KAWASAKI
KMX125 & 200

1986 to 1996 □ 124cc □ 191cc

Owners Workshop Manual

Haynes®

3046

Kawasaki KMX125 & 200 Owners Workshop Manual

by Julian Ryder

Models covered:
Kawasaki KMX125. 124cc. 1986 to 1996
Kawasaki KMX200. 191cc. 1988 to 1992

(3046-2V1)

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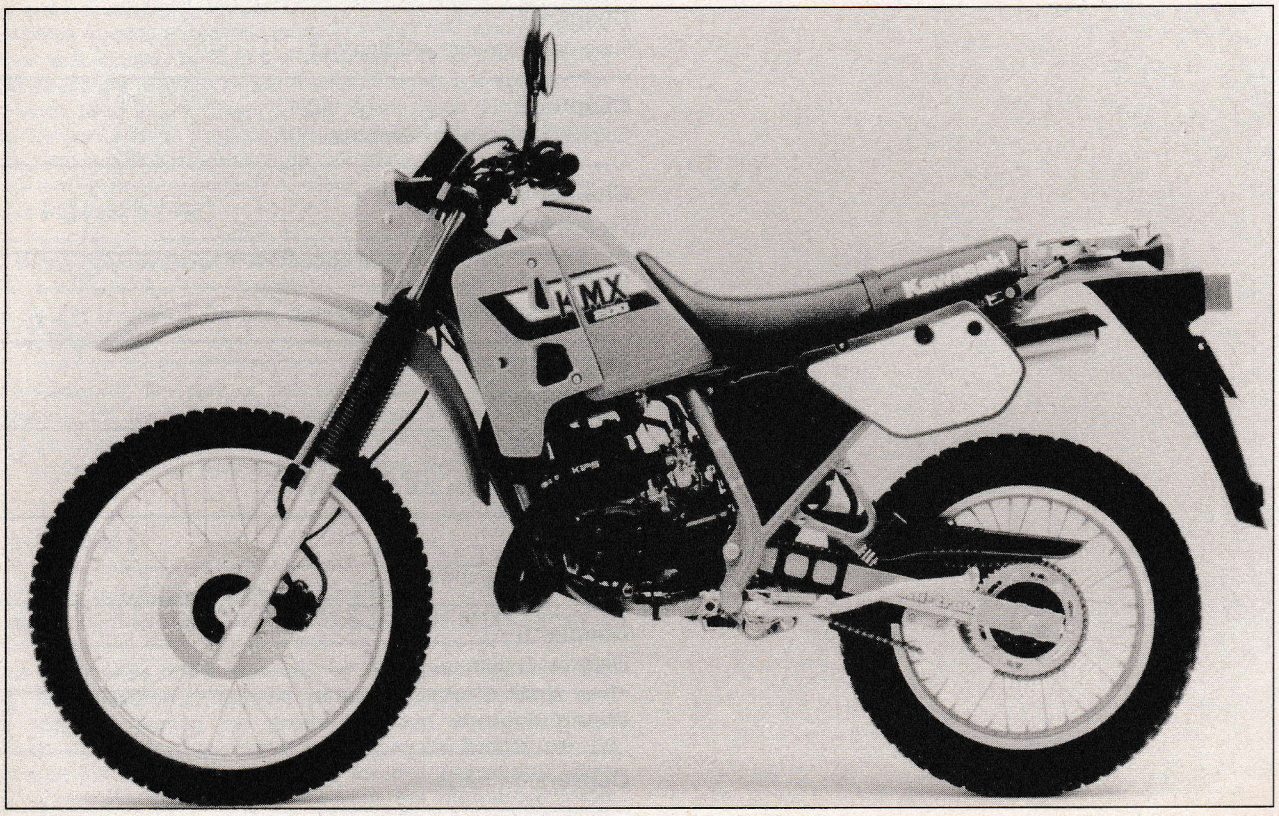
The KMX125B1 model



The KMX200A2 model

About this manual

Its purpose

The purpose of this manual is to help you get the best value from your motorcycle. It can do so in several ways. It can help you decide what work must be done, even if you choose to have it done by a dealer service department or a repair shop; it provides information and procedures for routine maintenance and servicing; and it offers diagnostic and repair procedures to follow when trouble occurs.

We hope you use the manual to tackle the work yourself. For many simpler jobs, doing it yourself may be quicker than arranging an appointment to get the motorcycle into a shop and making the trips to leave it and pick it up. More importantly, a lot of money can be saved by avoiding the expense the shop must pass on to you to cover its labour and overhead costs. An added benefit is the sense of satisfaction and accomplishment that you feel after doing the job yourself.

Using the manual

The manual is divided into Chapters. Each Chapter is divided into numbered Sections, which are headed in bold type between horizontal lines. Each Section consists of consecutively numbered paragraphs or steps.

At the beginning of each numbered Section you will be referred to any illustrations which apply to the procedures in that Section. The reference numbers used in illustration captions pinpoint the pertinent Section and the Step within that Section. That is, illustration 3.2 means the illustration refers to Section 3 and Step (or paragraph) 2 within that Section.

Procedures, once described in the text, are not normally repeated. When it's necessary to refer to another Chapter, the reference will be given as Chapter and Section number. Cross references given without use of the word "Chapter" apply to Sections and/or paragraphs in the same Chapter. For example, "see Section 8" means in the same Chapter.

References to the left or right side of the motorcycle assume you are sitting on the seat, facing forward.

Motorcycle manufacturers continually make changes to specifications and recommendations, and these, when notified, are incorporated into our manuals at the earliest opportunity.

Even though we have prepared this manual with extreme care, neither the publisher nor the author can accept responsibility for any errors in, or omissions from, the information given.

NOTE

A **Note** provides information necessary to properly complete a procedure or information which will make the procedure easier to understand.

CAUTION

A **Caution** provides a special procedure or special steps which must be taken while completing the procedure where the Caution is found. Not heeding a Caution can result in damage to the assembly being worked on.

WARNING

A **Warning** provides a special procedure or special steps which must be taken while completing the procedure where the Warning is found. Not heeding a Warning can result in personal injury.

Introduction to the Kawasaki KMX125 & 200

The Kawasaki KMX125 and 200 trail bikes were developed from Kawasaki's KX motocrossers. The styling, frame and long travel suspension all make these bikes particularly suitable for off-road use. The 125 is sold in restricted, UK learner legal (B model), and unrestricted (A model) forms.

The engine is a liquid-cooled single cylinder two-stroke with reed valve induction and Kawasaki's KIPS (Kawasaki Integrated Power-valve System) exhaust valve that widens the spread of power through the rev range. Fuel is delivered through a Mikuni carburettor.

Front suspension is by a pair of oil-damped coil-spring telescopic fork legs. The rear suspension uses Kawasaki's Uni-Trak rising rate design which employs a single shock absorber mounted above the swinging arm pivot. The suspension provides progressive spring and damping effects.

The front and rear brakes use single discs. Later models featured plastic guards over the front disc and fork lower legs and handlebar-mounted hand guards.

Ignition is fully electronic and the electrical equipment operates off a 12 volt system.

Identification numbers

Frame and engine numbers

The frame number is stamped into the right-hand side of the steering head. The engine number is stamped into the right-hand upper side of the crankcase, directly above the clutch housing. Both of these numbers should be recorded and kept in a safe place so they can be furnished to law enforcement officials in the event of a theft.

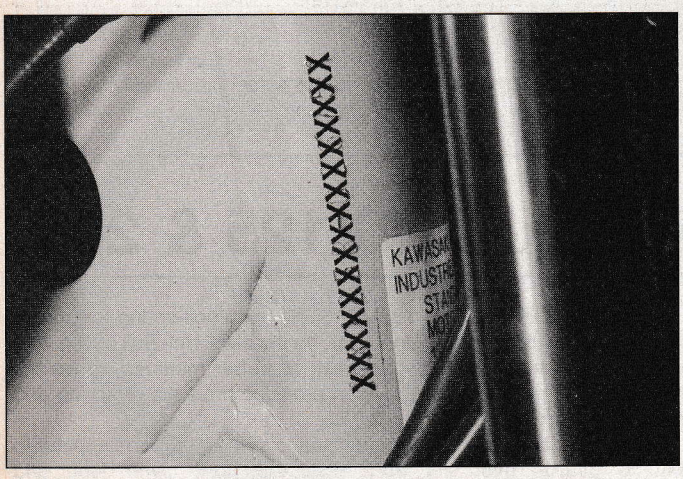
The frame number, engine number and carburettor identification number should also be kept in a handy place (such as with vour driver's licence) so they are always available when purchasing or ordering parts for your machine.

Model	Production year	Engine number
KMX125 A1	1986	MX125AE000001 on
KMX125 A2	1987	MX125AE006801 on
KMX125 A3	1988	MX125AE015001 on
KMX125 A4	1989	MX125AE019901 on
KMX125 A5	1990	As A4 model
KMX125 A6	1991	As A4 model
KMX125 B1	1986	MX125AE000001 on
KMX125 B2	1987	MX125AE006801 on
KMX125 B3	1988	MX125AE015001 on
KMX125 B4	1989	MX125AE019901 on
KMX125 B5	1990	As B4 model
KMX125 B6	1991	As B4 model
KMX125 B7	1992 to 1994	As B4 model
KMX125 B8	1995 to 1996	As B7 model
KMX200 A2	1988	MX200AE006501 on
KMX200 A3	1989 to 1992	MX200AE011501 on

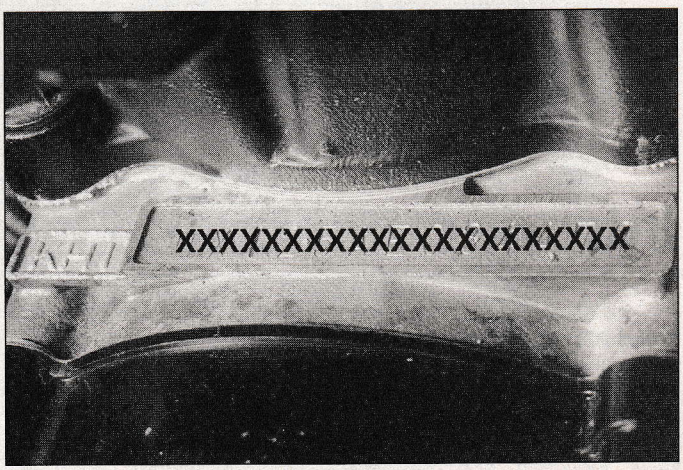
Identifying codes

The procedures in this manual identify the motorcycles by model code. The model code (eg KMX125B3) is printed on the model information label on the steering head. In the case of KMX125B models, the label will also identify the bike as a UK learner legal model restricted to a power output of 9 kW (12 bhp). The model code and production year can also be determined from the engine and frame numbers as given in the table below:

Frame number
MX125A-000001 on
MX125A-004001 on
MX125A-008001 on
MX125A-010201 on
MX125A-012501 on
MX125A-018001 on
MX125B-000001 on
MX125B-003801 on
MX125B-008001 on
MX125B-011501 on
MX125B-016001 on
MX125B-022001 on
MX125B-026001 on
MX125B-029001 on
MX200A-006001 on
MX200A-011501 on



Frame number is stamped into right side of steering head. The plate on the front of the steering head identifies the model as a 9kW restricted machine



Engine number is stamped into right crankcase above clutch housing

Buying parts

Once you have found all the identification numbers, record them for reference when buying parts. Since the manufacturers change specifications, parts and vendors (companies that manufacture various components on the machine), providing the ID numbers is the only way to be reasonably sure that you are buying the correct parts.

Whenever possible, take the worn part to the dealer so direct comparison with the new component can be made. Along the trail from the manufacturer to the parts shelf, there are numerous places that the part can end up with the wrong number or be listed incorrectly.

The two places to purchase new parts for your motorcycle - the accessory store and the franchised dealer - differ in the type of parts they carry. While dealers can obtain virtually every part for your motorcycle, the accessory dealer is usually limited to normal high wear items such as shock absorbers, tune-up parts, various engine gaskets, cables, chains, brake parts, etc. Rarely will an accessory outlet have major suspension components, cylinders, transmission gears, or cases.

Used parts can be obtained for roughly half the price of new ones, but you can't always be sure of what you're getting. Once again, take your worn part to the breaker for direct comparison.

Whether buying new, used or rebuilt parts, the best course is to deal directly with someone who specialises in parts for your particular make.

General specifications

Dimensions

Wheelbase	1375 mm (54.1 in)
Overall length	
125A1, A2, B1, B2 and 200 models	2145 mm (84.4 in)
125A3 and B3 models onward	2100 mm (82.7 in)
Overall width	840 mm (33.1 in)
Overall height	
125 models	1175 mm (46.2 in)
200 models	1180 mm (46.4 in)
Seat height	
125 models	865 mm (34.1 in)
200 models	860 mm (33.9 in)
Ground clearance	
125 models	295 mm (11.6 in)
200 models	285 mm (11.2 in)

Weights (with oil and full fuel tank)

125A1, A2, B1 and B2 models	117 kg (258 lb)
125A3 and B3 models onward	114 kg (251 lb)
200 models	119 kg (262 lb)

Maintenance techniques, tools and working facilities

Basic maintenance techniques

There are a number of techniques involved in maintenance and repair that will be referred to throughout this manual. Application of these techniques will enable the amateur mechanic to be more efficient, better organised and capable of performing the various tasks properly, which will ensure that the repair job is thorough and complete.

Fastening systems

Fasteners, basically, are nuts, bolts and screws used to hold two or more parts together. There are a few things to keep in mind when working with fasteners. Almost all of them use a locking device of some type (either a lock washer, locknut, locking tab or thread adhesive). All threaded fasteners should be clean, straight, have undamaged threads and undamaged corners on the hex head where the spanner fits. Develop the habit of replacing all damaged nuts and bolts with new ones.

Rusted nuts and bolts should be treated with a penetrating oil to ease removal and prevent breakage. Some mechanics use turpentine in a spout type oil can, which works quite well. After applying the rust penetrant, let it work for a few minutes before trying to loosen the nut or bolt. Badly rusted fasteners may have to be chiselled off or removed with a special nut breaker, available at tool shops.

If a bolt or stud breaks off in an assembly it can be drilled out and removed with a special tool called an E-Z Out (or screw extractor). Most dealer service departments and motorcycle repair shops can perform this task, as well as others (such as the repair of threaded holes that have been stripped out).

Flat washers and lock washers, when removed from an assembly, should always be replaced exactly as removed. Replace any damaged washers with new ones. Always use a flat washer between a lock washer and any soft metal surface (such as aluminium), thin sheet metal or plastic. Special locknuts can only be used once or twice before they lose their locking ability and must be replaced

Tightening sequences and procedures

When threaded fasteners are tightened, they are often tightened to a specific torque value (torque is basically a twisting force). Over-tightening the fastener can weaken it and cause it to break, while under-tightening can cause it to eventually come loose. Each bolt, depending on the material it's made of, the diameter of its shank and the material it is threaded into, has a specific torque value, which is noted in the Specifications. Be sure to follow the torque recommendations closely.

Fasteners laid out in a pattern (ie cylinder head bolts, engine case bolts, etc.) must be loosened or tightened in a specific sequence to avoid warping the component. Initially, the bolts/nuts should go on finger tight only. Next, they should be tightened one full turn each, in a criss-cross or diagonal pattern. After each one has been tightened one full turn, return to the first one tightened and tighten them all one half turn, following the same pattern. Finally, tighten each of them one quarter turn at a time until each fastener has been tightened to the proper torque. To loosen and remove the fasteners the procedure should be reversed.

Disassembly sequence

Component disassembly should be done with care and purpose to help ensure that the parts go back together properly during reassembly. Always keep track of the sequence in which parts are removed. Take note of special characteristics or marks on parts that can be installed more than one way (such as a grooved thrust washer on a shaft). It's a good idea to lay the disassembled parts out on a clean surface in the order that they were removed. It may also be helpful to make sketches or take instant photos of components before removal.

When removing fasteners from a component, keep track of their locations. Sometimes threading a bolt back in a part, or putting the washers and nut back on a stud, can prevent mixups later. If nuts and bolts can't be returned to their original locations, they should be kept in a compartmented box or a series of small boxes. A baking tray for small cakes or tarts is ideal for this purpose, since each cavity can hold the bolts and nuts from a particular area (ie engine cover bolts, engine mounting bolts, etc). A pan of this type is especially helpful when working on assemblies with very small parts (such as the carburettor). The cavities can be marked with paint or tape to identify the contents.

Whenever wiring looms, harnesses or connectors are separated, it's a good idea to identify the two halves with numbered pieces of masking tape so they can be easily reconnected

Gasket sealing surfaces

Throughout any motorcycle, gaskets are used to seal the mating surfaces between components and keep lubricants, fluids, vacuum or pressure contained in an assembly.

Many times these gaskets are coated with a liquid or paste type gasket sealing compound before assembly. Age, heat and pressure can sometimes cause the two parts to stick together so tightly that they are very difficult to separate. In most cases, the part can be loosened by striking it with a soft-faced hammer near the mating surfaces. A standard hammer can be used if a block of wood is placed between the hammer and the part. Do not hammer on cast parts or parts that could be easily damaged. With any particularly stubborn part, always recheck to make sure that every fastener has been removed.

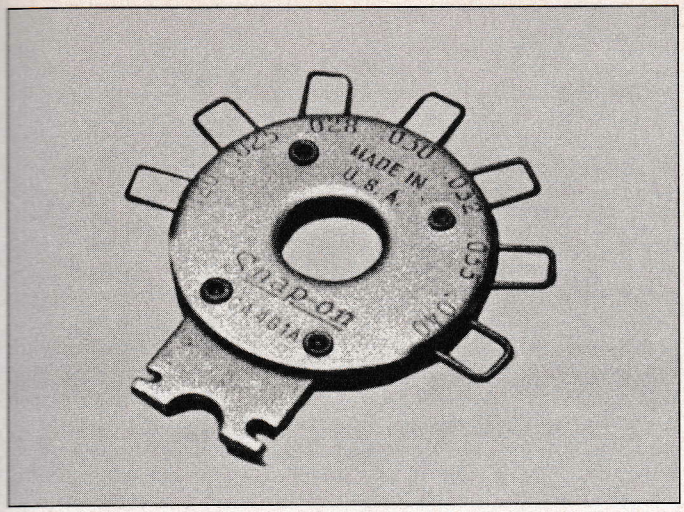
Avoid using a screwdriver or bar to pry components apart, as they can easily mar the gasket sealing surfaces of the parts (which must remain smooth). If prying is absolutely necessary, use a piece of wood, but keep in mind that extra clean-up will be necessary if the wood splinters.

After the parts are separated, the old gasket must be carefully scraped off and the gasket surfaces cleaned. Stubborn gasket material can be soaked with a gasket remover (available in aerosol cans) to soften it so it can be easily scraped off. A scraper can be fashioned from a piece of copper tubing by flattening and sharpening one end. Copper is recommended because it is usually softer than the surfaces to be scraped, which reduces the chance of gouging the part. Some gaskets can be removed with a wire brush, but regardless of the method used, the mating surfaces must be left clean and smooth. If for some reason the gasket surface is gouged, then a gasket sealer thick enough to fill scratches will have to be used during reassembly of the components. For most applications, a non-drying (or semi-drying) gasket sealer is best.

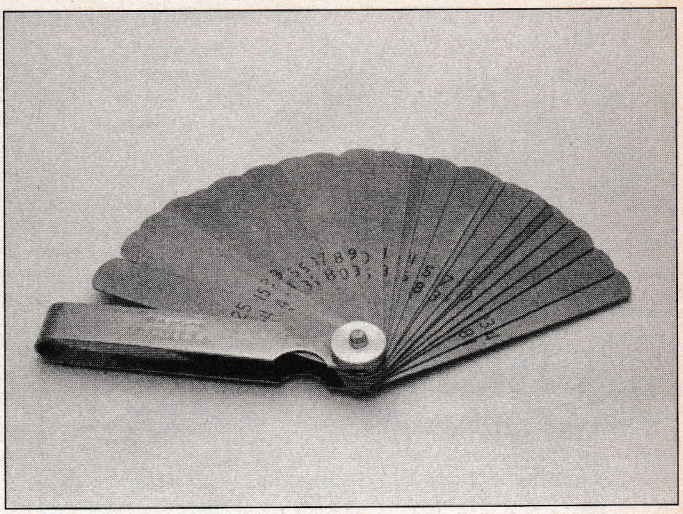
Hose removal tips

Hose removal precautions closely parallel gasket removal precautions. Avoid scratching or gouging the surface that the hose mates against or the connection may leak. Because of various chemical reactions, the rubber in hoses can bond itself to the metal spigot that the hose fits over. To remove a hose, first loosen the hose clamps that secure it to the spigot. Then, with slip joint pliers, grab the hose at the clamp and rotate it around the spigot. Work it back and forth until it is completely free, then pull it off (silicone or other lubricants will ease removal if they can be applied between the hose and the outside of the spigot). Apply the same lubricant to the inside of the hose and the outside of the spigot to simplify installation.

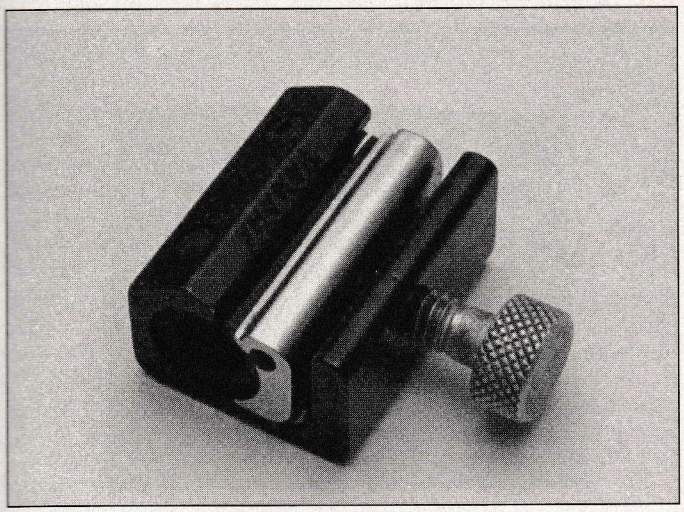
If a hose clamp is broken or damaged, do not reuse it. Also, do not reuse hoses that are cracked, split or torn.



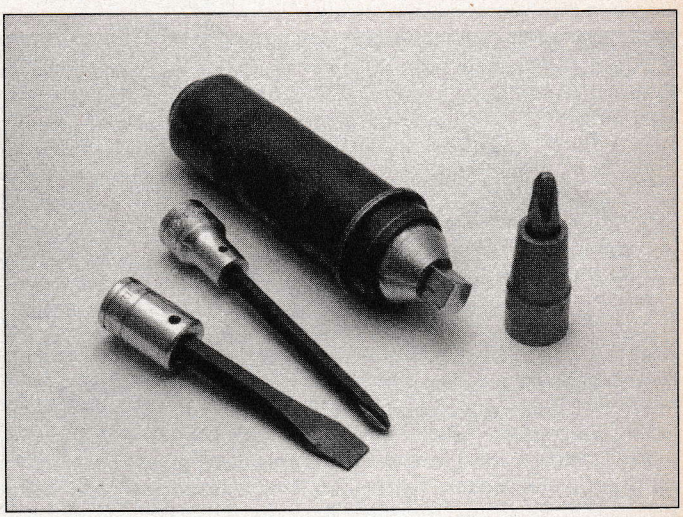
Spark plug gap adjusting tool



Feeler gauge set



Control cable pressure luber



Hand impact screwdriver and bits

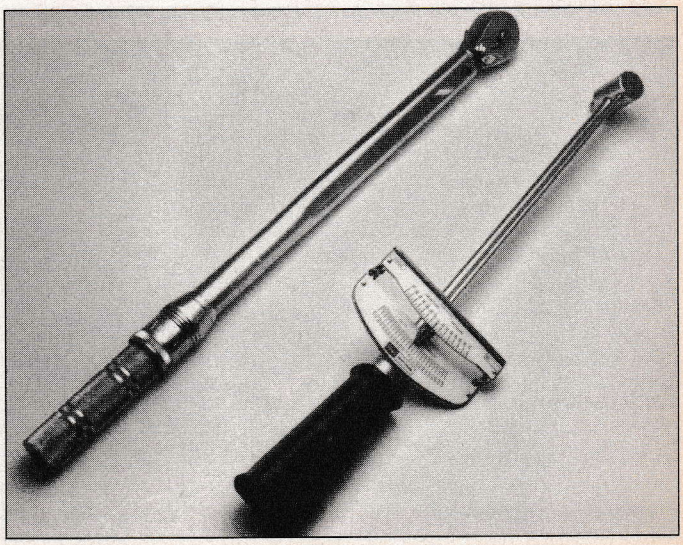
Tools

A selection of good tools is a basic requirement for anyone who plans to maintain and repair a motorcycle. For the owner who has few tools, if any, the initial investment might seem high, but when compared to the spiralling costs of routine maintenance and repair, it is a wise one.

