

SERVICE CHECK/ADJUSTMENT

1. Oil Filter Element Replacement

Remove the left-hand crankcase cover (2), remove the oil filter element mounting bolt and screws, and remove the oil filter element.

Caution

Whenever the oil filter element has been replaced, the "O" rings must also be replaced with new ones. Be sure to tighten the oil filter cover mounting bolt with correct torque.

Tighten Torque: 2.8 ~ 3.0 kg-m (252 - 270 in-lbs)

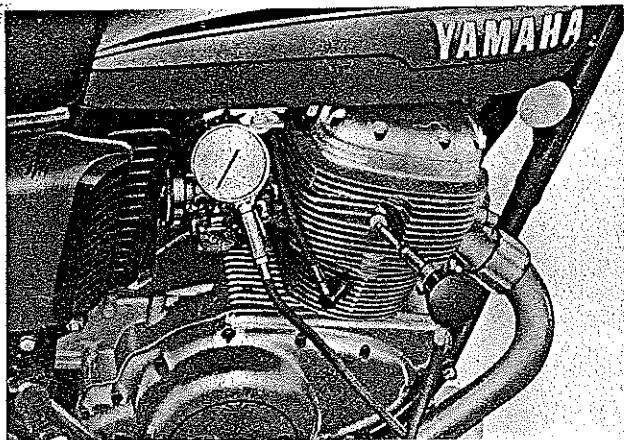
2. Carburetor Adjustment

To check whether both carburetor operate correctly, measure the vacuum in each carburetor.

(Refer to page 77,78)

3. Cylinder Compression Check

- a) Low cylinder compression means that the combustion area is not sealing correctly. A leakage exists at one of the following points: Past one of the valves; out a defective gasket; through a warped head; down past the rings.



- b) Remove both spark plugs and screw the compression gauge adaptor tightly into either spark plug hole.
- c) Twist the throttle grip FULLY OPEN and kick the engine over several times.
- d) With 5 or 6 full kicks the gauge should register 10.5 kg/cm² (145 lbs/in²), but it could measure as low as 9.5 kg/cm² (130 lbs/in²) and still be considered adequate. If compression reads lower than 9.5 kg/cm² (130 lbs/in²), then a failure has occurred to one of the parts directly associated with the combustion chamber.

- e) If cylinder compression reads more than 10.5 kg/cm² (145 lbs/in²), then carbon has built up on the combustion chamber or piston crown, reducing combustion chamber volume. This in turn creates a higher compression ratio. This situation must be corrected by decarbonizing or excessive heat will develop.

- f) Perform steps c) through e) on the other cylinder.

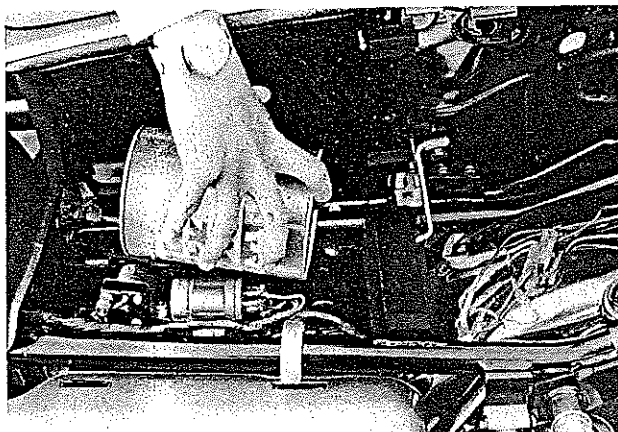
4. Engine Oil Replacement

- a) First warm up the engine for a few minutes, then remove the crankcase drain bolt and the oil tank drain bolt.

Note:

To drain the oil, the motorcycle must be placed on a level ground, with the stand upright.

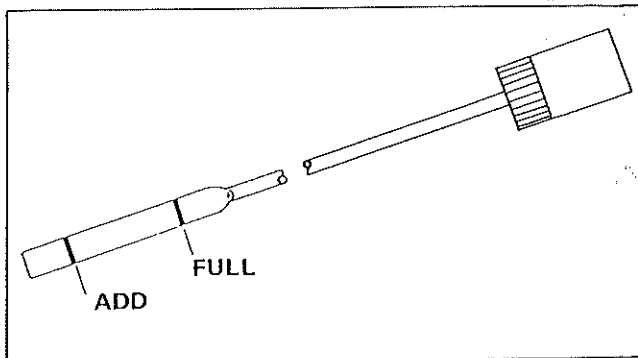
- b) Fully tighten the drain bolts and feed 2 liters (2 qts) of oil through the oil tank filter.



- c) Start the engine, run at idle speed and check oil tank level with gauge. After 2 ~ 3 minutes operation. Add oil as necessary until level is correct.

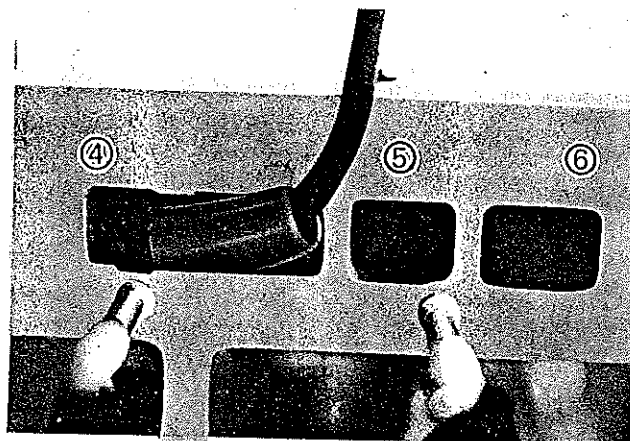
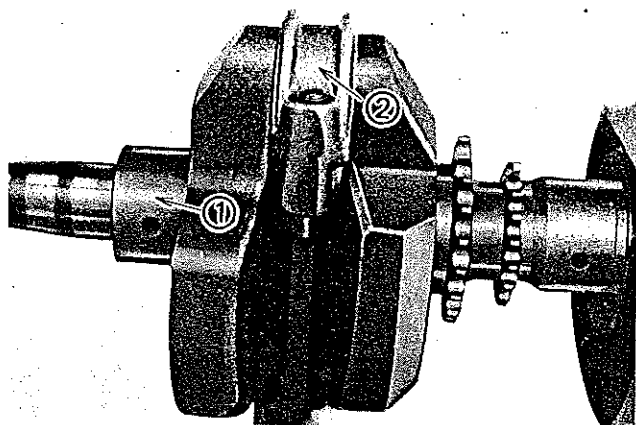
Note:

The engine must be run at idling speed for this operation.



This allows for a standard clearance, when all securing bolts are properly torqued, of: 3.7 ~ 4.0 kg-m

ITEM	NOMINAL	WEAR LIMITS
Crankshaft/Case Journal	0.036mm to 0.059mm	If the oil clearance is beyond 0.0032 in. (0.08mm), the bearing should be replaced with new part.
Connecting Rod/Crank Pin Journal	0.034mm to 0.057mm	



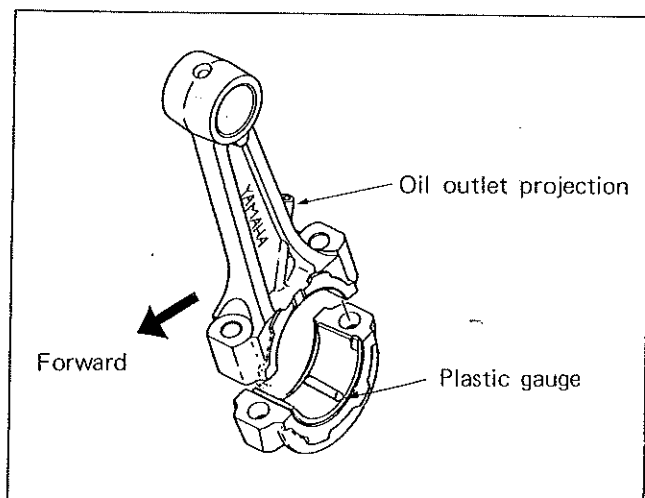
Installation

Bearing clearance measurement

Place the plastic gauge (a thin wire-shaped gauge) in the center of the bearing cap, and tighten the housing with the specified torque. Determine the bearing clearance by measuring the thickness of the flattened plastic gauge.

Caution

Install the connecting rod on the crankshaft, with the oil outlet projection toward the rear of the motorcycle. (See the illustration below.)



- 2) Clean the crank pin, and oil it amply. Then install the connecting rod with the oil outlet projection toward the intake valve and with the arrow mark on the connecting cap facing.
Cap bolt tightening torque is 3.7~4.0 kg-m. (330~360 in-lbs.)

After installation, apply a MOLYBDENUM oil to the threaded portion of each cap bolt. Tighten the cap bolts gradually to 3.7~4.0 kg-m. Make sure that the connecting rod rotates smoothly.

- 1) Thoroughly clean the connecting rod big end housing and inserts, and install the inserts in the housing by pushing them in.

Handling of the Plain Bearings (Inserts)

The inserts must be handled with special care, and the following three points must be adhered to.

1. Keep the inserts free from dust.
2. Take care not to scratch their mating surfaces during the installation and removal operations.
3. After installation, be sure to oil them amply.

Selection of Inserts for Proper Fit

There are five types of bearings (inserts) available, and they must be selected according to the crankcase housing diameter and crankshaft journal diameter, or according to the crank pin diameter, crankshaft journals diameter and crankcase housing diameter.

On the TX750, the inserts are selected in the following manner.

Crankshaft Inserts

The crankcase housing diameters are numbered 4, 5 and 6, respectively, and these numbers are engraved on the crankcases. On the other hand, the crankshaft journals are numbered 1, 2 and 3, respectively, and these numbers are shown on the crank webs.

The inserts can be selected by the following formula:

Housing No. minus (—) Journal No. = Insert Metal No.

Example: If housing No. is 4 and journal No. is 1, the insert should be $4 - 1 = 3$.
Each insert is marked with 1, 2, 3, 4 or 5 on the seat side.

Crankcase	—	Crankshaft	=	Insert
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Connecting rod big end inserts

The connecting rod big end inserts should be selected in the same manner.

The housing is marked 4, 5 or 6, while the crankshaft journal is numbered 1, 2 or 3 on the crank web.

See table below.

	Center thickness T	Housing diameter	No.	Shaft diameter	No.	Oil clearance
BEARING 1	1.5 $\begin{smallmatrix} +0.001 \\ -0.003 \end{smallmatrix}$	41 $\begin{smallmatrix} \phi +0.024 \\ +0.016 \end{smallmatrix}$	4	38 $\begin{smallmatrix} \phi +0.001 \\ -0.008 \end{smallmatrix}$	1	0.034~0.057
BEARING 2	1.5 $\begin{smallmatrix} -0.003 \\ -0.007 \end{smallmatrix}$	41 $\begin{smallmatrix} \phi +0.016 \\ +0.008 \end{smallmatrix}$	5	38 $\begin{smallmatrix} \phi -0.009 \\ -0.016 \end{smallmatrix}$	2	0.034~0.057
BEARING 3	1.5 $\begin{smallmatrix} -0.007 \\ -0.011 \end{smallmatrix}$	41 $\begin{smallmatrix} \phi +0.008 \\ +0 \end{smallmatrix}$	6	38 $\begin{smallmatrix} \phi -0.017 \\ -0.024 \end{smallmatrix}$	3	0.034~0.057
BEARING 4	1.5 $\begin{smallmatrix} -0.001 \\ -0.055 \end{smallmatrix}$					
BEARING 5	1.5 $\begin{smallmatrix} -0.015 \\ -0.019 \end{smallmatrix}$					

The insert should be selected by the following formula:

Housing No. minus (—) Journal No. = Metal No.

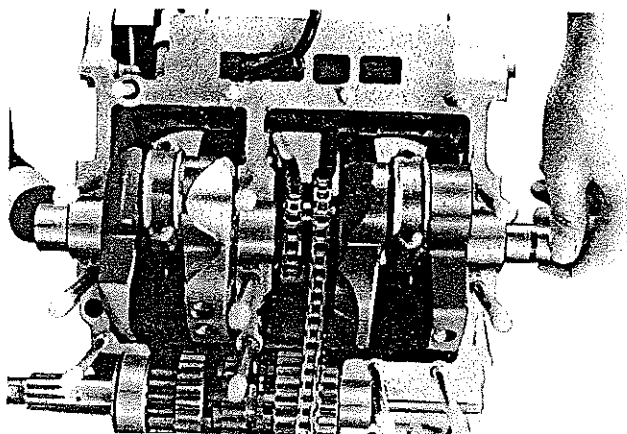
Example: If housing No. is 6 and journal No. is 2, the insert should be $6 - 2 = 4$.
That is, insert No. is 4.

Crankshaft Ass'y

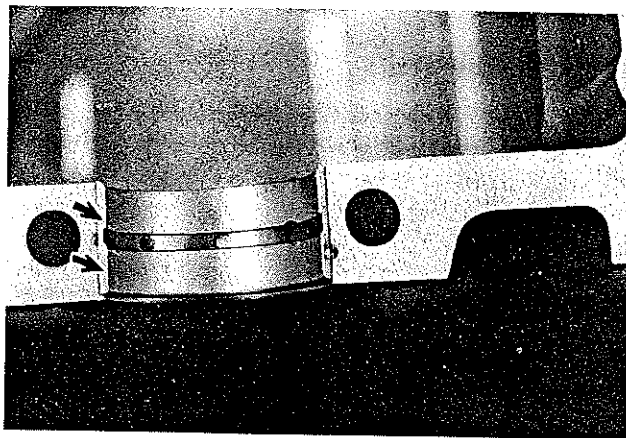
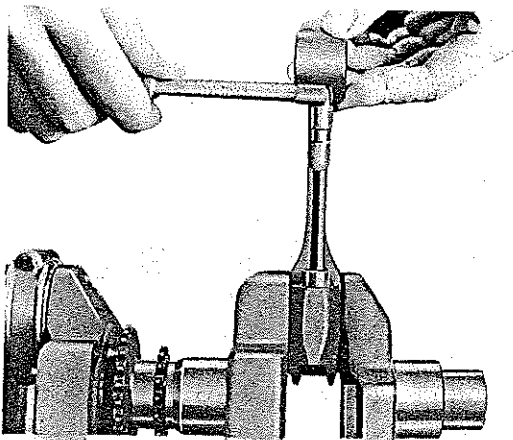
The crankshaft is a one piece forging to ensure high rigidity and easy accessibility for maintenance. It is designed for 360° ignition. The bearings, are of split type, and the connecting rod big end is also split into two sections. In addition to the cam chain sprocket, the balancer drive sprocket is provided.

Disassembly

- 1) Remove the crankshaft ass'y by tapping the crankshaft with a soft-faced hammer.



- 2) Remove the connecting rod by use of an internal hexagon wrench.



Inspection

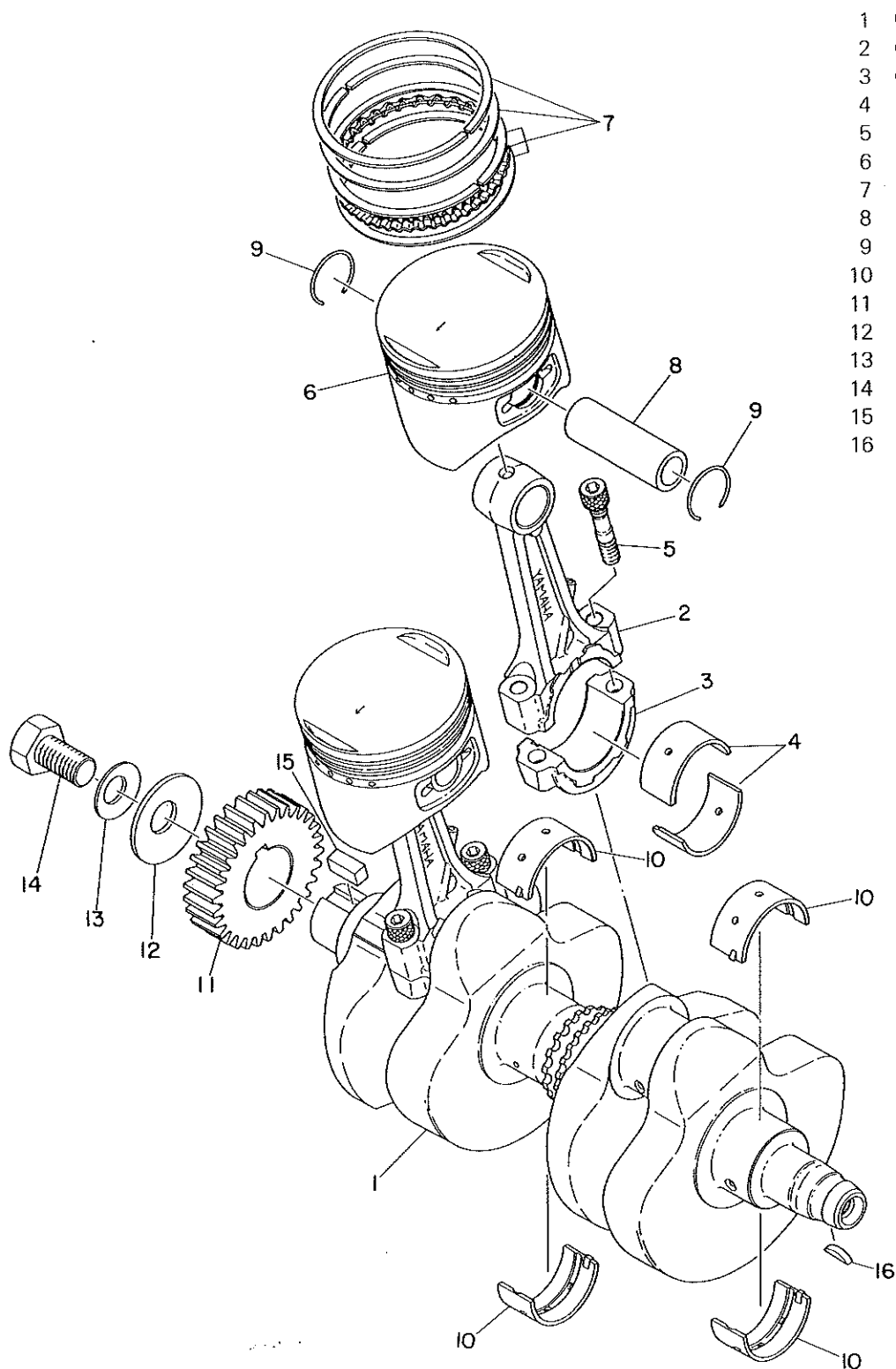
- 1) Check the bearing metals. If the outer surface is found flaked, burned, rough, scratched or worn, the metal should be replaced. The inner surface should also be checked, and if it is burned with oil, it is considered to lack enough tension and crush. This will result in warping or seizing up.
- 2) Clean the oil passages with compressed air.

Removing the bearing inserts

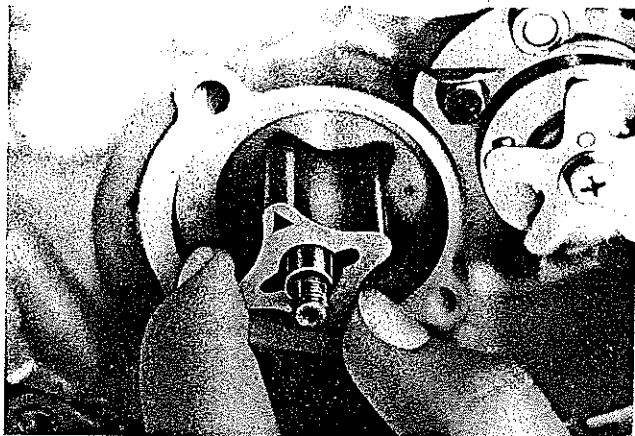
The insert can easily be removed by a finger-tip pressure. Never strike it out with a hammer.

The inserts removed should be separately placed. Avoid putting one upon the other.

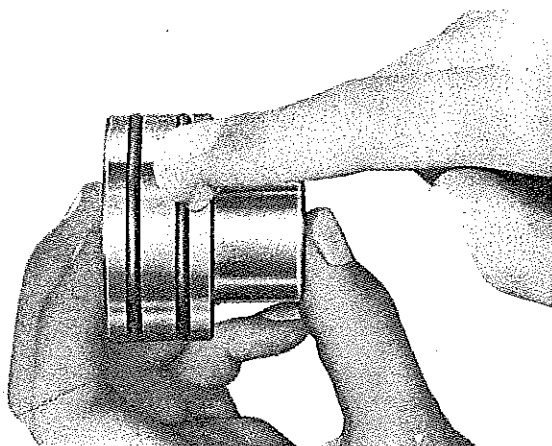
CRANKSHAFT REPAIR



- 6) Remove the pumps (suction and scavenging) and rotor housing. Then remove the dowel pin.
The dowel pin is located in a very narrow space.
Do not let the pin fall in the oil passage.



- 7) Remove the circlip. Insert the 6-mm bolt into the two holes located inside the body, and screw the bolt into the hole in the side plate. Pull the two bolts at same time, until the side plate can be removed and remove the side plate.
Take care not to scratch the crankcase.



- 8) Remove the pump shaft from the left side.

Installation

1. Clean all component parts, and assemble them. To assemble, reverse the procedure for disassemble.
Oil all parts (Except the governor ass'y and breaker ass'y)
2. When installing the dowel pin for pump mounting, take special care not to drop it into the oil passage.
3. Grease and install the side plate "O" ring.
Be careful not to break the "O" ring.

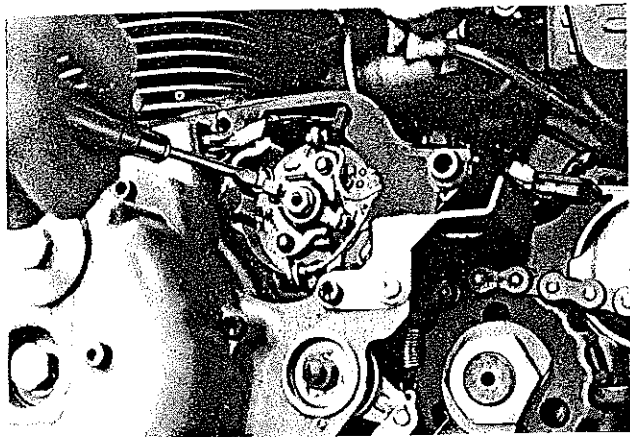
Note:

The pump shaft oil seal must be installed with the special tool provided in order to prevent seal lip damage on the shaft shoulder with subsequent oil leakage into the points area.

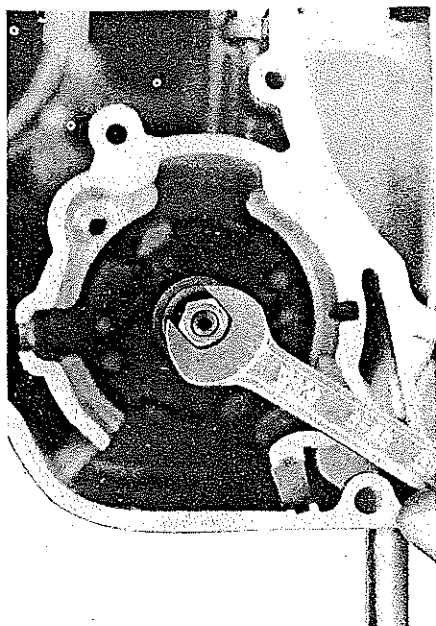


Disassembly

- 1) Remove the contact breaker ass'y.

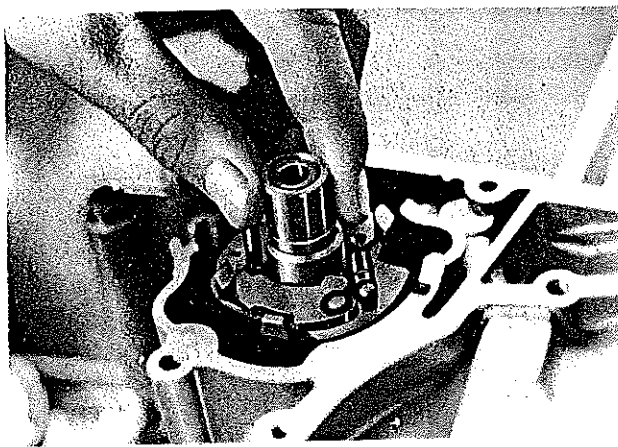


- 2) Remove the breaker cam holding nut.
If the pump shaft turns, lock it by inserting an 8-mm-dia. rod into the timing hole in the pump driven gear on the opposite side.



- 3) Pull out the governor ass'y.

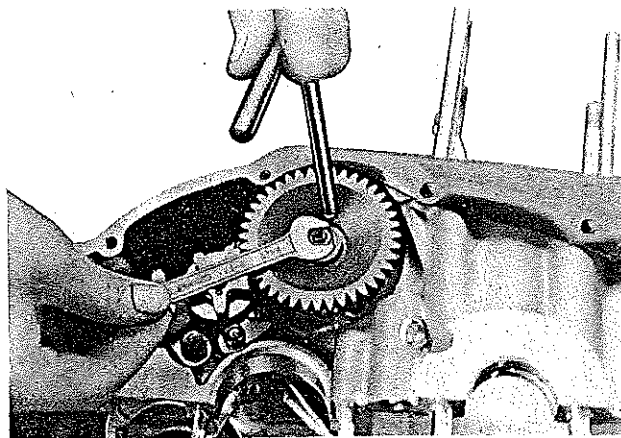
The governor shaft is locked to the pump shaft with a pin. Remove this pin.



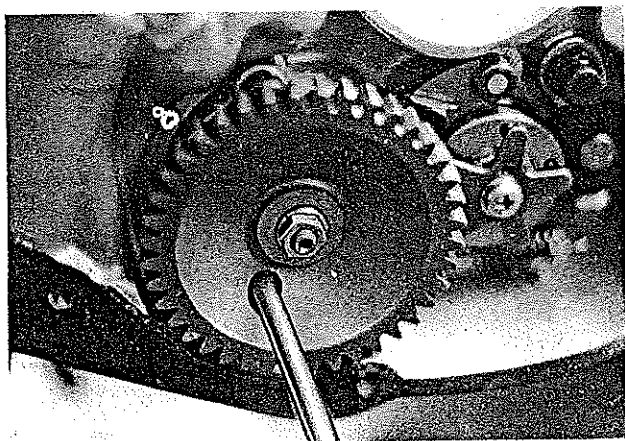
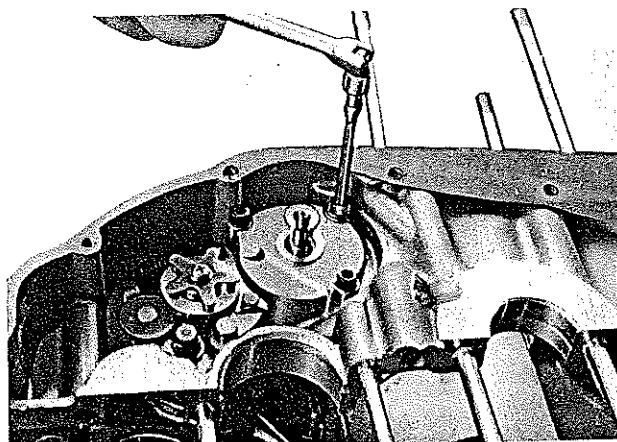
- 4) Remove the pump driven gear.

In this case, it is necessary to lock the pump shaft by inserting an 8-mm-dia. rod into the timing hole in the pump driven gear and the hole in the crankcase, and loosen the nut.

After removing the pump driven gear, be sure to remove the key.

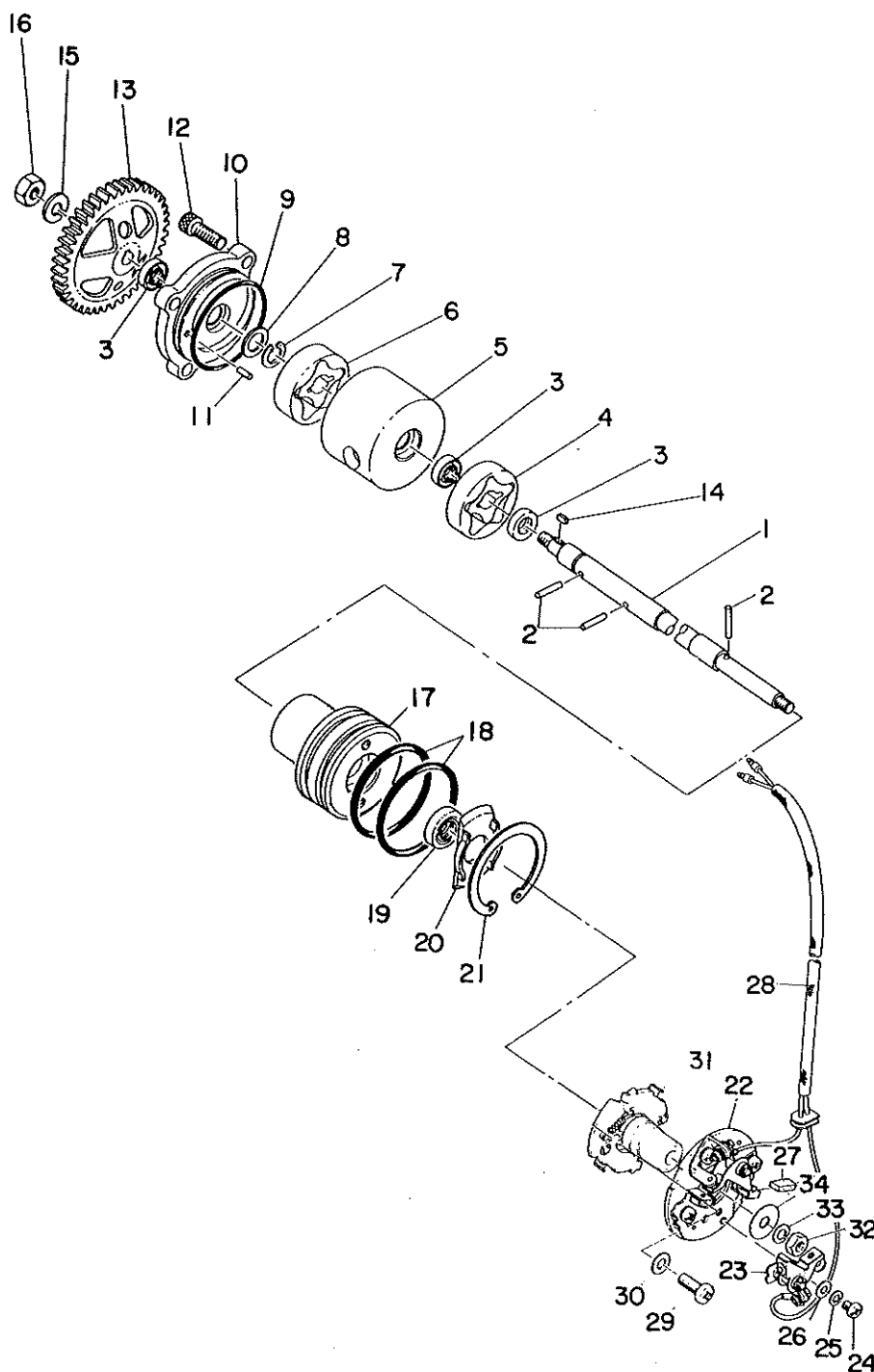


- 5) Remove the pump cover, washer and circlip.



