

5. SPECIAL FEATURES

RL250

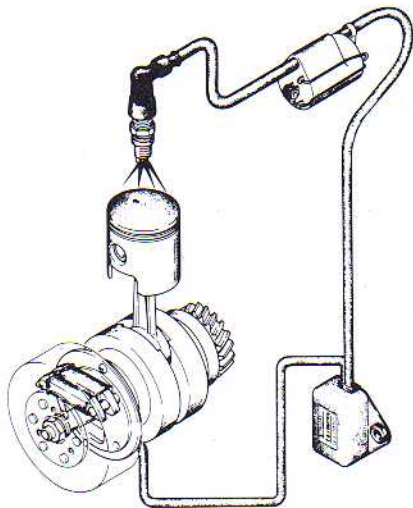
5-1. Engine

The engine mounted on the Model RL250 is of single-cylinder design. It is built with a special aluminum-alloy cylinder and a cast iron sleeve in order to obtain excellent cooling effect and a wider range of power capability especially suited for the observation trial bike.

5-2. New ignition system – P.E.I.

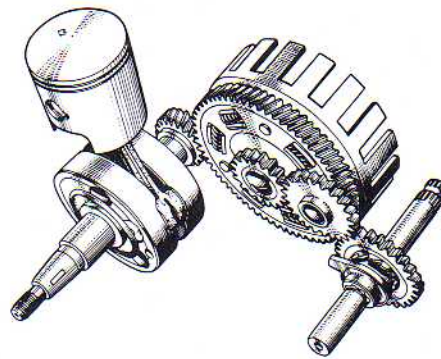
The P.E.I. system produces more energetic ignition sparks. Hence, engine starting is easier, and power delivery from the engine is more dependable throughout the entire speed range. The engine responds more quickly to throttle control.

This new system is a wide departure from the conventional system based on the mechanical make-break action of a breaker. It uses no contact points, which need refacing from time to time because of burns or wear. Its ignition timing is factory-set, and is such that neither inspection nor adjustment is required.



5-3. Primary kick starter

No need of searching for the neutral position when kicking. Just disengage the clutch and kick: the engine starts up right away, whether the transmission is in gear position or not.



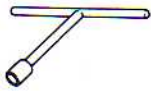
6. SPECIAL TOOLS FOR SUZUKI RL250

RL250

Special tools listed here facilitate the disassembly, assembly and other maintenance operations on the Model RL250 motorcycle. Use of makeshift or common handtools instead of the listed tools is not recommendable because they tend not only to foul up the operation but also to damage the parts. Each service shop is advised to have the complete set of listed tools as shop equipment.

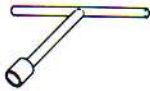
| REF. NO. | TOOL NO. | TOOL NAME |
|----------|-------------|-------------------------------------|
| 1 | 09910-10710 | 8mm stud installing tool |
| 2 | 09910-11510 | 10mm stud installing tool |
| 3 | 09910-20112 | Piston holder |
| 4 | 09910-32810 | Crankshaft installing tool |
| 5 | 09910-80113 | Crankshaft separating tool |
| 6 | 09910-92810 | Crankshaft removing tool |
| 7 | 09920-51510 | Clutch sleeve hub holder |
| 8 | 09920-60310 | Clutch sleeve hub holder handle |
| 9 | 09930-40113 | Engine sprocket and flywheel holder |
| 10 | 09900-06904 | 8mm hexagon L type wrench |
| 11 | 09911-70120 | 6mm hexagon L type wrench |
| 12 | 09940-60112 | Spoke nipple wrench |
| 13 | 09930-30130 | Rotor remover set |
| 14 | 09920-70111 | Snap ring opener (small) |
| 15 | 09920-70120 | Snap ring opener (large) |
| 16 | 09913-50110 | Oil seal remover |
| 17 | 09913-70122 | Bearing and oilseal installing tool |
| 18 | 09913-80110 | Bearing and oilseal installing tool |
| 19 | 09940-10122 | Steering stem lock nut wrench |
| 20 | 09930-10111 | Spark plug wrench |
| 21 | 09920-20310 | Clutch spring hook |

8 mm stud installing tool



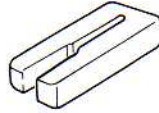
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10 mm stud installing tool



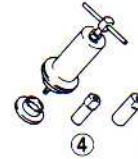
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Piston holder



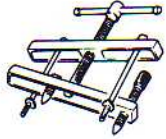
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Crankshaft installing tool



④

Crankcase separating tool



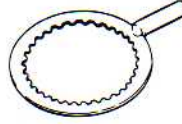
⑤

Crankshaft removing tool



⑥

Clutch sleeve hub holder



⑦

Clutch sleeve hub holder handle



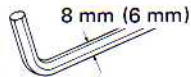
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Engine sprocket and flywheel holer



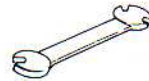
⑨

8 mm hexagon L type wrench
6 mm hexagon L type wrench



⑩ ⑪

Spoke nipple wrench



⑫

Rotor remover set



⑬

Snap ring opener (small)



⑭

Snap ring opener (large)



⑮

Oil seal remover



⑯

Bearing and oil seal installing tool



⑰

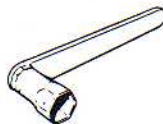
Bearing and oil seal installing tool Steering stem lock nut wrench Spark plug wrench



⑱



⑲



⑳

Clutch spring hock



㉑

Fig. 6-1. Special tools

7. TROUBLE-SHOOTING

RL250

The following trouble-shooting guide covers the seven commonest complaints: 1) Engine will not start or is hard to start. 2) Engine runs rough. 3) Engine gives abnormal noise. 4) Engine halts suddenly. 5) Engine overheats. 6) Faulty clutch. 7) Hard gear shifting or shifting failure.

7-1. Engine will not start or is hard to start.

The first step is to make sure the fuel tank is full or has enough fuel.

| | Symptom | Possible cause | Remedy |
|----|--|---|---|
| 1. | Fuel is not reaching the carburetor. | (1) Fuel strainer is clogged. (2) Fuel pipe is clogged or ruptured. (3) Fuel cock is clogged. | (1) Clean (2) Clean or replace. (3) Clean, and clear with a wire. |
| 2. | The spark plug is in good condition. Sparks jump across the gap when engine is kicked. | (1) Disturbed ignition timing. (2) Improper fuel. (Too much oil in the mixture.) (3) Defective carburetor float. (4) Loss of compression. | (1) Adjust. (2) Check the proportions, change as necessary. (3) Repair and adjust, or replace. (4) Refer to specifications. |
| | The spark plug looks good, but sparks are weak, reddish in color, when tested. | (1) Damaged spark plug. (2) Gap out of adjustment. (3) Damaged plug cap. (4) Damaged ignition coil. (5) Damaged exciter or pulser coil. | (1) Replace. (2) Adjust. (3) Replace. (4) Replace (5) Replace. |
| | No sparks jump across when tested. | (1) Damaged spark plug. (2) Dirty or wet spark plug. (3) Gap out of adjustment. (4) Damaged ignition coil. (5) Fault in the P.E.I. unit. (6) Defective ignition switch. (7) Damaged exciter or pulser coil. (8) Fault in the wiring harness. | (1) Replace. (2) Clean or dry. (3) Adjust. (4) Replace. (5) Replace. (6) Replace. (7) Replace (8) Repair or replace. |
| 3. | Reduced engine compression. | (1) Worn cylinder or piston rings. (2) Piston rings seized in the groove. (3) Ruptured cylinder head gasket. (4) Damaged piston. | (1) Repair or replace. (2) Repair or replace. (3) Replace. (4) Replace. |

| | Symptom | Possible cause | Remedy |
|-----|-----------------------------|--|--|
| 3.. | Reduced engine compression. | (5) Spark plug loose. (6) Cylinder head nuts loose. (7) Leaky crankcase joints. (8) Damaged cylinder or head. | (5) Retighten. (6) Retighten. (7) Repair or replace. (8) Replace. |

NOTE: "Hard engine starting" should direct your attention to these three items: FUEL, SPARKING and COMPRESSION, in that order.

7-2. Engine runs rough.

| | Symptom | Possible cause | Remedy |
|----|---|--|--|
| 1. | Engine obeys throttle control, but the bike will not run fast enough. | (1) Slipping clutch. | (1) Adjust clutch cable or replace clutch plates. |
| 2. | Engine will not pick up speed. | (1) Improper carburetor setting. (2) Clogged air cleaner. (3) Clogged fuel line. (4) Ignition timing off adjustment. (5) Clogged exhaust pipe or muffler. | (1) Adjust. (2) Clean. (3) Clean. (4) Adjust. (5) Clean. |
| 3. | Engine begins to run rough when accelerated. | (1) Ignition timing off adjustment. (2) Improper carburetor setting. (3) Dirty spark plug. | (1) Adjust. (2) Adjust. (3) Clean. |
| 4. | Engine runs rough in low-speed range. | (1) Ignition advanced too much. (2) Dirty spark plug, or maladjusted, plug gap. (3) Maladjusted carburetor pilot air. (4) Clogged or damaged fuel line. | (1) Adjust. (2) Clean, or adjust. (3) Adjust pilot air screw. (4) Clean or replace. |
| 5. | Engine runs rough in high-speed range. | (1) Clogged or damaged fuel line. (2) Dirty spark plug, or maladjusted plug gap. (3) Ignition retarded too much. (4) Improper carburetor setting. (5) Clogged air cleaner. | (1) Clean or replace. (2) Clean, or adjust. (3) Adjust. (4) Adjust. (5) Clean. |

NOTE: The above guide for "rough engine" presupposes that the engine is free from overheating tendency and that it develops a sufficiently high compression pressure.

7-3. Engine gives abnormal noise.

| | Symptom | Possible cause | Remedy |
|----|--|--|---|
| 1. | Excessive noise coming from the interior of the engine unit. The higher the running, the higher the noise frequency. | (1) Too much clearance between piston and cylinder. (2) Piston rings too loose in the groove. (3) Piston rings stiff with carbon. (4) Too much running clearance in connecting rod big end. | (1) Repair or replace. (2) Replace the piston. (3) Clean. (4) Replace. |

| | Symptom | Possible cause | Remedy |
|----|--|--|---|
| 1. | Excessive noise coming from the interior of the engine unit. The higher the running, the higher the noise frequency. | (5) Connecting rod small end bearing worn excessively. (6) Broken piston ring. (7) Ignition timing advanced to much. (8) Defective primary pinion of gear. (9) Crankshaft bearings worn down excessively. (10) Damaged transmission gears. (11) Defective transmission shaft bearings. | (5) Replace. (6) Replace. (7) Adjust. (8) Replace. (9) Replace. (10) Replace. (11) Replace. |

7-4. Engine halts suddenly.

Make sure the fuel tank is full and the wiring harness is in good condition, before proceeding as follows:

| | Symptom | Possible cause | Remedy |
|----|--|---|--|
| 1. | Engine dies down abruptly. (If the bike is brought in with its engine refusing to turn, it is likely that any of the parts (1) to (3) has seized.) | (1) Piston is tending to seize. (2) Crankshaft is tending to seize. (3) Transmission gears tending to seize. (4) Spark plug bridged. (5) Defective ignition coil. (6) Defective P.E.I. unit. (7) Clogged fuel line. | (1) Repair or replace. (2) Repair or replace. (3) Repair or replace. (4) Clean. (5) Replace. (6) Repair or replace. (7) Clean. |
| 2. | Engine dies down rather gradually. | (1) Loose spark plug. (2) Cylinder head secured loose. (3) Ruptured head gasket. (4) Clogged fuel line. | (1) Retighten. (2) Retighten the nuts. (3) Replace. (4) Clean. |

7-5. Engine overheats.

