



## ENGINE OVERHAUL

### ENGINE REMOVAL

**NOTE:**

It is not necessary to remove the engine in order to remove the following components:

- Cylinder head
- Cylinder
- Piston
- Clutch
- Water pump
- A.C. magneto

### LOWER COWLING, CENTER COWLING, UPPER COWLING AND TOP COVER

**1. Remove:**

- Lower cowlings (Left and right)
- Center cowlings (Left and right)
- Upper cowling
- Seat
- Top cover

Refer to the "COWLING REMOVAL AND INSTALLATION — REMOVAL" section in the CHAPTER 3.

### FUEL TANK

**1. Remove:**

- Fuel tank

Refer to the "CARBURETOR — REMOVAL" section in the CHAPTER 6.

### ENGINE OIL

**1. Drain:**

- Engine oil

Refer to the "ENGINE OIL REPLACEMENT" section in the CHAPTER 3.

### COOLANT

**1. Drain:**

- Coolant

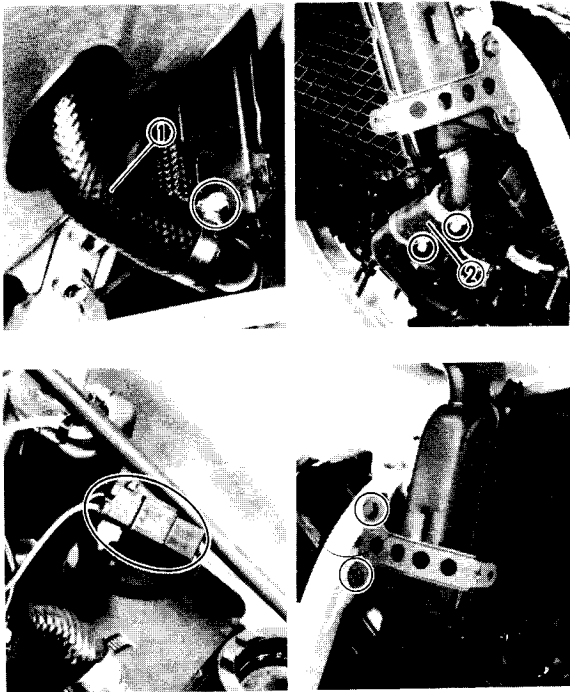
Refer to the "COOLANT REPLACEMENT" section in the CHAPTER 3.

### AIR FILTER CASE AND CARBURETOR

**1. Remove:**

- Air filter case
- Carburetor

Refer to the "CARBURETOR — REMOVAL" section in the CHAPTER 6.

**RADIATOR**

## 1. Disconnect:

- Hose (Radiator – Inlet) ①
- Hose (Radiator – Outlet) ②

## 2. Disconnect:

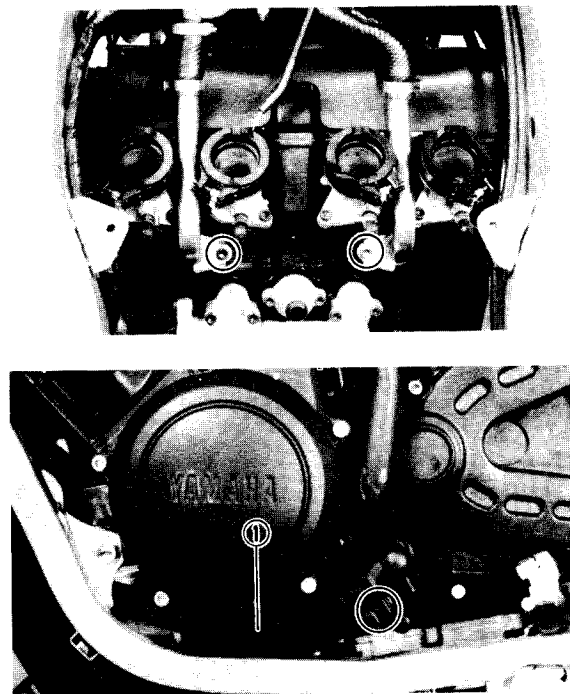
- Fan motor coupler

## 3. Remove:

- Radiator assembly

**⚠ CAUTION:**

Cover the cylinder head cover and the fender with rugs to prevent a scratching.

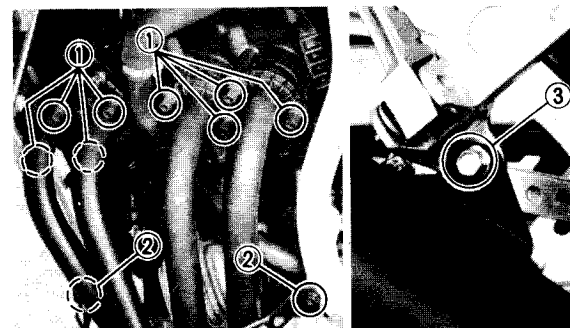


## 4. Disconnect:

- Pipes (Left and right)

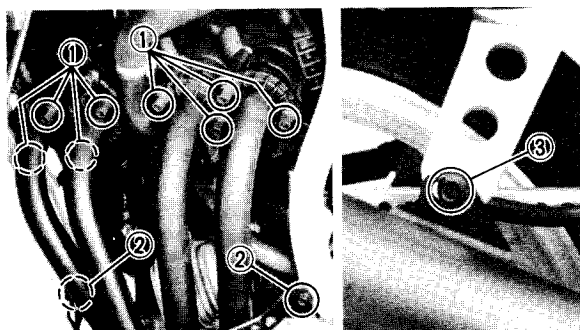
## 5. Remove:

- Pipes (Radiator – Outlet) ①

**MUFFLER ASSEMBLY**

## 1. Remove:

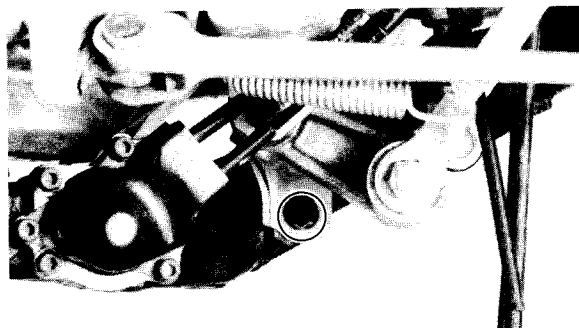
- Nuts (Exhaust pipe) ①
- Cowling stays ②
- Bolt (Muffler bracket) ③



## MUFFLER ASSEMBLY (For California only)

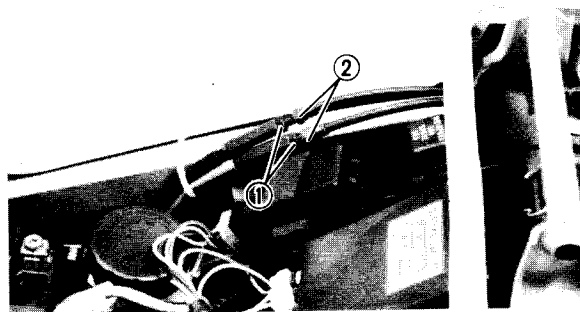
### 1. Remove:

- Nuts (Exhaust pipe) ①
- Cowling stays ②
- Bolt (Muffler bracket) ③



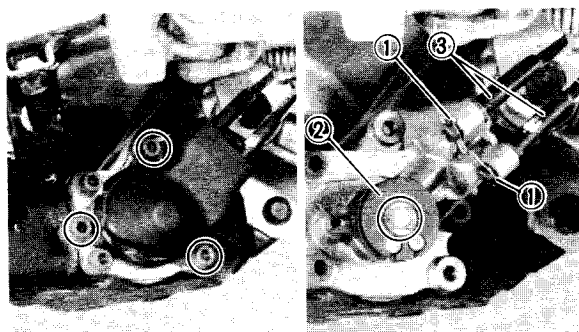
### 2. Remove:

- Bolt (Muffler stay)



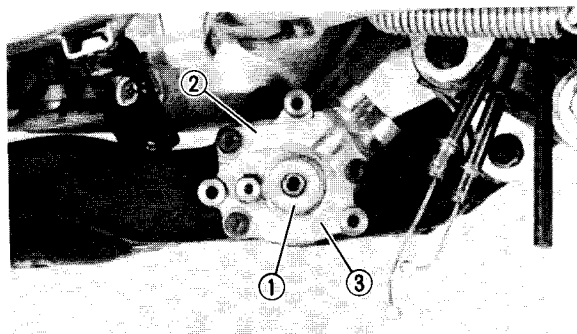
### 3. Loosen:

- Lock nut ①
- Adjuster ②



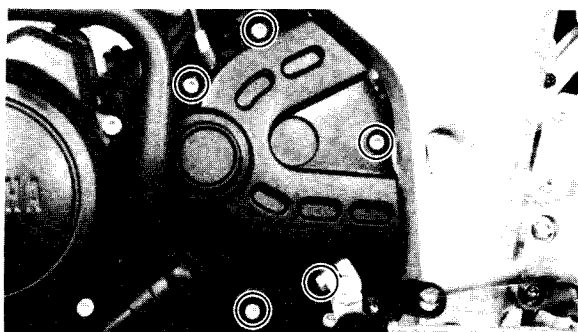
### 4. Remove:

- Cover ①
- Clips ②
- Pulley ②
- Cables ③

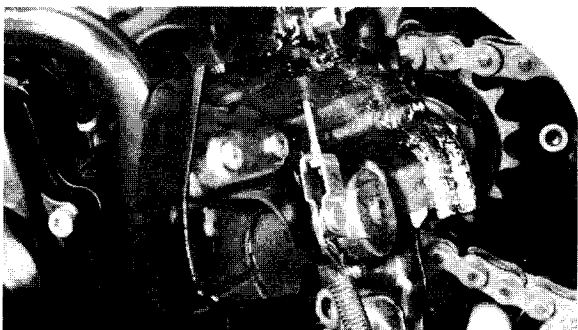


### 5. Remove:

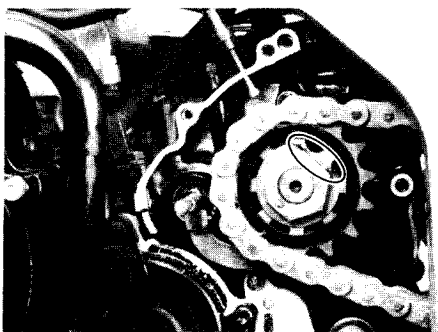
- Washer ①
- Bracket ②
- Housing ③
- Gasket
- (Left side)
- Shaft arm

**CLUTCH CABLE AND DRIVE CHAIN**

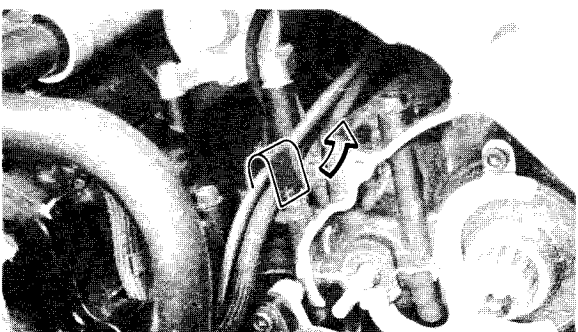
1. Remove:
  - Shift arm
  - Crankcase cover (Left)



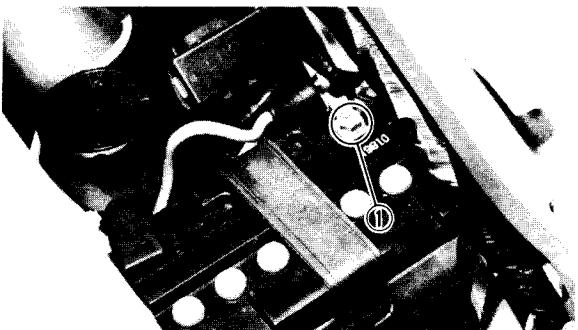
2. Remove:
  - Clutch cable



3. Straighten:
  - Lock washer tab
4. Remove:
  - Drive sprocket

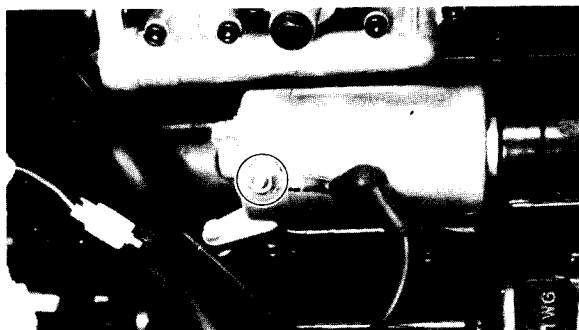
**LEADS**

1. Straighten:
  - Clamp



2. Disconnect:
  - Battery leads

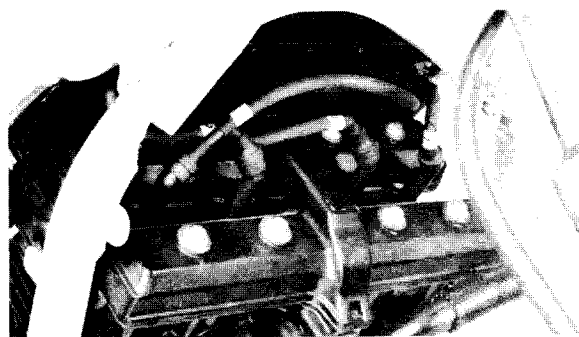
**NOTE:** \_\_\_\_\_  
Disconnect the negative lead ① first.



3. Disconnect:
  - Lead (Starter motor)

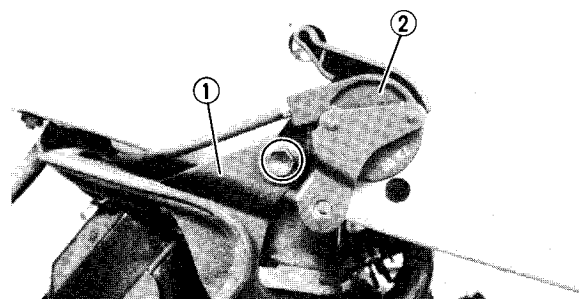


4. Remove:
  - Cover
5. Disconnect:
  - Coupler (Oil level Neutral switch)
  - Coupler (A.C. generator)
  - Coupler (Sidestand switch)

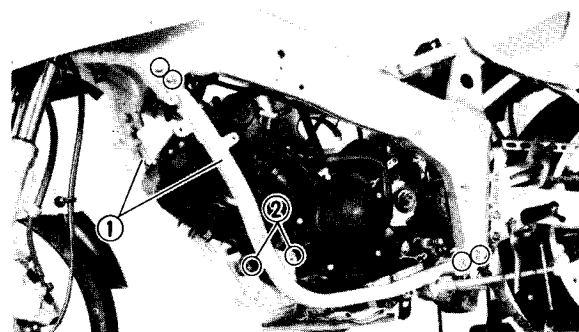


6. Remove:
  - Spark plug leads

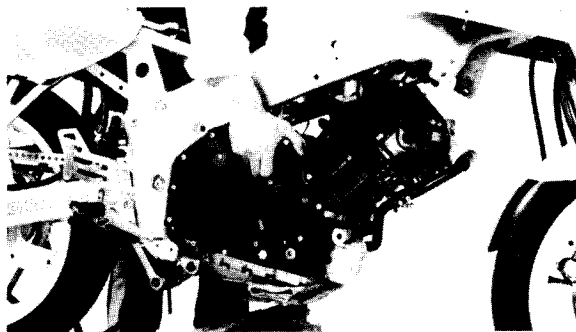
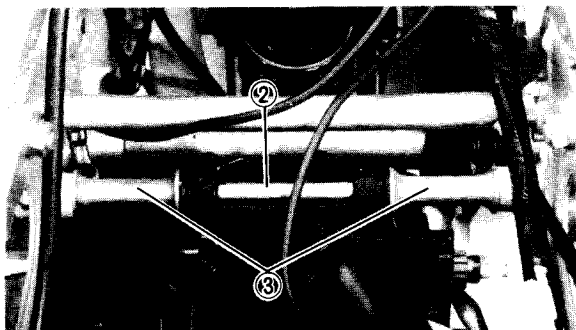
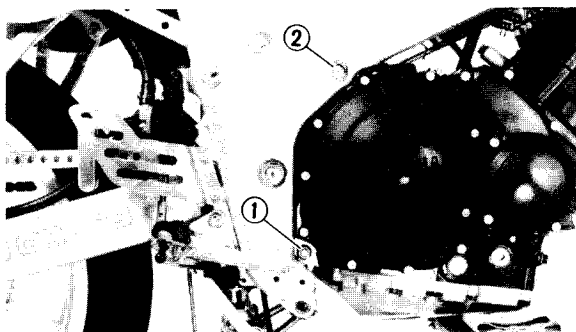
## ENGINE REMOVAL



1. Remove:
  - Cover ①
  - Starter lever ②



2. Place a suitable stand under the engine.
3. Remove:
  - Down tube frames (Left and right) ①
  - Bolt (Engine-mount) ②

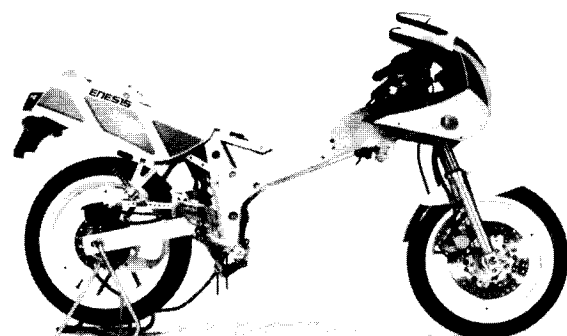


## 4. Remove:

- Bolt (Engine-mounting Lower) ①
- Bolt (Engine-mounting Upper) ②
- Collars ③

## 5. Remove:

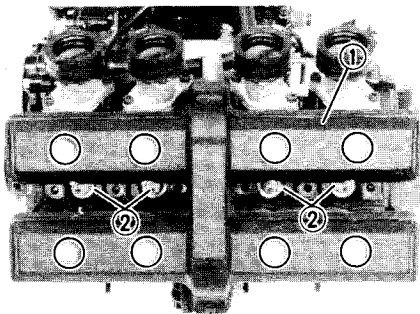
- Engine assembly .  
From right side.



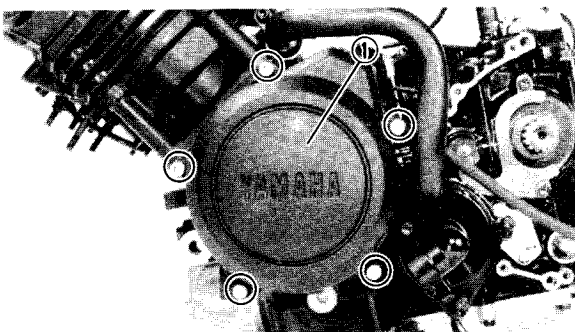
**ENGINE DISASSEMBLY****CYLINDER HEAD COVER, CAMSHAFT AND CYLINDER HEAD****NOTE:**

With the engine mounted, the cylinder head cover, camshaft and cylinder head can be maintained by removing the following parts.

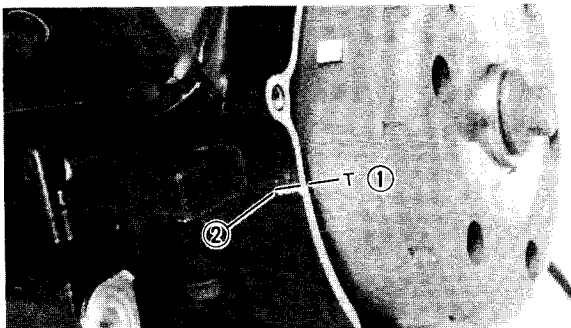
- Lower cowlings (Left and right)
- Center cowlings (Left and right)
- Seat
- Top cover
- Radiator
- Air filter case
- Carburetor
- Muffler assembly
- Down tube frame (Right)

**1. Remove:**

- Cylinder head cover ①
- Gasket (Cylinder head cover)
- Spark plugs ②

**2. Remove:**

- Generator cover ①
- Dowel pins

**3. Turn:**

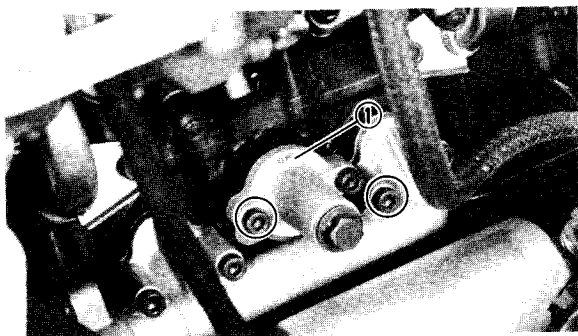
- Crankshaft  
Counterclockwise

**4. Align:**

- "T" mark ①
- Crankcase end ②

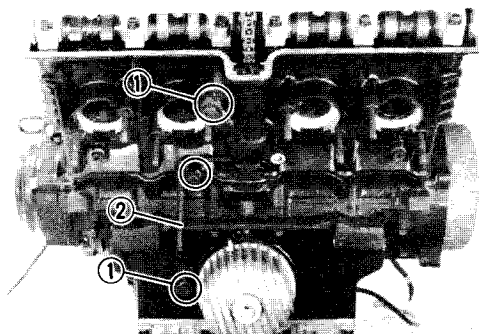
**NOTE:**

When #1 piston is at TDC on compression stroke.



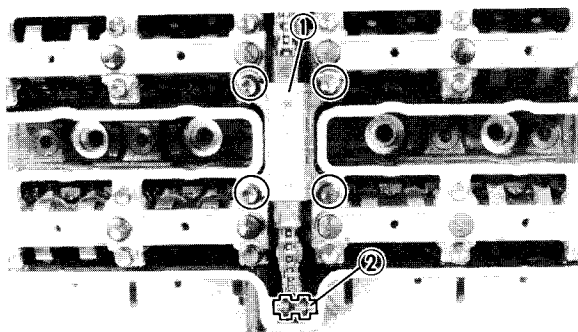
## 5. Remove:

- Cam chain tensioner ①
- Gasket (Cam chain tensioner)



## 6. Remove:

- Union bolts ①
- Oil delivery pipe ②



## 7. Remove:

- Cam chain guide (Upper) ①
- Cam chain guide (Exhaust side) ②

**NOTE:**

- Select either of the two procedures explained in this manual, as follows:

**• Procedure 1.**

For engine service except cylinder head disassembly.

→ Disconnect the cam chain.

The pistons and cylinder can be removed without removing the camshafts.

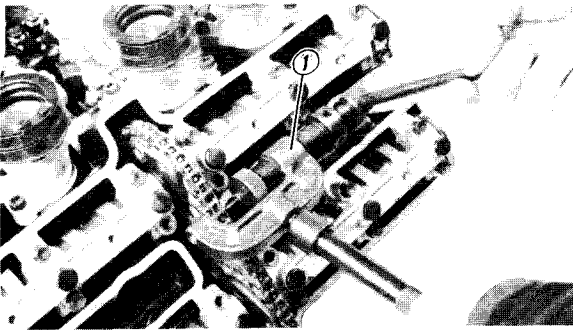
**• Procedure 2.**

For engine service including cylinder head disassembly.

→ Remove the cam caps and camshafts.

The camshafts can be removed without disconnecting the cam chain.



**Procedure 1.**

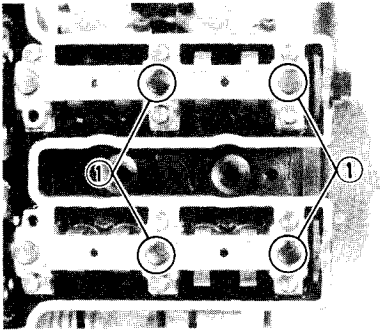
## 1. Disconnect:

- Cam chain

Use the Cam Chain Cutter ①.

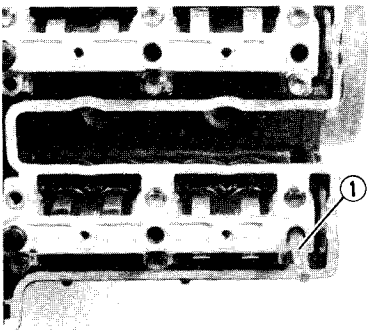


**Cam Chain Cutter:**  
P/N YM-01112



## 2. Remove:

- Rubbers (Camshaft cap) ①



## 3. Remove:

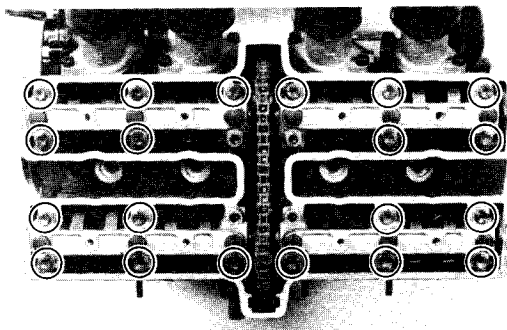
- Nuts (Cylinder head)

Use the Hexagon Wrench 6 mm (0.24 in) ①.

## 4. Remove:

- Cylinder head
- Gasket (Cylinder head)
- Dowel pins

## 5. Go to "CYLINDER AND PISTON".

**Procedure 2.**

## 1. Remove:

- Camshaft caps
- Dowel pins

**NOTE:**

Remove the camshaft caps in a crisscross pattern from outermost to inner caps.

**CAUTION:**

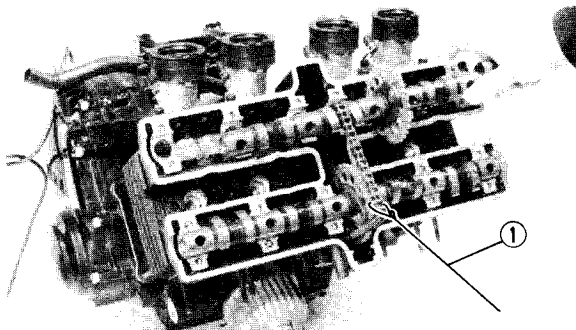
Do not rotate the camshaft or valve damage may occur.

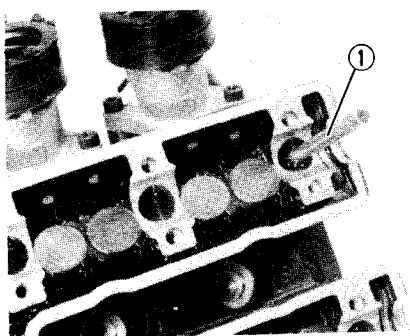
## 2. Remove:

- Camshafts

**NOTE:**

Fasten safety wire ① to the cam chain to prevent it from falling into the crankcase.



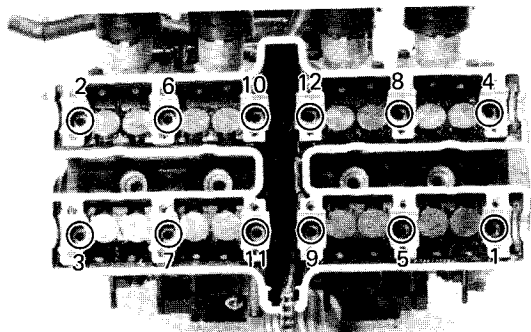


## 3. Remove:

- Nuts (Cylinder head)
- Use the Hexagon Wrench 6 mm (0.24 in) ①.

## NOTE:

- Loosen the nuts in their proper loosening sequence.
- Follow numerical order shown in photo. Start by loosening each nut 1/2 turn until all are loose.

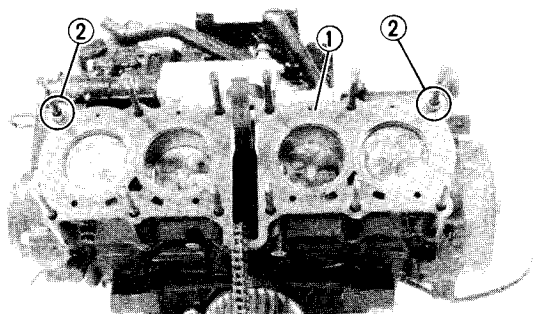


## 4. Remove:

- Cylinder head

## NOTE:

Remove the cylinder head as a whole to prevent the valve lifters and adjusting pads from falling into the crankcase.



## 5. Remove:

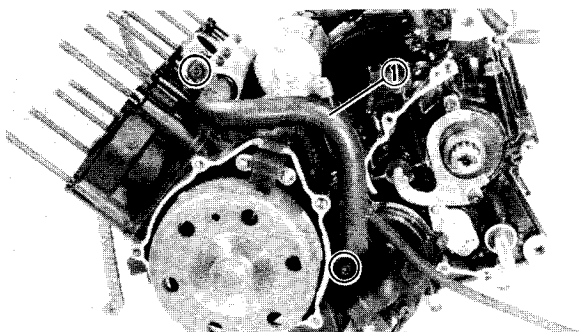
- Gasket (Cylinder head) ①
- Dowel pins ②

## CYLINDER AND PISTON

## NOTE:

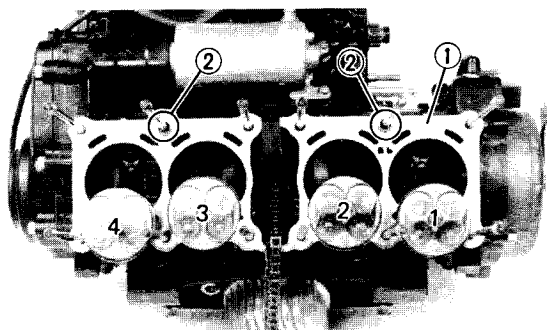
With the engine mounted, the cylinder and piston can be maintained by removing the following parts.

- Lower cowlings (Left and right)
- Center cowlings (Left and right)
- Seat
- Top cover
- Radiator
- Air filter case
- Carburetor
- Muffler assembly
- Down tube frame (Right)
- Cylinder head



## 1. Remove:

- Water pipe ①
- O-rings
- Cylinder



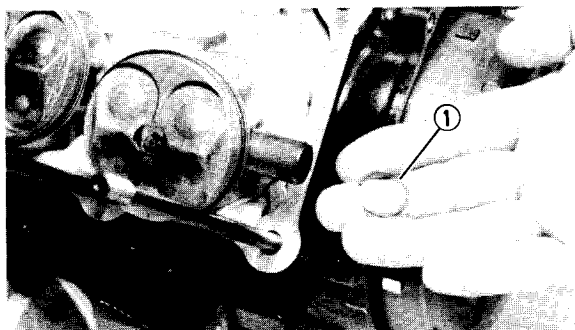
## 2. Remove:

- Gasket (Cylinder) ①
- Dowel pins ②

## 3. Mark:

- Pistons

With the piston number designations as shown.

