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# KAWASAKI

## SERVICE • REPAIR HANDBOOK

**Twins and Mach III · 1967-1971**



# KAWASAKI SERVICE • REPAIR HANDBOOK

## 250-350cc (TWO STROKE) TWINS — ALL YEARS
## 500cc THREE CYLINDER MACH III — 1969-1971

| | | |
|---|---|---|
| A1 | ALL YEARS | 250cc |
| A1SS | ALL YEARS | 250cc |
| A1R | ALL YEARS | 250cc |
| A7 | ALL YEARS | 350cc |
| A7SS | ALL YEARS | 350cc |
| A7R | ALL YEARS | 350cc |
| H1 | 1969-1971 | 500cc |

Year shown indicates the first year a model was produced.

# KAWASAKI
## SERVICE • REPAIR HANDBOOK

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# CHAPTER ONE

# GENERAL INFORMATION

## INTRODUCTION

This book provides complete service and repair information for owners of Kawasaki twin cylinder motorcycles as well as the 500cc triple. The contents apply to the following machines:

| | |
|---|---|
| A1 | A7 |
| A1SS | A7SS |
| A1R | A7R |
| | H1 |

## SERVICE HINTS

Most of the service procedures described are straightforward, and can be performed by anyone reasonably handy with tools. It is suggested, however, that you consider your own capabilities carefully before attempting any operation which involves major disassembly of the engine.

Some procedures, for example, require the use of a press. It would be wiser to have those performed by a shop equipped for such work, rather than to try it with makeshift equipment. Other maintenance requires precision measurements. Unless you have the skills and equipment needed, it would be better to have a motorcycle shop make them for you.

Repairs will be much faster and easier if your machine is clean before you begin work. There are special cleaners for washing the engine and related parts. Just brush or spray on the cleaning solution, let it stand, then rinse away with a garden hose.

Clean all oily or greasy parts with cleaning solvent as you remove them. **Never use gasoline as a cleaning agent.** It presents an extreme fire hazard. Be sure to work in a well-ventilated area when using any solvent. Have a fire extinguisher, rated for gasoline fires, handy just in case.

Special tools are required for some service procedures. These may be purchased at Kawasaki dealers. If you are on good terms with the dealer's service department, you may be able to borrow tools occasionally.

Much of a dealer's labor charge for repairs covers preliminary removal and disassembly to reach a defective part. It is frequently possible to do all this yourself, then take the affected subassembly into the shop for repair.

Once you decide to tackle a job yourself, read the entire section in this manual pertaining to it. Study the illustrations and the text until you have a good idea of what is involved. If special tools are required, make arrangements to get them **before** you start the job. It's frustrating to get partly into a repair and then find yourself unable to complete it.

## TOOLS

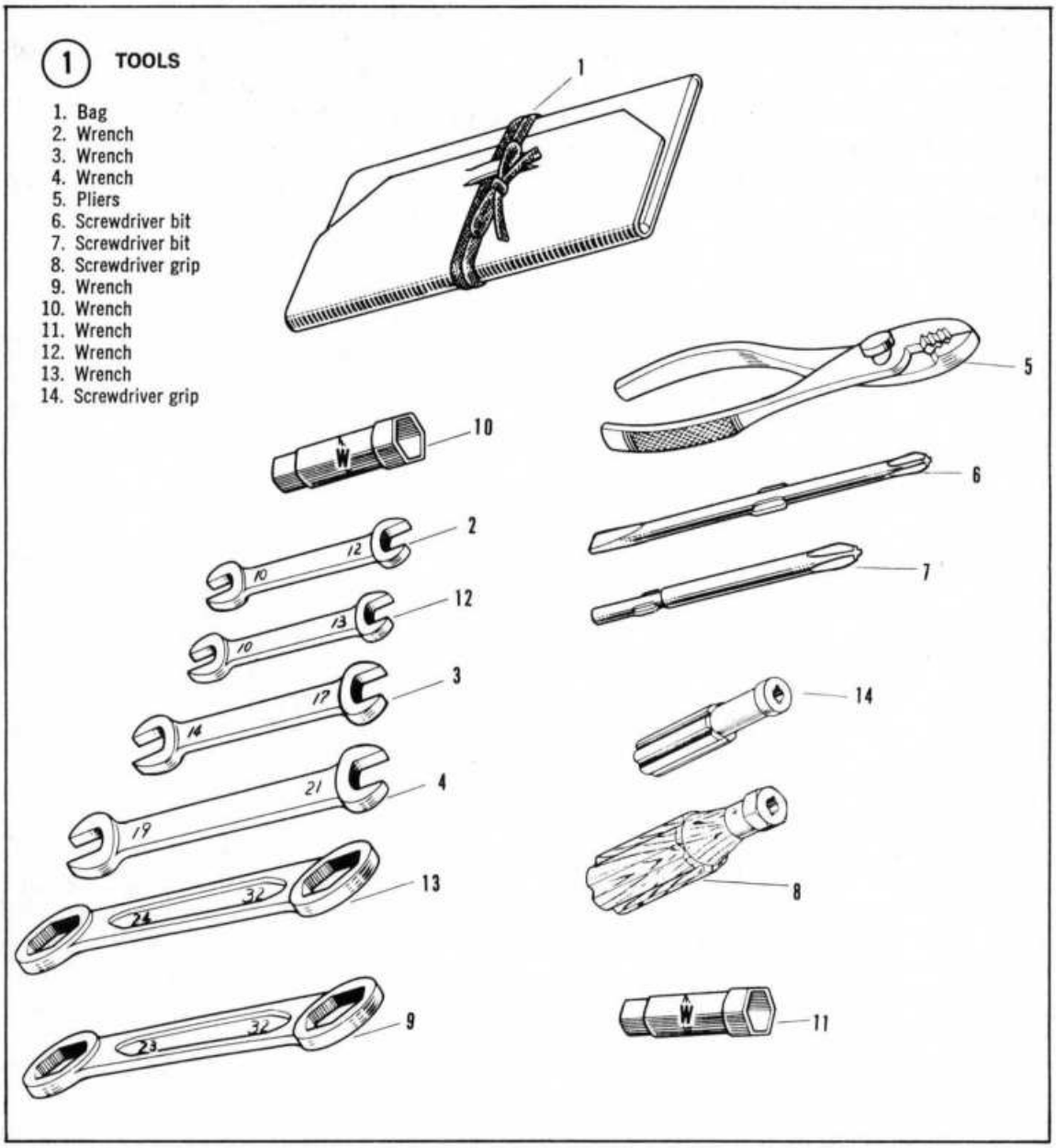
To properly service your bike, an assortment

of ordinary hand tools will be required. Be sure to have the following:

1. Combination wrenches
2. Socket wrenches
3. Plastic mallet
4. Small hammer
5. Snap ring pliers
6. Phillips screwdrivers
7. Pliers
8. Slot screwdrivers
9. Feeler gauges
10. Spark plug gauge
11. Spark plug wrench
12. Dial indicator

A tool kit suitable for most minor servicing is shown in **Figure 1**. It's available through Kawasaki dealers.

Electrical system servicing requires a voltmeter, ohmmeter or other device for determining continuity; and a hydrometer for battery checking. The hydrometer is inexpensive, and should be part of every motorcyclist's tool kit.



## EXPENDABLE SUPPLIES

Certain expendable supplies are also required. These include grease, oil, gasket cement, wiping rags, cleaning solvent, and distilled water. Cleaning solvent is available at many service stations and auto supply outlets. Distilled water for the battery is available at every supermarket. It is sold for use in steam irons.

## SAFETY FIRST

Professional motorcycle mechanics can work for years and never sustain a serious injury. If you observe a few rules of common sense and safety, you can enjoy many safe hours servicing your own machine. You can also hurt yourself or damage your machine if you ignore these rules.

1. Never use gasoline as a cleaning solvent.
2. Never smoke or use a torch in the area of flammable liquids, such as cleaning solvent, kept in open containers.
3. Never smoke or use a torch in an area where batteries are charging. Highly explosive hydrogen gas is formed during the charging process.
4. If welding or brazing is required, remove the fuel tank to a safe distance, at least 50 feet away.
5. Be sure to use the proper size wrenches for nut turning.
6. If a nut is tight, think for a moment what would happen to your hand should the wrench slip. Be guided accordingly.
7. Keep your work area clean and uncluttered.
8. Wear safety goggles in all operations involving drilling, grinding, or use of a chisel.
9. Do not use worn tools.
10. Keep a fire extinguisher handy. Be sure it is rated for gasoline and electrical fires.

# CHAPTER TWO

# ENGINE, TRANSMISSION, AND CLUTCH

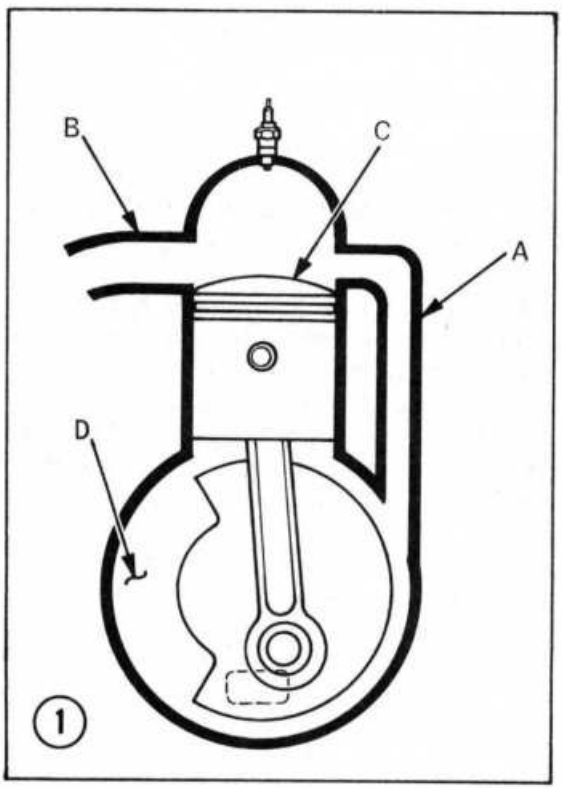
This chapter describes removal, disassembly, service, and reassembly of the engine, transmission, and clutch. The engine should be serviced without removing it from the chassis except for overhaul of the crankshaft assembly, transmission, gearshift mechanism, or bearings. Operating principles of rotary valve and piston port two-stroke engines are also discussed in this chapter. H series machines are equipped with three-cylinder piston port engines. A1 and A7 series machines use rotary valves.

## ENGINE PRINCIPLES

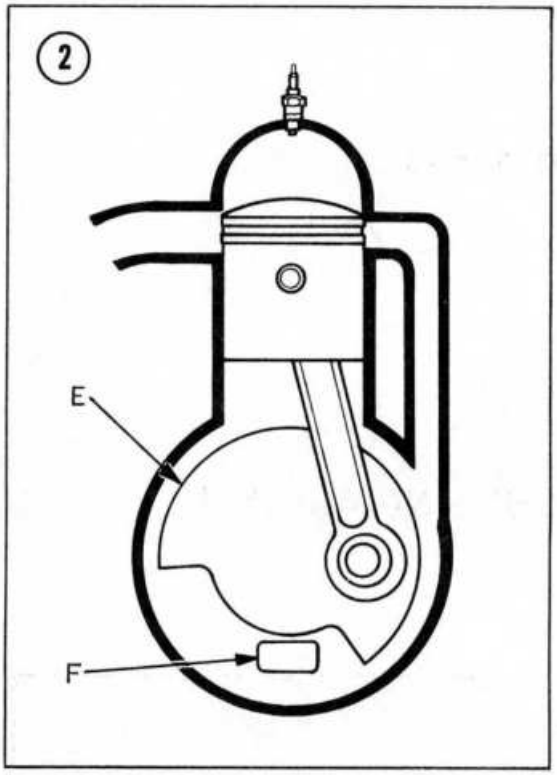
### Rotary Valve Engines

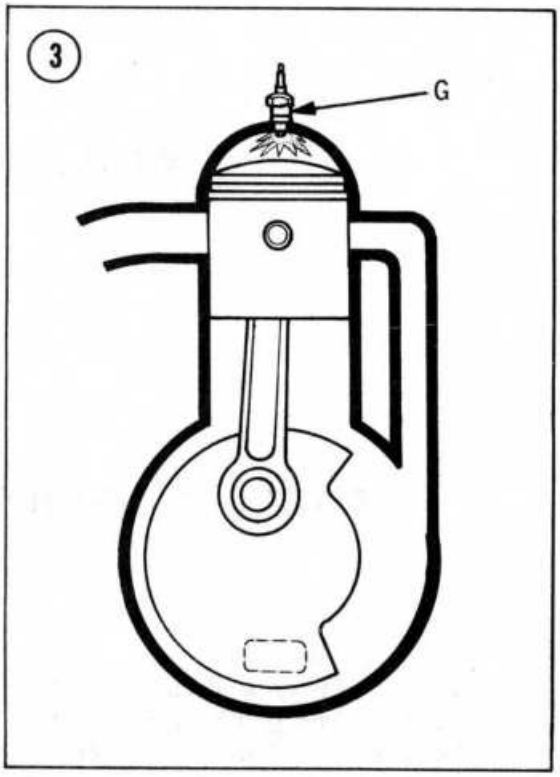
Figures 1 through 4 illustrate the four phases of the operating cycle. During this discussion, assume that the crankshaft is rotating counterclockwise. In **Figure 1**, as the piston travels downward, a transfer, or scavenging, port (A) is opened. The exhaust gases leave the cylinder through the exhaust port (B), which is also opened by the downward movement of the piston (C). A fresh fuel/air charge, which has previously been compressed, travels from the crankcase (C) through the scavenging port (A) as the port opens.

**Figure 2** illustrates the next phase in the cycle. As the crankshaft rotates, the piston moves upward, closing the exhaust and scavenging ports.




The fresh fuel/air mixture is trapped in the cylinder and compressed by the upward movement of the piston. Notice also that a low pressure area is created in the crankcase as the piston moves upward. The rotary valve (E), which is

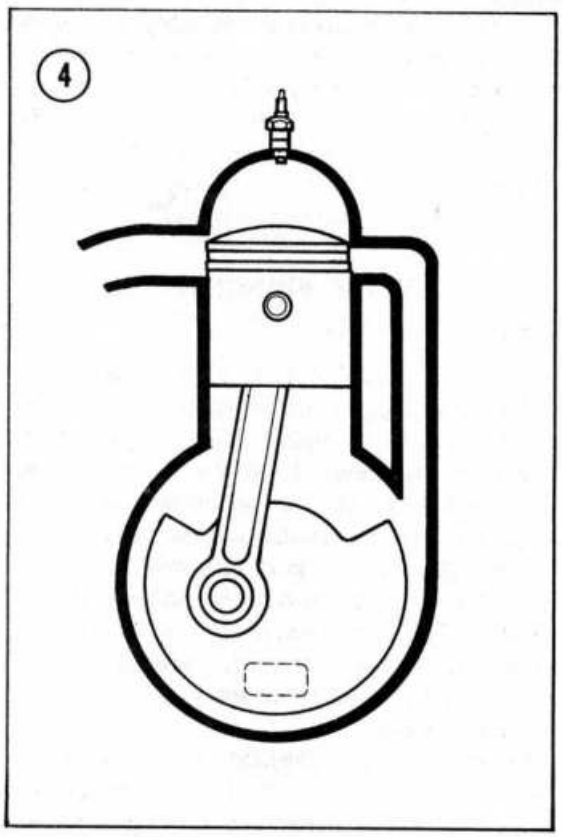



attached to the crankshaft and rotates with it, opens the intake port (F). The upward movement of the piston then draws a fresh fuel/air charge into the crankcase through the intake port.

The third phase is shown in **Figure 3**. As the piston approaches top dead center, the spark plug (G) fires, igniting the mixture. The piston is then driven downward by the expanding gases. The rotary valve also closes at the time the piston reaches top dead center. As the piston continues downward, the mixture in the crankcase is compressed.

When the piston uncovers the exhaust port, the fourth phase begins, as shown in **Figure 4**. The exhaust gases leave the cylinder through the exhaust port. Further movement of the piston opens the scavenging port, and the cycle is then repeated.




**Piston Port Engines**

Figures 5 through 8 illustrate the operation of the piston port engine. This engine is similar to the rotary valve type, except that intake valving is accomplished by the piston rather than by a valve which rotates with the crankshaft. During

this discussion, assume that the crankshaft is rotating counterclockwise, as in the rotary valve engine discussed in the foregoing paragraph. In **Figure 5**, as the piston travels downward, a scavenging port (A) between the crankcase and the cylinder is uncovered. The exhaust gases leave the cylinder through the exhaust port (B), which is also opened by the downward movement of the piston. A fresh fuel/air charge, which has previously been compressed slightly, travels from the crankcase (C) to the cylinder through the scavenging port (A) as the port opens. Since the incoming charge is under pressure, it rushes into the cylinder quickly and helps to expel the exhaust gases from the previous cycle.

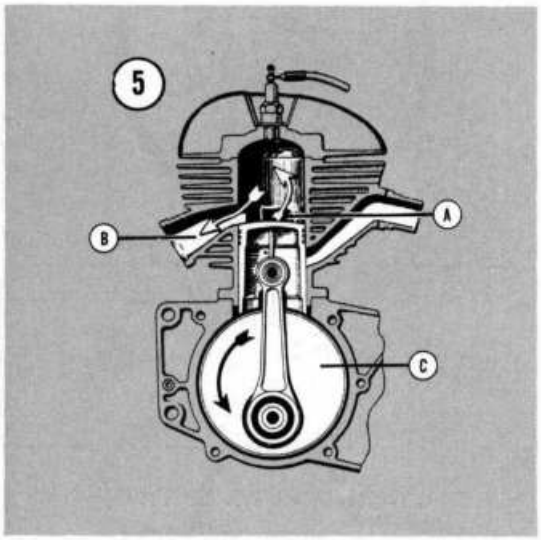
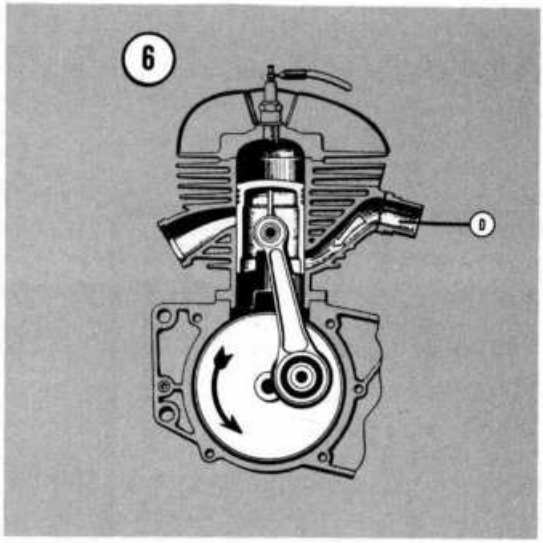
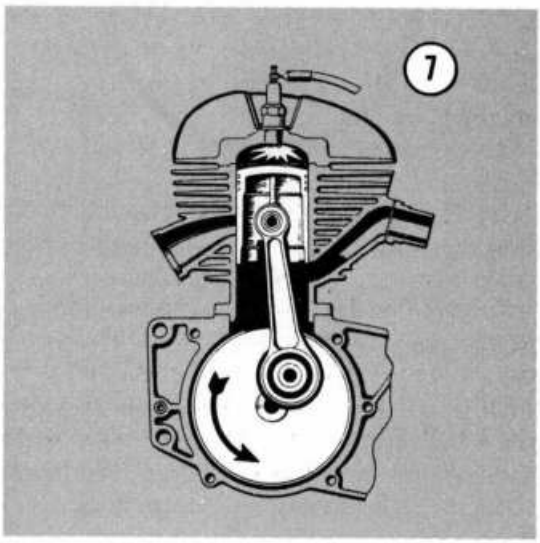



**Figure 6** illustrates the next phase of the cycle. As the crankshaft continues to rotate, the piston moves upward, closing the exhaust and scavenging ports. As the piston continues upward, the air/fuel mixture in the cylinder is compressed. Notice also that a low pressure area is created in the crankcase at the same time. Further upward movement of the piston uncovers the intake port (D). A fresh fuel/air charge is then drawn into the crankcase through the intake port because of the low pressure created by the upward piston movement.

The third phase is shown in **Figure 7**. As the piston approaches top dead center, the spark plug fires, igniting the compressed mixture. The piston is then driven downward by the expanding gases.

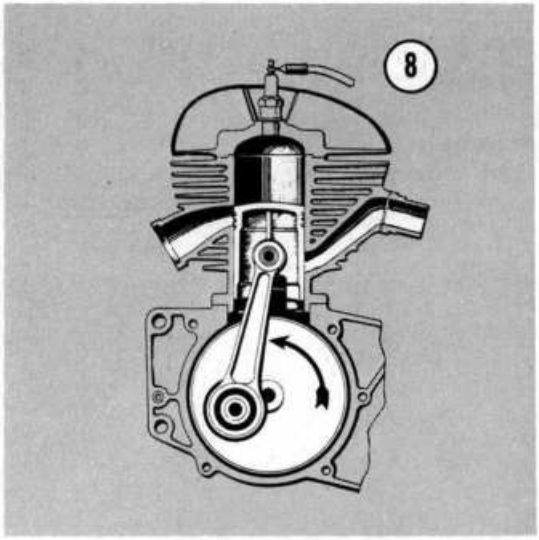
When the top of the piston uncovers the exhaust port, the fourth phase begins, as shown in **Figure 8**. The exhaust gases leave the cylinder through the exhaust port. As the piston continues downward, the intake is closed and the mixture in the crankcase is compressed in preparation for the next cycle.




It can be seen from the foregoing discussion that every downward stroke of the piston is a power stroke. Twin-cylinder engines are so arranged that the cylinders fire alternately, to produce two power strokes for each revolution of the crankshaft. H series models produce three power strokes for each crankshaft revolution.

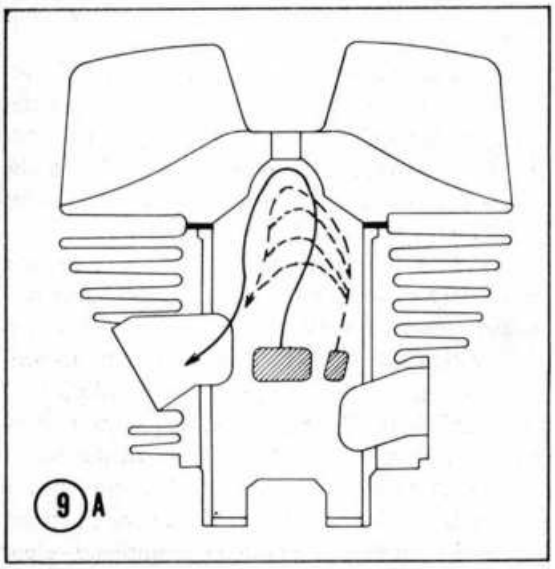
The conventional piston port engine has a design limitation in that the scavenging ports cannot be made large enough to completely clear

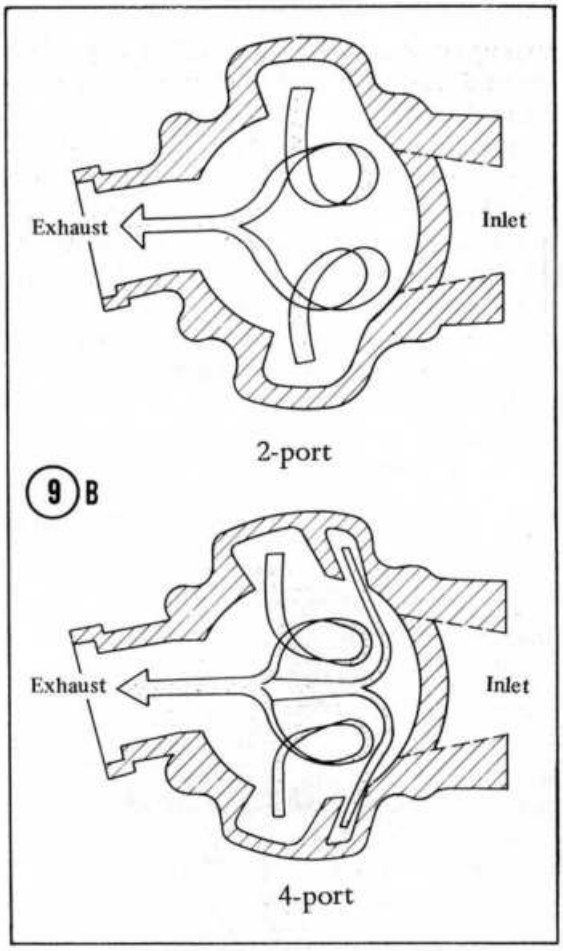



the cylinder of exhaust gases because of the position of the intake and exhaust ports. This condition results in contamination of the fresh mixture by residual exhaust gases.

To overcome this limitation, H series machines have two additional scavenging ports, shown in **Figures 9A and 9B** which permit more complete removal of the exhaust gases which would otherwise remain in the cylinder.

The additional scavenging ports are placed to the rear of the conventional scavenging ports, and are designed to direct the fresh charge to the area containing the remaining exhaust gases. The action of these ports result in more efficient operation over the entire engine operating range.



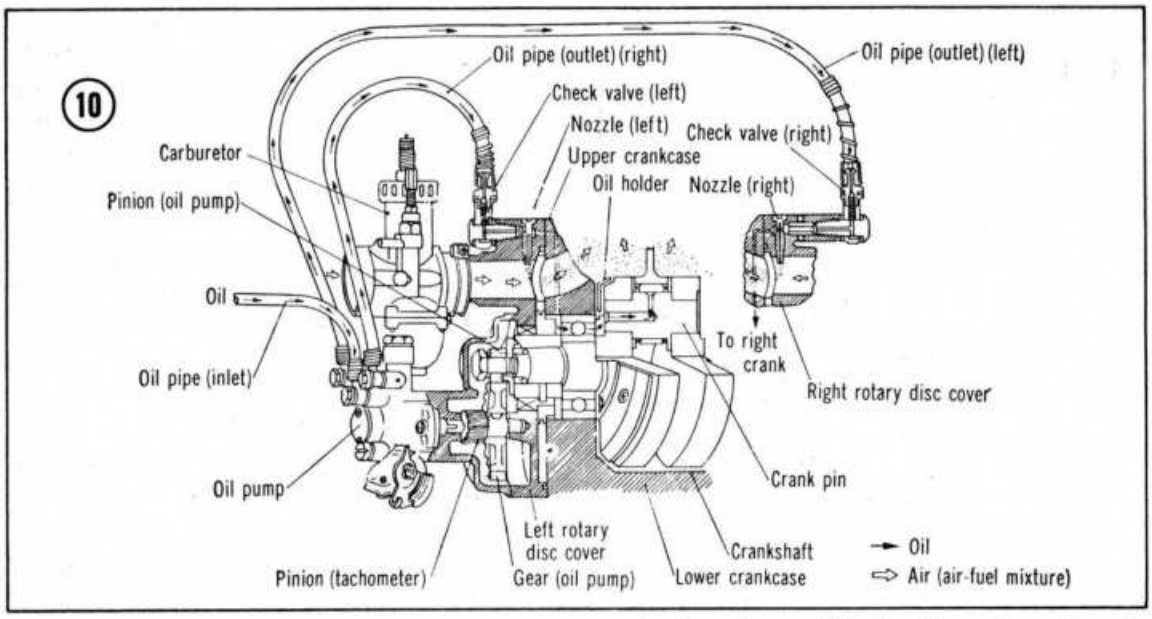




## ENGINE LUBRICATION

A conventional two-stroke engine cannot receive its lubrication from an oil supply in the crankcase. Oil splash in the crankcase would be carried into the cylinder with the fuel/air charge, resulting in high oil consumption and spark plug fouling. Multi-cylinder Kawasaki two-stroke engines use one of two methods for engine lubrication.

### Superlube System

This system is used on A1 series machines. A separate engine-driven oil pump (**Figure 10**) supplies lubricating oil from an oil tank to the engine induction tract. The output from the pump is controlled not only by engine speed, but also by throttle position, which is closely related to engine load. Therefore, the engine is supplied with the proper amount of oil under all operating conditions.



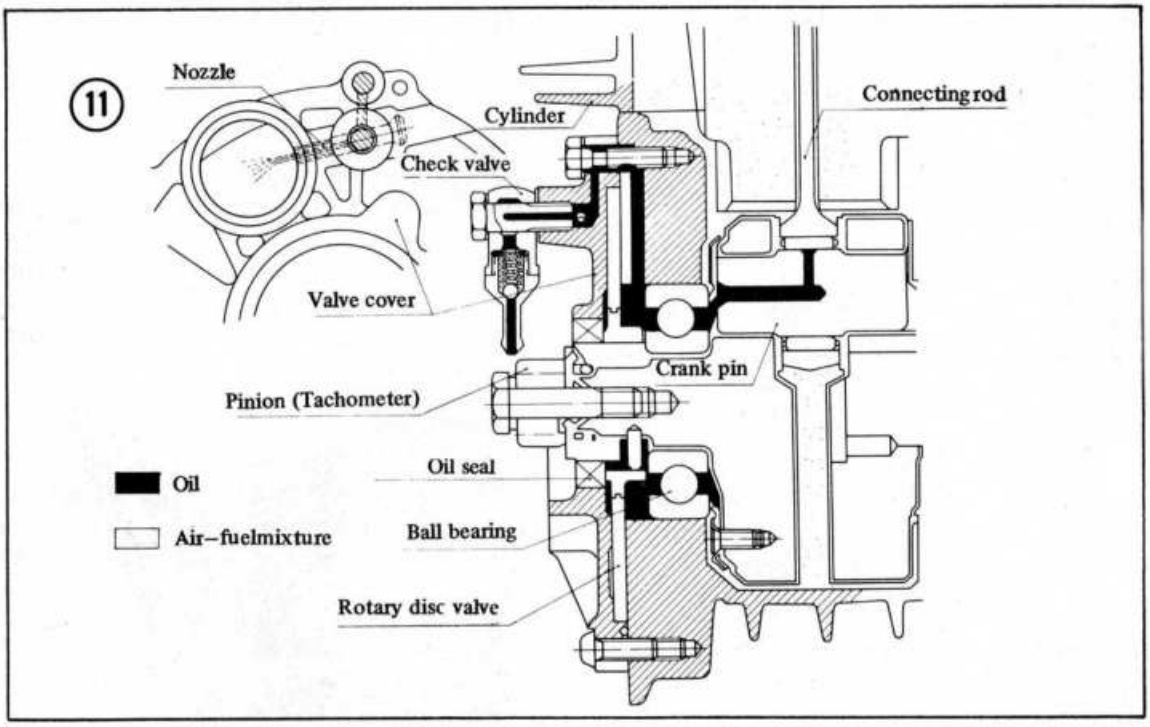

### Injectolube System

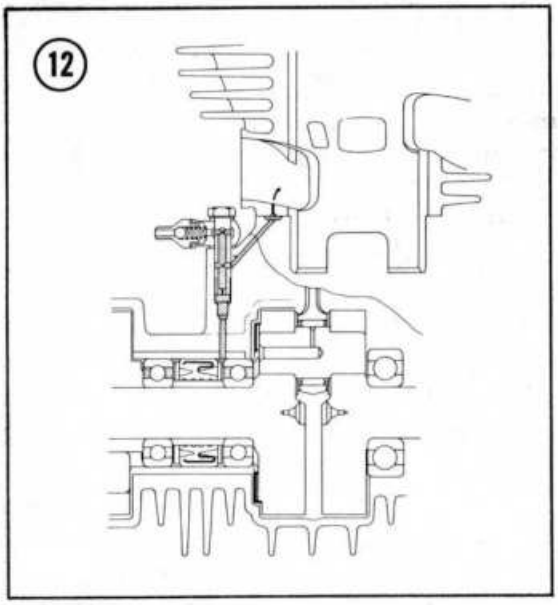
The Injectolube system, used on A7 and H series models, is similar to the Superlube system in that it supplies oil to the engine in varying quantities to meet the engine needs. The oil pump has an additional output, however, which supplies oil under pressure to the main and connecting rod bearings (**Figure 11**) of the engine.

On H series models, the oil supply to the cylinders is through the intake port, as shown in **Figure 12**.

### Oil Pump

**Figure 13** (page 10) illustrates a typical oil pump. The pump is a precision assembly; never attempt to disassemble it. Should a malfunction occur, replace it.






To check the condition of the pump, proceed as follows:

1. Mix sufficient two-stroke oil with the fuel in the tank to produce an approximate 15 to 1 mixture.

| Fuel | Oil |
|---|---|
| 1 gallon | 2 ounces |
| 4 liters | 250 cubic centimeters |

2. Remove the outlet pipe at the check valve. Connect the outlet from the pump to a collecting vessel by means of a suitable piece of tubing.

3. Start the engine and run it at 2,000 rpm.

4. Pull the control lever on the pump fully upward.

5. Measure the quantity of oil pumped in three minutes. Proper quantities are listed in the following table:

| Series | Oil Quantity | |
|---|---|---|
| | Ounces | Cubic Centimeters |
| A1 | 0.13-0.16 | 3.9-4.6 |
| A7 | 0.16-0.19 | 4.7-5.5 |
| H | 0.17-0.20 | 5.1-5.8 |

## PREPARATION FOR ENGINE DISASSEMBLY

1. Thoroughly clean the engine exterior of dirt, oil, and foreign material, using one of the cleaners formulated for the purpose.

2. Be sure that you have the proper tools for the job. See the general information in Chapter I.

3. As you remove parts from the engine, place them in trays in the order of their disassembly. Doing so will make reassembly faster and easier, and will ensure correct installation of all engine parts.

4. Note that disassembly procedures vary slightly among the different models. Be sure to read the steps carefully and follow those which apply to your engine.

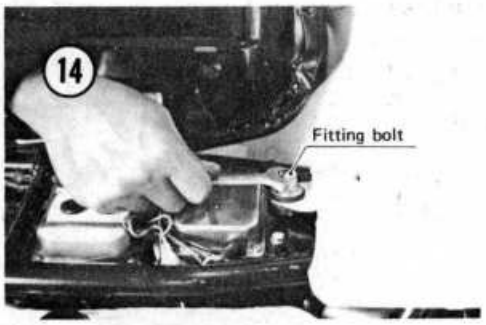
## ENGINE REMOVAL

The procedure for removing the engine is generally similar for all models. The following steps are set forth as a guide:

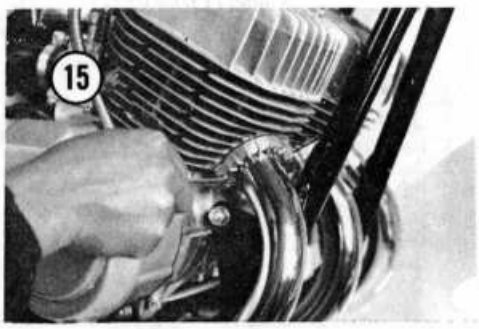
1. If the engine runs, start it and let it run for a few minutes to warm the oil. Then remove the drain plug and drain the transmission oil.

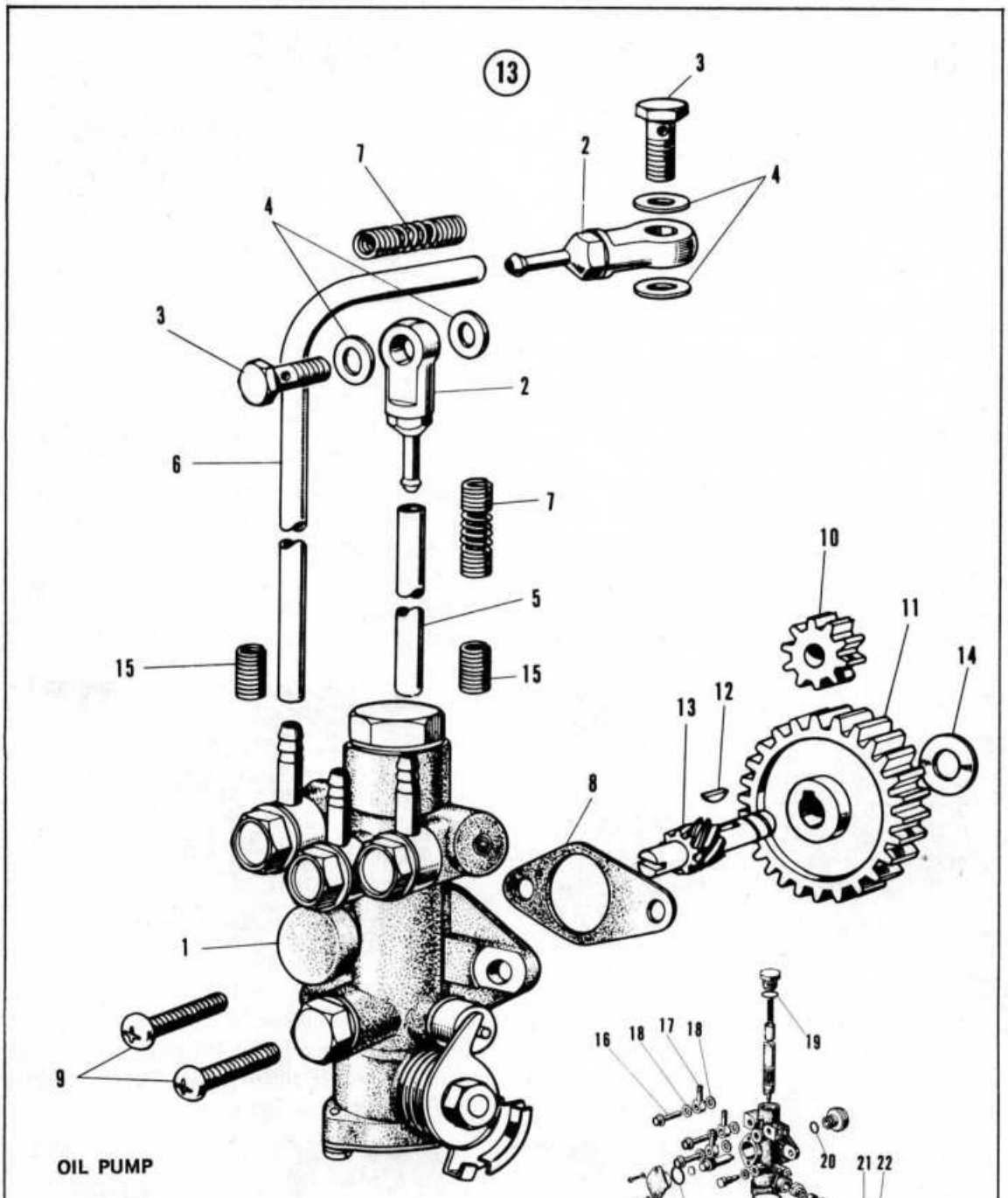
2. Turn the fuel petcock off. Disconnect the fuel lines at the carburetors.

3. On H series only, remove the fuel tank **(Figure 14)**.



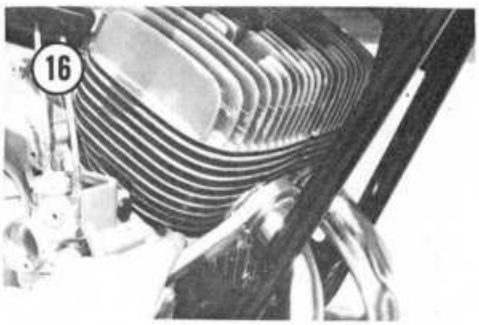

4. Remove the exhaust pipes at the cylinders and the muffler attaching bolts. The mufflers and exhaust pipes may then be removed together **(Figures 15 and 16)**.



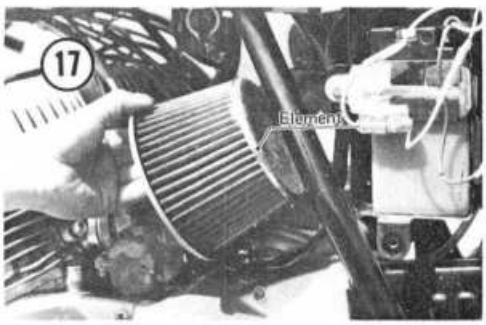


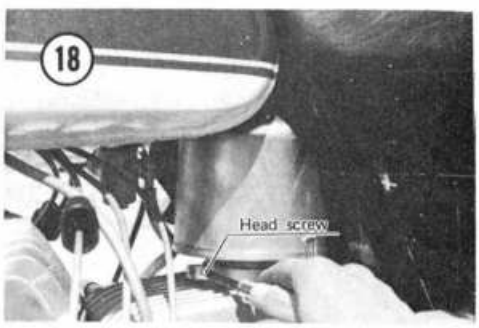

**OIL PUMP**

1. Oil pump
2. Check valve
3. Banjo bolt
4. Gasket
5. Oil tube
6. Oil tube
7. Oil tube holder
8. Gasket
9. Screw
10. Oil pump pinion
11. Oil pump gear
12. Woodruff key
13. Tachometer pinion
14. Thrust washer
15. Oil tube holder
16. Banjo bolt
17. Banjo connection
18. Gasket
19. O-ring
20. O-ring
21. O-ring
22. Spring
23. O-ring
24. O-ring

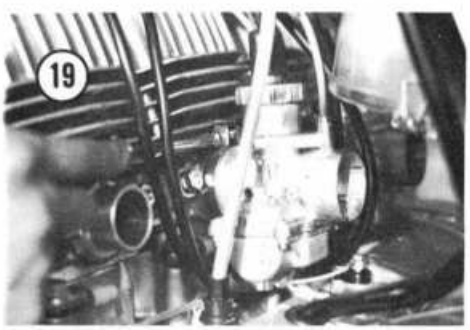


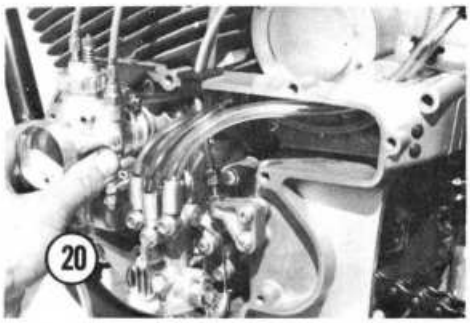

5. Remove the left side cover, then the air cleaner (**Figures 17 and 18**).



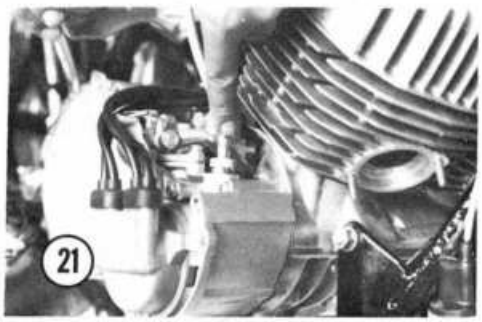




6. Remove the carburetors from the rear of the cylinders on H series models (**Figure 19**). On A series models, remove the carburetor cover from each side of the engine, remove the fuel lines, then remove the carburetors (**Figure 20**).




7. Remove the attaching screw, then the tachometer cable (**Figures 21 and 22**).

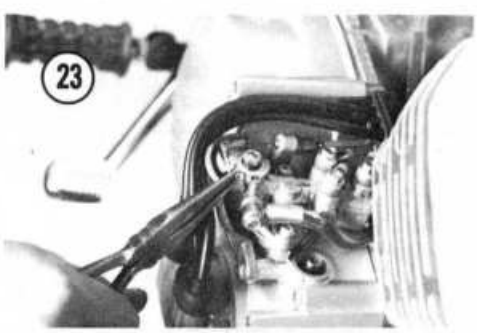


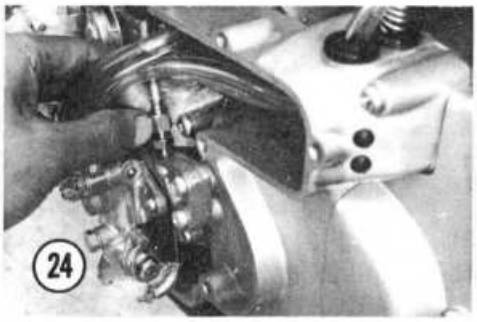




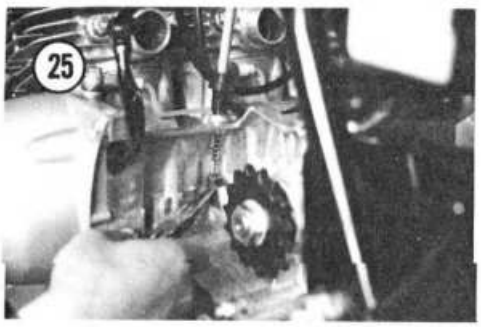
8. Remove the oil pump cable from the pump control lever (**Figures 23 and 24**).

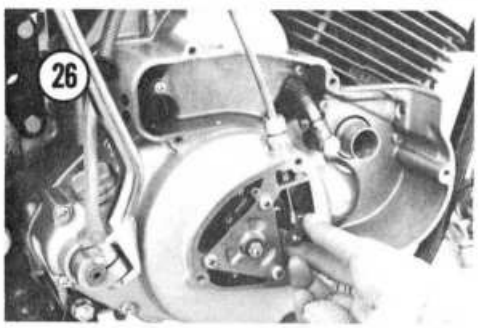
9. Remove the banjo bolt from the oil pump, then remove the oil inlet tube. Be sure to plug the tube to prevent loss of oil.






10. Slacken the outer clutch cable, then remove the inner cable from the clutch release lever (**Figures 25 and 26**).

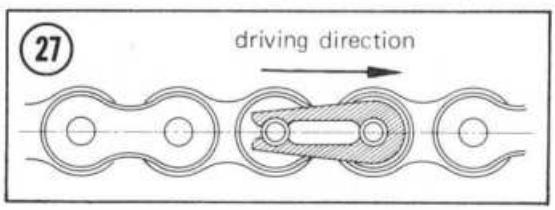


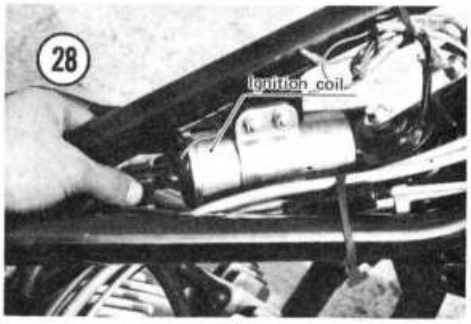



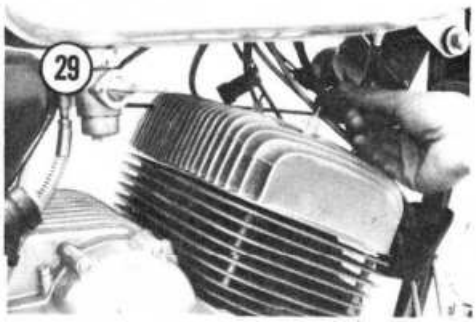

11. Remove the front chain cover if necessary, then remove the master link to remove the drive chain. It may be necessary to rotate the rear wheel to position the master link for convenient removal. When you replace the chain, be sure to position the master link clip (**Figure 27**).

12. Remove the wiring from the alternator.

13. On H series models, remove the high voltage wire from the coil (**Figure 28**). On A1 and A7 series, remove the wires from the spark plugs (**Figure 29**).




14. Remove the engine mounting bolts.

15. Straddle the machine and remove the engine from the frame.

16. Reverse the removal procedure to install the engine. Be sure to check the following items before you start the engine:

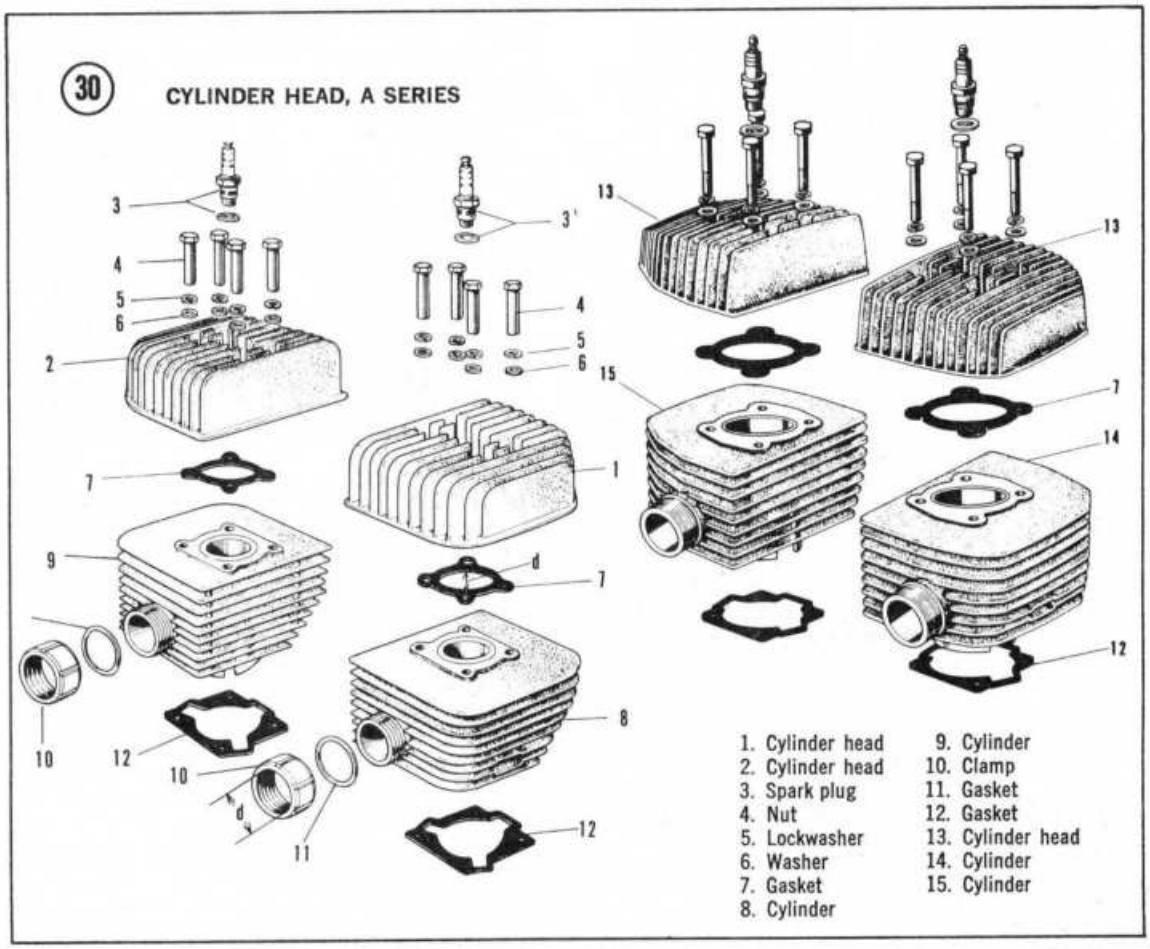
a. Oil supply
b. Transmission oil level
c. Clutch adjustment
d. Oil pump and throttle cables
e. Drive chain adjustment
f. Engine mounting bolts
g. Ignition timing

## CYLINDERS AND CYLINDER HEADS

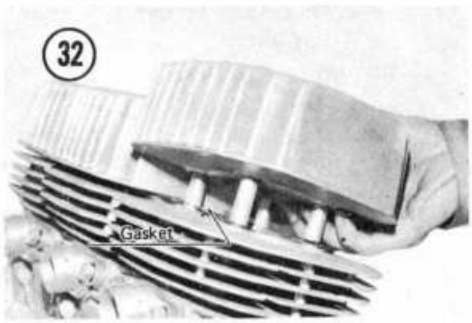
**Figure 30** is a typical exploded view of the cylinders and cylinder heads used on A series models. The cylinders and cylinder heads on H series models are shown in **Figure 31** (page 14). The cylinders are made from lightweight aluminum alloy, with cast iron sleeves.

### Cylinder Head Removal and Replacement

Remove the special nuts from the cylinder

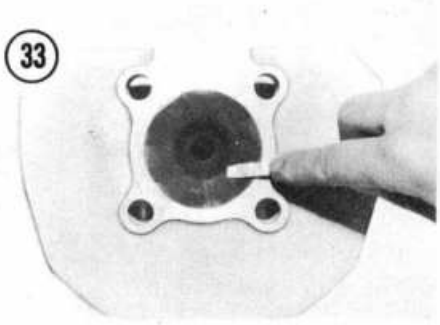



heads, then remove the cylinder heads and gaskets as shown in **Figure 32**. Be sure to use new gaskets upon reassembly. Torque the nuts to approximately 18 foot-pounds (2.5 kg-m).



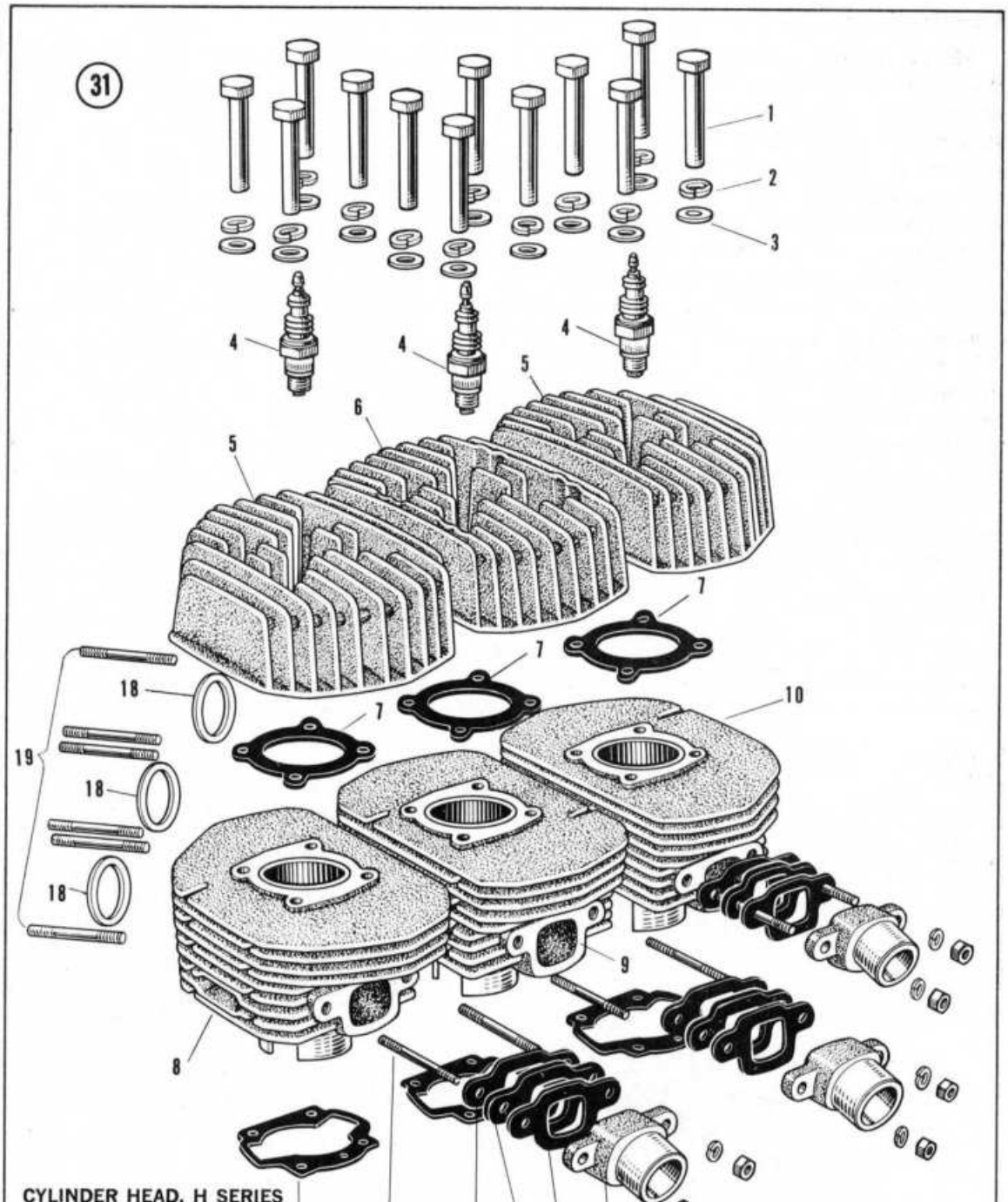

### Removing Carbon Deposits

Carbon deposits in the combustion chamber increase compression ratio and can cause preignition, over-heating, and excessive fuel consumption. To remove these deposits, scrape them off with the rounded end of a hacksaw blade or a screwdriver, as shown in **Figure 33**. Be careful not to damage the gasket surface.




### Cylinder Removal

With the cylinder head removed, tap the cylinder around the exhaust port with a plastic mallet, then pull it away from the crankcase. Stuff clean rags into the crankcase openings to prevent entry of any foreign material.