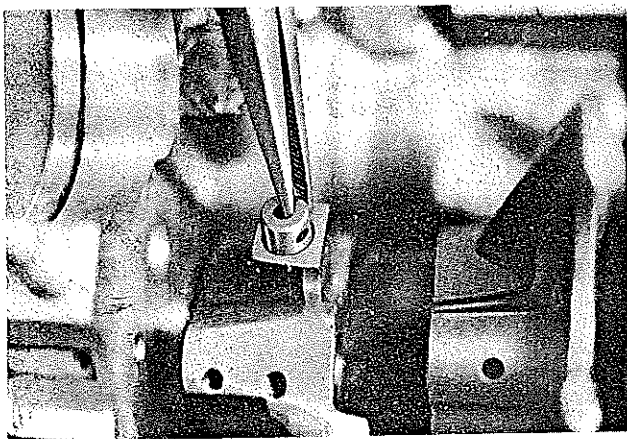
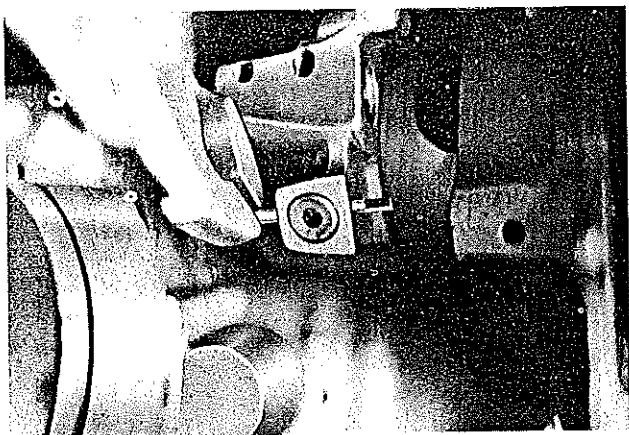
CONTACT BREAKER ASS'Y, GOVERNOR ASS'Y, TROCHOIDAL PUMPS (Suction and Scavenging Pumps)

As the TX750 lubrication employs the dry sump system, both suction pump and scavenging pump are required. These pumps are installed on the pump shaft. In addition to the pumps, the contact breaker ass'y and governor ass'y are attached to the pump shaft. The pump shaft is driven by the crankshaft through the primary drive gear, pump drive gear and pump driven gear. It turns at half the speed of the crankshaft.

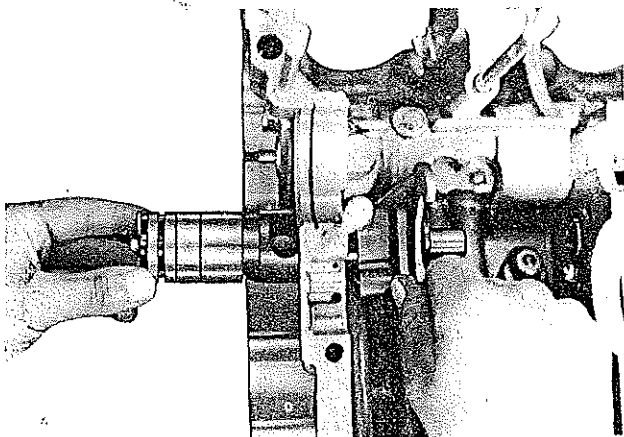


- 1 Pump shaft
- 2 Dowel pin (3-17)
- 3 Oil seal (SD-11-15-3)
- 4 Rotor 1 ass'y
- 5 Rotor housing
- 6 Rotor 2 ass'y
- 7 Circlip (11 ϕ special)
- 8 Washer (11.5-14.5-0.5)
- 9 O-ring (2.2-45.5)
- 10 Pump cover
- 11 Dowel pin (2.5-7.8)
- 12 Bolt
- 13 Driven gear
- 14 Woodruff key
- 15 Spring washer
- 16 Nut
- 17 Rotor filter cover
- 18 O-ring (2.2-45.5)
- 19 Oil seal (SD-11-22-7)
- 20 Rotor filter side plate
- 21 Circlip (R-52)
- 22 Breaker plate ass'y
- 23 Contact breaker
- 24 Panhead screw (4-6)
- 25 Spring washer
- 26 Plain washer
- 27 Lubricator
- 28 Lead wire ass'y
- 29 Brake plate screw
- 30 Plain washer
- 31 Governor ass'y
- 32 Nut
- 33 Spring washer
- 34 Special washer

- 4) A cam follower pin mounted in each fork is held in place by cotter pin and cam follower roller.



- 5) Pull out the shift drum and remove all three shift forks from the case. Take care, when removing the shift drum to catch all three cam follower rollers that rest in the grooves in the drum.

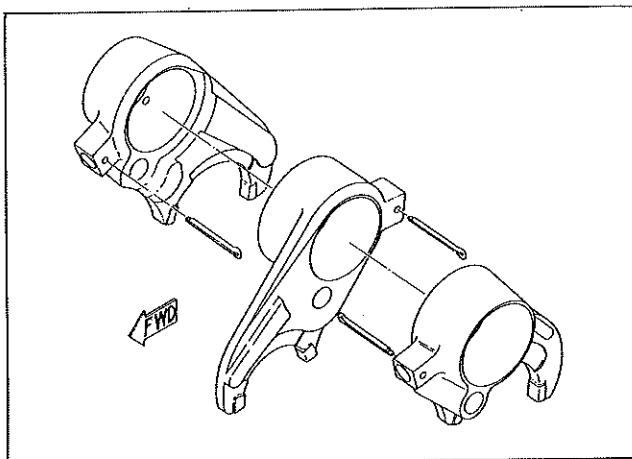


Inspection

Check the guide bar for alignment. Roll it over a surface plate and check for bends. If it is bent, replace it.

Shift drum and shift fork installation:

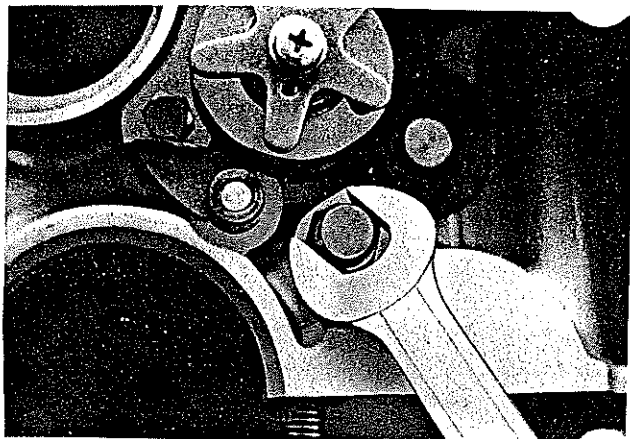
- 1) Pay particular attention to the direction and order of fork installation. Fifth gear wheel shift fork has a clearance notch machined into one side to allow clearance for the neutral light button. Fourth gear wheel shift fork is also notched on one side to provide clearance for the neutral position stopper. If these shift forks are incorrectly installed, the neutral stopper and neutral light button will not fit into position.
- 2) Installation of this unit is a reversal of the previous steps. Be sure to lubricate the shift drum and forks before installation. When installing the cam follower pin, always use new cotter pins. After bending the cotter pins, make sure the bent pin ends do not drag. Check for smooth fork movement on the shift drum after assembly.



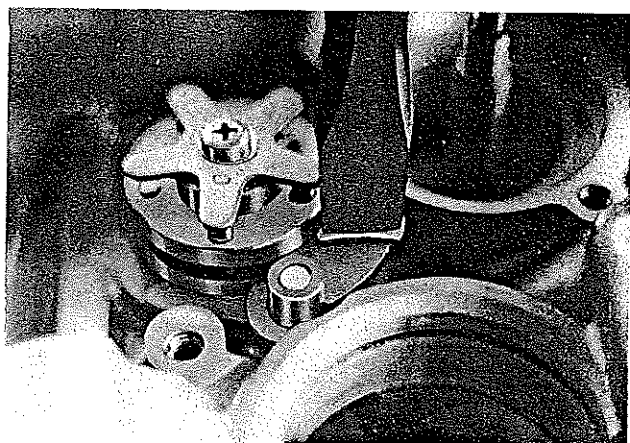
SHIFT DRUM ASSEMBLY

Fork Guide Bar Removal and Installation

- 1) On the exterior section of the right-hand case is the shift drum stopper. Release the stopper spring and remove the stopper unit. Bend the lock tabs down on the locating plate bolts and remove the plate.

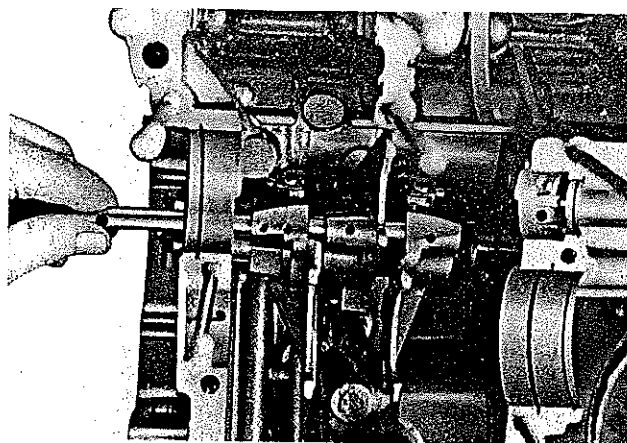


- 2) The fork guide bar is held in place by the shift drum stopper plate. With the plate removed, the bar can be pulled out.

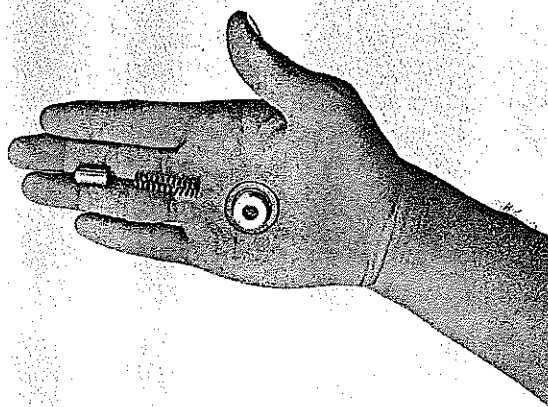
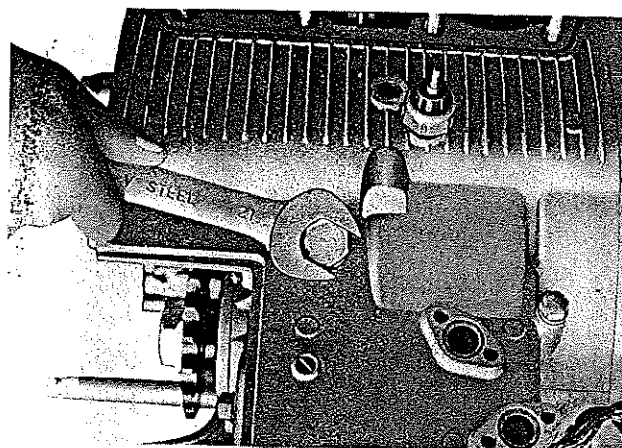


Caution

Note that the stopper plate has a locking tab to secure the two bolts holding the plate in place. During reassembly, always make sure the locking tabs are bent up firmly around the securing bolt heads.

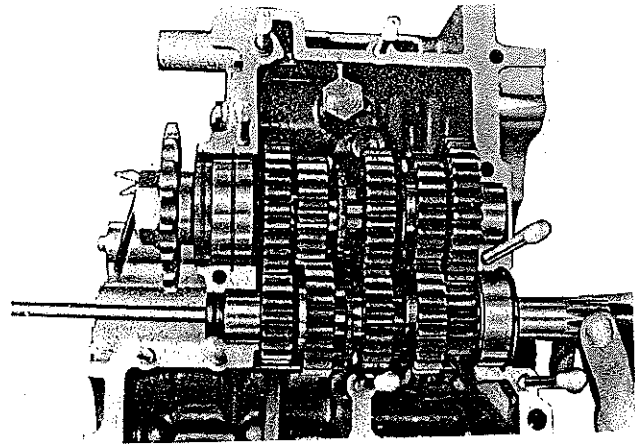
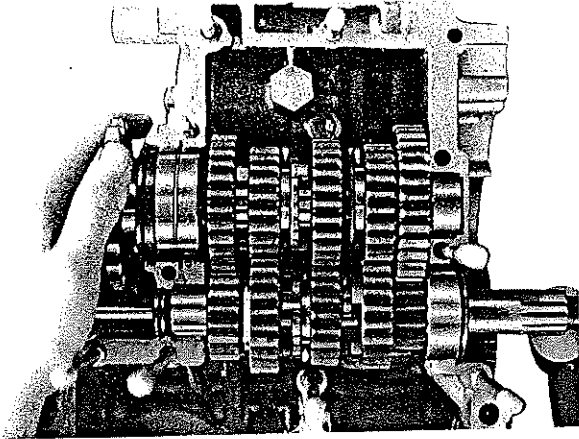


- 3) Remove the change stopper unit.



Disassembly

Tap lightly with a rubber hammer to loosen the transmission, then lift it out.

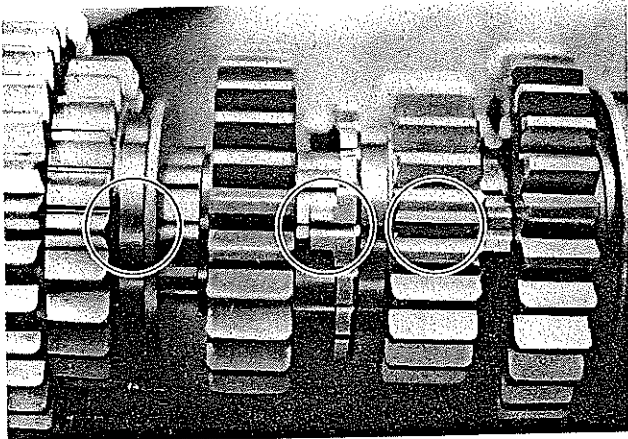


Inspection

- Check the gears for chipped teeth.
- Check engagement dogs and slots for rounded edges.
- Check the sliding gear fork grooves for a blue discoloration. If any of the above mentioned conditions is obviously noticeable, replace the gears.

Note:

Especially in the case of damaged engagement dogs, check the mating gear for damage or excessive wear. It is sometimes necessary to replace the parts as a set.



Installation

With both shafts assembled, including all bearings and seals, fit the transmission into the TOP CASE. This permits the shift forks to slip over the sliding gears easily. Be sure both transmission shaft circlips are fitted to the bearings and the circlips have been positioned in the circlip grooves.

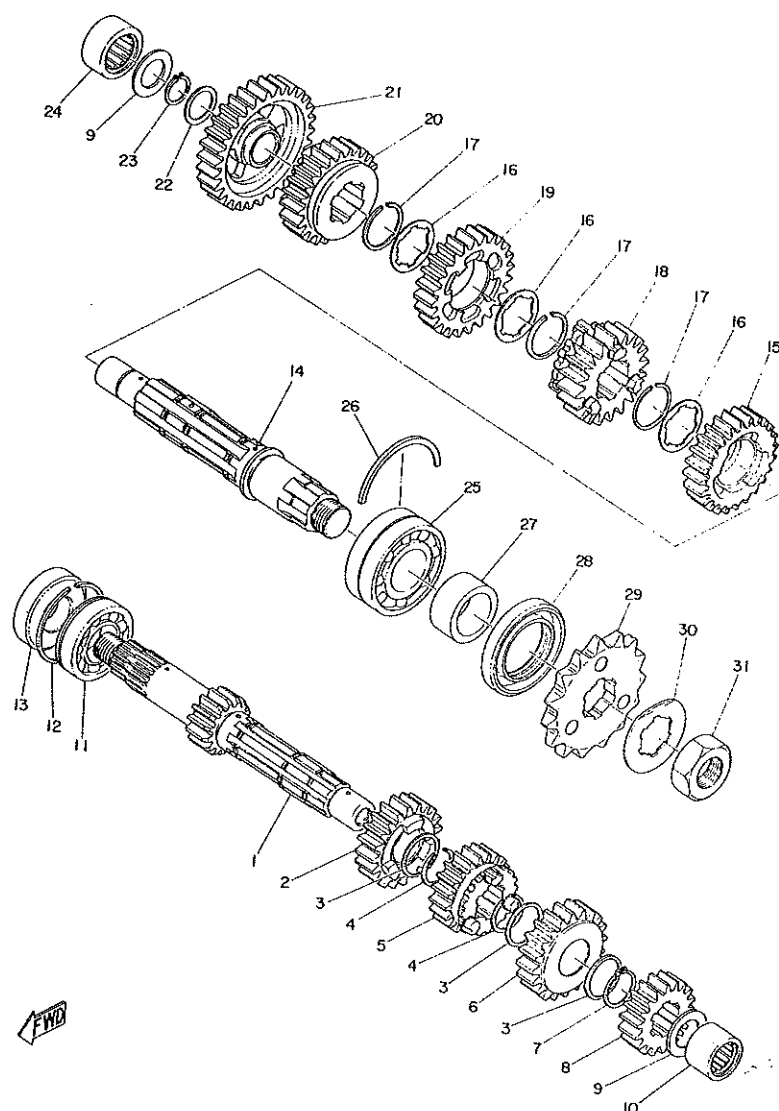
Note:

Transmission installation is easier if the shift drum is rotated to the neutral position.

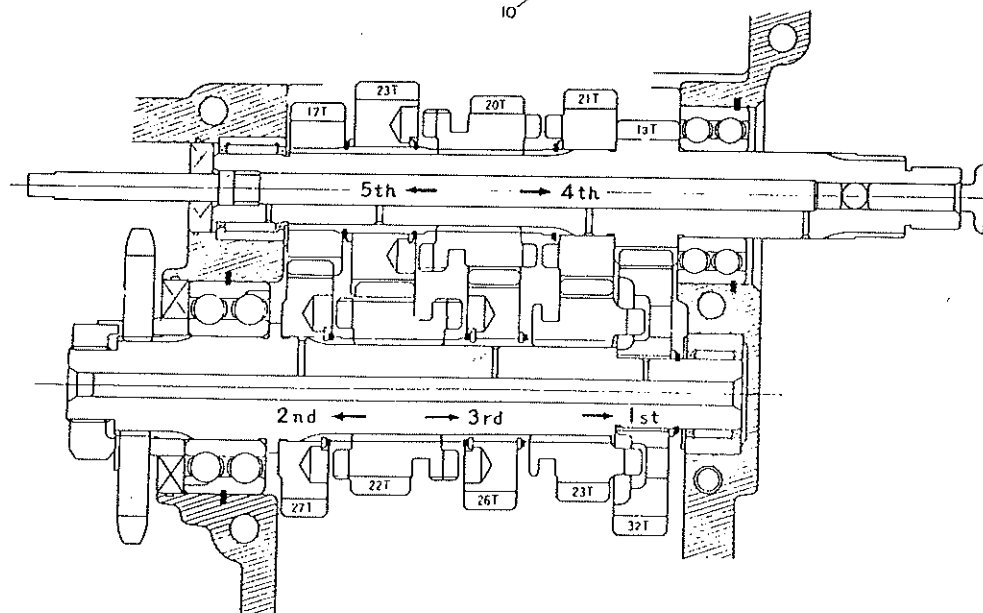
Very important

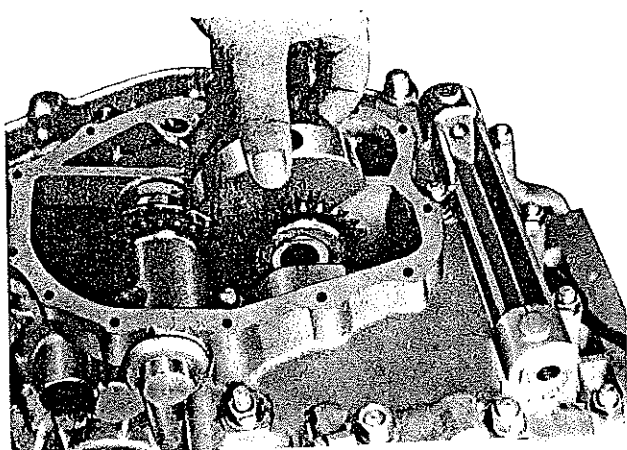
Check for smooth and complete shifting through all gears after installing the shift drum, shift forks, guide bar, and transmission. At the same time check for complete engagement of all engaging dogs into the appropriate gear slots.

TRANSMISSION



- 1 Main axle (13T)
- 2 4th pinion gear (21T)
- 3 Gear hold washer 5 (25.2-30-1.0)
- 4 Circlip (25 ϕ special)
- 5 3rd pinion gear (20T)
- 6 5th pinion gear (23T)
- 7 Circlip (S-25)
- 8 2nd pinion gear (17T)
- 9 Drive axle shim (20.2-23-1.0)
- 10 Bearing
- 11 Bearing (B5205)
- 12 Circlip (52 ϕ special)
- 13 Collar
- 14 Drive axle
- 15 2nd wheel gear (27T)
- 16 Gear hold washer 3 (26.2-34-1.0)
- 17 Circlip (30 ϕ special)
- 18 5th wheel gear (22T)
- 19 3rd wheel gear (26T)
- 20 4th wheel gear (23T)
- 21 1st wheel gear (32T)
- 22 Gear hold washer (20-25-1.0)
- 23 Circlip (S-20)
- 24 Bearing
- 25 Bearing (B5206)
- 26 Circlip
- 27 Distance collar
- 28 Oil seal (SDO-40-62-9)
- 29 Drive sprocket (17T)
- 30 Lock washer
- 31 Lock nut



**Note:**

To insure correct balancer sprocket alignment, the balancer washers must be installed in their original positions.

- 7) Align mark on balancer #1 (large balancer) sprocket teeth with mark on case. Place washers on both sides of the weight and insert the balancer shaft in the case and through the balancer.

- 8) Make sure the balancer hole is aligned with the balancer shaft hole, and insert the pinch bolt into the holes to lock them together.

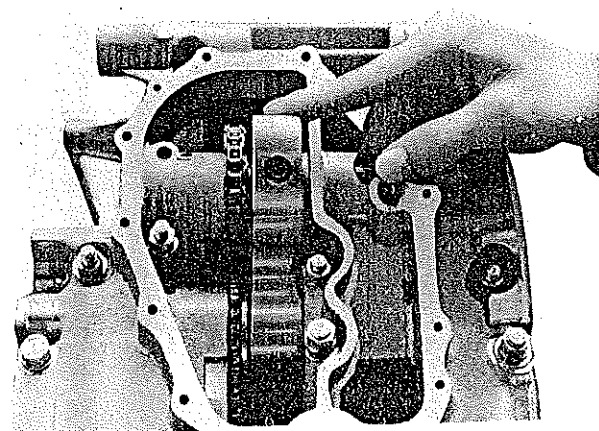
Tightening torque: 3.7 ~ 4.0 kg-m (333~360 in-lbs)

CAUTION:

Before tightening the pinch bolt, coat it with "LOCK-TITE" and tighten with correct torque.

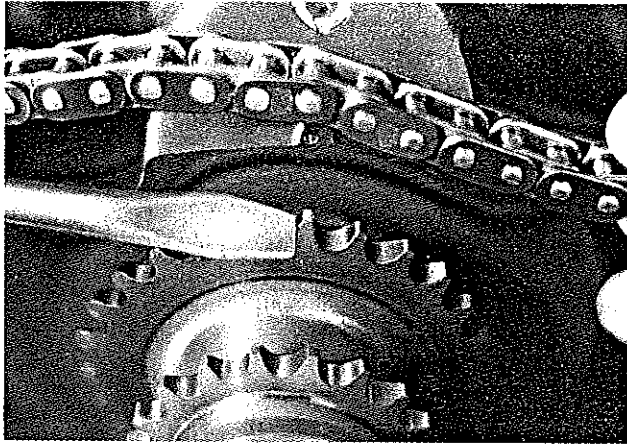
- 9) After installing the balancers, check to see that they don't contact each other by turning the crankshaft at least four revolutions.

Be sure to oil the chain and shaft.



Balance Weight Timing

- 1) Place chain around balancer drive sprocket on crankshaft.



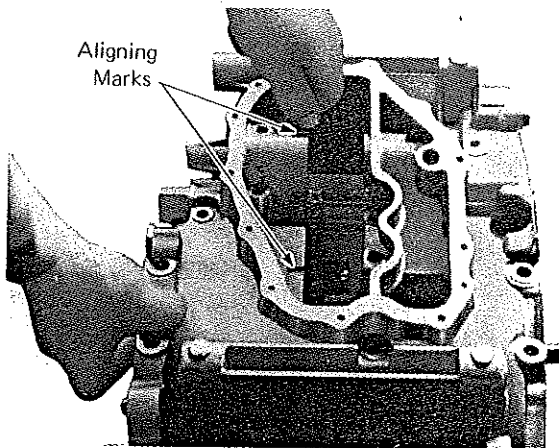
Note:

Install the cam chain at the same time of installing the crankshaft with the balancer chain set in the crankcase lower.

- 2) Thread the chain through the lower crankcase, and tie it to the crankcase with a wire. Then put together the upper and lower crankcases, and tighten the nuts. The nuts should be tightened in steps and in numerical order indicated on the crankcase.

Tightening torque:

M8	2.0~2.2 kg-m (180 ~ 198 in-lbs)
M10	3.7~4.0 kg-m (333 ~ 360 in-lbs)



- 3) Rotate crankshaft until pistons are at T.D.C. Place balancer #2 (small balancer) in chain, at the same time aligning the mark on sprocket with mark on case. Keep bottom row of chain taut.
- 4) Place washers on both sides of the weight and insert the balancer shaft into the case and through the balancer shaft hole.

- 5) Make sure the balancer hole is aligned with the balancer shaft hole, and insert the pinch bolt into the holes to lock them together.

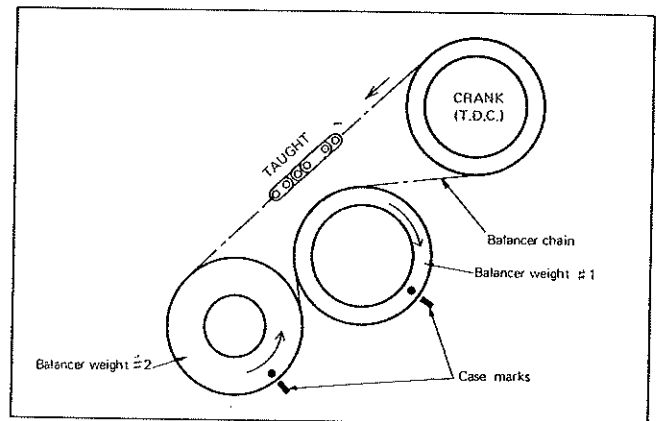
Tightening torque: 3.7 ~ 4.0 kg-m
(333 ~ 360 in-lbs)

CAUTION:

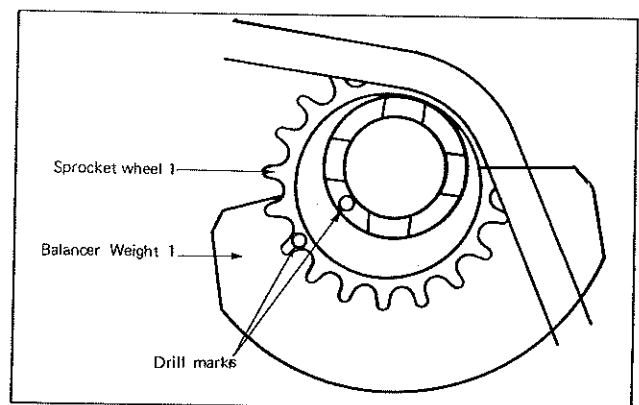
Before tightening the pinch bolt, coat it with "LOCK TITE" and tighten with correct torque.

