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CLYMER®

KAWASAKI

KZ, ZX & ZN 1000-1100cc • 1981-2002
(Includes Z1000 P Series Police models)

SERVICE • REPAIR • MAINTENANCE

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QUICK REFERENCE DATA

MOTORCYCLE INFORMATION

MODEL:______________________________ YEAR:______________

VIN NUMBER:______________________________

ENGINE SERIAL NUMBER:______________________________

CARBURETOR SERIAL NUMBER OR I.D. MARK:______________________________

TIRES AND TIRE PRESSURE (U.S. AND CANADA)

	Pressure @ load 0-215 lb. (0-97.5 kg)	Pressure @ load Over 215 lb. (over 97.5 kg)
KZ1000-J, KZ1100-B (tubeless)		
Front 3.25V-19 4PR	28 psi (200 kPa)	8 psi (200 kPa)
Rear 4.25V-18 4PR	32 psi (225 kPa)	36 psi (250 kPa)
KZ1000-K (tubeless)		
KZ1000-M (tube-type)		
Front 3.25H-19 4PR	28 psi (200 kPa)	28 psi (200 kPa)
Rear 130/90-16 67H 4PR	28 psi (200 kPa)	32 psi (225 kPa)
KZ1000-A (tubeless)		
Front 3.50H-19 4PR	28 psi (200 kPa)	28 psi (200 kPa)
Rear 130/90-16 67H 4PR	28 psi (200 kPa)	36 psi (250 kPa)
KZ1000-D (tubeless)		
Front 3.25H-19 4PR	28 psi (200 kPa)	28 psi (200 kPa)
Rear 130/90-16 67H 4PR	28 psi (200 kPa)	36 psi (250 kPa)
Police model (tubeless)		
Front F16MN90-18	36 psi (250 kPa)	36 psi (250 kPa)
Rear KZ327M MR 90-18	36 psi (250 kPa)	36 psi (250 kPa)

LUBRICANTS AND FUEL

Engine oil	SAE 10W 40, 10W 50, 20W 40, 20W 50, API rated SE or better
Front fork oil	SAE 10W 20
Fuel	87 pump octane (ROM + MON)/2 91 research octane (RON)

FORK OIL CAPACITY

Model	Dry capacity U.S. fl. oz. (cc)	Wet Capacity U.S. fl. oz. (cc)	Oil level* inches (mm)
KZ1000-J	11.1 (327)	10.1 (300)	C 4.3 (110)
KZ1000-K, M	11.9 (351)	10.8 (320)	C 7.2 (184)
KZ1100-A	11.1 (328)	10.1 (300)	E 18.5 (470)
KZ1100-B	11.6 (343)	10.5 (310)	C 4.7 (120)
KZ1100-D	11.7 (347)	10.0 (295)	E 18.0 (457)

*Fork oil level is checked with the fork springs removed and the forks fully extended (E) or compressed (C).

TUNE-UP SPECIFICATIONS

Spark plug gap	0.28-0.32 in. (0.7-0.8 mm)	
Spark plug type		
U.S. models	NGK B8ES	ND W24ES-U
Others	NGK BR8ES	ND W24ESR-U
Valve clearance		
(Intake and exhaust)		
ZX1100-A	0.003-0.007 in. (0.08-0.18 mm)	
All other models	0.002-0.006 in. (0.05-0.15 mm)	
Idle speed	1,000 rpm	
Carburetor synchronization	Within 0.8 in. (2 cm) Hg	
Clutch cable play	About 1/8 in. (2-3 mm)	
Drive chain play (on centerstand)	1 1/4 in. (30-35 mm)	
Throttle cable play	About 1/8 in. (2-3 mm)	

TORQUE SPECIFICATIONS

	ft.-lb.	mkg
Alternator rotor bolt	95	13.0
Camshaft cap bolts	12	1.7
Clutch hub nut	85	12.0
Crankcase bolts		
Small	90	1.0
Large	18	2.5
Crankshaft main bearing cap bolts	18	2.5
Cylinder head		
Bolts	8.5	1.2
Nuts	30	4.0
Engine mounting bolts	30	4.0
Engine mounting bracket bolts	17.5	2.4
Engine sprocket bolt	60	8.0
Shaft-drive front bevel gear case		
Damper cam nut	90	12.0
Bevel drive mounting bolts	18	2.5
Bevel drive gear bolt	90	12.0
Bevel drive gear nut	90	12.0
Oil drain plug	22	3.0
Oil filter mounting bolt	14.5	2.0
Spark plugs	20	2.8
Caliper holder shaft bolts	13	1.8
Caliper mounting bolts	24	3.3

(continued)

TORQUE SPECIFICATIONS (continued)

	ft.-lb.	mkg
Disc mounting bolts		
Front, cast wheels	16.5	2.3
Front, wire wheels	30	4.0
Rear	16.5	2.3
Front axle nut	50	7.0
Front axle clamp nuts (J)	13	1.8
Front axle pinch bolt (K, M, A, D)	14.5	2.0
Fork clamp bolts	13	1.8
Fork bottome Allen bolt	17	2.3
Handlebar clamp bolts		
One-piece handlebars	13	1.8
Built-up handlebars	18	2.5
Handlebar holder-to-triple clamp bolts		
Built-up handlebars	55	7.5
Rear axle nut		
Chain drive	90	12.0
Shaft drive	100	14.0
Rear sprocket nuts	30	4.0
Shock absorber mounts		
Chain drive	22	3.0
Shaft drive	18	2.5
Steering head clamp bolt	13	1.8
Steering head top bolt	30	4.3
Swing arm pivot nut	70	10.0
Torque link nuts	22	3.1
Wire wheel spokes	26 in.-lb.	0.30
Shaft drive		
Final gear case cover bolts	18	2.5
Final gear case mounting nuts	22	3.0
Final gear case drain plug	14.5	2.0
Final gear case pinion nut	90	12.0
Swing arm pivot screws	11	1.5

FASTENER TORQUES

	ft.-lb.	mkg
Alternator rotor bolt	95	13.0
Camshaft cap bolts	12	1.7
Clutch hub nut	85	12.0
Crankcase bolts		
Small	90	1.0
Large	18	2.5
Crankshaft main bearing cap bolts	18	2.5
Cylinder head		
Bolts	8.5	1.2
Nuts	30	4.0
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Bevel drive gear nut	90	12.0
Oil drain plug	22	3.0
Oil filter mounting bolt	14.5	2.0
Spark plugs	20	2.8
Caliper holder shaft bolts	13	1.8
Caliper mounting bolts	24	3.3
Disc mounting bolts		
Front, cast wheels	16.5	2.3
Front, wire wheels	30	4.0
Rear	16.5	2.3
Front axle nut	50	7.0
Front axle clamp nuts (J)	13	1.8
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Fork clamp bolts	13	1.8
Fork bottom Allen bolt	17	2.3
Handlebar clamp bolts		
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Chain drive	90	12.0
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Rear sprocket nuts	30	4.0
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INTRODUCTION

This detailed, comprehensive manual covers the Kawasaki 1000 and 1100. The expert text gives complete information on maintenance, repair and overhaul. Hundreds of photos and drawings guide you through every step. The book includes all you need to know to keep your Kawasaki running right.

Where repairs are practical for the owner/mechanic, complete procedures are given. Equally important, difficult jobs are pointed out. Such operations are usually more economically performed by a dealer or independent garage.

A shop manual is a reference. You want to be able to find information fast. As in all Clymer books, this one is designed with this in mind. All chapters are thumb tabbed. Important items are indexed at the rear of the book. Finally, all of the most frequently used specifications and capacities are summarized on the *Quick Reference* pages at the front of the book.

Keep the book handy. Carry it in your tool box. It will help you to better understand your Kawasaki, lower repair and maintenance costs, and generally improve your satisfaction with your vehicle.

CHAPTER ONE

GENERAL INFORMATION

The troubleshooting, maintenance, tune-up, and step-by-step repair procedures in this book are written specifically for the owner and home mechanic. The text is accompanied by helpful photos and diagrams to make the job as clear and correct as possible.

Troubleshooting, maintenance, tune-up, and repair are not difficult if you know what to do and what tools and equipment to use. Anyone of average intelligence, with some mechanical ability, and not afraid to get their hands dirty can perform most of the procedures in this book.

In some cases, a repair job may require tools or skills not reasonably expected of the home mechanic. These procedures are noted in each chapter and it is recommended that you take the job to your dealer, a competent mechanic, or a machine shop.

MANUAL ORGANIZATION

This chapter provides general information, safety and service hints. Also included are lists of recommended shop and emergency tools as well as a brief description of troubleshooting and tune-up equipment.

Chapter Two 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.

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

Subsequent chapters cover specific systems such as the engine, transmission, and electrical system. Each of these chapters provides disassembly, inspection, repair, and assembly procedures in a simple step-by-step format. If a repair is impractical for the home mechanic it is indicated. In these cases it is usually faster and less expensive to have the repairs made by a dealer or competent repair shop. Essential specifications are included in the appropriate chapters.

When special tools are required to perform a task included in this manual, the tools are illustrated. It may be possible to borrow or rent these tools. The inventive mechanic may also be able to find a suitable substitute in his tool box, or to fabricate one.

The terms NOTE, CAUTION, and WARNING have specific meanings in this manual. A NOTE provides additional or explanatory information. A

CAUTION is used to emphasize areas where equipment damage could result if proper precautions are not taken. A WARNING is used to stress those areas where personal injury or death could result from negligence, in addition to possible mechanical damage.

SERVICE HINTS

Time, effort, and frustration will be saved and possible injury will be prevented if you observe the following practices.

Most of the service procedures covered 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 the parts that will be worked on are clean before you begin. There are special cleaners for washing the engine and related parts. Brush or spray on the cleaning solution, let 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, make sure you locate the appropriate section in this manual, and read it entirely. 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. Also, purchase any known defective parts prior to starting on the procedure. It is frustrating and time-consuming to get partially 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 bearing in a case, there is usually a tool designed to separate them. Never use a screwdriver to pry apart parts with machined surfaces such as cylinder head or crankcase halves. You will mar the surfaces and end up with leaks.

Make diagrams wherever similar-appearing parts are found. You may think you can remember where everything came from — but mistakes are costly. There is also the possibility you may get 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 that are sealed and labeled with masking tape.

Wiring should be tagged with masking tape and marked as each wire is removed. Again, do not 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 like Liquid Wrench or WD-40, then sharply striking the bolt head a few times with a hammer and punch (or screwdriver for screws). Avoid heat unless absolutely necessary, 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 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 two parts, start all fasteners, then tighten evenly.

Wiring connections and brake shoes, drums, pads, and discs and contact surfaces in dry clutches 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, clutch, and brake components.

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, but only if the float has been removed first.

Take your time and do the job right. Do not forget that a newly rebuilt engine must be broken in the same as a new one. Refer to your owner's manual for the proper break-in procedures.

SAFETY FIRST

Professional 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 motorcycle. You could hurt yourself or damage the motorcycle if you ignore these rules.

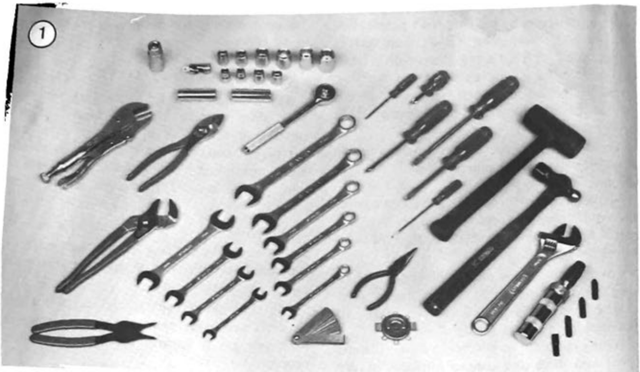
1. Never use gasoline as a cleaning solvent.
2. Never smoke or use a torch in the vicinity of flammable liquids such as cleaning solvent in open containers.
3. Never smoke or use a torch in an area where batteries are being charged. Highly explosive hydrogen gas is formed during the charging process.
4. Use the proper sized wrenches to avoid damage to nuts and injury to yourself.
5. When loosening a tight or stuck nut, be guided by what would happen if the wrench should slip. Protect yourself accordingly.
6. Keep your work area clean and uncluttered.
7. Wear safety goggles during all operations involving drilling, grinding, or use of a cold chisel.
8. Never use worn tools.
9. Keep a fire extinguisher handy and be sure it is rated for gasoline (Class B) and electrical (Class C) fires.

EXPENDABLE SUPPLIES

Certain expendable supplies are necessary. These include grease, oil, gasket cement, wiping rags, cleaning solvent, and distilled water. Also, special locking compounds, silicone lubricants, and engine and carburetor cleaners may be useful. Cleaning solvent is available at most service stations and distilled water for the battery is available at supermarkets.

SHOP TOOLS

For complete servicing and repair you will need an assortment of ordinary hand tools (**Figure 1**).



As a minimum, these include:

a. Combination wrenches
b. Sockets
c. Plastic mallet
d. Small hammer
e. Impact driver
f. Snap ring pliers
g. Gas pliers
h. Phillips screwdrivers
i. Slot (common) screwdrivers
j. Feeler gauges
k. Spark plug gauge
l. Spark plug wrench

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

Engine tune-up and troubleshooting procedures require other special tools and equipment. These are described in detail in the following sections.

EMERGENCY TOOL KITS

Highway

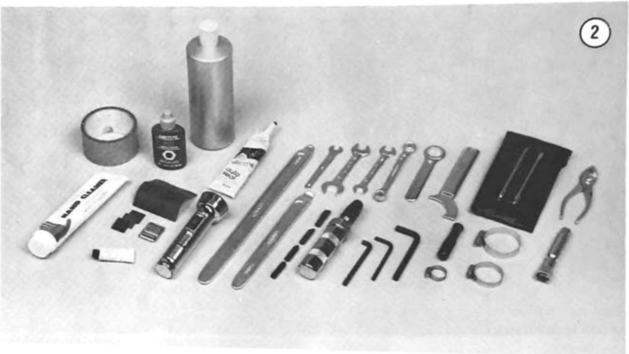
A small emergency tool kit kept on the bike is handy for road emergencies which otherwise could leave you stranded. The tools and spares listed below and shown in **Figure 2** will let you handle most roadside repairs.

a. Motorcycle tool kit (original equipment)
b. Impact driver
c. Silver waterproof sealing tape (duct tape)
d. Hose-clamps (3 sizes)
e. Silicone sealer
f. Lock 'N' Seal
g. Flashlight
h. Tire patch kit
i. Tire irons
j. Plastic pint bottle (for oil)
k. Waterless hand cleaner
l. Rags for clean up

Off-Road

A few simple tools and aids carried on the motorcycle can mean the difference between walking or riding back to camp or to where repairs can be made. See **Figure 3**.

A few essential spare parts carried in your truck or van can prevent a day or weekend of trail riding from being spoiled. See **Figure 4**.



On the Motorcycle

a. Motorcycle tool kit (original equipment)
b. Drive chain master link
c. Tow line
d. Spark plug
e. Spark plug wrench
f. Shifter lever
g. Clutch/brake lever
h. Silver waterproof sealing tape (duct tape)
i. Loctite Lock 'N' Seal

In the Truck

a. Control cables (throttle, clutch, brake)
b. Silicone sealer
c. Tire patch kit
d. Tire irons
e. Tire pump
f. Impact driver
g. Oil

WARNING

Tools and spares should be carried on the motorcycle — not in clothing where a simple fall could result in serious injury from a sharp tool.

TROUBLESHOOTING AND TUNE-UP EQUIPMENT

Voltmeter, Ohmmeter, and Ammeter

For testing the ignition or electrical system, a good voltmeter is required. For motorcycle use, an instrument covering 0-20 volts is satisfactory. One which also has a 0-2 volt scale is necessary for testing relays, points, or individual contacts where voltage drops are much smaller. Accuracy should be ± ½ volt.

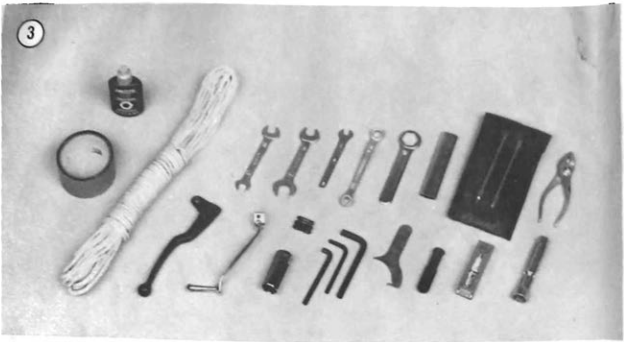
An ohmmeter measures electrical resistance. This instrument is useful for checking continuity (open and short circuits), and testing fuses and lights.

The ammeter measures electrical current. Ammeters for motorcycle use should cover 0-50 amperes and 0-250 amperes. These are useful for checking battery charging and starting current.

Several inexpensive VOM's (volt-ohm-milliammeter) combine all three instruments into one which fits easily in any tool box. See **Figure 5**. However, the ammeter ranges are usually too small for motorcycle work.

Hydrometer

The hydrometer gives a useful indication of battery condition and charge by measuring the



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4

specific gravity of the electrolyte in each cell. See **Figure 6**. Complete details on use and interpretation of readings are provided in the electrical chapter.

Compression Tester

The compression tester measures the compression pressure built up in each cylinder. The results, when properly interpreted, can indicate general cylinder, ring, and valve condition. See **Figure 7**. Extension lines are available for hard-to-reach cylinders.

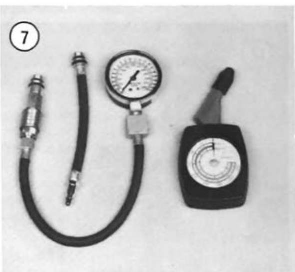
Dwell Meter (Contact Breaker Point Ignition Only)

A dwell meter measures the distance in degrees of cam rotation that the breaker points remain closed while the engine is running. Since

5

6

7



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this angle is determined by breaker point gap, dwell angle is an accurate indication of breaker point gap.

Many tachometers intended for tuning and testing incorporate a dwell meter as well. See **Figure 8**. Follow the manufacturer's instructions to measure dwell.

Tachometer

A tachometer is necessary for tuning. See **Figure 8**. Ignition timing and carburetor adjustments must be performed at the specified idle speed. The best instrument for this purpose is one with a low range of 0-1,000 or 0-2,000 rpm for setting idle, and a high range of 0-4,000 or more for setting ignition timing at 3,000 rpm. Extended range (0-6,000 or 0-8,000 rpm) instruments lack accuracy at lower speeds. The instrument should be capable of detecting changes of 25 rpm on the low range.

> NOTE: *The motorcycle's tachometer is not accurate enough for correct idle adjustment.*

Strobe Timing Light

This instrument is necessary for tuning, as it permits very accurate ignition timing. The light flashes at precisely the same instant that No. 1 cylinder fires, at which time the timing marks on the engine should align. Refer to Chapter Three for exact location of the timing marks for your engine.

Suitable lights range from inexpensive neon bulb types to powerful xenon strobe lights. See **Figure 9**. Neon timing lights are difficult to see and must be used in dimly lit areas. Xenon strobe timing lights can be used outside in bright sunlight.

Tune-up Kits

Many manufacturers offer kits that combine several useful instruments. Some come in a convenient carry case and are usually less expensive than purchasing one instrument at a time. **Figure 10** shows one of the kits that is available. The prices vary with the number of instruments included in the kit.

Manometer (Carburetor Synchronizer)

A manometer is essential for accurately synchronizing carburetors on multi-cylinder engines. The instrument detects intake pressure differences between carburetors and permits them to be adjusted equally. A suitable manometer costs about $75 and comes with detailed instructions for use See **Figure 11**.

Fire Extinguisher

A fire extinguisher is a necessity when working on a vehicle. It should be rated for both *Class B* (flammable liquids – gasoline, oil, paint, etc.) and *Class C* (electrical – wiring, etc.) type fires. It should always be kept within reach. See **Figure 12**.

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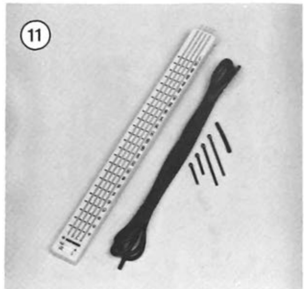


11

12

TROUBLESHOOTING

Troubleshooting motorcycle problems is relatively simple. To be effective and efficient, however, it must be done in a logical step-by-step manner. If it is not, a great deal of time may be wasted, good parts may be replaced unnecessarily, and the true problem may never be uncovered.

Always begin by defining the symptoms as closely as possible. Then, analyze the symptoms carefully so that you can make an intelligent guess at the probable cause. Next, test the probable cause and attempt to verify it; if it's not at fault, analyze the symptoms once again, this time eliminating the first probable cause. Continue on in this manner, a step at a time, until the problem is solved.

At first, this approach may seem to be time consuming, but you will soon discover that it's not nearly so wasteful as a hit-or-miss method that may never solve the problem. And just as important, the methodical approach to troubleshooting ensures that only those parts that are defective will be replaced.

The troubleshooting procedures in this chapter analyze typical symptoms and show logical methods for isolating and correcting trouble. They are not, however, the only methods; there may be several approaches to a given problem, but all good troubleshooting methods have one thing in common — a logical, systematic approach.

ENGINE

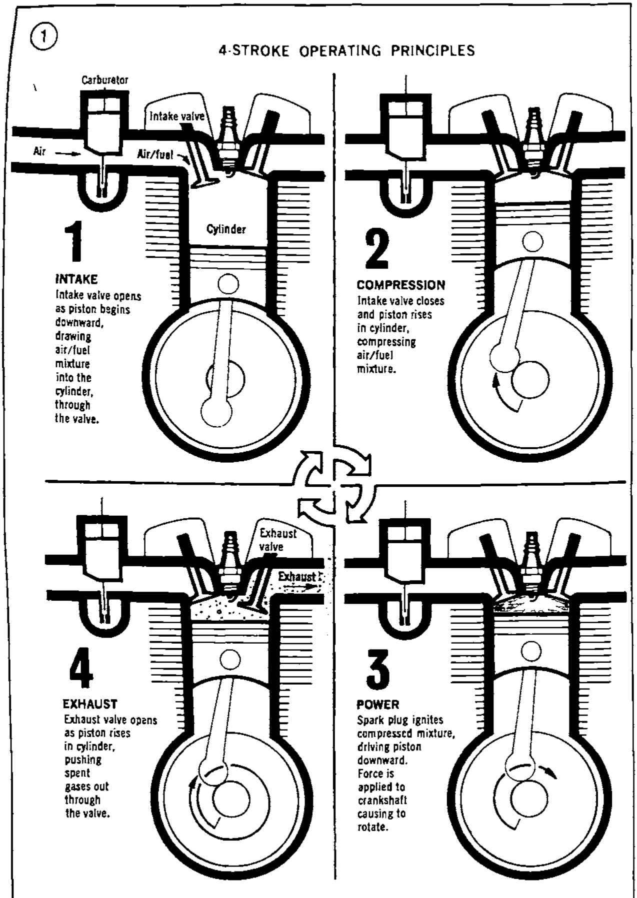
The entire engine must be considered when trouble arises that is experienced as poor performance or failure to start. The engine is more than a combustion chamber, piston, and crankshaft; it also includes a fuel delivery system, an ignition system, and an exhaust system.

Before beginning to troubleshoot any engine problems, it's important to understand an engine's operating requirements. First, it must have a correctly metered mixture of gasoline and air (**Figure 1**). Second, it must have an air-tight combustion chamber in which the mixture can be compressed. And finally, it requires a precisely timed spark to ignite the compressed mixture. If one or more is missing, the engine won't run, and if just one is deficient, the engine will run poorly at best.

Of the three requirements, the precisely timed spark — provided by the ignition system — is most likely to be the culprit, with gas/air mixture (carburetion) second, and poor compression the least likely.

STARTING DIFFICULTIES

Hard starting is probably the most common motorcycle ailment, with a wide range of problems likely. Before delving into a reluctant or non-starter, first determine what has changed


1
4-STROKE OPERATING PRINCIPLES
Carburetor
Intake valve
Air
Air/fuel
Cylinder
1
INTAKE
Intake valve opens as piston begins downward, drawing air/fuel mixture into the cylinder, through the valve.
2
COMPRESSION
Intake valve closes and piston rises in cylinder, compressing air/fuel mixture.
Exhaust valve
Exhaust
4
EXHAUST
Exhaust valve opens as piston rises in cylinder, pushing spent gases out through the valve.
3
POWER
Spark plug ignites compressed mixture, driving piston downward. Force is applied to crankshaft causing to rotate.

since the motorcycle last started easily. For instance, was the weather dry then and is it wet now? Has the motorcycle been sitting in the garage for a long time? Has it been ridden many miles since it was last fueled?

Has starting become increasingly more difficult? This alone could indicate a number of things that may be wrong but is usually associated with normal wear of ignition and engine components.

While it's not always possible to diagnose trouble simply from a change of conditions, this information can be helpful and at some future time may uncover a recurring problem.

Fuel Delivery

Although it is the second most likely cause of trouble, fuel delivery should be checked first simply because it is the easiest.

First, check the tank to make sure there is fuel in it. Then, disconnect the fuel hose at the carburetor, open the valve and check for flow (**Figure 2**). If fuel does not flow freely make sure the tank vent is clear. Next, check for blockage in the line or valve. Remove the valve and clean it as described in the fuel system chapter.

If fuel flows from the hose, reconnect it and remove the float bowl from the carburetor, open the valve and check for flow through the float needle valve. If it does not flow freely when the float is extended and then shut off when the flow is gently raised, clean the carburetor as described in the fuel system chapter.

When fuel delivery is satisfactory, go on to the ignition system.

Ignition

Remove the spark plug from the cylinder and check its condition. The appearance of the plug is a good indication of what's happening in the combustion chamber; for instance, if the plug is wet with gas, it's likely that engine is flooded. Compare the spark plug to **Figure 3**. Make certain the spark plug heat range is correct. A "cold" plug makes starting difficult.

After checking the spark plug, reconnect it to the high-tension lead and lay it on the cylinder head so it makes good contact (**Figure 4**). Then, with the ignition switched on, crank the engine several times and watch for a spark across the plug electrodes. A fat, blue spark should be visible. If there is no spark, or if the spark is weak, substitute a good plug for the old one and check again. If the spark has improved, the old plug is faulty. If there was no change, keep looking.

Make sure the ignition switch is not shorted to ground. Remove the spark plug cap from the end of the high-tension lead and hold the exposed end of the lead about ¼ inch from the cylinder head. Crank the engine and watch for a spark arcing from the lead to the head. If it's satisfactory, the connection between the lead and the cap was faulty. If the spark hasn't improved, check the coil wire connections.

If the spark is still weak, remove the ignition cover and remove any dirt or moisture from the points or sensor. Check the point or air gap against the specifications in the *Quick Reference Data* at the beginning of the book.

If spark is still not satisfactory, a more serious problem exists than can be corrected with simple adjustments. Refer to the electrical system chapter for detailed information for correcting major ignition problems.

Compression

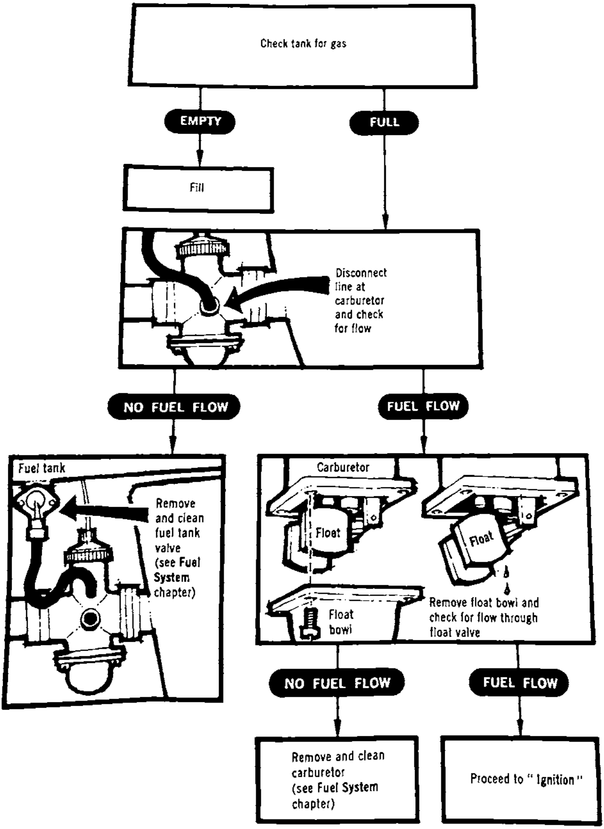
Compression — or the lack of it — is the least likely cause of starting trouble. However, if compression is unsatisfactory, more than a simple adjustment is required to correct it (see the engine chapter).

An accurate compression check reveals a lot about the condition of the engine. To perform this test you need a compression gauge (see Chapter One). The engine should be at operating temperature for a fully accurate test, but even a cold test will reveal if the starting problem is compression.

Remove the spark plug and screw in a compression gauge (**Figure 5**). With assistance, hold the throttle wide open and crank the engine several times, until the gauge ceases to rise. Normal compression should be 130-160 psi, but a reading as low as 100 psi is usually sufficient for the engine to start. If the reading is much lower than normal, remove the gauge and pour about a tablespoon of oil into the cylinder.

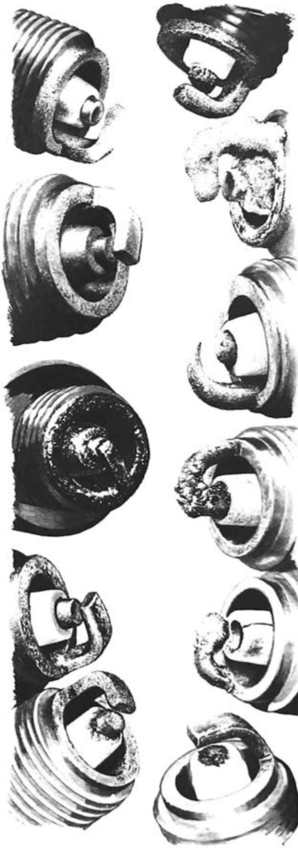
2

FUEL DELIVERY



NOTE: If fuel flow is adequate and spark is present (see Ignition which follows), increase fuel ratio with idle screw.

(3)



NORMAL
- Appearance—Firing tip has deposits of light gray to light tan
- Can be cleaned, regapped and reused

CARBON FOULED
- Appearance—Dull, dry black with fluffy carbon deposits on the insulator tip, electrode and exposed shell
- Caused by—Fuel/air mixture too rich, plug heat range too cold, weak ignition system, dirty air cleaner, faulty automatic choke or excessive idling
- Can be cleaned, regapped and reused

OIL FOULED
- Appearance—Wet black deposits on insulator and exposed shell
- Caused by—Excessive oil entering the combustion chamber through worn rings, pistons, valve guides or bearings
- Replace with new plugs (use a hotter plug if engine is not repaired)

LEAD FOULED
- Appearance — Yellow insulator deposits (may sometimes be dark gray, black or tan in color) on the insulator tip
- Caused by—Highly leaded gasoline
- Replace with new plugs

LEAD FOULED
- Appearance—Yellow glazed deposits indicating melted lead deposits due to hard acceleration
- Caused by—Highly leaded gasoline
- Replace with new plugs

OIL AND LEAD FOULED
- Appearance—Glazed yellow deposits with a slight brownish tint on the insulator tip and ground electrode
- Replace with new plugs

FUEL ADDITIVE RESIDUE
- Appearance — Brown colored hardened ash deposits on the insulator tip and ground electrode
- Caused by—Fuel and/or oil additives
- Replace with new plugs

WORN
- Appearance — Severely worn or eroded electrodes
- Caused by—Normal wear or unusual oil and/or fuel additives
- Replace with new plugs

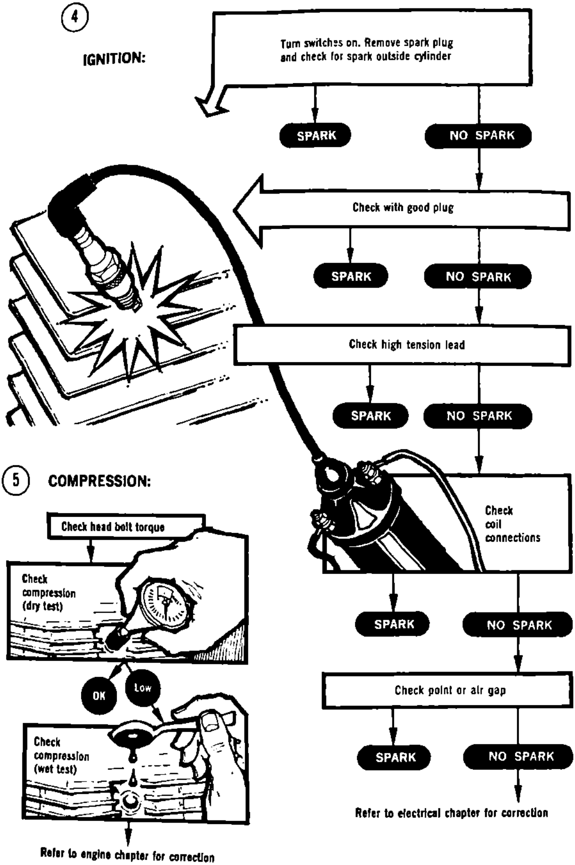
PREIGNITION
- Appearance — Melted ground electrode
- Caused by—Overadvanced ignition timing, inoperative ignition advance mechanism, too low of a fuel octane rating, lean fuel/air mixture or carbon deposits in combustion chamber

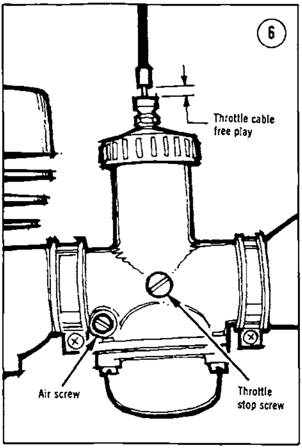
PREIGNITION
- Appearance—Melted center electrode
- Caused by—Abnormal combustion due to overadvanced ignition timing or incorrect advance, too low of a fuel octane rating, lean fuel/air mixture or carbon deposits in combustion chamber
- Correct engine problem and replace with new plugs

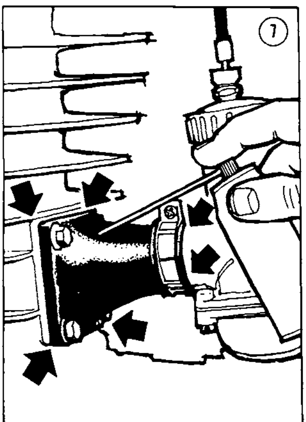
INCORRECT HEAT RANGE
- Appearance—Melted center electrode and white blistered insulator tip
- Caused by—Incorrect plug heat range selection
- Replace with new plugs

(4) IGNITION:

(5) COMPRESSION:







Crank the engine several times to distribute the oil and test the compression once again. If it is now significantly higher, the rings and bore are worn. If the compression did not change, the valves are not seating correctly. Adjust the valves and check again. If the compression is still low, refer to the engine chapter.

NOTE: *Low compression indicates a developing problem. The condition causing it should be corrected as soon as possible.*

POOR PERFORMANCE

Poor engine performance can be caused by any of a number of things related to carburetion, ignition, and the condition of the sliding and rotating components in the engine. In addition, components such as brakes, clutch, and transmission can cause problems that seem to be related to engine performance, even when the engine is in top running condition.

Poor Idling

Idling that is erratic, too high, or too low is most often caused by incorrect adjustment of the carburetor idle circuit. Also, a dirty air filter or an obstructed fuel tank vent can affect idle speed. Incorrect ignition timing or worn or faulty ignition components are also good possibilities.

First, make sure the air filter is clean and correctly installed. Then, adjust the throttle cable free play, the throttle stop screw, and the idle mixture air screw (**Figure 6**) as described in the routine maintenance chapter.

If idling is still poor, check the carburetor and manifold mounts for leaks; with the engine warmed up and running, spray WD-40 or a similar light lube around the flanges and joints of the carburetor and manifold (**Figure 7**). Listen for changes in engine speed. If a leak is present, the idle speed will drop as the lube "plugs" the leak and then pick up again as it is drawn into the engine. Tighten the nuts and clamps and test again. If a leak persists, check for a damaged gasket or a pinhole in the manifold. Minor leaks in manifold hoses can be repaired with silicone sealer, but if cracks or holes are extensive, the manifold should be replaced.

A worn throttle slide may cause erratic running and idling, but this is likely only after many thousands of miles of use. To check, remove the carburetor top and feel for back and forth movement of the slide in the bore; it should be barely perceptible. Inspect the slide for large worn areas and replace it if it is less than perfect (**Figure 8**).

If the fuel system is satisfactory, check ignition timing and breaker point gap (air gap in electronic ignition). Check the condition of the system components as well. Ignition-caused idling problems such as erratic running can be the fault of marginal components. See the electrical system chapter for appropriate tests.

Rough Running or Misfiring

Misfiring (see **Figure 9**) is usually caused by an ignition problem. First, check all ignition connections (**Figure 10**). They should be clean, dry, and tight. Don't forget the kill switch; a loose connection can create an intermittent short.

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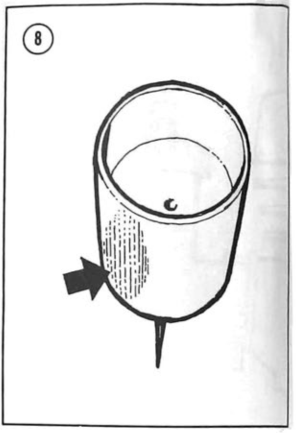

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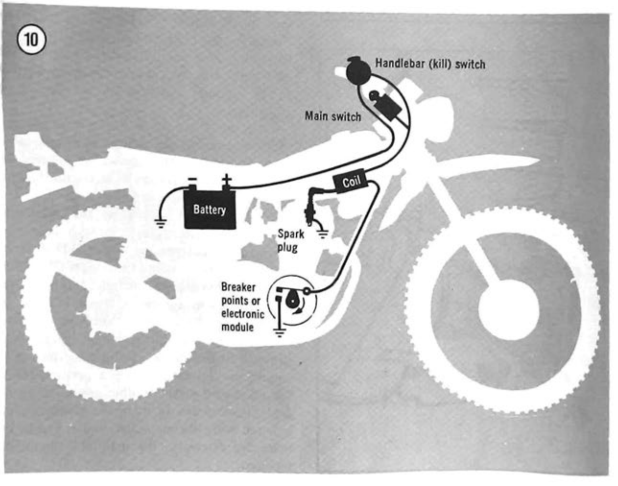


ENGINE RUNS ROUGH AND MISFIRES

ENGINE MISSES—ALL SPEEDS

9

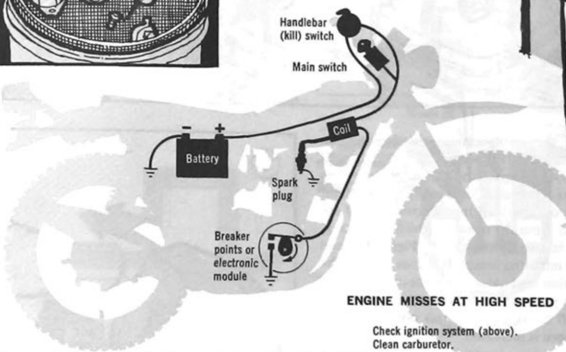
- Check ignition wire connections.
- Inspect the insulation on the spark plug high-tension lead for cracking and deterioration.
- Inspect the spark plug for correct heat range and condition.
- Check the point gap and the spring tension on the contact breaker or check electronic module on models with electronic ignition.

ENGINE MISSES AT LOW SPEED

- Check ignition system (above).
- Clean carburetor—pay particular attention to low-speed jet and circuit.

ENGINE MISSES AT MID-RANGE

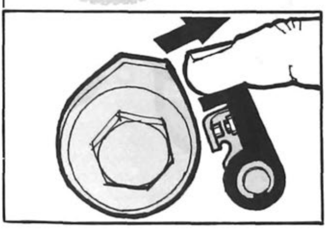
- Check ignition system (above).
- Clean carburetor.
- Check position and condition of slide needle.

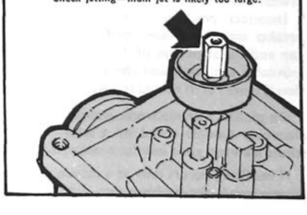


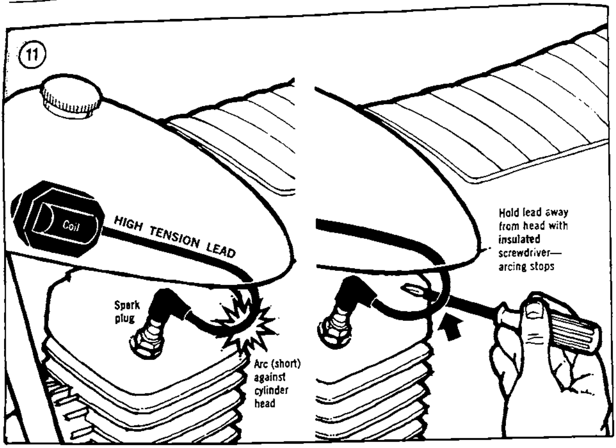
ENGINE MISSES AT HIGH SPEED

Check ignition system (above).
Clean carburetor.

Check jetting—main jet is likely too large.







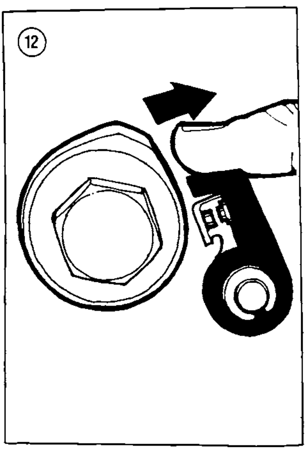
Check the insulation on the high-tension spark plug lead. If it is cracked or deteriorated it will allow the spark to short to ground when the engine is revved. This is easily seen at night. If arcing occurs, hold the affected area of the wire away from the metal to which it is arcing, using an insulated screwdriver (**Figure 11**), and see if the misfiring ceases. If it does, replace the high-tension lead. Also check the connection of the spark plug cap to the lead. If it is poor, the spark will break down at this point when the engine speed is increased.

The spark plug could also be poor. Test the system with a new plug.

Incorrect point gap or a weak contact breaker spring can cause misfiring. Check the gap and the alignment of the points. Push the moveable arm back and check for spring tension (**Figure 12**). It should feel stiff.

On models with electronic ignition, have the electronic module tested by a dealer or substitute a known good unit for a suspected one.

If misfiring occurs only at a certain point in engine speed, the problem may very likely be



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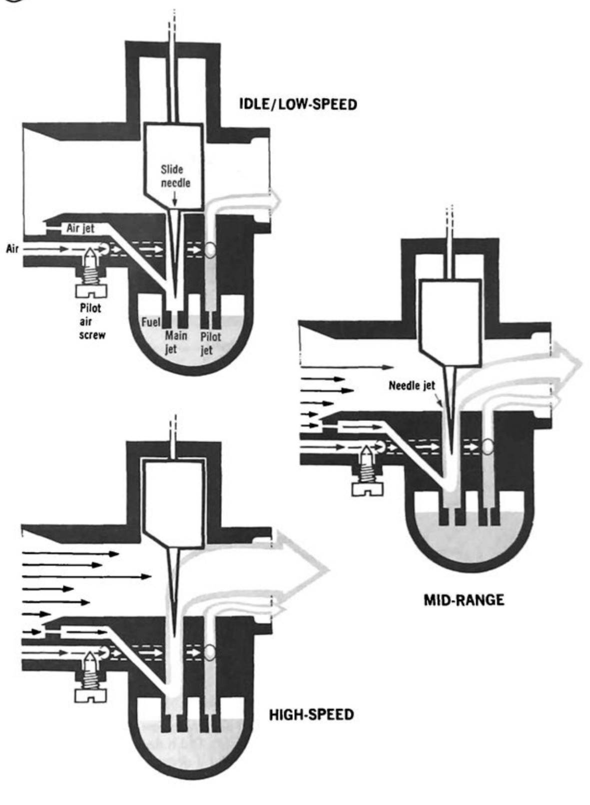
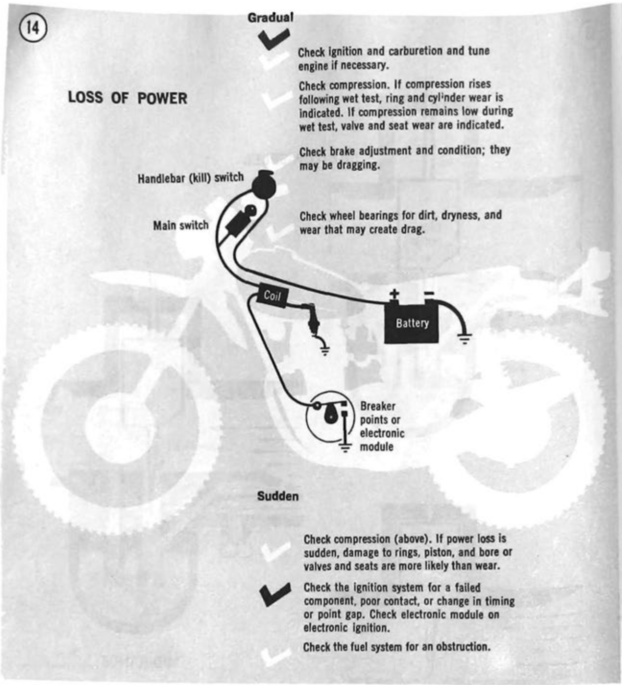
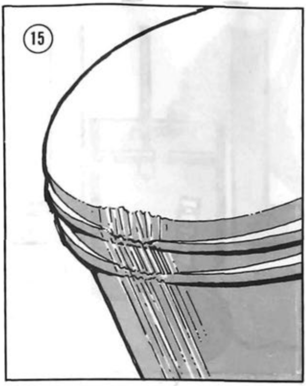

IDLE/LOW-SPEED
Slide needle
Air jet
Air
Pilot air screw
Fuel
Main jet
Pilot jet
Needle jet
MID-RANGE
HIGH-SPEED



carburetion. Poor performance at idle is described earlier. Misfiring at low speed (just above idle) can be caused by a dirty low-speed circuit or jet (**Figure 13**). Poor midrange performance is attributable to a worn or incorrectly adjusted needle and needle jet. Misfiring at high speed (if not ignition related) is usually caused by a too-large main jet which causes the engine to run rich. Any of these carburetor-related conditions can be corrected by first cleaning the carburetor and then adjusting it as described in the tune-up and maintenance chapter.

Loss of Power

First determine how the power loss developed (**Figure 14**). Did it decline over a long period of time or did it drop abruptly? A gradual loss is normal, caused by deterioration of the engine's state of tune and the normal wear of the cylinder and piston rings and the valves and seats. In such case, check the condition of the



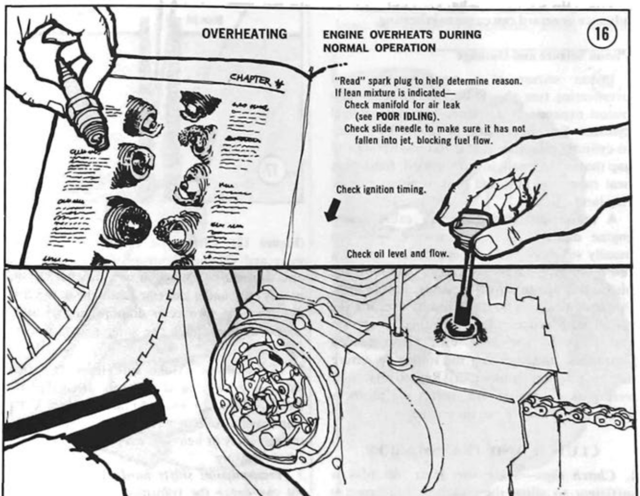
ignition and carburetion and measure the compression as described earlier.

A sudden power loss may be caused by a failed ignition component, obstruction in the fuel system, damaged valve or seat, or a broken piston ring or damaged piston (**Figure 15**).

If the engine is in good shape and tune, check the brake adjustment. If the brakes are dragging, they will consume considerable power. Also check the wheel bearings. If they are dry, extremely dirty, or badly worn they can create considerable drag.

Engine Runs Hot

A modern motorcycle engine, in good mechanical condition, correctly tuned, and operated as it was intended, will rarely experience overheating problems. However, out-of-spec conditions can create severe overheating that may result in serious engine damage. Refer to **Figure 16**.



Overheating is difficult to detect unless it is extreme, in which case it will usually be apparent as excessive heat radiating from the engine, accompanied by the smell of hot oil and sharp, snapping noises when the engine is first shut off and begins to cool.

Unless the motorcycle is operated under sustained high load or is allowed to idle for long periods of time, overheating is usually the result of an internal problem. Most often it's caused by a too-lean fuel mixture.

Remove the spark plug and compare it to **Figure 3**. If a too-lean condition is indicated, check for leaks in the intake manifold (see *Poor Idling*). The carburetor jetting may be incorrect but this is unlikely if the overheating problem has just developed (unless, of course, the engine was jetted for high altitude and is now being run near sea level). Check the slide needle in the carburetor to make sure it hasn't come loose and is restricting the flow of gas through the main jet and needle jet (**Figure 17**).

Check the ignition timing; extremes of either advance or retard can cause overheating.

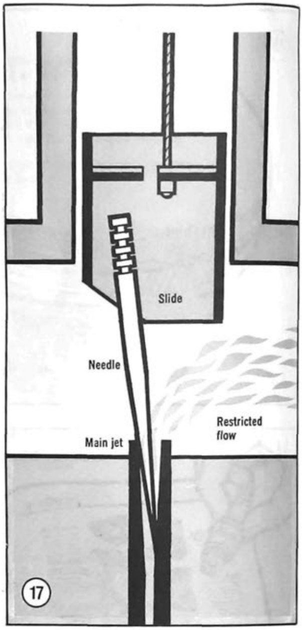
Piston Seizure and Damage

Piston seizure is a common result of overheating (see above) because an aluminum piston expands at a greater rate than a steel cylinder. Seizure can also be caused by piston-to-cylinder clearance that is too small; ring end gap that is too small; insufficient oil; spark plug heat range too hot; and broken piston ring or ring land.

A major piston seizure can cause severe engine damage. A minor seizure — which usually subsides after the engine has cooled a few minutes — rarely does more than scuff the piston skirt the first time it occurs. Fortunately, this condition can be corrected by dressing the piston with crocus cloth, refitting the piston and rings to the bore with recommended clearances, and checking the timing to ensure overheating does not occur. Regard that first seizure as a warning and correct the problem before continuing to run the engine.

CLUTCH AND TRANSMISSION

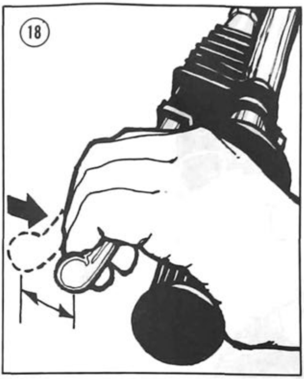
1. ***Clutch slips***—Make sure lever free play is sufficient to allow the clutch to fully engage

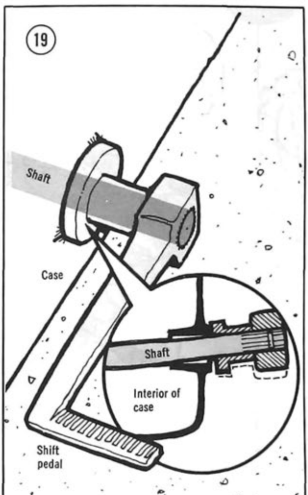


(**Figure 18**). Check the contact surfaces for wear and glazing. Transmission oil additives also can cause slippage in wet clutches. If slip occurs only under extreme load, check the condition of the springs or diaphragm and make sure the clutch bolts are snug and uniformly tightened.

2. ***Clutch drags***—Make sure lever free play isn't so great that it fails to disengage the clutch. Check for warped plates or disc. If the transmission oil (in wet clutch systems) is extremely dirty or heavy, it may inhibit the clutch from releasing.

3. ***Transmission shifts hard***—Extremely dirty oil can cause the transmission to shift hard.





Check the selector shaft for bending (**Figure 19**). Inspect the shifter and gearsets for wear and damage.

4. ***Transmission slips out of gear***—This can be caused by worn engagement dogs or a worn or damaged shifter (**Figure 20**). The overshift travel on the selector may be misadjusted.

5. ***Transmission is noisy***—Noises usually indicate the absence of lubrication or wear and damage to gears, bearings, or shims. It's a good idea to disassemble the transmission and carefully inspect it when noise first occurs.

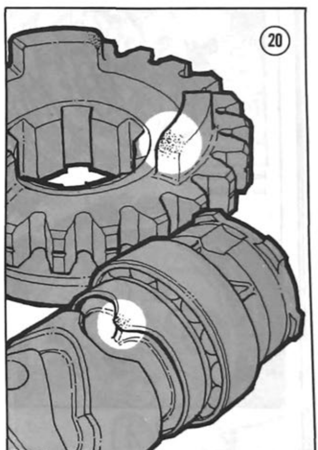
DRIVE TRAIN

Drive train problems (outlined in **Figure 21**) arise from normal wear and incorrect maintenance.

CHASSIS

Chassis problems are outlined in **Figure 22**.

1. ***Motorcycle pulls to one side***—Check for loose suspension components, axles, steering



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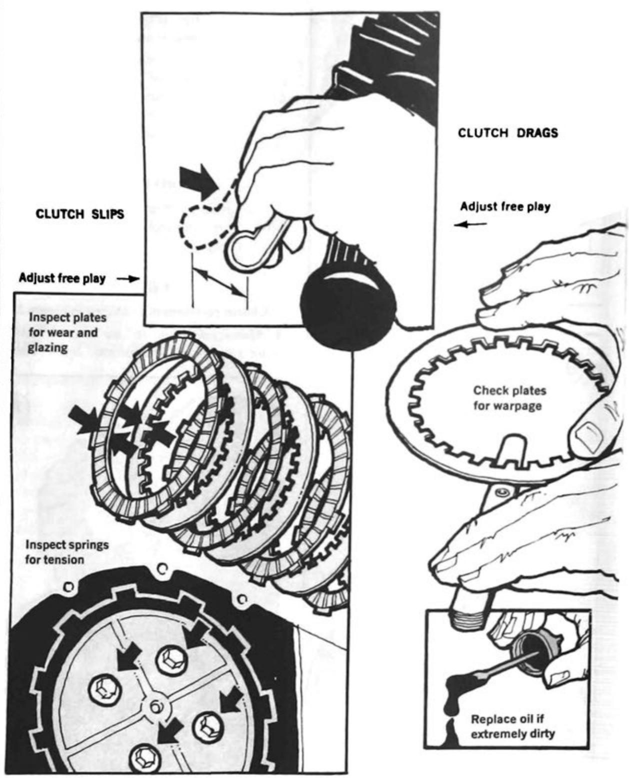
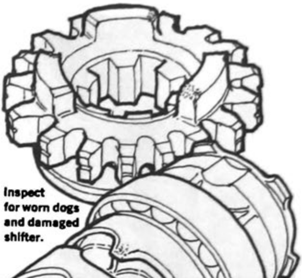
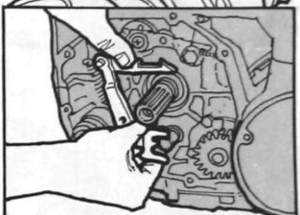
DRIVE SYSTEM



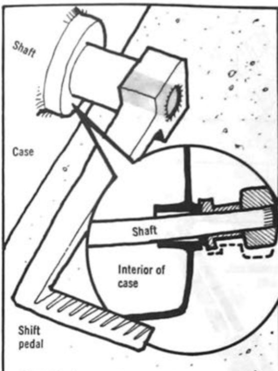
TRANSMISSION SLIPS OUT OF GEAR



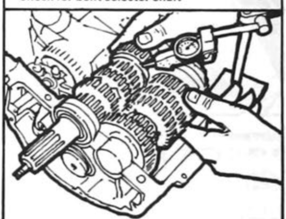


Check overshift travel and increase if insufficient

TRANSMISSION SHIFTS HARD



Check for bent selector shaft

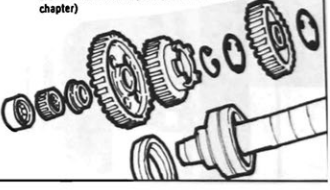


Inspect selector and gearsets for wear

TRANSMISSION IS NOISY

Check oil level

Disassemble and inspect (see Transmission chapter)



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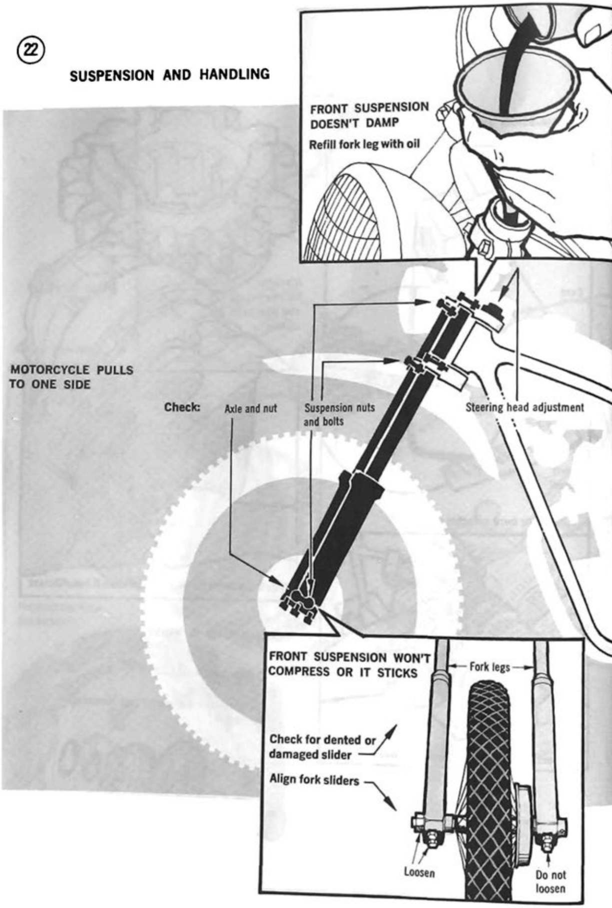
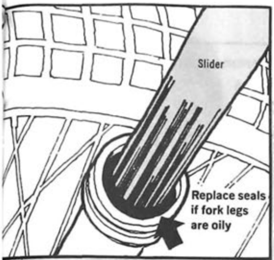
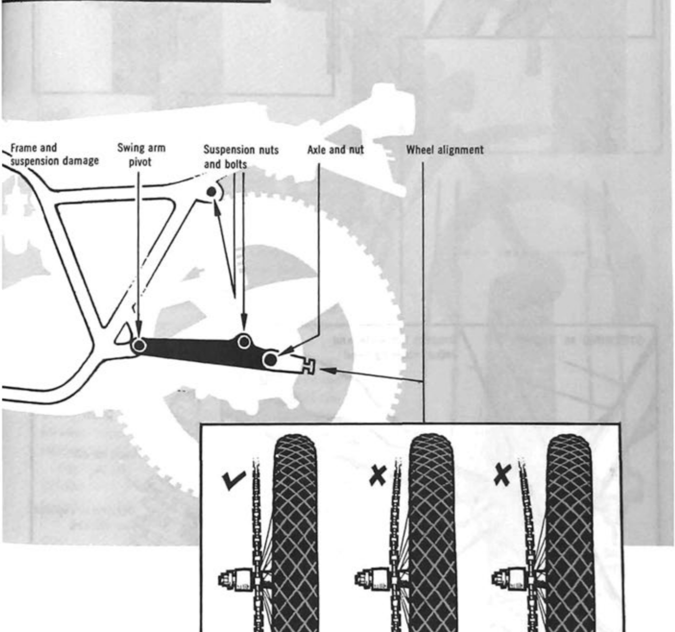
SUSPENSION AND HANDLING

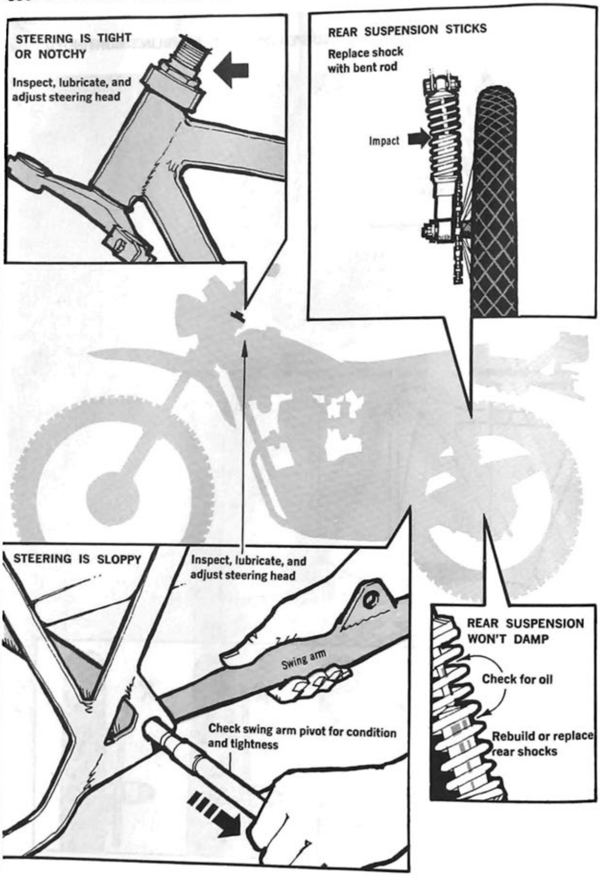




SUSPENSION AND HANDLING CONTINUED



SUSPENSION AND HANDLING CONTINUED



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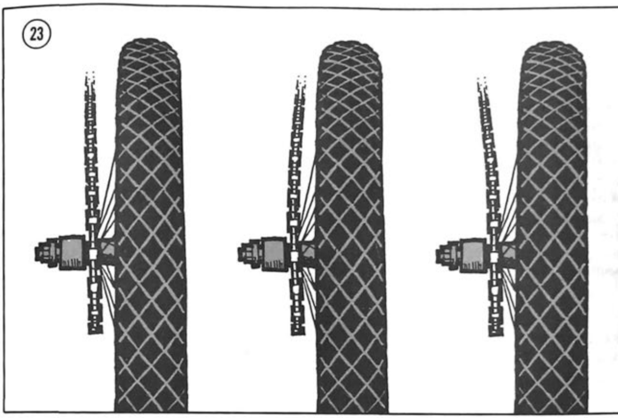

head, swing arm pivot. Check wheel alignment (**Figure 23**). Check for damage to the frame and suspension components.

2. ***Front suspension doesn't damp***—This is most often caused by a lack of damping oil in the fork legs. If the upper fork tubes are exceptionally oily, it's likely that the seals are worn out and should be replaced.

3. ***Front suspension sticks or won't fully compress***—Misalignment of the forks when the wheel is installed can cause this. Loosen the axle nut and the pinch bolt on the nut end of the axle (**Figure 24**). Lock the front wheel with the brake and compress the front suspension several times to align the fork legs. Then, tighten the pinch bolt and then the axle nut.

The trouble may also be caused by a bent or dented fork slider (**Figure 25**). The distortion required to lock up a fork tube is so slight that it is often impossible to visually detect. If this type of damage is suspected, remove the fork leg and remove the spring from it. Attempt to operate the fork leg. If it still binds, replace the slider; it's not practical to repair it.

4. ***Rear suspension does not damp***—This is usually caused by damping oil leaking past

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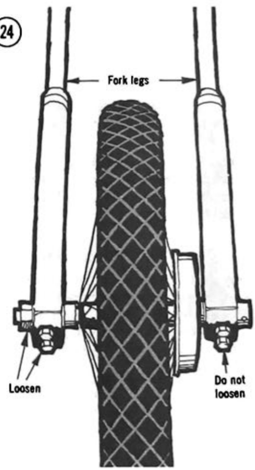

worn seals. Rebuildable shocks should be refitted with complete service kits and fresh oil. Non-rebuildable units should be replaced.

5. ***Rear suspension sticks***—This is commonly caused by a bent shock absorber piston rod (**Figure 26**). Replace the shock; the rod can't be satisfactorily straightened.

6. ***Steering is tight or "notchy"***—Steering head bearings may be dry, dirty, or worn. Adjustment of the steering head bearing pre-load may be too tight.

7. ***Steering is sloppy***—Steering head adjustment may be too loose. Also check the swing arm pivot; looseness or extreme wear at this point translate to the steering.

BRAKES

Brake problems arise from wear, lack of maintenance, and from sustained or repeated exposure to dirt and water.

1. ***Brakes are ineffective***—Ineffective brakes are most likely caused by incorrect adjustment. If adjustment will not correct the problem, remove the wheels and check for worn or glazed linings. If the linings are worn beyond the service limit, replace them. If they are simply glazed, rough them up with light sandpaper.

In hydraulic brake systems, low fluid levels can cause a loss of braking effectiveness, as can worn brake cylinder pistons and bores. Also check the pads to see if they are worn beyond the service limit.

2. ***Brakes lock or drag***—This may be caused by incorrect adjustment. Check also for foreign matter embedded in the lining and for dirty and dry wheel bearings.

ELECTRICAL SYSTEM

Many electrical system problems can be easily solved by ensuring that the affected connections are clean, dry, and tight. In battery equipped motorcycles, a neglected battery is the source of a great number of difficulties that could be prevented by simple, regular service to the battery.

A multimeter, like the volt/ohm/milliammeter described in Chapter One, is invaluable for efficient electrical system troubleshooting.

See **Figures 27 and 28** for schematics showing

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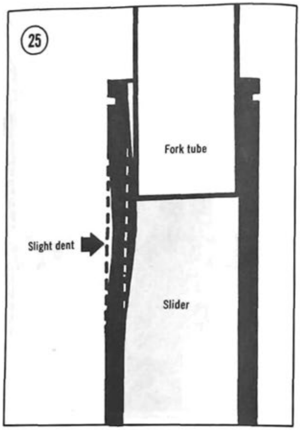

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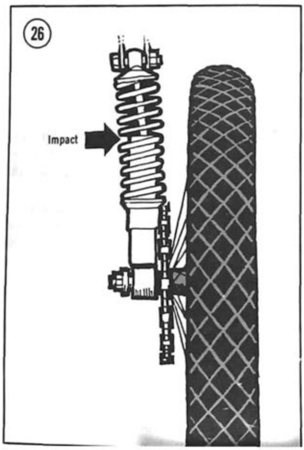

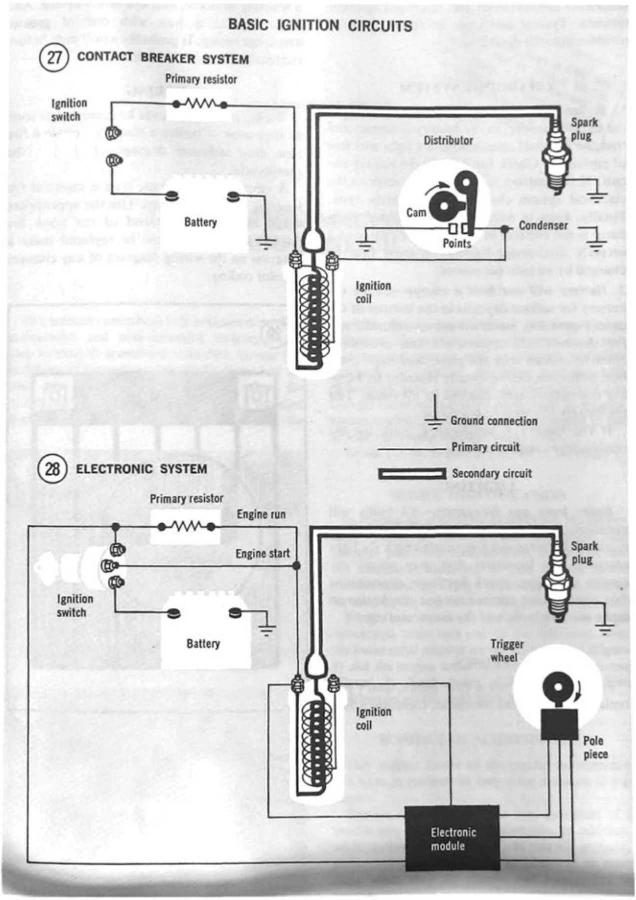
BASIC IGNITION CIRCUITS
27
CONTACT BREAKER SYSTEM
Primary resistor
Ignition switch
Distributor
Spark plug
Cam
Condenser
Points
Battery
Ignition coil
Ground connection
Primary circuit
Secondary circuit
28
ELECTRONIC SYSTEM
Primary resistor
Engine run
Engine start
Spark plug
Ignition switch
Battery
Trigger wheel
Ignition coil
Pole piece
Electronic module

simplified conventional and electronic ignition systems. Typical and most common electrical troubles are also described.

CHARGING SYSTEM

1. ***Battery will not accept a charge***—Make sure the electrolyte level in the battery is correct and that the terminal connections are tight and free of corrosion. Check for fuses in the battery circuit. If the battery is satisfactory, refer to the electrical system chapter for alternator tests. Finally, keep in mind that even a good alternator is not capable of restoring the charge to a severely discharged battery; it must first be charged by an external source.

2. ***Battery will not hold a charge***—Check the battery for sulfate deposits in the bottom of the case (**Figure 29**). Sulfation occurs naturally and the deposits will accumulate and eventually come in contact with the plates and short them out. Sulfation can be greatly retarded by keeping the battery well charged at all times. Test the battery to assess its condition.

If the battery is satisfactory, look for excessive draw, such as a short.

LIGHTING

Bulbs burn out frequently—All bulbs will eventually burn out, but if the bulb in one particular light burns out frequently check the light assembly for looseness that may permit excessive vibration; check for loose connections that could cause current surges; check also to make sure the bulb is of the correct rating.

FUSES

Fuse blows—When a fuse blows, don't just replace it; try to find the cause. Consider a fuse a warning device as well as a safety device. And never replace a fuse with one of greater amperage rating. It probably won't melt before the insulation on the wiring does.

WIRING

Wiring problems should be corrected as soon as they arise — before a short can cause a fire that may seriously damage or destroy the motorcycle.

A circuit tester of some type is essential for locating shorts and opens. Use the appropriate wiring diagram at the end of the book for reference. If a wire must be replaced make a notation on the wiring diagram of any changes in color coding.

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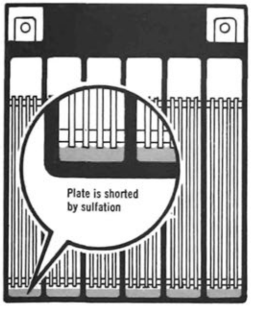


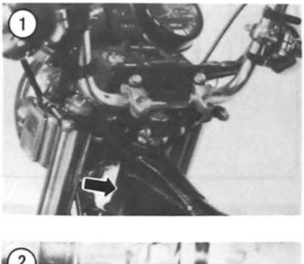
NOTE: If you have a 1982 and later P Series Police Model, first check the Supplement at the back of this manual for any specific service information.

CHAPTER THREE

LUBRICATION, MAINTENANCE AND TUNE-UP

This manual covers both U.S. emission controlled motorcycles and non-controlled motorcycles. If your motorcycle is emission controlled, we urge you to follow all procedures specifically designated for your bike (**Table 1**). If you don't follow the maintenance schedule in this manual or if you alter engine parts or change their settings from the standard factory specifications (ignition timing, carburetor idle mixture, exhaust system, etc.), your bike may not comply with government emissions standards. In addition, the bikes equipped with carburetors have a lean fuel-air mixture, and any changes to emission-related parts (such as exhaust system modifications) could cause the engine to run so lean that engine damage would result.

Tables 1-7 are located at the end of the chapter.



MODEL IDENTIFICATION

In the process of building motorcycles, the factory often introduces new models throughout the calendar year. New models, when introduced, are not necessarily identified by year but by model number suffix. See **Table 2** at the end of this chapter for model year and model suffix equivalents.

When you need to order parts for your motorcycle, make sure you get the right ones. Note the frame serial number on the steering head (**Figure 1**) and the engine serial number on the crankcase (**Figure 2**). Your dealer will often need these numbers to get the right parts for your bike.

SCHEDULED MAINTENANCE

This chapter covers all the regular maintenance you have to perform to keep your machine in top shape.

Regular maintenance is the best guarantee of a trouble-free, long-lasting motorcycle. In addition, while performing the routine jobs you will probably notice any other developing problems at an early stage when they are simple and inexpensive to correct.

Table 1 is a recommended minimum maintenance schedule. **Tables 1-7** are at the end of the chapter. However, you will have to determine your own maintenance requirements based on the type of riding you do and the place you ride. If you ride in dusty areas or at high speeds or if you make a lot of short 10- or 15-minute rides, service the items more often. Perform the maintenance at each *time* or *mileage* interval, whichever comes first.

NOTE

If you have a brand new motorcycle, we strongly recommend you take the bike to your dealer for the initial break-in maintenance at 500 miles (800 km). Your dealer will know of any recent product update or recall campaigns.

ENGINE OIL AND FILTER

Oil Level Inspection

1. Wait several minutes after shutting off the engine before making the check, to give all oil enough time to run down into the crankcase.
2. Put the bike on its centerstand (or hold it level).
3. Look at the oil inspection window near the bottom of the clutch cover (A, **Figure 3**). The oil level should lie between the upper and lower lines at the window.
4. If the oil level is below the lower line, remove the filler cap and add oil slowly, in small quantities, through the filler (B, **Figure 3**). Add enough to raise the oil level up to (but not above) the top line. Be sure to give the oil enough time to run down into the crankcase before rechecking the level in the inspection window. Refer to **Figure 4** for recommended viscosity for anticipated ambient temperatures.
5. Install the filler cap.

Oil and Filter Change

Change the oil according to the maintenance schedule (**Table 1**). The filter should be changed at every other oil change. If you ride hard or in dusty areas or if you take a lot of short trips, change the oil and filter more frequently.

Try to stay with one brand of oil. The use of oil additives is not recommended; anything you add to the engine oil also gets on the clutch plates and could cause clutch slippage or damage.

1. Ride the bike to warm it up fully, then turn the engine off.
2. Put the bike up on its centerstand.

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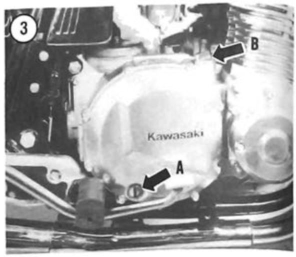

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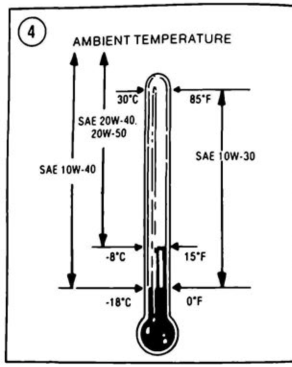

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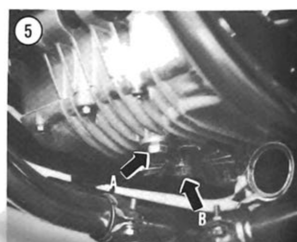

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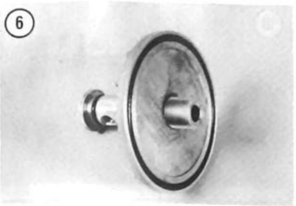

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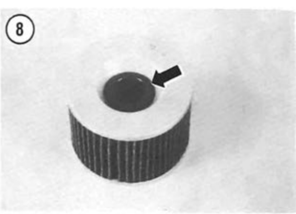

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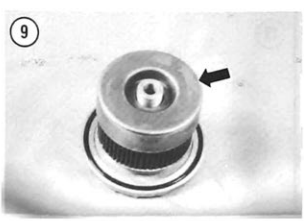

3. Put a drain pan under the crankcase and remove the drain plug (A, **Figure 5**). After the oil has drained, install the drain plug and torque it to 22 ft.-lb. (3 mkg).

4. The oil filter should be replaced every other engine oil change. If you are not changing the filter, skip to Step 11.

5. To remove the oil filter, unscrew the filter cover, bolt (8, **Figure 5**).

6. Remove the cover and filter. Discard the filter. Clean the cover and the bolt. Inspect the O-rings on the cover and on the filter bolt (**Figure 6**). Replace the O-rings if damaged.

7. Insert the bolt into the cover and install the spring and washer (**Figure 7**).

8. Check that the oil filter grommets are in place at both ends of the filter (**Figure 8**) and turn the filter onto the filter bolt.

9. Place the filter shield on top of the filter (**Figure 9**).

10. Clean the crankcase mating surface and install the filter assembly in the crankcase. Torque the filter bolt to 14.5 ft.-lb. (2 mkg).

11. Remove the oil filler cap and add the specified oil until it just reaches the upper line at the inspection window. Be sure to give the oil enough time to run down into the crankcase before checking the level in the inspection window.

12. Screw in the filler cap and start the engine. Let it idle and check for leaks.

13. Turn off the engine and recheck the oil level.

NOTE

*Never dispose of motor oil in the trash, on the ground, or down a storm drain. Many service stations accept used motor oil and waste haulers provide curbside used motor oil collection. Do not combine other fluids with motor oil to be recycled. To locate a recycler, contact the American Petroleum Institute (API), at **www.recycleoil.org**.*

Oil Filter Bypass Valve

The oil filter bypass valve is inside the oil filter mounting bolt. If the oil filter becomes so dirty that it blocks oil flow to the engine, the bypass valve routes unfiltered oil directly to the engine.

To remove the bypass valve, remove the oil filter. The bypass valve cannot be disassembled without damaging it, but you can push on the end of the bypass ball or piston (**Figure 10**) inside the valve to make sure it moves freely. If it does not, replace the valve.

DRIVE CHAIN LUBRICATION

(Chain-drive Models)

Many lubricants are available that are specially formulated for drive chains. If a special lubricant is not available, Kawasaki recommends SAE 90 gear oil for chain lubrication; it is less likely to be thrown off the chain than lighter oils.

NOTE
*The drive chain has a permanent internal bushing lubricant sealed in by O-rings between the side plates (**Figure 11**). Do not use a solvent or aerosol lubricant not designed for use on O-rings.*

SWING ARM LUBRICATION

The swing arm bearings must be lubricated with grease according to the maintenance schedule (**Table 1**). The swing arm has to be removed in order to lubricate the bearings; see *Swing Arm Removal* in Chapter Eleven.

STEERING HEAD LUBRICATION

The steering head should be disassembled and the bearings cleaned, inspected for wear and lubricated with a waterproof grease according to the maintenance schedule (**Table 1**). See *Steering Adjustment* in Chapter Eleven.

WHEEL BEARING LUBRICATION

The ball bearings in the wheel hubs should be lubricated with high-temperature grease according to the maintenance schedule (**Table 1**). Refer to Chapter Ten.

SHAFT DRIVE LUBRICATION

Check and lubricate the following items according to the maintenance schedule (**Table 1**).

Final Gear Case Oil Level

1. Put the bike up on its centerstand.
2. Remove the filler cap (A, **Figure 12**) and check that the lubricant level is just at the bottom of the filler threads.
3. If the level is low, add hypoid gear oil, API rated GL-5 or GL-6, until the level reaches the filler opening.

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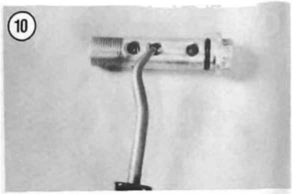

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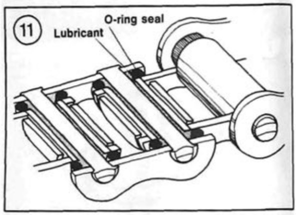

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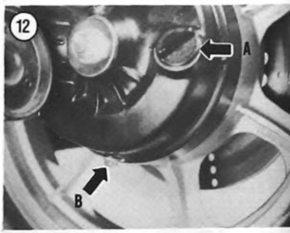

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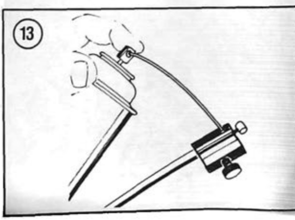

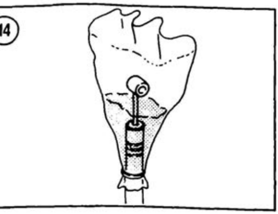

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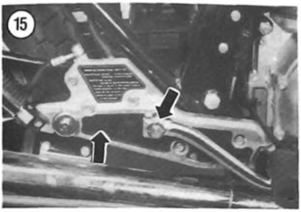

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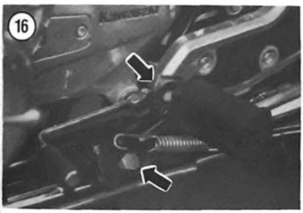

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Final Gear Case Oil Change

1. Ride the motorcycle until the final gear case is warm to the touch.
2. Put the bike up on its centerstand and put a drain pan under the final gear case.
3. Remove the filler cap and the drain plug (B, **Figure 12**) and allow the oil to drain.

WARNING
Don't get any lubricant on the wheel, tire or brake disc. Clean off any spilled oil with solvent.

4. Install the drain plug and gasket.
5. Add lubricant as described in this chapter.

Drive Shaft Joints

Remove the drive shaft as described in Chapter Ten. At the front, apply a thin coat of high-temperature grease to the front drive shaft splines. At the rear, coat the splines and pack the swing arm pocket forward of the splines with about 1/2 oz. (20 cc) of high-temperature grease.

GENERAL LUBRICATION

The following items should be lubricated according to the maintenance schedule (**Table 1**) and after cleaning the motorcycle. Special lubricants are available for control cables and other applications, but regular lubrication is more important than the type of lubricant you use: oil, grease, WD40, LPS3, etc.

Control Cables

The most positive method of control cable lubrication is to use a lubricator like the one shown in **Figure 13**. Disconnect the cable at the lever, attach the lubricator and inject lubricant into the cable sheath until it runs out of the other end.

If you do not have a lubricator, make a funnel from stiff paper or a plastic bag and tape it securely to one end of the cable (**Figure 14**). Hold the cable upright and add lubricant to the funnel. Work the cable in and out to help the lubricant work down the cable.

Control Pivots

Lubricate the brake pedal and linkage pivots (**Figure 15**), the footpeg and sidestand pivots (**Figure 16**), the centerstand pivot, the control lever pivots and control cable ends (**Figure 17**).

Throttle Grip Lubrication

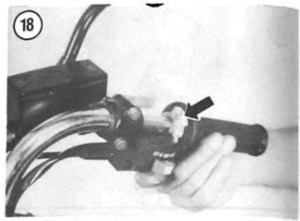
1. Remove the screws that assemble the twist grip housing. Raise the top half of the housing.
2. Slide the grip back (disconnect the throttle cable if necessary). Grease the handlebar under the grip, and the cable end (**Figure 18**).
3. Reassemble the twist grip housing, fitting the upper housing peg into its hole (**Figure 19**). Check that the grip works smoothly.

Meter Cables

On models with cable-driven instruments, disconnect the cables at the lower end. Pull the inner cable out, apply a light coat of grease and reinstall the cables. You may have to rotate the wheel to allow the speedometer cable to seat. If the tachometer cable won't seat, rotate the engine with the starter. Securely tighten the cable fasteners at the instruments with pliers.

Ignition Advance Lubrication

To lubricate the ignition advance mechanism, refer to *Ignition Advance* in Chapter Nine.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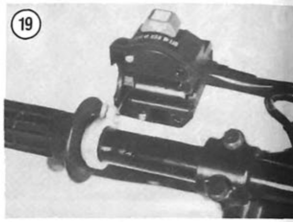
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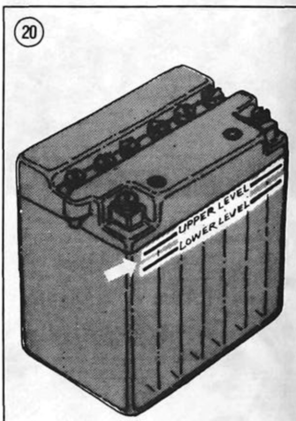
BATTERY

The battery electrolyte level should be checked regularly, particularly during hot weather. Motorcycle batteries are marked with electrolyte level limit lines (**Figure 20**). Always maintain the fluid level between the lines, adding distilled water as required. Distilled water is available at most supermarkets and its use will prolong the life of the battery, especially in areas where tap water is hard (has a high mineral content).

Inspect the fluid level in all the cells. The battery is behind the right-hand side cover (**Figure 21**). Refer to *Battery* in Chapter Nine before removing the battery from the motorcycle.

WARNING
Battery electrolyte contains sulfuric acid, which can destroy clothing and cause serious chemical burns. Electrolyte splashed into the eyes is extremely dangerous; wear safety glasses. In case of contact, flood with cool water for about 5 minutes and call a doctor immediately if the eyes were exposed.



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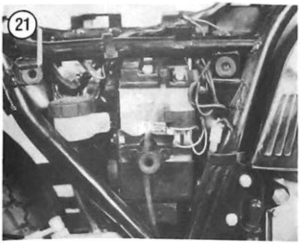
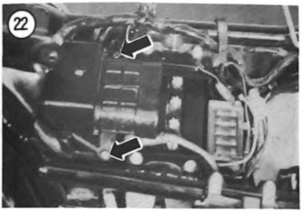
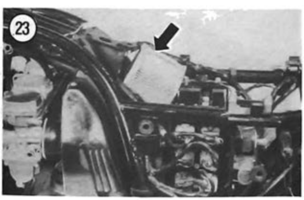
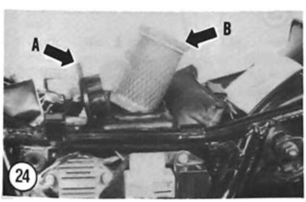
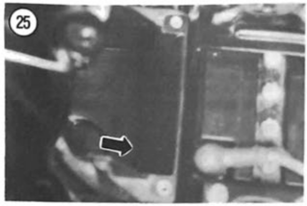










Don't overfill the battery or you'll lose some electrolyte, weakening the battery and causing corrosion. Never allow the electrolyte level to drop below the top of the plates or the plates may be permanently damaged.

CAUTION
If electrolyte is spilled on the motorcycle, wash it off immediately with plenty of water.

AIR FILTER

A clogged air filter will cause a rich fuel-air mixture, resulting in power loss and poor gas mileage. Never run the bike without an air filter. Even minute particles of dust can cause severe internal engine wear and clogging of air and fuel passages.

Install a new air filter every 5 cleanings or every 6,000 miles (10,000 km) or any time the element or gaskets are found to be damaged. Clean the filter more frequently in dusty areas and after riding in the rain.

Kawasaki recommends replacing foam air filter elements after cleaning them five times because the cleaning process enlarges the filter pores. Handle them carefully and replace them at the first sign of tearing or any other damage.

Air Filter
Removal/Installation

1. Raise or remove the seat.
2A. *On carburetted models,* remove the air filter cover screws and washers (**Figure 22**). Remove the cover. Lift the rear of the fuel tank for clearance if necessary and remove the filter (**Figure 23**).
2B. *On fuel injected models,* remove the air filter cover (A, **Figure 24**), and remove the filter (B).
3. To install, reverse the removal steps. Make sure the bottom of the filter is squarely seated in front of the ridge in the bottom of the air box (**Figure 25**).

Paper Element Cleaning

NOTE

Dry paper filters should be cleaned with compressed air or a non-oily solvent. Replace the filter after cleaning 5 times. Do not oil the filter or you will ruin it and cause the engine to run too rich.

Tap the filter sharply against a solid surface to remove the heavy particles, then blow it clean from the inside with compressed air, if available. Kawasaki recommends cleaning the paper-type filter in a non-oily solvent, then allowing it to dry.

Foam Element Cleaning

1. Pull the element carefully off its frame.
2. Clean the element in solvent to remove oil and dirt and let it dry. Inspect the element and replace it if it has any holes or tears.
3. Soak the foam element with SAE 30 oil, then carefully squeeze it as dry as possible. Other oils made specifically for foam air filters, such as Bel-Ray Foam Air Filter Oil, may be used.
4. Slide the element back inside the filter frame.

CLUTCH ADJUSTMENT

Clutch Lever Play

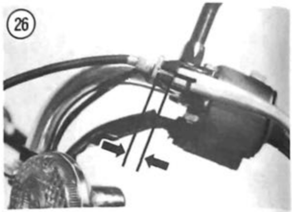
The clutch cable should have about 1/8 in. (2-3 mm) play at the cable end of the lever before the clutch starts to disengage (**Figure 26**). Minor adjustments can be made at the hand lever; loosen the locknut, turn the adjuster as required and tighten the locknut.

According to the maintenance schedule (**Table 1**) or whenever the hand lever adjustment range is used up, adjust the clutch release as described here.

Clutch Release Adjustment

As the clutch cable stretches, cable play will exceed the range of the cable adjusters. As the clutch plates and discs inside the engine wear, the clutch release must be adjusted even if the cable play is within tolerance; otherwise, the clutch can drag and cause rapid wear. Adjust the clutch as follows.

1. In front of the engine, loosen the clutch mid-cable adjuster locknut and shorten the adjuster all the way (**Figure 27**).
2. At the clutch lever, loosen the locknut and turn the adjuster until 3/16-1/4 in. (5-6 mm) of threads are showing between the locknut and the adjuster body (**Figure 28**).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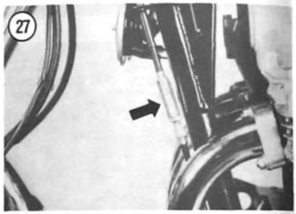
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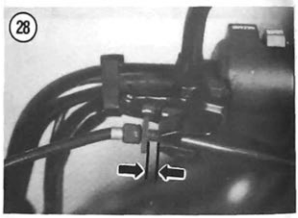
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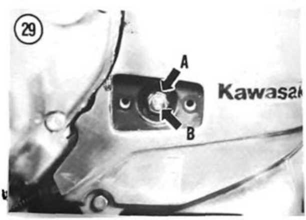

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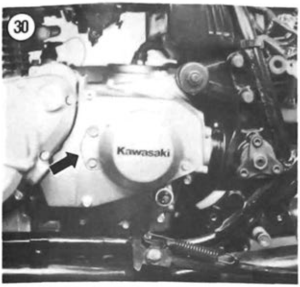

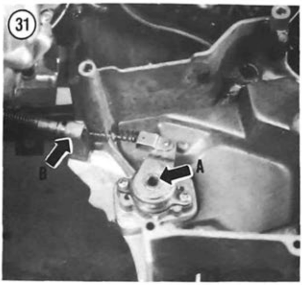

3A. On 1981 chain-drive models, perform the following:

a. Remove the clutch adjuster cover screws and the cover located above the shift pedal.
b. Loosen the locknut (A, **Figure 29**) and turn the release adjusting screw (B, **Figure 29**) clockwise until it becomes hard to turn, then stop.
c. Turn the release adjusting screw counterclockwise 1/4 turn from that point and tighten the locknut. Make sure the adjusting screw does not turn when the locknut is tightened.
d. Install the clutch adjuster cover.

3B. On 1982-on chain-drive models, perform the following:

a. Remove the clutch adjuster cover screws and the cover located above the shift pedal.
b. Loosen the locknut (A, **Figure 29**) and turn the release adjusting screw (B, **Figure 29**) counterclockwise until it becomes hard to turn, then stop.
c. Turn the release adjusting screw clockwise 1/4 turn from that point and tighten the locknut. Make sure the adjusting screw does not turn when the locknut is tightened.
d. Install the clutch adjuster cover.

3C. On shaft-drive models, perform the following:

a. To remove the release adjusting cover (**Figure 30**), perform Steps 1-6 of *Clutch Release Disassembly/Assembly (Shaft-drive)* in Chapter Five.
b. Loosen the locknut and turn the release adjusting screw (A, **Figure 31**) clockwise until it becomes hard to turn, then stop.
c. Turn the release adjusting screw counterclockwise 1/4 turn from that point and tighten the locknut. Make sure the adjusting screw does not turn when the locknut is tightened.
d. Make sure the clutch cable is fully seated in the receptacle in the cover (B, **Figure 31**).
e. Reinstall all components removed; refer to Chapter Five.

4. In front of the engine, lengthen the mid-cable adjuster until it has just taken all slack out of the cable and the clutch lever has no free play. Tighten the locknut.
5. At the clutch lever, turn the adjuster as required to get about 1/8 in. (2-3 mm) of cable free play at the clutch lever.

DRIVE CHAIN ADJUSTMENT (CHAIN-DRIVE MODELS)

Clean, lubricate, adjust and check the drive chain for wear according to the maintenance schedule (**Table 1**). The drive chain is endless (it has no master link) for maximum strength.

Chain Play Inspection

The drive chain must have adequate play so that the chain is not strung tight when the swing arm is horizontal (when the rider is seated). On the other hand, too much play may cause the chain to jump off the sprockets with potentially disastrous results.

1. Put the motorcycle on its centerstand.
2. Turn the rear wheel slowly until you locate the part of the chain that stretches tightest between the 2 sprockets on the bottom chain run (the chain wears unevenly).

3. With thumb and forefinger, lift up and press down the chain at that point, measuring the distance the chain moves vertically. The chain should have about 1 1/4 in. (30-35 mm) of vertical travel at midpoint (**Figure 32**). If it has less than 1 1/8 in. (30 mm) or more than 1 1/2 in. (40 mm) of travel, adjust the chain play.

Drive Chain Adjustment

When adjusting the drive chain, you must also maintain rear wheel alignment. A misaligned rear wheel can cause poor handling and pulling to one side or the other, as well as increased chain, sprocket and tire wear. All models have wheel alignment marks on the swing arm and chain adjusters. If the alignment marks are kept at the same position left and right, the rear wheel should be aligned correctly.

1A. On ZX1100-A models, perform the following:
   a. Put the motorcycle on the centerstand.
   b. Loosen the clamp bolt (**Figure 33**) on each side.
   c. On the left-hand side, insert the shank of a screwdriver or drift into the hole in the rear axle (**Figure 34**) and turn the adjuster either forward or rearward until the correct amount of chain play is achieved.
   d. Remove the drift or screwdriver. Tighten the clamp bolt to 24 ft.-lb. (3.3 mkg).
   e. Rotate the wheel and recheck chain play. Readjust if necessary.

1B. On all other models, perform the following:
   a. Put the motorcycle on the centerstand.
   b. Remove the rear axle nut cotter pin and remove the rear axle nut (A, **Figure 35**).
   c. Loosen the rear torque link nut (B, **Figure 35**).
   d. Loosen the locknuts on both chain adjusters (C, **Figure 35**).
   e. *If the chain was too tight*, back out both adjuster bolts an equal amount and kick the rear wheel forward until the chain is too loose.

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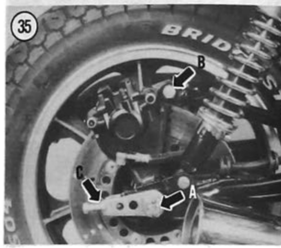

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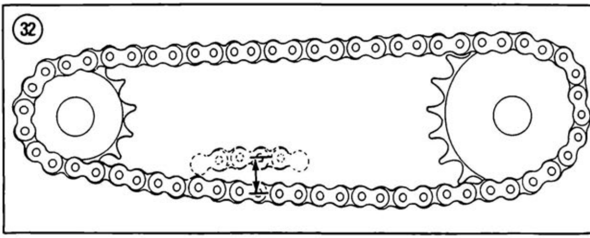

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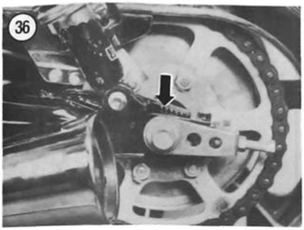

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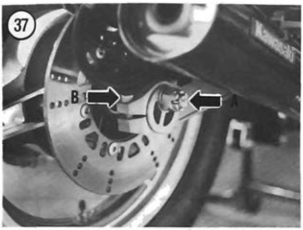

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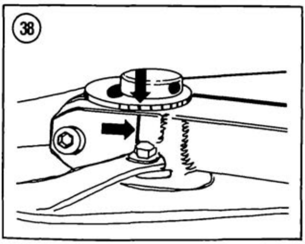

f. Turn both adjuster bolts in an equal amount until the chain play is within specifications. The notch in each chain adjuster should be align with the same alignment mark on each side of the swing arm (**Figure 36**).

g. Rotate the wheel and recheck chain play. Readjust if necessary.

h. Tighten the axle nut to 90 ft.-lb. (12 mkg) and install a new cotter pin.

i. Tighten the chain adjuster locknuts and the rear torque link nut.

Chain Alignment

When chain play is correct, check wheel alignment by sighting along the chain from the rear sprocket. It should leave the sprocket in a straight line. If it is cocked to one side or the other, adjust wheel alignment as follows.

1A. On ZX1100-A models, perform the following:
  a. Put the motorcycle on the centerstand.
  b. Remove the rear axle nut cotter pin and axle nut (A, **Figure 37**).
  c. Loosen the clamp bolt on each side (B, **Figure 37**).
  d. On the left-hand side, insert the shank of a screwdriver or drift into the hole in the rear axle (**Figure 34**) and turn the adjuster either forward or rearward until the notch on each adjuster aligns with the same line on each side of the swing arm (**Figure 38**).
  e. Remove the screwdriver or drift. Tighten the clamp bolt to 24 ft.-lb. (3.3 mkg).
  f. Tighten the axle nut to 72 ft.-lb. (10 mkg) and install a new cotter pin.

1B. On all other models, perform the following:
  a. Put the motorcycle on the centerstand.
  b. Remove the rear axle nut cotter pin and axle nut (A, **Figure 35**).
  c. Loosen the rear torque link nut (B, **Figure 35**).
  d. Loosen the locknuts on both chain adjusters (C, **Figure 35**).
  e. Turn both adjuster bolts until the notch on each chain adjuster aligns with the same line on each side of the swing arm (**Figure 36**).
  f. Tighten the axle nut to 90 ft.-lb. (12 mkg) and install a new cotter pin.
  g. Tighten the chain adjuster locknuts and the rear torque link nut.

Chain Wear Inspection

Kawasaki recommends replacing the drive chain when it has worn longer than 2% of its original length. A quick check will give you an indication of when to measure chain wear. At the rear sprocket, pull one of the links away from the sprocket. If the link pulls away more than 1/2 the height of a sprocket tooth, the chain has probably worn out. To measure chain wear, perform the following.

1. Stretch the chain tight, using the chain adjusters.

2. Lay a scale along the top chain run and measure the length of any 20 links in the chain, from the center of the first pin to the 21st pin (**Figure 39**). If the 20 link length is more than 15.3 in. (389 mm), install a new drive chain; see *Swing Arm Removal* in Chapter Eleven.
3. If the drive chain is worn, inspect the rear wheel and engine sprockets for undercutting or sharp teeth (**Figure 40**). If wear is evident, replace the sprockets too or you'll soon wear out your new drive chain.
4. Readjust drive chain play.

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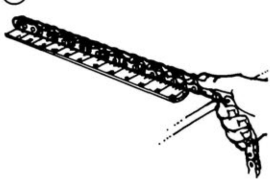

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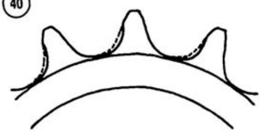
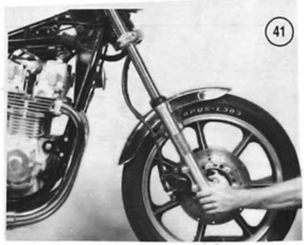


STEERING PLAY INSPECTOR

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. Try the same in the other direction.

NOTE
On some bikes, the wiring and control cables tend to stop the wheel movement. If the steering drags, make sure it's not because of wiring stiffness.