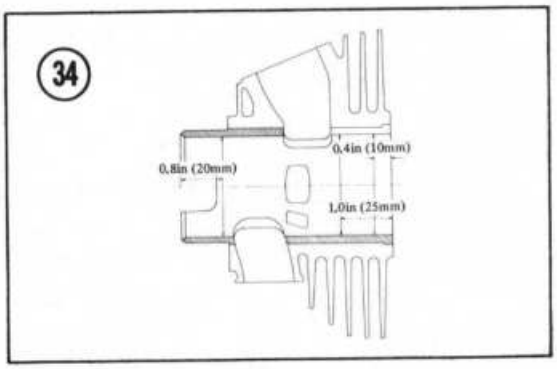

**CYLINDER HEAD, H SERIES**

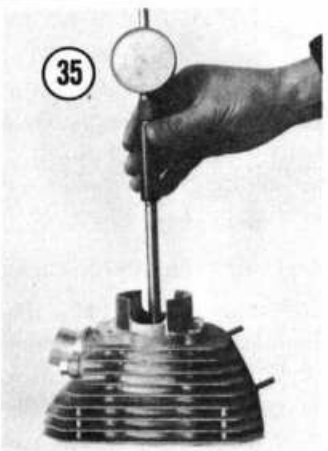
1. Nut
2. Lockwasher
3. Washer
4. Spark plug
5. Cylinder head
6. Cylinder head
7. Gasket
8. Cylinder
9. Cylinder
10. Cylinder
11. Gasket
12. Stud
13. Gasket
14. Insulator
15. Air inlet
16. Lockwasher
17. Nut
18. Gasket
19. Stud
20. Stud

### Checking the Cylinders

Measure cylinder wall wear at the four locations shown in **Figure 34**. Use a cylinder gauge or inside micrometer, as shown in **Figure 35**. Position the instrument parallel to and then at right angles to the crankshaft at each depth. If any measurement exceeds 0.006 inch (0.15 millimeter) over the standard value, or if the difference between any two measurements exceeds 0.002 inch (0.05 millimeter) rebore and hone the cylinder to the next oversize, or replace the cylinder. Pistons are available in oversizes of 0.02 inch (0.50 millimeter) and 0.04 inch (1.00 millimeter). After boring and honing, the difference between maximum and minimum diameters must not be more than 0.0004 inch (0.01 millimeter). Standard measurements are listed in the following table.

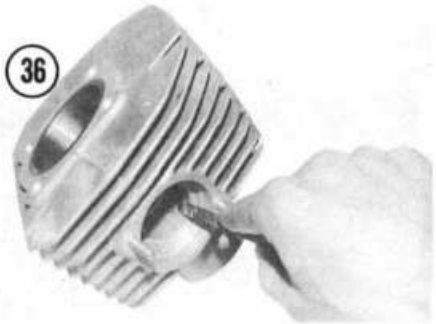
| Model | Standard Dimensions | |
|---|---|---|
| | Inches | (Millimeters) |
| A1 Series | 2.09 | (53.0) |
| A7 Series | 2.44 | (62.0) |
| H1 | 2.36 | (60.0) |



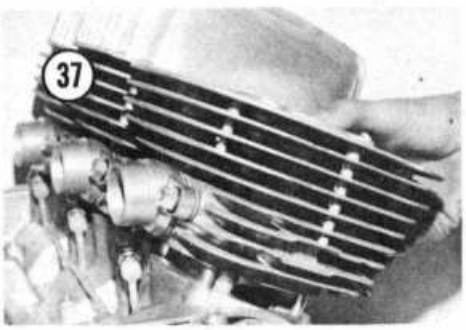

### Removing Carbon Deposits

Scrape the carbon deposits from around the cylinder exhaust port, as shown in **Figure 36**. The rounded end of a hacksaw blade is a suitable tool for carbon removal.




### Cylinder Installation

Be sure that each piston ring end gap is aligned with the locating pin in the ring groove. Lubricate the piston and cylinder, then insert the piston into the lower end of the cylinder. It will be necessary to compress each piston ring as it goes into the cylinder. **Figure 37** illustrates this operation. Always use a new cylinder base gasket upon reassembly.



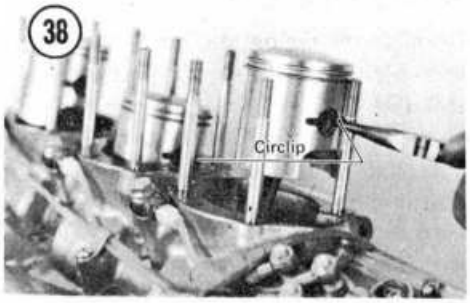

## PISTON, PISTON PIN, AND PISTON RINGS

### Removing the Piston Pin

Remove the clips at each end of the piston pin with needle nose pliers (**Figure 38**). Press out the piston pin with the piston pin removal tool, as shown in **Figure 39**.

### Replacing Piston Rings

Remove piston rings by spreading the top ring with a thumb on each end, as shown in **Figure 40**, then remove the ring from the top of the



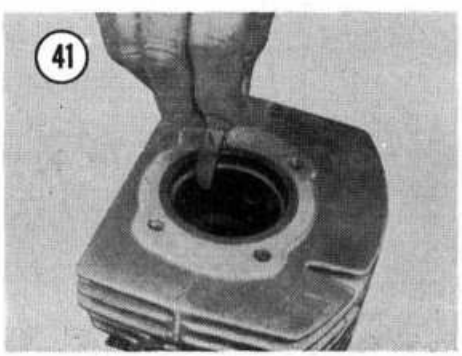







piston. Repeat the procedure for the remaining ring or rings. The expander rings used on some models may be removed easily by prying the ends apart with a narrow screwdriver.

Measure each ring for wear as shown in **Figure 41**. Insert the ring 0.2 inch (5 millimeters) into the cylinder, then measure the ring gap with a feeler gauge. To ensure that the ring is squarely in the cylinder, push it into position with the head of the piston. The standard gap for all models is 0.008 to 0.012 inch (0.2 to 0.3 millimeter). If the gap exceeds 0.031 inch (0.8 millimeter), replace the rings.




Scrape carbon from the head of the piston (**Figure 42**). Clean all carbon and gum from the piston ring grooves (**Figure 43**) using a broken piston ring, or a ring groove cleaning tool. Any deposits left in the grooves will cause the rings to stick, leading to gas blowby and loss of power.







To check the fit of a piston ring in its groove, slip the outer surface of the ring into the groove next to the locating pin, then roll the ring completely around the piston. If any binding occurs, determine and correct the cause before proceeding.

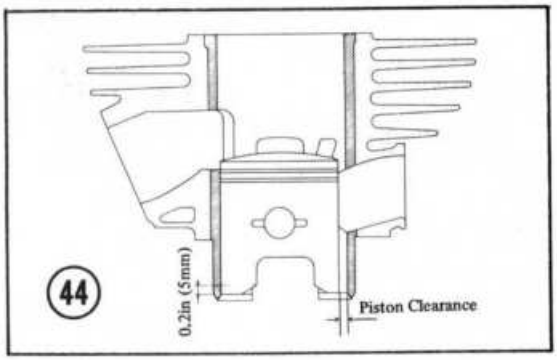
When you replace the rings, install the lower one first. Be sure that any printing on the ring is toward the TOP of the piston. Spread the rings carefully with your thumbs, just enough to slip them over the piston. Align the end gaps with the locating pin in each ring groove.

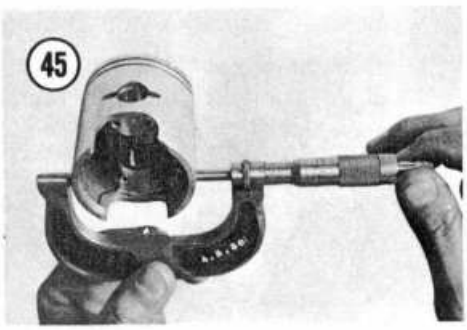
### Checking and Correcting Piston Clearance

Piston clearance (**Figure 44**) is the difference between the maximum piston diameter and the minimum cylinder diameter. Measure the outside diameter of the piston skirt (**Figure 45**) at right angles to the piston pin. The measurement

should be made 0.2 inch (5 millimeters) from the bottom of the piston. Proper piston clearances are listed in the following table.

| Model | Piston Clearance | |
|---|---|---|
| | Inch | (Millimeter) |
| A1 Series | 0.0015 | (0.037) |
| A7 Series | 0.0032 | (0.081) |
| H1 Series | 0.0022 | (0.056) |



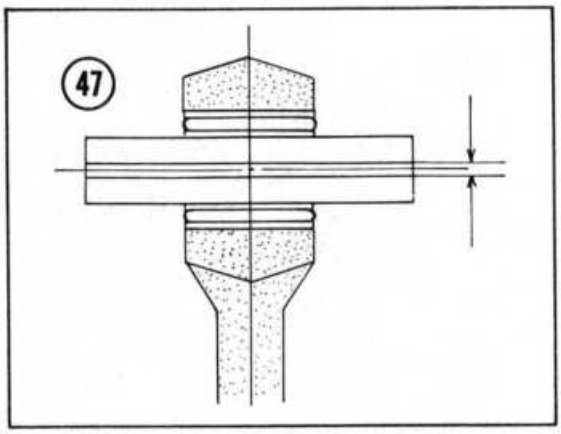




A piston showing signs of seizure will result in noise, loss of power, and damage to the cylinder wall. If such a piston is reused without correction, another seizure will develop. To correct this condition, lightly smooth the affected area with No. 400 emery paper or a fine oilstone (**Figure 46**). Replace the piston if it is deeply scratched.



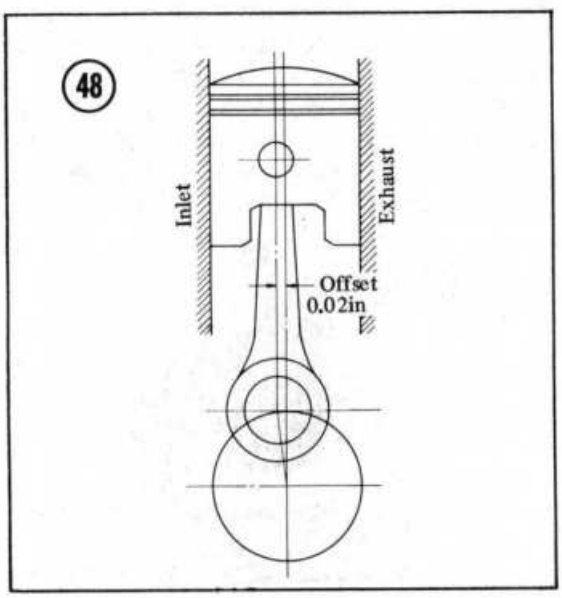

**Small End Bearing**

Assemble the piston pin, needle bearing, and connecting rod. Measure radial play, as shown in **Figure 47**. Replace the bearing and/or the piston pin if clearance is over the service limit, or if there are scratches on the piston pin. The standard clearance for all models is 0.00012 to 0.00086 inch (0.003 to 0.022 millimeter). The service limit for all models is 0.004 inch (0.10 millimeter).



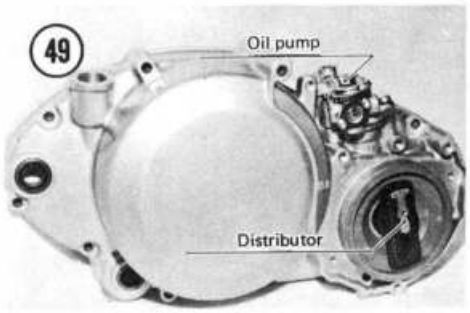

**Piston Installation**

Install the piston with the arrow mark (**Figure 48**) pointing toward the FRONT of the machine. This is important because the hole for the piston pin is offset slightly to prevent piston slap, as shown in Figure 48.



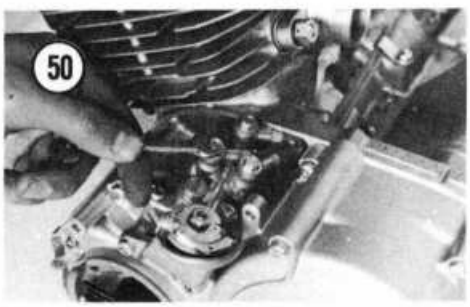
## RIGHT CRANKCASE COVER

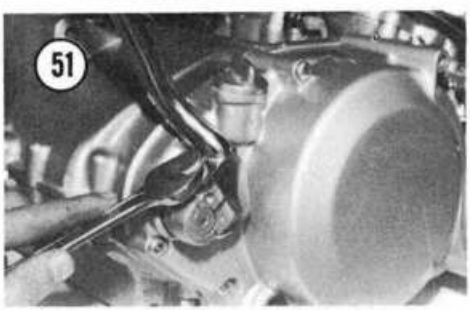
On H series models, the right crankcase cover contains the distributor, oil pump, and tachometer drive, as shown in **Figure 49**. On A1 and A7 series models, the clutch release mechanism and the right carburetor are under the cover.




### Removal, H Series

1. Remove the oil tube banjo bolt and oil inlet tube (**Figure 50**).
2. Remove the kick starter pedal (**Figure 51**).



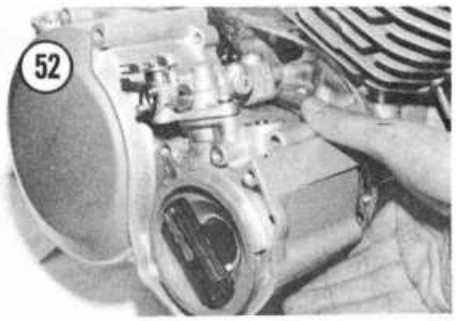



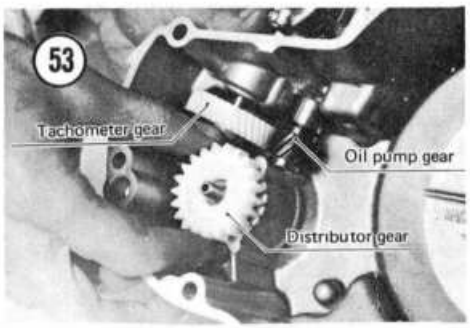

3. Remove the screws, then pull the cover from the engine (**Figure 52**). Note the locations of the long and short screws. The distributor and oil pump may be removed with the cover.

### Distributor

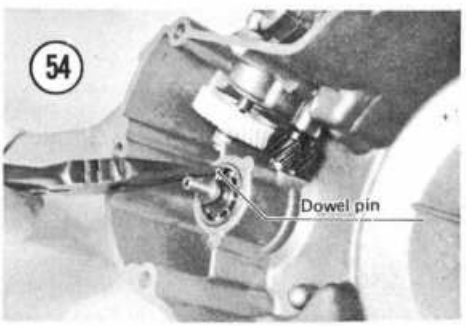
To remove the distributor, refer to **Figure 53**, then proceed as follows:

1. Remove the distributor gear.

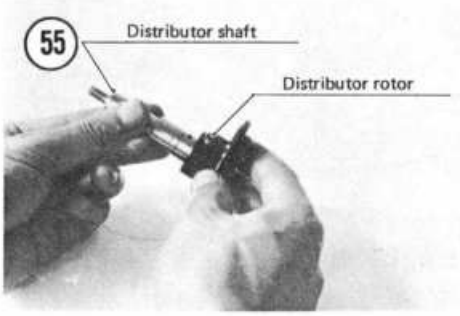



2. Pull out the dowel pin (**Figure 54**), then remove the distributor shaft. It may be necessary to drive out the shaft with a plastic mallet.



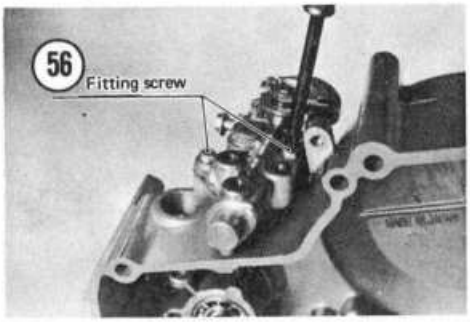

3. Remove the distributor rotor from the shaft (**Figure 55**).



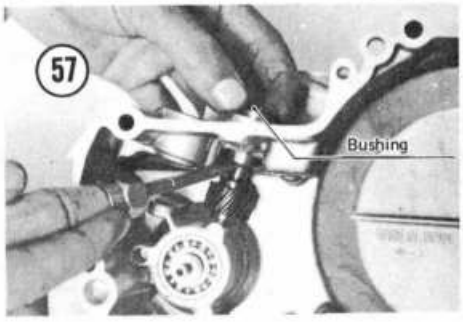
### Oil Pump Gear

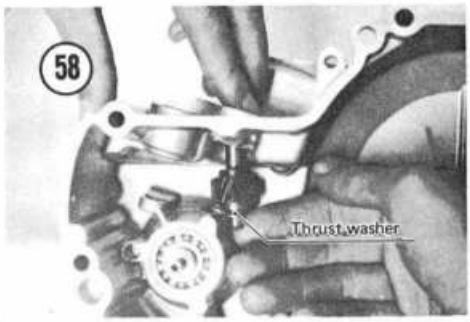
To remove the oil pump gear, proceed as follows:

1. Remove the screws which secure the oil pump (**Figure 56**) then pull off the pump.




2. Pry the bushing from the crankcase cover (**Figure 57**).
3. Remove shaft and thrust washer (**Figure 58**).



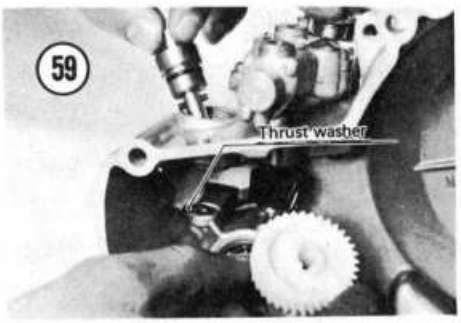




### Tachometer Drive Gear

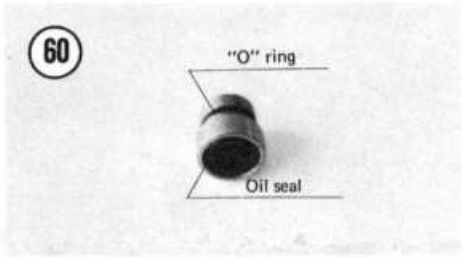
To remove the tachometer drive gear, pull out the gear shaft and the bushing from the tachometer cable. Then pull off the tachometer drive gear (**Figure 59**) and thrust washer.

### Inspection

1. Refer to Chapter Three for inspection of the distributor.




2. The oil pump and tachometer bushing each have an oil seal and O-ring (**Figure 60**). Examine the lip of the oil seal and the outside surface of the O-ring. Replace each of them if there is any damage.




3. Check the oil seal on the kickstarter shaft, and replace it if there is any damage.

### Reassembly

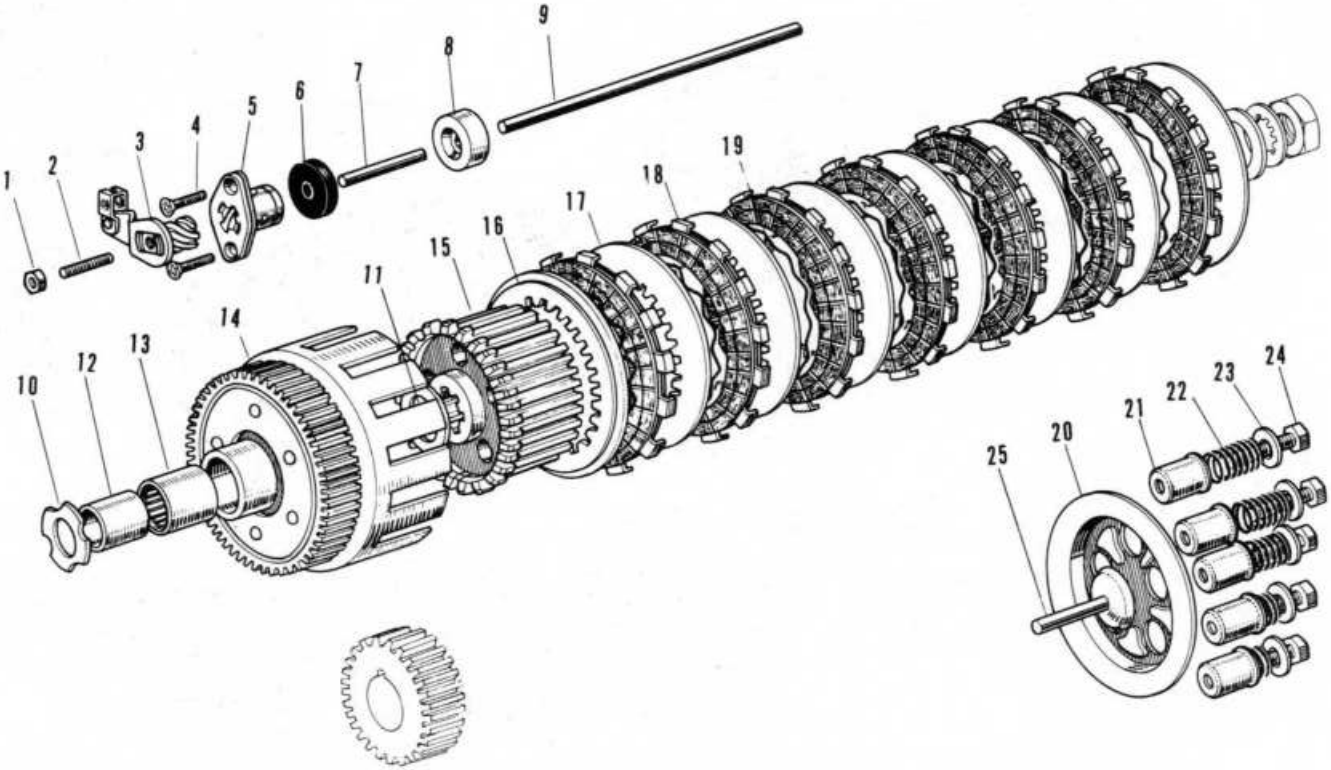
Reverse the disassembly procedure to reassemble the crankcase cover. Use a new gasket upon reassembly. Refer to Chapter Three for distributor installation.

## CLUTCH

Two types of clutches and clutch release mechanisms are used. **Figure 61** illustrates the clutch used on H series models, and **Figure 62** illustrates the A1 and A7 series clutches.

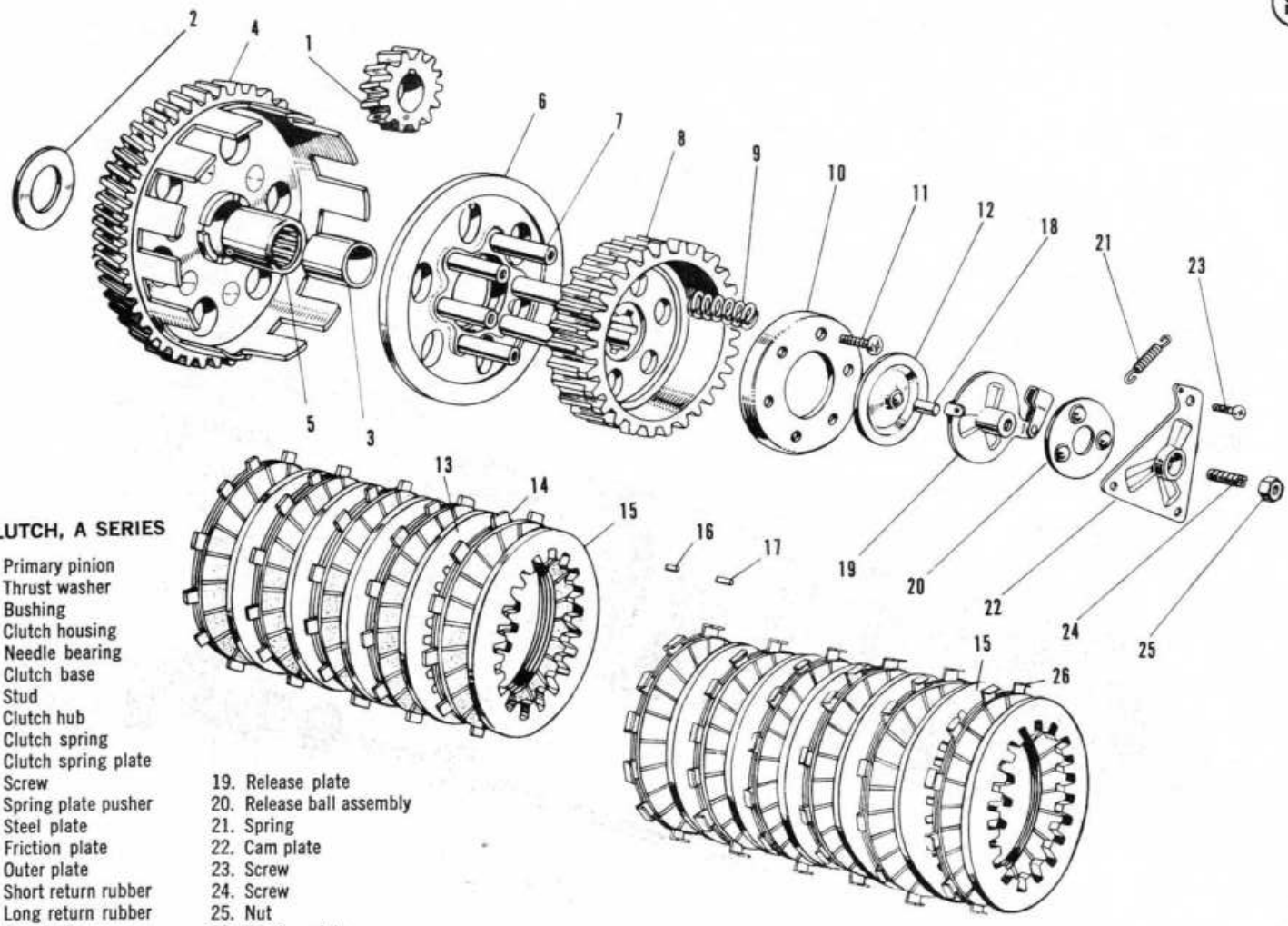
### Operation, H Series

Refer to Figure 61. As the rider operates the clutch lever, the clutch cable pulls the release lever (3), causing it to rotate in the release housing (5). As the release lever rotates, the helical splines force the lever to move away from the release housing. As the release lever moves, the short (6) and long (7) push rods move with it, and disengage the clutch. The screw (2) and lock nut (1) are used to adjust the clutch.




**CLUTCH, H SERIES**

1. Nut
2. Screw
3. Inner clutch release
4. Screw
5. Outer clutch release
6. Oil seal
7. Push rod
8. Bushing
9. Push rod
10. Thrust washer
11. Thrust washer
12. Bushing
13. Bearing
14. Clutch housing
15. Clutch hub
16. Clutch outer plate
17. Steel plate
18. Friction plate
19. Steel ring
20. Spring plate
21. Spring guide
22. Clutch spring
23. Clutch spring holder
24. Bolt
25. Spring plate pusher

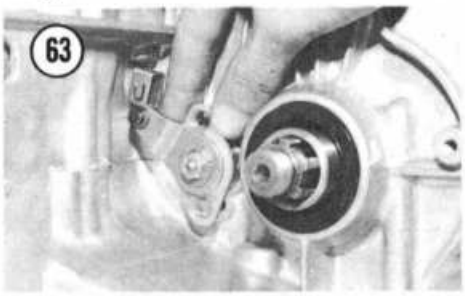



**CLUTCH, A SERIES**

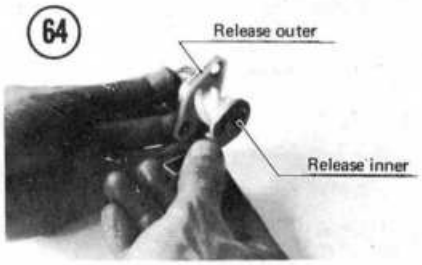
1. Primary pinion
2. Thrust washer
3. Bushing
4. Clutch housing
5. Needle bearing
6. Clutch base
7. Stud
8. Clutch hub
9. Clutch spring
10. Clutch spring plate
11. Screw
12. Spring plate pusher
13. Steel plate
14. Friction plate
15. Outer plate
16. Short return rubber
17. Long return rubber
18. Dowel pin
19. Release plate
20. Release ball assembly
21. Spring
22. Cam plate
23. Screw
24. Screw
25. Nut
26. Friction plate

### Release Mechanism, H Series

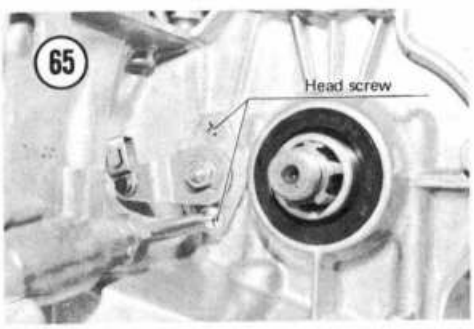
Refer to **Figure 63**. Remove the drive chain and clutch cable. Then remove the two screws from outer release housing and pull out the assembly.




To check the clutch release lever and clutch release housing, refer to **Figure 64**. Check the assembled parts for wear or play by moving the release lever. Replace both parts if any large scratches or cracks are evident, as these impair clutch action.

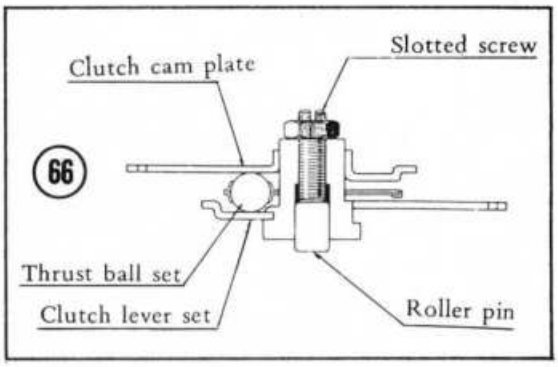



Assemble the release lever and release housing, then install the clutch release housing on the front chain case cover (**Figure 65**). Consider the operating angle of the clutch release lever as it is pulled by the clutch cable. This angle should be 90 to 100 degrees. Tighten the mounting screws evenly to prevent warpage of the release housing.




### Operation, A1 and A7 Series

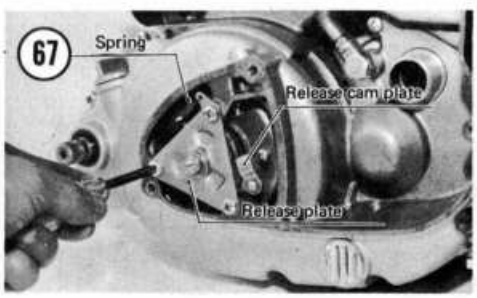
**Figure 66** is a sectional view of the release mechanism. Refer to this illustration, and also to the clutch exploded view, Figure 62, during the following discussion. The three steel balls in the release ball assembly (2) normally rest in depressions in the clutch release plate (19). As the rider operates the clutch lever on the handlebar, the clutch cable pulls the arm on the clutch release plate, causing it to rotate. As the clutch release plate rotates, the balls are forced out of the depressions. The balls then force the release plate and cam plate (22) apart. The dowel (18) then moves the pusher (12) to release the clutch.




### Release Mechanism, A1 and A7 Series

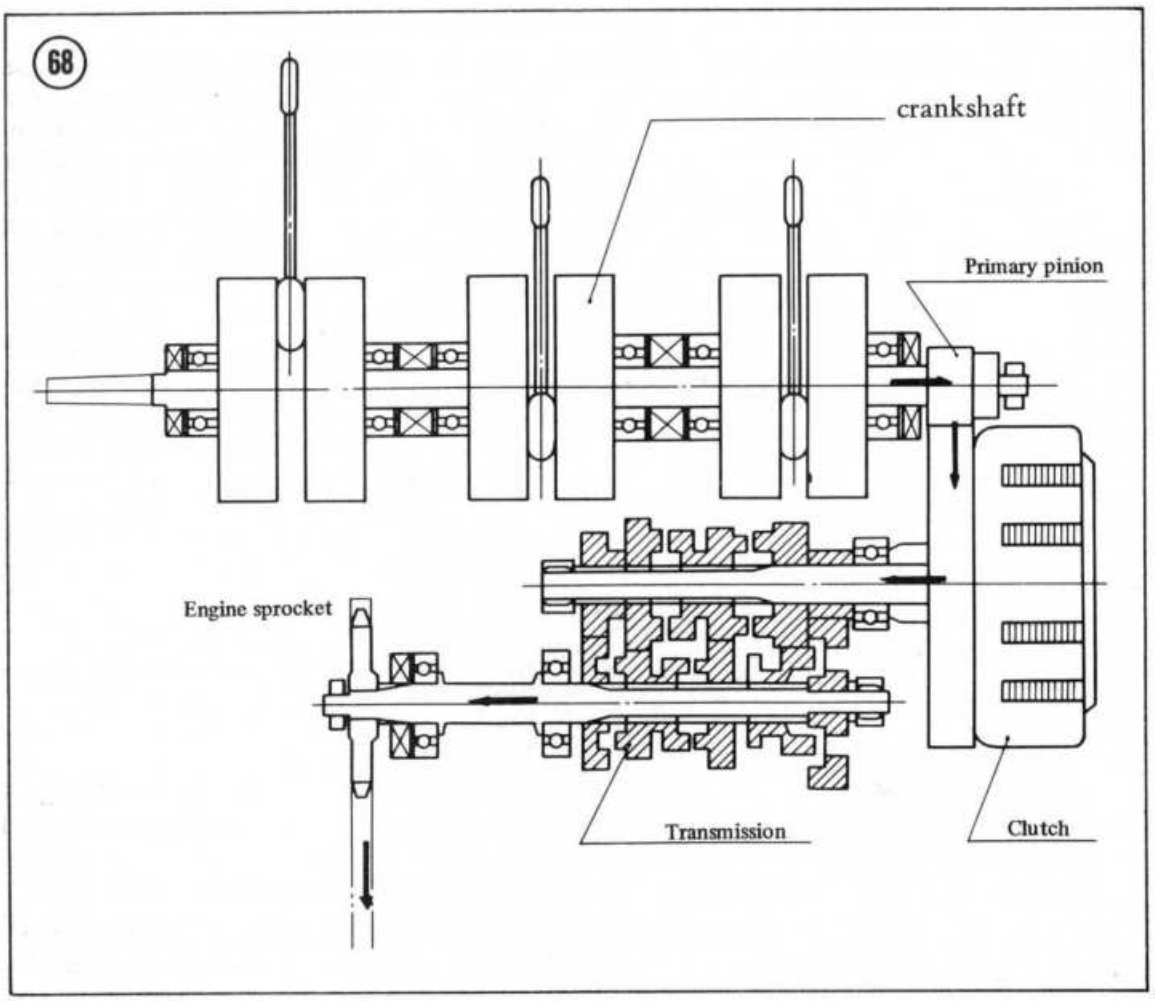
To remove the release mechanism, refer to **Figure 67**. Remove the three screws, then take off the assembly. Inspect all parts carefully, and replace any that are worn or damaged.

Reverse the removal procedure to install the clutch release mechanism.



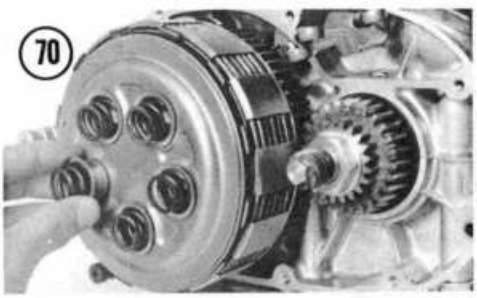

### Clutch Operation

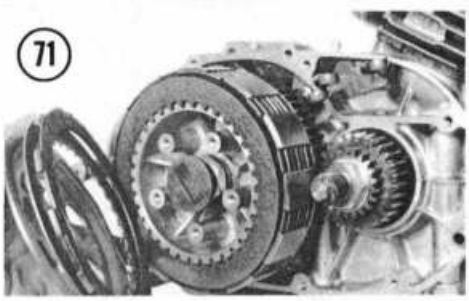
**Figure 68** shows the relationship of the clutch to the engine and transmission. The function of the clutch is to interrupt transmission of power to the rear wheel when the engine is running




and the machine is at rest with the transmission in gear, when shifting gears, and to allow smooth application of power when starting from a stop.

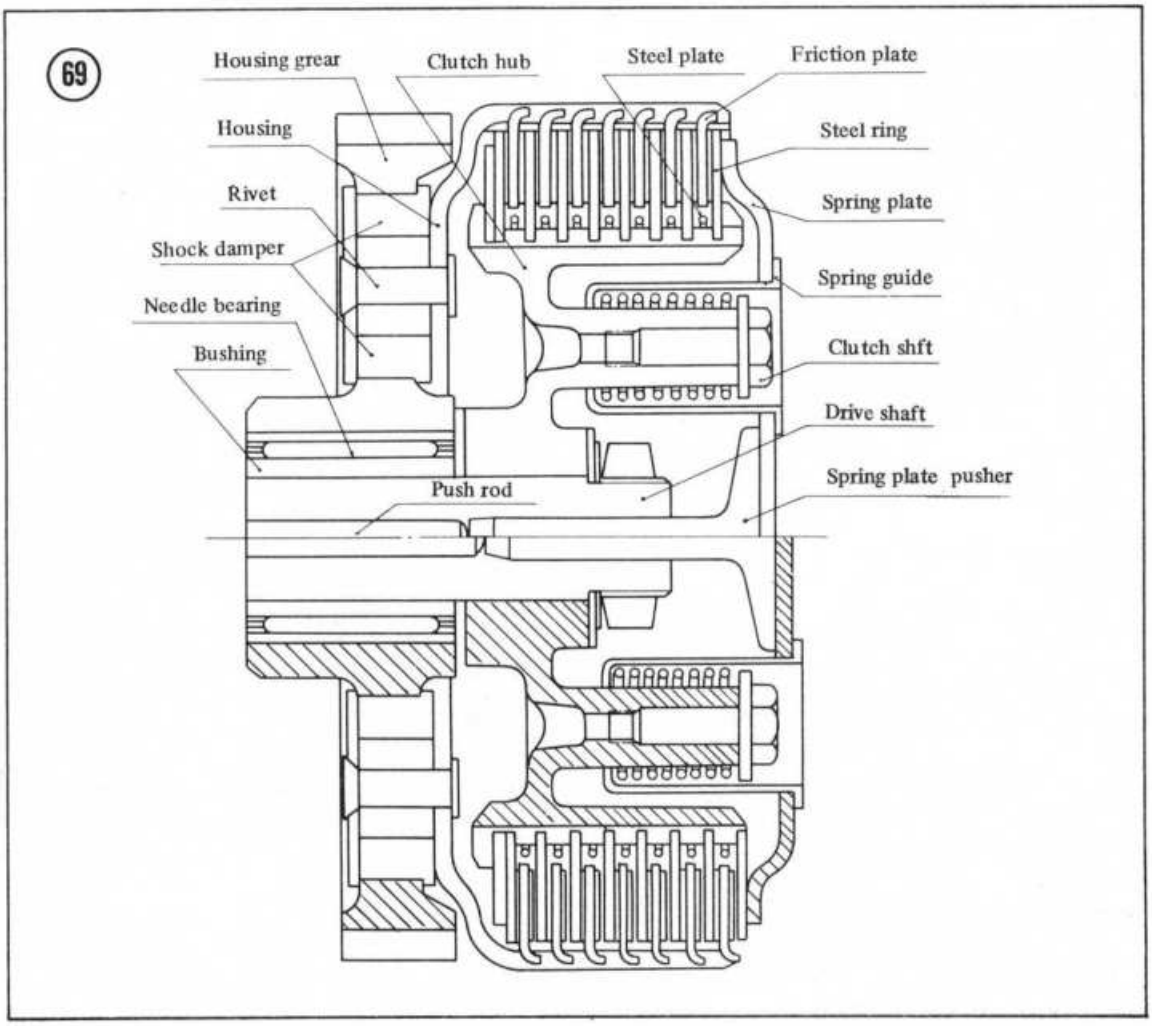
A sectional view of a typical clutch is shown in **Figure 69**. The action of the clutch release mechanism moves the push rod and spring plate pusher to the right. The spring plate pusher forces the spring plate to overcome pressure exerted by the clutch springs. As the pressure is relieved, the clutch plates and friction plates are disengaged, and thereby interrupt power transmission.



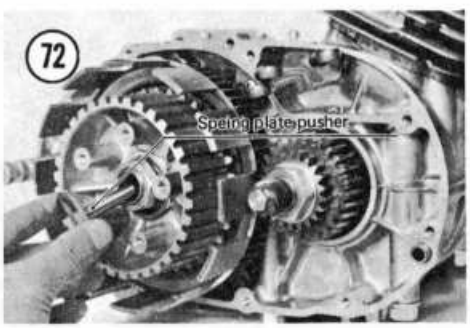

### Clutch Disassembly, H Series

1. Remove the bolts, clutch springs, and spring guides (**Figure 70**).
2. Remove the spring plate, the friction plates, and the steel rings (**Figure 71**).



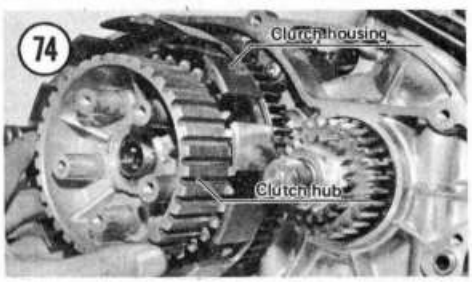

3. Remove the spring plate pusher (**Figure 72**).

4. Hold the clutch hub in position, then remove the clutch hub nut (**Figure 73**).





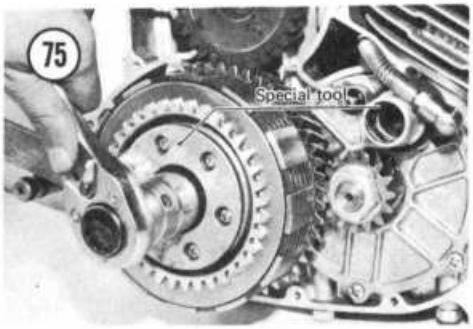




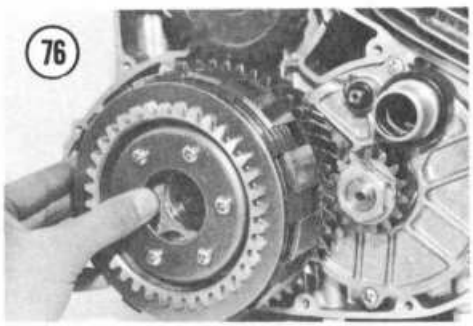

5. Remove the clutch hub and clutch housing from the shaft (**Figure 74**), then pull out the bushing and remove the thrust washer.

### Clutch Disassembly, A1 and A7 Series

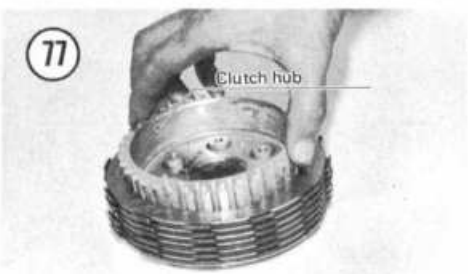
1. Hold the clutch in position and remove the nut (**Figure 75**). Then remove the lock washer and thrust washer.




2. Remove the clutch as an assembly as shown in **Figure 76**.
3. Remove the bushing and thrust washer.

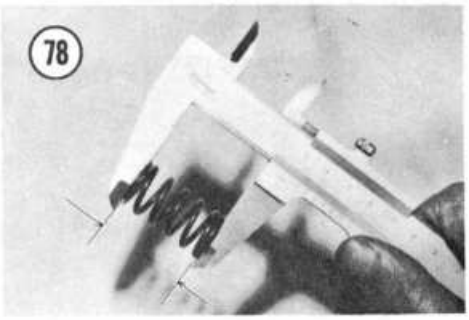



4. Remove the six screws, then the spring plate, clutch plates, and friction plates (**Figure 77**). Note the positions of the return rubbers.




### Clutch Inspection

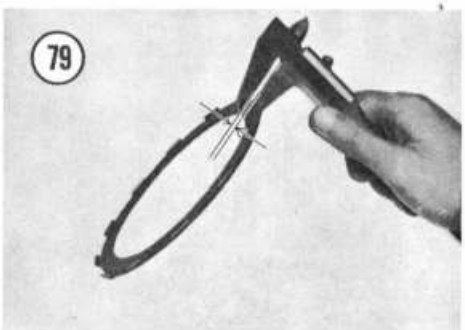
Measure the free length of each clutch spring, as shown in **Figure 78**. If the free length is shorter than the wear limit specified in the following table, replace the spring.




| Model | Standard Length | | Wear Limit | |
|---|---|---|---|---|
| | Inches | (Millimeters) | Inches | (Millimeters) |
| A1 | 1.18 | (29.5) | 1.10 | (28.0) |
| A7 | 1.20 | (30.0) | 1.13 | (28.5) |
| H1 | 1.40 | (36.0) | 1.32 | (34.5) |

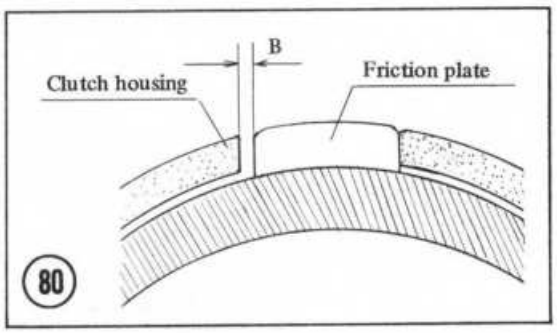
Measure the thickness of each friction plate at several places, as shown in **Figure 79**. Replace any plate that is worn unevenly, or more than the wear limit listed in the following table.

| Model | Standard Thickness | | Wear Limit | |
|---|---|---|---|---|
| | Inch | (Millimeters) | Inch | (Millimeters) |
| A1 | 0.16 | (4.0) | 0.14 | (3.65) |
| A7 | 0.12 | (3.1) | 0.11 | (2.85) |
| H1 | 0.11 | (2.8) | 0.11 | (2.50) |



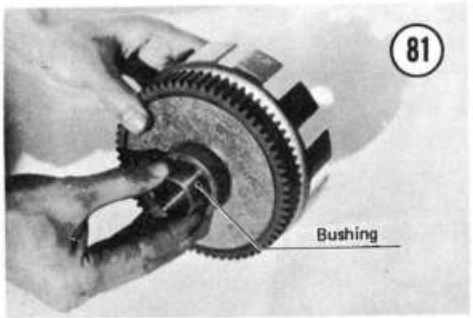

Measure the gap (B) between the splines on the clutch friction discs and the clutch housing (**Figure 80**), using a feeler gauge. The gap must be 0.002 to 0.012 inch (0.05 to 0.03 millimeter) to prevent noisy operation. Replace the friction plates if the gap is too large.

Check the gear teeth on the clutch housing for burrs, nicks, or damage. Smooth any such defects with an oilstone. If the oilstone doesn't




smooth out the damage, replace the clutch housing.

Insert the bushing into the needle bearing in the clutch housing (**Figure 81**). Replace the bushing if there is noticeable play. Excessive play causes gear noise.



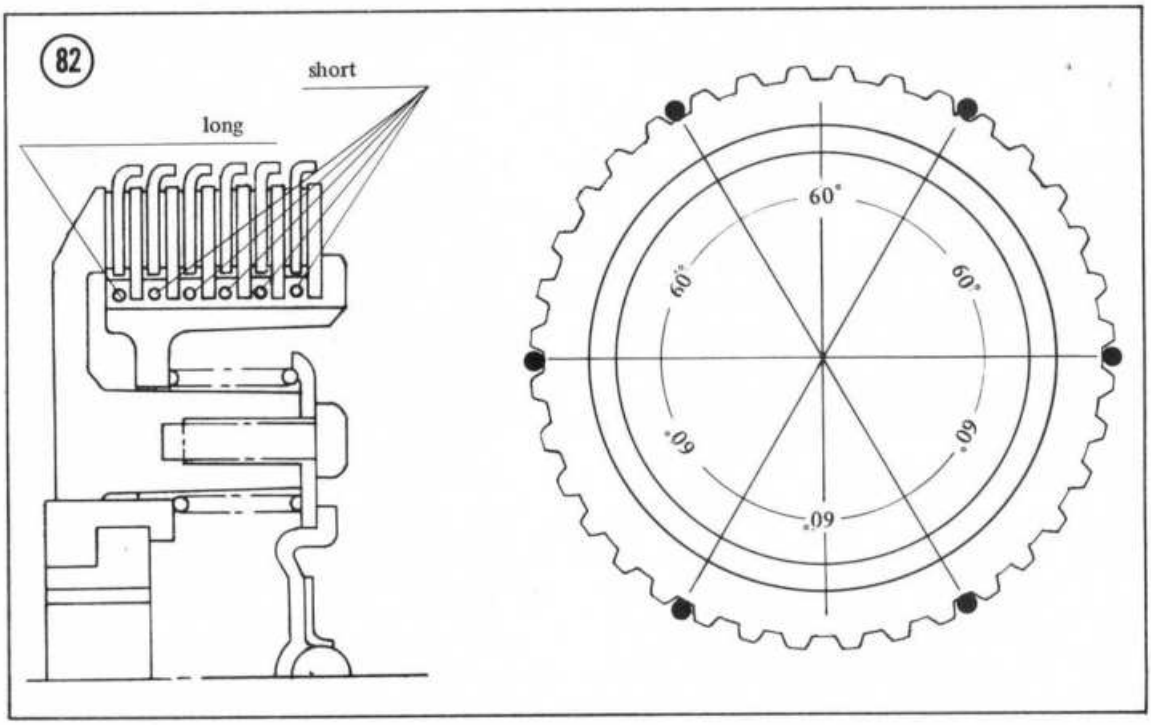

### Clutch Installation

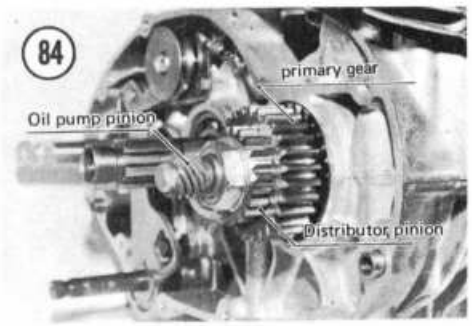
Reverse the applicable disassembly procedure to assemble and install the clutch. Note that there are three thrust washers in the clutch. Make sure they are installed correctly to ensure proper clutch operation. Refer to the exploded view of your clutch. (Figure 61 or 62 on A1 and A7 series machines.) Be sure to position the long and short return rubbers correctly (**Figure 82**). Be sure that timing marks on the primary gear, clutch gear, and alternator gear are aligned (**Figure 83**).



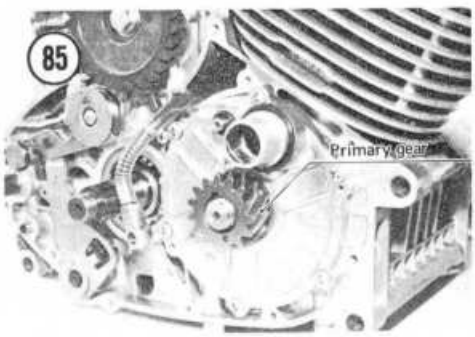

## PRIMARY REDUCTION GEARS

**Figure 84** illustrates the primary, distributor, and oil pump pinions at the right end of the



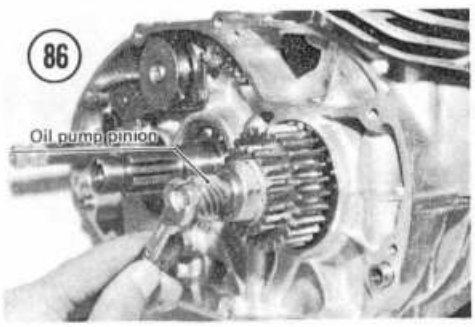


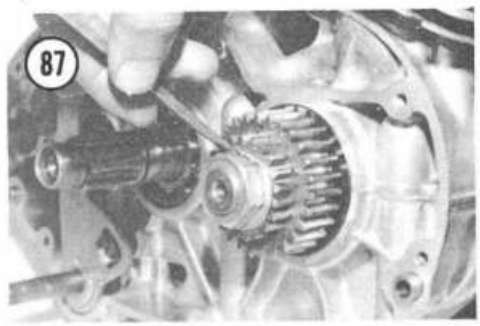

crankshaft on H1 series machines. **Figure 85** shows the primary drive gear on A1 and A7 series machines.



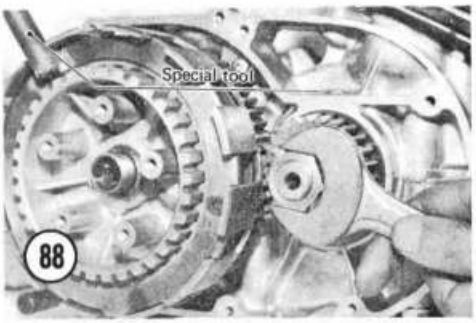

### Disassembly, H Series

1. Remove the oil pump pinion (**Figure 86**).
2. Straighten tab on the lock washer (**Figure 87**).

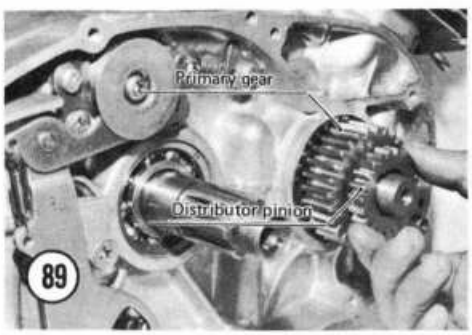



3. Hold the clutch, then remove the two nuts from the end of the crankshaft (**Figure 88**).

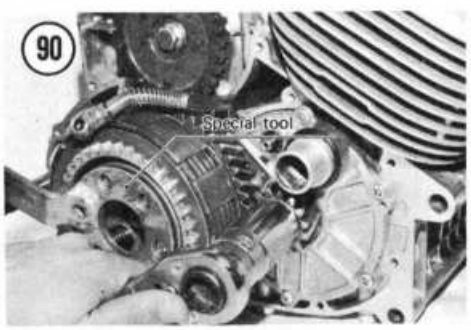



4. Remove the primary gear and distributor pinion (**Figure 89**), then remove the woodruff key.




### Disassembly, A1 and A7 Series

1. Straighten the tab on the lock washer with a chisel.
2. Hold the clutch, then remove the nut as shown in **Figure 90**.




### Inspection

Check the gear teeth for burrs, nicks, or scratches. If any small defects are found, smooth the gear teeth with an oilstone. Replace the gear if the oilstone doesn't clean up the defects.

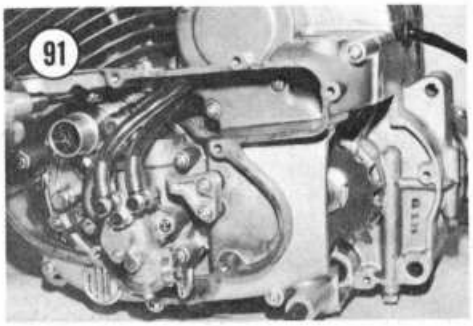
### Installation

Reverse the disassembly procedure to replace the gears. Use new lockwashers upon assembly. Don't forget to bend the tabs on the lockwashers.

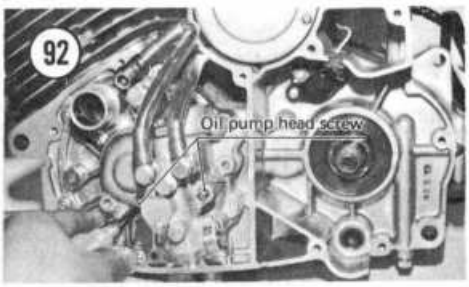
## LEFT ENGINE COVER

### Removal

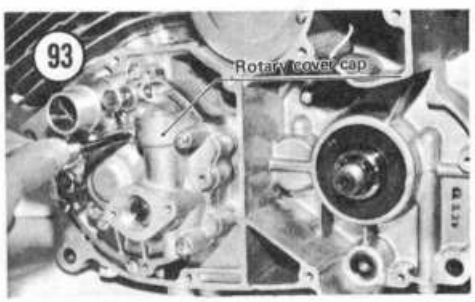
1. Remove left carburetor cover (**Figure 91**).




2. Remove the banjo bolt and oil tubes from the oil pump, then the pump itself (**Figure 92**).



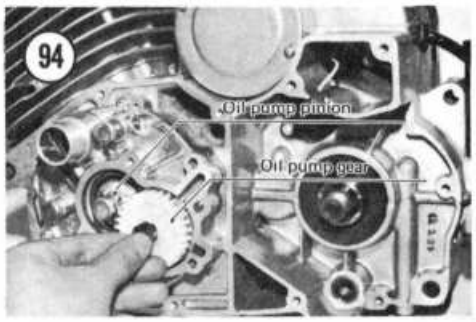

3. Remove the screws which attach the rotary valve cover cap (**Figure 93**).




4. Remove the tachometer pinion and oil pump gear (**Figure 94**). Then remove the oil pump pinion.

### Inspection

Check the oil seal in the tachometer bushing. If the seal is worn or damaged, replace it.




### Installation

Reverse the disassembly procedure to install the left engine cover. Note that the convex end of the oil pump shaft fits into the concave shaft end of the oil pump gear. Be sure to tighten the screws evenly.

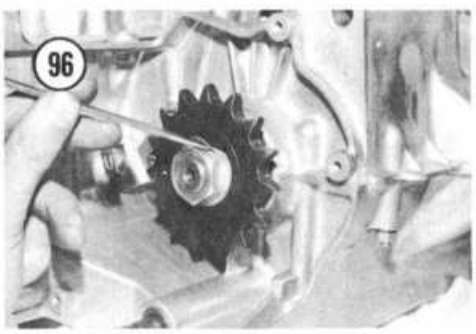
## ENGINE SPROCKET

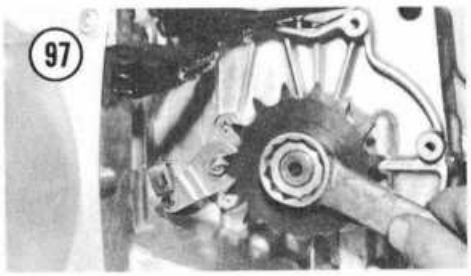
The engine sprocket is subject to wear and abrasion from sand and dust, which tend to collect on the sprocket. To minimize wear, the sprocket (**Figure 95**) is made of abrasion resistant steel.