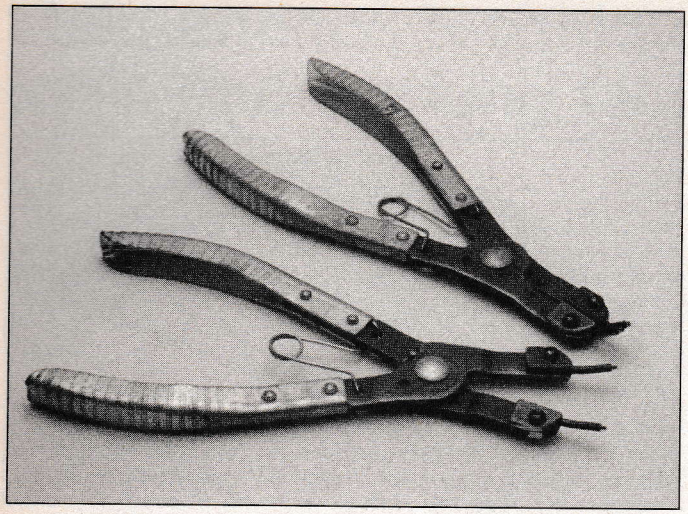
To help the owner decide which tools are needed to perform the tasks detailed in this manual, the following tool lists are offered: Maintenance and minor repair, Repair and overhaul and Special. The newcomer to practical mechanics should start off with the Maintenance and minor repair tool kit, which is adequate for the simpler jobs. Then, as confidence and experience grow, the owner can tackle more difficult tasks, buying additional tools as they are needed. Eventually the basic kit will be built into the Repair and overhaul tool set. Over a period of time, the experienced do-it-yourselfer will assemble a tool kit complete enough for most repair and overhaul procedures and will add tools from the Special category when it is felt that the expense is justified by the frequency of use.

Maintenance and minor repair tool kit

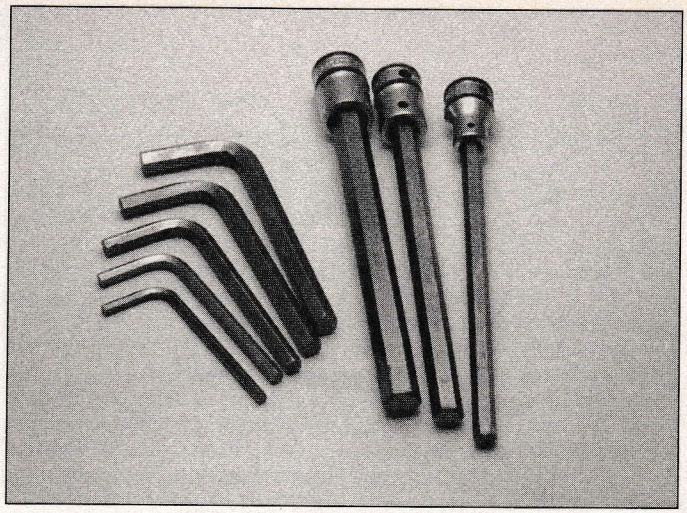
The tools in this list should be considered the minimum required for performance of routine maintenance, servicing and minor repair work. We recommend the purchase of combination spanners (box end and



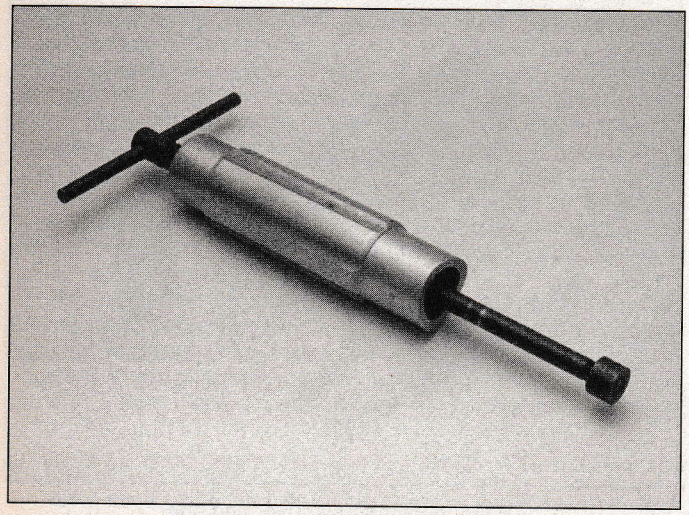
Torque wrenches (left - click; right - beam type)



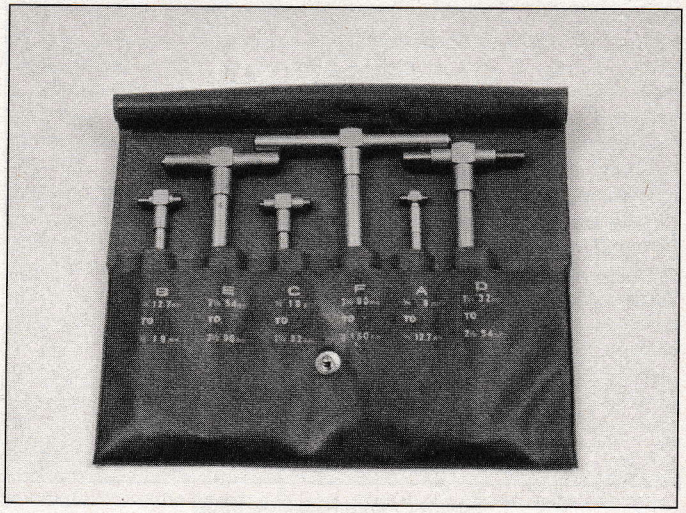
Circlip pliers (top - external; bottom - internal type)



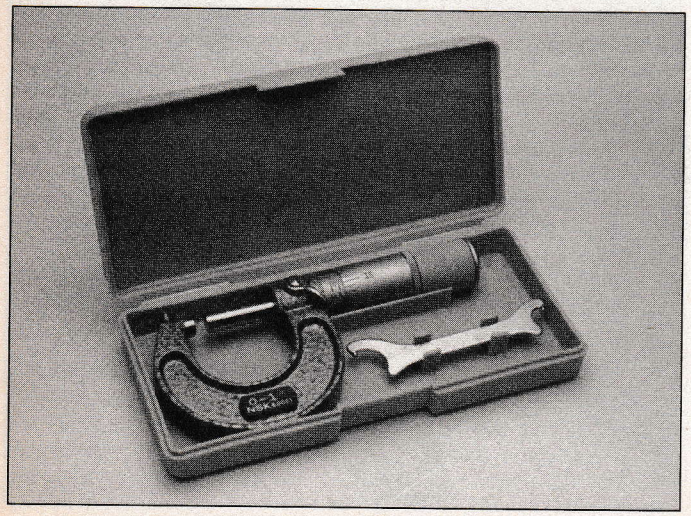
Allen keys (left), and Allen head sockets (right)



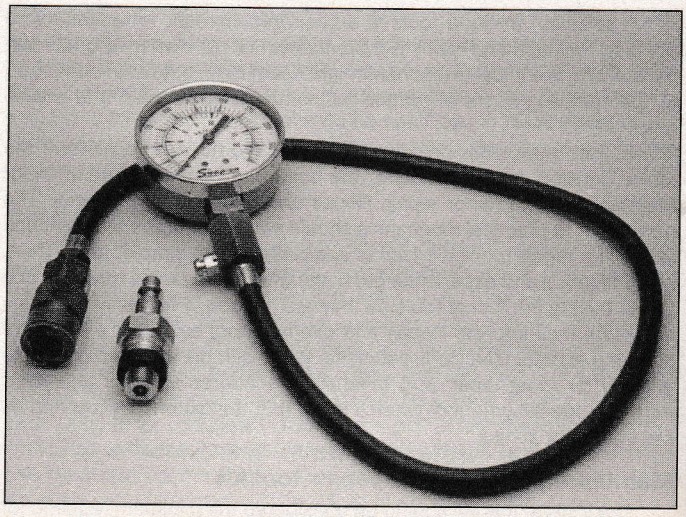
Piston pin puller



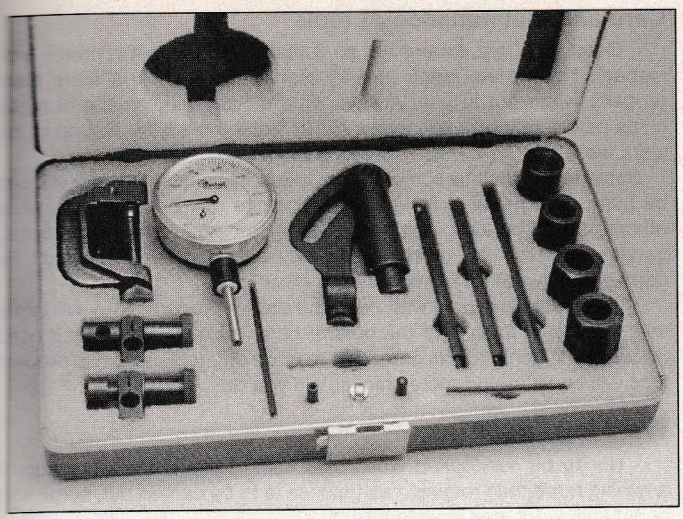
Telescoping gauges



0-to-1 inch micrometer



Cylinder compression gauge



Dial indicator set

open end combined in one spanner); while more expensive than open-ended ones, they offer the advantages of both types of spanner.

Combination spanner set (6 mm to 22 mm)
Adjustable spanner - 8 in
Spark plug socket (with rubber insert)
Spark plug gap adjusting tool
Feeler gauge set
Standard screwdriver (5/16 in x 6 in)
Phillips screwdriver (No. 2 x 6 in)
Allen key set (4 mm to 12 mm)
Combination (slip-joint) pliers - 6 in
Hacksaw and assortment of blades
Tyre pressure gauge
Control cable pressure luber
Oil can
Fine emery cloth
Wire brush
Hand impact screwdriver and bits
Funnel (medium size)
Safety goggles
Drain pan
Work light with extension cord

Repair and overhaul tool set

These tools are essential for anyone who plans to perform major repairs and are intended to supplement those in the Maintenance and minor repair tool kit. Included is a comprehensive set of sockets which, though expensive, are invaluable because of their versatility (especially when various extensions and drives are available). We recommend the 3/8 inch drive over the 1/2 inch drive for general motorcycle maintenance and repair (ideally, the mechanic would have a 3/8 inch drive set and a 1/2 inch drive set).

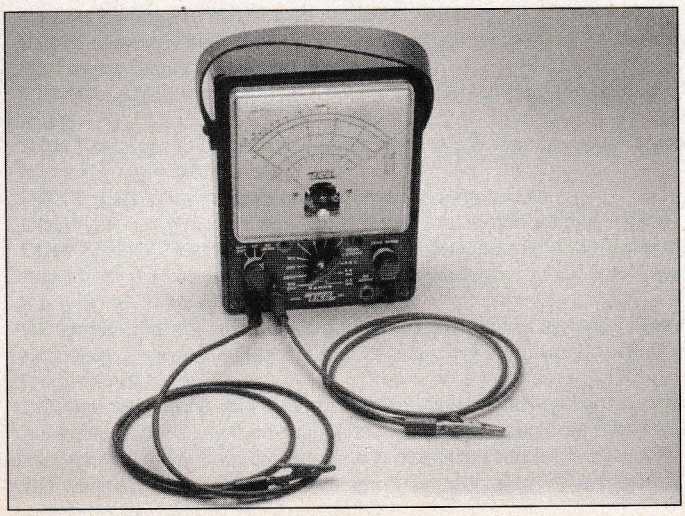
Altemator rotor removal tool
Socket set(s)
Reversible ratchet
Extension - 6 in
Universal joint
Torque wrench (same size drive as sockets)
Ball pein hammer - 8 oz
Soff-faced hammer (plastic/rubber)
Standard screwdriver (1/4 in x 6 in)
Standard screwdriver (stubby - 5/16 in)
Phillips screwdriver (No. 3 x 8 in)
Phillips screwdriver (stubby - No. 2)
Pliers - locking
Pliers - wire stripping
Pliers - needle nose
Pliers - circlip (internal and external)
Cold chisel - 1/2 in
Scriber
Scraper (made from flattened copper tubing)
Centre punch
Pin punches (1/16, 1/8, 3/16 in)
Steel rule/straightedge - 12 in
A selection of files
Wire brush (large)

Note: *Another tool which is offen useful is an electric drill with a chuck capacity of 3/8 inch (and a set of good quality drill bits).*

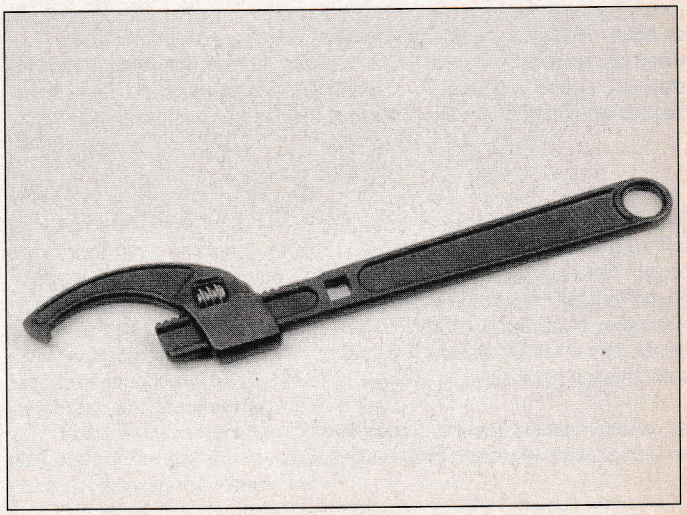
Special tools

The tools in this list include those which are not used regularly, are expensive to buy, or which need to be used in accordance with their manufacturer's instructions. Unless these tools will be used frequently, it is not very economical to purchase many of them. A consideration would be to split the cost and use between yourself and a friend or friends (ie members of a motorcycle club).

This list primarily contains tools and instruments widely available to the public, as well as some special tools produced by the vehicle manufacturer for distribution to dealer service departments. As a result, references to the manufacturer's special tools are occasionally included



Multimeter (volt/ohm/ammeter)



Adjustable spanner

in the text of this manual. Generally, an alternative method of doing the job without the special tool is offered. However, sometimes there is no alternative to their use. Where this is the case, and the tool can't be purchased or borrowed, the work should be turned over to the dealer service department or a motorcycle repair shop.

Piston pin puller
Telescoping gauges
Micrometer(s) and/or dial/Vernier calipers
Cylinder compression gauge
Dial indicator set
Multimeter
Adjustable spanner

Buying tools

For *the* do-it-yourselfer who is just starting to get involved in motorcycle maintenance and repair, *there are a number of options available when* purchasing tools. If maintenance and minor repair is the extent of the work to be done, the purchase of individual tools is satisfactory. If, on the other hand, extensive work is planned, it would be a good idea to purchase a modest tool set from one of the large retail chain stores. A set can usually be bought at a substantial saving over the individual tool prices (and they often come with a tool box). As additional tools are needed, add-on sets, individual tools and a larger tool box can be purchased to expand the tool selection. Building a tool kit gradually allows the cost of the tools to be spread over a longer period of time and gives the mechanic the freedom to choose only those tools that will actually be used.

Tool stores and motorcycle dealers will often be the only source of some of the special tools that are needed, but regardless of where tools are bought, try to avoid cheap ones (especially when buying screwdrivers and sockets) because they won't last very long. There are plenty of tools around at reasonable prices, but always aim to purchase items which meet the relevant national safety standards. The expense involved in replacing cheap tools will eventually be greater than the initial cost of quality tools.

It is obviously not possible to cover the subject of tools fully here. For those who wish to learn more about tools and their use, there is a book entitled Motorcycle Workshop Practice Manual (Book no. 1454) available from the publishers of this manual. It also provides an introduction to basic workshop practice which will be of interest to a home mechanic working on any type of motorcycle.

Care and maintenance of tools

Good tools are expensive, so it makes sense to treat them with respect. Keep them clean and in usable condition and store them properly when not in use. Always wipe off any dirt, grease or metal chips before putting them away. Never leave tools lying around in the work area.

Some tools, such as screwdrivers, pliers, spanners and sockets, can be hung on a panel mounted on the garage or workshop wall, while others should be kept in a tool box or tray. Measuring instruments, gauges, meters, etc. must be carefully stored where they can't be damaged by weather or impact from other tools.

When tools are used with care and stored properly, they will last a very long time. Even with the best of care, tools will wear out if used frequently. When a tool is damaged or worn out, replace it; subsequent jobs will be safer and more enjoyable if you do.

Working facilities

Not to be overlooked when discussing tools is the workshop. If anything more than routine maintenance is to be carried out, some sort of suitable work area is essential.

It is understood, and appreciated, that many home mechanics do not have a good workshop or garage available and end up removing an engine or doing major repairs outside (it is recommended, however, that the overhaul or repair be completed under the cover of a roof).

A clean, flat workbench or table of comfortable working height is an absolute necessity. The workbench should be equipped with a vice that has a jaw opening of at least four inches.

As mentioned previously, some clean, dry storage space is also required for tools, as well as the lubricants, fluids, cleaning solvents, etc. which soon become necessary.

Sometimes waste oil and fluids, drained from the engine or cooling system during normal maintenance or repairs, present a disposal problem. To avoid pouring them on the ground or into a sewage system, simply pour the used fluids into large containers, seal them with caps and take them to an authorised disposal site or service station. Plastic jugs (such as old antifreeze containers) are ideal for this purpose.

Always keep a supply of old newspapers and clean rags available. Old towels are excellent for mopping up spills. Many mechanics use rolls of paper towels for most work because they are readily available and disposable. To help keep the area under the motorcycle clean, a large cardboard box can be cut open and flattened to protect the garage or shop floor.

Whenever working over a painted surface (such as the fuel tank) cover it with an old blanket or bedspread to protect the finish.

Safety first!

Professional mechanics are trained in safe working procedures. However enthusiastic you may be about getting on with the job at hand, take the time to ensure that your safety is not put at risk. A moment's lack of attention can result in an accident, as can failure to observe simple precautions.

There will always be new ways of having accidents, and the following is not a comprehensive list of all dangers; it is intended rather to make you aware of the risks and to encourage a safe approach to all work you carry out on your bike.

Essential DOs and DON'Ts

DON'T start the engine without first ascertaining that the transmission is in neutral.
DON'T suddenly remove the pressure cap from a hot cooling system - cover it with a cloth and release the pressure gradually first, or you may get scalded by escaping coolant.
DON'T attempt to drain oil until you are sure it has cooled sufficiently to avoid scalding you.
DON'T grasp any part of the engine or exhaust system without first ascertaining that it is cool enough not to burn you.
DON'T allow brake fluid or antifreeze to contact the machine's paintwork or plastic components.
DON'T siphon toxic liquids such as fuel, hydraulic fluid or antifreeze by mouth, or allow them to remain on your skin. **DON'T** inhale dust - it may be injurious to health (see *Asbestos* heading).
DON'T allow any spilled oil or grease to remain on the floor - wipe it up right away, before someone slips on it.
DON'T use ill-fitting spanners or other tools which may slip and cause injury.
DON'T attempt to lift a heavy component which may be beyond your capability - get assistance.
DON'T rush to finish a job or take unverified short cuts.
DON'T allow children or animals in or around an unattended vehicle.
DON'T inflate a tyre to a pressure above the recommended maximum. Apart from over stressing the carcass and wheel rim, in extreme cases the tyre may blow off forcibly.
DO ensure that the machine is supported securely at all times. This is especially important when the machine is blocked up to aid wheel or fork removal.
DO take care when attempting to loosen a stubborn nut or bolt. It is generally better to pull on a spanner, rather than push, so that if you slip, you fall away from the machine rather than onto it.
DO wear eye protection when using power tools such as drill, sander, bench grinder etc.
DO use a barrier cream on your hands prior to undertaking dirty jobs - it will protect your skin from infection as well as making the dirt easier to remove afterwards; but make sure your hands aren't left slippery. Note that long-term contact with used engine oil can be a health hazard.
DO keep loose clothing (cuffs, ties etc., and long hair) well out of the way of moving mechanical parts.
DO remove rings, wristwatch etc., before working on the vehicle - especially the electrical system.
DO keep your work area tidy - it is only too easy to fall over articles left lying around.
DO exercise caution when compressing springs for removal or installation. Ensure that the tension is applied and released in a controlled manner, using suitable tools which preclude the possibility of the spring escaping violently.
DO ensure that any lifting tackle used has a safe working load rating adequate for the job.
DO get someone to check periodically that all is well when working alone on the vehicle.
DO carry out work in a logical sequence and check that everything is correctly assembled and tightened afterwards.
DO remember that your vehicle's safety affects that of yourself and others. If in doubt on any point, get professional advice.
IF, in spite of following these precautions, you are unfortunate enough to injure yourself, seek medical attention as soon as possible.

Asbestos

Certain friction, insulating, sealing and other products - such as brake pads, clutch linings, gaskets, etc. - contain asbestos. Extreme care must be taken to avoid inhalation of dust from such products since it is hazardous to health. If in doubt, assume that they do contain asbestos.

Fire

Remember at all times that petrol is highly flammable. Never smoke or have any kind of naked name around, when working on the vehicle. But the risk does not end there - a spark caused by an electrical short-circuit, by two metal surfaces contacting each other, by careless use of tools, or even by static electricity built up in your body under certain conditions, can ignite petrol vapour, which in a confined space is highly explosive. Never use petrol as a cleaning solvent. Use an approved safety solvent.

Always disconnect the battery earth terminal before working on any part of the fuel or electrical system, and never risk spilling fuel on to a hot engine or exhaust.

It is recommended that a fire extinguisher of a type suitable for fuel and electrical fires is kept handy in the garage or workplace at all times. Never try to extinguish a fuel or electrical fire with water.

Fumes

Certain fumes are highly toxic and can quickly cause unconsciousness and even death if inhaled to any extent. Petrol vapour comes into this category, as do the vapours from certain solvents such as trichloroethylene. Any draining or pouring of such volatile fluids should be done in a well ventilated area.

When using cleaning fluids and solvents, read the instructions carefully. Never use materials from unmarked containers - they may give off poisonous vapours.

Never run the engine of a motor vehicle in an enclosed space such as a garage. Exhaust fumes contain carbon monoxide which is extremely poisonous; if you need to run the engine, always do so in the open air or at least have the rear of the vehicle outside the workplace.

The battery

Never cause a spark, or allow a naked light near the vehicle's battery. It will normally be giving off a certain amount of hydrogen gas, which is highly explosive.

Always disconnect the battery earth terminal before working on the fuel or electrical systems (except where noted).

If possible, loosen the filler plugs or cover when charging the battery from an external source. Do not charge at an excessive rate or the battery may burst.

Take care when topping up, cleaning or carrying the battery. The acid electrolyte, even when diluted, is very corrosive and should not be allowed to contact the eyes or skin. Always wear rubber gloves and goggles or a face shield. If you ever need to prepare electrolyte yourself, always add the acid slowly to the water; never add the water to the acid.

Electricity

When using an electric power tool, inspection light etc., always ensure that the appliance is correctly connected to its plug and that, where necessary, it is properly earthed. Do not use such appliances in damp conditions and, again, beware of creating a spark or applying excessive heat in the vicinity of fuel or fuel vapour. Also ensure that the appliances meet national safety standards.

A severe electric shock can result from touching certain parts of the electrical system, such as the spark plug wires (HT leads), when the engine is running or being cranked, particularly if components are damp or the insulation is defective. Where an electronic ignition system is used, the secondary (HT) voltage is much higher and could prove fatal.

Motorcycle chemicals and lubricants

A number of chemicals and lubricants are available for use in motorcycle maintenance and repair. They include a wide variety of products ranging from cleaning solvents and degreasers to lubricants and protective sprays for rubber, plastic and vinyl.

Contact point/spark plug cleaner is a solvent used to clean oily film and dirt from points, grime from electrical connectors and oil deposits from spark plugs. It is oil free and leaves no residue. It is also used remove gum and varnish from carburettor jets and other orifices.

