
ENGINE MECHANICAL

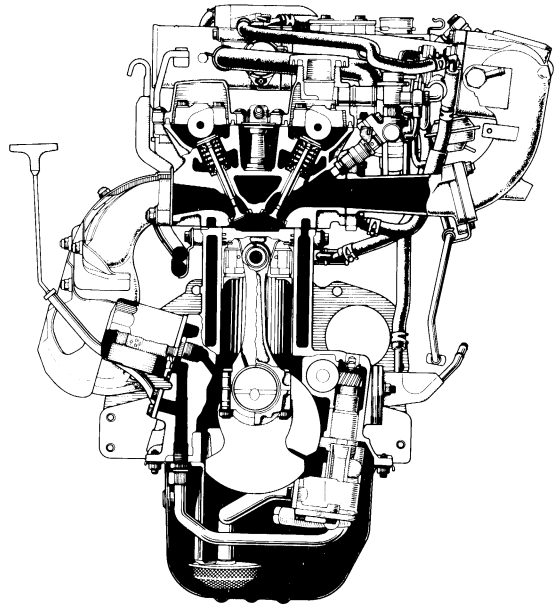
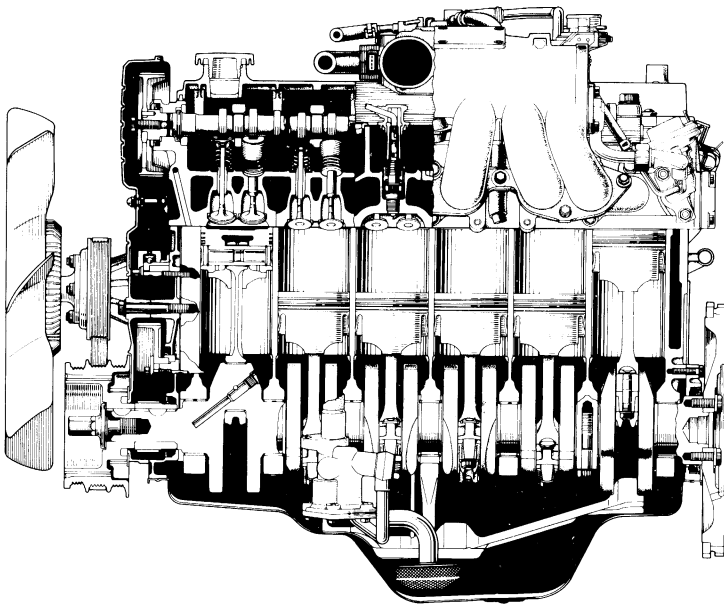
	Page
DESCRIPTION	EM-2
TROUBLESHOOTING	EM-4
ENGINE TUNE-UP	EM-7
IDLE AND/OR 2,500 RPM HC/CO CONCENTRATION CHECK METHOD	EM-18
COMPRESSION CHECK	EM-20
TIMING BELT	EM-22
CYLINDER HEAD	EM-32
CYLINDER BLOCK	EM-63

EM

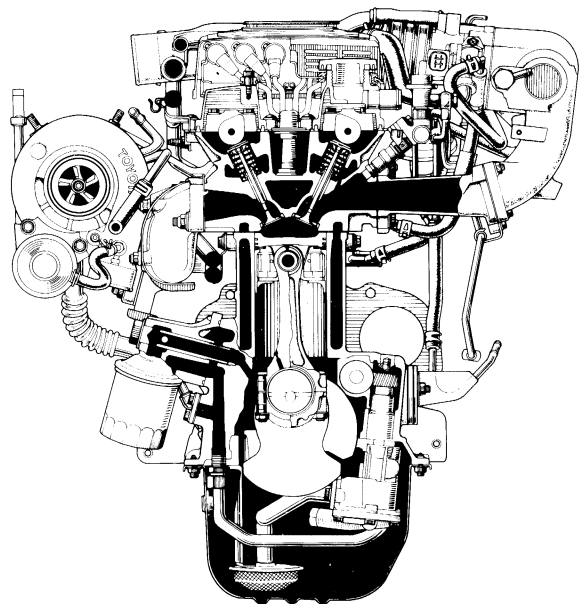
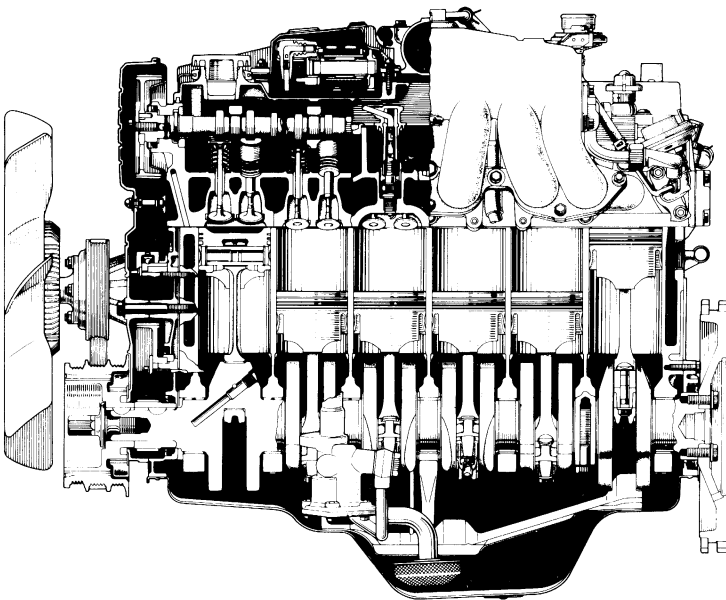
DESCRIPTION

The 7M-GE and 7M-GTE engines are an in-line 6-cylinder 3.0 liter DOHC 24 valve engine.

