



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

SIDE COWLINGS AND TOP COVER

1. Remove:

- Side cowlings (left and right)
- Upper cowling
- Seats (front and rear)
- Top cover

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

4

FUEL TANK

1. Remove:

- Fuel tank
- Air filter case

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

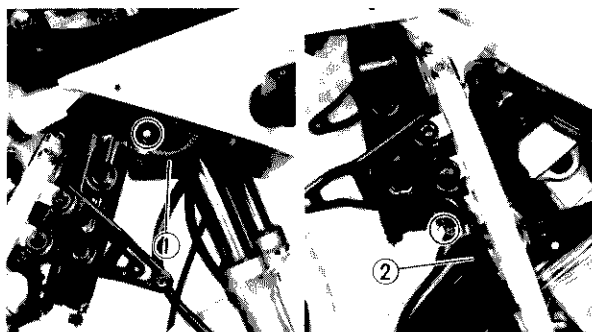
Refer to the "COOLANT REPLACEMENT" section in the CHAPTER 3.

AIR FILTER CASE AND CARBURETOR

1. Remove:

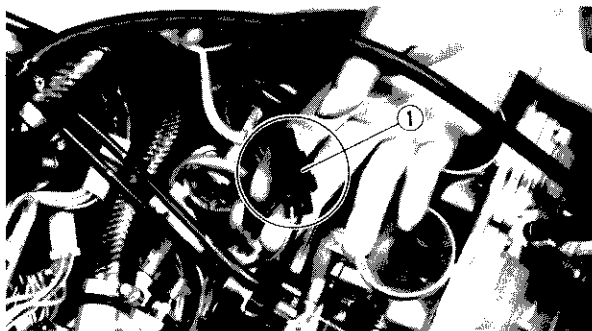
- Carburetor

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

**RADIATOR**

1. Disconnect:

- Radiator hose (radiator — inlet) ①
- Radiator hose (radiator — outlet) ②



2. Disconnect:

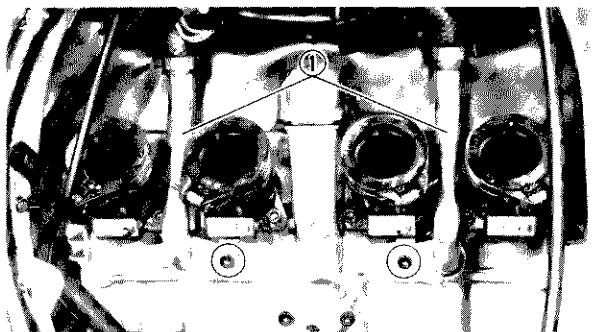
- Fan motor coupler

3. Remove:

- Radiator assembly

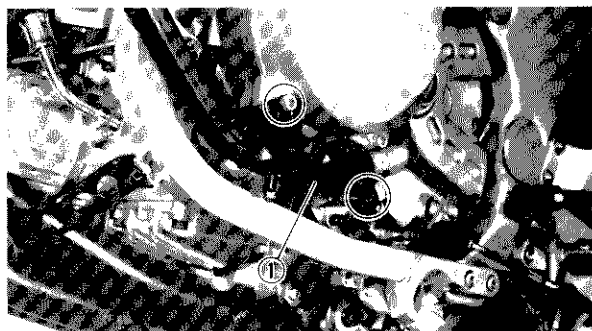
⚠ CAUTION:

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



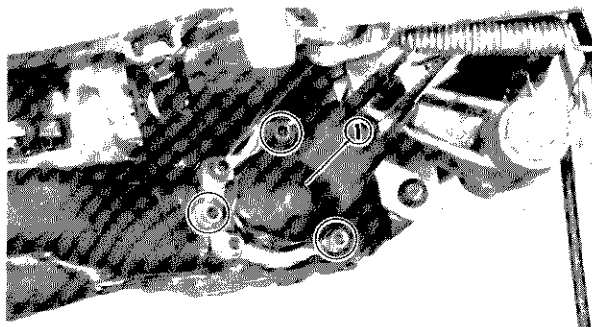
4. Disconnect:

- Pipes (left and right) ①



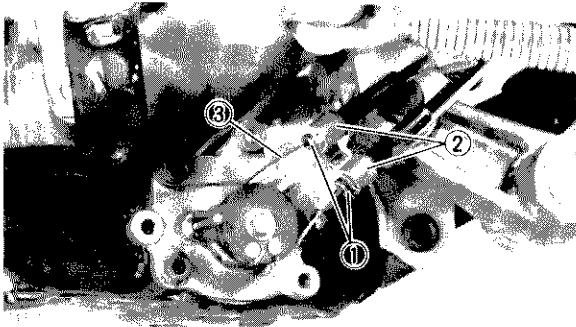
5. Remove:

- Pipes (radiator — outlet) ①

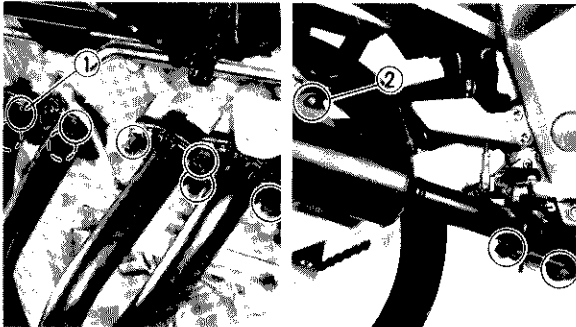
**MUFFLER ASSEMBLY**

1. Remove:

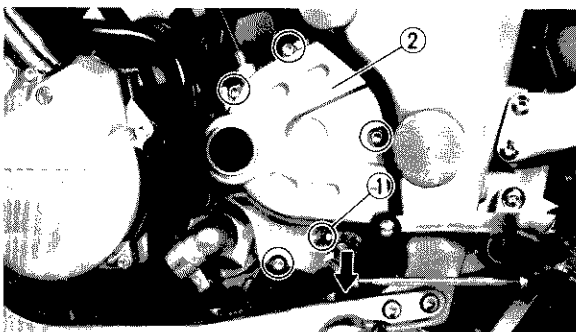
- Valve cover ① (FZR600WC only)



2. Fully loosen the locknuts ① and turn in the adjusters ② completely (FZR600WC only).
3. Disconnect:
 - EXUP cables ③ (FZR600WC only)

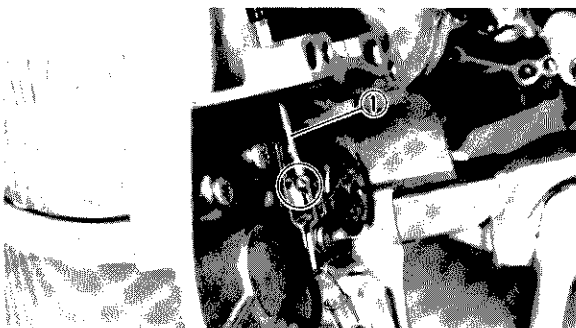


4. Remove:
 - Nuts (exhaust pipe) ①
 - Bolt (muffler bracket) ②
 - Muffler assembly

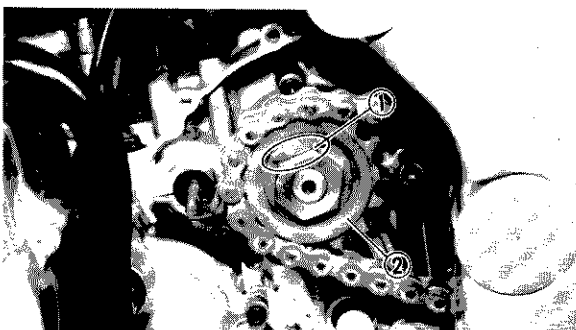


CLUTCH CABLE AND DRIVE CHAIN

1. Remove:
 - Bolt (shift arm) ①
Pull out the shift arm.
 - Crankcase cover (left) ②
 - Collar (shift shaft)



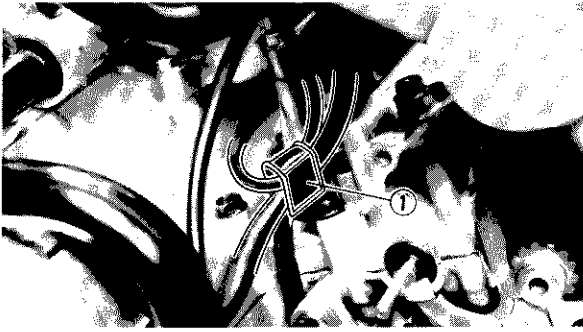
2. Disconnect:
 - Clutch cable ①



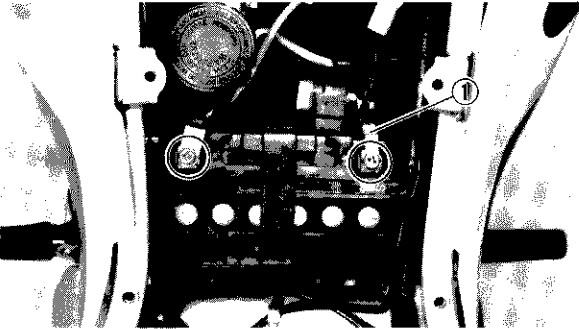
3. Straighten:
 - Lock washer tab ①
4. Remove:
 - Nut (drive sprocket)
 - Lock washer
 - Drive sprocket ②

NOTE:

Loosen the nut (drive sprocket) while applying the rear brake.

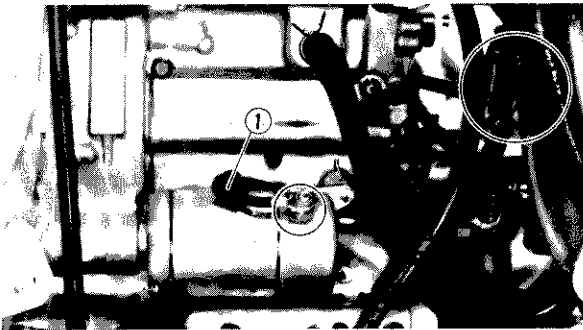
**LEADS**

1. Straighten:
 - Clamp ①



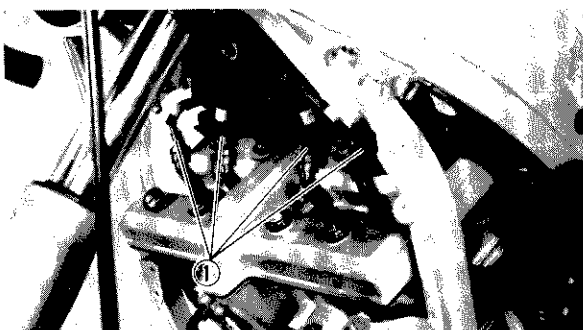
2. Disconnect:
 - Battery leads ①

NOTE: _____
Disconnect the negative lead ① first, and then disconnect the positive lead.

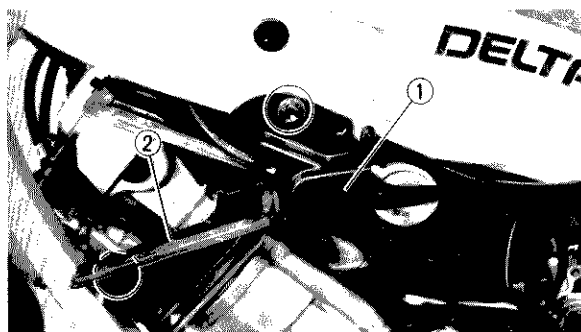


3. Disconnect:
 - Lead (starter motor) ①

4. Remove:
 - Cover
5. Disconnect:
 - Coupler (oil level neutral switch)
 - Coupler (A.C. generator)
 - Coupler (sidestand switch)



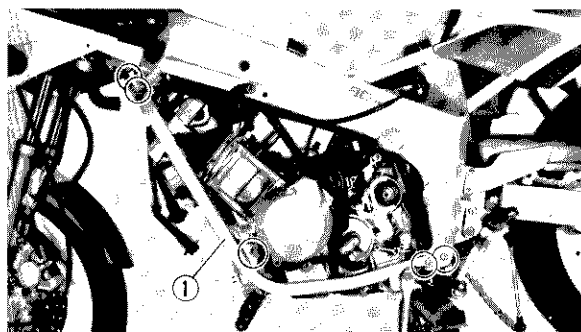
6. Disconnect:
 - Spark plug leads ①



ENGINE REMOVAL

1. Remove:

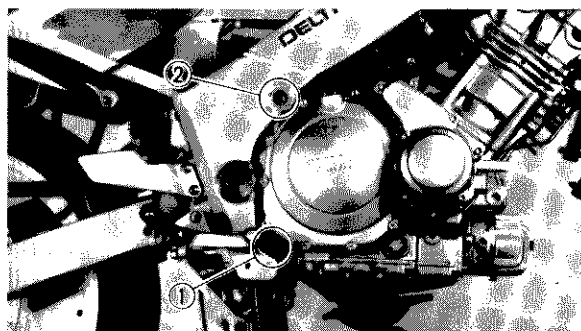
- Cover ①
- Starter lever ②



2. Place a suitable stand under the engine.

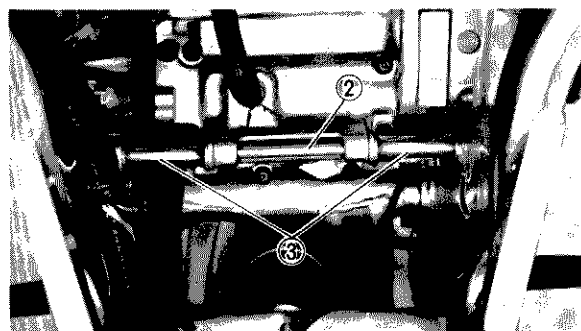
3. Remove:

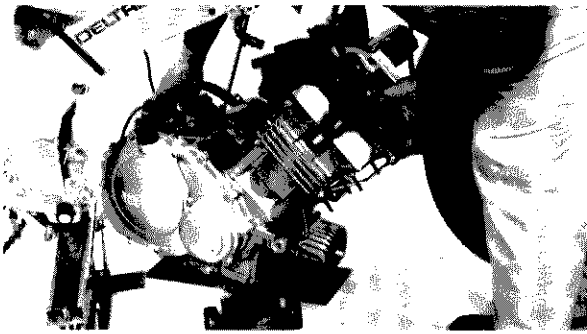
- Down tube frames (left and right) ①



4. Remove:

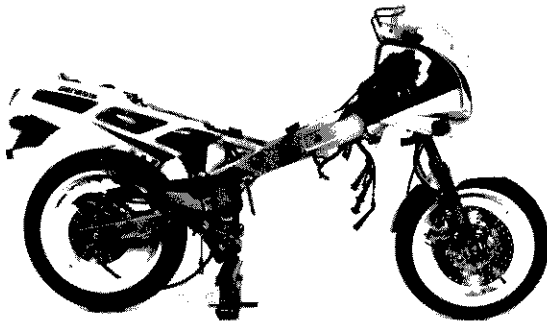
- Bolt (engine-mounting lower) ①
- Bolt (engine-mounting upper) ②
- Collars ③





5. Remove:

- Engine assembly
From right side.





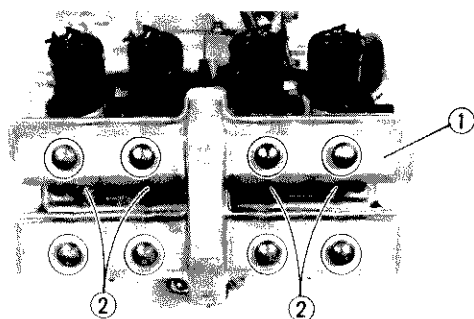
ENGINE DISASSEMBLY

CYLINDER HEAD COVER, CAMSHAFT AND CYLINDER HEAD

NOTE:

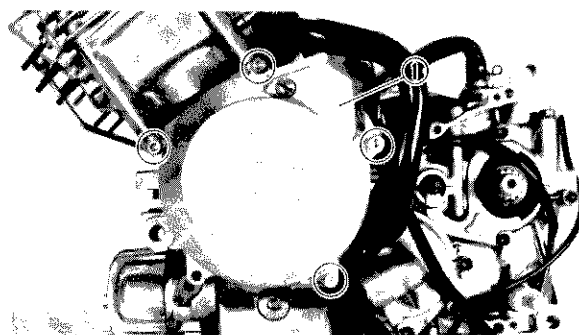
With the engine mounted, the cylinder head cover, camshaft and cylinder head can be maintained by removing the following parts.

- Side cowlings (left and right)
- Seats (front)
- Top cover
- Radiator
- Air filter case
- Carburetor
- Muffler assembly
- Down tube frame (right)



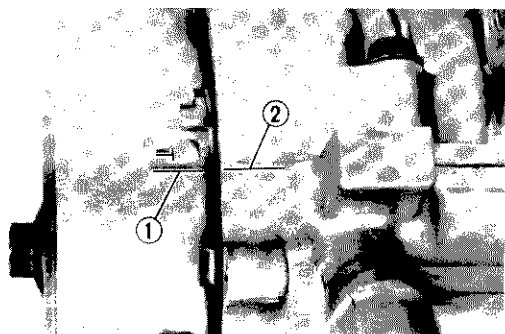
1. Remove:

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



2. Remove:

- Generator cover ①
- Dowel pins

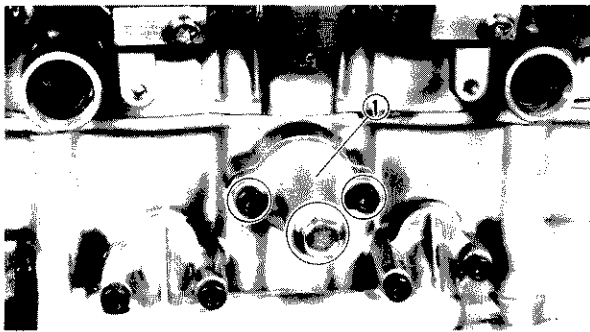


3. Align:

- "T" mark ①
- Crankcase matching line ②

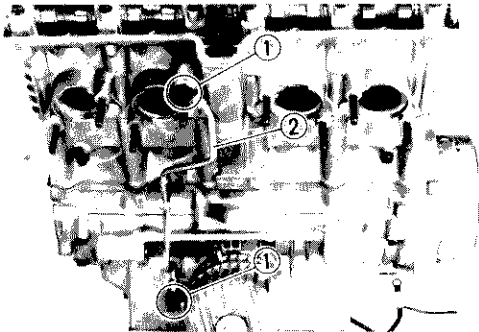
NOTE:

Turn the crankshaft counterclockwise and align the "T" mark ① on the rotor with the crankcase matching line ② when #1 piston is at TDC on compression stroke.



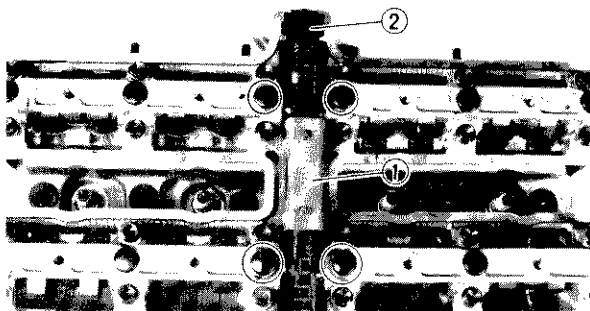
4. Remove:

- Timing chain tensioner ①
- Gasket (cam chain tensioner)



5. Remove:

- Union bolts ①
- Oil delivery pipe ②
- Copper washers



6. Remove:

- Timing chain guide (upper) ①
- Timing 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 timing chain.

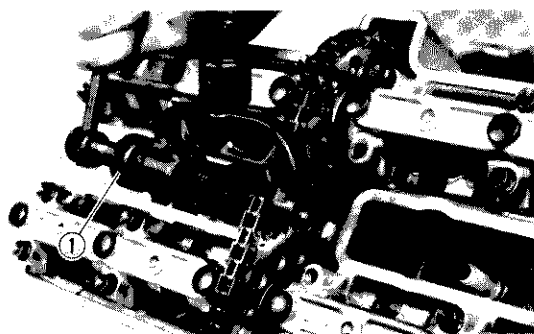
The pistons and cylinder can be removed without removing the camshafts.

• Procedure 2.

For engine service including cylinder head disassembly.

→ Remove the cam caps and camshafts.

The camshafts can be removed without disconnecting the timing chain.

