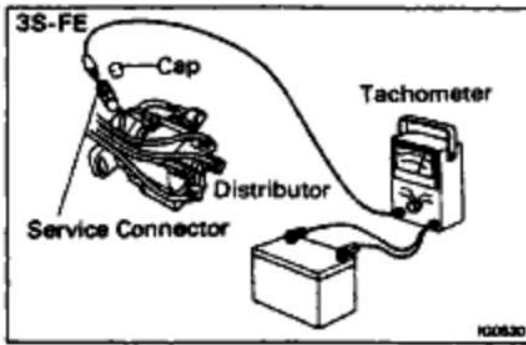


IGNITION SYSTEM

IG-2

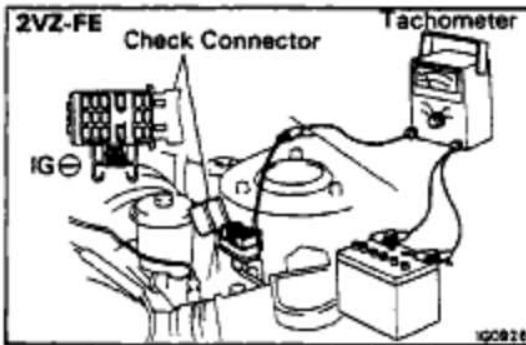
IGNITION SYSTEM – Precautions

**PRECAUTIONS**

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

2. (3S-FE)

When a tachometer is connected to the system, connect the test probe of the tachometer to service connector of the distributor.



3. (2VZ-FE)

When a tachometer is connected to the system, connect the test probe of the tachometer to terminal IG E) of the check connector.

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 test probe to touch ground as this could damage the igniter and/or ignition coil.

6. Do not disconnect the battery when the engine is running.

7. Check that the igniter is properly grounded to the body.

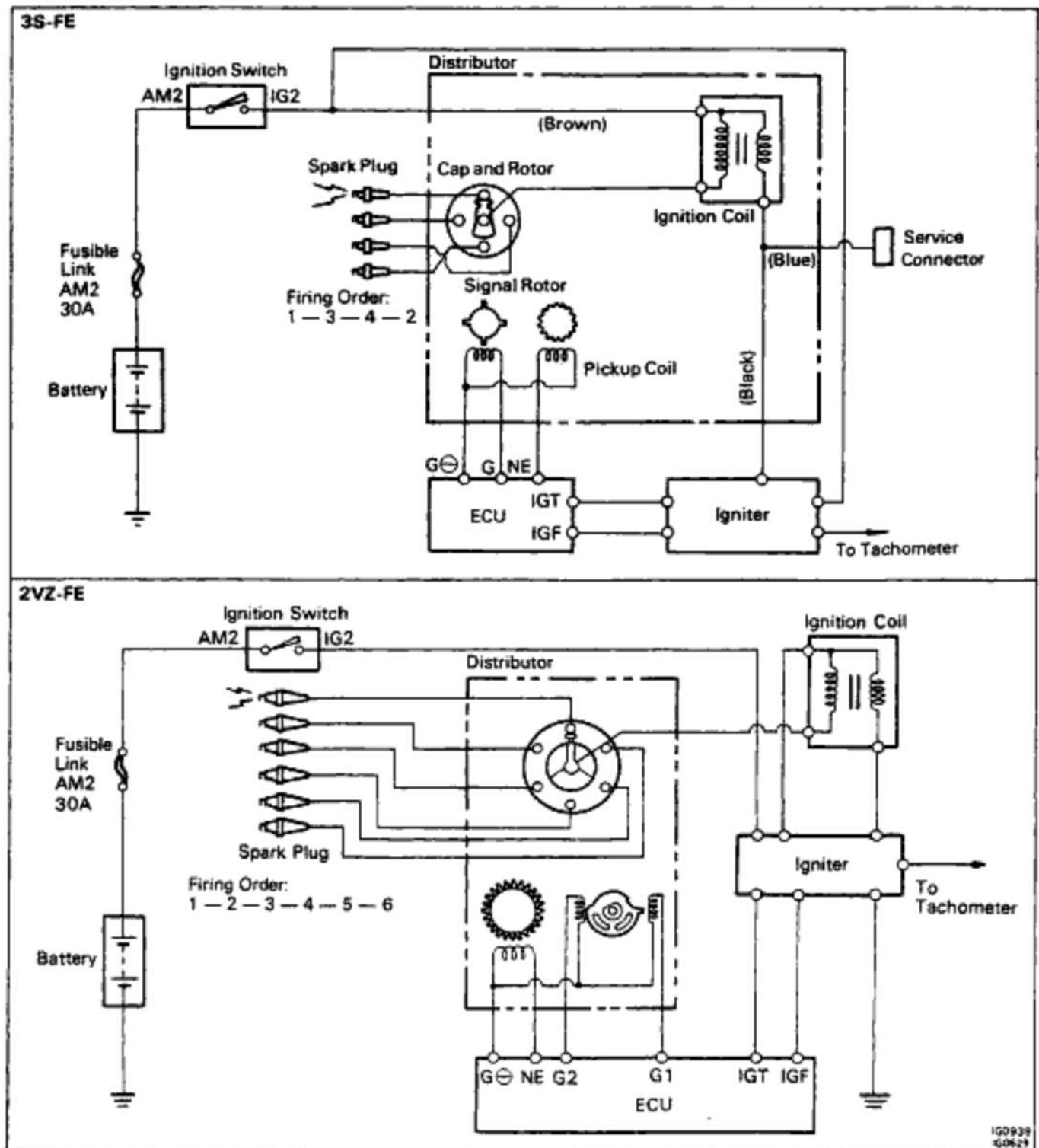
TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Engine will not start/ hard to start (cranks OK)	Incorrect ignition timing Ignition problems • Ignition coil • Igniter • Distributor • High-tension cords Ignition wiring disconnected or broken	Reset timing Inspect coil Inspect igniter Inspect distributor Inspect high-tension cords Inspect wiring	IG-17, 20 IG-7, 12 IG-8, 12 IG-7, 12 IG-6, 10
Rough idle or stalls	Spark plug faulty Ignition wiring faulty Incorrect ignition timing Ignition problems • Ignition coil • Igniter • Distributor • High-tension cords	Inspect plugs inspect wiring Reset timing Inspect coil Inspect igniter Inspect distributor Inspect high-tension cords	IG-6, 10 IG-17, 20 IG-7, 12 IG-8, 12 IG-7, 12 IG-6, 10
Engine hesitates/ poor acceleration	Spark plug faulty Ignition wiring faulty Incorrect ignition timing	Inspect plugs Inspect wiring Reset timing	IG-6, 10 IG-17, 20
Engine dieseling (runs after ignition switch is turned off)	Incorrect ignition timing	Reset timing	IG-17, 20
Muffler explosion (after fire) all the time	Incorrect ignition timing	Reset timing	IG-17, 20
Engine backfires	Incorrect ignition timing	Reset timing	IG-17, 20
Poor gasoline mileage	Spark plug faulty Incorrect ignition timing	Inspect plugs Reset timing	IG-6, 10 120
Engine overheats	Incorrect ignition timing	Reset timing	IG-17, 20

IG-4

IGNITION SYSTEM – Ignition System Circuit

IGNITION SYSTEM CIRCUIT



ELECTRONIC SPARK ADVANCE (ESA)

The ECU 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, eng. temperature, etc.) the microcomputer (ECU) triggers the spark at precisely the right instant.

