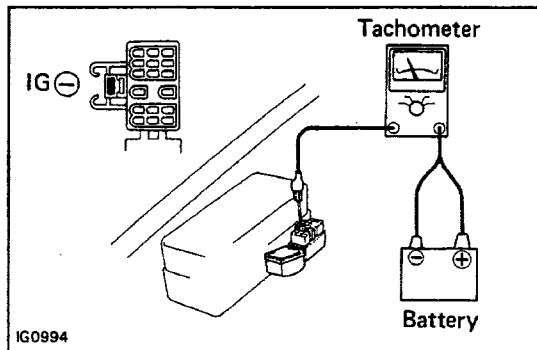


IGNITION SYSTEM

(22R –E)

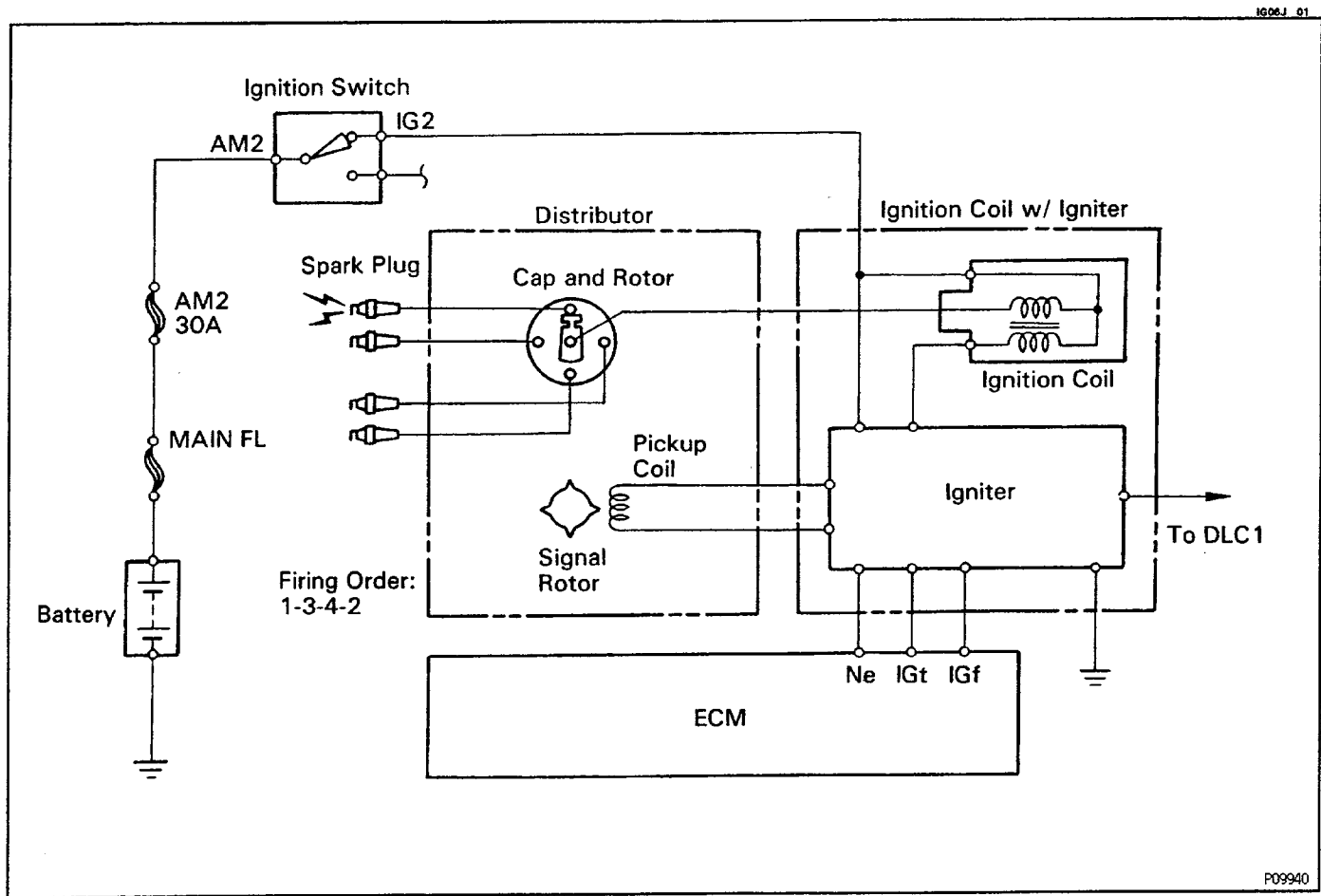
PRECAUTIONS

1. Do not allow the ignition switch to be ON for more than 10 minutes if the engine will not start.



2. When a tachometer is connected to the system, connect the tachometer test probe to the IG(-) terminal of the DLC 1.
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 ignition coil terminals to touch ground as it could result in damage to the igniter and/or ignition coil.
5. Do not disconnect the battery when the engine is running.
6. Make sure that the igniter properly grounded to the body.

SYSTEM CIRCUIT




ELECTRONIC SPARK ADVANCE (ESA)

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



PREPARATION**SST (SPECIAL SERVICE TOOLS)**

IG00R-04

	09843-18020 Diagnosis Check Wire	
---	----------------------------------	--

RECOMMENDED TOOLS

IG00S-02

	09082-00015 TOYOTA Electrical Tester	
	09200-00010 Engine Adjust Kit	

EQUIPMENT

IG00T-01

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

SSM (SPECIAL SERVICE MATERIALS)