### Removal

1. Straighten the tab on the lock washer, using a small hammer and a chisel (**Figure 96**).
2. Hold the sprocket in position (**Figure 97**), then remove the sprocket nut and sprocket.

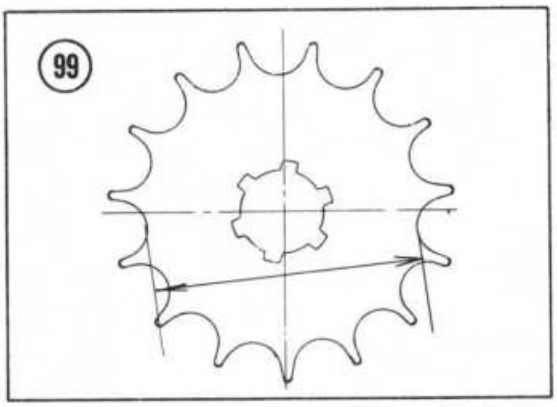





### Inspection

A worn sprocket results in excessive chain noise, and will shorten the life of the chain. **Figure 98** compares worn and serviceable sprockets. Measure the root diameter, as shown in **Figure 99**. Replace the sprocket if it shows any defects, or if the root diameter is less than specified in the following table.

| Sprocket | Standard Dimension | | Wear Limit | |
|---|---|---|---|---|
| | Inches | (Millimeters) | Inches | (Millimeters) |
| 15 teeth | 2.60 | (65.8) | 2.55 | (65.0) |
| 16 teeth | 2.80 | (71.2) | 2.75 | (70.4) |



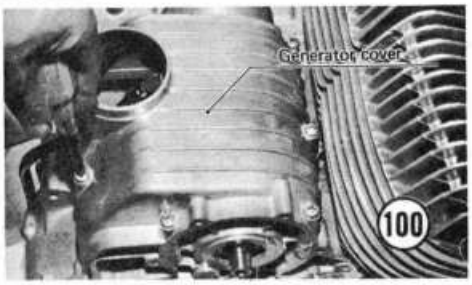

### Installation

Reverse the removal procedure to install the sprocket. Use a new lockwasher, and be sure to bend up the tab.

## ALTERNATOR

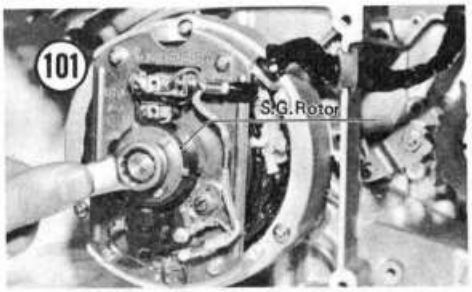
### Removal, A1 and A7 Series

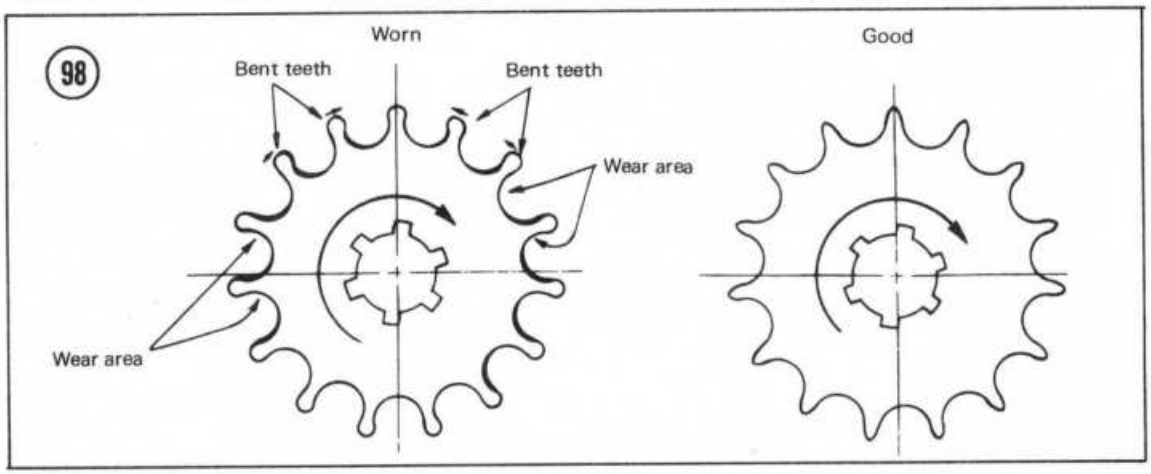
1. Remove the attaching nut, then pull out the alternator drive gear.
2. Remove the cover **(Figure 100)**, then remove the alternator.



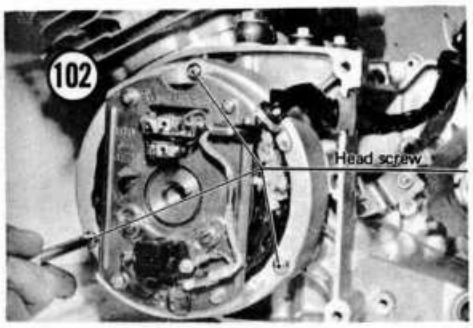

### Removal, H Series

1. Remove the right-hand engine cover.
2. Remove the signal generator rotor as shown in **Figure 101**.



3. Remove three screws which attach the yoke (**Figure 102**).




4. Pull out the rotor (**Figure 103**). Do not strike the rotor to remove it.
5. Remove the key.

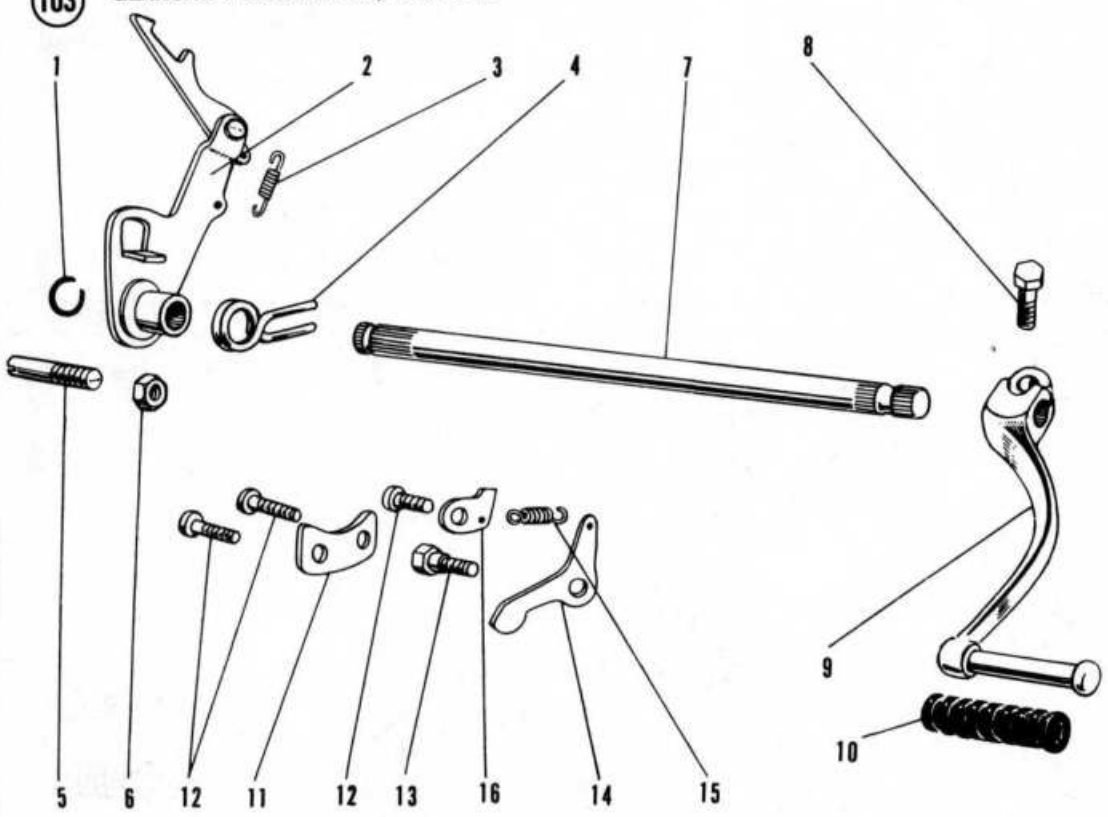
### Inspection and Installation

Refer to Chapter Three for inspection, repair, and installation procedures for the alternators.

## GEARSHIFT MECHANISM

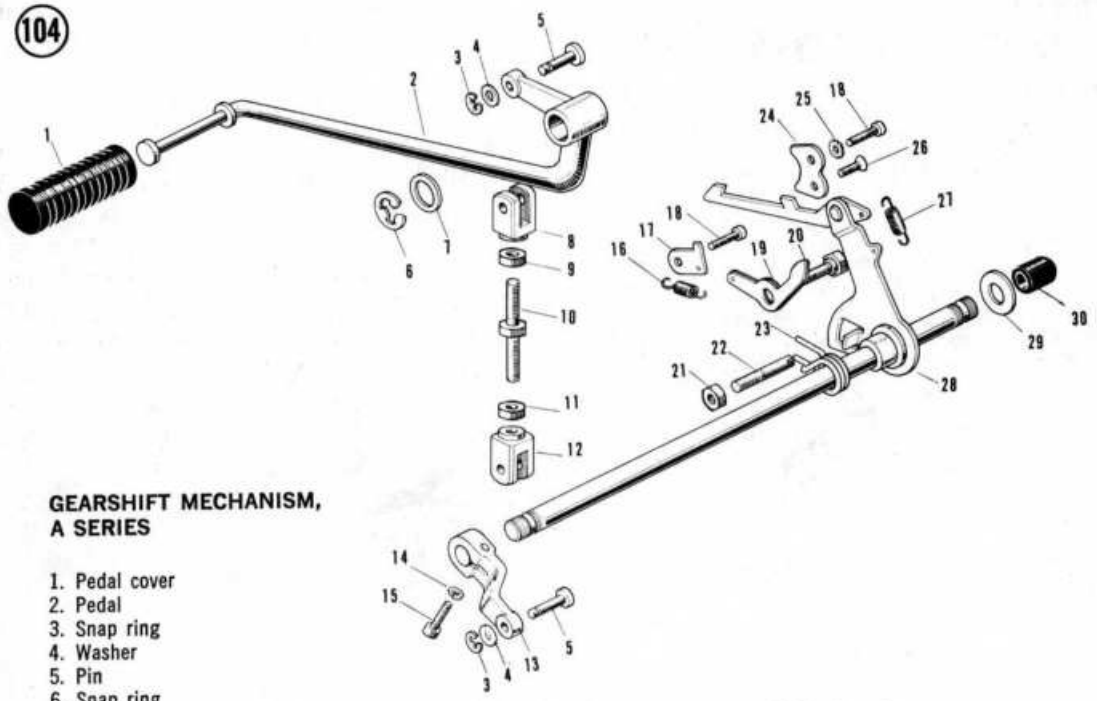
**Figure 104** (and 103) are exploded views of the A series and H series shifters. **Figure 105** illustrates the shifter operation. As the rider presses the gearshift pedal, the shaft turns, and moves the change lever. The change lever meshes with pins on the shift drum (part of the transmission assembly). Therefore, as the pedal is moved, the shift drum rotates. Grooves on the shift drum cause shift forks in the transmission to move, and thereby select the various gear ratios.

103 GEARSHIFT MECHANISM, H SERIES




1. Snap ring
2. Lever assembly
3. Spring
4. Return spring
5. Spring pin
6. Nut
7. Shaft
8. Bolt
9. Pedal
10. Pedal cover
11. Positioning plate
12. Screw
13. Bolt
14. Lever
15. Spring
16. Fitting plate

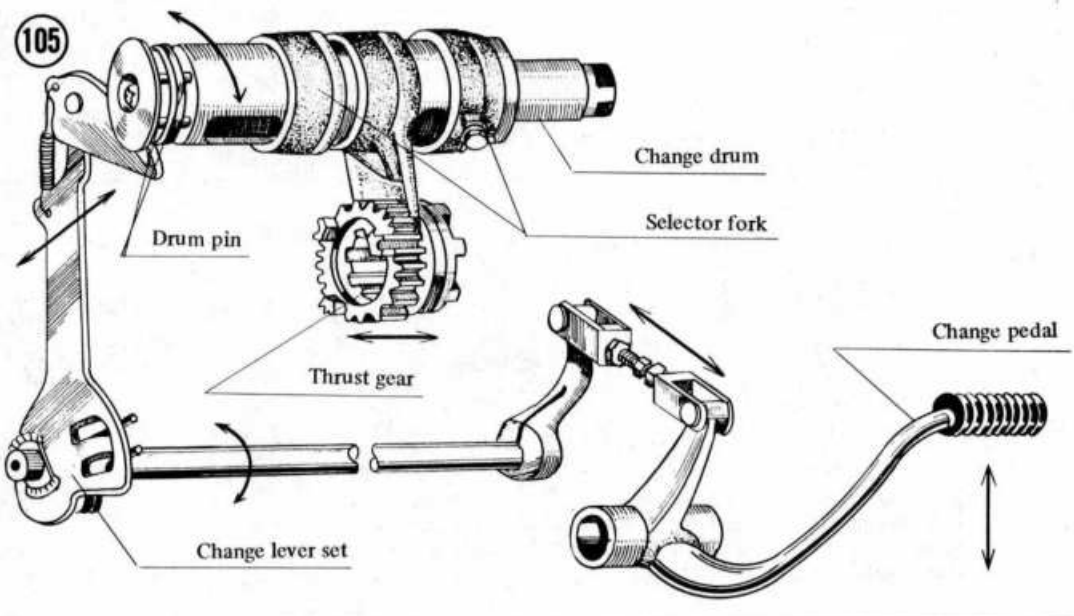
104



**GEARSHIFT MECHANISM, A SERIES**

1. Pedal cover
2. Pedal
3. Snap ring
4. Washer
5. Pin
6. Snap ring
7. Washer
8. Joint
9. Nut
10. Rod
11. Nut
12. Joint
13. Lever
14. Lockwasher
15. Bolt
16. Spring
17. Fitting plate
18. Screw
19. Drum lever
20. Bolt
21. Nut
22. Return spring pin
23. Pedal return spring
24. Positioning plate
25. Lockwasher
26. Screw
27. Spring
28. Gear change lever assembly
29. Washer
30. Cap

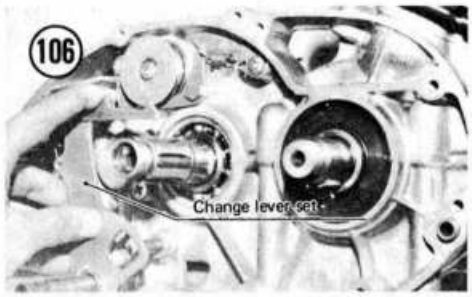
105



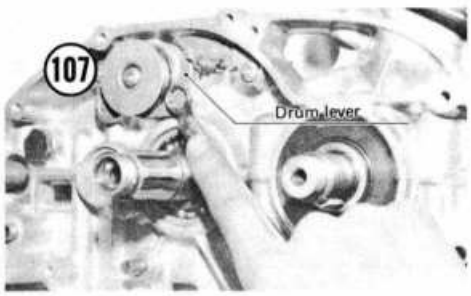
Set levers are also meshed with the pins on the change drum. They keep the drum in position after each step of rotation of the drum.

### Removal

1. Disengage the set levers and change lever from the change drum pins (**Figure 106**).

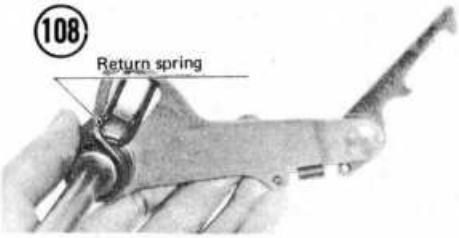



2. Remove the hex bolt from the set lever (**Figure 107**).
3. Pull out the change lever and shaft as a unit.

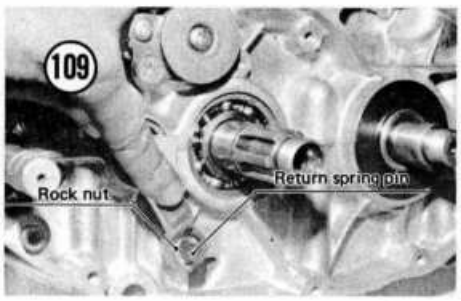



### Inspection

Check the return spring tension (**Figure 108**). Replace the spring if it is weak or cracked. Inspect the set lever spring for cracks or weakness.




Be sure that the return spring set pin (**Figure 109**) is not loose. If this pin is loose, it will cause missed shifts. Be sure that the lock nut is tight.

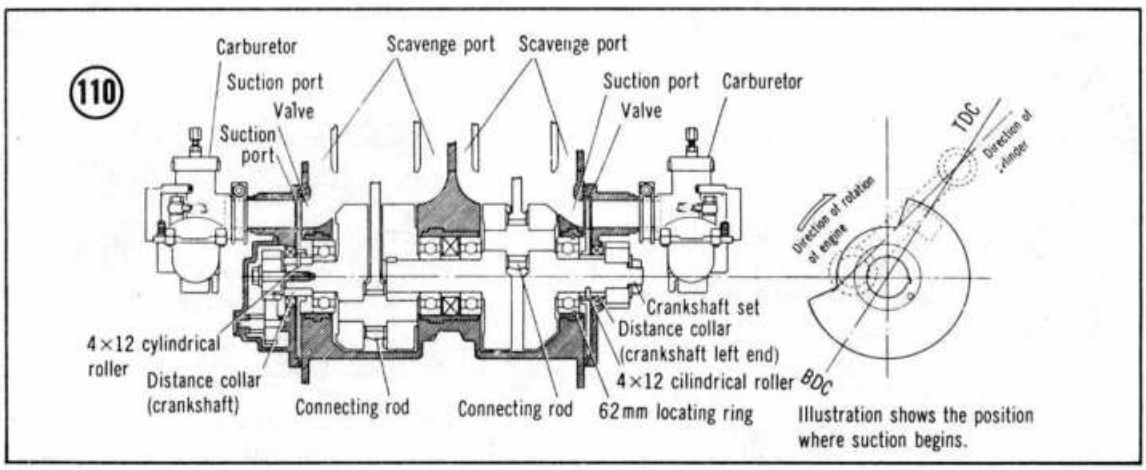



### Installation

Reverse the removal procedure to install the shift mechanism. Be sure that each spring is installed correctly.

## ROTARY VALVE

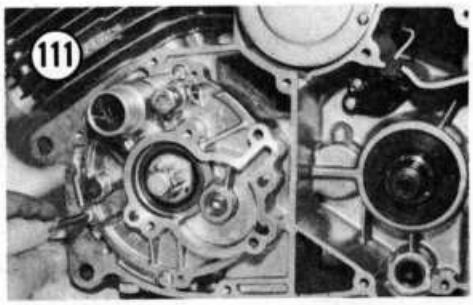
This rotary valve system consists of the crankshaft, disc valves, crankcase, and valve covers. **Figure 110** shows the valve mechanism. The valves are made from hardened phenol resin, with steel centers.



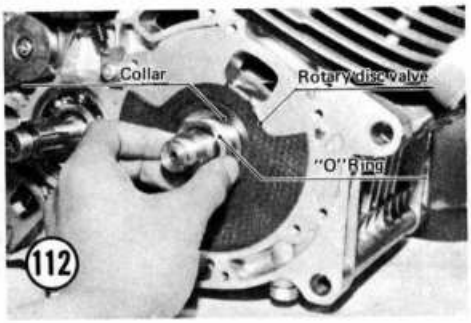
The valves float back and forth slightly on the crankshaft. This floating action permits the valve to seat against the O-ring on the valve cover, and thereby seal the crankcase during the down stroke of the piston.

### Removal

1. Remove the valve cover retaining screws, then pull off the valve cover (**Figure 111**).

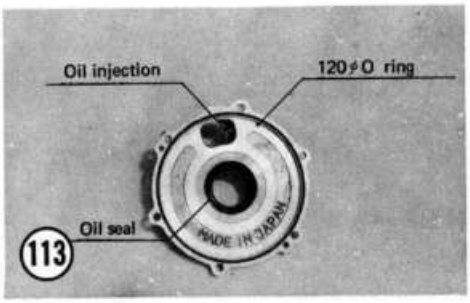



2. Slide the valve disc (**Figure 112**) from the shaft.
3. Remove the spacer and O-ring from the crankshaft.
4. Remove the dowel pin.

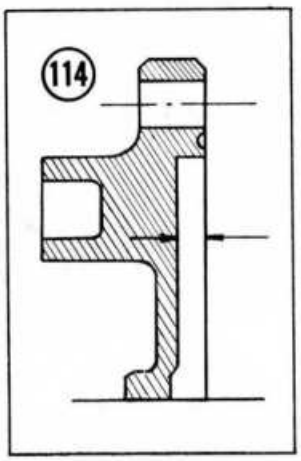


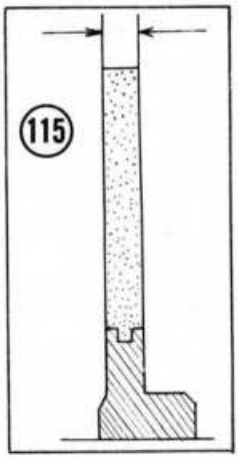

### Inspection

**Figure 113** shows the valve cover. Examine the oil seal for scratches, lip deformation, or other damage. Check for any damage to the O-ring. Replace the valve cover in the event of deep scratches, or if it is worn to a depth of 0.16 inch (4.0 millimeters), as shown in **Figure 114**. Standard valve cover depth is 0.14 inch (3.5 millimeters).




Measure the thickness of the valve disc, as shown in **Figure 115**. Replace the disc if it is worn beyond the wear limit, or if there are any scratches or damage on its surface. Standard thickness is 0.14 inch (3.5 millimeters).



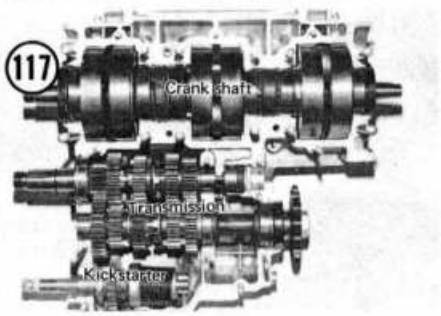




### Installation

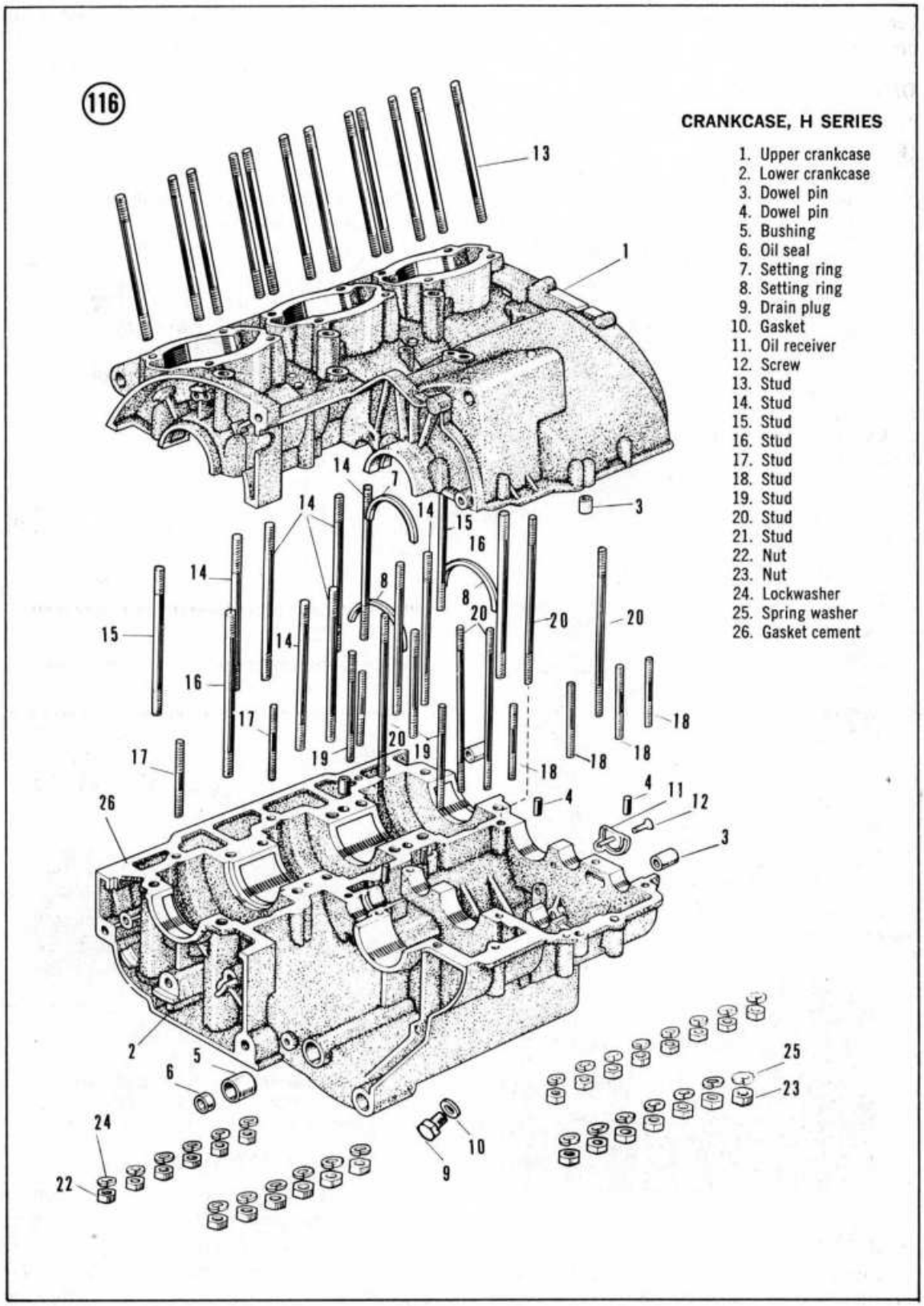
Reverse the removal procedure to install the valve. Soak the disc in two-stroke oil before installation. Be sure that the O-ring is installed correctly in the valve cover.

## CRANKCASE

**Figure 116** is an exploded view of the H1 series crankcase. A1 and A7 series crankcases are similar, except for the number of cylinders. The crankcase supports the crankshaft, transmission, and kick starter (**Figure 117**).



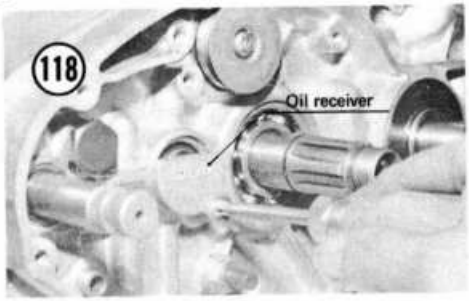

Lubricating oil passages are machined in the crankcase. Be careful that these passages don't


116
CRANKCASE, H SERIES
1. Upper crankcase
2. Lower crankcase
3. Dowel pin
4. Dowel pin
5. Bushing
6. Oil seal
7. Setting ring
8. Setting ring
9. Drain plug
10. Gasket
11. Oil receiver
12. Screw
13. Stud
14. Stud
15. Stud
16. Stud
17. Stud
18. Stud
19. Stud
20. Stud
21. Stud
22. Nut
23. Nut
24. Lockwasher
25. Spring washer
26. Gasket cement

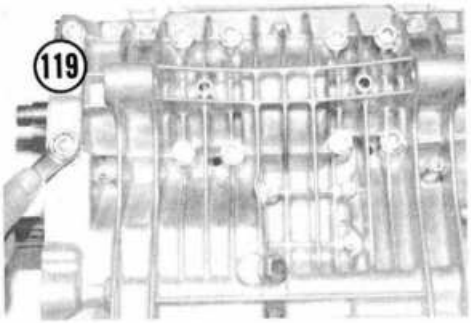
become clogged with dirt when you work on the crankcase.

### Disassembly

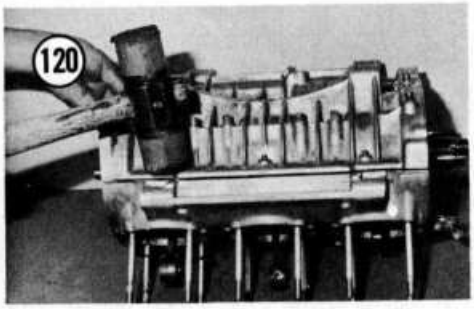
1. Remove the oil reservoir at the output shaft (**Figure 118**).




2. On H series machines, remove the clutch release mechanism.
3. Invert the crankcase, then remove the nuts from the bottom side (**Figure 119**).




4. With the crankcase still inverted, tap the crankcase and shifter shaft boss with a plastic mallet (**Figure 120**) to separate the two halves.
5. Remove the crankshaft, transmission, and kick starter assemblies.

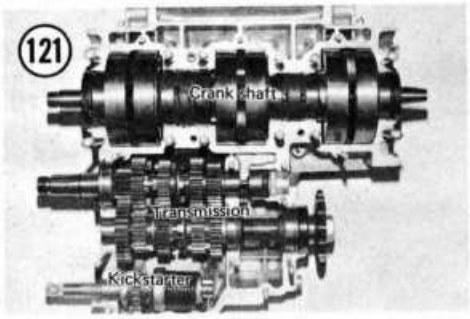



### Inspection

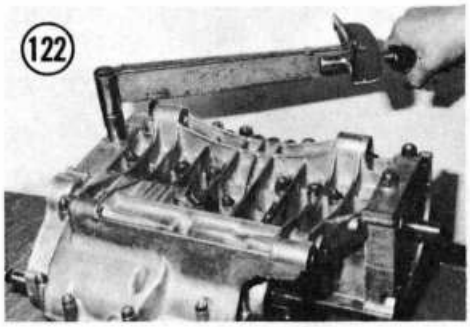
Check each lubrication passage. If any is found to be clogged, blow it out with compressed air. Check the transmission breather hole. Oil leakage will result if this hole is clogged. Examine the mating surfaces of the crankcase halves. Any nicks or scratches will lead to oil leakage.

### Assembly

1. Install the internal parts into the upper crankcase. **Figure 121** shows the parts installed.



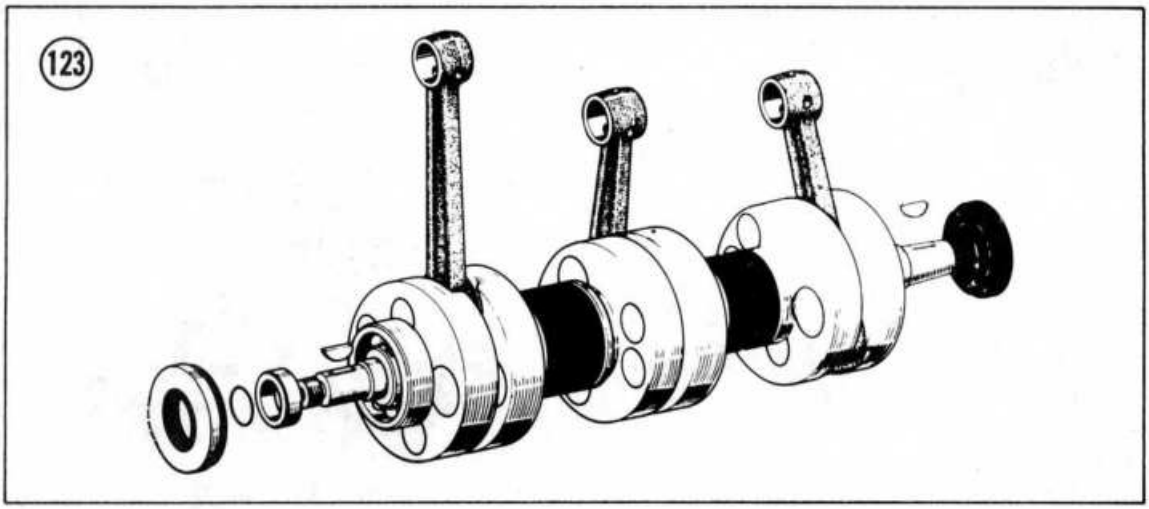

2. Clean the mating surfaces carefully with solvent.
3. Apply gasket cement to the mating surfaces. Follow the application instructions furnished by the manufacturer.
4. Place the lower crankcase half into position, then tighten the nuts (**Figure 122**) as specified.




| Nut Size | Torque |
|---|---|
| 6 millimeters | 7.5 ft-lbs (1 kg-m) |
| 8 millimeters | 15 ft-lbs (2 kg-m) |
| 10 millimeters | 25 ft-lbs (3.5 kg-m) |

## CRANKSHAFT

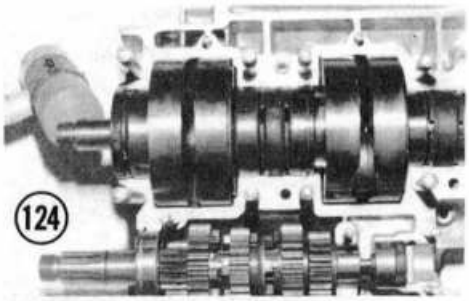
The crankshaft operates under conditions of high stress. Dimensional tolerances are critical. It is necessary to locate and correct defects in the crankshaft to prevent more serious trouble later. **Figure 123** shows the crankshaft assembly on



the H1 series machines. A1 and A7 crankshafts are similar, except that they are for twin cylinder machines.

### Removal

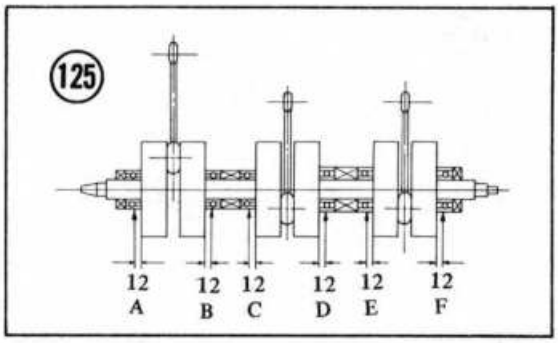
To remove the crankshaft, tap each end lightly with a plastic mallet, as shown in **Figure 124**.

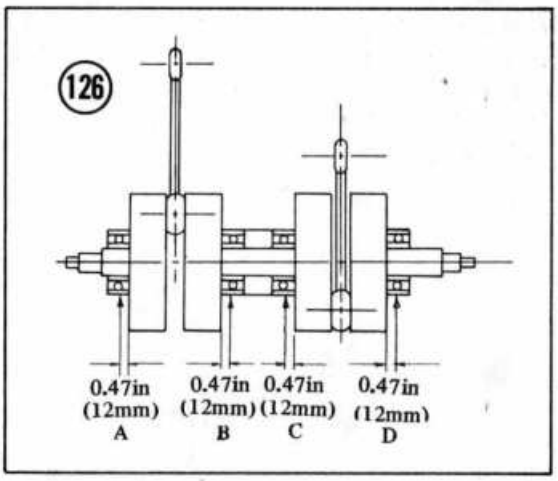


### Inspection

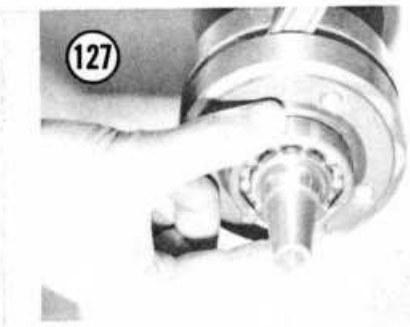
The crankshaft is serviced as a complete assembly; it cannot be disassembled. If the following checks reveal any defects, the crankshaft must be replaced. The right and left oil seals are replaceable, however.

Mount the crankshaft in a lathe, V-blocks, or other suitable centering device. Rotate the crankshaft through a complete revolution, and measure the runout at each of the locations shown in **Figures 125 or 126**. The runout limit on a new crankshaft assembly should not exceed 0.0008 inch (0.02 millimeter) at any measurement location. Replace the crankshaft assembly if any measurement exceeds 0.0024 inch (0.06 millimeter).

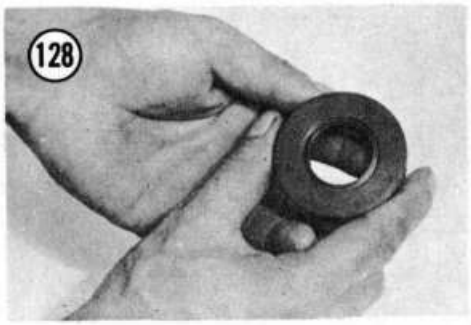


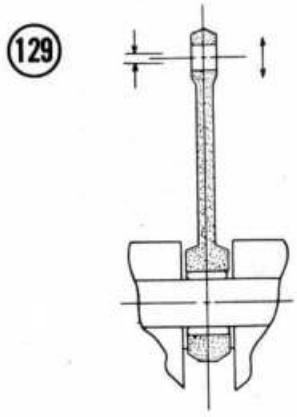

Clean the main bearings (**Figure 127**) thoroughly, then spin them to determine their condition. Listen carefully for any unusual noises as they coast down. Rotate them slowly by hand to check for any binding or roughness. Be sure to lubricate the bearings before you reinstall the crankshaft.




Check the oil seals (**Figure 128**) for damage or evidence of leakage. Primary compression leakage will occur if the oil seals leak, thereby causing poor performance. The center oil seal on H1 machines is not replaceable.




Measure the radical clearance (**Figure 129**) of the big end of each connecting rod. Standard clearance is 0.00016 to 0.00047 inch (0.004 to 0.012 millimeter). Replace the crankshaft assembly if any measurement exceeds 0.002 inch (0.05 millimeter).

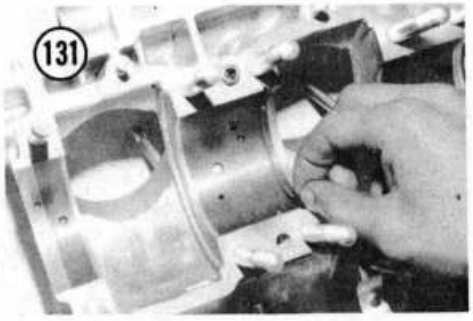


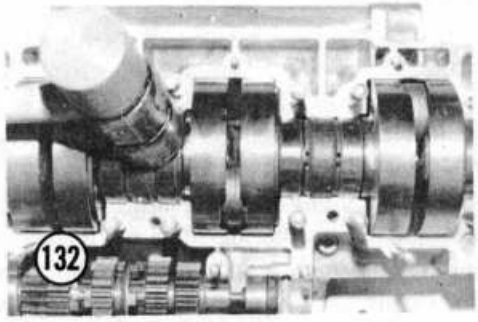

Measure the side clearance (**Figure 130**) of each connecting rod, using a feeler gauge. Standard side clearance is 0.016 to 0.020 inch (0.40 to 0.50 millimeter). Replace the crankshaft assembly if side clearance exceeds 0.028 inch (0.7 millimeter).




**Installation**

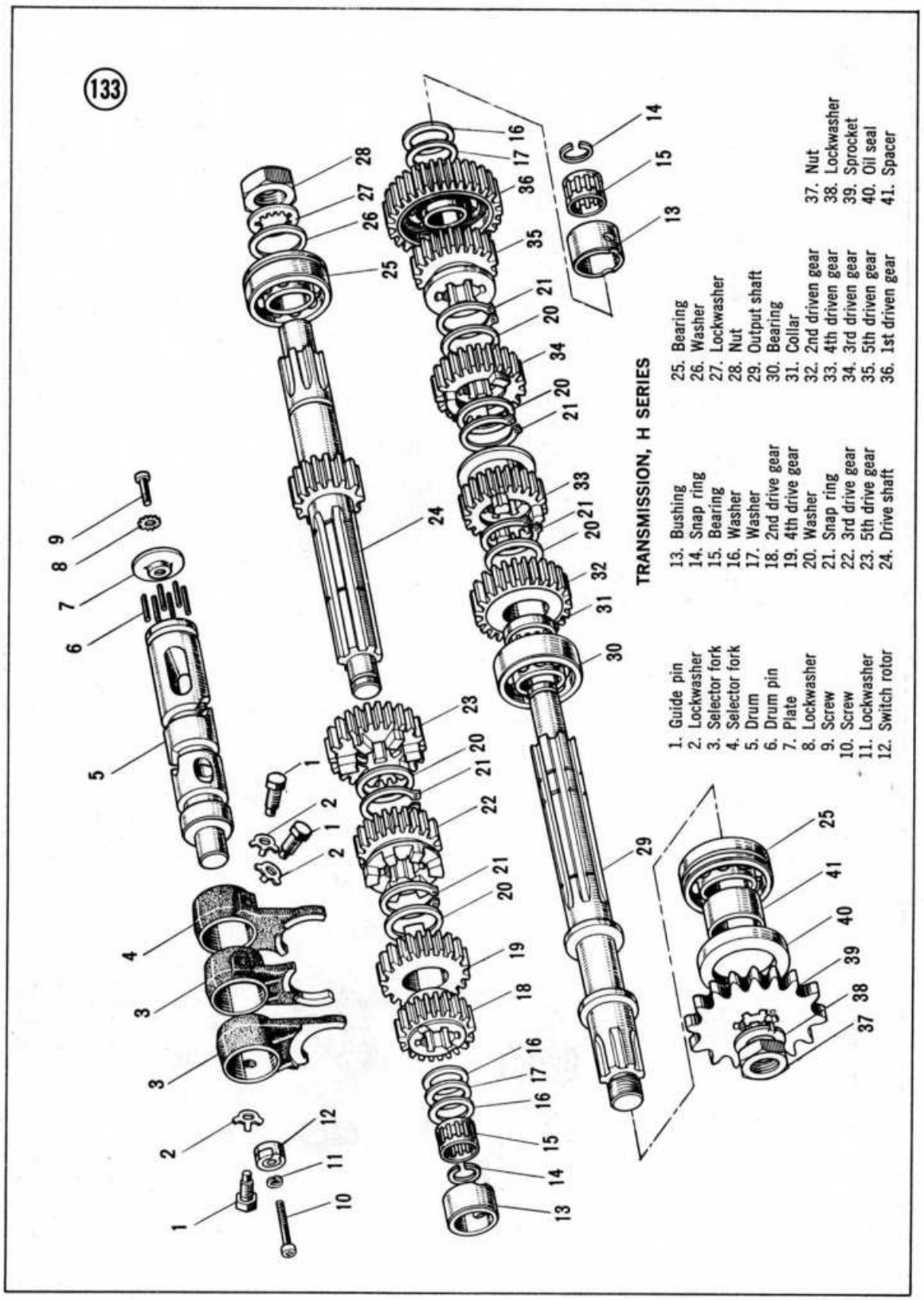
Install the setting ring (**Figure 131**) into the upper crankcase half. Then tap the crankshaft assembly into position, using a plastic mallet (**Figure 132**).

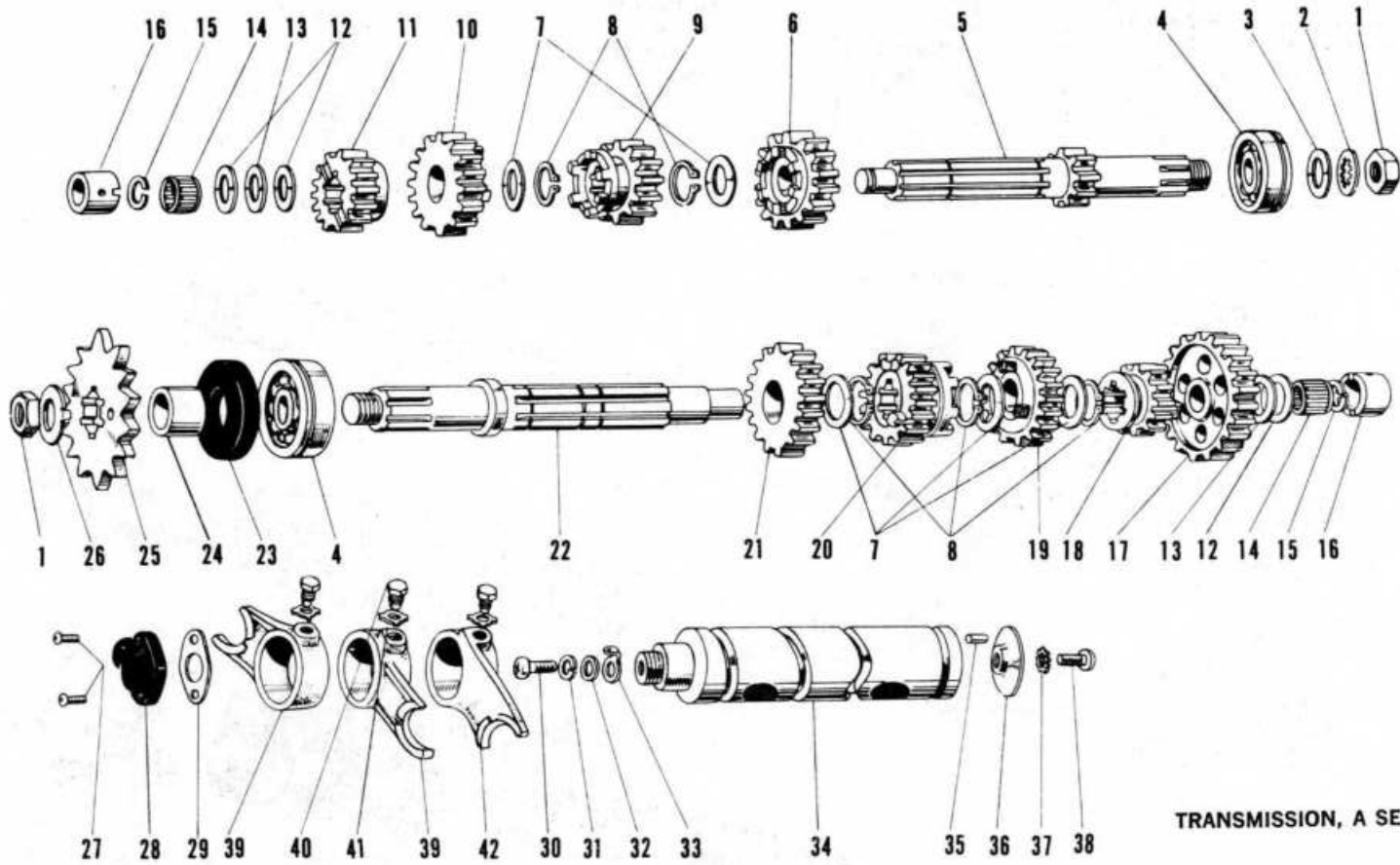



## TRANSMISSION

All models are equipped with five-speed, constant mesh transmissions. **Figures 133 and 134** are exploded views of the transmissions on H1


133
TRANSMISSION, H SERIES
1. Guide pin
2. Lockwasher
3. Selector fork
4. Selector fork
5. Drum
6. Drum pin
7. Plate
8. Lockwasher
9. Screw
10. Screw
11. Lockwasher
12. Switch rotor
13. Bushing
14. Snap ring
15. Bearing
16. Washer
17. Washer
18. 2nd drive gear
19. 4th drive gear
20. Washer
21. Snap ring
22. 3rd drive gear
23. 5th drive gear
24. Drive shaft
25. Bearing
26. Washer
27. Lockwasher
28. Nut
29. Output shaft
30. Bearing
31. Collar
32. 2nd driven gear
33. 4th driven gear
34. 3rd driven gear
35. 5th driven gear
36. 1st driven gear
37. Nut
38. Lockwasher
39. Sprocket
40. Oil seal
41. Spacer




(134)

## TRANSMISSION, A SERIES

1. Nut
2. Lockwasher
3. Washer
4. Ball bearing
5. Drive shaft
6. Drive shaft 5th gear
7. Washer
8. Snap ring
9. Drive shaft 3rd gear
10. Drive shaft 4th gear
11. Drive shaft 2nd gear
12. Washer
13. Thrust washer
14. Needle bearing
15. Snap ring
16. Bushing
17. Output shaft 1st gear
18. Output shaft 5th gear
19. Output shaft 3rd gear
20. Output shaft 4th gear
21. Output shaft 2nd gear
22. Output shaft
23. Oil seal
24. Spacer
25. Sprocket
26. Lockwasher
27. Screw
28. Neutral indicator switch
29. Gasket
30. Screw
31. Lockwasher
32. Washer
33. Switch rotor
34. Gear change drum
35. Drum pin
36. Drum pin plate
37. Lockwasher
38. Screw
39. Selector fork
40. Selector fork guide pin
41. Lockwasher
42. Selector fork

and A series machines, respectively. Both transmissions are similar in construction and operation. The output shaft on the H series is supported by three bearings; A series machines have two. The following table lists individual gear ratios within each transmission.

| Gear | Ratio | |
|---|---|---|
| | A series | H series |
| 1st | 2.50 to 1 | 2.20 to 1 |
| 2nd | 1.53 to 1 | 1.40 to 1 |
| 3rd | 1.13 to 1 | 1.09 to 1 |
| 4th | 0.92 to 1 | 0.92 to 1 |
| 5th | 0.78 to 1 | 0.81 to 1 |

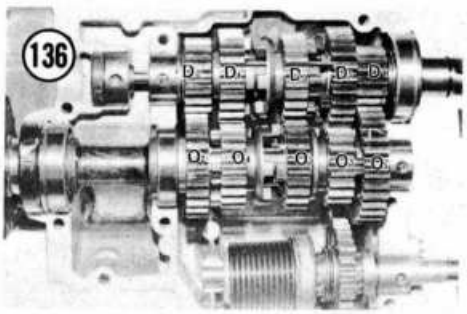
### Transmission Operation

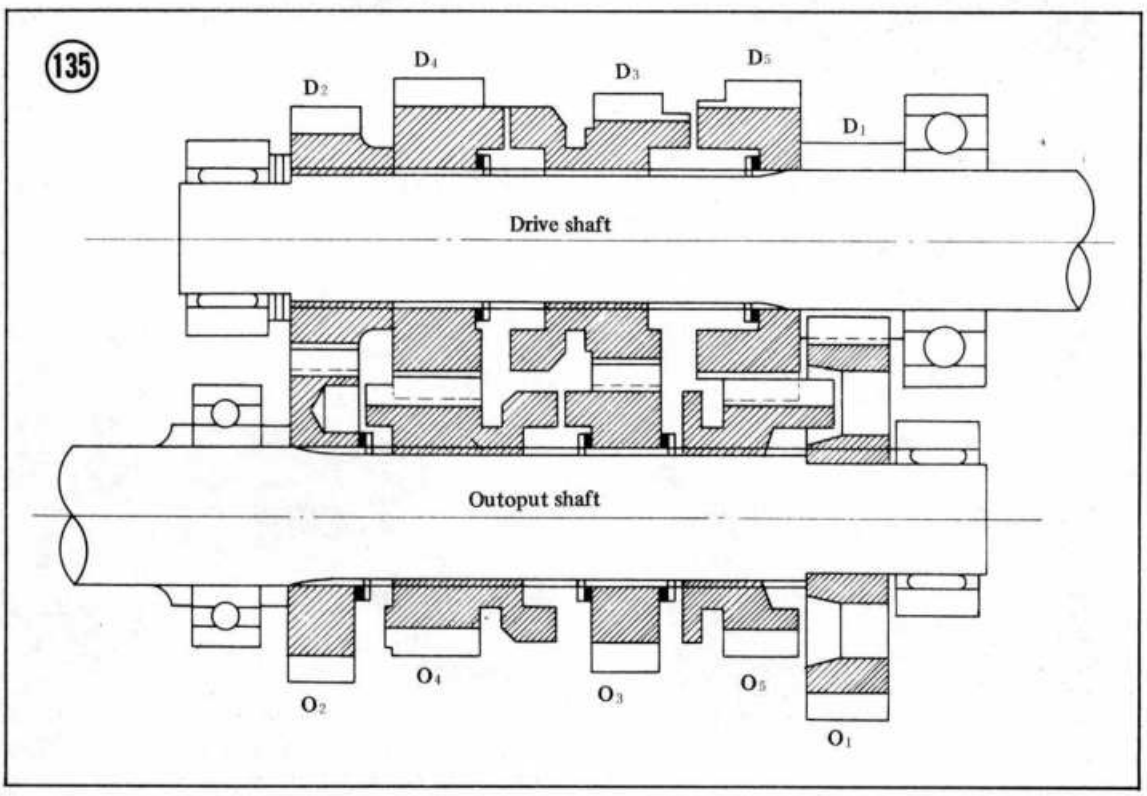
**Figure 135** is a sectional view of the transmission. Gears D2, D3, O4, and O5 are splined to their shafts. Gear D1 is part of the drive shaft. Gears D4, D5, O1, 02, and O3 are free to rotate on their respective shafts. Gears D3, O4, and O5 are moved left or right along the shafts by the action of the shifter forks.

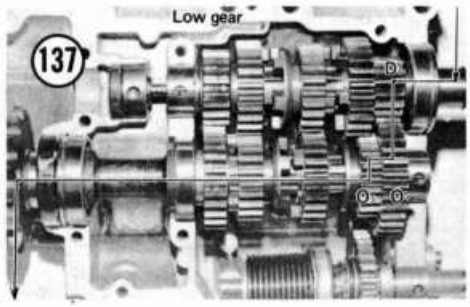
Consider third gear as an example. Gear O4 is moved to the right by its shift fork. Dog clutches on gears O4 and O3 interlock. The power flow is then from the input shaft, through gear D3, which is splined to the input shaft, then through gear O3, the dog clutch which connects gears 03 and 04, and finally through the splines on gear O4 to the output shaft.

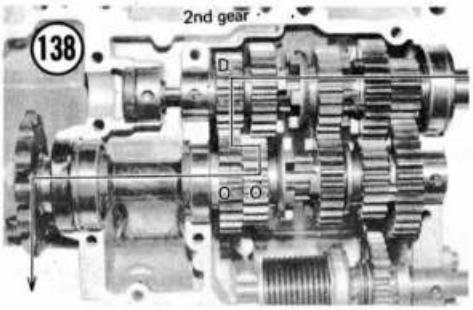
Power flow for each gear position is shown in **Figures 136 through 141**.

| Figure | Gear |
|---|---|
| 136 | Neutral |
| 137 | 1st |
| 138 | 2nd |
| 139 | 3rd |
| 140 | 4th |
| 141 | 5th |



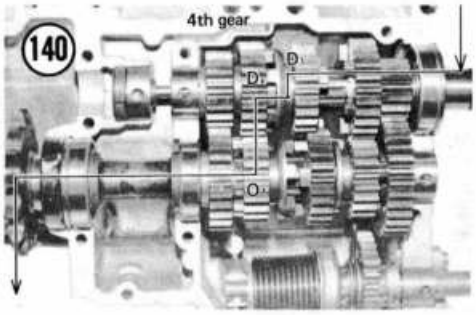



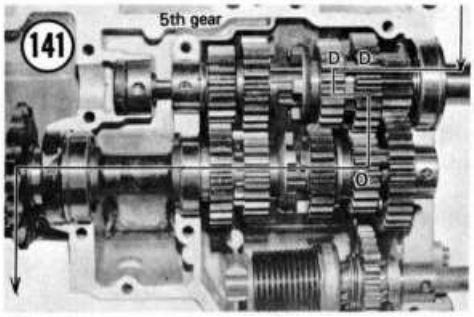




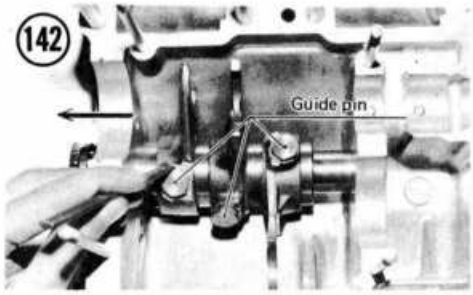




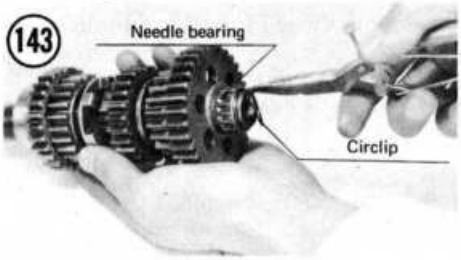

### Transmission Removal

Remove the guide pins from the shifter selector forks (**Figure 142**). Next pull the gear change drum out in the direction shown by the arrow. The transmission may then be removed from the upper crankcase half. Tap the shafts lightly with a plastic mallet if necessary.



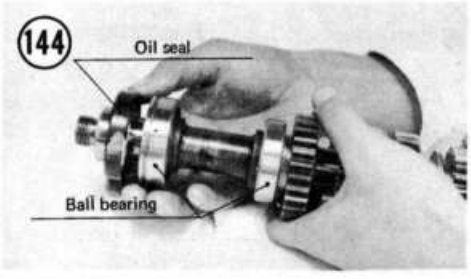

### Disassembly

1. Remove the snap rings (**Figure 143**) from the needle bearings.



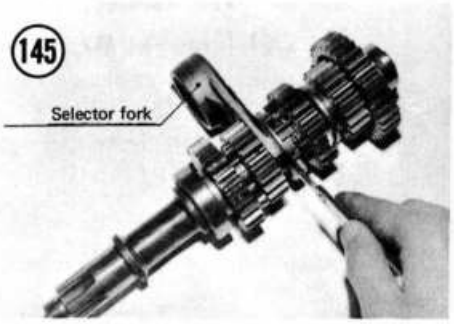

2. Remove each gear individually by removing its associated snap ring and washer. Pay particular attention to the order in which the gears come off the shafts.