ON-VEHICLE INSPECTION (3S-FE)

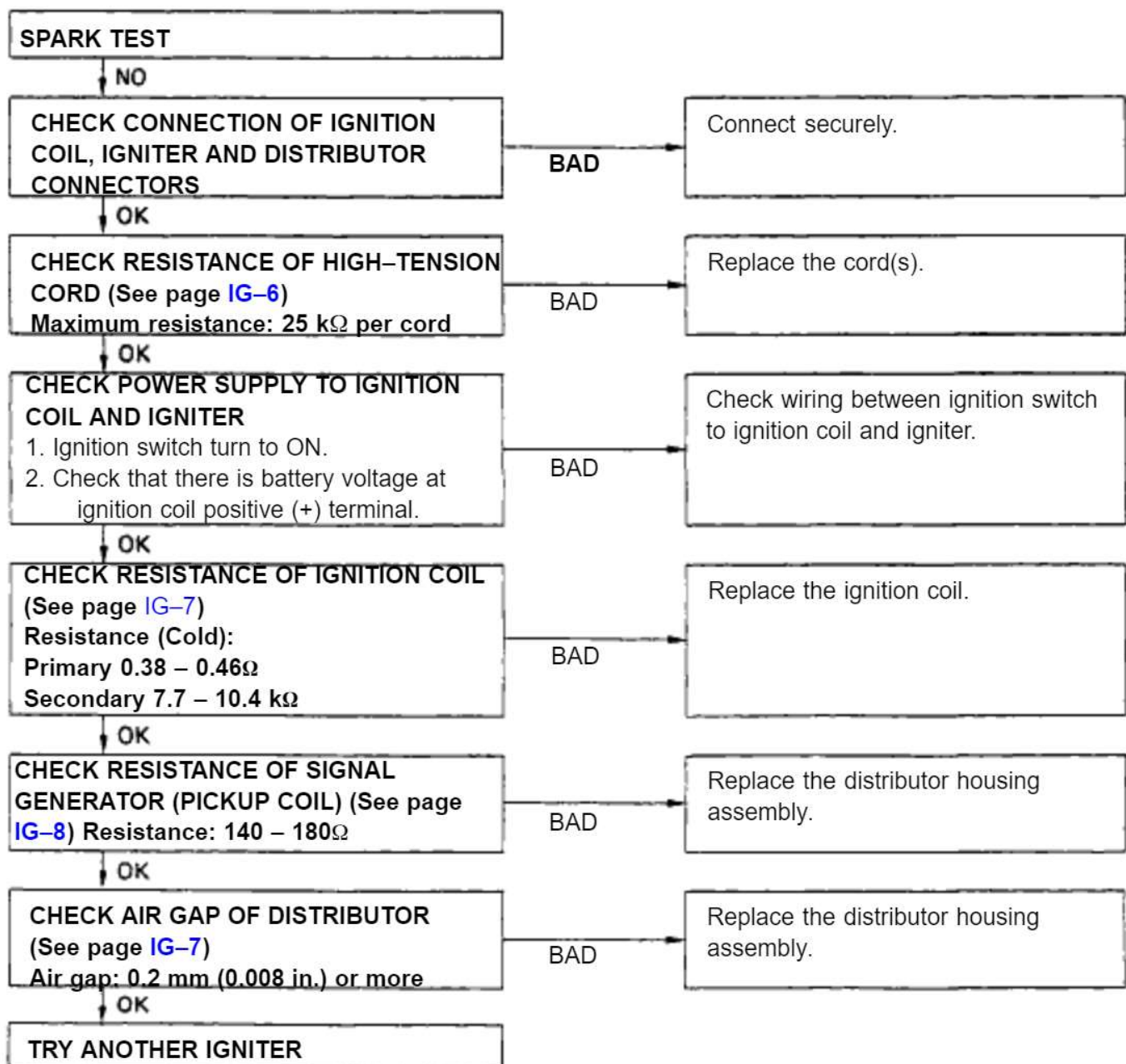
SPARK TEST

CHECK THAT SPARK OCCURS

- Disconnect the high-tension cords from the spark plugs.
- Remove the spark plugs.
- Install the spark plugs to each high-tension cord.
- Ground the spark plug.
- Check if spark occurs while engine is being cranked.

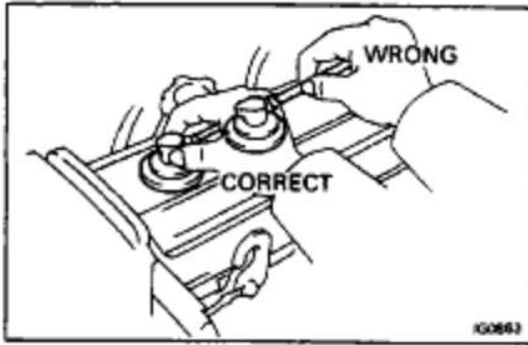
HINT: To prevent gasoline from being injected from injectors during this test, crank the engine for no more than 1 – 2 seconds at a time.

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



IG-6

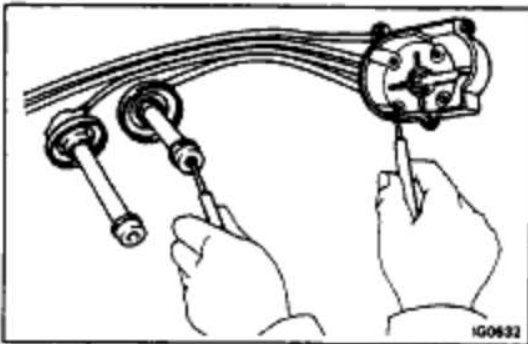
IGNITION SYSTEM — On-Vehicle Inspection (3S-FE)



INSPECTION OF HIGH-TENSION CORDS

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

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

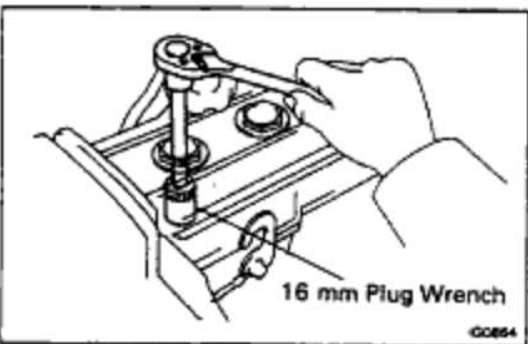


2. INSPECT HIGH-TENSION CORD RESISTANCE

Using an ohmmeter, measure the resistance without disconnecting the distributor cap.

Maximum resistance: 25 kΩ per cord

If the resistance is greater than maximum, check the terminals. If necessary, replace the high-tension cord and/or distributor cap.



INSPECTION OF SPARK PLUGS

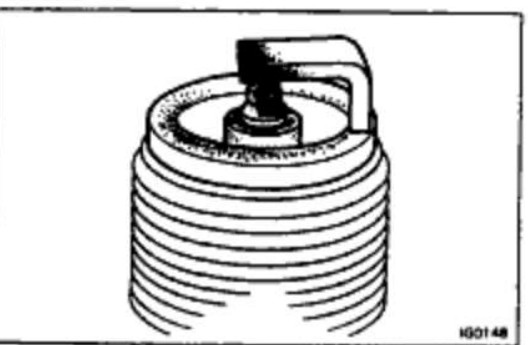
1. REMOVE SPARK PLUGS

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



2. CLEAN SPARK PLUG

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

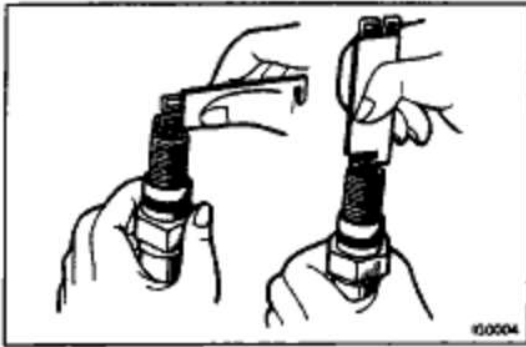


3. VISUALLY INSPECT SPARK PLUGS

Check the spark plug for electrode wear, thread damage or insulation damage.

If abnormal, replace the spark plug.

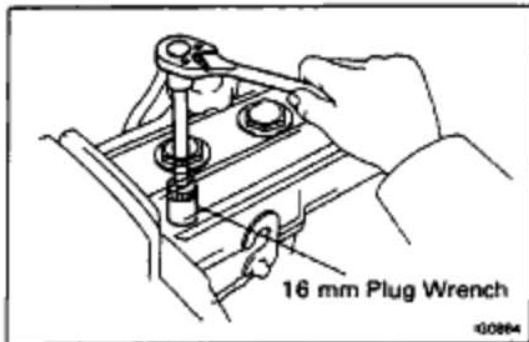
**Recommended spark plug: ND Q1 6R-U11
NGK6CPR5EY11**



4. ADJUST ELECTRODE GAP

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

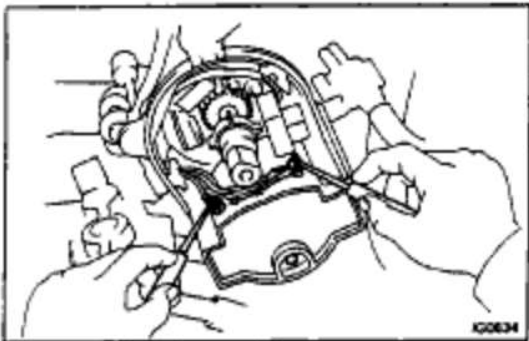
Correct electrode plug: 1.1 mm (0.043 in.)