The following trouble-shooting guide assumes that 1) the engine has been "broken in," 2) the lube system is in good condition, 3) the brake does not drag, and 4) the cylinder cooling fins are clean.

| | Symptom | Possible cause | Remedy |
|----|---|---|--|
| 1. | Engine runs smoothly but tends to overheat. | (1) Improper fuel-oil mixture ratio. (2) Wrong oil used in the mixture. (3) Clogged oil hole in the crankcase. (4) Piston rings are stiff in the groove because of carbon formation. (5) Ignition timing out of adjustment. (6) Drive chain too tight. (7) Wrong spark plug heat range. (8) Fuel-air mixture too lean. | (1) Use 20-to-1 mixture. (2) Use specified oil. (3) Clear. (4) Disassemble engine and clean. (5) Adjust. (6) Adjust. (7) Replace. Use a colder plug. (8) Adjust carburetor. |

| | Symptom | Possible cause | Remedy |
|----|-----------------------------------|--|---|
| 2. | Compression pressure is too high. | (1) Carbon deposited excessively in the combustion chamber. (2) Head gasket too thin. (3) Excessive carbon deposits in muffler, exhaust pipe, or exhaust port. | (1) Decarbon. (2) Replace. (3) Disassemble and clean. |

7-6. Faulty clutch.

| | Symptom | Possible cause | Remedy |
|----|------------------|--|---|
| 1. | Slipping clutch. | (1) Improper clutch adjustment. (2) Weakened clutch springs. (3) Worn clutch plates. (4) Worn clutch release screw. | (1) Set the clearance to specification. (2) Repair or replace. (3) Replace. (4) Replace. |
| 2. | Dragging clutch. | (1) Too heavy oil. (2) Faulty movement of clutch plates in place. (3) Clutch cable maladjusted. | (1) Replace. (2) Repair or replace. (3) Adjust. |

7-7. Hard gear shifting or shifting failure.

Make sure the clutch operates satisfactorily and the transmission has oil up to level.

| | Symptom | Possible cause | Remedy |
|----|---|--|---|
| 1. | The lever moves but gears will not mesh. | (1) Damaged groove in change cam. (2) Shift forks not moving smoothly, because of burrs or dents. (3) Damaged shift forks. (4) Gears seized. (5) Damaged gear shift shaft. | (1) Replace the cam. (2) Repair. (3) Replace. (4) Replace. (5) Replace. |
| 2. | The lever shifts but will not return by itself. | (1) Return spring on gear shift shaft is damaged. | (1) Replace. |
| 3. | Gears jump out of mesh. | (1) Gear shifting cam stopper is working improperly. (2) Worn or deformed gear shift forks. (3) Worn gear teeth or worn dog teeth on driven gear wheel. | (1) Check and repair or replace. (2) Replace. (3) Replace. |

8. ENGINE

RL250

8-1. Engine services not requiring engine removal

The parts listed hereunder can be serviced with the engine in place:

| | Parts | Operation |
|-----|----------------------------------|--|
| 1. | Spark Plug | Retighten, inspect, adjust gap, remove carbon, replace; Inspect gasket for flexibility, replace |
| 2. | Cylinder Head | Retighten cylinder head nuts; Remove carbon, check for warpage, repair |
| 3. | Cylinder Head Gasket | Inspect, replace |
| 4. | Cylinder | Remove carbon from ports; Check for burned spots and scoring, repair; Check for wear rebore |
| 5. | Piston | Remove carbon from heads and ring grooves; Inspect for burned spots and scoring, repair or replace; Check piston pin holes and ring locating pins for wear, replace |
| 6. | Piston Ring | Inspect for wear and tension, replace |
| 7. | Piston Pin | Inspect for wear, replace |
| 8. | Piston Pin Circlip | Inspect for warpage and dropping out, replace or repair |
| 9. | Con-rod Small End Needle bearing | Inspect for wear, replace |
| 10. | Flywheel Magneto | Inspect ignition timing, adjust |
| 11. | Neutral indicator Switch | Inspect for wire break, repair or replace; Inspect gasket, replace |
| 12. | Engine Sprocket | Inspect for wear, replace |
| 13. | Primary Pinion | Inspect for backlash, replace |
| 14. | Clutch | Inspect cork plates for wear, replace; Inspect free length of clutch springs, repair or replace; Check housing, for loose riveting and burrs on grooves, repair or replace, check gear backlash, replace, check push rod for bent, replace |
| 15. | Gear Shifting Shaft | Inspect tension of shaft return spring, replace, inspect for wear, replace |
| 16. | Carburetor | Check play in throttle cable, adjust; check float level, adjust; check fuel mixture at various throttle openings, adjust, Clean |

When removing the crankcase cover to gain access to clutch parts, gear shifting shaft or any others inside in order to inspect or repair, be sure to drain out the oil in the crankcase: the drain plug is located on the right-hand side of the cover.

8-2. Services requiring removal of the engine

To carry out the following maintenance services, take down the engine from the frame, and separate the crankcase into the two halves, right and left:

| | Part | Maintenance service on engine unit |
|----|----------------------|--|
| 1. | Crankshaft | Inspect for shake, repair or replace; Check bearings for wear, replace; Check oil seals for leakage, replace |
| 2. | Transmission system | Check gears and shafts, adjust or replace; Check bearings and bushing, replace |
| 3. | Gear shifting system | Inspect shifting cam groove for damage, repair or replace; Inspect shifting forks for burned spots and wear, repair or replace |
| 4. | Kick starter system | Inspect kick starter shaft return spring, replace; Inspect ratchet for damage, replace |

8-2-1. Removing engine from frame.

Before beginning the removal operation, thoroughly clean the engine with a steam cleaner or cleaning solvent to remove road dirt. Work according to the order of the following figures.

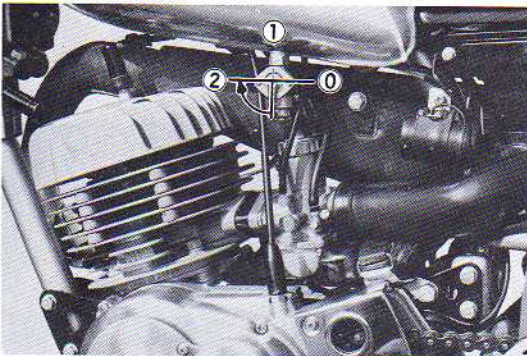


Fig. 8-1. Turning the fuel cock lever to "0"