**Procedure 1.**

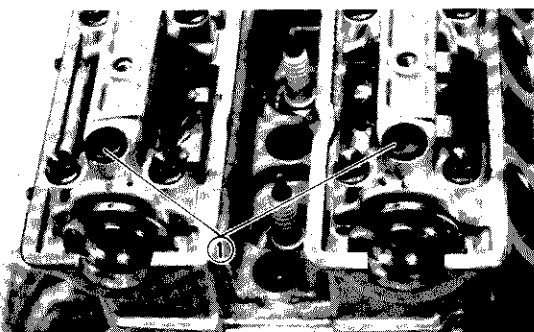
1. Disconnect:

- Timing chain

Use the Timing chain cutter ①

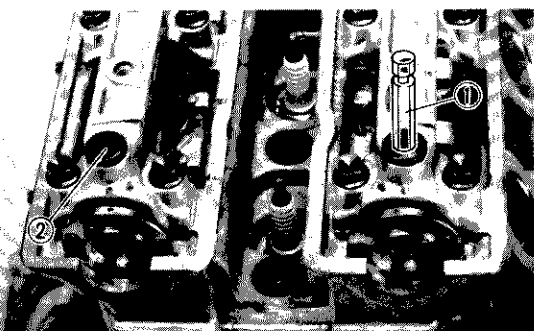


Timing chain cutter:
YM-01112,
90890-01112



2. Remove:

- Rubbers (camshaft cap) ①



3. Remove:

- Caps ②
- 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:

- Bolts (camshaft sprocket exhaust)

2. Push the camshaft sprocket with arrow (a) direction and take of sprocket from its home position.

3. Remove:

- Camshaft caps
- Dowel pins

NOTE:

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

CAUTION:

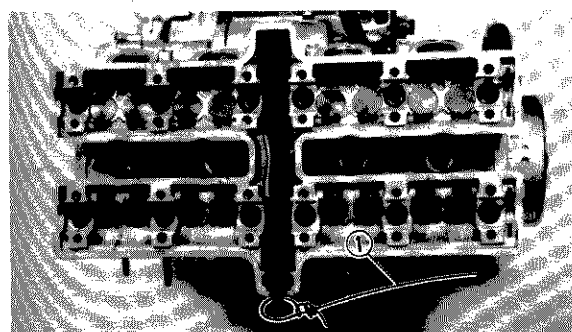
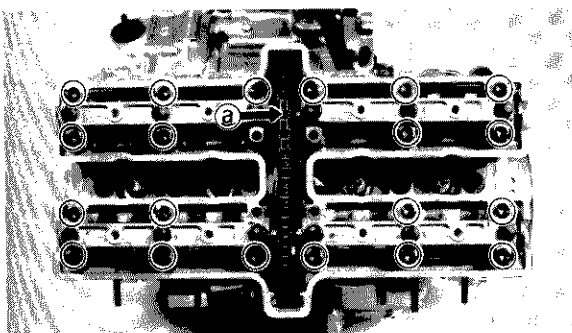
Do not rotate the camshaft or valve damage may occur.

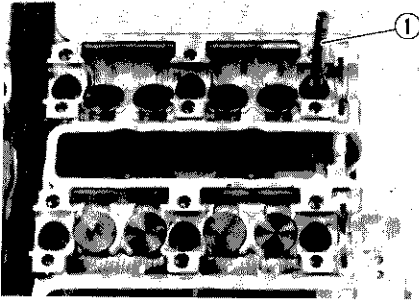
4. Remove:

- Camshafts

NOTE:

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





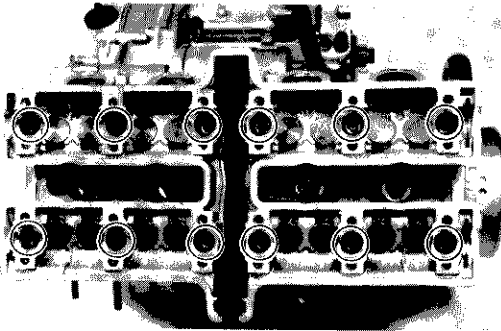
5. Remove:

- 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.

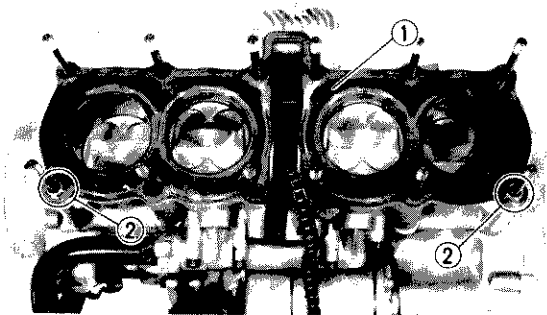


6. Remove:

- Cylinder head

NOTE:

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



7. Remove:

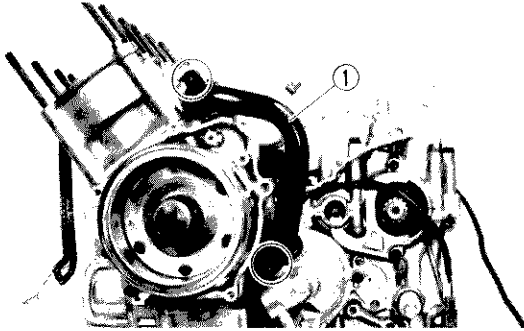
- Gasket (cylinder head) ①
- Dowel pins ②

CYLINDER AND PISTON

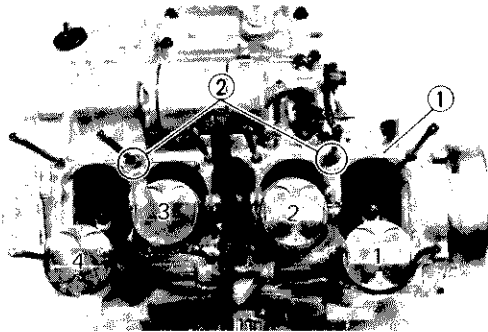
NOTE:

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

- Side cowlings (left and right)
- Seat
- Top cover
- Radiator
- Air filter case
- Carburetor
- Muffler assembly
- Down tube frame (right)
- Cylinder head

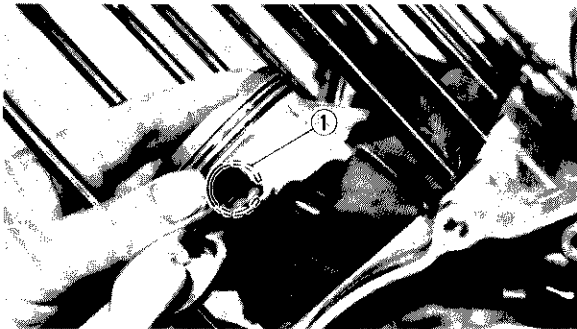


1. Remove:
 - Water pipe ①
 - O-rings
 - Cylinder



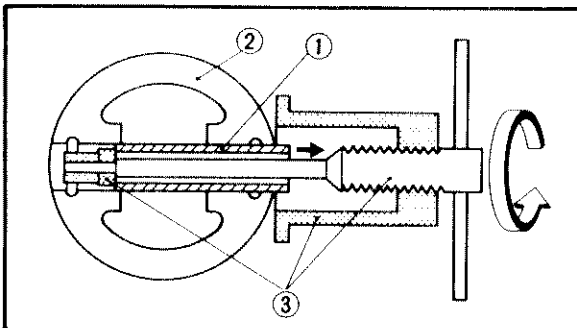
2. Remove:
 - Gasket (cylinder) ①
 - Dowel pins ②

NOTE: _____
Put identification marks on the each piston head for reference reinstallation.



3. 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.



4. Remove:
 - Piston pins ①
 - Pistons ②

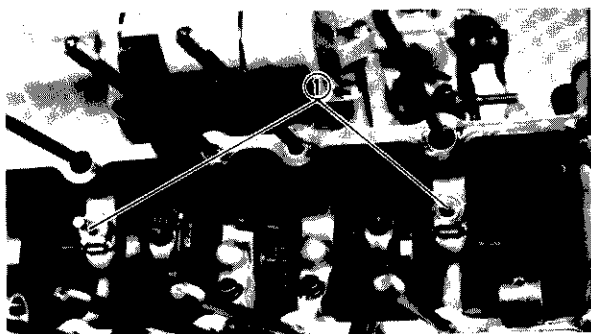
NOTE: _____
Before removing the piston pin, deburr the clip grooved and pin hole area. If the piston pin groove is deburred and piston pin is still difficult to remove, use the Piston pin puller ③.



Piston pin puller:
YU-01304,
90890-01304

CAUTION: _____

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



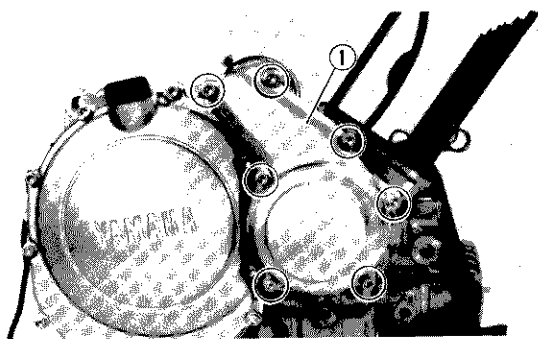
5. Remove:
- Oil jet nozzles ⑪

STARTER CLUTCH

NOTE:

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

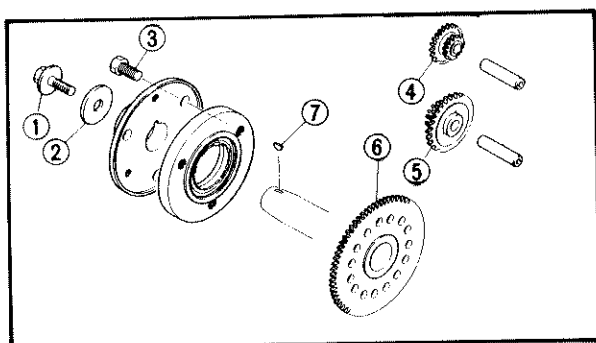
- Side cowlings
- Starter clutch cover



1. Remove:
- Starter clutch cover ①
 - Dowel pins
 - Gasket

NOTE:

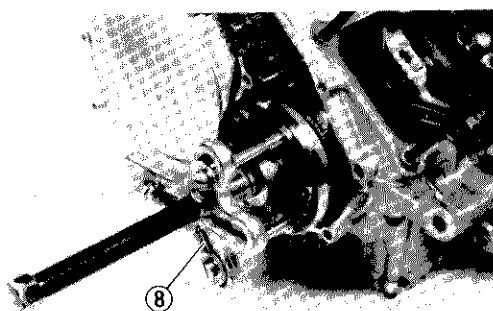
Working in a crisscross pattern, loosen bolts 1/4 turn each. Remove them after all are loosened.



2. Remove:
- Starter clutch ①
 - Washer ②
 - Bolt (starter clutch) ③
 - Starter idle gear (primary) ④
 - Starter idle gear (secondary) ⑤
 - Starter clutch gear ⑥
 - Woodruff key ⑦

NOTE:

Use the flywheel puller set ⑧ to remove the starter clutch.



Flywheel puller set:
YU-33270,
90890-01362

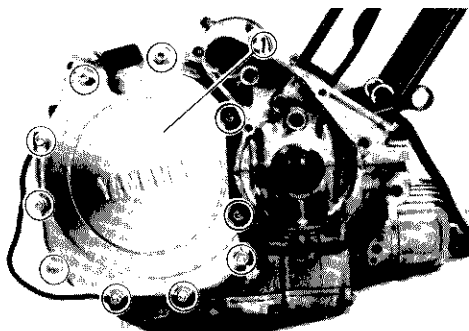


CLUTCH

NOTE:

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

- Side cowling (right)
- Crankcase cover (right)

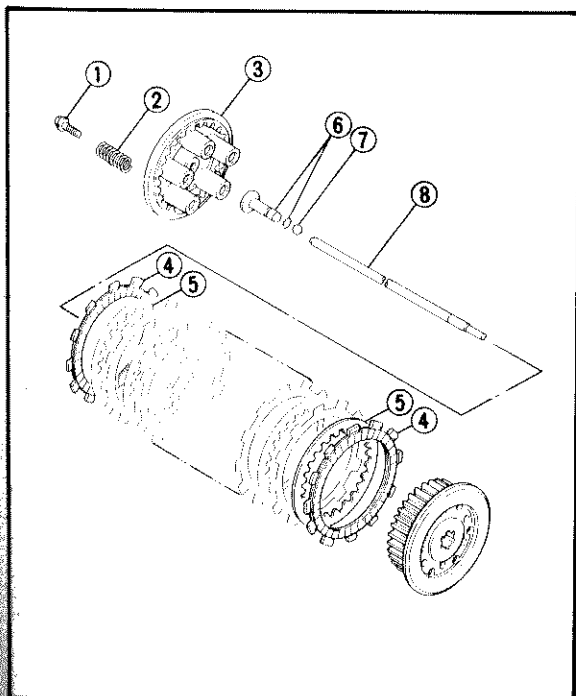


1. Remove:

- 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.

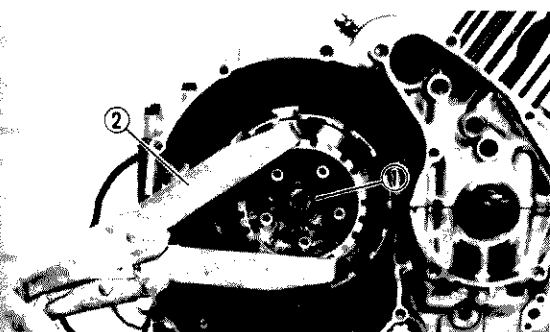


2. Remove:

- Bolts (clutch spring) ①
- Clutch springs ②
- Pressure plate ③
- Friction plates ④
- Clutch plates ⑤
- Push rod #1 ⑥
- Ball ⑦
- Push rod #2 ⑧

NOTE:

Loosen the bolts in a crisscross pattern.



3. Straighten the lock washer tabs.

4. Loosen:

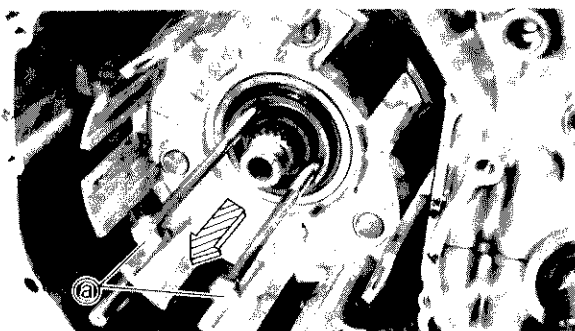
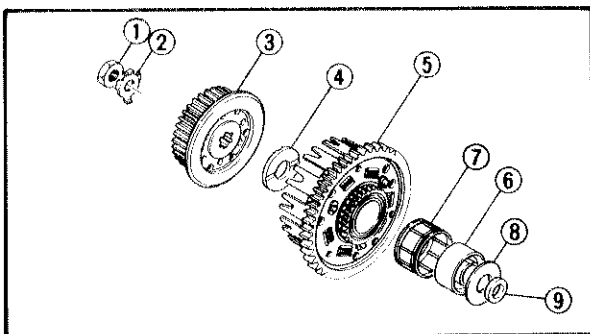
- Nut (clutch boss) ①



Universal clutch holder:
YM-91042,
90890-04086

NOTE:

Loosen the nut ① (clutch boss) while holding the clutch boss with the Universal clutch holder ②



5. Remove:

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

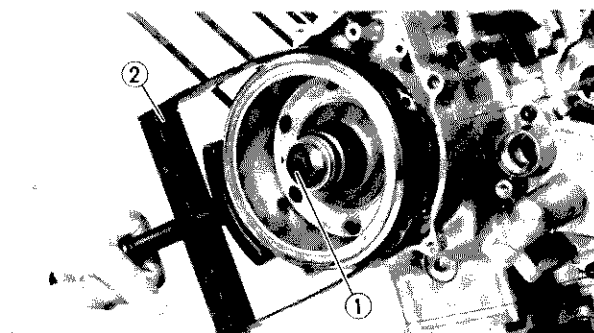
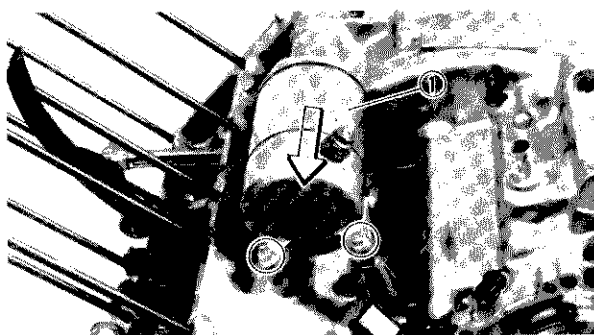
NOTE:

Install the 5 mm (0.2 in) screw (a) into the spacer. Then, remove the spacer by pulling on the screw.

STARTER MOTOR AND A.C. GENERATOR**NOTE:**

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

- Seat
- Top cover
- Fuel tank



1. Remove:

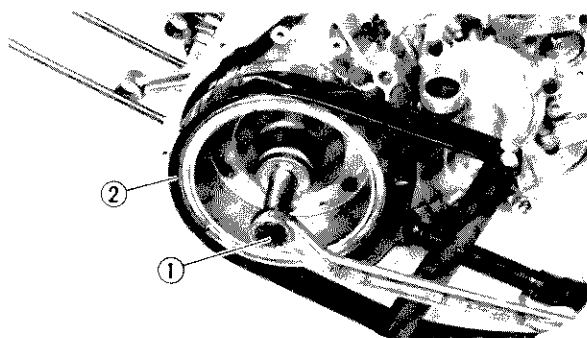
- Starter motor ①

2. Remove:

- Bolt (magneto) ①
- Washer



Rotor holding tool ②:
YS-01880,
90890-01235



3. Attach:

- Rotor puller (1)



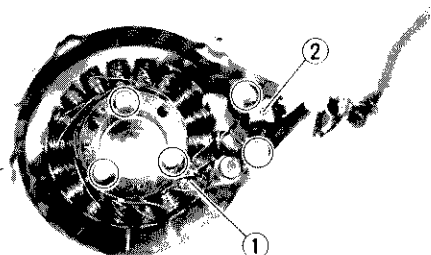
Rotor puller:
YM-01080,
90890-01080

4. Remove:

- Magneto (2)
- Woodruff key

5. Remove:

- Starter coil assembly (1)
- Pickup coil (2)

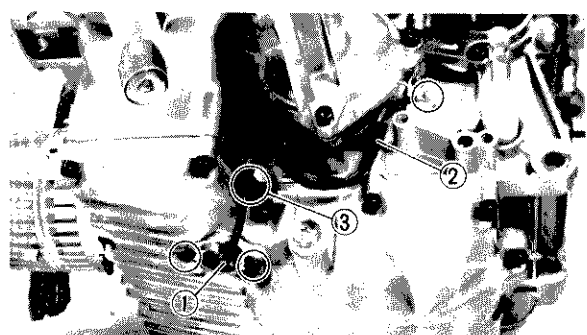


OIL PAN AND OIL STRAINER

NOTE:

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

- Side cowlings (left and right)
- Exhaust pipe assembly
- Cowling stay



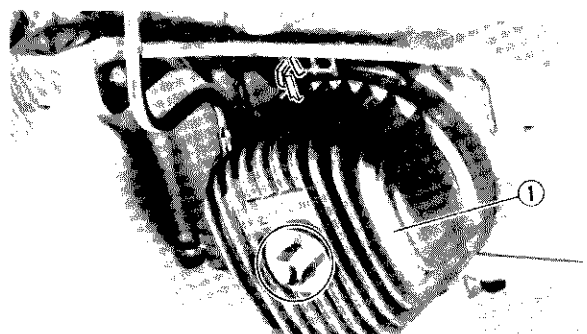
1. Disconnect:

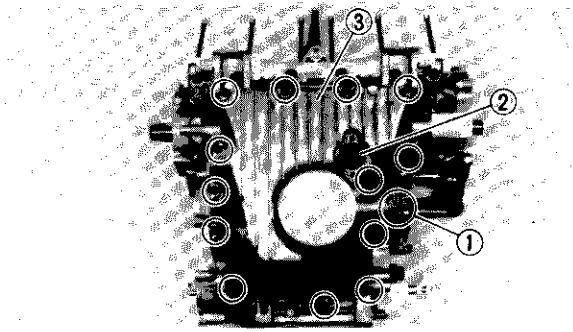
- Oil level switch lead (1)
- Neutral switch lead (2)

(3) Clamp

2. Remove:

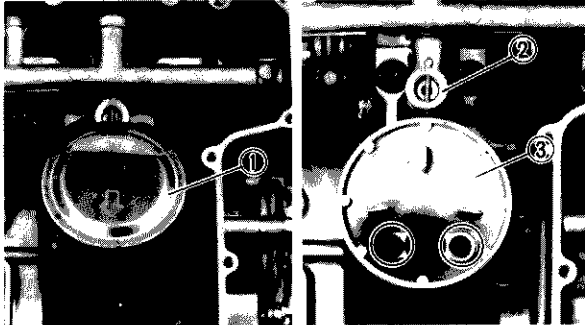
- Oil filter assembly (1)





3. Remove:

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



4. Remove:

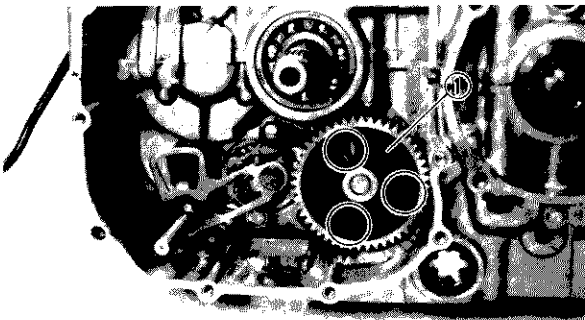
- Oil strainer cover ①
- Relief valve ②
- Oil strainer assembly ③

OIL PUMP AND SHIFT SHAFT

NOTE:

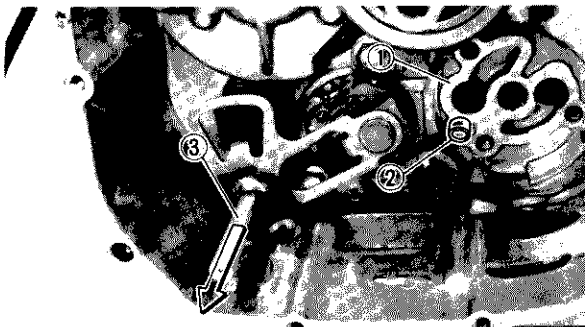
With the engine mounted, the oil pump and shift shaft can be maintained by removing the following parts.

