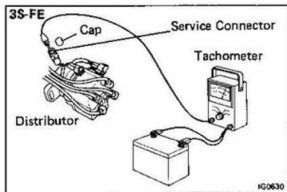


IGNITION SYSTEM

	Page
PRECAUTIONS	IG-2
TROUBLESHOOTING	IG-3
IGNITION SYSTEM CIRCUIT	IG-4
ON-VEHICLE INSPECTION	IG-5
DISTRIBUTOR (3S-FE)	IG-11
DISTRIBUTOR (3S-GE)	IG-16



PRECAUTIONS

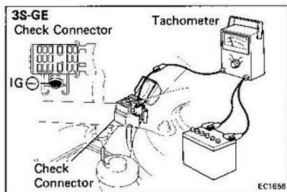
1. Do not leave the ignition switch on for more than 10 minutes if the engine will not start.

2. (3S-FE)

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

3. (3S-GE)

With a tachometer is connected to the system, connect the test probe of the tachometer to terminal IG \ominus of the check connector.

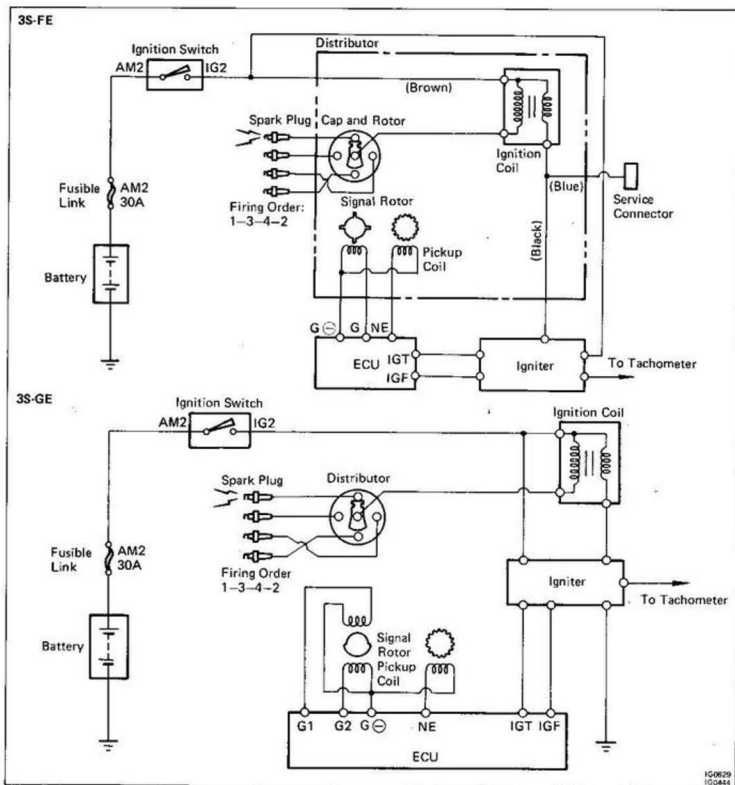


4. As some tachometer are not compatible with this ignition system, we recommend that you confirm the compatibility of your unit before using.
5. NEVER allow the tachometer terminal to touch ground as this could damage the igniter and/or ignition coil.
6. Do not disconnect the battery when the engine 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 <ul style="list-style-type: none"> ● 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-15, 18 IG-9 IG-10 IG-10 IG-6
Rough idle or stalls	Spark plug faulty Ignition wiring faulty Incorrect ignition timing Ignition problems <ul style="list-style-type: none"> ● 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, 7 IG-15, 18 IG-9 IG-10 IG-10 IG-6
Engine hesitates/ poor acceleration	Spark plug faulty Ignition wiring faulty Incorrect ignition timing	Inspect plugs Inspect wiring Reset timing	IG-6, 7 IG-15, 18
Engine dieseling (runs after ignition switch is turned off)	Incorrect ignition timing	Reset timing	IG-15, 18
Muffler explosion (after fire) all the time	Incorrect ignition timing	Reset timing	IG-15, 18
Engine backfires	Incorrect ignition timing	Reset timing	IG-15, 18
Poor gasoline mileage	Spark plug faulty Incorrect ignition timing	Inspect plugs Reset timing	IG-6, 7 IG-15, 18
Engine overheats	Incorrect ignition timing	Reset timing	IG-15, 18