Carburettor cleaner is similar to contact point/spark plug cleaner but it usually has a stronger solvent and may leave a slight oily reside. It is not recommended for cleaning electrical components or connections.

Brake system cleaner is used to remove grease or brake fluid from brake system components (where clean surfaces are absolutely necessary and petroleum-based solvents cannot be used); it also leaves no residue.

Silicone-based lubricants are used to protect rubber parts such as hoses and grommets, and are used as lubricants for hinges and locks.

Multi-purpose grease is an all purpose lubricant used wherever grease is more practical than a liquid lubricant such as oil. Some multi-purpose grease is coloured white and specially formulated to be more resistant to water than ordinary grease.

Gear oil (sometimes called gear lube) is a specially designed oil used in transmissions and final drive units, as well as other areas where high friction, high temperature lubrication is required. It is available in a number of viscosities (weights) for various applications.

Motor oil, of course, is the lubricant specially formulated for use in the engine. It normally contains a wide variety of additives to prevent corrosion and reduce foaming and wear. Motor oil comes in various thicknesses (viscosity ratings) from 5 to 80. The recommended weight of the oil depends on the seasonal temperature and the demands on the engine. Light (thin) oil is used in cold climates and under light load conditions; heavy (thick) oil is used in hot climates and where high loads are encountered. Multi viscosity oils are designed to have characteristics of both light and heavy oils and are available in a number of weights from 5W-20 to 20W-50.

Petrol additives perform several functions, depending on their chemical makeup. They usually contain solvents that help dissolve gum and varnish that build up on carburettor and intake parts. They also serve to break down carbon deposits that form on the inside surfaces of the combustion chamber. Some additives contain upper cylinder lubricants for the valves and piston rings of four-stroke engines.

Brake fluid is a specially formulated hydraulic fluid that can withstand the heat and pressure encountered in brake systems. Care must be taken that this fluid does not come in contact with painted surfaces or plastics. An opened container should always be resealed to prevent contamination by water or dirt.

Chain lubricants are formulated especially for use on motorcycle final drive chains. A good chain lube should adhere well and have good penetrating qualities to be effective as a lubricant inside the chain and on the side plates, pins and rollers. Most chain lubes are either the foaming type or quick drying type and are usually marketed as sprays.

Degreasers are heavy duty solvents used to remove grease and grime that may accumulate on engine and frame components. They can be sprayed or brushed on and, depending on the type, are rinsed off with either water or solvent.

Solvents are used alone or in combination with degreasers to clean parts and assemblies during repair and overhaul. The home mechanic should use only solvents that are non-flammable and that do not produce irritating fumes.

Gasket sealing compounds may be used in conjunction with gaskets, to improve their sealing capabilities, or alone, to seal metal-to-metal joints. Many gasket sealers can withstand extreme heat, some are impervious to petrol and lubricants, while others are capable of filling and sealing large cavities. Depending on the intended use, gasket sealers either dry hard or stay relatively soft and pliable. They are usually applied by hand, with a brush, or are sprayed on the gasket sealing surfaces.

Thread locking compound is an adhesive that prevents threaded fasteners from loosening because of vibration. It is available in a variety of types for different applications.

Moisture dispersants are usually sprays that can be used to dry out electrical components such as the fuse block and wiring connectors. Some types can also be used as treatment for rubber and as a lubricant for hinges, cables and locks.

Waxes and polishes are used to help protect painted and plated surfaces from the weather. Different types of paint may require the use of different types of wax polish. Some polishes utilise a chemical or abrasive cleaner to help remove the top layer of oxidised (dull) paint on older vehicles. In recent years, many non-wax polishes (that contain a wide variety of chemicals such as polymers and silicones) have been introduced. These non-wax polishes are usually easier to apply and last longer than conventional waxes and polishes.

Troubleshooting

Contents

1 Introduction

This Section provides an easy reference-guide to the more common faults that are likely to afflict your machine. Obviously, the opportunities are almost limitless for faults to occur as a result of obscure failures, and to try and cover all eventualities would require a book. Indeed, a number have been written on the subject.

Successful fault diagnosis is not a mysterious 'black art' but the application of a bit of knowledge combined with a systematic and logical approach to the problem. Approach any fault diagnosis by first accurately identifying the symptom and then checking through the list of possible causes, starting with the simplest or most obvious and progressing in stages to the most complex. Take nothing for granted, but above all apply liberal quantities of common sense.

The main symptom of a fault is given in the text as a major heading below which are listed, as Section headings, the various systems or areas which may contain the fault. Details of each possible cause for a fault and the remedial action to be taken are given, in brief, in the paragraphs below each Section heading. Further information should be sought in the relevant Chapter.

Engine does not start when turned over

2 No fuel flow to carburettor

1 Fuel tank empty or level too low. Check that the tap is turned to the ON or RES position as required. If in doubt, prise off the fuel feed pipe at the carburettor end and check that fuel runs from the pipe when the tap is turned ON.
2 Tank breather pipe obstructed. This can prevent fuel from flowing into the carburettor float chamber because air cannot enter the fuel tank to replace it. The problem is more likely to appear when the machine is being ridden. Check by listening close to the filler cap and releasing it. A hissing noise indicates that a blockage is present. Clear the breather pipe blockage.
3 Fuel tap or filter blocked. Blockage may be due to accumulation of rust or paint flakes from the tank's inner surface or of foreign matter from contaminated fuel. Remove the tap and clean it and the filter. Look also for water droplets in the fuel.
4 Fuel pipe blocked. Blockage of the fuel pipe is more likely to result from a kink in the pipe rather than the accumulation of debris.

3 Fuel not reaching cylinder

1 Float chamber not filling. Caused by float needle or float sticking in up position. This may occur after the machine has been left standing for an extended length of time allowing the fuel in the float chamber to evaporate. When this occurs a gummy residue is often left which hardens to a varnish-like substance. This condition may be worsened by corrosion and crystalline deposits produced prior to the total evaporation of contaminated fuel. Sticking of the float needle may also be caused by wear. In any case removal of the float chamber will be necessary for inspection and cleaning.
2 Blockage in starting circuit, slow running circuit or jets. Blockage of these items may be attributable to debris from the fuel tank by-passing the filter system or to gumming up as described in Step 1. Water droplets in the fuel will also block jets and passages. The carburettor should be dismantled for cleaning.
3 Fuel level too low. The fuel level in the float chamber is controlled by float height. The fuel level may increase with wear or damage but will never reduce, thus a low fuel level is an inherent rather than developing condition. Check the float height, renewing the float or needle if required.

4 Engine flooding

1 Float valve needle worn or stuck open. A piece of rust or other debris can prevent correct seating of the needle against the valve seat thereby permitting an uncontrolled flow of fuel. Similarly, a worn needle or needle seat will prevent valve closure. Dismantle the carburettor float chamber for cleaning and, if necessary, renewal of the worn components.
2 Fuel level too high. The fuel level is controlled by the float height which may increase due to wear of the float needle, pivot pin or operating tang. Check the float height, and make any necessary adjustments. A leaking float will cause an increase in fuel level, and thus should be renewed.
3 Cold starting mechanism. Check the choke cable for correct operation. If the choke jams in the "On" position subsequent starting of a hot engine will be difficult.
4 Blocked air filter. A badly restricted air filter will cause flooding. Check the filter and clean or renew as required. A collapsed inlet hose will have a similar effect. Check that the air filter inlet has not become blocked by a rag or similar item if a rebuild has been carried out.

5 No spark at plug

1 Ignition switch not on.
2 Engine kill switch off.
3 Fuse blown. See wiring diagram.
4 Spark plug dirty, oiled or fouled. Because the induction mixture of a two-stroke engine is inclined to be of a rather oily nature it is comparatively easy to foul the plug electrodes, especially where there have been repeated attempts to start the engine. A machine used for short journeys will be more prone to fouling because the engine may never reach full operating temperature, and the deposits will not burn off. On rare occasions a change of plug grade may be required but the advice of a dealer should be sought before making such a change. On all two-stroke machines, it is a sound precaution to carry a new spare spark plug for substitution in the event of fouling problems.
5 Spark plug failure. Clean the spark plug thoroughly and reset the electrode gap. Refer to the spark plug section and the colour condition guide in Chapter 1. If the spark plug shorts internally or has sustained visible damage to the electrodes, core or ceramic insulator it should be renewed. On rare occasions a plug that appears to spark vigorously will fail to do so when refitted to the engine and subjected to the compression pressure in the cylinder.
6 Spark plug cap or high tension (HT) lead faulty. Check condition and security. Replace if deterioration is evident. Most spark plug caps have an internal resistor designed to inhibit electrical interference with radio and television sets. On rare occasions the resistor may break down, thus preventing sparking. If this is suspected, fit a new cap as a precaution.
7 Spark plug cap loose. Check that the spark plug cap fits securely over the plug and, where fitted, the screw-on terminal on the plug end is secure.
8 Shorting due to moisture. Certain parts of the ignition system are susceptible to shorting when the machine is ridden or parked in wet weather. Check particularly the area from the spark plug cap back to the ignition coil. A water dispersant spray may be used to dry out waterlogged components. Recurrence of the problem can be prevented by using an ignition sealant spray after drying out and cleaning.
9 Ignition or engine kill switch shorted. May be caused by water corrosion or wear. Water dispersant and contact cleaning sprays may be used. If this fails to overcome the problem, dismantling and visual inspection of the switches will be required.
10 Shorting or open circuit in wiring. Failure in any wire connecting any of the ignition components will cause ignition malfunction Check also that all connections are clean, dry and tight.
11 Ignition HT coil failure. Check the coil, referring to Chapter 5.
12 CDI unit faulty.

6 Weak spark at plug

1 Feeble sparking at the plug may be caused by any of the faults mentioned in the preceding Section other than those items in the first three paragraphs. Check the spark plug first, this being the most likely culprit.

7 Compression low

1 Spark plug loose. This will be self-evident on inspection, and may be accompanied by a hissing noise when the engine is turned over. Remove the plug and check that the threads in the cylinder head are not damaged. Check also that the plug sealing washer is in good condition.
2 Cylinder head gasket leaking. This condition is often accompanied by a high pitched squeak from around the cylinder head and oil loss, and may be caused by insufficiently tightened cylinder head bolts, a warped cylinder head or mechanical failure of the gasket material. Retorqueing the fasteners to the correct specification may seal the leak in some instances but if damage has occurred this course of action will provide, at best, only a temporary cure.
3 Low crankcase compression. This can be caused by worn crankshaft bearings and seals and will upset the incoming fuel/air mixture. A good seal in these areas is essential on any two-stroke engine.

4 Piston rings sticking or broken. Sticking of the piston rings may be caused by seizure due to lack of lubrication or overheating as a result of poor carburation or incorrect fuel type. Gumming of the rings may result from lack of use, or carbon deposits in the ring grooves. Broken rings result from over-revving, overheating or general wear. In either case a top-end overhaul will be required.

Engine stalls after starting

8 General causes

1 Improper choke operation. Check that the operating controls function smoothly. A cold engine may not require application of an enriched mixture to start initially but may baulk without choke once firing. Likewise a hot engine may start with an enriched mixture but will stop almost immediately if the choke is inadvertently in operation.
2 Ignition malfunction. See Section 9, *Weak spark at plug.*
3 Carburettor incorrectly adjusted. Maladjustment of the mixture strength or idle speed may cause the engine to stop immediately after starting. See Chapter 4.
4 Fuel contamination. Check for filter blockage by debris or water which reduces, but does not completely stop, fuel flow, or blockage of the slow speed circuit in the carburettor by the same agents. If water is present it can often be seen as droplets in the bottom of the float chamber. Clean the filter and, where water is in evidence, drain and flush the fuel tank and float chamber.
5 Intake air leak. Check for security of the carburettor mounting and hose connections, and for cracks or splits in the inlet hose Check also that the carburettor top is secure.
6 Air filter blocked or omitted. A blocked filter will cause an over-rich mixture; the omission of a filter will cause an excessively weak mixture. Both conditions will have a detrimental effect on carburation. Clean or renew the filter as necessary.
7 Fuel tank breather pipe blocked. Usually caused by dirt or water. Clean the vent orifice.
8 Choked exhaust system. Caused by excessive carbon build-up in the system, particularly around the silencer baffles. Refer to Chapter 4 for further information.
9 Excessive carbon build-up in the engine. This can result from failure to decarbonise the engine at the specified interval or through excessive oil consumption. Check oil pump synchronisation (see Chapter 1).

Poor running at idle and low speed

9 Weak spark at plug or erratic firing

1 Battery voltage low. In certain conditions low battery charge, especially when coupled with a badly sulphated battery, may result in misfiring. If the battery is in good general condition it should be recharged; an old battery suffering from sulphated plates should be renewed.
2 Spark plug fouled, faulty or incorrectly adjusted. See Section 5 or refer to Chapter 1.
3 Spark plug cap or high tension lead shorting. Check the condition of both these items ensuring that they are in good condition and dry and that the cap is fitted correctly.
4 Spark plug type incorrect. Fit plug of correct type and heat range as given in Specifications. In certain conditions a plug of hotter or colder type may be required for normal running.
5 Faulty ignition HT coil. Partial failure of the coil's internal insulation will diminish the performance of the coil. No repair is possible, a new component must be fitted.
6 Defective ignition source coil. Refer to Chapter 5 for further details on test procedures.

10 Fuel/air mixture incorrect

1 Intake air leak. Check carburettor and air cleaner hoses for security and signs of splitting. Ensure that carburettor top is tight.
2 Mixture strength incorrect. Adjust slow running mixture strength using pilot screw.
3 Pilot jet or slow running circuit blocked. The carburettor should be removed and dismantled for thorough cleaning. Blow through all jets and air passages with compressed air to clear obstructions.
4 Air filter clogged or omitted. Clean or renew element as necessary. Check also that the element and air filter cover are correctly seated.
5 Choke in operation. Check that the choke has not been left on inadvertently and the operation is correct.
6 Fuel level too high or too low. Check the float height, renewing float needle if required. See Section 3 or 4.
7 Fuel tank breather pipe obstructed. Obstructions usually caused by dirt or water.

11 Compression low

See Section 7.

Acceleration poor

12 General causes

1 All items as for previous Section.
2 Choked air filter. Failure to keep the air filter element clean will allow the build-up of dirt with proportional loss of performance. In extreme cases of neglect acceleration will suffer.
3 Choked exhaust system. The increased back pressure will make the machine noticeably sluggish. Refer to Chapter 4 for further information on decarbonisation.
4 Excessive carbon build-up in the engine. This can result from failure to decarbonise the engine at the specified interval or through excessive oil consumption. Check oil pump adjustment.
5 Ignition timing incorrect. As no provision for adjustment exists, test the electronic ignition components and renew as required.
6 Carburation fault. See Section 10.
7 Mechanical resistance. Check that the brakes are not binding.

Poor running or lack of power at high speeds

13 Weak spark at plug or erratic firing

1 All items as for Section 9.
2 HT lead insulation failure. Insulation failure of the HT lead and spark plug cap due to old age or damage can cause shorting when the engine is driven hard. This condition may be less noticeable, or not noticeable at all at lower engine speeds.

14 Fuel/air mixture incorrect

1 All items as for Section 10, with the exception of items relating exclusively to low speed running.
2 Main jet blocked. Debris from contaminated fuel, or from the fuel tank, and water in the fuel can block the main jet. Clean the fuel filter, float chamber area, and if water is present, flush and refill the fuel tank.
3 Main jet is the wrong size. The standard carburettor jetting is for sea level atmospheric pressure. For high altitudes, usually above 5000 ft, a smaller main jet will be required.
4 Jet needle and needle jet worn. These can be renewed individually but should be renewed as a pair. Renewal of both items requires partial dismantling of the carburettor.
5 Air bleed holes blocked. Dismantle carburettor and use compressed air to blow out all air passages.

6 Reduced fuel flow. A reduction in the maximum fuel flow from the fuel tank to the carburettor will cause fuel starvation, proportionate to the engine speed. Check for blockages through debris or a kinked fuel pipe.

15 Compression low

See Section 7.

Knocking or pinking

16 General causes

1 Carbon build-up in combustion chamber. After high mileages have been covered a large accumulation of carbon may occur. This may glow red hot and cause premature ignition of the fuel/air mixture in advance of normal firing by the spark plug. Cylinder head removal will be required to allow inspection and cleaning.
2 Fuel incorrect. A low grade fuel, or one of poor quality, may result in compression induced detonation of the fuel resulting in knocking and pinking noises. Old fuel can cause similar problems. A too highly leaded fuel will reduce detonation but will accelerate deposit formation in the combustion chamber and may lead to early pre-ignition as described in item 1.
3 Spark plug heat range incorrect. Uncontrolled pre-ignition can result from the use of a spark plug the heat range of which is too hot.
4 Weak mixture. Overheating of the engine due to a weak mixture can result in pre-ignition occurring where it would not occur when engine temperature was within normal limits. Maladjustment, blocked jets or passages and air leaks can cause this condition.

Overheating

17 Firing incorrect

1 Spark plug fouled, defective or maladjusted. See Section 5.
2 Spark plug type incorrect. Refer to the Specifications and ensure that the correct plug type is fitted.
3 Incorrect ignition timing.

18 Fuel/air mixture incorrect

1 Slow speed mixture strength incorrect. Adjust pilot screw.
2 Main jet wrong size. The carburettor is jetted for sea level atmospheric conditions. For high altitudes, usually above 5000 ft, a smaller main jet will be required.
3 Air filter badly fitted or omitted. Check that the filter element is in place and that it and the air filter housing cover are sealing correctly. Any leaks will cause a weak mixture.
4 Induction air leaks. Check the security of the carburettor mountings and hose connections, and for cracks and splits in the hoses. Check also that the carburettor top is secure.
5 Fuel level too low. See Section 3.
6 Fuel tank breather pipe obstructed. Clear blockage

19 Lubrication inadequate

1 Oil pump settings incorrect. The oil pump settings are of great importance since the quantities of oil being injected are very small. Any variation in oil delivery will have a significant effect on the engine. Refer to Chapter 1 for further information.
2 Oil tank empty or low. This will have disastrous consequences if unnoticed. Check and replenish tank regularly.
3 Transmission oil low or worn out. Check the level regularly and investigate any loss of oil. If the oil level drops with no sign of external leakage it is likely that the crankshaft main bearing oil seals are worn, allowing transmission oil to be drawn into the crankcase during induction.

20 Miscellaneous causes

1 Radiator fins clogged. Accumulated debris in the radiator core will gradually reduce its ability to dissipate heat generated by the engine. It is worth noting that during the summer months dead insects can cause as many problems in this respect as road dirt and mud during the winter. Cleaning is best carried out by dislodging the debris with a high pressure hose from the back of the radiator. Once cleaned it is worth painting the matrix with a heat-dispersant matt black paint both to assist cooling and to prevent external corrosion.

Clutch operating problems

21 Clutch slip

1 No clutch cable freeplay. Adjust according to the procedure in Chapter 1.
2 Friction plates worn or warped. Overhaul clutch assembly, replacing plates out of tolerance.
3 Plain plates worn or warped. Overhaul clutch assembly, replacing plates out of tolerance.
4 Clutch spring broken or worn. Old or heat-damaged (from slipping clutch) springs should be renewed as a set.
5 Clutch inner cable snagging. Caused by a frayed cable or kinked outer cable. Renew the cable. Repair of a frayed cable is advised.
6 Clutch release mechanism defective. Inspect the release arm in the engine right-hand cover.
7 Clutch centre and outer drum worn. Severe indentation by the clutch plate tangs of the channels in the centre and drum will cause snagging of the plates preventing correct engagement. If this damage occurs, renewal of the worn components is required.
8 Lubricant incorrect. Use of a transmission lubricant other than that specified may allow the plates to slip.

22 Clutch drag

1 Clutch cable freeplay excessive. Adjust cable (see Chapter 1).
2 Clutch plates warped or damaged. This will cause a drag on the clutch, causing the machine to creep. Overhaul clutch assembly.
3 Clutch spring tension uneven. Usually caused by a sagging or broken spring. Check and renew springs as a set.
4 Transmission oil deteriorated. Badly contaminated transmission oil and a heavy deposit of oil sludge on the plates will cause plate sticking. The oil recommended for this machine is of the detergent type, therefore it is unlikely that this problem will arise unless regular oil changes are neglected.
5 Transmission oil viscosity too high. Drag in the plates will result from the use of an oil with too high a viscosity. In very cold weather clutch drag may occur until the engine has reached operating temperature.
6 Clutch centre and outer drum worn. Indentation by the clutch plate tangs of the channels in the centre and drum will prevent easy plate disengagement. If the damage is light the affected areas may be dressed with a fine file. More pronounced damage will necessitate renewal of the components.
7 Clutch outer drum seized to shaft. Lack of lubrication, severe wear or damage can cause the drum to seize to the shaft. Overhaul of the clutch, and perhaps the transmission, may be necessary to repair damage.
8 Clutch release mechanism defective. Inspect the release arm in the engine right-hand cover.
9 Loose clutch nut on 200 models. Causes drum and centre misalignment, putting a drag on the engine. Engagement adjustment continually varies. Overhaul clutch assembly.

Gear selection problems

23 Gear lever does not return

1 Weak or broken return spring. Renew the spring.
2 Gearshift shaft bent or seized. Distortion of the gearshift shaft often occurs if the machine is dropped heavily on the gear lever Provided that damaqe is not severe, straightening of the shaft is permissible.

24 Gear selection difficult or impossible

1 Clutch not disengaging fully. See Section 22.
2 Gearshift shaft bent. This often occurs if the machine is dropped heavily on the gear lever. Straightening of the shaft is permissible if the damage is not too great.
3 Mechanism arm or drum cam worn or damaged. Wear or breakage of these items may cause difficulty in selecting one or more gears. Overhaul the external shift mechanism (see Chapter 2).
4 Shift drum detent arm damaged. Failure, rather than wear, may jam the drum thereby preventing gearchanging or causing false selection at high engine speeds.
5 Shift forks bent or seized. This can be caused by dropping the machine heavily on the gearchange lever or as a result of lack of lubrication. Though rare, bending of a shaft can result from a missed gearchange or false selection at high engine speed.
6 Shift fork end and pin wear. Pronounced wear of these items and the grooves in the shift drum can lead to imprecise selection and, eventually, no selection. Renewal of the worn components will be required.
7 Structural failure. Failure of any one component of the shift rod and mechanism will result in improper or fouled gear selection.

25 Jumping out of gear

1 Detent arm assembly worn or damaged. Wear of the arm and the cam with which it locates and breakage of the return spring can cause imprecise gear selection resulting in jumping out of gear. Renew the damaged components.
2 Gear pinion dogs worn or damaged. Rounding off the dog edges and the mating recesses in the adjacent pinion can lead to jumping out of gear when under load. The gears should be inspected and renewed. Attempting to reprofile the dogs is not permitted.
3 Shift forks, drum and pinion grooves worn. Extreme wear of these interconnected items can occur after high mileages especially when lubrication has been neglected. The worn components must be renewed .
4 Gear pinions and shafts worn. Renew the worn components.
5 Bent gearshift shaft. Often caused by dropping the machine on the gear lever.
6 Gear pinion tooth broken. Chipped teeth are unlikely to cause jumping out of gear once the gear has been selected fully; a tooth which is completely broken off, however, may cause problems in this respect and in any event will cause transmission noise.

26 Overselection

1 Detent arm worn or broken. Renew the damaged items.
2 Gearshift mechanism arm pawls worn.

Abnormal engine noise

27 Knocking or pinking

See Section 16.

28 Piston slap or rattling from cylinder

1 Cylinder bore/piston clearance excessive. Resulting from wear, or partial seizure. This condition can often be heard as a high, rapid tapping noise when the engine is under little or no load, particularly when power is just beginning to be applied. The piston may be replaced but if the cylinder bore is out of tolerance the cylinder barrel must be replaced as its plated bore cannot be bored or honed.
2 Connecting rod bent. This can be caused by over-revving, trying to start a very badly flooded engine (resulting in an hydraulic lock in the cylinder) or by earlier mechanical failure. Trying to straighten a bent connecting rod is not recommended. The crankshaft should be inspected carefully before renewing the damaged connecting rod.
3 Piston pin, piston boss bore or small-end bearing wear or seizure. Excess clearance or partial seizure between normal moving parts of these items can cause continuous or intermittent tapping noises. Rapid wear or seizure is caused by lubrication starvation.
4 Piston rings worn, broken or sticking. Renew the rings after careful inspection of the piston and bore.