7M-GE

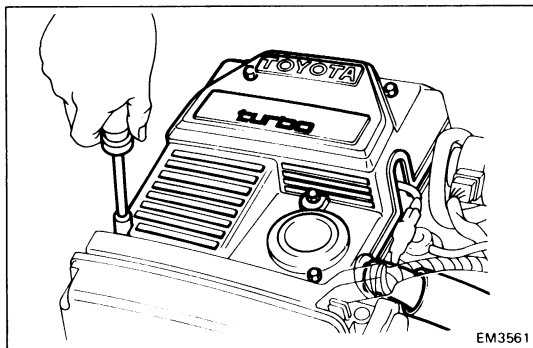


7M-GTE

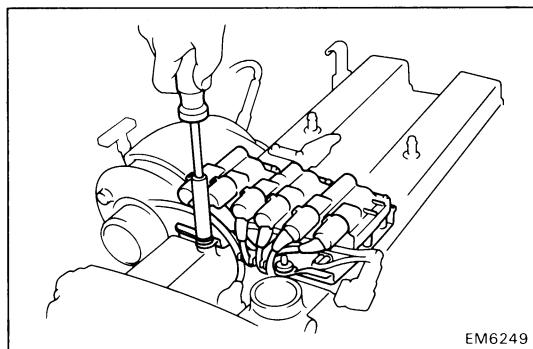


TROUBLESHOOTING (Cont'd)

Problem	Possible cause	Remedy	Page
Rough idle, stalls or misses (cont'd)	Spark plugs faulty Engine overheats Low compression	Inspect plugs Check cooling system Check compression	IG-7 CO-4 EM-20, 21
Engine hesitates/ poor acceleration	Vacuum leaks <ul style="list-style-type: none"> ● PCV hoses ● EGR valve ● Intake manifold ● Air intake chamber ● Throttle body ● ISC valve Pulling in air between air flow meter and throttle body Incorrect ignition timing Emission control system problem (cold engine) <ul style="list-style-type: none"> ● EGR system always on High-tension cord faulty Fuel system clogged Air cleaner clogged EFI system problems Spark plugs faulty Engine overheats Low compression	Repair as necessary Repair as necessary Reset timing Check EGR system Inspect cord Check fuel system Check air cleaner Repair as necessary Inspect plugs Check cooling system Check compression	 IG-20 EC-12, 16 IG-6, 11 FI-70 MA-5 IG-7 CO-4 EM-20, 21
Engine diesels (runs after ignition switch is turned off)	EFI system problems	Repair as necessary	
Muffler explosion (after fire) on deceleration only	Deceleration fuel cut system always off	Check EFI (fuel cut) system	FI-124
Muffler explosion (after fire) all the time	Air cleaner clogged EFI system problem Incorrect ignition timing	Check air cleaner Repair as necessary Reset timing	MA-5 IG-20
Engine backfires	Vacuum leak <ul style="list-style-type: none"> ● PCV hoses ● EGR valve ● Intake manifold ● Air intake chamber ● Throttle body ● ISC valve Pulling in air between air flow meter and throttle body EFI system problem Insufficient fuel flow Incorrect ignition timing Carbon deposits in combustion chambers	Check hoses and repair as necessary Repair as necessary Repair as necessary Troubleshoot fuel system Reset timing Inspect cylinder head	 IG-20 EM-32

**6. REMOVE IGNITION COIL COVER**

- (a) Remove the oil filler cap.
- (b) Remove the five nuts and ignition coil cover.

**7. REMOVE IGNITION COIL WITH BRACKET**

- (a) Disconnect the connector and ground strap.
- (b) Remove the nut.
- (c) Remove the No.1 and No.2 high-tension cords from ignition coil and clamp.
- (d) Remove the ignition coil with bracket and high-tension cords.
- (e) Remove the No.1 and No.2 high-tension cords from spark plugs.