- Side cowlings
- Crankcase cover (right)
- Clutch assembly



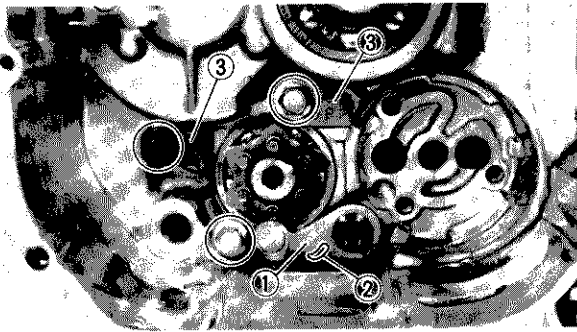
1. Remove:

- Oil pump assembly ①



2. Remove:

- Gasket (oil pump assembly) ①
- Dowel pin ②
- Shift shaft ③



3. Remove:

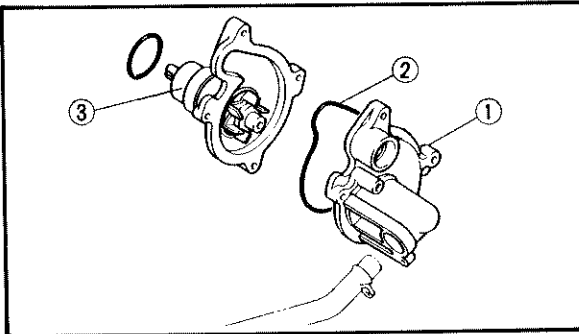
- Stopper lever ①
- Spring ②
- Stopper plate (shift shaft guide bar) ③

WATER PUMP

NOTE:

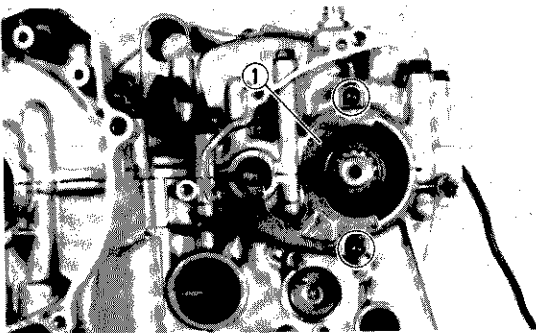
With the engine mounted, the water pump can be maintained by removing the following parts.

- Seat
- Top cover
- Side cowlings
- Shift arm
- Crankcase cover (right)
- Radiator hose
- Water pump cover



1. Remove:

- Water pump cover ①
- O-ring ②
- Water pump housing ③



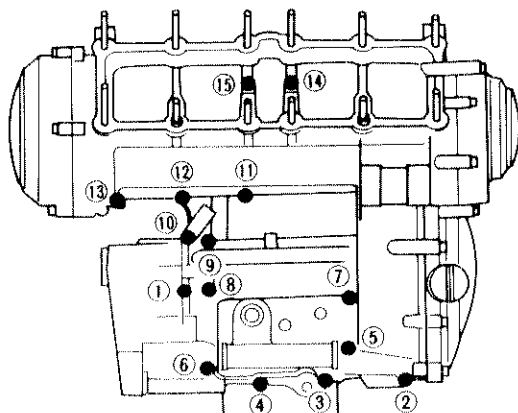
CRANKCASE DISASSEMBLY

1. Remove:

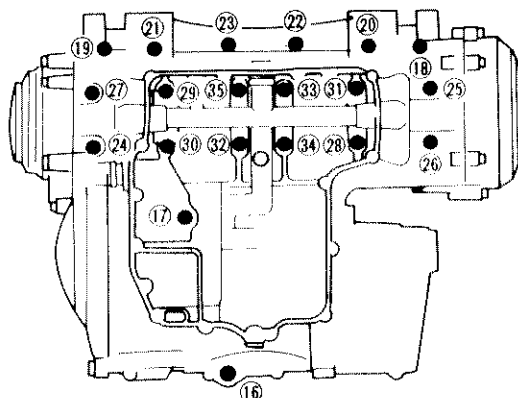
- Oil seal stopper ①



A



B



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.

CAUTION:

Use a soft hammer to tap on the case half. Tap only on reinforced portions of the case. Do not tap on the gasket mating surface. Work slowly and carefully. Make sure that the case halves separate evenly.

[A] Upper case

[B] Lower case

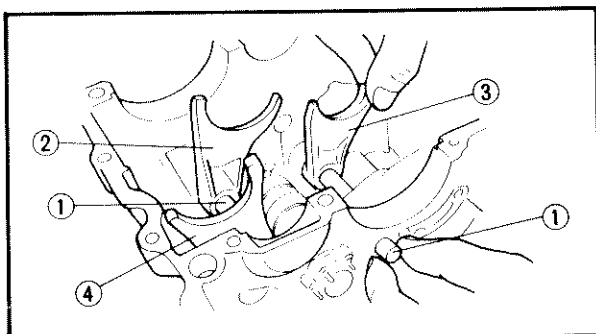
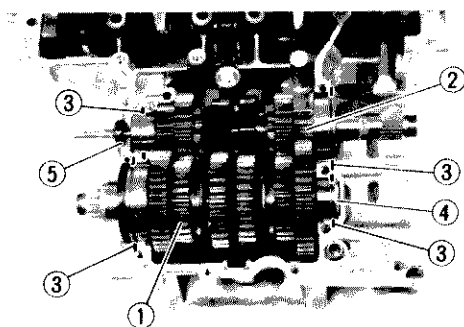
TRANSMISSION, SHIFTER AND SHIFT CAM

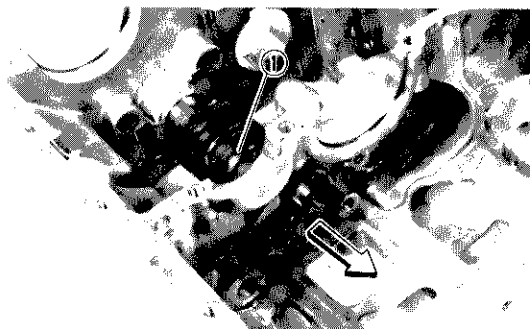
1. Remove:

- Drive axle assembly ①
- Main axle assembly ②
- Dowel pins
- Circlip ③
- Special washer ④
- Oil seal ⑤

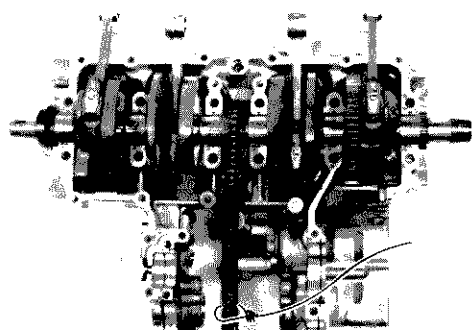
2. Remove:

- Guide bars ①
- Shift fork #1 ②
- Shift fork #2 ③
- Shift fork #3 ④



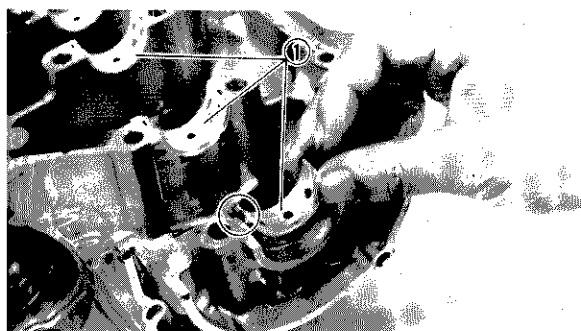


3. Remove:
- Shift cam ①



CRANKSHAFT

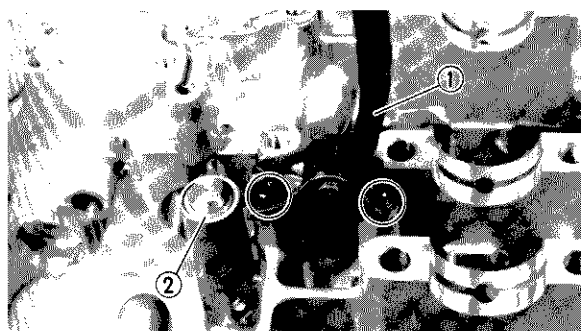
1. Remove:
- Crankshaft assembly



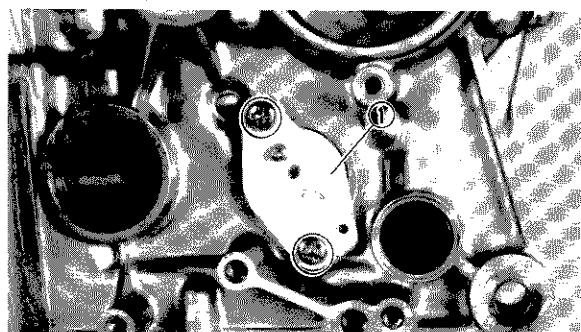
2. Remove:
- Main journal bearing ①

NOTE:

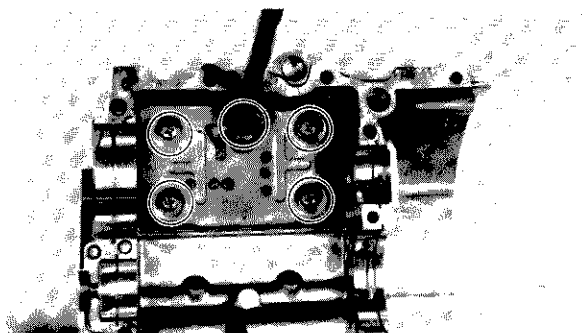
Identify each main journal bearing position very carefully so that it can be reinstalled in its original place.



3. Remove:
- Timing chain guide (intake side) ①
 - O-ring ②



4. Remove:
- Neutral switch ①



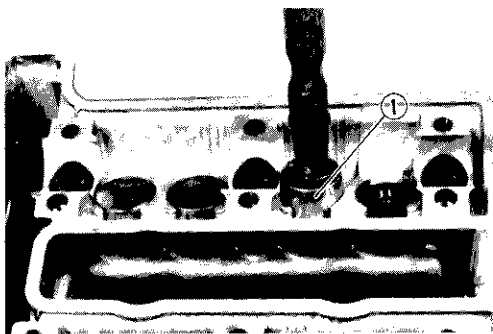
5. Remove:

- Breather hose
- Oil baffle plate

VALVE PAD AND VALVE

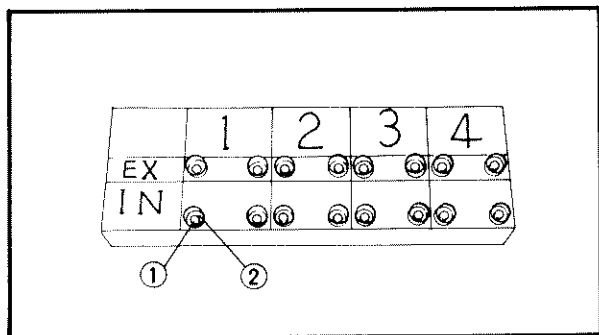
NOTE:

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



1. Remove:

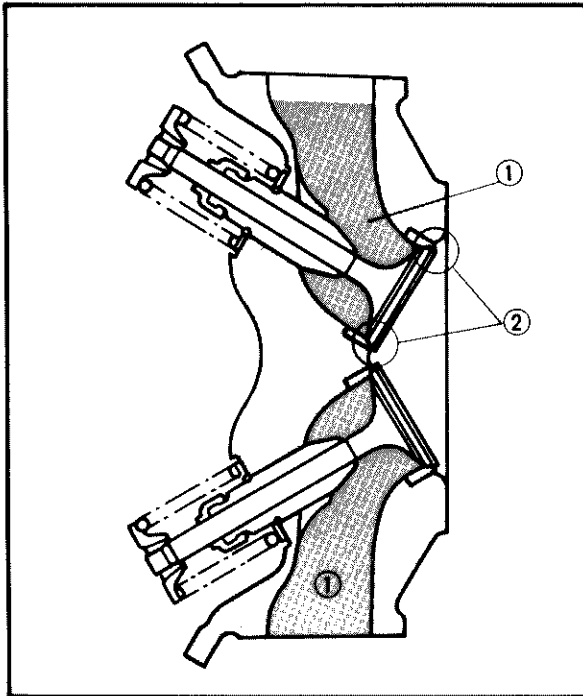
- Lifters ①
- Valve pads



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:

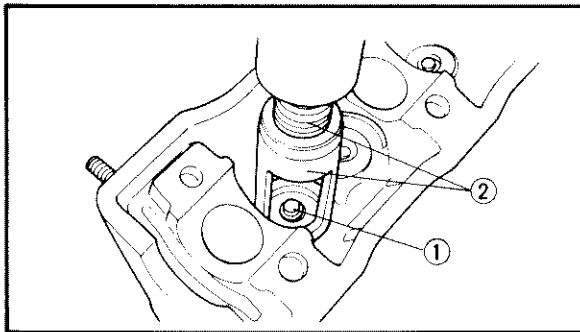
• Valve sealing

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

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

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).

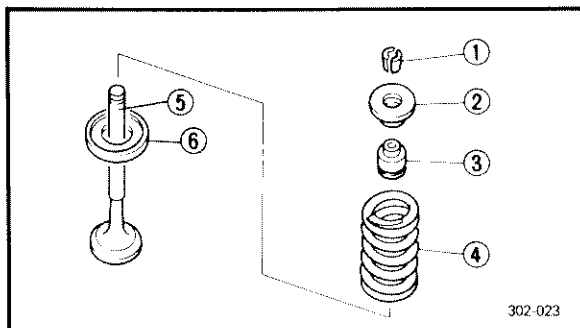


3. Remove:

- Valve cotteners (1)

NOTE:

Attach the valve spring compressor and attachment (2) between the valve spring seat and cylinder head to remove the valve cotteners.



Valve spring compressor:

YM-04019,
90890-04019

Attachment:

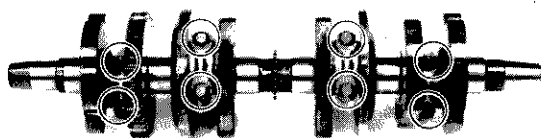
YM-04018,
90890-04108

4. Remove:

- Valve cotteners (1)
- Valve retainer (2)
- Oil seal (3)
- Valve spring (4)
- Valve (5)
- Valve retainer (6)

NOTE:

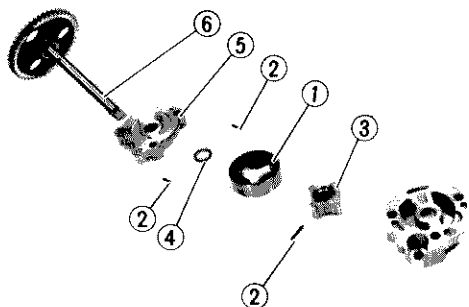
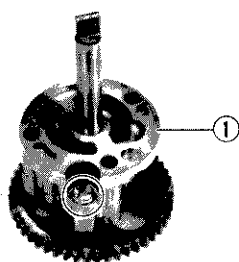
Identify each part position very carefully so that it can be reinstalled in its original place.

**CONNECTING ROD**

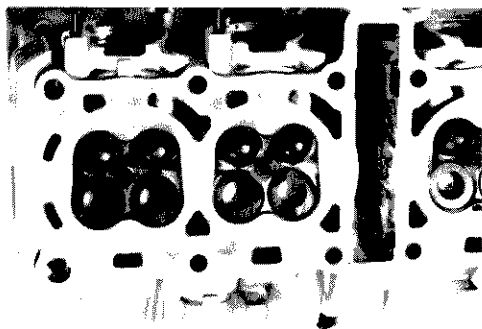
1. Remove:
 - Connecting rod
 - Connecting rod bearing

NOTE:

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

**INNER ROTOR (OIL PUMP)**

1. Remove:
 - Pump housing ①
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:

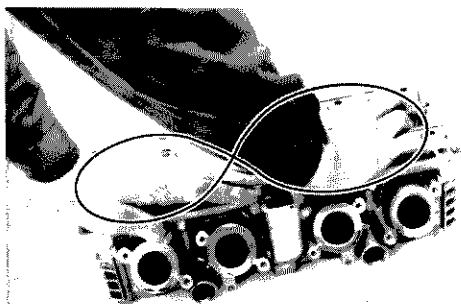
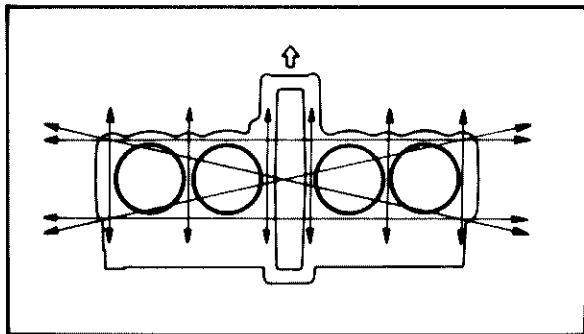
- Cylinder head
Scratches/Damage → Replace.

3. Measure:

- Warpage
Out of specification → Resurface.



Cylinder head warpage:
Less than 0.03 mm (0.0012 in)



4. Resurface:

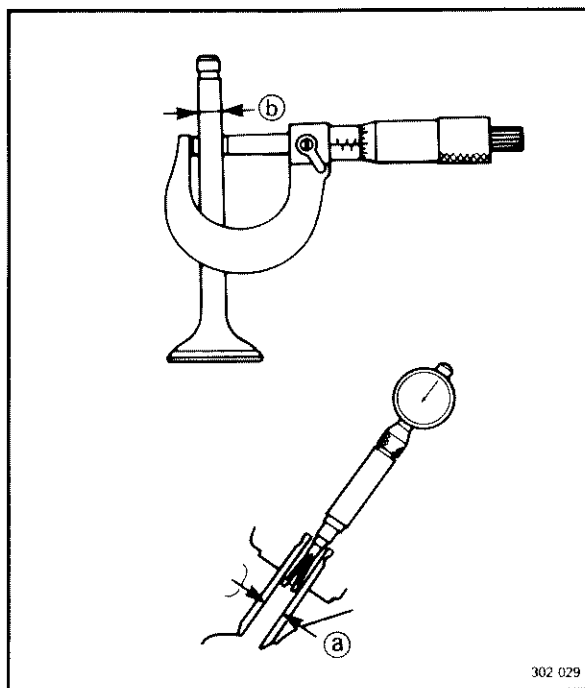
- Cylinder head

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 AND VALVE GUIDE

1. Measure:

- Stem-to-guide clearance

Stem-to-guide clearance

Valve guide inside diameter (a) –

Valve stem diameter (b)

Out of specification → Replace valve guide.



