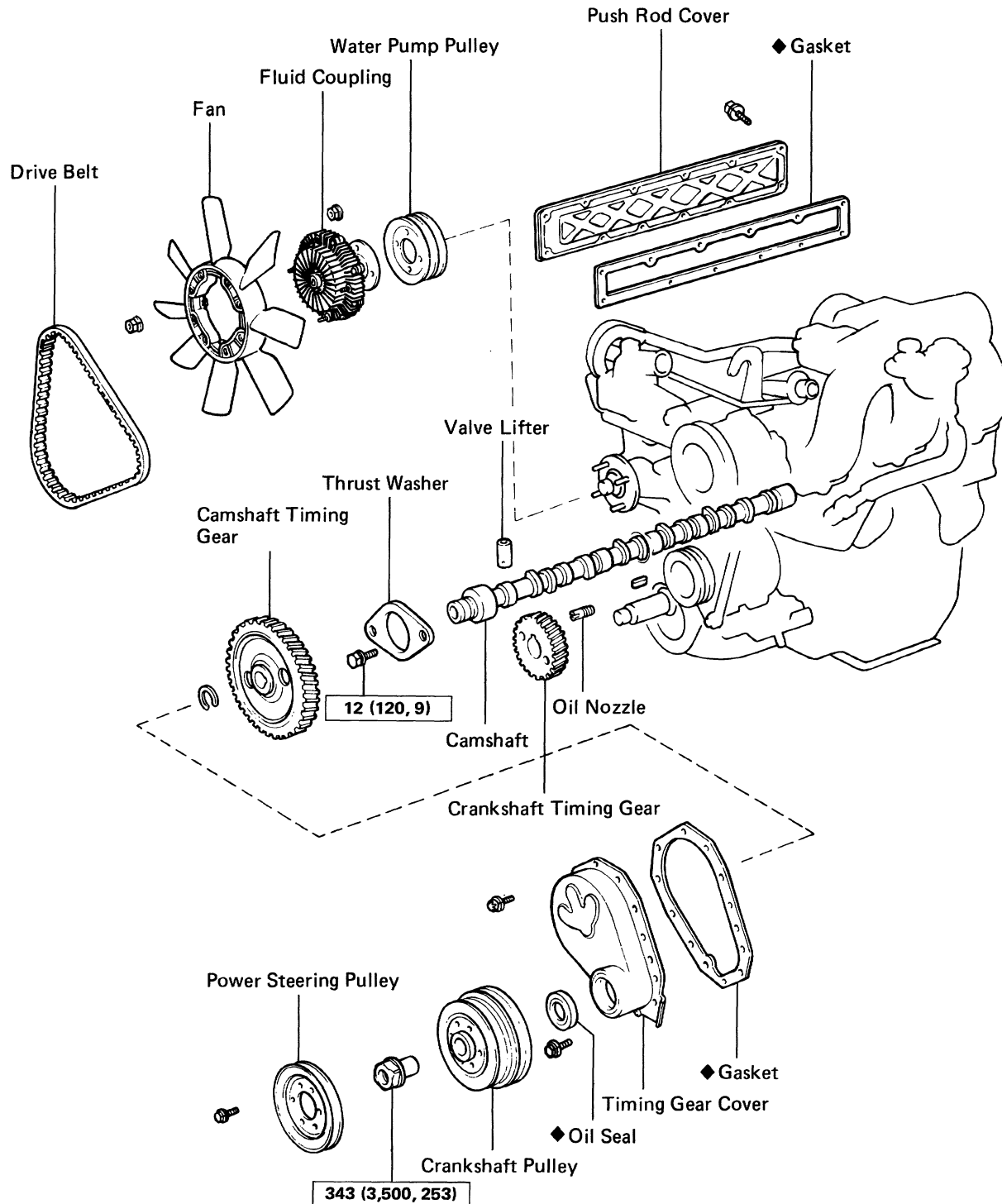


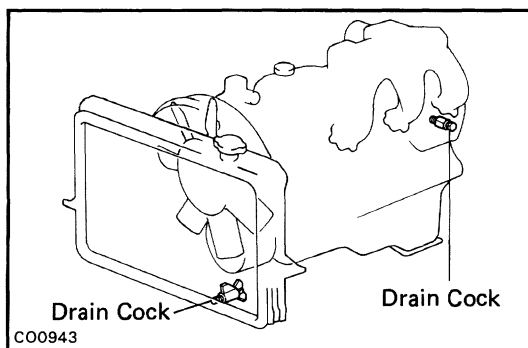
TIMING GEARS AND CAMSHAFT COMPONENTS



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

◆ Non-reusable part

EM8786



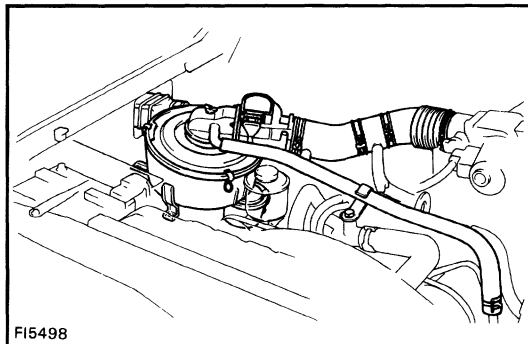
REMOVAL OF TIMING GEARS AND CAMSHAFT

(See page [EM-35](#))

1. DRAIN ENGINE COOLANT

(See page [CO-5](#))

2. DISCONNECT ACCELERATOR AND THROTTLE CABLES



3. REMOVE AIR INTAKE HOSE, AIR FLOW METER AND AIR CLEANER ASSEMBLY

- (a) Disconnect the air flow meter connector and clamp.
- (b) Disconnect the following hoses:
 - ISC hose
 - Air pump hose
 - Distributor hose
 - PCV hose
 - Three hoses from the intake chamber rear side
 - Two hoses from the VCV of the charcoal canister
- (c) Loosen the air intake hose clamp.
- (d) Remove the wing nut and loosen the three clips, and remove the air intake hose, air flow meter and air cleaner cap.