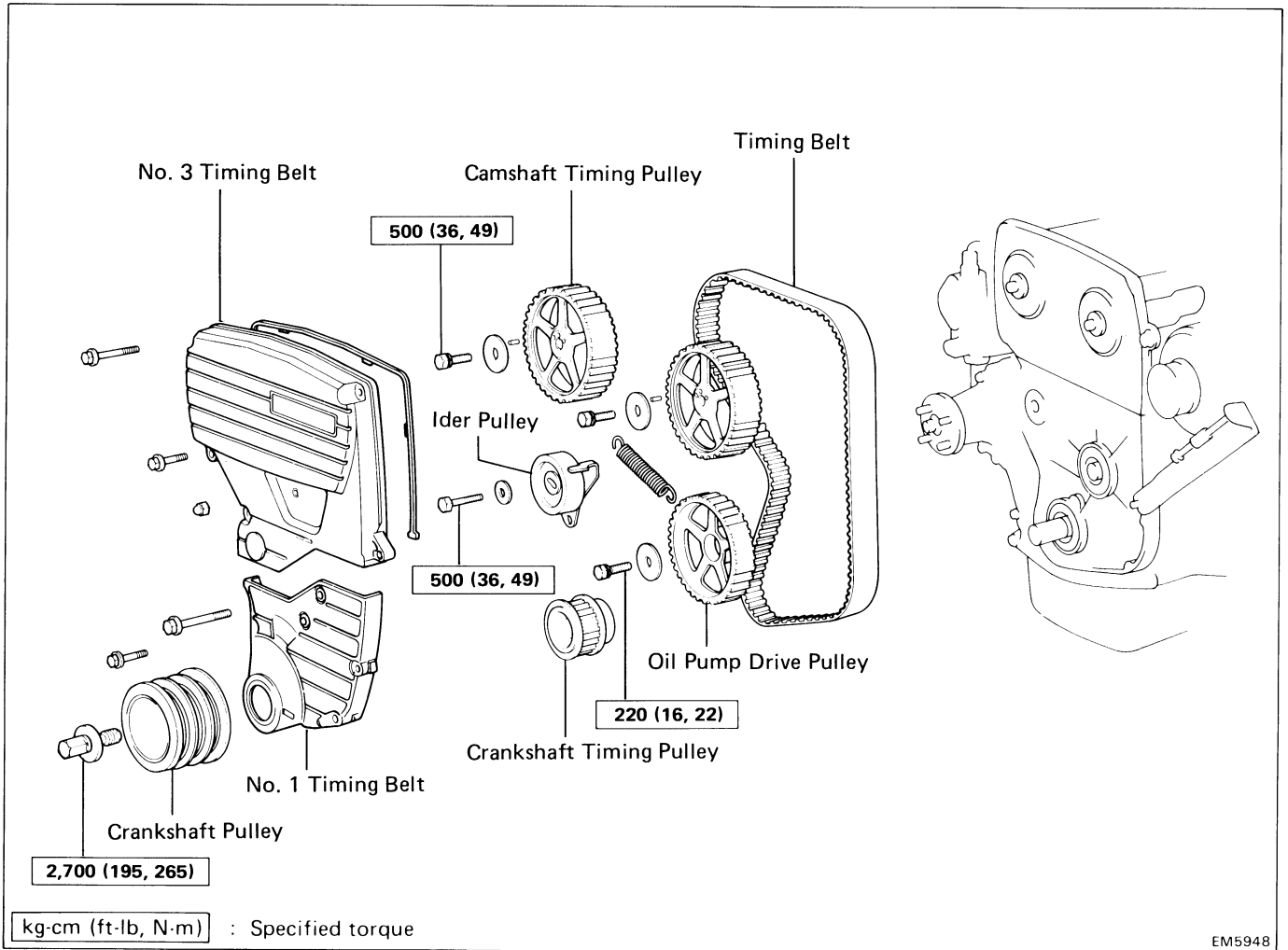
8. REMOVE CYLINDER HEAD COVERS

- (a) Remove the accelerator link.
- (b) Disconnect the No.3 PCV hose.
- (c) Remove the cylinder head covers.

9. MEASURE VALVE CLEARANCE
(See step 5 on pages EM-8, 9)**10. ADJUST VALVE CLEARANCE**
(See step 6 on pages EM-9, 10)**11. RECHECK VALVE CLEARANCE****12. INSTALL CYLINDER HEAD COVERS**
(See step 4 on pages EM-55, 56)**13. INSTALL IGNITION COIL WITH BRACKET**

- (a) Install the No.1 and No.2 high-tension cords to spark plugs.
- (b) Install the ignition coil with bracket and high-tension cords.
(See page IG-13)
- (c) Install the No.1 and No.2 high-tension cords to ignition coil and clamp.

TIMING BELT COMPONENTS



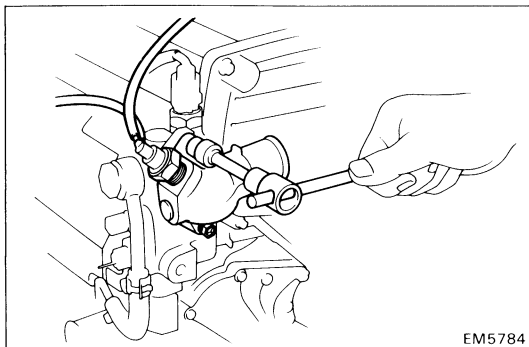
REMOVAL OF TIMING BELT

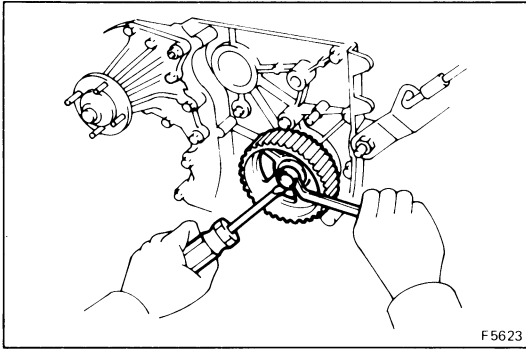
1. REMOVE RADIATOR
(See page CO-9)
2. REMOVE SPARK PLUGS

3. REMOVE WATER OUTLET

Remove the two bolts, water outlet and thermostat with gasket.

4. REMOVE A/C BELT





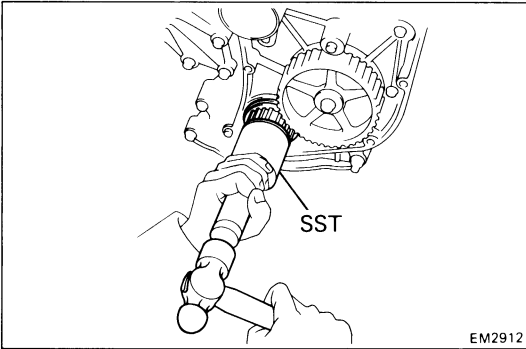
INSTALLATION OF TIMING BELT

(See page EM-22)

1. INSTALL OIL PUMP DRIVE PULLEY

- (a) Install the pulley and bolt.
- (b) Using a screwdriver to hold the pulley, torque the pulley bolt.

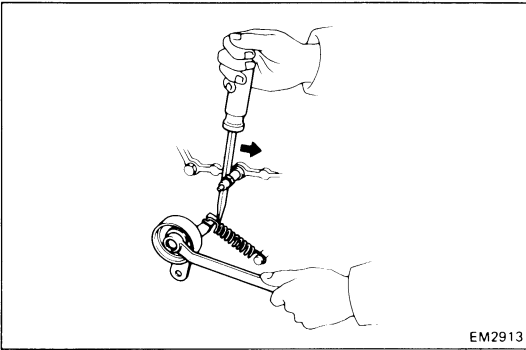
Torque: 220 kg-cm (16 ft-lb, 22 N·m)



2. INSTALL CRANKSHAFT TIMING PULLEY

Using SST and hammer, drive in the pulley.