Stem-to-guide clearance:

Intake:

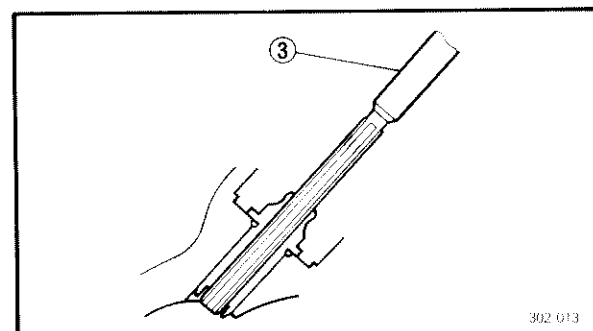
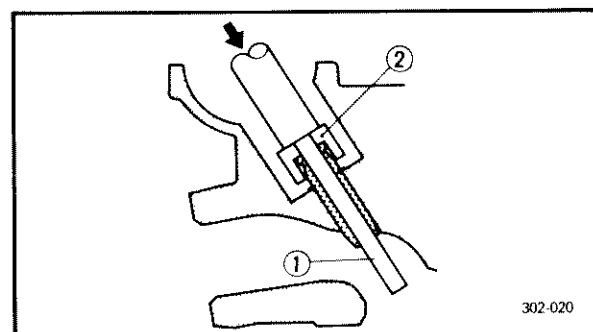
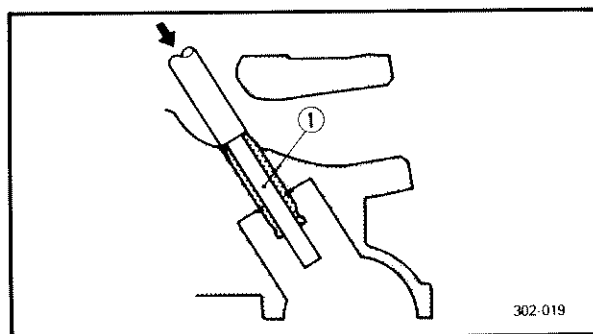
0.010 ~ 0.031 mm
(0.0004 ~ 0.0015 in)

< Limit > : 0.08 mm (0.0031 in)

Exhaust:

0.025 ~ 0.052 mm
(0.0010 ~ 0.0020 in)

< Limit > : 0.10 mm (0.0039 in)



2. Replace:

- Valve guide

Replacement steps:

NOTE:

Heat the cylinder head in an oven to 100°C (212°F) to ease guide removal and installation and to maintain correct interference fit.

- Remove the valve guide using the valve guide remover ①.
- Install the valve guide (new) using the valve guide installer ② and valve guide remover ①.
- After installing the valve guide, bore the valve guide using the valve guide reamer ③ to obtain proper stem-to-guide clearance.



Valve guide remover:

YM-04116

90890-04116

Valve guide installer:

YM-04117

90890-04117

Valve guide reamer:

YM-04118

90890-04118

NOTE:

Reface the valve seat after replacing the valve guide.

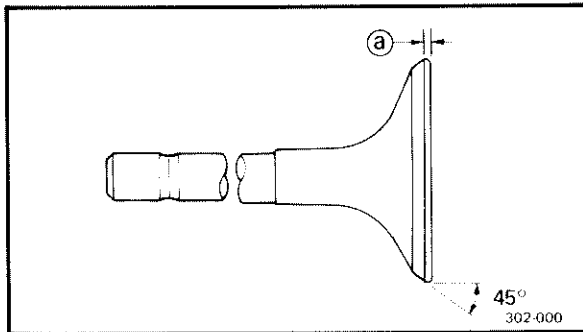


3. Eliminate:

- Carbon deposit
(from valve face)

4. Inspect:

- Valve face
Pitting/Wear → Grind the face.
- Valve stem end
Mushroom shape or diameter larger than rest of stem → Replace.

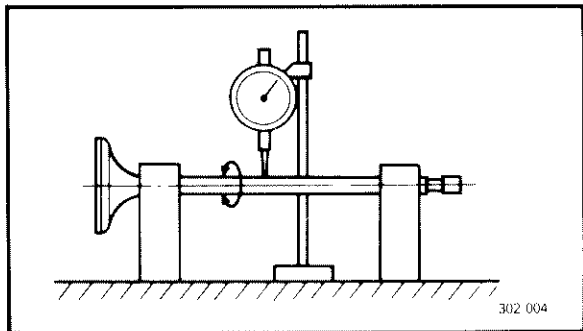


5. Measure:

- Margin thickness (a)
Out of specification → Replace.



Margin Thickness:
Limit: 0.7 mm (0.0276 in)



6. Measure:

- Runout (valve stem)
Out of specification → Replace.



Runout:
Less than 0.02 mm (0.0008 in)

NOTE: _____

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



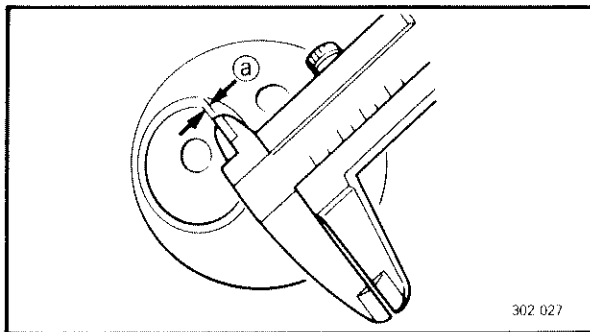
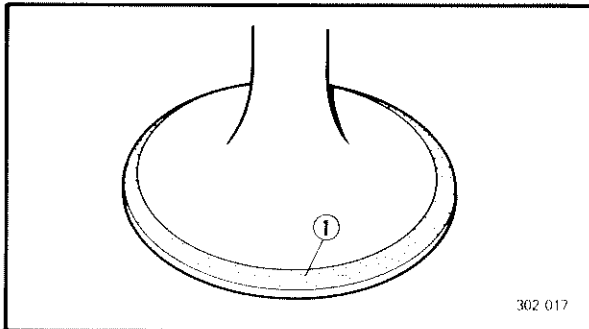
VALVE SEAT

1. Clean:

- Valve face
 - Valve seat
- Eliminate carbon deposit.

2. Inspect:

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



3. Measure:

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

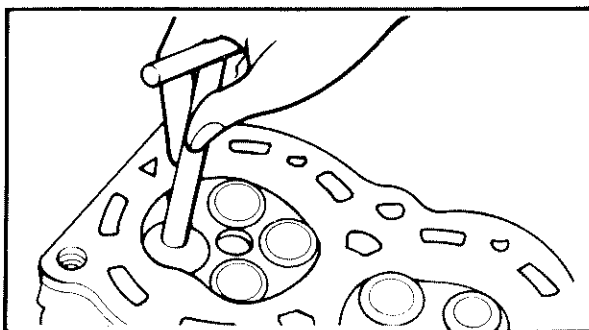
Valve seat width measurement steps:

- 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 clear pattern.
- Remove the valve from the cylinder head.
- Measure the valve seat width (a).

When the valve seat and valve face make contact, bluing will be applied to the valve face.

	Valve seat width	Limit
Intake	0.9 ~ 1.1 mm	1.6 mm
Exhaust	(0.035 ~ 0.043 in)	(0.063 in)

- If the valve seat width is too wide, too narrow, or seat has not centered. The valve seat must be refaced.



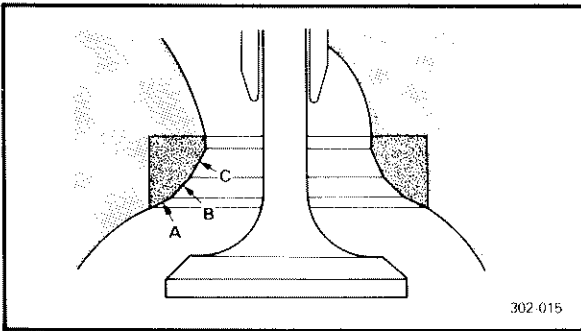
4. Reface:

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

⚠ CAUTION:

Remove just enough material to achieve satisfactory seat.

When twisting cutter, keep and 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.

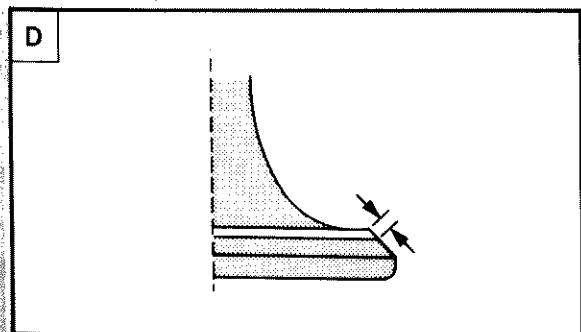
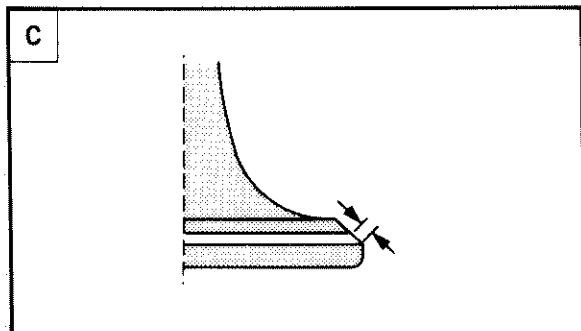
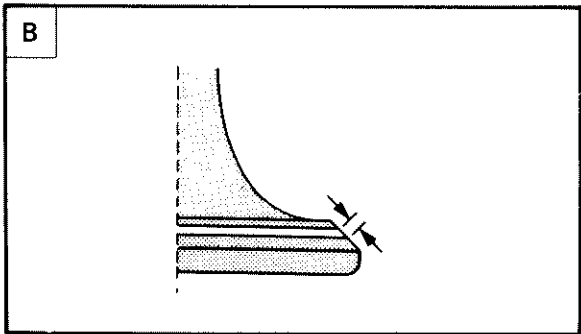
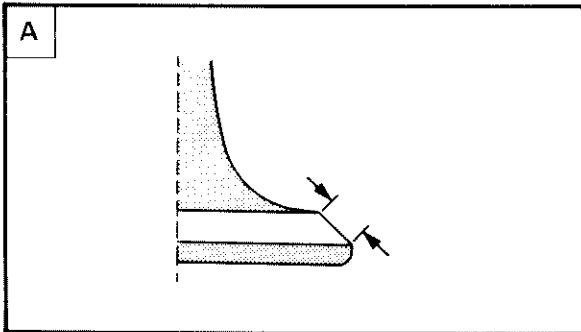
Valve seat cutter set		Desired result
Use	45° cutter	To achieve a uniform valve seat width of 1.0 mm (0.04 in)

- 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	



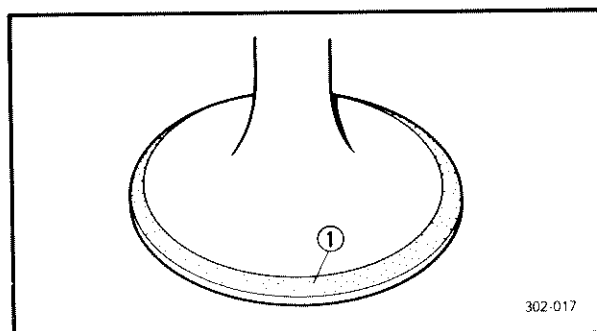
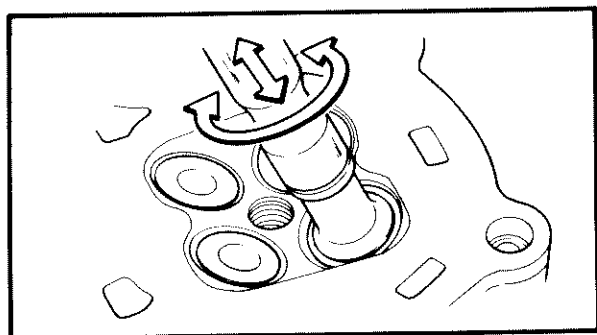
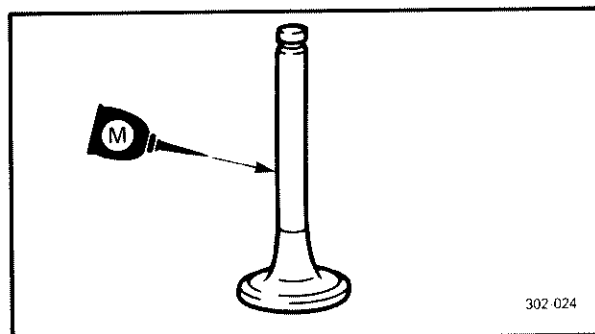
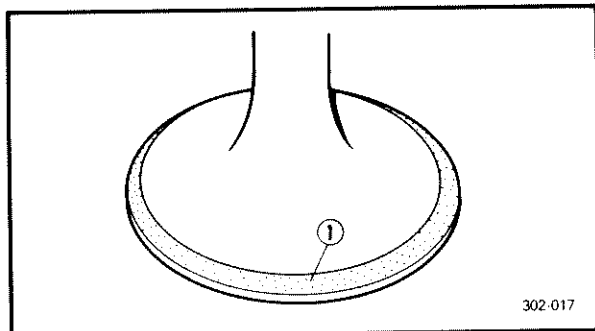


5. Lap:

- 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:

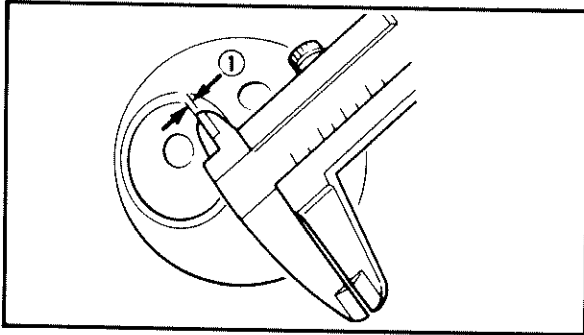
To obtain the best lapping result, lightly tap the valve seat while rotating the valve back and forth between your hand.

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

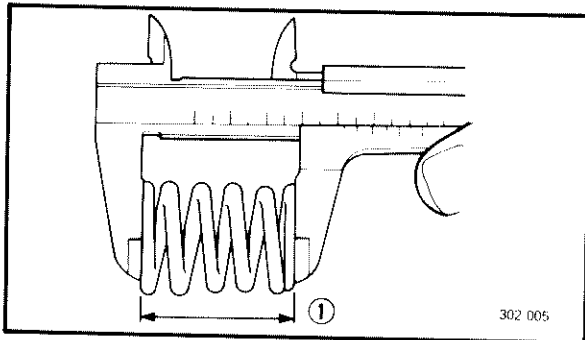
NOTE:

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.

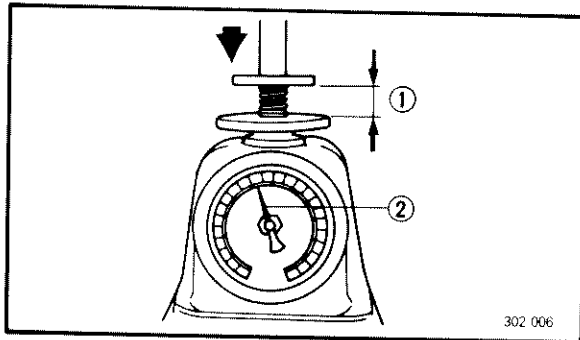
**VALVE SPRING**

1. Measure:

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



Valve spring free length:
43.15 mm (1.70 in)



2. Measure:

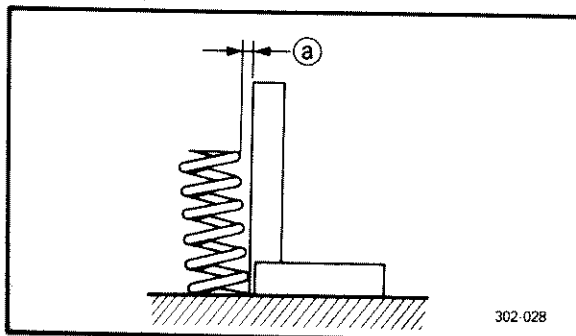
- Valve spring installed force ②
Out of specification → Replace.

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)

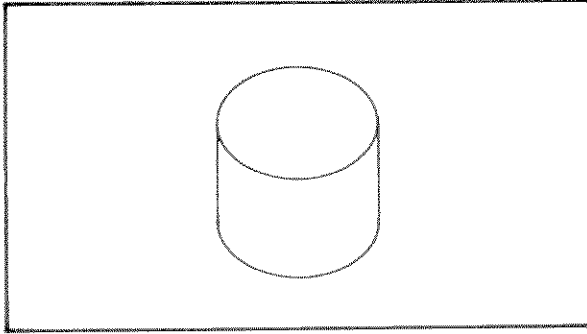


3. Measure:

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



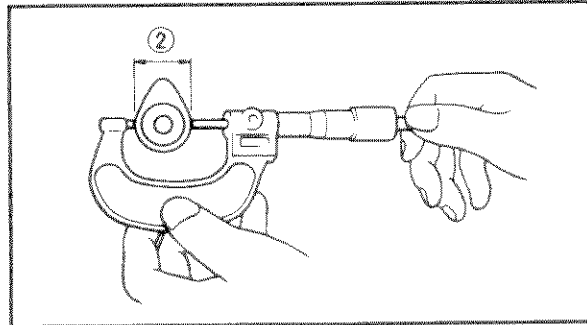
Spring tilt:
Less than 1.8 mm (0.0709 in)

**VALVE LIFTER**

1. Inspect:

- Valve lifters

Scratches/Damage → Replace both lifters and camshaft case.

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

1. Inspect:

- Cam lobes

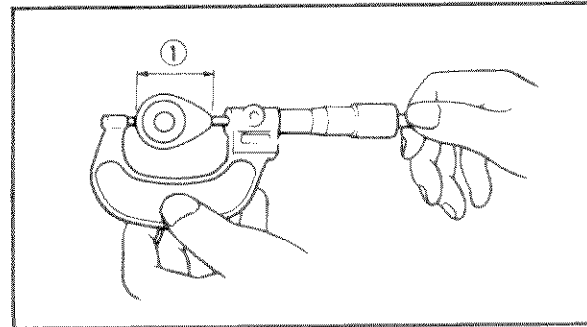
Pitting/Scratches/Blue discoloration → Replace.

2. Measure:

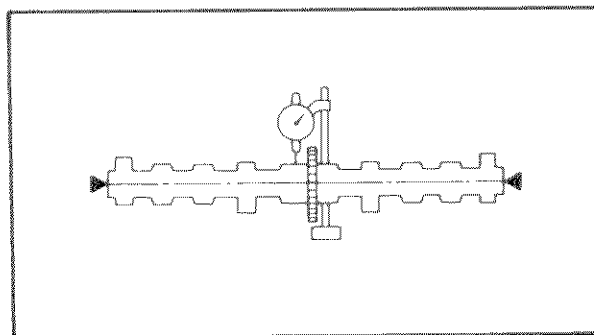
- Cam lobes

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)



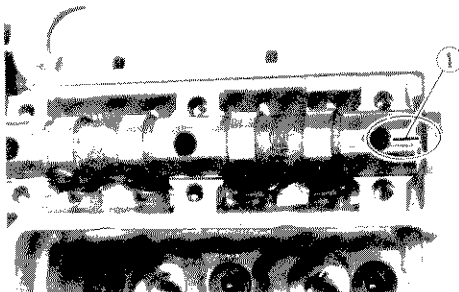
3. Measure:

- Camshaft runout

Use the Micrometer.

Out of specification → Replace.

	Camshaft runout limit: 0.03 mm (0.0012 in)
--	---

**Camshaft/Cap clearance measurement**

1. Install:

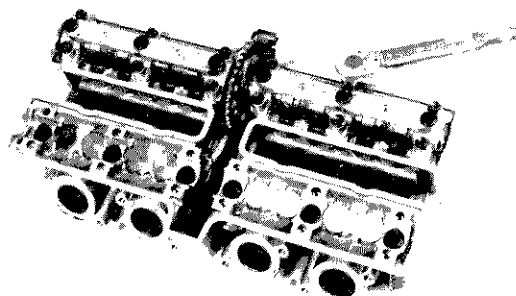
- Camshaft (intake and exhaust)

2. Position:

- Plastigage® ①

Onto the camshaft.