IG00U-02

08826-00080 Seal packing or equivalent	Ignition coil
--	---------------

ON-VEHICLE INSPECTION

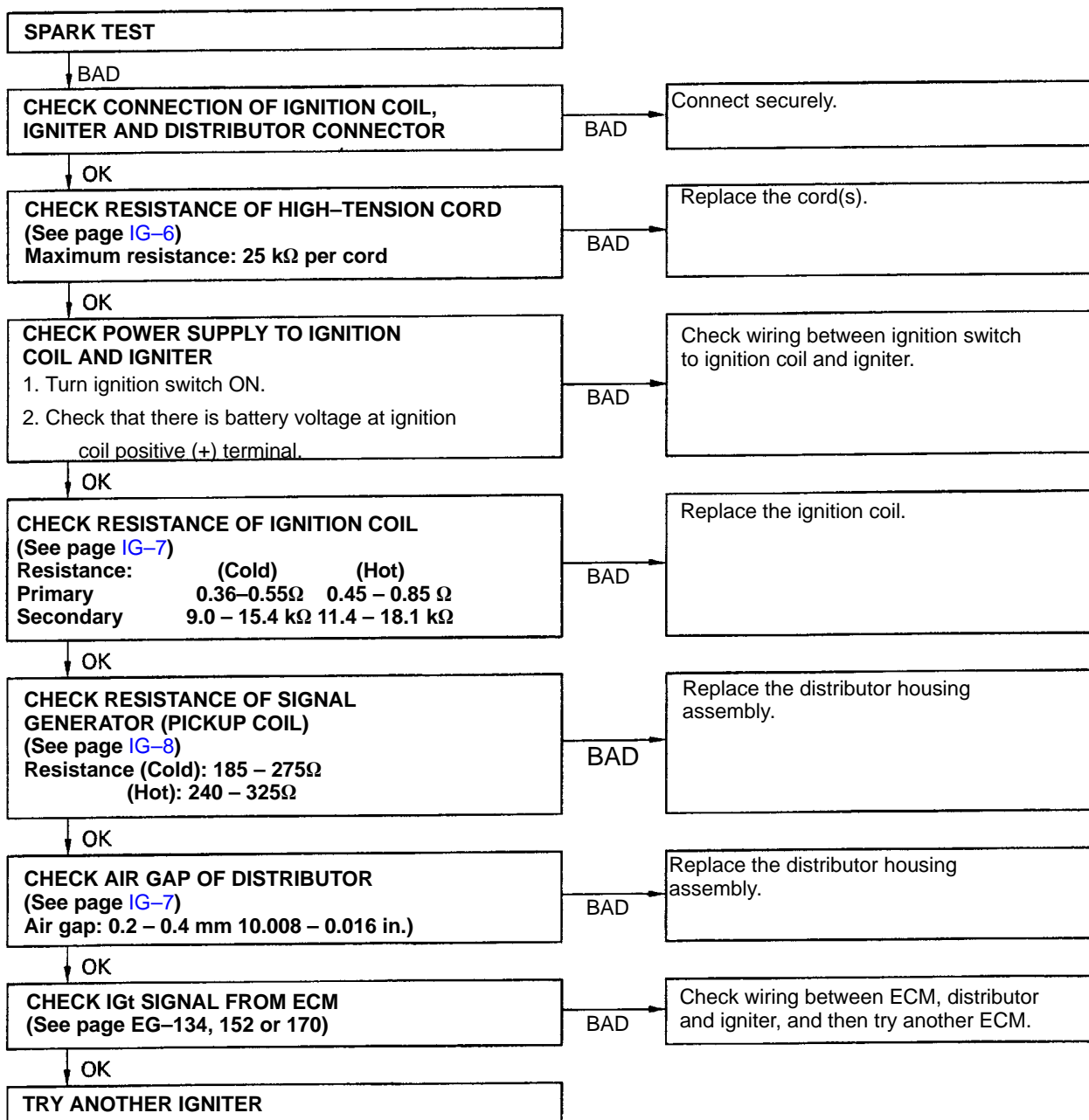
SPARK TEST

IG06L-01

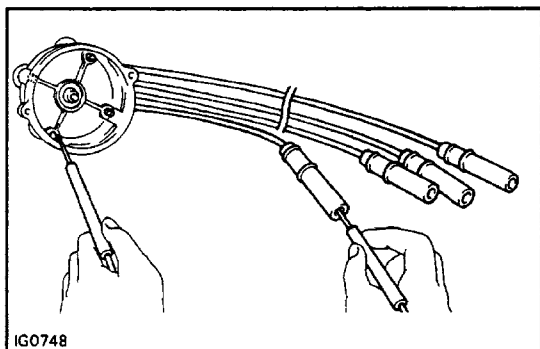
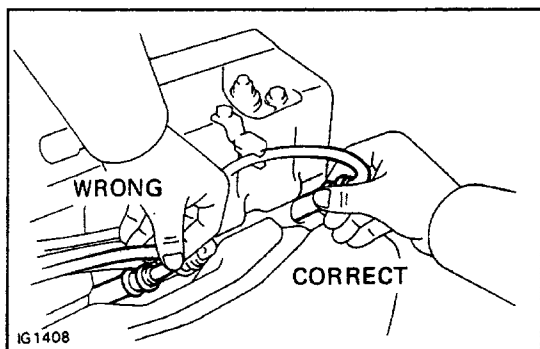
- Disconnect high-tension cord from the distributor.
- Hold the cord end approx. 12.5 mm (0.50 in.) from engine ground of vehicle.
- Check if spark occurs while engine is being cranked.

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.



V01995



HIGH-TENSION CORD INSPECTION

IG06M-01

1. CAREFULLY REMOVE HIGH-TENSION CORDS BY THEIR RUBBER BOOTS FROM SPARK PLUGS

CAUTION: Do not pull on or bend the cords to avoid damaging the conductor inside.

2. INSPECT HIGH-TENSION CORD TERMINALS

Check the terminals for corrosion, breaks or distortion.

Replace cords as required.

3. INSPECT HIGH-TENSION CORD RESISTANCE

Using an ohmmeter, check that the resistance does not exceed the maximum.

Maximum resistance:

25 kΩ per cord

If the resistance exceeds maximum, check the terminals. If any defect has been found, replace the high-tension cord and/or distributor cap.

SPARK PLUGS INSPECTION

IG06N-01

1. REMOVE SPARK PLUGS

2. CLEAN AND INSPECT SPARK PLUGS

(a) Clean the spark plugs with a spark plug cleaner or wire brush.

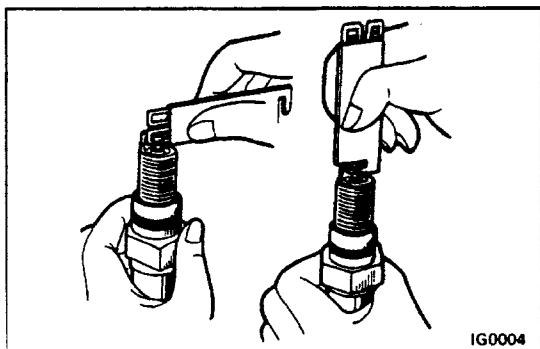
(b) Inspect the spark plugs for electrode wear, thread damage and insulator damage.

If a problem is found, replace the plugs.

Spark plug:

ND W16EXR-U

NGK BPR5EY



3. ADJUST ELECTRODE GAP

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

Correct electrode gap:

0.8 mm (0.031 in.)

4. INSTALL SPARK PLUGS

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

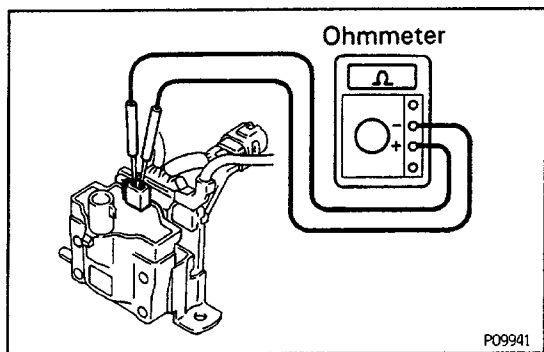
IGNITION COIL INSPECTION

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 (104°F) and "Hot" is from 50°C (104°F) to 100°C (212°F).

1. DISCONNECT HIGH-TENSION CORD

2. CLEAN COIL AND CHECK FOLLOWING:

- (a) Check for cracks or damage.
- (b) Check the terminals for carbon tracks.
- (c) Check the high-tension cord hole for carbon deposits and corrosion.

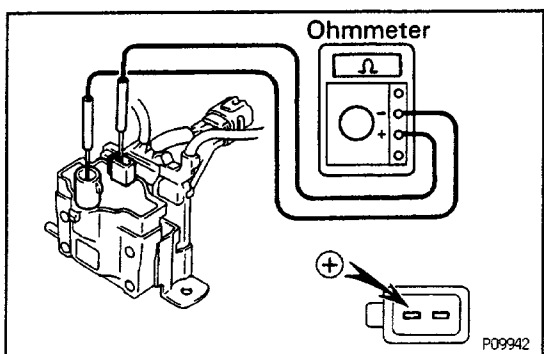


3. MEASURE PRIMARY COIL RESISTANCE

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

Primary coil resistance (Cold): $0.36\text{--}0.55\Omega$

Primary coil resistance (Hot) : $0.45\text{--}0.65\Omega$



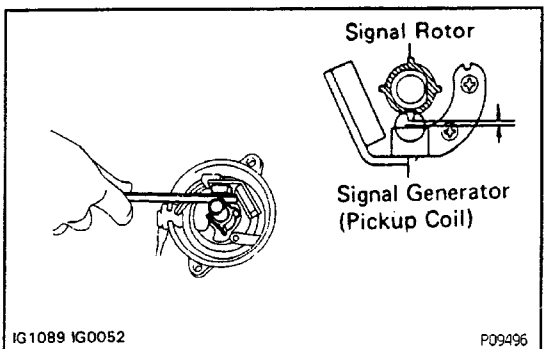
4. MEASURE SECONDARY COIL RESISTANCE

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

Secondary coil resistance (Cold): $9.0\text{--}15.4\text{k}\Omega$

Secondary coil resistance (Hot) : $11.4\text{--}18.1\text{ k}\Omega$

5. CONNECT HIGH-TENSION CORD



DISTRIBUTOR INSPECTION

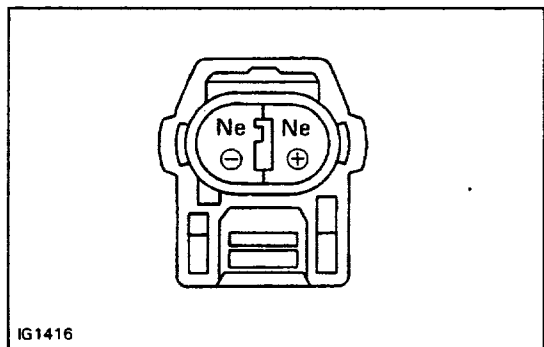
1. INSPECT AIR GAP

Using a thickness gauge, measure the gap between the signal rotor and the signal generator (pickup coil) projection.

Air gap:

0.2–0.4mm(0.008–0.015in.)

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



2. CHECK SIGNAL GENERATOR (PICKUP COIL)

Using an ohmmeter, check the resistance of the signal generator (pickup coil).

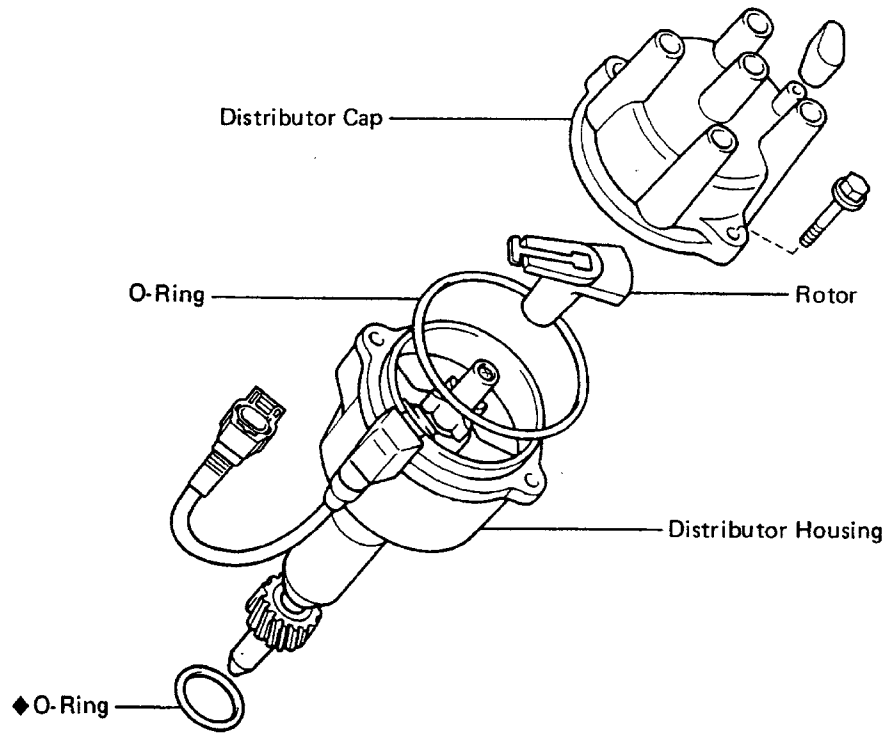
Generator resistance (Cold): 185–2750

Generator resistance (Hot): 240–325Ω

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

DISTRIBUTOR COMPONENTS

IG06R-01



◆ Non-reusable part

P10048

DISTRIBUTOR REMOVAL

IG06S-01

1. DISCONNECT HIGH - TENSION CORDS AND WIRING CONNECTOR
2. REMOVE TWO SCREWS AND PULL OFF DISTRIBUTOR CAP
3. REMOVE HOLD - DOWN BOLT AND PULL OUT DISTRIBUTOR

