

# HOW TO USE THIS MANUAL INDEX

IN00F-01

An INDEX is provided on the first page of each section to guide you to the item to be repaired. To assist you in finding your way through the manual, the Section Title and major heading are given at the top of every page.

IN

## GENERAL DESCRIPTION

IN00G-01

At the beginning of each section, a General Description (Precautions) is given that pertains to all repair operations contained in that section.

Read these precautions before starting any repair task.

## TROUBLESHOOTING

IN00H-01

TROUBLESHOOTING tables are included for each system to help you diagnose the problem and find the cause.

## PREPARATION

IN00J-01

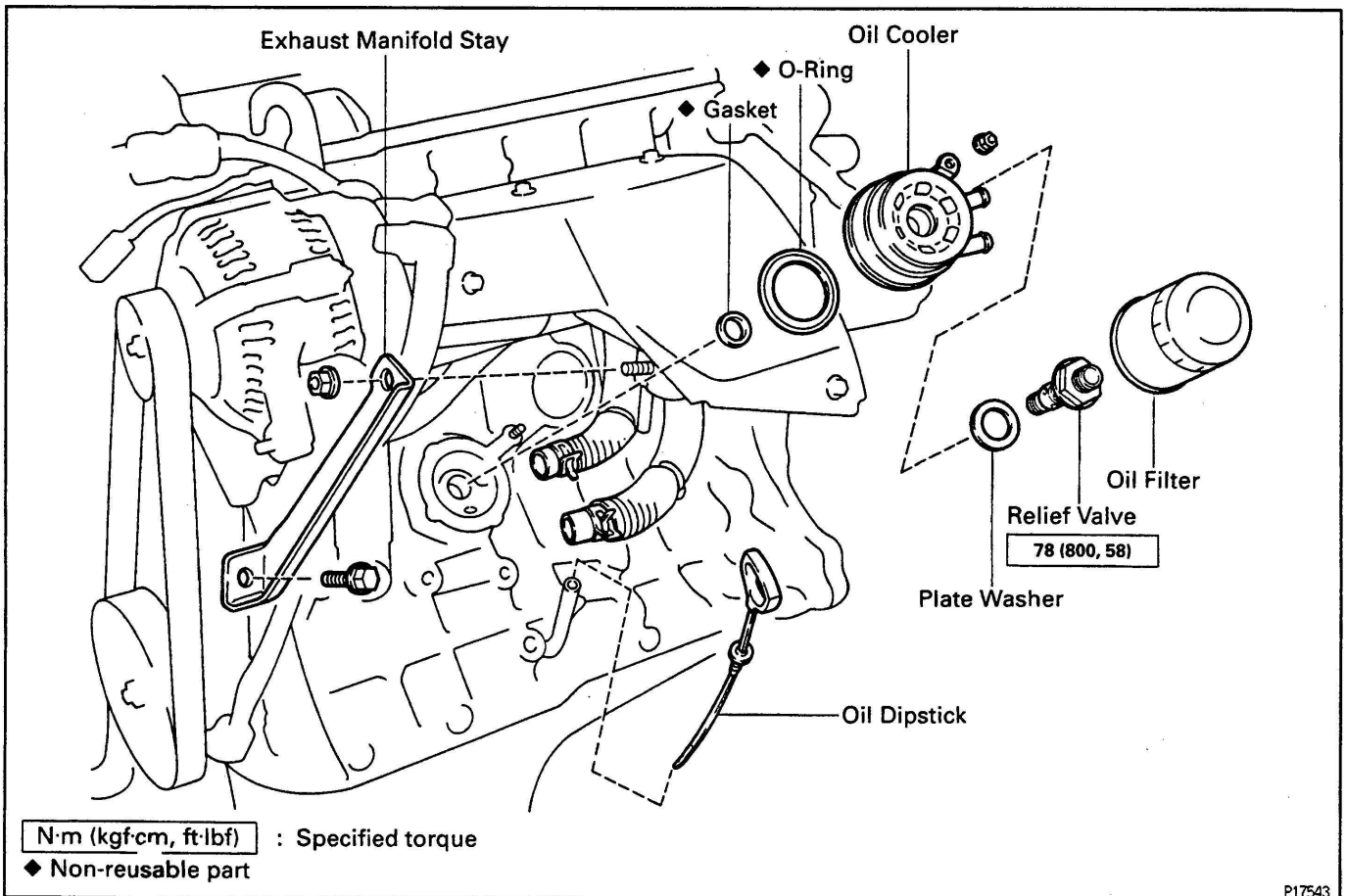
Preparation lists the SST (Special Service Tools), recommended tools, equipment, lubricant and SSM (Special Service Materials) which should be prepared before beginning the operation and explains the purpose of each one.

## REPAIR PROCEDURES

IN00K-06

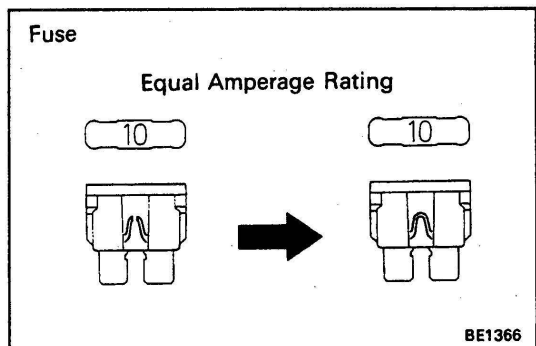
Most repair operations begin with an overview illustration. It identifies the components and shows how the parts fit together.

Example:



IN

9. Use of special service tools (SST) and special service materials (SSM) may be required, depending on the nature of the repair. Be sure to use SST and SSM where specified and follow the proper work procedure. A list of SST and SSM can be found in the preparation part at the front of each section in this manual.



10. When replacing fuses, be sure the new fuse has the correct amperage rating . DO NOT exceed the rating or use one with a lower rating.

Illustration	Symbol	Part Name	Abbreviation
<p>BE5594</p>	<p>IN0365</p>	FUSE	FUSE
<p>BE5595</p>	<p>IN0366</p>	MEDIUM CURRENT FUSE	M-FUSE
<p>BE5596</p>	<p>IN0367</p>	HIGH CURRENT FUSE	H-FUSE
<p>BE5597</p>	<p>IN0367</p>	FUSIBLE LINK	FL
<p>BE5598</p>	<p>IN0368</p>	CIRCUIT BREAKER	CB

V00076

11. Care must be taken when jacking up and supporting the vehicle. Be sure to lift and support the vehicle at the proper locations.
  - (a) If the vehicle is to be jacked up only at the front or rear end, be sure to block the wheels at the opposite end in order to ensure safety.

# ENGINE

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# ENGINE MECHANICAL

## DESCRIPTION

The 3S-FE engine is an in-line, 4 cylinder, 2.0 liter DOHC 16-valve engine.