	Plastigage®: P/N YU-33210
--	------------------------------



3. Install:

- Dowel pins
- Camshaft caps

4. Tighten:

- Camshaft cap bolts



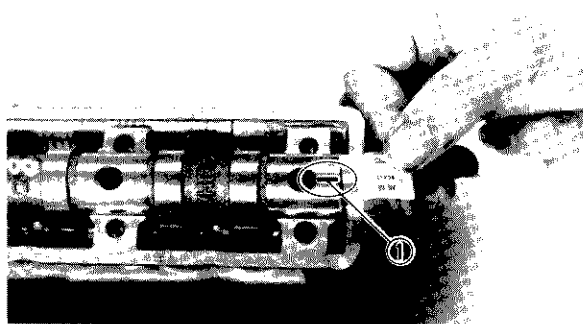
Bolts (camshaft cap):
10 Nm (1.0 m·kg, 7.2 ft·lb)

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

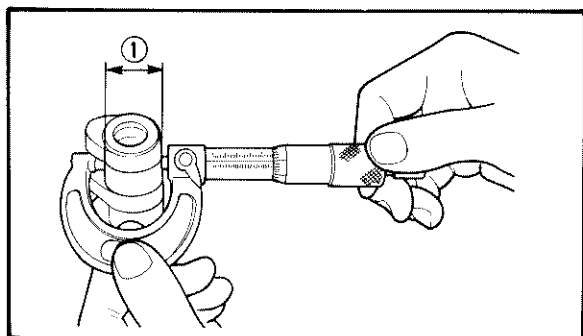


6. Measure:

- 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 cylinder head.



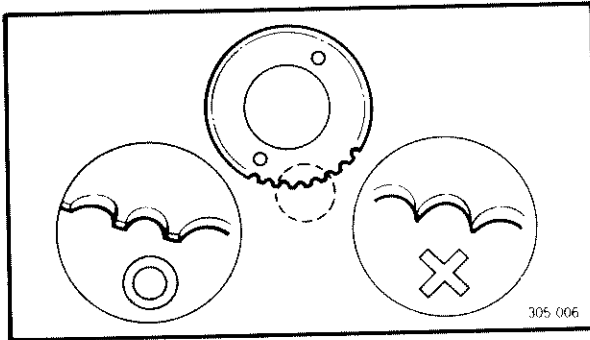
Camshaft outside diameter:
Standard: 22.967 ~ 22.980 mm
(0.9042 ~ 0.9047 in)

Cam cap inside diameter:
Standard: 23.000 ~ 23.021 mm
(0.9056 ~ 0.9063 in)

**Timing chain**

1. Inspect:

- Timing chain
Chain stretch/Cracks → Replace.

**Cam sprockets**

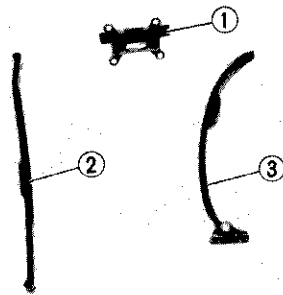
1. Inspect:

- Cam sprockets
Wear/Damage → Replace.

Timing chain guide

1. Inspect:

- Timing chain guide (upper) ①
- Timing chain guide (exhaust side) ②
- Timing chain guide (intake side) ③
- Wear → Replace.

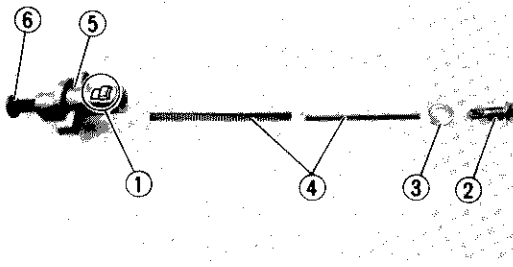
**Timing chain tensioner**

1. Check:

- One-way cam ① operation
Unsmooth operation → Replace.

2. Inspect:

- All parts
Damage/Wear → Replace.



- | | |
|------------|------------------|
| ② End plug | ⑤ Tensioner body |
| ③ Washer | ⑥ Tensioner rod |
| ④ Springs | |

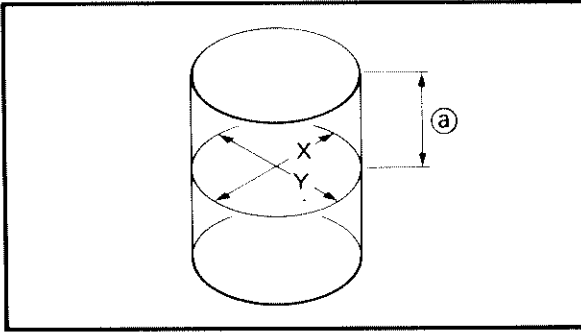
CYLINDER AND PISTON

1. Inspect:

- Cylinder and piston walls
Vertical scratches → Rebore or replace cylinder and piston.

2. Measure:

- Piston-to-cylinder clearance

**Measurement steps:****First step:**

- Measure the cylinder bore "C" with a cylinder bore gauge.

(a) 40 mm (1.57 in) from the cylinder top.

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"	59.00 ~ 59.01 mm (2.3228 ~ 2.3232 in)	59.15 mm (2.3288 in)

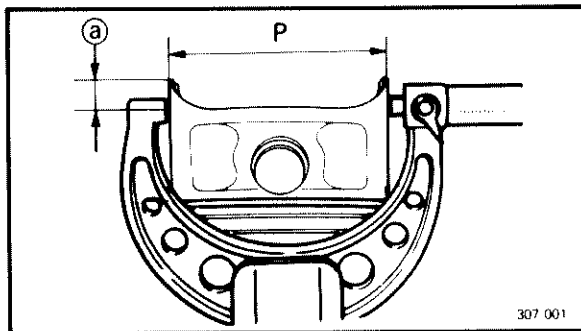
$$C = \frac{X + Y}{2}$$

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

2nd step:

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

(a) 5 mm (0.20 in) from the piston bottom edge.



	Piston size P
Standard	58.940 ~ 58.955 mm (2.321 ~ 2.322 in)
Oversize 2	59.5 mm (2.343 in)

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

3rd step:

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

$$\text{Piston-to-cylinder clearance} = \text{Cylinder bore "C"} - \text{Piston skirt diameter "P"}$$



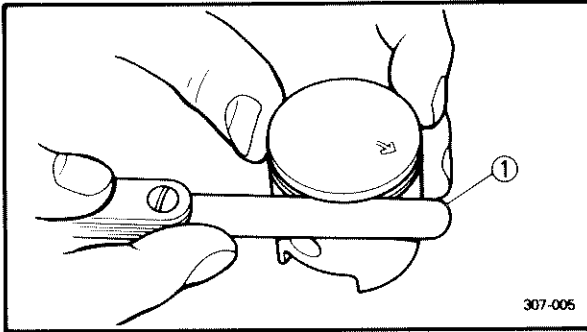
- If out of specification, rebore or replace cylinder, and replace piston and piston rings as a set.



Piston-to-cylinder clearance:

0.045 ~ 0.070 mm
(0.0018 ~ 0.0028 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:

Eliminate the carbon deposits from 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)

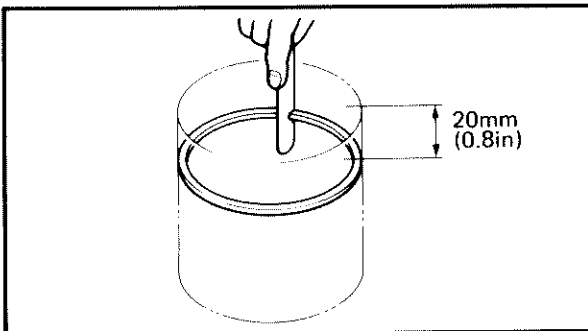
2. Position:

- 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

Use a feeler gauge.

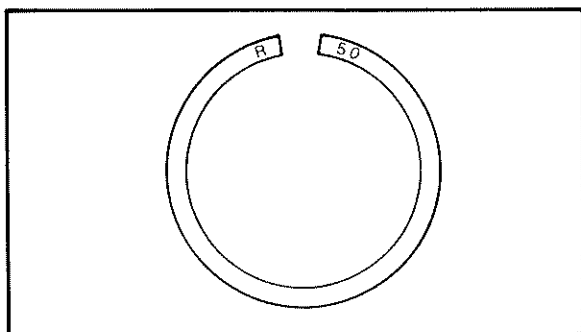
Out of specification → Replace.



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 ~ 0.6 mm (0.0079 ~ 0.0236 in)

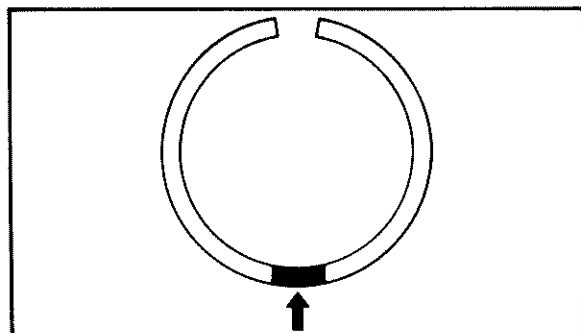


Piston ring oversize

- Top and 2nd piston ring

Oversize top and middle ring size is stamped on the top of ring.

Oversize 2	0.50 mm (0.0197 in)
------------	---------------------



- Oil control ring

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

Size	Color
Oversize 2	Red

PISTON PIN

1. Inspect:

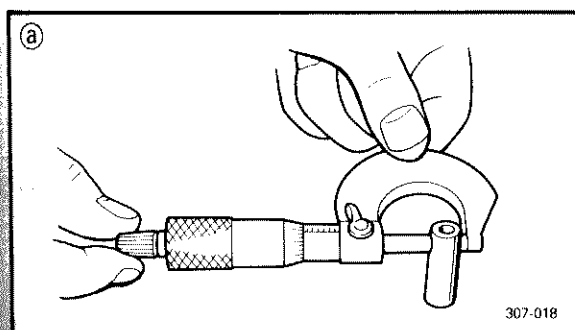
- Piston pin

Blue discoloration/Groove → Replace, then inspect lubrication system.

2. Measure:

- Outside diameter ① (piston pin)

Out of specification → Replace.

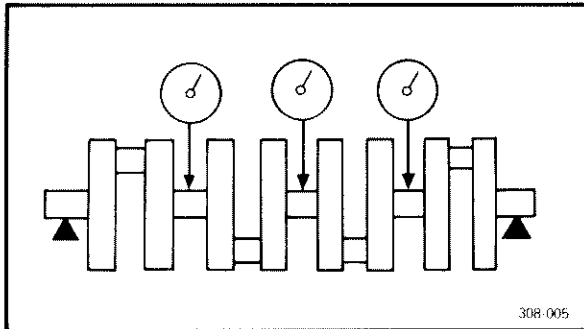
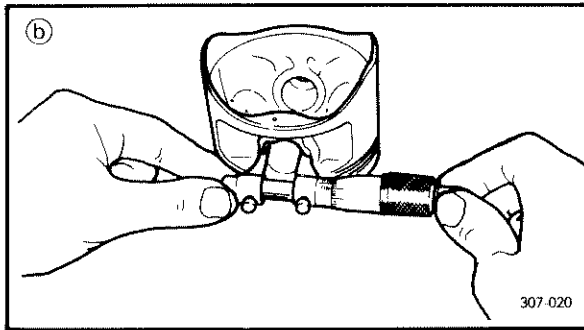


307-018



Outside diameter (piston pin):

15.991 ~ 16.000 mm
(0.6296 ~ 0.6300 in)



3. Measure:

- Piston pin-to-piston clearance (b)
Out of specification → Replace piston.

Piston pin-to-piston clearance =
bore size (piston pin) (b) –
outside diameter (piston pin) (a)



Piston pin-to-piston clearance:
0.002 ~ 0.022 mm
(0.0001 ~ 0.0009 in)

< Limit: 0.07 mm (0.003 in) >

CRANKSHAFT AND CONNECTING ROD

1. Measure:

- Runout (crankshaft)
Out of specification → Replace.



Runout:
Less than 0.03 mm (0.0012 in)

2. Inspect:

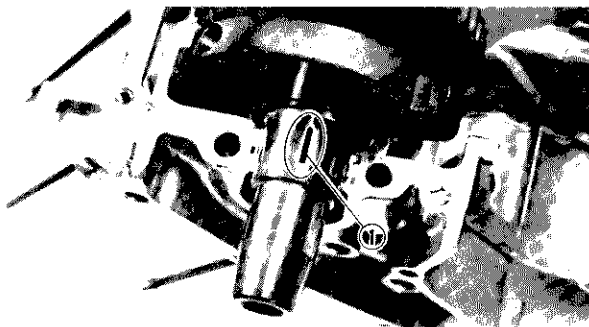
- Crankshaft bearing surfaces
Wear/Scratches → Replace.

Main journal oil clearance

1. Clean all parts.
2. Position:
 - Crankcase half (upper)
Place it on a bench in an upside down position.
3. Install:
 - Bearings
(into upper crankcase).
 - Crankshaft
4. Attach:
 - Plastigage® ①
(onto crankshaft journal surface).

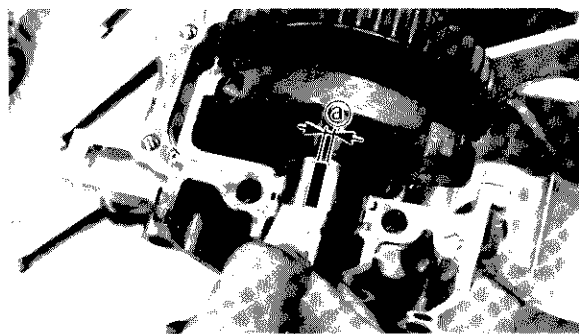
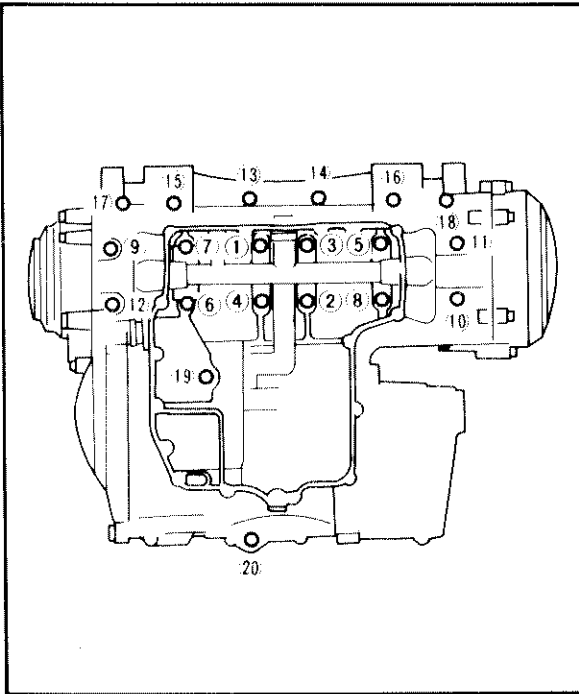
NOTE:

Do not turn the crankshaft until clearance measurement has been completed.



5. Install:

- Bearings
(into lower crankcase).
- Crankcase (lower)



6. Tighten:

- Bolts

⚠ CAUTION:

Tighten the bolts to specified torque. Tightening sequence is casted on the crankcase.



9 mm (0.35 in) bolt:
32 Nm (3.2 m · kg, 23 ft · lb)

7. Remove:

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

8. Measure:

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

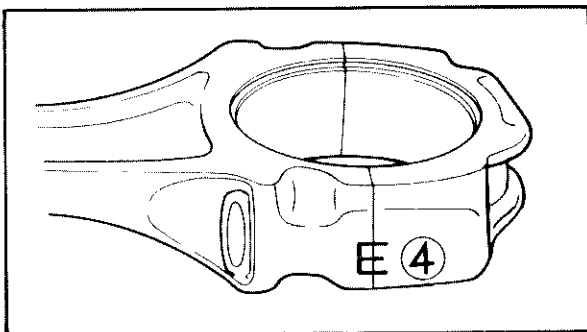
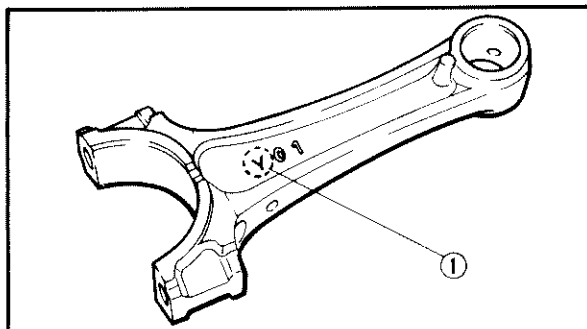
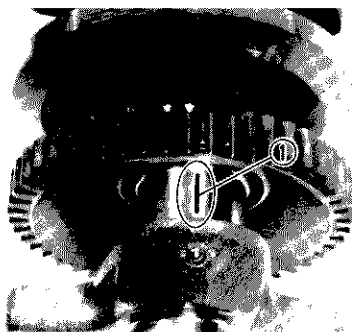


Main journal oil clearance:
0.020 ~ 0.044 mm
(0.0008 ~ 0.0017 in)

Connecting rod bearings

1. Inspect:

- Bearings
Burns/Flaking/Roughness/Scratches →
Replace.

**Connecting Rod Oil Clearance**

1. Clean all parts thoroughly.
2. Install:
 - Connecting rod bearings (into connecting rod and cap)
3. Attach:
 - Plastigage® ① (onto crank pin)
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:

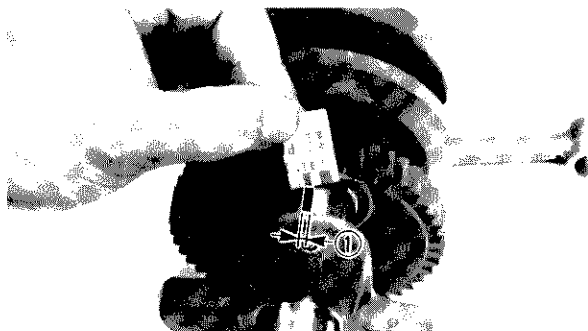
Do not turn the connecting rod until the clearance measurement has been completed.

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):
36 Nm (3.6 m·kg, 25 ft·lb)



7. Remove:

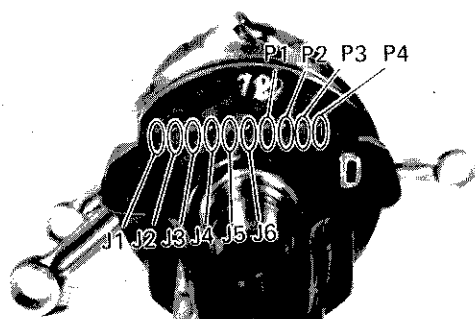
- Connecting rod cap
Use care in removing.

8. Measure:

- Width of Plastigage® ①
Out of specification → Replace the bearings and/or replace the crankshaft if necessary.



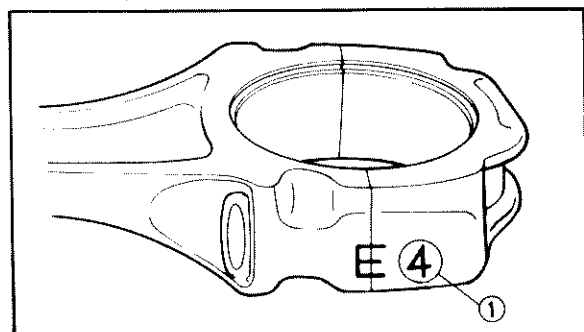
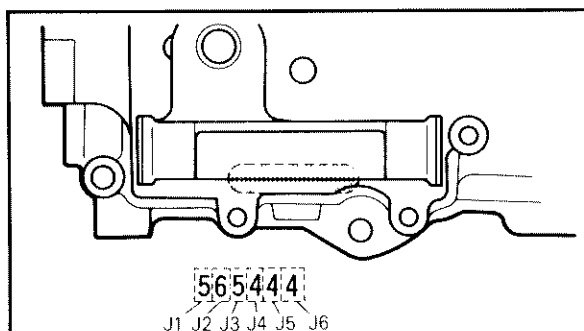
Crank pin oil clearance:
0.032 ~ 0.056 mm
(0.0013 ~ 0.0022 in)



Crankshaft main journal and crank pin bearing selection

- Numbers used to indicate crankshaft journal sizes are stamped on the LH crankweb. The first five (5) are main journal bearing numbers, starting with the left journal. The four (4) crank pin bearing numbers follow in the same sequence.

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

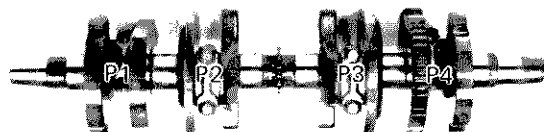
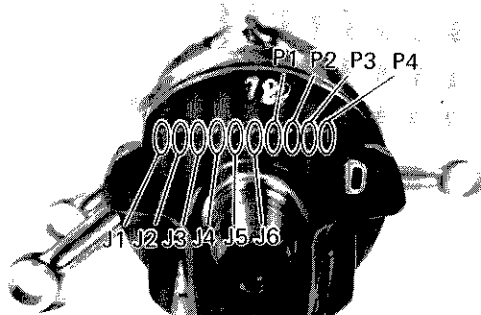


- The numbers are stamped in ink on the rod cap ①.

