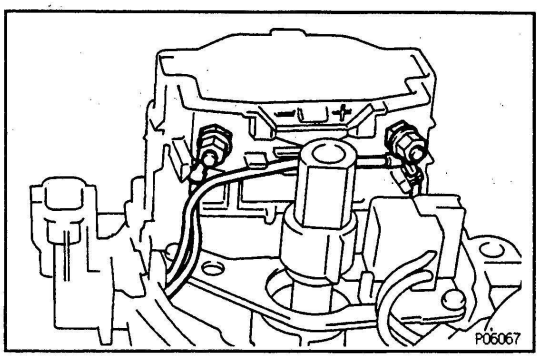
(c) Install the ignition coil with the 4 screws.



3. **INSTALL DISTRIBUTOR WIRE**
   (a) Install the grommet of the wire to the distributor housing.

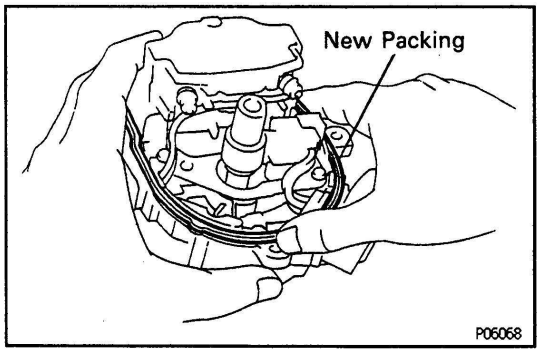


(b) Connect the 3 wires to the ignition coil terminals with the 2 nuts.



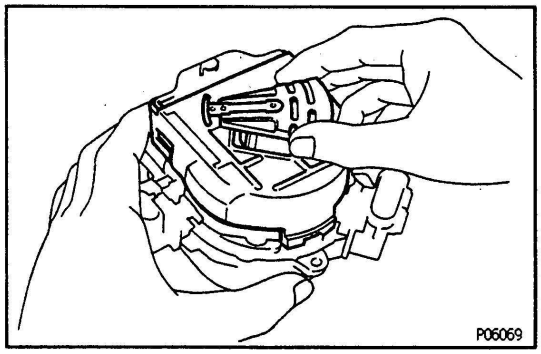
NOTICE:

- **When connecting the wires to the ignition coil, insert both properly into their grooves found on the side of the ignition coil.**
- **Be sure the wires do not contact with the signal rotor or distributor housing.**



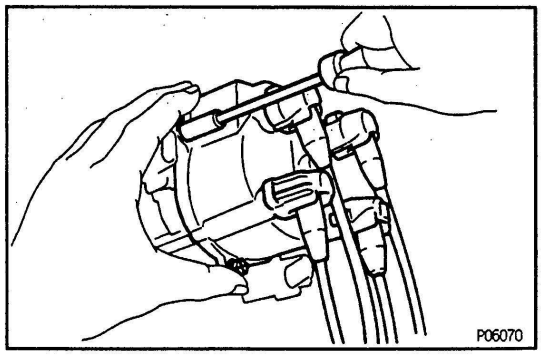
4. INSTALL IGNITION COIL DUST COVER

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



(b) Install the dust cover.

5. INSTALL ROTOR

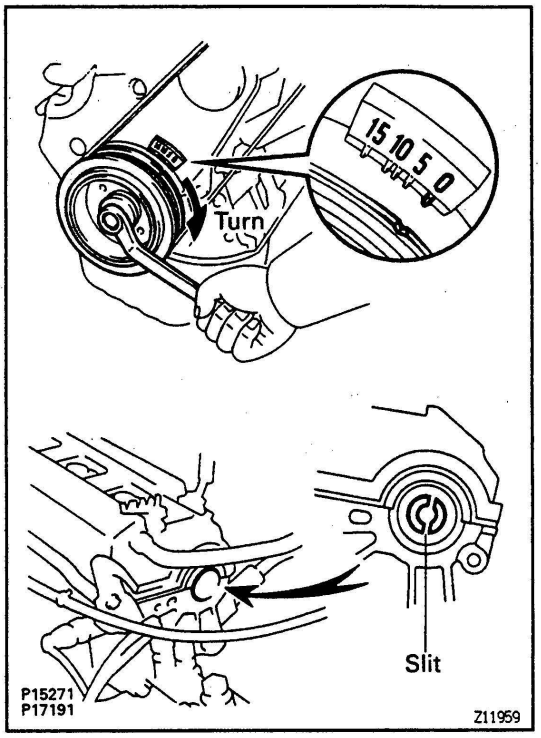


6. INSTALL DISTRIBUTOR CAP AND HIGH–TENSION CORDS

Install the distributor cap with the 3 bolts.