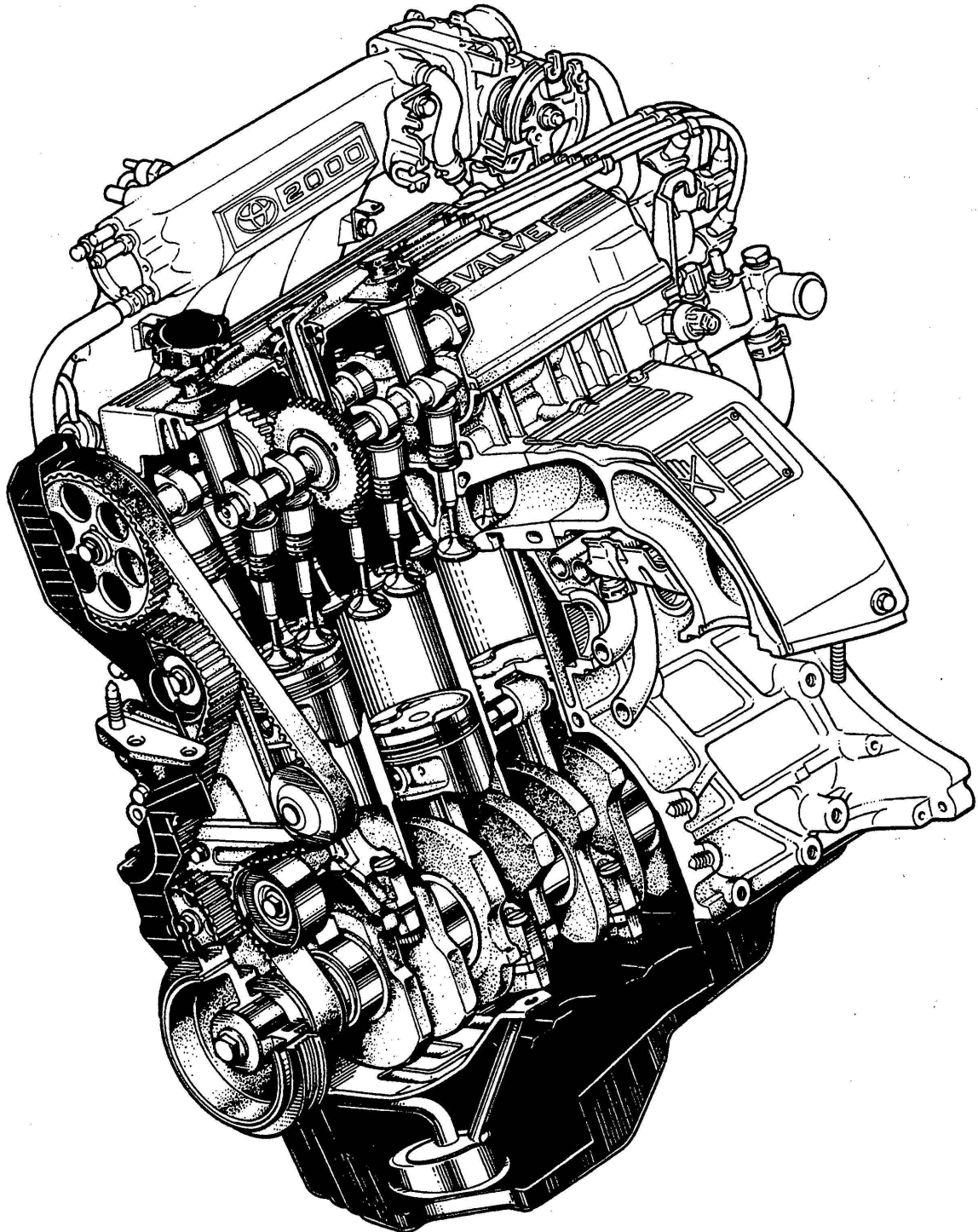
EG10Y-07

## OPERATION

EG

EG3UQ-01

ST202



P17544

# TROUBLESHOOTING

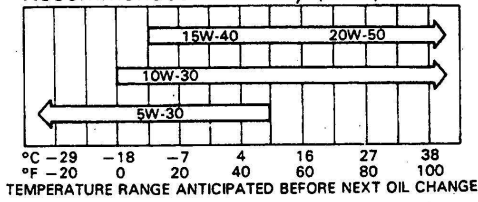
EG082-0C

You will find the source of the trouble more easily by correctly using the table shown below. In this table, each number shows the order of priority of the causes of the trouble. Check each part in the order shown. If necessary, replace the part.

EG

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Suspect area		RPM Signal Circuit	Ignition Circuit	Oxygen Sensor Circuit	Water Temp. Sensor Circuit	Intake Air Temp. Sensor Circuit	Vacuum Sensor Circuit	Throttle Position Sensor Circuit	STA Signal Circuit	Knock Sensor Circuit	NSW Signal Circuit	A / C Signal Circuit	Fuel Pump	Fuel Pressure Regulator	Fuel Lines	Injectors	Idle Speed Control Valve
Symptom																	
Does not start	Engine does not crank																
	Starter runs – engine does not crank																
	No combustion	12	2				5						6				8
	No complete combustion				4		1							3		9	2
Difficult to start	Engine cranks slowly											2					
	Engine cranks normally	12	13		4	14							7	6	8	16	3
	Cold engine				1	5			2				7	6	8	9	4
	Hot engine				1	4							6	5	7	8	3
Poor idling	Incorrect first idle				2												3
	High engine idle speed				2	4		5			7	6				8	3
	Low engine idle speed				1		4									5	2
	Rough idling		17		2		12						7	6	8	16	9
	Misfire		4		6		8									9	
Poor drivability	Hesitant acceleration			12	10	11	9	8					14	13	15	18	
	Backfire			6	3	7	5	4					9	8	10	11	
	Muffler explosion (after fire)			8	3	7	5	6						4		9	
	Surging													1		4	
	Knocking									1							
Engine stall	Soon after starting				8		7						3	2	4	9	6
	After accelerator pedal depressed						1	3						5	6	7	
	After accelerator pedal released						3										1
	During A/C operation											1					2
	When shifting N to D										1						2
Others	Poor fuel economy			19	14	20	16	15				17	18			13	
	Engine overheat									9							
	Engine overcool																
	Excessive oil consumption																
	Low oil pressure																
	High oil pressure																
	Starter keeps running																
	Battery often discharges																

Recommended Viscosity (SAE) :



P02645

EG

**ENGINE OIL INSPECTION**

**1. CHECK OIL QUALITY**

Check the oil for deterioration, entry of water, discoloring or thinning.

If oil quality is visibly poor, replace the oil.