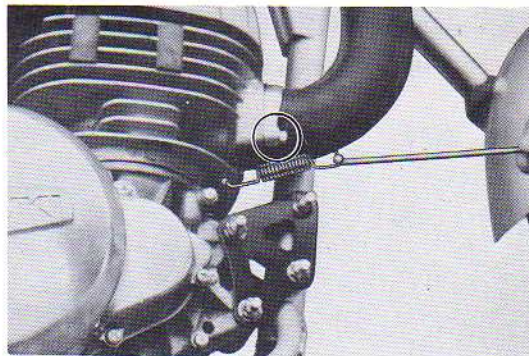


Fig. 8-2. Releasing the exhaust pipe spring and unscrewing muffler fitting bolts

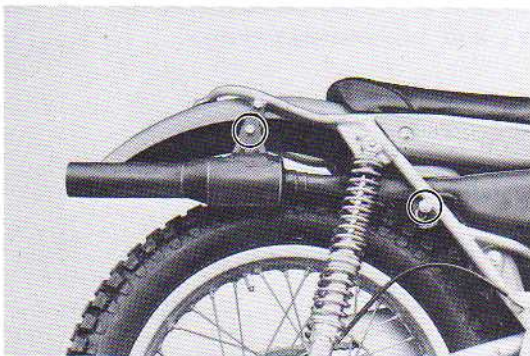


Fig. 8-3. Unscrewing muffler fitting bolts

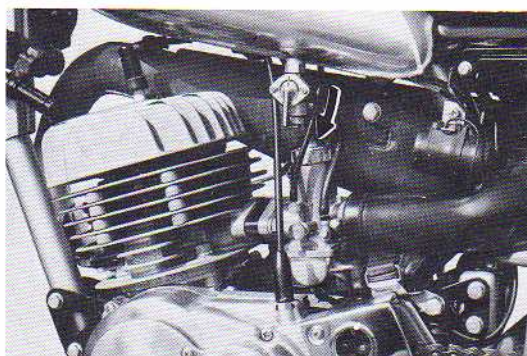


Fig. 8-4. Unscrewing air cleaner tube clamp and removing fuel hose

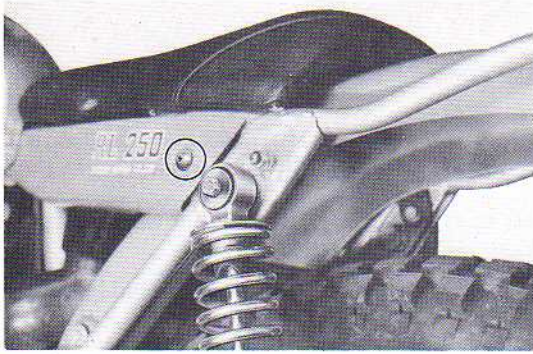


Fig. 8-5. Unscrewing the frame cover screw

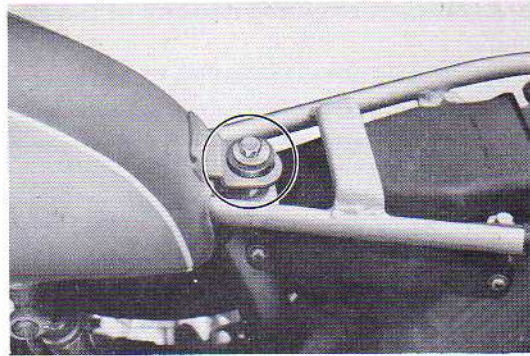


Fig. 8-6. Unscrewing the fuel tank fitting bolt

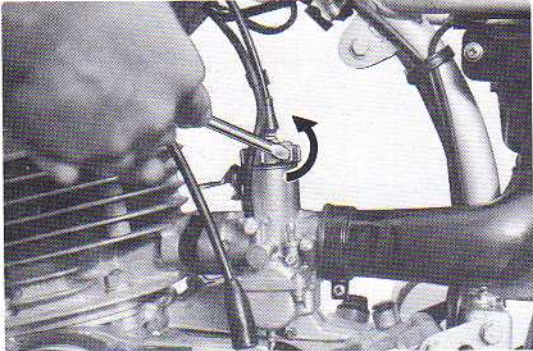


Fig. 8-7. Removing carburetor mixing chamber top

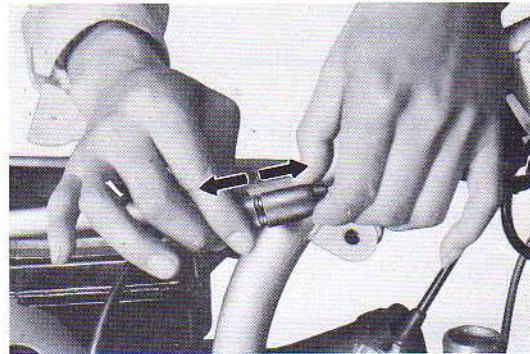


Fig. 8-8. Removing the P.E.I. unit

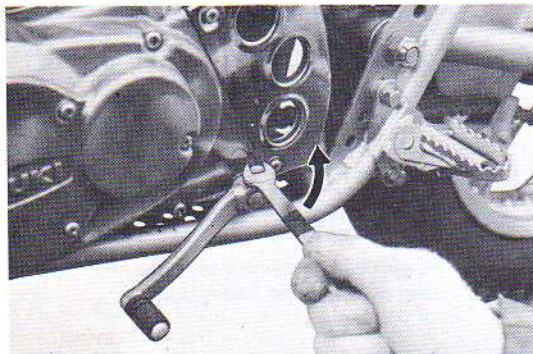


Fig. 8-9. Removing the gear shifting lever

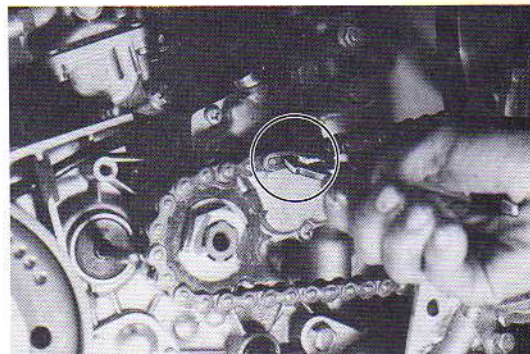


Fig. 8-10. Disconnecting drive chain

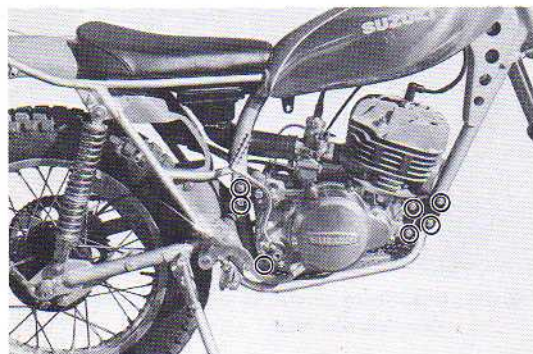


Fig. 8-11. Removing engine mounting bolts

8-2-2. Clutch cushioning device

Some cushioning materials are assembled between the primary driven gear and the clutch housing so that engine power can be transmitted more smoothly the moment the clutch is engaged. In the RL250 clutch, two varieties of coil springs have been employed in order to ensure sufficient cushioning for quick transmission of high power.

8-2-3. Primary reduction ratio

No. of teeth in primary drive gear 18
No. of teeth in primary driven gear 75
Primary reduction ratio 75/18

8-2-4. Clutch disassembly

- 1) Remove the clutch spring fitting bolts on clutch pressure plate with 10 mm wrench.
- 2) Remove the pressure plate, release rod, drive plates, and driven plates from the clutch housing.
- 3) Pry up bent lock tongue of clutch sleeve hub washer with a chisel. Using clutch sleeve hub holder (special tool 09920-51510), secure the clutch sleeve hub and loosen the clutch sleeve hub nut with 27 mm socket wrench.
- 4) Remove the clutch sleeve hub and clutch housing from the countershaft.

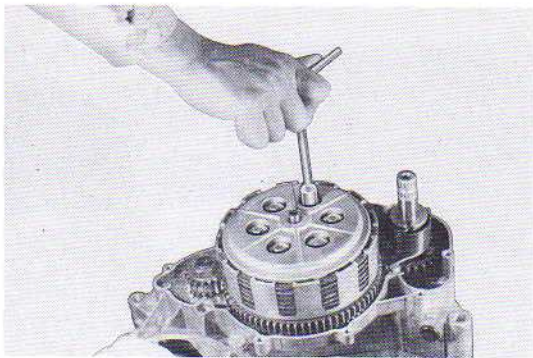


Fig. 8-12. Removing clutch fitting bolts

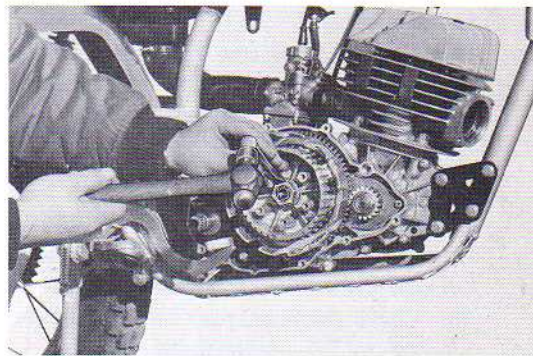


Fig. 8-13. Flattening clutch sleeve hub washer

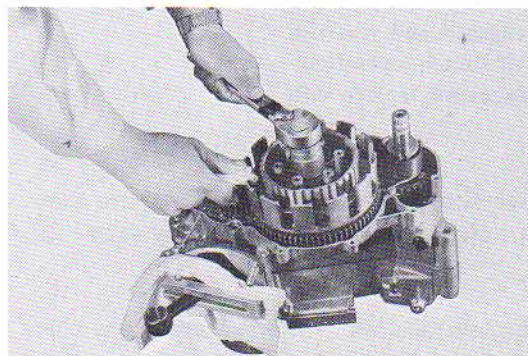


Fig. 8-14. Loosening clutch sleeve hub nut

8-2-5. Inspecting clutch parts

Improper use of the clutch, incorrect adjustments, or use of low grade transmission oil may result in excessive wear of the clutch parts. In such case, abnormal noise will be produced, or clutch slipping may develop, leading to insufficient transmission of power. Therefore, when the clutch is disassembled, the parts should be inspected carefully and any defective part found should be replaced.

1) Clutch drive plates

Inspect the clutch drive plates to see if the surfaces are burnt or roughened, and measure the thickness and warpage (run-out) to see if within the specified limits. Replace if found defective.

| | Standard | Limit |
|-----------|----------------------------|----------------------|
| Thickness | 3.5 mm (0.138 in) | 3.2 mm (0.126 in) |
| Warpage | Under 0.4 mm (0.016 in) | 0.4 mm (0.016 in) |

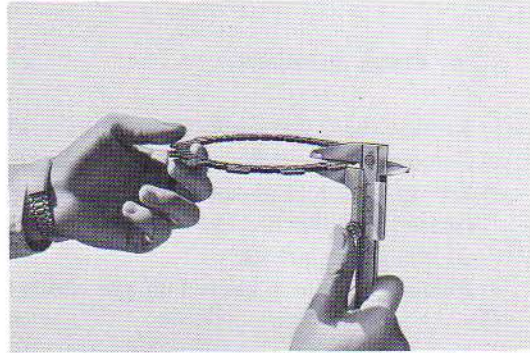


Fig. 8-15. Measuring drive plate thickness

2) Clutch springs

If the clutch spring free length should become shorter than the standard by 1.5 mm or more.

Spring free length 38.4 mm (1.15 in)

3) Clutch housing

Inspect the primary driven gear tooth surfaces for abnormal conditions. Check the axial play between the primary driven gear and the housing. Check the radial play between the clutch housing and the countershaft.

4) Clutch sleeve hub

If there are dented wear in the clutch sleeve hub splines, the clutch driven plates may stick when the clutch is disengaged and result in losing the smoothness of clutch operation. Repair or if the wear is excessive, replace with new part.

5) Clutch release screw

Check for excessive looseness by moving the release screw arm back and forth. If excessively loose, cracked, or injured, the clutch will not operate smoothly so in such case, replace the entire release screw assembly.

6) Clutch push rods

Pull out the two clutch push rods from the countershaft and check them for bending by rolling them on top of surface plate. A bent push rod will contact partially inside the countershaft during operation, resulting in eccentric wear, so that it should either be repaired or replaced.

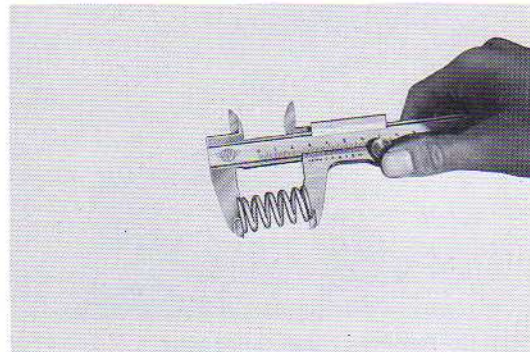


Fig. 8-16. Measuring clutch spring free length

8-2-6. Clutch assemblies

Do it through the reverse procedures of disassembling.

8-2-7. Adjusting clutch

With the engine in place, proceed as follows:

- 1) Adjusting clutch release screw.
 - (a) Remove the clutch release screw cap.
 - (b) Loosen the lock nut (A) with 12-mm box wrench.
 - (c) Tighten the adjusting screw (B) until it contacts with the push rods inside release screw lightly, and then return the adjusting screw one-fourth turn. After checking the clutch lever to see that it has proper play, tighten the lock nut.
- 2) Adjusting clutch cable
 - (a) Loosen the clutch cable adjusting lock nut. (a)
 - (b) With the clutch cable adjuster (b), adjust so that there will be about 4 mm (0.16 in) play at the clutch lever and then tighten the lock nut.

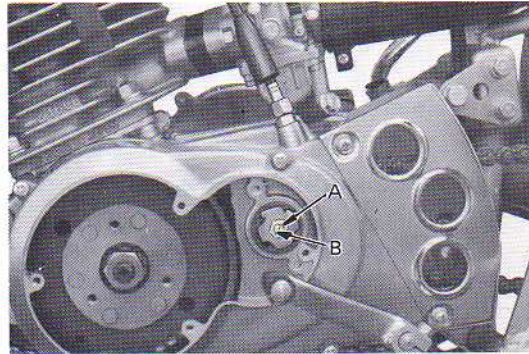


Fig. 8-17. Adjusting clutch release screw

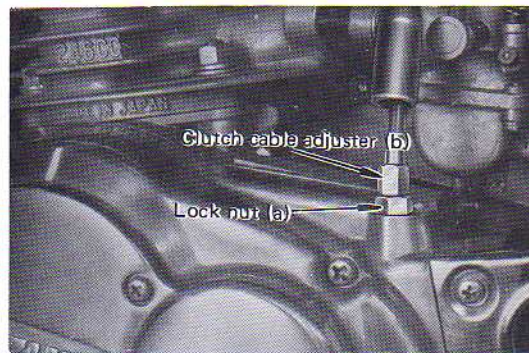


Fig. 8-18. Adjusting clutch cable

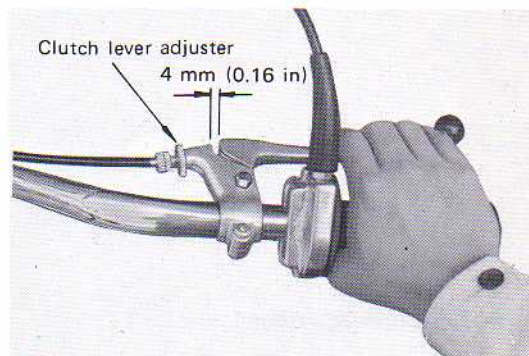


Fig. 8-19. Adjusting clutch lever

8-3. Tips on disassembling and assembling engine

The Engine must be handled and assembled most carefully. When working on the engine, keep your hands and tools clean at all times.

Before beginning work, prepare work benches, necessary tools, clean rags and cleaning solvent for washing parts.

8-4. Cylinder head

8-4-1. Removing and installing

Loosen the six cylinder head set nuts and remove the cylinder head and gasket. The tightening and removing of the cylinder head set nuts should be performed in the sequence shown in Fig. 8-20.

The cylinder head set nuts should be re-tightened after the initial driving of 20 hours, and should then be checked every 50 hours after that.

Set nut tightening torque is 200 kg-cm
(14.5 lb-ft).