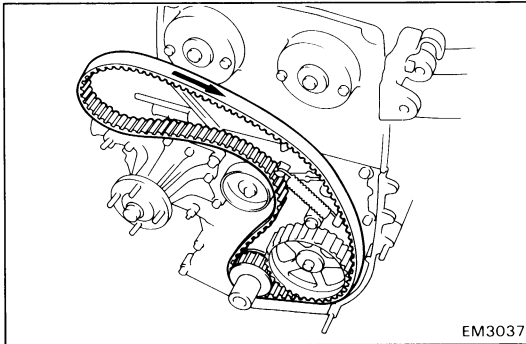
SST 09214-60010



3. TEMPORARILY INSTALL IDLER PULLEY AND TENSION SPRING

- (a) Install the idler pulley and tension spring.
- (b) Pry the idler pulley toward the left as far as it will go and temporarily tighten it.

HINT: Remove any oil or water on the idler pulley and keep it clean.

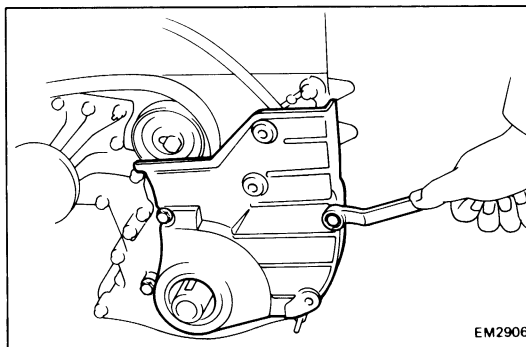


4. TEMPORARILY INSTALL TIMING BELT

NOTICE: The engine should be cold.

HINT: If reusing the timing belt, install it with the rotation direction mark pointing in the same direction as before disassembly.

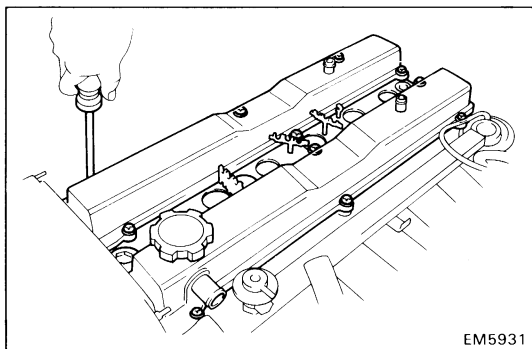
Install the timing belt on the crankshaft timing pulley, oil pump drive pulley and idler pulley.



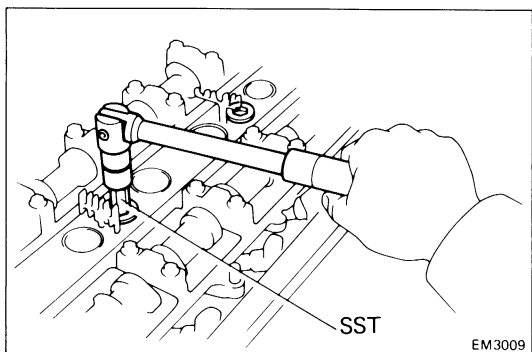
5. INSTALL NO.1 TIMING BELT COVER

- (a) Install the No.1 timing timing belt cover, A/C compressor bracket and idler pulley bracket with the nine bolts and two nuts.
- (b) Install the A/C compressor.

6. INSTALL PS AIR PIPE

**15. REMOVE CYLINDER HEAD COVERS**

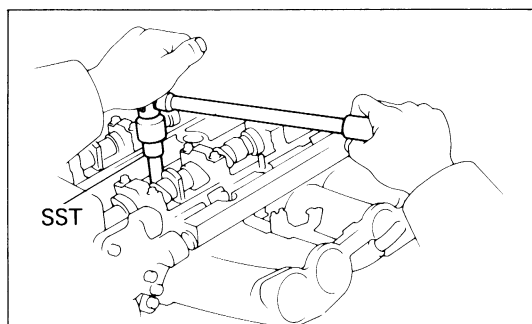
- (a) Remove the accelerator link.
- (b) Remove the heater hose clamp.
- (c) Remove the No. 1 and No. 2 cylinder head covers.



- (d) Using SST, remove the No.3 cylinder head cover.
SST 09923-00010

16. REMOVE SPARK PLUGS**17. REMOVE TIMING BELT AND CAMSHAFT TIMING PULLEYS**

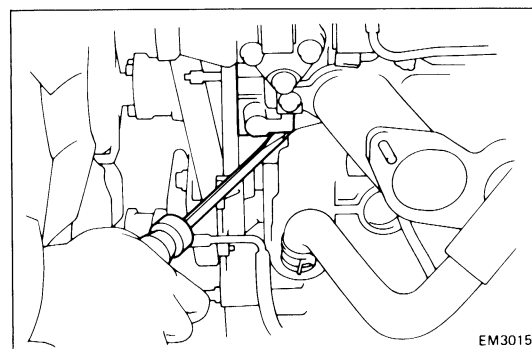
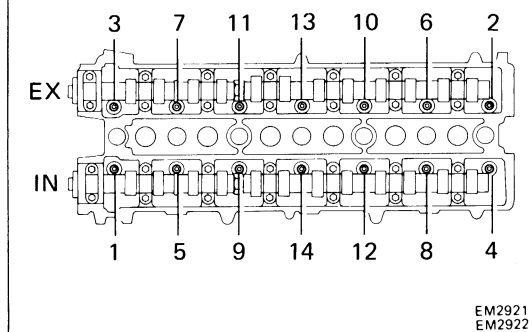
(See steps 5 and 8 to 10 on pages EM-23, 24)

**18. REMOVE CYLINDER HEAD**

- (a) Using SST, remove the head bolts gradually in three passes and in the numerical order shown.

SST 09043-38100

NOTICE: Head warpage or cracking could result from removing bolts in incorrect order.