**Oil grade:**

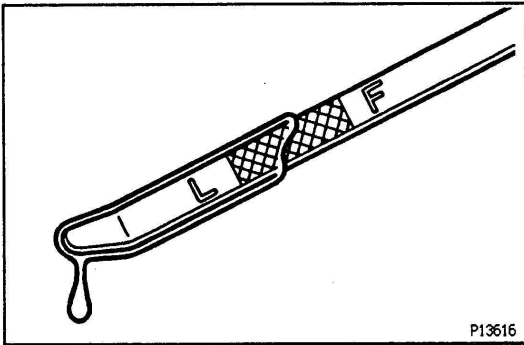
API grade SG or SH, or ILSAC multigrade engine oil.

Recommended viscosity is as shown in the illustration.

**2. CHECK ENGINE OIL LEVEL**

The oil level should be between the "L" and "F" marks on the dipstick.

If low, check for leakage and add oil up to the "F" mark.



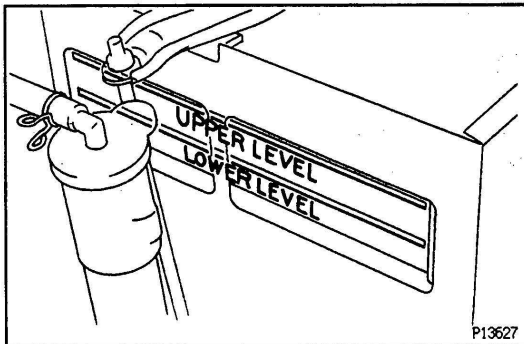
P13616

**BATTERY INSPECTION**

**1. CHECK BATTERY SPECIFIC GRAVITY AND ELECTROLYTE LEVEL**

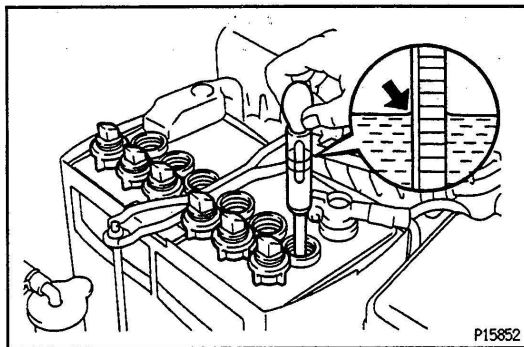
(a) Check the electrolyte level of each cell.

If insufficient, refill with distilled (or purified) water.



P13627

(b) Check the specific gravity of each cell.



P15852

## COMPRESSION CHECK

HINT: If there is lack of power, excessive oil consumption or poor fuel economy, measure the compression pressure. EG08E-0A

### 1. WARM UP AND STOP ENGINE

Allow the engine to warm up to normal operating temperature.

### 2. DISCONNECT DISTRIBUTOR CONNECTORS

### 3. DISCONNECT HIGH-TENSION CORDS FROM SPARK PLUGS

- (a) Disconnect the 4 high-tension cords from the clamp on the cylinder head cover.
- (b) Disconnect the high-tension cords at the rubber boot. Do not pull on the high-tension cords.

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

### 4. REMOVE SPARK PLUGS

Using SST, remove the 4 spark plugs.  
SST 09155-16100

### 5. CHECK CYLINDER COMPRESSION PRESSURE

- (a) Insert a compression gauge into the spark plug hole.
- (b) Fully open the throttle.
- (c) While cranking the engine, measure the compression pressure.

HINT: Always use a fully charged battery to obtain engine speed of 250 rpm or more.

- (d) Repeat steps (a) through (c) for each cylinder.

**NOTICE:** This measurement must be done in as short a time as possible.

**Compression pressure:**

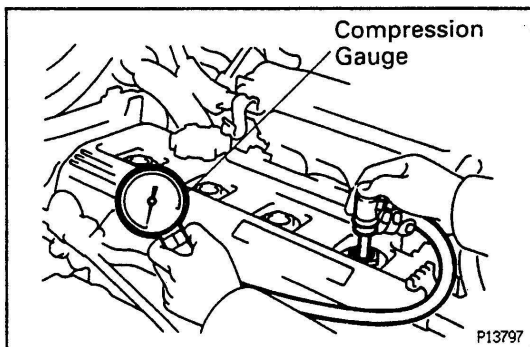
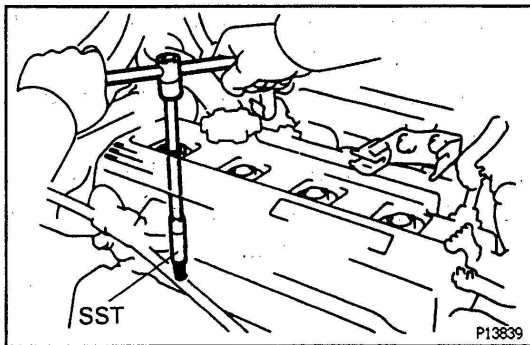
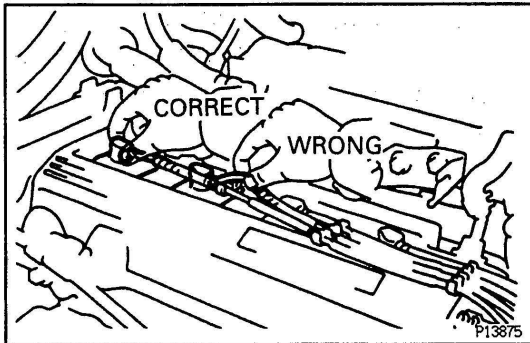
w/ TWC:

1,275 kPa (13.0 kgf/cm<sup>2</sup>, 185 psi) or more

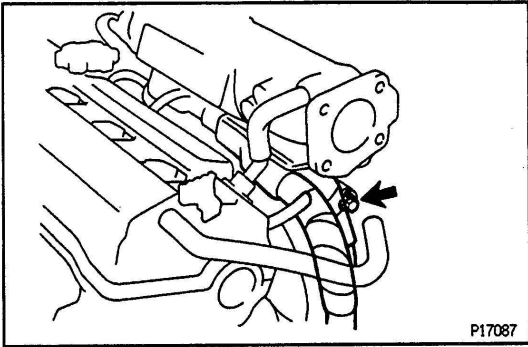
w/o TWC:

1,226 kPa (12.5 kgf/cm<sup>2</sup>, 178 psi) or more

EG

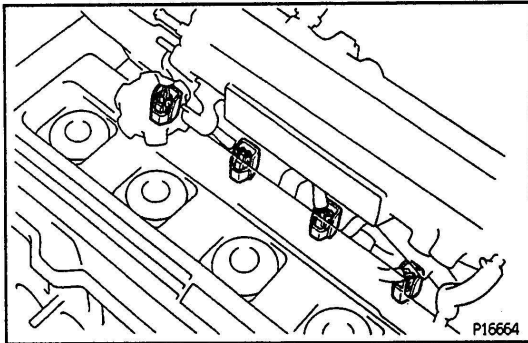


EG

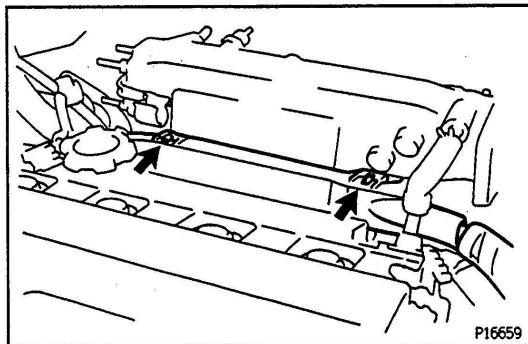


**15. DISCONNECT ENGINE WIRE**

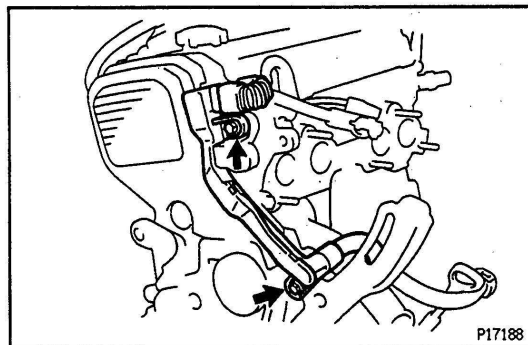
(a) Remove the bolt, and disconnect the engine wire protector from the LH side of the intake manifold.



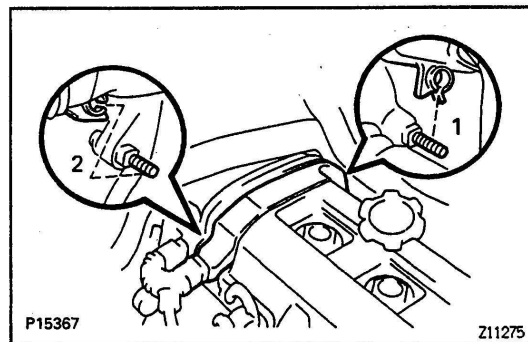
(b) Disconnect the 4 injector connectors.



(c) Disconnect the engine wire protector from the 2 brackets on the front side of the intake manifold.



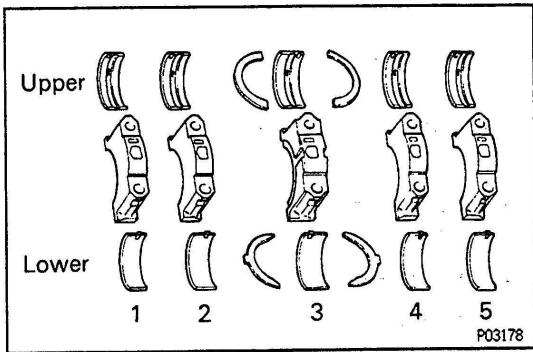
(d) Remove the 2 bolts, and disconnect the engine wire protector from the alternator bracket and adjusting bar.



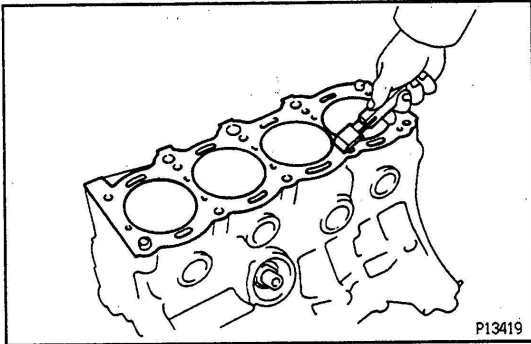
(e) Disconnect the engine wire protector from the 2 mounting bolts of the No.2 timing belt cover in the sequence shown.



EG



HINT: Arrange the main bearing caps, bearings and thrust washers in the correct order.



## CYLINDER BLOCK INSPECTION

EG08U-0E

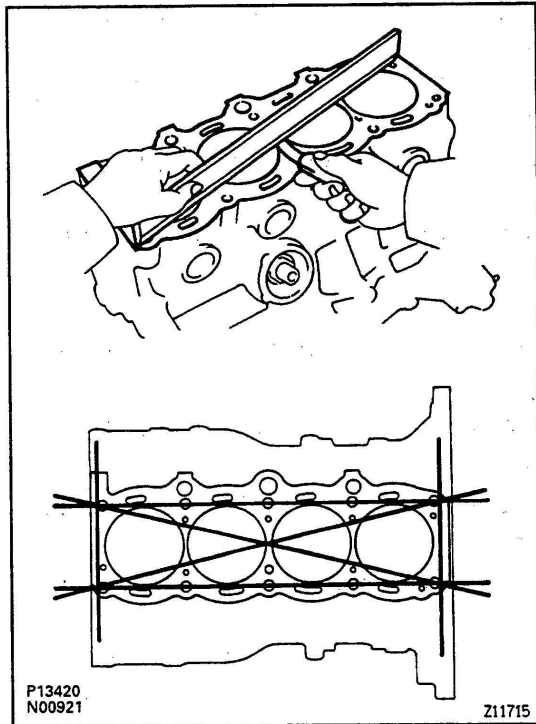
### 1. CLEAN CYLINDER BLOCK

#### A. Remove gasket material

Using a gasket scraper, remove all the gasket material from the top surface of the cylinder block.

#### B. Clean cylinder block

Using a soft brush and solvent, thoroughly clean the cylinder block.



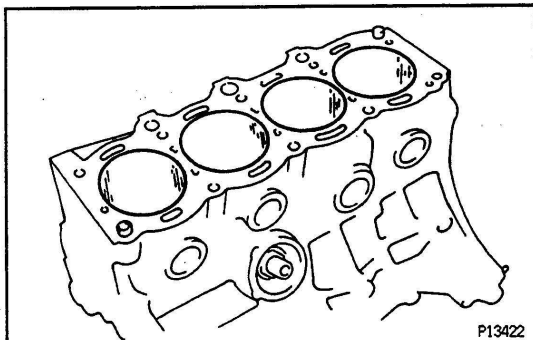
### 2. INSPECT TOP SURFACE OF CYLINDER BLOCK FOR FLATNESS

Using a precision straight edge and feeler gauge, measure the surfaces contacting the cylinder head gasket for warpage.

Maximum warpage:

0.05 mm (0.0020 in.)

If warpage is greater than maximum, replace the cylinder block.