29 Other noises

1 Big-end bearing wear. A pronounced knock from within the crankcase which worsens rapidly is indicative of big-end bearing failure as a result of extreme normal wear or lubrication failure. Remedial action in the form of a bottom end overhaul should be taken; continuing to run the engine will lead to further damage including the possibility of connecting rod breakage.
2 Main bearing failure. Extreme normal wear or failure of the main bearings is characteristically accompanied by a rumble from the crankcase and vibration felt through the frame and footrests. Renew the worn bearings and carry out a very careful examination of the crankshaft.
3 Crankshaft excessively out of true. A bent crank may result from over-revving or damage from an upper cylinder component or gearbox failure. Damage can also result from dropping the machine on either crankshaft end. Straightening of the crankshaft is not possible in normal circumstances; a replacement item should be fitted.
4 Engine mounting loose. Tighten all engine mounting nuts and bolts.
5 Cylinder head gasket leaking. The noise most often associated with a leaking head gasket is a high pitched squeaking, although any other noise consistent with gas being forced out under pressure from a small orifice can also be emitted. Gasket leakage is often accompanied by coolant seepage from around the mating joint. Leakage results from insufficient or uneven tightening of the cylinder head fasteners, or from random mechanical failure. Retightening to the correct torque figure will, at best, only provide a temporary cure. The gasket should be renewed at the earliest opportunity.
6 Exhaust system leakage. Popping or crackling in the exhaust system, particularly when it occurs with the engine on the overrun, indicates a poor joint either at the cylinder port or at the exhaust pipe/silencer connection. Failure of the gasket or looseness of the clamp should be looked for.

Abnormal transmission noise

30 Clutch noise

1 Clutch outer drum/friction plate tang clearance excessive.
2 Clutch outer drum/thrust washer clearance excessive.
3 Primary drive gear teeth worn or damaged

31 Transmission noise

1 Bearings worn or damaged. Renew the affected components.
2 Gear pinions worn or chipped. Renew the gear pinions.
3 Metal chips jammed in gear teeth. This can occur when pieces of

metal from any failed component are picked up by a meshing pinion. The condition will lead to rapid bearing wear or early gear failure.
4 Transmission oil level too low. Top up immediately to prevent damage to gearbox.
5 Gearshift mechanism worn or damaged. Wear or failure of certain items in the selection and change components can induce mis-selection of gears (see Section 24) where incipient engagement of more than one gear set is promoted. Remedial action, by the overhaul of the gearbox, should be taken without delay.
6 Drive chain snagging on cases or cycle parts. A badly worn chain or one that is excessively loose may snag or smack against adjacent components.

Exhaust smokes excessively

32 White/blue smoke (caused by oil burning)

1 Oil pump settings incorrect. Check and reset the oil pump as described in Chapter 1.
2 Crankshaft main bearing oil seals worn. Wear in the main bearing oil seals, often in conjunction with wear in the bearings themselves, can allow transmission oil to find its way into the crankcase and thence to the combustion chamber. This condition is often indicated by a mysterious drop in the transmission oil level with no sign of external leakage.
3 Accumulated oil deposits in exhaust system. If the machine is used for short journeys only it is possible for the oil residue in the exhaust gases to condense in the relatively cool silencer. If the machine is then taken for a longer run in hot weather, the accumulated oil will burn off producing ominous smoke from the exhaust.

33 Black smoke (caused by over-rich mixture)

1 Air filter element clogged. Clean or renew the element.
2 Main jet loose or too large. Remove the float chamber to check for tightness of the jet. If the machine is used at high altitudes, rejetting will be required to compensate for the lower atmospheric pressure.
3 Choke jammed on. Check that the mechanism works smoothly and correctly.
4 Fuel level too high. The fuel level is controlled by the float height which can increase as a result of wear or damage. Remove the float chamber and check the float height. Check also that floats have not punctured; a punctured float will lose buoyancy and allow an increased fuel level.
5 Float valve needle stuck open. Caused by dirt or a worn valve. Clean the float chamber or renew the needle and, if necessary, the valve seat.

Poor handling or roadholding

34 Directional instability

1 Steering head bearing adjustment too tight. This will cause rolling or weaving at low speeds. Re-adjust the bearings.
2 Steering head bearings worn or damaged. Correct adjustment of the bearing will prove impossible to achieve if wear or damage has occurred. Inconsistent handling will occur including rolling or weaving at low speed and poor directional control at intermediate and higher speeds. The steering head bearings should be dismantled for inspection and renewed if required. Lubrication should also be carried out.
3 Bearing races pitted or dented. Impact damage caused, perhaps, by an accident or riding over a pothole can cause indentation of the bearing, usually in one position. This should be noted as notchiness when the handlebars are turned. Renew and lubricate the bearings.
4 Steering stem bent. This will occur only if the machine is subjected to a high impact such as hitting a kerb or a pothole. The lower yoke/stem should be renewed; do not attempt to straighten the stem.
5 Front or rear tyre pressure too low.
6 Front or rear tyre worn. General instability, high speed wobbles and skipping over white lines indicates that tyre renewal may be required. Tyre induced problems, in some machine/tyre combinations, can occur even when the tyre in question is by no means fully worn.
7 Swinging arm or linkage bearings worn. Difficulty in holding line, particularly when cornering or when changing power settings indicates wear in the bearings. The swinging arm/linkage should be removed from the machine and the bearings renewed.
8 Swinging arm flexing. The symptoms given in the preceding paragraph will also occur if the swinging arm flexes badly. This can be caused by structural weakness as a result of corrosion, fatigue or impact damage, or because the rear wheel axle nut is loose.
9 Wheel bearings worn. Renew the worn bearings.
10 Loose wheel spokes. The spokes should be tightened evenly to maintain tension and trueness of the rim.
11 Tyres unsuitable for machine. Not all available tyres will suit the characteristics of the frame and suspension, indeed some tyres or tyre combinations may cause a transformation in the handling characteristics. If handling problems occur immediately after changing to a new tyre type or make, revert to the original tyres to see whether an improvement can be noted. In some instances a change to what are, in fact, suitable tyres may give rise to handling deficiencies. In this case a thorough check should be made of all frame and suspension items which affect stability.

35 Steering bias to left or right

1 Rear wheel out of alignment. Caused by uneven adjustment of chain tensioner adjusters allowing the wheel to be askew in the swinging arm ends. A bent rear wheel axle will also misalign the wheel in the swinging arm.
2 Wheels out of alignment. This can be caused by impact damage to the frame, swinging arm, wheel spindles or front forks. Although occasionally a result of material failure or corrosion, it is usually as a result of a crash.
3 Front forks twisted in the steering yokes. A light impact, for instance with a pothole or low kerb, can twist the fork legs in the steering yokes without causing structural damage to the fork legs or the yokes themselves. Re-alignment can be made by loosening the yoke pinch bolts and wheel axle. Re-align the wheel with the handlebars and tighten the bolts working upwards from the wheel axle. This action should be carried out only when there is no chance that structural damage has occurred.

36 Handlebar vibrates or oscillates

1 Tyres worn or out of balance. Either condition, particularly in the front tyre, will promote shaking of the fork assembly and thus the handlebars. A sudden onset of shaking can result if a balance weight is displaced during use.
2 Tyres badly positioned on the wheel rims. A moulded line on each wall of a tyre is provided to allow visual verification that the tyre is correctly positioned on the rim. A check can be made by rotating the tyre; any misalignment will be immediately obvious.
3 Wheel rims warped or damaged. Inspect the wheels for runout as described in Chapter 7.
4 Swinging arm or linkage bearings worn. Renew the bearings.
5 Wheel bearings worn. Renew the bearings.
6 Steering head bearings incorrectly adjusted. Vibration is more likely to result from bearings which are too loose rather than too tight. Re-adjust the bearings.
7 Loose fork component fasteners. Loose nuts and bolts holding the fork legs, wheel axle or steering stem can promote shaking at the handlebars. Fasteners on running gear such as the forks and suspension should be check tightened occasionally to prevent dangerous looseness of components occurring.
8 Engine mounting bolts loose. Tighten all fasteners.

37 Poor front fork performance

1 Damping fluid level incorrect. If the fluid level is too low poor suspension control will occur resulting in a general impairment of roadholding and early loss of tyre adhesion when cornering and braking. Too much oil is unlikely to change the fork characteristics unless severe overfilling occurs when the fork action will become stiffer and oil seal failure may occur.
2 Damping oil viscosity incorrect. The damping action of the fork is directly related to the viscosity of the damping oil. The lighter the oil used, the less will be the damping action imparted. For general use, use the recommended viscosity of oil, changing to a slightly higher or heavier oil only when a change in damping characteristic is required. Overworked oil, or oil contaminated with water which has found its way past the seals, should be renewed to restore the correct damping performance and to prevent bottoming of the forks.
3 Damping components worn or corroded. Advanced normal wear of the fork internals is unlikely to occur until a very high mileage has been covered. Continual use of the machine with damaged oil seals which allows the ingress of water, or neglect, will lead to rapid corrosion and wear. Dismantle the forks for inspection and overhaul.
4 Weak fork springs. Progressive fatigue of the fork springs, resulting in a reduced spring free length, will occur after extensive use. This condition will promote excessive fork dive under braking, and in its advanced form will reduce the at-rest extended length of the forks and thus the chassis geometry. Renewal of the springs as a pair is the only satisfactory course of action.
5 Bent or corroded fork tubes. Both conditions will prevent correct telescoping of the fork legs, and in an advanced state can cause sticking of the fork in one position. In a mild form, corrosion will cause stiction of the fork thereby increasing the time the suspension takes to react to an uneven road surface. Bent fork tubes should be attended to immediately because they indicate that impact damage has occurred, and there is a danger that the forks will fail with disastrous consequences.

38 Front fork judder when braking (see also Section 46)

1 Wear between the fork tubes and the fork legs. Renewal of the fork bushes is required.
2 Slack steering head bearings. Re-adjust the bearings.
3 Warped brake disc. If irregular braking action occurs, fork judder can be induced in what are normally serviceable forks. Renew the damaged brake components.

39 Poor rear suspension performance

1 Rear shock absorber damper worn out or leaking. The damping performance of most shocks falls off with age. This is a gradual process, and thus may not be immediately obvious. Indications of poor damping include hopping of the rear end when cornering or braking, and a general loss of positive stability.
2 Weak rear spring. If the spring fatigues it will promote excessive pitching of the machine and reduce the ground clearance when cornering.
3 Swinging arm flexing or bearings worn. See Sections 34 and 36.
4 Suspension linkage pivot bearings worn. Overhaul as described in Chapter 6.
5 Bent shock absorber damper rod. This is likely to occur only if the machine is dropped or if seizure of the piston occurs. If either happens the shock should be renewed

Abnormal frame and suspension noise

40 Front end noise

1 Oil level low or too thin. This can cause a "spurting" sound and is usually accompanied by irregular fork action.
2 Spring weak or broken. Makes a clicking or scraping sound. Fork oil will have a lot of metal particles in it.
3 Steering head bearings loose or damaged. Clicks when braking. Check, adjust or renew.
4 Fork clamps loose. Make sure all fork clamp pinch bolts are tight.
5 Fork tubes bent. Good possibility if machine has been dropped. Repair or replace tubes.

41 Rear suspension noise

1 Fluid level too low. Leakage of the shock absorber, usually evidenced by oil on the outer surfaces, can cause a spurting noise. The shock absorber should be renewed.
2 Defective shock absorber (internal damage). Renew the shock.

Brake problems

42 Brakes are spongy or ineffective

1 Air in brake circuit. This is only likely to happen in service due to neglect in checking the fluid level or because a leak has developed. The problem should be identified and the brake system bled of air.
2 Pads worn. Check the pad wear and renew the pads if necessary.
3 Contaminated pads. Cleaning pads which have been contaminated with oil, grease or brake fluid is unlikely to prove successful; the pads should be renewed.
4 Pads glazed. This is usually caused by overheating. The surface of the pads may be roughened using glass-paper or a fine file.
5 Brake fluid deterioration. A brake which on initial operation is firm but rapidly becomes spongy in use may be failing due to water contamination of the fluid. The fluid should be drained and then the system refilled and bled.
6 Master cylinder seal failure. Wear or damage of master cylinder internal parts will prevent pressurisation of the brake fluid. Overhaul the master cylinder unit.
7 Caliper seal failure. This will almost certainly be obvious by loss of fluid, a lowering of fluid level in the master cylinder reservoir and contamination of the brake pads and caliper. Overhaul the caliper assembly.

43 Brake drag

1 Disc warped. The disc must be renewed.
2 Caliper piston, caliper or pads corroded. The brake caliper assembly is vulnerable to corrosion due to water and dirt, and unless cleaned at regular intervals and lubricated in the recommended manner will become sticky in operation.
3 Piston seal deteriorated. The seal is designed to return the piston into the caliper to the retracted position when the brake is released. Wear or old age can affect this function. The caliper should be overhauled if this occurs.
4 Brake pad damaged. Pad material separating from the backing plate due to wear or faulty manufacture. Renew the pads. Faulty installation of a pad will also cause dragging.
5 Wheel axle bent. The axle may be straightened if no structural damage has occurred.
6 Brake lever or pedal not returning. Check that the lever or pedal works smoothly throughout its operating range and does not snag on any adjacent cycle parts. Lubricate the pivot if necessary.
7 Twisted caliper mounting bracket. This is likely to occur only after impact in an accident. No attempt should be made to re-align the caliper; the bracket should be renewed.

44 Brake lever or pedal pulsates in operation

1 Disc warped or irregularly worn. The disc must be renewed.
2 Wheel axle bent. The axle may be straightened provided no structural damage has occurred.

45 Brake noise

1 Brake squeal can be caused by dust on the pads, usually in combination with glazed pads, or other contamination from oil grease, brake fluid or corrosion. Persistent squealing which cannot be traced to any of the normal causes can often be cured by applying a thin layer of high temperature silicone grease to the rear of the pads. Make absolutely certain that no grease is allowed to contaminate the braking surface of the pads.
2 Glazed pads. This is usually caused by high temperatures or contamination. The pad surfaces may be roughened using glasspaper or a fine file. If this does not effect a cure, the pads should be renewed.
3 Disc warped. This can cause a chattering, clicking or intermittent squeal and is usually accompanied by a pulsating brake lever or pedal or uneven braking. The disc must be renewed.
4 Brake pads fitted incorrectly or undersize. Longitudinal play in the pads, due to omission of the anti-rattle spring, or because the wrong pads have been fitted, will cause a single tapping noise every time the brake is operated. Inspect the pads for correct installation and security.

46 Brake induced fork judder

1 Worn front fork bushes, or worn or badly adjusted steering head bearings. These conditions, combined with uneven or pulsating braking as described in Section 44 will induce more or less judder when the brakes are applied, dependent on the degree of wear and poor brake operation. Attention should be given to both areas of malfunction. See the relevant Sections.

Electrical problems

47 Battery dead or weak

1 Battery faulty. Battery life should not be expected to exceed 3 to 4 years. Gradual sulphation of the plates and sediment deposits will reduce the battery performance. Plate and insulator damage can often occur as a result of vibration. Complete power failure, or intermittent failure, may be due to a broken battery terminal. Lack of electrolyte will prevent the battery maintaining charge.
2 Battery leads making poor contact. Remove the battery leads and clean them and the terminals, removing all traces of corrosion and tarnish. Reconnect the leads and apply a coating of petroleum jelly to the terminals.
3 Load excessive. If additional items, such as spot lamps, are fitted, which increase the total electrical load above the maximum alternator output, the battery will fail to maintain full charge. Reduce the electrical load to suit the electrical capacity.
4 Rectifier failure.
5 Alternator stator (charging) coils open-circuit or shorted

48 Battery overcharged

1 Regulator faulty. Overcharging is indicated if the battery becomes hot or it is noticed that the electrolyte level falls repeatedly between checks. In extreme cases the battery will boil causing corrosive gases and electrolyte to be emitted through the vent pipes. Perform a charging system output check (see Chapter 8).
2 Battery wrongly matched to the electrical circuit. Ensure that the specified battery is fitted to the machine.

49 Total electrical failure

1 Fuse blown. Check the main fuse. If a fault has occurred, it must be rectified before a new fuse is fitted.
2 Battery faulty. See Section 47.
3 Earth failure. Check that the main earth wire is securely affixed to the frame and is making a good contact.
4 Ignition switch or power circuit failure. Check for current flow through the battery positive lead (white) to the ignition switch. Check the ignition switch for continuity.

50 Circuit failure

1 Cable failure. Refer to the machine's wiring diagram and check the circuit for continuity. Open circuits are a result of loose or corroded connections, either at terminals or in-line connectors, or because of broken wires. Occasionally, the core of a wire will break without there being any apparent damage to the outer plastic cover.
2 Switch failure. All switches may be checked for continuity in each switch position, after referring to the switch position boxes incorporated in the wiring diagram for the machine. Switch failure may be a result of mechanical breakage, corrosion or water.

51 Bulbs blowing repeatedly

1 Vibration failure. This is often an inherent fault related to the natural vibration characteristics of the engine and frame and is, thus, difficult to resolve. Modifications of the lamp mounting, to change the damping characteristics, may help.
2 Intermittent earth. Check that a good contact is available at each earthing point in the circuit.
3 Reduced voltage. Where a quartz-halogen bulb is fitted (such as the headlight) the voltage to the bulb should be maintained or early failure of the bulb will occur. Do not overload the system with additional electrical equipment in excess of the system's power capacity and ensure that all circuit connections are maintained clean and tight.

Chapter 1
Tune-up and routine maintenance

Contents

Specifications

Engine

Spark plug	
Type	NGK BR8ES
Electrode gap	0.7 to 0.8 mm (0.028 to 0.031 in)
Engine idle speed	
125 models	1200 ± 100 rpm
200 models	1200 to 1400 rpm
Cylinder compression pressure	
125 models	115 to 178 psi (7.9 to 12.3 Bars)
200 models	109 to 171 psi (7.5 to 11.8 Bars)

Miscellaneous

Brake pad friction material minimum thickness	1 mm (0.04 in) - see text
Freeplay adjustments	
Throttle grip	2 to 3 mm (0.08 to 0.12 in)
Choke cable	2 to 3 mm (0.08 to 0.12 in)
Clutch lever	2 to 3 mm (0.08 to 0.12 in)
Drive chain	40 to 50 mm (1.5 to 2.0 in)
Drive chain 20 link standard length	254.0 to 254.6 mm (10.0 to 10.02 in)
Service (stretch) limit	260 mm (10.24 in)
Tyre pressures (cold)	
Front	21 psi (1.4 Bar)
Rear	
Up to 97.5 kg (215 lb) load	21 psi (1.4 Bar)
97.5 to 186 kg (215 to 410 lb) load	25 psi (1.7 Bar)

Minimum tyre tread depths*	
Front	2 mm (0.08 in)
Rear	2 mm (0.08 in)

**At the time of writing, UK law requires that tread depth be at least 1 mm over 3/4 of the tread breadth all the way round the tyre with no bald patches.*

Torque settings

	Nm	ft-lbs
Transmission oil drain plug	20	14.5
Spark plug	25	18
Water pump drain plug	15	11

Recommended lubricants and fluids

Engine oil	Good quality injector type 2-stroke oil
Transmission oil	
Type	API grade SE
Viscosity	SAE 10W30 or 10W40
Capacity	0.75 litres (1.3 pints)
Coolant	
Mixture type	50% distilled water, 50% corrosion inhibited ethylene glycol antifreeze
Capacity (including reservoir tank)	1.1 litres (1.9 pints)
Front fork oil	See Chapter 6
Brake fluid	DOT 3
Drive chain	
125 models	Aerosol chain lubricant or SAE 90 gear oil
200 models	SAE 90 gear oil. Chain lubricant can be used if marked as being suitable for O-ring chains
Steering head bearings	Multi-purpose grease
Wheel bearings	Medium weight, lithium based multi-purpose grease
Swinging arm pivot bearings	Molybdenum-disulphide grease
Suspension linkage bearings	Molybdenum-disulphide grease
Cables and lever pivots	Dry film lubricant or 10W/40 motor oil
Side stand pivot	Multi-purpose grease or motor oil
Brake pedal pivot	Multi-purpose grease or motor oil
Throttle grip	Multi-purpose grease or dry film lubricant

1 Kawasaki KMX125 & 200 Routine maintenance intervals

Note: *The pre-ride inspection outlined in the owner's manual covers the checks and maintenance that should be carried out on a daily basis. It's condensed and included here to remind you of its importance. Always perform the pre-ride inspection at every maintenance interval (in addition to the procedures listed). The intervals listed below are the shortest intervals recommended by the manufacturer for each particular operation during the model years covered in this manual. Your owner's manual may have different intervals for your model.*

Daily or before riding

Check the engine oil level
Check the transmission oil level
Check the fuel level and inspect for leaks
Check the level of coolant in the expansion tank, that there are no coolant leaks and that the radiator cap is secure
Check the operation of both brakes - also check the fluid levels and check there is no leakage
Check the tyres for damage, the presence of foreign objects and correct air pressure
Check the throttle for smooth operation
Check the operation of the clutch - make sure the freeplay is correct
Check the drive chain tension
Make sure the steering operates smoothly, without looseness or binding
Check for proper operation of the headlight, tail light, brake light, turn signals, speedometer and horn
Make sure the side stand returns to its fully up position and stays there under spring pressure
Make sure the engine KILL switch works properly

After the initial 500 miles (800 km)

Note: *This check is usually performed by a Kawasaki dealer after the first 500 miles (800 km) from new. Thereafter, maintenance is carried out according to the following intervals of the schedule.*

Check and adjust the idle speed
Check and adjust the throttle cable freeplay
Check and adjust the oil pump and carburettor synchronisation
Check cylinder head bolt tightness
Clean spark plug and check gap, replace if necessary
Check the brake fluid levels
Check battery electrolyte level
Check brake light switch operation
Check and adjust the clutch cable
Check, adjust and lubricate the drive chain
Check the tightness of all fasteners
Check the steering head bearings
Check the radiator hose connections
Change the transmission oil

Every 200 miles (300 km)

Lubricate the drive chain

Every 500 miles (800 km)

Adjust drive chain tension

Every 2,500 miles (4,000 km)

Check and adjust the engine idle speed
Check and adjust the oil pump synchronisation
Clean the spark plug and check its gap, replace if necessary
Clean the air filter element
Check the battery electrolyte level
Check front and rear brake pad wear
Check brake light switch operation
Check the brake fluid levels
Check and adjust the clutch
Check steering head bearings
Check drive chain wear and condition
Check tyre wear

Every 5,000 miles (8,000 km)

Check the throttle cable freeplay
Check the fuel system
Check cylinder head bolt tightness
Check all fasteners for tightness
Change the transmission oil (or change every year)
Lubricate the swinging arm pivot and rear suspension linkage
Check the radiator hoses (or check every year)

Every 10,000 miles (16,000 km)

Renew the air filter element (or renew every five cleanings)

Every 12,500 miles (20,000 km) or two years (whichever comes sooner)

Renew the brake fluid
Repack the steering stem bearings with fresh grease (Chapter 6)

Every 15,000 miles (24,000 km) or two years (whichever comes sooner)

Check the cooling system and renew the coolant
Replace the brake caliper fluid and dust seals
Replace the brake master cylinder piston cup seal and dust cover
Change the front fork oil

Every four years

Renew the brake hoses
Renew the fuel line

2 Introduction to tune-up and routine maintenance

This Chapter covers in detail the checks and procedures necessary for the tune-up and routine maintenance of your motorcycle. Section 2 includes the routine maintenance schedule, which is designed to keep the machine in proper running condition and prevent possible problems. The remaining Sections contain detailed procedures for carrying out the items listed on the maintenance schedule, as well as additional maintenance information designed to increase reliability.

Since routine maintenance plays an important role in the safe and efficient operation of your motorcycle, it is presented here as a comprehensive check list. For the rider who does all his/her own maintenance, these lists outline the checks which should be done on a routine basis.

Maintenance information is printed on decals attached to the motorcycle. If the information printed on the decals differs from that included here, use the information on the decal.

Deciding where to start or plug into the routine maintenance schedule depends on several factors. If you have a motorcycle whose warranty has recently expired, and if it has been maintained according to the warranty standards, you may want to pick up routine maintenance as it coincides with the next mileage or calendar interval. If you have owned the machine for some time, but have never performed any maintenance on it, then you may want to start at the nearest interval and includes some additional procedures to ensure that nothing important is overlooked. If you have just had a major engine overhaul, then you may want to start the routine maintenance from the beginning. If you have a used machine and have no knowledge of its history or maintenance record, you may desire to combine all checks into one large service initially and then settle into the maintenance schedule prescribed.

