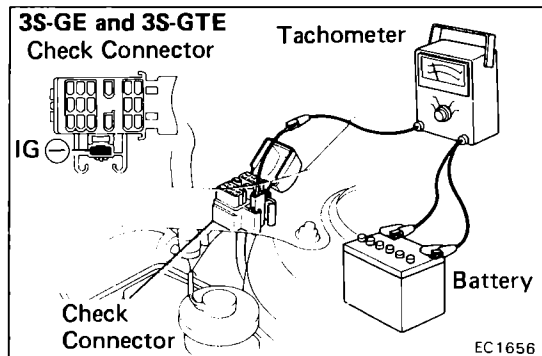
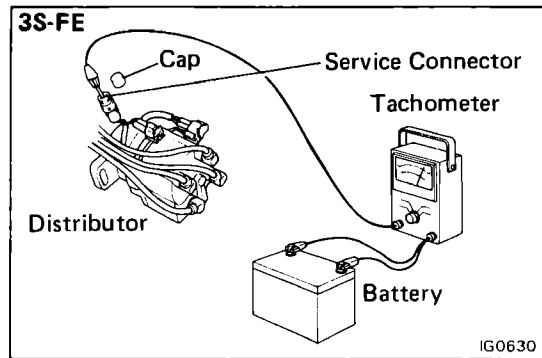


IGNITION SYSTEM

	Page
PRECAUTIONS	IG-2
TROUBLESHOOTING	IG-3
IGNITION SYSTEM CIRCUIT	IG-4
ON-VEHICLE INSPECTION (3S-FE)	IG-5
ON-VEHICLE INSPECTION (3S-GE and 3S-GTE)	IG-9
DISTRIBUTOR (3S-FE)	IG-13
DISTRIBUTOR (3S-GE and 3S-GTE)	IG-18



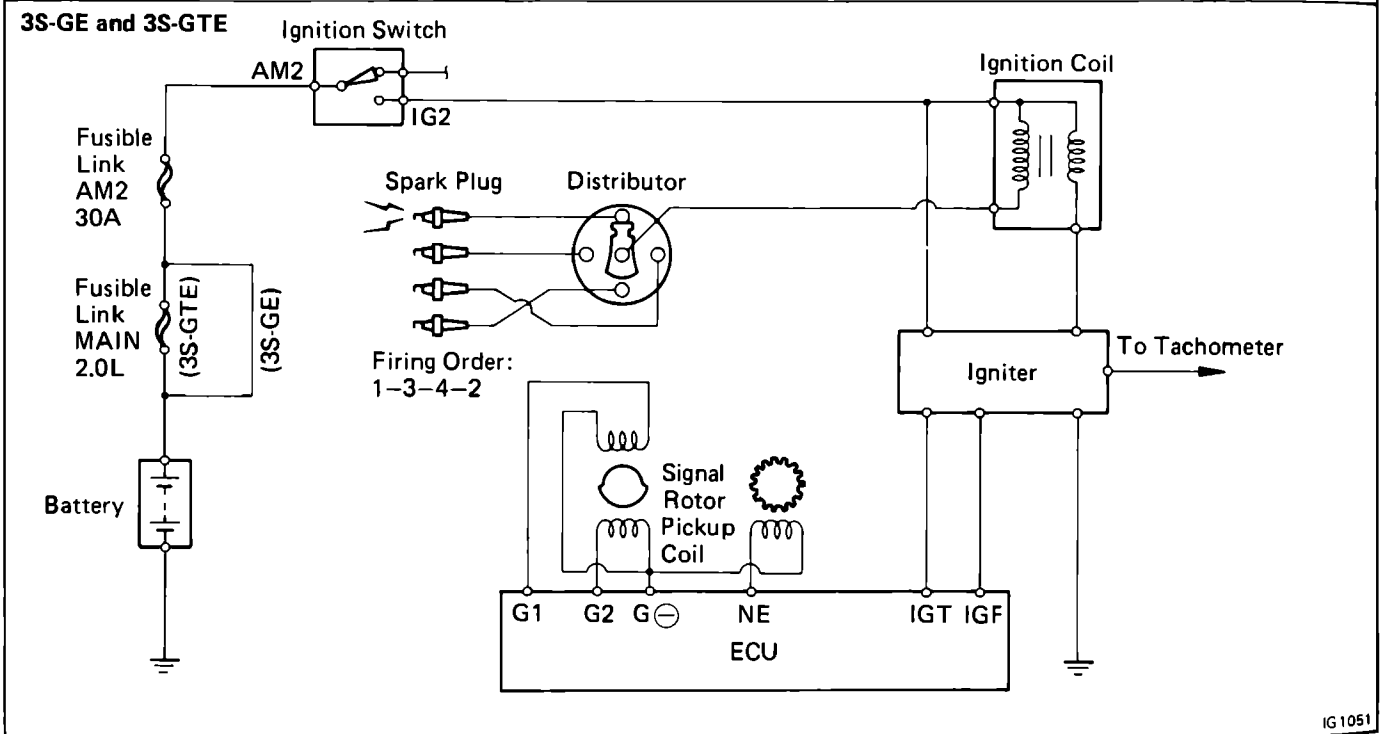
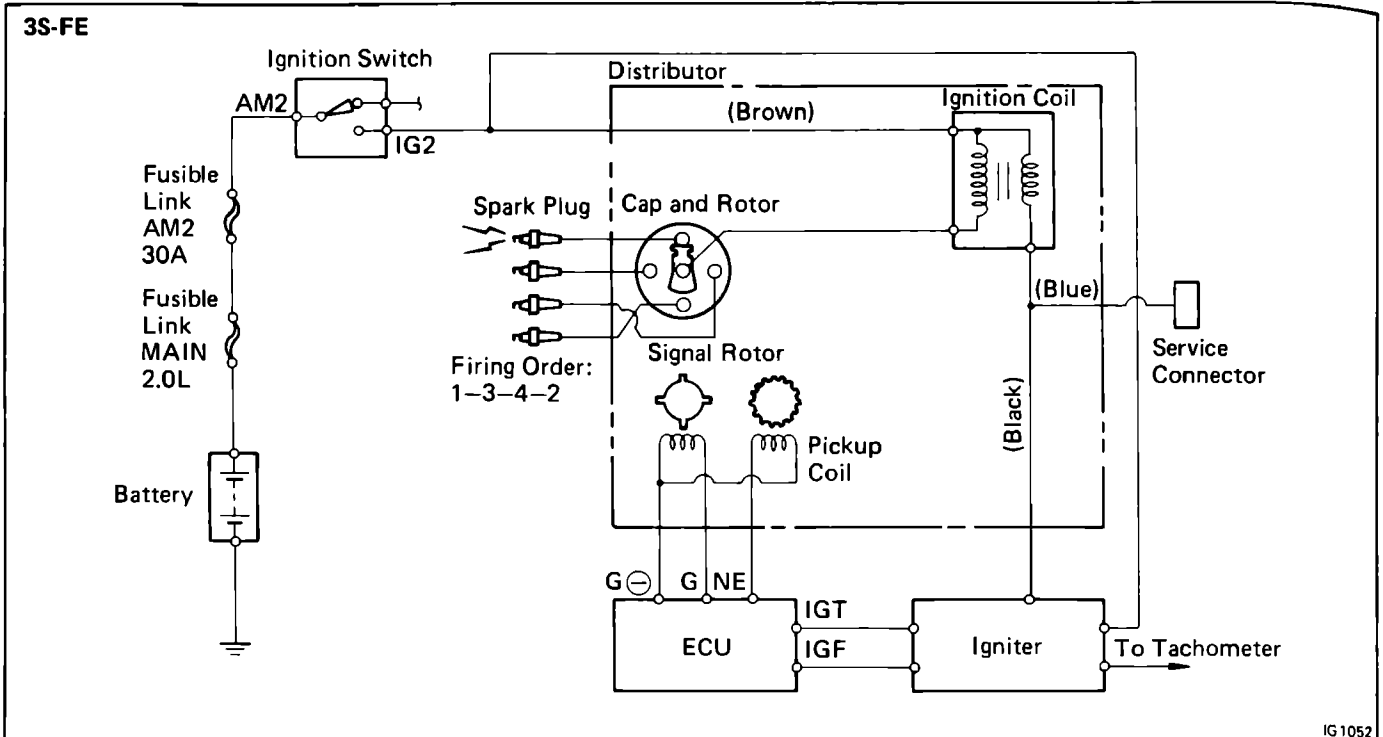
PRECAUTIONS