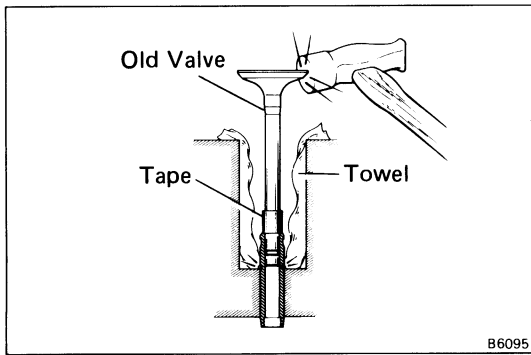
- (b) Lift the cylinder head from the dowels on the cylinder block. As the cylinder head is lifted, separate the No.5 water by-pass hose from the union.

- (c) Place the head on wooden blocks on a bench.

If the cylinder head is difficult to lift off, pry with a screwdriver between the cylinder head and block projection.

NOTICE:

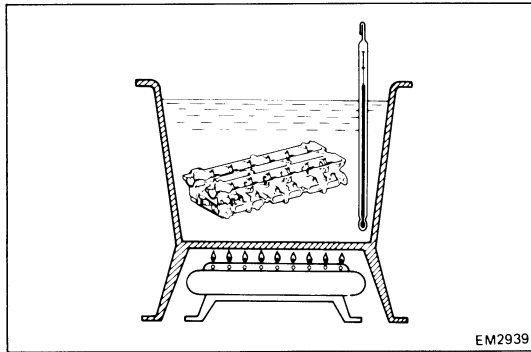
- Be careful not to damage the cylinder head and block surface of the cylinder head gasket.
- Be careful not to damage the VSV.



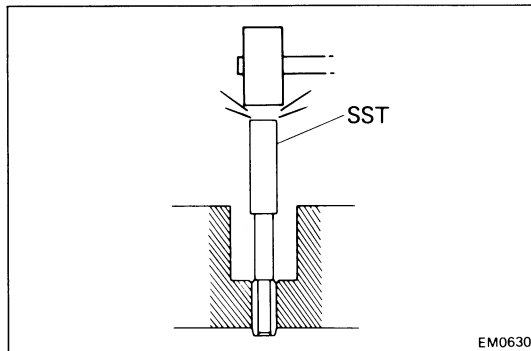
10. IF NECESSARY, REPLACE VALVE GUIDE BUSHINGS

- (a) Insert an old valve wrapped with tape into the valve guide bushing and break off the valve guide bushing by hitting it with a hammer.

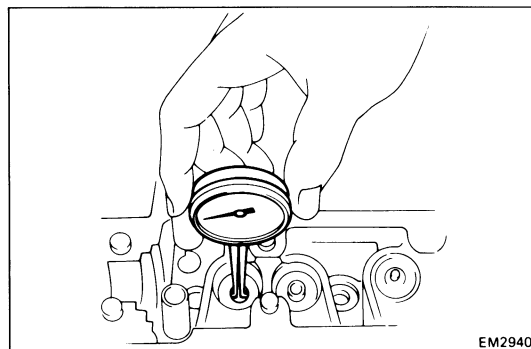
NOTICE: Be careful not to damage the lifter hole.



- (b) Gradually heat the cylinder head to approx. 90°C (194°F).



- (c) Using SST and hammer, drive out valve guide bushing.
SST 09201-70010



- (d) Using a caliper gauge, measure the valve guide bore of the cylinder head.

- (e) Select a new valve guide bushing.

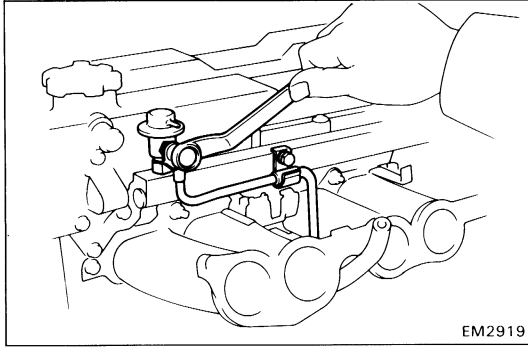
If the valve guide bushing bore of the cylinder head is more than 11.027 mm (0.4341 in.), machine the bore to the following dimensions.

Rebored valve guide bushing bore dimension:

11.050 — 11.077 mm (0.4350 — 0.4361 in.)

Both intake and exhaust

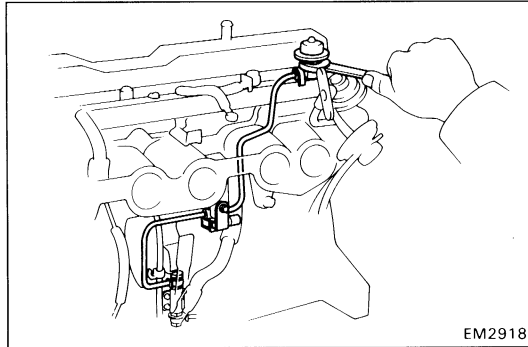
Bushing bore mm (in.)	Bushing size
11.000 — 11.027 (0.4331 — 0.4341)	Use STD
Over 11.027 (0.4341)	Use O/S 0.05

**11. INSTALL NO.2 FUEL PIPE**

- (a) Install a new gasket, No.2 fuel pipe, another gasket and union bolt to the pressure regulator.

Torque: 250 kg-cm (18 ft-lb, 25 N·m)

- (b) Install the No.2 fuel pipe to the delivery pipe with the bolt.
 (c) Connect the fuel hose to fuel return pipe support.

**12. INSTALL NO.1 FUEL PIPE**

- (a) Install the No.1 fuel pipe with VSV with the clamp bolt.

- (b) Connect the pipe to the fuel pipe support with the union bolt and new gaskets. Torque the union bolt.

Torque: 300 kg-cm (22 ft-lb, 29 N·m)

- (c) Connect the pipe to the delivery pipe with the union bolt (7M-GE) or pulsation damper (7M-GTE) and new gaskets. Torque the union bolt or pulsation damper.