Note:

- * Balancer shafts 1 and 2 are retained with roller bearings. Therefore make sure that the shafts come in smoothly before assembling the balancer.
- * In assembling the balancer weight, apply grease on it so that the washers on both sides do not come off. Then go on to assemble the balancer weight.

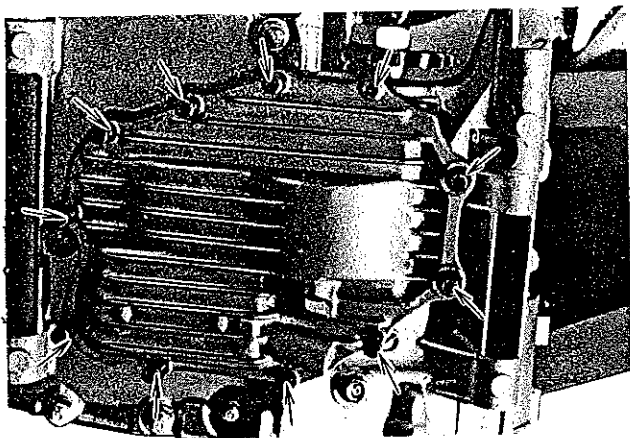


- 6) Install sprocket wheel 1 and balancer weight 1 with the dowel pins and springs. Align the drill marks on these two parts.

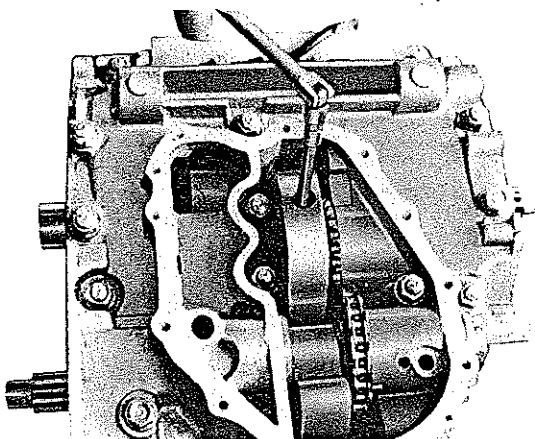


Disassembly

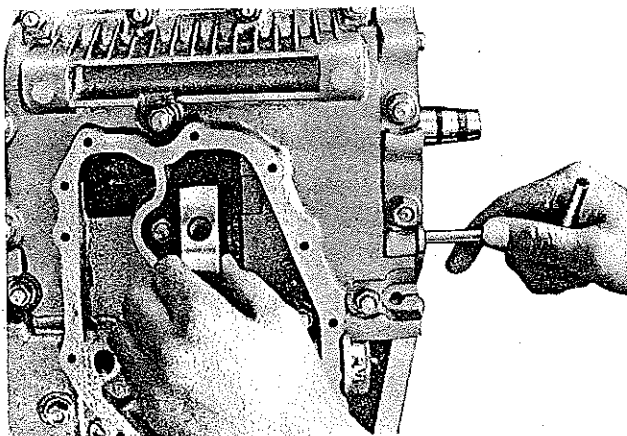
- 1) Remove the oil strainer cover.



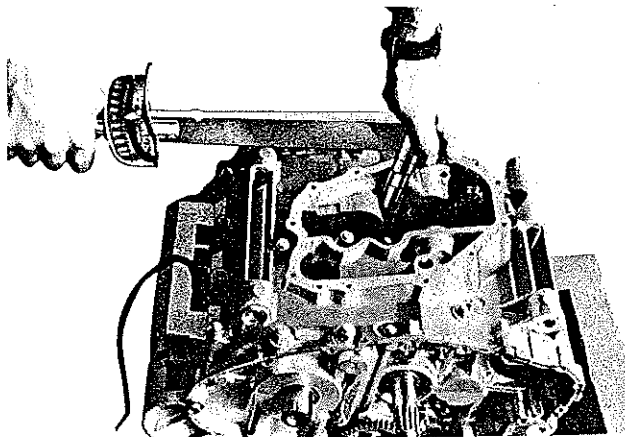
- 2) Remove the balancer weight pinch bolts by use of a hexagon wrench.



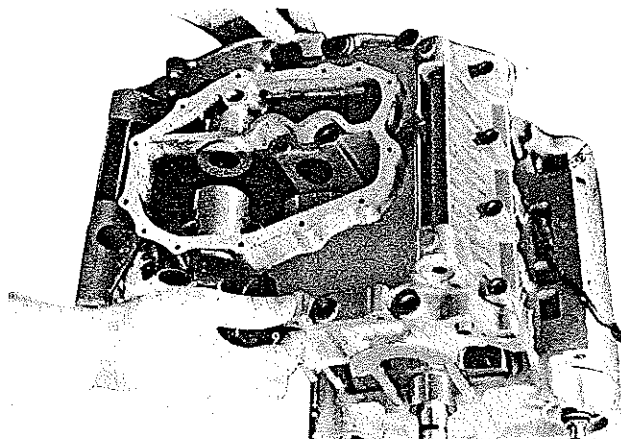
- 3) Pull out the balancer weight shaft with the balancer shaft puller.



- 2) Loosen and remove all case securing bolts located on the bottom of the case plus the case bolts around the dip stick on top. Start with # 21 and loosen each bolt to # 1. Loosen each bolt 1/4 turn at a time to avoid case warpage.

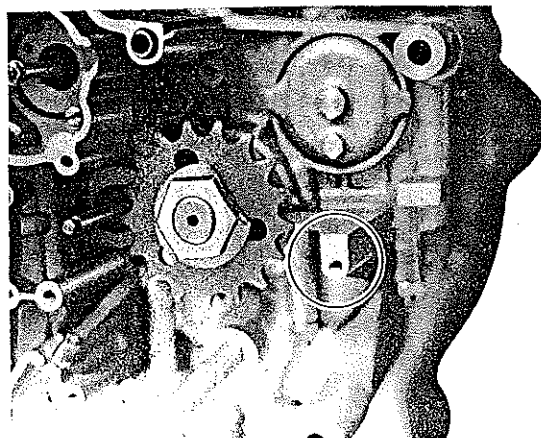


- 3) Separate the cases by lifting off the bottom case. It might be necessary to tap the case loose with a rubber hammer.



Caution

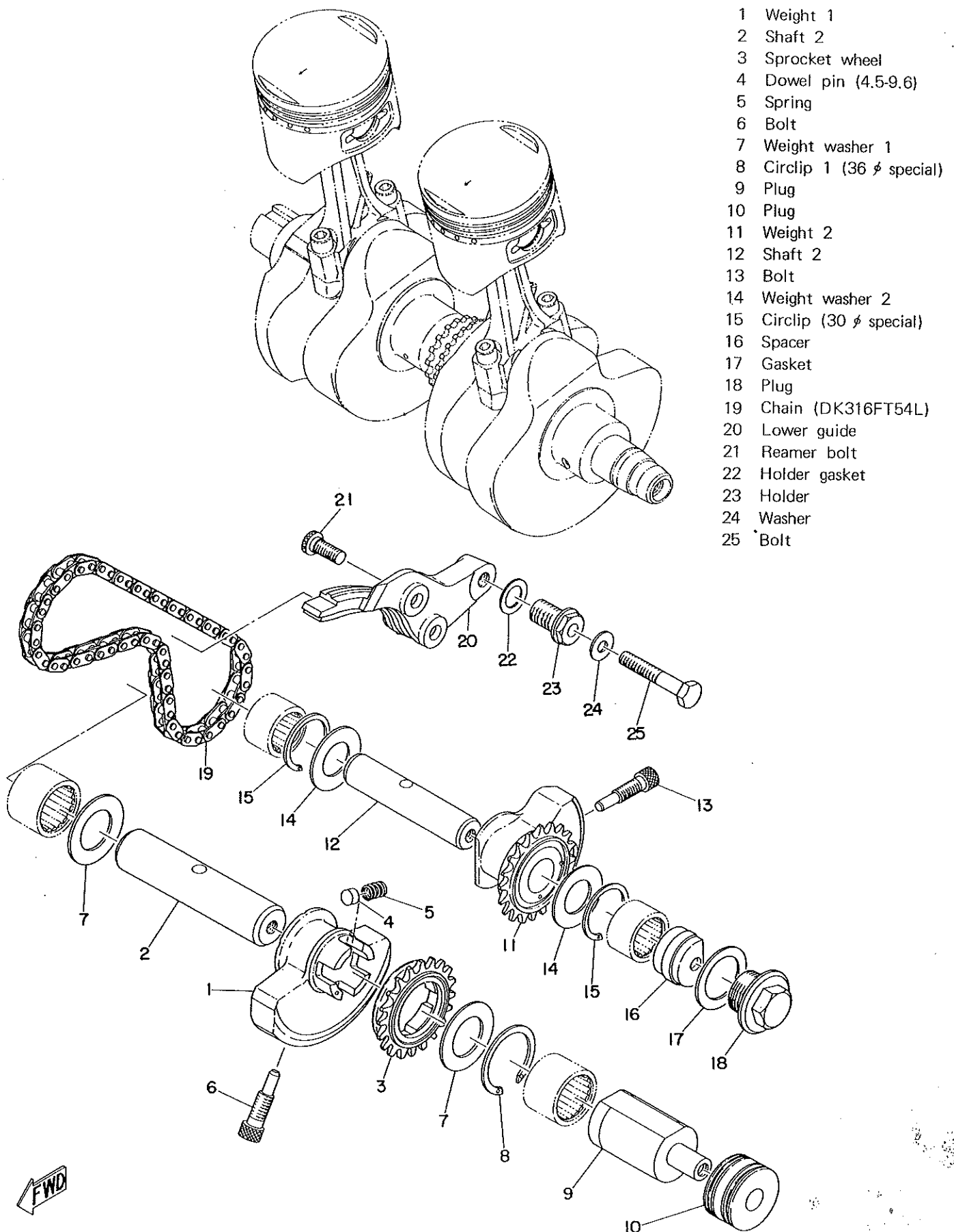
Do not hammer on the case cover mounting flange; it could easily break off.



Crankcases

- 1) The TX750 unit construction crankcase contains the transmission, crankshaft, balancers, and associated parts such as oil strainer (in crankcase sump), etc.

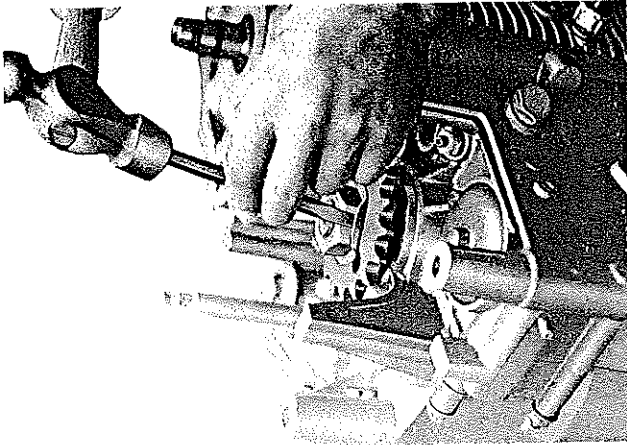
OMNI-PHASE BALANCER



DRIVE SPROCKET

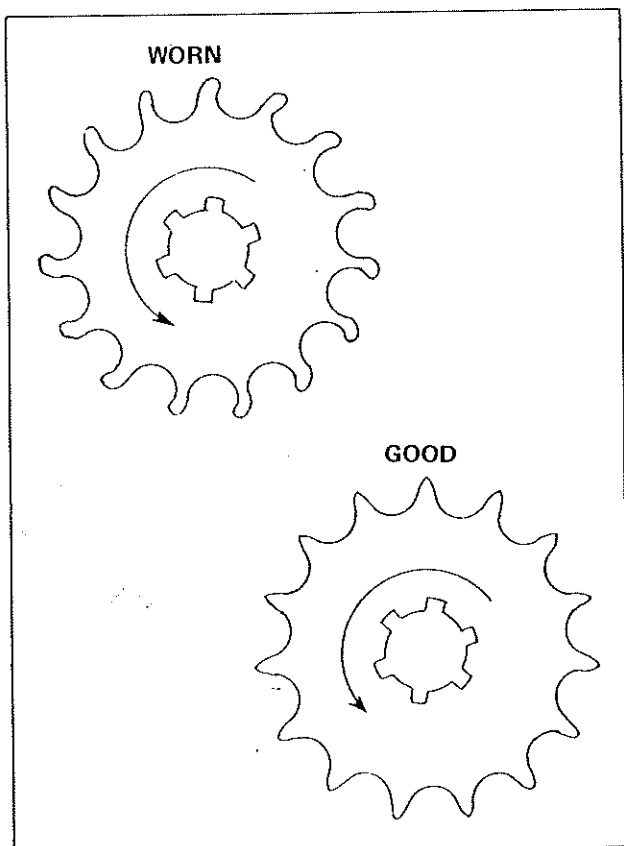
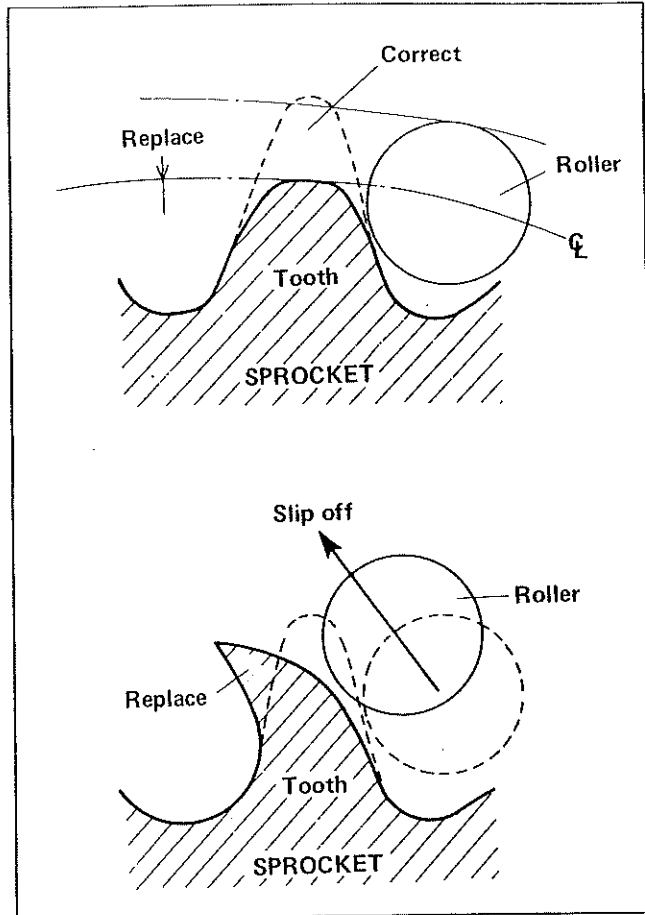
Disassembly

Flatten the bent lock tab. Place the transmission into gear (to keep the shaft from rotating) and remove the lock nut. The drive sprocket need only be removed if transmission repair is necessary. In addition, it can be removed prior to removing the engine from the frame. Reverse the above procedures to install the sprocket. Be sure to bend the lock tab back up.



Inspection

Constant tension and friction from the drive chain eventually wears away the base of the sprocket teeth. The weakened teeth bend and do not mesh correctly with the chain. Replace an excessively worn sprocket.



Description of Operation

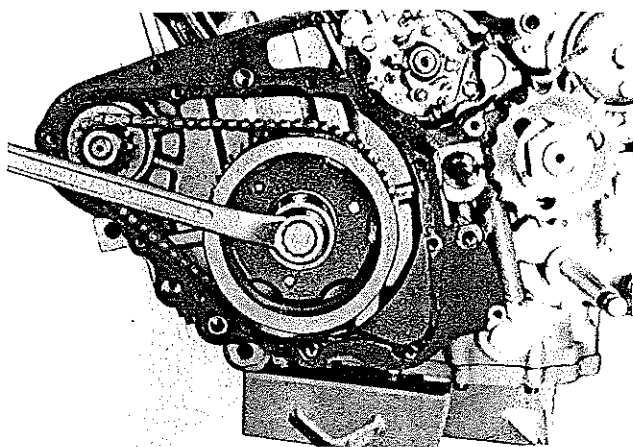
As the starter button is depressed, the starter motor begins turning. As the starter motor turns, the sprocket held to the starter motor makes the sprocket wheel turn by means of the chain. The sprocket wheel is provided with a one-way roller lock mechanism. As the sprocket wheel begins turning, the one-way clutch is locked. Thus the turning force is carried from the sprocket to the crankshaft through the chain, sprocket wheel and rotor.

As the engine starts, the crankshaft keeps turning, and the roller lock is released, thus uncoupling the starter motor from the crankshaft.

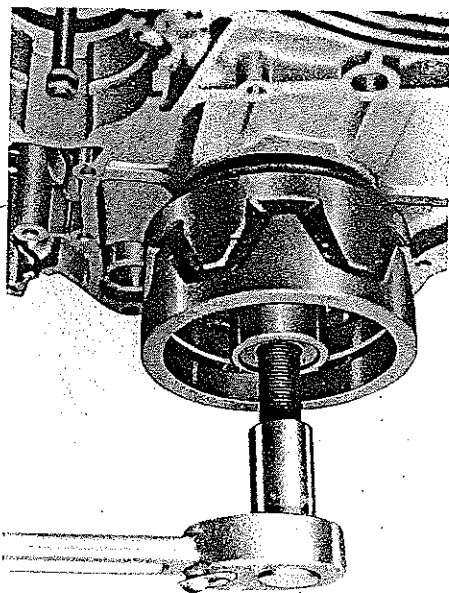
Outer Starter Clutch, Starter Sprocket 1,2

Disassembly

- 1) Remove the starter clutch holding bolt with a special tool, and remove the starter clutch. The woodruff key should also be removed.

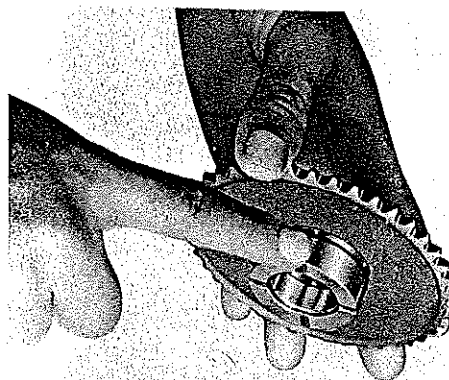


- 2) Remove the starter sprocket 1 and starter sprocket 2 at the same time. Next, remove the chain tensioner.



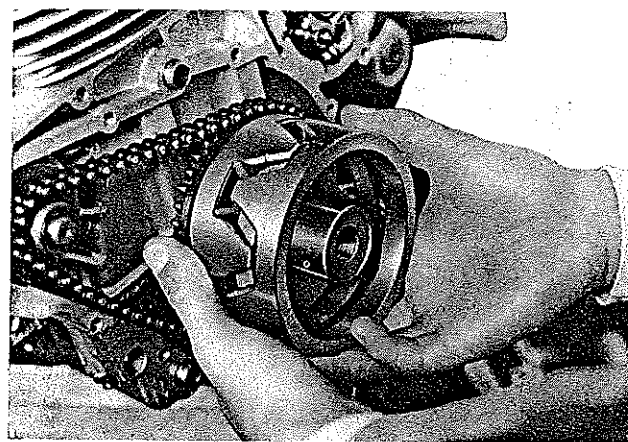
Inspection

Check the contact surface of the sprocket wheel with the roller. If it is excessively roughened, replace both sprocket wheel and roller.

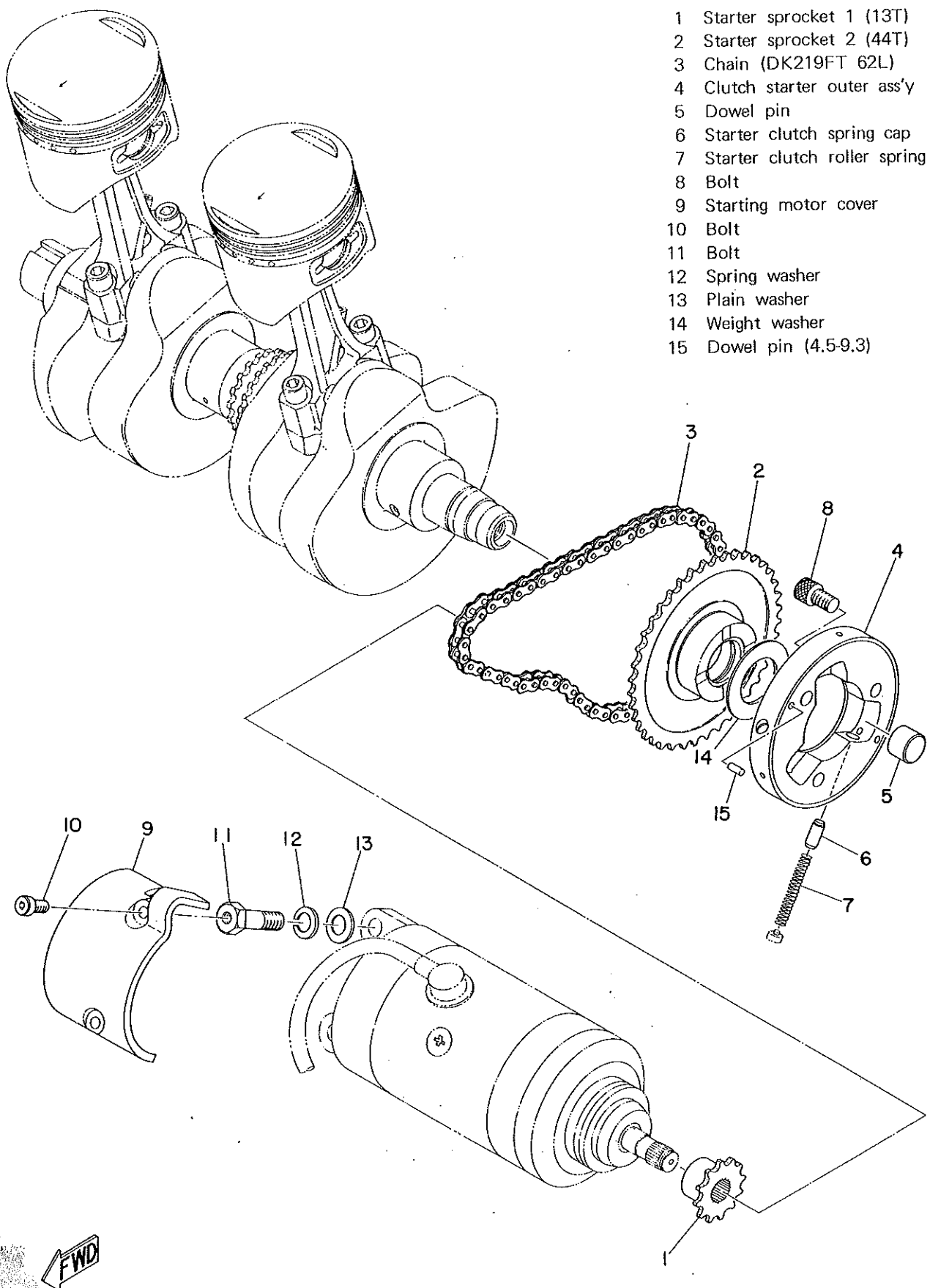


Installation

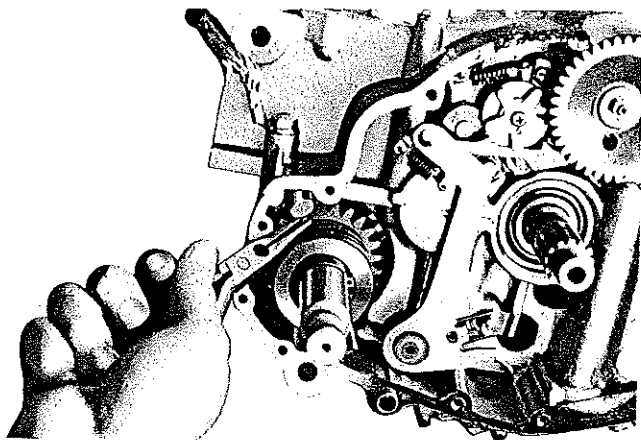
Place the chain around sprockets 1 and 2, and install sprockets 1 and 2 at the same time. Install the key, and coat the tapered end of the crankshaft with a molybdenum disulfide grease, then install the starter clutch.



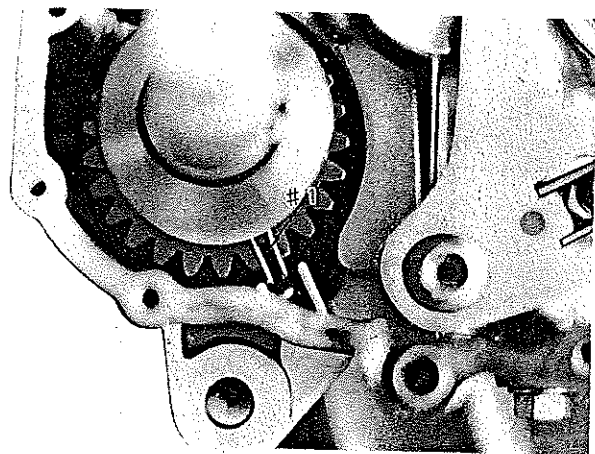
ROUTE OF POWER FLOW FROM STARTER MOTOR



- 1) Slip the bent spring end off its anchor point and pull the kick starter assembly out of the case.

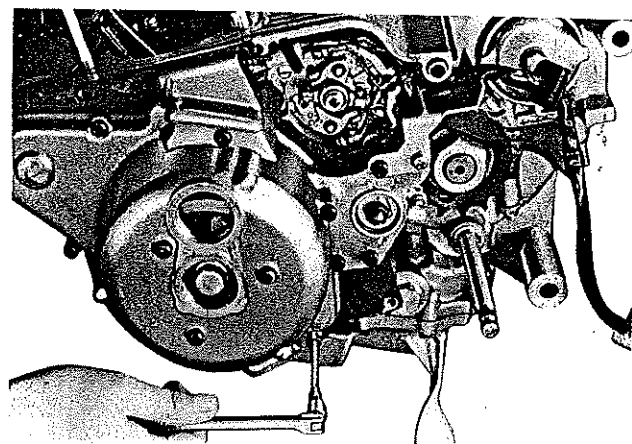


- 2) To install the kick assembly, partially insert the assembly until the return spring can be slipped over its anchor point, then rotate the kick clip (#1) until it slips into the appropriate recessed area in the case. Attach the kick lever and rotate the kick axle $1/2$ – $3/4$ revolution in a counter-clockwise direction. Push the axle in. The kick stopper will slip into its recessed area in the case. The kickstarter is now pre-loaded to achieve positive kick return.

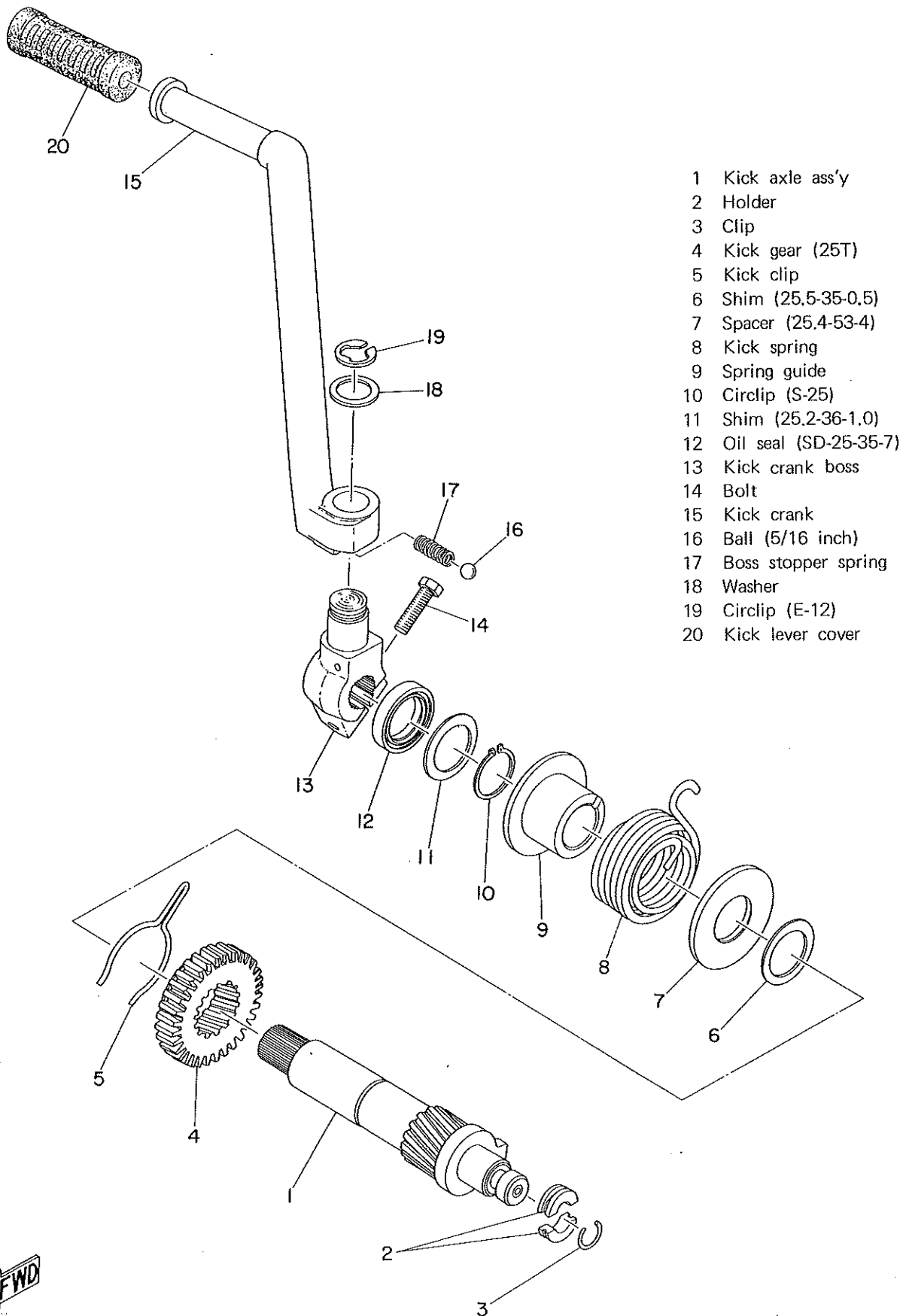


Generator Cover Removal and Installation

Remove the hexagon bolts holding the generator cover.