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. **(3S-GE and 3S-GTE)**
When a tachometer is connected to the system, connect the test probe of the tachometer to terminal IG ⊖ 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 use.
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 while 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-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 <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, 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 IG-17, 20
Engine overheats	Incorrect ignition timing	Reset timing	IG-17, 20

IGNITION SYSTEM CIRCUIT



ELECTRONIC SPARK ADVANCE (ESA)

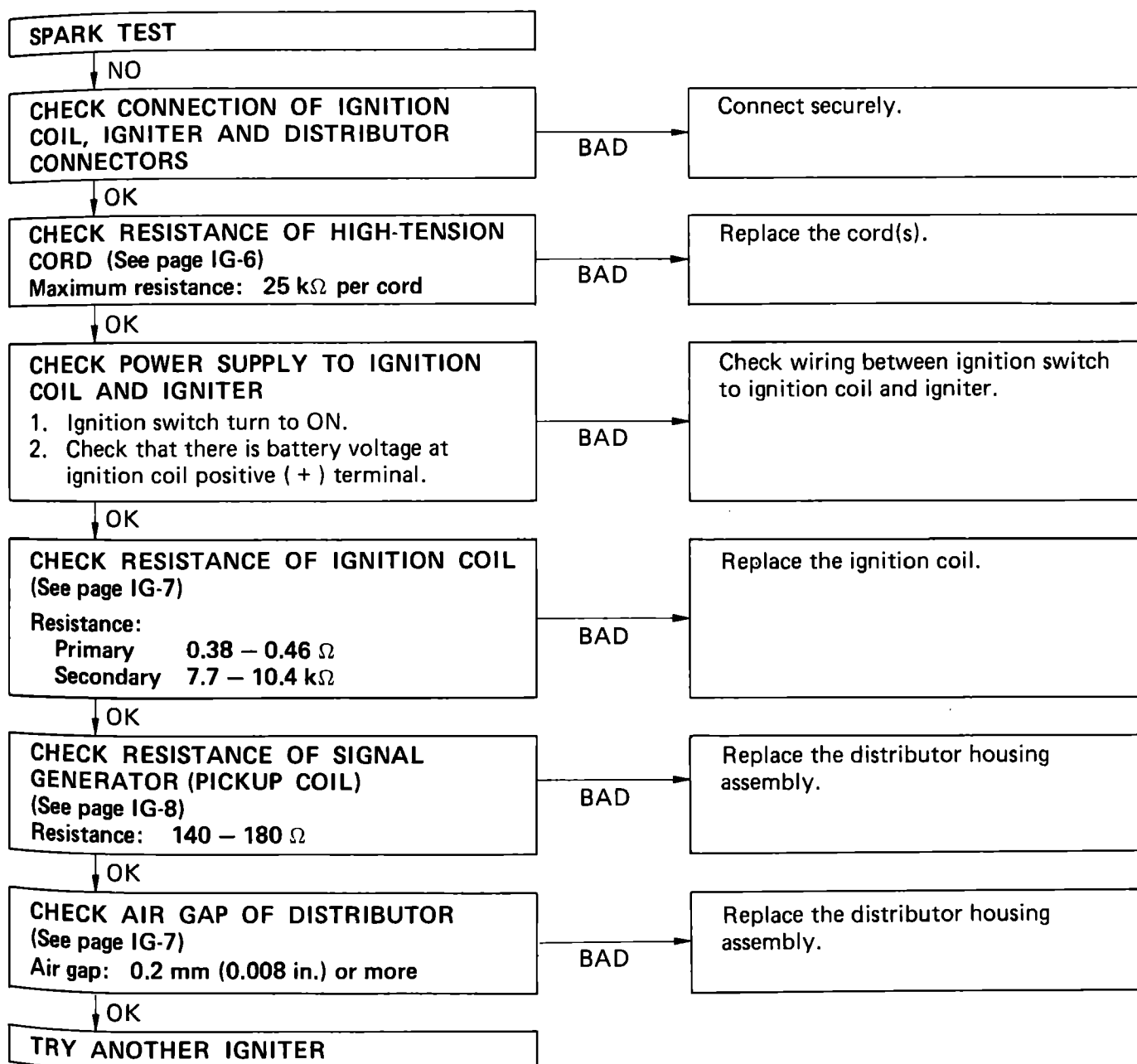
The ECU is programmed with data for optimum ignition timing under any and all operating conditions. Using data provided by sensors which monitor various engine functions (rpm, intake air volume, eng. temperature, etc.) the microcomputer (ECU) triggers the spark at precisely the right instant.

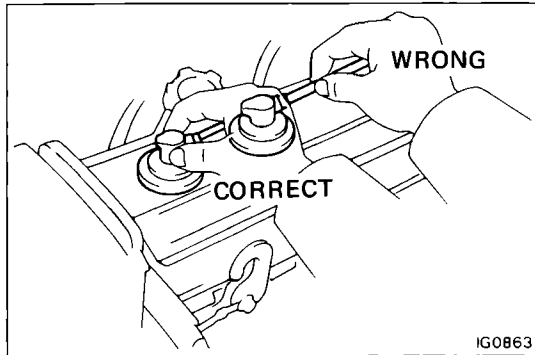
ON-VEHICLE INSPECTION (3S-FE)**- SPARK TEST****CHECK THAT SPARK OCCURS**

- (a) Disconnect high-tension cords from spark plugs.
- (b) Remove the spark plugs.
- (c) Install the spark plugs to each high-tension cord.
- (d) Ground the spark plug.
- (e) Check 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:

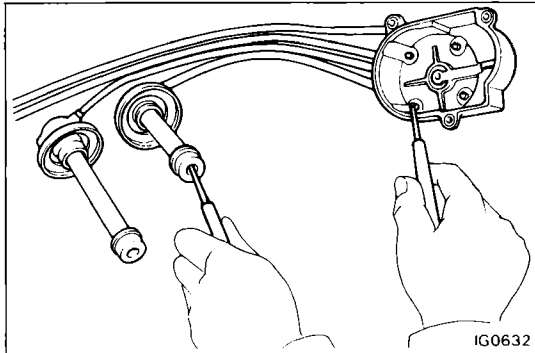




INSPECTION OF HIGH-TENSION CORDS

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.

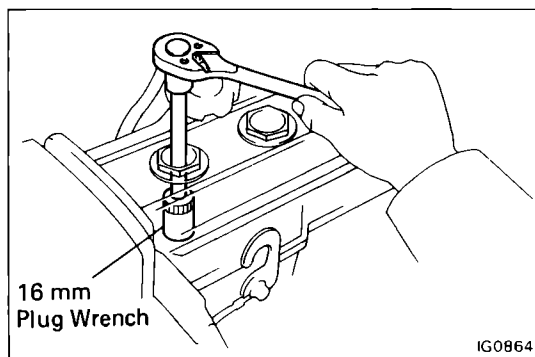


2. INSPECT HIGH-TENSION CORD RESISTANCE

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

Maximum resistance: 25 kΩ per cord

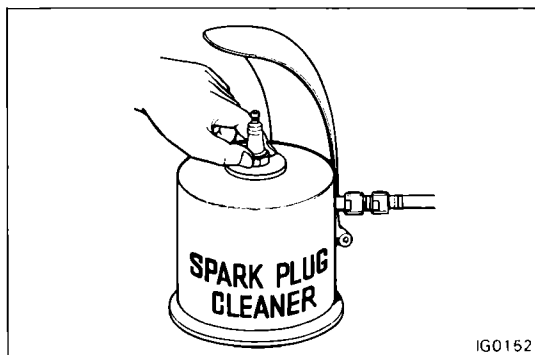
If the resistance is greater than maximum, check the terminals. If necessary, replace the high-tension cord and/or distributor cap.



