COMPRESSION

142 PSI

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KAWASAKI

900 & 1000cc FOURS · 1973-1978

SERVICE • REPAIR • PERFORMANCE

ERIC JORGENSEN
Editor

JEFF ROBINSON
Publisher

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Motorcycle courtesy of Kawasaki Motors U.S.A. and ridden by top professional road racer Steve McLaughlin

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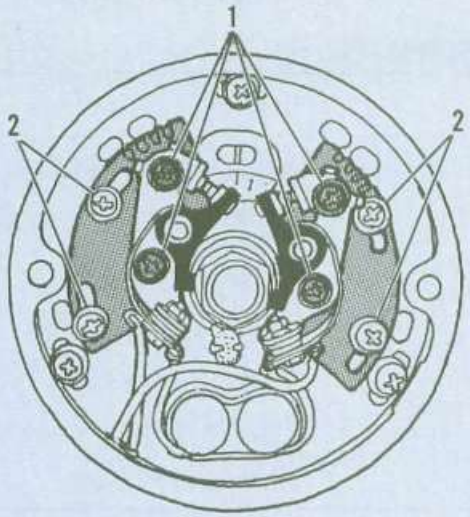
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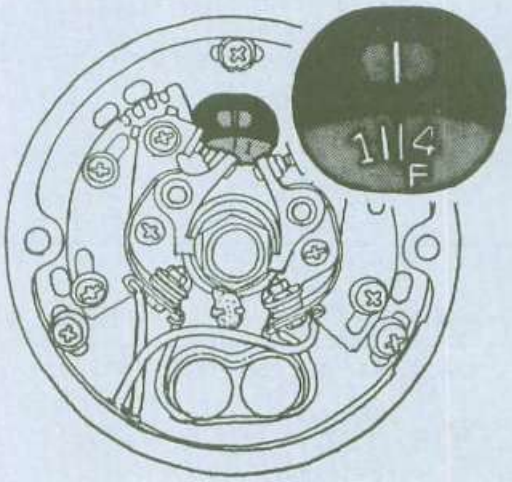
QUICK REFERENCE DATA

BREAKER PLATE



1. Mounting screws
2. Base plate screws

TIMING MARKS



ENGINE TUNE-UP

Cylinder firing order	1-2-4-3
Firing interval	180° of crankshaft rotation
Spark plugs .028 .031 or .7 .8	
Type	NGK B8-ES, Champion N4-MC, ND W24ES, Bosch W260T2
Gap	0.028-0.031 in. (0.7-0.8mm)
Valve clearance	0.002-0.004 in. (0.05-0.10mm), engine cold
Breaker point gap	0.012-0.016 in. (0.3-0.4mm)
Ignition timing	From 20° BTDC @ 1,500 rpm to 40° BTDC @ 3,000 rpm (1973); or @ 2,350 rpm (1974 on)
Idle speed	950-1,050 rpm

CHASSIS ADJUSTMENTS

Clutch lever free play	1/16-1/8 in.
Drive chain play	1 1/4 in.
Brake pedal travel	3/4-1 1/4 in.

TIRES

	Front	Rear
Pressure	28 psi	31 psi
Size	3.25 x 19	4.00 x 18

RECOMMENDED LUBRICANTS AND FUEL

	Capacity	Type
Engine oil	4.2 qt. (1973-1976) 3.9 qt. (1977 on)	SAE 10W-40, 10W-50, or 20W-50 "SE"
Front forks	169cc (each fork), 1973-1976) 140cc (1977 on)	SAE 10W nondetergent
Brake fluid	—	DOT-3
Fuel	4.7 gal. (1973-1976) 4.5 gal. (1977 on)	85 octane or higher

TORQUE SPECIFICATIONS

	Z-1, KZ900	KZ1000, Z1-R
Engine mount bolts (12mm diameter)	47-50 ft.-lb.	25-33 ft.-lb.
Engine mount bolts (10mm diameter)	26-29 ft.-lb.	25-33 ft.-lb.
Engine mount bracket bolts	14.5-16.5 ft.-lb.	14.5-16.5 ft.-lb.
Cylinder head bolts	105 in.-lb.	95-113 in.-lb.
Cylinder head cap nuts	25 ft.-lb.	27-31 ft.-lb.
Camshaft cap bolts	13.5 ft.-lb.	95-113 in.-lb.
Cylinder head cover bolts	102 in.-lb.	95-113 in.-lb.
Output sprocket nut	87-108 ft.-lb.	54-61 ft.-lb.
Handlebar mounting bolts	18 ft.-lb.	11.5-16 ft.-lb.
Fork tube clamp bolts (12mm diameter)	39-43 ft.-lb.	25-33 ft.-lb.
Fork tube clamp bolts (8mm diameter)	12-13 ft.-lb.	11.5-16 ft.-lb.
Front axle clamp bolts	13-14.5 ft.-lb.	11.5-16 ft.-lb.
Spoke nipples	22-26 in.-lb.	17-35 in.-lb.
Swing arm pivot nut	87-108 ft.-lb.	58-87 ft.-lb.
Rear shock bolt (upper)	44-47 ft.-lb.	19-25 ft.-lb.
Rear shock bolt (lower)	22-25 ft.-lb.	19-25 ft.-lb.
Torque link nut	22-25 ft.-lb.	19-25 ft.-lb.
Rear sprocket bolts	23-30 ft.-lb.	25-33 ft.-lb.
Rear axle nut	95-115 ft.-lb.	72-100 ft.-lb.

CHAPTER ONE

GENERAL INFORMATION

This manual provides maintenance and repair information for Kawasaki Z-1, KZ900, KZ1000, and Z1-R motorcycles from 1973 through 1978. Refer to the supplement at the back of this manual for 1977-1978 models.

Procedures requiring the use of special tools have been kept to a minimum. Where special tools are required, illustrations are provided. The resourceful mechanic can, in many cases, think of acceptable substitutes—there is always another way. If a substitute is used, however, be careful not to damage parts.

The terms NOTE, CAUTION, and WARNING have specific meanings in this manual. A NOTE provides additional information to make a step or procedure easier or clearer. Disregarding a NOTE could cause inconvenience, but would not cause damage or personal injury.

A CAUTION emphasizes areas where equipment damage could result. Disregarding a CAUTION could cause permanent mechanical damage; however, personal injury is unlikely.

A WARNING emphasizes areas where personal injury or even death could result from negligence. Mechanical damage may also occur. WARNINGS *are to be taken seriously*. In some cases serious injury or death has resulted from disregarding similar warnings.

All dimensions and capacities are expressed in English (inch) units familiar to U.S. mechanics as well as in metric units.

MANUAL ORGANIZATION

This chapter provides general information and specifications. See **Table 1** which is found at the end of the chapter. It also discusses equipment and tools useful both for preventive maintenance and troubleshooting.

Chapter Two explains all periodic lubrication and routine maintenance necessary to keep your bike running well. Chapter Two also includes recommended tune-up procedures, eliminating the need to constantly consult chapters on the various subassemblies.

Chapter Three provides methods and suggestions for quick and accurate diagnosis and repair of problems. Troubleshooting procedures discuss typical symptoms and logical methods to pinpoint the trouble.

Subsequent chapters describe specific systems such as the engine, transmission, and electrical system. Each chapter provides disassembly, repair, and assembly procedures in simple step-by-step form. If a repair is impractical for a home mechanic, it is so indicated. It is usually faster and more economical to take such repairs to a dealer or competent repair shop. Specifications concerning a particular system are included at the end of the appropriate chapter.

Throughout this manual keep in mind 2 conventions. "Front" refers to the front of the bike. The front of any component such as the engine

is that end which faces toward the front of the bike. The left and right side refer to a person sitting on the bike facing forward. For example, the shift lever is on the left side. These rules are simple, but even experienced mechanics occasionally become disoriented.

SERVICE HINTS

Most of the service procedures 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 involving major disassembly of the engine.

Some operations, for example, require the use of a press. It would be wiser to have these performed by a shop equipped for such work, rather than to try to do the job yourself with makeshift equipment. Other procedures require precision measurements. Unless you have the skills and equipment required, it would be better to have a qualified repair shop make the measurements for you.

Repairs go 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 it away with a garden hose. Clean all oily or greasy parts with cleaning solvent as you remove them.

WARNING

Never use gasoline as a cleaning agent. It presents an extreme fire hazard. Be sure to work in a well-ventilated area when using cleaning solvent. Keep a fire extinguisher, rated for gasoline fires, handy in any case.

Much of the labor charge for repairs made by dealers is for the removal and disassembly of other parts to reach the defective unit. It is frequently possible to perform the preliminary operations yourself and then take the defective unit in to the dealer for repair at considerable savings.

Once you have decided to tackle the job yourself, read the entire section in this manual which pertains to it, making sure you have identified the proper one. Study the illustrations and text until you have a good idea of what is involved in completing the job satisfactorily. If special tools are required, make arrangements to get them before you start. It is frustrating and time-consuming to get partly into a job and then be unable to complete it.

Simple wiring checks can be easily made at home; but knowledge of electronics is almost a necessity for performing tests with complicated electronic testing gear.

During disassembly of parts keep a few general cautions in mind. Force is rarely needed to get things apart. If parts are a tight fit, like a magneto on a crankshaft, there is usually a tool designed to separate them. Never use a screwdriver to pry apart parts with machined surfaces such as crankcase halves and valve covers. You'll mar the surfaces and end up with leaks.

Make diagrams wherever similar-appearing parts are found. For instance, case cover screws are often not the same length. You may think you can remember where everything came from—but mistakes are costly. There is also the possibility you may be sidetracked and not return to work for days or even weeks—in which interval, carefully laid out parts may have become disturbed.

Tag all similar internal parts for location and mark all mating parts for position. Record number and thickness of any shims as they are removed. Small parts such as bolts can be identified by placing them in plastic sandwich bags. Seal and label the bags with masking tape.

Wiring should be tagged with masking tape and marked as each wire is removed. Again, don't rely on memory alone.

Disconnect battery ground cable before working near electrical connections and before disconnecting wires. Never run the engine with the battery disconnected; the alternator could be seriously damaged.

Protect finished surfaces from physical damage or corrosion. Keep gasoline and brake fluid off painted surfaces.

Frozen or very tight bolts and screws can often be loosened by soaking with penetrating oil, then sharply striking the bolt head a few times with a hammer and punch (or screwdriver for screws). Avoid heat unless absolutely neces-

sary, since it may melt, warp, or remove the temper from many parts.

Avoid flames or sparks when working near a charging battery or flammable liquids such as brake fluid or gasoline.

No parts, except those assembled with a press fit, require unusual force during assembly. If a part is hard to remove or install, find out why before proceeding.

Cover all openings after removing parts to keep dirt, small tools, etc., from falling in.

When assembling 2 parts, start all fasteners, then tighten evenly.

Clutch plates, wiring connections, and brake shoes and drums should be kept clean and free of grease and oil.

When assembling parts, be sure all shims and washers are replaced exactly as they came out.

Whenever a rotating part butts against a stationary part, look for a shim or washer. Use new gaskets if there is any doubt about the condition of old ones. Generally you should apply gasket cement to one mating surface only so the parts may be easily disassembled in the future. A thin coat of oil on gaskets helps them seal effectively.

Heavy grease can be used to hold small parts in place if they tend to fall out during assembly. However, keep grease and oil away from electrical components or brake shoes and drums.

High spots may be sanded off a piston with sandpaper, but emery cloth and oil do a much more professional job.

Carburetors are best cleaned by disassembling them and soaking the parts in a commercial carburetor cleaner. Never soak gaskets and rubber parts in these cleaners. Never use wire to clean out jets and air passages; they are easily damaged. Use compressed air to blow out the carburetor only if the float has been removed first.

A baby bottle makes a good measuring device for adding oil to forks and transmissions. Get one that is graduated in ounces, and cubic centimeters.

Take your time and do the job right. Don't forget that a newly rebuilt motorcycle engine must be broken in the same as a new one. Keep rpm's within the limits given in your owner's manual when you get back on the road.

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 could hurt yourself or damage the bike if you ignore these rules.

1. Never use gasoline as a cleaning solvent.
2. Never smoke or use a torch in the vicinity of flammable liquids such as cleaning solvent in open containers.
3. Never smoke or use a torch in an area where batteries are being charged. Highly explosive hydrogen gas in formed during the charging process.
4. If welding or brazing is required on the machine, remove the fuel tank to a safe distance, at least 50 feet away. Welding on gas tanks requires special safety procedures and must be performed by someone skilled in the process.
5. Use the proper sized wrenches to avoid damage to nuts and injury to yourself.
6. When loosening a tight or stuck nut, be guided by what would happen if the wrench should slip. Protect yourself accordingly.
7. Keep your work area clean and uncluttered.
8. Wear safety goggles during all operations involving drilling, grinding, or use of a cold chisel.
9. Never use worn tools.
10. Keep a fire extinguisher handy and be sure it is rated for gasoline and electrical fires.

PARTS REPLACEMENT

Kawasaki makes frequent changes during a model year; some minor, some relatively major. When you order parts from the dealer or other parts distributor, always order by engine and chassis number. Write the numbers down and carry them in your wallet. Compare new parts to old before purchasing them. If they are not alike, have the parts manager explain the difference to you.

TOOLS

Most new models are equipped with fairly complete tool kits which are satisfactory for most small jobs and emergency roadside repairs.

Shop Tools

For proper servicing, you will need an assortment of ordinary handtools. As a minimum, these include:

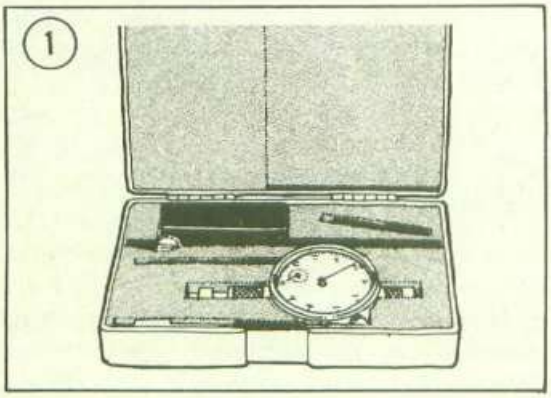
a. Metric combination wrenches
b. Metric sockets
c. Plastic mallet
d. Small hammer
e. Snap ring pliers
f. Pliers
g. Phillips screwdrivers
h. Slot (common) screwdrivers
i. Feeler gauges
j. Spark plug gauge
k. Spark plug wrench
l. Dial indicator

Special tools necessary are shown in the chapters covering the particular repair in which they are used.

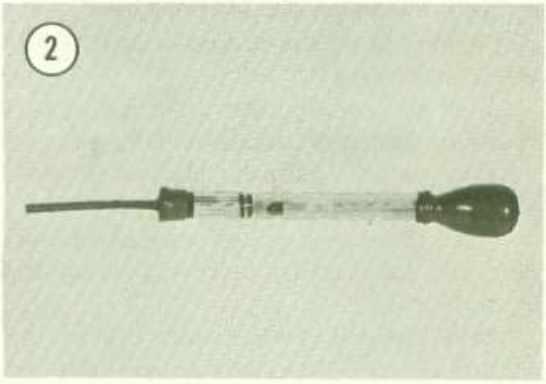
Electrical system servicing requires a voltmeter, ohmmeter, or other device for determining continuity, and a hydrometer for battery equipped machines.

Advanced tune-up and troubleshooting procedures require a few more tools.

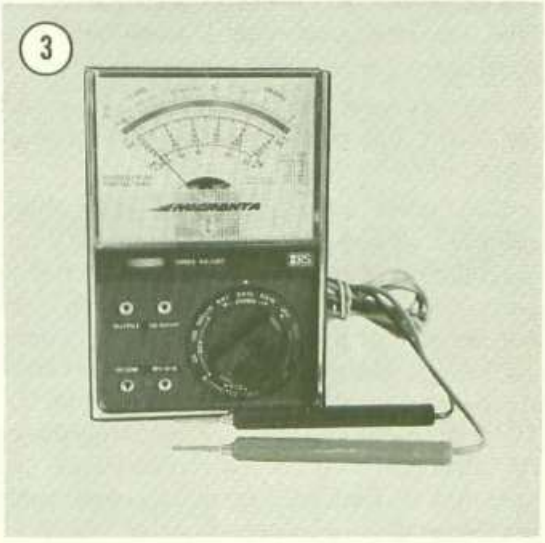
1. *Timing gauge* (**Figure 1**). By screwing this instrument into the spark plug hole, piston position may be determined. The tool shown costs about $20, and is available from larger dealers and mail order houses. Less expensive ones, which utilize a vernier scale instead of a dial indicator, are also available. They are satisfactory, but are not quite so quick and easy to use.



2. *Hydrometer* (**Figure 2**). This instrument measures state of charge of the battery, and tells much about battery condition. Such an instrument is available at any auto parts store and through most larger mail order outlets. A satisfactory one costs less than $3.



3. *Multimeter or VOM* (**Figure 3**). This instrument is invaluable for electrical system troubleshooting and service. A few of its functions may be duplicated by locally fabricated substitutes, but for the serious hobbyist, it is a must. Its uses are described in the applicable sections of this book. Prices start at around $10 at electronics hobbyist stores and mail order outlets.

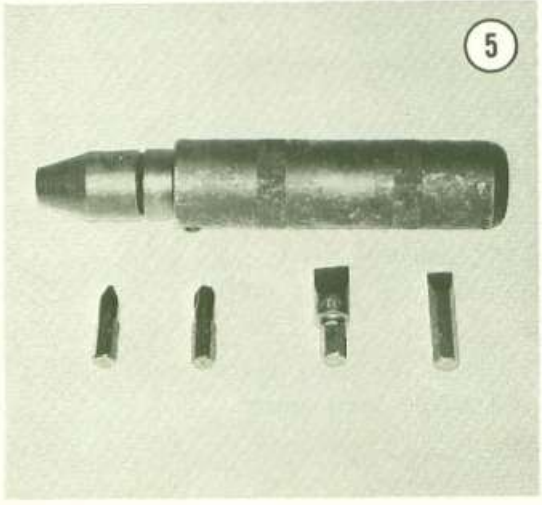


4. *Compression gauge* (**Figure 4**). An engine with low compression cannot be properly tuned and will not develop full power. A compression gauge measures engine compression. The one

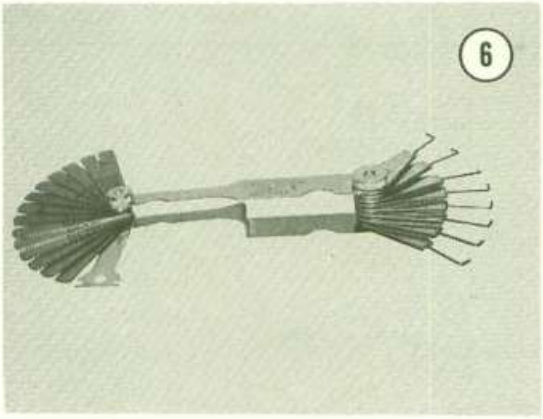


shown has a flexible stem, which enables it to reach cylinders where there is little clearance between the cylinder head and frame. Inexpensive ones start around $3, available at auto accessory stores or by mail order from large catalog order firms.

5. *Impact driver* (**Figure 5**). This tool might have been designed with the motorcyclist in mind. It makes removal of engine cover screws easy, and eliminates damaged screw slots. Good ones run about $12 at larger hardware stores.



6. *Ignition gauge* (**Figure 6**). This tool measures point gap. It also has round wire gauges for measuring spark plug gap.



A few special tools may also be required for major engine service. They are available at Kawasaki dealers.

EXPENDABLE SUPPLIES

Certain expendable supplies are also required. These include grease, oil, gasket cement, wiping rags, cleaning solvent, and distilled water. Ask your dealer for the special locking compounds, silicone lubricants, and commercial chain lube products which make motorcycle maintenance simpler and easier. Solvent is available at most service stations and distilled water for the battery is available at most supermarkets.

SERIAL NUMBERS

You must know the model serial number for the sake of registration and when ordering special parts. These identification numbers are located in the same general areas on all Kawasaki models.

The engine number is located on the crankcase between the front motor mount and frame.

The frame number is located on the steering head down-tube on the right-hand side. This same number is repeated on central frame tube under the seat (near battery on street models).

These numbers can be permamently recorded by placing a sheet of paper over the imprinted area and rubbing with the side of a pencil. Some motor vehicle registration offices will accept such evidence in lieu of inspecting the bike in person.

Table 1 BASIC SPECIFICATIONS — Z-1 AND KZ900

Engine type	4-stroke DOHC transverse inline 4-cylinder
Bore and stroke	66mm x 66mm
Displacement	903cc (55.1 cu. in.)
Compression ratio	8.5 : 1
Carburetion	4 Mikuni VM-28SC (1976 model — VM 26SS x 4)
Ignition	Battery and coil
Lubrication system	Forced lubrication
Clutch	Wet, multi-plate
Transmission type	5-speed, constant mesh, return-shift
Overall drive ratios (USA)	(1) 12.78; (2) 8.83; (3) 6.73; (4) 5.56; (5) 4.92
Output (countershaft) sprocket	15T
Rear wheel sprocket	35T
Starting system	Electric and kick
Frame type	Double cradle, tubular steel
Wheelbase	58.7 in. (1,490mm)
Steering angle	41° to either side
Trail	3.54 in. (90mm)
Front suspension	Telescopic forks, 5.5 in. (140mm) travel
Rear suspension	Swing arm, 5-way adjustable shock absorbers, 3.15 in. (80mm) travel
Front tire	3.25 x 19
Rear tire	4.00 x 18
Front brake	Single hydraulic disc, 9.6 in. (245mm) effective diameter
Rear brake	7.9 x 1.4 in. internal expanding
Ground clearance	6.5 in. (165mm)
Seat height	31.5 in.
Handlebar height	46.1 in.
Handlebar width	31 in.
Overall length	86.6 in. (2,200mm)
Fuel tank	4.5 gallons
Dry weight	514 lb.
Advertised maximum torque	52.8 ft.-lb. @ 7,000 rpm
Advertised maximum brake horsepower	81 @ 8,500 rpm, at crankshaft
Maximum rpm recommended	9,000
Minimum turning radius	98.4 in. (2,500mm)
Braking force, in G's	0.92
Top speed attainable	Average 135 mph

CHAPTER TWO

LUBRICATION, MAINTENANCE, AND TUNE-UP

Regular maintenance is the best guarantee of a trouble-free motorcycle. An afternoon spent cleaning and adjusting can minimize costly mechanical problems and unexpected breakdowns on the road.

This chapter provides a guide for all required preventive maintenance and procedures for a tune-up. Anyone with average mechanical ability can perform the procedures.

TOOLS

The basic tools needed are listed in Chapter One. In addition, equipment required for a complete tune-up includes a static timing light, a strobe light, dwell tachometer, carburetor float gauge, and sets of flat and round feeler gauges. A set of vacuum gauges to balance the carburetors is desirable, but less expensive alternatives are presented in Chapter Four.

PERIODIC LUBRICATION

These procedures apply to all models after the initial break-in period. For a lubrication schedule to use during the break-in period, see a Kawasaki dealer. **Table 1** summarizes required lubrication.

Table 1 LUBRICATION SCHEDULE

Daily

a. Engine oil level

Every 200 miles (320 km)

a. Rear chain lubrication
b. Chain oil level
c. Control linkage lubrication

Every 2,000 miles (3,200 km)

a. Engine oil change
b. Contact breaker points lubrication
c. Swing arm lubrication
d. Front fork oil level
e. Clutch cable lubrication

Every 6,000 miles (9,600 km)

a. Front fork oil change
b. Front brake fluid change
c. Throttle cable lubrication

Every 12,000 miles (19,200 km)

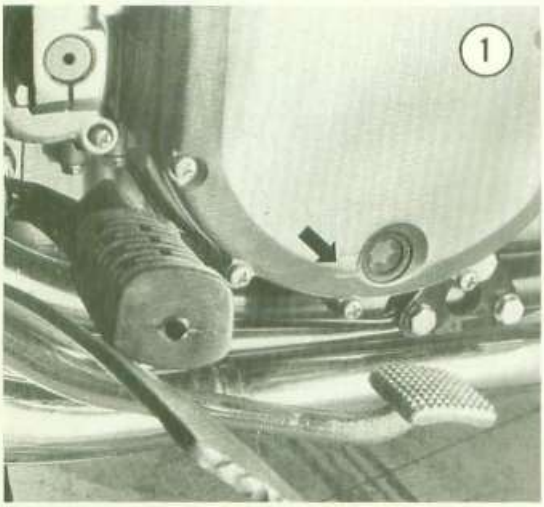
a. Rear brake cam lubrication
b. Wheel bearing lubrication
c. Steering stem bearing lubrication

Engine Oil Level

To be checked daily, as follows.

1. Wait several minutes after shutting off the engine before making the check, to give the oil enough time to run down into the crankcase.

2. Look at the oil inspection window near the bottom of the clutch cover (lower right side of the engine) to see that the oil level visible through the window lies between the upper and lower lines on the clutch cover (**Figure 1**).



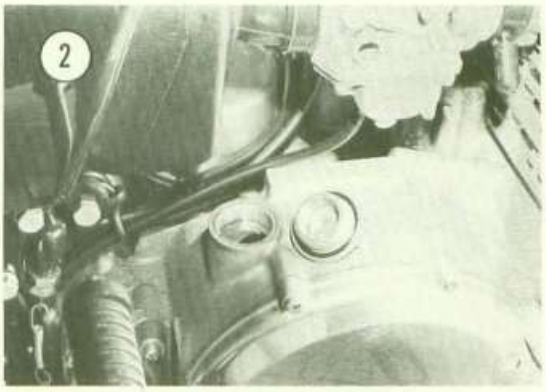
3. If the oil level lies beneath the lower line, add oil slowly, in small quantities, through the filler spout atop the clutch housing (**Figure 2**). Add enough to raise the oil level close to (but not above) the top line. Use SAE 10W-40 motor oil designated "For Service SE."

NOTE: *Too much oil in the engine will foul spark plugs, make smoke, and cause a rapid buildup of carbon in the combustion chambers.*

Rear Chain Lubrication

To be done every 200 miles (or weekly, or after riding in the rain, whichever comes first), as follows.

1. Check that the rear chain is lightly oiled, but not dripping, on 1973-1974 models. If the chain is dry or dripping, adjust the chain oil pump (for the procedure, refer to the adjustments later in this chapter).



2. On 1975 and later models, place the motorcycle on its centerstand, oil as much of the bottom chain run as you can reach with SAE 30 motor oil in a long-spout oil can. Concentrate on getting the oil down between the side plates of the chain links.

3. Rotate the rear wheel to bring unoiled portions of the chain within reach, to complete the lubrication.

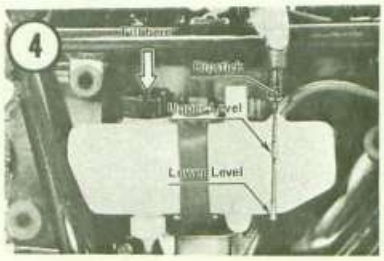
Chain Oil Level (1973-1974 Only)

To be checked every 200 miles (or weekly, whichever comes first), as follows.

1. Lift the saddle. Take off the left side cover (**Figure 3**).



2. Use the dipstick to check the level in the chain oil tank (**Figure 4**).

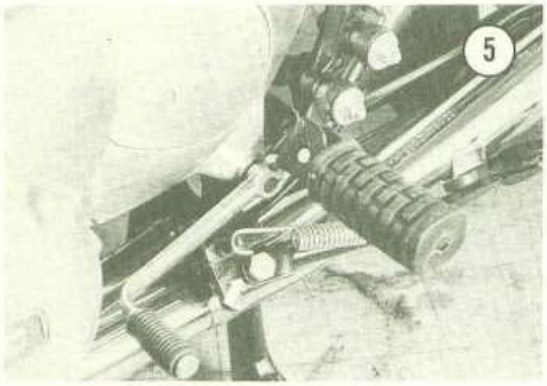


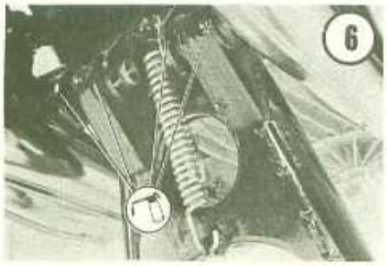
3. When the tank is less than about ⅓ full, refill it with SAE 10W-30 or 10W-40 motor oil.

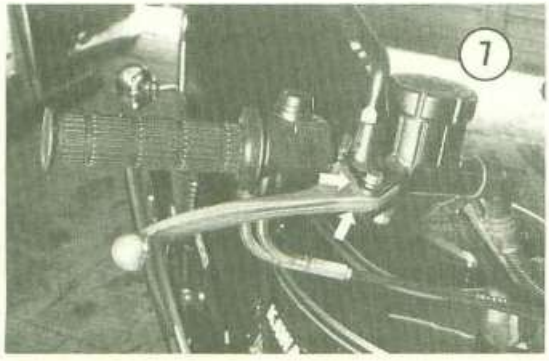
Control Linkage Lubrication

To be done every 200 miles (or weekly, or after riding in the rain, or after washing the motorcycle, whichever comes first), as follows.

1. Use a long-spout oil can to lubricate the points shown in **Figures 5 through 9**. Use SAE 30 motor oil.

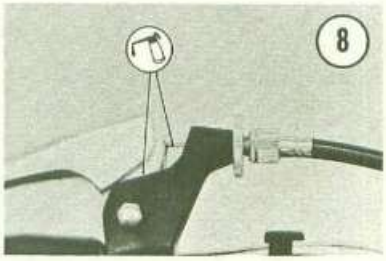


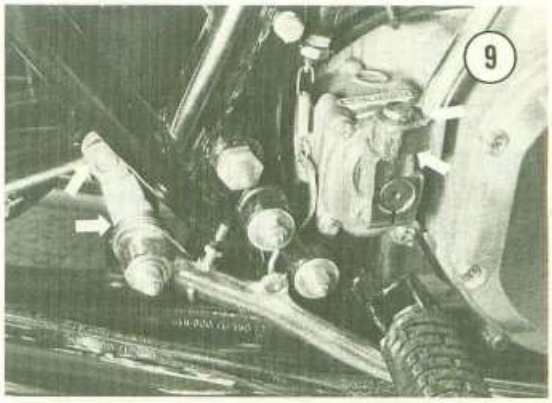




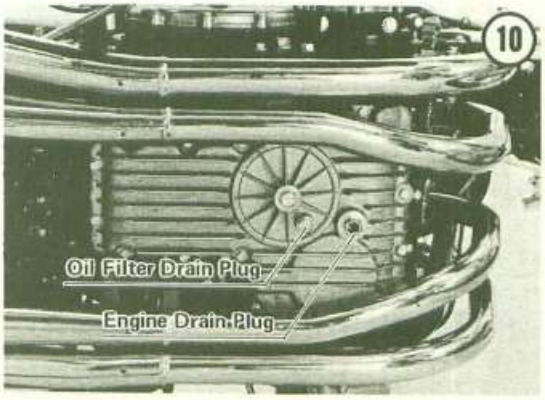
Engine Oil Change

To be done every 2,000 miles (or every 4 months, whichever comes first), as follows.





1. Run the engine long enough to warm the oil, and put the bike on its centerstand.
2. Place a drain pan beneath the engine.
3. Unscrew the engine drain plug and the oil filter drain plug (**Figure 10**). Drain the oil.

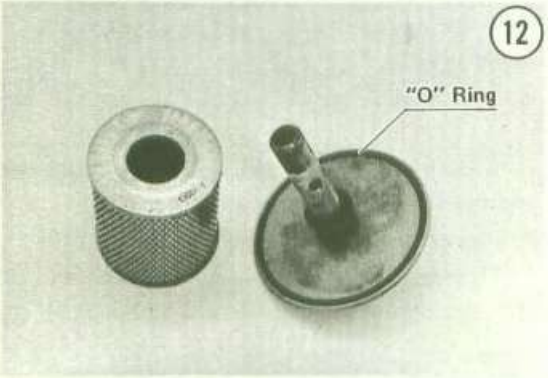


4. The oil filter should be replaced every 4,000 miles (every other engine oil change). If the oil filter is not to be changed, skip to Step 9.
5. If the oil filter is to be changed, unscrew its mounting bolt and pull it out of the engine (**Figure 11**). Take off the gaskets and discard the oil filter.



6. Wash the remaining oil filter parts that you removed in suitable solvent.

7. Check the condition of the large O-ring (**Figure 12**). If the O-ring is worn or damaged, replace it with a new one.



8. Fit a new oil filter to the base, and install it in the motorcycle.

9. Clean the metal filings off the magnetic engine drain plug, and install it.

10. Screw in the oil filter drain plug.

11. Remove the oil filler cap from atop the clutch housing. Pour in SAE 10W-40 oil until it just reaches the upper line at the inspection window. The engine will hold between 3.5 and 4.2 quarts. While adding the last pint, be sure to give the oil enough time to run down into the crankcase before checking the level in the inspection window.

Contact Breaker Points Lubrication

To be done every 2,000 miles (or every 4 months, or when the points are inspected, whichever comes first), as follows.

1. Remove the 2 screws that mount the breaker point cover to the right side of the engine. Remove the cover and its gasket.

2. Rub a small amount of high-temperature grease into the felt that bears against the breaker point cam. If you use too much grease, the cam will sling it into the points, fouling them.

3. Install cover and gasket.

Swing Arm Lubrication

To be done every 2,000 miles (or every 4 months, whichever comes first), as follows.

1. Use a gun to force cup grease into the fitting on the swing arm, until the grease runs out both ends.

2. Clean off excess grease.

3. If grease will not run out of the ends of the swing arm, unscrew the grease fitting from the swing arm. Clean it, and make certain that the ball check valve is free. Reinstall fitting.

4. Apply the grease gun again. If grease does not run out both ends of the swing arm, remove the swing arm (for the procedure, see Chapter Eight). Clean out the old grease, install the swing arm, and lubricate it.

Front Fork Oil Level

To be checked every 2,000 miles (or every 4 months, whichever comes first), as follows.

1. Prop up the motorcycle so that the front tire just clears the ground.

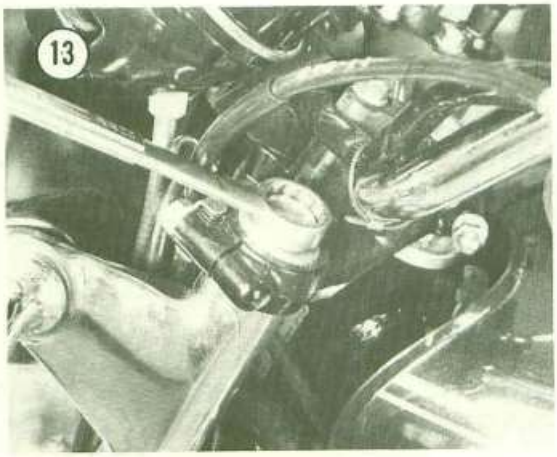
2. Loosen a fork tube clamp bolt on one side of the top triple clamp.

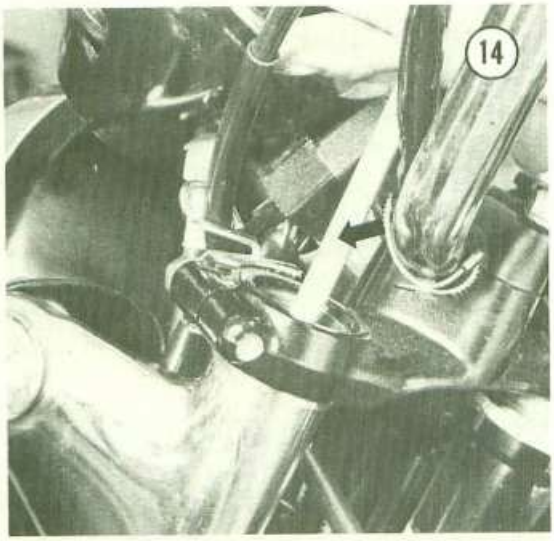
3. Unscrew the fork tube plug (top fork bolt) from the fork tube on the side of triple clamp (**Figure 13**).

4. Stick a long rod down into the fork tube, and measure the distance from the top of the fork oil to the top of the fork tube (**Figure 14**). If the oil is dirty, change it.

5. The distance should measure 17-15/16 in. in the 1973 model; 18.7 in. in the 1974-1976 model. If it is greater, add good quality SAE 10W non-detergent motor oil to bring the oil up to the proper level.

6. Install the fork plug.





7. Check that the top edge of the fork tube is flush with the top edge of the top triple clamp.

8. Torque the clamp bolt to 12-13 ft.-lb.

9. In the same manner, check the oil level in the other fork tube.

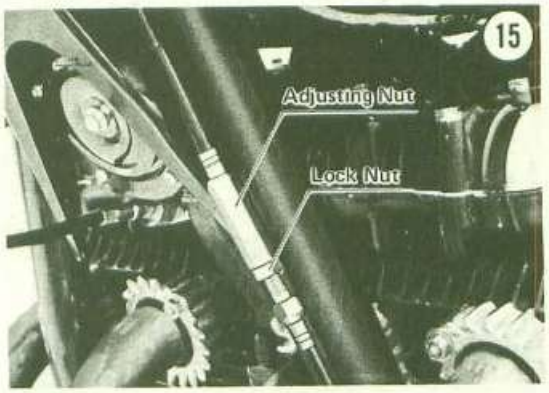
10. Even though it was not loosened, check to see that the 3rd clamp bolt in the top triple clamp is torqued to 12-13 ft.-lb.

11. Even though they were not loosened, check to see that the 2 clamp bolts in the bottom triple clamp are torqued to 39-43 ft.-lb.

Clutch Cable Lubrication

To be done every 2,000 miles (or every 4 months, or if the cable begins to drag when you pull the lever, whichever comes first), as follows.

1. At the clutch lever mount, loosen the locknut and bottom cable adjuster against the mount (**Figure 15**), to provide slack in the cable.



2. Partway down the clutch cable, loosen the locknut and screw together the 2 parts of the adjuster to get more slack in the cable.

3. If there is enough slack in the cable, pull the cable housing (outer cable) free of the lever mount, and lift the inner cable out of the mount. Bend the inner cable around to match the slot in the lever, and pull the cable and its fitting out of the lever.

4. If there is not yet enough slack in the cable to complete Step 3, remove the 2 screws that mount the oil pump cover to the chain cover on the left side of the engine. Remove the oil pump cover.

5. Loosen the locknut on the clutch adjusting screw. Back out the screw 3 or 4 turns. This will provide enough slack in the clutch cable so that it can be freed from the handlebar lever.

6. At the top of the clutch cable, examine the exposed portion of the inner cable. If it is clean, hold the cable vertical and spray it with Dri-Slide or one of the thin spray-on chain lubricants.

7. Hold the spray can close to the inner cable, near the top ferrule of the cable housing, so that the lubricant will run down between the inner cable and its housing. Spray the cable until it is lubricated along its entire length.

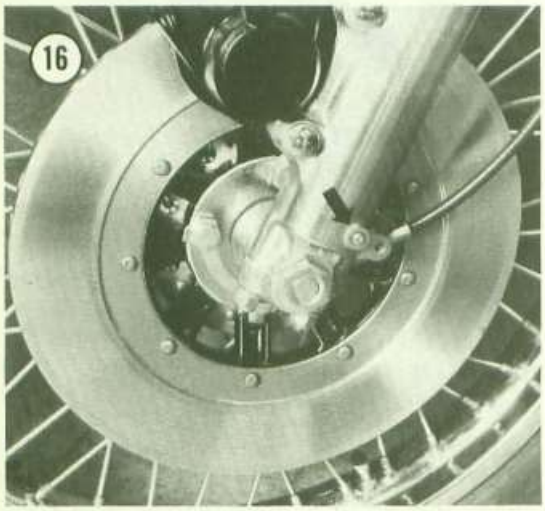
8. If the exposed portion of the inner cable is dirty, or the cable feels gritty while moving it up and down in its housing, spray it instead with a lubricant/solvent, such as LPS-25, or WD-40.

9. Attach the cable to the clutch lever, and then fit it to the lever mount. To adjust the clutch adjusting screw and/or the cable linkage, refer to the *Clutch Linkage* adjustment procedures in this chapter.

Front Fork Oil Change

To be done every 6,000 miles (or yearly, whichever comes first), as follows.

1. Position a drain pan beneath one of the front fork slider legs. Remove the drain screw near the bottom of the slider leg (**Figure 16**).



2. With both of the motorcycle's wheels on the ground, pull the front brake lever and hold it in. Push on the handlebar grips to work the forks up and down until all of the oil has drained out.

3. Install the drain screw.

4. In the same way, drain the oil out of the other slider leg.

5. Fill each fork tube with 170cc of good quality SAE 10W non-detergent motor oil. For the procedure, refer to the *Front Fork Oil Level* section of this chapter.

Front Brake Fluid Change

To be done every 6,000 miles (or yearly, or whenever the fluid becomes dirty or watery, whichever comes first), as follows.

1. Pull the rubber cap off the bleeder valve (located on the brake caliper which clamps the disc).

2. Attach one end of a piece of clear plastic tubing to the nipple at the end of the bleeder valve. Stick the other end of the tubing into an empty can.

3. Unscrew the bleeder valve body enough to open the valve fully.

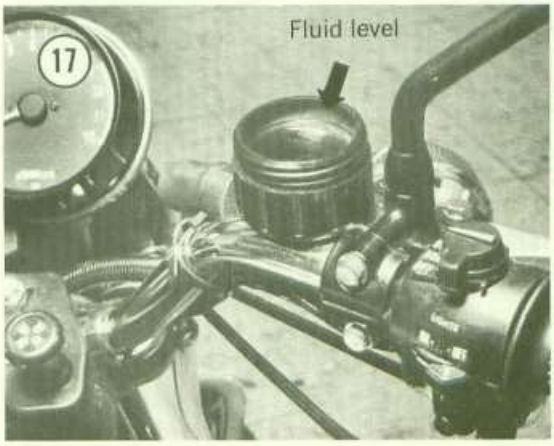
4. Squeeze and release the front brake lever until all of the fluid has been drained out of the reservoir, the line, and the caliper.

5. Screw in the bleeder valve body to close the valve. Pour out the used fluid and stick the bottom end of the tubing back into the can.

6. Unscrew the cap from the handlebar fluid reservoir. Fill the reservoir with fresh fluid.

7. Use only a disc brake fluid which is clearly marked; the correct functioning of the brake depends upon it. Continue using the same brand each time the fluid is changed; don't mix brands. Use fluid only from a recently opened can.

8. Open the bleeder valve. Squeeze the brake lever and keep pressure on it. Close the valve, and quickly release the lever. Continue this operation until brake fluid starts coming out of the bleeder valve. Add fluid as necessary to prevent the reservoir from running dry. See **Figure 17**.



9. Bleed the air from the system. See the *Front Brake Bleeding* procedure, Chapter Eight.

Throttle Cable Lubrication

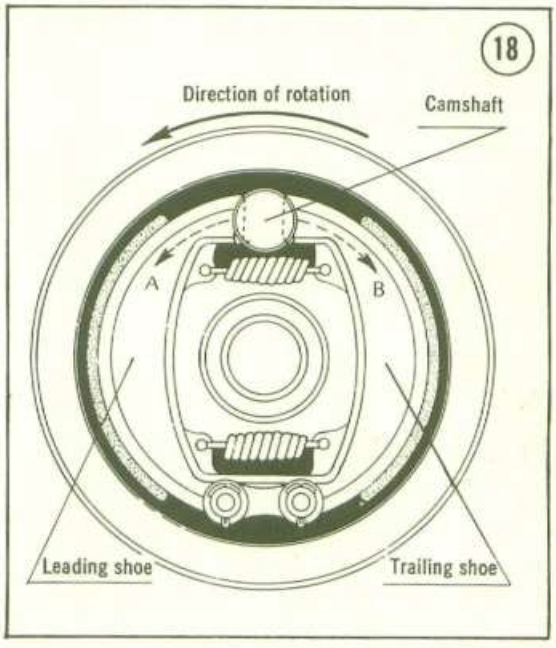
To be done every 6,000 miles (or yearly, or when the cables begin to bind, whichever comes first), as follows.

1. Loosen the nuts (at the carburetor pulley) and remove the 2 throttle cables from the pulley.
2. Remove the screws (at the handlebars) that assemble the twist grip housing. Remove the top half of the housing.
3. Remove the throttle cables from the twist grip, noting which cable goes where.
4. Examine the exposed parts of the inner cables. Pull each inner cable up and down in its housing to determine by feel whether it is clean or gritty.
5. If the cables are clean, hold the top part of one cable vertical and spray it with Dri-Slide or one of the thin spray-on chain lubricants.
6. Hold the spray can close to the inner cable, near the top ferrule of the cable housing, so that the lubricant will run down between the inner cable and its housing. Spray the cable until the lubricant runs out of the bottom of the cable housing. Lubricate the other cable in the same way.
7. If the cables are dirty, spray them instead with a lubricant/solvent, such as LPS-25, or WD-40. Continue spraying the upper portion of the inner cable until the lubricant running out the bottom of the cable housing is clean.
8. Lubricate the twist grip assembly with cup grease.
9. Reassemble throttle linkage in reverse order of disassembly. Refer to *Throttle Linkage* adjustment procedures, Chapter Four.

Rear Brake Cam Lubrication

To be done every 12,000 miles (or every 2 years, or whenever the rear wheel is removed, whichever comes first), as follows.

1. Remove the rear wheel (for procedures, refer to Chapter Eight).
2. Take out the brake backing plate.
3. Wipe away the old grease, being careful not to get any of it on the brake shoes.
4. Sparingly apply high-temperature grease to the camming surfaces of the camshaft, the camshaft groove, the brake shoe pivots, and the ends of the springs (**Figure 18**). Do not get any grease on the brake shoes.
5. Reassemble the rear wheel and install it.



Wheel Bearing Lubrication

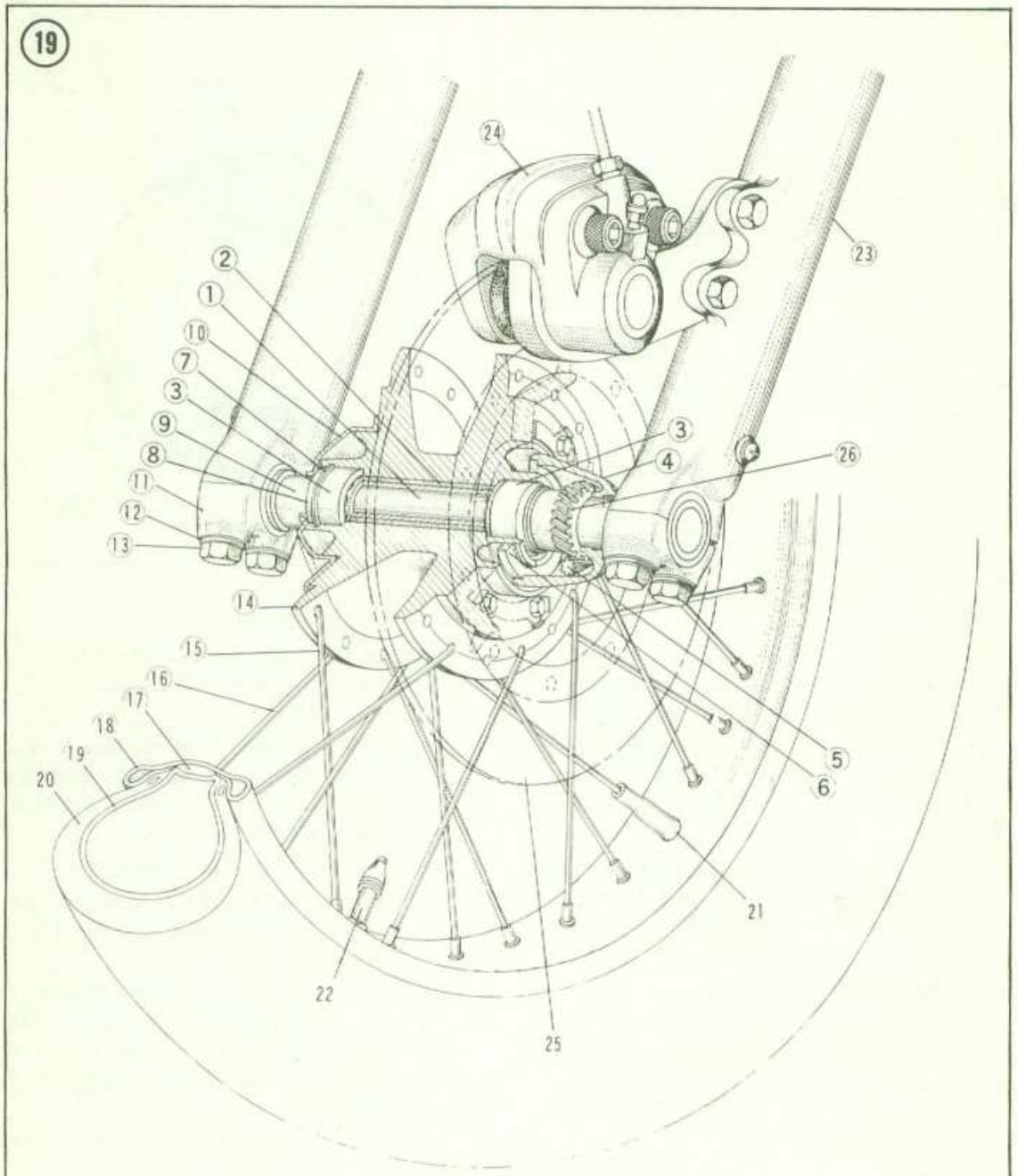
Lubricate the front and rear wheel bearings every 12,000 miles (or every 2 years, whichever comes first), as follows.

1. Remove the wheels from the motorcycle and remove the bearings (**Figures 19 and 20**). For front and rear wheel removal and disassembly procedures, see Chapter Eight.
2. Clean the old grease out of the hub.
3. Wash each wheel bearing in a suitable solvent and dry it, taking pains not to spin it in the process.
4. Oil each bearing, and spin it. See **Figure 21**. If it won't spin smoothly, or is noisy, or has rough spots, replace it with a new one. Safe steering requires that the wheel bearings be in good condition.
5. Pack the bearings with good quality bearing grease.
6. Grease the front hub speedometer gearbox.
7. Reassemble and install the wheel.

Steering Stem Bearing Lubrication

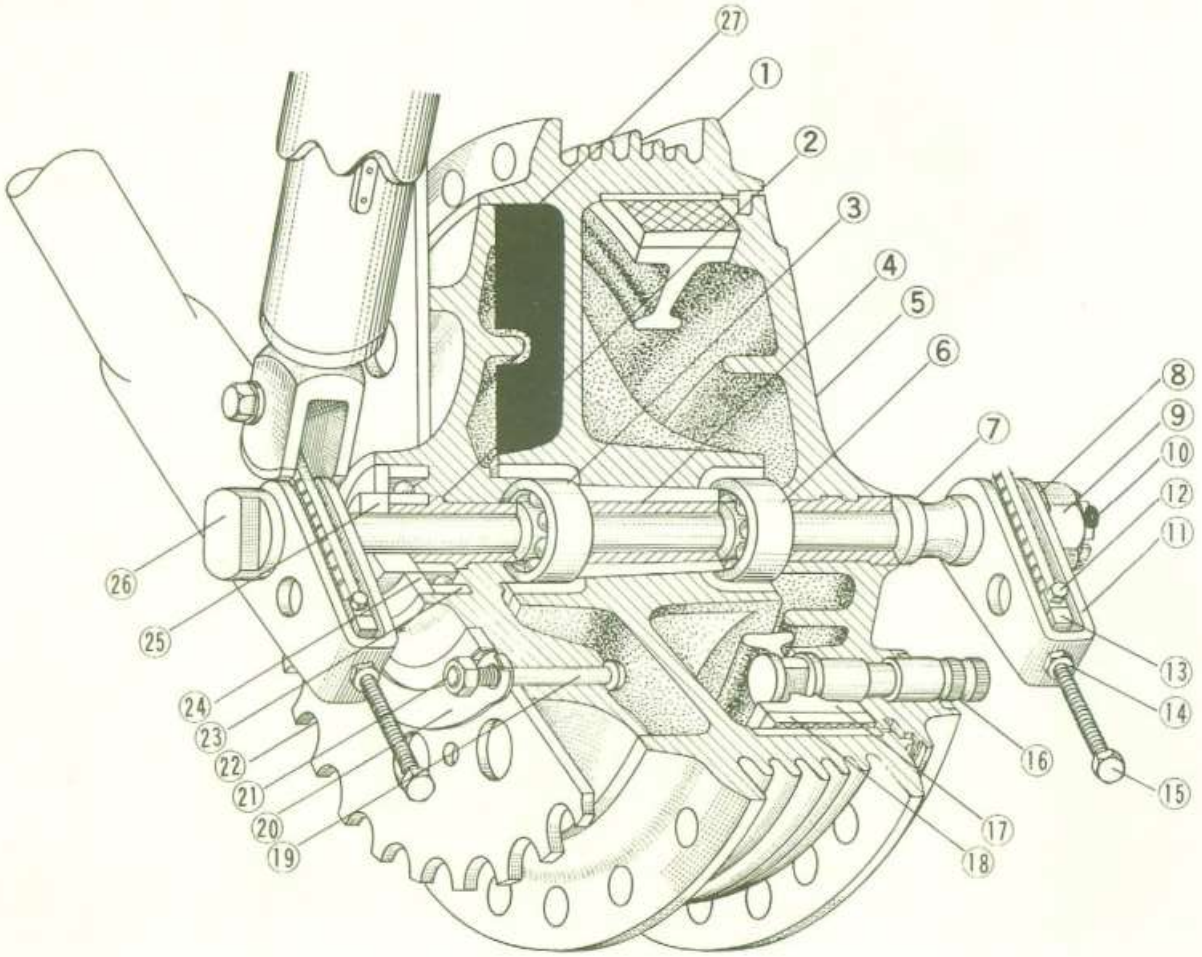
To be done every 12,000 miles (or every 2 years, whichever comes first), as follows.

1. Remove the steering stem (**Figure 22**). Procedures are given in Chapter Eight.



FRONT WHEEL

1. Front axle
2. Distance collar
3. Bearing
4. Gearbox
5. Speedometer pinion
6. Oil seal
7. Snap ring
8. Oil seal
9. Collar
10. Wheel cap
11. Axle clamp
12. Washer
13. Bolt
14. Front hub
15. Inner spoke
16. Outer spoke
17. Rim band
18. Rim
19. Tube
20. Tire
21. Wheel balancer
22. Valve
23. Front fork
24. Caliper
25. Disc
26. Speedometer gear

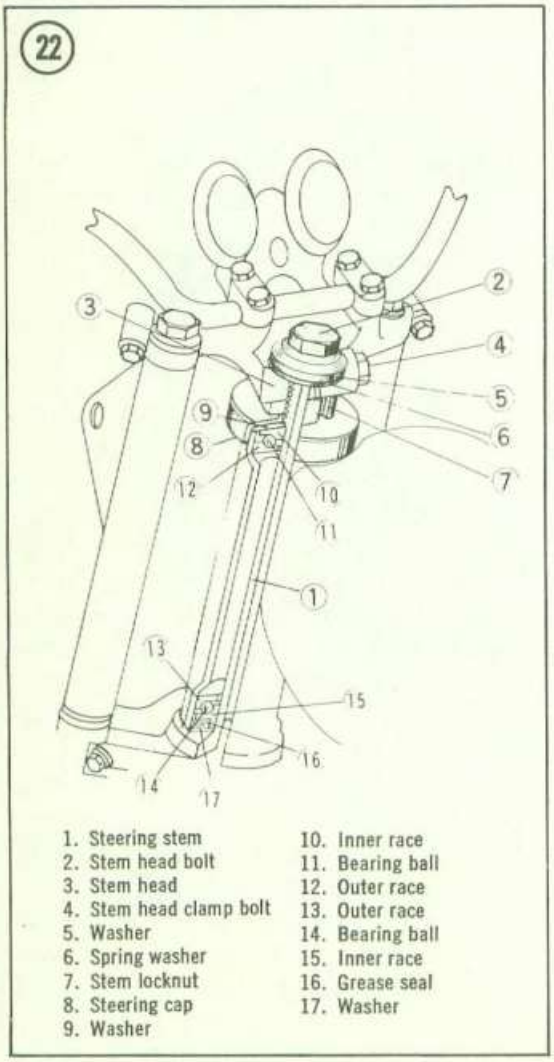


REAR WHEEL

1. Rear hub
2. Distance collar
3. Bearing
4. Distance collar
5. Panel assembly
6. Bearing
7. Collar
8. Washer
9. Axle nut
10. Cotter pin
11. Chain adjuster
12. Bolt
13. Chain adjuster stopper
14. Locknut
15. Bolt
16. Camshaft
17. Brake shoe
18. Brake lining
19. Bolt
20. Lockwasher
21. Nut
22. Rear sprocket
23. Bearing
24. Oil seal
25. Axle sleeve collar
26. Axle
27. Shock damper rubber
28. Coupling

20



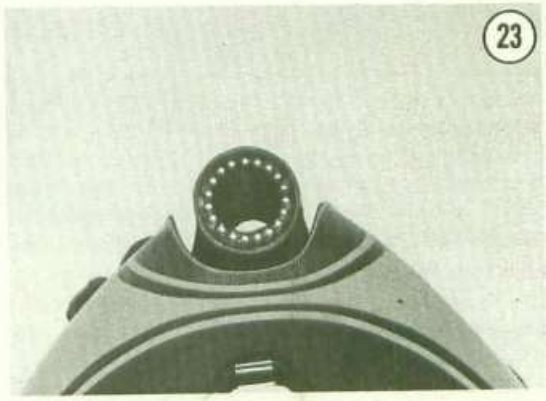


2. Clean the upper race, the lower race, and the balls of each bearing in a suitable solvent.

3. Inspect the balls and races of each bearing for wear or damage. If any component shows wears or damage, replace the entire bearing with new parts.

4. Coat all 4 races with cup grease, and position the balls on their races with more cup grease (**Figure 23**).

5. Install the steering stem.



PERIODIC MAINTENANCE

These procedures apply to the bike after the initial break-in period. For a schedule of checks to make during the break-in period, see a Kawasaki dealer. **Table 2** summarizes periodic maintenance. Also see *Periodic Lubrication* in this chapter.

DAILY CHECKS

Before starting the engine for the first time each day, check the following.

Tire Pressures

1. For normal solo riding, inflate the front tire (Dunlop F6B, 3.25H x 19) to 28 lb. Inflate the rear tire (Dunlop K-87 Mk2-M, 4.00 x 18) to 31 lb.

2. For normal double riding (with passenger), inflate the front tire to 28 lb., and the rear tire to 36 lb.

3. For sustained high-speed riding, increase the tire pressures to 3-6 psi over normal.

Table 2 PERIODIC MAINTENANCE

Daily checks a. Tire pressures b. Spoke condition c. Rear chain tension d. Front brake operation e. Rear brake operation f. Operation of lights and horn g. Clutch operation
Every 200 miles a. Front brake-pad wear b. Battery fluid level c. Wheel spoke tension d. Tire wear
Every 1,000 miles Air cleaner element condition
Every 2,000 miles a. Fuel line condition b. Camshaft chain tension c. Spark plug condition d. Contact breaker-points condition e. Steering play f. Rear chain wear g. Wheel balance and rim trueness h. Tightness of nuts and bolts
Every 4,000 miles Valve clearance adjustment
Every 6,000 miles Front fork spring condition

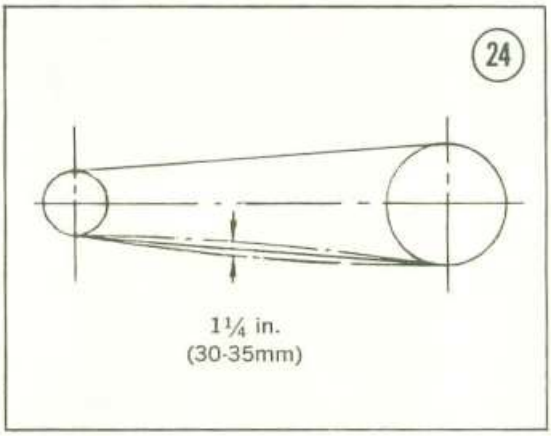
4. Remove any embedded stones from the tires. Check each tire for bad cracks or cuts, and replace the tire if you find any (for the replacement procedures, see Chapter Eight).

Spoke Condition

Examine both wheels carefully for bent or broken spokes. If you find any, replace them with new ones (for the procedures, see Chapter Eight).

Rear Chain Tension

1. Put the motorcycle on the centerstand.
2. Turn the rear wheel slowly until you locate the portion of chain that stretches tightest between the 2 sprockets on the bottom chain run (the chain wears unevenly).
3. Hold a ruler vertical beside the bottom chain run, at a point halfway between the 2 sprockets.
4. With thumb and forefinger, lift up and press down the chain at that point, measuring the distance the chain moves vertically.
5. The chain should have 1¼ in. of vertical travel at midpoint (**Figure 24**). If it has less than one in. or more than 1½ in. of travel, adjust the chain tension (see the *Chain Tension* adjustment procedure in this chapter).



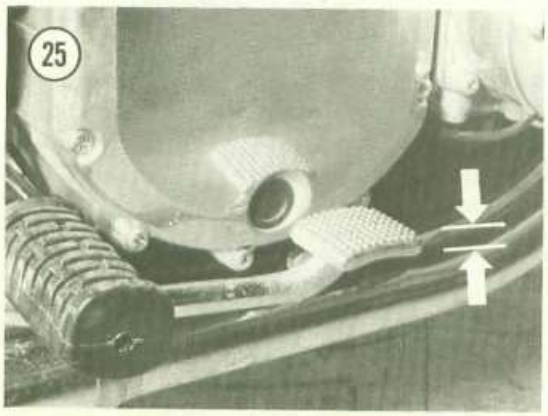
Front Brake Operation

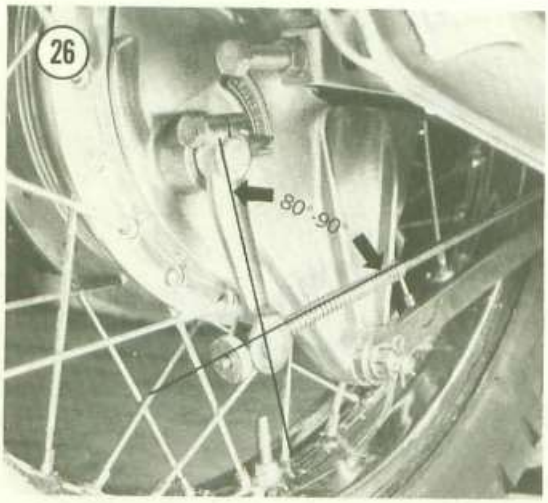
1. Unscrew the top from the brake fluid reservoir on the handlebar and check the fluid level. If the reservoir is less than ½ full, add enough fluid to bring the level up to the line on the inside of the reservoir. Use brake fluid clearly marked.
2. Pull the front brake lever. Check that it does not feel spongy, and that the lever does not have too much travel.
3. With the gearbox in neutral and the front brake on, try to move the motorcycle back and forth, to check that the caliper pads are clamping the disc.
4. If the brake is spongy, or there is too much lever travel, bleed the brake (see *Front Brake Bleeding* procedure, Chapter Eight). If caliper pads do not clamp the disc, see Chapter Eight.

Rear Brake Operation

1. Check the position of the rear brake pedal at rest. The top of the pedal should be slightly below the top of the front footpeg.

2. Hold a ruler vertical alongside the pedal, and push down the pedal by hand. The pedal should move ¾-1¼ in. (**Figure 25**). The brake cam lever should then form an angle of 80-90 degrees with the brake rod (**Figure 26**).

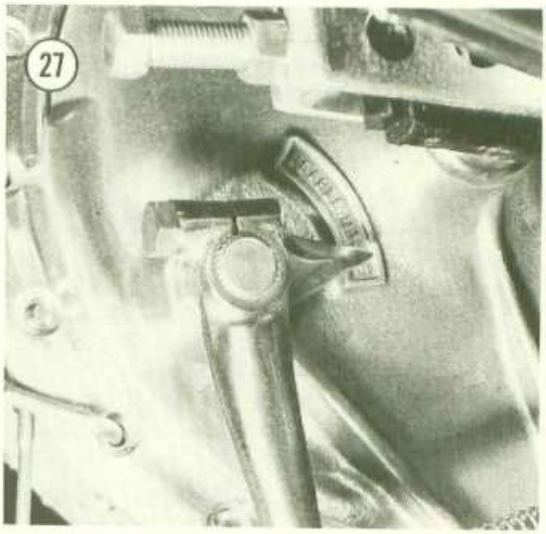




3. If the brake pedal travels more than 1½ in., adjust the linkage (see *Rear Brake Linkage Adjustment* procedure in this chapter).

4. If the angle between the brake cam lever and the brake rod exceeds 100 degrees when the brake is applied, check the brake for wear (see Chapter Eight).

5. On the 1974-1976 models, check the brake lining wear indicator on the backing plate (**Figure 27**). When the indicator needle moves into the red range, replace the brake shoes (Chapter Eight).



Lights and Horn

With the engine running, check the following.

1. Pull the front brake lever and check that the brake light comes on.

2. Push the rear brake pedal, and check that the brake light comes on soon after you have begun depressing the pedal.

3. Turn the headlight switch to the ON position. Check to see that headlight and taillight are on.

4. Move the dimmer switch up and down between the high and low positions, and check to see that both headlight elements are working.

5. Push the turn signal switch to the left position and the right position and check that all 4 turn signal lights are working.

6. Push the horn button and note that the horn blows loudly.

7. If, during the tests, the rear brake pedal traveled too far before the brake light came on, adjust the rear brake light switch (see the brake light switch adjustment procedure in this chapter). If the horn or any light failed to work properly, see Chapter Five.

Clutch Operation

1. With the engine oil warm and the transmission in neutral, pull the clutch lever all the way

to the handlebar and check to see that you can shift up into 2nd gear without a jolt or a clunking sound.

2. When you shift into 1st gear to ride away, check that you can let the ball end of the lever move at least ½ in. from the handlebar before the clutch begins to engage. As you continue to let out the clutch, check that the clutch is fully engaged at least ½ in. before the ball end of the lever reaches the end of its travel.

3. At rest, the clutch lever should have 1/16 to ⅛ in. of slack.

4. If the clutch does not perform correctly, adjust the linkage (see *Clutch Linkage Adjustment* procedure in this chapter).

WEEKLY CHECKS

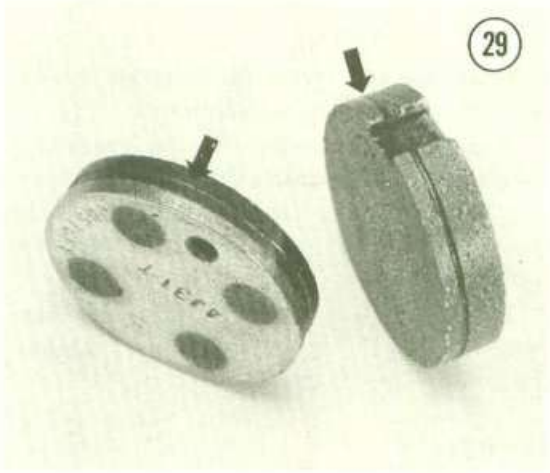
Front Brake Pad Wear

To be checked every 200 miles (or weekly, whichever comes first), as follows.

1. Have an assistant apply the front brake.
2. Shine a light between the caliper and the disc and inspect the brake pads (**Figure 28**).



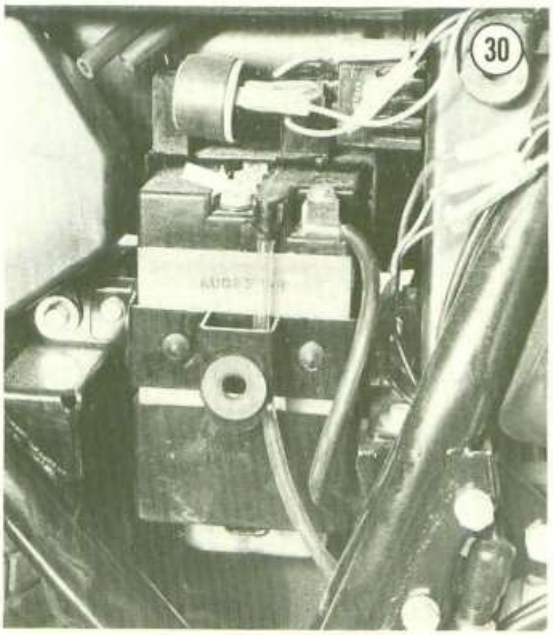
3. If either pad has worn enough so that its red line is touching the disc, replace both pads as a set (**Figure 29**). See Chapter Eight.



Battery Fluid Level

To be checked every 200 miles (or weekly, whichever comes first), as follows.

1. Take off the right side cover.
2. Check the electrolyte level in the battery (**Figure 30**).



3. If the electrolyte level is below the bottom line in any of the 6 cells, raise the seat and add

enough distilled water to raise the level above the bottom line (but not above the top line) on the battery case. Do not use tap water.

Wheel Spoke Tension

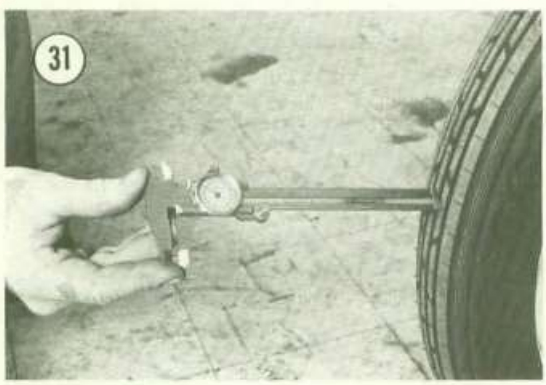
To be checked every 200 miles (or weekly, whichever comes first), as follows.

1. Tap each spoke with a wrench. The higher the pitch of sound it makes, the tighter the spoke. The lower the sound frequency, the looser the spoke. A "ping" is good; a "klunk" says the spoke is too loose.
2. If one or more spokes are loose, tighten them (see the *Spoke Tension and Wheel Balance* procedure in this chapter).

Tire Wear

To be checked every 200 miles (or weekly, whichever comes first), as follows.

1. With a depth gauge or a machinist's scale, measure the depth of the tread on each tire (**Figure 31**).



2. On a new front tire, the tread is 0.157 in. (4.0mm) deep. On a new rear tire, the tread is 0.276 in. (7.0mm) deep.
3. If you ride at speeds over 80 mph, replace the front tire when its tread is less than 0.04 in. (1.0mm) deep. Replace the rear tire when its tread is less than 0.12 in. (3.0mm).

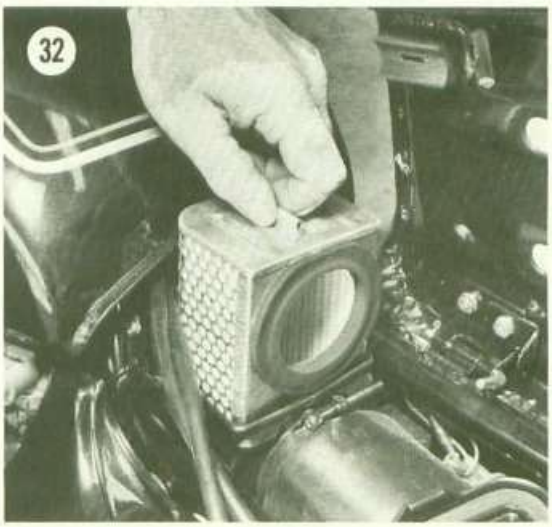
LONG TERM CHECKS

Air Cleaner Element Condition

To be checked every 1,000 miles (or every 2 month, whichever comes first), as follows.

1. Lift the seat, take the screen off the air cleaner, and lift out the element (**Figure 32**).

NOTE: *The 1976 KZ900 has a redesigned air cleaner body and element and an added silencer to reduce noise. Service instructions are the same for all models.*



2. Wash the element with a suitable solvent. Allow the element to drip-dry, or blow it dry from the inside.
3. Replace the element with a new one if it is damaged, or after you have washed it 5 times.

Fuel System Cleaning

To be done every 2,000 miles (or every 4 months, whichever comes first). See the procedure in Chapter Four.

Camshaft Chain Tension

To be adjusted every 2,000 miles (or every 4 months, whichever comes first). See the adjustment procedure in this chapter.

Spark Plug Condition

To be checked every 2,000 miles (or every 4 months, whichever comes first), as follows.

1. Remove the spark plugs.
2. Check each one for damaged threads or insulator. If a spark plug is damaged, replace it with a new one.

3. Check each spark plug for burned electrodes and a white tinge on the center insulator (which can indicate an overheating condition that must be corrected). Replace any spark plug that has worn or rounded electrodes with a new one.

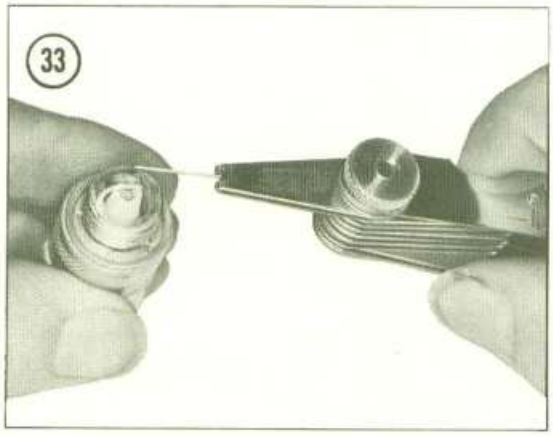
4. Check each spark plug for sooty carbon deposits on the bottom edge and on the electrodes (which can indicate an excessively rich mixture, or a weak spark).

5. Check each spark plug for oil on the electrodes, the bottom edge, or the center insulator (which can indicate worn or sticking piston rings or leaky valve guides).

6. The spark plugs should have unworn electrodes with sharp edges, and the center insulator should be light brown in color, indicating that the fuel mixture is correct, the spark is strong, and the spark plugs are of correct heat range.

7. Have dirty or oily spark plugs with good electrodes cleaned in a spark plug sandblaster with clean sand.

8. Check the electrode gap of each spark plug with wire gauges (**Figure 33**). The gap should be 0.028-0.031 in. (0.7-0.8mm). If any spark plug has a thinner or wider gap, correct it by bending the outer electrode with a gapping tool.



9. Use an anti-seize compound and replace the plugs; be careful not to overtighten them. Use a new washer.

Contact Breaker Points Condition

To be checked when lubricating the points cam every 2,000 miles (or every 4 months, whichever comes first), as follows.

1. Remove the 2 screws that mount the breaker points cover to the right side of the engine. Remove the cover and its gasket.

2. Check the condition of each set of points.

3. If the points are dirty, clean them with a clean piece of cloth wetted with solvent.

4. If the points are lightly worn or lightly pitted, smooth them with an oilstone or sandpaper, and clean them.

5. If the points are badly worn or pitted, replace them and the capacitors with new components.

6. If the spring on the movable arm of one set of points feels weaker than the spring on the other set, replace the assembly that has the weak spring.

7. For removal of the breaker points, see Chapter Five.

8. Check the ignition timing and the points gap (see the *Ignition Timing* procedure in this chapter).

Steering Play

To be checked every 2,000 miles (or every 4 months, whichever comes first), as follows.

1. Prop up the motorcycle so that the front tire clears the ground.

2. Center the front wheel. Push lightly against the left handlebar grip to start the wheel turning to the right, then let go. The wheel should continue turning under its own momentum until the forks hit their stop.

3. Center the wheel, and push lightly against the right handlebar grip.

4. If, with a light push in either direction, the front wheel will turn all the way to the stop, the steering adjustment is not too tight.

5. Center the front wheel and kneel in front of it. Grasp the bottoms of the 2 front fork slider legs. Try to pull the forks toward you, and then try to push them toward the engine. If no play is felt, the steering adjustment is not too loose.

6. If the steering adjustment is too tight or too loose, readjust it (see the *Steering Play* procedure in this chapter).

Rear Chain Wear

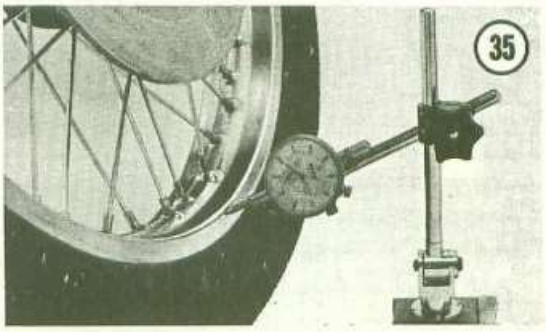
To be checked every 2,000 miles (or every 4 months, whichever comes first), as follows.

1. With motorcycle on centerstand, screw in chain adjusters to move wheel rearward until the chain is tight (see *Rear Chain Tension Adjustment* procedure in this chapter).
2. Lay a scale along the top chain run.
3. Measure the length of any 20 links in the chain, from the center of the first pin you select to the 21st pin (**Figure 34**).
4. Twenty links in a new chain stretched tight are 15 in. long. If you measure more than 15-15/16 in. of length, replace the chain with a new one (for procedures, see Chapter Eight).

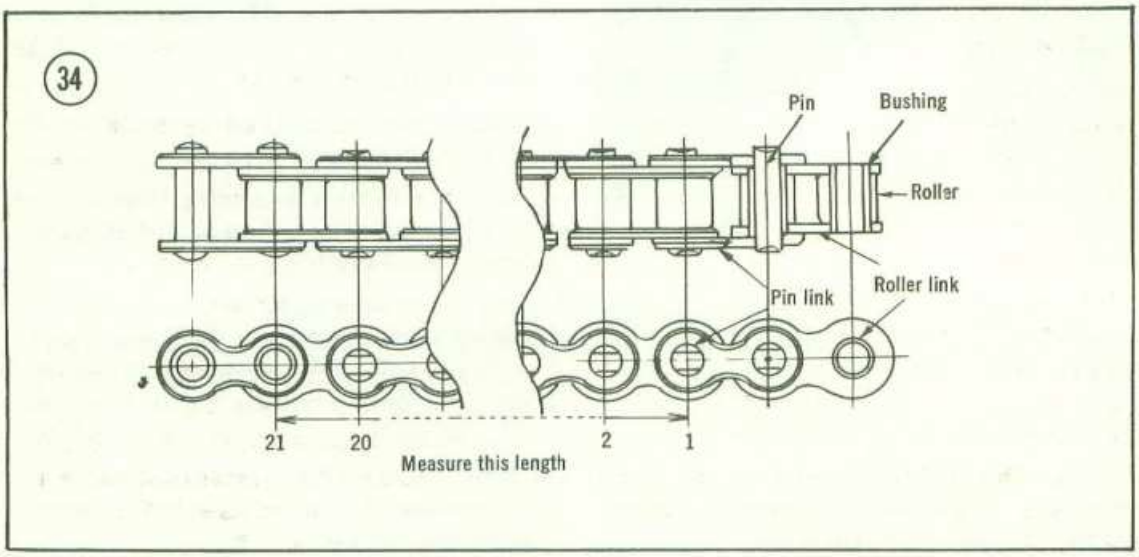
Wheel Balance and Rim Trueness

To be checked in both wheels every 2,000 miles (or every 4 months, whichever comes first), as follows.

1. Prop motorcycle so wheel clears the ground.
2. For checking the rear wheel, remove the rear chain from the rear sprocket (for the procedures, see Chapter Eight).
3. Position a dial gauge so that it bears against the side of the rim (**Figure 35**). Turn the wheel slowly, and write down the highest and lowest readings. Subtract the lowest from the highest reading to get the axial (side wobble) runout of the rim.



4. Position the dial gauge so that it bears against the inner face of the rim near the edge. Turn the wheel slowly, and write down the highest and lowest readings. Subtract the lowest from the highest reading to get the radial (up-and-down wobble) runout of the rim.
5. A new wheel has an axial runout of less than 0.04 in. (1.0mm), and a radial runout of less than 0.04 in. (1.0mm).
6. If you measure more than 0.12 in. (3.0mm) of axial runout, or more than 0.08 in. (2.0mm) of radial runout, remove the axle from the wheel and check it for runout (for the procedures, see Chapter Eight).
7. If the axle runout is within tolerance, adjust the spoke tension (see the *Spoke Tension* procedure in this chapter).
8. If you cannot true the rim with a reasonable amount of spoke tuning, the rim is bent and must be replaced with a new one.



9. Spin the wheel. When it stops, mark the lowest part of the tire with a piece of chalk. Repeat the process 4 or 5 times. If the wheel stops in the same place (or nearly the same place) each time, it will need balancing (see the *Wheel Balance* procedure in this chapter).

Tightness of Nuts and Bolts

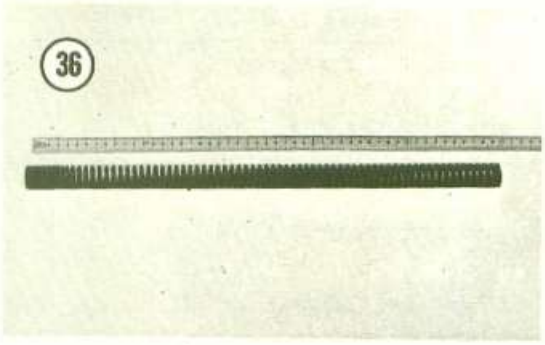
To be checked every 2,000 miles (or every 4 months, whichever comes first), as follows.

1. Check the torque of the following:
   a. Long engine mount bolts, 47-50 ft.-lb.
   b. Short engine mount bolts, 26-29 ft.-lb.
   c. Handlebar clamp bolts, 18 ft.-lb.
   d. Top triple clamp bolts, 12-13 ft.-lb.
   e. Bottom triple clamp bolts, 39-43 ft.-lb.
   f. Front axle clamp nuts, 13-14.5 ft.-lb.
   g. Top shock absorber mounting nuts, 44-47 ft.-lb.
   h. Bottom shock absorber mounting bolts, 22-25 ft.-lb.
   j. Swing arm pivot nut, 87-108 ft.-lb.
   k. Rear brake backing plate torque link, 22-25 ft.-lb.
   l. Rear axle nut, 95-115 ft.-lb.
2. Check the engine cover screws for tightness.
3. Check the remaining nuts and bolts on the motorcycle for tightness. For additional torque figures, refer to *Specifications* in Chapter Nine.

Front Fork Spring Condition

To be checked when the fork oil is being changed every 6,000 miles (or once a year, whichever comes first), as follows.

1. Remove the fork plug from the top of a fork tube (see the *Front Fork Oil Change* procedure in this chapter).
2. Pull the fork spring out of the fork tube.
3. Measure the length of the spring (**Figure 36**).
4. In the 1973 Z-1, a new fork spring has a free length of 19.5 in. If the spring is shorter than 19.1 in., replace it with a new one.
5. In the 1974-1975 Z-1, a new fork spring has a free length of 19.9 in. If the spring is shorter than 19.5 in., replace it with a new one.



6. In the 1976 KZ900 and 1977 and later KZ1000, a new fork spring has a free length of 18.30 in. If the spring is shorter than 17.90 in., replace it with a new one.
7. Check the length of the other fork spring in the same manner.

ADJUSTMENT PROCEDURES

The most frequently required adjustments to the motorcycle are listed in **Table 3**. In some cases you will have been referred to them by the periodic checks described earlier in this chapter. If not—if instead you are tracking down a malfunction—you should glance at the periodic checks anyway. In some instances they offer procedures to tell whether or not you will need to make the adjustment. In a few cases they tell how to begin making adjustment.

Valve Clearance Adjustment

Check valve clearance with the engine cold.

1. Remove valve covers as outlined in Chapter Six under *Camshafts, Disassembly,* Steps 1-5.
2. Torque camshaft cap bolts to 13.5 ft.-lb. (1973-1976) or 95-113 in.-lb. (1977 on).
3. Remove contact breaker cover.
4. Turn crankshaft with a wrench until marks on appropriate camshaft sprocket lines up with cylinder head surface (**Figure 37**).
5. Insert feeler gauge between cam lobe and shim and measure valve clearance on valves 1 and 3. The correct clearance is 0.002-0.004 in. (0.05-0.10mm). See **Figure 38**.

Table 3 ADJUSTMENTS

Engine
- a. Valve clearance
- b. Camshaft chain tension
- c. Clutch linkage
- d. Chain oil pump flow rate

Fuel system
- a. Fuel system cleaning
- b. Carburetor linkage
- c. Throttle linkage
- d. Carburetor idle (without vacuum gauges)
- e. Carburetor idle (with vacuum gauges)

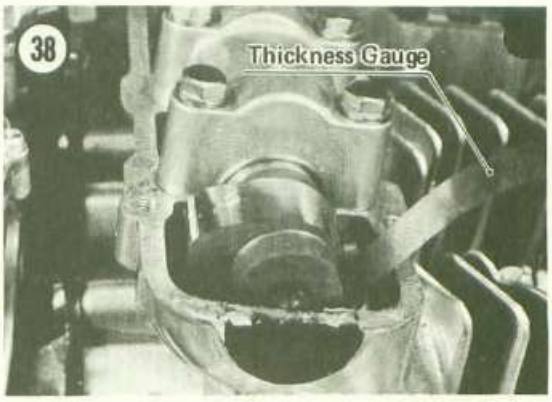
Ignition and other electrical components
- a. Points gap (with feeler gauges)
- b. Points gap (with dwell-angle meter)
- c. Ignition timing
- d. Headlight position
- e. Rear brake light switch

Front end and frame
- a. Steering play
- b. Front brake bleeding
- c. Spoke tension and wheel balance (both wheels)

Rear end
- a. Rear chain tension
- b. Rear brake linkage



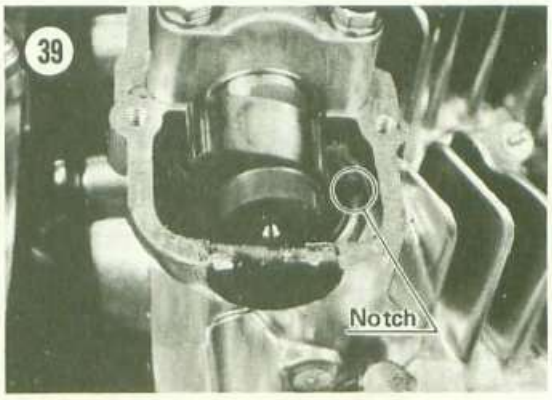
6. Turn crankshaft one turn until marks on camshaft sprocket line up again (refer to Figure 37). Measure valve clearance on valves 2 and 4 (refer to Figure 38).



7. Check valve clearance on other camshaft following same procedure given in Steps 4-6, preceding.

8. If valve clearance needs adjusting, proceed with Step 9; if valve clearance is within acceptable limits, install valve covers as outlined in Chapter Six under *Camshafts, Reassembly*, Steps 19-22.

9. Changing the valve clearance is accomplished by replacing the old shim with a new one of different thickness. (If clearance is too little, install a thinner shim; if too great, install a thicker one.) Turn crankshaft until cam points away from lifter. Position the notch in the lifter so it points toward opposite camshaft (**Figure 39**). This will allow easy shim removal.



10. Turn crankshaft until cam is pushing down on lifter. Hold lifter down (use special Kawasaki Lifter Cup Holding Tool if available).

11. Turn crankshaft until cam points away from the lifter and remove shim.

CAUTION

When valve lifter holder tool is fitted to a valve assembly and crankshaft is turned to rotate camshaft, it must *be turned so cam lobe turns away from the tool. If it is turned toward the tool, serious engine damage can result. (The camshaft rotates in same direction as crankshaft.)*

12. Check shim thickness, which is printed on shim surface, and select a new shim which will bring valve clearance within acceptable limits. Shims are available in sizes from 0.051-0.081 in. (2.00-3.20mm) in increments of 0.002 in. (0.05mm).

13. Insert new shim on valve lifter with numbered side facing downward so the number will not be ground off by the action of the cam.

CAUTION

Never put shim stock under a shim. The shim could come loose at high rpm and cause extensive engine damage. Never grind the shim; this can cause a fracture which can also cause extensive engine damage.

NOTE: *If smallest available shim does not increase clearance to within acceptable limits, the valve seat is probably worn. If this is the case, repair the valve seat, grind the stem slightly, and recheck the clearance.*

14. Turn crankshaft until cam lobe pushes down on lifter and remove the special tool.

15. Recheck valve clearance.

16. Install valve covers as outlined in Chapter Six under *Camshafts, Reassembly,* Steps 19-22.

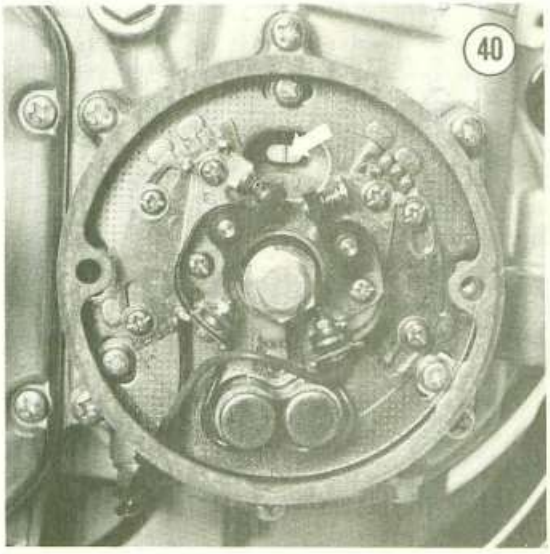
Camshaft Chain Tension

The camshaft chain gradually develops slack and becomes noisy; it should be adjusted periodically to prevent it from breaking or jumping the sprockets.

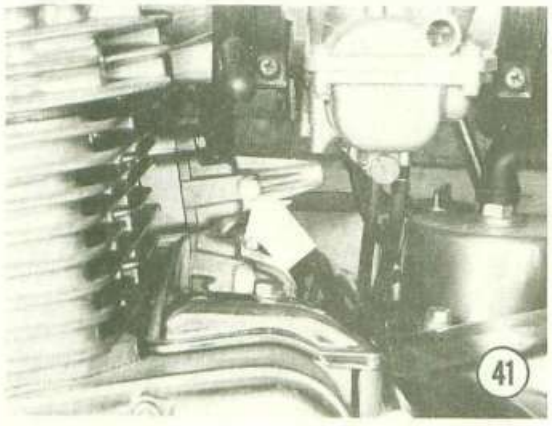
Adjust the tension as follows.

1. Remove the 2 screws that mount the breaker points cover to the right engine cover. Remove the breaker points cover and its gasket.

2. Locate the ignition timing marks (stamped on the ignition advance unit) by looking through the cutout between the contact breaker points. Rotate the crankshaft (with the kickstarter) until the T mark (the left vertical mark) for cylinders 1 and 4 or for cylinders 2 and 3 lies beneath the pointer (**Figure 40**).



3. Back off the tensioner bolt locknut located on the rear of the cylinder block, at the left side of tensioner body. Loosen the bolt (**Figure 41**). This enables a spring inside the tensioner body to take up slack in the camshaft chain.



4. Rotate the crankshaft a few times.

5. Torque the tensioner bolt to 35-52 in.-lb. Tighten the locknut.

6. Install breaker points cover and its gasket.

Clutch Linkage

If there is too much slack in the clutch linkage, the clutch will not disengage completely when you pull the clutch lever to the handlebars. The result is a jolt (and heavy wear on the transmission components) when shifting gears.

If there is too little slack in the clutch linkage, the clutch will not be fully engaged when the clutch lever is at rest. The resulting slippage will cause a loss of power and rapid wear of the clutch components. Clutch slippage is particularly noticeable just after you have shifted up at high rpm; the motorcycle will continue to accelerate, while the rpm — after jumping momentarily — will decrease for a short time.

The linkage develops slack (causing clutch drag) because of cable stretch. It develops slippage because of clutch plate wear, which allows the pressure plate to move into the clutch; the clutch pushrod is jammed against the clutch release mechanism and the pressure plate, causing the clutch to slip.

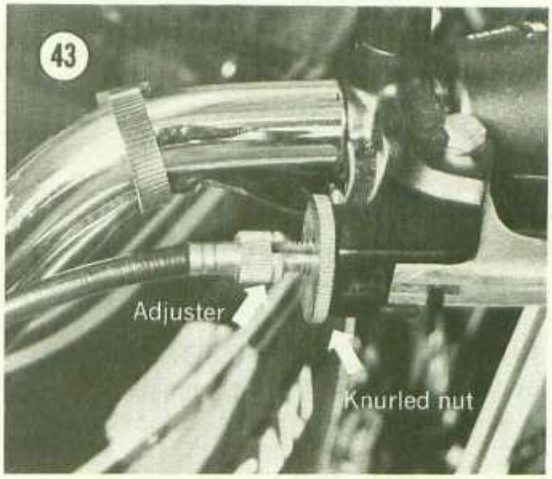
Adjust the linkage as follows.

1. The adjuster is located partway down the clutch cable. Loosen the locknut and screw both parts of the adjuster together (**Figure 42**).



2. Loosen the locknut at the clutch lever mount, just enough to allow turning the adjuster. Screw the adjuster in or out until 3/16-¼ in. of threads are showing between the locknut and the adjuster body (**Figure 43**).

NOTE: *There is no chain oil pump on 1975 and later models.*



3. On the left side of the 1973-1974 models, remove the 2 screws which mount the chain oil pump cover to the chain cover. Remove the oil pump cover and its gasket.

4. Loosen the locknut on the clutch adjusting screw inside the chain cover. Back out the screw 3 or 4 turns (**Figure 44**).

5. Screw in the clutch adjusting screw until the point is reached where it is hard to turn. Back out the screw ½ turn and tighten the locknut.

6. Unscrew the adjuster body (located partway down the clutch cable) until it has just taken all the slack out of the cable, and the clutch lever has no free play. Tighten the locknut.

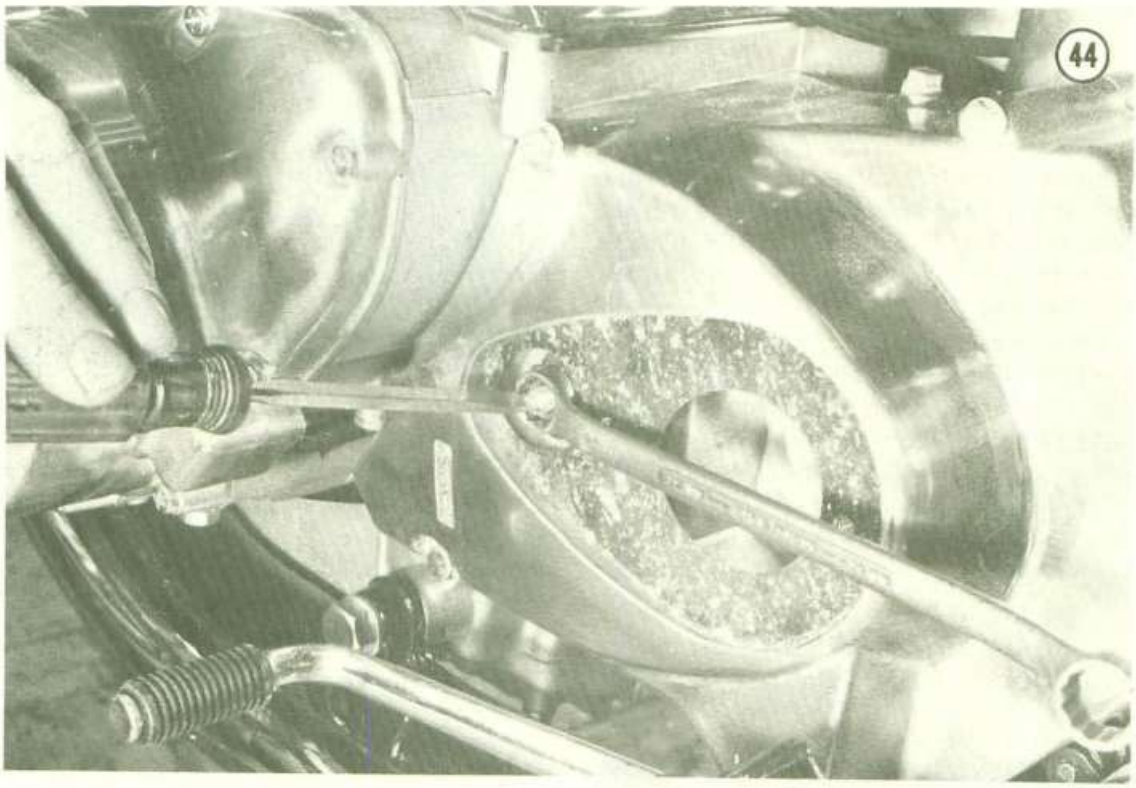
7. Screw the clutch lever cable adjuster into the lever mount until there is 1/16-⅛ in. of slack between the cable-end of the lever and the mount (**Figure 45**). Tighten the locknut.

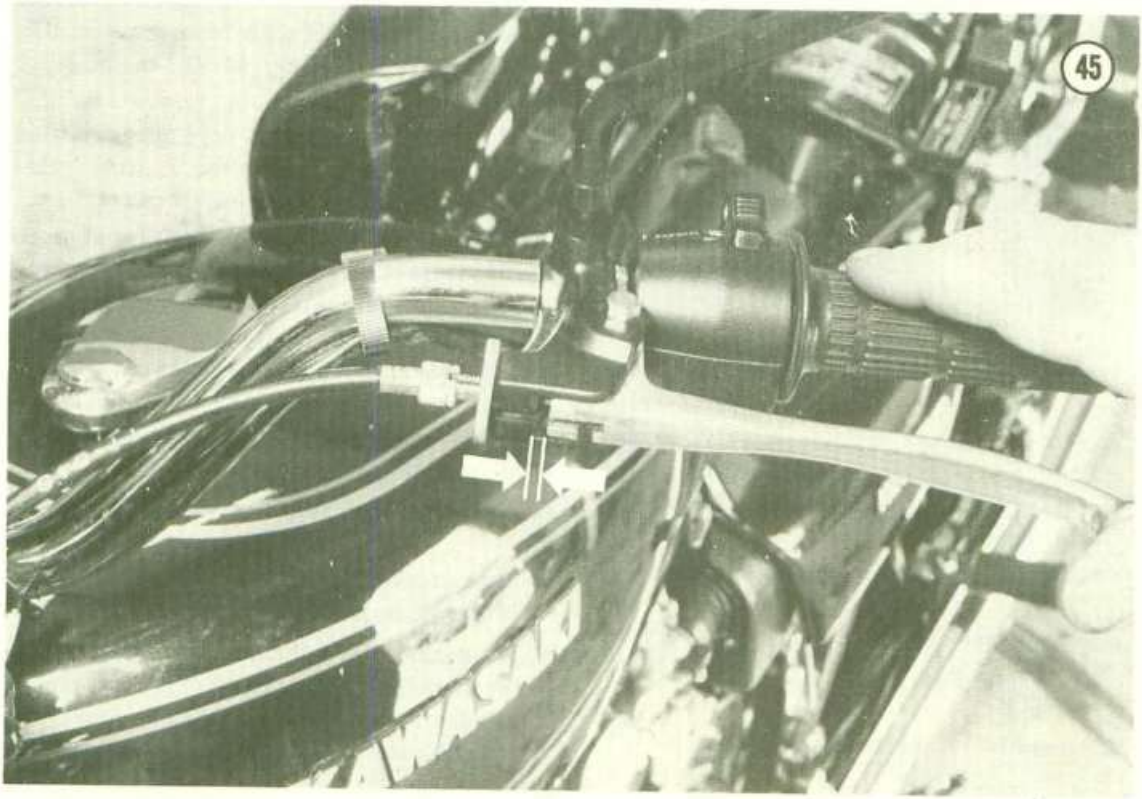
8. Install chain oil pump cover and its gasket on the 1973-1974 models.

NOTE: *There is no chain oil pump on 1975 and later models.*

Chain Oil Pump Flow Rate (1973-1974 Models)

The chain oil pump should operate at a flow rate that will keep the rear chain dampened with


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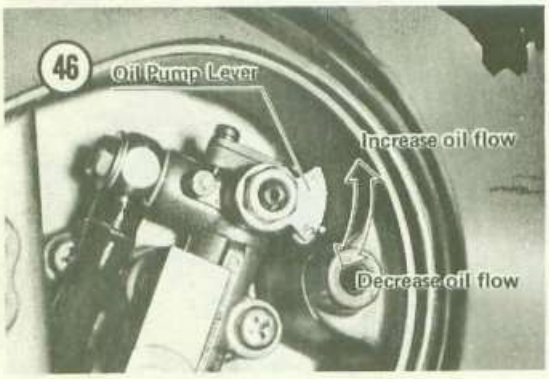
oil. If the chain runs dry, or is dripping wet with oil while the motorcycle is moving, adjust the flow rate of the pump.

There is a slight difference between 1973 and 1974 model chain oil pumps. The 1973 pump has a flow rate cam plate marked from 0 to 5; 0 is the minimum flow rate, and 5 is the maximum. The 1974 flow rate cam plate is marked from 1 to 5; 1 is the minimum, and 5 is the maximum.

On both cam plates, the average flow rate is provided when the cam plate is set halfway between the minimum and maximum rates.

Adjust the flow rate as follows.

1. Remove the 2 screws on the left side of the engine that mount the chain oil pump cover to the chain cover. Remove the oil pump cover and its gasket.
2. *(1973 only)* To increase the flow rate, rotate the cam plate counterclockwise so that the peg is closer to 5. To decrease the flow rate, rotate the cam plate toward 0 (**Figure 46**).



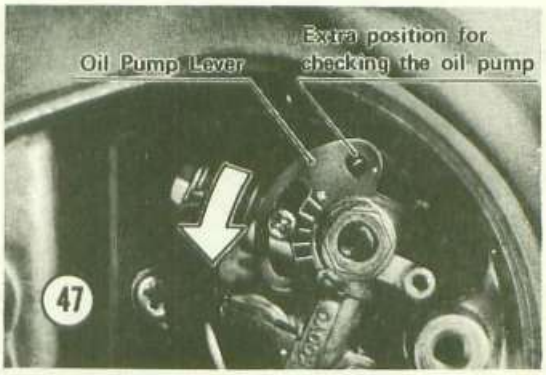
3. *(1974 only)* Loosen the Phillips screw that clamps the cam plate. To increase the flow rate, rotate the cam plate counterclockwise so that the Phillips screw is closer to 5. To decrease the flow rate, rotate cam plate toward 1 (**Figure 47**). Tighten the screw.
4. Install the oil pump cover and its gasket.

Carburetor and Throttle Linkage

See Chapter Four.

Carburetor Idle Adjustment

See Chapter Four.



Contact Breaker Points Gap (With Feeler Gauge)

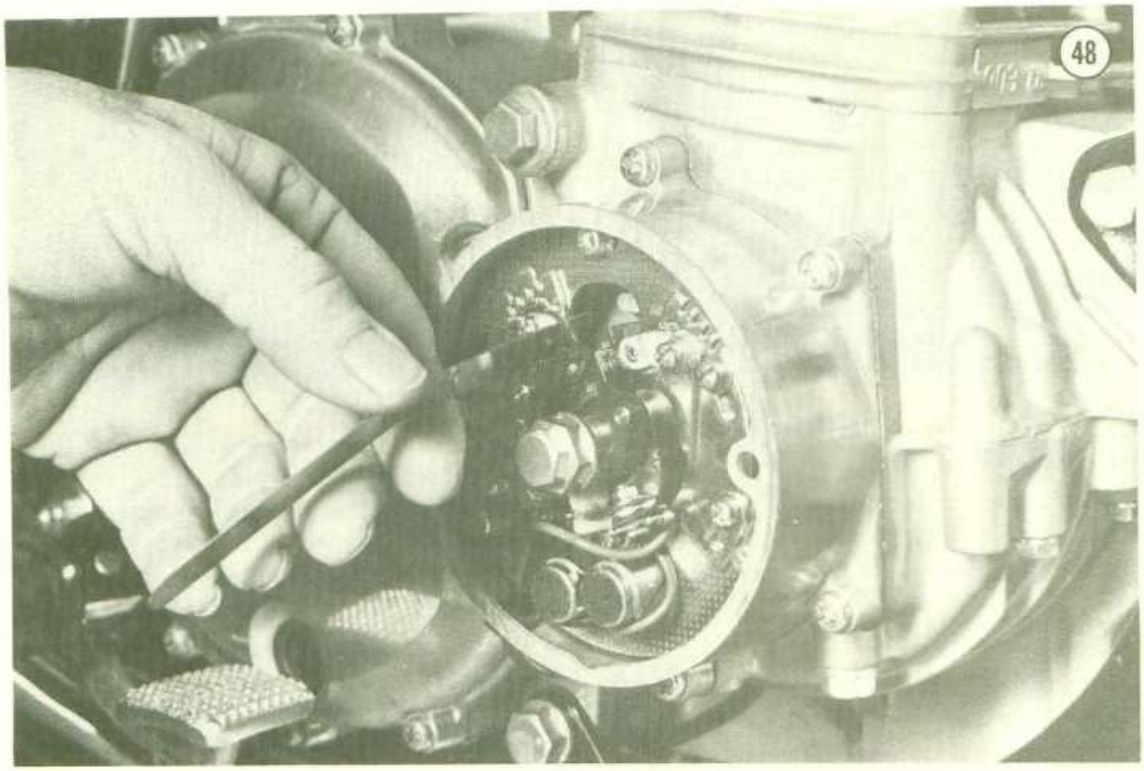
There are 2 sets of contact breaker points, each of which fires 2 of the cylinders. The gap for each set of points must be adjusted correctly before adjusting the ignition timing.

Adjust the gap as follows.

1. Remove the 2 screws that mount the breaker points cover to the right engine cover. Remove the breaker points cover and its gasket.
2. Rotate the crankshaft until the left set of points is at its widest opening. Measure the gap between the contacts with feeler gauges. The correct gap is 0.012-0.016 in. (0.3-0.4mm). See **Figure 48**.
3. If the gap measurement does not fall within the limits, slightly loosen the 2 screws that mount the fixed arm of the left set of points.
4. Wedge a screwdriver into the pry point on the fixed arm base, and move the fixed arm away from the movable arm until the gap measures 0.014 in. (0.35mm). Tighten the mounting screws and recheck the gap. Check the ignition timing.
5. In the same manner, adjust the gap of the right set of breaker points.
6. Install breaker points cover and its gasket.

Contact Breaker Points Gap (With Dwell Angle Meter)

The dwell angle is the number of degrees (or the percentage of 360 degrees) of breaker points camshaft rotation during which the points are closed and current can flow through them to the primary windings of the ignition coil. The



breaker points gap can be adjusted with greater accuracy with a dwell angle meter than with feeler gauges.

Adjust the gap with a dwell angle meter as follows.

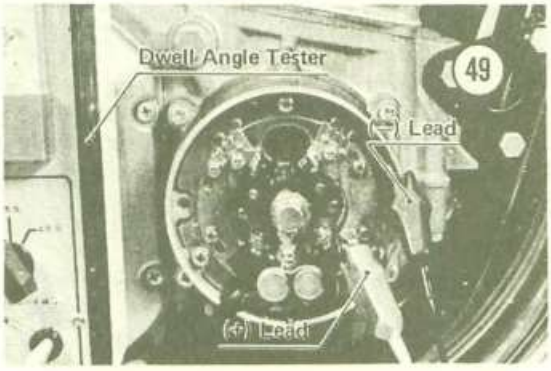
1. With the engine shut off, remove the 2 screws that mount the breaker points cover to the right engine cover. Remove the breaker points cover and its gasket.

2. Connect the negative (—) dwell angle meter lead to the engine case, for ground. Connect the positive (+) lead to one set of the contact breaker points at the pring, or an exposed part of the wire (**Figure 49**).

3. If the dwell angle meter is calibrated in degrees, turn the selector knob to the single cam lobe position. If the switch does not have such a position, use the setting for the minimum number of cam lobes.

4. Start the engine and allow it to idle.

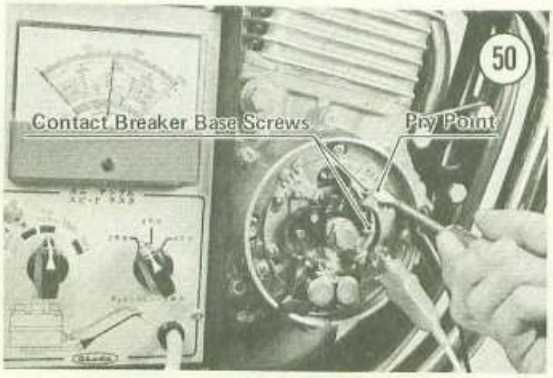
5. Read the meter. The reading for the correct gap on a meter calibrated in percentages is 50%; the correct reading on a meter calibrated in degrees is 180 degrees.

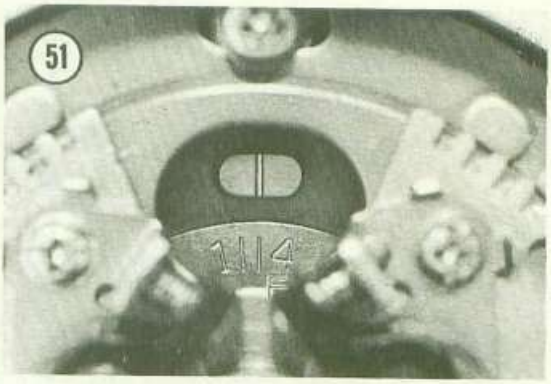


6. If the meter could not be set for a single cam lobe, multiply the reading you get by the number of cam lobes the meter thinks it is checking, to get the desired reading.

7. If the dwell angle reading is not 180 degrees (or 50%), loosen slightly the 2 screws that mount the fixed arms of the breaker points (**Figure 50**).

8. Wedge a screwdriver against the pry point for the fixed arm, and move the fixed arm's contact point toward or away from the contact point on the movable arm until the correct read-





ing on the meter is obtained. Tighten the screws. Check the ignition timing.

9. In the same manner, adjust the gap for the other set of breaker points.

10. Install breaker points cover and its gasket.

Ignition Timing

All models have 2 sets of contact breaker points and 2 ignition coils. The spark plugs in cylinders 1 and 4 are wired in series; so are the spark plugs in 2 and 3. When the left set of points opens, its ignition coil fires through the spark plugs in 1 and 4; the right set of points fires spark plugs 2 and 3.

Incorrect ignition timing can cause a drastic loss of engine performance and overheating. Clean the points and adjust their gap (see procedures in this chapter) before adjusting timing.

Adjust the ignition timing as follows.

1. With the engine shut off, remove the 2 screws that mount the breaker points cover to the right engine cover. Remove the breaker points cover and its gasket.

2. Rotate the crankshaft until the right vertical line (the "F" mark) for cylinders 1 and 4 is aligned beneath the timing mark above and between the 2 sets of points (**Figure 51**).

> NOTE: *The left vertical line (the "T" mark) indicates* TDC *(top dead center). The right vertical line (the "F" mark) idicates ignition timing when the engine is running at idle or shut off.*

3. Connect one lead from an ohmmeter to the engine case, for ground. Connect the other lead to the left set of points (for 1 and 4).

4. Loosen the 2 screws that mount the left-hand set of points to the backing plate, but don't loosen them too much. Pry point serrations in the edge of the contact breaker mounting plate are above the top mounting screw. Insert a screwdriver in the pry point. See **Figure 52**.

5. Use the screwdriver to move the points plate clockwise or counterclockwise around the backing plate until the ohmmeter needle begins to fluctuate, showing that the points are beginning to open.

6. Tighten the breaker points mounting plate screws, and check that the ohmmeter needle is still fluctuating. If not, repeat the adjustment.

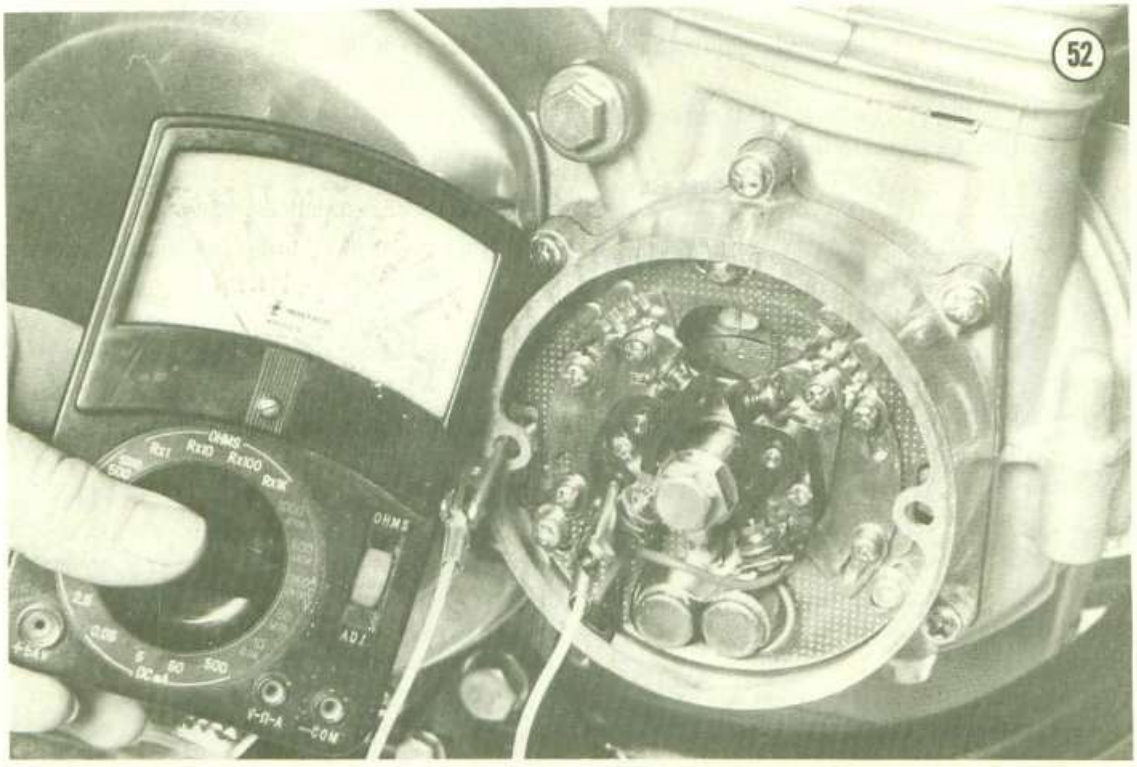
7. Rotate the crankshaft until the "F" mark for 2 and 3 is aligned beneath the timing mark. Adjust the ignition timing for the right set of contact breaker points.

If you run out of travel while adjusting a set of points, loosen the 3 screws that mount the backing plate to gain more travel. This will throw out the ignition timing for the other set of points, if it has already been adjusted.

8. Hook the adapter for an ignition timing light (usually a coil spring) to the top of the spark plug in cylinder 4. Connect the spark plug cap to the top of the adapter. Hook the test lead from the timing light to the adapter.

9. Start the engine and allow it to idle. Shine the timing light on the timing mark.

At idle, the strobe light should flash and freeze the "F" line for 1 and 4 while aligned beneath the timing mark. If so, the ignition has been timed correctly and the ignition advance mechanism is functioning properly at idle.



10. Increase the rpm and continue aiming the timing light at the timing mark. The 1 and 4 markings should appear to move counterclockwise past the timing mark when strobe light fires.

11. On 1973 models, the peg to the right of the 1 and 4 marks on the ignition advance mechanism should be aligned beneath the timing mark at an rpm between 2,900 and 3,100; above that rpm the timing should not change again.

12. On 1974 and later models, the peg should be beneath the timing mark, and stabilized in that position, at 2,250-2,450 rpm. If that does not happen, check the advance mechanism. See Chapter Five.

13. Shut off the engine. Move the spark plug adapter to cylinder 3. Start the engine and let it idle. Use the timing light to check the timing of the right-hand set of points.

14. Install breaker points cover and its gasket.

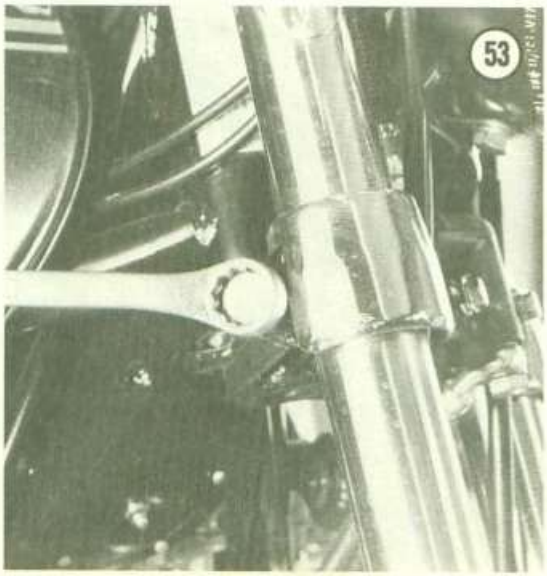
Steering Play Adjustment

See the steering play checking procedures earlier in this chapter. Adjust the steering play as follows.

1. Loosen the big steering stem cap nut on top of the top triple clamp.

2. Loosen the steering stem clamp bolt at the rear of the top triple clamp.

3. Loosen the 2 fork tube clamp bolts on the bottom triple clamp (**Figure 53**).



4. Fit a spanner wrench to the notched steering stem collar between the top triple clamp and the steering head (**Figure 54**).

5. Turn the collar clockwise to tighten the steering, or counterclockwise to loosen it.

6. Tighten the steering stem cap nut on top of the top triple clamp.

7. Torque the steering stem clamp bolt at the rear of the top triple clamp to 12-13 ft.-lb. Check that the 2 fork tube clamp bolts on the top triple clamp (which you didn't loosen) are torqued to 12-13 ft.-lb.

8. Hit each side of the bottom triple clamp from the top and bottom with a rubber mallet to reposition it on fork tubes and relieve strain.

9. Torque the 2 fork tube clamp bolts on the bottom triple clamp to 39-43 ft.-lb.

10. Recheck the steering play per the steering play checking procedures listed earlier in this chapter.

Spoke Tension and Wheel Balance

Refer to procedures in this chapter for checking wheel balance and rim trueness. If the axial (side-to-side) or radial (up-and-down) runout of the rim exceeds the service limit, and the rim is not obviously bent or dented, correct the rim runout by adjusting the spoke tension. Similarly, out-of-balance wheels can adversely affect the handling characteristics of the motorcycle at high speeds and should be balanced.

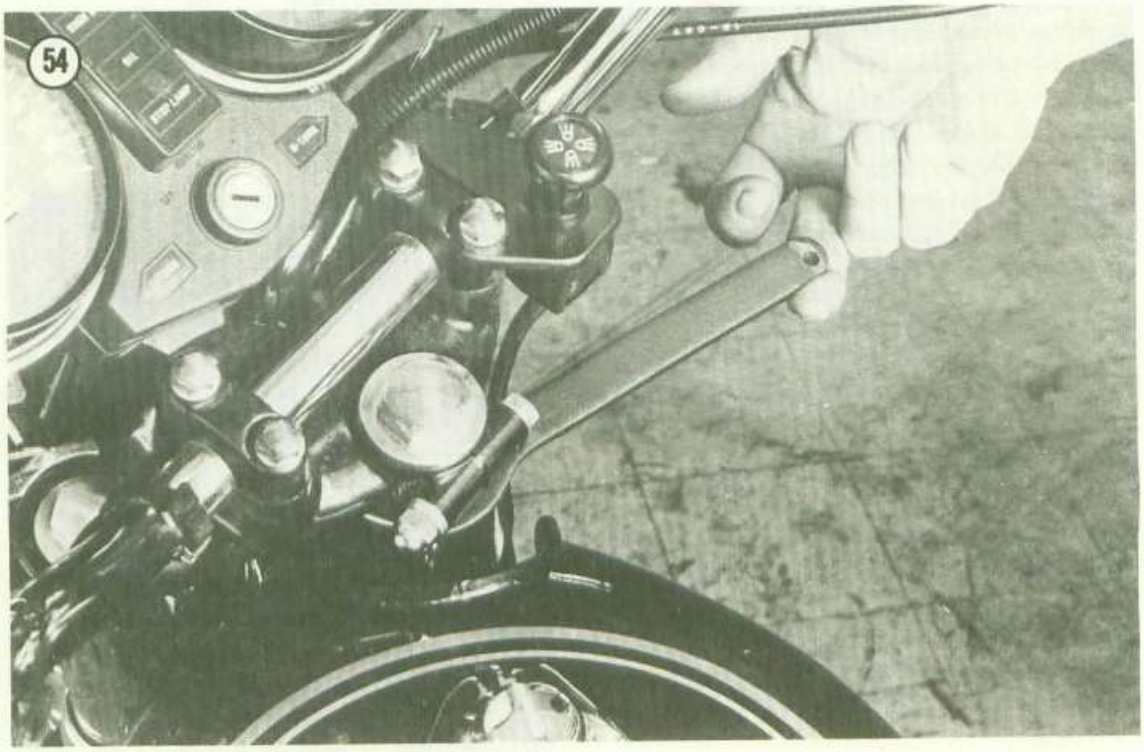
Adjust the spoke tension to correct for rim runout as follows.

1. Follow the first 6 steps in the procedures for checking the wheel balance and rim trueness.

2. If the axial runout exceeds the limit, mark the tire with a piece of chalk at the point where runout is greatest.

3. Note whether the reading at the point of greatest runout is a high number or a low number on the dial gauge. If the number is high, the rim is warped toward the side of the wheel being checked with the dial gauge. If low, it is warped toward the opposite side.

4. Loosen the 2 nearest spokes (½ turn each) on each side of the chalk mark that are laced to the side of the hub toward which the rim is warped.



5. Tighten the 2 nearest spokes (½ turn each) on each side of the chalk mark that are laced to the other side of the hub.

6. Check the axial runout again. Continue loosening or tightening those same spokes in the same sequence until the axial runout lies within the acceptable limits.

7. Tap each spoke in the wheel with a wrench, and listen to the sound, to check that you have not tightened or loosened any spoke too much. If considerable tightening of any spoke was required, you may need to remove the tire and grind off the protruding end of the spoke to prevent it from puncturing the tube.

8. If the radial runout exceeds the limit, mark the tire with a piece of chalk at the point where runout is greatest.

9. Note whether the reading at the point of greatest runout is a high number or a low number on the dial gauge. If the number is high, the rim is stretched away from the hub at that point. If the number is low, the rim is pulled toward the hub at that point.

10. If the number was high, tighten the 2 nearest spokes on each side of the chalk mark ½ turn each. Make another chalk mark on the opposite end of the tire, and loosen the 2 nearest spokes on each side of the new chalk mark ½ turn each.

11. If the dial gauge reading at the point of greatest runout was a low number, loosen the 4 spokes nearest the chalk mark, and tighten the 4 spokes at the opposite end of the wheel.

12. Check the radial runout again. Continue loosening or tightening those same spokes in the same sequence until the runout lies within the acceptable limits. The same cautions apply as for correcting the axial runout.

Adjust the wheel balance as follows.

1. Follow Step 9 in the procedures for checking wheel balance and rim trueness.

2. If the wheel, after being spun, always comes to a stop in the same position (as indicated by a chalk mark on the lowest part of the tire), hang a 10 gram balance weight near the rim on the spoke at the opposite end of the wheel.

3. Spin the wheel and notice where it stops. If the 10 gram weight was not heavy enough to overcome the imbalance, try a 20 gram weight, and then a 30 gram weight.

4. After you have overcome the imbalance, spin the wheel again. Put a double chalk mark on the lowest part of the tire. Spin the wheel 6 more times. If the wheel comes to a stop several times in roughly the same position, hang a 10 gram weight on the spoke opposite that point.

5. When the wheel is balanced and will stop at random, squeeze the weights to clamp them to the wheel.

2

Rear Chain Tension

Refer to procedures in this chapter for checking the rear chain tension.

In tensioning the rear chain, you must also align the rear wheel. Rear wheel alignment is critical for safe steering. A misaligned rear wheel can sometimes cause speed wobbles and make cornering difficult, besides greatly increasing the wear of the tires, the rear chain, and the sprockets. All models have wheel alignment marks on the swing arm and notches in the chain adjusters, the theory being that if each chain adjuster is moved the same number of alignment marks, the rear wheel will be aligned correctly.

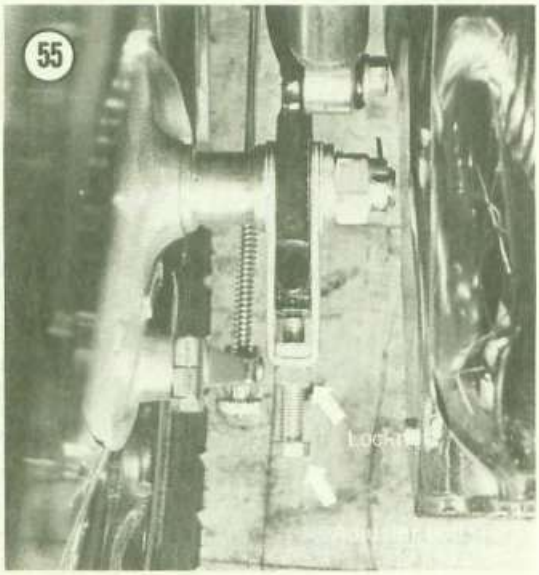
Some authorities believe that manufacturing tolerances for the frame, the swing arm bushings, and the swing arm are so great as to make the alignment marks on the swing arm of any current street motorcycle useless for aligning the rear wheel.

Some authorities recommend aligning the rear wheel by aligning the rear sprocket with the output (countershaft) sprocket, so that the chain runs straight. Because of the construction of the Kawasaki, it is extremely difficult to sight along either chain run. Besides, sprocket/chain/sprocket alignment is not always a true indication of rear wheel alignment.

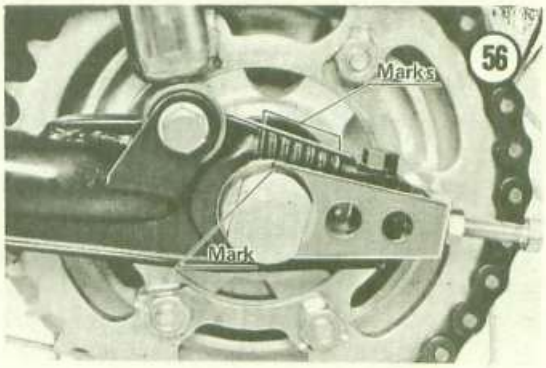
Other authorities recommend using string or boards or long straightedges to check rear wheel alignment. These methods are at best awkward, and they are only truly practical if the front and rear wheels are the same size, type, and diameter—which is not the case with the models covered in this book.

If the rear chain is too loose or too tight, adjust it as follows.

1. Loosen the right side muffler mount, so as to make it easier to get at the rear axle nut.
2. Back off the nut at the rear of the brake rod until it is flush with the end of the rod.
3. Remove the spring clip from the end of the bolt that mounts the torque link to the rear brake backing plate. Loosen the nut.
4. Remove the cotter pin from the rear axle nut and loosen the nut.
5. Loosen the locknuts on both chain adjusters (**Figure 55**).



6. Put the motorcycle on the centerstand.
7. If the chain was too tight, back out both chain adjuster bolts and kick the wheel forward until the chain tension is too loose.
8. Screw in both chain adjuster bolts until the chain tension is correct, and so that the notch in each chain adjuster is positioned the same distance along the alignment marks cast into the swing arm (**Figure 56**).
9. Tighten the chain adjuster locknuts.
10. Torque the rear axle nut to 95-115 ft.-lb. Install a new cotter pin.
11. Check the chain tension again.
12. Torque the torque link nut on the rear brake backing plate to 22-25 ft.-lb. Install spring clip.



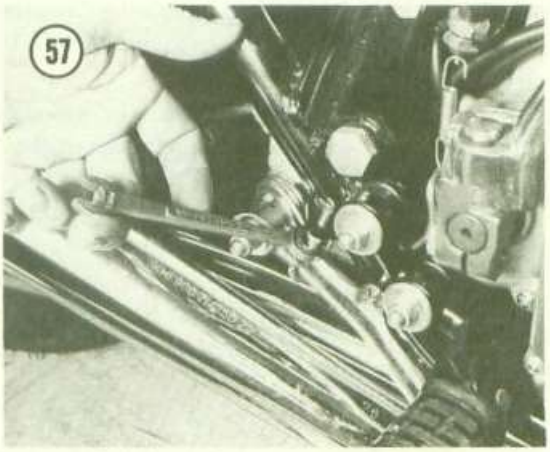
13. Tighten the right side muffler mounts.
14. Adjust the brake rod nut (see the following procedure).

Rear Brake Linkage

Refer to procedures in this chapter for checking the rear brake operation.

Adjust the rear brake linkage as follows.

1. When it is at rest, the top of the brake pedal should be positioned about 1/16 in. lower than the bottom of the right front footpeg. If it is not, loosen the locknut on the brake pedal stop bolt (**Figure 57**).



2. To lower the pedal, back out the stop bolt. To raise the pedal, screw in the stop bolt.
3. When the pedal is positioned correctly while at rest, tighten the stop bolt locknut.
4. Push down the rear brake pedal by hand. The brake cam lever and the brake rod should form an angle of 80-90 degrees. If the angle they

form is 100 degrees or larger, remove the rear wheel (see Chapter Eight) and inspect the brake components for wear. If they are not worn past the acceptable limits, reassemble and install the wheel.

5. Scribe a line across the faces of the brake camshaft and the brake cam lever.

6. Disconnect the brake rod from the brake cam lever. Remove the mounting bolt from the lever.

7. Pull the brake came lever off the camshaft splines, rotate the lever one tooth counterclockwise, and install it on the brake camshaft.

8. Attach the brake rod to the brake cam lever. Tighten the nut on the brake rod until the brake pedal has ¾-1¼ in. of travel when pushed down lightly by hand.

9. Check to see that the brake cam lever and the brake rod now form an angle of 80-90 degrees when the brake is applied by hand.

10. Prop the motorcycle so the rear wheel clears the ground. Spin the wheel and check that the brake shoes are not binding against the drum, causing the wheel to make a hissing sound and to stop spinning too quickly. If the brake shoes are dragging, back off the brake rod nut a turn or so, and check to see if that solves the problem. If not, disassemble the brake and check the components.

DECARBONIZING

After an engine has been run for many hours it will probably require the removal of carbon from the piston crown and cylinder head. The best way to detect this need is if the engine has shown progressively worsening preignition or a gradual loss of power. Several new products are now being marketed to allow a simple approach to decarbonizing without the need to dismantling the engines. These products will not be as thorough, but can be used periodically. The procedure for their use is as follows.

1. Start and warm the engine to normal operating temperature.

2. Slowly pour 10 ounces (284 grams) of cleaner into the carburetor with the engine running at a fast idle of 1,500 rpm.

3. Slowly increase the speed of the engine and kill it my dumping in the remaining liquid.

4. Let the engine stand for ½ hour with the liquid still in the cylinder.

5. Start the engine and run it at full throttle, under load, for at least 5 minutes to clear out the system and remove the last traces of fluid. If this fails to completely decarbonize the cylinder then you will have to remove the head as outlined in Chapter Six.

WINTER STORAGE

Several months of inactivity can cause serious problems and a general deterioration of bike condition. This is especially true in areas of weather extremes. During the winter months it is advisable to specially prepare the bike for lay-up.

Selecting a Storage Area

Most cyclists store their bikes in their home garage. If you do not have a home garage, facilities suitable for long-term motorcycle storage are readily available for rent or lease in most areas. In selecting a building, consider the following points.

1. The storage area must be dry, free from dampness and excessive humidity. Heating is not necessary, but the building should be well insulated to minimize extreme temperature variations.

2. Buildings with large window areas should be avoided, or such windows should be masked (also a good security measure) if direct sunlight can fall on bike.

3. Buildings in industrial areas, where factories are liable to emit corrosive fumes, are not desirable, nor are facilities near bodies of salt water.

4. The area should be selected to minimize the possibility of loss by fire, theft, or vandalism. The area should be fully insured, perhaps with a package covering fire, theft, vandalism, weather, and liability. The advice of your insurance agent should be solicited on these matters. The building should be fire-proof and items such as the security of doors and windows, alarm facilities, and proximity of police should be considered.

Preparing for Storage

Careful pre-storage preparation will minimize deterioration and will ease restoring the bike to service in the spring.

1. Wash the bike completely making certain to remove any accumulation of road salt that may have collected during the first weeks of winter. Wax all painted and polished surfaces.
2. Run the engine for 20-30 minutes to stabilize oil temperature. Drain oil regardless of mileage since last oil change and replace with normal quantity of fresh oil.
3. Remove battery and coat cable terminals with petroleum jelly. If there is evidence of acid spillage in the battery box, neutralize with baking soda, wash clean, and repaint. Batteries should be kept in an area where they will not freeze, and where they can be recharged every 2 weeks.
4. Drain all gasoline from fuel tank, settling bowl, and carburetor float bowls. Leave fuel cock on the RESERVE position.
5. Remove spark plugs and add a small quantity of oil to each cylinder. Turn the engine a few revolutions by hand. Install spark plugs.
6. To avoid ignition point oxidation, place a paper card, lightly saturated with silicone oil, between the points.
7. Check tire pressure. Move the bike to storage area and store on center stand. If preparation is performed in an area remote from the storage facility, the bike should be trucked, not ridden, into storage.

Inspection During Storage

Try to inspect the bike weekly while it is in storage. Any deterioration should be corrected as soon as possible. For example, if corrosion of bright metal parts is observed, coat with a light film of grease or silicone spray.

Restoring to Service

A bike that has been properly prepared, and stored in a suitable area, requires only light maintenance to restore it to service. It is advisable, however, to perform a spring tune-up.

1. Before removing the bike from the storage area, re-inflate tires to the correct pressures. Air loss during the storage period may have nearly flattened the tires, and moving the bike can cause damage to tires, tubes, or rims.
2. When the bike is brought to the work area, immediately install the battery (fully charged) and fill the fuel tank. (The fuel cock should be on the RESERVE position; do not move yet.)
3. Check the fuel system for leaks. Remove the carburetor float bowl or open the float bowl drain cock and allow several cups of fuel to pass through the system. Move the fuel cock slowly to the CLOSE position, remove the settling bowl and empty any accumulated water.
4. Perform a normal tune-up as described earlier, adjust valve clearance, apply oil to camshaft, and while checking spark plugs add a few drops of oil to the cylinder. Be especially certain to de-grease ignition points if an oily card was used to inhibit oxidation during storage; use a non-petroleum solvent such as trichloroethylene or denatured alcohol.
5. Check safety items, i.e., lights, horn, etc., as oxidation of switch contacts and/or sockets during storage may make one or more of these critical devices inoperative.
6. Test ride and clean the motorcycle.

CHAPTER THREE

TROUBLESHOOTING

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

The troubleshooting procedures in this chapter analyze typical symptoms, and show logical methods of isolating causes. These are not the only methods. There may be several ways to solve a problem, but only a systematic, methodical approach can guarantee success.

Never assume anything. Do not 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 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 3 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 exhaust, and so on. Remember that the more complicated a machine is, the easier it is to troubleshoot because symptoms point to specific problems.

After the symptoms are defined, areas which could cause the problems are tested and analyzed. Guessing at the cause of a problem may provide the solution, but it can easily lead to frustration, wasted time, and a series of expensive, unnecessary parts replacements.

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 capabilities. 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 3 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 3 basics. 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 carburetors. 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.

TROUBLESHOOTING INSTRUMENTS

Chapter One lists many of the instruments needed and detailed instructions on their use.

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 only 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 is new.

Once the plug has been cleared of guilt, but there is 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 in. 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 don'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 is no spark at the plug wire, look for loose connections at the coil and battery. If all seems in order there, check next for oily or dirty contact points. Clean points with electrical contact cleaner, or a strip of paper. On battery ignition models, 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 Two (*Periodic Maintenance and Tune-up*) 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 will not 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 manifold. Check for a clogged air filter.

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 starting will be readily apparent in this case.

Compression may be checked in the field by turning the kickstarter by hand and noting that an adequate resistance is felt.

An accurate compression check gives a good idea of the condition of the basic working parts of the engine. 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.
5. The normal compression is 142 psi. If the readings are significantly lower than 142 psi as a group, or if they vary more than 15 psi between any 2 cylinders, proceed to the next step.
6. Pour a tablespoon of motor oil into the suspect cylinder and record the compression.

NOTE: *If oil raises the compression significantly—10 psi in an old engine—the rings are worn and should be replaced.*

Valve adjustments should be checked next. Sticking, burned, or broken valves may hamper starting. As a last resort, check valve timing.

STARTER

Starter system troubles are relatively easy to isolate. The following are common symptoms and causes.

1. *Engine cranks very slowly or not at all*—Turn on the headlight. If the light is very dim, the battery or connecting wires are probably at fault. Check the battery. Check the wiring for breaks, shorts, or dirty connections.

If the battery or connecting wires are not at fault, turn the headlight on and try to crank the engine. If the light dims drastically, the starter is probably shorted to ground. Remove it and test as described.

If the light remains bright, or dims only slightly when trying to start the engine, the trouble may be in the starter, relay, or wiring. Perform the following steps to isolate the cause.

WARNING

Disconnect the coil wire to prevent accidental starting. Keep away from moving parts when working near the engine.

a. If the starter does not respond, connect a 12-volt test lamp between the starter terminal and ground. Turn the ignition key to START. If the lamp lights, the starter is probably at fault. Remove it and test the unit. If the lamp does not light, the problem is somewhere in the starting circuit. Perform the next steps.

b. Connect a jumper wire between the battery and starter terminals on the starter relay. If the starter does not respond at all, the relay is probably defective. If the starter cranks normally, perform the next step.

c. Connect a test lamp between the starter terminal on the starter relay and ground. Turn the ignition key to START. If the lamp does not light, check the ignition switch and associated wiring. Turn the key to START and work it around in the switch. If the lamp lights erratically, the ignition switch is probably defective.

d. If the problem still has not been isolated, check all wiring in the starting circuit with an ohmmeter or other continuity tester. See the wiring diagrams in Chapter Seven.

2. *Starter turns, but does not engage*—This problem may be caused by a defective starter drive mechanism, or broken gear teeth. Remove and inspect starter as described in Chapter Seven.

3. *Loud grinding noises when starter runs*—This may mean the teeth are not meshing properly, or it may mean the starter drive mechanism is damaged. In the first case, remove the starter and examine the gear teeth. In the latter case, remove the starter and replace the starter drive mechanism.

POOR IDLING

Poor idling may be caused by incorrect carburetor adjustment, incorrect timing, or ignition system defects. 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 to check for spark leaks along plug wires and under spark plug cap.

WARNING

Do not run engine in dark garage to check for spark leaks. There is considerable danger of carbon monoxide poisoning.

If misfiring occurs only at certain throttle settings, refer to the fuel system 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. Ignition timing should be checked.

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. Do not ride in too high a gear. Broken or worn rings may permit compression gases to leak past them, heating heads and cylinders excessively. Check oil level and use the proper grade lubricants.

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 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. Also see *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 uneven clutch spring pressure.

All clutch problems, except adjustments or cable replacement, require removal to identify the cause and make repairs.

1. *Slippage*–This condition is most noticeable when accelerating in high gear at relatively low speed. To check slippage, drive at a steady speed in 4th or 5th gear. Without letting up the accelerator, push in the clutch long enough to let engine speed increase (1-2 seconds). Then let the clutch out rapidly. If the clutch is good, engine speed will drop quickly or the bike will jump forward. If the clutch is slipping, engine speed will drop slowly and the bike will not jump forward.

Slippage results from insufficient clutch lever free play, worn friction plates, or weak springs. Riding the clutch can cause the disc surfaces to become glazed, resulting in slippage.

2. *Drag or failure to release*–This trouble usually causes difficult shifting and gear clash especially when downshifting. The cause may be excessive clutch lever free play, warped or bent plates, stretched clutch cable, or broken or loose disc linings.

3. *Chatter or grabbing*–Check for worn or misaligned steel plate and clutch friction plates.

TRANSMISSION

Transmission problems are usually indicated by one or more of the following symptoms.

a. Difficult shifting gears
b. Gear clash when downshifting
c. Slipping out of gear
d. Excessive noise in neutral
e. Excessive noise in gear

Transmission symptoms are sometimes hard to distinguish from clutch symptoms. Be sure the clutch is not causing the trouble before working on the transmission.

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, misaligned wheels, loose or missing spokes, worn tires, bent handlebar, 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.

ELECTRICAL PROBLEMS

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

A dead battery or one which discharges quickly may be caused by a faulty alternator 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.

TROUBLESHOOTING GUIDE

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

Loss of Power

1. *Poor compression*–Check piston rings and cylinder, cylinder head gasket, and crankcase leaks.

2. *Overheated engine*–Check lubricating oil supply, air leaks, ignition timing, clogged cool-

ing fins, slipping clutch, and carbon in the combustion chamber.

3. *Improper mixture*–Check for dirty air cleaner, restricted fuel flow–jets, clogged gas cap vent hole.

Gearshifting Difficulties

1. *Clutch*–Check clutch adjustment, clutch springs, friction plates, steel plates, and oil quantity and type.

2. *Transmission*–Check oil quantity and type, oil grade, gearshift mechanism adjustment, return spring, and gear change forks.

Brake Troubles

1. *Poor brakes*–Check brake adjustment, brake drum out-of-round, oil or water on the brake linings, and loose brake linkage or cables.

Steering Problems

1. *Pulls to one side*–Check for worn swinging arm bushings, bent swinging arm, bent steering head, bent frame, and front and rear wheel alignment.

2. *Shimmy*–Check for improper drive chain adjustment, loose or missing spokes, deformed wheel rims, worn wheel bearings, and improper wheel balance.

CHAPTER FOUR

FUEL SYSTEM

The fuel system comprises the carburetor, air cleaner, and fuel tank. This chapter describes the operation of a motorcycle carburetor, the design of the Mikuni slide needle carburetor, and how to maintain, disassemble, reassemble, and whether to re-jet the carburetor.

Soon after its introduction, the Mikuni carburetor gained widespread acceptance among tuners in the United States, because it is well-engineered and carefully manufactured. In fact, many tuners and riders have discarded other brands of carburetors supplied as original equipment on their motorcycles and installed Mikunis.

CARBURETOR OPERATION

Figure 1 is an exploded view of a typical Mikuni 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 below.

Float Mechanism

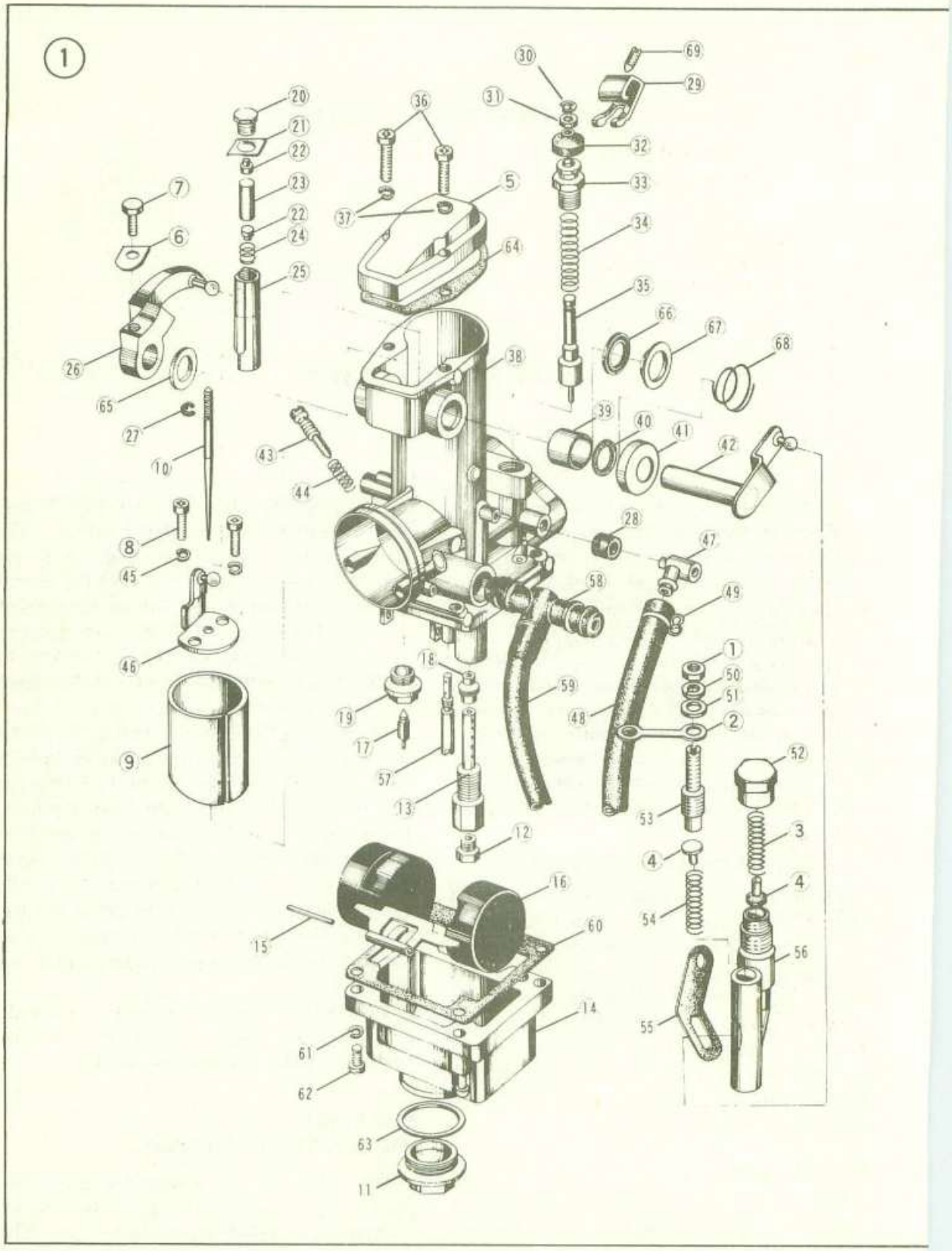
The distance from the bottom of the carburetor bore to the top of the fuel level in the float bowl is critical in a slide/needle carburetor. The flow rate of fuel from the float bowl up to the carburetor bore depends not only upon the amount of vacuum in the bore and the size of the jet(s) in the venturi tube or fuel passage, but also upon the distance the fuel has to travel to get to the bore (measured from the fuel level in the float bowl to the bore venturi). Therefore, this distance must remain constant at all times.

To maintain the fuel at a constant level, the float bowl is equipped with an intake jet through which gasoline flows by gravity from the gas tank into the bowl. Inside the bowl is a float, which floats on the surface of the gasoline. Linked to the float is a needle, which rides inside the float jet. As the float rises, the float needle rises inside the float jet and blocks it, so that when the fuel has reached its specified level in the float bowl, no more gasoline can enter (**Figure 2**).

The pilot and main fuel metering jets protrude from the bottom of the carburetor body into the float bowl, below the specified fuel level.

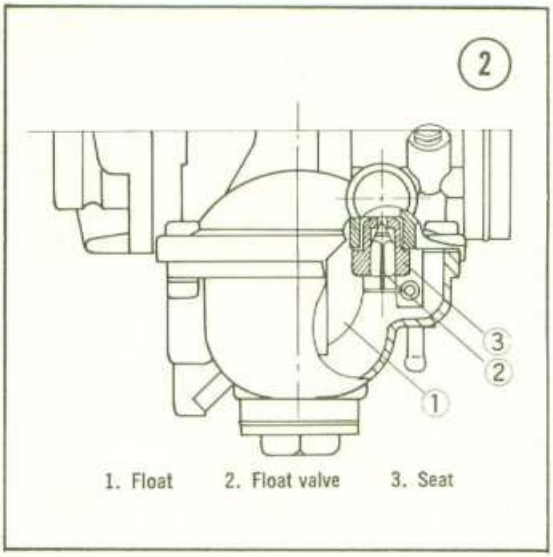
Main System (Full to ¾ Throttle Operation)

The carburetor bore diameter is selected to provide the volume of air required to feed the combustion chamber at maximum rpm. The


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CARBURETOR (TYPICAL 1973-1975)

1. Throttle stop screw locknut
2. Double washer link
3. Spring
4. Spring seat
5. Top cover
6. Lockwasher
7. Bolt
8. Screw
9. Slide
10. Jet needle
11. Drain plug
12. Main jet
13. Air bleed pipe
14. Float bowl
15. Pin
16. Float
17. Float valve needle
18. Needle jet
19. Valve seat
20. Guide screw
21. Lockwasher
22. Spring seat
23. Pin
24. Spring
25. Connector
26. Lever assembly
27. Circlip
28. Hose
29. Lever
30. Circlip
31. Ring
32. Cap
33. Guide screw
34. Spring
35. Plunger assembly
36. Bolt
37. Lockwasher
38. Mixing chamber
39. Hose
40. Washer
41. Cup
42. Lever assembly
43. Air screw
44. Spring
45. Lockwasher
46. Bracket assembly
47. Air vent pipe fitting
48. Air vent pipe
49. Clamp
50. Lockwasher
51. Washer
52. Cap nut
53. Slide stop adjusting screw
54. Spring
55. Rubber washer
56. Connector
57. Pilot jet
58. Fuel pipe fitting
59. Fuel pipe
60. Gasket
61. Lockwasher
62. Bolt
63. O-ring
64. Gasket
65. Spacer
66. Oil seal
67. Collar
68. Spring
69. Screw



1. Float 2. Float valve 3. Seat

slide, which acts as a gate, blocks off an ever-increasing portion of the bore diameter as it is lowered, to decrease the volume of air fed to the engine at lower rpm.

The size of the main jet (a plug with an accurately bored hole that caps off the bottom of the venturi tube) is selected to provide the volume of fuel required for maximum rpm, in proper mixture ratio with the air. Different sizes are available.

As the slide comes down, and the rpm drops, the vacuum at the mouth of the venturi drops accordingly, for an initial period, decreasing the volume of fuel fed to the engine. The needle and needle jet described in the next section also have an effect upon fuel delivery.

Main System (¾-¼ Throttle Operation)

The air supply is still metered primarily by the slide at medium throttle settings. The slide continues to block off more and more of the carburetor bore as it is lowered.

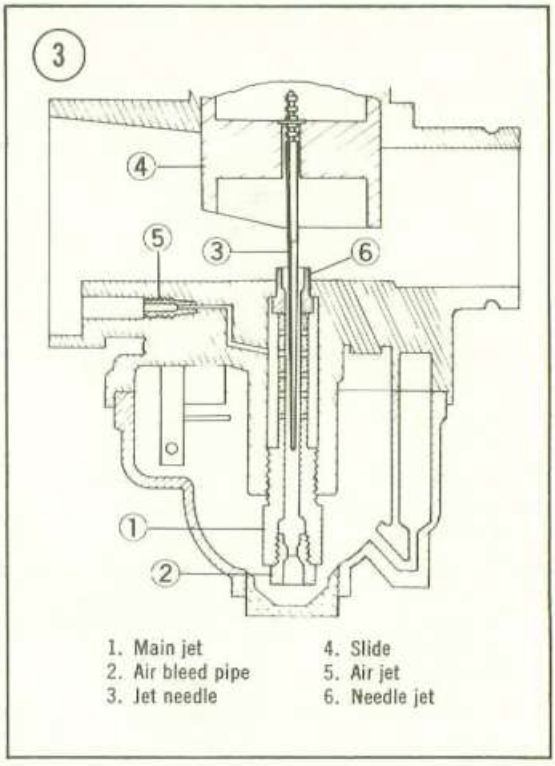
Now the engine needs to operate at a different (leaner) mixture ratio. To provide the leaner ratio, a needle jet is installed in the venturi tube above the main jet. The needle jet by itself will pass a larger volume of fuel than the main jet, but a needle suspended from the slide rides inside the needle jet. As the slide comes down, so does the needle, blocking off the needle jet

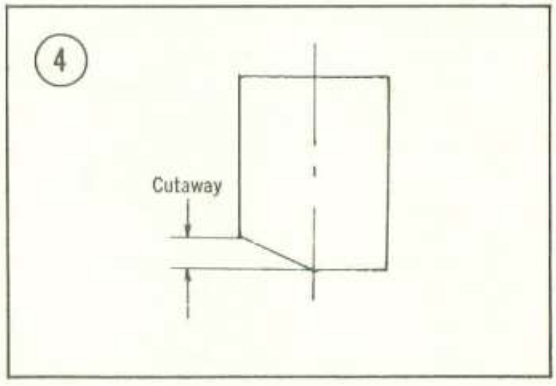
and decreasing the volume of fuel flowing up through the venturi tube.

The needle has a number of grooves around its circumference near the top. A clip fitted to one notch suspends the needle in the slide. By fitting the clip to another notch, the mechanic can raise or lower the needle in the slide, thus raising or lowering the needle in the needle jet and changing the fuel volume and mixture ratio between ¾ throttle and ¼ throttle. The needle has 5 notches and the clip is fitted to the middle notch.

Different sizes of needle jets are available, as are needles with different tapers.

As the bottom of the slide nears the middle of the carburetor bore, small downward movements of the slide block off proportionately large areas of the bore. At that point the needle and needle jet cannot keep pace with the slide by cutting off similarly large volumes of fuel flow. A tube drilled with holes (air bleed pipe) to the venturi tube between the main jet and the needle jet connect to the pilot/air passage. This arrangement pulls air into the venturi tube, displacing some of the gasoline that could otherwise flow up through the tube. The effect of the air bleed pipe is greatest when the slide is in the middle of the bore, and it maintains the proper mixture ratio when the needle and needle jet cannot do so (**Figure 3**).





Main System (¼-⅛ Throttle Operation)

The slide and the needle and needle jet continue to regulate the flow of air and fuel.

As the slide nears the bottom of the bore, the speed of the air flowing through the sharply restricted bore increases, even though the volume of air is decreasing. The resulting high vacuum at the mouth of the venturi would make the venturi tube increase the rate of fuel flow, enrichening the mixture too much. To prevent that, the bottom of the slide is cut away at an angle, to deflect part of the air flow downward against the mouth of the venturi tube and destroy part of the vacuum there (**Figure 4**).

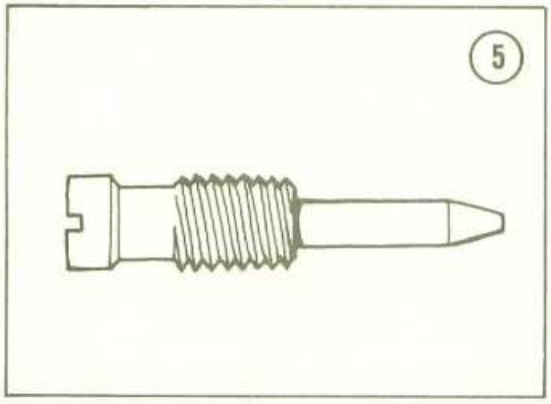
Slides with different amounts of cutaway are available to regulate the mixture ratio differently at these throttle openings.

Pilot System

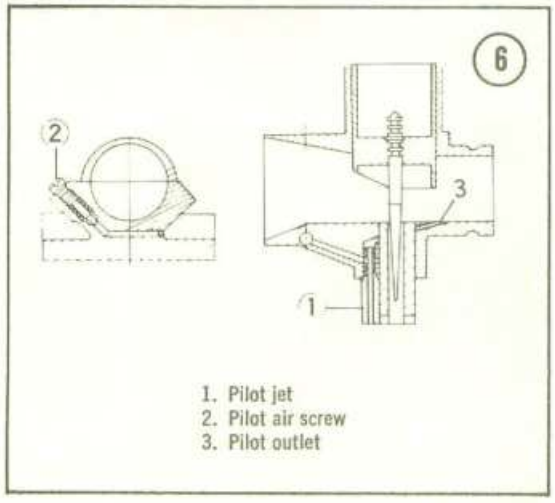
At low rpm, the slide does not efficiently regulate the air intake, so the carburetor has separate metering devices to feed the engine at idle.

A small separate passage beneath the main carburetor bore provides air for idling. This passage is equipped with a screw that regulates the maximum volume of air that can flow through it (**Figure 5**).

Alongside the main jet in the float bowl is another venturi tube. It is capped by the pilot jet, which regulates the maximum volume of



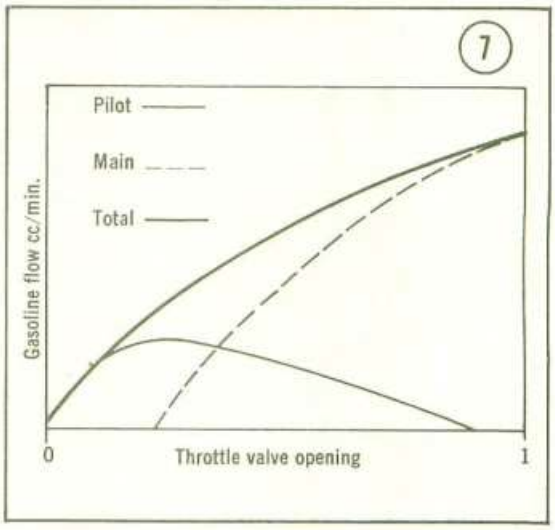
fuel that can flow through it. The pilot venturi tube empties into the bottom of the pilot air passage; the 2 function in the same manner as the main bore and venturi tube. The pilot mixture enters the carburetor bore through a small hole behind the leading edge of the slide (**Figure 6**).



The carburetor is also equipped with a slide stop adjusting screw, to bottom the slide before it blocks off the bore completely, allowing some additional air and fuel to flow through the bore.

The carburetor linkage has a throttle stop screw that varies the bottoming positions of all 4 carburetors the same amount (but not to the same positions, if each slide stop adjusting screw has been set a little bit differently, as is usually the case).

See **Figure 7** for the effect of the pilot system upon carburetion at other throttle openings.



Starting System

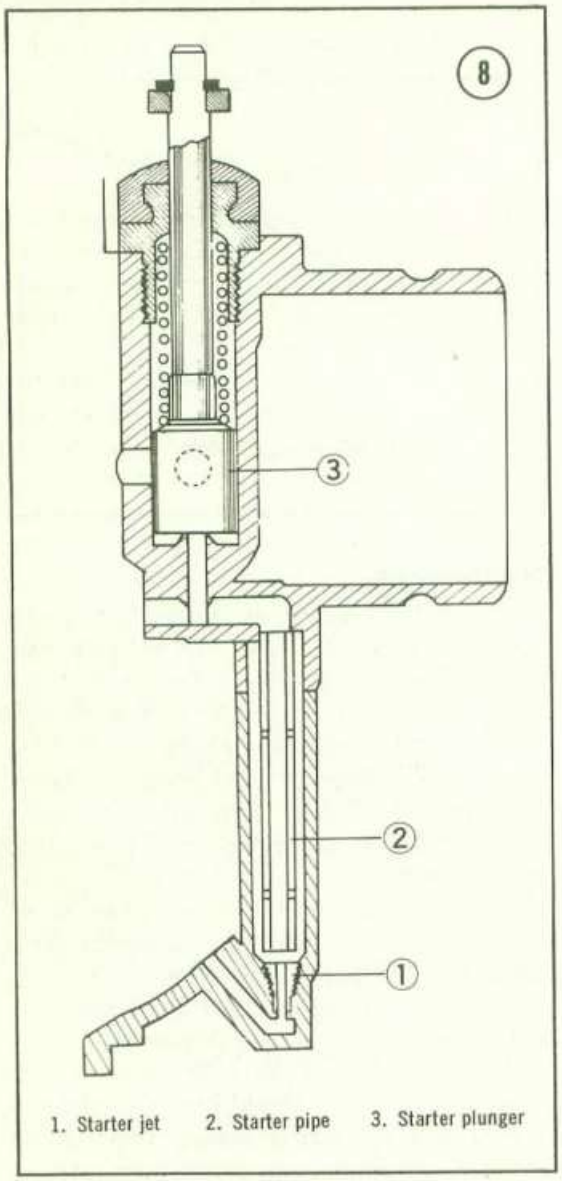
The engine needs an exceptionally rich mixture—1:1—for cold starts. The carburetor has an additional pair of metering devices to provide this mixture ratio. In the rear wall of the float bowl, a fuel passage near the bottom of the bowl leads to the starter jet. The gasoline is mixed with air and partially atomized in a mixing chamber directly above the jet. A passageway leads from there to a second chamber near the rear of the slide, which is normally blocked by the starter plunger. When the starter plunger is lifted, the fuel is mixed with more air in the second chamber and atomized. From there it is fed into the carburetor bore (**Figure 8**).

The starter system can work effectively only if the throttle is left closed while the engine is started with the starter plunger lifted. If the throttle is held open, the mixture is too lean.

FUEL SYSTEM CLEANING

Clean the fuel system as follows.

1. Turn the petcock lever at the bottom of the gas tank to "S" (**Figure 9**).
2. Unscrew the sediment cup from the bottom of the petcock. Clean out any dirt or water. Clean any dirt out of the petcock strainer.
3. If there was water in the petcock sediment cup, there may be water in the gas tank. Hold a clean glass container beneath the petcock, turn the lever to "R", and notice whether the gasoline



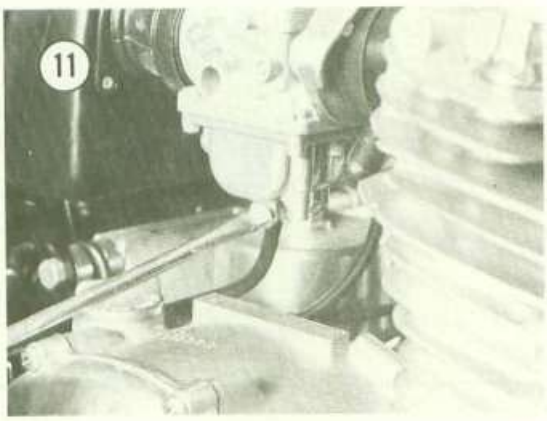


that comes out has any water mixed with it. After any water has been drained out, turn the lever to "S".

4. Install the sediment cup and its gasket, being careful not to damage the petcock screen.

5. Hold a shallow pan or a funnel with tubing beneath a carburetor. Unscrew the drain plug from the bottom of the carburetor, and drain the float bowl. **Figure 10** shows a 1973 carburetor; **Figure 11** is typical for 1974 and later models.





6. Drain the float bowls of the 3 remaining carburetors in the same way.

7. Install the carburetor drain plugs.

TROUBLESHOOTING

Symptoms

If the mixture is too lean at any or all throttle settings, the engine may overheat. It may generate brown exhaust smoke. It may stutter at high rpm. The performance (acceleration and top

speed) will fall off. You may be able to confirm this by checking the spark plugs. If the mixture is too lean across the rpm scale, the spark plugs will be white, and their electrodes may be rounded. While riding the motorcycle, turn on the carburetor starting system to see if the performance improves with what would normally be an overrich mixture.

If the mixture is too rich at any or all throttle settings, the engine may run sluggish and blubbery. It may generate black exhaust smoke. It may perform best while still cold. If the mixture is too rich across the rpm scale, the spark plugs may be black and sooty. Take out the air cleaner element and ride the motorcycle to see if the performance improves with what would normally be too lean a mixture.

Specific Spark Plug Readings

Pulling out the spark plugs and reading them after coming to a normal stop will be of benefit only if the mixture being burned is too rich or too lean all along the rpm scale. To get a rough measurement of the mixture being burned at a particular throttle opening, take spark plug readings at the throttle opening, as follows.

1. Wrap a strip of masking tape around the twistgrip rubber next to the twistgrip housing.
2. Using a switch on the twistgrip housing as the reference, mark a line across the tape at the closed throttle position. Open the throttle, and mark a line across the tape at that point.
3. Estimate the midpoint throttle opening, and mark a line across the tape there. Estimate the ¼ throttle openings, and mark lines at those points. Label the lines.
4. Taking along the spark plug wrench, ride the motorcycle to a long straightaway with turnouts or smooth shoulders, and no traffic.
5. In 3rd, 4th, or 5th gear, ride the motorcycle for at least one minute at the throttle opening you wish to check.
6. Being careful not to turn the throttle away from the throttle opening being checked, flick the handlebar kill switch to shut off the ignition, and simultaneously pull the clutch lever.
7. Holding in the clutch, coast to a stop with the engine dead.
8. Remove the spark plugs and read them. For the details of spark plug reading, see the spark plug condition check in Chapter Two and the *Spark Plugs* section in Chapter Five.

Diagnosing the Problem

The fact that the mixture being burned is too rich or too lean does not necessarily indicate that the carburetion is at fault. The motorcycle may as easily have an ignition or compression problem.

If the mixture is wrong all up and down the rpm range, check the obvious fuel system components. For example, if the mixture is too rich, check for a clogged air cleaner element or too high a float level. If the mixture is too lean, check the petcock strainer and the fuel lines for foreign material, check for too low a float level, and check for an air leak at the intake manifold.

Before taking apart the carburetors, you should first check out the spark plugs, the contact breaker points and ignition timing, and the cylinder compression. The procedure for running a compression check is listed in the section on *Cylinder Block Repairs*, Chapter Six, and/or the *Adjustment Procedures*, Chapter Two.

If after checking the above you suspect that the carburetion is at fault, refer to the descriptions of the metering systems for specific components to check.

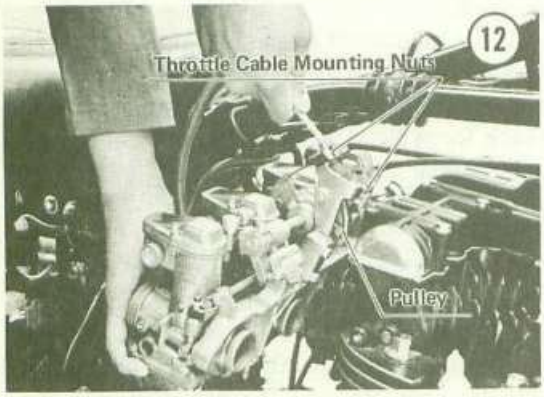
CARBURETOR OVERHAUL

There is no set rule regarding frequency of carburetor overhaul. A carburetor used primarily for street riding may go 5,000 miles (8,000 km) without attention. Poor engine performance, hesitation, and little response to idle mixture adjustment are all symptoms of possible carburetor malfunctions. As a general rule, it is good practice to overhaul carburetors each time you perform a routine decarbonization of the engine.

There are minor difference between the 1973, the 1974-1975, and the 1976 and later carburetors. The 1974 and later carburetors are equipped with an overflow pipe.

Carburetor Assembly Removal/Installation

1. Loosen the screws of the 4 clamps mounting the carburetors to the intake manifolds.
2. Loosen the screws of the 4 clamps mounting the air intake hoses to the carburetors.
3. Atop the throttle linkage in the center of the carburetor block, loosen the 2 throttle cable mounting nuts (**Figure 12**), and remove the throttle cables from the pulley.



4. Pull the air intake hoses off the carburetor mouths. Pull the block of carburetors off the intake manifolds.
5. Install the carburetor block in the reverse order, being careful to tighten the clamps sufficiently to avoid air leaks. Below the handlebar twistgrip, use the cable adjuster to remove all slack from the opening cable. On the return cable, use the adjuster to get 1/16 in. play. For further adjustments, refer to Chapter Two.

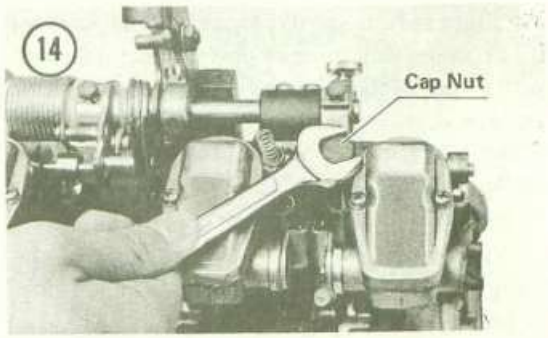
Carburetor (Single) Removal/Installation (1973-1975 Models)

Remove and install a single carburetor as follows.

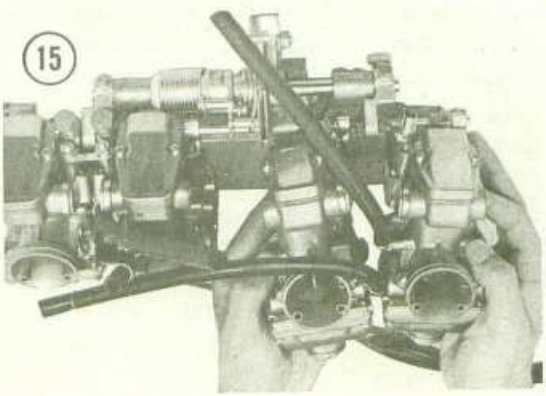
1. The carburetors are linked in pairs—a left pair and a right pair. In the pair from which you wish to remove a carburetor, unscrew the locknut from the slide stop adjusting screw on each carburetor. Take off the double washer link (**Figure 13**).
2. Unscrew the slide stop adjusting screw from each of the 2 carburetors. Lift off the springs and spring seats.



3. On the carburetor you wish to remove, unscrew the linkage cap nut, keeping finger pressure on it to prevent the spring beneath it from flying out. Take out the spring and the spring seat (**Figure 14**).



4. Remove the 4 screws that mount the 2 carburetors to the linkage mounting plate. Swing the carburetors away from the plate and remove the carburetor you want (**Figure 15**). Remove the fuel line and the vent tube (and the overflow tube on the 1974-1976 models).



5. Reassemble the carburetor in the reverse order. Apply Loctite to the carburetor mounting screws.

6. Adjust the idle as described in this chapter.

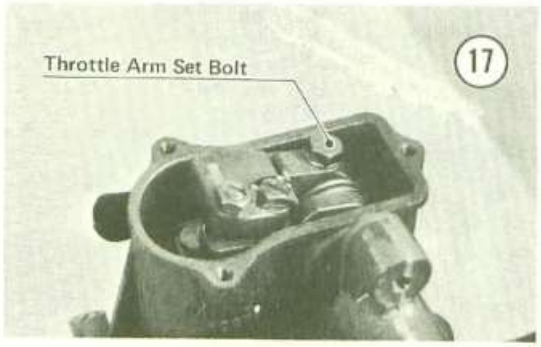
Carburetor (Single) Removal/Installation (1976 and Later)

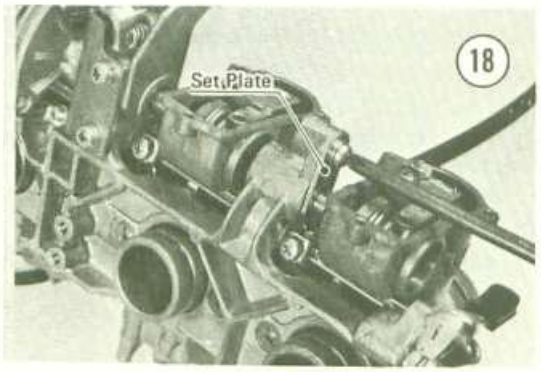
Refer to **Figure 16** for following procedure.

1. In the pair (left or right) containing the single carburetor to be removed, remove the top covers and plate.

2. Unscrew throttle arm set bolts (**Figure 17**).

3. Remove throttle shaft set plate (**Figure 18**).





4. Remove the rubber cap from each side of carburetor assembly (Figure 16).

5. Pull off the throttle shaft.

6. Remove the mounting screws and detach the 2 carburetors from the plate.

7. Pull off the wanted single carburetor from the side.

8. Reassemble carburetor in reverse order. Apply Loctite to carburetor mounting screws.

9. Adjust the idle as described in this chapter.

Slide Removal/Installation (1973-1975 Models)

1. Remove the 2 screws from the top of the carburetor. Take off the top.

2. Flatten the tab washer beneath the mounting screw in the top of the slide operating lever beneath the carburetor top. Remove the mounting screw.

3. Remove the 2 screws which mount the operating linkage to the slide.

4. Lift up the linkage and take out the slide.

5. Install the slide in the reverse order.

Slide Removal/Installation (1976 and Later)

1. Remove the top covers and plate.

2. Unscrew throttle arm set bolts (Figure 17).

3. Remove throttle return spring.

4. Remove throttle shaft set plate (Figure 18).

5. Pull off the throttle shaft.

6. Remove screws and pull out the slide and jet needle (Figure 16).

7. Install the slide in reverse order.

Main Jet Removal/Installation (1973 Model)

1. Unscrew the drain plug at the bottom of the float bowl. Remove the gasket.

2. Unscrew the main jet with a screwdriver.

3. Install the main jet in the reverse order.

Main Jet Removal/Installation (1974 and Later)

1. Remove the 4 screws that mount the float bowl to the carburetor body. Remove float bowl.

2. Unscrew the main jet and air bleed pipe with a screwdriver.

3. Install the main jet in the reverse order.

Needle Jet Removal/Installation (1973 and Later)

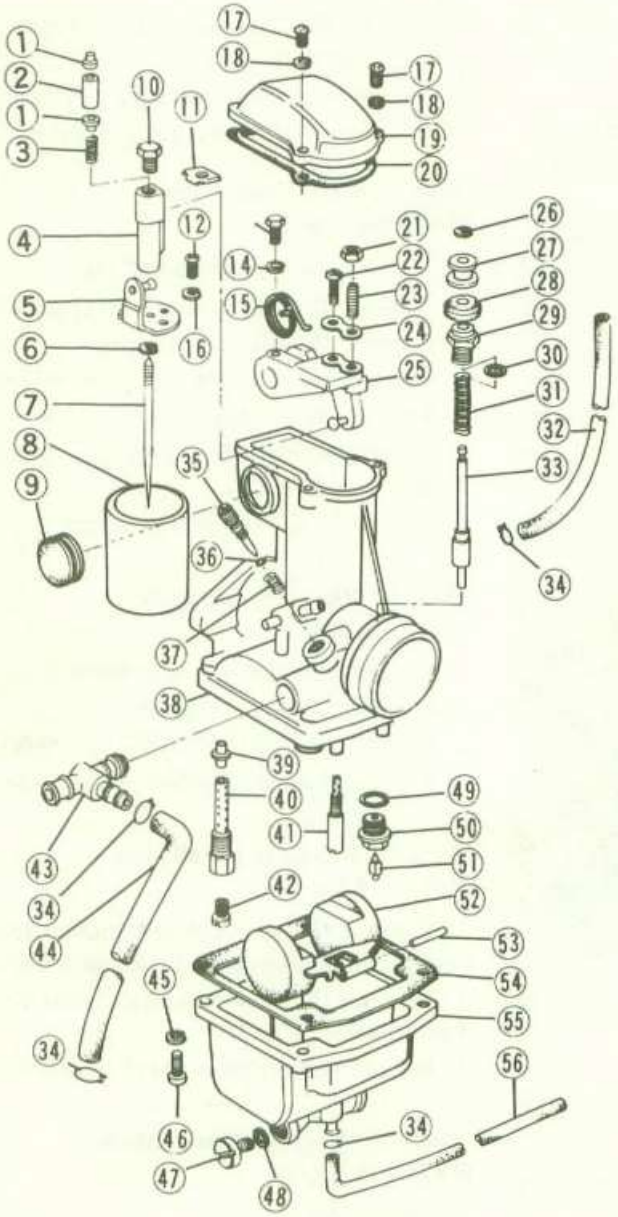
1. Remove the slide.

2. Remove the float bowl.

3. Pull the pin out of the float pivot. Remove the float and the float needle.

(16)

CARBURETOR — 1976 AND LATER



1. Throttle shaft holder
2. Spring seat
3. Spring
4. Connector
5. Throttle valve plate
6. Circlip
7. Jet needle
8. Throttle valve
9. Rubber cap
10. Guide screw
11. Lockwasher
12. Screw
13. Bolt
14. Lockwasher
15. Spring
16. Lockwasher
17. Screw
18. Lockwasher
19. Top cover
20. Gasket
21. Locknut
22. Lock bolt
23. Adjusting screw
24. Lockwasher
25. Lever
26. Circlip
27. Ring
28. Cap
29. Guide screw
30. O-ring
31. Spring
32. Air vent pipe
33. Plunger
34. Clamp
35. Air screw
36. O-ring
37. Spring
38. Carburetor body
39. Needle jet
40. Air bleed pipe
41. Pilot jet
42. Main jet
43. Fuel pipe fitting
44. Fuel pipe
45. Lockwasher
46. Screw
47. Drain plug
48. Gasket
49. Gasket
50. Valve seat
51. Valve needle
52. Float
53. Float pin
54. Gasket
55. Float chamber
56. Overflow pipe

4. Unscrew and remove the main jet from the air bleed pipe.

5. Unscrew and remove the air bleed pipe.

6. From the top of the carburetor, insert a wooden rod or brass drift, and push the needle jet down through the bottom of carburetor body.

7. Install the needle jet in the reverse order.

8. Check the float level (as described in this chapter).

CARBURETOR ADJUSTMENT

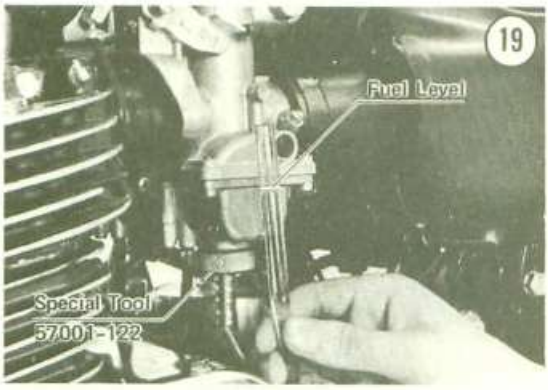
Check/Adjust Float Level

Obtain a special fuel level gauge from a Kawasaki dealer with fittings for your particular set of carburetors.

Check and adjust the float level as follows.

1. Turn off the petcock. Unscrew the drain plug from the float bowl.

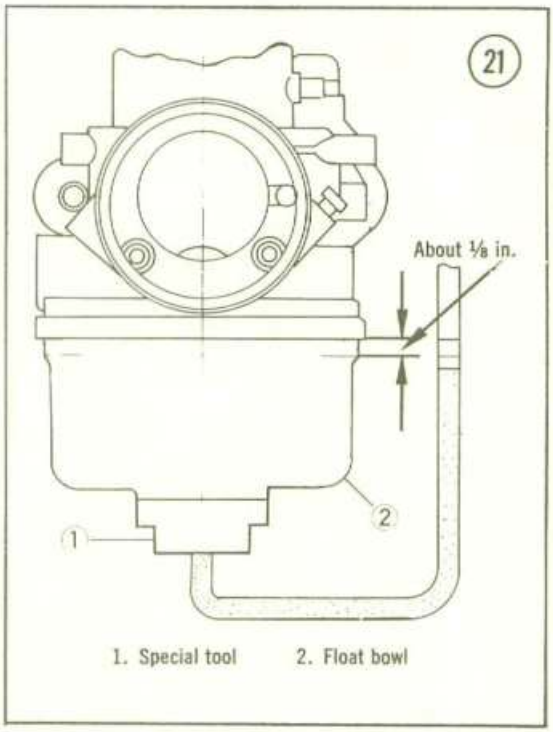
2. Screw in the fuel level gauge. See **Figures 19 and 20** for illustration of use of typical fuel level gauges for the 1973 and 1974 and later models, respectively.





3. Hold the graduated tube of the tool against the side of the carburetor. Turn on the petcock and measure the fuel level.

4. The fuel level in the plastic tube should be 0.10-0.18 in. (2.5-4.5mm, or approximately ⅛ in.) below the bottom of the carburetor body. For 1973 models, see **Figure 21**; for 1974 and later models, see **Figure 22**.



5. If the fuel level is not within tolerance, remove the 4 screws which mount the float bowl to the carburetor body. Remove the float bowl.

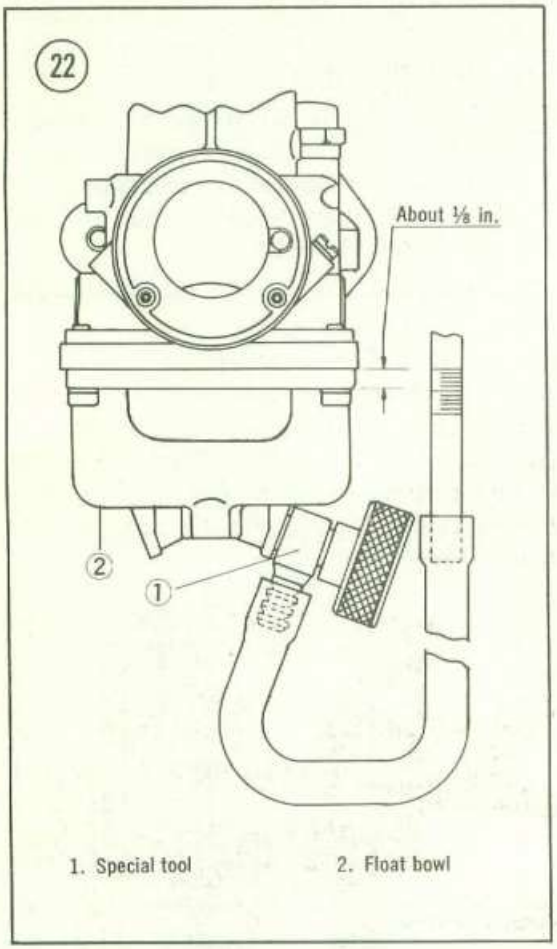
6. Take the pin out of the float pivot, remove the float, and catch the float needle as it drops out of the jet.

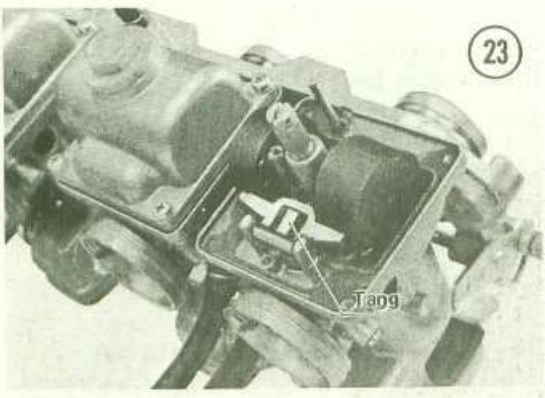
7. Bend the tang upward very slightly to lower the fuel level; bend the tang downward very slightly to raise the fuel level (**Figure 23**).

8. Reassemble the carburetor and recheck the float level.

Carburetor Linkage Adjustment

For good engine performance, the 4 carburetors must do everything in exact synchronization. That is the job of the carburetor linkage. If one or more of the carburetors have been re-



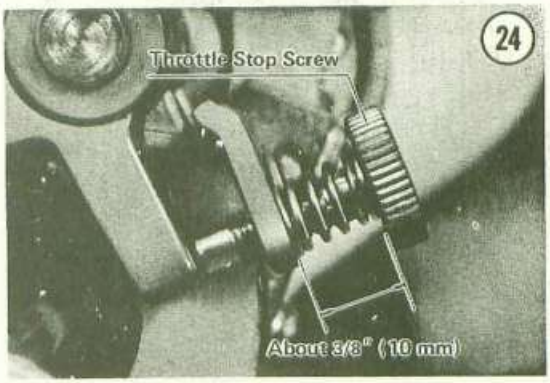


moved and reinstalled or if the engine idle is rough, adjust the carburetor linkage before attempting to adjust the idle.

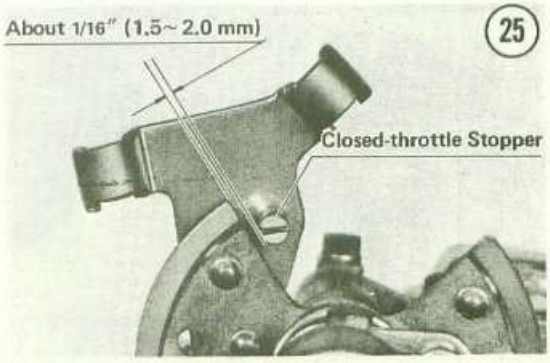
There are some minor differences in carburetors and carburetor linkages between the 1973 and 1974 and later models. The adjustment procedures are similar for all models; some specifications are different.

Adjust the carburetor linkage as follows.

1. Remove the 4 carburetors from the motorcycle as a unit (see procedures in this chapter).
2. Turn the throttle stop screw (located on the upper right end of the carburetor linkage) until the bottom of the screw head is 3/8 in. from its bracket (**Figure 24**).

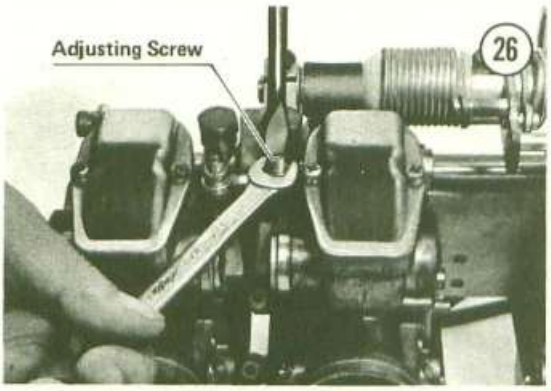


3. Loosen the locknut on the closed throttle stop at the rear of the pulley.
4. *(1973 only)* Turn the eccentric closed throttle stop until it is positioned 1/16 in. away from the edge of the pulley (**Figure 25**).



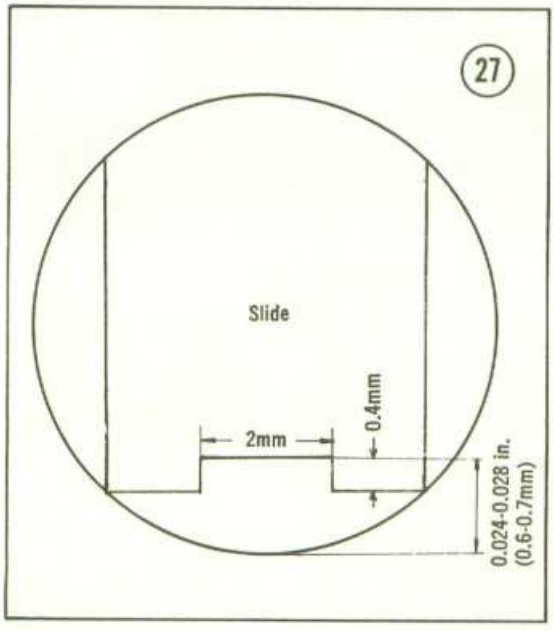
5. *(1974-1975)* Turn the eccentric closed throttle stop until it is positioned 1/8 in. away from the edge of the pulley.
6. *(1976 and later)* Turn the throttle stop until the throttle cable holder end is positioned 1/16 in. from the stopper on the pulley.
7. *(1973-1975)* The slide stop adjusting screw is alongside the top of each carburetor. Loosen

its locknut and turn the screw to move the slip up or down in the carburetor bore (**Figure 26**). The correct bottomed position of the slide is measured from the top of the notch in the bottom of the slide to the bottom of the bore.



8. *(1976 and later)* Remove the top covers and plates. Flatten the bent-up lockwashers. Loosen the locknuts and bolts.

9. *(1973 and 1976 and later)* Turn the slide top adjusting screw to provide a distance of 0.024-0.028 in. (0.6-0.7mm) from the top of the notch to the bottom of the bore (**Figure 27**).



10. *(1974-1975)* Turn the slide stop adjusting screw to provide a distance of 0.024-0.031 in. (0.7-0.8mm) from the top of the notch in the slide to the bottom of the bore.

11. Tighten the locknut on the slide stop adjusting screw. Make the same adjustment on the 3 remaining carburetors.

> NOTE: *This adjustment is critical to the synchronization of the 4 carburetors; make it carefully.*

12. *(1976 and later)* Bend up lockwashers against the lock bolts.

13. Rotate the pulley until the bottom edge of the lowest of the 4 carburetor slides is level with the top edge of its carburetor throat (viewed from the intake manifold end). Hold the pulley in that position. Turn the open throttle stop screw until it bottoms against the pulley at that point (**Figure 28**).



14. Screw in the air screw until it bottoms gently (**Figure 29**).



15. *(1973 only)* Back out each air screw precisely 1½ turns.

16. *(1974 and later)* Back out each air screw precisely 1¼ turns.

17. Install the 4 carburetors as a unit (for the procedures, see Chapter Four).

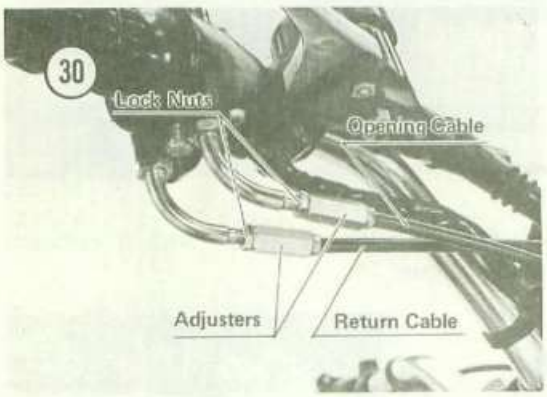
18. Adjust the throttle linkage and adjust the engine idle, using the procedures described in this chapter.

Throttle Linkage Adjustment

One throttle cable pulls the carburetor slides open, and the other cable pulls them closed. If the throttle cables have become stretched, or are adjusted too loose, there will be a delay between the time of turning the twistgrip and the time the engine responds. If the throttle cables are too tight, the engine will be oversensitive, and the rpm can change whenever the handlebars are turned.

Adjust the linkage as follows.

1. Loosen the locknut on the adjuster in the throttle opening cable. Screw the adjuster in or out until cable slack is barely removed. Tighten the locknut (**Figure 30**).



2. Loosen the locknut on the adjuster in the throttle return cable. Screw the adjuster in or out until there is approximately 1/16 in. of slack in the cable (adjust it from there to suit your taste). Tighten the locknut.

Carburetor Idle (Without Vacuum Gauges)

Engine performance throughout the rpm range depends upon a correct idle adjustment. Before you can get a good idle, the following items must be in good condition and/or adjustment, so check them first.

a. Spark plugs
b. Contact breaker points and ignition timing
c. Cylinder compression
d. Valve clearance
e. Engine oil
f. Air cleaner
g. Throttle and carburetor linkages.

The procedures for running a compression check are listed in the section on cylinder block repairs in Chapter Six.

Adjust the carburetors for a satisfactory engine idle as follows.

1. Run the engine for 5 minutes to warm it up.

2. Turn the throttle stop screw on the right end of the carburetor linkage until the engine is idling at 800-1,000 rpm by the tachometer (**Figure 31**).

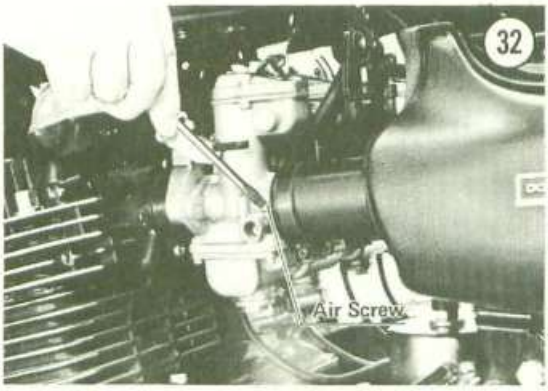


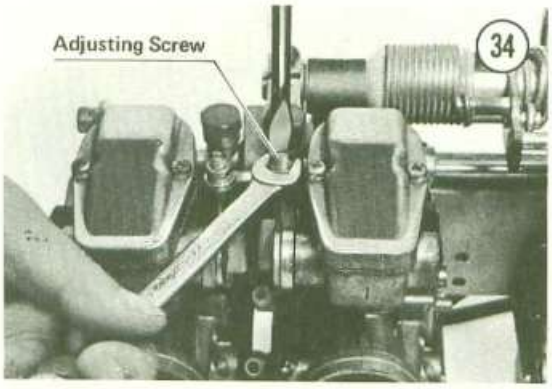
3. Screw in and then back out the air screw on the side of each carburetor until you find the setting which results in the highest engine rpm (**Figure 32**).

> NOTE: *If any air screw gives its best performance within ½ turn of bottoming, something is probably wrong with that carburetor.*

4. Back out all 4 air screws exactly ⅛ turn. If the engine rpm is above 1,000, slow it down with the throttle stop screw.

5. Listen carefully to the exhaust noises, and hold the palms of your hands in front of the muffler to compare exhaust pressures. If there





are differences in noise or exhaust pressures between the cylinders, readjust the individual stop screws using the following procedure.

6. *(1976 and later)* Remove the fuel tank. Supply fuel by alternate means during the following adjustments. Remove the carburetor top covers and plate. Flatten the bent-up lockwashers and loosen locknuts and bolts.

7. *(All models)* Use a screwdriver and wrench tool (a Kawasaki dealer has a special tool available) to make fine corrections to the slide stop adjusting screw for that carburetor (**Figure 33**). Or use an 8mm wrench and a screwdriver (**Figure 34**). Backing out the adjusting screw increases the pressure; screwing it in decreases the pressure. Tighten the locknut.



8. *(1976 and later)* Tighten the locknuts and bolts. Bend up the lockwashers. Replace top covers and plate. Replace the fuel tank.

9. If the setting of a slide stop adjusting screw was changed, readjust the air screw in that carburetor for maximum engine rpm at idle. Back out the air screw ⅛ turn.

10. If these operations have increased the engine idle above 1,000 rpm, turn the throttle stop screw to adjust the idle to 800-1,000 rpm.

4

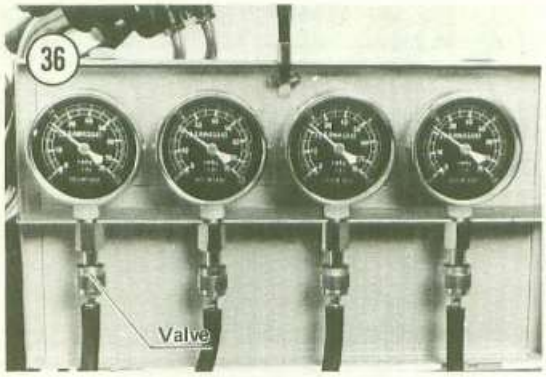
Carburetor Idle (With Vacuum Gauges)

If a vacuum gauge or a set of gauges (such as Kawasaki special tool set 57001-127) are on hand, adjust the idle as follows.

1. Read the instructions preceding the procedures for adjusting idle without vacuum gauges.
2. Follow the first 4 steps of the procedures for adjusting the idle without gauges.
3. Shut off the engine. Take the rubber caps off the vacuum gauge fittings on the intake manifold. Install the vacuum gauges (**Figure 35**).



4. Run the engine; allow it to idle.
5. Adjust the intake valve at the bottom of each vacuum gauge until the gauge needle is fluctuating less than 2 cm (0.8 in.) on the scale as shown in **Figure 36**.



6. Read the gauges. The standard reading is 20-25 cm (7.9-10.0 in.).

7. If any gauge reads less than 15 cm (6.0 in.), check that the spark plug and the carburetor hose clamps are tight. If that does not solve the problem, recheck the idle adjustments made so far to that carburetor.

8. *(1976 and later)* Remove the fuel tank. Supply fuel by alternate means during following adjustments. Remove the carburetor top covers and plate. Flatten the bent-up lockwashers and loosen locknuts and bolts.

9. *(All models)* Use a screwdriver and wrench tool (a Kawasaki dealer has a special tool available) to make fine corrections to the slide stop adjusting screw on each carburetor so that each gauge will read within 2 cm of the other 3 gauges. Or use an 8mm wrench and a screwdriver. The adjusting screw is located next to the top of the carburetor. See **Figure 37**. Backing out the adjusting screw decreases the vacuum; screwing it in increases the vacuum. Tighten the locknut on each adjusting screw when the vacuum gauge is at the desired reading.



10. Open the throttle and let it snap shut a few times. Check that the vacuum readings remain the same. If not, readjust the slide stop adjusting screws.

11. *(1976 and later)* Tighten the locknuts and bolts. Bend up the lockwashers. Replace top covers and plate. Replace the fuel tank.

12. Shut off the engine. Take off the vacuum gauges. Put the rubber caps on the vacuum gauge fittings on the intake manifold.

13. Start the engine and allow it to idle. If you have adjusted any of the slide stop adjusting screws, readjust the air screws in those carburetors, as described previously.

14. If the engine rpm at idle has changed, use throttle stop screw to adjust to 800-1,000 rpm.

REJETTING THE CARBURETORS

Do not try to solve a carburetion problem by rejetting if all the following conditions hold true.

1. The engine has never held a good tune in the past with the standard jetting and needle positions.
2. The engine has not been modified.
3. The motorcycle is being operated in the same geographical region under the same general climatic conditions as in the past.
4. The motorcycle was and is being ridden at average highway speeds.

If those conditions all hold true, the chances are that the problem is due to a malfunction in the carburetion or in another component, that needs to be adjusted or repaired. Changing the carburetion probably won't solve the problem.

Rejetting the carburetors may be needed if any of the following conditions hold true.

1. A nonstandard type of air filter element is being used.
2. A nonstandard exhaust system is being used.
3. Any of the top end components in the engine (pistons, valves, compression ratio, etc.) have been modified.
4. The motorcycle is in use at considerably higher or lower altitudes, or in a markedly hotter or colder climate, than in the past.

5. The motorcycle is being operated at considerably higher speeds than before, and changing to colder spark plugs did not solve the problem.

6. Someone has changed the jetting or the needle positions in your motorcycle (see the standard jetting listed in the specifications in the Appendix (Z-1 and KZ900) or the Supplement (KZ1000).

7. The motorcycle has never held a satisfactory engine tune.

If rejetting the carburetors is needed, check with a Kawasaki dealer for recommendations as to the sizes of jets to install.

AIR CLEANER

See Chapter Two for periodic maintenance of the air cleaner.

GAS TANK

Removal/Installation

1. Press down on the saddle catch (on the left side of the motorcycle, to the rear of the side cover), and lift up the saddle.
2. Unhook the wire prop-stand that normally holds the lifted saddle in a vertical position. Pivot the saddle as far to the right side of the motorcycle as it will go.
3. Pull the left side cover off the motorcycle.
4. Turn the gas tank petcock lever to the "S" position.
5. On the right side of the petcock, work the 2 wire fuel line clamps free of the petcock nipples. Pull the fuel lines off the petcock.
6. Unhook the rubber tie-down strap from the rear of the gas tank (**Figure 38**).



7. Lift the rear end of the gas tank. Slide the gas tank toward the rear of the motorcycle and lift it off the frame.
8. Installation is the reverse of these steps.

CHAPTER FIVE

ELECTRICAL SYSTEM

The electrical system includes the battery, ignition system, charging system, starter system, lighting, and horn. Wiring diagrams are given at the end of this chapter. Specifications for service and replacement parts are given in the Appendix (1973-1976) or Supplement (1977-1978).

A crankshaft-mounted alternator generates 3-phase alternating current which is rectified into direct current by a full wave diode bridge. The current enters a voltage regulator with a zener and thyristor, which shunts excess current back to the alternator and feeds the rest into a 12-volt, 14 ah battery. The breaker point ignition system operates from battery current, as do the lights and horn.

Any part of the electrical system may be repaired with a minimum of special tools by following the procedures described.

BATTERY

The bike is equipped with a Yuasa 12-volt, 14-ampere-hour battery, with a specific gravity of 1.260 at 68 degrees F when fully charged.

WARNING

Read and thoroughly understand the section of safety precautions before doing any battery service.

Safety Precautions

While working with batteries, use extreme care to avoid spilling or splashing the electrolyte. Electrolyte contains sulfuric acid, which can destroy clothing and cause serious chemical burns. If any electrolyte is spilled or splashed on clothing, body, or other surface, neutralize it *immediately* with a solution of baking soda and water, then flush with plenty of clean water.

WARNING

Electrolyte splashed into the eyes is extremely dangerous. Safety glasses should always be worn while working with batteries. If electrolyte is splashed into the eye, call a physician immediately, *force the eye open, and flood with cool, clean water for about 5 minutes.*

If electrolyte is spilled or splashed onto painted or unpainted surfaces, it should be neutralized immediately with baking soda solution and then rinsed with clean water.

When batteries are being charged, highly explosive hydrogen gas forms in each cell. Some of this gas escapes through the filler openings and may form an explosive atmosphere around the battery. *This explosive atmosphere may exist for several hours.* Sparks, open flame, or a lighted

cigarette can ignite the gas, causing an internal explosion and possible serious personal injury. The following precautions should be taken to prevent an explosion.

1. Do not smoke or permit any open flame near any battery being charged or which has been recently charged.

2. Do not disconnect live circuits at battery terminals, because a spark usually occurs where a live circuit is broken. Care must always be taken when connecting or disconnecting any battery charger; be sure its power switch is off before making or breaking connections. Poor connections are a common cause of electrical arcs which cause explosions.

Electrolyte Level

Battery electrolyte level should be checked regularly, particularly during hot weather. Most batteries are marked with electrolyte level limit lines. Always maintain the fluid level between the 2 lines, using distilled water as required for replenishment. Distilled water is available at almost every supermarket. It is sold for use in steam irons and is quite inexpensive.

Overfilling leads to loss of electrolyte, resulting in poor battery performance, short life, and excessive corrosion. Never allow the electrolyte level to drop below the top of the plates. That portion of the plates exposed to air may be permanently damaged, resulting in loss of battery performance and shortened life.

Excessive use of water is an indication that the battery is being overcharged. The 2 most common causes of overcharging are high battery temperature or high voltage regulator setting. It is advisable to check the voltage regulator if this situation exists.

Cleaning

Check the battery occasionally for presence of dirt or corrosion. The top of the battery, in particular, should be kept clean. Acid film and dirt permit current to flow between terminals, which will slowly discharge the battery.

For best results when cleaning, wash first with diluted ammonia or baking soda solution, then flush with plenty of clean water. Take care to keep filter plugs tight so that no cleaning solution enters the cells.

Battery Cables

To ensure good electrical contact, cables must be clean and tight on battery terminals. If the battery or cable terminals are corroded, disconnect and clean the cables separately with a wire brush and baking soda solution. After cleaning, apply a very thin coating of petroleum jelly or Vaseline to the battery terminals before installing the cables. After connecting the cables, apply a light coating to the connection. This procedure will help to prevent future corrosion.

Testing State of Charge

Although sophisticated battery testing devices are on the market, they are not available to the average motorcycle owner, and their use is beyond the scope of this book. A hydrometer, however, is an inexpensive tool, and will tell much about battery condition.

To use a hydrometer, place the suction tube into the filler opening and draw in just enough electrolyte to lift the float. Hold the instrument in a vertical position and read specific gravity on the scale, where the float stem emerges from the electrolyte. See **Figure 1**.

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

Repeat this measurement for each battery cell. If there is more than 0.050 difference (50 points) between cells, battery condition is questionable.

State of charge may be determined from **Table 1**.

Don't measure specific gravity immediately after adding water. Ride the machine a few miles to ensure thorough mixing of the electrolyte.

It is most important to maintain batteries fully charged during cold weather. A fully charged battery freezes at a much lower temperature than does one which is partially dis-

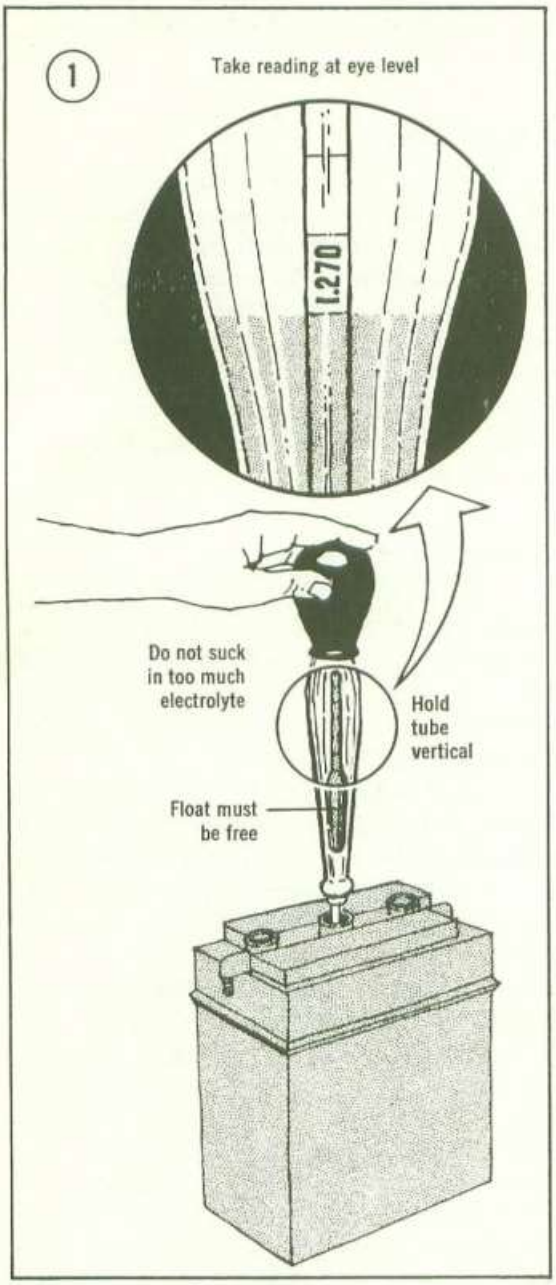


Table 1 STATE OF CHARGE

Specific Gravity	State of Charge
1.110 - 1.130	Discharged
1.140 - 1.160	Almost discharged
1.170 - 1.190	One-quarter charged
1.200 - 1.220	One-half charged
1.230 - 1.250	Three-quarters charged
1.260 - 1.280	Fully charged

charged. Freezing temperature depends on specific gravity, as shown in **Table 2**.

Table 2 BATTERY FREEZING TEMPERATURES

Specific Gravity	Freezing Temperature Degrees F.
1.100	18
1.120	13
1.140	8
1.160	1
1.180	—6
1.200	—17
1.220	—31
1.240	—50
1.260	—75
1.280	—92

Battery life should normally be 2 to 3 years. This period will be shortened by any of the following conditions:

a. Overcharging
b. Leaving the battery in a discharged state
c. 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 battery fully charged
d. Allowing the electrolyte level to drop below the tops of the plates
e. 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 2 months while it is in storage, and again before it is put back into service.

Be very careful when installing the battery to connect it properly. If the battery is installed backward, the rectifier and alternator will be damaged.

Removal/Installation

1. Disconnect the ground, or negative (—) cable first, then the positive (+) cable.
2. Lift the battery from its carrier.
3. Test and service the battery as described in this section.

4. Wash the battery with water to remove spilled electrolyte. Coat the terminals with Vaseline or light grease before installing.

5. Connect the positive terminal first, then the negative one. Don't overtighten the clamps.

6. Remeasure the specific gravity of the electrolyte with a bulb hydrometer, reading it as shown.

Battery Charging

WARNING

Do not smoke or permit any open flame in any area where batteries are being charged, or immediately after charging. Highly explosive hydrogen gas is formed during the charging process. Be sure to reread Safety Precautions *in the beginning of this section.*

Motorcycle batteries are not designed for high charge or discharge rates. It is recommended that a motorcycle battery be charged at a rate not exceeding 10 percent of its ampere-hour capacity. That is, do not exceed 0.5 ampere charging rate for a 5 ampere-hour battery, or 1.5 amperes for a 15 ampere-hour battery. This charge rate should continue for 10 hours if the battery is completely discharged, or until specific gravity of each cell is up to 1.260-1.280, corrected for temperature. If after prolonged charging, specific gravity of one or more cells does not come up to at least 1.230, the battery will not perform as well as it should, but it may continue to provide satisfactory service for a time.

Some temperature rise is normal as a battery is being charged. Do not allow the electrolyte temperature to exceed 110 degrees F. Should the temperature reach that figure, discontinue charging until the battery cools, then resume charging at a lower rate.

If possible, always slow-charge a battery. See **Table 3**. Quick-charging will shorten the battery service life. Use a quick-charge only if *absolutely* necessary.

After removing the battery, use the following procedure for charging.

1. Hook the battery to a charger by connecting the positive lead to the positive terminal on the battery and the negative lead to the negative terminal. To do otherwise could cause severe damage to the battery and could result in injury if the battery explodes.

2. The electrolyte will begin bubbling, signifying that explosive hydrogen gas is being released. Make sure the area is adequately ventilated and that there are no open flames.

3. It will normally take at least 8 hours to bring the battery to full charge. Test the electrolyte periodically with a hydrometer to see if the specific gravity is within the standard range of 1.26-1.28, corrected for temperature. If the reading remains constant for more than an hour, the battery is charged. See Table 3.

Table 3 BATTERY CHARGE

Charging current rate	Maximum of 10% of ampere-hour rating.
Checking for full charge	(1) Specific gravity: 1.260-1.280 at 20°C (68°F) maintained constant for one hour. (2) 7.5V-8.3V maintained constant at terminals, checked with voltmeter.
Charging duration	By this method, a battery with specific gravity of electrolyte below 1.220 at 20°C (68°F) will be fully charged in approximately 10-13 hours.

WIRING DIAGRAMS

Wiring diagrams are located at the end of this chapter. In some instances, wire colors may vary but wiring points remain the same.

IGNITION SYSTEM OPERATION

The ignition system is equipped with 2 coils and 2 sets of points, each of which fires 2 spark plugs wired in series, simultaneously. One of the spark plugs in the pair is fired on the compression stroke; the other is fired (harmlessly) on the exhaust stroke.

Ignition takes place every 180 degrees of crankshaft rotation; each set of points opens every 360 degrees of crankshaft rotation. The firing order is 1-2-4-3. The left set of points fires cylinders 1 and 4; the right set of points fires cylinders 2 and 3.

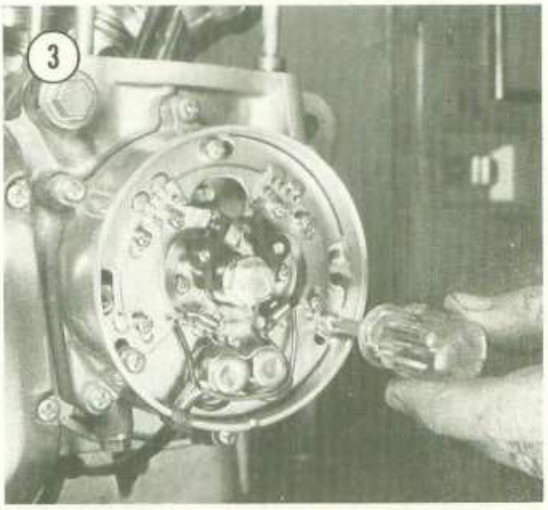
Because the ignition coil fires through 2 spark plugs wired in series, if one of the plugs fails to fire, so will the other. If one plug develops a weak spark, so will the other.

In other respects, the ignition system functions like any other battery coil system with contact breaker points.

When the points close, current flows from the battery through the points through the primary windings of the ignition coil, setting up an electromagnetic field which penetrates the secondary windings of the coil.

At ignition time, the points camshaft on the end of the crankshaft opens the points. As the points are opening, current that might flow across them in the form of a spark is diverted instead into the capacitor (condenser), breaking off sharply the flow of current through the primary windings of the coil. The electromagnetic field around the coil collapses rapidly, inducing a voltage in the secondary windings of the coil. Since there are many more turns of wire in the secondary windings than in the primary windings, the voltage generated in the secondary windings is far higher than that in the primary circuit (though the amperage is much lower). This current from the secondary windings arcs across the electrodes of both spark plugs as shown in the ignition system wiring schematic at the end of this chapter.



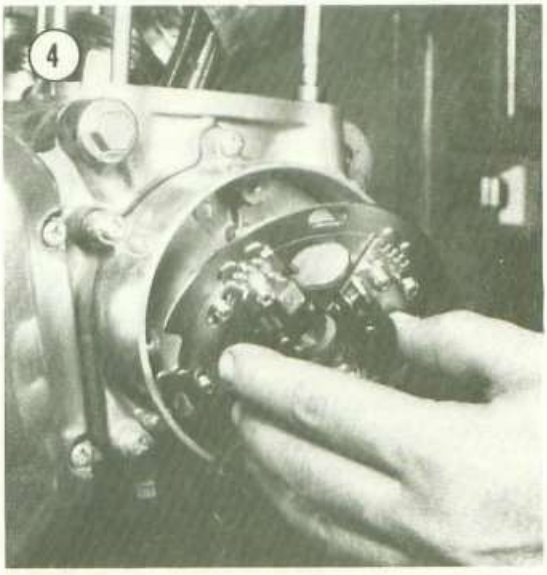


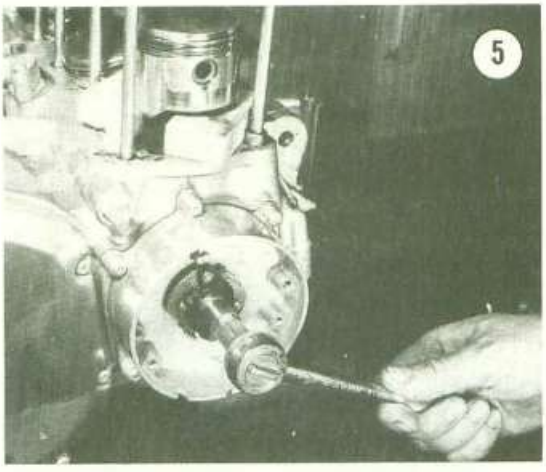
IGNITION ADVANCE MECHANISM

The ignition advance mechanism is bolted to the right end of the crankshaft, inside the right engine cover.

Removal/Installation

1. Remove the 2 screws securing the breaker point cover to the right engine cover. Remove the breaker point cover and its gasket (**Figure 2**).
2. Remove the 3 screws holding the breaker point plate in place (**Figure 3**). Remove the backing plate (**Figure 4**).
3. Remove the bolt holding the ignition cam and advance unit to the end of the crank (**Figure 5**). Pull the ignition advance mechanism off the end of the crankshaft (**Figure 6**).

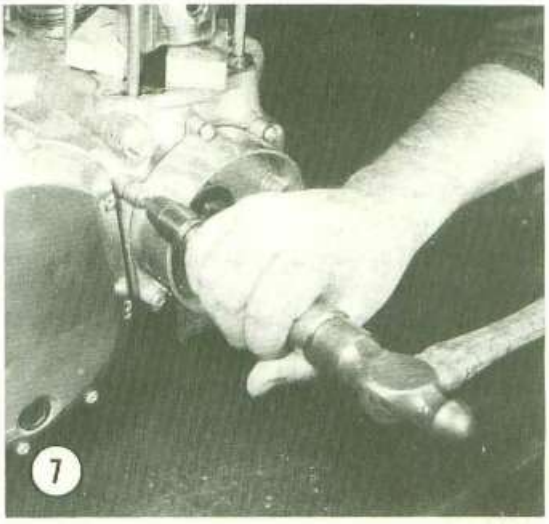


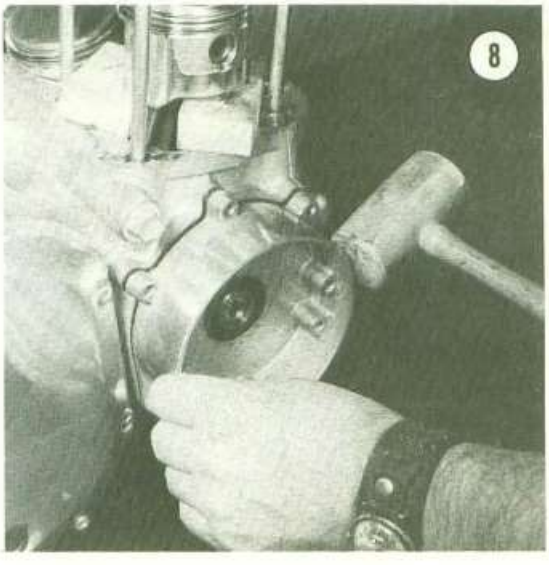




4. Remove the 6 screws holding the ignition base to the right side of the engine (**Figure 7**).
5. Gently tap the cover loose with a soft mallet (**Figure 8**).
6. To install, reverse the preceding steps.

NOTE: *When installing the ignition advance mechanism, be sure that the peg on the end of the crankshaft fits into the slot in the back of the advance mechanism.*





IGNITION COIL

An ignition coil can fail in any of 3 ways. It can develop an open-circuit (broken wire) in the primary windings or the secondary windings, in which case the coil won't function at all, or it can develop a partial short-circuit, arcing to bridge some of the secondary windings. If that happens, the coil will generate weak sparks at the electrodes of the spark plugs.

Removal/Installation

1. Disconnect battery ground lead.
2. Disconnect leads to coil.
3. Detach coil and remove it.

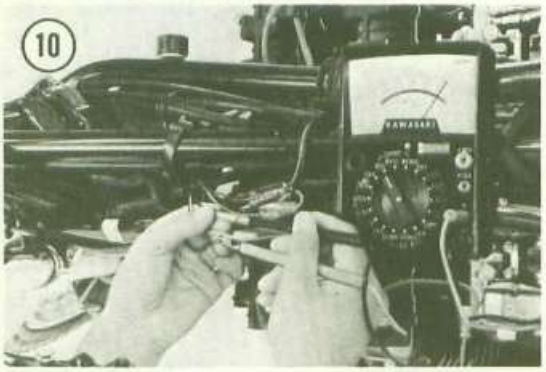
4. Install in reverse order of removal. Check to see that battery ground lead is disconnected before beginning installation.

Troubleshooting

A 3-point gap tester can be used to check the coil for open circuits in the primary and secondary windings and for partial short-circuits in the secondary windings. On the tester, the coil must generate a spark at least 0.28 in. (7mm) long (**Figure 9**).

If you don't have access to a spark gap tester, and the spark plugs won't spark at all, check for open circuits with an ohmmeter, as follows.

1. Set the resistance scale to R X 1, and measure across the red/yellow wire and the green or black) wire. The ohmmeter should show a resistance of 3.2-3.8 ohms. If the ohmmeter reads infinity, there is an open circuit in the primary windings; replace the coil (**Figure 10**).



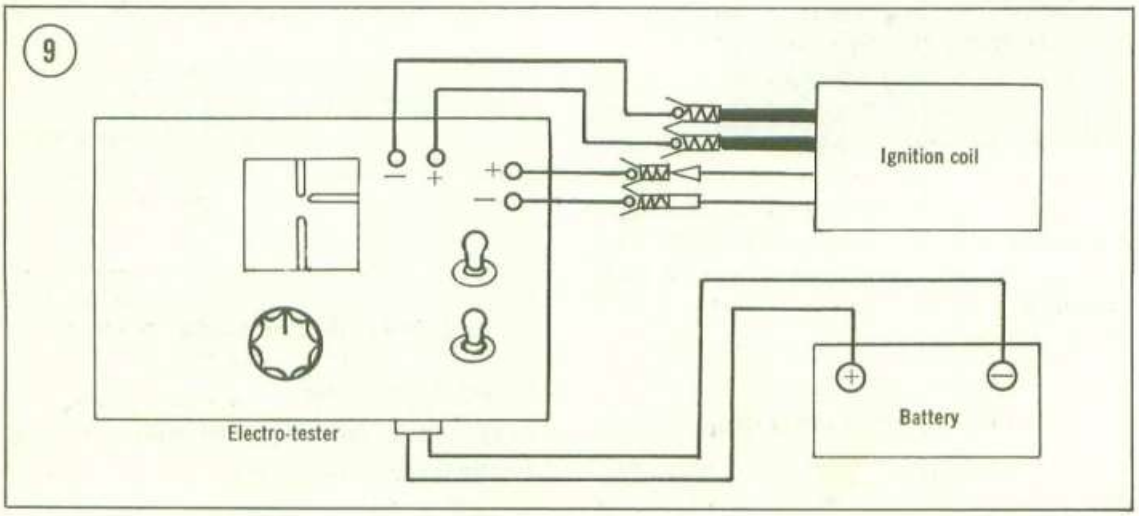
2. Set the ohmmeter scale for the highest resistance reading. Measure across the 2 spark plug wires, inside the spark plug caps. See **Figure 11**. The resistance should be 30,000 ohms. If the meter reads infinity, there is an open circuit in the secondary windings; replace the coil.



If the coil is generating weak sparks, substitute the other coil in the circuit and check the sparks again. If the other coil generates stronger sparks at the electrodes of the spark plugs, there is a partial short-circuit in the secondary windings of the original coil; replace it with a new one.

SPARK PLUGS

It is important to use spark plugs of the correct heat range. If a spark plug has the correct heat range, it will create flame waves hot enough



to prevent carbon from building up on its electrodes, but not hot enough to cause engine damage.

Too cold a spark plug will develop carbon deposits which can short-circuit the plug, or glow and cause preignition which can damage the engine. Too hot a spark plug can cause engine overheating and preignition (**Figure 12**).

The correct spark plug for normal operating conditions is the NGK B8-ES, a 14mm spark plug with ¾ in. reach. For high-speed operation in hot climates, the engine may prefer the B9-ES, a spark plug one heat range colder.

Troubleshooting

If you suspect that 2 of the spark plugs are failing to fire, or are delivering weak sparks, check them as follows.

1. Remove the spark plugs from the engine and check their condition visually. Refer to *Spark Plug Condition* procedures in Chapter Two.
2. If visual inspection shows that one or both of the spark plugs are defective, discard them and install new ones.
3. Check both spark plugs (whether new or used) by putting on their spark plug wires and taping them to the cylinder head fins or cover with duct tape, so that metal touches metal.
4. Wheel the motorcycle over to a dark corner. Turn on the ignition, operate the starter, and observe the sparks. If the plugs throw sparks that are intermittent, or feeble, or orange-yellow in color, which do not make snapping sounds when they jump, the sparks are weak.
5. If one or both of the spark plugs throwing weak sparks are old, fit new plugs to the spark plug wires and observe the sparks again. Watch also for arcing inside the spark plug cap.
6. If the used spark plugs fail to fire or generate weak sparks, and if the new spark plugs throw strong sparks (bluish in color, accompanied by a snapping sound), then one or both of the old spark plugs are defective.

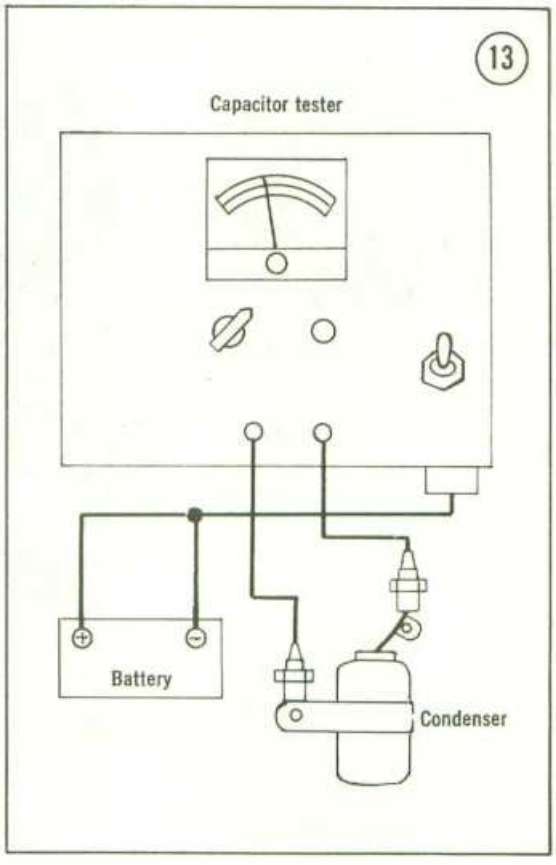
CAPACITOR (CONDENSER)

If the capacitor has deteriorated internally, it will no longer store current temporarily. It will allow a spark to jump across the points after they have opened, causing the electromagnetic field in the ignition coil to collapse more slowly. This will lower the voltage generated in the secondary windings of the coil, and weaken the ignition sparks.

Troubleshooting

If the capacitor has gone bad, the points will be pitted or dirty because they have been sparking, in which case replace the capacitors. Also, replace both capacitors whenever you replace a set of points.

The capacitor specifications are: 0.25±0.03 microfarads, 1,000 WVDC (**Figure 13**).



CONTACT BREAKER POINTS AND CAPACITORS

The contact breaker points and capacitors are located at the right end of the crankshaft, inside the right engine cover. See *Capacitor* section of Chapter Two.

(12)

SPARK PLUG CONDITION



NORMAL

- Identified by light tan or gray deposits on the firing tip.
- Can be cleaned.



GAP BRIDGED

- Identified by deposit buildup closing gap between electrodes.
- Caused by oil or carbon fouling. If deposits are not excessive, the plug can be cleaned.



OIL FOULED

- Identified by wet black deposits on the insulator shell bore electrodes.
- Caused by excessive oil entering combustion chamber through worn rings and pistons, excessive clearance between valve guides and stems, or worn or loose bearings. Can be cleaned. If engine is not repaired, use a hotter plug.



CARBON FOULED

- Identified by black, dry fluffy carbon deposits on insulator tips, exposed shell surfaces and electrodes.
- Caused by too cold a plug, weak ignition, dirty air cleaner, too rich a fuel mixture, or excessive idling. Can be cleaned.



LEAD FOULED

- Identified by dark gray, black, yellow, or tan deposits or a fused glazed coating on the insulator tip.
- Caused by highly leaded gasoline. Can be cleaned.



WORN

- Identified by severely eroded or worn electrodes.
- Caused by normal wear. Should be replaced.



FUSED SPOT DEPOSIT

- Identified by melted or spotty deposits resembling bubbles or blisters.
- Caused by sudden acceleration. Can be cleaned.



OVERHEATING

- Identified by a white or light gray insulator with small black or gray brown spots and with bluish-burnt appearance of electrodes.
- Caused by engine overheating, wrong type of fuel, loose spark plugs, too hot a plug, or incorrect ignition timing. Replace the plug.



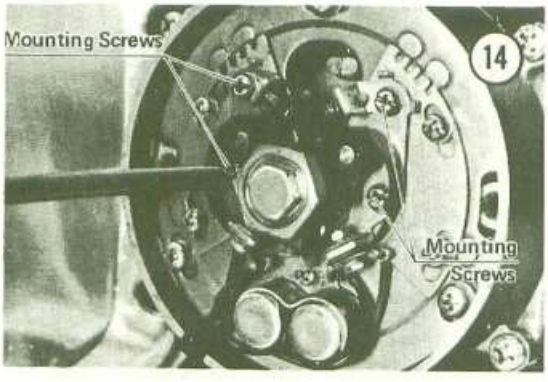
PREIGNITION

- Identified by melted electrodes and possibly blistered insulator. Metallic deposits on insulator indicate engine damage.
- Caused by wrong type of fuel, incorrect ignition timing or advance, too hot a plug, burned valves, or engine overheating. Replace the plug.

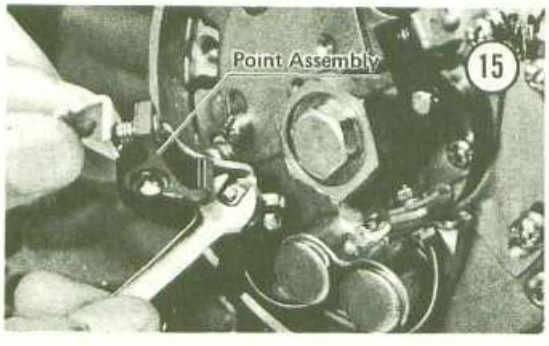
The ignition will suffer if a set of points has a weak spring, dirty or eroded contacts, the wrong contact gap, or the wrong ignition timing. See *Contact Breaker Points Condition, Contact Breaker Points Gap,* and *Ignition Timing* sections of Chapter Two.

Removal/Installation

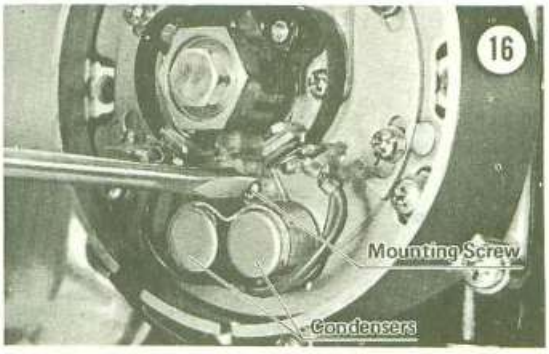
1. Remove the 2 screws that mount the breaker point cover to the right engine cover. Remove the breaker point cover and its gasket.
2. Remove the 2 screws that mount each breaker point assembly to its backing plate, and lift up the breaker points (**Figure 14**).



3. At the rear of the breaker point assembly, loosen the nut and remove the ignition coil wire and the capacitor wire (**Figure 15**).

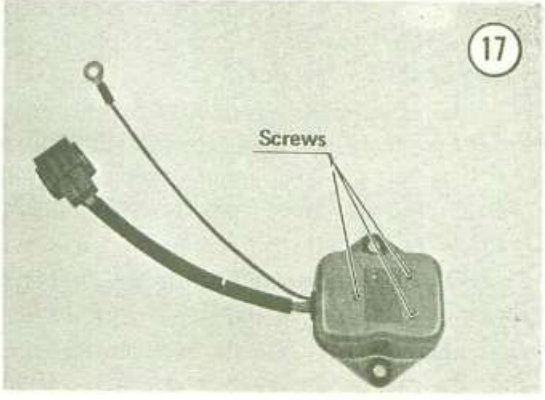


4. To take off the capacitors, remove their mounting screw from the backing plate and lift them off as a pair (**Figure 16**).
5. Install the components in the reverse order of their removal.



VOLTAGE REGULATOR

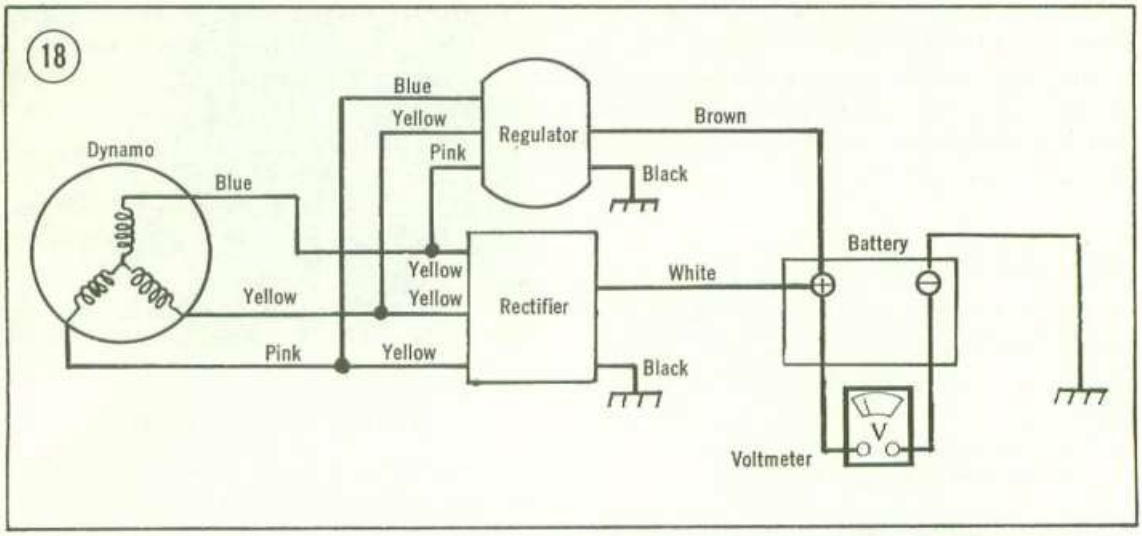
The voltage regulator limits the amount of charging current that can flow from the rectifier to the battery, so as to avoid overcharging the battery. The regulator is a sealed solid-state unit. See the voltage regulator wiring schematic at the end of this chapter and **Figure 17**.



If the battery is continually discharging or overcharging, the voltage regulator may have gone bad. If the battery is being overcharged, the electrolyte level will drop necessitating frequent addition of water to the cells. Also, the lights will burn out frequently when the engine is running at high rpm.

Check the voltage regulator as follows.

1. Check that the battery is fully charged and in good condition (12-15.5 volts).
2. Connect a voltmeter across the battery with the (+) lead on the (+) terminal and the (—) lead on the (—) terminal (**Figure 18**).
3. Start the engine and turn off all the lights. Run the engine at 4,000 rpm.



4. Voltmeter should read 14.5-15.5 volts.

5. If the meter reads more than 15.5 volts, either the voltage regulator is bad, or it is hooked up with a loose connection or to a bad wire. Check those possibilities before replacing the regulator with a new one.

6. If the meter reads less than 14.5 volts, either the regulator or the rectifier or the alternator is bad. Shut off the engine and unplug the green voltage regulator plug from its socket behind the right side cover.

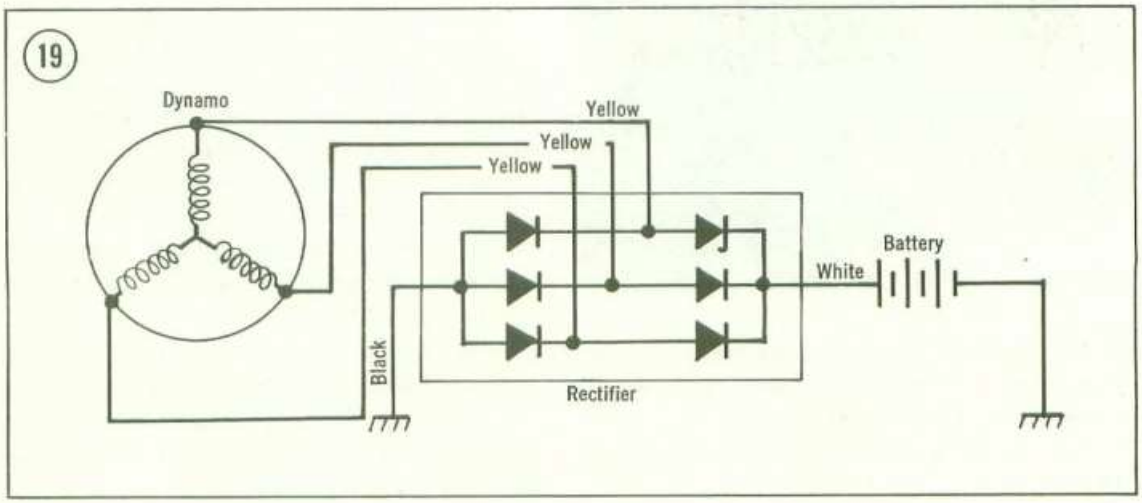
7. Restart the engine and run it at 4,000 rpm.

8. Check voltmeter. If the meter reads 14.5-20 volts, the alternator and the rectifier are good, and the voltage regulator is defective. If the meter reads less than 14.5 volts, the voltage regulator is probably good, and either the rectifier or the alternator is defective.

RECTIFIER

The motorcyce is equipped with an alternator that generates alternating current. But the battery and the ignition components cannot use alternating current, so the rectifier converts it into direct current (**Figure 19**).

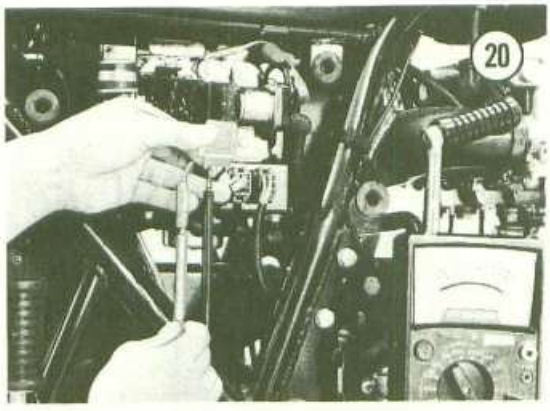
The full-wave rectifier uses all of the alternating current instead of wasting half. This rectifier consists of 6 diodes, one-way valves that allow current to flow in one direction through a circuit, but not in opposite direction.



If a diode goes bad, it may allow current to flow through it in both directions, or not at all. Either case results in a smaller flow of current to the voltage regulator, and the battery discharges.

Check the rectifier as follows.

1. With the engine turned off, unplug the white rectifier plug from its socket behind the right side cover, and unplug the white wire going to the battery.
2. Set up ohmmeter to read R X 1 or R X 10.
3. Make a series of resistance measurements between the rectifier wires, as described below. Take a measurment across 2 wires, and then take the same measurement with the ohmmeter test leads reversed. In one of the 2 readings, the resistance should be very low. In the other reading, the resistance should be at least 10 times greater.
4. Check the resistance between the white wire and each of the 2 yellow wires, and the black wire and each of the 2 yellow wires. This gives 6 combinations of wires to measure, and a total of 12 measurements (**Figure 20**).



5. In taking the 2 readings across a pair of wires, if you find that the resistance is either low or high in both directions, replace the rectifier with a new one.

ALTERNATOR

The alternator consists of a rotor containing permanent magnets, and a stator containing 3 sets of coils. The rotor is mounted on the left end of the crankshaft, and the stator—shaped like a cup—is mounted in the left engine cover.

The stator coils are connected in a wye configuration, so as to generate 3-phase alternating current with 120 degrees of phase separation. Although this requires a rectifier, the alternator uses relatively little space, is reliable, and normally requires no maintenance.

The alternator can fail in 3 ways. The coil wiring can develop an open circuit (broken wire), or it can develop a short-circuit; which will result in decreased power output, or no power output. The rotor magnets can lose some of their magnetism (from being hit or dropped, or from old age), resulting in reduced output.

Removal/Installation

See Chapter Six.

Testing Rotor Condition

If no charging current is going to the battery, check the alternator coils as follows.

1. Behind the right side cover, unplug the blue plug from its socket.
2. Set up the ohmmeter to read R X 1.
3. Read the resistance between each 2 of the 3 alternator wires going into the plug—between the blue wire and the pink wire; between the blue wire and the yellow wire; and between the pink wire and the yellow wire.
4. In each measurement, the meter should read 0.45-0.60 ohms. If it reads less, the coils are short-circuited and the stator must be replaced. If the resistance is higher, the coils have an open circuit and the stator must be replaced.
5. Set up the ohmmeter for its highest resistance readings.
6. Ground one of the meter leads to the engine case. With the other lead, take resistance readings across each of the 3 alternator wires you just finished checking.
7. In each case, the meter should read infinity. If there is any other reading, the stator is short-circuited and must be replaced.

Testing Stator Condition

If the battery is receiving an insufficient amount of charging current, check the alternator as follows.

1. Check the rectifier to verify that it is working properly.

2. Check the battery to verify that it is in good condition; if necessary, charge it to 12 volts.

3. Take off the right side cover and remove the green regulator plug from its socket.

4. Set up the voltmeter to read 30 VDC.

5. Start the engine, turn off the lights, and run the engine at 4,000 rpm.

6. Connect the voltmeter across the battery with the (+) lead to the (+) terminal and the (—) lead to the (—) terminal.

7. Read the meter. If the voltage is less than 15, the alternator is defective.

8. To determine whether the stator or the rotor is at fault, make the ohmmeter measurements listed above. If the voltage is down, but the resistance readings are within tolerance, the problem is probably weakened magnets in the rotor.

STARTER MOTOR

Operation

The starter motor is a 12-volt DC motor geared to the left side of the crankshaft through idler gears behind the alternator rotor. The starter motor is connected mechanically to the crankshaft, and can rotate it, when the engine is not running. The starter clutch (between the rotor and the idler gear) uncouples the idler gear from the crankshaft when the engine is running.

The starter motor is turned on by the starter relay, which is energized by the starter button on the handlebar. The reason for the relay is that the starter motor draws a lot of current, which requires a big switch and heavy cables that will not fit well on the handlebar. See the starter motor wiring schematic at end of this chapter.

The motor consists of field coils on 4 cores, and an armature. The armature windings, which receive their current through carbon brushes riding on the commutator, are wired in series with the field coils. Thus, a short-circuit or an open circuit in the field coils or the armature windings, or a brush that doesn't make contact, will prevent any current from flowing through the circuit.

Removal/Installation

See Chapter Six.

Carbon Brushes

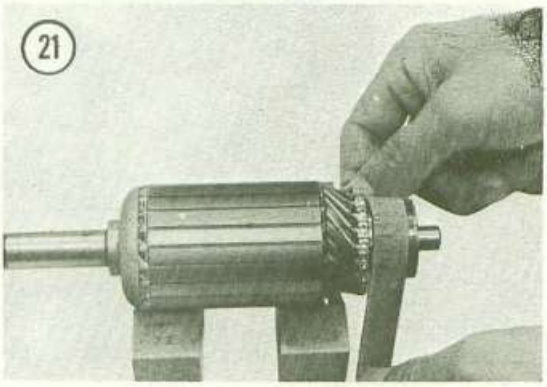
If a brush is worn, or its spring is weak, it will make poor contact with the commutator. Check each brush as follows.

1. Measure the length of the brush. A new brush is ½ in. long. If the brush is shorter than ¼ in., replace it with a new one.

2. Measure the brush spring tension with a spring scale. Acceptable tension is 20-24 ounces. If the spring has less tension, replace it with a new one.

Commutator

A scored, dirty, or worn commutator will make poor contact with the brushes, and it will wear them out quickly. Clean, smooth, and shape the commutator segments with fine sandpaper (**Figure 21**). Clean any dust out of the grooves between the segments. If the segments are badly worn, replace motor with a new one.



Armature Coil

All of the commutator segments should make electrical contact with one another. If they do not, there is an open circuit in the coil. To check this, do the following procedure.

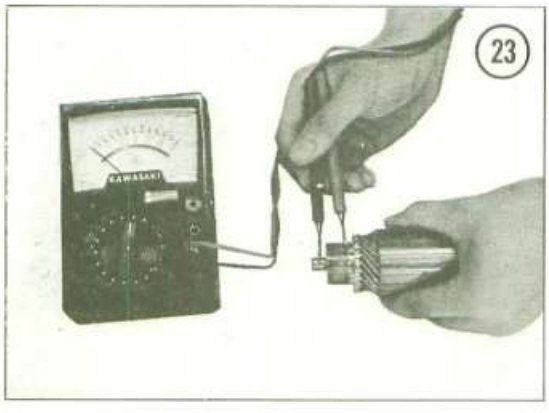
1. Set up the ohmmeter to read R X 1.

2. Read the resistance across each 2 commutator segments (**Figure 22**). Each reading should show a low resistance. If any reading shows a high resistance or infinity, replace the motor with a new one.



Also check for a short-circuit, as follows.

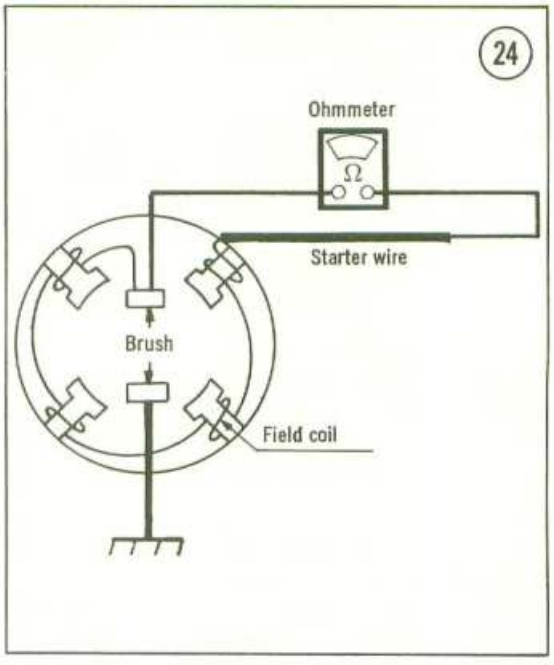
1. Set up the ohmmeter for its highest resistance reading.
2. Check the resistance between any one of the commutator segments and the armature shaft.
3. The meter should read infinity. If it shows any other reading, replace the starter motor with a new one (**Figure 23**).



Field Coils

Check the field coils for an open circuit or a short-circuit as follows.

1. Set up the ohmmeter to read R X 1.
2. Measure the resistance between the (+) carbon brush (the one not grounded) and the starter wire (**Figure 24**).
3. You should read a low resistance. If you read a high resistance or infinity, the field coils have an open circuit and must be replaced.
4. Set up the ohmmeter for its highest resistance reading.



5. Measure the resistance between the (+) carbon brush and the field coil housing. If you read anything but infinity, the field coils are short-circuited, and the motor must be replaced.

STARTER RELAY

Check the functioning of the electromagnetic coil and the contacts inside the starter relay as follows.

1. Take off the right side cover. Turn on the ignition. Push the starter button and listen for the starter relay click, indicating that the relay coil has been energized and has attracted the armature, to close the starter motor circuit.
2. If the relay does not click, set up the voltmeter to read 30 VDC.
3. Remove the starter button yellow/black and black wires from the relay. Connect the (+) lead from the meter to the black wire, and connect the (—) lead to the yellow/black wire.
4. With the ignition turned on, read the meter. It should read whatever the battery voltage is. If it does, the relay is no good. If it does not, there is an open somewhere in the circuit.
5. Push the starter button. If the relay clicks, remove the starter motor wires from the relay.
6. Set up the ohmmeter to read R X 1.

7. Connect the ohmmeter leads to the terminals from which the starter motor wires were removed.

8. Push the starter button and check the meter. It should read zero ohms. If it does not, the relay is bad.

HEADLIGHT ADJUSTMENT

Proper headlight adjustment is essential to safe night riding. If the lights are set too low, the road will not be visible. If set too high, they will blind oncoming vehicles. Adjustment is simple; proceed as follows.

1. Place the machine approximately 16 feet from a white or light colored wall. Refer to **Figure 25**. Make sure the bike and wall are on level, parallel ground and that the machine is pointing directly ahead. Make all measurements with one rider sitting on the bike and both wheels on the ground.

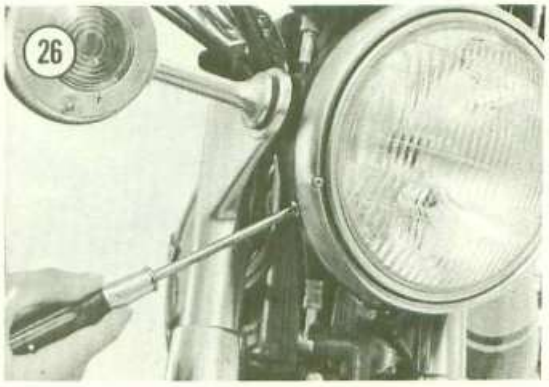
2. Draw a cross on the wall equal in height to the center of the headlight.

3. Put on the high beam. The cross should be centered in the concentrated beam of light. If necessary, adjust the headlight both vertically and horizontally.

Adjust the beam vertically as follows.

1. Remove the 2 screws located to the rear of the rim in the headlight shell (**Figure 26**).

2. Take the headlight unit out of the shell.



3. Loosen the 2 turn signal stalk mounting nuts inside the shell.

4. Loosen the headlight positioning bolt at the bottom of the shell.

5. Fit the headlight unit to the shell, and hold it there. Turn on the headlight, and tilt the shell up or down until the beam is aimed correctly.

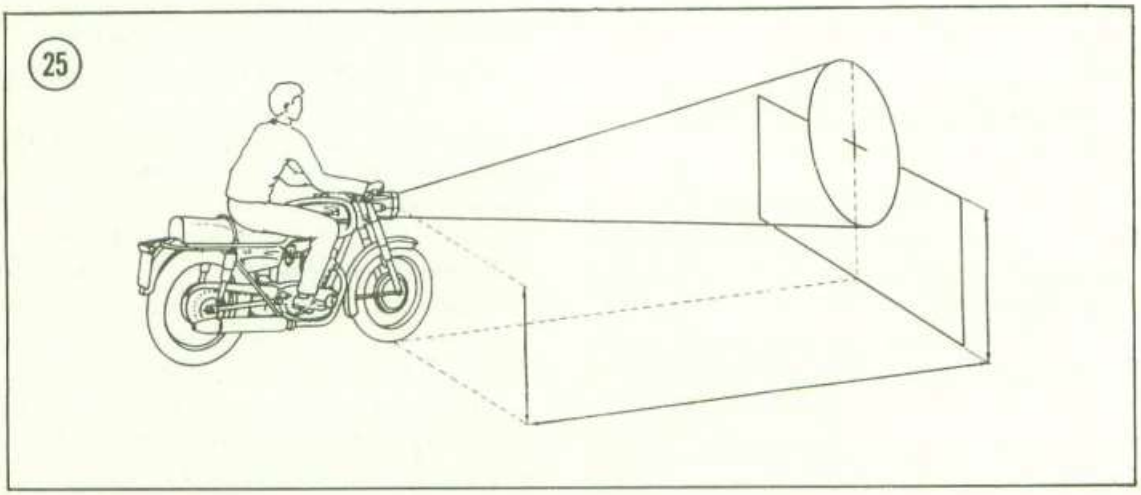
6. Take the headlight unit out of the shell.

7. Without disturbing the positioning of the shell, tighten the turn signal stalk mounting nuts and the headlight positioning bolt.

8. Install the headlight in the shell. Check the aim of the headlight beam, at both positions of the dimmer switch.

Adjust the beam horizontally as follows.

1. The horizontal beam adjustment screw is located in the front of the rim on the right side of the headlight. Screw it in to shift the beam to the right; back it off to move the beam to the left.

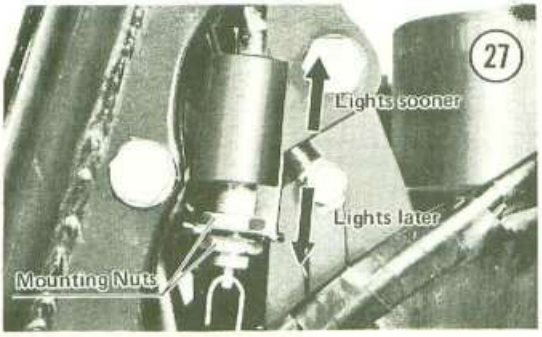


2. Check the aim of the headlight beam, at both positions of the dimmer switch.

REAR BRAKE LIGHT SWITCH

The front brake light switch is hydraulically operated, and non-adjustable. The rear brake light switch is operated by the travel of the rear brake pedal, and it needs to be repositioned periodically. Adjust it as follows.

1. Loosen the 2 mounting nuts near the bottom of the brake light switch (**Figure 27**).



2. Turn the mounting nuts to move the switch up or down so that the brake light will come on after ¼-⅜ in. downward travel of the brake pedal (measured at the pedal). While doing this, do not rotate the switch body.
3. Tighten the mounting nuts.

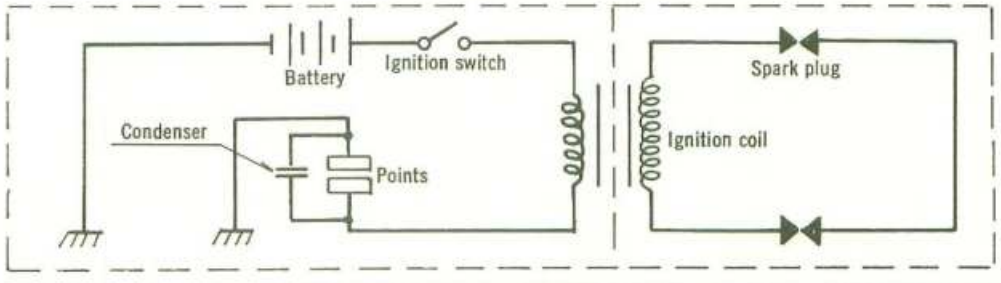
LIGHTING CIRCUITS

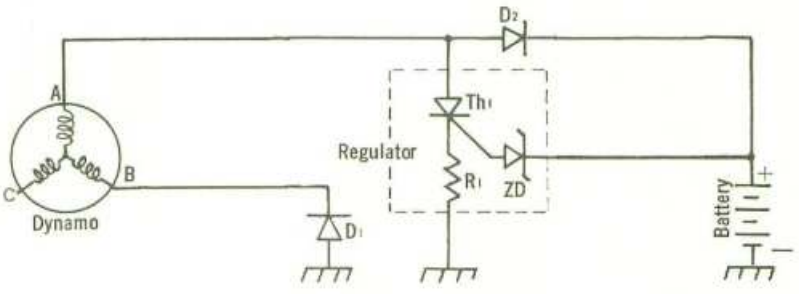
Wiring schematics for the lighting system, brake/taillight system, and turn signal system are given in **Figures 28 through 35**.

If a light stops burning, check first for a burned-out or broken bulb. If bulbs burn out frequently, check for a low level of electrolyte in the battery, or for a defective voltage regulator overcharging the battery.

If the problem is not in the bulb, check the wiring from the socket back to the battery. Measure voltages with the ignition turned on, or resistances with the ignition switch turned on and the fuse removed from its holder.

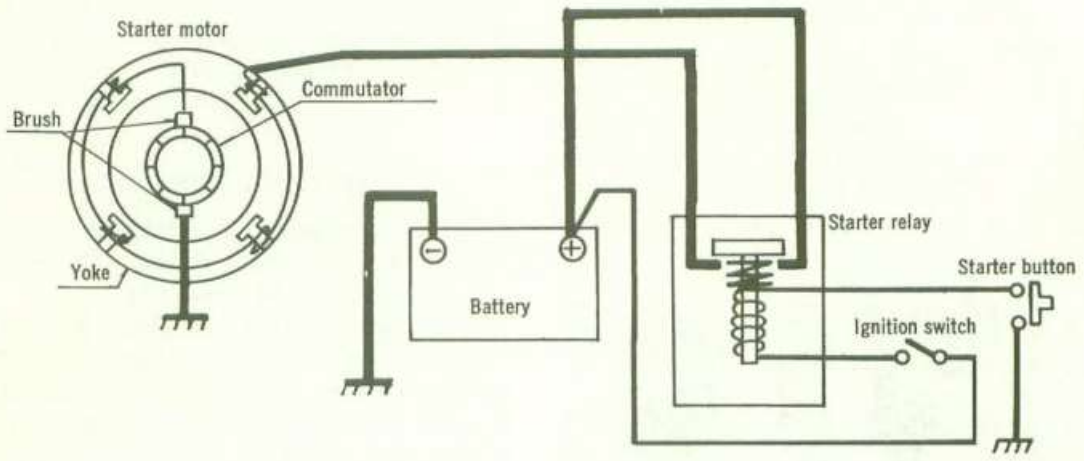
IGNITION SYSTEM WIRING SCHEMATIC — 1973-1976





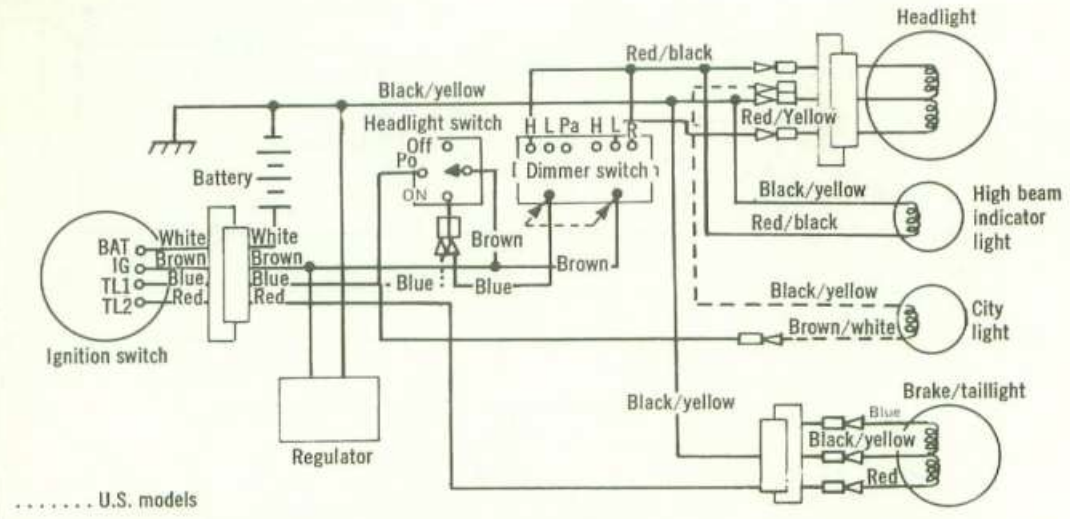
VOLTAGE REGULATOR WIRING SCHEMATIC — 1973-1976

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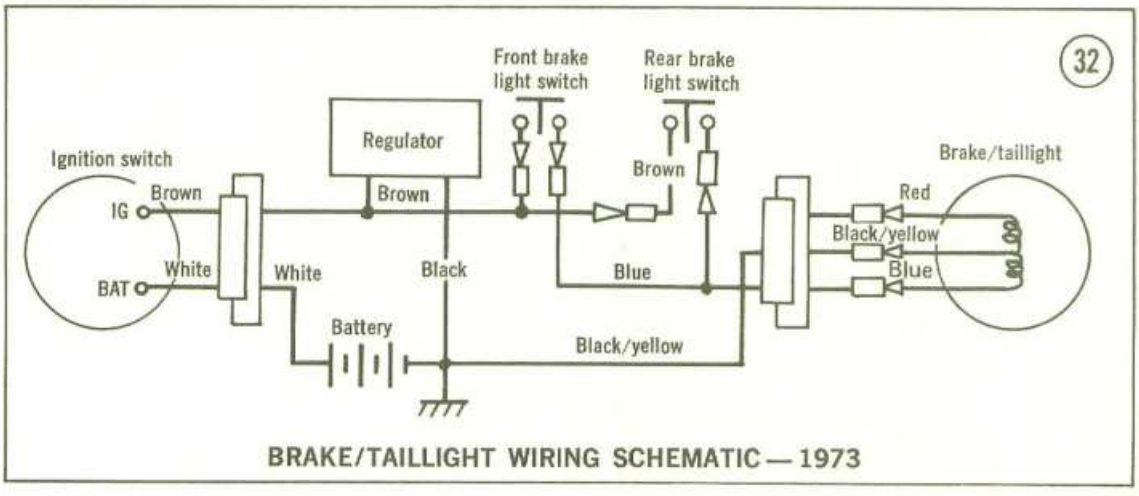


STARTER MOTOR WIRING SCHEMATIC — 1973-1976

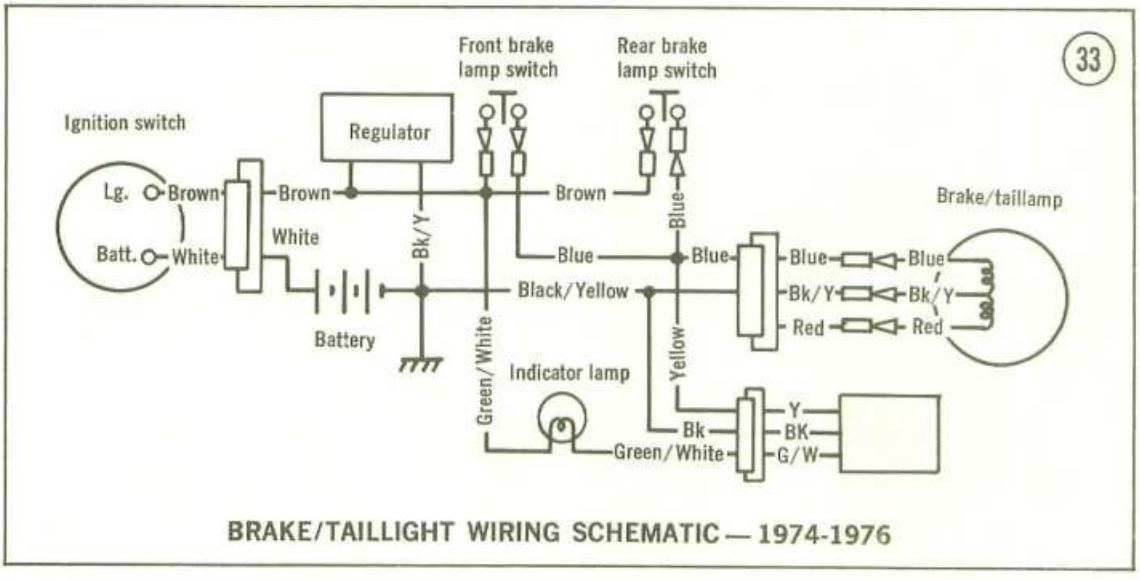
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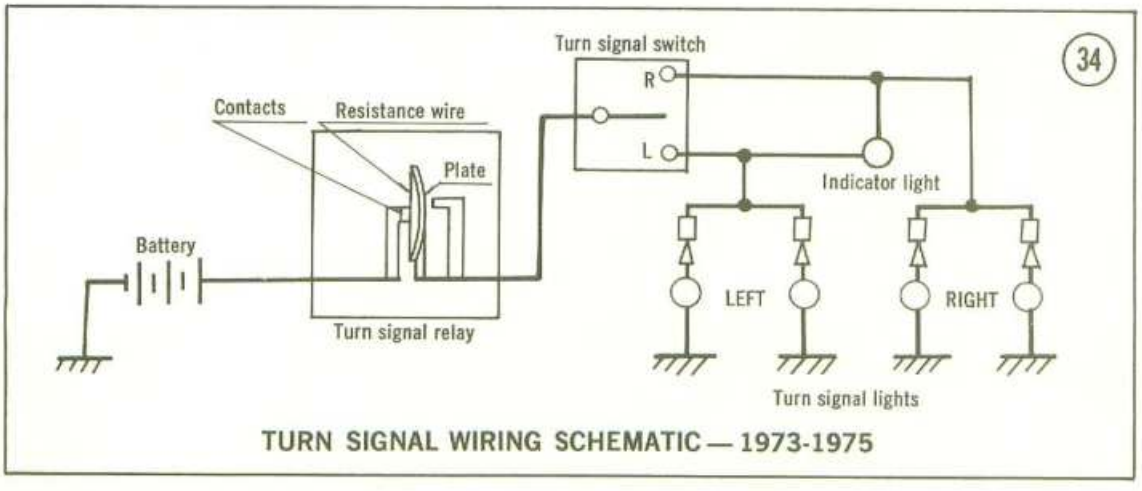
LIGHTING CIRCUIT WIRING SCHEMATIC — 1973-1976



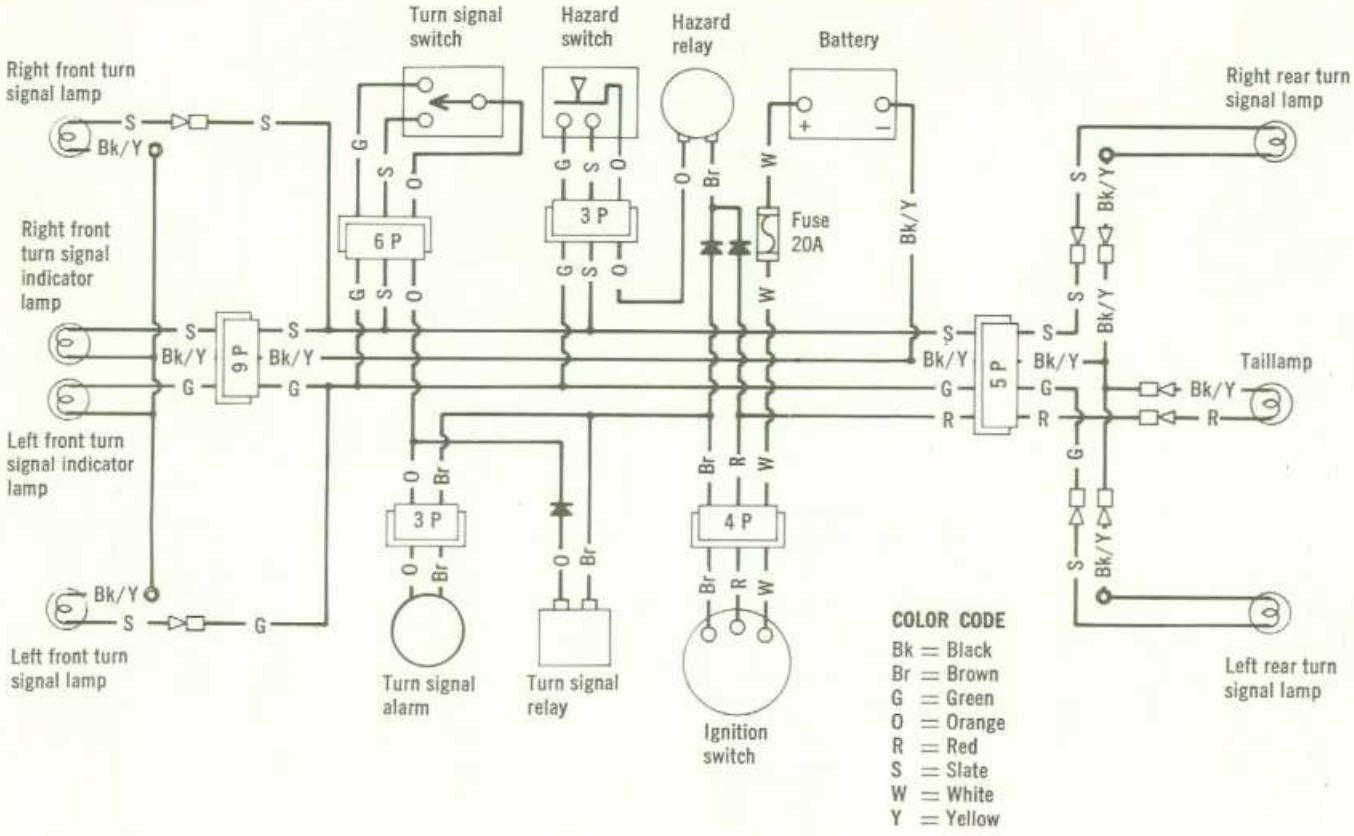
BRAKE/TAILLIGHT WIRING SCHEMATIC — 1973



BRAKE/TAILLIGHT WIRING SCHEMATIC — 1974-1976



TURN SIGNAL WIRING SCHEMATIC — 1973-1975



TURN SIGNAL WIRING SCHEMATIC — 1976

CHAPTER SIX

ENGINE

This chapter gives procedures on how to disassemble, inspect, repair, and reassemble the engine. Refer to Supplement, Chapter Six, in the back of this manual for additional information on the KZ1000 engine.

ENGINE LAYOUT

Figure 1 shows the general layout of the unit-construction engine which combines the power plant, clutch, and transmission into one set of engine cases.

The crankcase is located in the front portion of the aluminum alloy engine cases, which are split horizontally. The built up (pressed together) crankshaft is mounted in 6 caged-roller main bearings.

The 4 pistons operate inside an alloy cylinder block with pressed in cylinder sleeves. The alloy cylinder head houses the 2 overhead camshafts. Both camshafts are driven by a single chain from a sprocket on the crankshaft (between cylinders 2 and 3). The cam lobes depress lifter cups fitted to the tops of the valve stems, opening the valves.

The alternator and the starter motor clutch are mounted on the left end of the crankshaft.

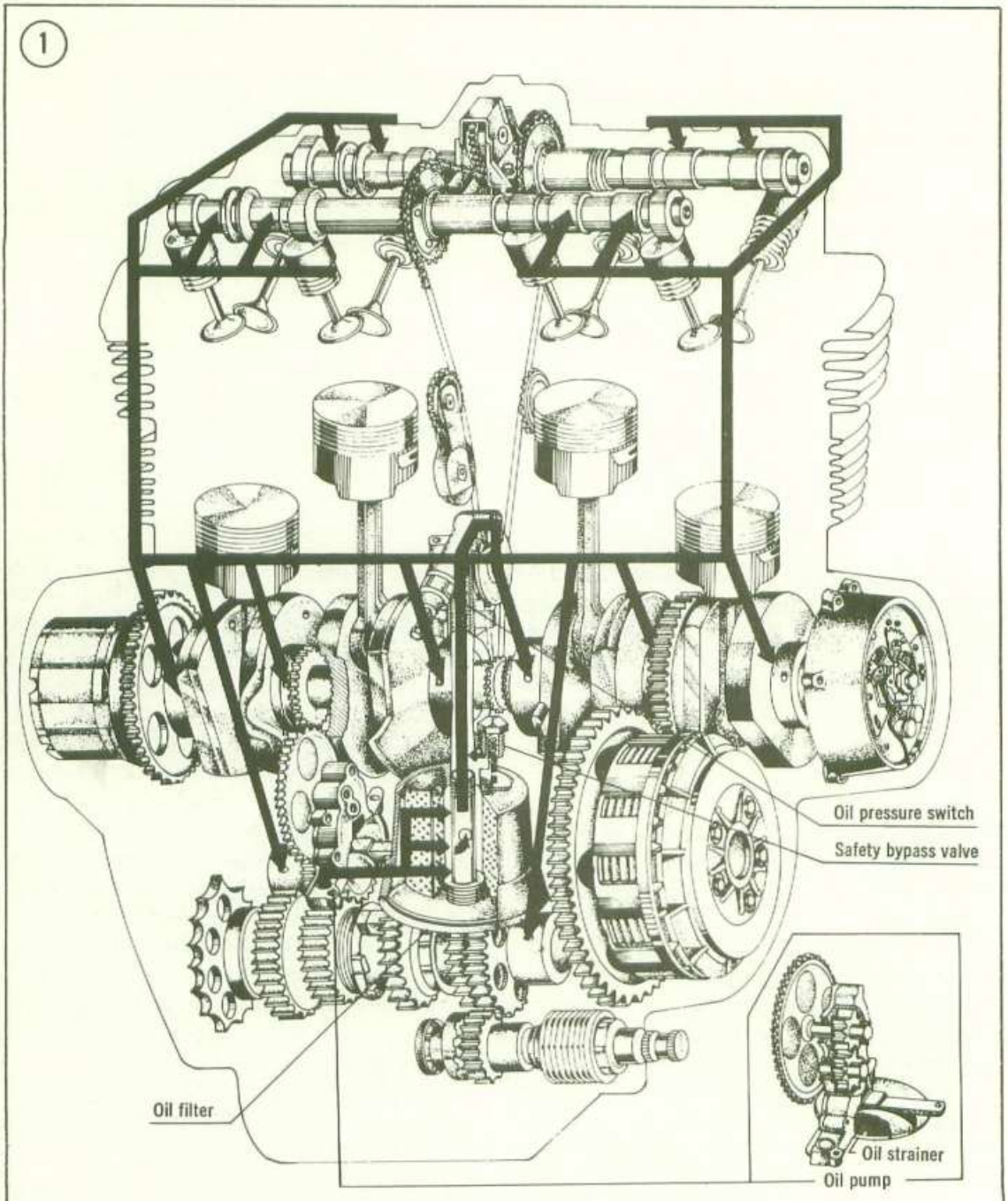
The breaker points camshaft, the ignition advance mechanism, and the 2 sets of contact breaker points are on the right end of the crankshaft.

The 2 parallel transmission shafts, the drive shaft, and the output shaft are to the rear of the crankshaft. The multiplate clutch is mounted to the right end of the drive shaft; the outer clutch hub spins freely on the drive shaft, and the inner hub is locked to the drive shaft. A gear on the crankshaft (between cylinders 3 and 4) is meshed with a gear locked to the back of the outer clutch hub. The power is transferred from the crankshaft to the outer clutch hub, through the clutch plates to the inner hub, which is locked to the transmission drive shaft.

Power is transferred from the drive shaft to the output shaft through any of 5 sets of reduction gears. The output sprocket on the left end of the output shaft drives the rear chain.

The kickstarter is located to the rear of the output shaft. The kickstarter shaft extends through the right side of the engine cases.

The gears on the transmission shafts are selected by 3 shifter forks. One of the forks is sleeved to the cylindrical shifter drum, which is located beneath the drive shaft. The 2 remaining shifter forks are mounted on a shaft beneath the output shaft. The selector mechanism, through which the gearshift lever rotates the shifter drum, is located on the left side of the engine to the left of the shifter drum.



ENGINE LAYOUT

(Heavy lines indicate oil flow)

The starter motor is mounted high in the left side of the engine to the rear of the cylinder block. Also on the left side are the clutch linkage and the chain oil pump, both mounted on the chain cover.

Engine lubrication is by wet sump, with the oil supply housed in the bottom of the crankcase. An oil pump, accessible from the bottom of the engine, feeds the main and big-end bearings, camshafts and valves, and some of the bearings on the transmission shafts.

The engine has been laid out so that most of the repairs can be done with the engine still in the frame. However, for repairs to the crankshaft, cam chain, transmission, or kickstarter assembly, the engine must be removed from the frame.

HOW TO USE THIS CHAPTER

To troubleshoot the problem and determine which engine assembly is malfunctioning, refer to Chapter Three. Then find the instructions for repairing that assembly. The assemblies are grouped by location in the engine. The rough sequence for a complete tear down is as follows:

a. Top end
b. Left side
c. Right side
d. Inside the cases

The repair procedures for each assembly tell how to disassemble, inspect, and reassemble it. The disassembly instructions may list other assemblies that must first be removed from the engine. For details, refer to the disassembly instructions for those assemblies. Follow the same procedure, in reverse, for reassembly.

TOP END ASSEMBLIES

a. Gas tank (see Chapter Four)
b. Exhaust system (see Chapter Eight)
c. Carburetor block assembly (see Chapter Four)
d. Camshafts (see Chapter Seven)
e. Cylinder head and valves
f. Cylinder block and pistons

NOTE: *The gas tank and carburetor block (one or both) must be removed before performing some of the top end assembly repairs.*

CAMSHAFTS

Operation

The 2 overhead camshafts are mounted atop the cylinder head (**Figure 2**). The exhaust camshaft is located near the front of the head, and the intake camshaft is at the rear. Each camshaft runs on 4 sets of split bushings, located beneath 2 bushing caps doweled to cylinder head.

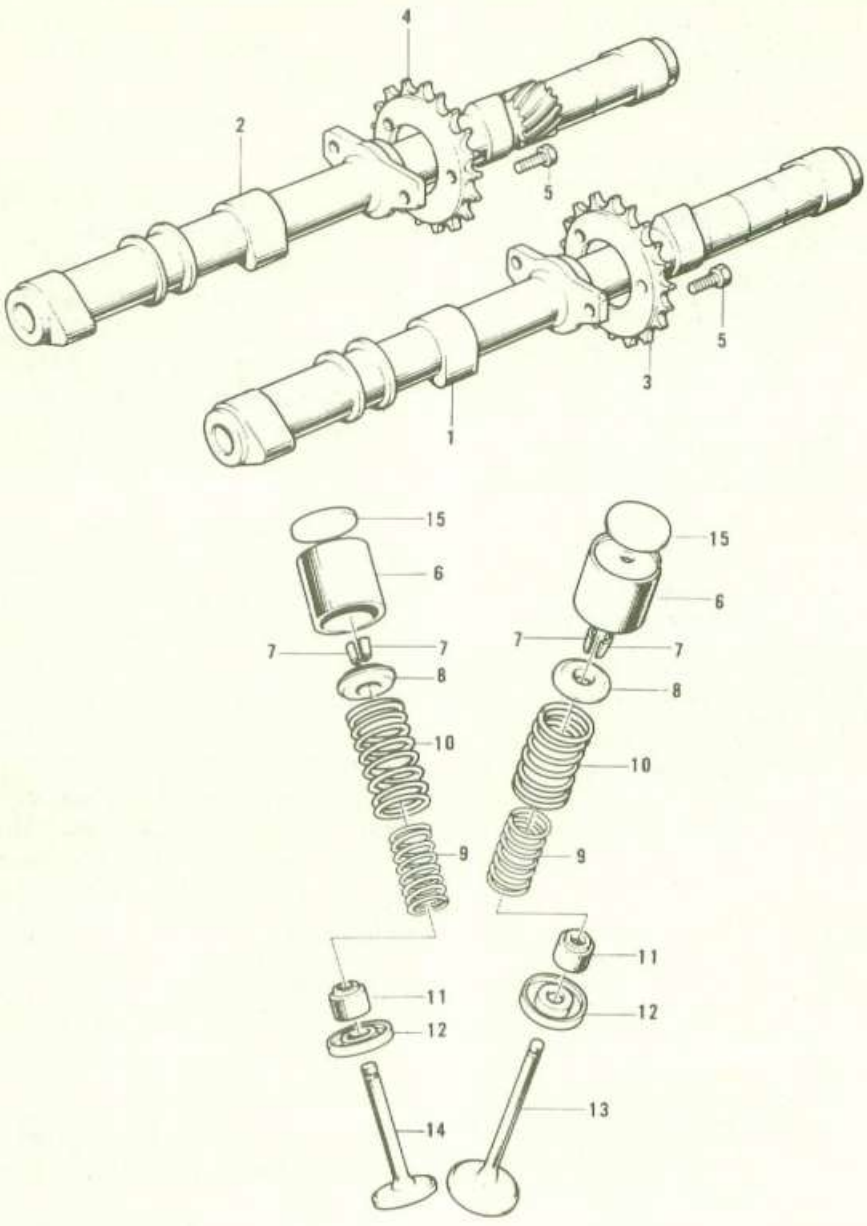
Each camshaft has 4 lobes and a drive sprocket in the center. Both camshafts are driven by an endless single row chain from the crankshaft.

In operation, the cam lobe strikes the top of the valve lifter cup fitted over the top of the valve stem. This lifts (pushes down) the valve off its seat in the top of the combustion chamber.

The top of the valve lifter cup is removable; it functions as a shim to regulate the valve stem to cam lobe clearance. The shims are available from Kawasaki in a wide range of thicknesses. As the valve and valve seat wear, the cam/valve clearance decreases; but the proper clearance can be restored by replacing the shim with a thinner one. See Chapter Two for procedure.

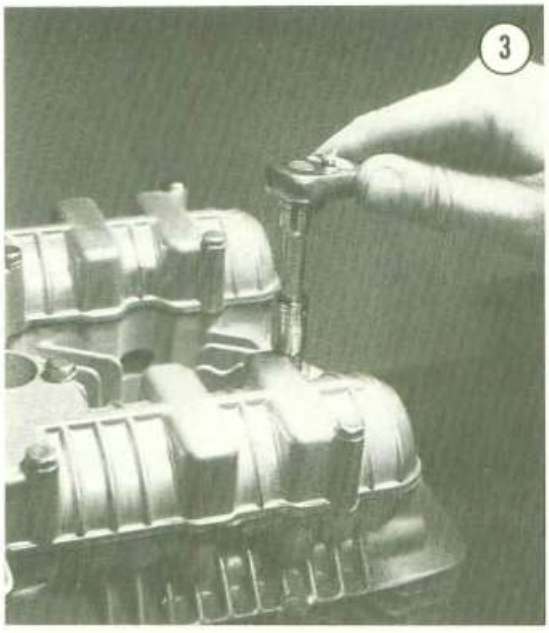
Disassembly

1. Remove gas tank.
2. Pull spark plug wires off spark plugs.
3. Remove 16 valve cover mounting bolts on top of engine (**Figure 3**).
4. Gently tap around the perimeter of the valve cover with a soft mallet (**Figure 4**) to break the cover loose.
5. Lift the cover off. If the gasket sticks, gently work it loose. See **Figure 5**.
6. Remove the 2 bolts holding the cam chain tensioner to the cylinder assembly. Remove the cam chain tensioner assembly.
7. Remove the 4 bolts holding the cam chain guide sprocket to the cylinder head (**Figure 6**). Lift off the guide sprocket and its rubber mounts (**Figure 7**).
8. Loosen bolts holding camshaft caps, uniformly (**Figure 8**).

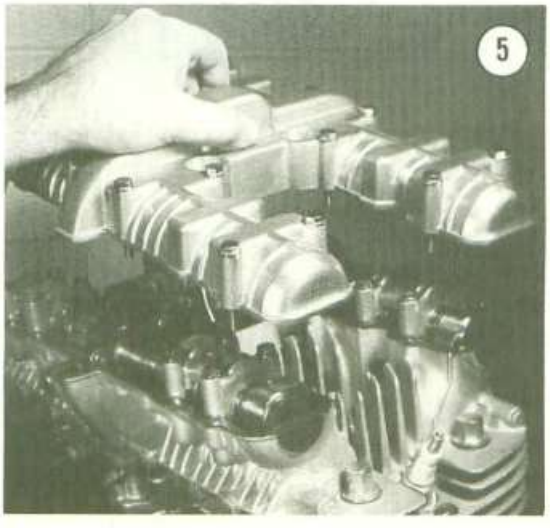


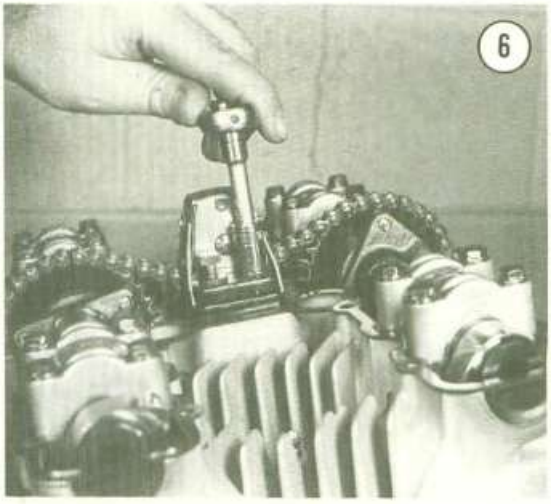
CAMSHAFTS AND VALVES

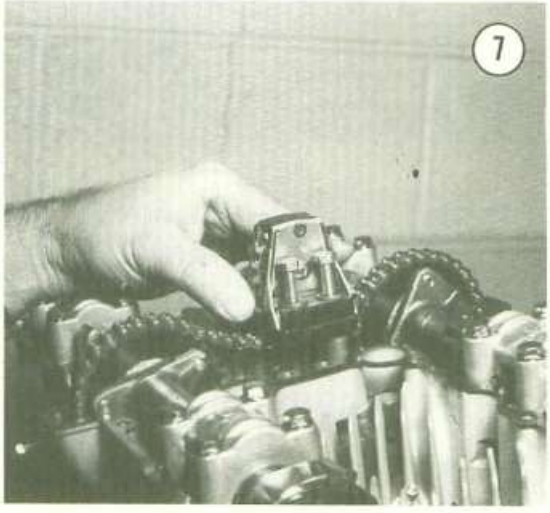
1. Intake camshaft
2. Exhaust camshaft
3. Intake camshaft sprocket
4. Exhaust camshaft sprocket
5. Hexagon head bolt
6. Tappet
7. Valve spring collar
8. Valve spring retainer
9. Inner valve spring
10. Outer valve spring
11. Oil seal
12. Valve spring seat
13. Intake valve
14. Exhaust valve
15. End cap

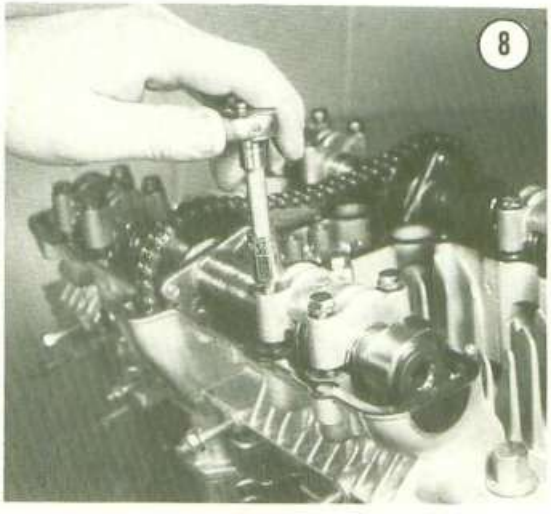

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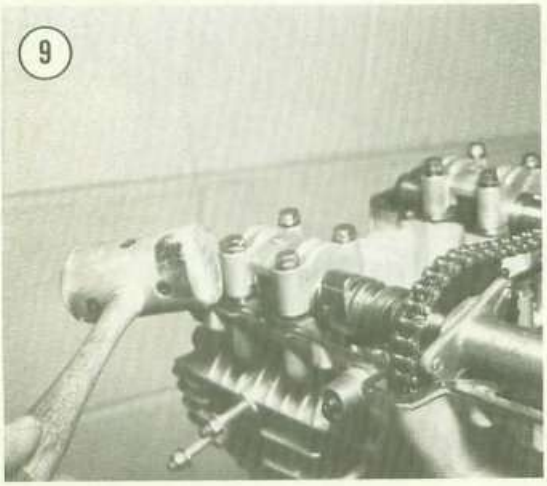

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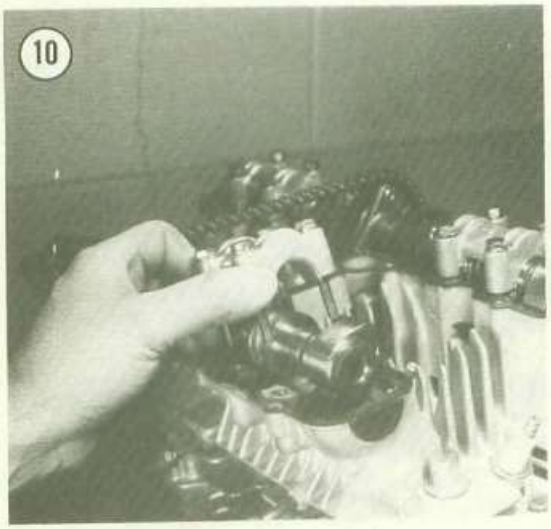

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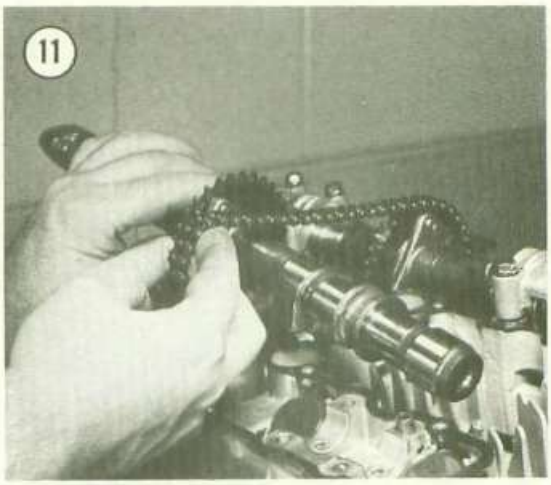
9. Gently tap camshaft caps with a soft mallet to loosen them (**Figure 9**). Lift them off (**Figure 10**). Mark the exposed bearing cap halves with a grease pencil so that you will be able to reassemble them in the same positions from which they were removed.

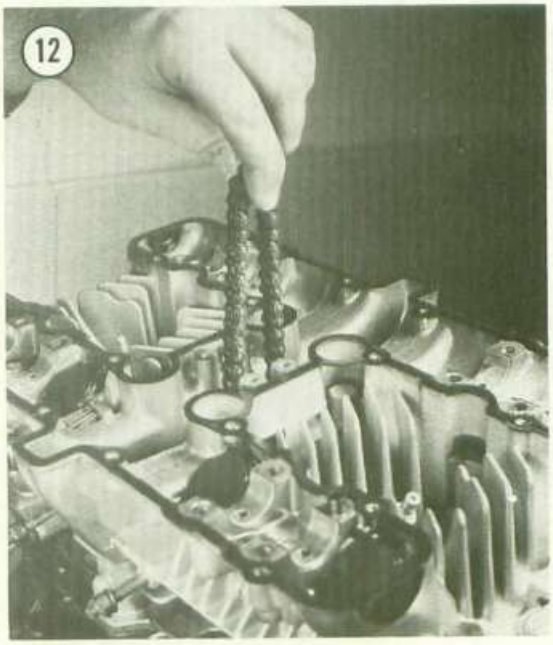




10. Lift the camshaft out and remove the chain from the camshaft sprocket (**Figure 11**).

NOTE: *If the engine is being worked on while it is still in the frame, tie the cam chain to the top of the frame with a piece of wire. If the engine is on the bench, merely let it drop into the bottom of the engine* (**Figure 12**). *Do not attempt to turn engine over if you drop chain down into bottom end.*





11. On removal of the exhaust camshaft (only), unscrew the tachometer drive cable from its guide on the cylinder head.

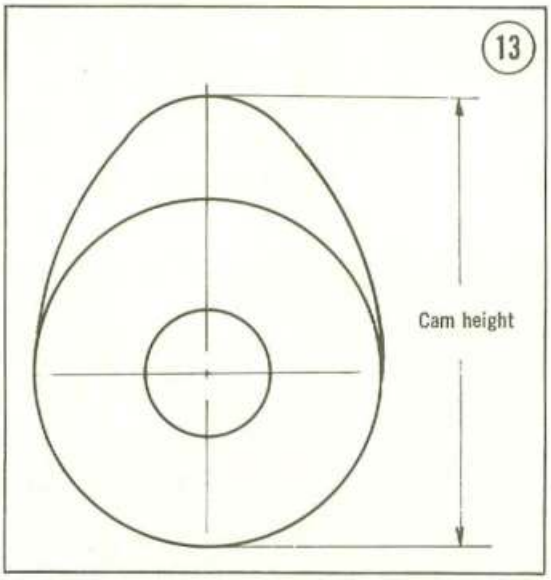
12. Remove the mounting screw from the tachometer cable guide. Pull the guide and its O-ring out of the cylinder head. Pull out the tachometer drive gear.

Inspection

Camshaft should be inspected for lobe wear, for excess clearance with the split bushings, and for runout.

To check for lobe wear:

1. Use a micrometer to measure the sectional height of the lobe, from the bottom of the shaft to the top of the lobe (camshaft diameter plus lobe height), as shown in **Figure 13**.



2. New intake camshafts have a lobe height of 1.4276-1.4307 in. (36.26-36.34mm). If any lobe on the intake camshaft has worn to a height less than 1.4236 in. (35.66mm), replace that camshaft with a new one.

3. New exhaust camshafts have a lobe height of 1.4079-1.4110 in. (35.76-35.84mm). If any lobe on the exhaust camshaft measures less than 1.4039 in. (35.66mm), replace the camshaft with a new one.

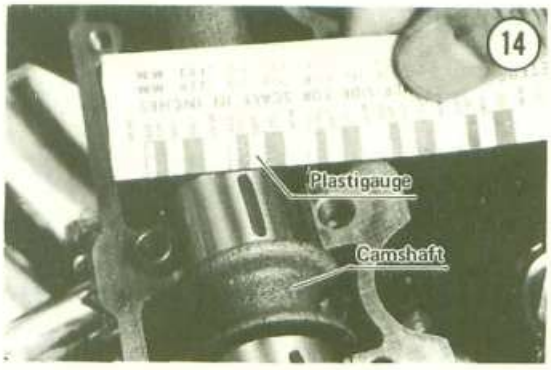
To check for bushing and camshaft wear:

The easiest method is to measure the shaft/bushing clearance with Plastigage (**Figure 14**), as follows.

1. Cut 4 strips of Plastigage in length to match the width of the bushings.

2. Fit the 4 bottom bushing halves into the cylinder head bosses from which they were removed. Lay a strip of Plastigage in the center of each bushing, parallel to the run of the camshaft.

3. Fit the drive chain to the camshaft, and position the camshaft on the bushings.

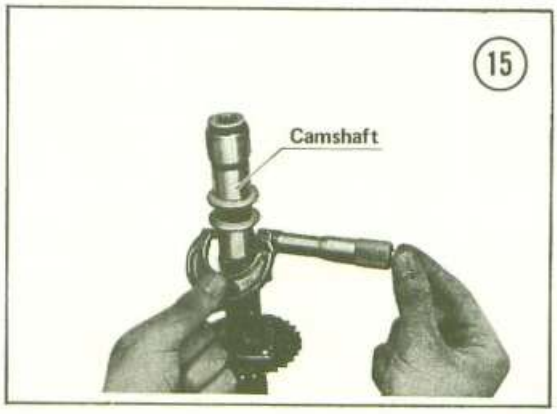


4. Place the upper bushing halves and the bushing caps on the camshaft, in the same locations from which they were removed. Install the 8 bushing cap bolts; torque them as described in the reassembly procedure.

5. Remove the camshaft. Using the special scale sold with the Plastigage, measure the width of each strip and compute the clearances between the bearing surfaces of the camshaft and the bushings.

6. When the camshaft and bushings are new, they have a clearance of 0.0008-0.0025 in. (0.020-0.064mm). If any bushing has a clearance greater than 0.0063 in. (0.16mm), replace all 4 sets of split bushings for that camshaft with new ones.

7. If it was necessary to replace the bushings, measure the outside diameters of the bearing surfaces on the camshaft for wear, using a micrometer (**Figure 15**).



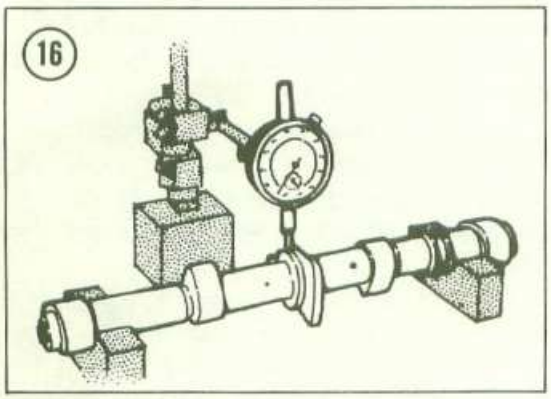
8. A new camshaft has a diameter of 0.9633-0.9638 in. (24.467-24.480mm) at each bearing surface. If any bearing surface has a diameter

less than 0.9614 in. (24.42mm), replace the camshaft with a new one.

To check the camshaft for trueness:

1. Unscrew the 3 bolts that mount the drive sprocket to the camshaft. Remove the sprocket from the camshaft.

2. Lay the camshaft in V-blocks, with the outer bearing surfaces of the camshaft resting in the blocks. Mount a dial gauge so that its probe bears against the circular sprocket mount base on the camshaft (**Figure 16**), with the probe depressed about 0.010 in.



3. Rotate the camshaft slowly in the V-blocks, and write down the minimum and maximum dial readings.

4. A new camshaft has less than 0.0008 in. (0.02mm) of runout. If the camshaft has more than 0.004 in. (0.1mm) of runout, replace it with a new one.

5. After completing the readings, fit the drive sprocket to its mount on the camshaft. Apply Loctite to the 3 mounting bolts, and tighten them securely.

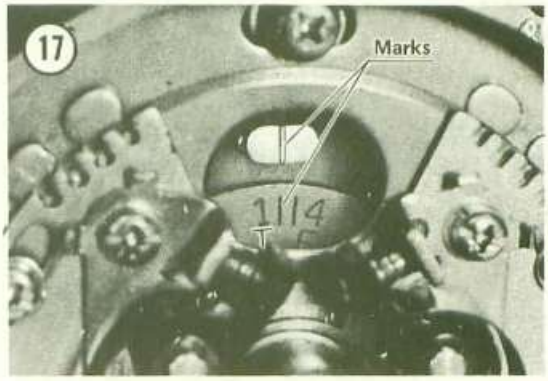
Reassembly

1. On the right side of the engine in line with the crankshaft, remove the 2 bolts from the breaker points cover. Remove the cover from the engine.

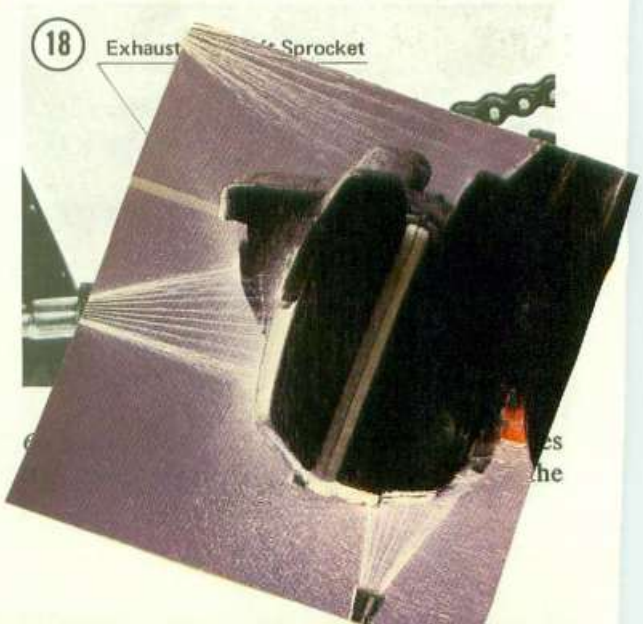
2. Fit the bottom bushing halves for each camshaft into the cylinder head bosses from which they were removed, making certain that each bushing half is returned to its old position.

3. Use your hand to hold the camshaft chain so that it is stretched tight and cannot jam when the crankshaft is rotated.

4. There is a cutout on the right side of the engine, between the contact breaker points, through which you can see the ignition timing marks stamped on the ignition advance unit. Use the kickstarter lever (or the large nut on the right end of the crankshaft) to rotate the crankshaft until the T mark for cylinders 1 and 4 lies beneath the pointer. The T mark is the left-hand vertical mark between the numerals "1" and "4" as shown in **Figure 17**.

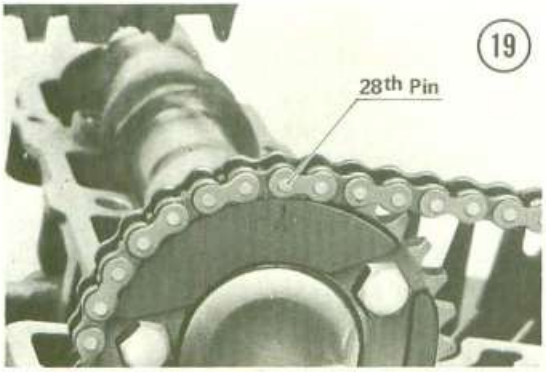


5. Take care not to move the camshaft chain so that it would rotate the crankshaft; fit the exhaust camshaft to the chain. Position the camshaft on its bushing halves such that the small timing mark on the edge of the drive sprocket lies parallel to and just above the top surface of the cylinder head boss (**Figure 18**).



exhaust camshaft sprocket. Beginning with the pin above that one, count off 28 pins along the chain in the direction of the intake camshaft, and mark the 28th pin.

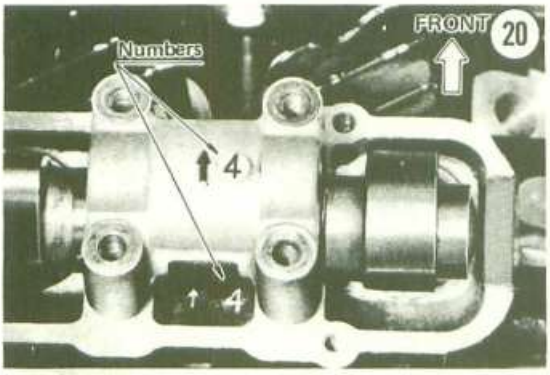
7. Taking care not to rotate the crankshaft, fit the intake camshaft to the chain and the mounts so that the 28th pin in the chain lies directly above the arrow and the number "28" stamped on the rubber surface of the drive sprocket (**Figure 19**).



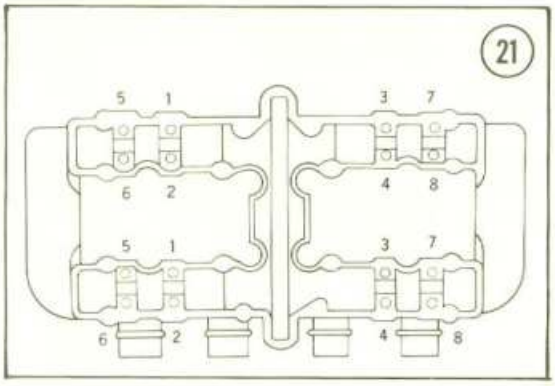
8. Place the top halves of the split bushings on the bearing surfaces of the camshafts, in the same positions from which they were removed.

9. Put the bushing caps on the camshafts.

NOTE: *Each of the 4 bushing caps is numbered to show its location on the cylinder head, and stamped with an arrow which should point toward the front of the engine* (**Figure 20**).



10. Install the 16 cap bolts in the 4 bushing caps. Tighten the bolts just enough to seat the camshafts. Then, following the sequence shown in **Figure 21**, torque each bolt to 13.5 ft.-lb.

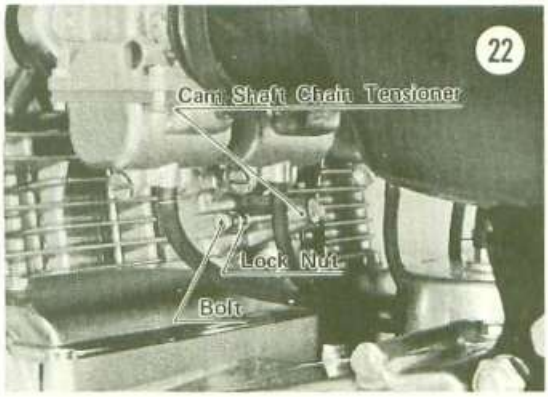


11. Position the chain guide sprocket (on its rubber feet) atop the camshaft chain on the cylinder head. Install the 4 mounting bolts.

12. Install the cam chain tensioner assembly on the cylinder and tighten the bolts (2) to 13-16 ft.-lb. torque.

13. Loosen the locknut and the bolt on the left side of the camshaft chain tensioner body, located on rear of cylinder block (**Figure 22**).

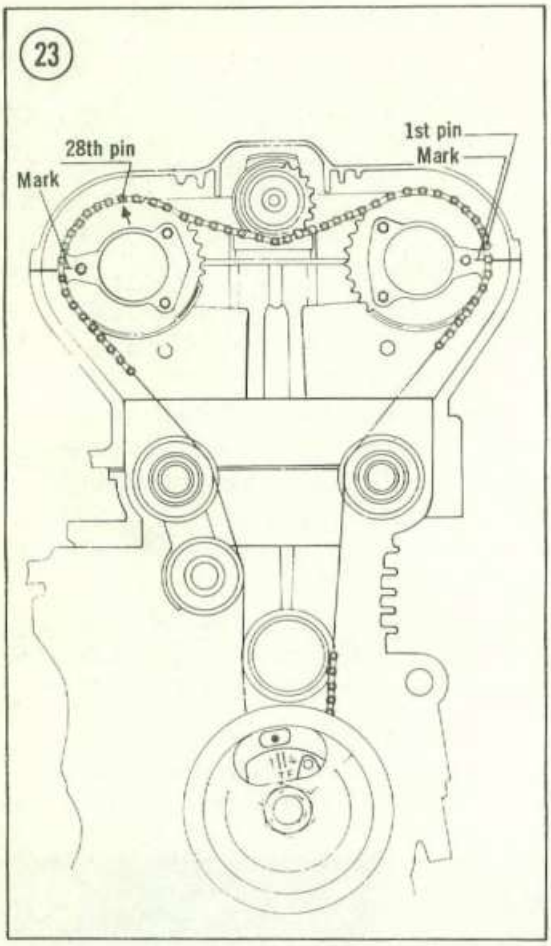
NOTE: *A spring inside the tensioner body will automatically take up the slack in the camshaft chain.*



14. Rotate the crankshaft until the 1 and 4 T mark again comes up beneath the ignition timing pointer. Check to see that the timing marks on the camshaft sprockets are again aligned as they were when you installed the camshafts (**Figure 23**). If so, the cam timing is correct.

15. Torque the camshaft chain tensioner bolt to 40 in.-lb. Tighten the locknut.

16. If you have replaced a camshaft or camshaft bushings with new ones, check the camshaft/



valve clearances, using the procedure described in Chapter Two.

17. If you removed and installed the exhaust camshaft, insert the tachometer drive gear (geared end first) into its housing in the front of the cylinder head, so that it engages with the gearing on the exhaust camshaft. Then insert the O-ring and the tachometer cable guide. Install the mounting screw. Attach the tachometer drive cable.

18. Oil all of the moving parts.

19. Coat with liquid sealer both sides of each of the 4 rubber plugs at the ends of the camshaft housing castings.

20. Place the valve cover gasket and the valve cover on the cylinder head. Install the 16 valve cover bolts, and the 4 spark plug cable clamps on the exhaust side. Torque each of the 16 bolts to 105 in.-lb.

21. Install spark plug wires on the spark plugs.

22. Fit the breaker points cover to the right side of engine, and install 2 mounting bolts.

23. Install the gas tank.

CYLINDER HEAD AND VALVES

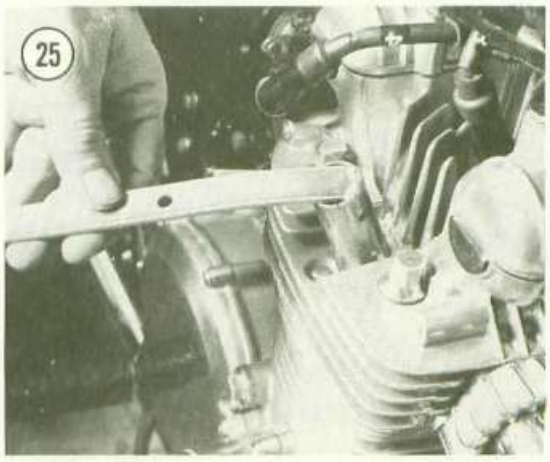
The alloy cylinder head has cast-in valve seats and pressed-in valve guides. Each valve operates against 2 coil springs, one inside the other. See **Figure 24**.

As the valves and valve seats wear, the valves move closer to the camshaft, decreasing the clearance. When the clearance can no longer be restored by fitting thinner lifter cup shims, the end of the valve stem can be ground down once.

Engines manufactured prior to 1973 are equipped with a single cylinder head gasket. The 1973 and later models are equipped with a 2-piece head gasket and an O-ring.

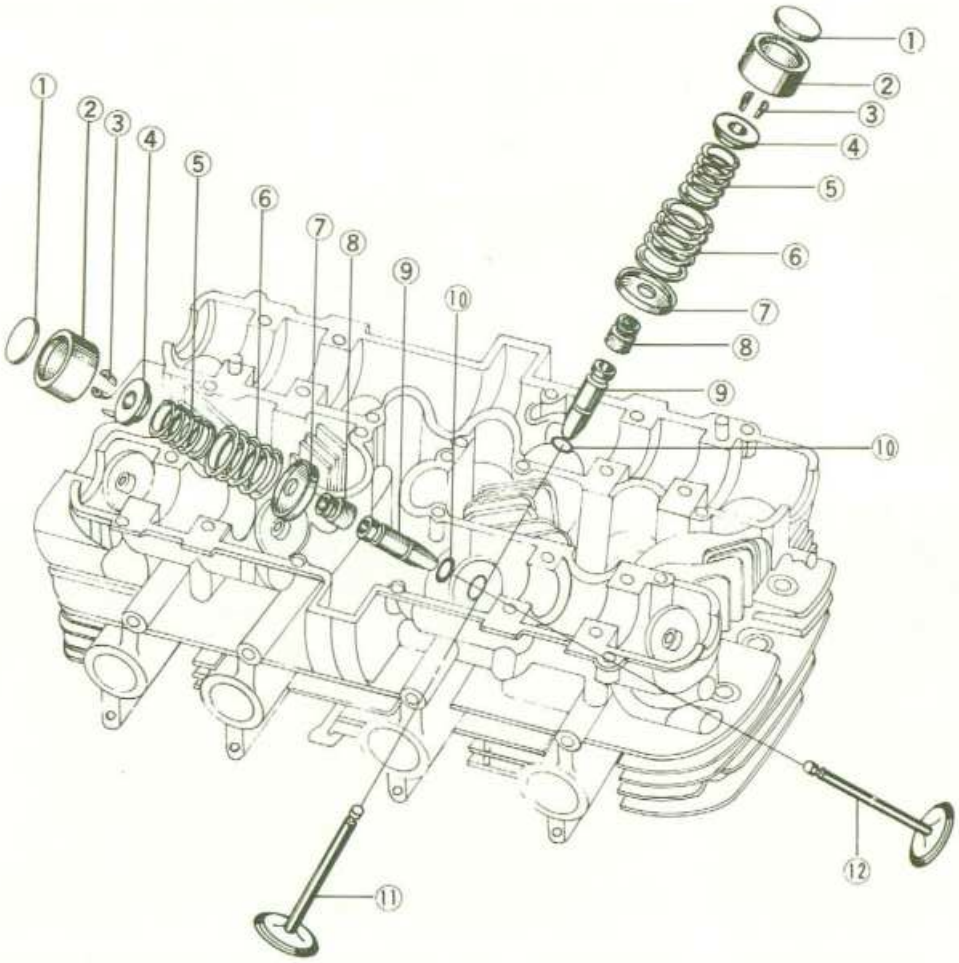
Disassembly

1. Remove gas tank.
2. Remove exhaust system.
3. Remove carburetors as an assembly.
4. Remove both camshafts.
5. Remove 4 spark plugs using a spark plug wrench. See **Figure 25**.



6. Remove 2 hex head bolts located at left and right ends of cylinder head. See **Figure 26**.

7. Remove 12 cylinder head nuts and washers. See **Figure 27**.

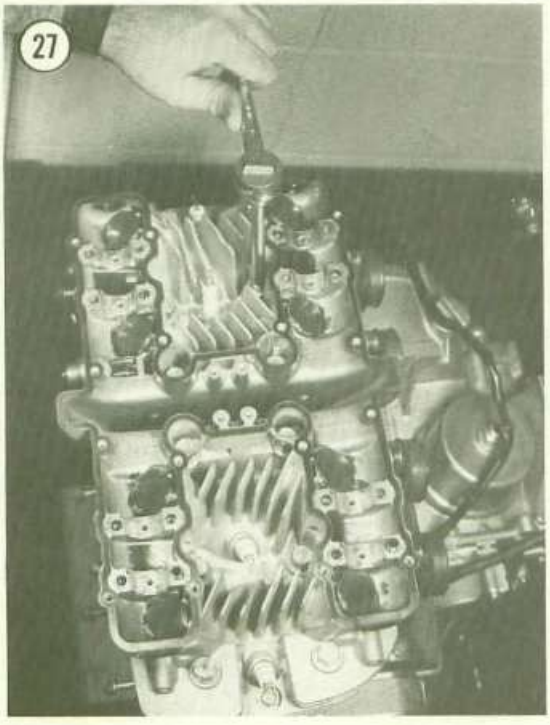


CYLINDER HEAD AND VALVE

1. Shim
2. Valve keeper
3. Slotted spacer
4. Valve spring retainer
5. Inner valve spring
6. Outer valve spring
7. Valve spring seat
8. Oil seal
9. Valve guide
10. Circlip
11. Exhaust valve
12. Inlet valve

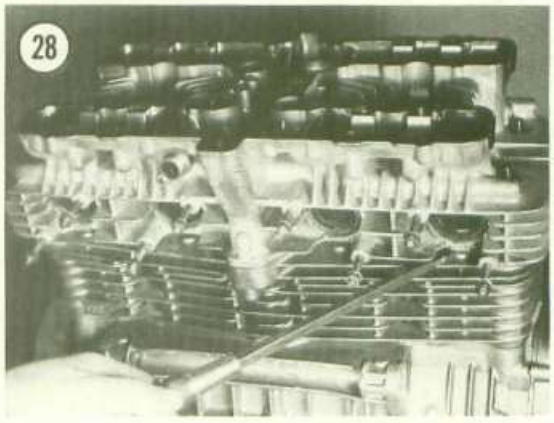
(24)



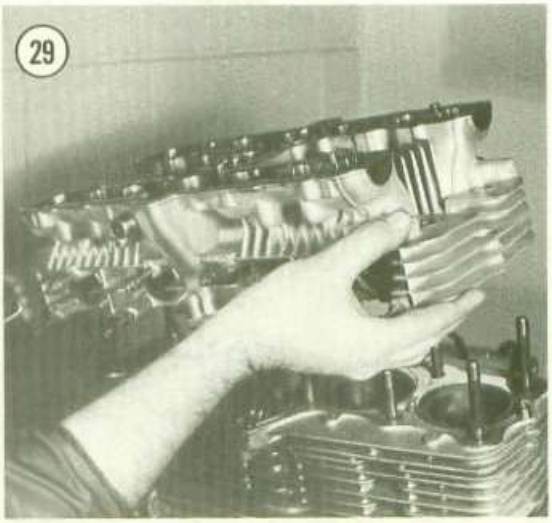


8. Mark all valve lifter cups and shims for position to enable reinstalling each one in the location from which it was removed.

9. Use a hefty screwdriver or light pry bar and gently pry the head upward, working from left to right with the pry bar placed as shown in **Figure 28**. Do not pry anywhere else.



10. Remove cylinder head (**Figure 29**). On pre-1973 engines, lift off the single cylinder head gasket. On later engines, lift off the 2-piece gasket and O-ring.



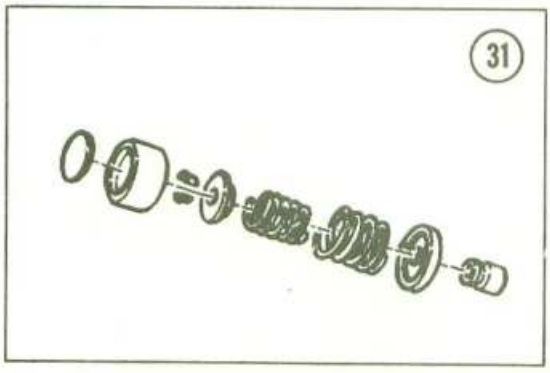
11. To remove a valve from the cylinder head, pull valve lifter cup and shim off valve stem.

12. Fit a valve spring compressor to the valve spring retainer and bottom of the valve head (**Figure 30**). Use the tool to press down the valve spring retainer and expose the split keepers on the valve stem. Remove the keepers.

13. Retract the compressor tool and remove it from the valve.



14. Take out the valve spring retainer, the 2 springs, the spring seat, and the valve as shown in **Figure 31**.



15. To remove a valve guide, pry the oil seal gently off the top end of the valve guide with a spring hook, being careful not to damage the seal or its spring (**Figure 32**).



16. With a torch, heat the portion of the cylinder head surrounding the valve guide to about 250-300°F.

17. Turn the head upside down. Fit a valve guide driver to the bottom of the valve guide. With a mallet, hammer lightly on the driver to push the valve guide out through the top of the head (**Figure 33**).



Inspection

Inspect the cylinder head for warp, for carbon buildup in the combustion chambers, and for poor sealing at the valve seats. Inspect the valve springs for sag and for bend. Check the valves for wear at the head, for wear at the stem, for bend, and for poor seating surfaces. Measure the valve guides for wear. Check the oil seals for damage.

Inspect the components in the following sequence: valves, valve guides, valve seats.

To inspect the combustion chambers:

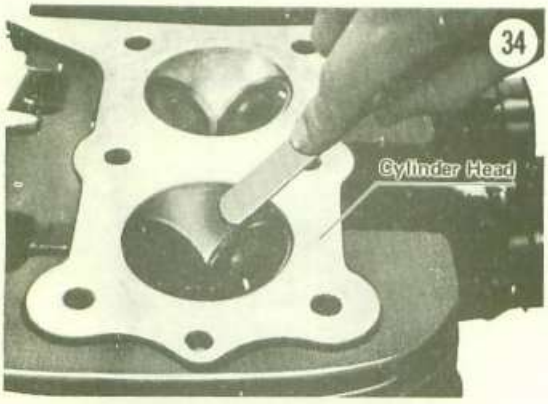
1. Visually examine the combustion chambers for carbon buildup, which can cause preignition and overheating.

2. If the surfaces of the combustion chambers contain carbon deposits, use a blunt edge scraper to remove the carbon (**Figure 34**), being careful not to gouge the metal.

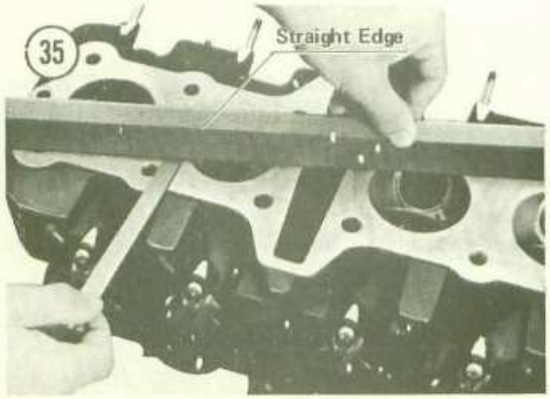
NOTE: *If one or more of the combustion chambers contained unusually large carbon deposits, check the valve guide oil seals for those combustion chambers very carefully.*

To check for cylinder head warpage:

1. Turn the head upside down, and lay a straightedge along its length.



2. At various points along the straightedge, insert feeler gauges between it and the surface of the head to measure the gap (**Figure 35**).



3. Move the straightedge to several different locations on the head, and continue trying to insert feeler gauges, to measure any warpage.

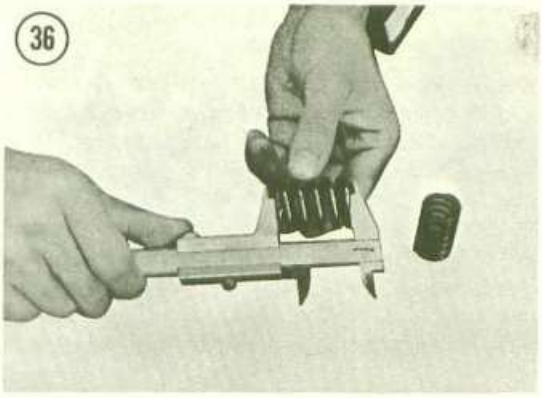
4. A new cylinder head will have less than 0.002 in. of warpage. If you measure more than 0.010 in. (0.25mm) of warpage anywhere, replace the cylinder head with a new one.

To check the valve springs:

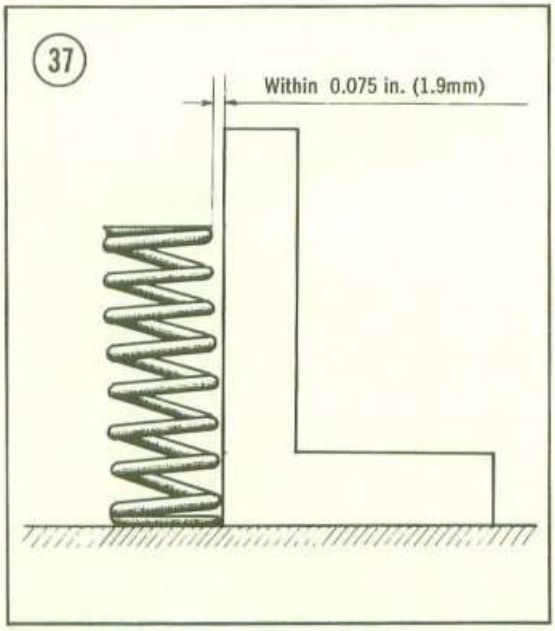
1. Measure their length with calipers. See **Figure 36**.

2. A new inner valve spring is 1.42 in. (36mm) long. If any inner spring measures less than 1.38 in. (35mm) long, replace it with a new one.

3. A new outer valve spring is 1.55 in. (39.3mm) long. If any outer spring measures less than 1.50 in. (38mm) long, replace it with a new one.



4. Measure each valve spring (inner and outer) for straightness by standing it on a flat surface and butting it against the vertical edge of a square (**Figure 37**).

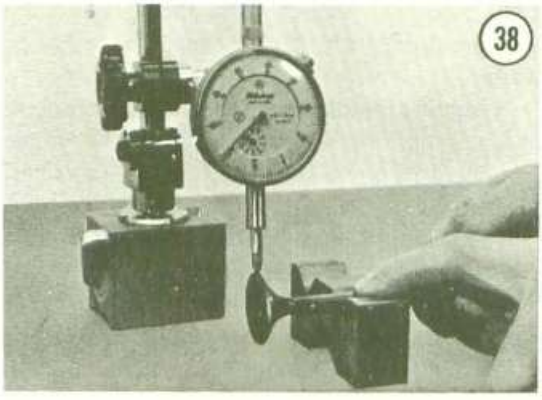


5. If there is any gap between the top edge of the spring and the vertical edge of the square, measure the gap with a feeler gauge.

6. If the gap is greater than 0.075 in. (1.9mm), replace the spring with a new one.

To check for a bent valve stem:

1. Lay the middle of the stem in a V-block. Position a dial gauge so that its probe bears against the outer edge of the seating surface on the face of the valve (**Figure 38**).

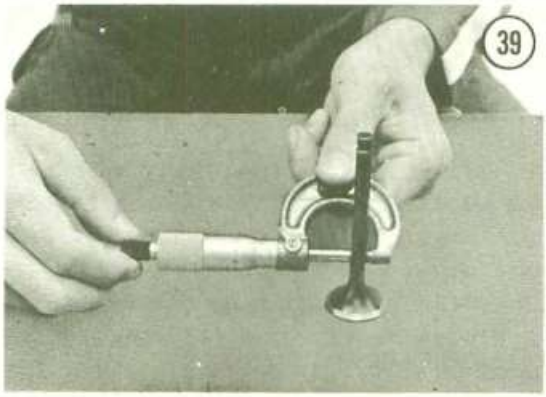


2. Rotate the valve slowly in the V-block, and measure the runout of the valve face. If the runout exceeds 0.002 in. (0.05mm), replace the valve with a new one.

NOTE: *This measurement will also identify a warped valve head.*

To check for valve stem wear:

1. Measure the diameter of the stem at 4 evenly-spaced intervals along its length, using a micrometer (**Figure 39**).

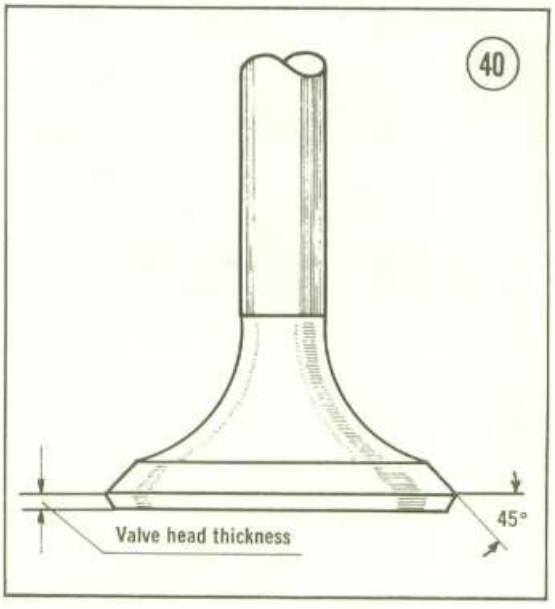


2. A new intake valve has a stem diameter of 0.2742-0.2748 in. (6.965-6.970mm). If the stem of an intake valve measures less than 0.270 in. (6.86mm) anywhere along its length, replace it with a new one.
3. A new exhaust valve has a stem diameter of 0.2738-0.2744 in. (6.955-6.970mm). If the stem of an exhaust valve measures less than 0.270 in. (6.85mm) anywhere along its length, replace it with a new one.

NOTE: *Excess clearance between the valve and its guide can be caused by wear in the valve stem, or the valve guide, or both. The procedure for checking the valve guide clearance is described in the valve guide checks.*

To check the valve head thickness:

1. Measure the thickness, with calipers, from the bottom of the valve head to the outer edge of the valve face (**Figure 40**).



2. On a new valve (intake or exhaust), the head thickness measures 0.034-0.045 in. (0.85-1.15mm). If the head is thinner than 0.020 in. (0.50mm), replace the valve with a new one.

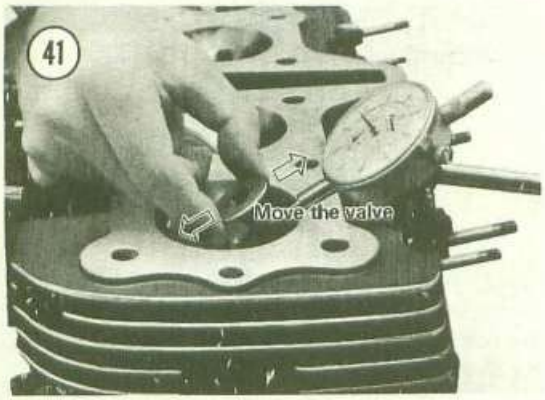
To check the valve face surface:

1. Visually inspect the valve face (seating surface). If it is chewed up, cracked, or badly worn, replace the valve with a new one.
2. If the seating surface is only mildly worn, regrind the valve face to an angle of 45 degrees (Figure 40) below horizontal, using a valve grinder.

To check for valve guide wear:

1. Leave (or reinstall) the valve guide in the cylinder head. Lay the cylinder head on the bench with the combustion chambers facing up.

2. Insert a new valve in the guide. Holding the valve head just above the surface of the cylinder head, position a dial gauge so that its probe will bear perpendicularly against the valve stem just above the bottom of the valve guide. Wriggle the valve back and forth in the guide, in line with the dial gauge probe, and read the amount of play (**Figure 41**).



3. Reposition the dial gauge 90 degrees to either side of the position from which the first reading was made. Move the valve back and forth in the guide, against the probe, and take another reading.

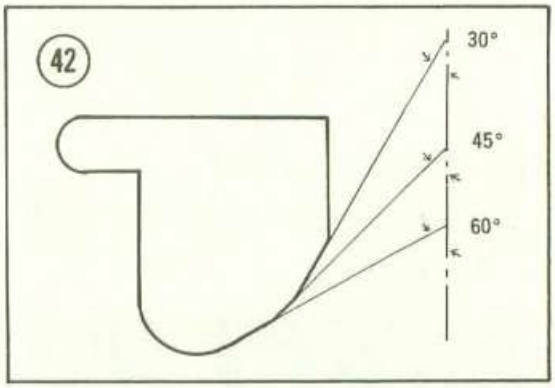
4. In a new engine, the stem/guide clearance for an intake valve is 0.008-0.0020 in. (0.2-0.05mm). If either of the readings exceeds 0.004 in. (0.10mm), replace the intake valve guide with a new one.

5. In a new engine, the stem/guide clearance for an exhaust valve is 0.0012-0.0024 in. (0.03-0.06mm). If the clearance exceeds 0.004 in. (0.10mm), replace the exhaust valve guide with a new one.

Before checking for cylinder head valve seat wear and describing the repair procedures, the objective of these procedures will be discussed. The face of the valve must bear against the valve seat in such a way as to create a gas-tight sealing area shaped like a circular band. This circular band must have a width of 0.04-0.06 in. (1.0-1.5mm). If the sealing surface is wider than that, the seating pressure psi will fall off, causing gas leakage through the valve port and carbon buildup on the valve seat. If the width of the circular band is too narrow, heat cannot be conducted fast enough from the valve to the cylinder head, which can cause the valve to warp.

Assuming that the face of the valve is smooth, and at a uniform 45 degrees, the width of the sealing surface will be determined by the shaping of the valve seat.

The seating surface of the valve seat is first cut to 45 degrees, to mate with the face of the valve. Then metal is removed from the inside edge of the seating surface with a 30 degree cutter, and from the outside edge with a 60 degree cutter, until the only remaining 45 degree portion of the valve seat (that can mate with the valve face to form a seal) is a circular band 0.04-0.06 in. wide (**Figure 42**).



To check the surface of a valve seat:

1. Remove the valve from the cylinder head, but leave the guide in place. Check the valve and the guide to make certain that all of their measurements are in tolerance, and that the surface of the valve face is in good condition.

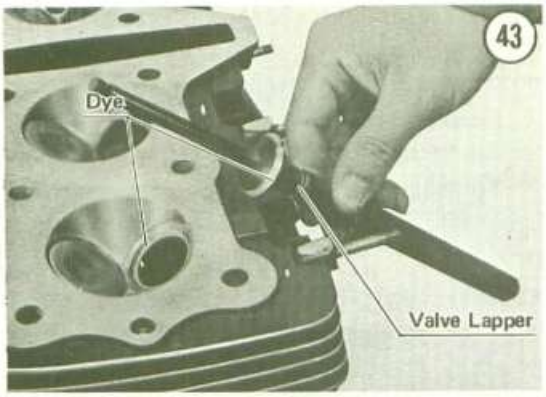
2. Smear the valve seat with blueing, or machinist's dye.

3. Attach a suction cup valve lapping tool to the bottom of the valve head (**Figure 43**). Insert the valve into its guide, and tap the valve lightly into place against its seat, taking care not to rotate the valve on its seat.

4. Pull the valve straight out of the guide.

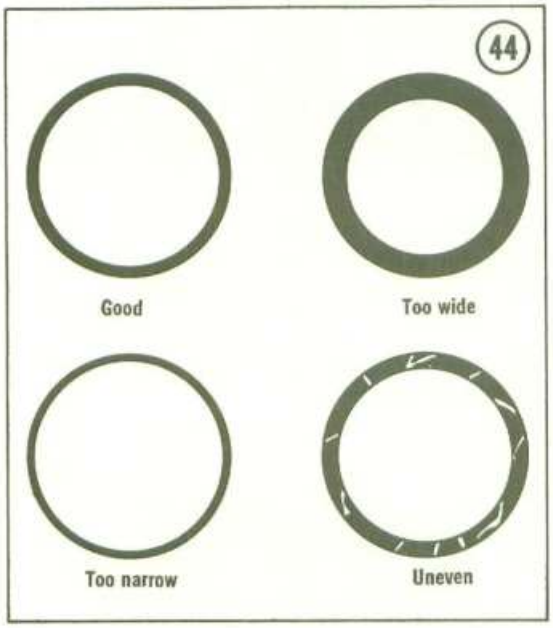
5. Inspect the circular band of blueing on the face of the valve. It should be uniform.

6. With calipers, measure the width of the band at several points around the face of the valve. The band should measure 0.04-0.06 in.





7. If the band is ragged, too wide, or too narrow (see **Figure 44**), reshape the sealing surface of the valve seat, using a set of valve seat cutters.



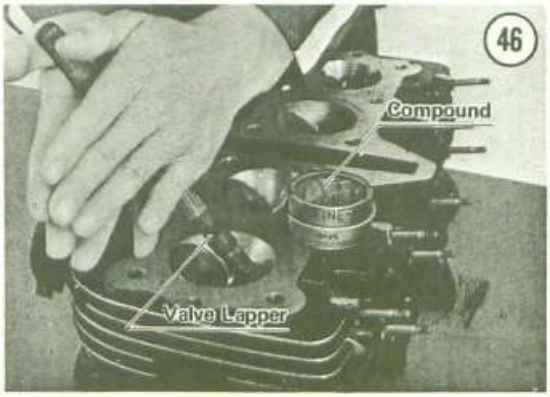
8. Fit the 45 degree cutter to the cutter holding tool. Insert the extension of the tool into the valve guide (**Figure 45**). Rotate the teeth of the cutter clockwise against the valve seat, removing only enough metal to regain a 45 degree circular band about 0.10 in. wide.

9. Fit the 30 degree cutter to the tool, and narrow the inside edge of the 45 degree band about 0.02 in.

10. Fit the 60 degree cutter to the tool, and narrow the outside edge of the 45 degree band, until the band measures 0.04-0.06 in. wide.

11. Clean the valve seat and apply coarse lapping compound to it.

12. With the lapping tool still attached to the bottom of the valve, insert the valve into the head and seat it. Rotate the lapping tool between the palms of your hands (**Figure 46**) to begin lapping in the sealing surface.



13. Finish lapping the sealing surface with fine lapping compound.

14. Clean the cylinder head thoroughly with a suitable solvent.

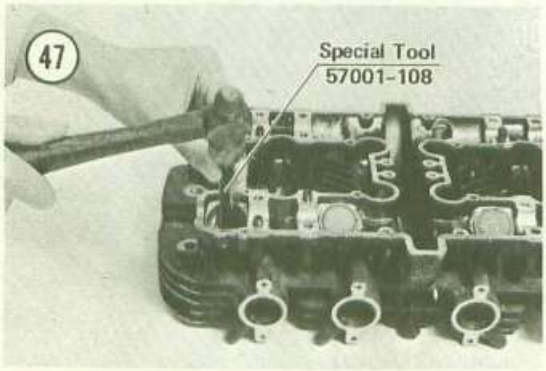
Reassembly

1. To install a valve guide into the cylinder head, first check to see that the circlip is fitted to the groove on the body of the guide.

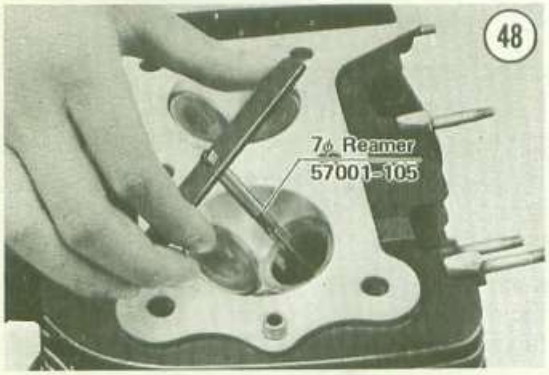
2. With a torch, heat the portion of the cylinder head around valve guide mount to 250-300°F.

3. Lay the cylinder head on the bench with the combustion chambers facing down. Fit the valve guide driver to the top of the valve guide. With

a mallet, drive the valve guide into the head until the circlip bottoms (**Figure 47**).



4. Whether installing a new valve guide or reinstalling the old one, ream the guide with a 7mm reamer as shown in **Figure 48**.



5. Before installing the old valve (or a new valve) into the valve guide just installed (or reinstalled), lap the valve to the valve seat.

6. If the valve guide was not removed but an old valve is being replaced with a new one, lap the valve to the valve seat.

7. After completion of any lapping operations, wash the cylinder head thoroughly with a suitable solvent.

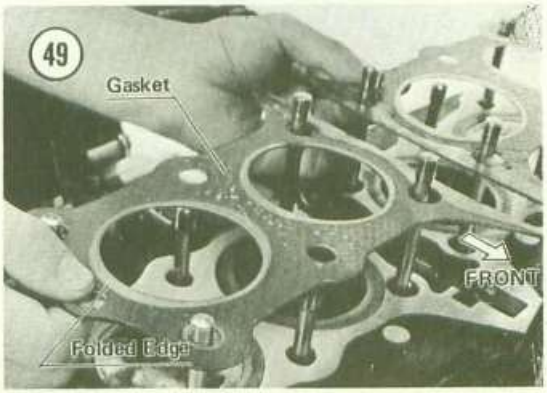
8. To install a valve, fit the oil seal to the top of the valve guide.

9. Insert the valve into the valve guide. On the valve stem, assemble the valve spring seat, the 2 valve springs, and the valve spring retainer.

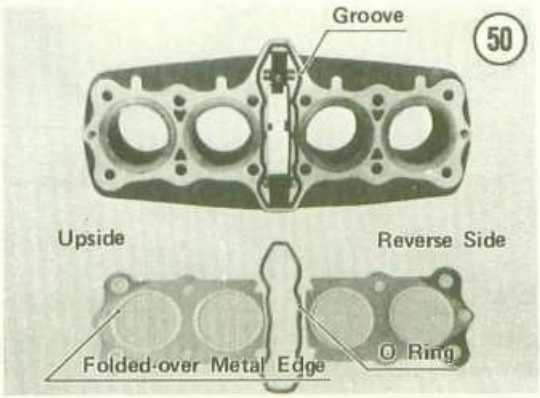
10. Fit the valve spring compressor to the valve spring retainer and the bottom of the valve head. Use the tool to press down the retainer and expose the keeper groove on the valve stem. Fit the split keepers to the valve stem. Retract the tool and remove it from the valve.

11. Fit the valve lifter cup and shim for that location to the top of the valve stem.

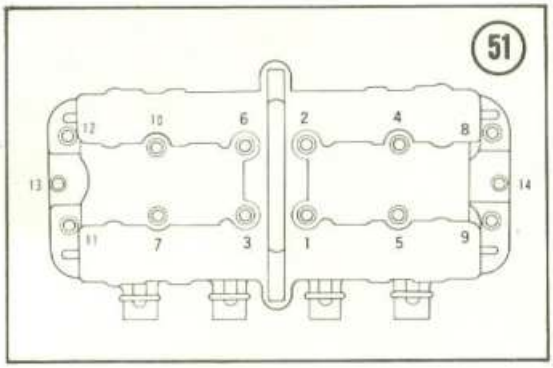
12. To install the cylinder head of a pre-1973 engine, discard the old cylinder head gasket and lay a new one on the cylinder block, with the wider crimped edges facing up (**Figure 49**).



13. To install the cylinder head on a 1973 or later engine, discard the old cylinder head gaskets and lay the 2 new ones on the cylinder block, with the wider crimped edges facing up. Place the O-ring in its groove between the 2 gaskets (**Figure 50**).



14. Place the cylinder head atop the cylinder block. Put the 12 washers and the 12 nuts on the through studs. Tighten the cylinder head nuts lightly. Torque each nut to 25 ft.-lb. using the sequence shown in **Figure 51**.

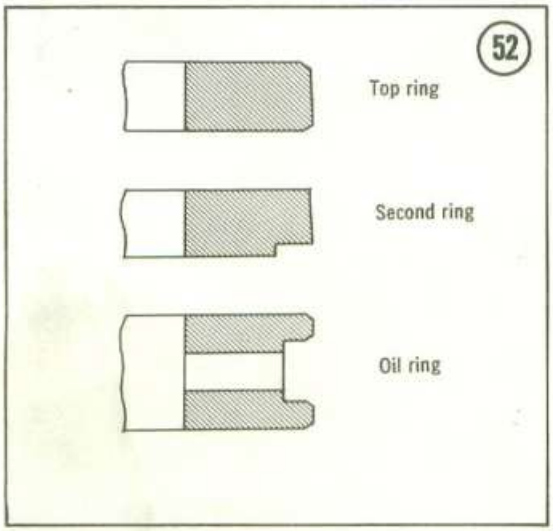


15. Install the 2 hex head bolts, at the left end and the right end of the cylinder head. Torque each one to 105 in.-lb.
16. Install the 4 spark plugs. Torque each one to 19-21 ft.-lb.
17. Install the camshafts.
18. Install the carburetors.
19. Install the exhaust system.
20. Install the gas tank.

CYLINDER BLOCK AND PISTONS

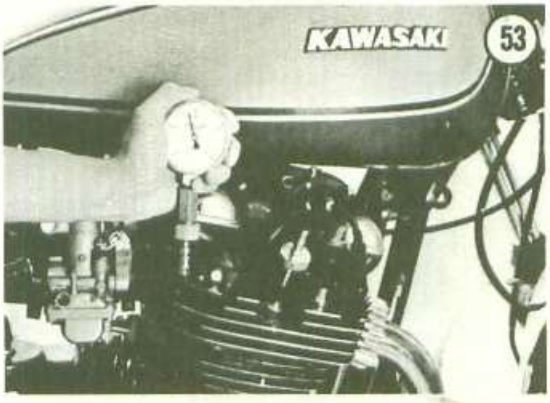
The alloy cylinder block has pressed-in cylinder sleeves, which can be bored 1mm oversize.

Each piston is fitted with 3 rings. The top 2 rings are compression rings, to prevent compression blow-by into the crankcase. The bottom ring is an oil scraper ring, to keep excess oil out of the compression chamber (**Figure 52**).



Compression Check

Before removing the cylinder block, you may wish to run a compression check. If so, run the engine until the oil is warm. Shut off the engine and remove the spark plugs. Fit the compression gauge to the spark plug hole in the first cylinder. Hold the throttle wide open and turn the engine over 3 or 4 times, until the compression gauge gives its highest reading. Take compression readings for the other 3 cylinders in the same way (**Figure 53**).

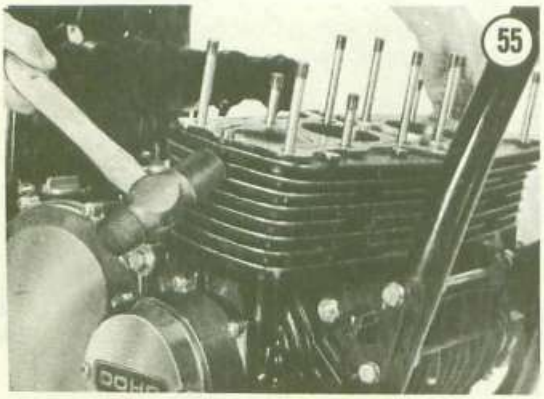


The standard amount of compression is 142 psi per cylinder. The compression is unsatisfactory if any cylinder gives a reading of less than 100 psi or if there is a difference in compression of more than 14 psi between any 2 cylinders.

Disassembly

1. Remove the gas tank.
2. Remove the exhaust system.
3. Remove the carburetors as an assembly.
4. Remove the camshafts.
5. Remove the cylinder head.
6. Remove the camshaft chain tensioner assembly and the guide sprocket from the top of the cylinder block (**Figure 54**).
7. Tap upward lightly at each end of the cylinder block with a plastic mallet, alternating from one end to the other (**Figure 55**). Do not tap hard enough to bend a cooling fin.
8. Lift the cylinder block off the engine cases, being careful not to let the cam chain get jammed in the bottom of the cases. Keep track





of the 2 dowel pins on the outermost front cylinder head studs.

9. Lift off the cylinder base gasket.

10. To remove a piston, stuff rags into the top of the crankcase beneath the piston, to catch any small parts that might drop down.

11. Use an awl or needle nose pliers to remove the wire wristpin keepers from the piston. See **Figure 56**.

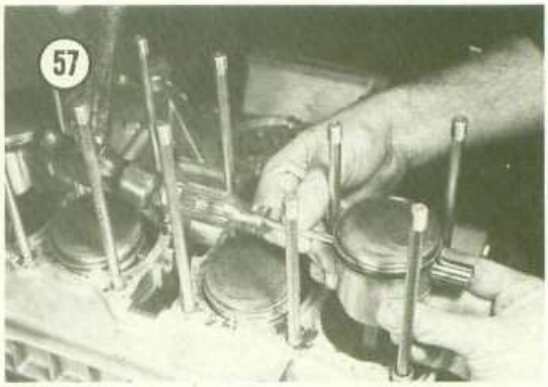
12. Support the piston and drive the wristpin out, using as little force as possible. See **Figures 57 and 58**.

CAUTION

When removing the wristpin, take care not to put any side pressure on the piston to avoid bending the connecting rod; it was not designed to handle side loads.

13. Lift the piston off the connecting rod if additional pistons are to be removed. Leave the wristpin in one of the piston bosses and number







the piston so that each piston, ring, and wristpin can be installed in the same location from which it was removed.

14. Fit piston ring pliers to the ends of the ring to remove the ring from a piston (**Figure 59**). Spread the ring and lift it off the piston.



Inspection

There are several sets of measurements for excess wear in the cylinder and the piston and its components. The first checks measure the fit of the piston to the cylinder; inside diameter of the cylinder; outside diameter of the piston; and the piston/cylinder clearance.

The next measurements check the fit of the wristpin: outside diameter of the wristpin; inside diameter of the wristpin bores in the piston; inside diameter of the wristpin bearing in the connecting rod; piston/wristpin clearance; and wristpin/connecting rod clearance.

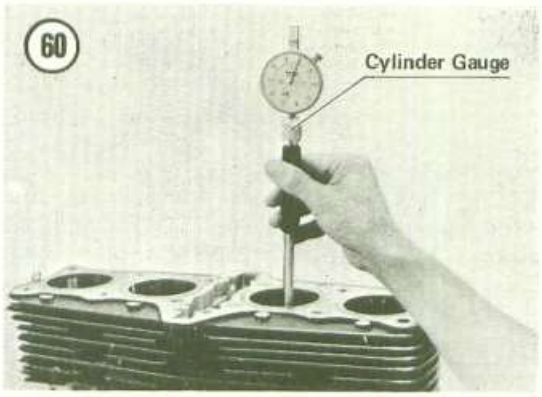
The final set of measurements checks the functioning of the piston rings: ring groove widths in the piston; piston ring thickness; groove ring clearance; ring end gap; and ring elasticity.

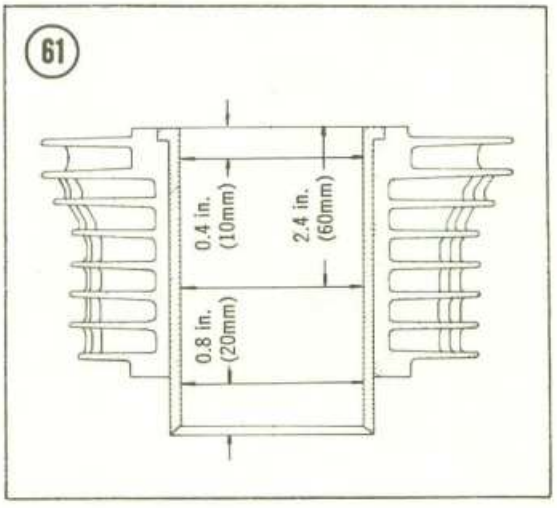
To check for cylinder wear:

1. Use a cylinder gauge (**Figure 60**) to measure the inside diameter of the cylinder front-to-rear and side-to-side, at a level 0.4 in. (10mm) below the top of the cylinder (**Figure 61**).

2. Repeat the 2 measurements above, at a level 2.4 in. (60mm) below the top of cylinder.

3. Repeat the 2 measurements above, at a level 3.2 in. (80mm) below the top of cylinder.





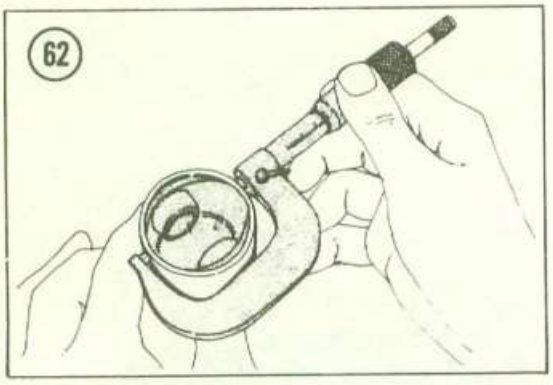
4. If there is a difference any greater than 0.002 in. (0.05mm) between any 2 of the 6 inside diameter measurements, the cylinder has worn too unevenly, and the 4 cylinders will have to be bored and honed.

5. A new cylinder has an inside diameter of 2.5984-2.5992 in. (66.0-66.019mm). If at any point the inside diameter of the cylinder is greater than 2.602 in. (66.1mm), the cylinders must be bored and honed to fit oversize pistons.

To check for piston wear:

1. Measure the outside diameter of the piston with a micrometer. Take the measurement 0.2 in. (5mm) above the bottom of the piston skirt, at a 90 degree angle to the wristpin bores (**Figure 62**).

2. A new piston has an outside diameter of 2.5956-2.5965 in. (65.93-65.95mm). If the



outside diameter of the piston is less than 2.59 in. (65.8mm), replace the piston with a new one.

To check the cylinder/piston clearance:

1. With a cylinder gauge, measure the inside diameter of the cylinder just above its bottom edge, where it will have undergone the least amount of wear.

2. To find the cylinder/piston clearance, subtract the outside diameter of the piston from the inside diameter of the cylinder.

3. The standard cylinder/piston clearance is 0.0025-0.003 in. (0.060-0.079mm). If a cylinder has not worn past the acceptable inside diameter limit, and installing a new piston will bring the clearance within tolerance, the cylinder block need not be bored. However, in no case should the cylinder/piston clearance be less than 0.0025 in.

Instructions for boring and honing:

1. Kawasaki sells 2 sizes of oversize pistons for the Z-1 and KZ900: 0.02 in. (0.5mm) over; and 0.04 in. (1mm) over. If oversize pistons are to be installed, each cylinder must be bored and honed to an inside diameter which equals the outside diameter of its piston plus 0.0025-0.003 in. (0.0635-0.0762mm). If a cylinder needs to be bored more than 0.039 in. (1mm), it should be replaced with a new one.

To avoid distorting the cylinders due to the heat generated by the boring operations, have the cylinders bored in either of the 2 following sequences: 3-1-4-2, or 2-4-1-3.

Do not measure cylinder diameters while they are hot.

2. When the boring and honing operations have been completed, measure the inside diameter of each cylinder in the same way as for checking cylinder wear, with a total of 6 measurements per cylinder. Within each cylinder, no 2 of those measurements should vary more than 0.0004 in. (0.01mm).

After piston seizure:

1. If the piston seizure only smeared small amounts of aluminum alloy on the cylinder walls, and did not damage the piston crown or ring grooves, repair it by smoothing the cylinder and the piston with No. 400 emery cloth.

2. If the piston seizure ruined the piston but did not score or gouge the cylinder walls, replace the piston with a new one and smooth the cylinder with No. 400 emery cloth.

3. If the piston seizure damaged the cylinder walls, replace the pistons with oversize pistons and have the cylinders bored and honed.

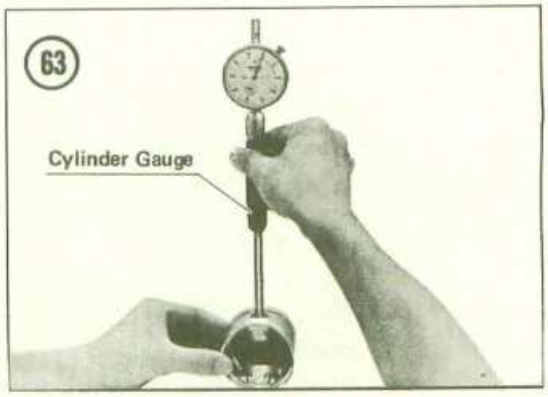
To check for wristpin wear:

1. With a micrometer, measure the outside diameter of the wrist pin on all 3 of its bearing surfaces.

2. A new wristpin has a diameter of 0.6691-0.6693 in. (16.994-17.0mm). If at any point the diameter measures less than 0.6677 in. (16.96mm), replace the wristpin with a new one.

To check the piston for wristpin bore wear:

1. Use a cylinder gauge to measure the inside diameters of the wristpin bores in the piston bosses (**Figure 63**).



2. In a new piston, the wristpin bores have an inside diameter of 0.6694-0.6701 in. (17.0035-17.0115mm). If the inside diameter of either bore is greater than 0.6724 in. (17.08mm), replace the piston with a new one.

To check the connecting rod for bearing wear:

1. Using a cylinder gauge, measure the inside diameter of the wristpin bearing in the connecting rod.

2. A new wristpin bearing has an inside diameter of 0.6694-0.6698 in. (17.0035-17.0114mm). If the inside diameter of the bearing is greater than 0.6713 in., replace it with a new one.

To check wristpin clearances:

1. To find the piston wristpin clearance, subtract the wristpin diameter from the inside diameter of the wristpin bores in the piston.

2. The acceptable piston wristpin clearance is 0.00026-0.00057 in. (0.0066-0.0145mm). If the clearance does not fall within those limits, replace the piston or the wristpin or both with new ones to attain the correct clearance.

3. To find the wristpin bearing clearance, subtract the wristpin diameter from the inside diameter of the wristpin bearing in the connecting rod. The acceptable wristpin bearing clearance is 0.00012-0.00079 in. (0.003-0.020mm). If the clearance does not fall within those limits, replace the wristpin or the bearing or both with new ones.

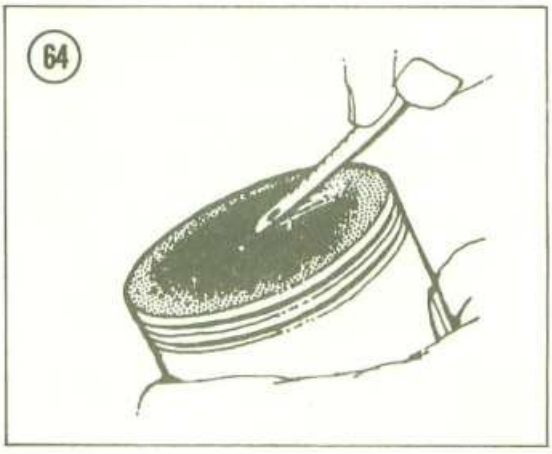
To clean the piston:

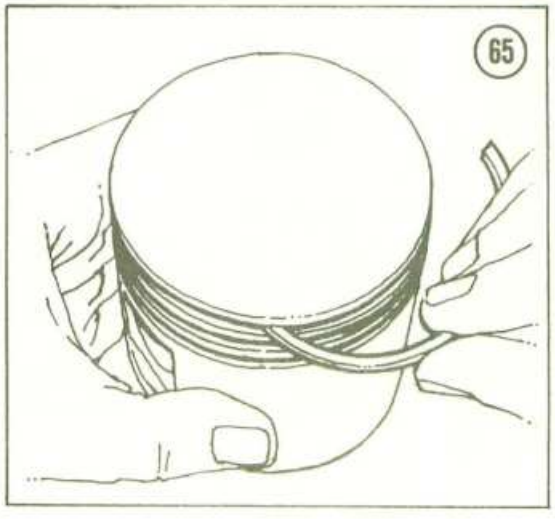
1. Remove any carbon buildup from the piston crown and ring lands with a flat, blunt-edge scraper (**Figure 64**).

2. With the piston rings removed, clean any carbon, varnish, or dirt out of the ring grooves, using a broken piston ring as a scraper (**Figure 65**). Take care not to damage the lands or grooves.

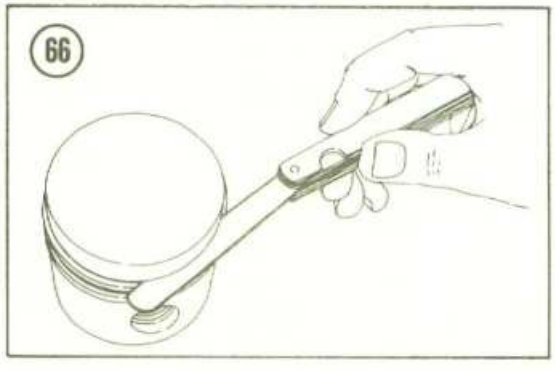
To check the piston for ring groove wear:

1. Visually inspect the ring grooves. If they are damaged, replace the piston with a new one.





2. With feeler gauges, measure the width of each ring groove around its circumference (**Figure 66**).



3. The widths of the top and second ring grooves in a new piston are 0.059-0.061 in.

(1.5-1.52mm). If either ring groove has a width greater than 0.063 in., replace the piston with a new one.

4. The width of the bottom ring in a new piston groove is 0.098-0.099 in. (2.5-2.52mm). If the bottom ring groove has a width greater than 0.102 in. (2.6mm), replace the piston with a new one.

To check piston ring thickness:

1. Inspect the 3 piston rings for damage or uneven wear. Replace any visibly worn or damaged rings with new ones.

2. Measure the top-to-bottom thickness of each ring with a micrometer at 3 points around its circumference.

3. A new top ring is 0.0567-0.0573 in. (1.44-1.455mm) thick. If the top ring measures less than 0.0535 in. (1.36mm) thick, replace it with a new one.

4. A new second ring is 0.0579-0.0587 in. (1.47-1.49mm) thick. If the second ring measures less than 0.055 in. (1.4mm) thick, replace it with a new one.

5. A new bottom ring is 0.0973-0.0980 in. (2.47-2.49mm) thick. If the bottom ring is less than 0.0945 in. (2.4mm) thick, replace it with a new one.

To check the groove ring clearance:

1. Install the rings on the piston. The side with the lettering faces up.

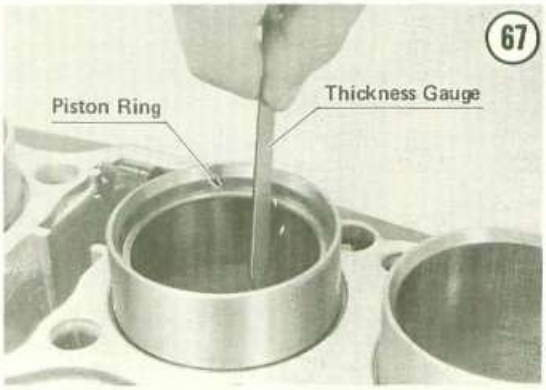
2. With feeler gauges, measure the clearance between the top of each ring and the top of its groove around the circumference of the ring.

3. A new piston and new top ring have a clearance of 0.0018-0.0031 in. (0.045-0.080mm). If the top ring clearance is greater than 0.007 in. (0.18mm), replace the top ring, or the piston, or both, with new ones.

4. A new piston and new second ring, or a new piston and new bottom ring, have a clearance of 0.0004-0.0020 in. (0.01-0.05mm). If the clearance between the second ring and its groove, or the bottom ring and its groove, is greater than 0.006 in. (0.15mm), replace the appropriate ring, or the piston, or both, with new ones.

To check the ring end gap wear:

1. Fit the piston ring (top, second, or bottom ring) into a new cylinder, parallel to the bottom edge of the cylinder. If you do not have a new cylinder, fit the ring into your last worn cylinder, just above the bottom. With feeler gauges, measure the gap between the ends of the ring for all 3 rings. See **Figure 67**.



2. A new piston ring has an end gap of 0.008-0.016 in. (0.2-0.4mm) when fitted to a new cylinder. If the end gap is greater than 0.028 in. (0.7mm), replace the ring with a new one.

To check the elasticity of the ring:

1. Lay the ring on the bench and measure its end gap with calipers.

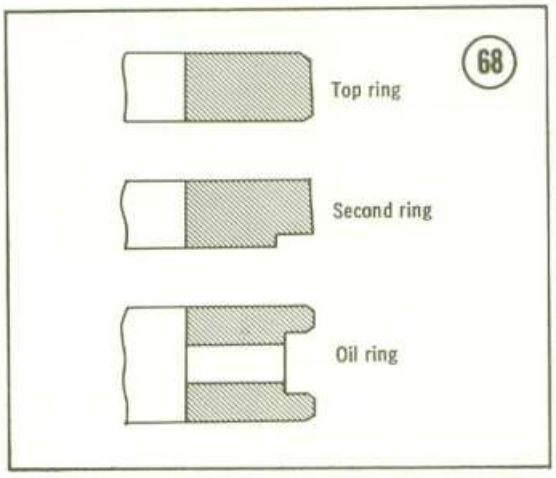
2. A new top or second ring has a free end gap of 0.354 in. (9mm). If either ring has a gap of less than 0.236 in. (6mm), replace it with a new one.

3. A new bottom ring has a free end gap of 0.315 in. (8mm). If the gap is less than 0.197 in. (5mm), replace bottom ring with a new one.

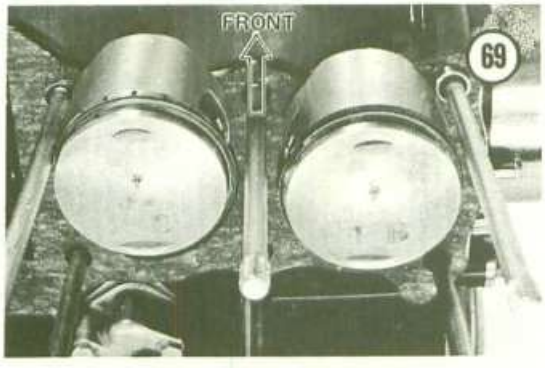
Reassembly

1. To install a ring on a piston, turn the ring so that the lettering faces up. Use the piston ring pliers to spread the ring, and slip it down over the piston crown into the proper groove.

> NOTE: *The top ring has beveled outer edges; the second ring has a notch at the outer bottom edge; and the bottom ring is considerably thicker than the other two* (**Figure 68**).



2. To install a piston, position it atop the rod so that the arrow on the piston crown faces forward (**Figure 69**).



3. With the wristpin in its bore in one of the piston bosses, fit the wristpin driver to the piston. Align the hole in the tool's strap with the wristpin bore, and butt the driver bolt against the end of the wristpin.

4. Align the piston and the wristpin with the wristpin bearing in the connecting rod. Screw the driver bolt into the tool to press the wristpin through the bearing and the other piston bore until the circlip grooves, near the outer ends of both bores, lie exposed. Remove the tool.

5. Install 2 new circlips. After installing each circlip, rotate it so that neither of its ends lie in either of the milled slots at the mouth of the wristpin bore (**Figure 70**).

6. To install the cylinder block, first fit the 2 hollow dowel pins to the outermost front cylinder head studs (**Figure 71**).

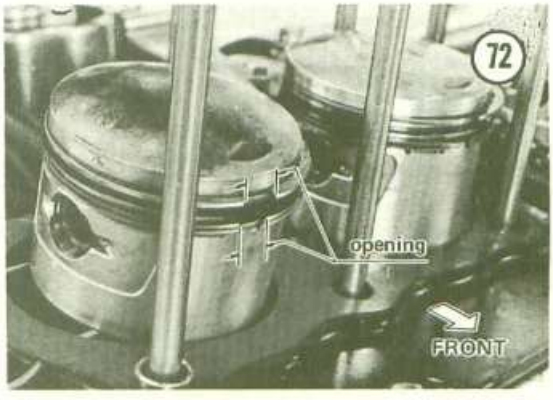




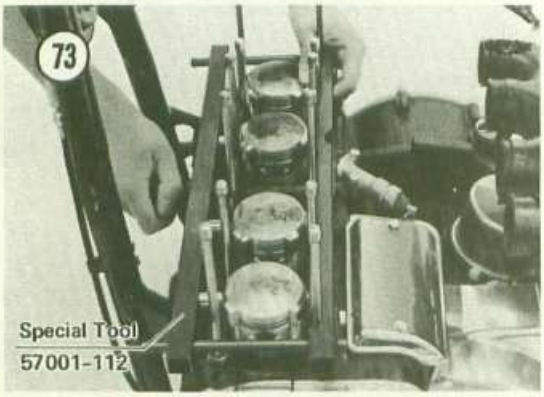
7. Lay a new cylinder base gasket atop the crankcase.

8. Hold up the cam chain, and use the kick-starter lever to rotate the crankshaft until all 4 pistons are up out of the cases and level with one another.

9. Rotate the top and bottom ring on each piston so that the ring ends face forward. Rotate the second ring so that its ends face the rear of the engine (**Figure 72**).



10. From the ring compressor set, slide the 2 piston support rods beneath the pistons from the sides of the engine. Fit the ring compressor tool to the pistons and compress the rings. See **Figure 73**.



11. Slide the cylinder block down over the pistons until the rings are inside the cylinders. Remove the ring compressor and the piston support rods. Bottom the cylinder block against the base gasket.

12. Mount the camshaft chain tensioner at the rear of the camshaft chain slot in the top of the cylinder block, and mount the guide sprocket at the front of the slot.

13. Install the cylinder head.

14. Install the camshafts.

15. Install the carburetor assembly.

16. Install the exhaust system.

17. Install the gas tank.

LEFT SIDE ASSEMBLIES

1. Chain cover removal/installation (Chapter Seven)
2. Chain oil pump (Chapter Seven)
3. Starter motor removal/installation
4. Clutch release mechanism (Chapter Seven)
5. Output sprocket (Chapter Seven)
6. Alternator removal/installation
7. Starter motor clutch (Chapter Seven)
8. Gear selector mechanism (Chapter Seven)

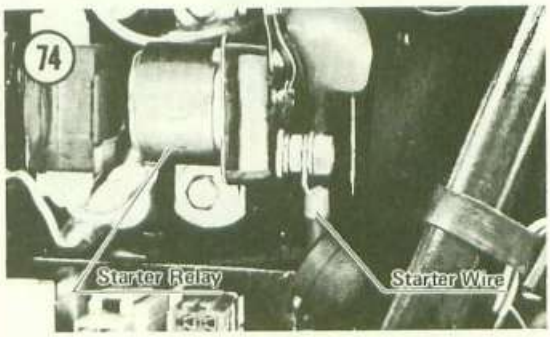
For further disassembly, inspection, and reassembly of the starter motor and the alternator, see Chapter Five. For removal, inspection, and reassembly of the rear chain, see Chapter Eight.

STARTER MOTOR

For inspection procedures, see Chapter Five.

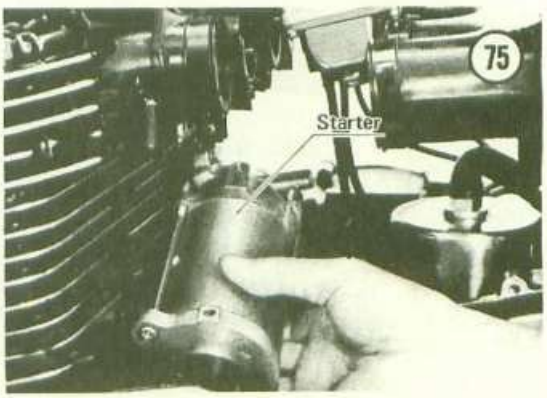
Removal/Installation

1. Remove the gas tank.
2. Remove the carburetor assembly.
3. Remove the chain cover.
4. Pull off the right side cover. Behind it, on the right side of the top row of electrical components, is the starter relay. Mounted to the right side of the relay near the bottom is the thick starter cable (**Figure 74**). Pull down the rubber cap and unbolt the starter cable from the relay. Remove the cable from the cable clamp.



5. Remove the 2 long starter motor mounting bolts and lockwashers.

6. Pull the starter motor to the right and lift it out of the engine (**Figure 75**).



7. Oil the O-ring on the left end cap of the motor assembly.

8. Apply Loctite to the 2 long starter motor mounting bolts.

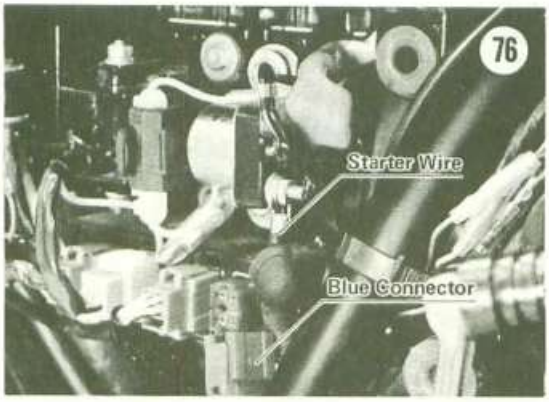
9. Install the starter motor in the reverse order of removal.

ALTERNATOR

The alternator rotor is mounted to the left end of the crankshaft. The stator (which fits around the rotor) is mounted to the left engine cover. For disassembly, inspection, and repair procedures, see Chapter Five.

Removal/Installation

1. Pull off the right side cover. Behind it, on the right side of the bottom row of electrical components, unplug the blue alternator connector (**Figure 76**).



2. Remove the chain cover.

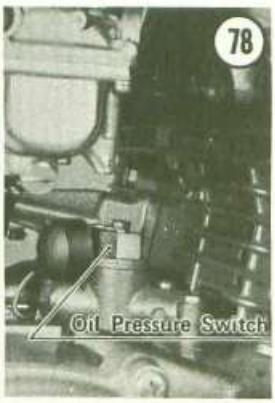
3. Below the lower left side of the sprocket guard, remove the screw that mounts the wire to the neutral switch (**Figure 77**). Free the wire.

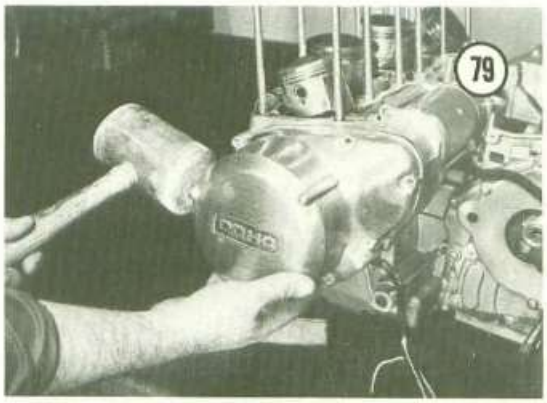
4. Top the engine cases to the rear of the cylinder block, pull the rubber cap off the oil pressure switch. Unscrew the bolt that mounts the wire to the switch (**Figure 78**). Free the wire.

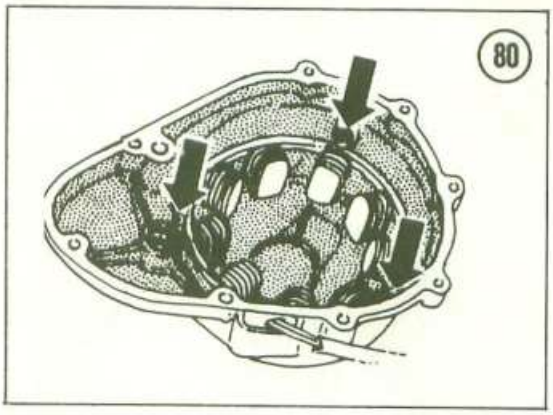
5. Remove the 8 Phillips screws from the alternator cover. Lightly tap the cover with a soft mallet to loosen it (**Figure 79**).

NOTE: *The alternator stator is mounted to the inside of the cover with Allen screws* (**Figure 80**).







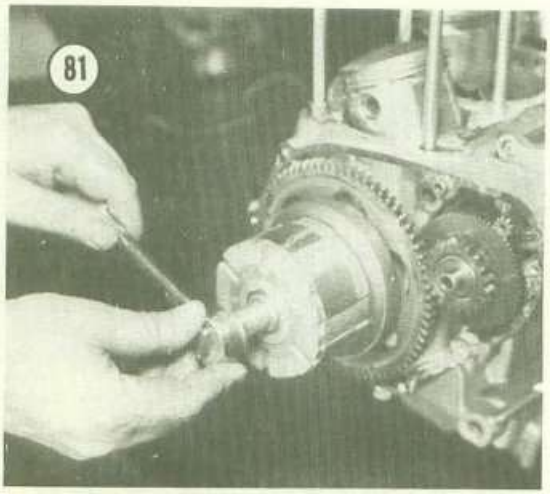


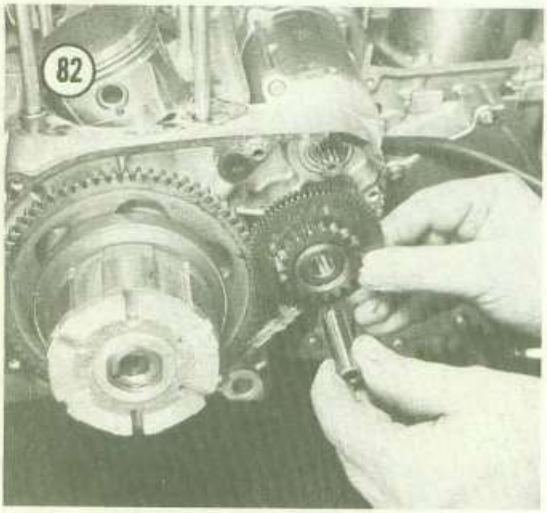
6. Remove the bolt holding the rotor to the shaft (**Figure 81**).

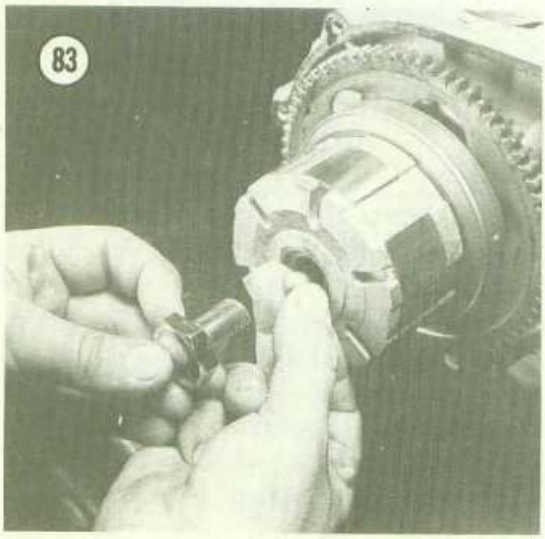
7. Remove the starter idler gear (**Figure 82**).

8. Fabricate an armature removing tool by using a large ball bearing and one of the top fork cap bolts. Slip the bearing in first, then thread in the cap bolt. See **Figure 83**.

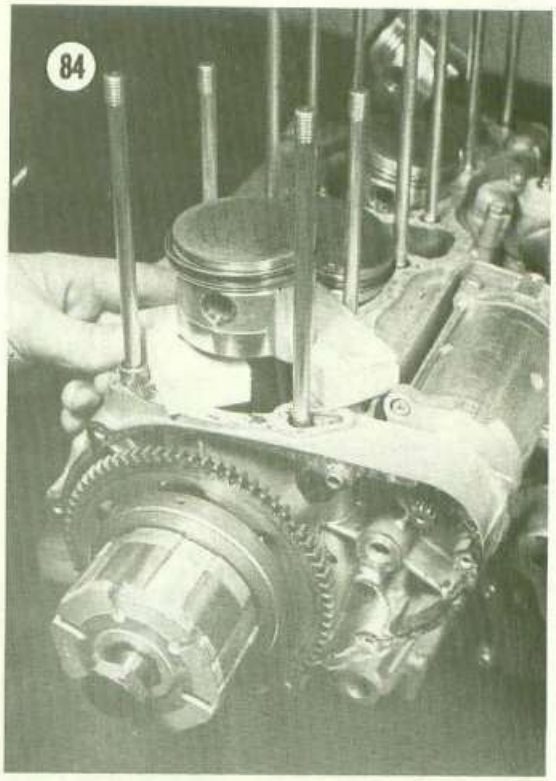
9. Turn the engine over in a clockwise direction, carefully and slowly, when viewing the



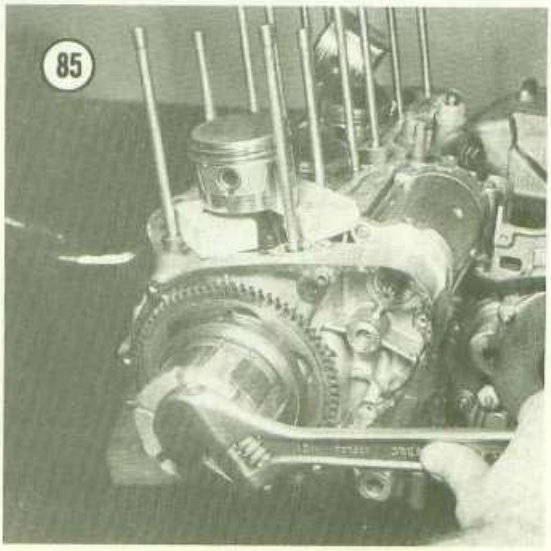




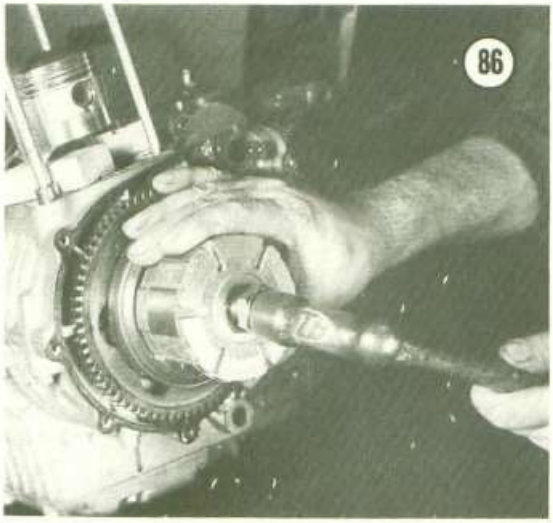
engine as shown in **Figure 84**. (Do not forget about the cam chain.) Slip 2 small wood blocks under the piston.



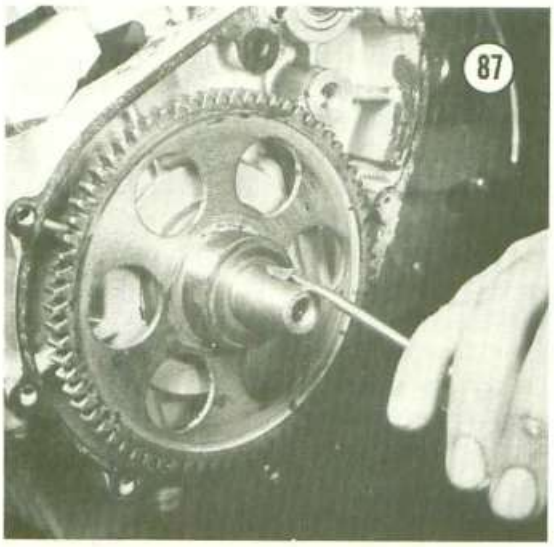
10. Tighten the bolt against the ball bearing (which is riding against the crankshaft). See **Figure 85**.



11. After tightening the bolt down it might be necessary to tap the bolt with a hammer to jar the rotor loose. See **Figure 86**. Remove the rotor. Be careful not to lose the ball bearing. Be sure to put the fork cap bolt back where it belongs.

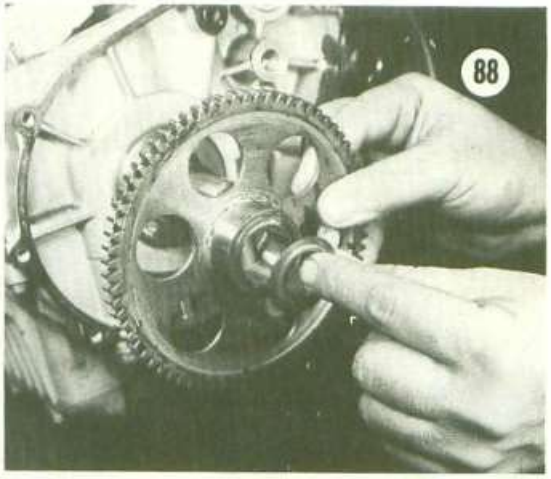


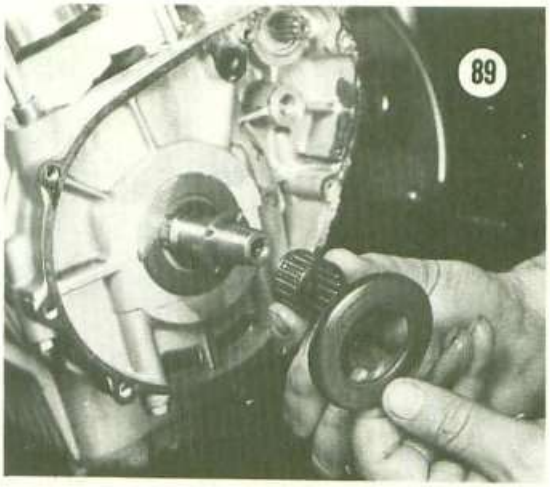
12. Remove the Woodruff key that held the armature in place (**Figure 87**).



13. Remove the shim and starter ring gear (**Figure 88**).

14. Remove the collar and needle bearing. Do not forget the thrust washer (still shown on the end of the shaft in **Figure 89**).





15. Remove 2 bolts holding the starter in place (**Figure 90**) and gently pry the starter loose (**Figure 91**).

16. Remove the starter and its attached cable (**Figure 92**).

17. To install, reverse the preceding.

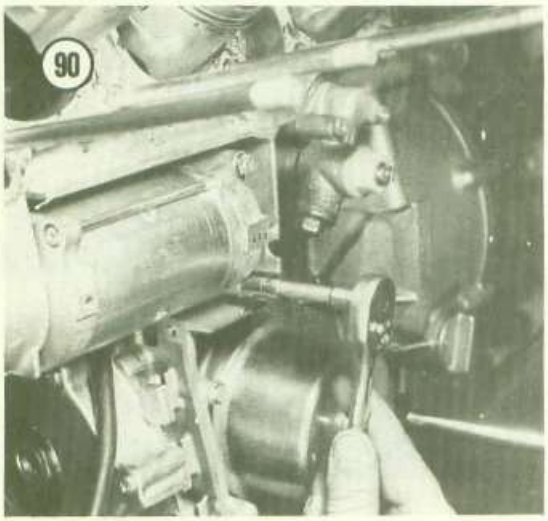
NOTE: *Apply Loctite to the rotor mounting bolt before screwing it into the crankshaft. Torque to 18 ft.-lb.*

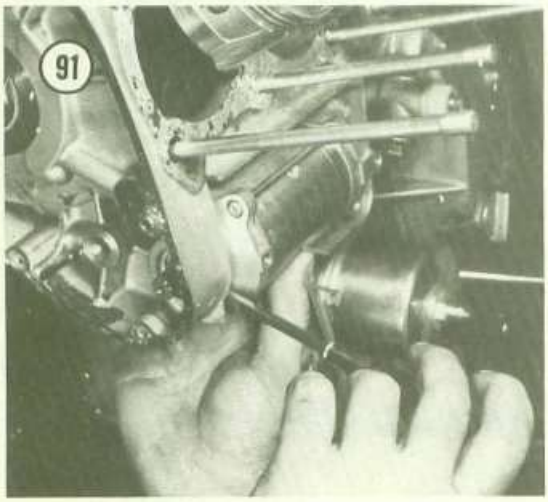
RIGHT SIDE ASSEMBLIES

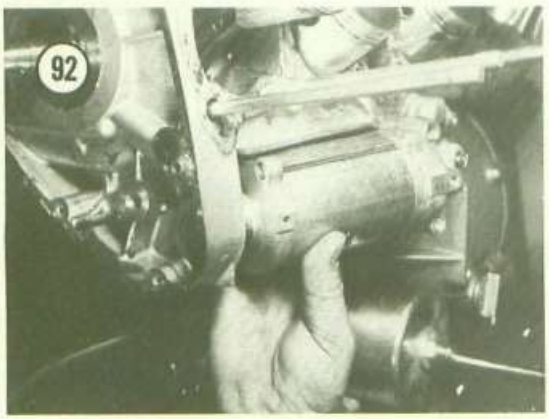
a. Contact breaker points (removal/installation, Chapter Five)

b. Ignition advance mechanism (removal/installation, Chapter Five)

c. Clutch (Chapter Seven)







For further disassembly, inspection, and repair of the contact breaker points, capacitors, and ignition advance mechanism, see Chapter Five. For contact breaker adjustment, see Chapter Two.

OIL PUMP

Oil Pump Operation

The oil pump, which is geared to the crankshaft, is located in the bottom of the crankcase toward the left side of the engine. The double gear pump pulls oil through a coarse mesh screen and pushes it through the filter to trap the finer particles. (If the filter becomes clogged, a bypass valve routes the oil—still dirty—around the filter.)

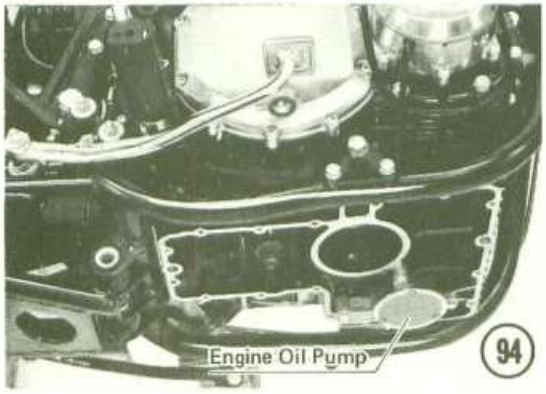
From the filter, the oil goes through the oil pressure switch, which turns off the warning light on the instrument panel whenever: (a) the engine rpm exceeds 1,300; and (b) there is oil coming through the lines. Beyond that point the oil flow is split among 3 passageways. The first passageway goes to the crankshaft main bearings and big end bearings, the spray from which lubricates the cylinder walls and the wristpins. The second passageway leads to the camshaft bushings; after the oil leaves the bushings it lubricates the cams and the valves. The third passage directs oil to the transmission main shaft and output shaft bearings. After lubricating the engine components, the oil eventually drips back down into the crankcase sump.

To check the functioning of the oil pump, remove the plug from the oil pressure check point on the right side of the crankcase, and screw in the fitting of an oil pressure gauge (Kawasaki special tool available). See **Figure 93**. Start the engine and run it long enough to warm the oil. Hold the rpm steady at 3,000, and check the gauge. The gauge should read 2.8 psi. If the pressure is less than 2.0 psi, check the lubrication system.

Disassembly

1. Drain the engine oil (see Chapter Two).
2. Remove the oil filter (see Chapter Two).
3. Remove the exhaust system.
4. Remove the 17 bolts and washers that mount the oil pan to the crankcase. Remove the oil pan and its gasket (**Figure 94**).

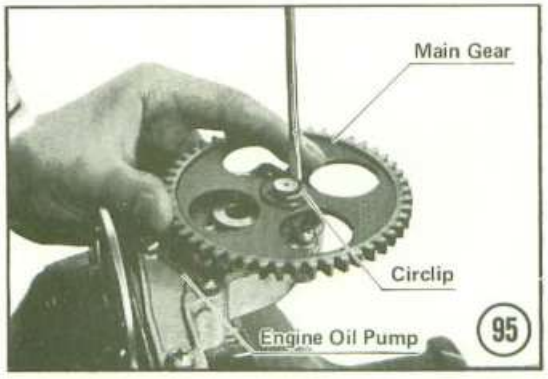




5. Remove the 3 bolts and washers that mount the oil pump to the crankcase. Pull out the oil pump and its driving gear.

6. Clamp the oil pump gently in a lead jaw vise.

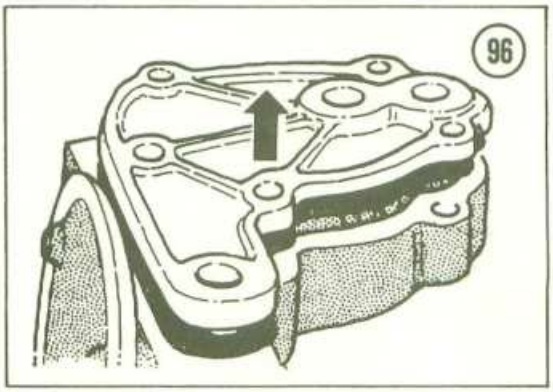
7. Pop off the circlip that mounts the driving gear to its shaft (**Figure 95**). Take off the driving gear, the alignment pin, and the shim.



8. Remove the 6 pump body screws.

9. Alternately tap the ends of the 2 gear shafts gently with a plastic mallet, to loosen the pump body cover.

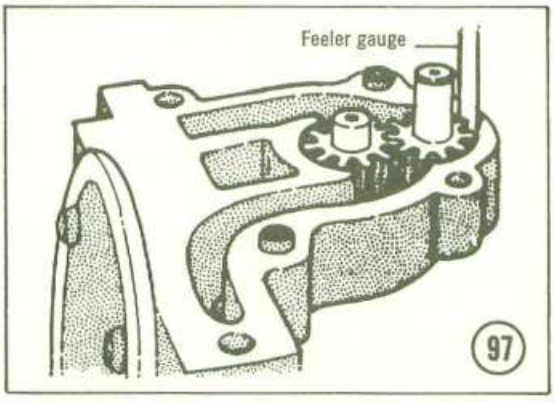
10. Remove the pump body cover and its gasket (**Figure 96**).



Inspection

1. Remove the 2 pump gears from the body and inspect their teeth for damage. If either gear has damaged teeth, replace the pump assembly with a new one.

2. Assemble the 2 pump gears into the body. With feeler gauges, measure the clearance between the teeth of each gear and the sides of the pump body, at the points where the teeth run closest to the body (**Figure 97**).



3. In a new oil pump, the clearance between the teeth of either pump gear and body is 0.0001-0.0014 in. (0.003-0.036mm). If either clearance is greater than 0.004 in. (0.1mm), replace the pump assembly with a new one.

Reassembly

1. Clean the mating surfaces of the pump body and the cover with a blunt edge scraper.

2. Fit a new gasket to the pump body, and put on the cover.

3. Apply Loctite to the 6 pump body screws and install them.

4. Mount the shim, the alignment pin, the driving gear, and the circlip on the pump shaft.

5. Install the pump in the engine. If it will not seat, rotate the driving gear enough to mesh it with the crankshaft gear.

6. Apply Loctite to the 3 pump mounting bolts. Install them and torque each one to 70 in.-lb.

7. Install the oil pan and its gasket.

8. Install the exhaust system.

9. Install the oil filter (for the procedure, see Chapter Two).

10. Add engine oil (for the procedure, see Chapter Two).

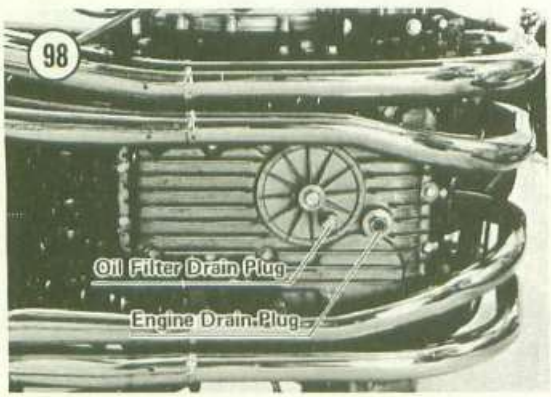
ASSEMBLIES INSIDE THE ENGINE CASES

1. Engine removal/installation
2. Splitting the engine cases
3. Crankshaft and camshaft chain removal/installation
4. Kickstarter
5. Transmission (Chapter Seven)

ENGINE REMOVAL/INSTALLATION

Removal

1. Remove the oil filter drain plug and the engine drain plug, and drain the oil from the engine (**Figure 98**).



2. Pull the right side cover and the left side cover (located below the saddle) off the bike.

3. Remove gas tank (Chapter Four).

4. Remove the exhaust system (Chapter Eight).

5. Pull the spark plug wires off the spark plugs.

6. Under the top frame tube, unplug the connectors joining the black wires and the green wires (**Figure 99**).



7. At the front of the cylinder head, unscrew the tachometer drive cable and remove it from the head.

8. Remove the carburetor block as an assembly (Chapter Four).

9. Take the screen off the top of the air cleaner.

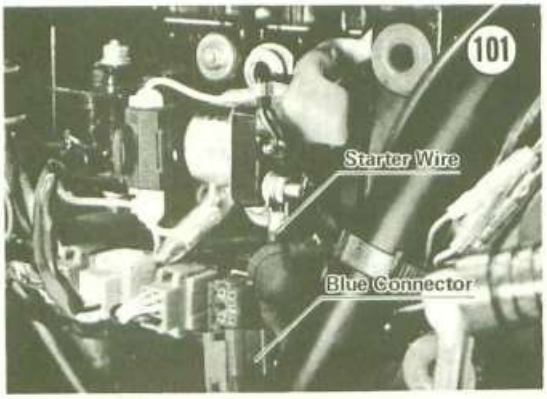
10. Atop the engine cases, work the oil breather hose clamp up the hose. Pull the hose off the oil breather.

11. Remove air cleaner assembly (**Figure 100**).



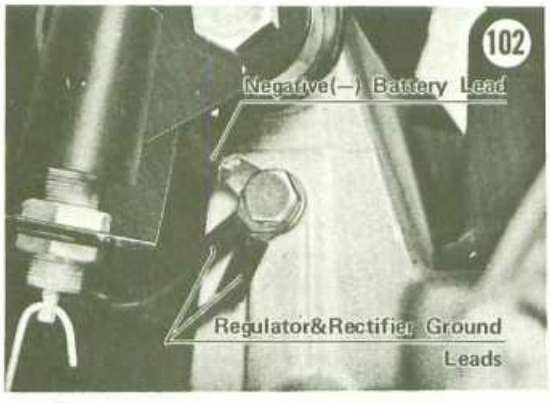
12. The starter relay is behind the right side cover, on the right side of the top row of elec-

trical components. Mounted to the right side of the relay is the thick starter cable. Pull down the rubber cap and unbolt the starter cable from the relay (**Figure 101**). Remove the cable from the cable clamp.



13. A blue alternator cable connector is behind the right side cover, on the right side of the bottom row of electrical components (Figure 101). Unplug it.

14. Unbolt the negative (black) battery wire from its ground on the engine. If other wires are grounded by the same bolt, release them also (**Figure 102**).



15. Unscrew the 2 cap nuts that mount the right front footpeg assembly to the motorcycle frame. Remove the footpeg assembly from its mounting studs.

16. Remove the chain cover (Chapter Seven).

17. Remove output sprocket (Chapter Seven).

18. To the rear of the kickstarter lever, remove the brake light switch from its mount. Unhook the spring.

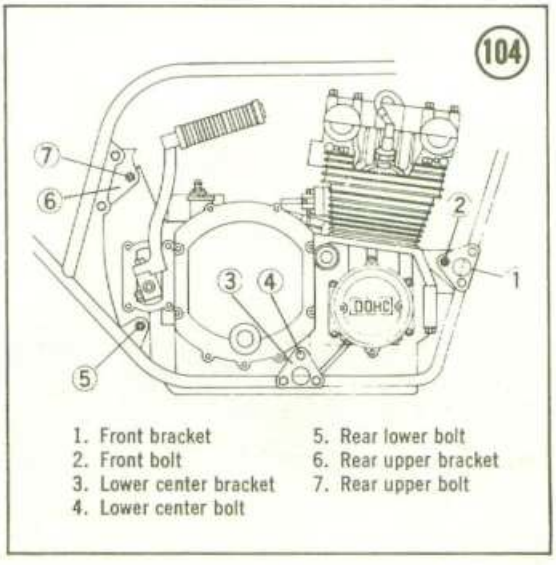
19. On the right side of the rear wheel, unscrew the brake rod nut until it is flush with the rear of the brake rod.

20. Loosen the locknut on the brake pedal positioning bolt, mounted above the pedal. Back out the bolt far enough to depress the pedal below the frame rail tube (**Figure 103**).



21. Place the motorcycle on its centerstand and a jack beneath the engine. Jack up the engine just enough to take the weight off the engine mount bolts.

22. Remove the short engine mount bolt from the lower center bracket on each side of the frame (**Figure 104**).



1. Front bracket
2. Front bolt
3. Lower center bracket
4. Lower center bolt
5. Rear lower bolt
6. Rear upper bracket
7. Rear upper bolt

23. On the right side of the frame, remove the 2 upper rear bracket mounting bolts. Remove the bracket.

24. Remove the 2 lower center bracket mounting bolts on the right side of the frame. Remove the bracket.

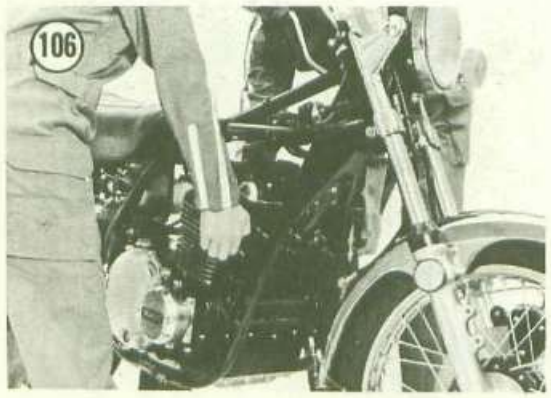
25. Remove the 2 front bracket mounting bolts on the right side of the frame. Remove the bracket.

26. Remove the (long) front, lower rear, and upper rear engine mount bolts.

27. Level the engine. Lift it one inch with the jack. Push the rear of the engine to the right until its mounting lug on the lower right side clears the mounting bracket on the frame (**Figure 105**).



28. Lift the front of the engine until it will clear the frame. Tilt the engine to the left and move it diagonally upward to the right to remove it from the frame (**Figure 106**).



Installation

1. With the motorcycle on its centerstand and the jack positioned beneath the frame, maneuver the engine into the frame using the reverse order of removal procedures.

2. Using the jack, align the engine's mounting lugs with the mounting brackets on the frame.

3. Loosely install the front, lower center, and upper rear mounting brackets on the right side of the frame.

4. From the left side of the engine, loosely install the 3 long engine mount bolts. When mounting the upper rear bolt, run it through the left side bracket, the long spacer, the engine, the short spacer, and the right side bracket.

5. Torque each frame bracket mounting bolt to 14.5-16.5 ft.-lb.

6. Torque each of the 3 long engine mount bolts to 47-50 ft.-lb. each.

7. Torque the 2 short (lower center) engine mount bolts to 26-29 ft.-lb. each.

8. Reassemble the remainder of the motorcycle in the reverse order of disassembly.

9. To adjust the throttle, clutch, rear brake, and rear brake light switch linkages, see Chapter Two. To add engine oil, see Chapter Two.

SPLITTING THE ENGINE CASES

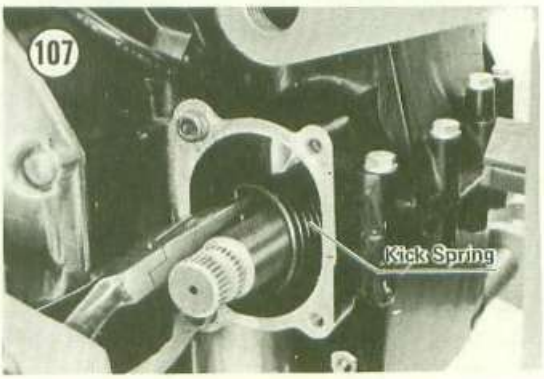
1. Remove the engine from the motorcycle.

2. Remove the mounting bolt at the bottom of the kickstarter lever. Pull kickstarter lever off the kickstarter shaft.

3. Remove the 4 bolts that mount the kickstarter mechanism cover to the engine. Pull off the cover and its gasket.

4. Pull the slotted spring guide off the kickstarter shaft.

5. Unhook the nearest end of the kickstarter return spring from the shaft. Unhook the other end and take out the spring (**Figure 107**).



6. Disassemble the clutch *if* you plan to remove the outer clutch hub from the transmission drive shaft after splitting the engine cases (for the procedures, see Chapter Seven).

7. Remove the ignition advance mechanism (Chapter Five).

8. Remove the 6 screws that mount the right engine cover. Remove the cover and its gasket.

9. Remove the alternator stator (see Steps 1-5, *Alternator Removal, Left Side Assemblies*). If you plan to perform the crankshaft inspections that require removal of the outer main bearings, remove the alternator rotor and starter clutch.

10. Remove the selector shaft. See *Gear Selector Mechanism*, Chapter Seven.

11. Remove the O-ring from the output shaft (**Figure 108**).

12. Remove starter motor (Chapter Seven).

13. Remove the 5 engine case bolts from the top of the engine, noting the location of the 2 cable clamps (**Figure 109**).

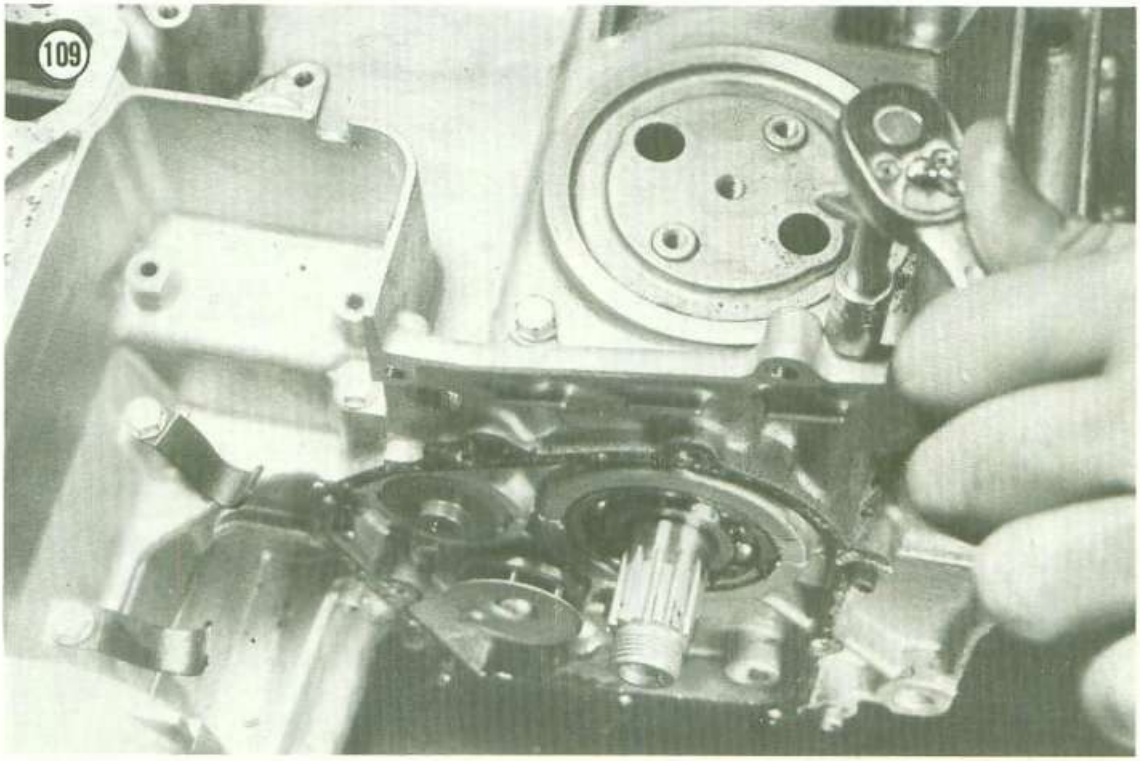
14. Turn the engine over. Remove the 17 bolts shown in **Figure 110** after you remove the oil filter assembly (**Figure 111**).

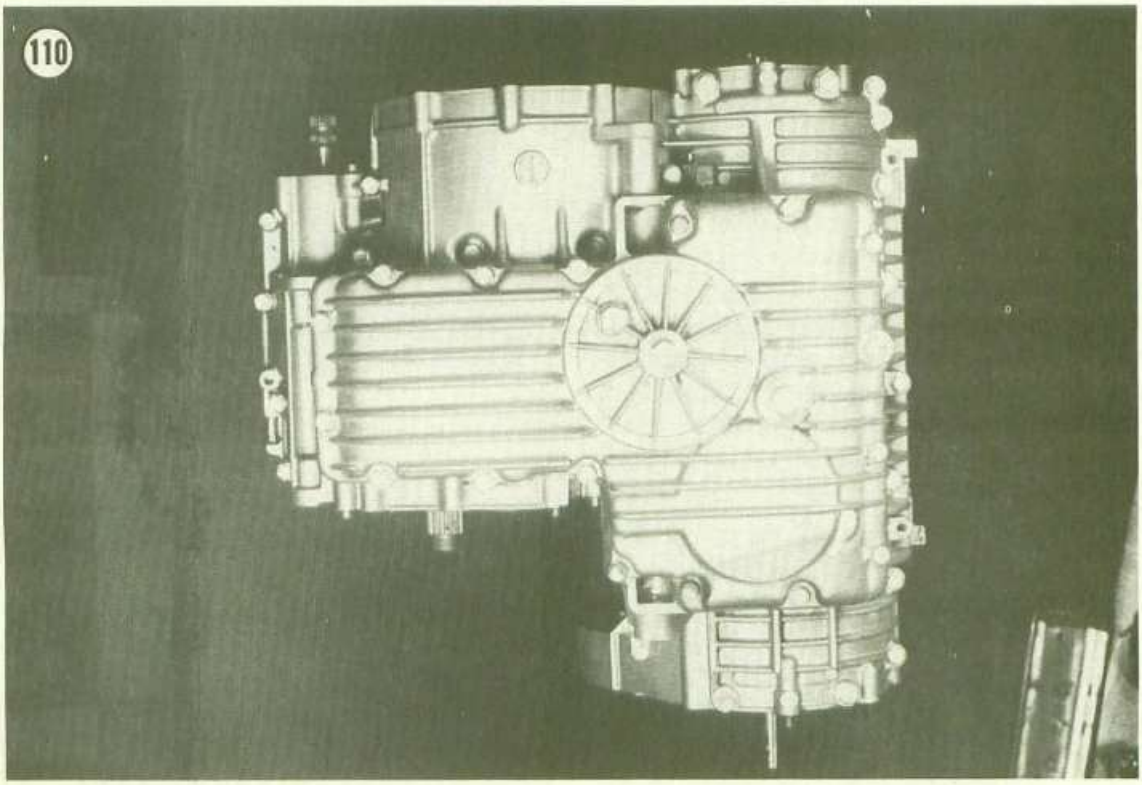


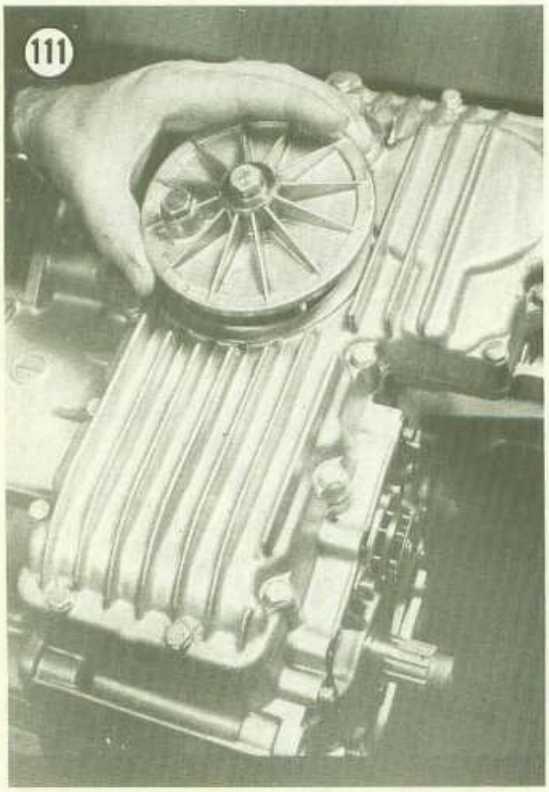
15. Tap the casting lightly with a soft mallet (**Figure 112**). Remove the casting.

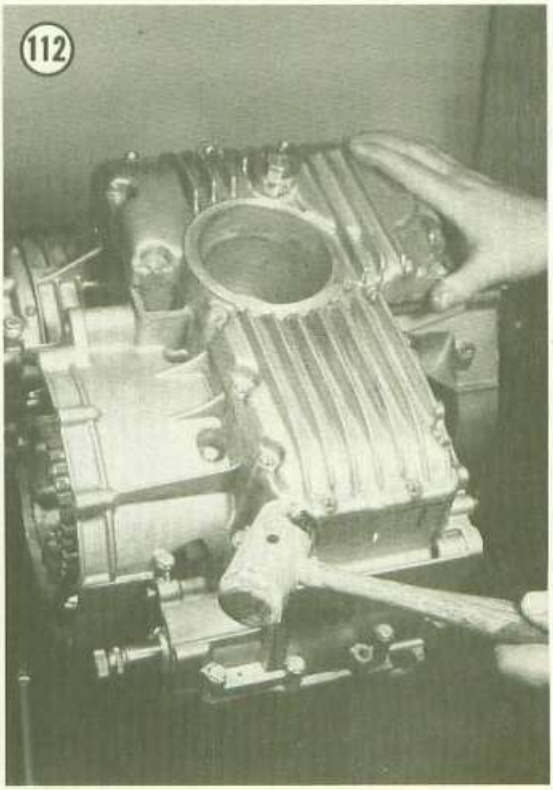
16. Remove the 3 bolts holding the oil pump in position on the bottom crankcase casting (**Figure 113**).

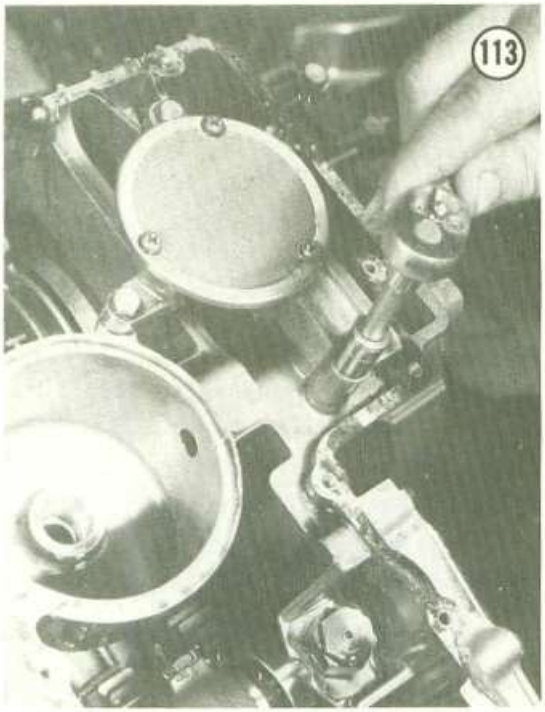
17. Tap the oil pump with a soft mallet to loosen it (it is positioned with a dowel). See **Figure 114**. Remove the oil pump as shown in **Figure 115**. With the oil pump out of the way, remove the bolts (situated on each side of the crankshaft) which hold the bottom crankcase casting, crankshaft, and top casting together.

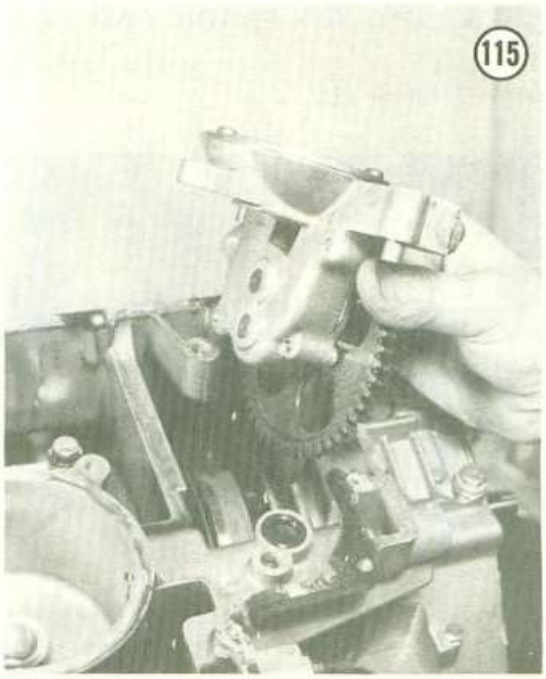


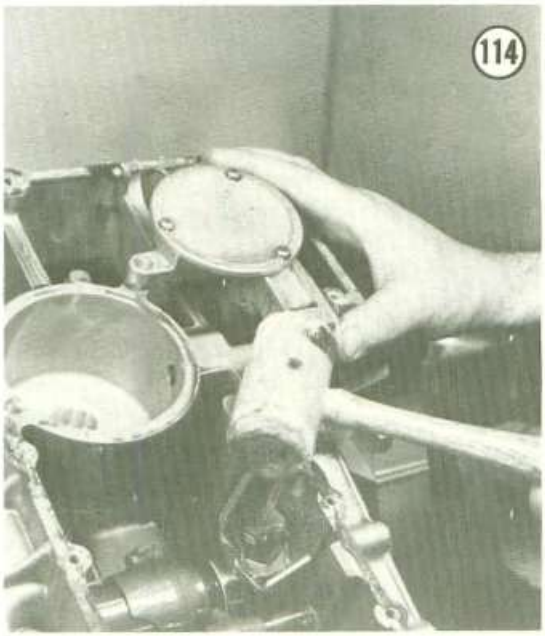

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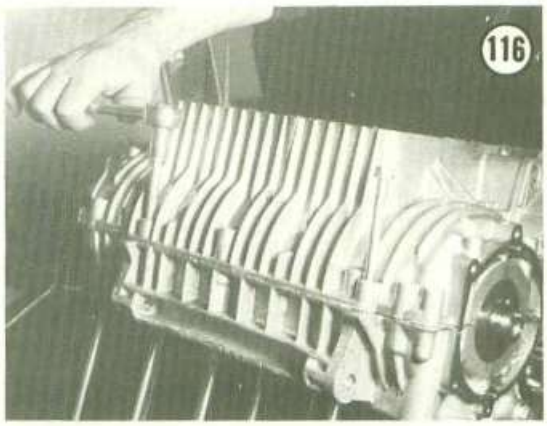

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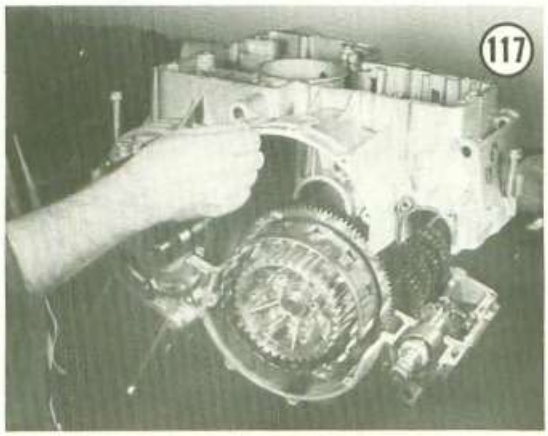

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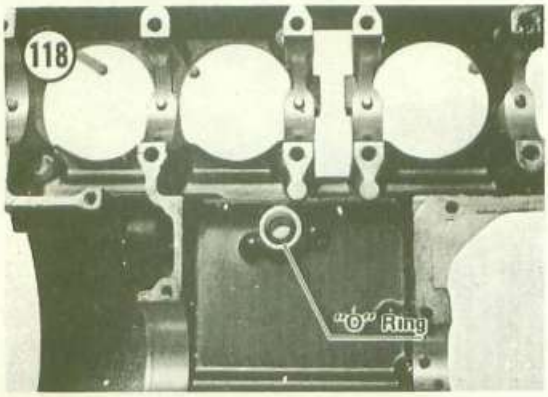


18. Use 2 engine bolts as jacking screws in the locations shown in **Figure 116**. It should not be necessary to pry or use a mallet. If you encounter resistance, check for bolts you may have missed.

19. Lift the bottom half off (**Figure 117**).

JOINING THE ENGINE CASES

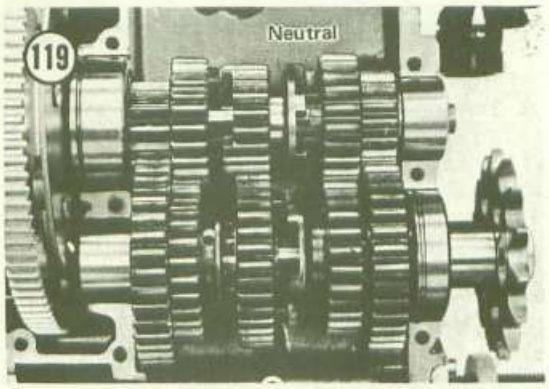
1. Check to see that the oil passage O-ring is in place (**Figure 118**).



2. While installing the kickstarter shaft, the transmission drive shaft, or the output shaft, position the shaft above its mounting bosses and rotate each bushing on the shaft so that the alignment pin in the engine case will enter the alignment hole in the bushing. Position each ball bearing assembly on the shaft so that the alignment ring in the engine case boss will mate with the groove in the bearing.

3. Rotate the shifter drum to the NEUTRAL position, so that the neutral plunger will bottom in the neutral dimple of the drum.

4. Align the transmission gears in the NEUTRAL position (**Figure 119**).

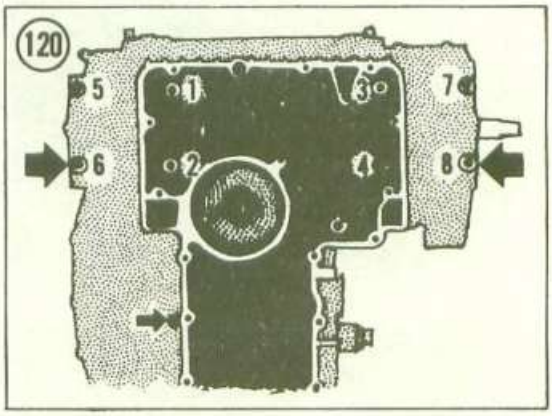


5. Clean the mating surfaces of the engine cases. Spread liquid gasket on the mating surface of the bottom engine case.

6. Assemble the engine cases, fitting the arm of the middle shifter fork into the groove in 3rd gear on the drive shaft, and the arms of the other 2 shifter forks into the grooves of their gears on the output shaft.

7. With the bottom of the engine facing up, loosely install the 8 larger (8mm) engine case bolts. Apply Loctite to the threads of bolts No. 6 and No. 8, and apply No. 1 sealer to the underside of their heads.

8. Torque the 8 engine case bolts to 18 ft.-lb., using the sequence shown in **Figure 120**.



9. Loosely install the 17 smaller (6mm) engine case bolts in the bottom case. Apply Loctite to the threads of the bolt indicated by the remaining arrow in Figure 120.

10. Install the 5 (6mm) engine case bolts in the upper engine case.

11. Torque the 22 (6mm) engine case bolts to 70 in.-lb.

12. To complete the engine reassembly, follow the remaining disassembly procedures in the reverse order, except for installation of the kickstarter spring and cover which is discussed below.

13. Put the kickstarter spring on the kickstarter shaft, and hook the end of the spring closer to the engine case. Rotate the kickstarter shaft clockwise as far as it will go. Work the near end of the spring into its hole in the kickstarter shaft.

14. Put the slotted spring guide on the kickstarter shaft.

15. Put the kickstarter mechanism cover gasket on the engine.

16. Use the oil seal guide (Kawasaki has a special tool) to mount the kickstarter mechanism cover on the engine. Install the 4 mounting bolts.

CRANKSHAFT AND CAMSHAFT CHAIN

Disassembling the crankshaft for repairs is impractical, because of the specialized machinery required. If the crankshaft assembly is defective, it should be replaced with a new one or possibly arrangements can be made with a Kawasaki dealer to have the old one rebuilt.

Removal

1. Remove the engine from the motorcycle.
2. Remove the camshafts (Chapter Seven).
3. Remove the cylinder head (see procedure in this chapter).
4. Remove the cylinder block and pistons (see procedure in this chapter).
5. Remove the chain guide wheel.
6. Split the engine cases.
7. With the upper engine case upside down, remove the 4 bolts from the bearing cap mounted on the center of the crankshaft. Remove the bearing cap. See **Figure 121**.

NOTE: *The bearing cap is machined in combination with the engine case. If the bearing cap is damaged, both it and the engine cases must be replaced as a set.*

8. Lift the crankshaft out of the engine case. Take off the cam chain. See **Figure 122**.





Inspection

The crankshaft assembly should be checked for runout, main bearing wear, proper clearances at the big end bearings, and bent or twisted connecting rods.

To check the crankshaft for runout:

1. Remove the main bearing from each end of the crankshaft. Lay the exposed bearing surfaces in V-blocks on a flat surface.
2. Position a dial gauge so that its probe bears perpendicularly against the face of one of the remaining main bearings.

3. Rotate the crankshaft, and write down the minimum and maximum dial gauge readings. Subtract the minimum from the maximum to get the runout.

4. Similarly, read the runout at each of the other main bearings.

5. A new crankshaft assembly has less than 0.0012 in. (0.03mm) of runout at any of the main bearings. If more than 0.004 in. (0.1mm) of runout is measured at any main bearing, replace the crankshaft assembly with a new one.

6. Leave off the end main bearings if you wish to continue the crankshaft inspections. Otherwise, reinstall them.

To check the big end bearings for radial clearance:

1. Remove the main bearing from each end of the crankshaft. Lay the exposed bearing surfaces of the crankshaft in V-blocks on a flat surface.

2. Rotate the crankshaft until one of the connecting rods is pointing straight down. Position a dial gauge above the crankshaft so that it bears against the bottom of the connecting rod at the big end, parallel to the shaft of the rod.

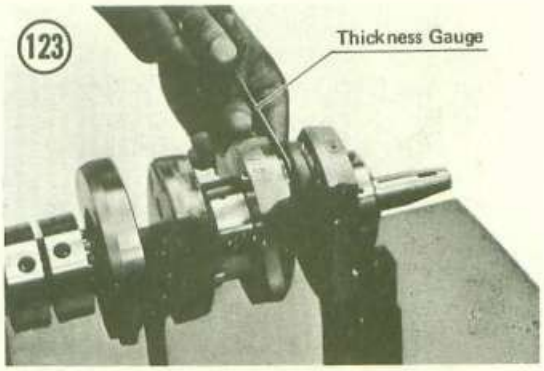
3. Push upward on the shaft of the connecting rod, to get a maximum reading on the dial gauge (without rotating the crankshaft). Pull downward on the shaft to get a minimum reading. Subtract the minimum from the maximum to get the radial clearance.

4. Take the same measurements at each of the remaining connecting rods.

5. A new crankshaft assembly has big end radial clearance of 0.0006-0.0012 in. (0.016-0.030mm). If any big end bearing has a radial clearance greater than 0.0031 in. (0.08mm), replace the crankshaft assembly with a new one.

To check the big end bearings for side clearance:

1. Rotate the crankshaft until one of the connecting rods is pointing straight down. From the top of the crankshaft, insert feeler gauges between the side of the connecting rod and the side of the flywheel (**Figure 123**).



2. Check the big end of each remaining connecting rod for side clearance in the same way.

3. A new crankshaft assembly has big end side clearances of 0.012-0.016 in. (0.3-0.4mm). If any big end has a side clearance greater than 0.024 in. (0.6mm), replace the crankshaft assembly with a new one.

To check for bent or twisted connecting rods:

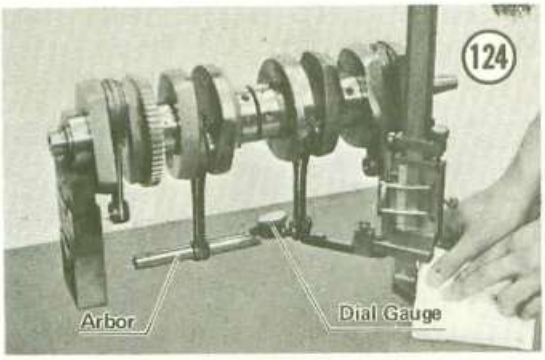
1. Remove the main bearing from each end of the crankshaft. Lay the exposed bearing surfaces of the crankshaft in V-blocks on a flat surface.

2. Rotate the crankshaft until one of the connecting rods is facing straight down. Insert a 4 in. or longer arbor (rod) of the same diameter as the wristpin into the wristpin bearing of the connecting rod. Center the arbor in the bearing.

3. Position a dial gauge (or height gauge) atop the arbor at a point 2 in. out from the center of the wristpin bearing. Adjust the dial gauge so that its probe is depressed 0.010 in. Without disturbing any of the dial gauge adjustments, take another reading at the other end of the arbor, 2 in. from the center of the wristpin bearing. Subtract the smaller reading from the larger reading to find the amount of bend in the connecting rod per 4 in. of arbor. See **Figure 124**, disregard the end bearings.

4. Take the same measurments of bend on the remaining connecting rods.

5. A new connecting rod has less than 0.002 in. (0.05mm) of bend measured with a 4 in. arbor. If any connecting rod has more than 0.008 in. (0.2mm) of bend, replace the crankshaft assembly with a new one.



6. Rotate a connecting rod that was hanging straight down 90 degrees in either direction and support it there, so that the centers of the big end and wristpin bearings are in a line parallel with the flat surface.

7. Insert an arbor into the wristpin bearing, and with a dial gauge or height gauge again compare the heights of the arbor at points 2 in. from the center of the wristpin bearing. Subtract one reading from the other to find the amount of connecting rod twist per 4 in. of arbor.

8. Take the same measurements of twist on the remaining connecting rods.

9. A new connecting rod has less than 0.002 in. (0.05mm) of twist per 4 in. of arbor. If any connecting rod has more than 0.008 in. (0.2mm) of twist, replace the crankshaft assembly with a new one.

To check the main bearings for wear:

1. Be careful not to rotate the main bearings while cleaning them. Wash each one with suitable solvent, blow it dry with compressed air, and lubricate it with motor oil.

2. Rotate each bearing slowly by hand. Check that it turns smoothly and has no rough spots.

3. Spin each bearing and listen for noise.

4. If either of the outer main bearings feels rough or spins noisily, replace it with a new one. If any other bearing is similarly worn or damaged, replace the crankshaft with a new one.

Reassembly

1. Turn the upper engine case upside down.

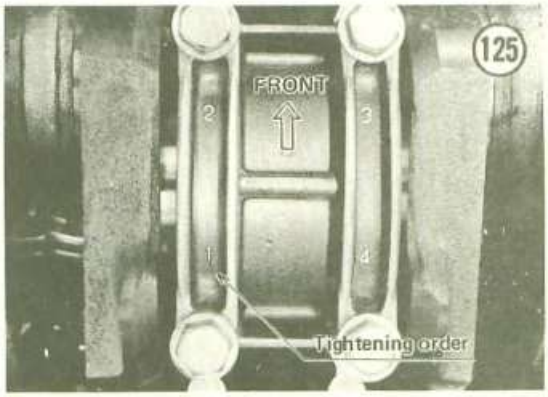
2. Position the cam chain on the crankshaft.

3. Hold the crankshaft above the engine case. Rotate each bearing so that its alignment hole will mate with the pin in the engine case bearing boss.

4. Put the crankshaft in the engine case.

5. Fit the crankshaft bearing cap to the engine case at the center of the crankshaft so that the arrow on the cap points toward the front of the engine.

6. Install the 4 bearing cap bolts loosely. Torque each one to 18 ft.-lb., using the sequence shown in **Figure 125**.



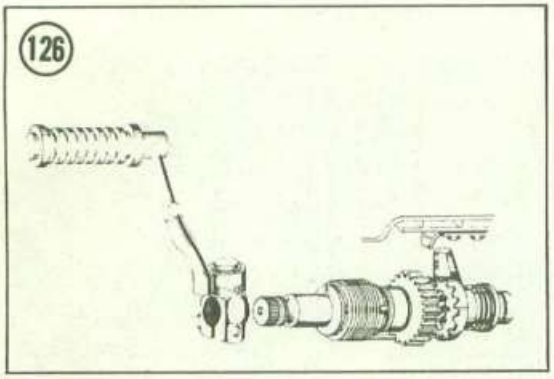
7. To complete reassembly, follow the reverse order of remaining disassembly procedures.

KICKSTARTER

Kickstarter Operation

The kickstarter shaft is located between the transmission output shaft and the rear of the engine. The kickstarter gear on the kickstarter shaft is always meshed with 1st gear on the output shaft, which is not locked to the output shaft but spins freely on it, except when 1st gear is engaged. The 1st gear on the output shaft is meshed with 1st gear on the drive shaft, which is locked to its shaft. When the kickstarter is operated with the transmission in neutral and the clutch engaged, the kickstarter gear turns 1st gear on the output shaft, which turns 1st gear on the drive shaft, which turns the drive shaft, which turns the clutch, which turns the crankshaft. Whenever the engine is running and the clutch is engaged and the drive shaft is running, the kickstarter gear is also turning.

The kickstarter gear is not locked to the kickstarter shaft, but can spin freely on it. A ratchet gear is splined to the kickstarter shaft and can move along it. An engaging spring behind it tries to force the ratchet gear along the shaft into engagement with the ratchet teeth in the side of the kickstarter gear. But the ratchet gear has an arm on it; when the kickstarter shaft is in its normal position, a camming ramp on the engine case holds the arm and keeps the ratchet gear from engaging kickstarter gear. See **Figure 126**.



When the kickstarter shaft is rotated clockwise, the arm on the ratchet gear is freed from the camming ramp. The engaging spring moves the ratchet gear against the kickstarter gear. The teeth engage, and the ratchet gear locks the kickstarter gear to the kickstarter shaft.

The kickstarter assembly is returned to its normal disengaged position by the kickstarter return spring. If the spring weakens or breaks, the shaft will not return completely, and the ratchets may stay partially engaged while the engine is running.

The kickstarter return spring can be replaced without splitting the engine cases. To get at the spring, simply take off the kickstarter lever, and the kickstarter mechanism cover. The procedures for removing and installing the kickstarter return spring are covered in the instructions for splitting and reassembling the engine cases. For all other repairs to the kickstarter mechanism, you will need to split the engine cases.

Disassembly

1. Remove the engine from the frame.
2. Split the engine cases.
3. Remove the kickstarter shaft retaining bolt as shown in **Figure 127**. Slide the kickstarter from the shaft.



4. Remove the 4 screws holding the kickstarter shaft cover to the lower end (**Figure 128**).



5. Tap the cover loose with a soft mallet as shown in **Figure 129**. Remove the cover.
6. To strip the kickstarter shaft, remove the 2 circlips from the splined portion of the shaft. Then slide off the cap, the engaging spring, the ratchet gear, the washer, the kickstarter gear, the other washer, and the bushing (**Figure 130**).

Inspection

1. Visually inspect the arm on the ratchet gear and the camming ramp bolted to the upper



engine case. If either component shows excess wear or damage, replace it with a new one.

2. With the kickstarter components assembled on the shaft, hold the ratchet gear in approximately the same position on the shaft as it is positioned by the camming clamp. Release the ratchet gear and check to see that it engages quickly and firmly with the kickstarter gear. If it does not, check for damaged splines or a weak engaging spring. Replace any worn or damaged components with new ones.

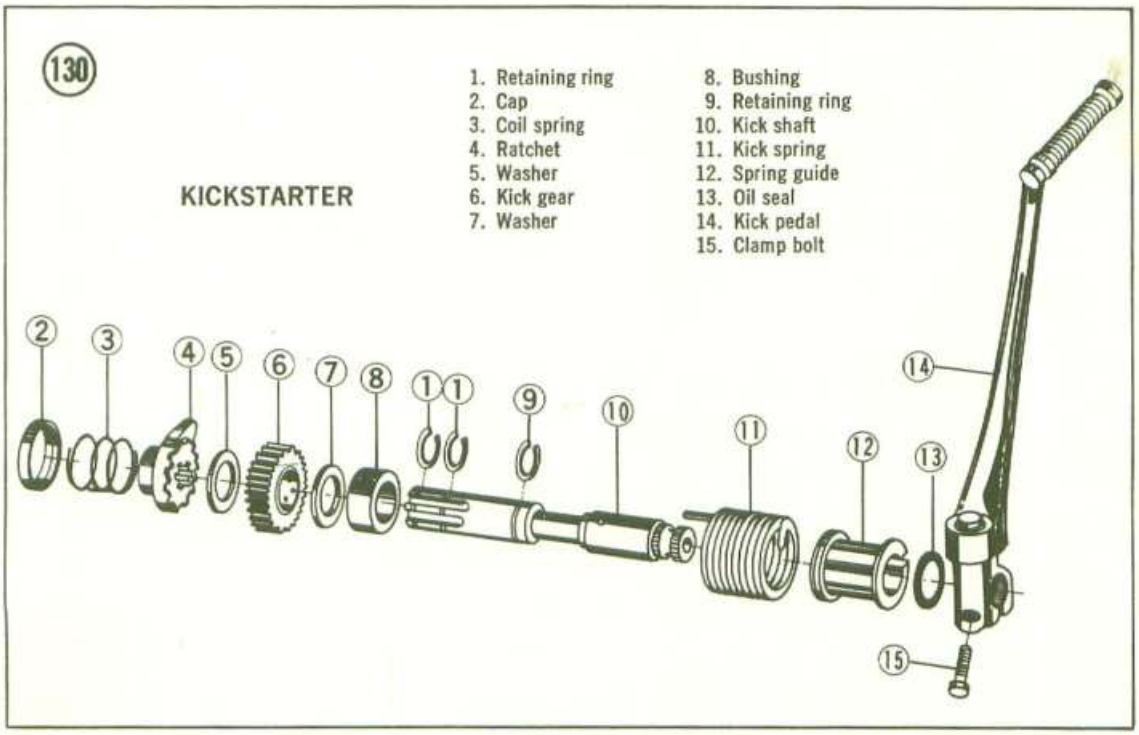
3. Visually inspect the ratchet teeth on the kickstarter gear and the ratchet gear. If either gear shows worn or damaged ratchet teeth, replace both gears with new ones.

4. Visually inspect the gear teeth on the kickstarter gear and 1st gear on the output shaft. If either gear shows worn or damaged teeth, replace kickstarter gear, 1st gear on output shaft, and 1st gear on drive shaft with new ones.

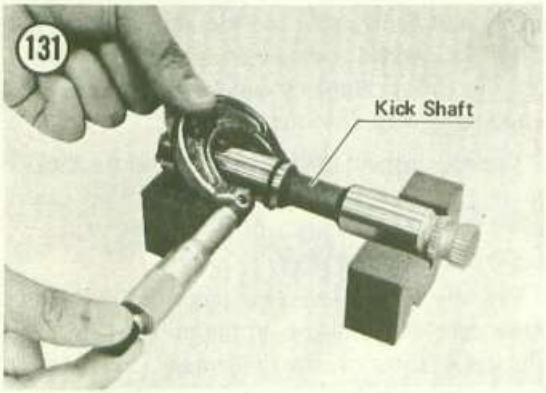
5. Measure the inside diameter of the center hole in the kickstarter gear with calipers.

6. A new kickstarter gear has a center hole diameter of 0.865-0.866 in. (21.98-22.0mm). If the diameter of the center hole is greater than 0.868 in. (22.05mm), replace the kickstarter gear with a new one.

7. With a micrometer, measure the outside diameter of the kickstarter shaft at the bearing



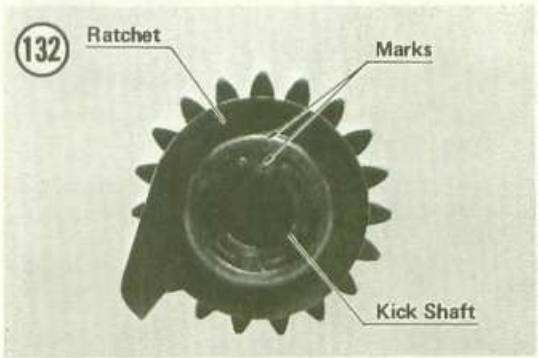
surface where the kickstarter gear is mounted (**Figure 131**).



8. A new kickstarter shaft has a bearing surface with an outside diameter of 0.864-0.865 in. (21.94-21.96mm). If the outside diameter is less than 0.863 in. (21.91mm), replace kickstarter shaft with a new one.

Reassembly

1. Reassemble the components on the kickstarter shaft in the reverse order of removal.
2. When fitting the ratchet gear to the splines of the shaft, align the mark on the gear with the mark on the end of the shaft (**Figure 132**).



3. Reassemble and install the engine in the reverse order of its removal and disassembly.

CHAPTER SEVEN

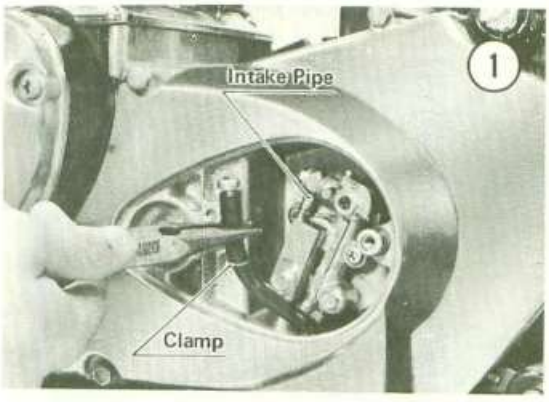
CLUTCH AND TRANSMISSION

CHAIN COVER

The chain cover mounts the chain oil pump and the clutch release mechanism. Remove the cover to gain access to the clutch release mechanism; it need not be removed for repairs to the chain oil pump.

Removal/Installation

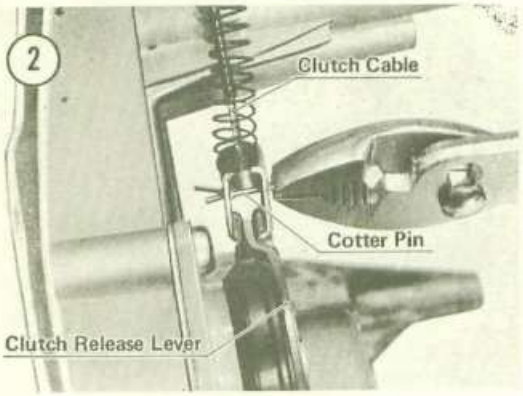
1. On the left side of the engine, remove the 2 screws that mount the oil pump cover to the chain cover. Remove the oil pump cover and its gasket.
2. Push the hose clamp on the oil intake tube far enough down the tube to free it from the chain oil pump nipple. Pull the tube off the pump. Plug the end of the tube with a screw to prevent oil from leaking out (**Figure 1**).
3. Unscrew the 2 cap nuts that mount left front footpeg assembly to motorcycle frame. Remove footpeg assembly from its mounting studs.
4. Remove the clamp bolt from the rear of the gearshift lever. Pull the lever off selector shaft.
5. On the left side of the engine behind the cylinder block, remove the 2 screws and flat washers that mount the starter motor cover. Remove the cover and its gasket.
6. Remove the 4 bolts that mount the chain cover to the engine. Remove the chain cover, being careful not to damage the selector shaft oil seals or the chain oil pump shaft in the rear.



7. At the rear of the chain cover, remove the cotter pin securing the clutch cable to the clutch release mechanism. Unhook the clutch cable (**Figure 2**).

Install as follows:

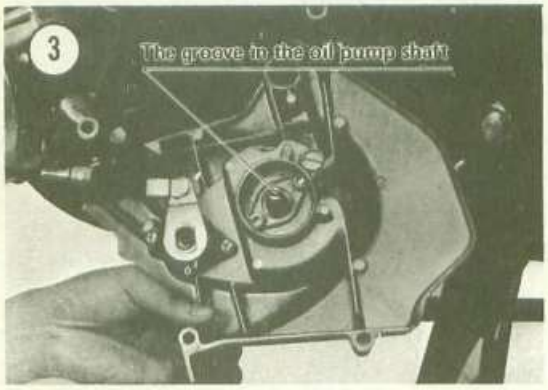
8. Bottom the clutch cable adjusters, and back out the clutch release adjuster screw.
9. Butt the bottom end of the outer clutch cable against its stop in the front of the chain cover.
10. Fit the clutch release spring to the exposed inner clutch cable.
11. Hook the bottom clutch cable fitting into the cable mount on the arm of the clutch release





mechanism. Insert the cotter pin through the cable mount, and spread its legs. Adjust the clutch linkage as described in Chapter Two.

12. At the rear of the chain cover, rotate the oil pump shaft until the slot in the shaft will be positioned horizontally when the cover is mounted (**Figure 3**).

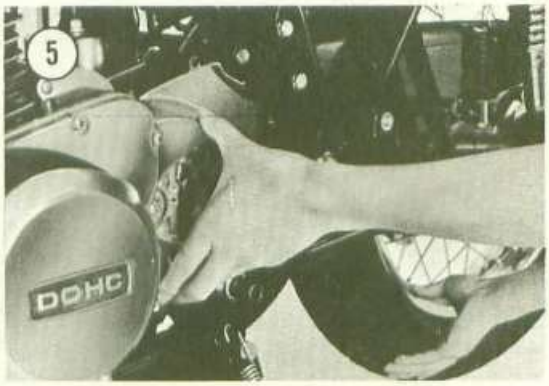


13. Rotate the rear wheel until the pin in the end of the transmission output shaft is aligned to fit the slot in the oil pump shaft.

14. From the outside of the chain cover, slide the oil seal guide (a Kawasaki dealer has a special tool available) into the selector shaft passage in the lower right corner of the cover (**Figure 4**).

15. Press the chain cover into place on the engine. If it will not bottom, rock the rear wheel back and forth until the output shaft will couple with the chain oil pump shaft (**Figure 5**).

16. Install the 4 bolts that mount the chain cover.



17. Install the starter motor cover and gasket.
18. Install the gearshift lever.
19. Install the left front footpeg.
20. Install the chain oil pump intake tube.
21. Install the oil pump cover.

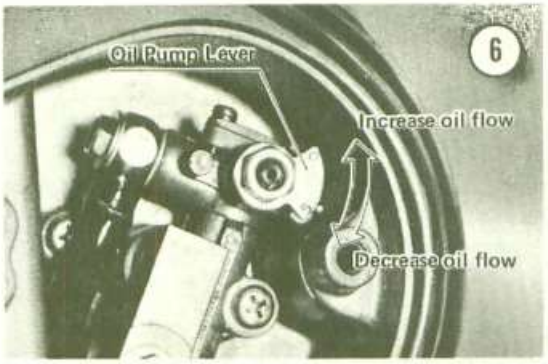
CHAIN OIL PUMP (1973-1974 MODELS ONLY)

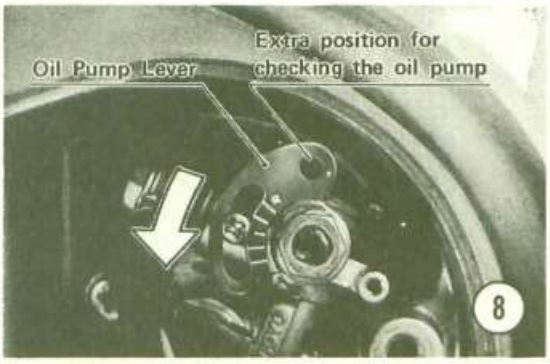
The chain oil pump was discontinued with the 1975 model.

Operation

The chain oil pump is connected to the transmission output shaft, which is hollow. Oil flows from the reservoir (behind the left side cover), through the pump, through the output shaft, and out around the output sprocket to the rear chain.

The flow rate is varied in 2 ways. An adjustable cam varies the amount of oil delivered by each rotation of the pump shaft (**Figure 6**). Since

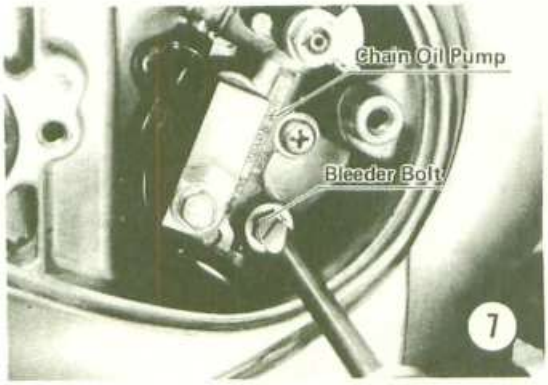




the pump is driven by the transmission output shaft, the rpm of the pump shaft varies with that of the output shaft.

Bleeding the Pump

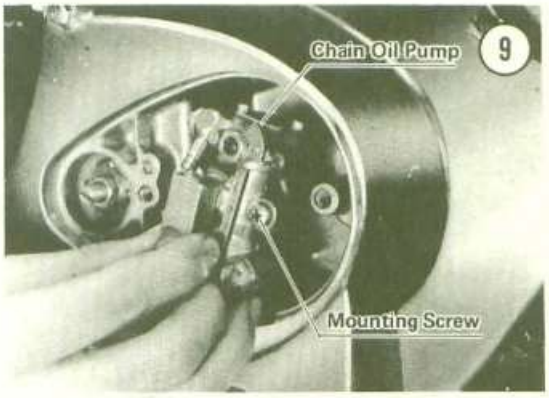
If the chain oil tank runs dry, the pump will get an air lock which must be bled. Unscrew the bleeder bolt on the pump body (**Figure 7**). Run the engine with the bike on the centerstand, in gear, until oil flows out of the bleeder hole. Screw in the bleeder bolt.



Testing the Pump

All 1974-1976 models have a redesigned pump with a built-in test device, as indicated by a hole drilled in the upper right corner of the flow rate plate (**Figure 8**). To use the test device, remove the oil pump cover, remove the Phillips screw that locks the flow rate plate, rotate the plate counterclockwise until the additional hole in the plate is aligned with the screwhole, and install and tighten the Phillips screw.

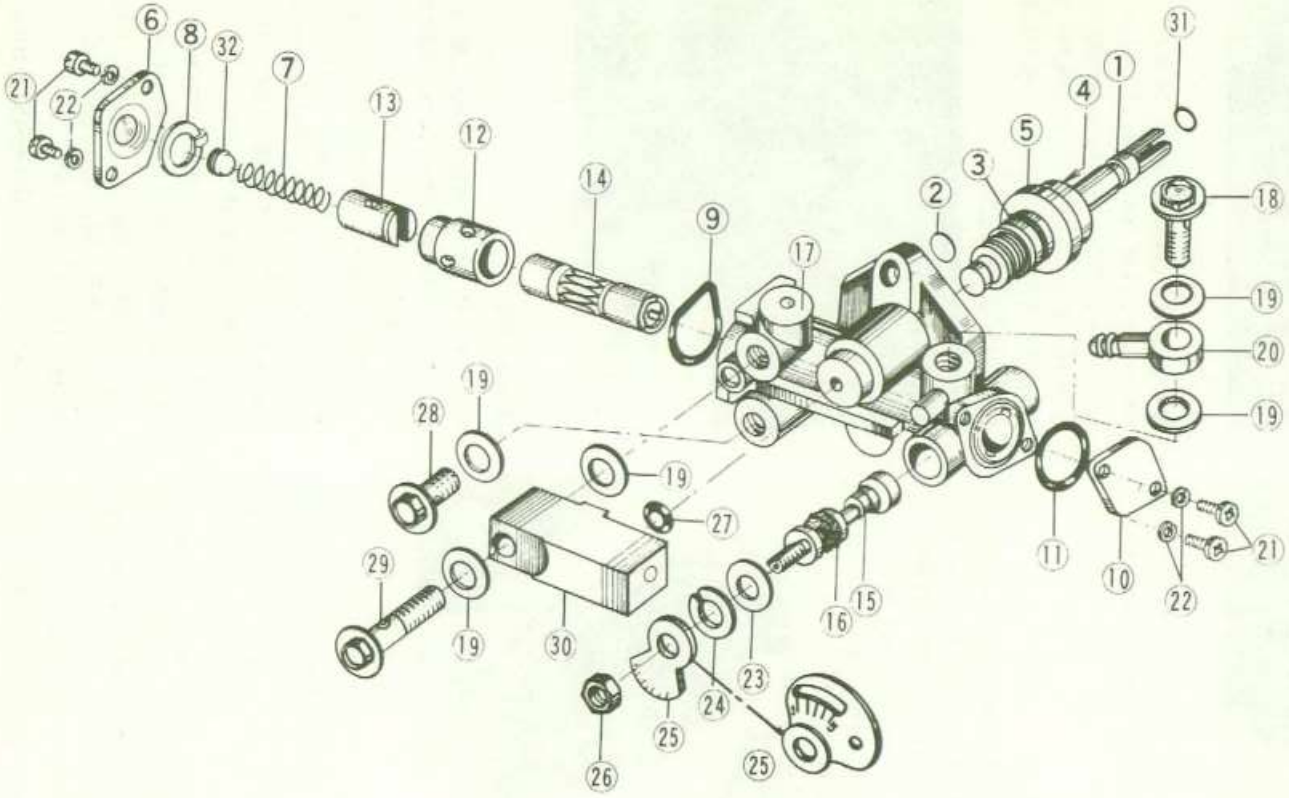
Put the motorcycle on the centerstand. Start the engine, shift into first gear, and hold the rpm at 2,000 for 2 minutes. Shut off the engine and observe the rear chain. If it has been well oiled, the pump is working properly; reset the flow rate plate. If the chain has not been oiled properly, remove the pump and replace it with a new one (**Figure 9**).



Disassembly

1. Remove the 2 screws that mount the oil pump cover to the chain cover. Remove the oil pump cover.
2. Push the hose clamp on the oil intake tube far enough down the tube to free it from the chain oil pump nipple. Pull the tube off the pump. Plug the end of the tube with a screw to prevent oil from leaking out.
3. Remove the 2 Phillips pump mounting screws. Remove the pump from the chain cover.
4. To remove the pump shaft, wrap it with cloth, grasp it with pliers, and pull it out of the pump body (**Figure 10**).
5. Remove the circular bushing from the pump shaft. Pry out the oil seal and/or the O-ring.

(10)



OIL PUMP

1. Pump shaft
2. Spacer
3. O-ring
4. Oil seal
5. Bushing
6. Cup
7. Plunger spring
8. Valve sleeve stopper
9. O-ring
10. Cap
11. O-ring
12. Valve sleeve
13. Plunger follower
14. Plunger
15. Control cam
16. V-ring
17. Oil pump body
18. Banjo bolt
19. Washer
20. Banjo
21. Bolt
22. Lockwasher
23. Washer
24. Lockwasher
25. Control lever
26. Nut
27. O-ring
28. Bleeder bolt
29. Bolt
30. Check valve
31. O-ring
32. Spring seat

6. To remove the O-ring beneath the top cap, remove the 2 screws and flat washers from the top cap. Lift off the cap and remove the O-ring.

7. To remove the O-ring inside the bottom cap, remove the 2 screws that mount the bottom cap. Take off the bottom cap. Take out the plunger spring, the valve spring stop, and the spring seat. Pry out the O-ring.

8. To remove the plunger, insert a thin rod at the top of the pump body, and push down against the top of the plunger. The valve sleeve, plunger follower, and plunger will come out of the bottom of the pump body.

9. To remove the rectangular check valve unit, unscrew the bolt that mounts it to pump body.

Inspection

1. If the pump will deliver oil to the check valve but not through it, remove the check valve and clean it by injecting gasoline with a hypodermic syringe. Do not use compressed air.

2. If the check valve will pass oil in both directions, replace it with a new check valve.

3. If output of pump is too low, or if pump body leaks, the most probable cause is deterioration of O-rings or pump shaft oil seal. Replace them with new ones. If that does not solve the problem, replace pump with a new one.

Reassembly

1. Oil all internal parts of the pump, including the seals and the O-rings.

2. To reassemble the main body of the pump, insert the following parts from the bottom in the following sequence: the plunger (cam and pin end first); the sleeve (large end first); the follower (slotted end first); the O-ring (on the base); the plunger spring; the spring seat; the sleeve stop; and the bottom cap. Install the 2 screws and lockwashers.

3. To install the pump shaft, insert the spacer into the shaft housing in the pump body.

4. Fit the bushing to the pump shaft, and press the shaft into its housing.

5. To install the check valve, fit a washer to each side of the check valve body, and install the mounting bolt.

6. To install the top cap, fit the O-ring and top cap to the top of the pump body. Install the 2 screws and flat washers.

7. To install the pump on the chain cover, note the positioning of the pin on the end of the transmission output shaft. Rotate the pump shaft so that its slot will be aligned with the pin when the pump is installed.

8. Fit the pump to the chain cover. If the pump shaft will not engage the output shaft, put the motorcycle in gear and work the rear wheel back and forth until the 2 shafts will engage.

9. Apply Loctite to the 2 pump mounting screws. Install the screws.

10. Fit the oil intake tube and its clamp to the pump nipple.

11. Remove the bleeder screw. Bleed the air out of the pump. Install the bleeder screw.

12. Fit the oil pump cover and its gasket to the chain cover. Install the 2 mounting screws.

CLUTCH RELEASE MECHANISM

Operation

The clutch release mechanism is mounted to the rear of the chain cover. The 2-piece mechanism consists of a spiral gear with an arm, riding in a base with spiral gearing (**Figure 11**). The clutch cable is attached to the arm; when pulled, it rotates the spiral gear which is cammed outward from the base. The adjusting screw in the spiral gear then pushes against the clutch pushrod, which extends through the hollow transmission drive shaft and—through additional linkage—operates the clutch.

Disassembly

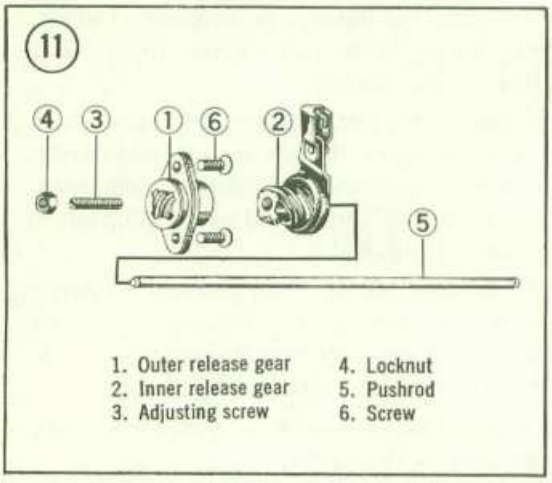
1. Remove the chain cover.

2. Unscrew the spiral gear from its base.

3. Remove the 2 screws that mount the base to the chain cover.

Inspection

1. Visually inspect the spiral gear surfaces for damage. Repair slight damage with an oilstone.



If the surfaces are seriously damaged, replace the mechanism with a new one.

2. Screw the gear together. Hold the base steady while pushing and pulling against the spiral gear. If there is excess play, replace the mechanism with a new one.

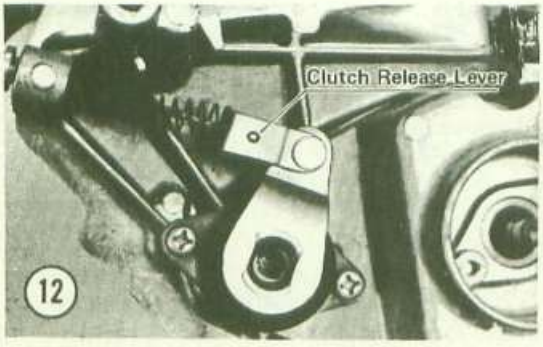
3. Work the clutch cable mount to make certain that it pivots freely on its arm. If it is binding, and you cannot free it, replace mechanism with a new one.

Reassembly

1. Lubricate both spiral gears with cup grease.

2. Apply Loctite to the 2 base mounting screws. Install the base on the chain cover.

3. Screw the spiral gear into the base, such that when the pivoted inner clutch cable mount is aligned with the outer cable stop on the chain cover, the arm on the end of the spiral gear will be pointing upward, forming a 90 degree angle with the pivoted inner cable mount (**Figure 12**).



4. Install the chain cover. Adjust the clutch linkage, per the procedure in Chapter Two.

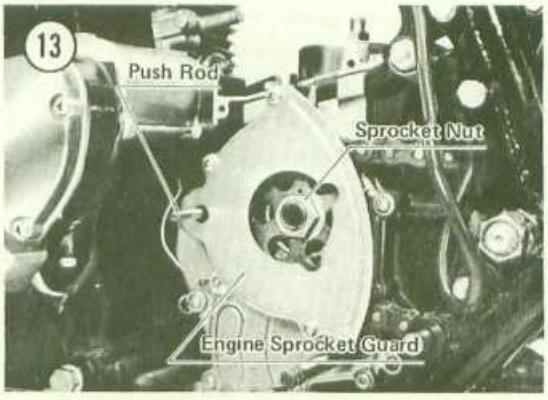
OUTPUT SPROCKET

The output sprocket is mounted on the left end of the transmission output shaft, behind the chain cover. It drives the rear chain, which drives the rear sprocket. The rear chain is an endless chain, without a master link. To remove the rear chain, remove the output sprocket from the output shaft. For chain inspection and repair procedures, see Chapter Eight.

Removal

1. Remove the clutch cover.

2. Pull the clutch pushrod out of the transmission drive shaft, to the left of the output sprocket (**Figure 13**).



3. Remove the 4 screws that mount the sprocket guard in front of the output sprocket. Remove the guard.

4. At the end of the output shaft, use a cold chisel and a hammer to bend the tab of the washer behind the sprocket nut away from the nut. Use a hammer and a drift to flatten the tab against the output sprocket.

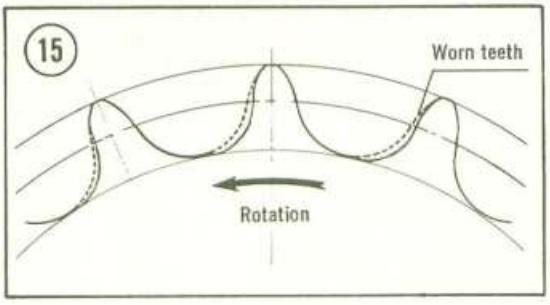
5. Fit the pegs of the sprocket holder (a Kawasaki dealer has a special tool available) into the holes drilled in the output sprocket. Hook the handle of the tool against the bottom of the upper footpeg amount stud or the swing arm. Use a socket on a strong tommy bar to turn the sprocket nut counterclockwise to loosen it. See **Figure 14**.



6. Remove the sprocket nut, the tab washer, and the output sprocket from the output shaft.

Inspection

1. Inspect the teeth on the output sprocket. If the teeth are visibly worn, replace the sprocket with a new one (**Figure 15**).



2. Use calipers to measure the outside diameter of the output sprocket, at the base of the teeth.

3. A new output sprocket has an outside diameter of 3.376-3.384 in. (85.76-85.96mm). If the diameter of the sprocket is less than 3.346 in. (85mm), replace it with a new one.

Installation

1. Position rear chain on the output sprocket.

2. Fit the output sprocket to its splines on the output shaft. If the sprocket won't go on the shaft because the rear chain is too tight, move the rear wheel forward in the swing arm to loosen the chain.

3. Butt the tab washer against the output sprocket, so that the tang on the washer fits into one of the sprocket holes.

4. Loosely install the output sprocket nut.

5. Fit the pegs of the sprocket holding tool into the holes of the output sprocket. Hook the handle of the tool against the swing arm. With a torque wrench and a socket, torque the sprocket nut to 87-108 ft.-lb.

6. Use a hammer and a chisel to begin bending up one side of the tab washer.

7. Use a hammer and a drift to finish bending one side of the tab washer up against one flat of the sprocket nut.

8. Position the sprocket guard in front of the output sprocket. Install the 4 mounting screws.

9. Insert the clutch pushrod into the transmission drive shaft.

10. Install the clutch cover.

11. If necessary, reposition the rear wheel in the swing arm, to adjust the tension of the rear chain.

STARTER MOTOR CLUTCH

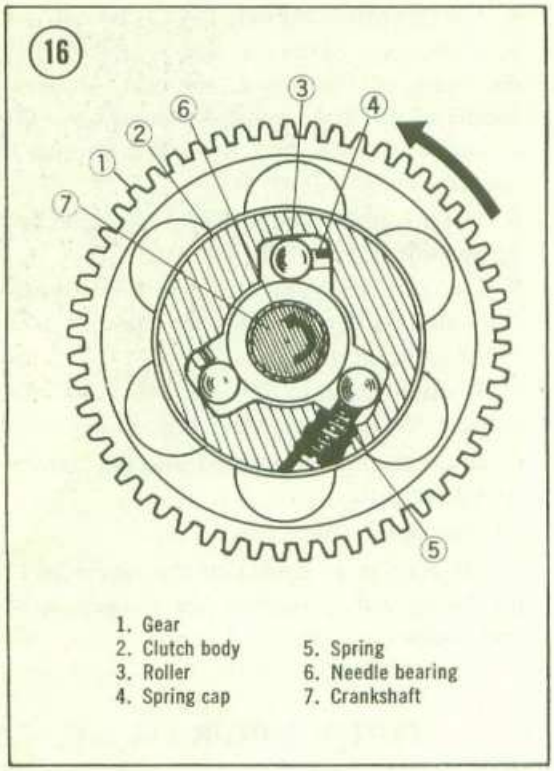
Operation

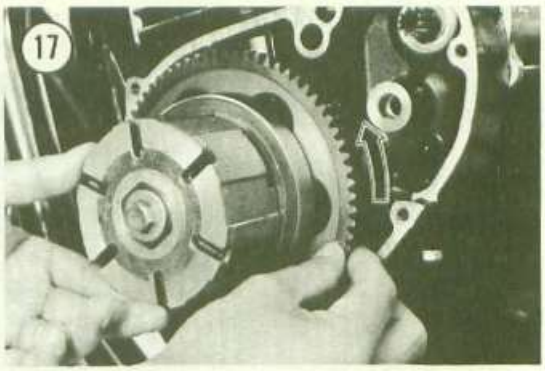
The starter motor is meshed with an idle gear, which in turn is meshed with the starter clutch on the crankshaft. The starter clutch gear spins freely (on a needle bearing) on the crankshaft.

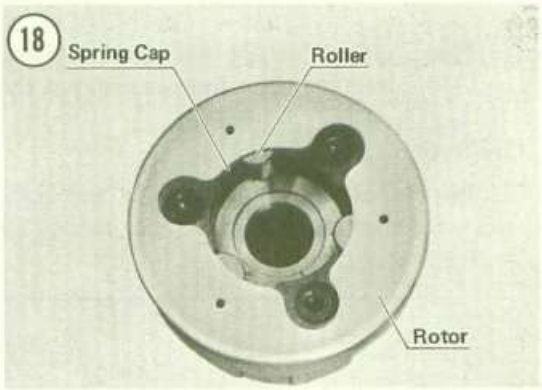
The starter clutch gear has a raised center hub which extends outward toward the rotor. The starter clutch body (which is bolted to the rotor and must turn whenever the crankshaft turns) fits over the extended hub of the starter clutch gear.

Three slots have been machined outward from the center hole in the starter clutch body (**Figure 16**). Each slot gets narrower toward its counterclockwise end. In each slot of the starter clutch body is a cylindrical roller standing on end. The rollers are unattached; they are free to move from side to side in their slots. Spring loaded plungers, mounted in the wide ends of the slots, force the rollers to move toward the narrow ends of their slots.

At the narrow end of its slot, the roller is jammed between the clutch body and the extended hub of the clutch gear, which locks the clutch gear to the clutch body. When the starter motor is running, it turns the idle gear, which







turns the starter clutch gear, which turns the starter clutch body (thus the rotor), which turns the crankshaft to start the engine.

When the engine is running, the centrifugal force pushes the rollers (against their plunger springs) back into the wide portions of their slots. There they are no longer jammed against the extended hub of the starter clutch gear, so it no longer rotates with the crankshaft.

Operation Checks

To check the operation of the starter motor clutch, remove the left engine cover and the idle gear. Try turning the starter clutch gear in both directions by hand (**Figure 17**). The gear should not turn at all in a counterclockwise direction. It should turn freely and quietly in the clockwise direction. If the gear fails to operate in that manner, the clutch assembly is malfunctioning.

Disassembly

1. Remove the rotor/starter clutch assembly.
2. Remove the rollers, plungers, and plunger springs from the clutch body (**Figure 18**).
3. Wrap the rotor with cloth and mount it in a lead jaw vise. Remove the 3 Allen screws that mount the clutch body to the rotor.
4. Pull the Woodruff key out of its slot in the crankshaft.
5. Remove the thin shim, the starter clutch gear, the needle bearing, the damper rubber, and the thick shim from the crankshaft.

Inspection

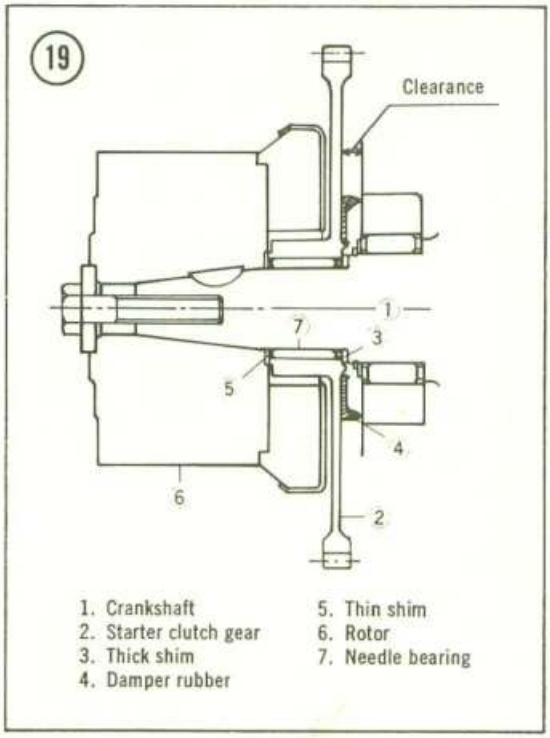
To check the functioning of the starter clutch:

1. Visually inspect the bearing surfaces of the rollers, the starter clutch gear hub, and the slots in the clutch body, for wear or damage. Replace worn or damaged components with new ones.
2. Check the functioning of the plungers and springs in the clutch body for binding or sag. Replace any weak springs with new ones. Relieve any binds with emery cloth, or by replacing the plungers with new ones.
3. Assemble the clutch body, rollers, plungers, springs, clutch gear, and needle bearing on the crankshaft.

4. Spin the assembly fast, counterclockwise, and stop the clutch gear suddenly. The clutch body should continue spinning momentarily. Repeat the operation, spinning the assembly clockwise. The clutch body should stop at the same time as the gear.

To select correct thickness of damper rubber:

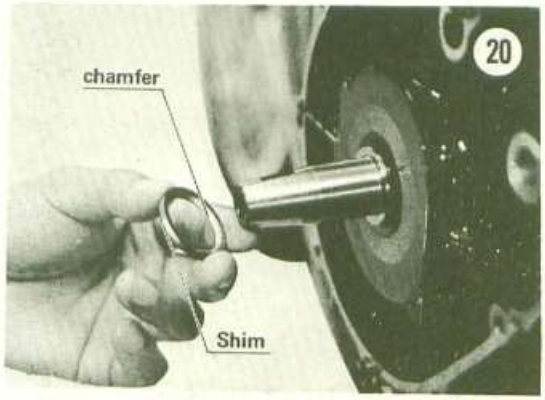
1. Assemble the thick shim, the needle bearing, and the clutch gear on the crankshaft.
2. With feeler gauges, measure the clearance between the inner face of the clutch gear and the surface of the crankcase (**Figure 19**).



3. If the clearance is 5.05-6.05mm, select a damper rubber 6.3mm thick.
4. If the clearance is 6.06-7.05mm, use a damper rubber 7.3mm thick.
5. If the clearance is 7.06mm or larger, use the 8.3mm damper rubber.

Reassembly

1. Place the thick shim on the crankshaft, with the chamfered side facing the crankcase (**Figure 20**).



2. Put the damper rubber, the needle bearing, the starter clutch gear, and the thin shim on the crankshaft.
3. Install the Woodruff key on the crankshaft.
4. Clamp the rotor in a vise (see the disassembly procedure). Place the clutch body atop the rotor. Apply Loctite to the Allen screws and install them.
5. Insert the plungers, plunger springs, and rollers into the clutch body.
6. Reassemble the alternator.

GEAR SELECTOR MECHANISM

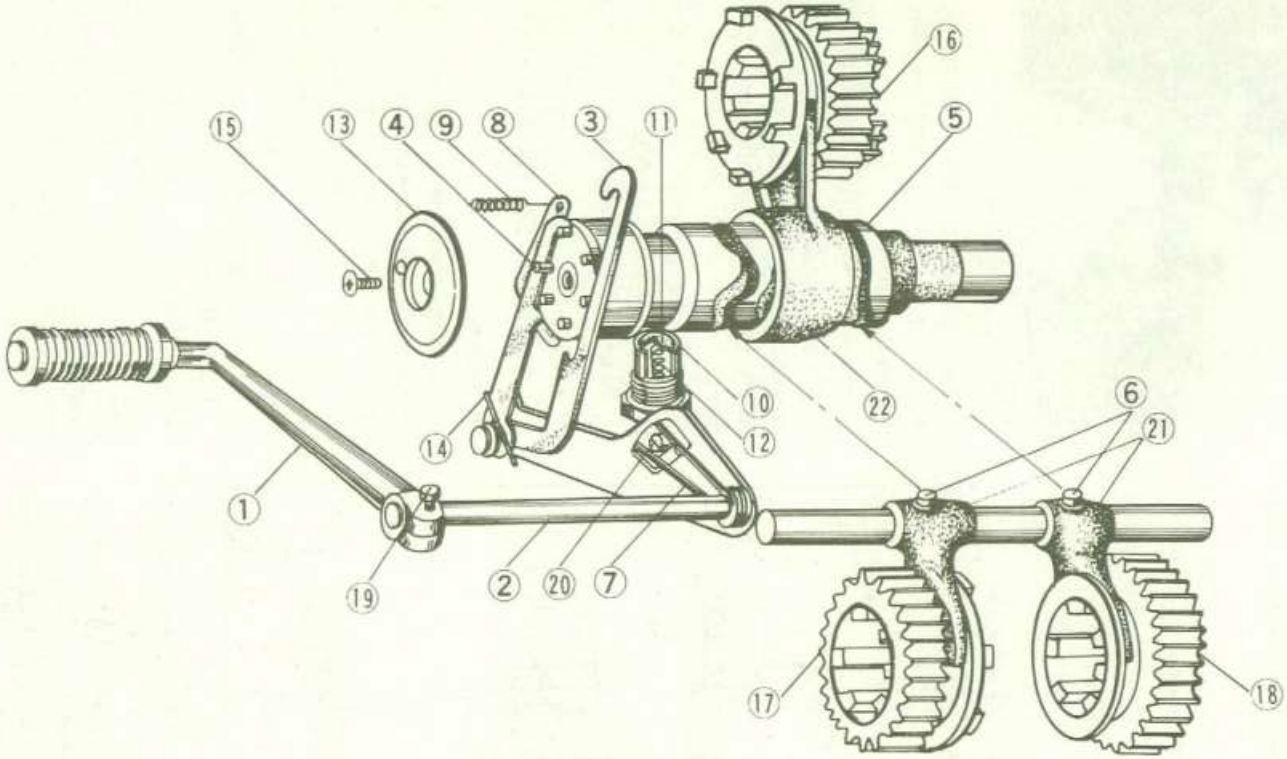
Operation

Inside the transmission, gears are shifted by shifter forks, which are moved from side to side by the camming slots cut into the cylindrical shifter drum. The linkage (outside the engine cases) that converts up-and-down motions of the gearshift lever into rotation of the shifter drum is the gear selector mechanism (**Figure 21**).

The shift lever is mounted to one end of the selector shaft. At the other end of the shaft is an arm with 2 hinged pawls. The pawls rest against pegs protruding from the left end of the shifter drum. When the selector shaft is rotated, the pawls grasp the pegs and rotate the shifter drum.

The 2 legs of the strong hairpin return spring on the selector shaft arm rest against a stationary centering peg. When the shift lever is released, the return spring brings the selector shaft back to its center position.

A spring loaded detent is mounted to the left of the shifter drum. It locks the pegs of the



SHIFT MECHANISM

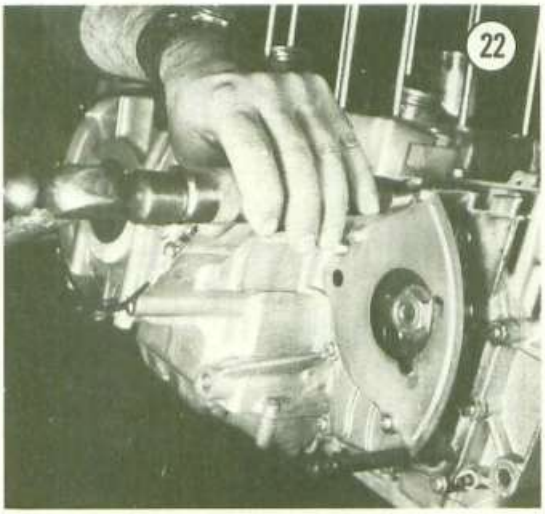
1. Shift pedal
2. Shaft
3. Shift pawl
4. Shift drum pin
5. Shift drum
6. Shift fork pin
7. Return spring
8. Detent arm
9. Detent arm spring
10. Shift drum positioning pin
11. Neutral detent pin
12. Spring
13. Shift drum pin holder
14. Pawl spring
15. Screw
16. Drive 3rd gear
17. Output 5th gear
18. Output 4th gear
19. Bolt
20. Return spring pin
21. Shift fork
22. Shift fork

shifter drum into their new position after the shift has been made, to prevent the transmission from jumping out of gear.

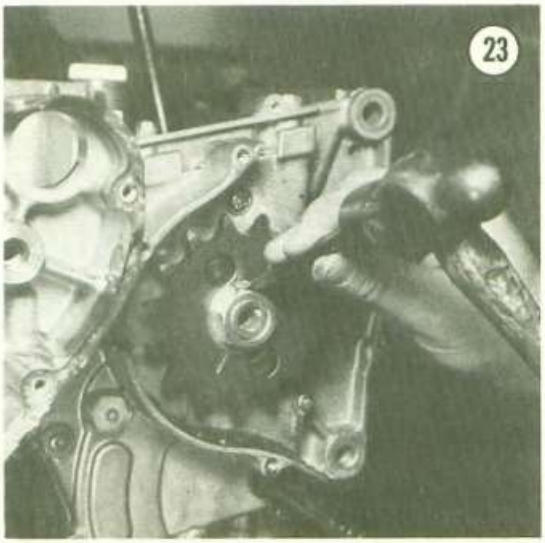
The detent cannot hold the drum in the NEUTRAL position. Inside the engine cases, a spring-loaded plunger beneath the shifter drum rises into a notch in the drum at the NEUTRAL position, to hold the drum immobile.

Disassembly

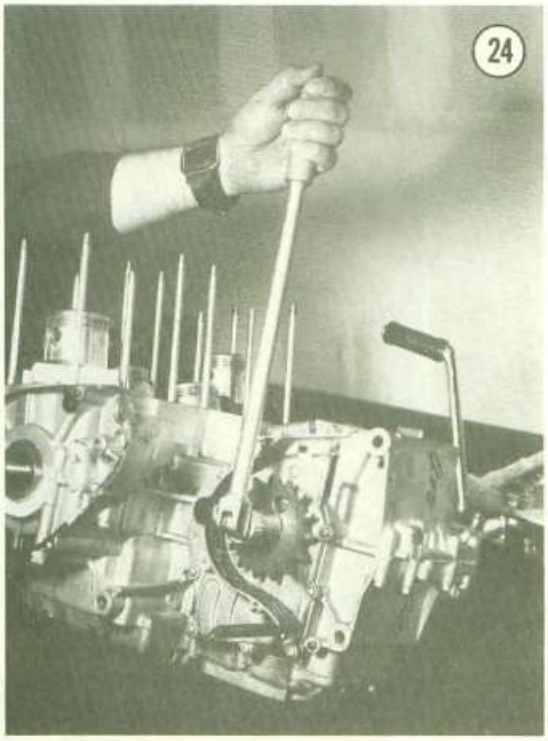
1. Remove the metal shield for the output sprocket (**Figure 22**).



2. Bend the locking tab washer up with a chisel (**Figure 23**).



3. Place wood blocks between the bottoms of the pistons and the top of the cylinder block to keep the crankshaft from rotating (**Figure 24**) and loosen the sprocket retaining nut.



4. Remove the screws indicated in **Figure 25**, then tap the cover loose with a soft mallet (**Figure 26**) and remove it. Use care; the cover is positioned with a dowel.

5. Refer to **Figure 27**. Note carefully how the shifter shaft assembly pawls engage on the shifting drum. To remove the shift shaft, pull the pawls away from the shifting drum and slide out the shaft assembly (**Figure 28**).

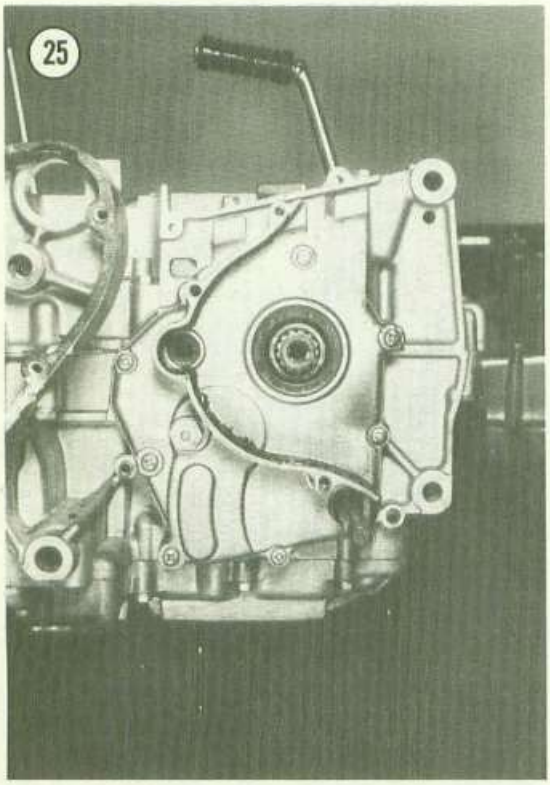
6. **Figure 29** shows the proper position for the spring on the main shift shaft. Be careful that you do not get it on upside down.

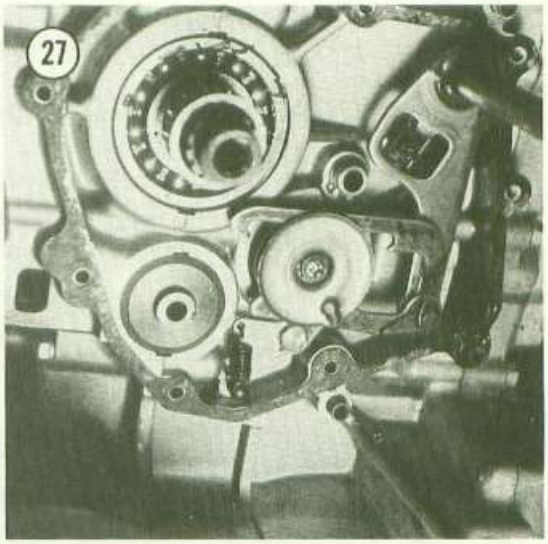
7. Remove the bolt shown in **Figure 30** and remove the pawl and spring (**Figure 31**).

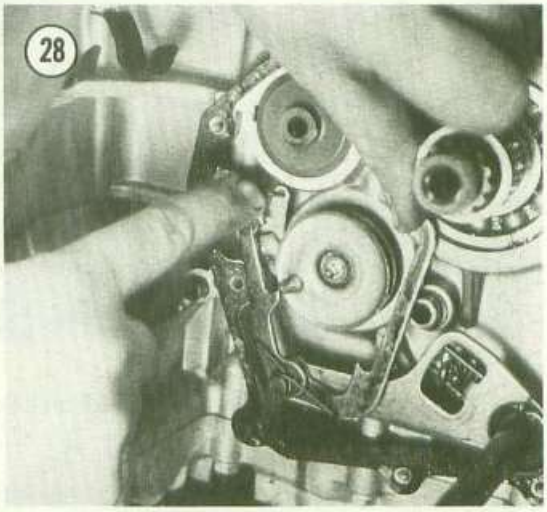
8. Remove the spacer bushing (**Figure 32**).

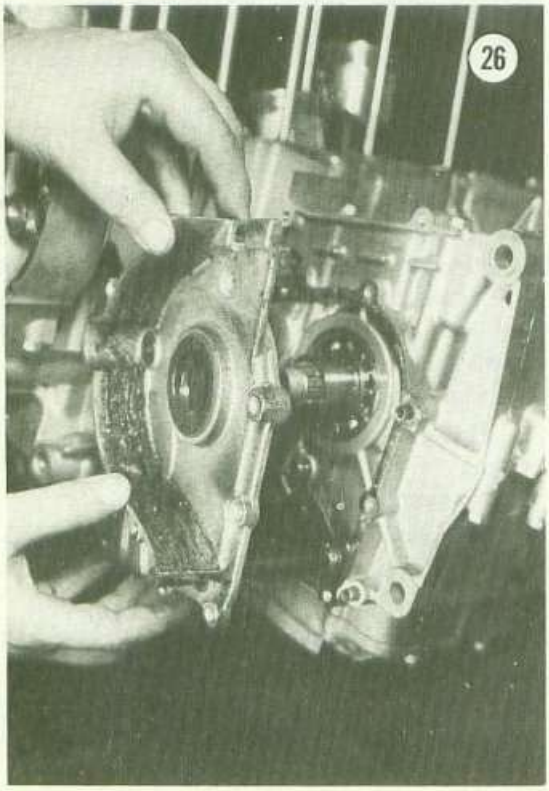
9. Remove the neutral light wire from its mount on the transmission cover (**Figure 33**).

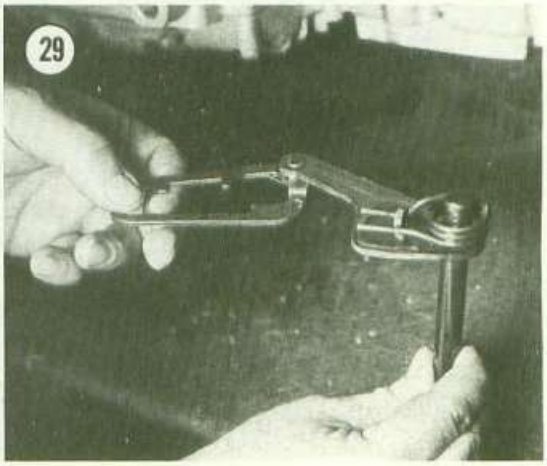
10. Remove the mounting screws from the transmission cover. Pull off the cover and its gasket.

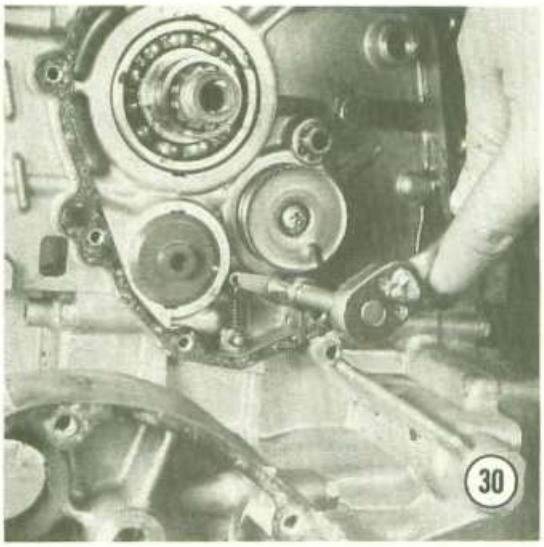

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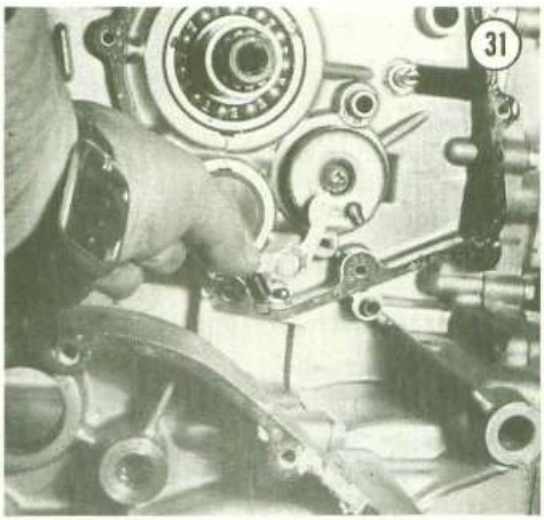

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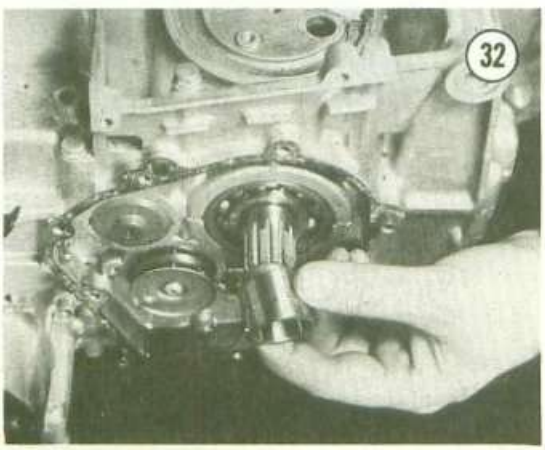

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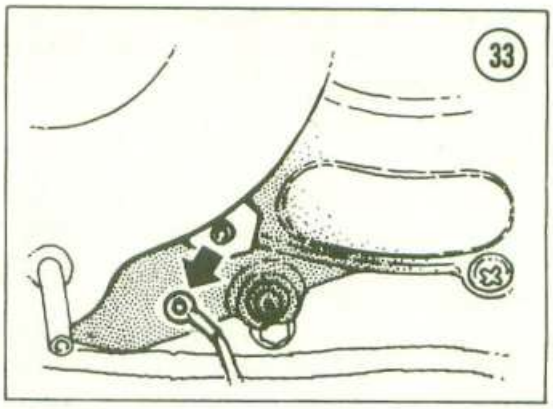

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29

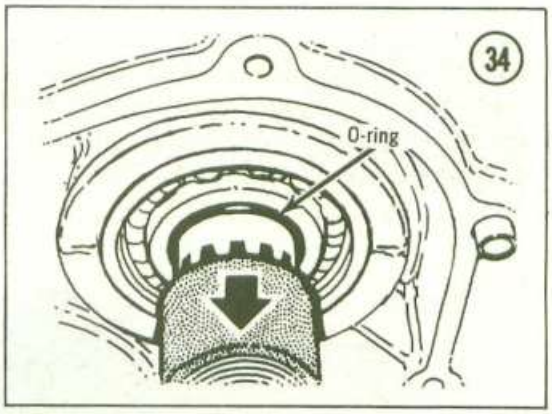






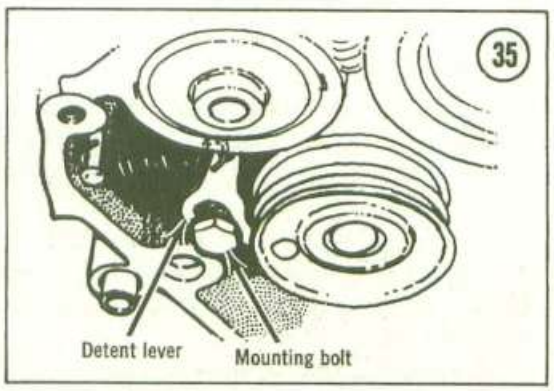


11. Pull the sprocket spacer off the output shaft (**Figure 34**). If it is stuck, use a bearing puller to free it.



12. To remove the selector shaft, hold the pawls free of the shifter drum, and pull the selector shaft out of its boss; at the same time free the return spring from its stop.

13. To remove the detent, unscrew its mounting bolt, and unhook the spring (**Figure 35**).



14. To expose the pegs on the shifter drum, remove the screw from the cover plate, and remove the plate.

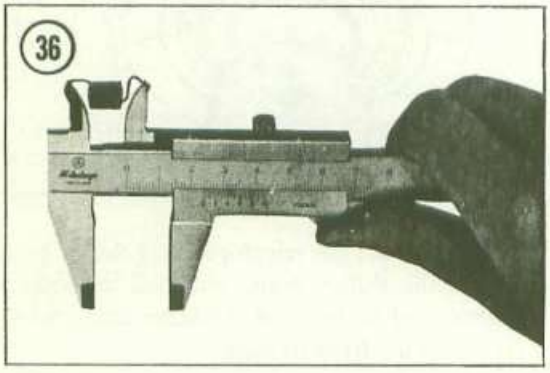
Inspection

1. If the transmission fails to shift gears, check for: a weak pawl spring; bent, worn, or binding pawls; worn shifter drum pegs; a broken return spring; or a broken return spring stop.

2. If the transmission undershifts or overshifts, check for: a binding, bent, or worn detent; a weak detent spring; bent or worn pawls; worn pegs; a loose return spring stop; or a bent or weak return spring.

3. If the transmission jumps out of gear, check for: a binding, bent, or worn detent; or a weak detent spring.

4. To check the tension of the detent spring, measure its free length with calipers (**Figure 36**). The standard length of a detent spring is 0.917 in. (23.3mm). If the spring is longer than 0.984 in. (25mm), replace it with a new one.



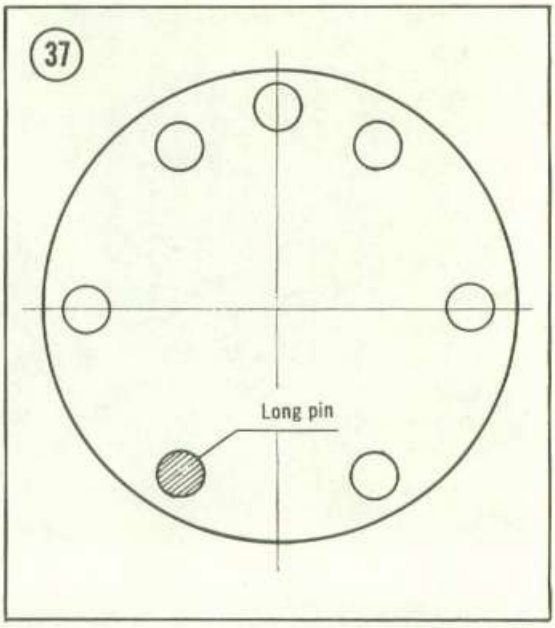
5. Replace any other broken, bent, binding, or worn parts, including shifter drum pegs.

Reassembly

1. If any of the shifter drum pegs were replaced, make certain that the long peg (which turns on the "neutral" light) is installed as shown in **Figure 37**.

2. Position the detent on its mount to the left of the shifter drum. Install the mounting screw, being careful not to jam the detent. Attach the detent spring.

3. Install the cover plate on the shifter drum.



4. Install the selector shaft in its boss. Spread the legs of the hairpin return spring and fit them around the return spring stop. Spread the pawls and position them alongside the pegs on the shifter drum.

5. Fit the oil seal guide (a Kawasaki dealer has a special tool available) to the selector shaft hole in the transmission cover (**Figure 38**).



6. Mount the transmission cover and install the mounting screws.

7. Put the sprocket spacer on the output shaft.

NOTE: *The spacer is installed after the transmission cover so as to avoid damaging the output shaft oil seal.*

8. Mount the neutral light wire.

9. Install the output sprocket.

CLUTCH

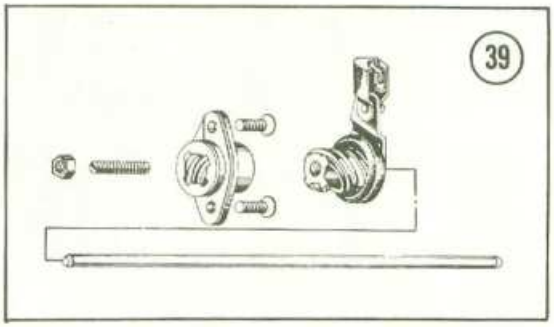
Operation

The clutch is mounted to the right end of the transmission main shaft. The inner clutch hub is splined to the main shaft. The outer hub can rotate freely on the main shaft. The outer hub is geared to the crankshaft.

Between the 2 clutch hubs is a sandwich of clutch plates. Every other plate (including the bottom one and the top one) is locked to the outer hub and must turn whenever it turns. The remaining plates are locked to the inner hub; when they turn, it turns. Atop this sandwich of clutch plates is the pressure plate. There are 5 coil springs that press the pressure plate in against the rest of the plates. This pressure, or friction, jams the plates together, which locks together the clutch hubs. Then the crankshaft can turn the transmission drive shaft.

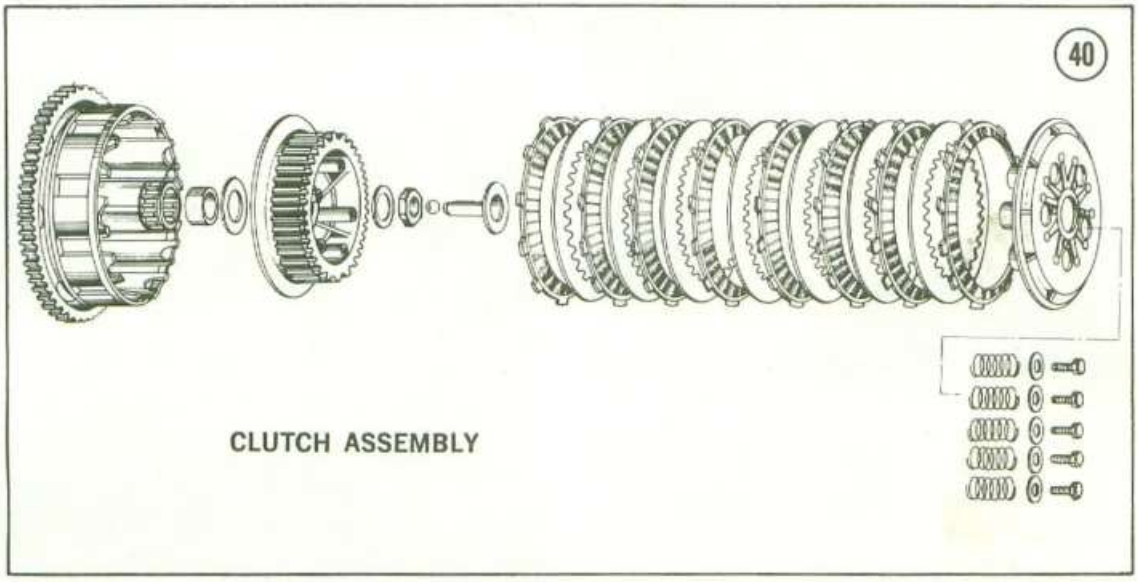
To disengage the clutch, a pushrod extending through the hollow main shaft pushes a steel ball, which pushes a shorter pushrod with a plate on the end, which pushes the pressure plate outward from the clutch. With the pressure gone, the outer hub and the alternate plates locked to it continue to turn, but the other plates (thus the inner hub) stop turning (**Figures 39 and 40**).

All of the clutch components except the outer hub can be removed without splitting the engine cases.

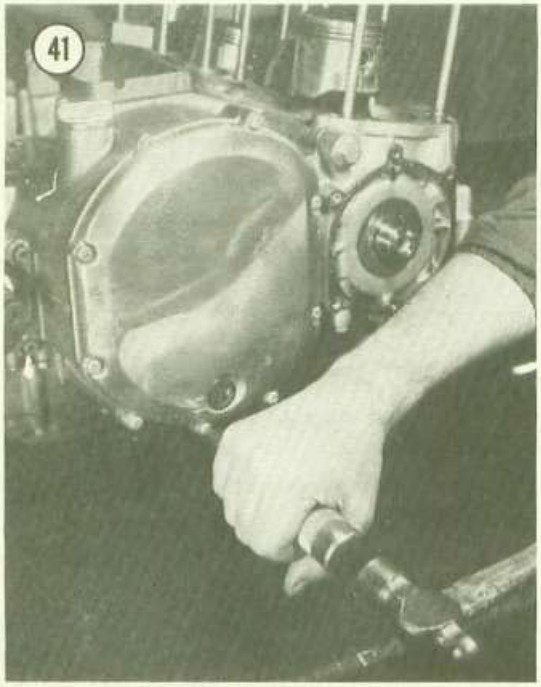


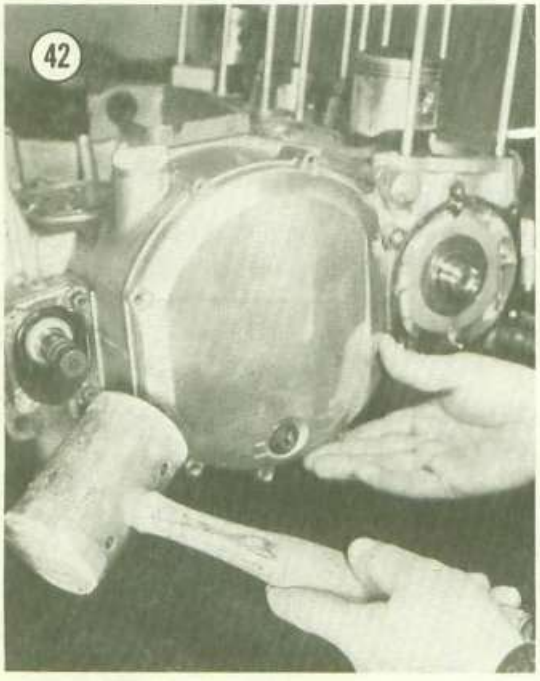
Disassembly

1. Drain the engine oil (for procedure, see Chapter Two).
2. Remove the screws holding the clutch cover in place (**Figure 41**).
3. Gently free the cover by tapping it with a soft mallet (**Figure 42**). Remove the cover.
4. Remove the 5 bolts holding the clutch spring assembly to the hub (**Figure 43**). Remove the washers and clutch springs (**Figure 44**) and then the pressure plate (**Figure 45**).
5. Remove the steel and friction plates (**Figure 46**).
6. Remove the short pushrod from the main shaft. Tilt the motorcycle to the right (if necessary) until the steel ball rolls out of the main shaft (**Figure 47**).
7. Fit the clutch hub holder (a Kawasaki dealer has a special tool available) to the inner clutch



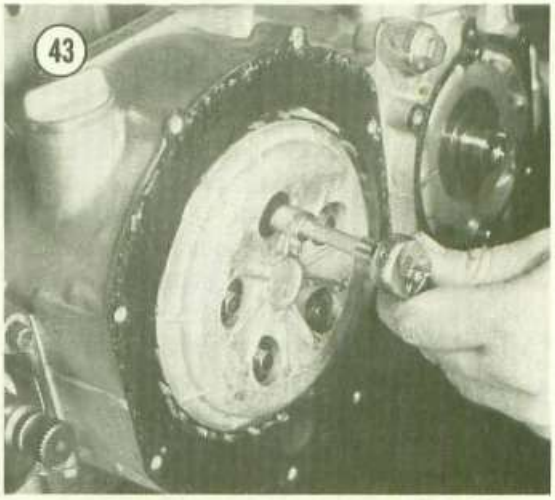
CLUTCH ASSEMBLY

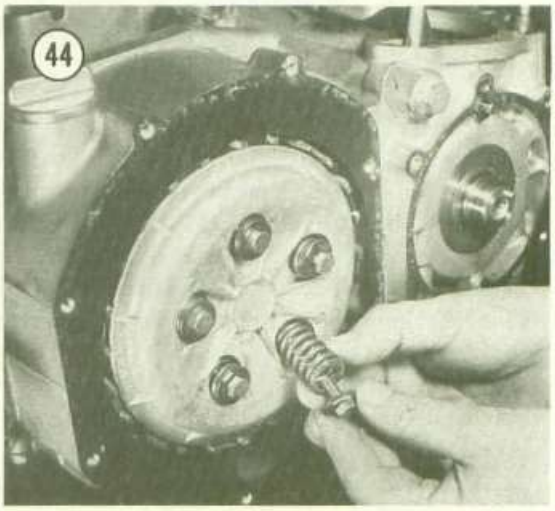


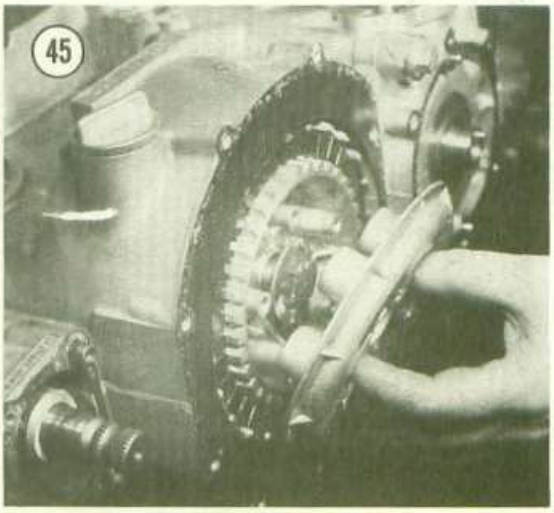


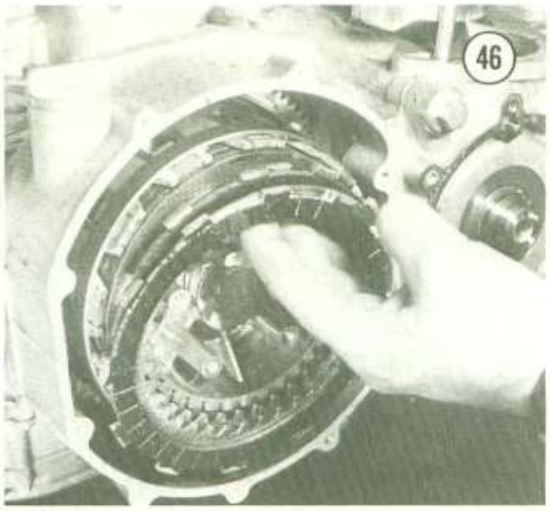
hub, and brace the handle against the footpeg. With a socket on a breaker bar, remove the clutch nut from the drive shaft (**Figure 48**).

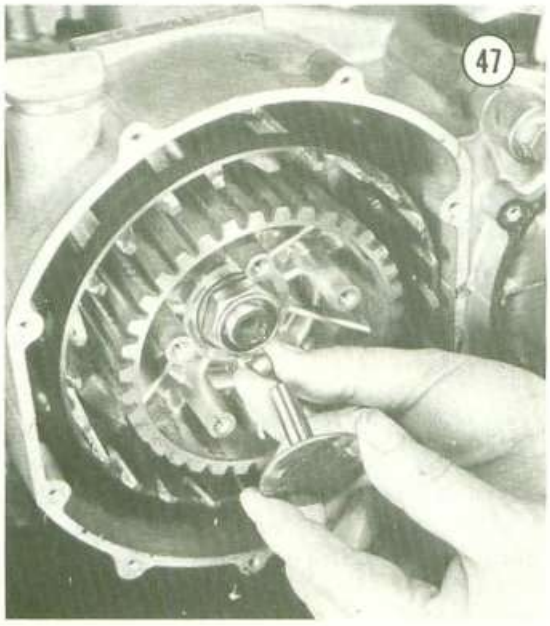
8. Remove the remaining clutch plates from the clutch.

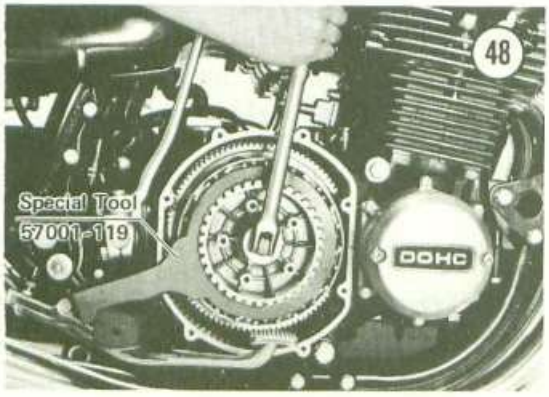












9. Remove the washer, inner clutch hub, and the other washer from the drive shaft.

Inspection

If the clutch is dragging or slipping, check to see that the clutch linkage is adjusted correctly and functioning properly.

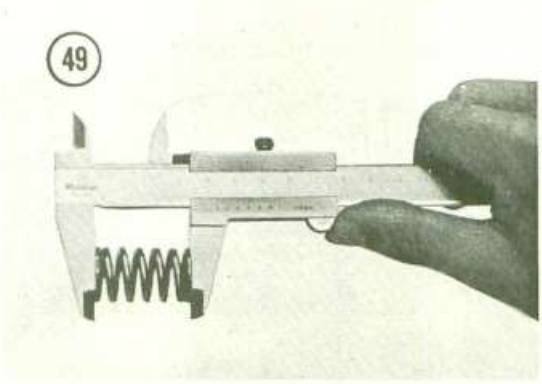
If the clutch is still dragging, check for the following: rough or warped clutch plates; one or more weak clutch springs; old or excessively thick engine oil; or uneven wear of the inner clutch hub or the outer clutch hub.

If the clutch is still slipping, check for worn friction plates; or weak clutch springs.

If the clutch is noisy, check for the following: too much slop between the teeth of the crankshaft gear and the teeth of the clutch gear; damaged teeth on the crankshaft gear and/or the clutch gear; too much play between the tabs of the friction plates and their slots in the walls of the outer clutch hub; a worn or damaged outer clutch hub needle bearing; or worn damper rubber or springs in the rear of the outer clutch hub.

To check for weak clutch springs:

1. With calipers, measure the free length of each spring (**Figure 49**).



2. A new clutch spring is 1.33 in. (33.8mm) long. If any clutch spring is shorter than 1.27 in. (32.3mm), replace all 5 springs with new ones.

To check for worn friction plates:

1. Visually inspect the bonded composition pads on each plate for roughness, uneven wear,

or evidence of seizure. Replace any damaged or worn plates with new ones.

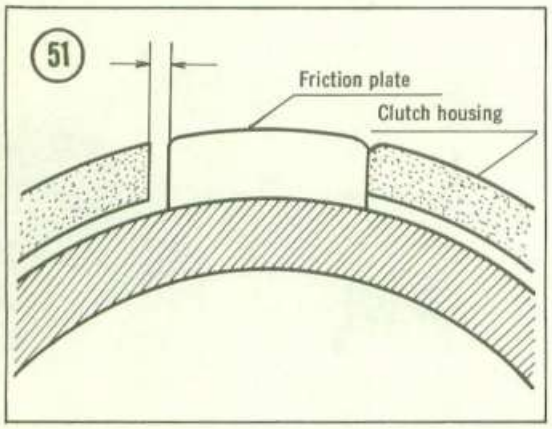
2. Measure the thickness of each plate, on the friction pads, at 4 points around its circumference, with calipers (**Figure 50**).



3. A new friction plate is 0.146-0.154 in. (3.7-3.9mm) thick. If any plate is thinner than 0.134 in. (3.4mm), replace it with a new one.

To check the clearance between the friction plate tabs and the slots in the outer clutch hub walls:

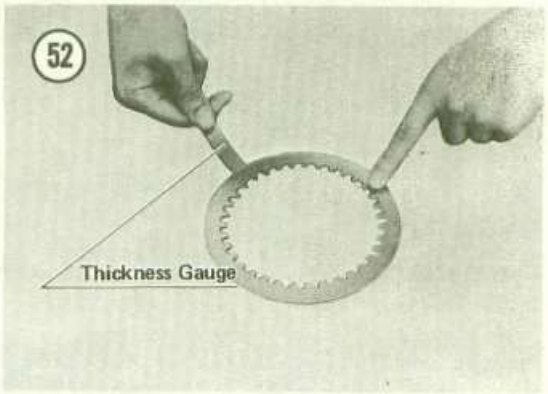
1. Insert a friction plate into the outer clutch hub, and rotate the plate until one side of each tab on it is butted up against a side wall of the hub. With feeler gauges, measure the clearance between the other side of each tab and the other side wall of the hub (**Figure 51**).



2. Each tab on a new friction plate in a new hub will have a clearance of 0.002-0.012 in. (0.04-0.30mm). If the clearance is greater than 0.020 in. (0.5mm), replace the friction plate with a new one. If the side walls of the outer hub are chewed up or badly worn, replace the outer hub with a new one.

To check for warped friction or steel clutch plates:

1. Lay the plate on a flat surface. If there is a gap between any part of the clutch plate and the flat surface, measure the gap with feeler gauges (**Figure 52**).



2. A new friction plate will have less than 0.006 in. (0.15mm) of warp. If the friction plate is warped more than 0.012 in. (0.3mm), replace it with a new one.

3. A new steel plate will have less than 0.008 in. (0.2mm) of warp. If the steel plate is warped more than 0.016 in. (0.4mm), replace it with a new one.

To check the inner clutch hub:

Visually inspect the outer splines that mount the steel clutch plates to the inner hub. If the splines are unevenly worn or notched, replace the inner hub with a new one.

Reassembly

1. Fit the washer and the inner clutch hub and the other washer to the drive shaft.

2. Put on the clutch nut. Fit the clutch holder tool to the inner hub and brace the tool. With a socket on a torque wrench, torque the clutch nut to 87-108 ft.-lb.

3. Install the 15 clutch plates. Begin with a friction plate. Alternate the friction plates and the steel plates. The last of the plates will be a friction plate.

4. Put the steel ball into the drive shaft.

5. Put the short pushrod into the drive shaft.

6. Fit the pressure plate to the clutch.
7. Put the 5 clutch springs and then the 5 washers into their cups in the pressure plate.
8. Install the 5 clutch spring bolts, finger-tight. Cross tighten them with a wrench, turning each one the same amount.
9. Put on the clutch cover gasket and the clutch cover. Install the 8 mounting screws.
10. Add motor oil to the engine (for the procedure, see Chapter Two).

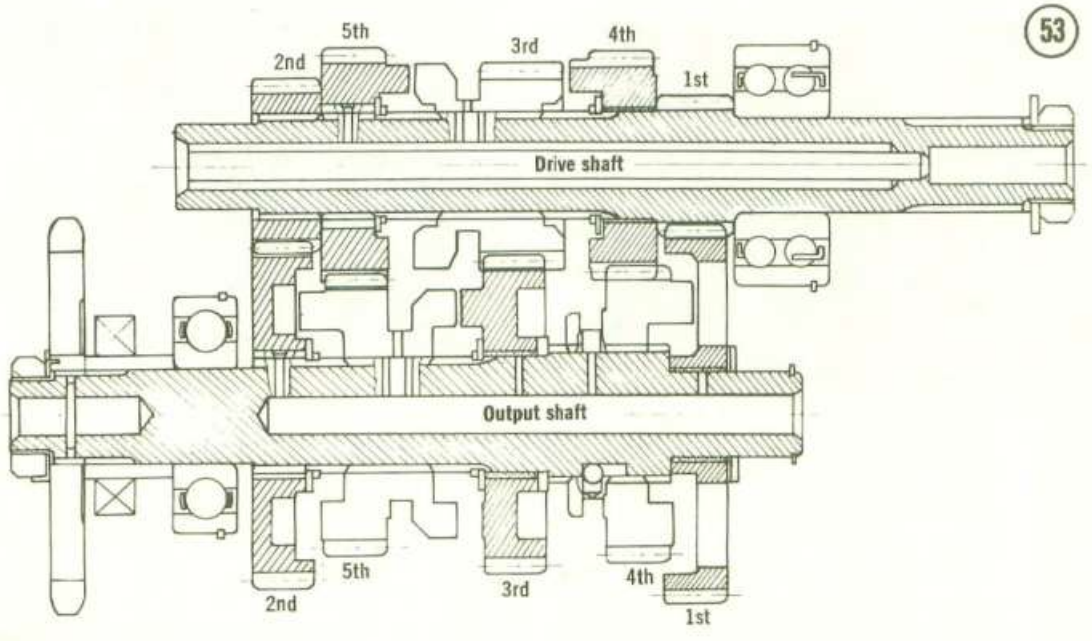
TRANSMISSION

Operation

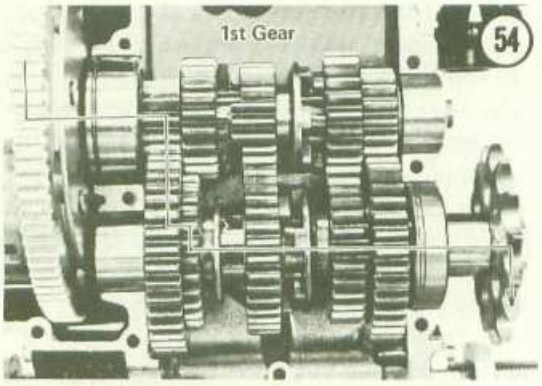
The basic transmission consists of 5 gears on the main shaft meshed with 5 gears on the output shaft (**Figure 53**). Each pair of meshed gears constitutes one speed (one gear ratio). In each pair, one of the gears is locked to its shaft and must turn with its shaft. The other gear is not attached to its shaft and can spin freely on it. Located next to the free spinning gear is a third gear which is splined to the shaft and must turn with it. This third gear can be slid from side to side along the splines of the shaft. The side of the splined gear and the side of the free-spinning gear have mating tongues and grooves. When the splined gear is slid up against the free-spinning gear, the 2 gears are locked together. This locks the free-spinning gear to its shaft. Since both of the meshed gears are now locked to their respective shafts, the power is transmitted from the drive shaft to the output shaft through that gear ratio.

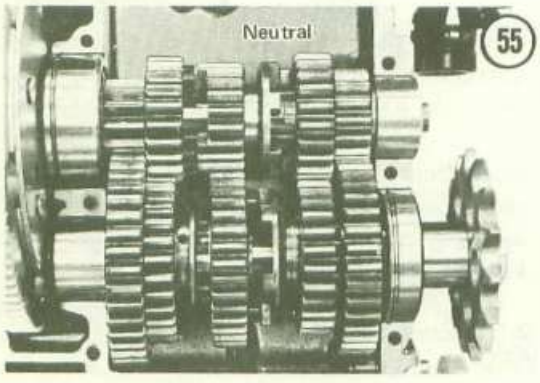
The transmission has 3 sliding gears; 3rd gear on the drive shaft; 4th gear on the output shaft; and 5th gear on the output shaft. Each sliding gear serves 2 basic purposes. It can lock a free-wheeling gear to its shaft. But the sliding gear also has gear teeth; though moved from side to side, it never moves far enough to unmesh from a free-wheeling gear on the other shaft. So the sliding gear also serves as the locked gear in a pair of transmission gears. See **Figures 54 through 59**.

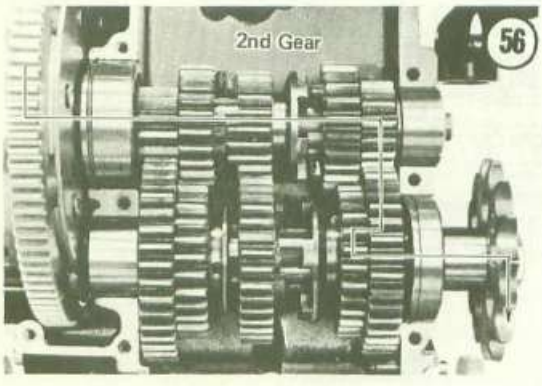
The 3rd gear on the drive shaft can: engage 4th gear on the drive shaft; engage 5th gear on

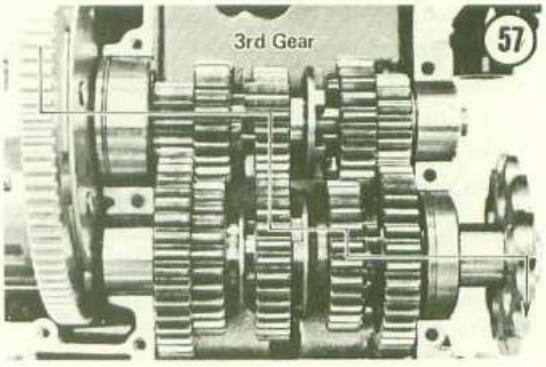


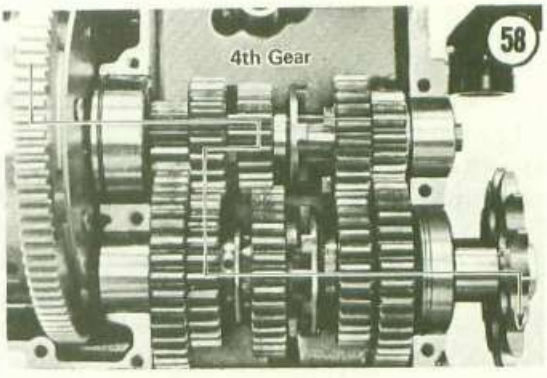
TRANSMISSION

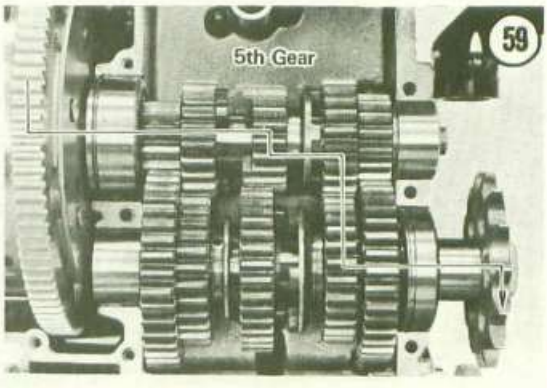












the drive shaft; be 3rd gear; or do nothing. The 4th gear on the output shaft can: engage 1st gear on the output shaft; engage 3rd gear on the output shaft; be 4th gear; or do nothing. The 5th gear on the output shaft can: engage 2nd gear, be 5th gear; or do nothing.

Each sliding gear has a deep groove machined in its face. In this groove rides the curved arm of a shifter fork. When the shifter fork is moved sideways, it moves the sliding gear sideways on its shaft.

Only 2 of the 3 shifter forks—the ones working the sliding gears on the output shaft—are mounted on the shifter fork shaft. The rear ends of the shifter forks are pegs, which ride in camming slots in the face of the shifter drum. When the gear selector mechanism rotates the shifter drum, the zigzag camming slots move the shifter forks from side to side along their shaft. In turn, the shifter forks move the sliding gears from side to side.

The third shifter fork, which operates the sliding gear on the drive shaft, is sleeved to the

shifter drum instead of being mounted on a separate shaft. But it works the same way. See **Figure 60**.

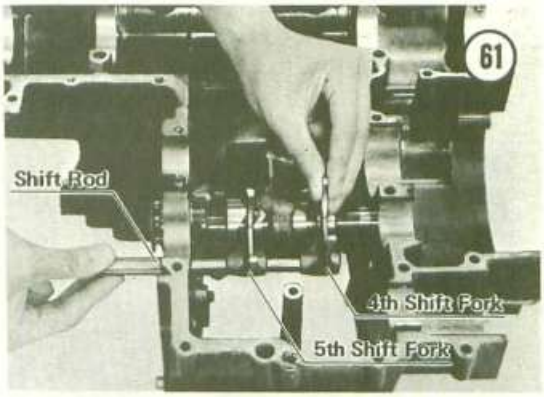
In 4th gear on the output shaft are 3 steel balls, spaced 120 degrees apart, which help prevent the transmission from overshooting to 2nd gear when the rider wants to shift from 1st to neutral.

Disassembly

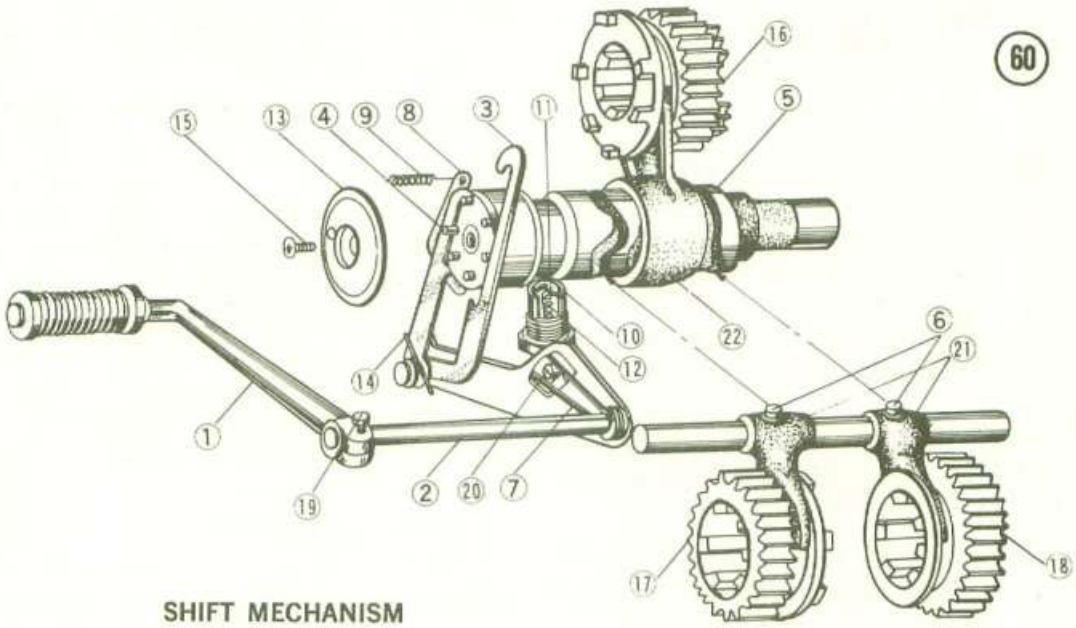
1. Remove the engine from the motorcycle.
2. Split the engine cases.

To disassemble the shifter drum/ shifter fork assemblies:

1. In the lower engine case, use a drift to push against the end of the shifter fork shaft nearest the clutch. Pull out the shaft from the other end of the engine case, taking off the 2 shifter forks as you go (**Figure 61**).



2. On the outside of the engine case, to the left of the shifter drum, remove the bolt that mounts



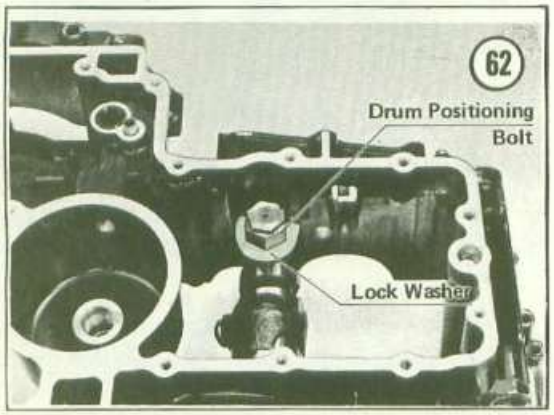
SHIFT MECHANISM

1. Shift pedal
2. Shaft
3. Shift pawl
4. Shift drum pin
5. Shift drum
6. Shift fork pin
7. Return spring
8. Detent arm
9. Detent arm spring
10. Shift drum positioning pin
11. Neutral detent pin
12. Spring
13. Shift drum pin holder
14. Pawl spring
15. Screw
16. Drive 3rd gear
17. Output 5th gear
18. Output 4th gear
19. Bolt
20. Return spring pin
21. Shift fork
22. Shift fork

the detent arm. Unhook the detent spring and remove the detent arm.

3. On the remaining shifter fork, flatten the tab washer and unscrew the peg.

4. Turn the engine case upside down. Flatten the tab washer that locks the large plunger bolt. Unscrew the plunger bolt assembly (**Figure 62**).



5. Pull the shifter drum out of the engine case, taking off the third shifter fork as you go.

To disassemble the drive shaft:

1. Remove the drive shaft assembly from the engine case.

2. Take off the outer clutch hub, the clutch needle bearing, the clutch bushing, and the thrust washer.

3. From the other end of the drive shaft, take off the drive shaft bushing and the circlip (**Figure 63**).

4. Pull off the shim, the needle bearing, the 2 washers, 2nd gear, 5th gear, the 5th gear bushing, and the splined washer.

5. Take off the snap ring, and pull off 3rd gear.

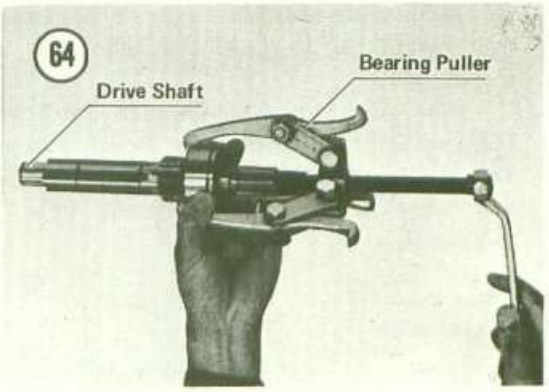
6. Take off the last snap ring. Pull off the splined washer and 4th gear.

7. Remove the ball bearing assembly with a bearing puller (**Figure 64**).

To disassemble the output shaft:

1. Remove the output shaft assembly from the engine case.

2. Remove the output shaft bushing and circlip.



3. Pull off the shim, the needle bearing, the 2 washers, 1st gear, and the shim.

4. Pull off 4th gear, turning the shaft if necessary to align the 3 steel balls.

5. Use a bearing puller to remove the ball bearing assembly from the other end of the shaft.

6. Pull off the washer, 2nd gear, the 2nd gear bushing, and the splined washer.

7. Remove the first snap ring. Pull off 5th gear.

8. Remove the second snap ring. Pull off the splined washer, 3rd gear, and the last washer.

Inspection

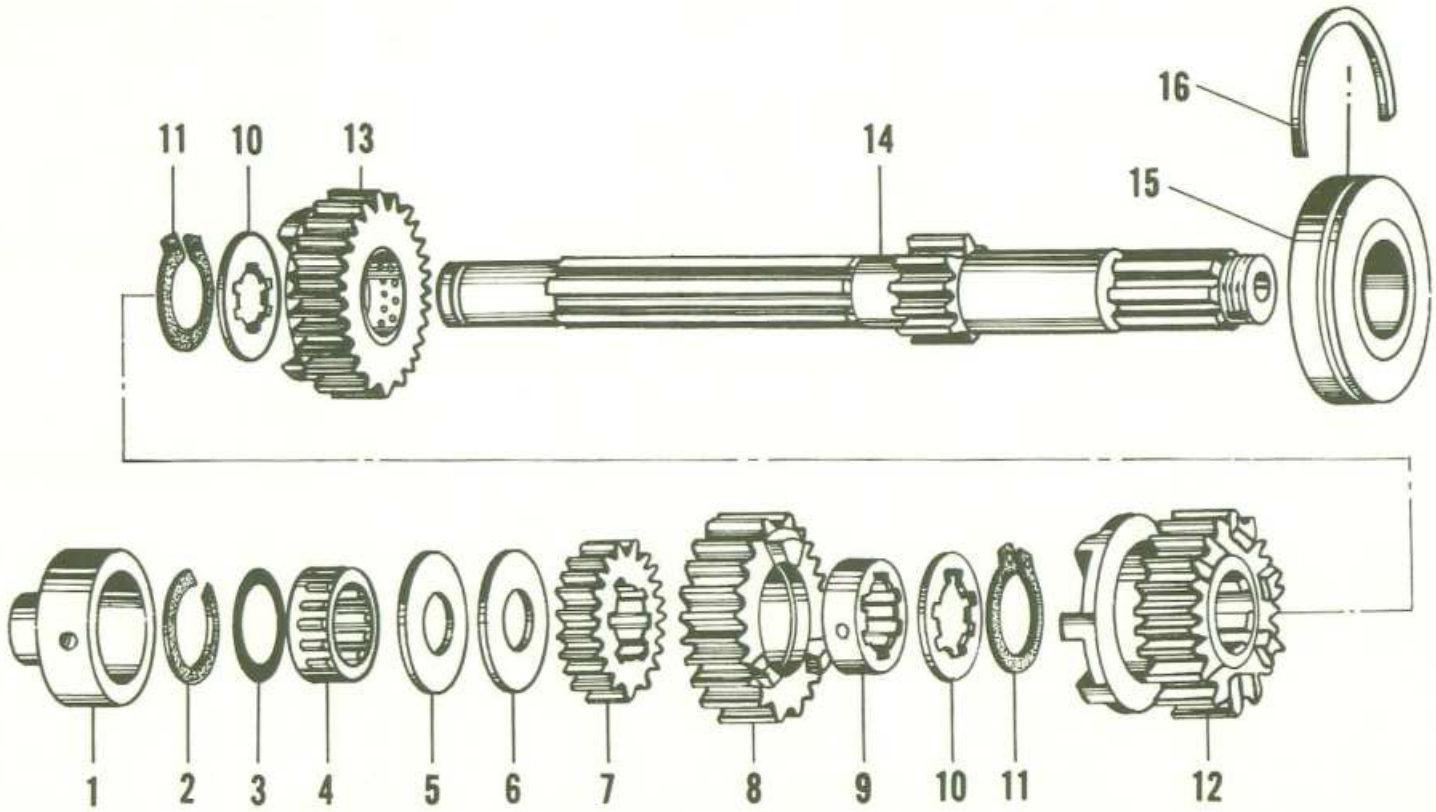
If the transmission fails to shift properly or jumps out of gear, check the functioning of the gear selector mechanism before splitting the engine cases. See *Gear Selector Mechanism* in this chapter.

If the transmission fails to shift properly into neutral, check for:

1. A weak neutral plunger spring.
2. A binding neutral plunger.
3. Wear or damage to 4th gear on the drive shaft, or its steel balls, or the drive shaft grooves.

If the transmission fails to shift properly or jumps out of gear, check the shifter mechanism for:

1. Worn camming slots in the shifter drum.
2. Worn cam follower pegs in the shifter forks.
3. A bent shifter fork shaft.
4. Bent or broken arms on the shifter forks.



DRIVE SHAFT

1. Bushing
2. Retaining ring
3. Shim
4. Needle bearing
5. Washer
6. Washer
7. 2nd gear (drive shaft)
8. 5th gear
9. 5th gear bushing
10. Toothed washer
11. Retaining ring
12. 3rd gear
13. 4th gear
14. Drive shaft
15. Bearing
16. Set ring

63

5. Worn arms on the shifter forks. Measure the thickness of each shifter fork arm with a micrometer. A new fork has an arm thickness of 0.228-0.236 in. (5.8-6.0mm). If any shifter fork has an arm thinner than 0.224 in. (5.7mm), replace it with a new shifter fork.

6. Worn shifter fork grooves in the sliding gears. A new gear has a groove width of 0.238-0.242 in. (6.05-6.15mm). If a sliding gear has a groove wider than 0.246 in. (6.25mm), replace the gear with a new one.

If the transmission fails to shift properly, jumps out of gear, or makes excessive noise, check drive shaft and output shaft assemblies for:

1. Worn tongues and slots on the sides of the sliding gears and the free-wheeling gears that they engage.

2. Damaged gear teeth.

3. Excessive gear backlash. Check each of the 5 sets of gears for backlash, with both transmission shaft assemblies in position in the upper engine case. Jam one shaft or gear so that the gear cannot turn. Position a dial indicator so that it bears perpendicularly against the leading or trailing edge of a tooth on the meshed gear. Rotate that gear back and forth, and write down the minimum and maximum dial gauge readings. Subtract the minimum from the maximum to get the backlash.

4. In a new engine, 1st gear has a backlash of 0.0008-0.0075 in. (0.02-0.19mm). If backlash if greater than 0.0098 in. (0.25mm), replace both 1st gears with new ones.

5. In a new engine, 2nd through 5th gears have a backlash of 0.0024-0.0091 in. (0.06-0.23mm). If backlash is greater than 0.0118 in. (0.3mm) in any of those gears, replace both gears in the pair with new ones.

6. Check for bent transmission shafts.

7. Check for worn or damaged transmission shaft ball bearings or bushings.

8. Check the clearances between the free-spinning gears and their transmission shafts, if the gears spin directly on their shafts. With a micrometer, measure the outside diameter of the drive shaft at the bearing surface for 4th gear. With calipers, measure the inside diameter of the center hole of the gear. To get the clearance, subtract the shaft diameter from the center hole diameter.

9. In the same way, measure the clearances of 1st gear and 3rd gear on the output shaft.

10. In a new engine, 4th gear on the drive shaft and 3rd gear on the output shaft have a clearance of 0.0008-0.0024 in. (0.020-0.062mm). If either gear has a clearance greater than 0.0064 in. (0.162mm), replace it with a new gear.

11. In a new engine, 1st gear on the output shaft has a clearance of 0.0011-0.0024 in. (0.027-0.062mm). If clearance is greater than 0.0063 in. (0.161mm), replace the gear with a new one.

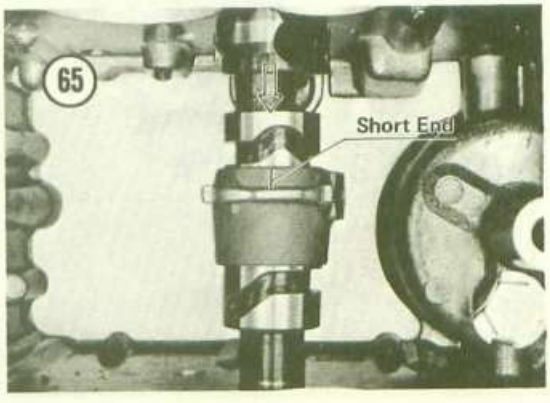
12. Only 2 of the free-spinning gears ride on bushings mounted to the splines of the transmission shafts. Measure the clearance between 5th gear on the drive shaft and its bushing, and the clearance between 2nd gear on the output shaft and its bushing.

13. In a new engine, 5th gear on the drive shaft and 2nd gear on the output shaft has a clearance of 0.001-0.003 in. (0.025-0.075mm). If clearance is greater than 0.0069 in. (0.175mm), replace the gear with a new one.

Reassembly

To reassemble the shifter mechanism in the lower engine case:

1. Push the shifter drum into the engine case. Position the 3rd gear shifter fork so that the drum will enter the short end of the fork first (**Figure 65**).



2. Rotate the shifter drum to the "neutral" position, so that the neutral dimple is aligned beneath the mounting hole for the neutral plunger.

3. Apply Loctite to the threads of the neutral plunger and install it. Torque it to 44-57 ft.-lb.

4. To complete the reassembly of the shifter mechanism, follow the remainder of the disassembly procedures in the reverse order.

To reassemble the drive shaft assembly:

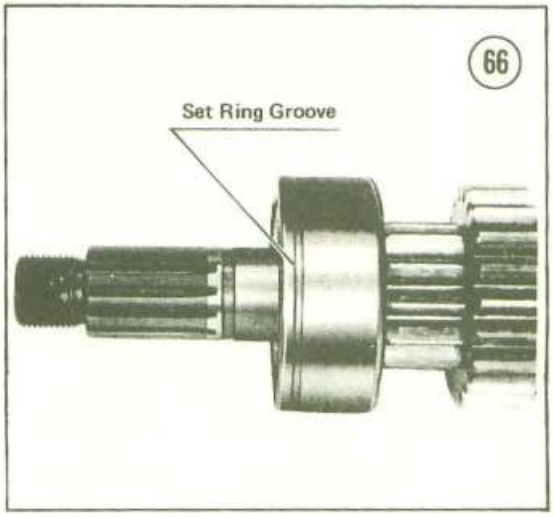
1. Follow the disassembly procedures in the reverse order, along with the additional procedures listed below.

2. To install the ball bearing assembly on the clutch end of the drive shaft, turn the bearing so that its groove faces away from the drive shaft. Put the bearing on the drive shaft and press it into place (**Figure 66**).

3. When fitting 3rd gear and the 5th gear bushing to the splines of the drive shaft, turn them so that their oil holes will be aligned with the oil holes in the splines of the drive shaft.

To reassemble the output shaft:

1. Follow disassembly procedures in the reverse order, along with the procedures listed below.



2. When fitting 5th gear and the 2nd gear bushing to the splines of the output shaft, turn them so that their oil holes will be aligned with the oil holes in the output shaft.

3. Put the ball bearing assembly on the threaded end of the output shaft with the groove in the bearing facing away from the shaft. Press the bearing into place.

4. When installing 4th gear and its 3 steel balls, do not grease the balls; they must be free to roll easily.

CHAPTER EIGHT

CHASSIS

This chapter provides removal, disassembly, inspection, reassembly, and installation procedures for the basic components of the chassis. Refer to Supplement, Chapter Eight, in the back of this manual, for additional information on the KZ1000.

FRONT WHEEL

Removal/Installation

1. Unscrew the serrated mounting nut at the bottom of the speedometer cable with pliers. Pull out the speedometer cable.
2. Prop up the motorcycle so that the front wheel is several inches off the ground.
3. Use a grease pencil to draw a vertical line across the mating surfaces at the bottom of each front fork tube and the axle clamp, in front, for reference as to location and position when reinstalling them.
4. Unscrew the 4 axle clamp nuts. Take off the clamps, and allow the wheel to drop out of the forks.

Install as follows.

5. Position the wheel in the forks.
6. Put on the axle clamps and the axle clamp nuts. Screw the nuts down finger-tight (**Figure 1**).

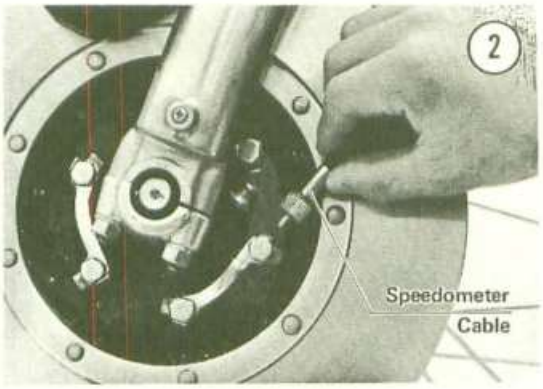


7. Torque the nuts on one clamp then the other, to 13-14.5 ft.-lb. Torque the front nut and then the rear one.
8. Install the speedometer cable; position the wheel so that the cable nut and its mount are aligned (**Figure 2**).
9. Check the wheel balance, and the axial and radial rim runout. For the checking and adjustment procedures, see Chapter Two.

FRONT HUB AND AXLE

Disassembly (1973-1975 Models)

1. Remove the front wheel from the motorcycle.
2. Clamp the speedometer gearbox so it cannot turn (and thus damage the speedometer gear), and unscrew the front axle from it (**Figure 3**).



3. Remove the speedometer gearbox and the front axle.

4. Remove the 3 screws that mount the wheel cap to the right side of the hub. Remove the cap and the collar.

5. Insert a drift from the right side of the hub and tap evenly around the inner race of the left wheel bearing to drive it out of the hub.

6. Take out the distance collar.

7. Pry out the oil seal from the right side of the hub.

8. Take out the snap ring from the right side of the hub.

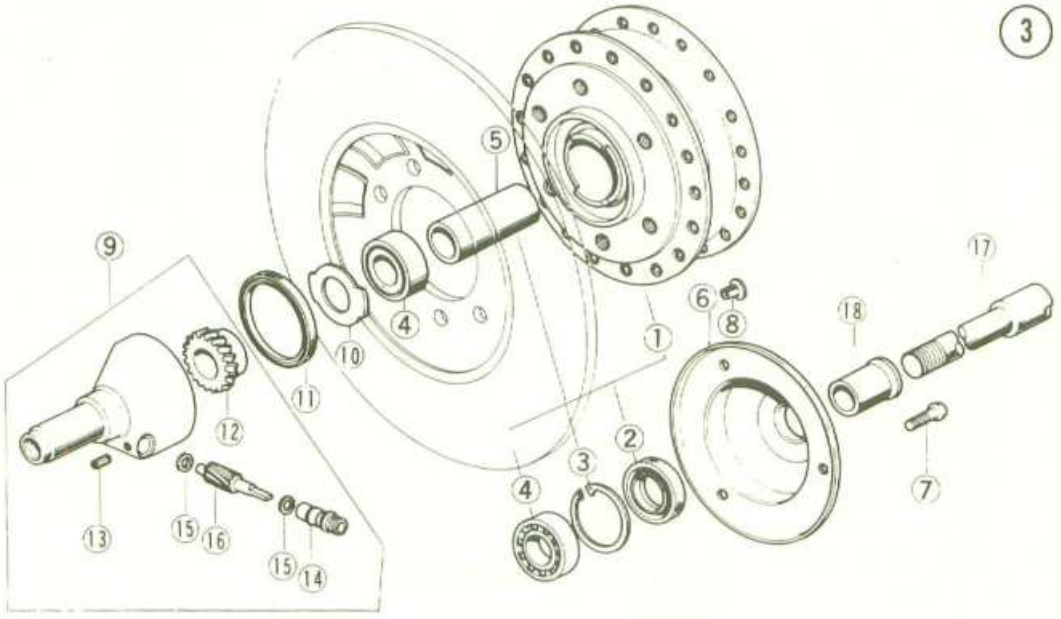
9. Insert a drift from the left side of the hub, and drive out the right-hand wheel bearing.

Disassembly (1976 Model)

See **Figure 4** for the front hub of the KZ900.

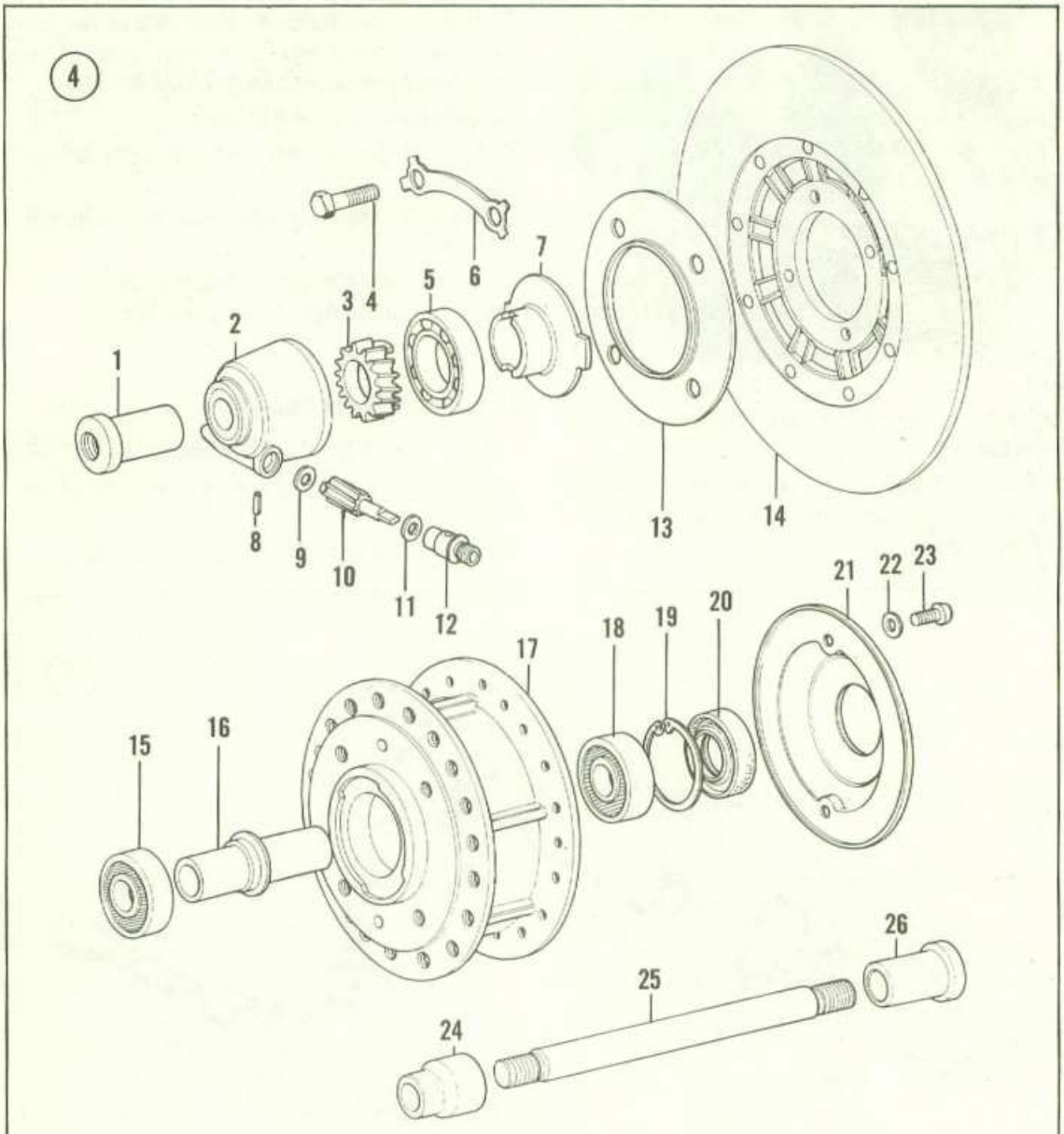
1. Remove the axle nut on the disc side of the front wheel.

2. Pull off the speedometer gear housing.



FRONT HUB — 1973-1975 MODELS

1. Drum assembly
2. Oil seal
3. Circlip
4. Bearing
5. Distance collar
6. Wheel cap
7. Screw
8. Cap
9. Gearbox
10. Speedometer gear drive
11. Oil seal
12. Speedometer gear
13. Pin
14. Bushing
15. Washer
16. Speedometer pinion
17. Axle
18. Collar



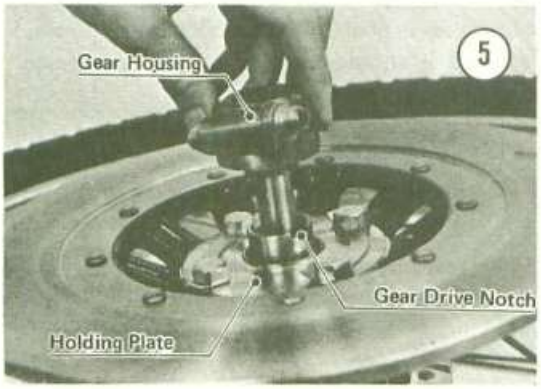
FRONT HUB — 1976 MODELS

1. Axle nut
2. Speedometer gear housing
3. Speedometer gear
4. Disc bolt
5. Grease seal
6. Double washer
7. Speedometer gear drive
8. Pin
9. Washer
10. Speedometer pinion
11. Washer
12. Bushing
13. Speedometer gear drive holding plate
14. Disc
15. Bearing
16. Distance collar
17. Front hub
18. Bearing
19. Circlip
20. Grease seal
21. Cap
22. Washer
23. Screw
24. Collar
25. Axle
26. Axle nut

3. Pull out the axle (along with the right axle nut). Remove the collar.

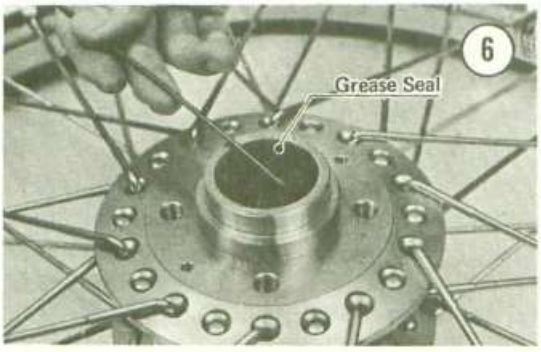
4. Flatten the disc bolt's double washers.

5. Remove the bolts, double washers, speedometer gear drive holding plate, speedometer gear drive, and disc (**Figure 5**).



6. Remove the screws, washers, and cap from the right side of the hub.

7. Use a hook to pull out the grease seal and remove the circlip (**Figure 6**).



8. Remove the right side bearing (along with the distance collar) by inserting a metal rod into the hub from the speedometer gear side and tapping it evenly around the bearing inner race (**Figure 7**).

9. Remove the left side bearing by inserting a metal rod into the hub from the right side and tapping it evenly around the bearing inner race.

Inspection

Check the front axle for runout, and inspect and lubricate the wheel bearings.



A bent axle can cause vibration, poor handling, and instability. To check the runout of the front axle:

1. Place the axle in V-blocks spaced 4 in. apart. Position a dial gauge halfway between the V-blocks so that its probe bears perpendicularly against the axle.

2. Rotate the axle and write down the highest and lowest dial gauge readings. The difference between them is the runout.

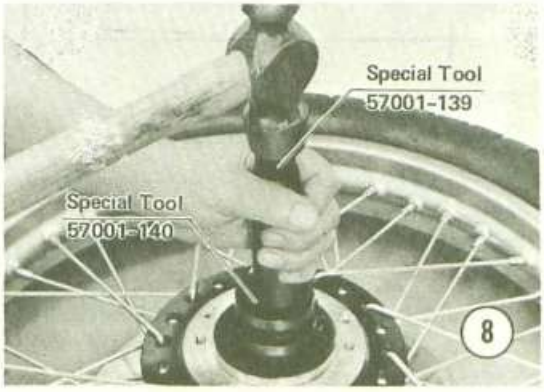
3. A new front axle has less than 0.004 in. (0.1mm) of runout. If runout exceeds 0.008 in. (0.2mm), replace the axle with a new one.

4. Lubricate the wheel bearings (Chapter Two).

Reassembly (All Models)

1. Reassemble the hub in the reverse order of disassembly, using the additional steps below.

2. When installing the wheel bearings and the right side grease seal, drive them in with a wheel bearing driver holder and a wheel bearing driver (a Kawasaki dealer has these special tools available). See **Figure 8**. Use a new grease seal.



3. When installing the gearbox hub for the speedometer drive, align it with the speedometer drive (**Figure 9**).



HYDRAULIC DISC FRONT BRAKE

In operation, the disc brake offers many important advantages. However, in working on that type of brake, it is important to observe the following precautions. Brake torques are given in **Table 1**.

Table 1 DISC BRAKE TORQUES

	Torque	
Brake lever	45-60 in.-lb.	0.5-0.7 mkg
Brake lever adjuster Locknut	155-200 in.-lb.	1.8-2.3 mkg
Master cylinder clamp	46-78 in.-lb.	0.6-0.9 mkg
Fitting (banjo) bolts	19-23 in.-lb.	2.5-3.3 mkg
Brake pipe nipple	150-155 in.-lb.	1.7-1.8 mkg
3-way joint	45-50 in.-lb.	0.5-0.6 mkg
Pressure switch	135-170 in.-lb.	1.5-2.0 mkg
Caliper shafts	22-26 ft.-lb.	3.0-3.6 mkg
Caliper mounting bolts	19-23 ft.-lb.	2.5-3.3 mkg
Bleeder valve	70-85 in.-lb.	0.8-1.0 mkg
Disc mounting bolts	140-190 in.-lb.	1.6-2.2 mkg

Precautions

1. Never reuse old brake fluid.
2. Never use fluid from a container that has been left open.
3. Use only disc brake fluid marked DOT 3.
4. Use only disc brake fluid, isopropyl alcohol, or ethyl alcohol for cleaning brake parts. Do not allow alcohol to remain in contact with rubber parts for more than 30 seconds.
5. Brake fluid will damage painted surfaces; any spilled fluid should be wiped off immediately.
6. Do not allow gasoline or any type of oil to come in contact with brake parts.

Front Brake Bleeding

If the front brake feels spongy when you pull the lever, air is probably trapped in the hydraulic lines, and it should be bled out. To replenish the supply of hydraulic fluid in the reservoir during the bleeding operation, refer to the *Front Brake Fluid Change* procedure listed in Chapter Two for acceptable brands of brake fluid.

Bleed the brake as follows:

1. Unscrew the top from the handlebar fluid reservoir and check to see that it is filled with fluid. Check the fluid level frequently during the bleeding operation, and add fluid as necessary. If the reservoir runs dry, you will have to start all over again.
2. Pull the brake lever slowly several times, until air bubbles stop rising from the passages in the bottom of the fluid reservoir.
3. On the brake caliper at the front wheel, pull the rubber cap off the bleeder valve.
4. Attach one end of a piece of clear plastic tubing to the nipple at the end of the bleeder valve. Stick the other end of the tubing into an empty can.
5. Squeeze the brake lever a few times in rapid succession to build up pressure. Holding the pressure, open the bleeder valve (by turning it counterclockwise), and close it again. Check the level of fluid in the reservoir. Continue this operation until there are no more air bubbles mixed with the fluid leaving the bleeder valve.
6. Remove the plastic tubing from the bleeder valve, and put on the rubber cap. Fill the reservoir to the level line with fluid and screw on the top.

BRAKE PADS

Removal

1. Remove the front wheel.
2. Near the bottom of caliper B facing the wheel, remove the screw that mounts pad B to the caliper (**Figure 10**).



3. Take out pad B.
4. Squeeze the front brake lever a few times. The piston in the caliper will push out pad A.

Inspection

Inspect the pads to see if they are worn out about the same amount. If not, you should replace the oil seal. If either brake pad is worn down to its red line, replace both pads with a new set.

Installation

1. Unscrew the bleeder valve enough to open it slightly (**Figure 11**).



2. With your hand, push the caliper piston in as far as it will go, and then close the valve.
3. Align the groove in pad A with the ridge in the caliper, and insert the pad into the caliper.
4. Apply Loctite to the mounting screw for pad B. Position pad B in the caliper and install the screw.
5. Check the fluid level in the master cylinder reservoir.
6. Install the front wheel.

CALIPER

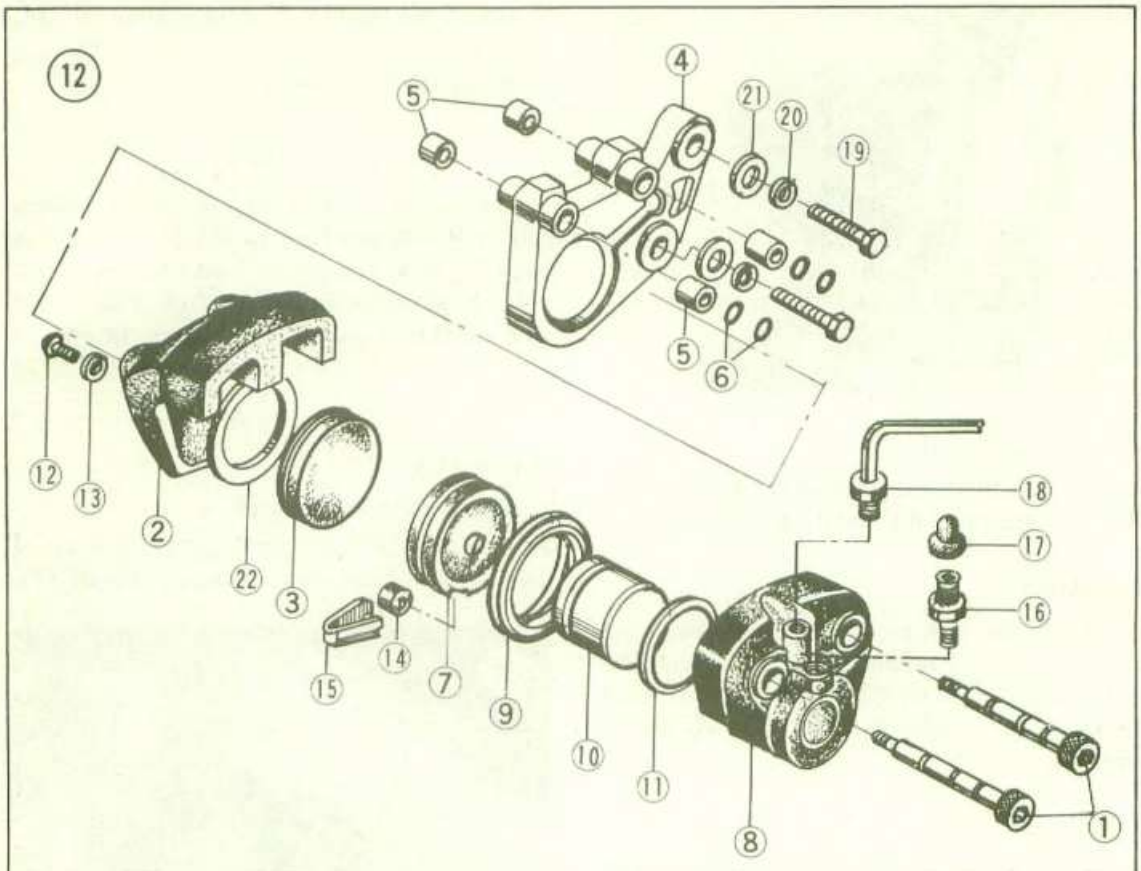
The caliper consists of the caliper holder, caliper B with pad B screwed into it, caliper A (which houses the piston), pad A, and the 2 Allen head shafts which slide from side to side with calipers A and B. See **Figures 12 and 13** for 1973-1975 models and **Figure 14** for 1976 model.

Disassembly

1. Remove the front wheel.
2. Unscrew the brake pipe nipple at the top of the caliper and disconnect the pipe (**Figure 15**).

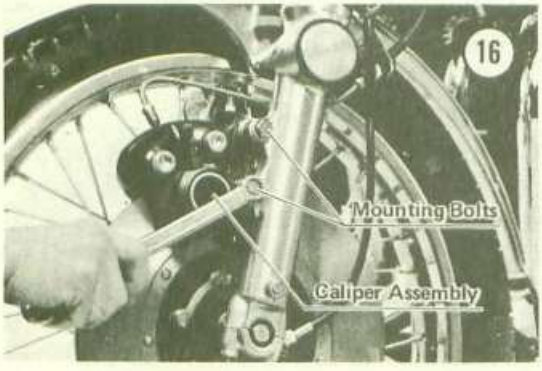


3. Take the rubber cap off the bleeder valve and put it on the bottom end of the brake pipe.
4. Loosen the Allen head shafts that connect the caliper halves.
5. Unscrew the caliper mounting bolts from the left slider leg and remove caliper. See **Figure 16** for 1973-1975 models or **Figure 17** for 1976 model.
6. Unscrew Allen head shafts alternately, ½ turn at a time.
7. Take off caliper B and pad B.
8. Slide the caliper holder carefully off the Allen head shafts.
9. Take pad A out of caliper A.
10. Remove the piston dust seal from caliper A.
11. Pull the piston straight out of its cylinder, without cocking it. If it will not come out, blow air into the brake passage (**Figure 18**).

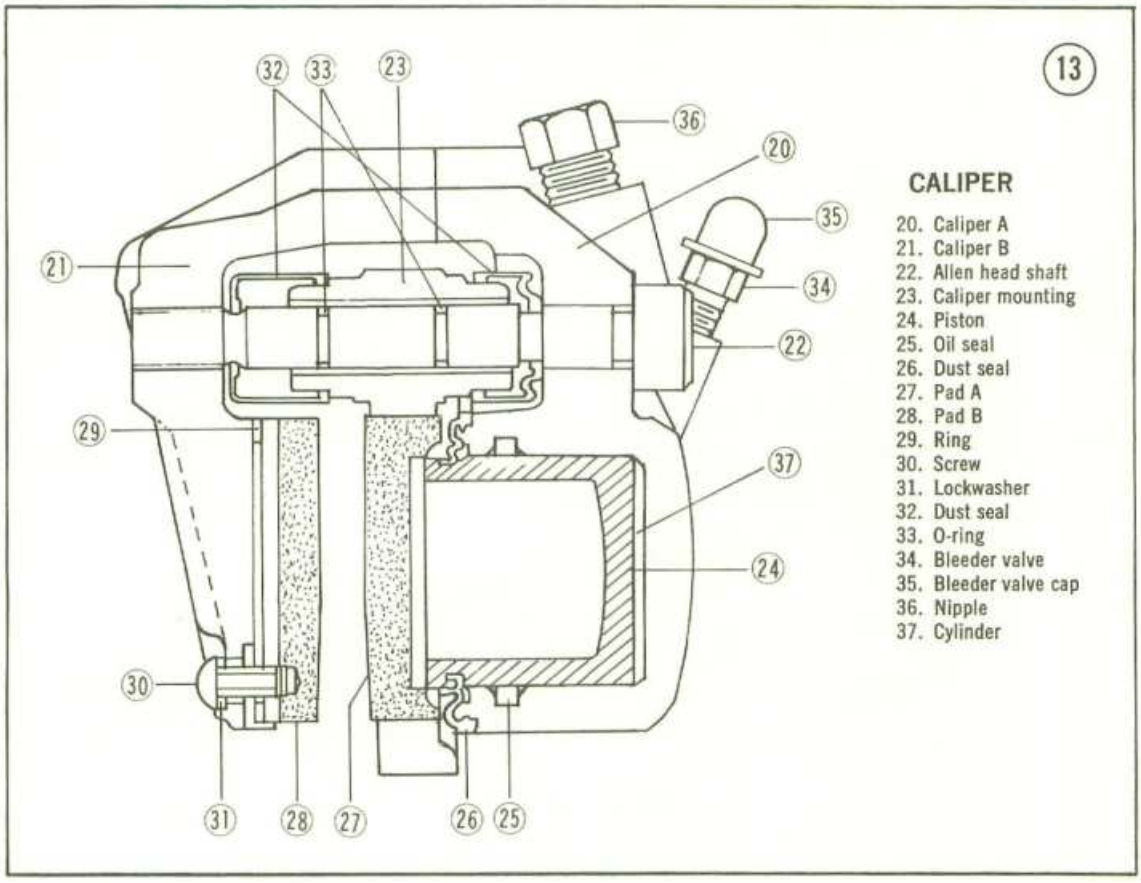


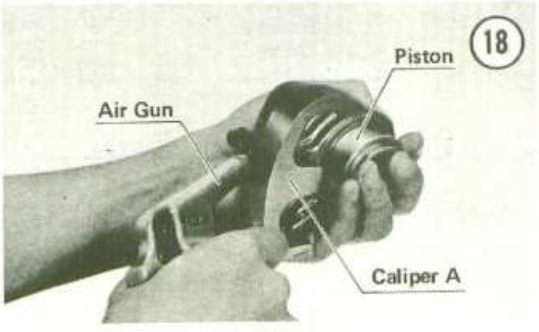
CALIPER ASSEMBLY

1. Allen head shaft
2. Caliper B
3. Pad B
4. Caliper holder
5. Boots
6. O-ring
7. Pad A
8. Caliper A
9. Piston dust seal
10. Piston
11. Seal
12. Screw
13. Lockwasher
14. Bushing
15. Stopper
16. Bleeder valve
17. Bleeder valve cap
18. Nipple
19. Mounting bolt
20. Lockwasher
21. Washer
22. Ring









12. Pull out the piston seal, being careful not to score the wall.

Inspection

Check the condition of the pads. If either pad is worn down to the red line, replace both pads with a new set.

Check for evidence that the oil seal around the caliper piston is malfunctioning. Replacement is necessary if:

a. One pad has worn more than the other one
b. There has been any fluid leakage around pad A
c. The seal is stuck to the piston
d. The brake has been overheating

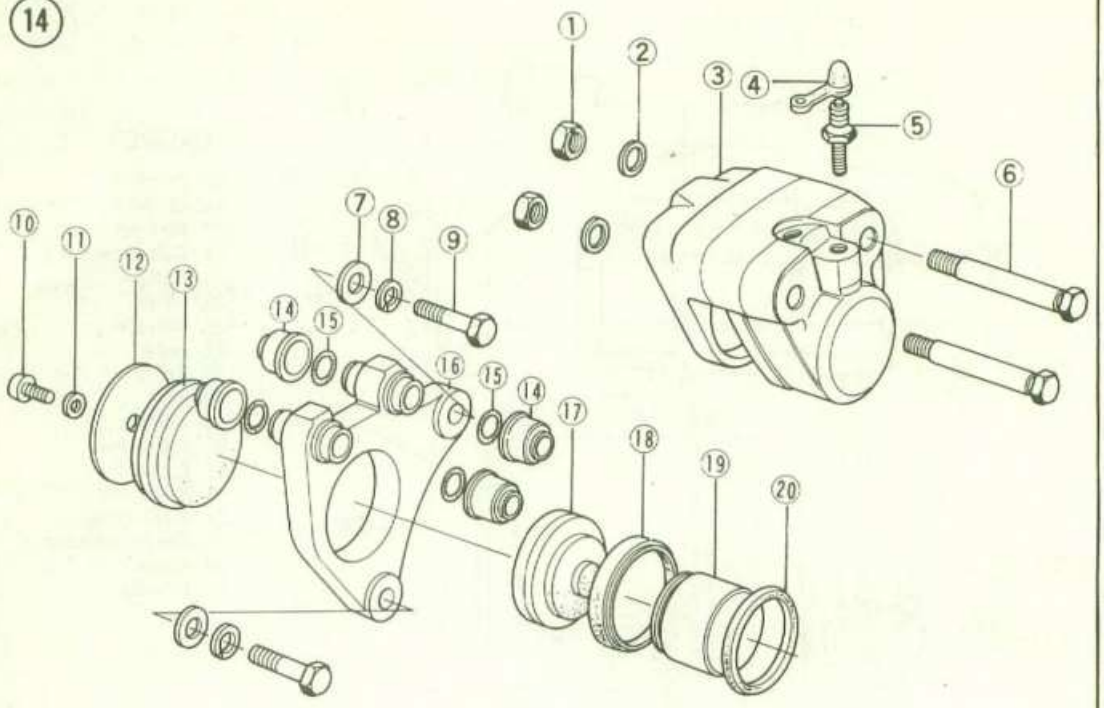
Measure the diameters of the piston and cylinder. If either exceeds the service limit, replace it with a new one (**Table 2**). Also replace them if they are rusty or scored.

Replace any oil seal or dust seal that is worn, cracked, or swollen.

Reassembly

1. Clean the caliper halves, the holder, the shafts, the seal, and the piston with brake fluid, and leave clean brake fluid on their working parts.

2. Reassemble the caliper in the reverse order of disassembly.



FRONT CALIPER

1. Nut
2. Spacer
3. Caliper
4. Bleeder valve cap
5. Bleeder valve
6. Caliper holder shaft
7. Flat washer
8. Lockwasher
9. Caliper mounting bolt
10. Mounting screw
11. Lockwasher
12. Metal plate
13. Pad B
14. Dust cover
15. O-ring
16. Caliper holder
17. Pad A
18. Dust seal
19. Piston
20. Fluid seal

Table 2 CALIPER SERVICE LIMITS

	Standard	Service Limit
Cylinder inside diameter (1973-1975)	1.5031-1.5039 in. (38.180-38.200mm)	1.5045 in. (38.215mm)
Cylinder inside diameter (1976)	1.6835-1.6854 in. (42.850-42.900mm)	1.686 in. (42.92mm)
Piston outside diameter (1973-1975)	1.5006-1.5019 in. (38.115-38.148mm)	1.5002 in. (38.105mm)
Piston outside diameter (1976)	1.6815-1.6823 in. (42.788-42.820mm)	1.680 in. (42.750mm)

3. Bleed the brake lines. See the front brake bleeding procedure in Chapter Two.

DISC

Before removing the front wheel or the disc, read the inspection procedures for measurements to make with the disc on the motorcycle.

Removal

1. Remove the front wheel.
2. Flatten the bent-up tabs of the lockwashers behind the disc mounting bolts.
3. Remove the 6 disc mounting bolts.
4. Pull off the disc.

Inspection

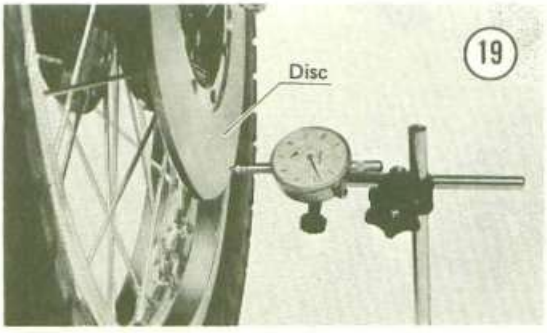
You should check the disc for wear and warp.

To check the disc for wear:

1. Measure the thickness of the disc at its point of greatest wear, with a micrometer.
2. A new disc is 0.276 in. (7.0mm) thick. If at any point the disc is thinner than 0.217 in. (5.5mm), replace it with a new one.

To check for warp:

1. Prop the front wheel off the ground, and turn the forks to their stop.
2. Position a dial gauge so that its probe bears against the outer surface of the disc near its edge (**Figure 19**).



3. Rotate the wheel and write down the highest and lowest readings of the dial gauge. The difference between them is the runout.
4. A new disc has less than 0.004 in. (0.1mm) of runout. If runout exceeds 0.012 in. (0.3mm), replace the disc with a new one.

Installation

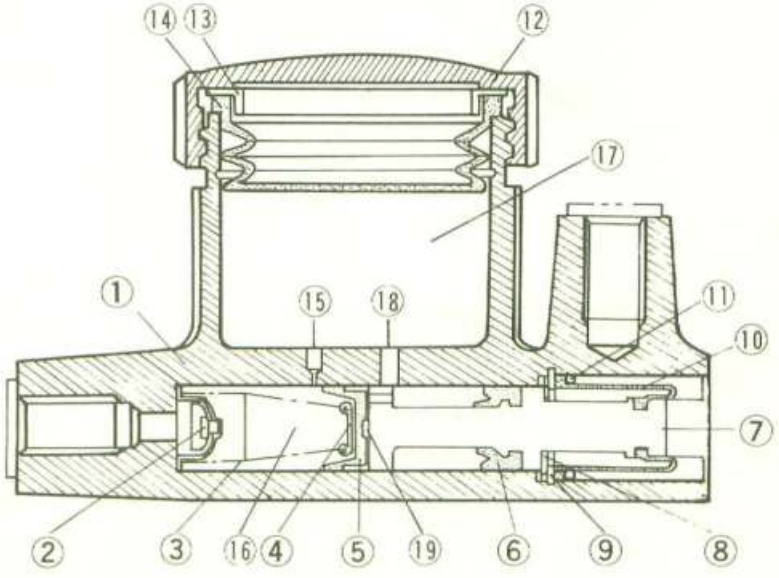
1. Install the disc in reverse order of removal.
2. Torque disc mounting bolts to 140-190 in.-lb.
3. Bend up the tabs on the tab washers so they press against the flats on the bolt heads.

MASTER CYLINDER

The main components of the master cylinder are the reservoir, the piston, the primary and secondary cups, the check valve, and the spring. See **Figures 20 and 21**.

Disassembly

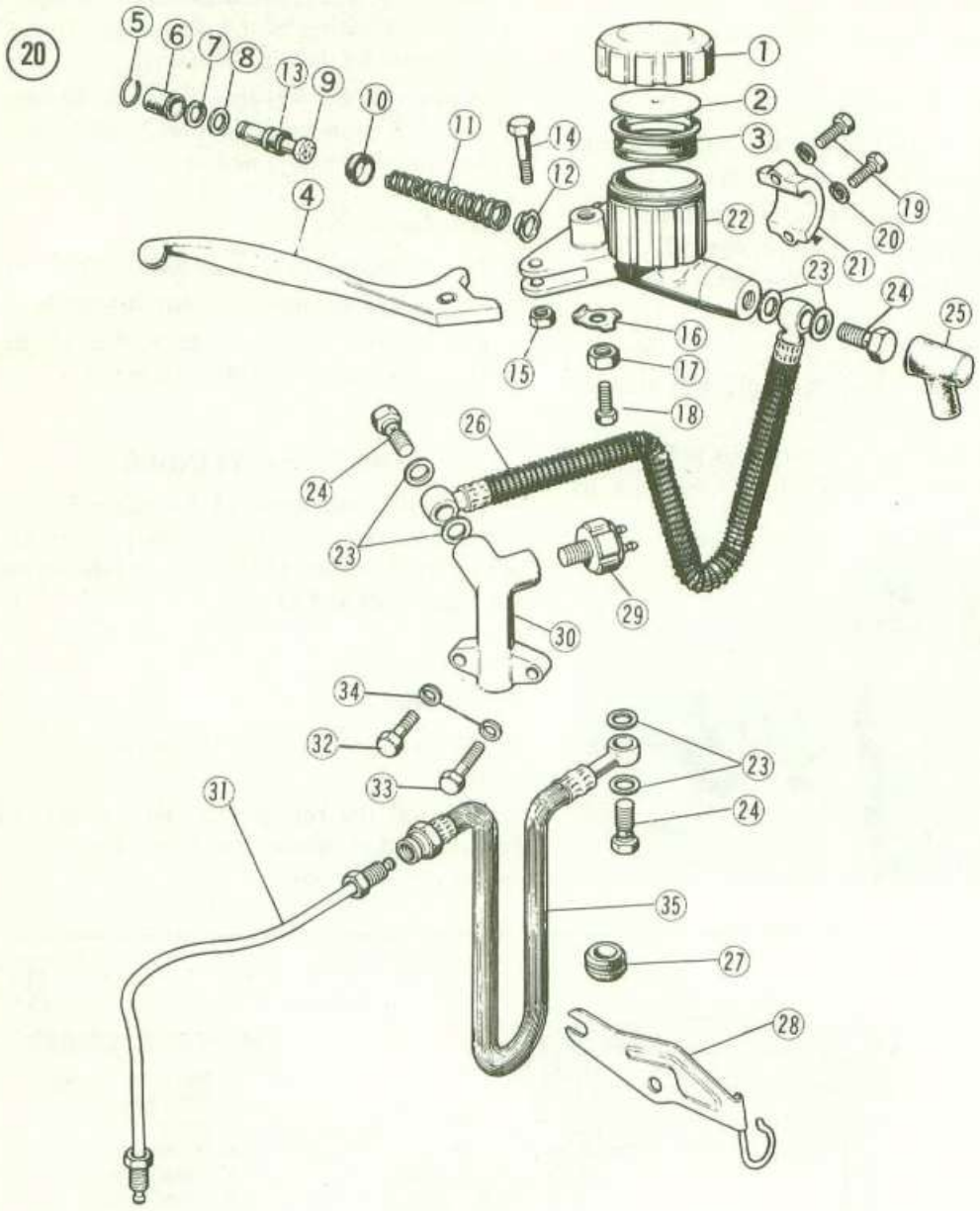
1. Unscrew and remove the right rear view mirror.
2. Take off the rubber cap and unscrew the banjo bolt that mounts the brake hose to the master cylinder body.



21

MASTER CYLINDER

1. Master cylinder body
2. Check valve
3. Spring
4. Spring seat
5. Primary cup
6. Secondary cup
7. Piston
8. Piston stopper
9. Circlip
10. Dust seal
11. Dust seal stopper
12. Cap
13. Plate
14. Cap seal
15. Relief port
16. Pressure chamber
17. Reservoir
18. Supply port
19. Non-return valve



MASTER CYLINDER AND BRAKE LINES

1. Cap
2. Plate
3. Cap seal
4. Brake lever
5. Dust seal stopper
6. Dust seal
7. Circlip
8. Piston stopper
9. Piston assembly
10. Primary cup
11. Spring assembly
12. Check valve assembly
13. Secondary cup
14. Bolt
15. Nut
16. Lockwasher
17. Nut
18. Bolt
19. Bolt
20. Washer
21. Master cylinder mounting
22. Master cylinder body
23. Washer
24. Banjo bolt
25. Dust cover
26. Hose
27. Grommet
28. Bracket
29. Pressure switch
30. 3-way fitting
31. Pipe
32. Bolt
33. Bolt
34. Washer
35. Hose

3. Unscrew the clamp bolts that mount the master cylinder to the handlebars (**Figure 22**). Take off the master cylinder.



4. Unscrew the cap from the fluid reservoir.

5. Take out the diaphragm plate and the diaphragm.

6. Empty the fluid out of the reservoir.

7. Remove the nut and bolt that mount the brake lever. Remove the brake lever.

8. Use a spring hook to remove the dust cover stopper. Take out the dust cover (**Figure 23**).

9. Take out the retaining ring in front of the piston with snap ring pliers. Pull the stopper, piston, primary cup, spring, and check valve out of the master cylinder body.

Inspection

If the piston or master cylinder is rusted or scored, replace them with new ones. If the primary or secondary cups are worn, damaged, or swollen, replace them with new ones.



If the small relief port in the bottom of the reservoir is plugged, the pads will drag on the disc; clean out the port if it is plugged.

Take the measurements listed in **Table 3**, and replace any part that exceeds the service limit.

Reassembly

1. Clean all parts with disc brake fluid, and leave clean fluid on their working surfaces.

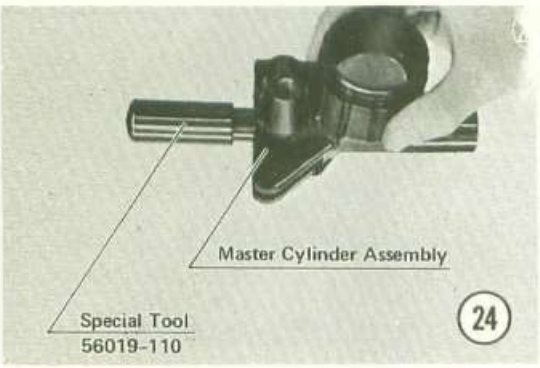
2. Reassemble the master cylinder in the reverse order of disassembly. Observe the following precautions.

3. Do not install the primary cup or check valve backward, or allow them to get cocked.

4. Use a retaining ring driver to install the retaining ring in its groove in the master cylinder wall. Use the same tool to install the boot and the boot stopper (**Figure 24**).

Table 3 MASTER CYLINDER SERVICE LIMITS

	Standard		Service Limit	
	Single Disc	Dual Disc	Single	Dual
Cylinder inside diameter	0.5512-0.5529 in. (14.00-14.043mm)	0.6248-0.6265 in. (15.870-15.913mm)	0.5543 in. (14.080mm)	0.6280 in. (15.950mm)
Piston outside diameter	0.5495-0.5506 in. (13.957-13.984mm)	0.6231-0.6242 in. (15.827-15.854mm)	0.5472 in. (13.900mm)	0.6209 in. (15.770mm)
Primary, secondary cup diameter	0.5768-0.5965 in. (14.650-15.150mm)	0.6476-0.6673 in. (16.450-16.950mm)	0.5709 in. (14.500mm)	0.6417 in. (16.300mm)
Spring length (free)	2.008 in. (51.0mm)	1.709 in. (43.4mm)	1.890 in. (48.0mm)	1.594 in. (40.5mm)



FRONT FORKS

Operation

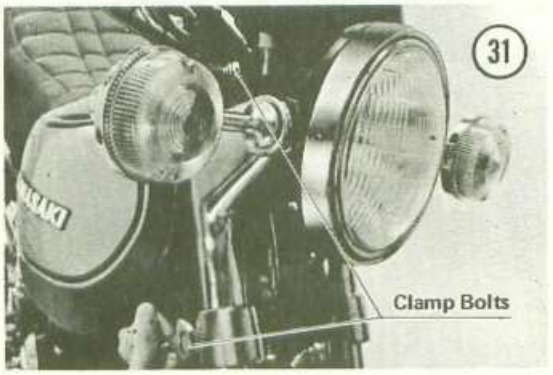
Each front fork leg consists of the fork tube (inner tube), slider leg (outer tube), fork spring, and damper cylinder with its damper components. There are some differences between a fork leg in the 1973 model (**Figure 25**) and a fork leg in the 1974-1976 models (**Figure 26**), mostly in the design of the damper cylinder components, but all models operate on the same general principles.

As the fork leg is compressed, the damper piston descends into the slider leg, forcing the damper oil out of its normal reservoir in the slider leg up into the fork tube. There are several routes the oil can take, including passage through large one-way valves that allow it to move rapidly. **Figure 27** shows the compression stroke of the 1973 model; **Figure 28** shows the 1974-1976 models.

On extension, as the damper piston moves back up into the fork tube, the damper oil is forced out of the fork tube back down into the slider leg. This time it must pass through smaller one-way valves, which retards the extension rate of the fork leg and dampens the fork spring action. **Figure 29** shows the extension stroke of the 1973 model; **Figure 30** shows the 1974-1976 models.

Disassembly

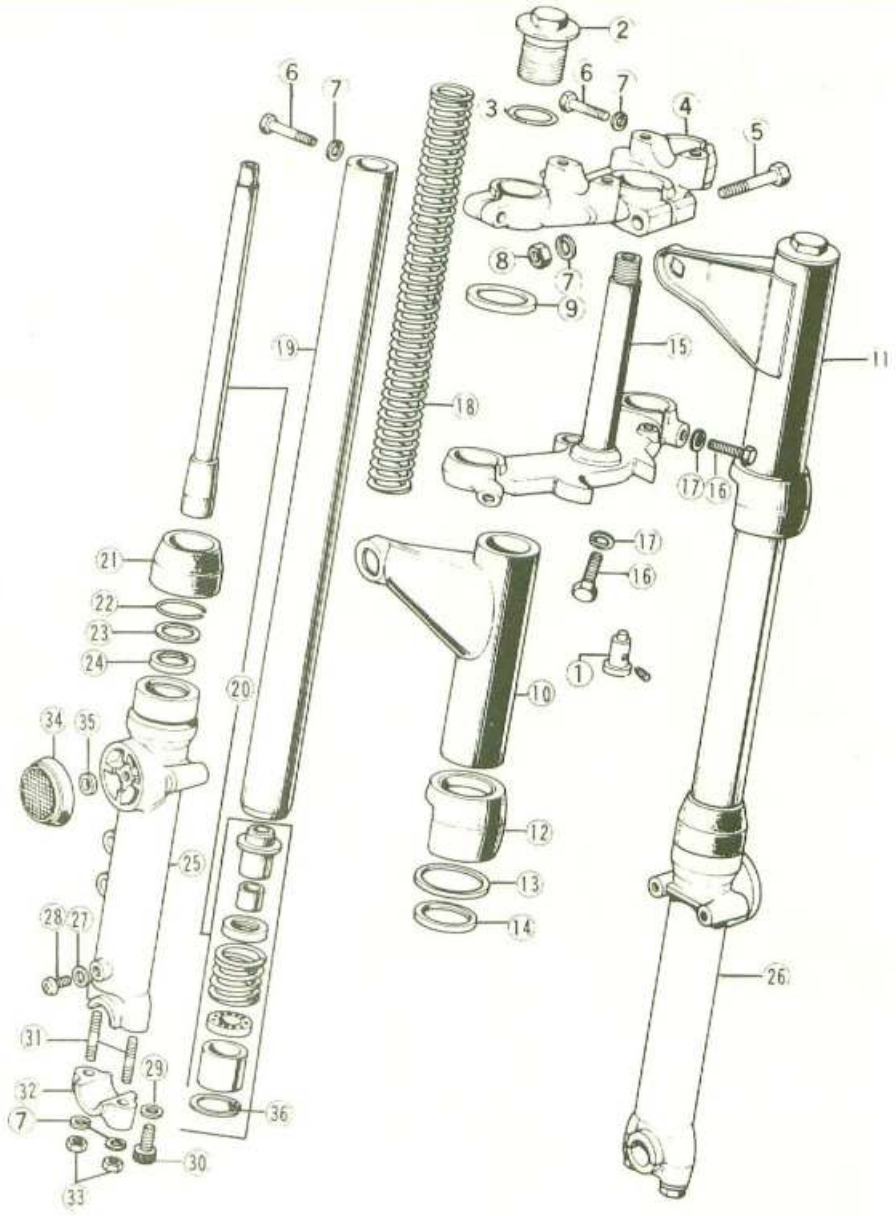
1. Remove the front wheel.
2. Remove the 4 front fender mounting bolts from the slider legs.
3. Unscrew the bolts that mount the caliper assembly to the slider leg. Take off the assembly and rest it on a crate that will keep it at its normal height off the ground.
4. Loosen the plug bolt (top bolt) in the top of the fork tube.
5. Loosen the fork tube clamp bolts that clamp the fork leg you wish to remove in the top and bottom triple clamps (**Figure 31**).



6. Slide the fork leg down out of the triple clamps.
7. Remove the plug bolt from the top of the fork tube.
8. Take out the fork spring and dump out the fork oil.
9. Pry the dust seal out of the top of the slider leg and slide it up the fork tube.
10. Insert a damper cylinder holding tool (a Kawasaki dealer has a special tool available) into the fork tube and attach it to the top of the damper cylinder. Remove the Allen screw from the bottom of the slider leg (**Figure 32**).

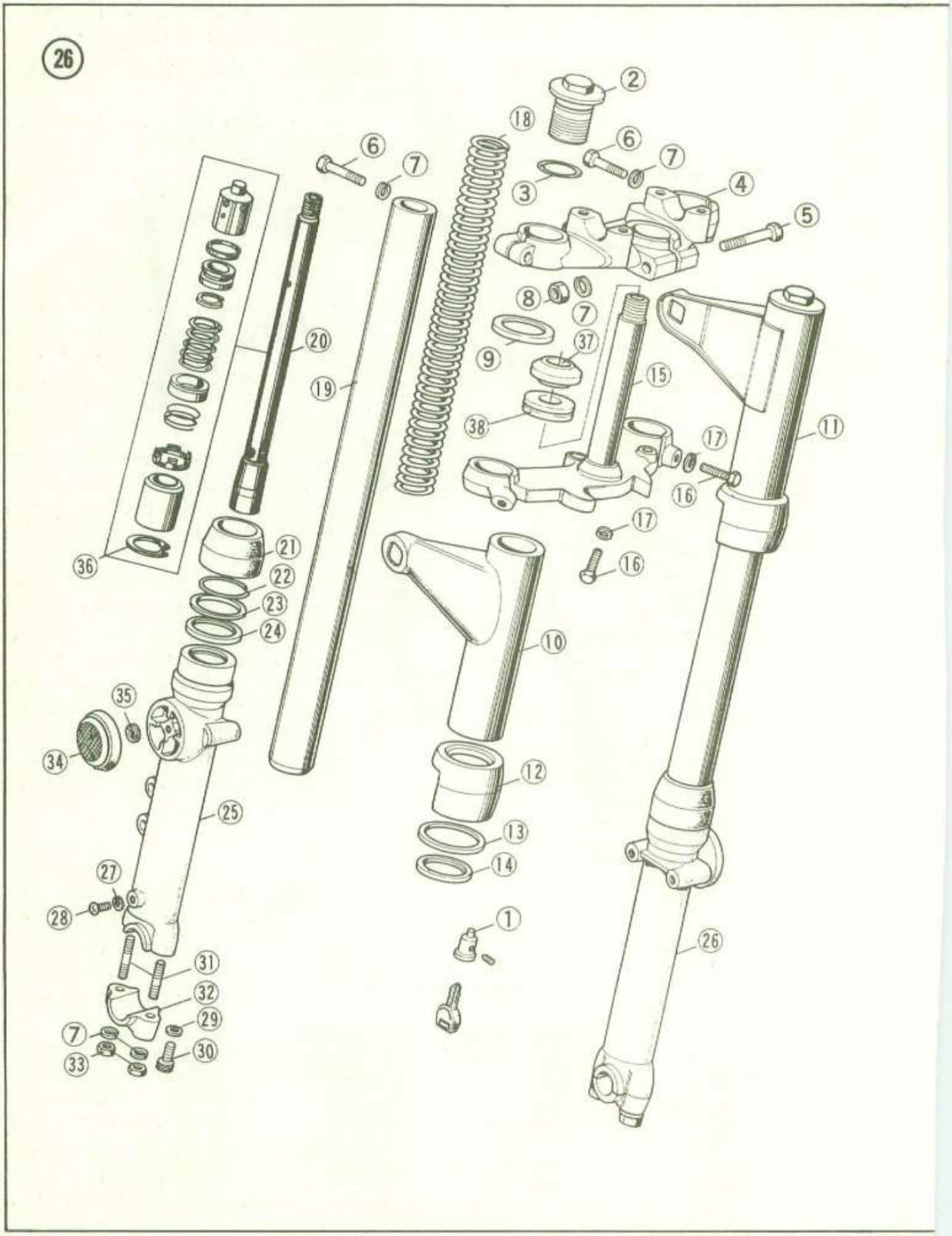


11. Pull the fork tube and the damper cylinder out of the slider leg.



FRONT FORK — 1973

1. Lock
2. Top bolt
3. O-ring
4. Stem head
5. Clamp bolt
6. Clamp bolt
7. Lockwasher
8. Nut
9. Washer
10. Headlight bracket
11. Headlight bracket
12. Guide
13. Washer
14. Gasket
15. Steering stem
16. Bolt
17. Lockwasher
18. Spring
19. Inner tube
20. Cylinder
21. Dust seal
22. Circlip
23. Washer
24. Oil seal
25. Outer tube
26. Outer tube
27. Gasket
28. Drain plug
29. Gasket
30. Allen bolt
31. Stud
32. Axle
33. Nut
34. Reflector
35. Rubber washer
36. Circlip


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FRONT FORK ASSEMBLY (1974-1976 MODELS)

1. Lock assembly
2. Top bolt
3. O-ring
4. Stem head
5. Clamp bolt
6. Clamp bolt
7. Lockwasher
8. Nut
9. Washer
10. Headlight stay
11. Headlight stay
12. Stay guide
13. Washer
14. Gasket
15. Steering stem
16. Bolt
17. Lockwasher
18. Spring
19. Inner tube
20. Cylinder assembly
21. Dust seal
22. Circlip
23. Washer
24. Oil seal
25. Outer tube
26. Outer tube
27. Gasket
28. Drain plug
29. Gasket
30. Allen bolt
31. Stud
32. Axle
33. Nut
34. Reflector
35. Rubber washer
36. Circlip
37. Inner race
38. Grease seal

12. Use snap ring pliers to remove the retaining ring from the lower end of the fork tube.

13. Take out the damper cylinder and components.

14. Use a spring hook to pull the retaining ring from the mouth of the slider leg.

15. Pry the oil seal out of the mouth of the slider leg with a spring hook (the seal will be destroyed in the process).

Inspection

Visually inspect the fork tube for bending. If you find a bend that cannot be straightened, replace the fork tube with a new one. Also inspect the areas of the fork tube that contact the seal in the slider leg, for roughness or scoring, which can quickly destroy a seal. Smooth any rough spots with fine emery paper. Inspect the inner surface of the fork tube for roughness that could accelerate the wear of the damper piston. If the tube is badly scored, replace it with a new one.

Inspect the damper cylinder for straightness. If it is bent, replace it with a new one.

Check the damper piston for wear, which can affect the damping rate of the fork leg considerably. Check the coil springs on the damper cylinder for sagging; they control the opening and closing of the one-way valves.

Measure the free length of the fork spring to check its tension. Refer to the front fork spring checking procedure in Chapter Two.

Reassembly

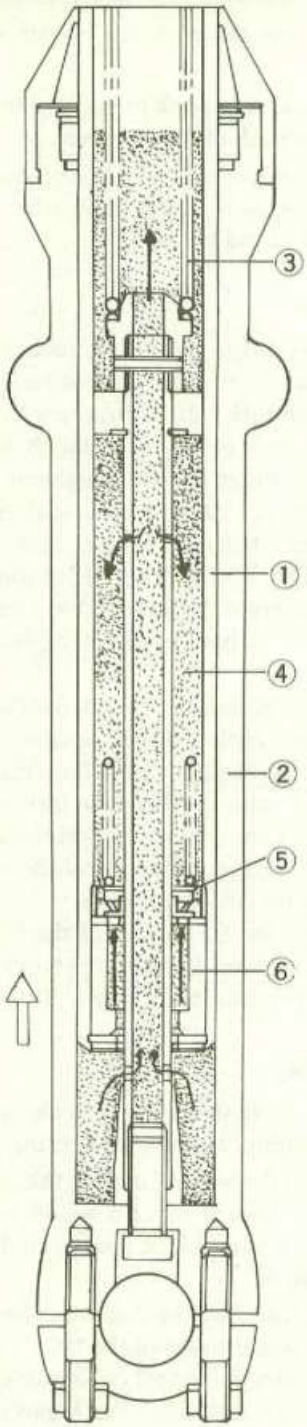
1. Reassemble the fork leg in the reverse order of disassembly, including following procedures.

2. To install a new oil seal in the mouth of the slider leg, drive it in with an oil seal guide (a Kawasaki dealer has a special tool available). See **Figure 33**.

3. When inserting the damper cylinder into the fork tube (inner tube) of the 1974-1976 models, use a cylinder guide tool (a Kawasaki dealer has a special tool available). See **Figures 34 and 35**.

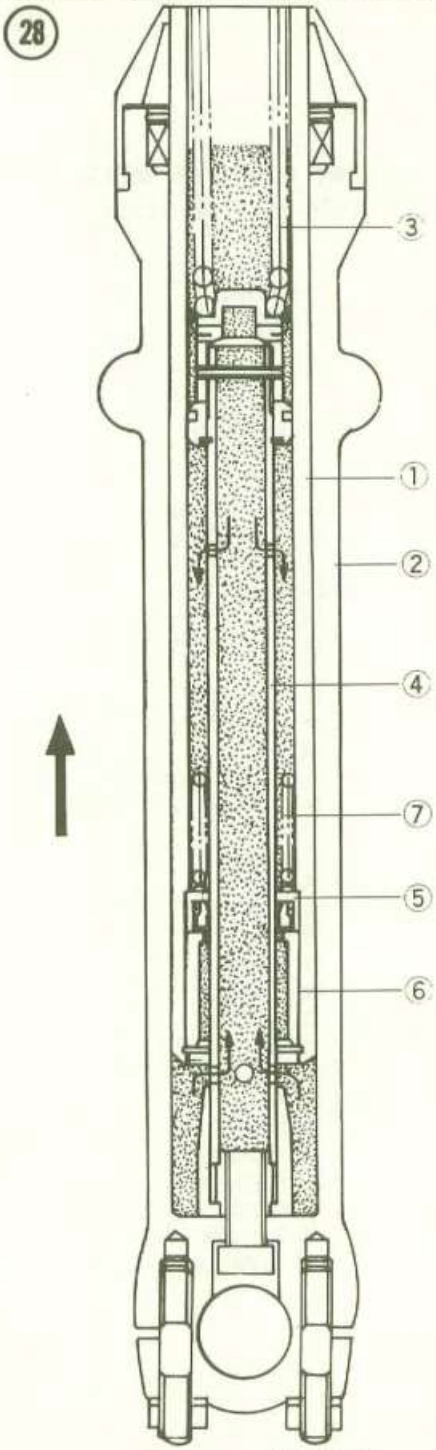
4. After inserting the fork leg into the triple clamps, check that the top of the fork tube is flush with the top edge of the top triple clamp (**Figure 36**).

COMPRESSION STROKE — 1973



1. Inner tube
2. Outer tube
3. Spring
4. Cylinder
5. Valve
6. Piston

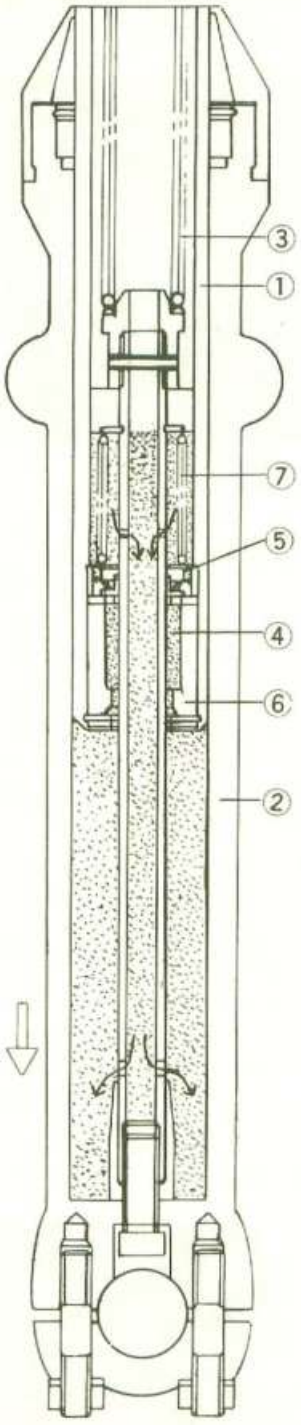
COMPRESSION STROKE — 1974-1976



1. Inner tube
2. Outer tube
3. Spring
4. Cylinder
5. Valve
6. Piston
7. Spring

EXTENSION STROKE — 1973

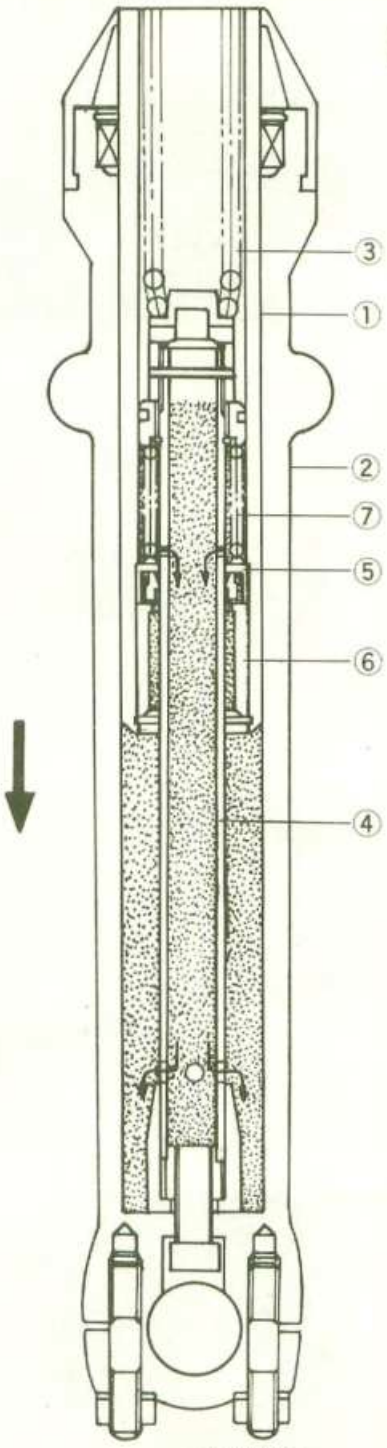
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1. Inner tube
2. Outer tube
3. Spring
4. Cylinder
5. Valve
6. Piston
7. Spring

EXTENSION STROKE — 1974-1976

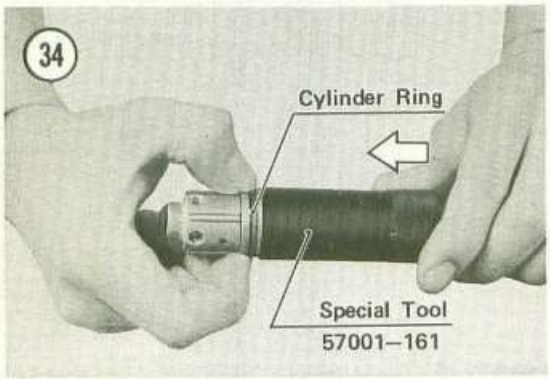
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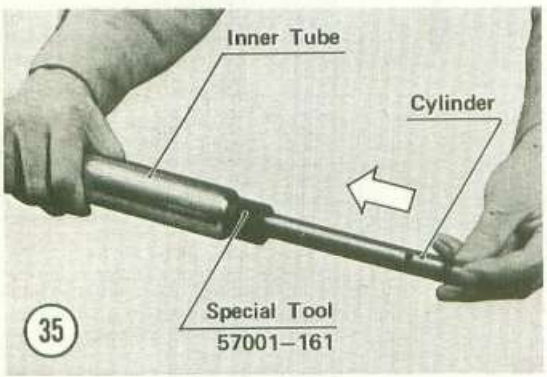


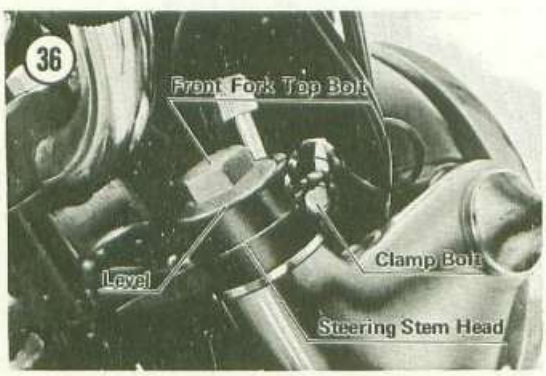
1. Inner tube
2. Outer tube
3. Spring
4. Cylinder
5. Valve
6. Piston
7. Spring

8

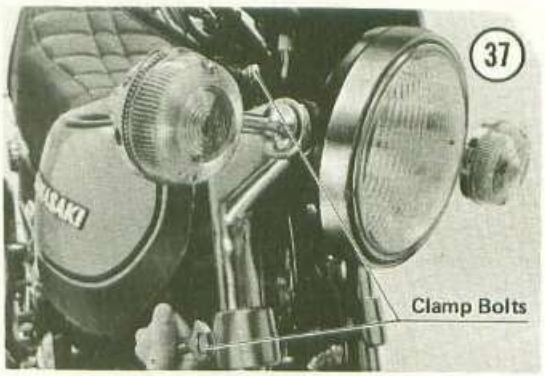








5. Torque the clamp bolt in the top triple clamp to 12-13 ft.-lb. Torque the clamp bolt in the bottom triple clamp to 39-43 ft.-lb. (**Figure 37**).



STEERING STEM

Disassembly

1. Remove the front wheel from the motorcycle.
2. Remove the 4 bolts that mount the front fender to the slider legs, and take off front fender.
3. Remove the headlight positioning bolt from the bottom of the headlight shell.
4. Remove the 2 headlight mounting screws from the sides of the headlight shell, and remove the headlight unit. Unplug the wires.
5. Unplug the connectors from the main wiring harness, and unplug the wires from turn signals.
6. Remove the turn signal mounting nuts inside the headlight shell. Take off the turn signals and the headlight shell.
7. Unscrew the tachometer cable nut from the cylinder head, and take out the cable.
8. Remove the mounting bolts from the ignition switch/tachometer/speedometer unit, and remove the unit from the motorcycle (**Figure 38**).



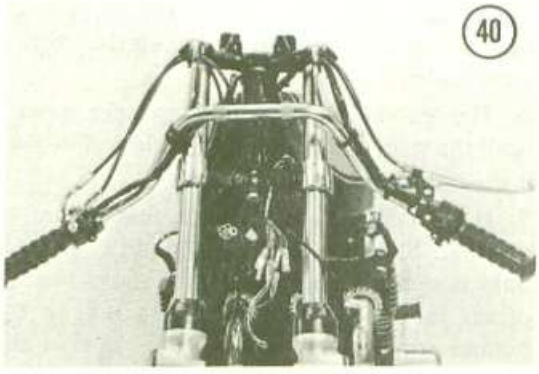
9. Unscrew and remove right rear view mirror.

10. Disconnect the wire from the front brake light switch.

11. Remove the mounting bolts from the disc brake caliper, the 3-way fitting, and the master cylinder. Remove the entire brake assembly as a unit, being careful not to bend the pipe. See **Figure 39**.



12. Unscrew the mounting bolts from the handlebar clamps. Take off the top clamps. Lift off the handlebar and rest it in front of the forks (**Figure 40**).



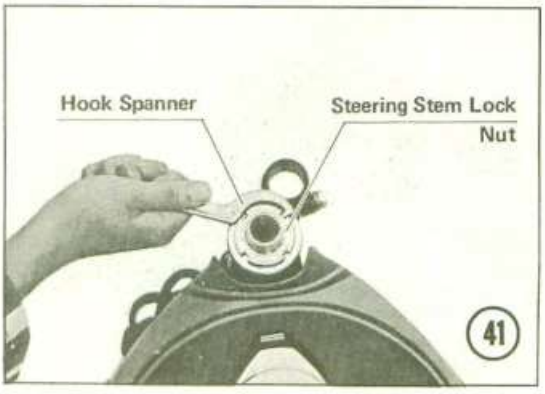
13. Loosen the 3 clamp bolts on the top triple clamps.

14. Remove the steering stem cap nut, and take off the top triple clamp.

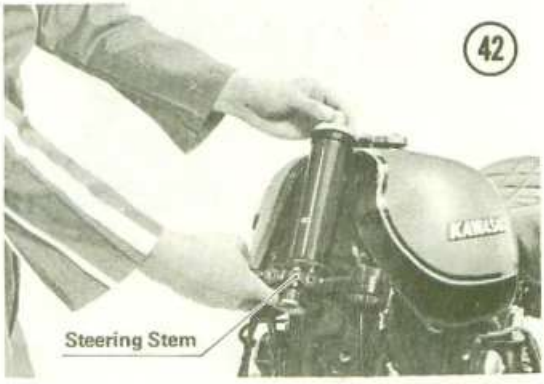
15. Move the handlebars off to one side.

16. Loosen the fork tube clamp bolts on the bottom triple clamp. Slide the fork tubes down out of triple clamps, and remove the headlight mounts.

17. Remove the steering stem collar with a spanner wrench (**Figure 41**).



18. Drop the steering stem and bottom triple clamp out of the steering head (**Figure 42**). The balls from the lower steering bearing will fall out.



19. Take off the stem cap. Take the upper race and the balls from the upper steering bearing out of the steering head.

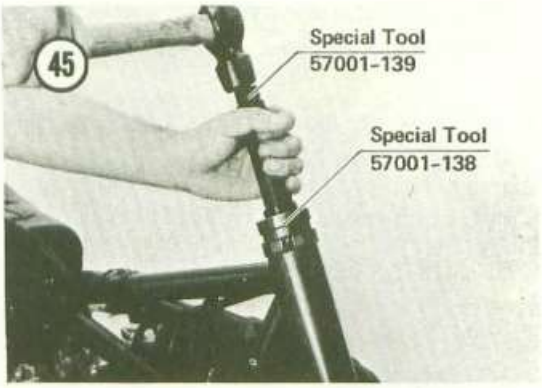
20. Remove an outer race from the steering head. Insert a drift from the other end of the steering head and hammer the drift evenly around the circumference of the race to knock it out (**Figure 43**).

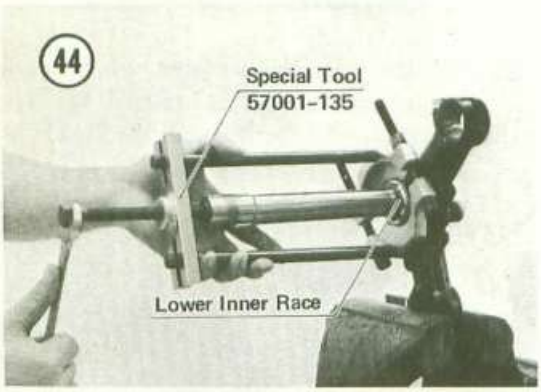
21. Remove the inner race of the lower steering bearing from the steering stem using a steering bearing puller (a Kawasaki dealer has a special tool available) as shown in **Figure 44**.

Inspection

Inspect the steering stem visually for bends. If the stem is even slightly bent, replace it with





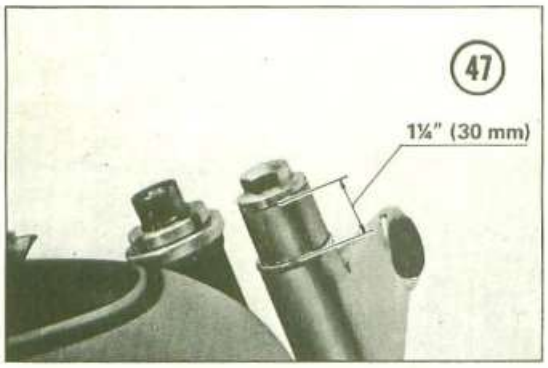


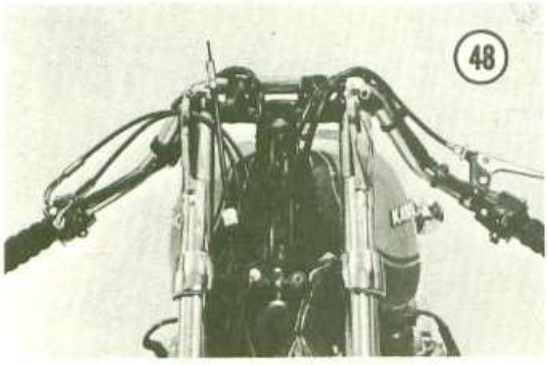


a new one. For other inspection procedures, see the *Steering Stem Bearing Lubrication* procedures and *Steering Play Adjustment* procedures as shown in Chapter Two.

Reassembly

1. Oil the outer steering bearing races, and drive them into the steering head using a stem cup driver and a bearing driver holder (a Kawasaki dealer has these tools available) as shown in **Figure 45**.
2. If the grease seal at the base of the steering stem was ruined during disassembly, replace it with a new one.
3. Oil the inner race for the lower steering bearing and drive it into position on the steering stem with a stem bearing driver (a Kawasaki dealer has a special tool available), as shown in **Figure 46**.
4. Stick the 19 upper and 20 lower steering bearing balls to their outer races with grease.
5. Slide the steering stem up into the steering head. Put on the inner race of the upper steering bearing, and the cap. Screw on the steering stem collar.
6. Tighten the collar with a spanner wrench until the stem will turn freely to either side with a slight push, but it has no play.
7. Hold each headlight guide and mount in position. Slide the fork leg up through them until it sticks out about 1¼ in. above the top of the mount. Tighten the clamp bolt in the bottom triple clamp just enough to hold the fork leg in place (**Figure 47**).
8. Rest the handlebars with the wiring routed as shown in **Figure 48**.
9. Put on the top triple clamp.
10. Install the steering stem cap nut and tighten it. Tighten the steering stem clamp bolt on the top triple clamp to 12-13 ft.-lb.
11. Loosen the clamp bolt on each side of the bottom triple clamp. Position the fork tube so that the top of the fork tube is flush with the





top of the triple clamp. Torque the clamp bolt in the bottom triple clamp to 39-43 ft.-lb.

12. Torque the fork tube clamp bolts in the top triple clamp to 12-13 ft.-lb.

13. Install the handlebars, handlebar clamps, and handlebar mounting bolts. Align the angle of the handlebars with that of the front forks, and torque the clamp bolts to 18 ft.-lb.

14. Mount the disc brake assembly.

15. Complete the reassembly in the reverse order of disassembly.

REAR WHEEL

On the left side of the rear wheel are located the rear sprocket and the rear wheel coupling, which rotates the rear wheel by means of vanes and shock damping rubbers. On the right side is the leading shoe/trailing shoe internal expand rear brake (**Figures 49 and 50**).

Removal/Installation

1. Loosen the right side muffler mounts, to make it easier to get at the rear axle nut.

2. Remove the 2 bolts that mount the chainguard to the swing arm brackets.

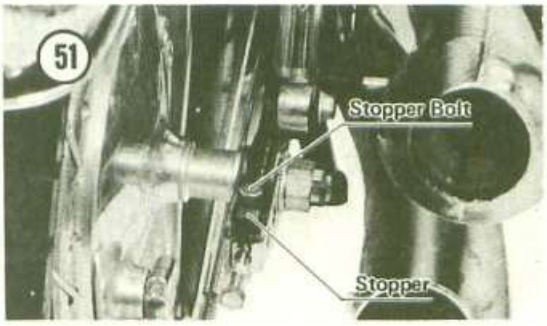
3. Remove the cotter pin from the rear axle. Loosen the rear axle nut.

4. Remove the spring clip from the end of the bolt that mounts torque link to rear brake backing plate (panel). Remove nut and bolt.

5. Remove the brake rod nut from the end of the brake rod. Remove the return spring. Remove the brake rod from the brake cam lever.

6. Loosen the locknuts on both chain adjuster bolts, and back out the bolts.

7. Unscrew both chain adjuster stop bolts, and remove the stops (**Figure 51**).



8. Push the rear wheel forward in the swing arm. Remove the rear chain from the rear sprocket.

9. Pull the wheel rearward and remove it from the motorcycle.

Install as follows.

10. Install the wheel in the reverse order of removal, with the additional steps below.

11. Adjust the rear chain tension with the brake rod nut positioned flush with the end of the brake rod before torquing the rear axle nut or the torque link bolt. Follow the *Rear Chain Tension* checking and adjustment procedures, both in Chapter Two.

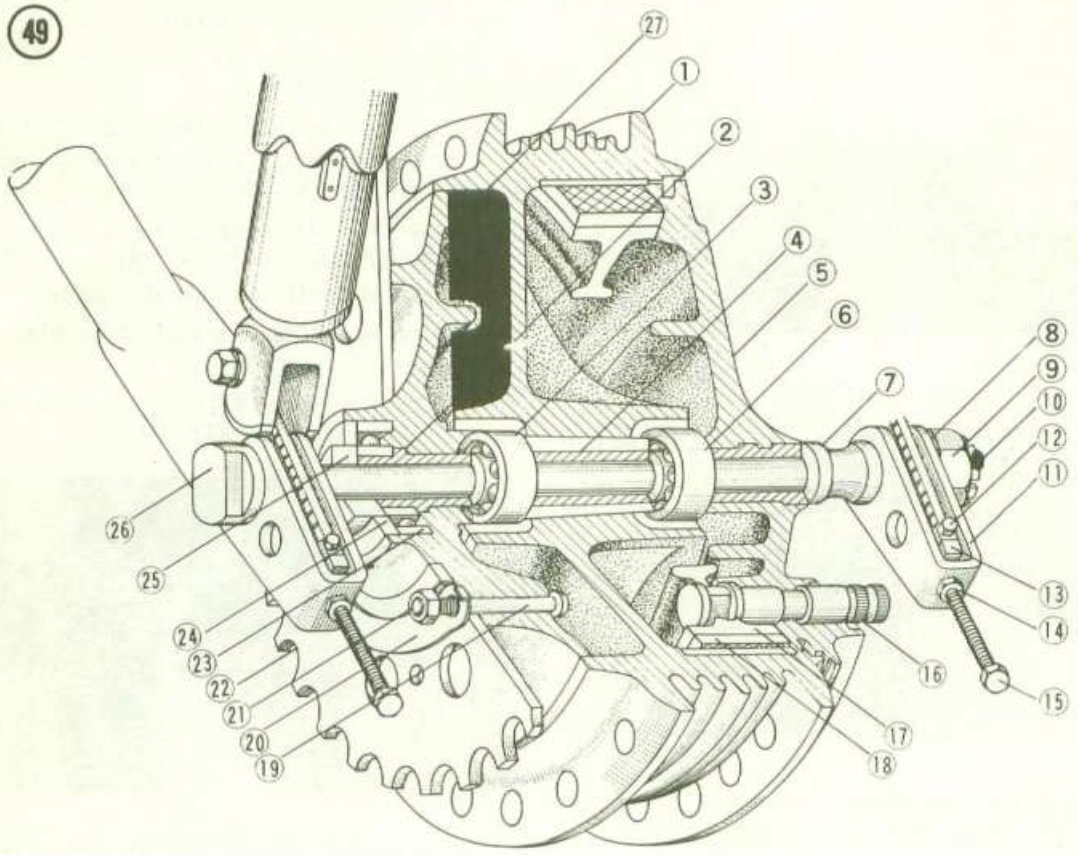
12. Adjust the rear brake linkage, following the adjustment procedures in Chapter Two.

REAR BRAKE

Disassembly

1. Remove the rear wheel as described earlier.

2. Pull out the rear axle.



REAR HUB

1. Rear hub
2. Distance collar
3. Bearing
4. Distance collar
5. Panel assembly
6. Bearing
7. Collar
8. Washer
9. Axle nut
10. Cotter pin
11. Chain adjuster
12. Bolt
13. Chain adjuster stopper
14. Locknut
15. Bolt
16. Camshaft
17. Brake shoe
18. Brake lining
19. Bolt
20. Lockwasher
21. Nut
22. Rear sprocket
23. Bearing
24. Oil seal
25. Axle sleeve collar
26. Axle
27. Shock damper rubber

3. Pull the rear brake backing plate (panel assembly) out of the rear hub.

4. Pull the 2 cotter pins out of the brake shoe pivots on the backing plate. Take off the double washer.

5. Scribe a line across the face of the brake camshaft and the brake cam lever, so that you will know how to reassemble them.

6. Remove the mounting bolt from the brake cam lever and pull the lever off the brake camshaft.

7. On 1974-1976 models, pull the brake lining wear indicator off the brake camshaft.

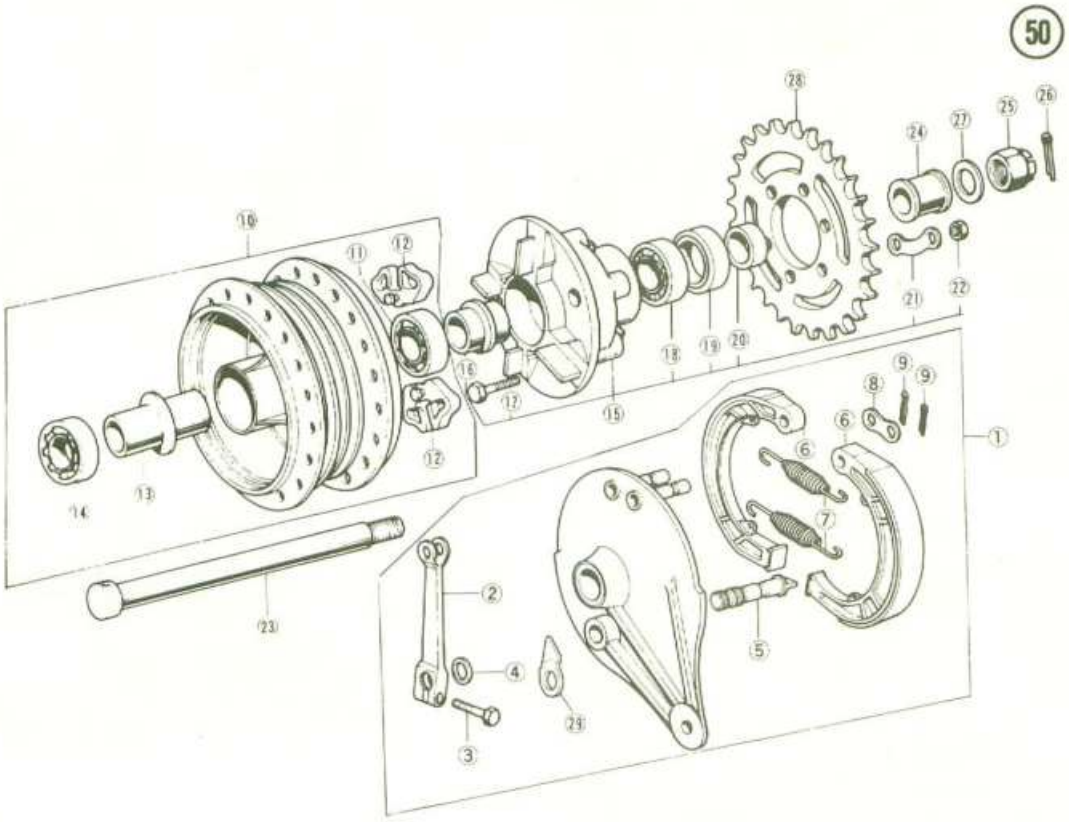
8. Pull the dust seal off the brake camshaft.

9. Pry the 2 brake shoes up their pivot shafts. Lift them off, together with the brake camshaft.

10. Remove the brake camshaft from the shoes. Remove brake springs and separate the shoes.

Inspection

The brake drums and the brake shoes should be checked for wear. The brake shoe springs should be checked for tension. The brake camshaft and its bore in the backing plate should be checked for wear, and the brake should be lubricated.



REAR HUB AND BRAKE

1. Panel assembly
2. Brake cam lever
3. Bolt
4. Dust seal
5. Brake cam
6. Brake shoe
7. Spring
8. Double washer
9. Cotter pin
10. Drum assembly
11. Bearing
12. Shock damper rubber
13. Spacer
14. Bearing
15. Coupling
16. Distance collar
17. Bolt
18. Bearing
19. Oil seal
20. Sleeve collar
21. Washer
22. Nut
23. Axle
24. Distance collar
25. Nut
26. Cotter pin
27. Washer
28. Rear sprocket
29. Brake lining wear indicator

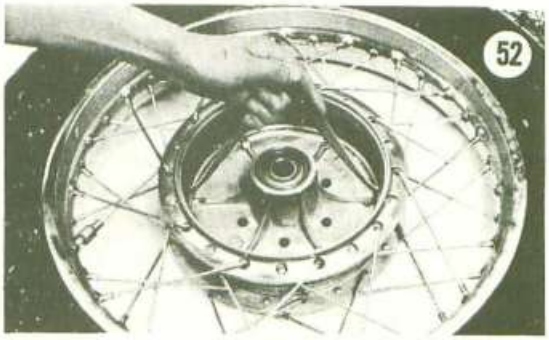
8

To check for brake drum wear:

1. Measure the inside diameter of the drum with calipers, in at least 2 different places (**Figure 52**).

2. A new drum has an inside diameter of 7.874-7.881 in. (200.00-200.185mm). If at any point in the drum you measure a diameter greater than 7.904 in. (200.75mm), replace the hub with a new one.

3. Visually inspect the surface of the drum for scoring, damage, or uneven wear. If you find



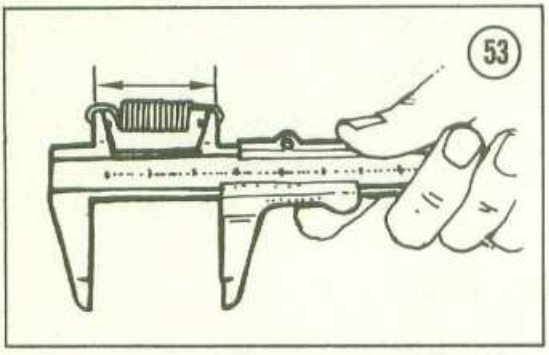
any, have the drum turned down unless its diameter would then exceed the service limit, in which case replace the hub with a new one.

To check for brake shoe wear:

1. Visually inspect the lining on each brake shoe for uneven wear. Sand or file down any high spots.
2. Measure the thickness of the lining at several points around each brake shoe.
3. A new brake shoe has a lining thickness of 0.1909-0.2146 in. (4.85-5.45mm). If the lining thickness is less than 0.079 in. (2mm) anywhere on the shoe, replace both brake shoes with new ones.

To check brake shoe spring tension:

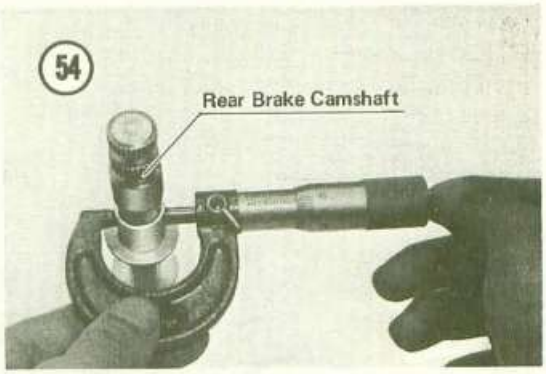
1. Measure the free length of each spring with calipers (**Figure 53**).

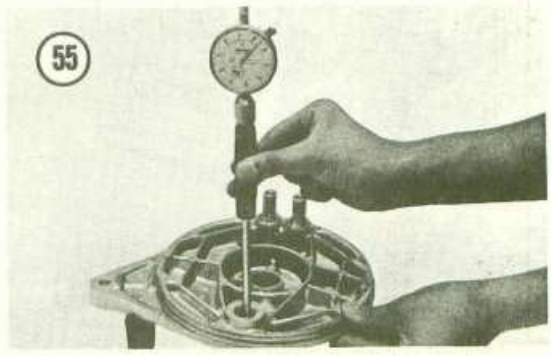


2. A new brake spring is 2.62 in. (66.5mm) long. If either spring is longer than 2.72 in. (69mm) long, replace it with a new one.

To check wear of camshaft and bore in backing plate:

1. Measure the diameter of the shaft with a micrometer (**Figure 54**).
2. A new brake camshaft has an outside diameter on its bearing surface of 0.6676-0.6687 in. (16.957-17.027mm). If the camshaft diameter is less than 0.6626 in. (16.83mm), replace the camshaft with a new one.
3. With a cylinder gauge, measure the inside diameter of the camshaft bore in the backing plate (**Figure 55**).





4. The camshaft bore diameter of a new backing plate is 0.6693-0.6704 in. (17.000-17.027mm). If the bore diameter is greater than 0.6764 in. (17.18mm), replace the backing plate with a new one.

To lubricate the brake components, follow the procedures for rear brake lubrication in Chapter Two.

Reassembly

Reassemble the rear brake in the reverse order of disassembly.

REAR COUPLING AND SPROCKET

Sprocket Runout Check

Check sprocket runout before removing the rear wheel from the motorcycle.

1. Place the motorcycle on its centerstand. Position a dial gauge near the bottom of the sprocket so that its probe bears against the outside of the sprocket near the teeth.

2. Rotate the rear wheel and write down the highest and lowest readings. The differences between the lowest and highest readings is the sprocket runout.

3. A new rear sprocket has less than 0.012 in. (0.3mm) of runout. If the runout is greater than 0.020 in. (0.5mm), replace the sprocket with a new one.

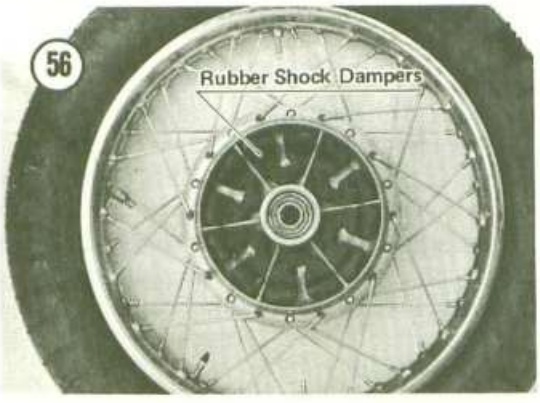
Disassembly

1. Remove the rear wheel from the motorcycle.

2. On the outer face of the coupling, flatten the bent-up tabs of the double washers. Remove the 6 bolts that mount the rear sprocket, and the 3 double washers. Remove the rear sprocket.

3. Pull the coupling assembly from the left side of the hub.

4. Remove the rubber shock dampers from the hub (**Figure 56**).



5. Remove the distance collar from the inner side of the coupler.

6. Take the axle sleeve collar from the outer side of the coupler.

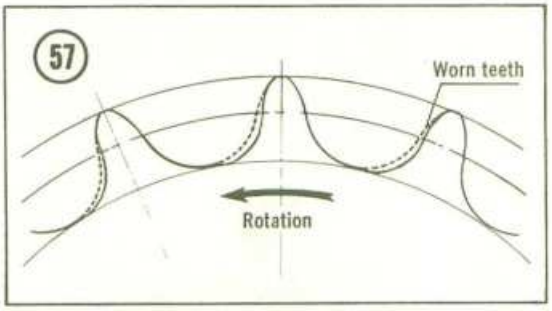
7. Pry out the oil seal.

8. Insert a drift into the coupler from the inner side. With it, tap evenly around the inner race of the coupler bearing, and drive it out of the coupler.

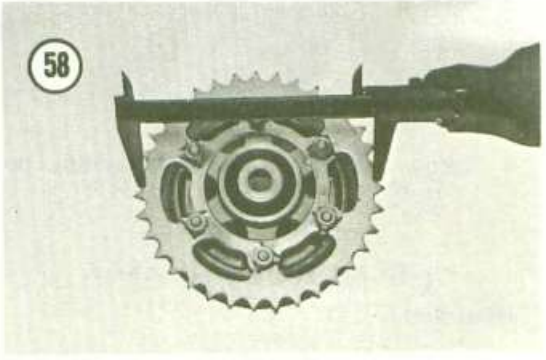
Inspection

Check the rear sprocket for wear as well as runout. Inspect the coupler rubbers for wear or damage. Check and lubricate the coupler bearings.

1. Visually inspect the sprocket teeth. If they are worn in the pattern shown in **Figure 57**, replace the sprocket with a new one.



2. Use calipers to measure the outside diameter of the sprocket at the base of the teeth. See **Figure 58**.



3. A new rear sprocket has an outside diameter of 8.560 in. (217.4mm). If the sprocket has an outside diameter less than 8.484 in. (215.5mm), replace it with a new one.

4. If the rear sprocket is badly worn, measure the rear chain wear (see the checking procedures in Chapter Two), and measure the outside diameter of the output (countershaft) sprocket. See Chapter Four for the removal procedures. A new output sprocket has an outside diameter of 3.376-3.384 in. If the diameter measures less than 3.346 in., replace the output sprocket with a new one.

5. Check the rubber shock dampers for weakness or damage. If you find any weak or damaged ones, replace them with new ones.

6. Inspect and lubricate the coupler bearing (see the *Wheel Bearing Lubrication* procedures in Chapter Two).

Reassembly

1. Reassemble the coupling in the reverse order of disassembly, adding the following procedures.
2. Discard the old oil seal and install a new one.
3. To install the coupler bearing and the oil seal, use a wheel bearing driver holder and a wheel bearing driver (a Kawasaki dealer has special tools available). See **Figure 59**.



4. Torque the rear sprocket mounting bolts to 23-30 ft.-lb.

REAR HUB AND AXLE

Disassembly

1. Remove the rear wheel from the motorcycle.
2. Remove the brake backing plate from the rear hub.
3. Remove the rear coupling from the hub.
4. Insert a drift through the coupling side of the hub. With it, tap gently around the inner race of the brake side wheel bearing, and drive it out of the hub.
5. Take out the distance collar from the brake side of the hub.
6. Insert a drift from the brake side of the hub, tap gently around the inner race of the coupling side wheel bearing, and drive it out of the hub.

Inspection

The rear axle should be checked for runout, and the wheel bearings should be inspected and lubricated.

1. Place the axle in V-blocks placed 4 in. apart. Position a dial gauge halfway between the V-blocks so that its probe bears perpendicularly against the axle.
2. Rotate the axle and write down the highest and lowest dial gauge readings. The difference between them is the runout.
3. A new rear axle has a runout of less than 0.002 in. (0.05mm). If the axle has more than 0.008 in. (0.2mm) of runout, replace it with a new one.
4. Inspect and lubricate the wheel bearings as described in Chapter Two.

Reassembly

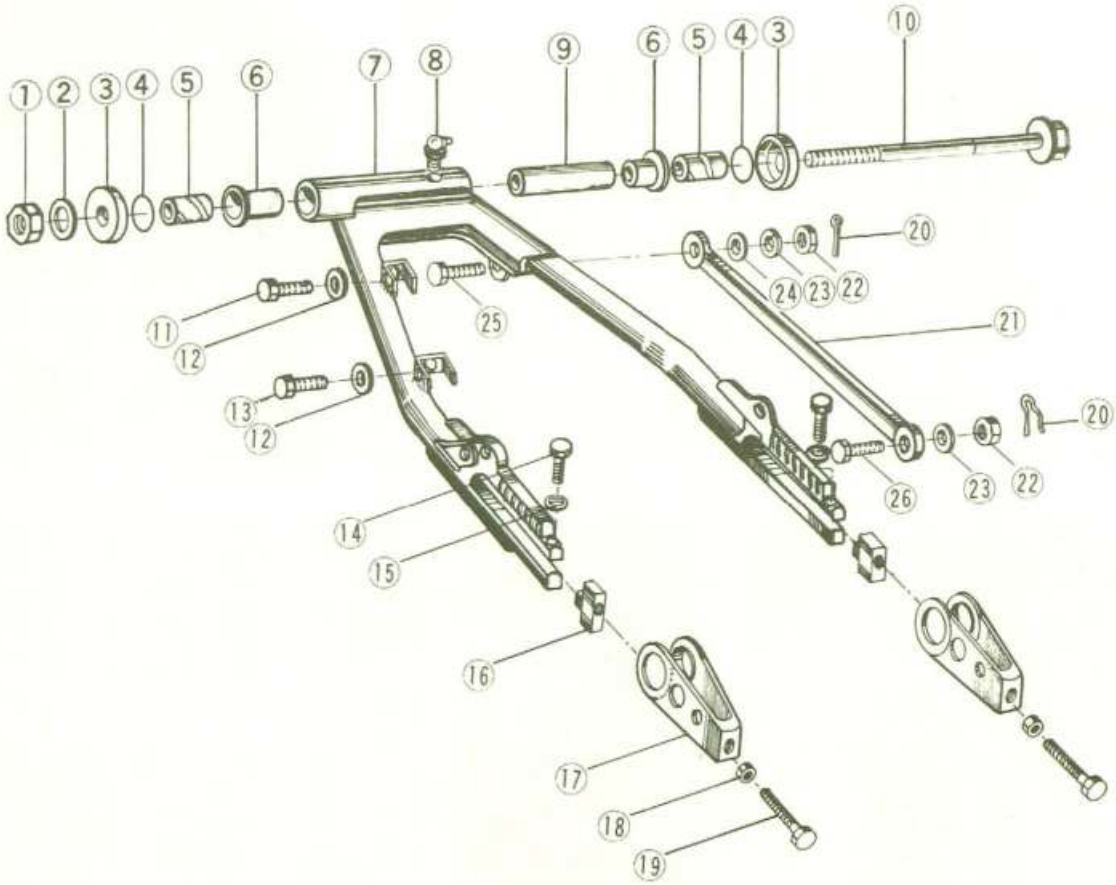
Reassemble the hub in the reverse order of disassembly. When installing the wheel bearings, use a wheel bearing driver holder and a wheel bearing driver (a Kawasaki dealer has special tools available). See Figure 59.

SWING ARM

If the swing arm sleeves and bushings wear, the swing arm will become loose on the pivot shaft, and the high speed stability of the motorcycle will suffer. If the pivot shaft is bent or the swing arm is twisted, the rear wheel will get out of alignment, which also harms the stability of the motorcycle (**Figure 60**).

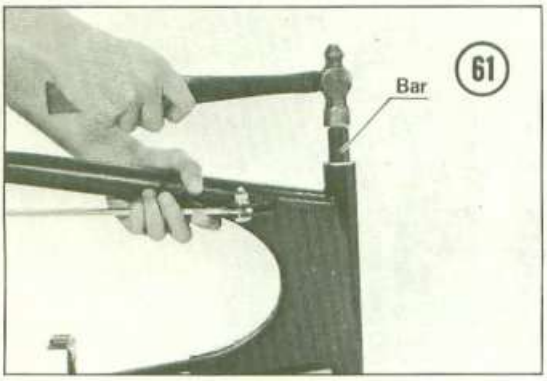
Disassembly

1. Remove the rear wheel from the motorcycle.
2. Take out the lower shock absorber mounting bolt on each side.
3. Unscrew the swing arm pivot shaft nut, and remove the washer and cap.
4. Pull out the pivot shaft, and remove the swing arm.
5. Pull the sleeve out of each end of the pivot tube.
6. Insert a thin drift into the pivot tube. Hammer it gently against the near end of the distance collar to drive out the bushing at the other end of the tube (**Figure 61**).
7. Insert the drift into the other end of the pivot tube and drive out the remaining bushing.



SWING ARM

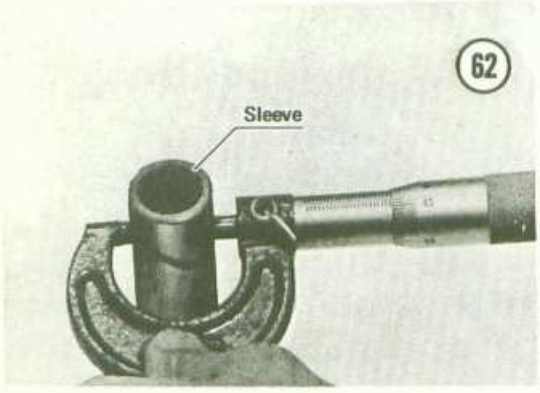
1. Self-locking nut
2. Washer
3. Cap
4. O-ring
5. Sleeve
6. Bushing
7. Swing arm
8. Grease nipple
9. Distance collar
10. Pivot shaft
11. Chain guard mounting bolt
12. Washer
13. Chain guard mounting bolt
14. Chain adjuster stopper mounting bolt
15. Washer
16. Chain adjuster stopper mounting
17. Chain adjuster
18. Locknut
19. Adjuster bolt
20. Cotter pin
21. Torque link
22. Nut
23. Lockwasher
24. Washer
25. Bolt
26. Bolt



Inspection

Check the sleeves for wear. Install new bushings when the swing arm is reassembled. Check the pivot shaft for runout. Lubricate the swing arm (Chapter Two).

1. Measure the outside diameter of the sleeve with a micrometer (**Figure 62**).



2. A new sleeve has an outside diameter of 0.8653-0.8661 in. (21.979-22.000mm). If either sleeve has an outside diameter of less than 0.864 in. (21.95mm), replace both sleeves as a set.

3. If either sleeve is visibly damaged, replace both sleeves as a set.

4. Place the pivot shaft in V-blocks set 4 in. apart. Position a dial gauge halfway between the V-blocks, with the probe bearing perpendicularly against the shaft.

5. Rotate the pivot shaft and write down the highest and lowest reading of the dial gauge. The difference between the lowest and highest readings is the runout.

6. A new swing arm pivot shaft has less than 0.004 in. (0.1mm) of runout. If the shaft has a runout greater than 0.008 in. (0.2mm), replace it with a new one.

Reassembly

1. Reassemble the swing arm in the reverse order of disassembly, adding the following procedures.

2. Install new swing arm bushings; do not reinstall the old ones.

3. Torque the pivot shaft nut to 87-108 ft.-lb.

SHOCK ABSORBER

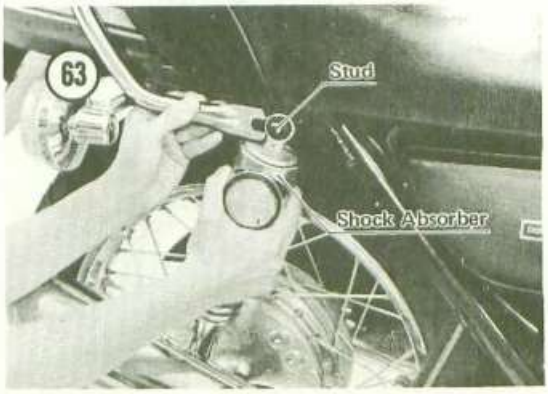
The shock absorbers are not considered maintainable. Check them by removing them from the motorcycle, compressing them by hand and observing the extension stroke, and comparing their "feel." If one has a different feel from the other, replace them both with a new pair.

Removal/Installation

1. Remove the nut from the upper shock absorber mount.

2. Remove the lower shock absorber mounting bolt. If the bolt is difficult to loosen and the mufflers get in the way, loosen the exhaust pipe mounts, or take off the exhaust pipes (for the procedures, see *Exhaust System* in this chapter).

3. Remove the 2 mounting bolts from the grab rail (sissy bar), and remove the grab rail. See **Figure 63**.



4. Pull the top end of the shock absorber free of its mounting stud and remove the shock absorber from the motorcycle.

Install as follows.

5. Install the shock absorber in the reverse order of removal, adding the following procedures.

6. Torque the upper shock absorber mounting nut to 44-47 ft.-lb. Torque the lower shock absorber mounting bolt to 22-25 ft.-lb.

7. Check to see that the cam ring on each shock absorber is turned to the same notch before riding the motorcycle.

REAR CHAIN

Do not break the rear chain to simplify the installation; Kawasaki believes that the chain will be able to handle the load only if it remains uncut.

Removal/Installation

1. Remove the chain cover (for the procedure, see Chapter Four).
2. Remove the rear wheel.
3. Remove the swing arm.
4. Remove the output sprocket (for the procedures, see Chapter Four).
5. Take off the chain.
6. Installation is the reverse of these steps.

Inspection

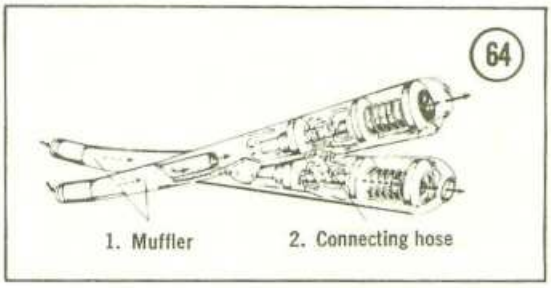
Inspect the chain for wear. See the *Rear Chain Wear* checking procedures, Chapter Two.

EXHAUST SYSTEM

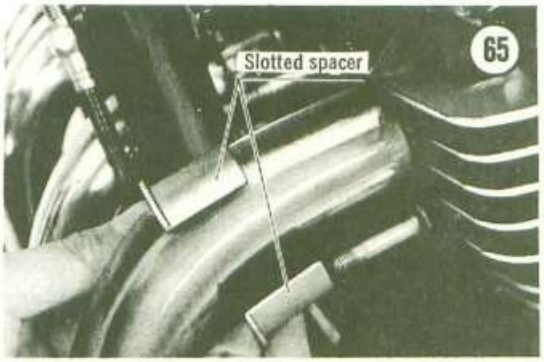
The exhaust system consists of the 4 exhaust pipes with mufflers, and their mounting hardware. The 2 mufflers on each side are interconnected, so that exhaust gases from each cylinder are sent through 2 mufflers (**Figure 64**).

Disassembly

1. Unscrew the 2 nuts and remove the 2 lockwashers mounting each finned exhaust pipe collar to the studs on the cylinder head. Pull each exhaust pipe collar off its studs.



2. Pull each slotted spacer out of the cylinder head (**Figure 65**).

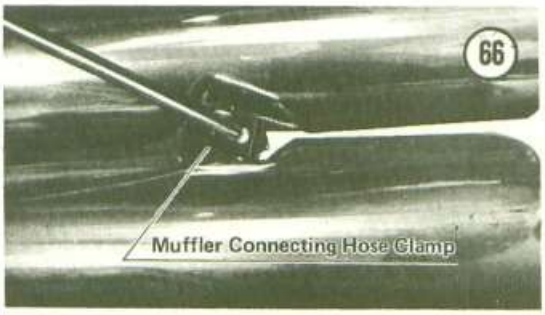


3. Remove the muffler mount nut and bolt from the frame lug on each side of the motorcycle.

4. Push the 2 left exhaust pipes (and mufflers) forward, to free them from the cylinder head. Remove them from the motorcycle. Remove the right exhaust pipes in the same manner.

NOTE: *The exhaust gaskets may remain in the cylinder head, or fall out when you remove the exhaust pipes.*

5. To separate a pair of pipes, loosen the screw of the hose clamp on the rubber tube connecting the mufflers (**Figure 66**). Pull one of the muffler nipples free of the rubber tube.



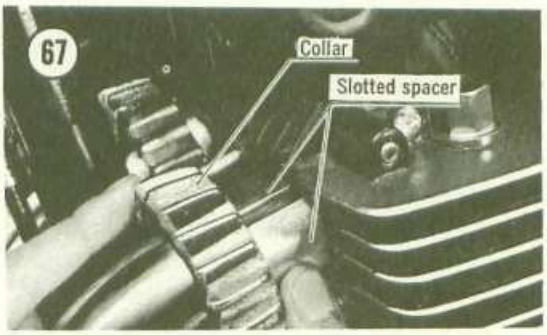
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Inspection

1. If any exhaust pipe/muffler is cracked or badly dented, replace it with a new one.
2. If any of the exhaust gaskets look chewed up, replace it with a new one. If you have noticed gas blow-by from any of the exhaust ports when the engine was running, and the finned exhaust pipe collar was tight, replace the exhaust gasket from that port with a new one.
3. If either of the rubber tubes connecting the mufflers has been leaking gas, and the hose clamp screw was tight, replace the tube with a new one.

Reassembly

1. Begin with the exhaust pipe/muffler for cylinder 2 or 3. Place the exhaust gasket in the exhaust port for that cylinder.
2. On the exhaust pipe, butt the slotted spacer against the mouth of the exhaust pipe, and hold it in place with the finned exhaust collar. Push the exhaust pipe and the spacer into the exhaust port (**Figure 67**), and fit the collar to its mounting studs on the cylinder head.
3. Loosely mount the lockwashers and the nuts on the studs.



4. Install the outside exhaust pipe on the same side of the motorcycle in the same way.
5. Press the muffler nipples into the rubber connecting tube. Tighten the hose clamp screw.
6. Insert the muffler mount bolt through the muffler bushing, the 2 lugs on the mufflers, and the mounting hole in the frame lug. Put on (loosely) the lockwasher and the nut.
7. Tighten the exhaust collar stud nuts at the cylinder head.
8. Tighten the muffler mount nut.
9. Install the exhaust pipes on the other side of the motorcycle in the same way.
10. With motorcycle completely reassembled, run the engine and check for gas blow-by at the exhaust ports and at muffler connecting tubes.

CHAPTER NINE

PERFORMANCE IMPROVEMENT

The Kawasaki Zee, in any of its several versions, is still one of the best-selling and best performing of today's super-bikes.

For most riders, stock peformance is more than enough. However, there a lot of owners who want more, whether they're building a production roadracing machine, a flat-out drag racer, a street-strip bike a street rod or even a touring machine.

Fortunately, the Kawasaki Zee is so highly engineered and so under-stressed in stock configuration that more performance is easily obtained without spending a fortune.

Very few stock components need reinforcing, particularly in the engine, when you start adding horsepower.

Of course, there is more to performance than just power. Some areas that need attention, even on a stock Zee, are braking, suspension, and reliability. When the bike has more-than-stock performance, or is ridden hard, these shortcomings become potentially hazardous.

As a starting point, consider what you have on the stock bike (**Table 1**). These figures should be considered as optimum, since they were obtained from factory-prepared test machines, tuned to maximum performance specifications.

It is interesting to note that performance characteristics of all but one of the various models are almost identical. In spite of its increased displacement, reduced performance figures on the KZ-1000 can be attributed to the gearing change made on that model and increased Federal noise pollution standards. Only the turbocharged TC shows significant difference from the 12 second ET bracket common to most Zee's.

Your own machine may, by the way, vary considerably from these performance figures due to significantly varying internal tolerances, and state of tune.

A properly-tuned Kawasaki Zee may run the quarter mile with an acceptable ET of anywhere from 12.0 to 12.9 seconds.

Drag strip figures are used throughout this chapter, even though the potential roadracer or touring rider may think they do not pertain to him. The reason is simple — drag strip times tend to be remarkably consistent and are the only actual riding test figures available which are neither subject to wild variations from rider ability nor are sterile, practically meaningless statistics like dynomometer readings.

BUILDING YOUR ZEE

Very few riders have the money to have their machines built to the ultimate point all at once.

Table 1 PERFORMANCE TESTS*

1973-1974 Z-1	• Rated horsepower at rear wheel: 64 (estimated). • Elapsed time/speed through quarter mile: 12.44 seconds at 109.86 mph.
1975 Z-1B	• Rated horsepower at rear wheel: 63 at 8,500 rpm. • Elapsed time/speed through quarter mile: 12.139 seconds at 112.07 mph.
1976 KZ900 & LTD	• Rated horsepower at rear wheel 66.5 at 9,000 rpm. • Elapsed time/speed through quarter mile: 12.37 seconds at 109.4 mph.
1977-1978 KZ1000	• Rated horsepower at rear wheel: 53.6 at 8,500 rpm. • Elapsed time/speed through quarter mile: 12.58 seconds at 107 mph.
1978 Z-1R	• Rated horsepower at rear wheel: 69.9 at 8,500 rpm. • Elapsed time/speed through quarter mile: 12.13 seconds at 109.6 mph.
1978 Z-1R TC	• Estimated horsepower at crankshaft: 120 at 8,500 rpm. • Elapsed time/speed through quarter mile: 10.8 seconds at 125-plus mph. Note: This figure was reached by a professional drag racer on a TC modified by a welded crankshaft and a heavy-duty clutch.
*Figures courtesy of Cycle Guide magazine.	

Work must be done little by little, as the money and the time become available.

Sometimes working piecemeal can lead to duplication of effort or sometimes even misspent money (for example, building a 1013cc engine and then, six months later, going to the ultimate street kit of 1132cc's). But it helps prevent overkill — building a motorcycle which is either very uncomfortable and unsuited for street use; a motorcycle having far more performance than the rider actually is comfortable with; or just a cycle with more horsepower or handling than is ever needed.

This chapter explains, step-by-step, what modifications can and/or should be made to the Zee. It stops short of the point where the motorcycle would not be practical for the street. Performance beyond this point is not an impossiblity, but can be utilized only in full competition.

The correct starting point for a rider who wants more performance is neither with a speed parts catalog, his checkbook, or the racetrack. Begin with an honest evaluation, both of your own riding ability and of the machine.

What do you want the bike for — honestly? There is no point in spending almost $2,000 for a superfast RC Engineering Pro Stock engine, when all you want is to have something fast enough to rip away from your riding partners at a stoplight.

Equally, there is no point in spending vast quantities of money on super-race-handling for your bike if you're going to load it with saddlebags, a fairing, scoot boot, and running boards.

Don't let your friends dictate your tastes. You may ride with a couple of cafe racer enthusiasts. But unless you are really excited by the thought of bending sideways through cor-

ners, building a bike to their style will give you a bike that you will hate — no matter how many admiring glances it gets from other bikers.

Also, evaluate yourself and your own riding abilities. You already have a motorcycle that strains the practical limits of street riding, let alone the limits of most riders. Do you really want *more* performance? Better, do you really *need* more performance?

If you are planning on building a bike for competition, check out the class rules in your field. It could save you from spending a lot of money on equipment that the tech inspectors would judge illegal.

Once you have decided what you want and what you can handle, then proceed, step-by-step, to whatever point you want to reach.

Table 2, at the end of this chapter, lists manufacturers and/or suppliers of performance equipment and services.

THE BEST FROM YOUR (ALMOST) STOCKER

Gearing

Performance is easily increased by substituting a 14-tooth countershaft sprocket for the stock 15-tooth part. This will give markedly better acceleration figures, while sacrificing only a few mph on the top end (and there are very few places to ride above 130 mph any more).

Shocks

Regardless of whether you are planning a super-performance Zee or leaving the stocker alone, the stock shock absorbers need immediate replacement.

The stock shock absorbers are extremely poor. Under repetitive cornering they pump up, giving wildly variable handling. Their damping characteristics are inadequate, they are undersprung, and their life expectancy is negligible.

There are several different accessory shocks available for the Kawasaki. One standard-design type of shocks which has proved to provide extremely long life (well over 50,000 miles), and excellent performance, is that made by S&W.

These shocks should be fitted with 85-115 lb. dual-rate S&W springs for solo riding, and 95-125 lb. dual-rate springs for performance riding or two-up heavy touring.

The problem with conventional shocks for most riders is that a single set of springs does not meet all of their riding requirements, and spring changing is not an easy swap for the street rider. A far better solution is to use a shock absorber with highly variable capabilities — the S&W airshock.

The conventional spring is replaced by a pressurized air reservoir. Damping is handled by a normal hydraulic oil system.

The airshocks may be pressurized to meet the exact riding needs of the moment — quite soft for long distance comfort, or with high pressure for precision canyon riding or to compensate for increased loading.

To avoid being tied to gas station air pumps for adjustment, it is suggested that the optional handlebar-mounted pressure gauge and syringe be purchased, so that any adjustment necessary can be made at the side of the road.

The airshocks differ from conventional shocks in two respects. The rear end will sit about one inch lower than with the stock suspension, and care must be taken when installing the shocks that the nylon protective sleeve is properly clearanced with the swing arm, chain guard, etc.

These airshocks will provide excellent service, and a lifespan well in excess of 50,000 miles. They are a bolt-on replacement for all models of the Zee, although the stock chain guard may need replacement with a small Racecrafters item, or else may be dinged in to allow proper clearance.

Air Cleaners

The better your engine breathes, the better it will perform. The first step is to replace the stock air cleaner with a less restrictive one. Highly recommended is the K&N stock-size replacement, which drops into the stock airbox.

Removal of the airbox and the use of four separate air cleaners, one attached to each carburetor bellmouth, is not recommended, since this will markedly reduce airflow into the carburetors.

Also not recommended for any street bike is replacement of the air cleaner system with vacuum stacks (airhorns). See **Figure 1**. Intake of dirt, unchecked by any filtering system, will radically shorten engine life.

Owners of KZ1000's should also not remove the long air intake tube that is at the rear of the airbox. Even though this appears as if it would improve airflow, tests have proven that performance is slightly decreased.

With the correct air filter replacement, carburetors should be carefully jetted for precision results (see Chapter Four). While the Mikuni carburetors are fairly complex, offering a wide range of variations, it will normally only be necessary to adjust the airscrew needle and to change the main jet.

Carburetor Synching

One area of periodic maintenance which must be performed by the rider/owner is carburetor synchronization. Too many mechanics approximate carburetor synchronization rather than take the time for exact results.

This synchronization is especially critical on 1973-75 Zee's. On these models, the synch mechanism is extremely sloppy, and will go out of adjustment in a very short time (as little as 100 miles).

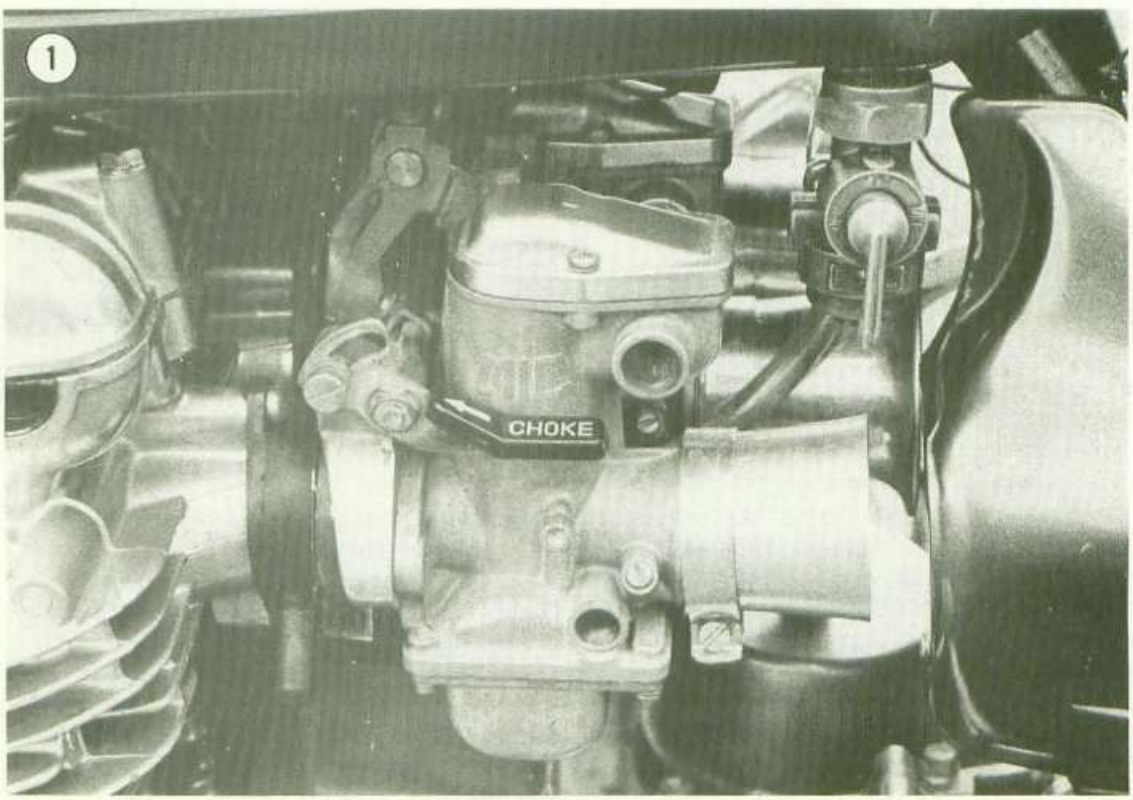
For precise results, it is recommended that carburetor synching be done with either vacuum gauges or a mercury column (Chapter Four, *Carburetor Idle With Vacuum Gauges*).

Cam Timing

Camshafts are normally installed in the Kawasaki following factory recommended methods (Chapter Six, *Camshafts, Reassembly*). This is acceptable for normal riding purposes.

However, significant performance increases may be obtained by exact installation of the cams. There is, inevitably, a certain variation in any mass-produced part, and correcting for that variation will enable your engine to perform more closely to its design potential.

Correct and painstaking installation of the camshafts may increase performance by up to

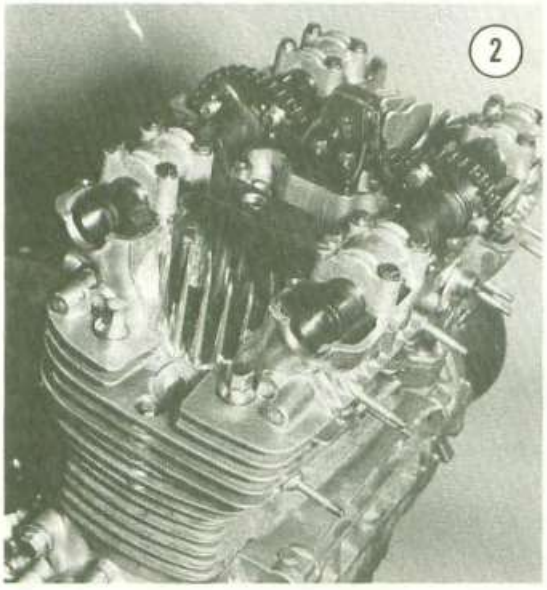


half a second elapsed time in the quarter mile, with no other modifications to the bike.

To correctly degree the camshafts, you will need two tools:

a. A precision dial indicator gauge, with magnetic base mount
b. A degree wheel

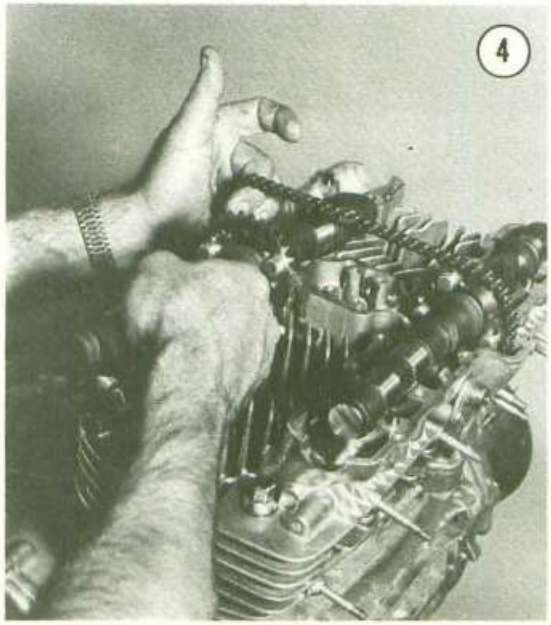
You will also need to make a dial gauge mounting bracket (**Figure 2**) — a two inch by one half inch chunk of iron, drilled at one end to mount on the engine with one of the camshaft cam bolts, or else purchase a magnetic mount from an automotive performance store. In addition, you will need RC Engineering's adjustable cam sprockets (**Figure 3**). Unlike the stockers, these have a total of nine mounting holes. With these, the cam may be turned slightly once installed by the book — each center hole provides stock location, and the two on either side provide a six degree variation, plus or minus, from stock. In some cases, the exact installation position may lie somewhere between the mounting holes, in which case it will be necessary to slot the holes slightly (this should be done on a milling machine to ensure exactness).





The timing procedure is as follows, and may be done with the engine still in the frame:

1. Remove camshafts (see Chapter Six, *Camshafts, Disassembly*, Steps 1-7).
2. Install the RC Engineering sprockets on the camshafts, using the center mounting holes for initial installation.
3. Reinstall camshafts (**Figure 4**). See Chapter Six, *Camshafts, Reassembly*, Steps 1-15. Then adjust valve clearance (see Chapter Two, *Valve Clearance Adjustment*) correctly.
4. Remove dyno cover and install degree wheel on rotor mounting bolt (**Figure 5**). Attach a piece of wire to the engine, and hang its tip next to the degree wheel, to use as a marker gauge.
5. Remove spark plugs, and rotate engine until No. 1 cylinder is at top dead center (TDC). Always turn engine forward.
6. Position the wire marker over 0 on the degree wheel.
7. Remove the forward outer intake cam cap bolt above No. 4 cylinder. Install the improvised mounting plate and install the cam cap

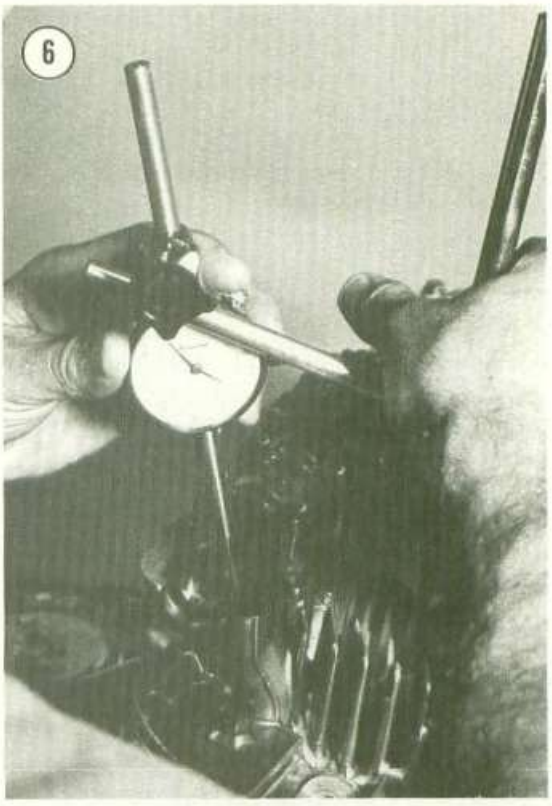


bolt. Lock the dial indicator gauge to the improvised plate and position the pointer directly on No. 4 intake valve shim. Set the dial indicator gauge at 0 (see **Figure 6**).

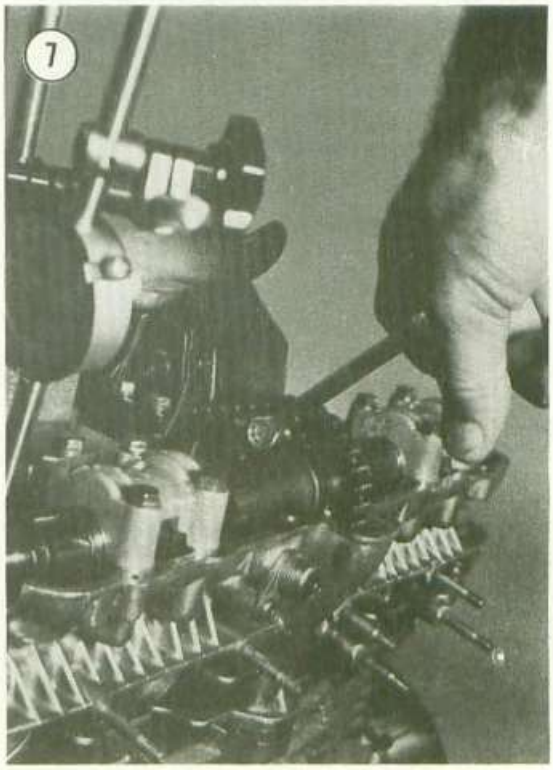
8. Turn the engine through until No. 4 intake valve just begins to lift. At this point, take a reading on the degree wheel. The intake valve should be opening at 30° before top dead center (BTDC). If the reading is not correct, remove the dial indicator gauge. Remove the cam and sprocket. Reinstall the sprocket on the cam in whichever set of mounting holes was indicated by the reading, or, if the cam is very close to being correct, slightly adjust the cam in the existing holes (**Figure 7**). Reinstall the cam and check your figures again.

9. Again turn the engine through until No. 1 cylinder is at TDC. Install the improvised mounting plate for the dial indicator gauge on the engine, using the forward outer exhaust cam cap bolt. Install the indicator gauge and zero it.

10. Again turn the engine through in a forward direction. When the exhaust valve lifts, read the degree wheel. It should read 70° before bottom







dead center (BBDC). Adjust as necessary as described in Step 8.

11. Once the cams are correctly degreed, remove the degree wheel, indicator gauge and mounting plate and reassemble the engine normally (see Chapter Six, *Camshafts, Reassembly,* Steps 16-22).

Ignition

Peak stock ignition performance may be insured by using only OEM Kawasaki points sets. Too many other-brand accessory points are not equipped with a strong enough spring.

To prevent points bounce on a stock engine that will be regularly wound to high rpm, two sets of springs may be installed on each set of points. The drawback to this quick-and-dirty system, of course, is that points cam wear will be markedly increased.

HIGH PERFORMANCE

For more performance than is provided by the above steps, accessory items and modified stock components must be used.

Hotrodding a Zee can produce almost unbelievable performance, without hurting the bike's reliability. For example, consider the RC Engineering-built 1132cc 1975 Kawasaki Z-1B owned by the author. The engine has upwards of 40,000 miles on it. It is ridden daily, in every circumstance from bumper-to-bumper rush hour traffic to long range open road touring.

Since the engine was modified, there have been absolutely no problems. The bike is given maintenance recommended in this book and no special provisions or care is taken with it.

Yet this machine, in addition to its road miles, has probably a hundred hard drag strip runs with a professional rider, with the best time being an elapsed time of 10.87 seconds and a terminal speed of 123 mph. It has also been run at top end. The engine pulled strongly to a slide-rule-figured top speed of 155 mph, without alterations to the gearing.

The above performance figures were reached on this street bike with no other changes than to remove the baffling in the exhaust. Shocks, street tires, and conventional seating position were retained.

So, the old saw that to hotrod an engine is to automatically shorten its lifespan is not necessarily true.

High Performance — Z-1R TC

Engine modifications to the turbocharged Z-1R TC should be limited, as the engine is already highly built in "stock" configuration.

However, three modifications are highly recommended for reliability and street use, and they are an absolute necessity for competition or long range touring.

The first recommendation is the addition of an oil cooler. Since turbochargers make an engine run hotter than stock, an oil cooler will significantly increase engine lifespan.

In addition, the stock clutch should be replaced with a heavy-duty RC Engineering clutch, and the springs exchanged for heavy-duty springs.

The final modification should consist of welding the crank throws, to prevent possible weight shift under high rpm shifts.

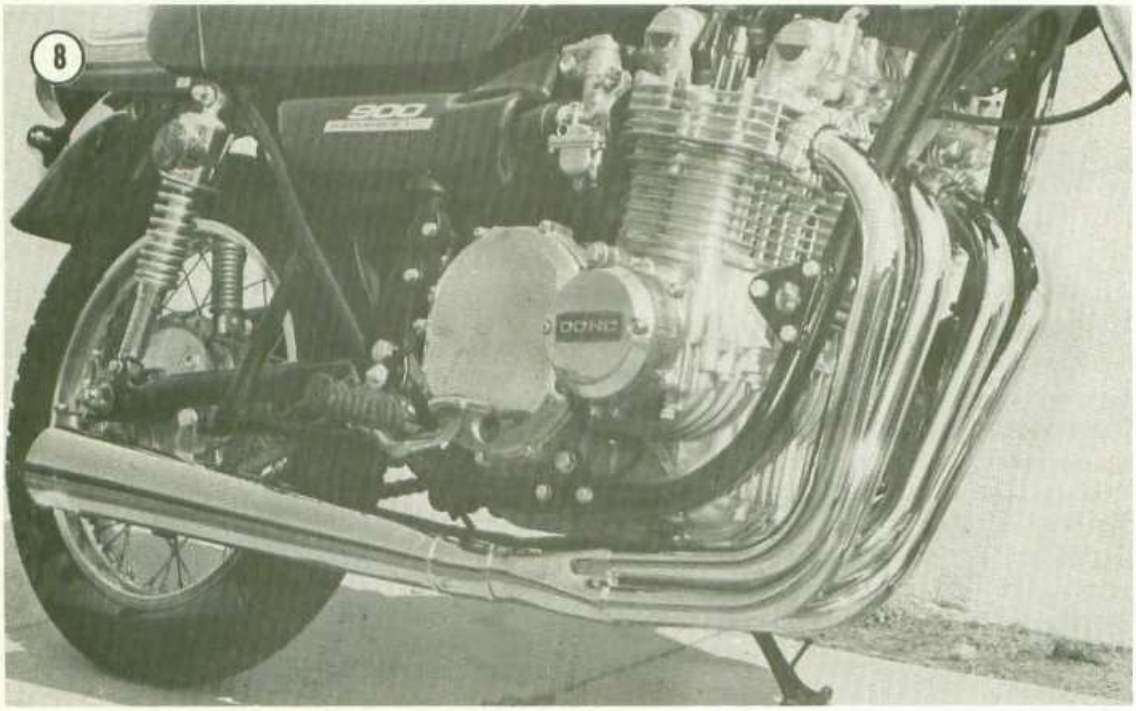
Beyond this, no changes should be made to the camshafts, bore, or compression ratio since a turbo is happiest with a low compression engine with mild-duration cams.

Exhaust Systems

Step one toward high performance is to replace the stock exhaust with an accessory four-into-one set. This style (**Figure 8**) has proven itself to be the most efficient of any of the optional exhausts available.

The problem for most riders is to pick the right exhaust — one which offers a real increase in performance, but is quiet enough for street use. There are many companies making pipes for the big Kawasaki. All of them offer huge increases in horsepower — or at least their ads do. Unfortunately, all too many of them are merely louder than stock (often illegally so), and actually decrease performance.

The best way to pick an exhaust system that works is to go to a local drag race, and see what the winning amateur riders use. You may also be able to judge how good a company's product is by how strongly it participates in racing —



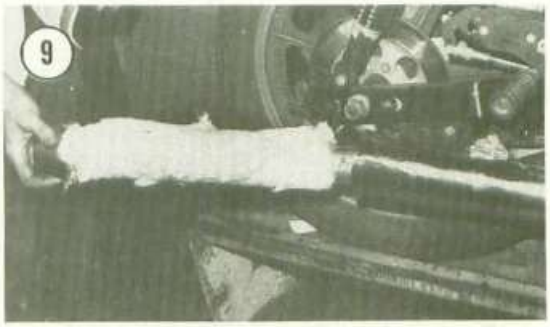
those firms are putting their products where their advertising claims are.

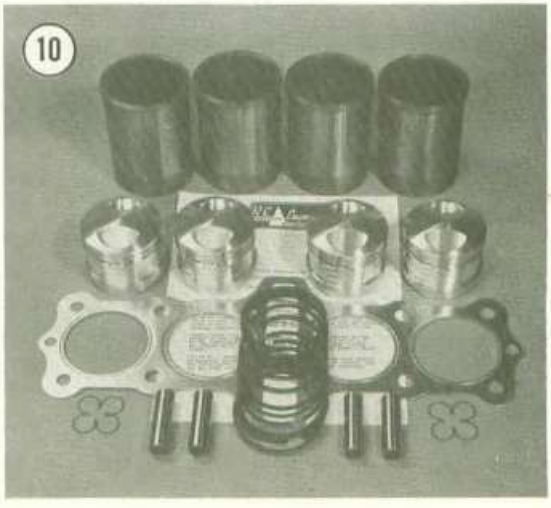
Whichever system you choose, the baffles should not be removed for street use (**Figure 9**). Noise pollution should concern any biker who wants to keep his sport alive. Furthermore, merely uncorking the pipe, without extensive rejetting, is completely pointless — it may even decrease performance.

Any exhaust system which claims to require no rejetting when installed is probably not going to offer much of a performance increase, if any at all.

Normally, rejetting for a four-into-one pipe consists of increasing the main jet one or two sizes.

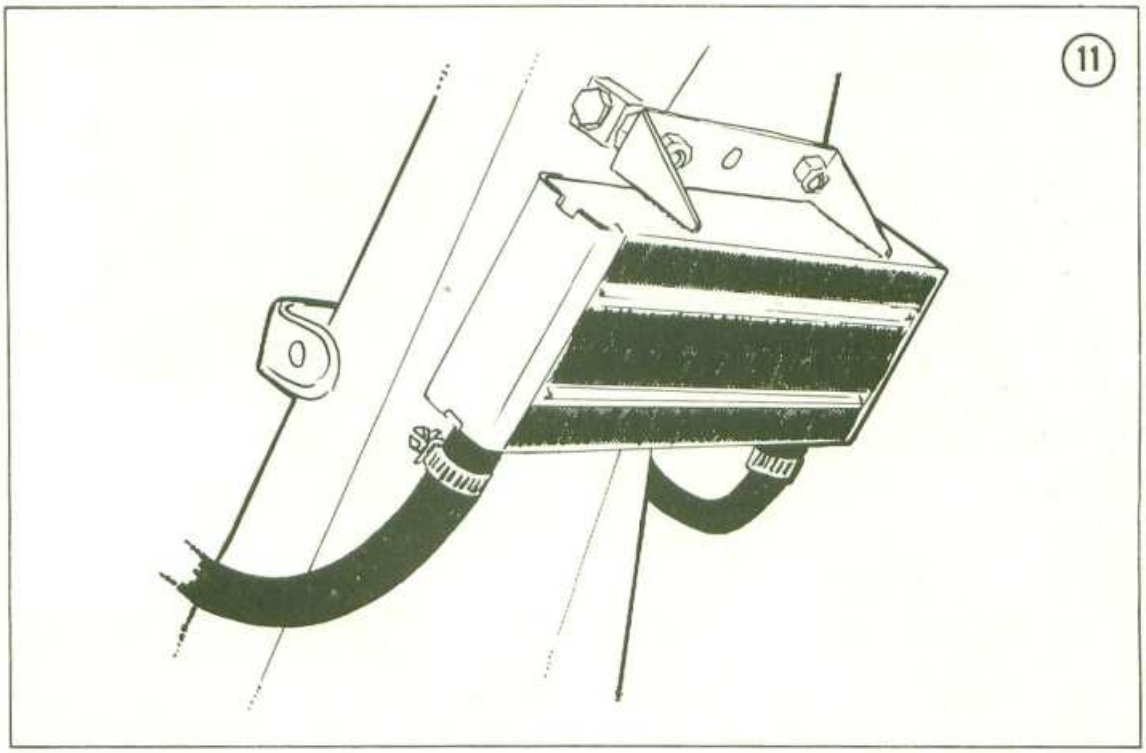
The best pipes will give you an increase of about 10% in power as well as cutting about 20-30 lb. off your bike.





Big Bore

With improved exhausts, the next stage is to increase your engine's displacement. Big bore kits are available in a dizzying number of variations, from the seemingly-mild Yoshimura R&D 987cc kit to RC Engineering's racer-only 1170 kit (**Figure 10**).



Other manufacturers making competition-proven bore kits are MTC Engineering and Denco Performance Engineering.

For street use, probably the best kit available is a 1013cc. If a rider still wants more power, he should go to the 1132cc size (largest recommended for street use) after he has performed all other modifications mentioned in this section.

All big bore kits increase performance through displacement and compression, and some offer the additional advantage of lighter-weight pistons (up to two grams per piston).

Any kit up to 1013cc's can be easily installed by the owner. The only outside work needed is to bore the cylinders.

However, beyond 1013cc, the upper case must be machined to accept the supersize cylinder liners.

All performance big bore kits will increase compression to around 10-11:1, and consequently require high-test gasoline. Most companies also offer higher compression pistons, usually about 12:1. These are for racing only — you simply can't get gasoline of a high enough octane to use these pistons except at the track. In any event, super high compression will only offer mildly increased midrange power. It will, however, make the engine run appreciably hotter.

Oil Coolers

With the increased compression of the big bore kit, engine temperature will also increase. Higher oil temperatures mean increased engine wear.

Most engine builders recommend an oil cooler for the street, such as the easily-installed and ultra-reliable Lockhart cooler (**Figure 11**). Also recommended, particularly for cold weather riding, is Lockhart's new higher-capacity cooler for performance engines, which is equipped with a thermostat to keep the oil from getting too cool (**Figure 12**).

Oil Pump

Unlike most Japanese four-cylinder motorcycles, the Kawasaki Zee's oil system is an extreme low pressure system.

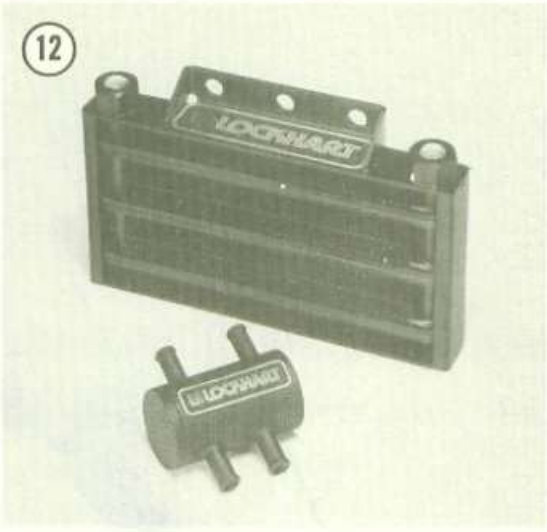
With a high performance engine, and the natural tendency of the rider to use the greater

power, it is possible to oil-starve the engine under acceleration. The sump oil pickup faces forward and, under power, enough oil will flow to the rear to make the pump suck.

One solution, which may be done by any Kawasaki shop familiar with performance motorcycles, is to simply reverse the pickup so that it faces to the rear. Under hard braking, the oil pressure lamp may light momentarily. But this is far better than under acceleration, since when braking the engine is normally not under load.

A second solution is to install a one-way trap door in the sump. A small hinge and door is welded to the pan. Under acceleration, oil will surge toward the rear of the pan, but will be blocked by the one-way door. Oil returning to the sump will open the door easily. This modification can be performed by MTC Engineering, Denco Performance, or any competent performance shop.

The third solution is to reverse the pickup as already outlined, and replace the stock sump pan with an RC Engineering deep sump. This adds about one quart greater capacity to the oil supply, and retains a greater amount of oil in the engine itself. This, however, should be considered for competition only, due to the cost of the part.





Lower End

The Kawasaki lower end (crankshaft, rods, bearings, etc.) is an unbelievably strong unit. Unlike some other multi-cylinder machines, very little work needs to be done to this crank. In addition, of course, since the crank is pressed-together, it is almost impossible to disassemble it for niceties like lightening, microgrooving, etc.

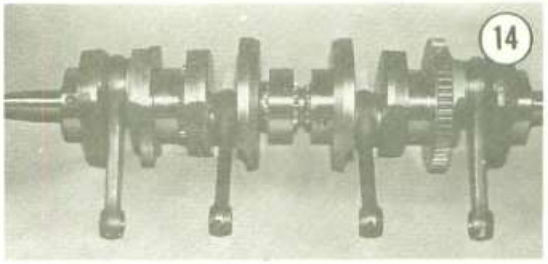
The only modification which is occasionally performed is to weld the crankshaft throws solidly to the shaft.

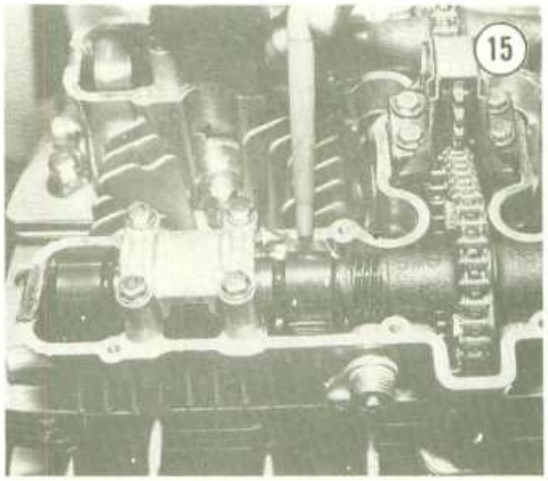
This is done to prevent the possibility of the throws shifting on the crank under high rpm shifting. Street engines displacing up to 1013cc's or, of course, stock late-model Zees will not need to have this done. However, owners of competition engines or high displacement Zees should consider this relatively inexpensive job.

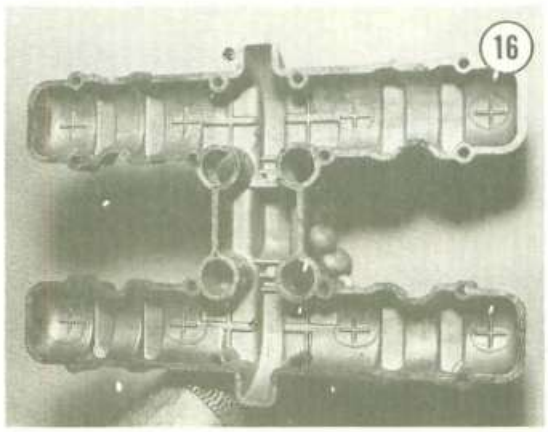
The work consists of a small heliarc bead welded between each crank throw and the shaft (**Figure 13**). It should be performed only by an experienced motorcycle performance shop. RC Engineering or Denco Performance will perform this reinforcement on a mail order basis.

Beyond that, there are no heavy-duty rods, performance double-row bearings, dyno lightening or other expensive reinforcements necessary.

On the 1977-up engines, Kawasaki has changed the crank from semi-circular throws (**Figure 14**) to full-circle throws. This has the advantage of increasing smoothness at the cost (very slight) of reducing the engine revving speed. For all-out competition you might consider swapping the late model lower end for an earlier model — but only when you've run out of other ways to pull power from the engine.







Camshafts

The stock Kawasaki camshafts are relatively mild, and significantly increased performance may be gained by installing a performance set.

Again, there are many manufacturers of cams. Among those showing up consistently in the winner's circle are RC Engineering, Norris, Denco, and Yoshimura.

Cams should be selected not for their ultimate performance potential, but rather for their suitability to your own riding style. Too many riders have chosen the hottest cams on the market, and ended up with something that would be far better suited for a land speed record machine than a bike for cruising the boulevard.

Fortunately, reputable cam manufacturers are aware of this. The better ones will specifically recommend what is best for each purpose, from hill climbing to touring. Most of them describe their cams in great detail in their catalogues, not only in technical terms but in terms of what each design was intended for. These descriptions should be considered carefully. Buying a cam that's a little hotter than what your friend has is less likely to produce a bike that'll beat him than it is to produce a machine that has become too single-purposed for practical road use.

Only the mildest of performance cams can be installed without modifications to the head and valve. These modifications consist of opening up a travel slot in the head for each lobe (**Figure 15**), and grinding down the eight crossmark castings on the valve cover (**Figure 16**).

Regardless of which manufacturer you choose for camshafts, the RC Engineering adjustable sprocket should be used, to ensure that the cams are precisely installed. With some manufacturers (RC, for example), special degreeing instructions are included with the shafts.

When this information is not provided, you will need three figures to enable you to properly degree the cams:

a. The opening point (in degrees) of the intake camshaft
b. The opening point (in degrees) of the exhaust camshaft
c. At how much lift this measurement is taken

Degreeing the camshaft is done as follows, once the cam is installed with the RC sprockets to the manufacturer's specifications:

1. Follow Steps 4-7 in this chapter's section on *Cam Timing*.

2. Turn the engine through, always turning in the direction of normal rotation, until the in-

take valve on No. 4 cylinder lifts to the point which the manufacturer specified for opening point.

3. Read the degree wheel, and adjust the camshaft mounting on the sprockets as indicated to get the precise opening point. Install the cams and check your work.

4. Repeat the same process on the exhaust camshaft, using No. 4 exhaust valve.

Valve Springs

The full benefits of a performance cam will not be realized if the components around it remain stock. Almost all cam manufacturers market complete kits, including valve springs, retainers, and guides **(Figure 17)**.

These springs should be installed exactly as the manufacturer specifies. Too often, riders figure that an additional amount of shimming, beyond specifications, will improve performance. Generally all it does is destroy camshafts.

If the cam manufacturer does not sell springs with his kit, recommended heavy-duty springs are avilable from RC Engineering, Yoshimura, and S&W.

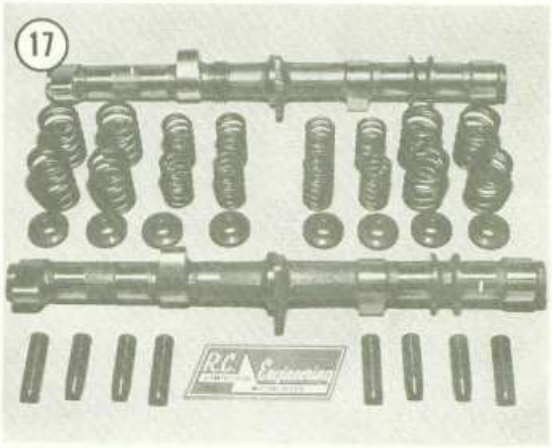
Valve Guides

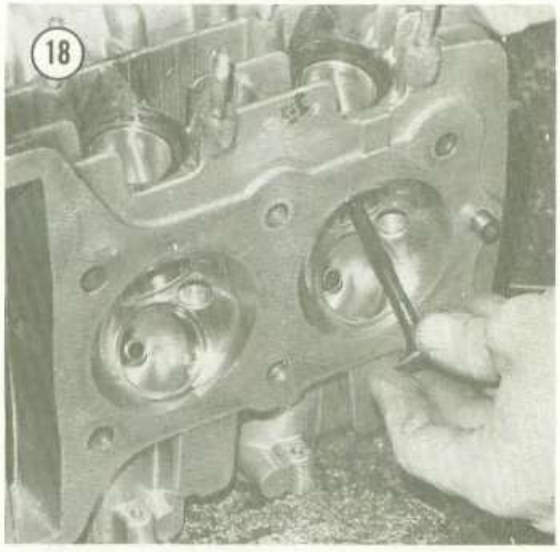
Stock Kawasaki valve guides are not known for longevity. Even a stock engine on rebuild could benefit from the installation of RC Engineering, Yoshimura, or S&W guides.

Trick Valves

For a street engine, the installation of oversize valves is an excellent way to waste money. You simply won't gain that much for the $150 or so that it will cost. Oversize valves will be of benefit only on a full competition engine that needs maximum power at peak rpm.

Normal-sized stainless steel valves **(Figure 18)**, available from RC Engineering, Yoshimura, and other manufacturers, will provide a marked increase in valve lifespan. As a reliability component, they might be worth considering for any rider.



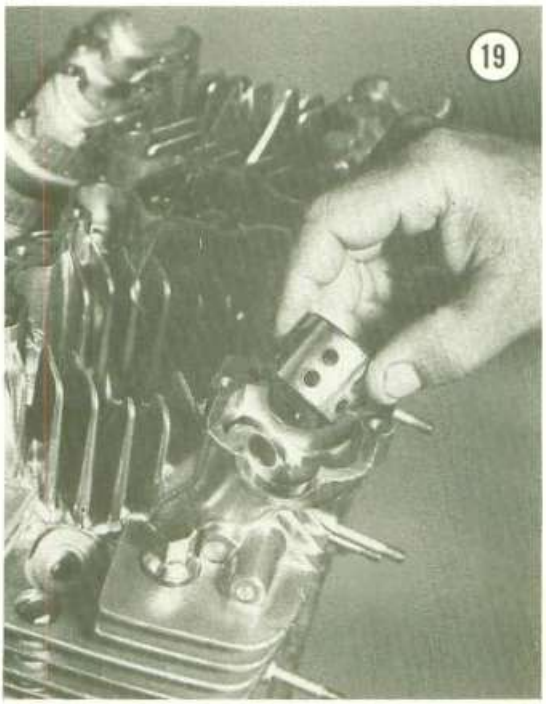


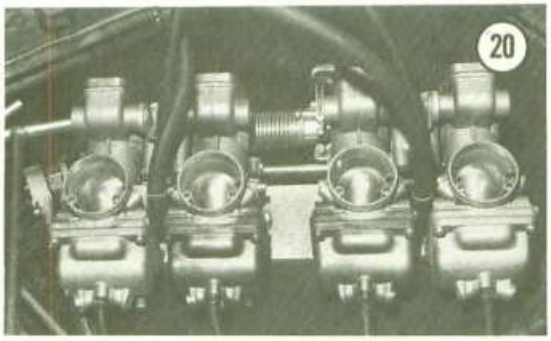
Valve Shims

One peculiarity of the Kawasaki Zee is its occasional tendency to spit valve adjustment shims out at high rpm. Once catapulted free of the tappet, a shim has enough velocity to smash the head, bend or break valves, springs, or guides.

For high rpm applications, or if the rider has a tendency to miss shifts, the solution is to install either the RC Engineering or Yoshimura R&D valve lifter/spring retainer/shim kits **(Figure 19)**.

Both of these systems place the shims under the tappet instead of being nestled in the top of the cup as on the stock engine. This system is identical to that used on the stock Kawasaki 650





Four. As a matter of fact, RC Engineering uses stock 650 shims to adjust the valves, while Yoshimura markets their own shims as part of the system.

With this system installed, valve adjustment becomes a more involved procedure — the cam-tappet clearance must be measured, the camshaft removed, the valve lifter taken off, shims installed, the cam replaced and then remeasured. However, there is no longer any possibility of tiddlywinking your engine to death.

There is also the additional advantage of a markedly decreased amount of valve train weight, which will mean greater engine life and slightly quicker revving.

Head Porting

The final modification to the head should be porting. For a number of reasons, porting should not be done by anyone other than a highly skilled and trained technician.

An amateur, rooting around in the intake and exhaust ports with a Dremel tool and rotary file is more likely to reduce performance — or even ruin his head — than to accomplish anything worthwhile.

There are as many theories about porting as there are skilled porters. Couple this with the fact that an ideal porting job for a 1013cc engine will not be the best for an 1132cc engine, just as a porting job for roadracing won't bear any resemblance to the optimum street job.

Select your porter in one way — how well do Kawasakis prepared by this man perform on the street and dragstrip — the strip, again, being the closest thing to street performance available. Do not pick a porter because he does a good job on Triumphs or Chevrolets or Ferraris — your cylinder head may be the first Zee part he's ever seen.

Companies such as Denco Performance, Fast Bike Enterprises, Jerry Branch, Yoshimura R&D and others will not only increase performance some 12-15% just with porting, but will give you a bike that will have equivalently improved mileage as well.

Carburetor Modifications/Replacements

With improved camshafts, flow, and displacement, the next area to modify is the carburetor. Stock carburetors will not let you realize all of the benefits you have gained through your previous modifications.

Pre-1976 Kawasakis used 28mm venturi Mikunis. These may be bored out to 29 or 30mms by any experienced motorcycle shop (or by mail through RC Engineering). See **Figure 20**.

The 1976 and later Zee's, with the exception of the Z-1R, use 26mm carburetors, which may be rebored to 29mm, as already described, and then rejetted. The Z-1R uses the 28mm Mikunis found on earlier Zees, and modification procedures are the same as for the early models.

While boring out the stock carburetors is the least expensive way to improve intake performance, there will be an appalling decrease in gas economy (from around 42mpg to 32mpg with a hot engine).

A better solution is to replace the carburetors with a set of 29mm Mikuni smoothbore carburetors. These sophisticated carburetors differ from normal slide-needle Mikunis. They are higher quality and do not have the open casting area in the base of the slide. They're a bolt-on installation, and will cost around $300.

With these carburetors installed, the rider will pick up about 0.2 seconds in the quarter mile with a modified engine, and realize still greater improvements on an otherwise-stock mill. Midrange performance will be greatly improved, and gas mileage will be amazing (up to 44mpg on an 1132cc Pro Stock engine ridden on the street). These are available from RC Engineering and Yoshimura R&D.

It is unfortunate that the smoothbores are only available in one, fairly small, size, since greater carburetion will be needed for any kind of a competition engine.

There are several options:

Amal Mark II carburetors: These larger-diameter carburetors (up to 34mm) are currently the favorite of the pro stock drag racers. They are closely styled after the slide-needle Mikunis, and provide excellent flow characteristics. However, they are not recommended for street use. Their biggest problem is the use of four separate throttle cables. These cables stretch and, consequently, the carburetors need constant readjustment to stay in synch.

Keihin CR carburetors: These also are for racing only, since they have little accomodation for adequate low end circuitry and no chokes at all. Riders who have experimented with CR's on the street have been largely dissatisfied. In addition, the high cost of the carburetors renders them impractical for the sensible builder.

Amal GP carburetors: These obsolete carburetors, originally intended for use on early British machines, have one large advantage for racers. With their remote float bowl they provide almost totally unobstructed venturis, and consequently high venturi volume and speed. However, they leak constantly, require constant readjustment, and wear rapidly. They are not recommended for any street use at all.

There are other kits on the market. Some of them convert the Zee to a single or dual carburetor. In spite of claims, the prospective purchaser should realize that the benefits realized will be in the areas of simplicity and increased mileage rather than increased performance.

Some riders have experimented with the so-called injectors of various makes. Actually, they are not injectors at all, but rather gravity-flow carburetors without float bowls. These have had some success at full-throttle competition, but have not performed adequately at the dragstrip or on high performance street engines.

Ignition

The stock ignition on the Kawasaki Zee is adequate for stock applications. However, after adding a big bore kit, head work, cams, and carburetors, the ignition system will need replacement.

One alternative is a capacitor discharge ignition (CDI) system — usually a transistorized ignition with magnetic pickups in place of the points.

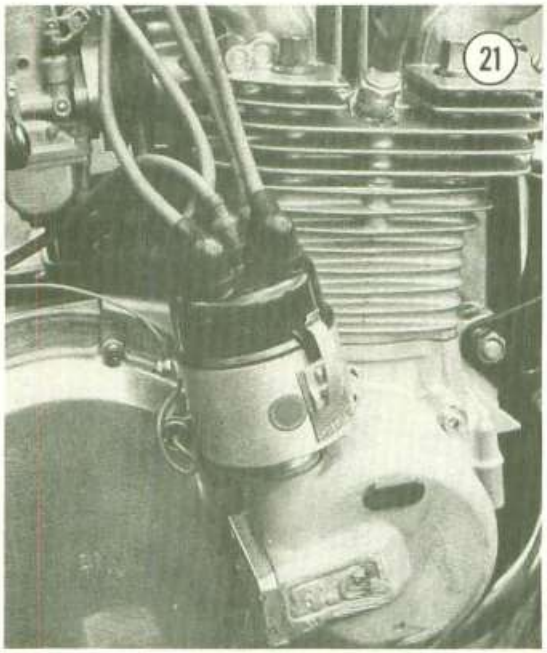
The sole advantage to be gained from most CDI systems is that they can be set and forgotten. This is the only advantage you will get — very few of the CDI systems will give you any better performance than stock. One exception is the Gerex Multifire, which is being used successfully by a number of professional racers.

One reason that most of the CDI systems on the market don't give you any increased performance is that they all (with the exception of Gerex) retain the stock twin coils.

First, all motorcycle coils are relatively low power items compared to automotive parts. Secondly, all four-cylinder bikes with dual coils must fire two cylinders at the same time.

One cylinder will be fired at its intended point. However, another coil will be fired (this is the so-called pilot spark) somewhere at the very beginning of the intake stroke.

With a normal-duration cam, this might not be significant. However, with a performance



cam that has an earlier opening point (for example — stockers open at 20° BTDC, the RC Engineering $400 cam opens at 45° BTDC), this will mean that the pilot spark is occuring well into the intake stroke and may actually fire a certain amount of the incoming mixture, thus reducing power.

An excellent ignition system for competition use is the RC Engineering distributor (**Figure 21**). It is an easy-to-install unit that fits on the right side of the engine, replacing the points plate and points assembly.

The RC ignition system features a Mallory distributor, driven at half crank speed to reduce the possibility of points bounce at higher rpm.

The distributor fires only one plug at a time, which totally eliminates the pilot spark.

The stock coils are replaced with either a single high performance RC coil, or a Mallory box coil mounted under the left sidecover of the bike.

There are many advantages to this system. First, it offers a much hotter spark (around 40,000 volts as opposed to the stock 10-12,000 volts). Secondly, the ignition curve may be modified to meet the requirements of the individual rider. Finally, Mallory points are used, which are long lasting, reliable, and less expensive than the OEM points.

There is, though, one large drawback to the RC system, and that is its susceptibility to dampness. The distributor itself is vented directly to the air. Ridden in the rain, enough moisture will be picked up to short the ignition out and deliver an occasional unpleasant shock to the rider. It will be necessary, in such conditions, to stop every 50 miles or so and dry the unit out. In addition, condensation will continue to appear up to a full day later. To prevent rust, it is suggested that the distributor be blown dry using a gas station pump at the earliest possible opportunity.

For overall use, the best suggestion would be to replace the stock system with a complete Gerex system, including coil; or else to install the RC/Martek CDI system, with a dual-wire Andrews coil, which will offer the same increased voltage as the RC/Mallory system.

Overall

With the ignition changes, you have now completed almost everything which is necessary for a super-performance street or street-strip engine.

Modifications beyond those already outlined will make the bike increasingly less suitable for the street, although the performance potential will be still further increased.

Turbocharging/Supercharging

In the past few years a number of people have begun experimenting with turbocharging or supercharging for Kawasakis. These competition-only bikes, particularly American Turbo Pak's record-breaking machines, have turned in amazing performances.

Interest has been still further fanned by the Z-1R TC, a machine which, in more or less stock trim, will turn in quarter mile times in the high ten second area.

However, there are drawbacks to turbocharging and supercharging. The question mark for supercharging is simple — there has been little experimentation with blown Kawasakis on the street. Consequently the builder will be working without a great deal of information. The drawback to this is the somewhat

sour one that pioneers generally pay for their knowledge with broken engines.

Turbocharging also has its problems. First and most importantly to the builder interested in lifespan is that a turbocharged bike runs hotter than stock. Since heat is the prime enemy of engine life, the owner of a turbo machine should expect somewhat decreased engine life expectancy.

There are other problems, specifically those of the lag between initiated acceleration and response, and pressure. This becomes critical given the wide rpm range of a Kawasaki engine and the requirements of street riding. If the turbo is putting out enough boost to give increased performance at low rpm's, it may be putting out breakage pressure at high rpm (since boost increases with rpm on a turbocharger). Conversely, if high rpm pressure is kept to a safe level, low rpm boost may be too slight to offer great performance improvements.

Response lag is something which must be adjusted to — the rider must learn to accelerate slightly before the actual acceleration is desired to compensate for the turbo's response time.

Turbo kits also are not pure bolt-ons. It is highly recommended that the engine be disassembled, the crank throws welded, and a heavy-duty RC Engineering clutch kit installed. These modifications, of course, drive up the actual cost of such a kit.

Still a third category that's being experimented with is the use of nitrous oxide. A pressurized bottle is attached to the bike, and inlet valves are attached to the carburetor intakes. When the system is manually triggered by the rider, nitrous oxide is dumped into the engine, giving significant and sudden performance boosts.

There are some advantages to this. The system may be easily added to a bike, no modification is required to the stock carburetion, and when the NO_2 system is off, the rider has an absolutely stock bike.

However, there are serious disadvantages. The system is quite expensive, it will require refilling at regular intervals and also the hotrod horsepower is only there for sudden spurts (off the line, passing, etc.).

The most serious drawback is nitrous oxide's cooling capabilities. Drag racers who have experimented with NO_2 have encountered difficulty with valving freezing up. This could result in the NO_2 being stuck full on and running until empty — about twice as serious as having your throttle stick wide open. The only solution would be to chop the kill button, with probable serious engine damage resulting. This system, for the most part, is something for extreme performance enthusiasts and has little to offer the normal street or street-strip rider.

POWER TRAIN

Transmission

For almost all applications, including racing, Kawasaki's stock gearing is more than adequate. However, for those who need or want different ratios, there are options available.

Yoshimura R&D markets a close-ratio five-speed gearbox, which effectively removes any gaps in the stock gearing. It also reduces fifth gear from 1.28:1 to 1.26:1. But with a high performance engine, and the consequent ability to rev higher than the stock redline, top speed will certainly not suffer.

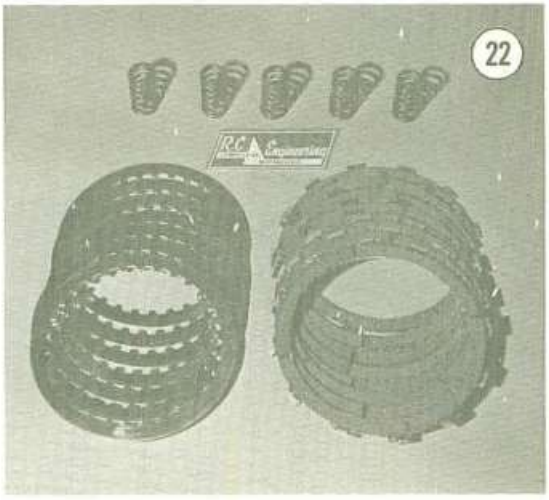
The second option is from Andrews Products — higher-ratioed first and fifth gears. First is designed to close the gap between low and second for better off-the-line performance. Fifth will give your motorcycle a higher top speed — which should be of interest only to those planning to try for land speed records.

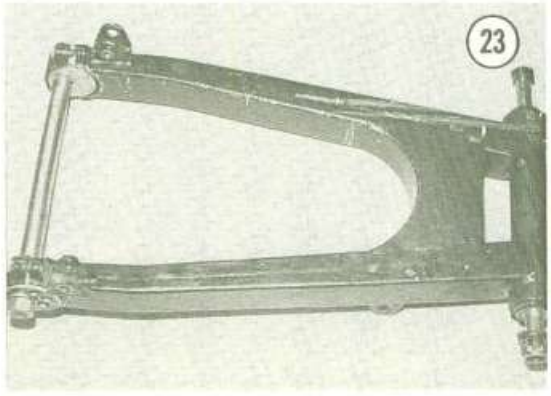
Both Andrews and Yoshimura's products are of the finest quality.

Clutch

While the stock clutch on the Kawasaki is almost bulletproof with a stock or near-stock engine, high performance or heavy usage (for example, consistently riding a fully-laden touring machine through rush-hour traffic), a heavy-duty clutch should be installed.

While it is possible to install just heavy-duty fiber plates, the best idea is to replace steel plates and springs. Complete clutch packs, such as the one from RC Engineering **(Figure 22)**, will have a far greater lifespan. Plus, with replacement steel plates, the owner may be certain that all plates are completely in contact, rather than making off-center, patchy contact





as occasionally happens with the stock components.

A complete clutch kit will provide not only absolutely no-slip hookups, but will greatly increase clutch life as well.

HANDLING

The most significant problem with the Kawasaki Zee is its handling. Very few Japanese machines are known for their agility, particularly the larger-displacement fours. The Kawasaki is very low on that list.

Fortunately, major improvements may be made to the bike's handling qualities, although there is simply no way that a high center of gravity bike weighing almost 700 pounds with one rider can be made to compete with some of the European bikes.

This does not mean that the Kawasaki cannot be made to handle far beyond the limitations of anyone but the most expert rider.

But, as in engine building, there comes a point where further improvements get increasingly more expensive, yet have no bearing on the bike's intended use.

Swing Arm Bushing

One easily-rectified problem with 1976 and earlier Zee's is the swing arm bushing. The tolerances between the swing arm sleeve and bushing vary widely. This can produce as much as one-quarter inch of side play at the end of the swing arm.

Frequent inspection and measurement of these parts will reduce this problem.

However, a better solution is to install the Target Products swing arm bushing kit. This consists of a new pivot shaft and all accompanying parts.

The only power tool that is required to install this is a drill fitted with a rotary file to enlarge the pivot shaft's installation hole on the frame. This kit will decrease swing arm play, and maintain close tolerance for 20,000 miles or more.

This modification is not necessary on KZ1000's. Among other frame modifications made in 1977 was the use of a needle bearing set instead of the plain bearing for the swing arm. This gives far closer tolerances than before, and a vastly increased life expectancy for the parts.

Swing Arm

A normal swing arm will have a certain amount of flex, which will increase as the amount of torque transmitted from the engine to the ground increases. This flexing, of course, will detract from handling.

Three high performance swing arms are available, all stronger-than-stock box sections.

A stock-dimension replacement, manufactured in Italy by Bimota, is available from Yoshimura R&D (**Figure 23**). It includes a replacement bushing and pivot shaft as part of the kit. This swing arm retains stock shock location and angle, and stock axle location.

Particularly noteworthy on the Bimota swing arm is the method of chain adjustment (**Figure 24**). The axle is mounted rigidly to an eccentric plate on either side. Chain adjustment is performed by loosening the axle bolt and two pinch bolts at the rear of the swing arm. Then the entire wheel is rotated on the plate until proper chain tension is reached. This eliminates any possibility of wheel cock during adjustment.

Another stock wheelbase boxed section swing arm is available from either CM Performance Products or from MRD Manufacturing Company. This is an ideal replacement item for a hotrod street machine.

For street/strip or strip drag racing, RC Engineering makes an ideal swing arm. This unit offers the rider the option of stock wheelbase or two rearward axle locations for better drag racing takeoffs.

There are two shock mounting positions, one of which rakes the shocks about 10° from normal, the second about 15°

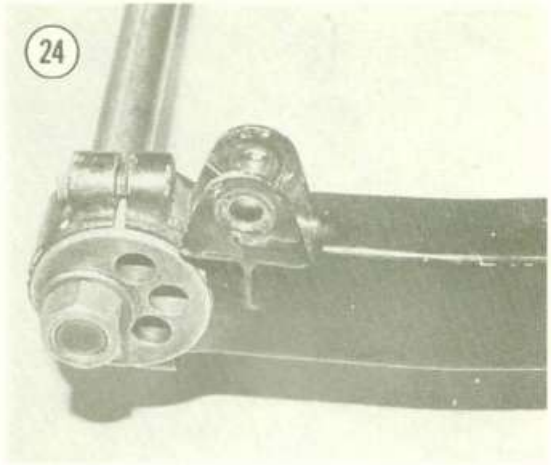
With this swing arm, further modifications will be necessary. The rider must add his own chain guard tabs, adapt a chain guard to the swing arm, and add links to this chain. Furthermore, it is necessary to increase the length of his shocks (or accept a slight increase in front fork angle and lowering of the bike) and increase stiffness of the springs (increased shock angle increases the leverage on the shocks).

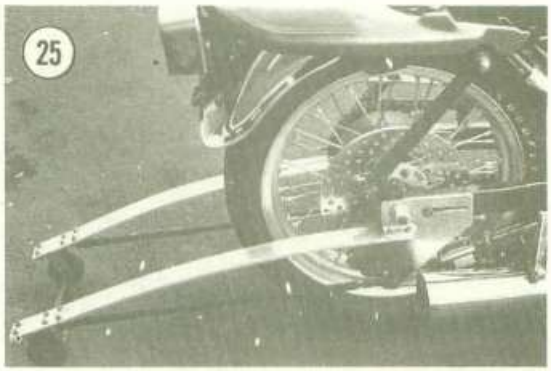
While the RC Engineering swing arm requires more work than the Bimota or MRD, it is larger and stronger than either of them, and allows the use of a super-wide rear tire for serious drag strip competition.

Struts/Wheelie Bars

While the drag strip may give some important tips to the street rider, what the racers use may not always be ideal for the boulevards. This is particularly true of struts.

Struts (**Figure 25**) are rigid metal bars, used to replace the shocks on drag racing bikes. For the racer, these offer several advantages: they lower the center of gravity, immediately transfer weight to the rear wheel on takeoff, and, when used with wheelie bars, decrease the tendency to wheelie.





However, there are no advantages for the street rider. Struts on a normal street bike — even a high performance one — will lower performance. If the rider worries about wheelies, he would be better advised to correct his overactive throttle hand.

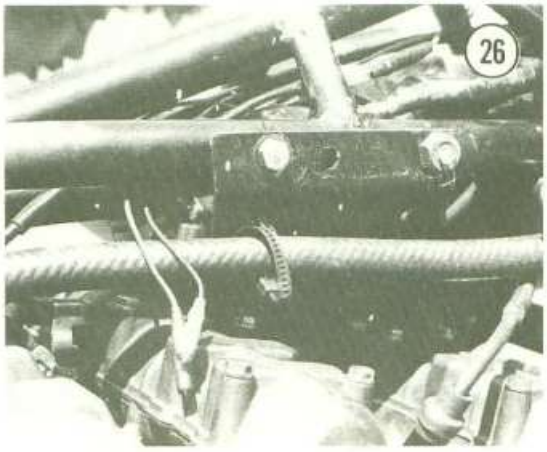
The disadvantages to struts are mostly obvious. There is a loss of riding comfort and increased vibration with a rigid rear end. More important, there is a dangerous loss of control when cornering on rough roads.

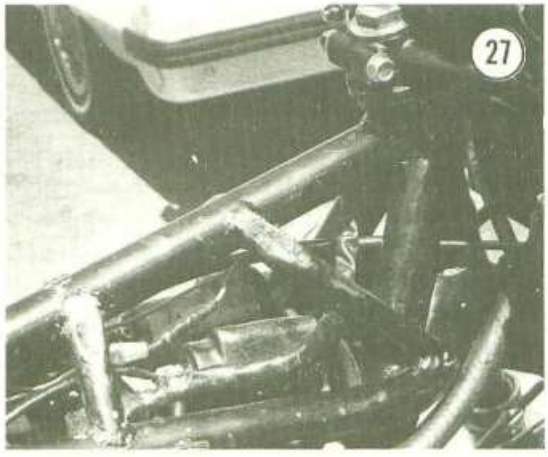
Wheelie bars (**Figure 25**) are in the same league. While they are of extreme benefit on 150-plus horsepower drag bikes, they are useless and possibly dangerous on the street.

If wheelie bars are mounted low enough to be functional, they will probably drag under anything more than the most gentle cornering.

But if they are mounted high enough to allow safe handling, they won't prevent anything but a complete over-backwards wheelie.

Leave both these items to the drag racers.





Front Forks

Kawasaki forks are not adequate for high performance riding, but there are several good fixes.

Installation of heavy duty fork springs from S&W, and use of the S&W heavy duty damping rod assembly will improve fork behavior immeasurably. They give a slightly stiffer, but not uncomfortable ride; they also provide improved damping.

Further improvement may be made on all Z-1's and KZ900's by replacing the stock fork sliders with those used on the LTD model.

These lower legs extend higher, and consequently will reduce fork flexing, particularly under hard braking conditions.

This is not a one-piece swap, however, since the caliper(s) must also be replaced with the LTD caliper(s).

The last step is to simply replace the entire stock fork assembly with a heavy-duty roadracing unit from Ceriani or Betor, at jaw-clenching expense.

Frame

Those interested in further improvement in handling, whether for a production racer, a cafe racer, or even an ultimate street bike may wish to further modify their bikes.

In spite of its weight and impressively thick tubing, the Kawasaki Zee's frame can still do with major improvements.

Although the KZ1000 models received major improvements to the frame, such as increased gusseting in critical areas, thicker section tubing and so forth, the modifications outlined here can help.

The easiest reinforcement to the frame is made by using the engine as a frame member. Yoshimura R&D does this first by adding a top motor mount. This is bolted to the lower two backbones. Holes are drilled in this curved section of steel plate, and longer head bolts are used to fasten engine to frame **(Figure 26)**.

The stock, rubber-mounted rear upper engine bracket is replaced with a rigid-mount, heavier-gauge section of plate connecting the two frame bolt locations to the rear upper engine mount.

For production racing, further gusseting is done by Yoshimura.

1. Plate gussets are added around the steering head, particularly connecting the head and second top frame tubes.
2. The three backbone tubes are connected, immediately ahead of the rubber gas tank seats, and again just behind the coil mounting location **(Figure 27)**.
3. The front downtubes are connected above the pipes with a welded-in crosstube.
4. The swing arm pivot area is tube-braced and plate-gusseted at the junction between the center frame downtube and the rear frame.
5. The two center downtubes are cross-braced with a diagonal tube.

Some riders, rather than go to the extensive trouble of gusseting, have considered high per-

formance frames. Unfortunately, those which are readily available seem plagued with the same handling difficulties as the stockers, particularly on high-horsepower Kawasakis.

There are exotic frames which will work — very expensive, hand-built custom-only items such as the Swiss Egli. But the availability of these units is low and the price is extremely high.

Weight Reduction

Your Zee doesn't have to weigh 530 lb. Weight reduction will greatly improve handling. And, as in other areas, the Kawasaki can be modified here quite easily.

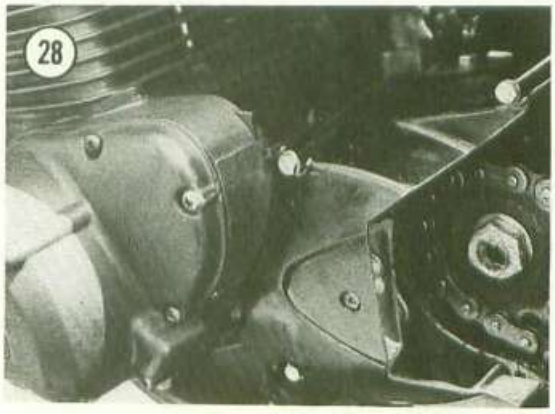
As much as 100 lb. can be removed from the bike. But for most street riders, a diet this drastic, this expensive, and this ugly won't be worthwhile. The benefits to be gained, for the normal rider, are not worthwhile.

Quite often, street riders have attempted to cut the weight of their bikes by drilling holes — lots of little tiny holes. This is, first of all, a great deal of work. Secondly, it doesn't do much good. Drilling 100 or so quarter-inch holes in the chain cover may cut its pound and a half weight by one third. This is hardly worth the effort.

Thirdly, there is the possibility of seriously weakening a major component. It may or may not look nice, but it isn't going to do any real good.

However, here are some areas to consider lightening, developed by Yoshimura R&D for the totally committed performance enthusiast:

1. Remove the rear fender. Modify the tail/brake light and license plate holder to mount on the rear fiberglass fenderlet.
2. Discard the turn signals and rear grab rail.
3. Replace the stock seat with a stripped-down single pad using a fiberglass pad.
4. Discard the fiberglass sidecovers.
5. Remove the chain guard, chain cover, starter cover, and electric starter (**Figure 28**). Dead-end the starter connections.
6. Replace the heavy stock battery with a small accessory product — without a starter the bigger battery is not necessary.

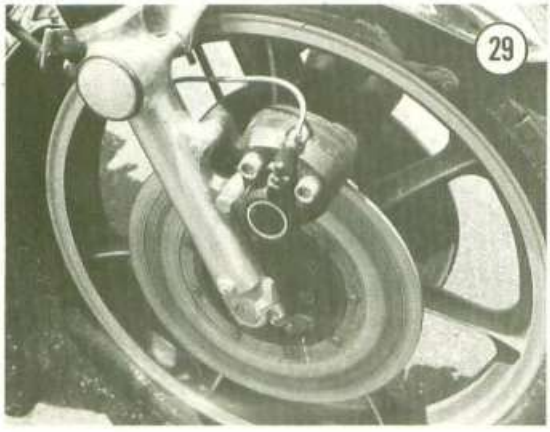


7. Remove the entire air cleaner assembly and use short vacuum stacks.
8. Remove the entire instrument cluster and replace with a single roadracing tachometer from Yoshimura.
9. Remove the stock gas tank, rear fenderlet, and front fender. Replace them with superlight stock-appearing fiberglass racing components from Camber Corporation. These are super-quality, high-cost items used by most of the Pro Stock category drag racers.
10. Replace the stock exhaust with a four-into-one system.
11. Replace stock brakes/wheels with either lightweight alloy wheels such as Borrani or Akront, or use aluminum alloy wheels (Morris Mags being the lightest). Install lightweight Lockheed caliper and master cylinder for the rear brake. Replace stock disc(s) with Harry Hunt's super light parts and install a Hunt disc on the rear wheel.

This will get a bike down to just about 400 lb. Unfortunately for street riders, it also produces a bike that is hideous to look at, a single-seater, and illegal in some states (no turn signals, rear fender dimensions, etc.). All in all, for anyone other than a competitor, it isn't worth the bother.

WHEELS, BRAKES, AND TIRES

One area of concern for riders interested in optimum handling is the reduction of unsprung weight (wheels, tires, fork legs, brakes, calipers, sprocket, etc.).



However, an equally valid area of concern is with safety — high performance parts are frequently not only better-handling, but safer under all road conditions as well.

Tires

Another limitation to the handling of the Zee is its tires. They're not only short-lived, but provide insufficient feel and not particularly great adhesion.

When worn, they should be replaced with one or another of the various high-performance street tires available.

A tire is a compromise between maximum adhesion, which will also mean high wear, and acceptable lifespan, which means a harder and less adhesive compound.

One of the finest sets available for the street rider is the Continental Twins. This set of tires gives extraordinary adhesion (up to 10 mph faster in given corners comfortably) and exceptional lifespan.

For the touring-oriented rider, use of the Michelin M45 series will offer long lifespan and a highly acceptable adhesion.

Other recommended tires are from Goodyear, Dunlop, and Pirelli.

The performance rider is well advised to experiment with tires since "feel" is a big part of handling. If a particular tire doesn't feel right to the rider, he will obviously not be able to ride it as fast as he might another brand.

Owners of LTD or Z-1R model machines have problems in choosing high performance tires, since almost all 16 inch rear tires currently available are designed for long-distance touring use, with secondary consideration being given to extreme adhesion characteristics.

Wheels

Stock Kawasaki wheels are extremely heavy. Unsprung weight can be reduced by using Borrani or Akront rims in place of the stock rims.

An even better idea is to use a set of alloy cast wheels. There are several manufacturers on the market who produce superior products. Among them are Lester Tire & Wheel and Morris Industries.

The Lester wheel retains the stock rear brake, so obviously there isn't an extreme amount of weight saving.

The Morris Mag (**Figure 29**) — actually a cast aluminum wheel, although they do make cast magnesium wheels for racing-only applications — requires the use of an aftermarket disc brake (except on the KZ1000, LTD, or Z-1R).

With the Morris wheels, unsprung weight will be significantly reduced — about 5 lb. on the front wheel and almost 18 lb. on the rear.

More pertinent for street riders, however, is the increased safety potential of these wheels. Both of them have extremely high outer lips. While this makes a tire harder to mount or remove, it also reduces the possibility of a tire coming off the rim in the event of a blowout. With a flat tire, it is possible to ride the bike down, experiencing nothing more than an extreme shimmy rather than the normal immediate getoff.

Other advantages to cast wheels include never having to worry about broken spokes, never having to adjust spokes, and a decrease in the amount of cleaning time.

Brakes

While Kawasaki's front disc brake has excellent efficiency, feel, and reliability, the pre-1977 drum on the rear is marginal.

This drum was originally developed for the Kawasaki 500 triple some years ago, and merely adapted to fit the larger Kawasakis as they were introduced. Since most riders didn't even consider the brakes on the 500 adequate, on the vastly higher-performanced Zee's, they're totally inadequate.

Any serious street rider should consider replacing the stock drum rear brake with an accessory rear disc. There are several systems on the market:

Lockheed: Probably the finest stopping system available. Unfortunately, it is also the highest-priced. Designed as a super-light competition product, the Lockheed makes extensive use of high-cost featherweight alloys. For well over $300, you get a master cylinder, line, caliper, and disc. You will have to fabricate your own caliper mount, master cylinder mount, and brake pedal system. While an excellent stopper, the Lockheed is not very reasonable for the street rider. Available from Morris Industries.

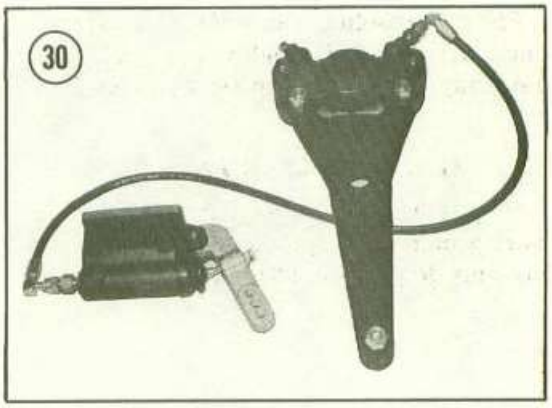
Grimeca: Visually, this Italian system resembles the Lockheed. However, with no exotic alloys used in its manufacture, the price is about half of the Lockheed. It is available in a bolt-on kit from Morris Industries (bolt-on to Morris wheels). The Grimeca provides excellent control, low wear, and no-fade stopping. It is probably the best kit for street riders.

Hurst/Airheart (**Figure 30**): This kit, too, is a complete bolt-on. However, with a single-piston caliper the caliper bracket must float on its axle mount. Some maintenance will be necessary to prevent the bracket from locking up. Also, maintenance must be performed to prevent a slight amount of puck drag. The fixed puck is held in place only by a rim, and under severe braking can be lost. Owners would be advised to tap through the rear of the caliper and bolt the puck in place. This unit provides improved braking performance over the stock drum.

There are many other high performance motorcycle dealers marketing their own systems. Most of these use Hurst/Airheart calipers and master cylinders, plus custom-made bracketry.

For normal riding, the stock front brake is more than sufficient. However, for high speed riding, a second disc may be added.

Absolutely the best disc kit to consider is made by Kawasaki (**Figure 29**). Priced quite reasonably, it includes simple instructions, a new disc, caliper, lines, and all necessary parts (plus several spares). The stock fork legs and wheel require no modification to install this excellent dual disc kit, which includes a special master cylinder. Installation time is about one hour, using normal hand tools.



With an accessory rear disc brake, plus the Kawasaki dual discs up front, stopping distance on single-disc, rear drum brake models is significantly improved.

Drilling Discs

Unsprung weight may be further reduced by drilling the disc brakes. This can reduce the disc weight by as much as 50%.

Drilling consists of punching lateral holes in the disc, up to ¼ inch in diameter.

While this modification appears easy, it should not be done by the inexperienced builder. There are two risks to this modification — too many holes may be drilled, thus weakening the disc itself; and it is possible to slip while drilling and ruin the disc itself.

It is highly recommended that this work be done by a qualified machine shop, such as Bill Bowman, Inc. Cost will be around $30.

When these holes are drilled, they should be slightly countersunk on either side, to prevent the possibility of the sharp edge cutting into the puck and having a cheesegrater effect.

Cautious owners of Z-1R's may wish to perform this countersinking on their already-drilled discs.

Further reduction of the disc weight may be made by facing the discs. This is done by mounting the disc in a lathe, and reducing its thickness. Again, due to the possiblity of ruining an expensive component, the work should be done by a qualified machine shop.

For the absolutely committed competition rider, very expensive lightweight replacement discs may be ordered from Morris Industries.

THE COMPLETE PACKAGE

Stage modification of your bike, while requiring more time, produces excellent results. Not only do you finish with a machine which is vastly superior to a stocker, but one which is suited to your own riding conditions and style. An overbuilt bike is not only very expensive, but frightening to the rider.

It is extremely fortunate that Kawasaki so over-engineered all variations of the Zee that performance building not only offers significant gains at a reasonable price, but in no way lessens the rideability or reliability of the bike.

Table 2 MANUFACTURERS AND SERVICES

Manufacturer	Service
American Turbo-Pak, Inc. 2127 S. Hathaway Santa Ana, Calif. 91705	Turbochargers
Andrews Products 9872 Farragut St. Rosemont, Ill. 60018	Gears, ignition coils, cams
Bill Bowman Inc. 2546 Manhattan Ave. Montrose, Calif. 91020	Disc brake drilling & facing
Branch Flowmetrics 2625 Lime Ave. Long Beach, Calif. 90806	Porting, Mikuni-Weber kits
Camber Corportation 741 Ohms Way Costa Mesa, Calif. 92627	Lightweight fiberglass components
CM Performance Products Inc. 3580 Progress Cornwell Heights, Pa. 19020	All high performance components, engine building
Denco Performance 4480 E. Enterprise St. Fremont, Calif. 94538	All high performance components, engine building
Harry Hunt 23 San Bruno Brisbane, Calif. 94005	Competition tires, lightweight disc brake components
Gerex P.O. Box 1566 Torrance, Calif. 90505	CDI systems
Lester Tire & Wheel Co. 26881 Cannon Road Bedford Heights, Ohio 44146	Cast alloy wheels
Lockhart Industries 15707 Texaco Ave. Paramount, Calif. 90723	Oil coolers
MRD Manufacturing Co. 8906 Tonnelle Ave. North Bergen, N.J. 07047	Swing arms
MTC Engineering 5204 Chakembo South Gate, Calif 90280	All high performance components, engine building
Morris Industries 2901 W. Garry Ave. Santa Ana, Calif. 92704	Cast alloy wheels, disc brake components

(continued)

Table 2 MANUFACTURERS AND SERVICES (continued)

Manufacturer	Service
Norris Cams 1502 N. El Camino Real San Clemente, Calif. 92672	Camshafts
RC Engineering 16216 S. Main St. Gardena, Calif. 90248	All high performance components, engine building
S&W Engineered Products 2617 W. Woodland Dr. Anaheim, Calif. 92801	Shocks, fork springs, fork damper kits, valve springs
Target Products 2724 W. Main St. Alhambra, Calif. 91801	Swing arm kits
Yoshimura R&D of America 5517 Cleon Ave. North Hollywood, Calif. 91601	All high performance components, engine building

APPENDIX

SPECIFICATIONS AND TIGHTENING TORQUES

GENERAL SPECIFICATIONS — Z-1 AND KZ900

ENGINE	
Type	Unit construction 4-stroke DOHC transverse in-line 4-cylinder
Crankshaft assembly	Built-up, with one-piece connecting rods, caged roller main bearings, caged needle big-end bearings
Cylinder construction	One-piece alloy block with pressed in liners
Cylinder head	One-piece alloy, with sintered metal valve seats
Bore and stroke	66mm x 66mm
Displacement	903cc (55.1 cu. in.)
Compression ratio	8.5 : 1
Piston/cylinder clearance	0.0025 in.
Piston rings	2 compression, one oil scraper
Camshaft drive	One single-row endless roller chain, by crankshaft drive sprocket
Valve opening	Cam lobe strikes lifter cup on valve stem
Valve closing	Dual coil springs
Intake valve diameter	36mm
Exhaust valve diameter	30mm
Inake valve timing	Opens 30 degrees BTDC; closes 70 degrees ABDC
Exhaust valve timing	Opens 70 degrees BBDC; closes 30 degrees ATDC
Valve clearance	0.004 in.
Lubrication system	Wet sump storage, pressure fed by double gear pump
Components lubricated	Engine, clutch, transmission
Oil type	SE class SAE 10W-40
Oil capacity, less filter	3.5 quarts
Oil capacity, including filter	4.2 quarts
Starting system	Electric and kick
IGNITION	
Cylinder firing order	1 - 2 - 4 - 3
Firing interval	180 degrees of crankshaft rotation
Ignition coils	2
Contact breaker points	2; left set fires 1 and 4 simultaneously; right set fires 2 and 3 simultaneously
Points gap	0.014 in.
Ignition timing (1973)	From 20 degrees BTDC at 1,500 rpm to o 40 degrees BTDC at 3,000 rpm
Ignition timing (1974-1976)	From 20 degrees BTDC at 1,500 rpm to o 40 degrees BTDC at 2,350 rpm
Spark plug diameter and reach	14mm x 3/4 in.
Spark plug type	NGK B8-ES
Spark plug gap	0.028 - 0.031 in.

(continued)

GENERAL SPECIFICATIONS — Z-1 AND KZ900 (continued)

CARBURETION		
Carburetors	4 Mikuni VM 28SC	
Carburetor type	Slide/needle, operated by common linkage; additional starter system	
Bore diameter	28mm	
Specifications	1973	1974
Pilot jet	20	17.5
Air jet	1.0	1.0
Air screw	1½ turns out	1¼ turns out
Slide cutaway	2.5	1.5
Needle jet	P-8	0-8
Needle	5J9 (last number may vary)	5J9 (last number may vary)
Needle position	Middle	Middle
Main jet	112.5	112.5
Fuel level	32mm (± 1mm) (1.26 in. ± 0.04 in.)	32mm (± 1mm) (1.26 in. ± 0.04 in.)
Gas tank capacity	4.7 gallons	
Type of gasoline	85 octane or higher	
Type of air filter element	Dry	
CLUTCH AND TRANSMISSION		
Clutch type	Wet, 14 friction or steel discs plus pressure plate	
Clutch drive	Geared to crankshaft driving gear; straight-cut gears	
Primary drive reduction	1.73 (56T/97T)	
Transmission layout	5-speed constant mesh main shaft/countershaft configuration	
Gear selection	Rotary shifter drum operates 3 shifter forks	
Transmission ratios		
1st gear	3.17 (12T/38T)	
2nd gear	2.19 (16T/35T)	
3rd gear	1.67 (21T/35T	
4th gear	1.38 (21T/29T)	
5th gear	1.22 (23T/28T)	
Final drive	Endless roller chain and sprockets	
Type of chain	Enuma EK630S-TG (92 link) only	
Chain lubrication	By piston pump from chain oil tank through hollow output shaft to chain	
Chain oil type	SAE 10W-30 or 10W-40	
Final drive ratio	2.33 (15T/35T)	
Overall reduction ratios in gears		
1st gear	12.78	
2nd gear	8.83	
3rd gear	6.73	
4th gear	5.56	
5th gear	4.92	

(continued)

GENERAL SPECIFICATIONS — Z-1 AND KZ900 (continued)

CHASSIS AND SUSPENSION	
Frame	Double cradle, tubular steel
Wheelbase	59 in.
Steering head angle	26 degrees
Trail	3.54 in.
Front suspension	Telescopic forks, 5.5 in. travel
Lubricant capacity	170cc per fork leg
Oil type	SAE 10W nondetergent motor oil
Rear suspension	Swing arm, 5-way adjustable shock absorbers, 3.2 in. travel
Front brake	Single hydraulic disc, 11.6 in.
Rear brake	7.9 in. internal expanding
Front tire	3.25H x 19 Dunlop F6B
Rear tire	4.00H x 18 Dunlop K-87 Mk2-M
Tire pressures, normal speeds	
Front (solo and two-up)	26 psi, cold
Rear, solo	31 psi, cold
Rear, two-up	36 psi, cold
Tire pressures, high speeds	Increase each inflation pressure by 3-6 psi, cold
ELECTRICAL	
Alternator type	Kokusan AR-3701
Regulator type	Kokusan RS-2122
Battery type	Yuasa 12N 14-3A 12V 14 AH
Starter motor type	Mitsuba SM-226-K
Headlight	Sealed beam, 12V, 50/35W
Taillight	12V, 8/23W
Turn signal lights	4 each 12V, 23W
Horn	12V, 2.5A
Neutral indicator light	12V, 3.4W
High beam indicator light	12V, 3.4W
Oil pressure light	12V, 3.4W
Brake light warning light	12V, 3.4W
Turn signal indicator light	12V, 3.4W
Speedometer light	12V, 3.4W
Tachometer light	12V, 3.4W
Fuse	12V, 20A
DIMENSIONS	
Overall length	86.6 in.
Overall width	34.1 in.
Overall height	46.1 in.
Ground clearance	6.3 in
Seat height	31.5 in.
Dry weight	506 lbs.
Wet weight	540 lbs.

(continued)

GENERAL SPECIFICATIONS — Z-1 AND KZ900 (continued)

SELECTED TORQUE SPECIFICATIONS	
Engine mount bolts (12mm diameter)	47-50 ft.-lb.
Engine mount bolts (10mm diameter)	26-29 ft.-lb.
Engine mount bracket bolts	14.5-16.5 ft.-lb.
Engine case bolts (8mm diameter)	18 ft.-lb.
Engine case bolts (6mm diameter)	70 in.-lb.
Crankshaft cap bolts	18 ft.-lb.
Cylinder head bolts	105 in.-lb.
Cylinder head cap nuts	25 ft.-lb.
Camshaft cap bolts	13.5 ft.-lb.
Cylinder head cover bolts	102 in.-lb.
Rotor mounting bolt	18 ft.-lb.
Clutch hub nut	87-108 ft.-lb.
Shifter drum neutral plunger bolt	44-57 ft.-lb.
Engine oil pump bolts	70 in.-lb.
Output sprocket nut	87-108 ft.-lb.
Handlebar mounting bolts	18 ft.-lb.
Fork tube clamp bolts (12mm diameter)	39-43 ft.-lb.
Fork tube clamp bolts (8mm diameter)	12-13 ft.-lb.
Front axle clamp bolts	13-14.5 ft.-lb.
Spoke nipples	22-26 in.-lb.
Swing arm pivot nut	87-108 ft.-lb.
Rear shock bolt (upper)	44-47 ft.-lb
Rear shock bolt (lower)	22-25 ft.-lb.
Torque link nut	22-25 ft.-lb.
Rear sprocket bolts	23-30 ft.-lb.
Rear axle nut	95-115 ft.-lb

SUPPLEMENT

1977-1978 SERVICE INFORMATION

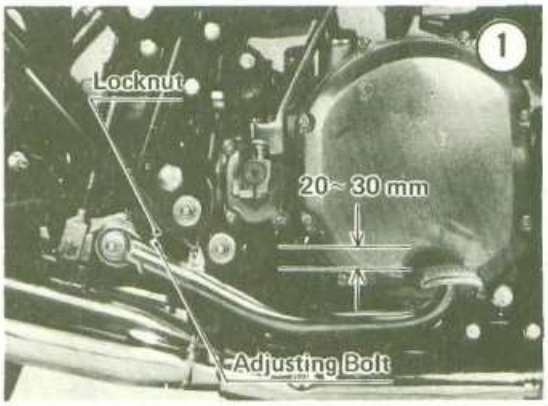
The following supplement provides the procedures that are unique to the Kawasaki models KZ1000, Z1-R, and the KZ1000 LTD.

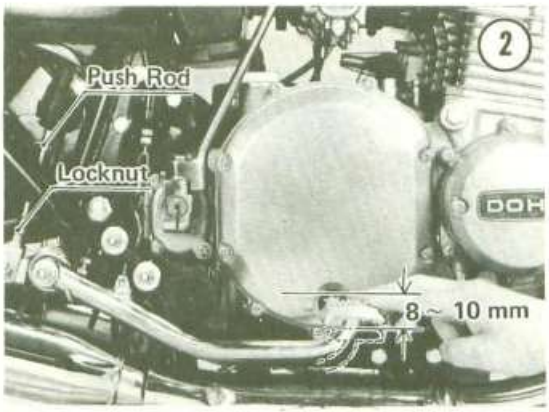
The chapter headings in this supplement correspond to those in the main portion of this book. If a chapter is not included in this supplement, there are no changes affecting the KZ1000 and its variations.

Specifications for the KZ1000, Z1-R, and the KZ1000 LTD will be found at the end of this supplement in **Tables 1, 2, and 3**.

CHAPTER TWO

LUBRICATION, MAINTENANCE, AND TUNE-UP





The following information applies to the KZ1000, KZ1000 LTD, and the Z1-R motorcycles from 1977.

BRAKE ADJUSTMENT

A rear disc brake has been added to the KZ1000. The disc is self-adjusting during normal use. However, the rear brake pedal can be adjusted for the proper amount of play as follows:

1. The brake pedal should be ¾-1¼ in. (20-30mm) lower than the top of the footpeg when at rest (**Figure 1**). If too high, loosen locknut and slide pushrod dust cover down. Shorten brake pushrod to give brake pedal more play. If the pedal is now too low, go to Step 2.
2. Loosen the locknut and turn brake pedal adjusting bolt to get correct pedal position (refer to **Figure 1**).
3. Tighten locknut and check brake pedal travel. Tighten brake pushrod locknut.
4. There should be 5/16-13/32 in. (8-10mm) of free play from the rest position before the pushrod contacts the master cylinder piston (**Figure 2**). If adjustment is necessary, proceed with Step 5.
5. Loosen the locknut and turn pushrod. Tighten the locknut.
6. Check the rear brake light switch, and check for brake drag and braking effectiveness.

Checking Brake Fluid

Check fluid level on the rear wheel brake fluid reservoir. Fill as needed to the upper line with DOT-3 brake fluid. (**Figure 3**).

WARNING

Do not mix 2 types of fluid. This lowers the brake fluid boiling point and could cause the brake to malfunction. Never use old brake fluid or fluid from a container that has been left unsealed for a long time. Do not leave reservoir cap off for any length of time (the fluid will absorb moisture from the air), or attempt

to add fluid during a rain or strong wind.

Brake Bleeding

The rear disc brake is bled in the same manner as the front disc brake. Refer to Chapter Eight Supplement, *Brake Bleeding*, for the procedure.

Disc Brake Pad Wear

1. Have an assistant apply the brakes.
2. Shine a light between the caliper and the disc and inspect the brake pads.
3. If either rear disc brake pad is worn down through the stepped portion **(Figure 4)**, replace both pads as set (refer to Chapter Eight Supplement, *Rear Disc Brake* section, for procedure).

WARNING

If grease or oil spills on the pads, wash it off immediately with trichloroethylene or a high flash-point solvent (do not use one which leaves an oily residue). Replace pads if oil cannot be thoroughly removed.

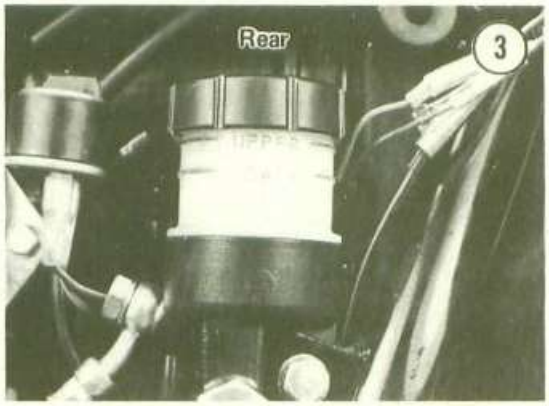
FRONT FORK OIL LEVEL

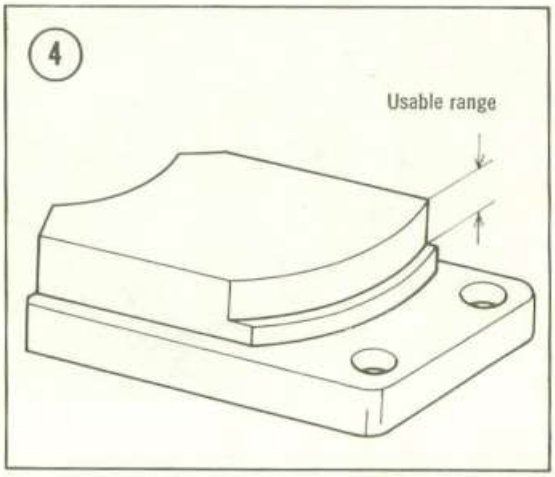
The front forks of the KZ1000 require less oil than previous models. Check the oil level as follows:

1. Prop the motorcycle until front tire just clears the ground.
2. Loosen a fork tube clamp bolt on one side of the top triple clamp.
3. Unscrew fork tube plug (top fork bolt) from the fork tube on the side of the triple clamp **(Figure 5)**.
4. Slide a long rod down into the fork tube and measure the distance from the top of the fork oil to the top of the fork tube **(Figure 6)**. The distance should measure 16.77 in. (426mm). If necessary, add SAE 10W non-detergent motor oil to bring oil level up to the proper level.

ENGINE TUNE-UP

The tune-up procedures are the same as the KZ900 except for the carburetor idle adjustment.





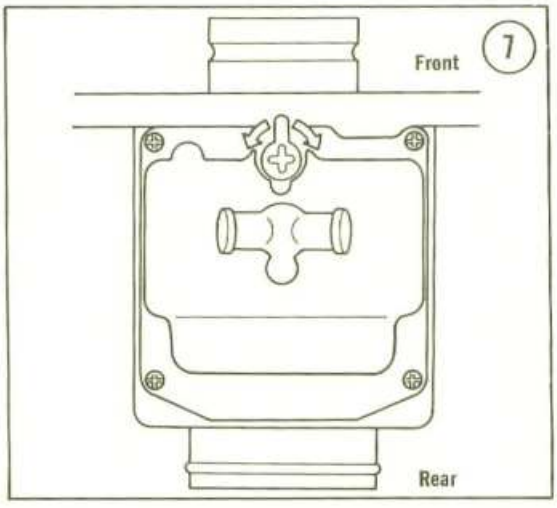


Carburetor Idle Adjustment

1. Start the engine and allow to warm up for 5 minutes.
2. Adjust the pilot screw of each carburetor (one at a time) by turning it first in one direc-







tion, then in the other, until the point of highest idle is determined **(Figure 7)**.

NOTE: *Turn the pilot screw only within the range by the ridge on the pilot screw extender stopping against the carburetor float bowl. This pilot screw adjustment will normally by within ⅛ turn (in or out) from specified pilot screw setting.*

3. Adjust idle speed to 950-1,050 rpm by turning the idling screw **(Figure 8)**.

4. Check to see if the engine rpm rises when pilot screw positions are altered. If it rises, repeat last two steps alternately until the engine is idling satisfactorily and engine speed cannot be increased by adjusting the pilot screws.

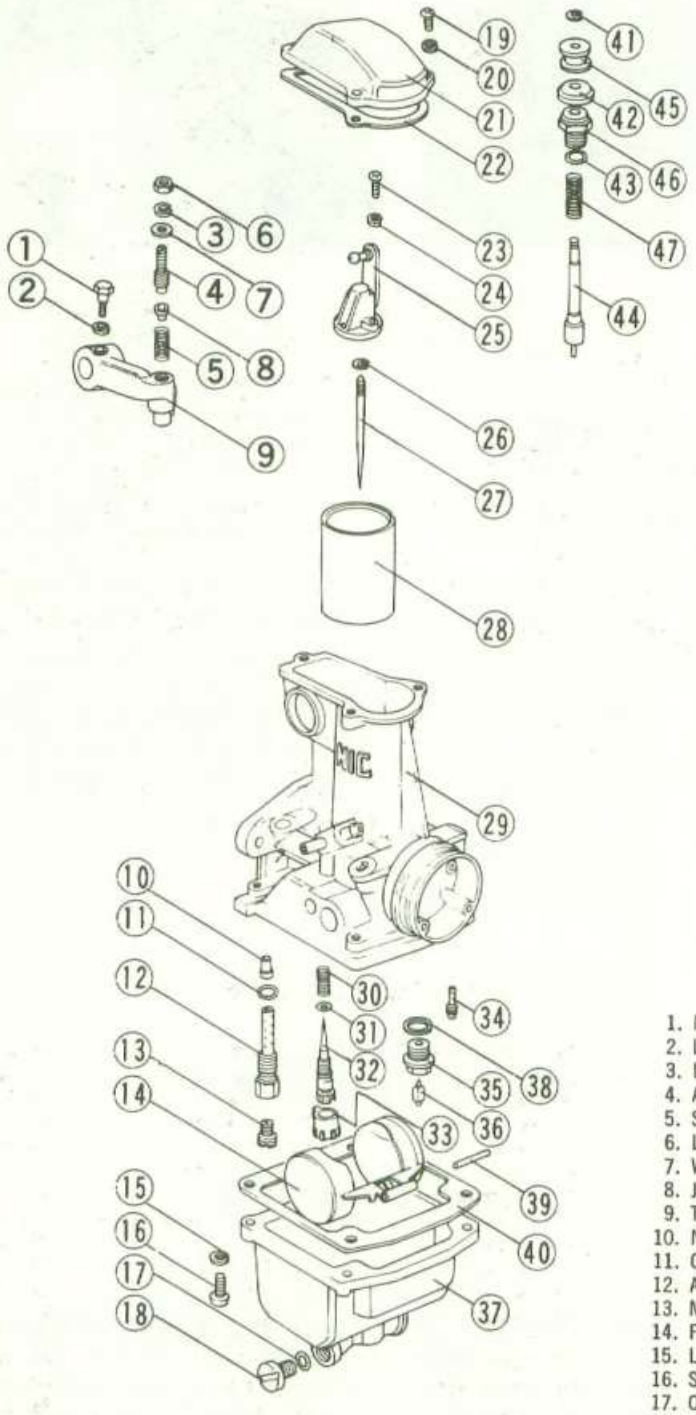
CHAPTER FOUR

FUEL SYSTEM

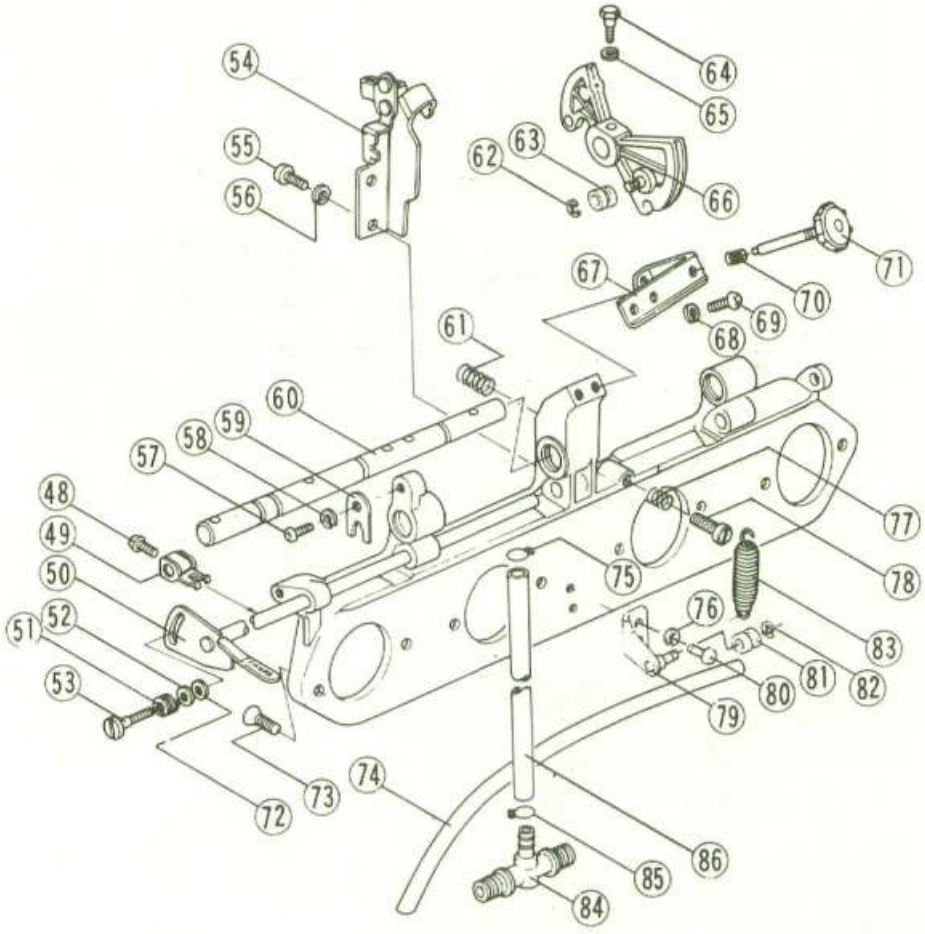
The carburetors used on the KZ1000 and the KZ1000 LTD are basically the same as those used on the KZ900, but with new internal idle-mixture circuits. The Z1-R uses carburetors identical to the KZ1000's carburetors except for an increase in bore size from 26mm to 28mm. The carburetors have fixed fuel and air jets with a needle valve to vary the fuel/air mixture delivered to the feed holes. Refer to **Figures 9 and 10** for views of the KZ1000 carburetors.

Individual specifications for these carburetors are given in **Table 2** (end of supplement).

(9)



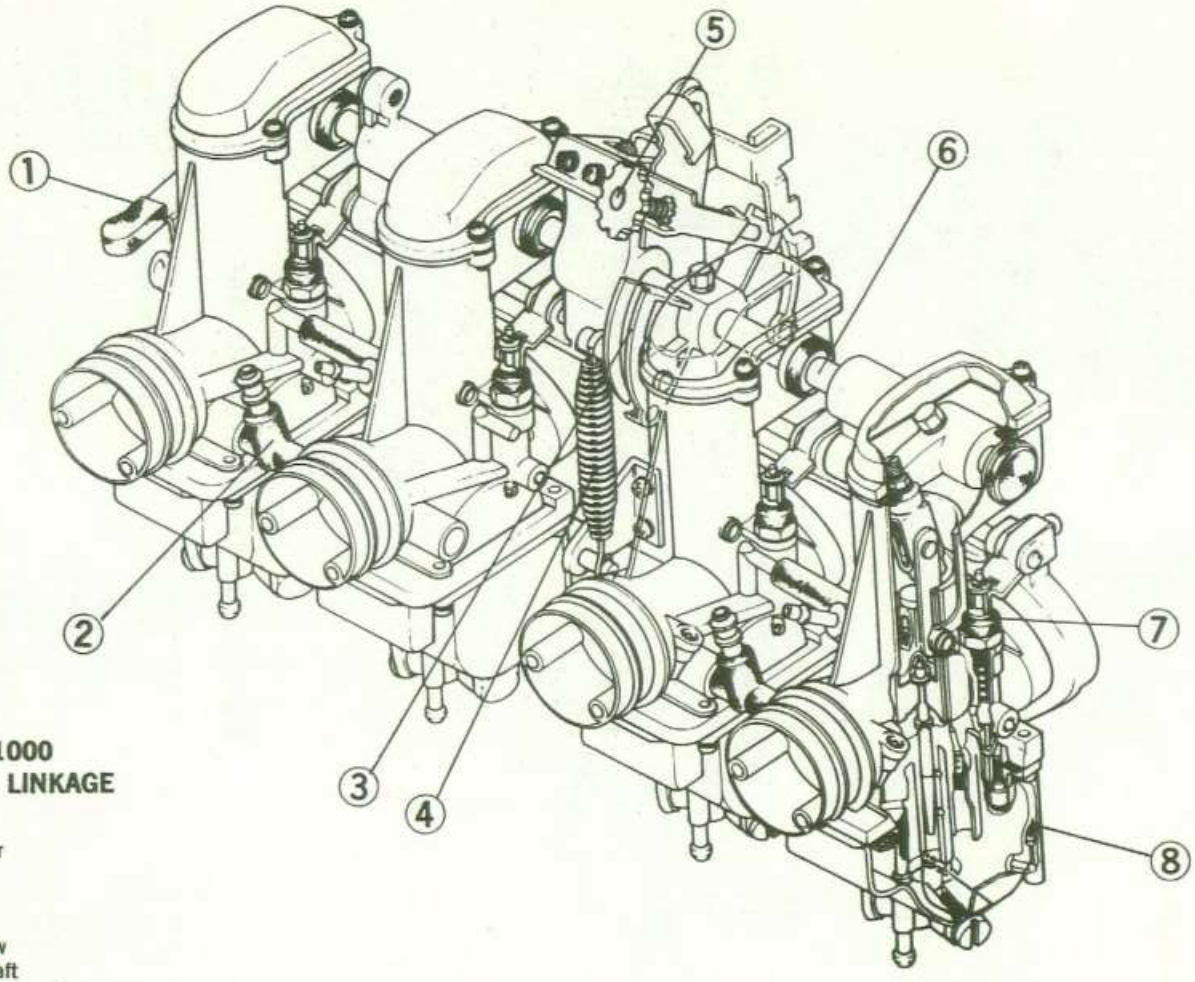
1. Mounting bolt
2. Lockwasher
3. Lockwasher
4. Adjusting screw
5. Spring
6. Locknut
7. Washer
8. Joint ball seat
9. Throttle arm
10. Needle jet
11. O-ring
12. Air bleed pipe
13. Main jet
14. Float
15. Lockwasher
16. Screw
17. O-ring
18. Drain plug



1977 KZ1000 CARBURETOR LINKAGE

19. Screw
20. Lockwasher
21. Top cover
22. Gasket
23. Screw
24. Lockwasher
25. Throttle valve bracket
26. Circlip
27. Jet needle
28. Throttle valve
29. Carburetor body
30. Spring
31. O-ring
32. Pilot screw
33. Extender
34. Pilot jet
35. Valve seat
36. Valve needle
37. Float bowl
38. Gasket
39. Float pin
40. Gasket
41. Clip
42. Dust seal
43. O-ring
44. Starter plunger
45. Bushing
46. Plunger cap
47. Spring
48. Screw
49. Plunger lever
50. Linkage shaft
51. Spring
52. Flat washer
53. Screw
54. Cable bracket
55. Screw
56. Lockwasher
57. Screw
58. Lockwasher
59. Set plate
60. Throttle shaft
61. Spring
62. Clip
63. Collar
64. Bolt
65. Lockwasher
66. Pulley
67. Bracket
68. Lockwasher
69. Screw
70. Spring
71. Idling screw
72. Plastic washer
73. Screw
74. Air vent hose
75. Clamp
76. Lockwasher
77. Spring
78. Stop screw
79. Bracket
80. Screw
81. Collar
82. Clip
83. Spring
84. 3-way joint
85. Clamp
86. Fuel hose

(10)

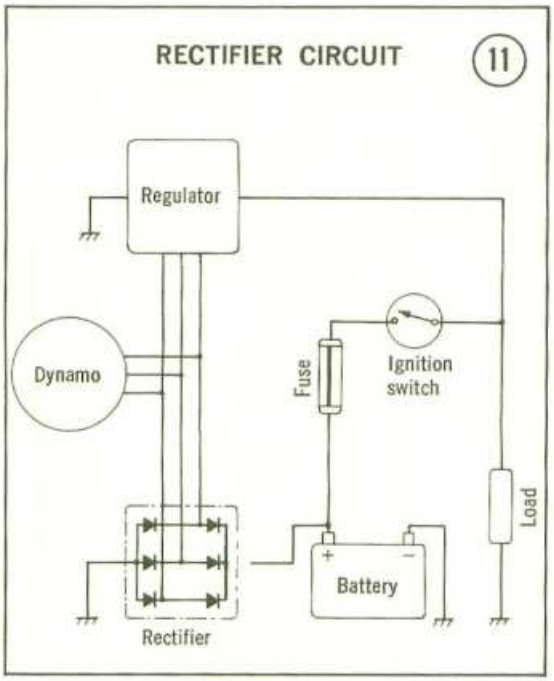


1977 KZ1000
CARBURETOR LINKAGE

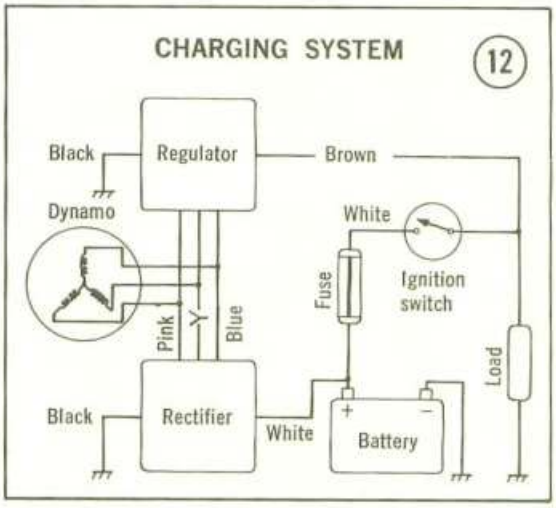
1. Choke lever
2. Fuel pipe
3. Pulley
4. Spring
5. Idling screw
6. Throttle shaft
7. Starter plunger unit
8. Starter jet

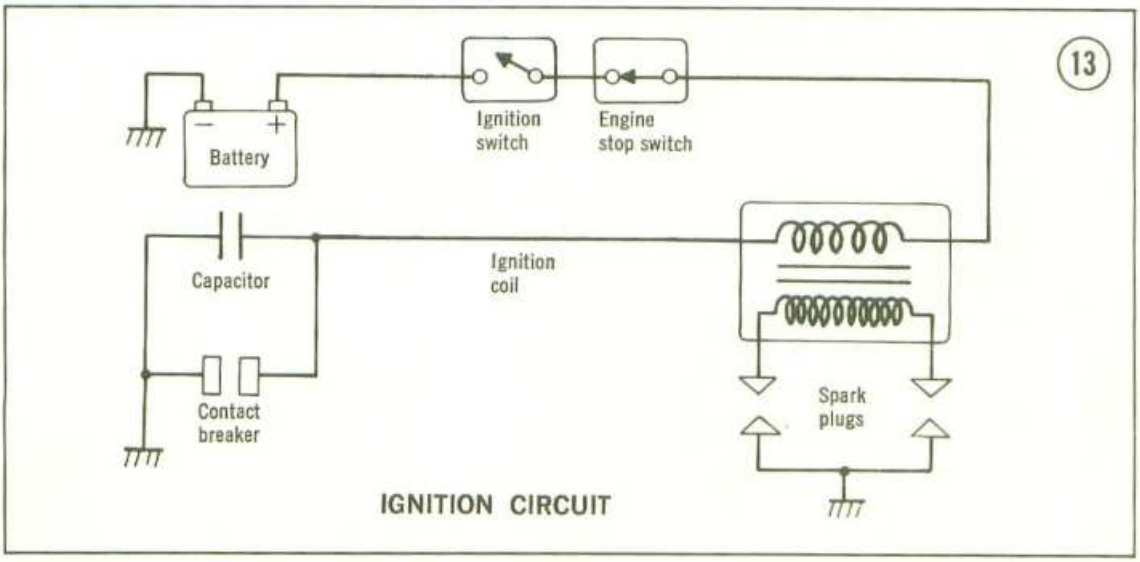
CHAPTER FIVE

ELECTRICAL SYSTEM

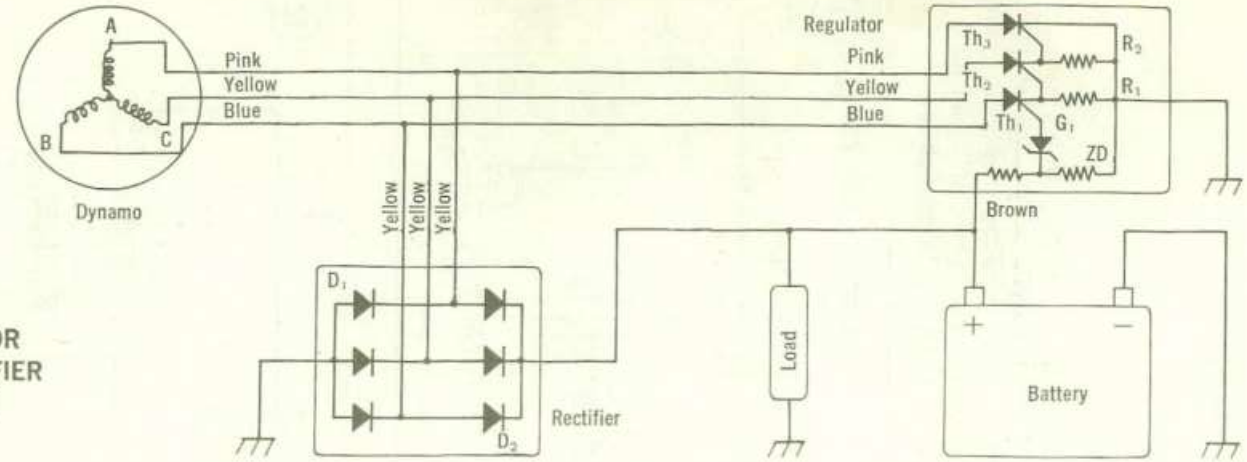


Included in this supplement are wiring diagrams for the charging system, ignition circuit, regulator and rectifier, headlight, starter motor, brake light, turn signal, and horn circuits (refer to **Figures 11 through 24**).



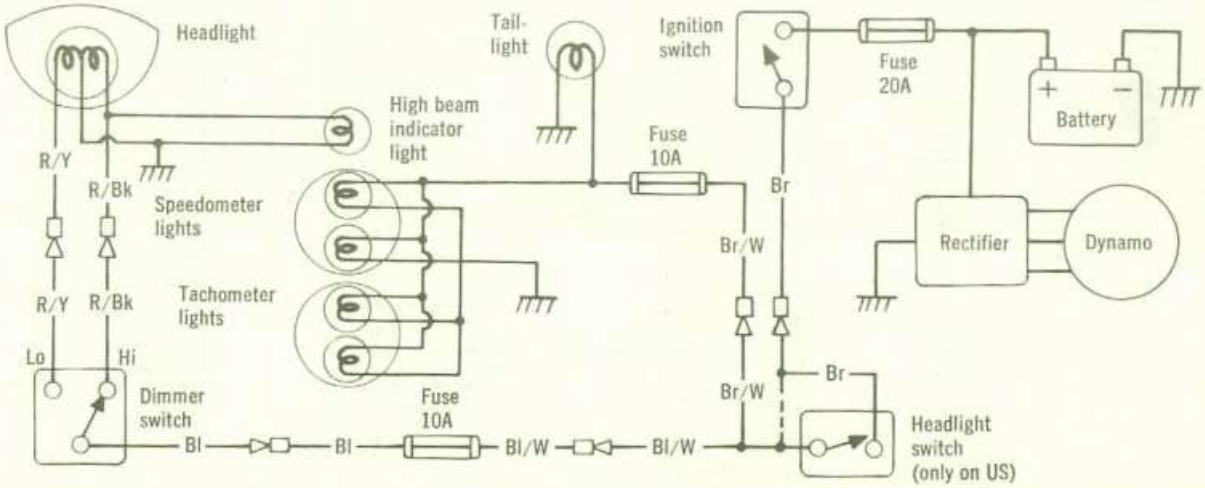


REGULATOR AND RECTIFIER CIRCUIT



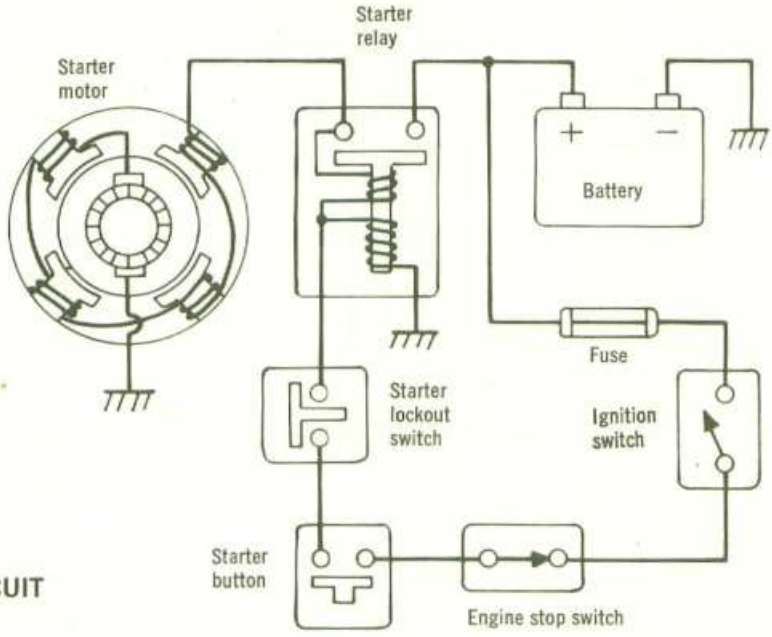
14

HEADLIGHT CIRCUIT (U.S./CANADA)



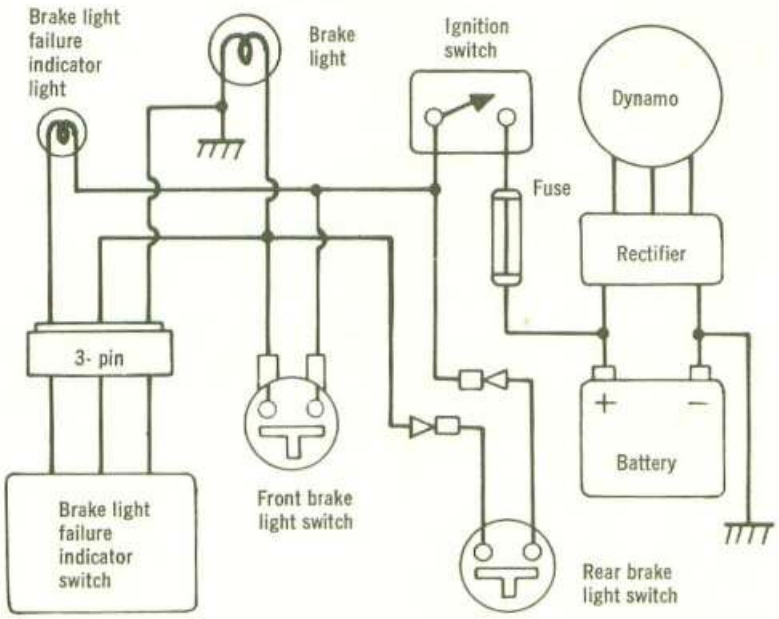
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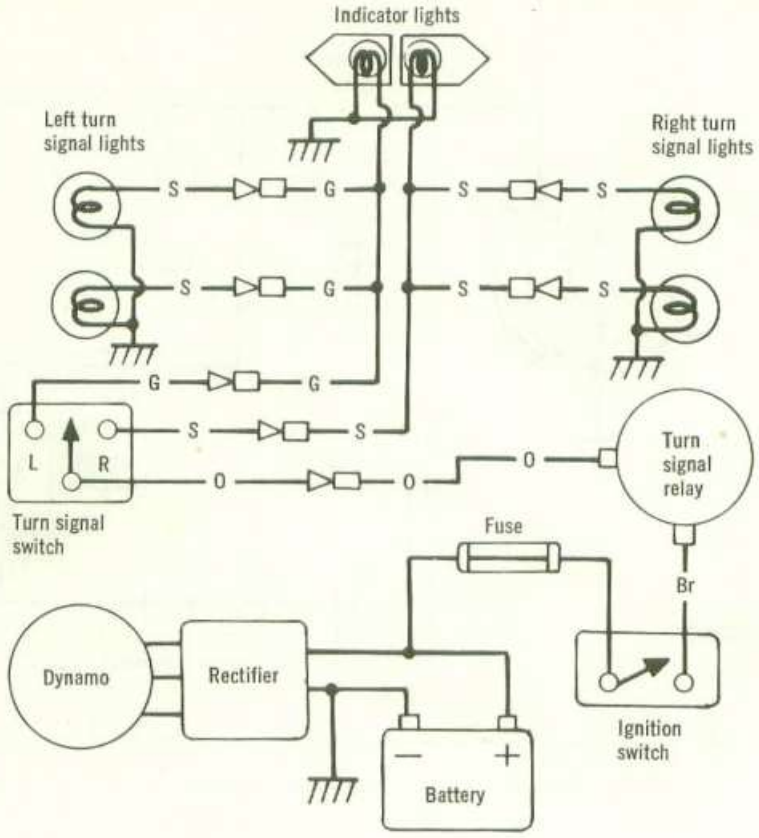
STARTER CIRCUIT

17



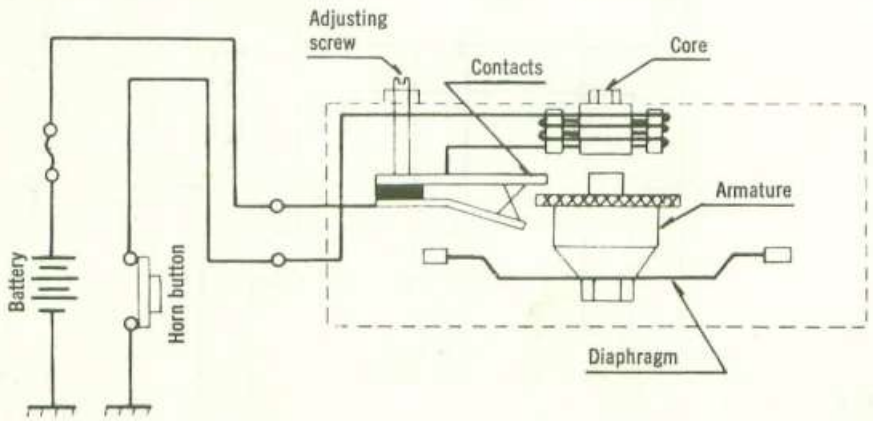
BRAKE LIGHT CIRCUIT

(18)

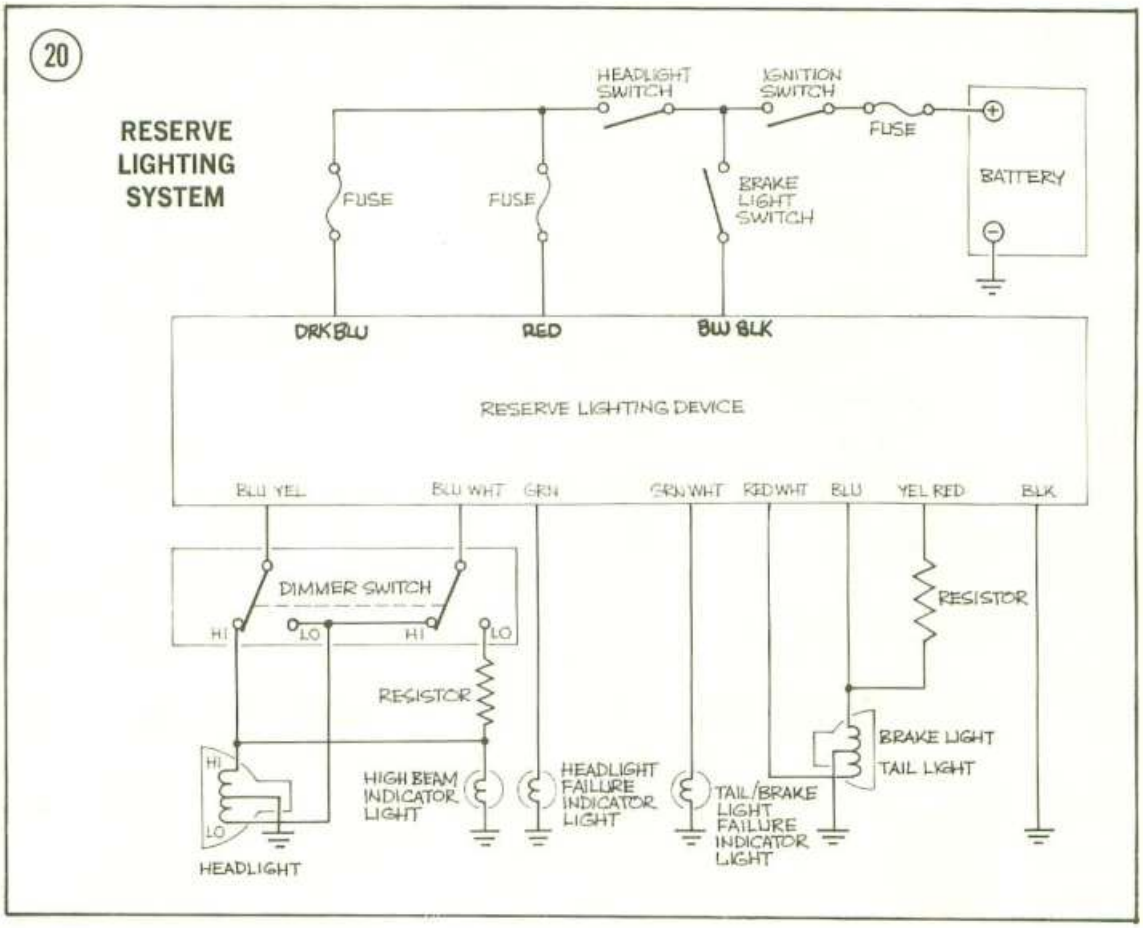


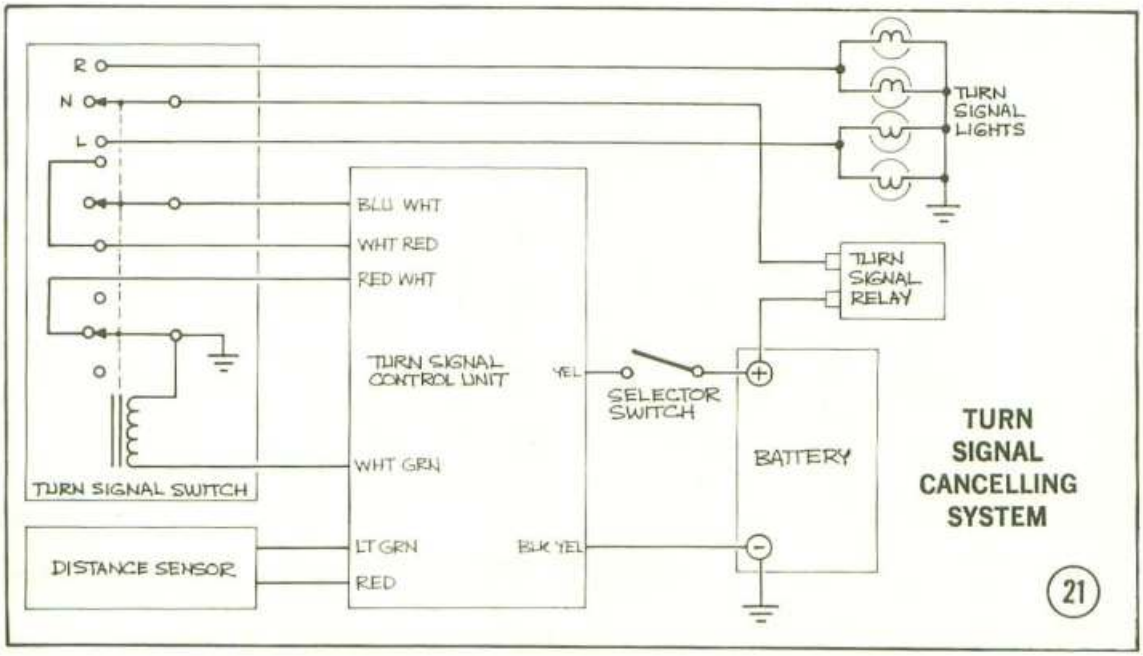
TURN SIGNAL CIRCUIT

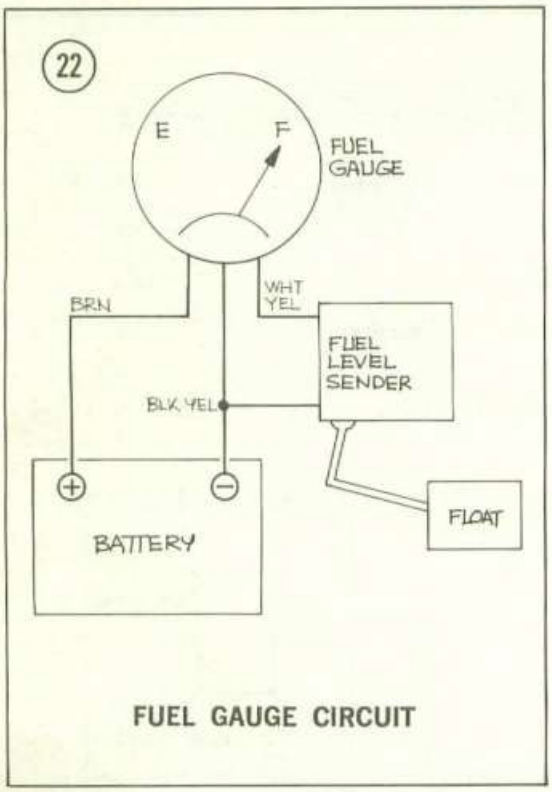
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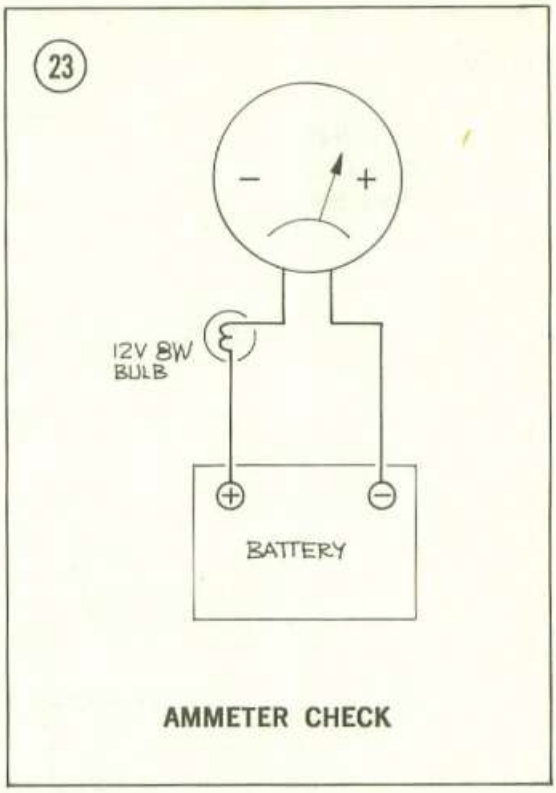
HORN CIRCUIT


20
RESERVE LIGHTING SYSTEM
HEADLIGHT SWITCH
IGNITION SWITCH
FUSE
BATTERY
FUSE
FUSE
BRAKE LIGHT SWITCH
DRK BLU
RED
BW BLK
RESERVE LIGHTING DEVICE
BLU YEL
BLU WHT
GRN
GRN WHT
RED WHT
BLU
YEL RED
BLK
DIMMER SWITCH
HI
LO
HI
LO
RESISTOR
RESISTOR
BRAKE LIGHT
TAIL LIGHT
HI
LO
HIGH BEAM INDICATOR LIGHT
HEADLIGHT FAILURE INDICATOR LIGHT
TAIL/BRAKE LIGHT FAILURE INDICATOR LIGHT
HEADLIGHT

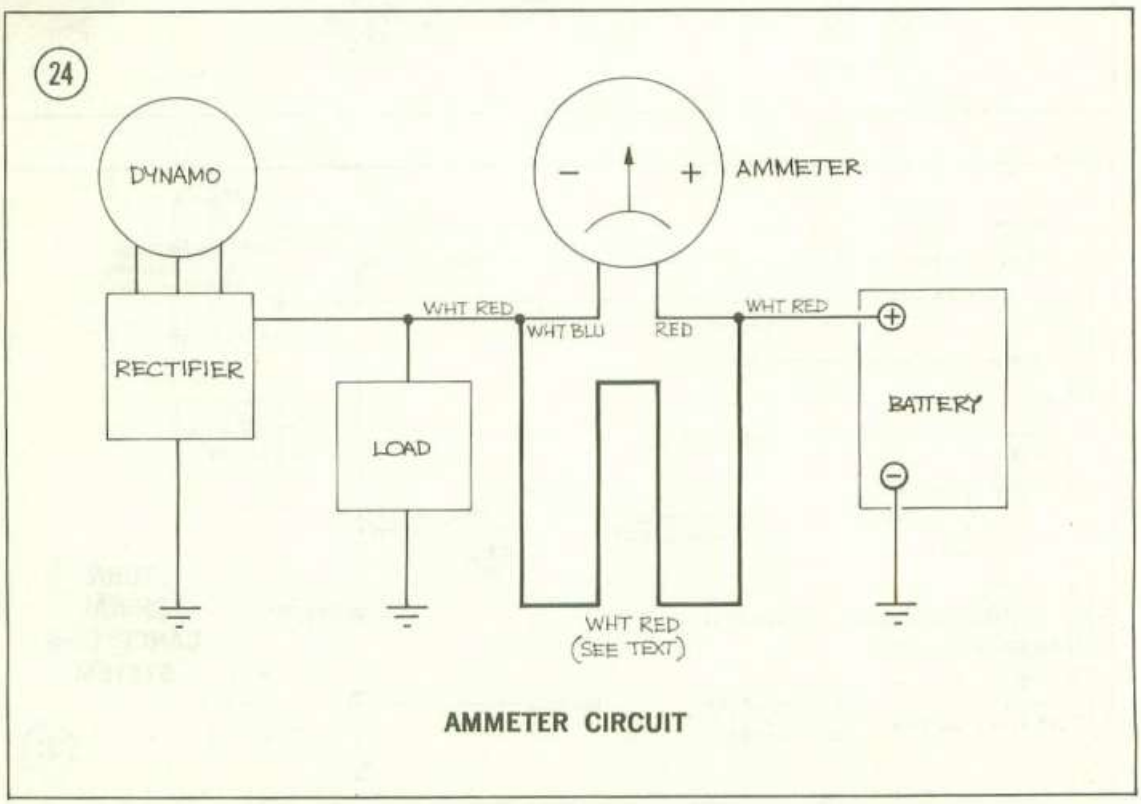

R
N
L
TURN SIGNAL LIGHTS
BLU WHT
WHT RED
RED WHT
TURN SIGNAL RELAY
TURN SIGNAL CONTROL UNIT
YEL
SELECTOR SWITCH
BATTERY
WHT GRN
TURN SIGNAL SWITCH
DISTANCE SENSOR
LT GRN
RED
BLK YEL
TURN SIGNAL CANCELLING SYSTEM
21



FUEL GAUGE CIRCUIT



AMMETER CHECK



AMMETER CIRCUIT

CHAPTER SIX

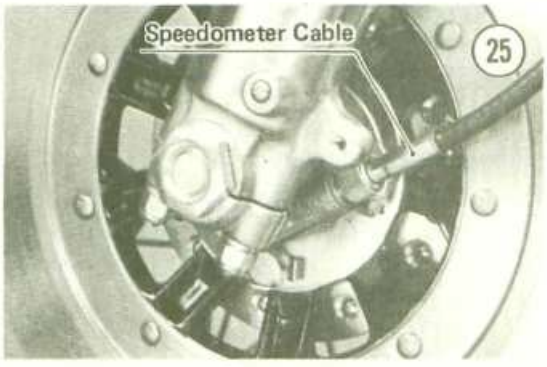
ENGINE

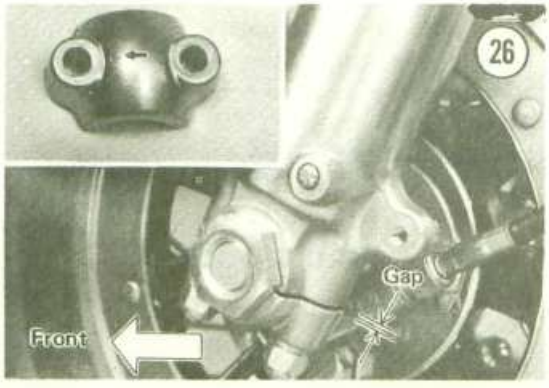
The engine used in the KZ1000, KZ1000 LTD, and the Z1-R is basically the same as the previous model except for a new crankshaft, 3-piece oil rings on new pistons, and a cylinder bore increase from 66mm to 70mm, which raises the engine displacement from 903cc to 1015cc.

Basic disassembly, inspection, and reassembly procedures are the same as for the KZ900. However, refer to **Table 1** at the end of this supplement for new engine specifications.

CHAPTER EIGHT

CHASSIS





This chapter supplement covers changes in chassis-mounted components on KZ1000 models from 1977. Complete removal, disassembly, inspection, reassembly, and installation procedures are given.

FRONT WHEEL

Removal

1. Loosen lower end of the speedometer cable with pliers. See **Figure 25**.
2. Loosen 4 front axle clamp nuts (but do not remove them). Loosen front axle nuts (refer to **Figure 26**).
3. Remove the 4 front axle clamp nuts, lockwashers, and clamps.
4. Lift front of motorcycle with a jack under the engine (or by other suitable means) and drop front wheel out of the forks.

NOTE: *Dual disc models may have insufficient clearance to remove the front wheel in this manner. Removal may be made easier if one caliper is removed and eased gently out of the way. Loosen*

the 2 caliper mounting bolts. Remove the bolts and lift the caliper. Remove the wheel from the forks. Replace the caliper on the fork leg and replace the caliper mounting bolts, but do not tighten them.

5. Insert a wood wedge between the disc brake pads to prevent them from moving out of position should the brake lever be accidentally squeezed.

Installation

1. Remove the wood wedge(s) from between disc brake pads and position the front wheel in place between front fork tubes. Lower the front fork tube (bottom ends) on front axle.
2. Mount the front axle clamps and install nuts finger-tight.

NOTE: *The arrow at the bottom clamp must point toward front. See* ***Figure 26****.*

3. Tighten the front axle nut to 51-65 ft.-lb. (7.0-8.9 mkg). Torque and position the speedometer housing (turn it counterclockwise until it stops).
4. Torque the front axle clamp nut to 11.5-16 ft.-lb. (1.5-2.2 mkg). Tighten the rear axle clamp nut to the same torque.

NOTE: *There should be a gap at the rear of the clamp after tightening. Refer to* ***Figure 26****.*

WARNING

Loss of control could result if clamps are installed wrong or improperly tightened, as clamps and/or studs could fail.

5. Guide speedometer inner cable into housing while turning wheel. The slot in the end of the cable will seat in the tongue of speedometer cable (**Figure 27**).
6. If the caliper was removed to facilitate wheel removal, replace the 2 caliper mounting bolts. Tighten to 17.5-20 ft.-lb. (2.4-2.7 mkg).

SPEEDOMETER GEAR HOUSING

Refer to **Figure 28** for the following number references in each step.



Removal

1. Remove front wheel.
2. Remove left axle nut (1) and pull speedometer gear housing (2) off hub (17).
3. Remove grease seal (4) with a hook, and pull out speedometer gear (3).

NOTE: *If the speedometer cable bushing (10) or speedometer gear pinion (8) must be removed, drill housing through pin (6) with a 1mm drill bit. Drill housing from gear side with a 2mm drill bit. Tap out pin, then pull out speedometer bushing and pinion. The assembly should be replaced, if possible, rather than rebuilt.*

Reassembly/Installation

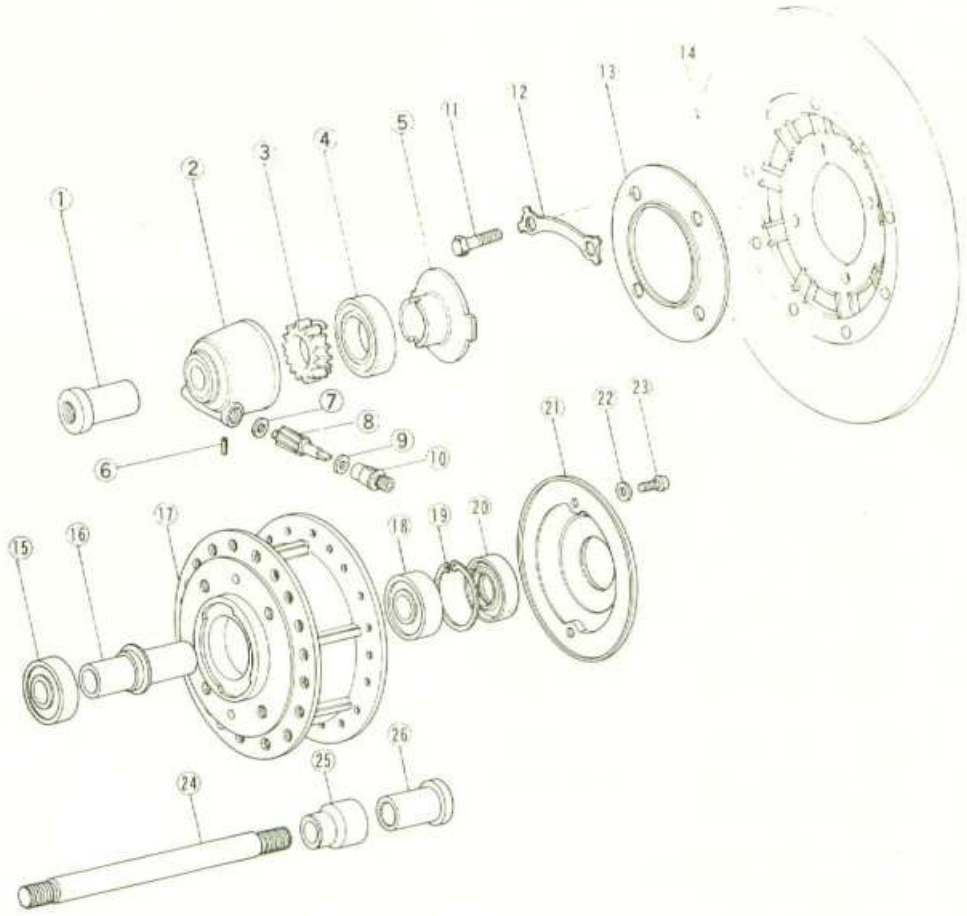
1. Apply grease sparingly to a new grease seal and install it with a press or suitable driver. The face of the seal should be level with the surface of the housing.
2. Insert a new pin and punch around the housing hole to partially close it, thus securing the pin in place.
3. Grease the speedometer gear and install speedometer gear housing so that it fits into the speedometer gear drive notches. See **Figure 29**. The clearance between the speedometer gear housing and the gear drive holding plate, when properly installed, is less than 0.12 in. (3mm).

FRONT FORKS

Removal (Left Leg)

1. Remove the front wheel (refer to *Front Wheel, Removal*, preceding section).

28



FRONT HUB

1. Axle nut
2. Speedometer gear housing
3. Speedometer gear
4. Grease seal
5. Speedometer gear drive
6. Pin
7. Washer
8. Speedometer pinion
9. Washer
10. Bushing
11. Disc bolt
12. Double washer
13. Speedometer gear drive holding plate
14. Disc
15. Bearing
16. Spacer
17. Front hub
18. Bearing
19. Circlip
20. Grease seal
21. Cap
22. Washer
23. Screw
24. Axle
25. Collar
26. Axle nut

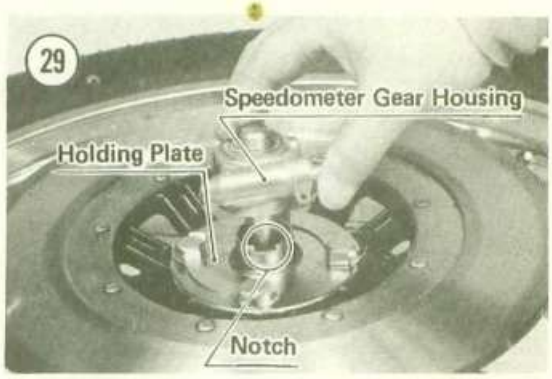
2. Remove the bolts and lockwashers holding front fender to left fork leg.

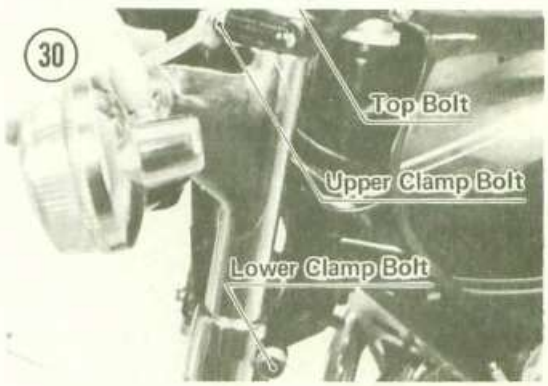
3. Remove caliper mounting bolts, lockwashers, and flat washers. Place the calipers on a stand so the brake fluid pipe will not be bent.

4. If the fork leg is to be disassembled after removal, loosen the top bolt at this time.

5. Loosen upper and lower clamp bolts. See **Figure 30**.

6. Work the fork leg down and out with a twisting motion.





Installation (Left Leg)

1. Slide fork leg up through lower and upper clamps until upper surface of top bolt flange is even with the upper surface of the stem head. Tighten the upper clamp bolt to 11.5-16.0 ft.-lb. (1.6-2.2 mkg) and lower clamp bolt to 25-33 ft.-lb. (3.5-4.5 mkg). Refer to **Figure 30**.

2. If the top bolt was loosened during removal, tighten it to 18-22 ft.-lb. (2.4-3.0 mkg).

3. Install the caliper and tighten the caliper mounting bolts to 25-33 ft.-lb. (3.5-4.5 mkg). Each mounting bolt has a flat washer and a lockwasher.

4. Install fender bolt and lockwashers through guide holder plate. Position plate between front fender and left fork leg.

5. Secure the lower brake hose in the guide (be sure the grommet is in position).

6. Install the front wheel.

Removal and Installation (Right Leg)

The removal and installation procedures are the same for the right side as the procedures for the left side. Bear in mind that the KZ1000 has only a single hydraulic disc brake in the front.

FRONT HUB AND AXLE

Disassembly

Refer to **Figure 28** for the number references in each of the following steps.

1. Remove the disc side axle nut (1) and pull off the speedometer gear housing (2).

2. Straighten portion of disc double washers (12) that are folded over disc bolts (11). Remove bolts, double washers, speedometer gear drive holding plate (13), speedometer gear drive (5), and disc (14).

3. Remove axle (24) and right axle nut (26). Then remove collar (25).

4. Remove screws (23) and washers (22), then take cap (21) off the right side of the hub.

5. Pull out grease seal (20) with a hook. Remove the circlip (19).

6. Remove bearing (18) on right side by tapping evenly around bearing inner face by inserting metal rod into hub from speedometer gear side (**Figure 31**). The distance collar (16) will also come out with bearing.

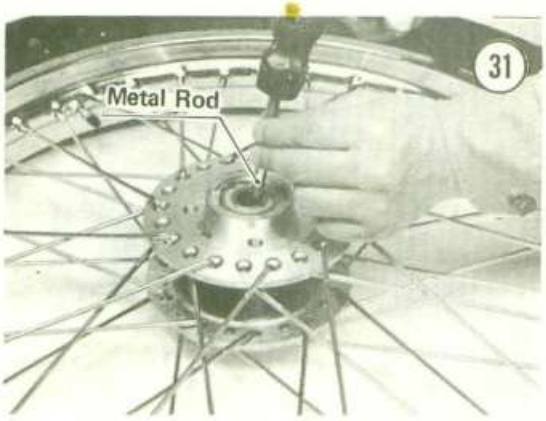
7. Insert rod into hub from right side and remove other bearing (15) by tapping evenly around bearing inner face.

Inspection and Lubrication

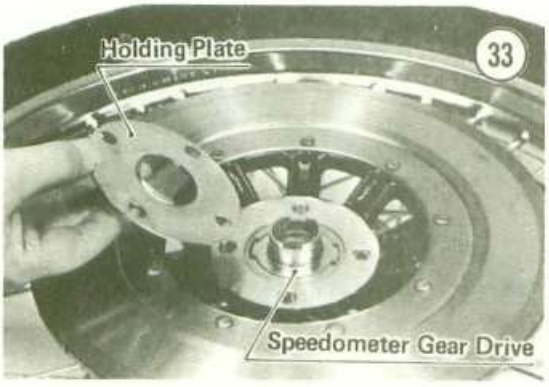
1. Inspect bearings and replace or grease if necessary. Wash bearing in a high flash-point solvent, then dry it.

CAUTION

Do not spin the bearing while it is dry.

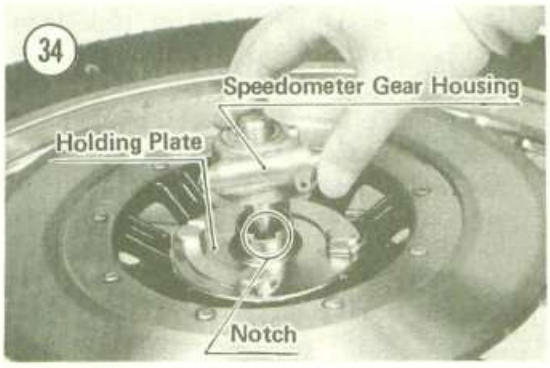






2. Oil the bearing, then spin with your fingers to check its condition. It should not make noise, and it should spin smoothly. If not, replace it with a new one.

3. If old bearing is to be reused, wash in solvent again and pack with good quality wheel bearing grease. Be sure grease is worked thoroughly into bearing.



4. Remove old grease from hub before installing new bearing. Clean and grease the front hub speedometer gear box.

Reassembly

1. Install the bearing with a wheel bearing driver and bearing driver holder. Press bearing until it bottoms in hole (**Figure 32**).

2. Install a new grease seal with wheel bearing driver. Press seal until its face is level with surface of front hub.

3. Fit speedometer gear drive into hub notches. Speedometer gear drive holding plate must be installed with plain side facing in (**Figure 33**).

4. Tighten disc mounting bolts to 25-33 ft.-lb. (3.5-4.5 mkg), then bend washer tabs back over bolts.

5. Install speedometer gear housing so that it fits into speedometer gear drive notches (**Figure 34**).

6. Remove any grease that may have gotten onto disc (use a high flash-point solvent).

WARNING

Never use a solvent which leaves an oily residue.

FRONT DISC BRAKE

Disc Removal/Installation

Refer to *Front Hub and Axle* section, preceding, for complete procedures for removing and installing brake disc.

Brake Pad Removal

1. Remove front wheel (refer to *Front Wheel, Removal*, this chapter).

2. Remove mounting screw for pad B, and remove pad (a lockwasher and metal plate must also be removed). See **Figure 35**.

3. Slide caliper body to right side of motorcycle and remove pad A (refer to **Figure 35**). Squeeze brake lever several times if you encounter difficulty removing pad A. The caliper piston will push it out.

Brake Pad Installation

1. Remove bleed valve cap, then loosen valve slightly and push piston in as far as it will go. Close valve. Clean up any spilled fluid, then install bleed valve cap **(Figure 36)**.

2. Install pad A in caliper holder, then pad B (align tongue on pad with groove in caliper). See **Figure 37**. Install metal plate, lockwasher, and mounting screw (use a non-permanent locking agent on screw). Refer to **Figure 35**.

3. Install front wheel (refer to *Front Wheel, Installation*, this chapter).

4. Check brake fluid level in master cylinder and bleed air from brake system (see *Brake Bleeding*, this chapter).

Caliper Removal

1. Unscrew brake pipe where it connects to caliper and cap end of pipe with rubber bleeder valve cap to prevent fluid from escaping.

2. Remove 2 mounting bolts, washers, and lockwashers, and remove caliper. Refer to **Figure 38**.

Caliper Installation

1. Install and torque caliper mounting bolts to 25-33 ft.-lb. (3.5-4.5 mkg).

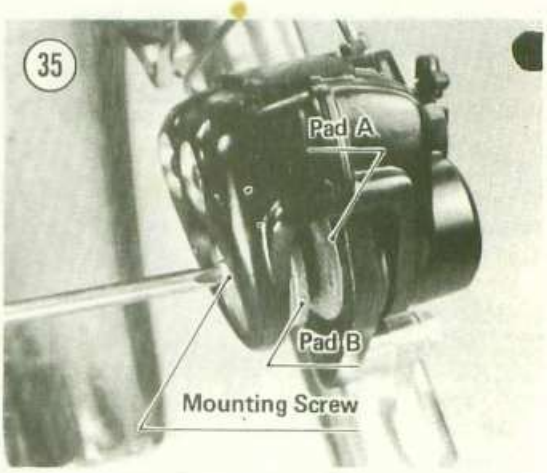
2. Torque caliper holder shaft nuts to 17.5-20.0 ft.-lb. (2.4-2.7 mkg).

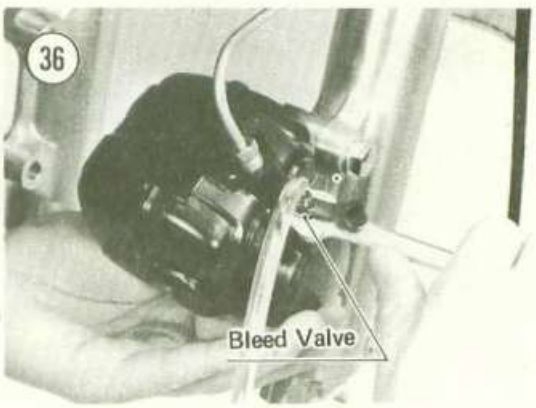
3. Connect brake pipe to caliper and torque bleed valve to 61-87 in.-lb. (0.7-1.0 mkg).

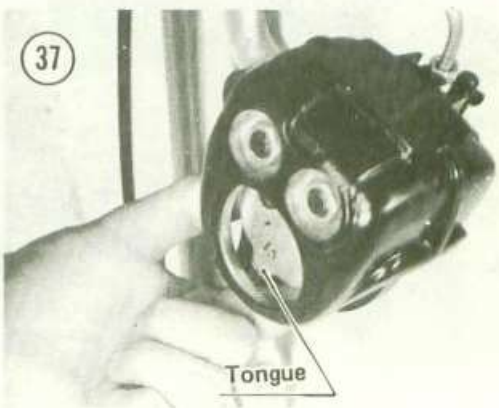
4. Check brake fluid level in master cylinder and bleed brake system (refer to *Brake Bleeding*, this chapter).

WARNING

Never attempt to ride the motorcycle until a full brake lever is obtained by pumping brake lever until pads are against disc. The brakes will not function on the first application of the brake lever if this is not done.

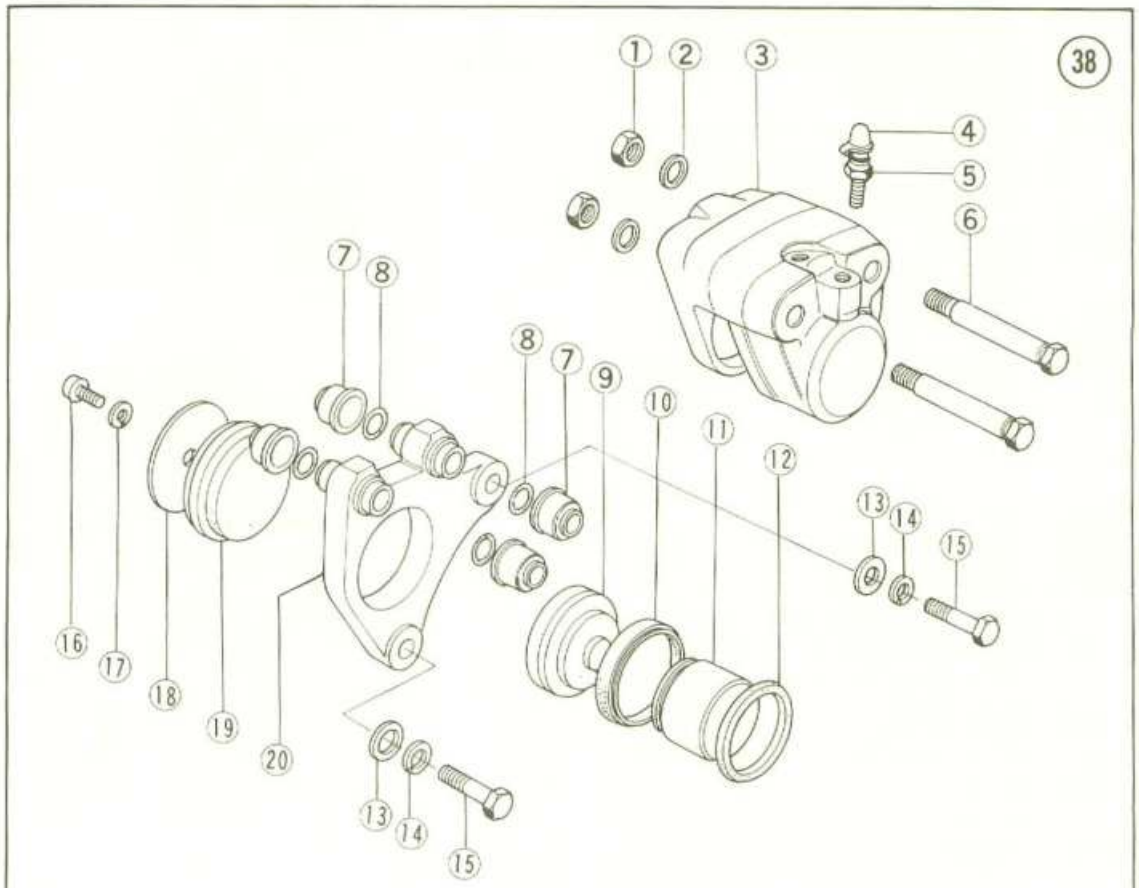






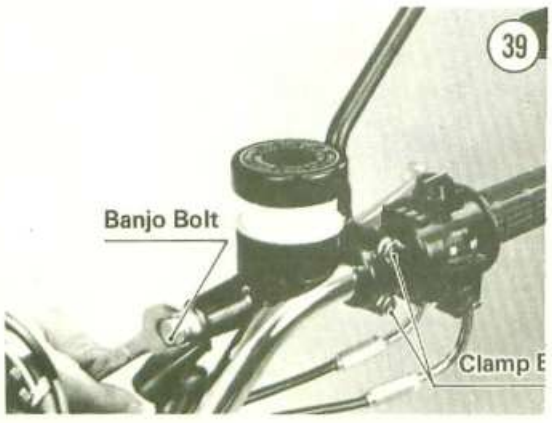
Master Cylinder Removal (KZ1000, KZ1000 LTD)

1. Remove right rearview mirror.



FRONT CALIPER

1. Nut
2. Spacer
3. Caliper
4. Bleed valve cap
5. Bleed valve
6. Caliper holder shaft
7. Dust cover
8. O-ring
9. Pad A
10. Dust seal
11. Piston
12. Fluid seal
13. Flat washer
14. Lockwasher
15. Caliper mounting bolt
16. Mounting screw
17. Lockwasher
18. Metal plate
19. Pad B
20. Caliper holder



2. Pull back dust cover and remove banjo bolt to disconnect upper brake hose from master cylinder (there is a flat washer on each side of the hose fitting). Refer to **Figure 39**.
3. Remove 2 clamp bolts and flat washers and take off master cylinder.

Master Cylinder Removal (Z1-R)

1. Drain the brake fluid from the line.
2. Remove the fairing and headlight to expose the front brake master cylinder.

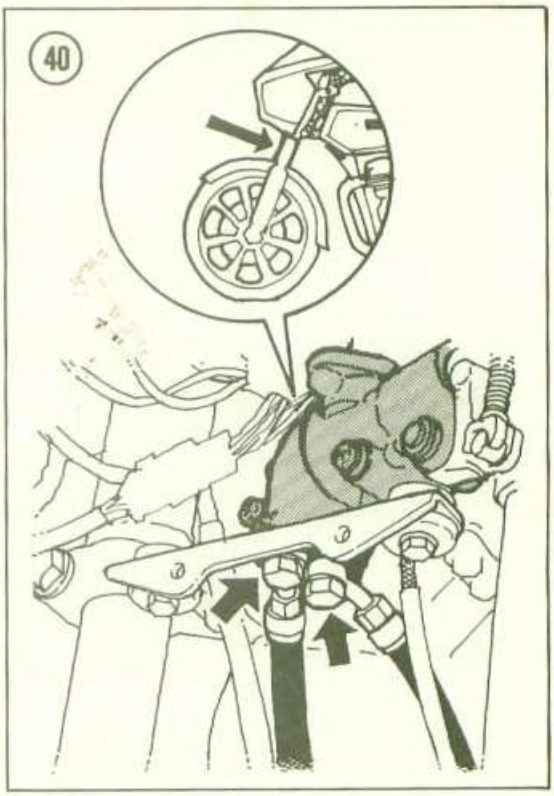
3. Adjust for maximum free play of the brake cable. Align the slot in the knurled adjuster on the brake lever.

4. Remove the cable from the handlebar lever.

5. Loosen and remove the banjo bolts to disconnect the 2 brake hoses from the master cylinder (**Figure 40**).

6. Loosen and remove the 3 brake master cylinder reservoir screws.

7. Remove the 2 screws holding the master cylinder. Remove the master cylinder, fluid reservoir and cable as a unit.



Master Cylinder Installation (Z1-R)

Installation is simply the reverse of removal with the following changes.

1. Replace the flat washers on each side of the banjo fitting; do not reuse the old ones.

2. Bleed the front brakes as instructed in the *Brake Bleeding* section.

3. Adjust brake cable for ¼-⅜ in. (6.4-9.5mm) of free play.

4. Check for proper brake fluid level and lever feel before riding.

Master Cylinder Disassembly (Z1-R)

Refer to **Figure 41** for the number references below.

1. Remove the brake cable from the master cylinder lever.

2. Loosen the 2 screws on the top of the master cylinder reservoir. Remove the screws, reservoir top, and diaphragm (1, 2, 3).

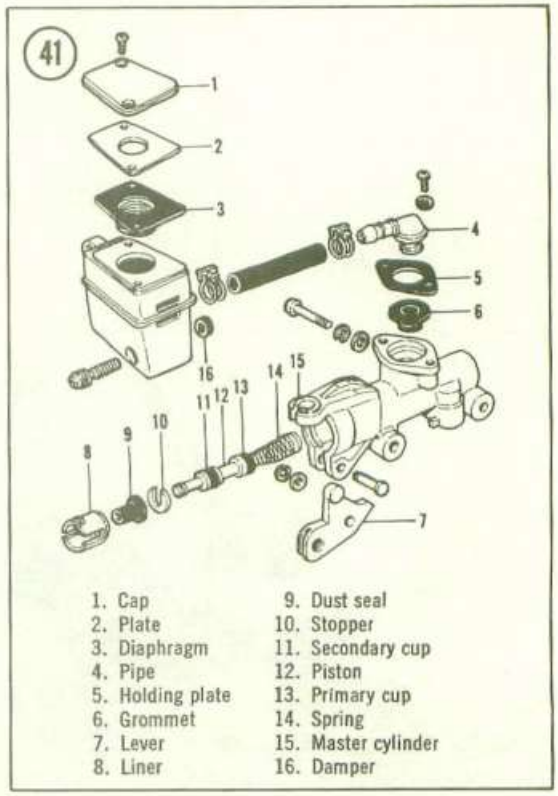
3. Loosen the clamp connecting the reservoir to the master cylinder. Remove the reservoir and drain any remaining brake fluid.

4. Remove the circlip holding the lever pivot pin. Remove the pivot pin and lever (7).

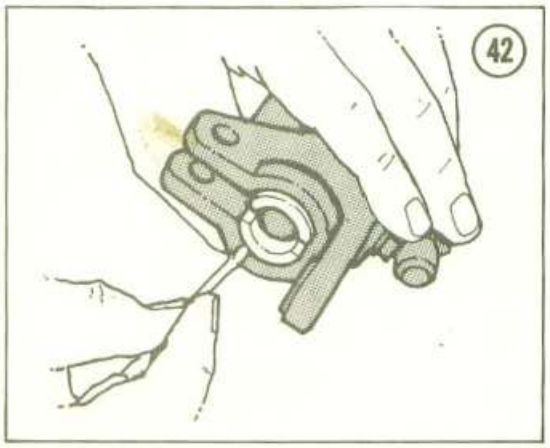
5. Pry the master cylinder liner loose with a small screwdriver. See **Figure 42**. Remove the liner (8).

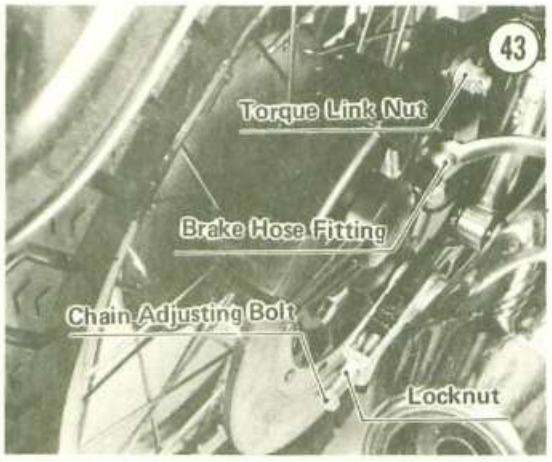
6. Remove the piston (12) and spring (14).

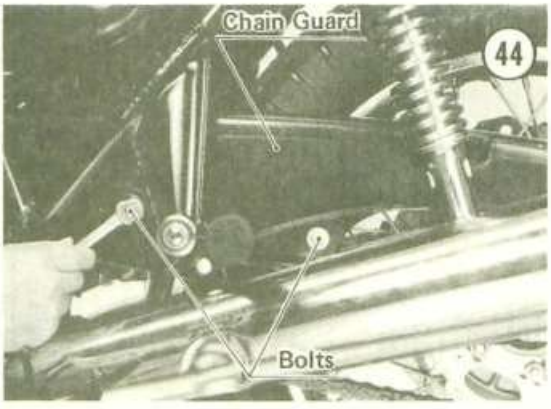
7. Loosen the 2 screws holding the pipe that connects the reservoir to the master cylinder. Remove the pipe (4) and grommet (6).



1. Cap
2. Plate
3. Diaphragm
4. Pipe
5. Holding plate
6. Grommet
7. Lever
8. Liner
9. Dust seal
10. Stopper
11. Secondary cup
12. Piston
13. Primary cup
14. Spring
15. Master cylinder
16. Damper



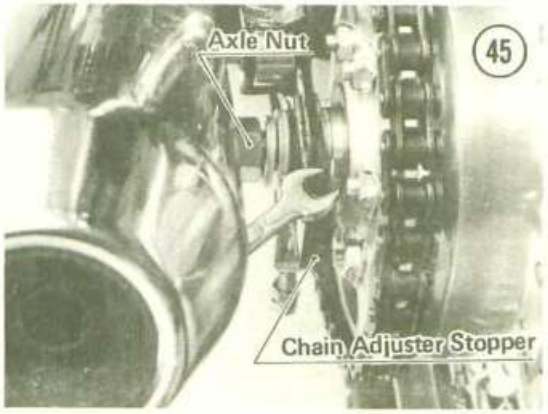




Master Cylinder Assembly (Z1-R)

Assemble in reverse order of disassembly with the following considerations.

1. Clean all internal brake parts with alcohol or brake fluid.



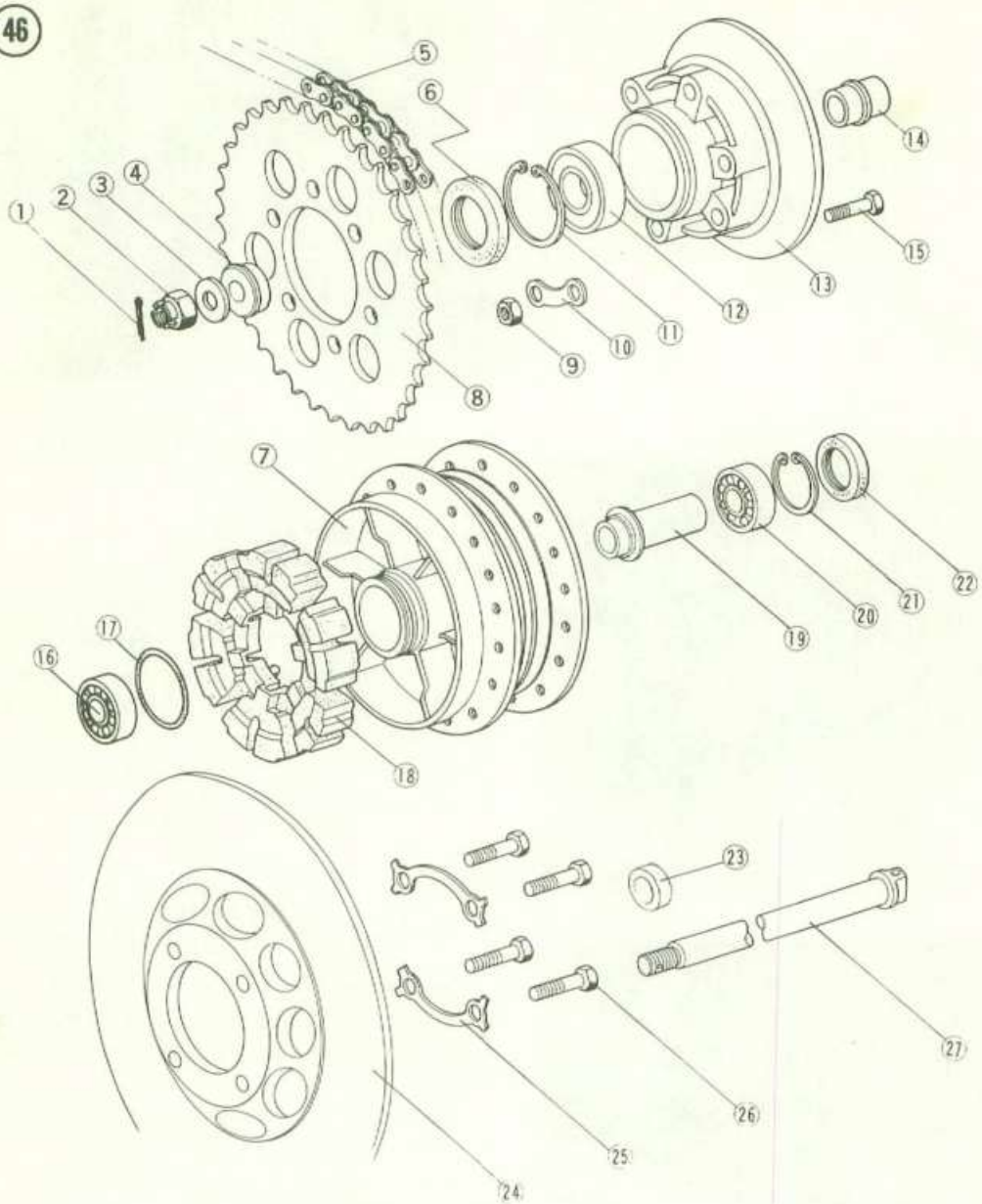
2. Apply a small coating of brake fluid to all parts during assembly.

Master Cylinder Installation (KZ1000, KZ1000 LTD)

1. Install the master cylinder with projection on clamp facing the throttle grip (**Figure 42**).
2. Tighten the upper clamp bolt to 52-78 in.-lb. (0.6-0.9 mkg), then tighten the lower clamp bolt to the same torque.
3. Bleed the brake system (refer to *Brake Bleeding*, this chapter).

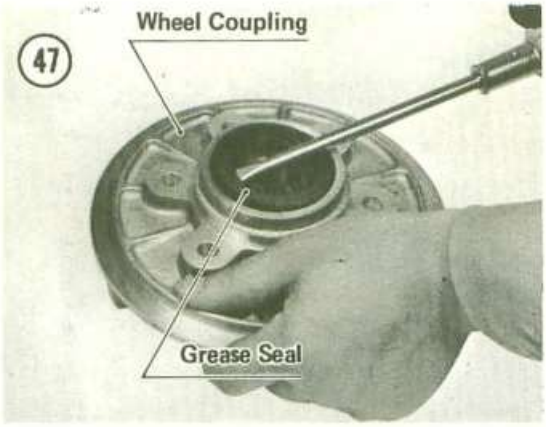
REAR WHEEL REMOVAL AND INSTALLATION

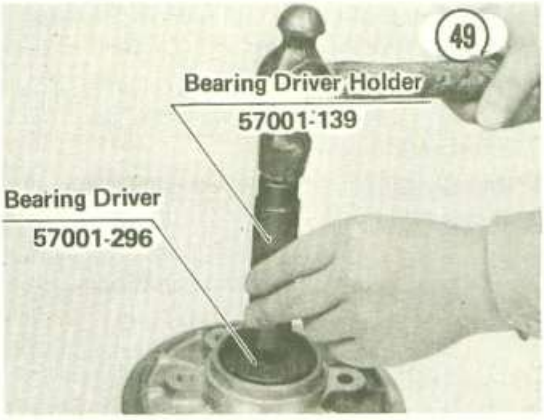
1. Set the motorcycle on its centerstand.
2. Remove the cotter pin, nut, lockwasher, and bolt from the rear end of the torque link. Refer to **Figure 43**.
3. Remove the 2 chain guard bolts and washers and take off chain guard. See **Figure 44**.
4. Remove the axle cotter pin and loosen the axle nut. Refer to **Figure 45**.
5. Loosen the left and right chain adjuster locknuts and both chain adjusting bolts. Push the wheel forward so chain can be removed from the sprocket. Remove the bolts and lockwashers and remove the chain adjuster stoppers.
6. Loosen the brake line from the grommets on the swing arm.
7. Slide the wheel rearward until it drops out of the swing arm.

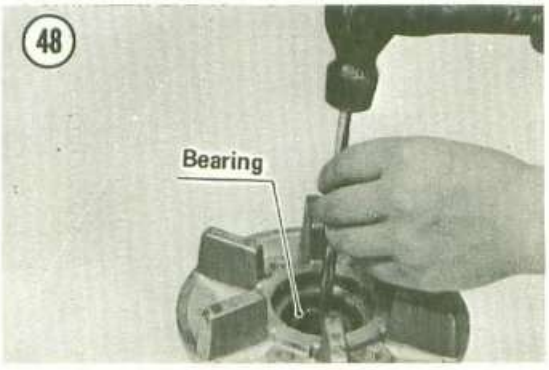


REAR HUB

1. Cotter pin
2. Axle nut
3. Washer
4. Coupling collar
5. Drive chain
6. Grease seal
7. Rear hub
8. Rear sprocket
9. Nut
10. Double washer
11. Circlip
12. Ball bearing
13. Coupling
14. Coupling sleeve
15. Bolt
16. Ball bearing
17. O-ring
18. Rubber damper
19. Spacer
20. Ball bearing
21. Circlip
22. Grease seal
23. Collar
24. Disc
25. Double washer
26. Bolt
27. Axle







NOTE: *Note carefully the position of the rear wheel spacers and their location on the axle.*

8. Install in reverse order of removal.

REAR COUPLING AND SPROCKET

Disassembly

Refer to **Figure 46** for following number references in each step.

1. Straighten the bent portions of double washers (10).

CAUTION

Do not lay wheel on ground with disc facing down (damage to the disc could result). Lay blocks under wheel so disc does not touch ground.

2. Remove rear sprocket nuts (9) and double washers to separate rear sprocket (8) and wheel coupling (13).

3. Remove rear sprocket and coupling from rear wheel. Pull coupling collar (4) from left and coupling sleeve (14) from right.

4. Remove circlip (11) and grease seal (6). Also refer to **Figure 47**.

5. Tap lightly and evenly around bearing inner face from wheel side to remove bearing (12). See **Figure 48**.

Inspection and Lubrication

1. Inspect bearing and replace or grease if necessary. Wash bearing in a high flash-point solvent, then dry it.

CAUTION

Do not spin bearing while it is dry.

2. Oil the bearing, then spin with your fingers to check its condition. It should not make noise, and it should spin smoothly. If not, replace it with a new one.

3. If old bearing is to be reused, wash in solvent again and pack with good quality wheel bearing grease. Be sure grease is worked thorougly into bearing.

Reassembly

1. Install bearing with a wheel bearing driver and bearing driver holder. Press bearing in until it bottoms in the hole (**Figure 49**).

2. Install circlip.

3. Replace grease seal with a new one (use same tools as for bearing installation in Step 1, preceding). Press seal in until face of seal is

level with end of grease seal hole. Apply grease sparingly to grease seal lip.

4. Install rear sprocket (numbered side facing out), bolts, new double washers, and nuts. Tighten nuts loosely.

5. Install coupling sleeve on right side and coupling collar on left side of coupling.

6. Inspect O-ring (17) on rear hub. Replace if it has deteriorated. Apply grease sparingly to the O-ring.

7. Install rubber damper and wheel coupling on rear hub. Tighten sprocket nuts to 25-33 ft.-lb. (3.5-4.5 mkg).

8. Bend tabs of double washers over the nuts.

REAR HUB AND AXLE

Disassembly

Refer to **Figure 46** for following numbered references in each step.

1. Remove wheel coupling (13) and rubber damper (18) from rear hub (7).

2. Pull out collar (23) from disc side.

3. Straighten bent portions of double washers (25) and remove bolts (26), double washers, and circlip (21).

4. Remove left side bearing (16) by inserting metal rod into hub from disc side and tapping evenly around bearing inner race. The distance collar (19) will come out with the bearing.

5. Tap out remaining bearing (20) by inserting metal rod into hub from other side.

Inspection and Lubricaton

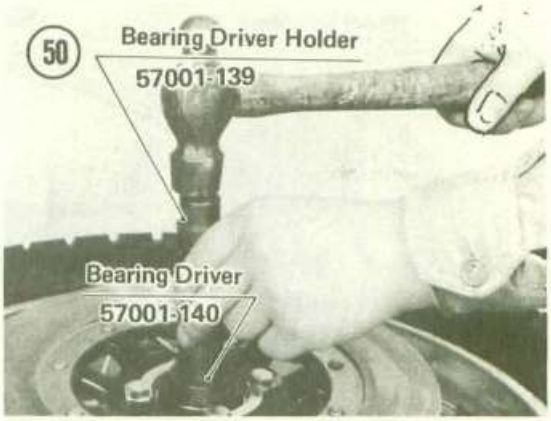
Perform all steps under *Inspection and Lubrication, Rear Coupling and Sprocket* section, preceding.

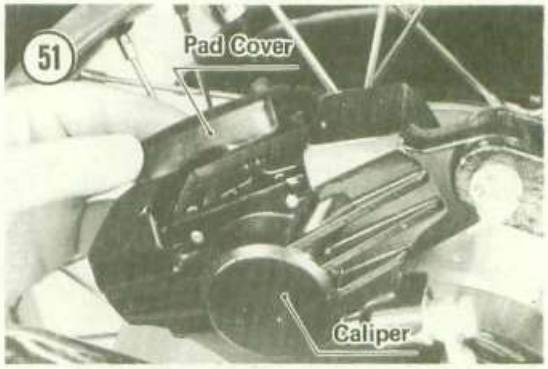
Reassembly

1. Install bearings with wheel bearing driver and bearing driver holder. Press bearing in until it bottoms in hole.

2. Install circlip.

3. Replace grease seal with a new one (use same tools as for bearing installation). Press seal in until it stops at bottom of hole (**Figure 50**).





4. Inspect and replace O-ring on rear hub if necessary. Apply grease sparingly to O-ring before installing coupling on rear hub.

REAR DISC BRAKE

Disc Removal/Installation

Refer to *Rear Hub and Axle* section, preceding, for complete procedures for removing and installing brake disc.

Caliper Removal/Installation

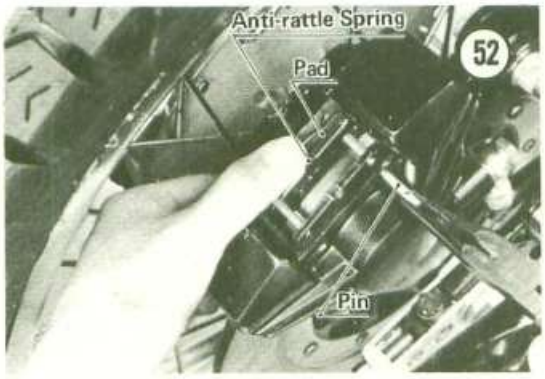
Refer to *Rear Wheel Removal and Installation* section in this chapter, for caliper removal and installation procedures.

Brake Pad Removal

1. Remove pad cover on caliper (**Figure 51**).

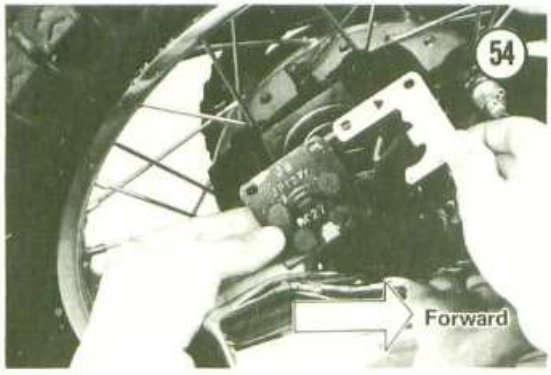
2. Remove clips from pins, then hold thumb on anti-rattle springs to keep it from flying off and pull pins off caliper (**Figure 52**).

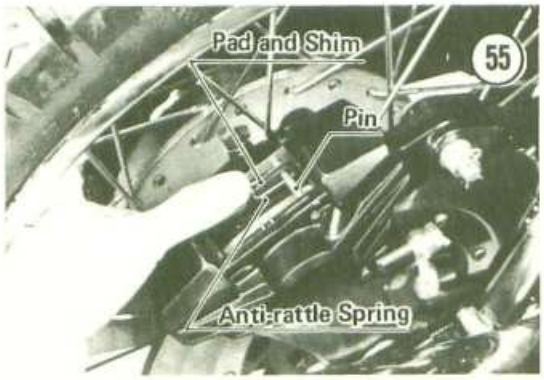
3. Remove pads and shims from caliper.











Brake Pad Installation

1. Remove bleed valve cap and attach clear plastic hose to bleed valve and run other end of hose into a container **(Figure 53)**.

2. Loosen valve slightly and push both pistons inward by hand as far as they will go using a worn pad. Tighten the valve and wipe up any spilled fluid. Recap the bleed valve.

CAUTION

Do not lever pistons against disc with a screwdriver. This can damage or warp the disc.

3. Put the shim on back of each pad and insert one of the pins through outer wall of caliper, shim, pads, the other shim, and into the inner wall of the caliper.

CAUTION

When inserting pads and shims into caliper, be careful not to get rubber dust seals out of place. Install shim so triangular hole points forward. Hold pin by end with hole to insert it. See Figure 54.

4. Install anti-rattle springs. The end of each spring must go under installed pin, and top of each spring must ride on pad and shim. See **Figure 55**.

5. Insert other pin through caliper, shims, and pads (press down the free end of each spring so pin can pass over it). See **Figure 56**.

6. Insert clips through pins on right side of right shim and install pad cover.

7. Check brake fluid level in master cylinder and bleed the brake system. Refer to *Brake Bleeding*, this chapter.

8. Push bleed valve cap onto valve.

WARNING

Never attempt to ride the motorcycle until a full brake lever is obtained by pumping brake lever until pads are against disc. The brakes will not function at the first application of the brake lever if this is not done.

Rear Master Cylinder Removal

1. Pull off right side cover and remove banjo bolt to disconnect brake hose from master cylinder. Free the master cylinder (there is a flat washer on each side of the hose fitting).

2. Remove master cylinder mounting bolts, lockwashers, flat washers, and side cover bracket. Remove rear master cylinder. See **Figure 57**.

Rear Master Cylinder Installation

1. Replace flat washer on each side of brake hose fitting with new ones.

2. Position master cylinder and install master cylinder mounting bolts, lockwashers, flat washers, and side cover bracket.

3. Connect the brake hose to the master cylinder with the banjo bolt (use new flat washers on each side of brake hose fitting as instructed previously).

4. Bleed the brake system (refer to *Brake Bleeding*, this chapter).

5. Adjust the rear brake (refer to Chapter Two, *Rear Linkage Brake Adjustment*).

BRAKE BLEEDING

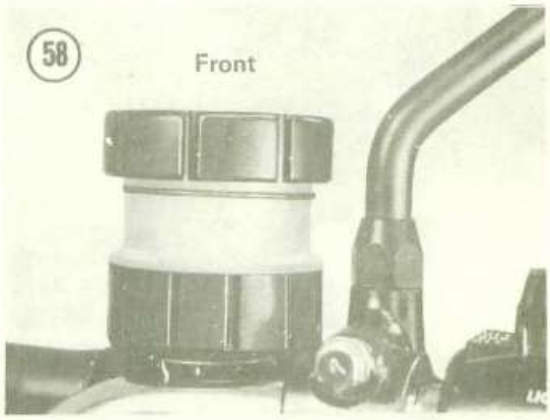
Bleed the hydraulic brake system whenever the brake lever or pedal action feels spongy or soft; after brake fluid has been changed; or whenever a brake line fitting has been loosened.

1. Remove reservoir cap and check for proper fluid level (**Figure 58**).

2. Slowly pump brake lever or pedal several times (reservoir cap still off) until no air bubbles rise up through the fluid from the holes at bottom of reservoir. (This bleeds air from the master cylinder end of the line.)

3. Install the reservoir cap. Connect a clear plastic hose to the bleed valve at the caliper





(**Figure 59**). Run other end of hose into a container.

4. Pump brake lever or pedal several times until it becomes hard. Hold lever or pedal down and quickly open (counterclockwise) and close the bleed valve. Release the lever or pedal. Repeat this operation until no air comes out of the plastic hose.

CAUTION

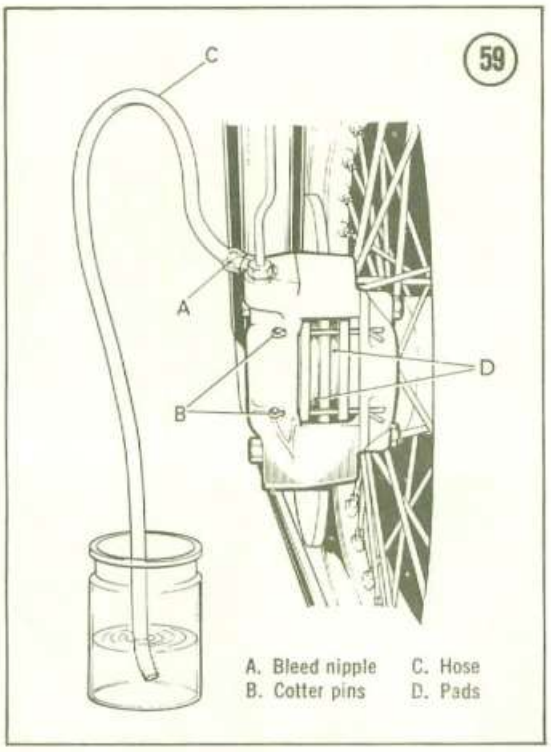
Be sure fluid level remains high in the reservoir during the bleeding operation, or air will enter the system at that point.

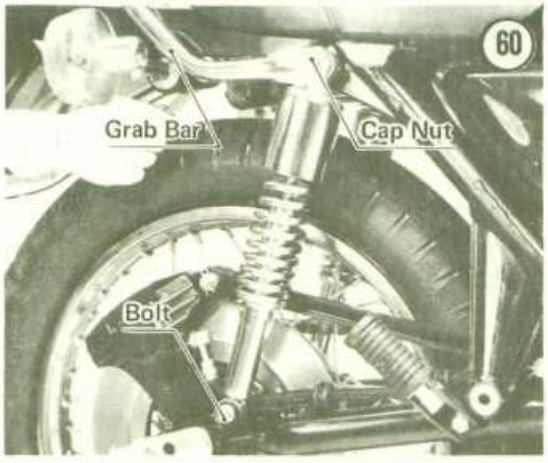
5. When you are satisfied that no air remains in the system, install the rubber cap on the bleed valve. Check brake fluid reservoir again for proper level.

6. Repeat preceding steps for brake system on remaining wheel.

CAUTION

On dual hydraulic disc models, always bleed the caliper furthest away from the





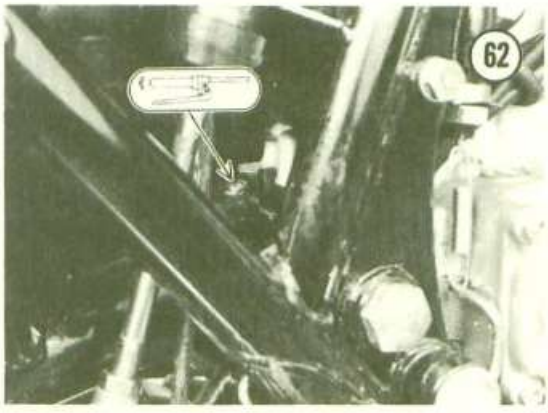
master cylinder first. Otherwise air bubbles may remain in the brake system causing a soft lever and poor braking performance.

SWING ARM

Removal

1. Place motorcycle on its centerstand.
2. Remove mufflers (refer to *Exhaust System* section, this chapter).



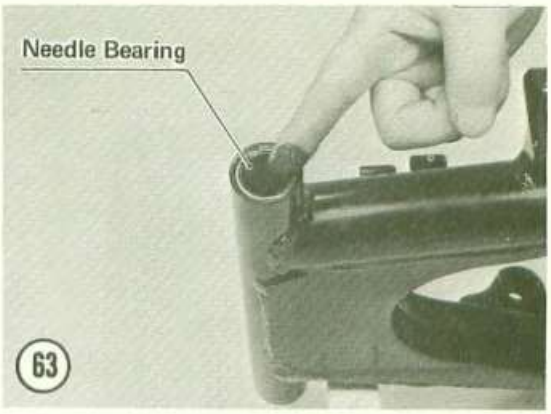


3. Remove rear wheel (refer to *Rear Wheel, Removal* section, this chapter).
4. Disconnect rear brake hose from guides on swing arm and fasten brake hose so its end is higher than rear brake reservoir to prevent fluid loss.
5. Remove mounting bolt from bottom of each shock absorber **(Figure 60)**. A lockwasher comes off with each bolt.
6. Move swing arm up and down to check for abnormal friction.
7. Remove pivot shaft nut and pull out pivot shaft **(Figure 61)**.
8. Pull back swing arm (a cap on each side of the pivot will also come off).

Lubrication

The swing arm is fitted with a grease fitting. This should be lubricated by forcing grease into the fitting until it comes out both sides of the swing arm (wipe off excess). See **Figure 62**.

If difficulty is encountered with fitting not taking grease, remove swing arm as outlined in preceding section, and pull out sleeve, clean out old grease, and apply regular cup grease to the needle bearings (**Figure 63**).



Disassembly

Refer to **Figure 64** for following number references in each step.

1. Remove clip (10) from torque link bolt (19). Take out nut (9) and bolt, then remove torque link (18) from swing arm (4).
2. Pull out swing arm sleeve (6).
3. Insert a bar into one side and hammer on it gently to remove needle bearing (3) on opposite side.
4. Remove needle bearing on opposite side in same manner as in Step 3, preceding.

> NOTE: *Z1-R models use two needle bearings on each side of the swing arm and should be replaced as a unit with the swing arm sleeve. There are no other changes and service procedures remain the same.*

Reassembly

Refer to **Figure 64** for following number references in each step.

1. Inspect swing arm sleeve and replace if worn or damaged.

> NOTE: *Both needle bearings must also be replaced whenever sleeve is replaced.*

2. Oil outside surface of new bearings (3) and install them with a press.
3. Install torque link and tighten torque link nut to 19-25 ft.-lb. (2.6-3.4 mkg). Install cotter pin on bolt.

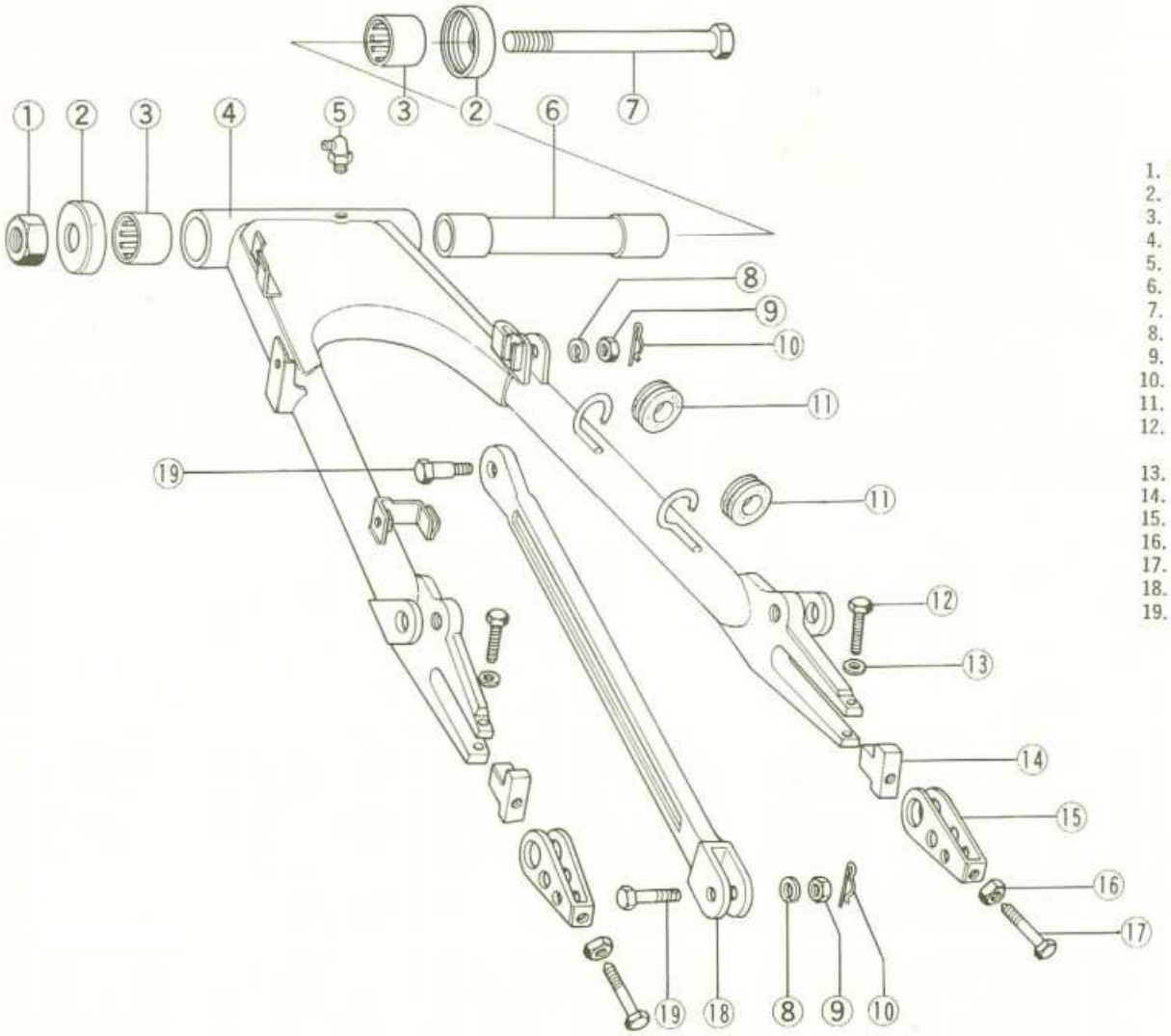
Installation

1. Lubricate swing arm pivot (refer to *Lubrication*, preceding).
2. Apply grease to cap inner surfaces.
3. Install cap on each end of swing arm pivot. Insert left side of swing arm through drive chain loop.



4. Position swing arm pivot in frame, then slide in pivot shaft from right to left. Insert screwdriver into left side of pivot to keep left cap in place (**Figure 65**).
5. Install pivot shaft nut and torque to 58-87 ft.-lb. (8.0-12.0 mkg).
6. Install rear shock absorber bolts and lockwashers (refer to **Figure 60**) and torque each bolt to 19-25 ft.-lb. (2.6-3.5 mkg).
7. Fasten brake hose in guides with rubber grommets, then install brake hose fitting in caliper and torque banjo bolt to 21-22 ft.-lb. (2.9-3.0 mkg). Use a new flat washer on each side of fitting.
8. Install right side cover.
9. Install rear wheel (refer to *Rear Wheel* section, *Installation*).
10. Install mufflers (refer to *Exhaust System* section, this chapter).
11. Bleed brake system (refer to *Brake Bleeding* section, this chapter).

SWING ARM



1. Pivot shaft nut
2. Cap
3. Needle bearing
4. Swing arm
5. Grease fitting
6. Swing arm sleeve
7. Pivot shaft
8. Lockwasher
9. Nut
10. Safety clip
11. Grommet
12. Chain adjuster stopper mounting bolt
13. Washer
14. Chain adjuster stopper mounting
15. Chain adjuster
16. Locknut
17. Adjusting bolt
18. Torque link
19. Bolt

12. Adjust drive chain (refer to Chapter Two, *Rear Chain Tension*).

SHOCK ABSORBER

Removal

1. Place motorcycle on its centerstand.
2. Remove muffler (refer to *Exhaust System* section, this chapter).
3. Remove grab bar mounting bolt, lockwasher, and flat washer on each side (refer to **Figure 60**).
4. Remove cap nut, lockwasher, and flat washer on each side; then slide grab bar toward rear and remove remaining 2 flat washers.
5. Lift up rear wheel slightly and remove shock absorber bolt and lockwasher. Remove shock absorber.

Installation

1. Fit 2 rubber dampers into upper pivot hole for shock absorber. Install shock absorber on stud.
2. Lift up rear wheel slightly and insert shock absorber bolt (with locknut). Torque to 19-25 ft.-lb. (2.6-3.4 mkg).
3. Install large flat washer, small flat washer, lockwasher, and cap nut. Install passenger grab bar between large and small flat washers (each side).
4. Install and tighten passenger grab bar mounting bolts, lockwashers, and flat washers. (One flat washer goes between bar and frame.)
5. Torque each cap nut to 19-25 ft.-lb. (2.6-3.4 mkg).
6. Install muffler (refer to *Exhaust System* section, this chapter).
7. Check both adjusting sleeves to be sure they are turned to same spring preload position.

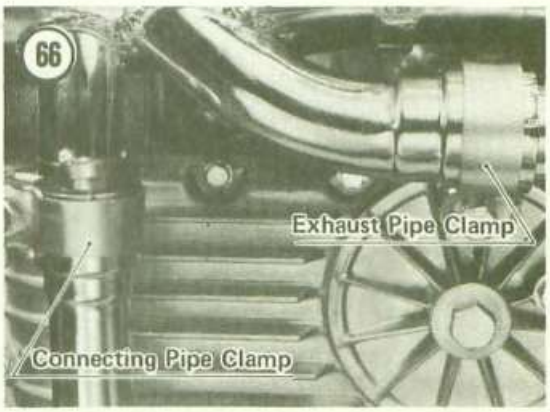
MUFFLERS (KZ1000)

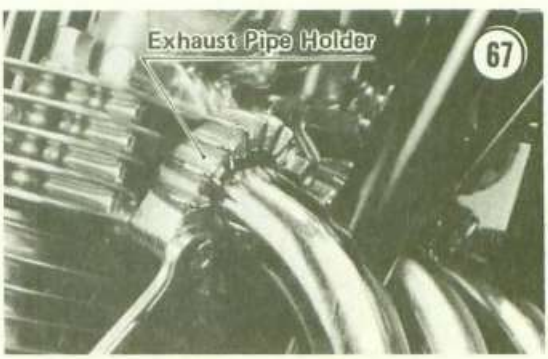
Removal

1. Loosen clamps holding muffler connecting pipe to mufflers. Loosen Nos. 2 and 3 exhaust pipe clamps (**Figure 66**).
2. Remove exhaust pipe holder self-locking nuts and slide holders off studs (**Figure 67**).
3. Remove mounting bolt and washers at rear (each side) and remove mufflers. Also remove gaskets and split keeper for each exhaust pipe (there is a self-locking nut behind the muffler bracket). See **Figure 68**.

Installation

1. Separate Nos. 2 and 3 exhaust pipes from left and right muffler.







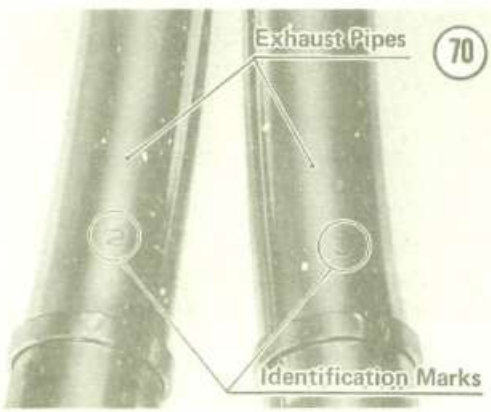
2. Install new gasket into Nos. 1 and 4 exhaust ports and place an exhaust pipe holder on stud bolts.

3. Fit end of exhaust pipes into exhaust ports and attach muffler rear parts to frame. Connect both mufflers with the connecting pipe. Tighten bolts loosely.

4. Fit split keeper in position and tighten exhaust pipe holder nuts evenly to avoid leakage. Tighten muffler bracket bolts (**Figure 69**).

5. Install new Nos. 2 and 3 exhaust port gaskets and place an exhaust pipe holder on stud bolts.





6. Fit Nos. 2 and 3 exhaust pipes into the exhaust ports and insert their lower ends into mufflers.

NOTE: *Do not mix up exhaust pipes. There is an identification mark on Nos. 2 and 3 exhaust pipes (**Figure 70**).*

7. Fit split keeper in place and tighten exhaust pipe holder nuts evenly. Tighten exhaust pipe clamp bolt, and tighten clamp bolts on muffler connecting pipe.

MUFFLERS (Z1-R, KZ1000 LTD)

Removal/Installation

1. Place the motorcycle on its centerstand.

2. Loosen the muffler clamp bolt, remove the rear footpeg. Remove the rear muffler from the connecting chamber.

3. Remove the exhaust pipe holder nuts and slide the holders down the exhaust pipes out of the way. See **Figure 67**.

4. Loosen the clamps holding the Nos. 2 and 3 exhaust pipes to the connecting chamber. Remove the exhaust pipes (**Figure 71**).

5. Loosen the muffler mounting bolts and remove the remainder of the exhaust system.

Installation Notes

1. The Nos. 2 and 3 exhaust pipes are numbered to aid in replacement in the proper position (see **Figure 70**).

2. Do not reuse the exhaust pipe gaskets; replace them.

3. Install the exhaust in reverse order of removal.

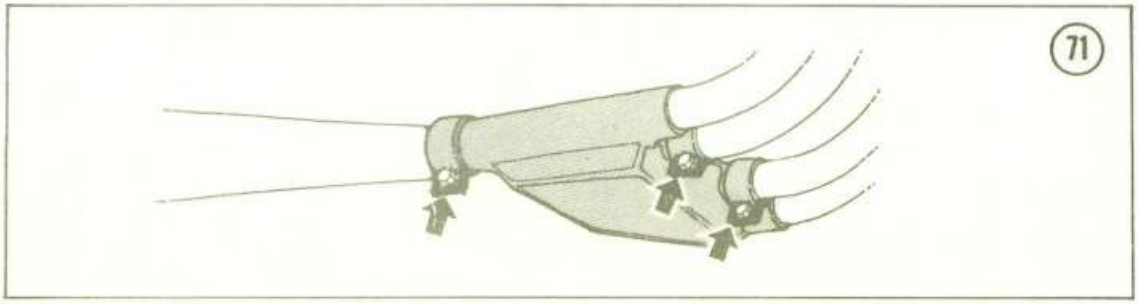


Table 1 ENGINE SPECIFICATIONS

Component	Standard	Service Limit
Camshaft height		
Intake	1.4255-1.4326 in. (36.21-36.39mm)	1.4220 in. (36.12mm)
Exhaust	1.4059-1.4129 in. (35.71-35.89mm)	1.4023 in. (35.62mm)
Camshaft journal/bearing insert clearance	0.0008-0.0027 in. (0.020-0.070mm)	0.0063 in. (0.16mm)
Camshaft journal diameter	0.9681-0.9637 in. (24.459-24.480mm)	0.9614 in. (24.42mm)
Camshaft runout	0.0008 in. (under 0.02mm)	0.0039 in. (0.10mm)
Camshaft chain 20-link length	6.2992 in. (160.0mm)	6.3779 in. (162.4mm)
Cylinder head warp	—	0.0020 in. (under 0.05mm)
Combustion chamber volume	2.196 cu. in. (36cc)	—
Valve head thickness	0.0335-0.0453 in. (0.85-1.15mm)	0.0197 in. (0.5mm)
Valve stem bend	0.0004 in. (under 0.01mm)	0.0020 in. (0.05mm)
Valve stem diameter		
Intake	0.2742 -0.2748 in. (6.965-6.980mm)	0.2717 in. (6.90mm)
Exhaust	0.2738-0.2744 in. (6.955-6.970mm)	0.2717 in. (6.90mm)
Valve guide inside diameter	0.2756-0.2762 in. (7.000-7.015mm)	0.2787 in. (7.08mm)
Valve/valve guide clearance		
Intake	0.0020-0.0049 in. (0.060-0.124mm)	0.0100 in. (0.25mm)
Exhaust	0.0028-0.0056 in. (0.071-0.142mm)	0.0094 in. (0.24mm)
Valve seat width	0.0315-0.0472 in. (0.8-1.2mm)	—
Valve spring tension		
Inner	11.84-13.14 lb. @ 0.9291 in. (26.20-28.96 kg @ 23.6mm)	11.20 lb. (24.7 kg)
Outer	22.5-24.59 lb. @1.0079 in. (49-06-54.22 kg @ 25.6mm)	20.96 lb. (46.2 kg)

(continued)

Table 1 ENGINE SPECIFICATIONS (continued)

Component	Standard	Service Limit
Cylinder compression	128-156 psi (0-11 kg/cm²)	100 psi (7 kg/cm²)
Cylinder inside diameter	2.7559-2.7565 in. (70.000-70.019mm)	2.7598 in. (70.10mm)
Piston diameter	2.7535-2.7543 in. (69.94-69.96mm)	2.7480 in. (69.8mm)
Piston/cylinder clearance	0.0197-0.0027 in. (0.050-0.069mm)	—
Piston ring/groove clearance		
Top	0.0016-0.0031 in. (0.040-0.080mm)	0.0060 in. (0.15mm)
2nd	0.0012-0.0025 in. (0.030-0.070mm)	0.0060 in. (0.15mm)
Piston ring thickness (top and 2nd rings)	0.0460-0.0468 in. (1.170-1.190mm)	0.0043 in. (1.10mm)
Piston ring groove width		
Top	0.0484-0.0492 in. (1.23-1.25mm)	0.0524 in. (1.33mm)
2nd	0.0480-0.0488 in. (1.22-1.24mm)	0.0520 in. (1.32mm)
Oil	0.0988-0.0996 in. (2.51-2.53mm)	0.1024 in. (2.60mm)
Piston ring end gap (top and 2nd)	0.0118-0.0196 in. (0.30-0.50mm)	0.0315 in. (0.80mm)
Piston ring free gap		
Top	0.2756 in. (about 7.0mm)	0.1575 in. (4.0mm)
2nd	0.3150 in. (about 8.0mm)	0.1968 in. (5.0mm)
Piston pin	0.6690-0.6693 in. (16.994-17.000mm)	0.6677 in. (16.96mm)
Piston pin hole	0.6694-0.6698 in. (17.004-17.012mm)	0.6724 in. (17.08mm)
Small end	0.6694-0.6698 in. (17.003-17.014mm)	0.6713 in. (17.05mm)
Connecting rod bend	0.0394/0.1968 in. (under 0.05/100mm)	0.0079 in. (0.20mm)
Connecting rod twist	0.0394/0.1968 in. (under 0.05/100mm)	0.0079 in. (0.20mm)
Connecting rod big end radial clearance	0.0006-0.0012 in. (0.016-0.030mm)	0.0031 in. (0.08mm)
Connecting rod big end side clearance	0.0119-0.0157 in. (0.3-0.4mm)	0.0236 in. (0.6mm)
Crankshaft runout	0.0016 in. (under 0.04mm)	0.0039 in. (0.10mm)
Crankshaft bearing outer race side clearance	0.0079-0.0118 in. (0.2-0.3mm)	0.0197 in. (0.5mm)

Table 2 GENERAL SPECIFICATIONS — KZ1000, KZ1000 LTD, and Z1-R

	KZ1000	KZ1000 LTD	Z1-R
Engine			
Type	4-stroke, DOHC, 4-cyl., air-cooled	4-stroke, DOHC, 4-cyl., air-cooled	4-stroke, DOHC, 4-cyl., air-cooled
Bore and stroke	70 x 66mm	70 x 66mm	70 x 66mm
Displacement	61.9 cu.in. (1015cc)	61.9 cu.in. (1015cc)	61.9 cu.in. (1015cc)
Compression ratio	8.7-1	8.7-1	8.7-1
Maximum horsepower	83 @ 8,000 rpm	85 @ 8,000 rpm	90 @ 8,000 rpm
Intake valve timing			
Open	30 degrees BTDC	30 degrees BTDC	30 degrees BTDC
Close	70 degrees ABDC	70 degrees ABDC	70 degrees ABDC
Duration	280 degrees	280 degrees	280 degrees
Exhaust valve timing			
Open	70 degrees BBDC	70 degrees BBDC	70 degrees BBDC
Close	30 degrees ATDC	30 degrees ATDC	30 degrees ATDC
Duration	280 degrees	280 degrees	280 degrees
Valve clearance (cold)	0.002-0.004 in. (0.3-0.4mm)	0.002-0.004 in. (0.3-0.4mm)	0.002-0.004 in. (0.3-0.4mm)
Lubrication system	Wet sump (forced lubrication)	Wet sump (forced lubrication)	Wet sump (forced lubrication)
Engine oil	SE class SAE 10W/40	SE class SAE 10W/40	SE class SAE 10W/40
Engine oil capacity	3.9 qt. (3.7 liter)	3.9 qt. (3.7 liter)	3.9 qt. (3.7 liter)
Starting system	Electric and kick	Electric and kick	Electric and kick
Ignition			
Cylinder firing order	1-2-4-3	1-2-4-3	1-2-4-3
Firing interval	180 degrees of crankshaft rotation	180 degrees of crankshaft rotation	180 degrees of crankshaft rotation
Ignition coils	2	2	2
Contact breaker points	2; left set fires cylinders 1 and 4 simultaneously; right set fires cylinders 2 and 3 simultaneously	2; left set fires cylinders 1 and 4 simultaneously; right set fires cylinders 2 and 3 simultaneously	2; left set fires cylinders 1 and 4 simultaneously; right set fires cylinders 2 and 3 simultaneously
Points gap	0.012-0.016 in. (0.3-0.4mm)	0.012-0.016 in. (0.3-0.4mm)	0.012-0.016 in. (0.3-0.4mm)
Ignition timing	From 20 degrees BTDC @ 1,500 rpm to 40 degrees @ 2,350 rpm	From 20 degrees BTDC @ 1,500 rpm to 40 degrees @ 2,350 rpm	From 20 degrees BTDC @ 1,500 rpm to 40 degrees @ 2,350 rpm
Spark plugs	NGK B8ES — 0.028-0.031 in. (0.7-0.8mm)	NGK B8ES — 0.028-0.031 in. (0.7-0.8mm)	NGK B8ES — 0.028-0.031 in. (0.7-0.8mm)
Carburetion			
Carburetors	Mikuni VM26SS x 4	Mikuni VM26SS x 4	Mikuni VM28SS x 4
Bore diameter	26mm	26mm	28mm
Specifications			
Pilot jet	17.5	15	15
Main jet	107.5 R	105 R	107.5 R
Jet needle*	5 CN 8-3	5DL 31-3	5 CN 12-3
Pilot screw	1 1/2 ± 1/8 turn-out	1 1/4 ± 1/8 turn-out	1 3/4 ± 1/8 turn-out
Needle jet	0-6	0-5/2	0-3 or A0-1
Throttle valve cutaway	1.5	1.5	1.5
Fuel level	1.26 in. ± 0.04 in. (32mm ± 1mm)	1.26 in. ± 0.04 in. (32mm ± 1mm)	1.26 in. ± 0.04 in. (32mm ± 1mm)
Type of air filter element	Dry	Dry	Dry
Type of gasoline	85 octane or higher	85 octane or higher	85 octane or higher

(continued)

Table 2 GENERAL SPECIFICATIONS — KZ1000, KZ1000 LTD, and Z1-R (continued)

	KZ1000	KZ1000 LTD	Z1-R
Clutch and transmission			
Clutch type	Wet, multi-disc	Wet, multi-disc	Wet, multi-disc
Transmission type	5-speed, constant mesh, return shift	5-speed, constant mesh, return shift	5-speed, constant mesh, return shift
Transmission ratios			
1st gear	3.17 (38/12)	3.17 (38/12)	3.17 (38/12)
2nd gear	2.19 (35/16)	2.19 (35/16)	2.19 (35/16)
3rd gear	1.67 (35/21)	1.67 (35/21)	1.67 (35/21)
4th gear	1.38 (29/21)	1.38 (29/21)	1.38 (29/21)
5th gear	1.22 (28/23)	1.22 (28/23)	1.22 (28/23)
Primary reduction ratio	1.73 (97/56)	1.73 (97/56)	1.73 (97/56)
Final reduction ratio	2.20 (33/15)	2.20 (33/15)	2.20 (33/15)
Overall drive ratio	4.64 (top gear)	4.64 (top gear)	4.64 (top gear)
Type of chain	Enuma EK-630-S-T30	Enuma EK-630-S-T30	Enuma EK-630-S-T30
Chassis			
Frame	Tubular, double cradle	Tubular, double cradle	Tubular, double cradle
Wheelbase	59.3 in.	59.3 in.	59.3 in.
Steering head angle	26 degrees	26 degrees	26 degrees
Trail	90mm	90mm	85mm
Front suspension	Telescopic forks	Telescopic forks	Telescopic forks
Lubricant capacity	180cc	180cc	180cc
Oil type	SAE 15W	SAE 15W	SAE 15W
Rear suspension	Swing arm, 5-way adjustable shock absorbers	Swing arm, 5-way adjustable shock absorbers	Swing arm, 5-way adjustable shock absorbers
Front brake	Hydraulic disc (9.8 in. effective diameter)	Dual hydraulic discs (9.6 in. ea. effective diameter)	Dual hydraulic discs (9.8 in. ea. effective diameter)
Rear brake	Hydraulic disc (9.8 in. effective diameter)	Hydraulic disc (9.0 in. effective diameter)	Hydraulic disc (9.8 in. effective diameter)
Front tire	3.25H x 19 4-PR	ML90 x 19	3.50 x 18 4-PR
Rear tire	4.00 x 18 4-PR	MT90-16T	4.00 x 18 4-PR
Tire pressure, normal speeds**			
Front-solo and two-up	28 psi	26 psi	28 psi
Rear (solo)	31 psi	22-24 psi	32 psi
Dual (rear)	36 psi	26-30 psi	36 psi
Electrical			
Alternator	Kokusan AR 3703	Kokusan AR 3703	Kokusan AR 3703
Regulator	Kokusan RS 2127	Kokusan RS 2127	Kokusan RS 2127
Battery type	Yuasa YB14L-A2 (12V-14AH)	Yuasa YB14L-A2 (12V-14AH)	Yuasa YB14L-A2 (12V-14AH)
Starter motor	Mitsuba SM-226-K	Mitsuba SM-226-K	Mitsuba SM-226-K
Headlight	Sealed beam 12V 50W/35W	Sealed beam 12V 50W/35W	Semi-sealed 12V 60/55W
Tail/brake light	12V 8/27W	12V 8/27W	12V 8/27W
Speedometer light	12V 3.4W	12V 3.4W	12V 3.4W
Tachometer light	12V 3.4W	12V 3.4W	12V 3.4W
Oil pressure gauge light	12V 3.4W	12V3.4W	12V 3.4W
Fuel gauge light	12V 3.4W	12V 3.4W	12V 3.4W
Neutral indicator light	12V 3.4W	12V 3.4W	12V 3.4W

(continued)

Table 2 GENERAL SPECIFICATIONS — KZ1000, KZ1000 LTD, and Z1-R (continued)

	KZ1000	KZ1000 LTD	Z1-R
Electrical (continued)			
High beam indicator light	12V 3.4W	12V 3.4W	12V 3.4W
Turn signal	12V 23W	12V 23W	12V 23W
Turn signal indicator	12V 3.4W	12V 3.4W	12V 3.4W
Oil pressure indicator	12V 3.4W	12V 3.4W	12V 3.4W
Horn	12V 2.5A	12V 2.5A	12V 2.5A
Dimensions			
Overall length	87.0 in.	87.4 in.	85.0 in.
Overall width	34.4 in.	32.7 in.	31.5 in.
Overall height	46.4 in.	46.5 in.	50.2 in.
Ground clearance	6.3 in.	6.1 in.	4.9 in.
Seat height	32.7 in.	30.5 in.	32.1 in.
Dry weight	529 lb.	531 lb.	542 lb.
Fuel capacity	4.4 U.S. gal.	3.6 U.S. gal.	3.4 U.S. gal.

* The "3" of 5 CN 8-3 refers to the clip position on the needle.

** For sustained high-speed driving, increase tire pressures to 3-6 psi over normal.

Table 3 SELECTED TORQUE SPECIFICATIONS — KZ1000

Fastener	Foot-pounds	Meter-kilogram
Breather cover bolt	13-16	1.8-2.2
Camshaft cap bolts	95-113 in.-lb.	1.1-1.3
Camshaft chain tensioner bolt	61-78 in.-lb.	0.7-0.9
Camshaft chain guide screw (front)	Use locking agent	
Camshaft chain guide sprocket shaft bolt	69-87 in.-lb.	0.8-1.0
Camshaft chain guide sprocket Allen bolts	61-78 in.-lb.	0.7-0.9
Camshaft chain tensioner bolt	61-78 in.-lb.	0.7-0.9
Camshaft sprocket bolts	10-11.5	1.4-1.6
Carburetor holder screws	Use locking agent	
Carburetor mounting screws	Use locking agent	
Clutch hub nut	87-108	12-15
Clutch release screws	Use locking agent	
Clutch spring bolts	78-95 in.-lb.	0.9-1.1
Crankcase bolts		
Upper (6mm, 1.0 pitch)	78-95 in.-lb.	0.9-1.1
Lower (8mm, 1.25 pitch)	16.5-19.5	2.3-2.7
Lower (6mm, 1.0 pitch)	78-95 in.-lb.	0.9-1.1
Crankshaft main bearing cap bolts	16.5-19.5	2.3-2.7
Cylinder head		
Bolts	95-113 in.-lb.	1.1-1.3
Nuts	27-31	3.7-4.3
Cover bolts	95-113 in.-lb.	1.1-1.3
Alternator		
Armature Allen bolts	78-95 in.-lb.	0.9-1.1
Cover screws	Use locking agent	
Rotor bolt	16.5-19.5	2.3-2.7
Engine drain plug	22-25	3.0-3.5
Engine mounting bolts		
Front	25-33	3.4-4.6
Center	25-33	3.4-4.6
Rear upper	25-33	3.4-4.6
Rear lower	25-33	3.4-4.6
Engine mounting brackets		
Front	14.5-20.0	2.0-2.8
Center	14.5-20.0	2.0-2.8
Rear	14.5-20.0	2.0-2.8
Engine sprocket nut	54-61	7.5-8.5
External shift mechanism cover	Use locking agent	
Neutral indicator switch	9.5-12.0	1.3-1.7
Oil breather cover bolt	13.0-16.0	1.8-2.2
Oil filter drain plug	13.0-16.0	1.8-2.2
Oil filter mounting bolt	13.0-16.0	1.8-2.2
Oil pan bolts	78-95 in.-lb.	0.9-1.1
Oil passage plug	Use locking agent	

(continued)

Table 3 SELECTED TORQUE SPECIFICATIONS — KZ1000 (continued)

Fastener	Foot-pounds	Meter-kilogram
Oil pressure indicator switch	43-61 in.-lb.	0.5-0.7
Oil pump cover screws	Use locking agent	
Oil pump mounting bolts	61-78 in.-lb.	0.7-0.9
Return spring pin	Use locking agent	
Right engine cover screws	Use locking agent	
Spark plugs	18.5-22.0	2.5-3.0
Starter		
Clutch Allen bolts	24-27	3.3-3.7
Motor lead terminal nuts	35-52 in.-lb.	0.4-0.6
Motor retaining bolts	78-95 in.-lb.	0.9-1.1
Stud bolts		
Cylinder	Less than 87 in.-lb.	Less than 1.0
Exhaust	Less than 43 in.-lb.	Less than 0.5
Timing advancer bolt	16.5-19.5	2.3-2.7
Brake pedal pivot cap nut	11.5-16.0	1.6-2.2
Front axle clamp nuts	11.5-16.0	1.6-2.2
Front axle nuts	51-65	7.0-9.0
Front brake light switch PT 1/8	19.0-22.0	2.6-3.0
Front fork bottom Allen bolts	11.0-18.0	1.5-2.5
Front fork clamp bolts		
Upper	11.5-16.0	1.6-2.2
Lower	25-33	3.4-4.6
Front fork top bolts	18.0-22.0	2.5-3.0
Handlebar clamp bolts	11.5-16.0	1.6-2.2
Pad mounting screw	Use locking agent	
Rear axle nut	72-101	10.0-14.0
Rear shock absorber mounting	19.0-25.0	2.6-3.5
Rear sprocket nuts	25-33	3.4-4.6
Spokes	17-35 in.-lb.	0.20-0.40
Steering stem head bolt	29-36	4.0-5.0
Steering stem head rear clamp bolt	11.5-16.0	1.6-2.2
Swing arm pivot shaft nut	58-87	8.0-12.0
Torque link nuts	19.0-25.0	2.6-3.5
Disc brake (front and rear)		
Brake lever	43-61 in.-lb.	0.5-0.7
Brake lever adjuster locknut	13.0-16.5	1.8-2.3
Master cylinder clamp	52-78 in.-lb.	0.6-0.9
Banjo bolts	21-22	2.9-3.1
Brake pipe nipple	12.0-13.5	1.7-1.9
3-way joint	61-78 in.-lb.	0.7-0.9
Front brake light switch	19-22	2.6-3.0
Caliper holder shafts	17.5-20.0	2.4-2.8
Caliper mounting bolts	25-33	3.4-4.6
Bleed valve	61-87 in.-lb.	0.7-1.0
Disc mounting bolts	25-33	3.4-4.6
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