KICK MECHANISM



← FWD

5) Primary Drive Gear

A bolt and lock washer hold the primary drive gear on the crankshaft. Remove the bolt and washer and slide the primary drive gear off. Use a gear puller if the primary drive gear does not come off easily. A square-shaped key fits into a crankshaft keyway to prevent the drive gear from spinning.

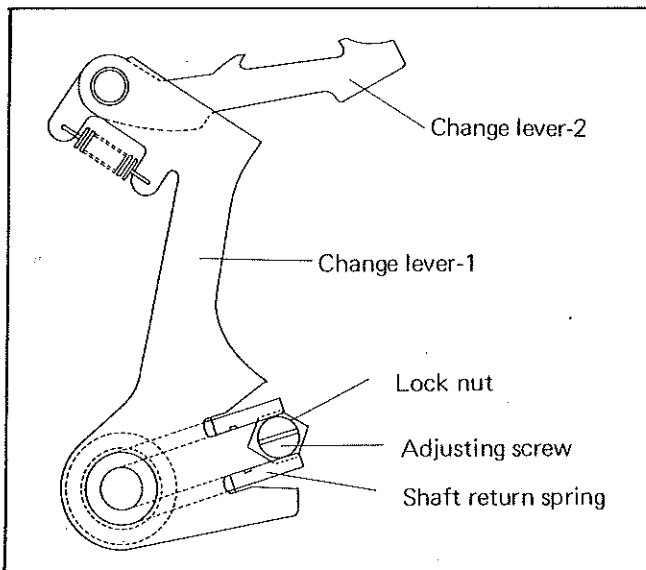
- b) To install the primary drive gear, slide it onto the crankshaft. Next, line up the keyways in the gear and the shaft and insert the square-shaped key. Install and tighten the lock bolt to 12 kg-m (85 ft-lbs).

Caution

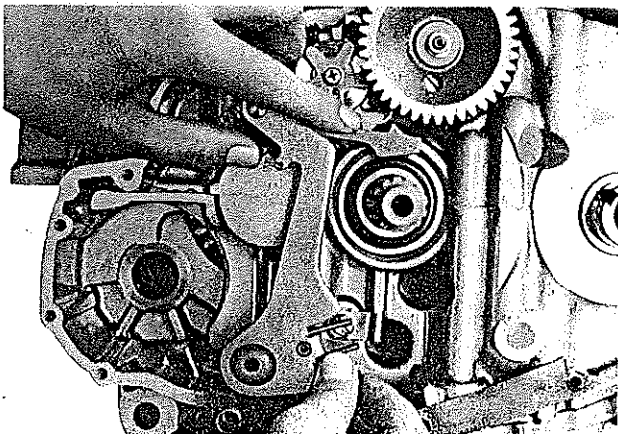
If the primary drive gear and primary driven gear teeth do not match up fully (if there is visible tooth overlay to one side), check the possibility of incorrect clutch installation.

SHIFT SHAFT ASSEMBLY

Disassembly



- a) Remove the shift shaft retaining "E" clip and washer (left-hand side), then pull the entire assembly out from the right-hand side.



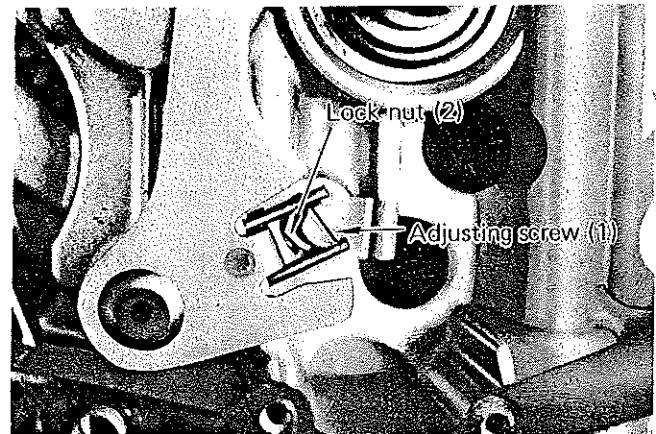
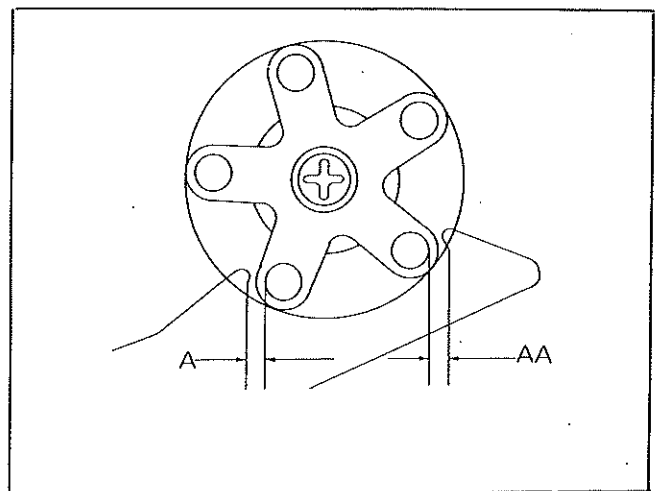
- b) Installation is accomplished by inserting the shift shaft from the right-hand side and installing the washer and "C" clip.

Shift Adjustment

- a) If shifting adjustment is correct, distances "A" and "AA" will be equal (see this page). If these are not equal, loosen the screw lock nut (2) and rotate the adjusting screw (1) until "E" and "AA" become equal. Retighten the lock nut and bend up the tab.

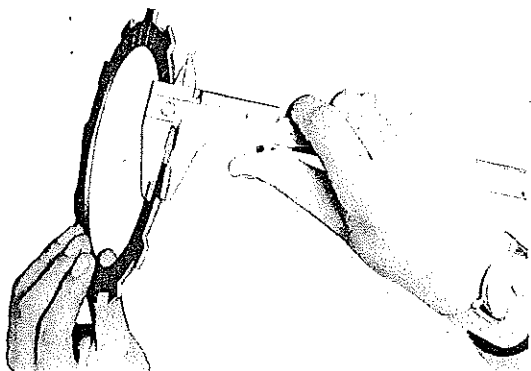
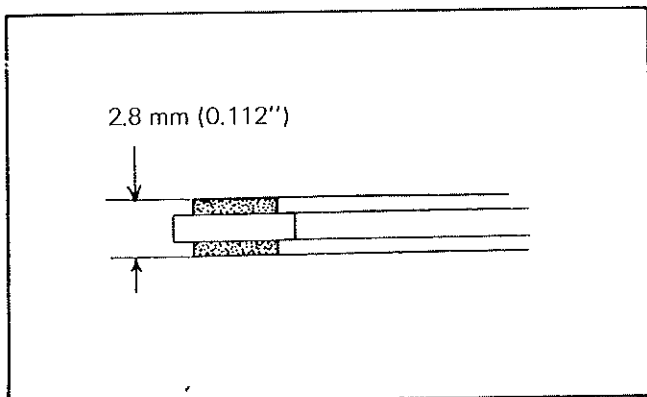
Note:

Make this adjustment in second, third, or fourth gear.



2) Friction Plate Wear

- a) Standard thickness is 2.8mm (0.112"). If wear has decreased the thickness to 2.6mm (0.104") replace the plate (measure at two or three points)



3) Clutch Plate Wear

- a) These plates must be flat. Lay each one on a surface plate and check both inner and outer edges for signs of "dishing" (a bow in the plate surface). Replace the plate if warpage exists.
- b) Run a feeler gauge around the inner and outer edges. Replace any plate that is warped sufficiently to permit a 0.2mm (0.008") feeler gauge to slide under either edge.

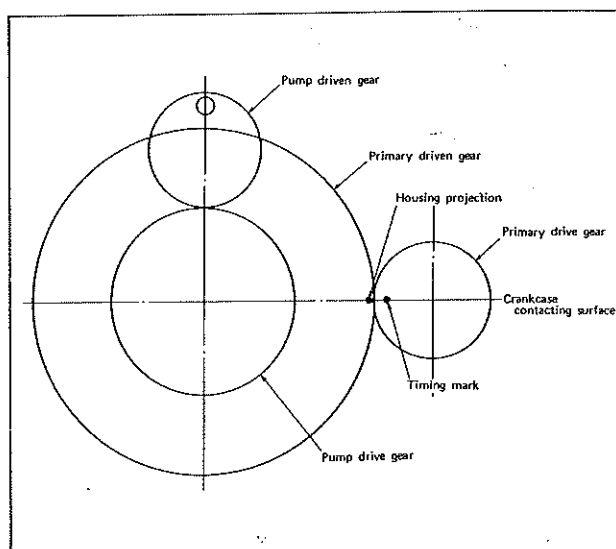
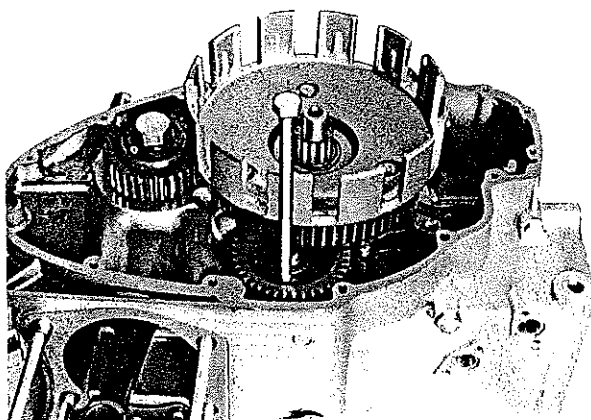
4) Push Rod

Roll the push rod over a surface plate. If the rod is bent, or if deep grooves have been worn in the rod, replace it.

Installation

- 1) The pump drive gear must be installed with the step facing the case side. Be careful not to lose the key.
- 2) To lock the pump drive gear, insert a 8-mm-dia. shaft into the 8-mm-dia holes in the pump driven gear and pump cover. Next, align the housing projection with the reduction timing mark (on the end of the drill), and install the housing ass'y.

In this case, it is necessary to keep the reduction gear mark aligned with the case sealing surface.



- 3) Reverse the clutch removal sequence. Tighten the clutch boss lock nut.

Caution

- 1) Be sure the two flat thrust washers and one flat thrust bearing are installed behind the clutch boss. Also, grease the flat thrust bearing and thrust washer closest to the clutch housing to prevent these parts from sliding forward, out of position, during clutch boss installation.
- 2) When installing the clutch spring bolts, screw them in until they bottom fully (approximately 0.8 kg-m/5 ft-lbs. torque).

Important

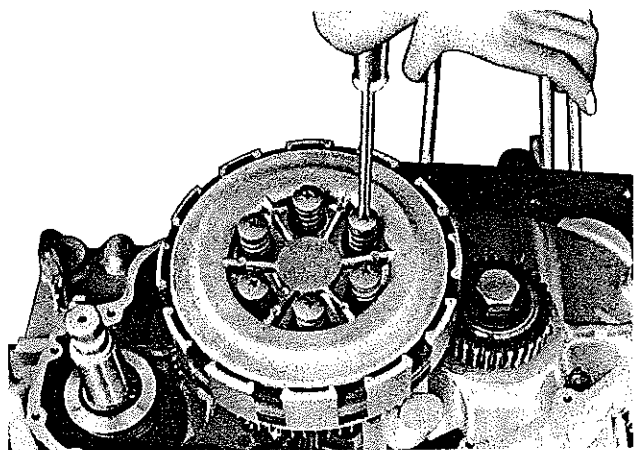
- When installing the seven friction plates (between the metal clutch plates), install two fiber-backed plates, then both aluminum-backed plates, and finally the remaining two fiber-backed friction plates, with the appropriate clutch plates between each friction plate.

Disassembly

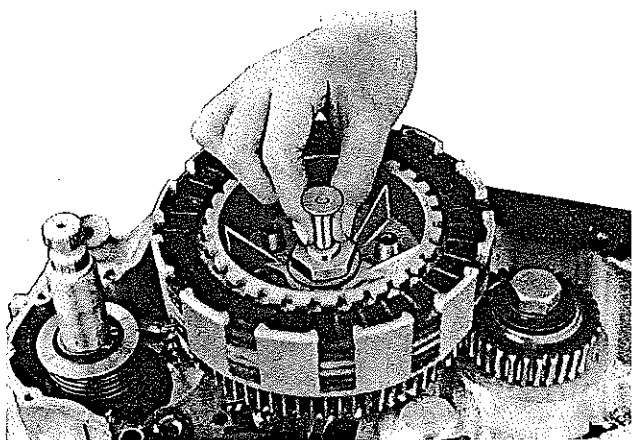
- 1) Remove all six clutch spring screws and pull off the pressure plate.

Note:

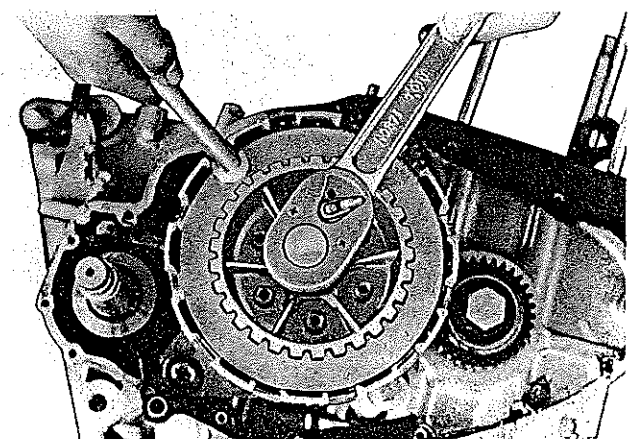
Loosen the screws in easy stages using a cross pattern.



- 2) Pull out the push crown, the ball directly behind the push crown, and the push rod behind the ball. The push rod is most easily removed from the other end of the main shaft.

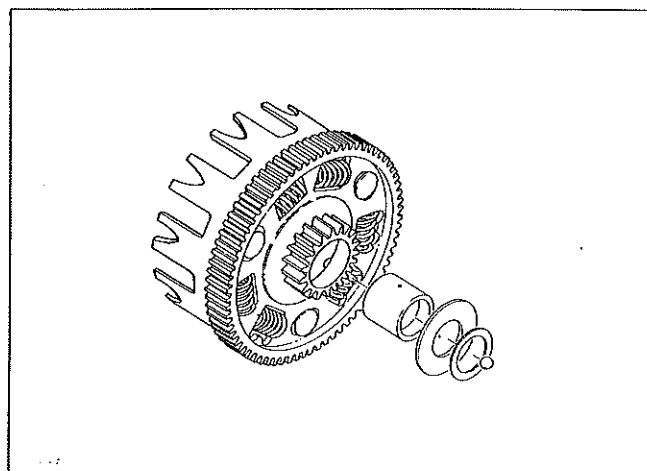


- 3) Hold the clutch unit with the holding tool (found in the Special Tool Kit), and unscrew the clutch boss lock nut.



- 4) Slide out the clutch boss and clutch plates. Behind the boss are two thrust washers with a flat thrust bearings in between. Remove these parts.

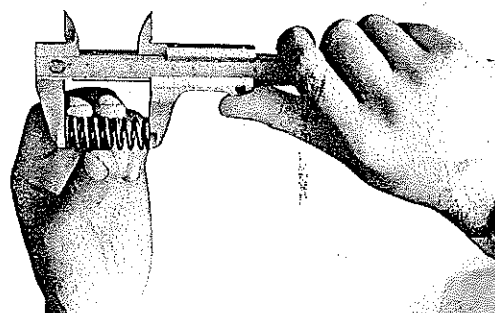
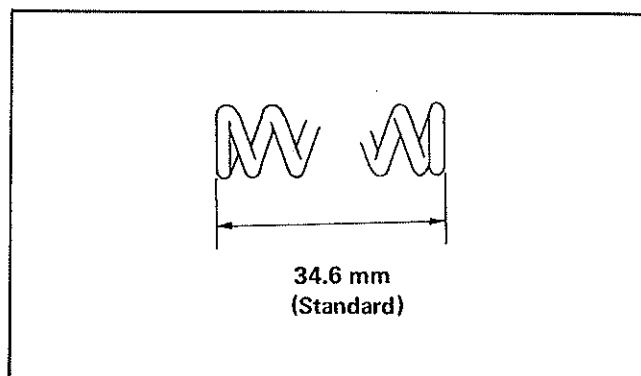
- 5) The clutch housing is now free. After pulling the housing off, slide off the clutch bushing spacer and thrust washers behind the spacer.



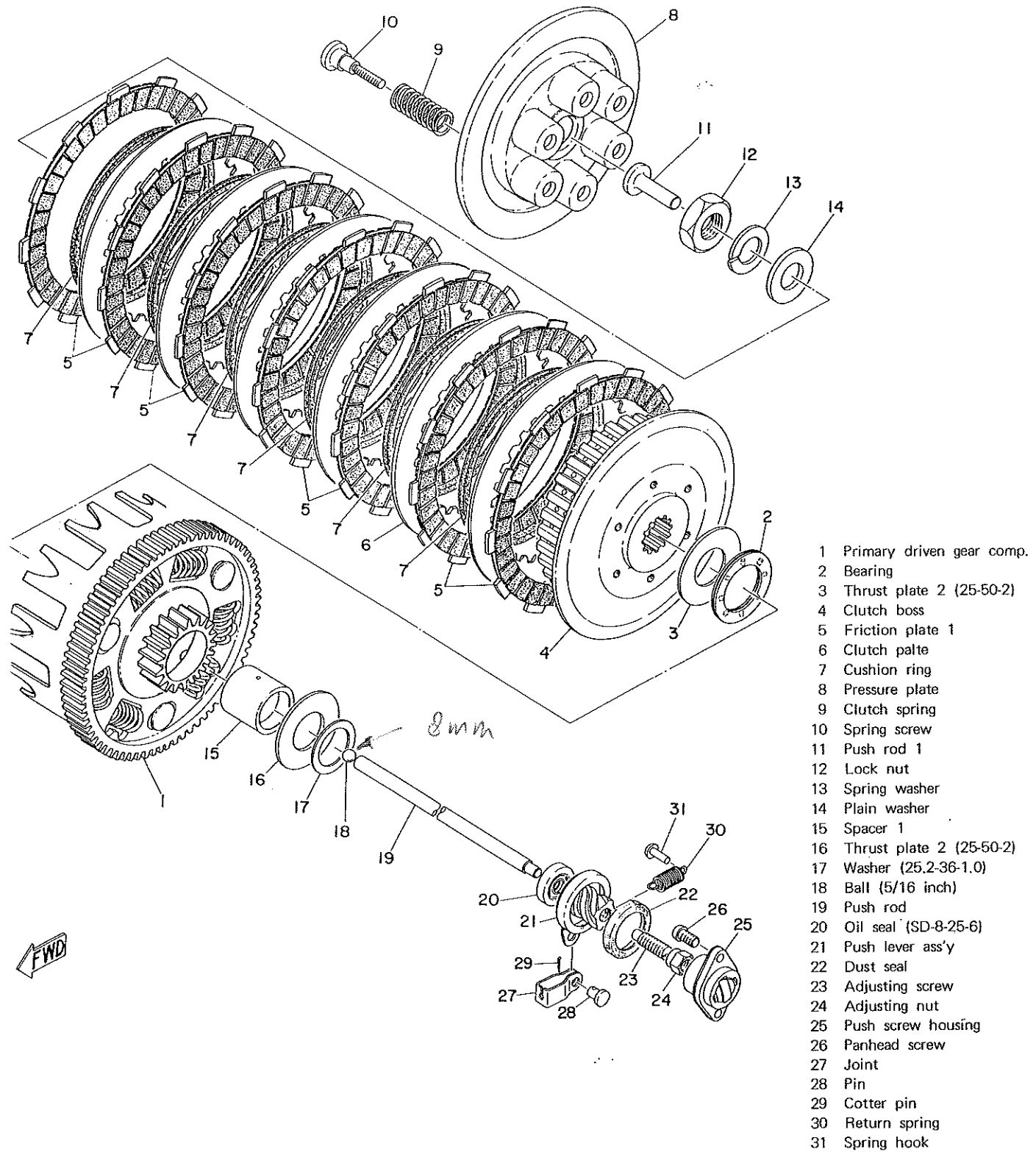
Inspection

- 1) Clutch Spring Wear

- a) Measure the spring free length with vernier caliper. If standard length has shortened by 1mm (0.04") or more, replace the spring.



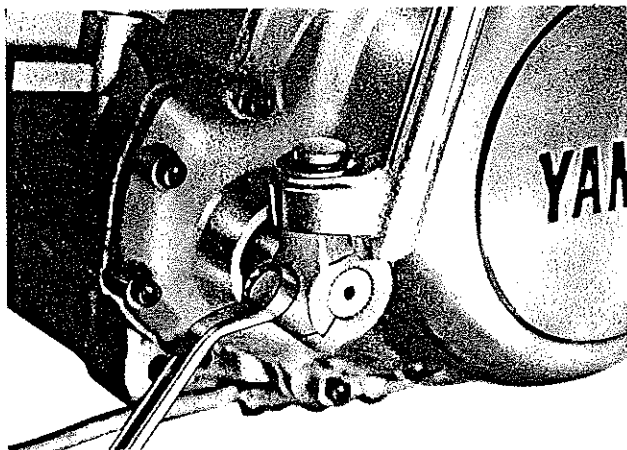
CLUTCH



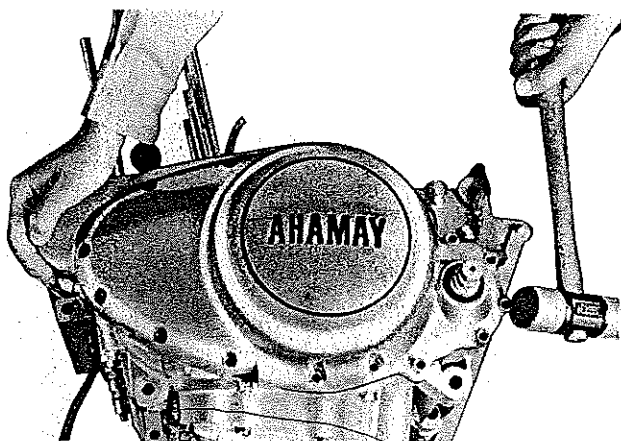
KICK CRANK, CRANK CASE COVER

Disassembly

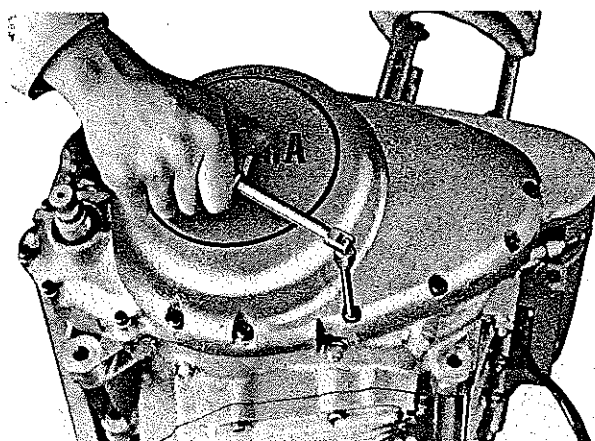
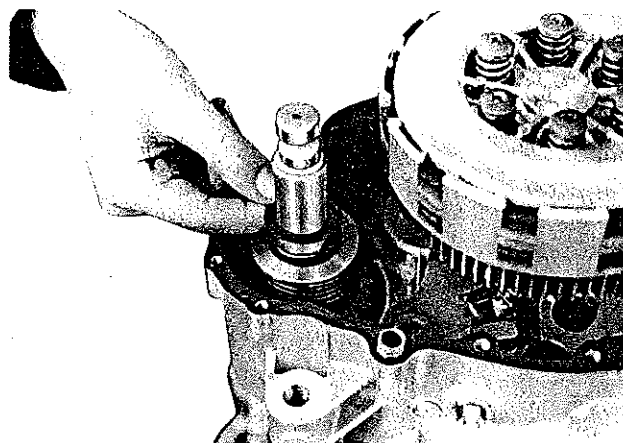
- 1) Remove the kick crank mounting bolt, and remove the kick crank ass'y.



- 2) Remove the crankcase cover holding bolts (5-mm internal hexagon head) then remove crankcase cover.

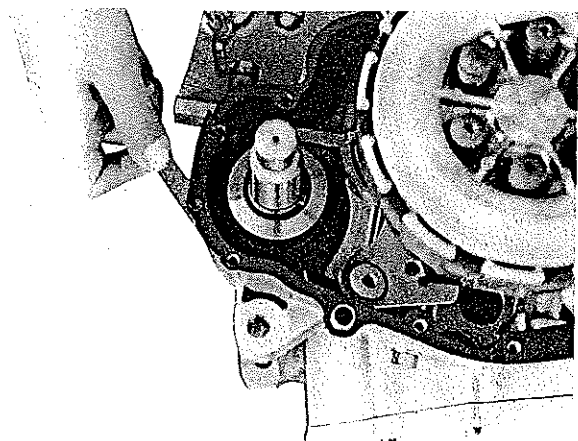


- 2) Install the crankcase cover gasket. Be sure to keep the knock pin fitted on the crankcase.
- 3) Grease the crankcase cover oil seal. Install the kick axle washer. Tightening torque for the crankcase cover hexagon bolts is 0.8 ~ 1.0 kg-m. (72 ~ 90 in-lbs)



Installation

- 1) Thoroughly remove the gasket with the dull end of a saw blade, or other suitable scraper. Also clean any oil off of the sealing surfaces.



- g) If any of the previous three wear checks prove any of the rings to be worn beyond acceptable tolerance. REPLACE THE ENTIRE SET.

Caution

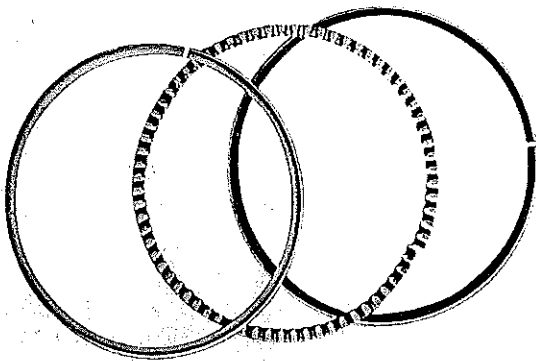
Whether the rings are new or used, they must always be checked for correct ring end gap clearances. This applies to all three piston rings.

Installation

Installation of these rings is basically a reversal of the above process, except for the bottom (oil control) ring.

1) Oil control Ring Installation (Installed first):

The oil control ring consists of three separate parts, two identical rails and one expanding spacer. First, slip the spacer over the piston, and into the bottom groove. Neither rail has a particular top side. So install one rail into the bottom part of the groove and then position the last rail, either slide up, into the top part of the groove. Finally, position the three end gaps approximately 120° from each other.

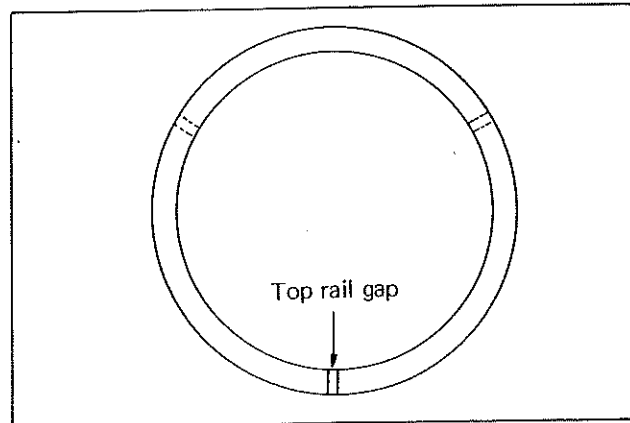


3) Spacing of All Ring End Gaps

All ring end gaps must be off-set from one another to prevent the leakage of compression and oil. Stagger their positions evenly around the perimeter of the piston.

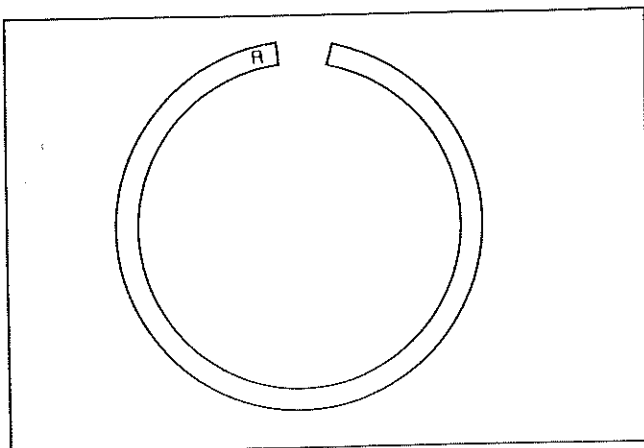
Note:

The oil control ring has three gaps. Use the top rails gap to judge where the compression and wiper ring gaps should be aligned.