3. If, with a light push in either direction, the front wheel will not turn all the way to the stop, the steering adjustment is too tight.
4. Center the front wheel and kneel in front of it. Grasp the bottoms of the fork legs (**Figure 41**). Try to pull the forks toward you and then try to push them toward the engine. If you feel play, the steering adjustment is too loose.
5. If the steering is too tight or too loose, adjust it as described in Chapter Eleven.



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FRONT FORK

Fork Air Pressure

An air pressurized fork is standard equipment on all models. Both the fork springs and air pressure support the motorcycle and rider. Air pressure should be measured when the fork is cold. The air pressure can be varied to suit the load and your ride preference, but it is very important to have the same pressure in both fork legs to prevent an unbalanced suspension with poor handling.

Some models have a pressure equalization hose just above the lower triple clamp. If your motorcycle doesn't have a pressure equalization hose, you may want to install an accessory pressure equalization line between the fork caps.

The maximum allowable air pressure difference between the fork legs is 1.5 psi, so be very careful when adding or bleeding air from the fork. Don't use a high-pressure hose or air bottle to pressurize the fork; a tire pump is a lot closer to the scale you

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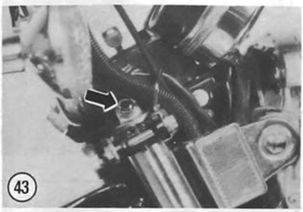

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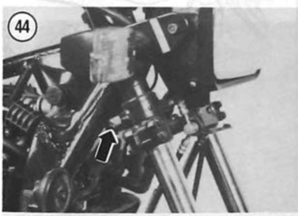

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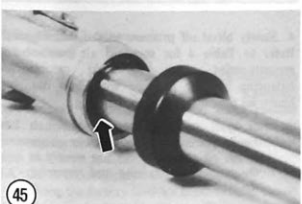


need. Use a combination hand pump/pressure gauge (**Figure 42**).

Keep the following points in mind when adjusting the front forks:

a. Increase air pressure for high-speed riding.
b. If the suspension is too hard, reduce air pressure.
c. If the suspension is too soft, increase air pressure.
d. Occasional bottoming of the fork shows that you are taking good advantage of all their travel. Severe or frequent bottoming should be avoided by increasing air pressure.

1. Support the bike with the front wheel off the ground.
2. Remove the air valve cap(s) (**Figure 43**). The cap is at the lower right triple damp on models with a crossover tube (**Figure 44**).
3. Connect a pump to the valve and pump the fork leg up to about 25 psi (172 kPa).

CAUTION
Do not exceed 36 psi (248 kPa) or the fork seals will be damaged.

4. Slowly bleed off pressure to reach the desired value. Refer to **Table 3** for standard air pressure and recommended range. Kawasaki recommends balancing low fork air pressure with light rear shock preload and damping; heavy fork air pressure with high rear shock preload and damping.

NOTE
Each application of a pressure gauge bleeds off some air pressure merely in the process of applying and removing the gauge.

5. Install the valve cap(s).

Fork Inspection

Apply the front brake and pump the fork up and down hard. You should hear the fork oil as it flows through its passages and there should be no binding.

On models without pleated fork boots, raise the fork dust covers and wipe away any dirt or grit (**Figure 45**). Inspect for fork oil leakage around the fork seals. If there is evidence of leakage, check the fork oil level; see *Fork Oil Change* in Chapter Eleven. New seals should be installed if leakage is excessive.

Anti-Drive Adjustment

On models so equipped, the anti-dive adjustment feature on both fork legs can be adjusted to 3 different positions for different road and load conditions. The number on the anti-dive adjuster (**A, Figure 46**) shows the load settings of 1 (weak), 2 (moderate) or 3 (strong). The number must align with the arrow (**B, Figure 46**) on the anti-dive chamber on the fork leg and both adjusters *must* be set on the same number.

WARNING

Both adjusters must be set at the same number or handling may be impaired and a hazardous riding condition may result.

Make sure the anti-dive adjuster is indexed into one of the position detents and not in between any of the positions.

REAR SHOCK ABSORBERS (DUAL-SHOCK MODELS)

Air Pressure Adjustment (Shaft-drive)

Air pressurized shocks are standard equipment on shaft-drive models. Air pressure should be measured with the shocks at room temperature. The air pressure can be varied to suit the load and your ride preference.

Be very careful when adding or bleeding air. Don't use a high-pressure hose or air bottle to pressurize the shocks; a tire pump is a lot closer to the scale you need. Kawasaki recommends balancing low rear shock air pressure with light shock damping; high shock air pressure with heavy shock damping.

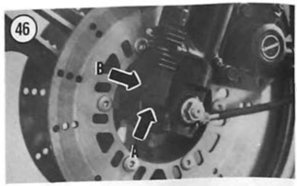
Keep the following points in mind when adjusting the air pressure:

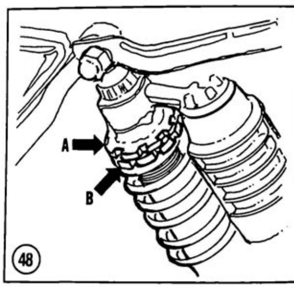
a. Increase air pressure for heavy loads.
b. Increase air pressure for high-speed riding.
c. If the suspension is too hard, reduce air pressure.
d. If the suspension is too soft, increase air pressure.
e. Occasional bottoming of the shocks shows that you are taking good advantage of all their travel. Severe or frequent bottoming should be avoided by increasing air pressure.

1. Support the bike with the wheel off the ground.
2. Remove the air valve cap (**Figure 47**).
3. Connect a pump to the valve and pump the shocks up to about 25 psi (172 kPa).

CAUTION

Do not exceed 70 psi (482 kPa) or the shock seals will be damaged.



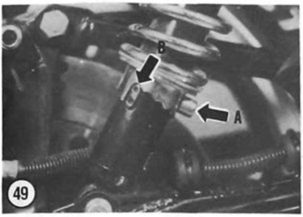


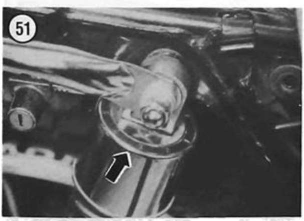
4. Slowly bleed off pressure to the desired value. Refer to **Table 4** for standard air pressure and recommended range. Kawasaki recommends balancing low air pressure with light damping; heavy air pressure with high damping.

NOTE

Each application of a pressure gauge bleeds off some air pressure merely in the process of applying and removing the gauge.

5. Install the valve cap.





Spring Preload Adjustment (Chain-drive)

On chain-drive models, the shock absorbers feature adjustable spring preload. Kawasaki recommends balancing a soft rear shock preload and damping settings with low front fork air pressure; hard shock preload and damping settings with high front fork air pressure.

1A. On R models, perform the following:
   a. Using the factory took kit hook wrench, loosen the upper locknut (A, **Figure 48**).
   b. Turn the lower adjusting nut (B, **Figure 48**) to the desired setting. As viewed from the top of the shock absorber, turn the adjusting nut clockwise for a softer feel or counterclockwise for a harder feel.
   c. Adjust both shocks to the same setting with the same number of threads showing above the adjusting nut.
   d. Tighten the locknut securely.

1B. On all other models, perform the following:
   a. Stick a screwdriver into the adjuster socket (A, **Figure 49**) and turn both preload adjusters to the desired setting (B, **Figure 49**).
   b. As viewed from the top of the shock absorber, turn the adjuster clockwise for a harder feel or counterclockwise for a softer feel.
   c. Adjust both shocks to the same setting.

WARNING
Both shock absorbers must be set at the same preload settings for safe handling.

Damping Adjustment (Shaft-drive Models)

The rear shock absorbers feature adjustable damping. Damping adjustment affects extension (rebound) damping.

Turn both damper wheels to one of the 4 click stops marked on the wheel (**Figure 50**). The No. 1 stop is the softest; the No. 4 stop is the hardest.

Damping Adjustment (Chain-drive Models)

The rear shock absorbers feature adjustable damping. Damping adjustment affects extension (rebound) damping.

1A. On 1983-on R models, turn both damper wheels to one of the 5 click stops marked on the wheel.

1B. On all other models, turn the shock absorber chrome cover (**Figure 51**) to adjust the damping.

2. The number settings are as follows: No. 1 is the softest setting; No. 4 or No. 5 (depending on model) is the hardest setting.

3. Kawasaki recommends balancing a soft rear shock preload and damping settings with low front fork air pressure; hard shock preload and damping settings with high front fork air pressure.

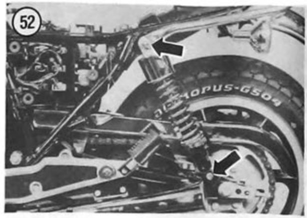
WARNING
Both shock absorbers must be set at the same damping settings for safe handling.

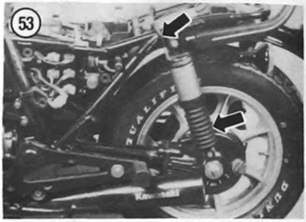
Inspection

Force the rear of the bike up and down. You should hear the fluid working in the shocks. Check for fluid leakage. If there is fluid leakage, replace the shocks; they are not rebuildable.

Check the shock mounting bolts for tightness and their rubber bushings for wear (**Figure 52**).

On models with adjustable air pressure, inspect the rubber dust boots and the interconnecting hoses (**Figure 53**). Install new parts if the old ones are cracked or damaged.





REAR SHOCK ABSORBER (UNI-TRACK MODELS)

Air Pressure Adjustment

The single shock absorber used on these models is air pressurized. Air pressure should be measured with the shock at room temperature. The air pressure can be varied to suit the load and your ride preference.

Be very careful when adding or bleeding air. Don't use a high-pressure hose or air bottle to pressurize the shock; a tire pump is a lot closer to the scale you need. Kawasaki recommends balancing a low rear shock air pressure with light shock damping; high rear shock air pressure with a hard shock damping setting.

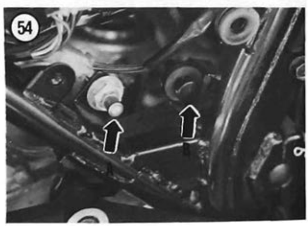
Keep the following points in mind when adjusting the air pressure:

a. Increase air pressure for heavy loads.
b. Increase air pressure for high-speed riding.
c. If the suspension is too hard, reduce air pressure.
d. If the suspension is too soft, increase air pressure.
e. Occasional bottoming of the shock shows that you are taking good advantage of all of the shock's travel. Severe or frequent bottoming should be avoided by increasing the air pressure.

1. Support the bike with the rear wheel off the ground.
2. Remove the right-hand side cover.
3. Remove the air valve cap (A, **Figure 54**).
4. Connect the air pump to the valve and pump the shock to about 60 psi (413 kPa).

CAUTION
Do not exceed 71 psi (490 kPa) or the shock seals may be damaged.

5. Slowly bleed off pressure to the desired value. Refer to **Table 4** for the standard air pressure and recommended range.

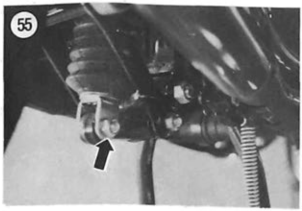


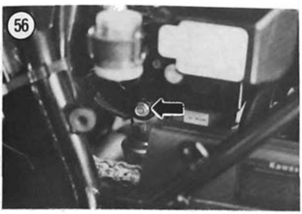
NOTE
Each application of a pressure gauge bleeds off some air pressure merely in the process of applying and removing the gauge.

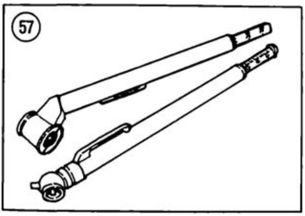
6. Install the valve cap.

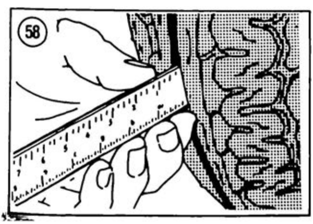
Damping Adjustment

The rear shock absorber features adjustable damping. Damping adjustment affects extension (rebound) damping.









1. Remove the right-hand side cover.
2. Pull out or push in on the adjusting stick (B, **Figure 54**) to one of the 4 click stops marked on the stick.
3. The number settings are as follows: No. 1 is the softest setting; No. 4 is the hardest setting. The No. 1 position is with the adjusting stick pushed all the way in and the No. 4 position is pulled all the way out.

Inspection

Force the rear of the bike up and down. You should hear the fluid working in the shock. Check for fluid leakage. If there is fluid leakage, replace the shock; it is not rebuildable.

Check the shock mounting bolts for tightness and their rubber bushings for wear. Refer to **Figure 55** for the upper bolt and **Figure 56** for the lower bolt.

Inspect the rubber dust boot and the interconnecting hose. Install new parts if the old ones are cracked or damaged.

TIRES

Tire Pressure

Tire pressure must be checked with the tires cold. Correct tire pressure depends a lot on the load you are carrying and how fast you are going. A simple, accurate gauge (**Figure 57**) can be purchased for a few dollars and should be carried in your motorcycle tool kit. See **Table 6** or **Table 7** at the end of the chapter for tire inflation specifications or see the tire and load data label on the motorcycle.

Tire Wear

Check the tread for excessive wear, deep cuts and imbedded objects such as stones, nails or glass. If you find a nail in a tire, mark its location with a light crayon before pulling it out. See *Tire Changing* in Chapter Ten. Check local traffic regulations concerning minimum tread depth. Measure with a small ruler (**Figure 58**). Kawasaki recommends replacement when the front tread depth is 0.04 in. (1 mm) or less. For the rear tire, the recommended limits are 0.08 in. (2 mm) for speeds below 70 mph and 0.12 in. (3 mm) for higher speeds.

WIRE WHEELS

Models equipped with wire spoked wheels require periodic inspection.

Spoke Inspection

Check wire spokes for tightness according to the maintenance schedule (**Table 1**). The "tuning fork" method for checking spoke tightness is simple and works well. Tap each spoke with a spoke wrench or the shank of a screwdriver and listen to the tone. A tight spoke will emit a clear, ringing tone; a loose spoke will sound flat. All of the spokes in a correctly tightened wheel will sound approximately the same pitch.

Tighten any loose spokes with a spoke wrench or a small adjustable wrench (**Figure 59**). One-half to one turn should be sufficient. After tightening the spokes, check the rim runout as described in this chapter to make sure you haven't pulled the rim out of shape.

Bent or damaged spokes should be replaced as soon as they are detected. Refer to *Spokes* in Chapter Ten.

Wire Wheel Runout

You can check runout on wire spoked wheels by simply supporting the wheel off the ground and turning the wheel slowly while you hold a pointer solidly against a fork leg or the swing arm (**Figure 60**). Just be sure any wobble you observe isn't caused by your own hand.

The maximum allowable wheel rim run-out on wire wheels is:

a. Axial (side-to-side): 1/8 in. (3 mm).

b. Radial (up-and-down): 1/16 in. (2 mm).

If runout exceeds these limits, refer to *Wire Wheel Runout* in Chapter Ten for wheel straightening procedures.

CAST WHEELS

On models with one-piece cast alloy wheels, check the cast wheels for cracks, bends or warping. If a wheel is damaged or cracked, replace it; repair is not possible. Periodic runout inspection is not necessary, but if the wheel has been subjected to a heavy impact or if you have any cause to suspect the wheel doesn't run "true," refer to Chapter Ten, *Cast Wheel Runout*.

DISC BRAKE

Inspect the brake function, brake fluid level and brake pad wear according to the maintenance schedule (**Table 1**). The front disc brake automatically compensates for wear and requires no periodic free play adjustment. The brake pedal free play must be inspected any time the pedal height is changed.

Brake Function

Check for a solid feel at the lever and pedal. If the hydraulic brake feels spongy, bleed the system as described in Chapter Ten.

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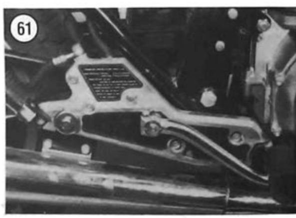

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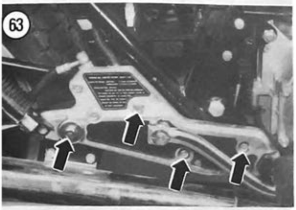
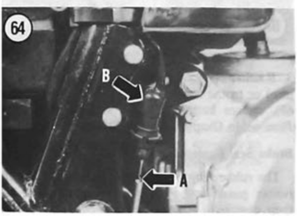
Brake Pedal Height (Major Adjustment)

The rear brake pedal height can be adjusted for comfort and quick reaction time. Once you have set the pedal height no periodic adjustment will be required. This adjustment does affect pedal free play and brake light adjustment. Normal brake pedal height is slightly below the top of the footpeg.

1. Remove the brake pedal clamp bolt (**Figure 61**) and pull the pedal off its splined shaft.

2. Reposition the pedal on the splined shaft, install and tighten the clamp bolt.





Brake Pedal Height (Minor Adjustment)

ZX1100-A models

1. Loosen the locknut and turn the master cylinder pushrod (**Figure 62**).
2. After the desired position is achieved, tighten the locknut.

NOTE
If the desired position cannot be achieved, the brake pedal is either installed incorrectly or is bent and must be replaced.

All other models

1. Remove the brake pedal, muffler mount and the footpeg bracket mounting bolts (**Figure 63**).
2. Disconnect the rear brake light switch spring at the switch (A, **Figure 64**), then carefully turn the footpeg bracket over, without twisting the brake hose excessively.
3. Loosen the brake pushrod locknut (**Figure 65**) and turn the adjuster rod as required for fine adjustment of pedal height. Do not turn the adjuster so far that it contacts the master cylinder piston and becomes hard to turn.
4. Check the adjustment by temporarily installing the bracket and pedal. Make sure the brake is off when the pedal is released. The brake pedal must have some free play or the rear brake may drag and overheat.
5. Tighten the pushrod locknut and install the footpeg bracket, rear footpeg, brake light switch spring and the brake pedal. Tighten all bolts securely.
6. After adjusting pedal height, spin the rear wheel to make sure it is turning freely and apply the brake several times to make sure it releases fully.
7. Adjust the rear brake light switch.

Brake Light Switch Adjustment

1. Turn the ignition switch ON.
2. Step on the brake pedal. The light should come on just as the brake begins to work.
3. To make the light come on earlier, hold the switch body and turn the adjusting nut (B, **Figure 64**) to move the switch body *up*. Move the switch body *down* to delay the light.

CAUTION
Do not turn the brake light switch body or you may [illegible] the wires off [illegible]

NOTE
Some riders prefer having the light come on a little early. This way, they can tap the pedal without braking to warn drivers who follow too closely.

Brake Fluid Level Inspection

On models with translucent reservoirs or transparent windows, check that the fluid level is between the upper and lower level lines (**Figure 66** or **Figure 67**). If you can not see the fluid level, add brake fluid as described in this chapter.

NOTE
To minimize fluid spillage, hold the handlebar as close to horizontal as possible when removing the front reservoir cap.

Adding Brake Fluid

1. Clean the outside of the reservoir cap thoroughly with a dry rag and remove the cap. Remove the diaphragm under the cap.
2. Add fresh brake fluid up to the upper level line in the reservoir.

WARNING
Kawasaki recommends DOT 3 brake fluid. Lower grades may vaporize and cause brake failure. Never use old brake fluid or fluid from a container that has been left unsealed for a long time. Do not leave the reservoir cap off too long or DOT 3 fluid will absorb moisture from the air and will vaporize more easily.

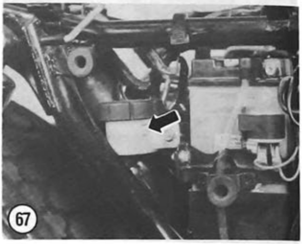
WARNING
Brake fluid is an irritant. Keep it away from your skin and eyes.

CAUTION
Be careful not to spill brake fluid on painted or plastic surfaces or it will destroy the finish. Wash spills immediately with soapy water and rinse thoroughly.

3. Reinstall the diaphragm (and washer on the rear master cylinder) and cap. Make sure that the cap is tight.

Brake Pad Wear Inspection

Inspect the disc brake pads for wear according to the maintenance schedule (**Table 1**).
1. Apply the brake and hold it tight.
2. Shine a light between the caliper and the disc to inspect the brake pads. The brake caliper is shown removed in **Figure 68** for clarity.



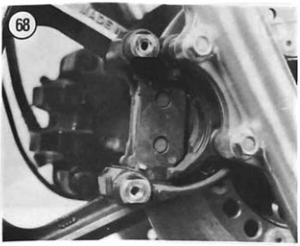
3. If either pad has worn thinner than 1/16 inch (1 mm) or to the stepped portion of the pad (**Figure 69**), replace both pads as a set; see *Brake Pad Removal* in Chapter Ten.

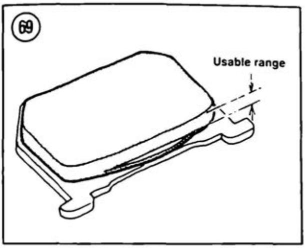
Brake Seal Replacement

The rubber cup inside each master cylinder, the rubber piston seal inside each wheel caliper and their dust seals should be replaced every 2 years regardless of the mileage put on the bike. Replacement of the seals should be accompanied by inspection and, if necessary, rebuilding of the master cylinder and calipers. Because of the special tools required for this kind of work, we recommend you have the job done by a Kawasaki dealer or qualified specialist. Brake system repair is critical work; see Chapter Ten before attempting to rebuild the cylinder and calipers.

Brake Hose Replacement

The hydraulic brake hoses should be replaced every 4 years regardless of the mileage put on the bike; see Chapter Ten.





NUTS, BOLTS AND FASTENERS

Check all exposed nuts, bolts, cotter pins, safety clips and circlips. Pay particular attention to:

a. Control lever, pedal, and linkage pivots.
b. Engine mounting bolts.
c. Handlebar clamp bolts.
d. Top fork clamp bolts.
e. Bottom fork clamp bolts.
f. Front axle clamp and axle nuts.
g. Shock absorber mounts.
h. Swing arm pivot.
i. Rear brake torque link.
j. Rear brake linkage pivot.
k. Rear axle nut.

This check is *especially* important on high mileage machines.

ENGINE TUNE-UP

The following list summarizes routine engine tune-up procedures. Detailed instructions follow the list. These tune-up procedures are arranged so that you start with the jobs that require a cold engine and finish with the jobs that call for a fully warmed-up engine. If you follow the sequence, you won't waste time waiting for your bike to cool down when required. If you aren't giving the bike a complete tune-up, backtrack through the procedures to make sure you've installed all parts.

Consult Chapter Two for troubleshooting procedures when you suspect more serious trouble. Refer to **Table** 5 at the end of the chapter for tune-up specifications.

1. Inspect the battery electrolyte level and add distilled water, if required.
2. Inspect the air filter and clean it or install a new one.

3A. *Carburetted models:* Clean the fuel system. Inspect the fuel lines for cracks or leakage.

3B. *Fuel injected models:* Replace the fuel filter. Periodic cleaning of the fuel system is not necessary unless indicated by a troubleshooting procedure.

4. Inspect the spark plugs; clean them and adjust the gap or replace them if necessary.
5. Inspect valve clearance and adjust if necessary.
6. Inspect the ignition timing mechanical advance operation. Ignition timing inspection should not be required.

7A. *Carburetted models:* Adjust the carburetors if required: throttle cable play, idle mixture (non-U.S. models), idle speed, and synchronizaion.

7B. *Fuel injected models:* Inspect and synchronize the throttle valves, if required.

8. Check and record cylinder compression.

FUEL SYSTEM

As water and dirt accumulate in the fuel tank, carburetor float bowls or fuel filter, engine performance will deteriorate. The fuel system should be cleaned when the engine is cold so that gasoline doesn't spill on hot surfaces.

WARNING
Some fuel may spill during these procedures. Work in a well ventilated area at least 50 feet from any sparks or flames, including gas appliance pilot lights. Do not smoke in the area. Keep a BC rated fire extinguisher handy.

Fuel System Cleaning (Carburetted Models)

1. Check that the ignition switch is OFF.
2. Turn the fuel tap to PRI (prime).
3. Place a tray under the carburetors to catch the gasoline.

4. Loosen one float bowl drain screw one or two turns (**Figure 70**). Any accumulated water will flow out of the drain tube on the bottom of the float bowl. When clean gasoline comes out of the tube, tighten the drain screw. Repeat for the other carburetors.
5. If any water or dirt came out of the carburetors, inspect and clean the carburetors, fuel tap and fuel tank as described in Chapter Seven.
6. Make sure there are no leaks and that the fuel lines are not cracked or worn out.

Fuel Filter (Fuel Injected Models)

Fuel injected models require fuel filter replacement at each yearly or 6,000 mile (10,000 km) maintenance interval. See Chapter Eight.

High-pressure Fuel Hoses (Fuel Injected Models)

Fuel injected models require high-pressure fuel hose replacement every 2 years. See Chapter Eight.

Fuel Line Replacement (Carburetted Models)

The rubber fuel lines should be replaced every 4 years, regardless of the mileage put on the bike; refer to Chapter Seven.

SPARK PLUGS

Heat Range and Reach

The proper spark plug is very important for maximum performance and reliability. The proper heat range requires that a plug operate hot enough to burn off unwanted deposits, but not hot enough to burn up or cause preignition. A spark plug of the correct heat range will show a light tan color on the portion of the insulator within the cylinder after the plug has been in service.

The spark plug recommended by the factory is usually the most suitable for your machine. For low speed riding or when riding in cold weather, a plug one step hotter may be preferable. Refer to **Table 5** at the end of the chapter for the recommended spark plug.

CAUTION
*Ensure the spark plug used has the correct thread reach (**Figure 71**). A thread reach too short will cause the exposed threads in the cylinder head to accumulate carbon, resulting in stripped cylinder head threads when the proper plug is installed. Too long a reach may cause plug/piston contact and serious damage.*

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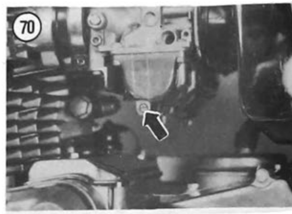

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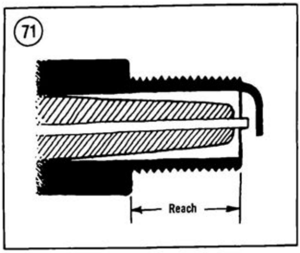


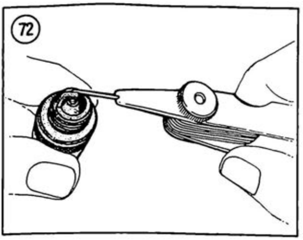
Inspection and Replacement

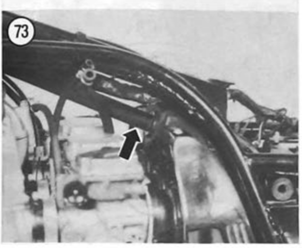
1. Grasp the spark plug lead as near to the plug as possible and pull it off the plug. Clear away any dirt that has accumulated in the spark plug well.

CAUTION
Dirt could fall into the cylinder when the plug is removed, causing serious engine damage.

2. Remove the spark plug with a spark plug wrench.
3. Inspect the spark plug carefully. Look for broken center porcelain, excessively eroded electrodes, or excessive carbon or oil fouling (see the illustrations in Chapter Two). If deposits are light the plug may be cleaned with a wire brush or in a spark plug sandblast cleaner, but the price of a new plug is cheap insurance for high power and gas mileage. Check the spark plug gasket. If it's completely flattened, install a new one.

CAUTION
Never sandblast an oily or wet plug. The grit will stick to the plug and later drop into the engine. After sandblasting a plug, clean it thoroughly.





4. If the plug is reusable, file the center and side electrodes flat. Less voltage is required to jump the gap when the electrode corners are sharp.
5. Measure the gap with a round wire spark plug gauge (**Figure 72**). The gap should be 0.028-0.032 in. (0.7-0.8 mm). The gauge should just be able to pass through the gap. Adjust the gap by bending the side electrode only.
6. Apply a small amount of anti-seize compound to the plug threads. Don't use oil or grease—they'll turn to pure carbon and make the plug harder to get out the next time.

NOTE
If you're going to adjust the valve clearance, leave the spark plugs out until you're finished. It will be easier to turn the engine over.

7. Clean the spark plug seating area on the cylinder head and thread the plug in by hand until it seats. Then tighten the plug 1/8 to 1/2 turn with a spark plug wrench. If you use a torque wrench, the proper torque is 20 ft.-lb. (2.8 mkg).

AIR SUCTION VALVES (U.S. MODELS)

Suction Valve Operation

Models imported into the U.S. are equipped with a simple air suction system to minimize exhaust emissions. The air suction valves (reed valves) allow clean intake air to be sucked into the exhaust ports during exhaust vacuum pulses. This helps complete combustion of unburned hydrocarbons in the exhaust gases.

The air suction valves also prevent exhaust gas from backing up and flowing into the air filter. If that happened, you would have an unplanned and unwanted EGR (exhaust gas recirculation) system. That would cut power a great deal and probably damage the engine. Periodic inspection of suction valve operation is very important.

Suction Valve Inspection

Check the suction valves with the engine off. You can check the air suction valve function by disconnecting the long suction hose at the air filter housing (**Figure 73**). You should be able to blow through this hose into the exhaust system and you should not be able to draw any air out of it because of the suction valve reeds. If you can draw air out of the hose, one or both of the suction valves is faulty.

To remove and inspect each suction valve individually, see *Air Suction System* in Chapter Seven.

VALVE CLEARANCE (ZX1100-A)

Normal wear of the valves and valve seats decreases valve clearance and alters valve timing slightly. Insufficient valve clearance can lead to burned valves and seats and will eventually cause serious engine damage. Excessive clearance causes noisy operation and more rapid valve train wear.

Engines with overhead camshafts that use shims to adjust the valve clearance should not require frequent valve clearance adjustment. The clearance must be inspected according to the maintenance schedule (**Table 1**).

NOTE
Check and adjust the valve clearance with the engine cool, at room temperature.

Valve Clearance Inspection

1. Check that the ignition switch is OFF.

WARNING
Some fuel may spill during this procedure. Work in a well-ventilated area at least 50 feet away from any sparks or flames, including gas appliance pilot lights. Keep a BC rated fire extinguisher handy.

2. Remove the fuel tank as described in Chapter Seven.
3. Remove the valve cover as described in Chapter Four.
4. Check that all 16 camshaft cap bolts (**Figure 74**) are properly tightened to 12 ft.-lb. (1.7 mkg).
5. Remove the timing cover and gasket from the lower right-hand side of the engine.
6. Turn the crankshaft clockwise with a 17 mm wrench on the pulse coil rotor bolt (A, **Figure 75**) until the "T 1.4" mark (B, **Figure 75**) aligns with the fixed pointer on the engine (C, **Figure 75**).

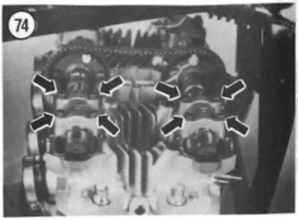
NOTE
The cylinders are numbered 1 through 4 starting at the left-hand side. The exhaust valves are at the front of the engine and the intake valves are at the rear.

7. Either the No. 1 or No. 4 cylinder will now be at top dead center (TDC) on the compression stroke.

NOTE
*A cylinder at TDC on the compression stroke will have both cam lobes pointing directly away from its valve lifter (**Figure 76**).*

8. Measure the valve clearance of the valves where the cam lobe is pointing directly away from the valve lifter. With the engine in this position you can measure either the exhaust valves on the No. 1 and No. 2 cylinders or the exhaust valves on the No. 3 or No. 4 cylinders.
9. Insert a flat feeler gauge between the cam lobe and the valve lifter (**Figure 77**). The clearance is correct when the feeler gauge drags slightly as it is inserted and withdrawn. Record the measurements and cylinder numbers.
10. Turn the crankshaft clockwise with a 17 mm wrench on the pulse coil rotor bolt until the "T 1.3" mark aligns with the fixed pointer on the engine.
11. Either the No. 2 or No. 3 cylinder will now be at top dead center (TDC) on the compression stroke.

74



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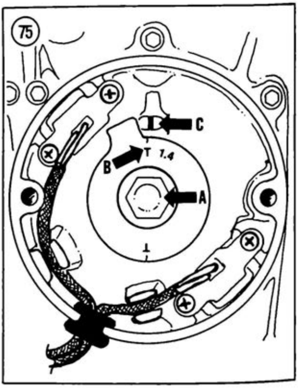
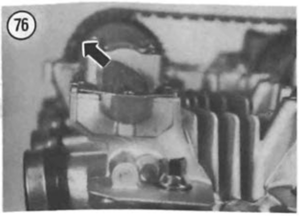


12. Measure the valve clearance of the valves where the cam lobe is pointing directly away from the valve lifter. With the engine in this position you can measure either the intake valves on the No. 1 and No. 2 cylinders or the intake valves on the No. 3 or No. 4 cylinders.
13. Repeat Steps 6-12 for the remaining valves.
14. If any of the clearances are not within the range specified in **Table 5**, skip ahead to *Valve Clearance Adjustment* in this chapter. If all the valve clearances are within the specifications, continue this procedure.
15. Install the valve cover as described in Chapter Four.
16. Install the fuel tank as described in Chapter Seven.



Valve Clearance Adjustment

To adjust the valve clearance the shim between the bottom of the valve lifter and the valve spring retainer must be removed and replaced with one of a different thickness. The shims are available from Kawasaki dealers in increments of 0.05 mm and range in size from 2.00-3.20 mm. The dimension is marked on the bottom shim surface.

This procedure pertains only to valves that need adjustment. Do not remove any shims on a valve within the specified clearance range.

1. Remove the valve cover as described in Chapter Four.

NOTE
In the following step, remove only the camshaft that is affected by a valve(s) with incorrect valve clearance.

2. Remove the camshaft(s) as described in Chapter Four.
3. Remove the valve lifter from the top of the affected valve(s).
4. Remove the shim from the top surface of the valve spring retainer(s).
5. Measure the thickness of the shim with a micrometer. The original thickness will be marked on the bottom surface of the shim. Do not rely on the marked thickness as the shim will have worn some, depending on the mileage, and will no longer be accurate.
6. Calculate the correct shim thickness using this example. To obtain the specified valve clearance listed in **Table 5**:

NOTE
For calculations, use the mid-point of the specified clearance tolerance; for example, if the specification is 0.08-0.18 mm, use 13 mm.

NOTE
The following numbers are for example only.

a. Subtract the specified clearance from the actual measured clearance. For example, 0.52 (measured) minus 0.13 (specified) equals 0.39 mm. This is the excess clearance.
b. Add the excess clearance to the existing shim thickness. For example, 0.39 (excess) plus 2.20 (existing shim) equals 2.59 mm. This is the required new shim thickness.
c. Round up to the nearest available shim number. For example, if your required thickness is 2.59 mm, use shim No. 260.

7. In order to keep the shim in place, apply a light coat of high-temperature grease to the spring retainer. Install the shim (number side down) into the receptacle in the spring retainer. Make sure the shim is completely seated in the spring retainer. If not, the valve clearance will be off.
8. Install the valve lifter.

CAUTION
Never place shim stock under a shim. This shim could work loose at high rpm and cause extensive engine damage. Never grind the shim; this can remove the hardened outer shim surface and cause shim fracture and extensive engine damage.

CAUTION
Do not grind the end of the valve stem to repair it or to permit additional valve clearance. If the valve end is ground, the shim may contact the spring retainer and/or the split keepers while the engine is running. This may cause the keepers to loosen and the valve may drop into the engine, causing extensive engine damage.

NOTE

*If the largest available shim does not increase clearance to within the acceptable limits, the valve seat is probably worn. If this is the case, repair the valve seat and/or replace the valve and recheck the clearance. See **Valve and Seat Inspection** in Chapter Four.*

9. Repeat this procedure for all affected valves.
10. Install the camshaft(s) as described in Chapter Four.
11. Rotate the crankshaft several times to fully seat the shim(s), then recheck the valve clearance.
12. Install the valve cover as described in Chapter Four.
13. Install the fuel tank as described in Chapter Seven.

VALVE CLEARANCE (ALL MODELS EXCEPT ZX1100-A)

Normal wear of the valves and valve seats decreases valve clearance and alters valve timing slightly. Insufficient valve clearance can lead to burned valves and seats and will eventually cause serious engine damage. Excessive clearance causes noisy operation and more rapid valve train wear.

Engines with overhead camshafts that use shims to adjust valve clearance should not require frequent valve clearance adjustment. The clearance must be inspected according to the maintenance schedule (**Table 1**).

NOTE

Check and adjust valve clearance with the engine cool, at room temperature.

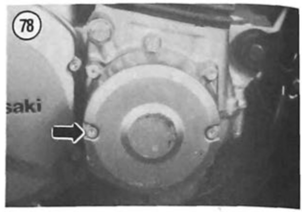
Valve Clearance Inspection

1. Check that the ignition switch is OFF.

WARNING

Some fuel may spill during this procedure. Work in a well-ventilated area at least 50 feet from any sparks or flames, including gas appliance pilot lights. Do not smoke in the area. Keep a BC rated fire extinguisher handy.

2. Remove the fuel tank as described in Chapter Seven.
3. Remove the valve cover as described in Chapter Four.
4. Check that all 16 camshaft cap bolts (**Figure 74**) are properly tightened to 12 ft.-lb. (1.7 mkg).
5. Remove the timing cover and gasket from the lower right side of the engine (**Figure 78**).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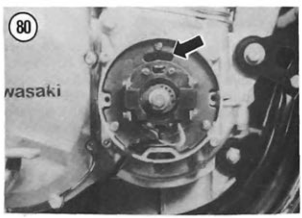
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6. Turn the crankshaft clockwise with a 17 mm wrench on the outer advancer bolt (**Figure 79**) until one of the cam lobes is pointing directly away from its valve (**Figure 76**).

NOTE

*For clarity, the timing marks are shown with the ignition timing assembly removed. Observe the marks through the upper hole in the timing plate (**Figure 80**).*

7. Insert a flat feeler gauge between the cam lobe and the lifter (**Figure 77**). The clearance is correct

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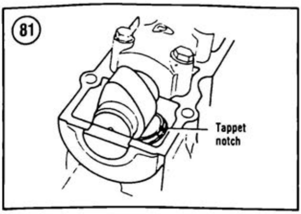

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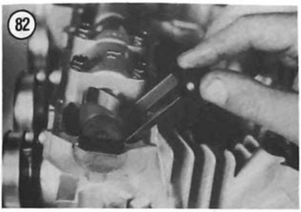

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when the feeler gauge drags slightly when it is inserted and withdrawn. Repeat for all valves, turning the crankshaft clockwise, viewed from the right side. Record the measurements and cylinder numbers.

NOTE

The cylinders are numbered 1 through 4 starting at the left side of the engine.

8. If any of the clearances are not within the range specified in **Table 5**, skip ahead to *Valve Clearance Adjustment*. If all the valve clearances are within specification, continue this procedure.

9. Install the valve cover as described in Chapter Four.

10. Install the fuel tank as described in Chapter Seven.

Valve Clearance Adjustment

To adjust the valve clearance the shim between the cam lobe and the valve lifter must be removed and replaced with one of a different thickness. The shims are available from Kawasaki dealers in increments of 0.05 mm and range in size from 2.00-3.20 mm. The dimension is marked on the bottom shim surface.

This procedure pertains only to valves that need adjustment. Do not remove any shims on valves whose clearance falls within the specified range.

1. Turn the crankshaft until the cam lobe points away from the lifter being adjusted. Rotate the lifter so its notch points to the spark plug (**Figure 81**). This makes it easier to remove the shim.

NOTE

Kawasaki supplies a special Valve Lifter Holder for changing valve shims. The part number is 57001-113.

2. Pry on the edge of the lifter to push it down, then insert a wedge to lock the lifter down (**Figure 82**).

CAUTION

When the valve lifter is held down, do not rotate the engine or the piston could contact and bend the valve being held open.

3. Remove the shim (**Figure 83**). Measure the thickness of the removed shim with a micrometer. The original thickness will be marked on the lifter side of the shim. Do not rely on the marked thickness as the shim will have worn some, depending on mileage, and will no longer be accurate.

4. Calculate the correct shim thickness using this example. To obtain the specified valve clearance listed in **Table 5**:

NOTE

The following numbers are for example only.

a. Subtract the specified clearance from the actual measured clearance. For example, 0,52 (measure) minus 0,15 (specified) equals 0.37 mm. This is the excess clearance.

b. Add the excess clearance to the existing shim thickness. For example, 0.37 (excess) plus 2.20 (exisiting) equals 2.57 mm. This is the required new shim thickness.

c. Round up to the nearest available shim number. For example, if your required shim thickness is 2.57 mm, use shim No. 260.

5. Insert the new shim with its numbered side facing down, so the cam lobe doesn't rub off the number.

CAUTION

Never put shim stock under a shim. The shim could work loose at high rpm and cause extensive engine damage. Never grind the shim; this can remove the hardened outer shim surface and cause shim fracture and extensive engine damage.

NOTE

If the largest 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 valve stem slightly, and recheck the clearance. See ***Valve and Seat Inspection*** *in Chapter Four.*

CAUTION

Do not insert the cam chain tensioner cross wedge until after the valve cover and its chain guide are installed.

6. Remove the tool holding the lifter down.

7. Rotate the crankshaft several times to fully seat the shim, then recheck the valve clearance.

8. Install the valve cover as described in Chapter Four.

9. Install the fuel tank as described in Chapter Seven.

IGNITION TIMING

Ignition timing inspection is not *required* maintenance. Transistorized ignition initial timing is very stable and once it is set properly it should last the life of the motorcycle without adjustment. This optional procedure is provided in case of suspected trouble.

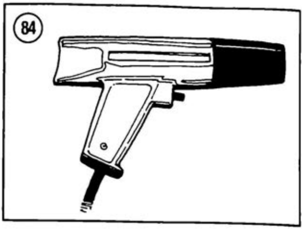
The ignition advance mechanism is a mechanical device that must be lubricated according to the maintenance schedule (**Table 1**). If not maintained properly, the advance mechanism could stick and cause low power, overheating, spark knock or detonation.

Transistorized ignition can not be checked statically. It must be inspected dynamically (engine running) with a strobe timing light (**Figure 84**).

1. Install the spark plugs as described in this chapter.

2. Remove the timing cover and gasket from the lower right side of the engine.

84



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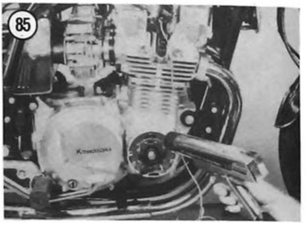

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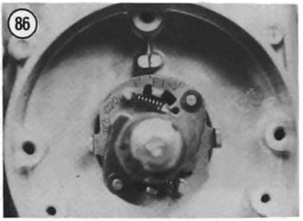
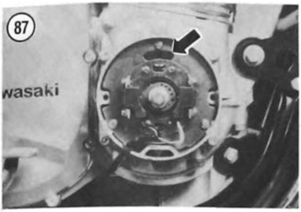
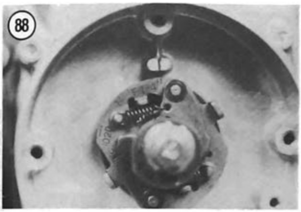


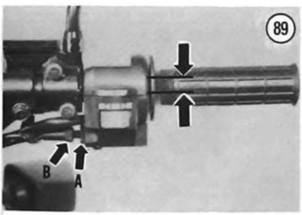
3. Hook up a stroboscopic timing light to the No. 1 or No. 4 spark plug lead according to the manufacturer's instructions (**Figure 85**).

4. Start the engine and let it idle. Check that the idle speed is within specification before inspecting dynamic timing; a very high idle speed may begin the ignition advance process and give a faulty reading.

5. Shine the timing light at the timing inspection marks. The "F" mark on the advancer should align with the index mark at idle (**Figure 86**).







NOTE

*For clarity, the timing marks are shown with the timing plate assembly removed. Observe the marks through the upper hole in the timing plate (**Figure 87**).*

6. If the "F" mark does not align at idle, stop the engine and remove and inspect the ignition advance assembly; see *Ignition Advance* in Chapter Eight. Recheck the timing.
7. Increase the engine speed to 4,000 rpm and check that the index mark falls between the double line advance mark (**Figure 88**). If the advancer does not work correctly, refer to *Ignition Advance* in Chapter Eight.
8. Stop the engine and install the timing cover and gasket.

CARBURETION OR FUEL INJECTION

Throttle Cable Play

Always check the throttle cable before you make any other carburetor or fuel injection adjustments. Too much free play causes jerky throttle response; too little free play will cause unstable idling.

1. Check free play at the throttle grip flange (**Figure 89**). Kawasaki specifies about 1/8 in. (2-3 mm).
2. If adjustment is required, loosen the throttle grip cable adjuster locknut (A, **Figure 89**) and turn the adjuster (B) to get your desired free play. Tighten the locknut.

Idle Speed

The idle speed should be adjusted only when the engine is fully warmed up and all other tune-up operations done.

Proper idle speed setting is necessary to prevent stalling and to provide adequate engine compression braking when you let off the throttle, but you can't set it perfectly with the bike's tachometer—it's just not accurate at the low end. If you don't have a portable tachometer you're about as well off setting idle by ear and feel: if it stalls, set idle faster; if you want more engine braking when decelerating, set idle slower.

1. Ride the bike to warm it up fully (about 10 minutes).
2. Stop the engine and attach a portable tachometer, following the instrument manufacturer's instructions.

3A. On carburetor equipped models, start the engine and turn the idle speed screw (**Figure 90**) to set the idle speed as specified in **Table 5**. If you do not have a tachometer, set the idle speed to the lowest speed at which the engine will idle smoothly.

3B. On fuel injected models, perform the following:

a. On R models, start the engine and turn the idle speed screw (**Figure 91**) to set the idle speed as specified in **Table 5**. If you do not have a tachometer, set the idle speed to the lowest speed at which the engine will idle smoothly.

NOTE

On 1981 models, make sure the wire connected to the idle speed screw is not twisted or kinked. If necessary, disconnect, straighten and reconnect the wire. If the idle speed is unstable, see Chapter Eight for fuel injection troubleshooting.

b. On ZX1100-A models, start the engine and turn the idle speed screw (**Figure 92**) to set the idle speed as specified in **Table 5**. If you do not have a tachometer, set the idle speed to the lowest speed at which the engine will idle smoothly.

4. Rev the engine a couple of times to see if it settles down to the set speed. Readjust if necessary.

Idle Mixture Adjustment (Non-U.S. Models)

The idle fuel-air *mixture* on carburetted models affects low-speed emissions, as well as idling stability and response off idle. See *Idle Mixture Adjustment* in Chapter Seven.

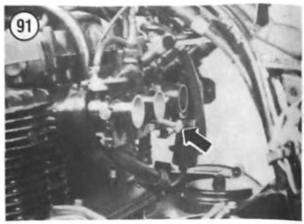
On motorcycles imported into the United States, the idle *mixture* screw is set and sealed at the factory and requires no adjustment.

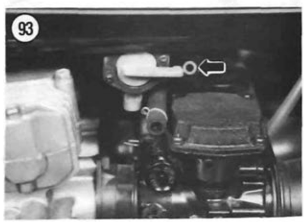
Carburetor Synchronization

Synchronizing the carburetors makes sure that one cylinder doesn't try to run faster than the others, cutting power and gas mileage. The only accurate way to synchronize the carburetors is to use a set of vacuum gauges (a manometer) that measures the intake vacuum of all cylinders at the same time. A typical set of gauges is shown in Chapter One.

NOTE

Before you try to synchronize the carburetors, make sure all of the following are checked or adjusted first; if not, you won't get a good synch: air filter, spark plugs, air suction valves (U.S. models), valve clearance, point gap and ignition timing, throttle cable play, carburetor holders and clamps air-tight.



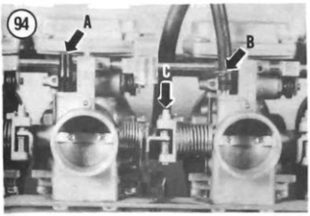


1. Ride the bike to warm it up fully, set the idle speed, then stop the engine.

2. Remove the fuel tank; see Chapter Seven. Hook up a temporary fuel supply or use a long fuel line to connect the carburetors to the fuel tank. Plug the vacuum line that goes from the carburetor to the vacuum fuel tap (**Figure 93**).

WARNING

When supplying fuel by temporary means, make sure the tank is secure and all fuel lines tight—no leaks.



3. Remove the rubber caps or vacuum line from the vacuum tap in front of each carburetor (A and B, **Figure 94**) and attach a set of vacuum gauges, following the instrument manufacturer's instructions.
4. Turn the fuel tap to PRI (prime), start the engine and check that the vacuum difference between the cylinders is less than 0.80 in. Hg (20 mm Hg). Identical readings are desirable.
5. If the difference is greater than specified, loosen the locknut and turn the appropriate synchronizing screw located between the carburetors as required to equalize the vacuum in all cylinders (C, **Figure 94**). First match No. 1 and No. 2 carburetors, then match No. 3 and No. 4, and finally match the left pair of cylinders to the right pair. The No. 1 cylinder is on the left-hand side.

WARNING
When supplying fuel by temporary means, make sure the tank is secure and all fuel lines are tight. There must be no fuel leaks.

6. Rev the engine once and check that all cylinders return to equal readings. Readjust if necessary, then tighten the adjuster locknuts while holding the adjusters steady.
7. Reset the idle speed, stop the engine and install the vacuum lines and caps.
8. Install the fuel tank as described in Chapter Seven.

Throttle Valve Synchronization (Fuel Injected Models)

Synchronization of the throttle valves on fuel injected models should be inspected on a regular basis, but adjustment should rarely be required; see *Throttle Valve Synchronization* in Chapter Eight.

If you suspect that a problem may be caused by poor synchronization, see Chapter Eight for fuel injection troubleshooting.

CYLINDER COMPRESSION

A cylinder cranking compression check is not *required* maintenance, but it is the quickest way to check the internal condition of the engine: rings, valves, head gasket, etc. It's a good idea to check compression at each tune-up, write it down and compare it with the reading you get at the next tune-up. This will help you spot any developing problems before they create a major breakdown.

Cylinder Compression (Carburetted Models)

1. Ride the bike to warm it up fully. Make sure the choke is off.
2. Remove the spark plugs.
3. Insert the tip of a compression gauge into the spark plug hole, making sure it seals fully (**Figure 95**).
4. Turn the kill switch off, hold the throttle wide open and crank the engine several revolutions until the gauge gives its highest reading. Record the number and repeat for the other cylinders.

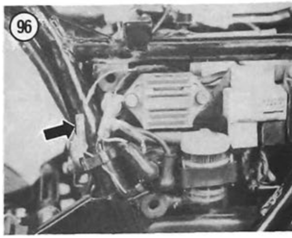
When interpreting the results, the actual reading is not as important as the difference from the last check and the differences between cylinders. Individual gauge calibrations vary widely. A significant drop (more than 10%) since the last check (made with the same gauge) may indicate engine top end problems. Barometric pressure could also cause variance.

If the compression is 150 psi or more on 1100 cc models (160 psi on 1000 cc models), and there is less than a 10% difference between cylinders, compression is normal. If any cylinder reads less than about 115 psi, check your readings with a recently calibrated gauge. It may be time to rebuild the top end (rings and valves).

To tell the source of a problem, pour about a teaspoon of motor oil into the spark plug hole. Turn the engine over once to distribute the oil, then take another compression reading. If the compression increases significantly, the valves are good, but the rings are worn. If compression does not increase, the valves may be damaged.

Cylinder Compression (Fuel Injected Models)

Check cylinder compression on fuel injected models the same as on carbureted models, but disconnect the white/red lead from the starter solenoid to the fuel injection wiring harness to temporarily disable the fuel injectors (**Figure 96**).



STORAGE

Several months of inactivity can cause problems and a general deterioration of bike condition if proper care is neglected. This is especially true in areas of weather extremes. During the winter months you should prepare your bike carefully for "hibernation."

Selecting a Storage Area

Most cyclists store their bikes in their home garages. If you do not have a garage, storage spaces are available for rent or lease in many areas. In selecting a building, consider the following points.

1. The storage area must be dry (free from excessive dampness). Heating is not necessary, but an insulated building is preferable.
2. Buildings with large window areas should be avoided or such windows should be masked if direct sunlight can fall on the bike (also a good security measure).
3. If you live near the ocean, make sure the area is sealed against salt spray and mist.
4. Select an area with minimum risk of fire or theft. Check your insurance to see if your bike is covered while in storage.

Preparing the Bike for Storage

Careful preparation will minimize deterioration and make it easier to restore the bike to service later. Use the following procedure.

1. Ride the bike until it is fully warmed up. Drain the oil, regardless of mileage since the last oil change. Change the oil filter and fill the engine with the normal quantity of fresh oil.
2. Wash the bike completely. Make certain to remove any road salt which may have accumulated during the first weeks of winter. Wax all painted and polished surfaces, including any chromed areas.
3. Remove the battery and coat the cable terminals with petroleum jelly. If there is evidence of acid spillage in the battery box, neutralize with baking soda, wash clean and repaint the damaged area. Store the battery in an area where it will not freeze and recharge it once a month.
4. Drain all gasoline from the fuel tank, connecting hoses and carburetors. As an alternative, a fuel preservative may be added to the fuel and the tank should be filled to minimize water condensation. These preservatives are available from many motorcycle shops and marine equipment suppliers.

CAUTION

Do not add any preservative to the fuel tank when storing a fuel-injected motorcycle. The injectors and filter may be damaged.

5. Remove the plugs and add about a teaspoon of motor oil to each cylinder. Crank the engine a few revolutions to distribute the oil and install the spark plugs.
6. Check the tire pressures. Move the machine to the storage area and prop it up with both wheels off the ground.
7. Cover the bike with material that will allow air circulation. Don't use plastic.

Before You Start the Bike

If you prepared the bike for storage, there are only a few things you will need to do before it is ready to ride again.

1. Before you move the bike, inflate the tires to the correct pressures. They often get soft over an extended period of non-use.
2. Check all fluid levels: brake fluid, engine oil, final drive case oil. Top them up if necessary.
3. Make sure the battery is fully charged and that the electrolyte level is correct before installing the battery.
4. Fill the fuel tank with fresh gasoline. If a fuel preservative was used, discard the treated fuel safely.
5. Perform a regular tune-up as described in this chapter.

Table 1 MAINTENANCE SCHEDULE

Weekly/gas stop	• Check tire pressure cold and adjust to suit load and speed • Check brake for a solid feel • Check throttle grip for smooth opening and return • Check clutch lever play and adjust if necessary • Check steering for smooth but not loose operation • Lubricate drive chain every 200 miles (300 km); check/adjust play if necessary • Check axles, suspension, controls and linkage nuts, bolts and fasteners; tighten if necessary • Check engine oil level; add oil if necessary • Check lights and horn operation, especially brake light • Check for any abnormal engine noise and leaks • Check kill switch operation
Monthly/3,000 miles (5,000 km)	• Check battery electrolyte level add water if necessary; check more frequently in hot weather • Check brake fluid level; add if necessary
6 month/3,000 miles (5,000 km)	• Clean or replace air filter • Inspect air suction valves (U.S. models), replace if necessary • Clean spark plugs, set gap, replace if necessary • Check/adjust valve clearance if necessary • Check/adjust carburetor cable play, idle speed and synchronization, if necessary • Change engine oil (and filter every other time) • Lube cables, levers, pedals, pivots, throttle grip • Adjust clutch release • Check tire wear • Check wheel spokes and rim runout • Check drive chain wear • Check brake pads wear • Check brake light switch operation; adjust if necessary • Check steering play; adjust if necessary • Check suspension • Drain float bowls (carburetted models)
Yearly/6,000 miles (10,000 km)	• Change air filter • Change brake fluid • Change fork oil • Lubricate ignition advance • Check nuts, bolts, fasteners; tighten all • Change fuel filter (fuel-injected models) • Grease swing arm bearings (chain-drive models) • Check final gear case oil level; add if necessary (shaft-drive models) • Grease drive shaft joints @ 6,000 miles, then every 18,000 miles (shaft-drive models) • Grease swing arm bearings @ 6,000 miles, then every 18,000 miles (shaft-drive models)
2 years/12,000 miles (20,000 km)	• Grease wheel bearings • Grease steering bearings • Change final gear case oil every 18,000 miles

(continued)

Table 1 MAINTENANCE SCHEDULE (continued)

2 years	• Replace disc brake master cylinder cup and dust seal • Replace disc brake caliper piston seal and dust seal • Replace high pressure fuel hoses (fuel-injected)
4 years	• Replace brake hoses • Replace fuel hoses

Table 2 MODEL YEAR/SUFFIX DESIGNATION (U.S. AND CANADA)

1981	1982
KZ1000-J1 KZ1000-K1 KZ1000-M1 KZ1100-A1 KZ1100-B1	KZ1000-J2 (Standard) KZ1000-K2 (LTD) KZ1000-M2 (CSR) KZ1000-R1 (Replica) KZ1100-B2 (GPz) KZ1100-A2 (Shaft-drive Standard) KZ1100-D1 (Shaft-drive Spectre)

1983	1984	1985
KZ1000-R2 (Replica) KZ1000-J3 ZX1100-A1 (GPz) KZ1100-A3 (Shaft-drive Standard) KZ1100-D2 (Shaft-drive Spectre) KZ1100-L1 (LTD)	ZN1100-B1 (LTD) ZX1100-A2 (GPz)	ZN1100-B2 (LTD)

Table 3 FORK AIR PRESSURE

Model	Standard	Range
KZ1000-J, KZ1000-R, KZ1100-B		
U.S., Canada	4.3 psi (30 kPa)	3.6-5.0 psi (25-35 kPa)
Others	7.1 psi (50 kPa)	6.4-7.8 psi (45-55 kPa)
KZ1000-K, M	7.1 psi (50 kPa)	5.8-8.7 psi (40-60 kPa)
KZ1100-A, D, L	8.5 psi (60 kPa)	7-10 psi (50-70 kPa)
ZX1100-A	7.1 psi (50 kPa)	0-14 psi (0-98 kPa)

Table 4 REAR SHOCK AIR PRESSURE

Model	Range
KZ1000-A, D	5.7-21 psi (40-150 kPa)
ZX1100-A	14-57 psi (98-390 kPa)

Table 5 TUNE-UP SPECIFICATIONS

Spark plug gap	0.28-32 in. (0.7-0.8 mm)	
Spark plug type		
U.S. models	NGK B8ES	ND W24ES-U
Others	NGK BR8ES	ND W24ESR-U
Valve clearance		
(Intake and exhaust)		
ZX1100-A	0.003-0.007 in. (0.08-0.18 mm)	
All other models	0.002-0.006 in. (0.05-0.15 mm)	
Idle speed	1,000 rpm	
Carburetor synchronization	with 0.8 in. (2 cm) Hg	

Table 6 TIRES AND TIRE PRESSURE (U.S. AND CANADA)

	Pressure @ load	
Model/tire size	0-215 lb. (0-97.5 kg)	Over 215 lb. (Over 97.5 kg)
KZ1000-J, KZ1100-B (tubeless)		
Front 3.25V-19 4PR	28 psi (200 kPa)	28 psi (200 kPa)
Rear 4.25V-18 4PR	32 psi (225 kPa)	36 psi (250 kPa)
KZ1000-K (tubeless)		
KZ1000-M (tube-type)		
Front 3.25H-19 4PR	28 psi (200 kPa)	28 (200 kPa)
Rear 130/90-16 67H 4PR	28 psi (200 kPa)	32 (225 kPa)
KZ1000-A (tubeless)		
Front 3.50H-19 4PR	28 psi (200 kPa)	28 (200 kPa)
Rear 130/90-16 67H 4PR	28 psi (200 kPa)	36 (250 kPa)
KZ1000-D (tubeless)		
Front 3.25H-19 4PR	28 psi (200 kPa)	28 (200 kPa)
Rear 130/90-16 67H 4PR	28 psi (200 kPa)	36 (250kPa)

Table 7 TIRES AND TIRES PRESSURE (EUROPEAN)

		Pressure @ load	
Model/tire size	0-215 lb. (0-97.5 kg)	215-330 lb. (97.5-150 kg)	Over 330 lb. (Over 150 kg)
KZ1000-J, KZ1100-B			
Front 3.25V-19 4PR (tubeless)			
Up to 130 mph (210 kph)	28 psi (200 kPa)	28 psi (200 kPa)	32 psi (225 kPa)
Over 130 mph (210 kph)	32 psi (225 kPa)	32 psi (225 kPa)	32 psi (225 kPa)
Rear 4.25V-18 4PR (tubeless)			
Up to 130 mph (210 kph)	32 psi (225 kPa)	32 psi (225 kPa)	36 psi (250 kPa)
Over 130 mph (210 kph)	41 psi (290 kPa)	41 psi (290 kPa)	41 psi (290 kPa)
KZ1000-K			
Front 3.25V-19 4PR (tubeless)			
Up to 130 mph (210 kph)	28 psi (200 kPa)	28 psi (200 kPa)	32 psi (225 kPa)
Over 130 mph (210 kph)	32 psi (225 kPa)	32 psi (225 kPa)	32 psi (225 kPa)

(continued)

Table 7 TIRES AND TIRES PRESSURE (EUROPEAN) (continued)

Model/tire size	Pressure @ load 0-215 lb. (0-97.5 kg)	215-330 lb. (97.5-150 kg)	Over 330 lb. (Over 150 kg)
KZ1000-K (continued)			
Rear 130/90V-16 4PR (tubeless)			
Up to 130 mph (210 kph)	28 psi (200 kPa)	32 psi (225 kPa)	36 psi (250 kPa)
Over 130 mph (210 kph)	41 psi (290 kPa)	41 psi (290 kPa)	41 psi (290 kPa)
KZ1100-A			
Front 3.50V-19 4PR (tubeless)			
Up to 130 mph (210 kph)	28 psi (200 kPa)	28 psi (200 kPa)	28 psi (200 kPa)
Over 130 mph (210 kph)	32 psi (225 kPa)	32 psi (225 kPa)	32 psi (225 kPa)
Rear 130/90V-16 4PR (tubeless)			
Up to 130 mph (210 kph)	28 psi (200 kPa)	36 psi (250 kPa)	36 psi (250 kPa)
Over 130 mph (210 kph)	41 psi (290 kPa)	41 psi (290 kPa)	41 psi (290 kPa)
ZX1100-A			
Front 110/90 V18 4PR (tubeless)			
Up to 130 mph (210 kph)	28 psi (200 kPa)	32 psi (225 kPa)	–
Over 130 mph (210 kph)	32 psi (225 kPa)	32 psi (225 kPa)	–
Rear 130/90 V17 4PR (tubeless)			
Up to 130 mph (210 kph)	32 psi (225 kPa)	36 psi (250 kPa)	–
Over 130 mph (210 kph)	41 psi (290 kPa)	41 psi (290 kPa)	–
KZ1100-D			
Front 3.25V-19 4 PR (tubeless)			
Up to 130 mph (210 kph)	28 psi (200 kPa)	28 psi (200 kPa)	–
Over 130 mph (210 kph)	32 psi (225 kPa)	32 psi (225 kPa)	–
Rear 130/90V-16 4PR (tubeless)			
Up to 130 mph (210 kph)	28 psi (200 kPa)	36 psi (250 kPa)	–
Over 130 mph (210 kph)	41 psi (290 kPa)	41 psi (290 kPa)	–

NOTE: If you have a 1982 and later P Series Police Model, first check the Supplement at the back of this manual for any specific service information.

CHAPTER FOUR

ENGINE

This chapter provides complete service and overhaul procedures for the Kawasaki 1000 and 1100cc 4-cylinder engines. **Table 1** provides wear limit specifications. **Table 2** provides tightening torques. **Table 1** and **Table 2** are at the end of the chapter.

This chapter is written in a general teardown sequence. If you only need to remove one particular part, follow the *Disassembly* procedures until you have the part you want. Then refer to the *Inspection* procedure for that part and work back through the *Assembly* procedures from installation of that part.

Although the clutch and transmission are located within the engine, they are covered in separate chapters to simplify the material. The alternator, starter and ignition system are covered in Chapter Nine.

Service procedures for all models are virtually the same. Where differences occur, they are identified. Right now, before you start any work, go back and read the *Service Hints* in Chapter One. You will save yourself a lot of mistakes with those hints fresh in your mind.

TOOLS

Several specialized tools will be helpful in the disassembly and inspection procedures in this chapter.

Although you may be able to make do without circlip or snap ring pliers (**Figure 1**), we highly recommend you have pliers with both straight and angled tips to prevent damage or loss of circlips.

Inspection measurements require a precision inside and outside micrometer, dial gauge or the equivalent (**Figure 2** and **Figure 3**). If you don't have the right tools, remove the parts and have your dealer or machine shop take the required measurements.

ENGINE DESIGN

The unit construction combines the power plant, clutch and transmission into one set of engine cases.

The crankcase is 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 iron 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 No. 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 ignition timing system (electronic pickups) and advance mechanism are on the right end of the crankshaft.

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

The B models and the ZX1100-A are equipped with an oil cooler.

BREAK-IN

Following cylinder repair (boring, honing, new rings, etc.) and major lower end work, the engine should be broken in just as though it were new. The performance and service life of the engine depend greatly on a careful and sensible break-in.

For the first 500 miles, no more than 1/3 throttle should be used and speed should be varied as much as possible within the 1/3 throttle limit. Avoid prolonged, steady running at one speed, no matter how moderate, as well as hard acceleration.

Following the 500 mile service, increasingly more throttle can be used, but full throttle should not be used until the motorcycle has covered at least 1,000 miles and then it should be limited to short bursts until 1,500 miles have been logged.

SERVICING ENGINE IN FRAME

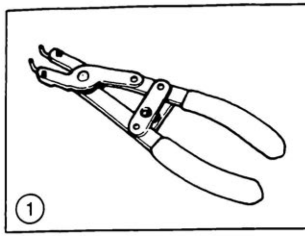
The engine has been laid out so that most "top end" repairs (camshaft, cylinder head, cylinder block and piston) can be done with the engine still in the frame. However, for repairs to the "bottom end" (crankshaft, cam chain, connecting rods and bearings) and transmission gears, the engine must be removed from the frame for separation of the crankcase halves.

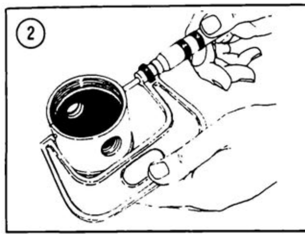
Although the engine "top end" can be left attached for engine removal, we recommend that you remove it first. It makes the engine much easier to handle and, while the engine is in the frame, you can use the rear brake to lock the drive train instead of resorting to makeshift or expensive tools.

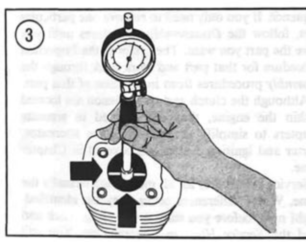
Once the engine is removed from the frame, some parts (like the alternator rotor, engine sprocket and clutch) cannot be loosened without special tools or locking techniques.

CAM CHAIN AND TENSIONER

See **Figure 4**. Proper cam chain tension is essential for safe operation, quiet running and maximum power. The cam chain has no master link and it wraps around the crankshaft, so it can't be removed without splitting the crankcase; see *Crankshaft Removal* in this chapter. The chain guides are removed during "top end" disassembly.



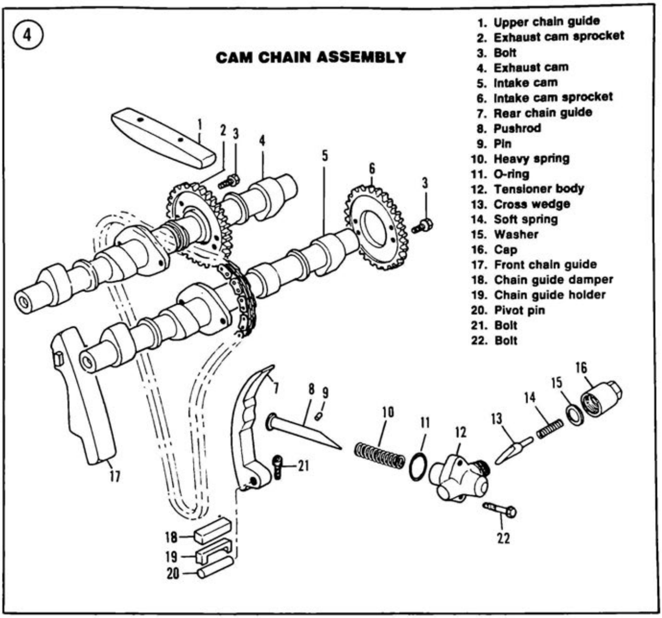


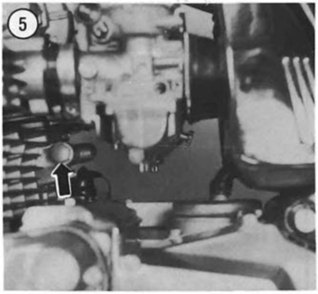


The tensioner pushrod is held against the rear chain guide by the cam chain tensioner assembly.

The automatic tensioner is continually self-adjusting. The pushrod is free to move inward, but can't move out because of the one-way cross wedge assembly.

The cross wedge cap (**Figure 5**) should be removed before performing any work that slackens the cam chain. The cap must be removed before installing the camshafts and the valve cover.





Tensioner Removal

1. *Carburetted models:* Remove the carburetor assembly as described in Chapter Seven or loosen the clamps at the front of the carburetors and slide the carburetor assembly back out of the front rubber holders; then push the front of the carburetors up for working room.
2. See **Figure 4**. Remove the cross wedge cap, washer, spring and cross wedge (**Figure 6**).
3. Remove the 2 tensioner base mounting bolts (**Figure 7**) and the tensioner assembly.

CAUTION
Do not loosen the tensioner mounting bolts without removing the cross wedge cap. The pushrod will overextend and lock, damaging the cam chain when the mounting bolts are tightened.

Tensioner Disassembly

1. Remove the pin (A, **Figure 8**) that keeps the pushrod from falling out.
2. Pull out the pushrod and the heavy spring (B, **Figure 8**).

Tensioner Assembly

1. Clean the tensioner body and all parts in solvent.
2. Grease the pushrod and cross wedge with molybdenum disulfide grease.
3. Insert the heavy spring and pushrod into the tensioner body with the pushrod flat facing the pin on the side of the tensioner.

CAUTION
Do not insert the cam chain tensioner cross wedge until after the valve cover and its cam chain guide are installed and the tensioner assembly is installed on the cylinder block.

Tensioner Installation

1. See **Figure 4**. Install the tensioner body and O-ring on the cylinder block. The cross wedge cap should face the left side of the engine.
2. After engine top end assembly is complete, grease the tensioner cross wedge and push it into the body lightly by hand so the flat on the end of the cross wedge faces the flat on the end of the pushrod. The end of the cross wedge should stick out about 5/16 in. (7.5 mm) from the tensioner body (**Figure 9**). If the cross wedge sticks out much more or less then specified, recheck for proper engine and tensioner assembly; also the cam chain or guides may be excessively worn.
3. Install the cross wedge spring, check that the washer is in place and install the cap.
4. *Carburetted models:* install the carburetor assembly; see in Chapter Seven.

CAUTION
Make sure there are no air leaks where the carburetors join with the front rubber holders. You should be able to feel the carburetors bottom out solidly on both sides. Any leakage here will cause a lean fuel mixture and engine damage.

VALVE COVER

Removal

The valve cover must be removed to inspect and adjust valve clearance.
1. Check that the ignition switch is OFF.

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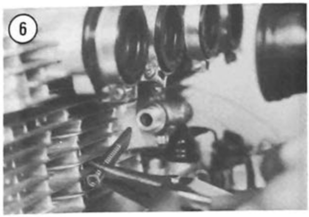

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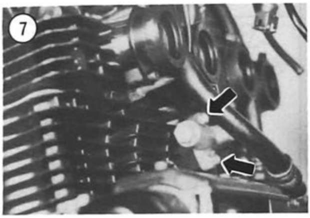

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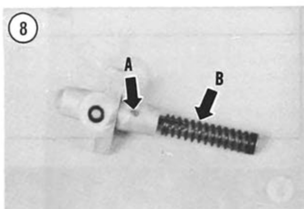

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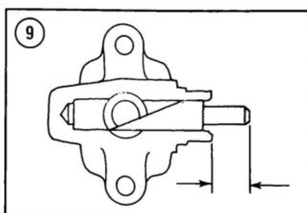
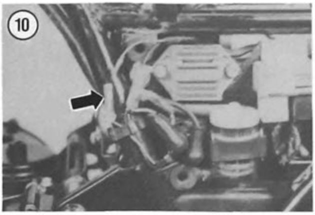
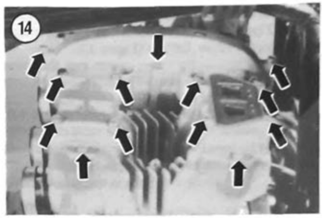
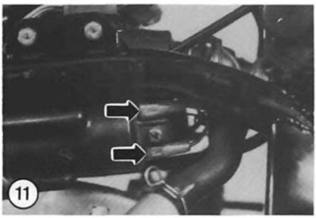
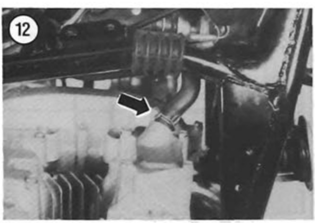
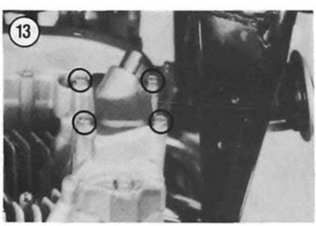












2. *Fuel injected models:* Turn the ignition switch OFF and disconnect the white/red lead from the starter solenoid to the fuel injection wiring harness (**Figure 10**).
3. Remove the fuel tank as described in Chapter Seven.
4. Disconnect the spark plug leads; grasp the spark plug leads as near to the plug as possible and pull them off the plugs.
5. Disconnect the leads to the ignition coils, then remove the coil bracket mounting bolts and the coils (**Figure 11**).
6. *U.S. models:* Slide up the lower hose clamps and pull the hoses off the air suction valve covers (**Figure 12**). Swing the vacuum switch and air hoses up out of the way. Remove the bolts securing the air suction valve covers (**Figure 13**).
7. Remove the cam chain tensioner cap and spring; see *Cam Chain Tensioner* in this chapter. Complete tensioner removal is not necessary.
8. Remove the bolts securing the valve cover (**Figure 14**); there are 20 bolts on U.S. models, and 24 bolts on other models. Tap around the cover's edge with a plastic or rubber mallet to loosen it and remove the cover.

Installation

1. Remove the cam chain tensioner cap and spring as described in this chapter.
2. Check that the 4 rubber plugs at the ends of the camshafts are in place and in good condition (**Figure 15**). When installing new plugs, coat the curved sides of the plugs with gasket sealer.

NOTE

If the rubber plugs leak oil, you may be able to stop the leakage by removing and cleaning the plugs, then wrapping them around their circumference with 5 or 6 layers of plumbing pipe thread sealing Teflon tape.

3. Inspect the top cam chain guide in the valve cover (**Figure 16**) and replace it if worn deeper than the service limit in **Table 1** (**Figure 17**).
4. Place a new valve cover gasket and the valve cover on the cylinder head. The arrow on the cover points to the front (**Figure 18**).
5. Loosely install the valve cover bolts (**Figure 14**).
6. *U.S. models:* Install the suction valve cover bolts (**Figure 13**). Install the hoses on the suction covers and slide the hose clamps into place (**Figure 12**).
7. Torque all valve cover bolts as specified in **Table 2**.
8. Install the cam chain tensioner cross wedge spring and cap as described in this chapter.
9. Install the ignition coils and connect the primary coil wires (**Figure 11**). The green wire goes to the left coil and the black wire goes to the right coil. The yellow/red wires can go to either coil.

NOTE

Since each coil fires through one spark plug to ground and back to the coil through another spark plug, coil polarity has no effect on performance.

10. Install the fuel tank as described in Chapter Seven.
11. After the engine has run and cooled off, retighten the valve cover bolts.

CAMSHAFTS

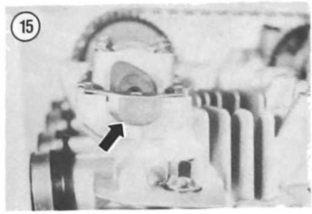
The exhaust camshaft is at the front of the engine and the intake camshaft is at the rear. The camshaft journals turn in replaceable bearing inserts in the cylinder head.

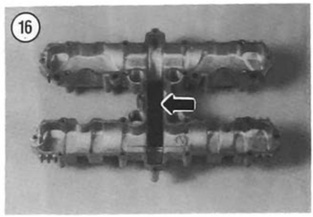
The cam lobes push down on valve lifter cups that lift the valves off their seats. The valve lifters are equipped with shims for valve clearance adjustment. The shims are available from Kawasaki dealers in a wide range of thicknesses. As the valve and valve seat wear, the working valve clearance increases and the proper clearance must be restored by removing the original shim and installing one of a different thickness as described in Chapter Three.

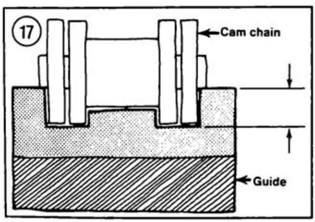
Removal

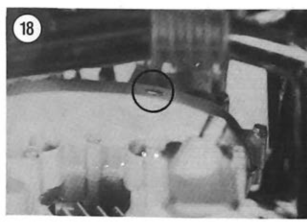
The camshafts can be removed after removing the valve cover.

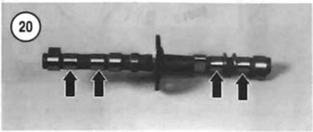
1. Mark each camshaft so that you will remember which is which: intake (rear) or exhaust (front).
2. Remove the 16 camshaft cap bolts securing the camshaft caps (**Figure 19**). Gently tap the caps with a soft mallet to loosen them and lift them off. There are 2 hollow dowel pins at each cap.

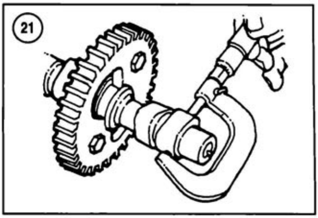


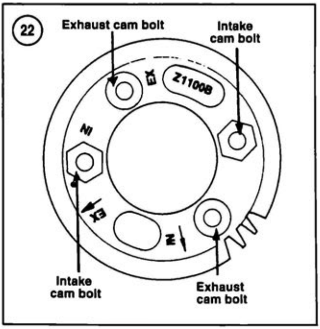












NOTE

Keep each camshaft bearing insert in its original place in the cylinder head and camshaft caps. If you are going to assemble the engine with the original inserts, they must be installed exactly as removed to prevent rapid wear.

3. Remove the camshafts. Tie the cam chain up to the frame with wire or place a tool through the chain loop to keep it from falling into the crankcase.

CAUTION

If the crankshaft must be rotated when the cam chain is off the sprockets, pull up on the cam chain and keep it taut while turning the crankshaft. If the chain is slack, it may jam up at the crankshaft and damage the chain and the sprocket.

CAUTION

Do not install the camshafts on a cylinder head that has been removed from the engine as you may bend the valves. The cams will have to be removed again before installing the cylinder head.

Inspection

NOTE

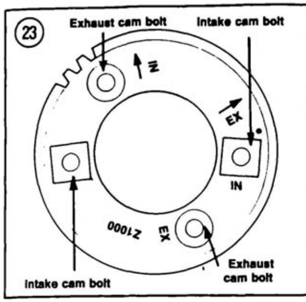
*Camshaft bearing clearance is measured with Plastigage while installing the camshafts. See **Bearing Clearance Check.***

1. Check the camshaft journal outside diameters (OD) for wear and scoring (**Figure 20**). If any journal outside diameter is smaller than the wear limit in **Table 1**, install a new camshaft.
2. Measure the cam lobe height (**Figure 21**). Replace the camshaft if any lobe height is less than the wear limit in **Table 1**. The lobes should not be scored and the edges should be square. Slight damage may be removed with a silicon carbide oilstone. Use No. 100-120 grit initially, then polish with a No. 280-320 grit.
3. Inspect the camshaft sprockets for damaged teeth. Install new sprockets if damaged; note the following:
   a. The intake and exhaust sprockets are identical; install the sprocket on the camshaft, using the proper holes for each cam. See **Figure 22** for 1982 B models, 1983 R models

and ZX1100-A models. Refer to **Figure 23** for all other models.

b. The marked side of the sprocket faces the end of the cam with a notch in it (**Figure 24**).

c. Use a locking agent such as Loctite Lock N' Seal on the sprocket bolts and torque them as specified in **Table 2**.



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Bearing Clearance Check

To check camshaft bearing clearance with Plastigage, follow the *Camshaft Installation* procedure, but leave the cam and bearing surfaces *dry*. It is very important not to turn the cams while assembled dry. After checking clearance, remove and lubricate the cams.

Installation

Whenever a camshaft has been removed, the camshaft position must be aligned in relation to crankshaft position or the engine will not develop normal power. If the timing is too far off, the valves could try to open when the piston is at TDC (top dead center). Bent or damaged valves and pistons could result.

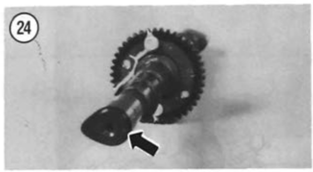
1. Remove the cam chain tensioner cap, spring and cross wedge; see *Tensioner Removal* in this chapter.
2. Remove the ignition timing cover and gasket from the lower right side of the engine (**Figure 25**).
3. Pull up on the cam chain and turn the crankshaft with the 17 mm bolt on the right end of the crankshaft (**Figure 26**) until the "T" mark next to the No. 1 and No. 4 "F" mark aligns with the fixed pointer (**Figure 27**). No. 1 and 4 cylinders are now at top dead center (TDC).

CAUTION
Pull up on the cam chain and keep it taut while turning the crankshaft. If the chain is slack, it may jam up at the crankshaft and damage the chain and the sprocket.

CAUTION
Do not use the small inner bolt to turn the engine or you will damage the ignition advance mechanism.

4. Install the bearing inserts in the cylinder head (**Figure 28**) and in the bearing caps (**Figure 29**). Make sure their locking tabs are seated in the notches.

NOTE
If the old bearing inserts are reused, be sure they are installed in their original positions to prevent rapid wear.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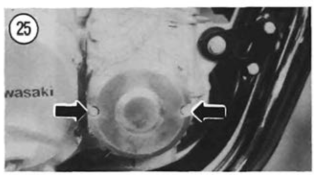

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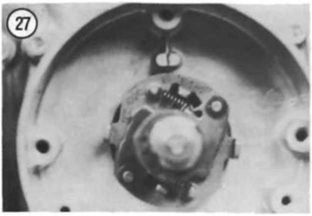

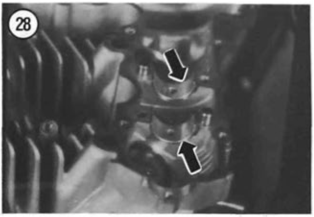

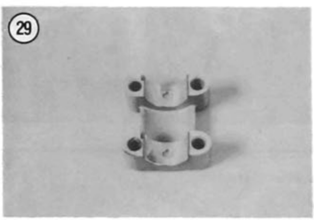

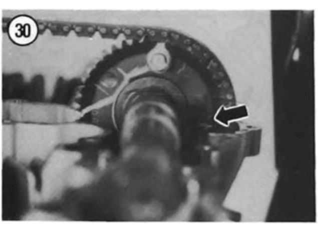

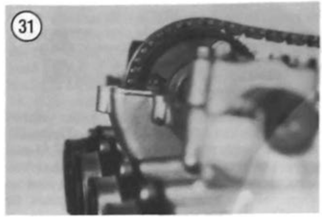

5A. *If you are checking cam bearing clearance with Plastigage:* Cut strips of Plastigage and lay them lengthwise across each camshaft cap insert. Do not lubricate the journals or bearing caps until after you remove the Plastigage.

5B. *If you are not checking cam bearing clearance:* Coat the camshaft journals and lobes with clean engine oil. Use molybdenum disulfide grease if new parts are being installed.

6. Insert the exhaust camshaft through the cam chain into the cylinder head. The notched end of the camshaft faces the right side of the engine. *KZ1000-M:* turn the camshaft carefully as you slide it in place the last 1/2 inch to mesh the gear on the camshaft with the tachometer drive gear.

CAUTION

On KZ1000-M models, if the exhaust camshaft worm drive gear does not mesh with the tachometer drive gear in the cylinder head, the parts will be damaged when the camshaft cap bolts are tightened.

7. Without turning the crankshaft, align the "EX" arrow on the exhaust cam sprocket with the front cylinder head surface (**Figure 30**). Keep the cam chain tight at the front and fit it onto the sprocket.

NOTE

Do not rotate either camshaft if Plastigage is in place. If the marks are not aligned, lift the cam and turn it.

8. Without turning the crankshaft, insert the intake camshaft through the cam chain into the cylinder head. Align the "IN" line a little above the rear surface of the cylinder head (**Figure 31**) and fit the chain to the sprocket. The notched end of the camshaft faces the right side of the engine.

NOTE

*When the camshafts are correctly installed with the No. 1 piston at TDC, the notch on the right end of each camshaft will point away from the other notch (**Figure 32**).*

9. Locate the cam chain pin on the exhaust sprocket in line with the "EX" line (**Figure 33**). Beginning with this pin as zero, count off 44 pins toward the intake cam. The "IN" line on the intake sprocket must align with the 44th pin. If it does not align, recheck your pin count and reposition the intake camshaft if required.
10. Check that the cam chain is properly seated in the front and rear cam chain guides.
11. Check that the camshaft cap dowel pins are in place (**Figure 34**).
12. Loosely install the camshaft caps in their original location.

NOTE

*Each of the caps is numbered to match its location on the cylinder head and marked with an arrow that must point to the front of the engine (**Figure 35**). The number matches a number cast into the cylinder head (**Figure 36**).*

13. Tighten the right cap bolts on both camshafts just enough to seat the camshafts, then tighten the remaining cap bolts. Torque the cap bolts as specified in **Table 2**.
14. *If you are checking cam bearing clearance with Plastigage:*
   a. Remove the camshaft cap bolts. Remove the caps and measure the width of the Plastigage with the Plastigage wrapper (**Figure 37**). The material may stick to the camshaft journal or the cap.
   b. If any bearing clearance is larger than the limit in **Table 1**, install new bearing inserts and recheck the clearance.
   c. Remove the camshafts, clean all Plastigage from the camshafts and inserts and reinstall the camshafts beginning at Step 5B of this procedure.
15. Slowly turn the crankshaft to the right (clockwise) 2 full turns, using the 17 mm bolt on the right end of the crankshaft. Align the "T" mark next tô the No. 1 and No. 4 "F" mark with the index mark (**Figure 38**). The No. 1 and No. 4 pistons should be at TDC (top dead center).

CAUTION

*If there is any binding while turning the crankshaft, **stop**. Recheck the camshaft timing marks. Improper cam timing can cause valve and piston damage.*

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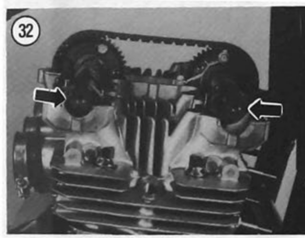

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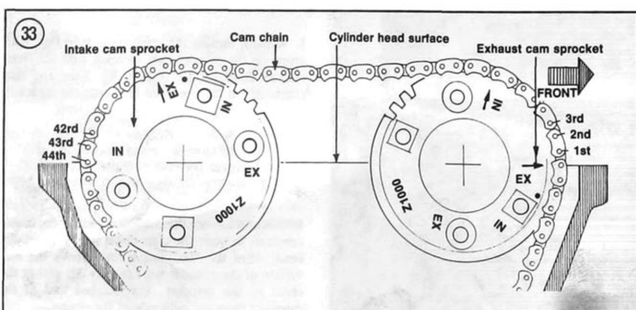

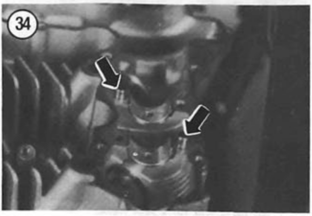

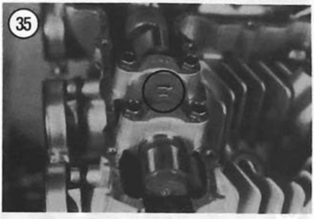

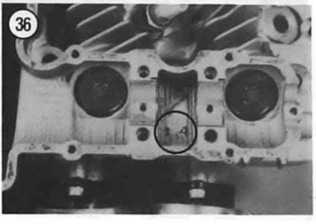

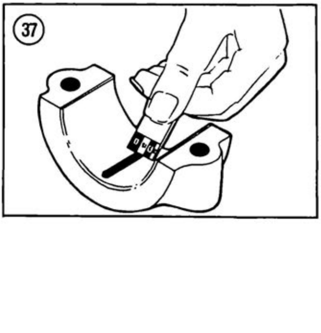

16. Check that all timing marks align as shown in **Figure 33**. After you tighten the camshaft cap bolts, the "IN" mark should align with the rear cylinder head surface. If all marks align as indicated, cam timing is correct.
17. *If the valve seats were ground or if a new valve, cylinder head, valve lifter, bearing inserts or camshaft was installed:* Check and adjust the valve clearance as described in Chapter Three.
18. Install the valve cover and gasket as described in this chapter.

CYLINDER HEAD

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.

As the valves and valve seats wear, the valves move closer to the camshaft, decreasing the valve clearance. On all models except the ZX1100-A, when the clearance can no longer be restored by fitting thinner valve shims, the end of the valve stem can be ground down slightly.

CAUTION

On ZX1100-A models, do not grind the end of the valve stem to repair it or to permit additional valve clearance. If the valve end is ground, the shim may contact the spring retainer and/or the split keepers while the engine is running. This may cause the keepers to loosen and the valve may drop into the engine, causing extensive engine damage.

Removal

1. Remove the exhaust system as described in Chapter Seven.
2. Remove the camshafts as described in this chapter.
3A. *Carburetted models:* Remove the carburetor assembly as described in Chapter Seven.
3B. *Fuel injected models:* Remove the fuel injection intake system as described in Chapter Eight.

4. Remove the bolts at each end of the cylinder head (**Figure 39**).
5. Remove the cylinder head nuts and washers (**Figure 40**).
6A. On ZX1100-A models, remove the valve lifter and then remove the shim from the receptacle in the valve retainer. Remove these items to prevent accidental mixup if they fall out while removing the head. Remove the lifter and shim from one cylinder at a time and place them into a container (such as an egg carton) marked with the cylinder number and "intake" or "exhaust." The No. 1 cylinder is on the left-hand side of the engine.
6B. On all other models, remove the shim and the valve lifter (**Figure 41**) now to prevent accidental mixup if they fall out while removing the head. Remove the shim and the lifter from one cylinder at a time and place them into a container (such as an egg carton—see **Figure 42**) marked with the cylinder number and "intake" or "exhaust." The No. 1 cylinder is on the left-hand side of the engine.

CAUTION
If the original lifters are to be reinstalled, be sure to install them into their original location during assembly.

7. Loosen the head by tapping around the edge with a rubber or plastic mallet. If necessary, *gently* pry the head loose with a broad tipped screwdriver only in the ribbed areas of the fins.

CAUTION
Remember, the cooling fins are fragile and may be damaged if tapped or pried too hard. Never use a metal hammer to loosen the cylinder head.

8. Lift the cylinder head straight up and off the studs and remove it.
9. Keep track of the 2 hollow dowel pins at the ends of the cylinder block.
10. Keep the cam chain tied up (**Figure 43**). Place a clean shop rag into the cam chain opening in the cylinder block to keep out dirt.

NOTE
*If you are going to remove the valves yourself, go on to **Valve Removal**. Otherwise, take the cylinder head to a Kawasaki dealer or qualified specialist for valve and valve seat work.*

Inspection

1. Remove all traces of gasket or sealant from the head and cylinder block mating surfaces.
2. Remove all deposits from the combustion chambers and intake and exhaust ports with a wire brush or *soft* metal scraper. Be careful not to gouge the soft aluminum surfaces. Burrs will create hot spots which can cause preignition and heat erosion. Clean the spark plug hole threads with a fine wire brush, then clean the head thoroughly with solvent.

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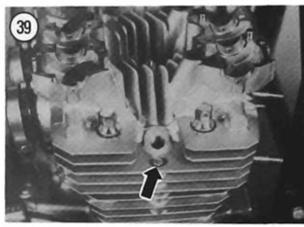

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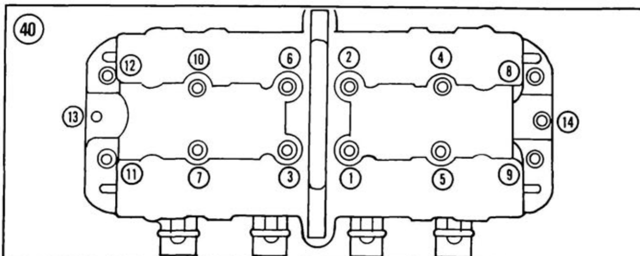
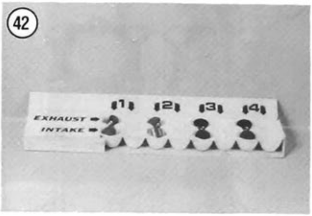
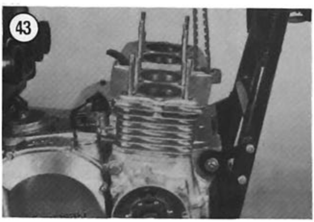
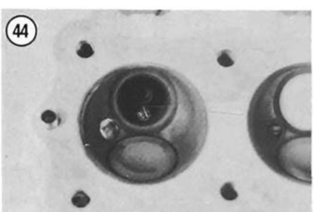






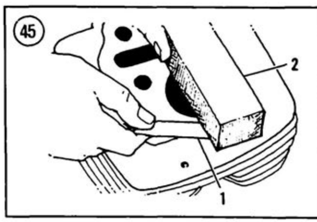


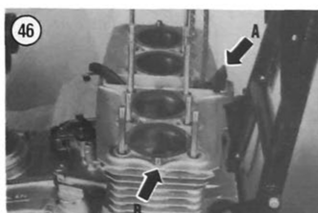
NOTE
If one or more of the combustion chambers contains unusually large carbon deposits, check the valve guides and oil seals for those combustion chambers very carefully.

3. *U.S. models:* Clean the air suction passages in the cylinder head exhaust ports (**Figure 44**).
4. Inspect the combustion chambers for cracks, especially between the valve seats. It may be possible to salvage a cracked head with heliarc welding; see a qualified welding specialist.
5. Place a straightedge across the gasket surface at several points. Measure warp by inserting a feeler gauge between the straightedge and cylinder head at each location (**Figure 45**). There should be less warp than the limit in **Table 1**. If a small amount is present, the head should be resurfaced by a Kawasaki dealer or a machine shop.

Installation

1. Check that the top surface of the cylinder block and the bottom surface of the cylinder head are clean before installing new gaskets. Make sure all oil passages are clear.
2. Check that the front cam chain guide is correctly installed (A, **Figure 46**).





3. Check that the 2 dowel pins are in place (B, **Figure 46**).
4. Lay 2 new cylinder head gaskets (left and right are the same) on the cylinder block, with the wider crimped edges facing up (**Figure 47**).
5. Place the large O-ring in its groove between the 2 gaskets (**Figure 48**).
6. Install new O-rings at the 4 corner cylinder head studs (**Figure 48**).
7. Lower the cylinder head onto the cylinder studs, threading the cam chain up through the head. Tie the chain up or stick a screwdriver through it to keep it from falling down into the crankcase.
8. Check that the cylinder head is fully seated against the cylinder block all around, then loosely install the 12 washers and nuts (**Figure 49**).

NOTE
Copper-plated washers are used at the outside corners of the cylinder head. These washers seal the oil passages and must be in good condition to prevent oil leaks.

9. Tighten the cylinder head nuts evenly in two stages to the torque specified in **Table 2**. Follow the sequence shown in **Figure 49**.
10. Install the 2 hex head bolts at the left and right ends of the cylinder head. Torque each one as specified in **Table 2**.
11A. On ZX1100-A models, perform the following:
  a. In order to keep the shim in place, apply a light coat of high-temperature grease to the spring retainer. Install the shim (number side down) into the receptacle in the spring retainer. Make sure the shim is completely seated in the spring retainer. If not, the valve clearance will be off.
  b. Apply a light coat of oil to the valve lifter and install it into the same location in the cylinder head as noted during removal. If new parts are being installed, apply molybdenum disulfide grease to them.
11B. On all other models, perform the following:
  a. Apply a light coat of oil to the valve lifter and install it into the same location in the cylinder head as noted during removal. If new parts are being installed, apply molybdenum disulfide grease to them.

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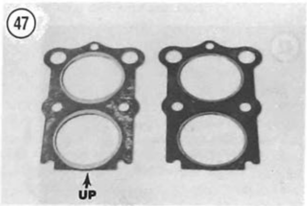

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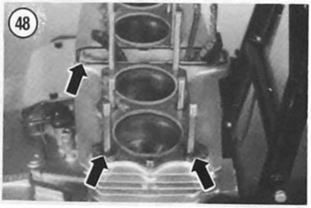

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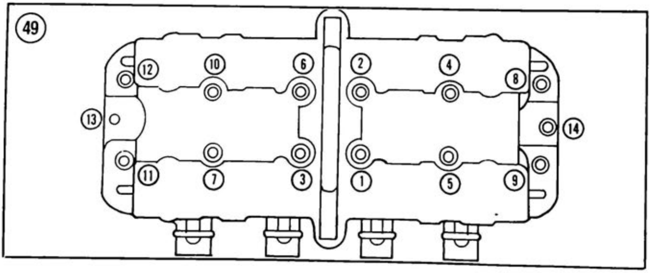

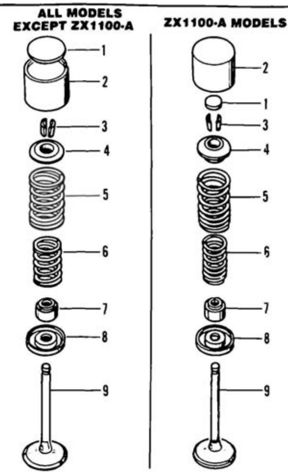

VALVE ASSEMBLY

1. Shim
2. Valve lifter
3. Split keeper
4. Valve spring retainer
5. Outer valve spring
6. Inner valve spring
7. Valve stem seal
8. Valve spring seat
9. Valve

(50)

b. Install the shim into the depression in the top of the valve lifter.

12. Install the camshafts as described in this chapter.

13A. *Carburetted models:* Install the carburetor assembly as described in Chapter Seven.

13B. *Fuel injected models:* Install the fuel injection intake system as described in Chapter Eight.

14. Install the exhaust system as described in Chapter Seven.

15. After the engine has run and cooled off, retorque the cylinder head nuts and bolts.

VALVES AND VALVE COMPONENTS

Valve Removal

See **Figure 50**. The valves can be removed after removing the cylinder head from the motorcycle, as described in this chapter. Use this procedure if you are going to disassemble the valves yourself. Otherwise, take the cylinder head to a Kawasaki dealer or qualified specialist for valve and valve seat work.

1. Fit a valve spring compressor to the valve spring retainer and the bottom of the valve head (**Figure 51**). Use the tool to press down the valve spring retainer and expose the split keepers on the valve stem. Remove the keepers.