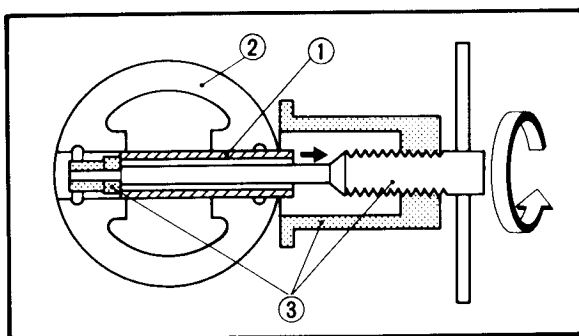


## 4. Remove:

- Circlips (Piston pin) ①

**NOTE:**

Before removing the piston pin circlip, cover the crankcase with a clean rag to prevent the circlip from falling into the crankcase cavity.



## 5. Remove:

- Piston pins ①
- Pistons ②

**NOTE:**

Before removing the piston pin, deburr the clip grooved and pin hole area. If the piston pin groove is deburred and piston pin is still difficult to remove, use the Piston Pin Puller ③.



**Piston Pin Puller:**  
P/N YU-01304

**CAUTION:**

Do not use a hammer to drive the piston pin out.

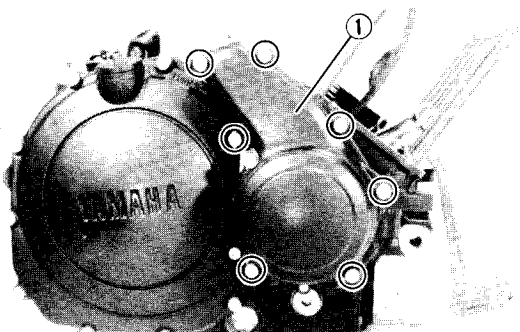


## STARTER CLUTCH

## NOTE:

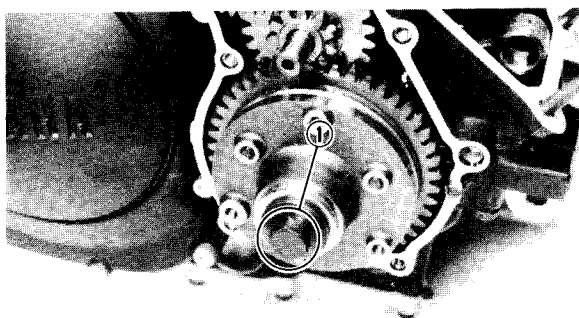
With the engine mounted, the starter clutch can be maintained by removing the following parts.

- Lower cowling (Right)
- Starter clutch cover



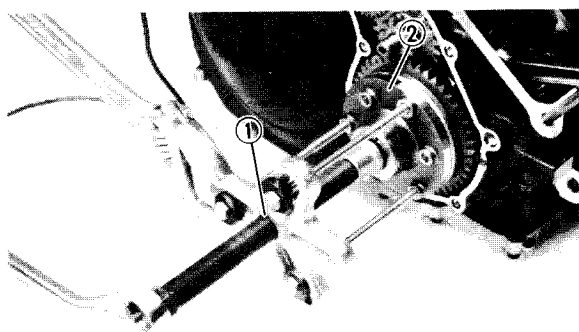
## 1. Remove:

- Starter clutch cover ①
- Gasket (Starter clutch cover)
- Dowel pins.



## 2. Remove:

- Bolt (Starter clutch) ①
- Washer



## 3. Attach:

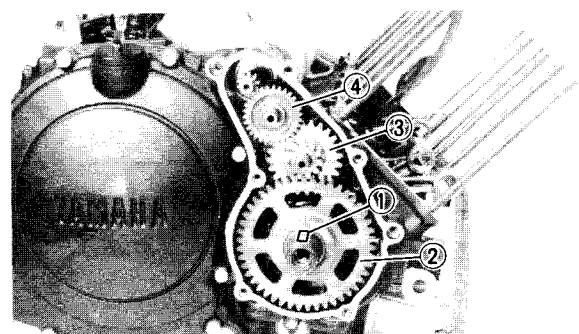
- Heavy Duty Puller ①



Heavy Duty Puller:  
YU-33270

## 4. Remove:

- Starter clutch ②



## 5. Remove:

- Woodruff key ①
- Starter clutch gear ②
- Idle gear ③
- Idle gear ④

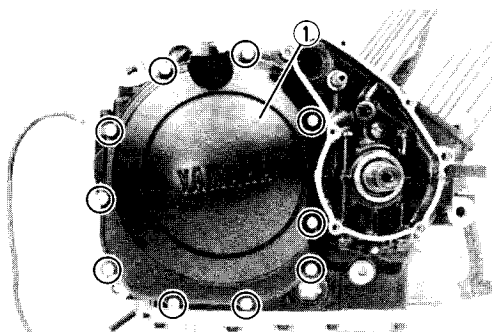


## CLUTCH

**NOTE:**

With the engine mounted, the starter clutch can be maintained by removing the following parts.

- Lower cowling (Right)
- Crankcase cover (Right)

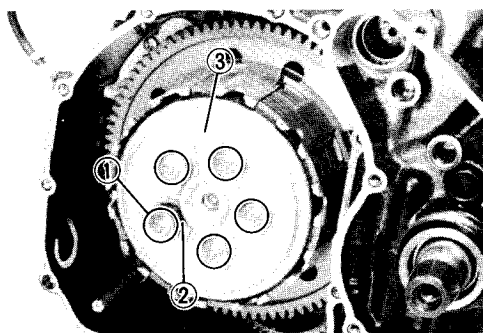


## 1. Remove:

- Crankcase cover (Right) ①
- Gasket (Crankcase cover)
- Dowel pins

**NOTE:**

Working in a crisscross pattern, loosen bolts 1/4 turn each. Remove them after all are loosened.

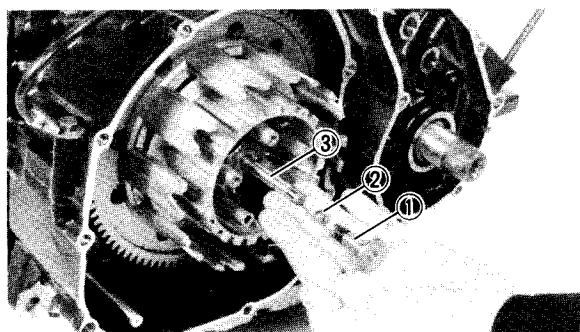


## 2. Remove:

- Bolts (Clutch spring) ①
- Clutch springs ②
- Pressure plate ③
- Friction plates
- Clutch plates

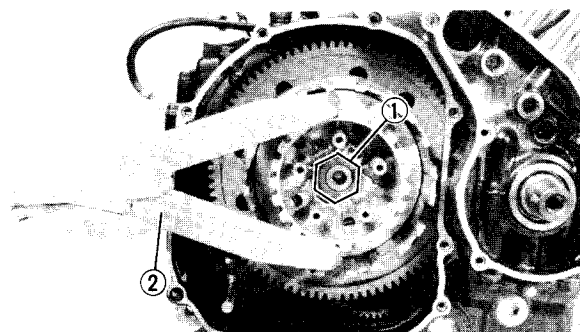
**NOTE:**

Loosen the bolts in a crisscross pattern.



## 3. Remove:

- Push rod #1 ①
- Ball ②
- Push rod #2 ③



## 4. Straighten the lock washer tabs.

## 5. Loosen:

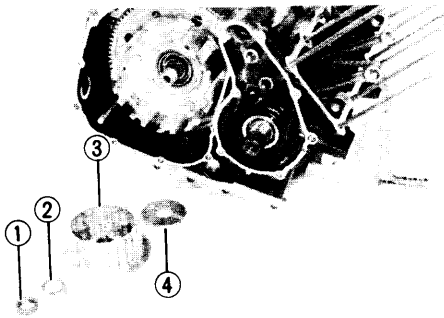
- Nut (Clutch boss) ①
- Use the Universal Clutch Holder ②.



**Universal Clutch Holder:**  
P/N YM-91042

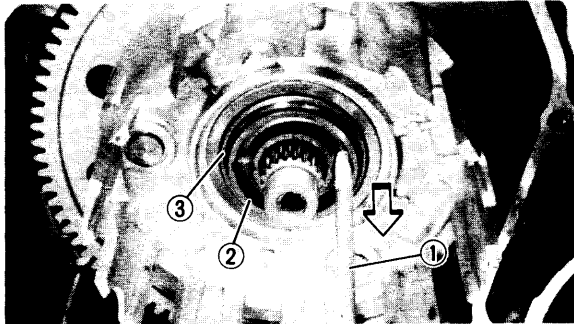
**NOTE:**

Hold the clutch boss loosen the nut by Universal Clutch Holder ②.



## 6. Remove:

- Nut (Clutch boss) ①
- Lock washer ②
- Clutch boss ③
- Thrust washer ④

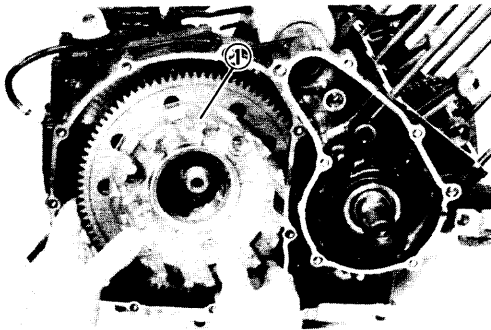


## 7. Remove:

- Spacer ②
- Bearing ③

**NOTE:**

Install the 5 mm (0.2 in) screw ① on the spacer ② then remove the spacer with pulling out screw.



## 8. Remove:

- Clutch housing ①



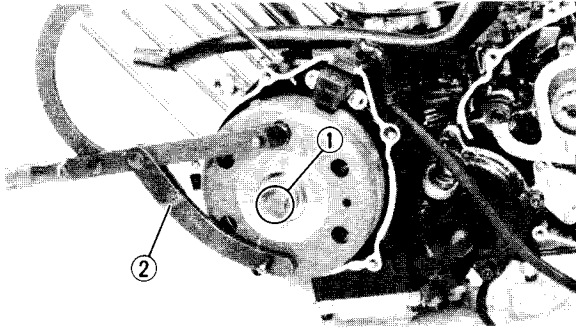
## 9. Remove:

- Thrust washer ①
- Collar ②

**A.C. MAGNETO****NOTE:**

With the engine mounted, the A.C. Magneto can be maintained by removing the following parts.

- Lower cowl (Left)
- Generator cover



## 1. Remove:

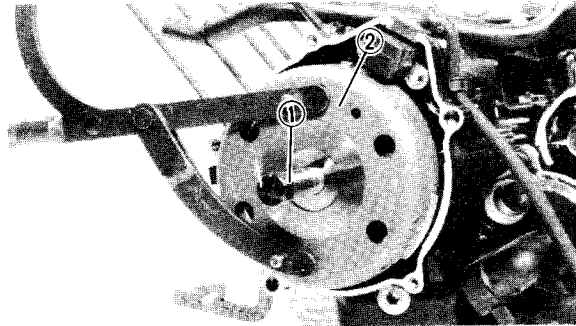
- Bolt (Magneto) ①
- Washer

## NOTE:

Hold the magneto to loosen the nut by the Universal Rotor Holder ②.



**Universal Rotor Holder:**  
P/N YU-01235

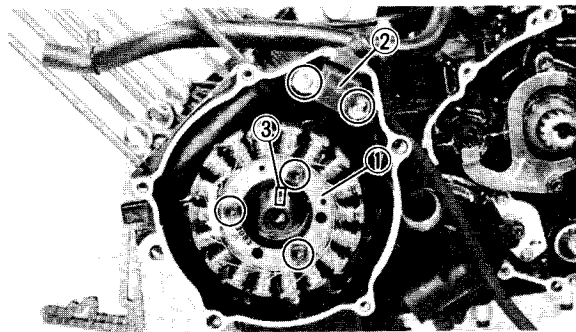


## 2. Attach:

- Rotor puller ①



**Rotor Puller:**  
P/N YM-01080



## 3. Remove:

- Magneto ②

## 4. Remove:

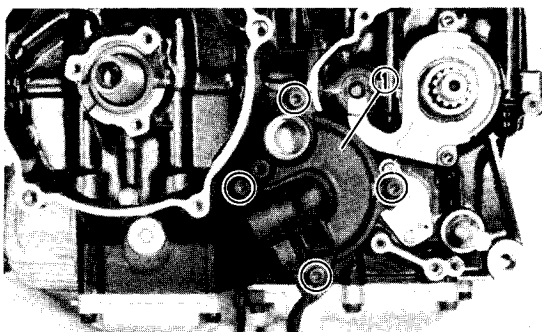
- Starter coil assembly ①
- Pickup coil ②
- Woodruff key ③

## WATER PUMP

## NOTE:

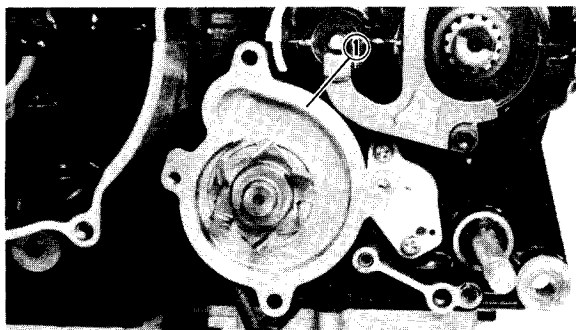
With the engine mounted, the water pump can be maintained by removing the following parts.

- Seat
- Top cover
- Lower cowling (Right)
- Shift arm
- Crankcase cover (Right)
- Water pipe
- Water pump cover



## 1. Remove:

- Water pump cover ①
- O-ring



## 2. Remove:

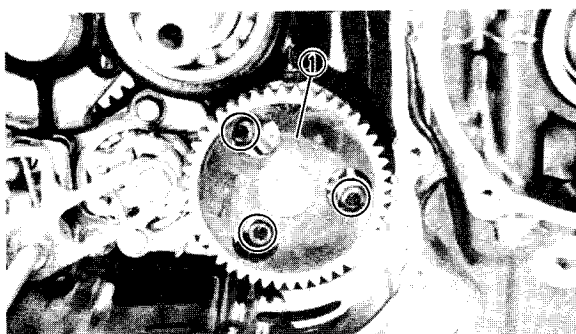
- Water pump housing ①

## OIL PUMP AND SHIFT SHAFT

## NOTE:

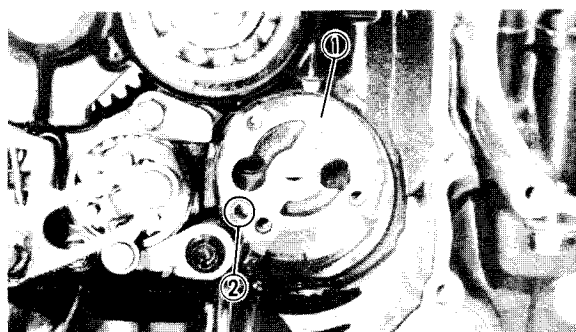
With the engine mounted, the oil pump and shift shaft can be maintained by removing the following parts.

- Lower cowl (Right)
- Crankcase cover (Right)
- Clutch housing



## 1. Remove:

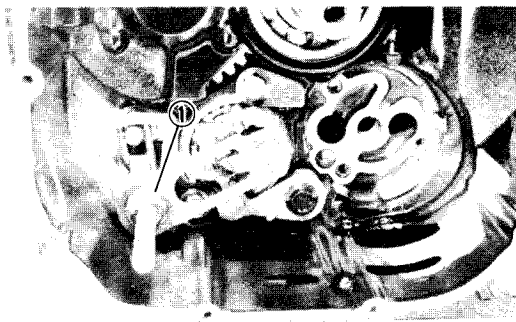
- Oil pump assembly ①



## 2. Remove:

- Gasket (Oil pump assembly) ①
- Dowel pin ②





## 3. Remove:

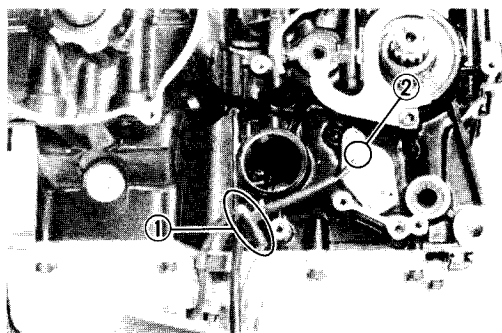
- Shift shaft assembly ①

## OIL PAN AND OIL STRAINER

## NOTE:

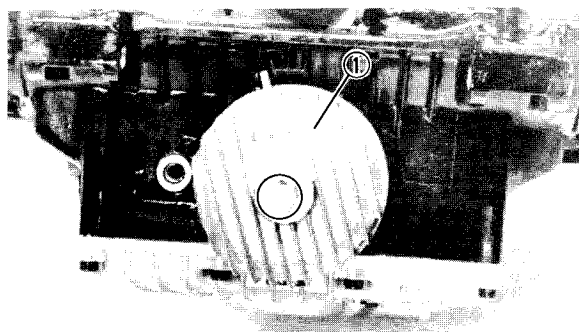
With the engine mounted, the oil pan and oil strainer can be maintained by removing the following parts.

- Lower cowlings (Left and right)
- Muffler assembly
- Cowling stay



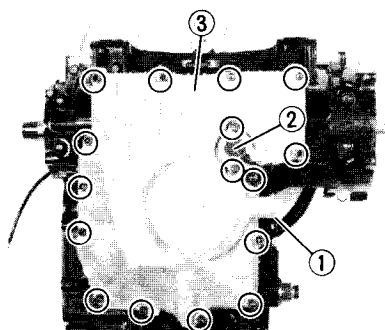
## 1. Disconnect:

- Oil level switch lead ①
- Neutral switch lead ②



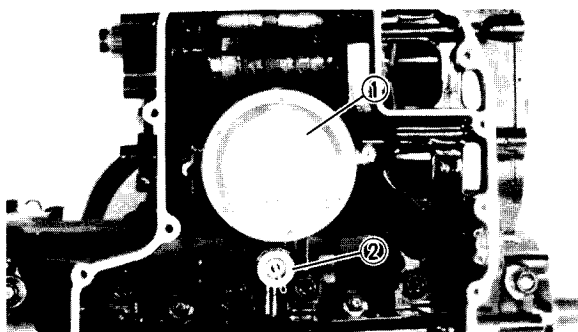
## 2. Remove:

- Oil filter cover ①
- Oil filter



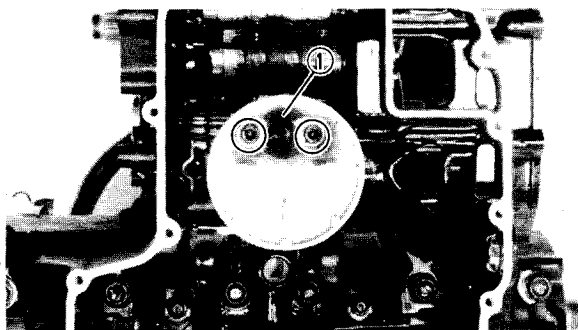
## 3. Remove:

- Drain plug ①
- Oil level switch ②
- Oil pan ③
- Gasket (Oil pan)
- Dowel pins



4. Remove:

- Oil strainer cover ①
- Relief valve ②



5. Remove:

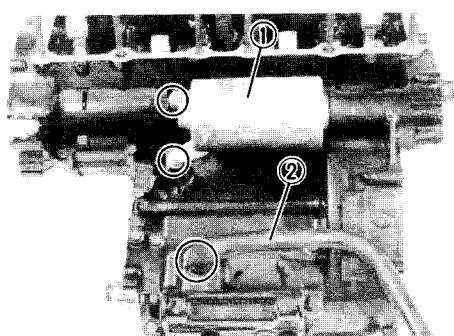
- Oil strainer assembly ①

## STARTER MOTOR

### NOTE:

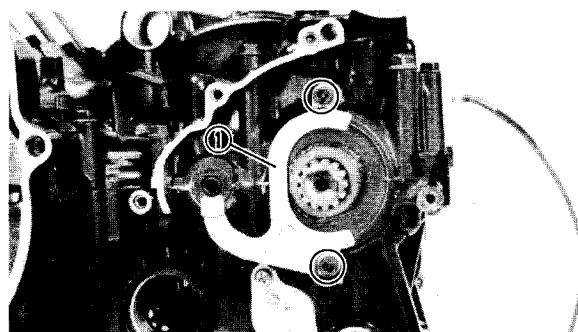
With the engine mounted, the starter motor, can be maintained by removing the following parts.

- Seat
- Top cover
- Fuel tank



1. Remove:

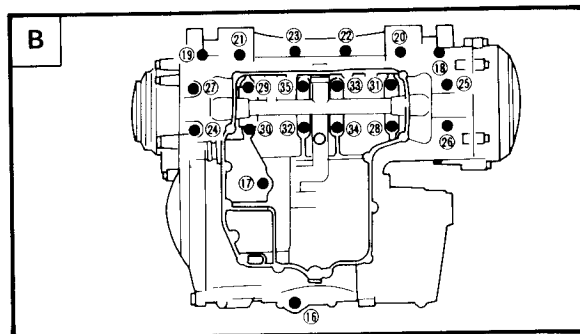
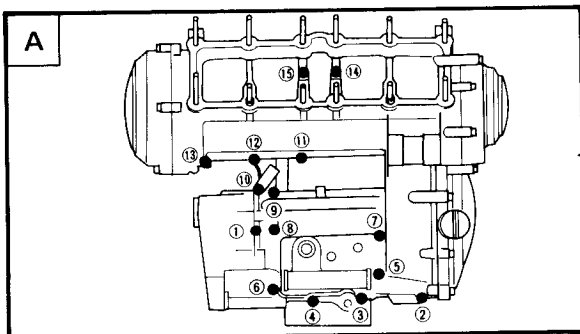
- Starter motor ①
- Crankcase ventilation hose ②



## CRANKCASE DISASSEMBLY

1. Remove:

- Oil seal stopper ①



3. Remove:
  - Bolts (Crankcase)

## NOTE:

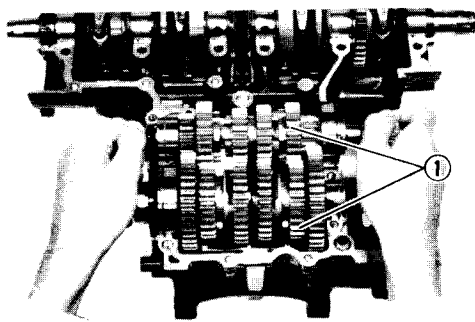
- Remove the bolts starting with the highest numbered one.
- The embossed numbers in the crankcase designate the crankcase tightening sequence.

4. Place the engine upside down.
5. Remove:
  - Crankcase (Lower)
 Use a soft hammer.

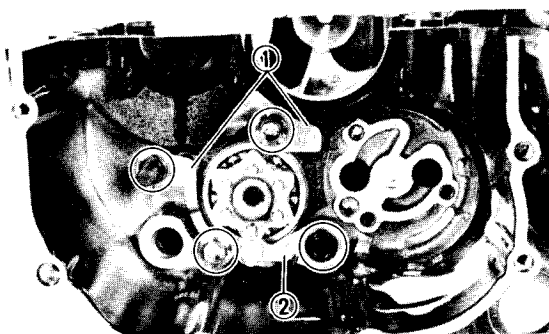
- A** Upper case  
**B** Lower case

## TRANSMISSION, SHIFTER AND SHIFT CAM

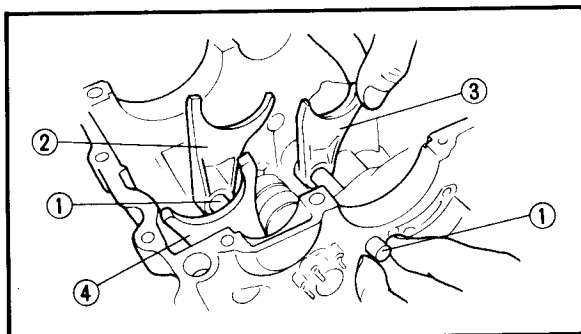
1. Remove:
  - Transmission assembly ①
  - Dowel pins

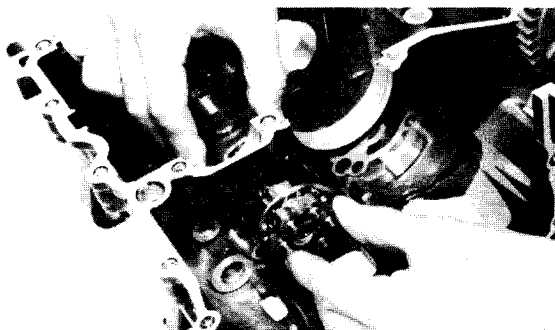


2. Remove:
  - Stopper lever ①
  - Stopper plate (Shift cam) ②

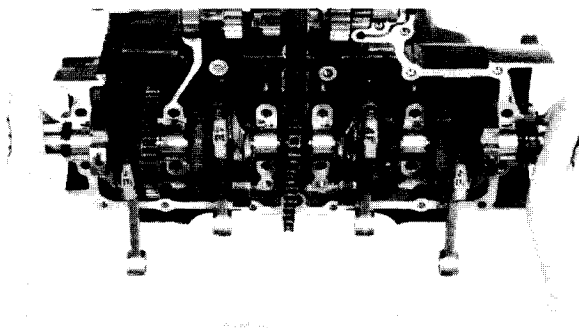


3. Remove:
  - Guide bars ①
  - Shift fork #1 ②
  - Shift fork #2 ③
  - Shift fork #3 ④



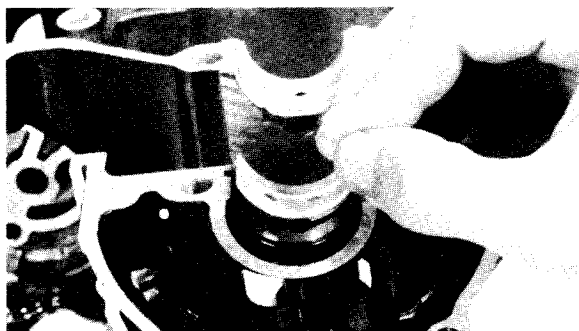


4. Remove:
- Shift cam



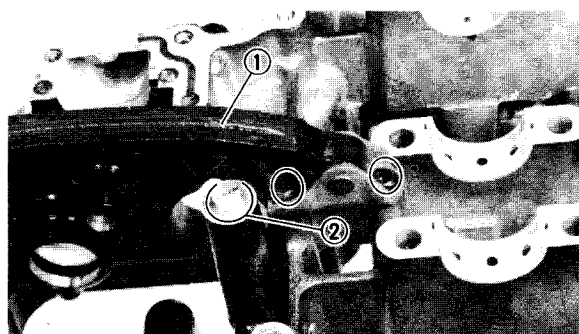
### CRANKSHAFT

1. Remove:
- Crankshaft assembly

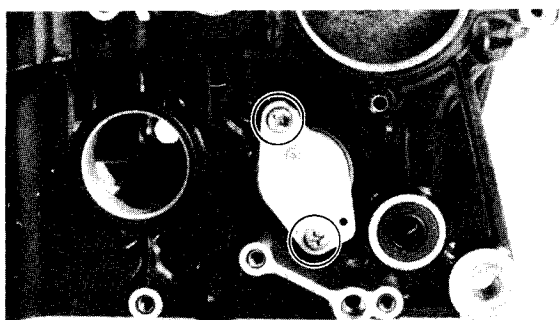


2. Remove:
- Main journal bearing

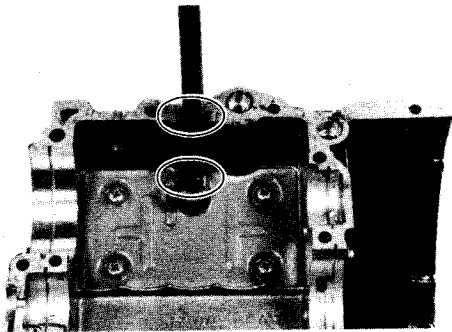
**NOTE:** \_\_\_\_\_  
Identify each main journal bearing position very carefully so that it can be reinstalled in its original place.



3. Remove:
- Cam chain guide (Intake side) ①
  - O-ring ②



4. Remove:
- Neutral switch



## 5. Remove:

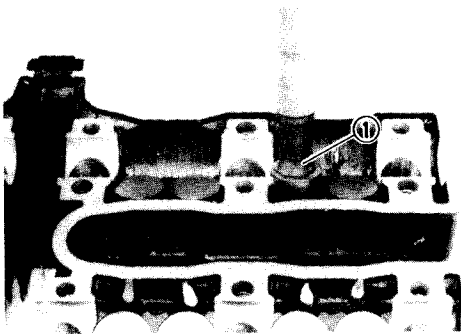
- Breather hose
- Oil baffle plate

## VALVE PAD AND VALVE

## NOTE:

With the engine mounted, the valve pad and valve can be maintained by removing the following parts.

- Lower cowlings (Left and right)
- Center cowlings (Left and right)
- Fuel tank
- Carburetor
- Radiator
- Generator cover
- Cylinder head cover
- Cam chain tensioner
- Cylinder head

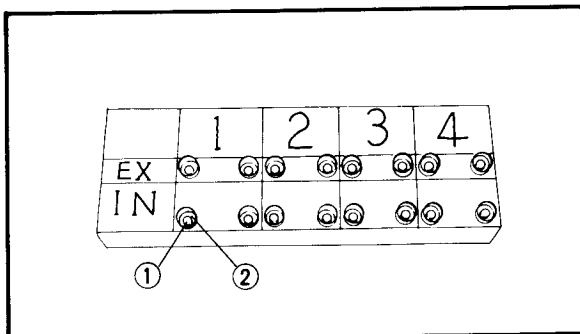


## 1. Remove:

- Lifters ①
- Valve pads

## NOTE:

Identify each lifter and pad position very carefully so that it can be reinstalled in its original place.



- ① Lifters
- ② Valve pads



## 2. Check:

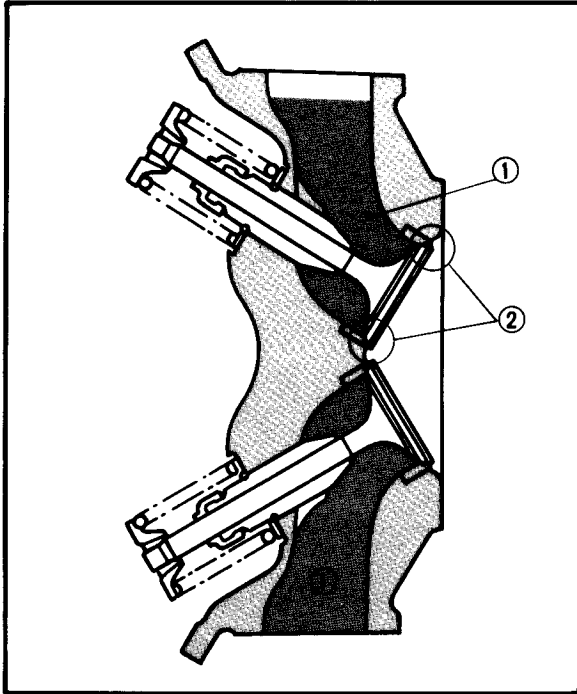
## • Valve sealing

Leakage at valve seat → Inspect the valve face, valve seat and valve seat width.