2) Middle and Top Ring Installation

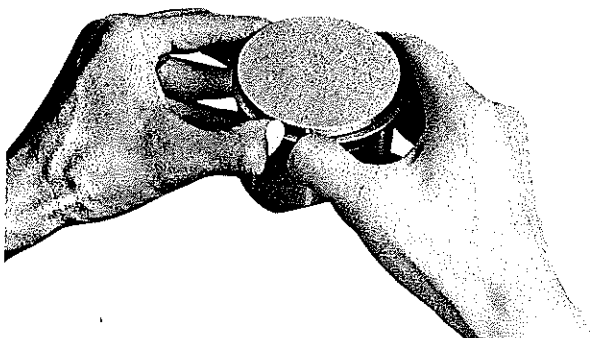
Install the middle ring and top ring. Each ring is stamped with an "R" on one side that must face up toward the piston crown when installed.



Disassembly

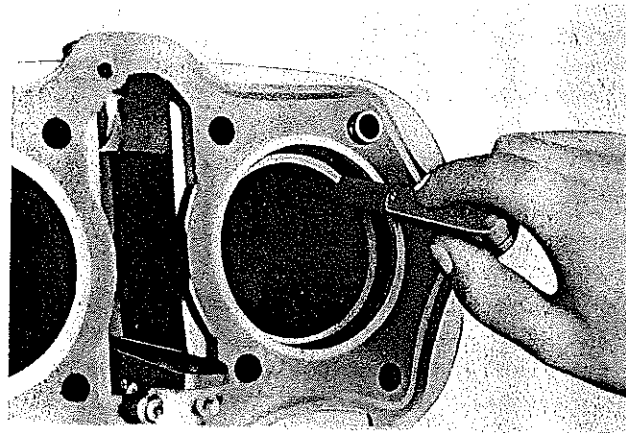
Push apart the piston ring ends with both thumbs so that the ring can be slipped out of the groove on the other side with the first fingers.

Avoid opening the ring ends too wide, or the ring may be broken. The top ring should be removed first.



Note:

The end gap on the expander spacer of the oil control ring is unmeasurable. If the oil control ring rail show excessive gap all three components should be replaced.

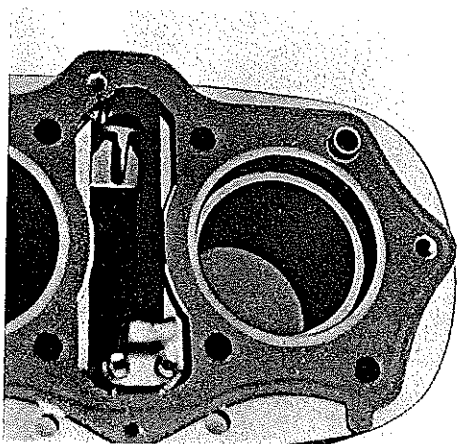


e) Piston ring wear

a) All three rings experience the same type of wear. Any check applied to one ring can be used to also test the others.

b) Before checking for wear, clean all carbon from the ring surface. This insures an accurate wear check.

c) Check for gaps between the ring contacting edge and the cylinder wall. Push the ring into the bore (with an inverted piston to make sure it is not cocked). Slip a piece of white paper beneath the cylinder bore (for visual contrast) and check the outer perimeter for visible gaps between the ring and the cylinder wall.

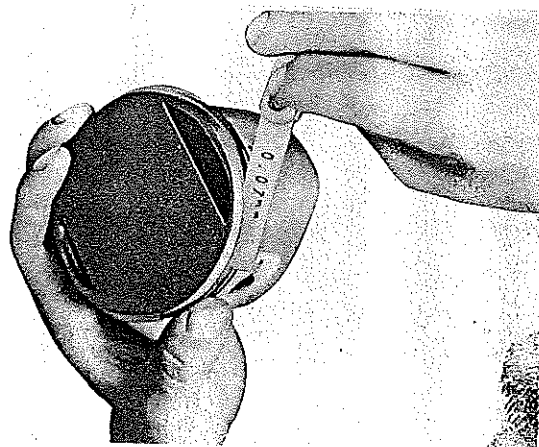


d) With the ring still positioned in the bore, check end gap clearance with a feeler gauge. Standard specifications and maximum wear limits are listed below.

Standard Gap(mm) Wear Limit (mm)

Compression Ring	0.2–0.4	0.8
Wiper Ring	0.2–0.4	0.8
Oil Control(Rails)	0.3–0.9	1.3

e) Piston ring/ring groove fit must have correct clearance. If the piston and ring have already been used in the engine, the ring must be removed, the ring groove cleaned of carbon, and then the ring should be reinstalled. Use a feeler gauge to measure the gap between the ring and the land. The standard tolerance is 0.04mm (0.0016") to 0.08mm (0.0032"). The wear limit is 0.15mm (0.006"). The second standard tolerance is 0.03mm (0.0012") to 0.07mm (0.0028").

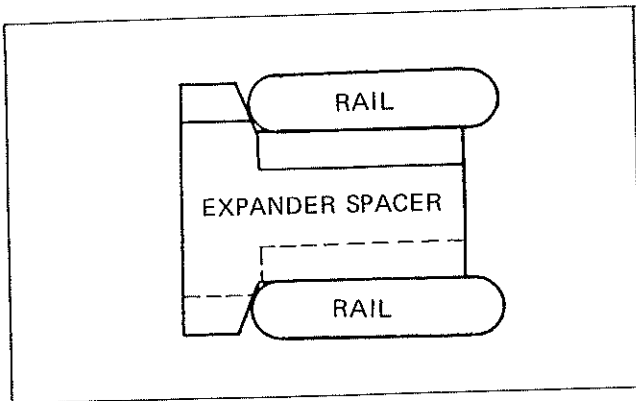


Note:

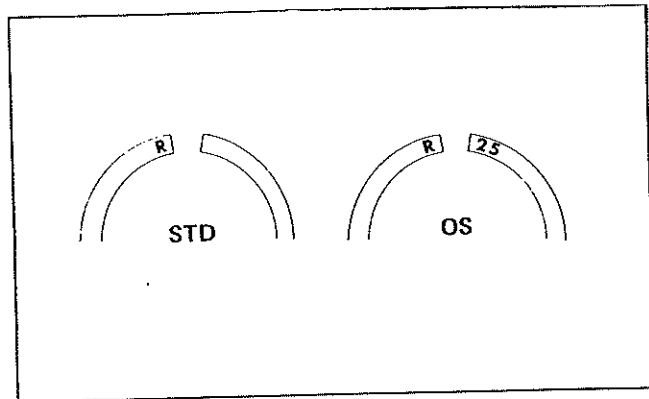
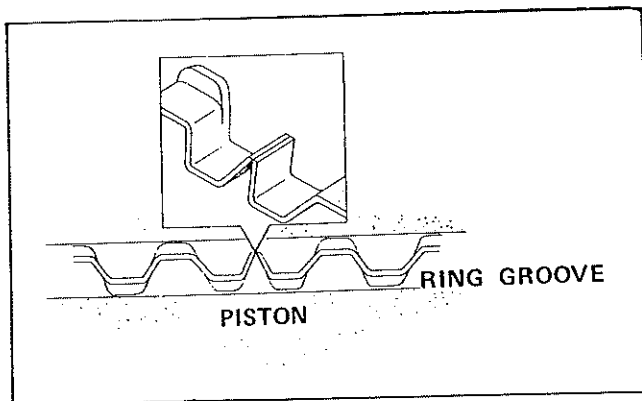
f) There must be no side clearance at all on the oil control ring. If any clearance exists, the expander spacer has become fatigued. Replace the ring.

c) Bottom ring:

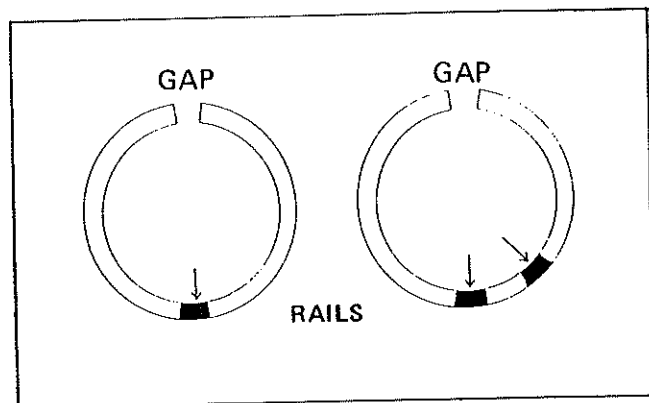
This ring's purpose is to trap and remove oil from the cylinder wall. The ring consists of three separate components: top and bottom spring steel rails, and a stainless steel wave type expanding spacer. Oil is trapped between the two rails and is forced out the holes drilled in the piston ring groove. The rail outer edge is chrome plated to resist wear.



The expander spacer, because of its design, pushes both rails against the ring groove sides. In addition, the spacer is equipped with a projecting inner lip that pushes both rails out, creating an excellent oil trapping action.



b) All three pieces of the bottom (oil control) ring are colorcoded to identify sizes. The color marks are painted on the ring, 180° opposite the end gap.



SIZE		COLOR	
Oversize 1st	25 (0.25mm)	Blue	(2 marks)
2nd	50 (0.50mm)	Red	(1 mark)

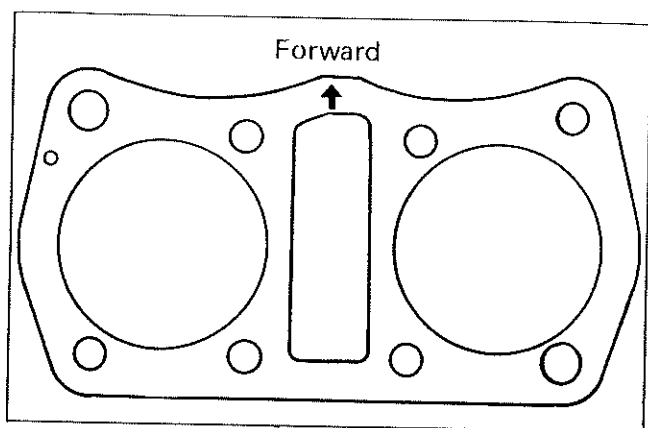
Caution

Install the cylinder after making sure that the ring ends meet perfectly.

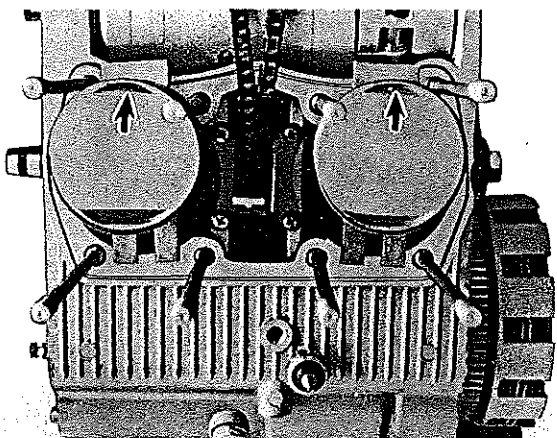
d) Piston ring (standard and oversize) identification Code

a) The oversize top and middle ring sizes are stamped on top of the ring.

Standard	Size (mm)
Oversize 1st	0.25
2nd	0.50

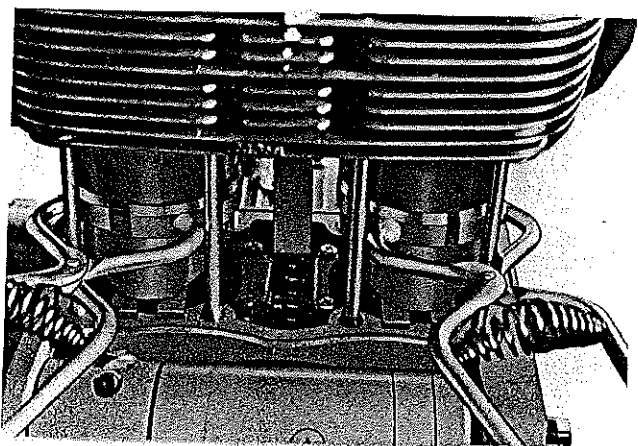


- 2) Slip a piston support plate (found in Special Tool Kit) under each piston skirt. This prevents the pistons from being pushed down during cylinder installation. Place a rag under each base special tool to protect the new gasket.



- 3) Lubricating the piston pin, and rings.

Position and tighten the ring compressors (found in Special Tool Kit) so the rings can slip up into the cylinder without catching on the bottom of the cylinder. Lubricate both bores. Slip the cylinder down over the studs until it slips over the pistons and rests on the ring compressors.



- 4) Rotate the crankshaft so that the pistons slide up into the bores. Remove the ring compressors and piston bases, then push the cylinder down until it butts against the crankcase.

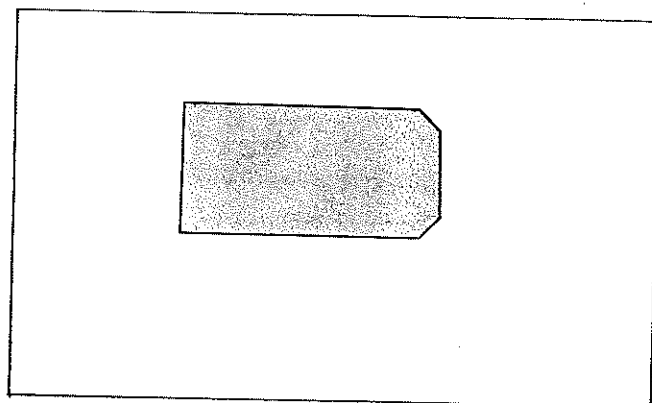
Note:

All parts should be well lubricated during assembly. When a newly rebuilt engine is started for the first time the oil supply passages will be empty and there will be a short period when no oil is delivered to various parts. It is a good ideal to kick the engine over several times prior to starting to fill these passages.

PISTON RING

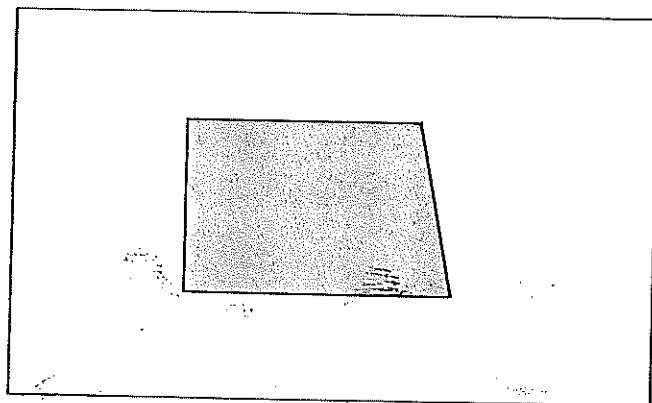
a) Top ring:

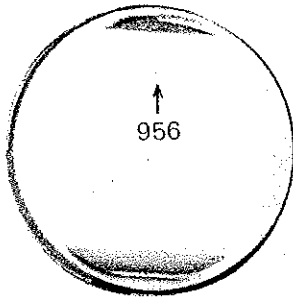
This is the compression ring. It must provide efficient sealing and must be able to withstand the greatest amount of heat. The outer edge is chrome plated for wear and heat resistance. Both outer edges of this ring are beveled (see the drawing of ring cross-sectional view) to provide a good compression sealing edge.



b) Middle ring:

This second ring is cast iron. It serves as a "wiper" ring to scrape excess oil from the cylinder wall. It flexes slightly which provides a narrow and effective scraping edge.





Example:

0.007 marked on cylinder really means 80.007mm cylinder bore, or 0.007mm oversize.

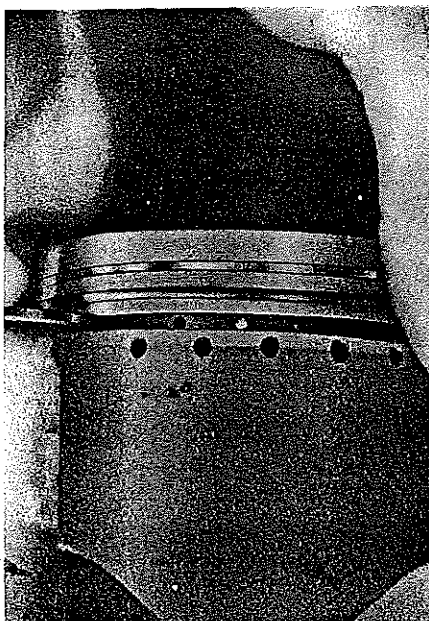
If the above piston is used with this cylinder, total clearance would be 0.051mm (0.0020").

Example:

$$\begin{array}{r} 80.007 \text{ (Cylinder)} \\ -79.956 \text{ (Piston)} \\ \hline 0.051 \text{ (Clearance)} \end{array}$$

Clearance Piston Ring Grooves

Carbon and varnish gradually build up in the ring grooves. Remove the rings and use the blunt end of a discarded ring to clean all carbon from the grooves. The oil ring (bottom) should not require this procedure. Check to make sure the oil relief holes are not blocked.



Piston Pin Wear

- a) The piston pin oscillates in a bushing. Check the piston pin wear. If any exist, replace the pin or connecting rod. However, a dull finish at the center section of the pin may be noticed. It is normal operating wear and does not indicate a defective pin (unless this dull surface is pitted).



- b) Check the pin for blue discoloration. This discoloration is caused by heat and is an indication of inadequate lubrication. The pin should be replaced and the lubrication system checked.

Caution

Whenever the piston pin is replaced, also replace the needle bearing and check the connecting rod small end for wear which might require rod replacement.

Piston Installation

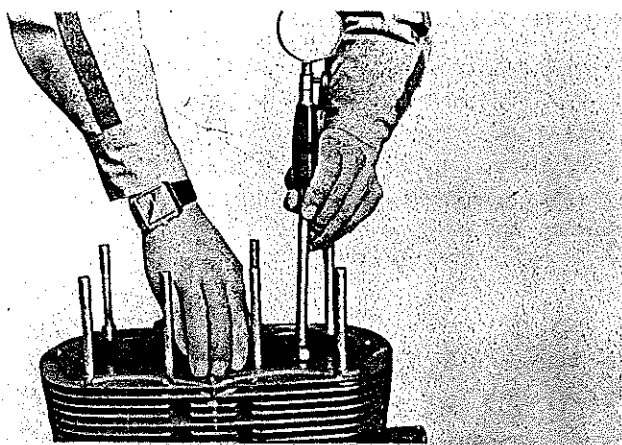
- a) Lubricate all surfaces with oil prior to piston installation.
- b) Mount the piston (rings installed) onto the connecting rods. Be sure the arrow stamped on the piston crown points forward. Also make sure that the left piston (already marked during removal) is fitted to the left-hand connecting rod. This guarantees that all previous clearances remain unchanged unless new parts are installed or cylinder work is done.

Note:

The piston pin should be a thumb-press fit into the piston. After the pin has been installed, lock it in place with two new circlips. Never use old circlips.

Installation

- 1) Make sure the crankcase and cylinder bottom matching surfaces are clean, then install a new base gasket.



- d) The bore might be lightly damaged with scratches or nicks. Run a hone through the bore a few times to see if the bore cleans up. If these scratches are too severe, a hone cannot remove them, and a cylinder rebore would be necessary several over sizes.

Note:

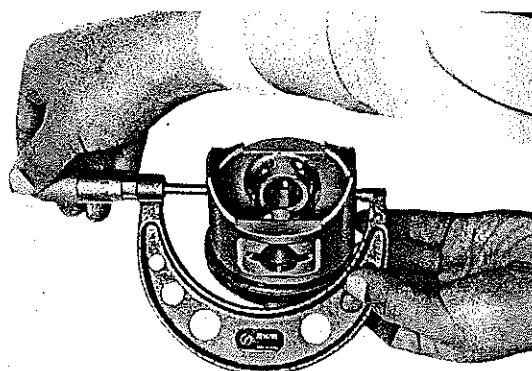
The hone should be used in a low rpm drill and the hone should be moved through the entire bore at an even speed. This should result in a "cross-hatch" pattern which aids ring seating.

- e) If the cylinder has been in use many miles, a ridge may form at the upper edge of the bore. This is mostly carbon. Normally this ridge can be removed by scraping with a soft scraper (to prevent damage to the bore). This ridge is automatically removed if the cylinder is bored out. Care should be taken that the ridge is completely removed if the cylinder is just to be honed. If scraping does not remove the ridge, previous to honing, a ridge reamer must be used to finish removing the ridge (reamer is commercially available).

Piston Wear

- First, check the piston for cracked or broken sections, including the crown, ring lands, and skirt. Also check the piston crown for possible metal disintegration due to excessive heat in the combustion chamber.
- If severe score marks are found on the skirt, this can be attributed to insufficient lubrication sometime during engine operation or improper clearance. If these marks can be removed with fine emery cloth the piston can be used again.
- All of the above wear conditions may require piston replacement (except as noted). If a defective piston is reinstalled, the engine will not perform satisfactorily and premature engine failure may occur.

- Check for additional wear by measuring piston diameter 10mm (3/8") from the bottom of the skirt and at right angles to the piston pin holes. Piston standard size is 80mm.
- Standard piston wear usually does not exceed 0.05mm. This measurement is important when determining piston-to cylinder clearance.



Piston Clearance

- Piston-to-bore clearance is the difference between minimum cylinder bore measurement and maximum piston diameter. Standard clearance is 0.050–0.055mm (0.0020"–0.0022"). If measurements prove that the clearance equals 0.15mm or more, it is excessive, and one of two corrective measures must be taken to bring the clearance back within tolerances.
- If cylinder taper is within tolerances, and if the cylinder can be cleaned up by honing then obtain a larger size standard piston that is large enough to obtain the correct clearance.
- Bore and hone out the cylinder to the size of a first oversize piston, plus the correct clearance.
- How to Calculate Standard Size Piston-to-Cylinder Clearance from Stamped Numbers
Nominal piston standard size is 80mm. The number stamped on the piston crown is the actual size. (The 80 is dropped.)

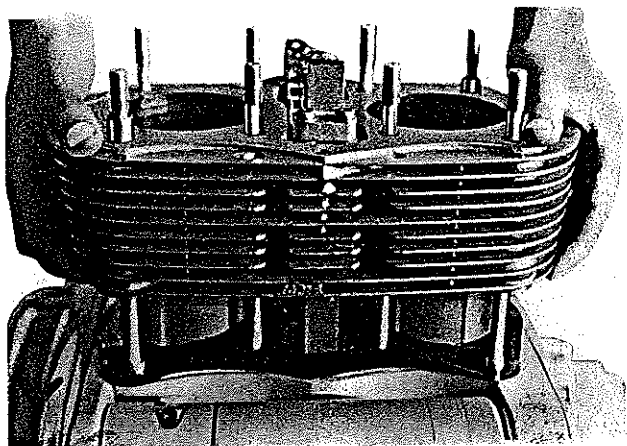
Example:

0.956 on crown really means 79.956mm piston diameter, or 0.044mm undersize.

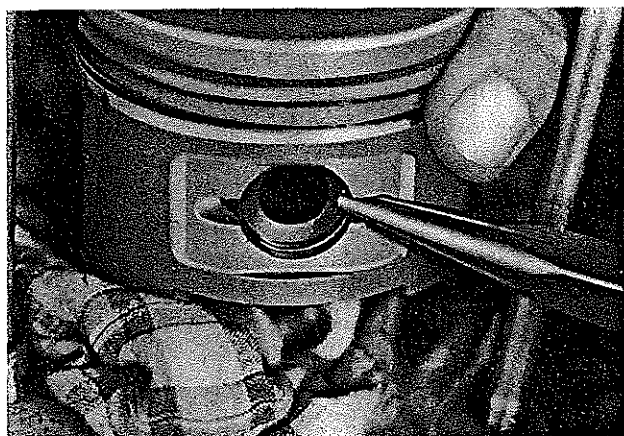
Cylinder standard bore size is marked in large numbers on the very bottom of the cylinder. It equals 80mm PLUS the amount marked.

Disassembly

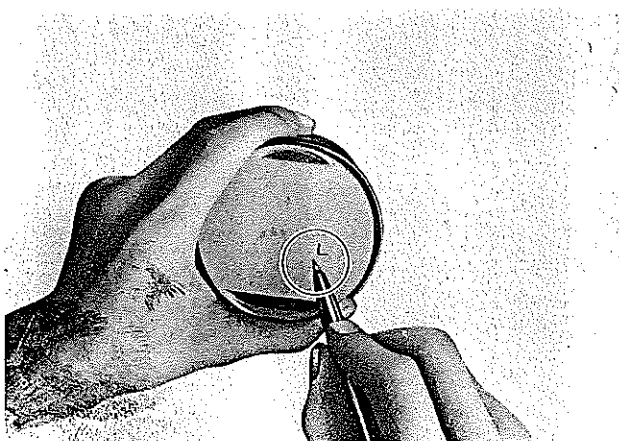
- 1) Remove the cylinder by tapping it with a soft hammer. Care should be taken not to break fins.



- 2) Remove the outer circlip from each piston. Support the piston by hand and push out the piston pin using a soft drift (do not use a hammer). Lift the piston off and set it to one side with the piston pin and needle bearing.



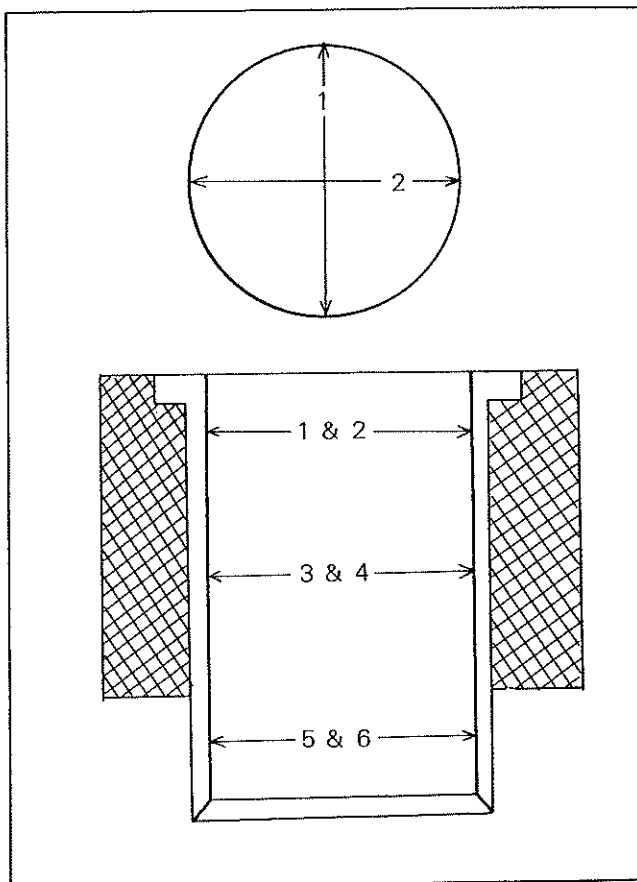
Each piston must be marked as to which cylinder it came from to ensure identical match-up during reinstallation. Lightly scribe an "L" inside the left piston skirt and an "R" inside the right piston skirt.



Inspection

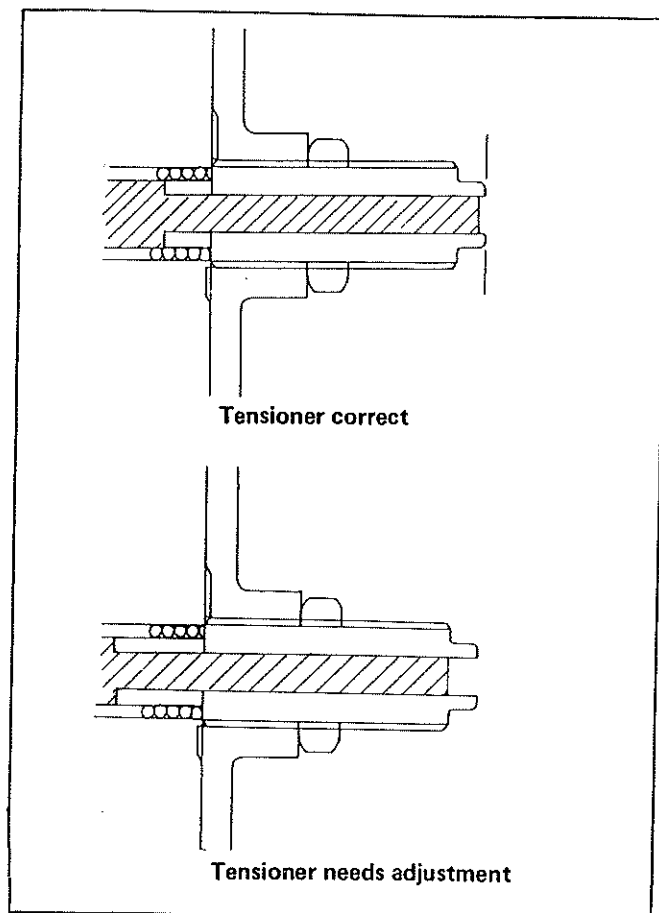
Cylinder Wear and Repair Procedures

- a) Constant friction between the bore and piston, plus microscopic particles of contamination that enter through the intake, cause a gradual wear of the bore. This wear can be detected by measuring various points in the bore and comparing these measurements against standard specifications.
- b) This drawing shows the places to take bore measurements with a cylinder measuring gauge.