INSPECTION OF SPARK PLUGS

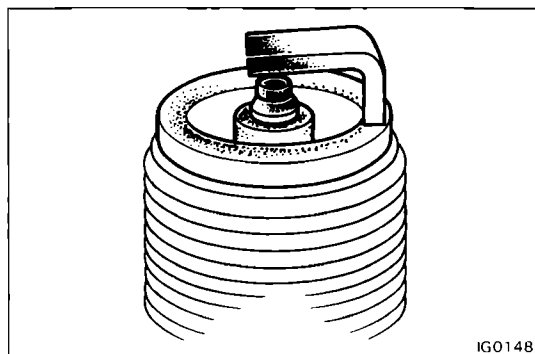
1. REMOVE SPARK PLUGS

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



2. CLEAN SPARK PLUGS

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

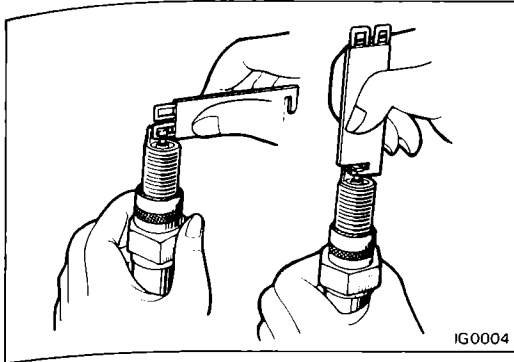


3. VISUALLY INSPECT SPARK PLUGS

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

If abnormal, replace the spark plug.

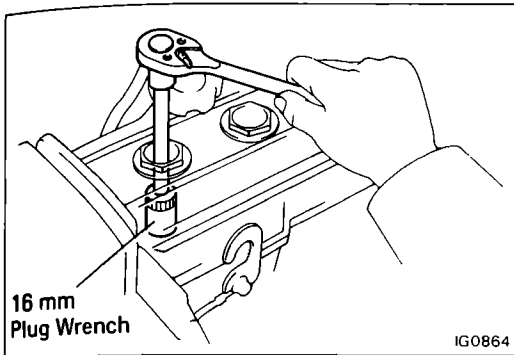
Recommended spark plug: ND Q16R-U11
NGK BCPR5EY11



4. ADJUST ELECTRODE GAP

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

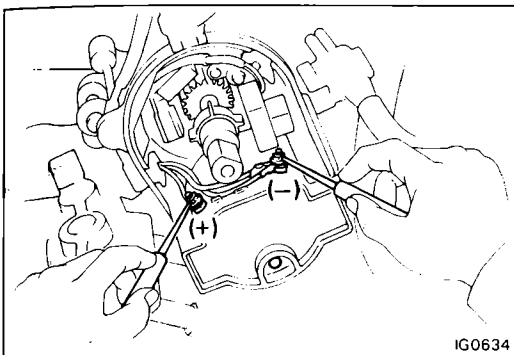
Correct electrode plug: 1.1 mm (0.043 in.)



5. INSTALL SPARK PLUGS

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

Torque: 180 kg-cm (13 ft-lb, 18 N·m)



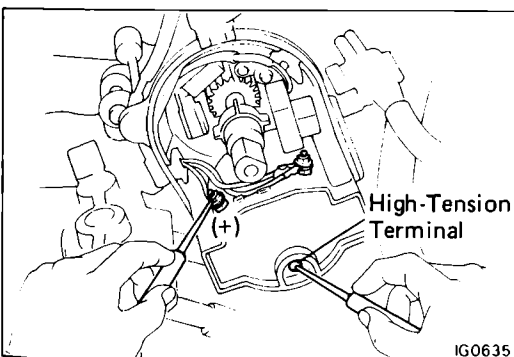
INSPECTION OF IGNITION COIL

1. INSPECT PRIMARY COIL RESISTANCE

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

Primary coil resistance (Cold): 0.38 – 0.46 Ω

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

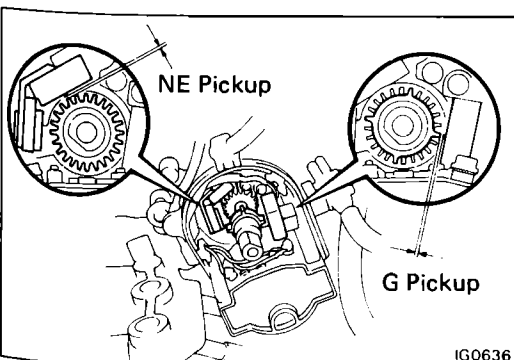


2. INSPECT SECONDARY COIL RESISTANCE

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

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

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



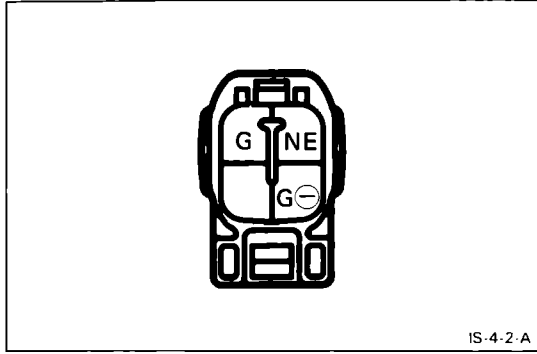
INSPECTION OF DISTRIBUTOR

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.



2. INSPECT SIGNAL GENERATOR (PICKUP COIL) RESISTANCE

Using an ohmmeter, measure the resistance between the terminals.

G pickup coil resistance (G — G[⊖]): 140 — 180 Ω

NE pickup coil resistance (NE — G[⊖]): 140 — 180 Ω

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 (3S-GE and 3S-GTE)