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 crank pin bearing:**

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

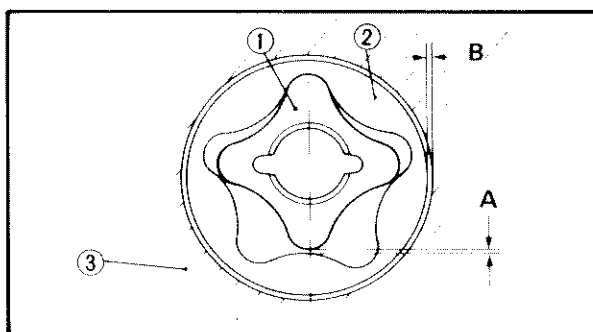
Bearing Size No. =

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:
0.15 mm (0.006 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:

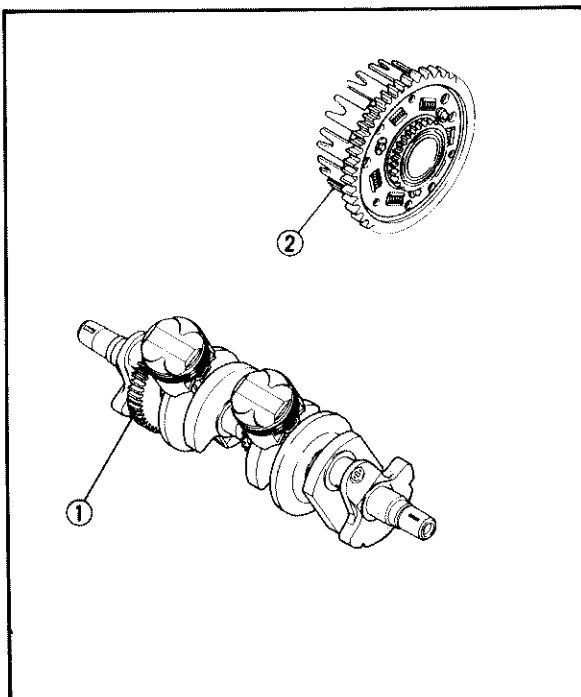
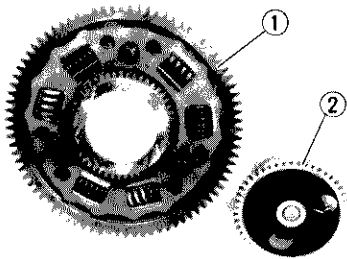
Align the pins in the pump shaft and the groove on the inner rotors dualing assembly.

4. Check:

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

5. Inspect:

- Oil pump drive gear ①
- Oil pump driven gear ②
- Wear/Cracks/Damage → Replace.



PRIMARY DRIVE

1. Inspect:

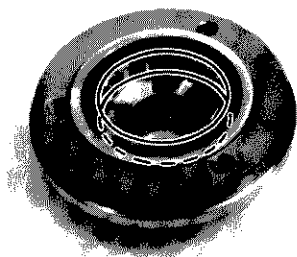
- Primary drive gear (crank shaft) ①
- Primary driven gear ②
- Wear/Damage → Replace both gears.
- Excessive noises during operation → Replace both gears.



STARTER DRIVES

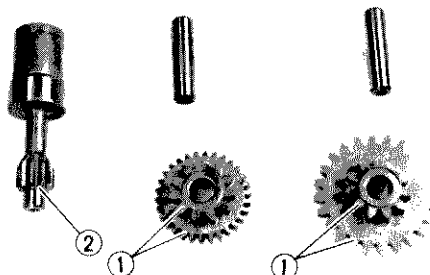
1. Inspect:

- Starter clutch roller
Wear/Damage → Replace.



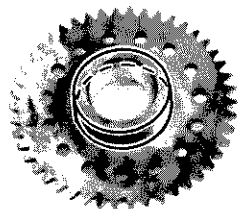
2. Inspect:

- Starter idle gear teeth ①
- Starter drive gear teeth ②
Burrs/Chips/Roughness/Wear → Replace.



3. Inspect:

- Contacting surfaces (starter clutch gear)
Pitting/Wear/Damage → Replace.

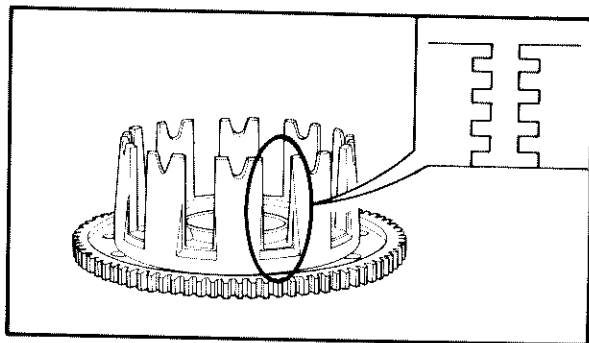


4. Check:

- Starter 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.

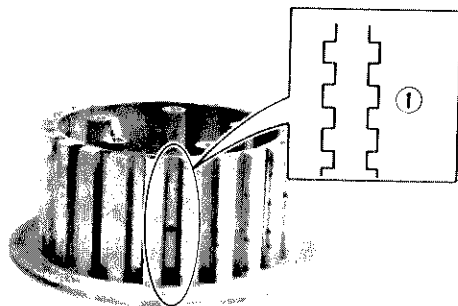
**CLUTCH****Clutch Housing**

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.

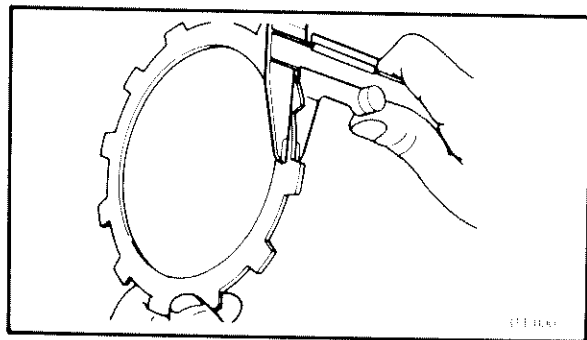
**Clutch Boss**

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:

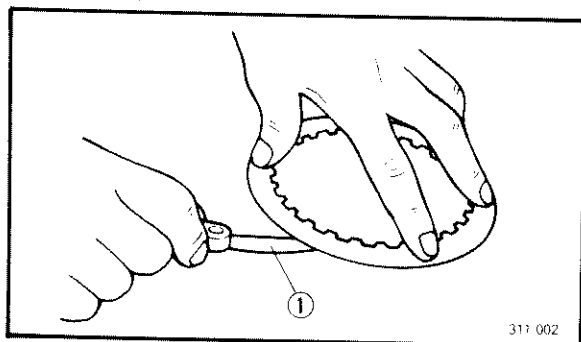
- Friction plate
Damage/Wear → Replace the friction plates as a set.

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)

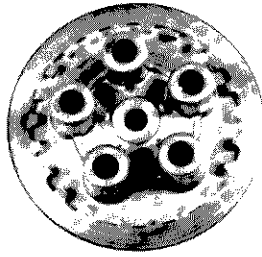
**Clutch Plates**

1. Measure:

- Clutch plate warp
Use the surface plate and feeler gauge ①.
Out of specification → Replace.

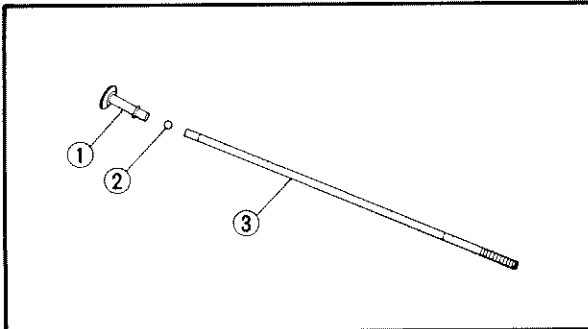


Warp limit:
0.1 mm (0.004 in)



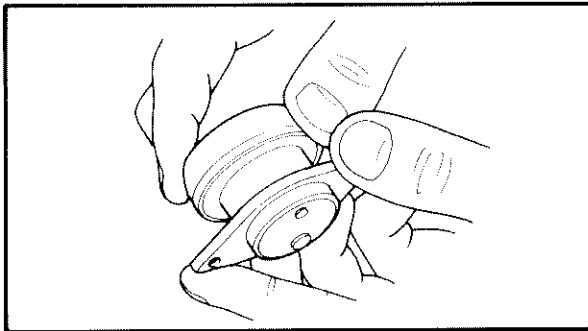
2. Inspect:

- Pressure plate
Damage → Replace.

**Push Rod**

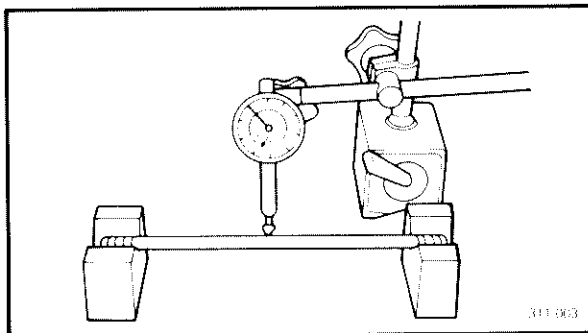
1. Inspect:

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

**Push lever assembly and push rod**

1. Inspect:

- Push lever assembly
Unsmooth → Replace.

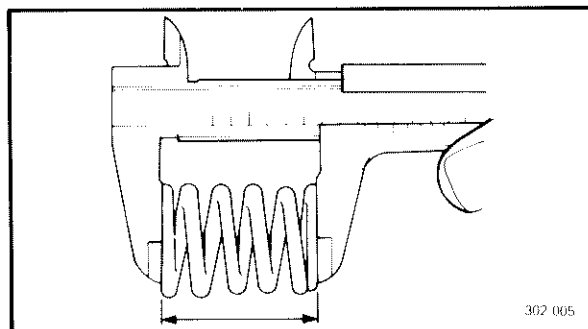


2. Measure:

- Push rod runout
Use the V-Blocks and dial gauge.
Out of specification → Replace.



Bending limit:
0.5 mm (0.020 in)

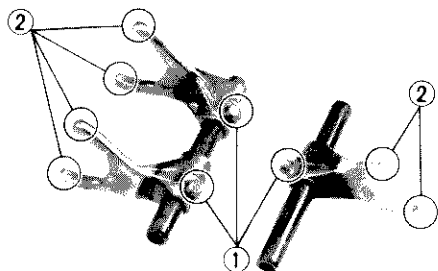
**Clutch spring**

1. Measure:

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



Clutch Spring Minimum Free Length:
32.6 mm (1.28 in)



TRANSMISSION Shift Fork

1. Inspect:

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

2. Inspect:

- Guide bar
- Roll the guide bar on a flat surface.
Bends → Replace.

WARNING:

Do not attempt to straighten a bent guide bar.

3. Check:

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

Shift Cam

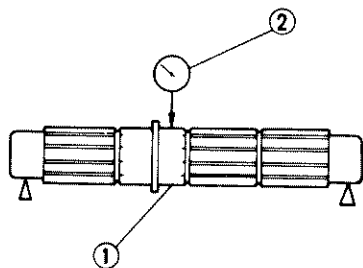
1. Inspect:

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

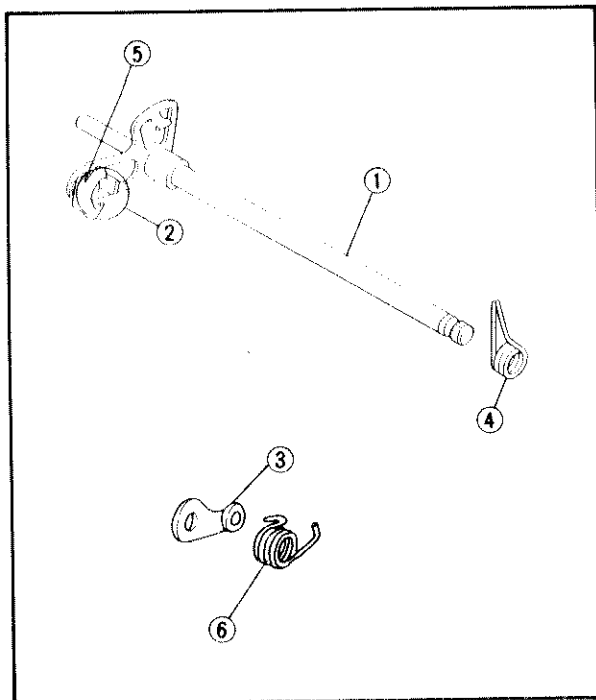
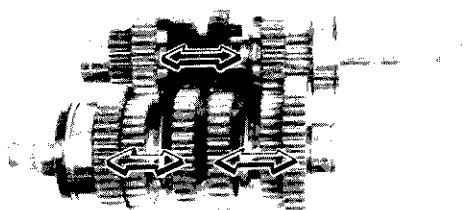
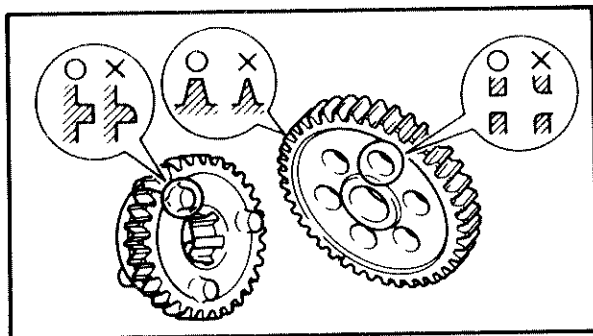
Main and Drive Axles

1. Measure:

- Axle runout (main and drive) ①
- Use the centering device and dial gauge ②.
Out of specification → Replace.



Runout limit:
0.08 mm (0.0031 in)



2. Inspect:

- Gear teeth
Blue discoloration/Pitting/Wear → Replace.
- Mated dogs
Rounded edges/Cracks/Missing portions → Replace.

3. Check:

- Proper gear engagement (each gear)
(to its counter part)
Incorrect → Reassemble.
- Gear movement
Roughness → Replace.

4. Inspect:

- Circlips
Damage/Looseness/Bends → Replace.

SHIFT SHAFT AND STOPPER LEVER

1. Inspect:

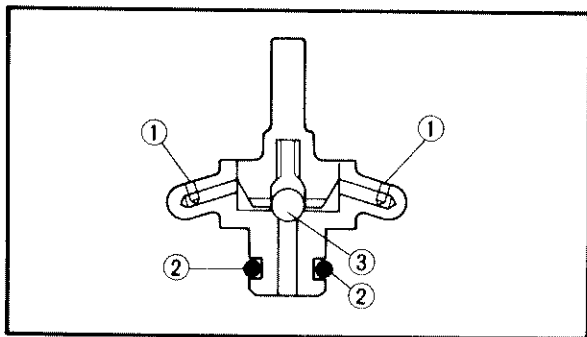
- Shift shaft ①
- Shift pawls ②
Bend/Wear/Damage → Replace.

2. Inspect:

- Stopper lever ③
Roller turns roughly → Replace.
Bend/Damage → Replace.

3. Inspect:

- Return spring (shift shaft) ④
- Return spring (shift pawls) ⑤
- Return spring (stopper lever) ⑥
Wear/Damage → Replace.

**OIL-JET NOZZLE**

1. Check:

- Oil-Jet nozzles ①
- O-rings ②
- Check ball ③
Damage/Wear → Replace.
- Oil jet passage
Clog → Blow out with compressed air.

RELIEF VALVE AND PIPE

1. Check:

- Relief valve body
- Cover
- Spring
- O-ring
Damage/Wear → Replace.

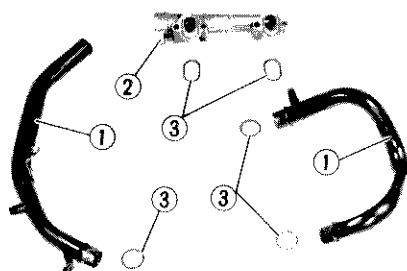
2. Check:

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

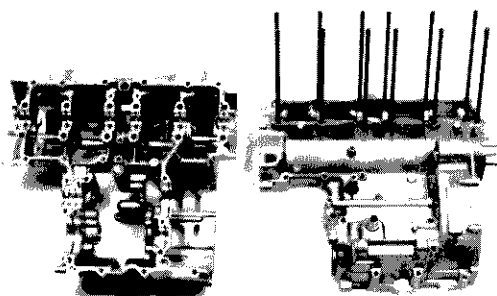


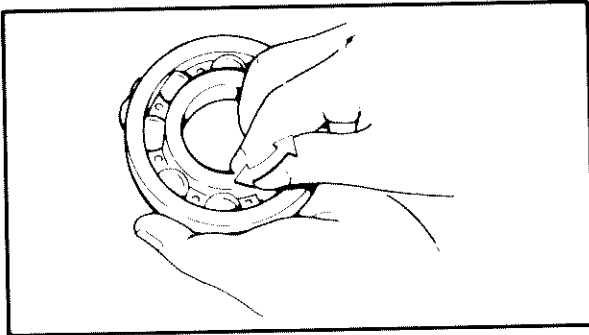
3. Check:

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

**CRANKCASE**

1. Thoroughly wash the case halves in mild solvent.
2. Clean all the gasket mating surfaces and crankcase mating surfaces thoroughly.
3. Inspect:
 - Crankcase
Cracks/Damage → Replace.
 - Oil delivery passages
Clog → Blow out with compressed air.



**BEARING AND OIL SEAL**

1. Inspect:

• Bearings

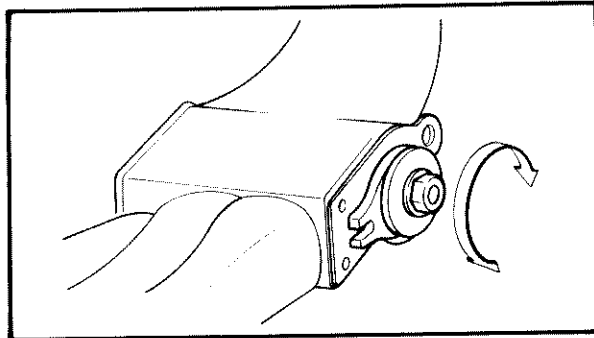
Clean and lubricate, then rotate inner race with finger.

Roughness → Replace the bearing (see Removal).

2. Inspect:

• Oil seals

Damage/Wear → Replace the (see Removal).

**EXUP VALVE AND CABLES
(FZR600WC ONLY)**

1. Check:

• EXUP valve smooth movement

Sticks → Repair or replace.

• EXUP cables

Sticks/Damage → Replace.

2. Inspect:

• Valve (EXUP) ①

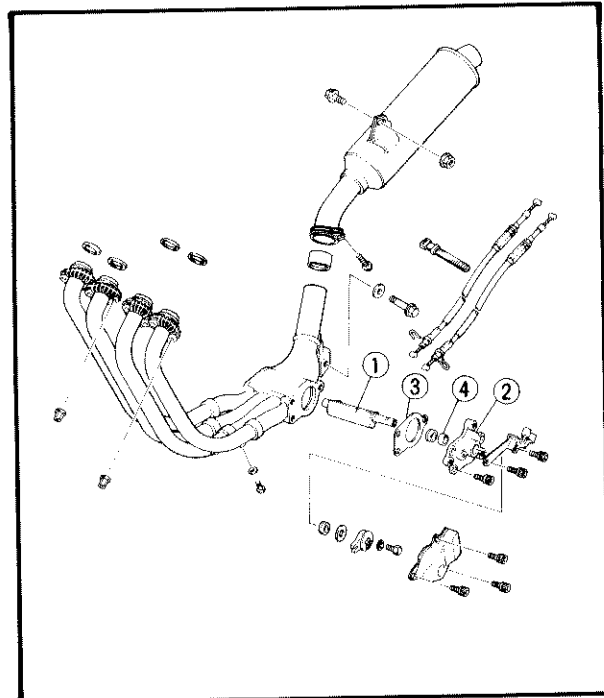
• Housing (valve) ②

• Gasket (steel) ③

Wear/Cracks/Damage → Replace.

• Bush ④

Wear → Replace.

**NOTE:**

When installing the valve (EXUP), apply the molybdenum disulfide grease on the valve.