2. Retract the compressor tool and remove the valve.

CAUTION
*Remove any burrs from the valve stem grooves before removing the valve (**Figure 52**). Otherwise the valve guides will be damaged when the valves come out.*

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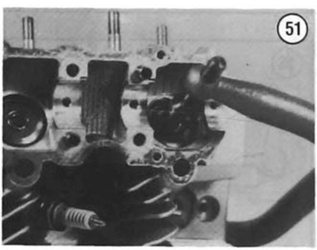

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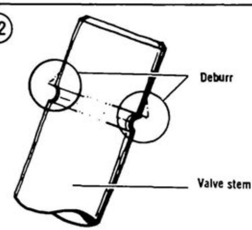
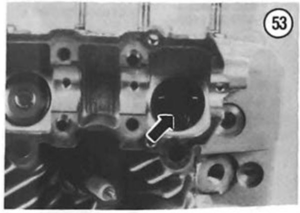
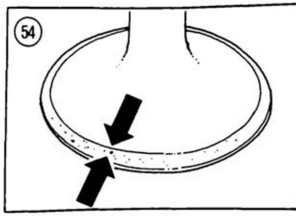


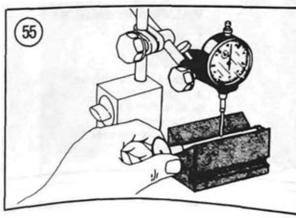
3. Remove the valve seal and valve spring seat (**Figure 53**) with needlenose pliers. Discard the old valve seals and install new ones during reassembly; rubber seals harden and crack with age and they will never be easier to replace than now.

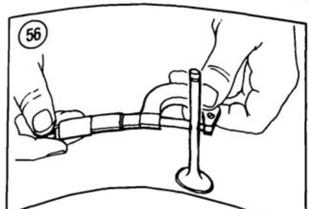




Valve and Seat Inspection

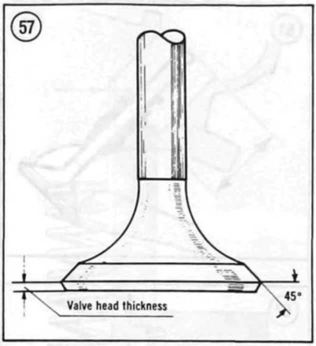
1. Clean valves with a wire brush and solvent. Inspect the contact face of each valve for burning (**Figure 54**). Minor roughness and pitting can be removed by lapping the valve as described in this chapter. Excessive unevenness of the valve face shows that the valve is not serviceable. The valve face may be ground lightly on a valve grinding machine, but it is best to replace a burned or damaged valve with a new one.
2. Measure the vertical runout of the valve stem with a V-block and dial indicator (**Figure 55**) or by rolling the stem on a piece of plate glass and measuring any gap with a feeler gauge. The runout should not exceed the service limit in **Table 1**.
3. Measure valve stems for wear (**Figure 56**). Replace the valve if the stem OD (outside diameter) is less than the wear limit in **Table 1**.
4. Measure the valve head thickness (**Figure 57**). If the head is thinner than the limit specified in **Table 1**, install a new valve.
5. Remove all carbon and varnish from the valve guides with a stiff spiral wire brush.
6. Inspect the valve/guide clearance by inserting each valve in its guide. Hold the valve just slightly off its seat and rock it sideways, then at a right angle to the first check (**Figure 58**). If it rocks more than the limit in **Table 1**, the the guide is probably worn and should be replaced.
7. Take the cylinder head to a dealer to have the valve guides measured and replaced if necessary. Installation of new guides requires special installation and reaming tools.
8. Inspect the valve seats. If worn or burned, they must be reconditioned with special cutting or grinding tools. This work should be done by your dealer or local machine shop. If you are performing the work yourself, see **Table 1** at the end of this chapter for valve seat specifications (**Figure 59**).

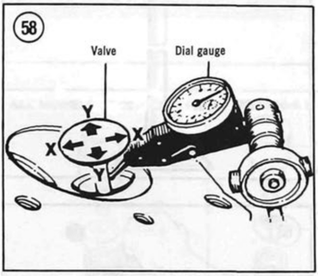


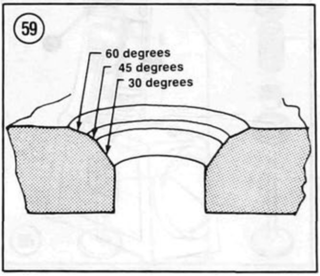


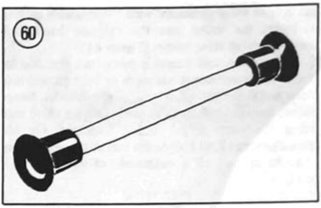
NOTE

Seats and valves in near-perfect condition can be reconditioned by lapping with fine carborundum paste. Lapping, however, is always inferior to precision grinding or cutting.









Valve Lapping

Valve lapping is a simple operation which can restore the valve seal without machining if the amount of wear or distortion is not too great.

NOTE
Valve lapping is not a substitute for precision grinding or cutting of valves and their seats. Get a professional opinion on whether lapping will do the job before you settle for it.

1. Coat the valve seating area in the head with a lapping compound such as Carborundum or Clover Brand.
2. Insert the valve into the combustion chamber.
3. Wet the suction cup of a lapping stick (**Figure 60**) and stick it onto the head of the valve. Lap the valve to the seat by rotating the lapping stick back and forth by hand. Every 5 to 10 seconds, turn the valve 120° in the seat; continue lapping until the contact surfaces of the valve and the seat are a uniform grey. Do not remove too much material.
4. Thoroughly clean the valves and cylinder head in solvent to remove all lapping compound. Any compound left on the valves or the cylinder head will end up in the engine and cause serious damage.
5. After the lapping is finished and the valves have been reinstalled in the head, the valve seal should be tested. Check the seal of each valve by pouring solvent into the intake and exhaust ports. There should be no leakage past the valve seat. If fluid leaks past any of the seats, disassemble that valve assembly and repeat the lapping procedure until there is no leakage.

Valve Stem Height

If the valve faces or seats were reground or recut, the valve face will drop deeper into the cylinder head and the valve stem will stick up higher on the other side of the head than before. Check valve stem installed height before you assemble the valves in the cylinder head; otherwise you may not be able to

get proper valve clearance with the available shims.
1. Insert the valve into the cylinder head and measure valve stem height (**Figure 61**).
2. If the valve stem height is more than specified in **Table 1**, the valve seat has worn or been ground too deep and the valve is too long for the cylinder. Swap valves between cylinders to see if another valve will bring the stem height within tolerance. On all models except ZX1100-A, the end of the valve stem may be ground off a *maximum* of 0.012 in. (0.3 mm).

CAUTION
*If the valve stub (**Figure 62**) is ground to less than 0.165 in. (4.2 mm) thickness, the valve lifter may hit the spring retainer and drop the valve into the engine while it is running, causing extensive engine damage.*

CAUTION
On ZX1100-A models, do not grind the end of the valve stem to repair it or to permit additional valve clearance. If the valve end is ground, the shim may contact the spring retainer and/or the split keepers while the engine is running. This may cause the keepers to loosen and the valve may drop into the engine, causing extensive engine damage.

Valve Spring Inspection

As the valve springs wear, they become weaker. The valve springs must be checked for tension *while compressed* (**Figure 63**). See **Table 1** at the end of this chapter for compression specifications.

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 64**). Install a new spring if the gap at the top is more than the limit in **Table 1**. Check the valve spring retainer and valve keepers. If they are in good condition, they can be reused.

Valve Installation

1. See **Figure 65**. Install the spring seats and new oil seals on the valve guides.
2. Coat the valve stems with molybdenum disulfide grease and insert the valves into the cylinder head.
3. Install the 2 valve springs and the valve spring retainer.

NOTE
*Install variable pitch springs with the closely wound coils toward the cylinder head (**Figure 66**).*

4. Fit a valve spring compressor to the valve spring retainer and the bottom of the valve head (**Figure 67**). Use the tool to press down the retainer and

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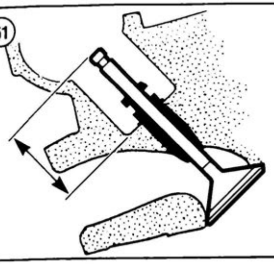

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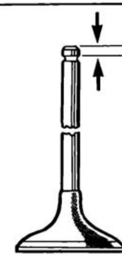

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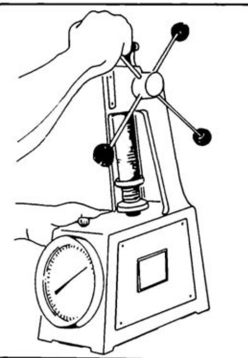
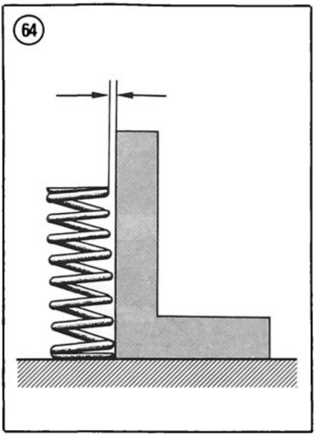
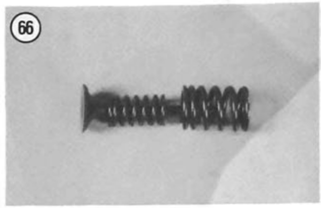
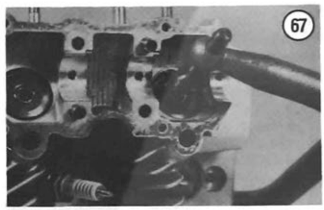
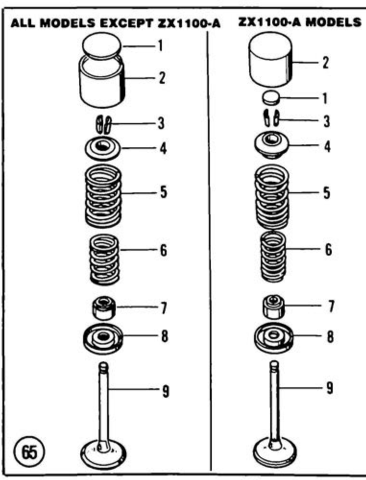




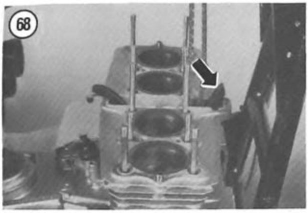


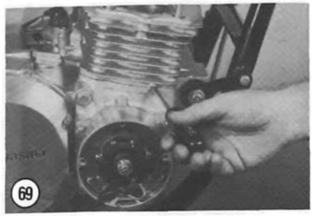




VALVE ASSEMBLY

1. Shim
2. Valve lifter
3. Split keeper
4. Valve spring retainer
5. Outer valve spring
6. Inner valve spring
7. Valve stem seal
8. Valve spring seat
9. Valve





expose the keeper groove on the valve stem. Install the keepers and remove the spring compressor. Make sure the keepers are securely seated. Tap the stem end lightly with a hammer, if necessary, to jar the keepers into place.

CYLINDER BLOCK

The alloy cylinder block has pressed-in cylinder sleeves which can be bored to 0.020 in. (0.5 mm) oversize and again to 0.040 in. (1 mm) oversize.

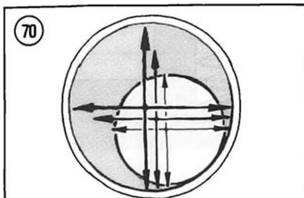
The cylinder can be removed after removing the cylinder head.

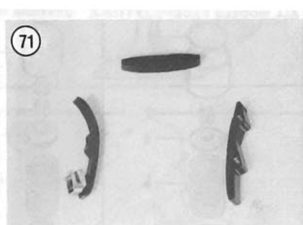
Removal

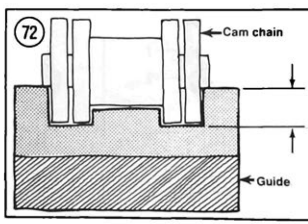
1. Pull the front cam chain guide up out of the block (**Figure 68**).
2. Loosen the cylinder block from the crankcase; there is a cast-in pry point at the cylinder block base (**Figure 69**). Use the widest tool that will fit the slot. Twist the tool; do not hammer into the opening.
3. Pull the cylinder block straight up and off the pistons and cylinder studs.
4. Stuff a clean rag into the crankcase under each piston to keep dirt or small parts from entering.
5. Remove the rubber chain guide plug at the rear of the cylinder base and pull out the aluminum block and cam chain guide.

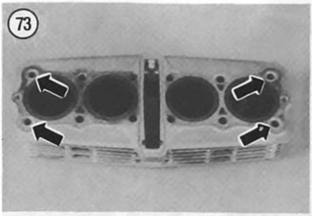
Inspection

1. Do not remove the carbon ridge at the top of the cylinder bore unless you are going to install new piston rings or bore or hone the cylinder. The ridge helps the top ring's compression seal.
2. Check the cylinder walls for scratches; if evident, the cylinders should be rebored.









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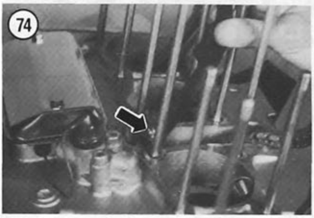

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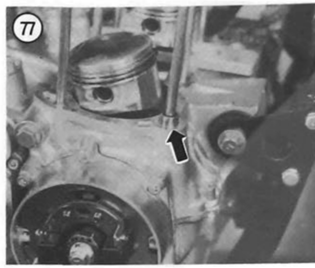

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3. Measure the cylinder bores, with a cylinder gauge or inside micrometer, at the points shown in **Figure 70**. Measure two ways—in line with the piston pin and at a right angle to the pin. If any measurement exceeds the wear limit in **Table 1** or if the taper or out-of-round is greater than 0.002 in. (0.05 mm), the cylinders must be rebored to the next oversize and new pistons and rings installed. The liner can be bored oversize twice, first 0.020 in. (0.5 mm) and again to 0.040 in. (1.0 mm). Rebore all cylinders even though only one may be faulty.

NOTE
Purchase new pistons before you have the cylinders bored. You'll need them to achieve proper piston/cylinder clearance.

4. Inspect the cam chain guides (**Figure 71**). Replace them if visibly damaged or if worn deeper than the service limit in **Table 1** (**Figure 72**).

Installation

1. Check that the top surface of the crankcase and the bottom surface of the cylinder block are clean before installing a new gasket. Make sure the 4 corner stud holes are clean (**Figure 73**); these holes are oil passage ways.
2. Install the rear cam chain guide and pivot (**Figure 74**), the aluminum block (**Figure 75**) and the rubber plug (**Figure 76**); the "R" mark on the rubber plug faces to the rear.
3. Check that the 2 locating dowels are in place at the front corner studs (**Figure 77**).
4. Install a new cylinder base gasket on the crankcase.

5. Install a piston holding fixture under the 2 inner pistons (**Figure 78**).

> NOTE
>
> *You can easily make a simple piston holding fixture out of wood. See **Figure 79**.*

6. Lightly oil the piston rings and cylinder walls.
7. Carefully slide the cylinder block down over the cylinder studs, threading the cam chain up through the block. Tie the chain up or stick a screwdriver through it to keep it from falling down into the crankcase.
8. Rock the cylinder block and slide it down over the inner 2 pistons and rings (**Figure 80**). Compress each piston ring with your fingers as the cylinder starts to slide over it, then slide the block down over the outer pistons.

> NOTE
>
> *If the rings are hard to compress, you can use large hose clamps or piston ring compressors (**Figure 81**).*

9. Remove the piston holding fixture and push the cylinder block down until it seats on the crankcase. Check that the cylinder block is fully seated against the crankcase all around.

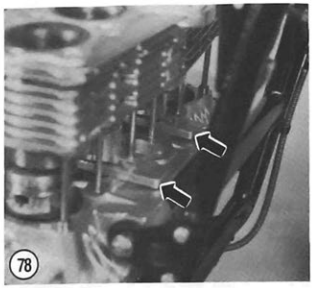
PISTONS AND RINGS

The pistons can be removed after removing the cylinder block. With the pistons off, the connecting rods can be examined without separating the crankcase halves.

Each piston has three rings. The top two rings are compression rings, to prevent compression blow-by into the crankcase. The bottom ring is an oil control ring, to keep excess oil out of the combustion chamber. Some models have a 1-piece oil control ring while others have a 3-piece oil control ring consisting of 2 flat rails with an expander in between.

Piston Removal

1. Lightly mark the top of the piston with a "1," "2," "3" or "4" so that each will be reinstalled into the correct cylinder. The No. 1 cylinder is on the left-hand side.
2. Before removing the piston, hold the rod tightly and rock the piston as shown in **Figure 82**. Any rocking motion (do not confuse with the normal side-to-side sliding motion) indicates wear on the piston, piston pin, connecting rod small bore or (more likely) a combination of all three. If there is detectable rocking, install new pistons and pins.



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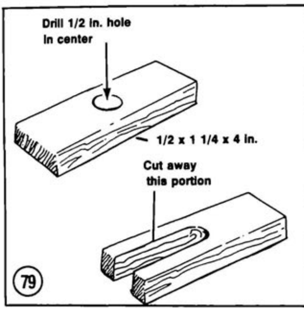

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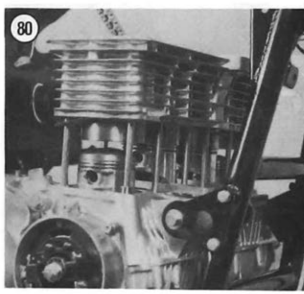

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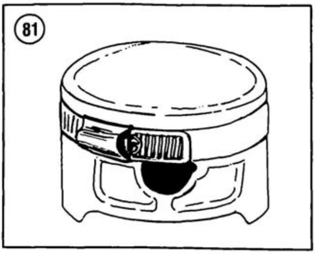

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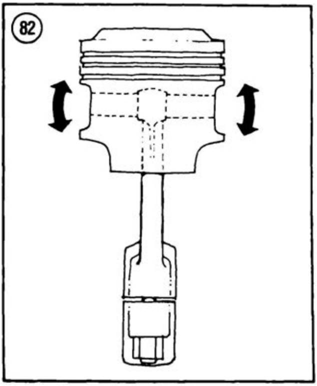

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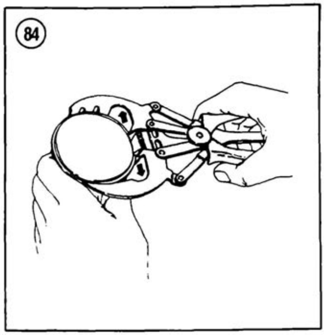


3. Pry out one or both piston pin circlips with a small screwdriver or awl (**Figure 83**). The circlip can spring out forcefully, so protect your face.
4. Push the piston pin out the side of the piston from which you removed the circlip. The pin will probably slide right out. Remove the piston; keep each piston pin inside its piston, so they can be reassembled in the original sets.

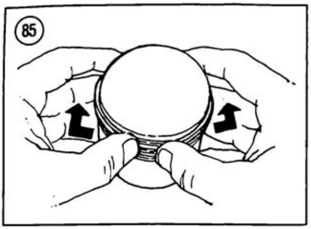
CAUTION
Do not try to hammer the pin out. You could bend the connecting rod or damage the rod bearings.

NOTE
It may be necessary to heat the piston slightly with a rag soaked in hot water or use a C-clamp and a small diameter rod to push the pin out.

NOTE
Keep each piston, pin and rings together in their original sets. If you are going to assemble the engine with the original parts, they must be installed exactly as removed in order to prevent rapid wear.

5. After you remove the piston, remove the top ring with a piston ring expander (**Figure 84**) or spread the ends with your thumbs just enough to slide it up over the piston (**Figure 85**). Repeat for the remaining rings.

WARNING
The rail portions of a 3-piece oil scraper can be very sharp. Be careful when handling them to avoid cut fingers.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Piston Inspection

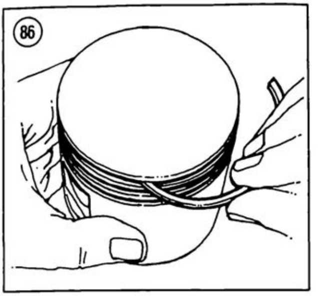
1. Carefully clean the carbon from the piston crown with a chemical remover or with a *soft* scraper.
2. Clean the carbon and gum from the ring grooves with a broken ring or a groove cleaner (**Figure 86**). Any deposits left in the grooves will prevent the rings from seating correctly and may result in piston damage. Inspect the grooves carefully for burrs, nicks or broken or cracked lands. Have the piston reconditioned or replace the piston as necessary. Examine each ring groove for burrs, dented edges and wear. Pay particular attention to the top compression ring groove, as it usually wears more than the others.
3. Check piston wear; measure the OD (outside diameter) of the piston with a micrometer. Take the measurement 3/16 in. (5 mm) above the bottom of the piston skirt, at a right angle to the piston pin bore (**Figure 87**). If the diameter of the piston measures less than the wear limit in **Table 1**, install a new piston.
4. Measure piston to cylinder clearance as described in this chapter.

Piston to Cylinder Clearance

The most accurate way to check piston to cylinder clearance is to measure the inside diameter of the cylinder just above its bottom edge (where it will have undergone the least amount of wear), then subtract the piston diameter as measured in *Piston Inspection*. The clearance should be within the range specified in **Table 1**.

You can also measure installed piston to cylinder clearance with a feeler gauge near the bottom of the cylinder (**Figure 88**). The piston (with no rings) should be just free enough to slide with a light push. This method is *not* as accurate as micrometer measurement calculation.

If a cylinder has not worn past the acceptable inside diameter limit and installing a new piston will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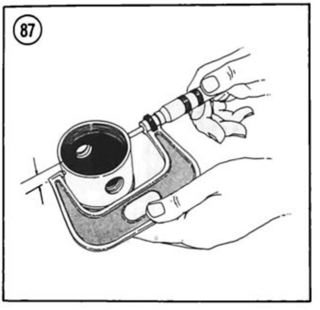
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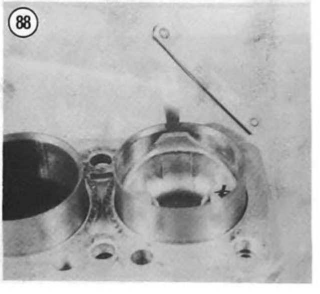
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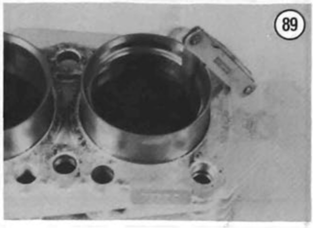

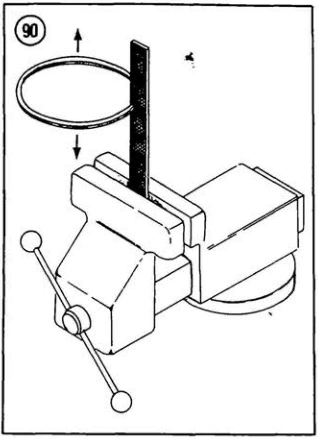

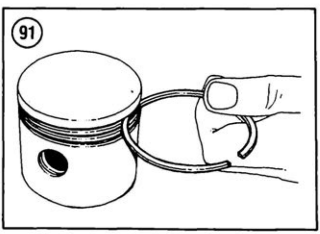

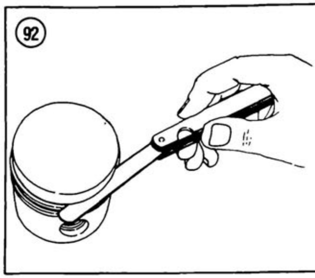

bring the clearance within tolerance, the cylinder block need not be bored. However, in no case should the piston to cylinder clearance be less than the minimum.

Piston Ring Inspection

Measure the top two rings for wear by inserting each into the *bottom* of the cylinder where the cylinder is least worn. Seat the ring squarely in the cylinder by pushing it in slightly with a piston. Measure the installed end gap with a feeler gauge (**Figure 89**). A new ring's gap should be no smaller than the limit in **Table 1**.

If the gap is smaller than specified, hold a small flat file in a vise, grip the ends of the ring with your fingers and enlarge the gap to the required minimum (**Figure 90**). As old rings wear, the gap will increase. Discard any rings whose installed gap exceeds the limit in **Table 1**. Always install new rings when installing new pistons or when you have any doubt about the condition of the rings.

Roll each ring around in its piston groove to make sure there is no binding (**Figure 91**). Check the side clearance of each ring with a feeler gauge (**Figure 92**). Refer to **Table 1**. If the clearance is incorrect, replace the pistons, rings or both.

Connecting Rod Inspection

After removing the pistons, the connecting rods can be inspected without separating the crankcase halves. Replacement of any connecting rod requires replacement of a complete crankshaft/connecting rod assembly, unless your dealer is capable of rebuilding the crankshaft assembly; see *Crankshaft Removal*.

1. Measure the ID (inside diameter) of the small end of the connecting rod with a snap gauge and

micrometer (**Figure 93**). If the ID is larger than the limit given in **Table 1**, install a new connecting rod.
2. Check the rod for obvious damage such as cracks and burns.
3. Check connecting rod big-end side clearance with a feeler gauge (**Figure 94**). If the clearance exceeds the limit in **Table 1**, the crankshaft should be replaced or rebuilt.
4. Check connecting rod big-end bearing radial play. Turn the crankshaft until the crankpin is at the top. Grasp the connecting rod firmly and pull up on it. Tap sharply on the top of the rod with your free hand. If the bearing and crankpin are in good condition, there should be no movement felt in the rod. If movement is felt or if there is a sharp metallic click, the bearing may be unserviceable; confirm the radial clearance by measuring with a dial indicator. If the clearance exceeds the limit in **Table 1** the crankshaft should be replaced or rebuilt.

Cam Chain Inspection

Removal of the cam chain requires engine removal and crankcase separation, but you can check cam chain wear now. Stretch a length of the chain with about a 10 lb. (5 kg) pull and measure a 20 link length (**Figure 95**). If the length from the 1st pin to the 21st pin exceeds the limit in **Table 1**, install a new chain; see *Crankshaft Removal*.

Piston Installation

1. Spread the ends of the rings with your thumbs or use a ring expander tool. Install them in the proper piston groove; note the following:
   a. The side of the ring with a letter or number mark faces up (**Figure 96**). If there is no mark, either side can face up.
   b. The top ring has chamfered outer edges and the second ring has a notched upper inner edge (**Figure 97**).
2. Coat the connecting rod holes and piston pin holes with clean engine oil.

NOTE
Keep each piston, pin and rings together in their original sets. If you are going to assemble the engine with the original parts, they must be installed exactly as removed in order to prevent rapid wear.

3. Oil the piston pin and push it into the piston until the end extends slightly beyond the inside of the boss (**Figure 98**).
4. Place the piston over the connecting rod with the arrow on the top of the piston pointing forward

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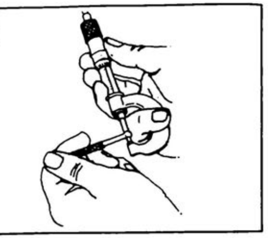

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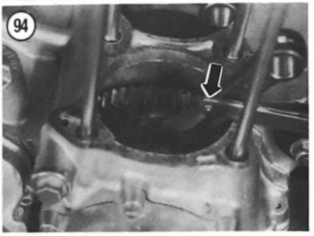

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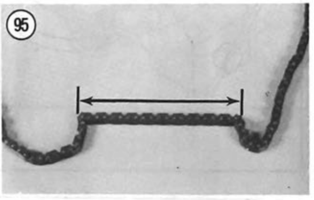

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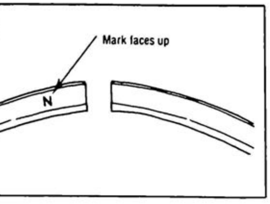
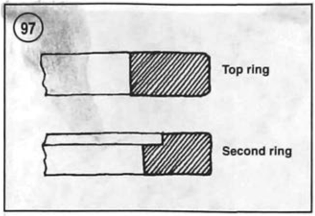
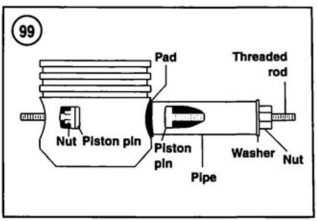
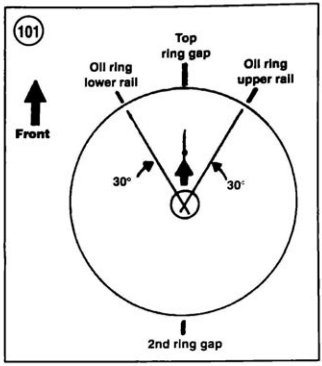








Line up the pin with the rod small end and push the pin into the piston until it is even with the circlip grooves.

CAUTION
Do not try to hammer the pin in. You could bend the connecting rod or damage the rod bearings.

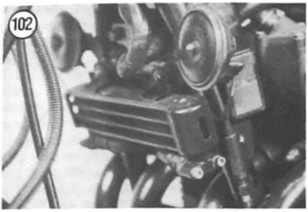
5. If the pin is tight, make the tool shown in **Figure 99** to remove it. Do not drive the piston pin out, as this may damage the piston pin, connecting rod or piston.
6. Install new circlips where removed. After installing each circlip, rotate it so that the gap lies at the bottom or top (**Figure 100**). Make sure that the clips are fully seated in the grooves.

CAUTION
Never reuse an old circlip. It becomes weak in the process of removal and it could work loose and cause serious engine damage.

7. To minimize blow-by, rotate the top and bottom ring on each piston so that the ring openings face forward. Rotate the second ring so that its opening faces the rear of the engine. With 3-piece oil rings, the 2 rails should each be offset about 30° to either side of the top ring (**Figure 101**).

OIL COOLER

The KZ1100-B and ZX1100-A are equipped with an oil cooler mounted in front of the engine



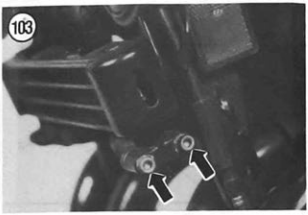
(Figure 102). The cooler must be disconnected when the engine is removed from the frame or when the oil pan is removed.

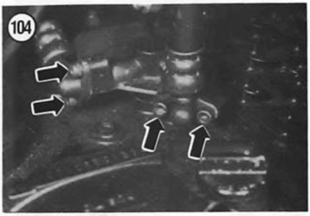
Oil Cooler Removal/Installation

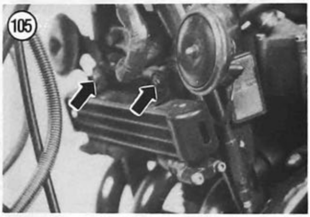
1. Remove the 4 oil cooling line mounting bolts below the oil cooler (**Figure 103**).
2. To remove the oil cooling lines from the engine, remove the 4 mounting bolts at the oil pressure switch behind the cylinder block (**Figure 104**).
3. Remove the 4 oil cooler mounting bolts above and below the cooler (**Figure 105**). Each bolt has an inner sleeve and a rubber grommet.
4. To install the cooler, reverse the removal steps. Note the following:
   a. Inspect the oil cooler fitting O-rings and install new ones if damaged.
   b. The right hose is shorter than the left hose. Make sure the hoses do not interfere with throttle operation. Route the hoses next to the ignition coils and inside the outer throttle valves (**Figure 106**).
   c. Torque the mounting bolts as specified in **Table 2**.
   d. Recheck the oil level after the engine has run a short time and add oil, if necessary, to compensate for cooler volume.

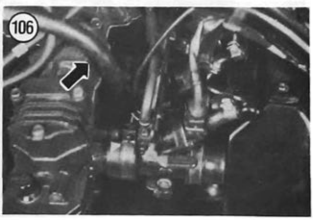
ENGINE REMOVAL/INSTALLATION

Engine removal and crankcase separation is required for repair of the "bottom end" (crankshaft, connecting rods and transmission gearsets). Although the following parts can be left attached for









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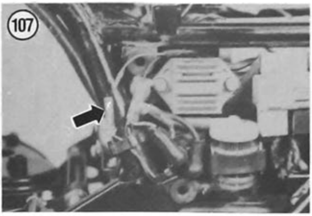

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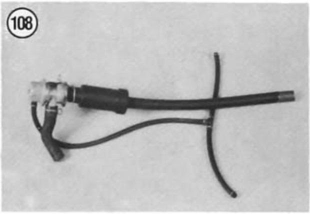

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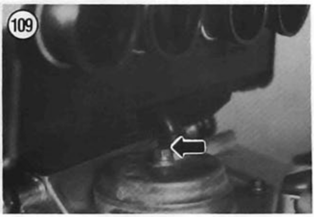

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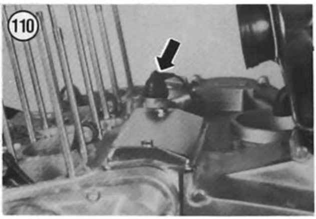

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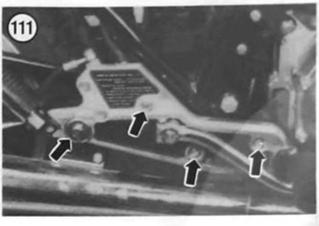

engine removal, we recommend that you remove them first; it makes the engine much lighter to handle, and while the engine is in the frame you can use the rear brake to lock the drive train when required, instead of resorting to makeshift or expensive tools:

a. Top end (camshafts, cylinder head, cylinder, pistons).
b. Alternator stator and electric starter (refer to Chapter Nine).
c. Clutch hub and plates (refer to Chapter Five).

Once the engine is removed from the frame, some parts (like the alternator rotor, clutch hub and engine sprocket) can not be removed from the engine without special tools or locking techniques.

If you only need to repair the transmission, removal of the engine "top end" is not essential.

Engine Removal

1. Drain the engine oil and discard it. Never reuse old engine oil.
2. *Fuel injected models:* Turn the ignition switch OFF and disconnect the white/red lead from the starter solenoid to the fuel injection wiring harness (**Figure 107**).
3. *Fuel injected models:* Remove the complete intake system as described in Chapter Eight.
4. Remove the ignition coils as described in Chapter Nine.
5. *U.S. models:* Remove the vacuum switch valve and hoses (**Figure 108**).
6. Disconnect the breather hose at the breather cap (**Figure 109**).
7. Disconnect the oil pressure switch lead (**Figure 110**).
8. Remove the left and right footpeg/bracket assemblies (**Figure 111** and **Figure 112**).

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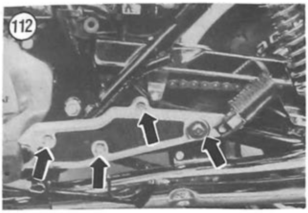

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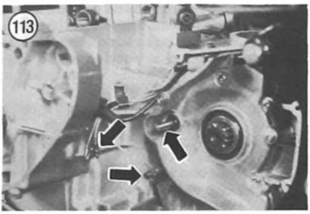

9. If you plan to remove the outer left main crankshaft bearing or replace the left crankshaft seal, remove the alternator rotor and starter clutch as described in Chapter Nine.

10A. *Chain-drive:*

  a. Remove the engine sprocket cover and the sprocket as described in Chapter Six.
  b. Disconnect the alternator leads and the neutral switch lead and remove the clutch pushrod (**Figure 113**).
  c. Remove the shift linkage cover and the linkage as described in Chapter Six.
  d. Remove the sprocket cover and shift linkage cover dowel pins (**Figure 114**) for clearance when removing the engine.

10B. *Shaft-drive:*

  a. Remove the rear wheel as described in Chapter Ten.
  b. Loosen the 4 rear bevel nuts on the swing arm flange (**Figure 115**) to take some load off the front bevel couping.
  c. Remove the front bevel drive as described in Chapter Six.
  d. Disconnect the alternator leads and remove the clutch pushrod (**Figure 116**).
  e. Remove the shift linkage as described in Chapter Six.

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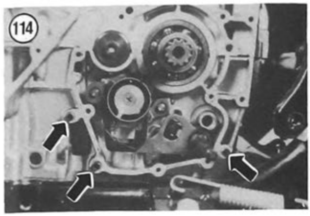

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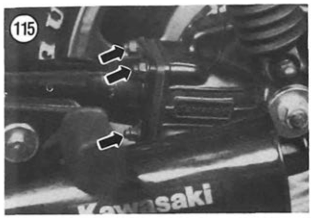

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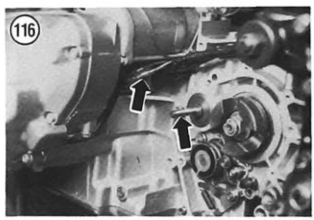

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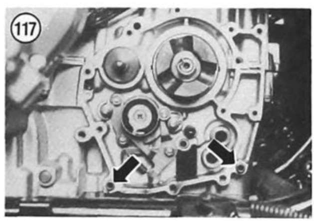
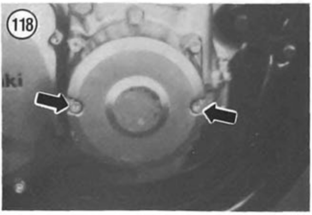
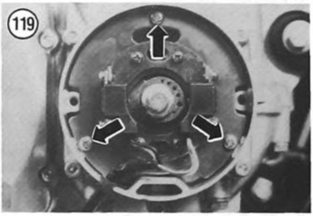
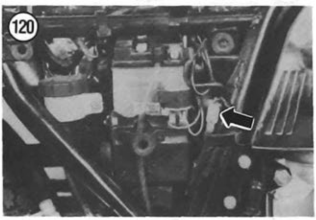
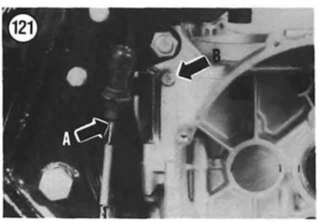
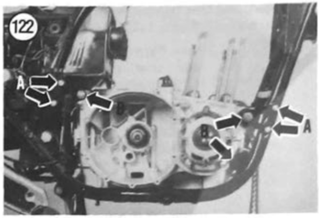


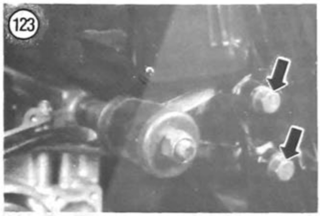












f. Remove the front bevel drive dowel pins for clearance when removing the engine (**Figure 117**).

g. Remove the side marker reflectors from the downtubes in front of the engine.

11. Remove the 2 screws and the ignition timing cover at the right end of the crankshaft (**Figure 118**).
12. Remove the 3 timing plate screws and the pickup coil assembly (**Figure 119**).
13. Disconnect the 4-pole pickup coil connector (**Figure 120**).
14. Remove the rear brake light switch (A, **Figure 121**).
15. Disconnect the battery ground lead at the right rear side of the engine (B, **Figure 121**).
16. *KZ1100-B and ZX1100-A:* Remove the oil cooler lines as described in this chapter.
17. Take a final look all over the engine to make sure everything has been disconnected.
18. Remove the 4 right engine mounting bracket bolts (A, **Figure 122**).
19. *Shaft-drive:* Remove the 2 left rear engine mounting bracket bolts and the bracket (**Figure 123**).

20. Loosen and then remove the engine mounting nuts and bolts (B, **Figure 122** and **Figure 124**).

WARNING

Keep your hands clear as you remove the bolts. The engine can easily smash your fingers.

NOTE

Bolt removal will be easier if you jack or lever the engine up slightly to take the weight off the bolts.

WARNING

If the recommended parts have not been removed, 2 people are required to safely remove the engine from the frame.

21. Pull the engine up slightly and to the right side so that it clears the lower right front and rear mounting brackets. Take the engine to a workbench for further disassembly.

Engine Installation

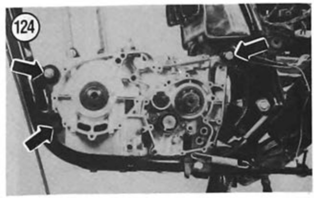
If you have removed the recommended parts listed at the beginning of *Engine Removal,* leave them off until you have installed the bare engine in the frame. It will be easier to handle the engine and to tighten the rotor bolt, clutch hub nut and engine sprocket nut.

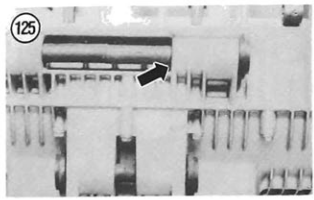
1. Inspect the rubber dampers inside the front upper crankcase mounting bosses (**Figure 125**). Replace them if worn or loose. Use soapy water to ease installation. They should extend 5/16 in. (8 mm) outside the case bosses.
2. Check that the 4 rubber side dampers are installed outside the front engine mounting bosses (**Figure 126**).
3. Install the engine through the right side of the frame.
4. Install the 2 right engine mounting brackets and lockwashers loosely (A, **Figure 122**).

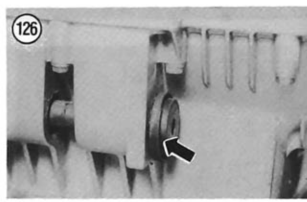
5A. *Shaft-drive:*
   a. Install the left rear engine mounting bracket and lockwashers loosely (**Figure 123**).
   b. Lift the engine and insert the 2 long front bolts with locknuts. The upper front bolt has a U-shaped shim inside the left frame bracket stub.
   c. See **Figure 127** for the rear bolt installation.

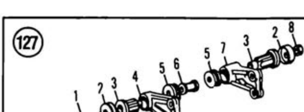
5B. *Chain-drive:* Lift the engine and insert the 3 long bolts with locknuts. The rear bolt has 2 spacers. The upper front bolt has a U-shaped shim inside the left frame bracket stub.

6. Use a locking agent such as Loctite Lock N' Seal on all engine mounting bolts and nuts. Torque the mounting bracket nuts, then the engine mounting nuts (B, **Figure 122** and **Figure 124**) as specified in **Table 2**.



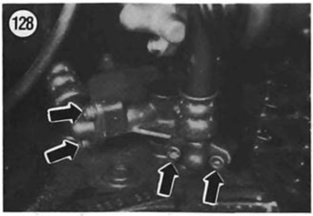


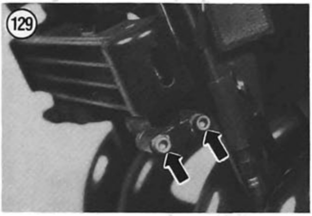


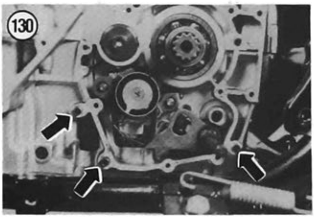


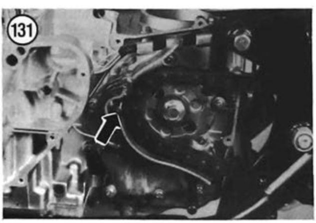
REAR BOLT ASSEMBLY

1. Rear mounting bolt
2. Cap
3. Damper
4. Left-hand rear bracket
5. Damper
6. Collar
7. Right-hand rear bracket
8. Nut









NOTE
Some engines have shims at the engine mounting bolts to take up play resulting from manufacturing variations. Check all mating surfaces after you torque the engine mounting bolts. If there is a gap between the engine and frame, add shims to take up any slack and provide a rigid engine/frame assembly.

7. *KZ1100-B and ZX1100-A:* Inspect the oil cooler fitting O-rings and install new ones if damaged. Install the oil cooler lines (**Figure 128** and **Figure 129**) as described in this chapter.
8. Install the shift linkage and the linkage cover (chain drive) as described in Chapter Six.
9. *Chain-drive:* Install the sprocket cover dowel pins (**Figure 130**). Install the engine sprocket and sprocket cover as described in Chapter Six. Use the rear brake to lock the engine while tightening the sprocket nut, alternator rotor bolt and clutch hub nut.
10. Install the clutch pushrod (**Figure 131**).
11. *Shaft-drive:* Install the front bevel drive unit as described in Chapter Six. Use the rear brake to lock the engine while tightening the alternator rotor bolt, and clutch hub nut.
12. Install the clutch as described in Chapter Five.
13. Install the alternator and electric starter as described in Chapter Nine.
14. Install the "top end" (pistons, cylinder block, cylinder head, camshafts and valve cover) as described in this chapter. Follow the *Installation* procedures when given separately or reverse the *Removal* procedures when separate installation procedures are not given. Do not omit any steps. Note the following:
   a. Secure the ignition timing leads in the clamps attached to the lower right side of the engine (**Figure 132**).

b. Route the alternator and starter leads behind the shift mechanism cover tabs (**Figure 133**).
c. After connecting multiple-pin plastic connectors, make sure none of the male pins have popped out of place. Tug on the wires to find a loose pin and push loose pins back into place until you feel the locking tang seat fully.
d. The oil pressure switch lead is blue/red.
e. The neutral switch lead is light green.
f. The rear brake light switch leads are blue and brown.
g. The No. 1 and 4 coil goes on the left. The yellow/red wires can go to either coil. The green wire goes to the left coil and the black wire goes to the right coil.

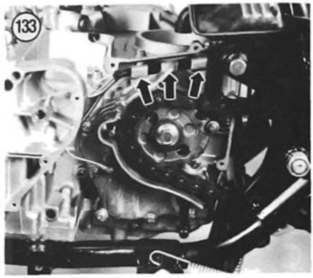
NOTE
Since the spark fires through one spark plug to ground and back to the coil through another spark plug, coil polarity has no effect on performance.

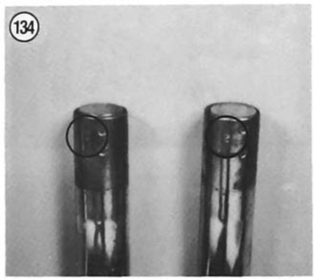
h. Don't tighten the air cleaner housing bolts until after the intake system is installed.
i. The No. 2 and the No. 3 exhaust pipes have identifying numbers (**Figure 134**).
j. Check that the engine oil drain plug is torqued as specified in **Table 2**. Add engine oil to the crankcase as described in Chapter Three.
k. Adjust the throttle cables, clutch, drive chain and rear brake light switch as described in Chapter Three.

WARNING
Make sure none of the control cables or wires are stretched or pinched when the handlebars are turned from lock to lock.

CAUTION
Do not hurry to start or ride the motorcycle yet. You have invested a lot of time, energy and money at this point. Do not take a chance on serious injury or mechanical damage. Thoroughly check and recheck all parts and controls on the motorcycle. Make sure all cables are correctly routed, adjusted and secured and that all bolts and nuts are properly tightened. Position all cables away from the exhaust system.

l. Start the engine and check for oil leaks.



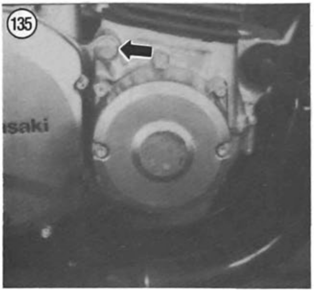


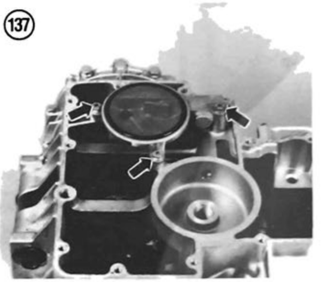
OIL PUMP

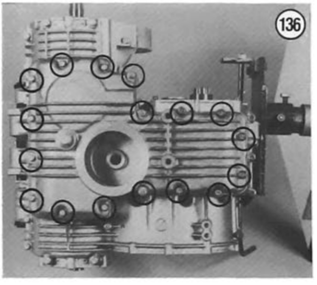
The oil pump, which is geared to the crankshaft, is in the bottom of the crankcase. The low pressure double gear pump pulls oil through a coarse mesh screen and pushes it through a filter to trap the finer particles. There is a metal shield on one end of the filter to keep oil from puncturing the filter where the oil enters. If the filter becomes clogged, a bypass valve routes the oil—still dirty—around the filter and into the engine crankcase.

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 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 rod big-end bearings, the spray from which lubricates the cylinder walls and piston pins.







The second passageway goes up through the cylinder block and head to the camshaft bushing inserts; after the oil leaves the inserts it lubricates the cam lobes and the valve stems. The third passage directs oil to the transmission input shaft and output shaft bearings. After lubricating the engine components, the oil eventually drips back down into the crankcase sump to be picked up again by the oil pump.

Oil Pressure Check

To check the pump, remove the plug from the oil pressure check point on the right side of the crankcase (**Figure 135**). Screw in the fitting of an oil pressure gauge (Kawasaki has a special gauge available). Start the engine and run it long enough to warm the oil to 140° F (60° C). Hold the rpm steady at 3,000 and check the gauge. The gauge should read about 2.8 psi (20 kPa). If the pressure is less than 2.0 psi, check the entire lubrication system to find the source of the trouble.

Oil Pump Removal

The oil pump can be removed without removing the engine from the frame. For clarity, the engine is shown removed.

1. Drain the engine oil and remove the oil filter.
2. Remove the exhaust system as described in Chapter Seven.
3. Remove the 17 bolts and washers that mount the oil pan to the crankcase (**Figure 136**). Remove the oil pan, gasket and O-ring.
4. Remove the 3 bolts and washers that mount the oil pump to the crankshaft (**Figure 137**). Pull out the oil pump and its drive gear.

Oil Pump Disassembly

1. See **Figure 138**. Inspect the pump body for cracks.
2. Pop off the circlip that mounts the driving gear to its shaft (**Figure 139**). Take off the driving gear, the alignment pin and the shim.
3. Remove the pump body screws.
4. Alternately tap the ends of the 2 gearshafts gently with a plastic mallet to loosen the cover. Remove the cover and gasket.
5. Remove the 2 pump gears from the body and inspect their teeth for damage. If either gear has damaged teeth, install a new pump assembly.

NOTE

The D models have an oil pressure relief valve on the oil pump body.

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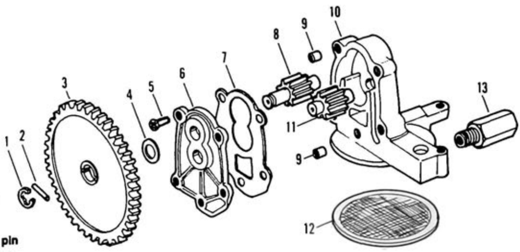

OIL PUMP

1. Circlip
2. Alignment pin
3. Driving gear
4. Washer
5. Bolt
6. Cover
7. Gasket
8. Driving gear
9. Locating dowel
10. Body
11. Driven gear
12. Screen
13. Relief valve

Oil Pump Inspection

Insert the 2 pump gears into the body. With feeler gauges, measure the clearance between the teeth of each gear and the side of the pump body, at the points where the teeth run closest to the body (**Figure 140**). Install a new oil pump if the clearance is greater than specified in **Table 1**.

Oil Pump Assembly

1. See **Figure 138**. 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 a locking agent such as Loctite Lock N' Seal to the pump body screws and tighten them securely.
4. Mount the shim, alignment pin, driving gear and the circlip on the pump shaft (**Figure 141**).
5. After assembling, turn the gear to make sure it turns freely.

Oil Pump Installation

1. Check the oil passage O-ring (A, **Figure 142**). Install a new one if damaged. The flat side of the O-ring faces the engine.
2. Check that the 2 dowel pins are in place (B, **Figure 142**).

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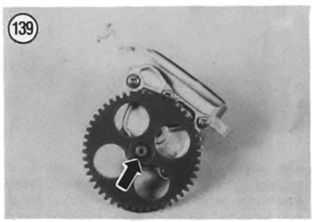

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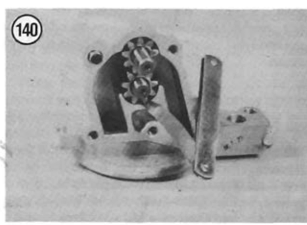

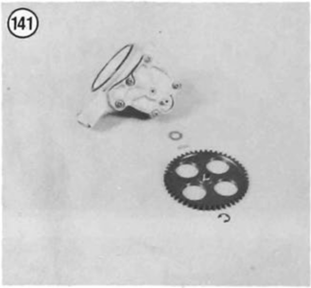

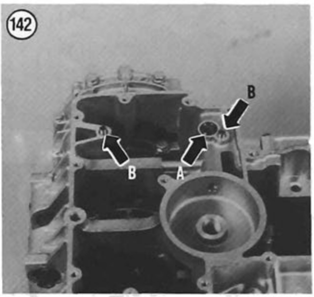

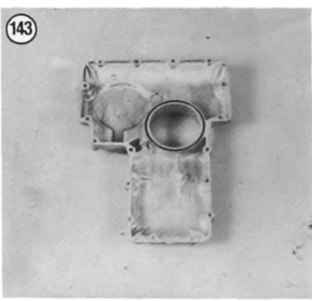

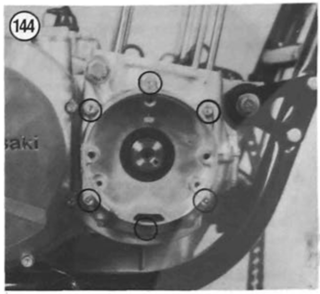

3. Fill the pump with engine oil to prime it.
4. Install the pump in the engine. If it will not seat, rotate the driving gear enough to mesh it with the crankshaft gear.
5. Apply a locking agent such as Loctite Lock N' Seal to the 3 pump mounting bolts. Tighten them securely.
6. Check the oil pan O-ring (**Figure 143**). Install a new one if damaged.
7. Install the oil pan with a new gasket. Tighten the mounting bolts in a crisscross pattern to the torque specified in **Table 2**.
8. Install the exhaust system as described in Chapter Seven.
9. Install the oil filter and add engine oil as described in Chapter Three.

CRANKCASE

Separation

The components of the "top end" do not have to be removed if only the transmission is going to be serviced and the crankshaft is going to be left in place.

1. Remove the engine from the frame as described in this chapter.
2. Remove the ignition pickup coil assembly and the ignition advance unit as described in Chapter Nine.
3. Remove the 6 screws that mount the right crankshaft cover (**Figure 144**). Remove the cover and its gasket.

4. Check that all parts outside of the crankcases have been removed from the engine (**Figure 145** and **Figure 146**).

NOTE
Alternator rotor and ignition advance removal is not essential unless you plan to replace those parts or the crankshaft outer bearings.

NOTE
The clutch cover must be removed, but the rest of the clutch does not have to be removed.

5. Remove the 5 engine case bolts from the top of the engine (**Figure 147**).
6. Turn the engine over and remove the oil pump as described in this chapter.
7. Remove the 16 small crankcase bolts from the bottom of the engine (**Figure 148**).
8. Remove the 8 large bolts on either side of the crankshaft (**Figure 149**). Do *not* remove the 4 main bearing cap bolts at the middle of the crank.

CAUTION
Make sure that you have removed all the fasteners. If the cases are hard to separate in Step 10, check for any fasteners you may have missed.

9. Pry the crankcase halves apart, using the largest tool that will fit in the pry points (**Figure 150**). There are pry points on both sides of the engine. If you encounter resistance, check for bolts you may have missed.
10. Lift the bottom crankcase half off. See Chapter Six for transmission removal and inspection.

Inspection

Check the crankcase halves for cracks or fractures in the stiffening webs, around the bearing bosses and at threaded holes. While such damage is rare, it should be checked for, particularly following a major failure (such as piston breakage, bearing failure, or gear breakage) or after a collision or hard spill in which the engine suffers external damage.

If cracks or fractures are found, they should be repaired immediately by a reputable shop equipped to perform repairs on precision aluminum castings.

The upper and lower crankcase halves are machined as a pair; if one half is not usable, both must be replaced.

CRANKSHAFT AND CAM CHAIN

Once the crankshaft is removed, the cam chain can be replaced. The crankshaft and connecting rod

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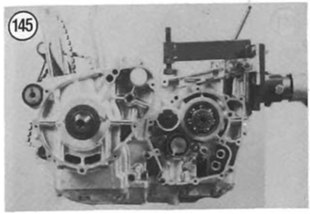

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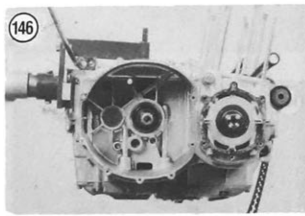

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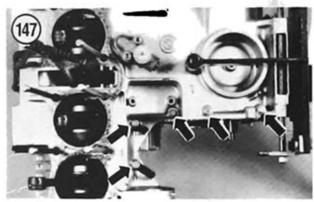

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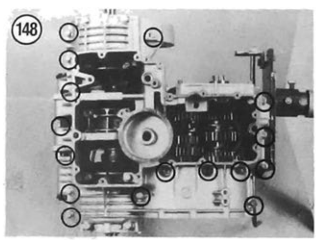

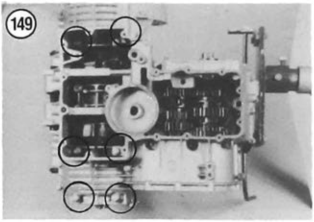
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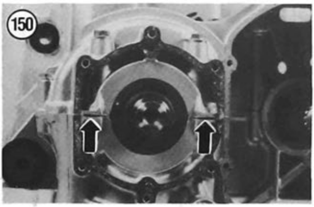
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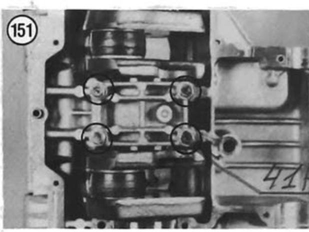
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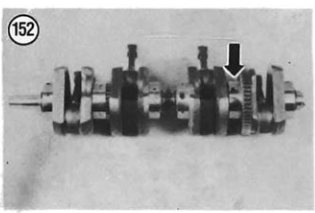
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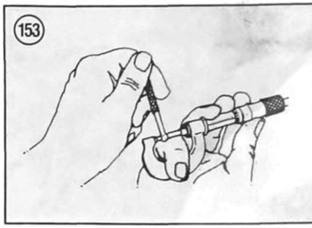
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assembly is pressed together and separate parts are not available from Kawasaki. There are very few specialty shops able to repair this kind of crankshaft, so in most cases you can inspect the crank and rods but only replace the whole assembly if some part is faulty. See your Kawasaki dealer if you suspect crankshaft trouble.

Crankshaft Removal

1. Separate the crankcase halves as described in this Chapter.
2. With the engine upside down, remove the 4 bolts from the bearing cap mounted on the center of the crankshaft. Remove the bearing cap (**Figure 151**).

> *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.*

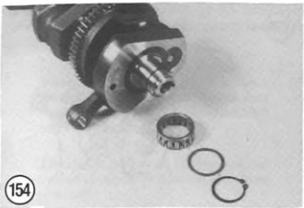
3. Lift the crankshaft out of the engine case. Take off the cam chain (**Figure 152**).

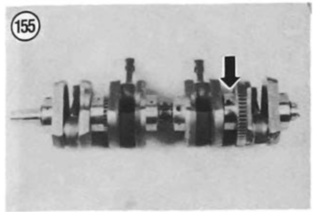
41Hm

Crankshaft Inspection

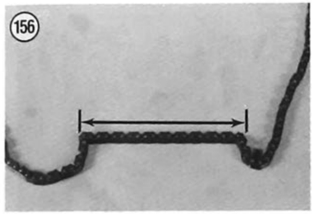
Replacement of any crankshaft parts, except the outer bearings, requires replacement of a complete crankshaft/connecting rod assembly, unless your dealer is capable of separating, reassembling and aligning the crankshaft.

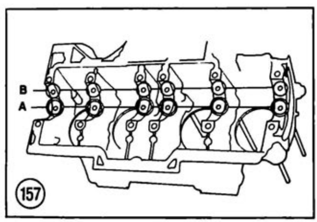
1. Measure the ID (inside diameter) of the small end of the connecting rods with a snap gauge and micrometer (**Figure 153**). If the ID is larger than the limit given in **Table 1**, the the crankshaft should be replaced or rebuilt.
2. Check the rods for obvious damage such as cracks and burns.
3. Check connecting rod big-end side clearance with feeler gauges. If the clearance exceeds the limit in **Table 1**, the crankshaft should be replaced or rebuilt.





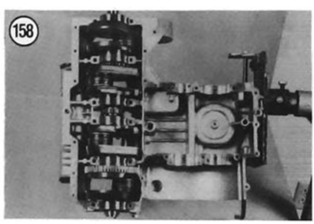
4. Check connecting rod big-end bearing radial play. Turn the crankshaft until the crankpin is at the top. Grasp the connecting rod firmly and pull up on it. Tap sharply on the top of the rod with your free hand. If the bearing and crankpin are in good condition, there should be no movement felt in the rod. If movement is felt or if there is a sharp metallic click, the bearing may be unserviceable; confirm the radial clearance by measuring with a dial indicator. If the clearance exceeds the limit in **Table 1** the crankshaft should be replaced or rebuilt.
5. Carefully examine the condition of the crankshaft main bearings. Turn the bearings by hand and feel for roughness and play. They should turn smoothly and evenly and there should be no apparent radial play. If any bearing is suspect, replace it. The outer bearings can be replaced easily after removing a circlip and washer (**Figure 154**).
6. Check the No. 5 bearing outer race side clearance with feeler gauges (**Figure 155**). This bearing determines crankshaft end play. If play exceeds the limit in **Table 1**, the crankshaft assembly should be replaced.
7. If these checks are satisfactory, take the crankshaft to your dealer or local machine shop. They can check crankshaft and connecting rod alignment and inspect for cracks. Check against the measurements given in **Table 1** at the end of this chapter.





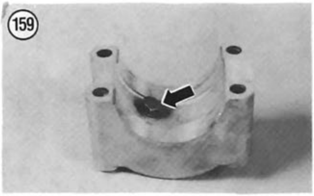
Cam Chain Inspection

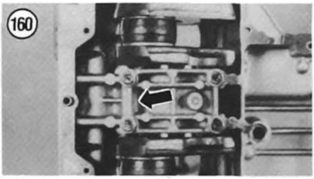
Stretch a length of the chain with about a 10 lb. (5 kg) pull and measure a 20 link length (**Figure 156**). If the length from the 1st pin to the 21st pin exceeds the limit in **Table 1**, install a new chain.

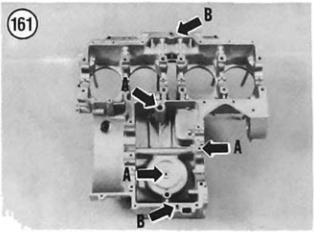


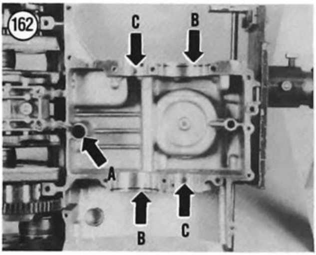
Crankshaft Installation

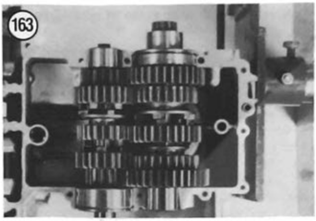
1. Turn the upper engine case upside down.
2. Check that the oil passages are clear (A, **Figure 157**) and that the bearing dowel pins are in place (B).











3. Lubricate the crankshaft bearings with engine oil.
4. Position the cam chain on the crankshaft and lay the crankshaft in place (**Figure 158**). Rotate each bearing outer race until the alignment hole mates with its dowel pin in the crankcase upper half.
5. Check that the cam chain anti-rattle bolt is installed in the crankshaft cap (**Figure 159**). The bolt head should extend 0.248 in. (6.3 mm) above the inside of the cap. Use a locking agent such as Loctite Lock N' Seal on the bolt threads.
6. Insert the main bearing cap with its arrow pointing to the front of the engine (**Figure 160**).
7. Install the bearing cap bolts loosely, and torque them in a crisscross pattern in two stages, as specified in **Table 2**.

CRANKCASE ASSEMBLY

The crankcases should be assembled with the engine upside down.

CAUTION
Set the upper crankcase half on wood blocks to protect the cylinder studs.

1. In the upper crankcase half, check that all oil passages (A, **Figure 161**) are clear and the 2 hollow dowel pins are in place (B).
2. Check that the oil passage O-ring is in place and in good condition (A, **Figure 162**). If the O-ring has a flat side, face it toward the top of the engine.
3. Check that the 2 transmission bearing alignment 1/2 rings (B, **Figure 162**) and the 2 transmission dowel pins (C) are in place.
4. Install the crankshaft assembly with cam chain in the upper crankcase half, as described in this chapter.
5. Oil the transmission gearsets and bearings. Install the transmission gearsets in the upper crankcase half, as described in Chapter Six. Align the transmission gears in the NEUTRAL position (**Figure 163**).

6. Rotate the shift drum to the NEUTRAL position (**Figure 164**).
7. If new crankcases are being used, check that input 1st gear and output 5th gear turn freely (**Figure 165**). If there is binding, install a different thickness steel washer next to output 1st gear; see *Transmission Assembly* in Chapter Six.
8. Check that the crankshaft and transmission bearings are fully seated in the crankcase. There must be no gap between the bearing races and case.
9. Test the transmission to make sure it has been assembled properly:
   a. Carefully place the lower case half in position, fitting the shift forks in their proper gear grooves (**Figure 166**).
   b. Seat the upper case half onto the lower and tap lightly with a plastic or rubber mallet—do not use a metal hammer or it will damage the cases.
   c. Turn the transmission input and output shafts to see that they are free. While spinning the output shaft, shift the transmission (turn the shift drum) through all gears to make sure the transmission is working right. Refer to Chapter Six if the transmission does not work correctly.

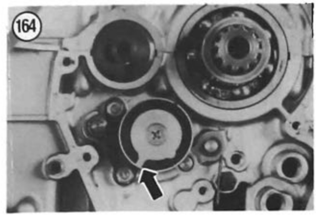
NOTE
These models have neutral locating balls inside output 4th gear. When operating correctly, the neutral locator will not allow the transmission to shift up from NEUTRAL as long as the output shaft is not turning. You must spin the output shaft quickly to shift up from NEUTRAL.

   d. Remove the lower case half.

10. Make sure the crankcase mating surfaces are completely clean and dry. Apply a light coat of gasket sealer to the sealing surfaces of the bottom case half. Cover only flat surfaces, not curved bearing surfaces. Make the coating as thin as possible.

CAUTION
Do not block any oil passages with sealant.

11. Carefully place the lower case half in position, fitting the shift forks in their proper gear grooves (**Figure 166**).
12. Seat the upper case half onto the lower and tap lightly with a plastic or rubber mallet. Do not use a metal hammer as it will damage the cases.
13. Loosely install the 8 large bolts on either side of the crankshaft (**Figure 167**). Use Loctite Lock N'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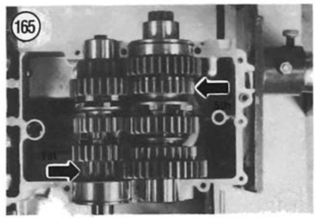
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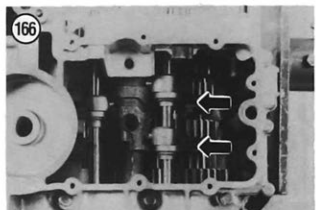
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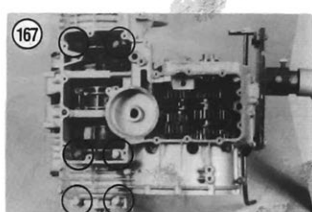
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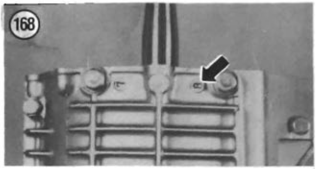

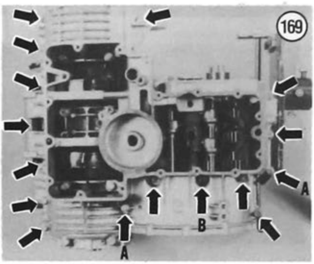

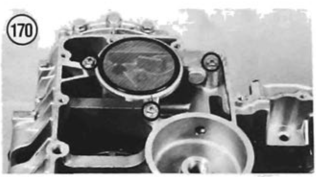

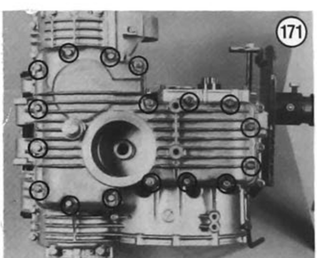

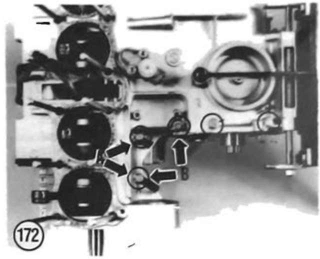

Seal or equivalent on the 2 bolts indicated and use liquid gasket sealant under their bolt heads. Torque the 8 bolts in 2 stages, as specified in **Table 2**, following the sequence numbers cast into the bottom of the engine next to the bolts (**Figure 168**).

14. Loosely install the 16 small crankcase bolts (**Figure 169**). Note the 2 ignition timing lead clamp positions (A). Use Loctite Lock N' Seal or equivalent on bolt B, **Figure 169**.

NOTE
When installing crankcase bolts, check that each one sticks up the same amount above the crankcase surface before you screw them all in. If not, you've got a short bolt in a long hole and vice versa.

15. Torque the 16 bolts in 2 stages, as specified in **Table 2**.
16. Rotate the crankshaft to make sure it turns freely.
17. Turn the transmission input and output shafts to see that they are free. While spinning the output shaft, shift the transmission (turn the shift drum) through all gears to make sure the transmission is working right.

NOTE
These models have neutral locating balls inside output 4th gear. When operating correctly, the neutral locator will not allow the transmission to shift up from NEUTRAL as long as the output shaft is not turning. You must spin the output shaft quickly to shift up from NEUTRAL.

18. Install the oil pump (**Figure 170**) and the oil pan (**Figure 171**) as described in this chapter.
19. Turn the engine right side up and install the 5 upper crankcase bolts (**Figure 172**). Note the 2

alternator lead clamp positions; put the clamps at location A on 1981 models and at location B on 1982 and later models.

NOTE
When installing crankcase bolts, check that each one sticks up the same amount above the crankcase surface before you screw them all in. If not, you've got a short bolt in a long hole and vice versa.

20. Install the right crankshaft cover and gasket, noting the following:
   a. Check that the 2 dowel pins are in place (**Figure 173**).
   b. The gasket is not symmetrical (**Figure 173**). Make sure you put it on so it matches the machined crankcase surface.
   c. Use a locking agent such as Loctite Lock N' Seal on the 3 upper screws (**Figure 174**).
21. Install the ignition advance assembly (**Figure 175**) and the pickup coil assembly (**Figure 176**) as described in Chapter Nine.

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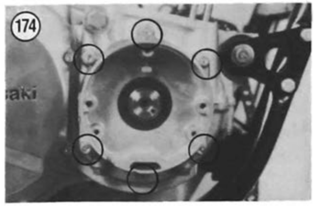

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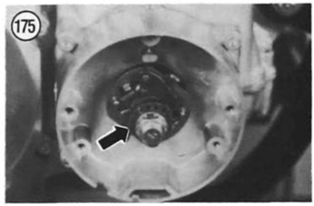

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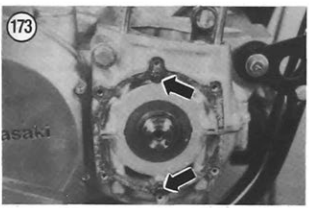

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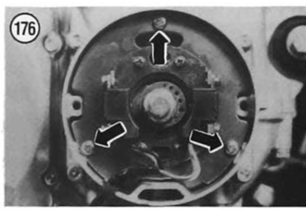


Tables are on the following pages.

Table 1 ENGINE WEAR LIMITS

		in.	mm
	Кулак цепи (20 длины связи)		
Cam chain (20 link length)		5.07	128.9
Cam chain guide rubber wear depth	Кулак цепи ведет резиновую земную глубину		
Upper	износ	0.17	4.3
Front and rear	фронт и тыл	0.13	3.3
Cam lobe height	кулак высота лепестка		
KZ1000-J, KZ1100-B			
Intake	потребление	1.449	36.80
Exhaust	исчерпать (истощить!	1.433	36.40
KZ1000-K, M; KZ1100-A, D			
Intake and exhaust	потребляет и исчерпывает	1.414	35.91
ZX1100-A			
Intake and exhaust	потребляет и исчерпывает	1.482	37.65
Camshaft journal/insert clearance	вставка оси кулака	0.006	0.16
Standard	стандарт	0.0008-0.0028	0.020-0.070
Camshaft journal OD	ведомость OD оси кулака	0.961	24.42
Camshaft runout	выход оси кулака	0.004	0.1
Compression (minimum)	сжатие (минимум)		
1000		120 psi	8.5 kg/cm²
1100		115 psi	8.2 kg/cm²
Compression (standard)	сжатие (стандарт		
1000		160-190 psi	11.2-13.2 kg/cm²
1100		150-180 psi	10.7-12.7 kg/cm²
Combustion chamber column	колонка изгиба сторания		
(from bottom of cylinder head)	(от основания головы цилиндра		
1000		39.9 cc	
1100		39.9 cc	
Connecting rod bend and twist	соединение прута сгибается и завивается		
per 4 in. (100 mm)		0.008	0.20
Connecting rod big end clearance	Соединение прута большего конца проведения расчетов		
Radial clearance	радиальное проведение расчетов	0.003	0.08
Side clearance	стороны проведения расчетов	0.024	0.60
Connecting rod small end ID	Соединение прута малого конца ID		
ZX1100-A		0.711	18.05
All others	все другие	0.671	17.05
Crankshaft side clearance @ No. #5	проведение расчетов стороны коленчатого вала N5		
main bearing outer race	главная несущая внешняя	0.020	0.50
Crankshaft runout	выход коленчатого вала	0.004	0.10
Cylinder head warp	деформация головы цилиндра	0.002	0.05
Cylinder bore ID	цилиндр перенос ID		
1000		2.736	69.50
1100		2.858	72.60
Oil pressure (@ 3,000 rpm @ 140° F [60° C])	давление масла оборотов/в минуту		
Standard	стандарт	2.8 psi	0.2 kg/cm²
Oil pump gear body clearance	масло в насосе	0.006	0.14
Piston/cylinder clearance	поршень / цилиндр		
Standard	стандарт	0.0017-0.0027	0.043-0.070
Piston OD	поршень OD		
1000		2.724	69.20
1100		2.846	72.30
Piston pin hole ID	отверстие булавки поршня ID		
ZX1100-A		0.712	18.08
All other models		0.672	17.08
Piston pin OD			
ZX1000-A		0.707	17.96
All other models	все др. модели	0.668	16.96

(continued)

Table 1 ENGINE WEAR LIMITS (continued)

	in.	mm
Piston ring/groove clearance кольца/углубление по ширине		
Top ring верх кольца	0.007	0.17
Second ring второе кольцо	0.006	0.16
Piston ring thickness толщина кольца поршня		
Top ring	0.035	0.90
Second ring	0.043	1.10
Piston ring groove width		
Top верх	0.044	1.12
Second секунда	0.052	1.31
Oil масло	0.103	2.61
Piston ring installed gap промежуток кольца поршня		
Limits ограничения	0.008-0.027	0.2-0.7
Valve stem runout выход стебля клапана	0.002	0.05
Valve stem OD клапан останов OD		
Intake потребление	0.274	6.95
Exhaust истощение	0.273	6.94
Valve guide ID клапан вдоль ID	0.279	7.08
Valve/guide clearance (rocking method) расчеты клапана (качающийся метод)		
Intake потребление	0.0094	0.24
Exhaust истощение	0.0866	0.22
Valve head thickness толщина головы клапана		
Intake потребление	0.020	0.5
Exhaust истощение	0.028	0.7
Valve seat width ширина места клапана		
Standard стандарт	0.040	1.0
Valve seat angles углы места клапана	32°, 45°, 60°	
Valve spring tension напряженность пружины клапана		
Inner внутренний		
ZX1100-A	58.6 lb. @ 0.91 in.	26.6 kg @ 23.1 mm
All other models др. модели	52 lb. @ 0.93 in.	23.7 kg @ 23.6 mm
Outer внешний		
ZX1100-A	104.5 lb. @ 1.01 in.	47.4 kg @ 25.6 mm
All other models др. модели	95 lb. @ 1.01 in.	43.3 kg @ 25.6 mm
Valve spring squareness квадратность пружины клапана		
Intake потребление	0.051	1.3
Exhaust истощение	0.059	1.5
Valve stem installed height (max.) стебель клапана устан. высоту (макс.)		
ZN1100-A	1.495	37.98
All other models	1.508	38.30

Table 2 ENGINE TORQUES

	ft.-lb.	mkg
Alternator rotor bolt задвижка ротора	95	13.0
Cam chain tensioner cap цепь кулака	20	2.8
Camshaft cap bolts ось клапана - болты	12	1.7
Camshaft sprocket bolts ось клапана болты цепного колеса	11	1.5
Clutch hub nut сжатие центра	85	12.0
Clutch spring bolts сжатие пружины болта	90 in.-lb.	1.0
Crankcase bolts болты картера		
Small маленькие	90 in.-lb.	1.0
Large большие	18	2.5
Crankshaft main bearing cap bolts коленчатый вал отношение глав. болту	18	2.5

(continued)

Table 2 ENGINE TORQUES (continued)

	ft.-lb.	mkg
Cylinder head Голова цилиндра		
Bolts задвижка	8.5	1.2
Nuts гайка	30	4.0
Engine mounting bolts двигатель устан. болтов	30	4.0
Engine mounting bracket bolts двигатель повышающий задвижки скобы	12.5	1.7
Engine sprocket bolt двигатель задвижка цепного колеса	60	8.0
Front belvel gear case фронтальн. случай механизма		
Damper cam nut увлажнитель кулака гайки	90	12.0
Bevel drive mounting bolts скос повышающ. болта	18	2.5
Bevel drive gear bolt скос механизма двигателя	90	12.0
Bevel drive gear nut скос гайки механизма	90	12.0
Ignition advance bolt задвижка аванса воспламенения	18	2.5
Neutral indicator switch нейтральный выключатель индикатора	11	1.5
Oil drain plug масло штепселя утечки	22	3.0
Oil filter mounting bolt масл. фильтр повышающ. болта	14.5	2.0
Oil pan bolts	90 in.-lb.	1.0
Oil pressure switch масло выключателя давления	50 in.-lb.	0.6
Oil cooler mounting bolts масло холодильника	69 in.-lb.	0.8
Shift return spring pin изменение возвращ. [illegible]	14.5	2.0
Spark plugs штепсели искры	20	2.8
Starter clutch Allen bolts стартер сцепления задвижек	30	4.0
Valve cover bolts задвижка покрытия клапана	90 in.-lb.	1.0

CLUTCH

The clutch can be serviced with the engine in the motorcycle or on a workbench. Generally, most service operations are easier with the engine in the motorcycle because the engine is held firmly.

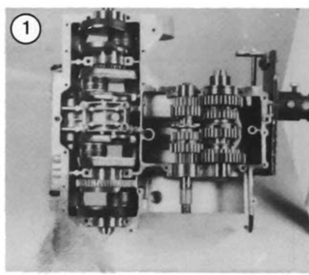
Clutch wear limit specifications are given in **Table 1** at the end of the chapter.

CLUTCH OPERATION

The clutch is a wet multi-plate type which operates immersed in the engine oil. It is mounted on the right-end of the transmission input shaft. The inner clutch hub is splined to the input shaft (chain-drive), or connected to the input shaft through a spring-loaded damper cam (shaft-drive); the outer housing can rotate freely on the input shaft. when the clutch release is actuated. The outer housing is driven by the crankshaft primary gear (**Figure 1**). The clutch release is mounted in the sprocket cover on the left side of the engine (chain-drive) or inside the front bevel drive case (shaft-drive).

CAUTION
The clutch friction plates are bathed in the same oil you put in the engine. Do not use oil additives or you may cause clutch slippage.

Between the clutch inner hub and outer housing is a sandwich of clutch plates. Every other plate (including the bottom and top friction plates) is locked to the outer housing and must turn whenever it turns. The remaining metal plates are locked to the inner hub; when they turn, it turns. Outside this sandwich of clutch plates is the pressure plate. There are coil springs that push the pressure plate in against the rest of the plates. This pressure jams the plates together and friction locks the clutch hubs together. The crankshaft will then turn the transmission input shaft.



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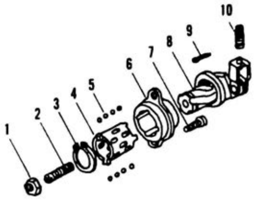
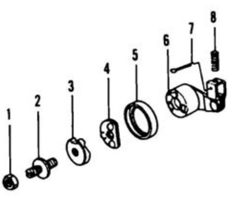


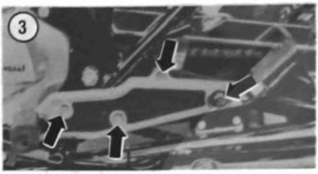
CLUTCH RELEASE MECHANISM (1981)

1. Locknut
2. Adjusting screw
3. Circlip
4. Ball retainer
5. Steel ball
6. Outer release gear
7. Bolt
8. Inner release gear
9. Cotter pin
10. Spring



CLUTCH RELEASE MECHANISM (1982-ON)

1. Locknut
2. Adjusting screw
3. Ball ramp plate
4. Ball assembly
5. Grease seal
6. Release lever
7. Cotter pin
8. Spring



To disengage the clutch, a clutch release mechanism lifts the pressure plate outward from the clutch. With the pressure gone, the outer housing and the friction plates locked to it continue to turn, but the metal plates and inner hub stop turning.

All of the clutch parts can be removed while the engine is mounted in the frame.

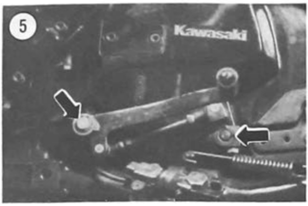
CLUTCH RELEASE

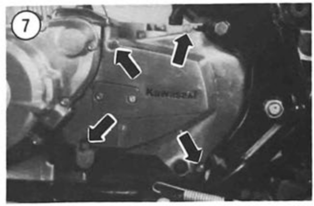
Routine cable free play and release adjustment are described in Chapter Three. The release consists of a release arm that rides on ball bearings inside the release housing. The clutch cable is attached to the arm; when pulled, it rotates the arm which moves toward the clutch. The adjusting screw in the arm pushes against the clutch pushrod, which extends through the hollow transmission input shaft and releases the clutch pressure plate from the pack of friction and steel plates.

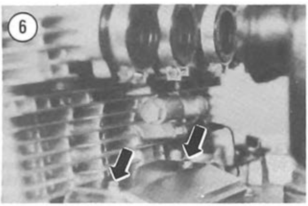
Disassembly/Assembly (Chain-drive)

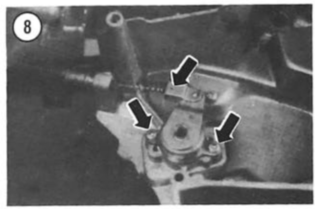
The 1981 models use a clutch release mechanism with 2 spiral gears riding on 11 steel balls. The 1982-on models use a clutch release mechanism with a ball bearing that rides up on ramps in the release arm. Refer to **Figure 2** for all models.

1. Remove the bolts and the left-hand footpeg bracket (**Figure 3**).
2. Remove the shift pedal (**Figure 4**); remove the bolt and spread the slot open with a screwdriver if necessary. If your bike has linkage between the shift



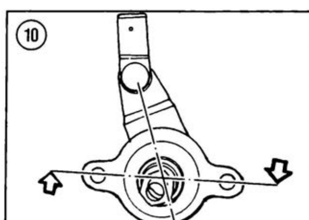


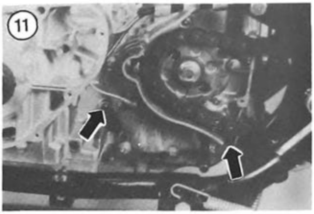


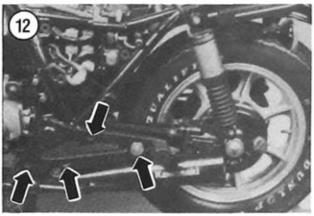


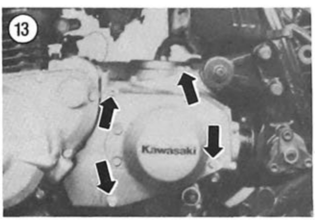
pedal and shift shaft, remove the circlip at the pedal and remove all the linkage (**Figure 5**).

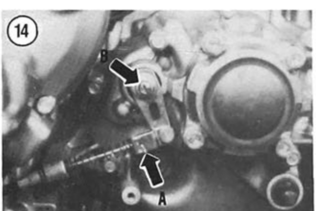
3. Remove the 2 bolts and washers securing the starter motor cover and remove the cover and gasket (**Figure 6**).
4. Remove the 4 bolts and washers securing the engine sprocket cover and remove the cover (**Figure 7**). Be careful not to damage the shift shaft oil seal.
5. If you want to detach the clutch cable, remove the clutch release lever cotter pin (**Figure 8**). Remove the cable tip from the lever.
6. *Late models:*
   a. Pull the release arm out of the release housing (**Figure 9**).
   b. Remove the 3 ball bearings and their cage.
7. *Early models* (**Figure 1**):
   a. Remove the 2 screws that mount the release housing to the sprocket cover (**Figure 8**).
   b. Remove the circlip and separate the outer and inner spiral release gears. Be careful not to lose the 11 release balls; in case you do, they are 1/8 in. diameter.
8. To assemble, reverse these steps. Note the following:
   a. Apply grease to all clutch release parts before assembly.
   b. *Early models:* The inner spiral gear must be installed so that when the 2 gears are fully

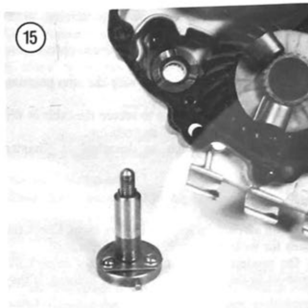












meshed, the clutch release lever will be positioned as shown in **Figure 10**, with the machined side of the housing facing up.

c. Use a new cotter pin to secure the cable in the release lever. Spread its ends.
d. Make sure the 2 sprocket cover dowel pins are in place (**Figure 11**).
e. Align the shift pedal with the top of the footpeg.
f. Adjust the clutch as described in Chapter Three.

Disassembly/Assembly (Shaft-drive)

The clutch release on shaft-drive models is installed inside the front bevel drive gearcase.

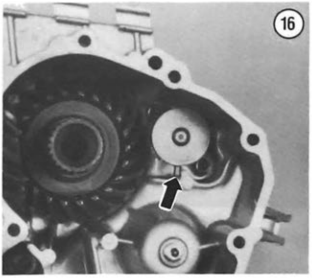
1. Place the bike on its centerstand.
2. Put an oil drain pan under the front bevel case.
3. Loosen the 2 starter cover bolts (**Figure 6**).
4. Remove the 4 bolts and the left footpeg bracket (**Figure 12**).
5. Remove the shift pedal; remove the clamp bolt and spread the slot open with a screwdriver if necessary.
6. Remove the 4 bolts and the front bevel cover (**Figure 13**).
7. Remove the clutch release lever cotter pin and free the cable from the lever (A, **Figure 14**).
8. Remove the adjuster locknut, flat washer and release lever (B, **Figure 14**).
9. Remove the front bevel gear case from the engine as described in Chapter Six.
10. On the inside of the case, remove the release shaft and ball assembly (**Figure 15**).

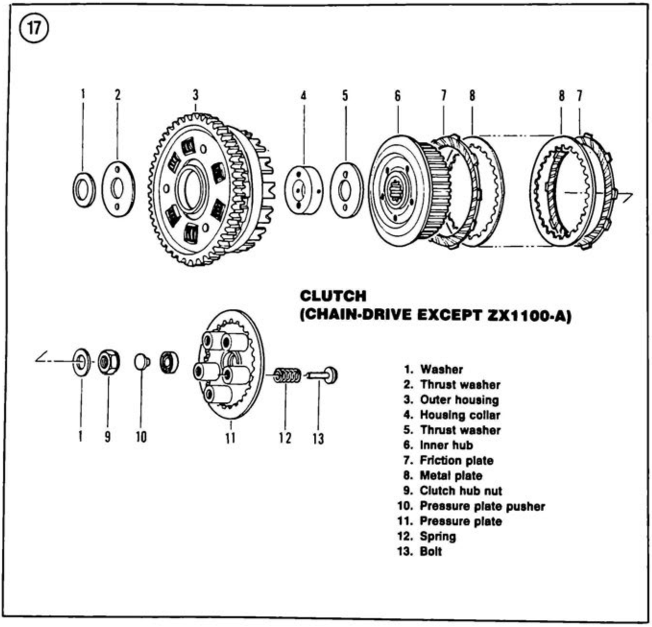
11. To assemble, reverse the disassembly steps. Note the following:
   a. Apply grease to all clutch release parts before assembly.
   b. Install the release shaft with the stop pointing as shown in **Figure 16**.
   c. Use a new cotter pin to secure the cable in the release lever. Spread its ends.
   d. Adjust the clutch as described in Chapter Three.

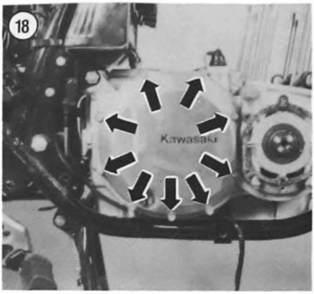
Inspection

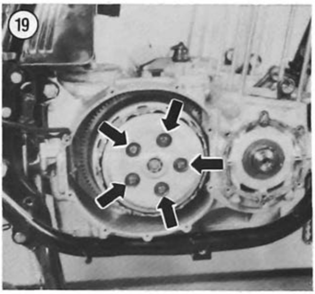
Clean all parts in solvent and dry them. Check the balls for wear or pitting; replace if damaged.

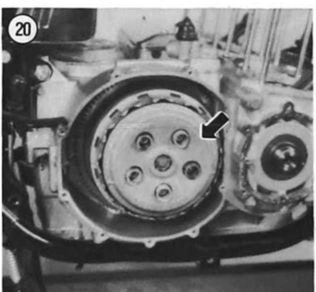
On models with spiral release gears, inspect the grooves in the inner gear and outer housing. If they











show signs of wear, replace the entire assembly. Upon reassembly, push the inner gear back and forth in the direction of the shaft without turning it. If there is excessive play, replace the entire assembly.

CLUTCH

All of the clutch components can be removed while the engine is mounted in the frame.

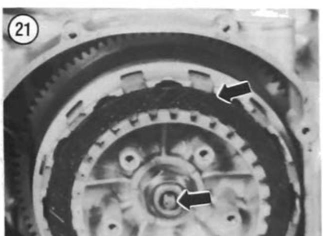
Disassembly/Assembly (Chain-drive except ZX110-A)

1. See **Figure 17**. Put the bike up on its centerstand and drain the engine oil, then put the oil drain pan under the clutch cover.
2. Remove the 9 clutch cover screws (**Figure 18**).
3. Free the cover by tapping it gently with a soft mallet. Remove the cover. Be careful not to damage the gasket.

> *CAUTION*
> *Make sure that you have removed all the fasteners. If the cover is hard to remove, check for any fasteners you may have missed. Do not try to pry the cover off the engine case or you will damage the sealing surfaces.*

> *NOTE*
> *If necessary to provide cover removal clearance, remove the brake pedal from its mount.*

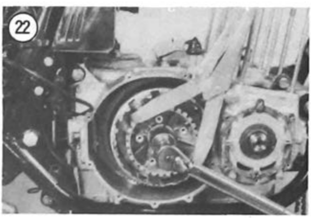
4. Loosen the 5 clutch pressure plate bolts (**Figure 19**) gradually in a criss cross pattern.
5. Remove the bolts, washers, springs and the pressure plate (**Figure 20**).
6. Remove the pressure plate pusher, if it did not come off with the pressure plate.
7. Pull the clutch release pushrod out of the center of the transmission input shaft and remove the clutch plates (**Figure 21**).

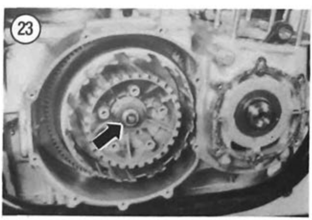


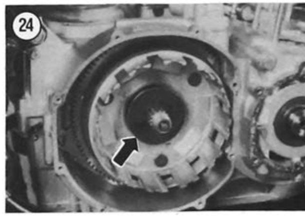
8. If the hub nut is staked to the shaft, pry out the staked area of the clutch hub nut with a punch.
9. Using a socket on a breaker bar, remove the clutch hub nut and washer from the input shaft (**Figure 22**).

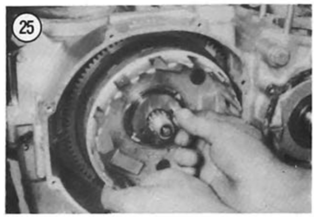
NOTE
To remove the clutch hub nut, you must hold the clutch hub (which is mounted on the transmission input shaft) steady. You can lock the input shaft by stuffing a clean rag or a penny between the primary gear and the clutch ring gear teeth. A special tool, the "Grabbit," is available from Joe Bolger Products Inc., Barre, Mass. 01005.

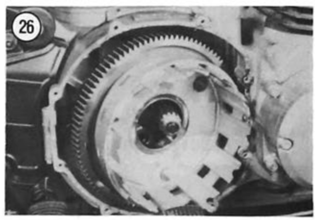
10. Remove the washer (**Figure 23**) and inner hub.
11. Remove the thrust washer (**Figure 24**).
12. Screw 2 clutch cover bolts into the housing collar (**Figure 25**) and pull out the collar assembly.
13. Slide the outer housing to the left and remove it from the engine (**Figure 26**).
14. Remove the thrust washer (**Figure 27**) and the washer (**Figure 28**).
15. To assemble, reverse these steps; note the following:
   a. If one side of any washer is marked "outside," be sure to face that side out.

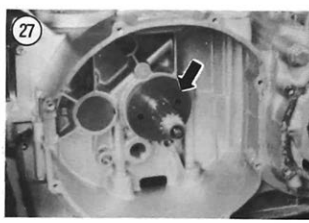


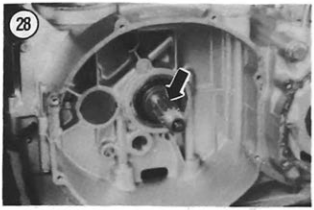








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b. Use a new clutch hub locknut when possible and torque it to 90 ft.-lb. (12 mkg).
c. If you are installing new dry plates, first wet them with oil to prevent clutch seizure.
d. When installing the clutch plates, the sequence is: friction plate, metal plate, friction plate, etc., starting and ending with a friction plate. The friction plate grooves should point in the direction shown in **Figure** 29.
e. When installing the clutch cover screws, check that each one sticks up the same amount from the cover surface before you screw them all in. If not, you've got a short screw in a long hole and vice versa. Do not use an impact driver to install cover screws; they'll be too tight.
f. Add engine oil and adjust the clutch release and cable play as described in Chapter Three.

Disassembly/Assembly (Shaft-drive and ZX1100-A))

1. See **Figure 30**. Put the bike up on its centerstand and drain the engine oil, then put the oil drain pan under the clutch cover.

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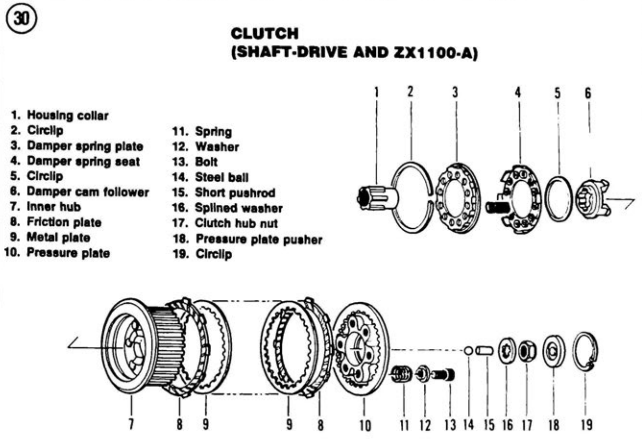
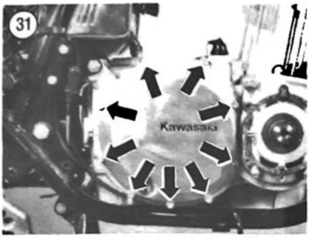
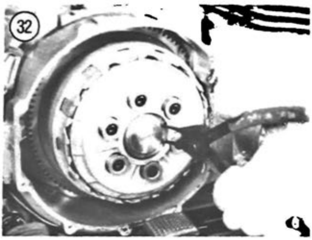


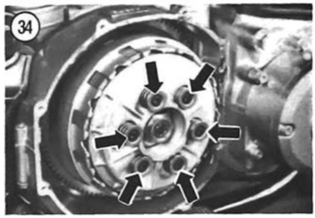


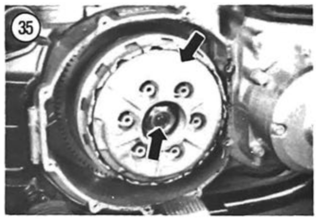


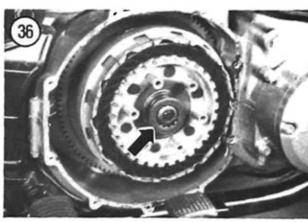
2. Remove the 9 clutch cover screws (**Figure 31**).
3. If necessary to provide cover removal clearance, remove the brake pedal.
4. Free the cover by tapping it gently with a soft mallet. Remove the cover. Be careful not to damage the gasket.

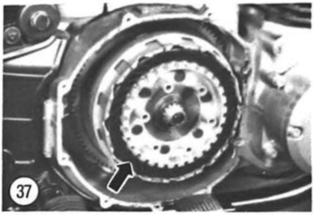
CAUTION
Make sure that you have removed all the fasteners. If the cover is hard to remove, check for any fasteners you may have missed. Do not try to pry the cover off the engine case or you will damage the sealing surfaces.

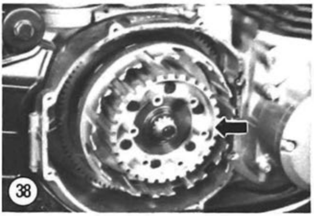
NOTE
If you have a special clutch holding tool, remove the pressure plate screws springs, and the plate. If not, use the rear brake to hold the clutch hub steady as follows.

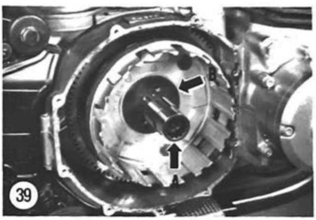


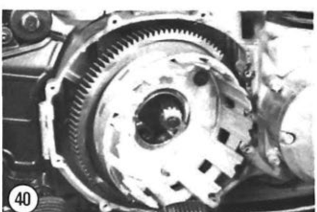


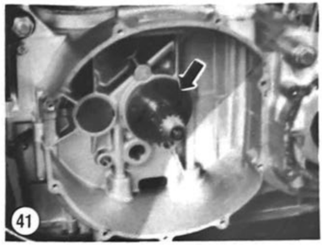


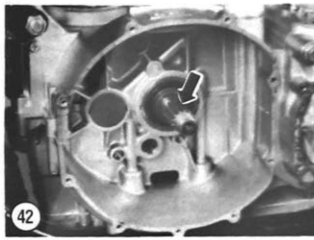




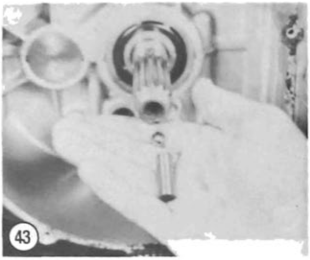








5. Remove the circlip and the pressure plate pusher (**Figure 32**).
6. If the hub nut is staked to the shaft, pry out the staked area of the clutch hub nut with a punch.
7. Shift the transmission into low gear, step on the rear brake pedal and loosen the clutch hub nut with a socket on a breaker bar (**Figure 33**).
8. Loosen the 6 clutch pressure plate screws (**Figure 34**) gradually in a crisscross pattern, then remove the screws, washers and springs.
9. Remove the hub nut and pressure plate (**Figure 35**).
10. Remove the hub nut splined washer (**Figure 36**).
11. Remove the clutch plates (**Figure 37**).
12. Remove the inner hub (**Figure 38**).
13. Remove the inner hub bushing (A, **Figure 39**).
14. Screw 2 clutch cover bolts into the housing collar (B, **Figure 39**) and remove the collar assembly.
15. Slide the outer housing to the left and remove it from the engine (**Figure 40**).
16. Remove the thrust washer (**Figure 41**) and the washer (**Figure 42**).