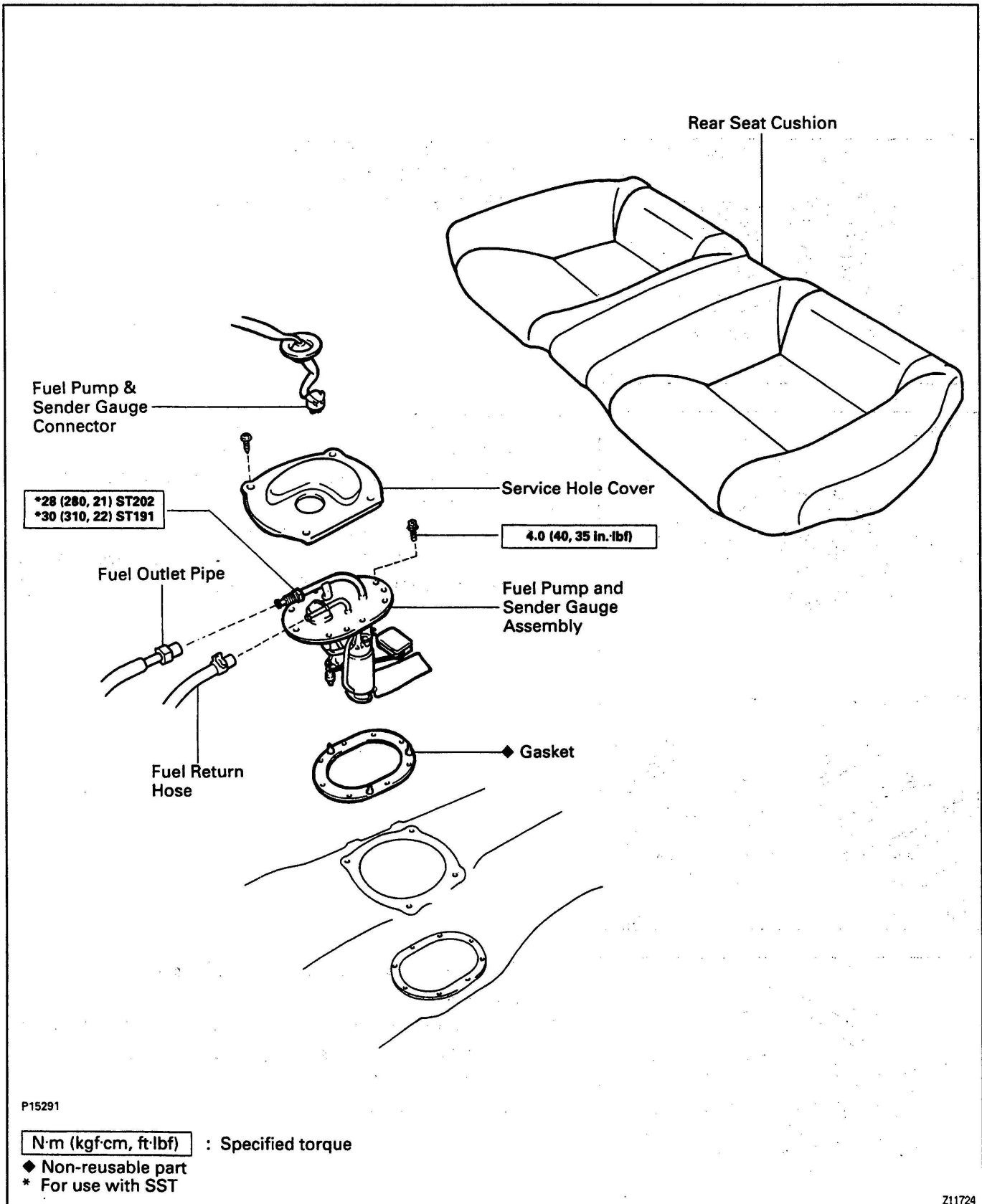
### 3. INSPECT CYLINDER FOR VERTICAL SCRATCHES

Visually check the cylinder for vertical scratches.

If deep scratches are present, rebore all the 4 cylinders. If necessary, replace the cylinder block.