Torque: 400 kg-cm (29 ft-lb, 39 N·m)

13. INSTALL ENGINE WIRE

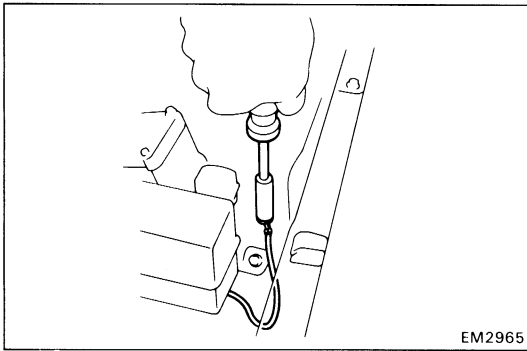
- (a) Install the engine wire to the four clamps.

- (b) Connect the following connectors and wire:

- Transmission connectors
- Starter connector (Terminal 50)
- Main relay connector
- Noise filter connector
- (7M-GE)
Ignition coil connector
- (7M-GTE)
Igniter connectors
- (7M-GTE)
Solenoid resistor connector
- Check connector
- Ground strap to intake manifold
- Knock sensor connector
- Two VSV connectors
- Injector connectors
- (7M-GE)
Distributor connector
- Cold start injector time switch connector
- Water temp. sender gauge connector
- Water temp. sensor connector
- Oil pressure sender gauge connector
- Oxygen sensor connector

14. (7M-GTE)

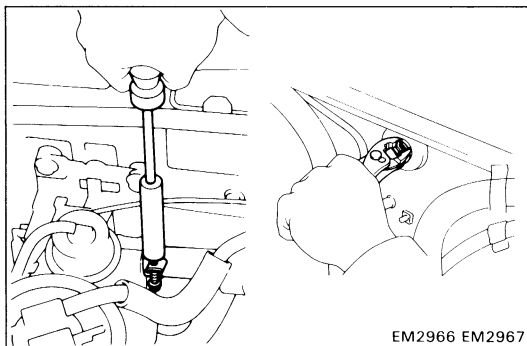
INSTALL IGNITION COIL WITH BRACKET
 (See steps 13, 14 on pages EM-13, 14)

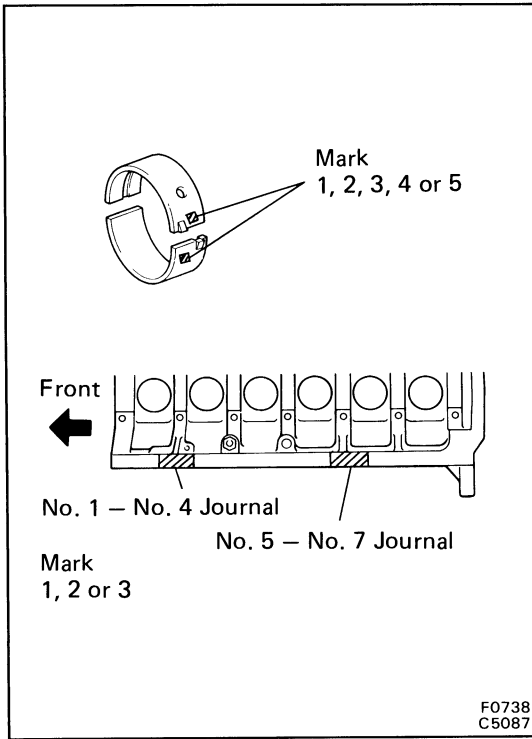
**13. DISCONNECT FOLLOWING CONNECTORS AND WIRES:**

- (a) Ground strap from LH front fender apron
- (b) Battery positive cable from battery
- (c) Noise filter connector
- (d) Theft deterrent horn connector
- (e) Check connector
- (f) (7M-GTE)
Solenoid resistor connector
- (g) (7M-GT)
Ignition coil connector
(7M-GTE)
Igniter connectors
- (h) Main relay connector
- (i) Alternator connector and wire
- (j) (7M-GE)
Oxygen sensor connector
- (k) Heater valve connector
- (l) Ground strap from engine rear side
- (m) Engine and ECT connectors

14. DISCONNECT FOLLOWING CABLES:

- (a) Cruise control cable
- (b) Accelerator cable
- (c) (A/T)
Throttle cable

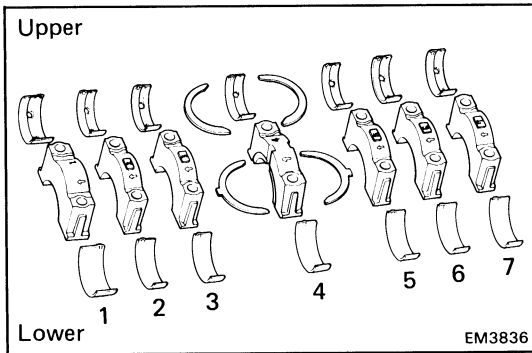
**15. DISCONNECT HEATER HOSES****16. REMOVE A/C COMPRESSOR WITHOUT DISCONNECTING HOSES****17. (7M-GTE)
REMOVE NO.6 AIR CLEANER HOSE****18. (7M-GTE)
REMOVE RADIATOR OUTLET HOSE****19. REMOVE PS PUMP WITHOUT DISCONNECTING HOSES****20. (M/T)
REMOVE SHIFT LEVER****21. DISCONNECT GROUND STRAP FROM FUEL HOSE CLAMP****22. (7M-GTE)
REMOVE ENGINE MOUNTING ABSORBER**



(Reference)

mm (in.)

Mark	Cylinder Block Main Journal Bore	Main Journal Diameter	Bearing Center Wall Thickness
0	—	60.007 – 60.012 (2.3625 – 2.3627)	—
1	64.024 – 64.030 (2.5206 – 2.5209)	60.001 – 60.006 (2.3622 – 2.3624)	1.988 – 1.991 (0.0783 – 0.0784)
2	64.031 – 64.036 (2.5209 – 2.5211)	59.994 – 60.000 (2.3620 – 2.3622)	1.992 – 1.994 (0.0784 – 0.0785)
3	64.037 – 64.042 (2.5211 – 2.5213)	—	1.995 – 1.997 (0.0785 – 0.0786)
4	—	—	1.998 – 2.000 (0.0787 – 0.0787)
5	—	—	2.001 – 2.003 (0.0788 – 0.0789)
U/S 0.25	64.022 – 64.046 (2.5205 – 2.5215)	59.730 – 59.740 (2.3516 – 2.3520)	2.123 – 2.133 (0.0086 – 0.0840)



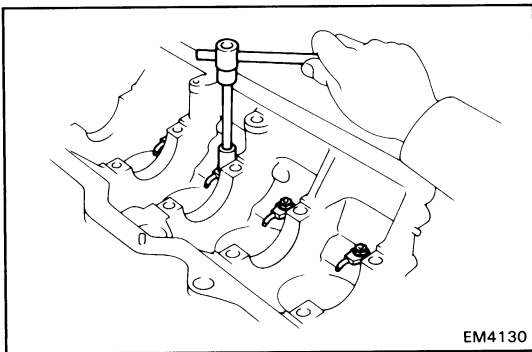
23. REMOVE CRANKSHAFT

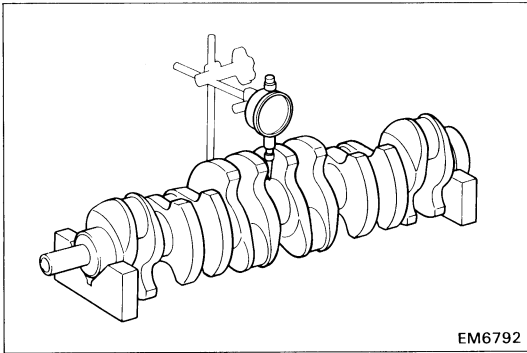
- (a) Lift out the crankshaft.
- (b) Remove the upper main bearings and upper thrust washers from the cylinder block.
- (c) Clean out the scraps of Plastigage from bearing and journals.

HINT:

- Arrange the caps, bearings and thrust washers in correct order.
- The pilot bearing in the crankshaft rear end is permanently lubricated and requires no cleaning or lubrication.

**24. (7M-GTE)
REMOVE OIL NOZZLES**





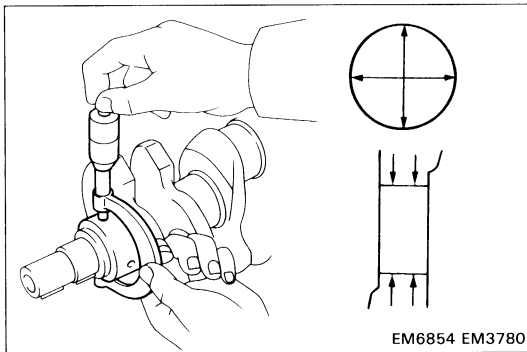
INSPECTION AND REPAIR OF CRANKSHAFT

1. INSPECT CRANKSHAFT FOR RUNOUT

- (a) Place the crankshaft on V-blocks.
- (b) Using a dial indicator, measure the circle runout at the center journal.

Maximum circle runout: 0.06 mm (0.0024 in.)

If the circle runout is greater than maximum, replace the crankshaft.



2. INSPECT MAIN JOURNALS AND CRANK PINS

- (a) Using a micrometer, measure the diameter of each main journal and crank pin.

Journal diameter:

STD size 59.994 – 60.012 mm
(2.3620 – 2.3627 in.)

U/S 0.25 59.730 – 59.740 mm
(2.3516 – 2.3520 in.)

Crank pin diameter:

STD size 51.976 – 52.000 mm
(2.0463 – 2.0472 in.)

U/S 0.25 51.725 – 51.735 mm
(2.0364 – 2.0368 in.)

If the diameter is not within specification, check the oil clearance. If necessary, grind or replace the crankshaft.

- (b) Check each main journal and crank pin for taper and out-of-round as shown.

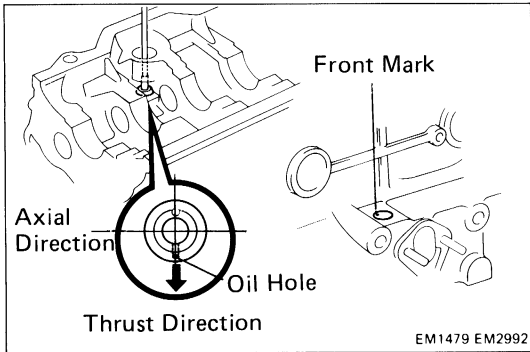
Maximum taper and out-of-round: 0.02 mm
(0.0008 in.)

If taper or out-of-round is greater than maximum, grind or replace the crankshaft.

3. IF NECESSARY, GRIND AND HONE MAIN JOURNALS AND/OR CRANK PINS

Grind and hone the main journals and/or crank pins to the finished undersized diameter (See procedure step 2).

Install new main journal and/or crank pin undersized bearings.



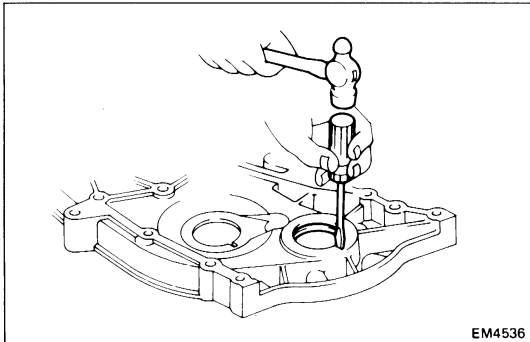
- (b) Drive in the bushing from the inside of the block with a suitable tool.

HINT: The oil hole should be positioned toward the crankshaft side.

- (c) Make sure the front mark of bushing should be positioned toward the front of block.