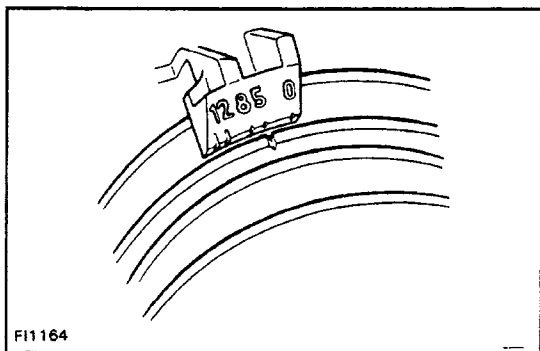
DISTRIBUTOR INSTALLATION

IG06T-01

1. INSTALL DISTRIBUTOR AND SET TIMING

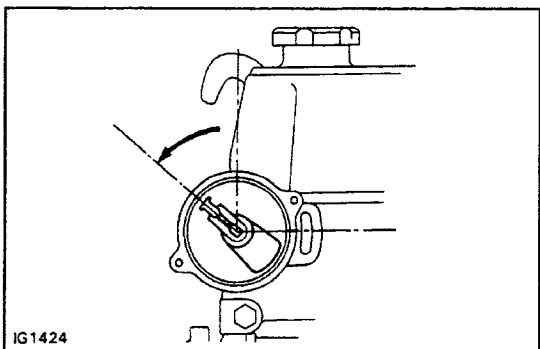
- (a) Install a new O-ring to the distributor.

HINT: Always use a new O-ring when installing the distributor.

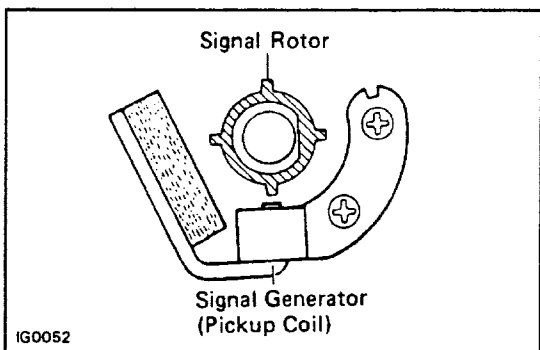


- (b) Turn the crankshaft pulley until No. 1 cylinder is in compression stroke and the timing mark is aligned with 5 °BTDC mark.

HINT: Check that the rocker arms on the No. 1 cylinder are loose. If not, turn the crankshaft one full turn.



- (c) Temporarily install the rotor.
(d) Begin insertion of the distributor with the rotor pointing upward and the distributor mounting hole approximately at center position of the bolt hole. When fully installed, the rotor will rotate to the position shown.



- (e) Align the rotor tooth with the signal generator (pickup coil) projection.

Install and torque the distributor mounting bolt.

Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)

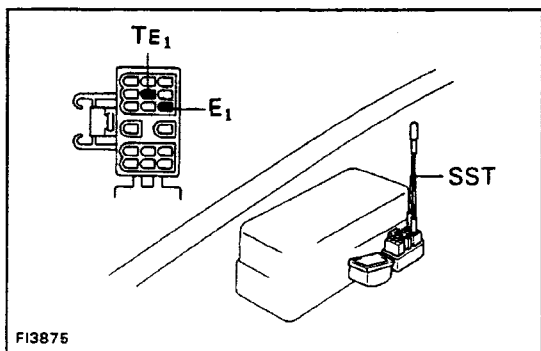
- (f) Install the rotor and distributor cap with wires.

2. CONNECT HIGH-TENSION CORDS AND WIRING CONNECTOR

3. WARM UP ENGINE TO NORMAL OPERATING TEMPERATURE

4. CONNECT TACHOMETER AND TIMING LIGHT TO ENGINE

(See page [IG-2](#))



5. ADJUST IGNITION TIMING

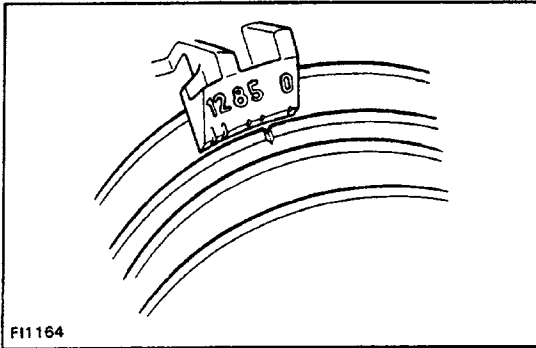
- (a) Using SST, connect terminals TE1 and E1 of the DLC 1.

SST 09843-18020

- (b) Check the idle speed.

Idle speed:

750 rpm



(c) Using a timing light, check the ignition timing.

Ignition timing:

5 ° BTDC @ idle

(Transmission in neutral range)

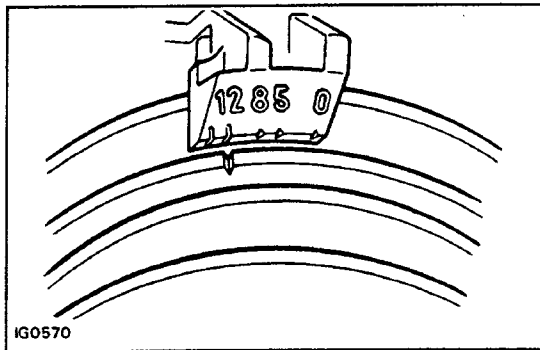
(d) Loosen the hold-down bolt, and adjust by turning the distributor.

(e) Tighten the hold-down bolt, and recheck the ignition timing.

Torque: 19 N·m (195 kgf·cm, 14 ft·lbf)

(f) Remove the SST.

SST 09843-18020



6. FURTHER CHECK IGNITION TIMING

Check that the ignition timing advances.

Ignition timing:

10 – 14 ° BTDC @ idle

7. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE

SERVICE SPECIFICATIONS

IG06U-01

SERVICE DATA

Spark plug	Type	ND NGK	W16EXR–U BPR5EY
	Gap		0.8 mm 0.031 in.
High–tension cord	Resistance	Limit	25 k Ω per cord
Ignition coil	Primary coil resistance (Cold)		0.36 – 0.55 Ω
	Primary coil resistance (Hot)		0.45 – 0.65 Ω
	Secondary coil resistance (Cold)		9.0 – 15.4 k Ω
	Secondary coil resistance (Hot)		11.4 – 18.1 k Ω
Distributor	Air gap		0.2 – 0.4 mm (0.008 – 0.016 in.)
	Pickup coil resistance (Cold)		185 – 275 Ω
	Pickup coil resistance (Hot)		240 – 325 Ω