4. LOOSEN PS DRIVE PULLEY NUT

Push on the drive belt to hold the pulley in place and loosen the pulley nut.

5. REMOVE FLUID COUPLING WITH FAN AND WATER PUMP PULLEY

(See steps 2 to 6 on pages [CO-6](#) and [CO-7](#))

6. REMOVE PS PUMP AND A/C COMPRESSOR

(See steps 6 and 7 on page [EM-14](#))

7. REMOVE PS AND A/C COMPRESSOR BRACKETS

8. REMOVE PS IDLER PULLEY AND BRACKET ASSEMBLY

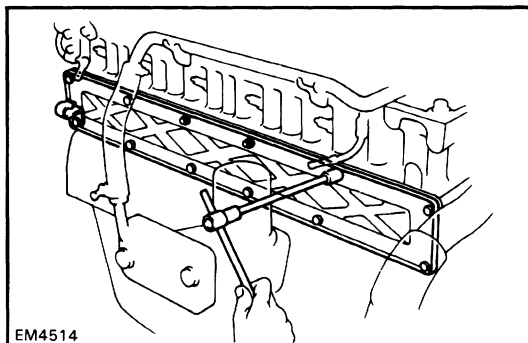
9. REMOVE DISTRIBUTOR

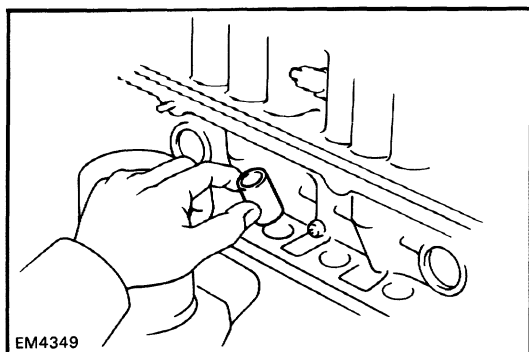
10. REMOVE VALVE ROCKER SHAFT ASSEMBLY

(See steps 21 to 23 on pages [EM-16](#), [EM-17](#))

11. REMOVE PUSH ROD COVER

Remove the ten bolts, two nuts, push rod cover and gasket.

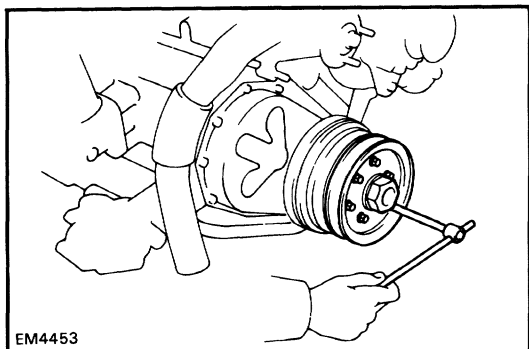
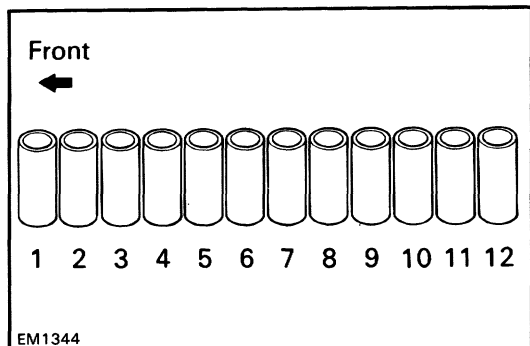




12. REMOVE VALVE LIFTERS

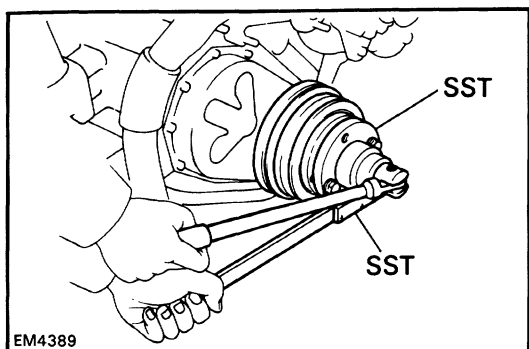
Remove the twelve valve lifters in order, beginning from the No.1 valve lifter.

HINT: Arrange the valve lifters in correct order.



13. REMOVE PS PULLEY FROM CRANKSHAFT PULLEY

Remove the six bolts and PS pulley.



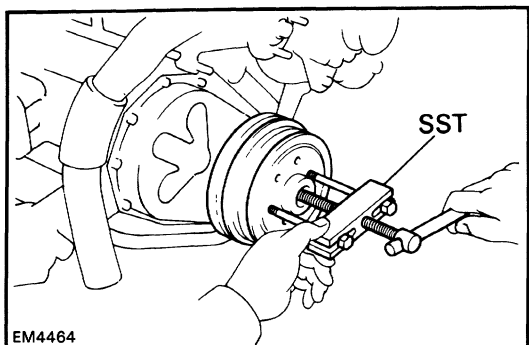
14. REMOVE CRANKSHAFT PULLEY

(a) Using SST and a 46 mm socket wrench, remove the pulley mount bolt.