5. INSTALL SPARK PLUGS

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

Torque: 180 kg-cm (13 ft-lb, 18 N-m)



INSPECTION OF IGNITION COIL

1. INSPECT PRIMARY COIL RESISTANCE

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

Primary coil resistance (Cold): 0.38 – 0.46Ω

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

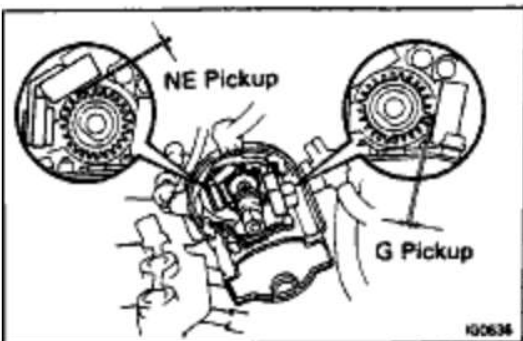


2. INSPECT SECONDARY COIL RESISTANCE

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

Secondary coil resistance (Cold): 7.7 – 10.4 kΩ

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



INSPECTION OF DISTRIBUTOR

1. INSPECT AIR GAP

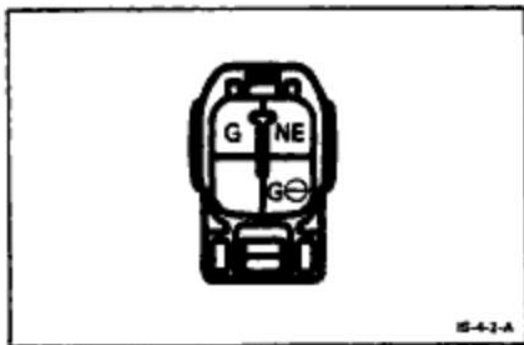
Using a feeler gauge, measure the gap between the signal rotor and pickup coil projection.

Air gap: 0.2 mm (0.008 in.) or more

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

IG-8

IGNITION SYSTEM – On-Vehicle Inspection (3S-FE)

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

Using an ohmmeter, measure the resistance between the terminals.

G pickup coil resistance (G – G[-]): 140 – 180Ω

N E pickup coil resistance (NE – G[-]): 140 –180Ω

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

INSPECTION OF IGNITER

(See procedure Spark Test on page [IG-5](#))

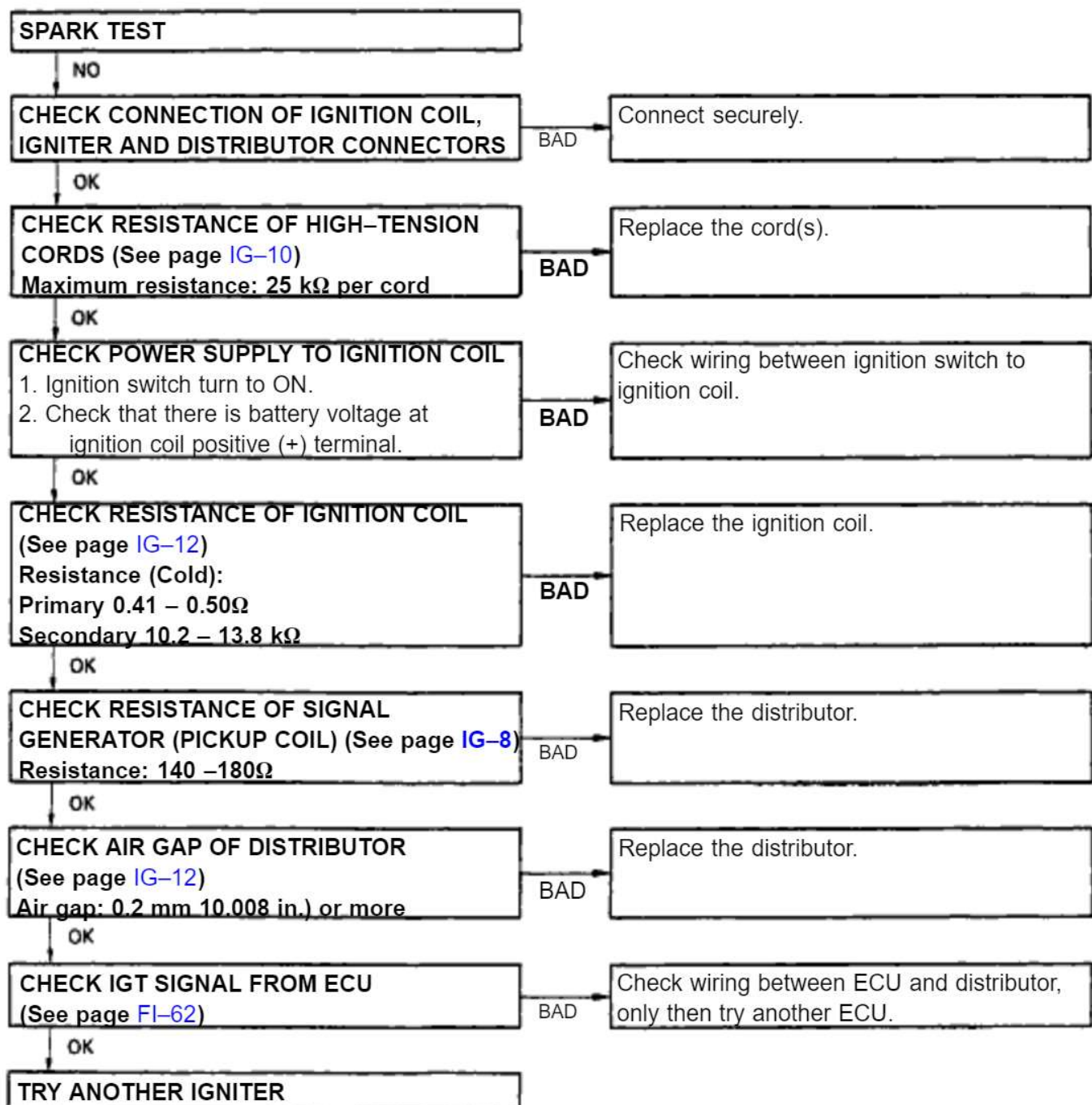
ON-VEHICLE INSPECTION (2VZ-FE)

SPARK TEST

CHECK THAT SPARK OCCURS

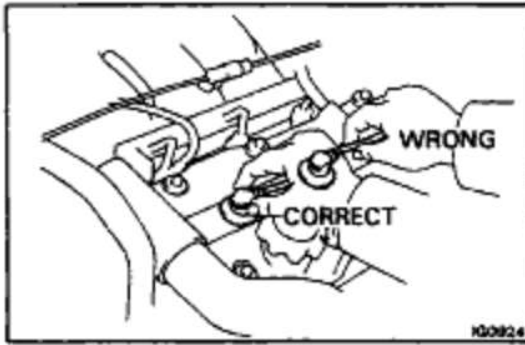
- (a) Disconnect the high-tension cord from the distributor.
 (b) Hold the end approx. 12.5 mm (0.50 in.) from body of vehicle.
 (c) See if spark occurs while engine is being cranked.
 HINT: To prevent gasoline from being injected from injectors during this test, crank the engine for no more than 1 –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

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

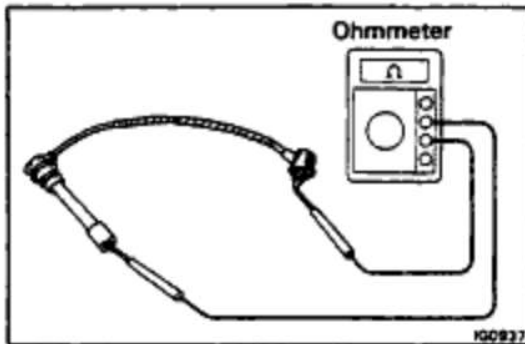


IG-10

IGNITION SYSTEM – On-Vehicle Inspection (2VZ-FE)

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

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

**2. INSPECT HIGH-TENSION CORD RESISTANCE**

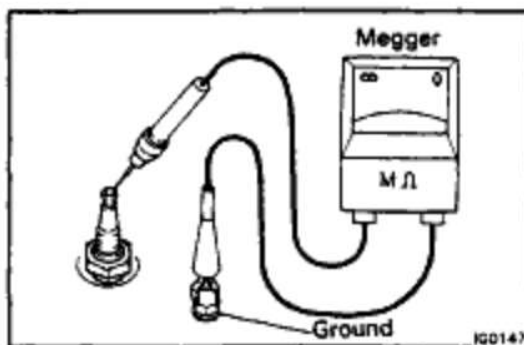
Using an ohmmeter, measure the resistance.