IG06V-01

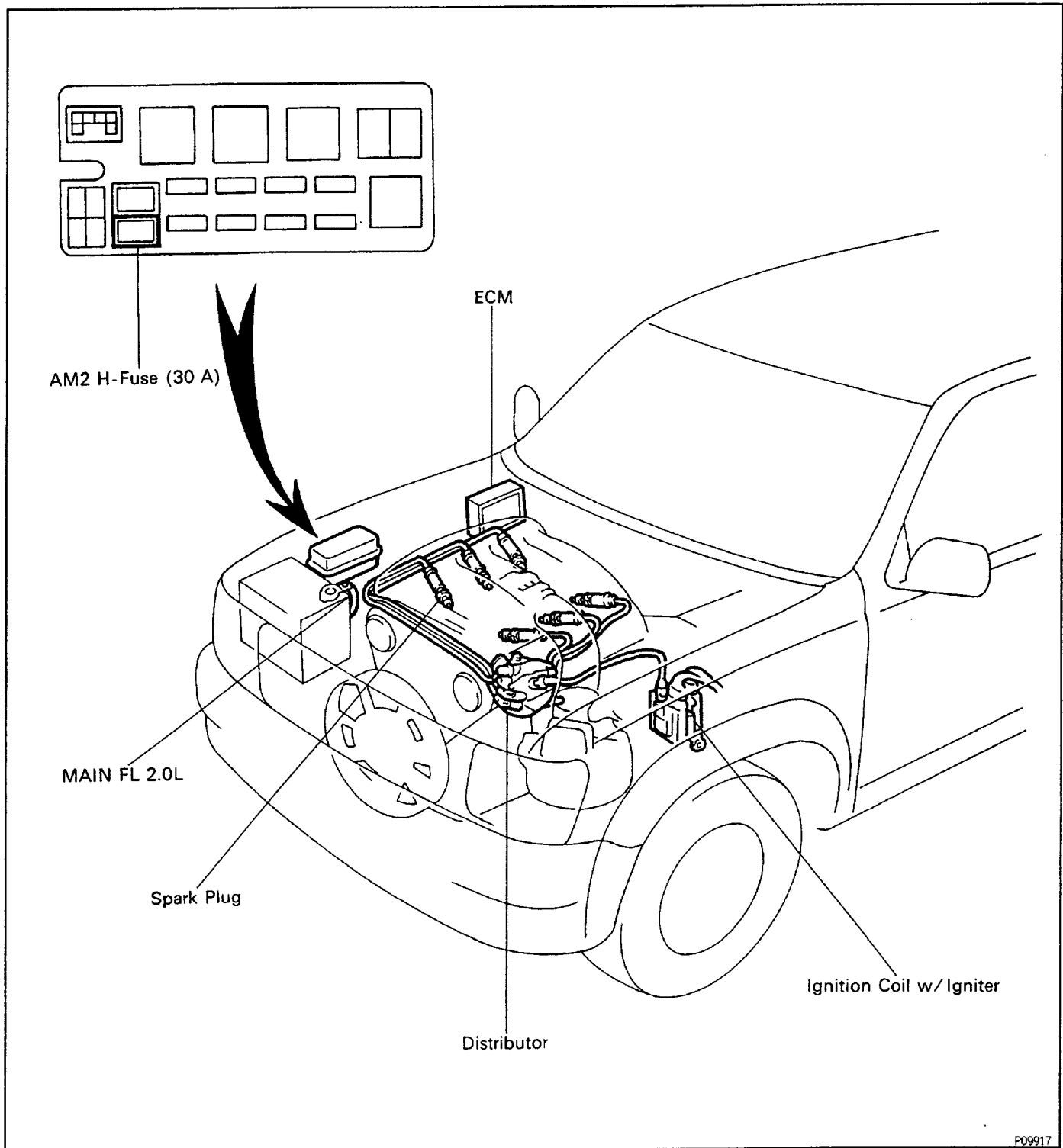
TORQUE SPECIFICATIONS

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

(3VZ-E)

DESCRIPTION

The ECM 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 coolant temperature, etc.), the microcomputer (ECM) triggers the spark at precisely the right instant.



The ECM 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 ECM 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 ECM.

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.

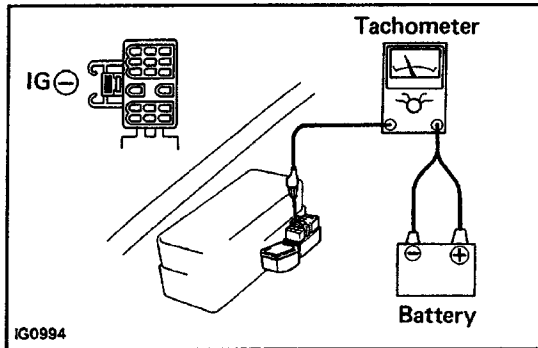
PICKUP COILS

The NE coil detects the crankshaft position, and the G 1 and G2 coils detect the camshaft position.

PRECAUTIONS

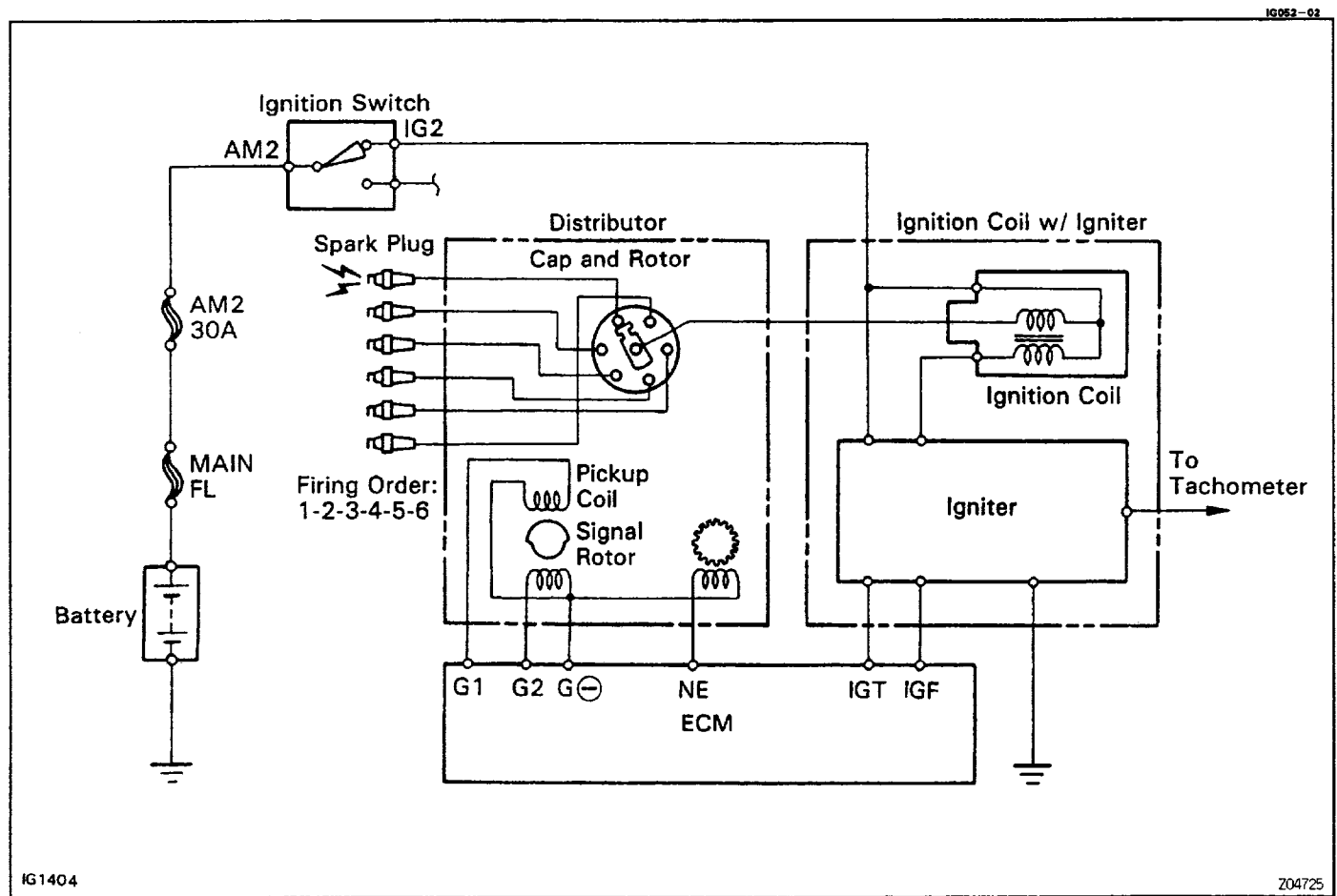
IG001-02

1. Do not leave the ignition switch on for more than 10 minutes if the engine does not start.



2. With a tachometer is connected to the system, connect the tachometer positive terminal to the IG (-) terminal of the DLC1.
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. Make sure that the igniter is properly grounded to the body.

SYSTEM CIRCUIT





OPERATION

To maintain the most appropriate ignition timing, the ECM 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)

IG064-01

	09240-00020 Wire Gauge Set	Air gaps of G 1 and G2 pickups
	09843-18020 Diagnosis Check Wire	