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

SPARK TEST

CHECK THAT SPARK OCCURS

(3S-FE)

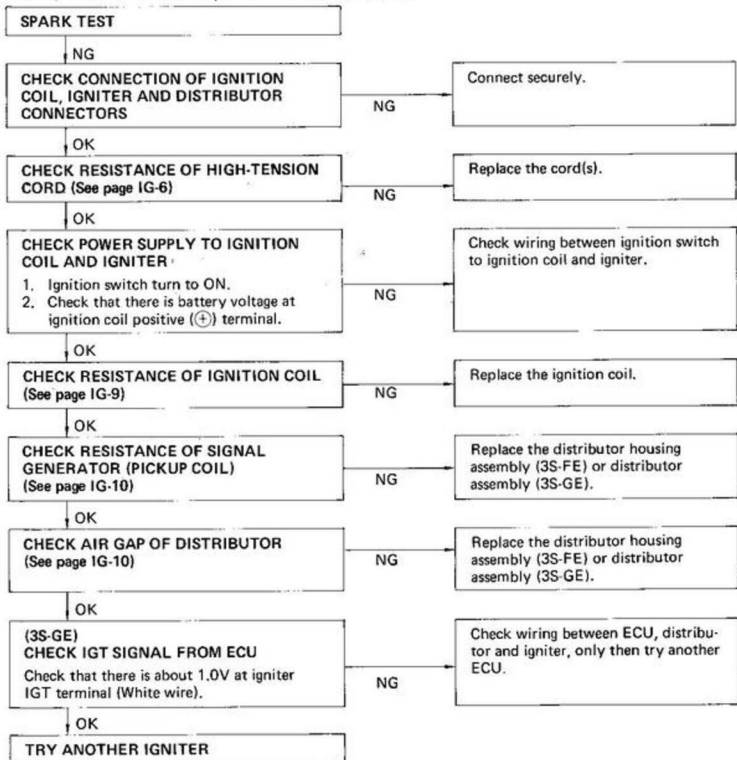
- Disconnect high-tension cords from spark plugs.
- Remove the spark plugs.
- Install the spark plugs to each high-tension cord.
- Ground the spark plug.
- Check if spark occurs while engine is being cranked.

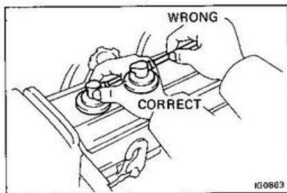
(3S-GE)

- Disconnect the high-tension cord from the distributor.
- Hold the end about 12.5 (1/2") from body of car.
- See if spark occurs while engine is being cranked.

NOTE: 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:





INSPECTION OF HIGH-TENSION CORDS

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

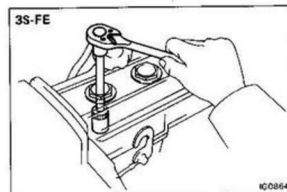
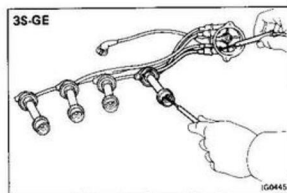
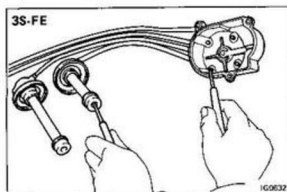
CAUTION: Pulling on or bending the cords may damage the conductor inside.