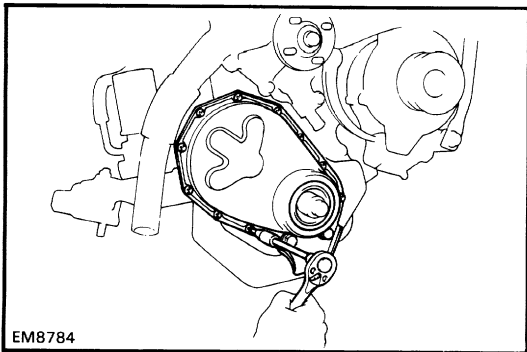
SST 09213-58011 and 09330-00021

(b) Using SST, remove the pulley.

SST 09213-60017 (09213-00020, 09213-00030, 09213-00090)



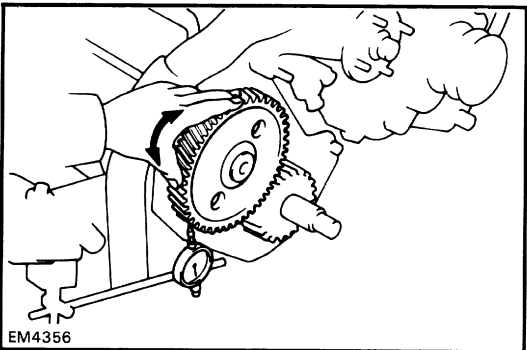
15. REMOVE OIL COOLER PIPE WITH HOSE



16. REMOVE TIMING GEAR COVER

Using a torx wrench and socket wrench, remove the ten torx bolts, two bolt, gear cover and gasket.

Torx wrench: T30 (Part No. 09042-00010 or locally manufactured tool.)



17. CHECK TIMING GEAR BACKLASH

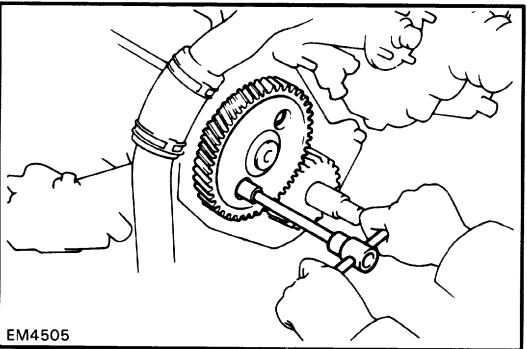
Using a dial indicator, measure the backlash at several places while turning the camshaft clockwise and counterclockwise.

Standard backlash: 0.100 – 0.183 mm

(0.0039 – 0.0072 in.)

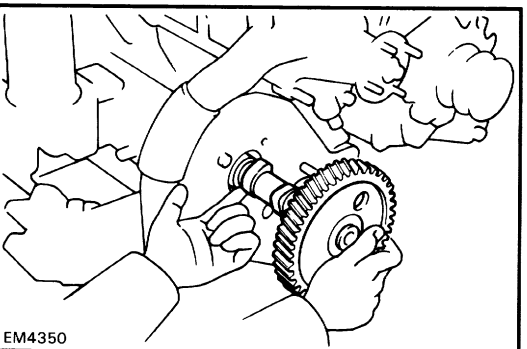
Maximum backlash: 0.25 mm (0.0098 in.)

If the backlash is greater than maximum, replace the camshaft and crankshaft timing gears.



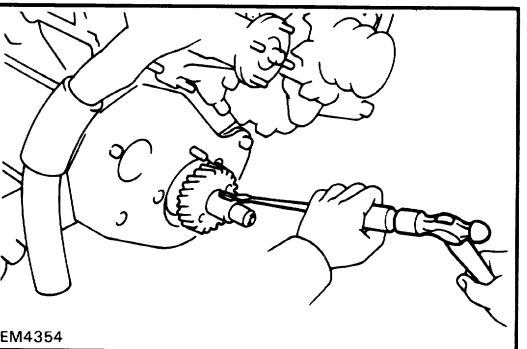
18. REMOVE CAMSHAFT TIMING GEAR AND CAMSHAFT ASSEMBLY

(a) Remove the two bolts.



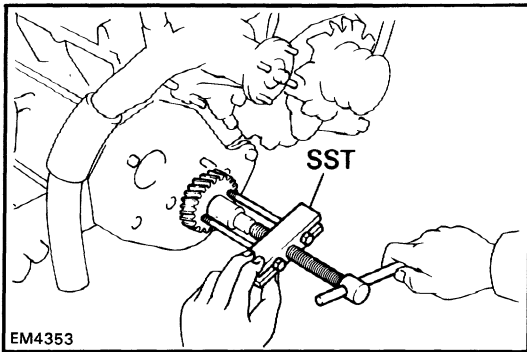
(b) Carefully pull out the camshaft and timing gear assembly.

NOTICE: Be careful not to damage the camshaft bearing.



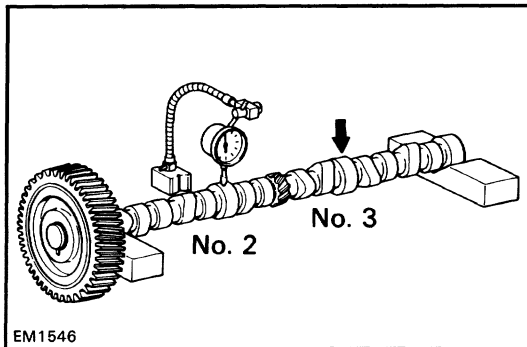
19. REMOVE CRANKSHAFT TIMING GEAR

(a) Using a screwdriver and hammer, tap out the crankshaft pulley set key.



- (b) Using SST, remove the timing gear.
 SST 09213-60017 (09213-00020,
 09213-00030, 09213-00090)

20. IF NECESSARY, REMOVE OIL NOZZLE



INSPECTION OF TIMING GEARS AND CAMSHAFT

INSPECT CAMSHAFT

- (a) Place the camshaft on V-blocks and, using a dial indicator, measure the circle runout at the No. 2 and No.3 journals.