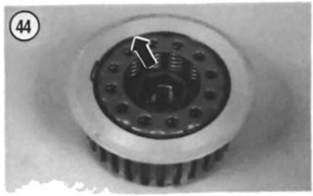
17. Remove the short pushrod and the steel ball behind it (**Figure 43**).
18. To assemble, reverse these steps; note the following:

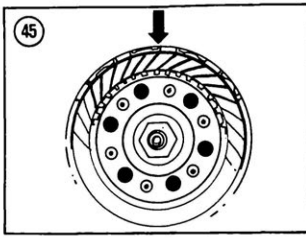
WARNING
*Do not try to disassemble the damper cam assembly without an arbor press. The assembly is under heavy spring preload. To remove the damper cam assembly from the clutch hub, push the spring plate into the hub and remove the circlip (**Figure 44**), then remove the damper parts.*

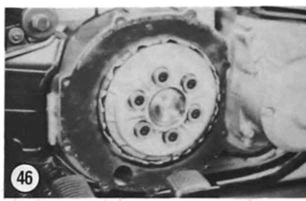
a. If one side of any washer is marked "outside," be sure to face that side out.
b. Use a new clutch hub locknut when possible and torque it to 90 ft.-lb. (12 mkg).
c. If you are installing new dry plates, first wet them with oil to prevent clutch seizure.
d. When installing the clutch plates, the sequence is: friction plate, metal plate, friction plate, etc., with a friction plate on the inside and outside of the pack. The friction plate grooves should point in the direction shown in **Figure 45**.
e. Install the cover gasket as shown in **Figure 46**.
f. When installing the clutch cover screws, check that each one sticks up the same amount from the cover surface before you screw them all in. If not, you've got a short screw in a long hole and vice versa. Do not use an impact driver to install cover screws; they'll be too tight.
g. Add engine oil and adjust the clutch release and cable play as described in Chapter Three.

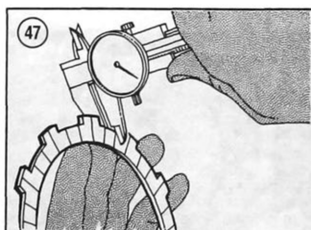
Clutch Inspection

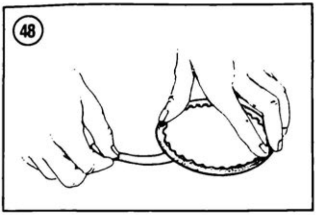
NOTE
If any plates or springs require replacement, you should replace them

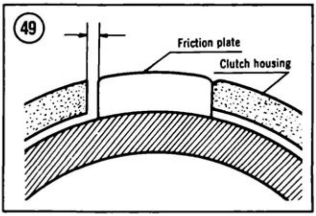


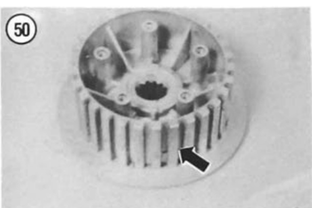






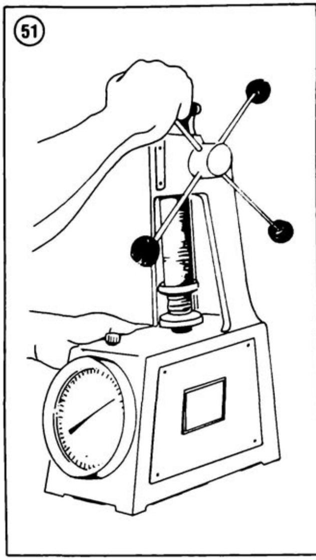






all as a set for optimum clutch performance.

1. Inspect the friction plates for signs of overheating or a burned smell. Replace them if damaged.
2. Measure the thickness of each friction plate at several places around the plate as shown in **Figure 47**. Replace any plate that is worn is less than the wear limit in **Table 1**.
3. Lay each plate on a flat surface. If there is a gap between any part of the clutch plate and the flat surface, measure the warpage with feeler gauges (**Figure 48**). Replace any plate with a warp greater than the service limit in **Table 1**.



4. Insert a friction plate into the outer housing and rotate the plate until one side of each tab on it is butted up against the housing. With feeler gauges, measure the clearance between the other side of each tab and the housing (**Figure 49**). Replace any plate with clearance greater than 0.035 in. (0.9 mm). Ideal clearance is 0.014-0.020 in. (0.35-0.65 mm). Too much clearance will cause a clutch rattle. Too little clearance will cause clutch drag.
5. Visually inspect the splines that mount the clutch plates to the inner hub (**Figure 50**); if the splines are chewed up or badly worn, install new parts.
6. Inspect the clutch springs. The spring tension must be checked *while compressed* in a special spring tester (**Figure 51**). See **Table 1** at the end of this chapter for compression specifications. Replace all springs if one has sagged below the limit.
7. Roll the clutch pushrod on a flat surface to check for bends or damage. Examine the rounded ends of the pushrod for damage. Replace it if bent or damaged.

8. Examine the clutch housing fingers and ring gear teeth (**Figure 52**). Check for excessive wear or loose rivets. If the condition is marginal, replace the housing. Clutch failure at high rpm can cause expensive engine damage.
9. *Chain-drive except ZX1100-A:* Inspect the pressure plate bearing (**Figure 53**) and replace it if it feels rough.
10. Check the clutch collar, spacers and thrust washers. Replace any parts that are cracked or excessively worn, loose or galled.
11. Measure the clutch housing inside diameter (ID) with an inside micrometer or vernier caliper (**Figure 54**). If the bushing ID is larger than the limit in **Table 1**, install a new clutch housing.
12. Measure the clutch collar outside diameter (OD) with a micrometer or vernier caliper (**Figure 55**). If the sleeve OD is smaller than the limit in **Table 1**, install a new collar.
13. *Shaft-drive and ZX1100-A*: Inspect the damper cam and follower (**Figure 56**). If they are excessively worn or damaged install new parts.
14. *Shaft-drive and ZX1100-A*: Inspect the damper springs. The spring tension must be checked *while* compressed in a special spring tester (**Figure 51**). See **Table 1** at the end of this chapter for compression specifications. Replace all springs if one has sagged below the limit.

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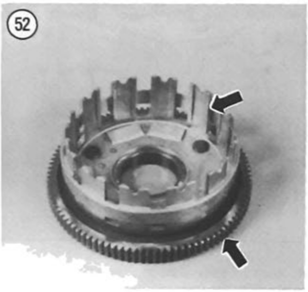

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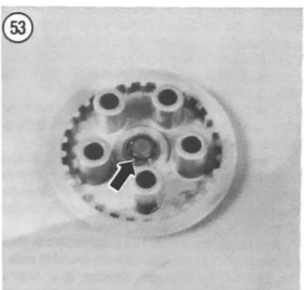

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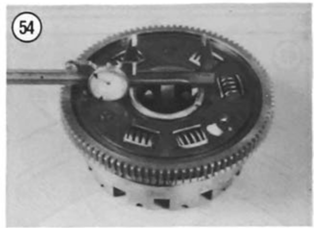

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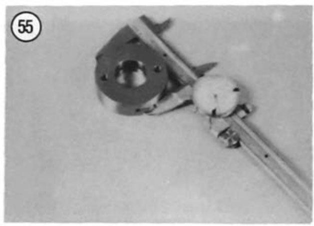

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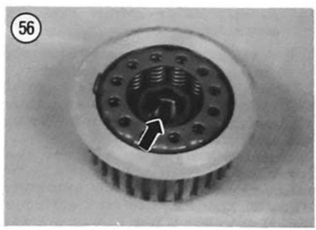


Table 1 CLUTCH WEAR LIMITS

	in.	mm
Clutch housing ID	2.246	57.06
Clutch bearing collar OD	2.240	56.90
Disc tab/housing clearance	0.035	0.9
Standard	0.014-0.026	0.35-0.65
Disc/plate warp	0.012	0.3
Friction disc thickness	0.11	2.8
Housing/primary gear backlash	0.0055	0.14
Standard	0.0012-0.004	0.03-0.10
Spring tension		
Chain-drive	50 lb. @ 0.93	22.5 kg @ 23.5
Shaft-drive	38 lb. @ 0.87	17.5 kg @ 22.1
Shaft-drive cam damper	65 lb. @ 0.79	29.5 kg @ 20.0

NOTE: If you have a 1982 and later P Series Police Model, first check the Supplement at the back of this manual for any specific service information.

CHAPTER SIX

TRANSMISSION

This chapter covers all the parts that transmit power from the clutch to the drive chain or drive shaft: the engine sprocket (chain drive) or front bevel drive gearcase (shaft drive), the transmission gears, the shift drum and forks that slide the gears and the shift linkage that turns the shift drum.

The shift linkage, the front bevel drive gearcase and the shift drum and forks can be repaired while the engine is mounted in the frame, but repair of the transmission gears requires engine removal and crankcase separation (Chapter Four).

Table 1 at the end of the chapter lists transmission wear limit specifications. Many inspection measurements require a precision inside and outside micrometer, dial gauge or the equivalent. If you don't have the right tools, have your dealer or machine shop take the required measurements. Torque values are listed in **Table 2**.

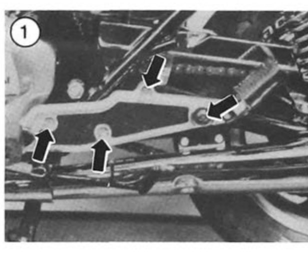
SPROCKET COVER (CHAIN-DRIVE)

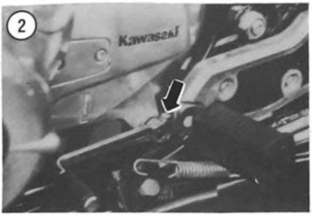
The clutch release mechanism is mounted on the inside of the sprocket cover. The sprocket cover and shift linkage cover underneath it must be removed for access to the shift linkage.

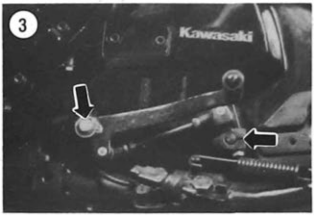
Sprocket Cover Removal/Installation

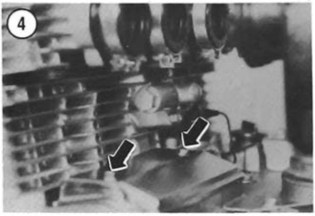
1. Remove the 4 bolts and the left footpeg bracket (**Figure 1**).
2. Remove the shift pedal (**Figure 2**); remove the bolt and spread the slot open with a screwdriver if necessary. If your bike has linkage between the shift pedal and shift shaft, remove the circlip at the pedal and remove all the linkage (**Figure 3**).
3. Remove the 2 bolts and washers securing the starter motor cover and remove the cover and gasket (**Figure 4**).
4. Remove the 4 bolts and washers securing the engine sprocket cover and remove the cover (**Figure 5**). Be careful not to damage the shift shaft oil seal.
5. To install, reverse these steps. Note the following:

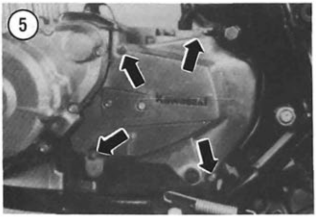
   a. Make sure the 2 sprocket cover dowel pins are in place (**Figure 6**).

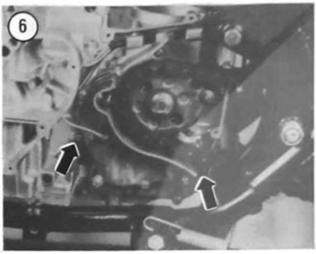


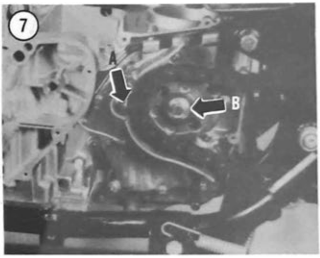












b. Align the shift pedal with the top of the footpeg.

ENGINE SPROCKET (CHAIN-DRIVE)

The engine sprocket is on the left end of the transmission output shaft, behind the sprocket cover. The drive chain is endless—it has no master link. To remove the drive chain, remove the engine sprocket from the output shaft and remove the swing arm as described in Chapter Eleven.

Removal

1. Remove the engine sprocket cover as described in this chapter.
2. To avoid damaging the clutch pushrod, pull it out of the transmission input shaft, to the left of the engine sprocket (A, **Figure 7**).
3A. On models with no sprocket lockplate, lock the rear wheel with the brake and remove the engine sprocket bolt and washer (B, **Figure 7**).

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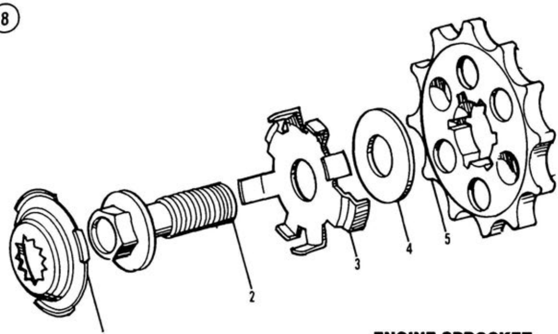

ENGINE SPROCKET

1. Stop washer
2. Bolt
3. Lockplate
4. Washer
5. Engine sprocket

3B. On models with a sprocket lockplate, flatten the lockplate tabs (**Figure 8**), then remove the stop washer. Lock the rear wheel with the brake and remove the engine sprocket bolt, lockplate and flat washer.

4. Slide the sprocket off the output shaft.

NOTE
*You may have to loosen the drive chain to allow sprocket removal. See **Drive Chain Adjustment** in Chapter Three.*

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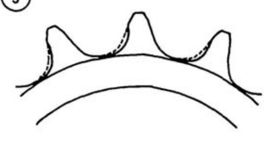


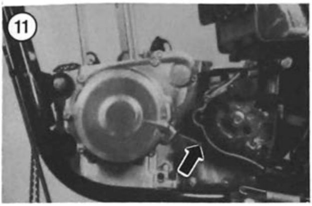
Installation

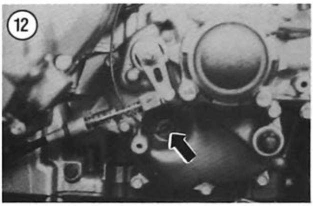
1. Inspect the engine sprocket for wear. If the teeth are undercut as shown in **Figure 9**, install a new sprocket; a worn sprocket will quickly wear out a new drive chain.
2. Position the drive chain on the sprocket, with the side marked "O.S." facing out, then slide the sprocket onto the output shaft.

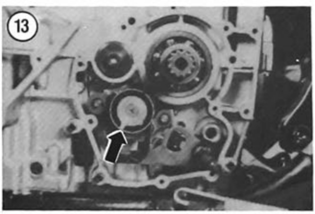
3A. On models with no sprocket lockplate:

a. Grease the sprocket bolt threads and install the bolt and washer.

b. Lock the rear wheel with the brake and torque the engine sprocket bolt to 60 ft.-lb. (8.0 mkg).







3B. On models with a sprocket lockplate:

a. Use a new lockplate. Install the flat washer and install the lockplate with its 2 tongues in the sprocket holes (**Figure 10**).

CAUTION
Do not fold a lockplate more then once in the same spot. The metal is too likely to break off, with possible loosening of the part and engine damage. Install a new lockplate when possible.

b. Install the sprocket bolt; lock the rear wheel with the brake and torque the bolt to 60 ft.-lb. (8 mkg).

c. Install the stop washer so its tangs fit between the lockplate long tabs (**Figure 8**).

d. Fold the the 4 long lockplate tabs down against the stop washer.

CAUTION
Do not fold a lockplate more than once in the same spot. The metal is likely to break off, with possible loosening of the part and engine damage. Install a new lockplate when possible.

4. Install the sprocket cover as described in this chapter.
5. Adjust drive chain play (if it was loosened) as described in Chapter Three.

NEUTRAL SWITCH

The neutral indicator light is activated by a switch mounted in the shift linkage cover on chain-drive models (**Figure 11**) and in the front bevel drive unit on shaft-drive models (**Figure 12**). When the shift drum end plate is at its NEUTRAL position (**Figure 13**), the insulated switch pin that rides against the end plate is grounded against the metal portion of the plate, completing the indicator light circuit.

SHIFT LINKAGE

Refer to **Figure 14**. Inside the transmission, gears are moved by shift forks, which are moved from side to side by camming slots in the cylindrical shift drum. The linkage (outside the engine case) converts up-and-down motions of the gearshift pedal into rotation of the shift drum.

The shift pedal is mounted on one end of the shift shaft. At the other end of the shaft are a shift arm and an overshift limiter under the arm. The shift arm pawls rest against pegs in the end of the shift drum. When the shift shaft is rotated, the pawls grasp the pegs and rotate the shift drum. The overshift limiter hooks keep the shift drum from moving more than one gear at a time.

The 2 legs of the strong hairpin return spring on the shift shaft rest against a stationary centering peg. When the shift pedal is released, the return spring brings the shift shaft back to its center position.

Shift Linkage Removal/ Installation (Chain-drive)

1. Remove the engine sprocket cover as described in this chapter.
2. Remove the engine sprocket as described in this chapter.

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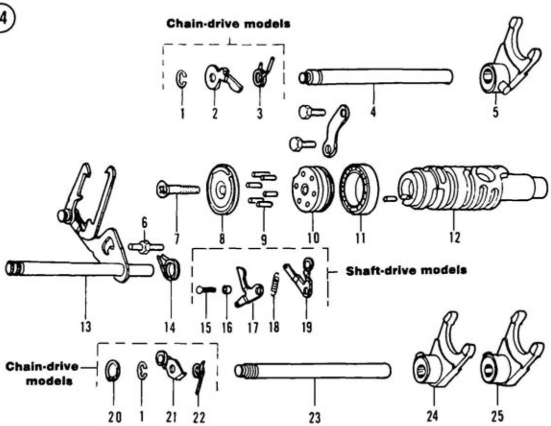
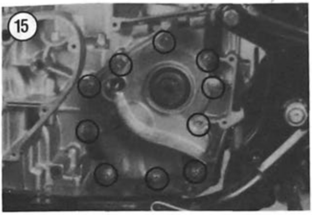


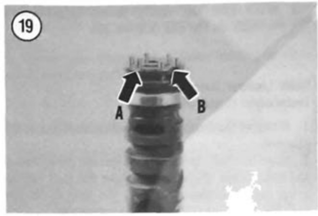
SHIFT LINKAGE

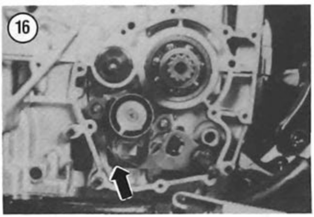
1. Circlip
2. Gear position lever
3. Spring
4. Shift rod
5. Shift fork
6. Shift shaft return spring pin
7. Bolt
8. Cover plate
9. Ratchet pin
10. Shift drum pin holder
11. Bearing
12. Shift drum
13. Shift linkage
14. Return spring
15. Bolt
16. Collar
17. Gear position lever
18. Detent spring
19. Neutral position lever
20. Circlip
21. Gear position lever
22. Spring
23. Shift fork rod
24. Shift fork
25. Shift fork

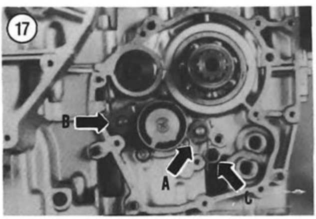
3. Place a drain pan under the shift linkage cover and remove the neutral indicator lead (**Figure 11**).
4. Remove the 9 screws and 1 bolt and washer (**Figure 15**), then remove the shift linkage cover and gasket. Tap the cover loose with a soft mallet, if necessary. Use care; the cover is positioned with dowel pins.
5. Note carefully how the shift linkage pawls engage the shift drum (**Figure 16**). Move the shift linkage arms out of engagement with the shift drum and pull the shift linkage out of the crankcase.
6. Remove the circlips from the end of the shift rods and remove the neutral position lever (A, **Figure 17**), gear position lever (B) and springs.

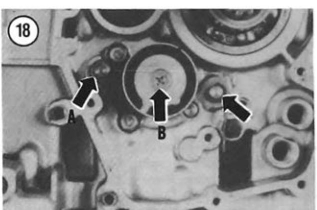
CAUTION
*Do not pull the shift fork rods (A, **Figure 18**) out. If they are pulled out more than 1 1/2 in. (50 mm), the shift forks within the crankcase will fall off the rods. This would require oil pan removal to reposition the forks.*









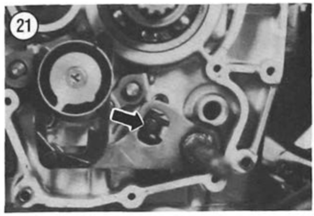


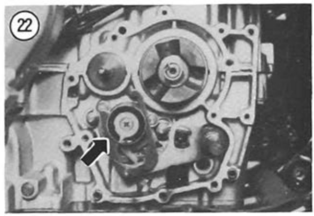
7. To expose the ratchet pins on the shift drum, remove the screw from the cover plate (B, **Figure 18**) and remove the plate.
8. To install, reverse these steps; note the following:

CAUTION
Use a locking agent such as Loctite Lock N' Seal on all shift linkage screws. Loose linkage will cause serious engine damage.

a. Check that the shift drum ratchet pins are in good condition. If the pins are removed, install the long pin (A, **Figure 19**), which times the NEUTRAL light, as shown in relation to the detent (B) on the end of the drum. Secure the pin plate screw with a locking agent such as Loctite Lock N' Seal.
b. Check that the shift shaft return spring pin is tight (C, **Figure 17**). If loose, remove it, apply a locking agent such as Loctite Lock N' Seal and tighten it securely.
c. Be sure the return spring and link springs are in place on the shift linkage (**Figure 20**).

d. Make sure the return spring is positioned correctly on the pin (**Figure 21**).





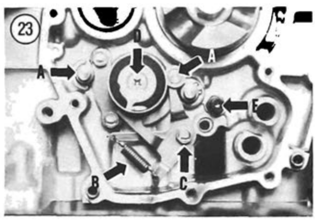
Shift Linkage Removal/ Installation (Shaft-drive)

1. Remove the front bevel drive as described in this chapter.
2. Note carefully how the shift linkage pawls engage the shift drum (**Figure 22**). Move the shift linkage arms out of engagement with the shift drum and pull the shift linkage out of the crankcase.

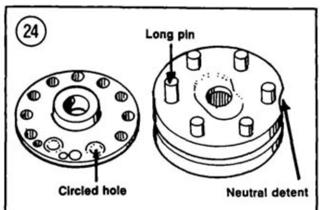
NOTE
*Do not pull the shift fork rods (A, **Figure 23**) out. If they are pulled out more than 1 1/2 in. (50 mm), the shift forks within the crankcase will fall off the rods. This would require oil pan removal to reposition the forks.*

3. Remove the detent spring (B, **Figure 23**).
4. Remove the detent arm pivot bolt and the gear position levers (C, **Figure 23**).
5. To expose the ratchet pins on the shift drum, remove the screw from the cover plate (D, **Figure 23**) and remove the plate.
6. To install, reverse these steps; note the following:

CAUTION
Use a locking agent such as Loctite Lock N' Seal on all shift linkage screws. Loose linkage will cause serious engine damage.



a. Check that the shift drum ratchet pins are in good condition. If the pins are removed, install the long pin (which times the NEUTRAL light) as shown in relation to the neutral detent notch (**Figure 24**). The long pin goes in the circled hole on the end of the drum (**Figure 24**). Secure the pin plate screw with a locking agent such as Loctite Lock N' Seal.
b. Check that the shift shaft return spring pin is tight (E, **Figure 23**). If loose, remove it, apply a locking agent such as Loctite Lock N' Seal and tighten it securely.
c. Be sure the return spring and link spring are in place on the shift linkage (**Figure 20**).
d. Make sure the return spring is positioned correctly on the pin (**Figure 25**).



Shift Linkage Inspection

1. *Chain-drive:* Inspect the seals in the shift linkage cover (**Figure 26**). To replace any damaged seals,

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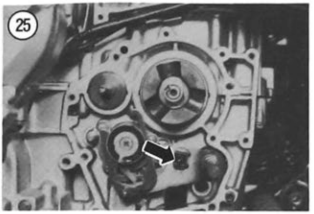

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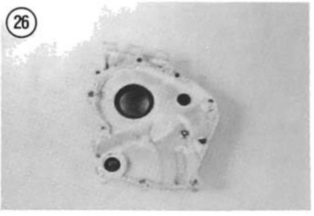

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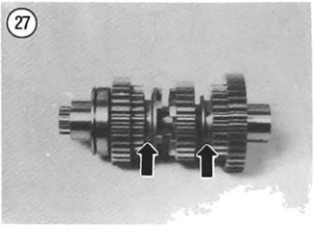


heat the cover in an oven to about 212° F and tap the old seals out. Install new seals flush with the surface of the cover, with their numbered side out.
2. If the transmission fails to shift gears, check for a weak pawl spring; bent, worn or binding pawls; worn shift drum pins; a broken return spring; or a broken return spring pin.
3. If the transmission undershifts or overshifts, check for a binding, bent, or worn detent; a weak detent spring; bent or worn pawls; worn shift drum pins; a loose return spring pin; or a bent or weak return spring.
4. If the transmission jumps out of gear, check for a binding, bent or worn detent or a weak detent spring.
5. Replace any other broken, bent, binding or worn parts, including shift drum pins.

TRANSMISSION OPERATION

Repair of the transmission gears requires engine removal and crankcase separation. If the transmission fails to shift properly or jumps out of gear, check the condition of the shift linkage, as described in this chapter, before splitting the engine cases.

The basic transmission has 5 pairs of constantly meshed gears on the input and output shafts. Each pair of meshed gears gives one gear ratio. In each pair, one of the gears is locked to its shaft and always turns with it. The other gear is not locked to its shaft and can spin freely on it. Next to each free spinning gear is a third gear which is splined to the same shaft, always turning with it. This third gear can slide from side to side along the shaft splines. The side of the sliding gear and the free spinning gear have mating "dogs" and "slots." When the sliding gear moves up against the free spinning gear, the 2 gears are locked together by the dogs and slots, locking the free spinning gear to its shaft. Since both meshed input and output gears are now locked to their shafts, power is transmitted from one shaft to the other at that gear ratio.

Neutral Finder

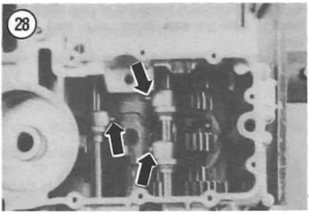
At 4th gear on the output shaft are 3 steel balls, spaced 120° apart, which help keep the transmission from overshooting to 2nd gear when the rider wants to shift from 1st to NEUTRAL. As long as the bike is moving and the output shaft is turning, the balls are thrown away from the shaft and will allow upshifting to 2nd. When the bike stops, the ball on top falls into a groove in the shaft and keeps the gear from sliding into position for higher gears.

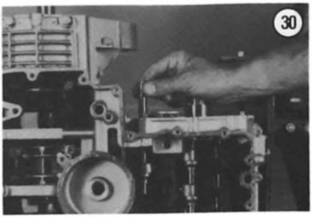
SHIFT DRUM AND FORKS

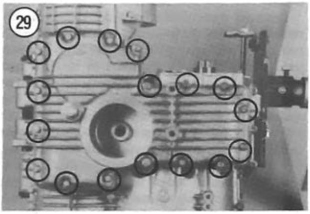
Operation

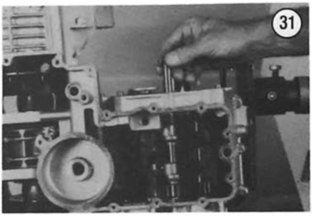
Each sliding gear has a deep groove machined around its outside (**Figure 27**). The curved shift fork arm rides in this groove, controlling the side-to-side sliding of the gear and therefore the selection of different gear ratios.

Each shift fork slides back and forth on a guide shaft and has a peg that rides in a groove on the face









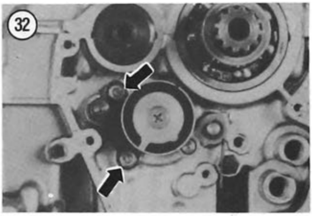
of the shift drum (**Figure 28**). When the shift linkage rotates the shift drum, the zigzag grooves move the shift forks and sliding gears back and forth.

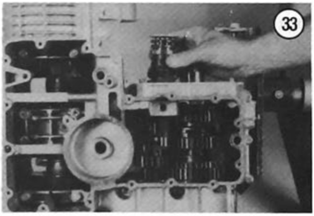
Spring-loaded detents ride on the plates and pins on the end of the shift drum. These detents help keep the drum in the selected gear or in NEUTRAL.

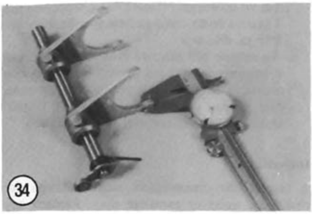
Removal/Installation

Refer to **Figure 14**. This procedure shows removal with the engine out of the frame, but the drum and forks can be removed while the engine is in the frame.

1. Remove the oil pan (**Figure 29**) as described in Chapter Four. Do not remove the oil pump.
2. In the lower engine case, pull out the front shift fork rod (**Figure 30**) and the rear shift fork rod (**Figure 31**). Remove the 3 shift forks.
3. Remove the shift linkage and shift drum detents as described in this chapter.
4. Remove the 2 shift drum bearing retainer bolts (**Figure 32**) and the retainer.
5. Pull the shift drum out of the engine (**Figure 33**).
6. To install, reverse these steps. Note the following:
   a. Apply molybdenum disulfide grease to any new parts. Oil all parts before assembly.
   b. The 2 rear shift forks are identical.



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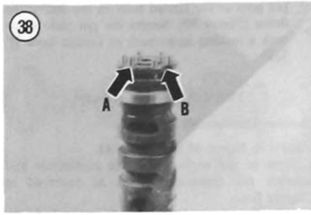

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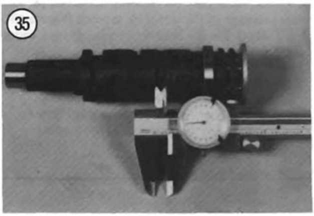
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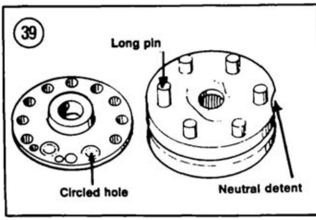

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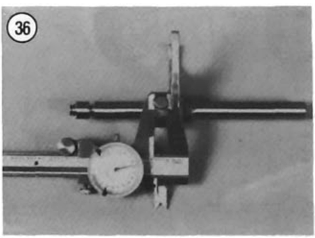
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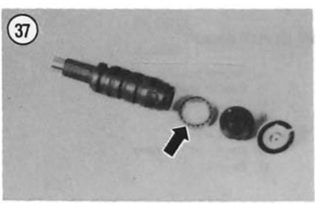
37

Inspection

1. Inspect each shift fork for wear on the fork fingers (**Figure 34**) and for signs of burning or cracking. See **Table 1** for the minimum shift fork thickness specification.
2. Make sure the forks slide smoothly on their shafts and check that the shafts are not bent.
3. Check the grooves in the shift drum for wear, chipping or roughness. The fork pegs should fit in the drum grooves without excessive play. The maximum shift drum groove width (**Figure 35**) and minimum shift fork guide pin diameter (**Figure 36**) are specified in **Table 1**.
4. Inspect the shift drum bearing (**Figure 37**) for excessive play or roughness. Replace it if damaged.
5. Check that the shift drum ratchet pins are in good condition. If you remove the ratchet pins, install them as follows:
   a. *Chain-drive:* Install the long pin (A, **Figure 38**), which times the NEUTRAL light, as shown in relation to the detent (B) on the end of the drum. Secure the pin plate screw with a locking agent such as Loctite Lock N' Seal.
   b. *Shaft-drive:* Install the long pin (which times the NEUTRAL light) as shown in relation to the neutral detent notch (**Figure 39**). The long

pin goes in the circled hole on the end of the drum (**Figure 39**). Secure the pin plate screw with a locking agent such as Loctite Lock N' Seal.

TRANSMISSION GEARS

Removal/Disassembly

Refer to **Figure 40** and **Figure 41**.

1. Remove the engine from the motorcycle and separate the crankcase halves as described in Chapter Four.
2. Carefully lift out the input and output shaft gear clusters.
3. To disassemble the transmission shafts, remove the circlips with circlip pliers. Carefully lay out all the clips, washers and gears in the order you remove them. Note the following:
   a. Any additional shims not shown in **Figure 40** or **Figure 41** should be installed in the same location during assembly.
   b. To remove the output shaft 4th gear, hold the shaft vertically by the 3rd gear, spin the shaft and lift off 4th gear (**Figure 42**). Do not lose the 3 neutral finder balls. In case you do, they are 3/16 in. diameter.
   c. To remove ball bearings from their shafts, use a commercial bearing puller or tap evenly around the bearing's inner race. If possible, heat the part in an oven to about 212° F (100° C) to ease bearing removal and installation.

Inspection

1. Inspect the transmission shaft bearings for roughness, noise or excessive play. Replace any bearing that is suspect in any way.
2. Check each gear for missing teeth, chips and excessive wear of the shift fork grooves (**Figure 43**). See **Table 1** for the maximum gear groove width specification.

NOTE
When one gear is replaced, inspect the mating gear on the opposite shaft very closely. Any damage is likely to affect both gears.

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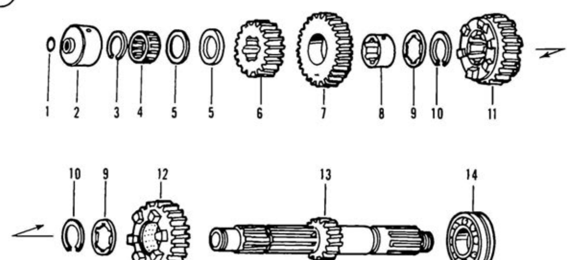
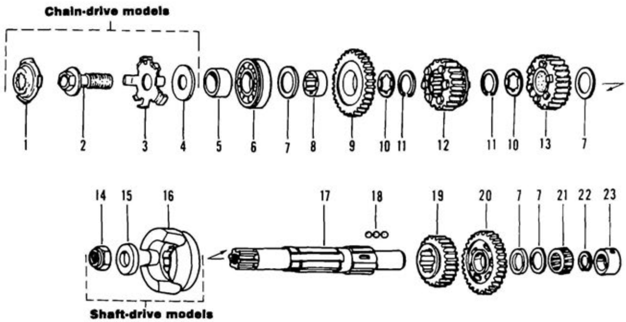


TRANSMISSION INPUT SHAFT

1. O-ring seal
2. Bearing outer race
3. Circlip
4. Needle bearing
5. Washer
6. Input 2nd gear
7. Input 5th gear
8. Copper bushing
9. Splined washer
10. Circlip
11. Input 3rd gear
12. Input 4th gear
13. Input shaft/1st gear
14. Bearing



TRANSMISSION OUTPUT SHAFT

1. Stop washer
2. Bolt
3. Lockplate
4. Washer
5. Sprocket spacer
6. Bearing
7. Washer
8. Copper bushing
9. Output 2nd gear
10. Splined washer
11. Circlip
12. Output 5th gear
13. Output 3rd gear
14. Locknut
15. Washer
16. Damper cam
17. Output shaft
18. Steel ball
19. Output 4th gear
20. Output 1st gear
21. Needle bearing
22. Circlip
23. Bearing outer race

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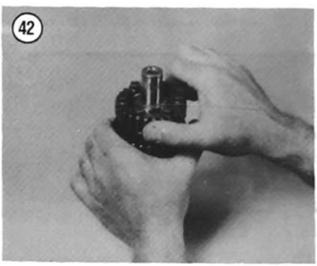

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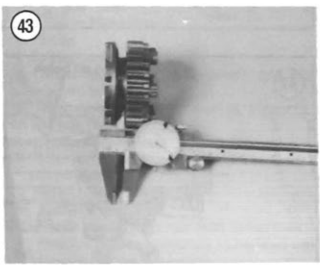

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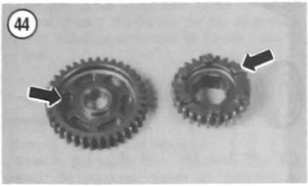
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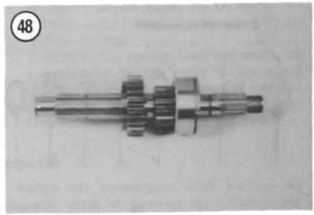
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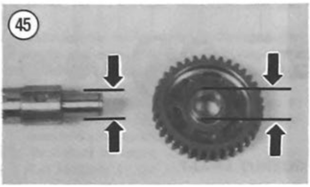
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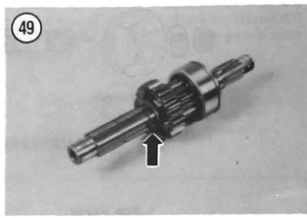
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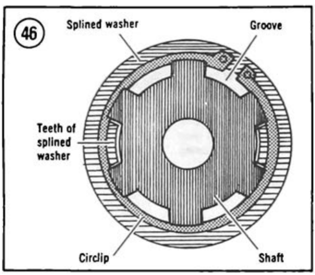
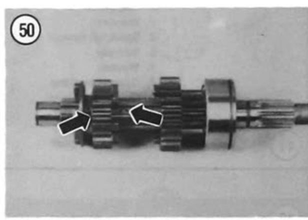

46
Splined washer
Groove
Teeth of splined washer
Circlip
Shaft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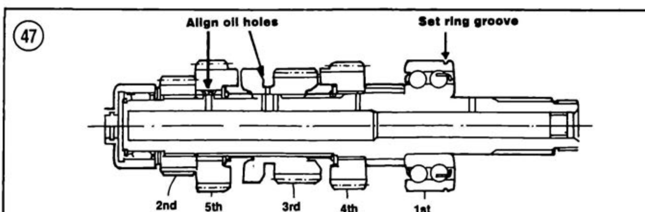
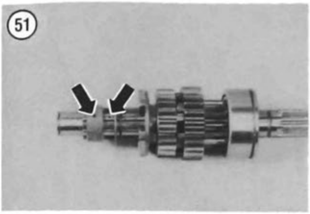
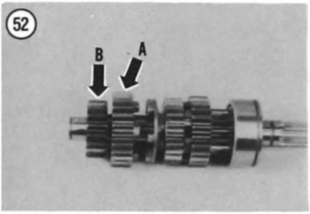
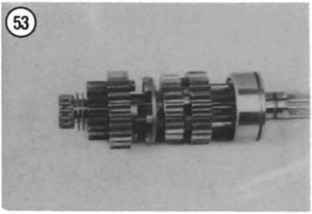
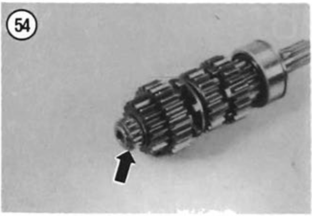
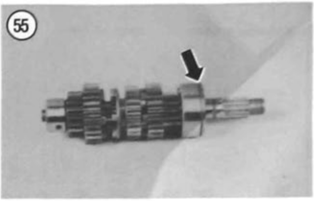

47
Align oil holes
Set ring groove
2nd
5th
3rd
4th
1st









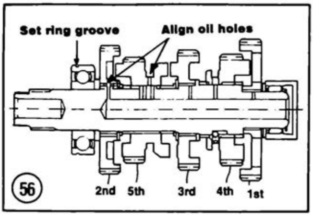


3. Check that the mating gear dogs and slots (**Figure 44**) are in good condition. Worn dogs and slots can cause the transmission to jump out of gear.
4. Check that the gears slide smoothly on the shaft splines.
5. To measure the output shaft gear/bushing clearance, subtract the shaft OD (outside diameter) from the gear's ID (inside diameter); see **Figure 45**. If the clearance exceeds the limit in **Table 1**, replace the gear, shaft or both.

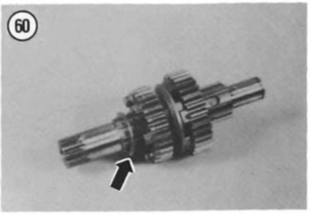
Assembly/Installation

Refer to **Figure 40** or **Figure 41**. Apply molybdenum disulfide grease to any new parts. Oil all parts before assembly. Use new circlips when possible. Old clips may have lost their tension during removal. When installing circlips on splined shafts, position them so that their opening falls on top of a spline groove and does not align with a splined washer tooth (**Figure 46**).

1. Assemble the parts on the input shaft (**Figure 47**) in this order:
   a. 4th gear (flat side toward the machined-in 1st gear) (**Figure 48**).
   b. Splined washer (**Figure 49**).
   c. Circlip (**Figure 49**).
   d. 3rd gear (align oil hole with shaft hole as shown in **Figure 50**).
   e. Circlip.
   f. Splined washer.
   g. Copper bushing (align oil hole with shaft hole as shown in **Figure 51**).
   h. 5th gear (dogs toward 3rd gear) (A, **Figure 52**).
   i. 2nd gear (B, **Figure 52**).
   j. 1.0 mm thick washer.
   k. 0.063 in. (1.6 mm) or 0.047 in. (1.2 mm) thick steel washer.
   l. Needle bearing (**Figure 53**).
   m. Circlip (**Figure 54**).
   n. Needle bearing outer race (with O-ring inside).
   o. Press ball bearing on opposite end of shaft with groove facing out (**Figure 55**).



Set ring groove
Align oil holes
56
2nd
5th
3rd
4th
1st



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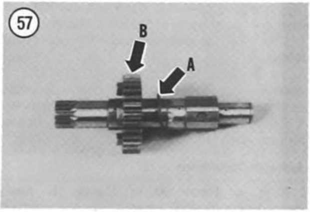

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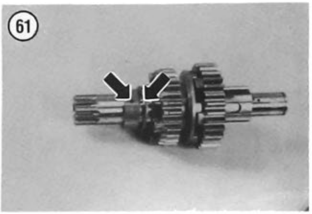

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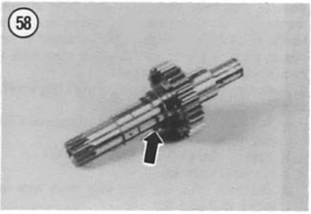

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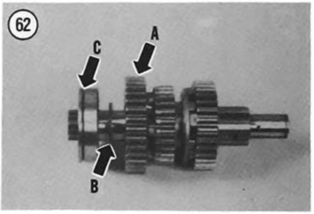

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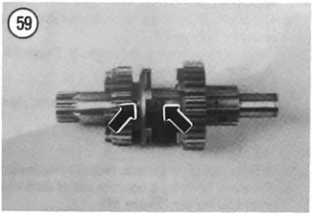

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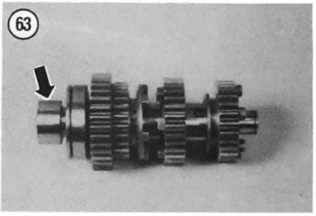

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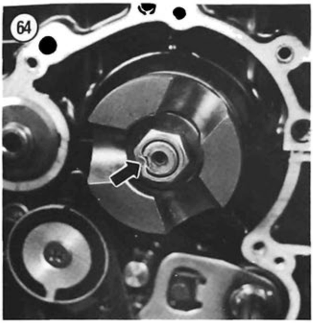
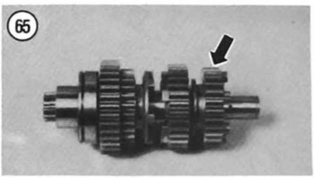
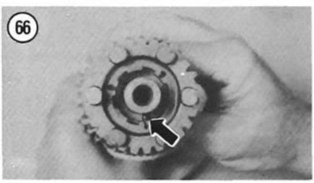
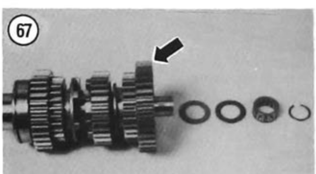
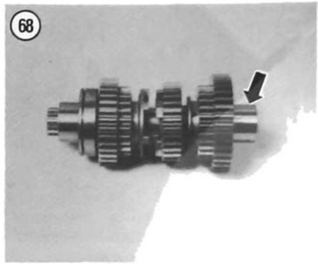








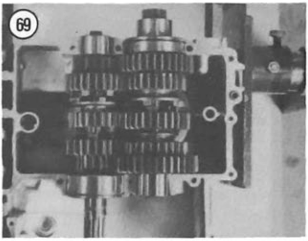


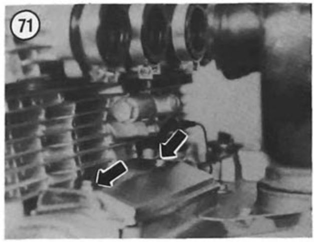
2. Assemble the parts on the long end of the output shaft (**Figure 56**) in this order:
   a. Washer (A, **Figure 57**).
   b. 3rd gear (dogs facing out) (B, **Figure 57**).
   c. Splined washer.
   d. Circlip (**Figure 58**).
   e. 5th gear (shift fork groove toward 3rd gear; align oil hole with shaft hole as shown in **Figure 59**).
   f. Circlip.
   g. Splined washer (**Figure 60**).
   h. Copper bushing (align oil hole with shaft hole as shown in **Figure 61**).
   i. 2nd gear (slots toward 5th gear) (A, **Figure 62**).
   j. Washer (B, **Figure 62**).
   k. Ball bearing (groove facing out) (C, **Figure 62**).
   l. *Chain-drive:* Output shaft sleeve (**Figure 63**).
   m. *Shaft-drive:* Damper cam, washer and new nut when available. Torque the nut to 90 ft.-lb. (12 mkg) and stake it into the shaft groove with a punch (**Figure 64**).
3. Assemble the parts on the short end of the output shaft (**Figure 56**) in this order:
   a. 4th gear (dogs facing out) (**Figure 65**).

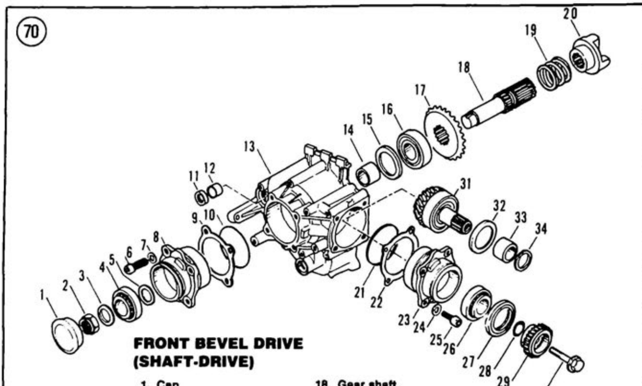
NOTE

*Do not grease the 3 steel balls to hold them in place. These balls must be able to move freely. Insert the balls in the holes with a smaller outer diameter as shown in (**Figure 66**).*

   b. 1st gear (flat side out) (**Figure 67**).
   c. 1 mm thick washer.
   d. 0.063 in. (1.6 mm) or 0.047 in. (1.2 mm) thick steel washer.
   e. Needle bearing.
   f. Circlip.
   g. Outer bearing race (**Figure 68**).







FRONT BEVEL DRIVE (SHAFT-DRIVE)

1. Cap
2. Locknut
3. Washer
4. Bearing
5. Shim
6. Bolt
7. Washer
8. Bearing holder
9. Shim
10. O-ring
11. Oil seal
12. Needle bearing
13. Gear case
14. Collar
15. Cup
16. Bearing
17. Gear assembly (part of Item No. 31)
18. Gear shaft
19. Damper spring
20. Damper cam
21. O-ring
22. Shim
23. Bearing holder
24. Washer
25. Bolt
26. Bearing
27. Oil seal
28. O-ring
29. Front driven coupling
30. Bolt
31. Gear assembly (part of Item No. 17)
32. Shim
33. Collar
34. Shim

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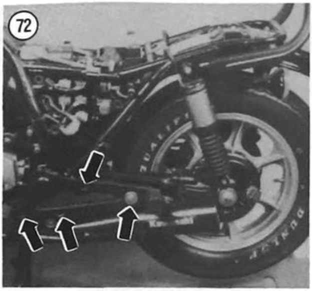

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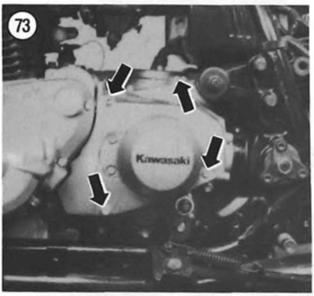

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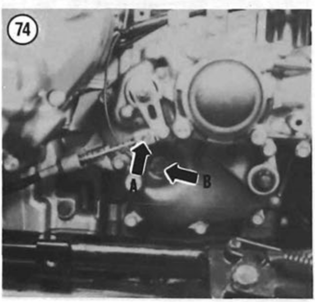


4. Install the gear sets in the upper crankcase half (**Figure 69**). Rotate the bearings until the dowel pins seat and make sure the alignment rings are fully seated in the bearing and case grooves.

NOTE
If you are using new engine cases and the old alignment rings won't fit, thinner rings are available.

5. Spin 1st gear on the output shaft and 5th gear on the input shaft. If they do not turn freely, a thinner 0.047 in. (1.2 mm) thick washer is available to replace the standard 0.063 in. (1.6 mm) thick steel washer next to the needle bearing. See your Kawasaki dealer.

FRONT BEVEL DRIVE (SHAFT-DRIVE)

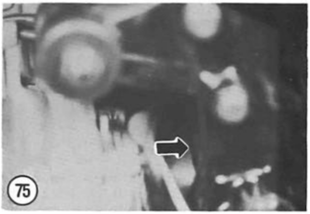
The front bevel drive gearcase is mounted on the left side of the engine cases, connecting to the transmission output shaft through a spring-loaded damper cam mechanism (**Figure 70**). Trouble should be very infrequent as long as the recommended lubrication scheduled is followed (see Chapter Three). The front bevel drive is lubricated by the same oil that lubricates the engine and transmission.

Bevel gear backlash, tooth contact patterns and tapered roller bearing preload are all critical to bevel drive strength, quietness and service life. Assembly to the proper tolerances requires many special tools and a high degree of skill. In the event of bevel drive trouble, we recommend you remove the unit from the motorcycle and take it to a Kawasaki dealer for repair. The following sections describe how to remove the unit and how to inspect it to see if it requires repair.

The clutch release is mounted inside the bevel drive, so that the bevel drive must be removed for clutch release service. The bevel drive must also be removed before servicing the shift linkage and before removing the engine from the frame.

Removal

1. Put the bike up on its centerstand.
2. Put an oil drain pan under the front bevel case.
3. Loosen the 2 starter cover bolts (**Figure 71**).
4. Remove the 4 bolts and the left footpeg bracket (**Figure 72**).
5. Shift the transmission to NEUTRAL and remove the shift pedal; remove the clamp bolt and spread the slot open with a screwdriver if necessary.
6. Remove the 4 bolts and the front bevel cover (**Figure 73**).
7. Remove the clutch release lever cotter pin and free the cable from the lever (A, **Figure 74**).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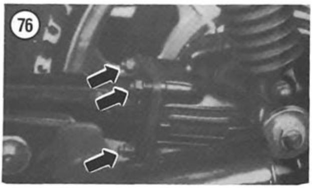
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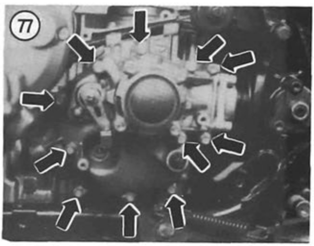
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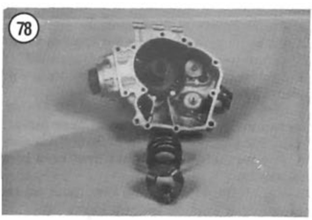
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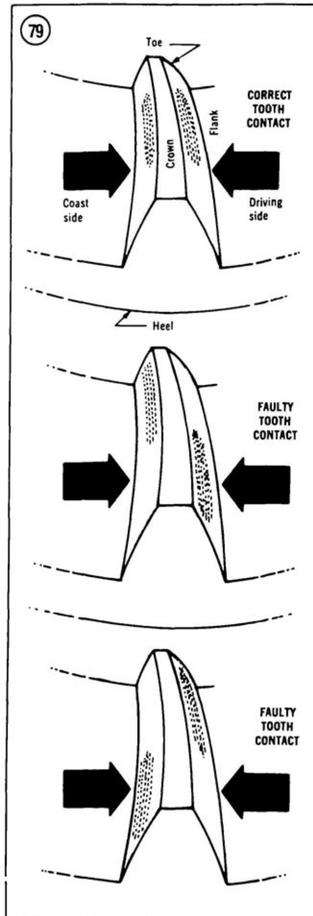
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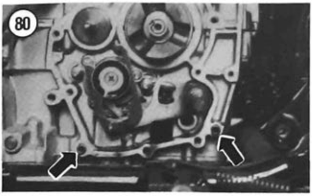
Toe
Flank
Crown
CORRECT TOOTH CONTACT
Coast side
Driving side
Heel
FAULTY TOOTH CONTACT
FAULTY TOOTH CONTACT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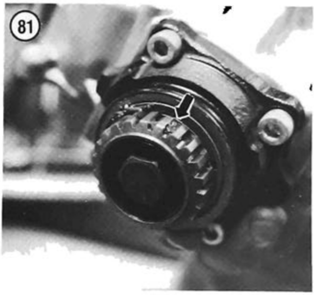
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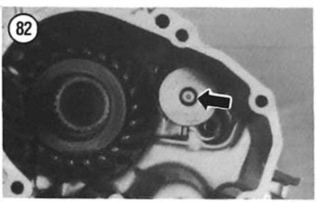
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8. Disconnect the neutral switch wire (B, **Figure 74**).
9. Pull the dust coupling cover forward and off the swing arm flange. Turn the rear wheel until you can see a hole in the smooth rim of the coupling (**Figure 75**). In the hole is a lock pin that locks the coupling forward on the bevel drive splined shaft.
10. Push the lock pin in about 3/16 in. (5 mm), and push or pry the coupling back off the bevel drive output shaft.

NOTE
*The drive shaft and coupling are spring-loaded to the front. Use only enough force to free the coupling on the side by the lock pin. If necessary, remove the rear wheel and loosen the 4 rear bevel nuts on the swing arm (**Figure 76**) to take some load off the coupling; see **Rear Wheel Removal** in Chapter Ten and **Final Gear Case Removal** in Chapter Eleven.*

11. Remove the 11 front bevel case bolts (**Figure 77**).
12. Tap the bevel case with a soft mallet to free it and remove the case and gasket. The damper cam follower and spring should come off with the bevel drive (**Figure 78**).

Inspection

1. Check the wear pattern on the bevel teeth (**Figure 79**). Look for the following characteristics:
   a. Some clearance between the top of the teeth and the top of the pattern.
   b. No distinct lines indicating high-pressure areas.
   c. Marks on adjoining teeth should be directly opposite each other.
   d. Both the "drive" and "coast" patterns should be fairly well centered on the teeth.
2. Inspect the gear teeth for chipping or cracks. If damaged, they should be replaced as a set.
3. Check driven (small) gear backlash with a dial indicator. Hold the drive gear steady while you rock the driven gear back and forth. The backlash should be 0.005-0.007 in. (0.13-0.18 mm).
4. If the bevel drive doesn't pass this inspection, take it to a Kawasaki dealer for repair. Assembly to the proper tolerances requires many special tools and a high degree of skill.

Installation

1. Install the 2 dowel pins and a new gasket (**Figure 80**).
2. Turn the bevel output shaft until the lock pin faces up (**Figure 81**). Make sure the lock pin spring is inside the shaft.
3. Check that the clutch release screw end is not protruding above the shaft (**Figure 82**).
4. Coat the clutch pushrod end and the bevel output shaft splines with molybdenum disulfide grease.
5. Align the damper cam and the cam follower and slip the front bevel drive over the shift shaft, into position on the engine. Be careful not to damage the oil seal.

NOTE
*The drive shaft and coupling are spring-loaded to the front. If necessary, remove the rear wheel and loosen the 4 rear bevel nuts on the swing arm to take some load off the couping; see **Rear Wheel Removal** in Chapter Nine and **Final Gear Case Removal** in Chapter Eleven.*

6. Align the lock pin on the bevel drive output shaft with the hole in the coupling (**Figure 83**).
7. Push the lock pin in just enough to let the coupling slide forward over the output shaft.

NOTE
Don't push the lock pin in too far. It can fall inside the output shaft.

8. Maneuver the coupling as required to allow the lock pin to spring out and seat in the coupling hole.
9. Slip the dust cover back into place over the swing arm flange.
10. To complete installation, reverse the removal steps. Note the following:
   a. Torque the 11 bevel drive bolts as specified in **Table 2**.
   b. Adjust the clutch and add engine oil as described in Chapter Three.


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Table 1 TRANSMISSION WEAR LIMITS

	in.	mm
Gear backlash	0.012	0.30
Gear fork groove width	0.246	6.25
Gear/shaft or bushing clearance		
Output 1st, 3rd; input 4th	0.006	0.16
Output 2nd; input 5th	0.007	0.17
Shift fork finger thickness	0.228	5.8
Shift fork pin diameter	0.313	7.94
Shift drum groove width	0.325	8.25

Table 2 TORQUE SPECIFICATIONS

	ft.-lb.	mkg
Alternator rotor bolt	95	13.0
Cam chain tensioner cap	20	2.8
Camshaft cap bolts	12	1.7
Camshaft sprocket bolts	11	1.5
Clutch hub nut	85	12.0
Clutch spring bolts	90 in.-lb.	1.0
Crankcase bolts		
Small	90 in.-lb.	1.0
Large	18	2.5
Crankshaft main bearing cap bolts	18	2.5
Cylinder head		
Bolts	8.5	1.2
Nuts	30	4.0
Engine mounting bolts	30	4.0

(continued)

Table 2 TORQUE SPECIFICATIONS (continued)

	ft.-lb.	mkg
Engine mounting bracket bolts	12.5	2.4
Engine sprocket bolt	60	8.0
Front bevel gear case		
Damper cam nut	90	12.0
Bevel drive mounting bolts	18	2.5
Bevel drive gear bolt	90	12.0
Bevel drive gear nut	90	12.0
Ignition advance bolt	18	2.5
Neutral indicator switch	11	1.5
Oil drain plug	22	3.0
Oil filter mounting bolt	14.5	2.0
Oil pan bolts	90 in.-lb.	1.0
Oil pressure switch	50 in.-lb.	0.6
Shift return spring pin	14.5	2.0
Spark plugs	20	2.8
Starter clutch Allen bolts	30	4.0
Valve cover bolts	90 in.-lb.	1.0

NOTE: If you have a 1982 and later P Series Police Model, first check the Supplement at the back of this manual for any specific service information.

CHAPTER SEVEN

CARBURETION AND EXHAUST SYSTEMS

This chapter includes removal and repair procedures for the carburetors, fuel tank (on carburetted models), fuel tap, air suction system (U.S. models) and the exhaust system. See Chapter Three for idle speed and idle mixture adjustment. See Chapter Eight for fuel injection system operation and service, including fuel tank and tap service.

Detailed carburetor specifications are given in **Table 1** at the end of this chapter.

CARBURETOR OPERATION

The following paragraphs explain the basic operation of carburetors, which may be helpful in troubleshooting a problem you suspect is caused by carburetion. If you are disassembling a carburetor, go on to *Carburetor Service* in this chapter.

The constant velocity (CV) carburetor has a rotating butterfly throttle valve, along with an engine vacuum-controlled sliding valve that carries the jet needle (**Figure 1**). This type of carburetor is less susceptible than some carburetors to a stall in acceleration when the throttle is snapped open, because the vacuum slide will not rise until gradually increasing engine vacuum pulls it up. The CV carburetor is also not as sensitive to changes in altitude as some carburetors are.

Float Mechanism

To assure a steady supply of fuel, the carburetor is equipped with a float valve through which fuel flows by gravity from the gas tank into the float bowl.

Inside the bowl is a pair of floats which move up and down with the fuel level. Resting on the float arm is a float needle, which rides inside the float valve. As the float rises, the float needle rises inside the float valve and blocks it so that when the fuel has reached the required level in the float bowl, no more can enter.

Vacuum Slide

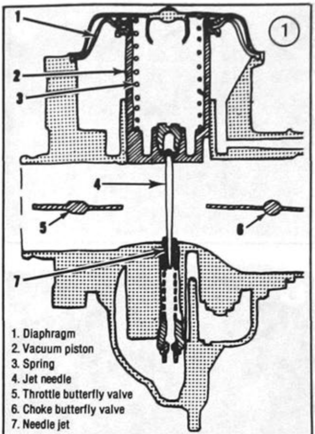
The vacuum slide position is controlled by a diaphragm that has engine vacuum on top and atmospheric pressure on the bottom. The slide moves up and down with engine vacuum, so any change in atmospheric pressure (such as a change in altitude) also moderates the slide position slightly to maintain a constant air-fuel ratio. The vacuum slide affects the fuel mixture from 1/4 to 3/4 throttle.

Pilot and Main Fuel Systems

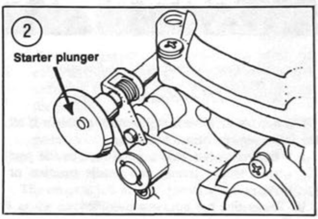
NOTE

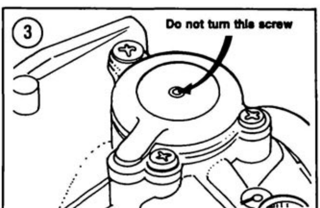
This description describes carburetor operation at a steady speed. When accelerating, the vacuum slide lags behind the throttle valve.

The carburetor's purpose is to supply and atomize fuel and mix it in correct proportions with air that is drawn in through the air intake. At primary throttle openings (from idle to 1/8 throttle), a small amount of fuel is siphoned through the pilot jet by suction from the incoming air. From 1/4 to 3/4 throttle, the vacuum slide continues to rise and fuel also siphons through the needle jet. The tapered needle allows



CONSTANT VELOCITY CARBURETOR





the needle jet to flow more fuel as the needle rises with the vacuum slide. From 3/4 to full throttle, the vacuum slide is fully open and fuel siphons through the main jet and needle jet. At full throttle, the needle is lifted far enough to permit the main jet to flow at full capacity.

Richener

The "choke" on these models is not really an air choking device but a fuel mixture richening device. The choke system consists of a starter plunger (**Figure 2**), mixing tube, starter jet and air passage. When the plunger valve is raised from its seat it opens the air passage, permitting air to flow through the passage where it siphons fuel through the starter jet, into the mixing tube and then into the air passage where it is mixed (fuel-rich) and discharged into the throttle bore. The effect, a fuel-rich starting mixture, is like that of a butterfly choke in the main carburetor bore, but because the starter valve meters a more precise mixture it's not as prone to flooding.

Coasting Richener
(J Models)

Kawasaki J models are equipped with a coasting richener valve that adds extra fuel when decelerating. A rubber diaphragm senses intake vacuum and opens an auxiliary fuel passage when vacuum exceeds a set level. The diaphragm is spring-loaded and set at the factory. Do not try to change the adjustment (**Figure 3**); there is no way to recalibrate it without special testing rigs.

CARBURETOR TROUBLESHOOTING

If the bike stalls or bogs down under hard acceleration, check the fuel level as described in this chapter.

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, or 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 plug insulators will be white and their electrodes may be rounded. While riding the motorcycle, use the starter plunger 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 be sluggish and blubbery, it may generate black exhaust smoke or it may perform best while still cold. If the mixture is too rich across the rpm scale, the spark plug electrodes will be black and sooty. Take out the air cleaner element and test ride the motorcycle to see if the performance improves with what would normally be too lean a mixture. If it does, the mixture is too rich. Replace the air filter element immediately to prevent engine damage from dust and dirt.

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 fuel level in the float bowl. If the mixture is too lean, check the fuel tap strainer and the fuel lines for blockage, check for too low a fuel level and check for an air leak at the rubber carburetor holders.

Before taking apart the carburetors, you should first make sure the spark plugs, ignition timing and cylinder compression are all in proper working order as described in Chapter Three.

Miscellaneous Carburetor Problems

If the engine won't rev to high rpm, check for a hole in the vacuum slide diaphragm.

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

Be sure that the carburetor mounting clamps are tight.

If gasoline leaks past the float bowl gasket, high speed fuel starvation may occur. Varnish deposits on the outside of the float bowl are evidence of this problem.

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

REJETTING

NOTE

This book covers U.S. models subject to governmental emission control laws. These laws subject motorcycle dealers and their employees to heavy fines for modifying emission-related components. Although Federal law does not cover modification by the motorcycle owner, some states have laws that prohibit emission-related modifications by owners. Check the laws in your area before you change carburetor parts.

Do not try to solve a carburetion problem if all the following conditions hold true:

a. The engine has held a good tune in the past with standard jetting and needle position or number.
b. The engine has not been modified.
c. The engine is being operated at the same altitude, climate and average speeds as in the past.

Rejetting the carburetors may be required if any of the following conditions hold true:

a. A nonstandard air filter element is being used.
b. A nonstandard exhaust system is being used.
c. Any of the top-end parts (piston, camshaft, cylinder head, etc.) have been modified.
d. The motorcycle is in use at considerably higher or lower altitudes or in a markedly hotter, colder, wetter or drier climate than in the past.

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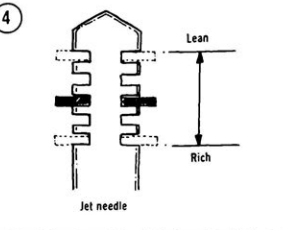

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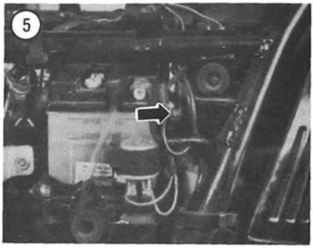
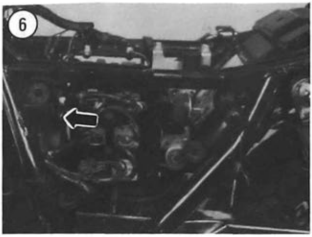
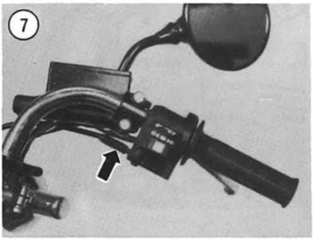






e. The motorcycle is being operated at considerably higher speeds than before and changing to colder spark plugs does not solve the problem.

f. Someone has changed the jetting or the needle position or number on your motorcycle.

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

The original jets and jet needle are listed in **Table 1** at the end of this chapter.

The following parts of the carburetor can be changed to alter the fuel mixture. Each part has the most effect over a narrow range of throttle openings, but each also has a lesser effect over a broader range of throttle openings.

Pilot Jet and Air Screw

The pilot jet and air screw setting affect mixture from idle to about 1/8 throttle. As pilot jet numbers increase, the fuel mixture gets richer. As the air screw is opened (turned out), the idle mixture gets leaner.

On motorcycles sold in the U.S., the air screw is sealed under a plug.

Jet Needle

The jet needle affects the mixture from 1/2 to 3/4 throttle. Models with grooves at the top of the jet needle permit adjustment of the mixture ratio: as the clip is raised (and the needle drops deeper into the jet), the mixture gets leaner (**Figure 4**). As the clip is put in a lower groove, the mixture gets richer.

U.S. models have only one fixed needle position. The only alteration possible is through substitution of a different needle number or by raising the needle by putting a washer under it; as the needle is raised, the mixture gets richer.

Needle Jet

The needle jet works in conjunction with the jet needle. Only one size needle jet is available on these motorcycles.

Main Jet

The main jet controls the mixture at full throttle and it has some effect at lesser throttle openings. Each main jet is stamped with a number. Larger numbers provide a richer mixture, smaller numbers a leaner mixture.

NOTE

Kawasaki uses reverse type main jets, which have a round head. Do not substitute hex head Mikuni or Amal jets. The numbering systems are not equivalent; a given jet number will flow different amounts of fuel.

CARBURETOR SERVICE

There is no set rule regarding frequency of carburetor overhaul. A motorcycle used strictly for street riding may go 30,000 miles or more without needing a carburetor overhaul. Operation in dusty areas or poor air cleaner maintenance may shorten the useful life of the carburetor. See **Table 1** at the end of this chapter for carburetor specifications.

Removal/Installation

Remove all 4 carburetors as an assembled unit. Replacement of an individual carburetor is described under *Separation* in this chapter.

1. Put the bike up on its centerstand.
2. Remove the fuel tank; as described in this chapter.
3. Remove the side panels from the motorcycle. Loosen the air cleaner housing mounting bolts on both sides (**Figure 5** and **Figure 6**).
4. Shorten the throttle cable adjuster at the handgrip (**Figure 7**) for maximum cable free play.

5. *U.S. models:* Slide the vacuum hose clamps up (**Figure 8**) and disconnect the hoses from the carburetors.
6. Loosen the clamp at the front of each carburetor, then roll the spring at the rear of each carburetor back away from the carb (**Figure 9**).
7. Pull the carburetor assembly to the rear and disconnect the throttle cable from the pulley and bracket (**Figure 10**). Remove the carburetor assembly.
8. To install, reverse these steps. Note the following:
   a. If the throttle linkage was disturbed, synchronize the throttle butterfly valves visually so that they each have an equal gap at the throttle bore when closed (**Figure 11**). To adjust, loosen the adjuster locknuts, turn the adjusters as required and tighten the locknuts.
   b. Make sure the carburetors are fully seated forward in the rubber carburetor holders. You should feel a solid "bottoming out" when they're correctly installed. Tighten the mounting clamps securely.

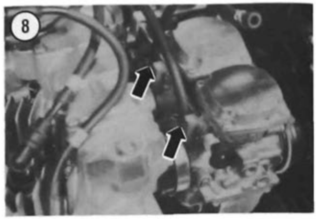
CAUTION
Make sure the carburetor mounts are ***air-tight****. Air leaks can cause severe engine damage from a lean mixture or intake of dirt.*

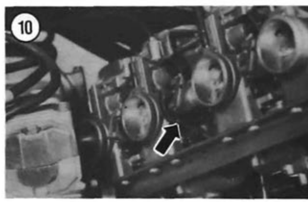
   c. Tighten the air cleaner housing mounting bolts *after* the carburetors have been installed.
   d. Make sure the throttle cable is not twisted, kinked or pinched.
   e. *U.S. models:* The vacuum hose from the No. 2 carburetor goes to the fuel tap. The vacuum hoses from the No. 1 and 4 carburetors go to the vacuum switch.
   f. Adjust the throttle cable and carburetors as described in Chapter Three.

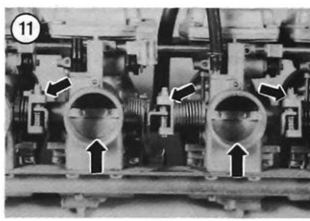
Disassembly/Assembly

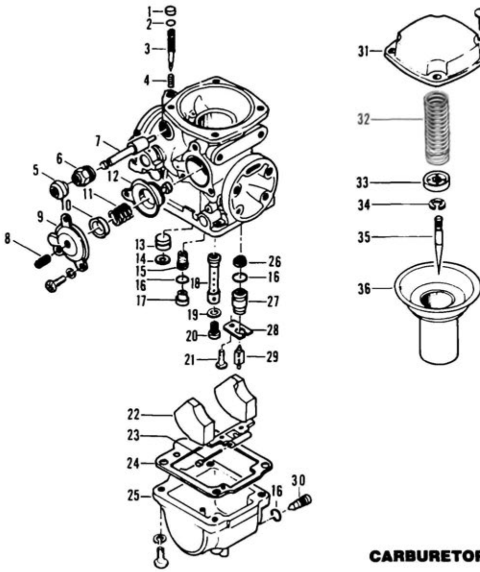
Refer to **Figure 12** and **Figure 13**. Most carburetor disassembly can be done without separating an individual carburetor from the assembly.

We recommend disassembling only one carburetor at a time to prevent accidental interchange of parts. The starter plungers (and the coasting richener on the J models) cannot be removed until the carburetors are removed from their mounting plates.









CARBURETOR

1. Plug (U.S. models)
2. O-ring
3. Idle mixture screw
4. Spring
5. Plunger cap
6. Starter plunger
7. Plunger
8. Adjust screw
9. Cover
10. Plate
11. Spring
12. Diaphragm
13. Plug
14. Gasket
15. Pilot jet
16. O-ring
17. Plug
18. Needle jet
19. Washer
20. Main jet
21. Screw
22. Float
23. Float pivot pin
24. Gasket
25. Float bowl
26. Filter
27. Float valve
28. Float valve retainer
29. Float valve
30. Drain screw
31. Diaphragm cover
32. Spring
33. Needle plate
34. E-clip
35. Needle
36. Diaphragm/slide

(12)

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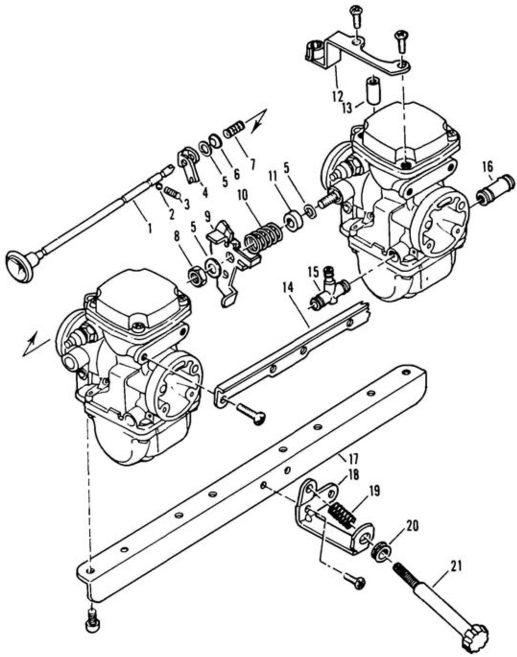
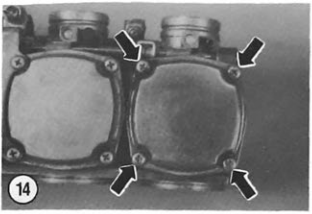
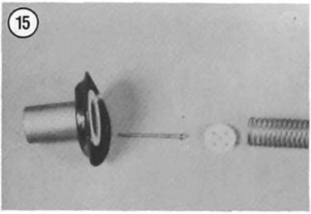


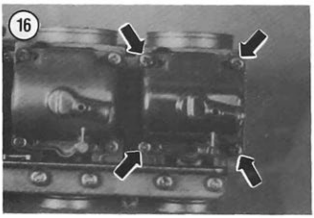
CARBURETOR ASSEMBLY

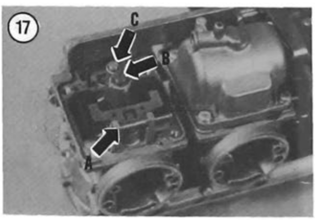
1. Starter plunger shaft
2. Steel ball
3. Spring
4. Starter plunger lever
5. E-clip
6. Spring washer
7. Spring
8. Locknut
9. Cam plate
10. Spring
11. Spacer
12. Upper throttle cable bracket
13. Spacer
14. Upper mounting bracket
15. T-fitting
16. I-fitting
17. Lower mounting bracket
18. Lower throttle cable bracket
19. Spring
20. Grommet
21. Idle speed screw

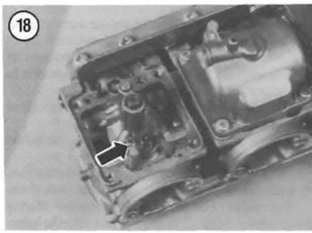
1. Remove the diaphragm cover screws (**Figure 14**) and remove the cover and spring.
2. Pull out the slide and diaphragm assembly (**Figure 15**). Remove the spring seat and the jet needle. Be careful not to puncture or tear the diaphragm.
3. Remove the float bowl screws, lockwashers, float bowl and O-ring (**Figure 16**).
4. Push out the float pivot pin (A, **Figure 17**) and remove the float assembly.
5. Remove the float valve retainer screw (A, **Figure 18**) and the retainer. Pull out the float valve (with O-ring) and the filter screen (**Figure 19**).
6. Unscrew the main jet and washer (B, **Figure 17**) and remove the needle jet under it (A, **Figure 20**).
7. Remove the plastic plug and O-ring (C, **Figure 17**) and unscrew the pilot jet under it (B, **Figure 20**).

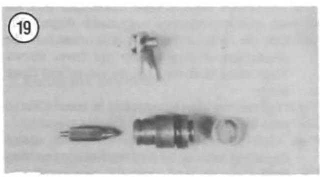


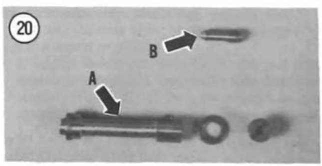












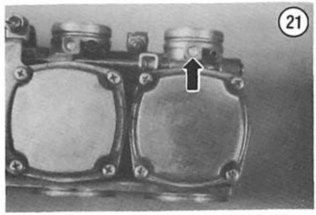
NOTE
Do not try to remove the throttle valve plates; they are precisely matched to the carburetor body and bypass ports. The throttle valve plates are not available separately. Replace the carburetor body if these plates are damaged.

NOTE
*On U.S. models, the idle mixture screw is covered by a plug (**Figure 21**) bonded in place at the factory. When disassembling the carburetor for overhaul, the plug should be removed in order to clean the passage with compressed air. Before removing the idle mixture screw, count the number of turns it takes to seat it lightly.*

8. *Non-U.S. models:* Remove the air screw, spring and O-ring (**Figure 21**).
9. If you want to remove the starter plungers or coasting richener (J models), go on to *Separation* in this chapter.
10. Perform *Cleaning and Inspection* as described in this chapter.
11. To assemble, reverse these steps. Note the following:
   a. *U.S. models:* To install the idle mixture screw, turn it in until it seats lightly, then back it out the same number of turns noted during removal. Install a new plug and seal the edges of the plug lightly with silicone sealant.
   b. Install the throttle slide diaphragm with the tab in the carburetor body notch (**Figure 22**). Lift the slide a little to take stress off the diaphragm as you tighten the cover screws. Then check that the slide moves up and down freely.
   c. Tighten the jets securely, but be careful not to strip their threads.
   d. After assembly, turn the carburetor upside down and listen to be sure the floats are moving freely.
   e. Perform *Fuel Level Inspection* as described in this chapter and *Carburetor Adjustment* in Chapter Three.

Separation

See **Figure 13**. The carburetors are joined by a common starter plunger shaft and 2 mounting bars.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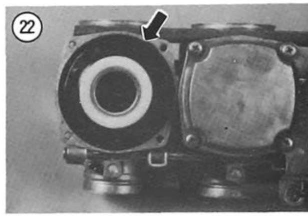
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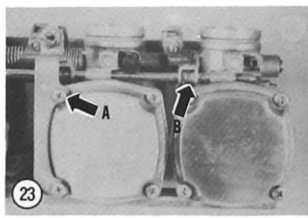

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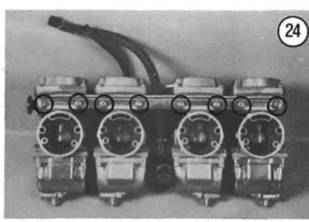
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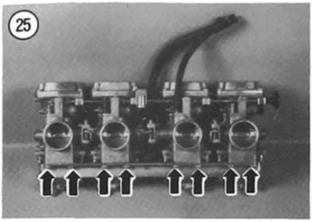
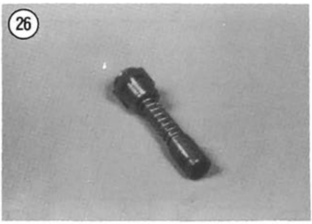
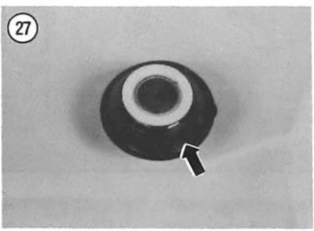






1. Remove the throttle cable bracket (A, **Figure 23**).
2. Remove the 4 circlips from the choke shaft (B, **Figure 23**) and pull out the shaft. Don't lose the 2 detent balls and springs from the No. 2 and 3 carburetors; in case you do, the balls are 1/8 in. diameter.
3. Remove the 8 screws and the upper mounting bar (**Figure 24**).
4. Remove the 8 screws and the lower mounting bar (**Figure 25**).
5. Separate the carburetors.
6. To remove the starter plunger from each carburetor, loosen the retaining nut and pull out the starter plunger assembly (**Figure 26**).

WARNING

*Do not turn the adjusting screw (**Figure 3**) on the cover as this will change the factory set position. There is no way to readjust it without special testing rigs.*

NOTE

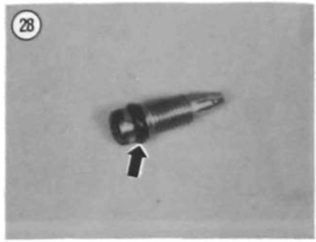
If more than one coasting richener system is going to be disassembled, keep all parts in sets so they can be installed into their original position.

7. On J models, to disassemble the richener, perform the following:
   a. Remove the crews on the cover and remove the cover.
   b. Remove the spring seat, spring and diaphragm.
8. To assemble, reverse these steps. Note the following:
   a. Make sure each connecting fuel tube has O-rings at both ends.
   b. The choke shaft should have a spring, spring seat and circlip at each carburetor (B, **Figure 23**). Make sure each choke plunger seats fully when the choke is off. There should be a gap between the circlip and the shaft bracket.
   c. Synchronize the throttle valve plates visually so that they each have an equal gap at the throttle bore when closed (**Figure 11**). To adjust, loosen the adjuster locknuts, turn the adjusters as required and tighten the locknuts.

Cleaning and Inspection

1. Thoroughly clean and dry all parts. If a special carburetor cleaning solution is used, all non-metal parts must be removed: gaskets, O-rings, starter plunger, coasting richener (J models), etc.
2. Blow out all the passages and jets with compressed air. Don't use wire to clean any of the orifices; wire will enlarge them.
3. Check the cone of the float needle and replace it if it is scored or pitted.
4. Inspect the throttle slide for scoring and wear. Replace it if necessary. Inspect the slide diaphragm carefully (**Figure 27**). If there are pinholes or other damage, replace the diaphragm.
5. Examine the end of the air screw for grooves or roughness. Replace it if damaged. Replace a worn O-ring.

6. Check the O-ring on the float chamber drain plug (Figure 28). Replace it if damaged.
7. Examine the rubber seat in the end of the starter plunger (Figure 26). Replace the plunger if the seat is scored or compressed.
8. *J models:* Inspect the richener diaphragm. If there are pinholes or other damage, replace the diaphragm.



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FUEL LEVEL INSPECTION

The fuel level in the carburetor float bowl is critical to proper performance. The fuel flow rate from the bowl up to the carburetor bore depends not only on the vacuum in the throttle bore and the size of the jets, but also upon the fuel level. Kawasaki gives a specification of actual fuel *level*, measured from the top edge of the float bowl with the carburetor held level (**Figure 29**).

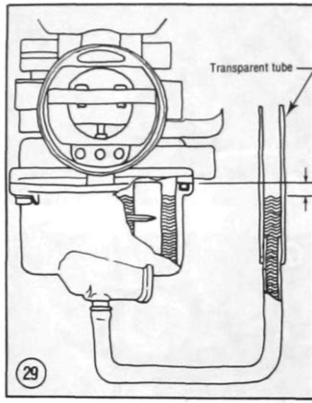
The fuel level measurement is more useful than a simple float height measurement because actual fuel level can vary from carburetor to carburetor, even when their floats are set at the same height. However, fuel level inspection requires a special clear tube that attaches to the carburetor drain fitting (**Figure 29**).

The fuel level is adjusted by bending the float arm tang.

1. Position the motorcycle so that the carburetor bores are horizontal; the carburetors must be level.
2. Connect a drain tube to the bottom of the float bowl and attach a transparent hose (**Figure 29**). The hose must have an inside diameter not less than 1/4 in. (6 mm) so that capillary action will not draw the fuel up inside, giving a false reading.
3. Hold the clear tube against the carburetor body and turn the fuel tap to PRI (prime). With the carburetor level to the ground, open the float bowl drain screw (**Figure 30**) several turns to allow fuel to flow into the tube. Check the fuel level in the tube; it should be slightly below the bottom edge of the carburetor body. See **Table 1** for your bike's fuel level specification.

NOTE

*Hold the tube steady and take your reading just after the fuel level has **risen** to its maximum in the tube. If you raise the tube (and the fuel drops in the tube) you'll probably get a faulty level reading. Turn the fuel tap ON to stop the fuel flow, drain the tube and try it again, forcing the fuel level to rise against surface tension within the tube.*



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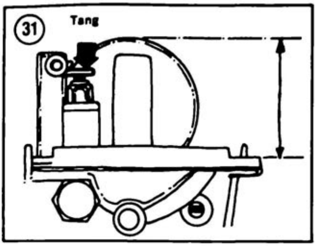
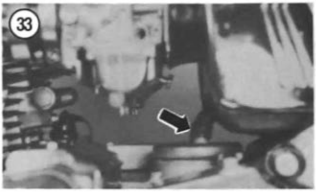




4A. If the fuel level was very far off, you can set the float height (**Figure 31**) to *approximate* the desired fuel level. Bend the tang so that it just touches the float valve when the floats are at the specified height. See **Table 1** at the end of this chapter for float height specifications.

4B. If the fuel level is close to specification, you can fine tune the fuel level. Remove the float bowl from the carburetor and bend the float tang (**Figure 31**) as required to get the right fuel level; install the float bowl and recheck the fuel level.

NOTE

A larger float height measurement lowers the fuel level. If you want the fuel level lower (a greater distance below the carburetor body), bend the tang so the floats stick up higher when held upside down.

IDLE MIXTURE ADJUSTMENT (NON-U.S. MODELS)

The idle fuel-air *mixture* on carburetted models affects low-speed emissions as well as idling stability and response off idle. On motorcycles imported into the United States, the idle *mixture* screw is set and sealed at the factory and requires no adjustment. For all other models, use the following procedure.

1. Adjust the idle speed to specification, then stop the engine.
2. Remove the fuel tank as described in this chapter. Hook up a temporary fuel supply.

WARNING

When supplying fuel by temporary means, make sure the tank is secure and all fuel lines are tight with no leaks.

3. Turn each idle mixture screw (**Figure 32**) in until it seats lightly, then back it out the number of turns specified in **Table 1**.

CAUTION

Never turn the idle mixture screw in tightly. You'll damage the screw or its soft seat in the carburetor.

4. Start the engine and turn each idle mixture screw in or out slightly to the setting that gives the highest stable idle speed.
5. Readjust idle speed to specification, if necessary.
6. Turn each mixture screw slightly again to see if the idle speed increases. Readjust idle speed if necessary. Repeat these steps until there is no further increase in idle speed.

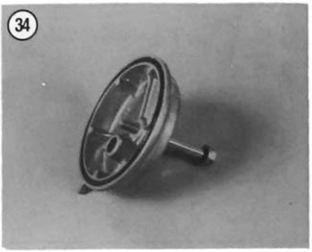
CRANKCASE BREATHER

The crankcase breather separates oil mist droplets from crankcase blowby gas and routes the oil back to the crankcase through a drain hole. The vapors are routed to the air cleaner housing. No maintenance is required but if the oil drain is not kept clear during engine assembly or the engine is overfilled with oil, oil can be sucked up into the air cleaner housing.

Breather Removal/Installation

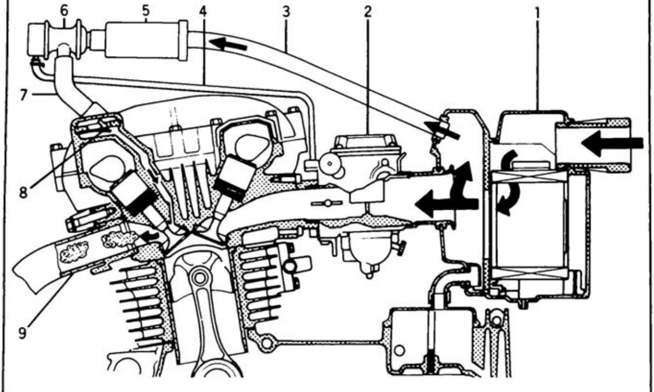
1. Disconnect the breather hose (**Figure 33**), and remove the cover bolt with its O-ring.

2. Remove the cover and O-ring (**Figure 34**).
3. When installing the breather cover, make sure the O-rings are in good condition, and make sure the breather cover pin seats between the pins cast into the crankcase.



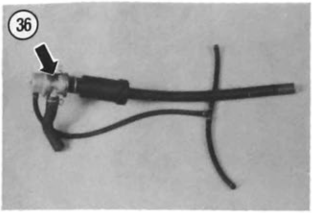
AIR SUCTION SYSTEM (U.S. MODELS)

The air suction system (**Figure 35**) consists of a vacuum switch valve, 2 air suction valves (reed valves) and air and vacuum hoses. This system does not pressurize air, but it does introduce fresh air into the exhaust ports when the valves are opened by momentary pressure differentials in the exhaust gas pulses.



AIR SUCTION SYSTEM (U.S. MODELS)

1. Air cleaner
2. Carburetor
3. Air hose
4. Vacuum hose
5. Silencer
6. Vacuum switch valve
7. Air hoses
8. Reed valve
9. Exhaust pipe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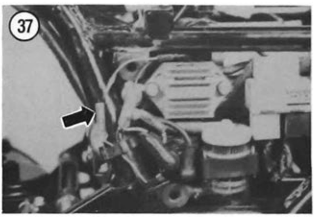
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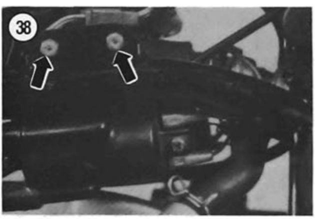
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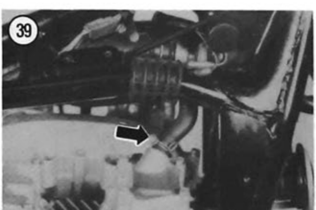
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The vacuum switch (**Figure 36**) normally allows fresh air pulses into the exhaust port but shuts off air flow during engine braking. This helps prevent backfiring in the exhaust system due to the greater amount of unburned fuel in the exhaust gas during deceleration.

The air suction valves, on top of the valve cover, are basically check valves. They allow the fresh air to enter the exhaust port and prevent any air or exhaust from reversing back into the system.

Suction Valve
Removal/Installation

If the engine idle is not smooth, if engine power decreases seriously or if there are any abnormal engine noises, remove the air suction valves and inspect them. The vacuum switch is not adjustable.

WARNING
Some fuel may spill during these procedures. Work in a well ventilated area at least 50 feet from any sparks or flames, including gas appliance pilot lights. Do not smoke in the area. Keep a BC rated fire extinguisher handy.

1. Check that the ignition switch is OFF.
2. *Fuel injected models:* Disconnect the white/red lead from the starter solenoid to the fuel injection wiring harness (**Figure 37**).
3. Remove the fuel tank as described in this chapter.
4. Disconnect the spark plug leads by grasping the spark plug leads as near to the plug as possible and pulling them off the spark plugs.
5. Disconnect the leads to the ignition coils, then remove the coil bracket mounting bolts and the coils (**Figure 38**).
6. Slide up the lower hose clamps and pull the hoses off the air suction valve covers (**Figure 39**).
7. Remove the bolts securing the air suction valve covers (**Figure 40**).


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8. Remove the covers and pull the valves up out of the valve cover (**Figure 41**).
9. Check the reed valves for cracks, folds, warpage or any other damage (**Figure 42**).
10. Check the sealing lip coating around the perimeter of the assembly. It must be free of grooves, scratches or signs of separation from the metal holder.

NOTE
The valve assembly cannot be repaired. It must be replaced if damaged.

11. Wash off any carbon deposits between the reed and the reed contact area with solvent.

CAUTION
Do not scrape deposits off or the assembly will be damaged.

12. Install by reversing these steps. When installing the ignition coils, the green wire goes to the left coil and the black wire goes to the right coil. The yellow/red wires can go to either coil.

Vacuum Switch Test

Inspect the vacuum switch if there is backfiring during deceleration or other abnormal engine noise.
1. Run the engine until it is warm.
2. Rev the engine to 4,000 rpm and snap the throttle shut. Note the intensity and frequency of any backfiring for comparison later in this test.
3. Shut the engine off. At the air cleaner housing, disconnect and plug the hose from the vacuum switch (**Figure 43**).
4. Start the engine, rev it to 4,000 rpm and compare the backfiring to what you heard before. If the backfiring is the same, there is nothing wrong with the vacuum switch.
5. If the backfiring is different, the vacuum switch is faulty. Install a new switch.

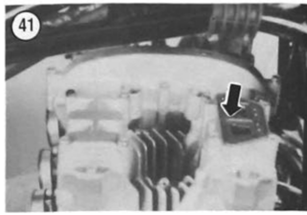
FUEL TANK

As water and dirt accumulate in the fuel tank, engine performance will deteriorate. The fuel system should be cleaned when the engine is cold.

WARNING
Some fuel may spill during these procedures. Work in a well ventilated area at least 50 feet from any sparks or flames, including gas appliance pilot lights. Do not smoke in the area. Keep a BC rated fire extinguisher handy.

Fuel Tank Removal/Installation (Carburetted Models)

See Chapter Eight for fuel tank removal on fuel injected models.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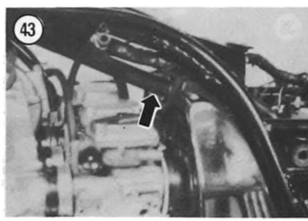
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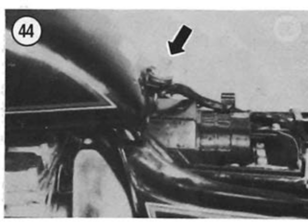
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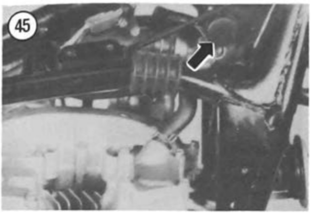
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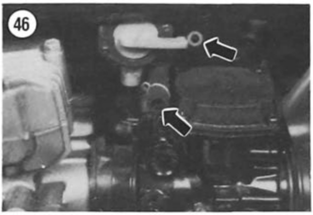
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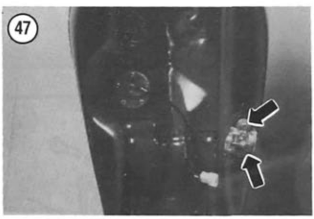
1. Check that the ignition switch is OFF.
2. Put the bike up on its centerstand.
3. Swing the seat open or remove it.
4. If there is a bolt at the rear of the fuel tank, remove the bolt, washer and collar (**Figure 44**).
5. Turn the fuel tap ON and disconnect the fuel and vacuum lines at the fuel tap. Lift up the rear of the tank slightly, if necessary.
6. Disconnect the sending unit cover breather hose.
7. Disconnect the fuel level sensor wires.
8. Remove the tank by pulling it up and to the rear.
9. Discard the fuel in the tank and pour about a pint of clean fuel into the tank. Install the cap, slosh the fuel around for about a minute and pour it out in a safe container.
10. To install, reverse these steps. Note the following:
    a. Moisten the frame grommets (**Figure 45**) with water or Armor All, and insert the tank brackets carefully over the grommets. Don't pinch any wires or control cables.
    b. The vacuum hose is smaller than the fuel line (**Figure 46**).
    c. When installation is complete, partially fill the tank with fresh fuel and check for leaks around the tap and at the fuel line connections.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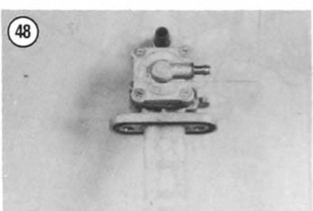
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FUEL TAP

Vacuum operated fuel taps have no OFF position. The tap should pass no fuel in ON or RES until the running engine provides the vacuum required to operate the diaphragm valve. In PRI (prime) the tap will pass fuel whether the engine is running or not.

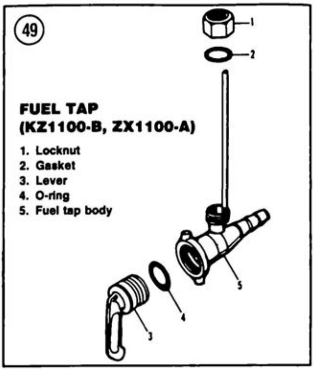
Fuel Tap Removal/Installation (Carburetted Models)

See Chapter Eight for fuel tap removal on fuel injected models.

WARNING
Some fuel may spill during these procedures. Work in at well ventilated area at least 50 feet from any sparks or flames, including gas appliance pilot lights. Do not smoke in the area. Keep a BC rated fire extinguisher handy.

1. Remove the fuel tank.
2. Turn the fuel tap to PRI (prime) and drain the fuel into a clean gas can.
3. Remove the 2 fuel tap mounting bolts and the tap and O-ring (**Figure 47**).
4. Inspect the fuel tap mounting O-ring and clean the feed tube screen whenever you remove the tap from the tank (**Figure 48**).

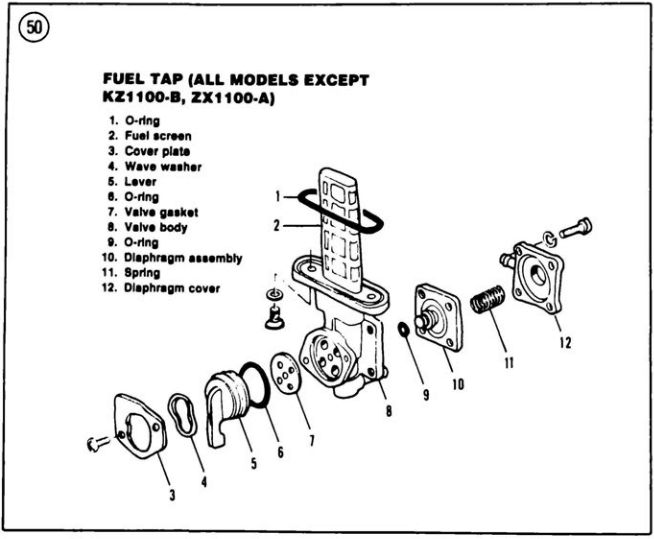
5. To install, reverse these steps. Note the following:
   a. The vacuum hose is smaller than the fuel hose (**Figure 46**).
   b. Make sure that fuel does not flow in the ON position when the engine is not running.
   c. Check for leakage after you install the fuel tap.

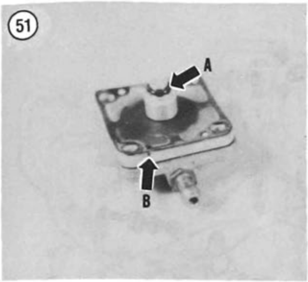


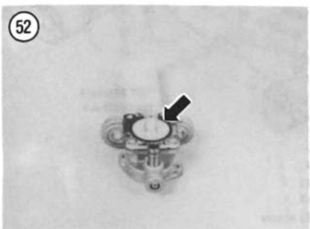
Fuel Tap Inspection

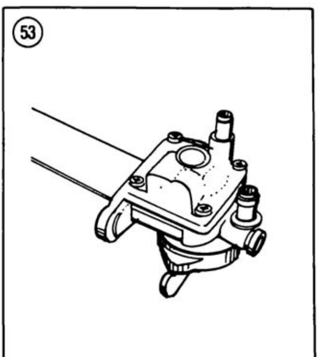
See **Figure 49** or **Figure 50**. Disassemble the tap and check that the O-ring (A, **Figure 51**) and diaphragm are clean and undamaged. Look for pin holes in the diaphragm. Any bit of debris on the valve O-ring will prevent the valve from closing.