2. INSPECT HIGH-TENSION CORD RESISTANCE

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

Maximum resistance: 25 k Ω per cord

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



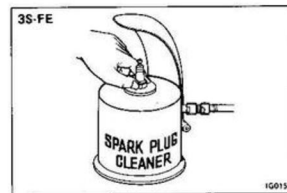
INSPECTION OF SPARK PLUGS (3S-FE) (Conventional Tipped Type)

1. REMOVE SPARK PLUGS

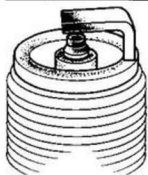
Using a plug wrench (16 mm), remove the spark plug.

2. CLEAN SPARK PLUGS

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



3S-FE



IG0148

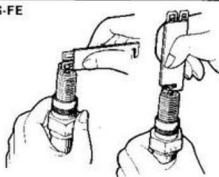
3. VISUALLY INSPECT SPARK PLUGS

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

If abnormal, replace the spark plug.

Recommended spark plug: ND Q16R-U11
NGK BCR5EY11

3S-FE



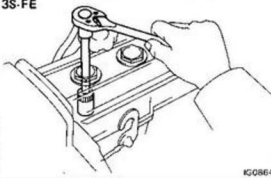
IG0004

4. ADJUST ELECTRODE GAP

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

Correct electrode gap: 1.1 mm (0.043 in.)

3S-FE



IG0864

5. INSTALL SPARK PLUGS

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

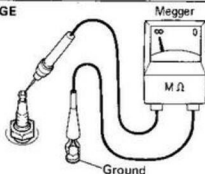
Torque: 180 kg-cm (13 ft-lb, 18 N·m)

INSPECTION OF SPARK PLUGS (3S-GE) (Platinum Tipped Type)

CAUTION:

- 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).

3S-GE



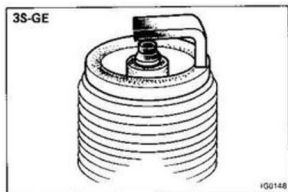
IG0147

1. INSPECT ELECTRODE**A. If using a megger (insulation resistance meter):**

Measure the insulation resistance.

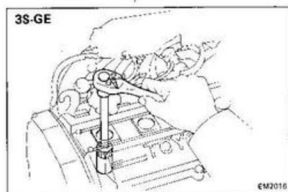
Correct insulation resistance: 10 MΩ or more

If the resistance is less than specified, clean the spark plug.



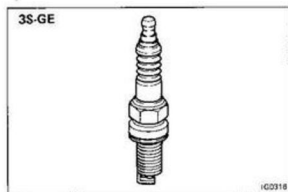
B. If not using a megger:

- (a) Quickly race the engine to 4,000 rpm five times.
- (b) Remove the spark plug.
(See step 2)
- (c) Visually check the spark plug.
If the electrode is dry ... Okey
If the electrode is wet ... Proceed to step 3



2. REMOVE SPARK PLUGS

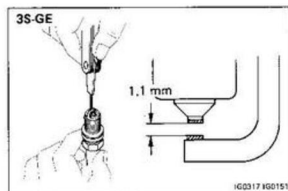
Using a plug wrench (16 mm), remove the spark plug.



3. VISUALLY INSPECT SPARK PLUGS

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

**Recommended spark plug: ND PQ16R
NGK BCPR5EP11**



4. INSPECT ELECTRODE GAP

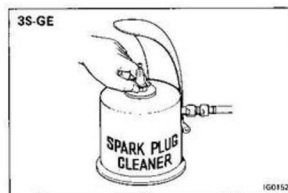
Maximum electrode gap: 1.3 mm (0.051 in.)

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

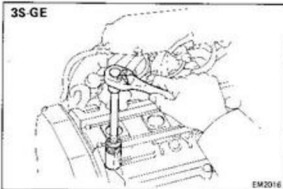
If the electrode has traces of wet carbon, allow it to dry and then clean with a spark plug cleaner.