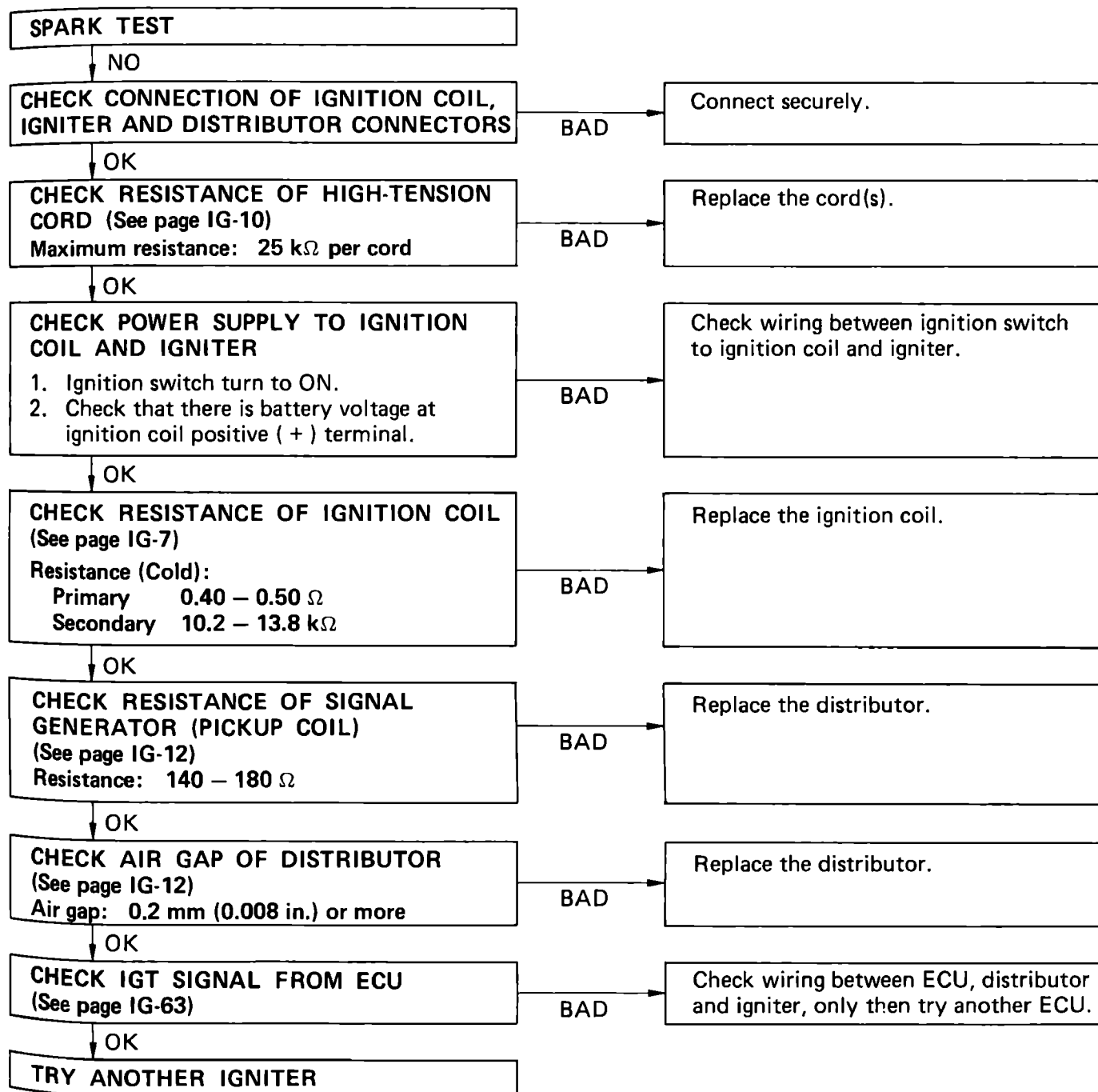
SPARK TEST

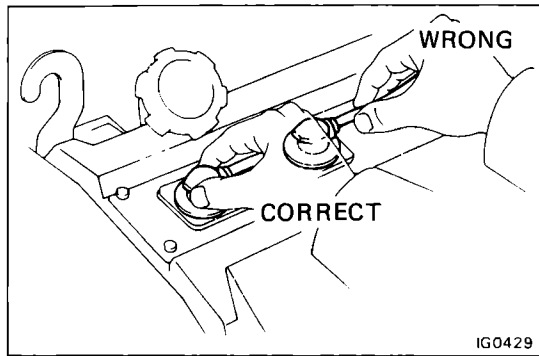
CHECK THAT SPARK OCCURS

- Disconnect the high-tension cord from the distributor.
- Hold the end about 12.5 mm (0.50 in.) 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:

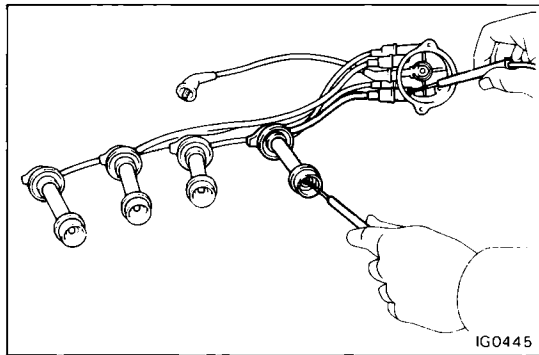




INSPECTION OF HIGH-TENSION CORDS

1. (3S-GTE)
REMOVE INTERCOOLER
(See steps 1, 3 and 7 on pages TC-9 and 10)
2. CAREFULLY REMOVE HIGH-TENSION CORDS BY THEIR RUBBER BOOTS FROM SPARK PLUGS

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



3. 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.

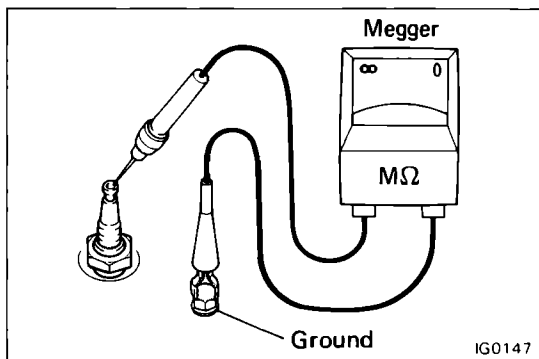
4. (3S-GTE)
INSTALL INTERCOOLER
(See steps 11, 16 to 18 on page TC-14)

INSPECTION OF SPARK PLUGS

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).

1. (3S-GTE)
REMOVE INTERCOOLER
(See steps 1, 3 and 7 on pages TC-9 and 10)



2. INSPECT ELECTRODE
- A. If using a megger (insulation resistance meter):

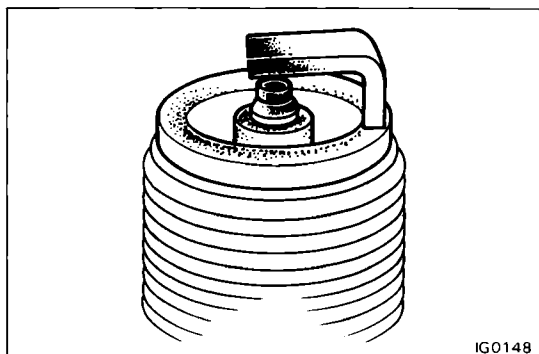
Measure the insulation resistance.

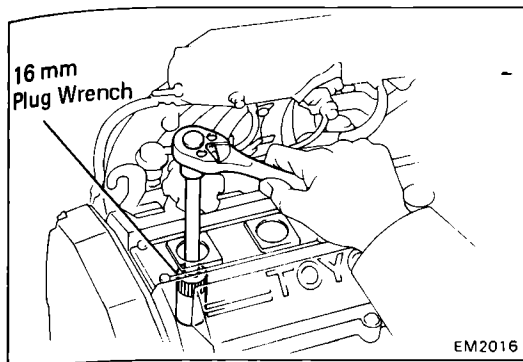
Correct insulation resistance: 10 MΩ or more

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

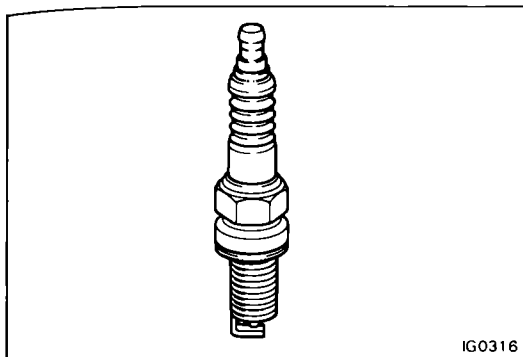
- B. If not using a megger:

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



**3. REMOVE SPARK PLUGS**

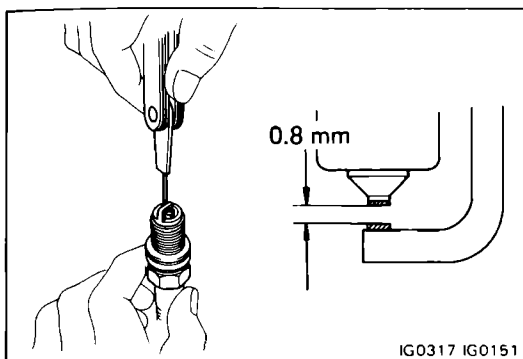
Using a 16 mm plug wrench, remove the spark plug.

**4. VISUALLY INSPECT SPARK PLUGS**

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

Recommended spark plug:

3S-GE	ND	PQ16R
		NGK BCPR5EP11
3S-GTE	ND	PQ16R8
		NGK BCPR5EP8

**5. INSPECT ELECTRODE GAP**

Maximum electrode gap:

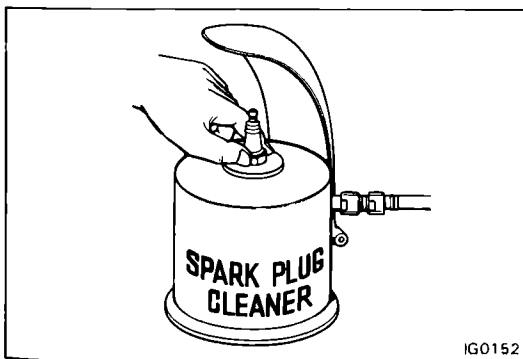
3S-GE	1.3 mm (0.051 in.)
3S-GTE	1.0 mm (0.039 in.)