IG065-01

RECOMMENDED TOOLS

	09082-00015 TOYOTA Electrical Tester	
	09200-00010 Engine Adjust Kit	

IG066-01

EQUIPMENT

Spark plug cleaner	
Tachometer	
Timing light	Ignition timing

ON-VEHICLE INSPECTION

SPARK TEST

10087-00

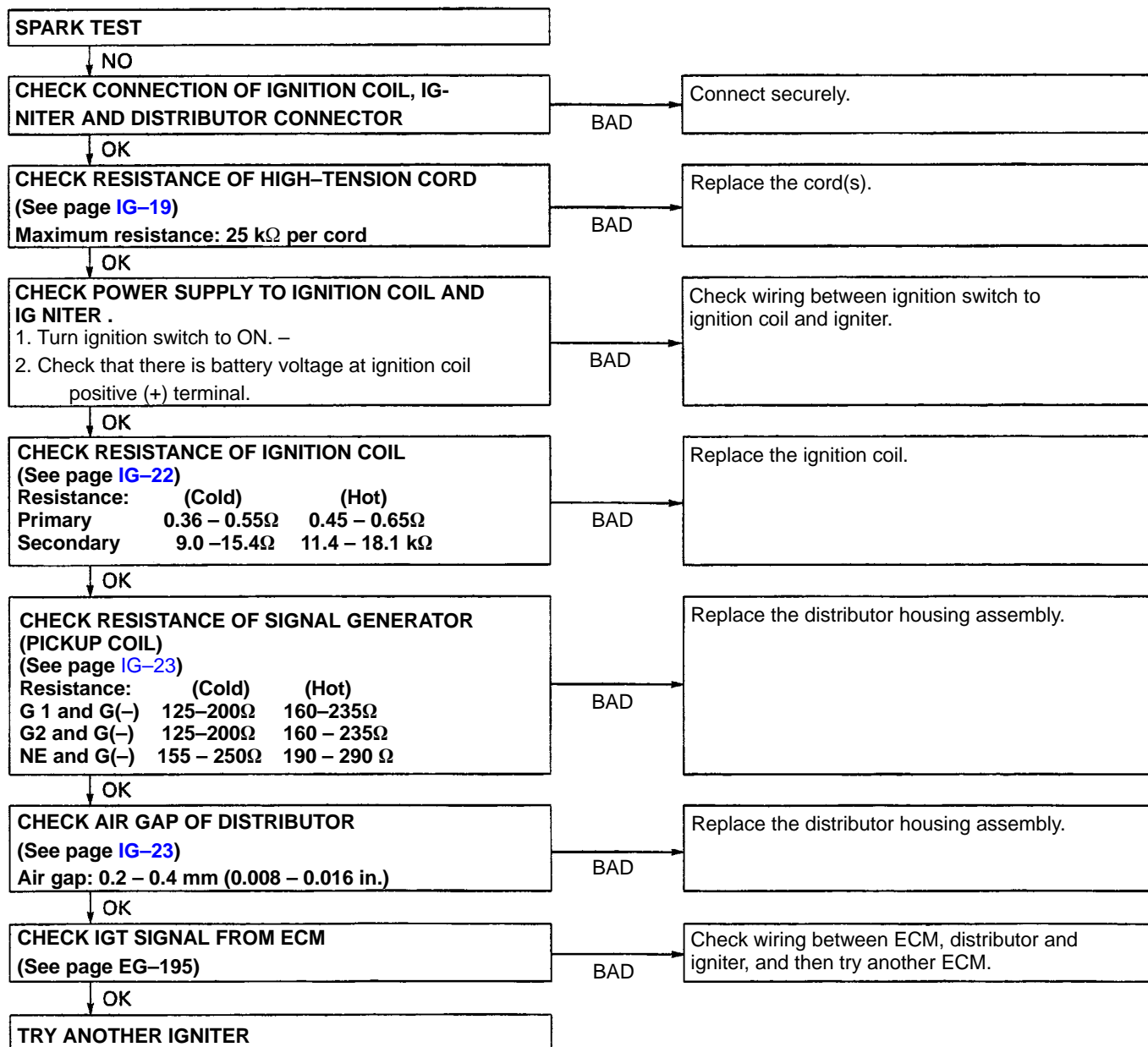
CHECK THAT SPARK OCCURS

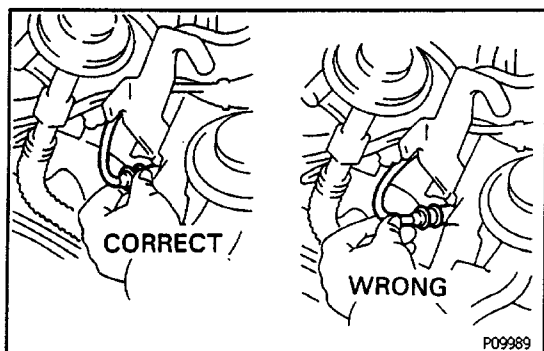
- (a) Disconnect high-tension cord from the distributor.
- (b) Hold the end approx. 12.5 mm (0.50 in.) from engine ground of vehicle.

(c) 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 a time.

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





HIGH-TENSION CORDS INSPECTION

IG06X-01

1. DISCONNECT HIGH –TENSION CORDS FROM SPARK PLUGS

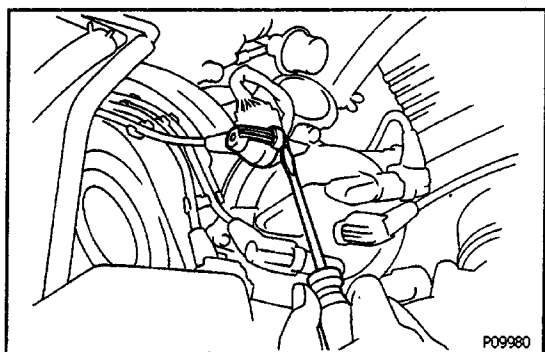
Disconnect the high – tension cords at the rubber boot.

DO NOT pull on the cords.

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

2. DISCONNECT HIGH-TENSION CORDS FROM DISTRIBUTOR CAP AND IGNITION COIL

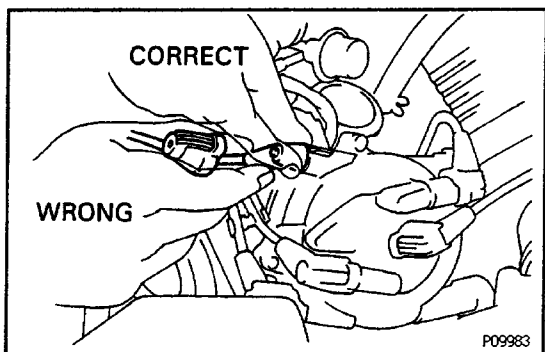
(a) Using a screwdriver, lift up the lock claw and disconnect the holder from the distributor cap (ignition coil).



(b) Disconnect the high-tension cord at the grommet. DO NOT pull on the cord.

NOTICE:

- Pulling on or bending the cords may damage the conductor inside.
- Do not wipe any of the oil from the grommet after the high-tension cord is disconnected.



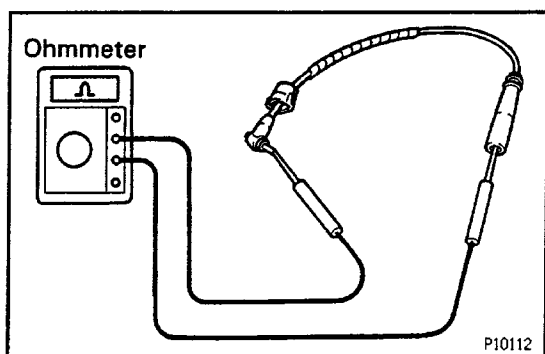
3. INSPECT HIGH-TENSION CORD RESISTANCE

Using an ohmmeter, measure the resistance.

Maximum resistance:

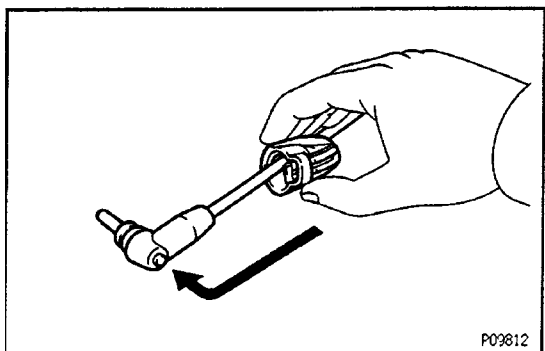
25 kΩ per cord

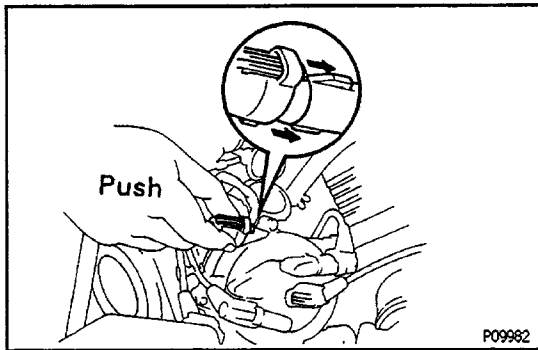
If the resistance is greater than maximum, check the terminals. If necessary, replace the high – tension cord.



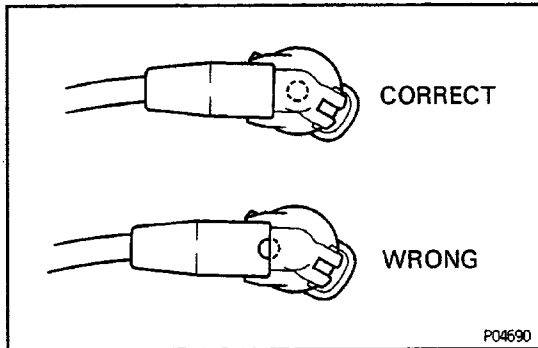
4. RECONNECT HIGH-TENSION CORDS TO DISTRIBUTOR CAP AND IGNITION COIL

(a) Assemble the holder and grommet.

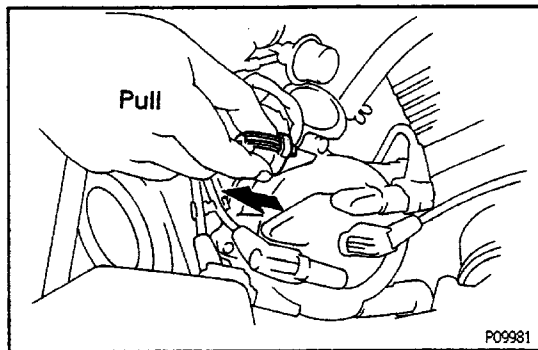




- (b) Align the spline of the distributor (ignition coil) with the spline of the holder, and push in the cord.



NOTICE: Check that the holder is correctly installed to the grommet and distributor cap as shown in the illustration.



- (c) Check that the lock claw of the holder is engaged by lightly pulling the holder.