# COMPONENTS FOR REMOVAL AND INSTALLATION

EG



P15291

**N·m (kgf·cm, ft·lbf)** : Specified torque

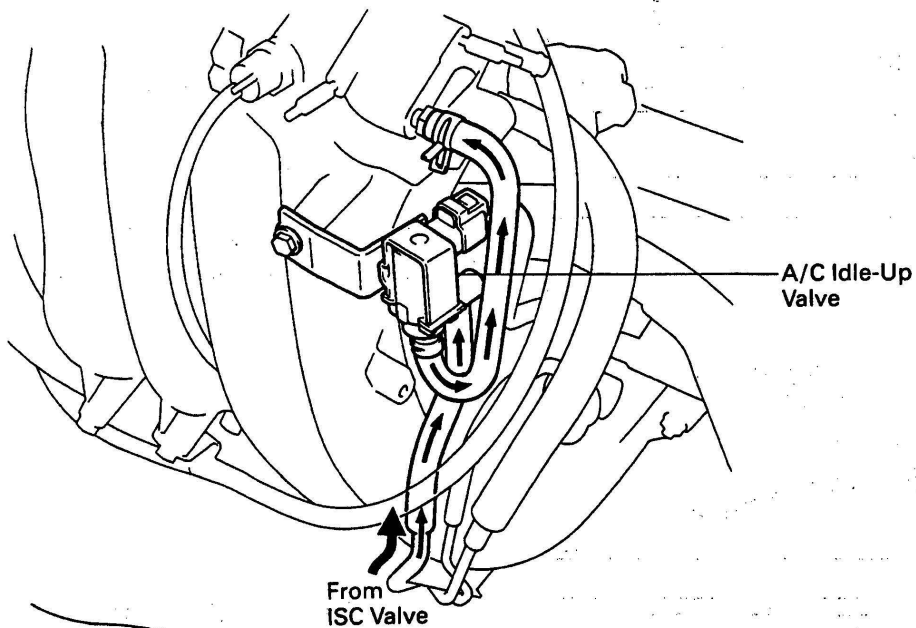
◆ Non-reusable part

\* For use with SST

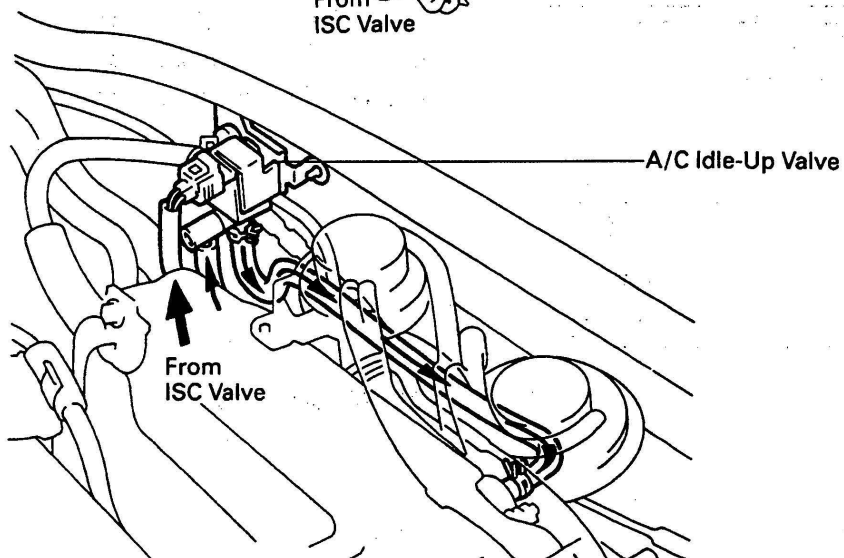
# A/C IDLE-UP VALVE

EG02-1W

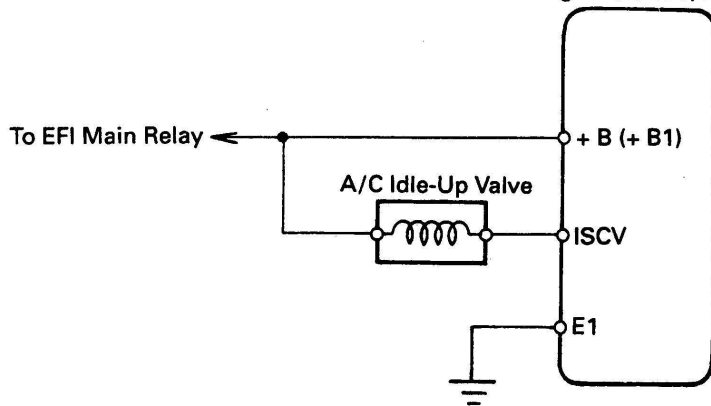
ST202



ST191



Engine (& ECT) ECU



P17134  
P17137  
P01447

Z11846

EG

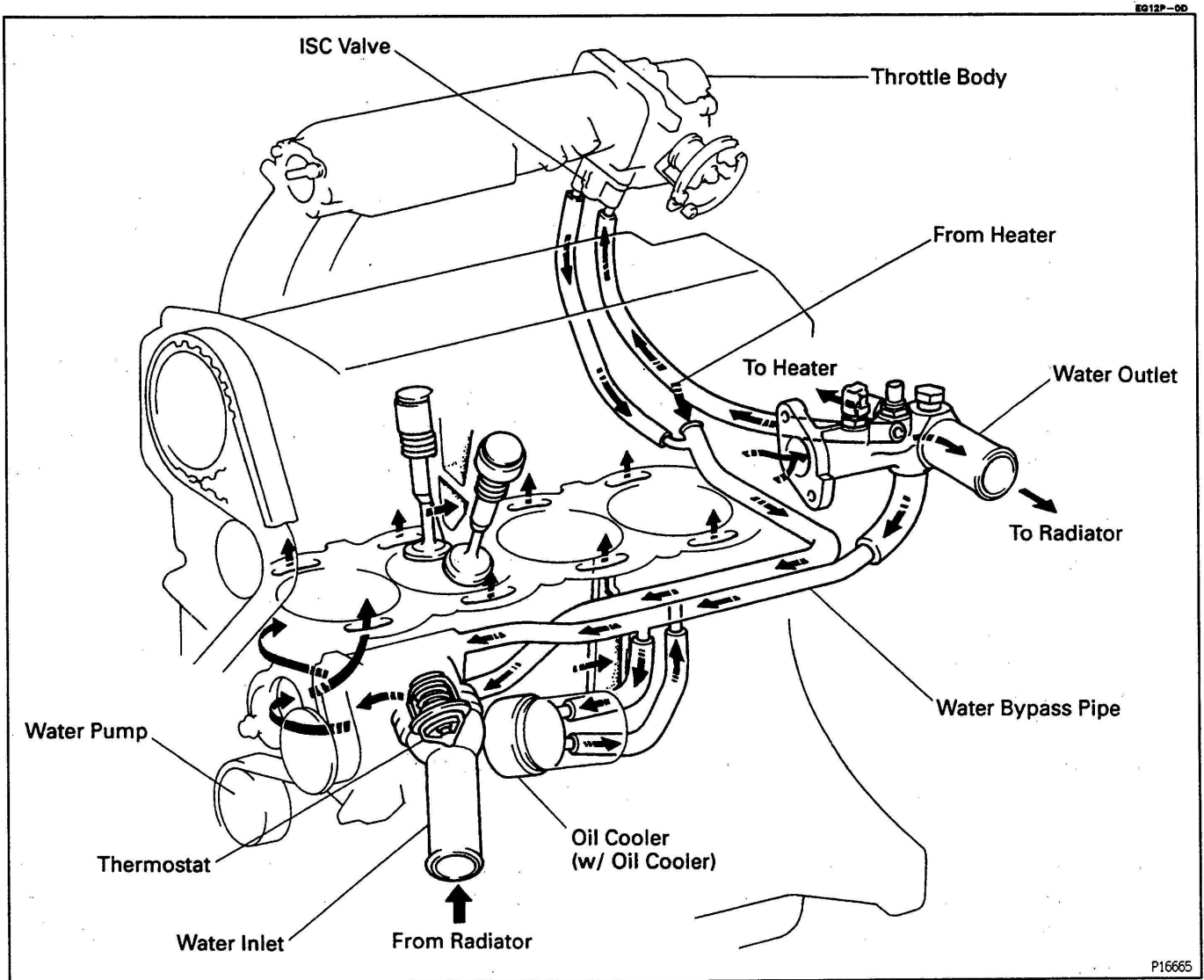
# COOLING SYSTEM

## DESCRIPTION

This engine utilizes a pressurized forced circulation cooling system which includes a thermostat equipped with a bypass valve mounted on the inlet side. EG12N-08

## OPERATION

EG



The cooling system is composed of the water jacket (inside the cylinder block and cylinder head), radiator, water pump, thermostat, electric fan, hoses and other components.