ENGINE ASSEMBLY AND ADJUSTMENT

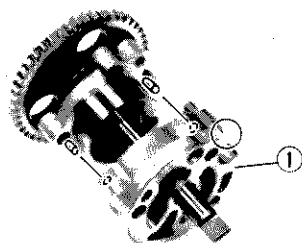
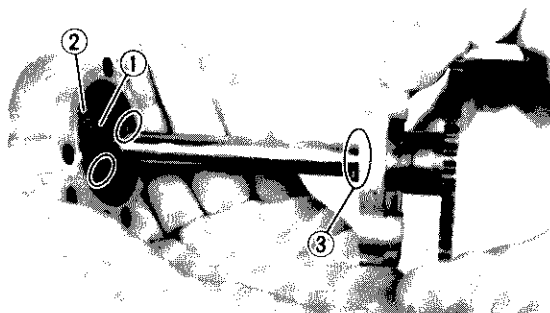
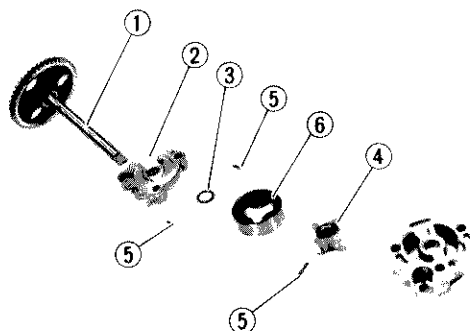
INNER ROTOR (OIL PUMP)

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 ①

CONNECTING ROD

1. Clean:

- Crankshaft
- Connecting rods

2. Install:

- Connecting rod bearings
(into the connecting rod and cap.)

NOTE:

- Align the projection of bearing with the groove of cap.
- Identify each bearing position very carefully so that it can be reinstalled in its original place.

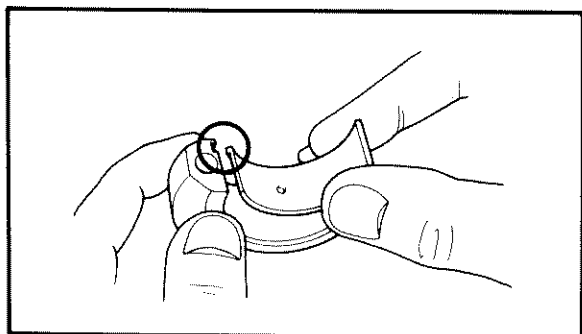
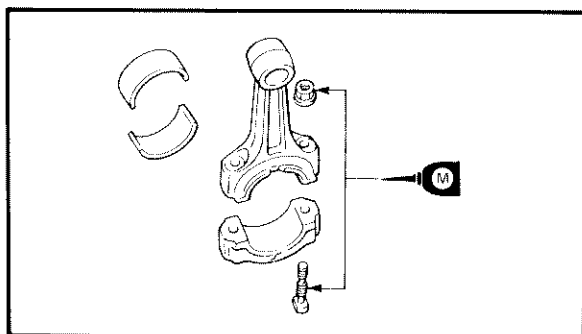
3. Lubricate:

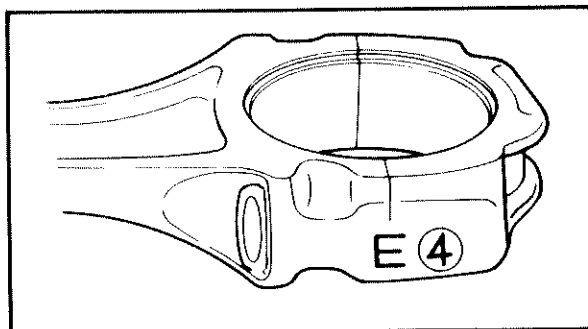
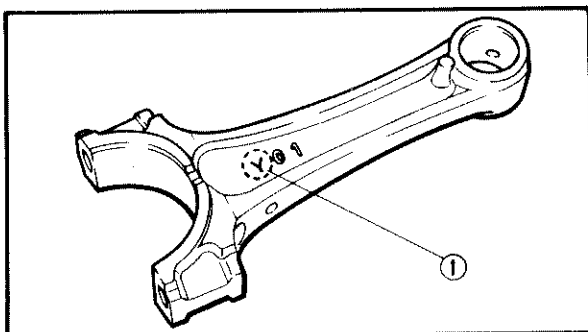
- Connecting rod bolt threads
- Connecting rod nuts



Molybdenum disulfide oil

- 4. Apply engine oil to the crankshaft pins.





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 ① and connecting rod cap.

7. Tighten:

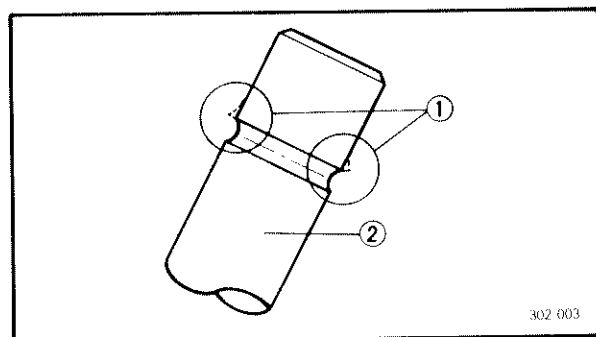
- Connecting rod nuts

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.



Nut (connecting rod):
23 Nm (2.3 m·kg, 17 ft·lb)



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

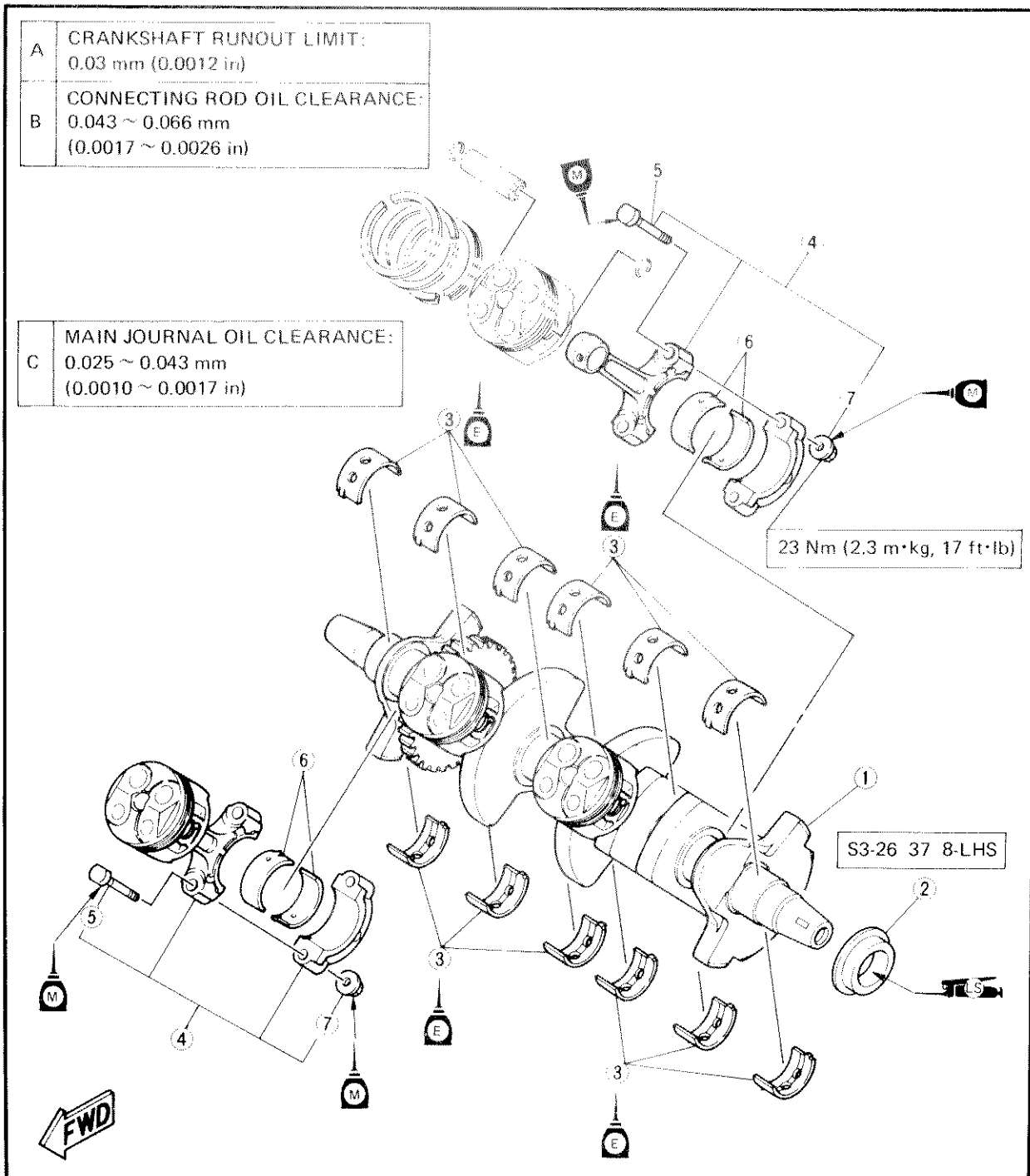


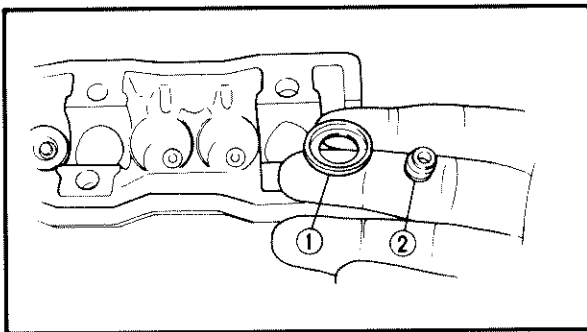
CRANKSHAFT

- 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 OIL CLEARANCE: 0.043 ~ 0.066 mm (0.0017 ~ 0.0026 in)

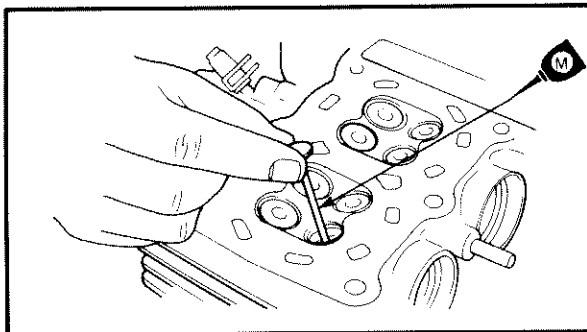
C	MAIN JOURNAL OIL CLEARANCE: 0.025 ~ 0.043 mm (0.0010 ~ 0.0017 in)
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2. Install:

- Valve retainer ①
- Oil seal ②

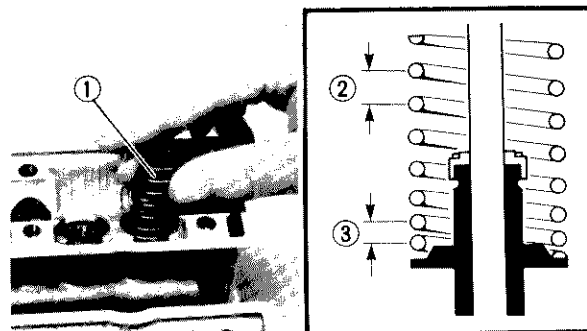


3. Install:

- Valve

NOTE:

Apply molybdenum disulfide oil.



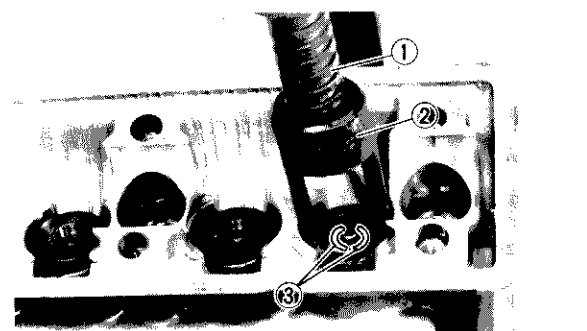
4. Install:

- 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

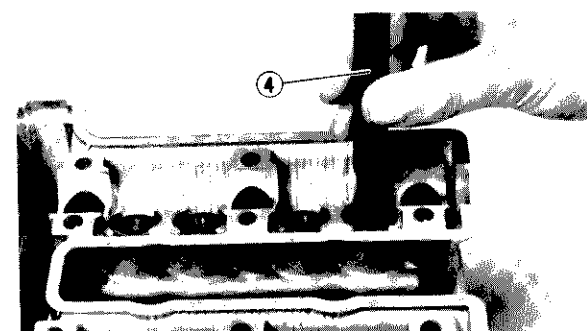


Valve spring compressor:

YM-04019
90890-04019

Attachment:

YM-04108
90890-04108



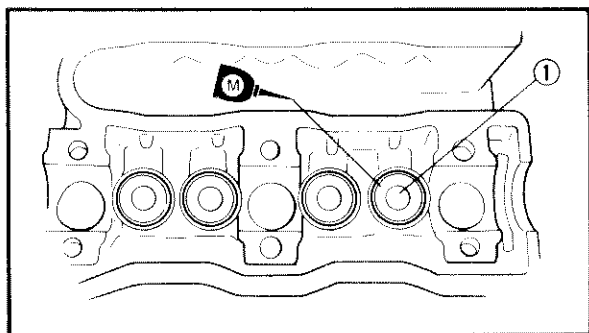
6. Install:

- Valve cotteners ③

7. Settle the valve cotter by lightly patting the valve seat with a piece of wood ④ in between.

NOTE:

Do not hit so much as to damage the valve.

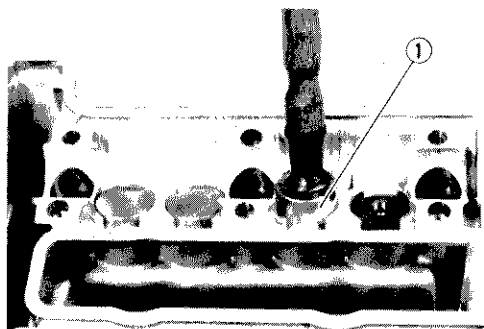


8. Install:

- Valve pads ①

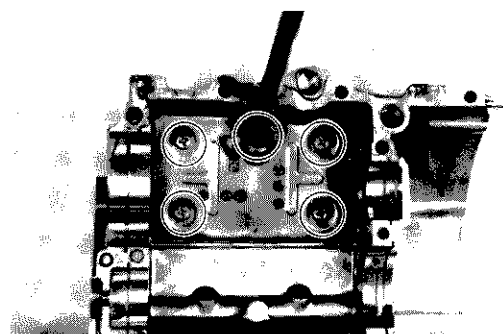
NOTE:

Apply molybdenum disulfide oil.



9. Install:

- Lifters ①



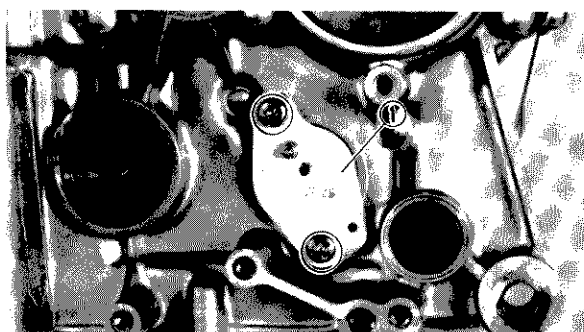
CRANKSHAFT

1. Install:

- Oil baffle plate
- Breather hose

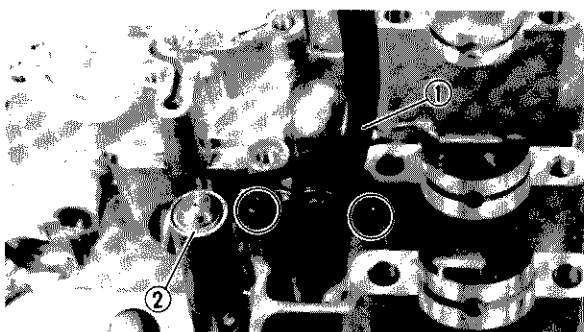


Oil baffle plate bolts:
7 Nm (0.7 m · kg, 5.1 ft · lb)



2. Install:

- Neutral switch assembly ①



3. Install:

- Timing chain guide (intake side) ①
- O-ring ②

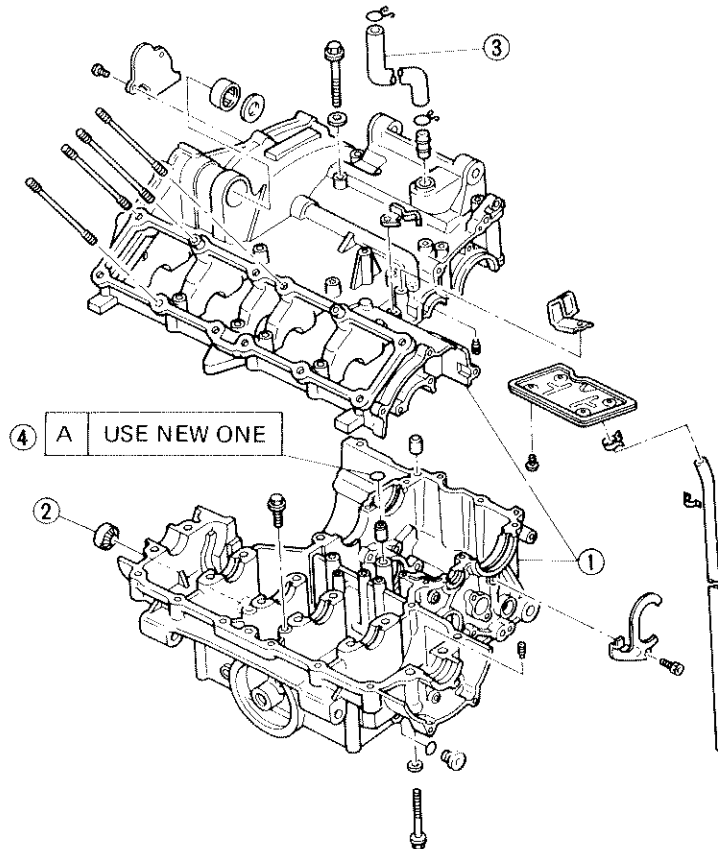


Bolts (chain guide):
10 Nm (1.0 m · kg, 7.2 ft · lb)

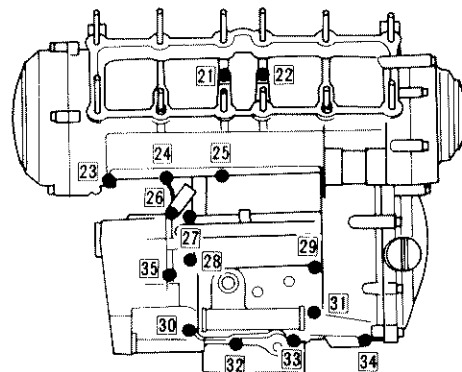
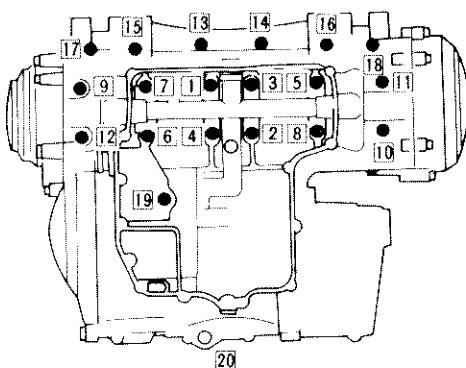


CRANKCASE

- ① Crankcase assembly
 - ② Oil level window
 - ③ Crankcase ventilation hose
 - ④ O-ring
- [A] Crankcase sequence tightening