Maximum resistance: 25 k Ω per cord

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

INSPECTION OF SPARK PLUGS**NOTICE:**

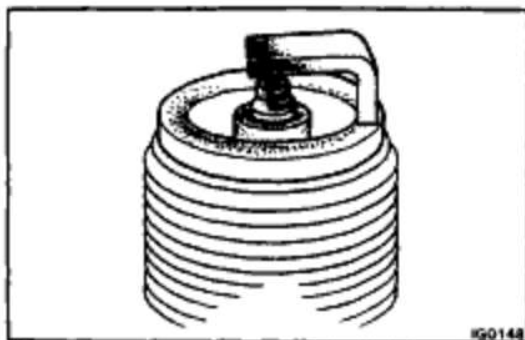
- Never use a wire brush for cleaning
- Never attempt to adjust the electrode gap on used spark plug.
- Spark plug should be replaced every 100,000 km (60,000 miles).

**1. INSPECT ELECTRODE**

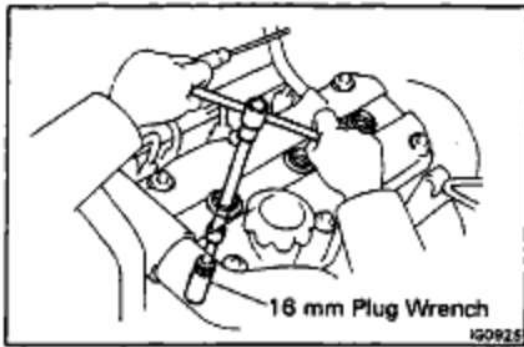
A. If using a megger (insulation resistance motor):
Measure the insulation resistance.

Correct insulation resistance: 10 M Ω or more

If the resistance is less than specified, proceed step 2.

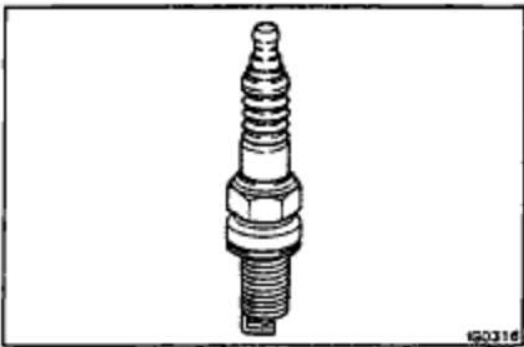
**6. If not using a megger:**

- Quickly race the engine to 4,000 rpm five times.
- Remove the spark plug.
(See step 2 on page IG-11)
- Visually check the spark plug.
If the electrode is dry ... Okay
If the electrode is wet ... Proceed to step 3



2. REMOVE SPARK PLUGS

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

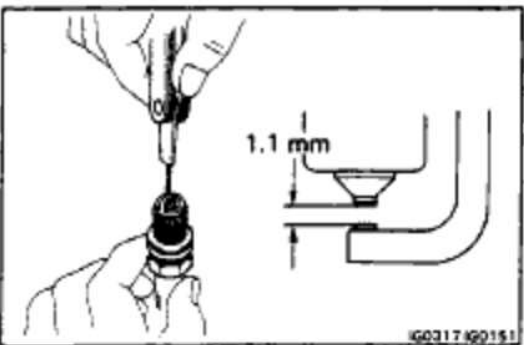


3. VISUALLY INSPECT SPARK PLUGS

Check the spark plug for thread or insulation damage. If abnormal, replace the spark plug.

Recommended spark plug: ND PQ2OR

NGK6CPR6EP11



4. INSPECT ELECTRODE GAP

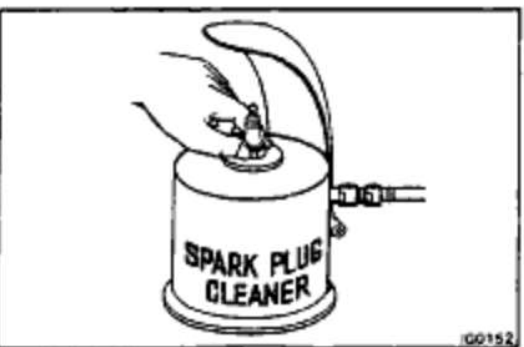
Maximum electrode gap: 1.3 mm, (0.051 in.)

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

Correct electrode gap of new spark plug:

1.1 mm (0.043 in.)

If adjusting the gap of a new spark plug, bend only the base of the ground electrode. Do not touch the tip.



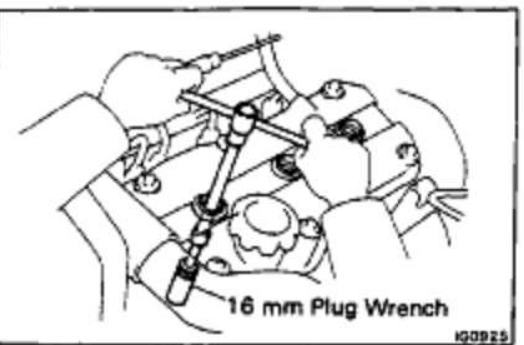
5. CLEAN SPARK PLUGS

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

Air pressure: Below 6 kg/cm² (85 psi, 588 kPa)

Duration: 20 seconds or less

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



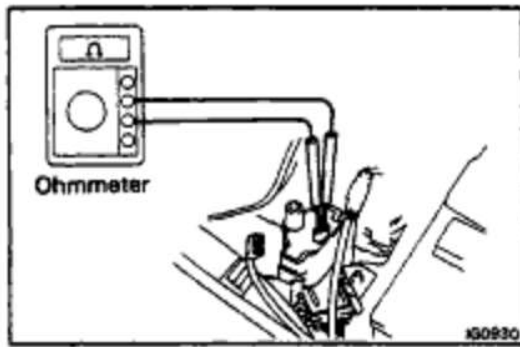
6. INSTALL SPARK PLUGS

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

Torque: 180 kg-cm (13 ft-Lb, 18 N-m)

IG-12

IGNITION SYSTEM – On-Vehicle Inspection (2VZ-FE)



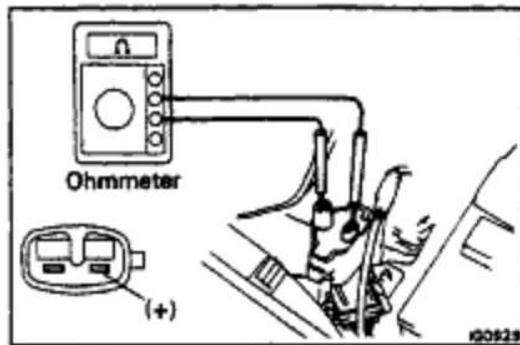
INSPECTION OF IGNITION COIL

1. INSPECT PRIMARY COIL RESISTANCE

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

Primary coil resistance (Cold): 0.41 – 0.50Ω

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

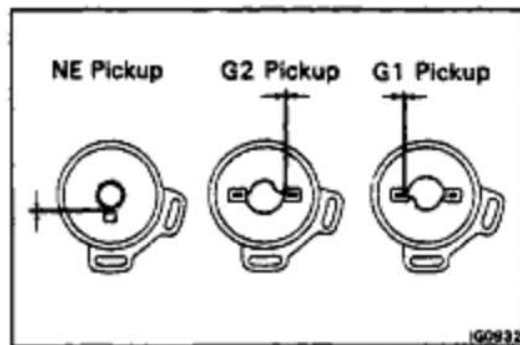


2. INSPECT SECONDARY COIL RESISTANCE

Using an ohmmeter, measure the resistance between the positive W and high-tension terminals.

Secondary coil resistance (Cold): 10.2 – 13.8 kΩ

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



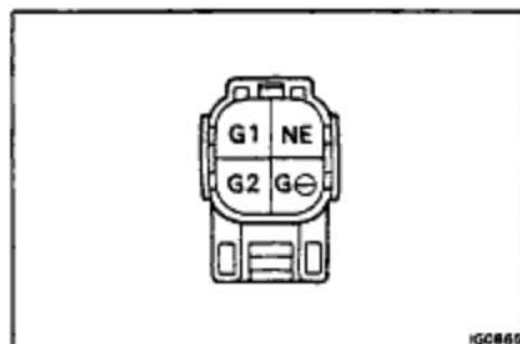
INSPECTION OF DISTRIBUTOR

1. INSPECT AIR GAPS

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

Air gap: 0.2 mm (0.008 in.) or more

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



2. INSPECT SIGNAL GENERATOR (PICKUP COIL) RESISTANCE

Using an ohmmeter, measure the resistance between the terminals.