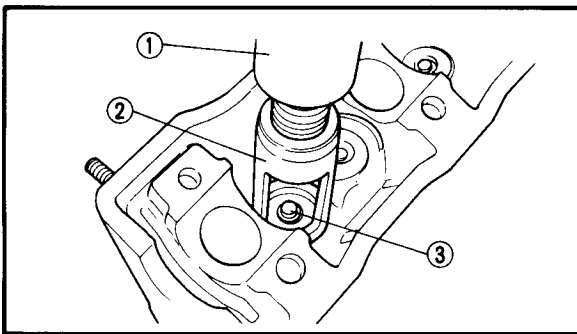
Refer to the "INSPECTION AND REPAIR – VALVE SEAT" section.

**NOTE:**

Before removing the internal parts (valve, valve spring, spring seat, etc.) of the cylinder head, the valve sealing should be checked.

**Valve seal checking steps:**

- Supply a clean solvent ① into the intake and exhaust ports.
- Check the valve sealing. There should be no leakage at the valve seats ②.



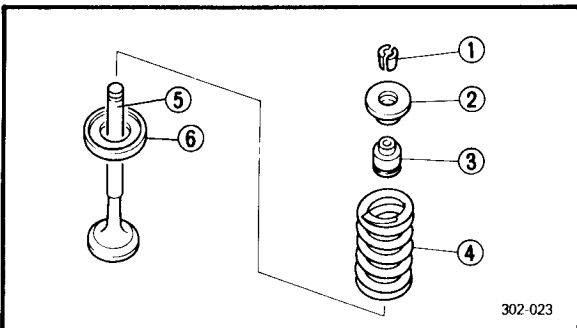
## 3. Attach:

- Valve spring compressor ①
- Attachment ②



**Valve Spring Compressor:**  
P/N YM-04019

**Attachment:**  
P/N YM-04108



## ③ Valve retainers

## 4. Remove:

- Valve retainers ①
- Valve spring seat ②
- Oil seal ③
- Valve spring ④
- Valve ⑤
- Valve spring seat ⑥

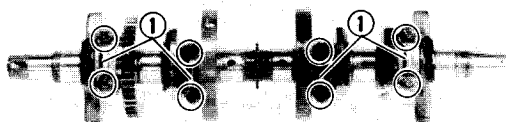
**NOTE:**

Identify each part position very carefully so that it can be reinstalled in its original place.

**CONNECTING ROD**

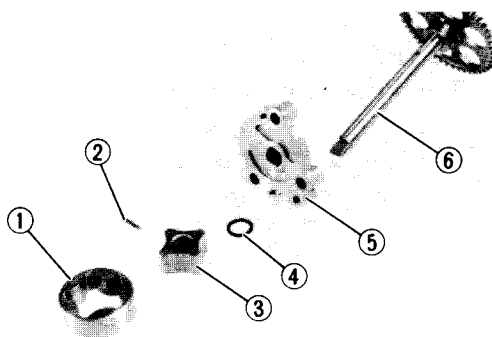
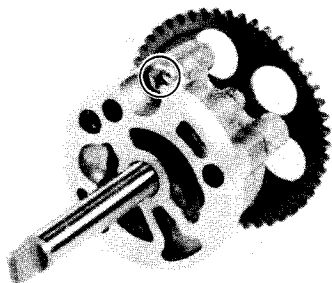
1. Remove:

- Connecting rod ①
- Connecting rod bearing

**INNER ROTOR (OIL PUMP)**

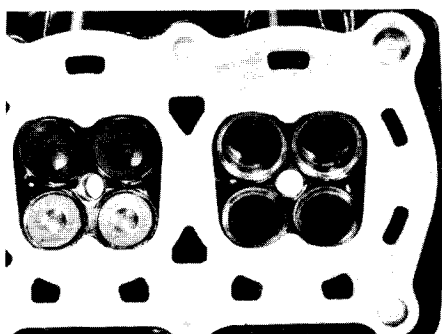
1. Remove:

- Pump housing



2. Remove:

- Outer rotor ①
- Pin ②
- Inner rotor ③
- Washer ④
- Pump cover ⑤
- Pump shaft ⑥



## INSPECTION AND REPAIR CYLINDER HEAD

### 1. Eliminate:

- Carbon deposit  
(from combustion chamber)  
Use rounded scraper.

**NOTE:** \_\_\_\_\_

Do not use a sharp instrument and avoid damaging or scratching:

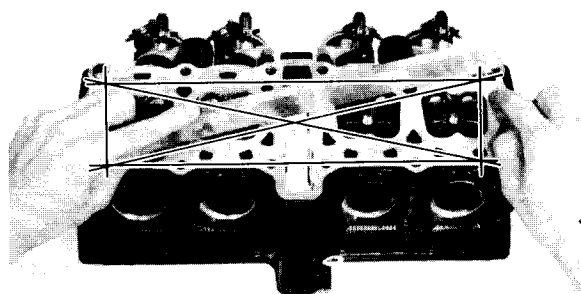
- Spark plug threads
- Valve seat

### 2. Inspect:

- Cylinder head  
Scratches/Damage → Replace.

### 3. Measure:

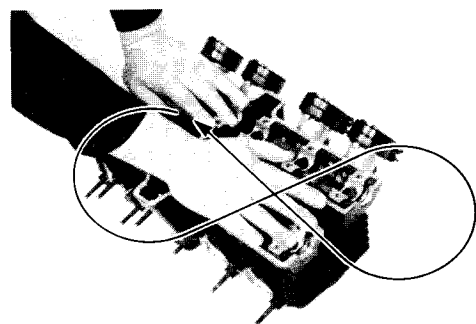
- Warpage  
Out of specification → Resurface.



**Cylinder Head Warpage:**  
Less than 0.03 mm (0.0012 in)

### 4. Resurface:

- Cylinder head



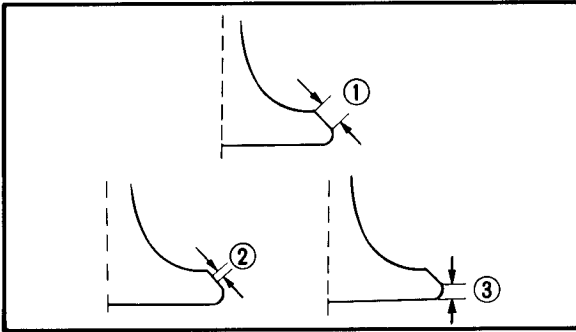
#### **Resurfacement steps:**

Place a 400 ~ 600 grit wet sandpaper on the surface plate, and resurface the head using a figure-eight sanding pattern.

**NOTE:** \_\_\_\_\_

Rotate the head several times to avoid removing too much material from one side.



**VALVE****1. Inspect:**

- Valve face
- Stem end

Wear/Pitting → Reface.

Out of specification → Replace.



**Face Width ① :**

1.6 ~ 2.4 mm (0.0630 ~ 0.0945 in)

**Seat Width ② :**

0.9 ~ 1.1 mm (0.0354 ~ 0.0433 in)

< Limit >

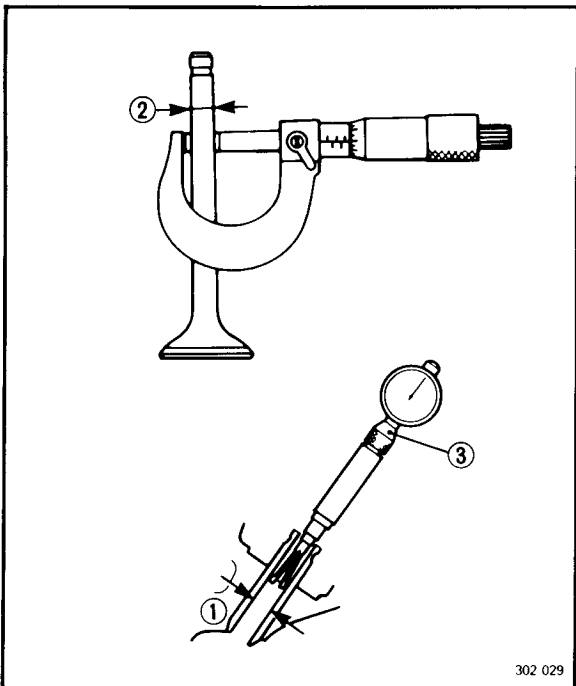
1.6 mm (0.063 in)

**Margin Thickness ③ :**

0.6 ~ 0.8 mm (0.0236 ~ 0.0315 in)

< Limit >

0.4 mm (0.0157 in)

**2. Measure:**

- Valve stem clearance

**Valve stem clearance =**

**Valve guide inside diameter ① –**

**Valve stem diameter ②**

Out of specification → Replace either valve and/or guide.

Use a Micrometer and Bore Gauge ③ .



**Valve Stem Clearance**

**Maximum**

**Intake**

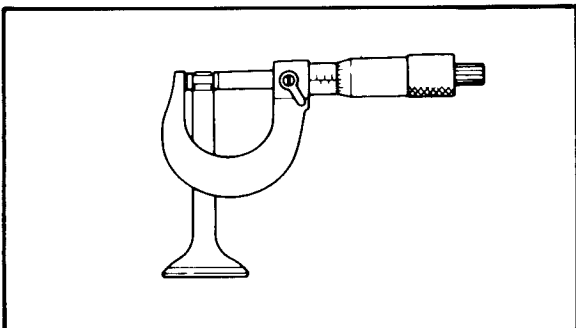
0.010 ~ 0.037 mm  
(0.0004 ~ 0.0015 in)

0.08 mm  
(0.0031 in)

**Exhaust**

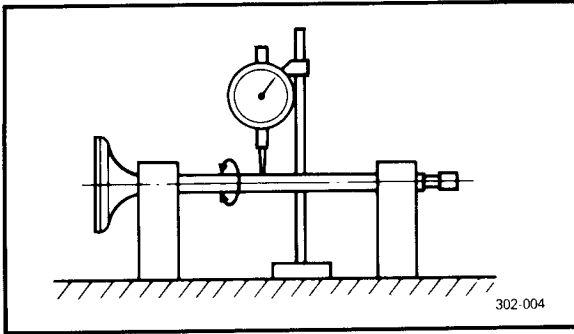
0.025 ~ 0.052 mm  
(0.001 ~ 0.002 in)

0.1 mm  
(0.0039 in)

**3. Inspect:**

- Valve stem end

Mushroom shape/Larger diameter than rest of stem → Replace valve, valve guide, and oil seal.



## 4. Measure:

- Valve stem runout

Out of specification → Replace.



**Maximum Runout:**

**0.02 mm (0.0008 in)**

## VALVE GUIDE

## NOTE:

- Always replace the valve guide if the valve is replaced.
- Always replace the oil seal if the valve is removed.

## 1. Inspect:

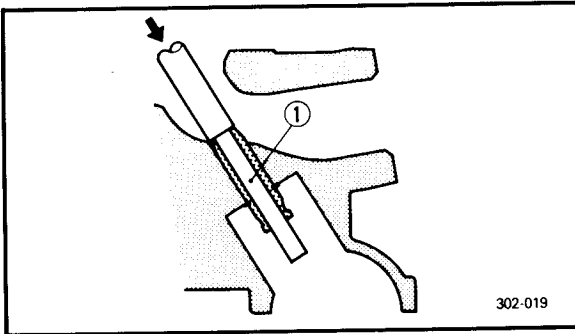
- Valve guide

Wear/Oil leakage into cylinder → Replace.

## 2. Remove:

- Valve guide

Use the Valve Guide Remover ①.

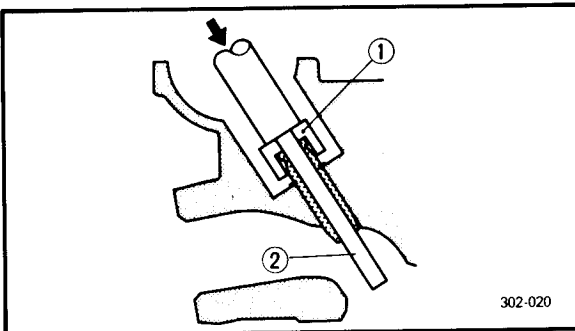


**Valve Guide Remover (4.5 mm):**  
**P/N YM-04116**

## 3. Install:

- Valve guide (New)

Use the Valve Guide Installer ① with the valve Guide Remover ②.

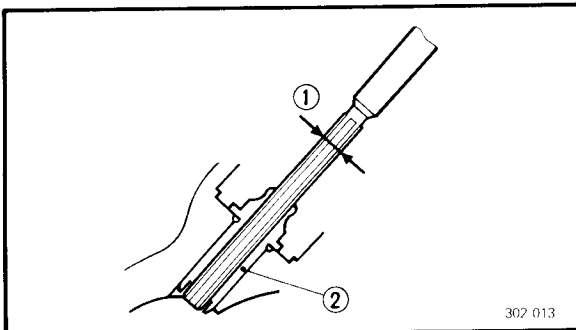


**Valve Guide Installer:**  
**P/N YM-04117**

**Valve Guide Remover (4.5 mm):**  
**P/N YM-04116**

## 4. Bore valve guide ② to obtain proper valve stem clearance.

Use the Valve Guide Reamer (4.5 mm) ①.



**Valve Guide Reamer (4.5 mm):**  
**P/N YM-04118**

## NOTE:

Reface the valve seat after installing the valve guide.



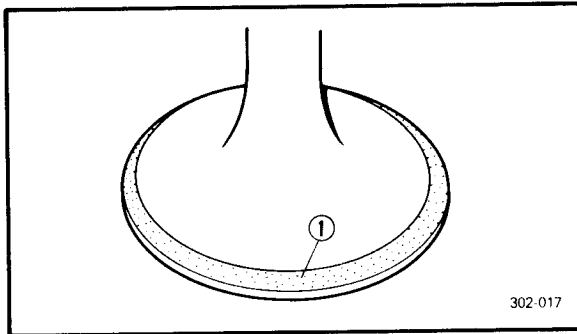
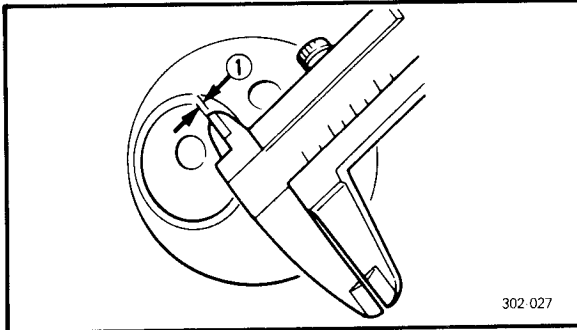
## VALVE SEAT

## 1. Clean:

- Valve face
  - Valve seat
- Remove carbon deposit.

## 2. Inspect:

- Valve seat
- Pitting/Wear → Reface valve seat.



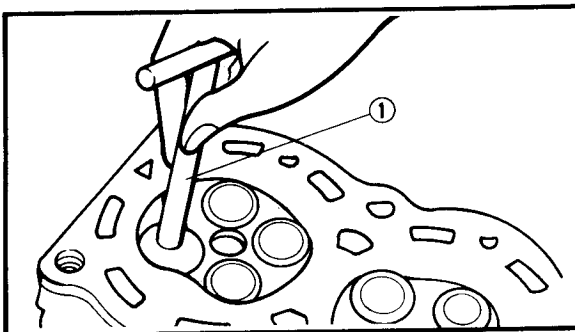
## 3. Measure:

- Valve seat width ①
- Out of specification → Reface valve seat.

Valve Seat Width	
Intake	0.9 ~ 1.1 mm (0.035 ~ 0.043 in)
Exhaust	0.9 ~ 1.1 mm (0.035 ~ 0.043 in)

## Valve seat width measurement steps:

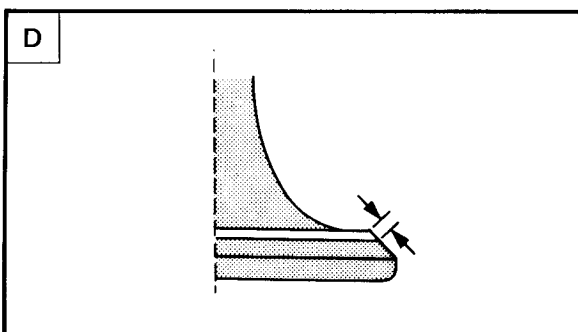
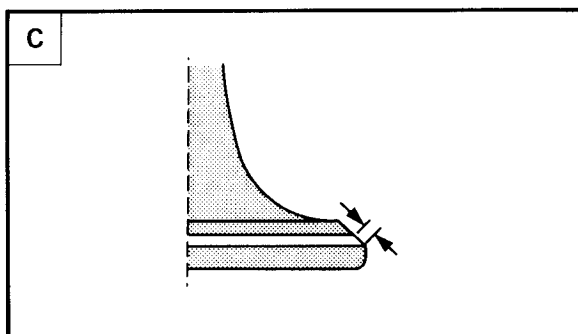
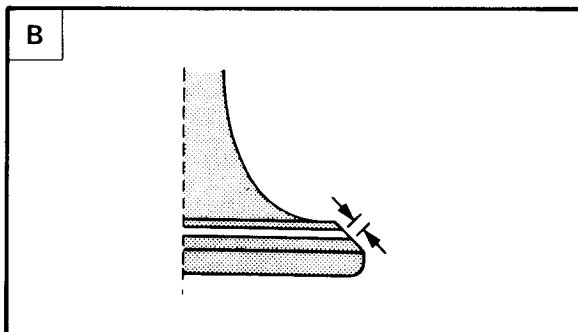
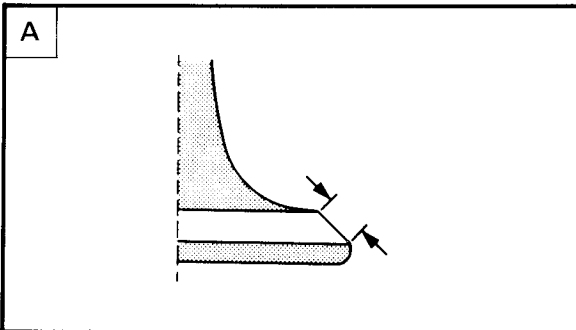
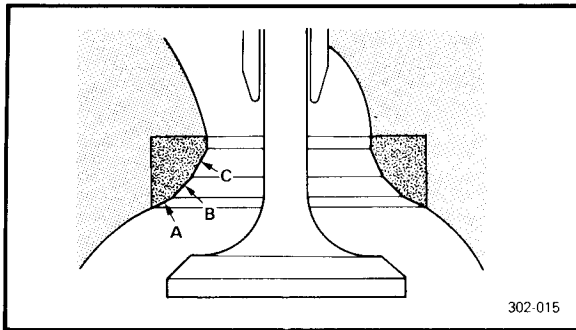
- Apply the Mechanic's bluing dye (Dykem) ① to the valve face.
- Install the valve into the cylinder head.
- Press the valve through the valve guide and onto the valve seat to make a clean pattern.
- Measure the valve seat width. Whether the valve seat and valve face made contact, bluing will have been removed.
- If the valve seat width is too wide, too narrow, or seat has not centered. The valve seat must be refaced.



## 4. Reface:

- Valve seat
- Use 20°, 45° and 60° Valve Seat Cutter.

Valve Seat Cutter Set ① : P/N YM-91043	
---	--



**⚠ CAUTION:**

Remove just enough material to achieve satisfactory seat.

When twisting cutter, keep an even downward pressure to prevent chatter marks.

**Cut sections as follows**

Section	Cutter
A	20°
B	45°
C	60°

**Valve seat refacing steps:**

- A** Valve face indicates that valve seat is centered on valve face but is too wide.

Valve Seat Cutter Set		Desired Result
Use lightly	20° cutter	To reduce valve seat width to 1.0 mm (0.04 in)
	60° cutter	

- B** Valve seat is in the middle of the valve face but too narrow.

Valve Seat Cutter Set		Desired Result
Use	45° cutter	To achieve a uniform valve seat width of 1.0 mm (0.04 in)

- C** Valve seat is too narrow and right up near valve margin.

Valve Seat Cutter Set		Desired Result
Use	20° cutter	To center the seat and to achieve its width of 1.0 mm (0.04 in)
	45° cutter	

- D** Valve seat is too narrow and is located down near the bottom edge of the valve face.

Valve Seat Cutter Set		Desired Result
Use	60° cutter, first	To center the seat and increase its width.
	45° cutter	

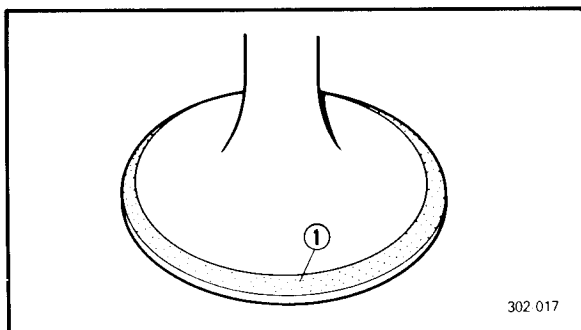
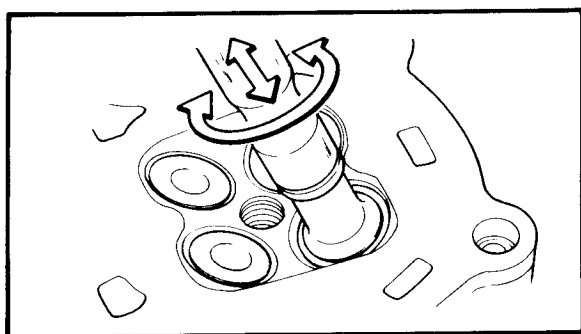
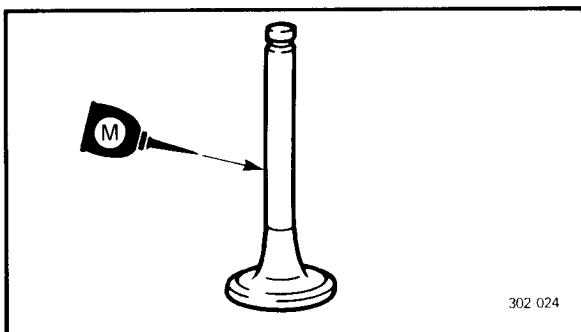
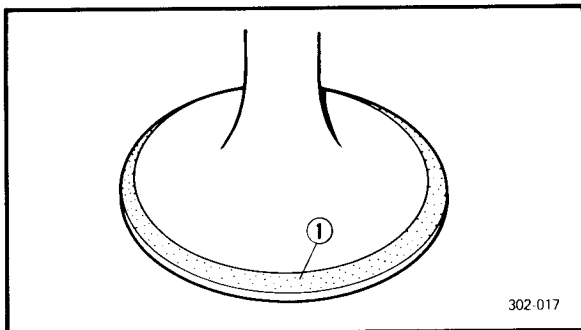


## 5. Lap:

- Valve face
- Valve seat

**NOTE:**

After refacing the valve seat or replacing the valve and valve guide, the valve seat and valve face should be lapped.

**Valve lapping steps:**

- Apply a coarse lapping compound ① to the valve face.

**CAUTION:**

Be sure no compound enters the gap between the valve stem and guide.

- Apply a molybdenum disulfide oil to the valve stem.
- Install the valve into the cylinder head.
- Turn the valve until the valve face and valve seat are evenly polished, then clean off all compound.

**NOTE:**

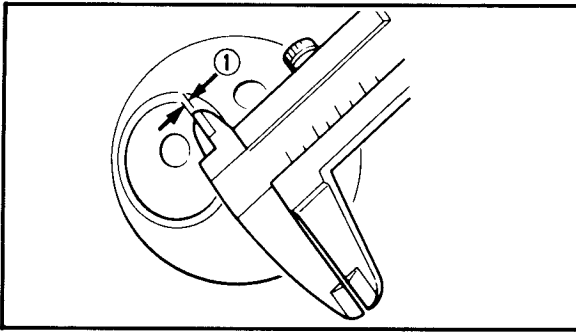
To obtain the best lapping result, lightly tap the valve seat while rotating the valve back and forth between your hand.

- Apply a fine lapping compound to the valve face and repeat the above steps.

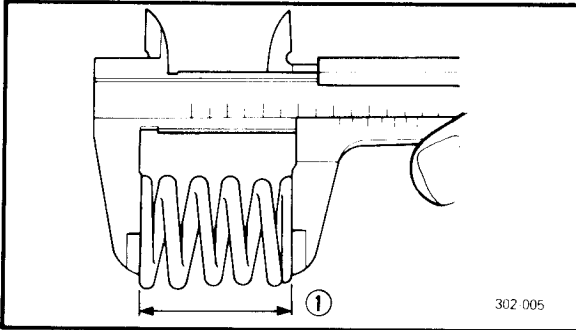
**NOTE:**

Be sure to clean off all compound from the valve face and valve seat after every lapping operation.

- Apply the Mechanic's bluing dye (Dykem) ① to the valve face.
- Install the valve into the cylinder head.



- Press the valve through the valve guide and onto the valve seat to make a clear pattern.
- Measure the valve seat width ① again. If the valve seat width is out of specification, reface and lap the valve seat.



302-005

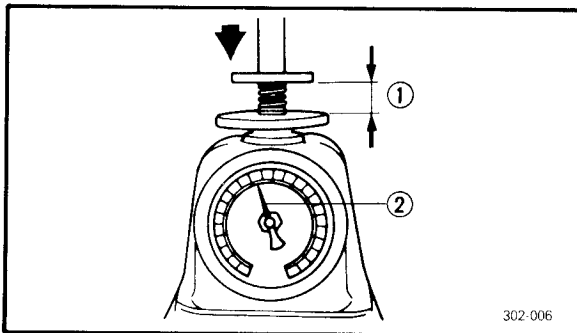
**VALVE SPRING**

## 1. Measure:

- Valve spring free length ①
- Out of specification → Replace.



**Valve Spring Free Length:**  
41.94 mm (1.65 in)



302-006

## 2. Measure:

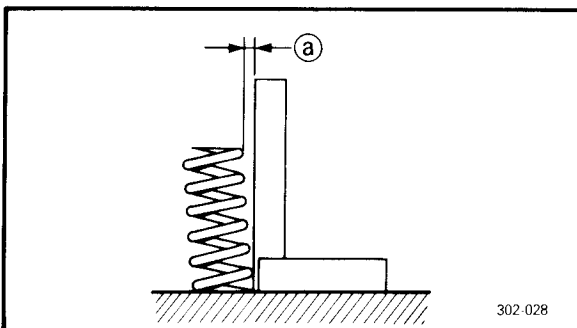
- Valve spring installed force ②
- Out of specification → Replace.

## ① Installed length



**Valve Spring Installed Force:**

①	②
37.5 mm (1.48 in)	14.2 ~ 16.4 kg (31.3 ~ 36.2 lb)



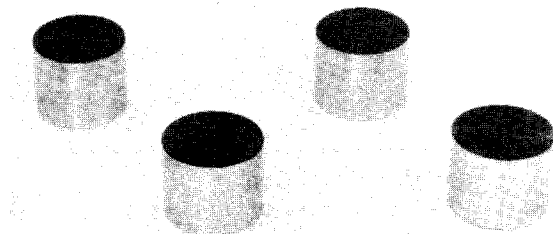
302-028

## 3. Measure:

- Spring Tilt (a)
- Out of specification → Replace.



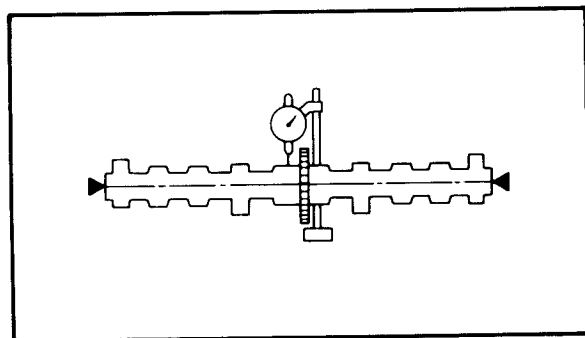
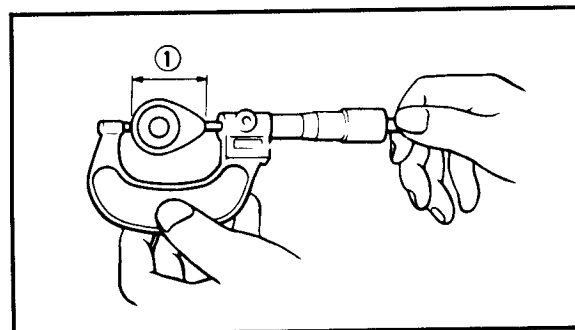
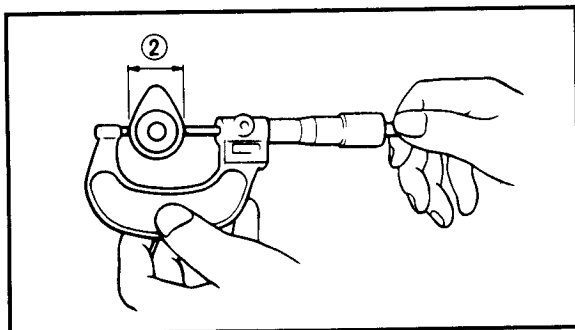
**Spring Tilt:**  
Less than 1.8 mm (0.0709 in)

**VALVE LIFTER**

## 1. Inspect:

- Valve lifters

Scratches/Damage → Replace both lifters and camshaft case.

**CAMSHAFT, CAM CHAIN, AND CAM SPROCKET****Camshaft**

## 1. Inspect:

- Cam lobes

Pitting/Scratches/Blue discoloration → Replace.

## 2. Measure:

- Cam lobes

Use the Micrometer.

Out of specification → Replace.


	Cam Lobe ① (Limit)	Cam Lobe ② (Limit)
Intake	32.51 mm (1.2799 in)	25.005 mm (0.9844 in)
Exhaust	32.21 mm (1.2681 in)	24.96 mm (0.9827 in)

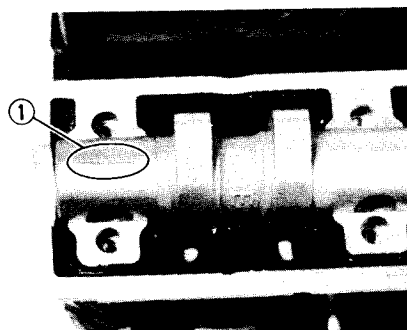
## 3. Measure:

- Camshaft runout

Use the Micrometer.

Out of specification → Replace.