A



① ~ ⑫, ③⑤

24 Nm (2.4 m·kg, 17 ft·lb)

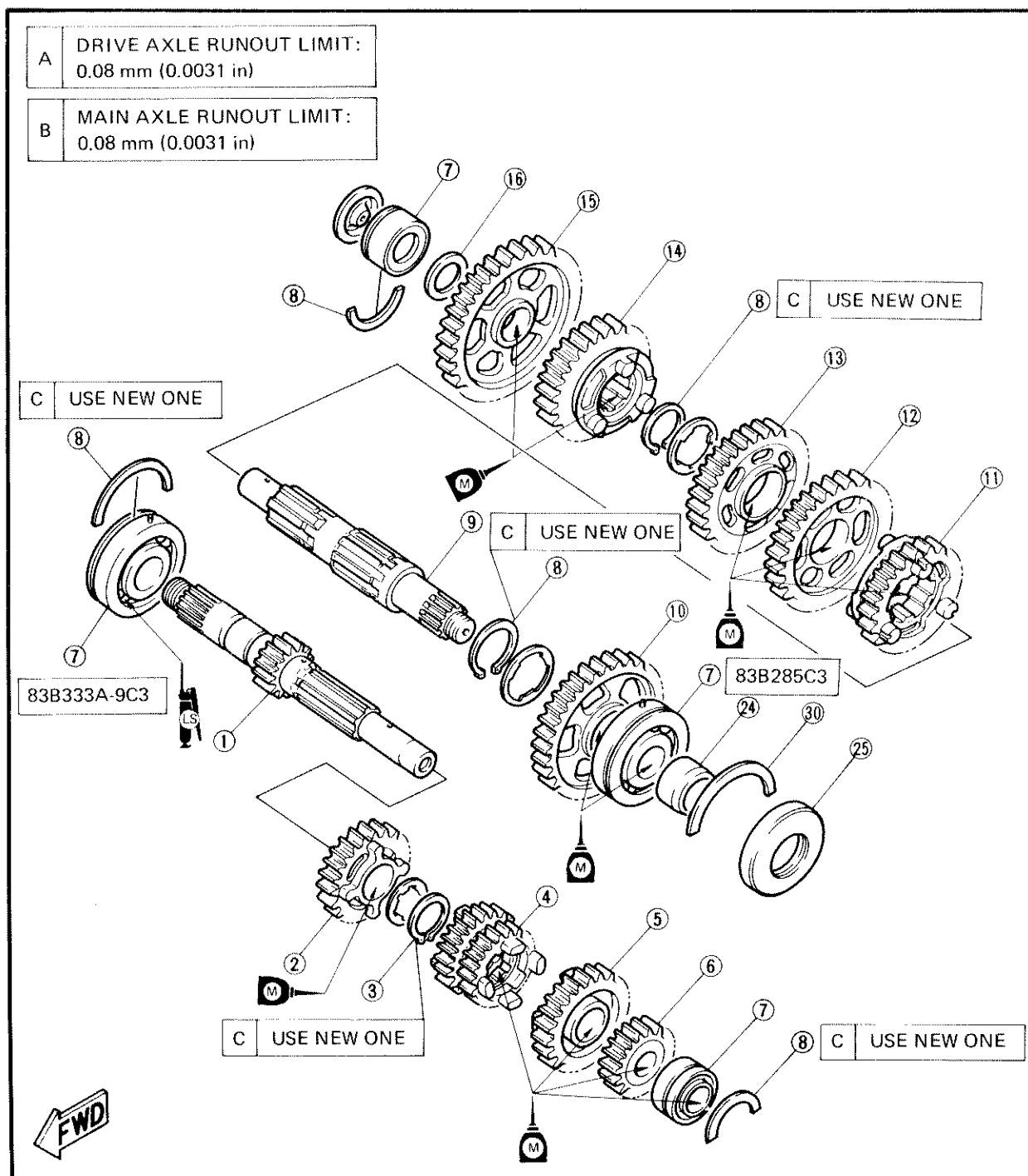
⑬ ~ ⑲, ③① ~ ③⑤

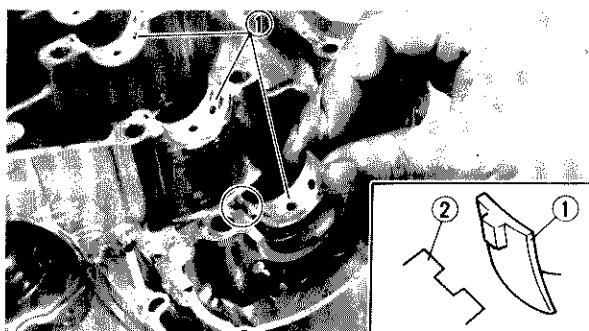
12 Nm (1.2 m·kg, 8.7 ft·lb)



TRANSMISSION

- | | |
|-------------------|------------------|
| ① Main axle | ⑨ Drive axle |
| ② 5th pinion gear | ⑩ 2nd wheel gear |
| ③ Circlip | ⑪ 6th wheel gear |
| ④ 3rd pinion gear | ⑫ 3rd wheel gear |
| ⑤ 6th pinion gear | ⑬ 4th wheel gear |
| ⑥ 2nd pinion gear | ⑭ 5th wheel gear |
| ⑦ Bearing | ⑮ 1st wheel gear |
| ⑧ Circlip | ⑯ Washer |
| | ⑰ Special washer |



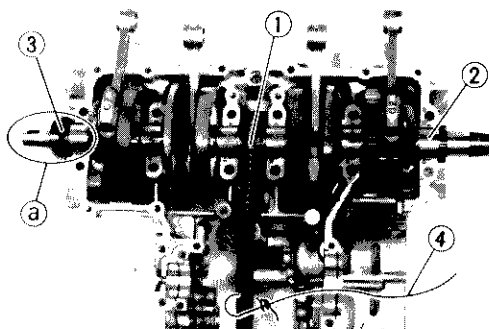


4. Install:

- Main journal bearing ①
- (to crankcase (lower) ②)

NOTE:

- Apply engine oil.
- Identify each bearing position very carefully so that it can be reinstalled in its original place.

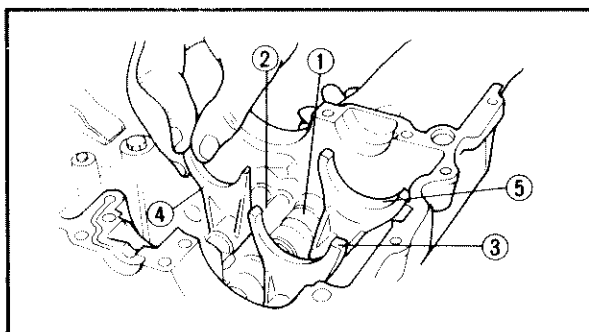


5. Install:

- Timing chain ①
- (onto the crankshaft)
- Crankshaft assembly ②

NOTE:

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



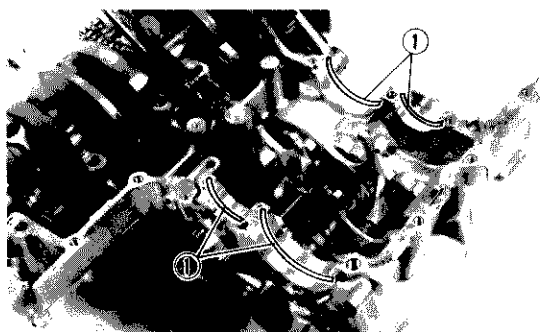
TRANSMISSION, SHIFTER AND SHIFT CAM

1. Install:

- Shift cam assembly ①
- Guide bars 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.

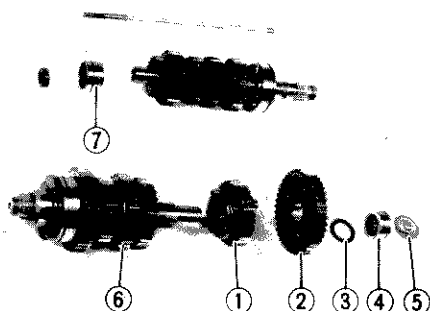


2. Install:

- Circlip (new) ①
(to crankcase (lower))

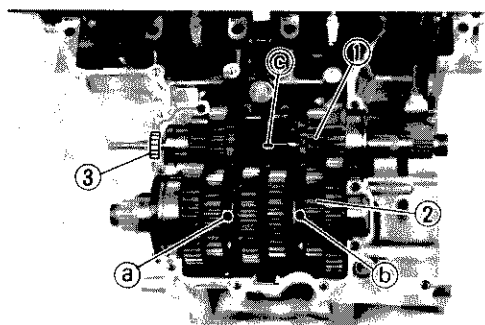
NOTE:

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



3. Install:

- 4th wheel gear ①
- 1st wheel gear ②
- Washer ③
- Bearing ④
- Special washer ⑤
(to drive axle ⑥)

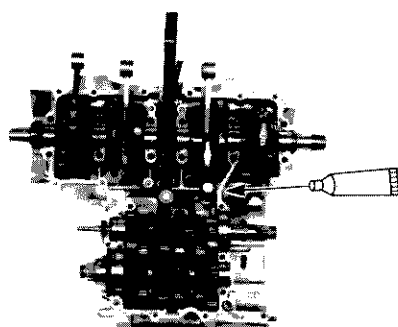
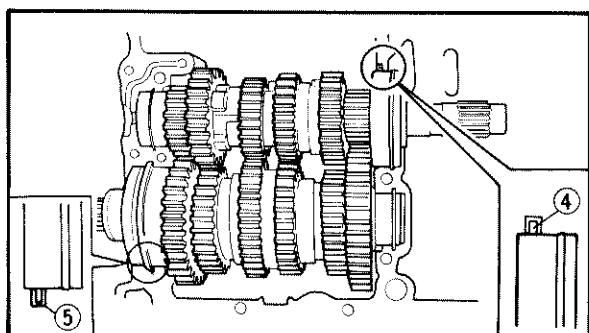


4. Install:

- Main axle assembly ①
- Drive axle assembly ②
- Oil seal (push rod) ③

NOTE:

- Be sure the manufacture mark on oil seal (push rod) face outward.
- Be sure the main axle bearing pin ④ should face to front and the drive axle bearing pins ⑤ should face to rear.
- Be sure the circlips are inserted into the bearings positioning groove.
- Mesh the shift fork #1 with the 4th wheel gear (a) and #3 with the 5th wheel gear (b) on the drive axle.
- Mesh the shift fork #2 with the 3rd pinion gear (c) on the main axle.
- Carefully guide the shift forks so that they mesh smoothly with transmission gears.

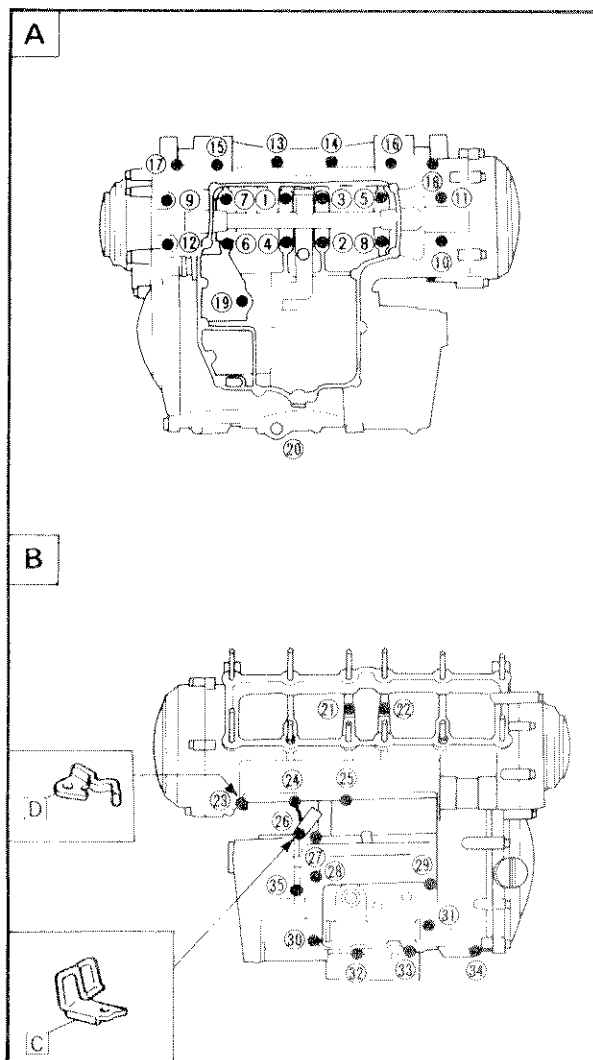
**CRANKCASE ASSEMBLY**

1. Apply:

- Yamaha bond No. 1215 or Quick gasket®
(to crankcase matching surfaces.)



Yamaha bond No. 1215:
P/N 90890-85505
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]
- Clamp (big) [C]
- Clamp (small) [D]

(follow the proper tightening sequence.)



8 mm bolt ① ~ ⑫ ③⑥ :

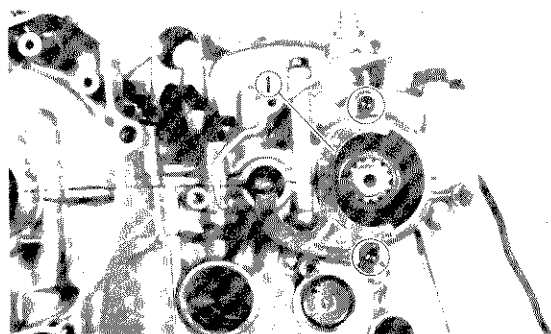
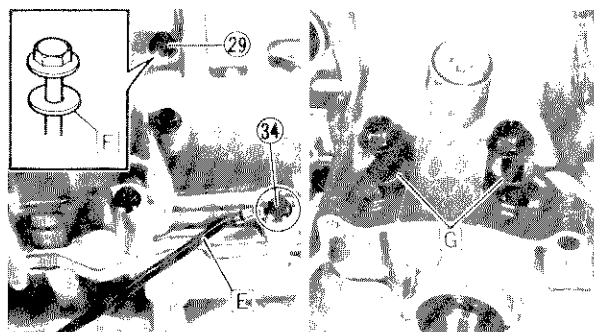
24 Nm (2.4 m·kg, 17 ft·lb)

6 mm bolt ⑬ ~ ⑲ ③① ~ ③⑤ :

12 Nm (1.2 m·kg, 8.7 ft·lb)

NOTE:

- Install the ground lead [E] on bolt No. ③④.
- Install the copper washer [F] on bolt No. ②⑨.
- Install the washer [G] on bolt No. ① ~ ⑫.



3. Install:

- Oil seal stopper ①



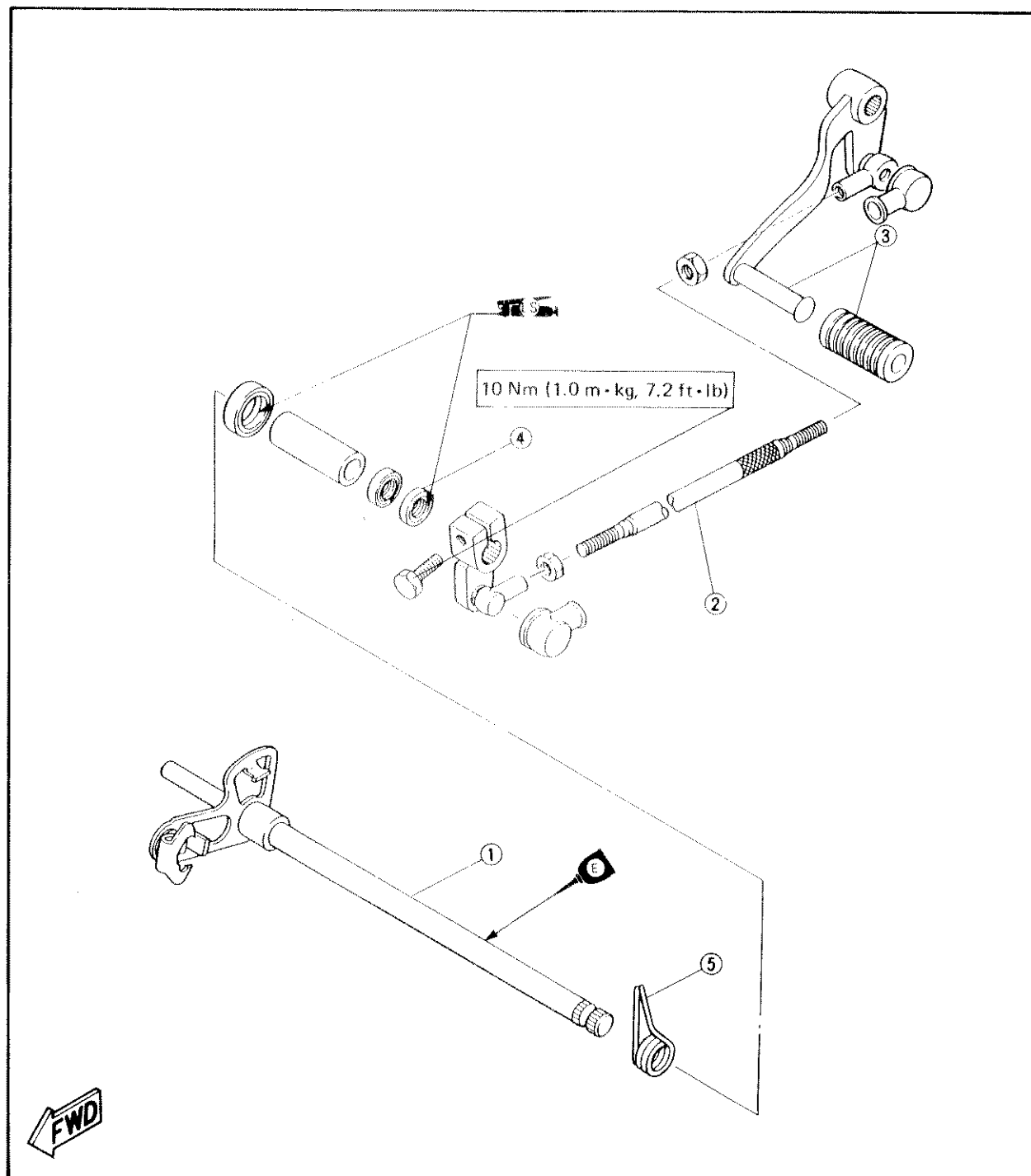
Bolts (oil seal stopper):

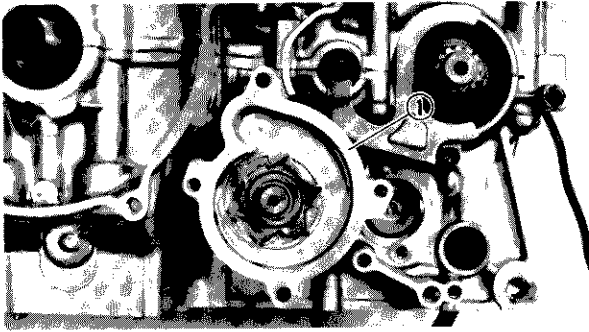
10 Nm (1.0 m·kg, 7.2 ft·lb)



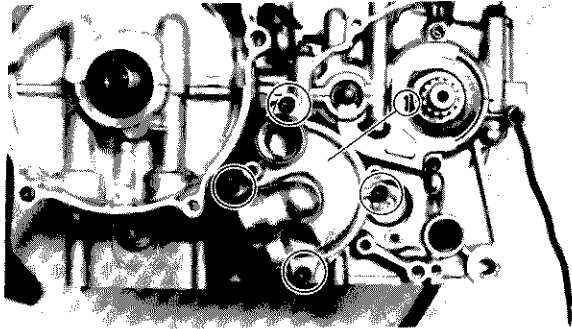
SHIFT SHAFT

- ① Shift shaft
- ② Change link shaft
- ③ Change pedal
- ④ Oil seal
- ⑤ Spring



**WATER PUMP****1. Install:**

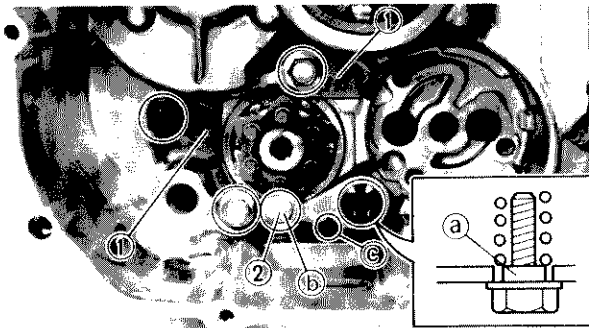
- Water pump housing ①

**2. Install:**

- O-ring (new)
- Water pump cover ①



Bolts (water pump cover):
10 Nm (1.0 m · kg, 7.2 ft · lb)

**SHIFT SHAFT AND OIL PUMP****1. Install:**

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

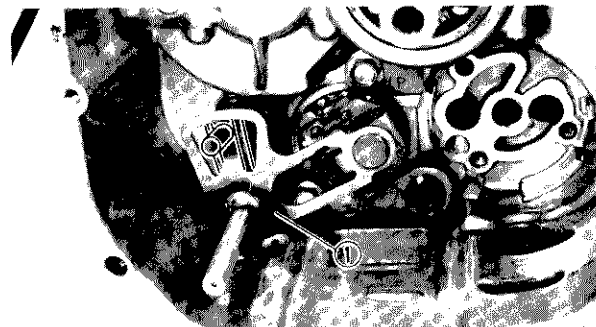


Bolts (stopper plate):
10 Nm (1.0 m · kg, 7.2 ft · lb)
Use LOCTITE®

Bolt (stopper lever):
10 Nm (1.0 m · kg, 7.2 ft · lb)
Use LOCTITE®

NOTE:

- Install the boss ③ of the bolt (stopper lever) into the stopper lever hole correctly.
- Mesh the stopper lever roller ② with the shift cam stopper.
- Hook the spring ends on the stopper lever and crankcase boss ③.

**2. Install:**

- Shift shaft assembly ①

NOTE:

- Insert the stopper between spring ends.
- Apply the grease to the oil seal lip.