5. RECONNECT HIGH-TENSION CORDS TO SPARK PLUGS

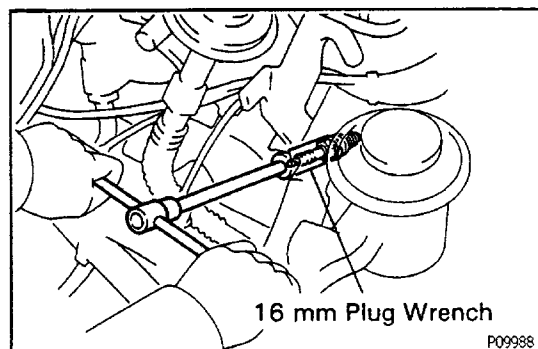
SPARK PLUGS INSPECTION

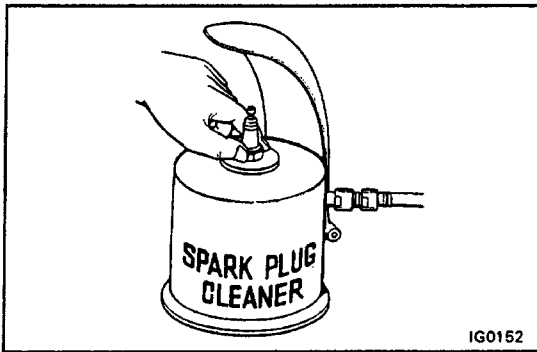
IG08B-01

1. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS

2. REMOVE SPARK PLUGS

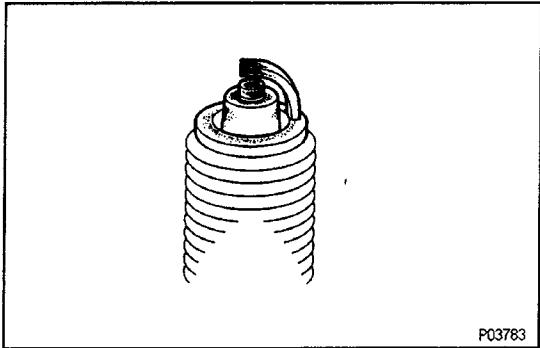
Using a 16 mm plug wrench, remove the spark plug.





3. CLEAN SPARK PLUGS

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



4. VISUALLY INSPECT SPARK PLUGS

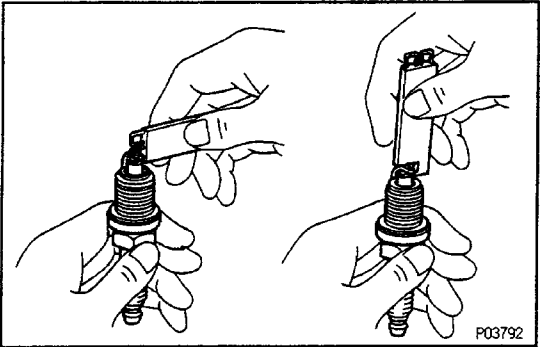
Check the spark plug for electrode wear, thread damage and insulator damage.

If abnormal, replace the spark plug.

Recommended spark plug:

ND K16R– U

NGK BKR5EYA

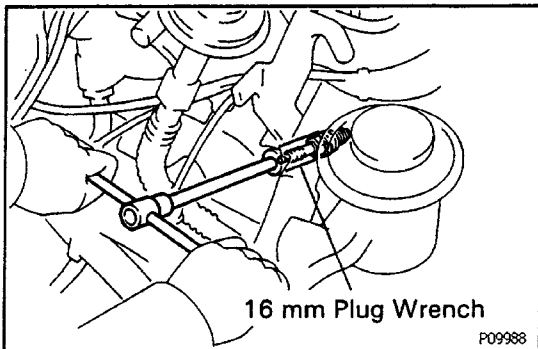


5. ADJUST ELECTRODE GAP

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

Correct electrode gap:

0.8 mm (0.031 in.)



6. INSTALL SPARK PLUGS

Using a 16 mm plug wrench, install and torque the spark plug.

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

7. RECONNECT HIGH–TENSION CORDS TO SPARK PLUGS

IGNITION COIL INSPECTION

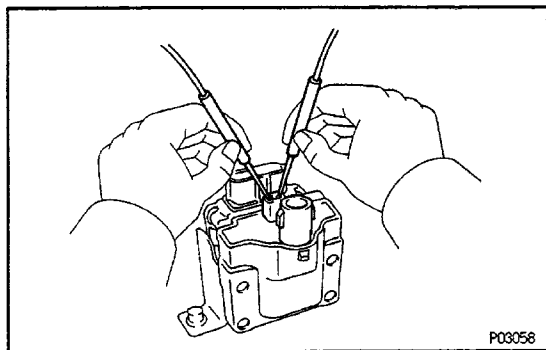
NOTICE: 'Cold' and 'Hot' in the following sentences express the temperature of the coils themselves. 'Cold' is from -10°C (14°F) to 50°C (122°F) and 'Hot' is from 50°C (122°F) to 100°C (212°F).

1. DISCONNECT IGNITION COIL CONNECTOR

2. DISCONNECT HIGH-TENSION CORD

3. CLEAN COIL AND CHECK FOLLOWING:

- (a) Check for cracks or damage.
- (b) Check the terminals for carbon tracks.
- (c) Check the high-tension cord hole for carbon deposits and corrosion.



4. INSPECT PRIMARY COIL RESISTANCE

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

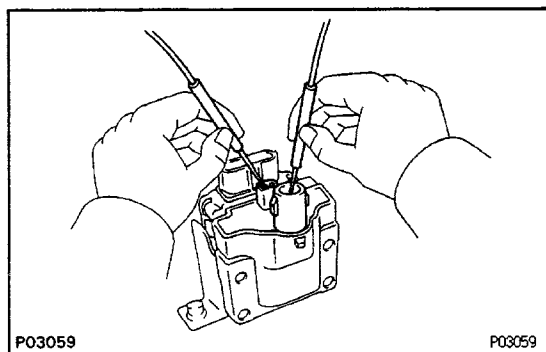
Primary coil resistance (Cold):

0.36–0.55 Ω

Primary coil resistance (Hot):

0.45–0.660

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



5. INSPECT SECONDARY COIL RESISTANCE

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

Secondary coil resistance (Cold):

9.0 – 15.4 k Ω

Secondary coil resistance (Hot):

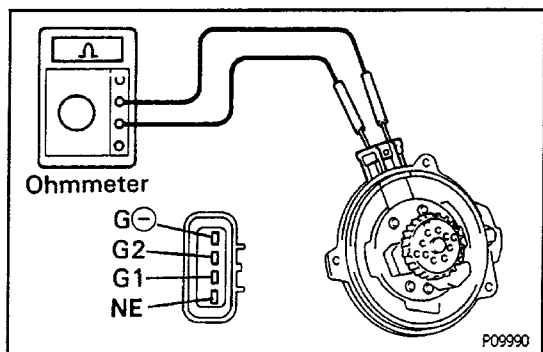
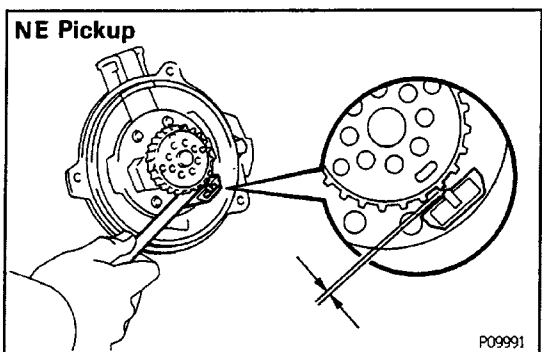
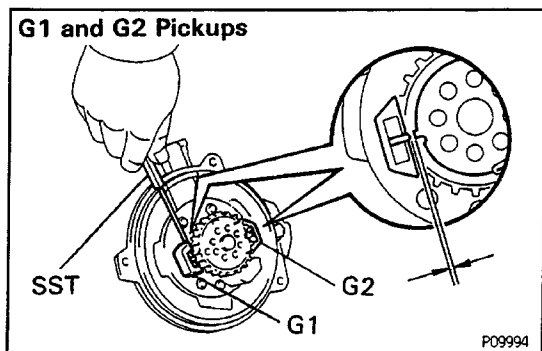
11.4 – 18.1 k Ω

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

6. RECONNECT HIGH-TENSION CORD

7. RECONNECT IGNITION COIL CONNECTOR

IG08D-01



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 CONNECTOR
2. REMOVE DISTRIBUTOR CAP WITHOUT DISCONNECTING HIGH-TENSION CORDS
3. REMOVE ROTOR
4. INSPECT AIR GAPS

Using SST (G1 and G2 pickups) and a thickness gauge (NE pickup), measure the 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 gap is not as specified, replace the distributor housing assembly.

5. INSPECT SIGNAL GENERATOR (PICKUP COIL) RESISTANCE

Using an ohmmeter, check resistance of the pickup coil.