Maximum circle runout: 0.30 mm (0.0118 in.)

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

- (b) Using a micrometer, measure the cam lobe height.

Standard cam lobe height:

Intake 38.36 – 38.46 mm

(1.5102 – 1.5142 in.)

Exhaust 38.25 – 38.35 mm

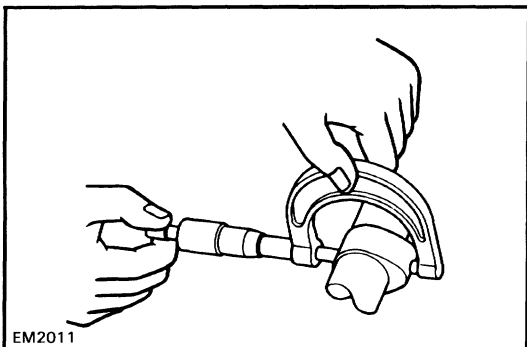
(1.5059 – 1.5098 in.)

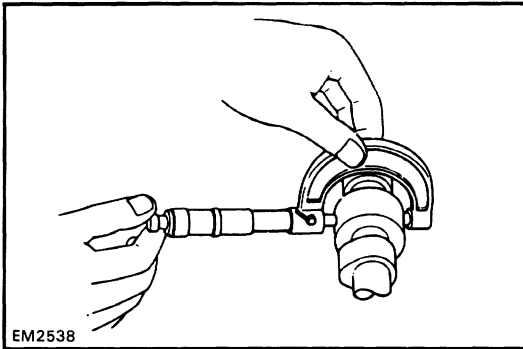
Minimum cam lobe height:

Intake 38.0 mm (1.496 in.)

Exhaust 37.9 mm (1.492 in.)

If the lobe height is less than minimum, replace the camshaft.





(c) Using a micrometer, measure the the journal diameter.

Journal diameter (from front side):

STD size No. 1 47.955 – 47.975 mm

(1.8880 – 1.8888 in.)

No. 2 46.455 – 46.475 mm

(1.8289 – 1.8297 in.)

No. 3 44.955 – 44.975 mm

(1.7699 – 1.7707 in.)

No. 4 43.455 – 43.475 mm

(1.7108 – 1.7116 in.)

U/S 0.25 No. 1 47.715 – 47.725 mm

(1.8785 – 1.8789 in.)

No. 2 46.215 – 46.225 mm

(1.8195 – 1.8199 in.)

No. 3 44.715 – 44.725 mm

(1.7604 – 1.7608 in.)

No. 4 43.215 – 43.225 mm

(1.7014 – 1.7018 in.)

U/S 0.50 No. 1 47.465 – 47.475 mm

(1.8687 – 1.8691 in.)

No. 2 45.965 – 45.975 mm

(1.8096 – 1.8888 in.)

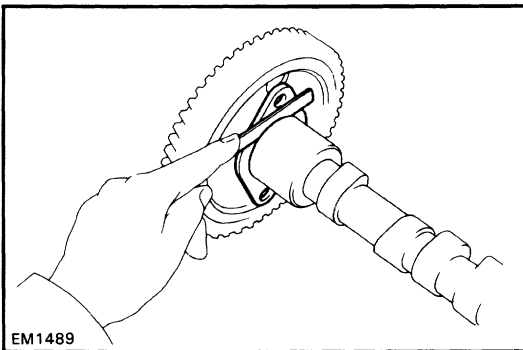
No. 3 44.465 – 44.475 mm

(1.7506 – 1.7510 in.)

No. 4 42.965 – 42.975 mm

(1.6915 – 1.6919 in.)

If the journal diameter is not within specification, check the oil clearance. (See page [EM-68](#))



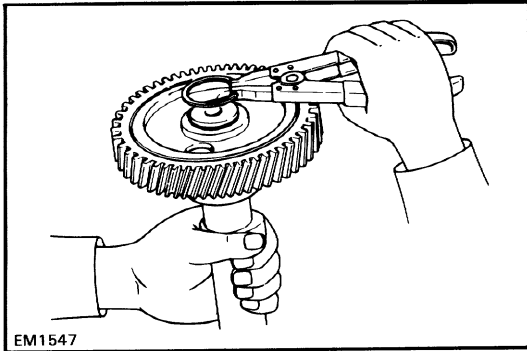
(d) Using a thickness gauge, measure the thrust clearance between the thrust plate and camshaft.

Standard thrust clearance: 0.200 – 0.290 mm

(0.0079 – 0.0114 in.)

Maximum thrust clearance: 0.33 mm (0.0130 in.)

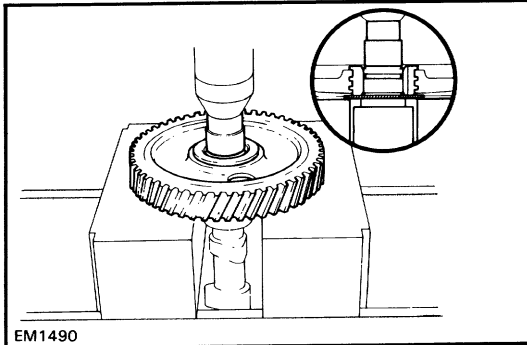
If the clearance is greater than maximum, replace the thrust plate. If necessary, replace the camshaft.