The Sections which outline the inspection and maintenance procedures are written as step-by-step guides to performing the work. They explain in detail each of the routine inspections and maintenance procedures on the check list. Reference to additional information in applicable Chapters is also included and should not be overlooked.

Before beginning any maintenance or repair, the machine should be cleaned thoroughly. Cleaning will ensure that dirt does not contaminate the engine and will allow you to detect wear and damage that could otherwise go unnoticed.

3 Fluid levels - check

Engine oil

Refer to illustration 3.2

1 If the oil level warning light stays on when the engine is in any gear other than neutral, top up the engine oil tank immediately.

2 Stop the engine, remove the seat, pull off the engine oil tank cap and top up the tank with the recommended oil. When the warning light comes on, the tank will take about 1.2 litres **(see illustration)**.

Transmission oil

Refer to illustrations 3.4 and 3.5

3 If the motorcycle has just been used, wait 2 or 3 minutes for the oil to settle. If oil has been added since the last check, run the engine for one or two minutes then switch it off and wait for a few minutes.

4 Check the transmission oil level by holding the motorcycle upright on level ground and observing the sight window in the right-hand engine cover; it is visible in the bend of the brake pedal. The oil level should be visible in the window and should be between the two lines on the crankcase cover **(see illustration)**.

5 If the oil level does not come up to the lower level mark, unscrew the filler cap in the top of the crankcase cover and top up to the upper level using oil of the recommended grade **(see illustration)**.

6 If you overfill the transmission, remove the excess.

Brake fluid

7 To ensure proper operation of the hydraulic disc brakes, the fluid level in the master cylinder reservoirs must be properly maintained.

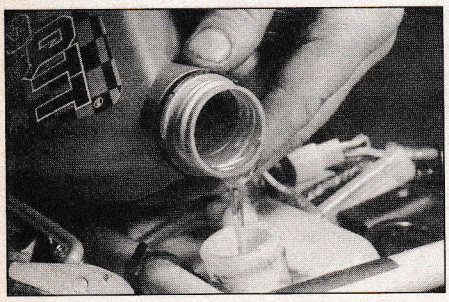
Front brake

Refer to illustrations 3.9 and 3.11a and 3.11b

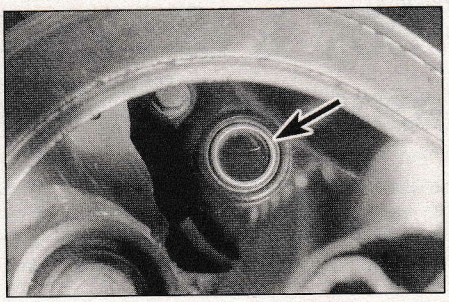
8 Turn the handlebars until the top of the master cylinder is as level as possible. If necessary, tilt the motorcycle to make it level.

9 Look closely at the inspection window in the master cylinder reservoir. Make sure that the fluid level, visible in the window, is above the LOWER mark on the reservoir **(see illustration)**.

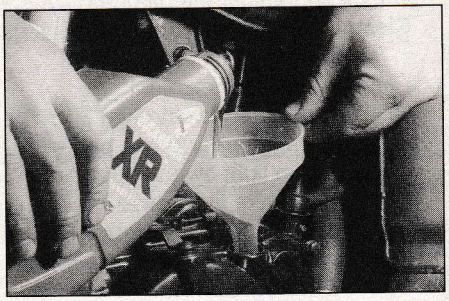
10 If the level is low, the fluid must be replenished. Before removing the master cylinder cap, cover the fuel tank to protect it from brake fluid



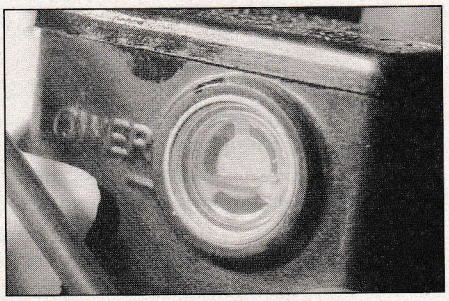
3.2 The engine's two-stroke oil tank is under the seat



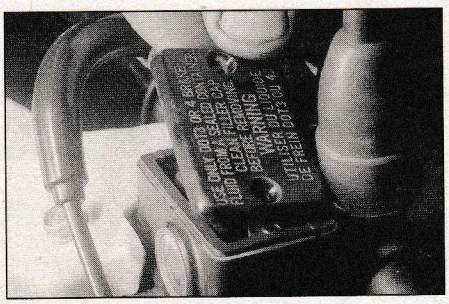
3.4 Transmission oil level must be visible in the window (arrow) in the right-hand engine cover



3.5 Transmission oil is topped up via filler cap on top of right-hand engine cover

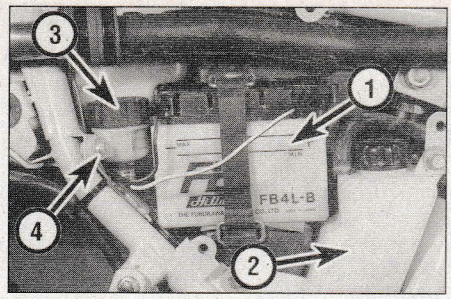


3.9 Front brake master cylinder fluid level must be above line cast in reservoir with the bike held upright on level ground

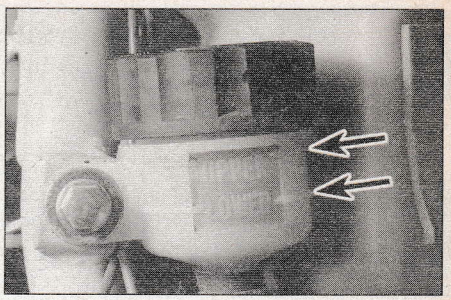


3.11a Front master cylinder cap is held on by two cross-head screws; a rubber diaphragm fits between cap and body

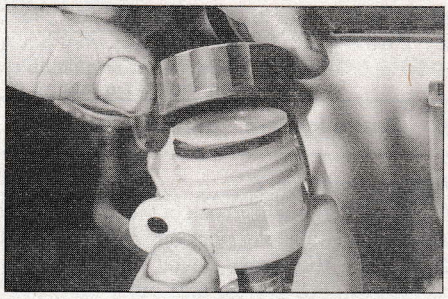
3.11b Upper level for fluid is the line cast around the interior of the reservoir



3.13a With the right-hand side cover off, access is gained to the battery (1), coolant tank (2), the rear brake master cylinder reservoir (3) and its mounting bolt (4)



3.13b Fluid level in the rear brake master cylinder reservoir should be between UPPER and LOWER lines on the reservoir with the bike held upright on level ground



3.16a With the mounting bolt removed, pull the reservoir away from the bike for access to the cap . . .

3.16b . . . the inner ring . . .

spills (which will damage the paint) and remove all dust and dirt from the area around the cover.

11 Unscrew the screws and lift off the cap and diaphragm. Using brake fluid of the recommended type, from a freshly opened container, top up the reservoir to the upper level mark; this mark is in the form of a line, cast around the inside of the reservoir **(see illustrations)**.

12 When the fluid level is correct, clean and dry the diaphragm, fold it into its compressed state and install it in the reservoir. Install the reservoir cap and securely tighten its retaining screws.

Rear brake

Refer to illustrations 3.13a, 3.13b, 3.16a, 3.16b, 3.16c and 3.16d

13 Remove the right-hand side cover. With the motorcycle vertical check the level in the rear brake reservoir. Make sure that the fluid level, visible through the translucent material of the reservoir, lies between the LOWER and UPPER lines on the reservoir **(see illustrations)**.

14 If the level is low, the fluid must be replenished. Remove all dust and dirt from the area around the cap.

15 Remove the rear brake reservoir mounting bolt to enable the reservoir to be pulled clear of the exhaust pipe.

16 Unscrew the reservoir cap and remove the plate and diaphragm. Using a good quality brake fluid of the recommended type, from a freshly opened container, top up the reservoir to the UPPER level mark **(see illustrations)**.

17 When the fluid level is correct, clean and dry the diaphragm, fold it into its compressed state and install it in the reservoir. Install the plate and reservoir cap, tightening it securely, and install the right side cover.

Both brakes

18 Check the operation of both brakes before taking the machine on the road; if there is evidence of air in the system, it must be bled as described in Chapter 7.

19 If the brake fluid level was low, inspect the brake system for leaks.

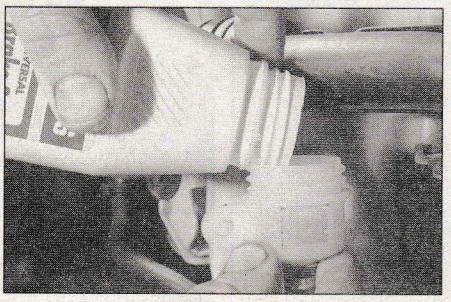
Coolant level

Refer to illustrations 3.20 and 3.21

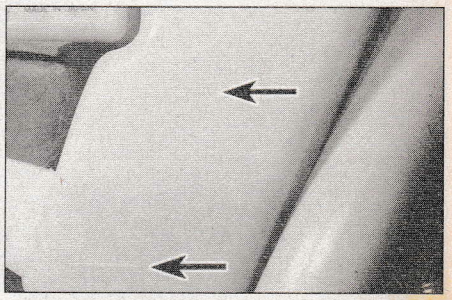
20 The coolant level should be between the UPPER and LOWER marks on the side of the coolant reservoir, visible through the slot in the battery cover. The reservoir is made of translucent plastic so that the coolant level can be easily seen in relation to the marks **(see illustration)**.

21 If the level is below the lower mark, remove the right-hand side cover and battery cover to gain access to the reservoir filler cap, then top up the level to the upper mark using the specified coolant

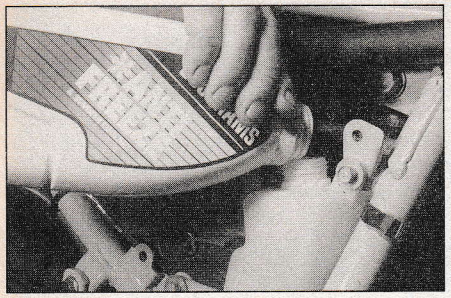
3.16c . . . and the diaphragm



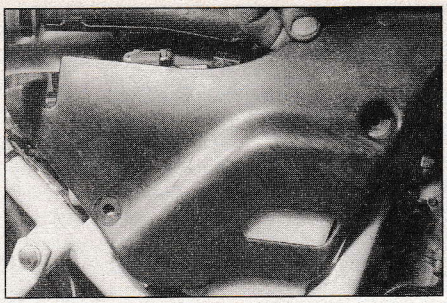
3.16d Top up with the specified fluid



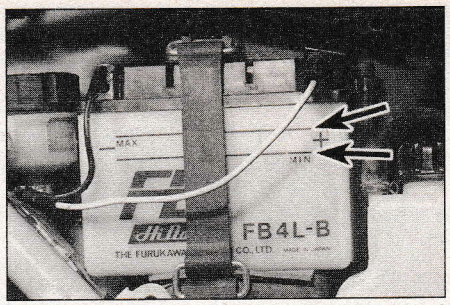
3.20 Coolant level in the reservoir should be between the two marks (arrow) cast in the plastic reservoir tank (black plastic battery cover removed for clarity)



3.21 Topping up the coolant reservoir



4.1 The black plastic battery cover has to be removed to gain access to the battery



4.2 Battery electrolyte level should be between the lines (arrows) with the bike held upright on level ground

mixture **(see illustration)**. **Note:** *Use only the specified ingredients as given in the Specifications at the start of this Chapter. If the coolant is significantly above the upper level mark at any time, the surplus coolant should be siphoned off to prevent it from being expelled out of the breather hose when the engine is running.*

22 If the coolant level falls steadily, check the system for leaks as described in Section 18. If no leaks are found and the level still continues to fall, it is recommended that the machine be taken to a Kawasaki dealer who will pressure test the system.

4 Battery - check

Refer to illustrations 4.1 and 4.2

1 Remove right-hand side cover and battery cover **(see illustration)**.

2 Hold the motorcycle upright on a level surface and check the electrolyte level is between the upper and lower level marks on the battery casing **(see illustration)**.

3 If the level is below the lower (MIN) mark, remove the battery for topping up. Unhook the rubber battery retaining strap. Disconnect the battery leads, starting with the negative terminal, and remove the battery from the motorcycle. Top up with distilled water and refit the filler plugs. Reconnect the negative lead last when installing the battery. Ensure that the battery vent tube is routed as shown on the label attached to the inside of the battery cover.

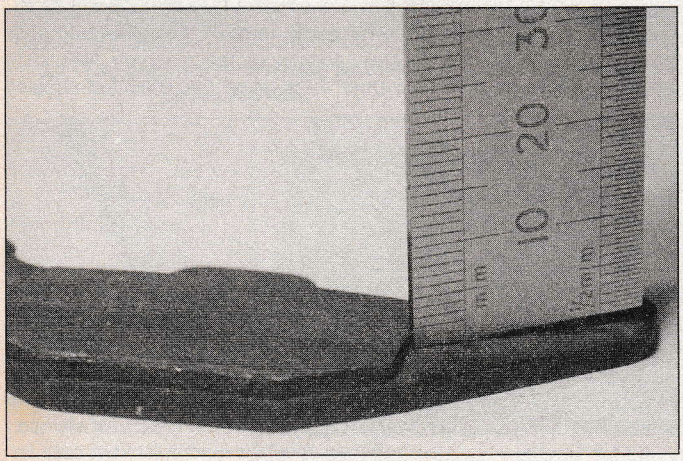
4 If the machine is not in regular use, disconnect the battery and give it a refresher charge every month to six weeks, as described in Chapter 8.

5 Brake pads - wear check

Refer to illustration 5.2

1 Although it may be possible to view the brake pad friction material with the caliper in situ, it is recommended that the caliper is removed from the fork leg (front) or support bracket (rear) for thorough inspection of the pads. Refer to Chapter 7, Section 2 for details.

2 If either pad's friction lining has worn down to a thickness of 1 mm (0.04 in) or less, both pads must be replaced as a set **(see illustration)**.



5.2 Brake pads must be renewed when friction material wears down to service limit or before (example shown requires renewal)

6 Brake system - general check

Refer to illustration 6.5

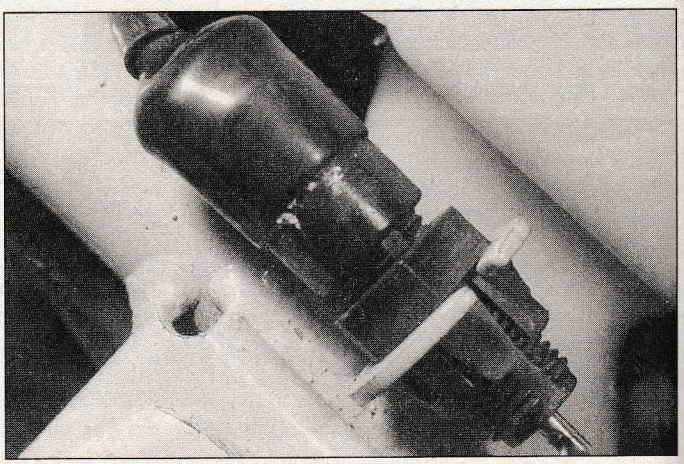
1 A routine general check of the brakes will ensure that any problems are discovered and remedied before the rider's safety is jeopardised.

2 Check the brake lever and pedal for loose connections, excessive play, bends, and other damage. Replace any damaged parts with new ones (see Chapter 7). The rear brake pedal height has a degree of adjustment to suit rider preference, measured as the distance from the top of the pedal tread to the top of the rider's footrest. Adjustment is made by disconnecting the split pin and clevis pin from the master cylinder pushrod-to-brake pedal link, slackening the locknut and turning the adjuster nut to obtain the correct pedal height; tighten the locknut on completion and use a new split pin in the clevis pin eye.

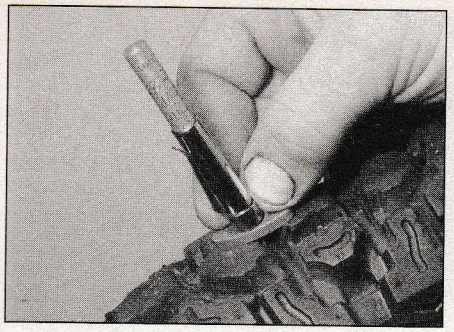
3 Make sure all brake fasteners are tight. Check the brake pads for wear (see Section 5) and make sure the fluid level in the reservoirs is correct (see Section 3). Look for leaks at the hose connections and check for cracks in the hoses. If the lever or pedal is spongy, bleed the brakes as described in Chapter 7.

4 Make sure the brake light operates when the front brake lever is depressed. The front brake light switch is not adjustable. If it fails to operate properly, replace it with a new one (see Chapter 8).

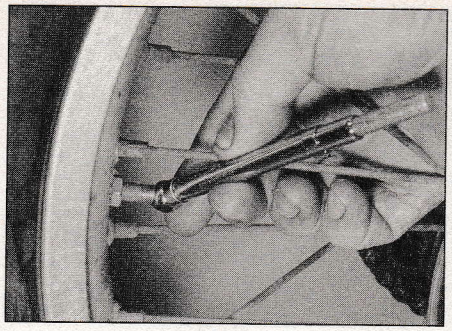
5 Make sure the brake light is activated just before the rear brake pedal takes effect. If adjustment is necessary, hold the switch and turn the adjusting ring on the switch body until the brake light is activated when required **(see illustration)**. If the switch doesn't operate the brake lights, check it as described in Chapter 8.



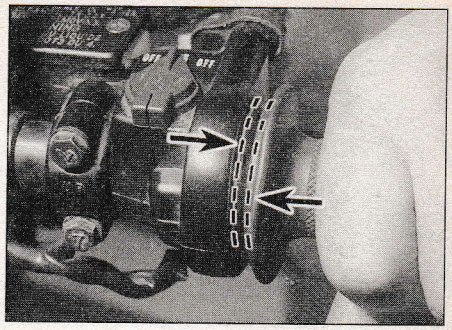
6.5 Brake light switch is mounted below and to the left of the coolant reservoir, it is adjusted by turning the body of the switch



7.2 Tyre tread depth being checked with a depth gauge



7.4 Tyre pressure being checked with a pressure gauge



8.3 Measure throttle cable freeplay in terms of twistgrip rotation

7 Tyres/wheels - general check

1 Routine tyre and wheel checks should be made with the realisation that your safety depends to a great extent on their condition.

Tyres

Refer to illustrations 7.2 and 7.4

2 Check the tyres carefully for cuts, tears, embedded nails or other sharp objects and excessive wear. Operation of the motorcycle with excessively worn tyres is extremely hazardous, as traction and handling are directly affected. Measure the tread depth at the centre of the tyre and replace worn tyres with new ones when the tread depth is less than specified **(see illustration)**.

3 Repair or replace punctured tyres as soon as damage is noted.

4 Check the tyre pressures when the tyres are cold and keep them properly inflated. Proper air pressure will increase tyre life and provide maximum stability and ride comfort. Keep in mind that low tyre pressures may cause the tyre to slip on the rim or come off, while high tyre pressures will cause abnormal tread wear and unsafe handling **(see illustration)**.

5 Check the valve stem cap is in place and tight. If it is missing, install a new one made of metal or hard plastic.

Wheels

6 Visually check the spokes for damage, breakage or corrosion. A broken or bent spoke must be renewed immediately because the load taken by it will be transferred to adjacent spokes which may in turn fail.

7 If you suspect that any of the spokes are incorrectly tensioned, tap each one lightly with a screwdriver and note the sound produced. Properly tensioned spokes will make a sharp pinging sound, loose ones will produce a lower pitch and overtightened ones will be higher pitched. Unevenly tensioned spokes will promote rim misalignment - seek the help of a wheel building expert if this is suspected.

8 Throttle and choke operation/grip freeplay - check and adjustment

Throttle cable

Refer to illustrations 8.3 and 8.4

1 Check that the throttle twistgrip operates smoothly and snaps shut quickly when released. Turn the handlebars all the way through their travel with the engine idling. Idle speed should not change. If it does, the cable may be routed incorrectly. Correct this condition before riding the bike (see Chapter 4).

2 If the throttle sticks, this is probably due to a cable fault. Remove the cable as described in Chapter 4 and lubricate it as described in Section 16. Install the cable, routing it so it takes the smoothest route possible. If this fails to improve the operation of the throttle, the cable must be replaced. Note that in very rare cases the fault could lie in the carburettor rather than the cable, necessitating the removal of the carburettor and inspection of the throttle valve (see Chapter 4).

3 With the throttle operating smoothly, check for a small amount of freeplay at the grip. The amount of freeplay in the throttle cable, measured in terms of twistgrip rotation, should be as given in this Chapter's Specifications **(see illustration)**. If adjustment is necessary, adjust idle speed afterwards (see Section 17).

4 Slacken the locknut on the cable upper adjuster and rotate the adjuster until the correct amount of freeplay is obtained, then tighten the locknut **(see illustration)**. If it is not possible to obtain the correct freeplay with the upper adjuster, it will also be necessary to make adjustment at the lower adjuster, situated on the top of the carburettor.

5 Screw the upper cable adjuster in to obtain the maximum possible freeplay. Slide the rubber cover off the adjuster on the carburettor top, using pliers withdraw the spring clip from the adjuster, then slacken the lower adjuster locknut and set the cable freeplay using first the lower adjuster and then, if necessary, the upper adjuster. Once the freeplay is correct tighten the adjuster locknuts securely and in the case of the lower adjuster install the spring clip and rubber cover.

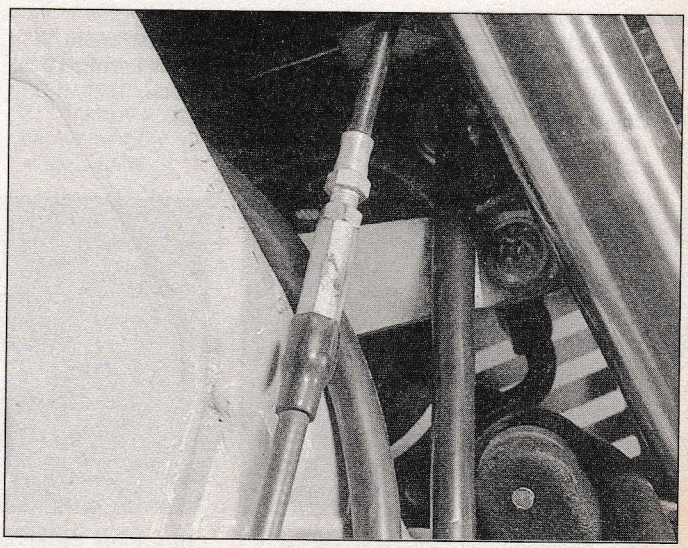
Choke cable

Refer to illustration 8.8

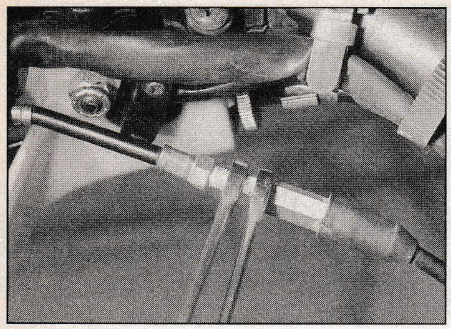
6 If the choke mechanism does not operate smoothly this is probably due to a cable fault. Remove the cable as described in Chapter 4 and lubricate it as described in Section 16. Install the cable, routing it so it takes the smoothest route possible. If this fails to improve the operation of the choke, the cable must be replaced.

7 With the choke mechanism operating smoothly check for a small amount of freeplay by pulling and pushing the outer cable at the lever connection on the handlebar; there should be 2 to 3 mm (0.08 to 0.12 in) movement.

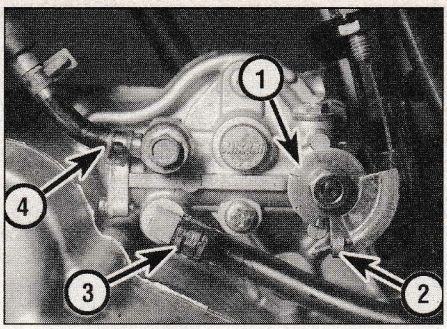
8 To adjust the choke cable freeplay, loosen the locknut on the cable



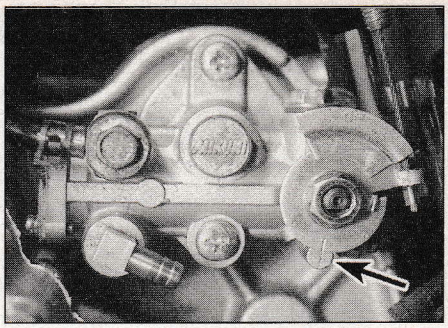
8.4 Throttle cable in-line adjuster location



8.8 Choke cable is adjusted by loosening locknut and turning long hexagonal adjuster



9.1 Engine oil pump details: pump pulley (1), cable end tag (2), oil feed from engine oil tank (3), and oil delivery to intake stub (4)



9.3 With throttle held fully open, the lines (arrow) on the pump pulley and the body should line up

adjuster and turn the adjuster until the required amount of freeplay is obtained. Tighten the locknut **(see illustration)**.