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

Duration: 20 seconds or less

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

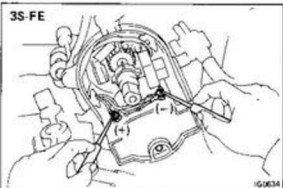
3S-GE

**6. INSTALL SPARK PLUGS**

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

Torque: 180 kg-cm (13 ft-lb, 18 N·m)

3S-FE

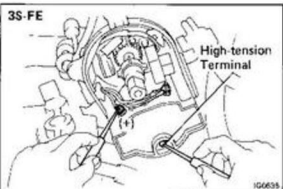
**INSPECTION OF IGNITION COIL (3S-FE)****1. INSPECT PRIMARY COIL RESISTANCE**

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

Primary coil resistance (Cold): 0.38 – 0.46 Ω

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

3S-FE

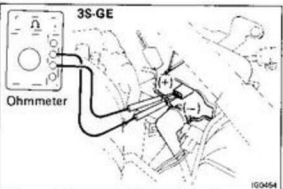
**2. INSPECT SECONDARY COIL RESISTANCE**

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

Secondary coil resistance (Cold): 7.7 – 10.4 k Ω

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

3S-GE

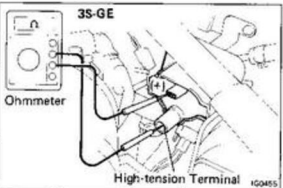
**INSPECTION OF IGNITION COIL (3S-GE)****1. INSPECT PRIMARY COIL RESISTANCE**

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

Primary coil resistance (Cold): 0.41 – 0.50 Ω

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

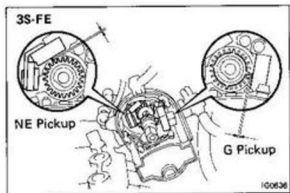
3S-GE

**2. INSPECT SECONDARY COIL RESISTANCE**

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

Secondary coil resistance (Cold): 10.2 – 13.8 k Ω

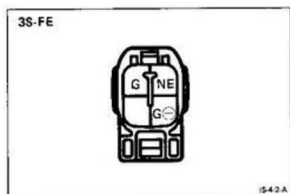
If the resistance is not as specified, replace the ignition coil.

**DISTRIBUTOR (3S-FE)****1. INSPECT AIR GAP**

Using a feeler gauge, measure the 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.

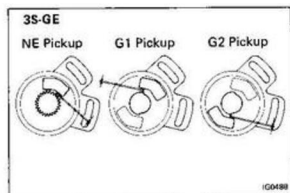
**2. INSPECT SIGNAL GENERATOR (PICKUP COIL) RESISTANCE**

Using an ohmmeter, measure the resistance between the terminals.

G pickup coil resistance (G to G⁻): 140 – 180 Ω

NE pickup coil resistance (NE to G⁻): 140 – 180 Ω

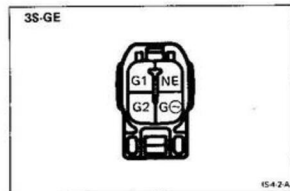
If the resistance is not as specified, replace the distributor housing assembly.

**DISTRIBUTOR (3S-GE)****1. INSPECT AIR GAP**

Using a feeler gauge, measure the 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.

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

Using an ohmmeter, measure the resistance between terminals.