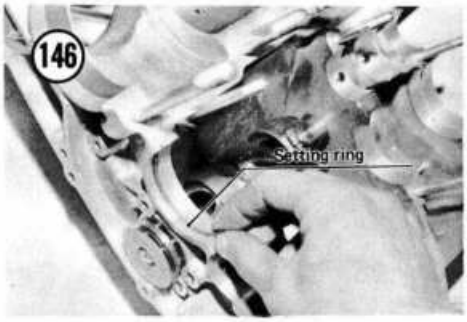
3. Pull the ball bearings and oil seals from the shafts (**Figure 144**).




### Inspection

1. Measure the clearance between each shift fork and the groove on the associated gear (**Figure 145**). Standard clearance is 0.004 to 0.01




inch (0.1 to 0.25 millimeter). Replace the gear and/or the fork if the clearance exceeds 0.024 inch (0.6 millimeter). Replace the shift fork if there are any burrs or other damage.

2. Any burrs, pits, or roughness on the gear teeth will cause wear on the mating gear. Replace any gear with such defects. Examine its mating gear carefully and replace it if there is any doubt about its condition. It may be possible to smooth minor burrs with an oilstone.

### Transmission Assembly and Installation

To assemble the transmission, reverse the disassembly procedure. Observe the following notes:

1. Install the gear change drum (**Figure 146**) into the upper crankcase half first.

2. Be sure that the gears are installed correctly on their shafts, and that each snap ring is seated in its groove.

3. Install the setting rings (Figure 146) before you install the transmission.

4. Be sure the lockwasher tabs on the shift fork guide pins are bent over.

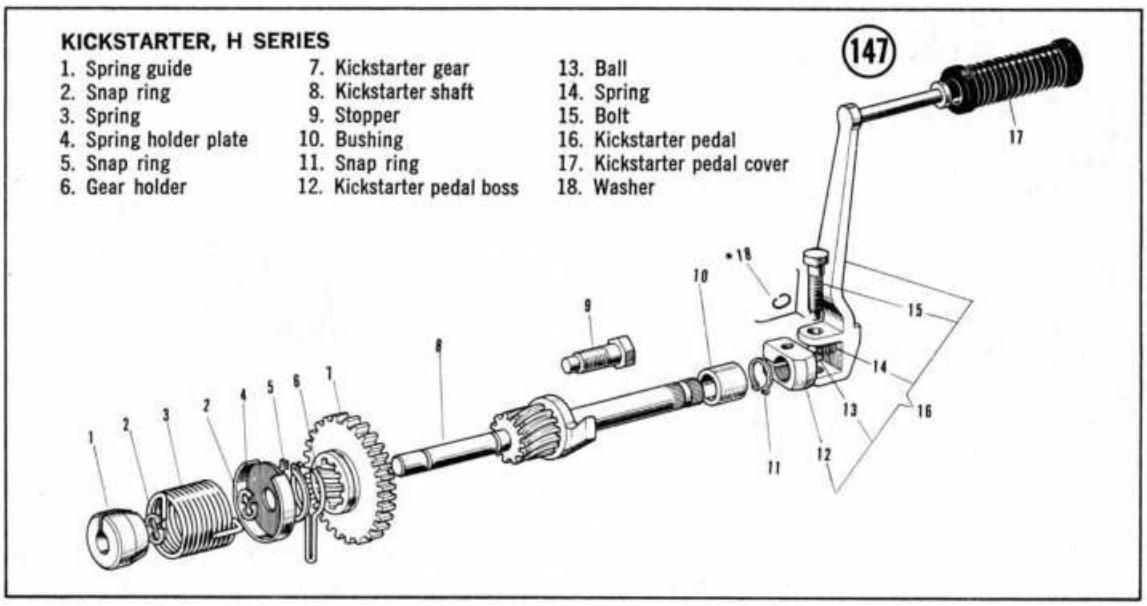
## KICKSTARTER

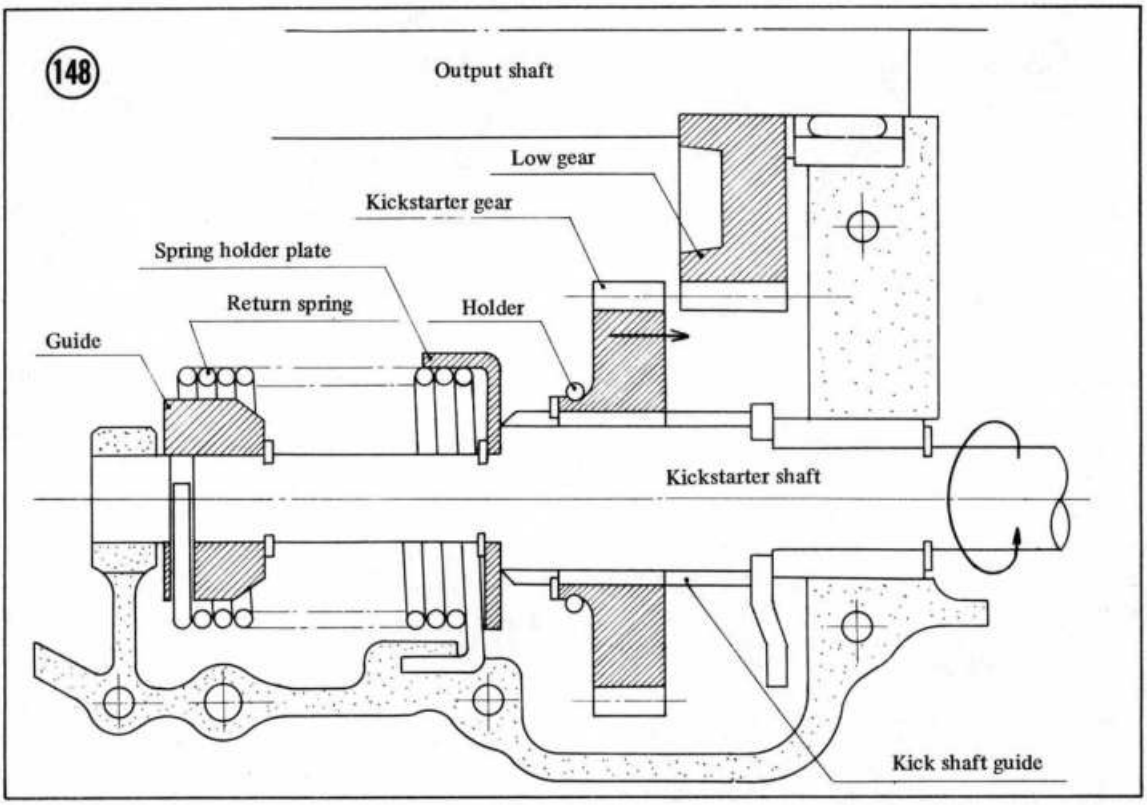
Two types of kickstarters are used on these machines. Refer to the applicable sections for your particular machine.

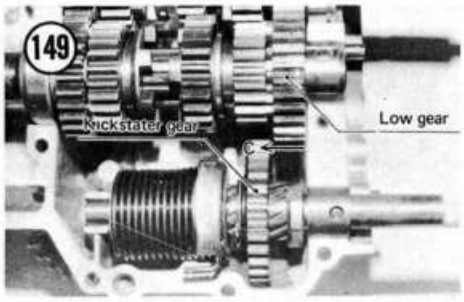
### H1 Series Kickstarter

**Figures 147 and 148** are exploded and sectional views of the H1 series kickstarters. As the rider kicks the pedal, the kickstarter gear slides in the direction of the arrow in Figure 148, and engages with the low driven gear in the transmission (**Figure 149**).

When the engine starts, rotation of the low gear in the transmission causes the kickstarter gear to rotate, and thereby force the kickstarter





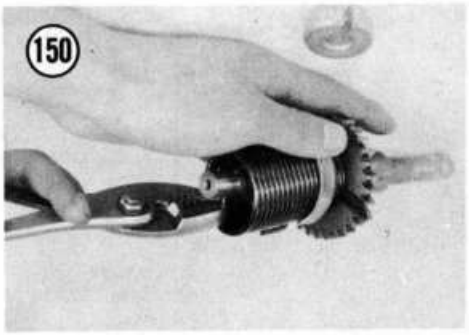

gear to the left along the helical splines on the kickstarter shaft. As the kickstarter gear moves to the left, it disengages itself from the gear in the transmission.

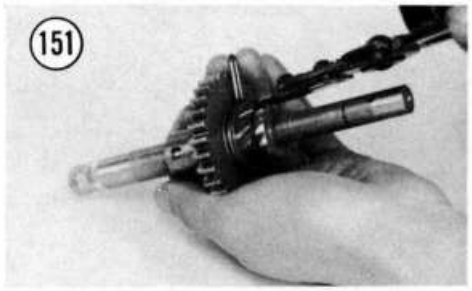
### Disassembly, H1 Series

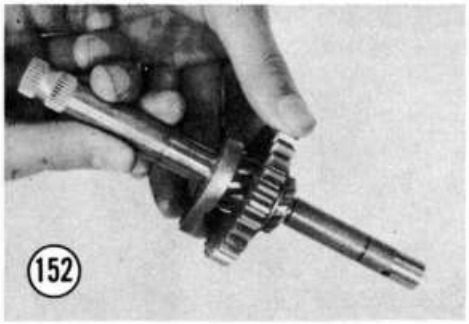
1. Remove the spring and spring guide as shown in **Figure 150**.
2. Remove the snap ring (**Figure 151**) and spring holder plate.
3. Remove the snap rings and kickstarter gear from the kick shaft.

### Inspection, H1 Series

Slide the kickstarter gear (**Figure 152**) along the helical splines on the kick shaft. Check for looseness or binding. Check for weakening of the kickstarter spring. Replace any worn or damaged parts.



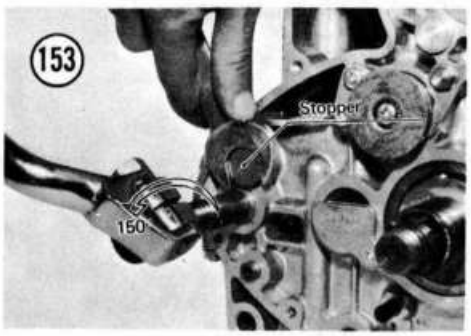






### Assembly, H1 Series

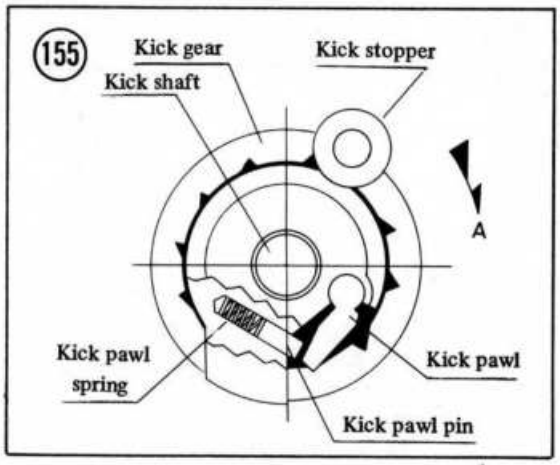
Reverse the disassembly procedure to assemble the kickstarter. Be sure that each snap ring is seated in its groove.

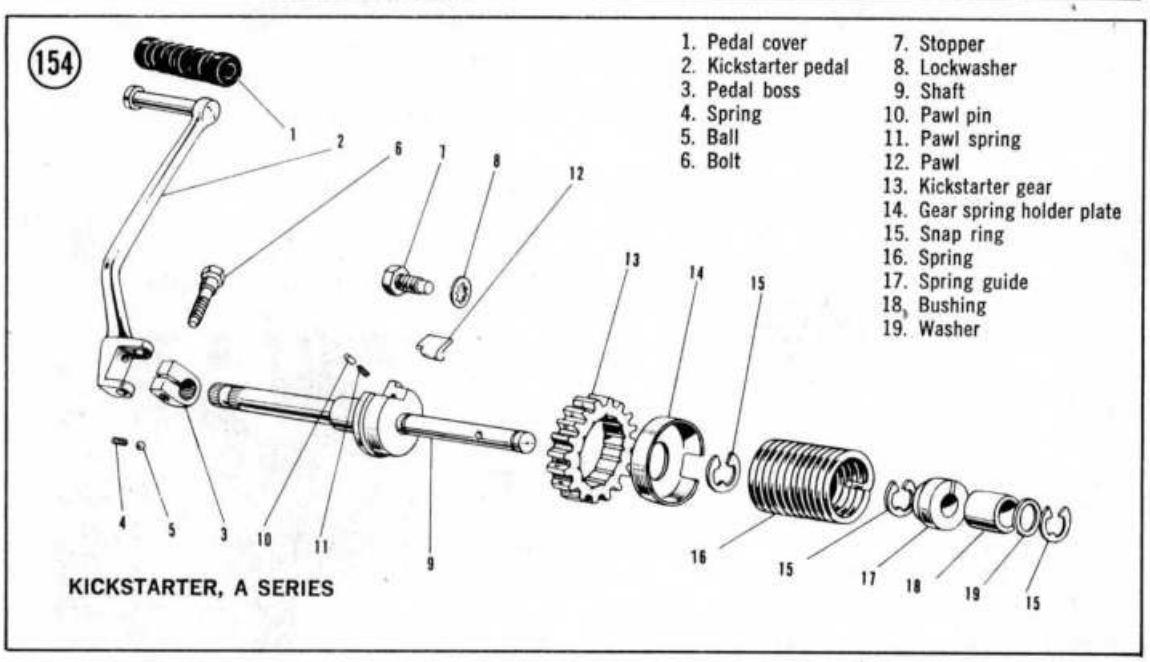
After the crankcase halves are assembled, install the kick stopper. Rotate the kickstarter pedal downward approximately 150 degrees (**Figure 153**), then install the stopper.

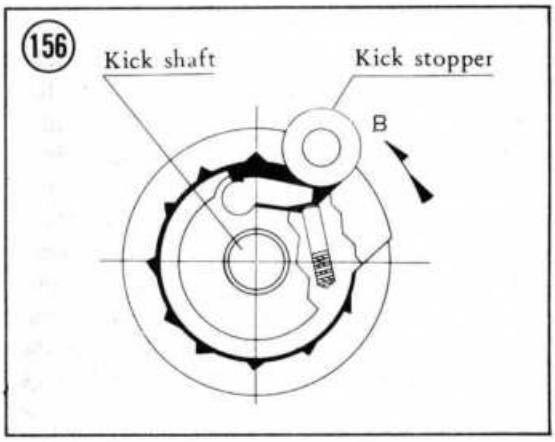



### A1 and A7 Series Kickstarter

**Figure 154** is an exploded view of the kickstarter mechanism on these machines. As the rider presses the kickstarter pedal, the kick shaft rotates clockwise (**Figure 155**). As the kick shaft rotates, the kick pawl spring and kick pawl pin push the kick pawl away from the kick pawl stopper, and into engagement with the internal teeth of the kick gear. After the engine starts, and the kick pedal is released, the kick shaft returns to its original position. At this time, the kick pawl stopper (**Figure 156**) contacts the kick pawl and holds the kick pawl away from the kick gear, thereby releasing the mechanism during normal running.





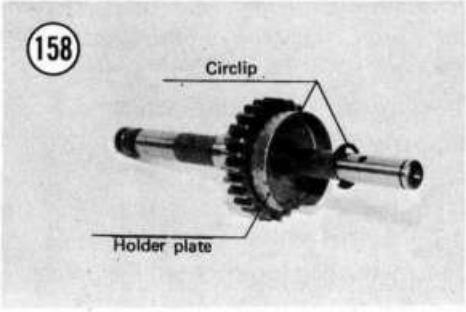

**Disassembly, A1 and A7 Series**

1. Remove the snap ring (**Figure 157**), then pull off the thrust washer, bushing, spring guide, and spring.



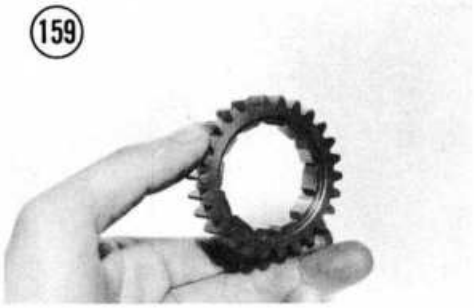

2. Remove the snap ring (**Figure 158**), then remove the kick gear and holder plate.

3. Remove the kick pawl, pawl pin, and spring from the kick shaft.



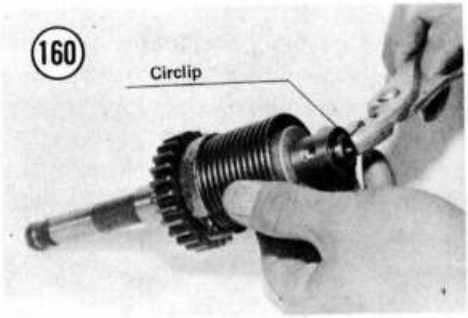

**Inspection, A1 and A7 Series**

1. Check the inner teeth of the kick gear (**Figure 159**) for wear. If these teeth are worn or rounded, the pawl will slip. Replace the gear if the teeth are worn or damaged.



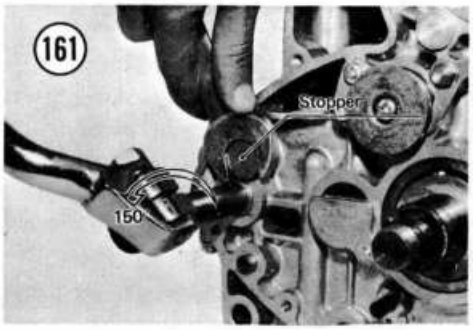

2. Check for wear on the tip of the kick pawl. Wear results in slippage. Replace the pawl if the tip is worn.

3. Be sure that no foreign material is in the pawl pin hole. Check for freedom of movement of the pawl pin and pawl spring (**Figure 160**)




**Assembly, A1 and A7 Series**

Reverse the disassembly procedure to assemble the kickstarter. After the crankcase is assembled, install the kick stopper. Rotate the kickstarter pedal downward approximately 150 degrees (**Figure 161**), then install the stopper.



# CHAPTER THREE

# ELECTRICAL SYSTEM

This chapter discusses operating principles and troubleshooting procedures for the ignition, charging, signal, and lighting systems. Kawasaki multicylinder machines are equipped with either a conventional battery ignition system or a capacitor discharge system, which operates without breaker points. All models use alternators as the source of electrical system power.

## BATTERY IGNITION SYSTEM

The battery ignition system is used mainly on A1 series machines. This system functions in a manner similar to that of an automobile.

### Functional Operation

**Figure 1** illustrates the battery ignition system used on these machines. Note that the system is shown for a single cylinder only; all components except the battery, fuse, and ignition switch are duplicated for the other cylinder.

When the breaker points are closed, current flows from the battery through the primary winding of the ignition coil, thereby building a magnetic field around the coil. The breaker cam rotates with the crankshaft and is so adjusted that the breaker points open as the piston reaches the firing position.

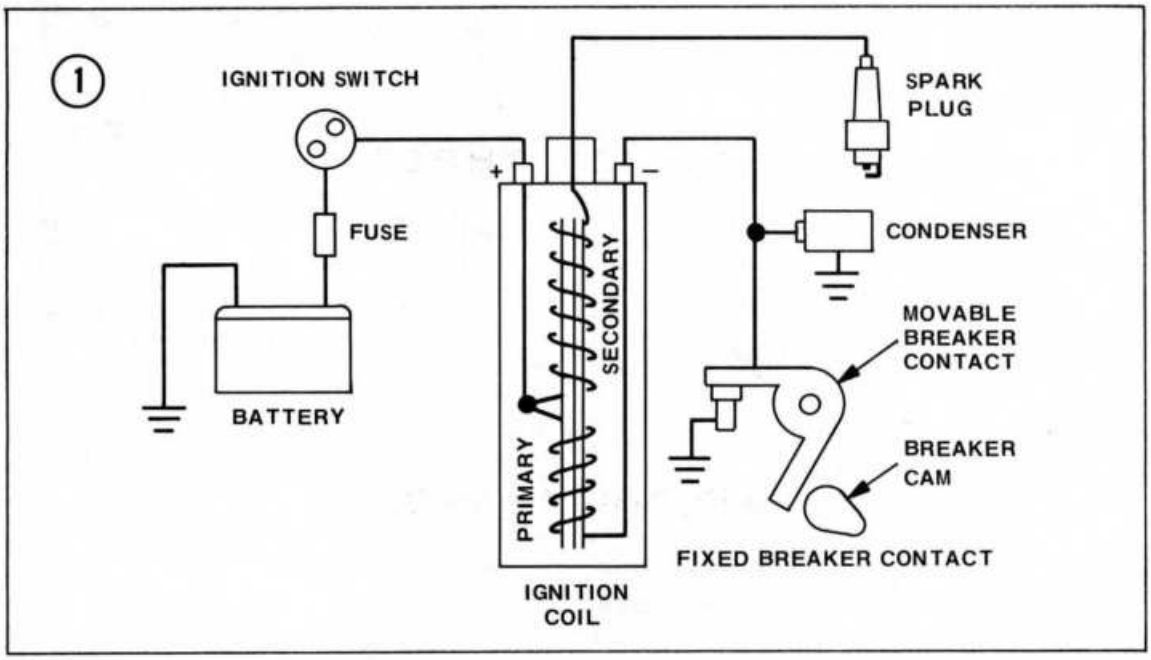
As the points open, the magnetic field collapses. As the field collapses, a very high voltage (approximately 15,000 volts) is induced in the secondary winding of the ignition coil. This high voltage is sufficient to jump the gap at the spark plug.

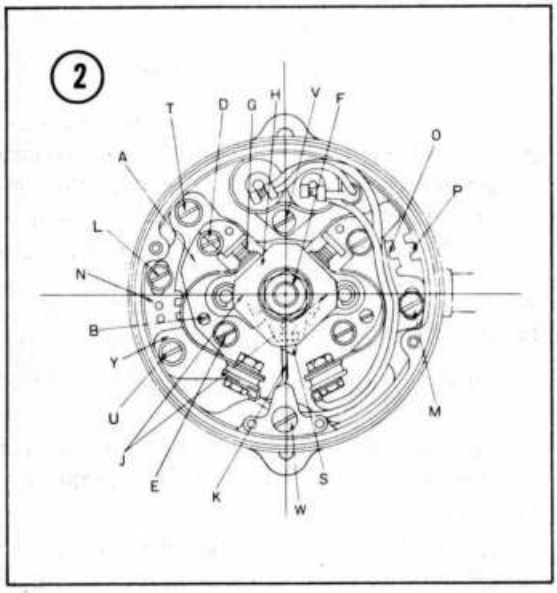
The condenser serves primarily to protect the points. Inductance of the ignition coil primary tends to keep a surge of current flowing through the circuit even after the points have started to open. The condenser stores this surge and thus prevents arcing at the points.

### Point Adjustment, A Series

**Figure 2** illustrates the ignition points on these models. To adjust the points, proceed as follows:

1. Turn the alternator rotor shaft (F) with a wrench until the left-hand breaker points are fully open.
2. Loosen the two clamp screws (D and E) enough so that the stationary contact (A) may be moved.
3. Turn the adjusting screw (B) until a 0.012 to 0.016 inch (0.3 to 0.4 millimeter) feeler gauge just enters the gap (G) between the points.
4. Tighten the two screws (D and E) and recheck the adjustment.
5. Adjust the right-hand points in a similar manner.
6. Be sure to adjust the ignition timing after you adjust the points.




**Ignition Timing, A Series**

To adjust the ignition timing on these models, refer to Figure 2, then proceed as follows:

1. Rotate the engine to align the timing pointer (K) with the painted mark (O) on the plate (P). At this point, the crankshaft is 23 degrees before left top dead center.

2. Loosen the two screws (L and M) on the base plate (N).

3. Move the base plate (N) by prying with a screwdriver between the projections on the rear cover (D) and the projections (E) on the base-plate until the left-hand points just begin to open. Point opening is most easily determined by disconnecting the spark plug wire and holding it one-quarter inch from the cylinder head with the ignition on. A spark will jump to the cylinder head as the points open.

4. Tighten the screws (L and M), then recheck the adjustment.

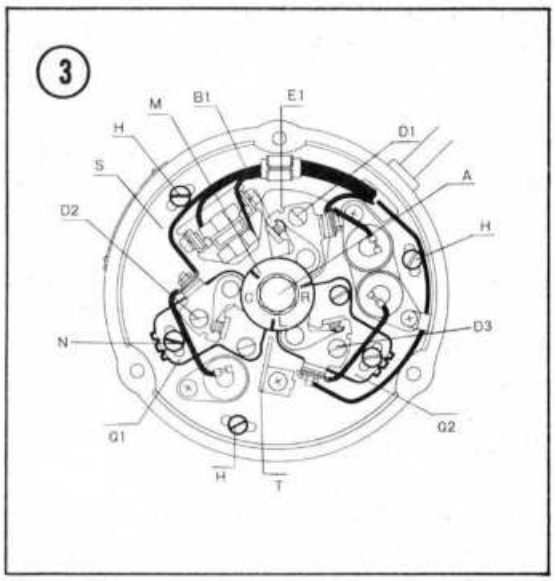
5. After the left-hand points are adjusted, turn the shaft (F) clockwise until the mark (Q) aligns with the timing pointer (K). Then loosen the clamping screws on the right-hand points and adjust the stationary point so that the points just begin to open. Tighten the screws and recheck the adjustment.

6. Apply a small quantity of distributor cam lubricant to the felt cam lubricator each time the points are inspected or serviced.

**Point Adjustment, H Series**

**Figure 3** illustrates the ignition points on these models. To adjust the point gap, proceed as follows:

1. Rotate the crankshaft until the upper set of points is open to its maximum.




2. Loosen screw D1 enough so that the breaker point base (B1) may be moved by prying with a screwdriver in the slit (E1).

3. Move the breaker point base until a 0.012 to 0.016 inch (0.3 to 0.4 millimeter) feeler gauge just enters the point gap.

4. Tighten the screw (D1) and recheck the adjustment.

5. Repeat the procedure for each remaining set of points. Be sure that the points are fully open before you attempt to adjust them.

6. Apply a very small amount of distributor cam lubricant to the breaker cam each time you inspect or service the points.

7. Adjust the ignition timing after you adjust the point gap.

**Ignition Timing, H Series**

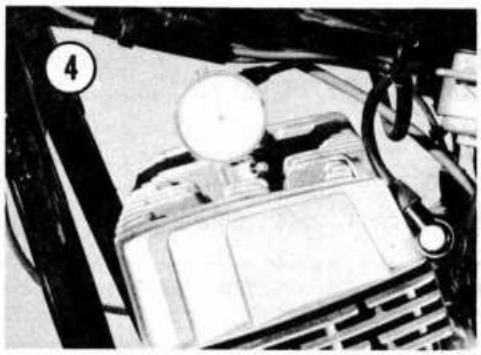
Any change in point gap, including that from normal wear of the point surfaces and rubbing blocks, affects ignition timing. To adjust the timing on H series models with breaker points, proceed as follows:

1. Insert a dial gauge into the left cylinder spark plug hole (**Figure 4**).

2. Slowly rotate the engine in its normal direction until the left piston is at top dead center, as determined by the dial gauge.

3. Set the dial indicator to zero.

4. Rotate the engine in reverse to lower the piston about one-half inch.




5. Connect a test lamp, buzzer, or other continuity tester across the points for the left cylinder.

6. Slowly rotate the engine in its normal direction until the piston is 0.136 inch (3.45 millimeters) below top dead center. At this point, the crankshaft position is 25 degrees before top dead center.

7. Refer to Figure 3. Loosen the three clamp screws (H) just enough so that the baseplate (S) may be moved.

8. Rotate the baseplate (S) slowly, so that the points for the left sylinder just open, as indicated by the continuity tester.

9. Tighten the clamp screws (H).

10. Recheck the adjustment by turning the engine backward to lower the piston slightly, then turning it forward very slowly. The points for the left cylinder should just open as the dial gauge indicates 0.136 inch (3.45 millimeters).

11. Loosen the screw on the timing pointer (T) and adjust the pointer so that it aligns with the left cylinder timing mark (L).

12. Rotate engine until the right cylinder timing mark (R) aligns with the timing pointer (T).

13. Loosen the timing plate clamp screw (N). Connect the continuity tester across the right-hand cylinder points.

14. Move the timing plate (G1) as required so that the points just begin to open, as indicated by the continuity tester. Tighten clamp screw (N).

15. Recheck the adjustment by turning the engine backward slightly, then very slowly turning it forward. The points should just begin to open as the right cylinder timing mark (R) and timing pointer (T) align.

16. Repeat steps (12) through (15) for the center cylinder.

### Battery Ignition Troubleshooting

Ignition system problems can be classified as no spark, weak spark, or improperly timed spark. These conditions can affect either or both cylinders of a twin-cylinder engine. The following table lists common causes and remedies for ignition system malfunctions.

| Symptoms | Probable Cause | Remedy |
|---|---|---|
| No spark, or weak spark, both cylinders. | Discharged battery | Change battery |
| | Defective fuse | Replace |
| | Defective main switch | Replace |
| | Loose or corroded connections | Clean and tighten |
| | Broken wire | Repair |
| No spark or weak spark, on cylinder only. | Incorrect point gap | Reset points. Be sure to readjust ignition timing |
| | Dirty or oily points | Clean points |
| | Spark plug lead damaged | Replace wire |
| | Broken primary wire | Repair wire |
| | Open winding in coil | Replace coil |
| | Shorted winding in coil | Replace coil |
| | Defective Condenser | Replace condenser |
| Misfires | Dirty spark plug | Clean or replace plug |
| | Spark plug is too hot | Replace with colder plug |
| | Spark plug is too cold | Replace with hotter plug |
| | Spring on ignition points is weak | Replace points, reset timing |
| | Incorrect timing | Adjust timing |

If the problem is no spark, at either cylinder, it is almost certainly because current is not reaching the coils. Since the only current path is through the battery connections and the main switch, the defect will be easy to locate.

Ignition failures confined to one cylinder are also easy to isolate.

1. Rotate the engine until the points associated with the affected cylinder are closed. The points for A series models are shown in Figure 2. Figure 3 illustrates the points on H series models.

2. Disconnect the high voltage lead from the affected spark plug and hold it one-quarter inch away from the cylinder head. Turn on the ignition. With an insulated tool, such as a piece of wood, open the points. A fat, blue-white spark should jump from the spark plug lead to the cylinder head. If the spark is good, clean or replace the spark plug. If there is no spark, or if it is thin, yellowish, or weak, continue with step 3.

3. Connect the leads of a voltmeter to the wire on the points and to a good ground. Turn on the ignition switch. If the meter indicates more than ⅛ volt, the problem is defective points. Replace them.

4. Open the points with an insulated tool, such as a piece of wood. The voltmeter should indicate battery voltage. If not, there are three possibilities:

   a. shorted points
   b. shorted condenser
   c. open coil primary circuit

5. Disconnect the condenser and the wire from the points. Connect the ungrounded (positive) voltmeter lead to the wire which was connected to the points. If the voltmeter does not indicate battery voltage, the problem is an open coil primary circuit. Replace the suspected coil with a known good one from the other cylinder. If that coil doesn't work, the problem is in the primary wiring.

6. If the voltmeter indicated battery voltage in step (5), the coil primary circuit is okay. Connect the positive voltmeter lead to the wire which goes from the coil to the points. Block the points open with a calling card or similar piece or cardboard. Connect the negative voltmeter lead to the movable point. If the voltmeter indicates any voltage, the points are shorted and must be replaced.

7. If the foregoing checks are satisfactory, the problem is in the coil or condenser. Substitute each of these separately with a known good one from the other cylinder to determine which is defective.

### Spark Plugs

The spark plugs recommended by the factory are usually the most suitable for your machine. Refer to the specifications, Chapter VII, for the recommended spark plugs for each machine. If your riding conditions are mild, it may be advisable to go to spark plugs one step HOTTER than normal. Unusually severe riding conditions may require slightly COLDER plugs.

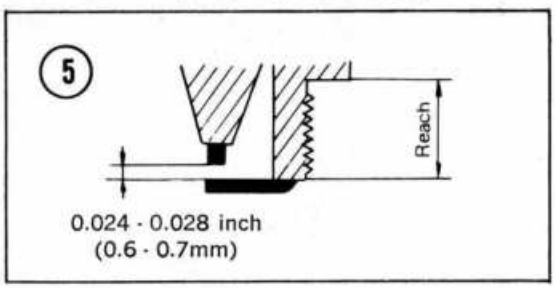
The proper heat range for the spark plugs is determined by the requirement that the plugs

operate hot enough to burn off unwanted deposits, but not so hot that they burn themselves or cause preignition. A spark plug of the correct heat range will show a light tan color on the portion of the insulator within the cylinder after the plug has been in service.

If the insulator appears to be burned or white, the plug is too hot. Possibly the insulator and center electrode will even show evidence of melting. Such plugs should be replaced with colder ones.

Unburned residue such as fluffy black carbon or grimy oil deposits indicate a spark plug that is too cold. The insulator color may range from dark brown to black. Try using hotter plugs if these conditions are found.

Remove and clean the spark plugs approximately every 2,000 miles. After cleaning, inspect them for worn or eroded electrodes. Replace them if there is any doubt about their condition. If the plugs are found to be serviceable, file the center electrodes square, then adjust the gaps by bending the outer electrodes only. Measure the gap with a round wire spark plug gauge only; a flat gauge will yield an incorrect reading. **Figure 5** illustrates the proper spark plug gap.




Should you encounter difficulty removing the spark plug, apply penetrating oil to the base of plug and allow time for the oil to work in. Be sure to clean the seating area on the cylinder head and use a new gasket when you replace the spark plug. Install the plug finger tight, then tighten it an additional half turn.

### Ignition Coil

The ignition coil is a form of transformer which develops the high voltage required to jump the spark plug gap. The only maintenance required is that of keeping the electrical connections clean and tight, and occassionally checking to see that the coil is mounted securely.

If coil condition is doubtful, several checks should be made.

1. Measure the resistance with an ohmmeter between the positive and negative primary terminals. Resistance should read approximately five ohms. Some coils, however, have a primary resistance of less than one ohm. Compare the measurement with that of a known good coil.
2. Measure the resistance between either primary terminal and the secondary high voltage terminal. Resistance should be in the range of 5,000 to 11,000 ohms.
3. Scrape the paint from the coil housing down to bare metal. Set the ohmmeter to its highest range, then measure the insulation resistance between this bare spot and the high voltage terminal. Insulation resistance must be at lease 3 megohms (3 million ohms).
4. If these checks don't reveal any defects, but the coil condition is still doubtful, substitute a known good one.

Be sure that you connect the primary wires correctly when you replace the coil.

### Condenser

The condenser is a sealed unit requiring no maintenance. Be sure that both connections are clean and tight.

Two tests can be made on the condenser. Measure condenser capacity with a condenser tester. Capacity should be 0.18 to 0.25 microfarad. The other test is insulation resistance, which should not be less than 5 megohms, measured between the the condenser pigtail and case.

In the event that no test equipment is available, a quick test of the condenser may be made by connecting the condenser case to the negative terminal of a 12-volt battery, and the positive lead to the positive battery terminal. Allow the condenser to charge for a few seconds, then quickly disconnect the battery and touch the condenser pigtail to the condenser case. If you observe a spark as the pigtail touches the case, assume that the condenser is okay.

Arcing between the breaker points is a common symptom of condenser failure.

### Ignition Points

There is one set of points for each cylinder.

Normal use of the motorcycle causes the points to burn and pit gradually. If the points are not too pitted, they can be dressed with a few strokes of a clean point file. Do not use emery cloth or sandpaper, as particles can remain on the points and cause arcing and burning. If a few strokes of the file don't smooth the points completely, replace them.

Oil or dirt may get on the points, resulting in premature failure. Common causes for this condition are defective crankshaft seals, improper lubrication of the breaker cam, or lack of care when the crankcase cover is removed.

If the point spring is weak, the points will bounce and cause misfiring at high speeds.

Clean and regap the points from time to time. To clean the points, dress them lightly with a point file, then remove all residue with lacquer thinner. Close the points on a piece of clean white paper such as a business card. Continue to pull the card through the closed points until no particles or discoloration remains on the card. Finally, rotate the engine and observe the points as they open and close. If they do not meet squarely, replace them.

Ignition timing is affected by any change in point gap. Always adjust the timing after you service the points.

## CAPACITOR DISCHARGE IGNITION SYSTEM

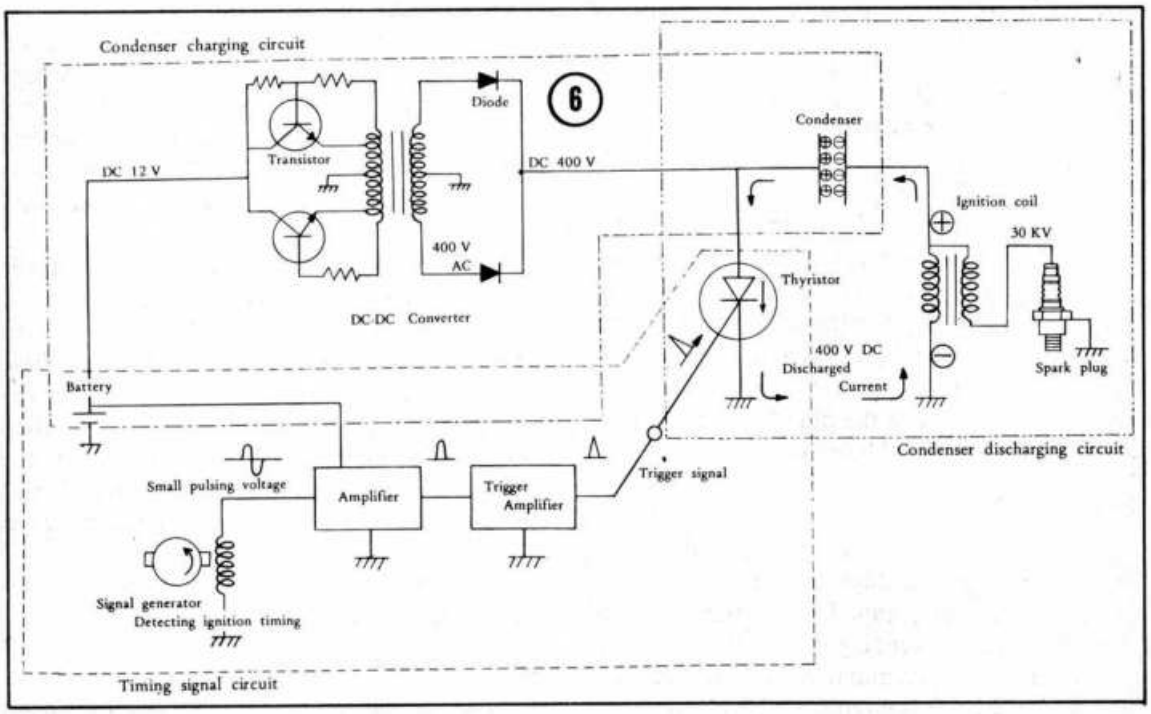
Some models are equipped with a capacitor discharge ignition system (CDI). This system, unlike battery or magneto ignition systems, uses no breaker points or other moving parts. Special surface-gap spark plugs are used with this system. Because of the extremely fast rise time of the high voltage, spark plug fouling is minimized.

### CDI Operation

**Figure 6** is a schematic diagram of the capacitor discharge system. Battery voltage is converted to alternating current, then stepped up, and rectified into high voltage direct current in the AC to DC converter. This current changes the capacitor (condenser) in the condenser discharge circuit.

A small magnet attached to, and rotating with, the alternator shaft generates a pulse in the signal pickup coil in the alternator. This pulse is amplified, then shaped, and used to trigger the thyristor. When the thyristor is triggered, it conducts, and thereby provides a discharge path for the capacitor.

The capacitor discharges very quickly into the primary circuit of the ignition coil, where it is stepped up to approximately 20,000 volts.



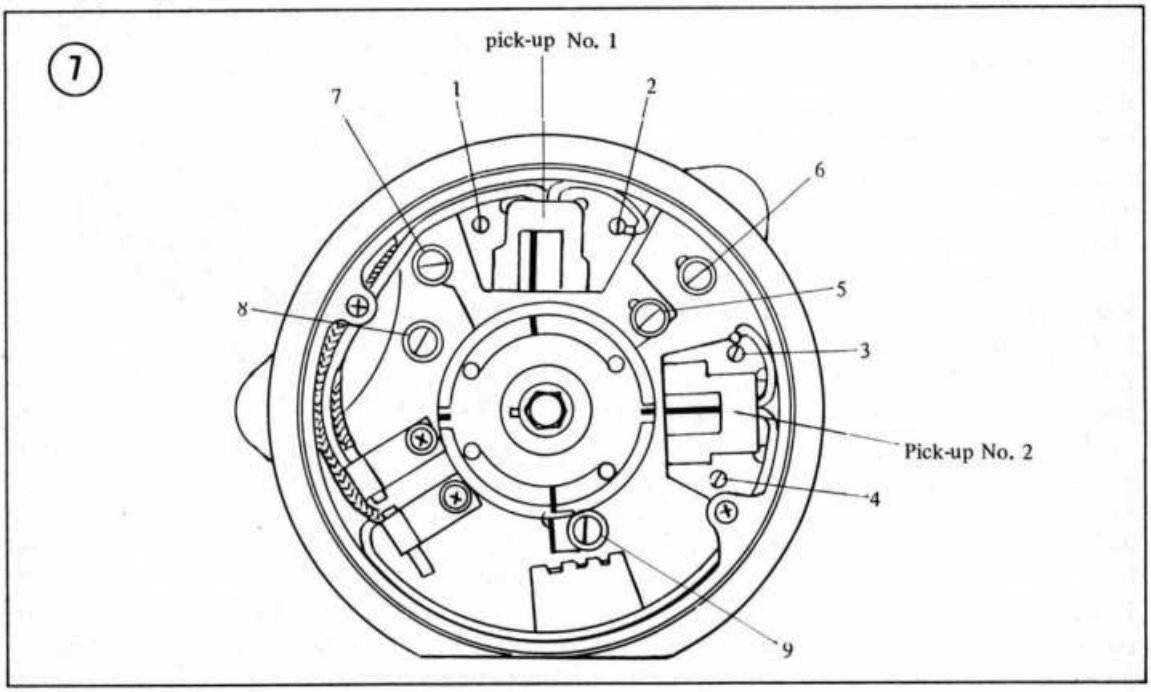
### A Series Timing

**Figure 7** shows the two signal pickup coils in the alternator. Refer to the illustration and proceed as follows:

1. Loosen the clamp screws (1, 2, 3, and 4) on the pickup coils and adjust the coils so that there is a gap of 0.016 to 0.024 inch (0.4 to 0.6 millimeter) between each coil and the signal generator rotor. Be sure to retighten the screws.
2. Rotate the engine so that the center of the pointer aligns with the stamped line on the signal generator rotor. Be sure that you DON'T align the pointer with the line on either projection on the signal generator rotor.
3. Loosen the clamp screws (5, 8, and 9) on the signal generator plate.
4. Insert a screwdriver between the screw (9) and the projection on the signal generator plate. Move the plate so that the stamped line on one rotor projection aligns with the line on pickup coil number 2. Don't forget to tighten the clamp screws (5, 8, and 9).
5. Turn the rotor counterclockwise 90 degrees, so that the line on the rotor projection aligns with the center of the pointer.
6. Loosen the clamp screws (6 and 7) on the primary pickup coil.
7. Adjust the primary pickup so that the stamped line on the pickup coil aligns with the stamped line on the rotor. Then tighten the clamp screws (6 and 7).

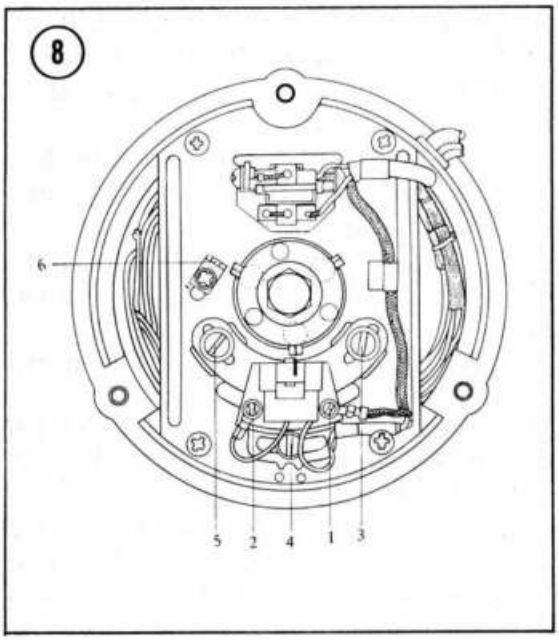
If the alternator is removed or disassembled, the position of the pointer will change. It will then be necessary to adjust the pointer position.

1. Mount a dial gauge in the spark plug hole in the right cylinder head (Figure 4).
2. Slowly rotate the engine until the piston is at top dead center, as indicated by the dial gauge. Zero the dial gauge.
3. Rotate the engine backward to lower the piston approximately one-quarter inch (6 millimeters).
4. Very slowly rotate the engine in its normal direction until the dial gauge indicates that the piston is 0.127 inch (3.28 millimeters) below top dead center. The crankshaft position will be 25 degrees before top dead center.
5. Be sure that the stamped line on the No. 2 pickup coil is roughly aligned with the stamped line on the rotor projection.
6. Bend the pointer with pliers so that the line at the bottom of the rotor aligns exactly with the pointer.
7. Perform steps (3) through (7) of the timing procedure.



### H Series Timing

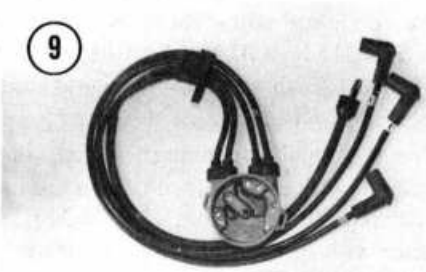
**Figure 8** illustrates the timing adjustment points in the H series alternators. Refer to this illustration and proceed as follows:




1. Loosen the two clamp screws (1 and 2) on the pickup coil, then adjust the gap between the projection on the rotor and the top of the coil. The gap must be 0.016 to 0.024 inch (0.4 to 0.6 millimeter). It may be necessary to turn the engine over to position the rotor for measurement. Tighten the clamp screws.
2. Mount a dial gauge in the spark plug hole of the right cylinder (Figure 4).
3. Slowly turn the engine until the piston is at top dead center, as indicated by the dial gauge. Zero the dial gauge.
4. Turn the engine backward to lower the piston approximately one-quarter inch (6 millimeters).
5. Very slowly turn the engine in its normal direction until the dial gauge indicates that the piston is 0.136 inch (3.45 millimeters) below top dead center.
6. Loosen the pickup clamp screws (3, 4, and 5), then adjust the pickup so that the line on the pickup aligns with the line on the rotor projection. Tighten the clamp screws (3, 4, and 5).
7. Bend the pointer (6) so that the center of the pointer aligns with the stamped line on the rotor projection.

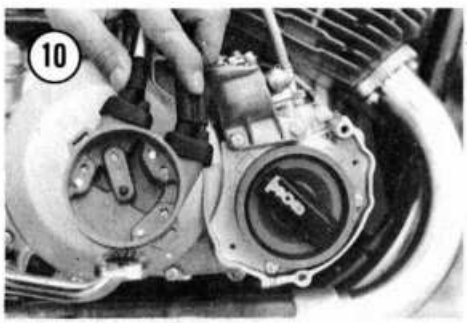
### H Series Distributor

The distributor (**Figure 9**) is a form of switch which directs the high voltage developed by the coil to the proper spark plug. The distributor rotor is driven by the crankshaft.




To install and adjust the distributor, proceed as follows:

1. Position the piston of the right-hand cylinder at top dead center.
2. Refer to **Figure 10**. Press the rotor onto the shaft by hand so that the line on the rotor aligns with the center of the timing mark. It may happen that the line on the rotor does not align exactly with the center of the mark. In such a case, its position is satisfactory as long as the line on the rotor falls within the tolerance marks on either side of the center.




### CDI Cautions

Certain measures must be taken to protect the capacitor discharge system. Instantaneous damage to the semiconductors in the system will occur if the following precautions are not observed:

1. Never connect the battery backward. If the polarity is wrong, damage will occur to the rectifier and alternator.

2. Do not disconnect the battery when the engine is running. A voltage surge will damage the rectifier and possibly burn out the lights.

3. Keep the connections between the various units clean and tight. Be sure that the wiring connectors are pushed together firmly.

4. Do not substitute another type of ignition coil or battery.

5. Each unit is mounted with a rubber vibration isolator. Always be sure that the isolators are in place when you replace the units.

### CDI Troubleshooting

Problems with the capacitor discharge system fall into one of the following categories:

a. Weak spark
b. No spark
c. Sparks occur at random

| Symptom | Probable Cause | Remedy |
|---|---|---|
| Weak spark | Low battery | Charge battery |
| | Poor connections | Clean and tighten connections |
| | High voltage leakage | Replace defective wire |
| | Defective coil | Replace coil |
| | Unit "B" defective | Replace |
| No spark | Discharged battery | Charge battery |
| | Fuse burned out | Replace fuse |
| | Wiring broken | Repair wire |
| | Defective coil | Replace coil |
| | Unit "A" or "B" defective | Replace defective unit |
| | Defective signal generator coil | Replace signal generator coil |
| Random sparks | Unit "A" or "B" defective | Replace defective unit |

### Unit Tests

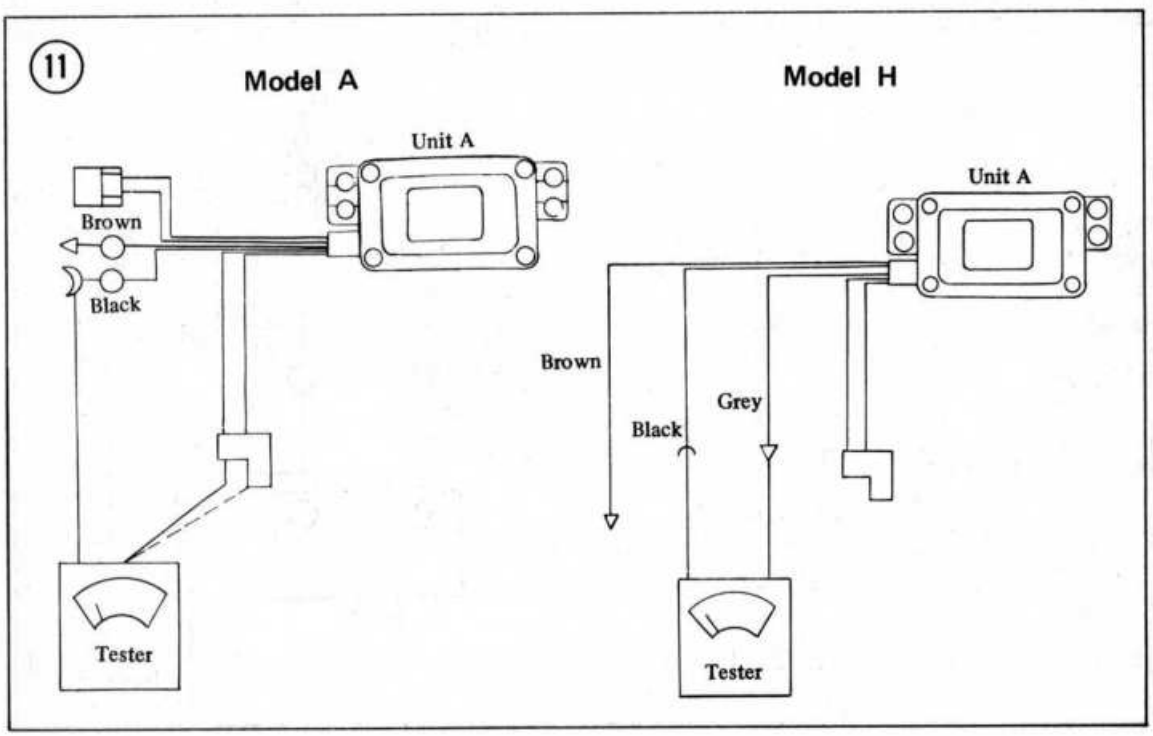
Although the most conclusive test can be made by substituting a known good unit for a suspected one, some tests may be made with a voltmeter, ammeter, and ohmmeter.

1. Refer to **Figure 11**. Measure the resistance between the black wire and the green or gray wire on unit "A." The ohmmeter must indicate infinite resistance.

2. Reverse the meter connections. The meter must again indicate infinite resistance.

CAUTION

*Unit "B" develops high voltage. Follow the procedure exactly to avoid shock hazard.*



3. Connect unit "B" as shown in **Figure 12**. Connect the brown wire to the negative terminal of the ammeter. Connect the positive terminal of the 12-volt battery to the positive terminal of the ammeter. Connect the black wire to the negative battery terminal.

4. The ammeter must indicate 1.8 plus or minus 0.5 amperes, and not fluctuate.

5. Disconnect the brown wire from the battery. Connect the negative lead on the voltmeter to the negative battery terminal. Connect the positive voltmeter lead to the green wire for A series, or the gray wire for H series machines.

6. Reconnect the brown wire to the battery. The voltmeter must indicate 370 to 500 volts.

7. It is normal that the unit emits a tone.

8. Disconnect the battery, then the voltmeter.

9. Connect both units together, as shown in **Figure 13**, but DO NOT connect the battery.

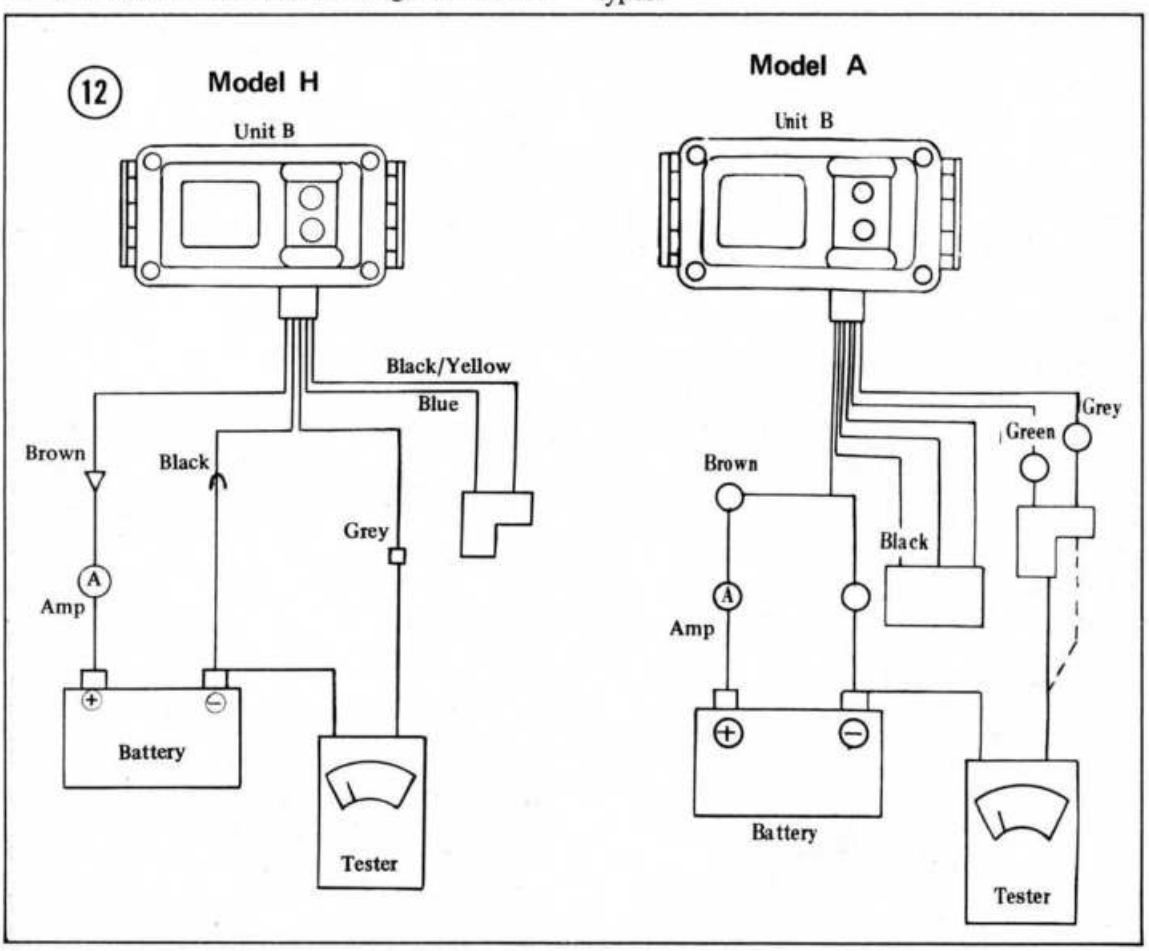
10. Connect the voltmeter to the green wire for A series, or the gray wire for H series. It may be necessary to fabricate some suitable wires to connect the plugs and the voltmeter.