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

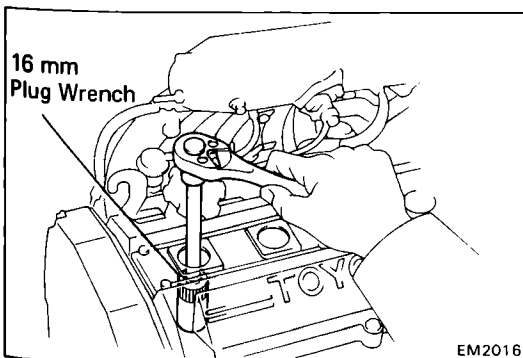
Correct electrode gap of new spark plug:

3S-GE	1.1 mm (0.043 in.)
3S-GTE	0.8 mm (0.031 in.)

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

**6. CLEAN SPARK PLUGS**

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

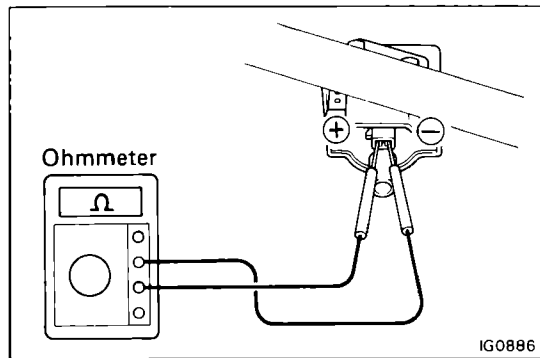
**7. INSTALL SPARK PLUGS**

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

Torque: 180 kg-cm (13 ft-lb, 18 N·m)

8. (3S-GTE) INSTALL INTERCOOLER

(See steps 11, 16 to 18 on page TC-14)



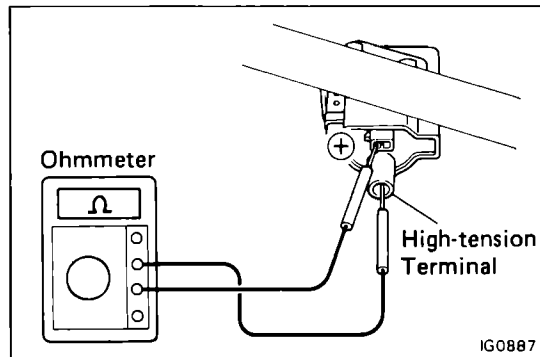
INSPECTION OF IGNITION COIL

1. INSPECT PRIMARY COIL RESISTANCE

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

Primary coil resistance (Cold): 0.40 – 0.50 Ω

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

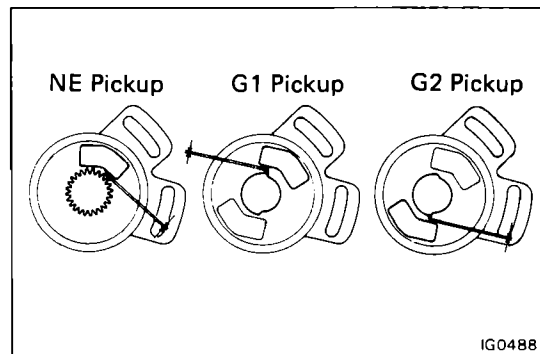


2. INSPECT SECONDARY COIL RESISTANCE

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.



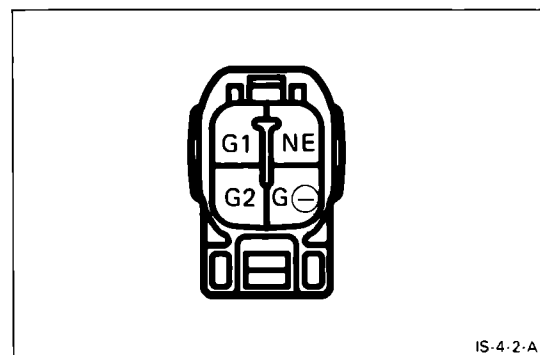
DISTRIBUTOR

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.



2. INSPECT SIGNAL GENERATOR (PICKUP COIL) RESISTANCE

Using an ohmmeter, measure the resistance between terminals.

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

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

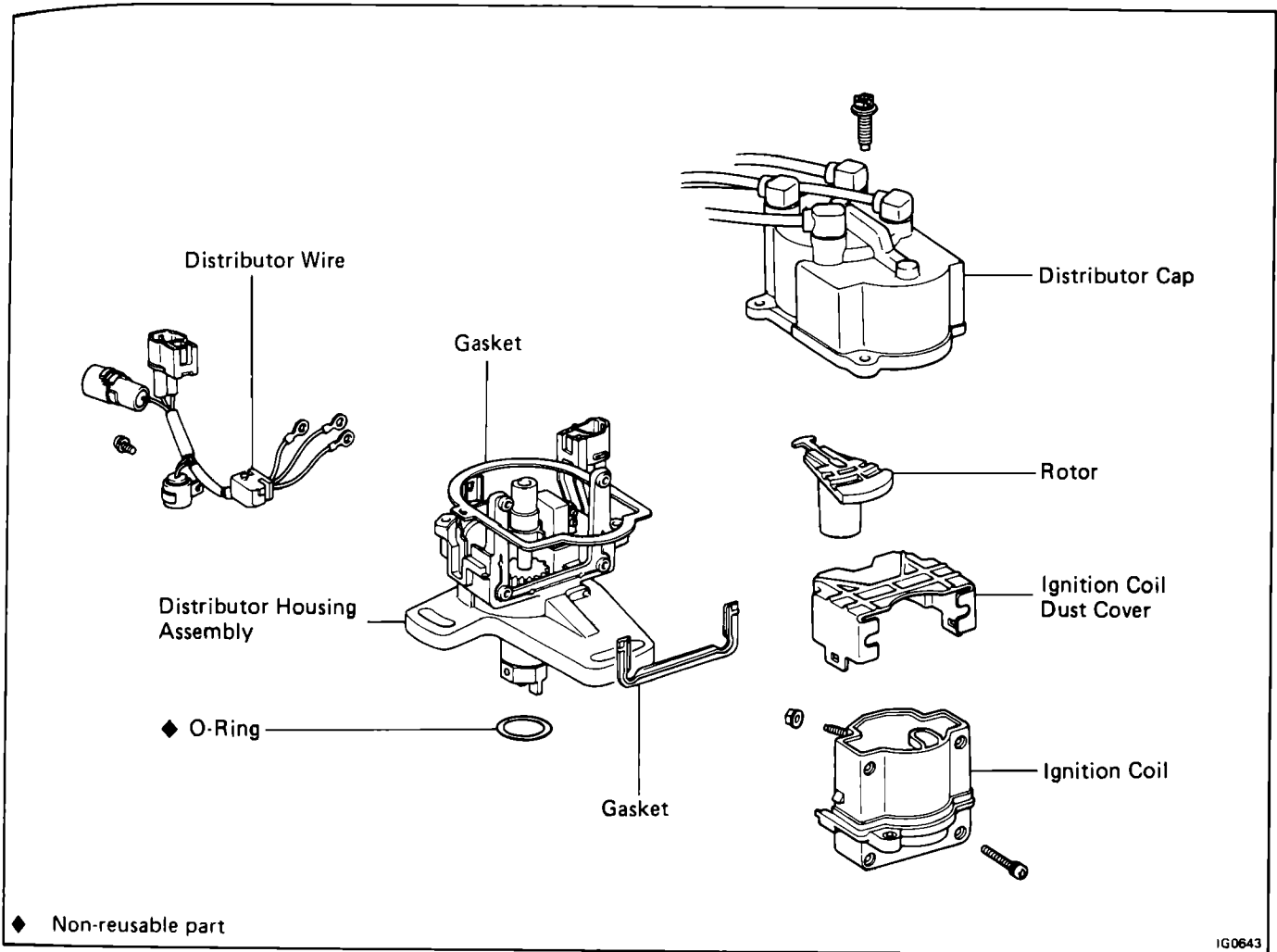
NE pickup coil resistance (NE to G \ominus): 140 – 180 Ω

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

INSPECTION OF IGNITER

(See procedure Spark Test on page IG-9)

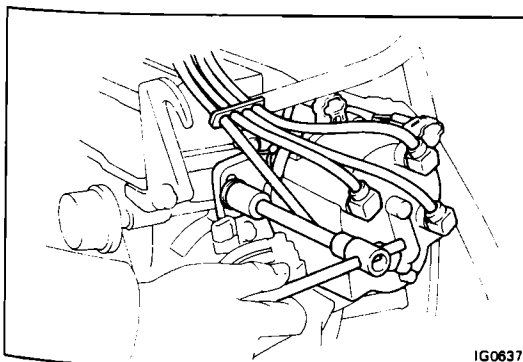
DISTRIBUTOR (3S-FE) COMPONENTS



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

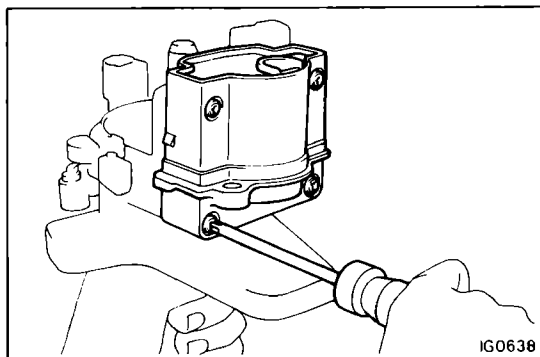
Remove the two hold-down bolts and pull out the distributor. Remove the O-ring.