9 Oil pump synchronisation - check and adjustment

Check

Refer to illustrations 9.1 and 9.3

1 The oil pump is situated underneath the carburettor on the left-hand side of the engine, and injects oil into the carburettor intake in accordance with throttle opening. Pump delivery is varied by a cable connected to the twistgrip via a junction box under the tank where it joins the throttle cable **(see illustration)**.

2 To check that the pump is correctly synchronised with the throttle twistgrip first check that the throttle cable freeplay is correct (see Section 8) and that the pump end of the outer cable is fully seated against the cable adjuster. The inner cable end should be securely clamped by the metal tag on the oil pump pulley which is bent over to trap the cable.

3 Have an assistant rotate the twistgrip until it is fully open and hold it there. The synchronisation mark on the pump pulley should line up with the index mark on the pump body **(see illustration)**. Note that the pulley has two marks on it. The other, the idle mark, is not used in this operation.

4 If the marks do not line up, adjust the cable as follows.

Adjustment

Refer to illustration 9.5

5 Loosen the oil pump cable adjuster locknut **(see illustration)**.

6 Turn the adjuster to synchronise the two marks **(see illustration 9.3)**.

7 Tighten the locknut and recheck the synchronisation.

8 Check the throttle cable freeplay (see Section 8).

10 Clutch - check and adjustment

Refer to illustrations 10.1, 10.3, 10.5 and 10.6

1 Check that the clutch cable operates smoothly and easily. Look for signs of damage at the exposed inner cable **(see illustration)**.

2 If the clutch lever operation is heavy or stiff, remove the cable as described in Chapter 2 and lubricate it as described in Section 16. Install the lubricated cable, making sure it takes the smoothest possible route.

3 Remove the hand guard (whre fitted) to check cable freeplay. Clutch cable freeplay is measured as the distance the pivot end of the lever moves away from the lever bracket before all freeplay in the cable is taken up **(see illustration)**.

4 Check the adjustment by pulling back the cable dust cover and ensuring the clutch cable is properly seated. Pull the clutch lever just enough to take up freeplay in the cable and measure the gap between the lever and the lever bracket. It should be 2 to 3 mm (0.08 to 0.12 in).

5 If adjustment is required, slacken the knurled locknut at the clutch lever end of the cable and turn the adjuster to obtain the necessary freeplay **(see illustration)**.

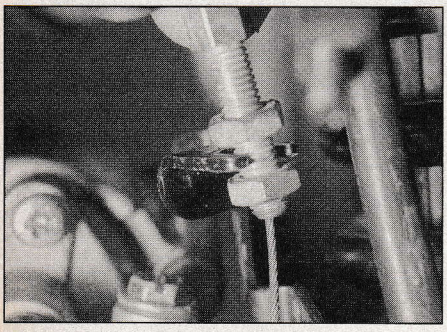
6 If there is insufficient range in the handlebar adjuster it will be necessary to adjust the freeplay at the lower adjuster on the crankcase cover **(see illustration)**. Slacken both nuts to re-position the threaded sleeve in relation to the bracket on the crankcase cover. If necessary, fine adjustments can then be made using the handlebar adjuster. Tighten both cable adjuster locknuts on completion.

11 Drive chain and sprockets - check, adjustment and lubrication

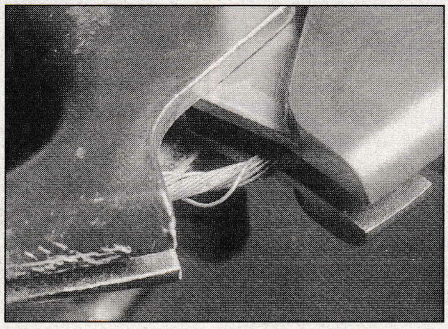
Check

Refer to illustrations 11.3 and 11.5

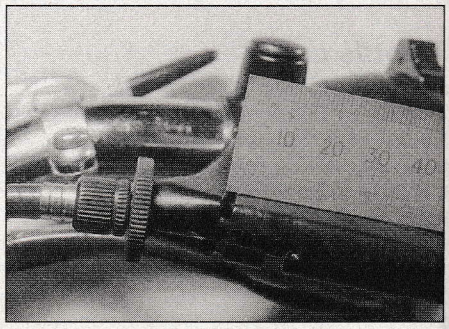
1 A neglected drive chain won't last long and can quickly damage the



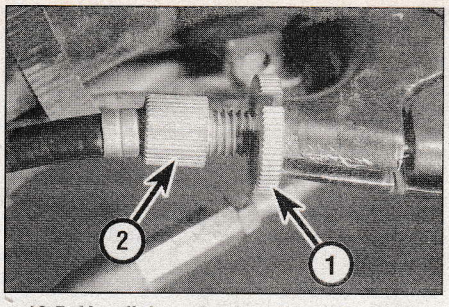
9.5 Slacken locknut and reposition adjuster in relation to mounting bracket



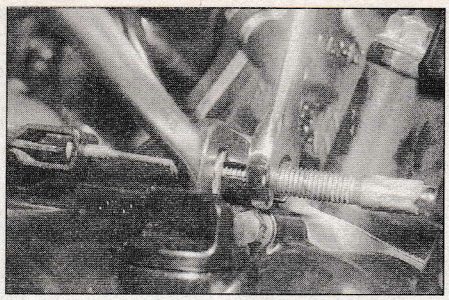
10.1 Inner cable damage like this cannot be repaired - cable renewal is required



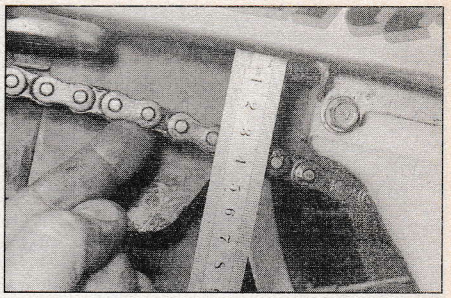
10.3 Clutch cable freeplay is measured at the lever pivot; lever pulled just enough to take up any slack in the cable



10.5 Handlebar clutch cable adjuster is adjusted by slackening the larger knurled locknut (1) and then turning the adjuster (2)



10.6 Clutch cable adjustment can also be made at the adjuster on the engine cover



11.3 Measure chain slack midway between sprockets on lower chain run

sprockets. Routine chain adjustment and lubrication isn't difficult and will ensure maximum chain and sprocket life.

2 To check the chain, put the transmission into neutral, make sure the ignition switch is OFF and put the motorcycle on its side stand.

3 Push up on the bottom run of the chain and measure the slack midway between the two sprockets, then compare your measurements to the value listed in this Chapter's Specifications **(see illustration)**. As wear occurs, the chain will actually stretch, necessitating adjustment to take up excess slack from the chain. In some cases where lubrication has been neglected, corrosion and galling may cause the links to bind and kink, which effectively shortens the chain's length. If the chain is tight between the sprockets, rusty or kinked, it's time to replace it with a new one. **Note:** *Repeat the chain slack measurement along the length of the chain - ideally, every inch or so. If you find a tight area, mark it with felt pen or paint, and repeat the measurement after the bike has been ridden. If the chain's still tight in the same area, it may be damaged or worn. Because a tight or kinked chain can damage the transmission countershaft bearing, it's a good idea to replace it.*

4 Check the entire length of the chain for damaged rollers, loose links and pins and replace if damage is found. On 125 models, which have a split link in the chain, check the securely of the link spring clip. **Note:** *Never install a new chain on old sprockets, and never use the old chain if you install new sprockets - replace the chain and sprockets as a set.* Drive chain wear can be assessed by hanging a weight of approximately 10 kg (20 lbs) on the chain's lower run and measuring the length of any 20 links (ie from any one pin to the 21st pin along) with the chain stretched taut; you may have to remove the chain guard to make the measurement. If the chain has stretched beyond the service limit (see Specifications) it must be renewed.

5 Remove the engine sprocket cover (see Chapter 6). Check the teeth on the engine and the rear wheel sprockets for wear **(see illustration)**.

6 Inspect the drive chain slider on the swinging arm for excessive wear and replace if necessary (see Chapter 6).

Adjustment

Refer to illustrations 11.9 and 11.10

7 Block the motorcycle up so the rear wheel is clear of the ground.

8 Rotate the rear wheel until the chain is positioned with the tightest point at the centre of its bottom run.

9 Slacken the rear axle nut and the locknut on each chain adjuster **(see illustration)**.

10 Turn the axle adjusting nuts on both sides of the swinging arm until the proper chain tension is obtained (get the adjuster on the chain side close, then set the adjuster on the opposite side) **(see illustration)**. Be sure to turn the adjusting nuts evenly to keep the rear wheel in alignment. If the adjusting nuts reach the end of their travel, the chain is excessively worn and should be replaced with a new one (see Chapter 6).

11 When the chain has the correct amount of slack, make sure the marks on the adjuster plates correspond to the same relative marks on each side of the swinging arm. Tighten the axle nut to the torque listed in the Chapter 7 Specifications.

12 With the axle nut tightened, tighten the chain adjuster locknuts.

Lubrication

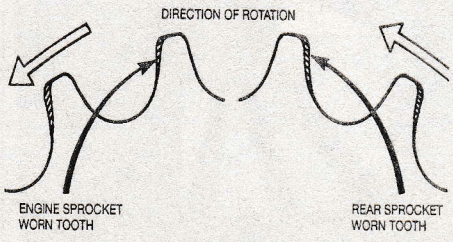
13 If the chain is extremely dirty, it should be removed as described in Chapter 6 and cleaned in paraffin. Do not use any other cleaner on the chain fitted to 200 models because the solvent may damage the O-rings. On 125 models, fitted with a conventional type chain as standard equipment, the chain can be lubricated in a chain bath after cleaning (see Chapter 6).

14 For routine lubrication, the best time to lubricate the chain is after the motorcycle has been ridden. On 125 models, apply the lubricant so that it works into the rollers, pins and side plates of the chain. On 200 models, lubricant is sealed into the pins and rollers by O-rings, and it is thus only necessary to apply oil to the area where the side plates overlap and the O-rings themselves - take care to use only a lubricant suitable for O-ring chains, otherwise the O-rings may be damaged.

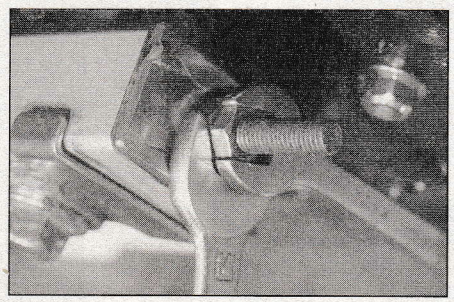
12 Transmission oil - change

1 Before draining the transmission oil, take the motorcycle on a short run to warm the oil and ensure it drains fully.

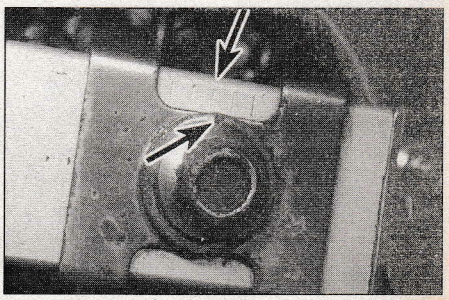
2 Position a clean drain pan below the engine. Unscrew the oil filler cap to vent the transmission and act as a reminder that there is no oil in the engine.



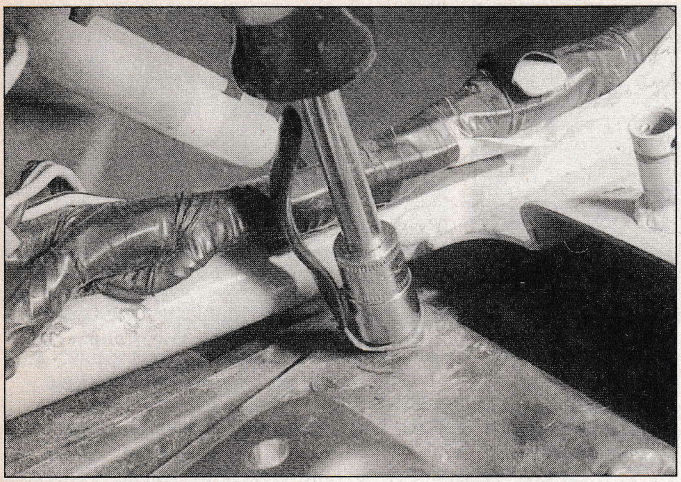
11.5 Check the sprockets in the areas indicated to see if they are worn excessively



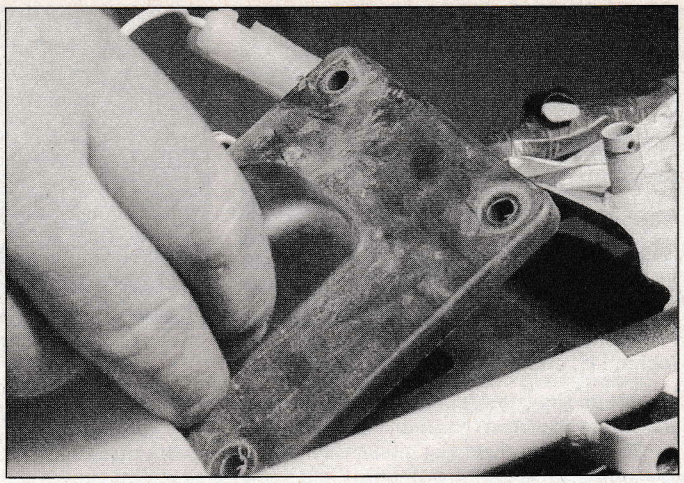
11.9 To adjust chain freeplay, slacken outer locknut and turn inner adjuster nut . . .



11.10 . . . noting that notch on adjuster (lower arrow) must line up with the same relative mark on each side of the swinging arm (upper arrow)



13.2a Remove the four bolts . . .



13.2b . . . and lift off the air filter housing cover

3 Next, remove the drain plug and its washer from the bottom of the crankcases and allow the oil to drain into the pan. Hold the bike vertical to drain the oil completely.

4 Replace the sealing washer over the drain plug, using a new one if there are any signs of damage. Fit the plug to the crankcase and tighten it to the specified torque setting. Avoid overtightening, as damage to the crankcases will result.

5 Before refilling the engine, check the old oil carefully. If the oil was drained into a clean pan, small pieces of metal or other material can be easily detected. If there are flakes or chips of metal in the oil, then something is drastically wrong internally and the transmission will have to be disassembled for inspection and repair.

6 If there are pieces of fibre-like material in the oil, the clutch is experiencing excessive wear and should be checked.

7 If inspection of the oil turns up nothing unusual, refill the transmission to the proper level with the recommended type and amount of oil and install the filler cap **(see illustration 3.5)**. Start the engine and let it run for two or three minutes. Shut it off, wait a few minutes, then check the oil level. If necessary, add more oil to bring the level up to the upper mark. Check around the drain plug for leaks.

8 The old oil drained from the transmission cannot be re-used and should be disposed of properly. Check with your local refuse disposal company, disposal facility or environmental agency to see whether they will accept the used oil for recycling. Don't pour used oil into drains or onto the ground. After the oil has cooled, it can be drained into a suitable container (capped plastic jugs, topped bottles, milk cartons, etc.) for transport to one of these disposal sites.

13 Air filter element - cleaning

Refer to illustrations 13.2a, 13.2b, 13.3 and 13.8

1 Remove the seat.

2 Unclip the fuse holder from the top of the air filter. Undo the four retaining screws and remove the cover from the air filter housing **(see illustrations)**.

3 Lift out the air filter element noting which way around it is fitted **(see illustration)**.

4 Wipe out the housing with a clean rag.

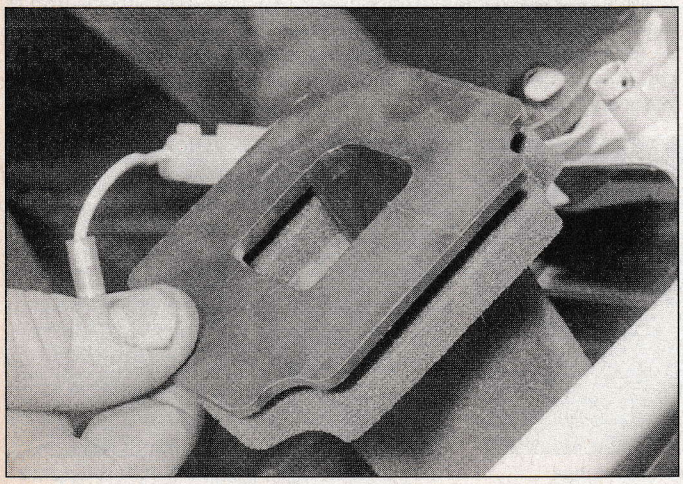
5 Pull the element off its frame. Examine the element for tears or holes and renew it if necessary. **Note:** *The element must be renewed at the specified mileage interval, or after every five cleanings.*

6 Wash the element in solvent and dry it by squeezing or using a compressed air line. **Caution:** *Do not wring out the element otherwise it may tear.*

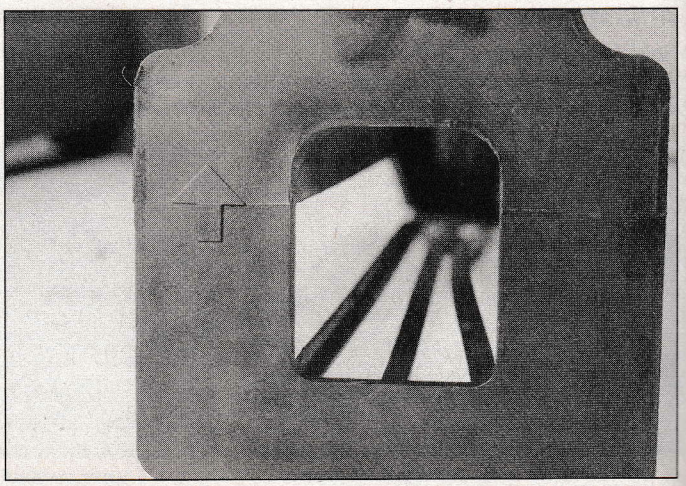
7 When the element is dry, saturate it with SAE30 oil, wrap it in a clean cloth and squeeze out excess oil, being careful not to tear the element.

8 Fit the element back over its frame and replace it in the housing **(see illustration)**, making sure it is the correct way round. The lug on the bottom of the frame fits in the depression in the bottom of the housing. Install the cover and securely tighten its retaining screws. Clip the fuse holder back into place.

9 Replace the seat.



13.3 Air filter element lifts out



13.8 Note arrow on top of frame which points forward when it is installed in the filter housing

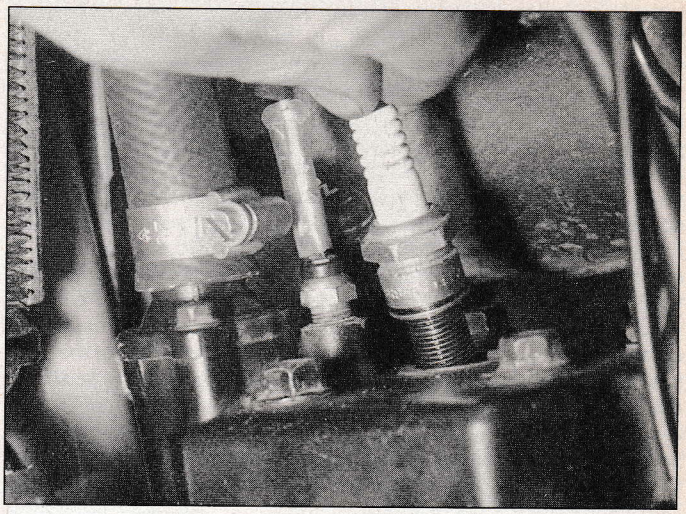
14 Cylinder compression - check

1 Among other things, poor engine performance may be caused by a leaking head gasket, worn piston, rings and/or cylinder walls or leaking crankshaft oil seals. A cylinder compression check will help pinpoint these conditions and can also indicate the presence of excessive carbon deposits in the cylinder head.
2 The only tools required are a compression gauge and a spark plug spanner. Depending on the outcome of the initial test, a squirt-type oil can may also be needed.
3 Start the engine and allow it to reach normal operating temperature, then stop it.
4 Remove the radiator shroud and spark plug as described in Section 15. **Warning:** *Work carefully - don't strip the spark plug hole threads and don't burn your hands on the hot cylinder head.*
5 Disable the ignition by switching the kill switch to OFF.
6 Install the compression gauge in the spark plug hole.
7 Hold the throttle wide open and kick the engine over a minimum of four or five revolutions (or until the gauge reading stops increasing) and observe the initial movement of the compression gauge needle as well as the final total gauge reading. Compare the result to the value listed in this Chapter's Specifications.
8 If the compression built up quickly and evenly to the specified amount, you can assume the engine is in reasonably good mechanical condition. Worn or sticking piston rings and worn cylinders will produce very little initial movement of the gauge needle, but compression will tend to build up gradually as the engine spins over. Head gasket leakage is indicated by low initial compression which does not tend to build up.
9 To further confirm your findings, add a small amount of engine oil to the cylinder by inserting the nozzle of a squirt-type oil can through the spark plug hole. The oil will tend to seal the piston rings if they are leaking.
10 If the compression increases significantly after the addition of the oil, the piston rings and/or cylinders are definitely worn. If the compression does not increase, the pressure is leaking past the head gasket or crankshaft oil seals.
11 If the compression reading is considerably higher than specified, the combustion chamber is probably coated with excessive carbon deposits. It is possible (but not very likely) for carbon deposits to raise the compression enough to compensate for the effects of leakage past rings. A fuel additive that will dissolve the adhesive bonding the carbon particles to the crown and chamber can be used, but due to the susceptibility of a two-stroke engine to carbonisation it is recommended that the cylinder head be removed and the deposits scraped off (see Chapter 2).

15 Spark plug - check and replacement

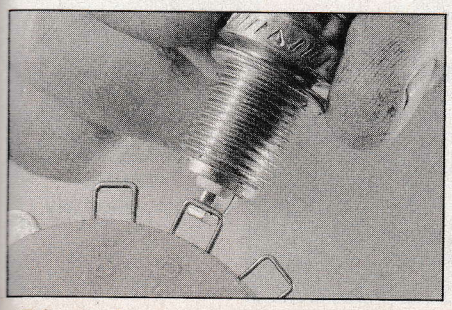
Refer to illustrations 15.2, 15.6a, 15.6b and 15.6c

1 This motorcycle is equipped with a spark plug that has 14 mm threads and a 20.6 mm spanner hexagon . Make sure your spark plug socket is the correct size before attempting to remove the plug.