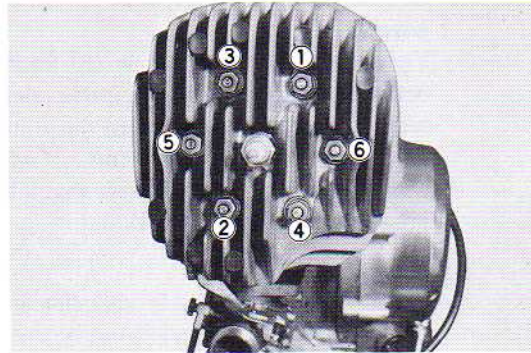


Fig. 8-20. Loosening and tightening order of cylinder head nuts

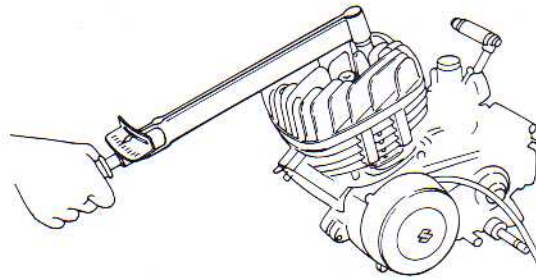


Fig. 8-21. Tightening cylinder head nuts

8-4-2. Removing carbon.

Accumulation of carbon in the cylinder head combustion chamber may cause preignition or overheating. Thus the combustion chamber should be inspected for carbon accumulation and the carbon be removed if excessive. In removing the carbon, care should be taken not to injure the combustion chamber surfaces.

Make periodical inspection every 100 hours for accumulation of carbon and remove it if excessive.

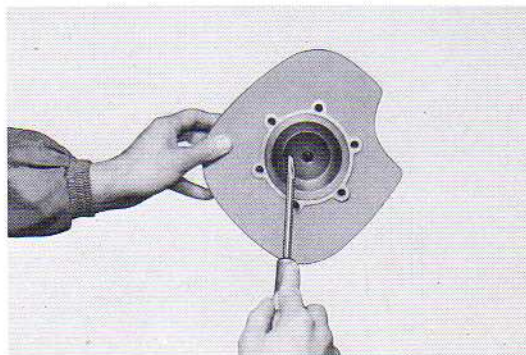


Fig. 8-22. Removing carbon

8-5. Cylinder

8-5-1. Removing cylinder

Remove the four cylinder set nuts and pull out the cylinder.

8-5-2. Inspecting for cylinder wear

Amount of wear can be obtained by measuring the cylinder bore at several points and taking the difference between the largest and smallest values. If the wear is found to exceed the limit, repair by boring or replace. In case of boring 0.5 mm and 1.0 mm oversize pistons and piston rings are available. (After boring the cylinder, be sure to chamfer the ports).

Wear limit 0.05 mm (0.002 in)

Use cylinder gauge to measure the cylinder liner. As shown in diagram, measure in longitudinal and lateral directions at two points, on three lengthwise positions for a total of six measurements.

8-5-3 Removing carbon

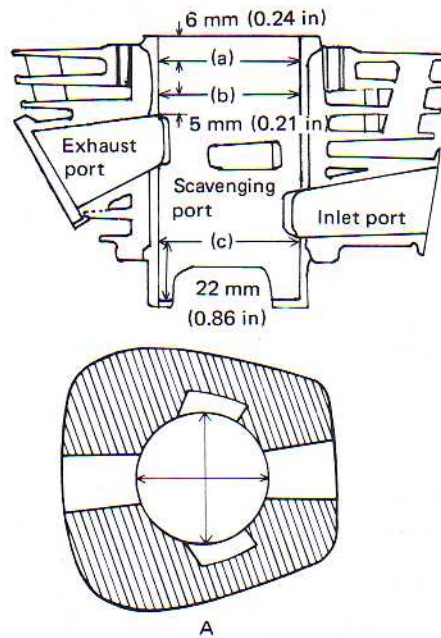
When the cylinder is removed, inspect the exhaust port for carbon accumulation and remove if found present. As shown in Fig. 24, carbon tends to collect most easily at around the exhaust port of cylinder. Remove the carbon with screwdriver or similar tool. When removing, use care not to damage the cylinder walls. The carbon accumulation will differ with the oil and gasoline used, and the operating conditions, but its state should be inspected every 100 hours.

8-6. Piston pin

The floating system of piston pin mounting has been adopted. Therefore, a set ring has been provided at each piston boss to prevent the piston pin from shifting in thrust direction and striking against the cylinder wall while in operation.

8-6-1. Removing

Pack waste in the crankcase to prevent the set ring from falling inside the crankcase. Then remove the set rings and drive out the piston pin from one end.



Pistons to be measured

Fig. 8-23. Piston dimensions

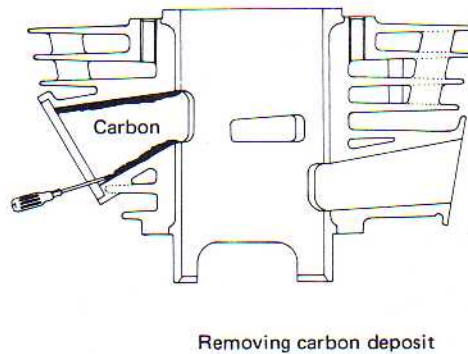


Fig. 8-24. Removing carbon deposit

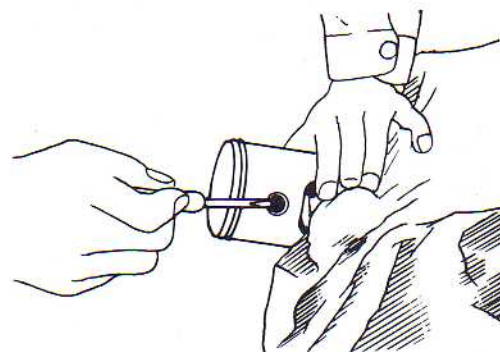


Fig. 8-25. Removing piston pin circlip

8-6-2. Inspecting

Inspect the piston pin to see if it is free from shouldered wear or scoring.

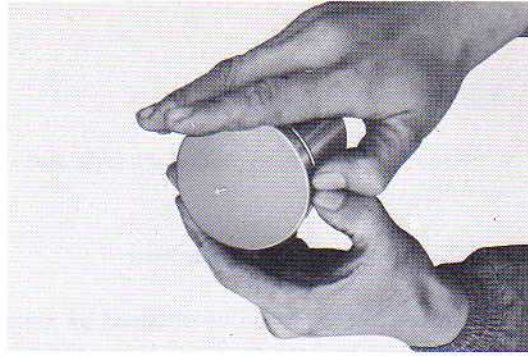


Fig. 8-26. Removing piston ring

8-7. Piston rings

8-7-1. Removing

Spread the piston ring ends with both thumbs, and remove from the other side of ring end gap.

8-7-2. Inspecting

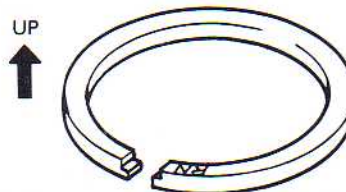
Inspect the piston ring outside surface for scoring and other damage. If defective replace with new ring. (In case the piston ring is found damaged, be sure to check the cylinder wall to see if damaged also.) To measure piston ring wear, insert the piston ring in the cylinder lowest part where the wear is the least, and measure the end gap clearance.

To insert the piston rings so that they will be perpendicular to the cylinder, insert by utilizing the piston skirt as shown in Fig. 8-27. Measure the end gap clearance by using thickness gauge in the manner shown in Fig. 8-28. Piston ring having excessive end gap clearance should be replaced.

| | Standard | Limit |
|---------|------------------------------------|---------------------|
| End gap | 0.15–0.35 mm (0.0059–0.0138 in) | 1.0 mm (0.04 in) |

8-7-3. Precautions on installing piston rings

- 1) Before installing the piston rings, inspect the ring grooves in the piston for presence of carbon. If present, remove and then wash clean.
- 2) Be sure not to intermix the first and second rings and install them in reversed vertical order. If their positions are reversed their end gap fixed positions will vary so that their contact against the cylinder wall will differ and may lead to compression leakage between piston rings and cylinder wall.
- 3) Both the first and second rings used in RL250 are of the keystone type (Fig. 8-29), necessitating special care in their installation. Be sure to install them so as not to be reversed. It will not only be impossible to insert piston with rings fitted in the cylinder, but there will be danger of damaging the piston and piston rings.



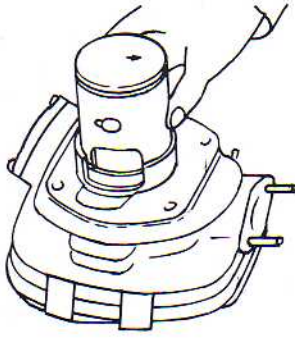


Fig. 8-27. Inserting piston ring into cylinder

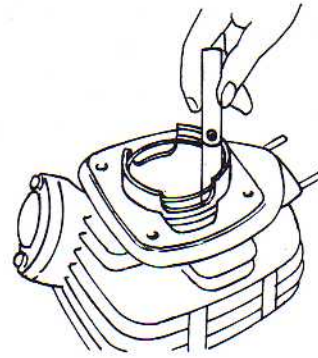


Fig. 8-28. Measuring end gap

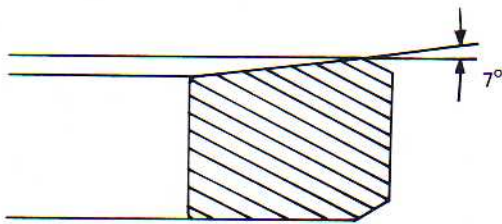


Fig. 8-29. Side angle

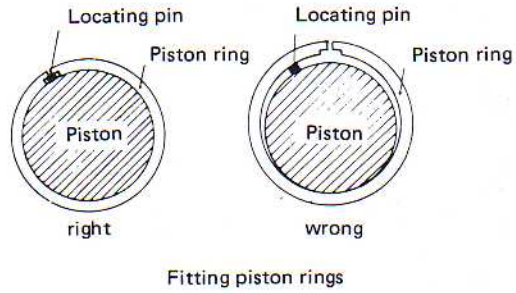


Fig. 8-30. Position of locating pin

8-8. Piston

8-8-1. Inspecting and repairing

1) Piston to cylinder clearance

Standard piston to cylinder clearance is 0.065 mm. The clearance is the difference between the cylinder bore and the piston outside diameter. The cylinder bore is the diameter 5 mm above the exhaust port measured in front-rear direction and the piston outside diameter is that measured 26 mm (1.02 in) above the piston skirt at 90 degrees to the piston pin holes.

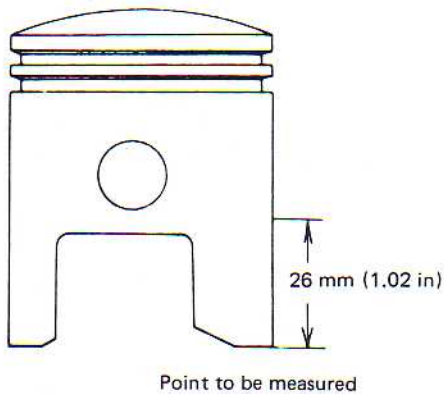


Fig. 8-31. Skirt measurement

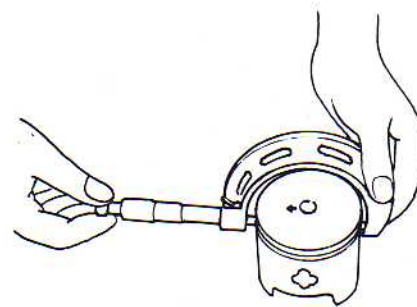


Fig. 8-32. Measuring piston diameter

2) Inspecting piston pin holes

Wear in piston pin holes will create noise. Check the wear by inserting a good piston pin in the piston to see how it fits. If very loose, replace the piston.