	<b>Camshaft Runout Limit:</b> 0.03 mm (0.0012 in)
---	--

**Camshaft/Cap Clearance Measurement**


## 1. Install:

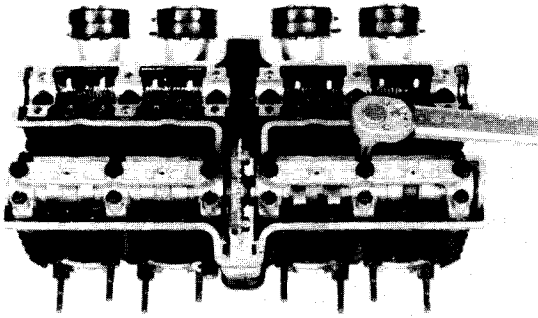
- Camshaft

## 2. Position:

- Strip of Plastigage® ①

Onto the camshaft.

	<b>Plastigage®:</b> P/N YU-33210
---	-------------------------------------



## 3. Install:

- Dowel pins
- Camshaft caps

## 4. Tighten:

- Camshaft cap bolts



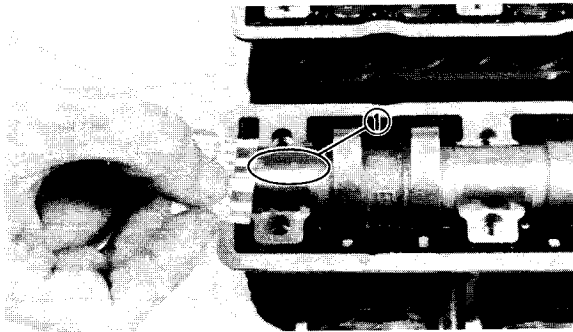
**Bolts (Camshaft Cap):**  
10 Nm (1.0 m·kg, 7.2 ft·lb)

**NOTE:**

- Tighten the camshaft caps in a crisscross pattern from innermost to outer caps.
- Do not turn the camshaft when measuring clearance with the Plastigage®.

## 5. Remove:

- Camshaft caps

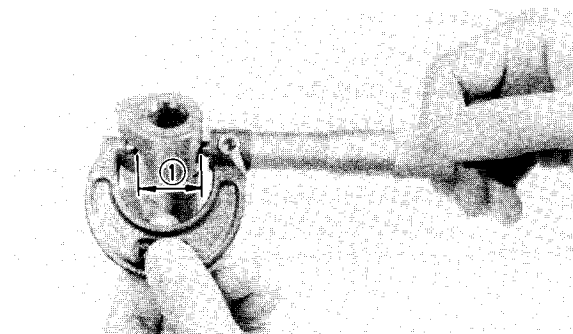


## 6. Measure:

- Width of Plastigage® ①
- Out of specification → Follow step 7.



**Camshaft-to-cap Clearance:**  
0.020 ~ 0.054 mm  
(0.0008 ~ 0.0021 in)



## 7. Measure:

- Camshaft outside diameter ①

Use a micrometer.

Out of specification → Replace the camshaft.

Within specification → Replace the camshaft case.



**Camshaft Outside Diameter:**  
Standard: 22.967 ~ 22.980 mm  
(0.9042 ~ 0.9047 in)

**Cam Cap Inside Diameter:**  
Standard: 23.000 ~ 23.021 mm  
(0.9056 ~ 0.9063 in)

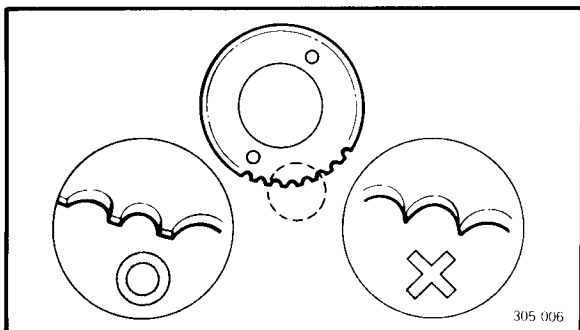


**Cam Chain**

## 1. Inspect:

- Cam chain

Chain stretch/Cracks → Replace.

**Cam Sprockets**

## 1. Inspect:

- Cam sprockets

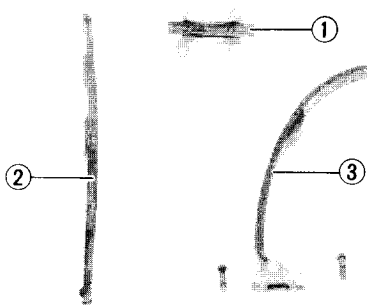
Wear/Damage → Replace.

**Cam Chain Guide**

## 1. Inspect:

- Cam chain guide (Upper) ①
- Cam chain guide (Exhaust side) ②
- Cam chain guide (Intake side) ③

Wear → Replace.

**Cam Chain Tensioner**

## 1. Check:

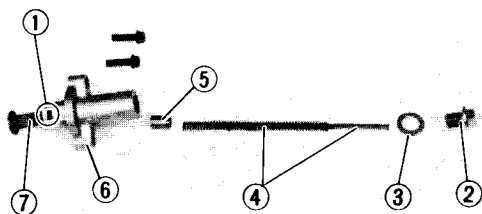
- One-way cam ① operation

Unsmooth operation → Replace.

## 2. Inspect:

- All parts

Damage/Wear → Replace.



② End plug

⑤ Collar

③ Washer

⑥ Tensioner body

④ Springs

⑦ Tensioner rod

**CYLINDER AND PISTON**

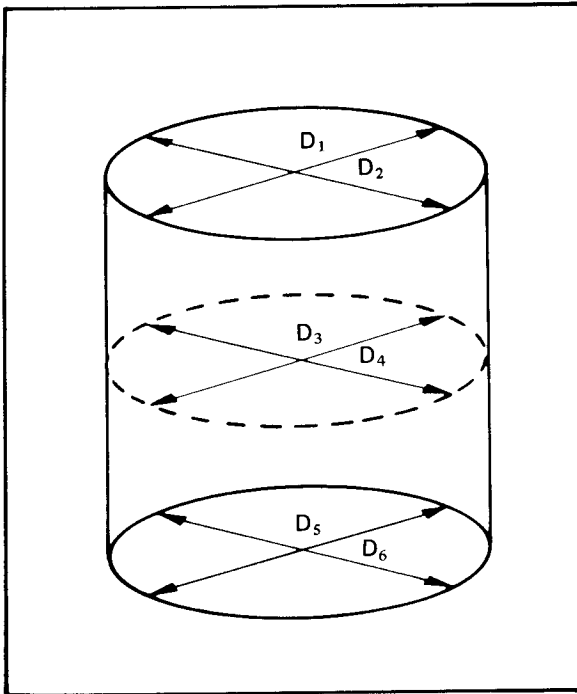
## 1. Inspect:

- Cylinder and Piston walls

Vertical scratches → Rebore or Replace cylinder and piston.

## 2. Measure:

- Piston-to-cylinder clearance




### Piston-to-cylinder clearance measurement steps:

First step:

- Measure the cylinder bore "C" with a Cylinder Bore Gauge.

NOTE:

Measure the cylinder bore "C" in parallel to and at right angles to the crankshaft. Then, find the average of the measurements.

	Standard	Wear Limit
Cylinder bore "C"	56.000 ~ 56.005 mm (2.2047 ~ 2.2049 in)	56.05 mm (2.2067 in)
Taper "T"	—	0.05 mm (0.0019 in)
Out of round "R"	—	0.03 mm (0.001 in)

C = Maximum D

T = (Maximum D<sub>1</sub> or D<sub>2</sub>) –  
(Maximum D<sub>5</sub> or D<sub>6</sub>)

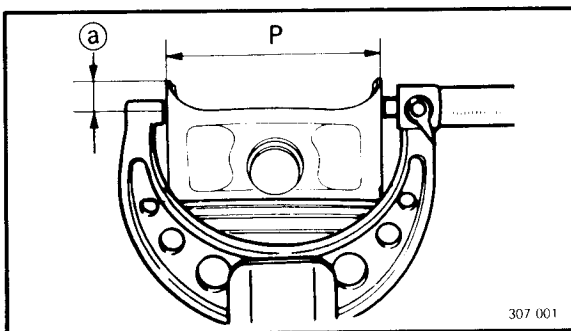
R = (Maximum D<sub>1</sub>, D<sub>3</sub> or D<sub>5</sub>) –  
(Minimum D<sub>2</sub>, D<sub>4</sub> or D<sub>6</sub>)


- If out of specification, rebore or replace cylinder, and replace piston and piston rings as a set.

2nd step:

- Measure the piston skirt diameter "P" with a micrometer.

Ⓐ 5.0 mm (0.2 in) from the piston bottom edge.



	Piston Size P
Standard	55.945 ~ 55.960 mm (2.2026 ~ 2.2031 in)
Overize 2	56.5 mm (2.22 in)
Overize 4	57.0 mm (2.24 in)

- If out of specification, replace piston and piston rings as a set.

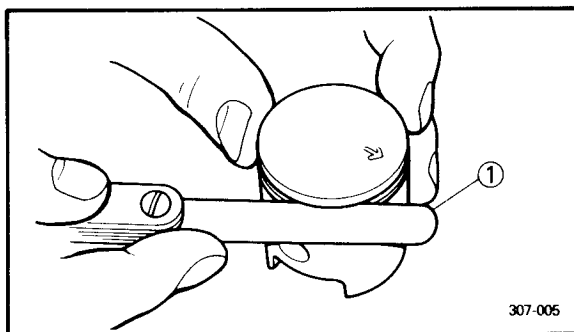
3rd step:

- Calculate the piston-to-cylinder clearance with following formula:

Piston-to-cylinder Clearance =  
Cylinder bore "C" –  
Piston skirt diameter "P"



- If out of specification, rebore or replace cylinder, and replace piston and piston rings as a set.

**Piston-to-cylinder Clearance:****0.04 ~ 0.06 mm****(0.0016 ~ 0.0024 in)****Limit: 0.15 mm (0.006 in)****PISTON RING AND PISTON PIN****Piston Ring****1. Measure:**

- Side clearance

Use the Feeler Gauge ①.

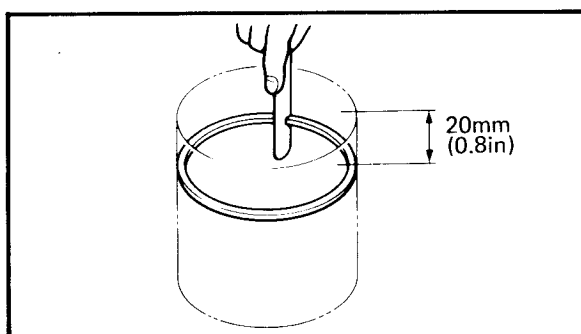
Out of specification → Replace the piston and/or rings.

**NOTE:**

Decarbon the piston ring grooves and rings before measuring the side clearance.

**Side Clearance:**

	Standard	Limit
Top ring	0.03 ~ 0.07 mm (0.0012 ~ 0.0028 in)	0.10 mm (0.004 in)
2nd ring	0.02 ~ 0.06 mm (0.0008 ~ 0.0024 in)	0.10 mm (0.004 in)

**2. Position:**

- Piston ring  
Into cylinder.

**NOTE:**

Insert the ring into the cylinder, and push it approximately 20 mm (0.8 in) into the cylinder. Push the ring with the piston crown so that the ring will be at a right angle to the cylinder bore.

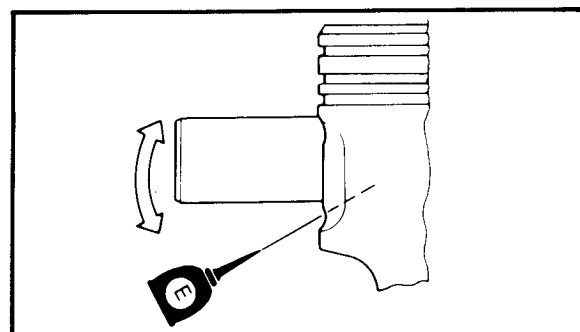
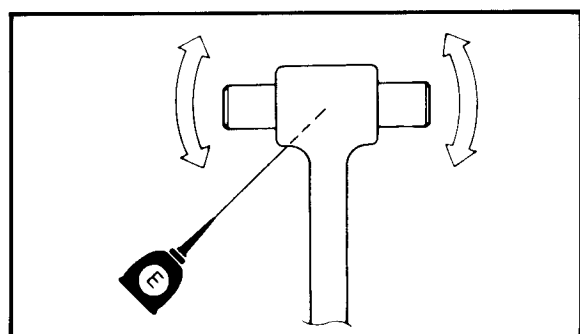
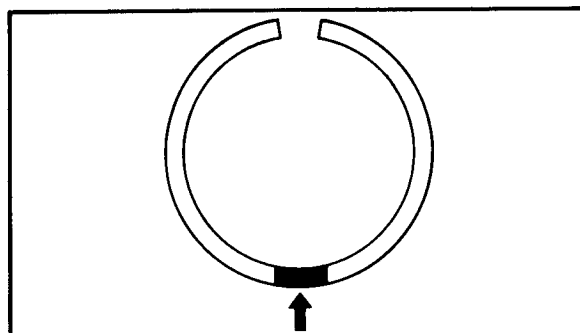
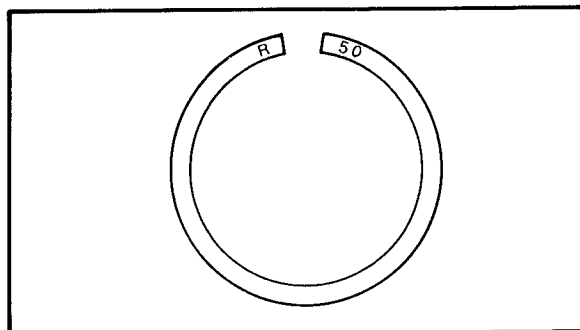
**3. Measure:**

- End gap

Out of specification → Replace.

**End Gap (Installed):****Standard**

Top ring	0.15 ~ 0.30 mm (0.0059 ~ 0.0118 in)
2nd ring	0.15 ~ 0.30 mm (0.0059 ~ 0.0118 in)
Oil control (Rails)	0.2 ~ 0.8 mm (0.0079 ~ 0.0315 in)

**Piston Ring Oversize**

- Top and 2nd piston ring  
Oversize top and middle ring size is stamped on the top of ring.

<b>Oversize 2</b>	<b>0.50 mm (0.0197 in)</b>
-------------------	----------------------------

- Oil control ring  
Expander spacer of bottom ring (oil control ring) is color-coded to identify sizes.

<b>Size</b>	<b>Color</b>
<b>Oversize 2</b>	<b>Red</b>

**Piston Pin****1. Lubricate:**

- Piston pin (Lightly)

**SAE 10W30 Motor Oil****2. Install:**

- Piston pin  
Into the small end of connecting rod.

**3. Check:**

- Free play  
Free play → Inspect the connecting rod for wear.  
Wear → Inspect the connecting rod and piston pin.

**4. Position:**

- Piston pin  
Into the piston.

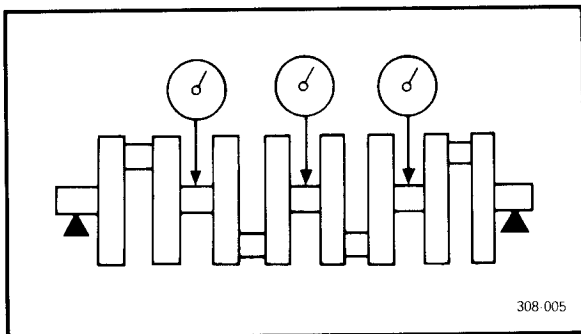


## 5. Check:

## • Free play

When the pin is in place in the piston.

Free play → Replace the piston pin and/or piston.



## CRANKSHAFT AND CONNECTING ROD

## Crankshaft

## 1. Measure:

## • Runout

Use the V-Blocks and Dial Gauge.

Out of specification → Replace.

Out of specification → Replace.



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

## 2. Inspect:

## • Crankshaft journal surfaces

Wear/Scratches → Replace.

## Main Journal Oil Clearance

## 1. Clean all parts.

## 2. Position:

## • Crankshaft journal surfaces

Place on a bench in an upside down position.

## 3. Install:

## • Main journal bearings

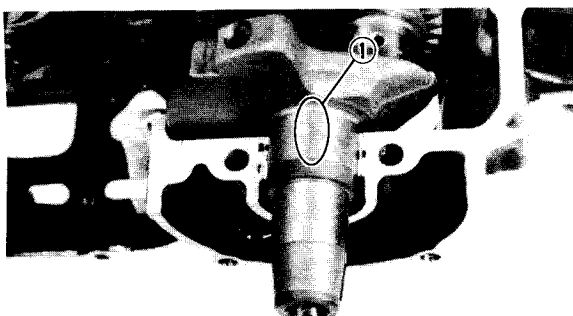
Into the upper crankcase.

## • Crankshaft

## 4. Attach:

## • Plastigage® ①

Onto the crankshaft journal surface.



**Plastigage® :**  
P/N YU-33210



## 5. Install:

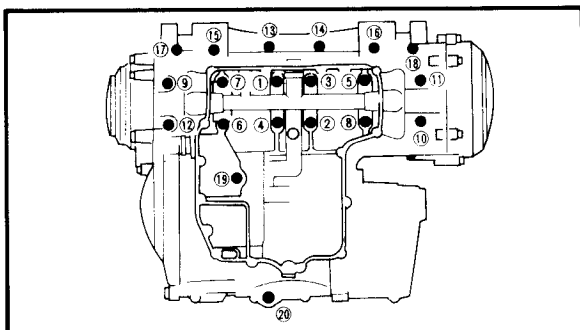
- Bearings  
Into the lower crankcase.
- Crankcase (Lower)

## 6. Tighten:

- Bolts

**⚠ CAUTION:**

Tighten to full torque in torque sequence cast on the crankcase.

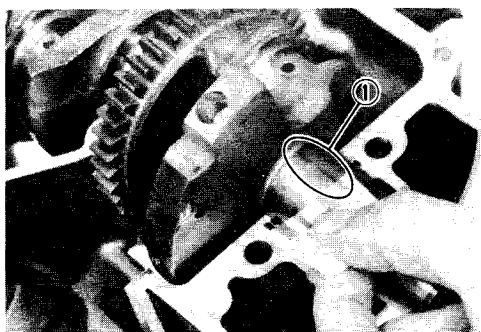


Bolt ① ~ ⑫ :  
24 Nm (2.4 m·kg, 17 ft·lb)

Bolt ⑬ ~ ⑳ :  
12 Nm (1.2 m·kg, 8.7 ft·lb)

## 7. Remove:

- Bolts  
Reverse assembly procedure.
- Crankcase (Lower)  
Use care in removing.



## 8. Measure:

- Plastigage width ⑪  
Out of specification → Replace the bearings;  
replace the crankshaft if necessary.

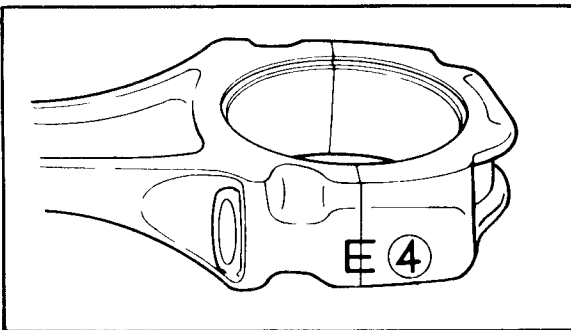
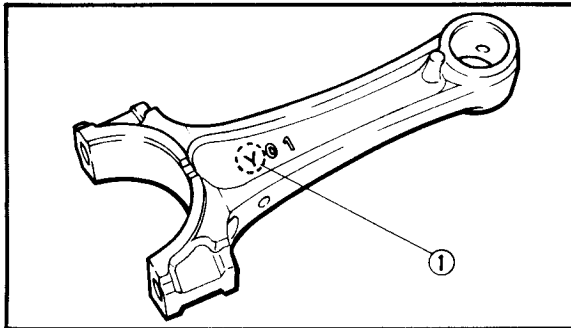
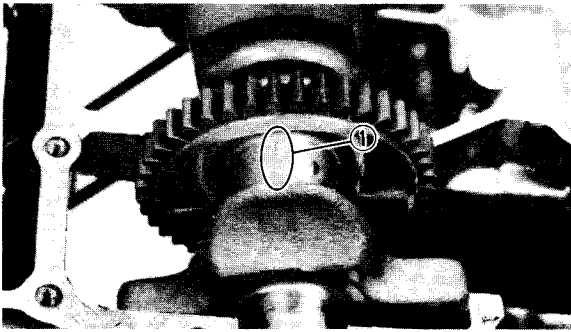


**Main Journal Oil Clearance:**  
0.025 ~ 0.043 mm  
(0.0010 ~ 0.0017 in)

**Connecting Rod Bearings**

## 1. Inspect:

- Connecting rod bearings  
Burns/Flaking/Roughness/Scratches →  
Replace.

**Connecting Rod Oil Clearance**

1. Clean all parts thoroughly.
2. Install:
  - Connecting rod bearings  
Into the connecting rod and cap.
3. Attach:
  - Plastigage® ①  
Onto the crank pin.



**Plastigage®:**  
P/N YU-33210

4. Install:
  - Connecting rod
  - Connecting rod cap

**NOTE:**

- Be sure the "Y" marks ① on the connecting rods face toward left crankshaft end .
- Be sure the letters on both components align to form a perfect character.

**5. Lubricate:**

- Bolt threads (Connecting rod)
- Nut seats (Connecting rod)



**Molybdenum Disulfide Grease**

**6. Tighten:**

- Nuts (Connecting rod cap)

**NOTE:**

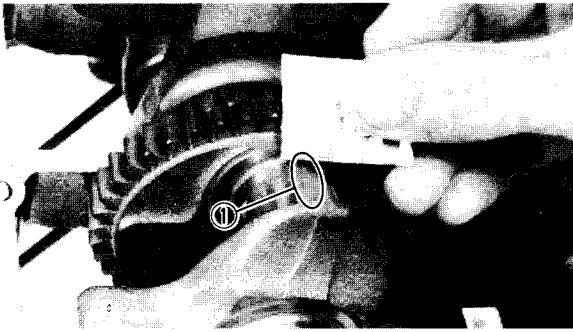
Do not turn the connecting rod until the clearance measurement has been completed.

**⚠ CAUTION:**

Tighten to full torque specification without pausing. Apply continuous torque between 1.2 and 2.3 m·kg. Once you reach 1.2 m·kg DO NOT STOP TIGHTENING until final torque is reached. If tightening is interrupted between 1.2 and 2.3 m·kg, loosen nut to less than 1.2 m·kg, and start again.



**Nuts (Connecting Rod):**  
23 Nm (2.3 m·kg, 17 ft·lb)



## 7. Remove:

- Connecting rod cap  
Use care in removing.

## 8. Measure:

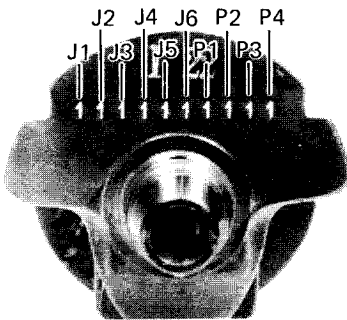
- Width of Plastigage® ①

Out of specification → Replace the bearings and/or replace the crankshaft if necessary.

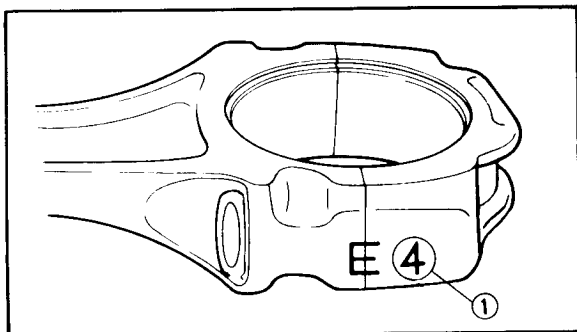
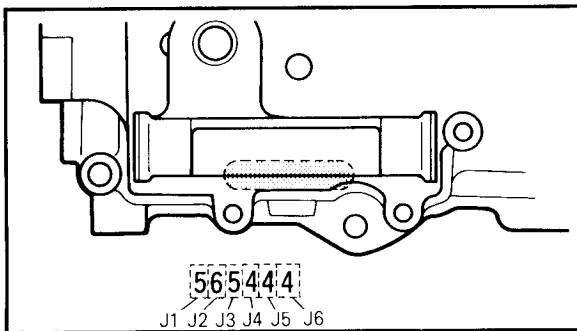
**Connecting Rod Oil Clearance:**

0.043 ~ 0.0066 mm

(0.0017 ~ 0.0026 in)

**Crankshaft Main Journal and Connecting Rod Bearing Selection**

- Numbers used to indicate crankshaft journal sizes are stamped on the LH crankweb. The first six (6) are main journal bearing numbers, starting with the left journal. The four (4) connecting rod bearing numbers follow in the same sequence.



- The upper crankcase half is numbered J1, J2, J3, J4, J5 and J6 on the rear right bosse as shown.

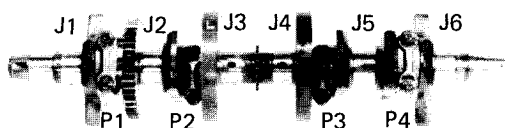
- The numbers are stamped in ink on the rod cap ①.

**BEARING COLOR CODE**

No. 1	Blue
No. 2	Black
No. 3	Brown
No. 4	Green
* No. 5	Yellow

- \* No. 5 applies only to the main journal bearing selection.





### Example 1: Selection of the main journal bearings:

- If the crankcase J1 and crankshaft J1 sizes are No. 4 and No. 1, respectively, the bearing size No. is:

Bearing Size No. =

Crankcase No. – Crankshaft No. =

4 – 1 = 3 (Brown)

#### BEARING COLOR CODE

No. 1	Blue
No. 2	Black
No. 3	Brown
No. 4	Green
No. 5	Yellow

### Example 2: Selection of the connecting rod bearing:

- If the connecting rod P1 and crankshaft P1 sizes are No. 5 and No. 1, respectively, the bearing size No. is:

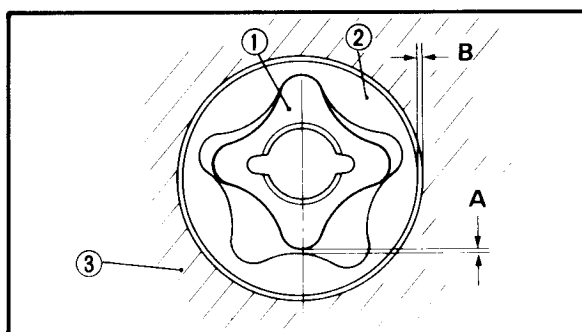
Bearing Size No. =

Connecting rod No. – Crankshaft No. =

5 – 1 = 4 (Green)

#### BEARING COLOR CODE

No. 1	Blue
No. 2	Black
No. 3	Brown
No. 4	Green



### OIL PUMP

#### 1. Measure:

- Tip clearance "A"

Between the inner rotor ① and the outer rotor ② .

- Side clearance "B"

Between the outer rotor ② and the pump housing ③ .

Use the Filler Gauge and Straight Edge.

Out of specification → Replace the oil pump assembly.



Tip Clearance "A" Limit:  
0.2 mm (0.008 in)

Side Clearance "B" Limit:  
0.15 mm (0.006 in)

2. Lubricate:

- Inner rotors
- Outer rotors
- Oil seal
- Pump shaft



SAE 10W30 Motor Oil

3. Install:

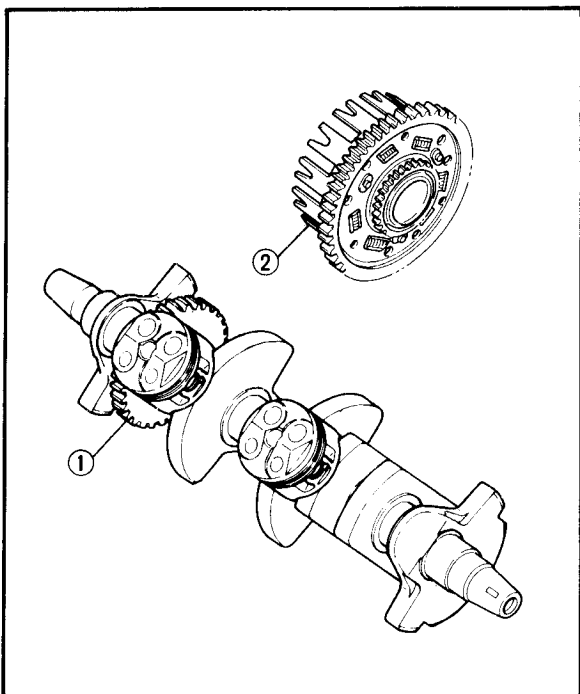
Reverse removal procedure.

**NOTE:**

Align the pins in the pump shaft and the groove on the inner rotors dualing assembly.

4. Check:

- Oil pump operation  
With a finger.  
Unsmooth operation → Repeat step 2. or replace.



**PRIMARY DRIVE**

1. Inspect:

- Primary drive gear (Crank shaft) ①
- Primary driven gear ②  
Wear/Damage → Replace both gears.  
Excessive noises during operation →  
Replace both gears.

Primary reduction ratio:		
No. of teeth		Ratio
Drive	Driven	
41	89	2.170



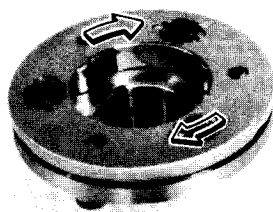
## STARTER CLUTCH

## 1. Check:

- Roller operation

Push the roller to arrow direction.

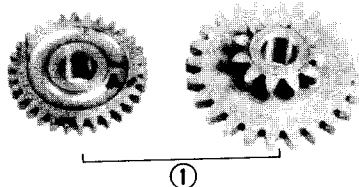
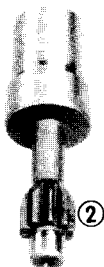
Unsmooth operation → Replace starter clutch.



## 2. Inspect:

- Starter idle gear teeth ①
- Starter drive gear teeth ②

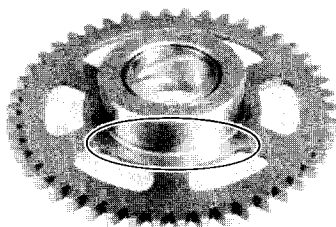
Burrs/Chips/Roughness/Wear → Replace.



## 3. Inspect:

- Contacting surfaces

Pitting/Wear/Damage → Replace.