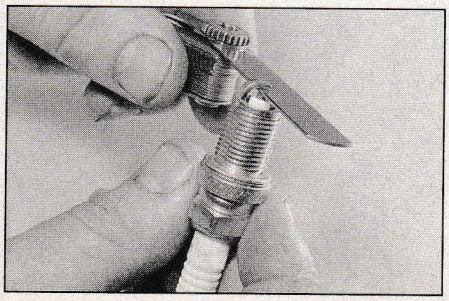


15.2 Removing the spark plug from the cylinder head

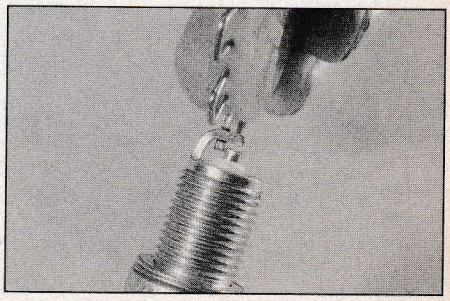
2 Disconnect the suppressor cap from the spark plug. If available, use compressed air to blow any accumulated debris from around the spark plug. Remove the plug **(see illustration)**.
3 Inspect the electrodes for wear. Both the centre and side electrodes should have square edges and the side electrode should be of uniform thickness. Look for excessive deposits and evidence of a cracked or chipped insulator around the centre electrode. Compare your spark plug to the colour spark plug reading chart. Check the threads, the washer and the ceramic insulator body for cracks and other damage.
4 If the electrodes are not excessively worn, and if the deposits can be easily removed with a wire brush, the plug can be regapped and re-used (if no cracks or chips are visible in the insulator). If in doubt concerning the condition of the plug, replace it with a new one, as the expense is minimal.
5 Cleaning spark plugs by sandblasting is permitted, provided you clean the plug with a high flash-point solvent afterwards.
6 Before installing a new plug, make sure it is the correct type and heat range. Check the gap between the electrodes, as they are not preset. For best results, use a wire-type gauge rather than a flat (feeler) gauge to check the gap **(see illustrations)**. If the gap must be adjusted, bend the side electrode only and be very careful not to chip or crack the insulator nose **(see illustration)**. Make sure the washer is in place before installing the plug.
7 Since the cylinder head is made of aluminium, which is soft and easily damaged, thread the plug into the head by hand.
8 Once the plug is finger-tight, the job can be finished with a socket. If a torque wrench is available, tighten the spark plug to the specified torque listed in this Chapter's Specifications. If you do not have a torque wrench, tighten the plug finger-tight (until the washer bottoms on the cylinder head) then use a spanner to tighten it an additional 1/4 turn. Regardless of the method used, do not overtighten it.
9 Reconnect the suppressor cap.



15.6a A wire type gauge is recommended to measure spark plug electrode gap



15.6b Using a feeler gauge to measure spark plug electrode gap



15.6c Electrode gap is adjusted by bending the side electrode

16 Lubrication - general

1 Since the controls, cables and various other components of a motorcycle are exposed to the elements, they should be lubricated periodically to ensure safe and trouble-free operation.

2 The footrests, clutch and brake lever, brake pedal and side stand pivot should be lubricated frequently. In order for the lubricant to be applied where it will do the most good, the component should be disassembled. However, if chain and cable lubricant is being used, it can be applied to the pivot joint gaps and will usually work its way into the areas where friction occurs. If motor oil or light grease is being used, apply it sparingly as it may attract dirt (which could cause the controls to bind or wear at an accelerated rate). **Note:** *One of the best lubricants for the control lever pivots is a dry-film lubricant (available from many sources by different names).*

3 To lubricate the cables, disconnect the relevant cable at its upper end, then lubricate the cable with a pressure lube adapter. Refer to Chapter 4 for the choke and throttle cable removal procedures, and to Chapter 2 for clutch cable removal details.

4 The speedometer and tachometer cables should be removed from their housings and lubricated with motor oil or cable lubricant. Do not lubricate the upper few inches of the cable as the lubricant may travel up into the instrument head.

17 Idle speed - check and adjustment

Refer to illustration 17.3

1 Before adjusting the idle speed, make sure the throttle cable grip freeplay is correct (see Section 8). Also, turn the handlebars back-and-forth and see if the idle speed changes as this is done. If it does, the throttle cable may not be adjusted correctly, or may be worn out. This is a dangerous condition that can cause loss of control of the bike. Be sure to correct this problem before proceeding.

2 The engine should be at normal operating temperature, which is usually reached after 10 to 15 minutes of stop and go riding. Place the motorcycle on the stand and make sure the transmission is in neutral.

3 Turn the idle speed screw, which is located on the left-hand side of the carburettor body until the idle speed listed in this Chapter's Specifications is obtained **(see illustration)**.

4 Snap the throttle open and shut a few times, then recheck the idle speed. If necessary, repeat the adjustment procedure.

5 If a smooth, steady idle can't be achieved, the fuel/air mixture may be incorrect. Refer to Chapter 4 for additional carburettor information.

18 Cooling system - checks

Refer to illustration 18.2

Warning: *The engine must be cool before beginning this procedure.*

1 Check the coolant level as described in Section 3.

2 Remove the radiator shroud **(see illustration)**.

3 The entire cooling system should be checked for evidence of leakage. Examine each rubber coolant hose along its entire length. Look for cracks, abrasions and other damage. Squeeze each hose at various points. They should feel firm, yet pliable, and return to their original shape when released. If they are dried out or hard, replace them with new ones.

4 Check for evidence of leaks at each cooling system joint. Tighten the hose clips carefully to prevent future leaks.

5 Check the radiator for leaks and other damage. Leaks in the radiator leave telltale scale deposits or coolant stains on the outside of the core below the leak. If leaks are noted, remove the radiator (see Chapter 3) and have it repaired at a radiator shop or replace it with a new one. **Caution:** *Do not use a liquid leak stopping compound to try to repair leaks.*

6 Check the radiator fins for mud, dirt and insects, which may impede the flow of air through the radiator. If the fins are dirty, force low pressure compressed air through the fins from the rear of the radiator. **Note:** *Direct the air jet perpendicular to the fins and not at an angle - the jet should be applied no closer than 20 inches from the radiator.* If the fins are bent or distorted, straighten them carefully with a screwdriver.

7 Remove the pressure cap by turning it anti-clockwise until it reaches a stop. If you hear a hissing sound (indicating there is still pressure in the system), wait until it stops. Now press down on the cap and continue turning the cap until it can be removed. Check the condition of the coolant in the system. If it is rust-coloured or if accumulations of scale are visible, drain, flush and refill the system with new coolant (See Section 19). Check the cap seal for cracks and other damage. If in doubt about the pressure cap's condition, have it tested by a Kawasaki dealer or replace it with a new one. Install the cap by turning it clockwise until it reaches the first stop then push down on the cap and continue turning until it can turn no further.

8 Check the antifreeze content of the coolant with an antifreeze hydrometer. Sometimes coolant looks like it's in good condition, but might be too weak to offer adequate protection. If the hydrometer indicates a weak mixture, drain, flush and refill the system (refer to Section 19).

9 Start the engine and let it reach normal operating temperature, then check for leaks again.

10 If the coolant level is consistently low, and no evidence of leaks can be found, have the entire system pressure checked by a Kawasaki dealer.

19 Cooling system - draining, flushing, refilling and bleeding

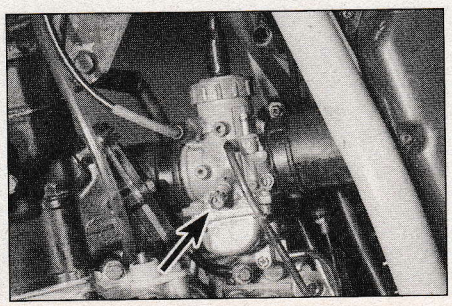
Warning: *Allow the engine to cool completely before performing this maintenance operation. Also, don't allow antifreeze to come into contact with your skin or the painted surfaces of the motorcycle. Rinse off spills immediately with plenty of water. Antifreeze is highly toxic if ingested. Never leave antifreeze lying around in an open container or in puddles on the floor; children and pets are attracted by its sweet smell and may drink it. Check with local authorities (councils) about disposing of antifreeze. Many communities have collection centres which will see that antifreeze is disposed of safely. Antifreeze is also combustible, so don't store it near open flames.*

Draining

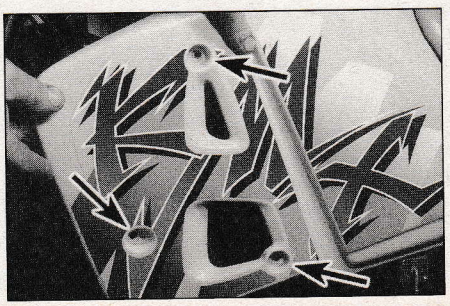
Refer to illustration 19.5

1 Remove the radiator shroud.

2 Remove the pressure cap by turning it anti-clockwise until it

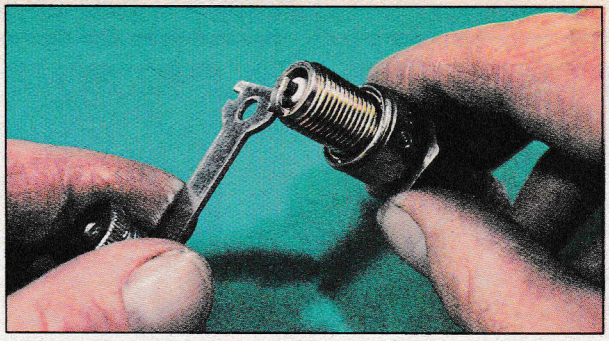


17.3 Idle speed adjuster screw (arrow)

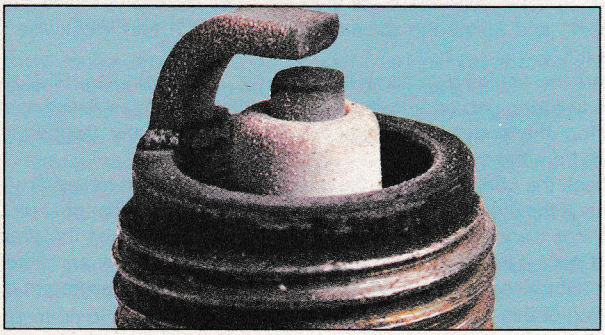


18.2 Radiator shroud is held on by three screws (arrow)

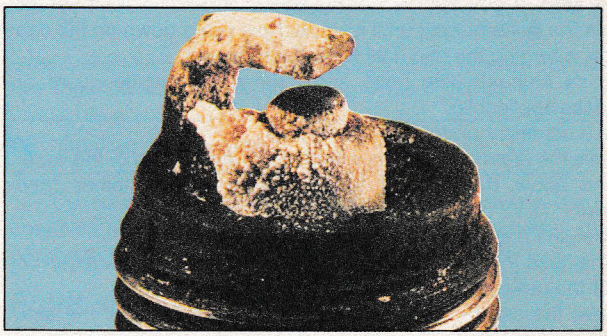
Electrode gap check – use a wire type gauge for best results



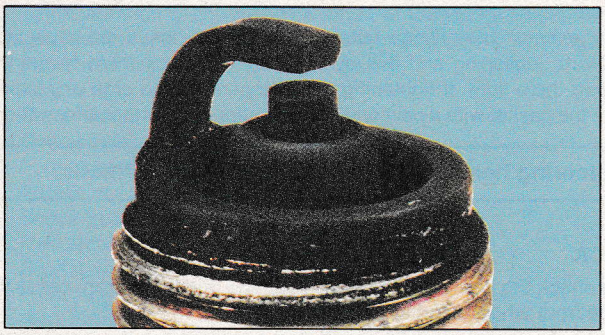
Electrode gap adjustment – bend the side electrode using the correct tool



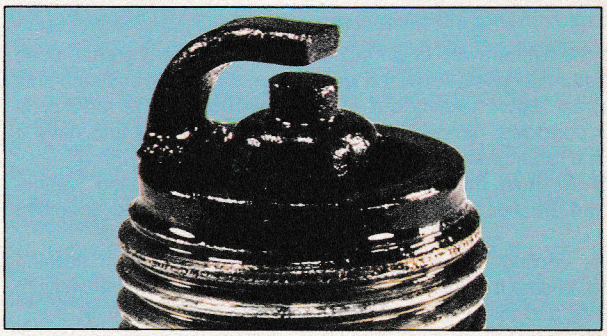
Normal condition – A brown, tan or grey firing end indicates that the engine is in good condition and that the plug type is correct



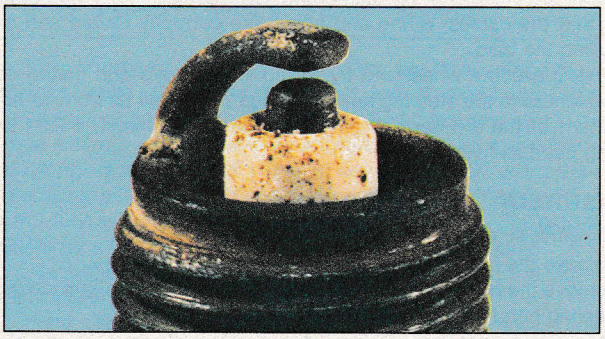
Ash deposits – Light brown deposits encrusted on the electrodes and insulator, leading to misfire and hesitation. Caused by excessive amounts of oil in the combustion chamber or poor quality fuel/oil



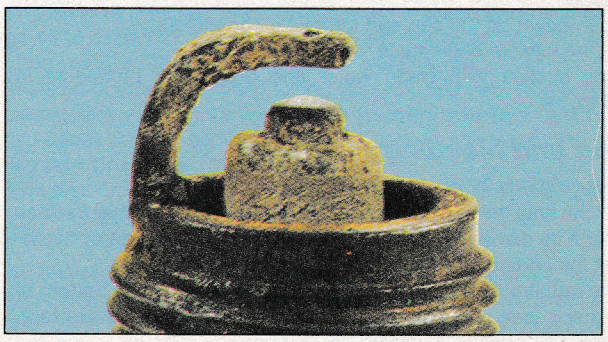
Carbon fouling – Dry, black sooty deposits leading to misfire and weak spark. Caused by an over-rich fuel/air mixture, faulty choke operation or blocked air filter



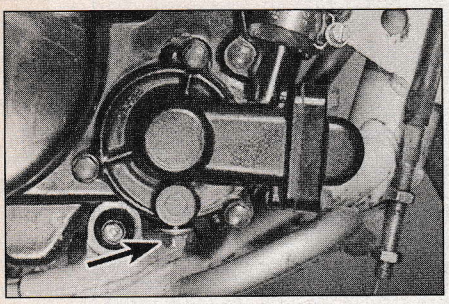
Oil fouling – Wet oily deposits leading to misfire and weak spark. Caused by oil leakage past piston rings or valve guides (4-stroke engine), or excess lubricant (2-stroke engine)



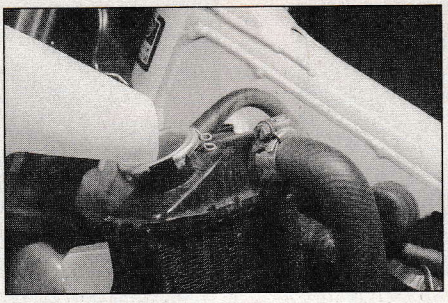
Overheating – A blistered white insulator and glazed electrodes. Caused by ignition system fault, incorrect fuel, or cooling system fault



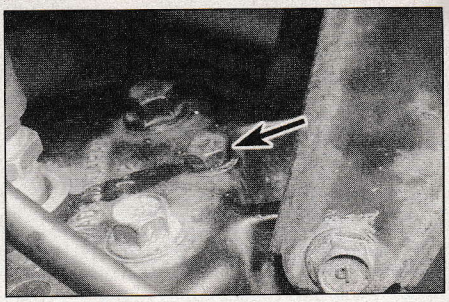
Worn plug – Worn electrodes will cause poor starting in damp or cold weather and will also waste fuel



19.5 Coolant drain plug (arrowed) is in bottom of water pump housing



19.20 Topping up the coolant



19.21 Coolant bleeder bolt on cylinder head (arrow)

reaches a stop. If you hear a hissing sound (indicating there is still pressure in the system), wait until it stops. Now press down on the cap and continue turning the cap until it can be removed.

3 Undo its four retaining bolts and remove the engine guard or bashplate (as applicable).

4 Place a container under the water pump.

5 Remove the drain plug and its washer from the bottom of the water pump and allow the coolant to drain into the container **(see illustration)**.

6 Remove the right-hand side cover and battery cover.

7 Pull the hose that runs from the top of the radiator to the reservoir tank off at the radiator end.

8 Remove the two reservoir tank mounting bolts and pull the tank away from the bike.

9 Unscrew the reservoir tank cap and pour the coolant into the container.

10 Re-install the reservoir tank and attach the hose, ensuring it is correctly routed.

Flushing

11 Flush the system with clean tap water by inserting a garden hose in the radiator filler neck. Allow the water to run through the system until it is clear and flows cleanly out of the drain hole. If the radiator is extremely corroded, remove it by referring to Chapter 3 and have it cleaned at a radiator shop.

12 Clean the hole then install the drain bolt and sealing washer (replace the washer if its damaged), tightening it to the specified torque.

13 Fill the cooling system with clean water mixed with a flushing compound. Ensure the flushing compound is compatible with aluminium components, and follow the manufacturer's instructions carefully.

14 Start the engine and allow it reach normal operating temperature. Let it run for about ten minutes.

15 Stop the engine. Let it cool for a while, then cover the pressure cap with a heavy towel and turn it anti-clockwise to the first stop, releasing any pressure that may be present in the system. Once the hissing stops, push down on the cap and remove it completely.

16 Drain the system once again.

17 Fill the system with clean water and repeat the procedure in Steps 14 to 16.

Refilling and bleeding

Refer to illustrations 19.20 and 19.21

18 Clean the hole then install the drain bolt and sealing washer (replace the washer if its damaged), tightening it to the specified torque.

19 Install the engine guard or bashplate (as applicable).

20 Fill the radiator with the proper coolant mixture up to the bottom of the filler neck (see this Chapter's Specifications) **(see illustration)**. **Note:** *Pour the coolant in slowly to prevent trapping air inside the radiator.* Also fill the reservoir tank up to the FULL mark with the proper coolant mixture.

21 Before running the engine, all air must be bled from the cooling system. Loosen the bleeder bolt at the rear of the cylinder head until coolant begins to escape (ie when all air has escaped) **(see illustration)**. Continue topping up the radiator until coolant flows freely out of the bleeder bolt, then tighten the bleeder bolt.

22 Ensure the system is full (all the way up to the top of the radiator filler neck) and install the radiator cap, rotating it fully clockwise to secure it.

23 Start the engine and allow it to idle for 2 to 3 minutes. Flick the throttle twistgrip part open 3 or 4 times, so that the engine speed rises, then stop the engine. This process should bleed any trapped air bubbles from the system.

24 Check the coolant level in the reservoir and top up if necessary.

25 Check the system for leaks. If all is well, install the radiator shroud.

26 Do not dispose of the old coolant by pouring it down the drain. Instead pour it into a heavy plastic container, cap it tightly and take it into an authorised disposal site or service station - see **Warning** at the beginning of this Section.

20 Exhaust system - check

1 Periodically check the exhaust system joints for leaks and loose fasteners.

2 The exhaust pipe flange nuts at the cylinder heads are especially sensitive to loosening and the joint to leaking. Check them frequently and keep them tight. If tightening the fasteners fails to stop any leaks, replace the gasket with a new one. See Chapter 4 for further information.

21 Steering head bearings - check and adjustment

Check

1 To check the bearings, block the machine under the crankcases so that the front wheel is in the air.

2 Point the wheel straight-ahead and slowly move the handlebars from side-to-side. Dents or roughness in the bearing races will be felt and the bars will not move smoothly.

3 With the wheel pointing straight ahead nudge each end of the handlebar; the handlebars should swing gently to full lock. If they don't, check that the cables, wiring and hoses are correctly routed and are not pulling the bars.

4 Next, grasp the wheel and try to move it forward and backward. Any looseness in the steering head bearings will be felt as front-to-rear movement of the fork legs. If play is felt in the bearings, adjust the steering head as follows.

Adjustment

Refer to illustrations 21.7a, 21.7b and 21.8

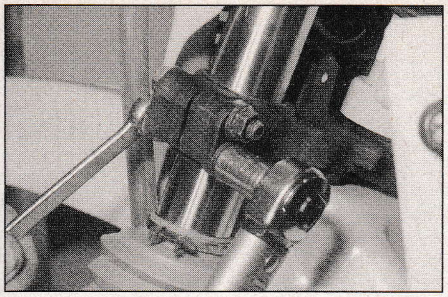
5 Remove the fuel tank (see Chapter 4).

6 Remove the handlebar clamps and position the handlebars clear of the steering head nut (see Chapter 6).

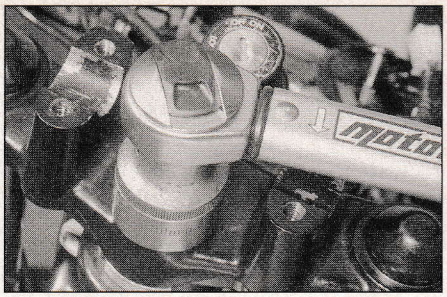
7 Loosen the front fork bottom yoke clamp bolts and the steering stem head nut **(see illustrations)**.

8 Adjust the steering stem adjuster nut with a C-spanner **(see illustration)**.

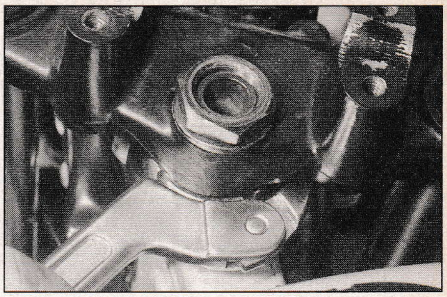
9 Tighten the adjuster nut to take up any bearing play, moving it only a fraction of a turn at a time. **Caution:** *Never overtighten, otherwise there is a danger of placing too high a loading on the bearings and causing their premature failure. The object of this adjustment is to*



21.7a There are two clamp bolts on each side of the lower yoke which must be loosened before the steering head bearings are adjusted . . .



21.7b . . . as must the steering stem head nut



21.8 Steering stem bearing nut is adjusted with a C-spanner

remove all play from the steering head bearings, yet at the same time allowing the handlebars to move freely from side to side.

10 When the setting is correct, tighten the steering stem head nut to the specified torque (see Chapter 6 Specifications).

11 Tighten the front fork lower yoke clamp bolts to the specified torque (see Chapter 6 Specifications).

12 Re-check the steering operation (see Steps 3 and 4) and if necessary repeat the adjustment procedure.

13 If it is impossible to achieve the correct bearing setting and the steering feels rough, dismantle the steering head for thorough inspection of the bearings (see Chapter 6).

14 Install the handlebars (see Chapter 6) and fuel tank (see Chapter 4).

22 Fasteners - check

1 Since vibration of the machine tends to loosen fasteners, all nuts, bolts, screws, etc. should be periodically checked for proper tightness.

2 Pay particular attention to the following:

Spark plug
Transmission oil drain plug
Gearshift lever
Footrests and side stand
Engine mounting bolts
Shock absorber mounting bolts
Handlebar and fork yoke clamp bolts
Rear suspension linkage bolts
Front axle nut
Rear axle nut
Exhaust system mounting nuts, bolt and clamps

3 If a torque wrench is available, use it along with the torque specifications at the beginning of this, or other, Chapters.

23 Fuel system - check and filter cleaning

Warning: *Petrol is extremely flammable, so take extra precautions when you work on any part of the fuel system. Don't smoke or allow open flames or bare light bulbs near the work area, and don't work in a garage where a natural gas-type appliance (such as a water heater or clothes dryer) is present. If you spill any fuel on your skin, rinse it off immediately with soap and water. When you perform any kind of work on the fuel system, wear safety glasses and have a fire extinguisher suitable for a Class B type fire (flammable liquids) on hand.*

1 Check the fuel tank, the fuel tap, the fuel line and the carburettor for leaks and evidence of damage.

2 If the carburettor gasket is leaking, the carburettor should be disassembled and rebuilt by referring to Chapter 4.

3 If the fuel tap is leaking, tightening the screws may help. If leakage persists, the tap should be disassembled and repaired, or renewed.

4 If the fuel line is cracked or otherwise deteriorated, renew it.

5 Although not part of the routine maintenance schedule, over a period of time the gauze filter on the fuel tap stack pipes will require cleaning. This will be evident by reduced fuel flow to the carburettor or even fuel starvation. Cleaning requires that the tank be drained and the tap unbolted from the base of the tank (see Chapter 4).

24 Suspension - check

1 The suspension components must be maintained in top operating condition to ensure rider safety. Loose, worn or damaged suspension parts decrease the motorcycle's stability and control.

Front suspension

2 While standing alongside the motorcycle, apply the front brake and push on the handlebars to compress the forks several times. See if they move up-and-down smoothly without binding. If binding is felt, the forks should be disassembled and inspected as described in Chapter 6.

3 Release the fork gaiter lower clamp and pull the gaiter upwards off the fork lower leg. Inspect the area around the fork dust seal for any signs of fork oil leakage. If leakage is evident, the oil seals must be replaced as described in Chapter 6. Reconnect the gaiter.

4 Check the tightness of all suspension nuts and bolts to be sure none have worked loose.

5 Over a period of time the fork damping oil will degrade and should be renewed. Since the forks on 125 models are not equipped with drain plugs, this task will necessitate removal of the forks from the yokes (see Chapter 6). On 200 models, proceed as follows.

6 Refer to Chapter 6 and remove the fork top bolts, then withdraw the spacer, spring seat and fork spring. Have a drain tray ready to catch the fork oil and a piece of card to direct it away from the wheel and tyre, and remove the fork drain plug from the bottom of the each fork leg. Pump the front forks up and down to expel the fork oil.