Pickup coil resistance	Cold ($-10 - 50^{\circ}\text{C}$)	Hot ($50 \sim 100^{\circ}\text{C}$)
G1 – G \ominus	125 – 200 Ω	160 – 235 Ω
G2 – G \ominus	125 – 200 Ω	160 – 235 Ω
NE – G \ominus	155 – 250 Ω	190 – 290 Ω

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

6. REINSTALL ROTOR
7. REINSTALL DISTRIBUTOR CAP
8. RECONNECT DISTRIBUTOR CONNECTOR

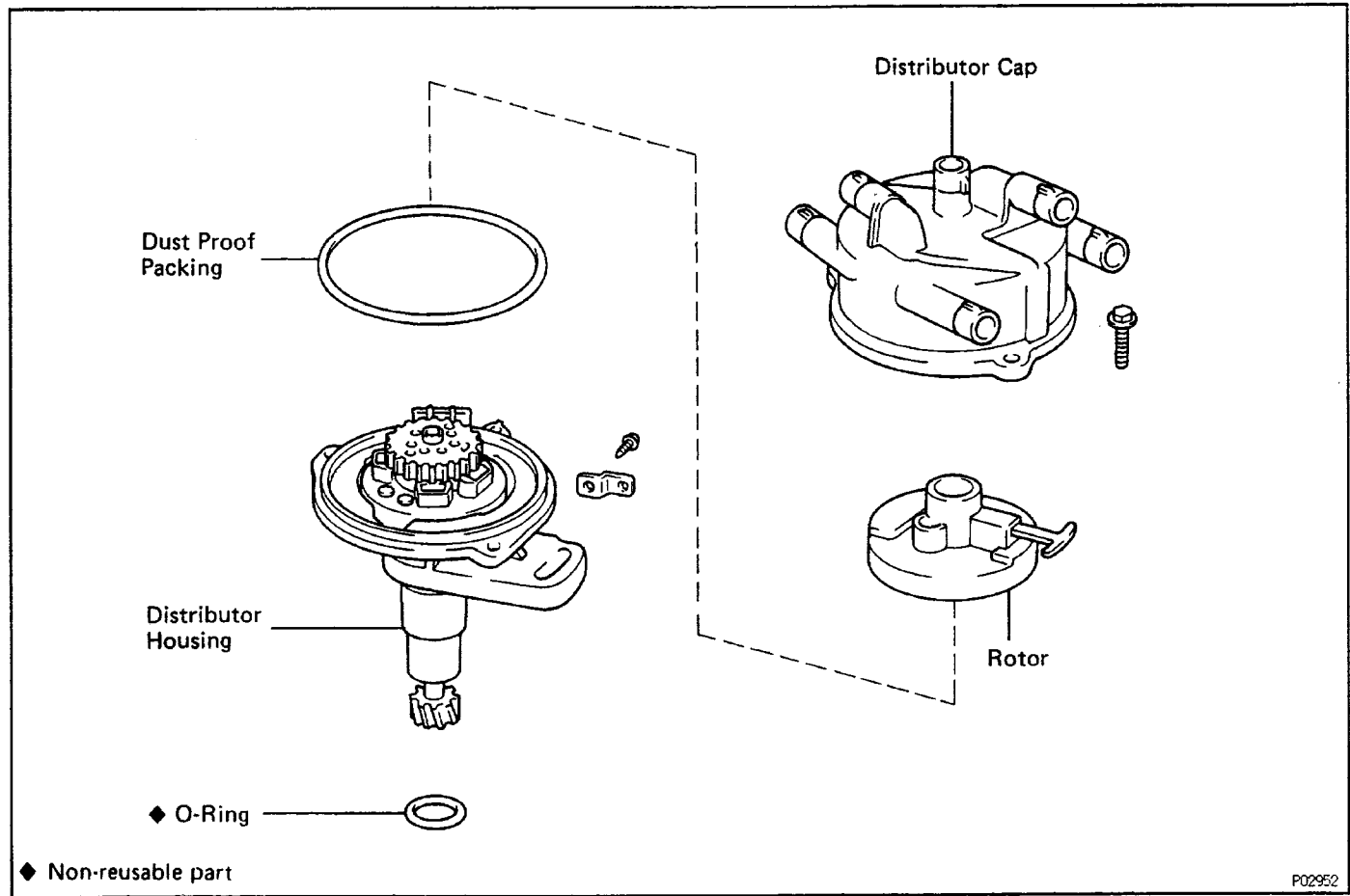
IGNITER INSPECTION

IG08E-01

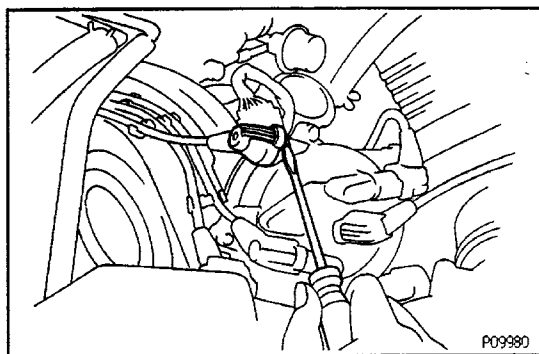
(See procedure Spark Test on page [IG-18](#))

DISTRIBUTOR COMPONENTS

IG08F-01



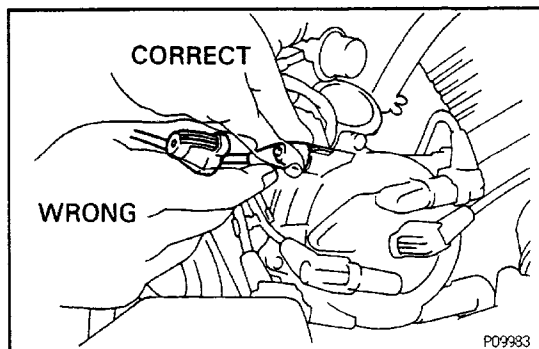
IG08G-01



DISTRIBUTOR REMOVAL

1. DISCONNECT HIGH-TENSION CORDS FROM DISTRIBUTOR CAP

- (a) Using a screwdriver, lift up the lock claw and disconnect the holder from the distributor cap.

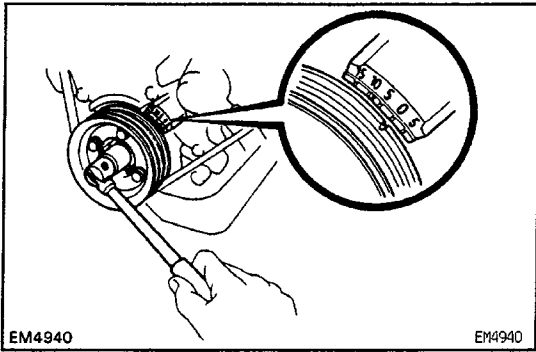


- (b) Disconnect the high-tension cord at the grommet. DO NOT pull on the cord.

NOTICE:

- Pulling on or bending the cords may damage the conductor inside.
- Do not wipe any of the oil from the grommet after the high-tension cord is disconnected.

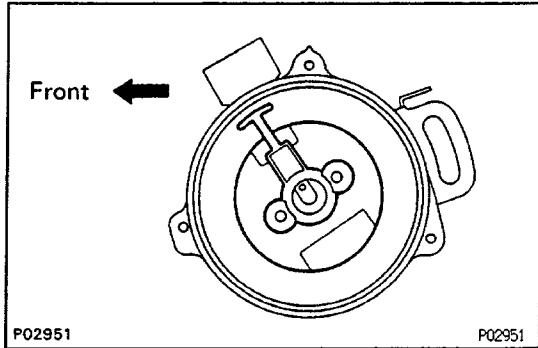
2. DISCONNECT DISTRIBUTOR CONNECTOR



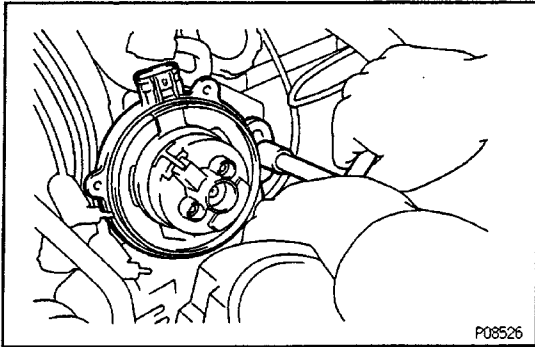
3. REMOVE DISTRIBUTOR CAP AND DUST PROOF PACKING

4. SET NO.1 CYLINDER TO TDC/COMPRESSION

- (a) Turn the crankshaft pulley until the timing mark is aligned with the "0" mark on the No.1 timing belt cover.



- (b) Check that the distributor rotor direction is as shown. If not, turn the crankshaft pulley one complete revolution.



5. REMOVE DISTRIBUTOR

- (a) Remove the hold-down bolt.
(b) Pull out the distributor from the cylinder head.