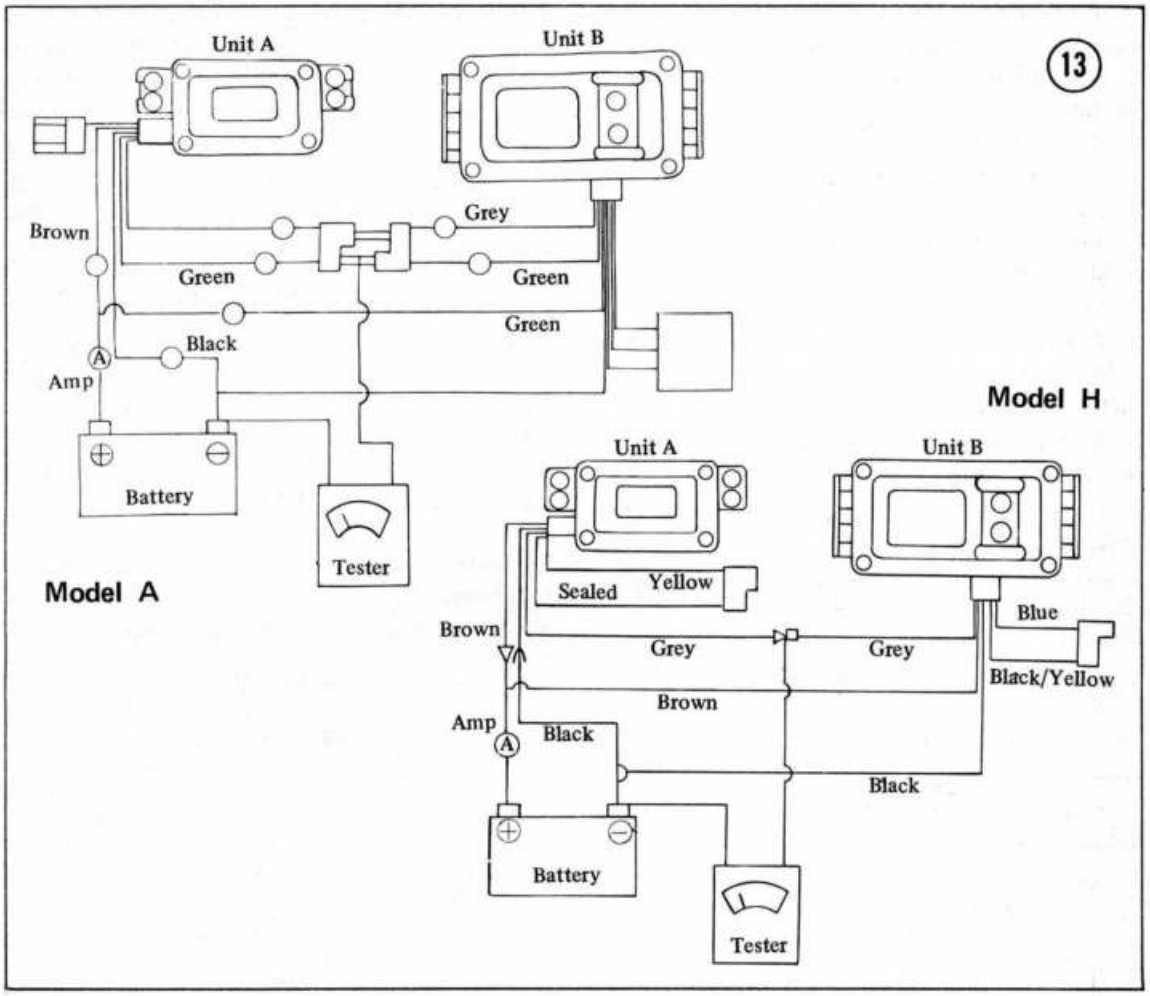
11. Connect the battery as in step (3).

12. If unit "B" checked okay earlier, but the ammeter does not indicate 1.8 plus to minus 0.5 amperes, or the voltmeter does not indicate 370 to 500 volts, unit "A" is defective.

## ALTERNATORS

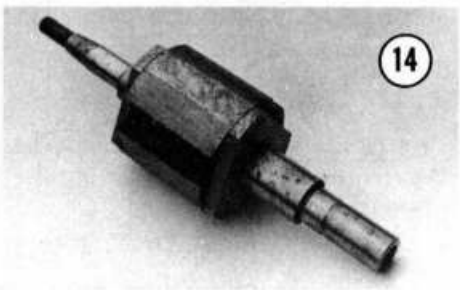
An alternator is a form of electrical generator in which a magnetized field called a rotor rotates within a set of stationary coils called a stator. As the rotor rotates, alternating current is induced in the stator. The current is then rectified (converted to DC) and used to operate electrical accessories on the motorcycle, and for charging the battery. The rotor may be either permanently magnetized, or magnetized by a separate winding in the rotor. Kawasaki machines use both types.






Alternators with permanently magnetized rotors are controlled by a solid state regulator. Alternators with externally excited field windings require a regulator similar to that in an automobile. **Figures 14, 15, and 16** illustrate the three types of rotors used in Kawasaki bikes. The rotor in Figure 14 is permanently magnetized; the rotors in Figures 15 and 16 require separate excitation.






If alternator problems are suspected, as in the case of a chronically undercharged battery or dim headlights, check the alternator output voltage.

1. Connect a 0-20 DC voltmeter across the battery terminals. Be sure that you connect the positive voltmeter lead to the positive battery terminal, and the negative voltmeter lead to the negative battery terminal. Do not start the engine.

2. Observe the voltmeter indication and record it for reference during the next step. The voltmeter will indicate battery voltage.

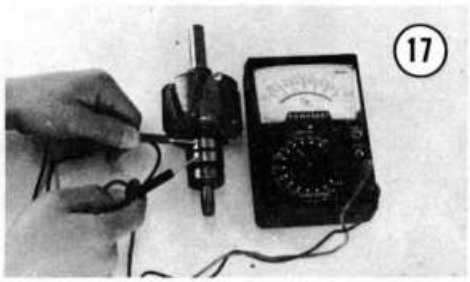
3. Start the engine and run it at 5,000 rpm. Turn on the headlights.

4. Again observe the voltmeter. If the meter indication is now approximately 1 to 1½ volts higher than the meter indication obtained in step (2), the alternator is okay, and no further checks are required.

5. If the indication obtained in step (4) was less than 1 volt greater than the battery voltage obtained in step (2), further checking will be required.

If further testing is required, perform the following steps:

1. Measure field winding resistance between the slip rings, as shown in **Figures 17 or 18**. If the resistance is not 3.5 to 5.5 ohms, replace the rotor.







2. Measure insulation resistance of the field winding. Set the ohmmeter to its highest range, then measure resistance between either slip ring and the rotor shaft. Insulation resistance must be essentially infinite.

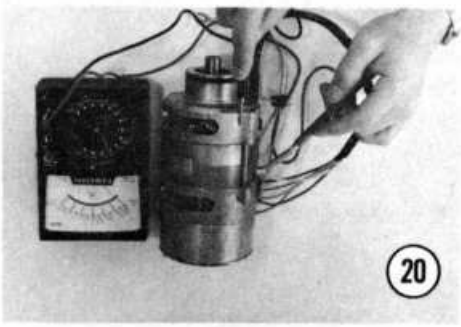
NOTE: *Steps 1 and 2 do not apply to alternators with permanently magnetized rotors.*

3. On A series machines with conventional breaker contact ignition systems, check for continuity between each pair of leads coming from the alternator (**Figure 19**). Measure between the leads listed:

Yellow - Green
Yellow - Green/yellow
Green - Green/yellow



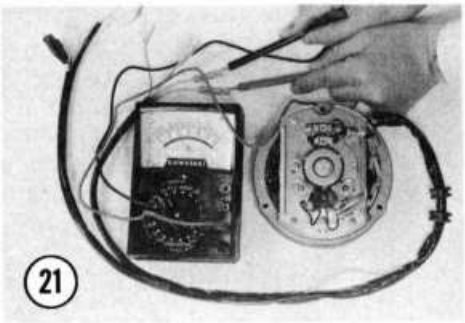

If all wires are connected, measure the insulation resistance between the yellow wire and the alternator housing (**Figure 20**). If the meter indicates infinite resistance, the stator coils are in good condition.




NOTE: *It is not possible to check the stators on A series models in this manner.*

4. On H series models, check for continuity between each of the three yellow wires leading

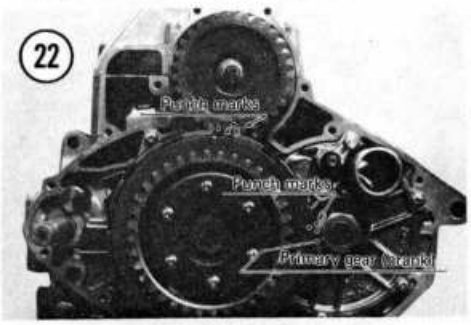
from the alternator stator, as shown in **Figure 21**. Next, set the ohmmeter to its highest range and measure the insulation resistance between the stator housing and the three yellow leads. Insulation resistance must be essentially infinite.



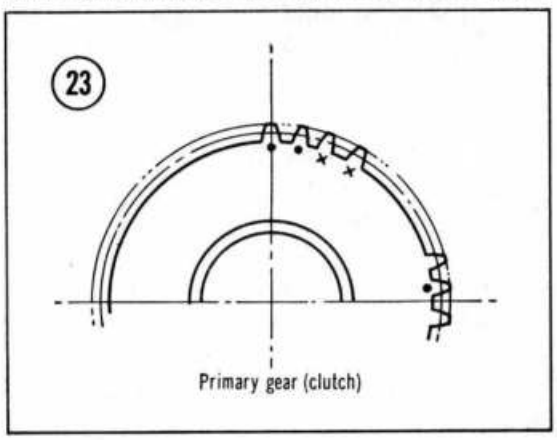

### Adjusting New Alternator

Whenever an alternator has been removed or installed on battery ignition models, it is necessary to make initial timing adjustments.

1. Refer to **Figure 22**. Align all the punched marks on the crankshaft primary gear, clutch primary gear, and alternator gear.




There are two types of timing marks on the clutch gear (**Figure 23**). Engines with idler gears must use EN09 alternators for A1 series, and EN11 alternators for A7 series. In this case, use the two teeth with the dotted marks to set the idler gear between the clutch gear and the alternator gear. On engines without idler gears, use alternator model EN04 for A1 machines, and model EN08 for A7 machines. Use the two teeth on the clutch gear having "x" marks to set the alternator gear and the clutch gear.

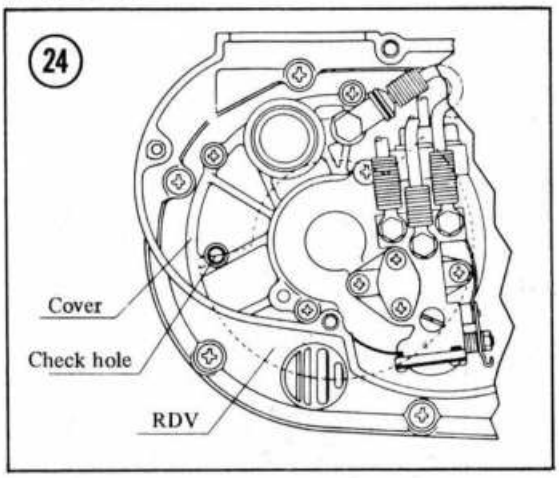



Alignment of the clutch gear and primary gear is always the same, regardless of whether or not an idler gear is used.

2. Position the alternator on the crankcase so that the dowel pin holes align with the dowels in the crankcase.

3. Adjust the left-hand point gap and ignition timing as specified elsewhere in this chapter.

4. Remove the bolt from the inspection hole (**Figure 24**).




5. Rotate the engine counterclockwise so that the cutaway in the left rotary valve is in the center of the inspection hole.

6. Adjust the ignition timing pointer (K) so that it is aligned with the red mark (J) on the timing plate (H).

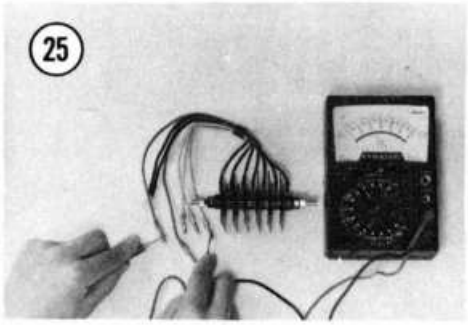
7. Further adjustments are made as described in the section on ignition timing.

## RECTIFIER

The rectifier assembly serves two purposes. It converts alternating current produced by the alternator into direct current which is used to charge the battery. It also prevents discharge of the battery through the alternator when the en-

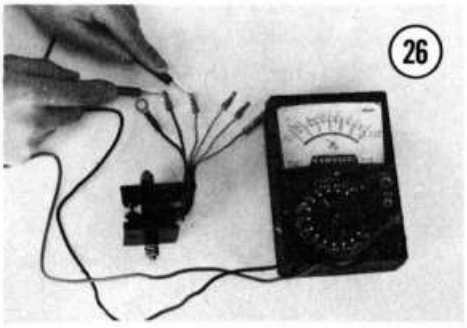
gine isn't running, or at other times when the output voltage of the alternator is less than battery voltage.

**Figure 25** illustrates the procedure for checking the rectifier on A series models with battery ignition. To test the rectifier, proceed as follows:




1. With an ohmmeter, check for continuity between each yellow wire and the two red wires. Record the meter indications.
2. Reverse the ohmmeter leads and repeat the measurements of step (1).
3. If each pair of measurements was essentially infinite in one direction and low in the reverse direction, proceed with steps (4) and (5). If a pair of measurements showed either high or low resistance in both directions, replace the rectifier assembly.
4. Measure the resistance between each yellow lead and the two black leads. Record the meter indications.
5. Reverse the meter leads and repeat the measurements.
6. If any pair of measurements obtained in steps (4) or (5) were either both high or both low, replace the rectifier assembly.

**Figure 26** illustrates the test procedure for the rectifier on H series models. Proceed as follows:



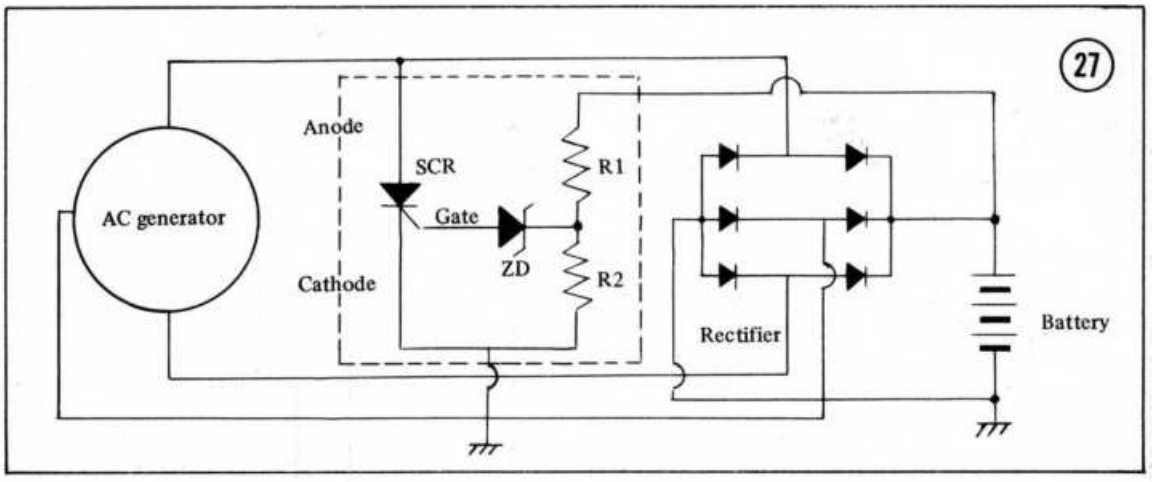

1. Measure the resistance between each yellow wire to the red wire. Record the meter indications.
2. Reverse the meter leads and repeat the measurements.
3. If each pair of measurements was essentially infinite in one direction and low in the reverse direction, proceed with step (4). If any pair of measurements was either high or low in both directions, replace the rectifier.
4. Measure the resistance between each yellow wire and the black wire. Record the meter indications.
5. Reverse the meter leads and repeat the measurements. If any pair of measurements was either high or low in both dirctions, replace the rectifier. If okay, proceed with step (6).
6. Measure resistance between the black and blue wires, then reverse the meter leads and repeat the measurement. If the meter indicated low resistance in one direction and high resistance with the leads reversed, the rectifier is okay. If both measurements were either high or low, replace the rectifier.

## SOLID STATE VOLTAGE REGULATOR

Some A series machines are equipped with a solid state voltage regulator (SVR). This unit consists of a zener diode (ZD), a silicon controlled rectifier (SCR), and two resistors as shown in **Figure 27**. Refer to this illustration during the following discussion.

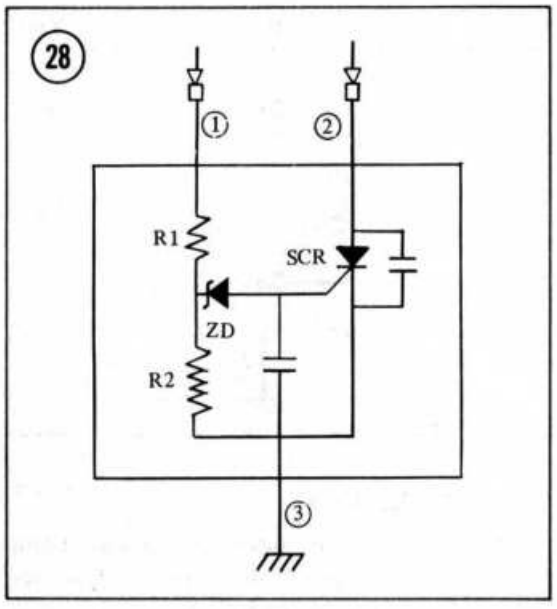
### Operation

Assume that the main switch is closed. As engine speed increases, the output voltage from the alternator tends to increase. If the battery is fully charged, the voltage at the junction of R1 and R2 will tend to rise. If it reaches the zener voltage, approximately 15 volts, the zener diode conducts in the reverse direction, thereby triggering the silicon controlled rectifier. When the silicon controlled rectifier conducts, the alternator output is grounded, thereby reducing the output voltage to near zero. As the voltage at the junction of R1 and R2 drops, the zener diode ceases to conduct, and removes the trigger signal to the silicon controlled rectifier.




### Checking the SVR

Refer to **Figure 28**. Connect a test lamp in series with a 12-volt battery, or use an ohmmeter to determine whether there is continuity between points "2" and "3". The continuity test lamp should not light, or the ohmmeter should show no continuity. Reverse the continuity tester connections to the SVR. If the lamp lights or the ohmmeter indicates continuity, the unit is defective. Also be sure that terminal "2" is not shorted to the case.




If the facilities are available, connect the test circuit shown in **Figure 29**. Slowly increase the voltage from the power supply and observe the lamp. The lamp must light when the voltmeter indicates 13 to 15 volts. If not, the unit must be replaced.

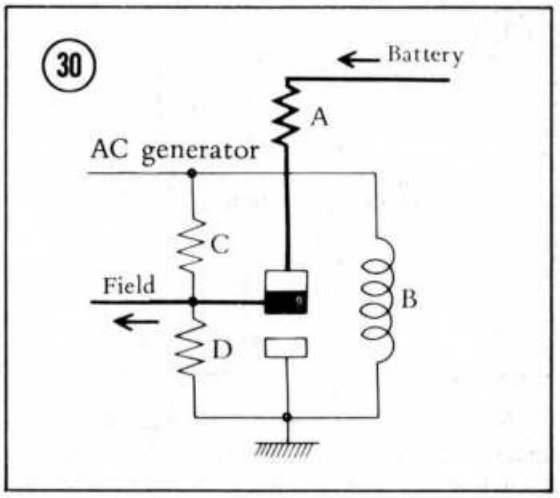
Reduce the power supply voltage to one volt below the point where the lamp became lit. Disconnect the battery momentarily, then reconnect it. If the lamp lights, replace the SVR.

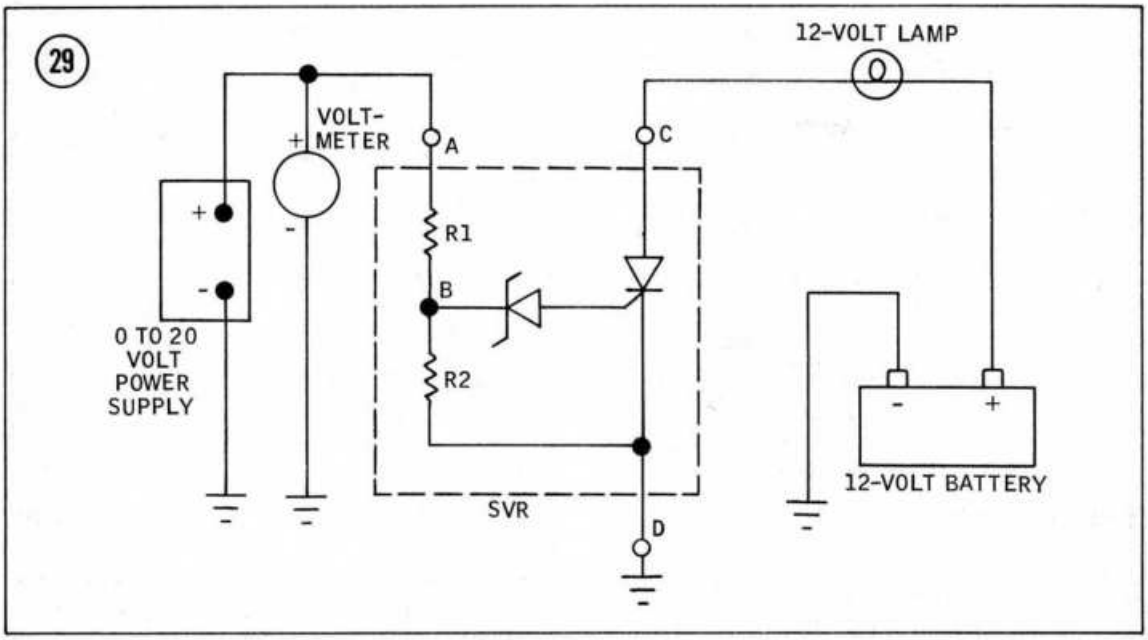
## ELECTROMECHANICAL VOLTAGE REGULATOR

### Operation

Some alternators use separately excited field windings. As engine speed increases, the alternator output tends to increase. It is possible, however, to control the alternator output by controlling the field current.

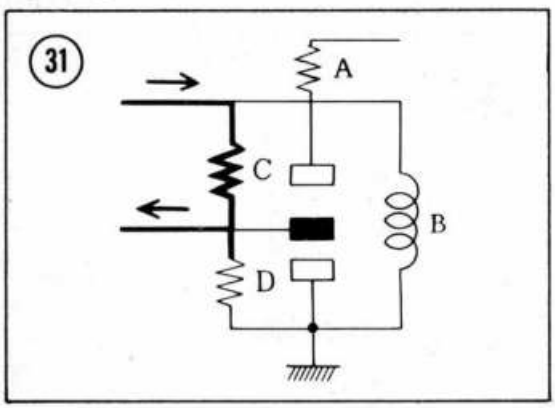
**Figure 30** illustrates the situation at low engine speeds. The rectified alternator output is applied to coil "B". However, since the output is low, the magnetic field developed by coil "B"



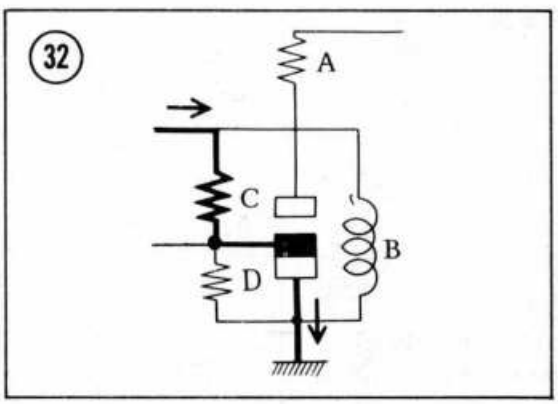



is too low to open the black and white relay contacts. Under these conditions, field current is supplied by the battery through the ignition switch, and is at its maximum value.

**Figure 31** illustrates the circuit as engine speed increases. As the alternator output voltage tends to increase, coil "B" generates more magnetic force, which breaks the black and upper white contact. Field current is then supplied from the alternator output, through resistor "C". Resistor "C" limits the field current, and thereby reduces the alternator output so that the upper white contact and the black contact again close, repeating the cycle.




At high engine speeds and light electrical loads, the action of the upper and center contacts is insufficient to control the alternator output. **Figure 32** illustrates the regulator action under there conditions. As the output voltage continues to rise, coil "B" pulls the movable (black) contact down to the lower contact. Under this condition the field is grounded, and the alternator output drops to zero. As it drops, the movable and lower contacts separate, and the cycle repeats.




### Testing the Regulator

The most common causes of voltage regulator trouble are open wires or short circuits. To check the regulator, proceed as follows:

1. Remove the four wires from the regulator.
2. With an ohmmeter (**Figure 33**) measure the resistance between the listed terminals. Resistance should be approximately as specified.

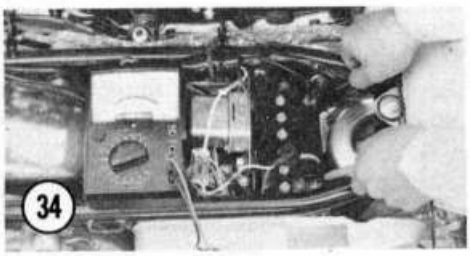
| Terminals | Resistance |
|---|---|
| 1 and 2 | 30 ohms |
| 1 and 3 | 30 ohms |
| 1 and 4 | 54 ohms |




If the measured values are greatly different from those specified, replace the regulator.

3. Remove the cover and inspect the contacts for pitting or burning.

4. Connect a voltmeter across the battery terminals, as shown in **Figure 34**. Reconnect the regulator.




5. Start the engine and run it at 5,000 rpm. If the measured voltage is 14.5 plus or minus 0.5, the regulator is okay.

## BATTERY

Check the battery occasionally for sulfation or deposits in the bottom of the cells. Replace the battery if such conditions exist, or if the battery will not accept or hold a charge.

Maintain the battery electrolyte level between the minimum and maximum level marks on the battery case. Use only distilled water to fill the cells. If the battery requires water more frequently than once a month, check the charging system, for it's possible the battery is being overcharged.

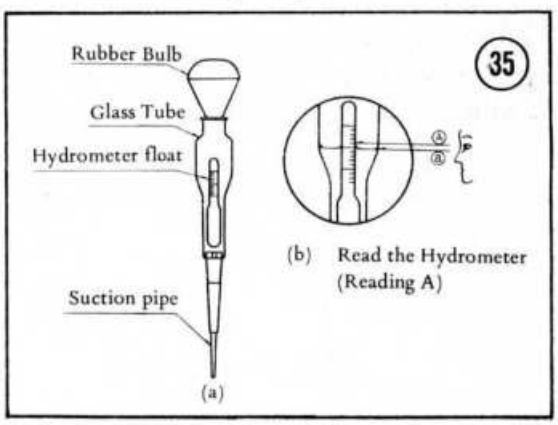
Battery life should normally be two to three years. This period will be shortened by any of the following conditions:

1. Overcharging.
2. Leaving the battery in a discharged state.
3. Freezing—a fully charged battery will freeze at a much lower temperature than one that is discharged. If the machine is exposed to cold weather, be sure to keep the battery fully charged.
4. Allowing the electrolyte level to drop below the tops of the plates.
5. Adding anything to the electrolyte except distilled water.

If the motorcycle is not to be used for an extended period, charge the battery fully, remove it from the machine, and store it in a cool, dry place. Recharge the battery every two months while it is in storage, and again before it is put back into service.

Be very careful when you install the battery to connect it properly. If the battery is installed backward, the rectifier and alternator will be damaged. It is also possible that the CDI will be damaged.

Determine the state of charge of the battery with a hydrometer. To use this instrument, place the suction tube (**Figure 35**) into the filter opening and draw in just enough electrolyte to lift the float. Hold the instrument in a vertical position and take the reading at eye level.




The specific gravity of the electrolyte varies with temperature, so it is necessary to apply a temperature correction to the reading you obtain. For each 10 degrees that the battery temperature exceeds 80 degrees F, add 0.004 to the indicated specific gravity. Subtract 0.004 from the indicated value for each 10 degrees that the battery temperature is below 80 degrees F.

The specific gravity of a fully charged battery is 1.260. If the specific gravity is below 1.220, recharge the battery.

## LIGHTS

Machines designed to be ridden on public streets are equipped with lights. Check them periodically to be sure that they are working properly.

### Headlight

The headlight unit consists primarily of a lamp body, a dual-filament bulb, a lens and reflector unit, a rim, and a socket. To adjust the headlight, loosen the two mounting bolts and move the assembly as required.

### Brake Light

The switch is actuated by the brake pedal. Adjust the switch so that the stop light goes on just before braking action occurs. Move the switch body up or down as required for adjustment. Tighten the clamp nut after adjustment.

### Turn Signals

Kawasaki machines are equipped with two different types of turn signal flasher relays. If replacement becomes necessary, be sure you replace with the proper type.

If any turn signal bulb burns out, be sure to replace it with the same type. Improper action of the flasher relay, or even failure to operate may result from use of the wrong bulbs.

## HORN

Current for the horn is supplied by the battery. One horn terminal is connected to the battery through the main switch. The other terminal is connected to the horn button. When the rider presses the button, current flows through the horn.

## MAIN SWITCH

Service on the main switch is limited to checking continuity between the various circuits. The following tables list the circuits which should show continuity under different switch positions.

**Models With CDI**

| Position | Leads connected |
|---|---|
| Off | None |
| Day | White and brown |
| Night | Red/white, white, brown, and blue |
| Parking | Red/white and white |

**Models With Battery Ignition**

| Position | Leads connected |
|---|---|
| Off | None |
| Day | White and brown |
| Night | Red, white, brown, and blue |
| Twilight | Red, white, brown, and brown/white |
| Parking | Red, white, and brown/white |

# CHAPTER FOUR

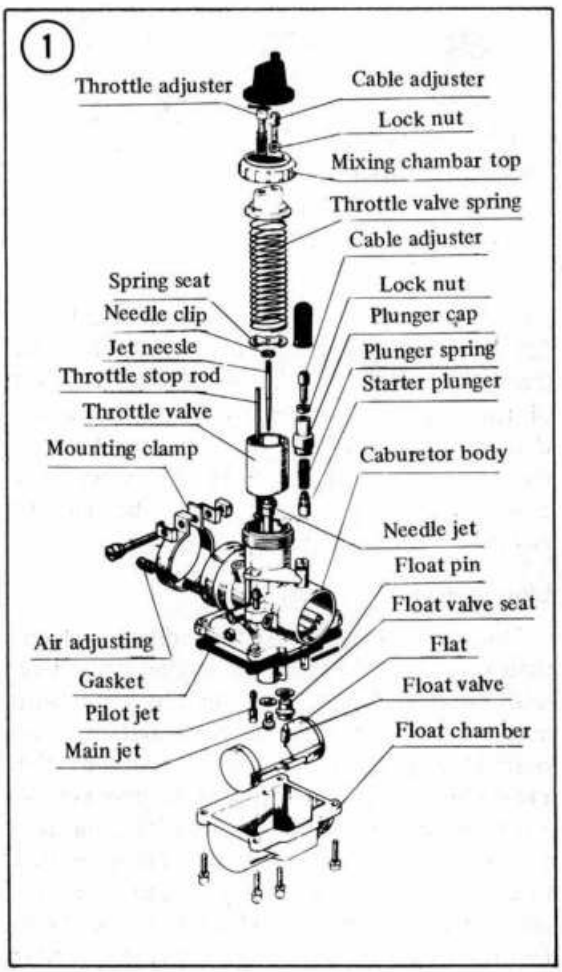
# CARBURETORS

For proper operation, a gasoline engine must be supplied with fuel and air, mixed in the proper proportions by weight. A mixture in which there is an excess of fuel is said to be rich. A lean mixture is one which contains insufficient fuel. It is the function of the carburetors to supply the proper mixture to the engine under all operating conditions.

Kawasaki multi cylinder machines have one carburetor for each cylinder.

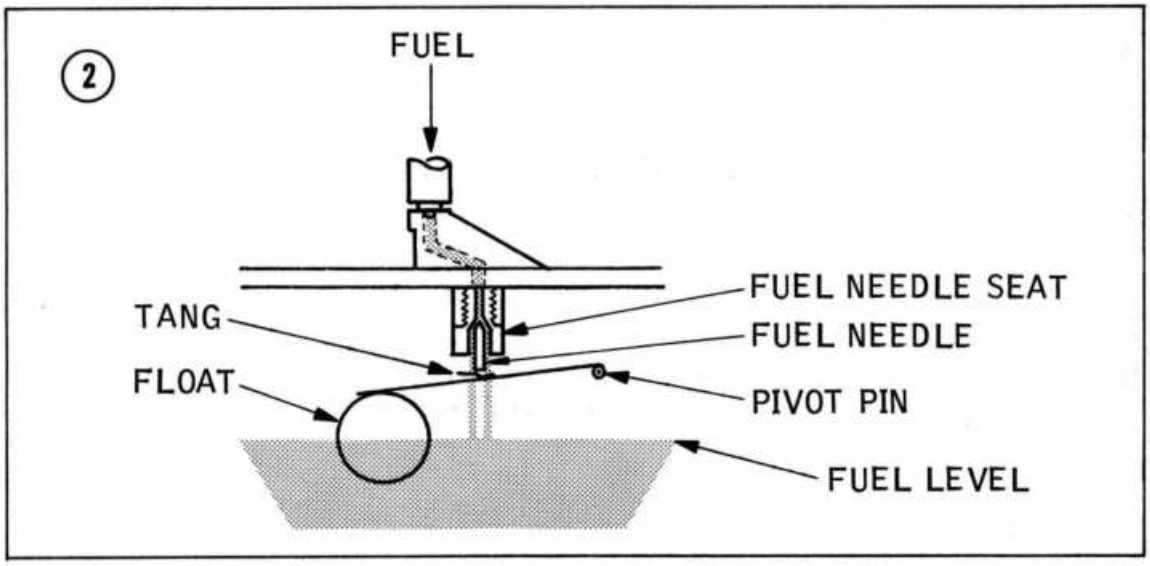
## CARBURETOR OPERATION

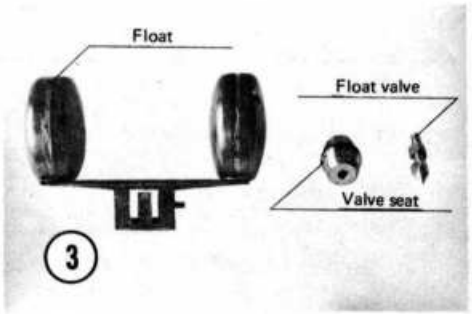
**Figure 1** is an exploded view of a typical carburetor. The essential functional parts are a float and float valve mechanism for maintaining a constant fuel level in the float bowl, a pilot system for supplying fuel at low speeds, a main fuel system which supplies the engine at medium and high speeds, and a starter system, which supplies the very rich mixture needed to start a cold engine. The operation of each system is discussed in the following paragraphs.

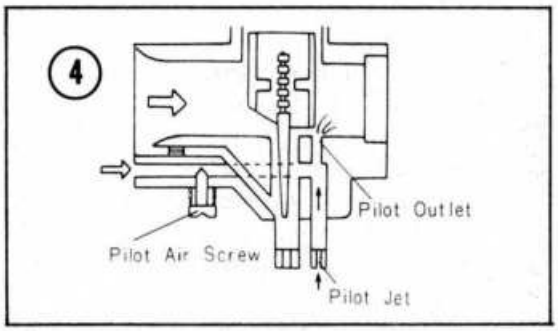



### Float Mechanism

**Figures 2 and 3** illustrate a typical float mechanism. Proper operation of the carburetor is dependent on maintaining a constant fuel level in the carburetor bowl. As fuel is drawn from the float bowl, the float level drops. When the float drops, the float valve moves away from its seat



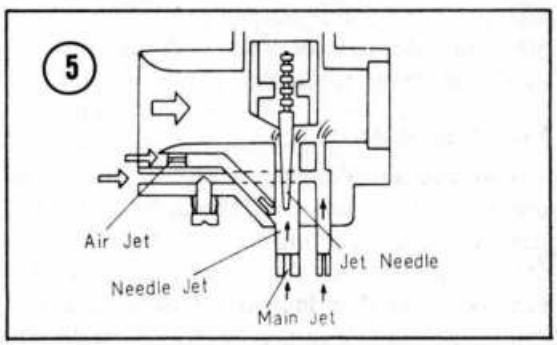

and allows fuel to flow past the valve into the float bowl. As this occurs, rises, eventually press the valve against its seat and shut off the flow of fuel. It can be seen from this discussion that a small piece of dirt can be trapped between the valve and seat, preventing the valve from closing and allowing fuel to rise beyond the normal level, resulting in flooding.

**Pilot System**

Under idle or low speed conditions, at less than one-eighth throttle, the engine doesn't require much fuel or air, and the throttle valve is almost closed. A separate pilot system is required for operation under such conditions. **Figure 4** illustrates the operation of the pilot system. Air is drawn through the pilot air inlet and controlled by the pilot air screw. The air is then mixed with fuel drawn through the pilot jet. The air/fuel mixture then travels from the pilot outlet into the main air passage, where it is further mixed with air prior to being drawn into the engine. The pilot air screw controls the idle mixture.

**Main Fuel System**

As the throttle is opened further, to about one-quarter open, the pilot circuit begins to supply less of the mixture to the engine, as the main fuel system, illustrated in **Figure 5**, begins to function. The main jet, the needle jet, the jet needle,



and the air jet make up the main fuel circuit. As the throttle valve opens more than about one-eighth of its travel, air is drawn through the main port, and passes under the throttle valve in the main bore. The velocity of the air stream results in reduced pressure around the jet needle. Fuel then passes through the main jet, past the needle jet and jet needle, and into the air stream where it is atomized and sent to the engine. As the throttle valve opens, more air flows through the carburetor, and the jet needle, which is attached to the throttle slide, rises to permit more fuel to flow.

A portion of the air bled past the air jet passes through the needle jet bleed air inlet into the needle jet, where the air is mixed with the main air stram and atomized.

Airflow at small throttle openings is controlled primarily by the cutaway on the throttle slide.

As the throttle is opened wide, up to about three-quarters open, the circuit draws air from two sources, as shown in **Figure 6**. The first source is air passing through the venturi; the second source is through the air jet. Air passing through the venturi draws fuel through the needle jet. The jet needle is tapered, and therefore allows more fuel to pass. Air passing through the air jet passes to the needle jet to aid atomization of the fuel there.

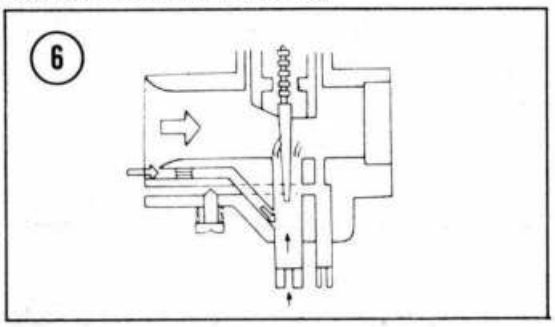
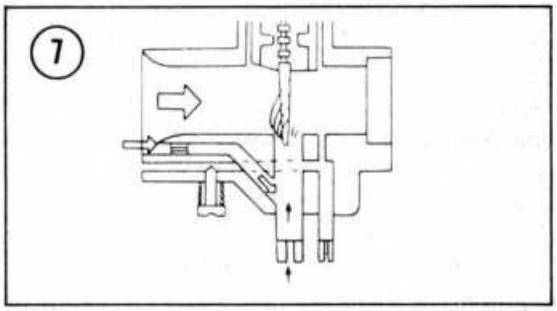
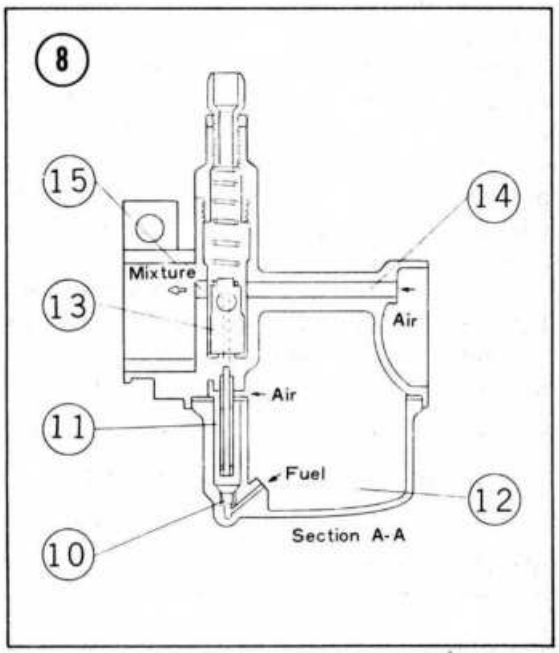



**Figure 7** illustrates the circuit at high speeds. The jet needle is withdrawn almost completely from the needle jet. Fuel flow is then controlled by the main jet. Air passing through the air jet continues to aid atomization of the fuel as described in the foregoing paragraph.

### Starter System

A cold engine requires a far richer mixture than a warm one. **Figure 8** illustrates the starter




system. When the rider operates the starter lever, the starter plunger (13) is pulled upward. As the engine is cranked, suction from the engine draws fuel through the starter jet (10). The fuel is then mixed with air from the bleed air port (11) in the float chamber (12). This mixture is further mixed with primary air which comes through the passage (14), and is then delivered to the engine through the port (15) behind the throttle valve. Note that the mixture from the starter system is mixed with that from the pilot system.

## CARBURETOR OVERHAUL

There is no set rule regarding frequency of carburetor overhaul. A carburetor on a machine used primarily for street riding may go 5,000 miles without attention. Used in dirt, the carburetor might need an overhaul in less than 1,000 miles. Poor engine performance, hesitation, and little or no response to idle mixture

adjustment are all symptoms of possible carburetor malfunction. As a general rule, its good practice to overhaul the carburetor each time you perform a routine decarbonization of the engine.

Remove the carburetor from the engine and disassemble it. Shake the float to check for gasoline inside. If fuel leaks into the float, the float chamber fuel level will rise, resulting in an overrich mixture. Replace the float if it is deformed or leaking.

Replace the float valve if its seating end is scratched or worn. Press the float valve gently with your finger and make sure that the valve seats properly. If the float valve does not seat properly, fuel will overflow, causing an overrich mixture and flooding of the float chamber whenever the fuel petcock is open.

Clean all parts in carburetor cleaning solvent. Dry the parts with compressed air. Clean the jets and other delicate parts with compressed air after the float bowl has been removed. Use new gaskets upon reassembly.

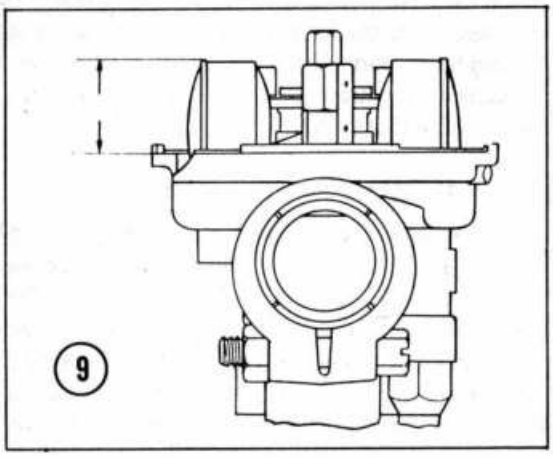
## CARBURETOR ADJUSTMENT

Carburetor adjustment is not normally required except for occasional setting of idling speed, or at time of carburetor overhaul.

### Float Level

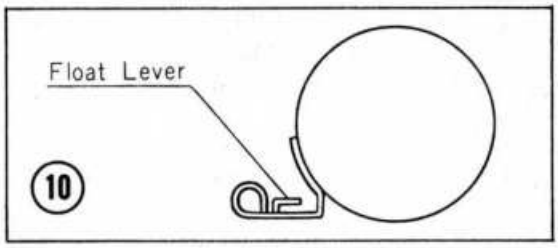
The machine was delivered with the float level adjusted correctly. Rough riding, a bent float arm, or a worn float needle and seat can cause the float level to change.

**Figure 9** illustrates the float level adjustment for these machines. Remove the carburetor, then remove the float chamber body. Measure distance "A" between the gasket surface and the top of the floats. Distance "A" must be equal for each float, and as listed in the following table.




| Model | Distance "A" |
|---|---|
| A1 Series | 1.06 - 1.14 in. (27-29mm) |
| A7 Series | 1.14 - 1.22 in. (29-31mm) |
| H1 | 1.14 - 1.22 in. (29-31mm) |

If the float level is not correct, bend the tang on the float (**Figure 10**) to make the adjustment.




### Standard Settings

The following table lists standard carburetor specifications. These specifications have been developed after exhaustive tests, and should not be changed unless there is definite reason to do so.

| Item | A1 Series | A7 Series | H1 |
|---|---|---|---|
| Type | VM22SC | VM28SC | VM28SC |
| Main jet | 140 | 97.5 | 100 |
| Needle jet | 0-6 | 0-4 | 0-2 |
| Jet needle | 4JI3-3 | 5EI4-4 | 5GL-3 |
| Pilot jet | 30 | 30 | 30 |
| Cutaway | 2.5 | 1.5 | 3.0 |
| Air screw | 1½ turns open | 1½ turns open | 1¼ turns open |

### Idle Speed Adjustment

To adjust idle speed on the various models, refer to the foregoing table. First set the idle mixture screw by turning it in until it seats lightly. Next, back it out the number of turns specified. Finally, adjust the idle speed. At higher altitudes, above approximately 3,000 feet (1,000 meters), it may be advisable to back out the mixture screw an additional quarter turn.

A suggested method for adjusting the idle speed is to warm up the engine, then stop it and disconnect all but one spark plug lead. Restart the engine, then very slowly reduce the idle

speed until the engine just dies. Repeat the procedure for each remaining cylinder. Reconnect the spark plug leads, and start the engine. Finally, adjust each idle speed screw equally to achieve the lowest stable idle speed.

**Carburetor Synchronization**

Power output from the cylinders will be unbalanced unless the carburetors are synchronized. If one cylinder receives more fuel/air mixture from its associated carburetor then the others, overall poor performance will result.

1. Remove the air filter connections.
2. Rotate the throttle grip to the full open position.
3. Look into the carburetor bores as you slowly rotate the throttle grip to the closed position. It may be helpful to use a small mirror to do so.
4. All slides must enter the carburetor bores at the same time. If they do not, use the cable adjuster at the top of the carburetor to raise or lower one slide to match the others.

**Speed Range Adjustments**

The carburetors on your machine were designed to provide the proper mixture under all operating conditions. Little or no benefit will result from experimenting. However, unusual operating conditions such as sustained operation at high altitudes or unusually high or low temperatures may make modifications to the standard specifications desirable. The adjustments described in the following paragraphs should only be undertaken if the rider has definite reason to believe they are required. Do not make any change to one carburetor without making a similar change to those remaining.

1. To adjust the carburetor for low speed operation, refer to Figure 4. With the engine warm and running at idle, open the throttle. If the engine does not accelerate smoothly from idle, turn each air screw in (clockwise) slightly to richen the mixture. If the condition still exists, return each air screw to its original position and replace each throttle valve with one having a smaller cutaway. If the engine operation is worsened by turning the air screws, replace each throttle valve with one having a larger cutaway.
2. For operation at throttle openings of one- to three-quarters, adjustment is made with the jet needles, as shown in Figure 6. To richen the mixture, place the jet needle clip in a lower groove. Conversely, placing the clip in a higher groove leans the mixture.
3. Figure 7 illustrates the fuel flow at and near full throttle operation. If at full throttle operation, the engine performs better when the starter lever is moved to the rich position, or when backing off, change the main jet to one with a larger number. If the engine shows evidence of running rich, change the main jet to one with a lower number.

Half throttle operation is controlled by the jet needle position, but main jet size has some influence also. For this reason, it is necessary to fifirst determine the main jet size. If half throttle tests show the mixture to be too lean, place the clip on the jet needle in a lower groove to richen the mixture. If the mixture at half throttle is too rich, place the clip in the next higher groove. Repeat the test as necessary.

Make road tests at full throttle and at half throttle for the final determination of main jet size and jet needle position. Since main jet size affects half throttle operation, make the full throttle tests first. To make such tests, operate the machine under each such condition for at least two minutes, then shut the engine off, release the clutch, and allow the machine to stop. After each such test, remove and examine the spark plug. The insulator should be a light tan color.

Full throttle operation is controlled by the main jet. If spark plug examination shows that the mixture is too lean, try a main jet with a higher number. Conversely, if the mixture was too rich, use a smaller jet. As a general rule, the main jet size should be reduced approximately five percent for each 3,300 feet above sea level.

The following table lists symptoms caused by rich and lean mixtures:

| Condition | Symptom |
|---|---|
| Rich Mixture | Rough idle<br>Black exhaust smoke<br>Hard starting, especially when hot<br>"Blubbering" under acceleration<br>Black deposits in exhaust pipe<br>Gas-fouled spark plug<br>Poor gas mileage<br>Engine performs worse as it warms up |

| | |
|---|---|
| Lean Mixture | Backfiring |
| | Rough idle |
| | Overheating |
| | Hesitation upon acceleration |
| | Engine speed varies at fixed throttle |
| | Loss of power |
| | White color on spark plug insulator |
| | Poor acceleration |
| | Performance improves if starter lever is held open |

A summary of carburetor adjustments is given in the following table:

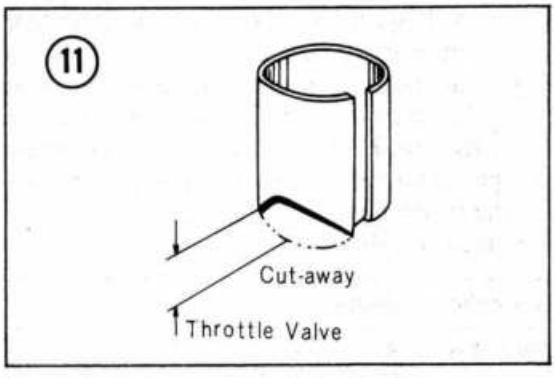
| Throttle Opening | Adjustment | If too Rich | If too Lean |
|---|---|---|---|
| 0 - 1/8 | Air screw | Turn out | Turn in |
| 1/8 - 1/4 | Throttle valve cut-away | Use larger cutaway | Use smaller cutaway |
| 1/4 - 3/4 | Jet needle | Raise clip | Lower clip |
| 3/4 to full | Main jet | Use smaller number | Use larger number |

## CARBURETOR COMPONENTS

The following paragraphs describe the various carburetor components which may be changed to vary performance characteristics.

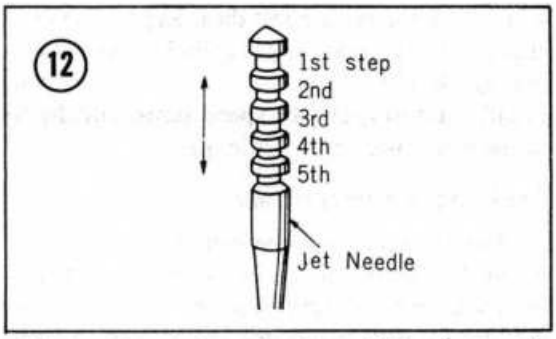
### Throttle Valve

**Figure 11** illustrates the throttle valve. The cutaway controls airflow at small throttle openings. Cutaway sizes are numbered. Larger numbers permit more air to flow at a given throttle opening and result in a leaner mixture. Conversely, smaller numbers result in richer mixture.




### Jet Needle

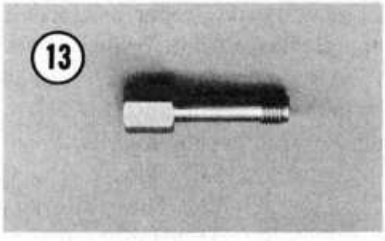
The jet needle **(Figure 12)** together with the needle jet, controls the mixture at medium speeds. As the throttle valve rises to increase airflow through the carburetor, the jet needle rises




with it. The tapered portion of the jet needle rises from the needle jet and allows more fuel to flow, providing the engine with the proper mixture at up to about three quarters throttle opening. The five grooves at the top of the jet needle permit adjustment of the mixture ratio in the medium speed range.

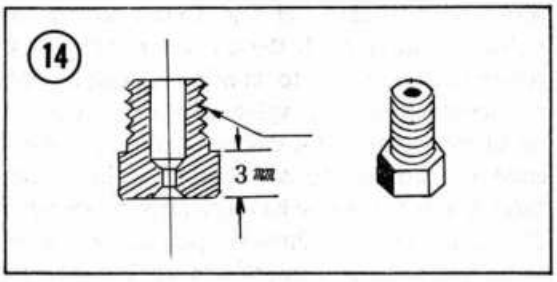
### Needle Jet

The needle jet **(Figure 13)** operates with the jet needle. Several holes are drilled through the side of the needle jet. These holes meter the airflow from the air jet. Air from the air jet is bled into needle jet to assist in atomization of fuel.




### Main Jet

**Figure 14** illustrates the main jet. The main jet controls the mixture at full throttle, and has some effect at lesser throttle openings. Each main jet is stamped with a number. Fuel flow is approximately proportional to the number. Larger numbers provide a richer mixture.



## MISCELLANEOUS CARBURETOR PROBLEMS

Water in the carburetor float bowl and sticking carburetor slide valves can result from careless washing of the motorcycle. To remedy the problem, remove and clean the carburetor bowl, main jet, and any other affected parts. Be sure to cover the air intake when you wash the machine.

Be sure that the ring nut on top of each carburetor is neither too tight nor too lose. If the carburetor mounting cinch bolt is loose, the carburetor can pivot, resulting in an improper mixture because the float level is changed.

If gasoline leaks past the float bowl gasket, high speed fuel starvation may occur. Varnish deposits on the outside of the float bowl point to this condition.

Dirt in the fuel may lodge in the float valve and cause an overrich mixture. As a temporary measure, tap the carburetor lightly with any convenient tool to dislodge the dirt. Clean the fuel tank, petcock, fuel line, and carburetor at the first opportunity, should this occur.

Check the starter plunger occasionally. The neoprene seal on the bottom may become damaged. If this occurs, fuel will leak into the chamber and eventually work its way into the carburetor venturi, causing the machine to run rich.

CHAPTER FIVE

# CHASSIS, SUSPENSION, AND STEERING

## FRAME

Frames on these machines are of welded steel tubing. **Figure 1** (next page) illustrates the frame on A1 and A7 series bikes. The H1 frame is shown in **Figure 2** (page 73). The double loop construction of the frame results in light weight and rigidity. The H1 frame is designed so that the rider may select either right or left braking and shifting.

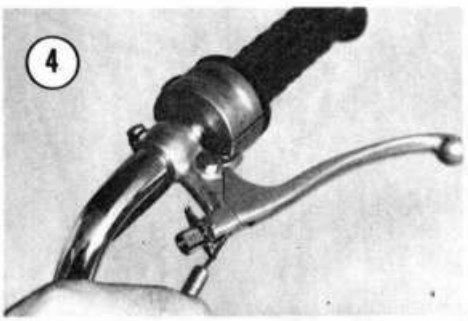
Service on the frame is limited to inspection for bending or cracked welds. Examine the frame carefully in the event that the machine has been in a collision or had a hard spill.

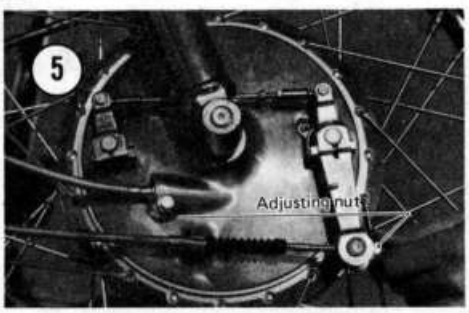
## HANDLEBAR

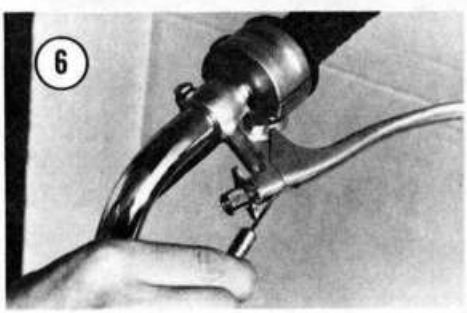
The handlebar is made from solid drawn steel tubing. Most of the manual controls (**Figure 3**) are mounted on the handlebar assembly. Wiring from the switches on the handlebar assembly is routed to the headlight assembly, where it is connected to the main wiring harness.