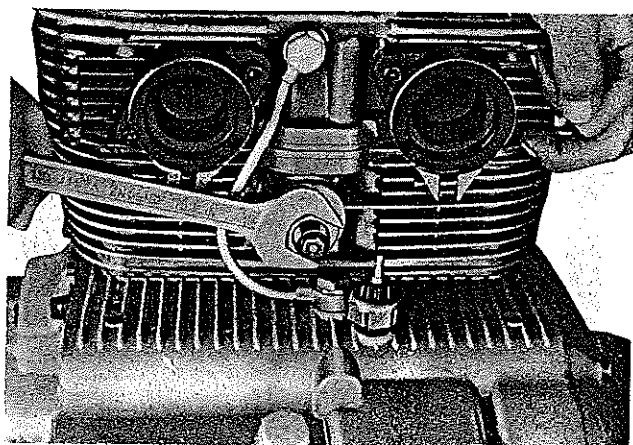


- c) Subtract the bottom bore measurement from the top bore measurement. The difference between these two dimensions is called the cylinder "taper". Check to see if the amount of taper is still within specified limits.

	Standard	Wear Limit
Cylinder Bore (mm)	80	80.1
Cylinder Taper (mm)	0.008	0.05



- 5) Tighten the lock nut and install the cover.
Check this adjustment every 2,000 miles. (1st 250, 500 miles new chain)



CYLINDER & PISTON

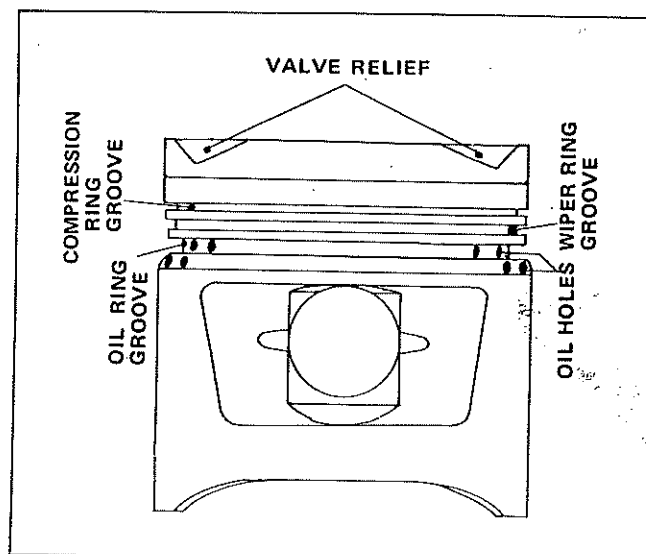
Cylinder

The cylinder is constructed of aluminum with cast iron sleeves. It has a cavity down the center of the cylinder that serves two purposes. First, it provides a channel for the cam chain to run in between the camshaft and the crankshaft. Secondly, it provides a space for air circulation that aids in cooling both cylinders.

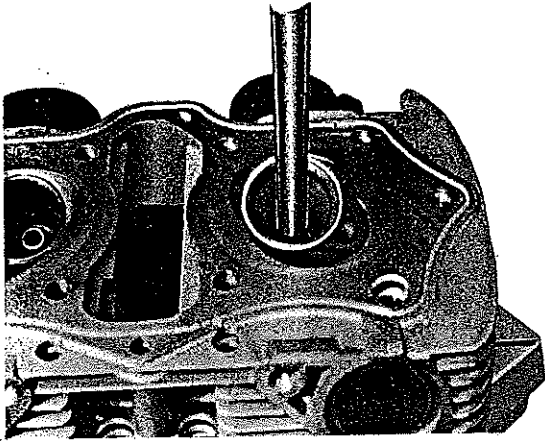
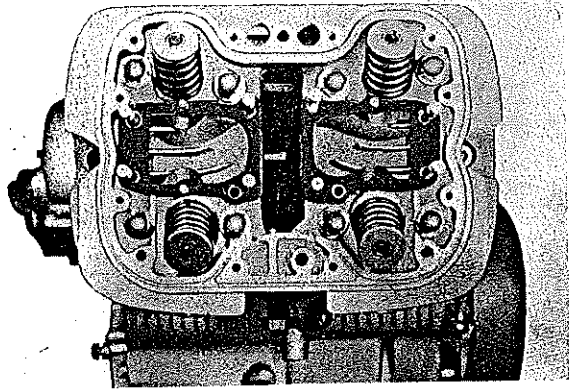
Piston

The piston crown is flat. It also has two relief areas for valve head clearance during engine operation. The relief areas are unequal in size since the intake valve is larger than the exhaust. An arrow is stamped on the crown to indicate piston position for installation. The piston should be installed with the arrow pointing forward.

Oil drain holes have been drilled in the oil scraper ring groove and in the piston wall just beneath the bottom groove. This provides an escape path for oil scraped off the cylinder wall. It also provides a path for lubrication of the piston pin and bearing.



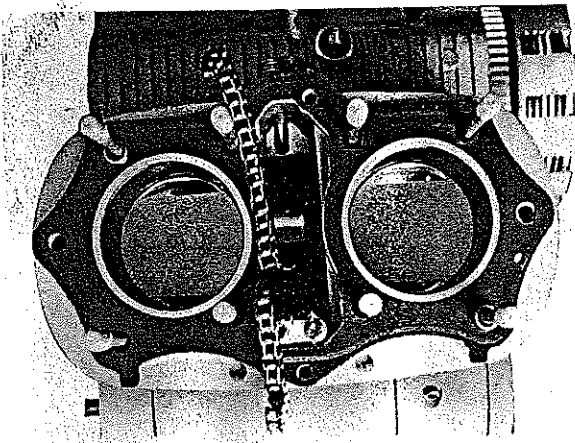
- b) The valve guide is replaceable. It is held in the cylinder head by an interference fit of approximately 0.04mm (0.0015"). To ease guide removal and reinstallation, and to maintain the correct interference fit, heat the head to 200 - 400° Fahrenheit. If possible, use an oven to avoid any possibility of head warpage due to uneven heating.



- c) Use the appropriate shouldered drift (Special Tools Kit) to drive the old guide out and the new guide in.

Installation

- 1) A new head gasket must be installed. The gasket can correctly fit only one way. Slip the cylinder head over the studs and onto the cylinder.



- 2) The cylinder head bolts must be tightened crosswise with a torque wrench and with correct torque. Oil the threaded portion of each bolt, before tightening. Tightening torque:

M8	2.0~2.3 kg-m (180~207 in-lbs.)
M10	3.7~4.0 kg-m (333~350 in-lbs.)

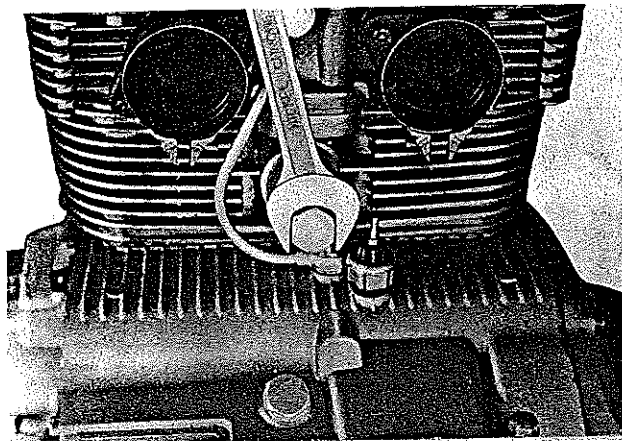
Note:

After completing this phase, plug the spark plug holes to prevent anything from dropping into the cylinder.

CHAIN TENSIONER

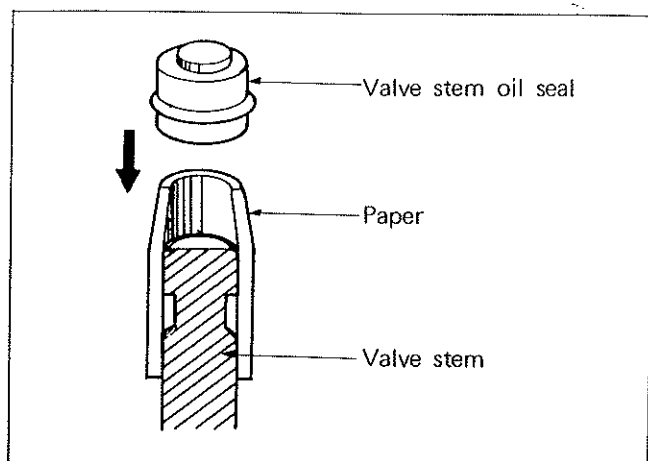
Disassembly

- 1) Remove the cover, lock nut and adjuster. The vibration damper attached to the crank case can be removed after the cylinder is pulled out.



Adjustment

- 1) Rotate the crankshaft clockwise (from the left side of the engine) to place all slack in the area of the chain tensioner.
- 2) Remove the cast metal protective cover.
- 3) Loosen the tensioner lock nut.
- 4) Turn the adjuster in until the push rod is flush with the adjuster. Then lock adjuster off 1½~2 turns.



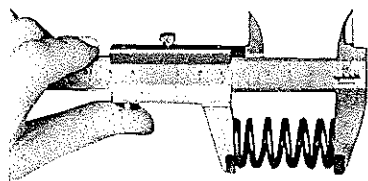
Valve springs

- a) The TX750 engine uses two springs of different size to prevent valve from floating or surging. The chart below shows the basic valve characteristics.

VALVE SPRING SPECIFICATION CHART

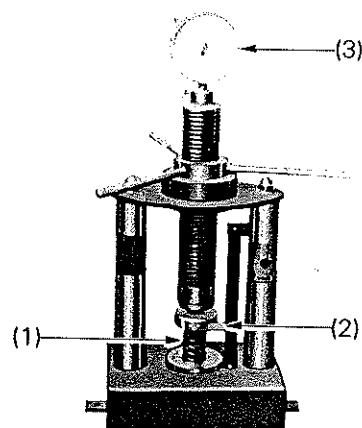
	OUTER	INNER
Diameter of Wire	4.3mm	2.9mm
Direction of Winding	Right Hand	Left Hand
Total Windings	5.25	7.25
Free Length	44.0mm	46.0mm
Installed Length (Valve Closed)	40.0mm	38.0mm
Installed Pressure	18 ± 1 kg (40 lbs)	13 kg (26.7 lbs)
*Compressed Length (Valve Open)	30.0 mm	28.0mm
Compressed Pressure	64 ± 3 kg (140 lbs)	29 kg (64 lbs)
*Measured without collar All measurements ± three percent		

- b) Even though the spring is constructed of durable spring steel, it gradually loses some of its tension. This is evidenced one way by a gradual shortening free length. Use a vernier caliper to measure spring free length. If the free length of any spring has reduced more than 2mm (0.080") from its specification, replace it.



- c) Another symptom of a fatigued spring is insufficient spring pressure when compressed. This can be checked using a valve spring compression rate gauge.

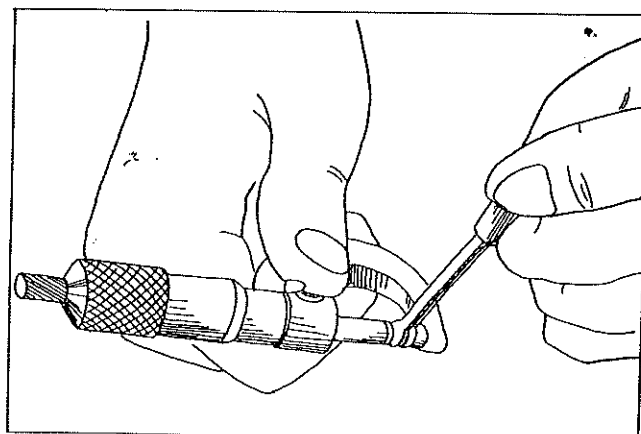
- (1) Individual spring
- (2) Length measuring scale
- (3) Pounds pressure scale



Test each spring individually. Place it in the gauge and compress the spring first to the specified compressed length with the valve closed (all spring specifications can be found in previous section, Valve Spring) then to the length with the valve open. Note the poundage indicated on the scale at each setting. This procedure must be performed on the outer springs, then the inner springs.

Valve guide

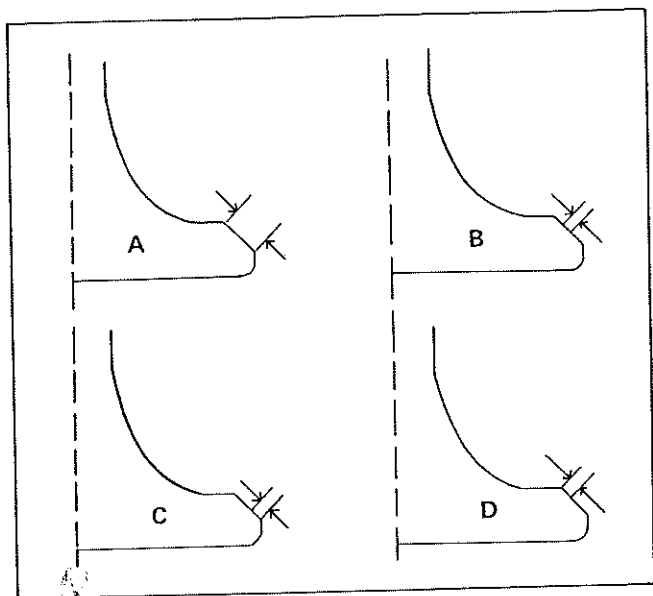
- a) The inside diameter must be measured with a ball gauge. Measure at each end and in the center of the drilled passage. Compare this measurement, using the largest measurement of these spots, with factory specifications listed in Valve Description. If this measurement exceeds the maximum tolerance, replace the guide.



- c) If the valve seat is uniform around the perimeter of the valve face, but is too wide or not centered on the valve face, it must be altered. Use either the 45° or 65° cutters to correct the improper seat location in the manner described below:

	Standard Width	Wear Limit
Seat Width	1.3mm (0.051")	2.0mm (0.078")

- (A) If the valve face shows that the valve seat is centered on the valve face, but too wide, then lightly use both the 65° cutter to reduce the seat width to 1.3mm.
- (B) If the seat shows to be in the middle of the valve face, but too narrow, use the 45° cutter until the width equals 1.3mm.
- (C) If the seat is too narrow, and right up near the valve margin, then first use the 45° cutter to get the correct seat width.
- (D) If the seat is too narrow and down near the bottom edge of the valve face, then first use the 65° cutter and then the 45° cutter.



Lapping the valve/valve seat assembly

- a) The valve/valve seat assembly should be lapped if,
- (1) the seat or the valve face is severely worn, or
 - (2) if the valve face and valve seat have been resurfaced and now require a final light grinding operation for perfect sealing.
- b) Apply a small amount of coarse lapping compound to the valve face. Insert the valve into the cylinder head. Rotate the valve until there is a burnished spot all the way around the valve face. Clean off the coarse compound, then follow the same procedure with fine compound. Continue lapping until the valve face shows a complete and smooth surface all the way around.

Clean off all compound material. Apply blueing dye to the valve face and rotate the valve face for full seat contact which is indicated by a shiny surface all around the valve face where the blueing has been rubbed away.

Note:

The valve can most easily be rotated if a section of flexible rubber hose of 5/16" ID is slipped over the valve stem and spun.

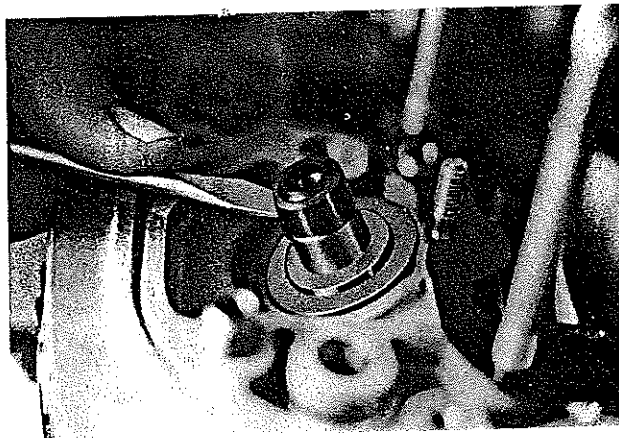
Valve leakage check

- a) After all work has been performed on the valve and valve seat, and all cylinder head parts have been assembled, check for proper valve/valve seat sealing by pouring solvent into each of the intake ports, then the exhaust ports. There should be no leakage by the seat. If this fluid leaks, disassemble the valve assembly and continue to lap with fine compound. Clean all parts thoroughly, reassemble and check again with solvent. Repeat this procedure as often as necessary to obtain a satisfactory seal.

Valve stem seal

This seal slips down over the valve stem to prevent excessive amounts of oil from passing down stem and into the combustion chamber.

Therefore, when installing the seal, be sure to replace the valve stem seal with a new one.



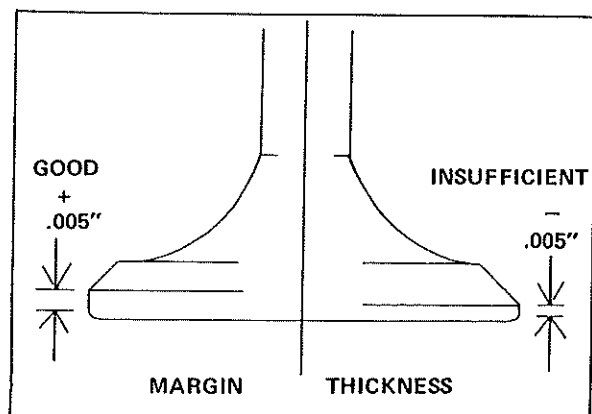
Caution

Before installation of the valve stem oil seal on the valve stem, wrap the valve stem end with a piece of paper as shown in the illustration below and apply enough grease on the surface of the oil seal lip for prevention of possible scratches or cuts on the seal lip. Then fit the valve stem oil seal on the valve stem.

Valve wear

- Check the valve stem tip for an indentation caused by the adjuster constantly striking the tip. If this indentation is 0.4~0.5 mm (0.015"~0.020") deep, or more, then grind the tip surface flat. Remove only the material necessary, no more. Use a commercial valve grinder with the appropriate adaptor mounted on it to grind the tip.
- Valve stem wear must be measured and then combined with valve guide measurements to arrive at a stem-to-guide clearance. This clearance must be within the tolerances. If it exceeds the maximum limit, then replace either or both parts as required.
- The valve should also be checked for a bent stem. Roll the stem along the edge of a surface plate and visually check for stem warpage. Replace the valve if any warpage exists.

			Original Clearance	Replacement Clearance
Intake	Valve Guide ID	8mm $+ .019$ $+ .010$	.020 - .044mm	.100mm
	Valve Stem OD	8mm $- .010$ $- .025$		
Exhaust	Valve Guide ID	8mm $+ .019$ $+ .010$	.035 - .059mm	.120mm
	Valve Stem OD	8mm $- .025$ $- .040$		



Note:

When checking the stem for warpage, be sure all carbon has been cleaned off. Otherwise, an accurate check cannot be made.

- Check the valve for pits, carbon deposits, warpage (including the entire head), and actual chips broken off the margin. If warpage exists or if the surface is chipped, replace the valve. If it is just pitted and/or carboned up, lap it to the valve seat. If it does not clean up by lapping then use a mechanical grinder to resurface the valve face. After grinding, check valve margin thickness. If it has been reduced to a sharp edge because of grinding, the valve should be replaced

as this thin edged margin can readily heat up and cause pre-ignition.

- Check the stem for scratches. These occur when carbon collects in the valve guide and then hardens. As the stem continually rubs against this hard carbon, scratches are worn in the stem. Replace the valve if deep scratches are found.

Grinding the valve seat

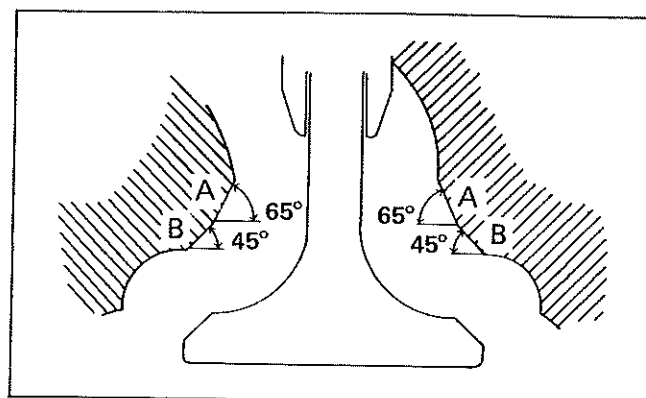
- The valve seat is subject to severe wear similar to the valve face. Whenever the valve face is resurfaced, the valve seat should also be resurfaced at a 45° angle. In addition, if a new valve guide has been installed (without any valve repair), the valve seat should be checked to guarantee complete sealing between the valve face and seat.

Caution

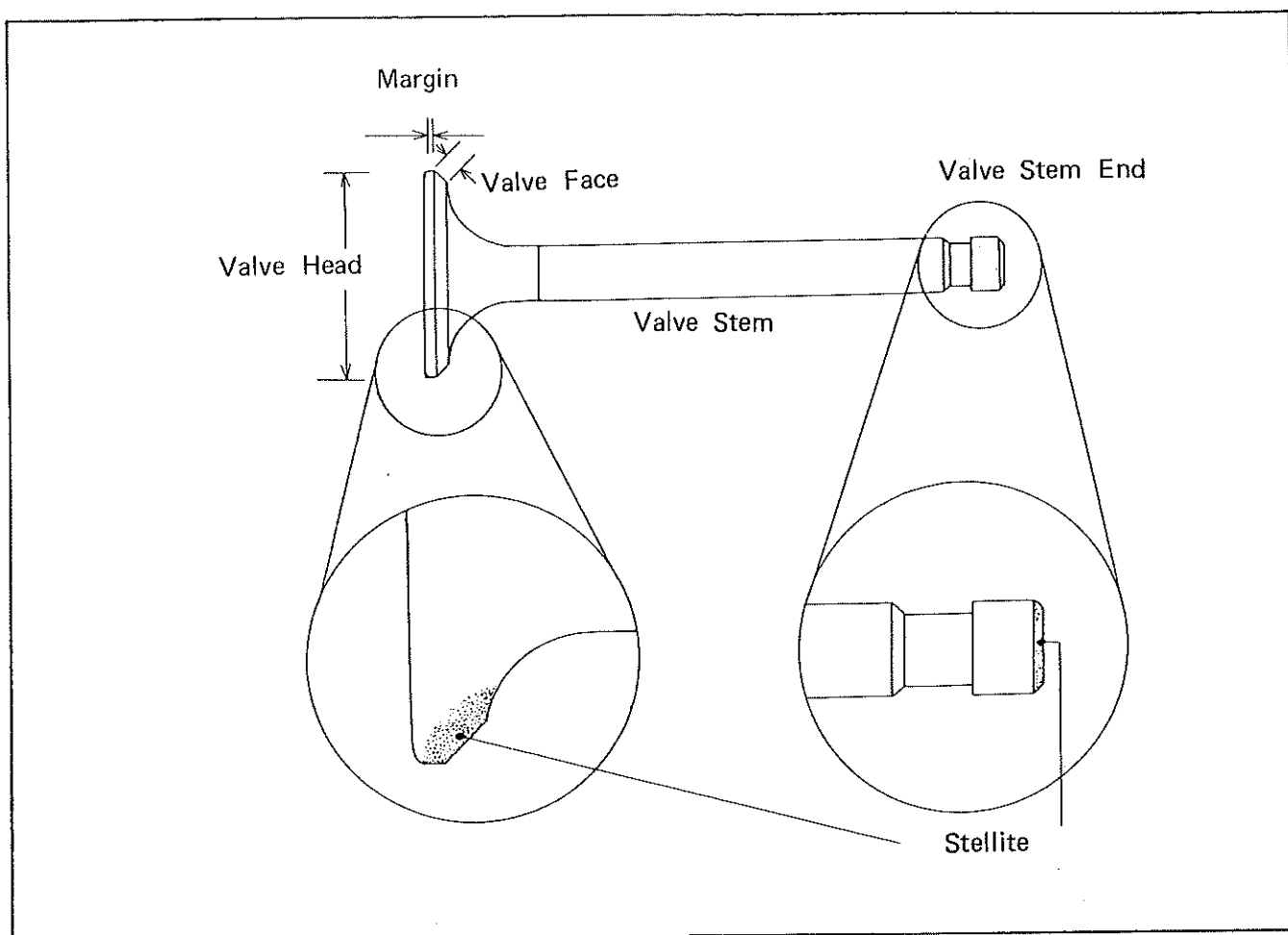
If the valve seat is obviously pitted or worn, it should be cleaned with a valve seat cutter. Use the 45° cutter, and when twisting the cutter, keep an even downward pressure to prevent chatter marks.

If cutting section "A" of the intake valve seat, use 65° cutter. If cutting section "A" of the exhaust valve seat, use 65° cutter for exhaust.

If cutting section "B", use the 45° cutter.



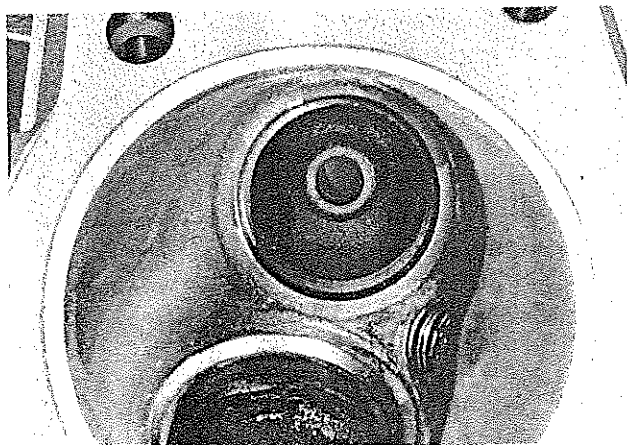
- Measure valve seat width. Apply mechanic's blueing dye (such as Dyken) to the valve face, apply a very small amount of fine grinding compound around the surface of the valve seat, insert the valve into position, and spin the valve quickly back and forth. Lift the valve, clean off all grinding compound, and check valve seat width. The valve seat will have removed the blueing wherever it contacted the valve face. Measure the seat width with vernier calipers. It should measure approximately 1.3mm. Also, the seat should be uniform in contact area. If valve seat width varies, or if pits still exist, then continue to cut with the 45° cutter. Remove just enough material to achieve a satisfactory seat.



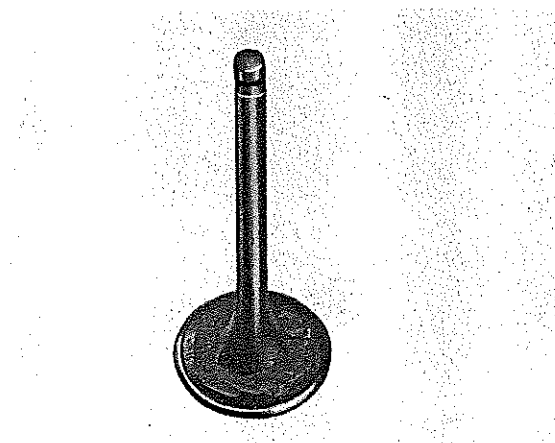
Inspection

Decarbonization of the Head and Components

Carbon deposits build up in the combustion chambers, on the valves, and in the exhaust ports. Thoroughly clean all parts with a blunt scraper, then wash in solvent and dry with compressed air. The parts can then be examined and measured for wear.



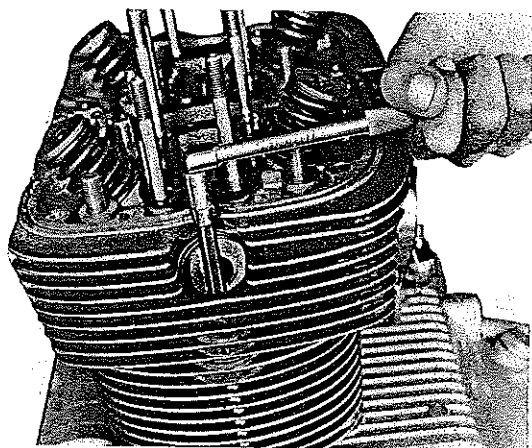
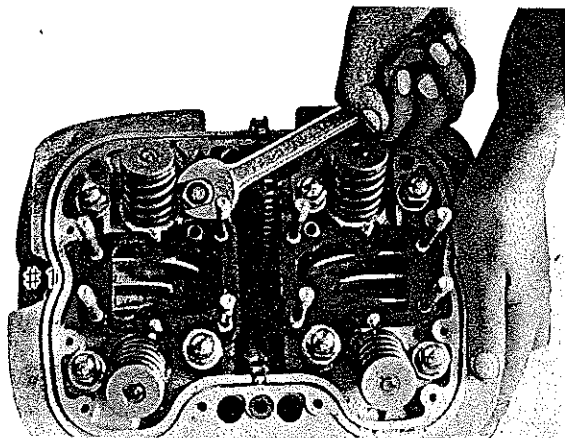
Combustion chamber carbon deposits



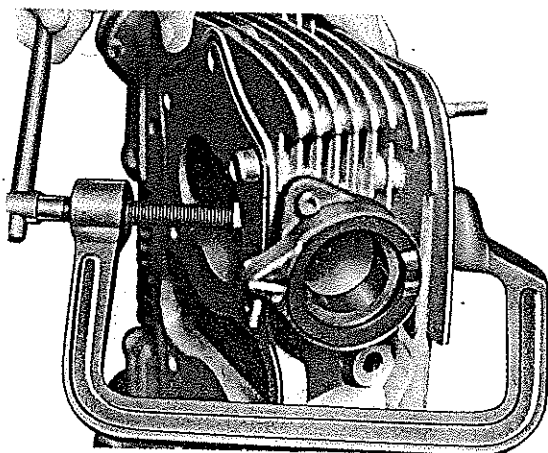
Valve carbon deposits

CYLINDER HEAD, VALVE SPRINGS, VALVES Disassembly

- 1) The head is now held in place by two hex-head screws (#1) beneath each spark plug hole and eight 10mm nuts and two 8mm bolts. Remove the bolts and slide the cylinder head up over the studs. While performing this operation, hold the safety wires so the cam chain does not fall into the crankcase.