6. REMOVE O-RING

DISTRIBUTOR INSTALLATION

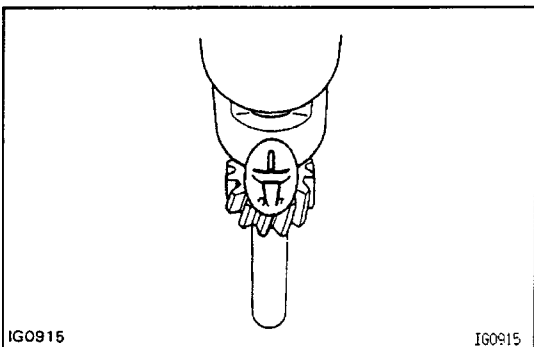
IG05D-02

1. CHECK NO.1 CYLINDER TO TDC/COMPRESSION

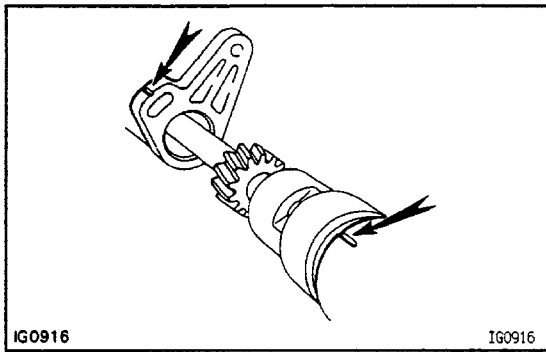
2. INSTALL DISTRIBUTOR

- (a) Install a new O-ring to the distributor.

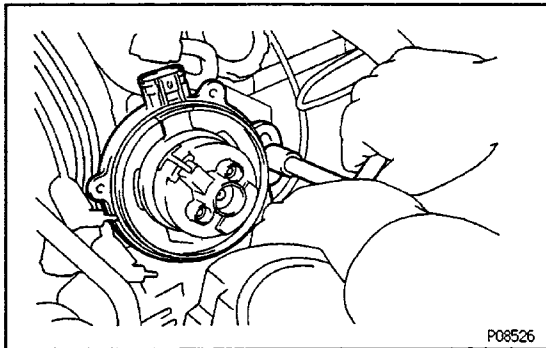
HINT: Always use a new O-ring when installing the distributor.



- (b) Align the protrusion on the driven gear with the groove of the distributor housing.

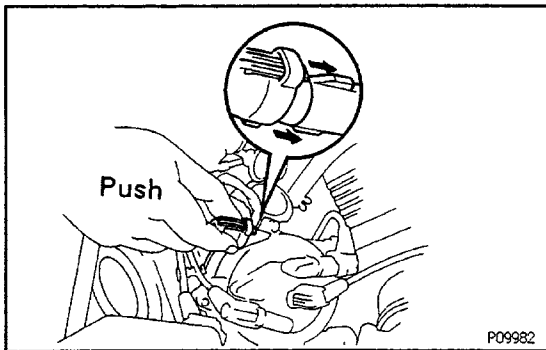


- (c) Insert the distributor, aligning the groove of the distributor housing with the groove on the No.4 camshaft bearing cap.



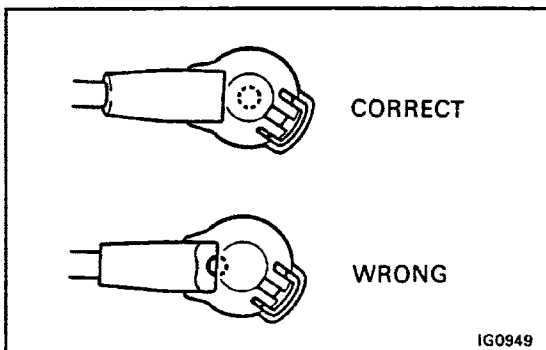
- (d) Lightly tighten the hold-down bolt.

3. INSTALL DUST PROOF PACKING AND DISTRIBUTOR CAP

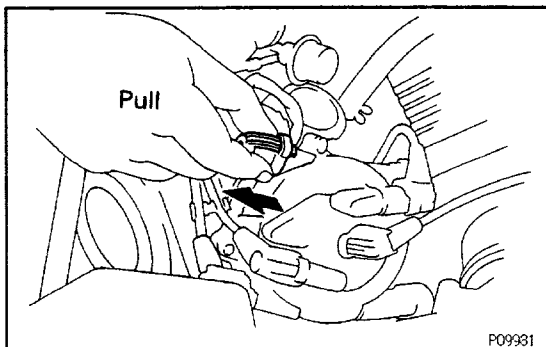


4. CONNECT HIGH-TENSION CORDS TO DISTRIBUTOR CAP

- (a) Aline the spline of the distributor cap with the spline groove of the holder, then slide the holder with the grommet onto the distributor cap.

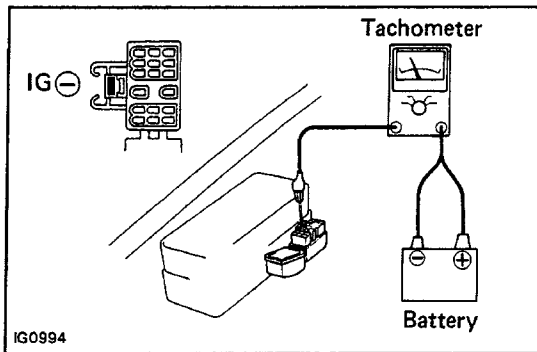


NOTICE: Check that the holder is correctly installed to the grommet and distributor cap as shown in the illustration.



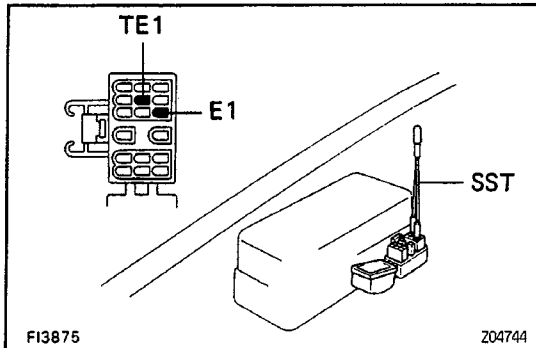
- (b) Check that the lock claw of the holder is engaged by lightly pulling the holder.

5. CONNECT DISTRIBUTOR CONNECTOR



6. WARM UP ENGINE TO NORMAL OPERATING TEMPERATURE

7. CONNECT TACHOMETER AND TIMING LIGHT TO ENGINE



8. ADJUST IGNITION TIMING

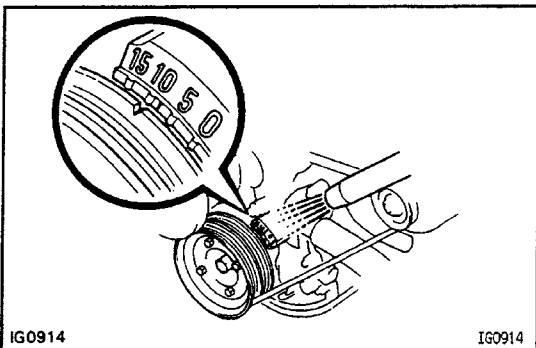
- Using SST, connect terminals TE1 and E1 of the DLC1.

SST 09843-18020

- Check the idle speed.

Idle speed:

800 ± 50 rpm



- Using a timing light, check the ignition timing.

Ignition timing:

10 ° BTDC @ idle

(Transmission in neutral position)

- Loosen the hold-down bolt, and adjust by turning the distributor.

- Tighten the hold-down bolt, and recheck the ignition timing.

Torque: 18 N·m (185 kgf·cm, 13 ft·lbf)

- Remove the SST from the DLC1.

SST 09843-18020

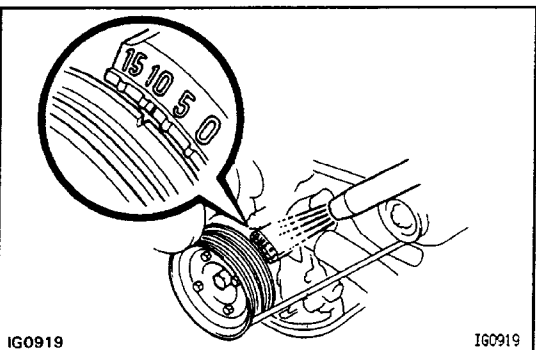
9. FURTHER CHECK IGNITION TIMING

Check that the ignition timing advances.

Ignition timing:

8° BTDC @ idle

10. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE



SERVICE SPECIFICATIONS

IG05E-02

SERVICE DATA

Ignition timing	w/ Terminals TE1 and E1 connected	10° BTDC @ idle
Firing order	—	1 – 2 – 3 – 4 – 5 – 6
High-tension cord	Resistance (Maximum)	25 kΩ per cord
Spark plug	Recommended spark plug Recommended spark plug Correct electrode gap	ND NGK K16R–U BKR5EYA 0.8 mm (0.031 in.)
Ignition coil	Primary coil resistance (Cold) Primary coil resistance (Hot) Secondary coil resistance (Cold) Secondary coil resistance (Hot)	0.36 – 0.55 Ω 0.45 – 0.65 Ω 9.0 – 15.4 kΩ 11.4 – 18.1 kΩ
Distributor	Air gap Signal generator (pickup coil) resistance (Cold) G1 – G⊖ G2 – G⊖ NE – G⊖ Signal generator (pickup coil) resistance (Hot) G1 – G⊖ G2 – G⊖ NE – G⊖	0.2 – 0.5 mm (0.008 – 0.020 in.) 125 – 200 Ω 125 – 200 Ω 155 – 250 Ω 160 – 235 Ω 160 – 235 Ω 190 – 290 Ω

TORQUE SPECIFICATIONS

IG08F-01

Part tightened	N·m	kgf·cm	ft·lbf
Spark plug x Cylinder head	18	180	13
Distributor x Cylinder head	18	185	13