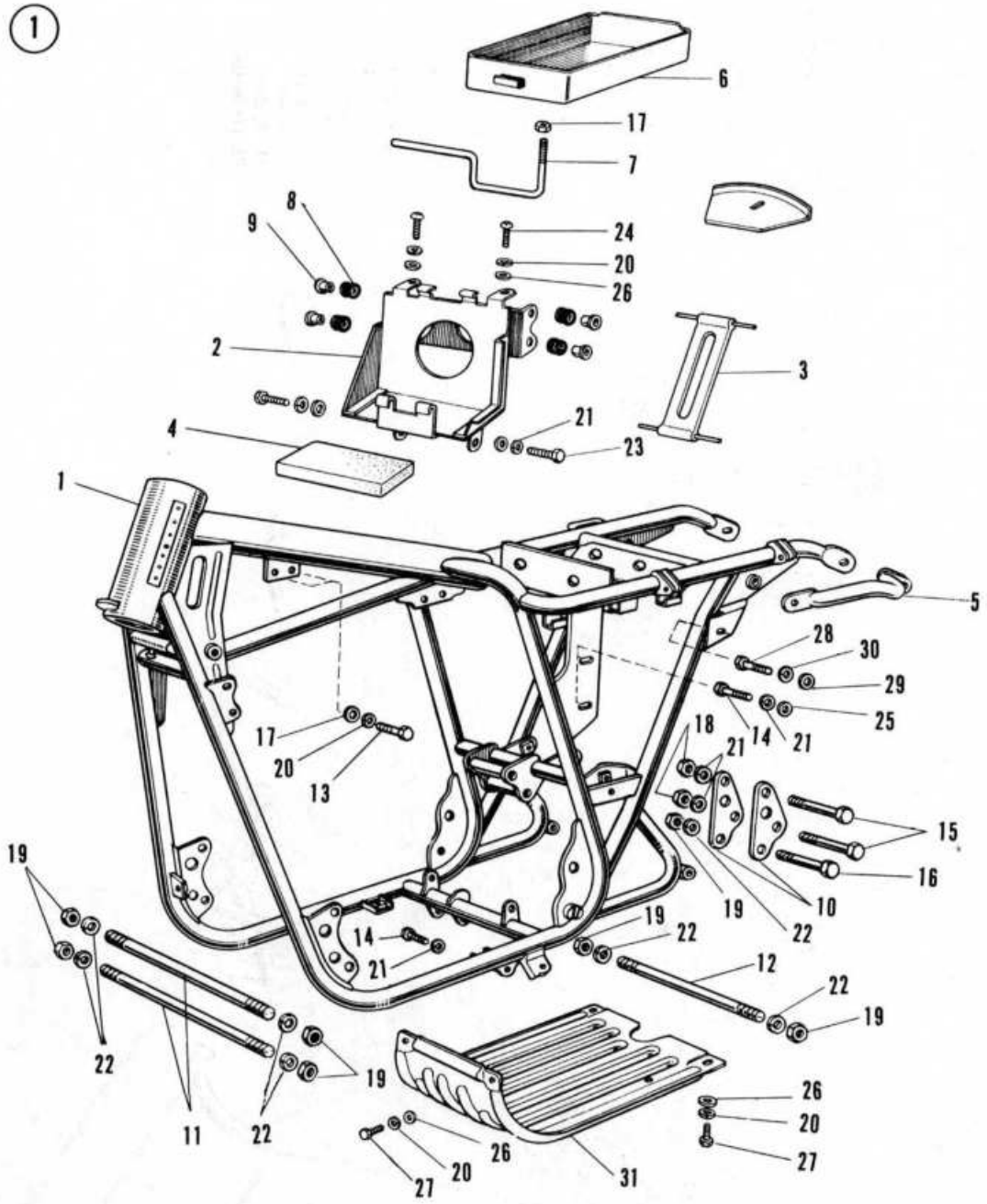
### Disassembly

1. Loosen the clutch cable lock nut (**Figure 4**), then rotate the adjustment nut to provide the inner clutch cable with sufficient slack to remove the clutch cable from the lever.
2. Loosen the front brake adjustment nut (**Figure 5**), then remove the brake cable (**Figure 6**) from the brake lever on the handlebar. On H1



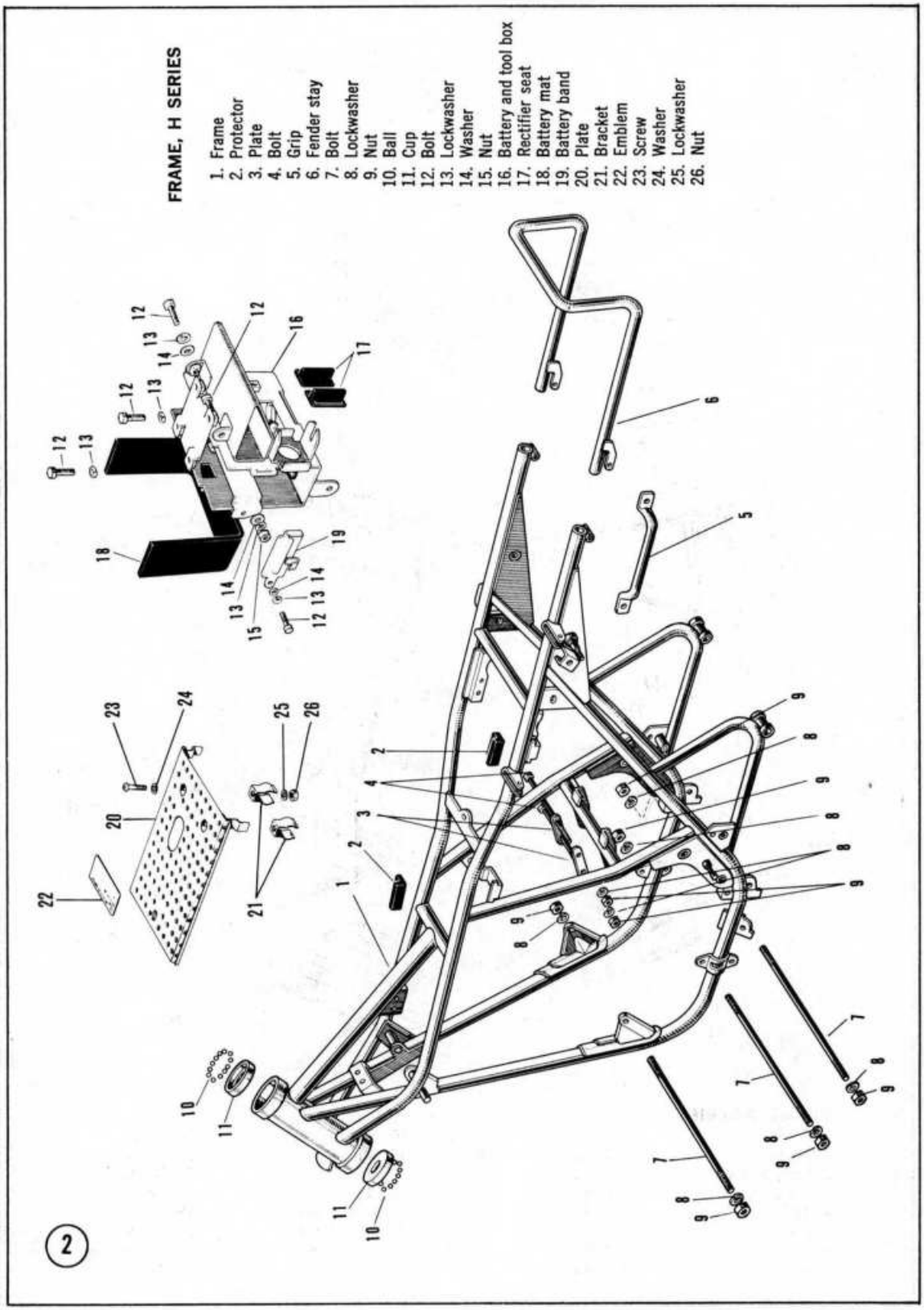



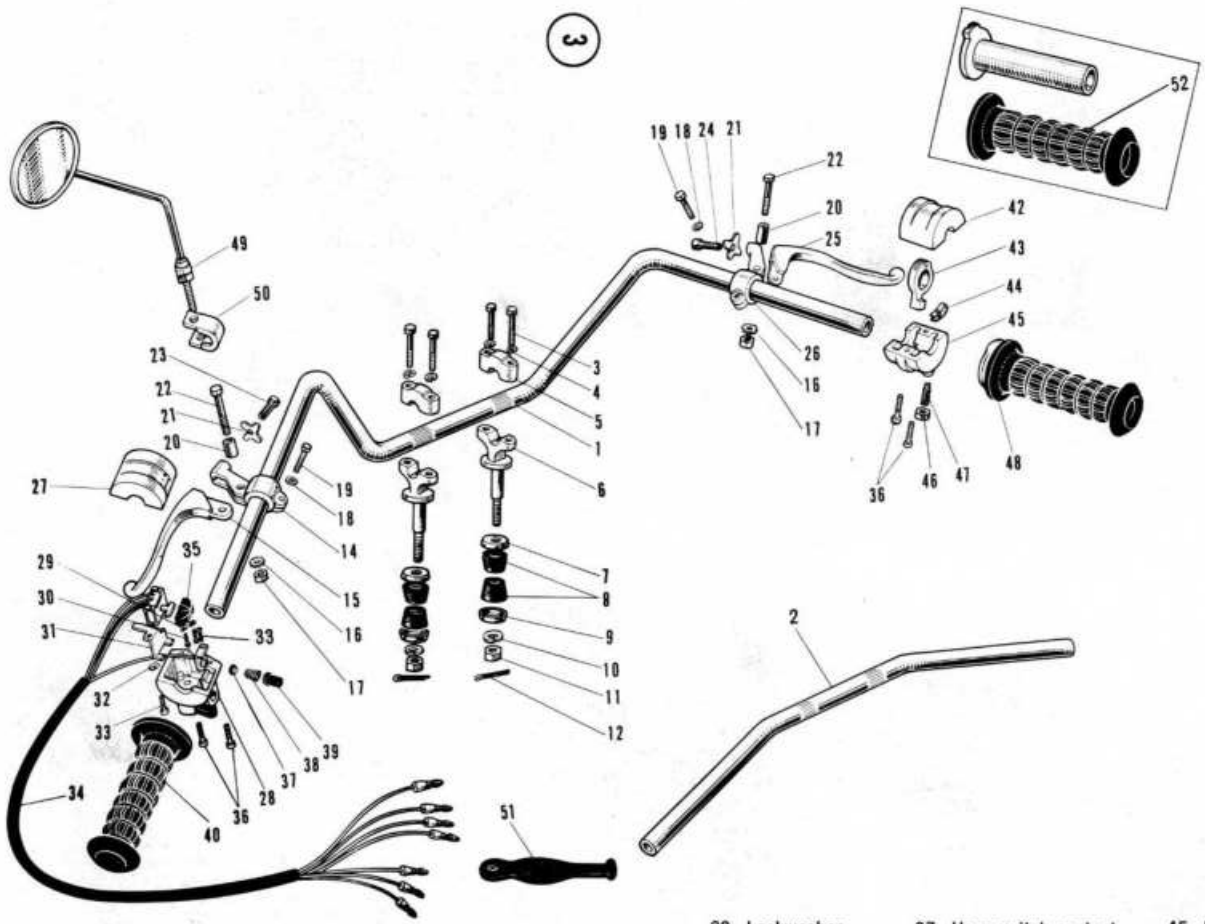






**FRAME, A SERIES**

1. Frame
2. Battery case
3. Battery band
4. Mat
5. Grip
6. Tool box
7. Stay
8. Bushing
9. Washer
10. Plate
11. Bolt
12. Bolt
13. Bolt
14. Bolt
15. Bolt
16. Bolt
17. Nut
18. Nut
19. Nut
20. Lockwasher
21. Lockwasher
22. Lockwasher
23. Bolt
24. Screw
25. Washer
26. Washer
27. Bolt
28. Bolt
29. Washer
30. Washer
31. Guard

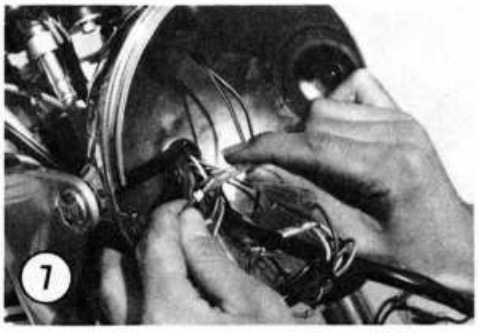

FRAME, H SERIES
1. Frame
2. Protector
3. Plate
4. Bolt
5. Grip
6. Fender stay
7. Bolt
8. Lockwasher
9. Nut
10. Ball
11. Cup
12. Bolt
13. Lockwasher
14. Washer
15. Nut
16. Battery and tool box
17. Rectifier seat
18. Battery mat
19. Battery band
20. Plate
21. Bracket
22. Emblem
23. Screw
24. Washer
25. Lockwasher
26. Nut
2



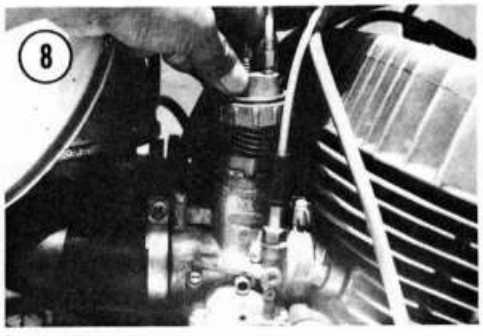

**HANDLEBARS**

1. Handlebar
2. Low handlebar
3. Bolt
4. Lockwasher
5. Upper holder
6. Lower holder
7. Handlebar holder cap
8. Damper rubber
9. Handlebar holder cap
10. Lockwasher
11. Nut
12. Cotter Pin
13. Not used
14. Clutch lever assembly
15. Clutch lever
16. Lockwasher
17. Nut
18. Lockwashef
19. Bolt
20. Collar
21. Lock nut
22. Bolt
23. Cable adjusting screw
24. Cable adjusting screw
25. Brake lever
26. Not used
27. Upper case
28. Lower case
29. Lockwasher
30. Screw
31. Wiring holder
32. Lockwasher
33. Screw
34. Wiring harness
35. Knob
36. Screw
37. Horn switch contact
38. Horn button spring
39. Horn button
40. Handlebar grip
41. Not used
42. Upper case
43. Starter lever
44. Spring
45. Lower case
46. Nut
47. Screw
48. Grip
49. Not used
50. Bracket
51. Band
52. Handlebar grip

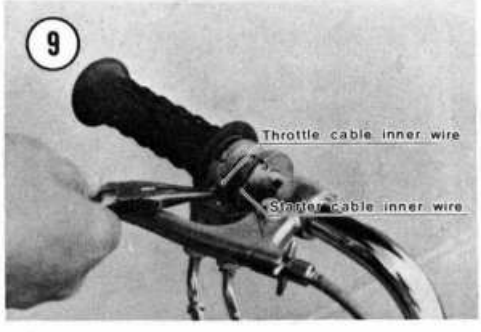
machines, the front brake stop lamp switch is built into the front brake cable. Disconnect the switch lead (**Figure 7**) from the main wire harness before you remove the cable.




3. Remove the throttle cables from the carburetors, as shown in **Figure 8**.

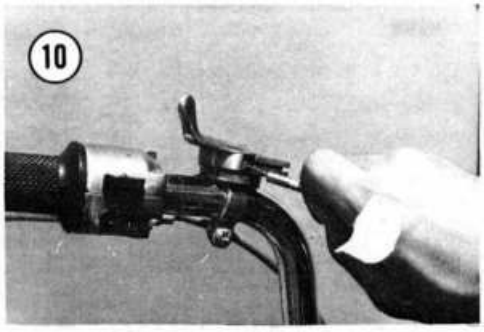



4. Disassemble the throttle grip assembly (**Figure 9**), then remove the control cable.




5. Disassemble the starter lever (**Figure 10**), then remove the starter cable. On H1 models, the throttle and starter cables are built into the throttle grip assembly.

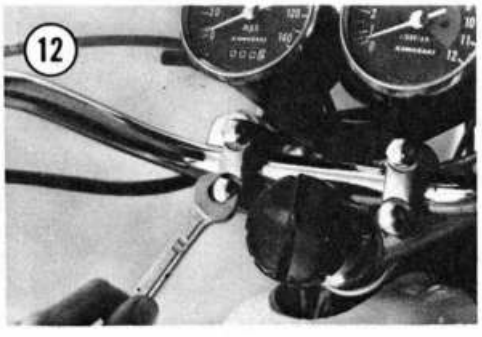
6. Remove the horn, turn signal, and headlight leads from the wire harness inside the headlight assembly, then disassemble the left-hand grip assembly (**Figure 11**).







7. Remove the clamp bolts (**Figure 12**), then remove the handlebar from the bracket.



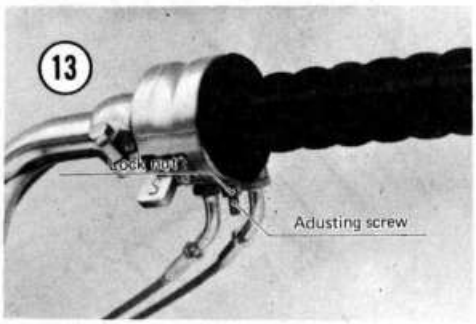

### Inspection

Examine the handlebar for cracking or bending. Minor bends may be straightened. Replace handlebars if any cracks exist, or in the event of major bending.

### Installation

Reverse the removal procedure to install the handlebars. Pass the wiring through the handlebar tubing and through the cord protector in the headlight. After installation, adjust the play in the throttle, clutch, and starter lever cables. Adjust the play in the front brake lever to 0.8 to 1.2 inches (20 to 30 millimeters) by means of the

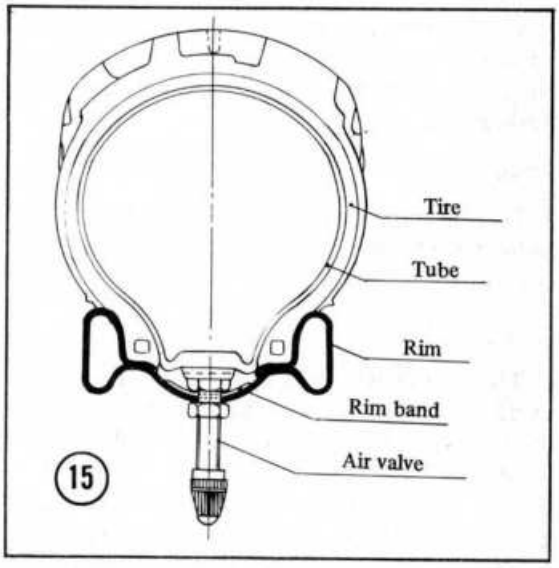
adjusting nut on the brake. Adjust the throttle grip with the adjustment screw (**Figure 13**), as desired.




## WHEELS AND TIRES

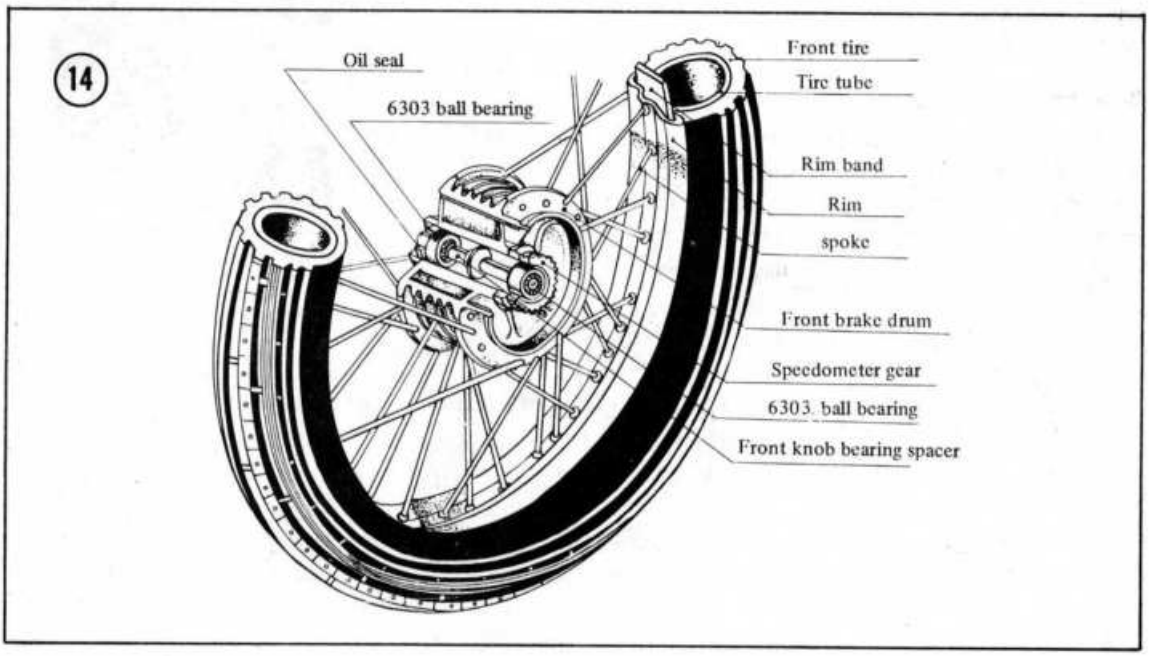
### Tires

**Figure 14** is a cutaway view of a typical wheel and tire assembly. **Figure 15** is a sectional view of a tire mounted on its rim. Various tire sizes are fitted to Kawasaki machines. Refer to the specifications for tire sizes for your machine. Tires are available in various tread types to suit riding requirements. The following table lists normal tire pressures for the various models, measured with the tires cold. It is normal for tire pressure to increase after prolonged operation. Do not bleed air from a hot tire to decrease the pressure.




| Model | Tire Pressure | |
|---|---|---|
| | Pounds per Square Inch | |
| | Front | Rear |
| A1 | 24 | 31 |
| A1SS | 24 | 31 |
| A7 | 24 | 31 |
| A7SS | 24 | 31 |
| H1 | 26 | 31 |

NOTE: *Adjust tire pressure on models A1R and A7R to suit the course.*



Check tires periodically for wear, bruises, cuts, or other damage. Remove any small stones lodged in the tread. Use a small screwdriver or similar tool.

### Rims

The rim supports the tire and provides rigidity to the wheel assembly. A rim band protects the inner tube from abrasion.

### Spokes

The spokes support the weight of the motorcycle and rider, and transmit tractive and braking forces, as shown in **Figure 16**. Diagram A illustrates action of the spokes as they support the machine. Tractive forces are shown in diagram B. Braking forces are shown in diagram C.

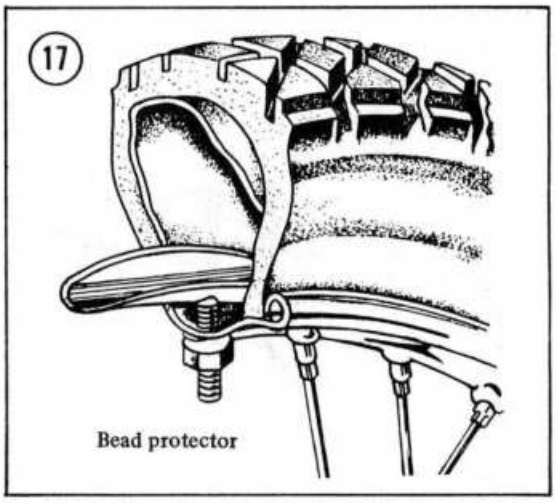
Check spokes periodically for looseness or bending. A bent or otherwise faulty spoke will adversely affect neighboring spokes, and should therefore be replaced immediately. To remove a spoke, completely unscrew the threaded portion, then remove the bent end from the hub.

Spokes tend to loosen with mileage. Retighten each spoke one turn, beginning with those on one side of the hub, then those on the other side. Tighten the spokes on a new bike after the first 50 miles of operation, then at 50-mile intervals until they no longer loosen.

If the machine is subjected to particularly severe service, as in off-road or competition riding, check the spokes frequently.

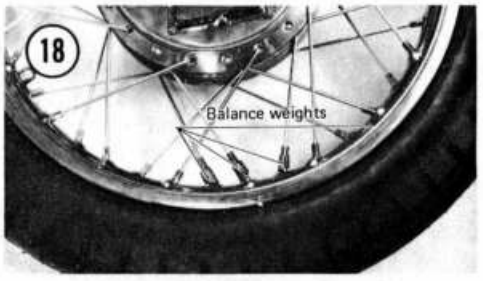
### Bead Protector

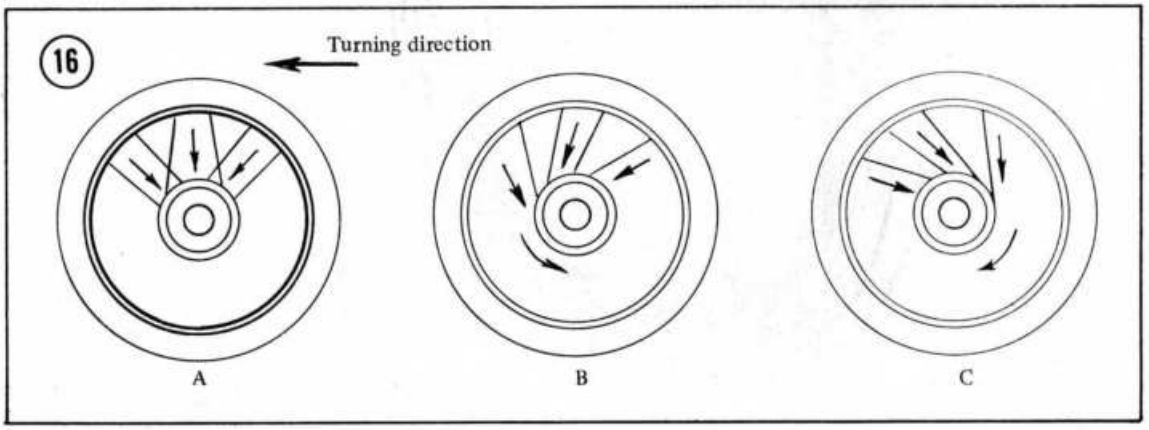
H1 machines are equipped with a bead protector **(Figure 17)** on each wheel. The bead protector prevents the tire from slipping on the rim, especially during maximum effort braking at high speeds, and thereby prevents damage to the valve stem.




### Wheel Balance

An unbalanced wheel is unsafe. Depending on the degree of unbalance and the speed of the motorcycle, you may experience anything from mild vibration to a violent shimmy which may even result in loss of control. Balance weights **(Figure 18)** are applied to the spokes on the light side of the wheel to correct this condition.



Before attempting to balance the wheel, be sure that the wheel bearings are in good condition and properly lubricated, and that the brakes do not drag, so that the wheel rotates freely. With the wheel free of the ground, spin it slowly and allow it to come to rest by itself. Add balance weights to the spokes on the light side as required, so that the wheel comes to rest at a different position each time it is spun. Balance weights are available in weights of 10, 20, and 30 grams. Remove the drive chain when you balance the rear wheel.

### Front Hub

**Figure 19** is an exploded view of a typical front hub. The entire hub assembly rotates on two ball bearings. The speedometer gears transmit the front wheel rotation to the speedometer. The brake panel supports the brake mechanism.

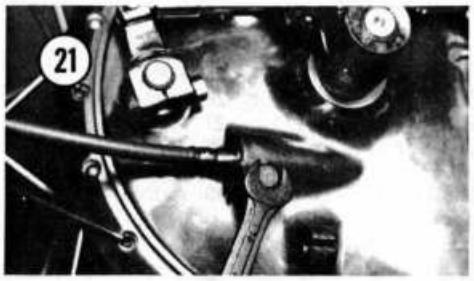
### Rear Hub

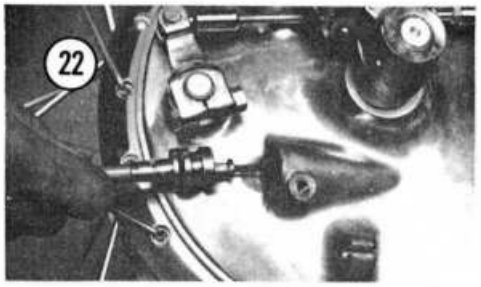
An exploded view of the rear hub is shown in **Figure 20** (page 80). The rear hub consists of four major parts: the brake drum, the brake panel, the sprocket coupling, and the rear sprocket. The rear wheel bearings are mounted in the brake drum. The brake panel supports the brake mechanism, except for the brake drum. The sprocket coupling absorbs shocks throughout the entire drive train. The sprocket transmits engine power to the rear wheel through the sprocket coupling. The H1 rear hub is equipped with an adjustable ventilator for brake cooling.

### Front Wheel Removal

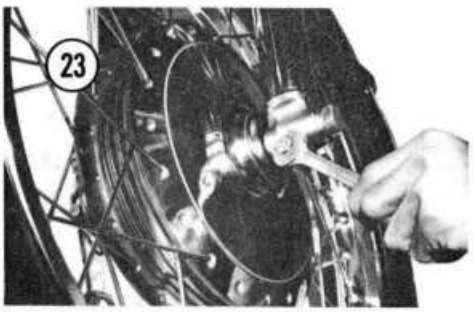
Front wheel removal is similar for all models. Proceed as follows:

1. Loosen the front brake adjustment nut, then remove the brake cable at the front hub.
2. Remove the speedometer cable bolt (**Figure 21**), then pull out the speedometer cable (**Figure 22**).

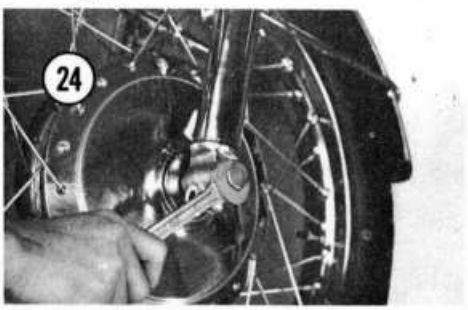



3. Raise the front of the motorcycle and support it on a box or stand under the engine.
4. Remove the shaft pinch bolt (**Figure 23**).

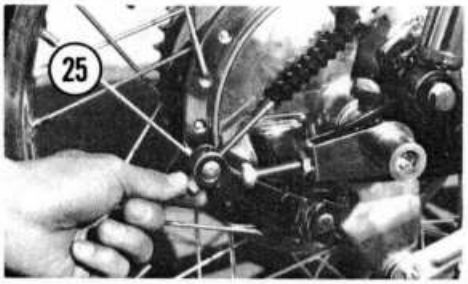


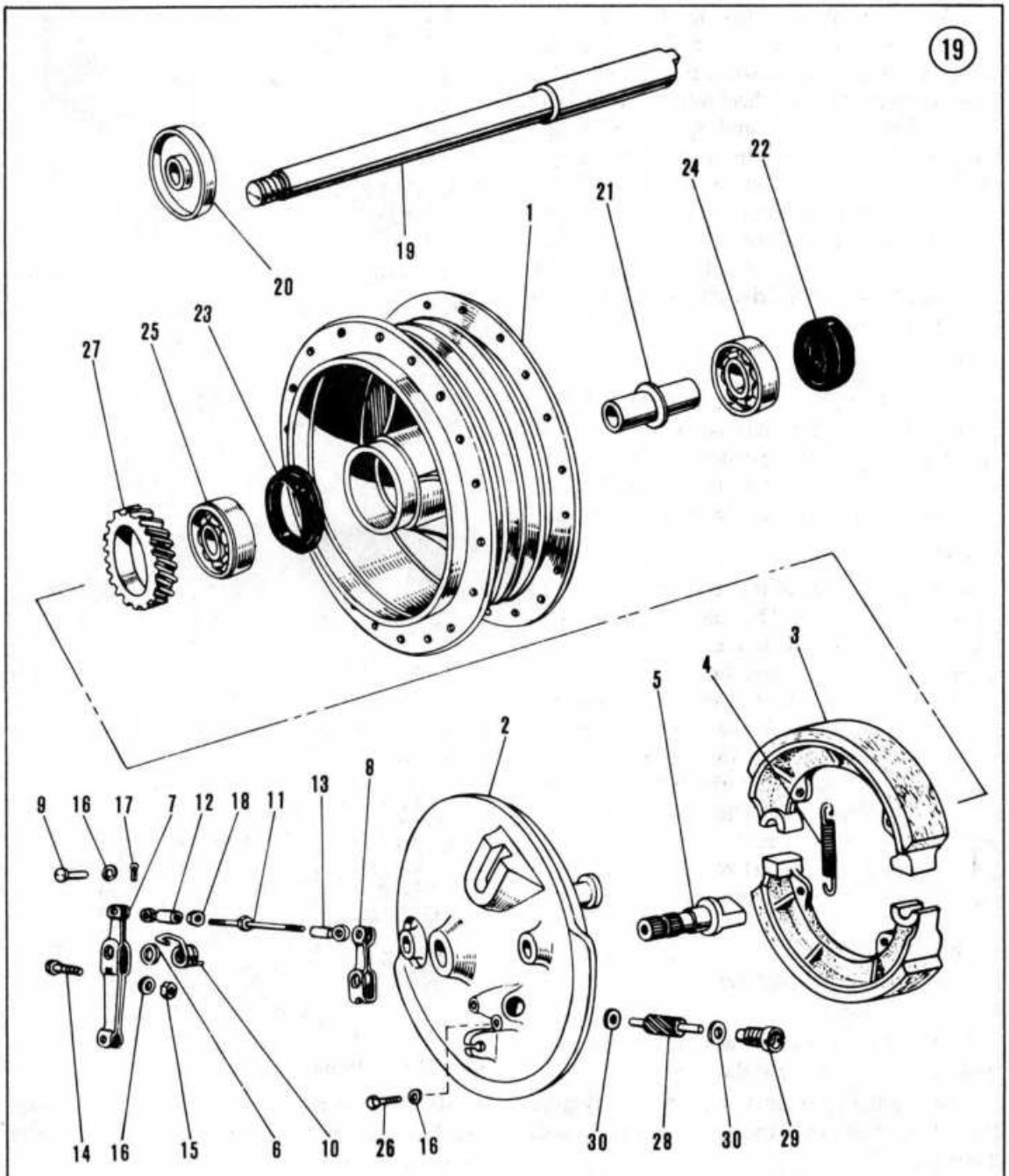

5. Remove the front hub shaft nut (**Figure 24**) on the side of the front brake panel.
6. Pull out the shaft and remove the wheel from the motorcycle.




### Rear Wheel Removal

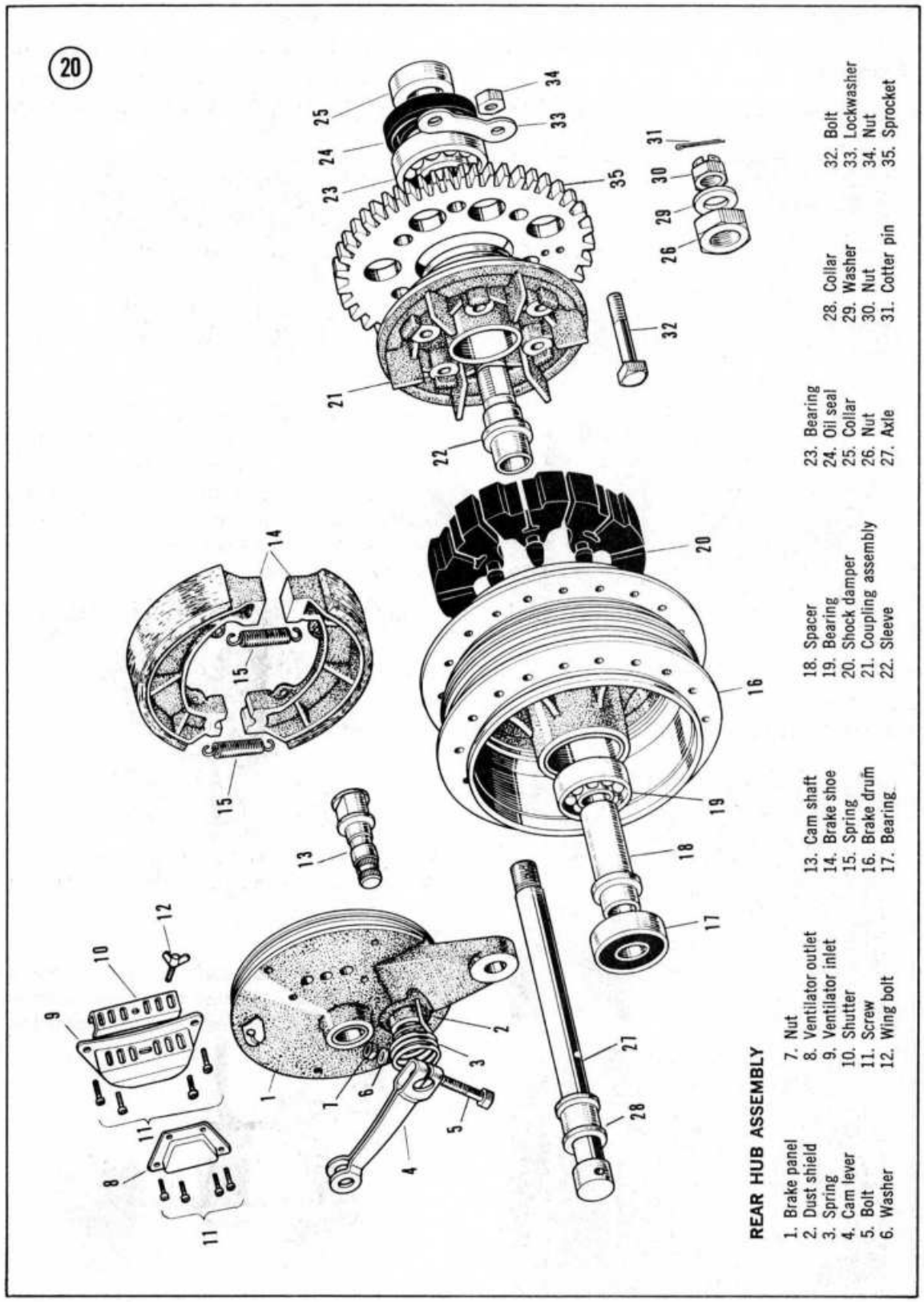
1. Remove the rear brake adjustment nut (**Figure 25**), then remove the inner brake cable from the brake lever.






**FRONT HUB ASSEMBLY**

1. Brake drum
2. Brake panel assembly
3. Brake shoe
4. Spring
5. Cam shaft
6. Dust shield
7. Lever
8. Lever
9. Pin
10. Spring
11. Connecting rod
12. Rod end
13. Rod end
14. Bolt
15. Nut
16. Washer
17. Cotter pin
18. Nut
19. Axle
20. Collar
21. Spacer
22. Oil seal
23. Oil seal
24. Ball bearing
25. Ball bearing
26. Bolt
27. Speedometer gear
28. Speedometer pinion
29. Bushing
30. Washer

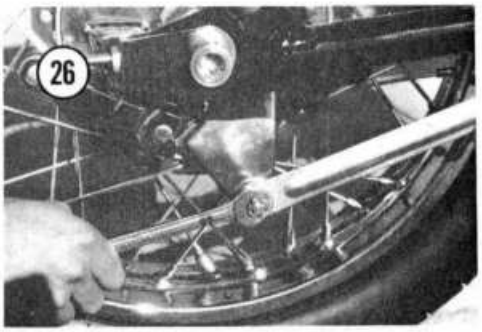


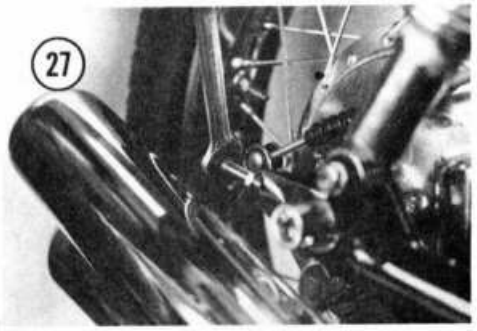

**REAR HUB ASSEMBLY**

1. Brake panel
2. Dust shield
3. Spring
4. Cam lever
5. Bolt
6. Washer
7. Nut
8. Ventilator outlet
9. Ventilator inlet
10. Shutter
11. Screw
12. Wing bolt
13. Cam shaft
14. Brake shoe
15. Spring
16. Brake drum
17. Bearing.
18. Spacer
19. Bearing
20. Shock damper
21. Coupling assembly
22. Sleeve
23. Bearing
24. Oil seal
25. Collar
26. Nut
27. Axle
28. Collar
29. Washer
30. Nut
31. Cotter pin
32. Bolt
33. Lockwasher
34. Nut
35. Sprocket

2. Remove the torque link (**Figure 26**).

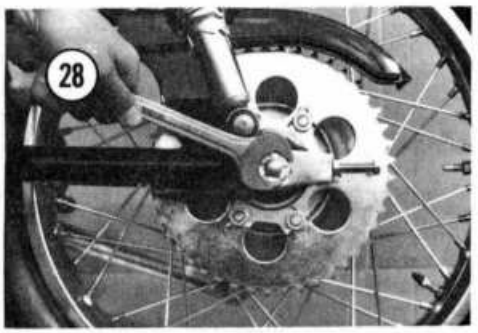
3. Loosen the chain tension adjustment bolts (**Figure 27**).




4. Remove the shaft nut (**Figure 28**).

5. Pull out the shaft, then remove the wheel and rear brake assembly together (**Figure 29**).

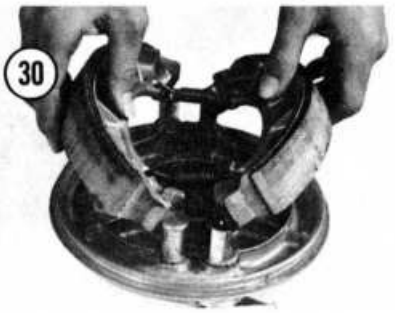






**Wheel Disassembly**

1. Lift the brake shoes, as shown in **Figure 30**, to remove them from the brake panel. The brake shoes and retracting springs will come out together.



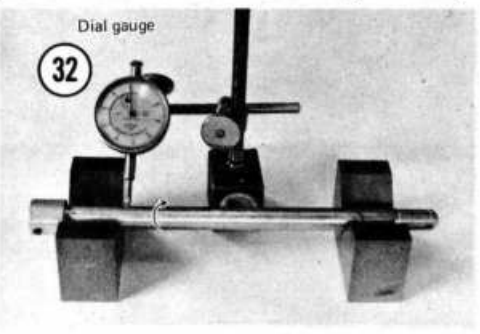

2. Insert a long drift punch (**Figure 31**) from the inner side of the brake drum, with its end against the inner race of the wheel bearing on the opposite side. Drive out the bearing and oil seal together. Be sure to reposition the drift punch after each hammer blow so that the bearing is not cocked in its bore.




3. Insert the drift punch from the other side of the brake drum, then repeat step (2) to drive out the other bearing.

**Inspection**

1. Support each wheel shaft in a lathe, V-blocks, or other suitable centering device as shown in **Figure 32**. Rotate the shaft through a complete



revolution. Straighten or replace the shaft if it is bent more than 0.02 inch (0.5 millimeter).

2. Check the inner and outer races of the wheel bearings for cracks, galling, or pitting. Rotate the bearings by hand and check for roughness. Replace the bearings if they are worn or damaged.

3. Inspect the main and auxiliary lips of the oil seal for wear or damage. Replace the oil seal if in doubt about its condition.

4. Inspect the rubber shock dampers in the rear hub. Replace the dampers if worn or damaged.

### Wheel Reassembly

Reverse the disassembly to reassemble the wheels. Observe the following notes as you reassemble the wheel.

1. Clean the wheel bearings carefully, then lubricate them before you install them.

2. Use an arbor press to install the bearings and oil seals. Be sure that the bearings and seals are seated squarely in their bores. Grease the oil seal lips upon assembly.

3. Be sure that there are no scratches, oil, or grease on the inner surface of the brake drum, or on the friction surfaces of the brake shoes. Clean the contact surfaces thoroughly with lacquer thinner before assembly.

4. The rubber shock dampers are tapered. Be sure that they are not reversed as you install them. The H1 shock damper has a projection in the center. Insert this projection into the hole in the brake drum (**Figure 33**).



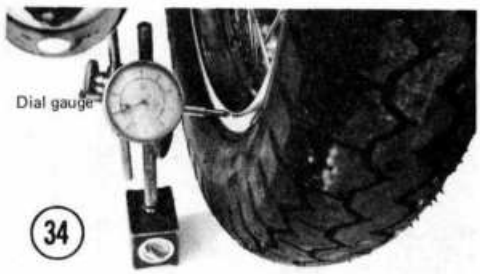

5. Tighten the axle shaft nuts as follows:

| Model | Rear | Front |
|---|---|---|
| A Series | 65-93 ft-lb (9-13 kg-m) | 44-58 ft-lb (6-8 kg-m) |
| H Series | 65-93 ft-lb (9-13 kg-m) | 65-93 ft-lb (9-13 kg-m) |

6. Check the wheels for runout after assembly.

### Checking Wheel Runout

To measure runout of the wheel rim, support the wheel so that it is free to rotate. Position a dial indicator as shown in **Figure 34**. Observe the dial indicator as you rotate the wheel through a complete revolution. The runout limit for all models is 0.12 inch (3.0 millimeters). Excessive runout may be caused by a bent rim or loose spokes. Repair or replace as required.




## BRAKES

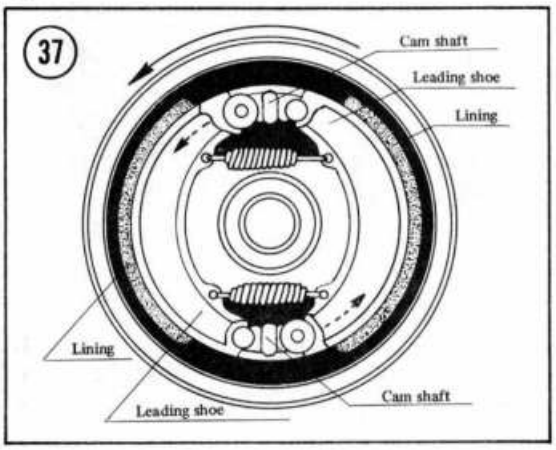
Each brake consists of a brake pedal or lever, cable, brake panel assembly, and brake drum. The brake panel assembly consists of the cam lever, cam shaft, brake shoes, retracting springs, and brake panel body. Front brakes are of the dual leading shoe type. The rear brakes have one leading and one trailing shoe. Both brakes are equipped with stop light switches (**Figures 35 and 36**).





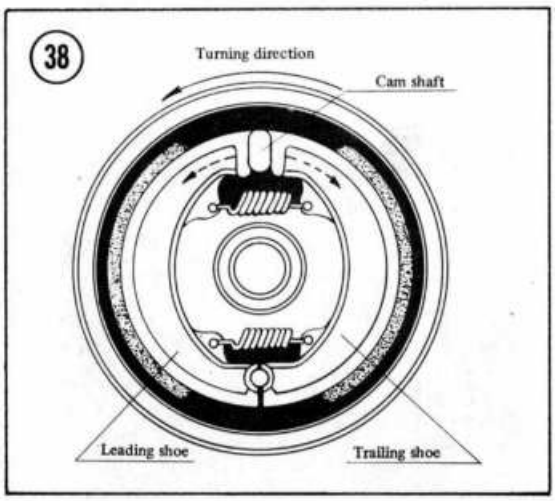

### Front Brakes

The front brake mechanism is shown in **Figure 37**. Two cam shafts are used, one for each brake shoe. As each cam shaft turns, it forces its associated shoe into contact with the brake drum. Notice that as the brake drum turns counterclockwise, the movement of the brake drum tends to increase the pressure of the brake shoe against the drum, thereby increasing the braking power. Because of the self-energizing action of both brake shoes, this brake arrangement is sometimes called a dual leading shoe type.



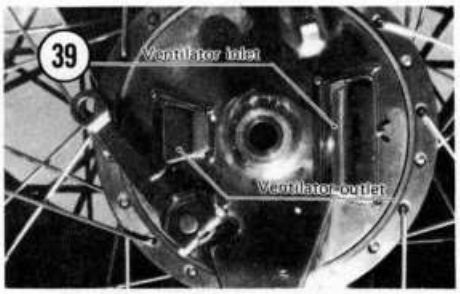

### Rear Brake

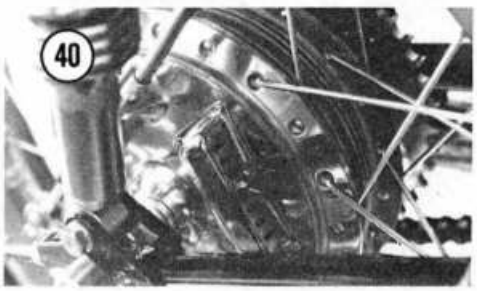
**Figure 38** illustrates the rear brake. There is only one cam shaft, which operates both brake shoes. When the cam shaft turns, it forces both shoes against the brake drum. The movement of the brake drum tends to increase the pressure of the forward shoe against the drum, therefore the forward shoe is a leading shoe because of the self-energizing effect. The rear shoe, however, makes contact with the drum rotation, and the self-energizing effect does not occur. Therefore, the rear brake shoe is a trailing shoe.




### Brake Ventilator

The rear brake on model H1 is equipped with a ventilator (**Figure 39**). The ventilator allows air to circulate within the brake mechanism, relieving the heat generated by the use of the brake. In wet weather, however, water may enter the brake and impair braking efficiency. Under wet riding conditions the ventilator inlet should be closed (**Figure 40**).

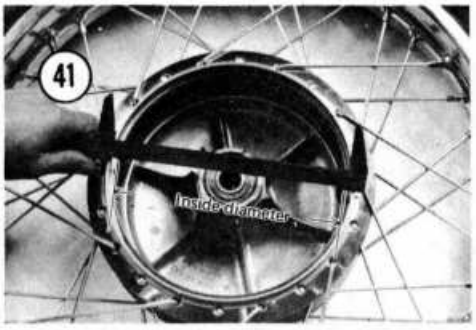


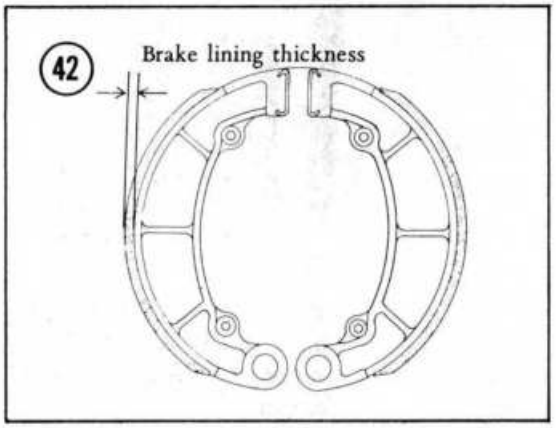

### Brake Inspection

Measure the inner diameter of the brake drum, as shown in **Figure 41**. Brake drum wear limits are listed in the following table. Replace the drum if it is worn beyond the service limit.

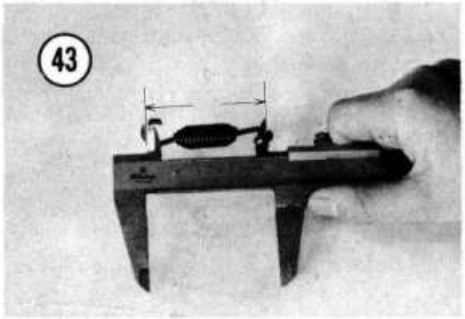
| Model | Standard Value | | Repair Limit | |
|---|---|---|---|---|
| | Front Inches (Millimeters) | Rear Inches (Millimeters) | Front Inches (Millimeters) | Rear Inches (Millimeters) |
| A Series | 7.08 (180) | 7.08 (180) | 7.12 (180.75) | 7.12 (180.75) |
| H1 | 7.87 (200) | 7.08 (180) | 7.90 (200.75) | 7.12 (180.75) |




Examine the brake lining for oil or other foreign material. Replace any oil-soaked lining immediately. Dirt imbedded in the brake lining may be removed with a wire brush. Measure the thickness of the brake lining (**Figure 42**) at the thinnest part. Standard thickness for all models is 0.192 inch (5 millimeters). Replace both shoes if the thinnest portion of the lining on either shoe is worn to 0.118 inch (3 millimeters).




If the brake shoe return spring is worn or stretched, the brake shoes will not retract fully and the brakes may drag. Measure the free length (**Figure 43**) of the return spring. Replace the spring if it is stretched beyond the repair limit.

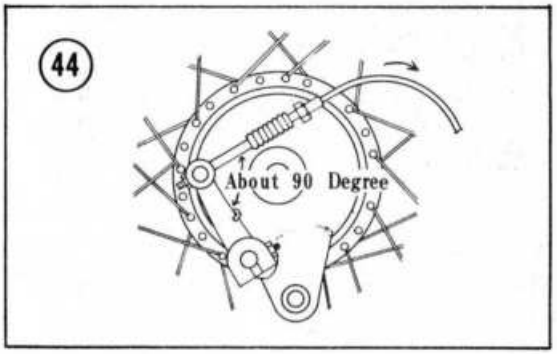



| Model | Standard Value | | Repair Limit | |
|---|---|---|---|---|
| | Front Inches (Millimeters) | Rear Inches (Millimeters) | Front Inches (Millimeters) | Rear Inches (Millimeters) |
| A Series | 1.80 (46) | 2.2 (56) | 1.92 (49) | 2.32 (59) |
| H1 | 2.40 (60) | 2.62 (66.5) | 2.48 (63) | 2.74 (69.5) |

Measure the clearance between the brake cam shift and the bushing in the brake panel. Standard clearance for all models is 0.0008 to 0.0028 inch (0.02 to 0.07 millimeter). Replace the cam shaft and/or the brake panel if the clearance exceeds 0.02 inch (0.5 millimeter).

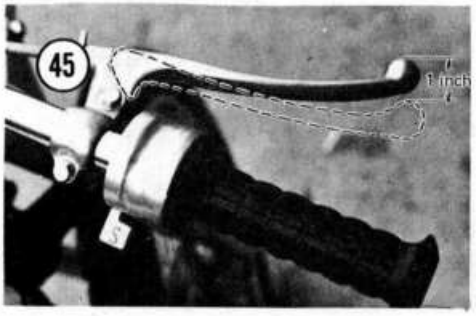
### Brake Reassembly

To reassemble the brake mechanism, reverse the disassembly procedure. Be sure that the front brake cable is approximately perpendicular to the brake cam lever (**Figure 44**). Be sure to grease the brake pedal bearing, brake lever, and the brake cam shaft bearings in the brake panels.



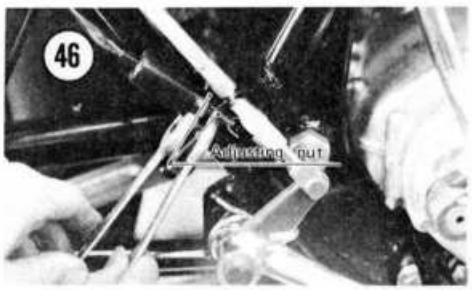

### Brake Adjustment

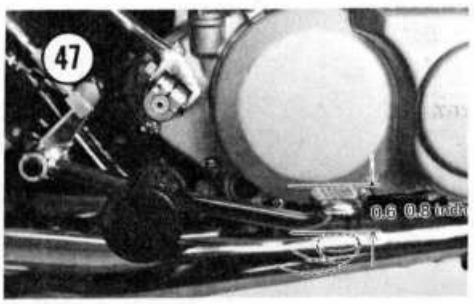
Adjust the front brake by turning the adjustment nut at the front brake cam lever. The adjustment is correct if braking action begins when the front brake lever (**Figure 45**) is pulled ap-



proximately 1 inch (25 millimeters). Since the front brake stop lamp switch is built into the cable, no adjustment is required.

Adjust the rear brake by turning the adjustment until braking action begins at 1.0 to 1.4 inches (25 to 35 millimeters) travel of the brake pedal. Adjust the rear brake stop lamp switch (**Figure 46**) so that the stop lamp lights when the brake pedal has traveled 0.6 to 0.8 inch (15 to 20 millimeters) as shown in **Figure 47**.




Adjustment of the front brake lever connecting rod is normally not required, except after replacement of the brake shoes. To adjust the lever, proceed as follows:

1. Support the machine so that the front wheel is clear of the ground.
2. Remove the brake lever connecting rod.
3. Spin the front wheel, then tighten the adjustment nut until the front brake drags very slightly.
4. Replace the connecting rod, then shorten or lengthen it as required so that the second brake shoe makes contact with the drum. Brake drag will increase at this point.
5. Readjust the front brake.

## FRONT FORKS

Two types of front forks are used on these machines. An exploded view of the fork on A series machines is shown in **Figure 48** (next page). The H1 fork is shown **Figure 49** (page 87). Both forks are oil-damped, with internal springs.

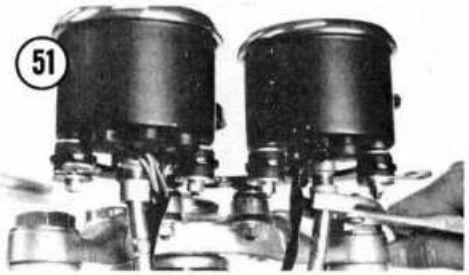
### Fork Removal

The initial steps for fork removal are similar for all models. Proceed as follows:

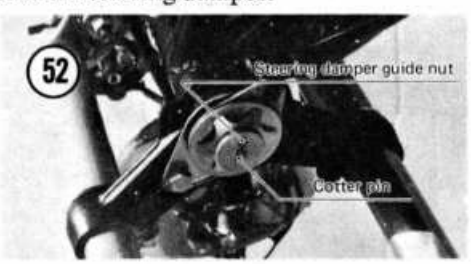
1. Remove all connectors in the headlight assembly from the main wire harness.
2. Remove the headlight assembly (**Figure 50**).

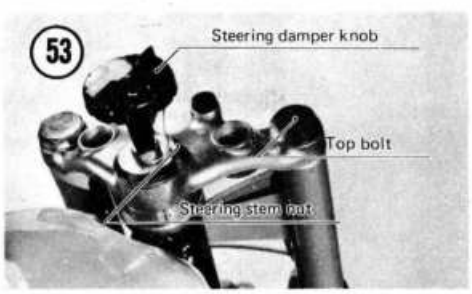


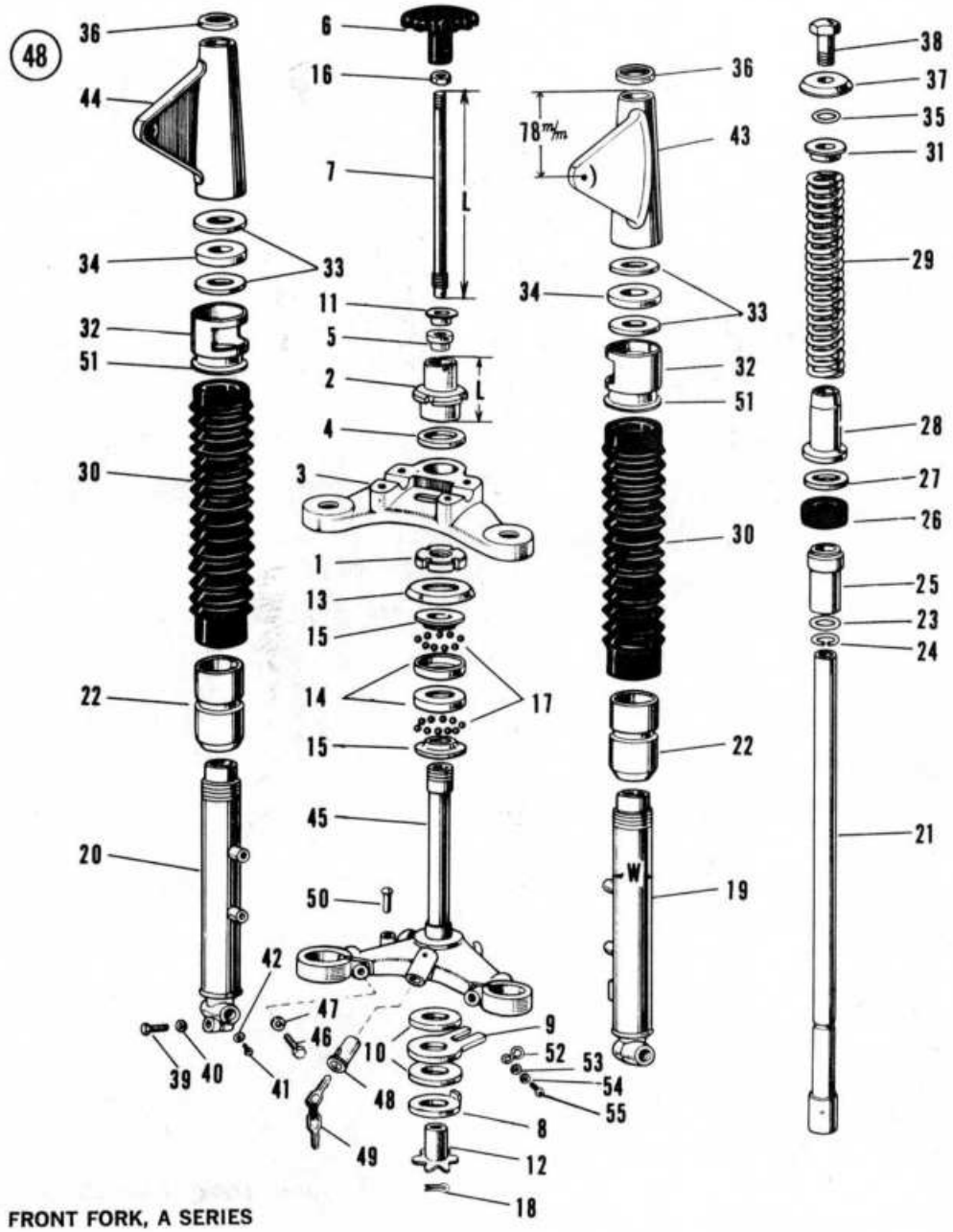

3. Remove the speedometer and tachometer, as shown in **Figure 51**.




4. Remove the cotter pin and nut at the lower end of the steering damper rod (**Figure 52**). Then loosen the steering damper knob (**Figure 53**) and remove the steering damper.

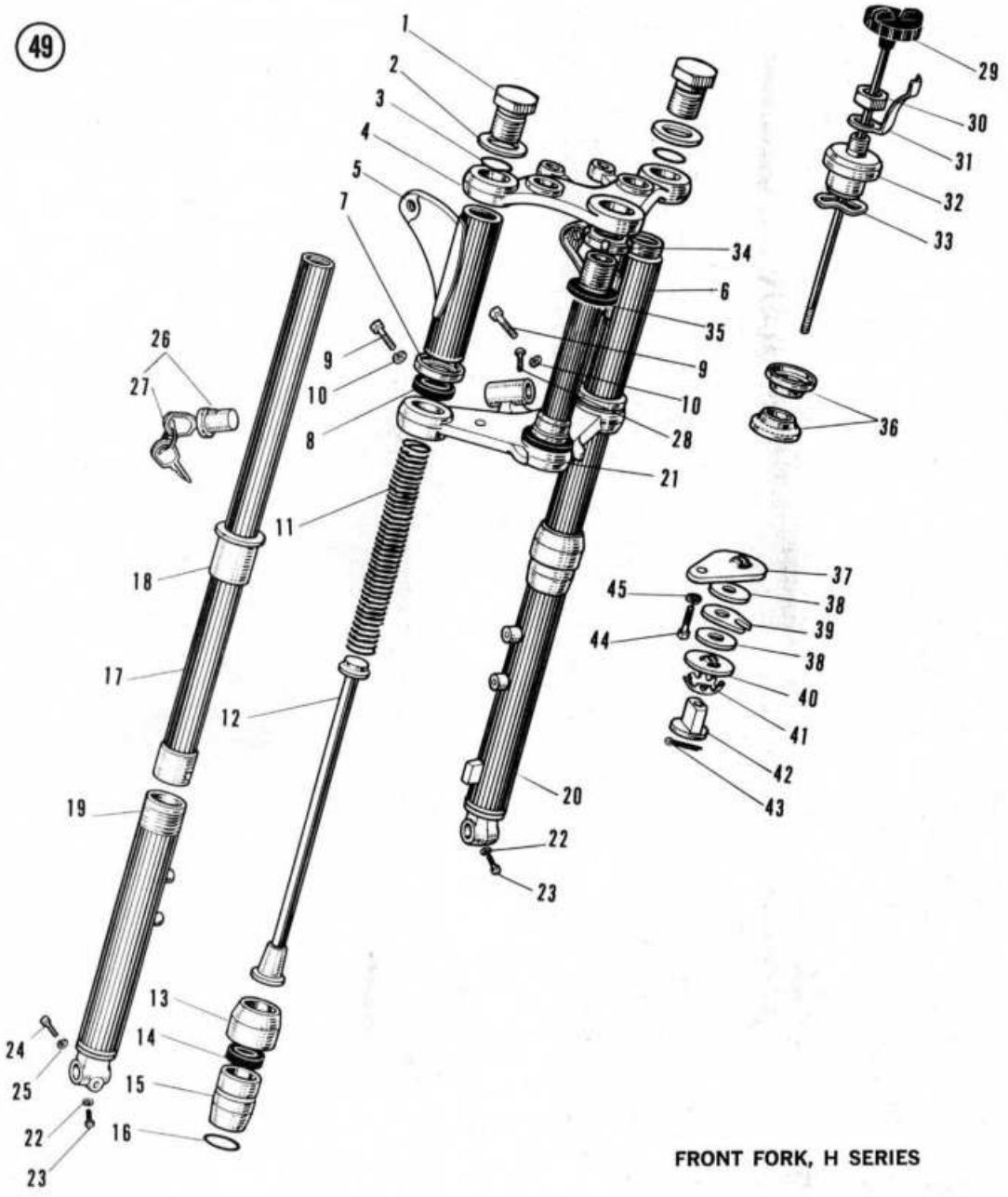





**FRONT FORK, A SERIES**

1. Lock nut
2. Steering stem nut
3. Steering steam head
4. Washer
5. Bushing
6. Damper knob
7. Rod
8. Disc
9. Stopper
10. Friction disc
11. Washer
12. Spring
13. Steering stem cap
14. Cup
15. Race
16. Lock nut
17. Ball
18. Cotter pin
19. Fork outer tube
20. Fork outer tube
21. Fork inner tube
22. Tube nut
23. O-ring
24. Snap ring
25. Guide
26. Oil seal
27. Washer
28. Dust shield
29. Spring
30. Dust cover
31. Spring guide
32. Cover guide
33. Washer
34. Gasket
35. O-ring
36. Cap
37. Washer
38. Bolt
39. Bolt
40. Lockwasher
41. Screw
42. Gasket
43. Fork cover
44. Fork cover
45. Steering stem
46. Bolt
47. Lockwasher
48. Lock assembly
49. Key set
50. Rivet
51. Dust cover holder
52. Clamp
53. Washer
54. Lockwasher
55. Screw

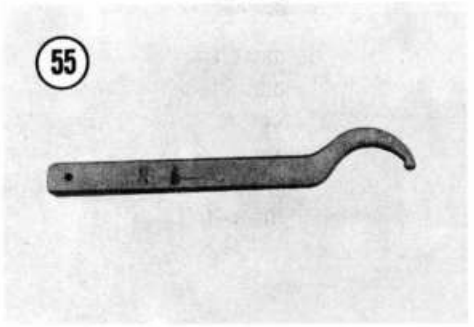



FRONT FORK, H SERIES

1. Bolt
2. Washer
3. O-ring
4. Steering stem head
5. Fork cover
6. Fork cover
7. Washer
8. Gasket
9. Bolt
10. Lockwasher
11. Spring
12. Spring holder
13. Dust shield
14. Oil seal
15. Tube nut
16. O-ring
17. Fork inner tube
18. Tube guide
19. Fork outer tube
20. Fork outer tube
21. Steering stem
22. Gasket
23. Screw
24. Bolt
25. Lockwasher
26. Lock assembly
27. Key set
28. Rivet
29. Knob
30. Nut
31. Spring
32. Steering stem nut
33. Washer
34. Lock nut
35. Cap
36. Ball race
37. Damper steel plate
38. Damper friction plate
39. Anchor plate
40. Damper steel plate
41. Spring
42. Nut
43. Cotter pin
44. Bolt
45. Lockwasher

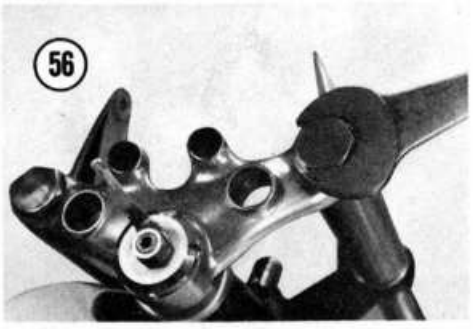
5. Remove the steering stem nut (**Figure 54**) with the special spanner wrench (**Figure 55**).

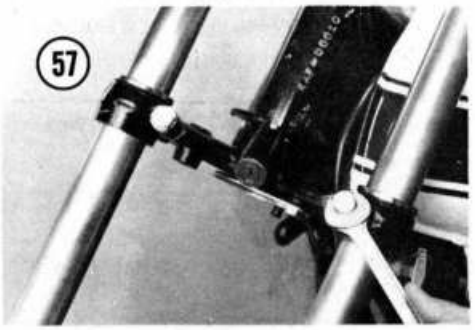




6. Remove the top bolts (**Figure 56**).

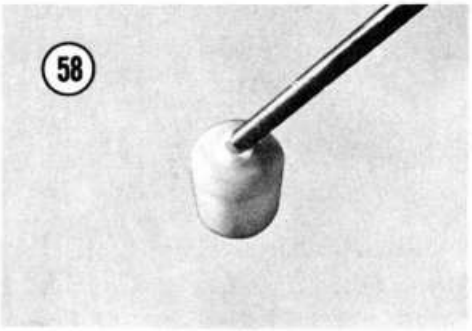
7. Remove the underbracket bolts (**Figure 57**), then pull out the fork legs.



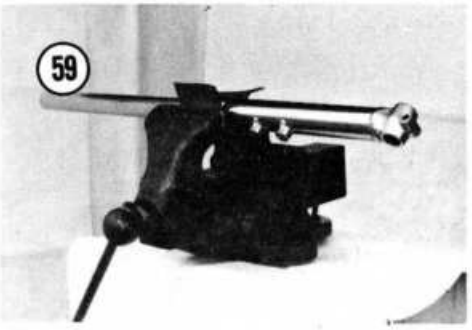


**Fork Disassembly**

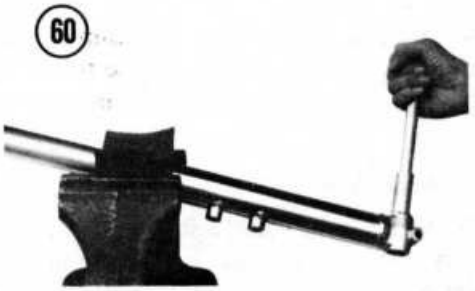
1. Invert the fork and drain the oil, as shown in **Figure 58**.



2. Wrap a piece of rubber sheeting or section of inner tube around the outer tube nut, and clamp the nut in a vise (**Figure 59**). Be careful that you do not deform the tube by clamping the vise too tightly.

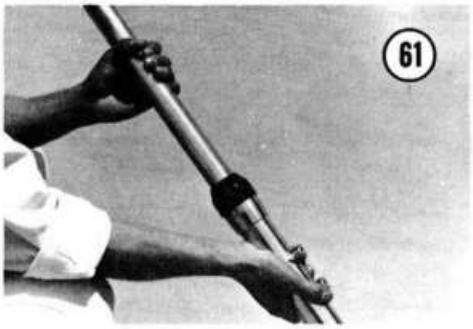


3. Turn the outer tube counterclockwise to separate the tubes. The outer tube may be turned easily by using the front axle shaft as a lever, as shown in **Figure 60**.



**Inspection**

1. Assemble the inner and outer tubes (**Figure 61**), then slide them together. Check for loose-

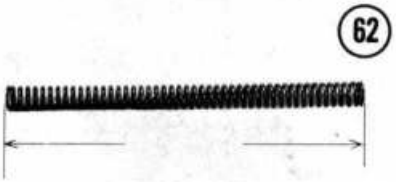



ness, noise, or binding. Replace defective parts.

2. Any scratches or roughness on the inner tube in the area where it passes through the oil seal will damage the oil seal. Examine this area carefully.

3. Inspect the dust seal carefully. If this seal is damaged, foreign material will enter the fork.

4. Measure the free length of each fork spring (**Figure 62**). Replace any spring which is shorter than the repair limit.




| Model | Standard Value | | Service Limit | |
|---|---|---|---|---|
| | Inches | (Millimeters) | Inches | (Millimeters) |
| A Series | 8.0 | (202.5) | 7.56 | (192) |
| H1 | 13.58 | (345) | 13.18 | (335) |

### Fork Reassembly

Reverse the disassembly procedure to reassemble the fork. Be sure to replace the oil seal and O-ring which are attached to the outer tube nut.

### Fork Installation

On A series machines, insert the fork through the lower part of the steering stem, pull it into position with the fork tool, then temporarily tighten the steering stem bolt (**Figure 63**). Install the top bolt, then again loosen the steering stem bolt and check the fork for play. Finally, retighten the top bolt, then the steering stem bolt.




On H1 models, insert the fork from underneath the steering stem. Push the inner tube up until the end of the tube contacts the stepped portion of the steering stem head (**Figure 64**), then install and tighten the top bolt. Finally, install the steering stem bolt.




### Front Fork Oil

Change the front fork oil initially at 300 miles (500 kilometers) and at every 3,000 miles (5,000 kilometers) thereafter. The following table lists the proper oil quantity for each fork leg. Refer to the notes for the proper oil mixture ratio.

| Model | Quantity U.S. Quart (cubic centimeters) | Note |
|---|---|---|
| A Series | 0.210 (200) | 1 |
| H1 | 0.243 (230) | 2 |

NOTES: *1. Four parts 30-weight engine oil mixed with one part 60-weight spindle oil.*

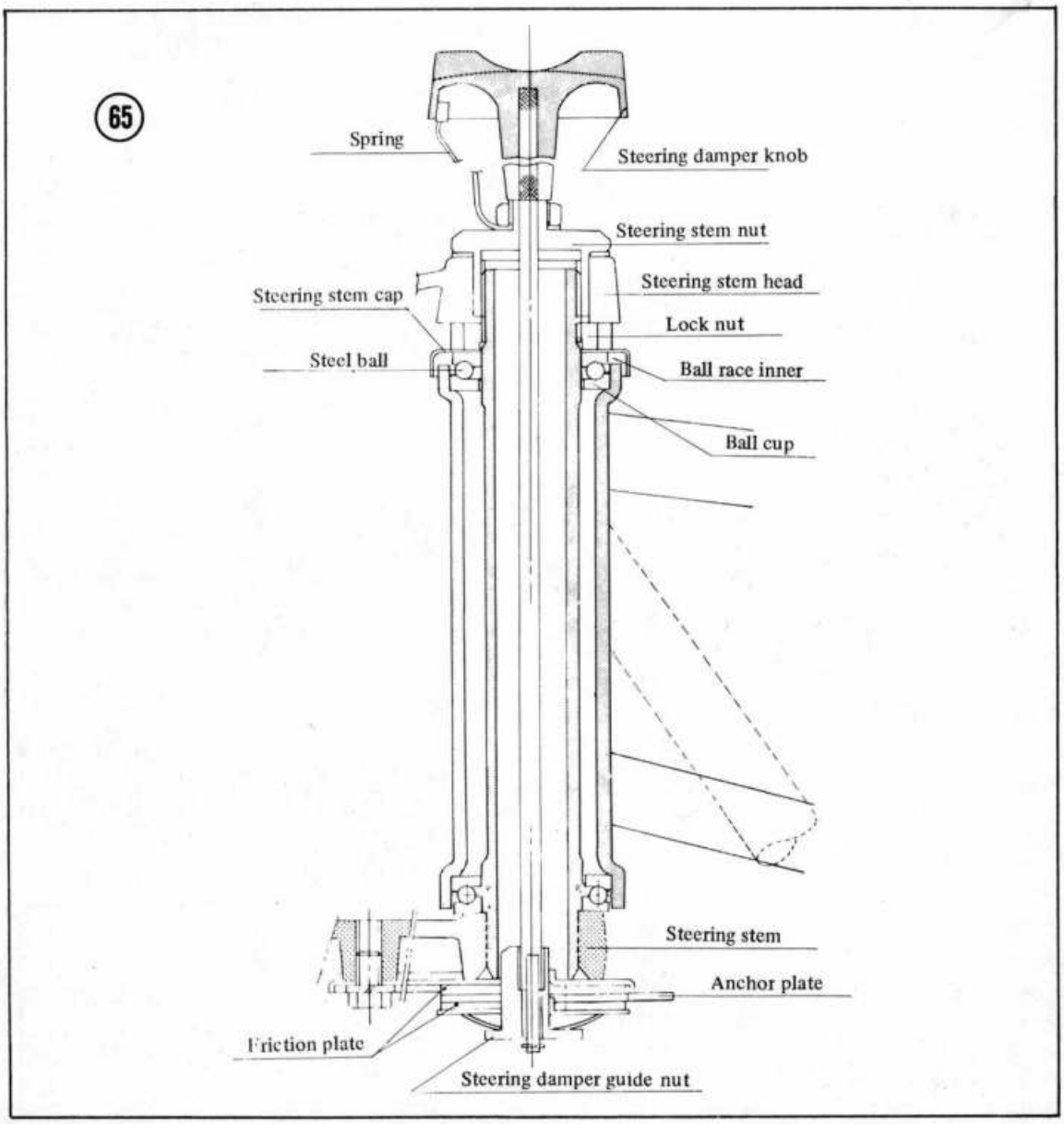
*2. Three parts 30-weight engine oil mixed with one part 60-weight spindle oil.*

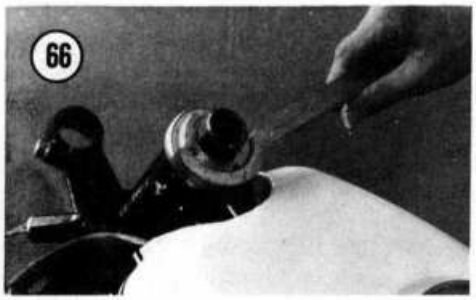
## STEERING SYSTEM

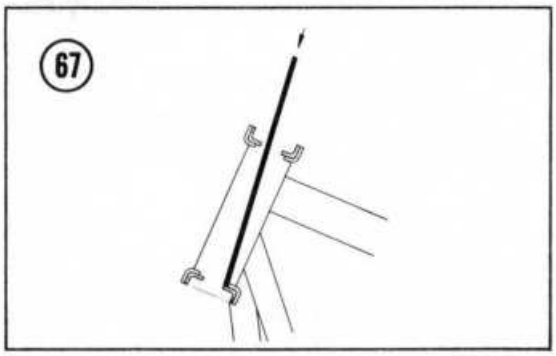
**Figure 65** is a sectional view of a typical steering stem. The frame head pipe and the underbracket are provided with ball bearings for smooth action. A friction damper adjusts the steering action to suit the rider.

### Disassembly

1. Remove the handlebar, tachometer, speedometer, and front fork.
2. Remove the steering stem head.
3. Remove the lock nut (**Figure 66**).
4. Pull the underbracket downward to remove it from the machine. Take care that you don't drop the ball bearings during this step.
5. If it is necessary to remove the ball races, tap them out with a hammer and long punch, as shown in **Figure 67**.







6. Remove the lower race from the steering stem with a hammer and chisel (**Figure 68**).



**Inspection**

Examine the underbracket shaft carefully. Replace it if the shaft is bent. Check the balls and races for cracks, wear, or other damage. Do not use a combination of new and used parts in the bearings. Replace the entire bearing assembly if any defects are found.

**Assembly**

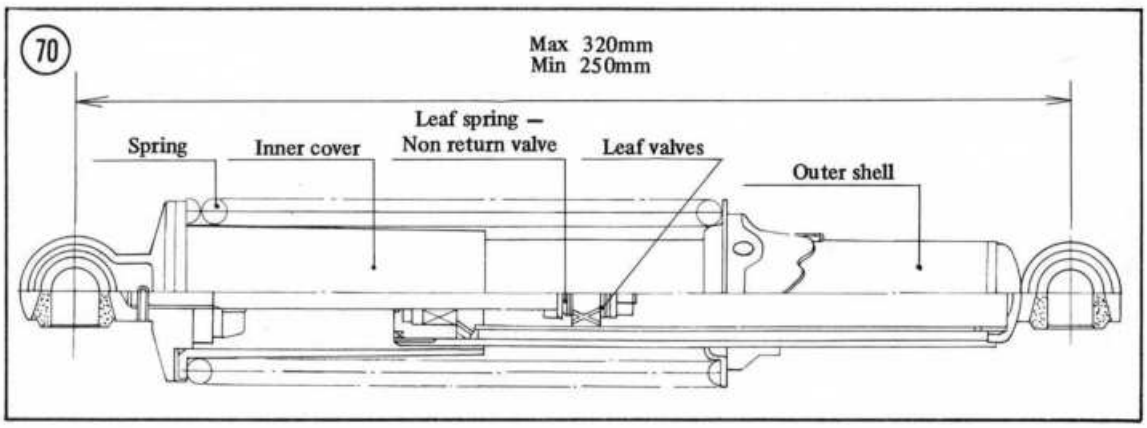
1. Press in the upper and lower races.
2. Grease the balls liberally, then attach them to the upper and lower races.
3. Insert the underbracket shaft from below (**Figure 69**), then install the upper bearing race and temporarily tighten the lock nut.



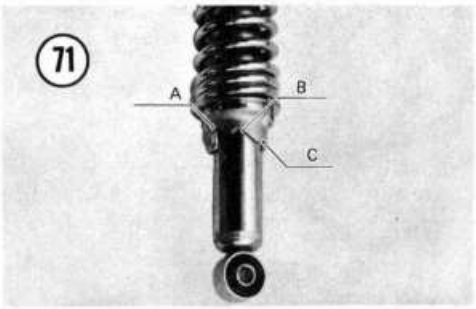
4. Turn the underbracket to the left and right, and as you do so, tighten the lock nut until the underbracket turns smoothly, with no looseness or binding.
5. Install the steering stem head.
6. Install the front forks.
7. Recheck the adjustment of the lock nut by grasping the tips of the forks and checking for any play.

## SHOCK ABSORBERS

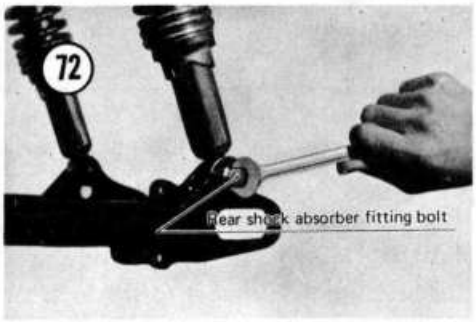
**Figure 70** is a sectional view of a typical rear shock absorber. The major parts of the shock absorber are a spring, and hydraulic damping



mechanism encased within the inner and outer shells. The shock absorbers may be adjusted to suit various riding conditions, as shown in **Figure 71**. Adjust both sides equally.



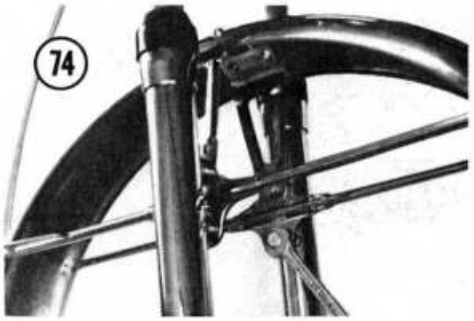

To remove the shock absorbers, remove the mounting bolts (**Figure 72**). Do not damage the rubber bushings as you remove and replace the bolts.

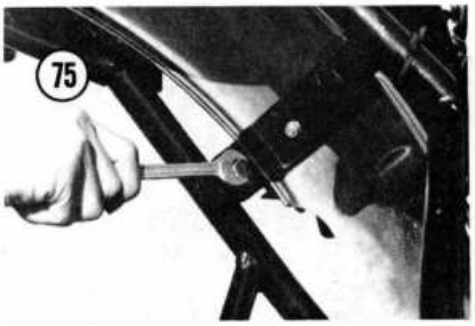


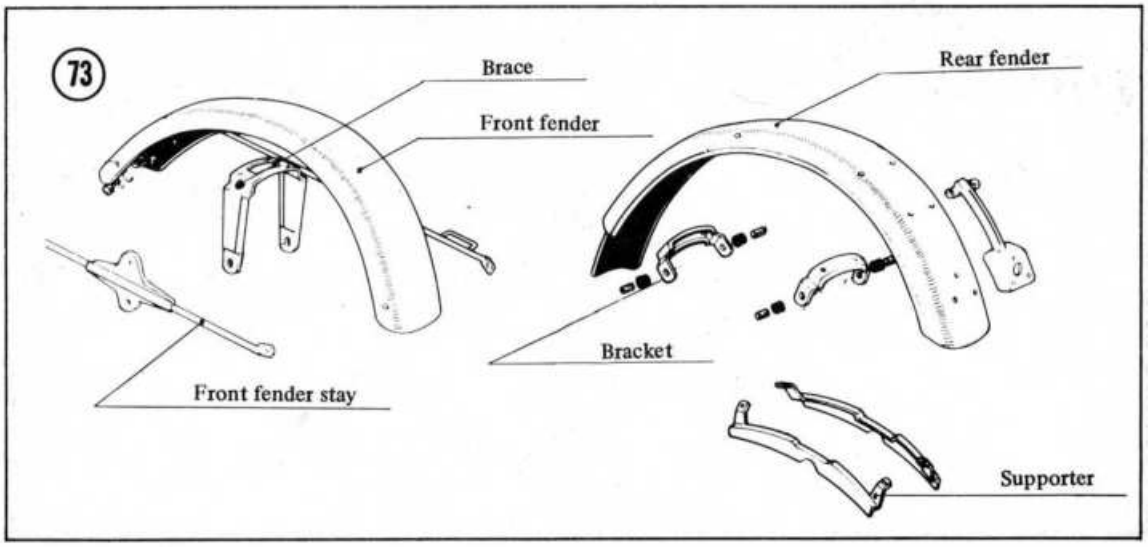

Check the damping force by attempting to compress and extend the units quickly. If there is no marked difference between the effort required to operate the unit quickly or slowly, or if there are any oil leaks, replace the shock absorber.

## FENDERS

**Figure 73** illustrates typical fenders and their attaching parts. Front and rear fenders may be removed easily after the wheels are removed. Merely remove the attaching hardware (**Figures 74 and 75**).



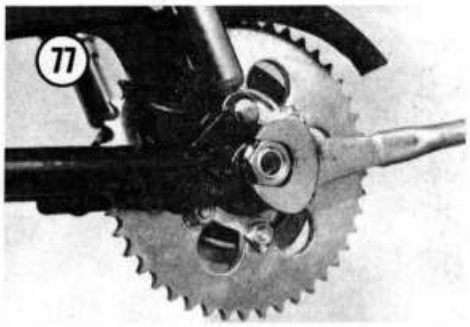



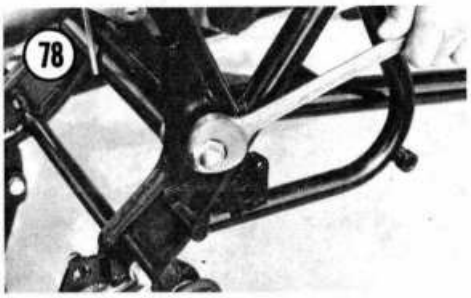
## SWINGING ARM

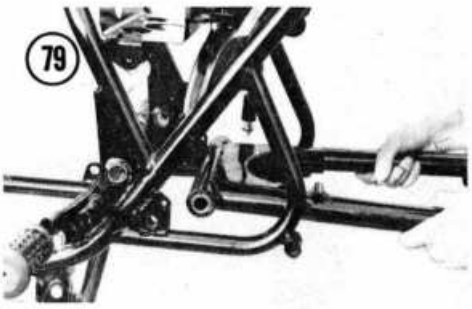
**Figure 76** illustrates a typical swinging arm assembly. The entire assembly pivots up and down on the pivot shaft. The rear part of the swinging arm is attached to the motorcycle frame through the shock absorbers.

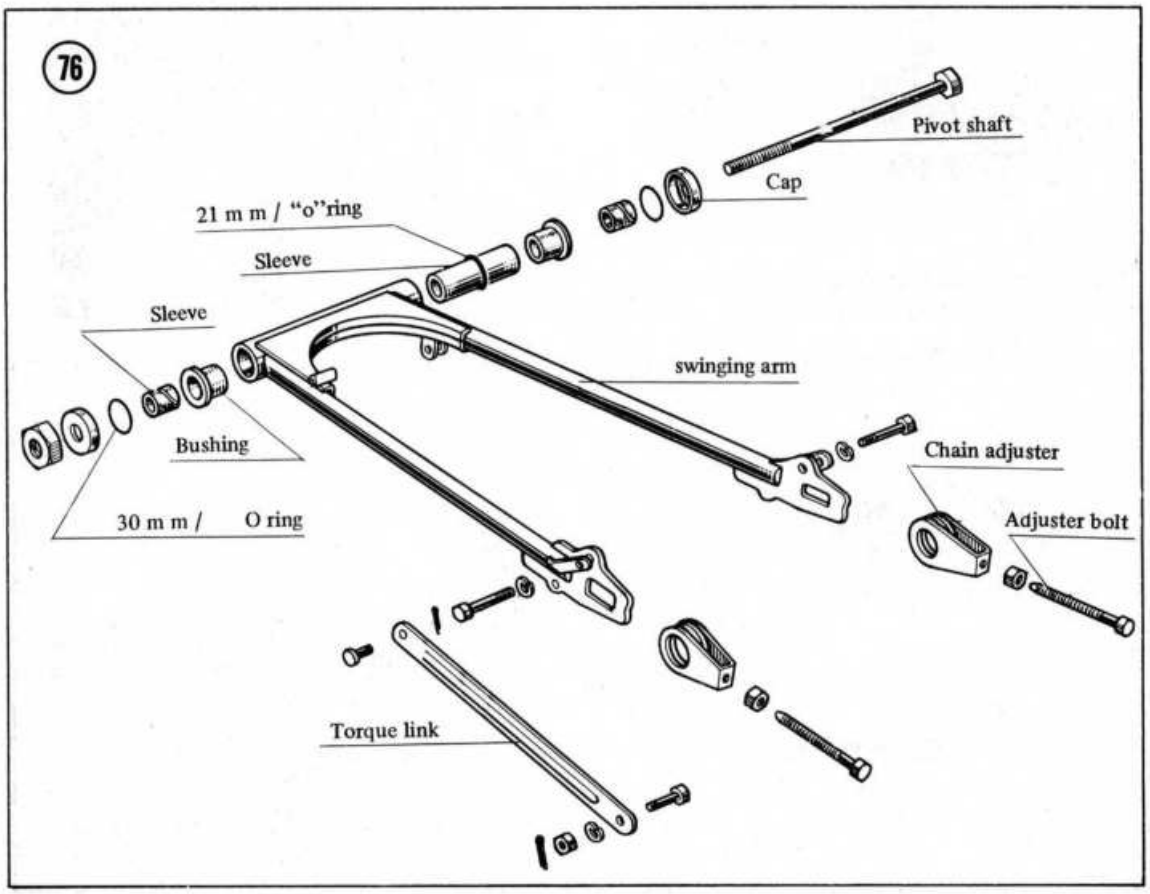
### Disassembly

1. Remove the drive chain.
2. Remove the rear sprocket (**Figure 77**).
3. Remove the pivot shaft (**Figure 78**).
4. Remove the swinging arm (**Figure 79**).



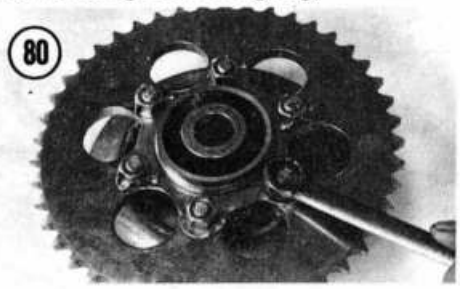



### Inspection

The pivot section is susceptible to wear, especially in the bushings and shaft. Examine these parts carefully. Replace the pivot shaft if it is bent more than 0.02 inch (0.5 millimeter). Replace the bushings and/or the shaft if the clearance between the shaft and the bushings exceeds 0.014 inch (0.35 millimeter) on H1 machines, or 0.008 inch (0.2 millimeter) on A1 and A7 series machines. Shimmy, wander, and wheel hop are common symptoms of worn swinging arm bushings. If either of the arms is bent, the rear wheel will be out of alignment. Examine the weld carefully. Replace the entire swinging arm assembly if the weld is cracked.

## REAR SPROCKET

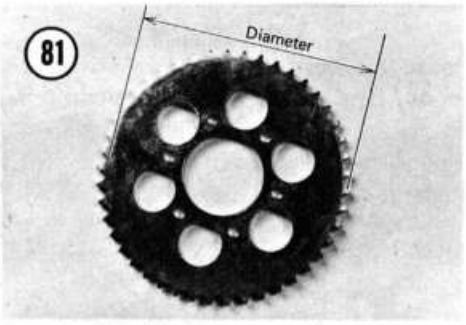
To remove the rear sprocket, use a hammer and chisel (**Figure 80**) to remove the lock washers, then remove the nuts which attach the sprocket to the sprocket coupling.




Any bending of the sprocket will make drive chain adjustment difficult, and may result in chain breakage. To check for bending, place the sprocket on a flat surface, then check the gap between the surface and the sprocket. Replace the sprocket if the gap exceeds 0.02 inch (0.5 millimeter) at any point.

The drive chain may slip from the sprocket if the sprocket is worn. Measure the diameter (**Figure 81**) of the sprocket at the base of the teeth. Replace any sprocket worn beyond the repair limit.

| Model | Standard Value | | Repair Limit | |
|---|---|---|---|---|
| | Inches | (Millimeters) | Inches | (Millimeters) |
| A1 | 7.0 | (177.0) | 6.88 | (175) |
| A1SS | 7.36 | (187.1) | 7.28 | (185) |
| A7, A7SS | 6.76 | (171.9) | 6.68 | (170) |
| H1 | 8.56 | (217.4) | 8.48 | (215.5) |




NOTE: *On A1R and A7R models, replace the sprocket when wear exceeds 0.08 inch (2mm).*

Reverse the disassembly procedure to reassemble the sprocket. Torque the self-locking nuts as follows:

| | | |
|---|---|---|
| A Series | 55 ft-lb | (7.5 m-kg) |
| H1 | 70 ft-lb | (11 m-kg) |

## FUEL AND OIL TANKS

**Figure 82** illustrates a typical fuel tank. The tank is made from corrosion resistant steel. A fuel cock is attached to the lower portion of the tank so that the fuel may be shut off when the machine is not running. H1 models are equipped with an automatic fuel cock.

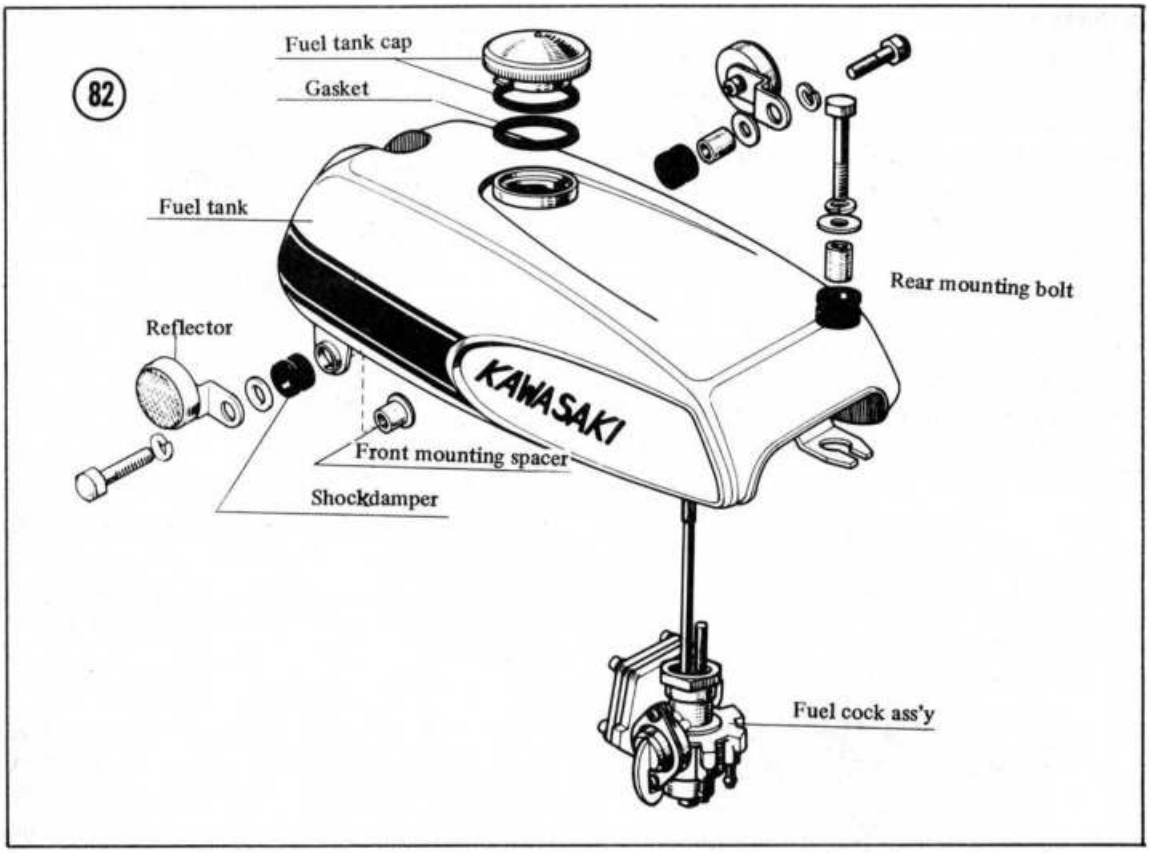
### Fuel Tank Removal

WARNING

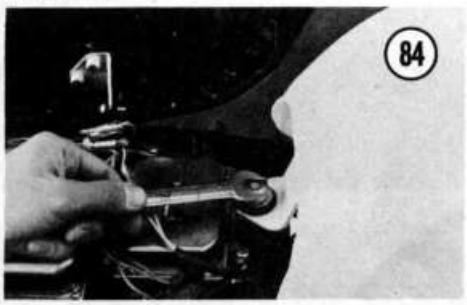
*These operations, or any other operations which may result in spilled gasoline are potentially hazardous. Do not smoke or permit any sparks or open flame within 50 feet of your work area.*

1. Turn the fuel cock to "O" (STOP). On H1 models, turn the cock to ON or RES.
2. Remove the nut from the front of the tank (**Figure 83**).



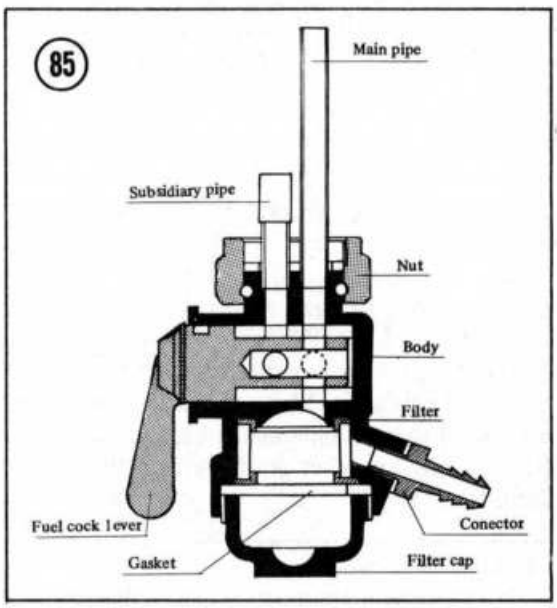



3. Remove the bolt from the rear of the tank (**Figure 84**).
4. Disconnect the fuel line from the fuel cock.
5. Lift the tank from the machine. Be sure that the wire harness does not interfere as you remove the tank.




## Fuel Cock

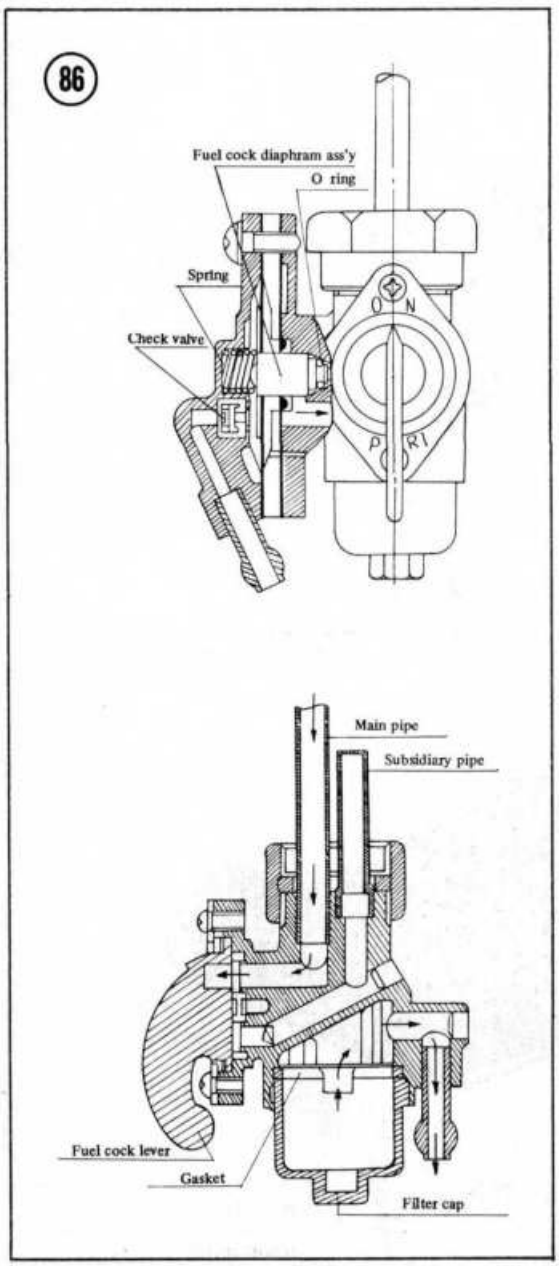
**Figure 85** is a sectional view of a typical fuel cock. During normal running, fuel is drawn from the main standpipe within the fuel tank, which permits fuel to flow only as long as the fuel level remains above the top of the standpipe. Reserve fuel is supplied from the auxiliary standpipe.



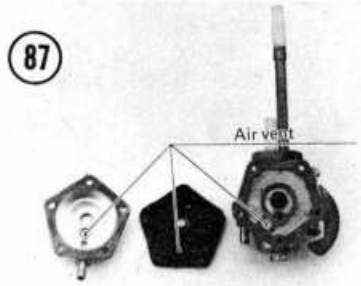

Inspect the fuel cock for leakage. Remove and clean the sediment bowl occasionally. Clean the fuel cock by blowing compressed air through it.

### Automatic Fuel Cock

H1 models are equipped with an automatic fuel cock (**Figure 86**). Negative pressure developed in the carburetor when the engine is running is transmitted through a tube to a diaphragm-actuated valve within the assembly.




If the fuel cock leaks, remove the diaphragm cover and diaphragm, then clean the valve and seat. Be sure to assemble the valve correctly (**Figure 87**) with the vent holes aligned. Also, be sure that there are no leaks in the signal tube from the carburetor to the fuel cock. Air leaks will result in poor fuel flow.

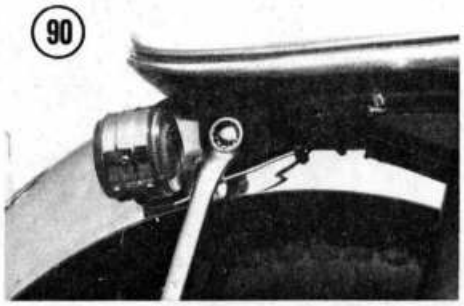


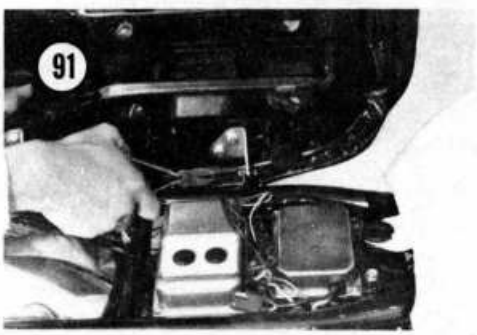

### Oil Tank

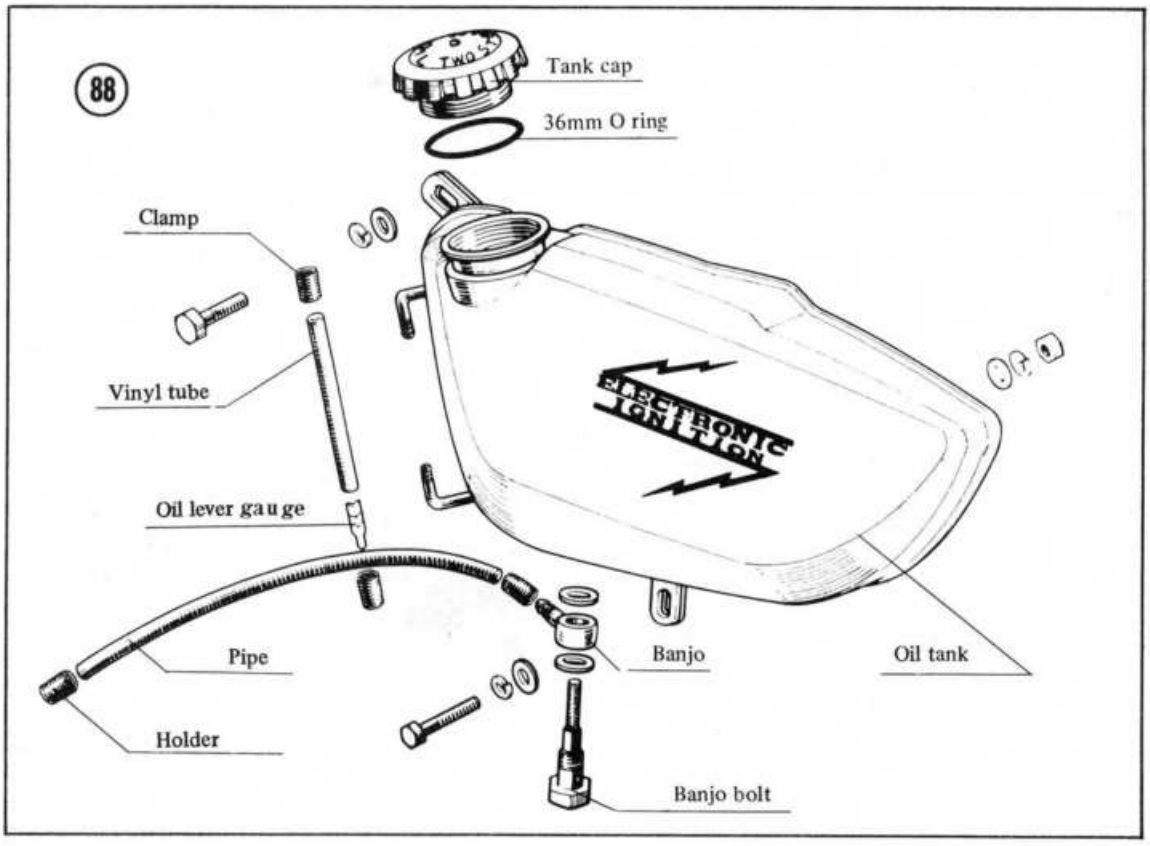
The oil tank (**Figure 88**) is below the seat, on the right side of the machine. Service to the oil tank is limited to occasional cleaning. Remember to bleed the oil pump after you clean the tank.

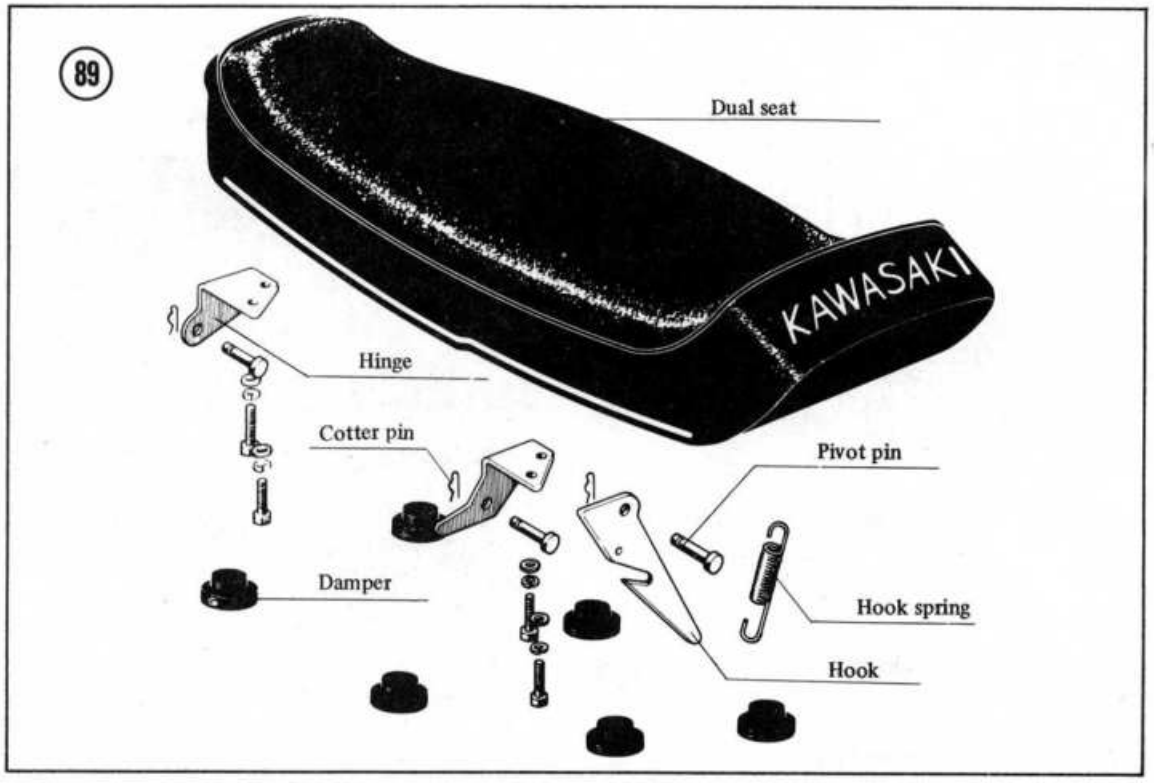
## SEAT

**Figure 89** illustrates a typical seat and its attaching hardware. On A1 and A7 models, the seat is attached with bolts; other models are attached with pivot holders and hooks. To remove the seat, remove the attaching hardware, as shown in **Figures 90 and 91**.



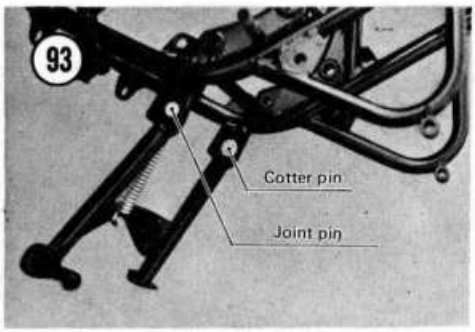

88
Tank cap
36mm O ring
Clamp
Vinyl tube
Oil lever gauge
Pipe
Holder
Banjo
Banjo bolt
Oil tank

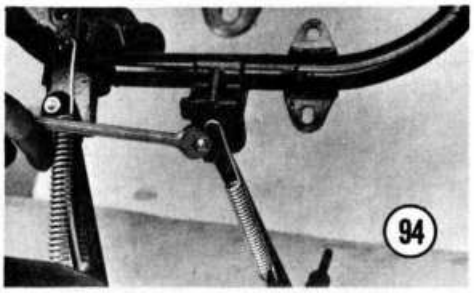

89
Dual seat
KAWASAKI
Hinge
Cotter pin
Pivot pin
Damper
Hook spring
Hook

## STANDS AND FOOTRESTS

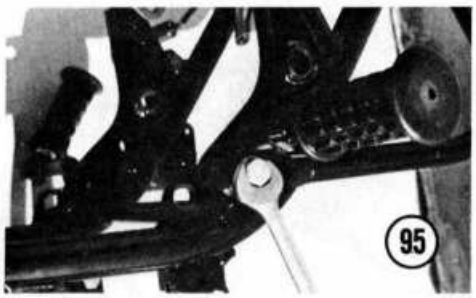
Street models are equipped with both center and side, or kick, stands (**Figure 92**). Racing models are equipped with portable stands not attached to the frame.

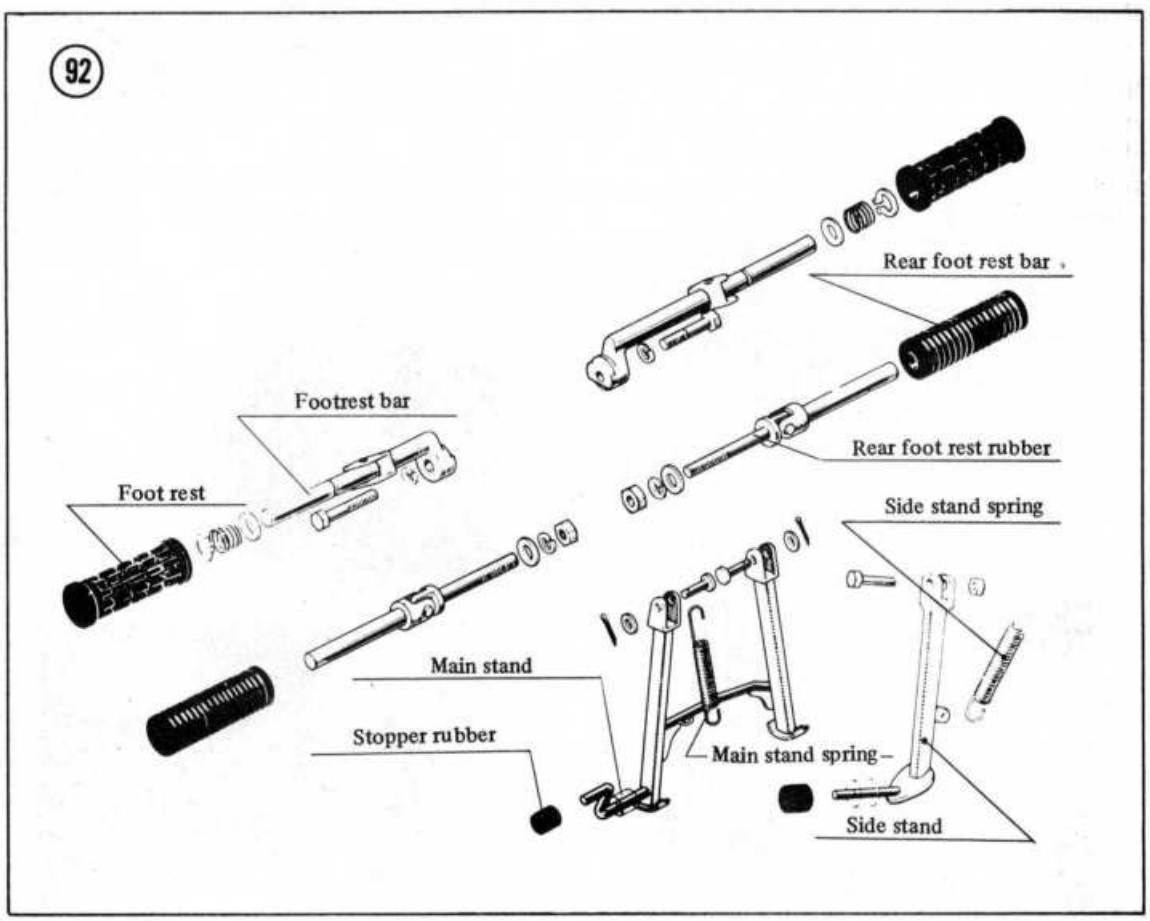
To remove the center stand (**Figure 93**), pull out the cotter pin, pull out the shaft, then remove the spring. To remove the side stand (**Figure 94**), remove the spring, then the attaching bolt.