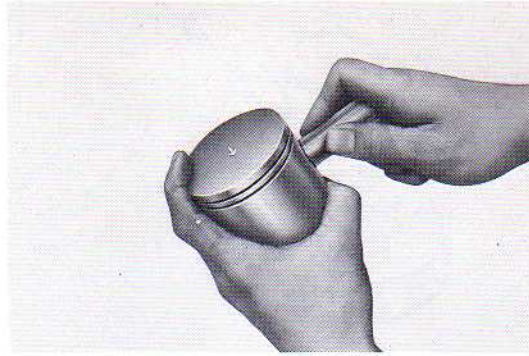


Fig. 8-33. Inspecting pin hole

3) Damage inspection and repairs

If the piston should be subjected to any damage such as scratch, the engine performance will drop, depending on the extent of damage. Not only that, the damaged area may grow larger. Thus, if any seized spot should be found, it should be removed by using above # 400 emery paper.

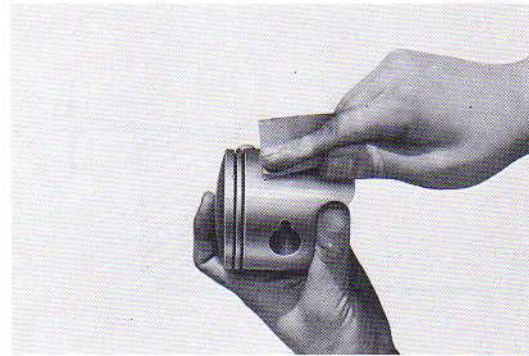


Fig. 8-34. Polishing piston surface

4) Removing carbon.

When carbon accumulates on the top of piston, piston cooling becomes bad and this may lead to preignition troubles. Therefore, do not forget to clean off the carbon whenever the piston is removed.

Carbon collected in the piston ring grooves will prevent smooth movement of the piston ring in the groove, and this may cause troubles such as ring stick and blow-by. Using an old piston ring, clean off the carbon so as to allow the rings to move smoothly in their grooves.

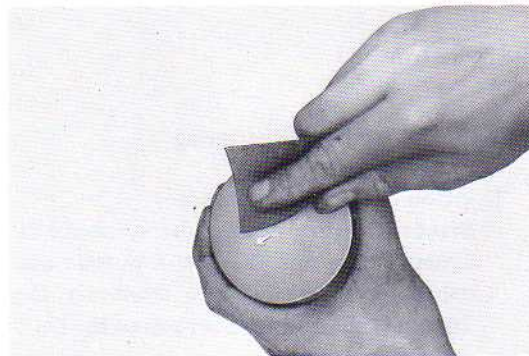


Fig. 8-35. Removing carbon



Fig. 8-36. Removing carbon

8-8-2. Precautions on installing piston

- 1) In installing the piston, be sure to position it so that the arrow mark on the head will be pointing toward the exhaust port (toward front side).
- 2) Before inserting the piston in the cylinder, check the piston ring end gap to make sure that it coincides with piston ring locating pin.

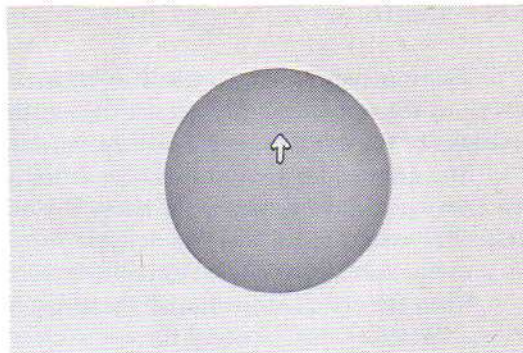


Fig. 8-37. Arrow mark

8-9. Flywheel magneto

8-9-1. Removing

- 1) Using rotor holder (special tool No. 09930-40113), secure the flywheel rotor and remove the flywheel set nut.
- 2) Secure the flywheel with rotor holder, and using rotor remover set (special tool No. 09930-30130), remove the flywheel rotor.
- 3) Loosen the three stator set screws, disconnect the neutral switch lead (blue wire) wire from the connector, and remove the stator from the crankcase.
- 4) After removing the stator, remove the wood-ruff key from the part where the flywheel is installed on the crankshaft. (Attaching the wood-ruff key on the magnet of the removed flywheel magneto would be a convenient method of not losing the key.)

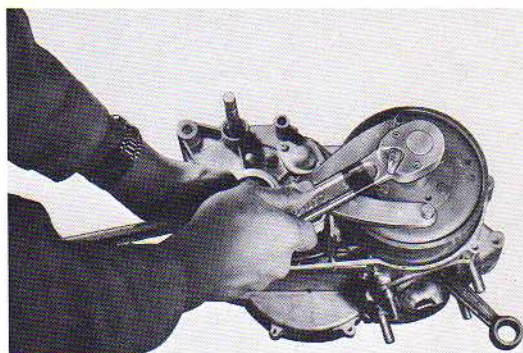


Fig. 8-38. Removing flywheel rotor nut

8-10. Crankcase right cover

8-10-1. Removing

- 1) Loosen the kick starter lever set bolt and remove the kick starter lever.
- 2) Loosen the ten crankcase right cover screws and remove the crankcase right cover. Before removing, make sure that the cover gasket is not sticking to the crankcase right cover. If sticking, separate it from the cover with a knife before taking off the cover.
- 3) Remove the crankcase right cover gasket. After removing, inspect the gasket to see if it is not damaged. (The general rule is to use new gasket when reassembling the engine after overhaul.)

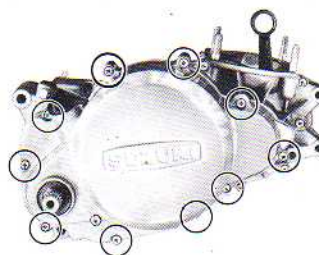


Fig. 8-39. Crankcase right cover screws

8-11. Clutch

The function of the clutch is to transmit or disengage the power produced by the engine for the driving of the rear wheel through the transmission gears. Fig. 8-40 is a schematic drawing of the operating principles of the wet type, multiple plate clutch equipped on RL250.

The drive plates are turned by the clutch housing rotating in accordance with the engine revolutions. The driven plates are meshed in the sleeve hub on the countershaft, and are unable to transmit power in this state. But when pressed together between the drive plates by the force of the clutch spring acting through the pressure plate, the frictional force produced allows power to be transmitted.

When the clutch is disengaged, the spring force acting on the pressure plate does not act on the clutch plates. Therefore, the frictional force is decreased and the transmission of power between the plates is cut off.

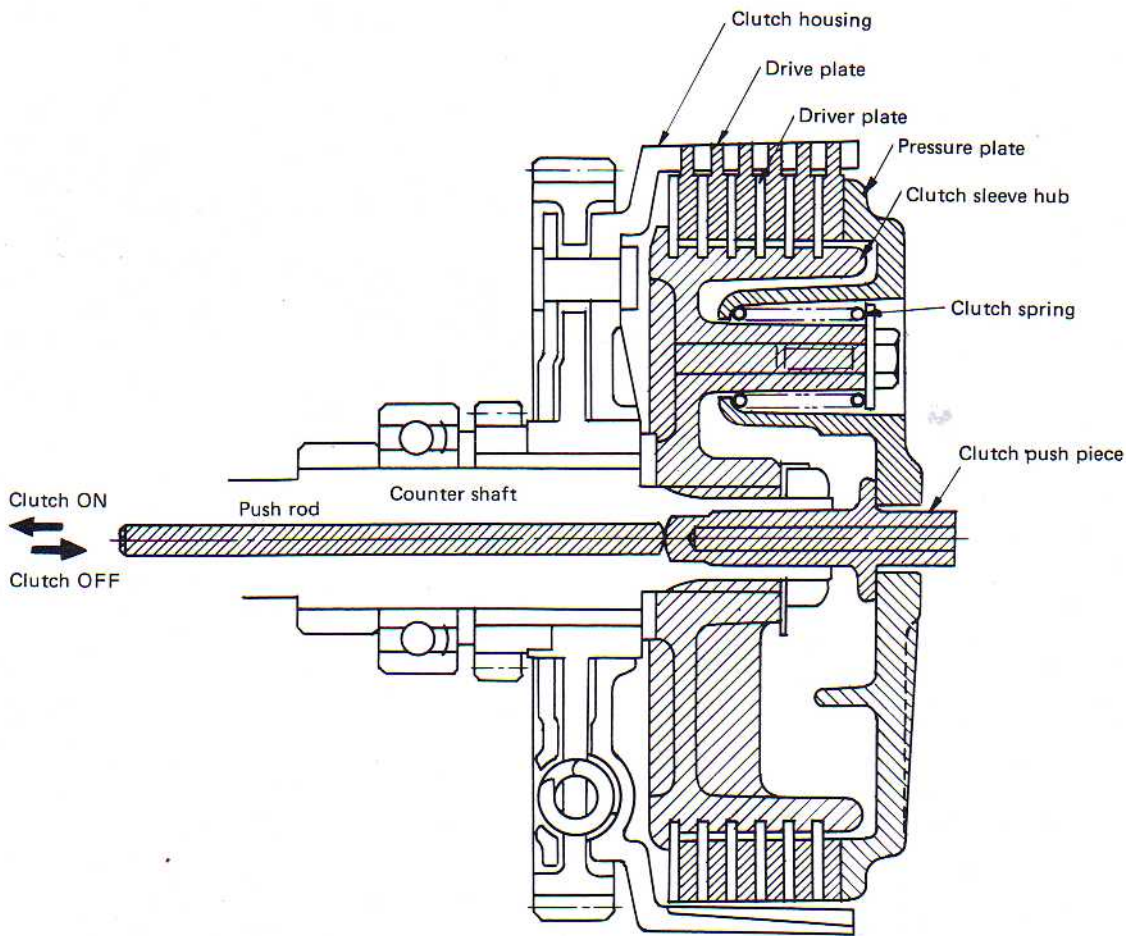
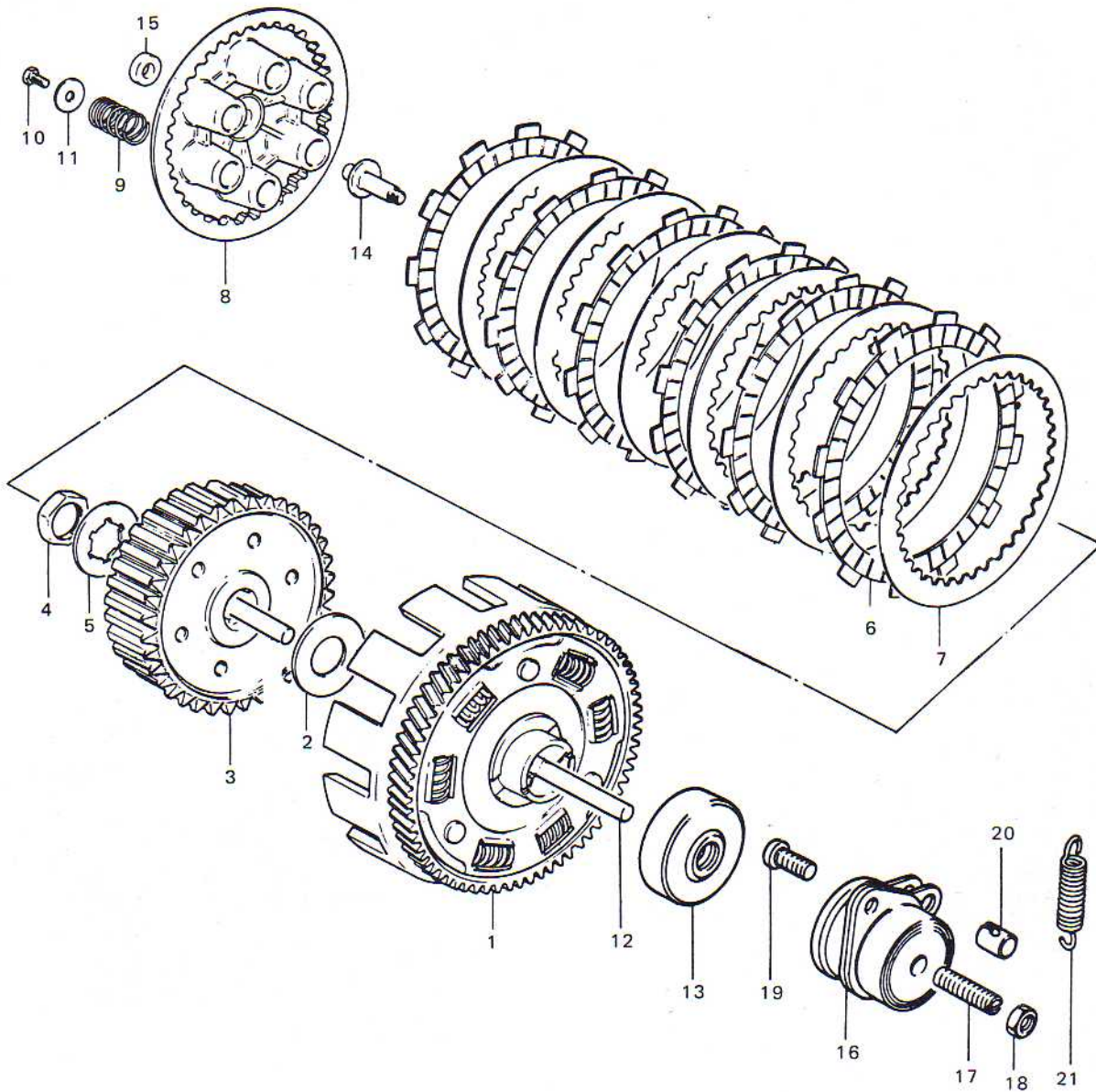