DISASSEMBLY OF DISTRIBUTOR

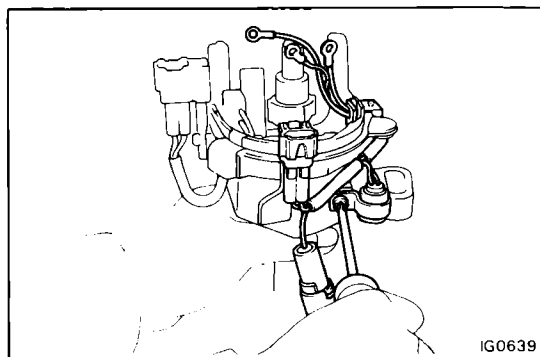
(See page IG-13)

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

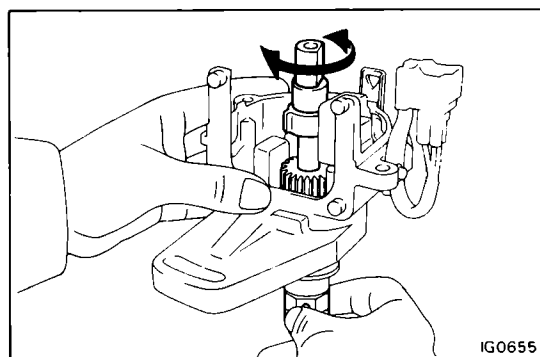


4. REMOVE IGNITION COIL

- (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

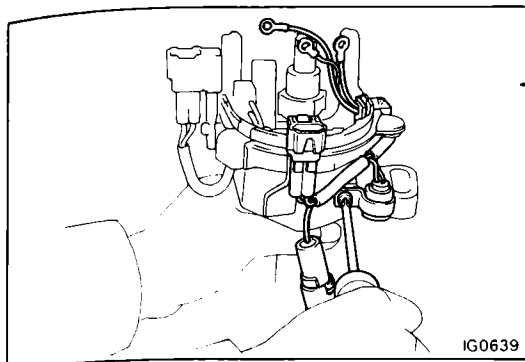


INSPECTION OF DISTRIBUTOR

INSPECT GOVERNOR SHAFT

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

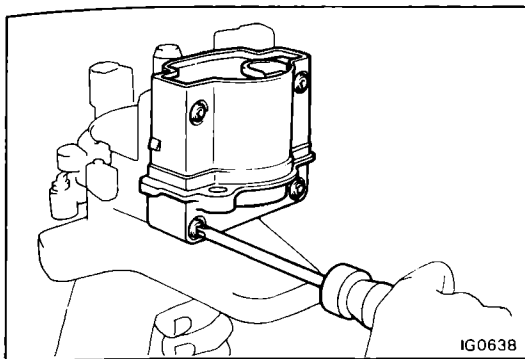
If it feels rough or worn, replace the distributor housing assembly.



ASSEMBLY OF DISTRIBUTOR

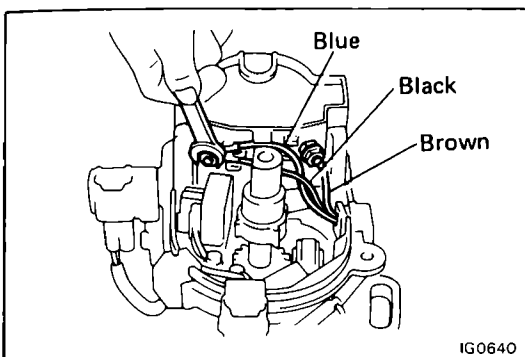
(See page IG-13)

1. INSTALL DISTRIBUTOR WIRE

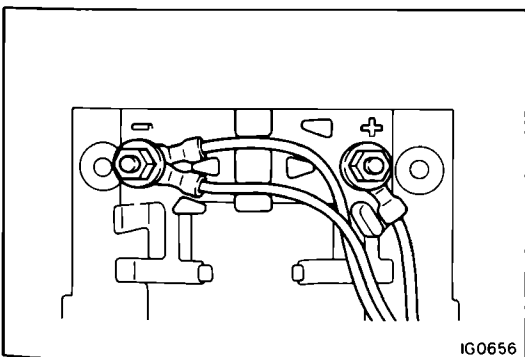


2. INSTALL IGNITION COIL

- (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.



CAUTION:

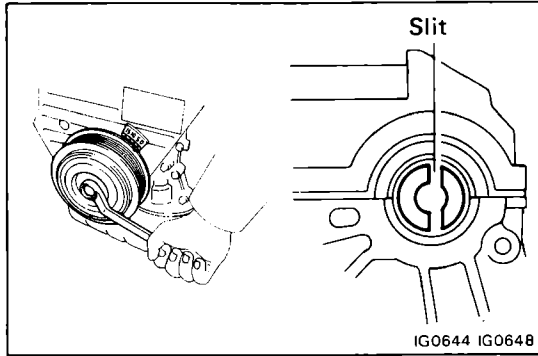
- When connecting the wires to the ignition coil, insert both properly into their grooves found on the side of the ignition coil.
- Be sure that the wires do not contact with signal rotor or distributor housing.

3. INSTALL IGNITION COIL DUST COVER

4. INSTALL ROTOR

5. INSTALL DISTRIBUTOR CAP AND HIGH-TENSION CORDS

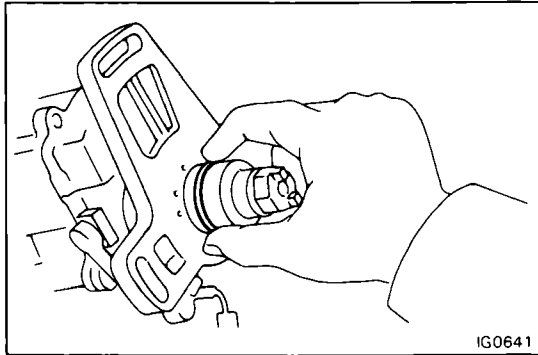
- (a) Place the gasket in position on the distributor housing.
- (b) Install the distributor cap with the three bolts.



INSTALLATION OF DISTRIBUTOR

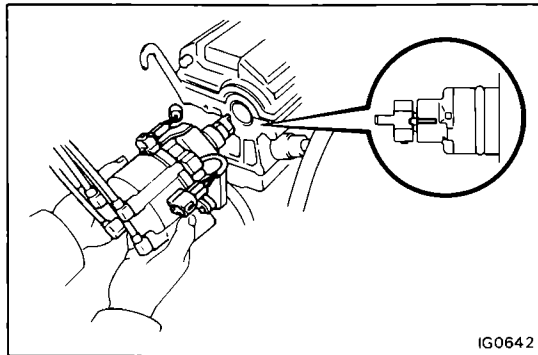
1. SET NO.1 CYLINDER TO TDC/COMPRESSION

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



2. INSTALL DISTRIBUTOR

- (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 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 – 2

4. CONNECT DISTRIBUTOR CONNECTOR

5. INSTALL AIR CLEANER HOSE

6. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

7. WARM UP ENGINE

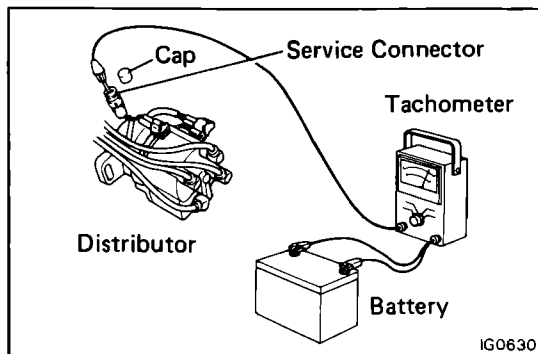
Allow the engine to normal operating temperature.