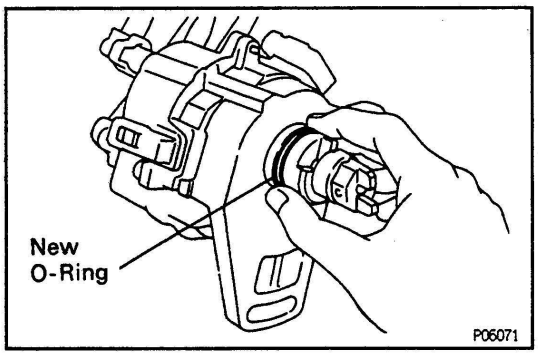
IG0084-01

DISTRIBUTOR INSTALLATION



1. SET NO.1 CYLINDER TO TDC/COMPRESSION

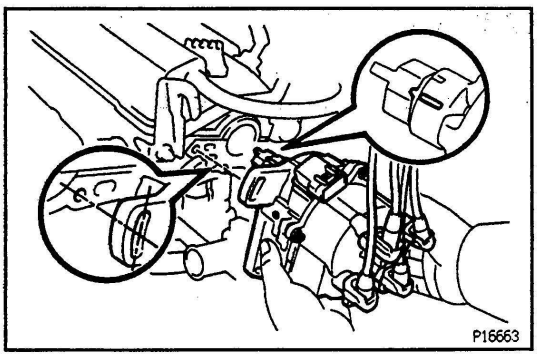
Turn the crankshaft clockwise, and position the slit of the intake camshaft as shown in the illustration.



2. INSTALL DISTRIBUTOR

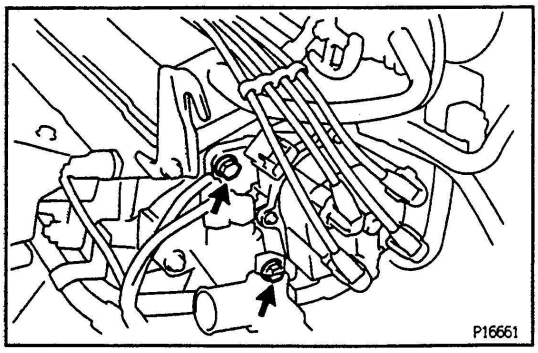
(a) Install a new O–ring to the housing.

(b) Apply a light coat of engine oil on the O–ring



(c) Align the cutout portion of the coupling with the protrusion of the housing.

(d) Insert the distributor, aligning the center of the flange with that of the bolt hole on the cylinder head.

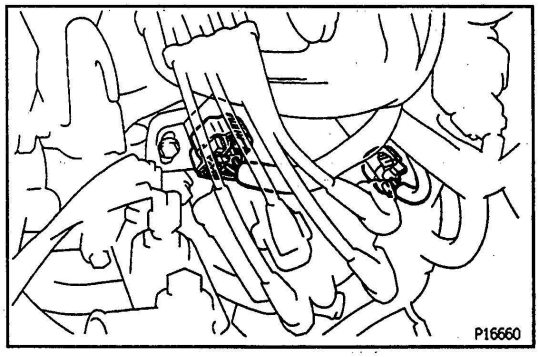


(e) Lightly tighten the 2 bolts.

3. CONNECT HIGH–TENSION CORDS TO SPARK PLUGS

(a) Connect the 4 high–tension cords to the spark plugs.
Firing order:
1 – 3 – 4 – 2

(b) Connect the 4 high–tension cords to the clamp on the cylinder head cover.



4. CONNECT DISTRIBUTOR CONNECTORS

5. ADJUST IGNITION TIMING (See page EG–25)
Ignition timing:
10° BTDC @ idle
(w/ Terminals TE1 and E1 connected)

SERVICE SPECIFICATIONS

SERVICE DATA

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Ignition timing	w/ Terminals TE1 and E1 connected		10° BTDC @ idle
Firing order	—		1 — 3 — 4 — 2
High—tension cord	Resistance	Limit	25 kΩ per cord
Spark plug	Recommended spark plug	ND	K20R—U11
		NGK	BKR6EYA11
	Electrode gap		1.1 mm (0.043 in.)
Ignition coil	Primary coil resistance	at cold	0.36 — 0.55 Ω
		at hot	0.45 — 0.65 Ω
	Secondary coil resistance	at cold	9.0 — 15.4 kΩ
		at hot	11.4 — 18.1 kΩ
Distributor	Air gap		0.2 — 0.4 mm (0.008 — 0.016 in.)
	Pickup coil resistance	at cold G⊕ — G⊖	185 — 275 Ω
		NE⊕ — NE⊖	370 — 550 Ω
		at hot G⊕ — G⊖	240 — 325 Ω
		NE⊕ — NE⊖	475 — 650 Ω

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TORQUE SPECIFICATIONS

Part tightened	N·m	kgf·cm	ft·lbf
Spark plug x Cylinder head	18	180	13
Distributor x Cylinder head	19	195	14