Fig. 8-40(a). Clutch section



| | | | | | |
|------------------------------|---|------------|-------------------------------|---|---------------|
| 1. PRIMARY DRIVEN GEAR COMP. | 1 | NT: 75 | 12. CLUTCH PUSH ROD | 2 | OD: 6, L: 104 |
| 2. THRUST WASHER | 1 | 20x44x3 | 13. OIL SEAL | 1 | 6x30x7 |
| 3. CLUTCH SLEEVE HUB | 1 | | 14. CLUTCH PUSH PIECE | 1 | |
| 4. NUT | 1 | | 15. OIL SEAL | 1 | 10x17x5 |
| 5. WASHER | 1 | | 16. CLUTCH RELEASE SCREW ASSY | 1 | |
| 6. CLUTCH DRIVE PLATE | 6 | | 17. SCREW | 1 | |
| 7. CLUTCH DRIVEN PLATE | 6 | OD: 136 | 18. NUT | 1 | |
| 8. CLUTCH PRESSURE DISK | 1 | | 19. SCREW | 2 | |
| 9. SPRING | 6 | | 20. RELEASE ARM END PIECE | 1 | |
| 10. BOLT | 6 | | 21. SPRING | 1 | |
| 11. WASHER | 6 | 6.5x20x1.6 | | | |

Fig. 8-40(b). Clutch exploded

8-12. Primary pinion

8-12-1. Removing

- 1) Pry up the lips of primary pinion lock washer with a chisel.
- 2) Using piston holder (special tool No. 09910-20111), secure the connecting rod small end on the tool, and remove primary pinion nut.
- 3) Take off the primary pinion and washer with hand.

8-12-2. Inspectin

In case there is more than 0.16 mm backlash between the primary pinion and primary driven gear, replace the primary pinion and recheck the backlash to make sure that the backlash has been reduced to less than 0.16 mm. Inspect the primary pinion tooth surfaces for wear. If worn excessively, replace the pinion as abnormal noise will be produced.

8-12-3. Reassembling

Reassemble by following the disassembling procedures in reverse order. Use a torque wrench when tightening the primary pinion nut.

Primary pinion nut tightening torque 500 kg-cm (36 lb-ft)

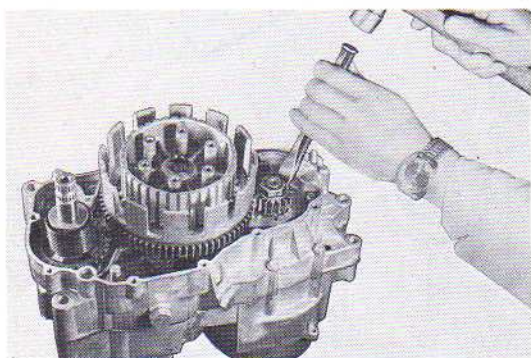


Fig. 8-41. Flattening primary pinion washer

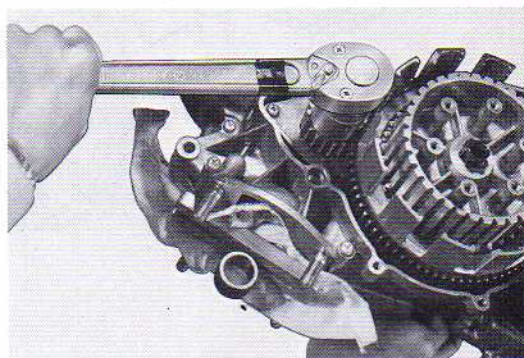


Fig. 8-42. Loosening primary pinion nut

8-13. Kick starter mechanism

There is a primary kick starter mechanism and it differs from the conventional kick starter mechanism in that it does not operate through the clutch but turns the crankshaft directly through a gear train. As long as the clutch is disengaged, kick starting is possible regardless of the transmission gear position. The primary kick starter mechanism is illustrated in Fig. 8-43.

8-13-1. Operation

Before kick starting the ratchet wheel is held by the ratchet wheel guide. Upon kick starting, the kick starter shaft rotates in accordance with the kick lever. The ratchet wheel being in mesh with the kick starter shaft also starts to turn, and on releasing from the ratchet wheel guide, the ratchet wheel is pushed toward the kick drive gear by the force of ratchet wheel spring wheel it meshes against the side of kick drive gear. The kick drive gear through its related gears then turns the crankshaft.

The transmission of power at kick starting takes places as follows:

Kick Lever → Ratchet Wheel → Kick Drive Gear → Kick Idle Gear → Kick Driven Gear
→ Primary Driven Gear → Primary Pinion → Crankshaft

On the releasing the kick lever, the kick starter shaft is returned to its former position by the kick spring. At this time, the ratchet wheel which turns together with the kick starter shaft, due to the ratchet wheel guide, moves away from the kick drive gear.

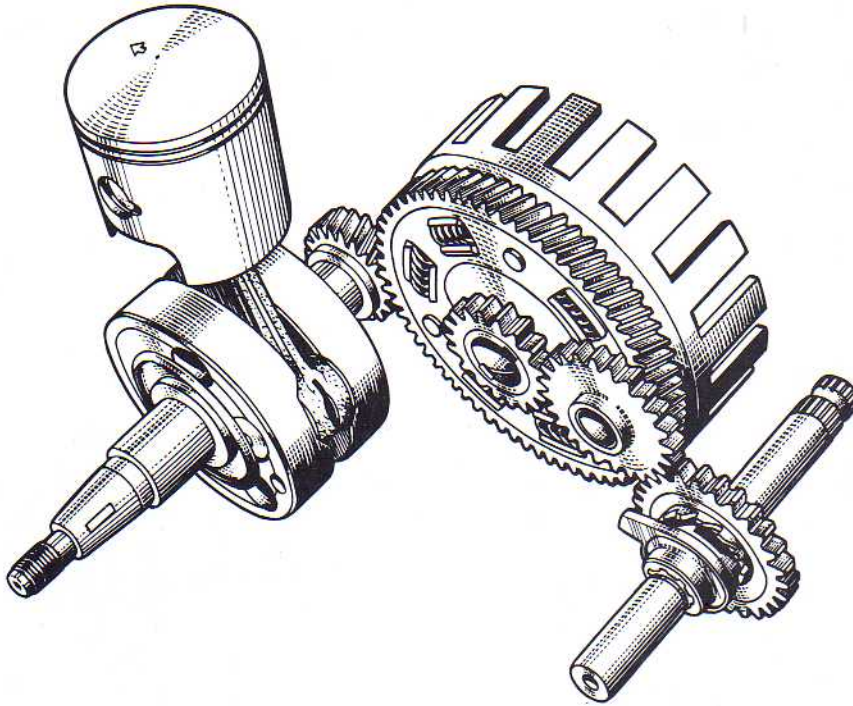


Fig. 8-43. Primary kick starter mechanism

| | | | |
|-------------------------|----------|-----------------------------|-----------|
| 1. KICK STARTER SHAFT | 1 | 11. CIRCLIP | 1 |
| 2. KICK STARTER | 1 | 12. SPRING | 1 |
| 3. SPRING | 1 | 13. SPRING GUIDE | 1 |
| 4. THRUST WASHER | 1 | 14. SPRING HOLDER | 1 |
| 5. KICK STARTER GUIDE | 1 | 15. WASHER | 1 |
| 6. KICK STARTER STOPPER | 1 | 16. OIL SEAL | 1 20x37x7 |
| 7. WASHER | 1 | 17. KICK STARTER LEVER ASSY | 1 |
| 8. BOLT | 2 | 18. BOLT | 1 |
| 9. DRIVE GEAR | 1 NT: 27 | 19. LOCK WASHER | 1 |
| 10. WASHER | 1 | | |

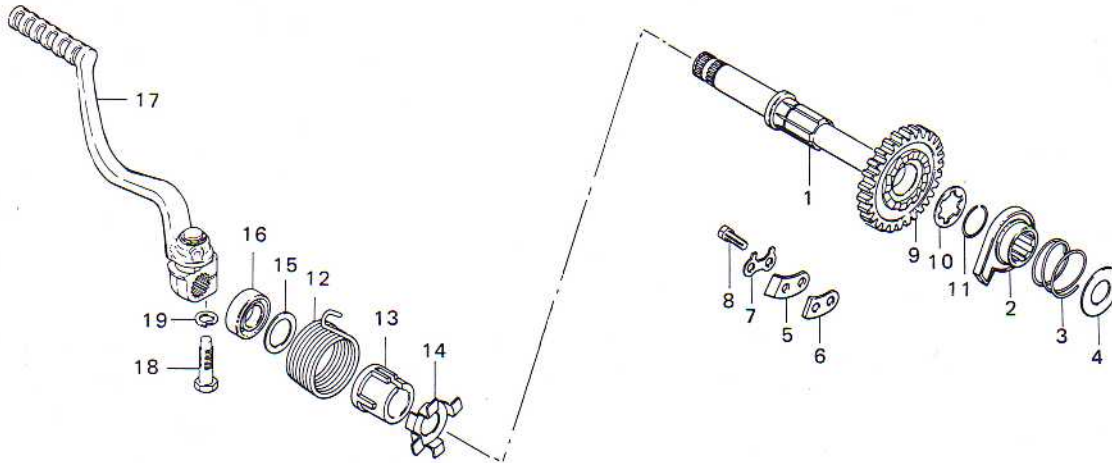


Fig. 8-44. Exploded view of kick starter

8-13-2. Precautions on reassembling

- 1) Be sure to align the punch mark on kick starter shaft with that on the ratchet wheel.
- 2) After assembling the kick starter shaft in the crankcase, check the shaft to see that it turns easily.