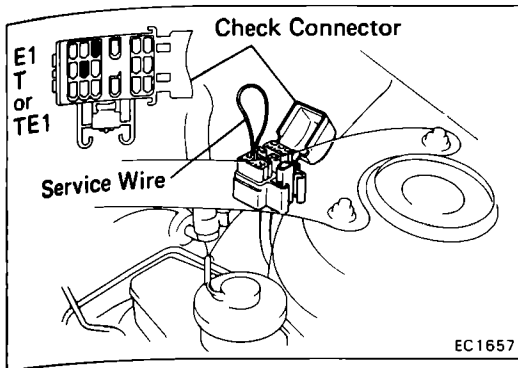
8. CONNECT TACHOMETER AND TIMING LIGHT TO ENGINE

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

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 use.

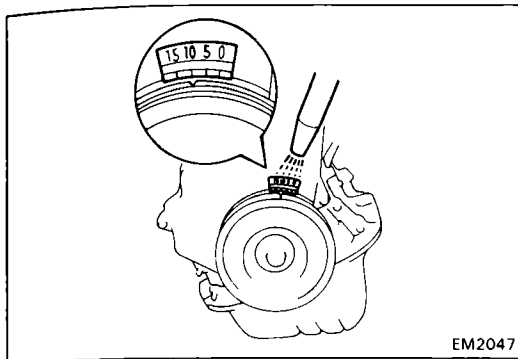




9. ADJUST IGNITION TIMING

- (a) Using a service wire, connect terminals TE1 (CALIF.) or T (others) 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.

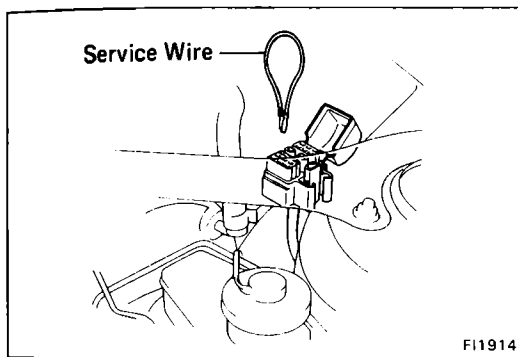


- (b) Using a timing light, check the ignition timing.

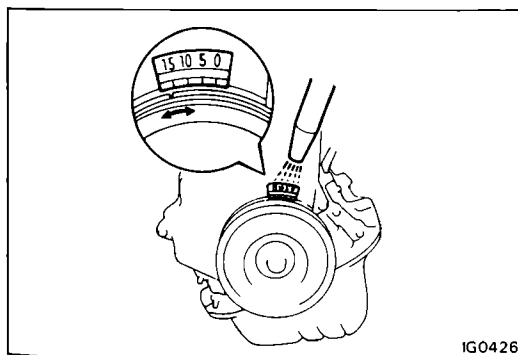
Ignition timing: 10° BTDC @ idle
(Transmission in N range)

- (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.



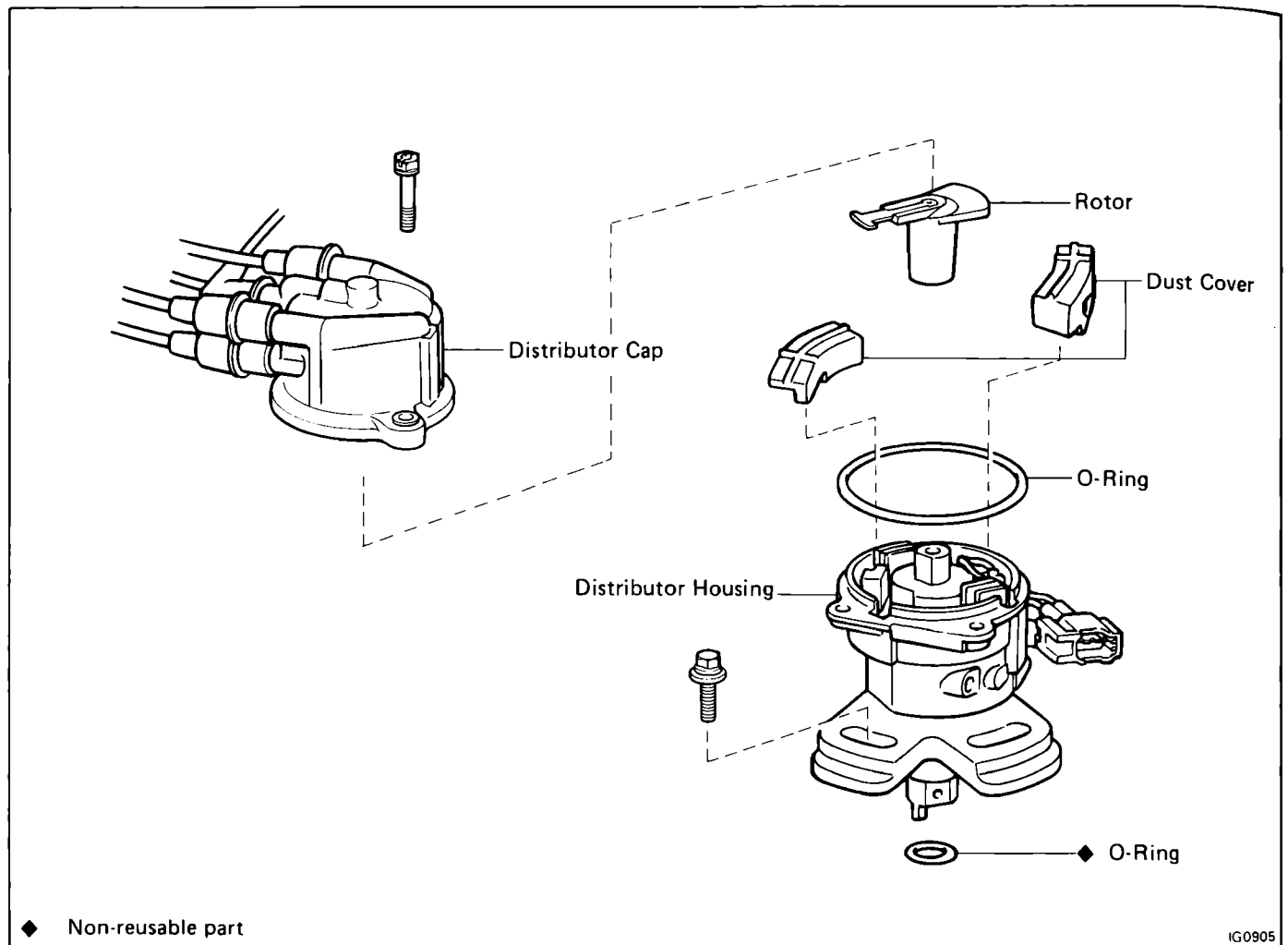
10. FURTHER CHECK IGNITION TIMING

Ignition timing: 13 – 22° BTDC @ idle
(Transmission in N range)

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

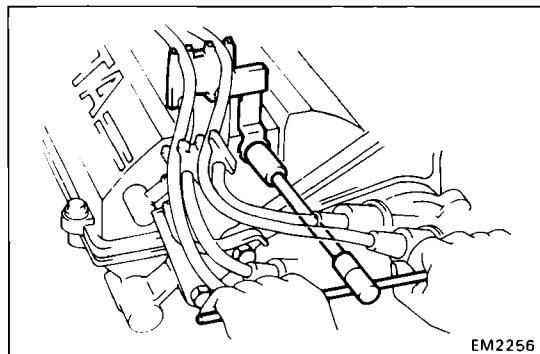
11. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE

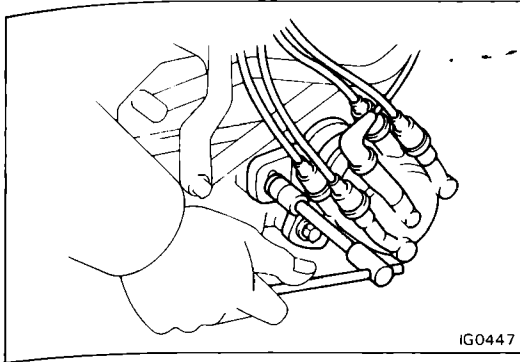
DISTRIBUTOR (3S-GE and 3S-GTE) COMPONENTS



REMOVAL OF DISTRIBUTOR

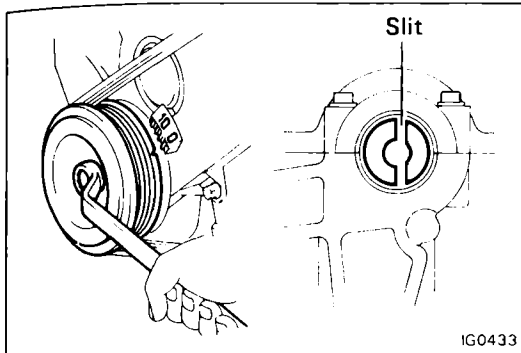
1. DISCONNECT CABLE FROM NEGATIVE TERMINAL OF BATTERY
2. (3S-GE)
REMOVE AIR CLEANER HOSE
3. (3S-GTE)
REMOVE INTERCOOLER
(See steps 3 and 7 on pages TC-9 and 10)
4. DISCONNECT DISTRIBUTOR CONNECTOR
5. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS AND IGNITION COIL
6. REMOVE DISTRIBUTOR
 - (a) (3S-GE)
Remove the bolt of the high-tension cord clamp.





IG0447

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

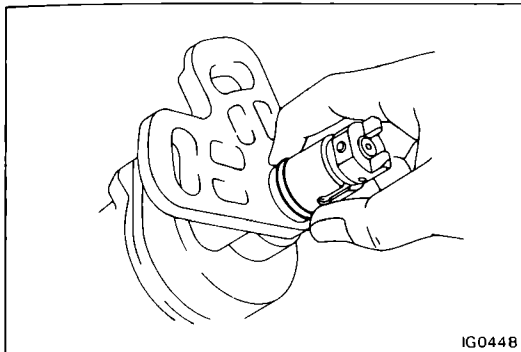


IG0433

INSTALLATION OF DISTRIBUTOR

1. SET NO.1 CYLINDER TO TDC/COMPRESSION

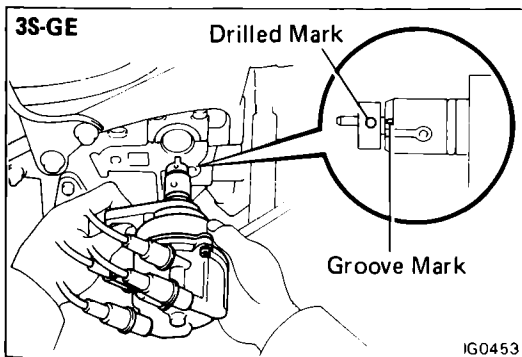
Turn the crankshaft clockwise, and position the slit of the intake camshaft as shown.



IG0448

2. INSTALL DISTRIBUTOR

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



IG0453

(c) Align the drilled mark (3S-GE) or cutout mark (3S-GTE) of the coupling with the groove mark 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 two hold-down bolts.

(f) (3S-GE)

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

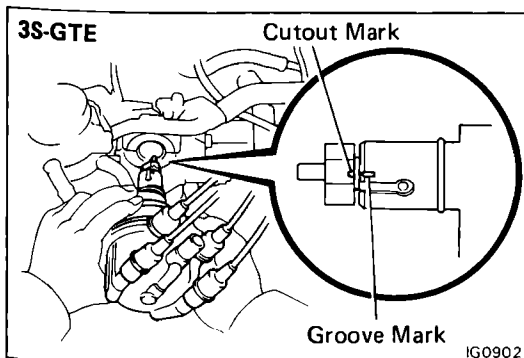
5. (3S-GE)
 INSTALL AIR CLEANER HOSE

6. (3S-GTE)
 INSTALL INTERCOOLER
 (See steps 11 and 16 on page TC-14)

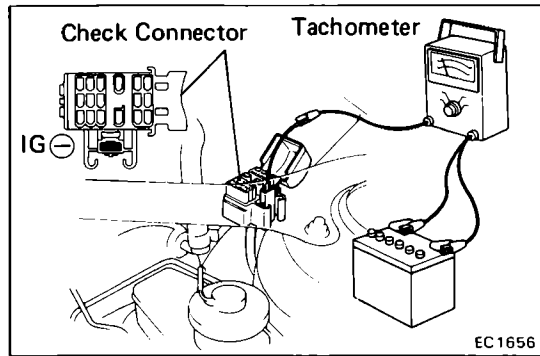
7. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY

8. WARM UP ENGINE

Allow the engine to normal operating temperature.



IG0902

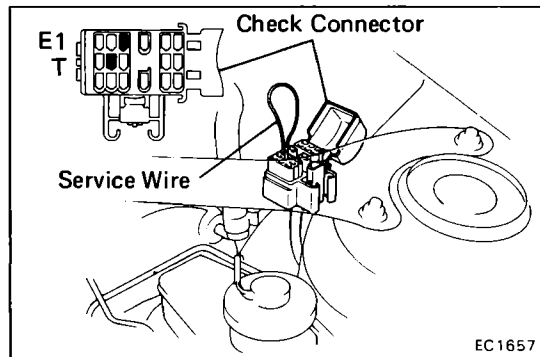


9. CONNECT TACHOMETER AND TIMING LIGHT TO ENGINE

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

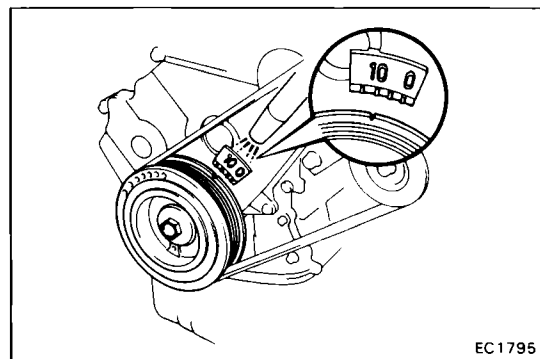
CAUTION:

- 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 unit before use.



10. ADJUST IGNITION TIMING

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



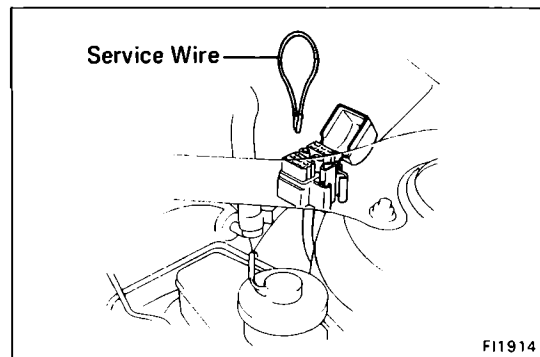
(b) Using a timing light, check the ignition timing.

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

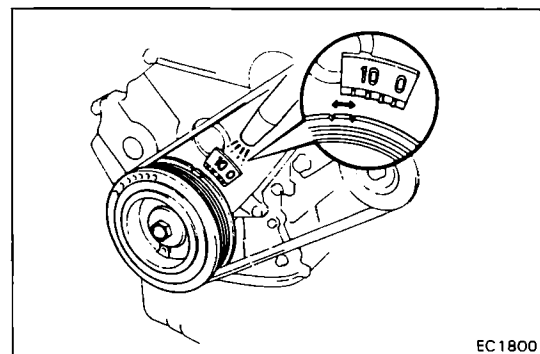
(c) Loosen the two hold-down bolts, and adjust by turning the distributor.

(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.



11. 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°.

12. DISCONNECT TACHOMETER AND TIMING LIGHT FROM ENGINE