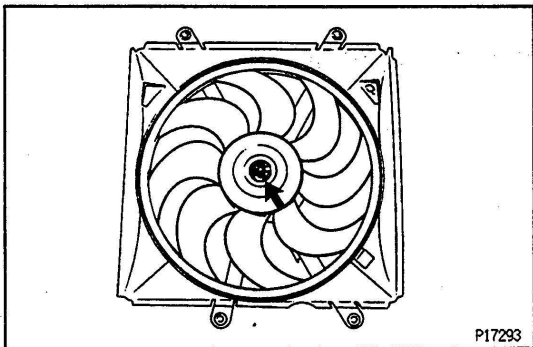
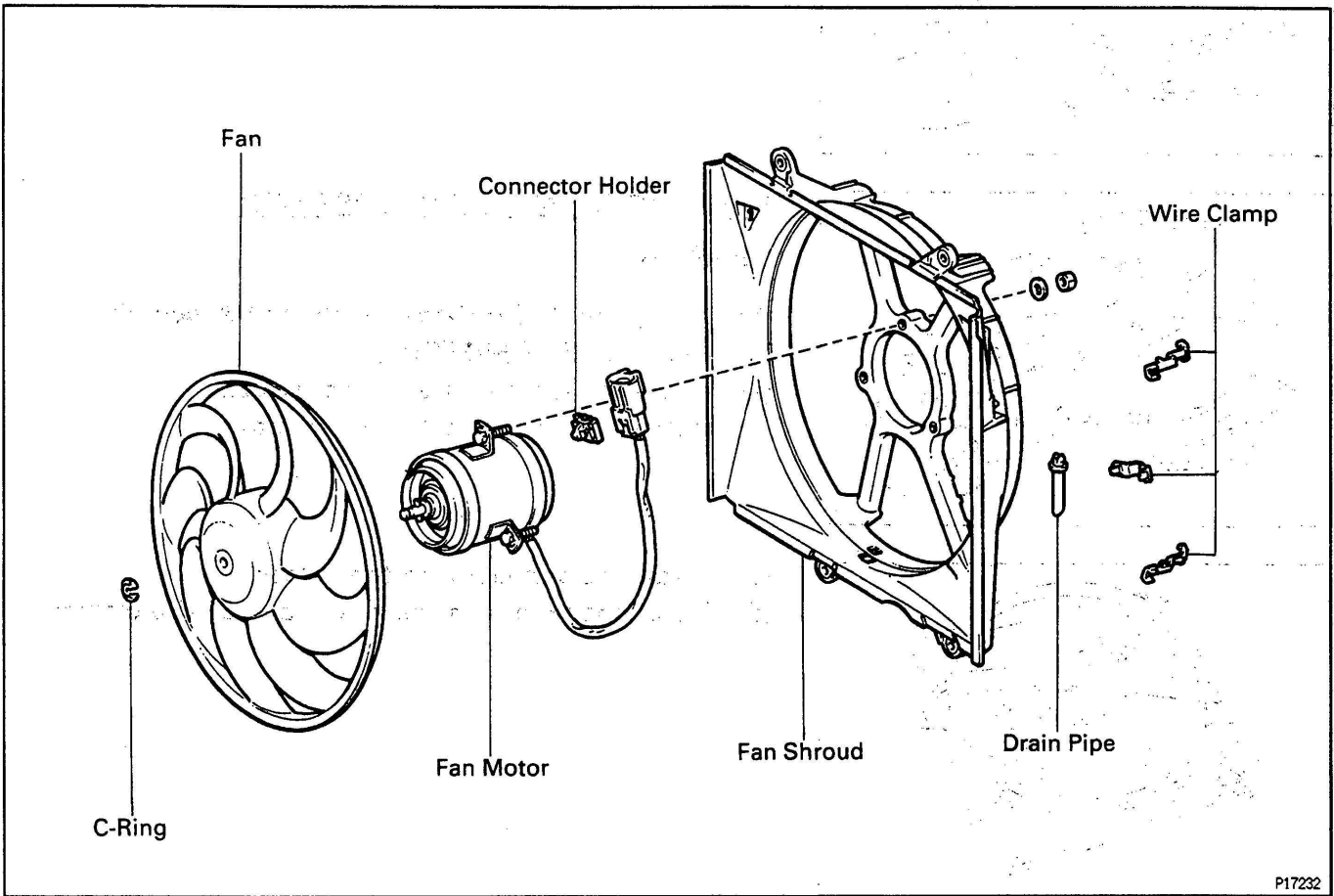
Coolant which is heated in the water jacket is pumped to the radiator, through which the electric fan draws air to cool the coolant as it passes through. Coolant which has been cooled is then sent back to the engine by the water pump, where it cools the engine.

The water jacket is a network of channels in the shell of the cylinder block and cylinder head through which coolant passes. It is designed to provide adequate cooling of the cylinders and combustion chambers which become heated during engine operation.

**COMPONENTS FOR DISASSEMBLY AND ASSEMBLY (BOSCH)**

EQ078-11

EG



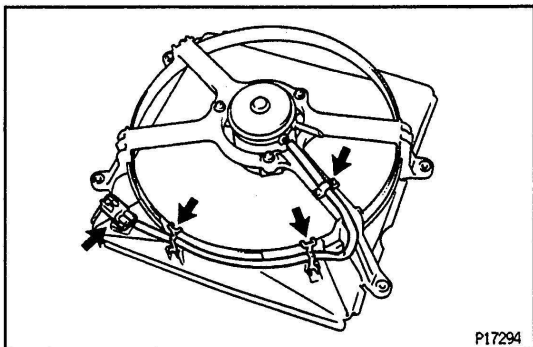
**NO.1 COOLING FAN DISASSEMBLY (BOSCH)**

EQ13X-08

(See Components for Disassembly and Assembly)

**1. REMOVE FAN**

Remove the C—ring and fan.



**2. REMOVE FAN MOTOR**

- (a) Remove the holder and 3 wire clamps, disconnect the wire from the fan shroud.
- (b) Disconnect the connector from the holder.