The groove in the diaphragm plate (B, **Figure 51**) must face the O-ring. Make sure the diaphragm spring is in place (**Figure 52**). Install the diaphragm cover as shown in **Figure 53** for J models or, **Figure 48** for K and M models and KZ1100-A and D models.









FUEL LEVEL SENDING UNIT

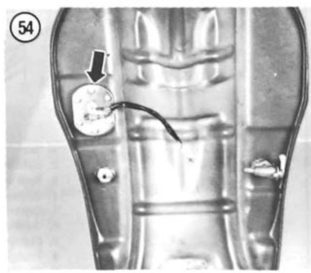
Models with a fuel level gauge or warning light have a sending unit mounted in the bottom of the fuel tank (**Figure 54**). When installing a sending unit, make sure the mounting O-ring is in good condition (**Figure 55**), and that the float points to the front of the tank.

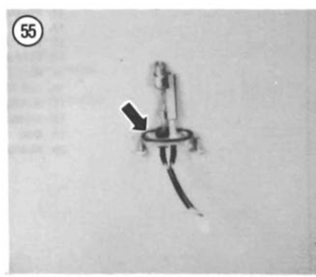
EXHAUST SYSTEM

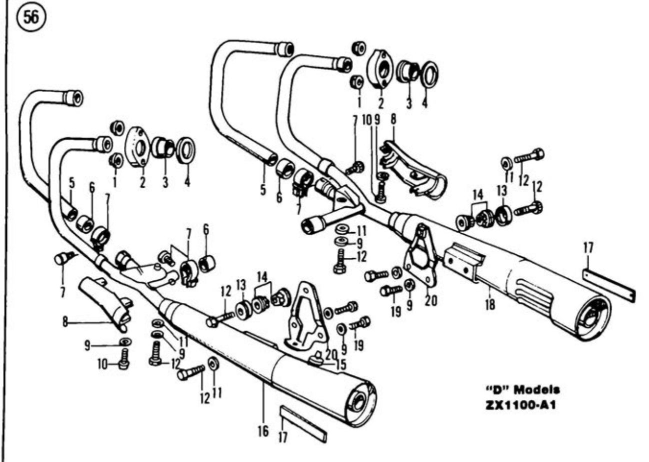
The exhaust system requires no maintenance other than to make sure the connecting clamps are tight.

Exhaust Removal/Installation

See **Figure 56** or **Figure 57**. The mufflers can be removed separately on A models. On other models, the whole system must be removed.

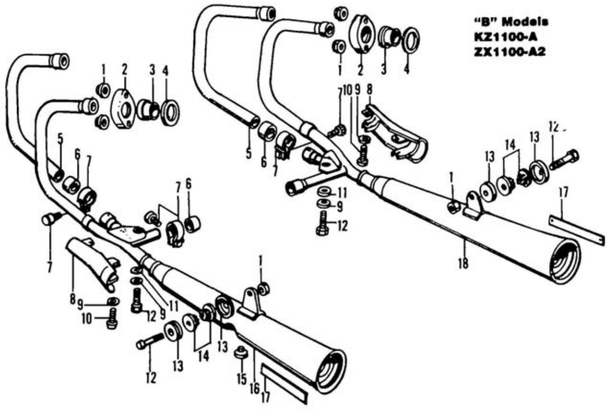






EXHAUST SYSTEM

1. Nut
2. Exhaust pipe holder
3. Split collar
4. Gasket
5. Center exhaust pipes
6. Gasket
7. Clamp and bolt
8. Footguard
9. Washer
10. Bolt
11. Washer
12. Bolt
13. Cup washer
14. Rubber bushing
15. Rubber bushing
16. Left-hand pipe/muffler
17. Nameplate
18. Right-hand pipe/muffler
19. Bolt
20. Muffler bracket



1. Nut
2. Exhaust pipe holder
3. Split collar
4. Gasket
5. Center exhaust pipes
6. Gasket
7. Clamp and bolt
8. Footguard
9. Washer
10. Bolt
11. Washer
12. Bolt
13. Cup washer
14. Rubber bushing
15. Rubber bushing
16. Left-hand pipe/muffler
17. Nameplate
18. Right-hand pipe/muffler

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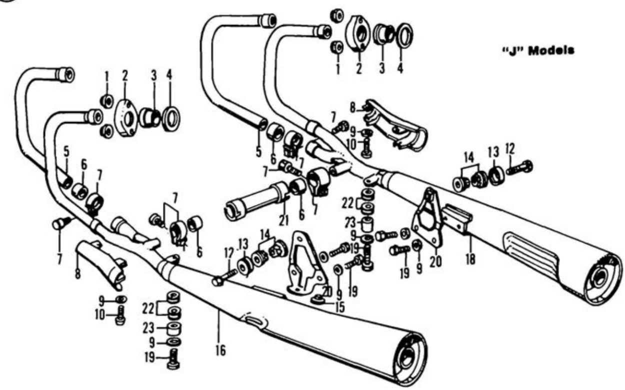
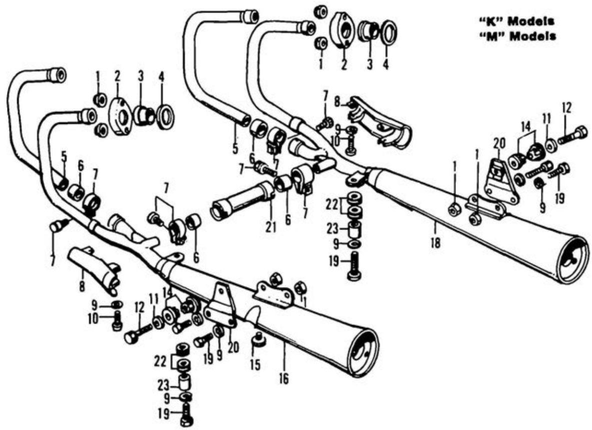


EXHAUST SYSTEM
(J, K AND M MODELS)

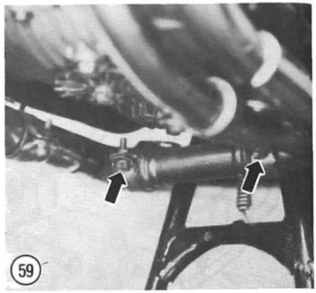
1. Nut
2. Exhaust pipe holder
3. Split collar
4. Gasket
5. Center exhaust pipes
6. Gasket
7. Clamp and bolt
8. Footguard
9. Washer
10. Bolt
11. Bolt
12. Bolt
13. Cup washer
14. Rubber bushing
15. Rubber bushing
16. Left-hand pipe/muffler
17. Nameplate (not shown)
18. Right-hand pipe/muffler
19. Bolt
20. Muffler bracket
21. Crossover pipe
22. Rubber grommet
23. Sleeve

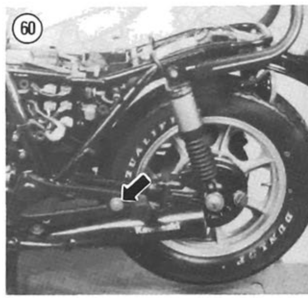


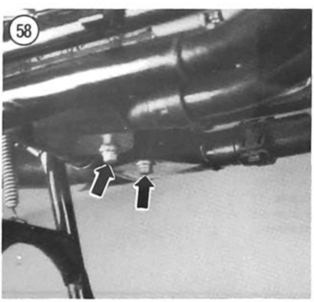
1. Nut
2. Exhaust pipe holder
3. Split collar
4. Gasket
5. Center exhaust pipes
6. Gasket
7. Clamp and bolt
8. Footguard
9. Washer
10. Bolt
11. Bolt
12. Bolt
13. Cup washer
14. Rubber bushing
15. Rubber bushing
16. Left-hand pipe/muffler
17. Nameplate (not shown)
18. Right-hand pipe/muffler
19. Bolt
20. Muffler bracket
21. Crossover pipe
22. Rubber grommet
23. Sleeve

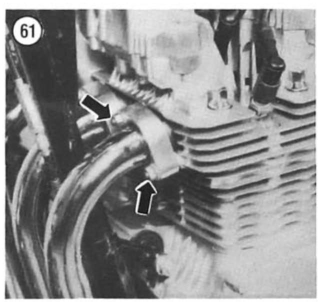
1. Put the motorcycle up on its centerstand.
2. Under the engine, remove the 2 mounting bracket bolts (**Figure 58**).
3. Under the engine, loosen the crossover pipe clamp(s) (**Figure 59**).
4. Remove the bolts at the rear footpeg brackets (**Figure 60**).
5. At the cylinder head, remove the exhaust pipe collar nuts (**Figure 61**) and slide the collars down out of the way. Remove the split keepers from behind the collars.
6. Pull the exhaust pipe and muffler assemblies out of the cylinder head.
7. To remove the No. 2 and 3 exhaust pipes, loosen the clamp bolt (**Figure 62**) and twist the pipe out.
8. To install, reverse these steps. Note the following:

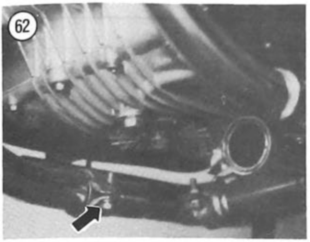
   a. Do not mix up the No. 2 (left) and No. 3 (right) exhaust pipes. Each has an identifying number stamped near the cylinder head end (**Figure 63**).
   b. Use new gaskets in the cylinder head exhaust ports (**Figure 64**). Stick the gaskets in place with grease.
   c. Hold the exhaust pipe split keepers in place with a piece of tape or with your fingers (**Figure 65**).
   d. Install the exhaust-to-frame bolts, collars, washers and dampers as shown in **Figure 66**.
   e. Make sure the gaskets at the pipe/muffler connections and at the crossover pipe are in good condition.
   f. Install all fasteners snugly. Then tighten the exhaust pipe holder nuts gradually and evenly and tighten the rest of the clamps and bolts.
   g. After the job is complete, ride the bike and check for exhaust leakage. Tighten the clamps again after the engine has cooled down.

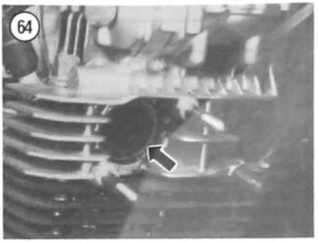


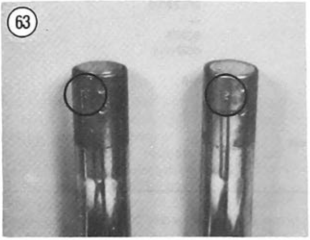


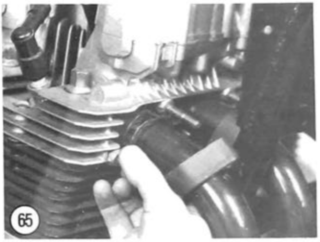












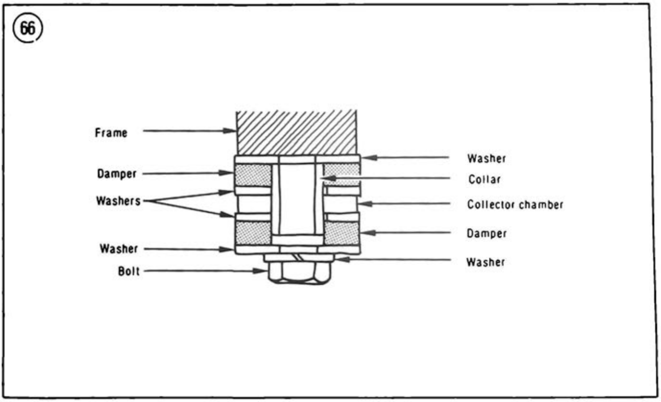

66
Frame
Damper
Washers
Washer
Bolt
Washer
Collar
Collector chamber
Damper
Washer

Table 1 CARBURETOR SPECIFICATIONS

	1981-82	1983
Size/type	BS34	
Main jet		
KZ1000-J	127.5R	127.5R
KZ1000-K, M	122.5R	—
KZ1100-A, D	120R	117.5
Pilot jet		
KZ1100-D	40	40
Others	37.5	37.5
Jet needle (U.S. models)		
KZ1000-J	5FLZ49	5FLZ49
KZ1000-K, M	5FL51	—
KZ1100-A	5GX28	5CF59
KZ1100-D	4CG14	4CG14
Jet needle (Non-U.S. models)		
KZ1000-J	5FLZ50-3	5FLZ50-3
KZ1000-K, M	5FL52-3	—
KZ1100-A	5GX29-3	5CF58
KZ1100-D	4CG15-3	4CG15-3
Needle jet		
KZ1000-J	Y-6	Y-6
KZ1000-K, M	Y-1	—
KZ1100-A, KZ1000D	Y-1	Y-1
Idle mixture screw	U.S.: preset Others: 1 1/4 turns out	
Fuel level	0.118 in. (3.0 mm)	
Float height	0.73 in. (18.6 mm)	

FUEL INJECTION SYSTEM

This chapter covers the fuel injection intake, fuel and electronic control systems and the fuel tank and fuel tap on fuel injected models.

The GPz models are equipped with a fuel injection system instead of carburetors. The 1981 KZ1100-B1 has electronic fuel injection which uses a mechanical air flow meter. In 1982 the electronic components were modified, the air flow meter was deleted and the throttle valve switch was replaced by a throttle position sensor.

On ZX1100-A models, a self-diagnosis system has been added to the fuel injection system to help simplify troubleshooting.

The fuel injection system is highly reliable, as it is based on time-tested systems used in the automotive field. As is typical of the complex electronic controls appearing on motorcycles, you are relieved of some traditional scheduled maintenance and there are fewer things to tinker with.

Also typical of complex electronic systems, most parts cannot be repaired, only replaced. This chapter describes how the fuel injection system works, how to maintain it, how to determine when a part is faulty and how to replace parts.

CAUTION

Servicing a motorcycle with electronic fuel injection requires special precautions to prevent damage to the expensive electronic control unit. Common electrical system service procedures acceptable on other motorcycles may cause damage to several parts of the fuel injection system. Be sure to read the ***Fuel Injection Precautions*** *listed in this chapter.*

Tables 1-3 are located at the end of this chapter.

FUEL INJECTION OPERATION

The fuel injection system consists of the intake system, fuel system and the control unit system. Together they measure air flow to the throttle valves (1981) or throttle valve open angle (1982 and later models), air temperature, engine temperature and engine speed. The control unit (computer) computes the best fuel mixture for smooth performance, maximum fuel economy and lowest exhaust emissions; the computer then signals the injector valves to open for a specific amount of time, allowing the correct amount of fuel into the cylinder head intake ports.

Intake System (1981)

The intake system routes air through the air cleaner, flow meter, surge tank, past the throttle valves and into the cylinder head intake ports.

The flow meter has an air flap that deflects in proportion to the rate of air flow past the flap. Connected to the flap is a variable resistor that tells the computer how much air is flowing into the engine. An air temperature sensor inside the flow meter signals the computer to deliver more fuel when cold, dense air is entering the system.

At idle, the flow meter flap is fully closed and a small amount of air goes to the engine through a bypass passage around the flap.

From the flow meter, the air enters a surge tank that smooths the air pressure pulses caused by normal engine operation. This keeps the pressure pulses from affecting operaton of the air flow meter. The surge tank is also the point at which combustion blow-by gases from the crankcase breather enter the intake system.

From the surge tank, the air passes through 4 individual butterfly type throttle valves into the intake ports. A rubber-capped fitting on two throttle valves provides intake vacuum sensing points for the fuel pressure regulator.

There is a throttle position switch on the left throttle valve that tells the computer when the throttle is fully closed or open.

Intake System (1982 and Later)

The intake system routes air through the air cleaner, through a duct into the surge tank, past the throttle valves and into the cylinder head intake ports.

The air duct from the air cleaner to the throttle valves contains an air temperature sensor that signals the computer to deliver more fuel when cold, dense air is entering the system.

From the air duct, the air enters a surge tank that smooths the air pressure pulses caused by normal engine operation. The surge tank is also the point at which combustion blow-by gases from the crankcase breather enter the intake system. From the surge tank, the air passes through 4 individual butterfly type throttle valves into the intake ports. A rubber-capped fitting on two throttle valves provides intake vacuum sensing points for the fuel pressure regulator.

There is a throttle position sensor on the right throttle valve that tells the computer the exact throttle valve opening angle.

Fuel System

See **Figure 1**. The fuel system routes fuel from the fuel tank through a filter, to an electric fuel pump, to the individual fuel injectors and into the cylinder head intake ports. The fuel system does not provide feedback to the electronic control unit, but the control unit turns the fuel pump and the injectors on and off.

The fuel pump is a constant flow pump; whatever fuel the injectors are not using is routed through a fuel pressure regulator, through a return line and a one-way check valve back into the fuel tank. The fuel pump is cooled and its bearings are lubricated by the fuel it is pumping.

CAUTION

If the pump is operated without fuel, its bearings will be damaged. The fuel pump cannot be disassembled.

The fuel pressure regulator is basically an on/off valve that dumps excess fuel back into the fuel tank when fuel pressure exceeds the regulator's limit. The regulator has a vacuum line leading to two of the intake ports. This line senses intake vacuum and allows the regulator to adjust fuel pressure so that it is at a constant level *above* intake vacuum.

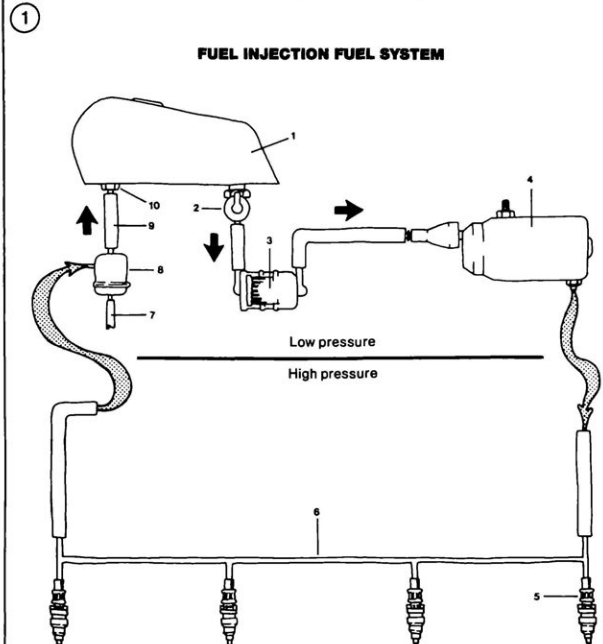
The fuel injectors are simply solenoid valves that open on signal from the computer. All the injectors open at the same time, once every 360° of crankshaft rotation, regardless of whether the engine's intake valves are open or closed. This means that for every time an intake valve opens, its injector will have opened twice. If the intake valve is not open when the injector operates, the finely atomized fuel-air mixture stays in the intake port until the intake valve opens.

An important feature of this type of intake port injection is that the fuel-air charge cools the intake valve head, just as in an engine with carburetors.

Control Unit System

The electronic control unit system consists of a relay that controls power to the fuel pump, the air flow meter (1981) and central computer; the computer that senses input signals; and the various sensors described here:

a. Signals from the ignition coil primary ground leads provide engine speed information that determines how often the injectors operate.
b. On 1981 models, the air flow meter variable resistor provides information about how much air is entering the engine, which is the most important factor in determining how long the injectors are open.
c. The control unit receives signals from the engine temperature sensor and the air temperature sensor and adjusts fuel mixture to compensate for a cold engine and cold air, similar to the operation of a carburetor choke.
d. On 1981 models, an idle switch is attached to the idle adjust knob. It tells the computer when the throttle valves are closed; the control unit then slightly richens the fuel-air mixture.
e. On 1981 models, the throttle position switch on the left throttle valve tells the computer when the throttle valves are more than about



1. Fuel tank
2. Fuel tap
3. Fuel filter
4. Fuel pump
5. Fuel injector
6. Fuel distributor
7. Engine vacuum
8. Pressure regulator
9. Fuel return line
10. Check valve

1/2 open; the computer then slightly richens the fuel-air mixture.

f. On 1982 and later models, the throttle position sensor on the right throttle valve tells the computer the exact opening angle of the throttle valves. This is the most important factor in determining how long the injectors are open.

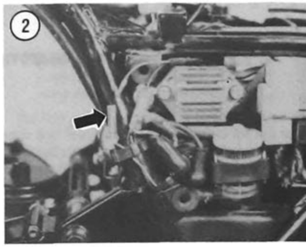
FUEL INJECTION PRECAUTIONS

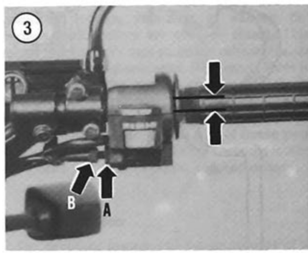
CAUTION
Servicing a motorcycle with electronic fuel injection requires special precautions to prevent damage to the expensive electronic control unit (computer). Common electrical system service procedures acceptable on other motorcycle electrical systems may cause damage to several parts of the fuel injection system.

Solid state electronic parts are usually very reliable, but they are sensitive to electrical overloads or polarity reversals and to physical shock. The following precautions must always be observed when servicing a fuel injected motorcycle.

Control Unit System Precautions

1. Unless specifically directed by these procedures, do not start the motorcycle while any electrical connectors are disconnected and do not disconnect the battery cables or any electrical connectors while the ignition switch is ON. Irreparable control system damage may result.
2. Before disconnecting any electrical connectors, turn the ignition switch OFF and disconnect the white/red lead from the starter solenoid to the fuel injection wiring harness (**Figure 2**). This lead supplies power to the control unit, relay and fuel injectors at all times; it is not switched or protected by a fuse so it is always "hot."
3. When repairs are complete, do not try to start the engine without double checking all fuel injection electrical connectors; faulty connections may damage the control system. Make sure the fuel injection black/green and black/yellow ground leads are securely connected at the battery negative (-) ground terminal black/yellow coupler.
4. Do not disconnect the battery while the engine is running.
5. Do not apply anything other than a 12 volt battery to the motorcycle's electrical system. The motorcycle's battery must be removed before attaching a battery charger.

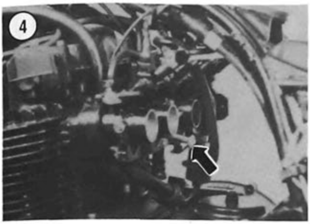


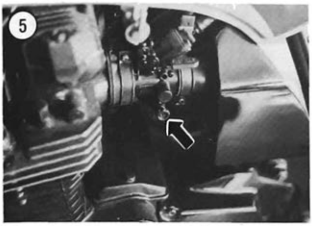


6. The fuel injection wiring harness must be at least 4 in. (100 mm) away from the ignition high tension leads to prevent electrical interference with the control unit.
7. If you install a radio transmitter, position the antenna as far away from the control unit as possible. If transmission causes fuel injection trouble, it may help to ground the control unit case to the motorcycle frame.
8. When washing the motorcycle, take special care to keep water spray away from all electrical connectors.

Fuel System Precautions

1. The fuel pump is cooled and its bearings are lubricated by the fuel it is pumping. If the pump is operated without fuel, its bearings will be damaged. The fuel pump cannot be disassembled.
2. Do not add any lubricants, preservatives or other additives to the gasoline; fuel system corrosion or clogging may result.





FUEL INJECTION SCHEDULED MAINTENANCE

This section covers only those scheduled maintenance items that are unique to fuel injected models. Refer to Chapter Three for other scheduled maintenance required for fuel injected models as well as carburetted models.

Throttle Cable Play

Always check the throttle cable before you make any other fuel injection adjustments. Too much free play causes jerky throttle response; too little free play will cause unstable idling.

1. Check free play at the throttle grip flange (**Figure 3**). Kawasaki specifies about 1/8 in. (2-3 mm).
2. If adjustment is required, loosen the throttle grip cable adjuster locknut (A, **Figure 3**) and turn the adjuster (B) for the desired free play. Tighten the locknut.

Idle Speed Adjustment

Adjust the idle speed at each 3,000 mile (5,000 km) maintenance interval. On 1981-1982 models, the idle speed adjustment knob is below the throttle valve assembly (**Figure 4**). On ZX1100-A models, the idle speed knob is located on the left-hand side of the No. 1 throttle valve (**Figure 5**). On 1981 models, an idle switch wire is attached to the knob. Refer to *Idle Speed Adjustment* in Chapter Three. If the idle is unstable or rough, check throttle cable play and throttle valve synchronization.

CAUTION
When adjusting idle speed on 1981 models, be careful not to twist the wire from the idle switch.

Fuel Filter Replacement

Replace the fuel filter at each 6,000 mile (10,000 km) maintenance interval. See *Fuel Injection Disassembly* for fuel filter replacement.

Fuel Hose Replacement

Replace the high-pressure fuel hoses every 2 years. See *Fuel Injection Disassembly*.

Throttle Valve Synchronization

Throttle valve synchronization should be performed at each 6,000 mile (10,000 km) maintenance interval. This adjustment may also be necessary if the idle is rough, if there is excessive exhaust smoke or if the engine stalls, has low power or low fuel mileage.

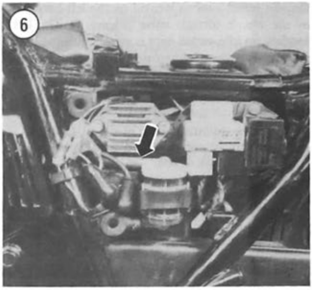
Synchronizing the throttle valves makes sure that one cylinder doesn't try to run faster than the others, cutting power and gas mileage. The only accurate way to synchronize the throttle valves is to use a set of vacuum gauges (a manometer) that measures the intake vacuum of all cylinders at the same time. A typical set of gauges is shown in Chapter One.

NOTE
Before you try to synchronize the throttle valves, make sure all of the following are checked or adjusted first. If not, you won't get a good synch: air cleaner, spark plugs, air suction valves, valve clearance, throttle cable play, all air system clamps air-tight.

1. Start the engine, warm it up fully, set the idle speed, then stop the engine.

WARNING
Some fuel may spill during these procedures. Work in a well ventilated area at least 50 feet from any sparks or flames, including gas appliance pilot lights. Do not smoke in the area. Keep a BC rated fire extinguisher handy.

2. Remove the fuel tank as described in this chapter. Set it on a bench the same height as on the motorcycle. Get a long piece of fuel tubing and



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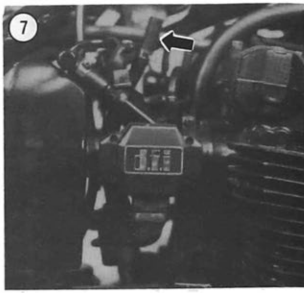

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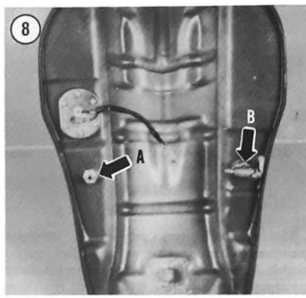
connect the inlet on top of the fuel filter (**Figure 6**) to the fuel tap and the return outlet on top of the pressure regulator (**Figure 7**) to the return check valve on the tank (A, **Figure 8**).

3. Remove the rubber cap or vacuum line from each throttle valve vacuum tap (**Figure 9** shows 1982 models) and attach a set of vacuum gauges following the manufacturer's instructions (**Figure 10** shows 1981 models).
4. Turn the fuel tap ON, start the engine and adjust the idle speed.
5. Check that the vacuum difference between the cylinders is less than 0.79 in. Hg (20 mm). The readings should be as close as possible.
6. If the difference is greater than specified, loosen the locknut and turn the appropriate synchronizing screw located between the throttle valves (**Figure 11**) as required to equalize the vacuum in all cylinders. First match No. 1 and No. 2, then match No. 3 and No. 4 and finally match the left pair of cylinders to the right pair. The left and right screws control the No. 1 and No. 4 throttle valves individually. The center screw controls both No. 1 and No. 2 throttle valves in relation to No. 3.
7. Rev the engine once and check that all cylinders return to equal readings. Readjust, if necessary, and tighten the adjuster locknuts while holding the adjusters steady.
8. Reset the idle speed, stop the engine and install the fuel tank.

NOTE

On 1981 models, poor synchronization of fuel injection throttle valves can cause many problems. If one throttle valve is open more than the others, more air will flow through the air flow meter and the computer will inject more fuel into all



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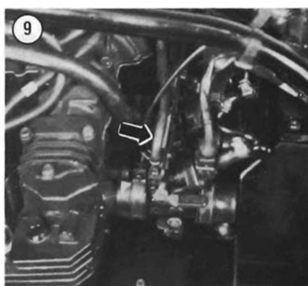

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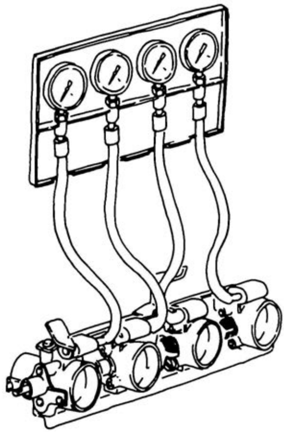

1981

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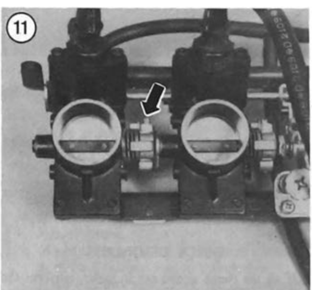


cylinders, causing a too-rich mixture in the remaining 3 cylinders.

Surge Tank Drain Plug

The surge tank is equipped with a drain plug in case water, oil or gas collect in the tank. To drain the tank, simply pull the plug down and out. When installing the plug, make sure it is air-tight; any air leaks will cause the fuel injection system to malfunction.

Fuel System Cleaning

Fuel system cleaning is not scheduled regularly, but it may be required when indicated by a troubleshooting procedure.

WARNING
Some fuel may spill during these procedures. Work in a well ventilated area at least 50 feet from any sparks or flames, including gas appliance pilot lights. Do not smoke in the area. Keep a BC rated fire extinguisher handy.

1. Remove and empty the fuel tank as described in this chapter. Make sure the return line check valve (A, **Figure 8**) will pass fuel into the tank, but not out of it. Make sure the air vent in the fuel tank cap is clear.
2. Remove the fuel tap (B, **Figure 8**) and clean the fuel tap filter screen.
3. Flush the tank with clean gasoline or solvent. Let it dry.
4. Remove the fuel pump, fuel distribution tube, injectors and pressure regulator; see *Fuel Injection Disassembly*. Clean the parts in solvent. Replace any parts that can't be cleaned.
5. Install a new fuel filter and new fuel hoses; see *Fuel Injection Disassembly*.

FUEL INJECTION TESTING

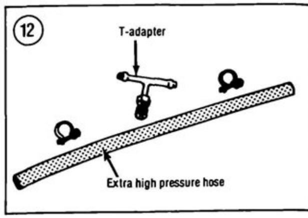
This testing section will help you solve most fuel injection system problems quickly, minimizing unnecessary parts replacement.

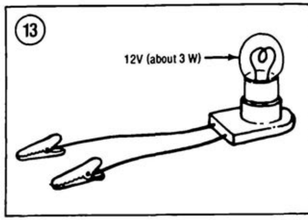
Re-read the *Fuel Injection Precautions* before trying to troubleshoot the system. Solid state electronic parts are usually very reliable, but they are sensitive to electrical overloads or polarity reversals and to physical shock. Be very careful not to create accidental short circuits when using a test meter.

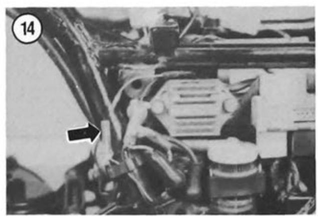
Tools

The troubleshooting procedures described here require the following special tools, in addition to the tools described in Chapter One:

a. For fuel pressure measurement, a fuel pressure gauge, T-shaped junction tube, and an extra length of high-pressure hose are required (**Figure 12**). Kawasaki offers a combination oil/fuel pressure gauge (part No. 57001-125 or 57001-164) and a T-adapter and hose kit (part No. 57001-1089). You can use any fuel or oil pressure gauge in the 50 to 100 psi range and a high-pressure hose with screw type clamps.
b. For relay and other parts inspection, an ohmmeter such as the one illustrated in Chapter One. You must zero the ohmmeter before each test and for each scale. Touch the meter probes together and adjust the meter reading to zero using the ohmmeter adjustment knob.
c. For relay inspection, a 3.4 watt test light is required (**Figure 13**).







Most Common Troubles

Before you suspect the expensive parts, check the obvious problem causes that are sometimes overlooked:
a. Is there fuel in the tank?
b. Is the fuel tap turned to ON or RES?
c. Check for debris or water in the fuel filter. If there is dirt or water in the filter, clean the fuel system as described in this chapter.
d. Is the air filter clean and in place?
e. Is the ignition fuse okay?
f. Are the throttle valves synchronized?
g. Many fuel injection troubles are caused by loose or corroded couplers. Recheck the wiring connections, especially if the motorcycle has just been assembled. Make sure the ground wires are clean and firmly attached at the battery, the color coded wires are correctly matched and all couplers securely connected.
h. Are the motorcycle's starting and ignition systems operating? If not, repair them first before blaming a problem on the fuel injection system; refer to Chapter Nine.

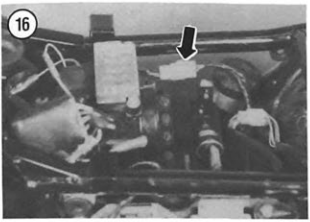
Troubles Unique to Fuel Injection

Now check the "not so obvious" fuel injection-related operating requirements that would not cause fuel problems in a motorcycle with carburetors.

Because the fuel pressure regulator uses engine intake vacuum to control fuel pressure and because the crankcase ventilation system affects the vacuum measurement, the following items must be in order for proper fuel injection operation:
a. Is the oil level correct?
b. Are the oil filler cap, surge tank drain plug and breather hose installed and air-tight?
c. Is the valve clearance correct?
d. Is the cranking compression acceptable? Refer to Chapter Three.

QUICK DIAGNOSIS

If all the items above are in order, perform the following initial checks before you proceed. You



may be able to save considerable troubleshooting time by using these preliminary checks.

1. Disconnect the starter motor. Remove the left side cover and disconnect the yellow/red wire from the starter solenoid (**Figure 14**). Push the starter button (and pull in the clutch lever on models with a starter lockout switch) and listen to hear if the fuel pump runs.
   a. If you can hear the fuel pump running, the fuel system is probably okay; go on to Step 2.
   b. If you cannot hear the fuel pump running, inspect the fuel pump, relay, air flow meter (1981) and the control unit.
2. Put the tip of a screwdriver on each injector body with the screwdriver grip against your ear (**Figure 15**). While cranking the engine with the electric starter, listen to the injector. If the electronic control system is working, you should be able to hear each injector "ticking" regularly while the engine is cranking.
   a. If none of the injectors are ticking, test the control system.
   b. If some, but not all of the injectors are ticking, go to *Fuel Injector Test* in this chapter.
   c. If all injectors are ticking, the control unit is probably okay. If both the fuel pump and injectors appear to be working but you still have a fuel injection problem, test the sensors.

FUEL SYSTEM TESTS

If none of the following tests reveals the source of trouble, inspect the items under *Control Unit System Tests* in this chapter.

Fuel Pump Inspection

1. Remove the air cleaner housing, then remove the air flow meter (1981) or air duct (later models); see *Fuel Injection Disassembly* in this chapter.
2. Disconnect the 2-pin fuel pump coupler (**Figure 16**).
3. Connect a 12 volt battery to the fuel pump socket from the fuel pump: positive (+) terminal to the orange/black lead and negative (–) terminal to the black/yellow lead. Listen for the sound of the fuel pump operating:
   a. If the fuel pump does not operate, the pump or its wiring is bad. Replace as required.
   b. If the fuel pump operates, it is okay.

Fuel Pressure Regulator Inspection

WARNING

Residual fuel pressure may exist in the fuel lines. Be careful to avoid accidental spillage.

WARNING

Some fuel may spill during these procedures. Work in a well ventilated area at least 50 feet from any sparks or flames, including gas appliance pilot lights. Do not smoke in the area. Keep a BC rated fire extinguisher handy.

A fuel pressure gauge, T-shaped junction tube and an extra length of high-pressure hose are required to inspect fuel pressure (**Figure 12**). Kawasaki offers a combination oil/fuel pressure gauge (part No. 57001-125 or 57001-164) and a T-adapter and hose kit (part No. 57001-1089). You can use any fuel or oil pressure gauge in the 50 to 100 psi range and a high-pressure hose with screw type clamps.

1. Disconnect the fuel pump outlet hose at the injector distribution pipe (**Figure 17**).
2. Connect the T-adapter and pressure gauge between the hose from the regulator and the injector distribution pipe. Tighten the hose clamps.
3. If the engine will start, start it and let it idle. Note the average gauge reading; at idle, the fuel pressure should be about 33 psi (2.3 kg/cm^2). Open the throttle fully for an instant and note the gauge reading; when the throttle is first opened the pressure should be about 36 psi (2.5 kg/cm^2). If the engine will not start: on 1982 and later models, turn the ignition switch ON; on 1981 models, remove the air filter, turn the ignition switch ON, and push the flow meter flap open to start the fuel pump (**Figure 18**). Note the average gauge reading; the fuel pressure should be about 36 psi (2.5 kg/cm^2):
   a. If the fuel pressure is normal, the fuel system is okay. Test the control unit and sensors.
   b. If the fuel pressure was higher than specified, go on to Step 4.
   c. If the fuel pressure was lower than specified, proceed to Step 5.
4. If the fuel pressure was too high in Step 3, check the regulator vacuum hose for leaks and check the fuel return line and fuel tank check valve for blockage:
   a. If there is no leakage or blockage, the fuel pressure regulator (A, **Figure 19**) is faulty and should be replaced.
   b. If there was leakage or blockage, clean or replace the parts and repeat Step 3.
5. If the fuel pressure was too low in Step 3, check the fuel lines from the fuel tap to the fuel pump and the fuel filter for blockage. Check the fuel high-pressure hoses for leaks:
   a. If there was leakage or blockage, clean or replace the parts and repeat Step 3.
   b. If there is no leakage or blockage, go on to Step 6.
6. If there is no leakage or blockage in Step 5, clamp shut or plug the fuel return line (B, **Figure 19**) and repeat Step 3:
   a. If the pressure is okay or too high, the fuel pressure regulator is faulty and should be replaced.
   b. If the pressure is too low, the fuel pump is faulty and should be replaced.

Fuel Injector Inspection

CAUTION
Do not connect a 12 volt power source directly to an injector or the injector's solenoid coil will be damaged.

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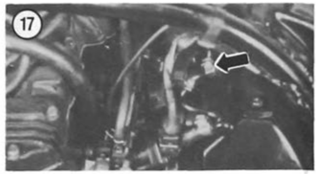

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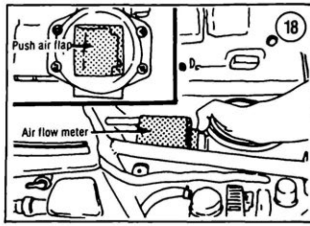

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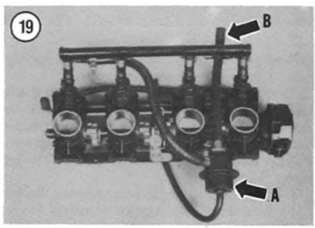
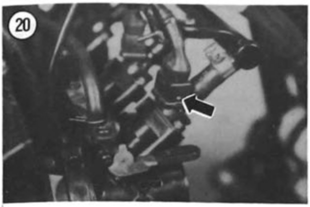
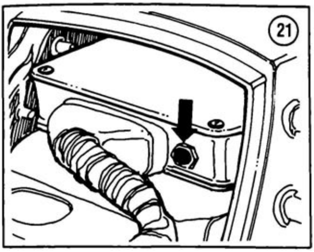


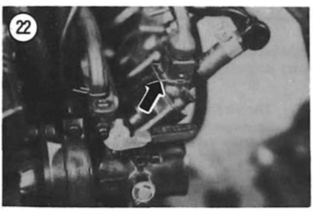
Connect a 1 1/2 or 3 volt power source (such as a flashlight battery) to the fuel injector's terminals (**Figure 20**), alternately make and break the circuit and listen to the injector; it should tick every time the circuit is made and broken.
   a. If the injector ticks, it is okay.
   b. If the injector doesn't tick, it is faulty. Replace the injector as described in this chapter.

CONTROL UNIT SYSTEM TESTS

These are key tests of the electronic control system. A failure of these parts will most likely







result in a bike that won't start or dies soon after starting.

If none of the following tests reveals the source of trouble, inspect the items under *Fuel System Tests* and *Sensor Tests* in this chapter.

The ZX1100-A models are equipped with a self-diagnosis feature that is built into the control unit. If trouble occurs in the fuel injection system while the engine is running, the trouble is diagnosed by the control unit. It sends a message to the warner unit which tells the rider of a system problem and also stores the problem in the memory of the control unit as long as the engine is running and the ignition switch is left in the ON position.

Control Unit Self-diagnosis (ZX1100-A)

If trouble occurs in the fuel injection system while the engine is running, the trouble is diagnosed by the control unit. The control unit sends a message to the warner unit which tells the rider of a system problem and also stores the problem in the memory of the control unit. This information is stored as long as the engine is running and the ignition switch is left in the ON position. Once the ignition switch is turned OFF the memory clears itself of all information and resets itself. There is an inspection hole on the front of the control unit where a green LED (light emitting diode) is located. If a problem exists this LED will transmit light pulses or codes of long and short durations. These codes tell you what problems exist within the fuel injection system. By using **Table 1** you will know what to look for and what needs to be tested or replaced.

The control unit starts to work only when the engine is running and ignition impulses are sent to the control unit. If the ignition switch has been turned OFF after a problem has been detected, the information stored in the memory is cleared. To recheck or confirm the problem; turn the ignition switch ON and crank the engine for a few seconds. Within this time the control unit will determine what part is not functioning correctly. The LED will start sending the coded messages as long as the ignition switch is left in the ON position.

1. Remove the seat.
2. Observe the light impulses or codes being emitted from the inspection hole on front of the control unit (**Figure 21**).
3. Write down the sequence of codes and refer to **Table 1. Table 1** will tell you which item is involved, what the problem may be and how to fix the problem.

Flow Meter Inspection (1981)

A switch inside the air flow meter is part of the control system on 1981 models; it provides a "run" signal to the relay which in turn provides power to the fuel pump when the engine is running. See *Flow Meter Inspection* under *Sensor Tests* in this chapter.

Injector Signal Inspection

1. Disconnect any fuel injector's coupler; pry off the wire clip (**Figure 22**) and pull off the plug.

2. Attach a 3.4 watt test light (SAE number 57) to the injector socket's 2 pins (from the wiring harness); one of the motorcycle's instrument or indicator lights will do.
3. Crank the engine with the electric starter and observe the light. If the light flickers at regular intervals, the injector control system is operating. If the light does not flicker, check the other injector couplers:

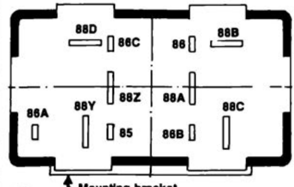
a. If the light does not flicker at any coupler, the control unit system is not operating; test the relay and the computer.
b. If the light flickers on *some* of the couplers but not all, check the connections and wiring back to the wiring harness.

Relay Inspection

A faulty relay may stop the fuel pump, the control unit, or both from operating. Testing the relay requires a 12 volt power source (the motorcycle's battery can be used), an ohmmeter with a 1 ohm scale and a 12 volt, 3.4 watt test light (SAE number 57); see **Figure 13**. One of the motorcycle's instrument or indicator lights will do.

The relay cannot be repaired. If faulty, it must be replaced. If another relay is available, you can bypass this procedure by simply substituting a known good relay to see if the problem is cured.

1. Remove the relay from the motorcycle as described in this chapter.
2. Connect an ohmmeter to terminals 88z and 88a (**Figure 23**).
3. Connect a 12 volt power source to each pair of terminals indicated in **Table 2**. Note the meter readings for each pair; the meter should show infinite resistance (no continuity) or zero resistance (continuity) as indicated in the table. If the meter readings do not correspond to the table, the relay is faulty; replace the relay.
4. Reconnect the ohmmeter to terminals 88y and 88d (**Figure 23**).
5. Connect a 12 volt power source to each pair of terminals indicated in **Table 3**. Note the meter readings for each pair; the meter should show infinite resistance (no continuity) or zero resistance (continuity) as indicated in the table. If the meter readings do not correspond to the table, the relay is faulty; replace the relay.
6. With the ohmmeter still connected between relay terminals 88y and 88d, connect the battery positive (+) terminal to relay terminal 85. Connect the test light between the battery negative (–) terminal and relay terminal 86b:



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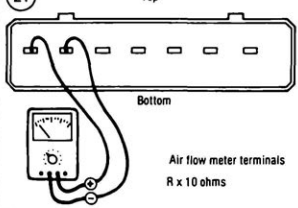


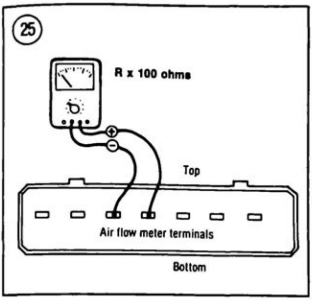
CAUTION
The test light serves as a current limiter. Do not perform this test without the light in series with the power source or the internal fuel pump relay resistor will burn out.

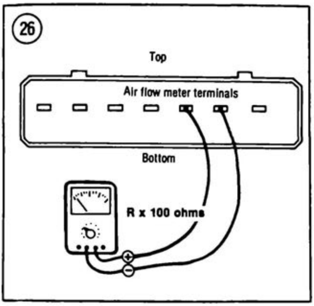
a. If the test light goes on and the meter shows infinite resistance (no continuity), the relay is in good condition.
b. If the meter shows zero resistance (continuity) or the test light does not go on, the relay is faulty. Replace the relay.

Control Unit Inspection

This test checks the functioning of the control unit when it receives the ignition timing signal from the ignition system. If the bike fails this test it will not start or run.

If you have not already inspected the ignition system, refer to *IC Igniter* in Chapter Nine. The





control unit can not function if the ignition system is faulty or if the relay is faulty.

The control unit cannot be repaired. If faulty, it must be replaced.

1. Make sure the relay is okay; see *Relay Inspection* in this chapter.
2. Disconnect any fuel injector's coupler (**Figure 20**).
3. Attach a 3.4 watt test light (SAE number 57) to the injector socket's 2 pins (from the wiring harness). See **Figure 13**; one of the motorcycle's instrument or indicator lights will do.
4. Crank the engine with the electric starter and observe the light:
   a. If the light flickers at regular intervals, the injector control system is operating. Inspect the sensors; see *Sensor Tests* in this chapter.
   b. If the light does not flicker, and there is no problem with the relay, the control unit is faulty and must be replaced.

NOTE
Before replacing an expensive part, be sure the problem is not caused by bad electrical connections. More fuel injection troubles are caused by loose or corroded couplers than by any other factor. Make sure the ground wires are clean and firmly attached at the battery, the color coded wires are correctly matched and all couplers are securely coupled.

SENSOR TESTS

If the previous tests did not indicate a faulty part or if the bike will run but is hard to start, runs poorly, hesitates, backfires or burns excessive fuel, these tests should detect the faulty part.

If none of the following tests reveals the source of trouble and you have inspected the fuel system and control unit system, go on to *Last Chance* in this chapter.

Flow Meter Inspection (1981)

This test checks the flow meter flap, the variable resistor and the air temperature sensor. If the flow meter fails on any step, it must be replaced. Repair parts are not available from Kawasaki.

1. Turn the ignition OFF and remove the air flow meter as described in this chapter.
2. Push the air flap in and let it return by itself. The flap must open and close fully and smoothly.
3. Connect an ohmmeter, set at R×10 ohms, to the 2 terminals furthest to the left on the flow meter body plug (**Figure 24**). Measure the resistance with the air flap valve closed and open. The resistance should be infinite (no continuity) at rest and zero ohms (continuity) when the flap is pushed. If the switch doesn't function as described, the entire air flow meter must be replaced. The switch is not available separately.
4. Connect an ohmmeter set at R×100 as shown in **Figure 25**:
   a. If the meter reads 250-400 ohms, go on to Step 5.
   b. If the meter reads more or less than 250-400 ohms, inspect the wiring to the meter. If the wiring is good, replace the flow meter.
5. Connect an ohmmeter set at R×100 as shown in **Figure 26**. Move the flap slowly, observing the meter reading as it changes:

a. If the meter indicates anything other than zero or infinite resistance at any flap position, the variable resistor is okay. Go on to Step 6.
b. If the meter shows zero resistance (continuity) or infinite resistance (no continuity) at any flap position, the variable resistor is faulty; replace the flow meter.

6. Connect an ohmmeter set at R×1000 as shown in **Figure 27**.
a. If the meter shows 2,000-3,000 ohms at 72° F (20° C), the air temperature sensor is okay.
b. If the meter shows more or less than 2,000-3,000 ohms, the sensor is faulty. Replace the flow meter.

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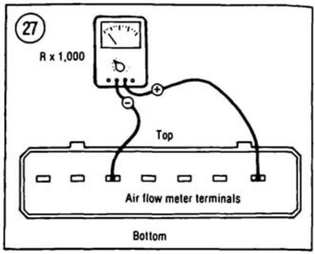

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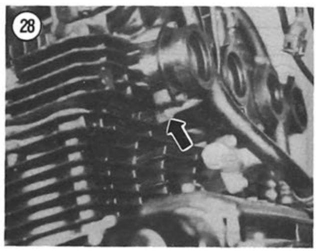


Air Temperature Sensor Inspection (1982-on)

Check the air sensor resistance when the engine is at room temperature.

1. Remove the air cleaner housing.
2. Disconnect the 2-pole coupler from the air temperature sensor in the air duct.
3. Connect an ohmmeter set at R×1000 to the two leads from the sensor:
a. If the meter shows 2,000-3,000 ohms at 72° F (20° C), the air temperature sensor is okay.
b. If the meter shows more or less than 2,000-3,000 ohms, the sensor is faulty. Replace the air duct.

Engine Temperature Sensor Inspection

Check the engine sensor resistance when the engine is at room temperature.

1. Turn the ignition switch OFF.
2. Disconnect the lead from the engine temperature sensor (**Figure 28**).
3. Connect an ohmmeter set at R×100: one test lead to the sensor's terminal and the other test lead to chassis ground:
a. If the meter reads 2,000-3,000 ohms at 72° F (20° C), the engine temperature sensor is okay.
b. If the meter reads more or less than 2,000-3,000 ohms, the sensor is faulty. Replace the sensor.

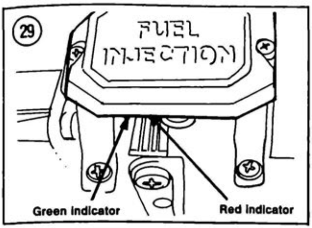
Idle Switch Inspection (1981)

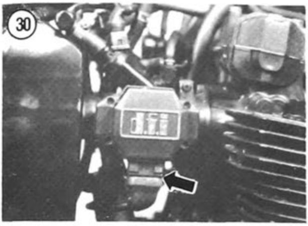
1. Turn the ignition switch OFF. Disconnect the yellow wire from the idle switch at the idle speed knob and the black wire from the bottom throttle valve mounting bar.
2. Connect an ohmmeter set at R×10 to the yellow and black wires. Note the meter readings at idle (closed throttle) and at partially open throttle:
a. If the meter shows zero resistance (continuity) at idle and infinite resistance (no continuity) when the throttle is partially open, the idle switch is okay.
b. If the switch gives any other indication, the switch is faulty; replace the switch.

Open Throttle Switch Inspection (1981)

The open throttle switch may be faulty if the motorcycle reacts sluggishly when the throttle is opened fully.

Turn the ignition switch ON. Observe the green (left) and red (right) indicators on the switch (**Figure 29**). With the throttle at idle (closed), the green indicator should be on and the red indicator should be off. With the throttle fully open, the green indicator should be off and the red indicator should be on:





a. If the indicators light as described, the switch is okay.
b. If the switch gives any other indication and the idle switch is okay, the open throttle switch may be faulty. Loosen the switch mounting screws and turn the switch body as required to adjust it. If the switch still doesn't function properly, install a new one.

Throttle Position Sensor Inspection (1982 and Later)

On 1982 and later models, a variable resistor is used to continuously monitor the throttle valve position.

1. Turn the ignition switch OFF.
2. Disconnect the coupler at the sensor (**Figure 30**).
3. Connect an ohmmeter set at R×1000 to the front terminal and the second terminal from the front end of the sensor. The meter should read 3,300-6,800 ohms at all throttle positions.
4. Connect one ohmmeter lead to the front terminal and the other lead to the third terminal from the front. Take readings at idle, at full open throttle and while gradually moving from idle to full throttle:
   a. The meter should read 2,100-4,100 ohms at idle.
   b. The meter should read 350-710 ohms at full throttle.
   c. The meter should change gradually and smoothly from the maximum to the minimum reading as you open the throttle.
5. If the sensor performs as described, it is okay. If not, install a new sensor.

SIGNAL TESTS

The following tests must be run under these conditions:

a. Use a 25 V voltmeter.
b. Connect the negative (-) voltmeter lead to the battery negative terminal.
c. Move the engine stop switch to the RUN position.
d. On models so equipped, remove the starter lockout switch from the clutch lever assembly. Leave the electrical connectors attached to the switch (the engine can now be cranked over without holding the clutch lever applied).
e. Measure the voltage with all electrical connectors *connected* to their respective terminals.
f. Remove both side covers and the seat.

Throttle Opening Angle Signal Test

1. Set the voltmeter to the 10V range.
2. Attach the voltmeter positive lead to the blue/red wire of the No. 5 pin of the control unit. The meter should read zero regardless of ignition switch position. If the reading is not correct, replace the control unit.
3. Attach the voltmeter positive lead to the blue/white wire of the No. 11 pin of the control unit. The meter should read zero with the ignition switch OFF. The meter should read 0.5-5.2 volts with the ignition switch ON and the the voltage should decrease smoothly as the throttle is opened. If the readings are not correct, replace the throttle sensor.
4. Attach the voltmeter positive lead to the blue/orange wire of the No. 17 pin of the control unit. The meter should read zero with the ignition switch OFF. The meter should read 7.2-8.8 volts when the ignition switch ON. If the reading is not correct, replace the contol unit.

Air Temperature Signal Test

1. Set the voltmeter to the 10V range.

2. Attach the voltmeter positive lead to the blue wire of the No. 6 pin of the control unit. The meter should read zero with the ignition switch OFF. If the reading is not correct, replace the control unit.
3. Attach the voltmeter positive lead to the blue wire of the No. 6 pin of the control unit. With the ignition switch ON check the readings according to ambient temperature:
   a. 30° C (86° F)—1.7-2.5 volts.
   b. 20° C (68° F)—2.0-3.1 volts.
   c. 0° C (32° F)—2.6-3.8 volts.

If the reading is not correct, replace the control unit.
4. Attach the voltmeter positive lead to the blue/red wire of the No. 5 pin of the control unit. The meter should read zero regardless of ignition switch position. If the reading is not correct, replace the control unit.

Engine Temperature Signal Test

1. Set the voltmeter to the 10V range.
2. Attach the voltmeter positive lead to the gray wire of the No. 10 pin of the control unit. The meter should read zero with the ignition switch OFF. If the reading is not correct, replace the control unit.
3. Attach the voltmeter positive lead to the gray wire of the No. 10 pin of the control unit. With the ignition switch ON check the reading according to the temperature of the engine at the location of the temperature sensor:
   a. 80° C (176° F)—0.52-0.96 volts.
   b. 20° C (68° F)—2.0-3.1 volts.
   c. 0° C (32° F)—2.6-3.8 volts.

If the reading is not correct, replace the engine temperature sensor.
4. Attach the voltmeter positive lead to the gray wire of the No. 10 pin of control unit. The meter should read 3.4-4.6 volts with the ignition switch ON and the gray wire disconnected from the engine temperature sensor. If the reading is not correct, replace the control unit.

Starter Signal Test

1. Attach the voltmeter positive lead to the red/black wire of the No. 19 pin of the control unit. When the starter switch is on the meter should read battery voltage. If the reading is not correct, replace the main pump relay.
2. Attach the voltmeter positive lead to the black wire of the main pump relay. When the starter switch is on the meter should read battery voltage. If the reading is not correct, replace the black wire from the starter relay to the main pump relay.

Engine Speed Signal Test

1. Attach the voltmeter positive lead to the green wire of the No. 8 pin of the control unit. The meter should read zero with the ignition switch OFF. When the starter switch is on the meter should read battery voltage. If the reading is not correct, replace the green wire from the ignition coil to the control unit.
2. Attach the voltmeter positive lead to the black wire of the No. 28 pin of the control unit. The meter should read zero with the ignition switch OFF. When the starter switch is on the meter should read battery voltage. If the reading is not correct, replace the black wire from the ignition coil to the control unit.

LAST CHANCE

If the fuel system, control unit system, sensors and signals seem to be in working order, inspect the following items.

Air Leaks

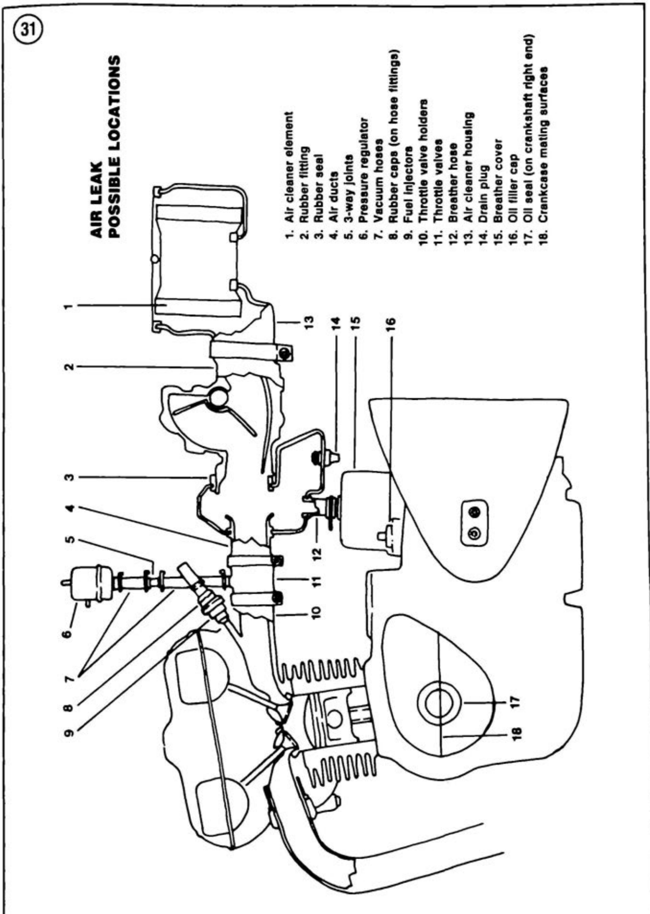
Air leaks at any of the points shown in **Figure 31** can be the cause if the bike is hard to start, runs poorly, hesitates, backfires or burns excessive fuel. Make sure all junctions are air-tight.

Wiring Harness

If the bike has passed all tests to this point but it still runs poorly, remove the fuel injection wiring harness; see *Wiring Harness Removal* in this chapter:
   a. Check the harness for burned, frayed or broken wires.
   b. Check all the coupler pins and wires for separation. If there is an O-ring in a multiple pin coupler, make sure it is in good condition.
   c. Check for continuity of all wires in the harness. All wires must conduct electricity from one color-coded end of the wire to the other end. Wiggle the wires and couplers to see if there is an intermittent open or short circuit. Repair or replace the harness if faulty.

Control Unit

If the bike has passed all tests to this point but it still runs poorly, grit your teeth and beg your Kawasaki dealer to substitute a known good control unit for yours. If the problem clears up you'll need to buy a new control unit.


31
AIR LEAK
POSSIBLE LOCATIONS
1. Air cleaner element
2. Rubber fitting
3. Rubber seal
4. Air ducts
5. 3-way joints
6. Pressure regulator
7. Vacuum hoses
8. Rubber caps (on hose fittings)
9. Fuel injectors
10. Throttle valve holders
11. Throttle valves
12. Breather hose
13. Air cleaner housing
14. Drain plug
15. Breather cover
16. Oil filler cap
17. Oil seal (on crankshaft right end)
18. Crankcase mating surfaces

FUEL INJECTION DISASSEMBLY

Observe the following precautions whenever removing any part of the fuel system:

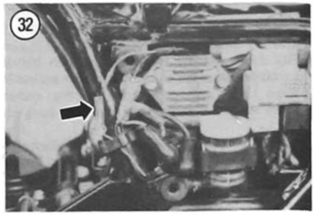
a. Servicing a motorcycle with electronic fuel injection requires special precautions to prevent damage to the very expensive electronic control unit. Common electrical system service procedures acceptable on other motorcycles may cause damage to several parts of the fuel injection system. Be sure to read the *Fuel Injection Precautions* listed in this chapter.
b. Before disconnecting any electrical couplers, turn the ignition switch OFF and disconnect the white/red lead from the starter solenoid to the fuel injection wiring harness (**Figure 32**). This lead supplies power to the computer, relay and fuel injectors at all times; it is not switched or protected by a fuse so it is always "hot."
c. Residual fuel pressure may exist in the fuel lines. Be careful to avoid accidental spillage.
d. Do not try to start the engine with the fuel return line disconnected. Gasoline will be pumped out of the return line. On 1982 and later models, do not turn the ignition switch ON when any fuel line is disconnected or the fuel pump will run.
e. Some fuel may spill during these procedures. Work in a well ventilated area at least 50 feet from any sparks or flames, including gas appliance pilot lights. Do not smoke in the area. Keep a BC rated fire extinguisher handy.

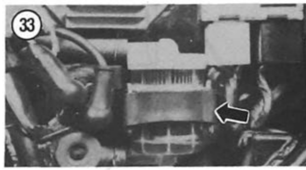
Fuel Filter Removal/Installation

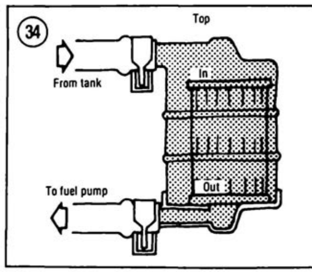
The fuel filter is under the left side cover.

1. Turn the ignition switch and fuel tap OFF.
2. Unhook the rubber fuel filter strap (**Figure 33**).
3. Loosen the hose clamps, slide them back and remove the filter.
4. To install, reverse the removal steps.

NOTE
*Install the fuel filter with the "IN" mark on top (**Figure 34**). The line from the fuel tap goes to the top "IN" fitting and the line to the fuel pump goes to the bottom "OUT" fitting.*



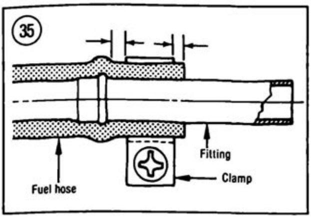


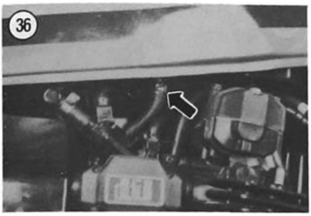


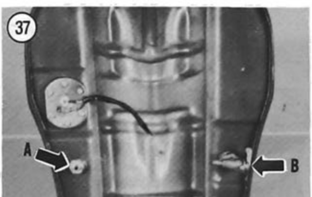
High-pressure Fuel Hoses Removal/Installation

The high pressure hoses run from the fuel pump to the fuel distribution tube and from the distribution tube to the fuel pressure regulator.

WARNING
Do not try to start the engine with the fuel return line disconnected. Gasoline will be pumped out of the return line. On 1982 and later models, do not turn the ignition switch ON when any fuel line is disconnected, or the fuel pump will run.







1. Loosen the hose clamps and remove the hoses.
2. Be careful not to kink or bend the hoses too sharply. If the inner plastic coating is damaged, the hoses must be replaced.
3. Kawasaki recommends using new hose clamps when the hoses are replaced. Make sure the hose extends well past the raised portion of the fitting and that there is a little extra hose space on either side of the clamp (**Figure 35**).

Fuel Tank Removal/Installation

There is a fuel supply line from the fuel tap on the left side of the tank to the fuel filter and a return line from the fuel pressure regulator to a one-way check valve back into the right side of the tank.

WARNING
Do not try to start the engine with the fuel return line disconnected. Gasoline will be pumped out of the return line.

1. Turn the ignition switch and fuel tap OFF.
2. Remove the seat.
3. Slide the hose clamp down and disconnect the fuel hose at the fuel tap.
4. Disconnect the high-pressure hose at the return check valve (**Figure 36**).
5. Raise the tank and disconnect the fuel gauge wire coupler.
6. Pull the fuel tank up and to the rear.
7. To install, reverse these steps. Note the following:
   a. The hose from the top of the fuel filter goes to the fuel tap.
   b. The hose from the top of the fuel pressure regulator goes to the check valve (A, **Figure 37**).

Manual Fuel Tap

To remove the fuel tap, unscrew the mounting nut (B, **Figure 37**). Inspect the fuel tap mounting gasket and clean the feed tube screen whenever you remove the tap from the tank. Check for leakage after you install the fuel tap.

Fuel Injectors
Removal/Installation

1. Turn the ignition switch and fuel tap OFF.
2. Remove the fuel tank as described in this chapter.
3. Disconnect the fuel injector's coupler; pry off the wire clip (**Figure 38**) and pull off the plug.
4. If you only need to remove one injector, loosen the injector hose clamps and pull the distribution tube free.

5. Remove the injector holder Allen bolts and remove the injector assembly from the cylinder head (**Figure 39**).

CAUTION
Be very careful not to damage the injector nozzle.

6. The injectors cannot be disassembled. To install, reverse the removal steps. Note the following:
   a. Make sure the seal at the injector nozzle is in good condition. Install new ones if necessary.
   b. Be careful not to kink or bend the high-pressure hoses too sharply. If the inner plastic coating is damaged, the hoses must be replaced.
   c. Kawasaki recommends using new hose clamps when the hoses are disconnected. Make sure the hose extends well past the raised portion of the fitting and that there is a little extra hose space on either side of the clamp (**Figure 35**).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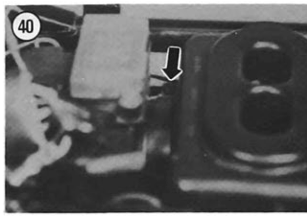
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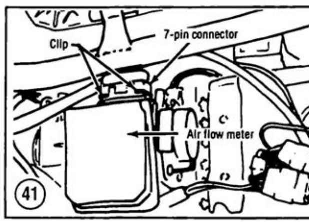
Air Cleaner Housing Removal/Installation

Loosen the clamp at the front of the housing (**Figure 40**) and pull the housing out.

Flow Meter Removal/Installation (1981)

The air flow meter is between the air cleaner housing and the surge tank.
1. Turn the ignition switch OFF.
2. Disconnect the white/red lead from the starter solenoid to the fuel injection wiring harness (**Figure 32**).
3. Remove the air cleaner housing.
4. Pry off the retaining clip and disconnect the meter's 7-pin electrical coupler (**Figure 41**).

CAUTION
Do not try to start the engine while the flow meter is disconnected. You may cause irreparable damage to the computer.



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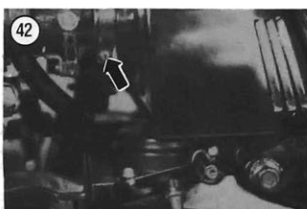
5. Pull the flow meter to the rear and out of the surge tank.

NOTE
You may find it easier to remove the meter if you lubricate the flow meter/surge tank junction with soapy water.

6. To install, reverse the removal steps. Make sure the meter flap and air passage are clean.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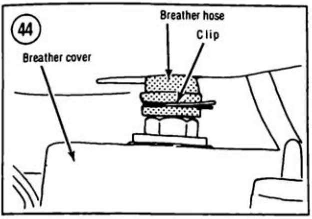
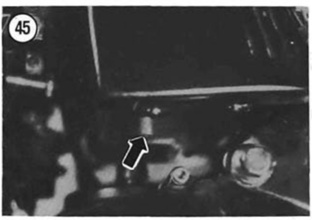
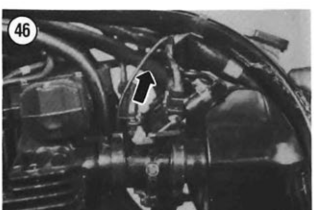






Surge Tank Removal/Installation

The surge tank is between the flow meter/air duct and the throttle valve assembly.

1. Remove the air cleaner housing and flow meter (1981) or air duct (1982 and later).
2. Loosen the clamps that connect the tank to the throttle valve assembly (**Figure 42**).

NOTE
You may have to loosen the 2 fuel pressure regulator mounting bolts and remove the regulator to get at the No. 3 surge tank clamp.

3. Slide the surge tank out to the right.
4. To install, reverse the removal steps. Note the following:
   a. The arrows on the rubber fittings should point at the dots on the surge tank (**Figure 43**).
   b. Make sure the breather hose is fastened to the breather fitting and slide the clip in place (**Figure 44**).
   c. Make sure the drain plug is installed in the bottom of the tank (**Figure 45**).
   d. On U.S. models, when installing the tank there should be a restrictor nozzle in the end of the hose from the vacuum switch valve (**Figure 46**).

Fuel Pump Removal/Installation

The fuel pump is under the air flow meter/air duct.

1. Turn the ignition switch and fuel tap OFF.
2. Disconnect the white/red lead from the starter solenoid to the fuel injection wiring harness (**Figure 32**).
3. Remove the air cleaner housing.
4. Remove the flow meter (1981) or air duct (1982 and later).
5. Remove the fuel pump clamp (**Figure 47**).

6. Loosen the hose clamps and pull the fuel hoses free from the pump. Wipe up any spilled fuel.
7. Disconnect the fuel pump's 2-pin coupler. Remove the pump (**Figure 48**).
8. The fuel pump cannot be disassembled and if defective it must be replaced. To install, reverse the removal steps. Note the following:

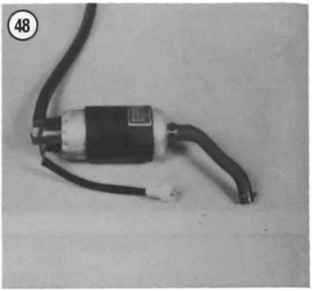
WARNING
Do not try to start the engine with the fuel return line disconnected. Gasoline will be pumped out of the return line. On 1982 and later models, do not turn the ignition switch ON when any fuel line is disconnected, or the fuel pump will run.

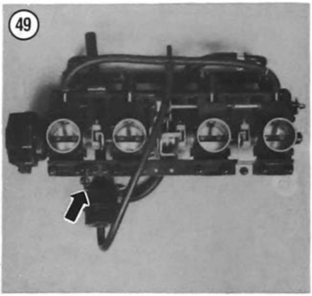
CAUTION
If the pump is operated without fuel, its bearings will be damaged.

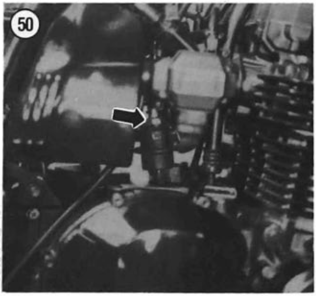
a. The hose from the filter connects to the inlet fitting on the left end of the pump and the hose to the distribution tube connects to the fitting on right end of the pump.
b. Be careful not to kink or bend the high-pressure hoses too sharply. If the inner plastic coating is damaged, the hoses must be replaced.
c. Kawasaki recommends using new hose clamps when the hoses are disconnected. Make sure the hose extends well past the raised portion of the fitting and that there is a little extra hose space on either side of the clamp (**Figure 35**).
d. If a new dry fuel pump has been installed, bleed the air from the pump before trying to start the engine. Before installing the air cleaner housing, connect the red/white power lead, turn the ignition switch and fuel tap ON and reach through the flow meter inlet to push the meter flap open so that the fuel pump runs for about 30 seconds. Repeat this step 2-3 times.

Pressure Regulator Removal/Installation

The fuel pressure regulator is attached to the bottom of the throttle valve bracket (**Figure 49**).
1. Turn the ignition switch and fuel tap OFF.
2. Loosen the fuel return hose clamp on top of the regulator and slide the clamp up away from the regulator (**Figure 50**).







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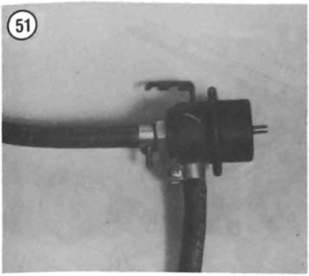

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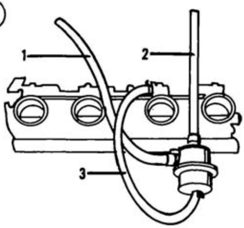
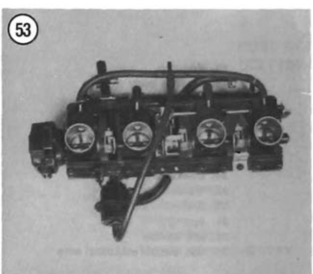


1. Fuel hose from distributing pipe
2. Return fuel hose to tank
3. Vacuum hose from throttle valve

(53)



3. Remove the regulator mounting nut, pushing the hose off the regulator fitting as you go.
4. Disconnect the vacuum and distribution pipe hoses, and remove the regulator (**Figure 51**).
5. To install, reverse the removal steps. Note the following:
   a. Connect the regulator and hoses as shown in **Figure 52** (1981) or **Figure 53** (1982 and later).
   b. Be careful not to kink or bend the high-pressure hoses too sharply. If the inner plastic coating is damaged, the hoses must be replaced.
   c. Kawasaki recommends using new hose clamps when the hoses are disconnected. Make sure the hose extends well past the raised portion of the fitting and that there is a little extra hose space on either side of the clamp (**Figure 35**).

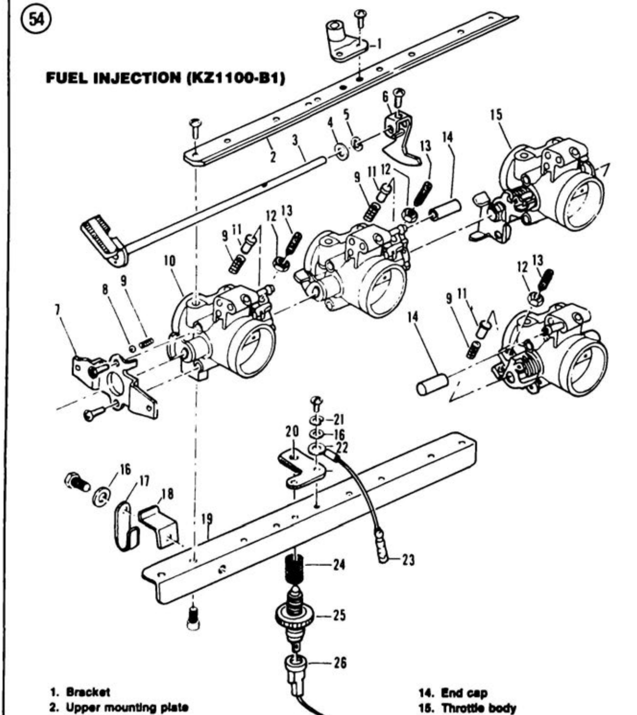
Throttle Valves
Removal/Installation

See **Figure 54** (1981) or **Figure 55** (1982 and later). Remove the throttle valve assembly in one piece, along with the throttle position switch and idle switch or the throttle sensor.

1. Remove the air cleaner housing, flow meter/duct and surge tank.
2. On 1981 models, disconnect the idle switch lead.
3. Pry off the throttle position switch/sensor retainer clip and remove the coupler (**Figure 56**).

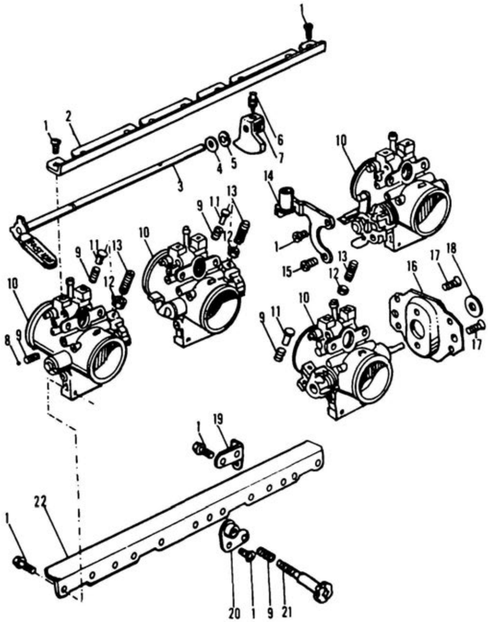
NOTE
*On 1982 and later models, do not disturb or remove the sensor from the throttle valve assembly. It is calibrated at the factory (**Figure 57**).*

4. Loosen the 4 clamps at the front of the throttle valves (**Figure 58**) and pull the valve assembly free from the cylinder head.
5. Disconnect the throttle cable (**Figure 59**) and vacuum hoses. Remove the throttle valve assembly (**Figure 60**).
6. To install, reverse the removal steps. Note the following:
   a. If the throttle valves were disassembled, synchronize the throttle valve plates visually so that they each have an equal gap at the throttle bore at the idle position (**Figure 61**).



1. Bracket
2. Upper mounting plate
3. Fast idle shaft
4. Washer
5. E-clip
6. Fast idle lever
7. Throttle switch bracket
8. 1/8 in. steel ball
9. Spring
10. Throttle body
11. Throttle valve adjust screw
12. Locknut
13. Adjust bolt
14. End cap
15. Throttle body
16. Washer
17. Wire harness clamp
18. Bracket
19. Lower mounting bracket
20. Bracket
21. Lockwasher
22. Washer
23. Electrical wire
24. Spring
25. Idle switch
26. Idle switch electrical wire

55



FUEL INJECTION (KZ1100-B2, ZX1100-A)

1. Screw
2. Upper mounting plate
3. Fast idle shaft
4. Washer
5. E-clip
6. Screw
7. Fast idle lever
8. 1/8 in. steel ball
9. Spring
10. Throttle body
11. Throttle valve adjust screw
12. Locknut
13. Adjust bolt
14. Throttle cable bracket
15. Screw
16. Throttle sensor bracket
17. Screw
18. O-ring
19. Bracket
20. Bracket
21. Idle adjust screw
22. Lower mounting bracket

To adjust, loosen the adjuster locknuts, turn the adjusters as required, and tighten the locknuts.

b. Kawasaki recommends using new hose clamps when the hoses are disconnected. Make sure the hose extends well past the raised portion of the fitting and that there is a little extra hose space on either side of the clamp (**Figure 35**).
c. On 1981 models, the marks on the throttle position switch base should align with the center of the mounting screws (**Figure 62**). Inspect the throttle switch operation after installation is complete; see *Throttle Switch Inspection* in this chapter.
d. Adjust the throttle cable play and idle speed as described in this chapter.
e. If a throttle valve was replaced or disassembled, synchronize the throttle valves as described in this chapter.
f. On 1982 and later models, throttle valve No. 4 and the throttle position sensor are calibrated at the factory. They must be recalibrated if replaced. This requires a special tool available at Kawasaki dealers.

Relay Removal/Installation

The relay is under the left side cover, to the right of the IC igniter.

1. Turn the ignition switch OFF.
2. Disconnect the white/red lead from the starter solenoid to the fuel injection wiring harness (**Figure 63**).
3. Pull the white and black 9-pin couplers off of the relay (**Figure 64**) and remove the relay.
4. To install, reverse the removal steps. Connect the black 9-pin coupler to the right side of the relay, marked with a black stripe.

CONTROL UNIT

Removal/Installation

The control unit is mounted inside the rear tail piece.

1. Turn the ignition switch OFF.
2. Disconnect the white/red lead from the starter solenoid to the fuel injection wiring harness (**Figure 63**).
3. Remove the seat and remove the 2 bolts with flat washers that hold the rear fender cover in place (**Figure 65**). Remove the cover.
4. Pull the dust cover away, press the lock pin on the coupler and pull the coupler straight off the control unit (**Figure 66**).
5. Remove the control unit from its 3 rubber mounts.
6. To install, reverse the removal steps. Make sure the coupler dust cover is securely installed (**Figure 67**).

Engine Temperature Sensor Removal

1. Turn the ignition switch and fuel tap OFF.
2. Disconnect the engine temperature sensor wire from the sensor and remove the sensor from the cylinder head (**Figure 68**).
3. To install, reverse the removal steps. Torque the sensor to 10 ft.-lb. (1.3 mkg). On 1982 and later models, there is an adapter between the sensor and the cylinder head.

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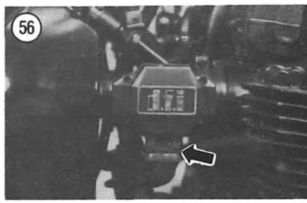

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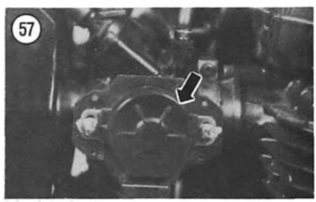

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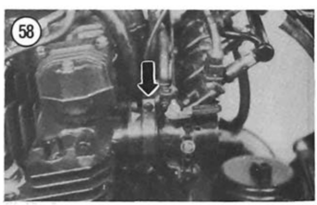
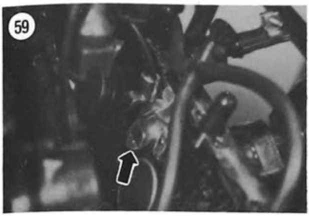
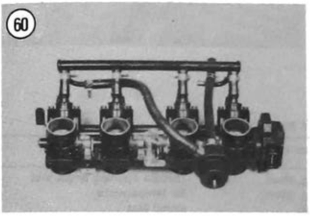
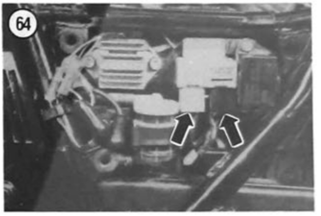
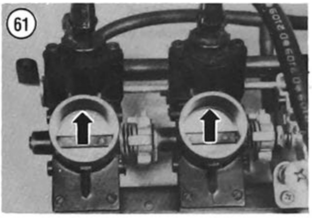
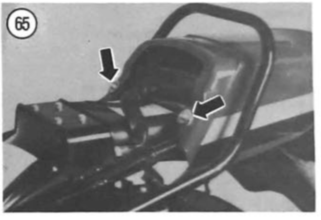




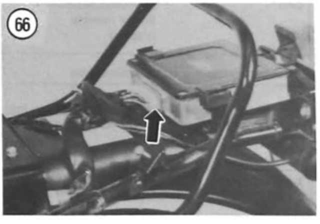


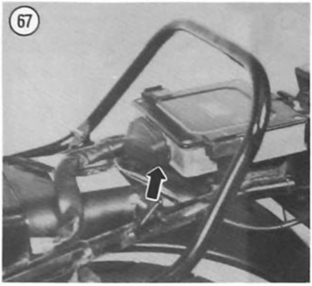







Align mark with screw





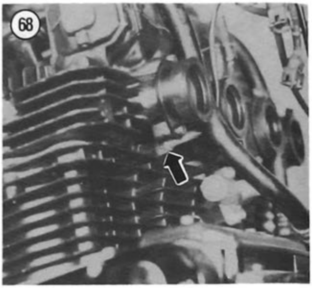


Table 1 CONTROL UNIT SELF DIAGNOSIS

Item	Criteria	Pulse length	Perform Test
Throttle sensor	Open or short	Long, short	Throttle opening angle test
Air temperature sensor	Open or short	Long, short, short,	Air temperature signal test
Engine temperature sensor	Open or short	Long, short, short, short	Engine temperature signal test
Atmospheric pressure sensor	Open or short	Long, long, short	Replace control unit
Starter switch	Continues on after engine starts	Long, long, short, short	Starter signal test, inspect starter switch for damage
Ignition pulse	No ignition pulses are transmitted to control unit when cranking engine	Long, long, short, short, short	Engine speed signal test and inspect ignition system for damage
CPU*	Memories in CPU do not operate properly	Long, long, long, short	Replace control unit memory

* Central processing unit in control unit.

Table 2 MAIN RELAY INSPECTION

Test	Connections + Lead	- Lead	Resistance between #88z and #88a
1	#88c	#85	0 ohms
2	#85	#88c	Infinity

Table 3 FUEL PUMP RELAY INSPECTION

Test	Connections + Lead	- Lead	Resistance between #88y and #88d
1	#86	#85	0 ohms
2	#85	#86	Infinity
3	#86a	#85	0 ohms
4	#85	#86a	Infinity
5	#86b	#85	0 ohms

NOTE: If you have a 1982 and later P Series Police Model, first check the Supplement at the back of this manual for any specific service information.

CHAPTER NINE

ELECTRICAL SYSTEM

The electrical system includes the battery, ignition system, charging system, electric starter, lighting, horn, instruments and gauges or sensors on some models.

The fuel injection electrical system is covered in Chapter Eight.

FUSES

There are 5 fuses in a fuse box under the seat (**Figure 1**). The main fuse is 30A and the various lighting system and horn fuses are 10A. Inside the cover are spare fuses; always carry spares.

There are 2 additional 10A fuses for electrical accessories. They are in a separate compartment, usually next to the main fuse box in a rubber holder (**Figure 2**).

Whenever a fuse blows, find out the reason for the failure before replacing the fuse. Usually, the trouble is a short circuit in the wiring. This may be caused by worn-through insulation, a disconnected wire shorting to ground or possibly a wire pinched during assembly or installation of parts.

WARNING
Never substitute metal foil or wire for a fuse. Never use a higher amperage fuse than specified. An overload could result in fire and destruction of the bike.

BATTERY

The bike is equipped with a 12 volt battery with an electrolyte specific gravity of 1.280 at 68° F when fully charged.

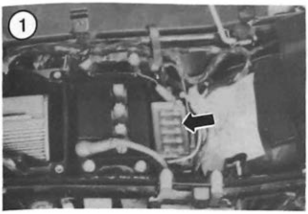
Battery electrolyte testing and battery charging may be required after long periods (more than a month) of inactivity or when electrical trouble arises.

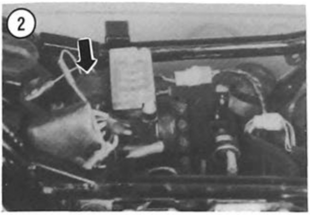
The battery is the heart of the electrical system. The majority of electrical system troubles can be attributed to neglect of this vital component. More water evaporates from the battery in warmer climates, but excessive use of water may be an indication that the battery is being overcharged. It is advisable to check the voltage regulator if this situation exists.

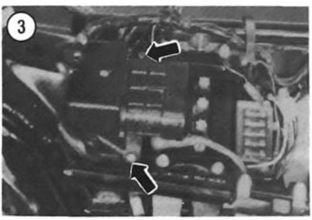
WARNING
*Study the **Safety Precautions** before servicing the battery.*

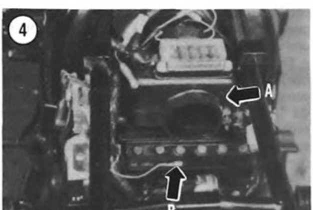
Safety Precautions

While working with batteries, use care to avoid spilling or splashing the electrolyte. The electrolyte is a sulfuric acid solution, which can destroy clothing and cause serious chemical burns. If you get any electrolyte on your clothing, body or any other surface, neutralize it immediately with a









solution of baking soda and water, then flush with plenty of clean water.

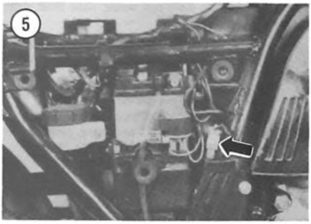
WARNING
Electrolyte splashed into the eyes is extremely dangerous. Wear safety glasses while working with batteries. If electrolyte is splashed into the eye, call a doctor immediately, force the eye open and flood it with cool water for about 5 minutes.

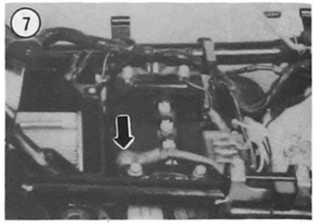
WARNING
When batteries are being charged, highly explosive hydrogen gas forms in the cells of the battery. Some of this gas escapes through the filler openings and may form an explosive atmosphere around the battery. Sparks, flames or a lighted cigarette can ignite the gas, causing a battery explosion and possible serious personal injury. Follow these precautions to help prevent accidents.

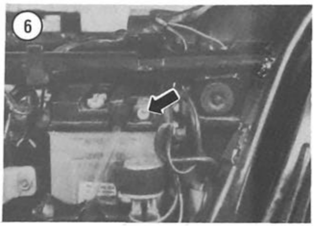
1. Do not smoke or permit any flame near a battery being charged or which has been charged recently. Keep the battery away from gas operated home appliances.
2. Do not disconnect or connect live circuits at the battery terminals, because a spark will occur when a live circuit is connected or broken. Turn off the ignition switch first or disconnect the circuit away from the battery. When using a battery charger, don't plug the charger in until the battery clips have been securely attached. Unplug the charger before you remove the clips from the battery.

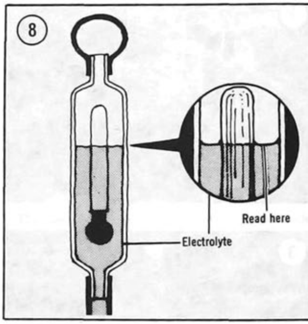
Battery Removal

If the motorcycle will not be used for an extended period, remove the battery from the machine, charge it fully 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.
1. Raise the seat or remove it.
2. Remove the air cleaner cover screws (**Figure 3**) and the cover.
3. On fuel injected models, remove the air cleaner case and the air flow meter or air duct (A, **Figure 4**) as described in Chapter Eight.
4. Disconnect the electrolyte level sensor (B, **Figure 4**), if so equipped.









5. On carburetted models, remove the right side cover, remove the battery holder bolt (**Figure 5**) and disconnect the holder.
6. Disconnect the negative (-) ground cable first (**Figure 6**), then the positive (+) cable (**Figure 7**). This minimizes the chance of a tool shorting to ground when disconnecting the "hot" positive cable.

Battery Installation

Be careful to connect the battery properly when installing it. If the battery is installed backwards, the electrical system may be damaged.

1. Clean the battery terminals, case and tray. Coat the terminals with Vaseline or silicone spray to retard corrosion of the terminals.
2. Connect the positive (+) terminal first, then the negative (-) ground. Don't overtighten the clamps.
3. Check to make sure the cable terminals won't rub against any metal parts (such as the seat). Slide the plastic boot over the positive (+) terminal.
4. On fuel injected models, make sure the fuel injection ground wires (black/green and black/yellow) are securely connected to the battery's negative (-) ground terminal lead.
5. Connect the battery vent tube and make sure it isn't pinched anywhere. Keep the end away from the mufflers and drive chain. The corrosive gases could cause damage.

Specific Gravity Testing

Hydrometer testing is the best way to check battery condition. A hydrometer with numbered graduations, from 1.100 to 1.300, is preferable to one with color-coded bands or floats.

To use the hydrometer, squeeze the rubber ball, insert the tip into the cell and release the ball. Draw enough electrolyte to float the weighted float inside the hydrometer. Note the number in line with surface of the electrolyte (**Figure 8**); this is the specific gravity for this cell. Return the electrolyte to the cell from which it came.

The specific gravity of the electrolyte in each battery cell is an excellent indication of that cell's condition. A fully charged cell will read

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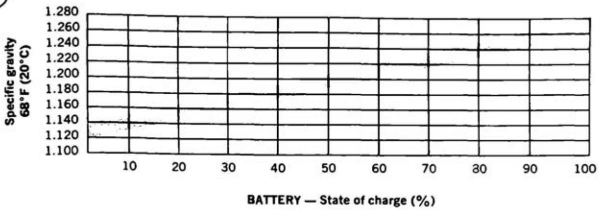


1.275-1.280, a cell in good condition reads from 1.225-1.250 and anything below 1.225 is practically dead.

Specific gravity varies with temperature. For each 10° that electrolyte temperature exceeds 80° F, add 0.004 to the reading indicated on the hydrometer. Subtract 0.004 for each 10° below 80° F.

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

If the cells test in the poor range, the battery requires recharging. The hydrometer is useful for checking the progress of the charging operation. **Figure 9** shows the approximate state of charge.

It is most important to keep the battery fully charged during cold weather. A fully charged battery freezes at a much lower temperature than one which is partially discharged.

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 and oxygen gases are formed during the charging process. Be sure to reread the **Safety Precautions** in this chapter.*

CAUTION
Always disconnect the battery cables before connecting charging equipment or you may damage part of the bike's charging system. It is preferable to remove the battery from the motorcycle so that corrosive gases do not cause damage.

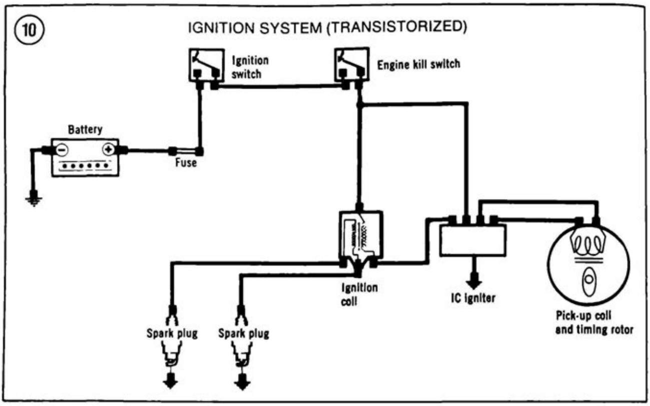
Motorcycle batteries are not designed for high charge or discharge rates. A motorcycle battery should be charged at a rate not exceeding 10 percent of its ampere-hour capacity. That is, do not exceed 0.5 ampere charging rate for a 5 ampere-hour battery or 1.5 amperes for a 15 ampere-hour battery. This charge rate should continue for about 10 hours if the battery is completely discharged or until the specific gravity of each cell is up to 1.260-1.280, corrected for temperature.

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

1. Remove the battery from the motorcycle or disconnect the negative (-) ground cable, then the positive (+) cable.

CAUTION
*On fuel injected models, you **must** remove the battery from the motorcycle to prevent irreparable damage to the fuel injection electrical system.*

2. Before you switch on or plug in the charger, connect the positive charger lead to the positive battery terminal and the negative charger lead to the negaive battery terminal.
3. Remove all vent caps from the battery, set the charger at 12 volts and switch it on. If the output of the charger is variable, it is best to select a setting that doesn't exceed 10% of the battery's ampere-hour capacity.
4. When you want to check the state of charge, turn the charger off or unplug it, disconnect the leads and check the specific gravity. It should be within the limits specified in **Figure 9**. If it is, and remains stable for one hour, the battery is charged.
5. Install the battery. Connect the positive (+) cable first, then the negative (-) ground.



IGNITION SYSTEM

Operation

The ignition system consists of 4 spark plugs, 2 ignition coils, an IC igniter unit and 2 timing pickup units. **Figure 10** is a diagram of the transistorized ignition circuit for 2 cylinders.

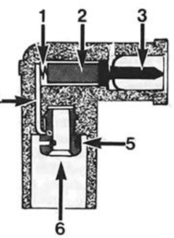
The transistorized ignition system has several unique characteristics:

a. The ignition timing is *not* adjustable. Once set properly, initial timing should be stable for the life of the motorcycle.
b. The transistorized ignition system's dwell angle *increases* slightly as rpm increases. This is a characteristic of the magnetic pickup coils.

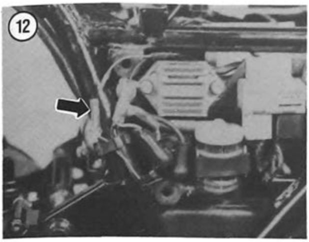
Ignition takes place every 180° of crankshaft rotation; each pickup unit fires every 360° of crankshaft rotation. The firing order is 1-2-4-3. The left pickup unit fires cylinders No. 1 and 4; the right pickup unit fires cylinders No. 2 and 3. One of the spark plugs in each pair is fired (harmlessly) on the exhaust stroke.

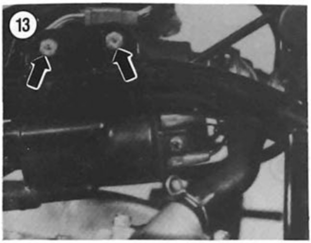
Because the ignition coil fires through 2 spark plugs wired in series, if one of the plugs fails to fire, so will the other. If one plug develops a weak spark, so will the other.

The ignition coil primary current is normally off until the ignition timing rotor cam approaches the pickup coil. As the rotor cam approaches the pickup coil, a pickup coil signal builds to a level that turns



1. Spring
2. Carbon resistor
3. Spike
4. Strip
5. Spring clip
6. Plug terminal





the IC igniter on, allowing primary current to flow through the ignition coil. As the rotor cam passes the pickup coil, the trigger signal reverses polarity and turns the IC igniter off. The sudden stoppage of current through the ignition coil primary winding causes the magnetic field to collapse. When this occurs, a very high voltage (up to about 20,000 volts) is induced in the secondary winding of the ignition coil. This high voltage is sufficient to jump the gap at the spark plug, causing the plug to fire.

SPARK PLUGS

Regular inspection and adjustment of spark plugs is covered in Chapter Three.

On most models, a resistor-type spark plug cap is used to reduce radio interference (**Figure 11**). If you have a high-speed misfire, check the resistance between the plug terminal and the plug wire spike. Normal is about 10,000 ohms. If resistance is more than 20,000 ohms, the cap is faulty and should be replaced.

Troubleshooting Spark Plugs

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 compare them to the spark plug chart in Chapter One.
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 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, feeble or orange-yellow in color and that 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 outside 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.

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 plug.

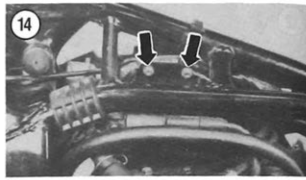
Removal/Installation

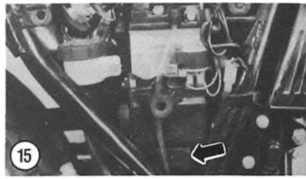
1. Check that the ignition switch is OFF.
2. *Fuel injected models:* Disconnect the white/red lead from the starter solenoid to the fuel injection wiring harness (**Figure 12**).
3. Remove the fuel tank as described in Chapter Seven.
4. Disconnect the spark plug leads by grasping the spark plug leads as near to the plug as possible and pulling them off the plugs.
5. Disconnect the primary leads to the ignition coils (**Figure 13**).

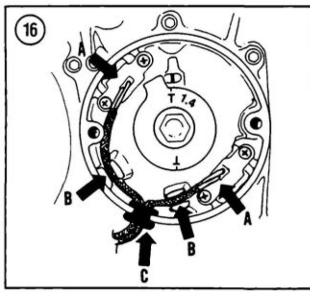
6. Remove the coil mounting bolts and the coils and brackets (**Figure 14**). Note any ground leads at the bracket bolts.
7. Install by reversing these steps. Note the following:
   a. The No. 1 and 4 coil goes on the left. The green wire goes to the left coil and the black wire goes to the right coil. The red/yellow wires can go to either coil.

NOTE
Since the spark fires through one spark plug to ground and back to the coil through another spark plug, coil polarity has no effect on performance.

   b. *U.S. models:* Make sure that none of the air induction system hoses or clamps contact the coil wires or terminals.
   c. Be sure to connect the spark plug leads to the correct spark plug, starting with No. 1 on the left-hand side.