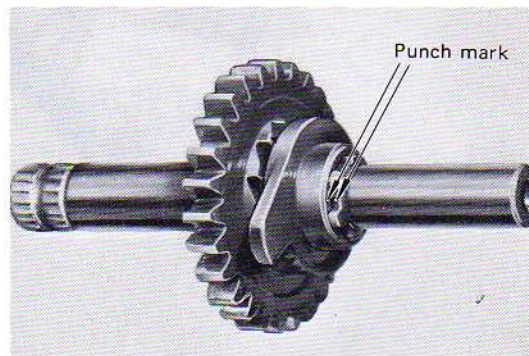


Fig. 8-45. Aligning the punch mark

8-13-3. Removing and Installing kick idle gear

Using snap ring opener, remove the circlip. Then remove the idle gear. When installing, be sure to insert the spring washer in the inner side of idle gear.

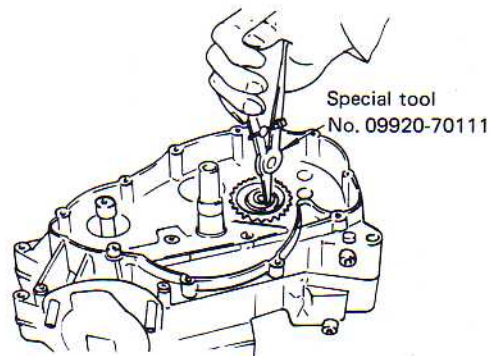


Fig. 8-46. Removing kick idle gear

8-14. Drive sprocket

8-14-1. Removing

- 1) Pry up bent tongue of the drive sprocket nut lock washer with a chisel.
- 2) Secure the drive sprocket with special tool (No. 09930 40113) and after loosening the drive sprocket nut, remove the drive sprocket.

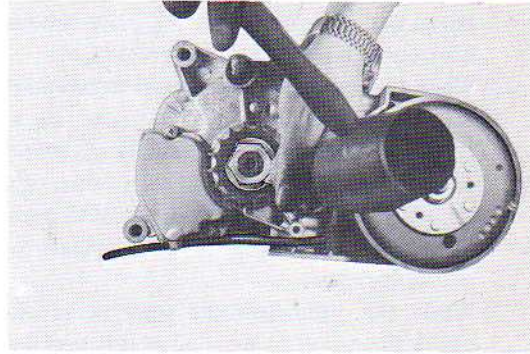


Fig. 8-47. Flattening drive sprocket washer

8-14-2. Inspecting

- 1) Inspect the sprocket teeth for wear. If abnormally worn, replace the sprocket as such condition will produce chain noise and will also shorten chain life.

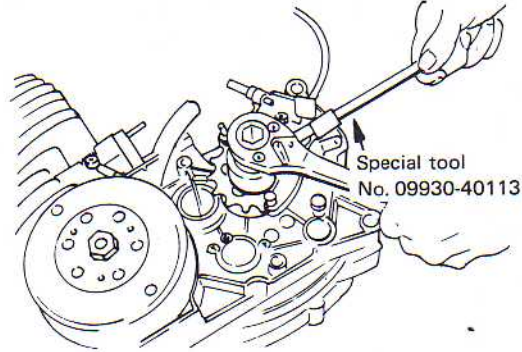


Fig. 8-48. Loosening drive sprocket nut

8-15. Crankcase

8-15-1. Disassembly sequence

- 1) Remove the gear shifting cam guide.
- 2) Loosen the 13 crankcase fitting screws.
- 3) Using crankcase separating tool (special tool No. 09910-80113), disassemble the crankcase. Set the separating tool on the right crankcase.

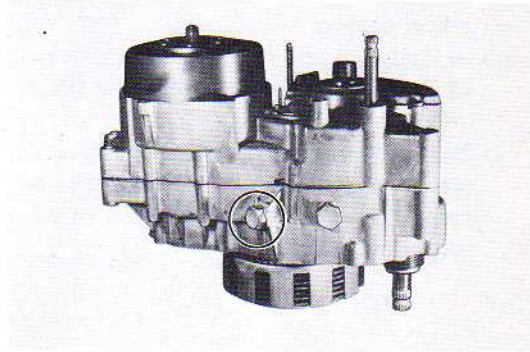


Fig. 8-49. Removing gear shifting cam guide

8-15-2. Disassembly precautions

- 1) In setting the crankcase separating tool on the crankcase, make sure that the plate surface is horizontal in relation to the crankcase.
- 2) When the crankcase joint starts to come apart after turning in the crankcase separating tool lever, separate while continually maintaining the joint surfaces parallel to each other. If the surfaces start to get lopsided, adjust to parallel by tapping the case or countershaft with plastic hammer.
- 3) When the joint surfaces start to separate, check the gasket to see if all of it is sticking to one side. If partially sticking to both the left and right cases, use a screwdriver or knife and separate the portion sticking to one side so that the entire gasket will remain on one side only.
- 4) The general rule is to use a new gasket when reassembling the engine after overhaul.

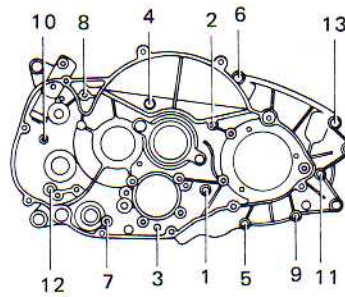


Fig. 8-50. Crankcase fitting screws

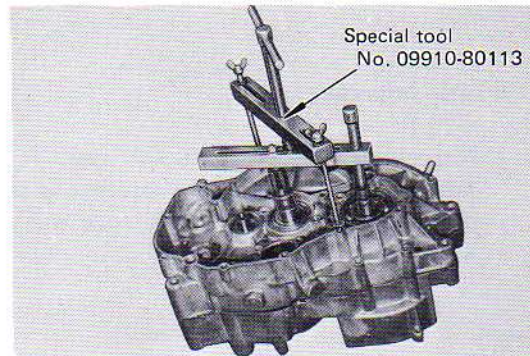


Fig. 8-51. Separating crankcase with Special tool

8-15-3. Assembly precautions

- 1) Check the two dowel pins for determining the left and right case positions by inserting them in the dowel holes and seeing that they fit properly without excessive looseness.
- 2) Make sure that the crankcase gasket is not damaged and that it has not shifted from its proper portion.
- 3) In tightening the crankcase fitting screws, be sure to start tightening from about the center of crankcase.
- 4) Before starting to tighten the crankcase fitting screws, insert the kick starter shaft and oil pump drive shaft and check them to see that they turn lightly.

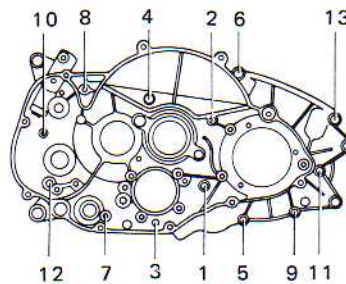


Fig. 8-52. Tightening order of crankcase joining screws

8-16. Transmission

When disassembled, be sure to inspect the teeth surfaces, dogs and sliding parts of all gears. Replace any part found defective. The relative positions of the gears and washers are as shown in Fig. 8-53.

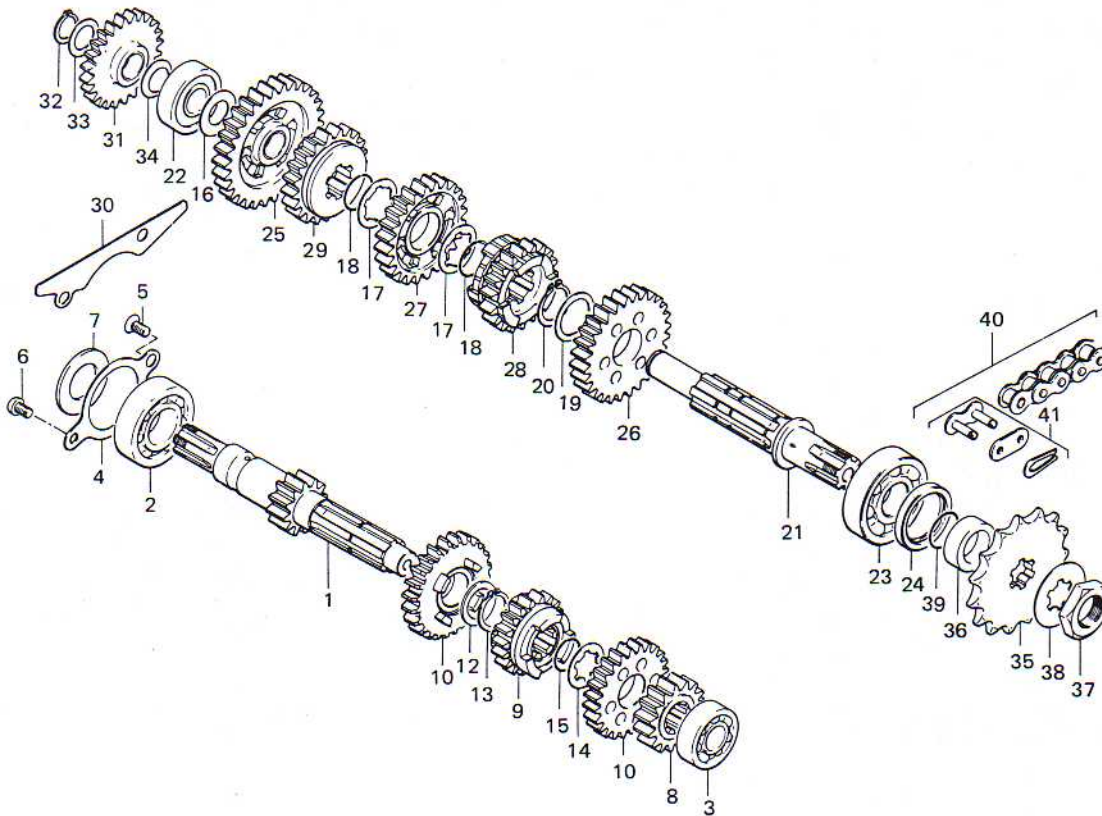
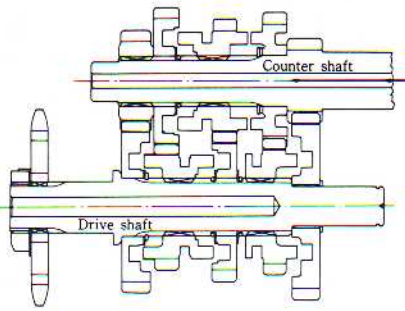
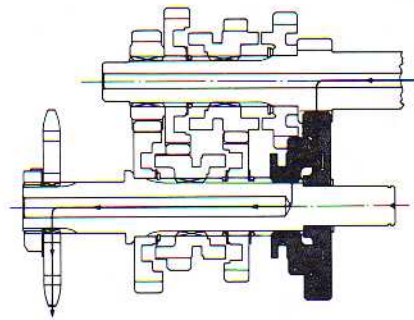