G1 pickup coil resistance (G 1 – G [-]): 140 – 180Ω

G2 pickup coil resistance (G2 – G [-]): 140 – 180Ω

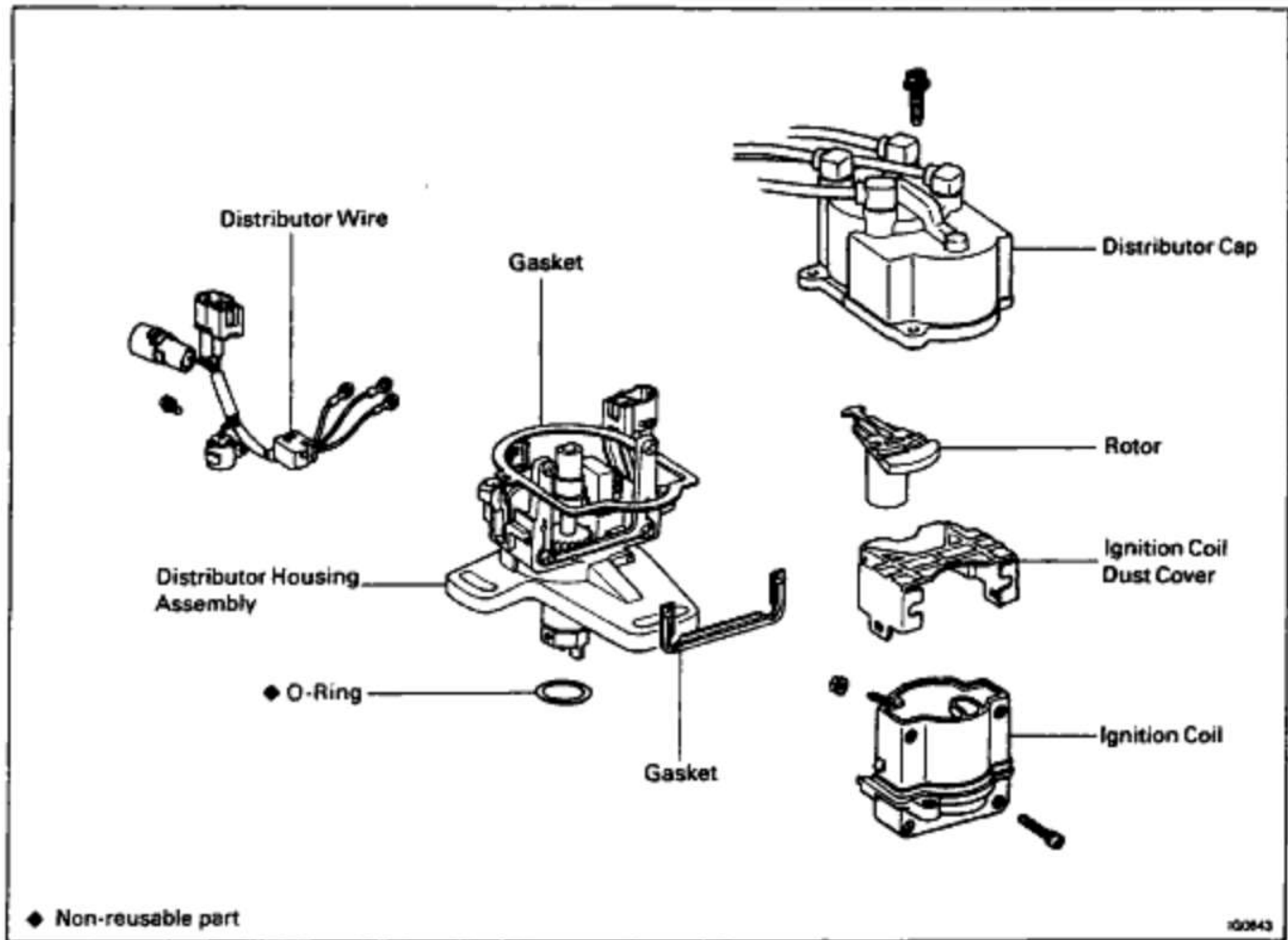
N E pickup coil resistance (NE – G [-]): 140 – 180Ω

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

INSPECTION OF IGNITER

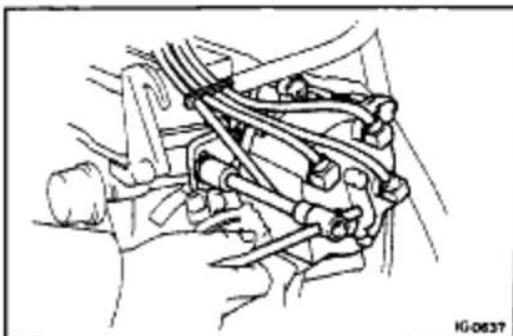
(See procedure Spark Test on page IG-9)

DISTRIBUTOR (3S-FE) COMPONENTS



REMOVAL OF DISTRIBUTOR

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY
2. REMOVE AIR CLEANER HOSE
3. DISCONNECT DISTRIBUTOR CONNECTORS
4. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS



5. REMOVE DISTRIBUTOR

Remove the two hold-down bolts and pull out the distributor. Remove the O-ring.

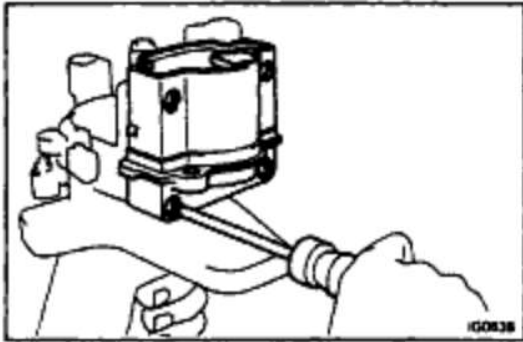
IG-14

IGNITION SYSTEM – Distributor (3S-FE)

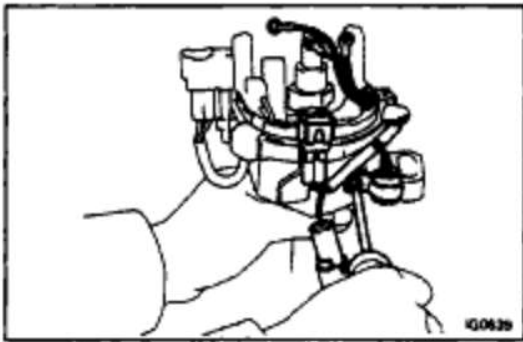
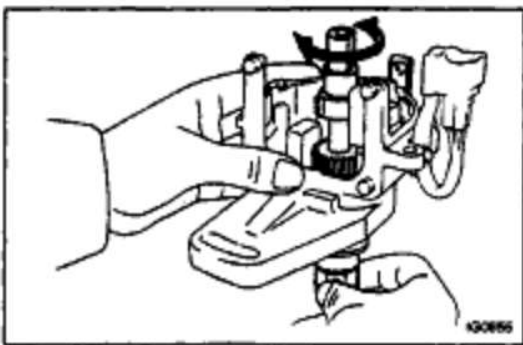
DISASSEMBLY OF DISTRIBUTOR

(See page IG-13)

1. REMOVE DISTRIBUTOR CAP WITHOUT DISCONNECTING HIGH-TENSION CORDS
2. REMOVE ROTOR
3. REMOVE IGNITION COIL DUST COVER

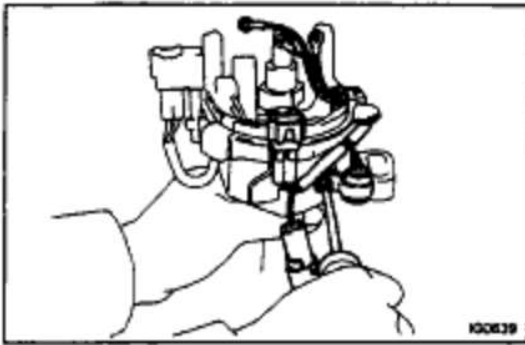
**4. REMOVE IGNITION COIL**

- (a) Remove the two nuts and disconnect the three wires from the terminals of the ignition coil.
- (b) Remove the four screws, ignition coil and gasket.

**5. REMOVE DISTRIBUTOR WIRE****INSPECTION OF DISTRIBUTOR****INSPECT GOVERNOR SHAFT**

Turn the governor shaft and check that it is not rough or worn.

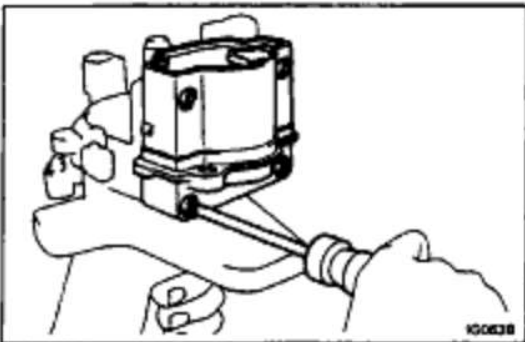
If it feels rough or worn, replace the distributor housing assembly.