Testing

1. If the coil condition is doubtful, there are several checks which can be made. Disconnect the coil wires before testing. Measure coil primary resistance using an ohmmeter set at R×1. The resistance should be *about* 1.8-2.8 ohms.
2. To measure coil secondary resistance, remove the plug caps from the leads and measure between the secondary leads. The resistance should be *about* 10,400-15,600 ohms when the coil is cold (at room temperature). A low reading indicates a short circuit.
3. Measure the resistance between the coil primary red wire and ground (coil core) and between the coil secondary lead and ground (coil core). The resistance should be infinite.
4. If a coil does not meet these resistance values or if it exhibits visible damage, it should be replaced.
5. If a 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 short circuit in the secondary windings of the original coil; install a new coil.

PICKUP COILS

Inspection

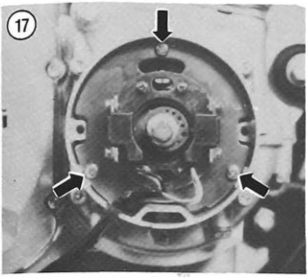
1. Remove the right side cover (or raise the seat) and disconnect the pickup coil/IC igniter 4-pole coupler (**Figure 15**).

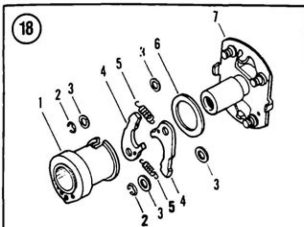
2A. On ZX1100-A models, set an ohmmeter at R×100 and measure the resistance between the 2 pair of leads:
   a. No. 1 and No. 4 cylinders—black and yellow.
   b. No. 2 and No. 3 cylinders—black/white and blue.

   The resistance should be 376-564 ohms.

2B. On all other models, set an ohmmeter at R×100 and measure the resistance between the 2 pair of leads:
   a. No. 1 and No. 4 cylinders—black and blue.
   b. No. 2 and No. 3 cylinders—yellow and red.

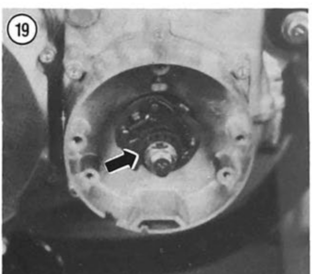
   The resistance should be 360-540 ohms.





IGNITION ADVANCE MECHANISM

1. Rotor
2. C-clip
3. Washer
4. Weight arm
5. Return spring
6. Washer
7. Advancer body



3. Set the ohmmeter at its highest scale and check the resistance between chassis ground and either lead for each pair of cylinders. There should be no continuity (infinite resistance).
4. If the pickup coil fails either of these tests, check the wiring to the coil. Replace the coil if the wiring is okay.

Removal/Installation

The pickup coils are under the timing cover on the right-hand side of the engine.
1. Remove the right side cover (or raise the seat) and disconnect the pickup coil/IC igniter 4-pole coupler (**Figure 15**).
2. Remove the screws securing the timing cover and remove the cover and gasket.
3A. On ZX1100-A models, perform the following:
  a. Remove the screws securing each pickup coil to the crankcase (A, **Figure 16**).
  b. Pull the electrical wires out of the holding grooves in the crankcase (B, **Figure 16**).
  c. Pull the electrical wires and grommet out of the groove in the crankcase (C, **Figure 16**).
3B. On all other models, perform the following:
  a. Remove the timing plate screws (**Figure 17**) and the plate containing the pickup coil assembly.
  b. Pull the electrical wires and grommet out of the groove in the crankcase.
4. To install, reverse these steps.

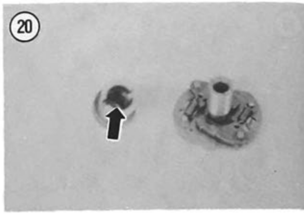
IGNITION ADVANCE MECHANISM

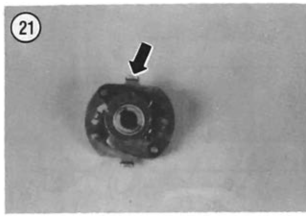
The ignition advance mechanism advances the ignition (fires the spark plugs sooner) as engine speed increases. If it does not advance smoothly, the ignition timing will be incorrect at high engine rpm. The advancer must be lubricated periodically to make certain it operates freely.

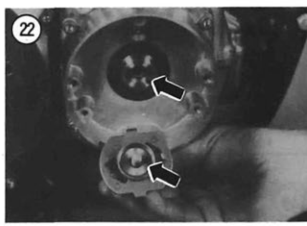
Disassembly/Lubrication/ Assembly

See **Figure 18**. The ignition advance mechanism is bolted to the right end of the crankshaft, under the timing cover.
1. Remove the ignition pickup coil assembly as described in this chapter.
2. Hold the larger nut and remove the advancer mounting bolt, large nut and the advancer (**Figure 19**).
3. To remove the cam from the advancer body, hold the base steady, turn the advancer cam until the weight arms come out of the cam, then pull the cam off its pivot.

4. Remove the weight C-clips, washers, weights and washers.
5. Install by reversing these steps. Note the following:
   a. Grease the groove inside the rotor (**Figure 20**), the weight pivots and the weight arms that fit into the rotor.
   b. When assembling the advancer unit, align the rotor peak with the arm next to the "TEC" mark (**Figure 21**).
   c. Check for free movement and full weight return by the advancer springs.
   d. When installing the advancer assembly, align the notch in the back of the advancer with the pin in the crankshaft (**Figure 22**).
   e. Torque the advancer bolt to 18 ft.-lb. (2.5 mkg).







IC IGNITER

The operation of the IC igniter (**Figure 23** on carburetted models or **Figure 24** for fuel injected models) can be checked simply by removing one of each pair of spark plugs, grounding it against the cylinder head while the plug lead is connected, turning the ignition ON and touching a screwdriver to the pickup coil core (**Figure 25**). If the IC igniter is good, the plug will spark.

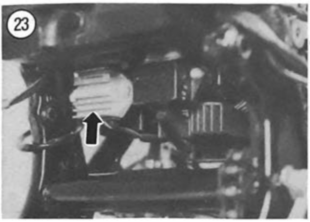
Remember that the IC igniter is battery powered and will not function if the battery is dead. The following IC igniter test can be made on the motorcycle.

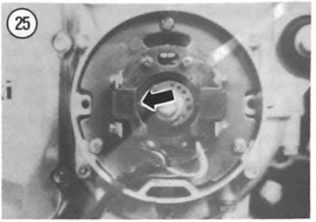
1. Remove one of each pair of spark plugs and ground it against the cylinder head while its plug wire is connected.
2. Disconnect the 4-pole coupler from the pickup coils (**Figure 26**).
3. Turn the ignition ON. Connect a positive (+) 12 volt source to the black lead and a negative (-) 12 volt source to the blue lead. As the voltage is connected, the plug should spark. Do not apply the 12 volt signal for more than a few seconds or the ignition coil may be damaged.
4. Repeat the test for the other pair of plugs, (+) to the yellow lead from the IC igniter and negative (-) to the red lead.
5. If the IC igniter fails these tests, install a new one. If the IC igniter passes these tests but you still have an ignition problem that can't be traced to any other part of the ignition system, substitute an IC igniter that you know is good and see if that solves the problem. Some transistorized ignition troubles just won't show up on your workbench.

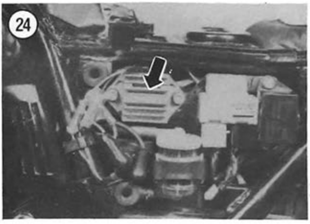
CHARGING SYSTEM

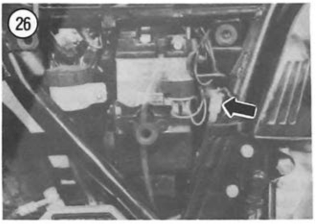
The charging system consists of the battery, alternator and voltage regulator/rectifier. **Figure 27** is a schematic diagram of the charging system. The rectifier and regulator are combined in one solid-state unit.

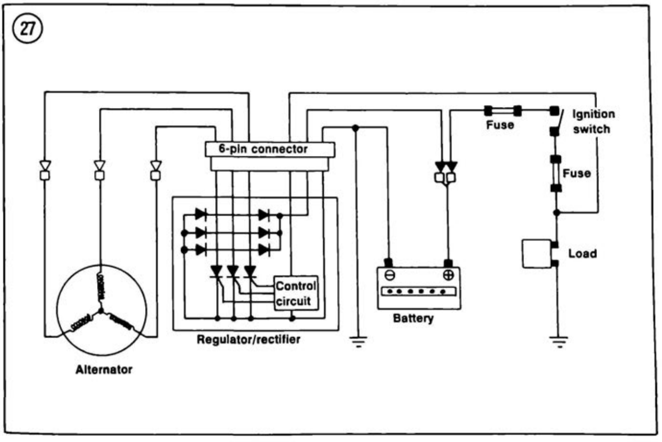
The alternator generates an alternating current (AC) which the rectifier converts to direct current (DC). The regulator maintains the voltage to the battery and loads (lights, ignition, etc.) at a fairly constant voltage, regardless of variations in engine speed and electrical power load.










27
6-pin connector
Fuse
Ignition
switch
Fuse
Load
Control
circuit
Battery
Regulator/rectifier
Alternator

Charging System Test

Whenever charging system trouble is suspected, make sure the battery is good before going any further. Check the specific gravity as described in this chapter. Battery voltage should be above 12 volts. If not, charge the battery. If the battery is okay and all connections are clean and tight, inspect the charging system.

Initial Inspection

1. Start the engine and let it reach normal operating temperature.
2. Connect a 0-20 DC voltmeter to the battery as shown in **Figure 28**. Bring the engine speed from idle to 4,000 rpm, observing the voltage as you go.
3. Turn the headlight on and off, observing the voltage.

NOTE
If your bike doesn't have a headlight switch, disconnect a wire to the headlight or remove and reinstall the headlight fuse.

4. The voltage should be at or near battery voltage at idle and it should increase with engine speed, up to about 15 volts. If the reading is much higher, the regulator/rectifier is defective and should be replaced. If the reading is less than specified or does not increase with rpm, check the alternator and regulator/rectifier.

Alternator Output Test

1. *Carburetted models:* Remove the left side cover and disconnect the red 6-pole coupler from the alternator (**Figure 29**).
2. *Fuel injected models:* Remove the engine sprocket cover and disconnect the 3 yellow leads from the alternator (**Figure 30**).
3. Start the engine and connect an AC voltmeter (0-250 volts) to every pair of yellow leads in turn (there are 3 combinations). The meter should read about 50 volts AC. If it is much lower, the alternator is defective. Check stator coil resistance.

Alternator Stator Resistance

1. With the engine off and an ohmmeter set on R×1, check resistance between every pair of yellow leads in turn (there are 3 combinations). The resistance should be about 0.36-0.54 ohms.
2. Set the ohmmeter on the highest scale and check resistance between each yellow lead and ground. Resistance should be infinite.
3. If the stator coil resistance is okay but alternator output is low, the rotor has probably been

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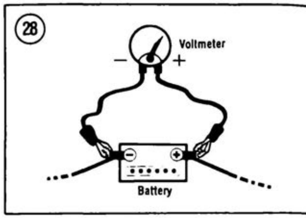

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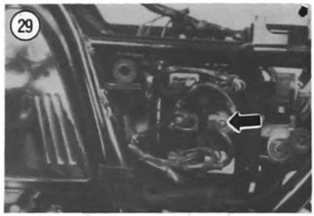

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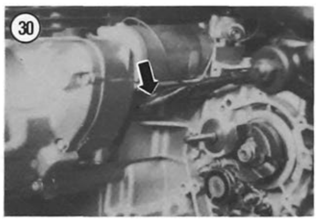

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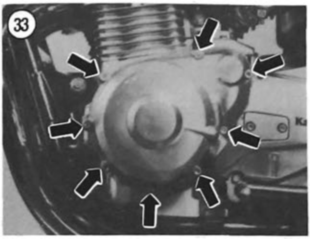
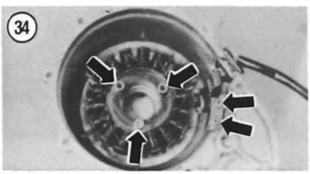
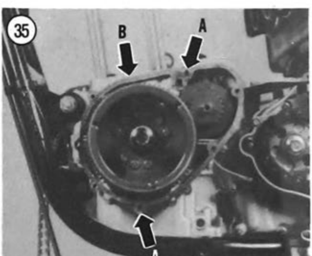






demagnetized. Replace the rotor as described in this chapter.

Regulator/Rectifier Resistance

The regulator/rectifier is in front of the battery case on fuel injected models (**Figure 31**) and under the left end of the battery case (**Figure 32**) on carburetted models.

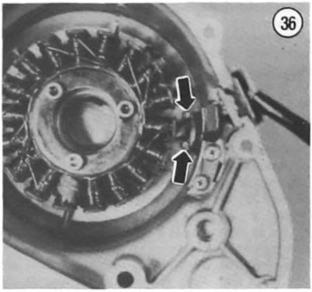
1. Remove the left side cover and disconnect the red 6-pole coupler from the regulator/rectifier (**Figure 29**). On fuel injected models, the coupler is white.
2. Set an ohmmeter at R×10 or R×100. Measure the resistance between each yellow lead and the white/red lead, then between each yellow lead and the black lead. Keep the same meter lead on the white/red and the black leads, in turn. Note the readings (there are 6 combinations).
3. Reverse the meter polarity (use the opposite probes to make the connections) and repeat the tests.
4. There should be more than 10 times as much resistance in one direction as in the other. If any 2 leads show the same resistance in both directions, the regulator/rectifier is faulty and should be replaced.

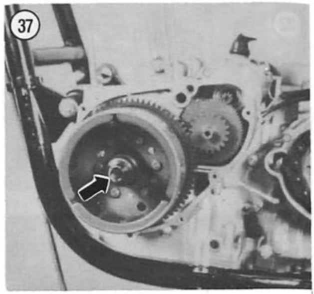
ALTERNATOR

The alternator rotor is mounted on the left-hand end of the crankshaft. The stator is mounted inside the left-hand engine cover.

Stator Removal/Installation

1A. *Chain-drive:* Remove the engine sprocket cover as described in Chapter Six.
1B. *Shaft-drive:* Remove the front bevel drive cover as described in Chapter Six.
2. Disconnect the 3 yellow leads from the alternator (**Figure 30**).
3. Put an oil pan under the alternator cover and remove the 8 cover bolts and the cover (**Figure 33**). There are 2 locating dowel pins.
4. To remove the stator coils from the cover, remove the 3 coil Allen bolts and the wire guide screws (**Figure 34**).
5. To install, reverse these steps. Note the following:
   a. Use a locking agent such as Loctite Lock N' Seal on the stator coil Allen bolts and the cover bolts that go through the dowel pins (A, **Figure 35**).





b. The bottom of the wire guide must fit outside the lugs cast into the alternator cover (**Figure 36**).
c. Use silicone sealant on both sides of the gasket between the 2 top cover screws (**B, Figure 35**).
d. Check the engine oil level and top it up if necessary.

Rotor Removal/Installation

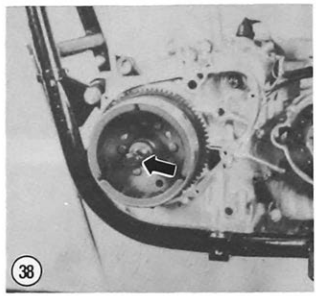
The alternator rotor incorporates the starter one-way clutch mechanism. Rotor replacement is usually necessary only if the rotor magnets have been damaged by mechanical shock or heat. Removal is necessary to repair the starter clutch. The rotor can be removed after removing the alternator cover.

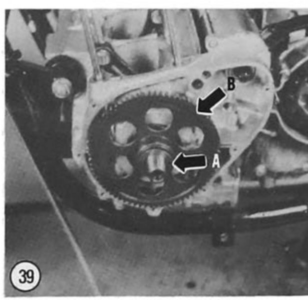
CAUTION
Rotor removal requires a puller such as the one illustrated in the procedure. Don't pry or hammer on the rotor itself. Damage is sure to result and you may destroy the rotor magnetism.

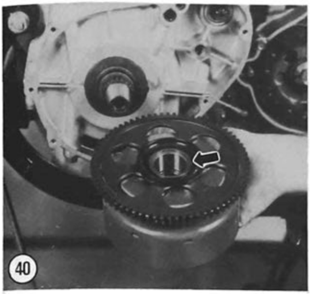
1. Remove the rotor bolt (**Figure 37**).

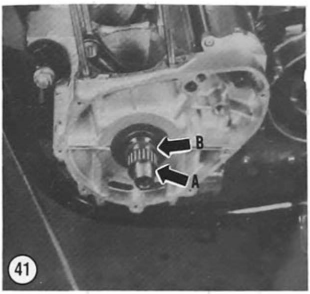
NOTE
To loosen the rotor bolt without a special tool, you can lock the engine by shifting the transmission into gear and stepping on the brake pedal or by removing the clutch cover and stuffing a penny or a clean rag, folded several times, between the primary drive gear and the clutch ring gear.

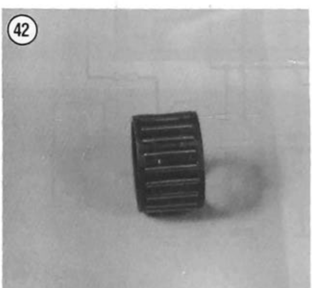
2. Loosen the rotor from its shaft. A simple long bolt with threads to match the large threaded rotor

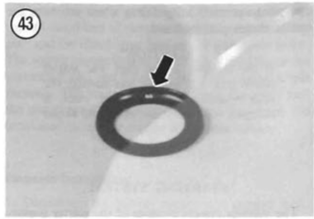












hole will work (**Figure 38**). Your Kawasaki dealer has a special tool to do the job. You may have to alternate tapping on the puller bolt sharply with a hammer and tightening the bolt some more, but don't hit the rotor.

3. Remove the puller and the rotor with the starter clutch assembly.
4. Remove the thin washer (A, **Figure 39**) and the starter clutch gear (B).
5. Remove the rubber damper (**Figure 40**), if it did not come out with the starter clutch gear.
6. Remove the needle bearing (A, **Figure 41**) and thick thrust washer (B).
7. To install, reverse these steps. Note the following:
   a. Inspect the inside of the rotor carefully for any bits of metal or small parts that may have been picked up by the rotor magnets. Remove them to prevent damage when the engine starts.
   b. Inspect the starter clutch gear needle bearing (**Figure 42**). If it is damaged or discolored *or* if a new rotor, clutch gear, thrust washer or crankshaft is being installed, check crankshaft bearing/clutch gear clearance; see *Starter Clutch Damper Selection* in this chapter.
   c. Install the chamfered face of the thrust washer toward the engine.
   d. Apply molybdenum disulfide grease to the starter idler shaft and to the starter clutch gear needle bearing and damper.
   e. Use a solvent to clean any oil from the tapered crankshaft end.
   f. Torque the rotor bolt to 95 ft.-lb. (13.0 mkg). After tightening the bolt, loosen and retorque it to make sure all parts are seated properly.

Starter Clutch Damper Selection

The starter clutch gear damper is available in three different thicknesses, designated by the star mark molded into the damper (**Figure 43**); the more stars, the thicker the damper. Select the proper damper to provide a *light* drag when you turn the starter clutch gear by hand.

CAUTION

If the damper is too thin, the starter clutch gear will wobble and damage the gear's needle bearing. Too thick a damper will accelerate shim and thrust washer wear.

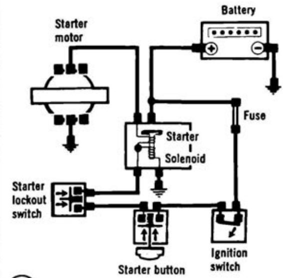
STARTING SYSTEM

The starting system consists of the starter motor, starter clutch, starter solenoid, starter lockout switch, starter circuit relay (ZX1100-A models only) and the starter button.

Figure 44 is a schematic diagram of the starting system for ZX1100-A models and **Figure 45** is a schematic diagram for all other models.

When the clutch lever is pulled and the starter button is pressed, current flows through the solenoid coil. The solenoid contacts close, allowing current to flow from the battery to the starter motor.

ALL MODELS EXCEPT ZX1100-A



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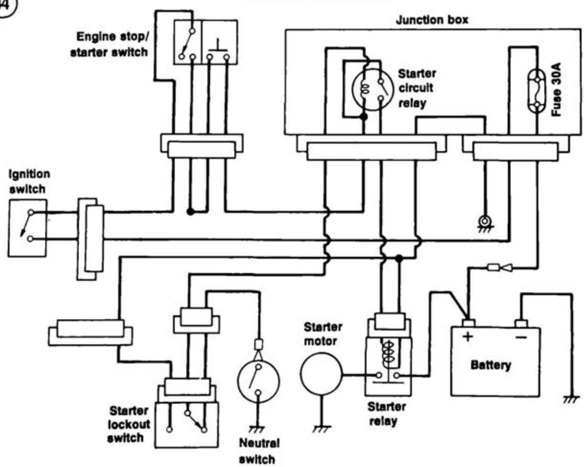
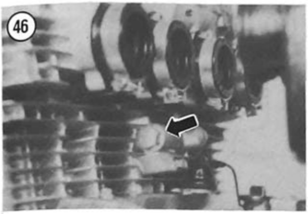
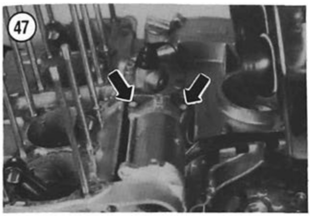
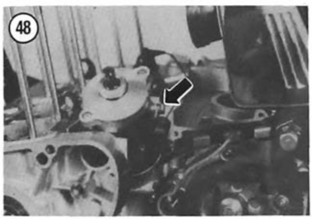
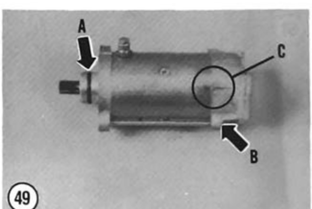
ZX1100-A MODELS











The starter motor is a 12 volt DC motor geared to the left-hand end of the crankshaft through an idler gear and the clutch gear 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 clutch gear) uncouples the clutch gear from the crankshaft when the engine is running.

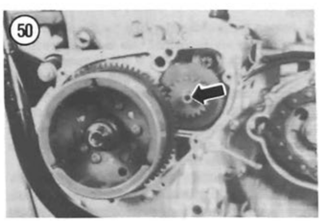
STARTER MOTOR

Removal/Installation

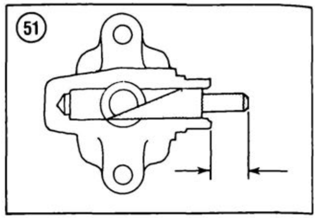
1. Disconnect the battery negative (–) ground lead.
2. If necessary to provide working room, remove the carburetor assembly as described in Chapter Seven.
3. If necessary to provide working room, remove the cam chain tensioner cross wedge cap, washer, spring and cross wedge (**Figure 46**).
4. Remove the 2 starter cover bolts and the cover.
5. Remove the alternator cover as described in this chapter.
6. Remove the 2 starter motor mounting bolts (**Figure 47**).
7. Pry the starter to the right, pull back the rubber boot and disconnect the starter cable at the motor (**Figure 48**).

CAUTION
Do not tap on the end of the starter shaft to free the motor. You will damage the starter.

8. To install, reverse these steps. Note the following:
   a. Make sure the starter case terminal and mounting bosses are clean and free of corrosion.
   b. Oil the O-ring on the end cap of the motor assembly (A, **Figure 49**).
   c. If necessary to aid meshing of the starter motor shaft with the starter clutch idler gear, remove the alternator cover/stator and remove the starter idler shaft (**Figure 50**) and gear.



d. Make sure the starter terminal is protected by the rubber cover.
e. Grease the tensioner cross wedge and push it into the body lightly by hand so the flat on the end of the cross wedge faces the flat on the end of the pushrod. The end of the cross wedge should stick out about 5/16 in. (7.5 mm) from the tensioner body (**Figure 51**). Install the cross wedge spring, check that the aluminum washer is in place and install the cap.
f. Check and adjust idle speed if necessary, and add oil as described in Chapter Three.



Disassembly/Assembly

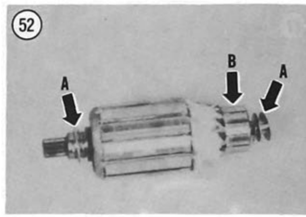
1. Remove the long starter motor case screws (B, **Figure 49**) and separate the cases.

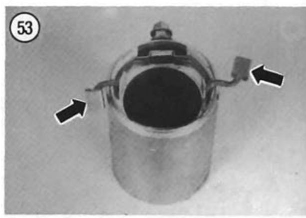
NOTE
*Write down how many thrust washers are used at each end of the armature (A, **Figure 52**) and install the same number when reassembling the starter.*

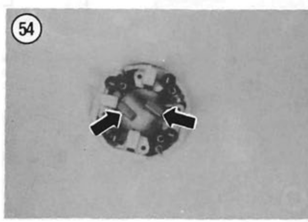
2. Clean all grease, dirt and carbon dust from the armature, case and end covers.

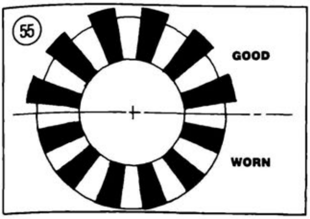
CAUTION
Do not immerse brushes or the wire windings in solvent or the insulation might be damaged. Wipe the windings with a cloth lightly moistened with solvent and dry thoroughly.

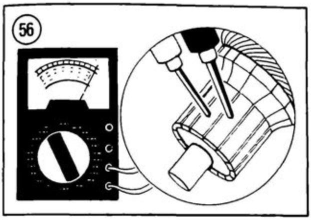
3. Measure the length of the brushes (**Figure 53** and **Figure 54**). The 1981 models have 2 brushes and 1982-on models have 4 brushes. If a brush is worn shorter than 1/4 in. (6 mm), it should be replaced.
4. Inspect the condition of the commutator (B, **Figure 52**). The mica in the normal commutator is cut below the copper (**Figure 55**). A worn commutator is also shown where the copper is worn to the level of the mica. A worn commutator can be undercut, but it requires a specialist. Take the job to your Kawasaki dealer or an auto electrical repair shop.
5. Inspect the commutator bars for discoloration. If a pair of bars are discolored, that indicates grounded armature coils.
6. Connect the leads of an ohmmeter or test light between pairs of armature bars (**Figure 56**); there *should* be continuity. Connect the test leads between the commutator bars and the shaft (**Figure 57**). There should be *no* continuity. If the armature fails either test, it must be replaced.
7. On 1981 models, inspect the field coil by checking continuity from the cable terminal to the brush wire. If there is a short or open, the case

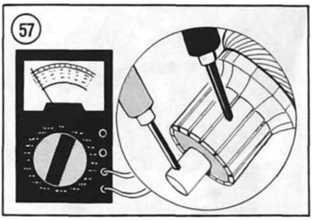


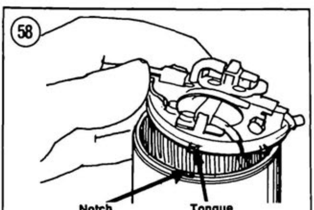


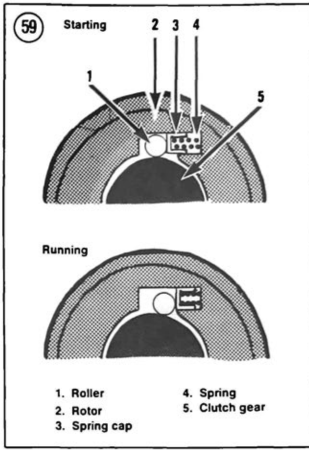












should be replaced. On 1982-on models, the field coil was replaced by permanent magnets; there is no wiring to check.

8. Inspect the front and rear cover bearings for damage. Replace the starter if they are worn or damaged.

9. Assemble by reversing these steps. Note the following:

a. Check that the 2 large case O-rings are in good condition.
b. On 1982-on models, align the brush plate tongue with the end cap notch (**Figure 58**).
c. Align the marks on the case and covers (C, **Figure 49**).

STARTER CLUTCH

The starter clutch is mounted on the left end of the crankshaft, behind the alternator rotor. The starter motor meshes 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 locks the starter clutch gear to the alternator rotor when the starter motor is turning the engine by jamming the clutch rollers between the clutch gear and rotor (**Figure 59**).

After the engine starts, the stationary clutch gear hub rolls the rollers back against their springs and frees the crankshaft from the clutch.

Inspection

To check the operation of the starter motor clutch, remove the alternator and the idler gear. Try turning the starter clutch gear in both directions by hand. The gear should not turn at all to the left (counterclockwise). It should turn freely and quietly to the right (clockwise). If the gear fails to operate in that manner, the clutch assembly is malfunctioning.

Disassembly/Assembly

1. Remove the alternator rotor as described in the chapter.
2. Remove the 3 rollers, spring caps, and springs from the clutch (**Figure 60**).
3. Remove the 3 Allen screws that mount the clutch body to the rotor.
4. When assembling the clutch, use a locking agent such as Loctite Lock N' Seal on the 3 starter clutch Allen bolts.

STARTER SOLENOID

Testing

Before testing the starter solenoid, make sure the battery is fully charged, with adequate electrolyte, and make sure all the connections between the battery and solenoid are corrosion-free and tight.

Remove the left side cover. The solenoid is to the rear of the coupler panel on carburetted models (**Figure 61**) and in front of the fuel filter on fuel injected models (**Figure 62**).

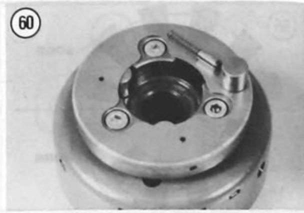
Turn on the ignition, check that the kill switch is ON, pull in the clutch lever (if your bike has a starter lockout) and operate the starter pushbutton. Listen for the loud clicking noise that tells you the solenoid is working.

If the solenoid does not click, check for battery voltage at the black wire to the solenoid when the starter button is pushed. If there is battery voltage but the solenoid doesn't click and all connections are clean and tight, the solenoid is bad and should be replaced. If battery voltage is not available at the black wire, there is an open somewhere in the circuit.

STARTER LOCKOUT SWITCH

Replacement

Push up on the bottom of the switch locking tab (**Figure 63**) and pull out the switch. To install, push the switch in until you feel the tab lock in place.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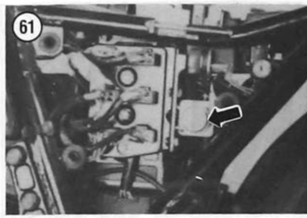
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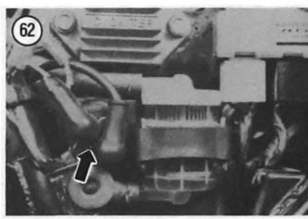
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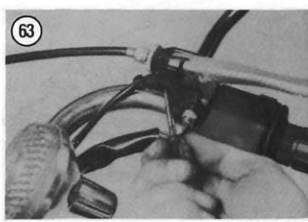
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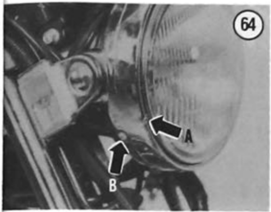
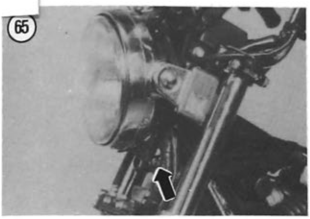
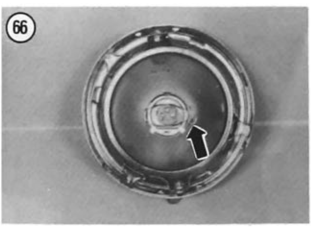






LIGHTING SYSTEM

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 faulty voltage regulator that could be overcharging the battery. **Table 1** lists replacement bulbs for the lights and indicators.

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 OFF and the fuse removed from its holder.

Headlight Adjustment

Adjust the headlight horizontally and vertically according to motor vehicle regulatio , in your area.

Horizontal adjustment

To adjust the headlight horizontally, turn the screw on the lower right front of the headlight rim (A, **Figure 64**). On the models with rectangular headlights, the screw is on the lower left side of the headlight rim.

Vertical adjustment

Remove the fairing on models so equipped, see in Chapter Eleven. Loosen the bottom positioning bolt (**Figure 65**) under the headlight and tilt the headlight as required. Tighten the positioning bolt and install the fairing on models so equipped.

NOTE
If the headlight is too tight to move, remove the headlight assembly and loosen the headlight shell mounting nuts. Tighten the nuts when done.

Headlight Replacement (All Except B Models, KZ1100-M and ZX1100-A)

1. Remove the mounting screw on each side of the headlight housing (B, **Figure 64**).
2. Swing the trim bezel and headlight unit out and remove the electrical coupler from the backside.
3. Remove the dust cover from the back of the light housing, squeeze the spring clip (**Figure 66**), and remove the lighting element. Install a new element.

CAUTION
Use a clean cloth to grasp the quartz bulb. Don't handle a quartz bulb with your bare fingers or a dirty rag. They will leave oil on the bulb and cause it to burn out early.

4. Adjust the headlight as described in this chapter.

Headlight Replacement (B Models and ZX1100-A)

1. Remove the fairing as described in Chapter Eleven.
2. Remove the mounting screw (**Figure 67**) at each bottom corner of the headlight housing.
3. Swing the trim bezel and headlight unit out and remove the electrical coupler from the backside.
4. Remove the dust cover from the back of the light housing. Push and turn the bulb holder to the left

After the engine starts, the stationary clutch gear hub rolls the rollers back against their springs and frees the crankshaft from the clutch.

Inspection

To check the operation of the starter motor clutch, remove the alternator and the idler gear. Try turning the starter clutch gear in both directions by hand. The gear should not turn at all to the left (counterclockwise). It should turn freely and quietly to the right (clockwise). If the gear fails to operate in that manner, the clutch assembly is malfunctioning.

Disassembly/Assembly

1. Remove the alternator rotor as described in the chapter.
2. Remove the 3 rollers, spring caps, and springs from the clutch (**Figure 60**).
3. Remove the 3 Allen screws that mount the clutch body to the rotor.
4. When assembling the clutch, use a locking agent such as Loctite Lock N' Seal on the 3 starter clutch Allen bolts.

STARTER SOLENOID

Testing

Before testing the starter solenoid, make sure the battery is fully charged, with adequate electrolyte, and make sure all the connections between the battery and solenoid are corrosion-free and tight.

Remove the left side cover. The solenoid is to the rear of the coupler panel on carburetted models (**Figure 61**) and in front of the fuel filter on fuel injected models (**Figure 62**).

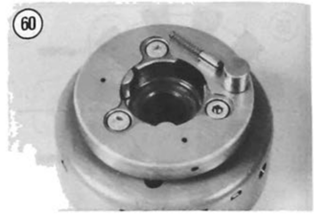
Turn on the ignition, check that the kill switch is ON, pull in the clutch lever (if your bike has a starter lockout) and operate the starter pushbutton. Listen for the loud clicking noise that tells you the solenoid is working.

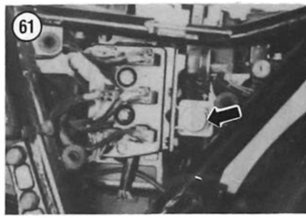
If the solenoid does not click, check for battery voltage at the black wire to the solenoid when the starter button is pushed. If there is battery voltage but the solenoid doesn't click and all connections are clean and tight, the solenoid is bad and should be replaced. If battery voltage is not available at the black wire, there is an open somewhere in the circuit.

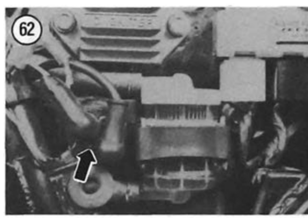
STARTER LOCKOUT SWITCH

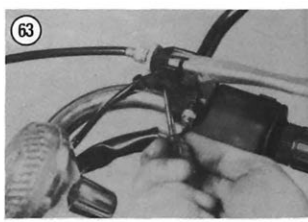
Replacement

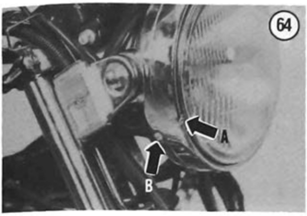
Push up on the bottom of the switch locking tab (**Figure 63**) and pull out the switch. To install, push the switch in until you feel the tab lock in place.











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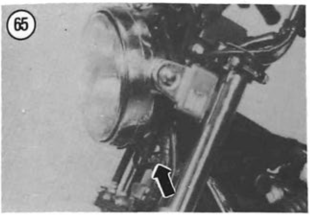
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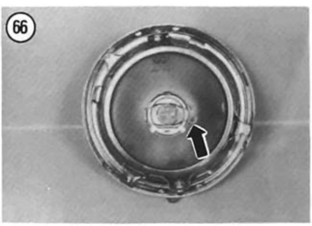
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LIGHTING SYSTEM

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 faulty voltage regulator that could be overcharging the battery. **Table 1** lists replacement bulbs for the lights and indicators.

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 OFF and the fuse removed from its holder.

Headlight Adjustment

Adjust the headlight horizontally and vertically according to motor vehicle regulations in your area.

Horizontal adjustment

To adjust the headlight horizontally, turn the screw on the lower right front of the headlight rim (A, **Figure 64**). On the models with rectangular headlights, the screw is on the lower left side of the headlight rim.

Vertical adjustment

Remove the fairing on models so equipped, see in Chapter Eleven. Loosen the bottom positioning bolt (**Figure 65**) under the headlight and tilt the headlight as required. Tighten the positioning bolt and install the fairing on models so equipped.

NOTE

If the headlight is too tight to move, remove the headlight assembly and loosen the headlight shell mounting nuts. Tighten the nuts when done.

Headlight Replacement (All Except B Models, KZ1100-M and ZX1100-A)

1. Remove the mounting screw on each side of the headlight housing (B, **Figure 64**).
2. Swing the trim bezel and headlight unit out and remove the electrical coupler from the backside.
3. Remove the dust cover from the back of the light housing, squeeze the spring clip (**Figure 66**), and remove the lighting element. Install a new element.

CAUTION

Use a clean cloth to grasp the quartz bulb. Don't handle a quartz bulb with your bare fingers or a dirty rag. They will leave oil on the bulb and cause it to burn out early.

4. Adjust the headlight as described in this chapter.

Headlight Replacement (B Models and ZX1100-A)

1. Remove the fairing as described in Chapter Eleven.
2. Remove the mounting screw (**Figure 67**) at each bottom corner of the headlight housing.
3. Swing the trim bezel and headlight unit out and remove the electrical coupler from the backside.
4. Remove the dust cover from the back of the light housing. Push and turn the bulb holder to the left

(counterclockwise) and remove the lighting element. Install a new element.

CAUTION

Use a clean cloth to grasp the quartz bulb. Don't handle a quartz bulb with your bare fingers or a dirty rag. They'll leave oil on the bulb and will cause it to burn out early.

5. Adjust the headlight as described in this chapter.

Headlight Replacement (KZ1100-M)

1. Remove the mounting screw (B, **Figure 64**) on each side of the headlight housing.
2. Pull the trim bezel and headlight unit out and remove the electrical coupler from the backside.
3. Remove the 2 top and bottom pivot screws and the horizontal adjusting screw (**Figure 68**). Take off the outer rim.
4. Remove the 2 screws from the inner rim and remove the sealed beam unit.
5. When installing a new sealed beam unit be sure the "TOP" mark faces up.
6. Adjust the headlight as described in this chapter.

Reserve Lighting Unit

Some models are equipped with a reserve lighting system that automatically switches from a burned-out headlight filament to the other filament (high or low beam). At the same time, a warning light will illuminate on the instrument cluster. Always replace the headlight when one filament is burned out.

The reserve lighting unit is on the right front of the battery holder (**Figure 69**). Replace the unit if it does not function properly.

Front Brake Light Switch Replacement

1. Using a screwdriver or other small tool, press in on the switch tabs to release the switch from the master cylinder (**Figure 70**).
2. Remove the switch and disconnect the electrical coupler from the switch.
3. To install, reverse these steps.

Rear Brake Light Switch Replacement

1. Disconnect the spring going to the rear brake pedal.
2. Disconnect the electrical coupler from the switch.
3. Push in on the switch locking tabs and remove the switch from the bracket on the frame.

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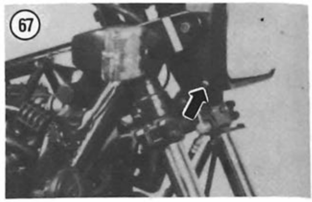

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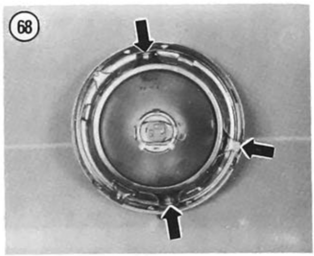

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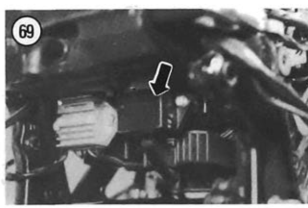

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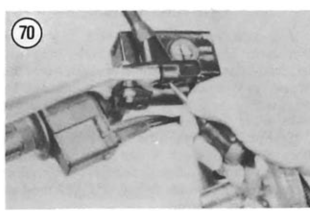

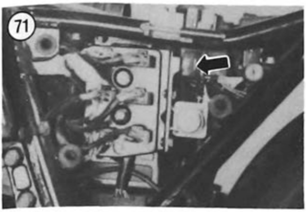

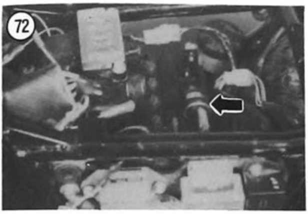

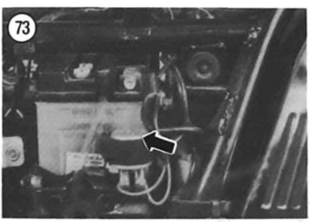

4. To install, reverse these steps. Adjust the switch as described in Chapter Three.

Turn Signal Flasher

On carburetted models, the turn signal flasher is under the left side cover, above the starter solenoid (**Figure 71**).

On fuel injected models, the turn signal flasher is under the air cleaner housing (**Figure 72**).

Hazard Flasher

The hazard flasher is under the right side cover (**Figure 73**).

TURN SIGNAL CANCELLING SYSTEM

Some models are equipped with an automatic turn signal cancelling system that tur.,s off the turn signals after 4 seconds have passed and after the bike has traveled 50 meters.

As the front wheel turns, the speed sensor at the front wheel sends pulses to the distance sensor in the electrical odometer. The distance sensor relays the signals to the turn signal control unit. The turn signal control unit counts 4 seconds after you push the turn signal switch on, then it counts the number of front wheel revolutions detected by the distance sensor. After both time and distance conditions have been met, the turn signal control unit energizes a solenoid in the turn signal switch body that pushes the switch off.

Troubleshooting

1. In case of trouble with the system, first check the wiring and couplers; see the wiring diagrams at the end of the book.
2. If the wiring is okay, check the distance sensor in the odometer as follows:
   a. Remove the headlight, locate the 6-pole coupler from the odometer and connect a voltmeter to the light green and black/yellow wire sockets, leaving the coupler connected.
   b. With the ignition switch ON, raise the front wheel off the ground and turn it slowly.
   c. The meter should fluctuate slowly between about 4-6 volts, about 11 times per wheel revolution.
   d. If not, replace the distance sensor/electric odometer.
3. If the distance sensor is okay, check the solenoid in the turn signal switch body as follows.
   a. Disconnect the 9-pole coupler from the turn signal switch.
   b. Push the turn signal switch ON.
   c. Momentarily apply a positive (+) 12 volt signal to the white/green lead from the switch, using a wire connected to the positive (+) battery terminal.
   d. If the solenoid is okay, it will push the switch OFF; if not, install a new turn signal switch.
   e. Reconnect the 9-pole coupler.
4. If the solenoid is okay, open the turn signal switch at the handlebar and clean the switch contacts. No replacement parts are available for the switch; it must be replaced if faulty.
5. If cleaning the switch contacts doesn't solve the problem and the distance sensor, wiring, and

couplers are all okay, check the turn signal control unit as follows:

a. Open the turn signal switch at the handlebar.
b. Set a voltmeter at 25 volts DC and connect the positive (+) probe to the white/green solenoid terminal (not the grounded side of the solenoid).
c. Connect the negative (-) probe to the grounded side of the solenoid.
d. With the ignition switch ON and the turn signal selector set at A (automatic), push the turn signal switch ON.
e. Raise the front wheel and spin it at least 30 revolutions.
f. If the turn signal control unit is okay, the voltmeter will show battery voltage as the control unit tries to energize the solenoid; if not, replace the turn signal control unit.
g. The turn signal control unit is under the right side of the battery case (**Figure 74**).

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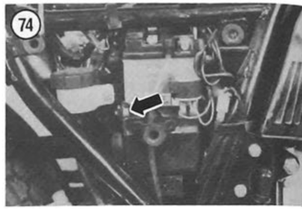

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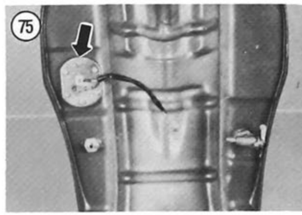


FUEL GAUGE

Some models have a fuel gauge that indicates the amount of fuel in the tank. The sending unit is a variable resistor, controlled by a float mounted in the fuel tank.

On the 1981 KZ1000-M and 1983 KZ1000R, the fuel gauge has a built-in 7-volt voltage regulator, with an electrical sending unit inside the fuel tank.

Gauge Circuit Inspection

1. Remove the fuel tank as described in Chapter Seven or Chapter Eight.
2. Disconnect the 2-pole coupler from the sending unit (**Figure 75**).
3. Turn the ignition switch ON. The gauge should read "E."
4. Short the black/yellow and white/yellow leads from the gauge together. The gauge should read "F."

CAUTION
Do not keep the gauge leads shorted after the needle swings to "F" or the gauge may be damaged.

5. If these readings are correct but the gauge indicates an erroneous fuel level during normal operation, the sending unit is probably bad. If the readings are incorrect, there is a fault in the gauge or the wiring.

Sending Unit Inspection

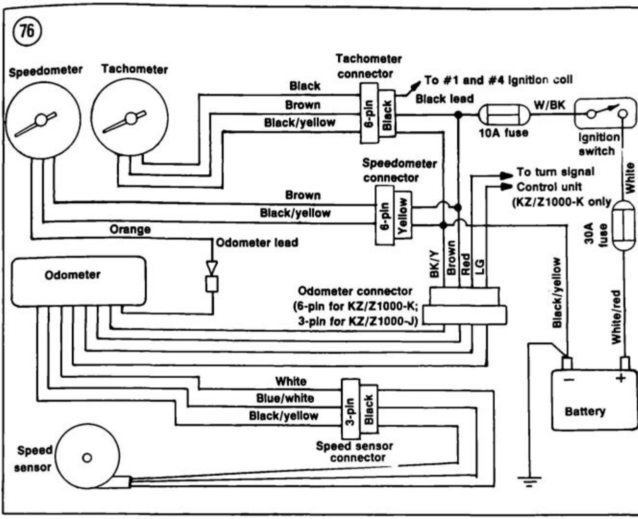
1. Remove the fuel tank as described in Chapter Seven.
2. Drain all fuel into a safe container.
3. Remove the sending unit mounting bolts and the sending unit (**Figure 75**).
4. Check that the float arm moves up and down smoothly throughout its range.
5. Measure the resistance of the sending unit with an ohmmeter. At the full position, resistance should be about 0.5-5.5 ohms. At the empty position, resistance should be about 102-118 ohms. If resistance does not vary smoothly as the arm is moved, the sending unit is faulty.

Gauge Inspection

1. Remove the headlight.
2. Disconnect the 4-pole coupler from the fuel gauge.
3. Measure the resistance of the fuel gauge with an ohmmeter. For the J and K models, the resistance should be about 170-185 ohms. For the 1981 KZ1000-M, the resistance should be about 50-60 ohms. If the resistance does not fall within these limits, the fuel gauge is probably faulty and should be replaced.

FUEL LEVEL SENSOR (1982 KZ1000-M)

Some models have a low fuel level sensor, a self-tester and a warning light that illuminates when



the fuel level is low. The self-tester turns the warning light on for a few seconds whenever the ignition is turned ON.

If the warning light malfunctions, make sure the 3-pole coupler under the tank and the 3-pole coupler to the self-tester are secure and the wiring is okay; then check the warning light bulb. If the bulb is okay, unplug the 3-pole coupler to the self-tester; if the warning light functions okay now, replace the self-tester. If not, replace the fuel level sensor; see Chapter Seven.

ELECTRIC INSTRUMENTS

The J, K, and B models are equipped with an electric tachometer, speedometer and odometer. See **Figure 76** for a schematic wiring diagram. The instruments receive battery power through a brown wire and they are grounded by a black/yellow wire. The speed sensor at the front wheel gets power from the white wire from the odometer and it is grounded by the black/yellow wire to the odometer.

The tachometer gets a fluctuating voltage pulse through the black wire from the No. 1 and 4 ignition coil. The tachometer counts the pulses and converts them to rpm.

The speed sensor provides a fluctuating voltage pulse back to the odometer through the blue/white wire. The odometer counts the pulses and registers them as distance traveled. The odometer relays the voltage pulse to the speedometer through the orange wire and the speedometer counts the pulses to indicate speed. On models with automatic turn signal cancelling, the odometer also relays the voltage pulse to the turn signal control unit to cancel the turn signal.

Instrument Troubleshooting (J, K and B models; 1983 KZ1100-A and 1983 KZ1100-D)

More electrical instrument failures are caused by problems in the wiring and couplers than by instrument failure. Before you blame an instrument for trouble, check the couplers. Clean any corrosion from coupler pins. Make sure all couplers are fully engaged. Make sure the instrument mounting nuts are tight.

instrument panel (**Figure 78**), after removing the fairing and the instrument panel bottom cover.

ELECTRONIC WARNING UNIT (1982 B MODELS, ZX1100-A)

These models have a computer-controlled warning display system that is combined with the fuel gauge display. See **Figure 79** and **Figure 80** for the system wiring diagrams. The control unit receives inputs from several electrical sensors that monitor the side stand/engine stop switch position, engine oil level, battery electrolyte level, fuel level and DFI (digital fuel injection) on ZX1100-A models. If any of these items is out of order, the control unit will cause the appropriate liquid crystal display (LCD) indicator to flash on and off.

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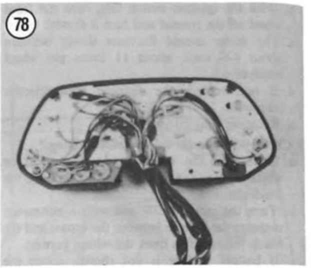

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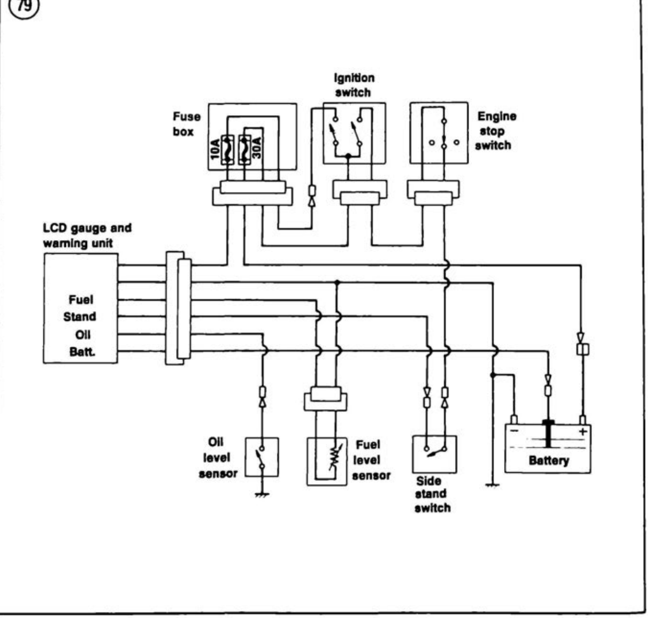

In addition, a warning light next to the LCD cluster will flash any time one of the systems is out of order. Fuel level is also displayed continuously on a series of LCD segments in the fuel gauge. When the ignition switch is turned ON, the control unit self-checks the fuel gauge and each of the warning systems before returning to its normal monitoring function.

Warning Unit Troubleshooting

More electrical failures are caused by problems in the wiring and couplers than by component failure. Before you blame a component for trouble, check the couplers. Clean any corrosion from coupler pins. Make sure all couplers are fully engaged.

Test No. 1: initial check

Turn the ignition OFF, then ON. Check that the warning unit displays each of its LCD segments one-by-one: fuel gauge, battery, oil level, side stand/engine stop switch and, lastly, the red warning light:

a. If only *some* of the LCD segments or the warning light do not appear, the warning unit/fuel gauge is faulty and should be replaced.
b. If the warning unit does not begin the self-check, battery power probably isn't reaching the warning unit. Go on to *Test No. 2*.
c. If the warning unit performs the self-check normally, there is probably trouble with the specific sensor involved. Go on to the appropriate sensor test.

Test No. 2: warning unit power

Disconnect the red 6-pole coupler in the headlight shell. Turn the ignition ON and with a voltmeter, measure the voltage between the brown and the black/yellow wires from the wiring harness:

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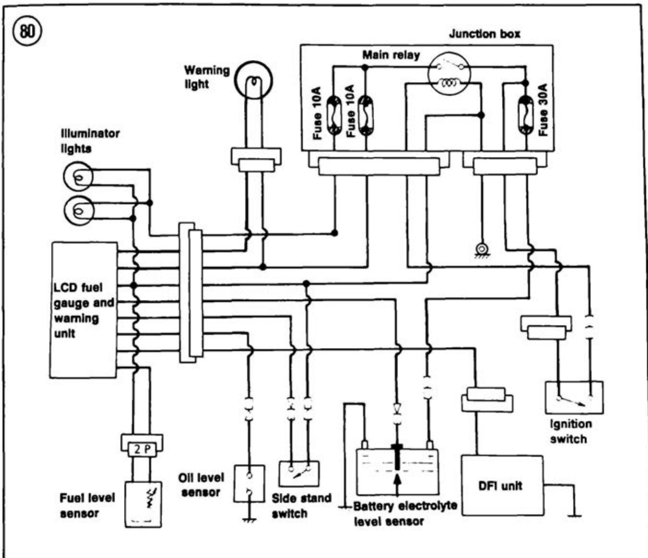


a. If battery voltage is not shown, repair the wiring harness.
b. If battery voltage is shown, the warning unit/fuel gauge is faulty and should be replaced.

Side stand switch test

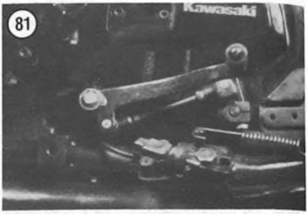
See **Figure 79** and **Figure 80**. The side stand switch (**Figure 81**) provides a battery voltage signal to the warning unit through the green/white wire.

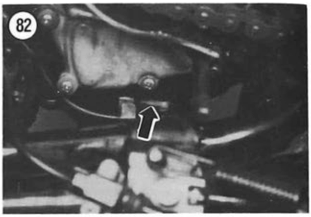
1. On ZX1100-A models, perform the following:
   a. Disconnect the electrical leads from the side stand switch.
   b. With an ohmmeter set at the R×1 scale, measure the resistance with the side stand up. The resistance should be zero ohms.
   c. With an ohmmeter set at the R×1 scale, measure the resistance with the side stand down. The resistance should be infinite.
   d. If the meter readings are not normal, check that the switch is mounted correctly in the frame. Remove and reinstall the switch if necessary.
   e. If the switch is mounted correctly and the meter readings are not normal, replace the switch.
2. On all other models, perform the following:
   a. Disconnect the red 6-pole connector in the headlight shell.
   b. Turn the ignition switch ON and with a voltmeter, measure the voltage between the green/white and the black/yellow wires from the wiring harness.
   c. The meter should indicate battery voltage when the sidestand is up and zero volts when the side stand is down.
   d. If the meter readings are normal, but the warning unit display is faulty, the warning unit should be replaced.
   e. If the meter readings are not normal, inspect and repair the wiring or replace the side stand switch.

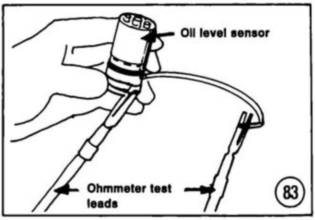
Oil level sensor test

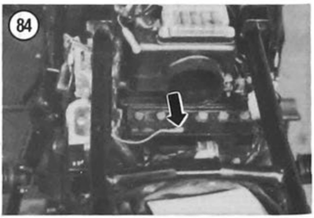
See **Figure 79** and **Figure 80**. The warning unit provides a signal to the oil level sensor through the black/red wire. When the oil level is above the lower level line next to the sensor, the sensor's resistance should be less than 1/2 ohm. When the oil level is below the lower level line, the sensor's resistance should be infinite.

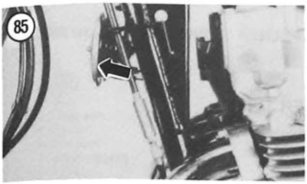
Drain the oil and remove the sensor (**Figure 82**). With an ohmmeter set on a 1 ohm scale, measure the resistance between the sensor wire and its body.











When the sensor is upright (**Figure 83**), its resistance should be infinite. When the sensor is upside-down, its resistance should be less than 1/2 ohm:

a. If the meter readings are not normal, replace the sensor.
b. If the meter readings are normal, but the warning unit display was faulty, check the black/red wire for continuity from the warning unit. If there is continuity, the warning unit should be replaced.

Electrolyte Level Sensor Test

See **Figure 79** and **Figure 80**. The electrolyte level sensor provides a minimum 6 volt signal to the warning unit through the pink wire when the battery electrolyte level is above the lower level line.

Disconnect the pink lead from the battery (**Figure 84**) and, with a voltmeter measure between the sensor wire and chassis ground. The reading should be at least 6 volts:

a. If the meter reading is not normal, replace the sensor.
b. If the meter reading is normal, but the warning unit display was faulty, check the pink wire for continuity to the warning unit. If there is continuity, the warning unit should be replaced.

Fuel Level Sensor Test

See **Figure 79** and **Figure 80**. The fuel level sending unit works the same as on models with a needle-type fuel gauge; see *Fuel Gauge Sending Unit Inspection* in this chapter.

HORN

The horn cannot be disassembled, but it can be adjusted if prolonged use causes a change in the pitch of the sound. An ammeter (0-5 amps) is required during adjustment to prevent misadjustment and excessive current draw.

Disconnect the black lead at the horn and connect an ammeter with the positive (+) probe to the horn and the negative (-) probe to the black lead. Loosen the adjusting screw locknut (**Figure 85**) and turn the adjuster as required, while keeping the horn current under 2.0-3.0 amps.

CAUTION
Don't turn the adjuster in (clockwise) too far or the battery drain will be excessive and the horn may burn out.

VOLTMETER (1981 B MODELS)

The voltmeter indicates battery voltage when the engine is not running. When the engine is running, the voltmeter indicates charging voltage.

To inspect the meter, remove the instrument panel bottom cover. Disconnect the brown and black/yellow leads from the panel (**Figure 77**). Use an ohmmeter to measure the resistance between the brown and black/yellow lead terminals. If the resistance is not 160-190 ohms, the meter is faulty.

Table 1 LIGHT BULB REPLACEMENT

Item	Watts (all bulbs are 12 volt)
Headlight	Quartz halogen 60/55W
Tail/brakelights	
U.S., Canada	8/27W
Australia, Europe	5/21W
Front turn signals	
U.S., Canada	23W/8W
Australia	23W
Europe	21W
Rear turn signals	
U.S., Canada, Australia	23W
Europe	21W
Meter lights	1.7W
Indicator lights	3.4W
City light (Europe)	4W

WHEELS, TIRES AND BRAKES

This chapter describes disassembly and repair of the front and rear wheels, hubs, tires and brakes.

Wear limits and torque specifications are given in **Tables 1-5** at the end of the chapter.

WIRE WHEELS

Figure 1 is a typical wire-spoked wheel assembly. The rim band protects the inner tube from abrasion by the spokes, but it will not save a tube if a spoke end protrudes too far into the tire. If you tighten spokes a lot, it pays to deflate the tire and check spoke protrusion. Note that there are different length spokes with different head angles for inner left, inner right, outer left and outer right.

Some wire-spoked wheels are equipped with rim locks (**Figure 2**) to keep the tire from slipping on the rim during vigorous acceleration and braking, thereby preventing a torn valve stem. Check the rim locks for tightness whenever you inspect the wheels.

Spoke Replacement

Check the spokes for tightness according the maintenance schedule in Chapter Three.

Bent or stripped spokes should be replaced as soon as they are detected or they will put more load on the surrounding spokes, leading to more spoke damage and possible destruction of an expensive hub. Unscrew the nipple from the spoke and depress the nipple into the rim far enough to free the end of the spoke, taking care not to push the nipple all the way in. Remove the damaged spoke from the hub and use it to match a new spoke of identical length. If necessary, trim the new spoke to match the original and dress the end of the threads with a spoke die. Install the new spoke in the hub and screw on the nipple, tightening it until the spoke's tone is similar to the tone of other spokes in the wheel. Periodically check the new spoke; it will stretch and must be retightened several times before it takes its final set.

CAUTION

During break-in of a new wheel, check the spoke tension after the first 15, 30 and 60 minutes of riding. Most spoke seating takes place during initial use.

Runout

Refer to Chapter Three for inspection procedures. Off the motorcycle, runout can be checked with a dial indicator as shown in **Figure 3**.

The maximum allowable wire wheel rim run-out is:

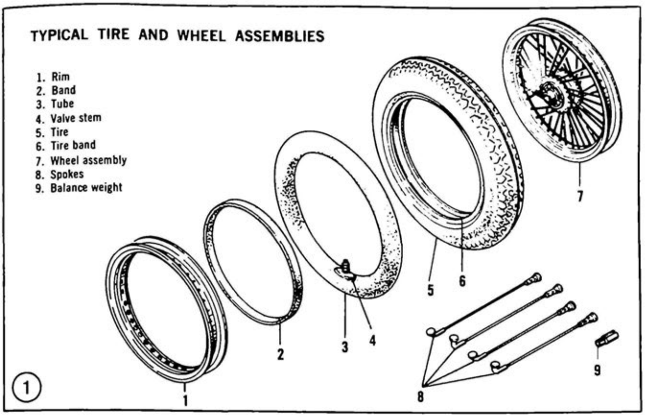
a. Axial (side-to-side)—1/8 in. (3 mm).

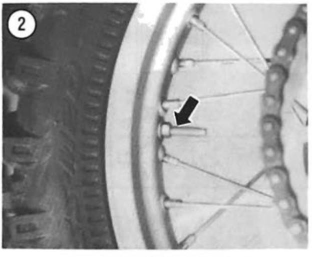
b. Radial (up-and-down)—1/16 in. (2 mm).

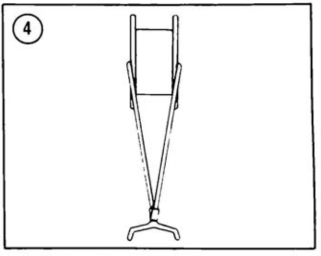
Excessive runout on wire wheels can be corrected as follows.

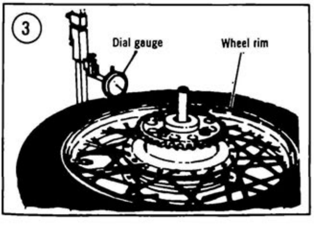
1. Draw the high point of the rim toward the centerline of the wheel by loosening the spokes in the area of the high point and on the same side as the high point and tightening the spokes on the side opposite the high point (**Figure 4**).

2. Rotate the wheel and check runout. Continue adjusting until the runout is within specification. Be patient and thorough, adjusting the position of the rim a little at a time. If you loosen 2 spokes at the high point 1/2 turn, loosen the adjacent spokes 1/4







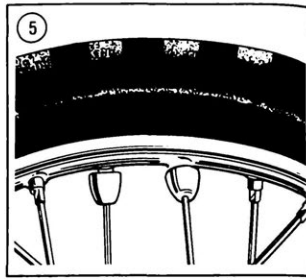


turn. Tighten the spokes on the opposite side equivalent amounts.

Wire Wheel Balance

An unbalanced wheel can be unsafe. Balance weights applied to the light side of the wheel will correct imbalance. Before attempting to balance a wheel, check to make sure the wheel bearings are in good condition and properly lubricated and that the brake does not drag and prevent the wheel from turning freely.

Support the motorcycle with the wheel off the ground. Spin the wheel and allow it to come to rest by itself. Mark the part of the wheel at the bottom and spin it again. If it does not come to rest at the same position, the balance of the wheel may already be acceptable. If you're unsure, spin it and check it again. If the wheel comes to rest at the same position, imbalance is indicated. In this case, add a weight to the top spoke (**Figure 5**) and spin the wheel to check the effect. Balance weights are available from Kawasaki in 5, 10, 20 and 30 grams (1/6, 1/3, 2/3 and 1 ounce). Begin with the lightest weight and increase the size as necessary. If more than 30 grams (1 oz.) are required to balance the wheel, add weight to adjacent spokes; never put 2 or more weights on the same spoke. When the wheel comes to rest at a different point each time that it is spun, consider it balanced. Tightly crimp the weights so they won't be thrown off.



CAST WHEELS

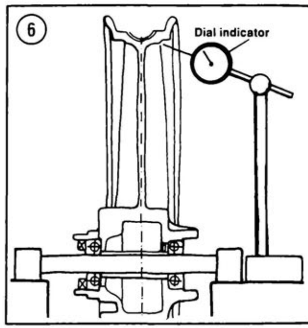
Runout

Wheel rim runout is the amount of "wobble" a wheel shows as it rotates. If the wheel has been subjected to a heavy impact or if you have any cause to suspect the wheel doesn't run "true," inspect the wheel runout.

1. Remove the tire from the wheel rim as described in this chapter.
2. Support the wheel on its axle and measure the axial and radial runout with a dial indicator (**Figure 6**).
3. The maximum allowable wheel rim runout on cast wheels is:
   a. Axial (side-to-side)—0.02 in. (0.5 mm).
   b. Radial (up-and-down)—0.03 in. (0.8 mm).

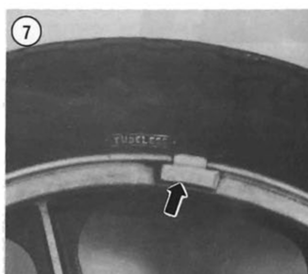
   If the runout exceeds these limits, check the condition of the wheel bearings and install new ones if worn.
4. Cast wheels cannot be straightened; they must be replaced if warped or damaged.

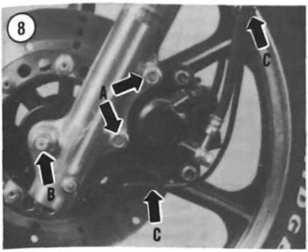
CAUTION
Do not attempt to straighten a cast wheel. The wheels will crack if a force strong enough to bend them is applied.

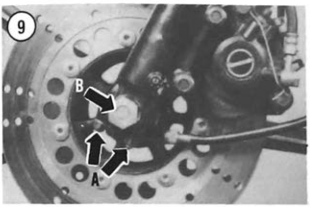


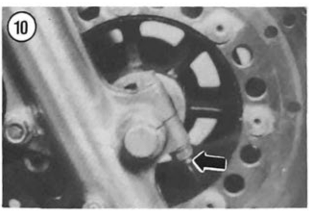
Balance

Cast wheels are balanced in the same manner as wire spoked wheels, but the weights are not attached to the spokes. "Tape-A-Weight" or similar adhesive weights are available at motorcycle or auto supply stores. These kits contain test weights and strips of









adhesive backed weights that can be cut to the desired length and attached directly to the rim.

NOTE
*Kawasaki offers weights that can be crimped on the aluminum rims (**Figure** 7). You may have to let some air out of the tire to install this type of weight.*

FRONT WHEEL

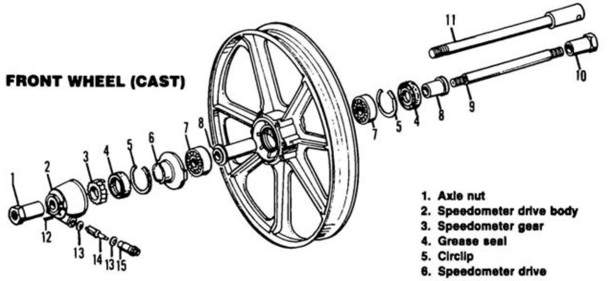
Removal/Installation

1. Support the motorcycle with the front wheel off the ground.
2A. *On models with a mechanical speedometer drive:* Loosen the speedometer cable nut and disconnect the cable at the wheel.
2B. *On models with an electrical speedometer drive:* If necessary to provide adequate wiring slack, disconnect the speedometer sensor coupler in the headlight.
3. Remove one brake caliper by removing 2 brake caliper mounting bolts (A, **Figure 8**). Support the caliper to keep tension off the brake hose.
4A. *On models with clamps at both ends of the axle:* Loosen the 4 axle clamp nuts (A, **Figure 9**), then loosen the 2 axle nuts (B). Remove the axle clamp nuts, lockwashers and the clamps.
4B. *On models with no clamp at one end of the axle:* Remove the axle nut (B, **Figure 8**), then loosen the pinch nut (**Figure 10**) and pull out the front axle.
5. Remove the wheel and mechanical speedometer drive assembly, if equipped (**Figure 11**). Note the location of any spacers or collars.

CAUTION
Do not set the wheel down on the brake disc surface. It may get warped or scratched. Place the rim on pieces of wood.

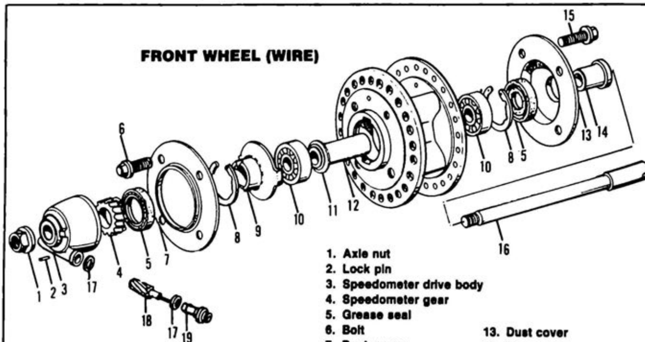
NOTE
You may want to insert a piece of wood in the brake calipers in place of the discs. If the brake lever is accidentally squeezed the caliper piston could be dislocated, which may require caliper disassembly and brake system bleeding.

NOTE
On models with an air balance tube at the bottom triple clamp, do not compress one fork leg or some fork oil may flow into the opposite leg. That would require inspection and adjustment of the fork oil level as described in Chapter Three.



1. Axle nut
2. Speedometer drive body
3. Speedometer gear
4. Grease seal
5. Circlip
6. Speedometer drive
7. Bearing
8. Spacer
9. Axle
10. Collar
11. Axle (complete)
12. Lockpin
13. Washer
14. Speedometer pinion
15. Bushing

(12)



1. Axle nut
2. Lock pin
3. Speedometer drive body
4. Speedometer gear
5. Grease seal
6. Bolt
7. Dust cover
8. Circlip
9. Speedometer drive
10. Bearing
11. Spacer
12. Hub
13. Dust cover
14. Spacer
15. Bolt
16. Axle
17. Washer
18. Speedometer pinion
19. Bushing

(13)

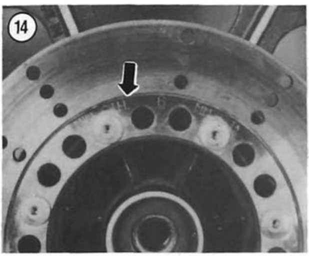
6. To disassemble the wheel hub, see **Figure 12** or **Figure 13**; refer to *Wheel Bearings and Seals* in this chapter. When installing a brake disc, install the disc with the marked side facing out (**Figure 14**) and torque the brake disc mounting bolts as specified in **Table 2**.
7. To install, reverse these steps. Note the following:
   a. *On models with no external tabs on the speedometer drive:* The hub driver notches (**Figure 15**) must mate with the internal tabs in the speedometer drive.
   b. *On models with external tabs on the speedometer drive:* The tabs must fit in the hub notches (**Figure 16**).

CAUTION
Make sure the speedometer drive tabs are correctly seated in both the wheel hub and in the speedometer drive gearbox before you tighten the axle nut or you may damage the drive.

   c. Do not tighten the axle nuts until after the speedometer cable/wires are connected to the gearbox. Thread the cable/wires through the guides (**Figure 17** and C, **Figure 8**) and tighten the cable nut with pliers.

NOTE
If the cable won't seat easily, slowly turn the wheel until the cable end aligns with the drive.

   d. *On models with no clamp at one end of the axle:* Torque the axle nut, then the pinch nut as specified in **Table 3**.
   e. *On models with clamps at both ends of the axle:* Assemble the wheel and axle assembly with the axle nuts flush with the ends of the axle (**Figure 11**). Install the wheel and axle assembly, install the axle clamps with lockwashers and tighten the clamp nuts finger-tight. The arrow on the clamp must point to the front, so there will be a gap at the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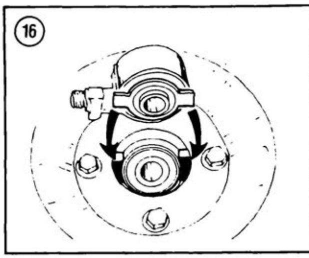
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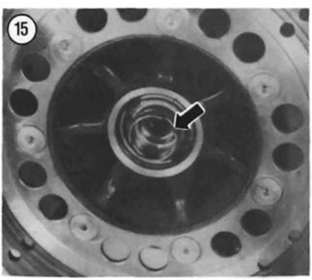
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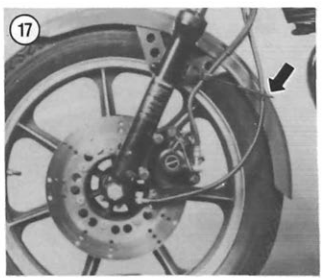
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rear of the clamp (**Figure 18**). Turn the speedometer gear housing to the left (counter-clockwise) until it stops against the fork leg. Torque the axle nuts, the front clamp nuts and then the rear clamp nuts as specified in **Table 3**.

f. Clean any oil or dirt from the brake disc with a non-oily solvent.
g. Install the brake caliper and torque the caliper mounting bolts as specified in **Table 2**.
h. After the wheel is installed, spin it to make sure it turns freely and apply the brake several times to make sure the pads are seated against the disc.

REAR WHEEL

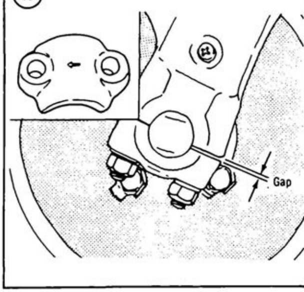
Removal/Installation (Chain-drive)

1. Support the motorcycle with the rear wheel off the ground.

2A. On ZX1100-A models, perform the following:

a. Loosen the rear brake caliper anchor bolt (A, **Figure 19**) and free the brake line from its guides on the swing arm (B).
b. Loosen the clamp bolt (**Figure 20**) on each side.
c. On the right-hand side, remove the rear axle nut cotter pin and remove the rear axle nut (**Figure 21**).
d. On the left-hand side, insert the shank of a screwdriver or drift into the hole in the rear axle (**Figure 22**).

18



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e. Slowly pull the rear axle out while holding the brake caliper up.

f. Observe the location of any spacers and catch any that may fall out when the wheel is removed.

2B. On all other models, perform the following:

a. Loosen the rear brake caliper anchor bolt (A, **Figure 23**) and free the brake line from its guides on the swing arm (B).

b. Remove the rear axle nut cotter pin and remove the rear axle nut (C, **Figure 23**).

c. Loosen the locknuts on both chain adjusters (D, **Figure 23**).

d. Kick the rear wheel forward enough to free the drive chain from the rear sprocket.

e. Slowly pull the rear axle out while holding the brake caliper up.

f. There is a long spacer on the right-hand side of the caliper and a short spacer on the left-hand side of the sprocket coupling.

3. Remove the rear wheel. You may find it necessary to let some of the air out of the tire or to have a *strong* friend tilt the bike to get adequate clearance.

WARNING

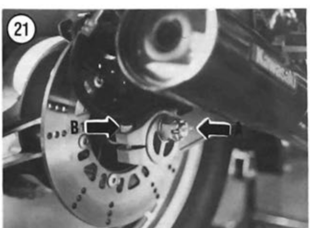
If you tilt the motorcycle for clearance, be very careful not to lean it too far or it will fall over.

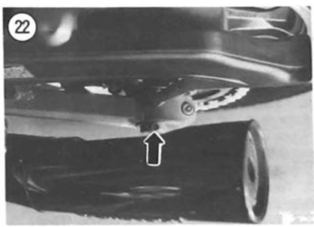
CAUTION

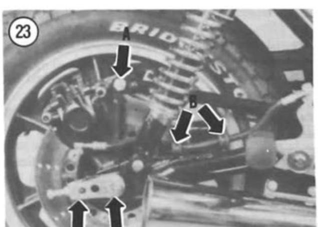
Do not set the wheel down on the brake disc surface. It may get warped or scratched. Place the rim on pieces of wood.

NOTE

Insert the axle back through the swing arm and caliper or tie the caliper up to keep stress off the brake hose. You may want to insert a piece of wood in the caliper in place of the disc. If the brake pedal is accidentally pushed the caliper piston could be dislocated, which may require caliper disassembly and brake system bleeding.







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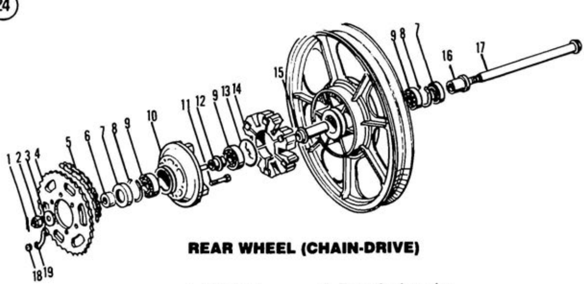
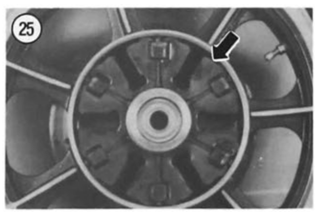


REAR WHEEL (CHAIN-DRIVE)

4. To disassemble the wheel hub, see **Figure 24**. Refer to *Wheel Bearings and Seals* in this chapter. When installing a brake disc, face the marked side out (**Figure 14**), and torque the brake disc mounting bolts as specified in **Table 2**.

5. To install, reverse the removal steps. Note the following:
   a. Inspect the wheel coupling damper (**Figure 25**) and install a new one if worn.
   b. Inspect the hub O-ring and grease it (**Figure 26**).
   c. Clean any oil or dirt from the brake disc with a non-oily solvent.
   d. Adjust drive chain play as described in Chapter Three.
   e. Torque the rear axle nut and brake anchor nut as specified in **Table 3**.
   f. After the wheel is installed, spin it to make sure it turns freely and apply the brake several times to make sure the pads are seated against the disc.



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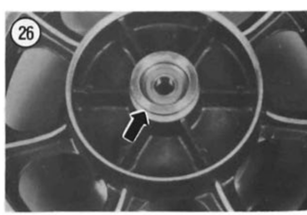

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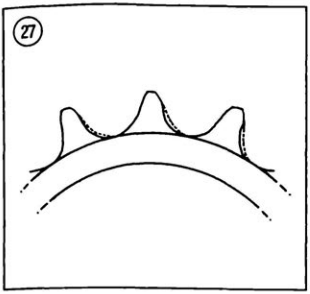
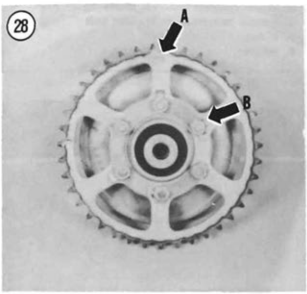
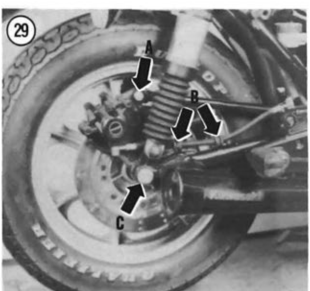
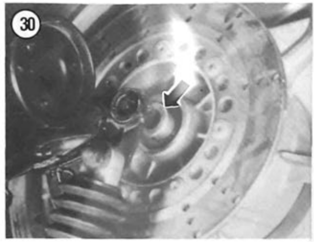
Rear Sprocket

Replace the sprocket any time the teeth are worn or undercut as shown in **Figure 27**. A worn









sprocket will quickly wear out a new drive chain. The sprocket is removed during rear wheel removal.

Install a new sprocket with the numbered side facing out (A, **Figure 28**). Torque the sprocket nuts as specified in **Table 3**. If there are lockplates under the sprocket nuts, bend up a tab on the lockplate against each sprocket nut (B, **Figure 28**).

Removal/Installation (Shaft-drive)

1. Support the motorcycle with the rear wheel off the ground.
2. Remove the left muffler as described in Chapter Seven.
3. Loosen the rear brake caliper anchor bolt (A, **Figure 29**) and free the brake line from its guides on the swing arm (B).
4. Remove the axle nut and pull out the axle (C, **Figure 29**) while holding the caliper up.
5. Remove the spacer on the right side of the wheel (**Figure 30**).
6. Pull the wheel to the right to free it from the splined drive coupling and remove the wheel from the motorcycle. You may find it necessary to let some air out of the tire or have a *strong* friend tilt the bike to get adequate clearance.

WARNING
If you tilt the motorcycle for clearance, be very careful not to lean it too far or it will fall over.

CAUTION
Do not set the wheel down on the brake disc surface. It may get warped or scratched. Place the rim on pieces of wood.

NOTE
Insert the axle back through the swing arm and caliper or tie the caliper up to

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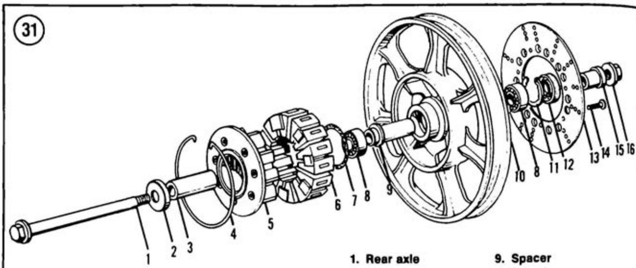


REAR WHEEL (SHAFT-DRIVE)

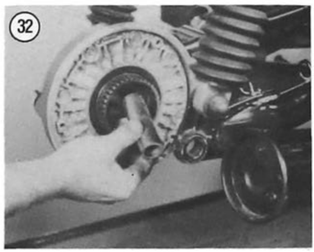
1. Rear axle
2. Cap
3. Spacer
4. Retainer
5. Wheel coupler
6. Rubber damper
7. O-ring
8. Bearing
9. Spacer
10. Wheel
11. Circlip
12. Grease seal
13. Brake disc
14. Disc bolt
15. Collar
16. Axle nut

keep stress off the brake hose. You may want to insert a piece of wood in the caliper in place of the disc. If the brake pedal is accidentally pushed the caliper piston could be dislocated, which may require caliper disassembly and brake system bleeding.

7. To disassemble the wheel hub, see **Figure 31**; refer to *Wheel Bearings and Seals* in this chapter. When installing a brake disc, face the marked side out (**Figure 14**) and torque the brake disc mounting bolts as specified in **Table 2**.
8. To install, reverse these steps. Note the following:
   a. Install the long spacer in the final drive (**Figure 32**).
   b. Grease the coupling splines (**Figure 33**).
   c. Clean any oil or dirt from the brake disc with a non-oily solvent.
   d. Torque the rear axle nut and brake anchor nut as specified in **Table 3**.
   e. After the wheel is installed, spin it to make sure it turns freely and apply the brake several times to make sure the pads are seated against the disc.

WHEEL BEARINGS AND SEALS

The original wheel bearings are not fully sealed and require periodic lubrication in accordance with the maintenance schedule in Chapter Three.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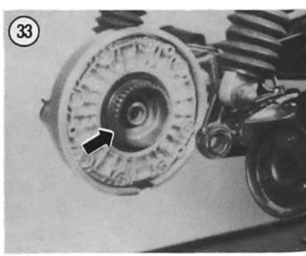
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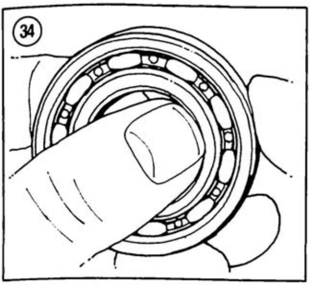
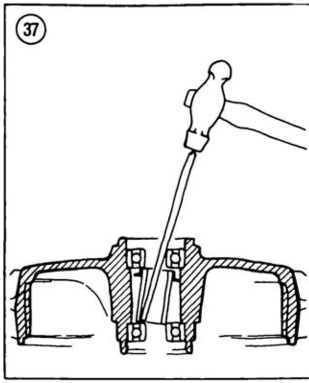




If bearing replacement is necessary, fully sealed bearings are available from any good bearing specialty shop. Be sure you take your old bearing along to ensure a perfect matchup. Fully sealed bearings provide better protection from dirt and moisture that may get into the hub.

Bearing Inspection and Lubrication

1. Clean away all old grease.
2. Check the inner and outer bearing races and balls for cracks, galling or pitting. Rotate the bearings by hand and check for roughness; they should make no noise (**Figure 34**). Replace any worn or damaged bearings.
3. Pack the bearings thoroughly with high-temperature grease, forcing the grease around the balls.
4. Inspect all grease seals for wear or damage and replace them if necessary.

Bearing and Seal Replacement

To disassemble the wheel hubs, refer to **Figure 12**, **Figure 13**, **Figure 24** or **Figure 31**.

1. *Shaft-drive rear wheel:* Remove the circlip and the coupling retainer (**Figure 35**).
2. *Shaft-drive rear wheel:* Remove the rubber coupling (**Figure 36**).
3. Remove any seal retaining circlips.
4. Insert a rod into one side of the hub. Move the spacer aside and tap the bearing out the other side of the hub by working around its diameter (**Figure 37**).

NOTE
It is not necessary to remove the seal first. The seal will be driven out with the bearing.

5. Remove the spacer and tap out the opposite bearing.
6. Carefully drive a new bearing into its bore, tapping evenly around the outer race. Invert the hub and set the spacer in place. Install the other bearing on the axle and insert the axle through the spacer and the bearing that has been installed. Carefully tap the other bearing into its bore, tapping evenly around the outer race. Install a new seal into the bore and gently tap it into place.
7. To assemble, reverse these steps; note the following:
   a. Inspect the wheel coupling damper and install a new one if worn.
   b. Inspect the hub O-ring and grease it (**Figure 26**).
   c. When installing semi-sealed wheel bearings, be sure the sealed side faces out.

AXLE

To inspect the axle, support it in V-blocks 4 inches apart as shown in **Figure 38** and check the runout with a dial indicator. Replace the axle if it is bent more than 0.028 in. (0.7 mm) or if it cannot be straightened to less than 0.008 in. (0.2 mm) runout.

NOTE
You can also check axle runout by rolling it on a piece of plate glass and slipping a feeler gauge under any visible gap.

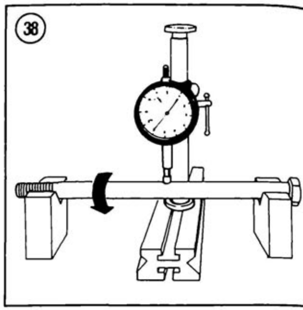
TUBELESS TIRES

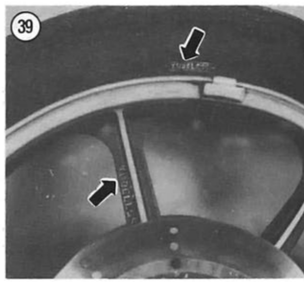
The original tire cross-sectional sizes and tread pattern are usually the best. See **Table 4** or **Table 5** for the standard sizes and inflation pressures.

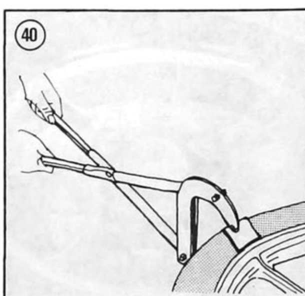
Models with wire-spoked wheels use tube-type tires. Tubeless tires are used on models with cast wheels. They are designated by the word "TUBELESS" cast into the tire sidewall (**Figure 39**) and are designed to be used only with rims that are dimensionally different from tube-type rims. These rims have "TUBELESS" cast into the side (**Figure 39**).

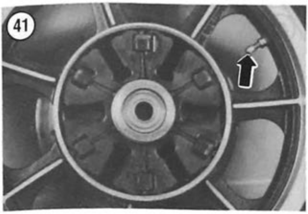
WARNING
Do not install an inner tube inside a tubeless tire, except in an emergency. The tube will cause an abnormal heat buildup in the tire.

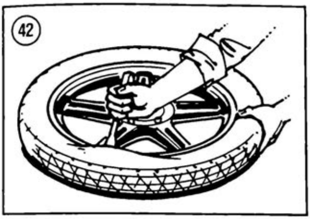
When a tubeless tire is flat, your best recourse is to take it to a motorcycle dealer for repair.

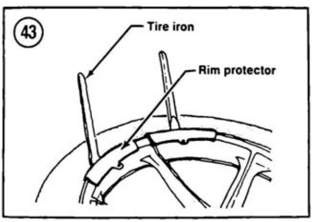


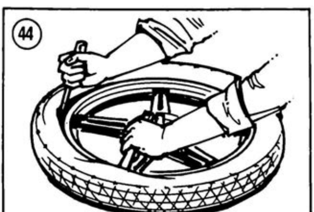












Punctured tubeless tires should be removed from the rim to inspect the inside of the tire and to apply a combination plug/patch from the inside. Don't rely on a plug or cord repair applied from outside the tire. They might be ok on a car, but they're too dangerous on a motorcycle.

After repairing a tubeless tire, don't exceed 50 mph (80 kph) for the first 24 hours. Never race on a repaired tubeless tire. The patch could work loose from tire flexing and heat.

Removal

Removal of tubeless tires from their rims can be very difficult because of a tight bead/rim seal. Breaking the bead seal may require the use of a special tool such as the one available from Kawasaki (**Figure 40**). If you have trouble breaking the seal, we recommend you take the tire to a motorcycle dealer and have them perform this operation.

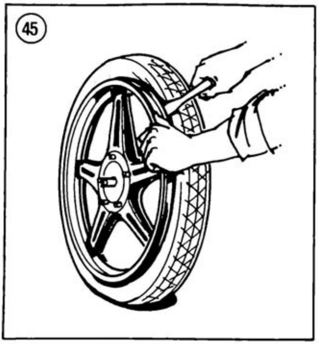
CAUTION
The inner rim and tire bead area are sealing surfaces on a tubeless tire. Do not scratch the inside of the rim or damage the tire bead.

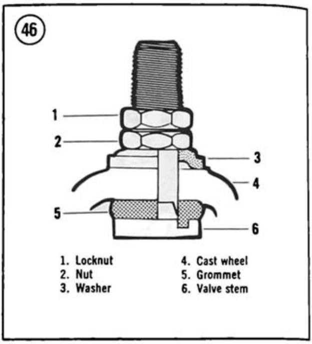
CAUTION
While removing a tire, support the tire on two blocks of wood, so the brake disc doesn't contact the floor and warp or get damaged.

1. Mark the valve stem location on the tire, so the tire can be installed in the same position for easy balancing.
2. Remove the valve core to deflate the tire (**Figure 41**).
3. Press the entire bead on both sides of the tire into the center of the rim. Use a rubber mallet or step on the tire with your heels. A special bead seal breaker may be required.
4. Lubricate the beads with soapy water.
5. Insert a tire iron under the bead next to the valve (**Figure 42**). Force the bead on the opposite side of the tire into the center of the rim and pry the bead over the rim with the tire iron.

CAUTION
*Use rim protectors (**Figure 43**) or insert scraps of leather between the tire irons and the rim to protect the rim from damage.*

6. Insert a second tire iron next to the first to hold the bead over the rim. Then work around the tire with the first tire iron, prying the bead over the rim (**Figure 44**).





1. Locknut
2. Nut
3. Washer
4. Cast wheel
5. Grommet
6. Valve stem

7. Stand the tire upright. Insert the tire iron between the second bead and the side of the rim that the first bead was pried over (**Figure 45**). Force the bead on the opposite side from the tire iron into the center of the rim. Pry the second bead off the rim, working around as with the first.

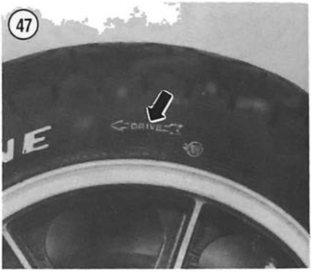
Installation

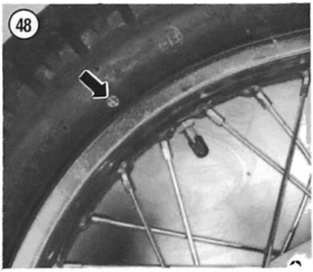
1. Install a new valve stem whenever you have the tire off the rim (**Figure 46**). Rubber deteriorates with age and valve stem replacement will never be as convenient as now.
2. Carefully inspect the tire for any damage, especially inside.
3. If the tire has a directional arrow on the sidewall (**Figure 47**), it should point in the normal direction of rotation.
4. Position the tire next to the rim with your mark at the valve stem hole.

NOTE

*On a new tire, a colored spot near the bead indicates a lighter point on the tire. This spot should be placed next to the valve stem (**Figure 48**).*

5. Lubricate both beads of the tire with soapy water.
6. Push the backside of the tire down into the center of the rim and insert the valve stem through the stem hole in the wheel. The lower bead should go into the center of the rim and the upper bead outside. Work around the tire in both directions (**Figure 49**). Use a tire iron for the last few inches of bead (**Figure 50**).





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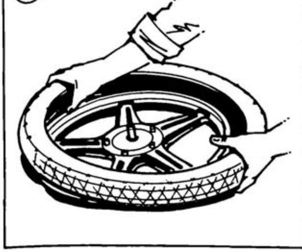

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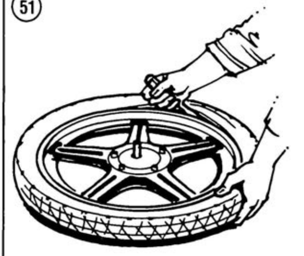


7. Press the upper bead into the center of the rim opposite the valve. Pry the bead into the rim on both sides of the initial point with a tire iron, working around the rim to the valve (**Figure 51**).
8. Inflate the tire slowly to seat the beads in the rim. Bounce the wheel several times while turning the wheel. This helps seat the bead. If an initial air seal is hard to get, your motorcycle or auto repair shop may have a bead seater to make the job easy.
9. After inflating the tire, check to see that the beads are fully seated and that the tire rim lines next to the rim are the same distance from the rim all the way around the tire. If the beads won't seat, deflate the tire, re-lubricate the rim and beads with soapy water and re-inflate the tire.
10. Balance the wheel as described in this chapter.

Tubeless Tire Repair

Do not rely on a plug or cord patch applied from outside the tire. Use a combination plug/patch applied from inside the tire (**Figure 52**).

1. Remove the tire from the rim.
2. Inspect the rim inner flange. Smooth any scratches on the sealing surface with emery cloth. If a scratch is deeper than 0.5 mm (0.020 in.), the wheel should be replaced.
3. Inspect the tire inside and out. Replace a tire if any of the following is found:

   a. A puncture larger than 1/8 in. (3 mm).
   b. A punctured or damaged sidewall.
   c. More than two punctures in the tire.

4. Apply the plug/patch, following the instructions supplied with the patch.

TUBE-TYPE TIRES

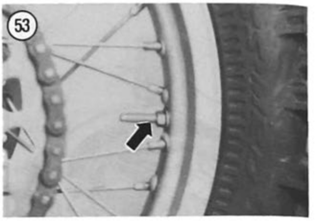
The original tire cross-sectional sizes and tread pattern are usually the best. See **Table 4** or **Table 5** for the standard sizes and inflation pressures.

Removal/Installation

Tube-type tire removal and installation is similar to that of tubeless tires, with these additional requirements:

CAUTION
Be very careful not to pinch the inner tube with the tire irons.

a. If the wheel has rim locks (**Figure 53**), loosen them fully, but don't remove them.
b. During installation, pry one side of the tire onto the wheel, then the tube, then the other side of the tire. Inflate the tube just enough to round it out. Too much air will make installation difficult.
c. Wiggle the valve to be sure the tube is not under the bead. Set the valve squarely in its hole before screwing in the valve nut to hold it against the rim.
d. Balance the wheel as described in this chapter.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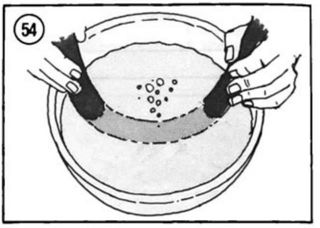
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INNER TUBE REPAIR

Patching an inner tube should be considered only a temporary repair. A motorcycle tire flexes a great deal and could rub a patch off the tube; however, a patched tube will get you far enough to buy a new tube for maximum reliability and safety.

Tube Repair Kits

Tube repair kits can be purchased from motorcycle dealers and auto supply stores. When buying, specify that the kit you want is for motorcycles.

There are 2 types of tube repair kits:

a. Hot patch.
b. Cold patch.

Hot patches are stronger because they actually vulcanize to the tube, becoming part of it. However, they are far too bulky to carry for roadside repairs and the strength is unnecessary for a temporary repair.

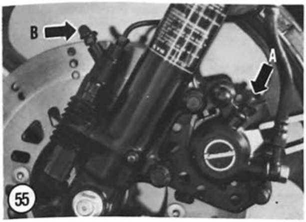
Cold patches are not vulcanized to the tube; they are simply glued to it. Though not as strong as hot patches, cold patches are still very durable. Cold patch kits are less bulky than hot and are more easily applied while on the road. A cold patch kit containing everything necessary tucks in easily with your emergency tool kit.

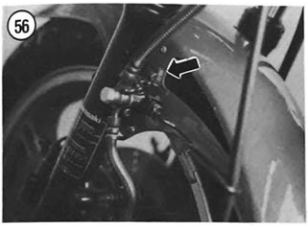
Follow the instructions provided with the repair kit or use these general instructions.

1. Install the valve core into the valve stem and inflate the tube slightly. Do not overinflate.
2. Immerse the tube in water a section at a time (**Figure 54**). Look carefully for bubbles indicating a hole. Mark each hole and continue checking until you are certain that all holes are discovered and marked. Also make sure that the valve core is not leaking; tighten it if necessary.

NOTE
If you do not have enough water to immerse sections of the tube, try running your hand over the tube slowly and very close to the surface. If your hand is damp, it works even better. If you suspect a hole anywhere, apply some saliva to the area to verify it.

3. Roughen the area around the hole slightly larger than the patch; use a cap from the tire repair kit or a pocket knife. Do not scrape too vigorously or you may cause additional damage.
4. Apply a small quantity of the special cement to the puncture and spread it evenly with a finger.
5. Allow the cement to dry until it's tacky—usually 30 seconds or so is sufficient.





6. Remove the backing from the patch.

CAUTION
Do not touch the newly exposed rubber with your fingers or the patch will not stick firmly.