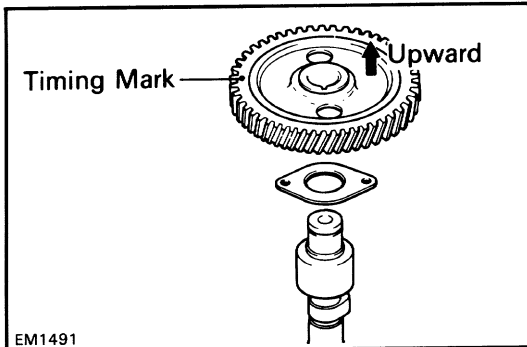
DISASSEMBLY AND ASSEMBLY OF CAMSHAFT AND CAMSHAFT TIMING GEAR

1. DISASSEMBLE CAMSHAFT AND CAMSHAFT TIMING GEAR

(a) Using snap ring pliers, remove the snap ring.



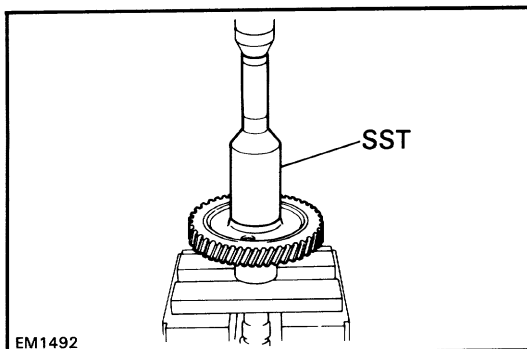
(b) Using a socket wrench and press, press out camshaft.



2. ASSEMBLE CAMSHAFT AND CAMSHAFT TIMING GEAR

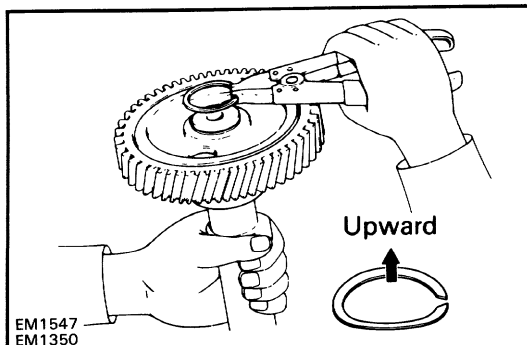
(a) Install the timing gear set key to the camshaft.

(b) Assemble the camshaft, thrust plate and timing gear as shown.



(c) Using SST and a press, align the timing gear set key with the key groove of the timing gear, and press in the camshaft.

SST 09214-60010



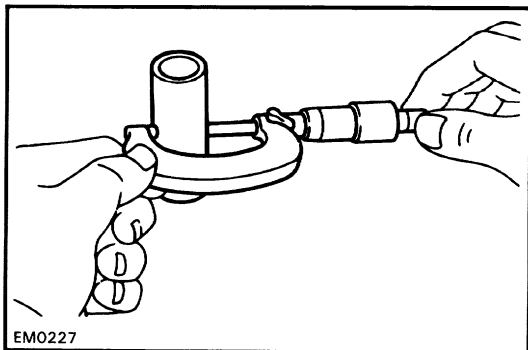
(d) Using snap ring pliers, install the snap ring as shown.

3. CHECK CAMSHAFT THRUST CLEARANCE

(See page [EM-40](#))

Thrust clearance: 0.200 – 0.290 mm

(0.0079 – 0.0114 in.)



INSPECTION OF VALVE LIFTERS

INSPECT VALVE LIFTERS

Using a micrometer, measure the valve lifter diameter.

Lifter diameter:

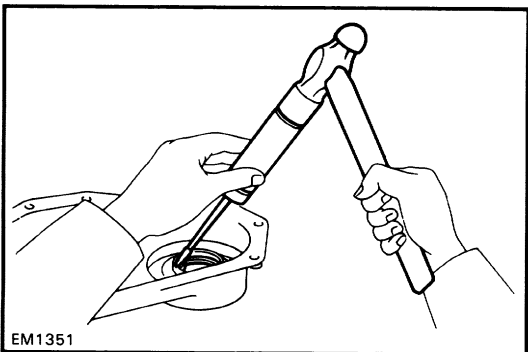
STD size 21.387 – 21.404 mm

(0.8420 – 0.8427 in.)

O/S 0.05 21.437 – 21.454 mm

(0.8440 – 0.8446 in.)

If the diameter is not within specification, check the oil clearance. (See page [EM-70](#))



REPLACEMENT OF CRANKSHAFT FRONT OIL SEAL

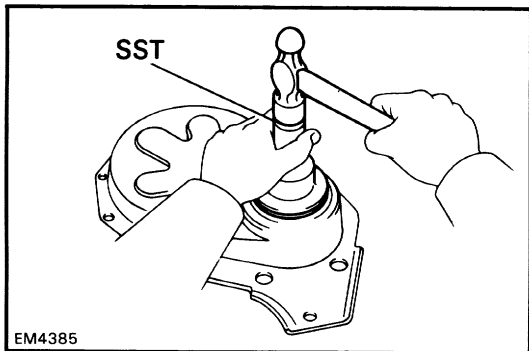
REPLACE CRANKSHAFT FRONT OIL SEAL

HINT: There are two methods (A and B) to replace the oil seal as follows.

A. If timing gear cover is removed from cylinder block:

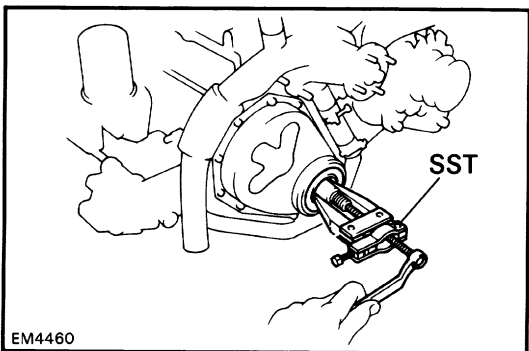
block:

- (a) Using a screwdriver and hammer, tap out the oil seal.
- (b) Using SST and a hammer, tap in a new oil seal.
SST 09223-50010
- (c) Apply MP grease to the oil seal.