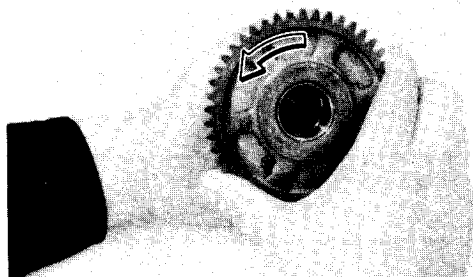
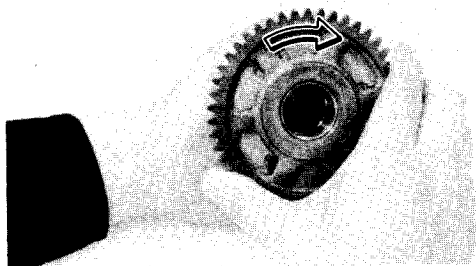


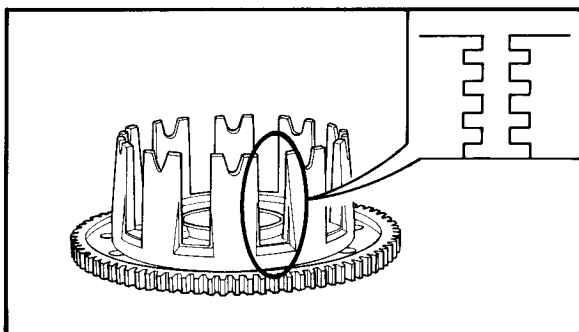
## 4. Check:

- Starter clutch operation

**Clutch operation checking steps:**

- Install the starter clutch gear to the starter clutch, and hold the starter clutch.
- When turning the starter clutch gear clockwise the starter clutch and the wheel gear should be engaged.  
If not, the starter clutch is faulty. Replace it.
- When turning the starter clutch gear counter-clockwise, the starter clutch gear should turn freely.  
If not, the starter clutch is faulty. Replace it.



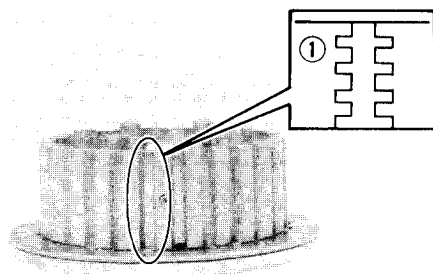
**CLUTCH****Clutch Housing**

## 1. Inspect:

- Dogs on the housing  
Cracks/Wear/Damage → Deburr or replace.
- Clutch housing bearing  
Chafing/Wear/Damage → Replace.

**NOTE:**

Wear on the friction plate dogs of the clutch housing will cause an erratic operation.

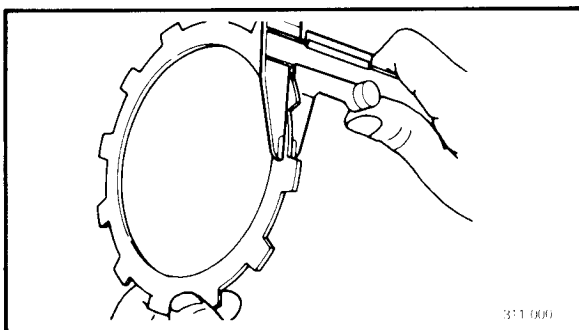
**Clutch Boss**

## 1. Inspect:

- Clutch boss splines ①  
Scoring/Wear/Damage → Replace clutch boss assembly.

**NOTE:**

Scoring on the clutch plate splines will cause erratic operation.

**Friction Plates**

## 1. Inspect:

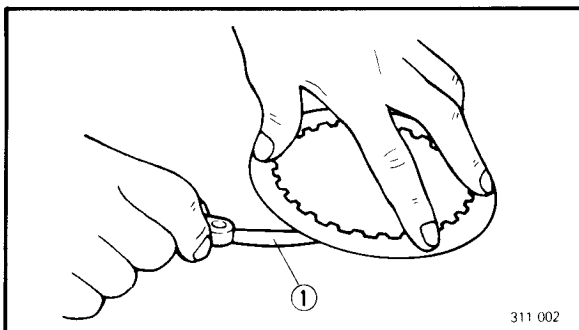
- Friction plate  
Damage/Wear → Replace the friction plates as a set.

## 2. Measure:

- Friction plate thickness  
Measure at all four points.  
Out of specification → Replace the friction plates as a set.



**Wear Limit:**  
2.8 mm (0.11 in)

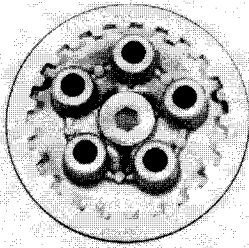
**Clutch Plates**

## 1. Measure:

- Clutch plate warpage  
Use the surface plate and Feeler Gauge ① .  
Out of specification → Replace.

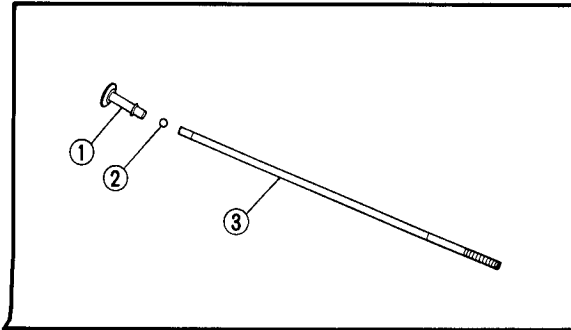


**Warp Limit:**  
0.1 mm (0.004 in)



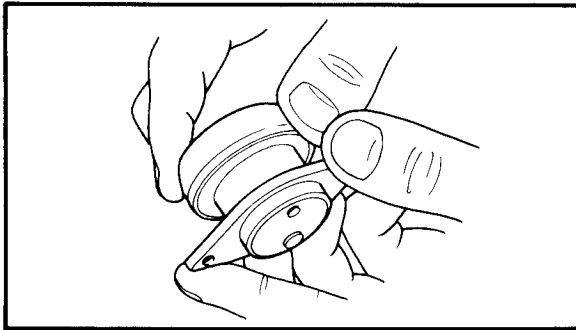
## 2. Inspect:

- Pressure plate  
Damage → Replace.

**Push Rod**

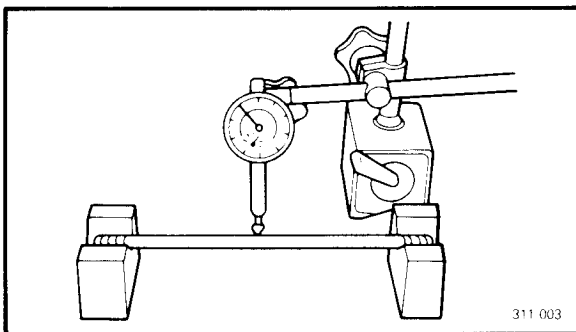
## 1. Inspect:

- Push rod 1 ①
  - Bolt ②
  - Push rod 2 ③
- Wear/Cracks/Damage → Replace.

**Push Lever Assembly and Bolt Screw Housing**

## 1. Inspect:

- Push lever assembly  
Unsmooth → Replace.

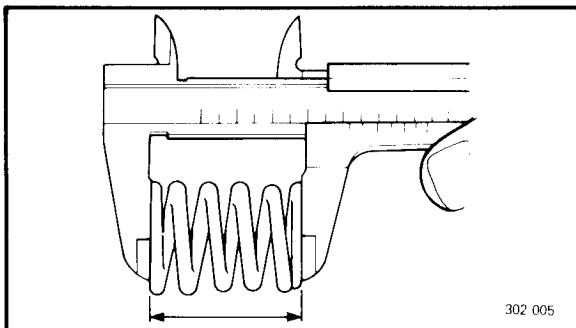


## 2. Measure:

- Push rod runout  
Use the V-Blocks and Dial Gauge.  
Out of specification → Replace.



**Bending Limit:**  
0.3 mm (0.012 in)

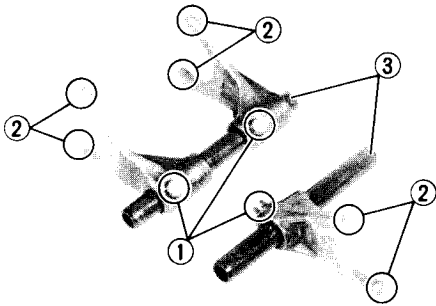
**Clutch Spring**

## 1. Measure:

- Clutch spring free length  
Out of specification → Replace the springs  
as a set.



**Clutch Spring Minimum Free Length:**  
29.0 mm (1.14 in)

**TRANSMISSION****Shift Fork**

## 1. Inspect:

- Shift fork cam follower ①
  - Shift fork pawl ②
- Wear/Chafing/Bends/Damage → Replace.

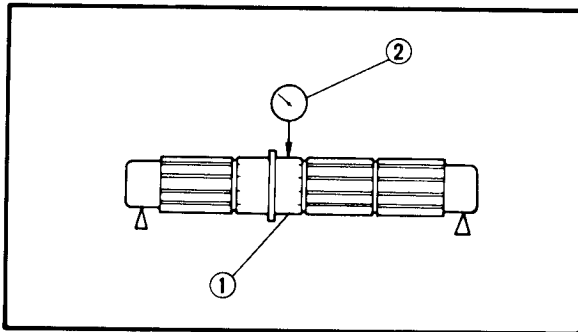
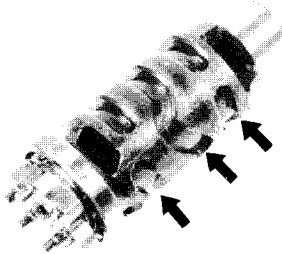
## 2. Check:

- Shift fork movement
- On its guide bar ③ .
- Unsmooth operation → Replace the fork and/guide bar.

**Shift Cam**

## 1. Inspect:

- Shift cam grooves
- Wear/Damage/Scratches → Replace.
- Shift cam segment
- Damage/Wear → Replace.
- Shift cam bearing
- Pitting/Damage → Replace.

**Main and Drive Axles**

## 1. Measure:

- Axle runout ①
- Use the centering device and Dial Gauge ② .
- Out of specification → Replace.
- Out of specification → Replace.

**Runout Limit: 0.08 mm (0.0031 in)****Gears**

## 1. Inspect:

- Gears
- Damage/Wear → Replace.

## 2. Check:

- Gear movement
- Unsmooth operation → Replace.

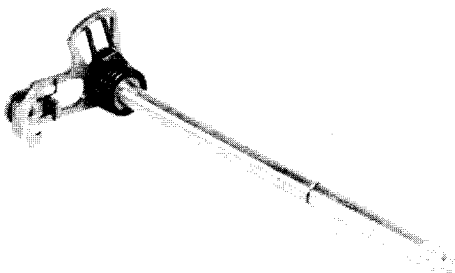
## 3. Inspect:

- Mating dogs
- Cracks/Wear/Damage → Replace.

**Shift Shaft Assembly**

## 1. Inspect:

- Shift shaft
- Bends/Wear/Damage → Replace.
- Spring
- Damage → Replace.

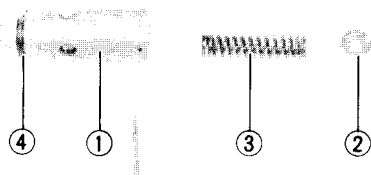




## RELIEF VALVE AND PIPE

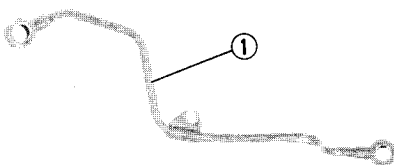
## 1. Check:

- Relief valve body ①
  - Cover ②
  - Spring ③
  - O-ring ④
- Damage/Wear → Replace.



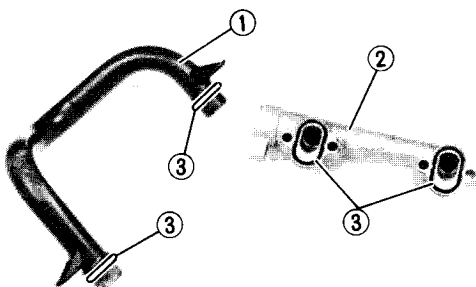
## 2. Check:

- Oil pipe ①
- Damage → Replace.  
Contamination → Wash and blow out the passage.



## 3. Check:

- Water pipe ①
  - Water jacket joint ②
  - O-rings ③
- Damage → Replace.



## CRANKCASE

## 1. Inspect:

- Case halves
  - Bearing seat
  - Fitting
- Damage → Replace

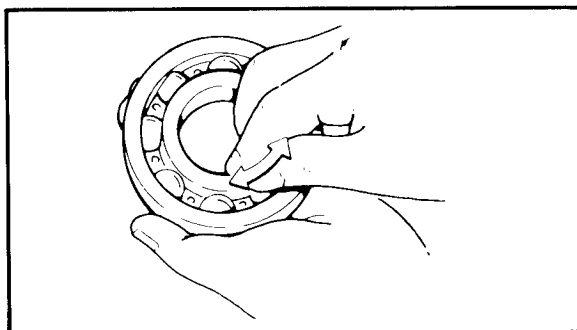
## BEARING AND OIL SEAL

## 1. Inspect:

- Bearings
- Clean and lubricate, then rotate inner race with finger.  
Roughness → Replace the bearing (see Removal).

## 2. Inspect:

- Oil seals
- Damage/Wear → Replace the (see Removal).





### YAMAHA EXHAUST VARIABLE VALVE (For California Only)

#### 1. Inspect:

- Shaft arm

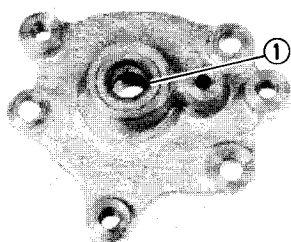
Wear/Cracks/Damage → Replace.



#### 2. Inspect:

- Bush ①

Wear → Replace.





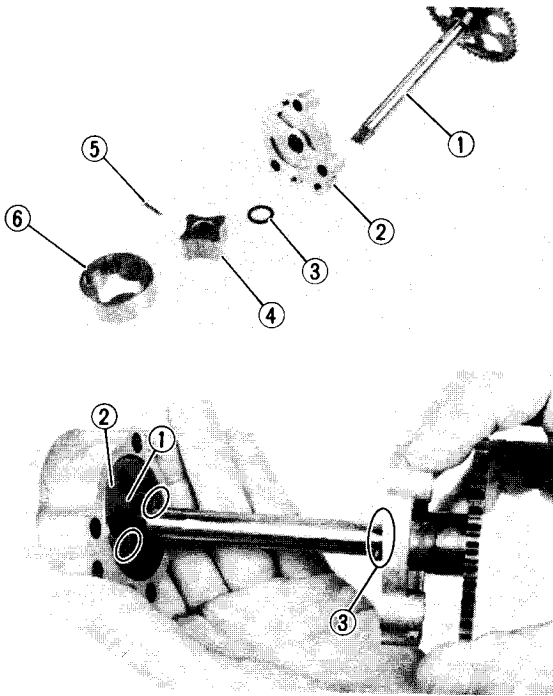


## ENGINE ASSEMBLY AND ADJUSTMENT

### INNER ROTOR (OIL PUMP)

#### 1. Install:

- Pump shaft ①
- Pump cover ②
- Washer ③
- Inner rotor ④
- Pin ⑤
- Outer rotor ⑥

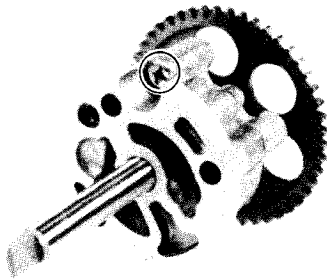


#### NOTE:

Insert the inner rotor ① into the outer rotor ②. Then with the pump shaft dowel pin ③ in the inner rotor slit.

#### 2. Install:

- Pump housing



### CONNECTING ROD

#### 1. Clean:

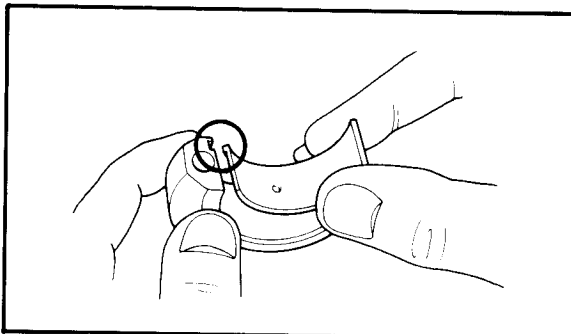
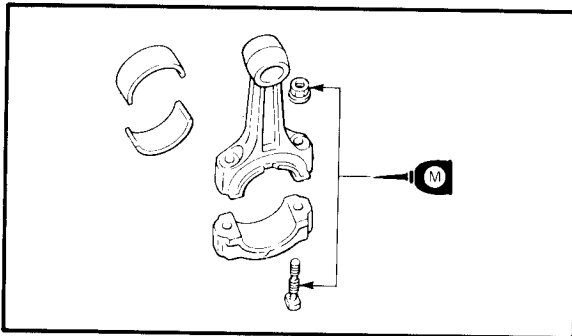
- Crankshaft
- Connecting rods

#### 2. Install:

- Connecting rod bearings  
Into the connecting rod and cap.

#### 3. Lubricate:

- Connecting rod bolt threads
- Connecting rod nuts



**Molybdenum Disulfide Oil**

4. Apply engine oil to the crankshaft pins.

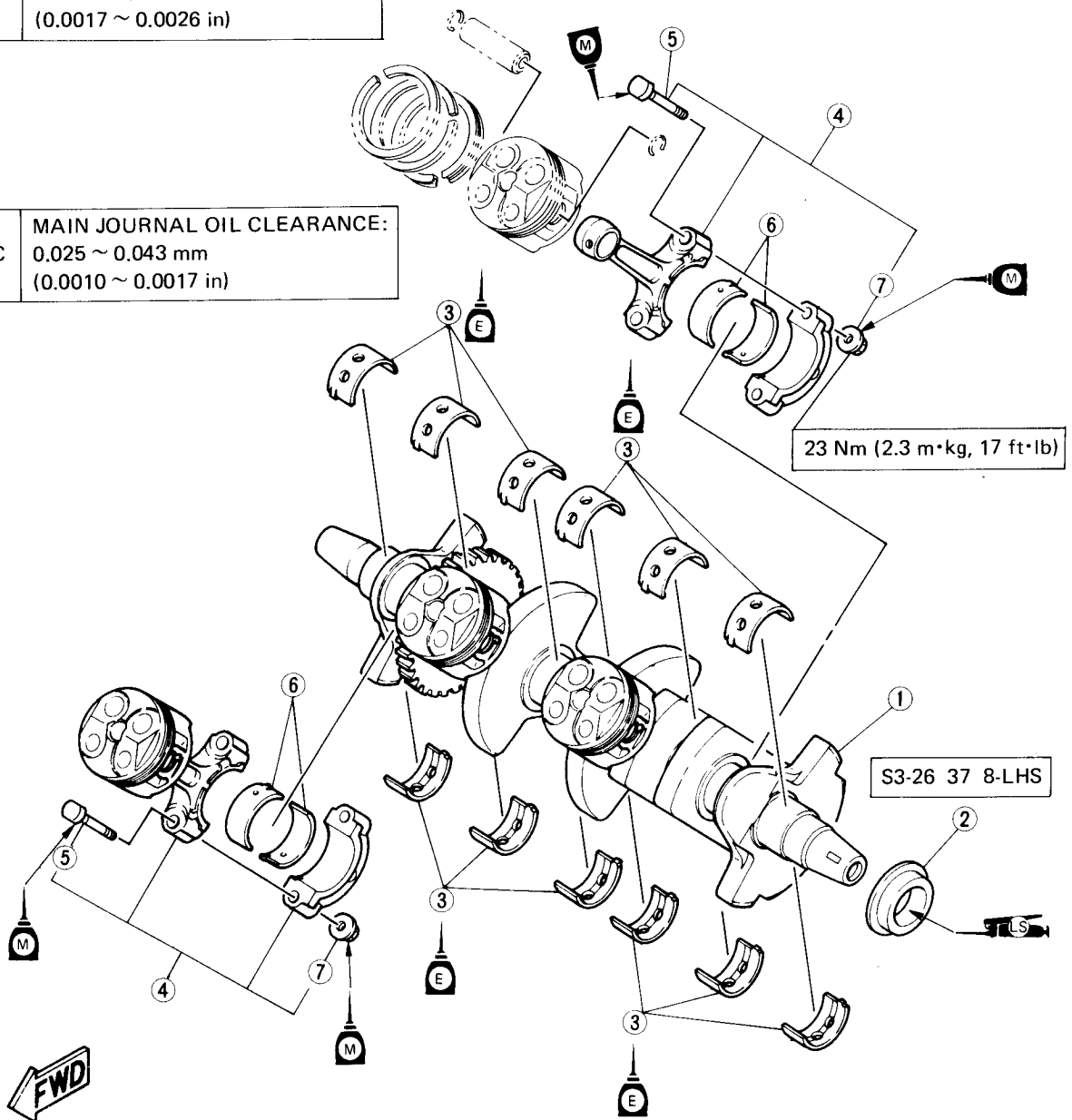


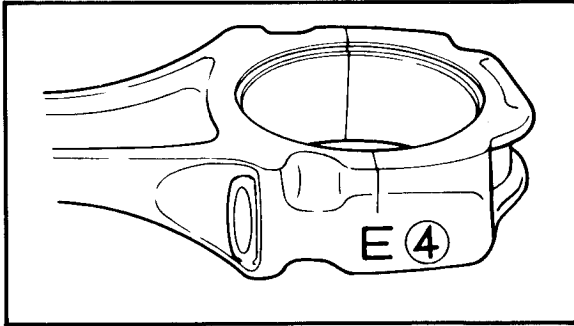
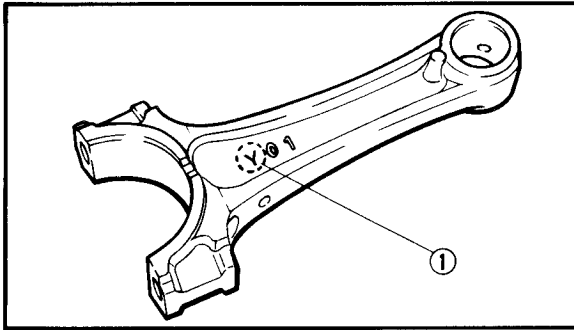
## CRANKSHAFT

- ① Crankshaft
- ② Oil seal
- ③ Main journal bearing
- ④ Connecting rod assembly
- ⑤ Connecting rod bolt
- ⑥ Connecting rod bearing
- ⑦ Nut

A	CRANKSHAFT RUNOUT LIMIT: 0.03 mm (0.0012 in)
B	CONNECTING ROD CLEARANCE: 0.043 ~ 0.066 mm (0.0017 ~ 0.0026 in)

C	MAIN JOURNAL OIL CLEARANCE: 0.025 ~ 0.043 mm (0.0010 ~ 0.0017 in)
---	---





5. Install:

- Connecting rods
- Connecting rod caps

**NOTE:**

- The stamped "Y" mark on the connecting rods ① should face towards the left side of the crankcase.
- Be sure the letter on both components align to form a perfect character.

6. Install:

- Connecting rod bolts

Align the bolt head and connecting rod cap.

7. Tighten:

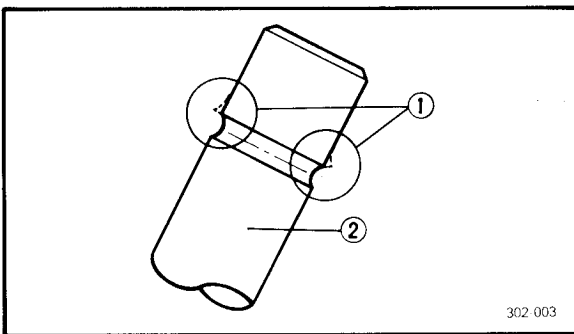
- Connecting rod nuts

**CAUTION:**

Tighten to full torque specification without pausing. Apply continuous torque between 1.2 and 2.3 m·kg. Once you reach 1.2 m·kg. **DO NOT STOP TIGHTENING** until final torque is reached. If the tightening is interrupted between 1.2 and 2.3 m·kg, loosen the nut to less than 1.2 m·kg and start again.



23 Nm (2.3 m·kg, 17 ft·lb)



302-003

## VALVE PAD AND VALVE

**NOTE:**

Deburr any deformed valve stem end. Use an oil stone to smooth the stem end.

- ① Deburr
- ② Valve stem

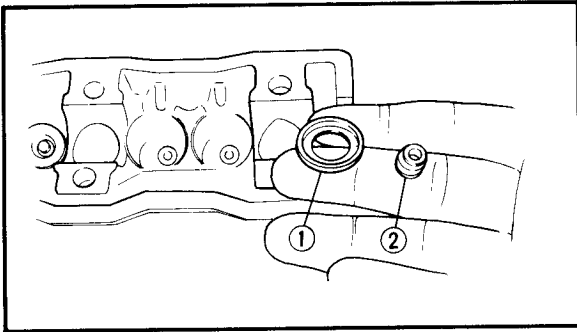
1. Eliminate:

- Carbon deposit  
From the combustion chamber.  
Use a rounded scraper.

**NOTE:**

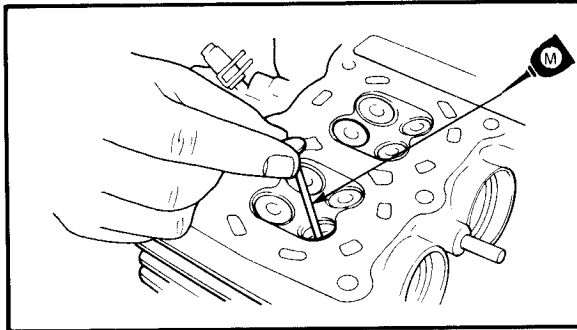
Do not use a sharp instrument and avoid damaging or scratching:

- Spark plug threads
- Valve seat
- Cylinder head



2. Install:

- Valve spring seat ①
- Oil seal ②

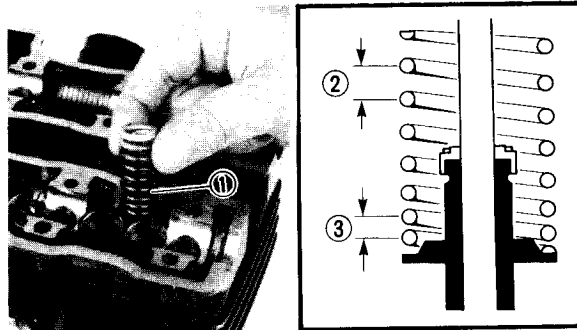


3. Install:

- Valve

**NOTE:** \_\_\_\_\_

Apply molybdenum disulfide oil.



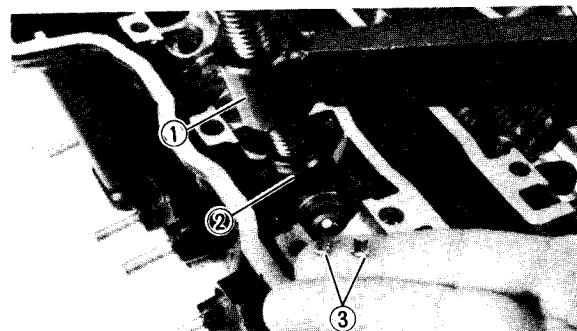
4. Install:

- Valve spring ①

**NOTE:** \_\_\_\_\_

Install springs with wider-gapped coils facing upwards, as shown.

- ② Larger pitch
- ③ Smaller pitch



5. Attach:

- Valve spring compressor ①
- Attachment ②



**Valve Spring Compressor:**

**P/N YM-04019**

**Attachment:**

**P/N YM-04108**

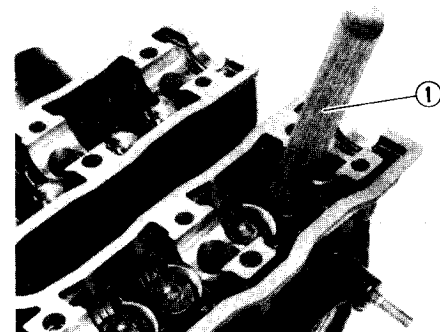
6. Install:

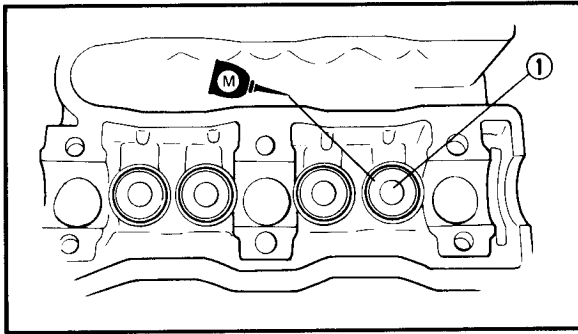
- Valve retainers ③

7. Settle the valve retainer by lightly patting the valve seat with a piece of wood ① in between.

**NOTE:** \_\_\_\_\_

Do not hit so much as to damage the valve.



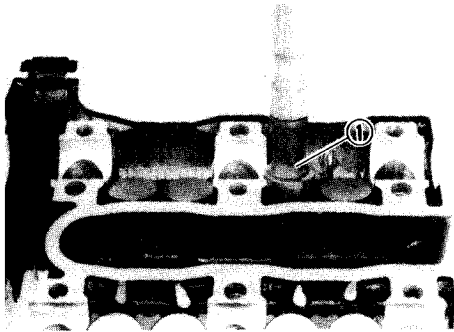


8. Install:

- Valve pads ①

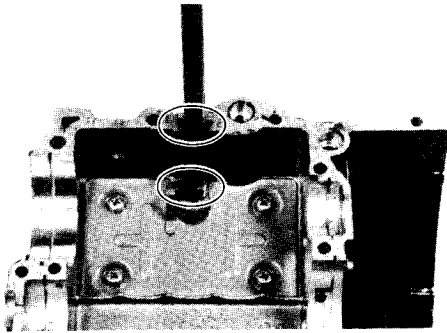
**NOTE:**

Apply molybdenum disulfide oil.