- 2) Valve spring compressor is available in the Special Tool kit. Compress the valve spring and then remove both keepers. Remove the compressor and lift off the collar and springs.



Note:

The keepers might be partially stuck in the collar. Use a rubber hammer to tap the edge of the collar a few times to loosen the keepers.

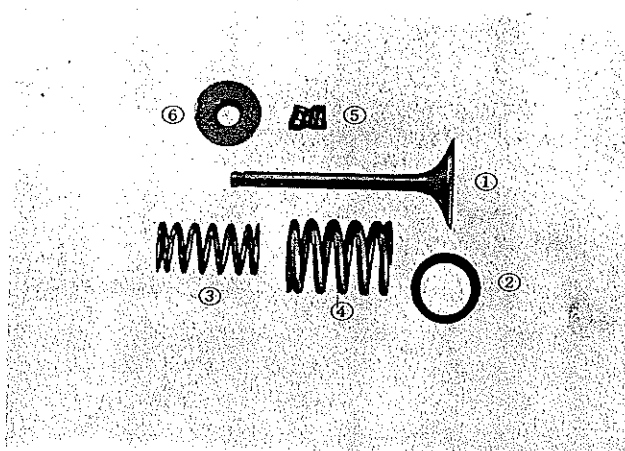
- 3) Pull the valve out. If the stem tip or keeper groove edges are slightly expanded, causing difficult removal, do not force the valve out as the valve guide inner diameter might be damaged. First, use a fine file to remove any lip that exists on the stem and then remove the valve.

Note:

Be sure to remove the valve stem seal before removing the valve. Otherwise the seal could be damaged.

Valve Description

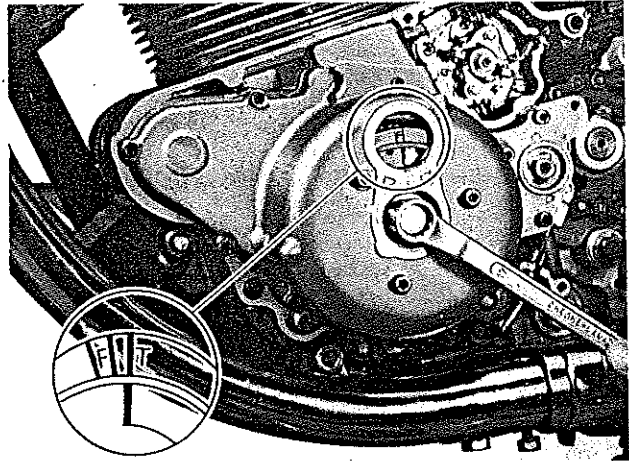
The head is equipped with four valves; two intake valves and two exhaust valves. The stem tip and valve face of each is plated with Stellite (hardened metal) to keep wear at a minimum. The intake valve diameters are larger to provide less restriction for the incoming fuel/air charge.



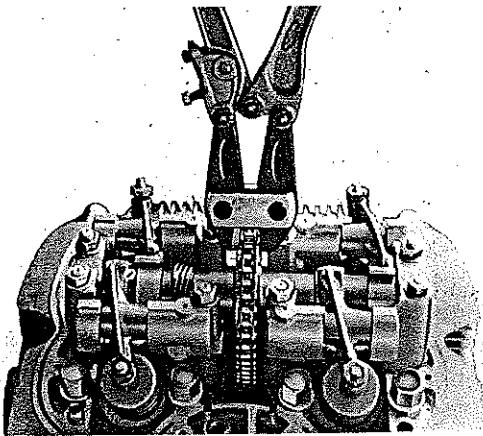
- | | |
|-----------------------|-----------------------|
| 1. Valve | 4. Outer valve spring |
| 2. Valve spring seat | 5. Keepers |
| 3. Inner valve spring | 6. Collar |

6) Reconnect the cam chain. The chain tensioner has been loosened during disassembly. Therefore, the cam chain will have excessive slack. To avoid incorrect timing the cam chain should be installed with no slack in the cam chain on the front portion (opposite side from the tensioner). Any slack on the back chain portion can be taken up with the tensioner.

7) Join the chain together by installing and riveting a new chain link. Always use a new link each time the chain is reconnected. (Use a chain riveter, not a hammer and punch, to mushroom the rivet ends). The Parts Book lists the replacement link to use.



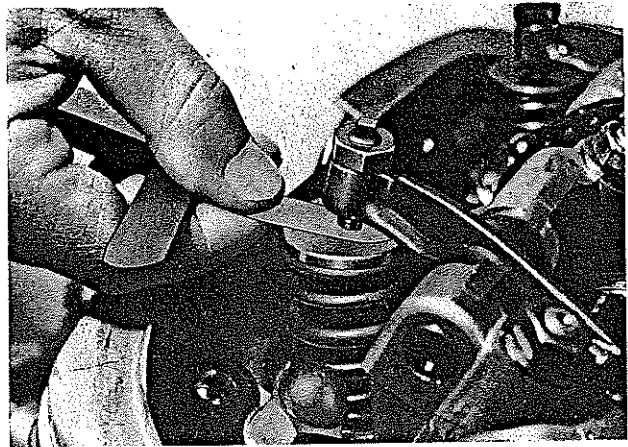
c) Use a feeler gauge to determine the existing clearance. The exhaust valve clearance should measure 0.05mm (0.002"), the intake clearance should measure 0.05mm (0.002"). (engine cold)



VALVE CLEARANCE ADJUSTMENT

Improper valve clearance causes poor engine performance and possible engine damage. If there is too little clearance, the valve is held partially open. This permits blowby past the valve and drop in compression. If there is too much clearance there will be excessive engine noise and the valve will not open fully which will create partial blockage of airflow at the port.

- Install all four rocker arms and remove the alternator cover and plug.
- Next, align the "T" mark on the rotor with the timing plate on the field coil assembly. This places the pistons at top dead center. One of the cylinder is now at the top of its compression stroke. The cylinder that is on the compression stroke has both valves shut. This can be noted by observing which cylinder has clearance at both valve adjusters.



- Loosen the lock nut and use the valve adjusting tool found in the Special Tool kit. Turn the adjuster in or out to obtain the correct clearance. Hold the adjuster solid to prevent it from moving and thoroughly tighten the lock nut. Recheck the clearance after tightening.

Tightening torque: 2.5~2.8 kg-m (225~252 in-lbs.)

- Rotate the crankshaft one complete revolution and once again line up the rotor mark with the field coil assembly timing plate. The valve train of the other cylinder is now in position for adjustment.

Caution

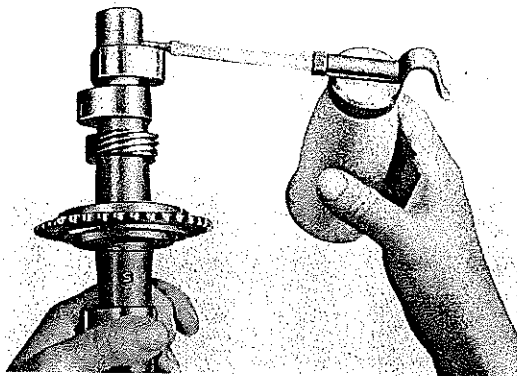
ADJUST VALVE CLEARANCE ONLY WHEN THE ENGINE IS COLD.

	A diameter		B diameter		Cam Lift(c)
	Standard Value	Wear Limit	Standard Value	Wear Limit	
Intake	39.31 ± 0.05	38.16	32.23 ± 0.05	32.08	7.31
Exhaust	39.34 ± 0.05	39.19	32.28 ± 0.05	32.13	7.34

(All dimensions given in millimeters.)

Installation

- 1) Clean the hole of the camshaft bracket, and oil them before installation.



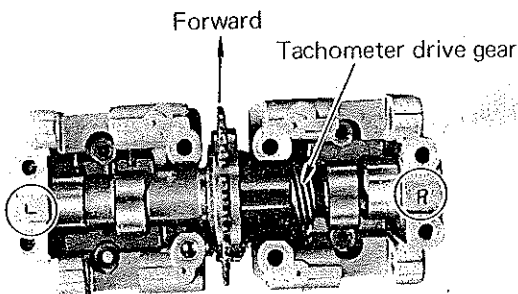
- 2) The camshaft is provided with the tachometer drive gear. Set the camshaft with the gear facing the right side viewed from the rear. The camshaft brackets must be installed correctly on the right and left sides, respectively. Take care not to install them in the reversed positions.

Tightening torque:

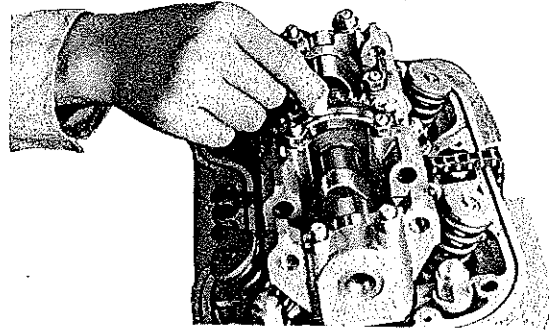
8-mm nut 2.0~2.3 kg-m (180~207 in-lbs.)

6-mm nut 0.8~1.0 kg-m (72~90 in-lbs.)

The cam surfaces of the camshaft should be oiled.

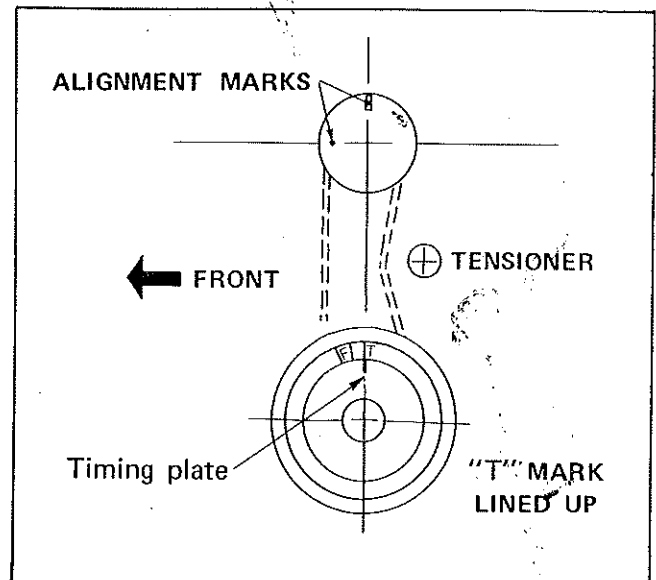


- 3) After tightening evenly both right and left camshaft brackets, check to see if the camshaft turns smoothly.



- 4) Next, rotate the pistons to TDC, as verified by lining up the field coil assembly timing plate with the "T" mark on the rotor.

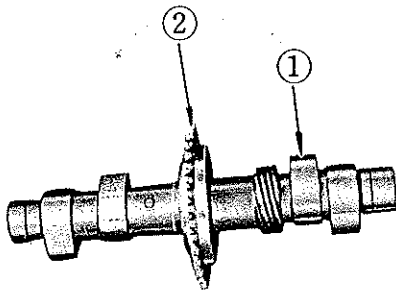
If the stator has been removed, use the "dowel pin" process described in the Valve Timing section carefully equalizing the "dead point" of piston travel by turning the crankshaft forward and backward a few degrees at TDC. Make sure the piston is at the top of its compression stroke first. Otherwise, an opening valve may catch the dowel pin.



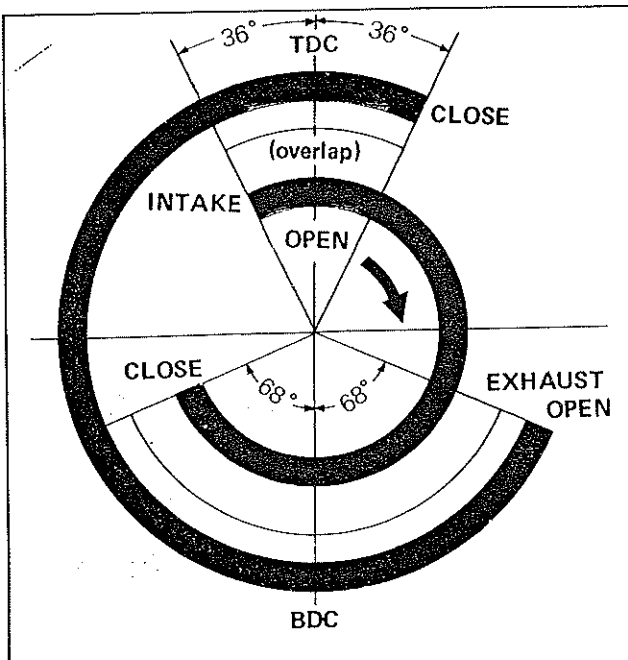
- 5) There is a groove in the left side of the cam sprocket. Position this groove so that it lines up with the sprocket centers. This can be checked. The punch mark on the camshaft sprocket must be parallel with the head gasket surface. Lay a straight edge across the head surface and check the punch mark.

3) Camshaft

The engine uses a single overhead camshaft. All four cam lobes (2 intake and 2 exhaust) are located on one shaft. The cam lobes have been specially tempered to resist wear. The camshaft is connected to the crankshaft by a single row endless chain. Sprocket ratio is 2 : 1, which turns the camshaft at half crankshaft r.p.m. The camshaft is supported on top of the cylinder head.



1. Cam lobes
2. Camshaft sprocket (teeth)



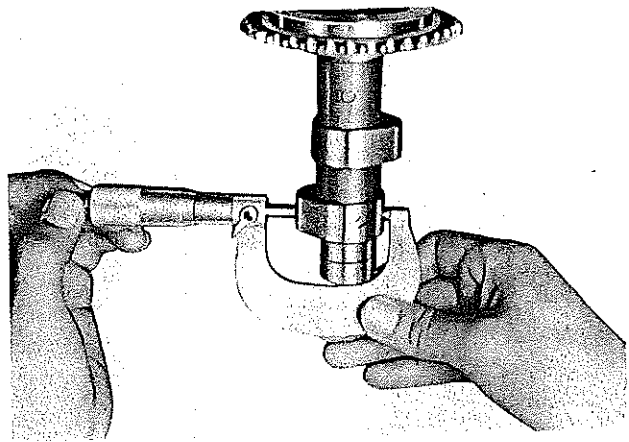
The intake valve opens 36° before top dead center and closes 68° after bottom dead center, which means the intake valve is held open 284° . The exhaust valve opens 68° before bottom dead center and closes 36° after top dead center. It remains open for a duration of 284° . At one point during cam rotation, both the intake and the exhaust valves are open. This is during the intake cycle and is called "overlap".

Inspection

1) Checking cam chain wear.

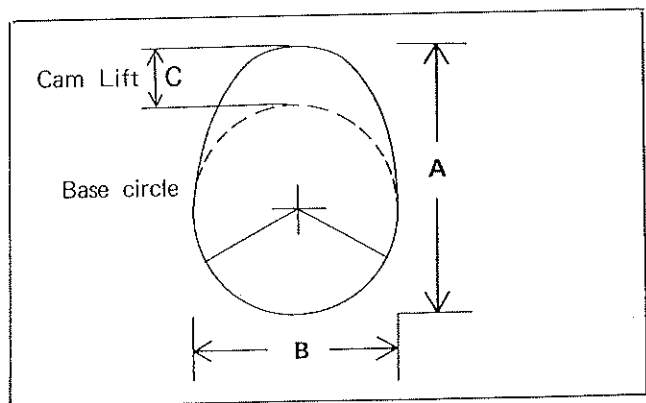
Check the cam chain using the same methods as when the secondary drive chain is checked. (Refer to page 117)

- 2) The cam lobe metal surface may have a blue discoloration due to excessive friction. The metal surface could also start to flake off or become pitted. This is due to poor lubrication, incorrect clearances (from poor adjustment or valve bounce), or due to normal wear.

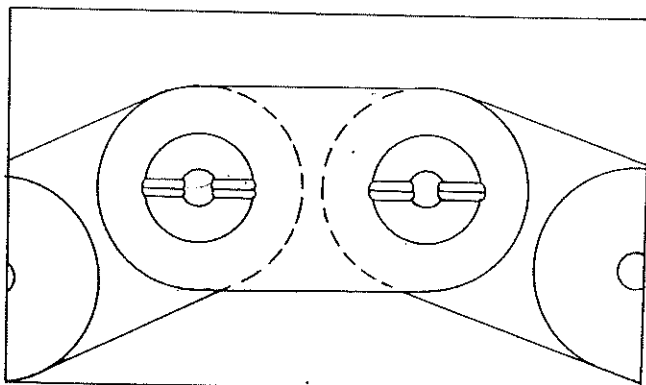


- 3) If any of the above wear conditions are readily visible, the camshaft should be replaced. Also, the corresponding rocker arm contacting surface should be checked for similar wear and replaced if obvious wear is noted.

- 4) Even though the cam lobe surface appears to be in satisfactory condition, the lobes should be measured with a micrometer. Cam lobe wear can occur without scarring the surface. If this wear exceeds a predetermined amount, valve timing and lift are affected. Replace the camshaft if wear exceeds the limits listed below.

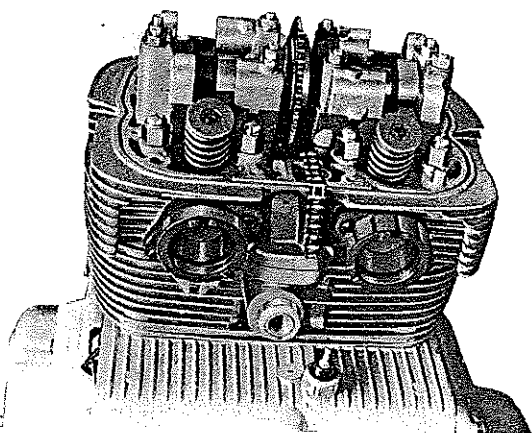


- c) Separate the chain link that was originally riveted at the factory. The rivet heads on this link have punch marks and slots across the heads.



Caution

- d) Attach a wire to a chain link on each side of the link to be separated. Do this before separating the chain to prevent the chain from dropping into the crankcase. After separating the chain anchor retaining both wires to prevent the chain from dropping down.



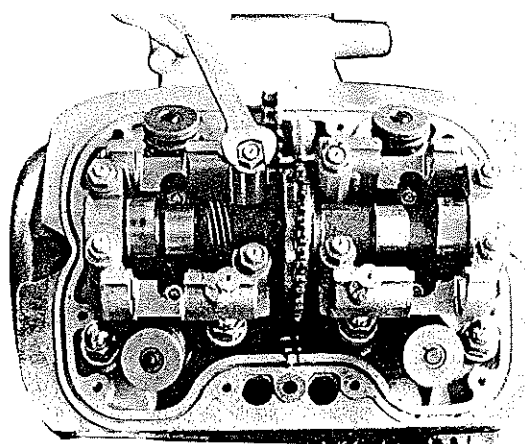
- e) Remove the chain, clean it in solvent, then examine for wear.

If the engine is not to be disassembled, pull a length of wire through with the chain during removal in order to provide a means of reinstalling the chain after cleaning and checking.

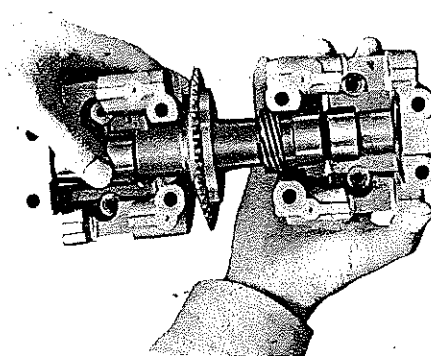
It is also a good idea to have a mechanic's mechanical claw on hand to help feed the chain around the guide bars on the lower drive sprocket during reassembly.

2) Camshaft Bracket

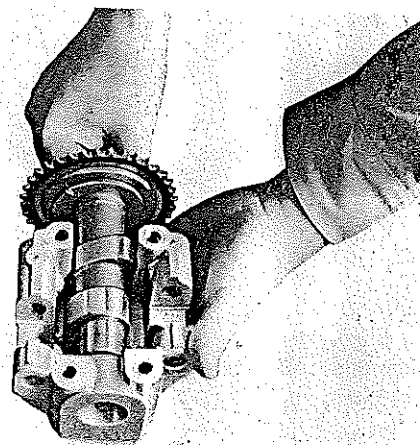
- a) Remove the camshaft brackets and cam shaft as an assembly.
Take care not to allow nuts, and washers to fall in the crankcase.



- b) Remove the camshaft bracket (R).
For removal, first pull out the camshaft bracket (R) to the right side taking care not to allow the cam heel to contact the bracket.

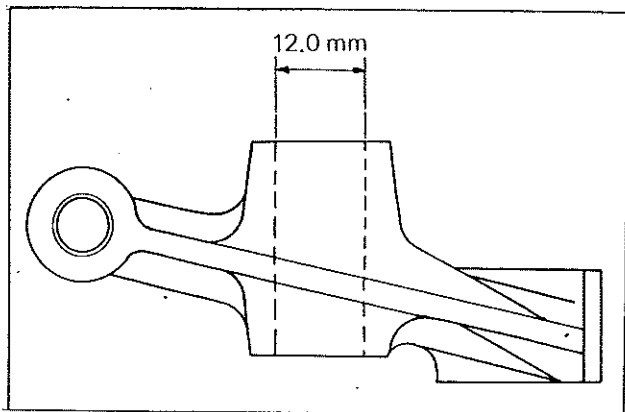


- c) Remove the camshaft bracket (L).
When the intake cam lift and exhaust cam lift are in the positions as shown below, removal is the easiest.



c) If any grooved wear is readily apparent, replace the rocker arm. Do not try to repair the surface by cleaning with an oil stone or emery cloth as this will change the curvature of the follower and thereby the rate of valve opening.

d) Measure the rocker arm shaft hole in the rocker arm. Standard size is 12.0mm.



e) Rocker arm shaft diameter measures 12.0mm when new.

The shaft has been hardened and it should not wear excessively. If a groove has developed in its surface that can be felt, or if it shows a blue discoloration, then the shaft should be replaced and the lubrication system (pump and passages) checked.



f) Standard clearance between the rocker arm shaft and hole should be 0.03mm. If measurement shows more than 0.10mm clearance, replace either or both parts as necessary.

Rocker arm/Rocker arm shaft	Clearance	Wear limit
	0.03 mm	0.10 mm

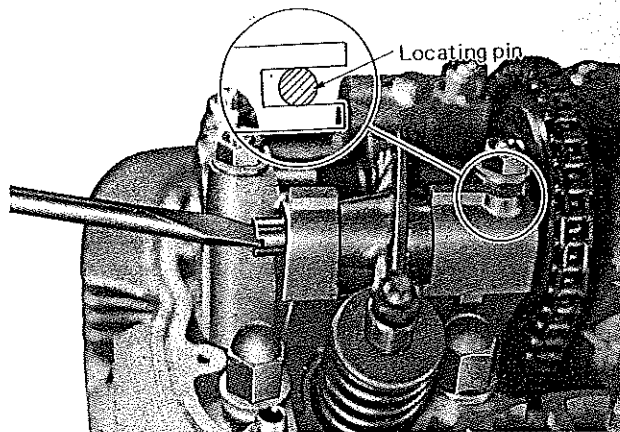
Installation

Reinstall the shafts using a 6mm screw. That way, the threaded hole will be properly positioned for future disassembly, without the hole and screw it is very difficult to remove the shaft.

The rocker arm shafts and rocker arm slippers should be oiled thoroughly. After installing the rocker arms, adjust the valve clearance. For details, refer to valve clearance Adjustment (Page30).

Note:

Insert the rocker arm shaft into the camshaft bracket so that its end fits into locating pin inside the camshaft bracket. If it is not in correct position, turn the rocker arm shaft to align the pin and slot with a screw driver.

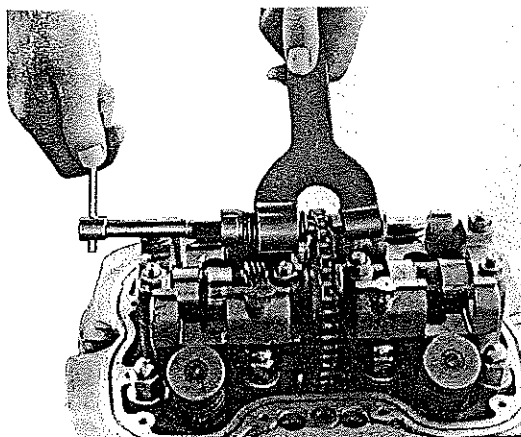


CAM CHAIN, CAMSHAFT BRACKET, CAM-SHAFT

1) Cam Chain

a) The single row cam drive chain connects the camshaft to the crankshaft. The chain is "endless" in that there is no master link to disassemble it, other than the link riveted at the factory when the chain was first installed.

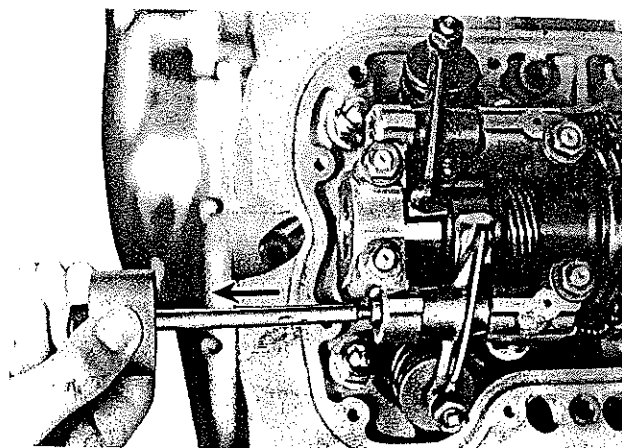
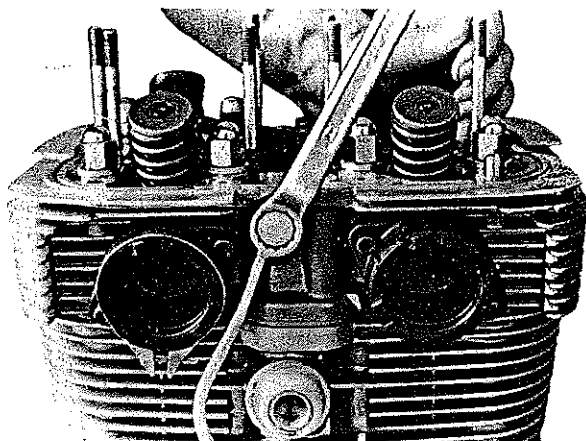
b) A chain cutter (in Special Tool kit) must be used to remove a selected link. Place a rag around the sprocket to prevent metal chips from falling into the engine.



1) Oil Delivery Line

The oil delivery line is located at the rear of the cylinder. Disconnect it at the crankcase and at the cylinder head where it is held in place by a banjo bolt.

Tightening torque for the banjo bolt is 2.0~2.3 kg-m.
(180~207 in-lbs)



Inspection

1) Rocker Arm and Rocker Arm Shaft Wear

- a) The rocker arm usually wears at two spots: (1) at the rocker arm shaft hole where it rubs against the rocker arm shaft, and (2) at the cam lobe contacting surface.

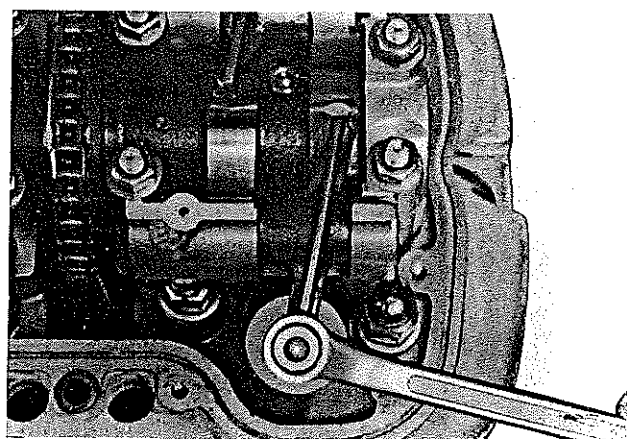
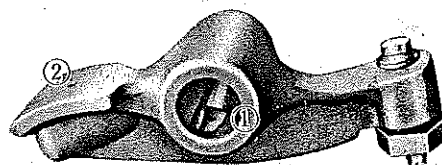
2) Rocker Arm Shaft, Rocker Arm

Set the special tool and withdraw the rocker shaft. It should slide out easily. Lift the rocker arm out of the way. Repeat this procedure for each rocker assembly.

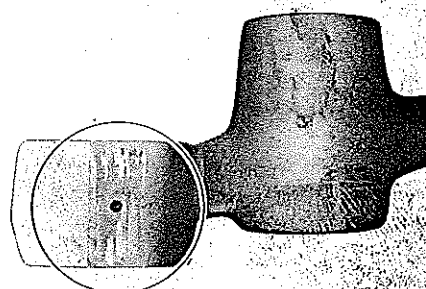
Note:

Keep each mating rocker arm and shaft assembly separated. Reinstall them as a unit.

Fully loosen the adjust screw of the rocker arm before pulling out the rocker arm shaft.



- b) Check the cam lobe contacting surface of the rocker arm for grooved wear in the surface, for deep and obvious scratches, flaking of the hardened surface, or a blue discoloration of the metal (obvious evidence of too much heat). Check the mating cam lobes in the same manner.