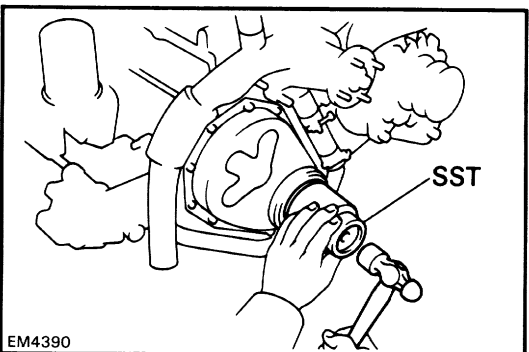


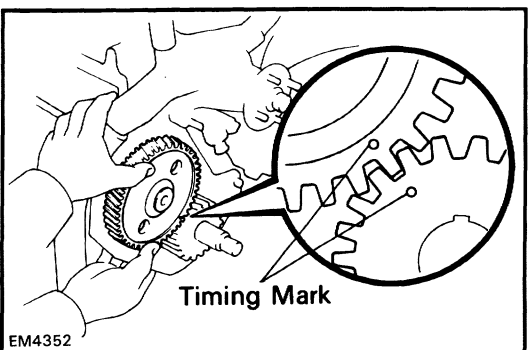
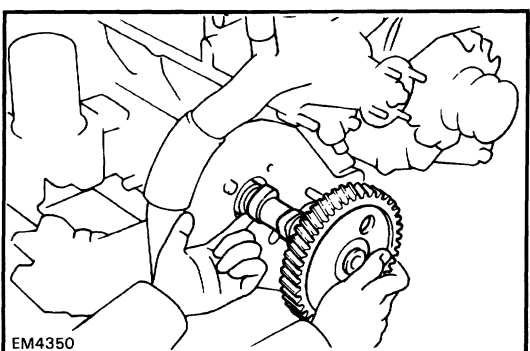
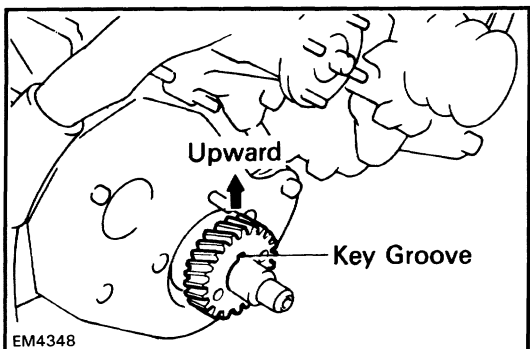
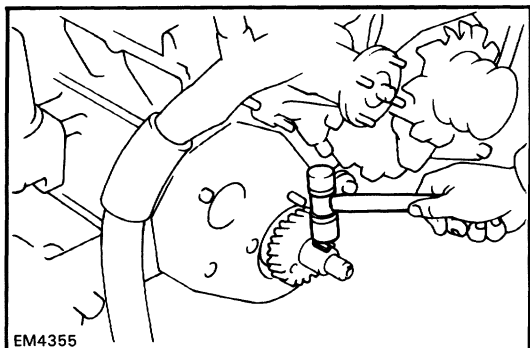
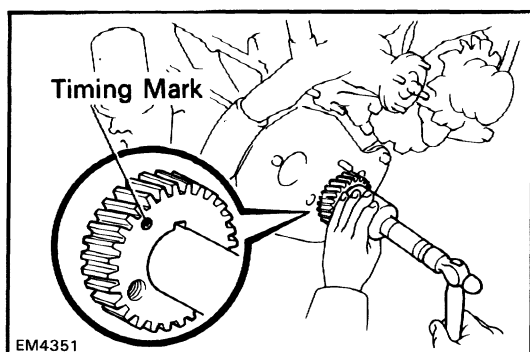
B. If timing gear cover is installed to cylinder block:

- (a) Using SST, remove the oil seal.
SST 09308-10010



- (b) Apply MP grease to a new oil seal lip.
- (c) Using SST and a hammer tap in the oil seal.
SST 09238-47012





INSTALLATION OF TIMING GEARS AND CAMSHAFT

(See page EM-35)

1. INSTALL CRANKSHAFT TIMING GEAR

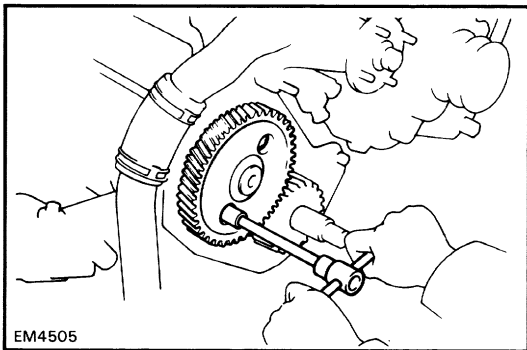
- Put the timing gear on the crankshaft with timing mark facing forward.
- Align the timing gear set key with the key groove of the timing gear.
- Using SST and a hammer, tap in the timing gear.
SST 09214-60010
- Using a plastic-faced hammer, tap in the crankshaft pulley set key.

2. INSTALL CAMSHAFT TIMING GEAR AND CAMSHAFT ASSEMBLY

- Set the crankshaft timing gear with the key groove facing upward by turning the crankshaft clockwise.

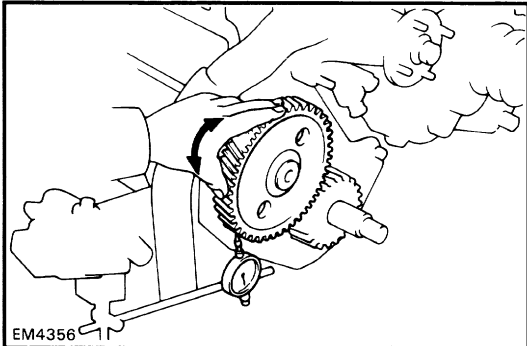
(b) insert the camshaft into the cylinder block.
NOTICE: Be careful not to damage the camshaft bearings.

(c) Align the timing marks of the crankshaft and camshaft timing gears and mesh the gears.
HINT: At this time, No. 6 cylinder should be at TDC/ compression.



- (d) Install the two bolts mounting the thrust washer to the cylinder block. Torque the bolts.

Torque: 12 N-m (120 kgf-cm, 9 ft-lbf)



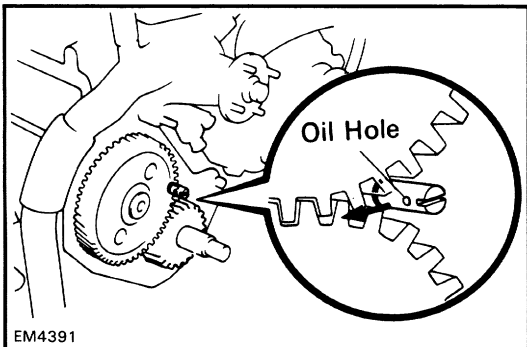
3. CHECK TIMING GEAR BACKLASH

Using a dial indicator, measure the backlash at several places while turning the camshaft clockwise and counterclockwise.

Standard backlash: 0.100 – 0.183 mm

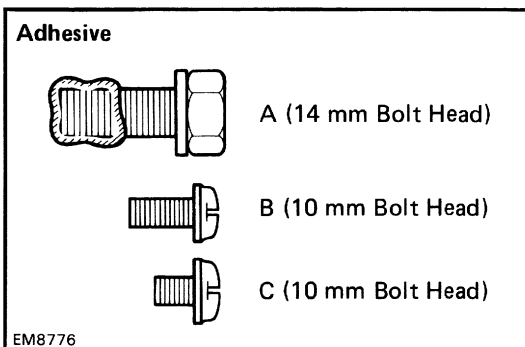
(0.0039 – 0.0072 in.)

Maximum backlash: 0.25 mm (0.0098 in.)



4. INSTALL OIL NOZZLE

- Install and set the oil nozzle in position.
- Using a chisel and hammer, stake the threads of the oil nozzle.

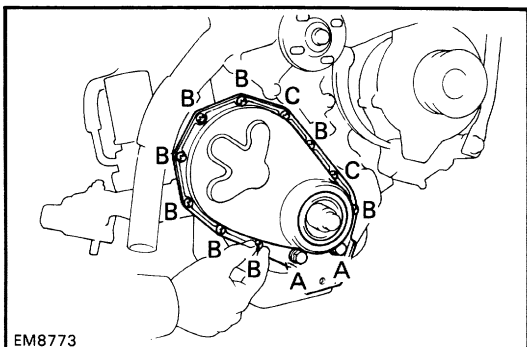


5. INSTALL TIMING GEAR COVER AND CRANKSHAFT PULLEY

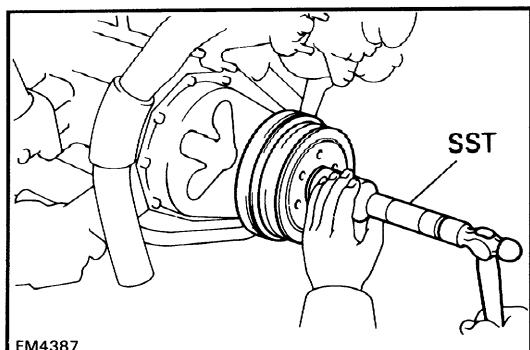
HINT: There are three size of timing gear cover bolts indicated A, B and C.

- Apply adhesive to the threads of the two A bolts.

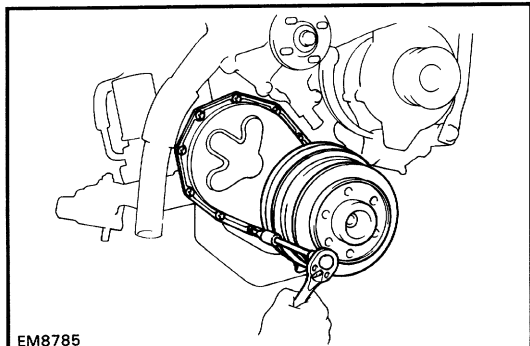
Adhesive: Part No. 08833-00080, THREE BOND 1344, LOCTITE 242 or equivalent



- Install a new gasket and the gear cover with the twelve bolts. Finger tighten all bolts.



- (c) Align the pulley set key with the key groove of the pulley.
- (d) Using SST and a hammer, tap in the pulley.
SST 09214-60010

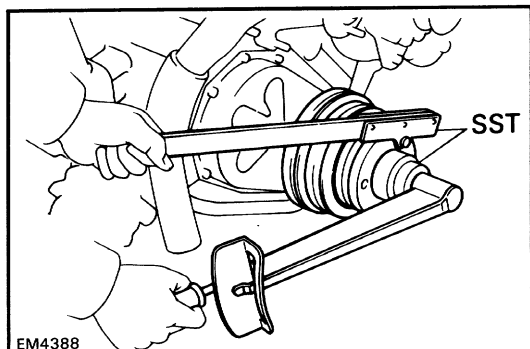


- (e) After installing the pulley, using a torx wrench and socket wrench, torque the cover bolts.
Torx wrench: T30 (Part No. 09042-00010 or locally manufactured tool.)