9. Install:

- Lifters ①



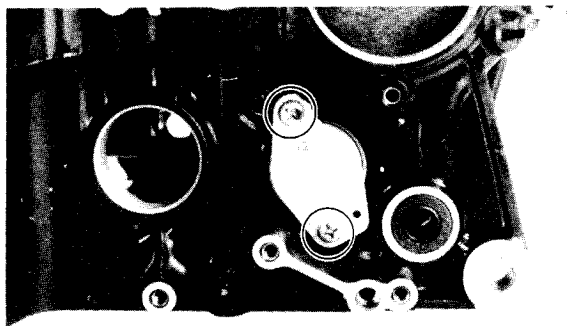
**CRANKSHAFT**

1. Install:

- Oil baffle plate
- Breather hose

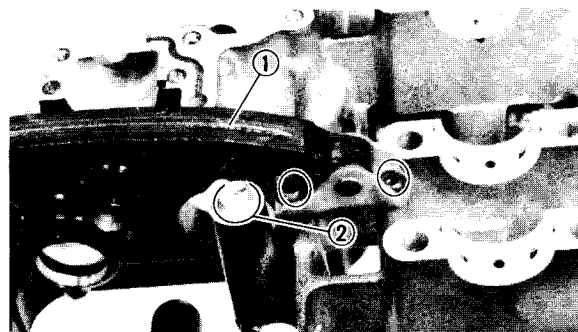


**Oil Baffle Plate Bolts:**  
10 Nm (1.0 m·kg, 7.2 ft·lb)



2. Install:

- Neutral switch assembly ①



3. Install:

- Cam chain guide (Intake side) ①
- O-ring ②



**Bolts (Chain Guide):**  
10 Nm (1.0 m·kg, 7.2 ft·lb)

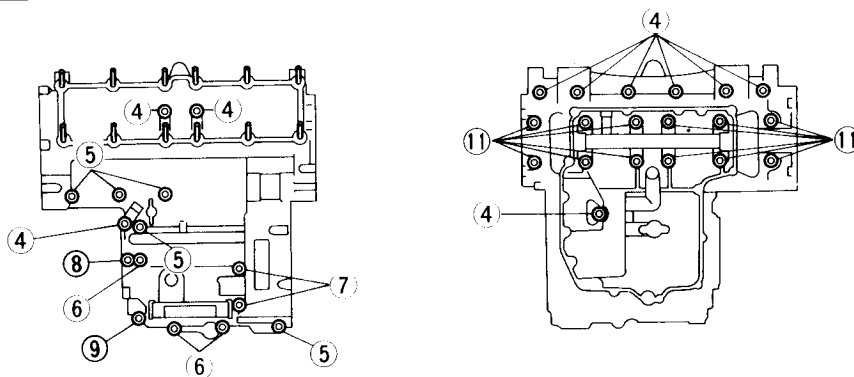
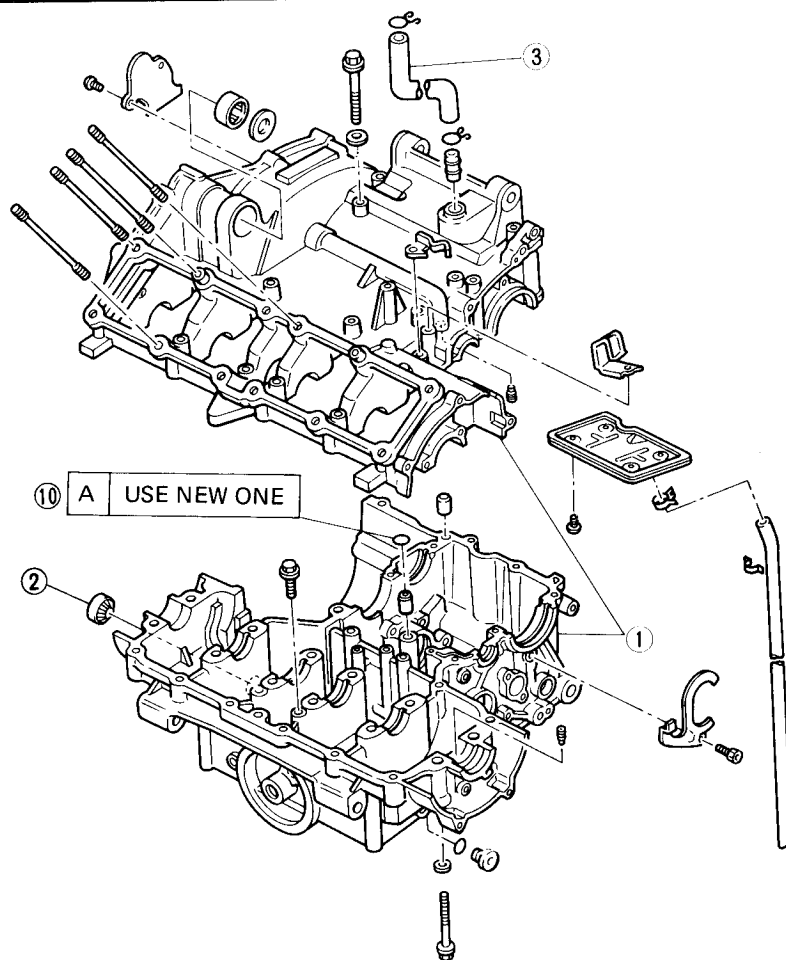


### CRANKCASE

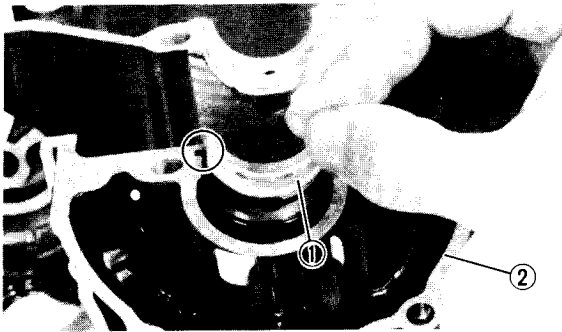
- ① Crankcase assembly
- ② Oil level window
- ③ Crankcase ventilation hose
- ④ 6 mm bolt
- ⑤ 6 mm bolt
- ⑥ 6 mm bolt
- ⑦ 6 mm bolt
- ⑧ 8 mm bolt
- ⑨ 8 mm bolt
- ⑩ O-ring
- ⑪ 8 mm bolt



- ④ ⑤ ⑥ ⑦ ⑧ :  
12 Nm (1.2 m·kg, 8.7 ft·lb)
- ⑨ ⑪ :  
24 Nm (2.4 m·kg, 17 ft·lb)



- ① Main axle
- ② 5th pinion gear
- ③ Circlip
- ④ 3rd pinion gear
- ⑤ 6th pinion gear
- ⑥ 2nd pinion gear
- ⑦ Bearing
- ⑧ Circlip
- ⑨ Drive axle
- ⑩ 2nd wheel gear
- ⑪ 6th wheel gear
- ⑫ 3rd wheel gear
- ⑬ 4th wheel gear
- ⑭ 5th wheel gear
- ⑮ 1st wheel gear
- ⑯ Washer

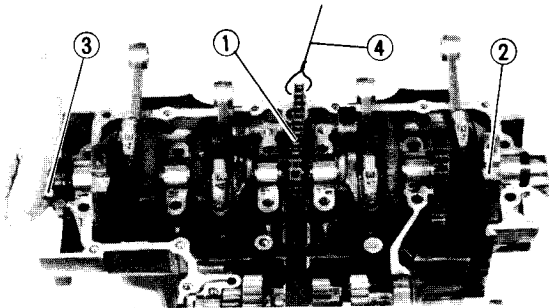


### 4. Install:

- Main journal bearing ①
- To crankcase (Lower) ②

### NOTE:

Apply molybdenum disulfide oil.

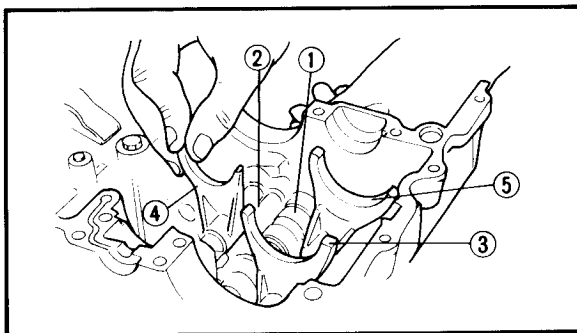


### 5. Install:

- Cam chain ①
- Onto the crankshaft
- Crankshaft assembly ②

### NOTE:

- The stepped crankshaft end ③ should face to the left.
- Pass the cam chain through the cam chain cavity. Be sure to attach a retaining wire ④ to the cam chain.



## TRANSMISSION, SHIFTER AND SHIFT CAM

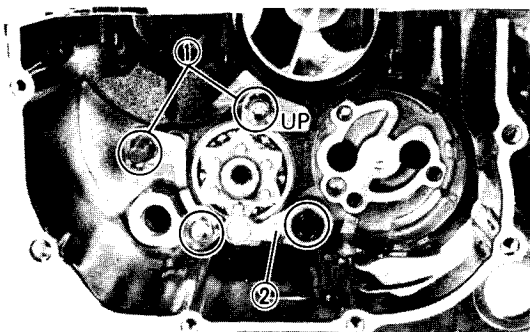
### 1. Install:

- Shift cam assembly ①
- Guide bar ②
- Shift fork #1 ③
- Shift fork #2 ④
- Shift fork #3 ⑤

### NOTE:

All shift fork letters should face to the left side and be in sequence (1, 2, 3) beginning from the left.





## 2. Install:

- Stopper plate (Shift cam) ①
- Stopper lever ②

**Bolts (Stopper Plate):**

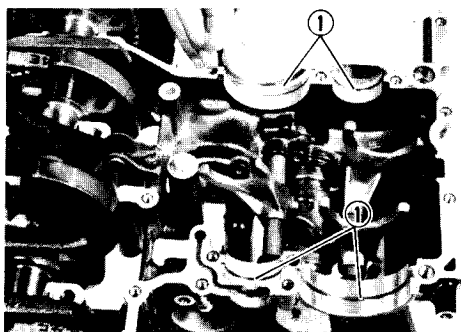
10 Nm (1.0 m·kg, 7.2 ft·lb)

Use LOCTITE®

**Bolt (Stopper Lever):**

10 Nm (1.0 m·kg, 7.2 ft·lb)

Use LOCTITE®

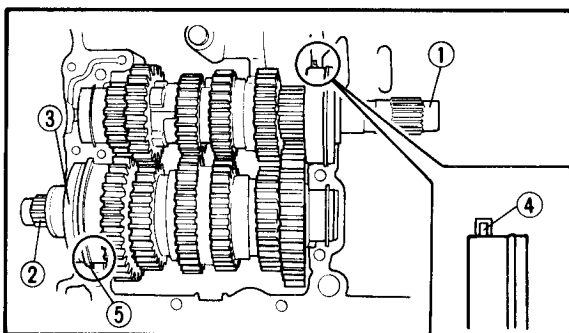


## 3. Install:

- Circlip ①
- To crankcase (Lower)

**NOTE:**

Be sure the circlips ① are inserted into the lower crankcase positioning grooves.

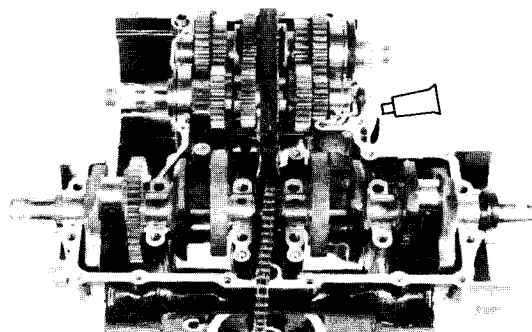


## 4. Install:

- Main axle assembly ①
- Drive axle assembly ②
- Oil seal ③

**NOTE:**

- Be sure the main axle bearing pin ④ should face to front and the drive axle bearing pins ⑤ should face to rear.
- Mesh the shift fork #1 with the 4th wheel gear ① and #2 with the 5th wheel gear ② on the drive axle.
- Mesh the shift fork #2 with the 3rd pinion gear ③ on the main axle.
- Carefully guide the shift forks so that they mesh smoothly with transmission gears.

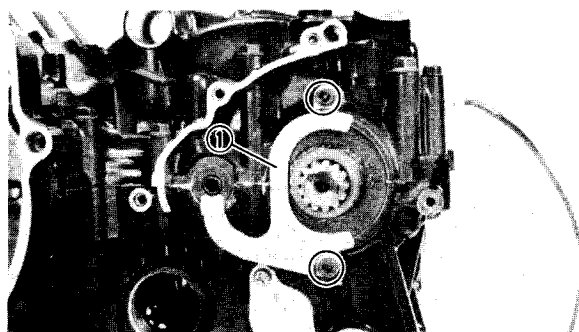
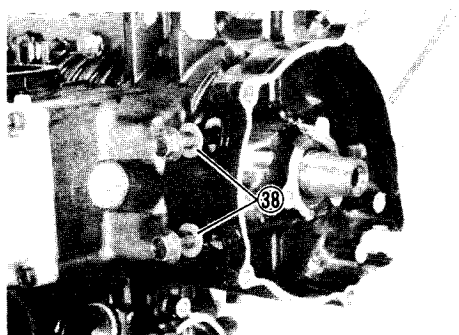
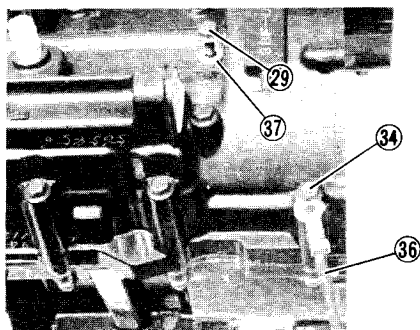
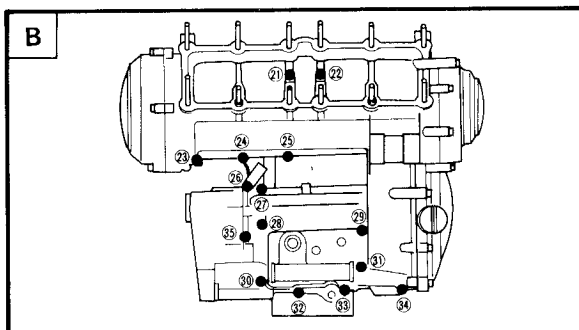
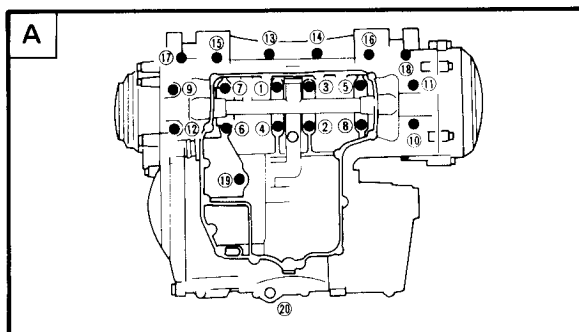
**CRANKCASE ASSEMBLY**

## 1. Apply:

- Quick Gasket®
- To crankcase matching surfaces.

**Quick Gasket®**

P/N ACC-11001-05-01



### ⚠ CAUTION:

Before tightening the crankcase bolts, check the following points:

- Be sure the gear shifts correctly while hand-turning the shift cam.

### 2. Tighten:

- Lower crankcase bolt **A**
- Upper crankcase bolt **B**

(Follow the proper tightening sequence.)



8 mm Bolt ① ~ ⑫ ③④ :  
24 Nm (2.4 m·kg, 17 ft·lb)  
6 mm Bolt ⑬ ~ ⑲ ③① ~ ③⑤ :  
12 Nm (1.2 m·kg, 8.7 ft·lb)

### NOTE:

- Install the ground lead ③⑥ on bolt No. ③④ .
- Install the copper washer ③⑦ on bolt No. ②⑨ .

### NOTE:

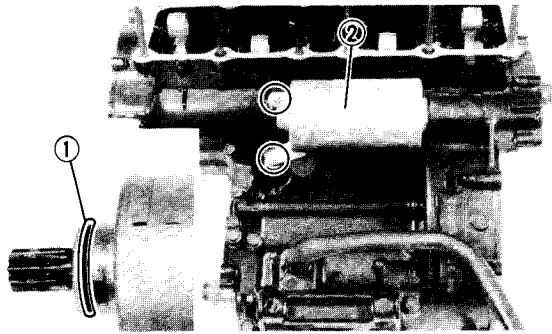
- Install the washer ③⑧ on bolt No. ⑨ , ⑩ , ⑪ , ⑫ .

### 3. Install:

- Oil seal stopper ①



Bolts (Oil Seal Stopper):  
10 Nm (1.0 m·kg, 7.2 ft·lb)

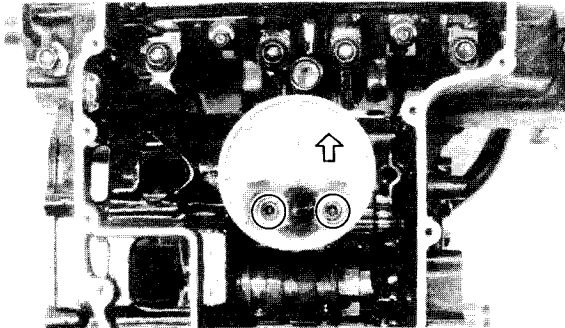


### STARTER MOTOR

1. Check:
  - O-ring (Starter motor) ①
  - Damage → Replace.
2. Install:
  - Starter motor ②



**Bolt (Starter Motor):**  
10 Nm (1.0 m·kg, 7.2 ft·lb)

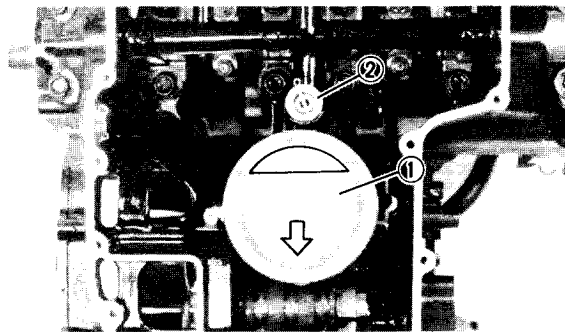


### OIL PAN AND OIL STRAINER

1. Install:
  - Oil strainer assembly



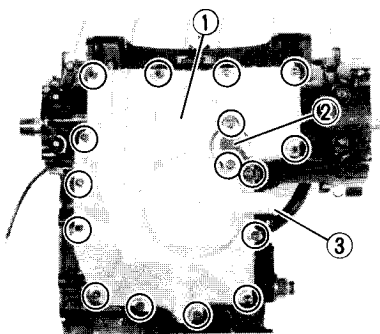
**Bolts (Oil Strainer Assembly):**  
10 Nm (1.0 m·kg, 7.2 ft·lb)



2. Install:
  - Oil strainer cover ①
  - Relief valve ②

### NOTE:

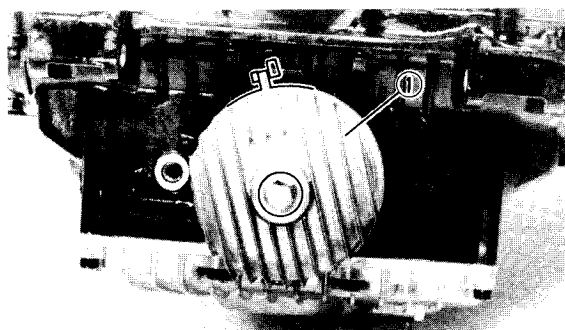
The element (window) must be installed vertically against housing arrow mark.



3. Install:
  - Dowel pins
  - Gasket (New)
  - Oil pan ①
  - Oil level switch ②
  - Drain plug ③



**Bolts (Oil Pan):**  
10 Nm (1.0 m·kg, 7.2 ft·lb)

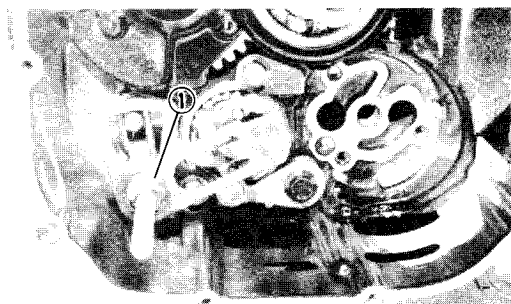


4. Install:
  - Oil filter
  - Oil filter cover ①



**Bolt (Oil Filter Cover):**  
15 Nm (1.5 m·kg, 11 ft·lb)

Refer to the "ENGINE OIL FILTER REPLACEMENT" section in the CHAPTER 3.

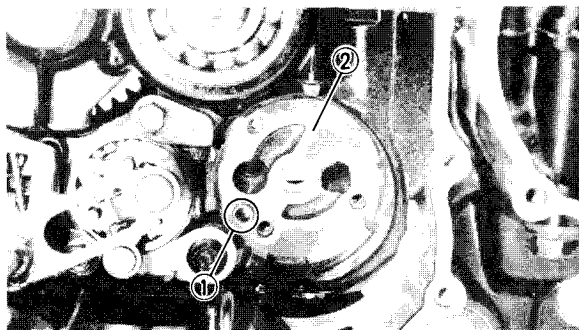
**OIL PUMP AND SHIFT SHAFT**

## 1. Install:

- Shift shaft

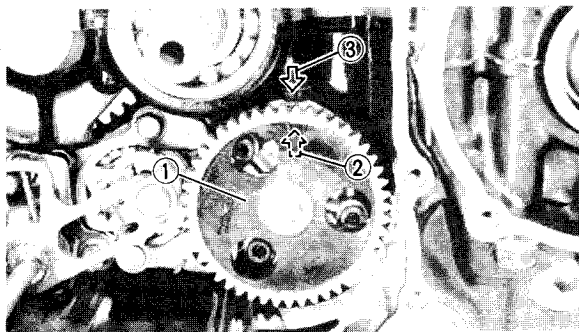
**NOTE:**

Insert the stopper between spring ends.



## 2. Install:

- Dowel pin ①
- Gasket (New) ②



## 3. Install:

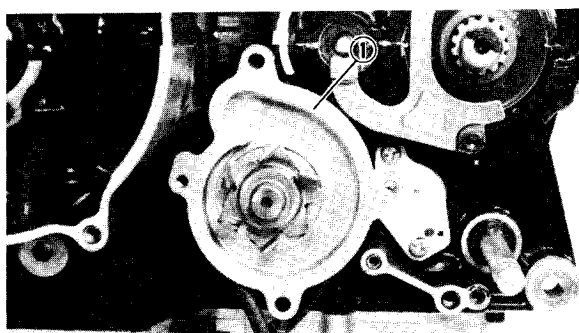
- Oil pump assembly ①



**Oil Pump Mounting Bolts:**  
10 Nm (1.0 m·kg, 7.2 ft·lb)  
Use LOCTITE®

**NOTE:**

Align the oil pump arrow mark ② with crankcase arrow mark ③.

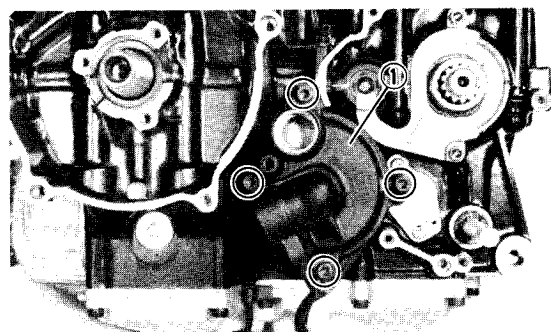
**WATER PUMP**

## 1. Install:

- Water pump housing ①



**Bolts (Water Pump Housing):**  
10 Nm (1.0 m·kg, 7.2 ft·lb)



## 2. Install:

- O-ring
- Water pump cover ①

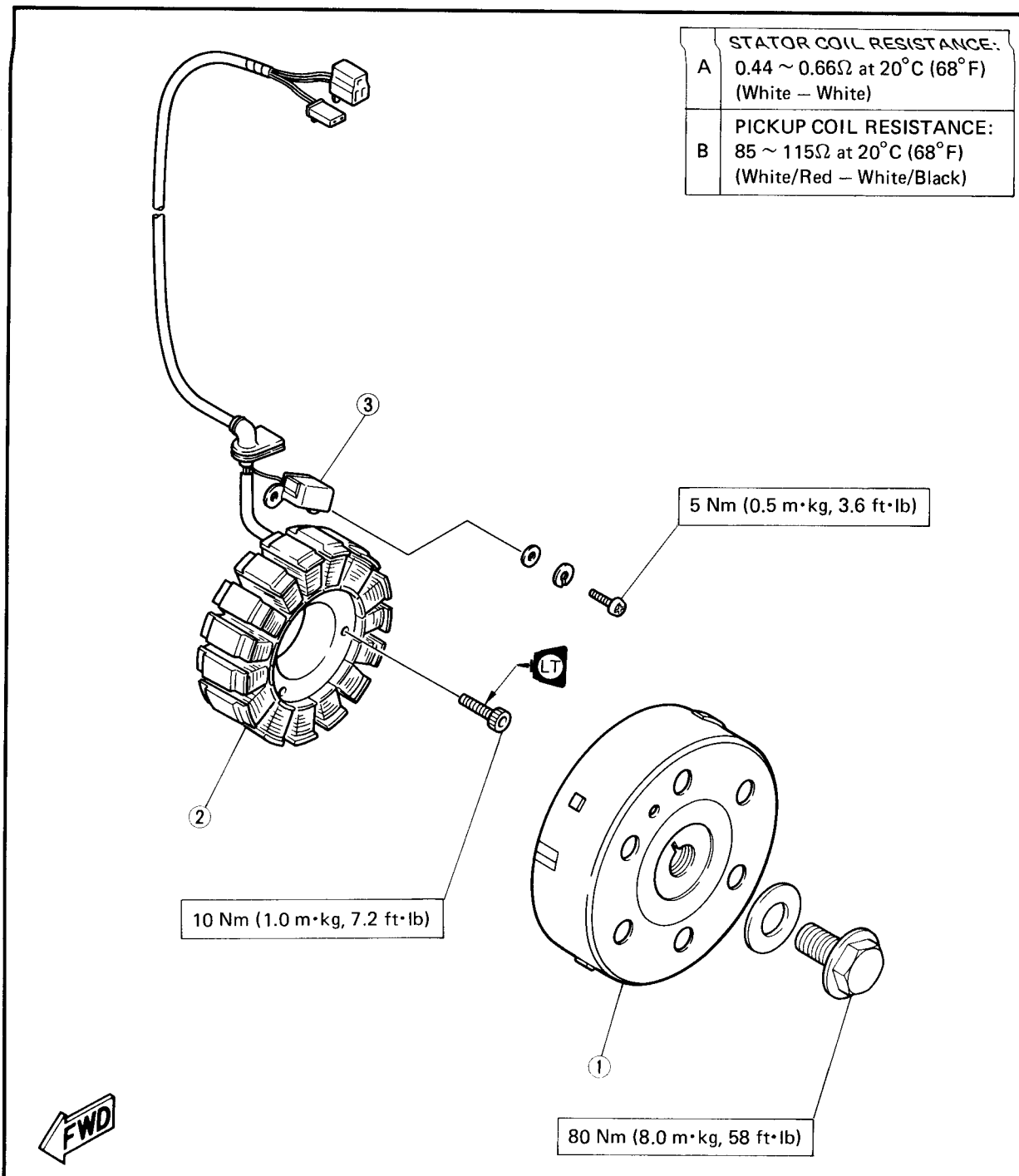


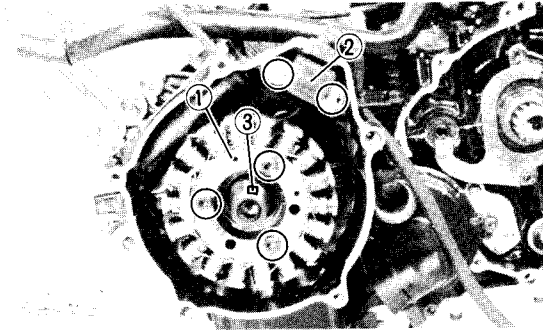
**Bolts (Water Pump Cover):**  
10 Nm (1.0 m·kg, 7.2 ft·lb)



## A.C. MAGNETO

- ① Magneto
- ② Stator coil assembly
- ③ Pickup coil





### A.C. MAGNETO

#### 1. Install:

- Stator coil assembly ①
- Pickup coil ②
- Woodruff key ③

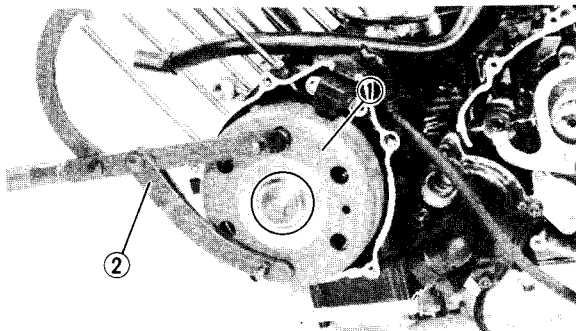


**Bolts (Stator Coil Assembly):**  
10 Nm (1.0 m·kg, 7.2 ft·lb)  
Use LOCTITE®

**Screws (Pickup Coil):**  
5 Nm (0.5 m·kg, 3.6 ft·lb)

#### NOTE:

- Clean the tapered portions of the crankshaft and magneto.
- When installing the magneto, make sure the woodruff key is properly seated in the key way of the crankshaft.



#### 2. Install:

- Magneto ①
- Bolt (Magneto)

#### 3. Attach:

- Universal Rotor Holder ②

#### NOTE:

Hold the magneto to tighten the nut by the Universal Rotor Holder ②.