ASSEMBLY OF DISTRIBUTOR

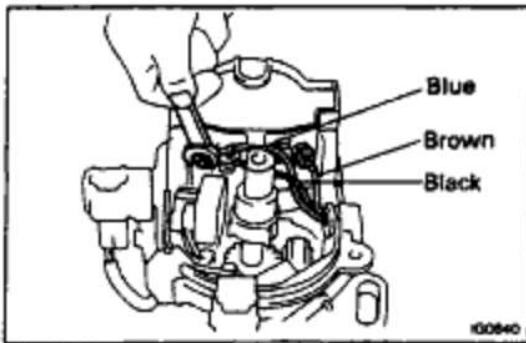
(See page IG-13)

1. INSTALL DISTRIBUTOR WIRE

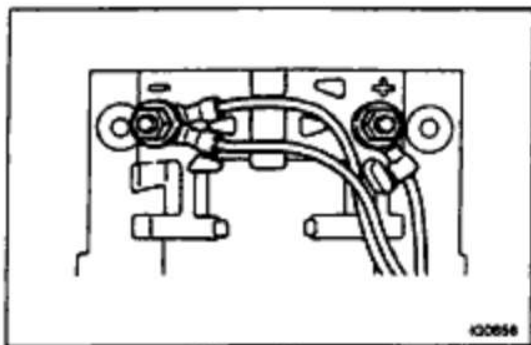


2. INSTALL IGNITION COIL

(a) Install the gasket and ignition coil with the four screws.



(b) Connect the three wires to the terminals of the ignition coil with the two nuts as shown.



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 that of the wires do not contact with signal rotor or distributor housing.

3. INSTALL IGNITION COIL DUST COVER

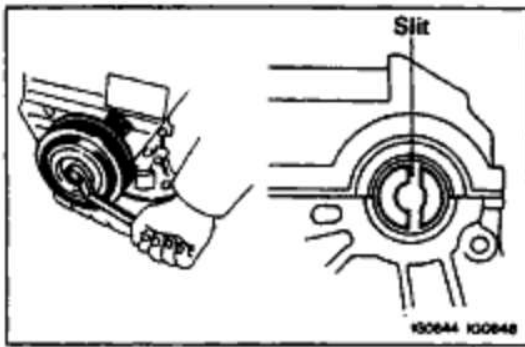
4. INSTALL ROTOR

5. INSTALL DISTRIBUTOR CAP AND HIGH-TENSION CORDS

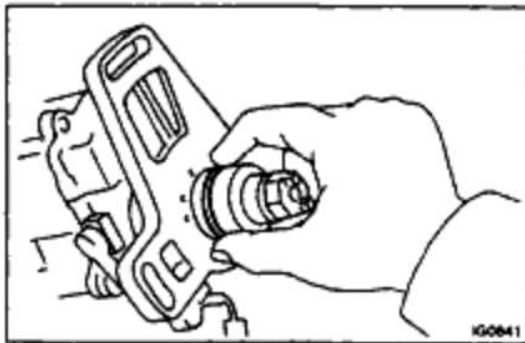
- (a) Place the gasket in position on the distributor housing.
 (b) Install the distributor cap with the three bolts.

IG-16

IGNITION SYSTEM – Distributor PS-FE)

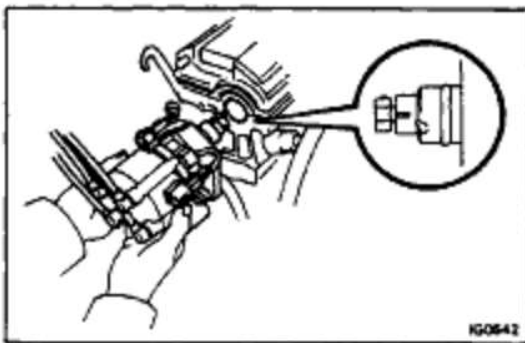
**INSTALLATION OF DISTRIBUTOR****1. SET NO.1 CYLINDER TO TDC/COMPRESSION**

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

**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 of the coupling with the line of the housing.

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

(e) Lightly tighten the two hold-down bolts.

3. CONNECT HIGH-TENSION CORDS TO SPARK PLUGS

Firing order: 1 – 3 – 4 – Z

4. CONNECT DISTRIBUTOR CONNECTORS**5. INSTALL AIR CLEANER HOSE****6. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY****7. WARM UP ENGINE**

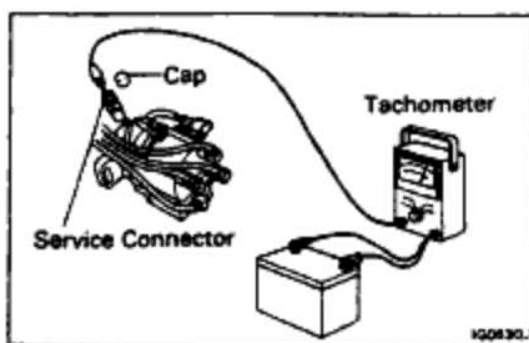
Allow the engine to normal operating temperature.

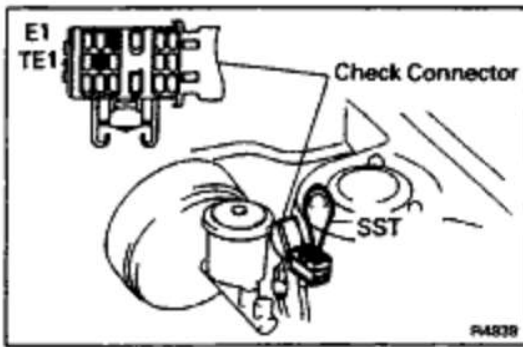
8. CONNECT TACHOMETER AND TIMING LIGHT TO ENGINE –

Connect the test probe of a tachometer to the service connector of the distributor.

NOTICE:

- **NEVER** allow the tachometer test probe to touch ground as it could result in damage to the igniter and/or ignition coil.
- As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before use.



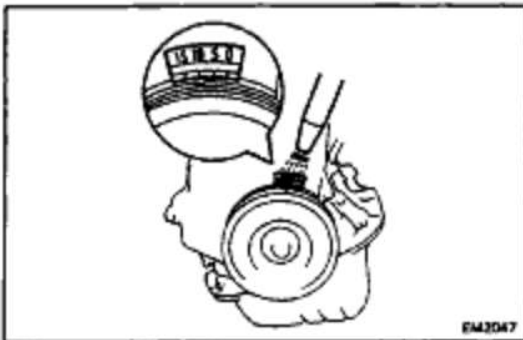


9. ADJUST IGNITION TIMING

(a) Using SST connect terminals TE1 and E1 of the check connector.

SST 09843-18020

HINT: After engine rpm are kept at 1,100 rpm for 5 seconds, check that they return to idle speed.



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

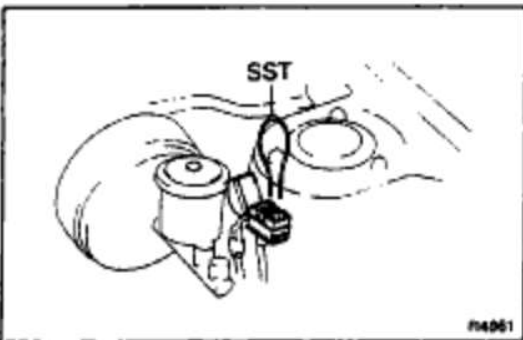
Ignition timing: 10° BTDC @ idle

(Transmission in N range)

(c) Loosen the two hold-down bolts, and adjust by turning the distributor.

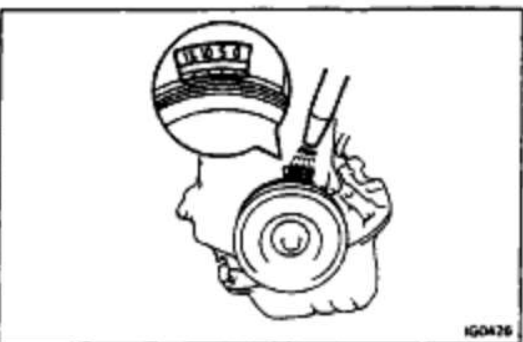
(d) Tighten the hold-down bolts, and recheck the ignition timing.

Torque: 130 kg-cm (9 ft-lb, 13 N-m)



(e) Remove SST.