REPLACEMENT OF OIL SEALS

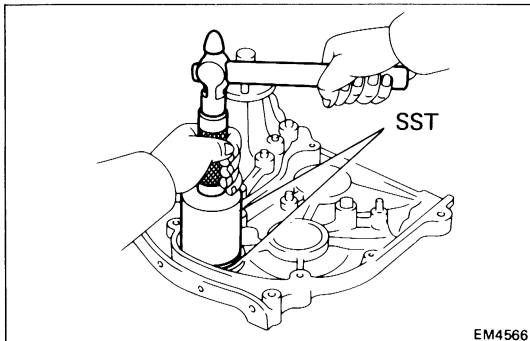
NOTE: There are two methods (A and B) of oil seal replacement.



1. REPLACE CRANKSHAFT FRONT OIL SEAL

A. If the timing case is removed from the cylinder block:

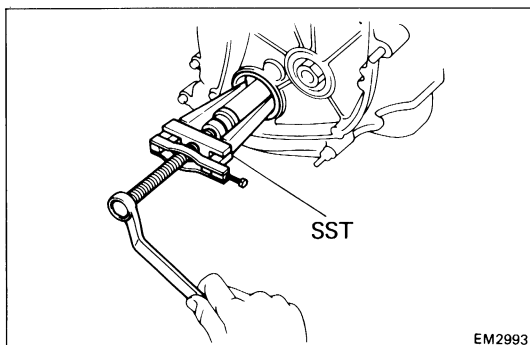
- (a) Using a screwdriver and hammer, tap out the oil seal.



- (b) Using SST and a hammer, tap in a new oil seal.

SST 09214-60010 and 09506-35010

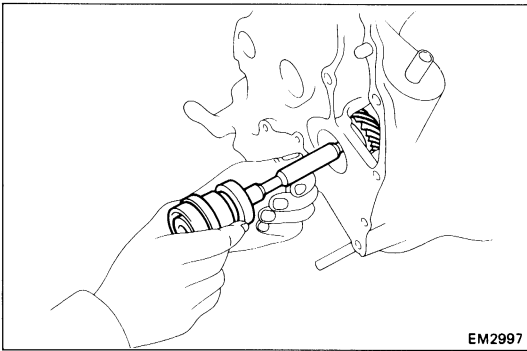
- (c) Apply MP grease to the oil seal lip.



B. If the timing case is installed to the cylinder block:

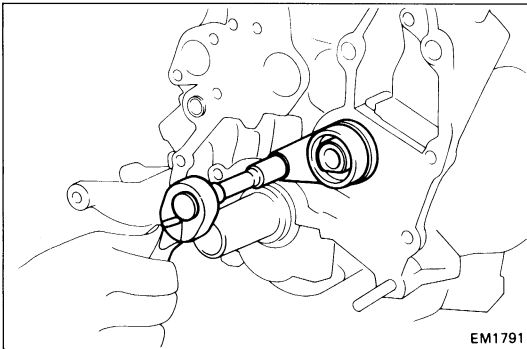
- (a) Using SST, remove the oil seal.

SST 09308-55010



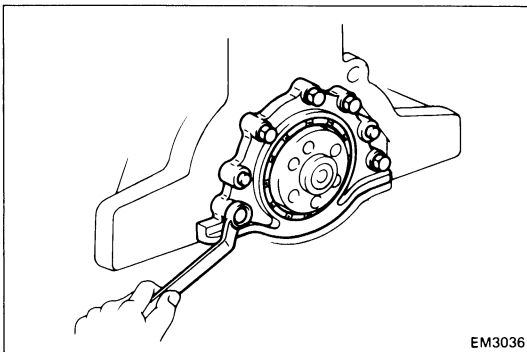
9. INSTALL OIL PUMP DRIVE SHAFT

- (a) While turning the drive shaft, insert slowly to avoid damaging the drive shaft bearing.



- (b) Install the bolt.

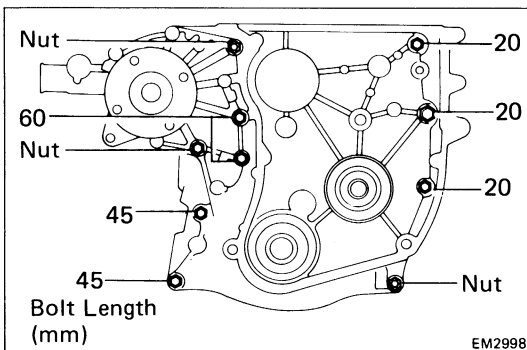
Torque: 130 kg-cm (9 ft-lb, 13 N·m)



10. INSTALL REAR OIL SEAL RETAINER

Install a new gasket and rear oil seal retainer with the five bolts.

Torque: 130 kg-cm (9 ft-lb, 13 N·m)



11. INSTALL TIMING BELT CASE WITH WATER PUMP

- (a) Position new gaskets on the cylinder block.
 (b) Apply sealant to two or three threads of the 10 mm bolt end.

Sealant: Part No. 08833-00070, THREE BOND 1324 or equivalent

- (c) Install the timing belt case with the seven bolts and three nuts.

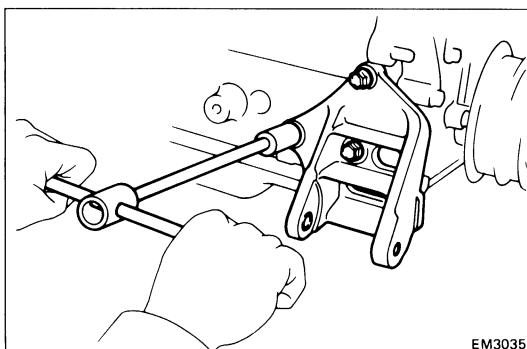
Torque:

12 mm head bolt and nut

195 kg-cm (14 ft-lb, 19 N·m)

14 mm head bolt

400 kg-cm (29 ft-lb, 39 N·m)



12. INSTALL OIL PAN

(See page LU-12)

13. INSTALL PS PUMP BRACKET