

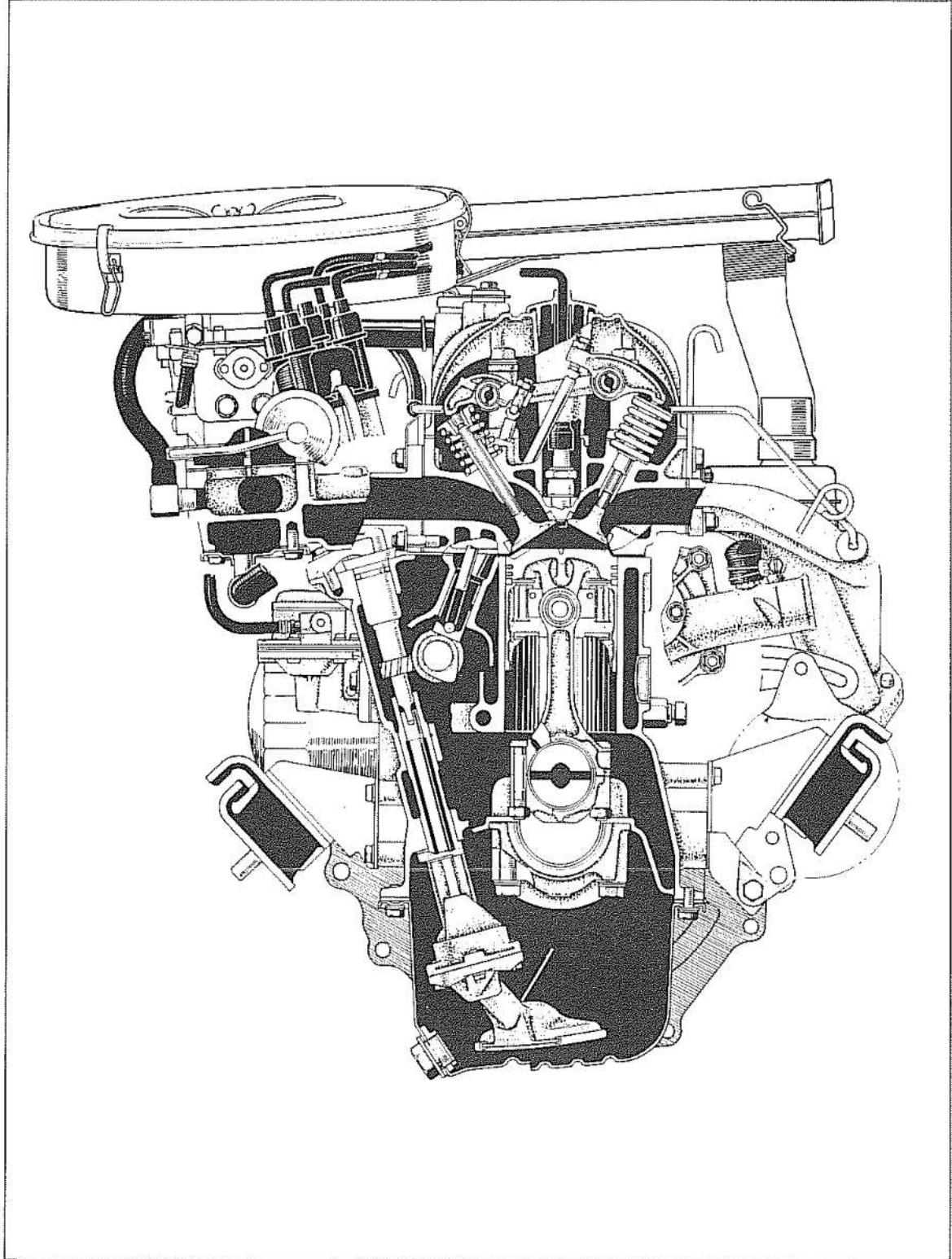
2T & 3T ENGINE SERVICE

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4-2 2T & 3T ENGINE SERVICE – Cutaway View

CUTAWAY VIEW

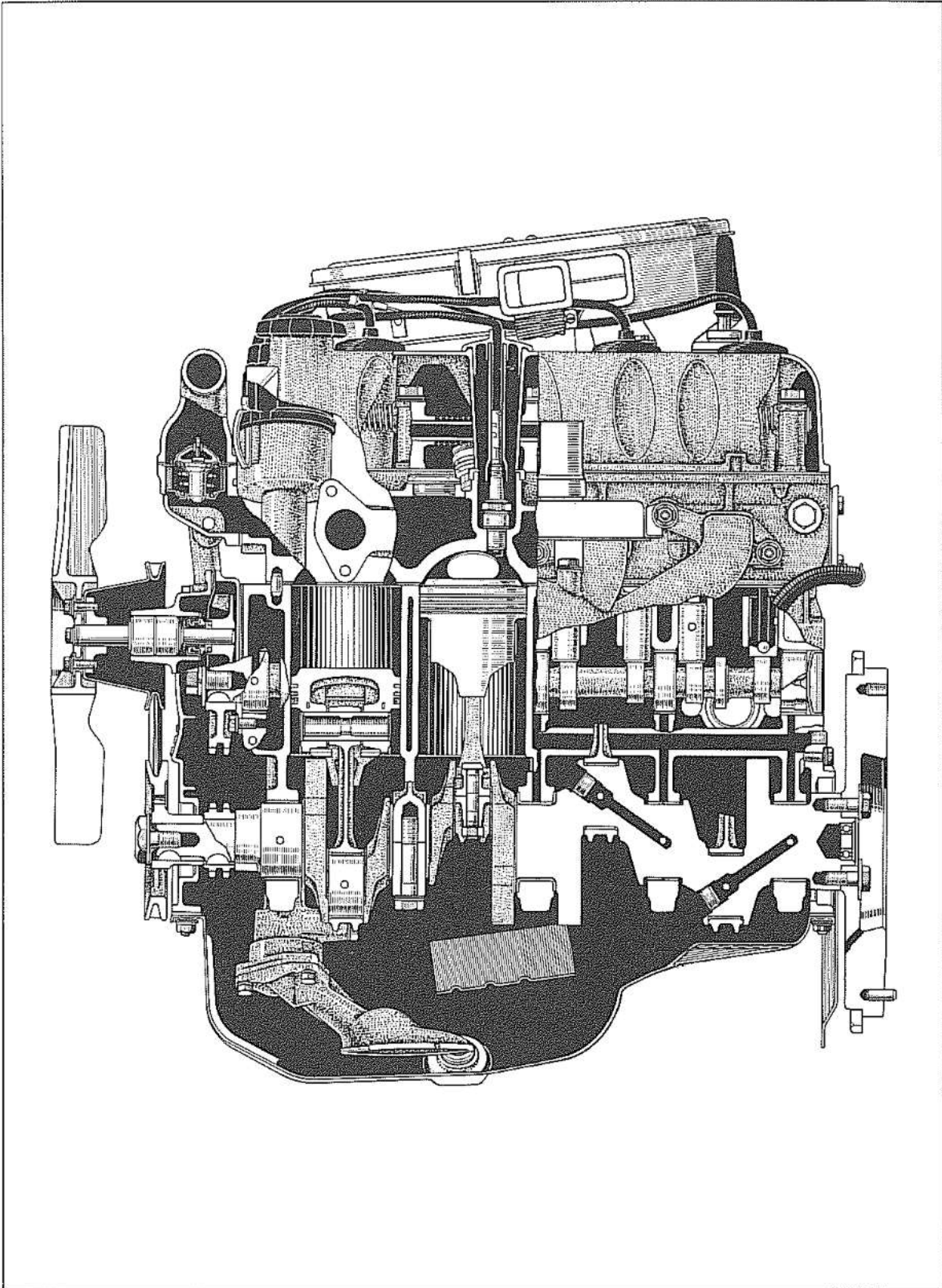
Fig. 4-1



2T & 3T ENGINE SERVICE – Cutaway View

4-3

Fig. 4-2



CYLINDER HEAD

DISASSEMBLY

Disassemble the parts in the numerical order shown in the figure.

Fig. 4-3

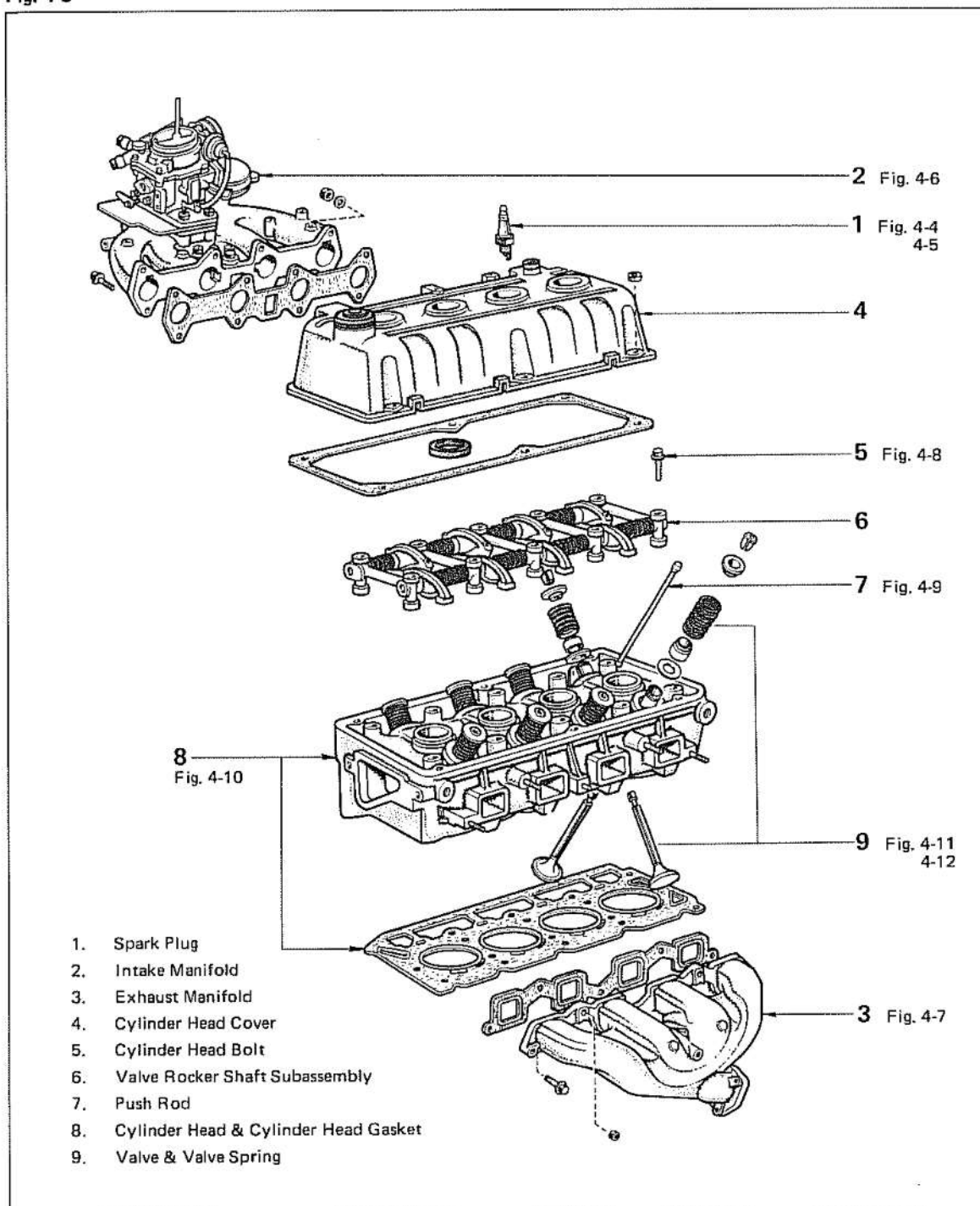
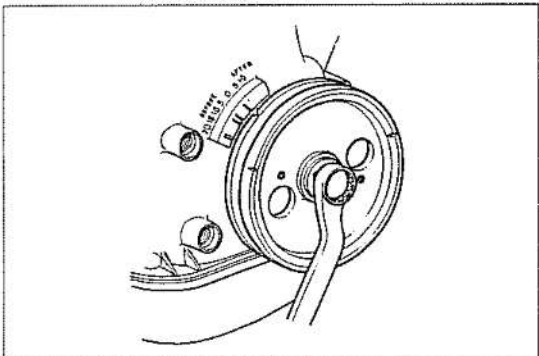
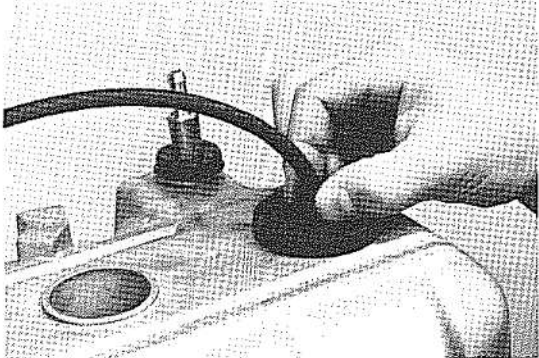


Fig. 4-4



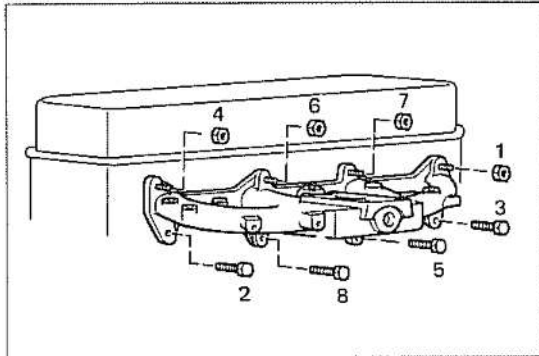
Set the No.1 cylinder to TDC/compression.

Fig. 4-5



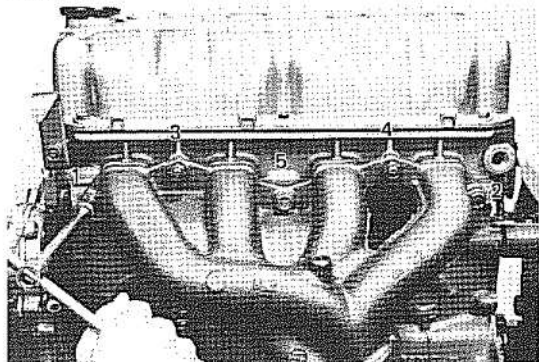
Remove the plug cords by carefully pulling on the rubber boots.

Fig. 4-6



Loosen the each intake manifold bolt and nut a little at a time, and in the sequence shown in the figure.

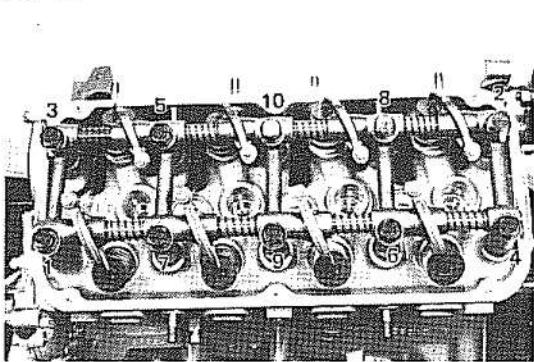
Fig. 4-7



Loosen the each exhaust manifold bolt and nut a little at a time, and in the sequence shown in the figure.

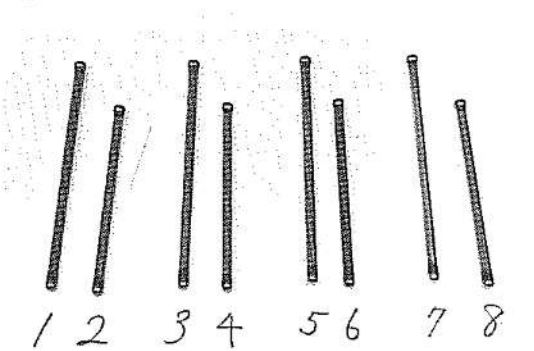
4-6 2T & 3T ENGINE SERVICE – Cylinder Head

Fig. 4-8



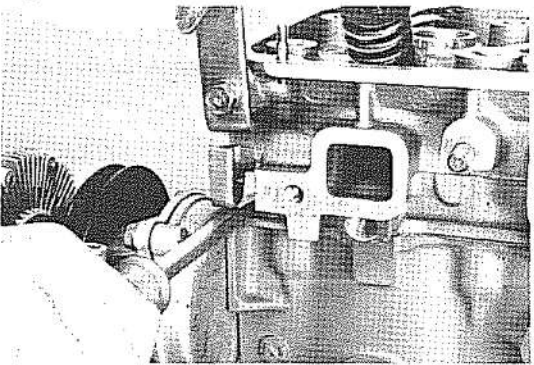
Loosen each cylinder head bolt a little at a time and in the sequence shown in the figure.

Fig. 4-9



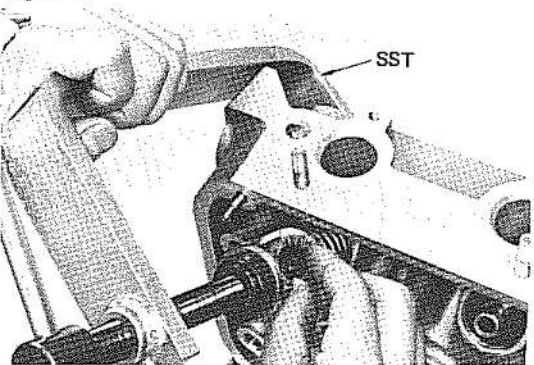
Arrange the push rods in order.

Fig. 4-10



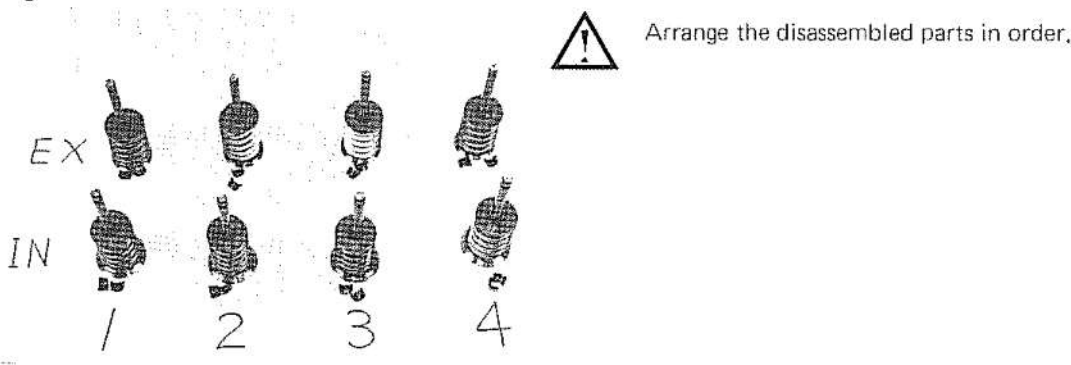
If the cylinder head is difficult to lift off, pry with a screwdriver between the head and block as shown in the figure.

Fig. 4-11



Remove the valve spring with SST.
SST [09202-43012]

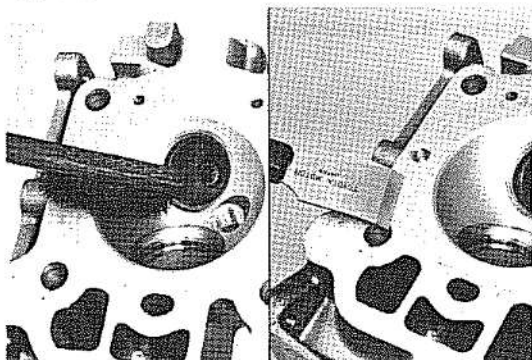
Fig. 4-12



4-8

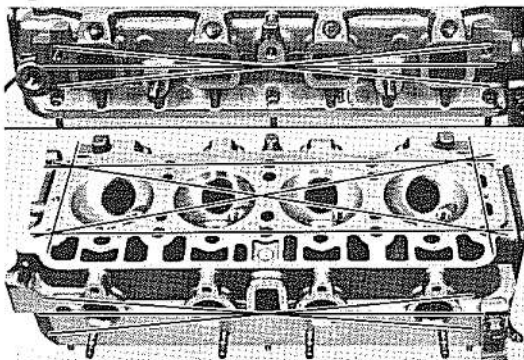
2T & 3T ENGINE SERVICE – Cylinder Head

Fig. 4-13

**INSPECTION & REPAIR****Cylinder Head**

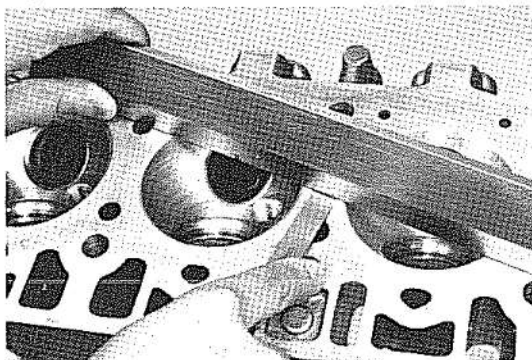
1. Clean the combustion chamber and remove any gasket material from the manifold and head surface.
Check the cylinder head for cracks or excessively burnt valve surfaces.

Fig. 4-14



2. Check the cylinder head surface flatness with a precision straight edge.

Fig. 4-15



3. If warpage exceeds the limit, correct it by machining, or replace the head.

Cylinder head surface warpage:

Limit 0.05 mm
(0.002 in.)

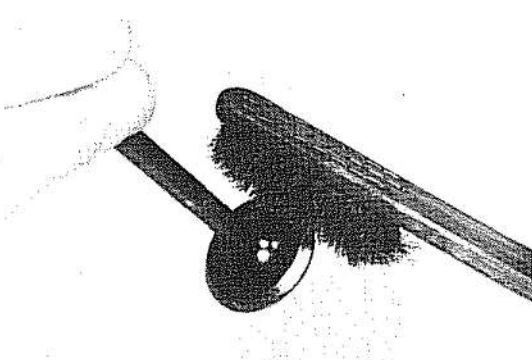
Maximum reface:

Limit 0.2 mm
(0.01 in.)

Manifold mounting surface warpage:

Limit 0.10 mm
(0.004 in.)

Fig. 4-16

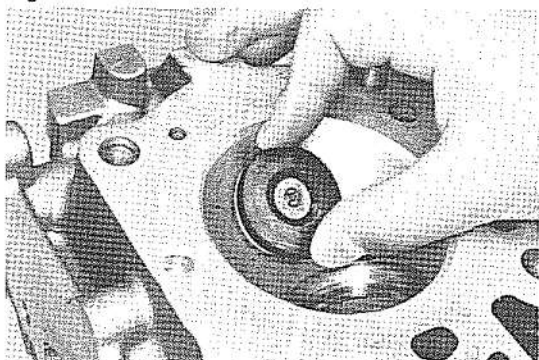
**Valve, Guide & Seat**

1. Clean the valves.

2T & 3T ENGINE SERVICE — Cylinder Head

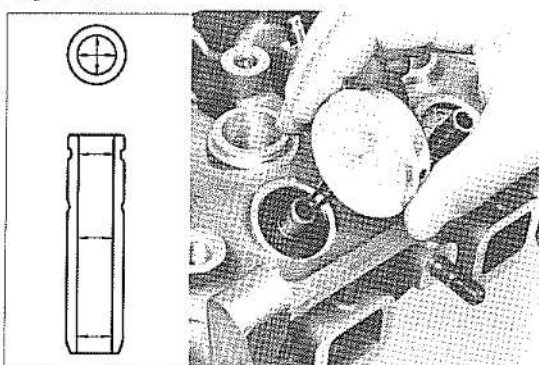
4-9

Fig. 4-17



2. Check the valve stem to valve guide clearance of each valve by inserting the valve stem into the guide and moving back and forth as shown in the figure.

Fig. 4-18



3. Measure the valve stem oil clearance.
 - (1) Measure the inside diameter of the valve guide at several places with an inside dial gauge.

- (2) Measure the valve stem diameter.
- (3) Calculate the clearance between the valve stem and valve guide by subtracting the difference where the clearance is the largest.

Stem oil clearance:

Limit	IN	0.08 mm (0.003 in.)
	EX	0.10 mm (0.004 in.)

If the clearance exceeds the limit, replace both valve and guide.

—Note —

Measure at several places and use the maximum wear for calculation.

Fig. 4-19

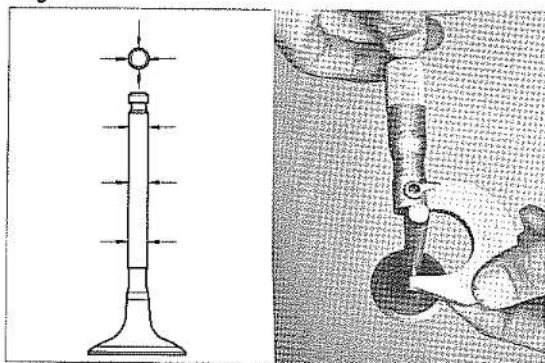
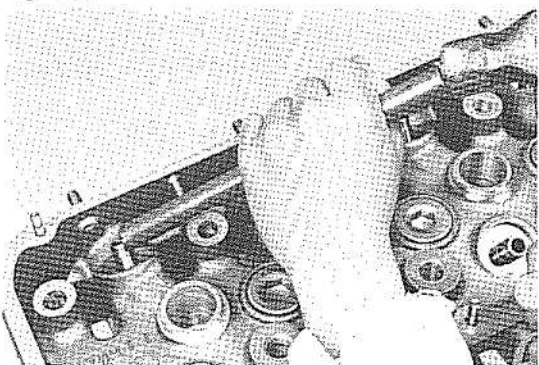
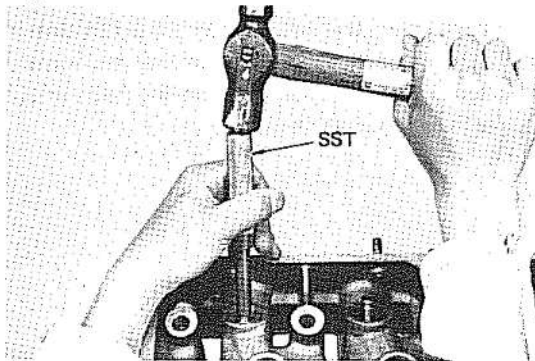


Fig. 4-20

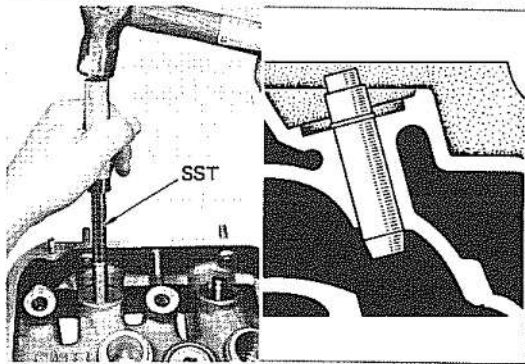


4. Replace the valve guide.
 - (1) Bend the bushing.

4-10

2T & 3T ENGINE SERVICE – Cylinder Head**Fig. 4-21**

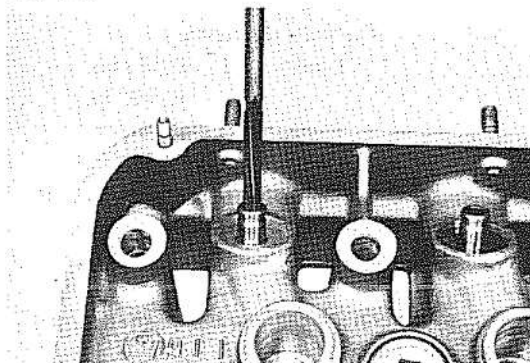
- (2) Heat the cylinder head to 80 – 100°C (176 – 212°F).
- (3) From the top, drive out the guide toward the combustion chamber with SST.
SST [09201-60011]

Fig. 4-22

- (4) Heat the cylinder head to 80 – 100°C (176 – 212°F).
- (5) With SST drive in the guide until the snap ring makes contact.
SST [09201-60011]

— Note —

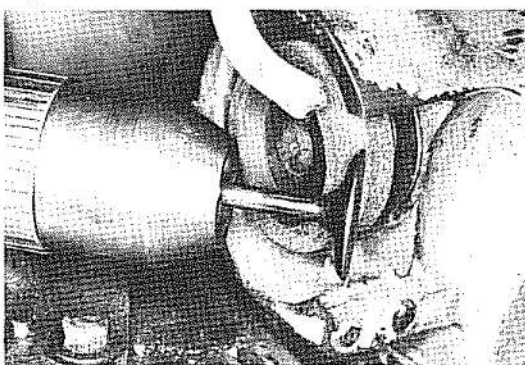
1. Insure that the hole is clean.
2. Before inserting the guide apply a thin coat of oil to it and the guide hole.

Fig. 4-23

- (6) Ream the guide to the specified clearance with an 8 mm (0.3 in.) reamer.

Stem oil clearance:

IN	0.025 – 0.060 mm (0.0010 – 0.0024 in.)
EX	0.030 – 0.065 mm (0.0012 – 0.0026 in.)

Fig. 4-24

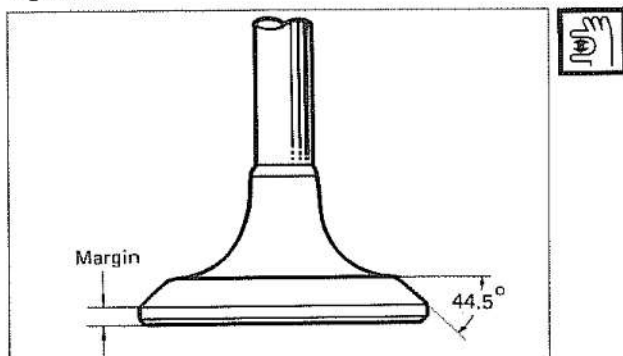
5. Grinding valves and seats
 - (1) Grind all valves to remove the pits and carbon.

Valve face angle: 44.5°

2T & 3T ENGINE SERVICE – Cylinder Head

4-11

Fig. 4-25

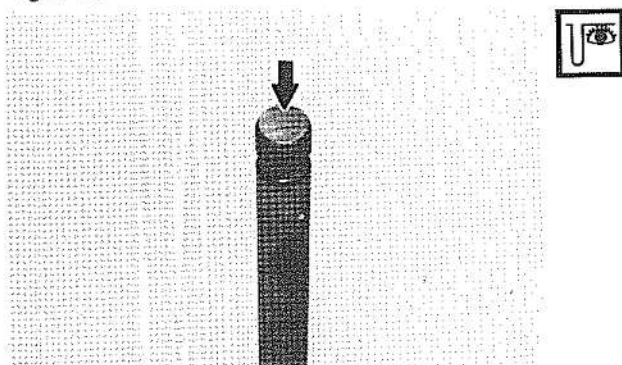


- (2) Check the valve head margin and replace if less than specified.

Head edge thickness:

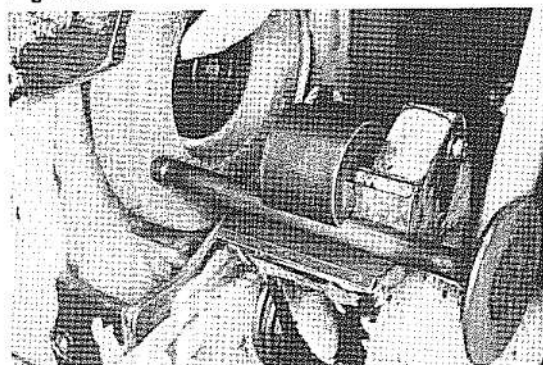
Limit	IN	0.5 mm (0.02 in.)
	EX	0.7 mm (0.03 in.)

Fig. 4-26



- (3) Inspect the valve stem tip.

Fig. 4-27

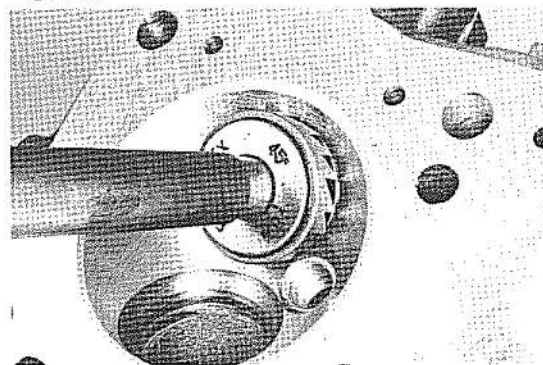


- (4) If the valve stem tip is worn, resurface with a valve grinder, but do not grind off more than 0.5 mm (0.02 in.).

Overall length:

Limit	108.5 mm (4.27 in.)
--------------	--------------------------------------

Fig. 4-28

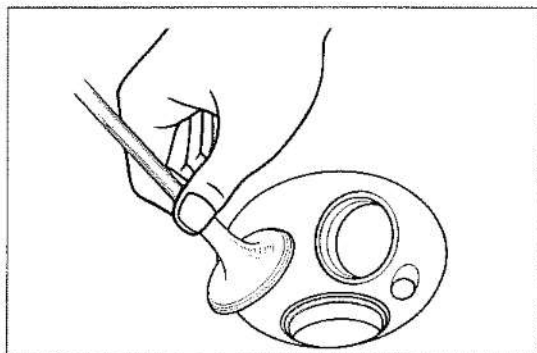


- (5) Resurface the valve seats with a 45° carbide cutter. Remove only enough metal to clean the seat.

4-12

2T & 3T ENGINE SERVICE — Cylinder Head

Fig. 4-29



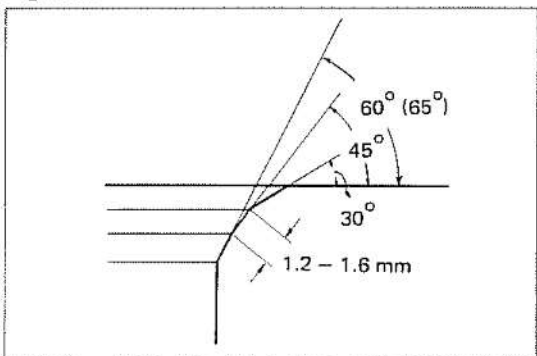
- (6) Coat the valve face with prussian blue or white lead. Locate the contact point on the valve by rotating the valve against seat.

— Note —

Seat contact should be in middle of valve face with the following width:

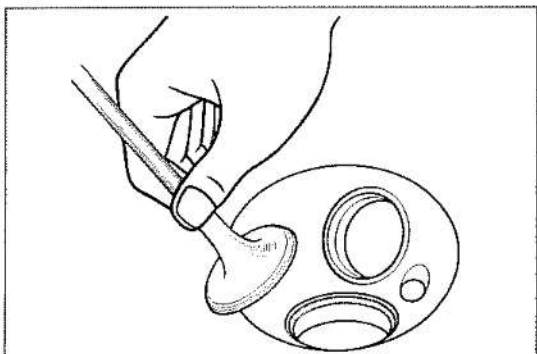
- | | |
|----|-----------------------------------|
| IN | 1.2 – 1.6 mm
(0.05 – 0.06 in.) |
| EX | 1.2 – 1.6 mm
(0.05 – 0.06 in.) |

Fig. 4-30



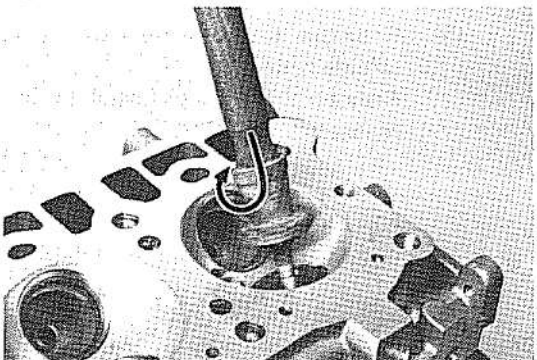
- (7) Correct the seat position.
To correct seating that is too high, use 30° and 45° cutters. If seating is too low, use 60° (IN) or 65° (EX) and 45° cutters.

Fig. 4-31



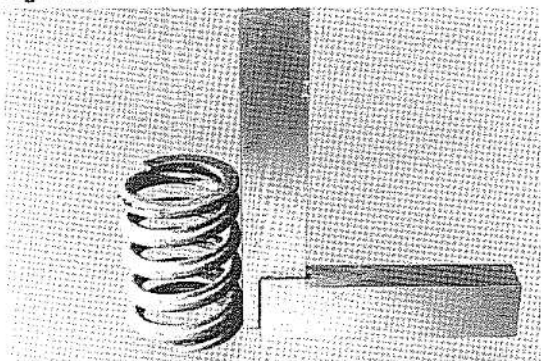
- (8) Check valve concentricity.
Lightly coat seat with prussian blue. Install valve and rotate. If blue appears 360° around face, valve stem and face are concentric. If not, replace the valve.

Fig. 4-32



- (9) Valve seat grinding
Turn the stem slightly with each light tap on the valve seat.

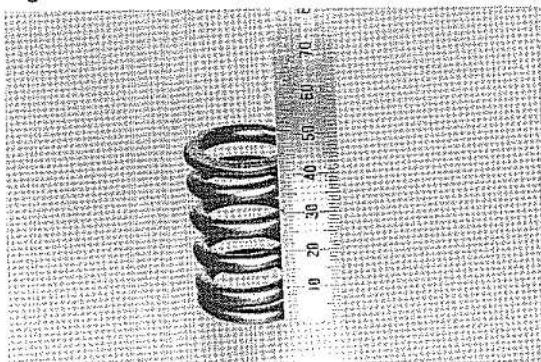
Fig. 4-33

**Valve Spring**

1. Check the squareness of the valve springs with a steel square and surface plate. Turn the spring around slowly and observe the space between the top of the spring and the square. Replace the spring if it is out of square more than the specified limit.

Squareness limit: 1.9 mm
(0.08 in.)

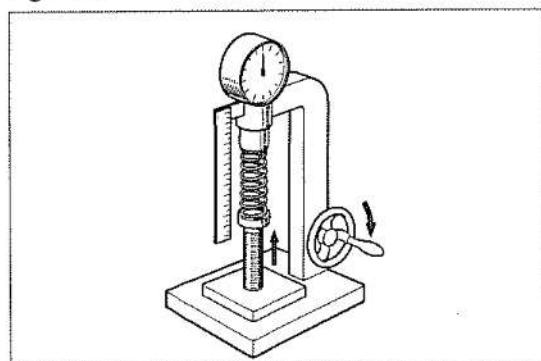
Fig. 4-34



2. Measure the spring free height. Replace springs that do not meet specification.

Free length: 42.1 mm
(1.66 in.)

Fig. 4-35

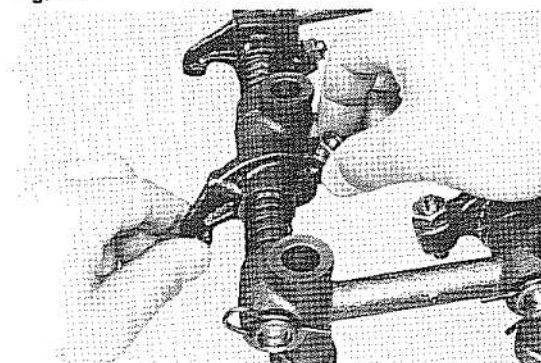


3. Using a spring tester, measure the tension of each spring at the specified installed height. Replace any spring that does not meet specification.

Installed length: 37.7 mm
(1.48 in.)

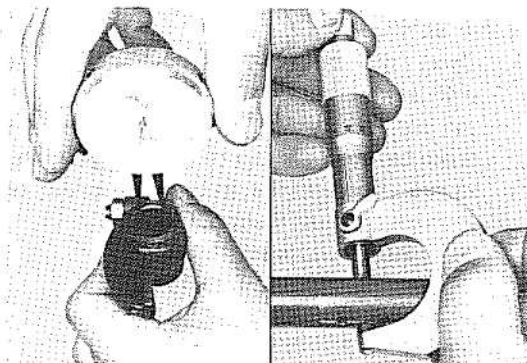
Installed load:
STD 26.3 kg
(58.0 lb)
Limit 23.7 kg
(52.3 lb)

Fig. 4-36

**Rocker Arm & Shaft**

1. Check the rocker arm to shaft clearance. If worn excessively, disassemble and inspect.

4-14

2T & 3T ENGINE SERVICE – Cylinder Head**Fig. 4-37**

2. Measure the clearance with a dial indicator and outside micrometer. If clearance exceeds the limit, replace the rocker arm bushings and/or shaft.

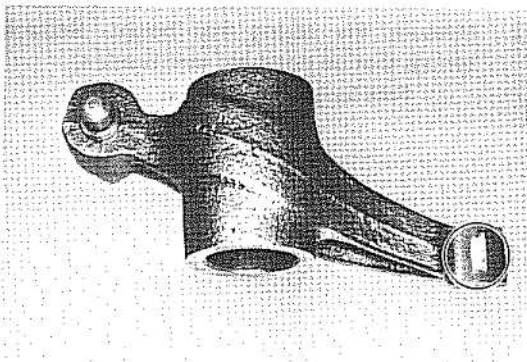
Oil clearance:

STD 0.01 – 0.05 mm
(0.0004 – 0.0020 in.)

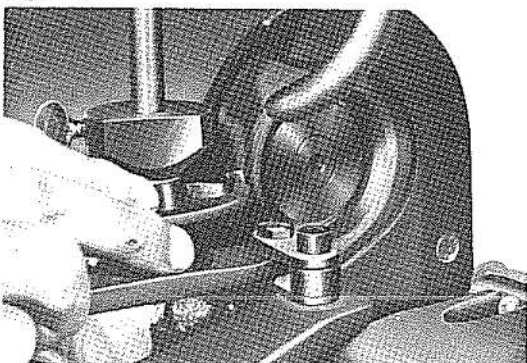
Limit 0.06 mm
(0.0024 in.)

– Note –

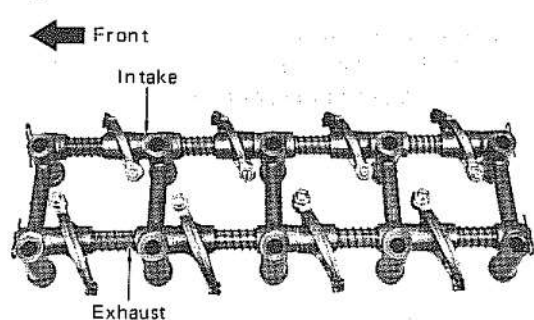
Measure at the maximum wear point on the rocker arm installation part.

Fig. 4-38

3. Check the contact surface of the valve rocker arm stem end.

Fig. 4-39

4. If the valve rocker arm surface contacting the valve stem end is worn excessively, either grind or replace the rocker arm.

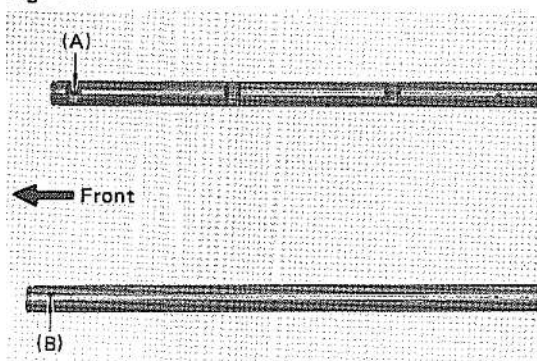
Fig. 4-40

5. Assemble the rocker arm and shaft.
(1) Assemble the rocker arm, springs and supports as shown in the figure.

2T & 3T ENGINE SERVICE – Cylinder Head

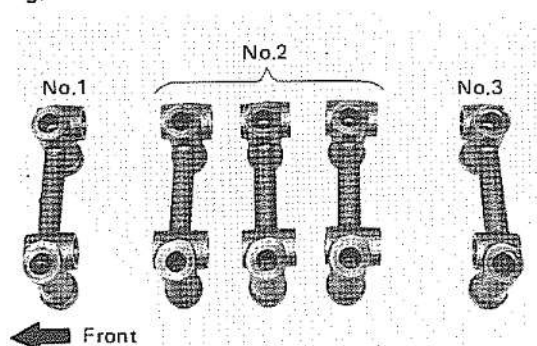
4-15

Fig. 4-41



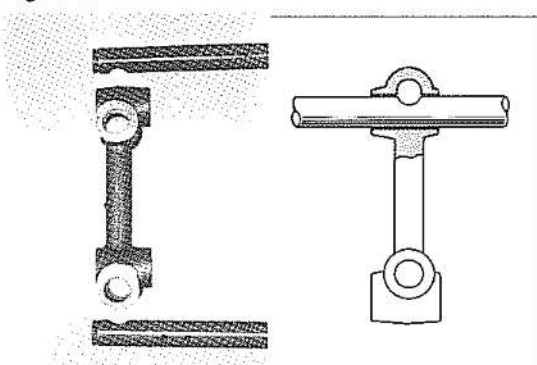
- (2) Face the hole of intake rocker shaft (A) and exhaust rocker shaft (B) towards the front.

Fig. 4-42



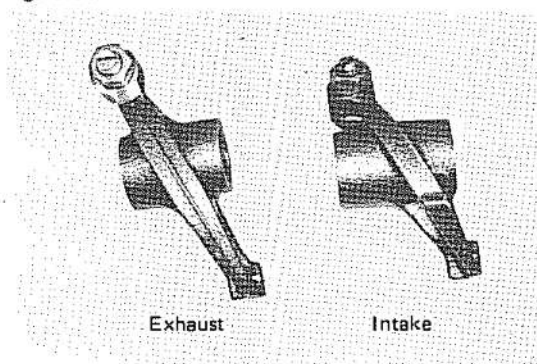
- (3) As there are 3 types of rocker supports, install No.1 to the front side and No.3 to the rear side.
 (4) Face the side of the rocker support with an F mark toward the front.
 (5) The short rocker arm is for intake side.

Fig. 4-43



- (6) Align the hole of the rocker support with the rocker shaft groove and install to the cylinder head bolt.

Fig. 4-44



- (7) The short rocker arms are for intake and the long for exhaust.

Fig. 4-45

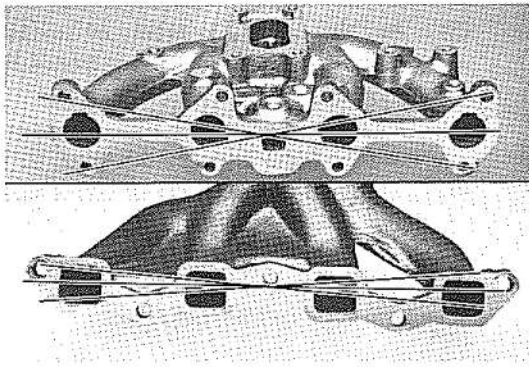
**Manifold**

1. Inspect the cylinder head contacting surfaces for warpage and replace the manifold if it exceeds the limit.

Installing surface warpage:

Limit **0.3 mm**
 (0.01 in.)

Fig. 4-46



2. Check the manifold surface for flatness with a precision straight edge.

2T & 3T ENGINE SERVICE – Cylinder Head

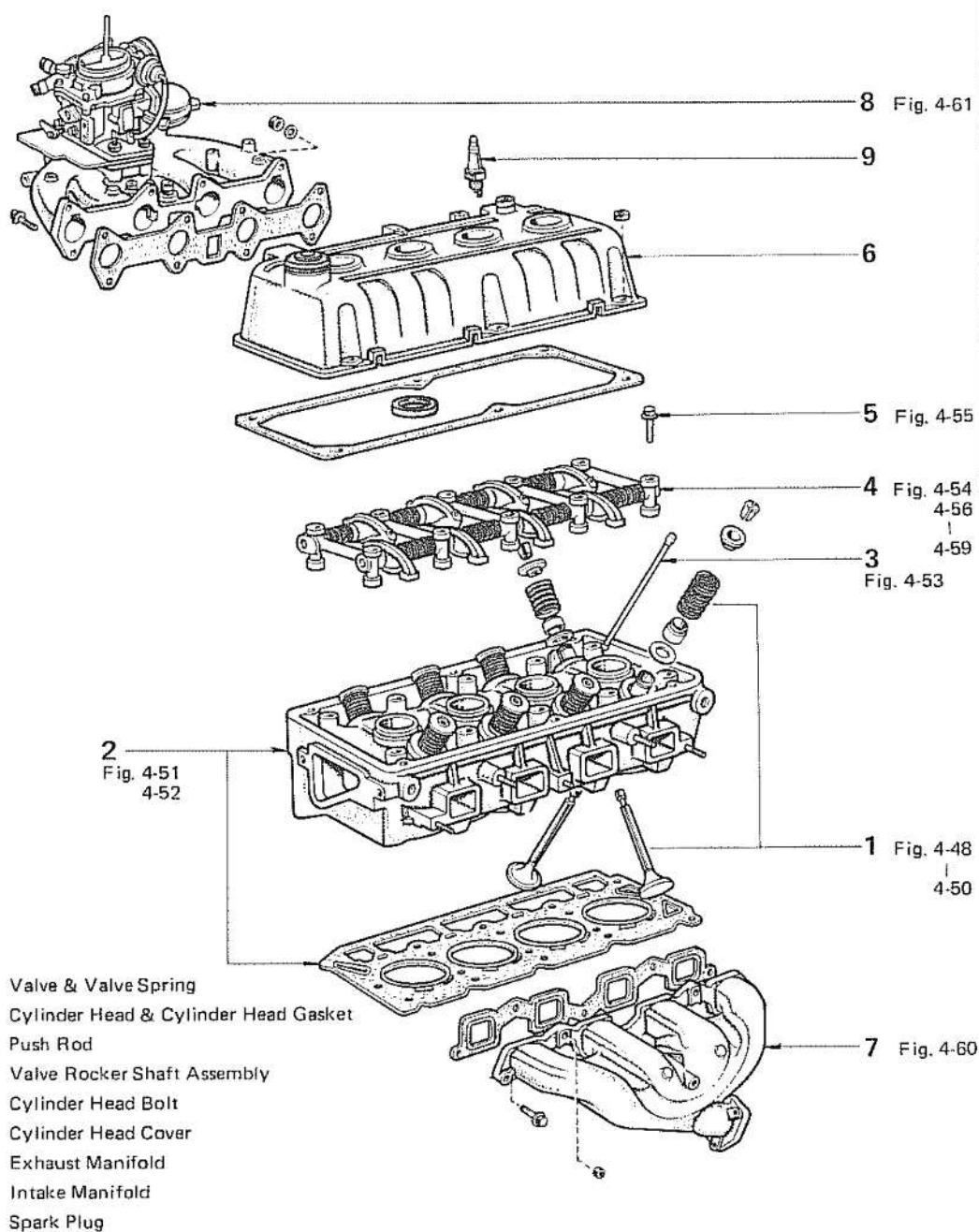
4-17

ASSEMBLY

Assemble the parts in the numerical order shown in the figure.

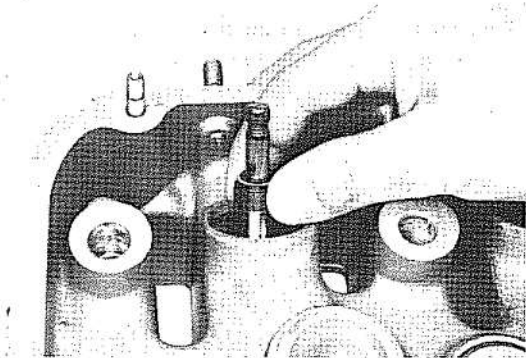
Fig. 4-47

- Thoroughly clean the parts to be assembled.
- Apply clean engine oil on the sliding and rotating surfaces of the parts before assembly.



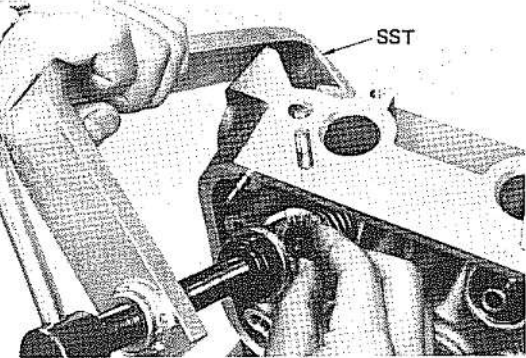
4-18 2T & 3T ENGINE SERVICE – Cylinder Head

Fig. 4-48



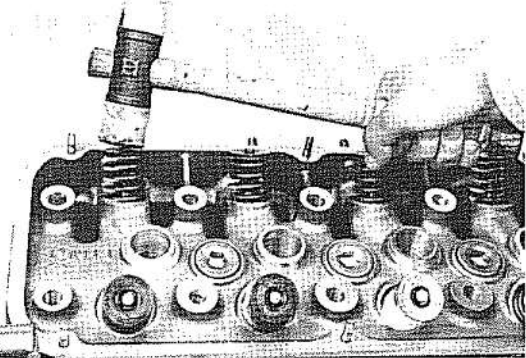
Install the spring seat and oil seal as shown in the figure. The head must be clean and the oil seal inserted to where the end contacts the spring seat top.

Fig. 4-49



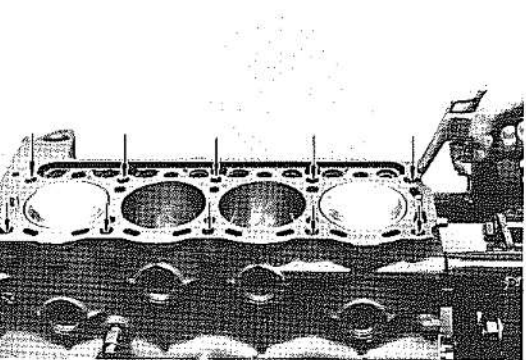
Assemble the valve spring and install the retainer locks with SST.
SST [09202-43012]

Fig. 4-50



Tap the valve stems lightly to assure proper fit.

Fig. 4-51

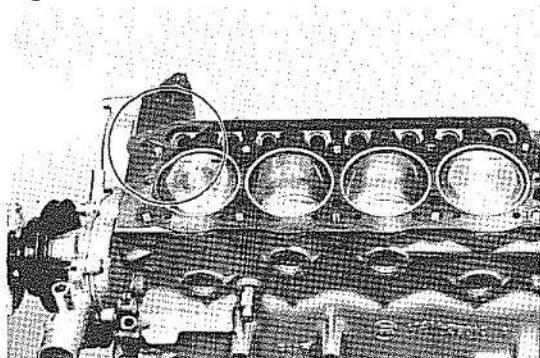


Clean the bolt hole with compressed air.

2T & 3T ENGINE SERVICE — Cylinder Head

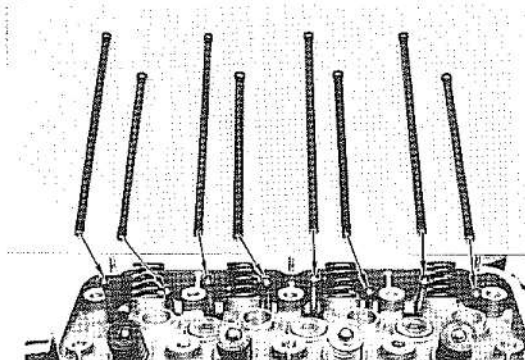
4-19

Fig. 4-52



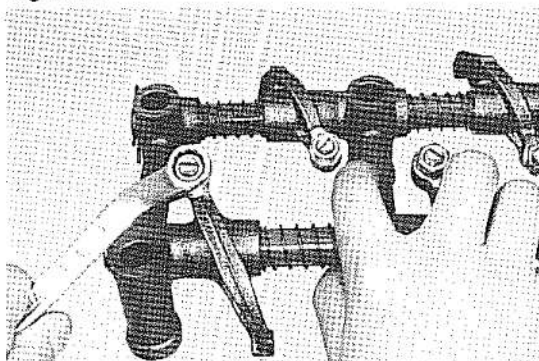
Install a new gasket as shown in the figure.

Fig. 4-53



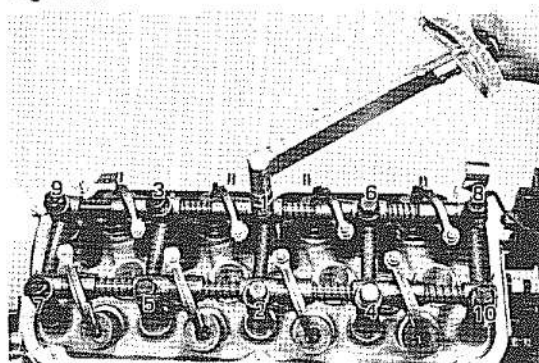
The short push rods are for intake and the long for exhaust.

Fig. 4-54



Loosen the adjusting screw lock nut before installing.

Fig. 4-55



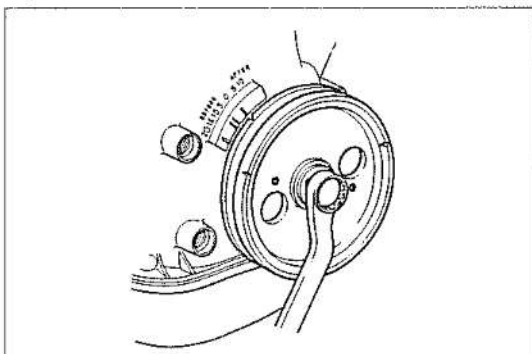
Tighten each cylinder head bolt a little at a time to the specified torque in the sequence shown in the figure.

Tightening torque: 8.5 — 9.5 kg-m
(61 — 69 ft-lb)

4-20

2T & 3T ENGINE SERVICE – Cylinder Head

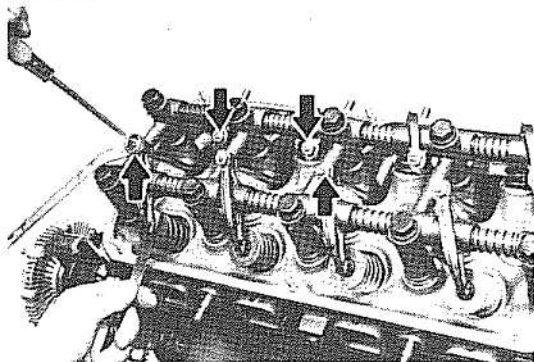
Fig. 4-56



Adjust the valve clearance.

1. Set No.1 cylinder TDC/compression.

Fig. 4-57



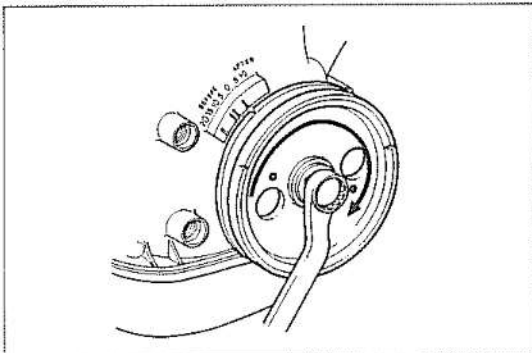
2. First, adjust the valve clearance of only the valves indicated by arrows in the figure.

Valve clearance:

IN 0.18 mm
(0.007 in.)

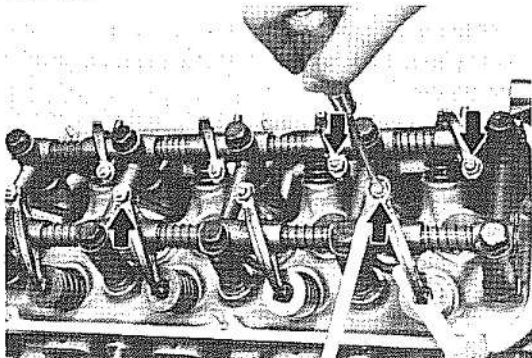
EX 0.30 mm
(0.012 in.)

Fig. 4-58



3. Turn the crankshaft 360° and align the mark.

Fig. 4-59

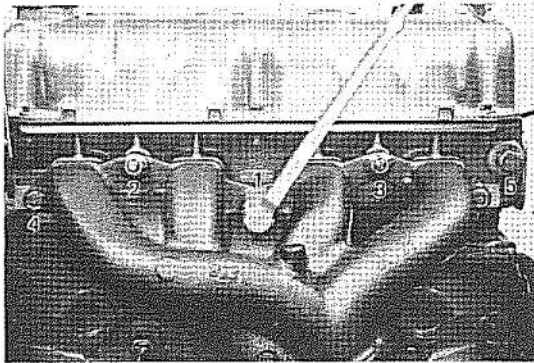


4. Next, adjust the clearances of the remaining valves (indicated by arrows).

2T & 3T ENGINE SERVICE – Cylinder Head

4-21

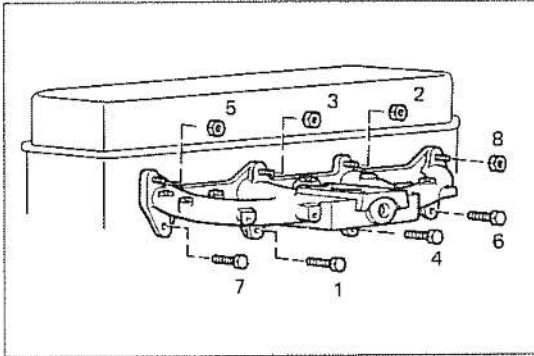
Fig. 4-60



5. Tighten the each exhaust manifold bolt and nut a little at a time to the specified torque in the sequence shown in the figure.

Tightening torque: 3.0 – 4.5 kg-m
(22 – 32 ft-lb)

Fig. 4-61



6. Tighten the each intake manifold bolt and nut a little at a time to the specified torque in the sequence shown in the figure.

Tightening torque: 1.8 – 2.5 kg-m
(13 – 18 ft-lb)

4-22

2T & 3T ENGINE SERVICE – Timing Chain**TIMING CHAIN****DISASSEMBLY**

Disassemble the parts in the numerical order shown in the figure.

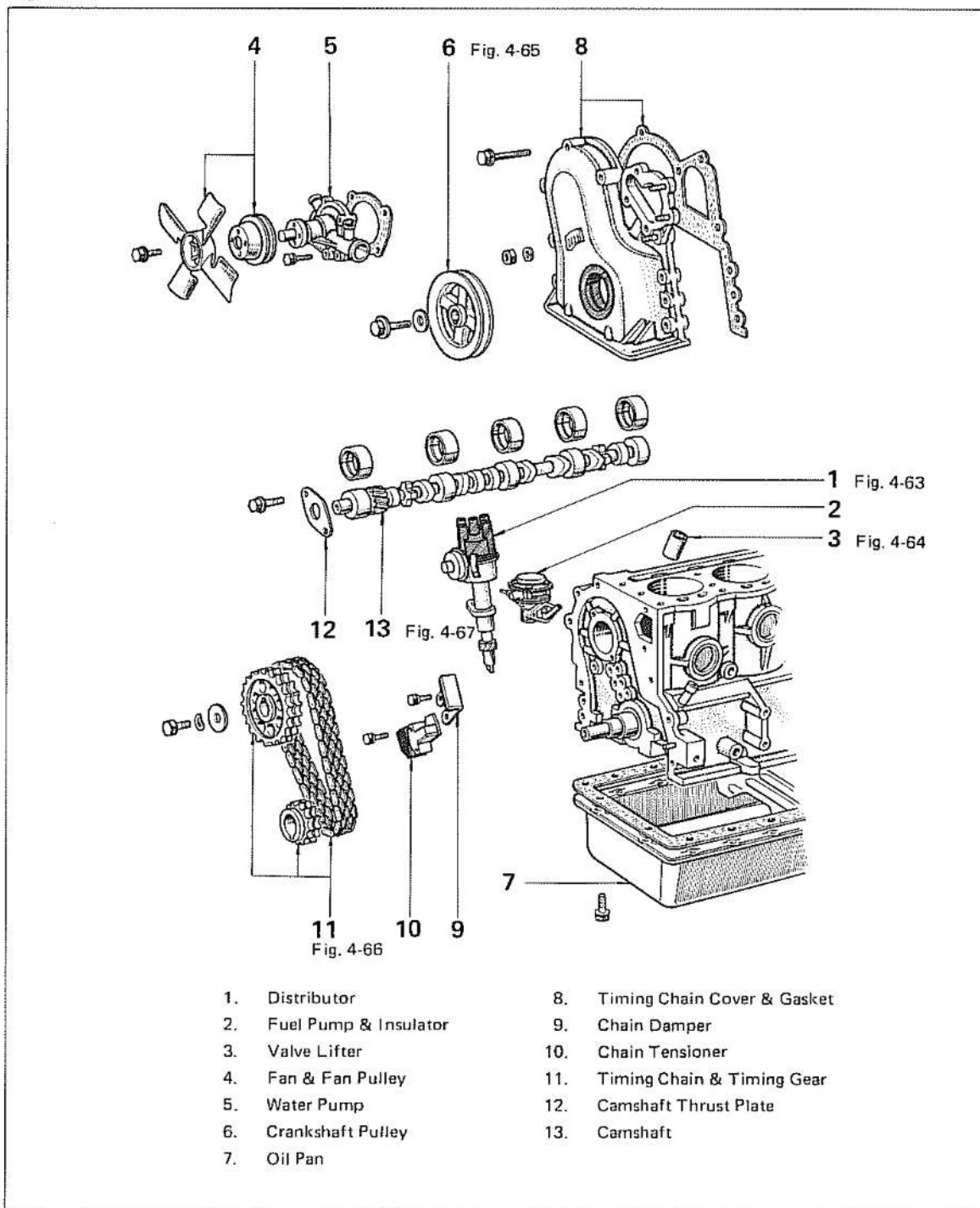
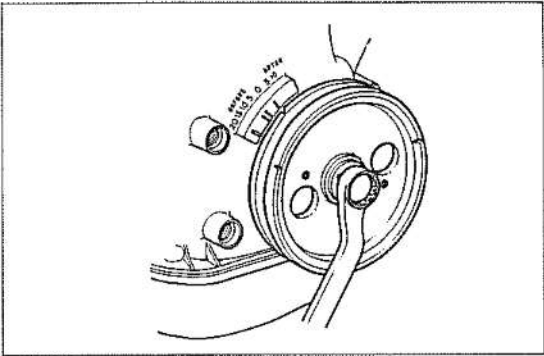
Fig. 4-62

Fig. 4-63

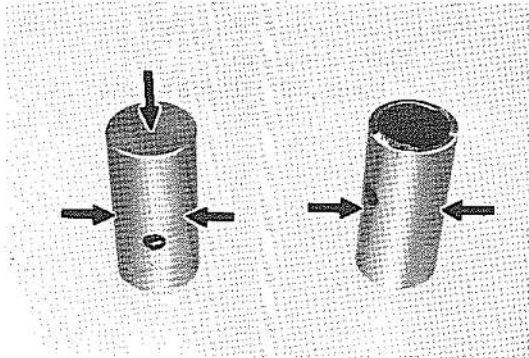


4-24 2T & 3T ENGINE SERVICE – Timing Chain

Fig. 4-67

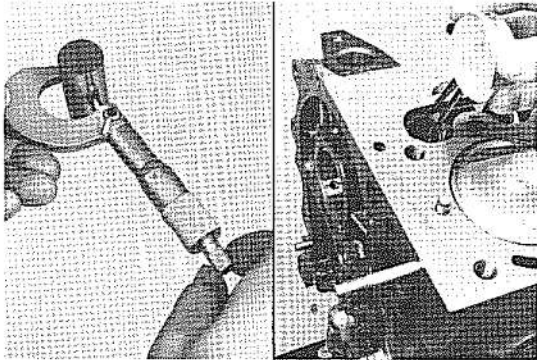
While turning the camshaft, slowly pull out so as not to damage the camshaft bearing.

Fig. 4-68

**INSPECTION & REPAIR****Valve Lifter**

Check the valve lifter for wear or damage.

Fig. 4-69

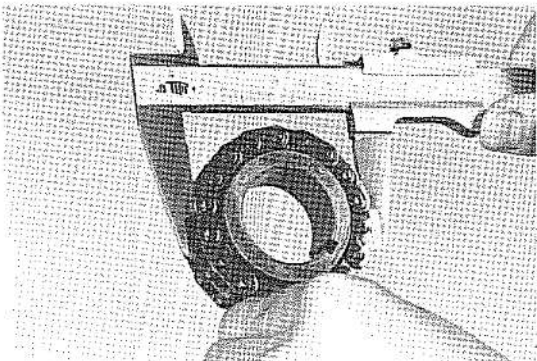


Inspect the lifters and lifter bores for wear.

Oil clearance:

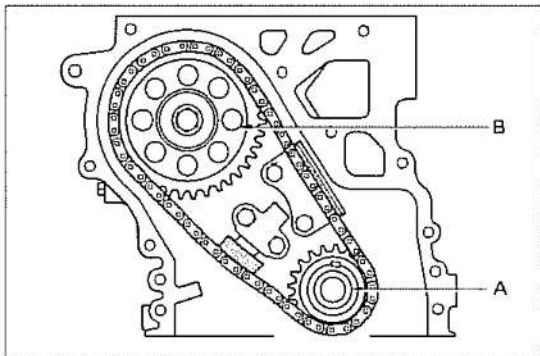
STD	0.02 – 0.03 mm (0.0008 – 0.0012 in.)
Limit	0.1 mm (0.004 in.)

Fig. 4-70

**Timing Gear & Chain**

1. Inspect gears and chains for cracks, wear or chipped teeth.
If damaged, replace gears and chain.
2. Measure the gear for wear in the method shown in the figure.

Fig. 4-71

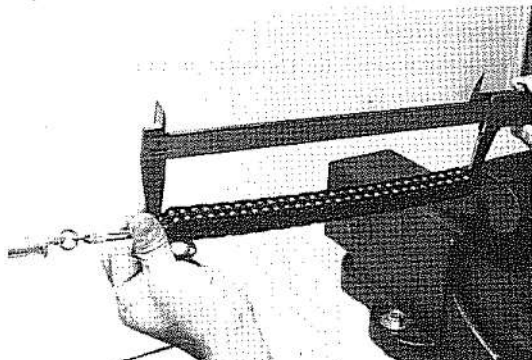


3. If measurement is below limit, replace gears and chains.

Wear limit:

A	Crankshaft sprocket
	59.4 mm (2.34 in.)
B	Camshaft sprocket
	113.8 mm (4.48 in.)

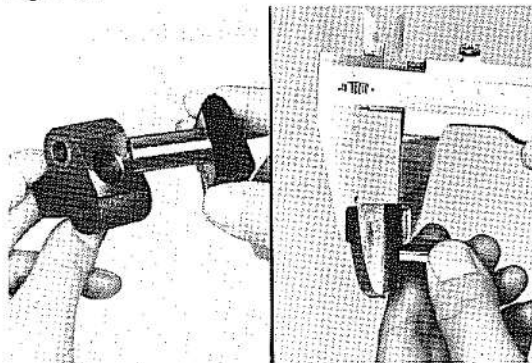
4-26

2T & 3T ENGINE SERVICE — Timing Chain**Fig. 4-72**

4. Measure the elongation of the timing chain.

Chain elongation:

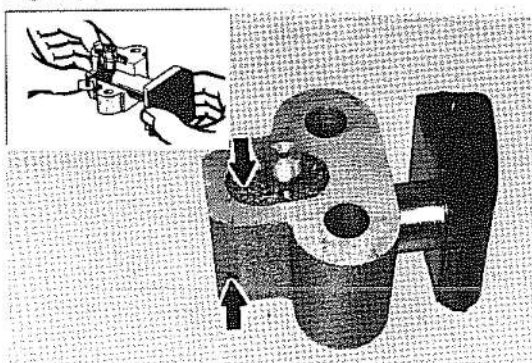
Limit 291.4 mm tension at 5 kg
(11.47 in.) (11 lb)

Fig. 4-73**Chain Tensioner**

1. Check the body and plunger for wear and measure the tensioner head as shown in the figure. If worn down over the limit, replace as a unit.

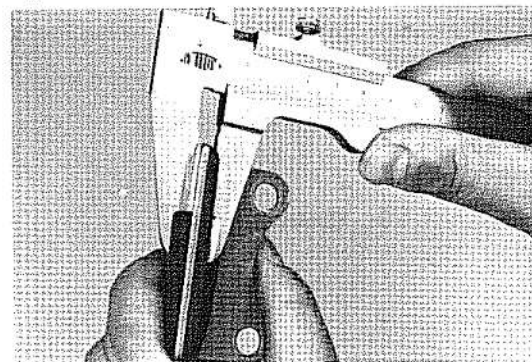
Plunger head thickness:

Limit 12.5 mm
(0.49 in.)

Fig. 4-74

2. Tensioner plunger and body cylinder air tightness test.

Take out the plunger spring. Coat the plunger with engine oil, close off the 2 oil orifices on the tensioner body and pull the plunger. If there is a return pulling force on the plunger, it is air tight.

Fig. 4-75**Chain Damper**

Inspect the chain damper for wear.

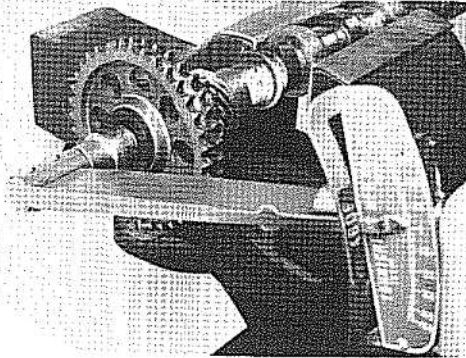
Measure chain damper and check for wear.

Damper thickness: Limit 5.0 mm
(0.20 in.)

2T & 3T ENGINE SERVICE – Timing Chain

4-27

Fig. 4-76

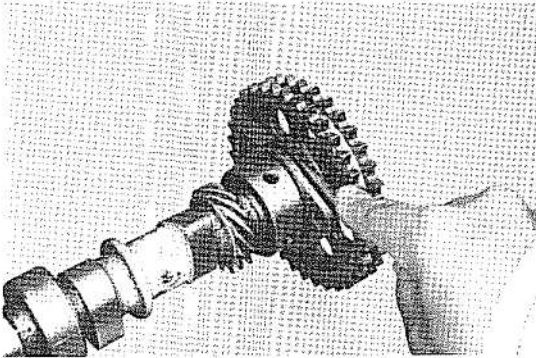
**Timing Gear & Thrust Plate**

1. Install the thrust plate and timing gear to the camshaft.

Tighten the camshaft timing gear set bolt.

**Tightening torque: 7.0 – 11.0 kg-m
(51 – 79 ft-lb)**

Fig. 4-77



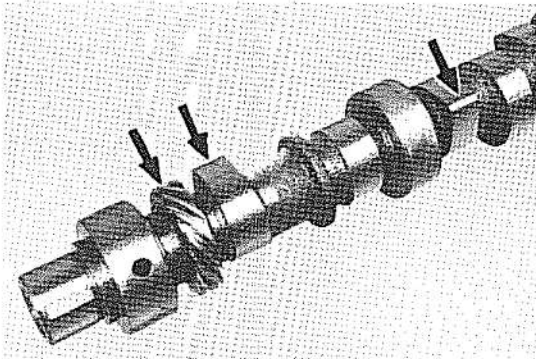
2. Measure the thrust clearance.
If it exceeds limit, replace the thrust plate.

Thrust clearance:

**STD 0.07 – 0.15 mm
(0.003 – 0.006 in.)**

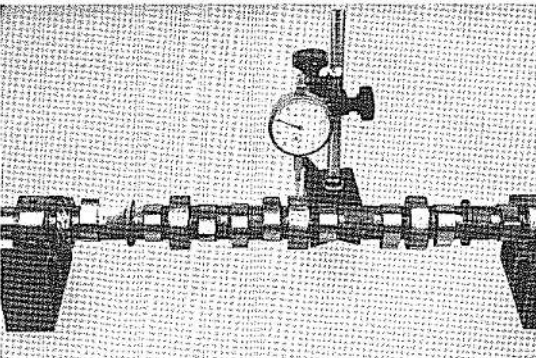
**Limit 0.3 mm
(0.01 in.)**

Fig. 4-78

**Camshaft**

1. Inspect the gear and cam for cracks, wear or chipped teeth.
If damaged, replace the camshaft.

Fig. 4-79



2. Check the camshaft for runout. Replace camshaft if it exceeds the limit.

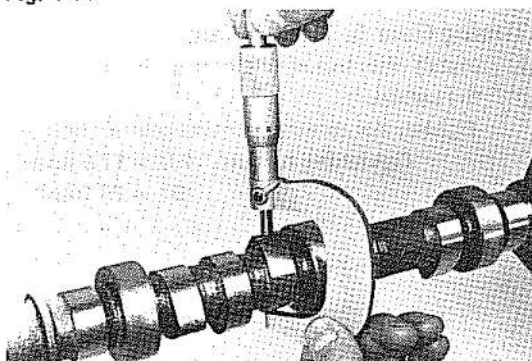
**Runout limit: 0.06 mm
(0.002 in.)**

— Note —

Rotate the camshaft one turn, and divide the maximum gauge difference by 2.

4-28 2T & 3T ENGINE SERVICE – Timing Chain

Fig. 4-80

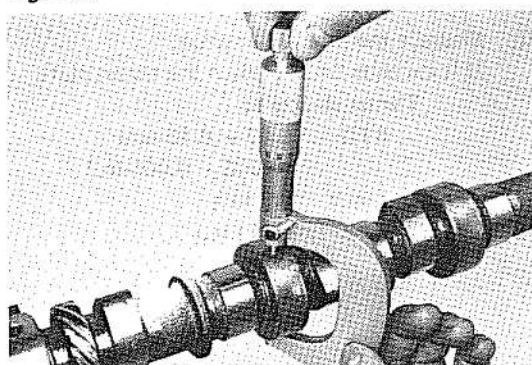


3. Measure the cam lobe height. If wear exceeds the limit, replace the camshaft.

Cam height:

Limit	IN	38.29 mm
		(1.507 in.)
	EX	38.19 mm
		(1.504 in.)

Fig. 4-81

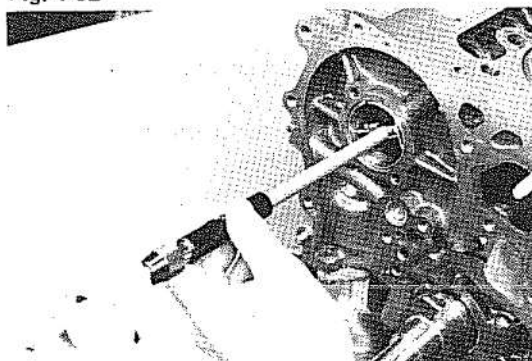


4. Measure the oil clearance.
(1) Measure the camshaft journal.

Journal diameter:

No.1	46.459 – 46.475 mm
	(1.8291 – 1.8297 in.)
No.2	46.209 – 46.225 mm
	(1.8192 – 1.8199 in.)
No.3	45.959 – 45.975 mm
	(1.8094 – 1.8100 in.)
No.4	45.709 – 45.725 mm
	(1.7996 – 1.8002 in.)
No.5	45.459 – 45.475 mm
	(1.7897 – 1.7904 in.)

Fig. 4-82

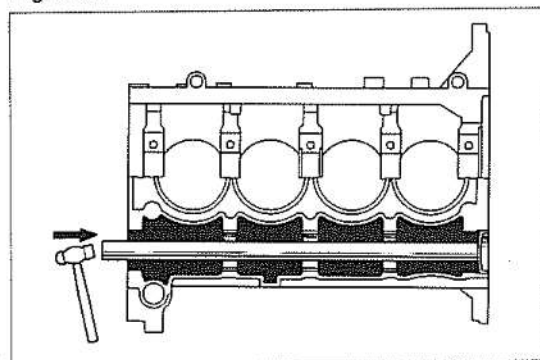


- (2) Measure the inner diameter of the bearing.

Oil clearance:

STD	0.025 – 0.066 mm
	(0.0010 – 0.0026 in.)
Limit	0.1 mm
	(0.004 in.)

Fig. 4-83

**Replace The Camshaft Bearing**

When replacing, use SST and remove parts in the following order:

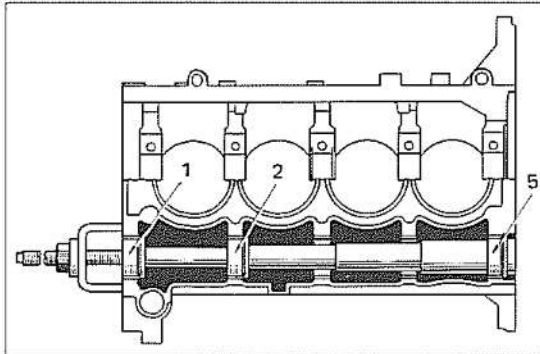
SST [09215-25010]

1. Tight plug

2T & 3T ENGINE SERVICE – Timing Chain

4-29

Fig. 4-84

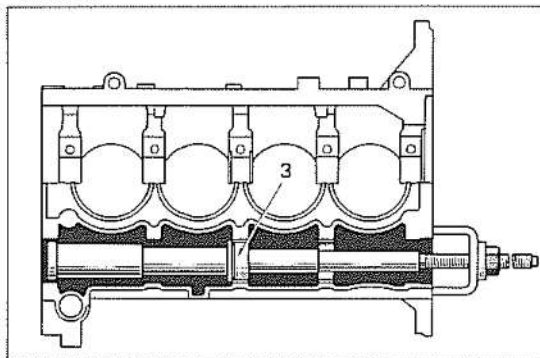


2. Remove the No.1, No.2 and No.5 bearings.

– Note –

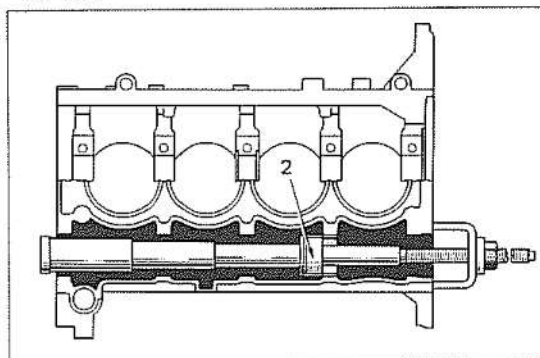
The numbers 1 through 5 imprinted on the SST refer to the bearing number.
SST [09215-25010]

Fig. 4-85



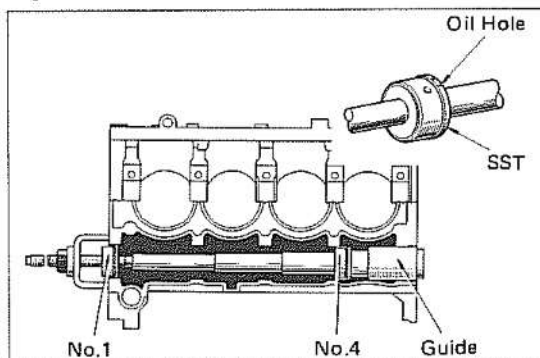
3. Remove the No.3 bearing.
Pull the No.3 bearing rearward and leave it in the cylinder block.

Fig. 4-86



4. Remove the No.3 and No.4 bearings.
Insert No.2 piece into the No.3 bearing in the block and remove both No.3 and No.4 bearings together.

Fig. 4-87

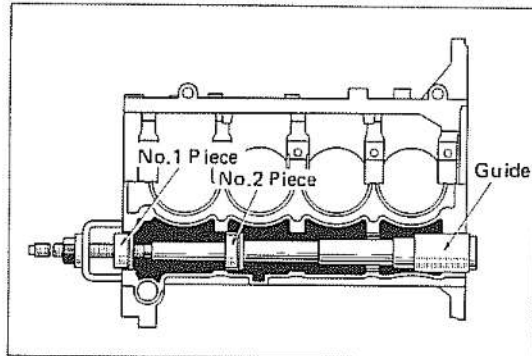


5. Install the No.4 bearing.
Use No.1 bearing as a guide.

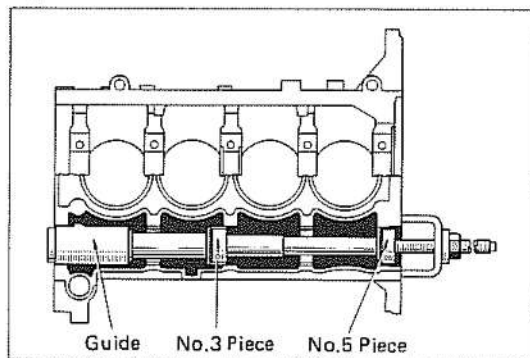
– Note –

When inserting the bearings, align each oil hole with those on each piece.

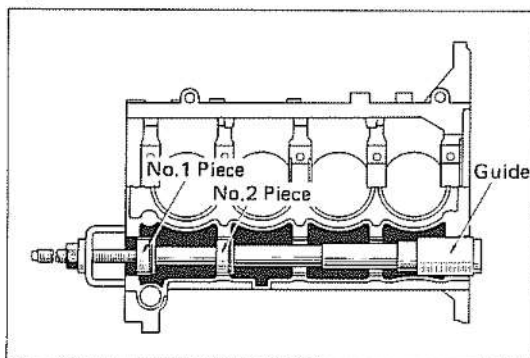
4-30

2T & 3T ENGINE SERVICE – Timing Chain**Fig. 4-88**

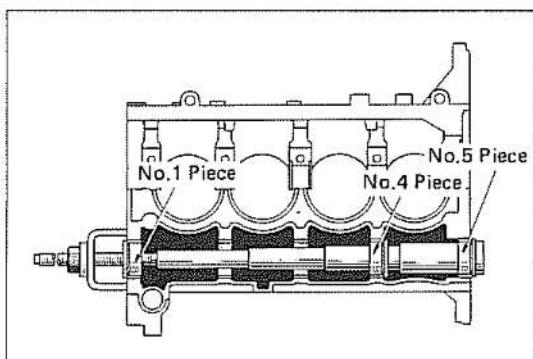
6. Install the No.2 bearing.
Use No.1 piece as a guide.

Fig. 4-89

7. Install the No.3 bearing.
Use No.5 piece as a guide.

Fig. 4-90

8. Install the No.1 bearing.
Use No.2 piece as a guide.

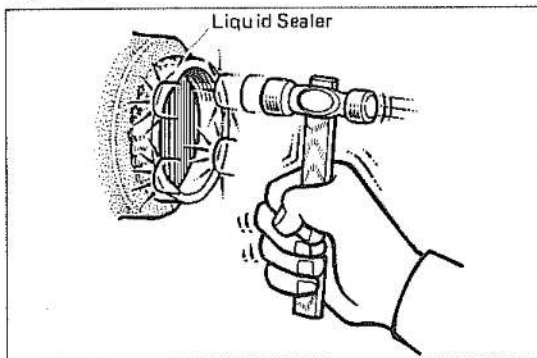
Fig. 4-91

9. Install the No.5 bearing.
Use No.1 and No.4 pieces as guides.

2T & 3T ENGINE SERVICE – Timing Chain

4-31

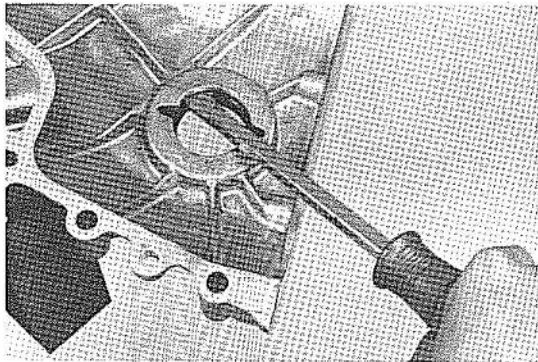
Fig. 4-92



10. Tight plug

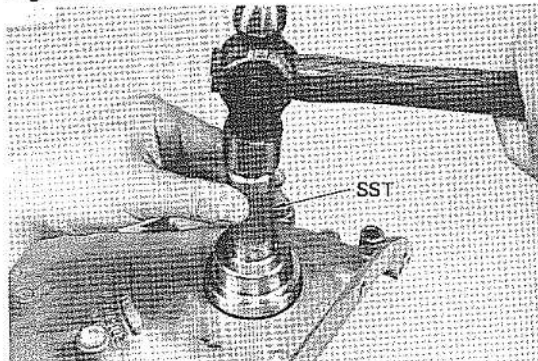
Use a new tight plug coated with liquid sealer.

Fig. 4-93

**Replace The Crankshaft Front Oil Seal**

1. Remove the oil seal with a screwdriver.

Fig. 4-94

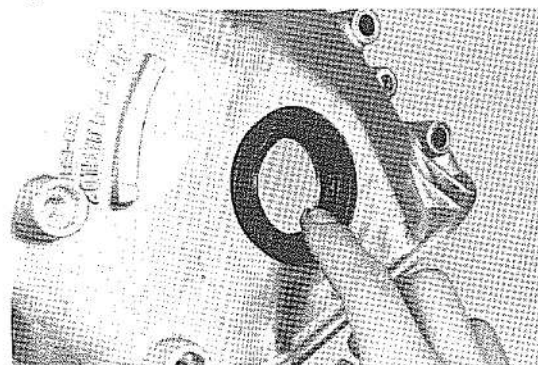


2. Install a new oil seal with SST.
SST[09223-22010]

– Note –

1. Drive in the oil seal until it is about even with the timing gear cover.
2. Be careful not to drive it in slant wise.

Fig. 4-95



3. After driving in the seal, coat the seal lip lightly with MP grease.

ASSEMBLY

Assemble the parts in the numerical order shown in the figure.

Fig. 4-96

- Thoroughly clean the parts to be assembled.
- Apply clean engine oil on the sliding and rotating surfaces of the parts before assembly.

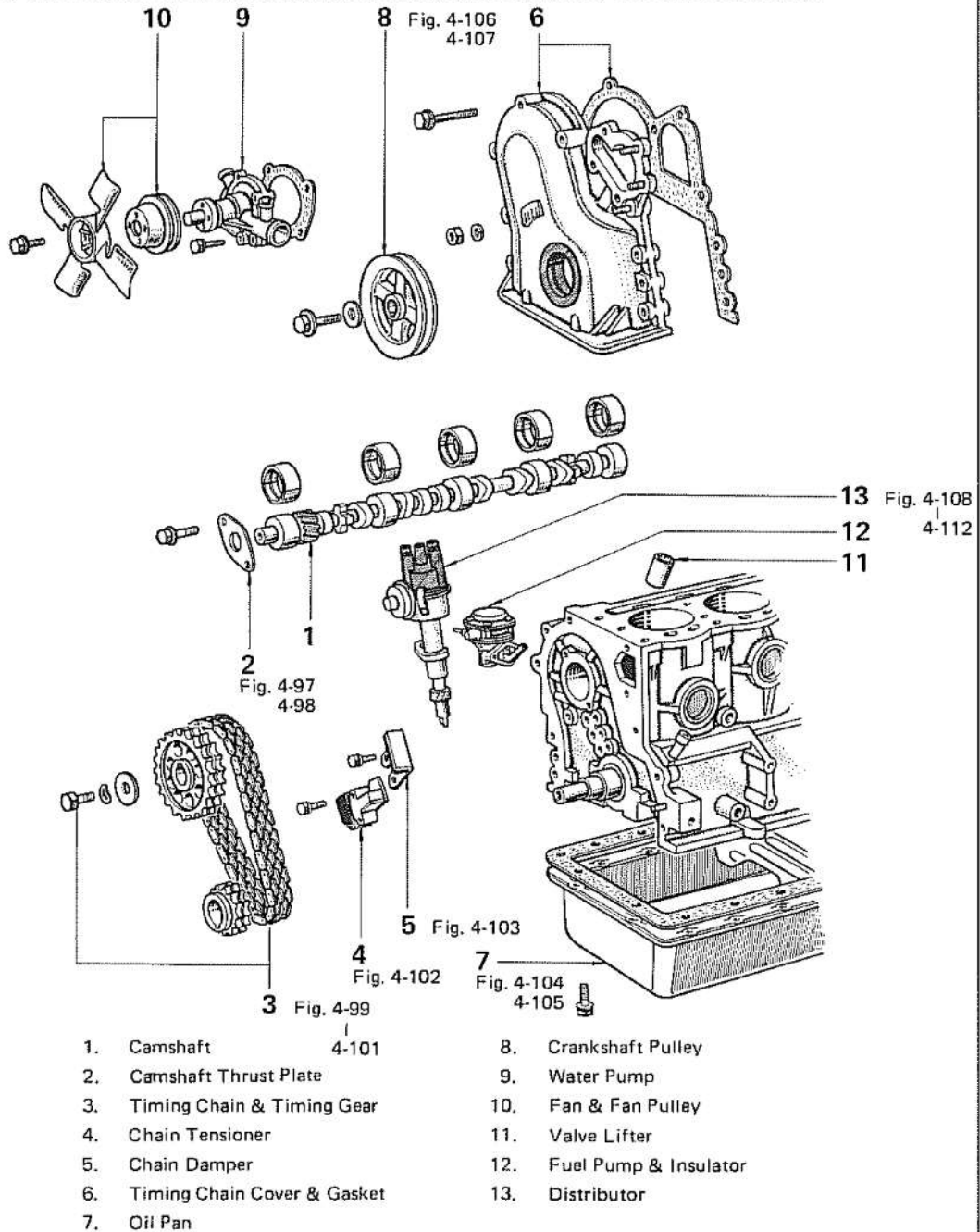
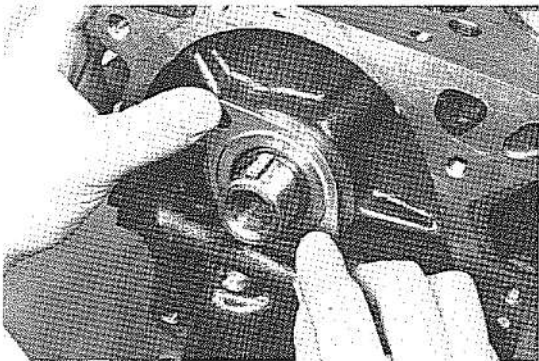
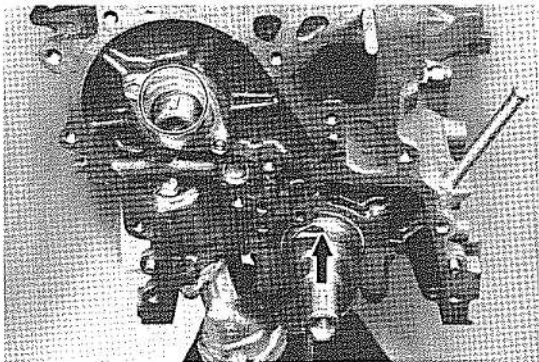


Fig. 4-97



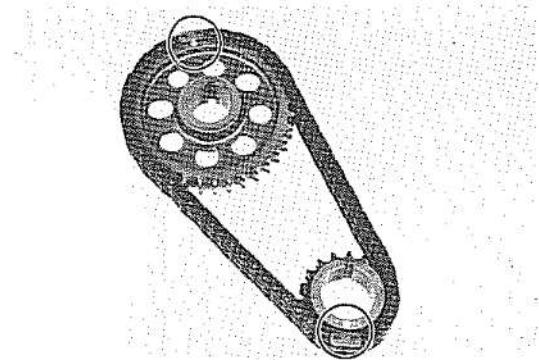
Place the camshaft thrust plate with the marked side outward.

Fig. 4-98



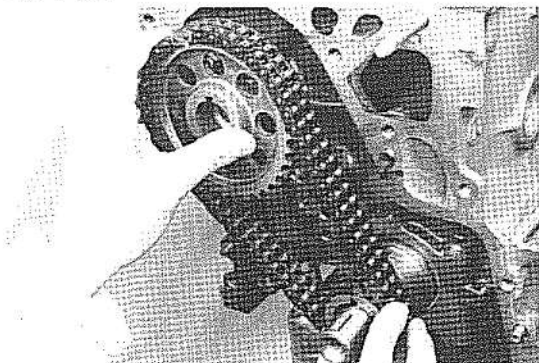
Align the camshaft key with the thrust plate mark.
Face the crankshaft key straight up.

Fig. 4-99



Align the chain and gear timing marks.

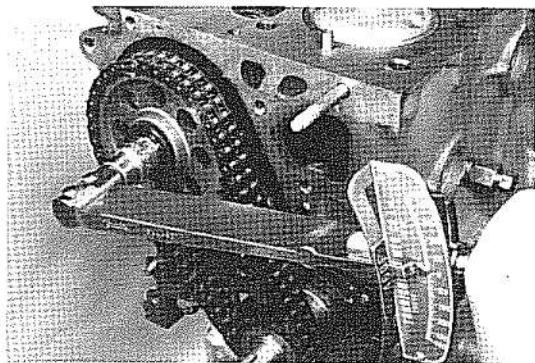
Fig. 4-100



Install the chain and gear together.

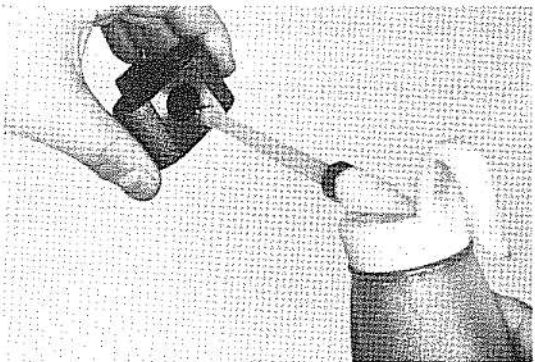
4-34 2T & 3T ENGINE SERVICE – Timing Chain

Fig. 4-101



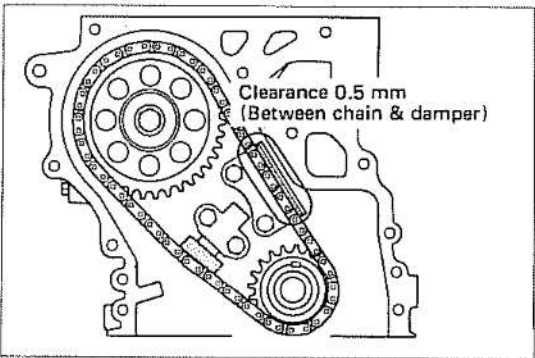
Tighten the camshaft timing gear set bolt.
**Tightening torque: 7.0 – 11.0 kg-m
(51 – 79 ft-lb)**

Fig. 4-102



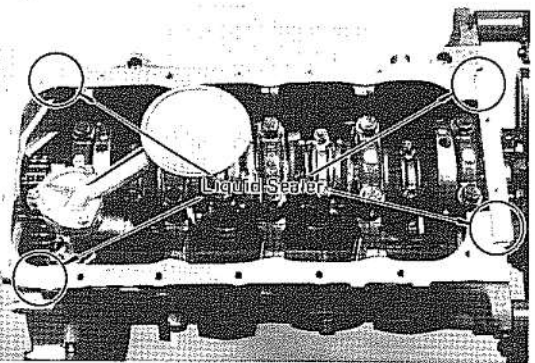
Insert oil into the chain tensioner cylinder.

Fig. 4-103



Install the chain damper parallel with the chain with a 0.5 mm (0.02 in.) space between.

Fig. 4-104

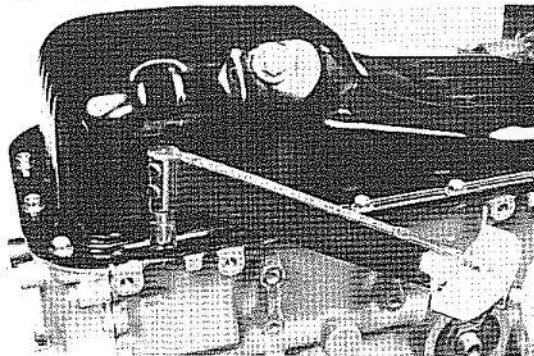


Apply sealer to the areas indicated in the figure.

2T & 3T ENGINE SERVICE – Timing Chain

4-35

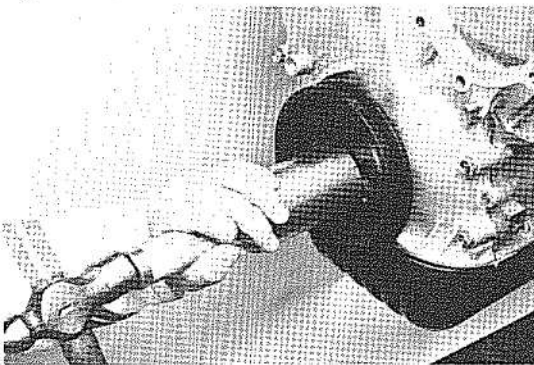
Fig. 4-105



Install the oil pan.

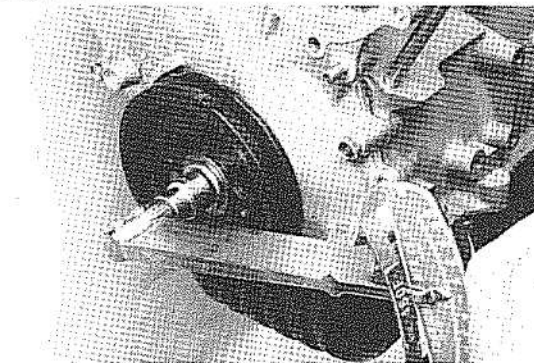
Tightening torque: 0.5 – 0.8 kg-m
(4 – 5 ft-lb)

Fig. 4-106



Drive in the crankshaft pulley with SST.
SST [09214-60010]

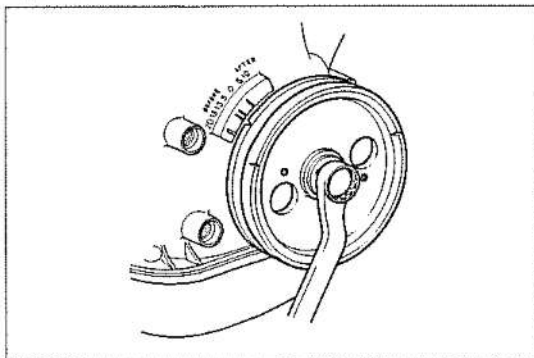
Fig. 4-107



Tighten the claw nut.

Tightening torque: 4.0 – 6.0 kg-m
(29 – 43 ft-lb)

Fig. 4-108

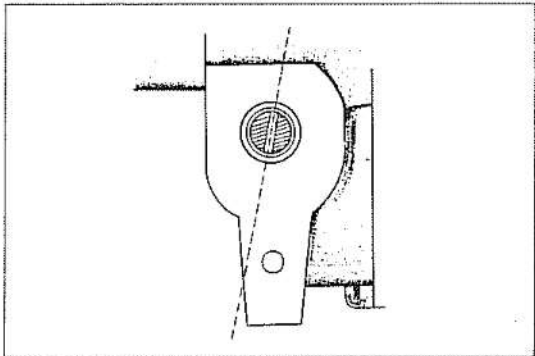


Insert the distributor.

1. Set the No.1 ignition timing.
BTDC 10°

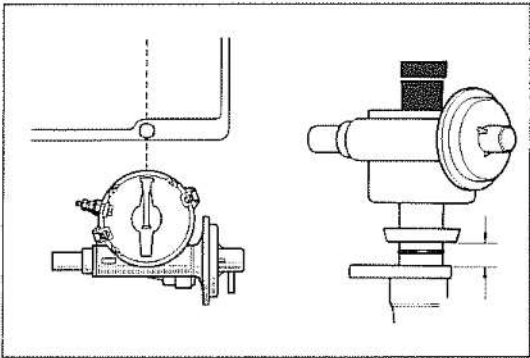
4-36 2T & 3T ENGINE SERVICE – Timing Chain

Fig. 4-109



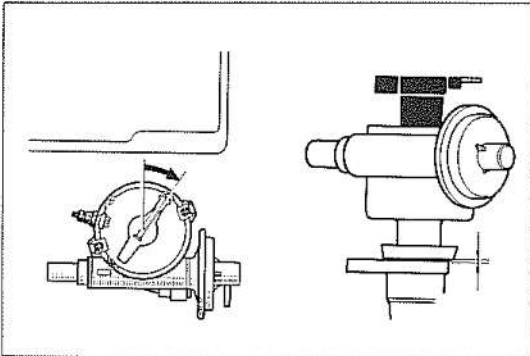
2. Set the oil pump shaft slot in the direction shown in the figure.

Fig. 4-110



3. Before inserting the distributor, position the rotor and diaphragm as shown in the figure.

Fig. 4-111

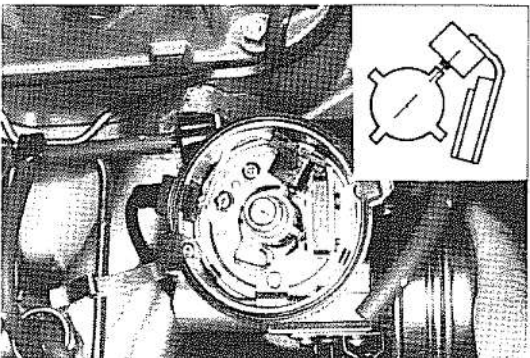


4. When fully installed, rotor should point in the direction shown in the figure.



— Note —
Turn the distributor housing and adjust to the position just before the points open.

Fig. 4-112



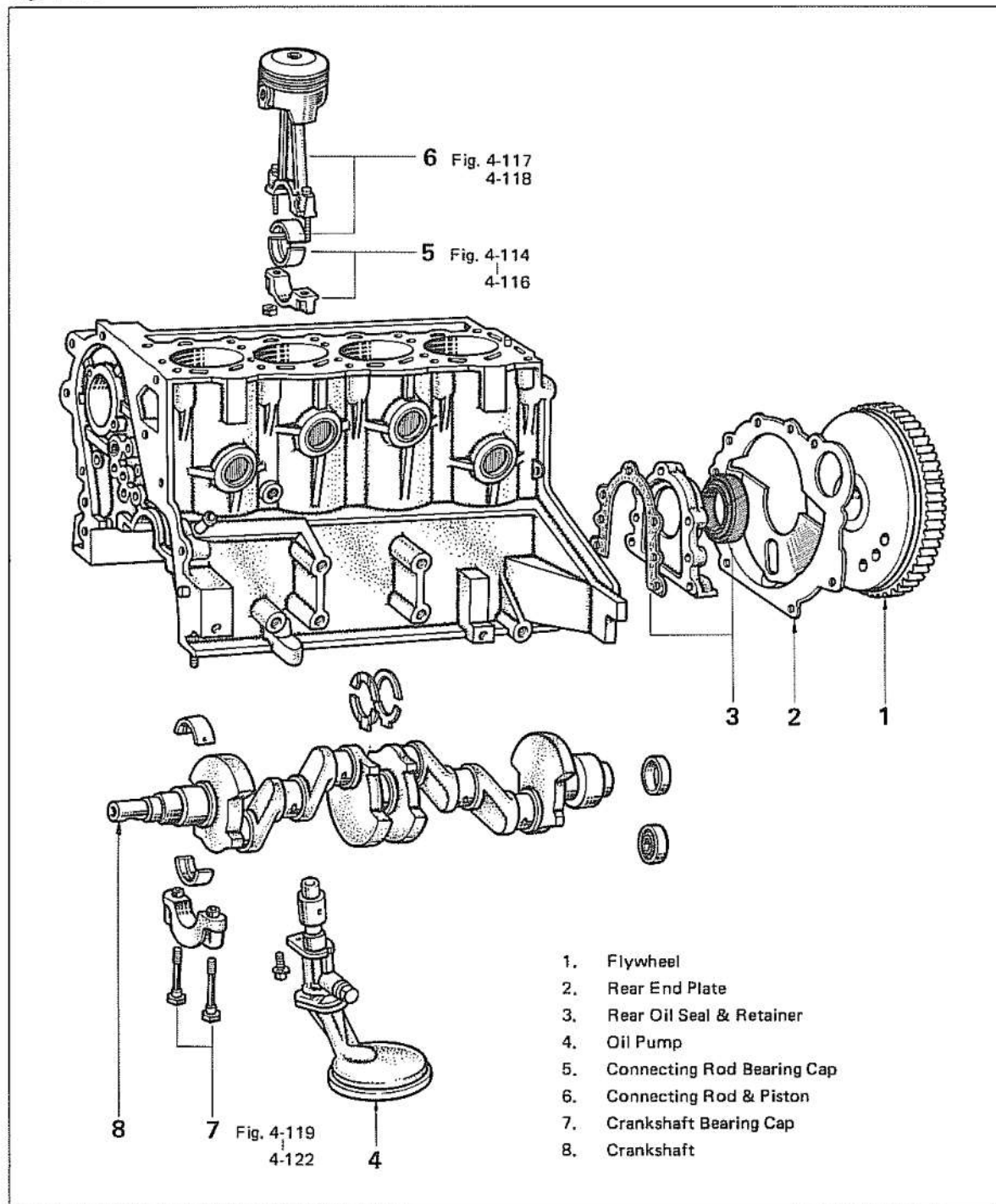
For USA

— Note —
Turn the distributor housing so that the signal rotor will just begin to cut the lines of flux and tighten the set bolt.

CYLINDER BLOCK**DISASSEMBLY**

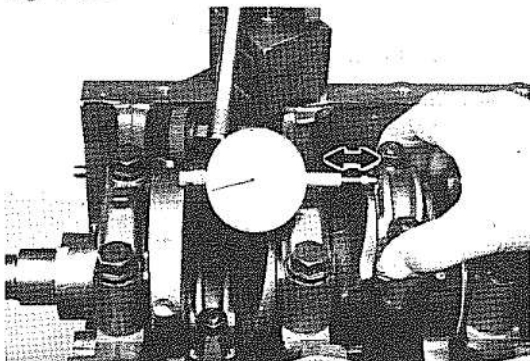
Disassemble the parts in the numerical order shown in the figure.

Fig. 4-113



4-38 2T & 3T ENGINE SERVICE – Cylinder Block

Fig. 4-114



Measure the connecting rod thrust clearance. If it exceeds the limit, replace the connecting rod.

Thrust clearance:

STD 0.16 – 0.26 mm
(0.006 – 0.010 in.)

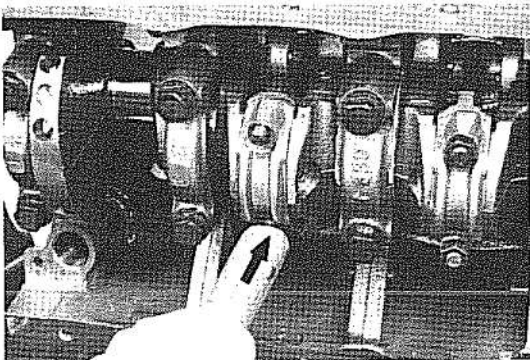
Limit 0.3 mm
(0.012 in.)

Fig. 4-115



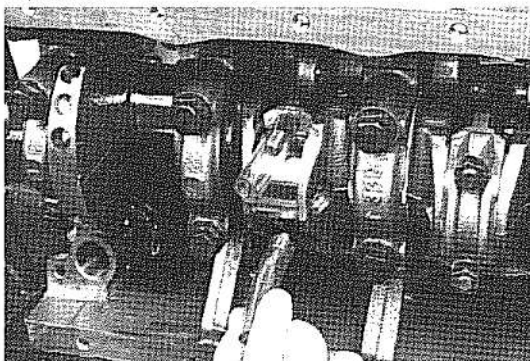
Mark the connecting rod and cap for correct reassembly.

Fig. 4-116



If the connecting rod cap is tight, lightly tap the stud bolt.

Fig. 4-117



Cover the rod bolts with a short pieces of hoses to protect the crankshaft from damage.

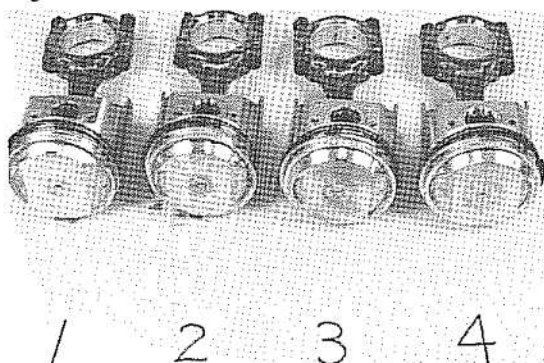
– Note –

If this step is not performed prior to removing the pistons, the piston ring lands will be damaged.

2T & 3T ENGINE SERVICE – Cylinder Block

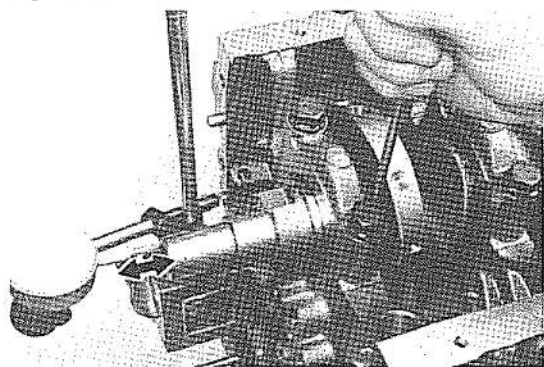
4-39

Fig. 4-118



Arrange the connecting rods and bearings in order.

Fig. 4-119



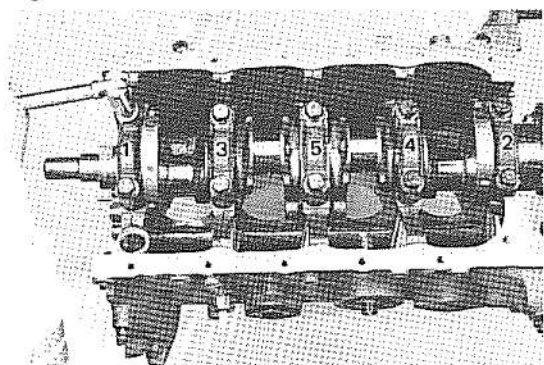
Measure the crankshaft thrust clearance.
If the clearance exceeds the limit, replace the thrust bearing as a set.

Thrust clearance:

STD 0.02 – 0.22 mm
 (0.0008 – 0.0087 in.)

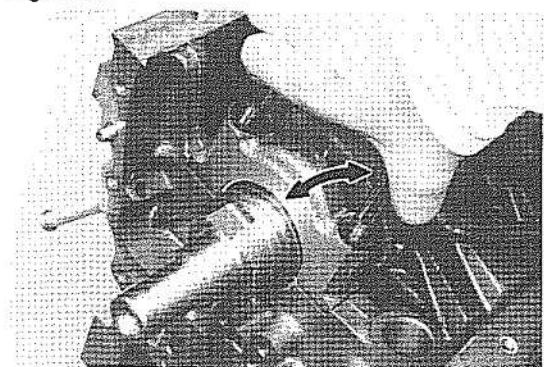
Limit 0.3 mm
 (0.012 in.)

Fig. 4-120



Loosen each crankshaft bearing bolts a little at a time and in the sequence shown in the figure.

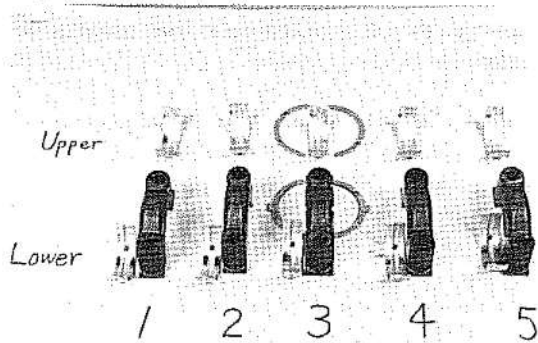
Fig. 4-121



If the crankshaft bearing cap will not come off, remove by raising the bolts and pry fore and aft.

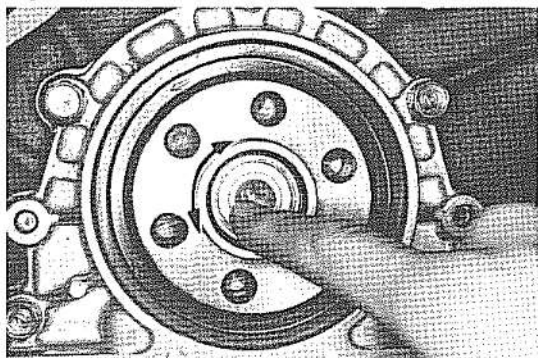
4-40 2T & 3T ENGINE SERVICE – Cylinder Block

Fig. 4-122



Arrange the crankshaft bearings and caps in correct order.

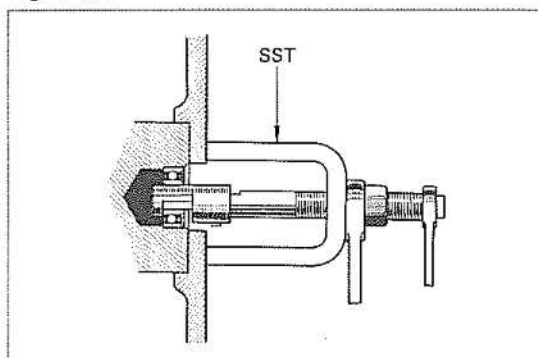
Fig. 4-123

**INSPECTION & REPAIR****Input Shaft Bearing (for M/T)**

Inspect the bearing for wear.

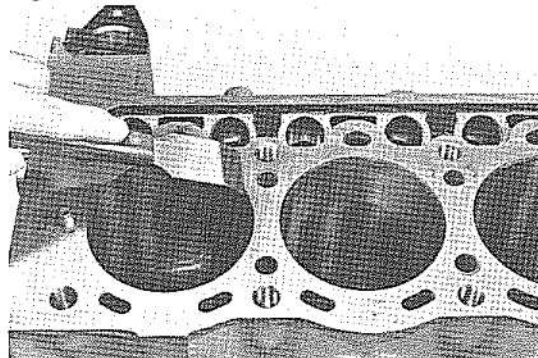
Check to see that there is no drag on the bearing when it is turned under pressure.

Fig. 4-124



With SST, remove the input shaft bearing.
SST [09303-35010]

Fig. 4-125

**Cylinder Block**

1. Clean and check the cylinder block for cracks or scoring.

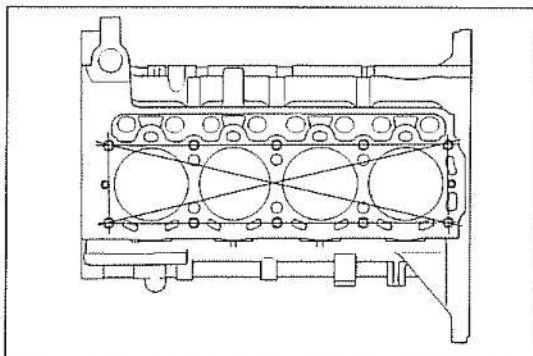
Fig. 4-126



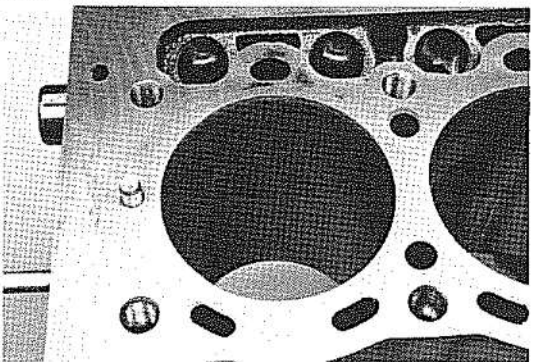
2. Check the block gasket surface for warpage. If warpage exceeds the specified limit, either machine the block or replace.

**Warpage limit: 0.05 mm
(0.002 in.)**

4-42

2T & 3T ENGINE SERVICE – Cylinder Block**Fig. 4-127**

3. Inspect for warpage along the lines indicated at left.

Fig. 4-128

4. Visually inspect the cylinders for vertical scratches. If deep scratches are present, the cylinder must be rebored.

5. Measure the cylinder bore at the position as shown in the figure.

Cylinder bore:

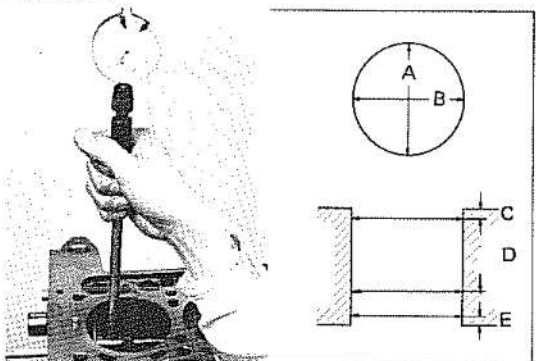
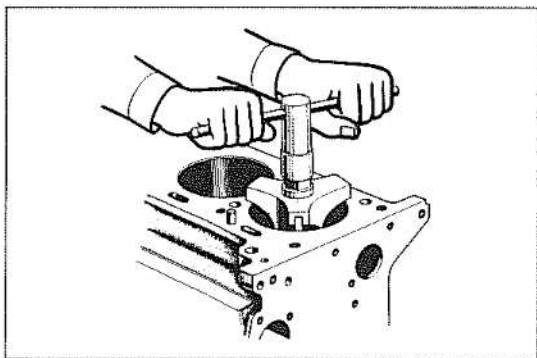
- A Thrust Direction
- B Axial Direction
- C 10 mm (0.4 in.)
- D 80 mm (3.1 in.)
- E 10 mm (0.4 in.)

If the bore exceeds specification, it must be rebored.

Cylinder bore:

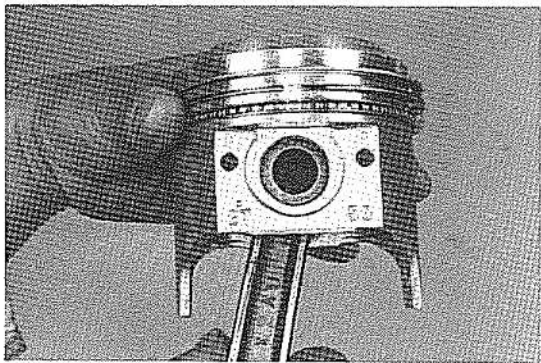
STD 85.00 – 85.05 mm
(3.346 – 3.348 in.)

Wear limit: 0.2 mm
(0.008 in.)

Fig. 4-129**Fig. 4-130**

6. If the wear is less than 0.2 mm (0.008 in.), machine the piston ring ridge at the top of the cylinder with a ridge reamer.

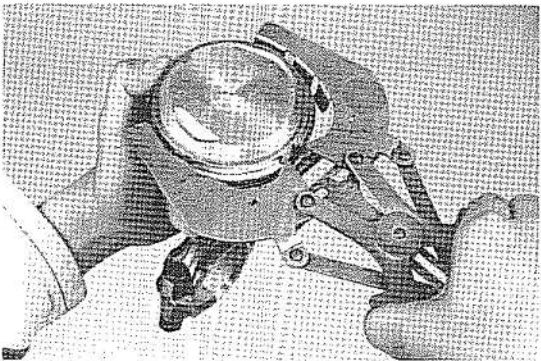
Fig. 4-131



Piston & Connecting Rod

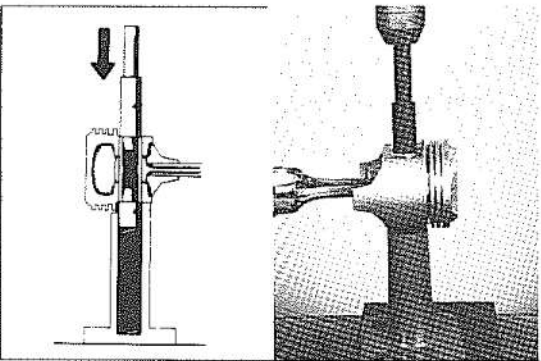
- 1. Check pin fit by trying to rock the piston at right angle to the pin. If any movement is felt, the piston with pin must be replaced.

Fig. 4-132



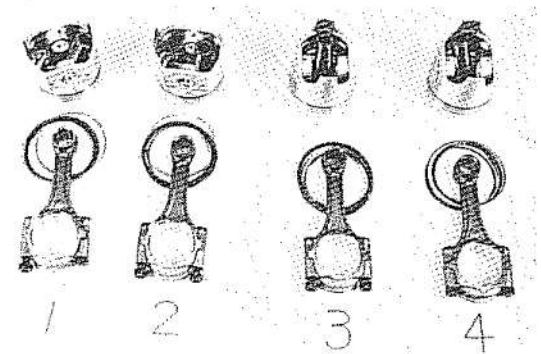
- 2. Remove the piston ring with a piston ring expander.

Fig. 4-133



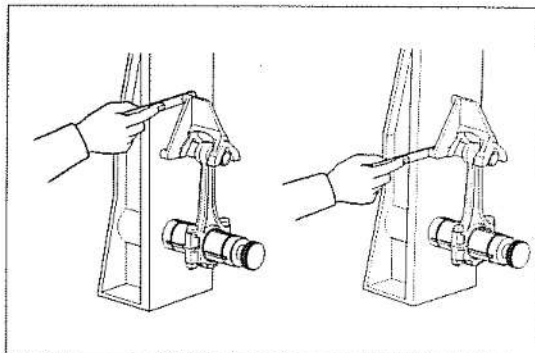
- 3. Press out the piston pin with SST. SST[09221-25014]

Fig. 4-134



- 4. After disassembly, arrange the pistons, pins, rings and rods in order.

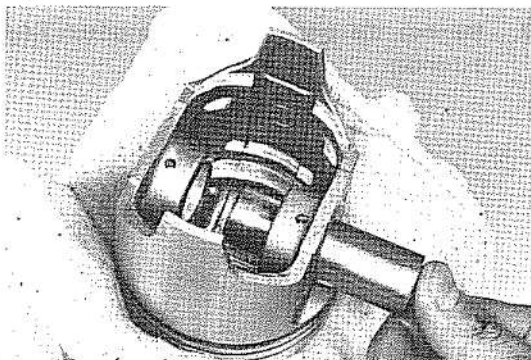
4-44

2T & 3T ENGINE SERVICE — Cylinder Block**Fig. 4-135**

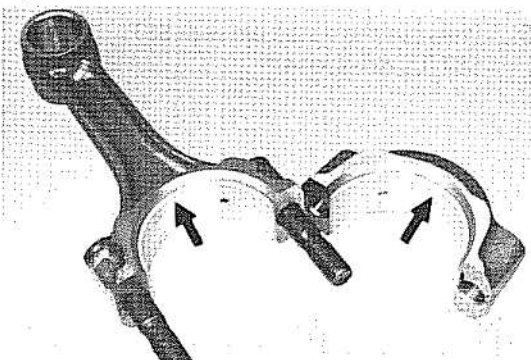
5. Inspect the connecting rod for bend or twisting.

Bend limit: 0.05 mm
(0.002 in.)

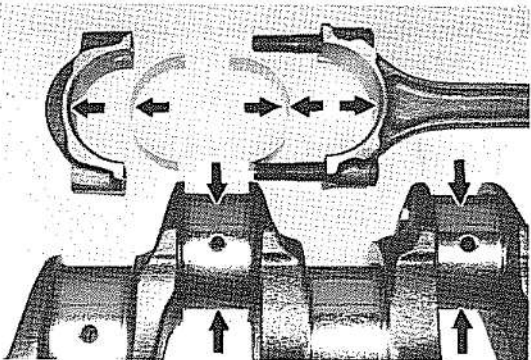
Twist limit: 0.05 mm
(0.002 in.)

Fig. 4-136

6. Coat pin with engine oil.
The pin should be able to be pushed into piston hole with thumb pressure.

Fig. 4-137**Crank Pin & Bearing**

1. Inspect the bearings for flaking or scoring. If bearings are damaged, replace.

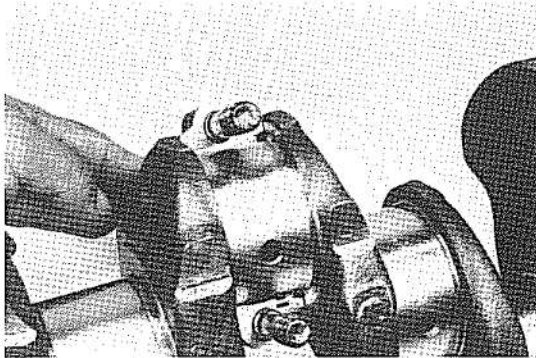
Fig. 4-138

2. Measure the crank pin oil clearance.
(1) Clean the crankshaft pin, rod, cap and bearing.

2T & 3T ENGINE SERVICE — Cylinder Block

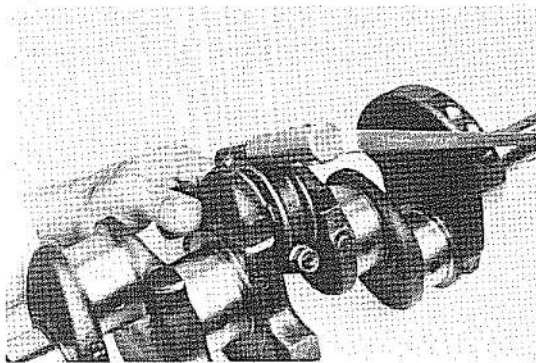
4-45

Fig. 4-139



- (2) Lay a strip of plastigage across the pin.

Fig. 4-140



- (3) Tighten the cap nuts to specified torque.

Tightening torque:

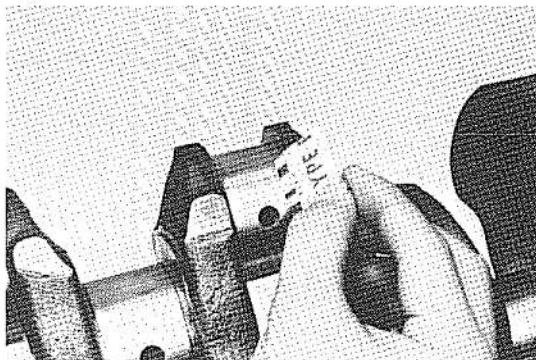
4.0 — 5.0 kg-m

(29 — 36 ft-lb)

— Note —

Do not turn the connecting rod.

Fig. 4-141



- (4) Measure the plastigage at its widest point.

If clearance is not within specification, replace the bearings.

Bearing oil clearance:

STD 0.024 — 0.048 mm

(0.0009 — 0.0019 in.)

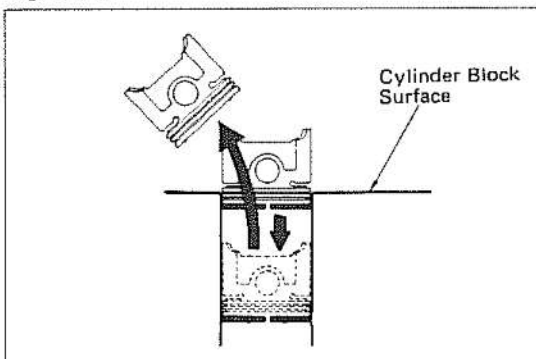
Limit 0.07 mm

(0.003 in.)

U/S bearing sizes:

U/S 0.05, 0.25, 0.50

Fig. 4-142



Piston Ring

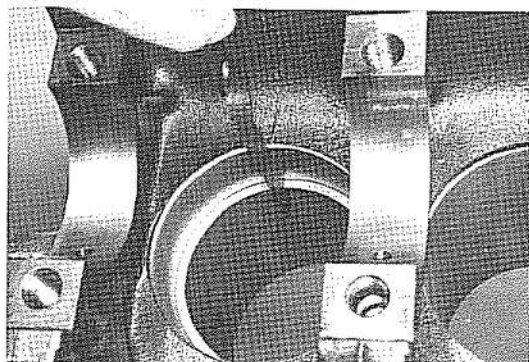
1. Measure the ring end gap.

- (1) Insert the ring into the cylinder using a piston. With the ring at the lower part of the cylinder bore, measure the end gap.

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2T & 3T ENGINE SERVICE – Cylinder Block

Fig. 4-143

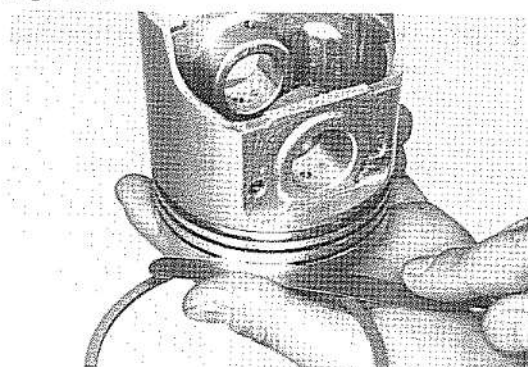


- (2) Measure the end gap. If it exceeds specification, the ring must be replaced.

End gap:

No.1	0.25 – 0.56 mm (0.010 – 0.022 in.)
No.2	0.20 – 0.51 mm (0.008 – 0.020 in.)
Oil	0.30 – 0.78 mm (0.012 – 0.030 in.)

Fig. 4-144

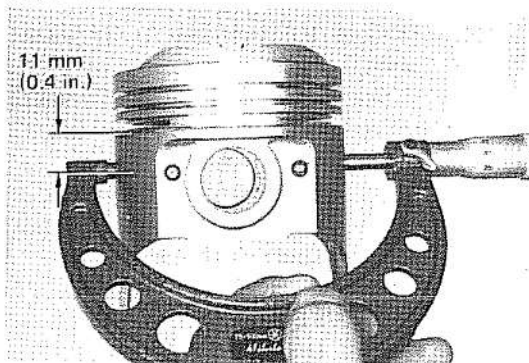


2. Measure the ring groove clearance. If it exceeds specification, replace ring and/or piston.

Ring groove clearance:

No.1	0.020 – 0.060 mm (0.0008 – 0.0024 in.)
No.2	0.015 – 0.055 mm (0.0006 – 0.0022 in.)
Oil	0.015 – 0.060 mm (0.0006 – 0.0024 in.)

Fig. 4-145

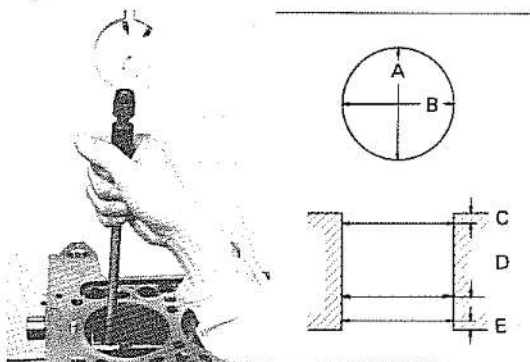
**Piston Clearance**

1. Measure the piston diameter at right angle to the piston pin center line. Measurement must be made at normal temperature (20°C or 68°F).

Piston diameter:

STD	84.94 – 84.99 mm (3.344 – 3.346 in.)
------------	--

Fig. 4-146



2. Measure cylinder bore and subtract piston measurement. If clearance exceeds specification, replace piston.

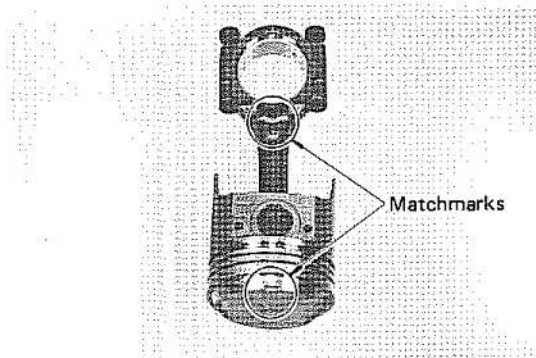
Piston oil clearance:

0.05 – 0.07 mm (0.002 – 0.003 in.)
--

— Note —

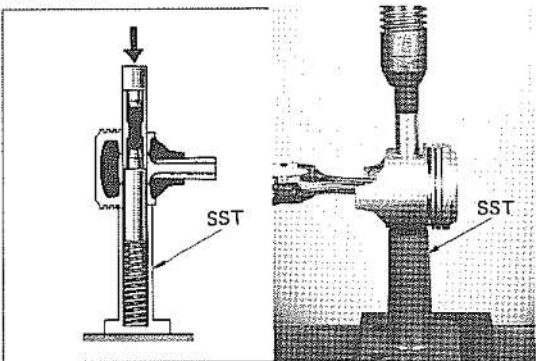
Use the measurement where wear is at maximum.

Fig. 4-147



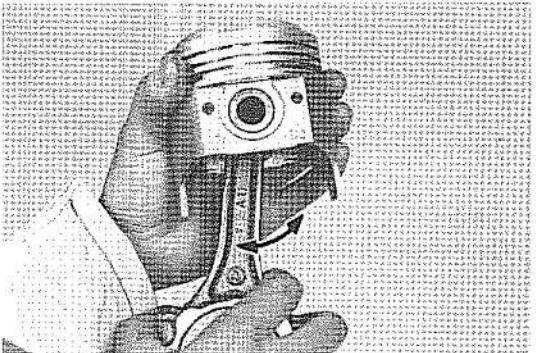
- Assemble The Piston & Connecting Rod.**
1. Align the notch on the piston with the ⊕ mark on the connector.

Fig. 4-148



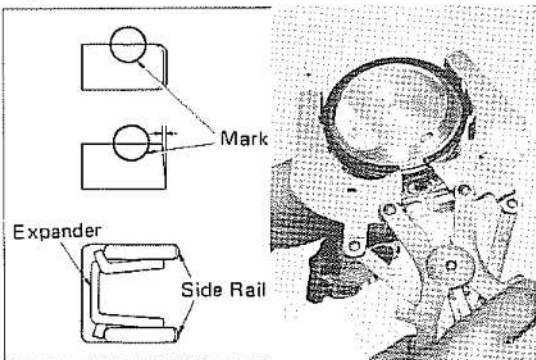
2. Press in the piston pin with SST.
SST[09221-25014]

Fig. 4-149



3. Check the pin fit by trying to rock piston at right angle to the pin.
If any movement is felt, the piston with pin must be replaced.

Fig. 4-150

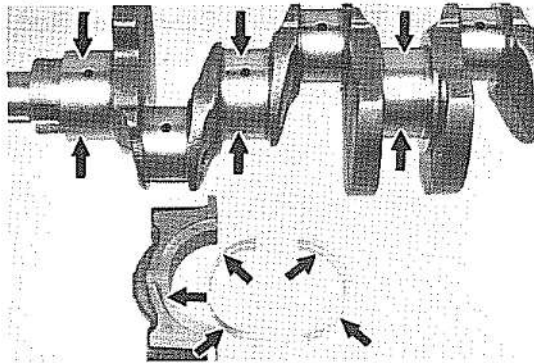


4. Install the piston ring with a piston ring expander.
Install the two compression rings with the code marks facing up.

4-48

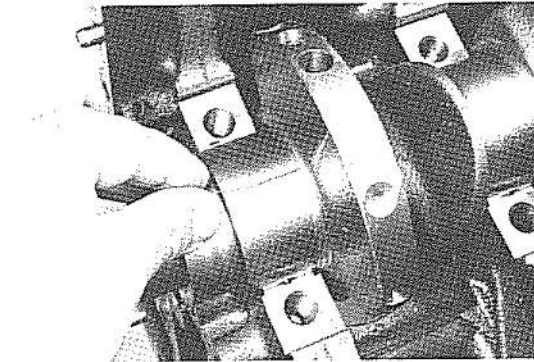
2T & 3T ENGINE SERVICE – Cylinder Block

Fig. 4-151

**Crankshaft & Bearing**

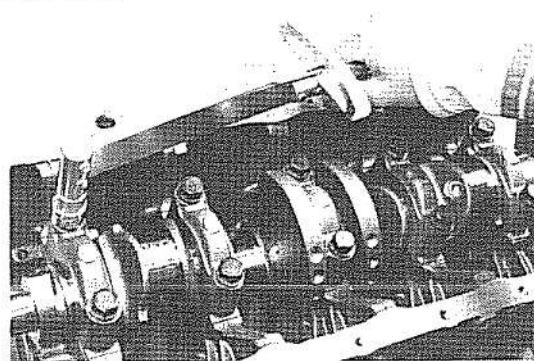
1. Measure the crankshaft oil clearance.
 - (1) Clean the journal, cap and bearing.

Fig. 4-152



- (2) Lay a strip of plastigage across the journal.

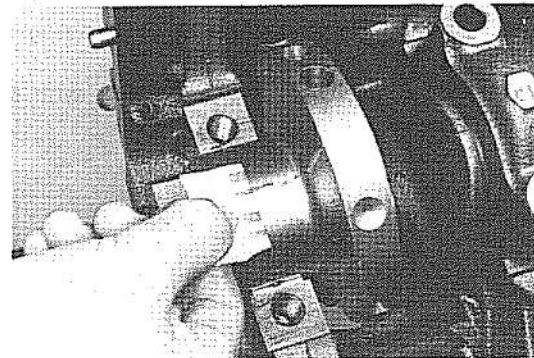
Fig. 4-153



- (3) Tighten the cap nuts to specified torque.

Tightening torque:**7.2 – 8.8 kg-m****(53 – 63 ft-lb)****– Note –****Do not turn the crankshaft.**

Fig. 4-154



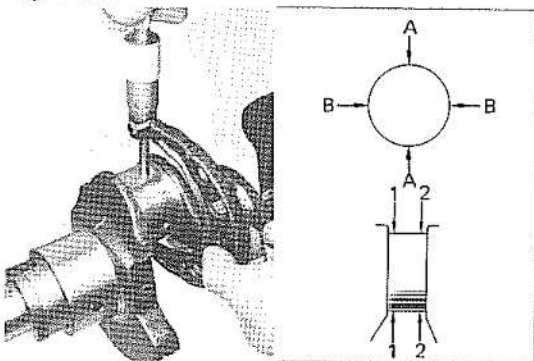
- (4) Measure the plastigage at its widest point. If clearance is not within specification, replace the bearing.

Bearing oil clearance:**STD 0.024 – 0.048 mm****(0.0009 – 0.0019 in.)****Limit 0.07 mm****(0.003 in.)****U/S bearing sizes:****U/S 0.05, 0.25, 0.50**

2T & 3T ENGINE SERVICE – Cylinder Block

4-49

Fig. 4-155



2. Measure the crank pin journal.
If wear is excessive, the crankshaft must be reground or replaced.

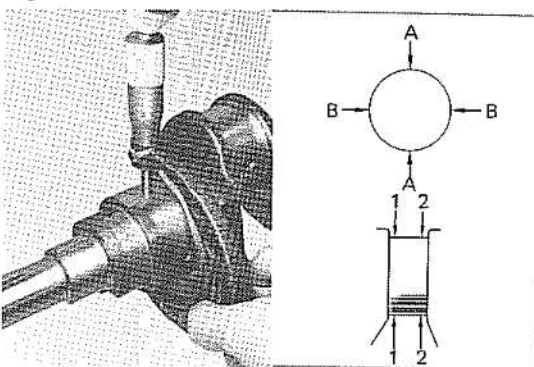
— Note —

Measure the A – B direction in two places.

Crank pin journal diameter:

STD	47.976 – 48.000 mm (1.8888 – 1.8898 in.)
U/S 0.05	47.93 – 47.95 mm (1.887 – 1.888 in.)
U/S 0.25	47.73 – 47.75 mm (1.879 – 1.880 in.)
U/S 0.50	47.48 – 47.50 mm (1.869 – 1.870 in.)

Fig. 4-156



3. Measure the crankshaft main journal.
If wear is excessive, the crankshaft must be reground or replaced.

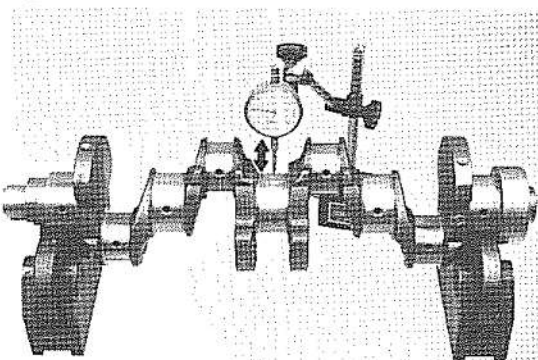
— Note —

Measure the A – B direction in two places.

Crankshaft main journal diameter:

STD	57.976 – 58.000 mm (2.2825 – 2.2835 in.)
U/S 0.05	57.93 – 57.95 mm (2.2807 – 2.2814 in.)
U/S 0.25	57.73 – 57.75 mm (2.2728 – 2.2736 in.)
U/S 0.50	57.48 – 57.50 mm (2.2630 – 2.2637 in.)

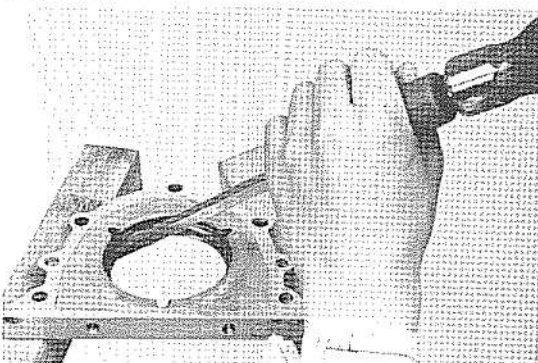
Fig. 4-157



4. Check the crankshaft for bend and if it exceeds the limit, replace.

Runout limit: 0.06 mm
(0.002 in.)

Fig. 4-158

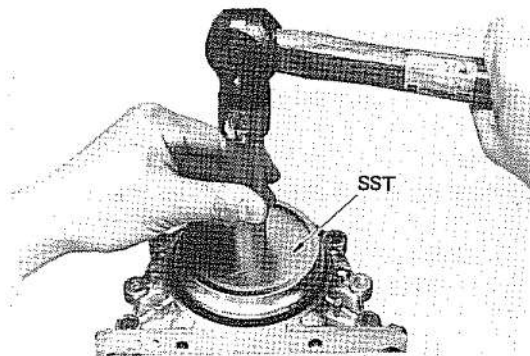


5. Check the journal and pin for streaks or burns.

Crankshaft Rear Oil Seal

1. Inspect the oil seal lip for wear or deformation. Also inspect crankshaft.
2. Remove the oil seal with a screwdriver.

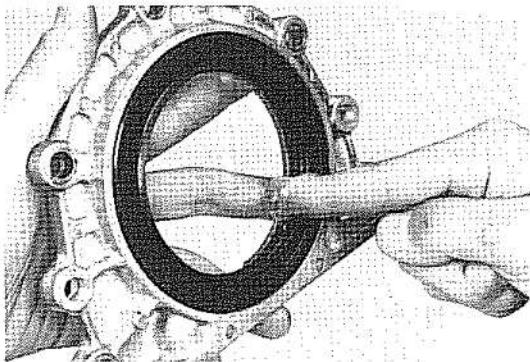
4-50

2T & 3T ENGINE SERVICE – Cylinder Block**Fig. 4-159**

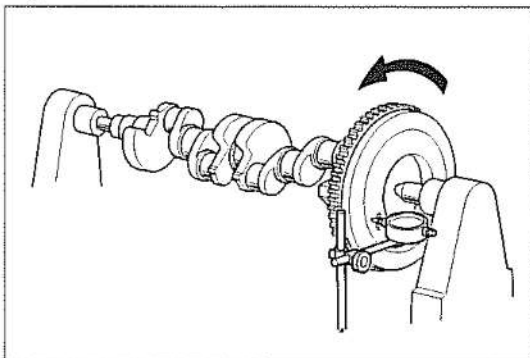
3. Install a new oil seal with SST, SST[09250-10011]

— Note —

Be careful not to install the oil seal slantwise.

Fig. 4-160

4. After driving in the seal, lightly coat the seal lip with MP grease.

Fig. 4-161**Flywheel**

1. Inspect the surface contacting the clutch disc.
2. Measure the runout of the surface contacting the clutch disc.
Runout limit: 0.1 mm (0.004 in.)
3. Inspect the ring gear.

2T & 3T ENGINE SERVICE – Cylinder Block

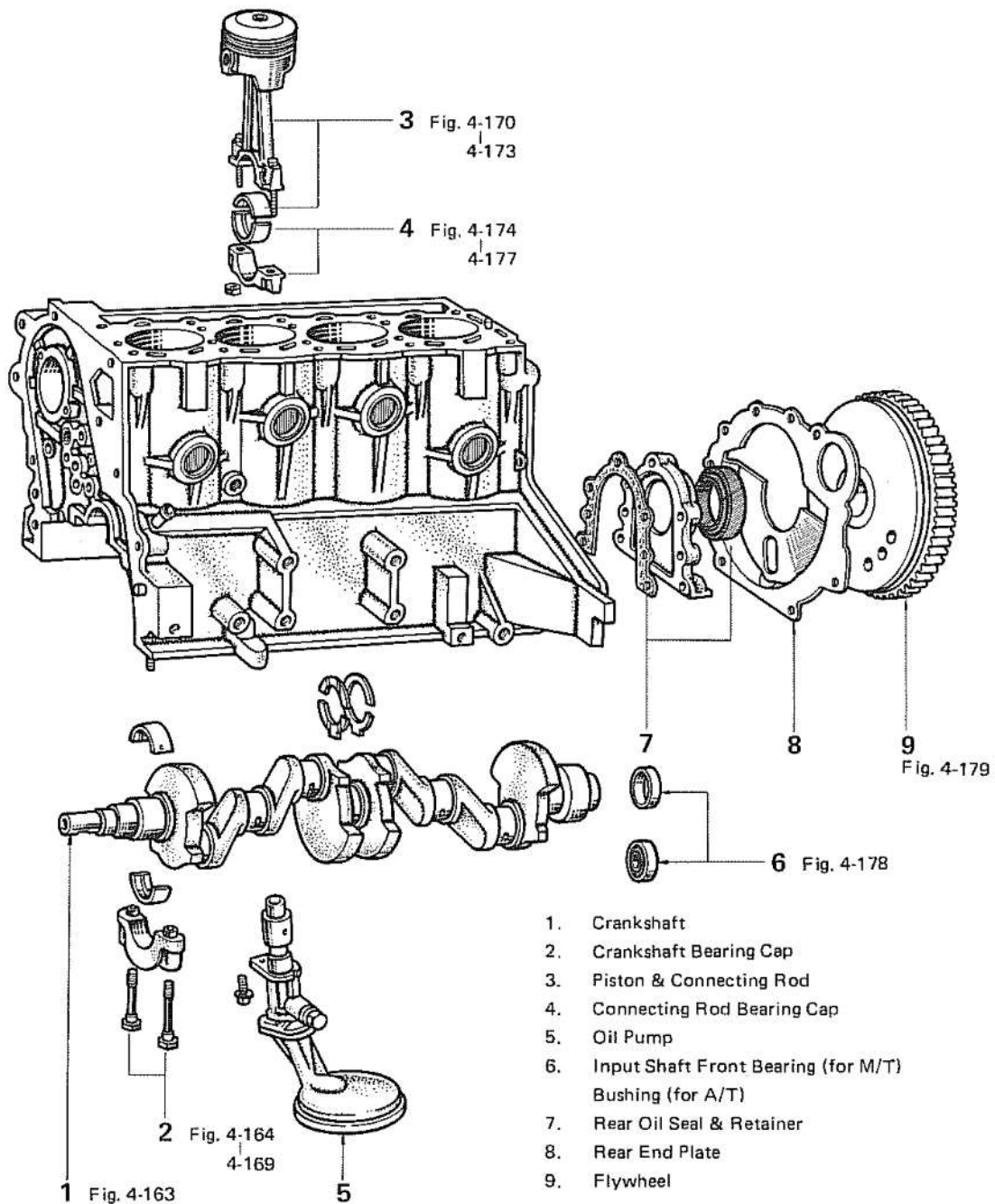
4-51

ASSEMBLY

Assemble the parts in the numerical order shown in the figure.

Fig. 4-162

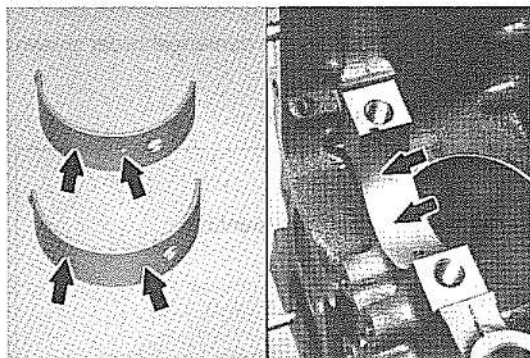
- Thoroughly clean the parts to be assembled.
- Apply clean engine oil on the sliding and rotating surfaces of the parts before assembly.



4-52

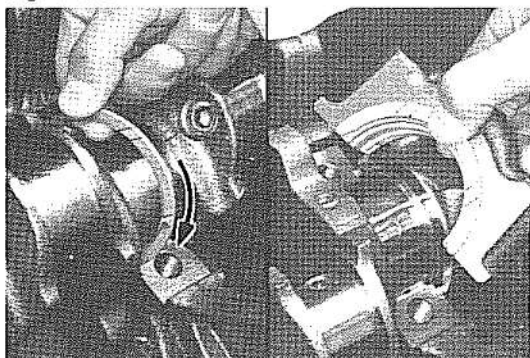
2T & 3T ENGINE SERVICE – Cylinder Block

Fig. 4-163



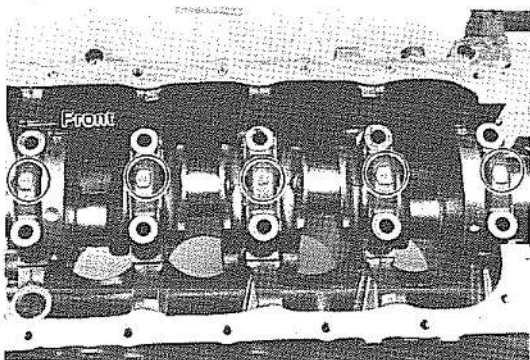
Do not allow oil to get on the back side of the bearing.

Fig. 4-164



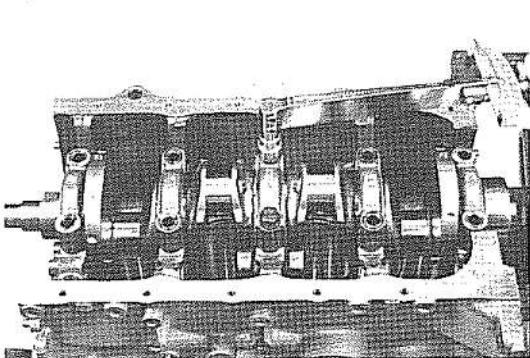
Face the oil groove of the thrust washer towards the outside.

Fig. 4-165



Face the arrows toward the front.

Fig. 4-166



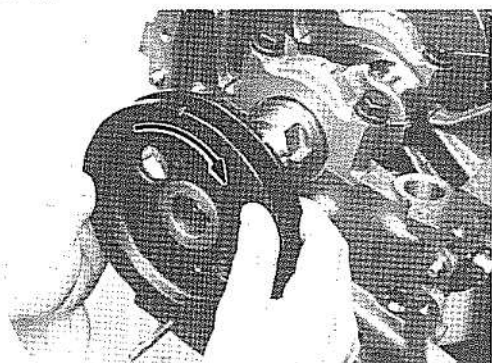
Tighten the bearing caps to specified torque.

Tightening torque: 7.2 – 8.8 kg-m
(53 – 63 ft-lb)

2T & 3T ENGINE SERVICE – Cylinder Block

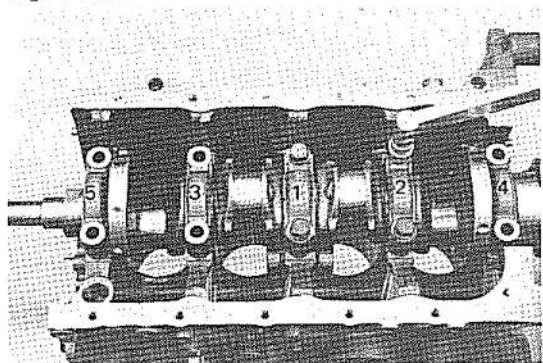
4-53

Fig. 4-167



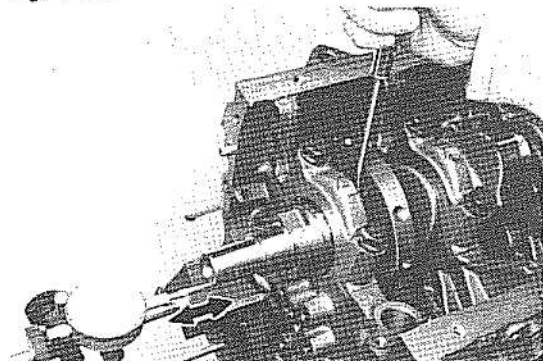
After tightening each bolt, check the rotation condition.

Fig. 4-168



Tighten the bearing caps in the order shown in the figure.

Fig. 4-169

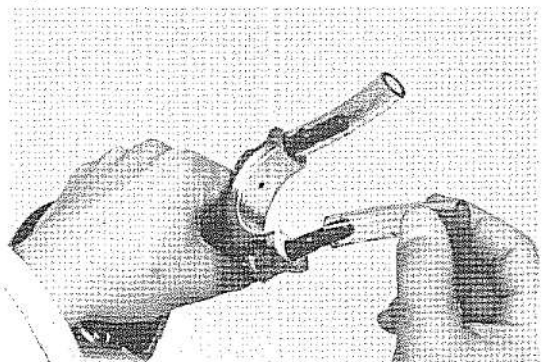


Measure the crankshaft thrust clearance.

Thrust clearance:

STD	0.02 – 0.22 mm (0.001 – 0.009 in.)
Limit	0.3 mm (0.01 in.)

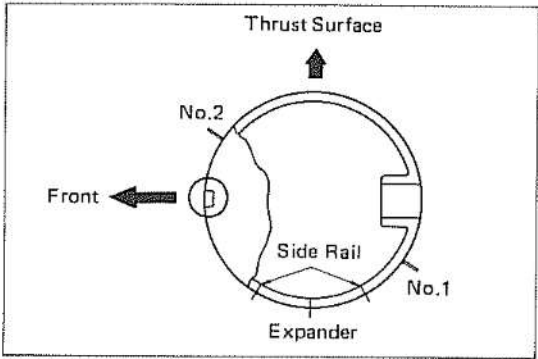
Fig. 4-170



Cover the rod bolts with a hose to protect the crank pin from damage.

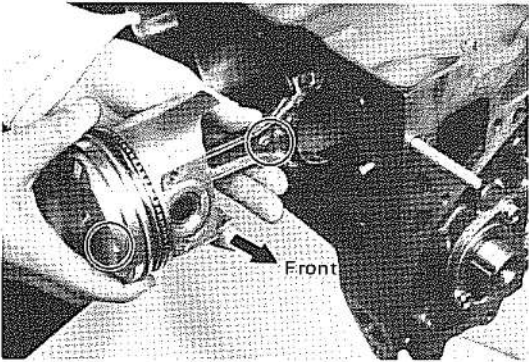
4-54 2T & 3T ENGINE SERVICE – Cylinder Block

Fig. 4-171



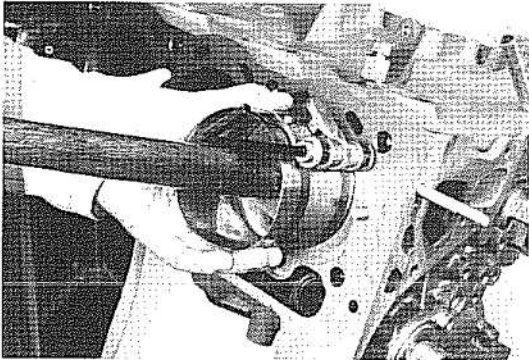
Position the ring gap in direction shown in the figure.

Fig. 4-172



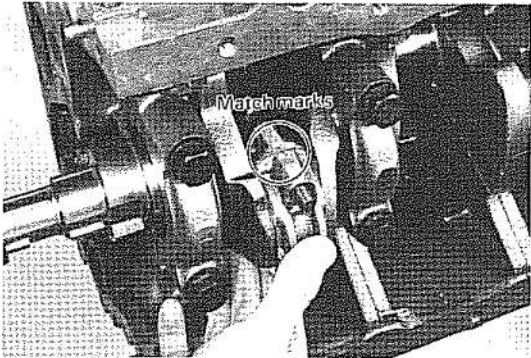
Push in each correctly numbered piston/rod assembly with the notch forward. The mark on the connecting rod should face toward the front.

Fig. 4-173



Insert pistons into the cylinder while compressing the rings with a piston ring compressor.

Fig. 4-174

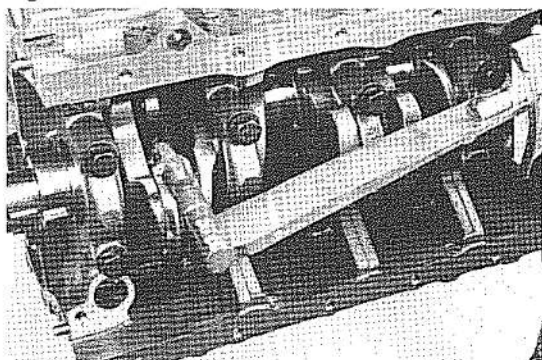


Align the rod and cap marks and fit on the cap.

2T & 3T ENGINE SERVICE – Cylinder Block

4-55

Fig. 4-175



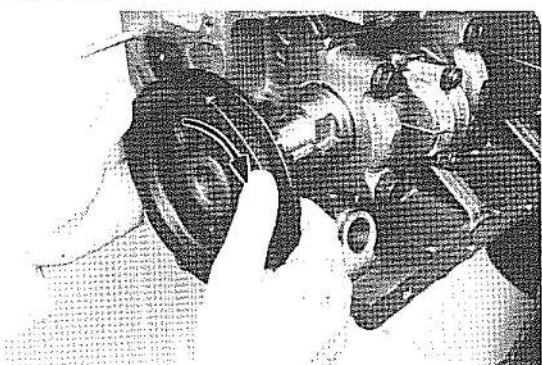
Tighten the rod cap to specified torque.

Tightening torque: 4.0 – 5.0 kg-m
(29 – 36 ft-lb)

– Note –

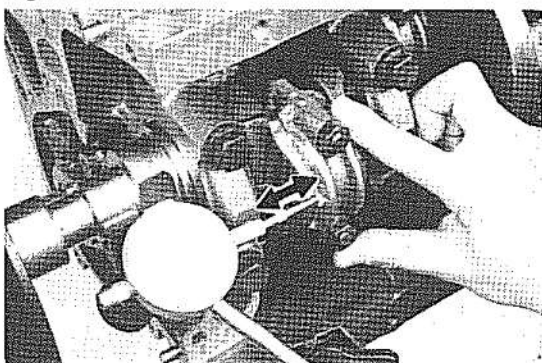
Check the rotation condition after tightening each cap.

Fig. 4-176



Insure that the crankshaft rotates smoothly.

Fig. 4-177



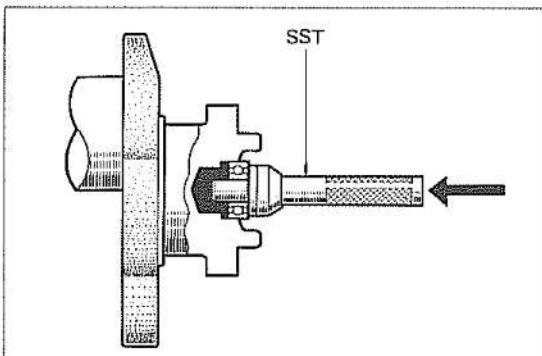
Check the connecting rod thrust clearance.

Thrust clearance:

STD 0.16 – 0.26 mm
(0.006 – 0.010 in.)

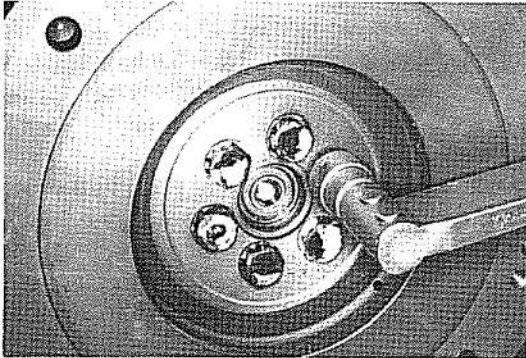
Limit 0.3 mm
(0.012 in.)

Fig. 4-178



Drive in the input shaft bearing with SST.
SST[09304-12012]

4-56

2T & 3T ENGINE SERVICE – Cylinder Block**Fig. 4-179**

Tighten the flywheel to specified torque.

**Tightening torque: 5.8 – 6.6 kg-m
(42 – 47 ft-lb)**

MEMO

MEMO