G1 pickup coil resistance (G1 to G⁻): 140 – 180 Ω

G2 pickup coil resistance (G2 to G⁻): 140 – 180 Ω

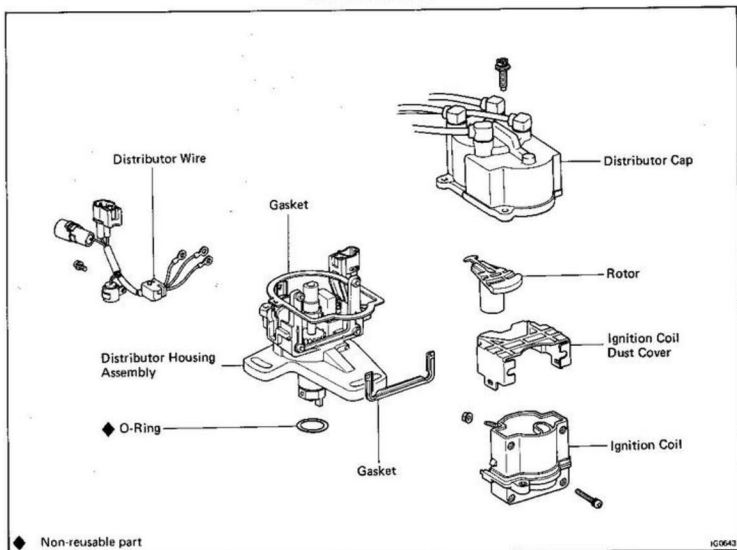
NE pickup coil resistance (NE to G⁻): 140 – 180 Ω

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

INSPECTION OF IGNITER

(See procedure Spark Test on page IG-5)

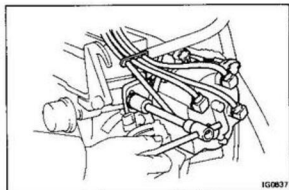
DISTRIBUTOR (3S-FE) COMPONENTS



REMOVAL OF DISTRIBUTOR

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

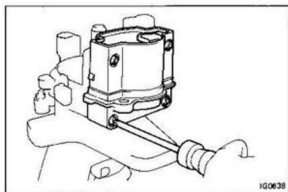
Remove the two hold-down bolts and pull out the distributor. Remove the O-ring.



DISASSEMBLY OF DISTRIBUTOR

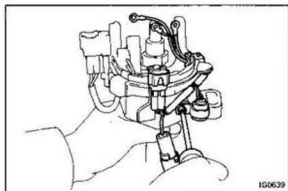
(See page IG-11)

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

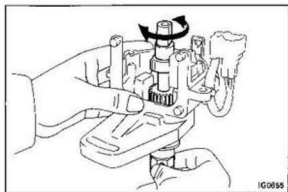


4. REMOVE IGNITION COIL

- (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

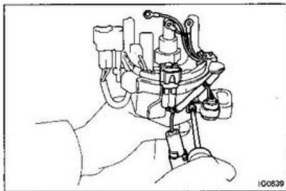
**INSPECTION OF DISTRIBUTOR****INSPECT GOVERNOR SHAFT**

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

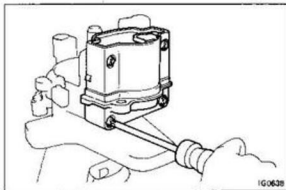
If it feels rough or worn, replace the distributor housing assembly.

ASSEMBLY OF DISTRIBUTOR

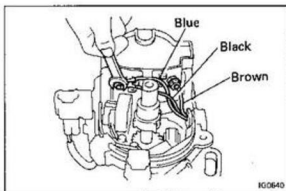
(See page IG-11)

1. INSTALL DISTRIBUTOR WIRE**2. INSTALL IGNITION COIL**

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



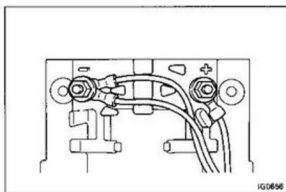
- (b) Connect the three wires to the terminals of the ignition coil with the two nuts as shown.

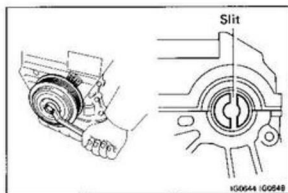
**CAUTION:**

- 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 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.

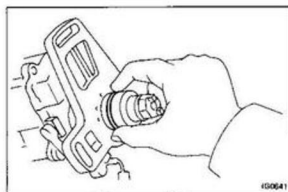




INSTALLATION OF DISTRIBUTOR

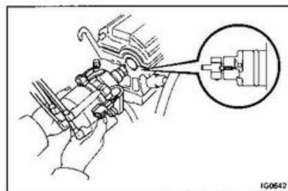
1. SET NO.1 CYLINDER TO TDC/COMPRESSION

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



2. INSTALL DISTRIBUTOR

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



- Align the cutout of the coupling with the line of the housing.
- Insert distributor, aligning the center of the flange with that of bolt hole on the cylinder head.
- Lightly tighten the two hold-down bolts.