SST 09843-18020



10. FURTHER CHECK IGNITION TIMING

Ignition timing: 13 - 22° BTDC @ idle

(Transmission in N range)

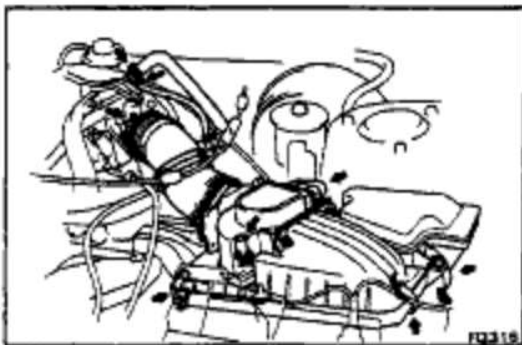
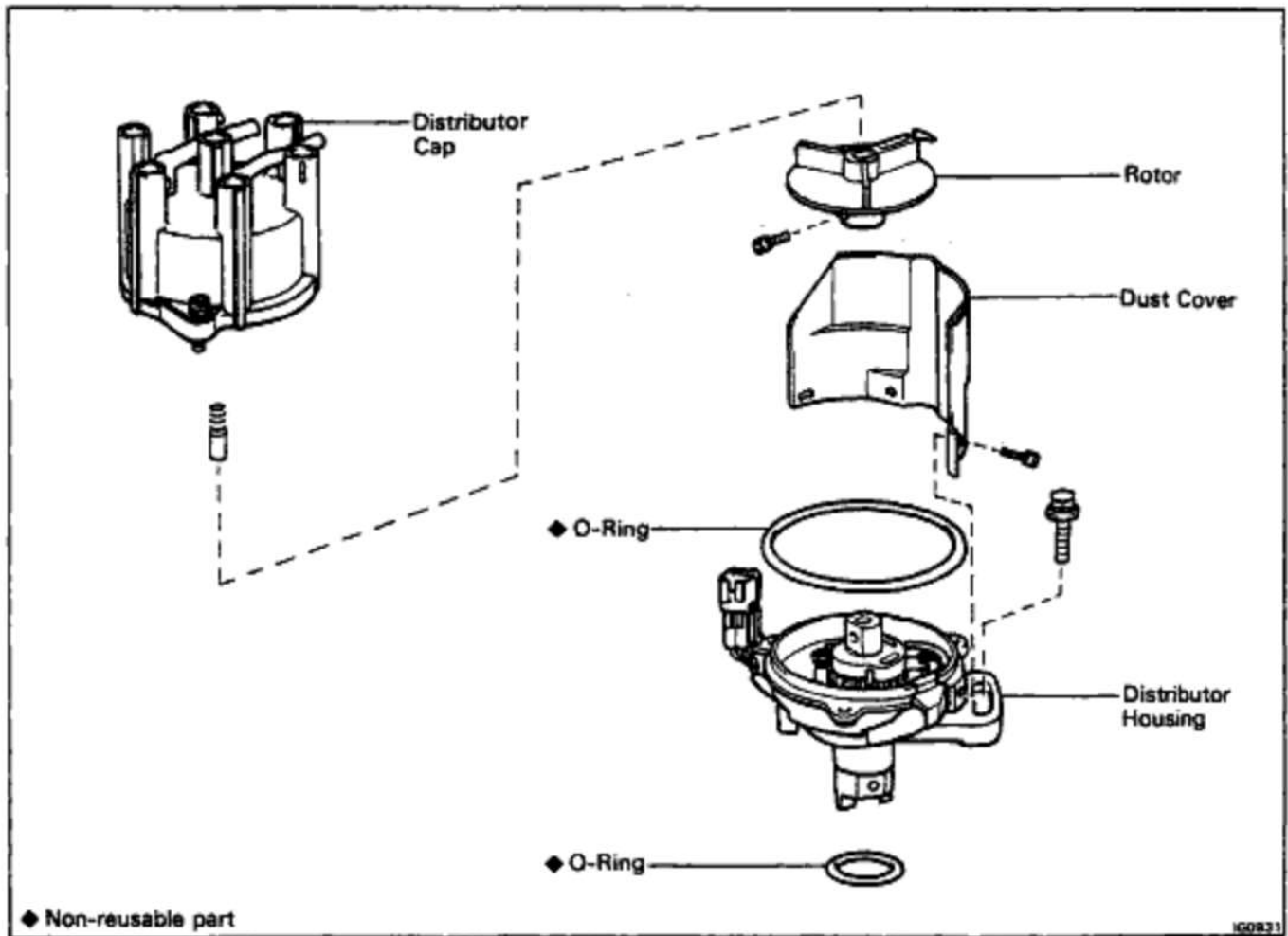
HINT: The timing mark moves in a range between 13° and 22°.

11. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE

IG-18

IGNITION SYSTEM – Distributor (2VZ-FE)

DISTRIBUTOR (2VZ-FE) COMPONENTS



REMOVAL OF DISTRIBUTOR

1. REMOVE AIR CLEANER CAP, AIR FLOW METER AND AIR CLEANER HOSE

- Disconnect the air flow meter connector.
- Disconnect the air hoses.
- Loosen the air cleaner hose clamp bolt.
- Disconnect the air cleaner cap clips.
- Remove the air cleaner cap and air flow meter together with air cleaner hose.

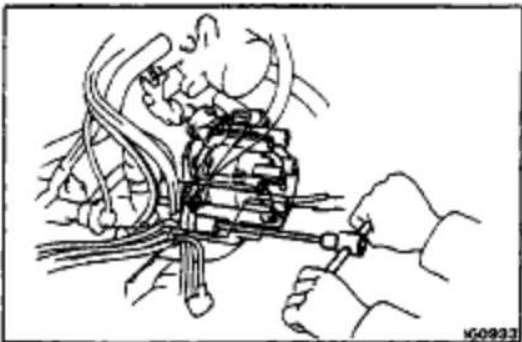
2. DISCONNECT HIGH-TENSION CORDS FROM DISTRIBUTOR CAP

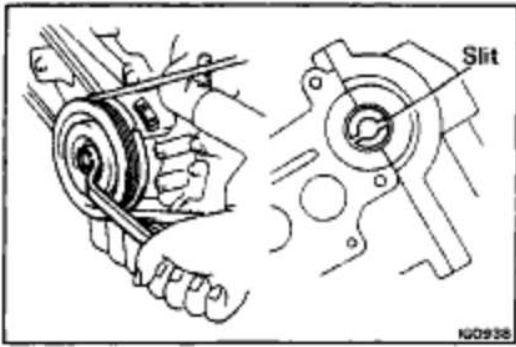
HINT: When disconnect the high-tension cords, unlock the distributor cap.

3. DISCONNECT DISTRIBUTOR CONNECTOR

4. REMOVE DISTRIBUTOR

Remove the two hold-down bolts, and pull out the distributor. Remove the O-ring.





INSTALLATION OF DISTRIBUTOR

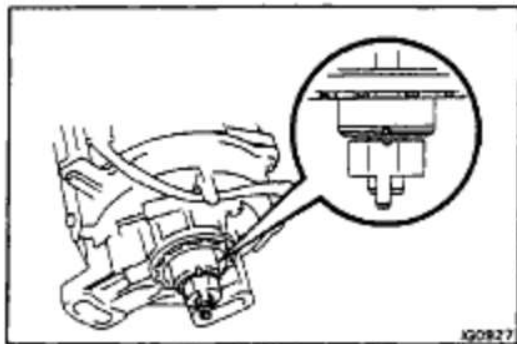
1. SET NO.1 CYLINDER TO TDC/COMPRESSION

Turn the crankshaft clockwise, and position the the slit of the intake camshaft (RH cylinder head) as shown. Look at the distributor attachment hole to set.

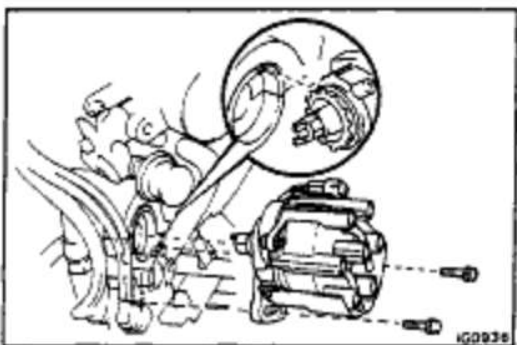


2. INSTALL DISTRIBUTOR

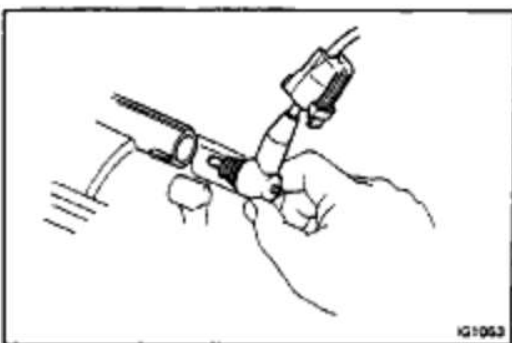
- (a) Install a new O-ring to the housing.
- (b) Apply a light coat of engine oil on the O-ring.