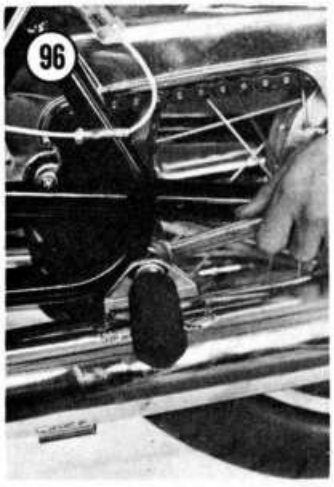




Front footrests are removed easily by removing the attaching bolts (**Figure 95**). The rear



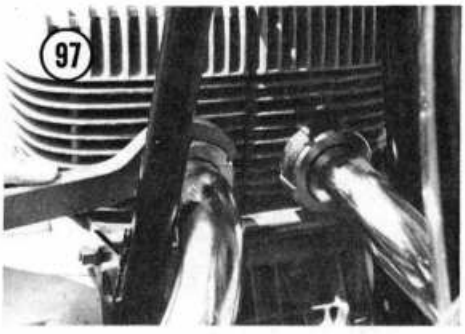
footrests are extensions of the muffler support structure. Support the muffler with your hand, then remove the attaching hardware (**Figure 96**).

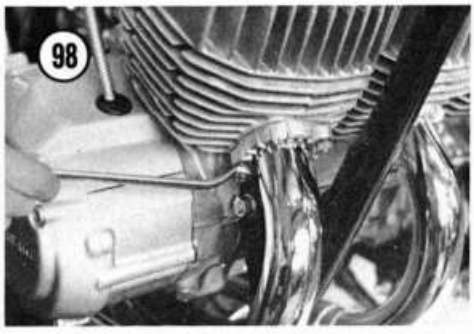


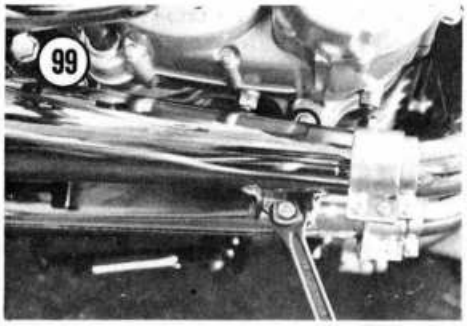

## EXHAUST PIPES AND MUFFLERS

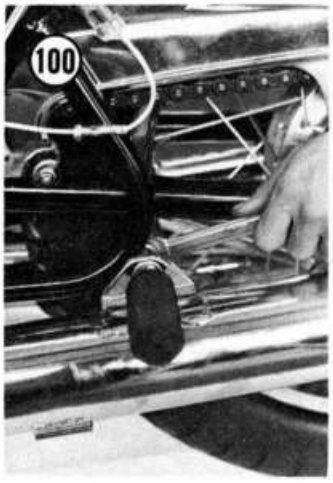
### Removal

To remove the exhaust pipes and mufflers, first loosen the muffler attachment hardware and remove the exhaust pipes at the cylinders, as shown in **Figures 97 and 98**. Then remove the front and rear attachment bolts from the mufflers (**Figures 99 and 100**).

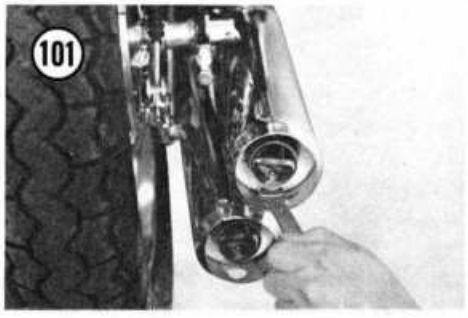


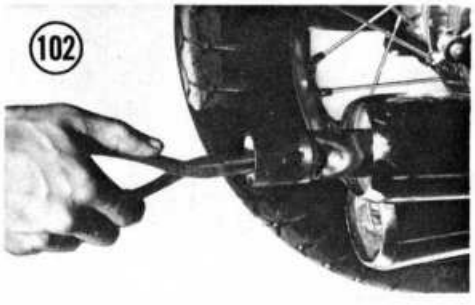



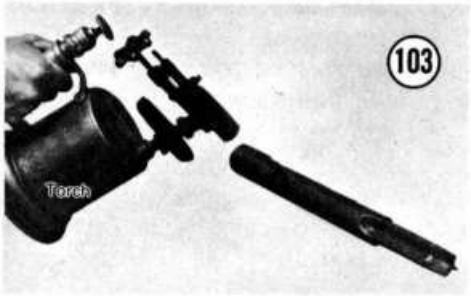

To remove the baffle tube, remove the screw at the back of the muffler (**Figure 101**), then pull out the baffle tube (**Figure 102**).



### Inspection

Carbon deposits within the exhaust pipe and muffler cause the engine to lose power. Clean the carbon from the baffle tube with a wire brush. If the deposits are too heavy to remove with a brush, heat the baffle tube with a torch (**Figure 103**) and tap the tube lightly. Clean the carbon from the exhaust pipe by running a used drive chain through the pipe.




As the machine ages, the joint between the exhaust pipe and muffler may leak. Replace the rubber connector if leakage occurs.

Always use new gaskets upon reassembly.

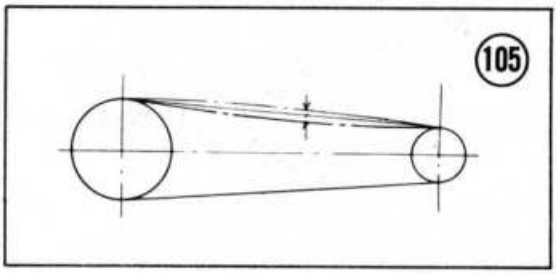
## DRIVE CHAIN

The drive chain (**Figure 104**) becomes worn after prolonged use. Wear in the pins, bushings, and rollers causes the chain to stretch. Sliding between the roller surface and sprocket teeth also contributes to wear.

### Inspection

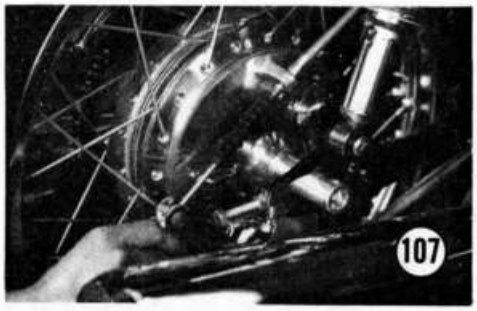
Inspect the drive chain periodically. Pay particular attention to cracks in the rollers and link plates, and replace the chain if there is any doubt about its condition.

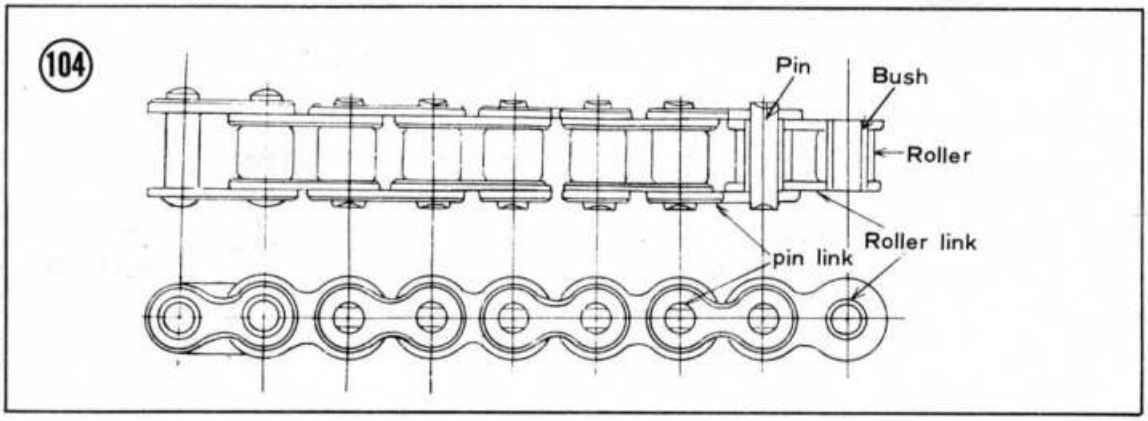
Adjust the free play in the chain so that there is one inch (25 millimeters) vertical play (**Figure 105**) in the center of the chain run with the machine on the ground. **Figure 106** illustrates the adjustment procedure. Be sure to adjust each side equally. The rear brake is affected by any chain adjustment. Be sure to adjust the rear brake after you adjust the chain (**Figure 107**).



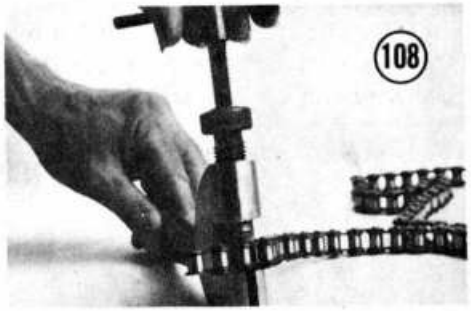






If the chain has become so worn that adjustment is not possible, use a chain breaker (**Figure 108**) or chisel (**Figure 109**) to shorten the chain by one link.



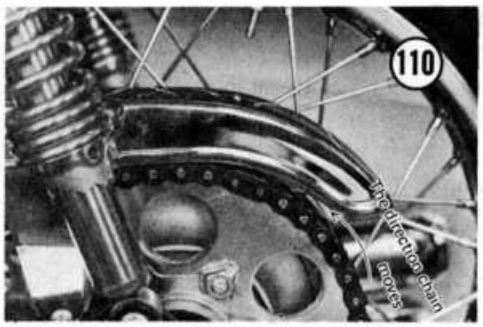




Install the master link so that the clip opening faces opposite to the direction of chain movement (**Figure 110**). Failure to do so may result in loss of the clip and resultant chain breakage.

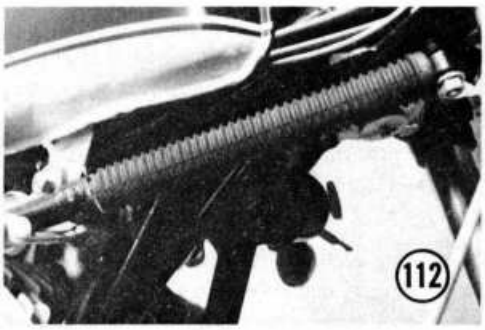
## HYDRAULIC STEERING DAMPER

The hydraulic steering damper is connected between the frame and steering head. The damper absorbs handlebar vibration during high speed riding. **Figure 111** is a cutaway view of the damper.

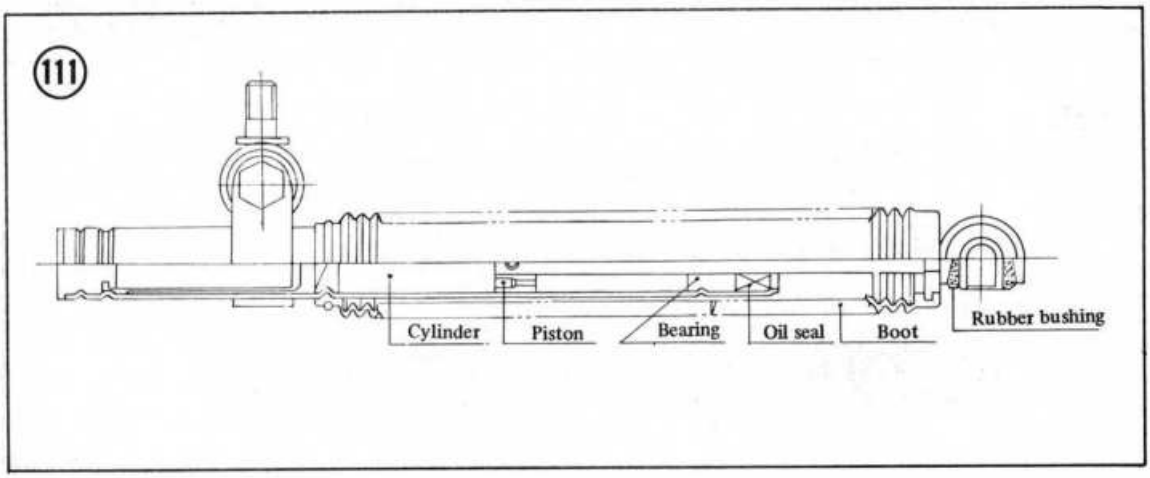



As the steering stem moves, the damper piston moves back and forth within the damper cylinder. As the piston moves, oil is forced through a small orifice in the piston, thereby preventing rapid motion of the steering stem.

To remove the oil damper, remove the attaching hardware (**Figure 112**).




Check the condition of the damper by alternately compressing and extending it quickly. If little or no resistance is encountered as you operate it, or if any oil leakage is evident, replace it. The steering oil damper is not serviceable.



# CHAPTER SIX

# PERIODIC SERVICE AND MAINTENANCE

To gain the utmost in safety, performance, and useful life from your machine, it is necessary to make periodic inspections and adjustments. It frequently happens that minor problems are found during such inspections that are simple and inexpensive to correct at the time, but which could lead to major problems later.

The following table is a suggested maintenance schedule. The procedures for performing these services are described in the applicable chapters.

| Maintenance Item | Miles | | |
|---|---|---|---|
| | Initial 500 | 1000 | 2000 |
| Change oil | X | | X |
| Check spark plug | X | | X |
| Ignition timing | X | | X |
| Adjust clutch | X | | X |
| Adjust carburetor | X | | X |
| Adjust oil pump | X | | X |
| Clean air cleaner | | | X |
| Clean exhaust system | | | X |
| Adjust brakes | X | X | |
| Clean brakes | | X | |
| Inspect chain | X | | X |
| Check spokes | | X | |
| Tighten all fastenings | X | | X |
| Clean fuel strainer | | X | |
| Remove carbon | | | X |
| Check battery | X | X | |
| Check electrical equipment | X | X | |
| Grease chassis | | X | |

# CHAPTER SEVEN

# TROUBLESHOOTING

Diagnosing motorcycle ills is relatively simple if you use orderly procedures and keep a few basic principles in mind.

Never assume anything. Don't overlook the obvious. If you are riding along and the bike suddenly quits, check the easiest, most accessible problem spots first. Is there gasoline in the tank? Is the gas petcock in the "on" or "reserve" position? Has a spark plug wire fallen off? Check the ignition switch. Sometimes the weight of keys on a key ring may turn the ignition off suddenly.

If nothing obvious turns up in a cursory check, look a little further. Learning to recognize and describe symptoms will make repairs easier for you or a mechanic at the shop. Describe problems accurately and fully. Saying that "it won't run" isn't the same as saying "it quit on the highway at high speed and wouldn't start," or that "it sat in my garage for three months and then wouldn't start."

Gather as many symptoms together as possible to aid in diagnosis. Note whether the engine lost power gradually or all at once, what color smoke (if any) came from the exhausts and so on. Remember that the more complicated a machine is, the easier it is to troubleshoot because symptoms point to specific problems.

You don't need fancy equipment or complicated test gear to determine whether repairs can be attempted at home. A few simple checks could save a large repair bill and time lost while the bike sits in a dealer's service department. On the other hand, be realistic and don't attempt repairs beyond your abilities. Service departments tend to charge heavily for putting together a disassembled engine that may have been abused. Some won't even take on such a job—so use common sense, don't get in over your head.

## OPERATING REQUIREMENTS

An engine needs three basics to run properly: correct gas-air mixture, compression, and a spark at the right time. If one or more are missing, the engine won't run. The electrical system is the weakest link of the three. More problems result from electrical breakdowns than from any other source. Keep that in mind before you begin tampering with carburetor adjustments and the like.

If a bike has been sitting for any length of time and refuses to start, check the battery for a charged condition first, and then look to the gasoline delivery system. This includes the tank, fuel petcocks, lines, and the carburetor. Rust may have formed in the tank, obstructing fuel flow. Gasoline deposits may have gummed up carburetor jets and air passages. Gasoline tends to lose its potency after standing for long periods. Condensation may contaminate it with

water. Drain old gas and try starting with a fresh tankful.

Compression or the lack of it, usually enters the picture only in the case of older machines. Worn or broken pistons, rings and cylinder bores could prevent starting. Generally a gradual power loss and harder and harder starting will be readily apparent in this case.

## STARTING DIFFICULTIES

Check gas flow first. Remove the gas cap and look into the tank. If gas is present, pull off a fuel line at the carburetor and see if gas flows freely. If none comes out, the fuel tap may be shut off, blocked by rust or foreign matter, or the fuel line may be stopped up or kinked. If the carburetor is getting usable fuel, turn to the electrical system next.

Check that the battery is charged by turning on the lights or by beeping the horn. Refer to your owner's manual for starting procedures with a dead battery. Have the battery recharged if necessary.

Pull off a spark plug cap, remove the spark plug, and reconnect the cap. Lay the plug against the cylinder head so its base makes a good connection, and turn the engine over with the kickstarter. A fat, blue spark should jump across the electrodes. If there is no spark, or a weak one, there is electrical system trouble. Check for a defective plug by replacing it with a known good one. Don't assume a plug is good just because it's new.

Once the plug has been cleared of guilt, but there's still no spark, start backtracking through the system. If the contact at the end of the spark plug wire can be exposed, it can be held about ⅛ inch from the head while the engine is turned over to check for a spark. Remember to hold the wire only by its insulation to avoid a nasty shock. If the plug wires are dirty, greasy, or wet, wrap a rag around them so you won't get shocked. If you do feel a shock or see sparks along the wire, clean or replace the wire and/or its connections.

If there's no spark at the plug wire, look for loose connections at the coil and battery. If all seems in order here, check next for oily or dirty contact points. Clean points with electrical contact cleaner, or a strip of paper. With the ignition switch turned on, open and close the points manually with a screwdriver.

No spark at the points with this test indicates a failure in the ignition system. Refer to Chapter Three (Electrical System) for checkout procedures for the entire system and individual components. Refer to the same chapter for checking and setting ignition timing.

Note that spark plugs of the incorrect heat range (too cold) may cause hard starting. Set gaps to specifications. If you have just ridden through a puddle or washed the bike and it won't start, dry off plugs and plug wires. Water may have entered the carburetor and fouled the fuel under these conditions, but wet plugs and wires are the more likely problem.

If a healthy spark occurs at the right time, and there is adequate gas flow **to** the carburetor, check the carburetor itself at this time. Make sure all jets and air passages are clean, check float level, and adjust if necessary. Shake the float to check for gasoline inside it, and replace or repair as indicated. Check that the carburetors are mounted snugly, and no air is leaking past the manifolds. Check for a clogged air filter.

Compression may be checked in the field by turning the kickstarter by hand and noting that an adequate resistance is felt, or by removing a spark plug and placing a finger over the plug hole and feeling for pressure.

An accurate compression check gives a good idea of the condition of the basic working parts of the engine—the cylinders, pistons and valves. To perform this test, you need a compression gauge. The motor should be warm.

1. Remove the plug on the cylinder to be tested and clean out any dirt or grease.
2. Insert the tip of the gauge into the hole, making sure it is seated correctly.
3. Open the throttle all the way and make sure the chokes on the carburetors are open.
4. Crank the engine several times and record the highest pressure reading on the gauge. Run the test on each of the cylinders. Refer to Chapter Two (Engine, Transmission, and Clutch) to interpret results.

Valve adjustments should be checked next. Sticking, burned, or broken valves may hamper starting. As a last resort, check valve timing as described in the Engine chapter.

### POOR IDLING

Poor idling may be caused by incorrect carburetor adjustment, incorrect timing, ignition system defects, an intake manifold leak, or leakage between the carburetors at the balance tube. Check the gas cap vent for an obstruction.

### MISFIRING

Misfiring can be caused by a weak spark or dirty plugs. Check for fuel contamination. Run the machine at night or in a darkened garage to check for spark leaks along the plug wires and under the spark plug cap. If misfiring occurs only at certain throttle settings, refer to the carburetor and fuel delivery sections in the Tune-up chapter for the specific carburetor circuits involved. Misfiring under heavy load, as when climbing hills or accelerating, is usually caused by bad spark plugs.

### FLAT SPOTS

If the engine seems to die momentarily when the throttle is opened and then recovers, check for a dirty main jet in the carburetor, water in the fuel, or an excessively lean mixture.

### POWER LOSS

Poor condition of rings, pistons, or cylinders will cause a lack of power and speed. Check that valves are correctly adjusted. Ignition timing should be checked along with the automatic spark advance.

### OVERHEATING

If the engine seems to run too hot all the time, be sure you are not idling it for long periods. Air cooled engines are not designed to operate at a standstill for any length of time. Heavy stop and go traffic is hard on a motorcycle engine. Spark plugs of the wrong heat range can burn pistons. An excessively lean gas mixture may cause overheating. Check ignition timing. Don't ride in too high a gear. Broken or worn rings and valves may permit compression gases to leak past them, heating heads and cylinders excessively. Check oil level and use the proper grade lubricants.

### BACKFIRING

Check that the timing is not advanced too far. Check the automatic advance mechanism for broken or sticking parts. Check fuel for contamination.

### ENGINE NOISES

Experience is needed to diagnose accurately in this area. Noises are hard to differentiate and harder yet to describe. Deep knocking noises usually mean main bearing failure. A slapping noise generally comes from loose pistons. A light knocking noise during acceleration may be a bad connecting rod bearing. Pinging, which sounds like marbles being shaken in a tin can, is caused by ignition advanced too far or gasoline with too low an octane rating. Pinging should be corrected immediately or damage to pistons will result. Compression leaks at the head-cylinder joint will sound like a rapid on and off squeal.

### PISTON SEIZURE

Piston seizure is caused by incorrect piston clearances when fitted, fitting rings with improper end gap, too thin an oil being used, incorrect spark plug heat range, or incorrect ignition timing. Overheating from any cause may result in seizure.

### EXCESSIVE VIBRATION

Excessive vibration may be caused by loose motor mounts, worn engine or transmission bearings, loose wheels, worn swinging arm bushings, a generally poor running engine, broken or cracked frame, or one that has been damaged in a collision. See also Poor Handling.

### CLUTCH SLIP OR DRAG

Clutch slip may be due to worn plates, improper adjustment, or glazed plates. A dragging clutch could result from damaged or bent plates, improper adjustment, or even clutch spring pressure.

### POOR HANDLING

Poor handling may be caused by improper tire pressures, a damaged frame or swinging arm, worn shocks or front forks, weak fork springs, a bent or broken steering stem, mis-

aligned wheels, loose or missing spokes, worn tires, bent handlebars, worn wheel bearing, or dragging brakes.

### BRAKE PROBLEMS

Sticking brakes may be caused by broken or weak return springs, improper cable or rod adjustment, or dry pivot and cam bushings. Grabbing brakes may be caused by greasy linings which must be replaced. Brake grab may also be due to out-of-round drums or linings which have broken loose from the brake shoes. Glazed linings or glazed brake pads will cause loss of stopping power.

### LIGHTING PROBLEMS

Bulbs which continuously burn out may be caused by excessive vibration, loose connections that permit sudden current surges, poor battery connections, or installation of the wrong type bulb.

A dead battery or one which discharges quickly may be caused by a faulty generator or rectifier. Check for loose or corroded terminals. Shorted battery cells or broken terminals will keep a battery from charging. Low water level will decrease a battery's capacity. A battery left uncharged after installation will sulphate, rendering it useless.

A majority of light and horn or other electrical accessory problems are caused by loose or corroded ground connections. Check those first, and then substitute known good units for easier troubleshooting.

The following "quick reference" guide summarizes the troubleshooting process. Use it to outline possible problem areas, then refer to the specific chapter or section involved.

### LOSS OF POWER

| Cause | Things to check | Cause | Things to check |
|---|---|---|---|
| Poor compression | Piston rings and cylinders | Improper mixture | Dirty air cleaner |
| | Head gaskets | | Starter lever position |
| | Crankcase leaks | | Restricted fuel flow |
| Overheated engine | Lubricating oil supply | | Gas cap vent hole |
| | Oil pump | Miscellaneous | Dragging brakes |
| | Clogged cooling fins | | Tight wheel bearings |
| | Ignition timing | | Defective chain |
| | Slipping clutch | | Clogged exhaust system |
| | Carbon in combustion chamber | | |

### STEERING PROBLEMS

| Problem | Things to check | Problem | Things to check |
|---|---|---|---|
| Hard steering | Tire pressures | Pulls to one side | Defective swinging arm |
| | Steering damper adjustment | | Defective steering head |
| | Steering stem head | | Defective steering oil damper |
| | Steering head bearings | Shimmy | Drive chain adjustment |
| | Steering oil damper | | Loose or missing spokes |
| Pulls to one side | Unbalanced shock absorbers | | Deformed rims |
| | Drive chain adjustment | | Worn wheel bearings |
| | Front/rear wheel alignment | | Wheel balance |
| | Unbalanced tires | | |

## GEARSHIFTING DIFFICULTIES

| Cause | Things to check | Cause | Things to check |
|---|---|---|---|
| Clutch | Adjustment<br>Springs<br>Friction plates<br>Steel plates | Transmission | Return spring or pin<br>Change lever or spring<br>Drum lever or lever spring<br>Drum position plate<br>Change drum<br>Change forks |
| Transmission | Oil quantity<br>Oil grade | | |

## BRAKE TROUBLES

| Problem | Things to check | Problem | Things to check |
|---|---|---|---|
| Poor brakes | Brake adjustment<br>Oil or water on brake linings<br>Loose linkage or cables | Unadjustable brakes | Worn linings<br>Worn drums<br>Worn brake cams |
| Noisy brakes | Worn or scratched lining<br>Scratched brake drums<br>Dirt in brakes | | |

# CHAPTER EIGHT

# SPECIFICATIONS

This chapter contains specifications and performance figures for the various Kawasaki models covered by this book. The tables are arranged in order of increasing engine size. Since there are differences between various models of the same engine size, be sure to consult the correct table for the motorcycle in question.

| SPECIFICATIONS, MODEL A1 | |
|---|---|
| DIMENSIONS | |
| Overall Length | 78.3 in. |
| Overall Width | 31.9 in. |
| Overall Height | 43.1 in. |
| Wheelbase | 51.2 in. |
| Road Clearance | 6.5 in. |
| Dry Weight | 318.5 lb. |
| PERFORMANCE | |
| Maximum Speed | 103 mph |
| Fuel Consumption | 80 mpg |
| Climbing Ability | 38° |
| Braking Distance | 39 ft/31 mph |
| Minimum Turning Radius | 86.6 in. |
| ENGINE | |
| Type | 2-cycle, 2 cylinder |
| Bore x Stroke | 2.09 x 2.21 in. |
| Displacement | 15.07 cu. in. (247cc) |
| Compression Ratio | 7.0:1 |
| Maximum Horsepower | 31 hp/8,000 rpm |
| Maximum Torque ft-lb/rpm | 2.92/7,500 |
| VALVE TIMING | |
| Inlet | |
| Open BTC | 112° |
| Close ATC | 65° |
| Scavenging | |
| Open BBC | 58° |
| Close ABC | 58° |
| Exhaust | |
| Open BBC | 89° |
| Close ABC | 89° |
| Carburetor Type | (2) VM22SC |
| Fuel Tank Capacity | 3.5 gal. |
| Lubrication System | Superlube Oil Injection |
| Engine Oil | 2-stroke engine oil |
| Oil Tank Capacity | 2.4 qt. |
| Starting System | Kickstarter |
| Ignition System | Battery and Coil |
| Ignition Type | Conventional/C.D.I. |
| Ignition Timing (before TDC) | 23° 25° |

(continued)

**SPECIFICATIONS, MODEL A1 (continued)**

| | | |
|---|---|---|
| SPARK PLUG | | |
| NGK | B-9HC | — |
| Hitachi | — | — |
| Denso | — | — |
| Champion | L-60T | UL-19V |
| Autolite | — | — |
| Bosch | W340T16 | — |
| KLG | F290 | |
| Lodge | R-50 | |
| TRANSMISSION | | |
| Type | 5-speed, constant mesh, return change | |
| GEAR RATIO | | |
| Low | 2.50 | |
| 2nd | 1.53 | |
| 3rd | 1.13 | |
| 4th | 0.92 | |
| 5th | 0.78 | |
| Primary Reduction Ratio | 3.40 (51/15) | |
| Final Reduction Ratio | 2.46 (37/15) | |
| Overall Drive Ratio | 6.52 | |
| Transmission Oil | SAE 30 | |
| Transmission Oil Capacity | 1.27 qt. | |
| CLUTCH | | |
| Type | Heavy duty multiple disk, Wet plate | |
| ELECTRICAL EQUIPMENT | | |
| Generator | | |
| Made by | Kokusan | Mitsubishi |
| Type | EN10 | AW2010A |
| Regulator | | |
| Made by | Kokusan | Mitsubishi |
| Type | ZR 905 | RL2128T |
| Ignition Coil | | |
| Made by | Diamond | Diamond |
| Type | TU-25M-7 | TU-51-1 |
| Battery | | |
| Type | 12N614A | |
| Capacity | 12V6AH | |

(continued)

| SPECIFICATIONS, MODEL A1 (continued) | |
|---|---|
| ELECTRICAL EQUIPMENT (continued) | |
| Head Lamp Type | Semi-sealed beam |
| Head Lamp | 12V, 35/25W |
| Tail/Brake Lamp | 12V, 8/25W (4/32 cp) |
| Speedometer Lamp | 12V, 3W |
| Neutral Indicator | 12V, 3W |
| Tachometer Indicator Lamp Bulb | 12V, 3W |
| Charge Indicator Lamp Bulb | — — |
| High Beam Indicator Bulb | 12V, 1.5W |
| Turn Signal Lamp Bulb | 12V, 8W |
| FRAME | |
| Type | Tubular, double cradle |
| Steering Angle | 40° |
| Caster | 63° |
| Trail | 3.4 in. |
| Tire Size | |
| Front | 3.00-18, 4PR |
| Rear | 3.25-18, 4PR |
| Suspension | |
| Front | Telescopic Fork |
| Rear | Swinging Arm |
| Damper Stroke | |
| Front | 4.3 in. |
| Rear | 2.8 in. |
| Front Fork Oil Capacity (each fork) | 0.22 qt. |
| Mixing Ratio Mobil Oil Spindle Oil | 8:2 |
| Diameter x Width | |
| Front | 7.1 x 1.2 in. |
| Rear | 7.1 x 1.2 in. |

| SPECIFICATIONS, MODEL A1SS | |
|---|---|
| **DIMENSIONS** | |
| Overall Length | 78.3 in. |
| Overall Width | 32.6 in. |
| Overall Height | 42.5 in. |
| Wheelbase | 51.0 in. |
| Road Clearance | 6.7 in. |
| Dry Weight | 323.3 lb. |
| **PERFORMANCE** | |
| Maximum Speed | 103 mph |
| Fuel Consumption | 80 mpg |
| Climbing Ability | 39° |
| Braking Distance | 39 ft/31 mph |
| Minimum Turning Radius | 86.6 in. |
| **ENGINE** | |
| Type | 2-cycle, 2 cylinder |
| Bore x Stroke | 2.09 x 2.21 in. |
| Displacement | 15.07 cu. in. (247cc) |
| Compression Ratio | 7.0:1 |
| Maximum Horsepower | 31 hp/8,000 rpm |
| Maximum Torque ft-lb/rpm | 2.92/7,500 |
| **VALVE TIMING** | |
| Inlet | |
| Open BTC | 112° |
| Close ATC | 65° |
| Scavenging | |
| Open BBC | 58° |
| Close ABC | 58° |
| Exhaust | |
| Open BBC | 89° |
| Close ABC | 89° |
| Carburetor Type | (2) VM22SC |
| Fuel Tank Capacity | 3.5 gal. |
| Lubrication System | Superlube Oil Injection |
| Engine Oil | 2-stroke engine oil |
| Oil Tank Capacity | 2.4 qt. |
| Starting System | Kickstarter |
| Ignition System | Battery and Coil |
| Ignition Type | Conventional/C.D.I. |
| Ignition Timing (before TDC) | 23° 25° |

(continued)

| SPECIFICATIONS, MODEL A1SS (continued) | | |
|---|---|---|
| SPARK PLUG | | |
| NGK | B-9HC | — |
| Hitachi | — | — |
| Denso | — | — |
| Champion | L-60T | UL019V |
| Autolite | — | — |
| Bosch | W340T16 | — |
| KLG | F290 | — |
| Lodge | R-50 | — |
| TRANSMISSION | | |
| Type | 5-speed, constant mesh, return change | |
| GEAR RATIO | | |
| Low | 2.50 | |
| 2nd | 1.53 | |
| 3rd | 1.13 | |
| 4th | 0.92 | |
| 5th | 0.78 | |
| Primary Reduction Ratio | 3.40 (51/15) | |
| Final Reduction Ratio | 2.60 (39/15) | |
| Overall Drive Ratio | 6.89 | |
| Transmission Oil | SAE 30 | |
| Transmission Oil Capacity | 1.27 qt. | |
| CLUTCH | | |
| Type | Heavy duty multiple disk, Wet plate | |
| ELECTRICAL EQUIPMENT | | |
| Generator | | |
| Made by | Kokusan | Mitsubishi |
| Type | EN10 | AW2010A |
| Regulator | | |
| Made by | Kokusan | Mitsubishi |
| Type | ZR 905 | RL2128T |
| Ignition Coil | | |
| Made by | Diamond | Diamond |
| Type | TU-25M-7 | TU-51-1 |
| Battery | | |
| Type | 12N6-4A | |
| Capacity | 12V6AH | |

(continued)

| SPECIFICATIONS, MODEL A1SS (continued) | |
|---|---|
| ELECTRICAL EQUIPMENT (continued) | |
| Head Lamp Type | Semi-sealed beam |
| Head Lamp | 12V, 35/25W |
| Tail/Brake Lamp | 12V, 8/25W (4/32 cp) |
| Speedometer Lamp | 12V, 3W |
| Neutral Indicator | 12V, 3W |
| Tachometer Indicator Lamp Bulb | 12V, 3W |
| Charge Indicator Lamp Bulb | — — |
| High Beam Indicator Bulb | 12V, 1.5W |
| Turn Signal Lamp Bulb | 12V, 8W |
| FRAME | |
| Type | Tubular, double cradle |
| Steering Angle | 40° |
| Caster | 63° |
| Trail | 3.4 in. |
| Tire Size | |
| Front | 3.00-18, 4PR |
| Rear | 3.50-18, 4PR |
| Suspension | |
| Front | Telescopic Fork |
| Rear | Swinging Arm |
| Damper Stroke | |
| Front | 4.3 in. |
| Rear | 2.8 in. |
| Front Fork Oil Capacity (each fork) | 0.22 qt. |
| Mixing Ratio Mobil Oil Spindle Oil | 8:2 |
| Diameter x Width | |
| Front | 7.1 x 1.2 in. |
| Rear | 7.1 x 1.2 in. |

| SPECIFICATIONS, MODEL A1R | |
|---|---|
| DIMENSIONS | |
| Overall Length | 75.4 in. |
| Overall Width | 22.8 in. |
| Overall Height | 37.2 in. |
| Wheelbase | 51.0 in. |
| Road Clearance | 4.9 in. |
| Dry Weight | 239.7 lb. |
| PERFORMANCE | |
| Maximum Speed | 125 mph |
| Fuel Consumption | — |
| Climbing Ability | — |
| Braking Distance | — |
| Minimum Turning Radius | 150.0 in. |
| ENGINE | |
| Type | 2-cycle, 2 cylinder |
| Bore x Stroke | 2.09 x 2.21 in. |
| Displacement | 15.07 cu. in. (247cc) |
| Compression Ratio | 8.0:1 |
| Maximum Horsepower | 40 hp/9,500 rpm |
| Maximum Torque ft-lb/rpm | 3.00/8,500 |
| VALVE TIMING | |
| Inlet | |
| Open BTC | 130° |
| Close ATC | 70° |
| Scavenging | |
| Open BBC | 62° |
| Close ABC | 62° |
| Exhaust | |
| Open BBC | 94.5° |
| Close ABC | 94.5° |
| Carburetor Type | (2) M26R |
| Fuel Tank Capacity | 5.3 gal. |
| Lubrication System | Superlube and Gasoline Oil |
| Engine Oil | (15:1) Mixing |
| Oil Tank Capacity | 1.05 qt. |
| Starting System | Push or Kick |
| Ignition System | Magneto |
| Ignition Type | Conventional |
| Ignition Timing (before TDC) | 23° |

(continued)

| SPECIFICATIONS, MODEL A1R (continued) | |
|---|---|
| SPARK PLUG | |
| NGK | B-10EN |
| Hitachi | — |
| Denso | — |
| Champion | L-55T |
| Autolite | AE-403 |
| Bosch | W370T16 |
| KLG | — |
| Lodge | — |
| TRANSMISSION | |
| Type | 5-speed, constant mesh, return change |
| GEAR RATIO | |
| Low | 2.06 (33/16) |
| 2nd | 1.47 (28/19) |
| 3rd | 1.18 (26/22) |
| 4th | 1.00 (24/24) |
| 5th | 0.89 (23/26) |
| Primary Reduction Ratio | 3.35 (57/17) |
| Final Reduction Ratio | 1.81 (29/16) |
| Overall Drive Ratio | 5.38 |
| Transmission Oil | SAE 10W30 |
| Transmission Oil Capacity | 1.27 qt. |
| CLUTCH | |
| Type | Heavy duty multiple disk, Wet plate |
| ELECTRICAL EQUIPMENT | |
| Generator | |
| Made by | Kokusan |
| Type | EN04 |
| Regulator | |
| Made by | — |
| Type | |
| Ignition Coil | |
| Made by | Kokusan |
| Type | ST-70 |
| Battery | |
| Type | — |
| Capacity | |

(continued)

| SPECIFICATIONS, MODEL A1R (continued) | |
|---|---|
| FRAME | |
| Type | Tubular, double cradle |
| Steering Angle | 40° |
| Caster | 63° |
| Trail | 3.4 in. |
| Tire Size | |
| Front | 2.75-18, 4PR |
| Rear | 3.00-18, 4PR |
| Suspension | |
| Front | Telescopic Fork |
| Rear | Swinging Arm |
| Damper Stroke | |
| Front | 4.7 in. |
| Rear | 2.8 in. |
| Front Fork Oil Capacity (each fork) | 0.24 qt. |
| Mixing Ratio Mobil Oil Spindle Oil | 8:2 |
| Diameter x Width | |
| Front | 7.9 x 0.8 in. |
| Rear | 7.1 x 1.4 in. |

## SPECIFICATIONS, MODEL A7

| | |
|---|---|
| **DIMENSIONS** | |
| Overall Length | 79.0 in. |
| Overall Width | 31.9 in. |
| Overall Height | 43.5 in. |
| Wheelbase | 51.0 in. |
| Road Clearance | 6.7 in. |
| Dry Weight | 327.7 lb. |
| **PERFORMANCE** | |
| Maximum Speed | 110 mph |
| Fuel Consumption | 80 mpg |
| Climbing Ability | 40° |
| Braking Distance | 39 ft/31 mph |
| Minimum Turning Radius | 86.6 in. |
| **ENGINE** | |
| Type | 2-cycle, 2 cylinder |
| Bore x Stroke | 2.44 x 2.21 in. |
| Displacement | 20.63 cu. in. (338cc) |
| Compression Ratio | 7.0:1 |
| Maximum Horsepower | 42 hp/8,000 rpm |
| Maximum Torque ft-lb/rpm | 3.99/7,000 |
| **VALVE TIMING** | |
| Inlet | |
| Open BTC | 112° |
| Close ATC | 65° |
| Scavenging | |
| Open BBC | 60° |
| Close ABC | 60° |
| Exhaust | |
| Open BBC | 91° |
| Close ABC | 91° |
| Carburetor Type | (2) VM28SC |
| Fuel Tank Capacity | 3.5 gal. |
| Lubrication System | Injecto lube Oil Injection |
| Engine Oil | 2-stroke engine oil |
| Oil Tank Capacity | 2.4 qt. |
| Starting System | Kickstarter |
| Ignition System | Battery and Coil |
| Ignition Type | Conventional/C.D.I. |
| Ignition Timing (before TDC) | 23° 25° |

(continued)

| SPECIFICATIONS, MODEL A7 (continued) | | |
|---|---|---|
| SPARK PLUG | | |
| NGK | B-9HC | — |
| Hitachi | — | — |
| Denso | — | — |
| Champion | L-60T | UL-19V |
| Autolite | — | — |
| Bosch | W340T16 | — |
| KLG | F290 | — |
| Lodge | R-50 | — |
| TRANSMISSION | | |
| Type | 5-speed, constant mesh, return change | |
| GEAR RATIO | | |
| Low | 2.50 | |
| 2nd | 1.53 | |
| 3rd | 1.13 | |
| 4th | 0.92 | |
| 5th | 0.78 | |
| Primary Reduction Ratio | 3.40 (51/15) | |
| Final Reduction Ratio | 2.40 (36/15) | |
| Overall Drive Ratio | 6.36 | |
| Transmission Oil | SAE 30 | |
| Transmission Oil Capacity | 1.27 qt. | |
| CLUTCH | | |
| Type | Heavy duty multiple disk, Wet plate | |
| ELECTRICAL EQUIPMENT | | |
| Generator | | |
| Made by | Kokusan | Mitsubishi |
| Type | EN8 | AW2010A |
| Regulator | | |
| Made by | Kokusan | Mitsubishi |
| Type | ZR906 | RL2128T |
| Ignition Coil | | |
| Made by | Diamond | Diamond |
| Type | TU-25M-7 | TU-51-1 |
| Battery | | |
| Type | 12N 6-4A | |
| Capacity | 12V 6AH | |

(continued)

| SPECIFICATIONS, MODEL A7 (continued) | |
|---|---|
| ELECTRICAL EQUIPMENT (continued) | |
| Head Lamp Type | Semi-sealed beam |
| Head Lamp | 12V, 35/25W |
| Tail/Brake Lamp | 12V, 8/25W (4/32 cp) |
| Speedometer Lamp | 12V, 3W |
| Neutral Indicator | 12V, 3W |
| Tachometer Indicator Lamp Bulb | 12V, 3W |
| Charge Indicator Lamp Bulb | — — |
| High Beam Indicator Bulb | |
| Turn Signal Lamp Bulb | 12V, 8W |
| FRAME | |
| Type | Tubular, double cradle |
| Steering Angle | 40° |
| Caster | 63° |
| Trail | 3.6 in. |
| Tire Size | |
| Front | 3.25-18, 4PR |
| Rear | 3.50-18, 4PR |
| Suspension | |
| Front | Telescopic Fork |
| Rear | Swinging Arm |
| Damper Stroke | |
| Front | 4.3 in. |
| Rear | 2.8 in. |
| Front Fork Oil Capacity (each fork) | 0.22 qt. |
| Mixing Ratio | |
| Mobil Oil / Spindle Oil | 8:2 |
| Diameter x Width | |
| Front | 7.1 x 1.2 in. |
| Rear | 7.1 x 1.2 in. |

| SPECIFICATIONS, MODEL A7SS | |
|---|---|
| DIMENSIONS | |
| Overall Length | 78.7 in. |
| Overall Width | 31.9 in. |
| Overall Height | 43.5 in. |
| Wheelbase | 51.0 in. |
| Road Clearance | 6.7 in. |
| Dry Weight | 329.0 lb. |
| PERFORMANCE | |
| Maximum Speed | 109 mph |
| Fuel Consumption | 80 mpg |
| Climbing Ability | 40° |
| Braking Distance | 39 ft/31 mph |
| Minimum Turning Radius | 86.6 in. |
| ENGINE | |
| Type | 2-cycle, 2 cylinder |
| Bore x Stroke | 2.44 x 2.21 in. |
| Displacement | 20.63 cu. in. (338cc) |
| Compression Ratio | 7.0:1 |
| Maximum Horsepower | 42 hp/8,000 rpm |
| Maximum Torque ft-lb/rpm | 3.99/7,000 |
| VALVE TIMING | |
| Inlet | |
| Open BTC | 112° |
| Close ATC | 65° |
| Scavenging | |
| Open BBC | 60° |
| Close ABC | 60° |
| Exhaust | |
| Open BBC | 91° |
| Close ABC | 91° |
| Carburetor Type | (2) VM28SC |
| Fuel Tank Capacity | 3.5 gal. |
| Lubrication System | Injecto lube Oil Injection |
| Engine Oil | 2-stroke engine oil |
| Oil Tank Capacity | 2.4 qt. |
| Starting System | Kickstarter |
| Ignition System | Battery and Coil |
| Ignition Type | Conventional/C.D.I. |
| Ignition Timing (before TDC) | 23° 25° |

(continued)

| SPECIFICATIONS, MODEL A7SS (continued) | | |
|---|---|---|
| SPARK PLUG | | |
| NGK | B-9HC | — |
| Hitachi | — | — |
| Denso | — | — |
| Champion | L60T | UL-19V |
| Autolite | — | — |
| Bosch | W340T16 | — |
| KLG | F290 | — |
| Lodge | R-50 | — |
| TRANSMISSION | | |
| Type | 5-speed, constant mesh, return change | |
| GEAR RATIO | | |
| Low | 2.50 | |
| 2nd | 1.53 | |
| 3rd | 1.13 | |
| 4th | 0.92 | |
| 5th | 0.78 | |
| Primary Reduction Ratio | 3.40 (51/15) | |
| Final Reduction Ratio | 2.40 (36/15) | |
| Overall Drive Ratio | 6.36 | |
| Transmission Oil | SAE 30 | |
| Transmission Oil Capacity | 1.27 qt. | |
| CLUTCH | | |
| Type | Heavy duty multiple disk, Wet plate | |
| ELECTRICAL EQUIPMENT | | |
| Generator | | |
| Made by | Kokusan | Mitsubishi |
| Type | EN8 | AM2010A |
| Regulator | | |
| Made by | Kokusan | Mitsubishi |
| Type | ZR905 | RL2128T |
| Ignition Coil | | |
| Made by | Diamond | Diamond |
| Type | TU-25M-7 | TU-51-1 |
| Battery | | |
| Type | 12N 6-4A | |
| Capacity | 12V 6AH | |

(continued)

| SPECIFICATIONS, MODEL A7SS (continued) | |
|---|---|
| ELECTRICAL EQUIPMENT (continued) | |
| Head Lamp Type | Semi-sealed beam |
| Head Lamp | 12V, 35/25W |
| Tail/Brake Lamp | 12V, 8/25W (4/32 cp) |
| Speedometer Lamp | 12V, 3W |
| Neutral Indicator | 12V, 3W |
| Tachometer Indicator Lamp Bulb | 12V, 3W |
| Charge Indicator Lamp Bulb | — — |
| High Beam Indicator Bulb | 12V, 1.5W |
| Turn Signal Lamp Bulb | 12V, 8W |
| FRAME | |
| Type | Tubular double cradle |
| Steering Angle | 40° |
| Caster | 63° |
| Trail | 3.6 in. |
| Tire Size | |
| Front | 3.25-18, 4PR |
| Rear | 3.50-18, 4PR |
| Suspension | |
| Front | Telescopic Fork |
| Rear | Swinging Arm |
| Damper Stroke | |
| Front | 4.3 in. |
| Rear | 2.8 in. |
| Front Fork Oil Capacity (each fork) | 0.22 qt. |
| Mixing Ratio | |
| Mobil Oil<br>Spindle Oil | 8:2 |
| Diameter x Width | |
| Front | 7.1 x 1.2 in. |
| Rear | 7.1 x 1.2 in. |

## SPECIFICATIONS, MODEL A7R

| | |
|---|---|
| **DIMENSIONS** | |
| Overall Length | 75.4 in. |
| Overall Width | 22.8 in. |
| Overall Height | 37.2 in. |
| Wheelbase | 51.0 in. |
| Road Clearance | 4.9 in. |
| Dry Weight | 240.0 lb. |
| **PERFORMANCE** | |
| Maximum Speed | 138 mph |
| Fuel Consumption | — |
| Climbing Ability | — |
| Braking Distance | — |
| Minimum Turning Radius | 150.0 in. |
| **ENGINE** | |
| Type | 2-cycle, 2 cylinder |
| Bore x Stroke | 2.48 x 2.21 in. |
| Displacement | 21.30 cu. in. (349cc) |
| Compression Ratio | 7.7:1 |
| Maximum Horsepower | 53 hp/9,500 |
| Maximum Torque ft-lb/rpm | 4.04/9,500 |
| **VALVE TIMING** | |
| Inlet | |
| Open BTC | 130° |
| Close ATC | 70° |
| Scavenging | |
| Open BBC | 63° |
| Close ABC | 63° |
| Exhaust | |
| Open BBC | 98.5° |
| Close ABC | 98.5° |
| Carburetor Type | (2) M29 |
| Fuel Tank Capacity | 5.3 gal. |
| Lubrication System | Injecto lube and Gasoline Oil |
| Engine Oil | (15:1) Mixing |
| Oil Tank Capacity | 1.05 qt. |
| Starting System | Push or Kick |
| Ignition System | Magneto |
| Ignition Type | Conventional |
| Ignition Timing (before TDC) | 27° — |

(continued)

| SPECIFICATIONS, MODEL A7R (continued) | | |
|---|---|---|
| SPARK PLUG | | |
| NGK | B-10N | — |
| Hitachi | — | — |
| Denso | — | — |
| Champion | L-55T | — |
| Autolite | AE403 | — |
| Bosch | W370T16 | — |
| KLG | — | — |
| Lodge | — | — |
| TRANSMISSION | | |
| Type | 5-speed, constant mesh, return change | |
| GEAR RATIO | | |
| Low | 2.06 (33/16) | |
| 2nd | 1.47 (28/19) | |
| 3rd | 1.18 (26/22) | |
| 4th | 1.00 (24/24) | |
| 5th | 0.89 (23/26) | |
| Primary Reduction Ratio | 3.35 (57/17) | |
| Final Reduction Ratio | 1.81 (29/16) | |
| Overall Drive Ratio | 5.38 | |
| Transmission Oil | SAE 10W30 | |
| Transmission Oil Capacity | 1.27 qt. | |
| CLUTCH | | |
| Type | Heavy duty multiple disk, Wet plate | |
| ELECTRICAL EQUIPMENT | | |
| Generator | | |
| Made by | Kokusan | |
| Type | EN04 | |
| Regulator | | |
| Made by | — | |
| Type | — | |
| Ignition Coil | | |
| Made by | Kokusan | |
| Type | ST-70 | |
| Battery | | |
| Type | — | |
| Capacity | — | |
| Head Lamp Type | Semi-sealed beam | |

(continued)

| SPECIFICATIONS, MODEL A7R (continued) | |
|---|---|
| FRAME | |
| Type | Tubular, double cradle |
| Steering Angle | 40° |
| Caster | 63° |
| Trail | 3.6 in. |
| Tire Size | |
| Front | 2.75-18, 4PR |
| Rear | 3.00-18, 4PR |
| Suspension | |
| Front | Telescopic Fork |
| Rear | Swinging Arm |
| Damper Stroke | |
| Front | 4.7 in. |
| Rear | 2.8 in. |
| Front Fork Oil Capacity (each fork) | 0.24 qt. |
| Mixing Ratio Mobil Oil Spindle Oil | 8:2 |
| Diameter x Width | |
| Front | 7.9 x 0.8 in. |
| Rear | 7.1 x 1.4 in. |

| SPECIFICATIONS MODEL H1 | |
|---|---|
| DIMENSIONS | |
| Overall Length | 82.5 in. |
| Overall Width | 33.1 in. |
| Overall Height | 42.5 in. |
| Wheelbase | 55.1 in. |
| Road Clearance | 5.3 in. |
| Dry Weight | 382.0 lb. |
| PERFORMANCE | |
| Maximum Speed | 118 mph |
| Fuel Consumption | 78 mpg |
| Climbing Ability | 40° |
| Braking Distance | 34.5 ft/31 mph |
| Minimum Turning Radius | 90.5 in. |
| ENGINE | |
| Type | 2-cycle, 3 cylinder |
| Bore x Stroke | 2.36 x 2.3 in. |
| Displacement | 30.4 cu. in. (498cc) |
| Compression Ratio | 6.8:1 |
| Maximum Horsepower | 60 hp/7,500 rpm |
| Maximum Torque ft-lb/rpm | 5.85/7,000 |
| VALVE TIMING | |
| Inlet | |
| Open BTC | 76° |
| Close ATC | 76° |
| Scavenging | |
| Open BBC | 59.5° |
| Close ABC | 59.5° |
| Exhaust | |
| Open BBC | 89° |
| Close ABC | 89° |
| Carburetor Type | (3) VM28SC |
| Fuel Tank Capacity | 4.0 gal. |
| Lubrication System | Injecto lube Oil Injection |
| Engine Oil | 2-stroke engine oil |
| Oil Tank Capacity | 2.5 qt. |
| Starting System | Kickstarter |
| Ignition System | Battery and Coil |
| Ignition Type | Conventional/C.D.I. |
| Ignition Timing (before TDC) | 25° 25° |

(continued)

| SPECIFICATIONS, MODEL H1 (continued) | | |
|---|---|---|
| SPARK PLUG | | |
| NGK | B-9HC | — |
| Hitachi | — | — |
| Denso | — | L-19V |
| Champion | L-60T | — |
| Autolite | — | — |
| Bosch | W340T16 | — |
| KLG | F290 | — |
| Lodge | R-50 | — |
| TRANSMISSION | | |
| Type | 5-speed, constant mesh, return change | |
| GEAR RATIO | | |
| Low | 2.20 | |
| 2nd | 1.40 | |
| 3rd | 1.09 | |
| 4th | 0.92 | |
| 5th | 0.81 | |
| Primary Reduction Ratio | 2.41 (65/27) | 2.41 (65/27) |
| Final Reduction Ratio | 2.81 (45/16) | 3.00 (45/15) |
| Overall Drive Ratio | 5.46 | 5.84 |
| Transmission Oil | SAE 10W30 | |
| Transmission Oil Capacity | 1.70 qt. | |
| CLUTCH | | |
| Type | Heavy duty multiple disk, Wet plate | |
| ELECTRICAL EQUIPMENT | | |
| Generator | | |
| Made by | Mitsubishi | Mitsubishi |
| Type | AZ-2010M | AZ2010A |
| Regulator | | |
| Made by | Mitsubishi | Mitsubishi |
| Type | RL-2128T | RL-T |
| Ignition Coil | | |
| Made by | Diamond | Diamond |
| Type | TU-25 | TU-51-2 |
| Battery | | |
| Type | 12N 9-4B | |
| Capacity | 12V 9AH | |

(continued)

| SPECIFICATIONS, MODEL H1 (continued) | |
|---|---|
| ELECTRICAL EQUIPMENT (continued) | |
| Head Lamp Type | Semi-sealed beam |
| Head Lamp | 12V, 35/25W |
| Tail/Brake Lamp | 12V, 8/25W (4/32 cp) |
| Speedometer Lamp | 12V, 3W |
| Neutral Indicator | 12V, 3W |
| Tachometer Indicator Lamp Bulb | 12V, 3W |
| Charge Indicator Lamp Bulb | 12V, 3W |
| High Beam Indicator Bulb | 12V, 1.5W |
| Turn Signal Lamp Bulb | 12V, 8W |
| FRAME | |
| Type | Tubular, double cradle |
| Steering Angle | 42° |
| Caster | 61° |
| Trail | 4.3 in. |
| Tire Size | |
| Front | 3.25-19, 4PR |
| Rear | 4.00-18, 4PR |
| Suspension | |
| Front | Telescopic Fork |
| Rear | Swinging Arm |
| Damper Stroke | |
| Front | 5.5 in. |
| Rear | 2.8 in. |
| Front Fork Oil Capacity (each fork) | 0.25 qt. |
| Mixing Ratio | |
| Mobil Oil<br>Spindle Oil | 6:4 |
| Diameter x Width | |
| Front | 7.9 x 1.4 in. |
| Rear | 7.1 x 1.4 in. |

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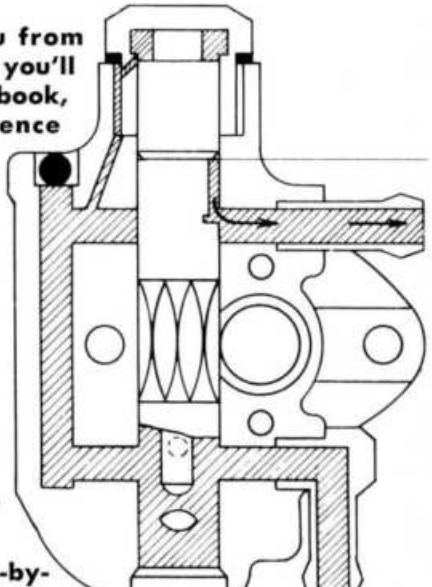
# NOTES

# KAWASAKI SERVICE • REPAIR HANDBOOK

## 250-350cc (TWO STROKE) TWINS — ALL YEARS
## 500cc THREE CYLINDER MACH III — 1969-1971

| | | |
|---|---|---|
| A1 | ALL YEARS | 250cc |
| A1SS | ALL YEARS | 250cc |
| A1R | ALL YEARS | 250cc |
| A7 | ALL YEARS | 350cc |
| A7SS | ALL YEARS | 350cc |
| A7R | ALL YEARS | 350cc |
| H1 | 1969-1971 | 500cc |

Year shown indicates the first year a model was produced.



Your motorcycle was designed to free you from crowds and congestion. Let it — but make sure you'll be able to get back when you want to. This book, plus a few basic tools, can spell the difference between completing a trip and breaking down miles from the nearest help.

This is a book for active bike enthusiasts. Glance through it. Carry it along as standard equipment. It's a good feeling to understand what's happening below you — and an even better one to realize you can get inside if necessary and make repairs.

More than 70% of bike problems stem from poor tuning, mis-adjustment or loosening caused by vibration. Most of these troubles can be cleared up quickly with simple tools — if you know what to do.

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