**Universal Rotor Holder:**  
P/N YU-01235

#### 4. Tighten:

- Bolt (Magneto)



**Bolt (Magneto):**  
80 Nm (8.0 m·kg, 58 ft·lb)



### CLUTCH

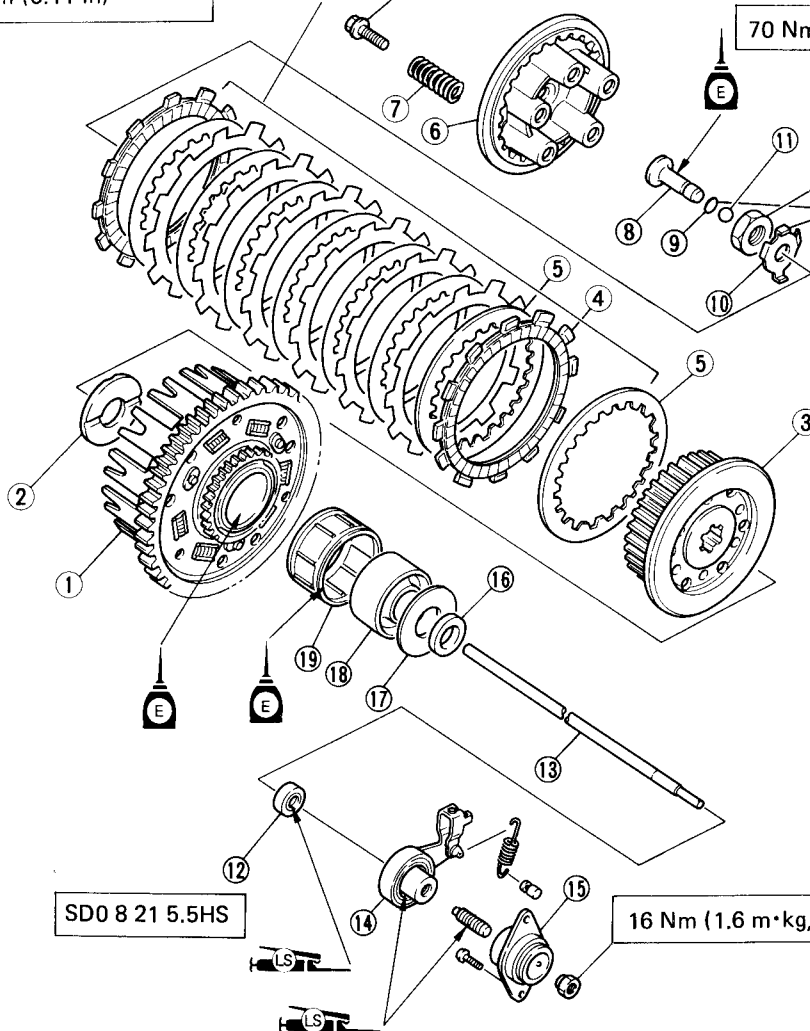
- |                       |                       |                 |
|-----------------------|-----------------------|-----------------|
| ① Primary driven gear | ⑨ O-ring              | ⑰ Thrust washer |
| ② Thrust washer       | ⑩ Lock washer         | ⑱ Spacer        |
| ③ Clutch boss         | ⑪ Bolt                | ⑲ Bearing       |
| ④ Friction plate      | ⑫ Oil seal            |                 |
| ⑤ Clutch plate        | ⑬ Push rod #2         |                 |
| ⑥ Pressure plate      | ⑭ Push lever assembly |                 |
| ⑦ Clutch spring       | ⑮ Bolt screw housing  |                 |
| ⑧ Push rod #1         | ⑯ Collar              |                 |

A	SPRING FREE LENGTH LIMIT: 29.0 mm (1.142 in)
B	CLUTCH PLATE WARP LIMIT: 0.1 mm (0.004 in)
C	FRICTION PLATE WEAR LIMIT: 2.8 mm (0.11 in)

6 Nm (0.6 m•kg, 4.3 ft•lb)

70 Nm (7.0 m•kg, 50 ft•lb)

D USE NEW ONE





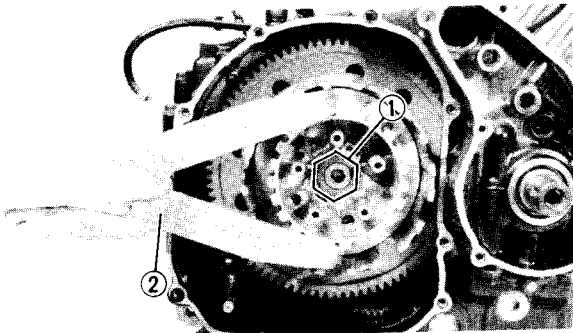
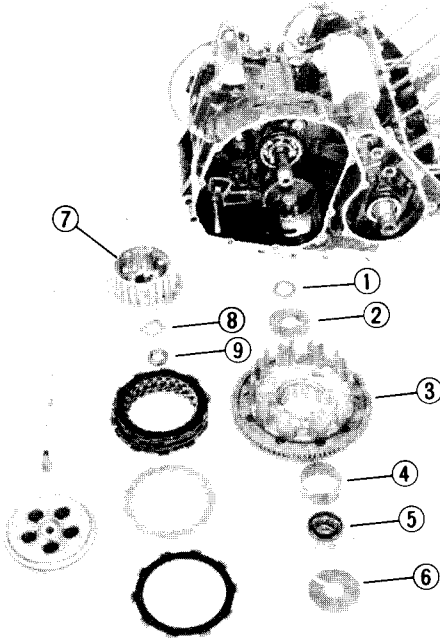
### CLUTCH

#### 1. Install:

- Collar ①
- Thrust washer ②
- Clutch housing ③
- Bearing ④
- Spacer ⑤
- Thrust washer ⑥
- Clutch boss ⑦
- Lock washer (New) ⑧
- Nut (Clutch boss) ⑨

#### NOTE:

Install the bearing ④ and spacer ⑤ after installation of the clutch housing ③.



#### 2. Tighten:

- Nut (Clutch boss) ①
- Use the Universal Clutch Holder ②.

#### NOTE:

Hold the clutch boss to tighten the nut by Universal Clutch Holder ②.



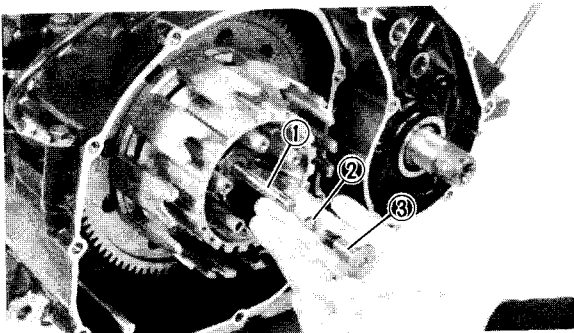
**Universal Clutch Holder:**  
P/N YM-91042



**Nut (Clutch Boss):**  
70 Nm (7.0 m·kg, 50 ft·lb)

#### NOTE:

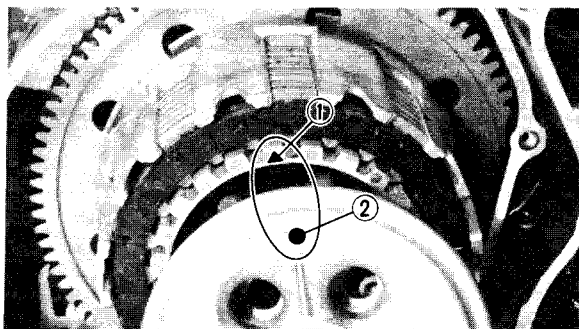
Bend the lock washer tab along the nut flat.



#### 3. Install:

- Push rod # 2 ①
- Boll ②
- Push rod # 1 ③
- Friction plates
- Clutch plates



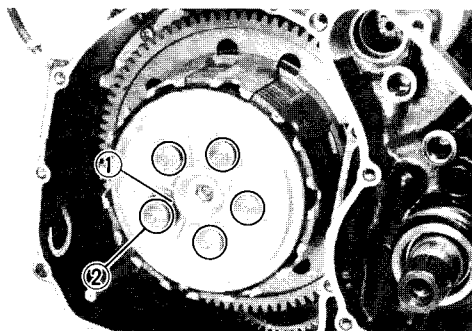


## 4. Install:

- Pressure plate

**NOTE:**

Be sure the match mark ① on the clutch boss is aligned with the match mark ② on the pressure plate.

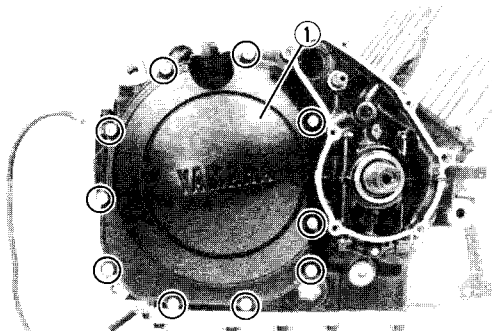


## 5. Install:

- Clutch springs ①
- Bolts (Clutch spring) ②



**Bolts (Clutch Spring):**  
6 Nm (0.6 m·kg, 4.3 ft·lb)

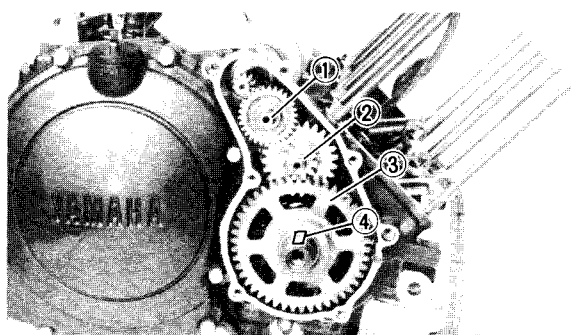


## 6. Install:

- Dowel pins
- Gasket (Crankcase cover)
- Crankcase cover (Right) ①

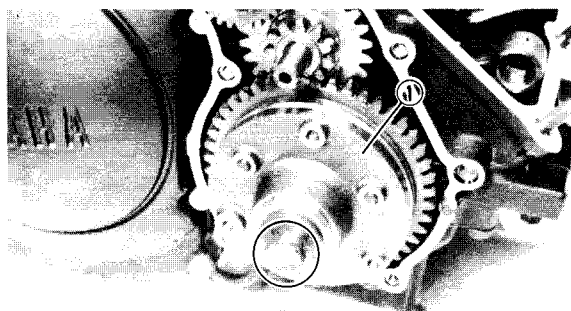


**Bolts (Crankcase Cover):**  
10 Nm (1.0 m·kg, 7.2 ft·lb)

**STARTER CLUTCH**

## 1. Install:

- Idle gear ①
- Idle gear ②
- Starter clutch gear ③
- Woodruff key ④



## 2. Install:

- Starter clutch ①
- Washer
- Bolt (Starter clutch)

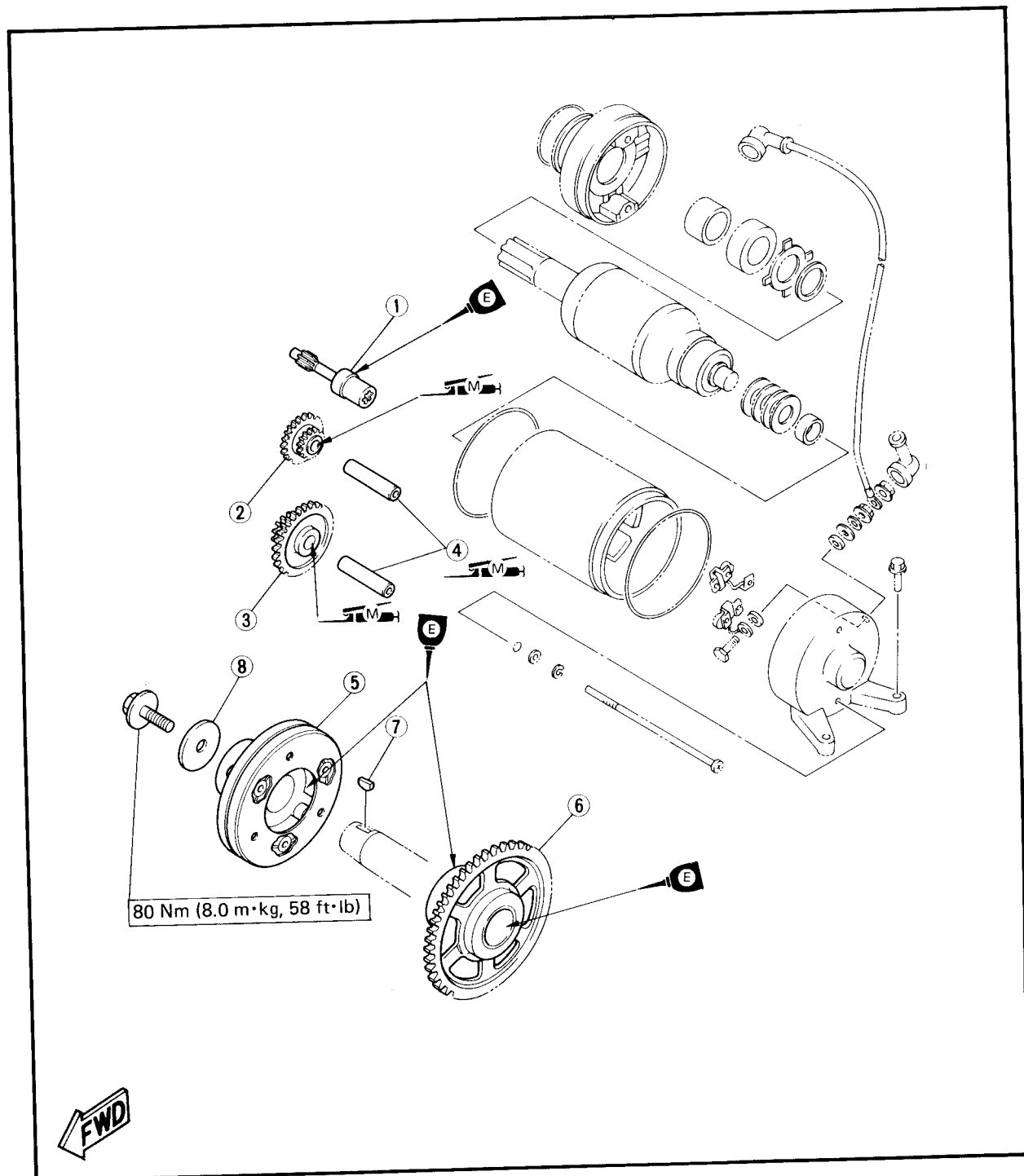


**Bolt (Starter Clutch):**  
80 Nm (8.0 m·kg, 58 ft·lb)



### STARTER CLUTCH

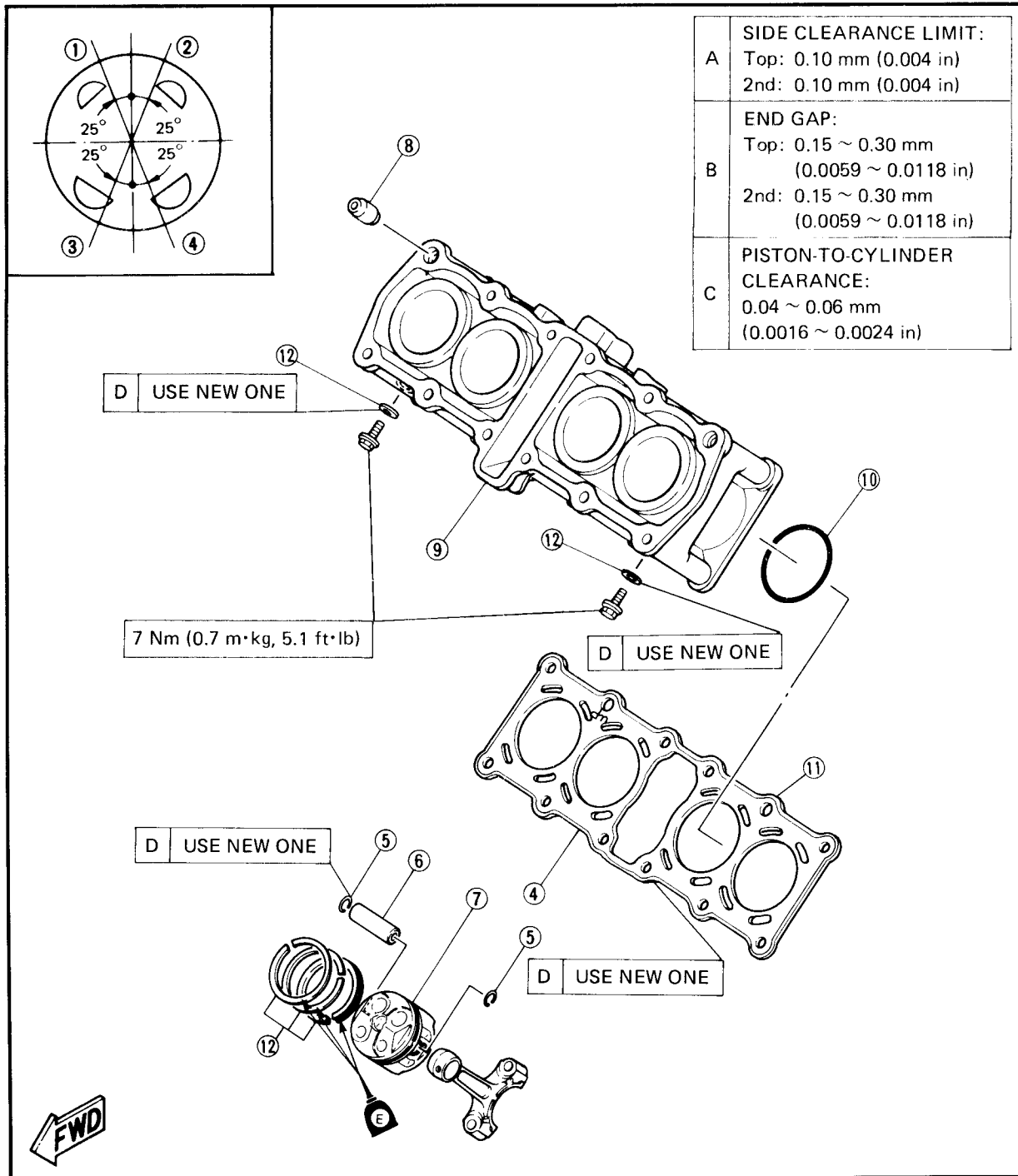
- |                           |                       |
|---------------------------|-----------------------|
| ① Starter drive gear      | ⑥ Starter clutch gear |
| ② Idle gear               | ⑦ Woodruff key        |
| ③ Idle gear               | ⑧ Washer              |
| ④ Shaft                   |                       |
| ⑤ Starter clutch assembly |                       |

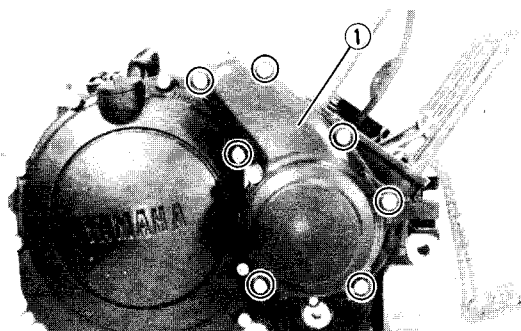




### PISTON AND CYLINDER

- |                    |                     |
|--------------------|---------------------|
| ① Top ring         | ⑧ Dowel pin         |
| ② Oil ring (Lower) | ⑨ Cylinder          |
| ③ Oil ring (Upper) | ⑩ O-ring            |
| ④ Second ring      | ⑪ Gasket (Cylinder) |
| ⑤ Circlip          | ⑫ Piston ring       |
| ⑥ Piston pin       |                     |
| ⑦ Piston           |                     |



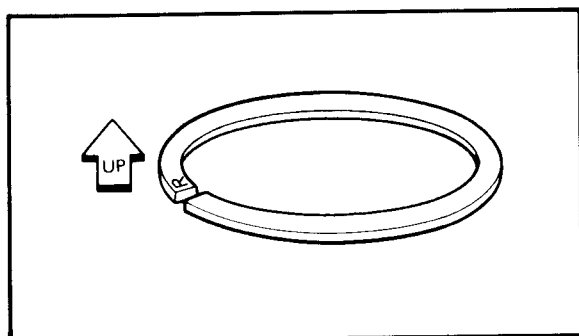


### 3. Install:

- Dowel pins
- Gasket (Stater clutch cover) (New)
- Stater clutch cover ①



**Bolts (Stater Clutch Cover):**  
10 Nm (1.0 m·kg, 7.2 ft·lb)



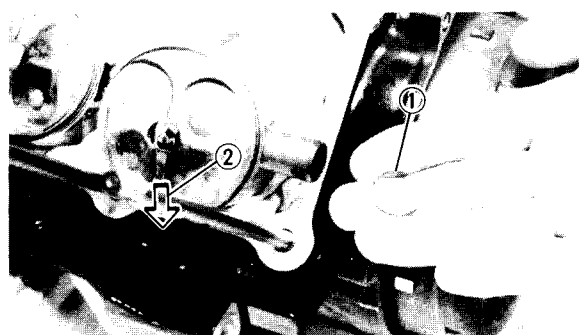
## PISTON AND CYLINDER

### 1. Install:

- Piston rings

### NOTE:

Be sure to install rings so that Manufacturer's marks or numbers are located on the top side of the rings. Oil the pistons and rings liberally.

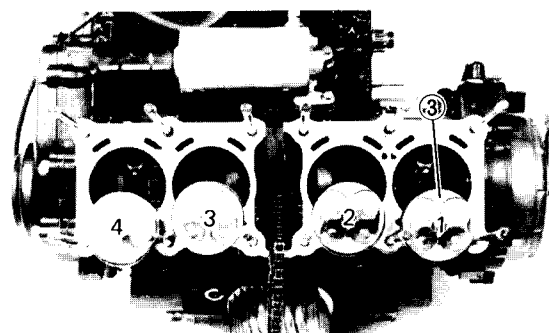


### 2. Install:

- Piston pins
- Pistons
- Circlips (Piston pin) ①

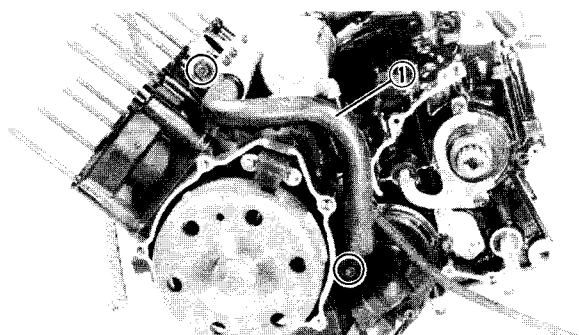
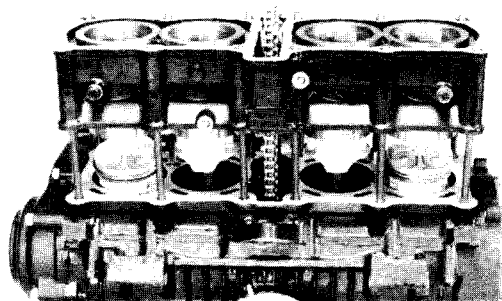
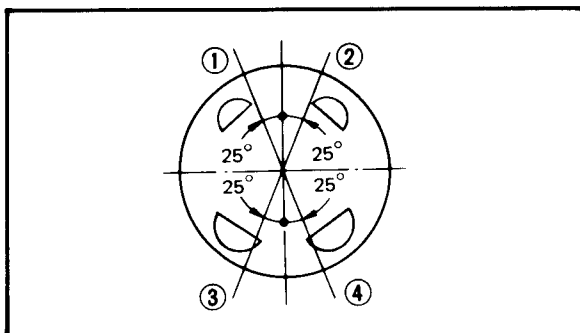
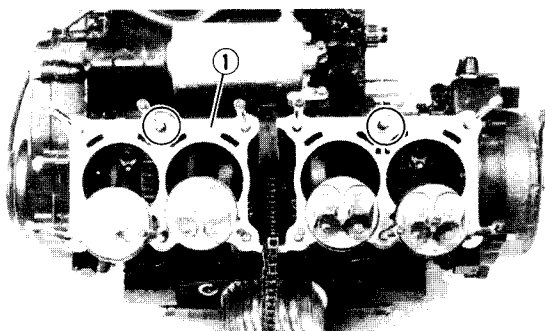
### NOTE:

- Be sure the piston arrow mark ② face to exhaust side of the engine.
- Before installing the piston pin circlip, cover the crankcase with a clean rag to prevent the circlip from falling into the crankcase cavity.
- Be sure the marked piston numbers ③ should be in sequence (1, 2, 3, 4) beginning from the left.



### WARNING:

Always use new circlips (Piston pin).



3. Install:

- Gasket (Cylinder) ①
- Dowel pins

4. Lubricate:

- Pistons
- Piston rings
- Cylinder

**NOTE:**

Apply a liberal coating of 4-stroke engine oil.

5. Position:

Offset the piston ring end gaps.

- Top ring end ①
- Oil ring end (Lower) ②
- Oil ring end (Upper) ③
- 2nd ring end ④

6. Install:

- Cylinder

**NOTE:**

- Install pistons #2 and #3 first.
- Pass the cam chain and cam chain guide (Exhaust side) through the cam chain cavity.

7. Install:

- O-ring
- Water pipe ①



**Bolts (Water Pipe):**  
10 Nm (1.0 m·kg, 7.2 ft·lb)

8. Turn:

- Crankshaft  
Counterclockwise.

9. Align:

- "T" mark
- Stationary pointer  
Refer to "ENGINE DISASSEMBLY - CYLINDER HEAD AND CAMSHAFT".

**NOTE:**

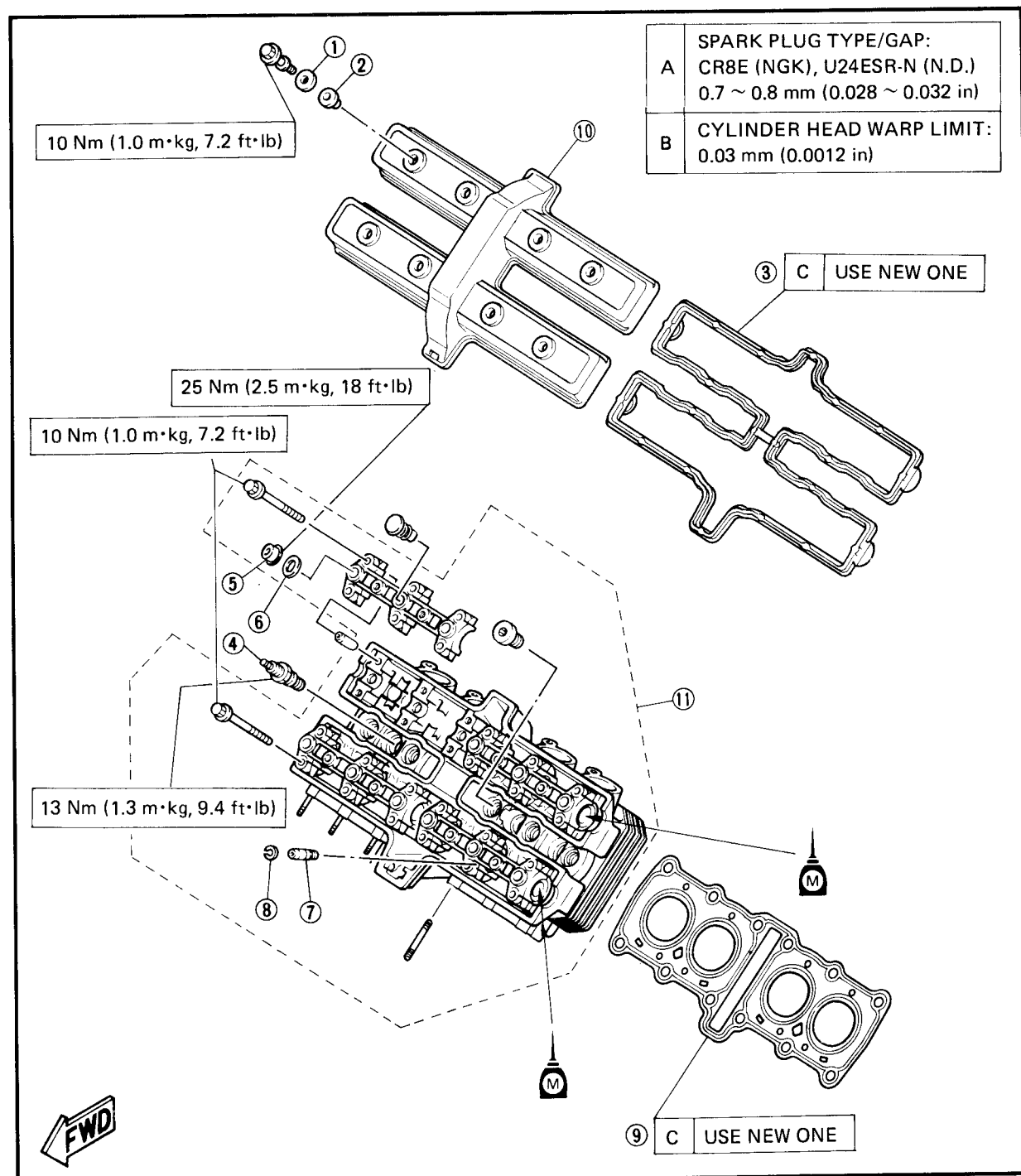
When # 1 piston is at TDC.



### CYLINDER HEAD AND CAMSHAFT

#### Cylinder Head

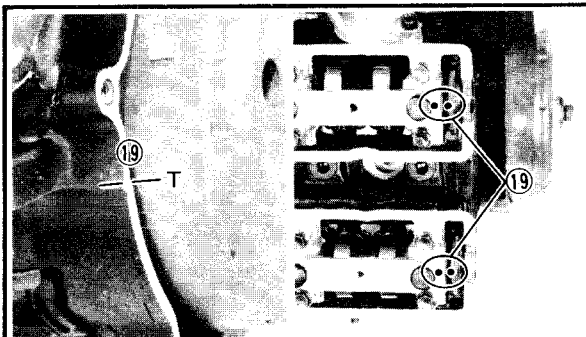
- |                                |                          |
|--------------------------------|--------------------------|
| ① Washer                       | ⑦ Valve guide            |
| ② Rubber washer                | ⑧ Circlip                |
| ③ Gasket (Cylinder head cover) | ⑨ Gasket (Cylinder head) |
| ④ Spark plug                   | ⑩ Cylinder head cover    |
| ⑤ Nut                          | ⑪ Cylinder head assembly |
| ⑥ Washer                       |                          |



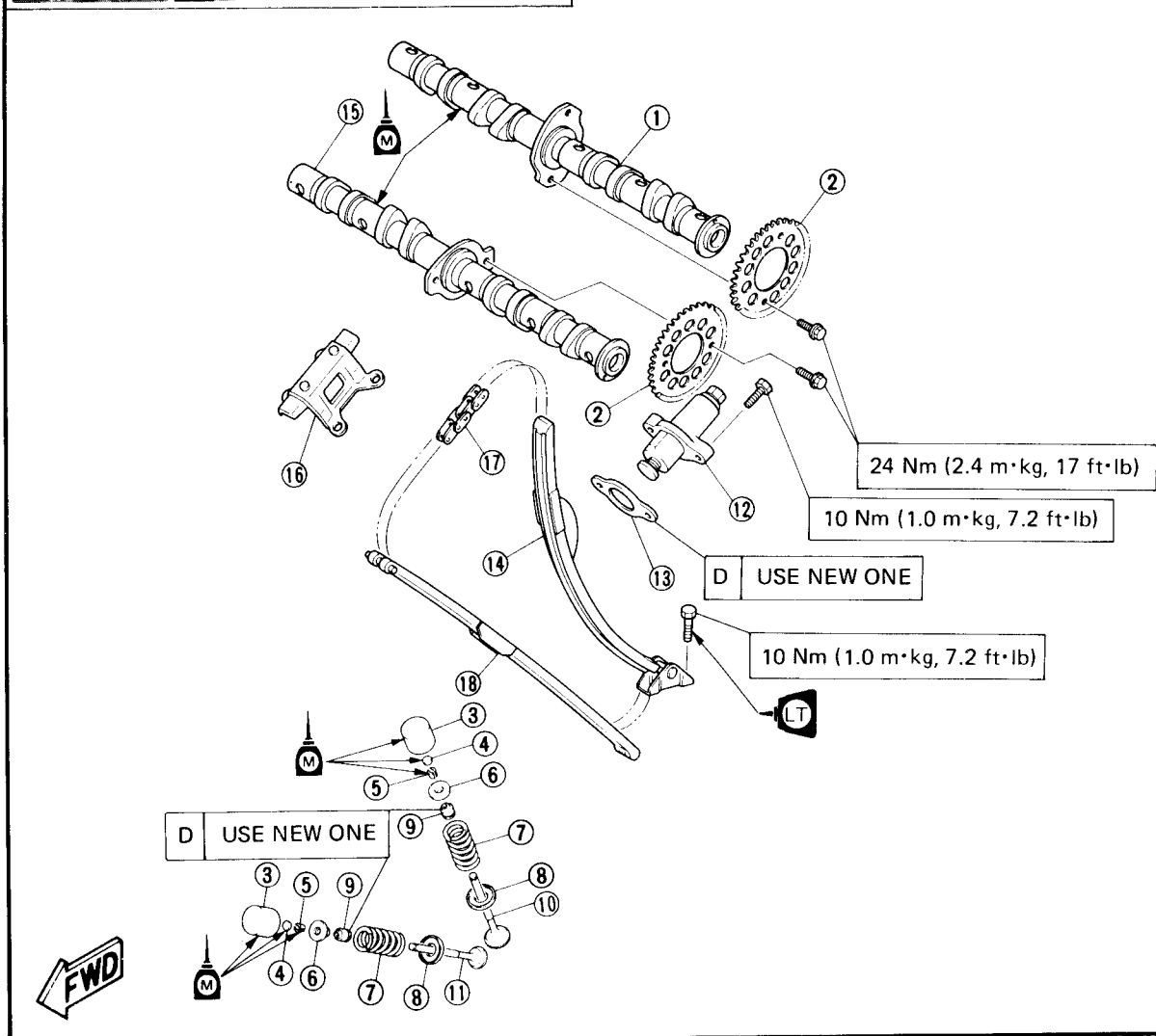


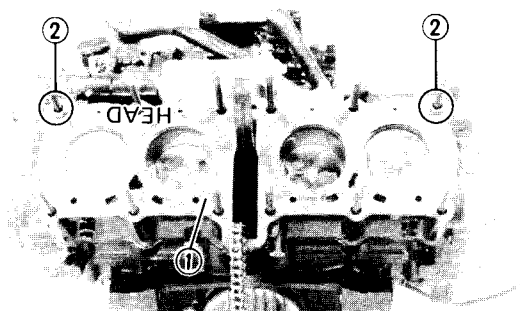
## Camshaft

- |                      |                                 |                                  |
|----------------------|---------------------------------|----------------------------------|
| ① Camshaft (Intake)  | ⑧ Spring seat                   | ⑮ Camshaft (Exhaust)             |
| ② Cam chain sprocket | ⑨ Oil seal                      | ⑯ Chain guide (Upper)            |
| ③ Valve lifter       | ⑩ Intake valve                  | ⑰ Cam chain                      |
| ④ Valve pad          | ⑪ Exhaust valve                 | ⑱ Cam chain guide (Exhaust side) |
| ⑤ Valve retainer     | ⑫ Cam chain tensioner           | ⑲ Match mark                     |
| ⑥ Spring seat        | ⑬ Gasket (Cam chain tensioner)  |                                  |
| ⑦ Valve spring       | ⑭ Cam chain guide (Intake side) |                                  |



A	VALVE CLEARANCE (COLD):
B	INTAKE: 0.11 ~ 0.20 mm (0.004 ~ 0.008 in)
C	EXHAUST: 0.21 ~ 0.30 mm (0.008 ~ 0.012 in)



**CYLINDER HEAD AND CAMSHAFT****1. Install:**

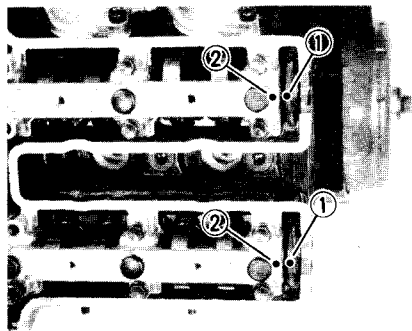
- Gasket (Cylinder head) (New) ①
- Dowel pins ②

**NOTE:**

The gasket "HEAD" mark should face upward.