7. Center the patch over the hole. Hold the patch firmly in place for about 30 seconds to allow the cement to set.
8. Dust the patched area with talcum powder to prevent sticking.
9. Carefully check inside the tire casing for glass particles, nails or other objects which may have damaged the tube. If the inside of the tire is split, apply a patch to the area to keep it from pinching and damaging the tube again.
10. Check the inside of the rim. Make sure the rim band is in place, with no spoke ends protruding, which could puncture the tube.
11. Deflate the tube before installing in the tire.

BRAKES

Repair of brake systems is extremely critical work. Don't take shortcuts and don't work with makeshift tools. When a procedure calls for a locking agent such as Loctite Lock N' Seal, use it. If a torque specification is given, use a torque wrench. Recheck your work and, when you're finished, test your brakes in a safe area. If you have any doubts about your ability to do the job according to these procedures, have the work done by your Kawasaki dealer or a qualified specialist. See **Table 1** (end of chapter) for brake wear limits. See **Table 2** for disc brake system torque specifications.

NOTE
On ZX1100-A models, an anti-dive feature is built into both front fork legs. This anti-dive mechanism uses the same hydraulic brake fluid as the brake calipers. Follow these same precautions when working on the anti-dive system.

WARNING
Brake fluid is an irritant. Keep it away from your eyes and off your skin.

The following precautions *must* be observed when servicing brake systems.
1. Never reuse old brake fluid.
2. Never use fluid from a container that has been left open.
3. Use only disc brake fluid rated DOT 3 or higher. Don't mix different rated brake fluids together.
4. Don't leave the fluid reservoir cap off for too long. DOT 3 or 4 fluid will absorb moisture from the air and will then boil at lower temperatures.
5. Don't contaminate the brake discs or pads with brake fluid, gasoline or any lubricants (including graphite or pencil lead).
6. Brake fluid can ruin paint and plastic. If you spill any, wipe it up immediately.
7. If you open a bleed valve or loosen a brake line fitting, bleed air from the system as described in this chapter.

BRAKE SYSTEM 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 (or anti-dive unit) line fitting has been loosened.
1. Remove the reservoir cap and add brake fluid. Don't let the fluid level drop too low during this procedure or air will enter the system and you'll have to start all over again.
2. Install the master cylinder reservoir cap.
3A. On models equipped with the anti-dive feature, bleed the system in the following order:
   a. Left-hand caliper bleed valve (A, **Figure 55**).
   b. Left-hand anti-dive bleed valve (B, **Figure 55**).
   c. Left-hand junction block bleed valve (**Figure 56**).

d. Right-hand caliper bleed valve.
e. Right-hand anti-dive bleed valve.
f. Right-hand junction block bleed valve.

Connect a clear plastic hose to the bleed valve on the left-hand caliper, then the left-hand anti-dive unit, etc., in the specified sequence. Run the other end of the hose into a clean container. Fill the container with enough fresh brake fluid to keep the end of the hose submerged in the fluid (**Figure 57**).

NOTE
On dual caliper models, bleed the caliper farthest away from the master cylinder first. Otherwise, air bubbles may remain in the brake system.

3B. On all other models, connect a clear plastic hose to the bleed valve on the caliper (**Figure 58**). Run the other end of the hose into a clean container. Fill the container with enough fresh brake fluid to keep the end of the hose submerged in the fluid (**Figure 57**).
4. Slowly apply the brake lever or pedal several times. Hold the lever or pedal in the applied position. Open the bleed valve about one-half turn. Allow the lever or pedal to travel to its limit. When this limit is reached, tighten the bleed screw. As the fluid enters the system, the level will drop in the reservoir. Make sure the fluid doesn't run out, to keep air from being drawn into the system.
5. Continue to pump the lever or pedal, open and close the bleed valve and fill the reservoir until the fluid emerging from the hose is completely free of bubbles.

NOTE
Do not allow the reservoir to empty during the bleeding operation or more air will enter the system. If this occurs, the entire procedure must be repeated.

6. Hold the lever or pedal down, tighten the bleed valve, remove the bleed tube and install the bleed valve dust cap.
7. Add fluid to correct the level in the reservoir. Slowly pump the brake lever or pedal several times (reservoir cap still off) until no air bubbles rise up through the fluid from holes at the bottom of the reservoir. This bleeds air from the master cylinder end of the line. Install the reservoir cap tightly.
8. Test the feel of the brake lever or pedal. It should be firm and should offer the same resistance each time it's operated. If it feels spongy, it is likely that there is still air in the system and it must be bled again.

WARNING
Do not ride the motorcycle until you are sure the brakes are working with a solid feel.

BRAKE FLUID CHANGE

Change the brake fluid according to the maintenance schedule in Chapter Three or

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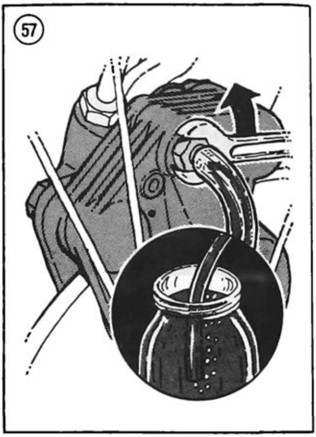

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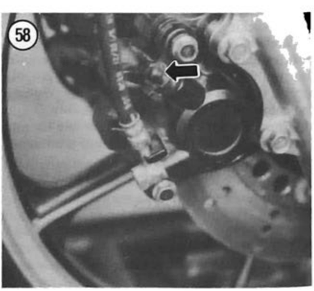


whenever the fluid becomes contaminated by water or dirt. Brake fluid changing is the same as bleeding; just continue adding fluid and bleeding it out until the fluid leaving the system is clean.

BRAKE HOSE REPLACEMENT

A brake hose should be replaced whenever it shows cracks, bulges or other damage. The deterioration of rubber by ozone and other atmospheric elements may require hose replacement more often than every 4 years. Refer to **Figure 59** and **Figure 60** for all brake hose components.

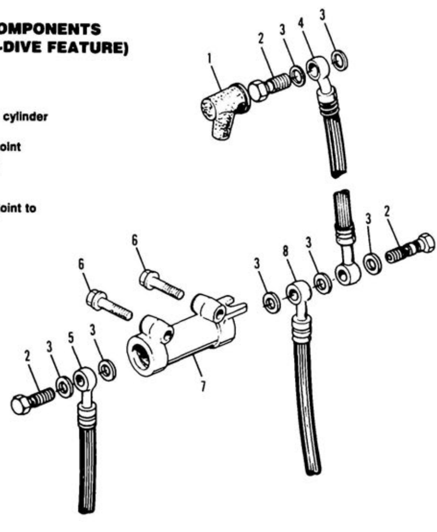
CAUTION

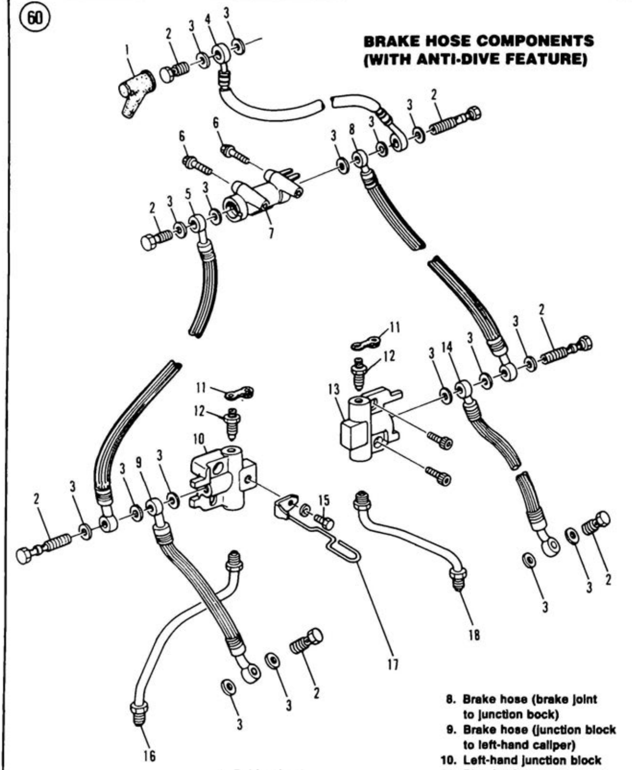
*On models with the anti-dive feature, the metal pipes (**Figure 61**) that go from the junction blocks on the front forks to the anti-dive units are plated (black chrome). If these pipes get scratched the plating will be removed and the pipe will start to rust. If neglected, this rust will work its way through the pipe and a hydraulic fluid leak will develop. These pipes should be inspected frequently; if rust has started to form, they must be replaced.*

(59)

BRAKE HOSE COMPONENTS (WITHOUT ANTI-DIVE FEATURE)

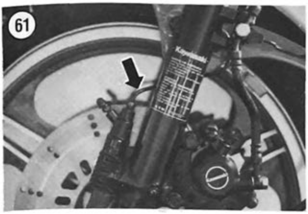
1. Rubber boot
2. Banjo bolt
3. Washer
4. Brake hose (master cylinder to brake joint)
5. Brake hose (brake joint to left-hand caliper)
6. Bolt
7. Brake joint
8. Brake hose (brake joint to right-hand caliper)





8. Brake hose (brake joint to junction bock)
9. Brake hose (junction block to left-hand caliper)
10. Left-hand junction block
11. Bleed valve cap
12. Bleed valve
13. Right-hand junction block
14. Brake hose (junction block to right-hand caliper)
15. Bolt
16. Left-hand brake pipe
17. Speedometer cable clip
18. Right-hand brake pipe

1. Rubber boot
2. Banjo bolt
3. Washer
4. Brake hose (master cylinder to brake joint)
5. Brake hose (brake hose to junction block)
6. Bolt
7. Brake joint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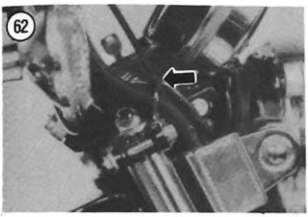
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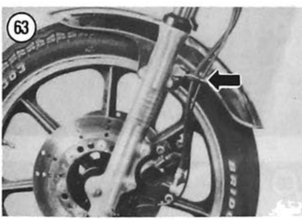
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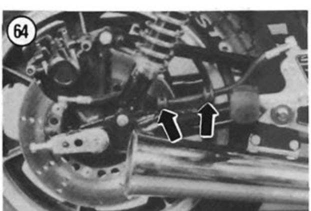
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1. Before replacing a brake hose, inspect the routing of the old hose carefully noting any guides and grommets the hose may go through as shown in **Figure 62**, **Figure 63** or **Figure 64**.
2. Put a drain pan beneath each connection to catch the brake fluid. Keep fluid off painted or plated surfaces.
3. Disconnect the banjo bolts securing the hose at each end (**Figure 65**). Remove the hose, the banjo bolt and washers on each side of the banjo bolt.
4. Install a new hose with new washers on each side of the banjo bolt. Make sure the hose fitting is correctly positioned in its attachment notch, if so equipped.
5. Torque the banjo bolts as described in **Table 2**.
6. Fill the master cylinder reservoir and bleed the system as described in this chapter.

BRAKE PADS

There is no recommended mileage interval for changing the friction pads in the disc brake. Pad wear depends greatly on riding habits and conditions. See *Brake Pad Inspection* in Chapter Three.

Always replace all pads (2 per disc) at the same time.

Front/Rear Brake Pad Removal

1. Remove the caliper mounting bolts. Refer to **Figure 66** for the front caliper and **Figure 67** for the rear caliper.


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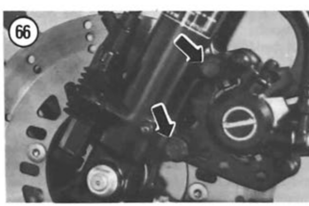
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2. Lift the caliper off the pad holder.
3. Remove the brake pads.

Front/Rear Brake Pad Installation

1. Remove the cap from the master cylinder and slowly push the piston (**Figure 68**) into the caliper while checking the reservoir to make sure it doesn't overflow. The piston should move freely. You may need to use a C-clamp to push the piston back into the caliper. If the piston sticks, remove the caliper and have it rebuilt by your Kawasaki dealer or a qualified specialist.
2. Make sure the brake pad sliders are in place (**Figure 69**).
3. Install the pads with the friction material toward the disc (**Figure 70**).
4. Make sure the anti-rattle spring is installed in the caliper (**Figure 71**).
5. Install the caliper. Make sure the flat-sided holder shafts are turned so that they allow the bolt to seat fully (**Figure 72**). Torque the caliper bolts as specified in **Table 2**.
6. Support the motorcycle with the wheel off the ground. Spin the wheel and pump the brake until the pads are seated against the disc.
7. Top up the fluid level in the master cylinder if necessary.

WARNING
Do not ride the motorcycle until you are sure the brakes are working with a solid feel. If necessary, bleed the brakes to remove any accumulated air from the system.

BRAKE CALIPERS

Caliper Rebuilding

See **Figure 73** or **Figure 74**. If the caliper leaks, it should be rebuilt. If the piston sticks in the cylinder, indicating severe wear or galling, the entire unit should be replaced. The factory recommends that the piston fluid seal and dust cover be replaced every 2 years or every other time the pads are replaced.

Rebuilding a leaky caliper requires special tools and experience. We therefore recommend that caliper service be entrusted to a Kawasaki dealer or brake specialist. You will save time and money by removing the caliper yourself and having a professional do the job.

Remove the calipers and disconnect the brake hoses as described in this chapter. Install the calipers and reconnect the brake hoses as described in this chapter; then bleed the brakes.

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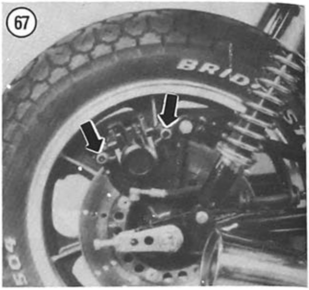

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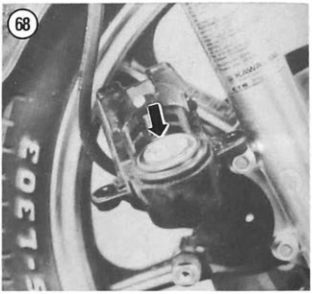

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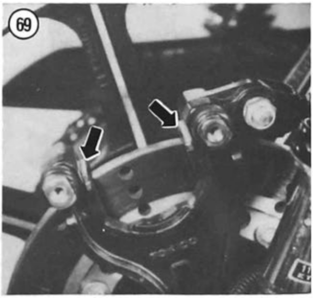

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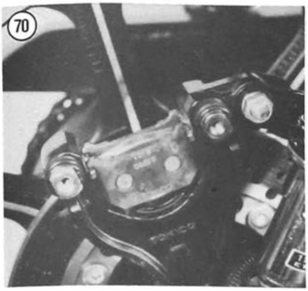

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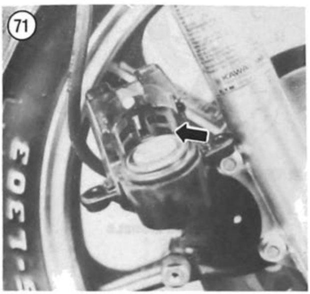

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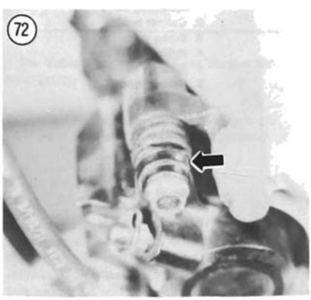

FRONT BRAKE CALIPER

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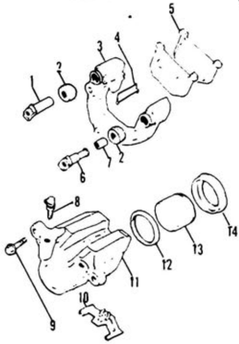
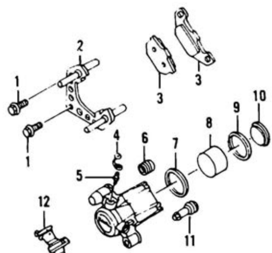


ALL MODELS EXCEPT ZX1100-A

1. Holder shaft
2. Shaft dust cover
3. Caliper body
4. Pad guide
5. Brake pad
6. Holder shaft
7. Friction boot
8. Bleed valve
9. Caliper shaft bolt
10. Anti-rattle spring
11. Caliper body
12. Piston fluid seal
13. Piston
14. Piston dust seal



ZX1100-A MODELS

1. Mounting bolts
2. Caliper holder
3. Brake pads
4. Rubber dust cap
5. Bleeder valve
6. Rubber boot
7. Fluid seal
8. Piston
9. Dust seal
10. Insulator
11. Friction boot
12. Anti-rattle spring

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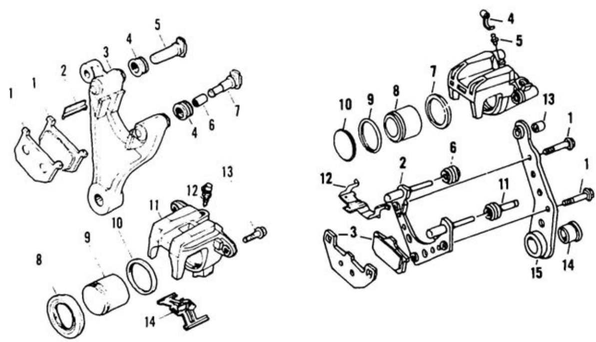
REAR BRAKE CALIPER



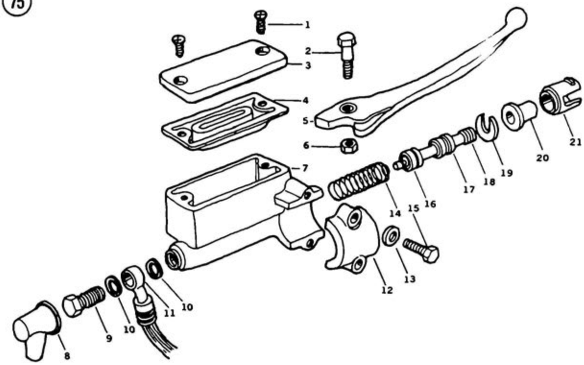
ALL MODELS EXCEPT ZX1100-A

1. Brake pad
2. Pad guide
3. Caliper holder
4. Shaft dust cover
5. Holder shaft
6. Friction boot
7. Holder shaft
8. Piston dust seal
9. Piston
10. Piston fluid seal
11. Caliper body
12. Bleed valve
13. Caliper shaft bolt
14. Anti-rattle spring

ZX1100-A MODELS

1. Mounting bolts
2. Caliper holder
3. Brake pads
4. Rubber dust cap
5. Bleeder valve
6. Rubber boot
7. Fluid seal
8. Piston
9. Dust seal
10. Insulator
11. Friction boot
12. Anti-rattle spring
13. Small spacer
14. Large spacer
15. Caliper bracket

75



FRONT MASTER CYLINDER

1. Cover screw (2)	8. Dust cover	15. Clamp bolt (2)
2. Lever pivot bolt	9. Banjo bolt	16. Primary cup
3. Cover	10. Copper washers	17. Secondary cup
4. Diaphragm	11. Brake hose	18. Piston
5. Lever	12. Clamp	19. Piston stop
6. Locknut	13. Washer (2)	20. Dust seal
7. Body/reservoir	14. Spring	21. Liner

See **Table 1** at the end of the chapter for brake wear limits.

WARNING
Do not ride the motorcycle until you are sure the brakes are operating properly.

MASTER CYLINDER REBUILDING

See **Figure 75** or **Figure 76**. If the master cylinder leaks, it should be rebuilt. If the piston sticks in the cylinder, indicating severe wear or galling, the entire unit should be replaced. Rapid darkening of fresh brake fluid is an indication that rubber parts inside the master cylinder have deteriorated.

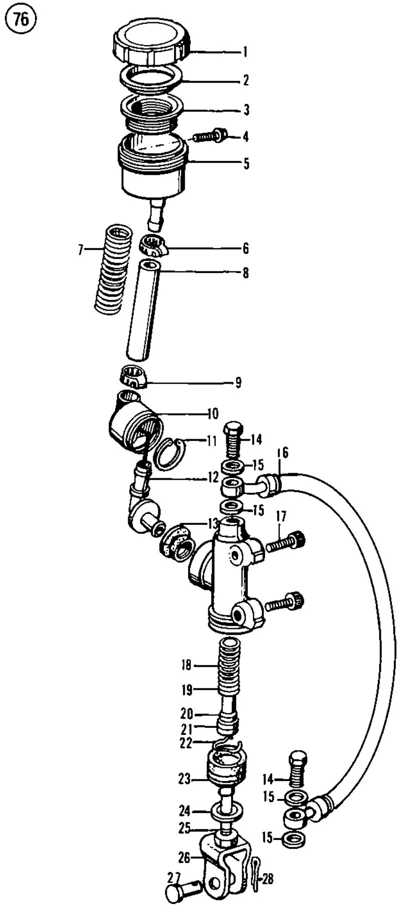
Rebuilding a master cylinder requires special tools and experience. We therefore recommend that service be entrusted to a Kawasaki dealer or brake specialist. You will save time and money by removing the master cylinder yourself, then having a professional do the rebuild.

See **Table 1** at the end of the chapter for brake wear limits.

FRONT MASTER CYLINDER

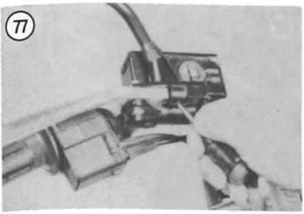
Removal

1. Remove the right rear view mirror.



REAR MASTER CYLINDER

1. Reservoir cap
2. Washer
3. Diaphragm
4. Bolt
5. Reservoir
6. Hose clamp
7. Hose protector
8. Brake hose
9. Hose clamp
10. Rubber boot
11. Circlip
12. Fitting
13. Rubber seal
14. Banjo bolt
15. Washer
16. Brake hose
17. Bolt
18. Return spring
19. Primary cup
20. Piston
21. End cap
22. Retainer
23. Rubber boot
24. Pushrod
25. Locknut
26. Eye
27. Pivot pin
28. Cotter pin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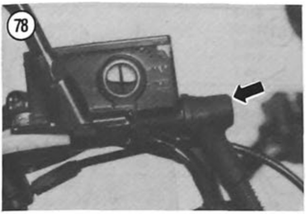
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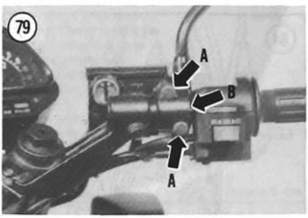

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2. Push up on the front brake light switch locking tab (on the bottom of the lever bracket) (Figure 77) and pull the switch free from the lever bracket.
3. Pull back the rubber boot (**Figure 78**) and remove the banjo bolt securing the brake hose to the master cylinder.

CAUTION
Brake fluid ruins paint and plastic surfaces. If you spill any, wipe it up immediately.

4. Remove the 2 clamp bolts (A, **Figure 79**) and the clamp. Take off the master cylinder.

Installation

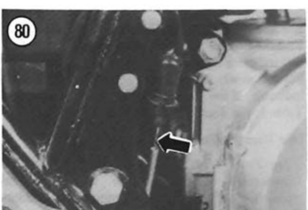
1. Install the master cylinder with the projection on the clamp toward the throttle grip (B, **Figure 79**).
2. Install the clamp bolts and washers. Tighten the upper bolt first, then the lower one.
3. Connect the brake line. Use new washers on each side of the banjo bolt and torque it as specified in **Table 2**.
4. Bleed the brake system as described in this chapter.

WARNING
Do not ride the motorcycle until you are sure the brakes are operating properly.

REAR MASTER CYLINDER

Removal/Installation

The rear master cylinder is behind the right footpeg bracket.
1. Disconnect the rear brake light switch spring at the switch (**Figure 80**).
2. Remove the brake pedal, muffler mount and the footpeg bracket mounting bolts (**Figure 81**). Carefully turn the footpeg bracket over, without twisting the brake hose excessively.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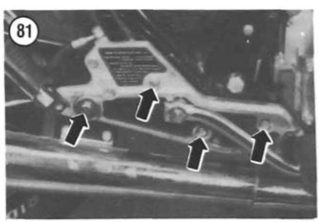
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3. Remove the cotter pin from the pushrod link pivot (**Figure 82**). Remove the pivot pin.
4. While holding the master cylinder, remove the 2 rear master cylinder mounting bolts. Pull the master cylinder free of the brake pushrod and dust cover.

WARNING
The rear master cylinder is mounted under strong spring pressure. Be careful not to injure yourself while removing and installing it.

5. Remove the banjo bolt that connects the master cylinder to the rear brake hose.

CAUTION
Brake fluid ruins paint and plastic surfaces. If you spill any, wipe it up immediately.

6. Loosen the reservoir hose clamp and pull the hose free from the master cylinder. Tie the hose up high to prevent fluid loss.
7. To install, reverse these steps. Note the following:
   a. Inspect the pushrod boot on the bottom of the master cylinder. Install a new one if cracked or worn.
   b. Install the master cylinder on the pushrod and pull the rubber boot up into place on the cylinder.
   c. Torque the 2 master cylinder mounting bolts as specified in **Table 2**.
   d. When connecting the brake hose, use new washers on both sides of the banjo bolt and torque the bolt as specified in **Table 2**.
   e. Fill and bleed the brake system as described in this chapter.
   f. Adjust the rear brake pedal height as described in Chapter Three.

WARNING
Do not ride the motorcycle until you are sure the brakes are operating properly.

BRAKE DISCS

Inspection

It is not necessary to remove the disc from the wheel to inspect it. Small marks on the disc are not important, but scratches deep enough to snag a fingernail reduce braking effectiveness and increase pad wear.

1. Measure the thickness at several points around the disc with vernier calipers or a micrometer (**Figure 83**). The disc must be replaced if the thickness, at any point, is less than the limit in **Table 1**.

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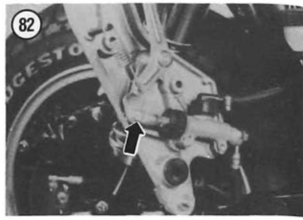

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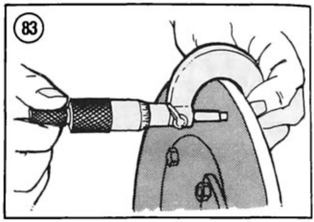

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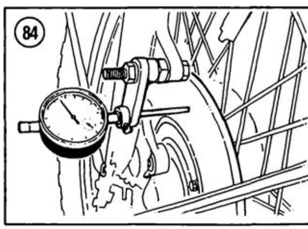


2. Check the disc runout with a dial indicator. Raise the wheel being checked, set the arm of the dial indicator against the surface of the disc (**Figure 84**) and slowly rotate the wheel while watching the indicator. If the runout is greater than specified in **Table 1**, the disc should be replaced.

Disc Removal/Installation

See *Front Wheel Disassembly* or *Rear Wheel Disassembly* in this chapter for brake disc replacement. Check the disc runout after installing the new disc.

Table 1 DISC BRAKE WEAR

Caliper/disc	in.	mm
Caliper ID	1.690	4[illegible]92
Caliper piston OD	1.683	4[illegible]75
Disc runout	0.012	0.[illegible]
Disc thickness–front	0.177	4.[illegible]
Disc thickness–rear	0.236	6.0
Pad thickness	0.040	1.0
Front master cylinder		
Cylinder ID	0.628	15.95
Piston OD	0.622	15.80
Primary cup OD	0.630	16.0
Secondary cup OD	0.646	16.4
Spring free length	1.37	34.8
Rear master cylinder		
Cylinder ID	0.554	14.08
Piston OD	0.543	13.80
Primary cup OD	0.555	14.1
Secondary cup OD	0.575	14.6
Spring free length	1.29	32.8

Table 2 DISC BRAKE TORQUES

	ft.-lb.	mkg
Banjo bolts	22	3.0
Bleed valve	70 in.-lb.	0.80
Brake anchor bolt/nut	22	3.0
Brake lever pivot bolt	25 in.-lb.	0.30
Brake lever pivot locknut	50 in.-lb.	0.60
Caliper holder shaft bolts	13	1.8
Caliper mounting bolts	24	3.3
Disc mounting bolts		
Front, cast wheels	16.5	2.3
Front, wire wheels	30	4.0
Rear	16.5	2.3
Master cylinder clamp bolts	80 in.-lb.	0.90

Table 3 CHASSIS TORQUES

	ft.-lb.	mkg
Chain-drive and shaft-drive		
Brake pedal pivot cap nut	14.5	2.0
Front axle nut	50	7.0
Front axle clamp nuts (J)	13	1.8
Front axle pinch bolt (K,M, A, D)	14.5	2.0
Fork clamp bolts	13	1.8
Fork bottom Allen bolt	17	2.3
Handlebar clamp bolts		
Tubular handlebars	13	1.8
Adjustable handlebars	18	2.5
Handlebar holder-to-triple clamp bolts		
Adjustable handlebars	55	7.5

(continued)

Table 3 CHASSIS TORQUES

	ft.-lb.	mkg
Chain-drive and shaft-drive (cont.)		
Rear axle nut		
Chain-drive		
ZX1100-A	90	12.0
All other models	72	10.0
Shaft-drive	100	14.0
Rear sprocket nuts	30	4.0
Shock absorber mounts		
Chain-drive	22	3.0
Shaft-drive	18	2.5
Steering head clamp bolt	13	1.8
Steering head top bolt	30	4.3
Swing arm pivot nut	70	10.0
Torque link nuts	22	3.1
Uni-Trak suspension		
Tie rod bolt	51	7.0
Rocker arm bolt	51	7.0
Shock absorber		
Upper bolt	27	3.8
Lower bolt	51	7.0
Wire wheel spokes	26 in.-lb.	0.30
Shaft drive only		
Final gear case cover bolts	18	2.5
Final gear case mounting nuts	22	3.0
Final gear case drain plug	14.5	2.0
Final gear case pinion nut	90	12.0
Swing arm pivot screws	11	1.5

Table 4 TIRES AND TIRE PRESSURE (U.S. AND CANADA)

	Pressure @ load	
	0-215 lb. (0-97.5 kg)	Over 215 lb. (Over 97.5 kg)
KZ1000-J, KZ1100-B (tubeless)		
Front 3.5V-19 4PR	28 psi (200 kPa)	28 psi (200 kPa)
Rear 4.25V-18 4PR	32 psi (225 kPa)	36 psi (250 kPa)
KZ1000-K (tubeless)		
KZ1000-M (tube-type)		
Front 3.25H-19 4PR	28 psi (200 kPa)	28 psi (200 kPa)
Rear 130/90-16 67 H 4PR	28 psi (200 kPa)	32 psi (225 kPa)
KZ1000-A (tubeless)		
Front 3.50 H-19 4PR	28 psi (200 kPa)	28 psi (200 kPa)
Rear 130/90-16 67H 4PR	28 psi (200 kPa)	36 psi (250 kPa)
KZ1000-D (tubeless)		
Front 3.25H-19 4PR	28 psi (200 kPa)	28 psi (200 kPa)
Rear 130/90-16 67H 4PR	28 psi (200 kPa)	36 psi (250kPa)

Table 7 TIRES AND TIRES PRESSURE (EUROPEAN)

Model/tire size	Pressure @ load 0-215 lb. (0-97.5 kg)	215-330 lb. (97.5-150 kg)	Over 300 lb. (Over 150 kg)
KZ1000-J, KZ1100-B			
Front 3.25V-19 4PR (tubeless)			
Up to 130 mph (210 kph)	28 psi (200 kPa)	28 psi (200 kPa)	32 psi (225 kPa)
Over 130 mph (210 kph)	32 psi (225 kPa)	32 psi (225 kPa)	32 psi (225 kPa)
Rear 4.25V-18 4PR (tubeless)			
Up to 130 mph (210 kph)	32 psi (225 kPa)	32 psi (225 kPa)	36 psi (250 kPa)
Over 130 mph (210 kph)	41 psi (290 kPa)	41 psi (290 kPa)	41 psi (290 kPa)
KZ1000-K			
Front 3.25V-19 4PR (tubeless)			
Up to 130 mph (210 kph)	28 psi (200 kPa)	28 psi (200 kPa)	32 psi (225 kPa)
Over 130 mph (210 kph)	32 psi (225 kPa)	32 psi (225 kPa)	32 psi (225 kPa)
Rear 130/90V-16 4PR (tubeless)			
Up to 130 mph (210 kph)	28 psi (200 kPa)	32 psi (225 kPa)	36 psi (250 kPa)
Over 130 mph (210 kph)	41 psi (290 kPa)	41 psi (290 kPa)	41 psi (290 kPa)
KZ1100-A			
Front 3.50V-19 4PR (tubeless)			
Up to 130 mph (210 kph)	28 psi (200 kPa)	28 psi (200 kPa)	28 psi (200 kPa)
Over 130 mph (210 kph)	32 psi (225 kPa)	32 psi (225 kPa)	32 psi (225 kPa)
Rear 130/90V-16 4PR (tubeless)			
Up to 130 mph (210 kph)	28 psi (200 kPa)	36 psi (250 kPa)	36 psi (250 kPa)
Over 130 mph (210 kph)	41 psi (290 kPa)	41 psi (290 kPa)	41 psi (290 kPa)
ZX1100-A			
Front 110/90 V18 4PR (tubeless)			
Up to 130 mph (210 kph)	28 psi (200 kPa)	32 psi (225 kPa)	-
Over 130 mph (210 kph)	32 psi (225 kPa)	32 psi (225 kPa)	-
Rear 130/90 V17 4PR (tubeless)			
Up to 130 mph (210 kph)	32 psi (225 kPa)	36 psi (250 kPa)	-
Over 130 mph (210 kph)	41 psi (290 kPa)	41 psi (290 kPa)	-
KZ1100-D			
Front 3.25V-19 4 PR (tubeless)			
Up to 130 mph (210 kph)	28 psi (200 kPa)	28 psi (200 kPa)	-
Over 130 mph (210 kph)	32 psi (225 kPa)	32 psi (225 kPa)	-
Rear 130/90V-16 4PR (tubeless)			
Up to 130 mph (210 kph)	28 psi (200 kPa)	36 psi (250 kPa)	-
Over 130 mph (210 kph)	41 psi (290 kPa)	41 psi (290 kPa)	-

NOTE: If you have a 1982 and later P Series Police Model, first check the Supplement at the back of this manual for any specific service information.

CHAPTER ELEVEN

CHASSIS

This chapter covers the front forks, steering head, rear shock absorbers, swing arm and drive chain. Chassis wear limits and torque specifications are given in **Tables 1-4** at the end of the chapter.

FAIRING

The 1982 KZ1100-B is factory equipped with a cafe-racer type fairing. See **Figure 1** for fairing and windscreen removal and installation.

The ZX1100-A has a frame mounted half-fairing. See **Figure 2** for 1983 models or **Figure 3** for 1984 models for fairing and windscreen removal and installation.

HANDLEBARS

One-piece Handlebars

The handlebars on most models are easy to detach by removing the handlebar damp bolts (**Figure 4**).

When installing the handlebars, make sure the arrows on the clamps point to the front. Torque the front bolts first, then the rear bolts as specified in **Table 3**. There should be an even gap at the rear of the clamps.

Built-up Handlebars

The 1982 B models and ZX1100-A models have 4-piece handlebars that clamp to each fork tube.

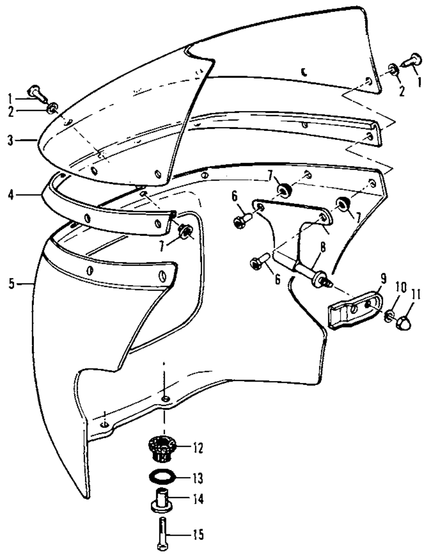
Special attention is required to install these handlebars properly.

1. The top of the fork tube should stick up 0.040 in. (1 mm) above the top of the triple clamp (equal to the thickness of the handlebar holder spacer); see **Figure 5**. If necessary reposition the fork tuber, see *Front Forks* in this chapter.
2. Lay the spacer in place (**Figure 6**).
3. Install the cast handlebar holder, the positioning plate and bolt (A, **Figure 7**). On B models the mm on the plate should point toward the front; on ZX1100-A models the arrow should point toward the rear.
4. Install the holder bolt (8, **Figure 7**) through the holder and into the fork tube. Tighten the holder bolt as specified in **Table 3**.
5. Tighten the positioning plate bolt.
6. Make sure the tube stub clamp bolt is tight. See **Figure 8** for B models or **Figure 9** for ZX1100-A models.

FRONT FORK

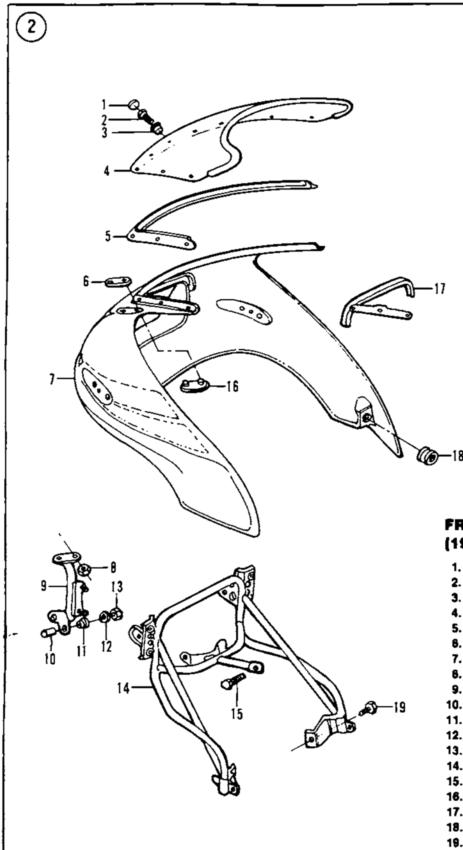
The front suspension consists of a spring-controlled, hydraulically damped telescopic fork. The damping rate is determined by the viscosity of the fork oil used and the spring rate can be altered by varying the air pressurization of the forks; refer to Chapter Three for air pressure adjustment. Before suspecting major trouble, drain

1



FRONT FAIRING (1982 KZ1100-B)

1. Bolt
2. Washer
3. Wind screen
4. Trim
5. Fairing
6. Nut
7. Damping rubber
8. Fairing mounting bracket
9. Bracket
10. Washer
11. Cap nut
12. Damping rubber
13. O-ring
14. Collar
15. Bolt



FRONT FAIRING (1983 ZX1100-A)

1. Cap
2. Bolt
3. Collar
4. Wind screen
5. Trim
6. Damping rubber
7. Fairing
8. Nut
9. Bracket
10. Collar
11. Damping rubber
12. Washer
13. Nut
14. Fairing mounting bracket
15. Bolt
16. Damper rubber
17. Trim
18. Damper rubber
19. Bolt

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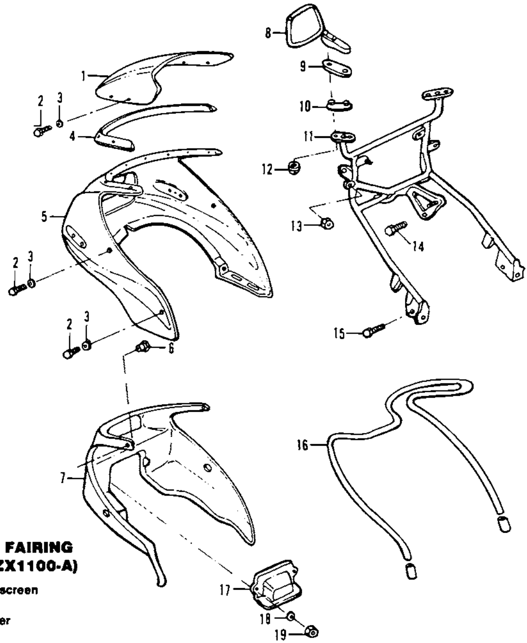
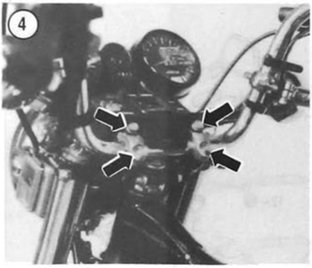


FRONT FAIRING (1984 ZX1100-A)

1. Wind screen
2. Bolt
3. Washer
4. Trim
5. Fairing
6. Nut
7. Fairing inner panel
8. Mirror
9. Damper rubber
10. Damper rubber
11. Fairing mounting bracket
12. Nut
13. Nut
14. Bolt
15. Bolt
16. Trim
17. Headlight cover
18. Washer
19. Bolt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the fork oil and refill with the proper type and quantity. If you still have trouble, such as poor damping, tendency to bottom out or top out or leakage around the fork seals, then follow the service procedures in this section.

To simplify fork service and to prevent the mixing of parts, the fork legs should be removed, serviced and reinstalled individually.

Each front fork leg consists of the fork leg (inner tube), slider (outer tube), fork spring and damper rod with its damper components.

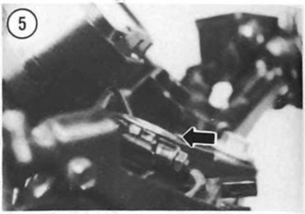
Some models have an air pressure equalizing tube just above the lower triple clamp (**Figure 10**). A hole drilled through each fork tube allows air to flow back and forth between the tubes. There are 2 O-ring seals on each tube to prevent leakage around the fork tubes.

NOTE
The ZX1100-A models are equipped with an anti-dive feature. The anti-dive unit is mounted to the lower end of each fork leg.

Oil Change

This procedure tells how to change the fork oil without removing the forks from the motorcycle. If the forks are removed and disassembled, more of the old oil will be drained.

1. Support the bike under the engine so the front wheel clears the ground.
2. Release all air pressure from the fork leg; remove the cap (**Figure 10** or A, **Figure 11**) and push in the valve core until all pressure is released.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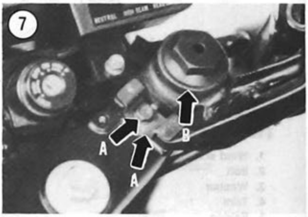
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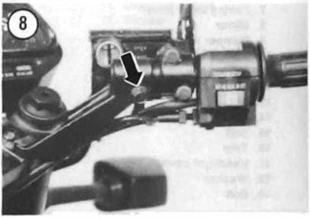
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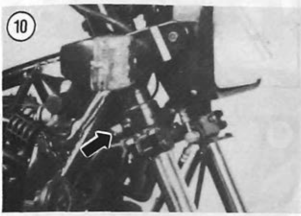

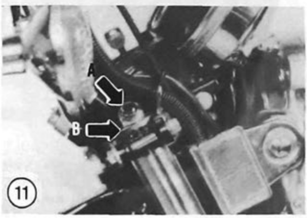

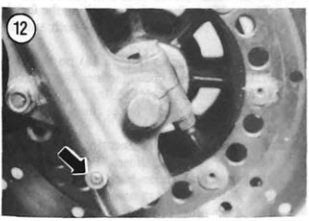

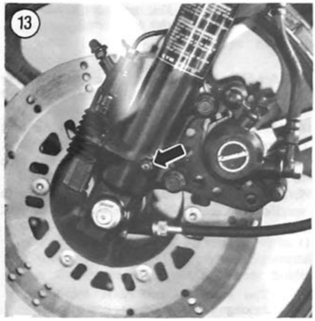

3. Place a drain pan under the fork and remove the drain screw. See **Figure 12** and **Figure 13**. Let the fork drain for a few minutes, then pump the fork (keeping your hand on the brake lever) to help expel the oil. Install the drain screw and repeat for the other fork leg.

WARNING

Do not allow the fork oil to contact the brake disc or pads. Stopping power will be greatly reduced. If the brakes are contaminated, clean the disc with a non-petroleum based solvent and install new brake pads.

4. Remove the fork top caps or plugs; see *Fork Removal* in this chapter.

WARNING

Release all fork air pressure before removing the fork plugs or caps. Air pressure and spring preload may cause the plugs or caps to pop out suddenly.

5. Remove the fork spring(s) and any spring seat(s) from inside the fork tubes.
6. Fill the fork tubes with slightly less than the specified quantity of oil; see **Table 4** at the end of the chapter.

NOTE

The amount of oil poured in is not as accurate a measurement as the actual *level of the oil. You may have to add more oil later in this procedure.*

7. After filling both tubes, slowly pump the forks up and down by hand several times to distribute the oil throughout the fork damper.
8. With the fork springs removed and the fork compressed or extended as indicated in **Table 4**, measure the distance from the top of the fork tube to the surface of the oil (**Figure 14**).
9. Add oil, if required, to bring the level up to specification; see **Table 4**. Don't overfill the fork legs.

CAUTION
Too much oil can cause hydraulic locking of the forks during compression, destroying the oil seals. An incorrect oil level will also interfere with proper operation of air forks.

10. Install the fork spring(s) and spring seat(s).

NOTE
If one end of the fork spring has more closely wound coils than the other end, install the spring with the closely wound coils at the top.

11. Install the fork top caps or plugs; see *Fork Installation* in this chapter.
12. Pressurize the forks as described in Chapter Three.

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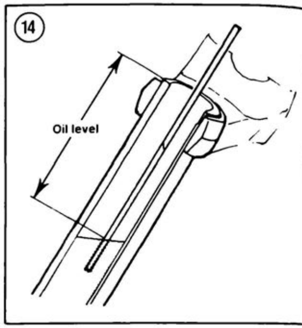

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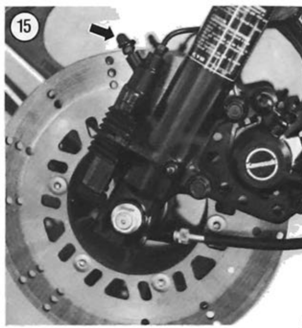
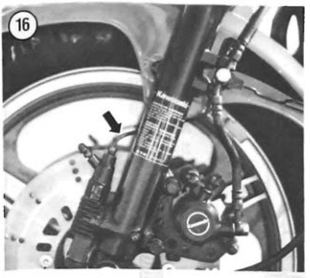
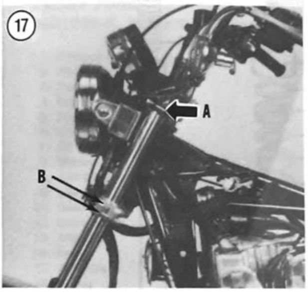


Removal/Installation

1. Raise the front wheel off the ground; support the motorcycle securely under the engine.
2. Remove the brake caliper and front wheel as described in Chapter Ten.
3. On models with rubber fork boots, loosen the fork boot clamps.
4. Remove the front fender.
5. Release all air pressure from the fork leg; remove the cap and push in the valve core until all pressure is released.
6. On models equipped with the anti-dive feature, perform the following:
   a. Attach a clear plastic hose to the bleed valve (**Figure 15**) on the anti-dive unit on the fork leg and drain the brake fluid from both anti-dive units.
   b. Loosen the nipples (**Figure 16**) on the metal brake line from the junction block to the anti-dive unit on each fork leg.
   c. Remove the metal brake lines from both anti-dive units.
   d. Remove the screws securing the junction blocks to the fork sliders. Pull the junction blocks and brake hoses back and away from the fork sliders. It is not necessary to disconnect any of the other brake lines.





7. On models with built-up handlebars, remove the fork cap bolt (B, **Figure 7**), and loosen the fork plug inside the tube.
8. Loosen the upper fork clamp bolt (A, **Figure 17**).
9. Loosen the fork cap, but do not remove it.

NOTE
On some models, the handlebars may need to be detached for access to the fork plugs or bolts.

10. Loosen the lower fork clamp bolts (B, **Figure 17**).
11. Work the fork leg down and out of the clamps with a twisting motion.
12. Install by reversing these steps. Note the following:

a. On models with an air balance tube at the bottom triple clamp, before installing the fork legs, oil the O-rings inside the connecting tube sleeves.
b. On models with one-piece handlebars, the top of the fork tube should be even with the top of the triple clamp; the cap will be above the clamp (B, **Figure 11**).
c. On models with built-up handlebars, the top of the fork tube should stick up 0.040 in. (1 mm) above the top of the triple clamp (equal to the thickness of the handlebar holder spacer).

CAUTION
Both fork tubes must be installed at exactly the same height to prevent axle and suspension damage when the suspension is bottomed or fully extended.

d. Torque the fork mounting bolts as specified in **Table 3**.
e. Pressurize the forks as described in Chapter
f. On models equipped with the anti-dive feature, re-attach the junction blocks to the fork sliders and tighten the screws securely. Install the metal brake lines from both anti-dive units to the junction blocks on the fork sliders. Tighten the nipples securely. Refill the front brake system with brake fluid and bleed the system as described in Chapter Ten.

Disassembly

Refer to **Figures 18-24** for this procedure. Disassembly of the fork leg requires some special tools and patience. If you have trouble taking the fork leg apart, take it to a Kawasaki dealer to keep from damaging it or hurting yourself.

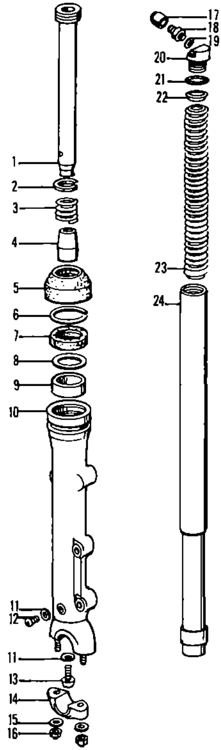
Minor variations exist between models. Pay particular attention to the location and positioning of spacers, washers and springs to make assembly easier.

1. Release any air pressure from the fork leg.

18

FRONT FORK (KZ1000-J, KZ1100-B1)

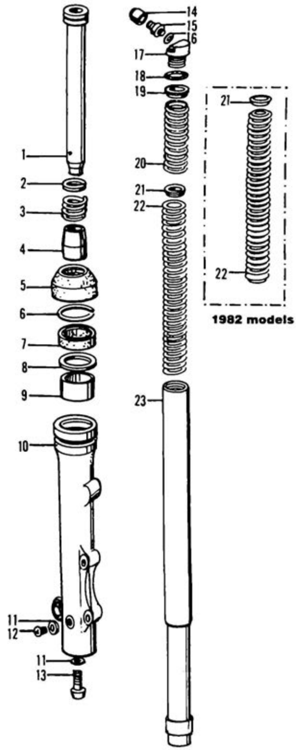
1. Damper rod
2. Piston ring
3. Rebound spring
4. Damper rod base
5. Dust seal
6. Circlip
7. Oil seal
8. Washer
9. Anti-friction ring
10. Slider
11. Gasket
12. Drain screw
13. Allen bolt
14. Axle clamp
15. Washer
16. Nut
17. Cap
18. Air valve
19. O-ring
20. Top cap
21. O-ring
22. Spring seat
23. Fork spring
24. Fork tube



(19)

FRONT FORK
(KZ1000-K, KZ1000-M, KZ1100-A)

1. Damper rod
2. Piston ring
3. Rebound spring
4. Damper rod base
5. Dust seal
6. Circlip
7. Oil seal
8. Washer
9. Anti-friction ring
10. Slider
11. Gasket
12. Drain screw
13. Allen bolt
14. Cap
15. Air valve
16. O-ring
17. Top cap
18. O-ring
19. Spring seat
20. Fork spring (upper)
21. Spring seat
22. Fork spring (lower)
23. Fork tube



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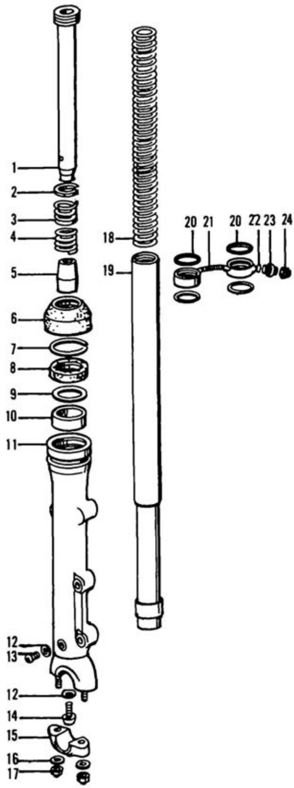
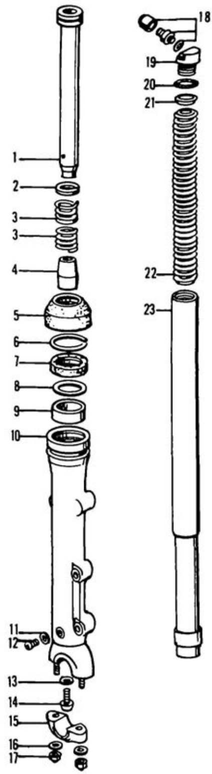


FRONT FORK (KZ1100-B2)

1. Damper rod
2. Piston ring
3. Rebound spring
4. Rebound spring
5. Damper rod base
6. Dust seal
7. Circlip
8. Oil seal
9. Washer
10. Anti-friction ring
11. Slider
12. Gasket
13. Drain screw
14. Allen bolt
15. Axle clamp
16. Washer
17. Nut
18. Fork spring
19. Fork tube
20. O-ring
21. Connecting tube
22. O-ring
23. Air valve
24. Cap

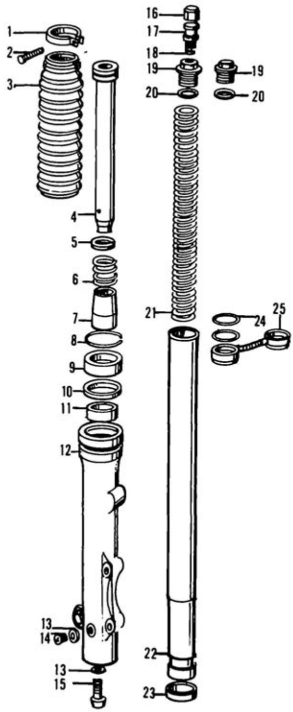
(21)



FRONT FORK (KZ1000-R)

1. Damper rod
2. Piston ring
3. Rebound spring
4. Damper rod base
5. Dust seal
6. Circlip
7. Oil seal
8. Washer
9. Anti-friction ring
10. Slider
11. Gasket
12. Drain screw
13. Washer
14. Allen bolt
15. Axle clamp
16. Washer
17. Nut
18. Air valve assembly
19. Top cap
20. O-ring
21. Spring seat
22. Fork spring
23. Fork tube

22



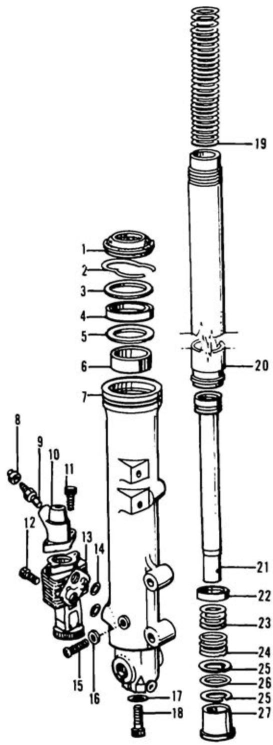
FRONT FORK
(KZ1100-L, KZ1000-D)

1. Clamp
2. Bolt
3. Rubber boot
4. Damper rod
5. Piston ring
6. Rebound spring
7. Damper rod base
8. Circlip
9. Dust seal
10. Washer
11. Anti-friction ring
12. Slider
13. Gasket
14. Drain screw
15. Allen bolt
16. Cap
17. Air valve
18. O-ring
19. Top cap
20. O-ring
21. Fork spring
22. Fork tube
23. Fork tube bushing
24. O-ring
25. Connecting tube

(23)

FRONT FORK (ZX1100-A)

1. Dust seal
2. Retainer
3. Washer
4. Oil seal
5. Washer
6. Guide bushing
7. Fork slider
8. Cap
9. Bleed valve
10. Plunger assembly
11. Bolt
12. Bolt
13. Anti-dive valve assembly
14. O-ring
15. Drain screw
16. Gasket
17. Gasket
18. Allen screw
19. Fork spring
20. Fork tube
21. Damper rod
22. Piston ring
23. Rebound spring
24. Rebound spring
25. Spring
26. Washer
27. Damper rod base



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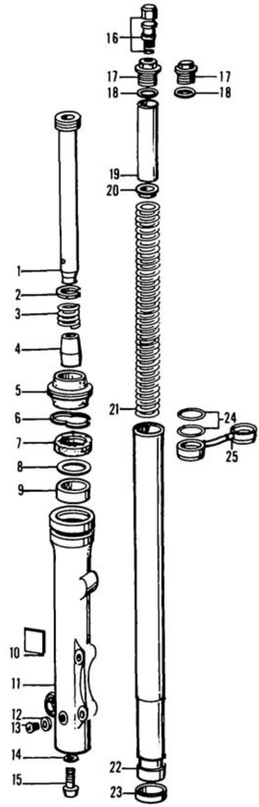
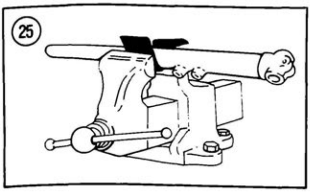


FRONT FORK (ZN1100-B)

1. Damper rod
2. Piston ring
3. Rebound spring
4. Damper rod base
5. Dust seal
6. Retainer
7. Oil seal
8. Washer
9. Anti-friction ring
10. Label
11. Slider
12. Gasket
13. Drain screw
14. Gasket
15. Allen bolt
16. Air valve assembly
17. Top cap
18. O-ring
19. Spacer
20. Spring seat
21. Fork spring
22. Fork tube
23. Fork tube bushing
24. O-ring
25. Connecting tube

25



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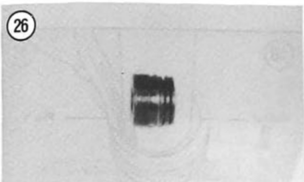

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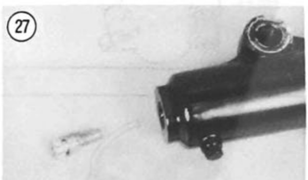
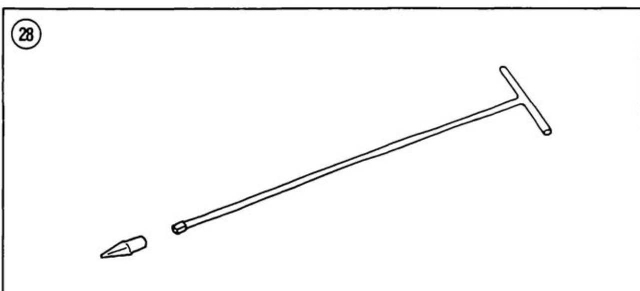


2. Hold the upper fork tube in a vise with a rubber sheet to grip the tube (**Figure 25**). Remove the top cap and spring seat(s), spacer(s) and spring(s). The B models have a plug with an O-ring inside the tube (**Figure 26**).
3. Remove the fork from the vise; pour the oil out and discard it. Pump the fork several times by hand to expel the remaining oil.
4. Clamp the fork slider in a vise with a rubber sheet to grip the slider.
5. Remove the Allen bolt and gasket from the bottom of the slider (**Figure 27**). The fork bottom Allen bolt is secured with a locking agent and can be hard to remove. After the Allen bolt is loosened, it may not come out because the damper rod base it screws into may turn with the bolt. Try one of the following methods:

   a. If a heavy-duty air powered impact wrench is available, try that first.
   b. If necessary, you may be able to keep the damper rod base from turning by temporarily installing the fork spring and cap and having an assistant compress the fork while you remove the bottom bolt.
   c. If the preceding methods are not successful, you will have to keep the damper rod from turning with a special tool on the end of several socket extensions (**Figure 28**). A Kawasaki dealer can tell you which tool to use or you may find that a bolt with a 22 mm head (welded to a long rod) will fit the end of the damper rod.

6. Slide the rubber dust cap up off of the fork slider; check for the presence of an oil seal retaining clip

28



with notches on the inside (**Figure 29**). If such a retainer is present, remove it with circlip pliers (**Figure 30**). If the oil seal retainer is a smooth wire with several indentations (**Figure 31**), the clip does not have to be removed until the fork tube is removed.

7. Pull the inner fork tube from the slider.

NOTE
You will probably have to slam the tube and slider apart repeatedly, removing the slider's anti-friction ring, washer and oil seal slider as the tube comes out.

8. Remove the damper rod and rebound spring. The damper rod base will probably be at the bottom of the fork slider.

9. On models whose oil seal retainer is a smooth wire circlip with several indentations, pry the circlip out of the slider (**Figure 32**).

10. Pry the oil seal out of the slider if you intend to install a new one.

NOTE
It may be necessary to slightly heat the area on the slider around the oil seal prior to removal. Be careful not to damage the top of the slider.

11. On models equipped with the anti-dive feature, the anti-dive mechanism does not have to be removed from the fork slider for routine fork service. If necessary, remove the screws securing the anti-dive unit to the fork slider and remove the unit and the O-ring seals.

Inspection

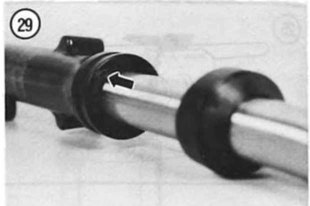
1. Thoroughly clean all parts in solvent and dry. Check the fork tube for signs of wear or scratches that would damage the oil seal.

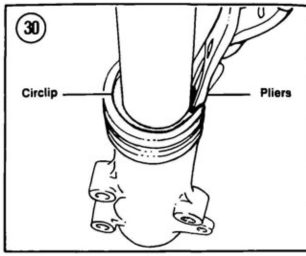
2. Inspect the fork tube and slider guide bushings (**Figure 33**). Install new bushings if worn or damaged.

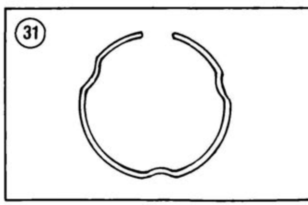
3. Check the damper rod for straightness (A, **Figure 34**). If bent, install a new rod.

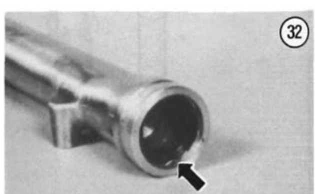
4. Carefully check the piston ring for wear or damage (B, **Figure 34**).

5. Inspect the oil seals and dust cap (**Figure 35**) for scoring and nicks or loss of resiliency. Replace them if their condition is questionable.









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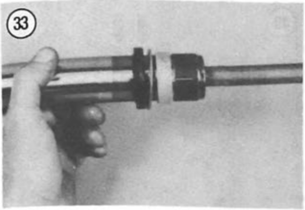

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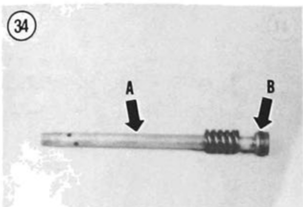

6. On models with built-up handlebars, check the O-ring on the top plug (**Figure 36**) and install a new one if damaged.
7. Check the upper fork tube for straightness. If bent or severely scratched, it should be replaced.
8. Check the lower slider for dents or exterior damage that may cause the upper fork tube to drag. Replace it if necessary.
9. Measure fork spring(s) free length (**Figure 37**). Replace the springs if shorter than specified in **Table 1**. Compare the left and right fork springs. Replace them all if one side is much shorter than the other.
10. On models with an air balance tube at the bottom triple clamp, inspect the O-rings inside the connecting tube sleeves. Install new O-rings if damaged.

Assembly

Refer to **Figures 18-24** for this procedure.
1. On models equipped with the anti-dive feature, if the anti-dive mechanism was removed from the fork slider install it at this time. Install new O-ring seals between the anti-dive unit and the fork slider and tighten the screws securely.
2. Put the damper rod spring(s) onto the damper rod and insert them into the top of the fork tube (**Figure 38**).

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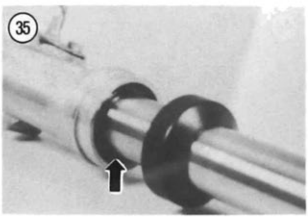

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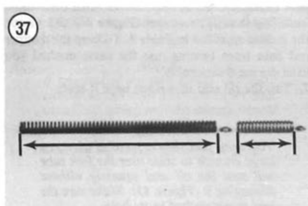

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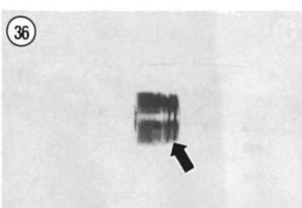

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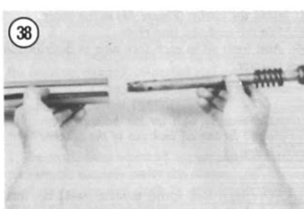
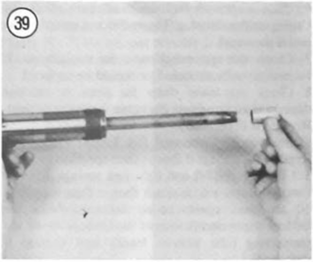




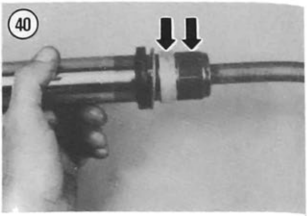
3. Insert the damper rod base onto the end of the damper rod (**Figure 39**).
4. Make sure that the slider's anti-friction ring, the washer and the oil seal are in place on the fork tube (**Figure 40**). Install the seal with the numbered or marked side up.
5. Insert the fork tube into the slider (**Figure 41**). The slit in the anti-friction ring should face either the right or left side of the fork slider, in order to minimize wear.
6. Apply a locking agent such as Loctite Lock N' Seal to the threads of the bottom Allen bolt before installing it with its washer (**Figure 42**) and torque the bolt as specified in **Table 3**. To keep the damper rod base from turning, use the same method you used during disassembly.
7. Tap the oil seal into place until it seats.

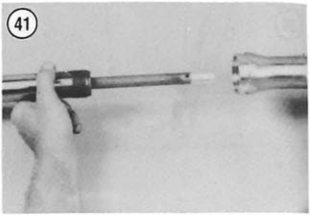
NOTE
*You may find that a piece of pipe just large enough to slide over the fork tube will seat the oil seal squarely without damaging it (**Figure 43**). Make sure the seal is not cocked in its hole.*

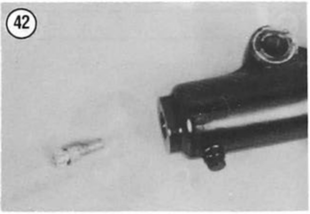
8. Install the circlip (**Figure 44**) in the slider.
9. Slide the dust cap into place.
10. Add fresh oil to each fork tube as described in this chapter.

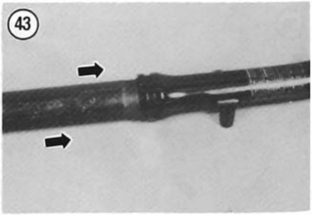
NOTE
On models with an air balance tube, don't let the oil leak out of the balance holes.

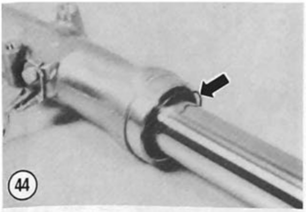
11A. On single fork spring models, install the fork spring, fork spring seat and spacer (if so equipped).











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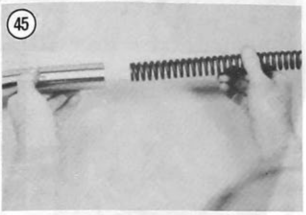

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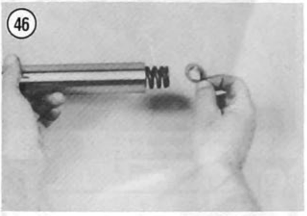

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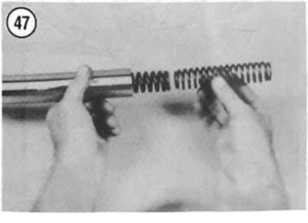

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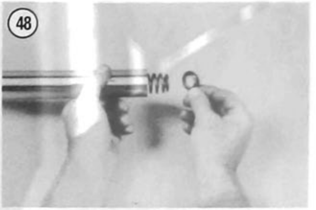

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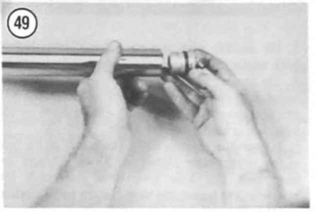

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11B. On dual fork spring models, install the long spring (**Figure 45**), spring seat (**Figure 46**), short spring (**Figure 47**) and spring seat (**Figure 48**).

NOTE
If one end of the fork spring has more closely wound coils than the other end, install the spring with the closely wound coils at the top.

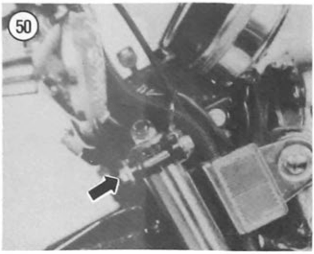
12. Install the top cap (**Figure 49**) or plug.

STEERING

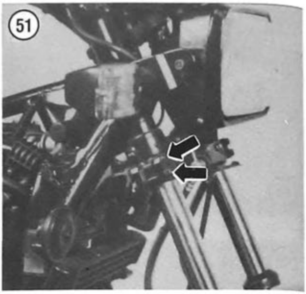
If your periodic checks detect excessive steering play, adjust the steering as described in this section. The steering head should also be disassembled and the bearings cleaned, inspected and lubricated with a waterproof grease according to the maintenance schedule in Chapter Three.

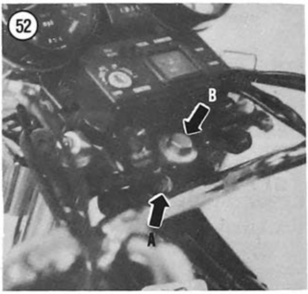
Adjustment

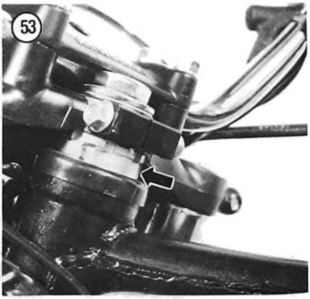
1. Raise the front wheel off the ground; support the motorcycle securely under the engine.
2. Remove the fuel tank to protect its finish as described in Chapter Seven.



3. *On models with one-piece handlebars,* loosen both upper fork clamp bolts (**Figure 50**).
4. *On models with built-up handlebars,* loosen the lower fork clamp bolts on both sides (**Figure 51**). Do not loosen the upper fork clamp bolts or the handlebars might become loose.
5. Loosen the steering stem clamp bolt at the rear of the upper triple clamp (A, **Figure 52**) and the head bolt (B). You may have to detach the handlebars to loosen the head bolt on some models; see *Handlebars* in this chapter.
6. Loosen the 2 headlight bracket bolts on the bottom of the upper triple clamp.
7. *On models with one-piece handlebars,* tap the upper triple clamp upward lightly with a mallet, to allow loosening of the adjuster and locknut.
8. Loosen the locknut (upper notched nut) fully, back the steering stem adjuster (**Figure 53**) out 1 or 2 turns until it feels free, then turn the adjuster back in 1/8 turn at a time, until you just feel the steering play taken up. Use the spanner wrench in the motorcycle's tool kit.
9. Tighten the adjuster another 1/16 turn.
10. Hold the adjuster still and tighten the locknut.
11. Recheck the steering play as described in Chapter Three. If the play is still incorrect, disassemble and inspect the steering head.
12. Torque the steering stem head bolt as specified in **Table 3** and tighten the rear clamp bolt.
13. *On models with one-piece handlebars,* torque the upper fork clamp bolts as specified in **Table 3**.
14. *On models with built-up handlebars,* torque the lower fork clamp bolts as specified in **Table 3**.
15. Tighten the headlight bracket bolts on both sides of the upper triple clamp.
16. If the handlebars were removed, install them as described in this chapter.
17. Install the fuel tank as described in Chapter Seven or Chapter Eight.







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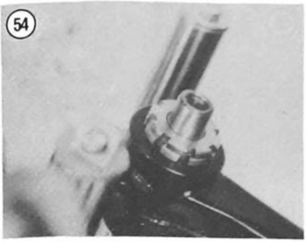

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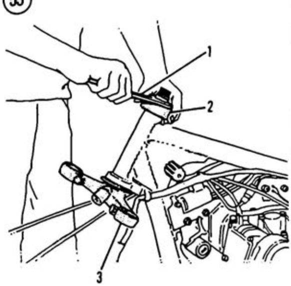
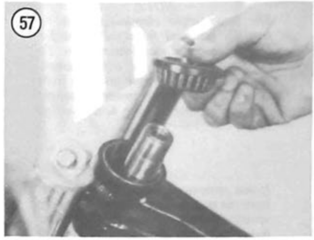


1. Pin spanner
2. Adjusting nut
3. Steering stem

56

57



Disassembly/Assembly

As you remove parts, note the location of all cable and wiring guides and straps for proper installation during reassembly. Watch what you're doing and make a note of anything you might not remember a week from now, in case you have to order parts from your dealer. Pay particular attention to control, wiring and instrument cable routing.

1. Raise the front wheel off the ground; support the motorcycle securely under the engine.
2. Remove the fuel tank to protect its finish as described in Chapter Seven or Chapter Eight.
3. *On 1982 B models:* Remove the fairing as described in this chapter.
4. Remove the front wheel as described in Chapter Ten.
5. Remove the front fender.
6. Remove the front fork legs as described in this chapter.
7. Detach the handlebar assembly as described in this chapter. Let the handlebars hang back behind the steering head, being careful not to damage any cables or wires.
8. Loosen the 2 headlight bracket bolts on the bottom of the upper triple clamp.
9. Loosen both upper fork clamp bolts (**Figure 50**).
10. Loosen the steering stem clamp bolt at the rear of the upper triple clamp (A, **Figure 52**), then remove the steering stem head bolt with washer and the head bolt (B).
11. Raise the upper triple clamp. If necessary, tap it up from the bottom with a soft mallet.
12. Remove the notched locknut (**Figure 54**).
13. Hold the lower triple clamp up to keep it from falling (**Figure 55**) and remove the notched steering adjuster nut and the steering stem cap (**Figure 56**).
14. Remove the roller bearing from the top of the steering head (**Figure 57**).

NOTE
The lower triple clamp can now be partially removed from the frame for bearing inspection and lubrication. To completely remove the triple clamps, you will have to remove all parts from the triple clamps: instruments, headlight and turn signals, brake hose junction block, etc.

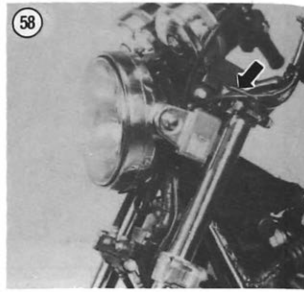
CAUTION
If you remove mechanical instruments, store the meters right side up. If they are upside down or sideways, the instrument fluids will leak and the meters won't work properly.

15. To assemble, reverse these steps. Note the following:
  a. Pack the upper and lower roller bearings with waterproof grease.
  b. Adjust the steering play after installing the upper bearing, cap and adjuster as described in this chapter.
  c. Leave the steering top head bolt loose until after you insert and align the fork legs.
  d. Make sure all hoses and cables are routed through any guides (**Figure 58** and **Figure 59**).
  e. Torque the fork clamp bolts, steering stem top bolt and handlebar clamp bolts as specified in **Table 3**.
  f. If any brake hoses were disconnected, bleed the brake system as described in Chapter Ten.
  g. If you replaced any bearings or races, recheck the steering play after a short ride. If the steering is loose, the bearings weren't fully seated during installation; readjust the steering play.

Inspection and Lubrication

1. Clean the bearing races and bearings with solvent.
2. Check for broken welds on the frame around the steering head.
3. Check the bearing rollers (**Figure 60** and **Figure 61**) for pitting or scratches, indicating wear or corrosion. Replace them in upper or lower sets if any are bad.
4. Check the upper and lower races in the steering head (**Figure 62**). See *Bearing Race Replacement* in this chapter if the races are pitted, scratched or worn.
5. Check the steering stem for cracks (**Figure 61**).
6. Grease the bearings and races.

58



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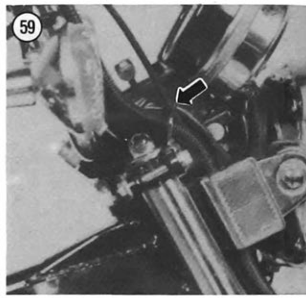

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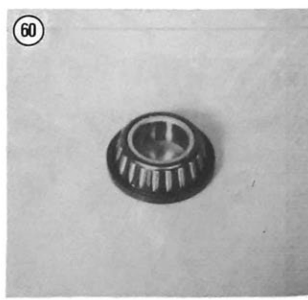

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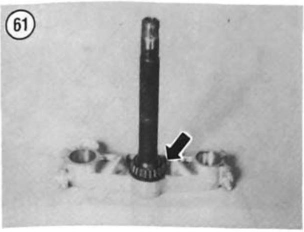

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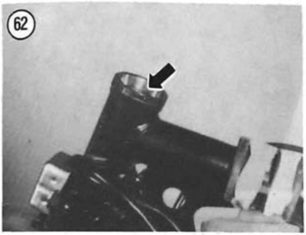

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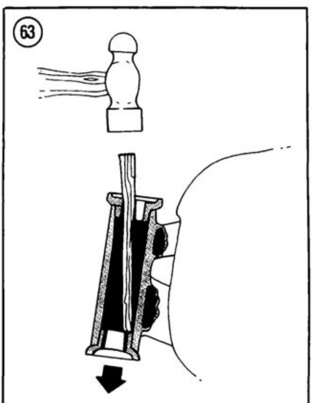

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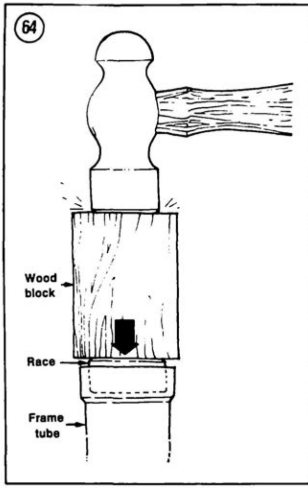


Bearing Race Replacement

The head and steering stem bearing races are pressed into place. Do not remove them unless they are worn and require replacement. Take old races to your dealer to ensure exact replacement.

Steering head

To remove the steering head races, insert a hardwood stick into the head tube and carefully tap the race out from the inside (**Figure 63**). Tap all around the race so that neither the race nor the head tube are bent.

To install a race, grease it and fit it into the end of the head tube. Tap it slowly and squarely with a block of wood (**Figure 64**). Make sure it is fully seated. You will notice a distinct change in the hammering sound as the race "bottoms-out."

Steering stem

A commercial bearing puller may be required to remove the lower roller bearing from the steering stem. When installing a new bearing, do not damage the attached grease seal. Make sure it is seated squarely and all the way down.

SHOCK ABSORBERS (CHAIN-DRIVE DUAL SHOCK MODELS)

Chain-drive, dual shock models are equipped with spring/gas shocks with adjustable damping and preload. See Chapter Three for periodic inspection and adjustment.

Removal/Installation

Removal and installation of one shock absorber at a time makes the task easier. The unit that remains will maintain the correct distance between the swing arm and the frame.

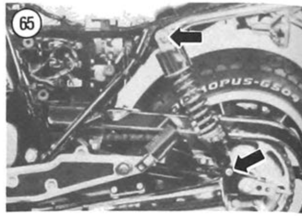
1. Put the motorcycle up on its centerstand.
2. Loosen the upper shock mounting nuts (A, **Figure 65**).
3. Remove the passenger grab rail (**Figure 66**).
4. Remove the nut, lockwasher and flat washer from the upper shock absorber mount.
5. Remove the bottom bolt and lockwasher (B, **Figure 65**), then remove the shock absorber.
6. To install, reverse these steps. Note the following:
   a. The grab rail goes outside the shock upper mounting eye; put a flat washer on either side of the grab rail ends.
   b. Torque the mounting nuts/bolts as specified in **Table 3**.
   c. Check that the spring preload cam adjuster on each shock is turned to the same notch (**Figure 67**).
   d. Check that the damping adjuster on each shock is turned to the same setting (**Figure 68**).

Inspection

Check the shocks by removing them from the motorcycle, and compressing them by hand. Observe the extension stroke and compare their "feel." Resistance during extension of the rod should be noticeably greater than during compression. Also, the resistance in both directions should be smooth throughout the stroke. If the shock absorber fails on either of these points, it is unsatisfactory and both should be replaced. If damping is noticeably different between the two shocks, they should both be replaced.

Visually check the damper rod for bending. If bending is apparent, the unit is unserviceable and both should be replaced.

Inspect for shock fluid leakage. If any is present, the shocks should be replaced.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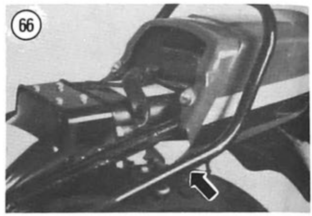
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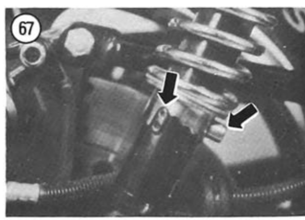
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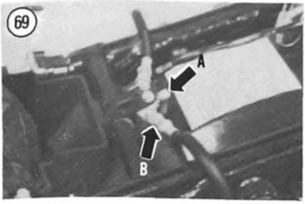
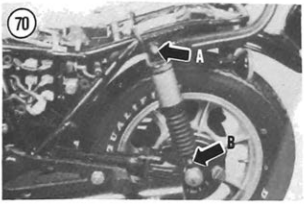




Check the rubber shock mounting eye bushings for damage or deterioration and replace them if necessary.

SHOCK ABSORBERS (SHAFT-DRIVE)

Air pressurized shocks are standard equipment on shaft-drive models. See Chapter Three for periodic inspection and adjustment.

Removal/Installation

Removal and installation of one shock absorber at a time makes the task easier. The unit that remain· ll maintain the correct distance between the swi rm and the frame.

CAUTIO·

T air sh ck absorbers are not re ble or rebuildable. When one or b ir sho s are off the motorcycle, a hold them upright. Don't hold th ock upside-down and never allow th op of the shock to be lower than the bottom. The oil could flow out of the shock or through the hoses into the other shock.

1. Put the motorcycle up on its centerstand.
2. Remove the air valve cap (A, **Figure 69**) and release all pressure from the shock absorbers.
3. Disconnect the shock absorber hose at the swivel nut next to the central air valve (B, **Figure 69**).
4. Loosen the upper shock mounting nuts (A, **Figure 70**).
5. Remove the passenger grab rail.
6. Remove the nut, lockwasher and flat washer from the upper shock absorber mount.
7. Remove the bottom nut and washer (B, **Figure 70**), then remove the shock absorber.
8. To install, reverse these steps. Note the following:
   a. The grab rail goes outside the shock upper mounting eye; put a flat washer on either side of the grab rail ends.
   b. Torque the mounting nuts as specified in **Table 3**.
   c. Pressurize the shocks as described in Chapter Three.
   d. Check that the damping adjuster on each shock is turned to the same setting (**Figure 71**).

Inspection

CAUTION

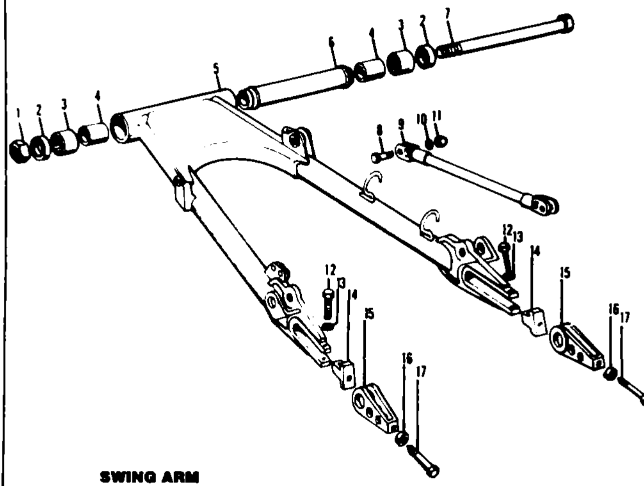
If the air shocks are connected while off the motorcycle, do not compress only one shock absorber. The oil could flow through the hoses into the other shock. The air shock absorbers are not refillable or rebuildable.

Visually check the connecting hoses and the dust boot; replace them if damaged.

Inspect for shock fluid leakage. If any is present, the shocks should be replaced.

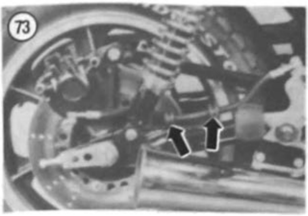
Check the rubber shock mounting eye bushings for damage or deterioration and replace them if necessary.

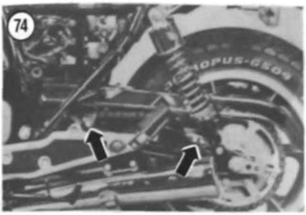
72

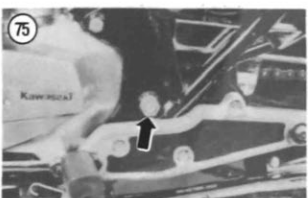


**SWING ARM
(CHAIN-DRIVE DUAL SHOCK)**

1. Nut
2. Grease seal
3. Needle bearing
4. Sleeve
5. Swing arm
6. Distance collar
7. Pivot shaft
8. Bolt
9. Brake torque link
10. Lockwasher
11. Nut
12. Bolt
13. Washer
14. Adjuster stop
15. Drive chain adjuster
16. Locknut
17. Adjusting bolt







SWING ARM (CHAIN-DRIVE DUAL SHOCK MODELS)

The swing arm has a sleeve at the pivot, riding inside needle bearings pressed into both ends of the swing arm. The sleeve must be inspected for wear and the needle bearings must be lubricated periodically for long life and good handling.

Kawasaki uses an endless drive chain on these models for high strength and reliability; there is no master link. The swing arm must be removed to remove the drive chain.

Inspecti... On The Bike)

1. Plac... motor...cle on its centerstand.
2. Disc...ct the ...hock ab...rbers at the bottom and swi...em up ...ut of the way.
3. Gras... top of the rear wheel and the frame and try ...ck the wheel back and forth. If you feel any mor... n a very slight movement of the swing arm and ...e pivot bolt is correctly tightened, the swing arm should be removed and inspected.

NOTE
Make sure any motion you feel is not caused by loose or worn wheel bearings.

Removal/Lubrication/ Installation

See Figure 72.

1. Remove the rear wheel as described in Chapter Ten.
2. Pull the rear brake hose from its swing arm guides (Figure 73), and tie the caliper up to keep stress off the brake hose.
3. Remove the drive chain guard (Figure 74).
4. Remove the lower shock absorber mounting bolt/nut and lockwasher on both sides and disconnect the shocks from the swing arm.
5. Move the swing arm up and down to check for abnormal friction.
6. Remove the swing arm pivot nut (Figure 75).
7. Push out the pivot shaft and move the swing arm to the rear.
8. Push out the swing arm sleeve with a soft metal rod. Take care not to damage the bearings in the swing arm.
9. Clean the old grease from the needle bearings and sleeve and apply a liberal amount of waterproof grease.
10. To install, reverse these steps. Note the following:
   a. Be sure to loop the drive chain around the swing arm when installing the swing arm.
   b. Torque the swing arm pivot nut and shock absorber bolts/nuts as specified in Table 3.

Inspection (Off The Bike)

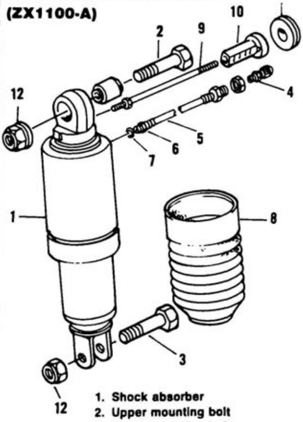
1. Inspect the needle bearings for discoloration or cracking. Replace them if damaged.

CAUTION
Do not try to remove the bearings unless you intend to replace them. They will be damaged during removal.

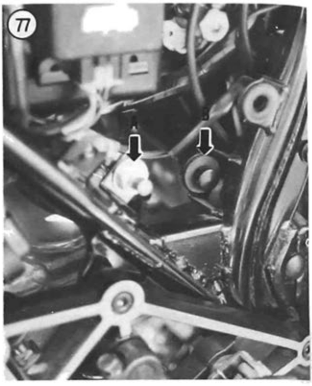
2. To remove the bearings, pry out the grease seals and drive the bearings out with a rod inserted from the opposite end of the swing arm.
3. When installing new bearings, oil the bearings first and be careful to prevent cocking or damage. Drive them in 3/16 in. (5 mm) below the end of the swing arm to allow room for new grease seals. Install new grease seals.
4. Measure the outside diameter (OD) of the swing arm sleeve that rides in the bearings. If the OD is smaller than the limit in **Table 2**, install a new sleeve.

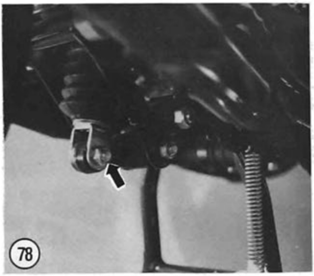
(76)

REAR SHOCK ABSORBER (ZX1100-A)



1. Shock absorber
2. Upper mounting bolt
3. Lower mounting bolt
4. Air valve
5. Air hose
6. Fitting
7. O-ring
8. Dust boot
9. Damping control rod
10. Damping control plunger
11. Rubber grommet
12. Mounting nut





5. Measure the pivot shaft runout. Roll the shaft across a piece of plate glass and measure any gap with a feeler gauge. If the runout is greater than the limit in **Table 2**, install a new pivot shaft.

UNI-TRACK REAR SUSPENSION (ZX1100-A)

Shock Absorber Removal/Installation

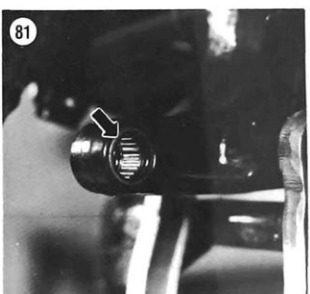
Refer to **Figure 76** for this procedure.

1. Remove both side covers.
2. Remove the rear wheel as described in Chapter Ten.

3. Loosen e nut securing the air valve (A, **Figure 77**) to the ame mounting tab and slide the valve out of the me tab.
4. Loosen he locknut securing the damping adjuster r (B, **Figure 77**) and unscrew the rod from the s k absorber.
5. Remove he lower bolt and nut (**Figure 78**) securing th hock absorber to the rocker arm.
6. Support the swing arm so it will not drop down when the shock absorber is removed.
7. Remove the upper bolt and nut (**Figure 79**) securing the shock absorber to the frame.
8. Carefully remove the shock absorber and air hose down and out through the swing arm.
9. Remove the sleeve (**Figure 80**) in the shock absorber lower mounting hole in the rocker arm.
10. Inspect the shock absorber as described in this chapter.
11. To install, reverse these steps. Note the following:
    a. Inspect the seals installed on the outer edges of the needle bearing (**Figure 81**) and replace them if they are worn or damaged.
    b. Grease the needle bearing (**Figure 82**) in the lower shock mounting hole in the rocker arm.
    c. Install the sleeve (**Figure 80**) into the lower shock mounting hole in the rocker arm.
    d. Torque the shock absorber mounting bolts and nuts as specified in **Table 3**.

Shock Absorber Inspection

1. Remove the rubber dust boot and check the body of the shock absorber for damage.
2. Check for loss of oil around the joint between the upper and lower portions of the shock body (**Figure**



83). Any more than a light film on the lower shock body indicates a bad internal seal; the shock absorber must be replaced.
3. Examine the upper shock mount for damage (**Figure 84**) and replace if necessary. If the upper mount is damaged or worn in any way, excessive play will be present in the action of the rear suspension.
4. Inspect the air hose and replace it if damaged. Make sure the O-ring is fitted to the air connection at the shock absorber (**Figure 85**).

Swing Arm Removal/Installation

Refer to **Figure 86** and **Figure 87** for this procedure.
1. Remove the rear wheel as described in Chapter Ten.
2. Remove the rear brake hose from the clips on the swing arm.
3. Remove the shock absorber (A, **Figure 88**) as described in this chapter.
4. Remove the bolt and nut securing the tie rod (B, **Figure 88**) to the rocker arm.
5. Move the tie rod toward the rear and out of the way. Don't lose the dust seals that are on each side of the needle bearings.
6. On the left-hand side, remove the swing arm pivot shaft nut.
7. On the right-hand side, remove the bolts securing the pivot shaft clamp (**Figure 89**).
8. Remove the pivot shaft clamp and the pivot shaft out of the frame.
9. Carefully slide the swing arm out of the frame.
10. To install, reverse these steps. Note the following:
   a. Inspect the seals installed on the outer edges of all needle bearings and replace them if they are worn or damaged. If removed, install the grease seal as shown in **Figure 90**.
   b. Grease all needle bearings in the rocker arm.
   c. Install the pivot shaft clamp with the arrow facing upward (**Figure 91**).
   d. Torque all mounting bolts and nuts as specified in **Table 3**.

DRIVE CHAIN

Because the drive chain has no master link, the swing arm must be removed to remove the drive chain from the motorcycle.

CAUTION
Kawasaki uses an endless chain on these models because an endless chain is stronger than a chain with a master link. Do not cut the chain with a chain cutter or install chain with a master link. The chain may fail.

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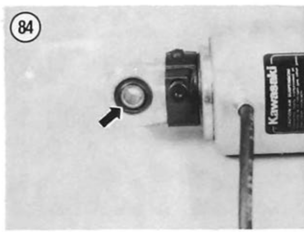

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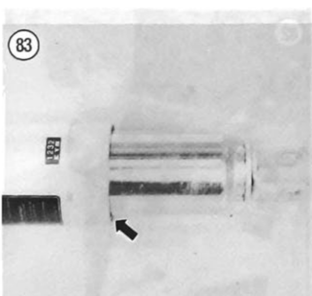

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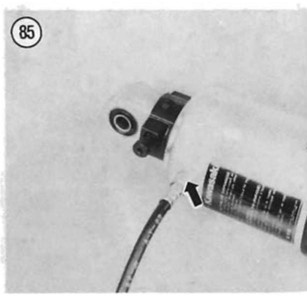

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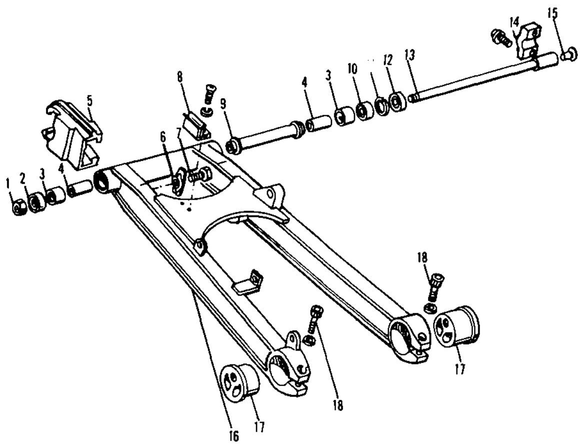

SWING ARM (UNI-TRAK MODELS)

1. Pivot shaft nut
2. Grease seal
3. Needle roller bearing
4. Sleeve
5. Swing arm protector
6. Holder
7. Bolt
8. Drive chain cover holder
9. Distance collar
10. Bearing
11. Circlip
12. Grease seal
13. Pivot shaft
14. Pivot shaft clamp
15. Plug
16. Swing arm
17. Eccentric drive chain adjuster
18. Bolt

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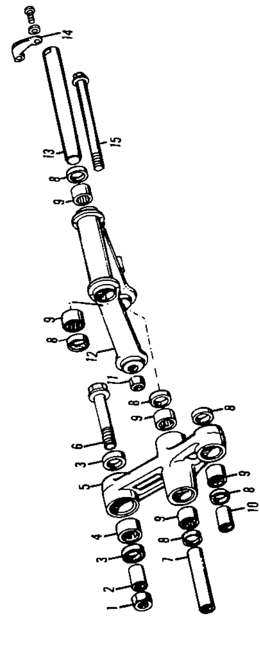
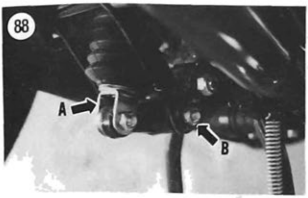
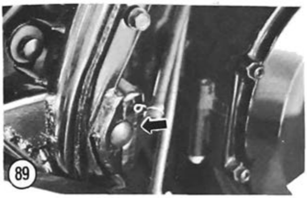
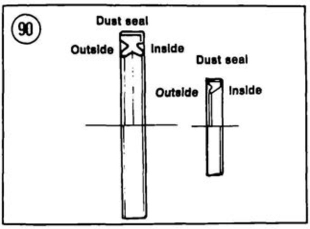


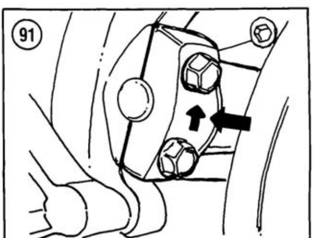
UNI-TRAK LINKAGE

1. Nut
2. Sleeve
3. Dust seal
4. Needle bearing
5. Rocker arm
6. Bolt
7. Sleeve
8. Dust seal
9. Needle bearing
10. Sleeve
11. Nut
12. Tie rod
13. Pivot shaft
14. Holding plate
15. Bolt









Removal/Installation

1. Remove the swing arm as described in this chapter.
2. Remove the engine sprocket cover as described in Chapter Six.
3. Remove the drive chain.
4. To install a chain, reverse these steps. Check the chain for wear, and lubricate it as described in Chapter Three.

FINAL GEAR CASE

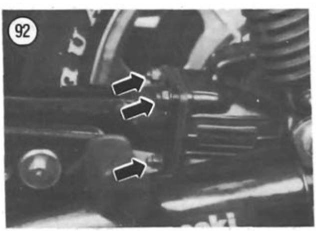
The final gear case is mounted on the left-hand end of the swing arm. It connects to the drive shaft with sliding spring-loaded coupling splines and it connects to the rear wheel through a splined coupling gear. Trouble should be very infrequent, as long as the recommended lubrication is adhered to (refer to Chapter Three). The final gear case uses hypoid gear oil as a lubricant.

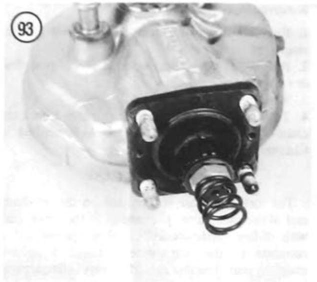
Bevel gear backlash, tooth contact patterns and tapered roller bearing preload are all critical to bevel drive strength, quietness and longevity. Assembly to the proper tolerances requires several special tools and measuring instruments and a high degree of skill. In the event of final gear case trouble, we recommend you remove the final gear case from the motorcycle and take it to a Kawasaki dealer for repair.

The final gear case must be removed to lubricate the rear drive shaft sliding joint and to replace the drive shaft.

Removal/Installation

1. Remove the rear wheel as described in Chapter Ten.
2. Remove the left shock absorber top and bottom nuts (**Figure 70**).
3. Remove the 4 final gear case/swing arm nuts (**Figure 92**), and separate the final gear case from the swing arm.

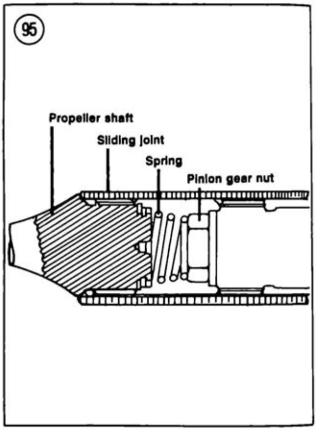




4. Remove the bottom shock mounting nut and washer and remove the bevel drive. A spring should come off with the drive (**Figure 93**).