- (c) Align the cutout marks of the coupling and housing.



- (d) Insert the distributor, aligning the line of the housing with the cutout of the distributor attachment bearing cap.
- (e) Lightly tighten the two hold-down bolts.

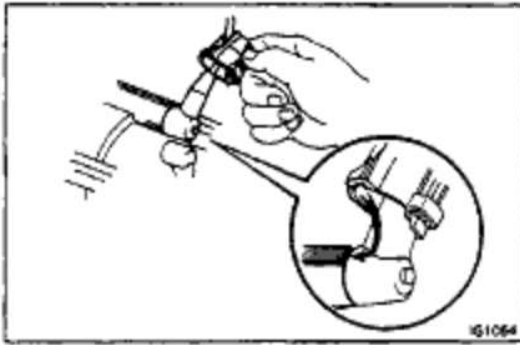


3. CONNECT HIGH-TENSION CORDS TO DISTRIBUTOR CAP

- (a) (Ex. Center Cord)
First, insert the grommet part only.

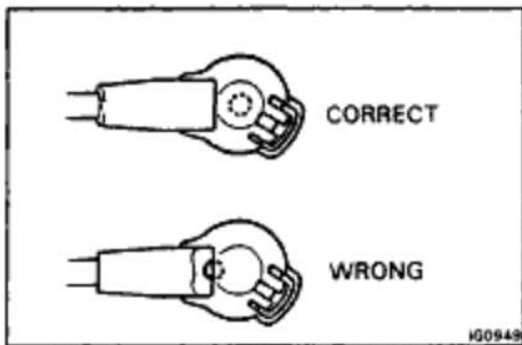
IG-20

IGNITION SYSTEM – Distributor (2VZ-FE)

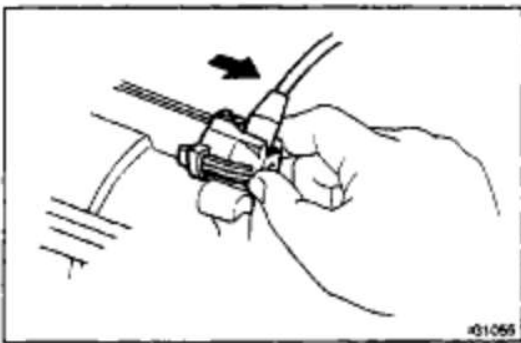


(b) (Ex Center Cord)

Align the spline of the distributor cap with the spline groove of the holder, and slide the holder.



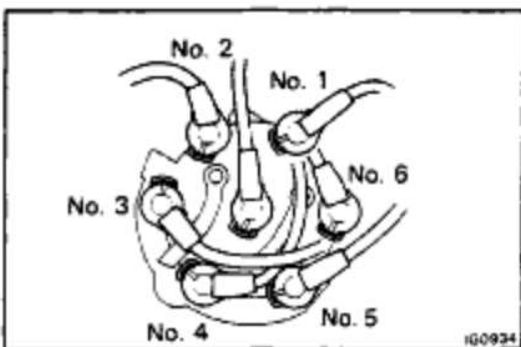
NOTICE: Check that the holder is correctly installed to the grommet and distributor cap as shown in the illustration.



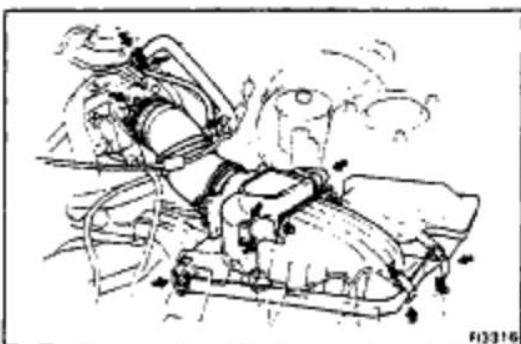
(c) Check that the claw of the holder is engaged by lightly pulling the holder.

(d) (Center Cord)

Insert the grommet and holder together.



(e) Connect the high-tension cords as shown in the illustration.

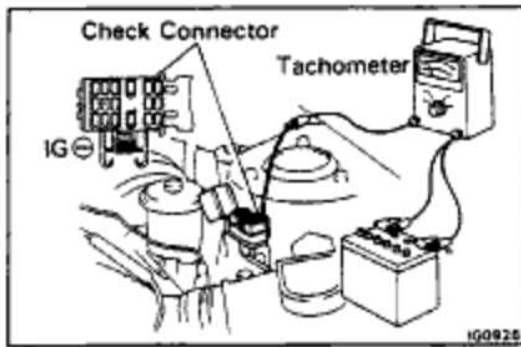
4. CONNECT DISTRIBUTOR CONNECTOR**5. INSTALL AIR CLEANER CAP, AIR FLOW METER AND AIR CLEANER HOSE**

(a) Connect the air cleaner hose, and install the air cleaner cap and air flow meter with the four clips.

(b) Tighten the air cleaner hose clamp bolt.

(c) Connect the air hoses.

(d) Connect the air flow meter connector.



6. WARM UP ENGINE

Allow the engine to normal operating temperature.

7. CONNECT TACHOMETER AND TIMING LIGHT TO ENGINE

Connect the tachometer test probe to terminal IG [-] of the check connector.

NOTICE:

- **NEVER** allow the tachometer test probe to touch ground as it could result in damage to the igniter and/or ignition coil.
- As some tachometers are not compatible with this ignition system, we recommended that you confirm the compatibility of your unit before use.

8. ADJUST IGNITION TIMING

(a) Check the idle speed.

Idle speed: 700 ± 50 rpm

(b) Using SST connect terminals TE1 and E1 of the check connector.

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

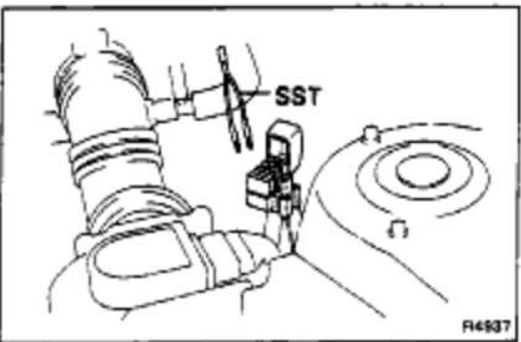
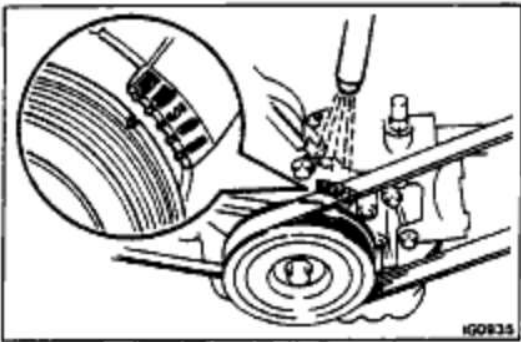
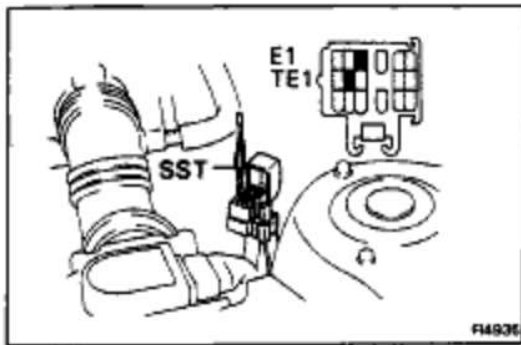
Ignition timing: $10^\circ 6\text{TDC}$ @ idle

(Transmission in N range)

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

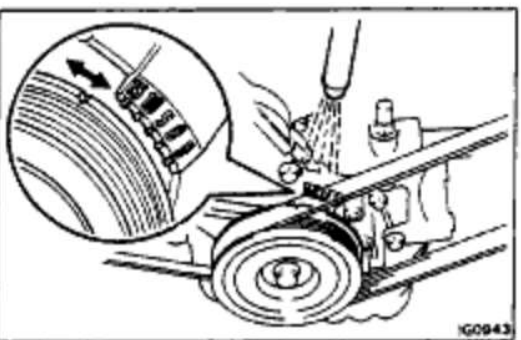
(e) Tighten the hold-down bolts, and recheck the ignition timing.

Torque: 185 kg-cm (13 ft-lb, 18 N-m)



(f) Remove SST.

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9. FURTHER CHECK IGNITION TIMING

Ignition timing: 10°BTDC @ idle

(Transmission in N range)

HINT: The timing mark moves in a range between 13° and 27° .

10. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE