# 18R ENGINE SERVICE

# CUTAWAY VIEW

Fig. 4-1

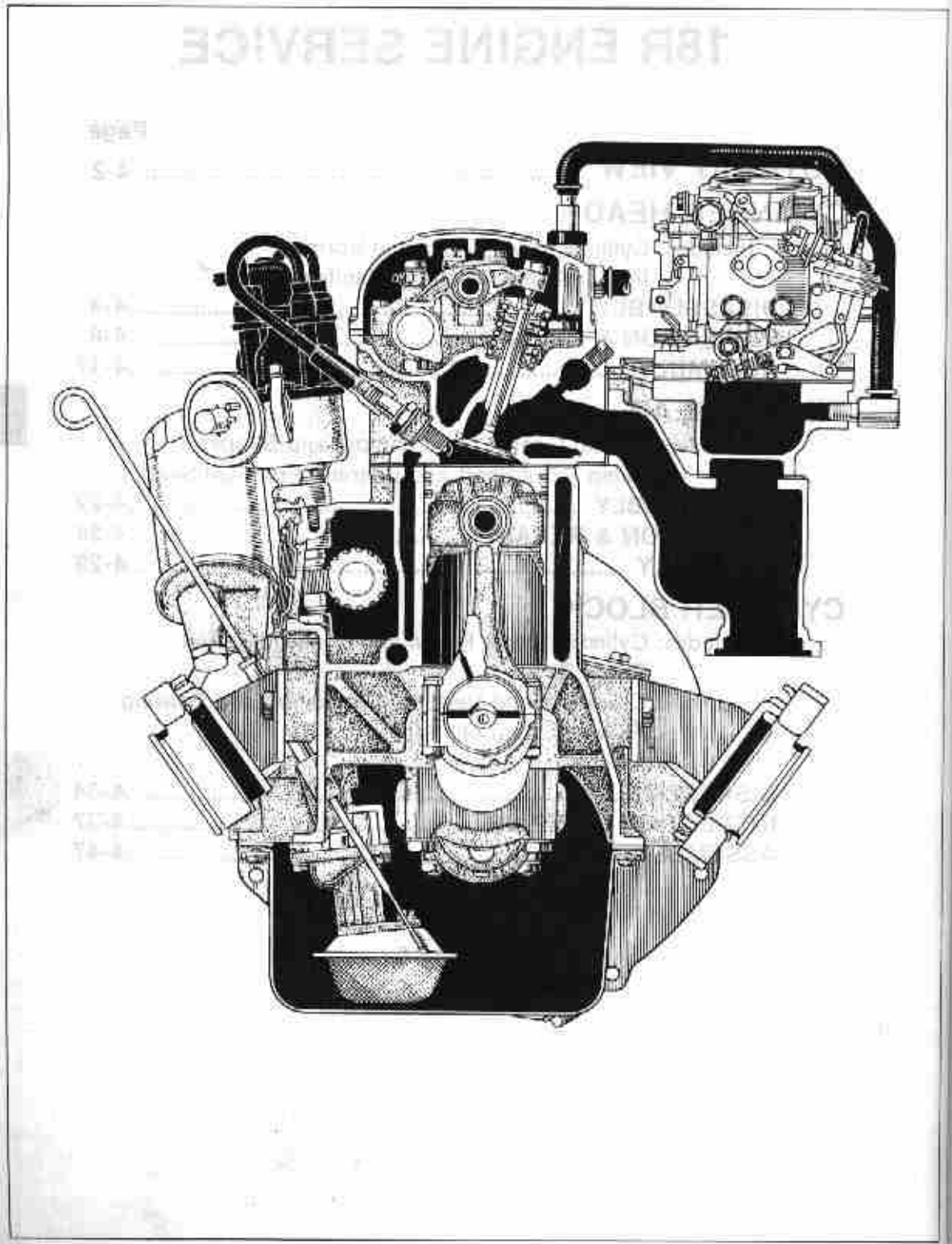
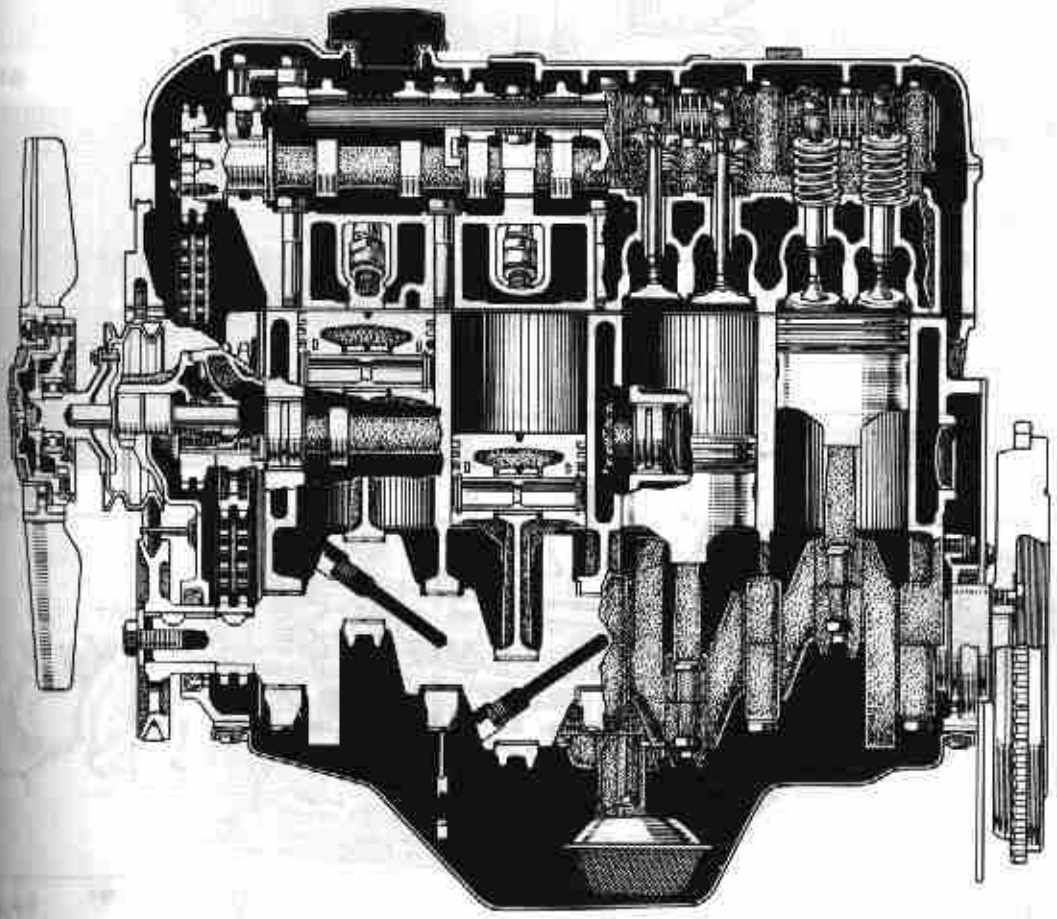


Fig. 4-2

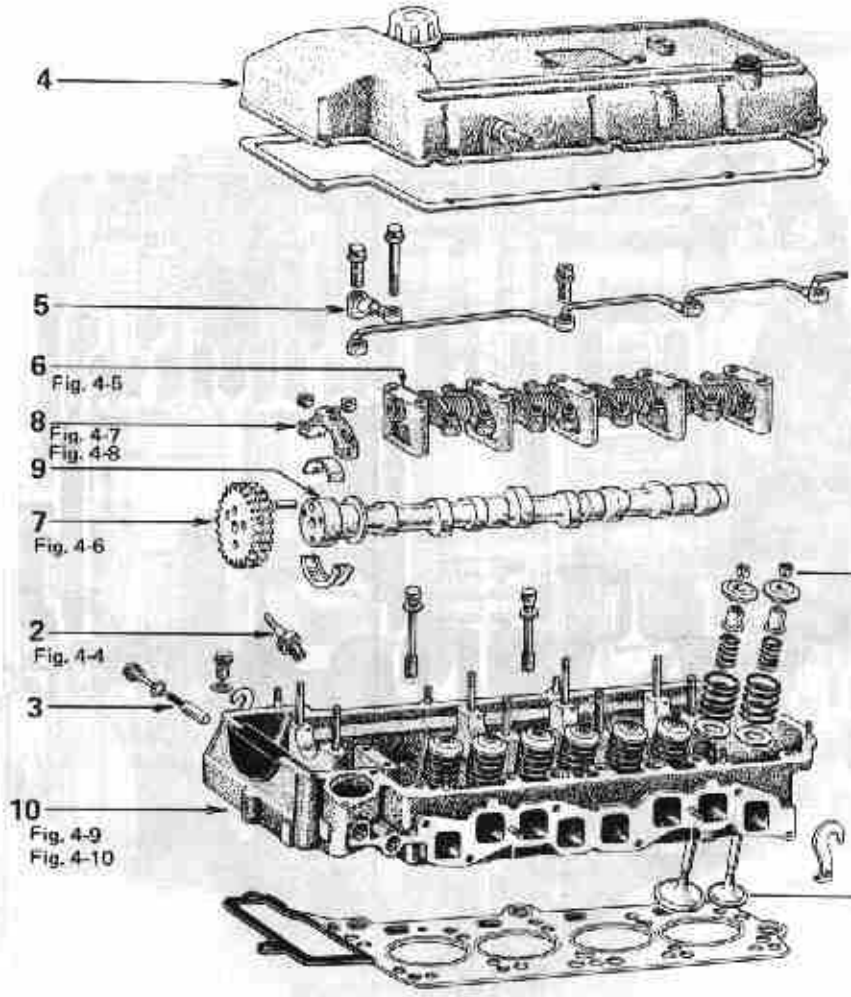


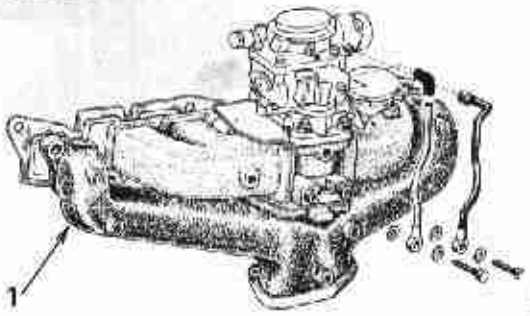
# CYLINDER HEAD

## DISASSEMBLY

Disassemble in numerical order.

**Fig. 4-3**



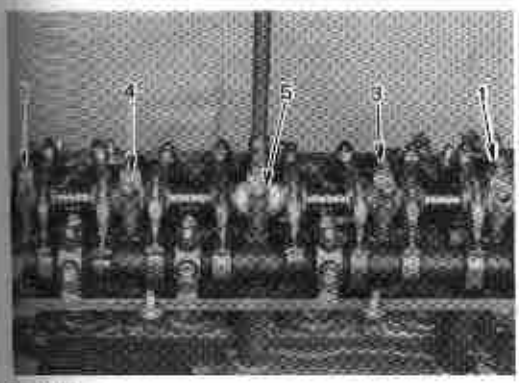




1 Manifold
2 Spark plug
3 No.2 chain tensioner
4 Cylinder Head Cover
5 Oil Pipe
6 Valve Rocker
7 Camshaft Gear
8 Bearing Cap
9 Camshaft
10 Cylinder Head
11 Valve

Fig. 4-4

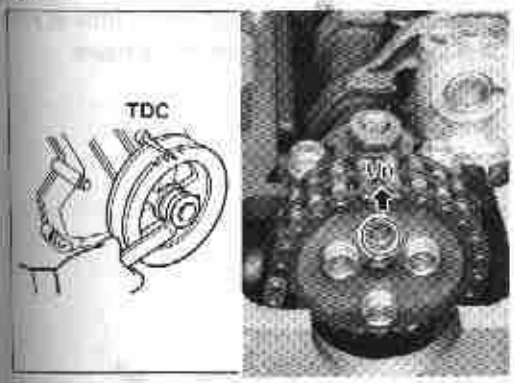
Remove the plug cords by carefully pulling on the rubber boots.

Fig. 4-5



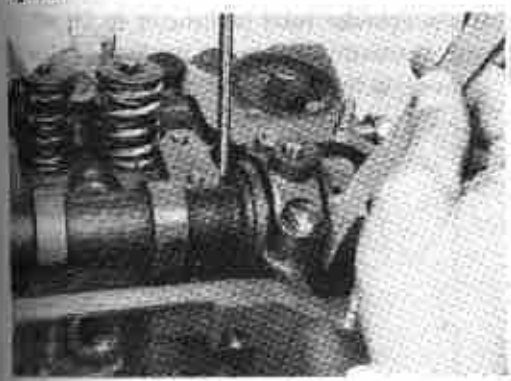

Loosen each rocker support bolt a little at a time and in the sequence shown in the figure.

Fig. 4-6




Set the No.1 cylinder to TDC/compression. The camshaft knock pin should be facing upward.

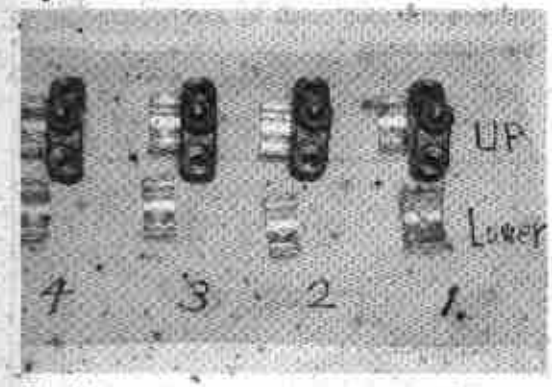
Fig. 4-7



Measure camshaft thrust clearance.

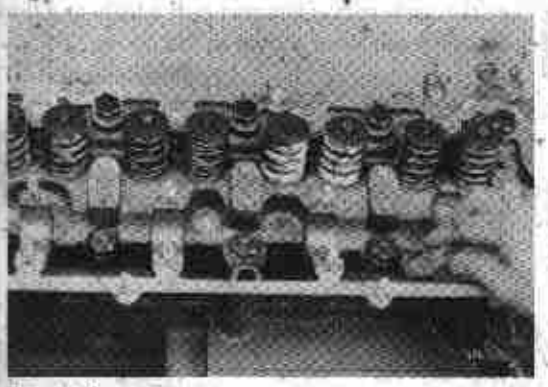
**Thrust clearance limit** **0.25 mm (0.0098 in)**

Fig. 4-8



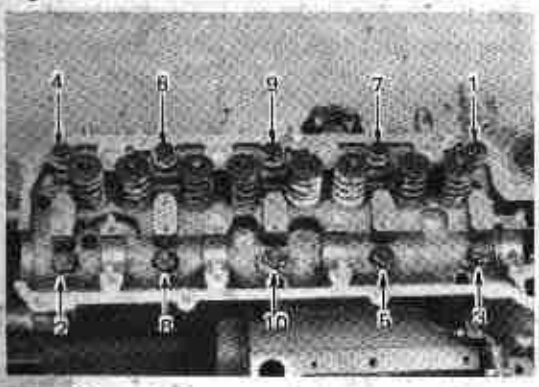

Arrange the camshaft bearings and bearing caps in order.

Fig. 4-9



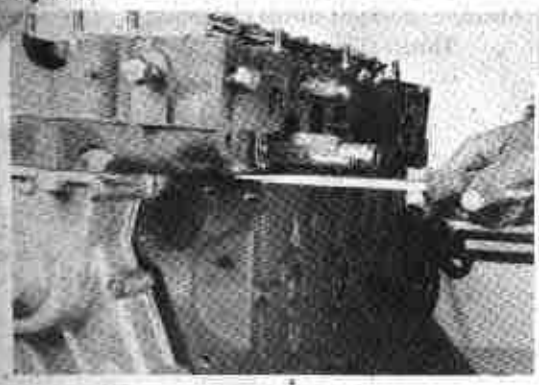
Wipe off the remaining oil on the camshaft.

Fig. 4-10



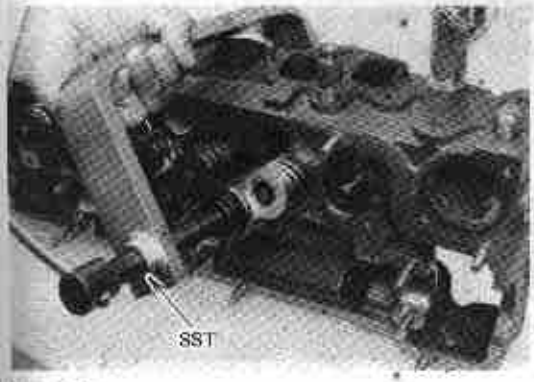

Loosen each cylinder head bolt a little at a time and in the sequence shown in the figure.

Fig. 4-11



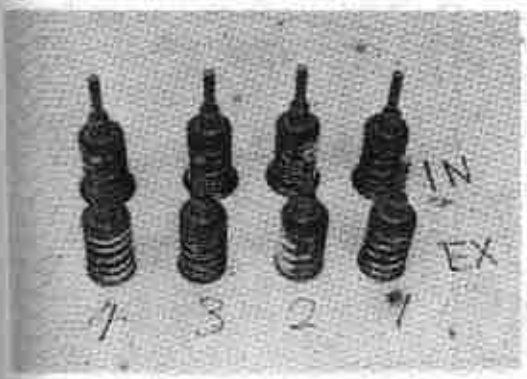
If the cylinder head is difficult to lift off, pry with a screwdriver between the head and block as is shown in the figure.

Fig. 4-12



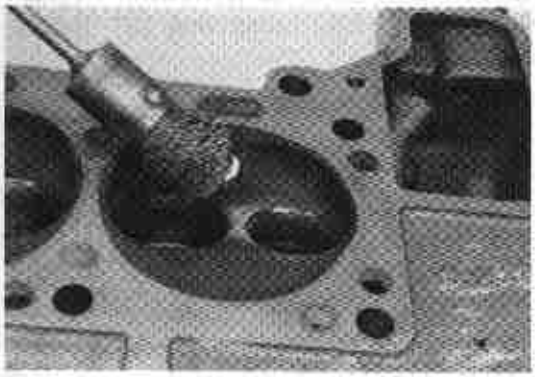

Compress the valve spring with SST [09202 43013].

Fig. 4-13




Arrange the disassembled parts in order.

Fig. 4-15

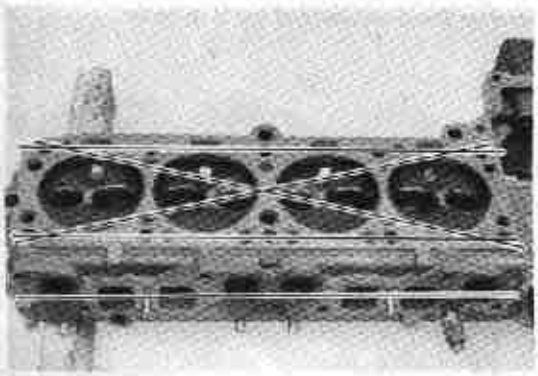


## INSPECTION & REPAIR

### Cylinder Head

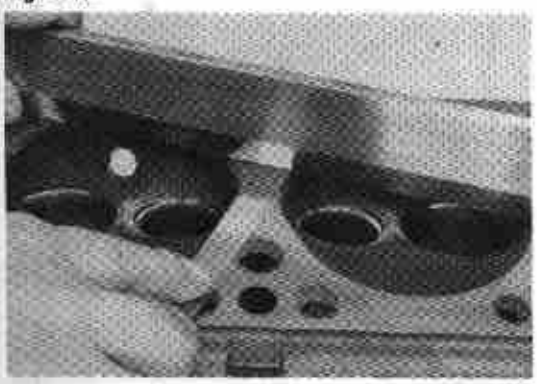
1. Clean the combustion chamber and remove any gasket material from the manifold and head surface.
   Check the cylinder heads for cracks or excessively burnt valve surfaces.

Fig. 4-16



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

Fig. 4-17



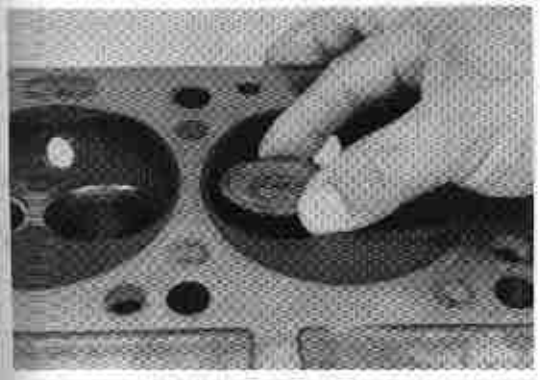
3. If warpage exceeds the limit, correct it by machining, or replace the head.
   **Head surface warpage limit**
   **0.05 mm (0.0019 in)**
   **Maximum reface limit**
   **0.2 mm (0.0079 in)**

Fig. 4-18

### Valve, Guide and Seat

1. Clean valves.

Fig. 4-19

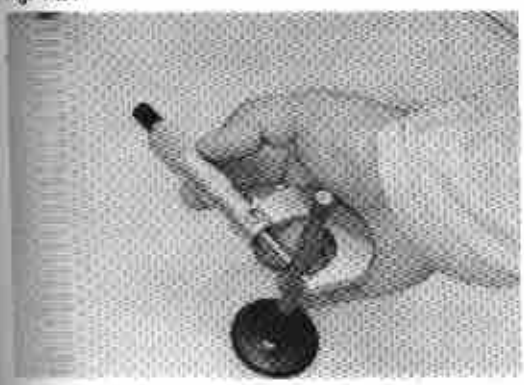


2. Check the valve stem to valve guide clearance of each valve by inserting the valve stem into the guide and moving back and forth as is shown in the figure.

Fig. 4-20

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

Fig. 4-21



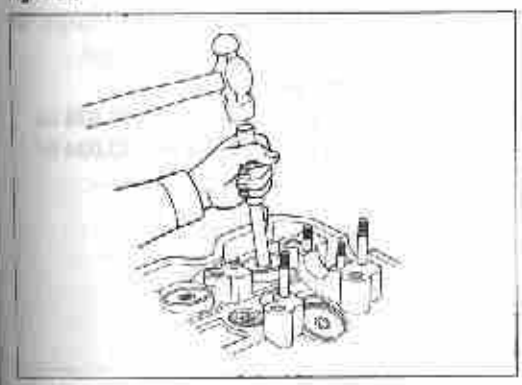
   (2) Measure the valve stem diameter.
   (3) Calculate the clearance between the valve stem and valve guide by subtracting the difference where the clearance is the largest.

**Clearance limit**

**Intake 0.08 mm (0.0032 in)**
**Exhaust 0.10 mm (0.0039 in)**

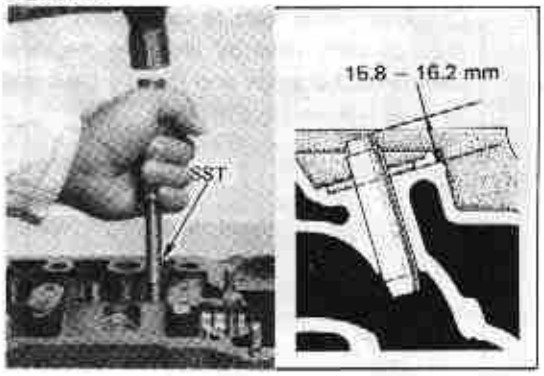
If the clearance exceeds the limit, replace both valve and guide.

Fig. 4-22



4. Replacing guide
   (1) From the top, drive out the guide toward the combustion chamber with SST.
   SST [09201-60011]

Fig. 4-23



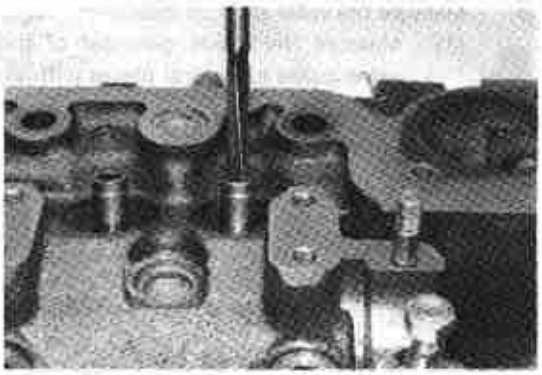

(2) With SST, drive in the new guide to the specified depth.
SST [09201-60011]

**– 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.**
**3. Do not drive in past the specified depth.**

**Guide protrusion**
**15.8–16.2 mm**
**(0.622–0.638 in)**

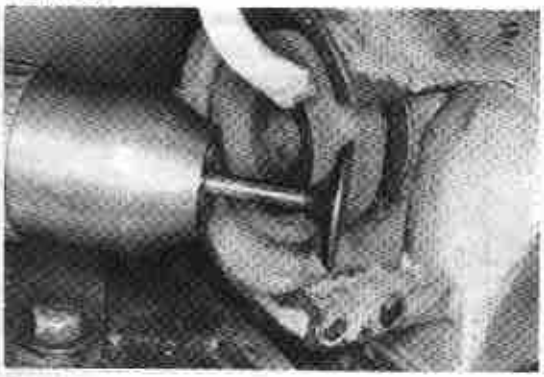
Fig. 4-24



(3) Ream the guide to the specified clearance with an 8 mm (0.32 in) reamer.

| | |
|---|---|
| **Intake** | **0.025 – 0.060 mm (0.0010 – 0.0024 in)** |
| **Exhaust** | **0.035 – 0.070 mm (0.0014 – 0.0028 in)** |

Fig. 4-25

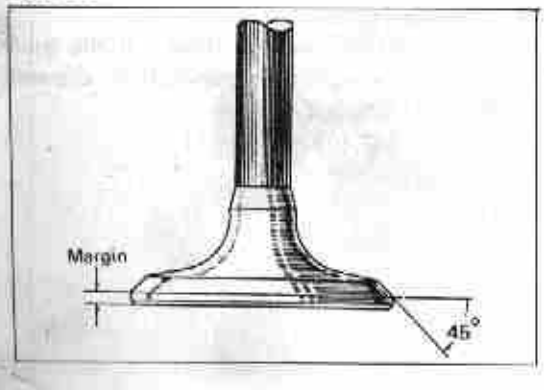


5. Grinding valves and seats

(1) Grind all valves to remove the pits and carbon.

**Valve face angle: 45.5°**

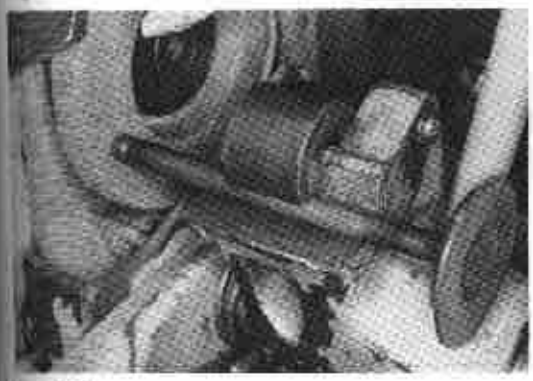
Fig. 4-26




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

**Margin limit**
**Intake 0.6 mm (0.024 in)**
**Exhaust 0.6 mm (0.024 in)**

Fig. 4-27

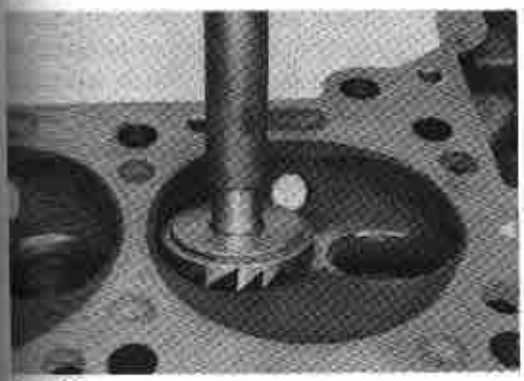


(3) If the valve stem end is worn, resurface with a valve grinder, but do not grind off more than 0.5 mm (0.02 in).

**Overall length limit**

| | |
|---|---|
| **Ex.** | **113.2 mm (4.457 in)** |
| **In.** | **112.7 mm (4.437 in)** |

Fig. 4-28



(4) Resurface valve seats with 45° carbide cutter.
Remove only enough metal to clean seat.

Fig. 4-29

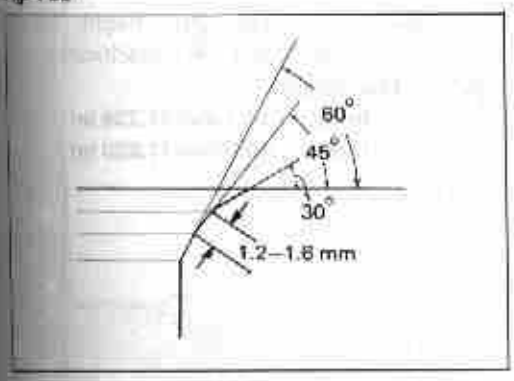
(5) Coat valve face with prussian blue or white lead. Locate contact point on valve by rotating valve against seat.

**— Note —**

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

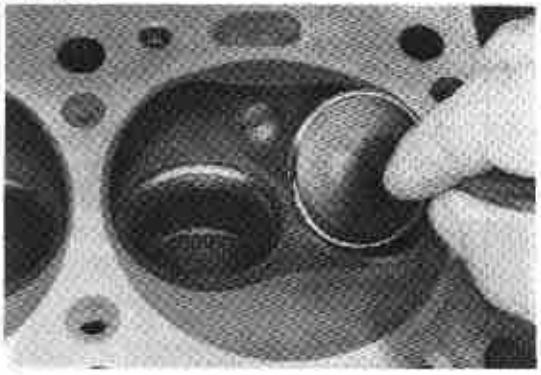
**Intake 1.2–1.6 mm (0.047–0.063 in)**
**Exhaust 1.2–1.6 mm (0.047–0.063 in)**

Fig. 4-30



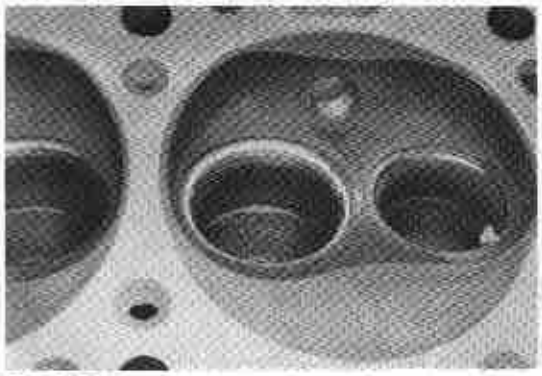

(6) Correct the seat position.
To correct seating that is too high, use 30° and 45° cutters. If seating is too low, use 65° and 45° cutters.

Fig. 4-31



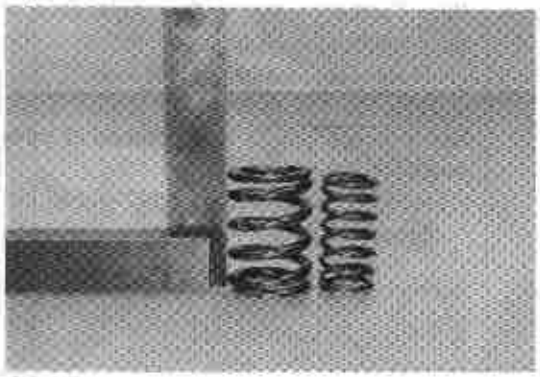
(7) Check valve concentricity.
Lightly coat seat with prussian blue. Install valve and rotate. If blue appears 360° around face, valve stem and face are concentric. If not, replace valve.

Fig. 4-32



(8) Check seat/guide concentricity.
Apply a light coat of prussian blue on valve face. Install and rotate valve. If blue appears 360° around valve seat, guide and seat are concentric. If not, recut seat.

Fig. 4-33

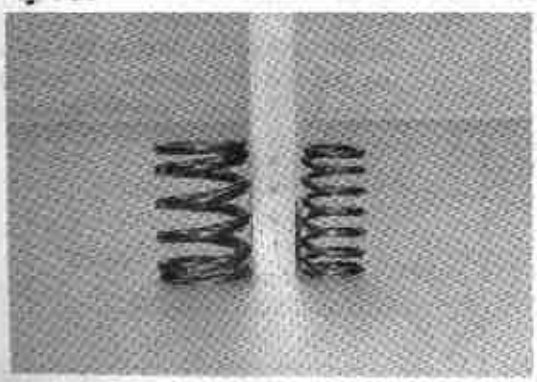


## Valve Springs

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.

| | | |
|---|---|---|
| **Limit** | **Inner** | **1.6 mm (0.063 in)** |
| | **Outer** | **1.6 mm (0.063 in)** |

Fig. 4-34

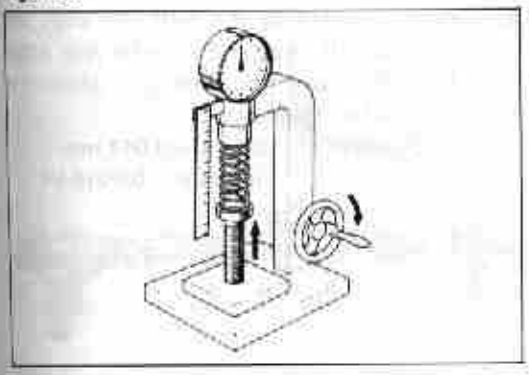


2. Measure the spring free height. Replace springs that do not meet specification.

**Free height**

| | |
|---|---|
| **Inner** | **44.1 mm (1.736 in)** |
| **Outer** | **46.5 mm (1.830 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.

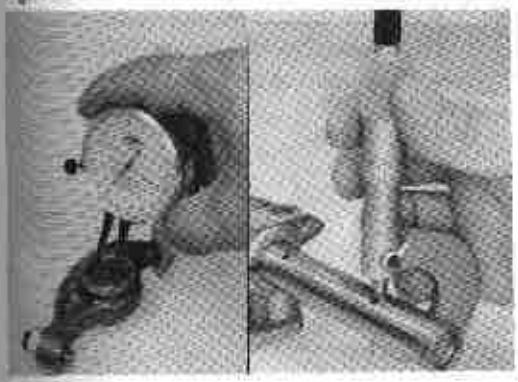
| | Inner | Outer |
|---|---|---|
| **Limit** | **6.8 kg (15.0 lb)** | **23.9 kg (52.7 lb)** |
| **Standard** | **7.8 kg (16.8 lb)** | **26.3 kg (58.0 lb)** |

Fig. 4-36

## Rocker Arm and Shaft

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

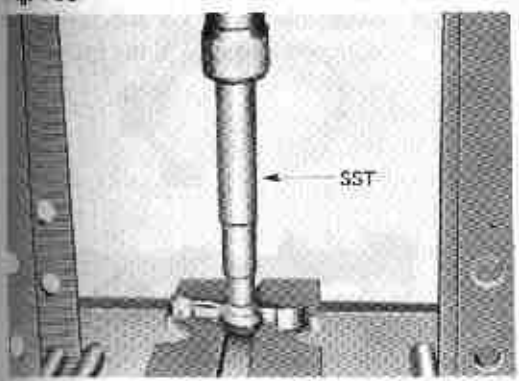
Fig. 4-37



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

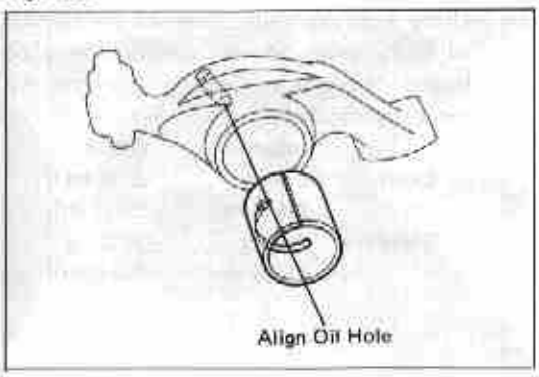
**Clearance limit 0.08 mm (0.0032 in)**
**Standard 0.02–0.05 mm (0.0008–0.0020 in)**

Fig. 4-38




3. With SST, remove the rocker arm bushing.
SST [09222-30010]

Fig. 4-39



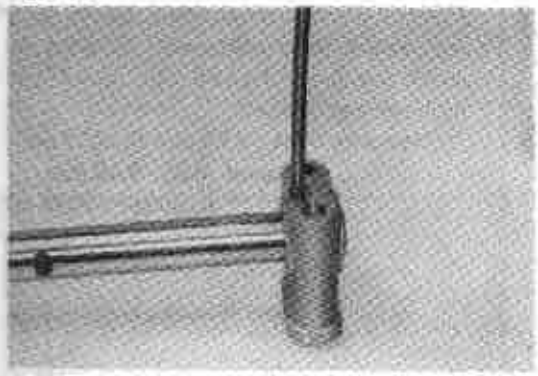

4. When assembling the bushing, align the oil hole with that of the rocker arm. After assembly, ream the bushing to obtain the specified oil clearance.

| | |
|---|---|
| **Standard** | **0.020 – 0.041 mm (0.0008 – 0.0016 in)** |

Fig. 4-40

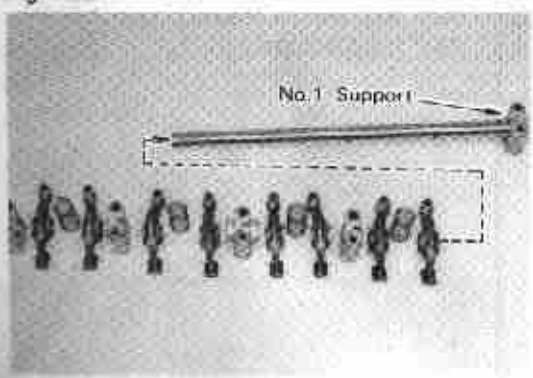
5. If the valve rocker arm surface contacting the valve stem end is worn excessively, either grind or replace the rocker arm.

Fig. 4-41



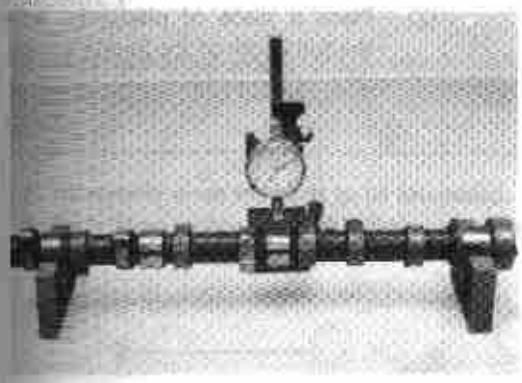
6. Assemble the rockers and shaft.
(1) Assemble the rocker shaft and No.1 support as shown in the figure.

Fig. 4-42




(2) Assemble the rocker arm, springs and supports as shown in the figure.

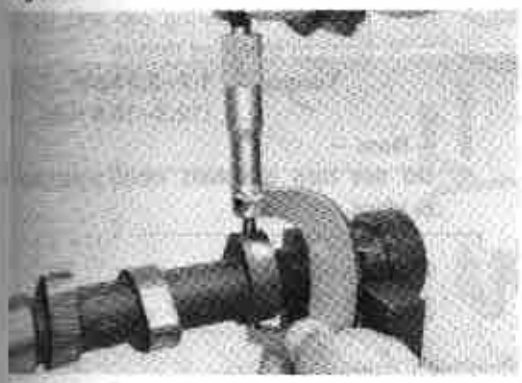
Fig. 4-43



### Camshaft and Bearing

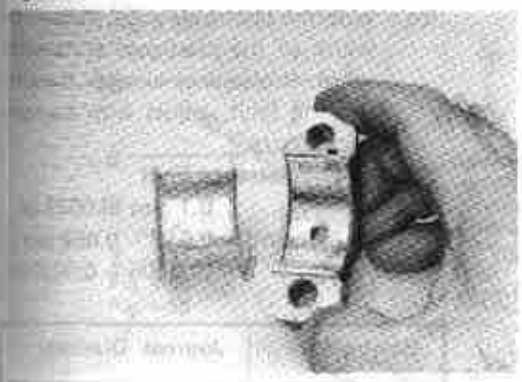
1. Check the camshaft for runout. Replace camshaft if it exceeds limit.
   **Limit 0.1 mm (0.004 in)**

Fig. 4-44



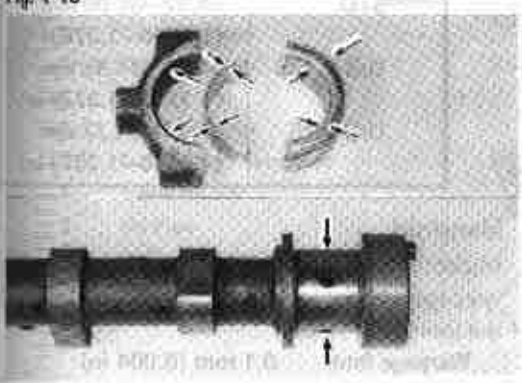
2. Measure the cam lobe height and check for wear. If wear exceeds the limit, replace the camshaft.
   **Height limit Intake 43.7 mm (1.720 in)**
   **Exhaust 43.8 mm (1.724 in)**

Fig. 4-45



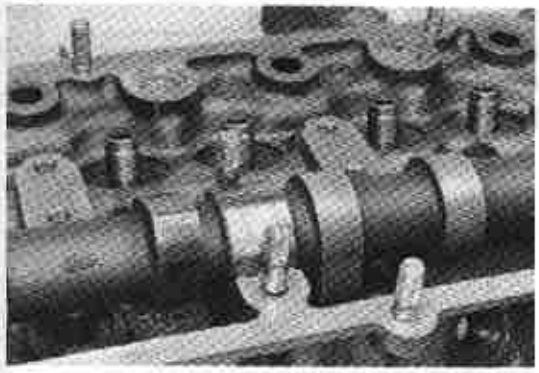
3. Check the bearings for flaking or scoring. Replace bearings, if damaged.

Fig. 4-46



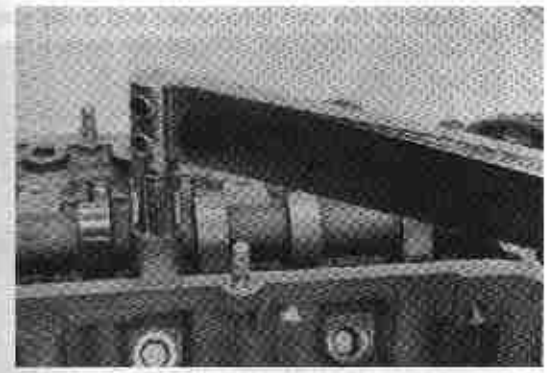
4. Measure the camshaft oil clearance.
   (1) Clean the bearing, cap and camshaft journal.

Fig. 4-47



(2) Place a piece of plastigage across the full width of the journal surface.

Fig. 4-48



(3) Install the bearing cap and tighten bolts to specified torque.

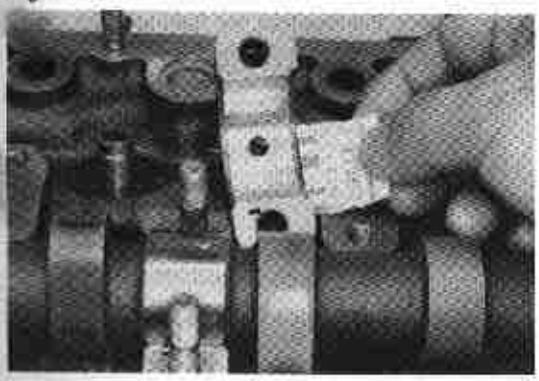
**Torque 1.7–2.3 kg-m (12.3–16.6 ft-lb)**

**– Note –**

**Do not turn camshaft while plastigage is in place.**

(4) Remove the bearing cap.

Fig. 4-49



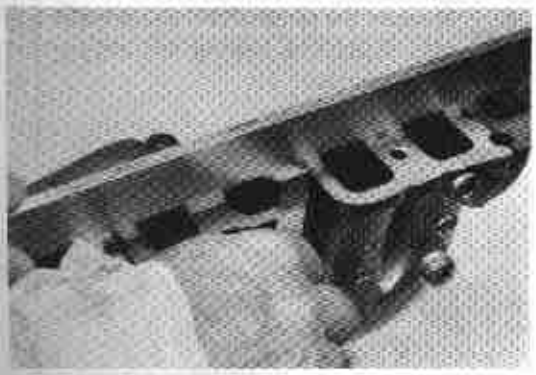
(5) With the plastigage scale, measure the width of the plastigage at its widest point. If clearance exceeds the specification limit, adjust with a suitable bearing size.

**Oil clearance limit**

**0.1 mm (0.0039 in)**

**Standard 0.012 – 0.052 mm (0.0005 – 0.0020 in)**

Fig. 4-50



| Bearing Size | Journal Diameter |
|---|---|
| STD | 34.97–35.00 mm (1.3768–1.3780) |
| U/S 0.125 | 34.84–34.85 mm (1.3717–1.3720 in) |
| U/S 0.25 | 34.72–34.73 mm (1.3670–1.3673 in) |

## Manifold

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

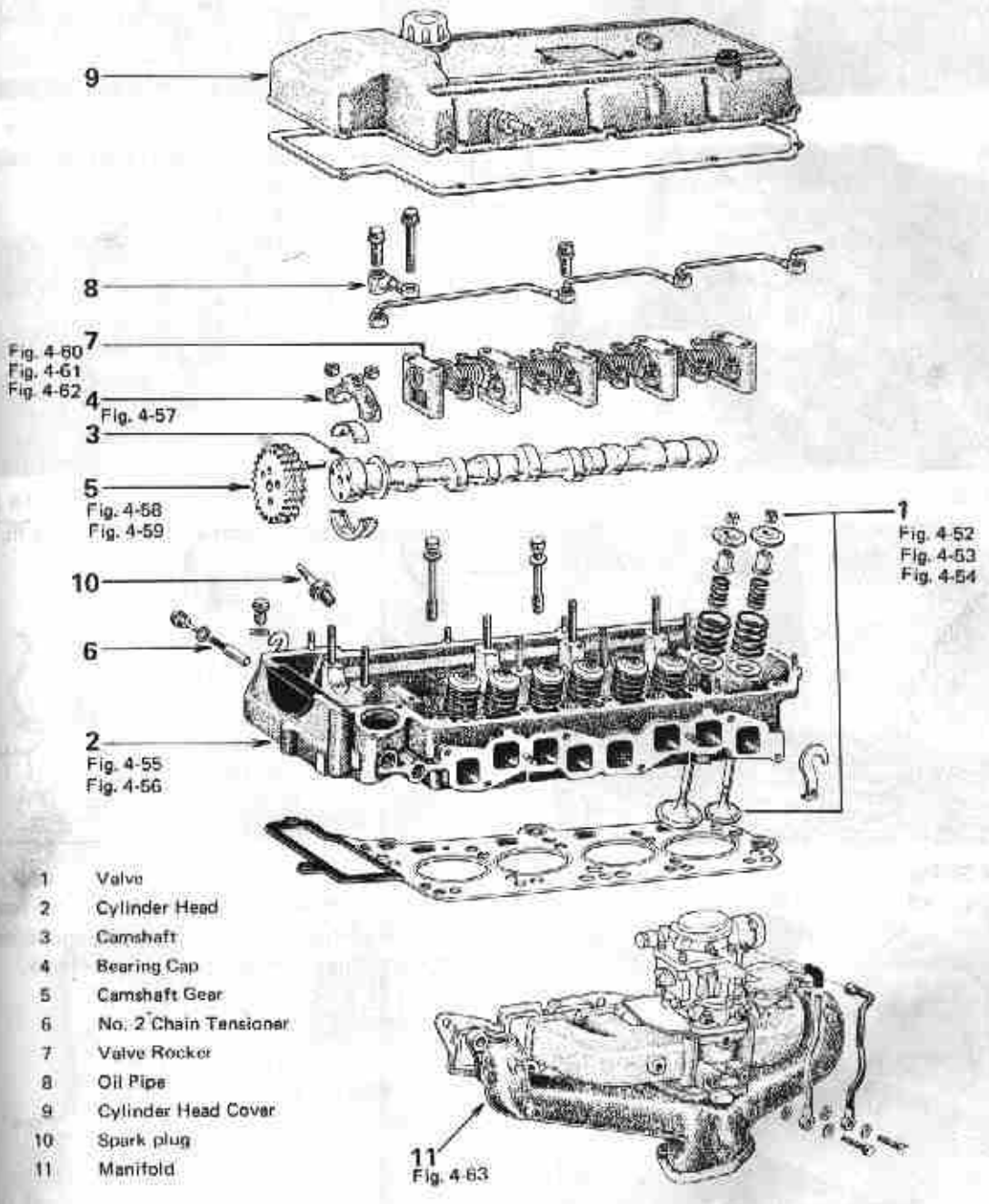
**Warpage limit 0.1 mm (0.004 in)**

## ASSEMBLY

Assemble in numerical order.

**Fig. 4-51**

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

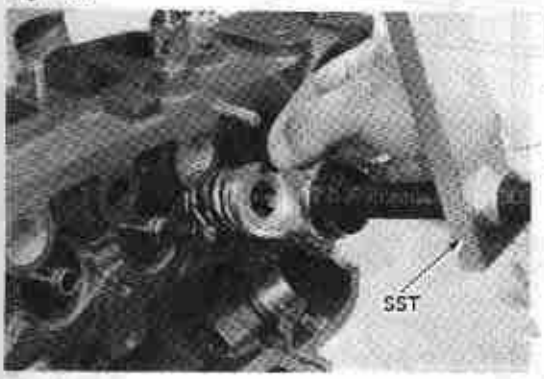



| | |
|---|---|
| 1 | Valve |
| 2 | Cylinder Head |
| 3 | Camshaft |
| 4 | Bearing Cap |
| 5 | Camshaft Gear |
| 6 | No. 2 Chain Tensioner |
| 7 | Valve Rocker |
| 8 | Oil Pipe |
| 9 | Cylinder Head Cover |
| 10 | Spark plug |
| 11 | Manifold |

Fig. 4-52

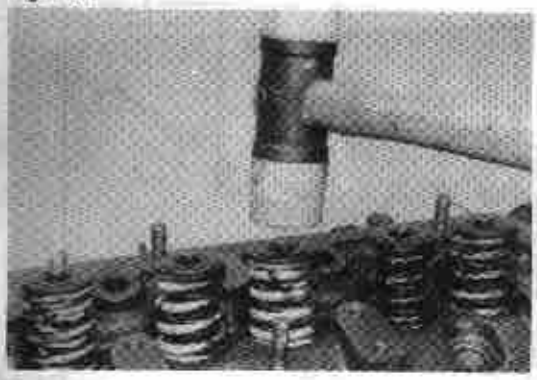
Install the spring seat and oil seal as shown in the figure. The head must be clean and the oil seal inserted to where the end contacts the spring seat top.

Fig. 4-53



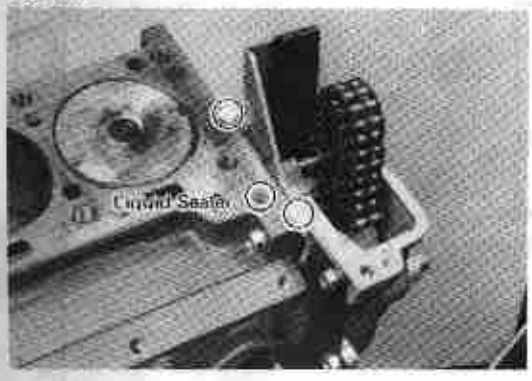

Assemble the valve spring and install the retainer locks.
Use SST [09202-43012].

Fig. 4-54



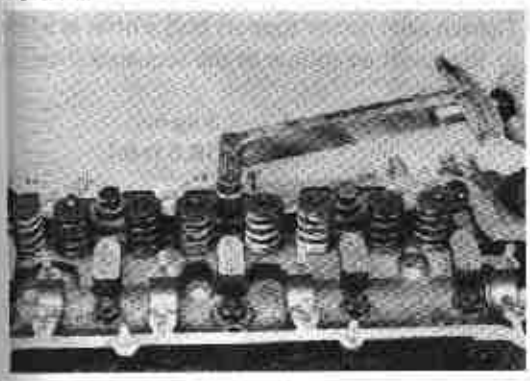
Tap the valve stems lightly to assure proper fit.

Fig. 4-55




Apply a coat of sealer to the cylinder head, around the holes in the block, and in the vicinity of the timing chain cover and cylinder block.

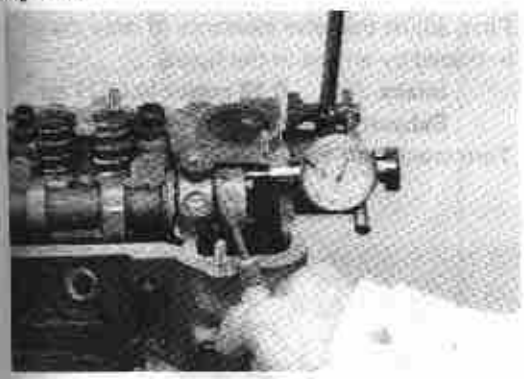
Fig. 4-56



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

**Torque 10–12 kg-m (72.3–86.8 ft-lb)**

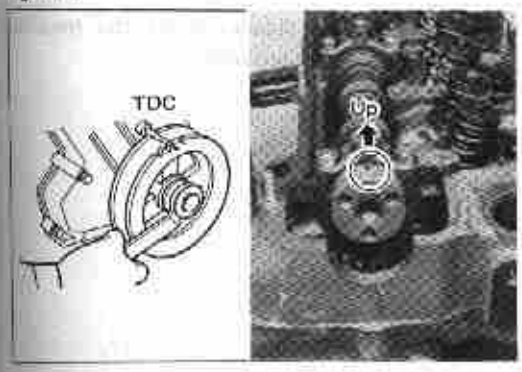
Fig. 4-57



Check the camshaft thrust clearance.

**Thrust clearance standard**
**0.042 – 0.167 mm**
**(0.0017 – 0.0118 in)**

Fig. 4-58

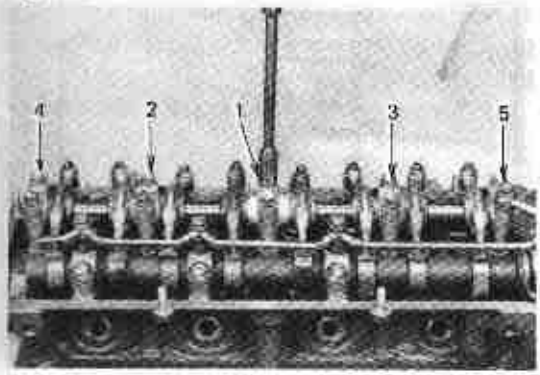



Set the No.1 cylinder to TDC/compression. The camshaft knock pin should be pointing upwards.

Fig. 4-59


Align the matchmarks on the chain and gear, and install the No.2 chain. Align the gear pin hole and camshaft knock pin and install them.

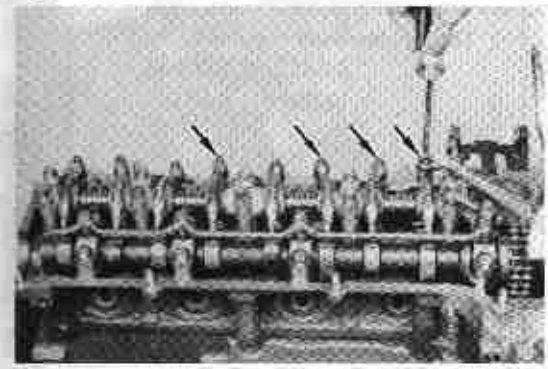
Fig. 4-60




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

**Torque** **1.7–2.3 kg-m (12.3–16.6 ft-lb)**

Fig. 4-61

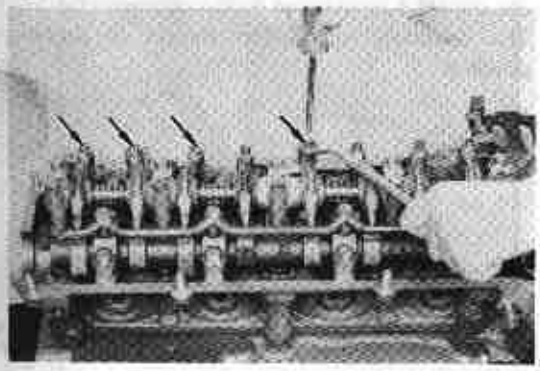


First, adjust the valve clearance of only the valves indicated by arrows in the figure.

| | | |
|---|---|---|
| **Intake** | **0.18 mm** | **(0.0071 in)** |
| **Exhaust** | **0.33 mm** | **(0.0130 in)** |

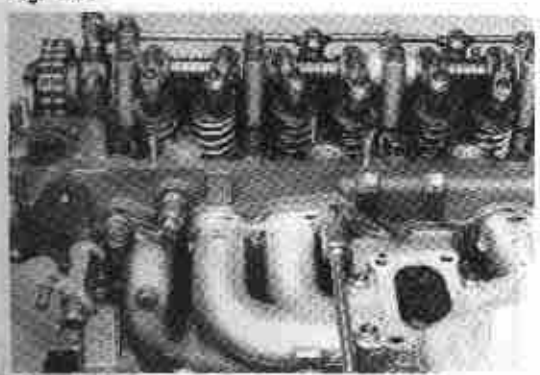
Turn crankshaft 360° and align timing mark.

Fig. 4-62



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

Fig. 4-63



Tighten the manifold bolts and nuts to the specified torque in the sequence shown in the figure.

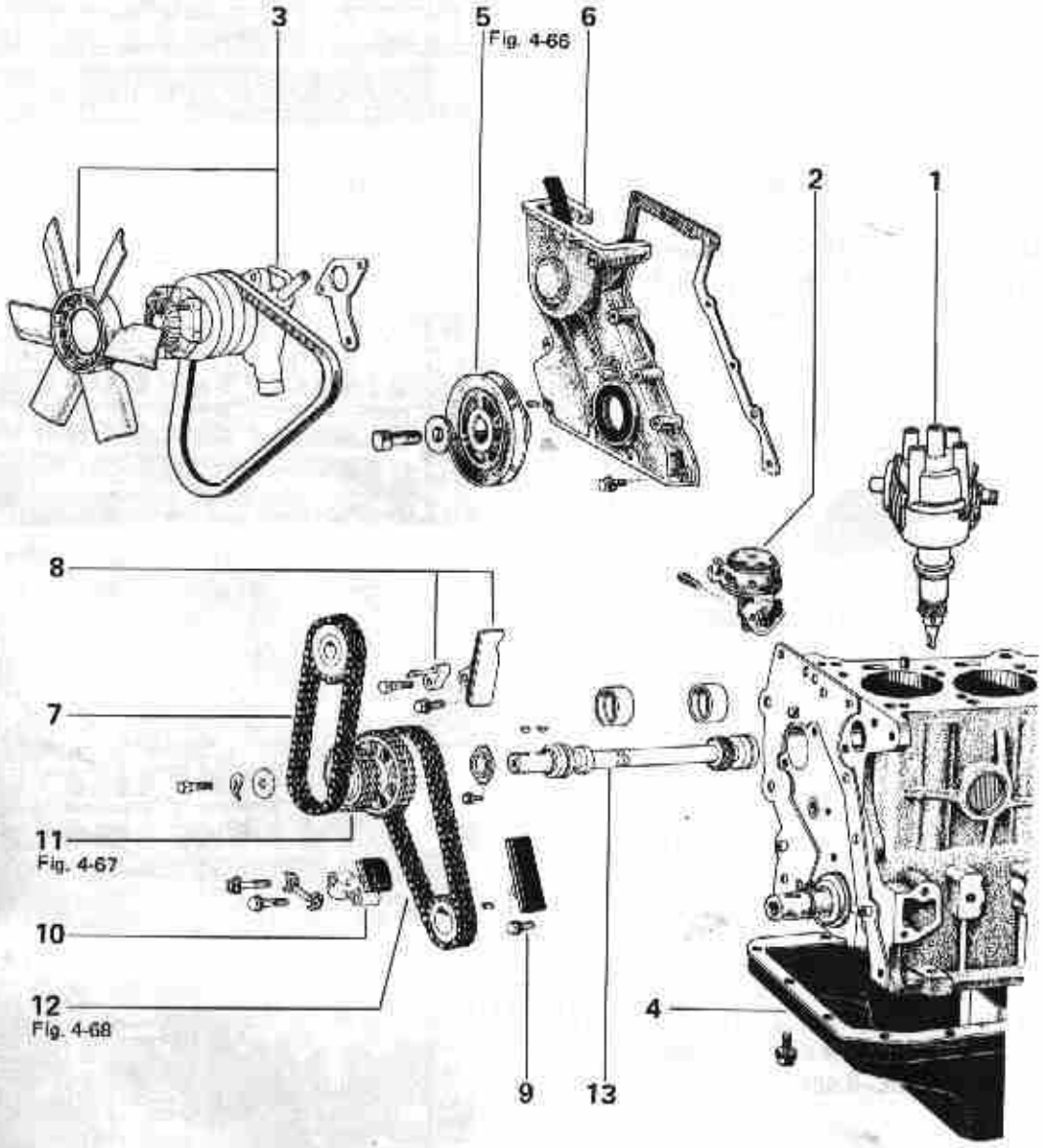
**Torque** **4.5–5.5 kg-m (32.6–39.8 ft-lb)**

# TIMING CHAIN

## DISASSEMBLY

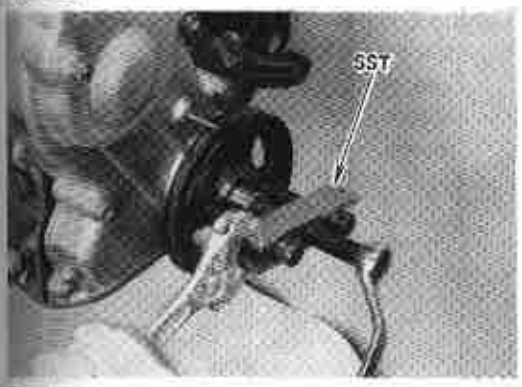
Disassemble in numerical order.

**Fig. 4-65**



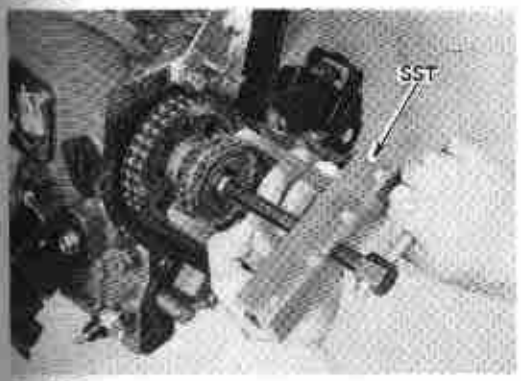

| | | | | | |
|---|---|---|---|---|---|
| 1 | Distributor | 5 | Crankshaft Pulley | 9 | No. 1 Chain Damper |
| 2 | Fuel Pump | 6 | Timing Gear Cover | 10 | No. 1 Chain Tensioner |
| 3 | Fan and Water Pump | 7 | No. 2 Timing Chain | 11 | Camshaft Drive Gear |
| 4 | Oil Pan | 8 | No. 2 Chain Damper and Oil Jet | 12 | No. 1 Timing Chain and Gear |
| | | | | 13 | Pump Drive Shaft |

Fig. 4-66



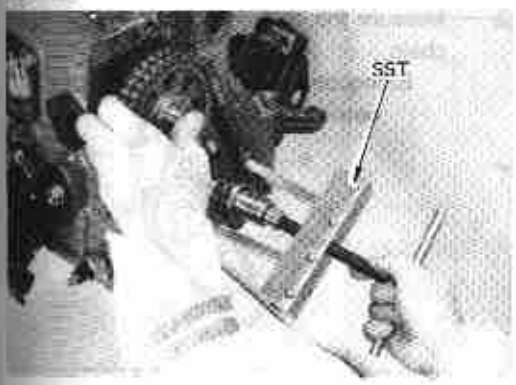

Remove the crankshaft pulley with SST.
Use SST [09213-31021].

Fig. 4-67



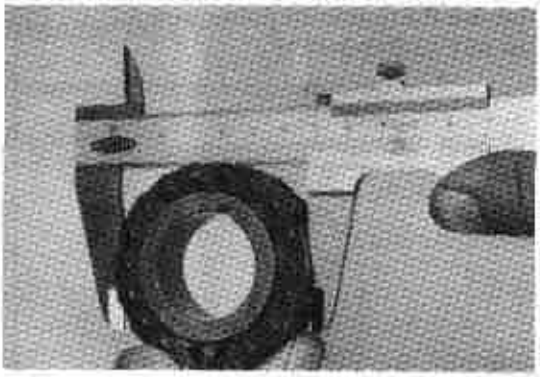

Remove the camshaft drive gear with SST.
Use SST [09213-36020].

Fig. 4-68




Attach the SST to the two gears and slide out both gears and chains as a unit.
Use SST [09213-36020].

Fig. 4-70

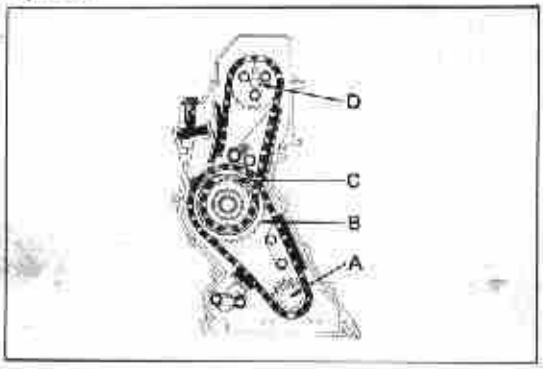


## INSPECTION AND REPAIR

### Timing Gear and Chains

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

Fig. 4-71

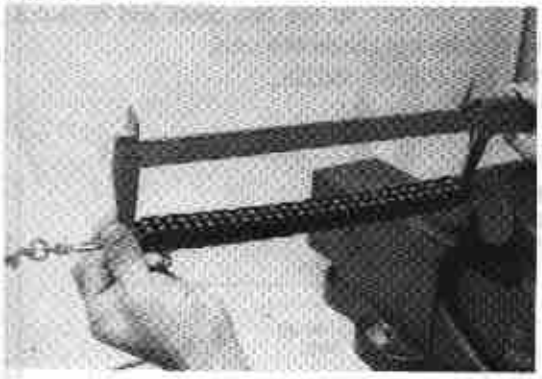



If measurement is below limit, replace gears and chain.

**Wear limit**

**A: Crank shaft gear 60.0 mm (2.362 in)**
**B: Pump drive shaft gear 114.5 mm (4.508 in)**
**C: Camshaft drive gear 78.2 mm (3.079 in)**
**D: Camshaft timing gear 78.2 mm (3.079 in)**

Fig. 4-72



3. Measure the elongation of the No. 1 timing chain.

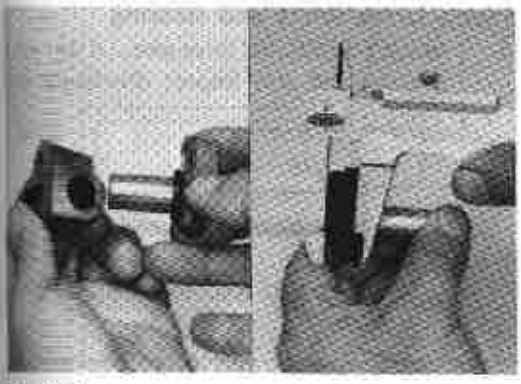
**Elongation limit 291.4 mm (11.47 in) tension at 5 kg (11 lb)**

Fig. 4-73

4. Measure the 17-link elongation of the No. 2 timing chain. Replace the chain if over the elongation limit.

**Elongation limit (at 17-links) 147 mm (5.787 in)**

Fig. 4-74

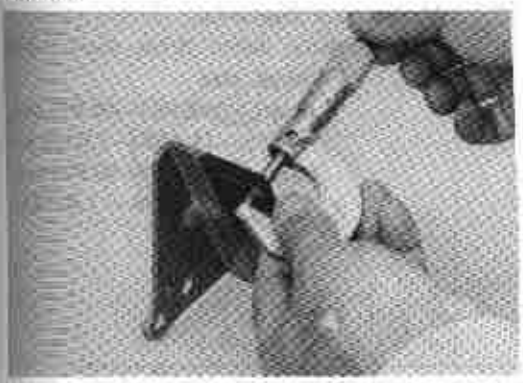


### No. 1 Chain Tensioner

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.

**Wear limit 11.5 mm (0.453 in)**

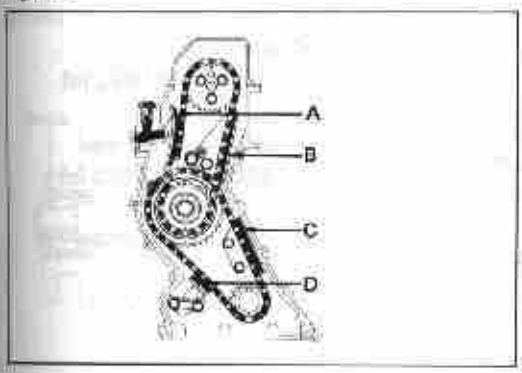
Fig. 4-75



### Chain Damper and Slipper

Measure each chain damper and check for wear.

Fig. 4-76




If either is visibly worn or measures less than limit, replace unit.

**Wear limit**

**A: Slipper**
**6.8 mm (0.26 in)**
**B: No. 2 damper**
**5.7 mm (0.224 in)**
**C: No. 1 damper**
**5.0 mm (0.20 in)**
**D: No. 1 tensioner**
**11.5 mm (0.45 in)**

Fig. 4-77

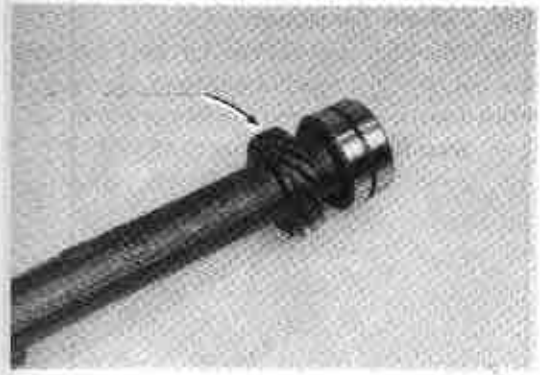
### Timing Gear and Thrust Plate

Measure thrust clearance.

If it exceeds limit, replace thrust plate.

**Thrust clearance**
**limit 0.3 mm (0.012 in)**
**Standard**
**0.06–0.13 mm (0.0024–0.0051 in)**

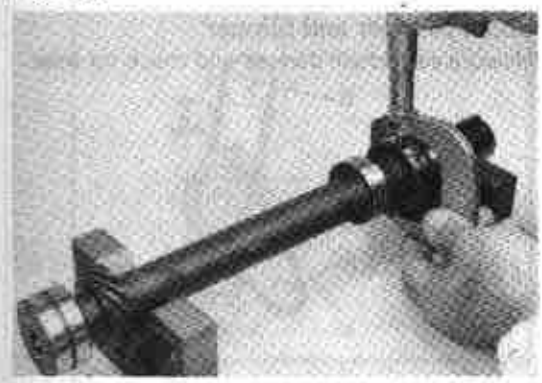
Fig. 4-78



### Pump Drive Shaft and Bearing

1. Inspect distributor drive gear. If damaged replace, and also inspect distributor gear.

Fig. 4-79



2. Measure oil clearance
   (1) Measure pump drive shaft journal.

**Finished size**

| | |
|---|---|
| **Front** | **45.951–45.975 mm (1.8091–1.8100 in)** |
| **Rear** | **40.959–40.975 mm (1.6126 – 1.6132 in)** |

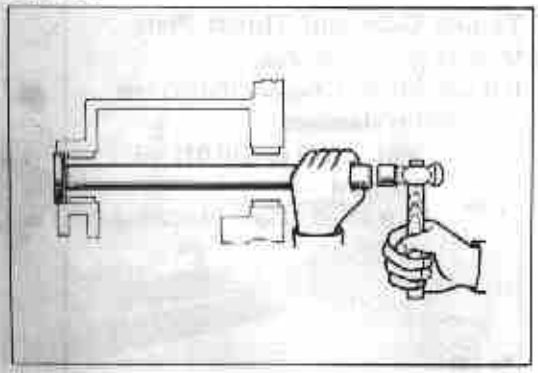
Fig. 4-80

(2) Measure inner diameter of bearing.

**Oil clearance limit**
**0.08 mm (0.0032 in)**

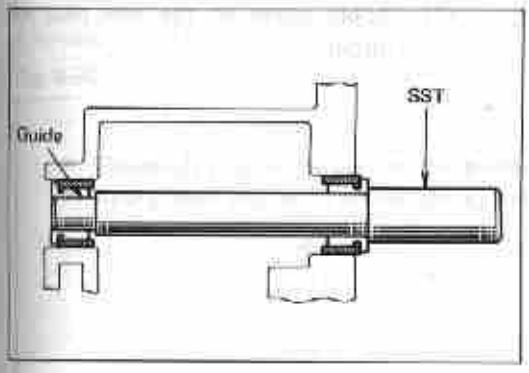
**Standard**
**0.025 – 0.066 mm (0.0010 – 0.0026 in)**

Fig. 4-81



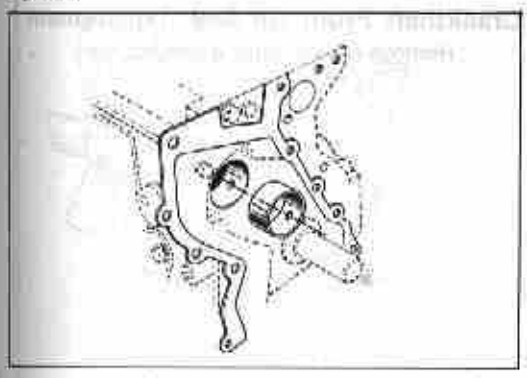
3. Bearing replacement
   (1) Drive out plug from cylinder block.

Fig. 4-82



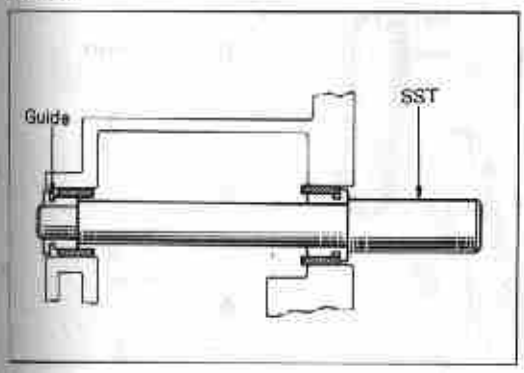

(2) Remove front bearing.
Use SST [09233-33010] as shown.

Fig. 4-83



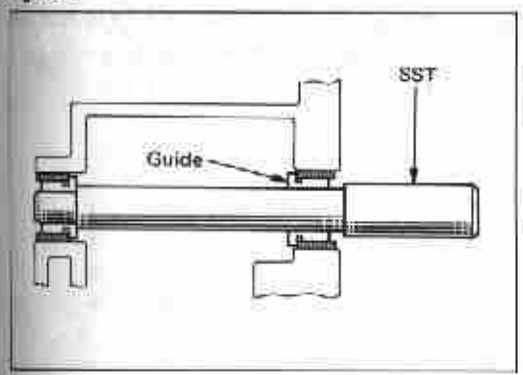
(3) Aligh bearing oil hole.

Fig. 4-84




(4) Install front bearing.
Use SST [09233-33010] as shown.
**Bearing fitting tolerance**
**0.02–0.06 mm**
**(0.0008–0.0024 in)**

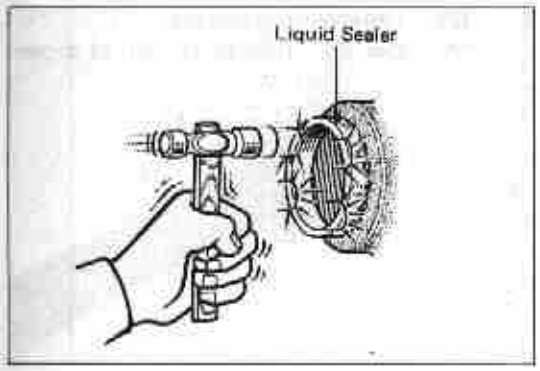
Fig. 4-85




(5) Remove the rear bearing.
(6) Install the rear bearing.

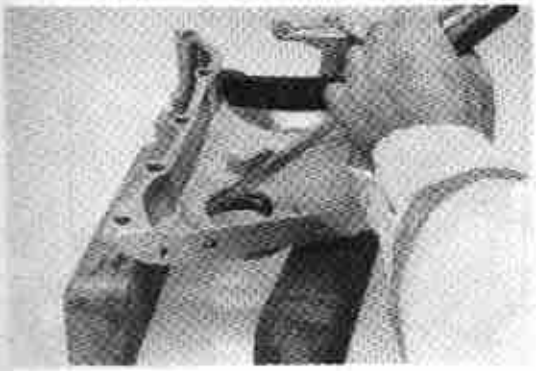
**– Note –**
**Installation procedure is the same as for the front bearing.**

Fig. 4-86




(7) Apply sealer to the new plug and install.

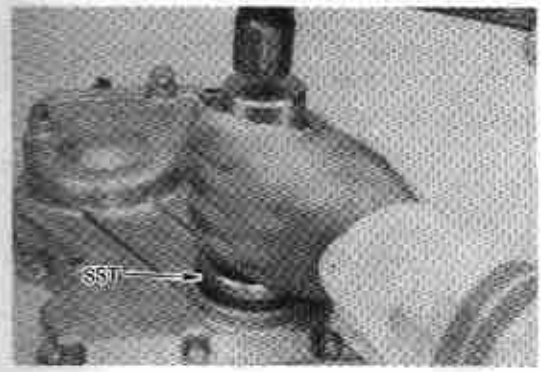
Fig. 4-87



**Crankshaft Front Oil Seal Replacement**

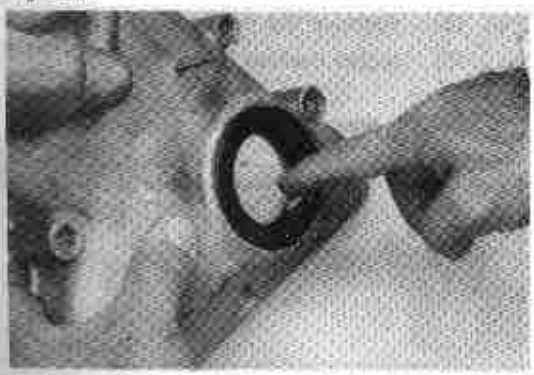
1. Remove oil seal with a screwdriver.

Fig. 4-88




2. Install new oil seal.
Use SST [09223-50010] as shown.

Fig. 4-89



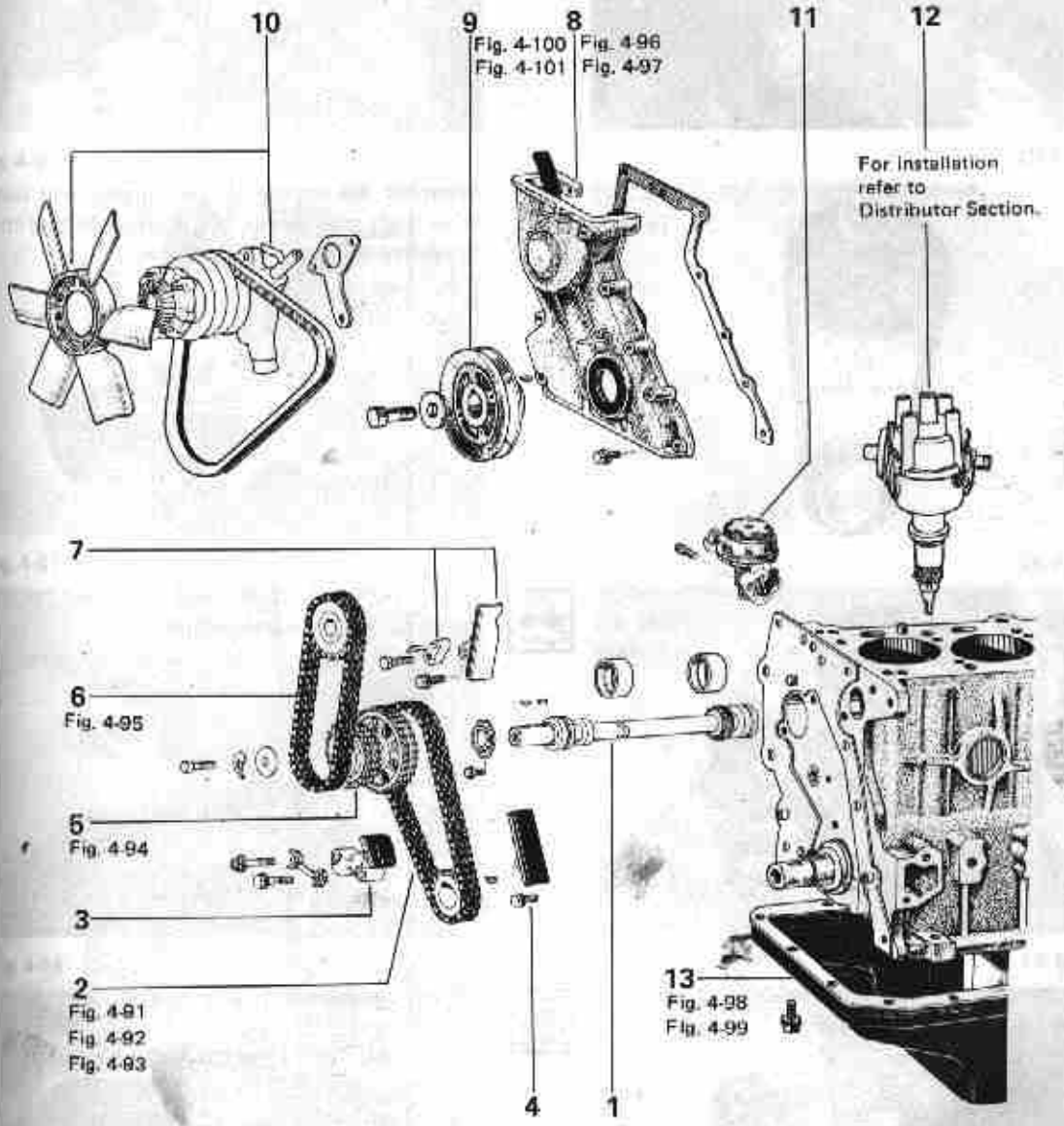
3. After driving in the seal, be sure to coat the seal lip lightly with MP grease.

## ASSEMBLY

Assemble in numerical order.

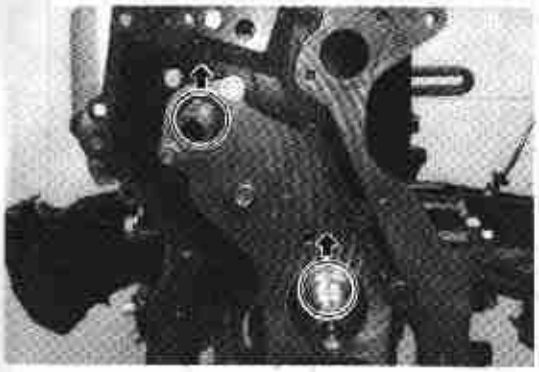
Fig. 4-90

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




| | | | | | |
|---|---|---|---|---|---|
| 1 | Pump Drive Shaft | 5 | Camshaft Drive Gear | 9 | Crankshaft Pulley |
| 2 | No. 2 Timing Chain and Gear | 6 | No. 2 Timing Chain | 10 | Fan and Water Pump |
| 3 | No. 1 Chain Tensioner | 7 | No. 2 Chain Damper and Oil Jet | 11 | Fuel Pump |
| 4 | No. 1 Chain Damper | 8 | Timing Gear Cover | 12 | Distributor |
| | | | | 13 | Oil Pan |

Fig. 4-91



Set the crankshaft keyway and the pump drive shaft keyway vertically upward.

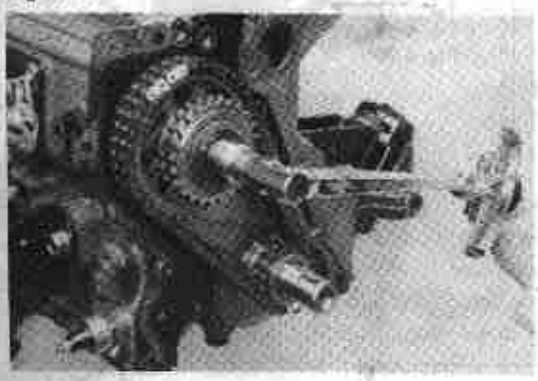
Fig. 4-92


Assemble the crankshaft timing gear and pump drive shaft gear to the No. 2 chain so that their respective marks are aligned.

Fig. 4-93

Drive in No. 1 chain and gears on to the crankshaft and pump driveshaft.

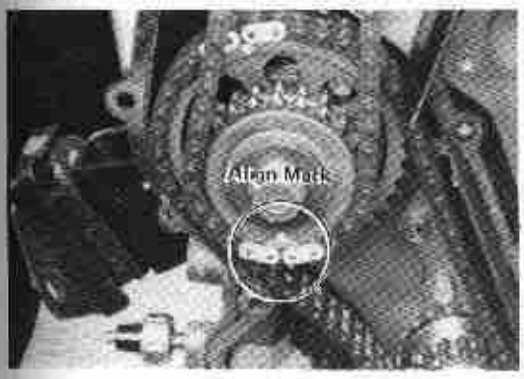
Fig. 4-94



Tighten camshaft drive gear bolt.

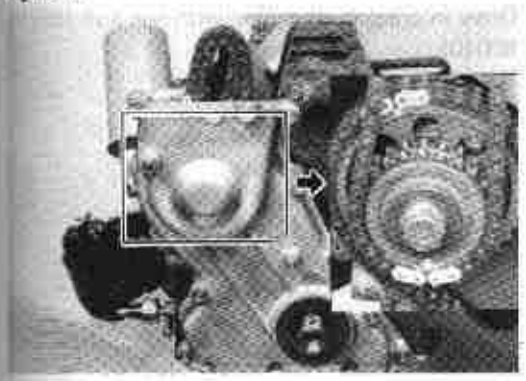
**Torque**
**8.0–10.0 kg-m (57.9–72.3 ft-lb)**

Fig. 4-95



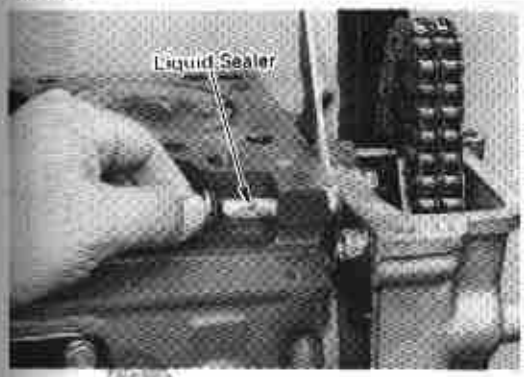

Align the No. 2 chain and gear matchmarks and install.

Fig. 4-96



Be careful not to drop the chain inside the housing.

Fig. 4-97




Before installing the upper right hand bolt for the chain cover mount, insert a seal washer and apply a sealer to the threads.

Fig. 4-98


Apply sealer to the areas indicated in the figure.

Fig. 4-99

Install oil pan.

**Torque**
**0.4–0.8 kg-m (2.9–5.8 ft-lb)**

Fig. 4-100

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

Fig. 4-101

Tighten claw nut.

**Torque**
**12.0 – 15.0 kg-m**
**(86.8 – 108.4 ft-lb)**

# CYLINDER BLOCK

## DISASSEMBLY

Disassemble in numerical order

**Fig. 4-110**

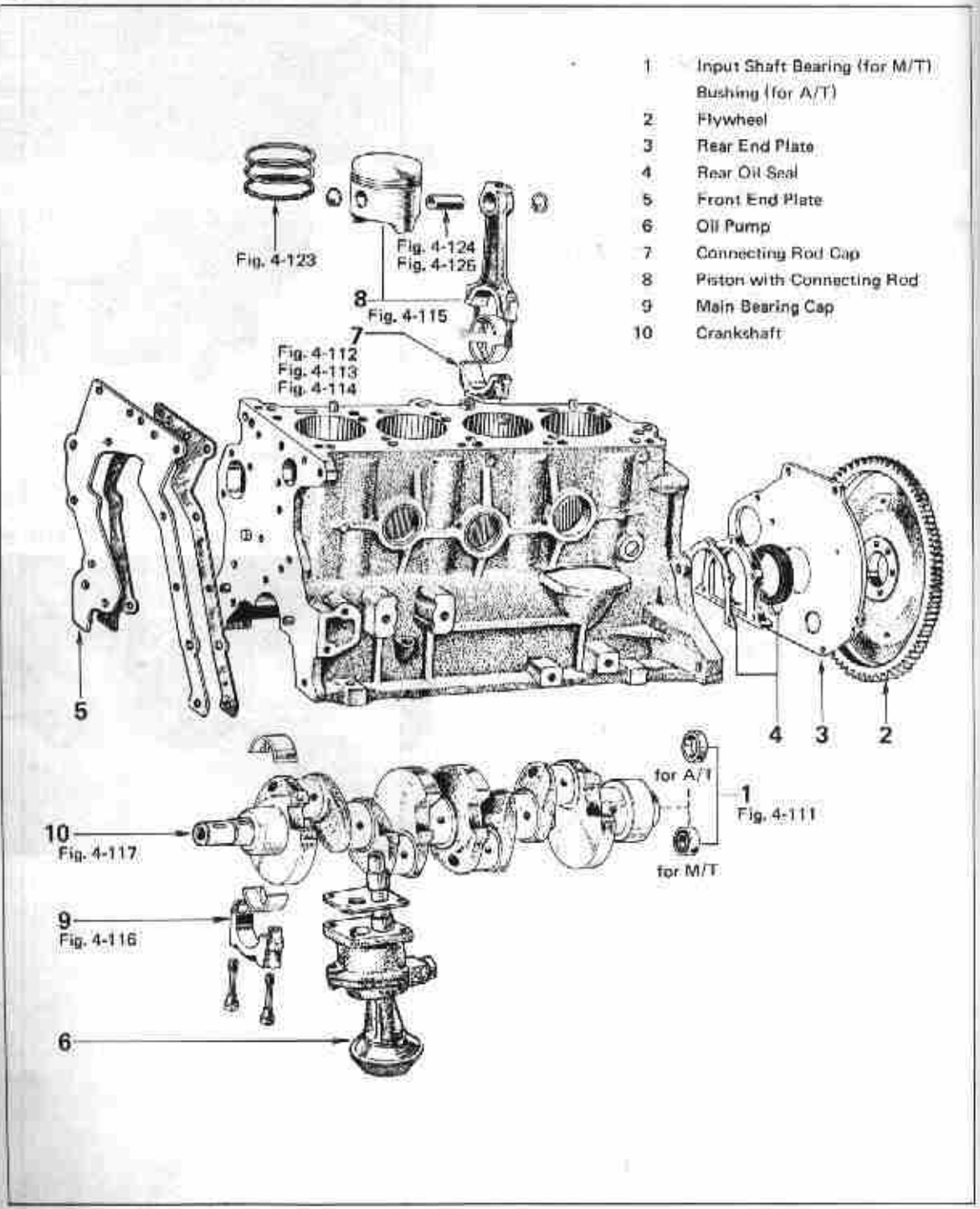
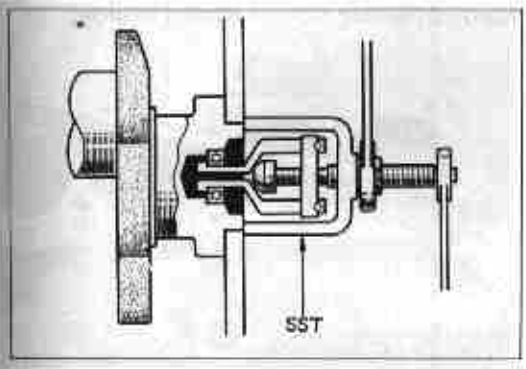
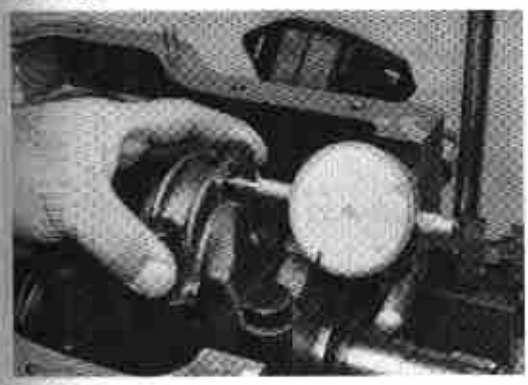


Fig. 4-111




Using SST [09303-35011], remove input shaft bearing.

Fig. 4-112



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

**Thrust clearance limit**

| | |
|---|---|
| | **0.4 mm (0.016 in)** |
| **Standard** | **0.21 – 0.34 mm (0.0083 – 0.0133 in)** |

Fig. 4-113


Mark connecting rod and cap for correct reassembly.

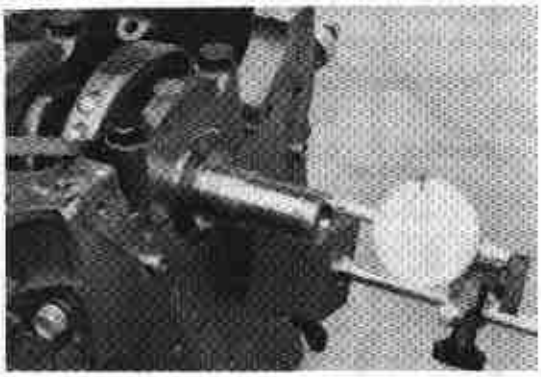
Fig. 4-114

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

Fig. 4-115

Keep connecting rod and bearing in order.

Fig. 4-116

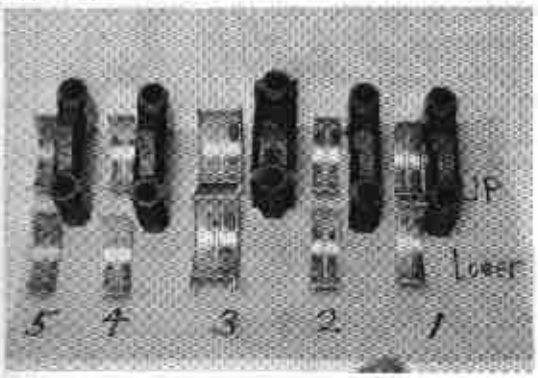


Measure the crankshaft thrust clearance. If the clearance exceeds the limit, replace the bearing as a set.

**Thrust clearance limit**
**0.3 mm (0.012 in)**

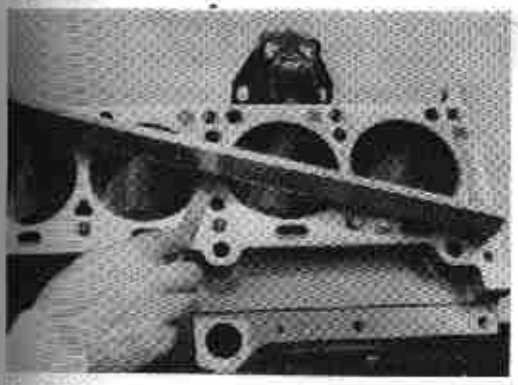
**Standard**
**0.02–0.22 mm (0.0008–0.0087 in)**

Fig. 4-117




Keep crankshaft bearing and cap in order.

Fig. 4-118



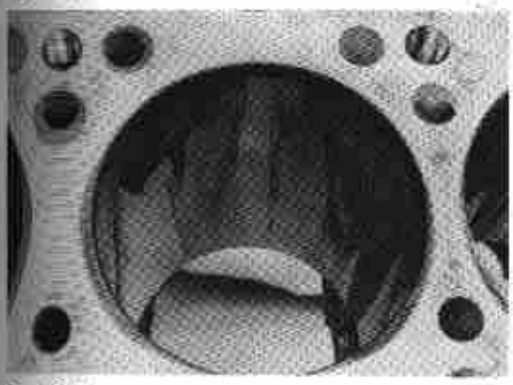
## INSPECTION & REPAIR

### Cylinder Block

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

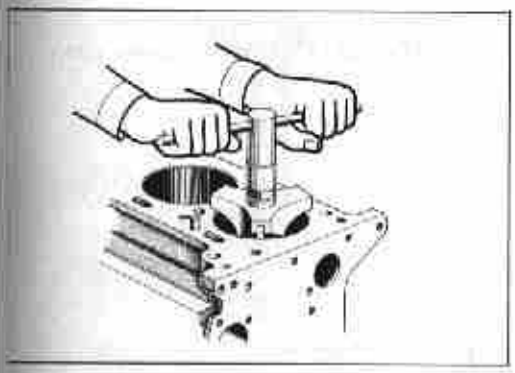
**Warpage limit 0.05 mm (0.0019 in)**

Fig. 4-119



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

Fig. 4-120

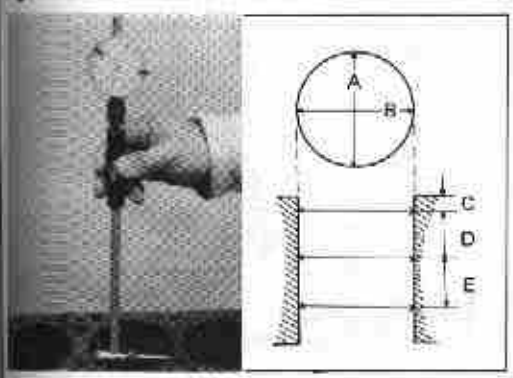


3. Machine piston ring ridge from top of cylinder.

**— Note —**

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

Fig. 4-121




4. Measure cylinder bore at position as shown.

**A : Thrust Direction**
**B : Axial Direction**
**C : 15 mm (0.59 in)**
**D : 60 mm (2.36 in)**
**E : 60 mm (2.36 in)**

If bore exceeds specification, it must be rebored.

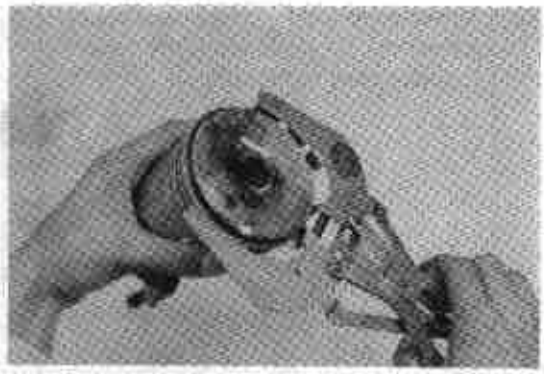
| | |
|---|---|
| **Wear limit** | **0.2 mm (0.008 in)** |
| **Standard** | **88.50–88.55 mm (3.4842–3.4862 in)** |

Fig. 4-122

## Piston and Connecting Rod

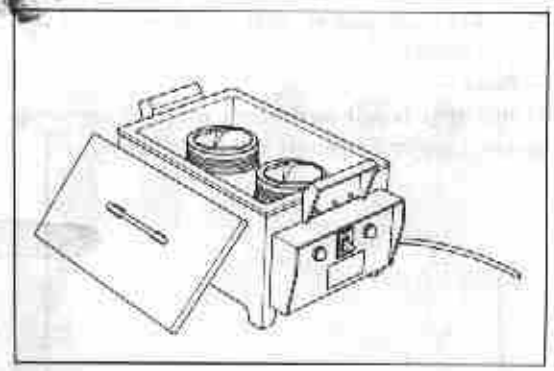
1. Check pin fit by trying to rock piston at right angle to pin. If any movement is felt, piston with pin must be replaced.

Fig. 4-123



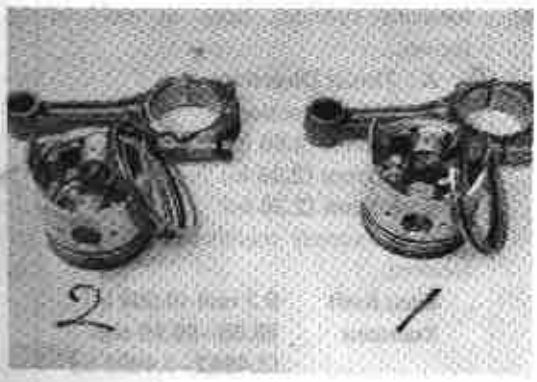
2. Remove piston ring, using the piston ring expander.

Fig. 4-124



3. Heat piston in piston heater to about 100°C (212°F) and remove piston pin.

Fig. 4-125

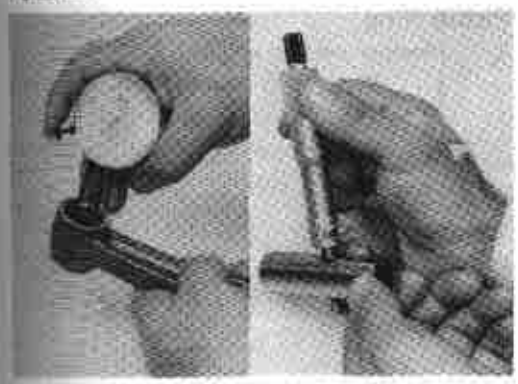


4. After disassembling, keep piston, pin, ring and rod in order.

Fig. 4-126

5. Heat piston to 100°C (212°F) coat pin with engine oil.
The pin should be able to be pushed into piston hole with thumb pressure.

Fig. 4-127

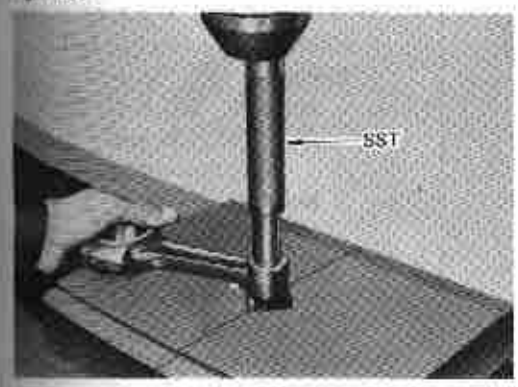


6. Measure oil clearance between bush and pin.

**Oil clearance:**

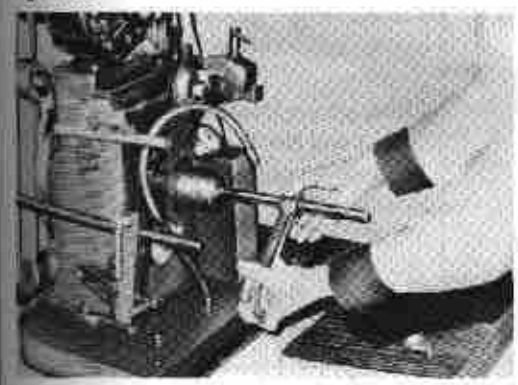
| | |
|---|---|
| **Limit** | **0.02 mm (0.0008 in)** |
| **Standard** | **0.005–0.014 mm (0.00020–0.00055 in)** |

Fig. 4-128



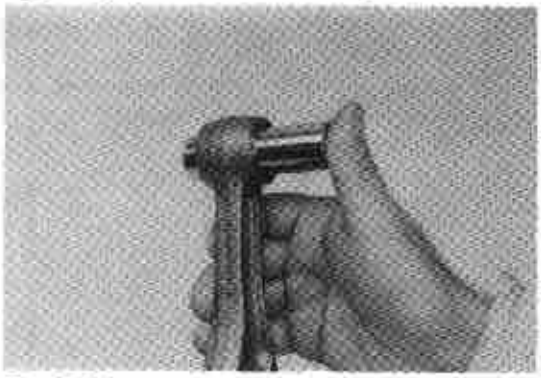

7. Replace bushing with SST [09222-30010].

Fig. 4-129



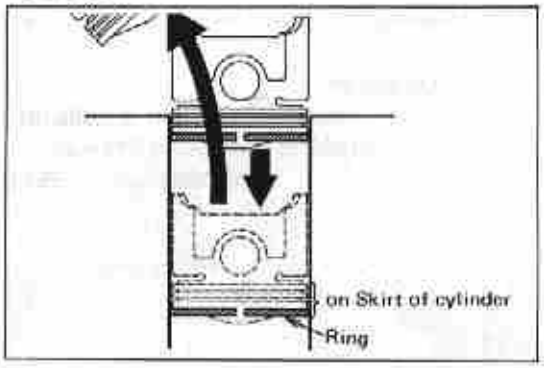
8. After pressing in the bushing, finish the bushing bore with a pin hole grinder.

Fig. 4-130



9. Coat the pin with engine oil. At normal room temperature, you should be able to press the pin into the rod your thumb.

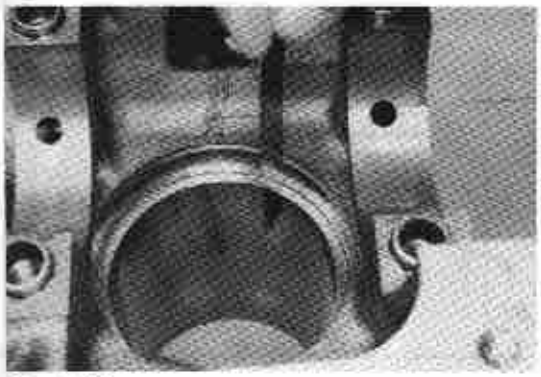
Fig. 4-131




## 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.

Fig. 4-132



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

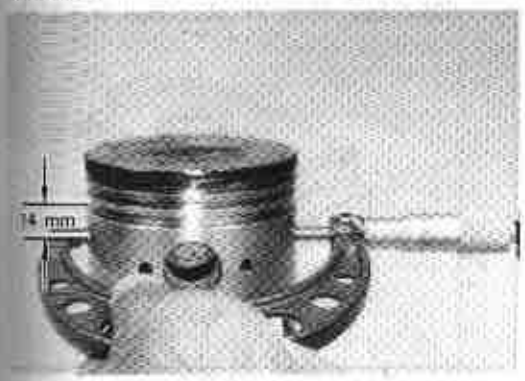
**End gap:**
**No.1**
**0.19 – 0.34 mm**
**(0.0075 – 0.0133 in.)**
**No.2**
**0.15 – 0.48 mm**
**(0.0059 – 0.0189 in.)**
**Oil ring (Side Rail)**
**0.20 – 0.88 mm**
**(0.0079 – 0.0346 in.)**

Fig. 4-133

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

**Ring groove clearance**
**No. 1 and No. 2**
**0.02–0.06 mm (0.0008–0.0024 in)**

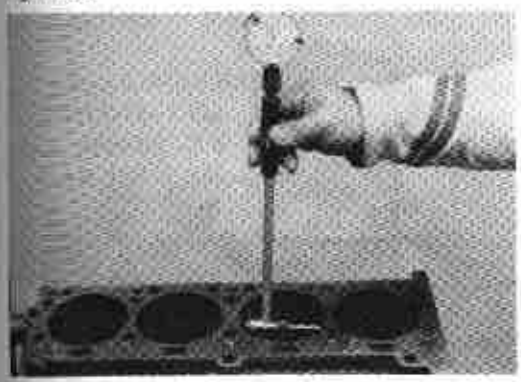
Fig. 4-134




## Piston Clearance

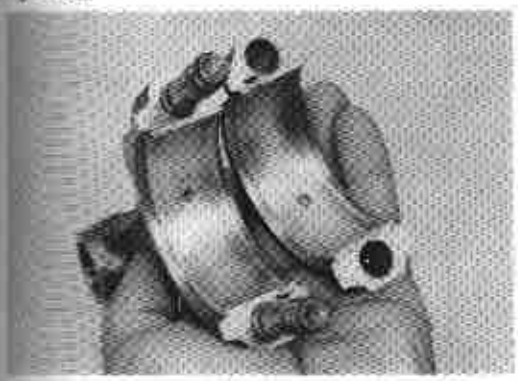
1. Measure piston diameter at right angle to piston pin center line.
   Measurement must be made at normal temperature (20°C or 68°F).
   **Piston diameter (STD)**
   **88.44–88.49 mm**
   **(3.4819–3.4839 in)**

Fig. 4-135



2. Measure cylinder bore and subtract piston measurement. If clearance exceeds specification, replace piston.
   **Piston clearance**
   **0.06–0.07 mm (0.0020–0.0028 in)**

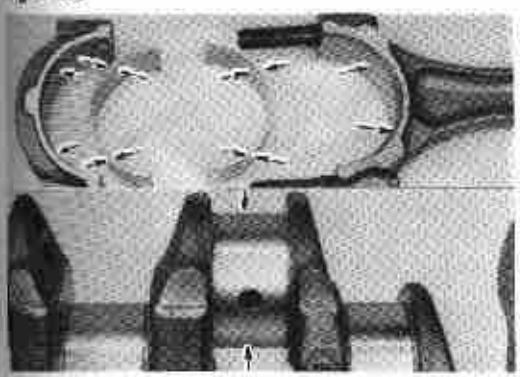
Fig. 4-136



## Crankpin and Bearing

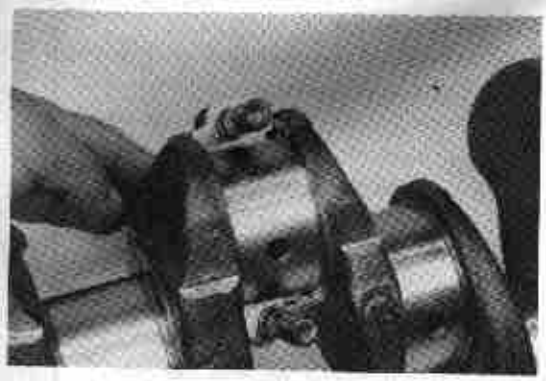
1. Inspect bearings for flaking or scoring. If bearings are damaged, replace.

Fig. 4-137



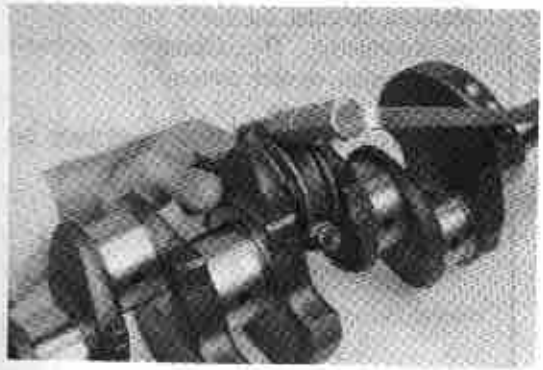
2. Measure crankpin oil clearance.
   (1) Clean crankshaft pin, rod, cap and bearing.

Fig. 4-138



(2) Lay strip of plastigage across pin

Fig. 4-139



(3) Tighten cap nuts to specified torque.

**Torque**

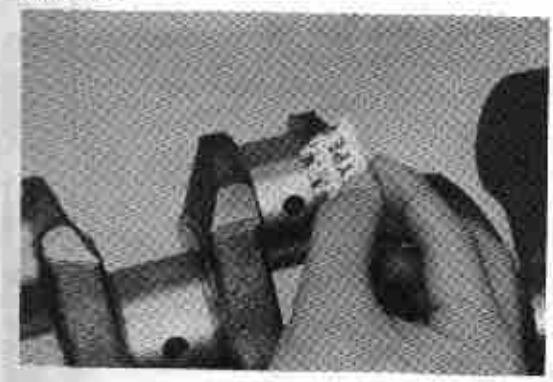
**16R, 18R 5.4–6.6 kg-m (39.1–47.7 ft-lb)**

**18R-G 6.4–7.0 kg-m (46.3–50.6 ft-lb)**

**– Note –**

**Do not turn connecting rod.**

Fig. 4-140



(4) Measure plastigage at its widest point.

If clearance is not within specification, replace bearings.

**Clearance limit**

**0.08 mm (0.0032 in)**

**Standard**

**0.24 – 0.48 mm (0.0094 – 0.0189 in)**

U/S Bearing sizes

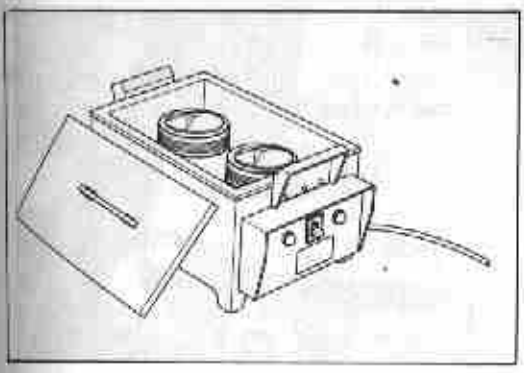
U/S 0.05, 0.25, 0.50

Fig. 4-141

Assemble piston and rod as follows.

1. Install snap ring on one side.

Fig. 4-142



2. Heat piston to about 100° (212°F)

Fig. 4-143


3. Aligning piston notch and rod mark as shown.

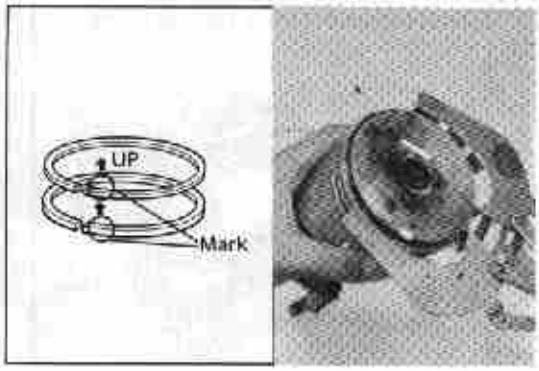
Fig. 4-144

4. Install piston pin.

Fig. 4-145

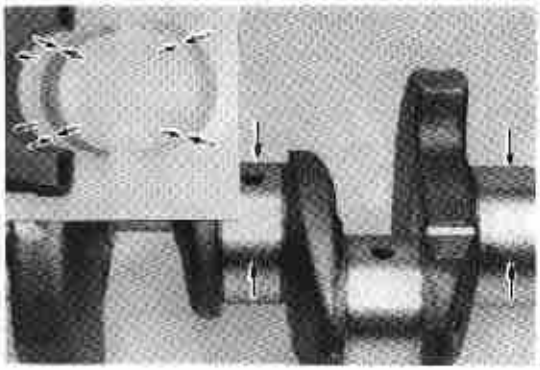
5. Install snap ring on other side.
Make sure snap ring is completely in place.

Fig. 4-146




6. Install piston ring, using piston ring expander.
Install two compression rings with code marks facing up.

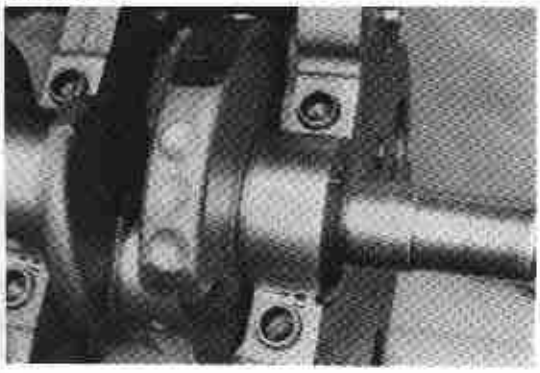
Fig. 4-147



## Crankshaft and Bearing

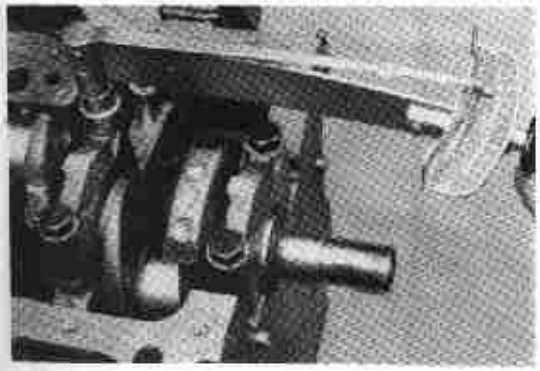
1. Measure crankshaft oil clearance.
(1) Clean journal, cap and bearing

Fig. 4-148



(2) Lay strip of plastigage across journal.

Fig. 4-149

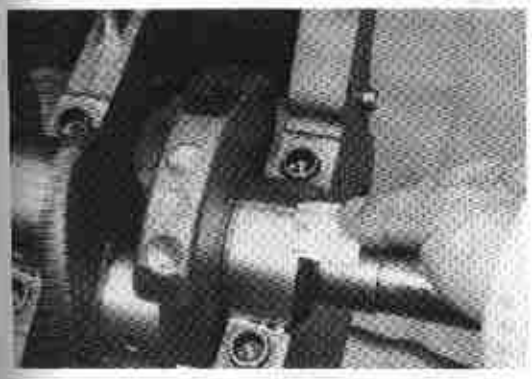


(3) Tighten cap nuts to specified torque.

| | |
|---|---|
| **Torque** | **16R, 18R** |
| | **9.5–11.5 kg-m** |
| | **(68.7–83.2 ft-lb)** |
| **18R-G** | **10.0–11.0 kg-m** |
| | **(72.3–79.6 ft-lb)** |

**– Note –**
**Do not turn crankshaft.**

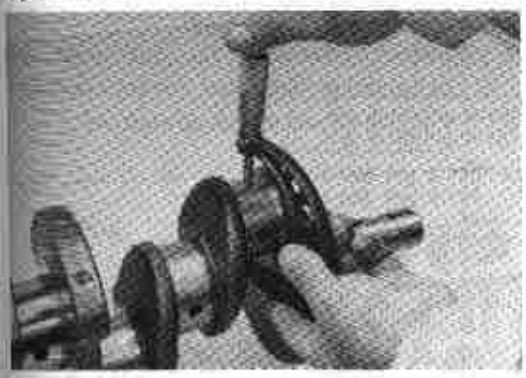
Fig. 4-150



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

**Clearance limit**
**0.08 mm (0.0032 in)**
**Standard**
**0.16 – 0.040 mm**
**(0.0063 – 0.0016 in)**
U/S bearing sizes
U/S 0.05, 0.25, 0.50

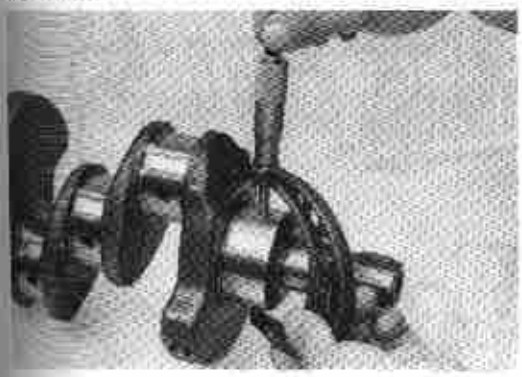
Fig. 4-151



2. Measure crankpin journal.
If wear is excessive, crankshaft must be reground or replaced.

| Crank Pin Journal Size | |
|---|---|
| STD | 52.976–53.000 mm (2.0857–2.0867 in) |
| U/S 0.25 | 52.70–52.71 mm (2.0748–2.0752 in) |

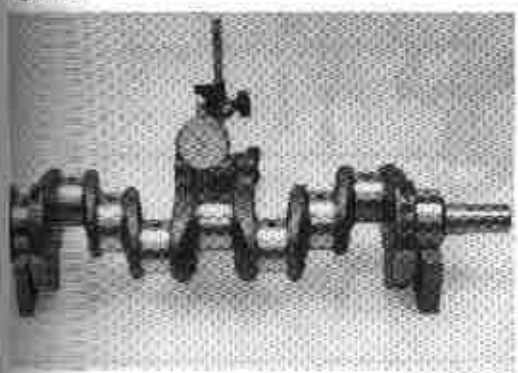
Fig. 4-152



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

| Crankshaft Main Journal Size | |
|---|---|
| STD | 59.976–60.000 mm (2.3613–2.3622 in) |
| U/S 0.25 | 59.70–59.71 mm (2.3504–2.3508 in) |

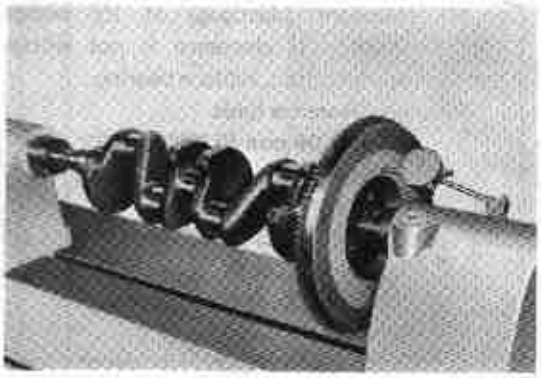
Fig. 4-153



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

**Limit** **0.03 mm (0.0012 in)**

Fig. 4-154



### Flywheel

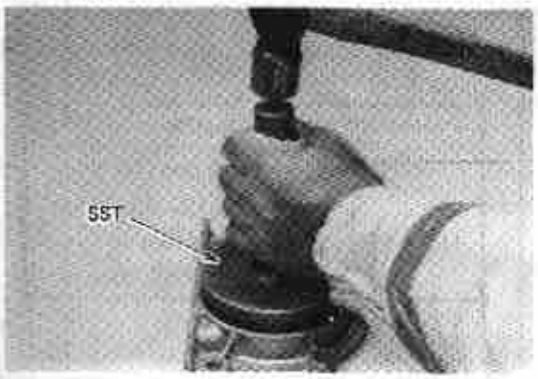
1. Inspect the surface contacting the clutch disc.
2. Measure the runout of the surface contacting the clutch disc.
   **Runout limit 0.3 mm (0.012 in)**
3. Inspect the ring gear.

Fig. 4-155

### Crankshaft Rear Oil Seal

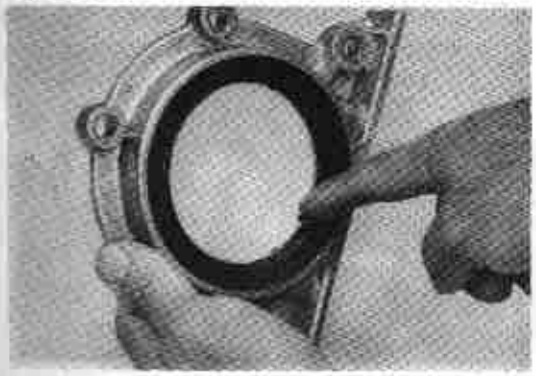
1. Inspect oil seal lip for wear and deformation, and also inspect crankshaft.
2. Remove oil seal with a screwdriver.

Fig. 4-156




3. Install new oil seal.
   Use SST [09223-41020] as shown.

Fig. 4-157



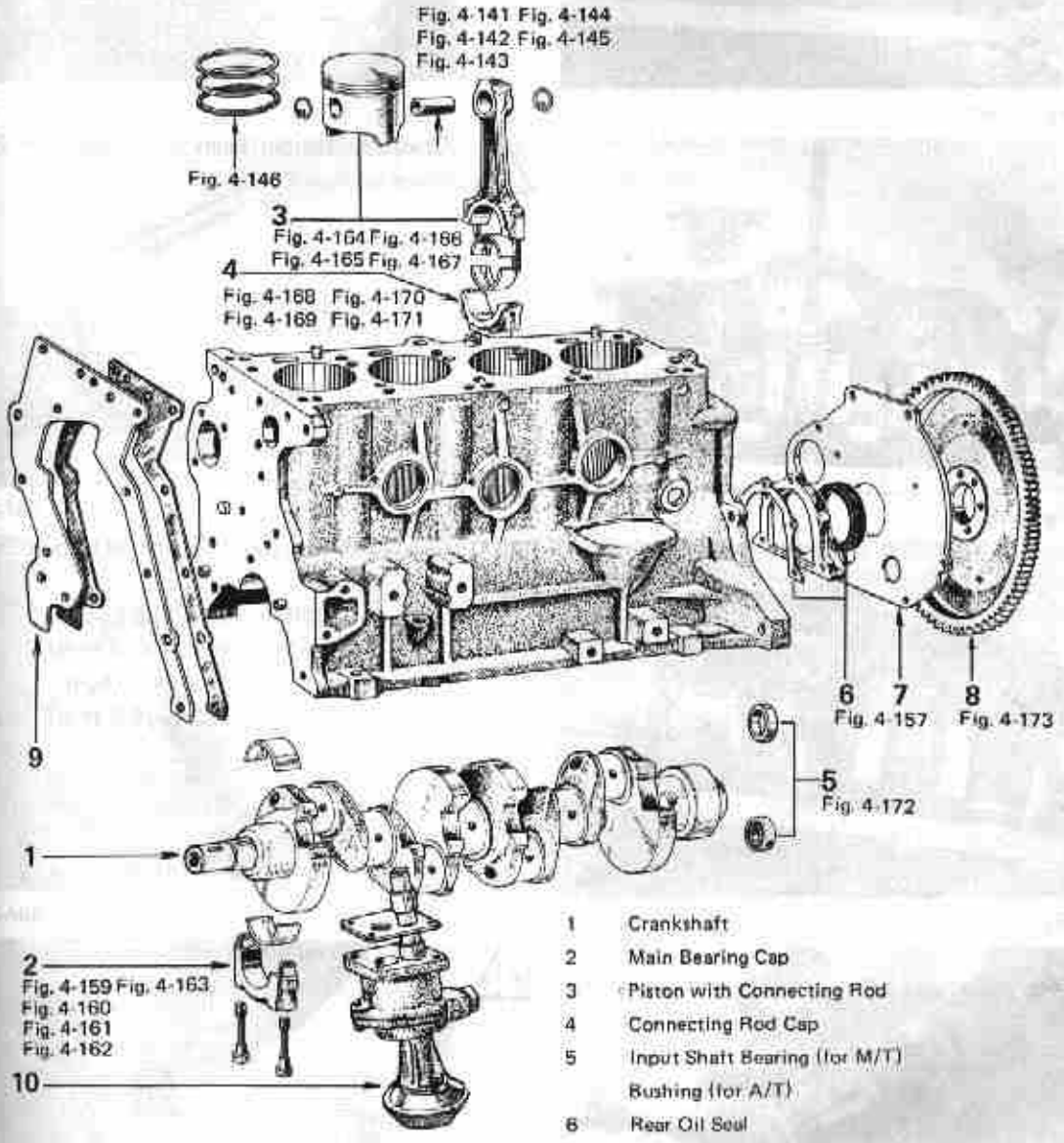
4. After driving in the seal, be sure to coat the seal lip lightly with MP grease.

## ASSEMBLY

Assemble in numerical order

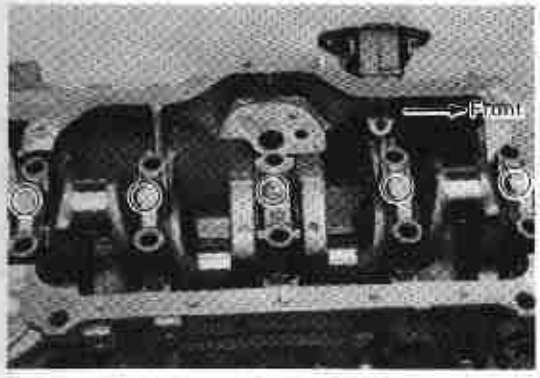
Fig. 4-158

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



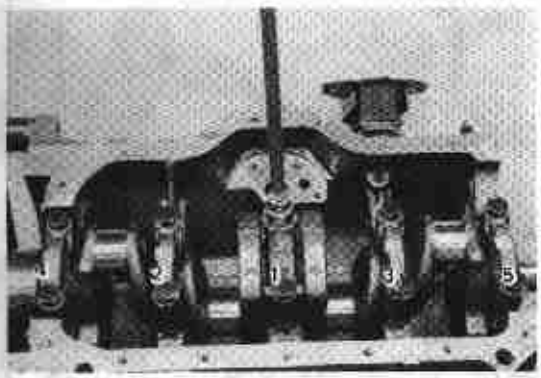

| | |
|---|---|
| 1 | Crankshaft |
| 2 | Main Bearing Cap |
| 3 | Piston with Connecting Rod |
| 4 | Connecting Rod Cap |
| 5 | Input Shaft Bearing (for M/T)<br>Bushing (for A/T) |
| 6 | Rear Oil Seal |
| 7 | Rear End Plate |
| 8 | Flywheel |
| 9 | Front End Plate |
| 10 | Oil Pump |

**Fig. 4-159**



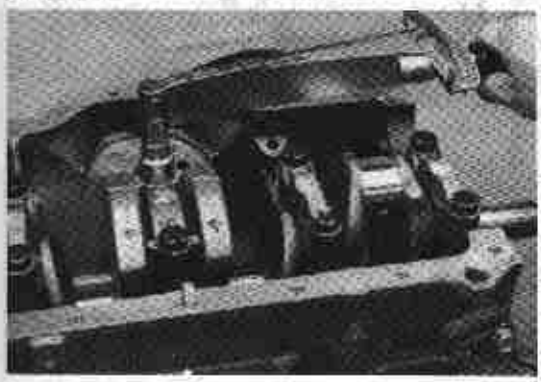

Face the arrow mark toward front.

**Fig. 4-160**




Gradually tighten bearing cap bolts in 2 to 3 stages as shown.

**Fig. 4-161**



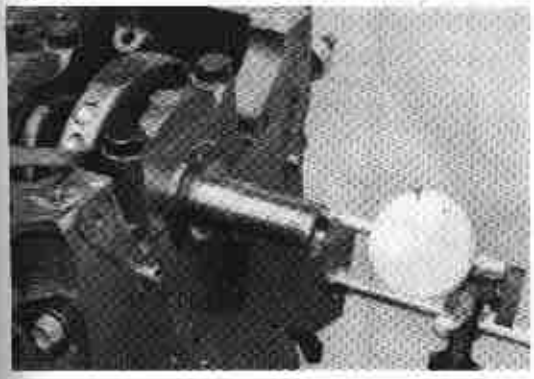
Tighten bearing caps to specified torque.

| Torque | |
|---|---|
| 16R, 18R | 9.5–11.5 kg-m (68.7–83.2 ft-lb) |
| 18R-G | 10.0–11.0 kg-m (72.3–79.6 ft-lb) |

**Fig. 4-162**

Make sure crankshaft rotates smoothly.

Fig. 4-163

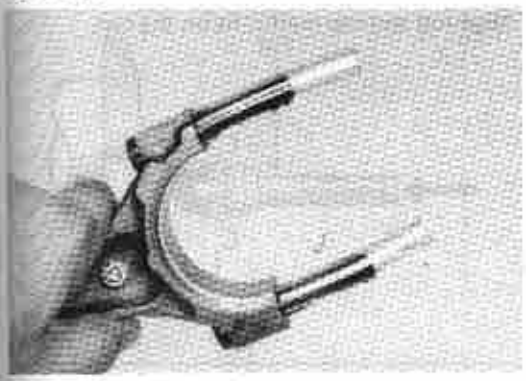


Make sure crankshaft thrust clearance.

**Thrust clearance**

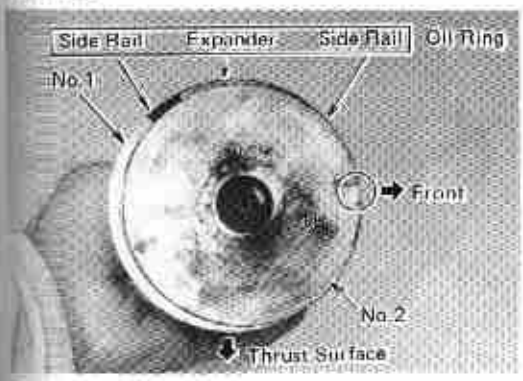
| | |
|---|---|
| **Limit** | **0.3 mm (0.0118 in)** |
| **Standard** | **0.002–0.22 mm (0.0008–0.0087 in)** |

Fig. 4-164



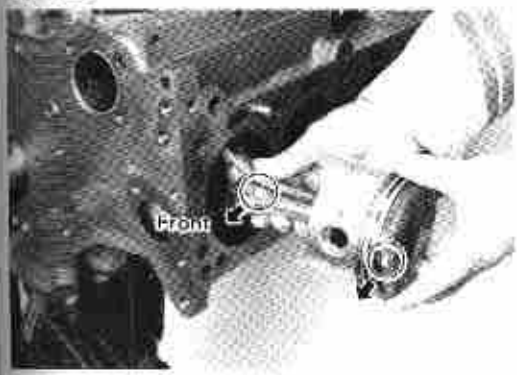
Cover rod bolts with a hose to protect crankpin from damage.

Fig. 4-165




Position ring gap in direction as shown.

Fig. 4-166




Push correctly numbered piston/rod assembly with notch forward.
Mark on connecting rod should face frontward.

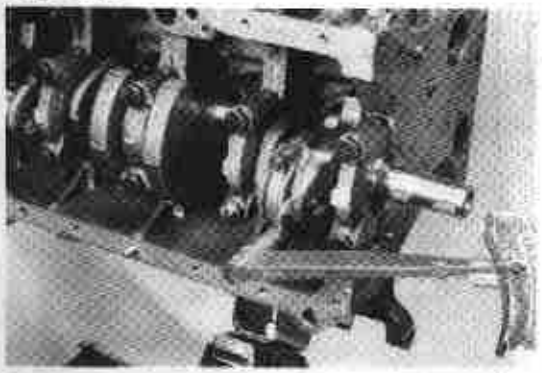
Fig. 4-167

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

Fig. 4-168


Align rod and cap marks, fit on the cap.

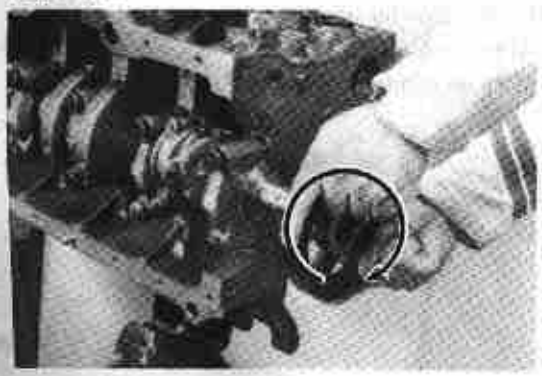
Fig. 4-169



Tighten rod cap to specified torque.

| | | |
|---|---|---|
| **Torque** | **18R** | **5.4–6.6 kg-m (39.1–47.7 ft-lb)** |
| | **18R-G** | **6.4–7.0 kg-m (46.3–50.6 ft-lb)** |

Fig. 4-170



Make sure the crankshaft rotates smoothly.

Fig. 4-171

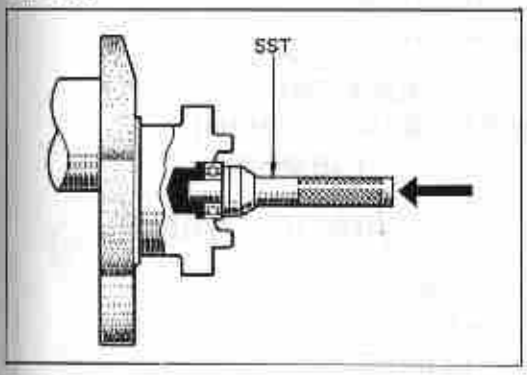
Check connecting rod thrust clearance.

**Thrust clearance limit**

**0.3 mm (0.012 in)**

**Standard** **0.16–0.26 mm (0.0063–0.0102 in)**

Fig. 4-172




Drive in input shaft bearing.
Use SST [09304-30012].

Fig. 4-173

Tighten flywheel to specified torque.

**Torque** **18R** **8.0–9.0 kg-m (57.7–65.1 ft-lb)**

**18R-G** **8.2–8.8 kg-m (59.3–63.7 ft-lb)**