# ON—VEHICLE INSPECTION SPARK TEST

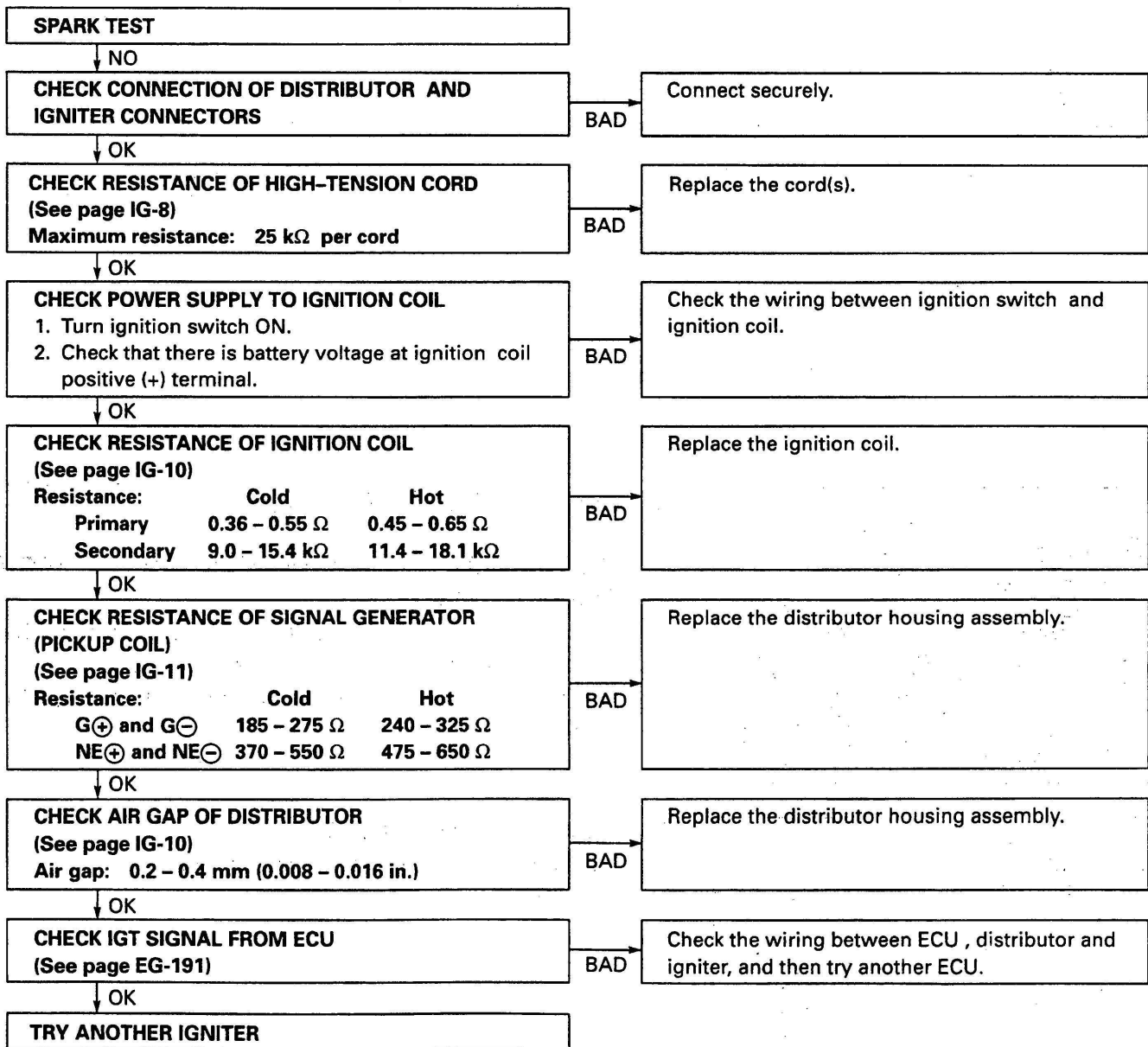
10038-03

## CHECK THAT SPARK OCCURS

- (a) Disconnect the high—tension cords from the spark plugs.
  - (b) Remove the spark plugs.
  - (c) Install the spark plugs to the each high—tension cord.
  - (d) Ground the spark plug.
  - (e) Check if spark occurs while engine is being cranked.
- HINT: To prevent gasoline from being injected from injectors during this test, crank the engine for no more than 1 — 2 seconds at a time.

IG

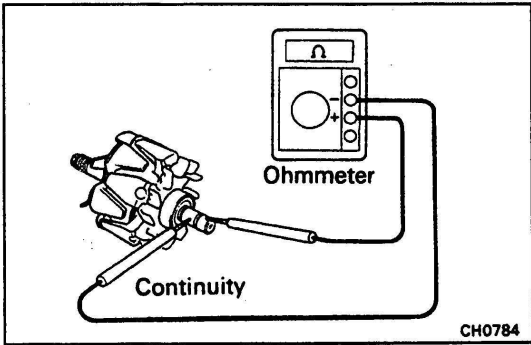
If the spark does not occur, perform the test as follows:



CH071-01

## ALTERNATOR INSPECTION AND REPAIR

### Rotor



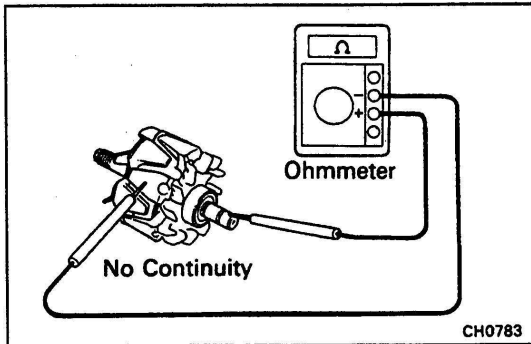
#### 1. INSPECT ROTOR FOR OPEN CIRCUIT

Using an ohmmeter, check that there is continuity between the slip rings.

Standard resistance:

2.3 – 2.9  $\Omega$  at 20°C (68°F)

If there is no continuity, replace the rotor.

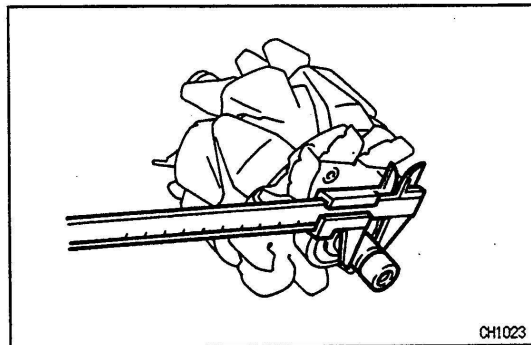


#### 2. INSPECT ROTOR FOR GROUND

Using an ohmmeter, check that there is no continuity between the slip ring and rotor.

If there is continuity, replace the rotor.

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#### 3. INSPECT SLIP RINGS

(a) Check that the slip rings are not rough or scored.

If rough or scored, replace the rotor.

(b) Using a vernier caliper, measure the slip ring diameter.

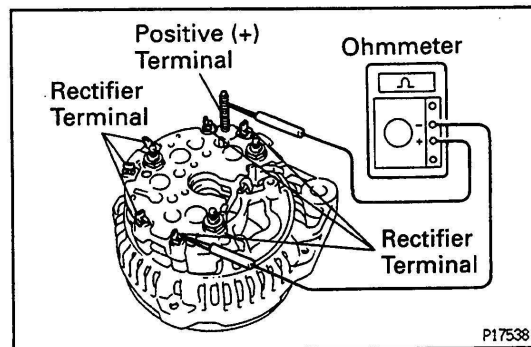
Standard diameter:

12.0 mm (0.472 in.)

Minimum diameter:

10.5 mm (0.413 in.)

If the diameter is less than minimum, replace the rotor.



### Stator Assembly

#### 1. INSPECT POSITIVE RECTIFIER

(a) Using an ohmmeter, connect one tester probe to the positive (+) terminal and the other to each rectifier terminal.

(b) Reverse the polarity of the tester probes and repeat step (a).

(c) Check that one shows continuity and the other shows no continuity.

If continuity is not as specified, replace the stator assembly.