3. CONNECT HIGH-TENSION CORDS TO SPARK PLUGS

Firing order: 1 - 3 - 4 - 2

4. CONNECT DISTRIBUTOR CONNECTOR

5. INSTALL AIR CLEANER HOSE

6. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

7. WARM UP ENGINE

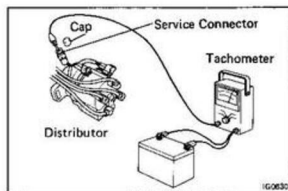
Allow the engine to reach normal operating temperature.

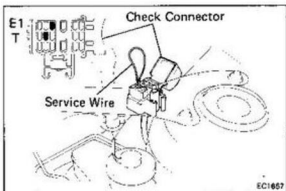
8. CONNECT TACHOMETER

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

CAUTION:

- NEVER allow the tachometer terminal 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 using.

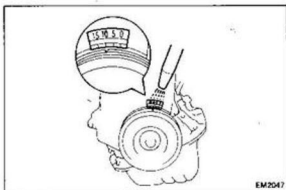




9. ADJUST IGNITION TIMING

- (a) Using a service wire, short terminals T and E1 of the check connector.

NOTE: After engine rpm are kept at 1,000 — 1,300 rpm for 5 seconds, check that they return to 600 — 800 rpm.

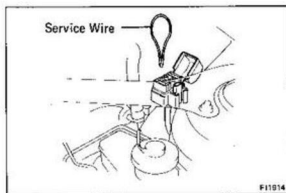


- (b) Using a timing light, check the ignition timing.

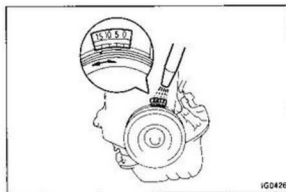
Ignition timing: 10° BTDC @ idle
(Transmission in "N" range)

- (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 the service wire.

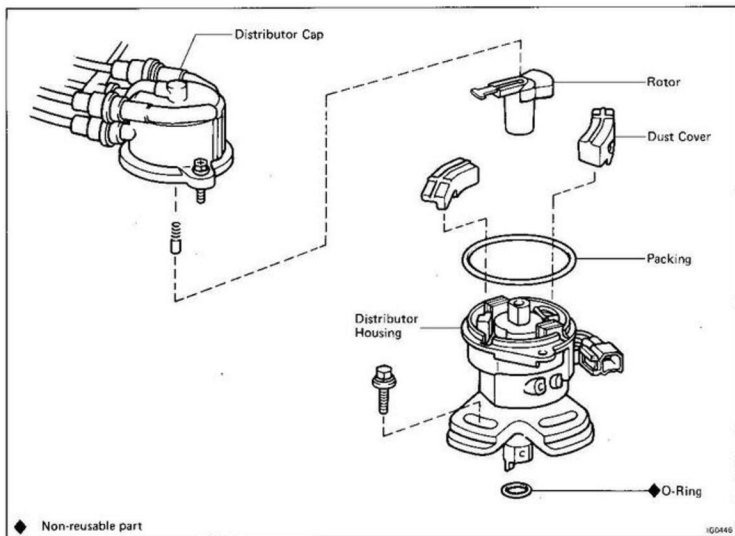


10. FURTHER CHECK IGNITION TIMING

Ignition timing: $13 - 22^{\circ}$ BTDC @ idle
(Transmission in "N" range)

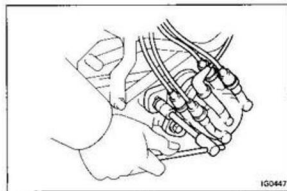
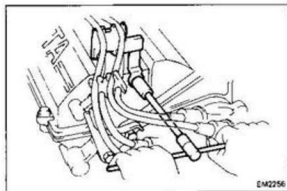
NOTE: The timing mark moves in a range between 13° and 22° .

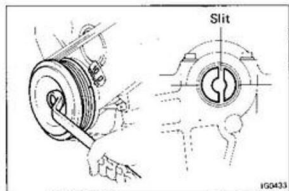
DISTRIBUTOR (3S-GE) COMPONENTS



REMOVAL OF DISTRIBUTOR

1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY
2. REMOVE AIR CLEANER HOSE
3. DISCONNECT DISTRIBUTOR CONNECTOR
4. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS AND IGNITION COIL
5. REMOVE DISTRIBUTOR
 - (a) Remove the bolt of the high-tension cord clamp.
 - (b) Remove the two hold-down bolts and pull out the distributor. Remove the O-ring.

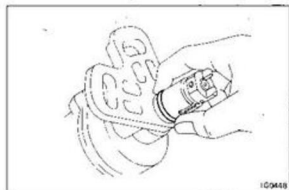




INSTALLATION OF DISTRIBUTOR

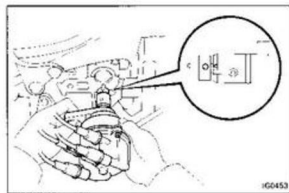
1. SET NO.1 CYLINDER TO TDC/COMPRESSION

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



2. INSTALL DISTRIBUTOR

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



- Align the drilled mark of the coupling with the groove mark of the housing.
- Insert the distributor, aligning the center of the flange with that of the bolt hole on the cylinder head.
- Lightly tighten the two hold-down bolts.
- Install the high-tension cord clamp with the bolt.

3. CONNECT HIGH-TENSION CORDS TO SPARK PLUGS

Firing order: 1 – 3 – 4 – 2

4. CONNECT DISTRIBUTOR CONNECTOR

5. INSTALL AIR CLEANER HOSE

6. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

7. WARM UP ENGINE

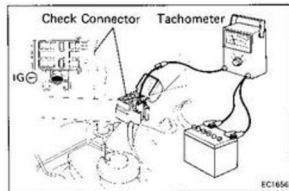
Allow the engine to reach normal operating temperature.

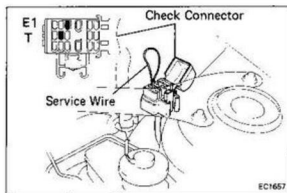
8. CONNECT TACHOMETER

Connect the test probe of a tachometer to terminal IG (⊖) of the check connector.

CAUTION:

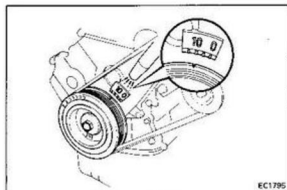
- NEVER allow the tachometer terminal to touch ground as it could result in damage to the igniter and/or ignition coil.
- As some tachometers are not compatible with this ignition system, we recommend that you confirm the compatibility of your until before using.





9. ADJUST IGNITION TIMING

- (a) Using a service wire, short terminals T and E1 of the check connector.

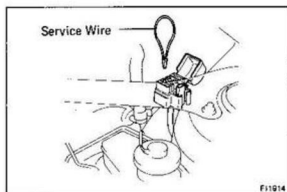


- (b) Using a timing light, check the ignition timing.

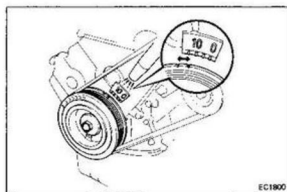
Ignition timing: 10° BTDC @ idle
(Transmission in "N" range)

- (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: 400 kg-cm (29 ft-lb, 39 N·m)



- (e) Remove the service wire.



10. FURTHER CHECK IGNITION TIMING

Ignition timing: 14 – 19° BTDC @ idle
(Transmission in "N" range)

NOTE: The timing mark moves in a range between 14° and 19°.