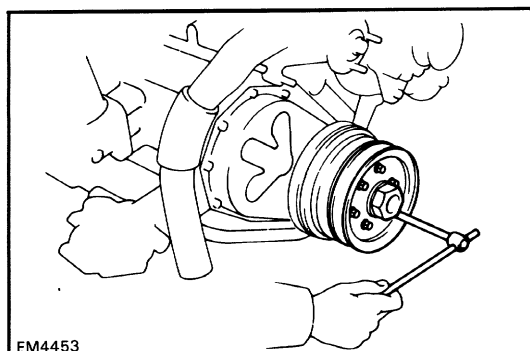
Torque:

Bolt A 25 N-m (250 kgf-cm, 18 ft-lbf)

Bolts B and C 4.9 N-m (50 kgf-cm, 43 in.-lbf)



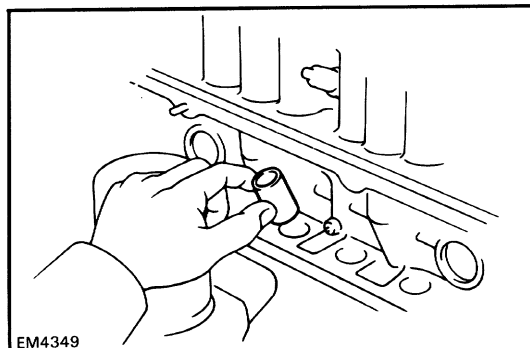
- (f) Using SST and a 46-mm socket wrench, install and torque the pulley mount bolt.
SST 09213-58011 and 09330-00021
Torque: 343 N-m (3,500 kgf-cm, 253 ft-lbf)



6. INSTALL PS PULLEY TO CRANKSHAFT PULLEY

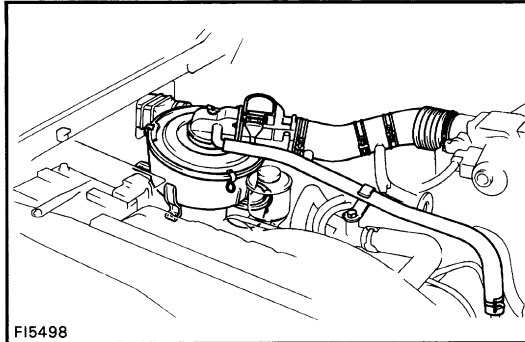
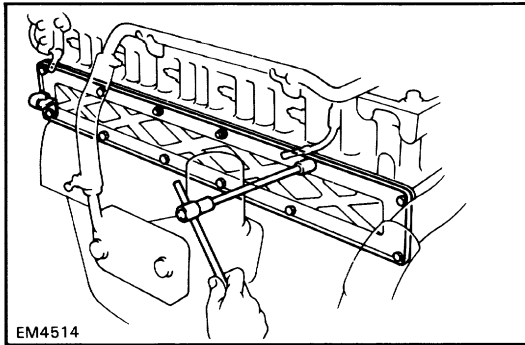
Install the PS pulley with the six bolts. torque the bolts.

Torque: 18 N-m (185 kgf -cm, 13 ft-lbf)



7. INSTALL VALVE LIFTERS

Carefully insert the twelve lifters into the lifter bore.

**8. INSTALL PUSH ROD COVER**

Install a new gasket and the push rod cover with the ten bolts and two nuts.

Torque: 3.9 N-m (40 kgf-cm, 35 in.-lbf)

9. INSTALL VALVE ROCKER SHAFT ASSEMBLY

(See steps 2 to 4 on pages [EM-30](#), [EM-31](#))

10. INSTALL DISTRIBUTOR (See page [IG-10](#))**11. INSTALL WATER PUMP PULLEY AND FLUID COUPLING WITH FAN (See page [CO-9](#))****12. INSTALL PS IDLER PULLEY AND BRACKET ASSEMBLY****13. INSTALL PS AND A/C COMPRESSOR BRACKETS****14. INSTALL PS PUMP AND A/C COMPRESSOR (See steps 19 and 20 on page [EM-33](#))****15. INSTALL AIR INTAKE HOSE, AIR FLOW METER AND AIR CLEANER ASSEMBLY**

- (a) Install the air intake hose, air flow meter and air cleaner cap with the wing nut and three clips.
- (b) Connect the following hoses:
 - ISC hose
 - Air pump hose
 - Distributor hose
 - PCV hose
 - Three hoses from the intake chamber rear side
 - Two hoses from the VCV of the charcoal canister

16. CONNECT ACCELERATOR AND THROTTLE CABLES, AND ADJUST THEM**17. FILL WITH ENGINE COOLANT (See page [CO-5](#))****18. CONNECT CABLE TO NEGATIVE TERMINAL OF BATTERY****19. START ENGINE AND CHECK FOR LEAKS****20. PERFORM ENGINE ADJUSTMENT**

- (a) Adjust the ignition timing.
(See steps 10 to 14 on page [IG-11](#))

Ignition timing: 7° BTDC @ idle

(w/ Terminals TE1 and E1 connected)

- (b) Adjust the valve clearance. (See page [EM-9](#))

Valve clearance (Hot):

Intake 0.20 mm (0.008 in.)

Exhaust 0.35 mm (0.014 in.)

21. PERFORM ROAD TEST

Check for abnormal noise, shock, slippage and smooth operation.

22. RECHECK ENGINE COOLANT LEVEL