NOTE
*Prop the bevel drive in a vertical position to keep lubricant from seeping out of the breather hole (**Figure 94**).*

5. To install, reverse these steps; note the following:
   a. Lubricate the drive shaft/rear bevel sliding joint. Remove all old grease, coat the splines and pack the coupling pocket forward of the splines with 0.7 oz. (20 cc) of high-temperature grease.
   b. Place the small end of the spring on the bevel input shaft nut (**Figure 95**). If one end of the spring is marked with yellow paint, that is the small end.
   c. Torque the final gear case/swing arm nuts and the shock absorber nuts as specified in **Table 3**.
   d. Check the final gear case lubricant as described in Chapter Three.



SWING ARM (SHAFT-DRIVE)

The swing arm has tapered roller bearings at the pivots. It houses the drive shaft and it must be removed to replace the drive shaft.

The swing arm must be inspected for wear and the roller bearings must be lubricated periodically for long life and good handling. Removal of the swing arm is required for bearing lubrication.

Removal/Lubrication

See **Figure 96**.

1. Remove the rear wheel as described in Chapter Ten.
2. Pull the rear brake hose from its swing arm guides and tie the caliper up (A, **Figure 97**) to keep stress off the brake hose.
3. Remove the final gear case.
4. Remove the right shock absorber's bottom nut and washer (B, **Figure 97**).

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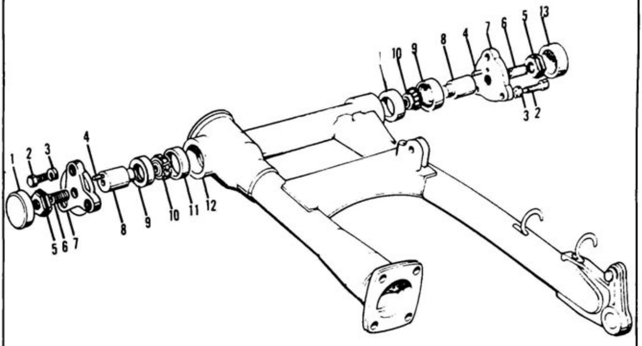

SWING ARM (SHAFT-DRIVE)

1. Cap
2. Bolt
3. Lockwasher
4. Pin
5. Locknut
6. Adjusting screw
7. Bracket
8. Pivot shaft
9. Grease seal
10. Roller bearing
11. Bearing outer race
12. Swing arm
13. Cap

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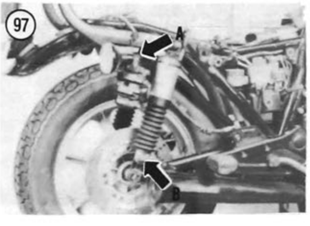

5. Move the swing arm up and down to check for abnormal friction.
6. Push the swing arm from side to side. If you detect any noticeable play, the bearings may be loose or damaged.
7. Remove the circlip from inside the rear drive shaft joint and pull out the splined joint and washer.
8. At the front of the swing arm, remove the covers from the left and right swing arm pivots.
9. Loosen the locknuts on the pivot shafts, then remove the three Allen bolts and the pivot shaft brackets (**Figure 98**).

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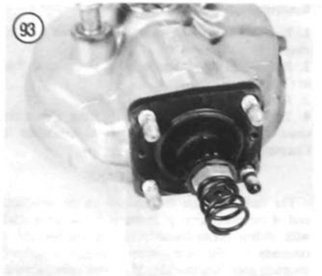

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4. Remove the bottom shock mounting nut and washer and remove the bevel drive. A spring should come off with the drive (**Figure 93**).

NOTE
*Prop the bevel drive in a vertical position to keep lubricant from seeping out of the breather hole (**Figure 94**).*

5. To install, reverse these steps; note the following:
   a. Lubricate the drive shaft/rear bevel sliding joint. Remove all old grease, coat the splines and pack the coupling pocket forward of the splines with 0.7 oz. (20 cc) of high-temperature grease.
   b. Place the small end of the spring on the bevel input shaft nut (**Figure 95**). If one end of the spring is marked with yellow paint, that is the small end.
   c. Torque the final gear case/swing arm nuts and the shock absorber nuts as specified in **Table 3**.
   d. Check the final gear case lubricant as described in Chapter Three.

SWING ARM (SHAFT-DRIVE)

The swing arm has tapered roller bearings at the pivots. It houses the drive shaft and it must be removed to replace the drive shaft.

The swing arm must be inspected for wear and the roller bearings must be lubricated periodically for long life and good handling. Removal of the swing arm is required for bearing lubrication.

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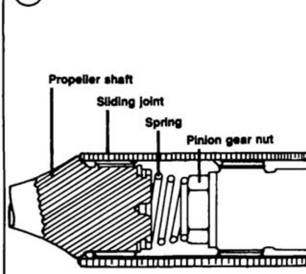

Removal/Lubrication

See **Figure 96**.

1. Remove the rear wheel as described in Chapter Ten.
2. Pull the rear brake hose from its swing arm guides and tie the caliper up (A, **Figure 97**) to keep stress off the brake hose.
3. Remove the final gear case.
4. Remove the right shock absorber's bottom nut and washer (B, **Figure 97**).

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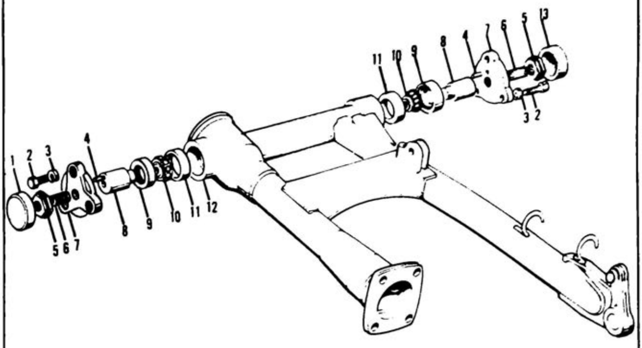
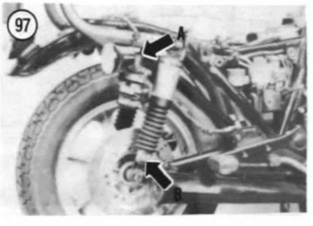


SWING ARM (SHAFT-DRIVE)

1. Cap
2. Bolt
3. Lockwasher
4. Pin
5. Locknut
6. Adjusting screw
7. Bracket
8. Pivot shaft
9. Grease seal
10. Roller bearing
11. Bearing outer race
12. Swing arm
13. Cap

97



5. Move the swing arm up and down to check for abnormal friction.
6. Push the swing arm from side to side. If you detect any noticeable play, the bearings may be loose or damaged.
7. Remove the circlip from inside the rear drive shaft joint and pull out the splined joint and washer.
8. At the front of the swing arm, remove the covers from the left and right swing arm pivots.
9. Loosen the locknuts on the pivot shafts, then remove the three Allen bolts and the pivot shaft brackets (**Figure 98**).

10. Remove the pivot shafts (**Figure 99**).
11. Pull the swing arm back and out, leaving the drive shaft attached to the front bevel drive.
12. Clean the old grease from the roller bearings and pack them with a liberal amount of waterproof grease.

Disassembly

CAUTION
Do not try to remove the bearings or races unless you intend to replace grease seals. The seals will be damaged during removal.

See **Figure 96**.

1. To remove the bearings, pry out the grease seals and remove the inner cone and rollers.
2. Inspect the roller bearings for discoloration or cracking. Replace them if damaged.
3. Drive the bearing outer races out with a rod inserted from the opposite end of the swing arm.
4. When installing new races, oil them first and be careful to prevent cocking or damage. Tap them in slowly with a wood block until they are fully seated (**Figure 100**).
5. Clean the old grease from the roller bearings and pack them with a liberal amount of waterproof grease.
6. Install new grease seals.

Installation

See **Figure 96**.

1. Pull back on the drive shaft to check that the front coupling is secure. If it is not, see *Drive Shaft Installation* in this chapter.
2. Install the swing arm over the drive shaft.
3. Install the pivot shafts (**Figure 99**).
4. Install the pivot shaft brackets (**Figure 98**). Make sure the adjuster screws are backed out to provide plenty of clearance. Torque the 3 Allen bolts on each side as specified in **Table 3**.
5. Insert a 0.060 in. (1.5 mm) feeler gauge between the inside of the frame boss and the left end of the swing arm (**Figure 101**).
6. Turn the right pivot adjuster screw in until it meets resistance. Tighten the locknut.
7. Remove the feeler gauge and torque the left pivot shaft adjuster as specified in **Table 3**. Tighten the left locknut.
8. Move the swing arm up and down and push it from side to side. There should be no play and the swing should be smooth. Readjust the pivots if necessary.
9. To complete installation, reverse the steps in *Swing Arm Removal*. Torque the fasteners as specified in **Table 3**.

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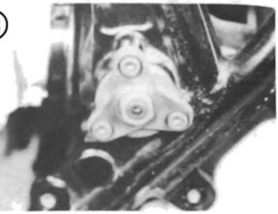

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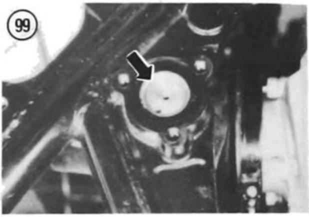

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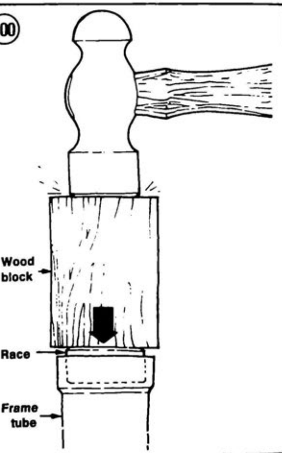
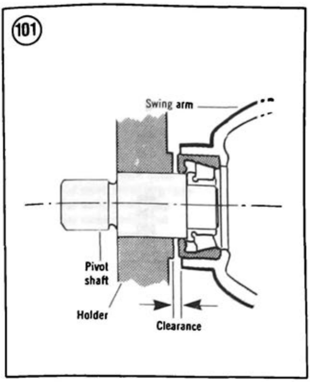
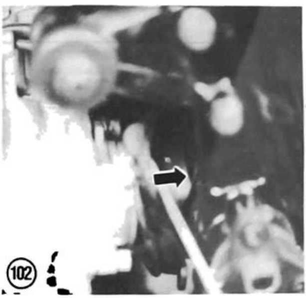






DRIVE SHAFT

The drive shaft connects the front bevel drive and final gear case. It has a pin-locked coupling at the front, a U-joint in the middle at the swing arm pivot axis and a sliding splined coupling at the rear. The entire assembly is spring-loaded to the front. There is no provision for lubricating the U-joint; if it wears out, the entire drive shaft assembly should be replaced.

Removal

1. Remove the swing arm as described in this chapter.
2. At the front drive shaft coupling, pull the dust cover forward and turn the drive shaft until you see a hole in the smooth rim of the coupling (**Figure 102**). In the hole is a pin that locks the coupling forward onto the front bevel drive.
3. Push the coupling lock pin in about 1/8 in. (3 mm) and pull the drive shaft back and out of the frame.

Installation

1. Check that the coupling lock pin and spring are in place in the front bevel drive output gear (**Figure 103**).
2. Coat the front coupling splines with high-temperature grease.
3. Position the drive shaft and align the coupling hole and lock pin (**Figure 104**).
4. Push the lock pin in just far enough to let the coupling slide forward over the gear.

NOTE

Don't push the lock pin in too far or it will fall inside the gear.

5. Maneuver the coupling as required to allow the lock pin to spring out into the coupling hole. Pull back on the drive shaft to check that the coupling is secure.
6. Install the swing arm as described in this chapter.

Table 1 FORK SPRING MINIMUM LENGTH

	in.	mm
KZ1000-J (U.S. and Canada)	21.4	543
KZ1000-J (Others)	20.4	518
KZ1000-K, M		
Long spring	18.1	461
Short spring	5.0	128
KZ1100-B (U.S. and Canada)	21.0	533
KZ1100-B (Others)	21.4	543
KZ1100-A (U.S. and Canada)	22.6	575
KZ1100-A (Others)		
Long spring	17.6	446
Short spring	5.0	128
KZ1100-D	23.2	590
KZ1100-LI (U.S. and Canada)	23.8	604

Table 2 CHASSIS WEAR LIMITS

Swing arm sleeve OD	0.983 in.	24.96 mm
Swing arm pivot runout	0.006 in.	0.14 mm
Repair limit	0.028 in.	0.7 mm

Table 3 CHASSIS TORQUES

	ft.-lb.	mkg
Chain-drive and shaft-drive		
Brake pedal pivot cap nut	14.5	2.0
Front axle nut	50	7.0
Front axle clamp nuts (J)	13	1.8
Front axle pinch bolt (K, M, A, D)	14.5	2.0
Fork clamp bolts	13	1.8
Fork bottom Allen bolt	17	2.3
Handlebar clamp bolts		
Tubular handlebars	13	1.8
Adjustable handlebars	18	2.5
Handlebar holder-to-triple clamp bolts		
Adjustable handlebars	55	7.5
Rear axle nut		
Chain-drive		
ZX1100-A	90	12.0
All other models	72	10.0
Shaft-drive	100	14.0
Rear sprocket nuts	30	4.0
Shock absorber mounts		
Chain-drive	22	3.0
Shaft-drive	18	2.5
Steering head clamp bolt	13	1.8
Steering head top bolt	30	4.3
Swing arm pivot nut	70	10.0
Torque link nuts	22	3.1
Uni-Trak suspension		
Tie rod bolt	51	7.0
Rocker arm bolt	51	7.0

(continued)

Table 3 CHASSIS TORQUES (continued)

	ft.-lb.	mkg
Chain-drive and shaft-drive (cont.)		
Shock absorber		
Upper bolt	27	3.8
Lower bolt	51	7.0
Wire wheel spokes	26 in.-lb.	0.30
Shaft-drive only		
Final gear case cover bolts	18	2.5
Final gear case mounting nuts	22	3.0
Final gear case drain plug	14.5	2.0
Final gear case pinion nut	90	12.0
Swing arm pivot screws	11	1.5

Table 4 STANDARD FORK OIL

Model	Dry capacity U.S. fl. oz.(cc)	Wet capacity U.S. fl. oz.(cc)	Oil level* Inches (mm)
KZ1000-J	11.1 (327)	10.1 (300)	C 4.3 (110)
KZ1000-K, M	11.9 (351)	10.8 (320)	C 7.2 (184)
KZ1100-A	11.1 (328)	10.1 (300)	E 18.5 (470)
KZ1100-B	11.6 (343)	10.5 (310)	C 4.7 (120)
KZ1100-D	11.7 (347)	10.0 (295)	E 18.0 (457)

* Fork oil level is checked with the fork springs removed and the forks fully extended (E) or compressed (C).

SUPPLEMENT

1982-2002 POLICE MODEL SERVICE INFORMATION

This Supplement contains all procedures and specifications unique to the P Series Police model. If a specific procedure is not included, refer to the procedure in the prior chapters in the main body of this manual.

This Supplement is divided into sections that correspond to the previous chapters.

CHAPTER THREE

LUBRICATION, MAINTENANCE AND TUNE-UP

MODEL IDENTIFICATION

The Police Model identification suffix is *P* with the P1 model starting in 1982 and ending with the P21 designation for the 2002 model. The *P* number increases with each year (P1—1982, P2—1983, P3—1994, etc.).

SCHEDULED MAINTENANCE

The maintenance for Police models is the same as for prior models, with the following exception:

1. Check the tightness of the cylinder head nuts at the 6000 mile (10,000 km) maintenance interval. Refer to *Cylinder Head Installation* in Chapter Four.
2. Slide the rubber boot up on the fork tube. Check and clean the area surrounding the fork oil seal. Remove any debris below the dust seal and slide the rubber boot back into position onto the groove in the fork slider.

FRONT FORK

Fork Air Pressure

The front fork on the Police models is not pressurized. The fork top cap is equipped with an air valve (**Figure 1**) and must only be maintained with atmospheric air pressure only.

Fork Inspection

Inspect the rubber boot on each fork slider for cracks or deterioration. Make sure the upper clamp is tight. Replace the rubber boot if necessary.

TIRES

Tire Pressure

Tire pressure must be checked with the tires cold. Use a simple, accurate tire gauge and maintain 36 psi (253 kPa) in both the front and rear tires.

The OE tires are as follows:

Front: Dunlop F16 MN90-18 (tubeless).

Rear: Dunlop K327M MR90-18 (tubeless).

Tire Wear

Kawasaki recommends replacement of the OE tires when the tread on both the front or rear tire is worn to 0.08in. (2 mm).

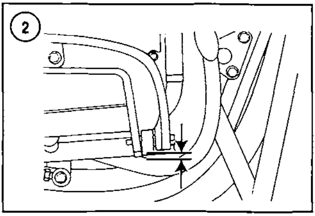
DISC BRAKE

Brake Pedal Clearance

Check that there is 3/16 in. (5 mm) clearance between the brake pedal and the frame mount (**Figure 2**) for the floorboard. If the clearance is incorrect, perform the following procedure.

Rear Brake Pedal Adjustment

The rear brake pedal adjustment should not be required once it is set correctly. The rear brake must have a 3/16 in. (5 mm) clearance between the brake pedal and the frame mount (**Figure 2**) for the floorboard. If the clearance is incorrect, perform the following procedure. Also the brake pedal and linkage



must not contact the engine case or any other adjacent parts.

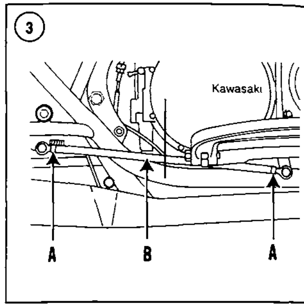
1. Place the motorcycle on the sidestand.
2. Check to be sure that the brake pedal is in the at-rest position.
3. Raise the right side floorboard.
4. Loosen both locknuts (A, **Figure 3**) on the linkage rod.
5. Rotate the linkage rod (B, **Figure 3**) in either direction to obtain the correct clearance.
6. Tighten the locknuts (A) securely.
7. Apply the rear brake several times and recheck the clearance dimension. Readjust if necessary.
8. Adjust the rear brake light switch, see *Rear Brake Light Switch Adjustment* in Chapter Three.

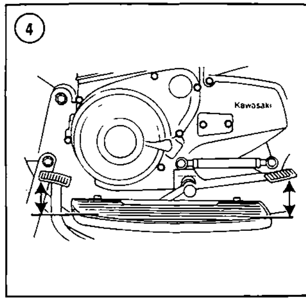
Shift Linkage Adjustment

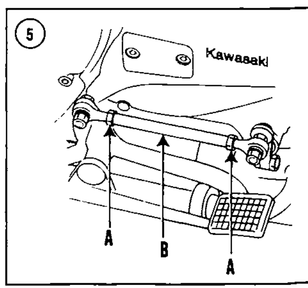
The gearshift pedals must be adjusted so they can be pressed down completely when up shifting and down shifting. The pedals cannot make contact with the frame or floorboard during its normal range of operation.

The top surface of both pedals must be the same distance from the top surface of the floorboard (**Figure 4**).

1. Place the motorcycle on the sidestand.
2. Shift the transmission into neutral.
3. Loosen both locknuts (A, **Figure 5**) on the linkage rod.
4. Rotate the linkage rod (B, **Figure 5**) in either direction to obtain the correct height of both gearshift pedals
5. Tighten the locknuts (A) securely.
6. Shift the transmission and shift through several gears to make sure the linkage is operating correctly and the adjustment is correct. Readjust if necessary.







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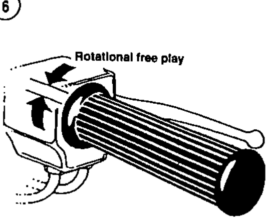

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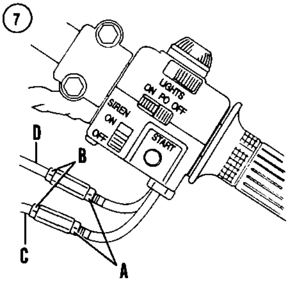

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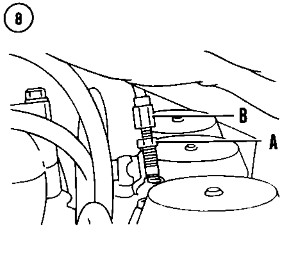

Throttle Cable Play

The Police models are equipped with two throttle cables. The forward cable is the opening cable and the rear cable is the closing cable.

1. Check the free play at the throttle grip flange (**Figure 6**). Kawasaki specifies 0.08-0.12 in. (2-3 mm). If adjustment is necessary, perform the following.
2. Loosen the locknuts (A, **Figure 7**), then rotate the adjusters (B) on both throttle cables all the way in to allow maximum throttle free play.
3. Completely close the throttle, then turn the closing cable (C, **Figure 7**) adjuster until the cable becomes tight. Tighten the locknut (A).
4. Turn the opening cable (D, **Figure 7**) adjuster (B) until the throttle cable free play is obtained. Tighten the locknut.
5. Open and close the throttle several times and recheck the adjustment.
6. At the carburetor assembly, check that the throttle linkage lever stops against the idle adjusting screw when the throttle is in the closed position.
7. If the throttle grip free play cannot be achieved with Steps 2-6, proceed to Step 8.
8. Loosen the locknuts, then rotate the adjusters on both throttle cables all the way in to allow maximum throttle free play.
9. At the carburetor assembly, loosen the locknut (A, **Figure 8**) and screw the closing cable adjuster (B) down as far as it will go.
10. At the throttle grip, adjust the closing cable adjuster until about 1/4 in. (5 mm) of threads are showing, then tighten the locknut.
11. Completely close the throttle, then turn the closing cable adjuster until the cable becomes tight. Tighten the locknut.
12. Turn the opening cable adjuster until the throttle cable free play is obtained. Tighten the locknut.
13. Open and close the throttle several times and recheck the adjustment.
14. At the carburetor assembly, check that the throttle linkage lever stops against the idle adjusting screw when the throttle is in the closed position.

SPARK PLUGS

Heat Range and Reach

The proper spark plug is very important for maximum performance and reliability. Kawasaki recommends using the NGK BR8ES or ND W24ESR-U spark plugs on the Police models. The gap is the same as on all other models, 0.028-0.032 in. (0.7-0.8 mm).

CHAPTER FOUR

ENGINE

Engine specifications and torque specifications for all Police models are identical to the KZ1000 K models.

Engine Removal/Installation

Engine removal and installation is the same as on previous model with the exception of removal of the floorboards.

1. Move the floorboard to the raised position.
2. On the left side, mark the position of the shift linkage clamp on the shift linkage.Remove the pivot bolt and clamp bolt and remove the shift linkage. Remove the floorboard mounting bolts and remove the floorboard assembly.
3. On the right side, disconnect the rear brake light switch from the brake pedal. Remove the rear mounting bolt on the brake pedal and the floorboard, then remove the remaining floorboard mounting bolts. Remove the floorboard assembly.
4. Reverse the removal procedure. Tighten the mounting bolts securely.

CHAPTER SIX

TRANSMISSION

SPROCKET COVER

Sprocket removal and installation is the same as on previous model with the exception of removal of the floorboards.

1. Remove the left side floorboard.
2. Remove the shift lever assembly as described in this supplement.
3. Reverse the removal procedure. Tighten the bolts securely, then adjust the linkage as described in this Supplement.

SHIFT LINKAGE

Removal/Installation

1. Remove the left side floorboard.
2. Remove the front bolt and lockwasher (A, **Figure 9**) securing the gearshift pedal to the link rod front pivot eye.
3. Remove the bolt, washer and nut (B, **Figure 9**) securing the shift pedal to the frame mounting bracket. Remove the shift pedal (C). Do not loose the sleeve in the pivot area.

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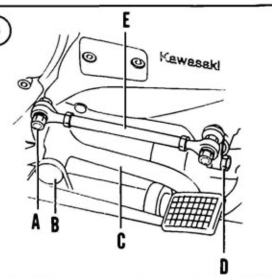

4. At the rear pivot eye, remove the clamping bolt (D, **Figure 9**), then spread the pivot eye slot open with a screwdriver if necessary.
5. Remove the linkage rod (E, **Figure 9**) and rear pivot eye from the gearshift linkage. Remove the assembly.

6. Install by reversing these removal steps. Adjust the linkage as previously described in the *Shift Linkage Adjustment* section of this Supplement.

CHAPTER SEVEN

CARBURETION AND EXHAUST SYSTEMS

THROTTLE CABLE REMOVAL/INSTALLATION

The carburetor service procedures for the Police models are the same as on prior models with the exception of the throttle cables. The Police models are equipped with two throttle cables instead of one as on prior models.

Prior to remove the throttle cables from the throttle wheel, note the location of the opening and closing cables within the cable bracket and throttle wheel. They must be reinstalled in the same location during installation.

To remove the cables from the carburetor assembly, perform the following:
1. At the throttle grip, loosen the locknuts (A, **Figure 7**), then rotate the adjusters (B) on both throttle cables all the way in to allow maximum throttle free play. The closing cable (C) is located at the rear of the throttle and the opening cable (D) is at the front.

2. At the carburetor assembly, loosen the locknut (A, **Figure 8**) and screw the closing adjuster (B) on the cable down as far as it will go. Disconnect the closing cable from the bracket and the throttle wheel.

3. At the carburetor assembly, lift the opening cable (A, **Figure 10**) out of the bracket (B) and slit (C) and remove it from the bracket and throttle wheel.

4. Install by reversing these removal steps. Adjust the throttle cables as described in this chapter.

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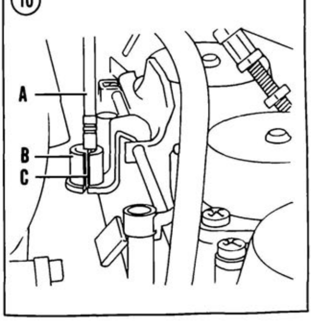

CARBURETOR SPECIFICATIONS

The BS34 carburetors are the same as on prior years with the exception of the following specifications.

Main jet: 127.5R
Needle jet: Y1
Jet needle: 5GN45
Pilot jet: 375.
Starter jet: 65
Main air jet: 85
Pilot air jet: 350

EXHAUST SYSTEM

Removal/Installation

Refer to **Figure 11**. Remove the floorboards, then refer to the removal/installation procedure relating to the ZX1100-A2 in Chapter Seven.

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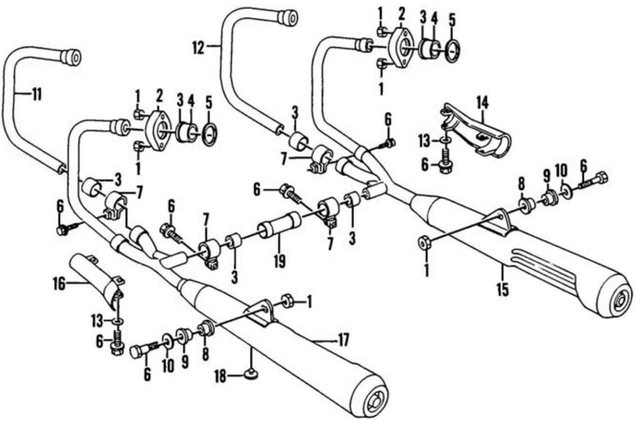
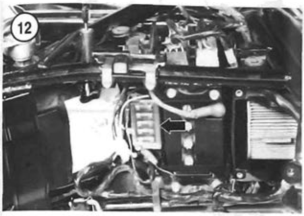
EXHAUST SYSTEM

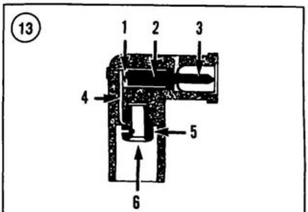


1. Nut
2. Exhaust pipe holder
3. Gasket
4. Split colar
5. Gasket
6. Bolt
7. Clamp
8. Rubber bushing
9. Rubber bushing
10. Washer
11. No. 2 cylinder exhaust pipe
12. No. 3 cylinder exhaust pipe
13. Washer
14. Foot guard
15. Right side muffler and No. 4 exhaust pipe
16. Foot guard
17. Left side muffler and No. 1 exhaust pip
18. Rubber stopper
19. Joint

CHAPTER NINE

ELECTRICAL SYSTEM





1. Spring
2. Carbon resistor
3. Spike
4. Strip
5. Spring clip
6. Plug terminal

FUSES

There are five fuses in the fuse box under the seat (**Figure 12**). The main fuse is 30A and various other fuses are rated at 10A. There were two additional 10A fuses for the siren assembly, accessory and hazard relay located next to the battery.

SPARK PLUGS

The spark plug caps are equipped with radio frequency interference (RFI) caps. The resistance of the cap may change under conditions of extreme heat and with age.

Resistance Test

If a high-speed misfire occurs, check the resistance of the spark plug cap between the plug terminal and the wire spike (**Figure 13**).

1. Pull the spark plug cap off the spark plug.
2. Unscrew the spark plug cap from the secondary lead.
3. Set the ohmmeter to the K ohms setting and connect the ohmmeter leads to plug terminal and the wire spike.
4. The specified resistance is 4000-6000 ohms. Replace the spark plug cap if out of specification. Replace all four spark plug caps even if only one or two require replacement.

ALTERNATOR

Removal/Installation

Alternator removal and installation is the same as on previous model with the exception of the following:

1. Remove the left side floorboard.
2. Remove the shift lever assembly as described in this Supplement.
3. Reverse the removal procedure. Tighten the bolts securely, then adjust the linkage as described in this Supplement.

LIGHTING SYSTEM

Headlight Replacement

WARNING
If the headlight has just burned out or just turned off it will be hot. Allow the bulb to cool prior to removal.

CAUTION
The bulb is quartz-halogen so do not touch the bulb glass. Traces of oil on the bulb drastically reduce the life of the bulb. Clean all traces of oil from the bulb glass with a cloth moistened in alcohol or lacquer thinner.

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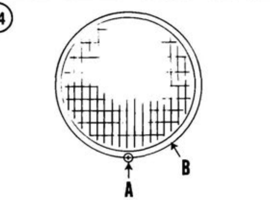

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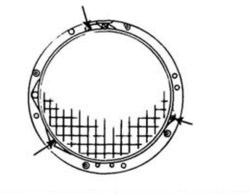

1. Remove the single screw (A, **Figure 14**) at the base of the trim ring (B).
2. Carefully pull up on the lower portion of the trim ring (B, **Figure 14**) and unhook it from the top. Remove the trim ring.
3. Remove the three small screws (**Figure 15**) securing the retaining ring. Hold onto the lens assembly and remove the retaining ring.
4. Partially pull the headlight lens out of the front fairing and disconnect the electrical connector.
5. Remove the dust cover from the back of the lens and squeeze the spring clip. Remove the headlight bulb and install a new one.
6. Install by reversing these steps.
7. Adjust the headlight as described under *Headlight Adjustment*in the following procedure.

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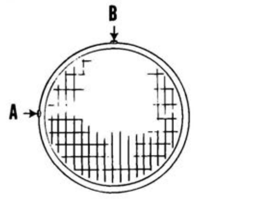

Headlight Adjustment

Adjust the headlight horizontally and vertically according to local motor vehicle regulations.

To adjust the headlight horizontally, turn the screw (A, **Figure 16**) on the right side of the headlight rim.

To adjust the headlight vertically, turn the screw (B, **Figure 16**) on the top of the headlight rim.

CHAPTER ELEVEN

CHASSIS

FAIRING

Removal/Installation

Refer to **Figure 17**.

1. Place the motorcycle on the sidestand.
2. Disconnect the battery negative lead.
3. Remove the headlight lens assembly as described in *Headlight Replacement* section of this Supplement.
4. On the inner left side surface of the firing, disconnect the electrical connector (**Figure 18**).

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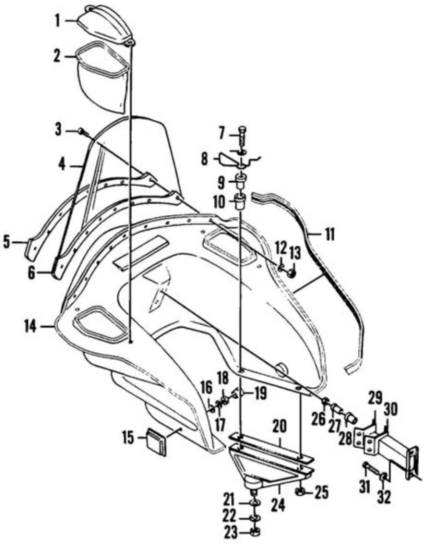
FRONT FAIRING



1. Storage bag cover
2. Storage bag
3. Plastic screw
4. Windshield
5. Mounting plate
6. Adhesive
7. Screw
8. Harness clamp
9. Collar
10. Rubber damper
11. Trim strip
12. Plastic washer
13. Plastic nut
14. Front fairing
15. Side reflex reflector
16. Washer
17. Spring washer
18. Hex nut
19. Cap
20. Rubber damper
21. Washer
22. Spring washer
23. Nut
24. Mounting bracket
25. Hex nut
26. Nut
27. Collar
28. Damper
29. Bracket
30. Mounting bracket
31. Bolt
32. Lockwasher

5. Have an assistant hold onto the fairing.
6. Remove the nut and lockwasher (A, **Figure 19**) securing the fairing to the engine guard (B) on each side.
7. Within the headlight area of the fairing, remove the two nuts securing the fairing to the central portion of the mounting bracket.
8. Carefully move fairing forward, then disconnect the 1-pin electrical connector for the light assemblies within the fairing.
9. Install by reversing these removal steps while noting the following:
   a. Make sure the rubber pad (**Figure 20**) is in place between the central mounting bracket and the fairing. Tighten the fasteners securely.
   b. Push the electrical harness (A, **Figure 21**) through the guide (B) and lock the harness in place.

Windshield Removal/Installation

The windshield is held on place with small plastic screws. These screws deteriorate with age and should be replaced whenever the windshield is removed or replaced.
1. Starting at the outside of the windshield and working toward the center from both sides in a crisscross pattern, loosen and remove the plastic screws (**Figure 22**).
2. Remove the windshield.
3. Thoroughly clean the windshield mounting surface on the fairing of all debris.
4. Install the windshield and have an assistant hold it in place.
5. Install *new* plastic screws. Starting from the center of the windshield and working toward both sides in a crisscross pattern, securely tighten the plastic screws. Do not overtighten as the screw(s) will break.

FRONT FORK

Oil Change

Fork oil change is the same as on previous models with the following exceptions:
1. Fill the fork tubes with approximately 7.7 oz. (230 cc) 10/20 W fork oil.
2. After filling both fork tubes, pump the forks several times to expel air from the upper and lower fork chambers.

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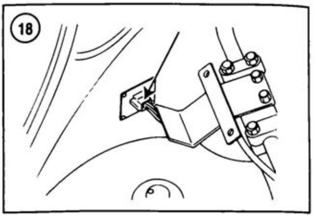

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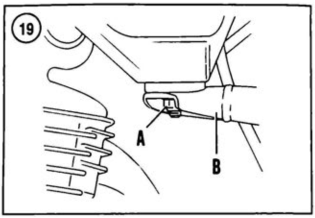

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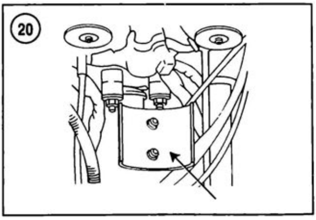
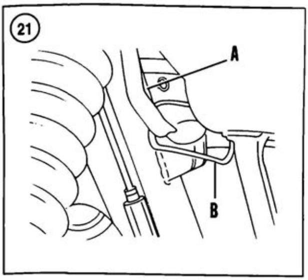
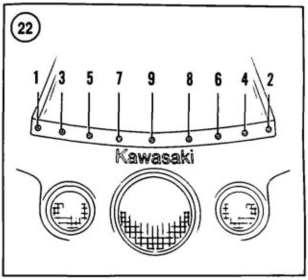


3. Stick a long wire (at least 24 in.) down into the fork tube. Measure the distance from the top of the fork oil to the top of the fork tube. The distance should be 6.1-6.2 in. (155-159 mm). Readjust if necessary.

Removal/Installation

Removal and installation is the same as on KZ1100-L and KZ1100-D models with the following exception. Tighten the fork clamp bolts to 15 ft.-lb. (2.1 mkg.).





Disassembly/Assembly

Disassembly and assembly is the same as on KZ1100-L and KZ1100-D models with the following exceptions.

Even though the fork assembly is equipped with an air valve. Do not pressurize the fork assemblies. After the fork assemblies have been service and installed in the motorcycle, perform the following:

1. Unscrew and remove the valve stem from the air valve.

2. Apply the front brake and compress the fork assemblies several times to equalize the air within the fork upper air chamber.

3. Install the valve stem, tighten securely and install the cap.

Inspection

Fork leg inspection is the same as on KZ1100-L and KZ1100-D models with the exception of the length of the fork spring.

Standard spring length: 21.87 in. (555.5 mm).
Service limit length: 21.42 in. (544 mm).

ENGINE GUARDS

Removal/Installation

Refer to **Figure 23**.

1. To remove the engine guard, perform the following:
   a. Loosen all bolts and nuts.
   b. Have an assistant hold onto the engine guard while removing it. Be careful not to scratch the front fender.
2. To remove the saddlebag guard, perform the following:
   a. Remove the saddlebag.
   b. Loosen all bolts and nuts.
   c. Remove the bolt, lock washer and washer securing the saddlebag guard to the rear guard.
   d. Remove the bolts, spring washers and washers securing the saddlebag guard to the frame in two places. Do not lose the collar and rubber damper.
   e. Remove the saddlebag guard.
   f. Repeat for the other side if necessary.
3. To remove the rear guard, perform the following:
   a. Remove both saddlebag guards.
   b. Remove the bolts, lockwasher washers and acorn nuts securing the rear guard to the frame mount on each side.
   c. Remove the rear guard.
4. Installation is the reverse of removal. Tighten all bolts and nuts securely.

FLOATING CARRIER

Removal/Installation

Refer to **Figure 24**.

1. Place the motorcycle on the sidestand.
2. Remove both saddlebags.
3. Remove the front center pivot bolt.
4. Remove the nut on each side securing the floating carrier to the frame mounting dampers.
5. Remove the floating carrier.
6. Install by reversing these removal steps. Tighten the bolt and nuts securely.

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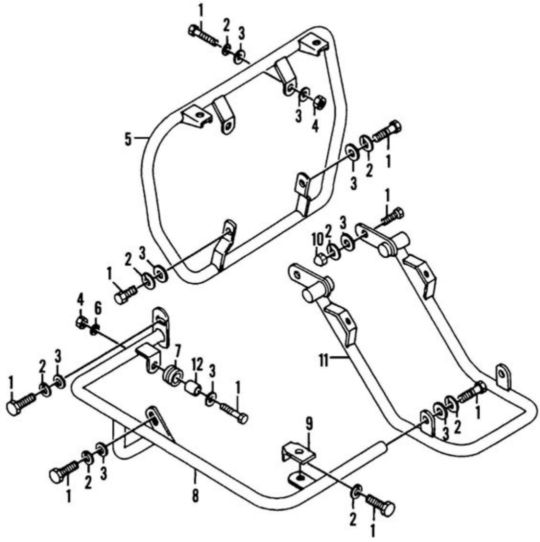
ENGINE AND REAR GUARDS



1. Flange bolt
2. Lockwasher
3. Washer
4. Hex nut
5. Engine guard
6. Lockwasher
7. Rubber damper
8. Saddlebag guard
9. Bracket
10. Acorn nut
11. Rear guard
12. Collar

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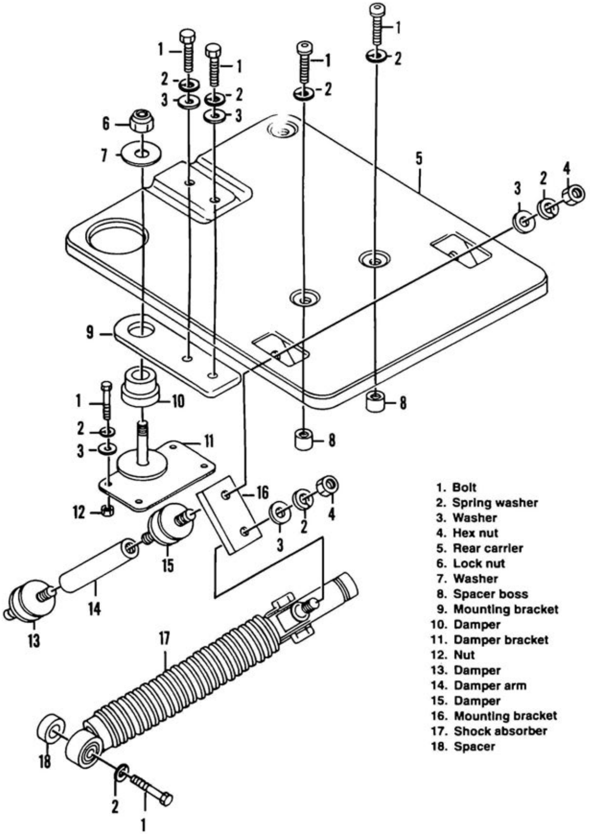
FLOATING CARRIER



1. Bolt
2. Spring washer
3. Washer
4. Hex nut
5. Rear carrier
6. Lock nut
7. Washer
8. Spacer boss
9. Mounting bracket
10. Damper
11. Damper bracket
12. Nut
13. Damper
14. Damper arm
15. Damper
16. Mounting bracket
17. Shock absorber
18. Spacer

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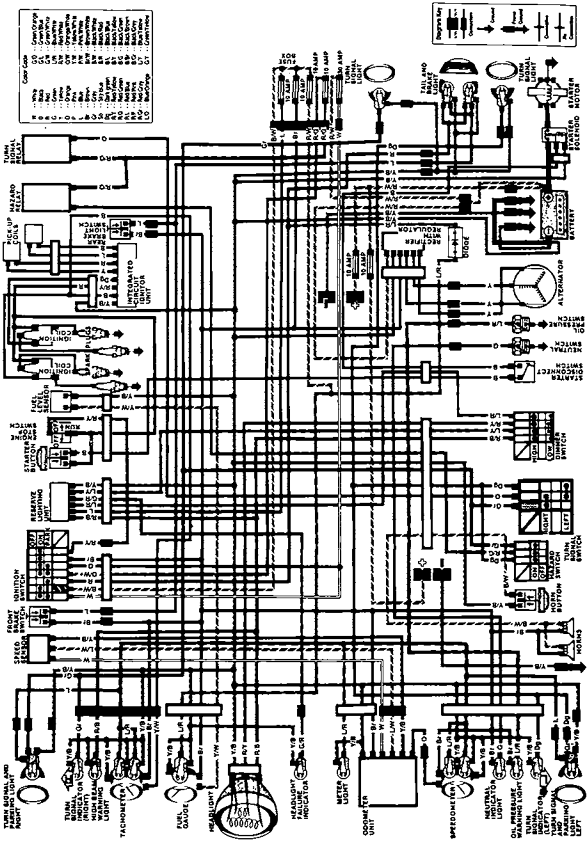
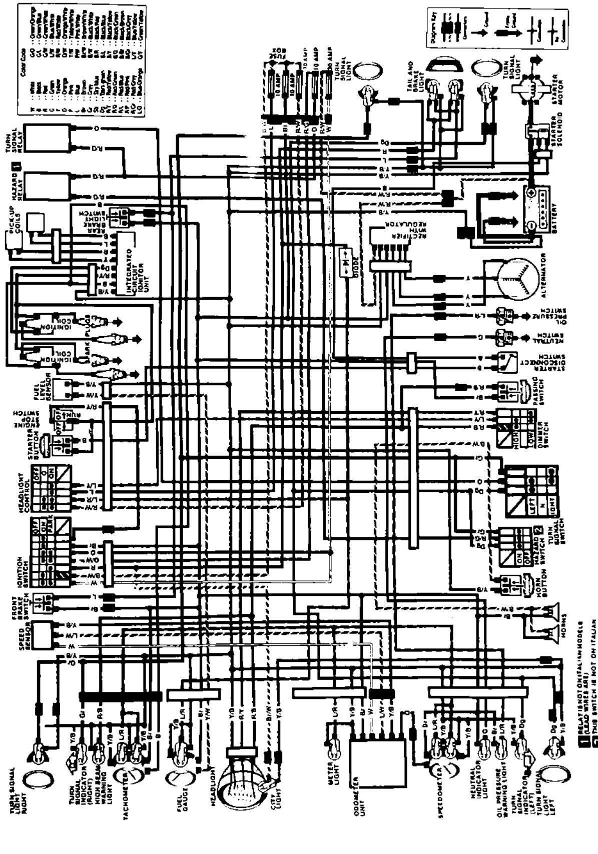
WIRING DIAGRAMS

1981-1982 KZ1000 J1 & J2-U.S. & CANADA



1981-1982 Z1000 J1 & J2-EXCEPT U.S. & CANADA



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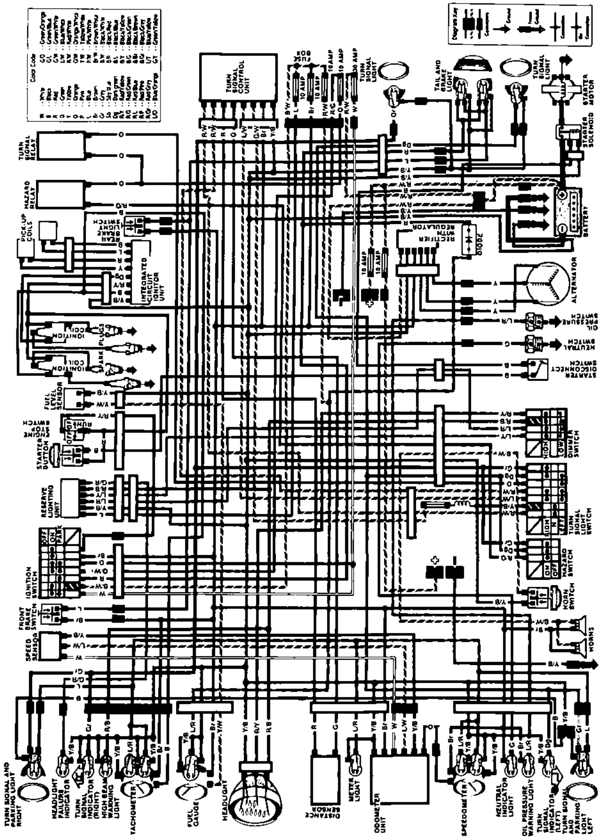

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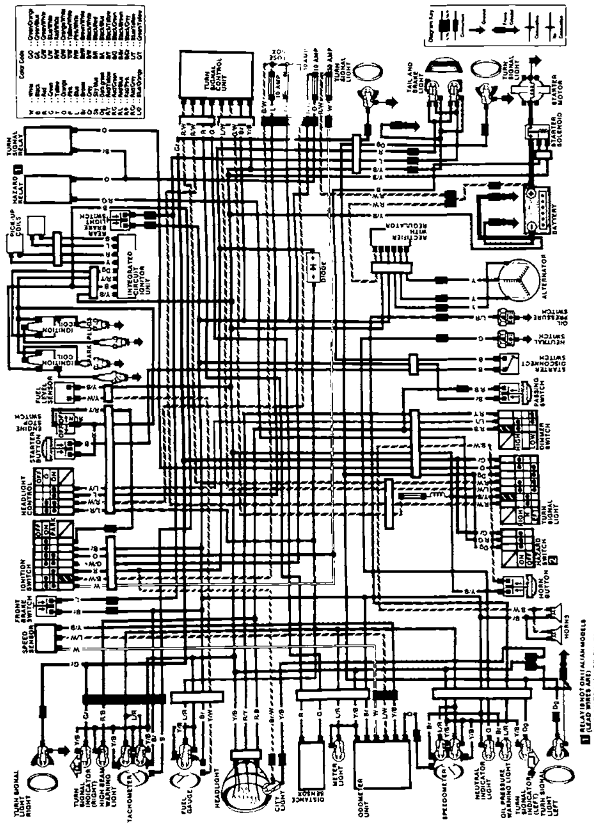

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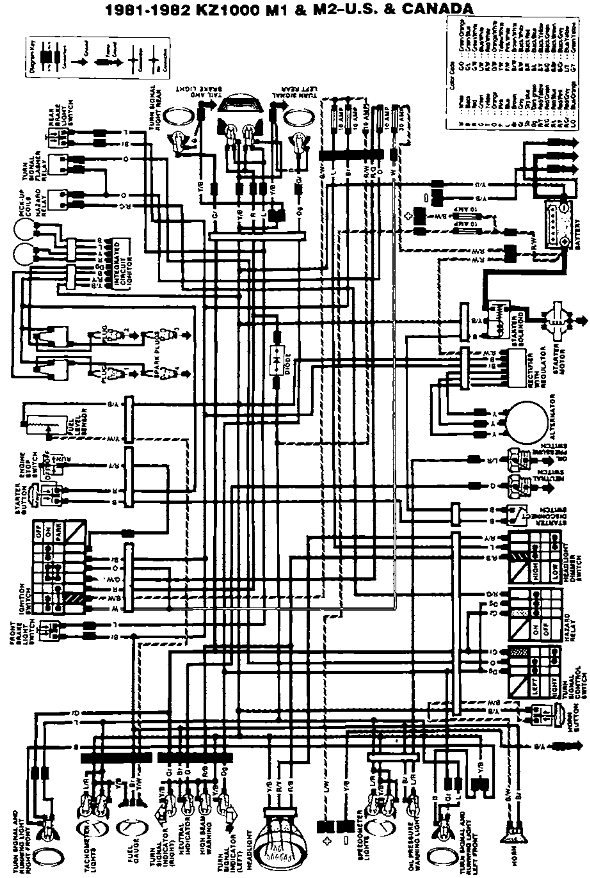

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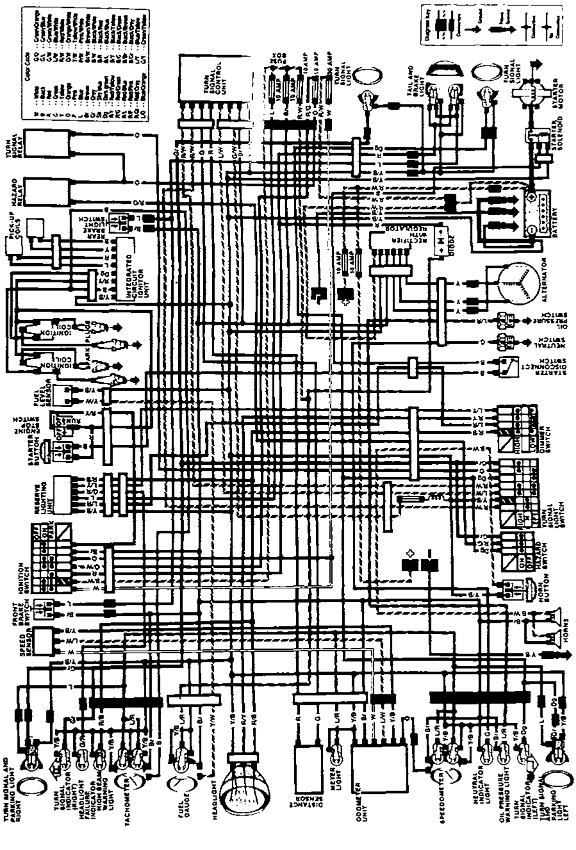

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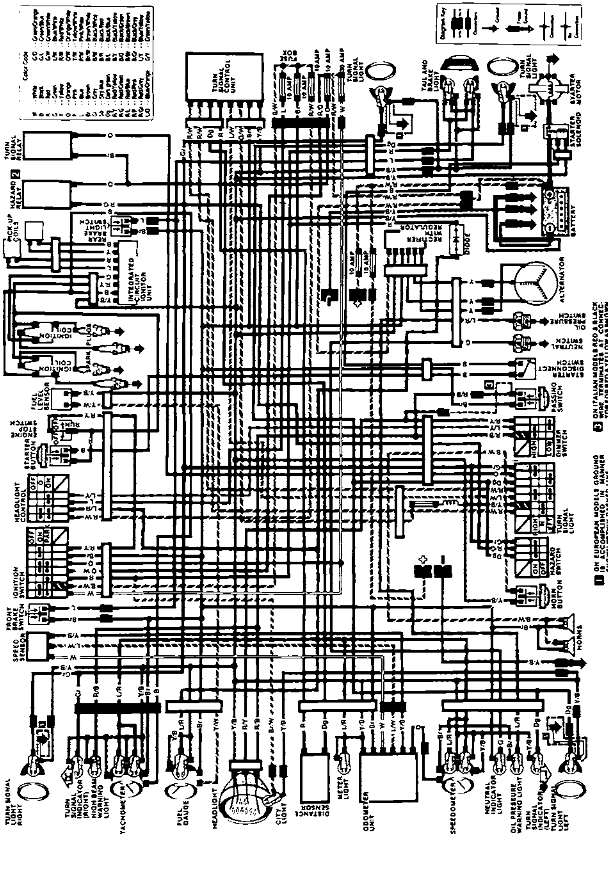
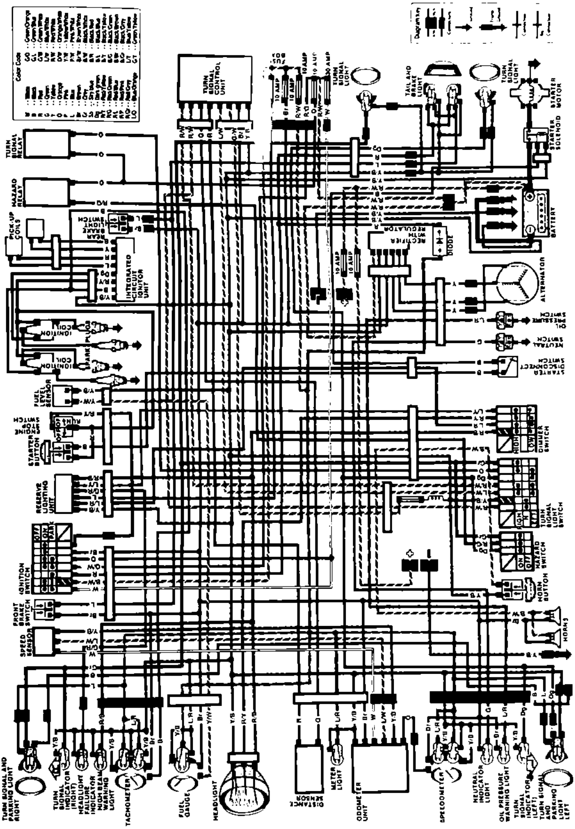
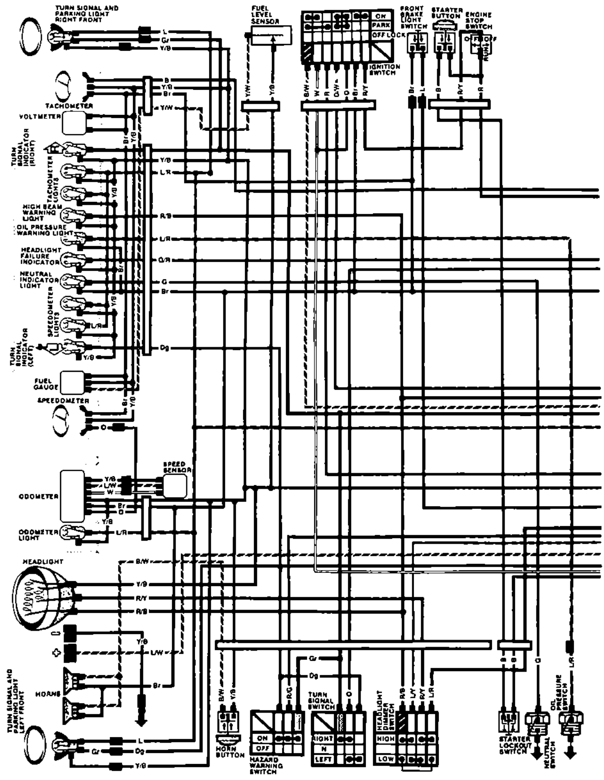
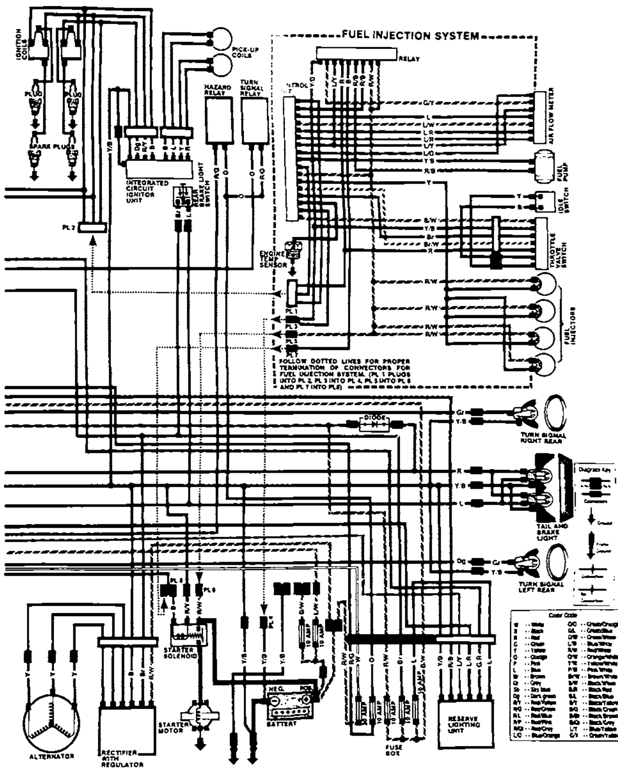


1982 KZ1100 D1–U.S. & CANADA

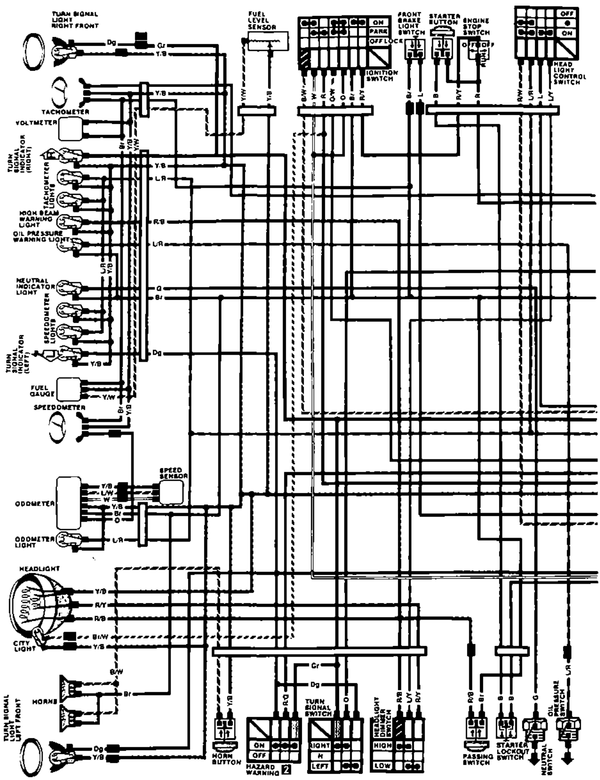


1981 KZ1100 B1-U.S. & CANADA



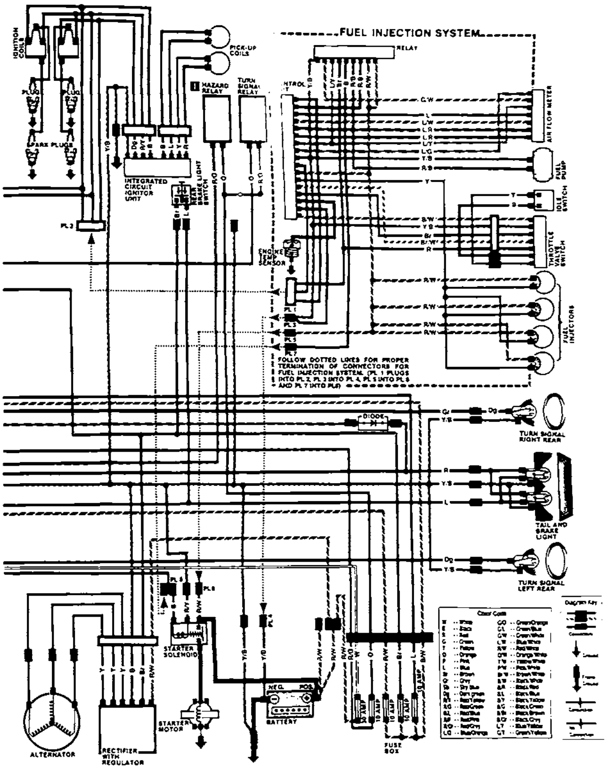

FUEL INJECTION SYSTEM
IGNITION COILS
PLUG
SPARK PLUGS
PICK-UP COILS
HAZARD RELAY
TURN SIGNAL RELAY
RELAY
INTEGRATED CIRCUIT IGNITOR UNIT
REAR BRAKE LIGHT SWITCH
AIR FLOW METER
FUEL PUMP
IDLE SWITCH
THROTTLE VALVE SWITCH
ENGINE TEMP SENSOR
FUEL INJECTORS
FOLLOW DOTTED LINES FOR PROPER TERMINATION OF CONNECTORS FOR FUEL INJECTION SYSTEM. (PL 1 PLUGS INTO PL 2, PL 3 INTO PL 4, PL 5 INTO PL 6 AND PL 7 INTO PL8)
DIODE
TURN SIGNAL RIGHT REAR
TAIL AND BRAKE LIGHT
TURN SIGNAL LEFT REAR
STARTER SOLENOID
STARTER MOTOR
BATTERY
ALTERNATOR
RECTIFIER WITH REGULATOR
FUSE BOX
RESERVE LIGHTING UNIT
Color Code

1981 Z1100 B1-EXCEPT U.S. & CANADA



1 RELAY IS NOT ON ITALIAN MODELS (LEAD WIRES ARE)

2 THIS SWITCH IS NOT ON ITALIAN MODELS


FUEL INJECTION SYSTEM
RELAY
IGNITION COILS
PICK-UP COILS
HAZARD RELAY
TURN SIGNAL RELAY
SPARK PLUGS
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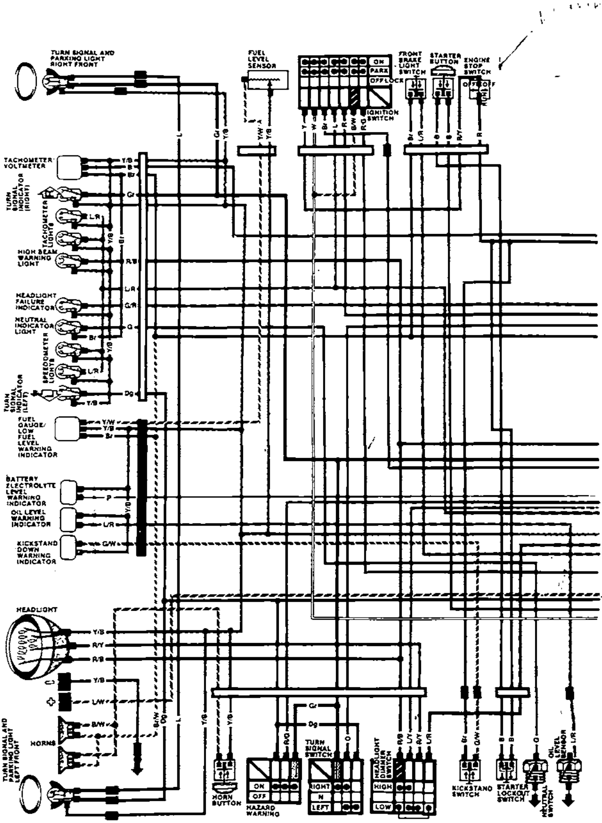
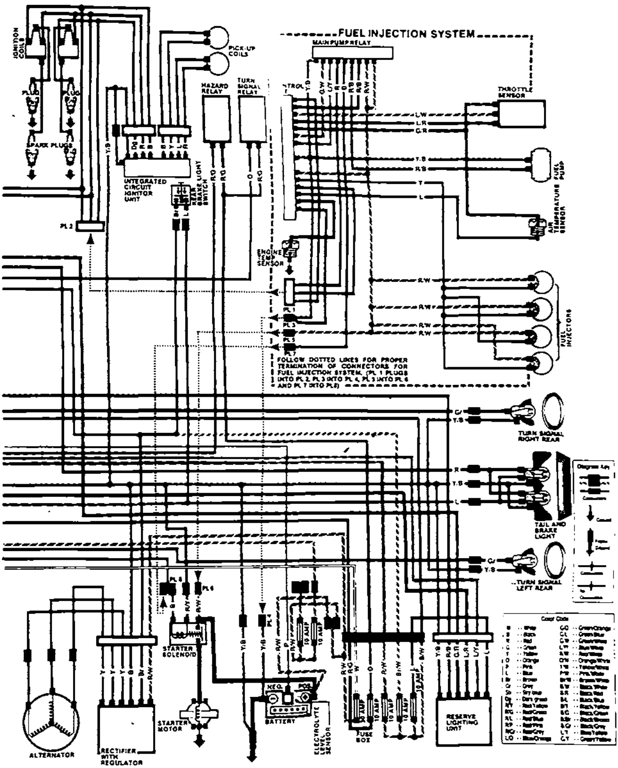
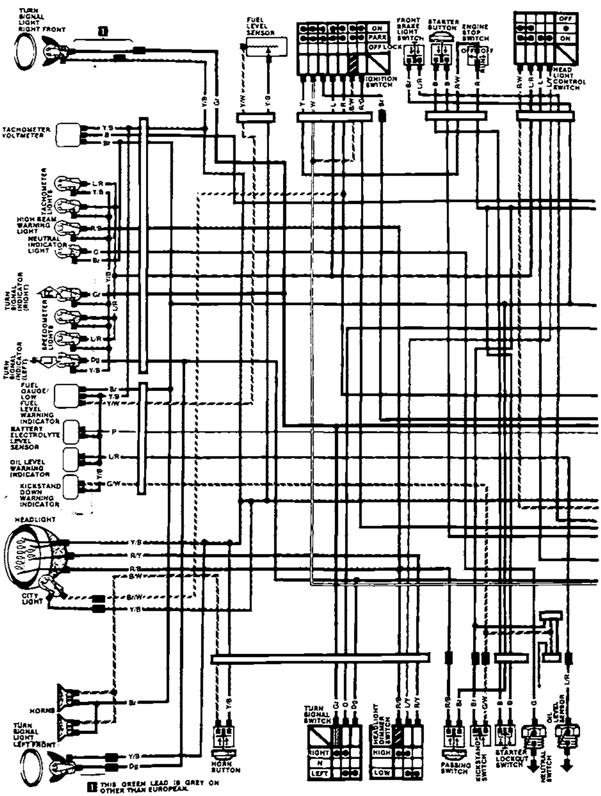
DIODE
TURN SIGNAL RIGHT REAR
TAIL AND BRAKE LIGHT
TURN SIGNAL LEFT REAR
STARTER SOLENOID
STARTER MOTOR
BATTERY
NEG.
POS.
FUSE BOX
10 AMP
ALTERNATOR
RECTIFIER WITH REGULATOR
Color Code
Diagram Key

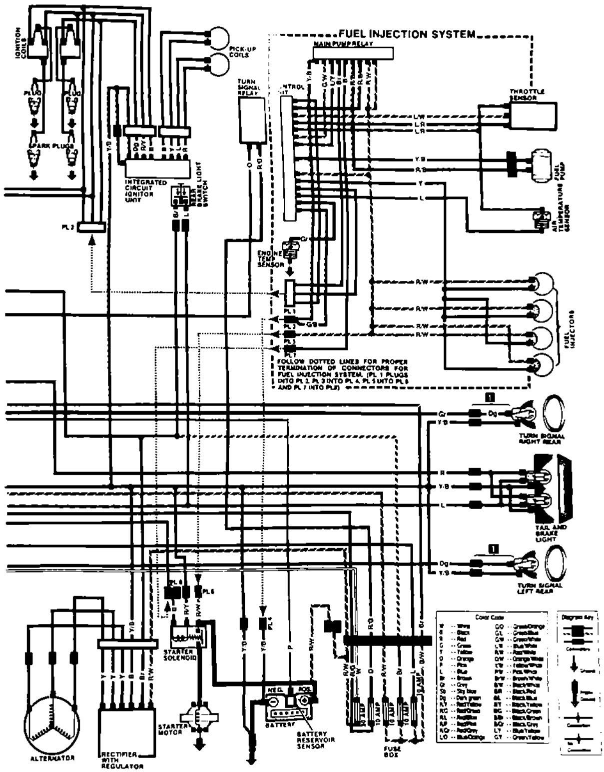
1982 KZ1100 B2–U.S. & CANADA



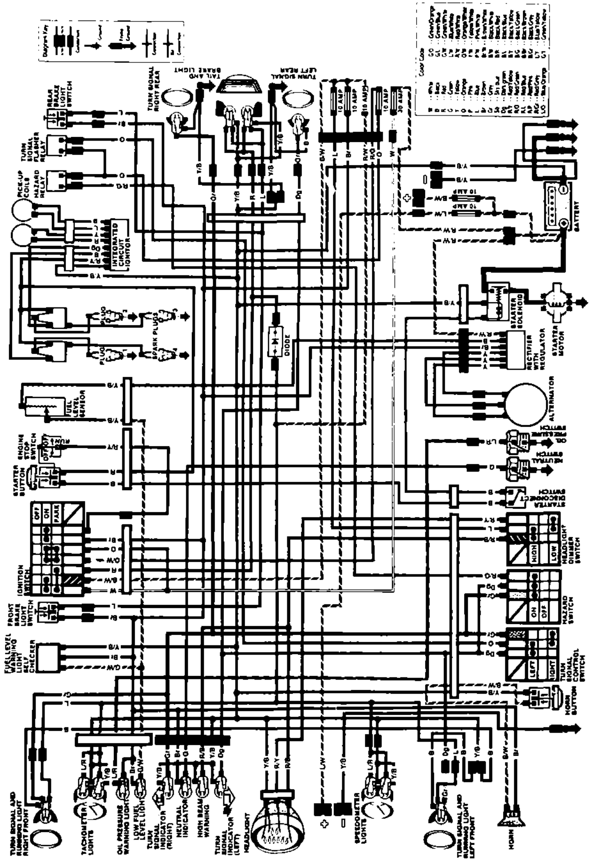

IGNITION COILS
PICK-UP COILS
FUEL INJECTION SYSTEM
MAIN PUMP RELAY
HAZARD RELAY
TURN SIGNAL RELAY
THROTTLE SENSOR
SPARK PLUGS
INTEGRATED CIRCUIT IGNITOR UNIT
REAR BRAKE LIGHT SWITCH
FUEL PUMP
AIR TEMPERATURE SENSOR
ENGINE TEMP SENSOR
FUEL INJECTORS
FOLLOW DOTTED LINES FOR PROPER TERMINATION OF CONNECTORS FOR FUEL INJECTION SYSTEM. (PL 1 PLUGS INTO PL 2, PL 3 INTO PL 4, PL 5 INTO PL 6 AND PL 7 INTO PL 8)
TURN SIGNAL RIGHT REAR
TAIL AND BRAKE LIGHT
TURN SIGNAL LEFT REAR
STARTER SOLENOID
STARTER MOTOR
BATTERY
ELECTROLYTE LEVEL SENSOR
FUSE BOX
RESERVE LIGHTING UNIT
ALTERNATOR
RECTIFIER WITH REGULATOR
Color Code

1982 Z1100 B2-EXCEPT U.S. & CANADA

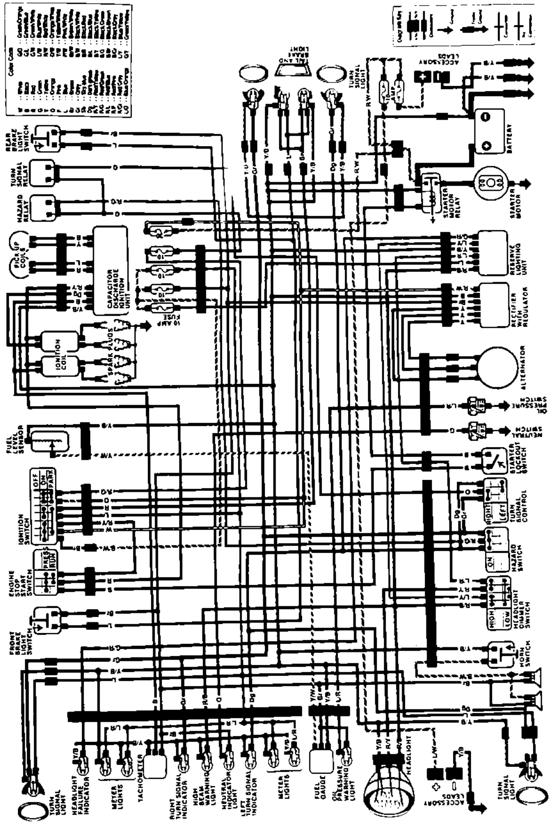



IGNITION COILS
PLUG
SPARK PLUGS
PICK-UP COILS
FUEL INJECTION SYSTEM
MAIN PUMP RELAY
TURN SIGNAL RELAY
THROTTLE SENSOR
FUEL PUMP
AIR TEMPERATURE SENSOR
INTEGRATED CIRCUIT IGNITOR UNIT
REAR BRAKE LIGHT SWITCH
ENGINE TEMP SENSOR
FUEL INJECTORS
FOLLOW DOTTED LINES FOR PROPER TERMINATION OF CONNECTORS FOR FUEL INJECTION SYSTEM. (PL 1 PLUGS INTO PL 2, PL 3 INTO PL 4, PL 5 INTO PL 6 AND PL 7 INTO PL8)
TURN SIGNAL RIGHT REAR
TAIL AND BRAKE LIGHT
TURN SIGNAL LEFT REAR
STARTER SOLENOID
STARTER MOTOR
BATTERY
BATTERY RESERVOIR SENSOR
FUSE BOX
ALTERNATOR
RECTIFIER WITH REGULATOR
Color Code

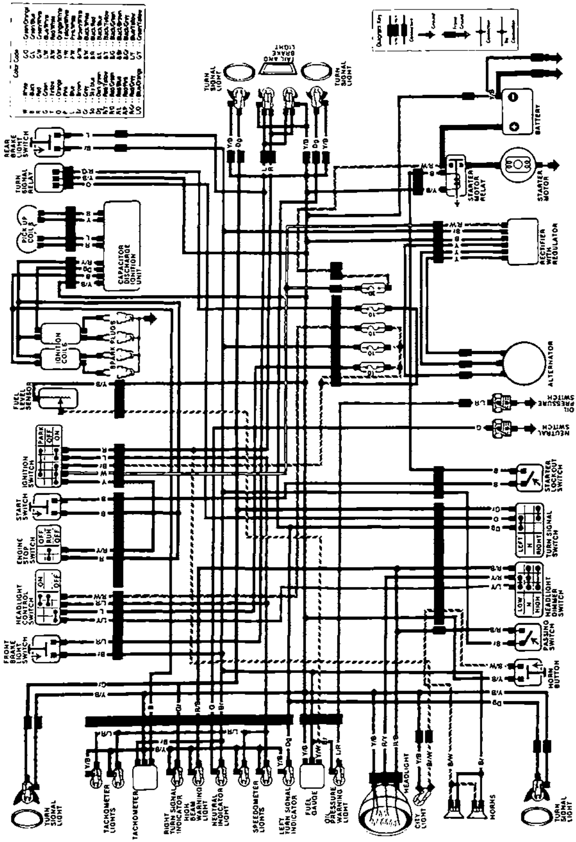
1982 KZ1000 M2-U.S. & CANADA



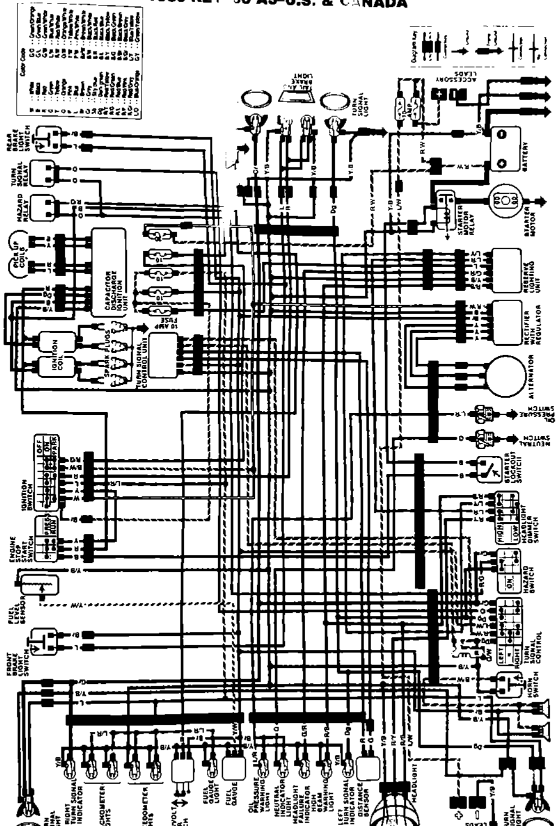
1982-1983 KZ1000 R1 & R2



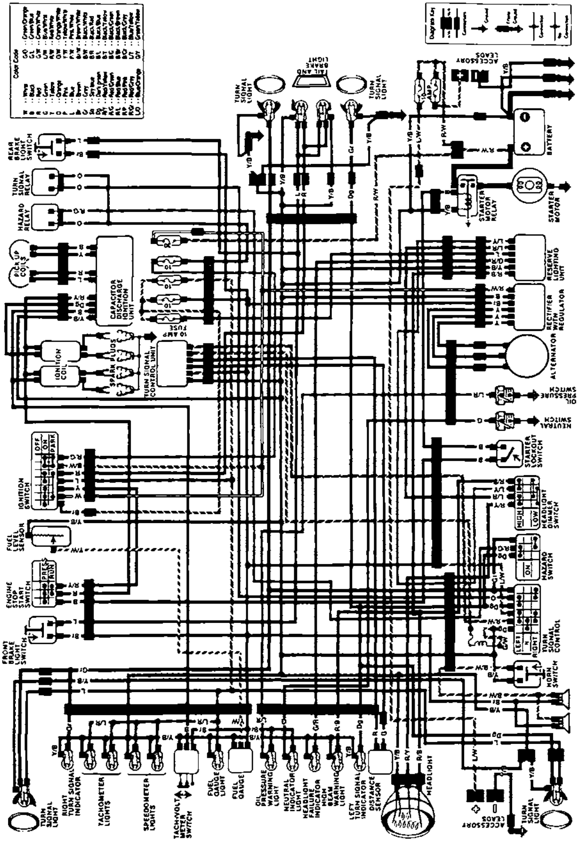
1983 Z1000 J3 & R2–EXCEPT U.S. & CANADA



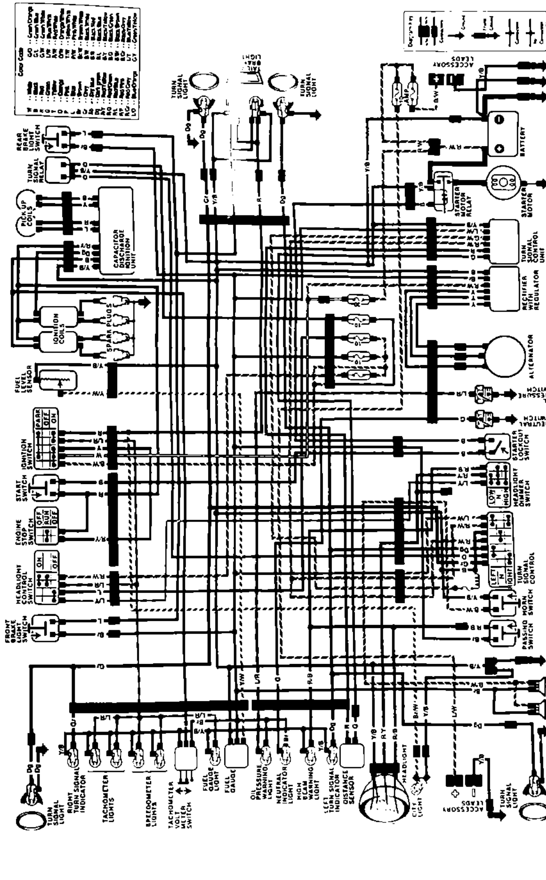
1983 KZ1100 A3–U.S. & CANADA



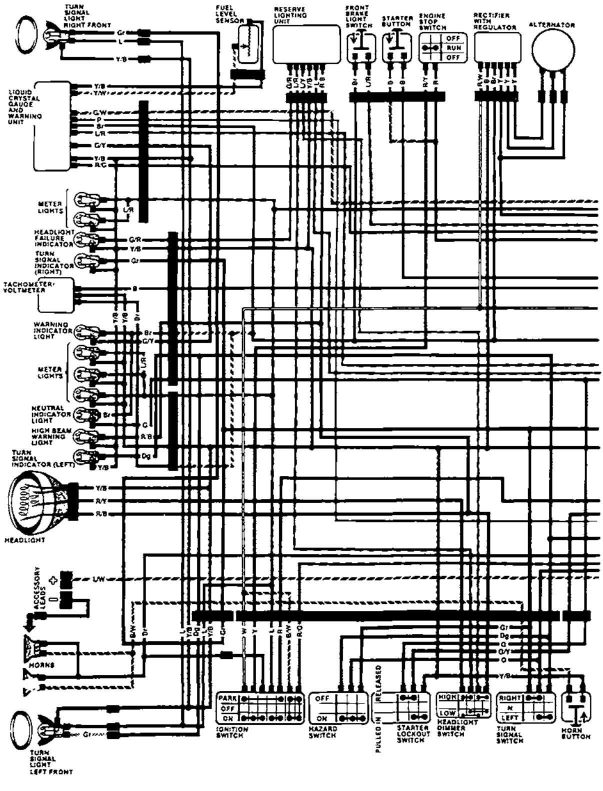
1983 KZ1100 D2 & L1

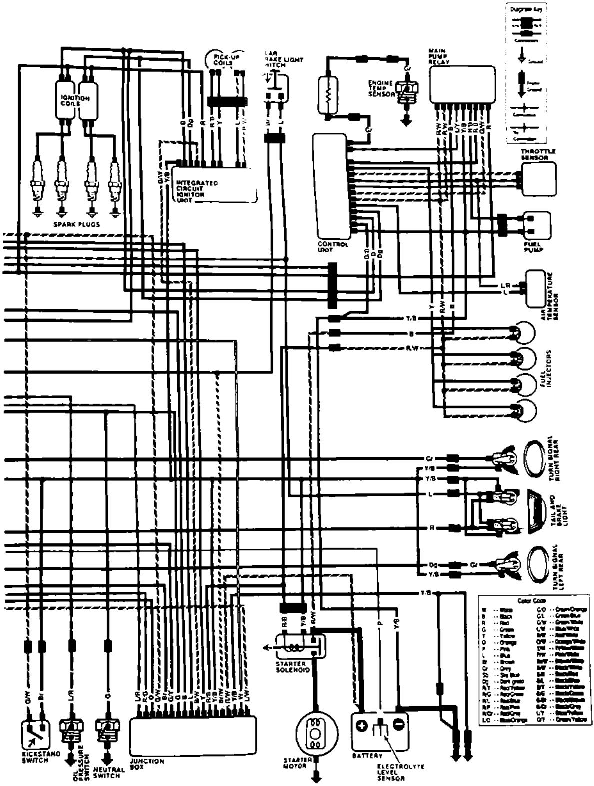


1985 Z1100 A3 EXCEPT U.S. & CANADA

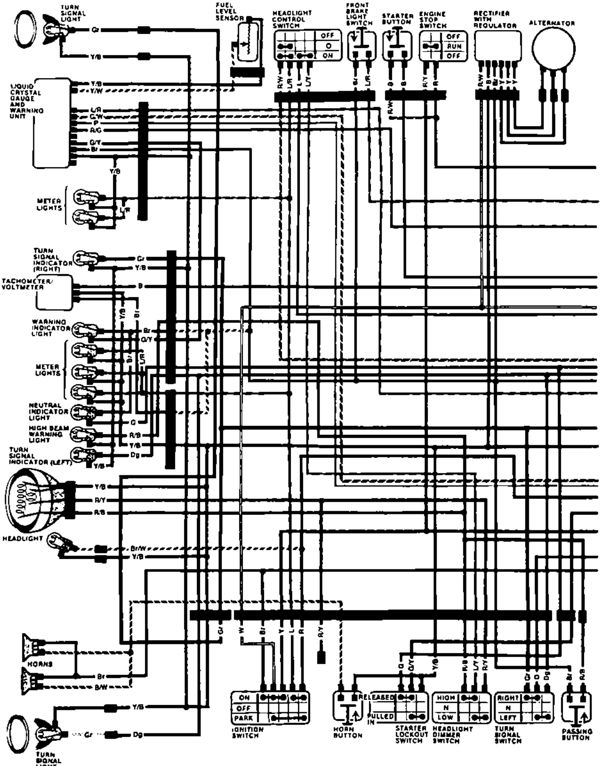


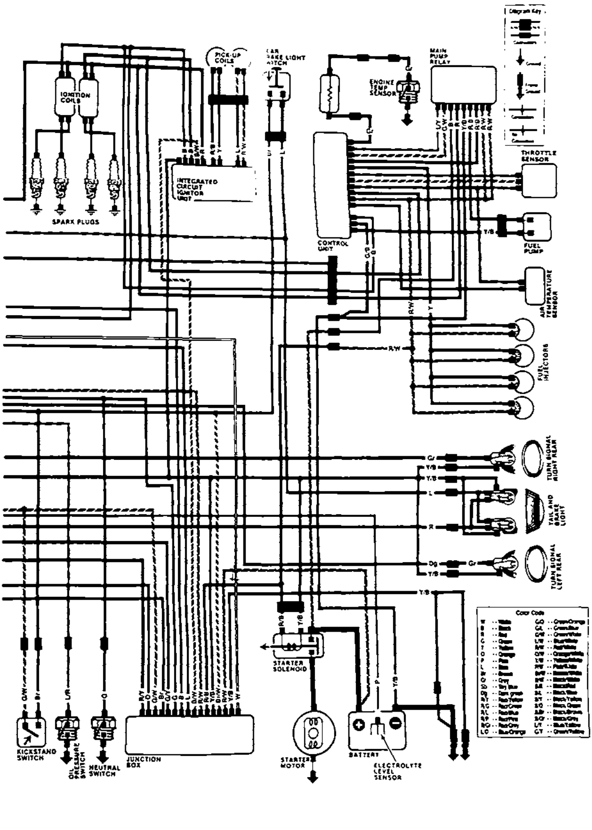
1983-1984 ZX1100 A1 & A2–U.S. & CANADA



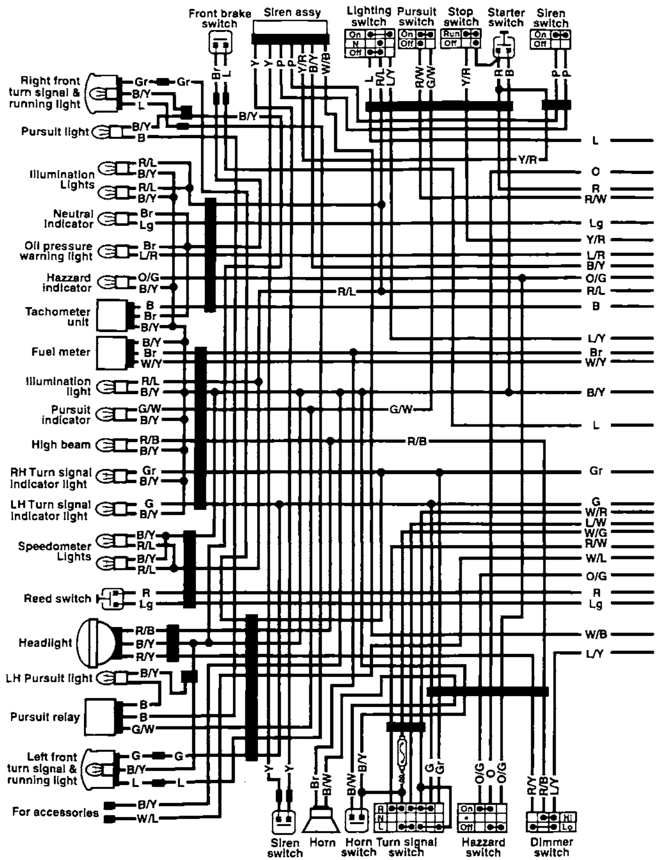

IGNITION COILS
SPARK PLUGS
PICK-UP COILS
INTEGRATED CIRCUIT IGNITOR UNIT
ENGINE TEMP SENSOR
MAIN PUMP RELAY
THROTTLE SENSOR
CONTROL UNIT
FUEL PUMP
AIR TEMPERATURE SENSOR
FUEL INJECTORS
TURN SIGNAL RIGHT REAR
TAIL AND BRAKE LIGHT
TURN SIGNAL LEFT REAR
Color Code
STARTER SOLENOID
STARTER MOTOR
BATTERY
ELECTROLYTE LEVEL SENSOR
KICKSTAND SWITCH
OIL PRESSURE SWITCH
NEUTRAL SWITCH
JUNCTION BOX

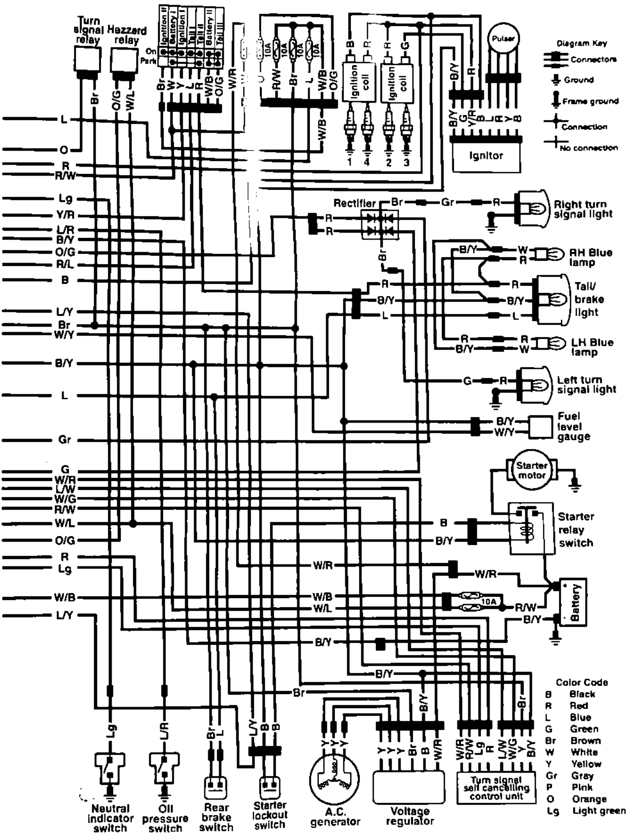
1983-1984 Z1100 A1 & A2–EXCEPT U.S. & CANADA



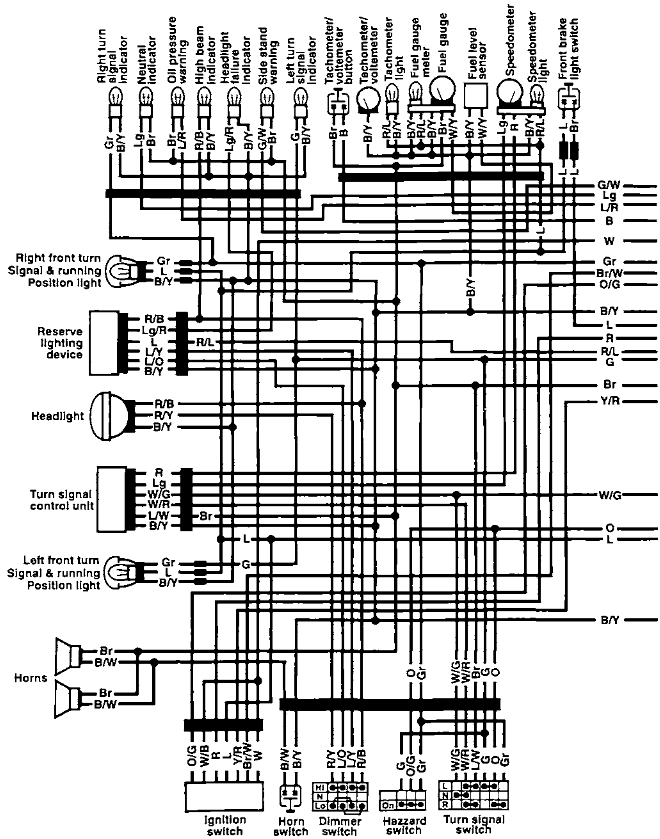

IGNITION COILS
SPARK PLUGS
PICK-UP COILS
INTEGRATED CIRCUIT IGNITOR UNIT
ENGINE TEMP SENSOR
MAIN PUMP RELAY
THROTTLE SENSOR
CONTROL UNIT
FUEL PUMP
AIR TEMPERATURE SENSOR
FUEL INJECTORS
TURN SIGNAL RIGHT REAR
TAIL AND BRAKE LIGHT
TURN SIGNAL LEFT REAR
STARTER SOLENOID
STARTER MOTOR
BATTERY
ELECTROLYTE LEVEL SENSOR
KICKSTAND SWITCH
OIL PRESSURE SWITCH
NEUTRAL SWITCH
JUNCTION BOX
Color Code

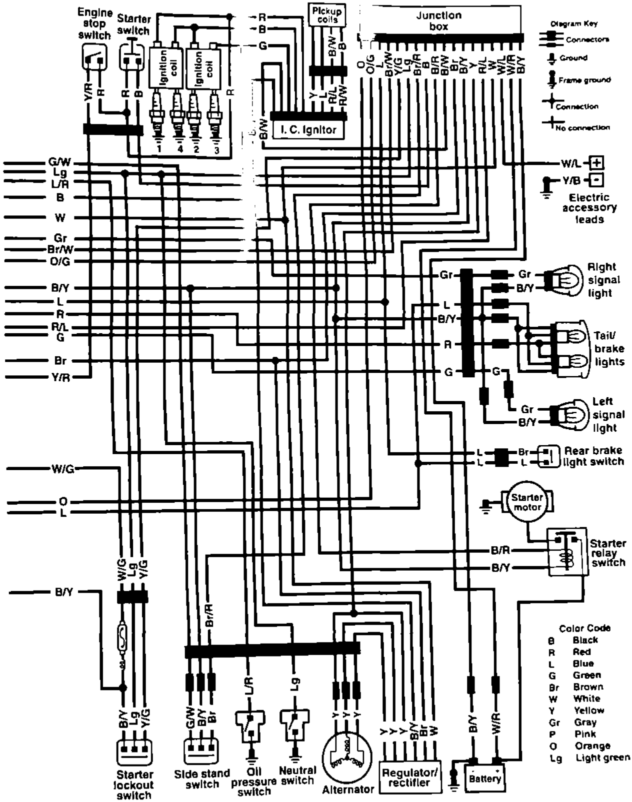
1982-2002 KZ1000 POLICE P1 & P21



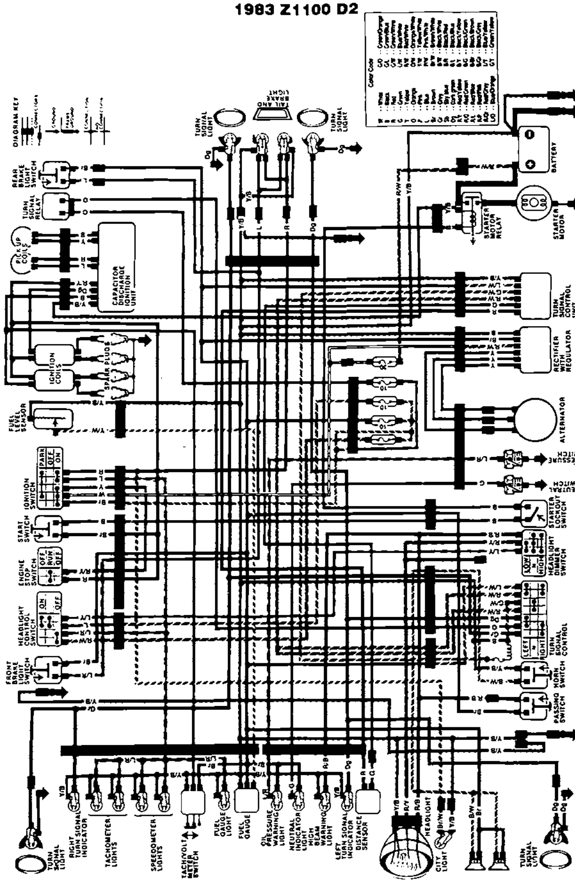

Turn signal relay
Hazzard relay
On
Park
Ignition II
Battery I
Ignition I
Tail I
Tail II
Battery II
Tail III
10A
Ignition coil
Pulser
Ignitor
Diagram Key
Connectors
Ground
Frame ground
Connection
No connection
Rectifier
Right turn signal light
RH Blue lamp
Tail/ brake light
LH Blue lamp
Left turn signal light
Fuel level gauge
Starter motor
Starter relay switch
Battery
Neutral indicator switch
Oil pressure switch
Rear brake switch
Starter lockout switch
A.C. generator
Voltage regulator
Turn signal self cancelling control unit
Color Code
B Black
R Red
L Blue
G Green
Br Brown
W White
Y Yellow
Gr Gray
P Pink
O Orange
Lg Light green

1984-1985 ZN1100 B1 & B2




Engine stop switch
Starter switch
Ignition coil
Ignition coil
Pickup coils
Junction box
I. C. Ignitor
Diagram Key
Connectors
Ground
Frame ground
Connection
No connection
Electric accessory leads
Right signal light
Tail/ brake lights
Left signal light
Rear brake light switch
Starter motor
Starter relay switch
Color Code
B Black
R Red
L Blue
G Green
Br Brown
W White
Y Yellow
Gr Gray
P Pink
O Orange
Lg Light green
Starter lockout switch
Side stand switch
Oil pressure switch
Neutral switch
Alternator
Regulator/ rectifier
Battery

1983 Z1100 D2



MAINTENANCE LOG

Date	Miles	Type of Service

KAWASAKI

KZ, ZX & ZN 1000-1100cc • 1981-2002

(Includes Z1000 P Series Police models)

U.S. and Canada Models

KZ1000 J1, J2 Standard (1981-1982)
KZ1000 K1, K2 LTD (1981-1982)
KZKKIO MI, M2 CSR (1981-1982)
KZ1000 RI, R2 Replica (1982-1983)
KZ1100 A1, A2, A3 Standard (1981-1983)
KZ1100 B1, B2 GP (1981 -1982)
KZ1100 D1, D2 Spectre (19>52-1983)
KZ1100 L1 LTD-shaft (1983)
ZX1100 A1, A2 (1983-1984)
ZN1100 B1, B2 (1984-1985)
Z1000 Police Model P1-P21 (1982-2002)

Other than U.S. and Canada

Z1000 J1, J2 (1981-1982)
Z1000 K1, K2 (1981-1982)
Z1100 A1, A2 (1981-1982)
Z1100 B1, B2 (1981-1982)
Z1000 J3 (1983)
Z1000 R2 (1983)
Z1100 D2 (1983)
Z1100 A1, A2 (1983-1984)
Z1100 A3 (1985)

Clymer manuals are user-friendly and written in an easy-to-follow format that includes the following features:

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- Clutch
- Transmission
- Carburetion and Exhaust Systems
- Fuel Injection Systems
- Electrical System
- Wheels, Tires and Brakes
- Chassis
- Supplement
- Index
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