**NOTE:**

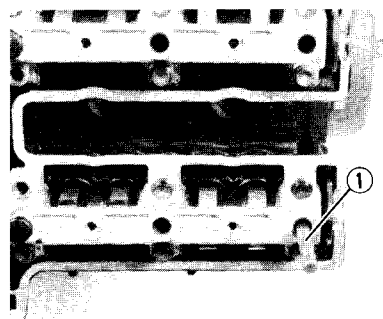
- Select either of the two procedures explained in this manual, as follows:
- Procedure 1.  
The cam chain is disconnected → Connect.
- Procedure 2.  
The camshafts are removed → Install.

**Procedure 1****1. Install:**

- Camshafts, and cylinder head assembly

**NOTE:**

- Be sure the camshaft timing marks ① align with the camshaft cap marks ②.
- Be sure the "T" mark on the magneto align the stationary pointer when #1 piston is at TDC.

**2. Tighten:**

- Nuts (Cylinder head)  
Use the Hexagon Wrench 6 mm (0.24 in) ①.

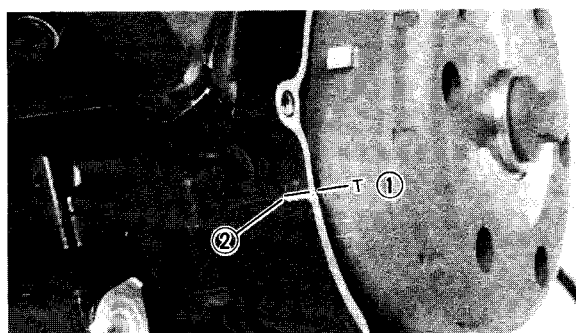
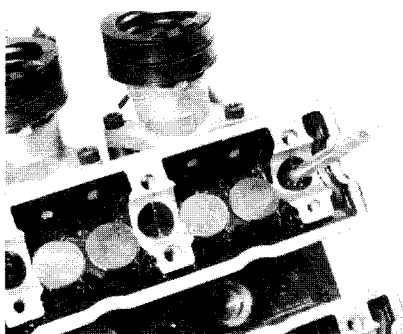
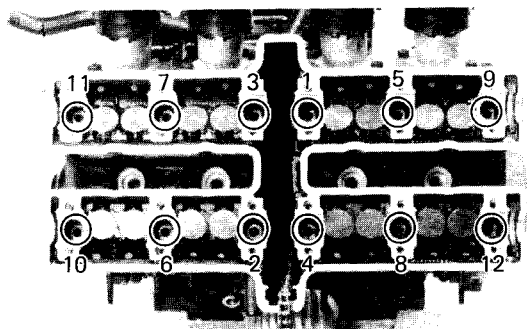
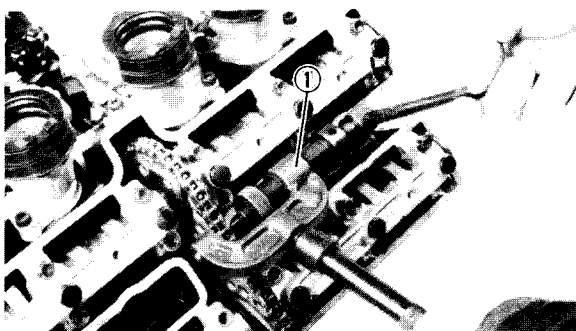
**NOTE:**

Tighten the nuts in their proper tightening sequence and torque nuts in two stages.



**Nuts (Cylinder Head):**  
25 Nm (2.5 m·kg, 18 ft·lb)





## 4. Connect:

- Cam chain

With the chain joint (New).

Use the Cam Chain Cutter (1).



**Cam Chain Cutter:**  
P/N YM-01112

**NOTE:**

Keep the cam chain as tense as possible on the exhaust side.

## 5. Go to "CAM CHAIN TENSIONER".

**Procedure 2.**

## 1. Install:

- Camshaft case and cylinder head assembly

## 2. Tighten:

- Nuts (Cylinder head)

Use the Hexagon Wrench 6 mm (0.24 in).

**NOTE:**

Tighten the nuts in their proper tightening sequence and torque nuts in two stages.



**Nuts (Cylinder Head):**  
25 Nm (2.5 m·kg, 18 ft·lb)

## 3. Install:

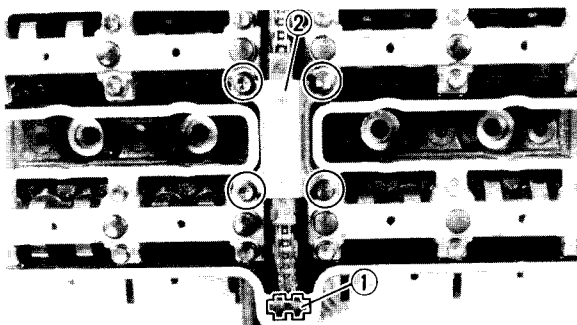
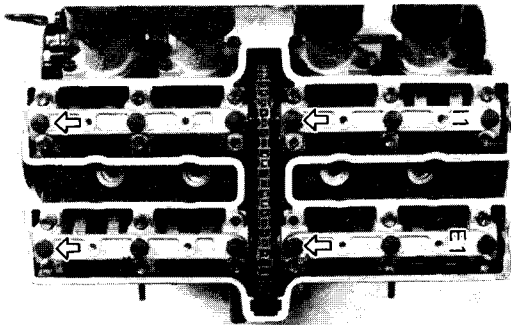
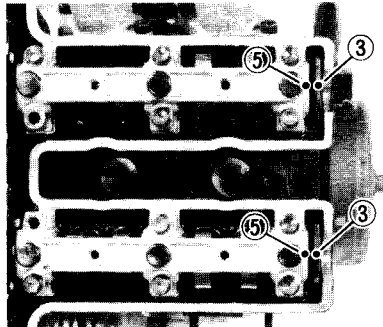
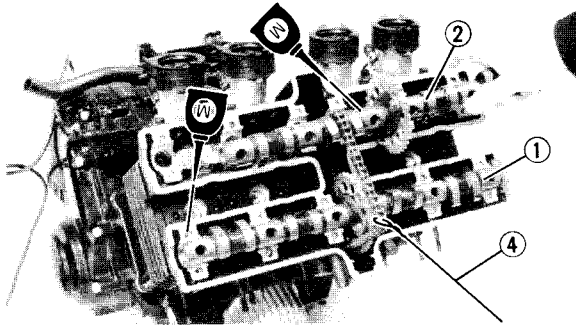
- Camshafts

**Camshaft installation steps:**

- Turn the crankshaft counterclockwise.
- Align the "T" mark (1) on the magneto with the crankcase end (2) when #1 piston is at TDC.

**CAUTION:**

Do not turn the crankshaft during the camshafts installation. Damage or improper valve timing will result.



- Lubricate the camshaft bearing surfaces, cam lobes and cam journals.



#### Molybdeum Disulfide Oil

- Install the exhaust camshaft ① first, then install the intake camshaft ②.
- Be sure the timing marks ③ on the camshaft face upward.
- Keep the cam chain as tense as possible on the exhaust side.
- Remove the retaining wire ④.

#### ⚠ CAUTION:

Do not turn the camshaft separately or damage to the piston and valve will result.

- Install the dowel pins.
- Install the camshaft caps.
- Align the camshaft timing marks ③ with the camshaft cap marks ⑤.

#### NOTE:

- The numbers are punched on the camshaft caps in increments from right to left.
- Do not install the bolts at \* marked place in this stage.
- Tighten the bolts (Camshaft caps).

#### NOTE:

Tighten the camshaft caps in a crisscross pattern from innermost to outer caps.

#### ⚠ CAUTION:

The cam caps must be tightened evenly or damage to the cylinder head, camshaft caps and cam will result.



**Bolts (Camshaft Cap):**  
10 Nm (1.0 m·kg, 7.2 ft·lb)

#### 4. Install:

- Cam chain guide (Exhaust side) ①
- Cam chain guide (Upper) ②



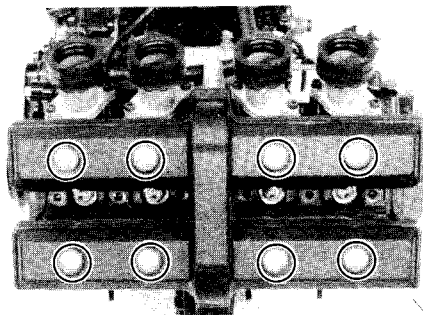
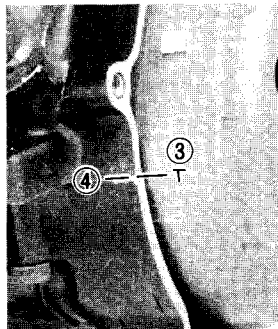
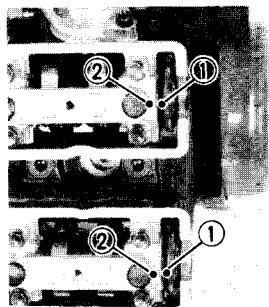
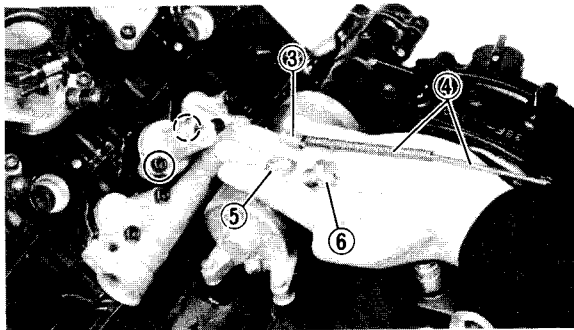
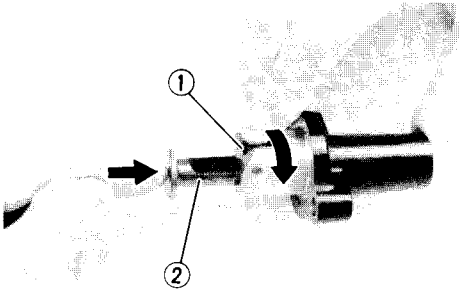
### CAM CHAIN TENSIONER

#### 1. Position:

- Cam chain
- Exhaust side → Tense.
- Intake side → Slack.

#### 2. Install:

- Cam chain tensioner



#### Cam chain tensioner installation steps:

- Remove the tensioner end cap bolt and spring.
- Release the cam chain tensioner one-way cam ① and push the tension rod ②.
- Install the tensioner with a new gasket into the cylinder.



**Bolts (Cam Chain Tensioner):**  
10 Nm (1.0 m·kg, 7.2 ft·lb)

- Install the collar ③, springs ④, washer ⑤ and end cap bolt ⑥.



**End Cap Bolt (Cam Chain Tensioner):**  
20 Nm (2.0 m·kg, 14 ft·lb)

#### 3. Turn:

- Crankshaft
- Counterclockwise for a several turns.

#### 4. Inspect:

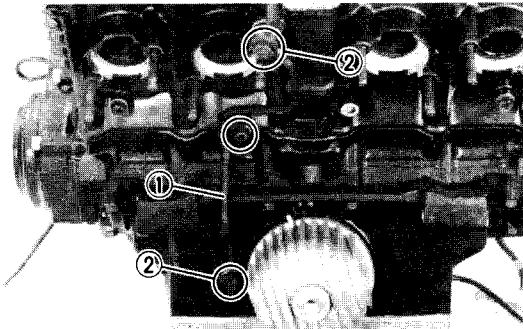
- Camshaft timing marks ①
- Align with the camshaft cap marks ②.
- Crankshaft "T" mark ③
- Align with the crankcase end ④.
- Out of alignment → Adjust.
- Refer to "CAMSHAFT INSTALLATION STEPS".

#### 5. Install:

- Gasket (Cylinder head cover)
- Cylinder head cover



**Bolts (Cylinder Head Cover):**  
10 Nm (1.0 m·kg, 7.2 ft·lb)

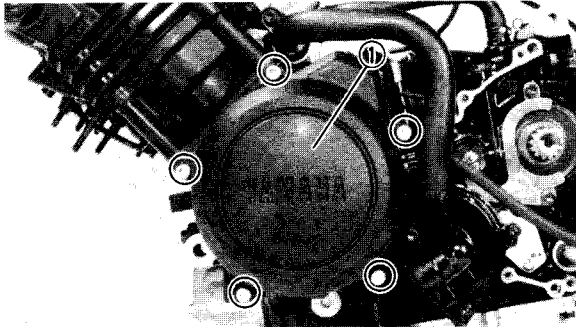


### 6. Install:

- Washers (New)
- Oil delivery pipe ①
- Union bolts ②



**Union Bolts (Oil Delivery Pipe):**  
20 Nm (2.0 m·kg, 14 ft·lb)

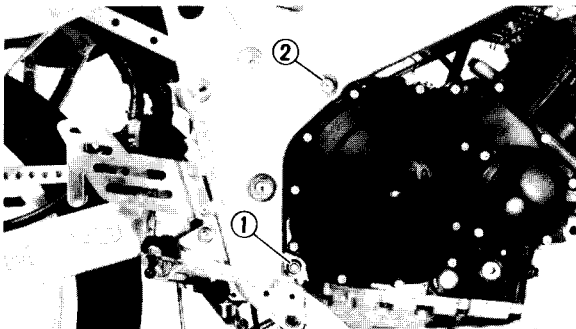


### 7. Install:

- Dowel pins
- Generator cover ①



**Bolts (Generator Cover):**  
10 Nm (1.0 m·kg, 7.2 ft·lb)



## REMounting ENGINE

When remounting the engine, reverse the removal procedure. Note the following points.

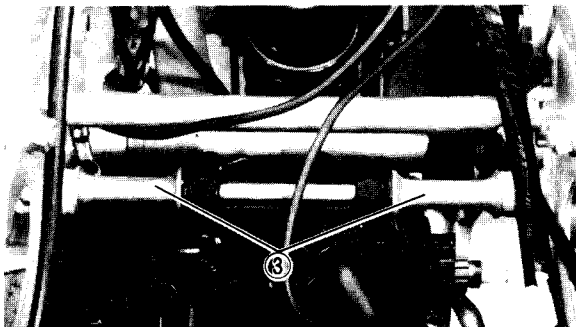
### 1. Install:

- Engine assembly
- Bolt (Engine mount – Rear Lower) ①
- Bolt (Engine mount – Rear Upper) ②



**Bolt (Engine Mount – Rear Lower):**  
45 Nm (4.5 m·kg, 32 ft·lb)

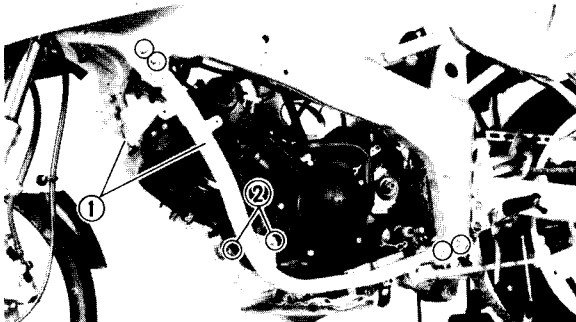
**Bolt (Engine Mount – Rear Upper):**  
55 Nm (5.5 m·kg, 40 ft·lb)



### ③ Collars

### 2. Install:

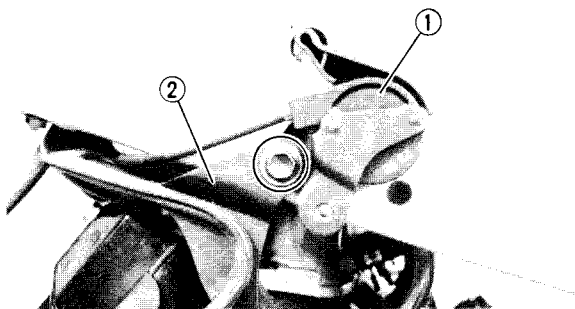
- Down tube frames (Left and right) ①
- Bolt (Engine – Mount) ②



**Bolts (Down Tube Frame – Lower):**  
33 Nm (3.3 m·kg, 24 ft·lb)

**Bolts (Down Tube Frame – Upper):**  
60 Nm (6.0 m·kg, 43 ft·lb)  
Use LOCTITE®

**Bolt (Engine Mount):**  
55 Nm (5.5 m·kg, 40 ft·lb)

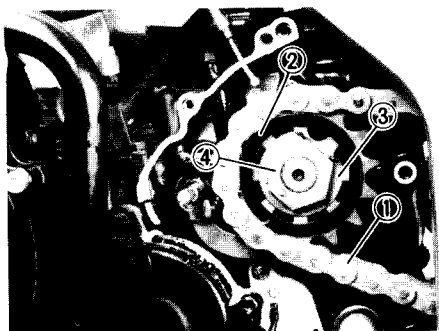


### 3. Install:

- Starter lever ①
- Cover ②



**Bolt (Starter Lever):**  
8 Nm (0.8 m·kg, 5.8 ft·lb)



### 4. Install:

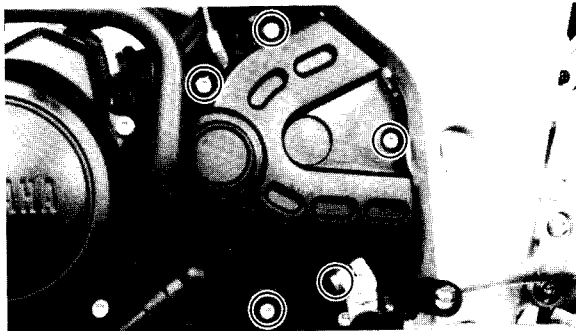
- Drive chain ①
- Drive sprocket ②
- Lock washer (New) ③
- Nut (Drive sprocket) ④



**Nut (Drive Sprocket):**  
70 Nm (7.0 m·kg, 50 ft·lb)

### NOTE:

Adjust the drive chain slack if necessary.



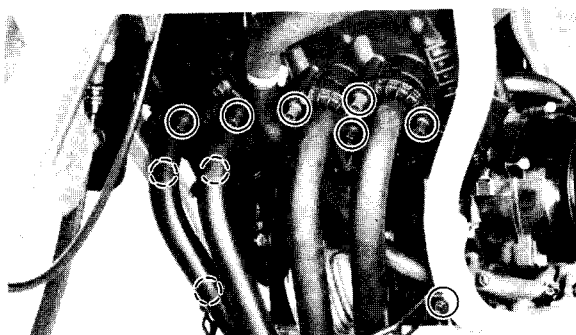
### 5. Install:

- Cover (Crankcase Left)
- Shift arm



**Bolts (Crankcase Cover):**  
10 Nm (1.0 m·kg, 7.2 ft·lb)  
Use LOCTITE®

**Bolt (Shift Arm):**  
10 Nm (1.0 m·kg, 7.2 ft·lb)



### 6. Install:

- Muffler assembly

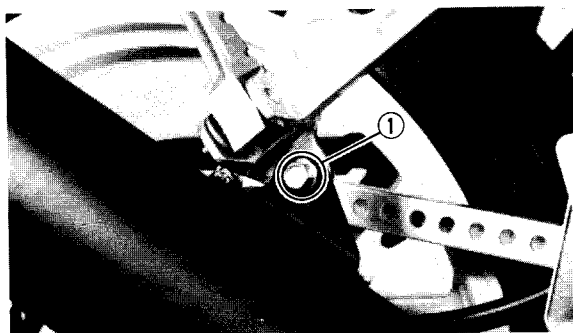
### 7. Tighten:

- Flange nuts (Exhaust pipe)



**Flange Nuts (Exhaust Pipe):**  
10 Nm (1.0 m·kg, 7.2 ft·lb)

**Bolts (Cowling Stay):**  
10 Nm (1.0 m·kg, 7.2 ft·lb)



### 8. Tighten:

- Bolt (Muffler bracket) ①
- Bolt (Muffler stay) (For California only) ②



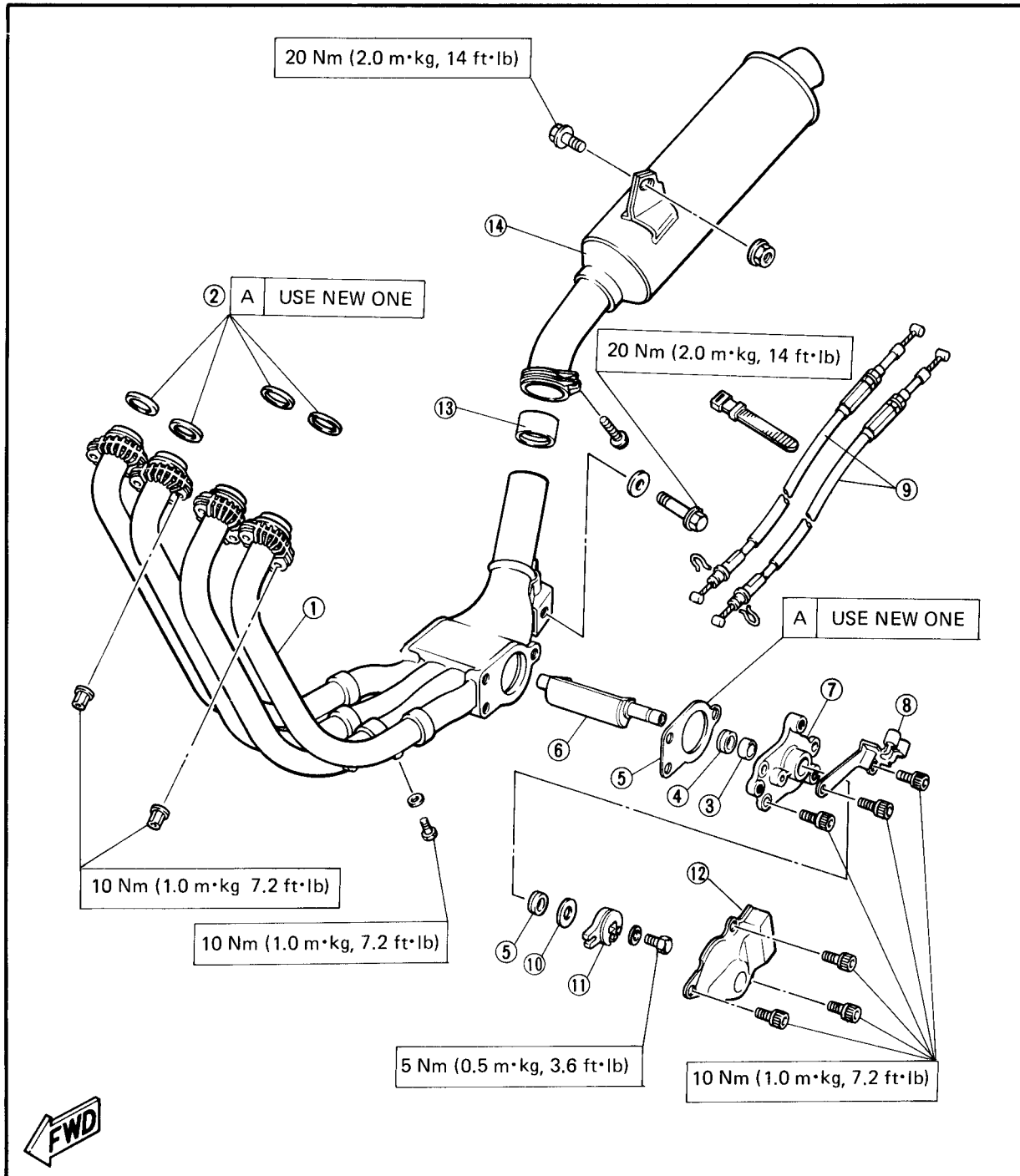
**Bolt (Muffler Bracket):**  
20 Nm (2.0 m·kg, 14 ft·lb)

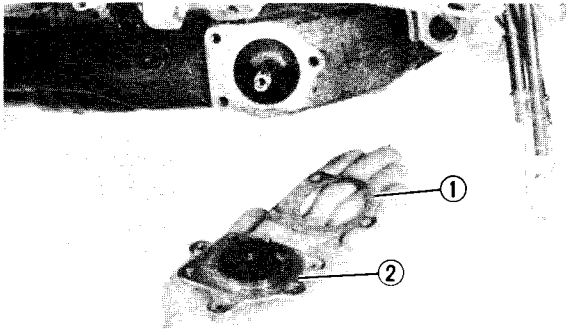
**Bolt (Muffler Stay —  
For California only):**  
20 Nm (2.0 m·kg, 14 ft·lb)



## YAMAHA EXHAUST VARIABLE VALVE (For California Only)

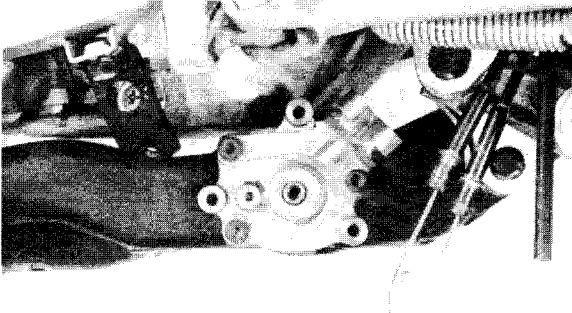
- |                         |                    |
|-------------------------|--------------------|
| ① Exhaust pipe assembly | ⑧ Bracket          |
| ② Gasket (Exhaust pipe) | ⑨ Cables           |
| ③ Bush                  | ⑩ Washer           |
| ④ Oil seal              | ⑪ Pulley           |
| ⑤ Gasket                | ⑫ Valve cover      |
| ⑥ Shaft arm             | ⑬ Gasket (Muffler) |
| ⑦ Housing               | ⑭ Muffler assembly |





### 9. Install (For California only):

- Shaft arm
- Gasket ①
- Housing ②

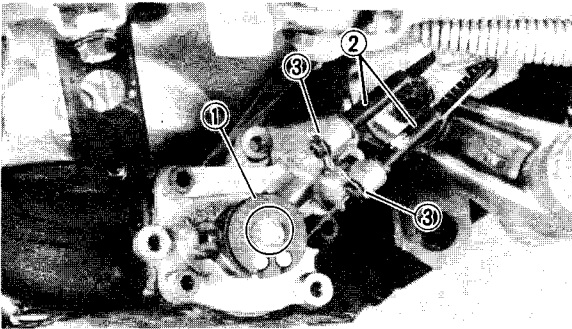


### 10. Install (For California only):

- Washer
- Bracket



**Bolts (Bracket):**  
10 Nm (1.0 m·kg, 7.2 ft·lb)



### 11. Install (For California only):

- Pulley ①
- Cables ②
- Clips ③

### 12. Adjust (For California only):

- Cable

Refer to the "EXUP CABLE ADJUSTMENT" section in the CHAPTER 3.

### 13. Adjust:

- Throttle cable



**Throttle Cable Free Play  
(Throttle Gripe):**  
2 ~ 5 mm (0.08 ~ 0.20 in)

Refer to the "THROTTLE CABLE FREE PLAY ADJUSTMENT" section in the CHAPTER 3.



14. Adjust:

- Clutch cable



**Clutch Cable Free Play:**  
2 ~ 3 mm (0.08 ~ 0.12 in)

Refer to the "CLUTCH ADJUSTMENT" section in the CHAPTER 3.

15. Fill:

- Coolant



**Total Amount:**  
1.0 L (0.9 Imp qt, 1.1 US qt)

Refer to the "COOLANT REPLACEMENT" section in the CHAPTER 3.

16. Fill:

- Engine oil



**Total Amount:**  
0.8 L (0.7 Imp qt, 0.84 US qt)

Refer to the "ENGINE OIL REPLACEMENT" section in the CHAPTER 3.