Fig. 8-53. Exploded view of transmission

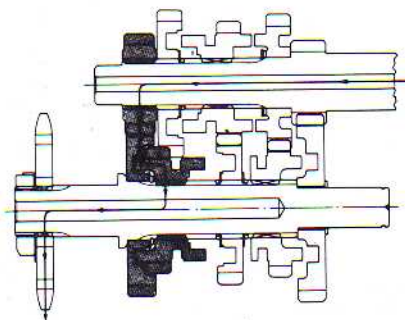
| | | | | | |
|--------------------|---|---------|----------------------------|---|-------------------------|
| 1. COUNTERSHAFT | 1 | NT: 12 | 23. BALL BEARING | 1 | 22x5x16 |
| 2. BALL BEARING | 1 | | 24. OIL SEAL | 1 | 28x47x8 |
| 3. BALL BEARING | 1 | | 25. 1st DRIVEN GEAR | 1 | NT: 29 |
| 4. BEARING HOLDER | 1 | | 26. 2nd DRIVEN GEAR | 1 | NT: 27 |
| 5. SCREW | 1 | | 27. 3rd DRIVEN GEAR | 1 | NT: 24 |
| 6. SCREW | 1 | | 28. 4th DRIVEN GEAR | 1 | NT: 21 |
| 7. WASHER | 1 | 25x41x3 | 29. 5th DRIVEN GEAR | 1 | NT: 16 |
| 8. 2nd DRIVE GEAR | 1 | NT: 15 | 30. OIL RESERVOIR PLATE | 1 | |
| 9. 3rd DRIVE GEAR | 1 | NT: 17 | 31. KICK STARTER IDLE GEAR | 1 | NT: 22 |
| 10. 4th DRIVE GEAR | 1 | NT: 22 | 32. CIRCLIP | 1 | |
| 11. 5th DRIVE GEAR | 1 | NT: 25 | 33. THRUST WASHER | 1 | |
| 12. THRUST WASHER | 1 | | 34. WASHER | 1 | |
| 13. CIRCLIP | 1 | | 35-1 ENGINE SPROCKET | 1 | NT: 15 |
| 14. WASHER | 1 | | 35-2 ENGINE SPROCKET | 1 | NT: 16 |
| 15. CIRCLIP | 1 | | 35-3 ENGINE SPROCKET | 1 | NT: 17 |
| 16. THRUST WASHER | 1 | 17x29x1 | 36. SPACER | 1 | |
| 17. WASHER | 2 | | 37. NUT | 1 | |
| 18. CIRCLIP | 2 | | 38. WASHER | 1 | |
| 19. THRUST WASHER | 1 | | 39. O RING | 1 | ID: 22, d: 1.7 |
| 20. CIRCLIP | 1 | | 40. DRIVE CHAIN ASSY | 1 | # 428x124ℓ #428x120ℓ |
| 21. DRIVESHAFT | 1 | | 41. DRIVE CHAIN JOINT | 1 | |
| 22. BALL BEARING | 1 | | | | |



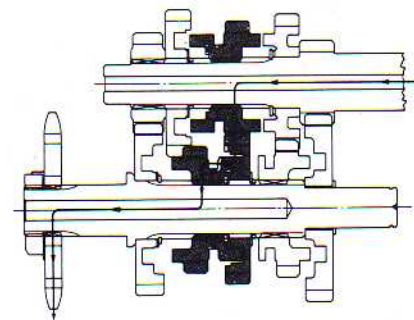
Gear position for neutral



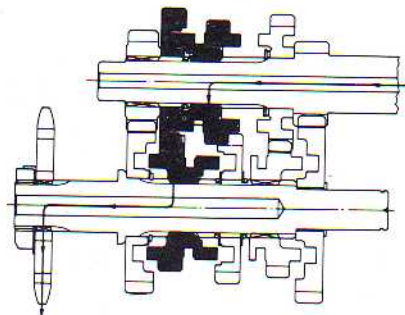
Gear position for low speed



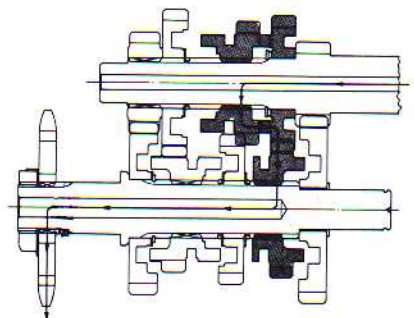
Gear position for 2nd speed



Gear position for 3rd speed



Gear position for 4th speed



Gear position for top speed

Operation of transmission

8-16-1. Precautions on reassembling

- 1) In assembling the 5th driven gear, position the gear teeth side toward the drive sprocket side. In assembling the 3rd drive gear position the gear teeth side toward the 1st gear side.
- 2) Have all gears and shafts washed clean with solvent before assembling.
- 3) After assembling the gears and shafts on the left crankcase, lubricate them with gear oil.
- 4) In fitting the right crankcase check presence of dowel pins.

8-16-2. Checking after assembling

After reassembling the transmission, turn the drive shaft and countershaft with hand to see that they turn lightly. If tight tap the shafts lightly with plastic hammer. If the shafts still turn heavily, or will not turn at all, they have not been assembled properly. Disassemble and check. Next, install the gear shifting mechanism such as gear shifting shaft, pawls, cam driven gears and cam guide, and check the gear shifting mechanism to see that it will work properly by operating the gear shifting lever.

8-17. Crankshaft

8-17-1. Removing crankshaft

Set the crankshaft remover (special tool No. 09910-92810) on the left crankcase. Tightening the crankshaft remover handle will force the crankshaft out of the left crankcase.

8-17-2. Installing crankshaft

In assembling the crankshaft in the crankcase, use crankshaft installing tool (special tool No. 09910-32810) and pull the crankshaft into the case. Have the crankshaft oil seal removed before-hand.

Note: The removing of crankshaft from the case and its installing must always be done with special tools. The crankshaft must never be hammered as this will destroy the precision as well as damaging the bearings.

8-17-3. Inspecting and repairing of crankshaft

- 1) Connecting rod large end bearing.
Support the crankshaft journals on V blocks and measure the deflection of the connecting rod small end using dial indicator. In this case, have the connecting rod large end pressed with hand so that any excessive looseness in its thrust direction will have no effect on the dial indicator deflection.

| | Standard | Limit |
|-------------------------------------|------------|-------|
| Connecting rod small end deflection | 0.5-0.8 mm | 3 mm |

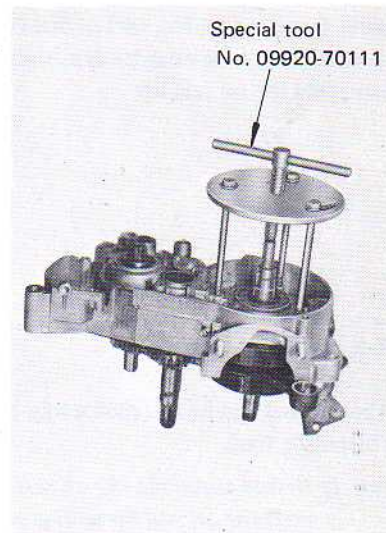


Fig. 8-55. Removing crankshaft 10-92810

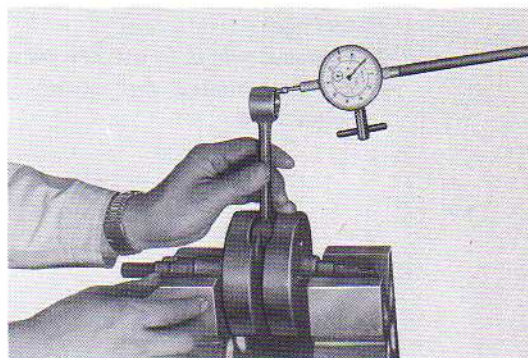


Fig. 8-56. Measuring con-rod small end deflection

2) Inspecting crankshaft deflection.

Contact the dial indicator on the crankshaft journal and measure the deflection. If over the limit, correct with plastic hammer or replace the crankshaft.

| | Standard | Limit |
|-----------------------|-----------------|----------------|
| Crankshaft deflection | 0.06 mm maximum | 0.1 mm maximum |

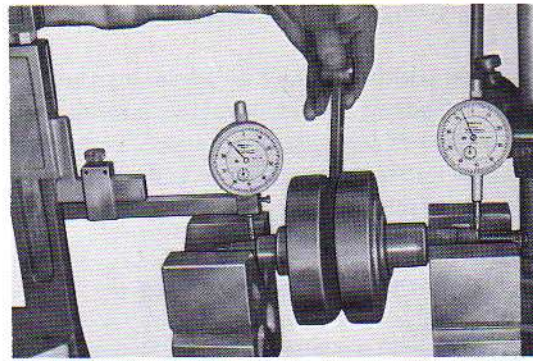


Fig. 8-57. Measuring crankshaft deflection

8-18. Oil seal

8-18-1. Removing oil seal.

In removing the oil seal, use the oil seal remover (special tool No. 09913-50110). Do not use screwdriver or similar tools as there is danger of damaging the oil seal lip.

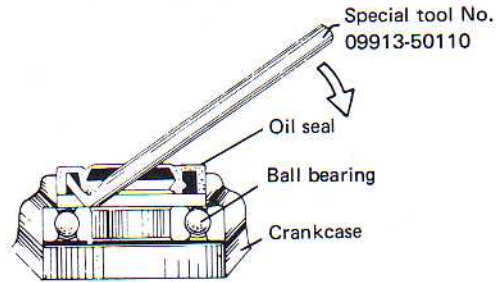


Fig. 8-58. Removing oil seal

8-18-2. Installing oil seal

The oil seal can be installed easily by using oil seal installing tool.

- Notes:
- 1) Before installing the oil seal, be sure to coat the oil seal lip with grease.
 - 2) Use care not to install the oil seal at an angle as this will allow the pressure to leak out. Coating the outer surface of the oil seal lightly with grease will enable installing the oil seal with greater ease.
 - 3) The general rule is to use new oil seals when reassembling the engine after overhaul.

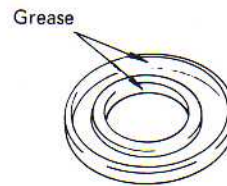


Fig. 8-59. Applying grease

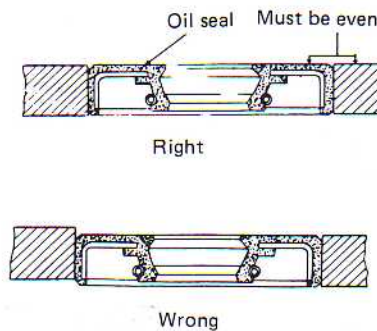


Fig. 8-60. Fitting oil seal

8-19. Bearing

8-19-1. Removing bearing

To remove the bearing first remove the oil seal and then heat the crankcase around bearing with blow torch and remove the bearing. Care must be taken not to heat the bearing itself as this will not only damage the bearing but make it more difficult to remove it.

8-19-2. Installing bearing

To install the bearing, heat the case first as during removal and then install the bearing. If found difficult to install, the work can be done easily by using the bearing installing tool and tapping the bearing in with a hammer.



Fig. 8-61. Installing Bearing

8-19-3. Inspecting bearing

Since the outer diameter of the bearing contracts slightly due to forcefitting allowance, a clearance is provided between the race and balls beforehand. Therefore in inspecting the bearing for wear, judgement cannot be made by checking for excessive clearance. The only method is to spin the race and listen to the noise. If abnormal noise is heard while the race is being turned, the bearing is no good. Before starting inspection, wash the bearing in clean gasoline and then lubricate it. If the bearing is just washed and then spun, even a new bearing will give off abnormal noise due to lack of lubrication, and moreover, repeated spinning will damage the bearing. Therefore care must be taken not to spin a dry bearing.

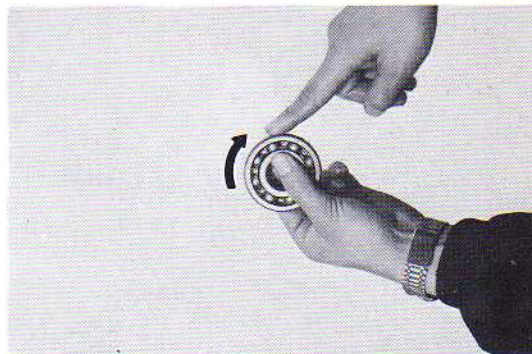


Fig. 8-62. Inspecting ball bearing