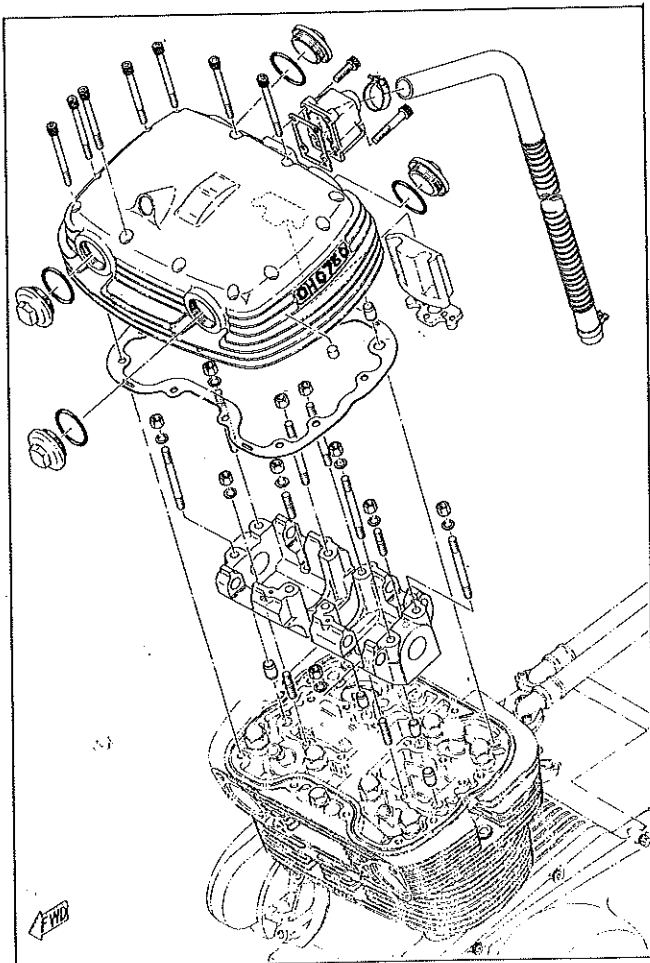


ENGINE DISASSEMBLY NOTES:

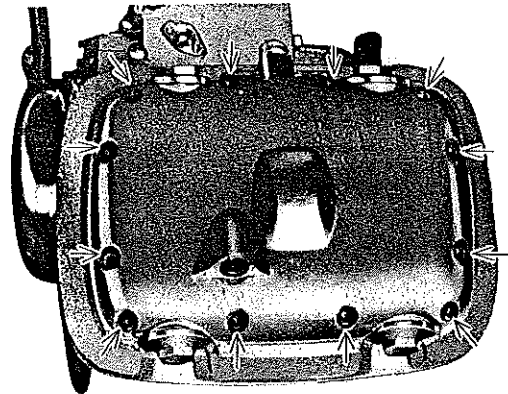
- 1) Keep all parts in separate sections to aid in reassembly.
- 2) All gaskets, cotter pins, O-rings, and circlips, if damaged or worn, should be replaced.
- 3) Always use proper tools (as listed in the Tools Section) and proper repair techniques. A set of metric Allen wrenches must be available for Allen head screws.
- 4) Clean all parts with solvent, and if any part has a drilled oil passage, blow the passage out with compressed air.
- 5) Tighten all nuts and bolts in proper rotation (in cases such as head nuts or case bolts) beginning with the larger bolts (if any) and then going back over and tightening the smaller bolts in the proper sequence.
- 6) Always check the torque specifications section for correct torque, and use a torque wrench.
- 7) After completing each section check to make sure every procedure has been done properly and completely to avoid having to go back and do it again.
- 8) Occasionally, after several hours of operation on a rebuilt engine, oil leaks will develop. This is caused by gasket compression. Re-torque all cylinder holding bolts, should this occur.

CYLINDER HEAD COVER

Disassembly

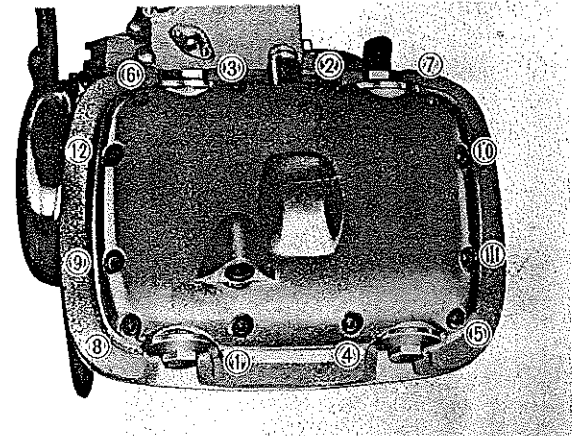


1. Remove the hexagon bolts holding the cylinder head cover.



Installation

1. Use a torque wrench for tightening the bolts. The bolts should be tightened crosswise in steps and finally with correct light torque (0.8 ~ 1.0 kg-m) (72 ~ 90 in-lbs.)



Note:

When installing the cylinder head cover, make sure that the tachometer drive gear is in correct mesh with the mating gear. If not, slightly move the tachometer drive gear for adjustment.

CYLINDER HEAD

The cylinder head consists of

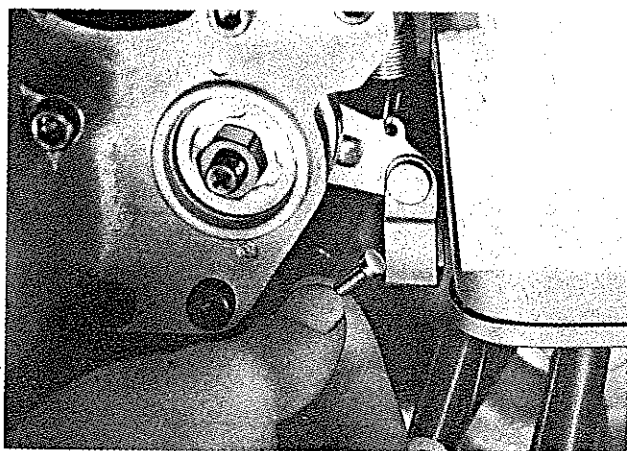
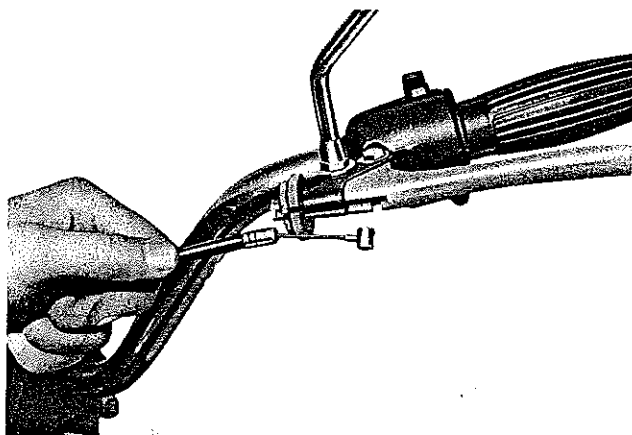
1. Oil delivery line (connected to head at top)
2. Rocker arm shaft
3. Cam shaft bracket (L.R)
4. Rocker arm
5. Cam shaft
6. Cylinder head
7. Valve spring
8. Valve (Ex, In)
9. Valve guide

20. Turn the clutch cable length adjuster on the clutch lever all the way in. Align all of the cable access slots. Squeeze in on the clutch lever while holding firmly onto the cable outer housing. (Actuates clutch and lengthens inner cable)

Release the clutch lever while simultaneously pulling back on the outer cable housing.

The cable ferrule will be pulled back and can now be removed from its seat in the cable length adjuster.

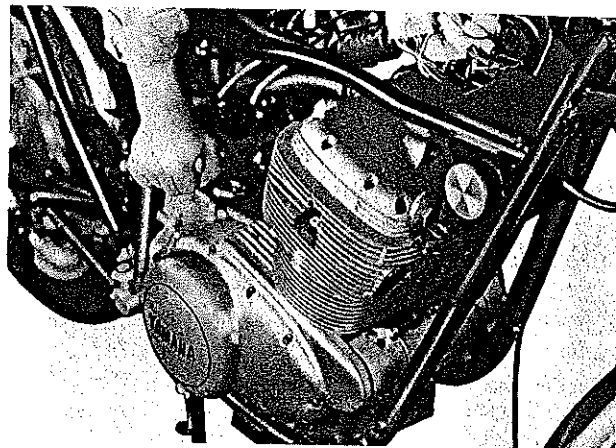
Next disconnect the clutch cable at the joint of the push lever ass'y.



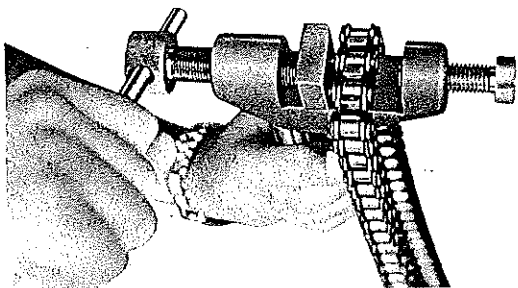
21. Remove the engine mounting bolts and brackets.



22. Hold the cylinder exhaust port with your left hand and the kick crank with your right hand, and then demount the engine from the right side of the motorcycle.



16. Disconnect the drive chain.

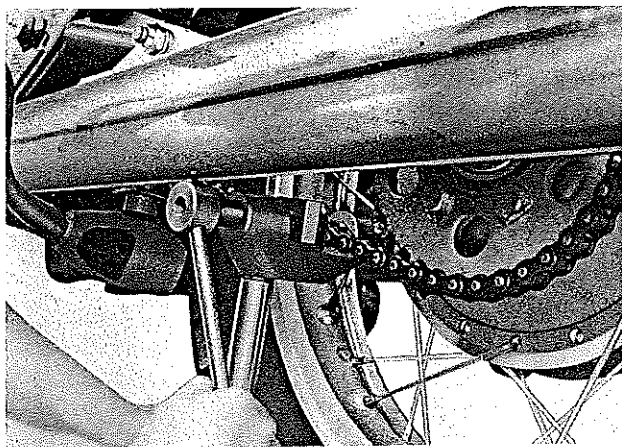


a) Removing the Chain

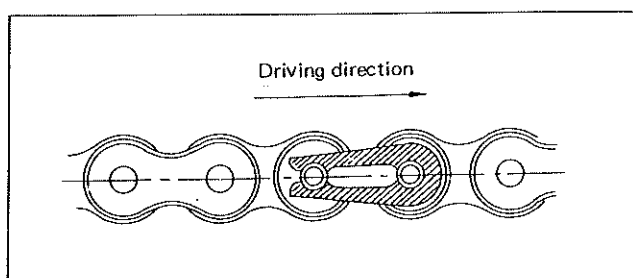
Fit the special tool with the adapter for removing the chain. Then place the chain joint on the special tool and put apart the chain by screwing in the pulling bolt.

b) Installing Chain

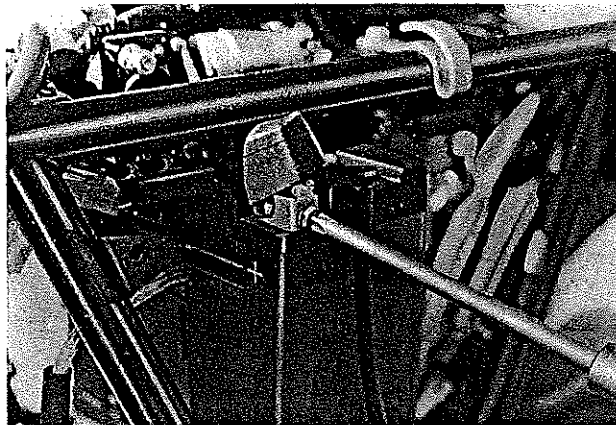
Join the chain ends on the rear wheel sprocket using a joint. Place the chain joint on the sprocket where it is easier to use the special tool. Use the special tool with a chain installing adapter to press the new joint plate by screwing in the pulling bolt.



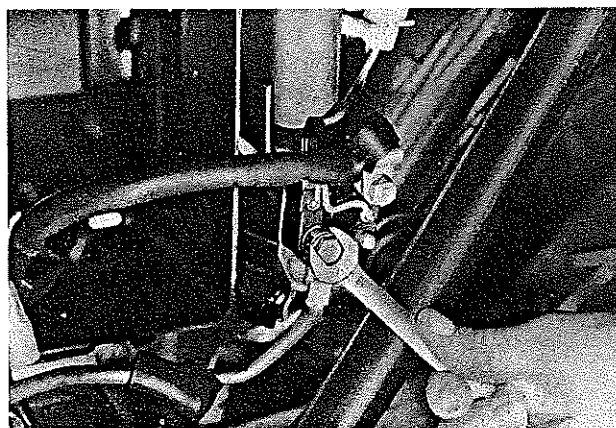
The drive chain clip should be installed as illustrated below. If it is installed in the opposite direction, it may contact adjacent parts and slip off.



17. Remove the battery band, and pull out the battery halfway toward you. Then disconnect the positive lead wire from the battery. Then pull out the battery, and disconnect the negative lead wire. Refer to the electrical wiring diagram.



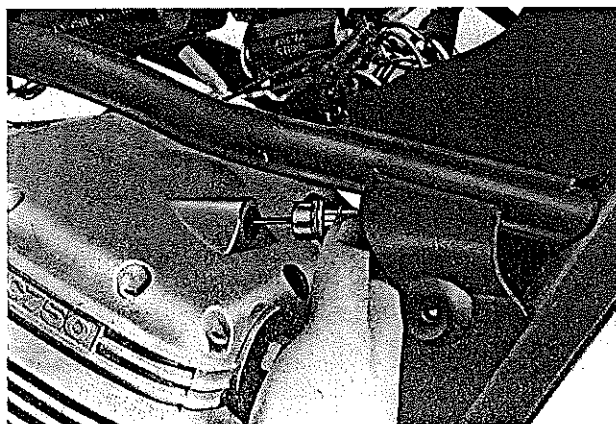
18. Remove the starter motor lead wires at the starter switch. Remember exactly where the lead wires are threaded through.



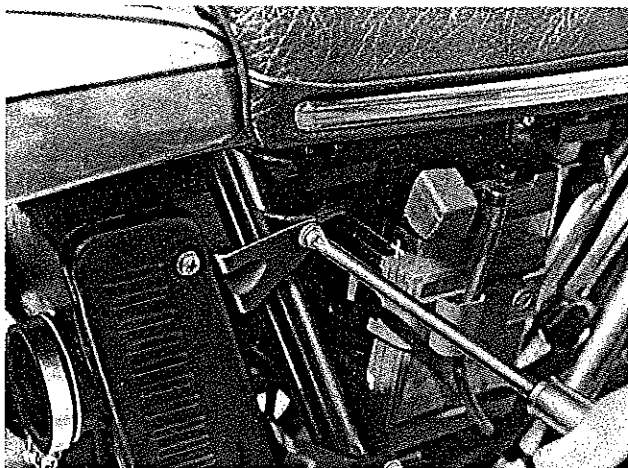
19. Remove the tachometer cable holding clip, and pull the cable out.

Note:

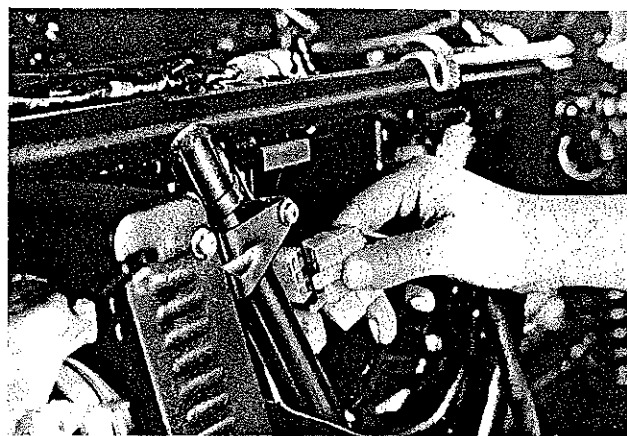
When installing the tachometer cable, grease the "O" ring, and make sure that the clip is firmly in position.



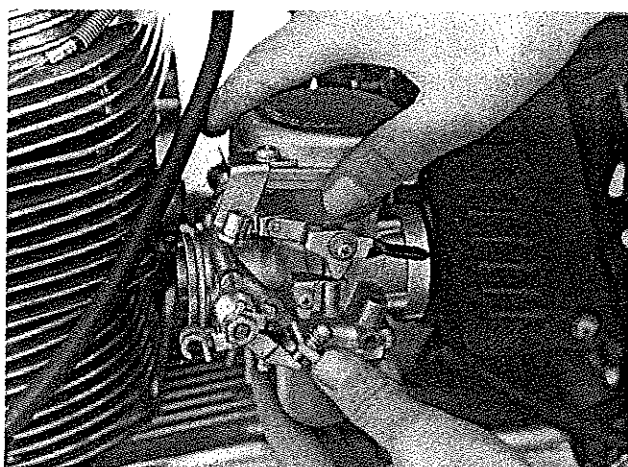
10. Remove the air cleaner case mounting screws. Next, pull air cleaner case backwards, and out towards you.



13. Disconnect the neutral lead wire, oil pressure switch lead wire and wires coming from the generator at the couplers.

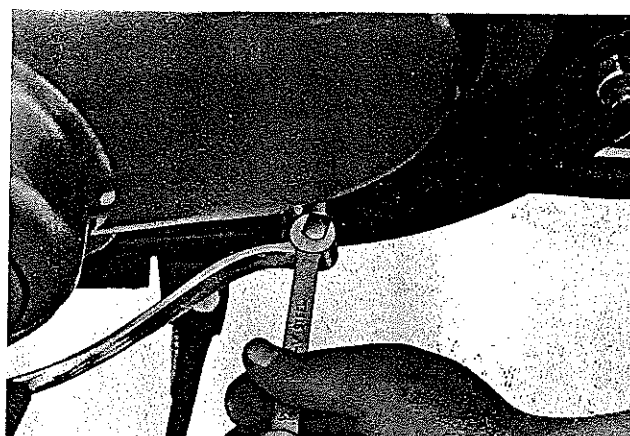


11. Remove the carburetors.



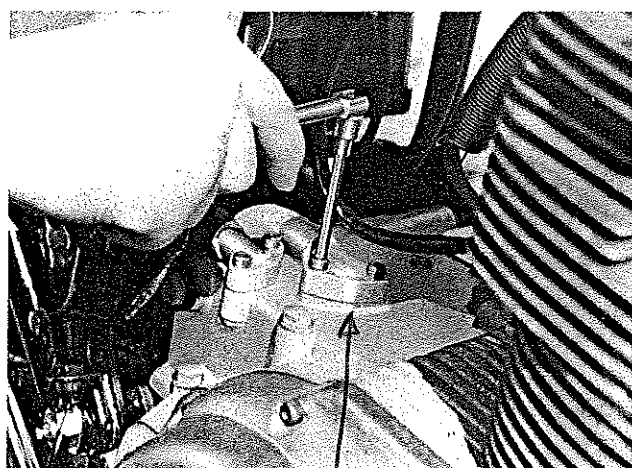
14. Remove the change pedal

When installing the change pedal, it should be positioned properly by taking into consideration the relative position from the foot rest.



12. Remove the oil pipes (for suction and scavenger pumps) with a 5-mm internal hexagon wrench.

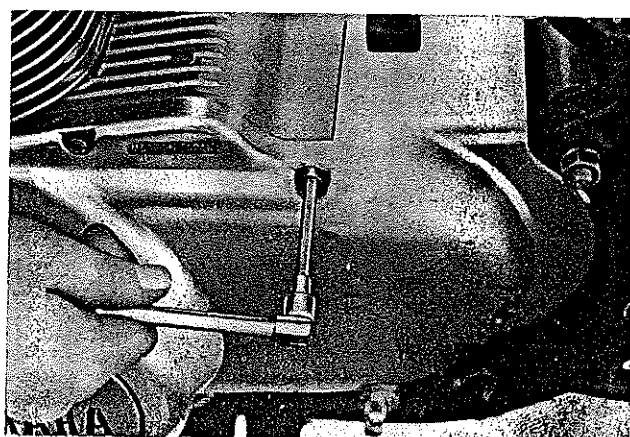
The oil pipes removed from the upper crankcase should be held properly until the engine is demounted.



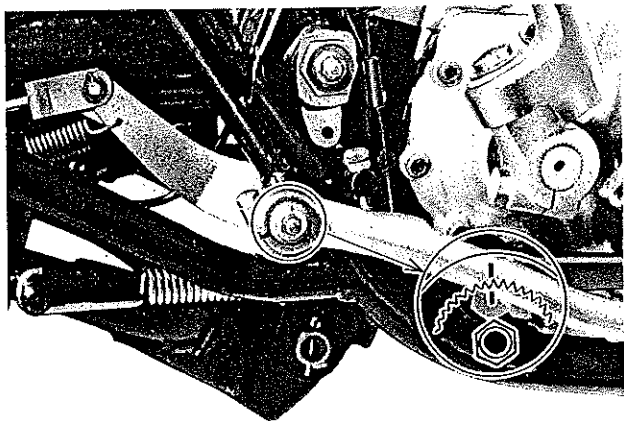
Oring 1,68 mm $\neq$
 $\varnothing$ 15 mm

15. Remove the crankcase cover (L) with a 5-mm internal hexagon wrench.

When installing the crankcase cover (L), take care not to allow the lead wires coming from the generator to slip out of the waterproofing grommet.

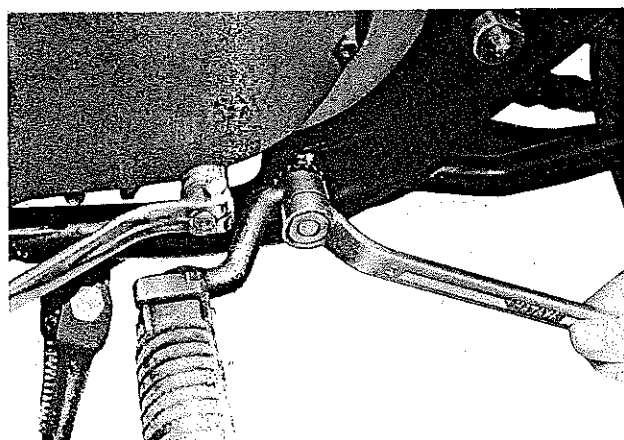


When installing the brake pedal, the punched mark on the brake pedal should be aligned with the punched mark on the brake shaft end, and then they should be fitted together at the serrated portions.



5. Remove the foot rests

The foot rests are held with engine mounting bolt. Remove the nut, and pull out the bolt, both foot rests can be removed at the same time.

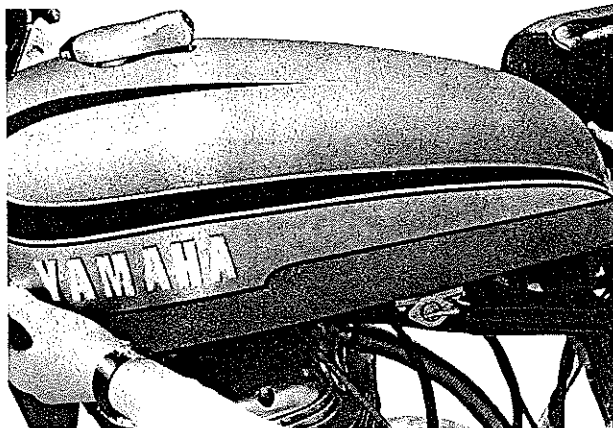


6. Remove the side cover (L).

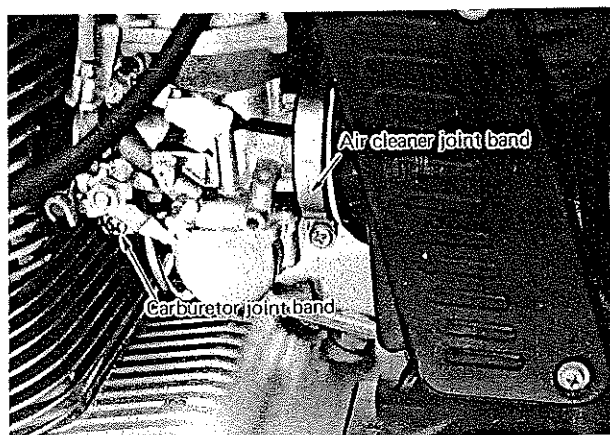


7. Turn both fuel petcock to STOP.

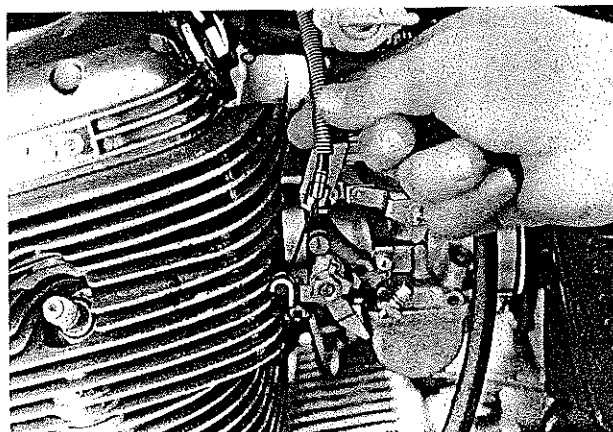
Disconnect the fuel pipes at the fuel petcocks and raise the seat. Lift the rear of the tank, then slide the tank back to free it from the front tank mounts.



8. Fully loosen the air cleaner joint bands and carburetor joint bands.



9. Fully open carburetor butterfly valves with the fingers to slacken the throttle wires, and then remove the throttle wires from the carburetors.



2. ENGINE

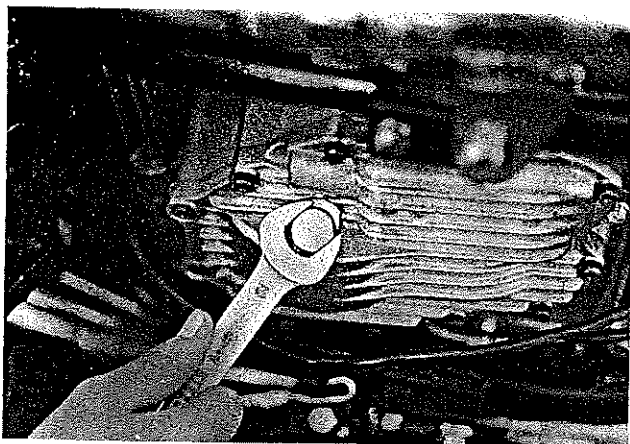
REMOVING THE ENGINE FROM THE FRAME

1. Remove the drain bolt from the crankcase bottom, and drain off any residual oil in the crankcase bottom.

Note:

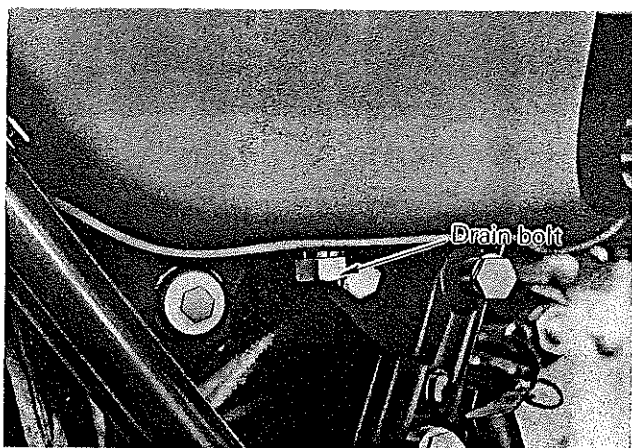
When reassembling the engine, be sure to install the drain bolt gasket. The drain bolt should be tightened until firmly seated.

Tightening torque: 4.0 ~ 4.5 kg-m
(350~400 in-lbs.)

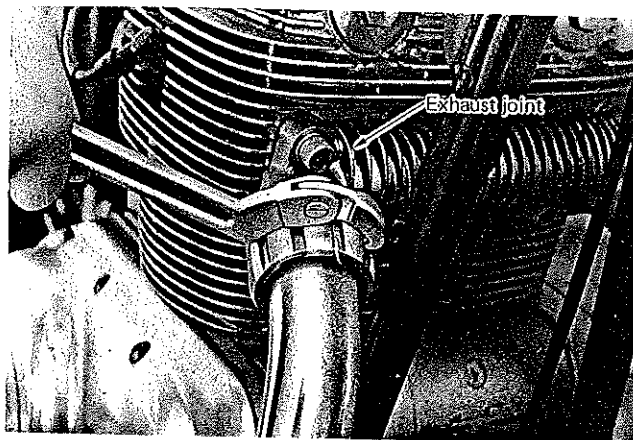


2. Remove the drain bolt from the bottom of the oil tank and drain.

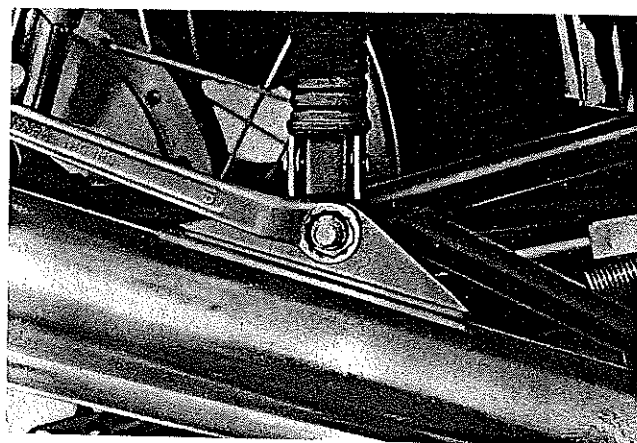
To drain the oil quickly, it is advisable to remove the oil tank cap.



3. Remove the ring nut with the exhaust pipe ring nut wrench. Take care not to lose the exhaust joint gasket.



The exhaust pipe is held at the ring nut and at two other places with bolts and nuts. It is necessary to remove them and next remove the exhaust joint with an internal hexagon wrench.



4. Remove the brake pedal

First remove the stop switch hook from the brake pedal, and then remove the brake pedal holding bolt.