7 When the oil has drained, clean the threads of the drain bolt, then apply a liquid gasket sealant to them. Install the drain bolts with their sealing washers in the fork legs.

8 Refer to the Chapter 6 Specifications and add the specified amount of oil to each fork leg. Measure the amount of oil from the top of the tube using a steel rule or length of welding rod - note that the forks must be compressed when taking this measurement. Add or remove oil as required - it is important that the level is the same in each fork leg.

9 Install the fork spring, spring seat, spacer and top bolt in each fork leg (see Chapter 6). Note that air pressure must be released from the fork legs on completion - see *Suspension - adjustment* in Chapter 6.

Rear suspension

10 Inspect the rear shock absorber for fluid leakage and tightness of the mounting nuts. If leakage is found, the shock should be replaced.

11 Block the bike up so the back wheel is off the ground. Grab the swinging arm on each side, just ahead of the axle. Rock the swinging arm from side to side - there should be no discernible movement at the rear. If there's a little movement or a slight clicking can be heard, make sure the pivot shaft nut is tight. If the pivot nut is tight but movement is still noticeable, the swinging arm will have to be removed and the bearings replaced as described in Chapter 6.

12 Check the tightness of all rear suspension nuts and bolts.

Chapter 2
Engine, clutch and transmission

Contents

Specifications

Engine

Capacity	
125 models	124 cc
200 models	191 cc
Bore	
125 models	54.0 mm (2.10 in)
200 models	67.0 mm (2.61 in)
Stroke	54.4 mm (2.12 in)
Compression ratio	
125 models	7.8:1
200 models	8.0:1

Cylinder head

Gasket face maximum warpage	0.03 mm (0.001 in)

Cylinder barrel

Cylinder bore ID	
125 models	54.000 to 54.015 mm (2.1260 to 2.1266 in)
200 models	67.050 to 67.065 mm (2.6397 to 2.6403 in)
Service limit	
125 models	54.09 mm (2.129 in)
200 models	67.14 mm (2.643 in)
Piston to bore clearance	0.050 to 0.060 mm (0.0020 to 0.0024 in)
Maximum taper and ovality	0.050 mm (0.0020 in)

Piston

Standard OD	
125 models	53.935 to 53.970 mm (2.1234 to 2.1248 in)
200 models	66.973 to 66.988 mm (2.6367 to 2.6373 in)
Service limit	
125 models	53.82 mm (2.119 in)
200 models	66.82 mm (2.631 in)

Piston rings

Top ring profile	Keystone
Second ring profile	Plain
End gap (installed)	0.15 to 0.35 mm (0.006 to 0.014 in)
Service limit	0.65 mm (0.026 in)
Second ring thickness	1.17 to 1.19 mm (0.046 to 0.047 in)
Service limit	1.10 mm (0.043 in)
Second ring groove width in piston	
125 models	1.22 to 1.24 mm (0.0480 to 0.0488 in)
200 models	1.23 to 1.25 mm (0.0484 to 0.0492 in)
Service limit (all models)	1.33 mm (0.0524 in)
Second ring to groove clearance	
125 models	0.03 to 0.07 mm (0.0012 to 0.0028 in)
200 models	0.04 to 0.08 mm (0.0016 to 0.0031 in)
Service limit	
125 models	0.17 mm (0.0067 in)
200 models	0.18 mm (0.0071 in)

Crankshaft

Standard runout	Less than 0.03 mm (0.0012 in)
Runout limit	0.08 mm (0.0031 in)
Big-end radial clearance	0.020 to 0.035 mm (0.0008 to 0.0014 in)
Service limit	0.08 mm (0.0031 in)
Big-end axial clearance (side clearance)	0.4 to 0.5 mm (0.02 to 0.04 in)
Service limit	0.7 mm (0.01 in)

Primary drive

Reduction ratio	3.272:1 (72/22T)

Clutch

Number of friction plates	6
Number of plain plates	5
Number of springs	4
Friction plate thickness	2.9 to 3.1 mm (0.11 to 0.12 in)
Service limit	2.8 mm (0.11 in)
Friction and plain plate warp limit	0.3 mm (0.01 in)
Clutch spring free length	
125 models	33.2 mm (1.30 in)
Service limit	31.5 mm (1.24 in)
200 models	36.5 mm (1.44 in)
Service limit	35.3 mm (1.39 in)

Transmission

	125 models	200 models
Ratios		
First gear	3.100:1 (31/10T)	2.727:1 (30/11T)
Second gear	1.928:1 (27/14T)	1.733:1 (26/15T)
Third gear	1.411:1 (24/17T)	1.277:1 (23/18T)
Fourth gear	1.090:1 (24/22T)	1.000:1 (23/23T)
Fifth gear	0.916:1 (22/24T)	0.840:1 (21/25T)
Sixth gear	0.807:1 (21/26T)	0.769:1 (20/26T)
Gear backlash	0.02 to 0.19 mm (0.0008 to 0.0075 in)	
Shift fork ear thickness	4.9 to 5.0 mm (0.1929 to 0.1968 in)	
Service limit	4.8 mm (0.1890 in)	
Transmission gear shift fork groove width	5.05 to 5.15 mm (0.1988 to 0.2027 in)	
Service limit	5.3 mm (0.2087 in)	
Shift fork guide pin diameter	5.9 to 6.0 mm (0.2323 to 0.2362 in)	
Service limit	5.8 mm (2.2835 in)	
Shift drum groove width	6.05 to 6.20 mm (0.2382 to 0.2441 in)	
Service limit	6.3 mm (0.2480 in)	

Final drive

Reduction ratios	
125 models	3.428:1 (48/14T)
200 models	3.125:1 (50/16T)
Chain size	428 (1/2 x 5/16)
Number of links	124
20-link length	254.0 to 254.6 mm (10.000 to 10.024 in)
Service limit	260 mm (10.24 in)

Torque settings

	Nm	ft-lbs
Cylinder head bolts	26	19
Cylinder head bracket nuts	25	18
Cylinder base flange nuts	25	18
Spark plug	25	18
Coolant temperature sender	15	11
Water pump impeller nut	9.8	7
Coolant drain plug	15	11
Exhaust valve shaft bolt	8.8	6.5
Exhaust valve shaft lever mounting Allen bolt	3.9	3
Clutch hub nut (200 models only)	64	47
Clutch spring bolts	9.3	6.5
Gear positioning lever nut	9.8	7
Brake pedal retaining bolt	9.8	7
Shift shaft return spring post	20	14.5
Primary gear nut	59	43
Oil pump delivery pipe banjo union bolt	4.4	3.5
Oil pump cable locknuts	9.8	7
Transmission oil drain plug	20	14.5
Swinging arm pivot shaft nut	98	72
Engine mounting bolt nuts	29	22
Neutral switch	15	11
Alternator rotor nut	59	43

1 General information

The engine/transmission unit is a water-cooled single-cylinder design with reed-valve induction into the crankcases. The barrel is fitted with the KIPS (Kawasaki Integrated Power valve System) exhaust valve which opens and closes a resonating chamber with changing engine revs. The cylinder head and barrel castings incorporate cast-in channels for the cooling system. The cylinder has a Nikasil lining which cannot be rebored. The crankshaft is of conventional design with needle roller bearings at the connecting rod big-end and small-end, and is supported by two ball journal main bearings. A balancer shaft is driven off the clutch via an idler gear.

Primary drive is by a gear on the right-hand end of the crankshaft to the wet, multi-plate clutch mounted on the end of the gearbox mainshaft. The gearbox is a six-speed constant mesh type lubricated by an oil bath it shares with the primary drive and clutch. The water pump is mounted in the front of the right-hand engine cover. The engine oil pump is mounted on top of the crankcases below the carburettor from where it pumps two-stroke oil into the intake stub between the carburettor and the reed valve block. Both pumps are gear driven, the water pump off the primary drive gear and the oil pump off the clutch via the kickstart gear.

2 Operations possible with the engine in the frame

The components and assemblies listed below can be removed without having to remove the engine/transmission assembly from the frame. If however, a number of areas require attention at the same time, removal of the engine is recommended.

Cylinder head
Cylinder barrel
Piston
Exhaust valve KIPS mechanism
Water pump
Oil pump
Alternator
Clutch assembly
Kickstarter assembly
Gearshift external components

3 Operations requiring engine removal

It is necessary to remove the engine/transmission assembly from the frame and separate the crankcase halves to gain access to the following components.

Transmission shafts
Crankshaft and bearings
Shift drum and forks
Balancer shaft

4 Major engine repair - general note

1 It is not always easy to determine when or if an engine should be completely overhauled, as a number of factors must be considered.

2 High mileage is not necessarily an indication that an overhaul is needed, while low mileage, on the other hand, does not preclude the need for an overhaul. Frequency of servicing is probably the single most important consideration. An engine that has regular and frequent maintenance, will most likely give many miles of reliable service. Conversely, a neglected engine, or one which has not been run in properly, may require an overhaul very early in its life.

3 If the engine is making obvious knocking or rumbling noises, the connecting rod and/or main bearings are probably at fault.

4 Loss of power, rough running and high fuel consumption rates may also point to the need for an overhaul, especially if they are all present at the same time. If a complete tune-up does not remedy the situation, major mechanical work is the only solution.

5 An engine overhaul generally involves restoring the internal parts to the specifications of a new engine. During an overhaul the piston rings, the usual fastest wearing components in a two-stroke engine, are usually replaced. While the engine is being overhauled, other components such as the carburettor can also be rebuilt. The end result should be a like new engine that will give as many trouble-free miles as the original.

6 Before beginning the engine overhaul, read through the related procedures to familiarise yourself with the scope and requirements of the job. Overhauling an engine is not all that difficult, but it is time consuming. Plan on the motorcycle being tied up for a minimum of two weeks. Check on the availability of parts and make sure that any necessary special tools, equipment and supplies are obtained in advance.

7 Most work can be done with typical hand tools, although a number of precision measuring tools are required for inspecting parts to determine if they must be replaced. Often a dealer service department or motorcycle repair shop will handle the inspection of parts and offer advice concerning reconditioning and replacement. As a general rule, time is the primary cost of an overhaul so it does not pay to install worn or substandard parts.

8 As a final note, to ensure maximum life and minimum trouble from a rebuilt engine, everything must be assembled with care in a spotlessly clean environment.

5 Engine - removal and installation

Note: *Engine removal and installation should be carried out with the aid of an assistant; personal injury or damage could occur if the engine falls or is dropped.*

Removal

Refer to illustrations 5.9. 5.10, 5.12, 5.13, 5.14, 5.15, 5.16, 5.17a, 5.17b, 5.18a, 5.18b, 5.21a, 5.21b, 5.21c, 5.22a, 5.22b, 5.24a, 5.24b, 5.24c, 5.24d, 5.26 and 5.29

1 If the machine is dirty, wash it thoroughly before starting any major dismantling work. This will make work much easier and rule out the possibility of caked on lumps of dirt falling into some vital component.

2 Block the bike up under the crankcases so that it sits straight and level; it makes working easier than if it is leaning on its side stand. Note that work can also be made easier by raising the machine to a suitable working height on a hydraulic ramp or a suitable platform.

3 Remove the seat and fuel tank as described in Chapter 4.

4 Remove the right-hand side panel and battery cover. Disconnect the battery (negative lead first).

5 Drain the transmission oil as described in Chapter 1.

6 Drain the coolant as described in Chapter 1.

7 Remove the exhaust system as described in Chapter 4.

8 Pull the cap off the spark plug and unscrew the spark plug from the cylinder head.

9 Loosen the clamp holding the lower end of the coolant hose to the thermostat housing on top of the cylinder head and pull the hose off **(see illustration)**. Also disconnect the wire from the coolant temperature sender next to the hose connection.

10 Disconnect the lower end of the tachometer cable by loosening the knurled fastener - be sure not to lose the small sealing washer **(see illustration)**.

11 Detach the carburettor by loosening the clips that hold it to the air filter housing at the rear and the intake stub at the front, then pull it clear still attached to the throttle and choke cables. Support the carburettor clear of the engine area so that no strain is placed on its cables.

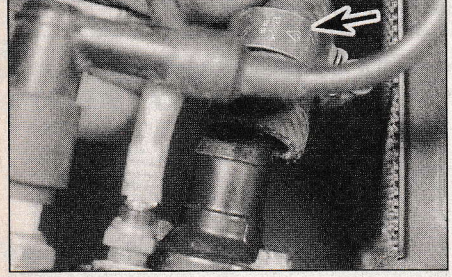
12 Disconnect the lower end of the oil pump cable by bending the tag on the oil pump pulley back to free the cable inner **(see illustration)**. Withdraw the cable through the adjuster and tie it to the frame top tubes.

13 Have ready a suitable plug to prevent to the escape of oil, such as a bolt or metal rod, and disconnect the oil feed hose (ie the hose which runs from the oil tank to the pump) from its union on the oil pump. Swiftly plug the hose as soon as the pipe is disconnected **(see illustration)**.

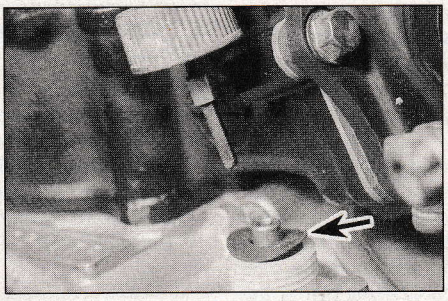
14 Detach the clutch cable at the lower end by slackening the adjuster on top of the engine right-hand cover and disengaging the cable inner from the clutch operating arm **(see illustration)**.

15 Disconnect the coolant hose that runs from the bottom of the radiator to the front of the water pump by slackening the clamp at the lower end and pulling the hose off the pump spigot **(see illustration)**.

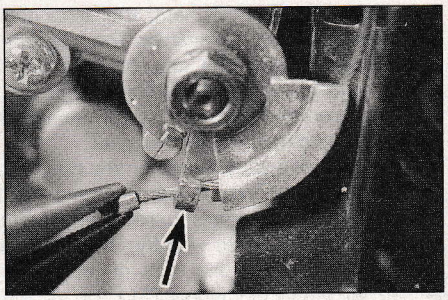
16 Unclip the lower end of the brake light switch spring from the top of the pedal **(see illustration)**.



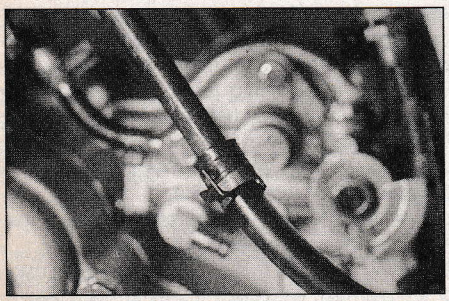
5.9 Loosen the clip (arrow) which retains the coolant hose to the thermostat housing on the cylinder head



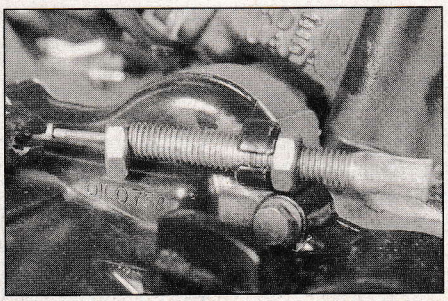
5.10 Detach the lower end of the tachometer cable - note washer (arrow)



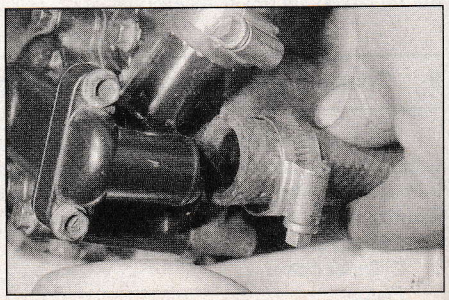
5.12 Bend tang back on oil pump pulley to free oil pump cable



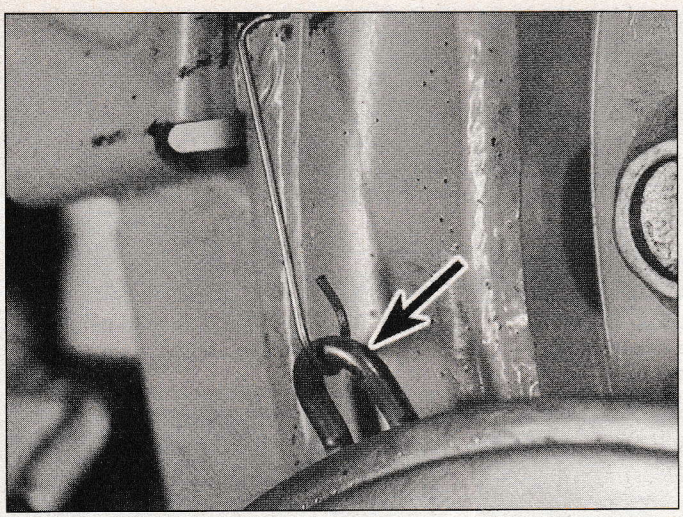
5.13 Plug oil feed hose from tank with a suitable screw or rod



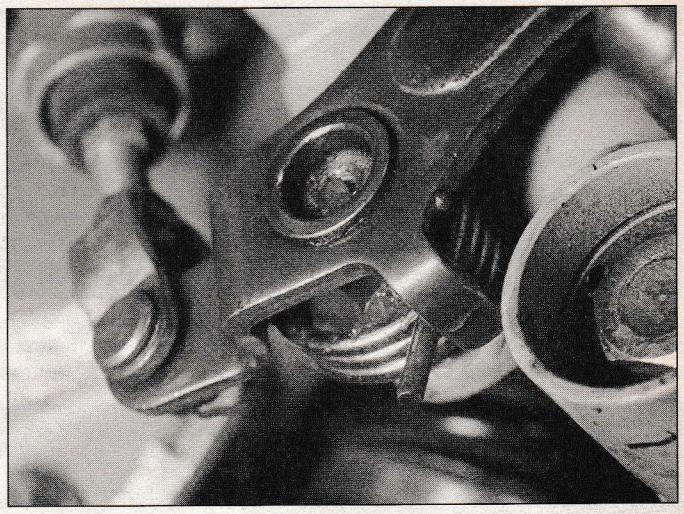
5.14 Disconnect clutch cable at operating lever on right-hand engine cover



5.15 Disconnect radiator-to-water pump hose at water pump union stub



5.16 Brake light switch spring hooks into pedal loop (arrow)



5.17a Before removing the brake pedal note how its tab locates with the return spring . . .

17 Remove the split pin and withdraw the clevis pin to separate the brake pedal from the master cylinder clevis. Remove the brake pedal mounting bolt with its washer. Withdraw the pedal, noting how its return spring engages the pedal tab and frame hole **(see illustrations)**.

18 Remove the bolt that clamps the gear lever to its splined shaft. You may have to pry the split clamp at the shaft end of the gear lever apart slightly before it will pull off the shaft **(see illustrations)**.

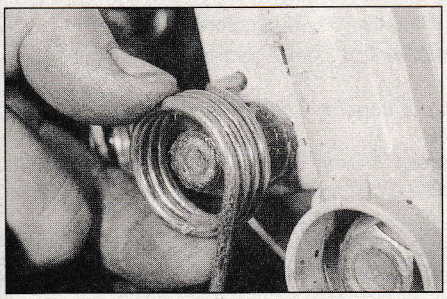
19 Remove the three Allen screws retaining the plastic engine sprocket cover and remove the cover.

20 On 125 models separate the final drive chain at its split link and remove the chain from the sprockets. Assemble the link with its plate and spring clip for safekeeping. The final drive chain fitted as original equipment on 200 models has no joining link; if there is enough slack in the chain, it may be possible to merely slacken the rear wheel axle nut, fully back off both chain adjusters and push the rear wheel forwards to allow the chain to be disengaged from the engine sprocket teeth. If not, the swinging arm pivot and suspension components must be detached as described in Step 26.

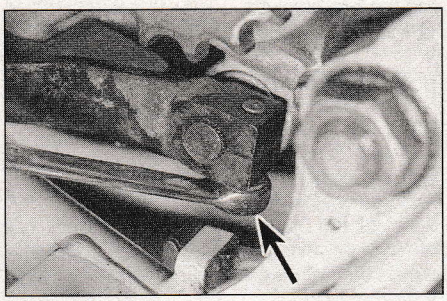
21 Undo the two Allen bolts securing the engine sprocket locking plate. Rotate the locking plate so that it pulls off over the countershaft splines, then pull the sprocket off **(see illustrations)**. On early models, remove the collar and O-ring from the countershaft and place with the sprocket for safekeeping.

22 Cut the cable ties which hold the engine wiring to the frame tubes. Separate the wiring from the following components at their electrical connectors **(see illustrations)**.

a) Alternator
b) Neutral switch
c) Pickup coil
d) Side stand switch
e) Coolant temperature sender (see Step 9)

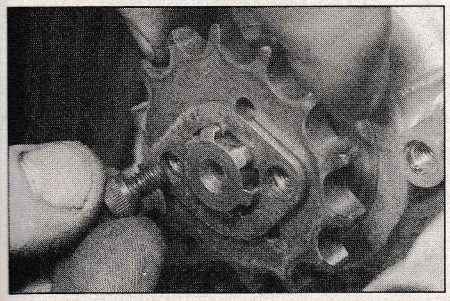


5.17b . . . and how the return spring end locates in the frame

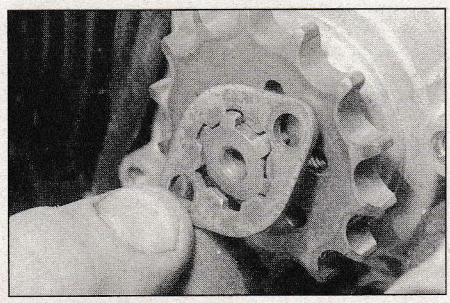


5.18a Gearchange lever clamp bolt must be removed totally . . .

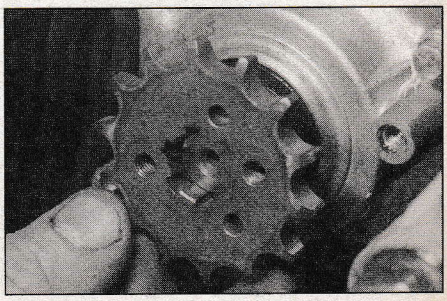
5.18b . . . before lever can be removed



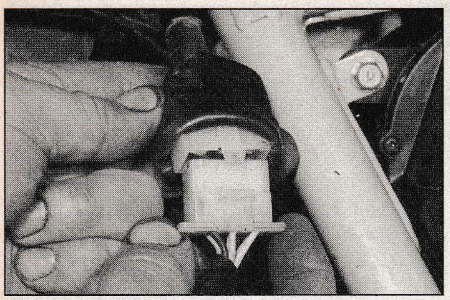
5.21a Undo the two Allen bolts . . .



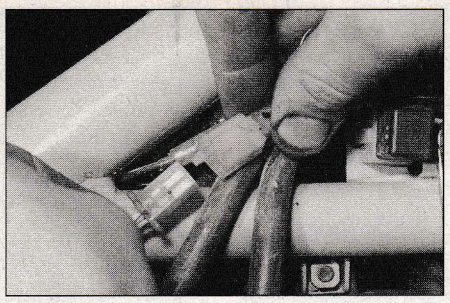
5.21b . . . and rotate the locking plate so that it pulls off over splines . . .



5.21c . . . then remove the sprocket

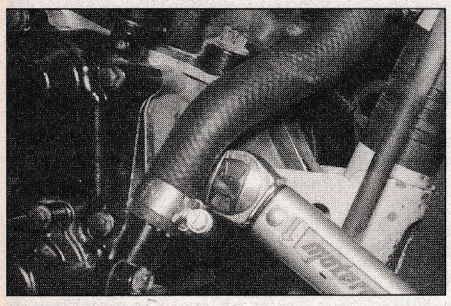


5.22a Trace and disconnector engine wiring at the connectors (alternator and neutral switch wire connector shown)

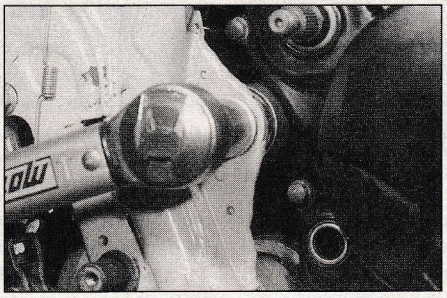


5.22b Ignition pickup coil wire connectors are situated on frame top tubes

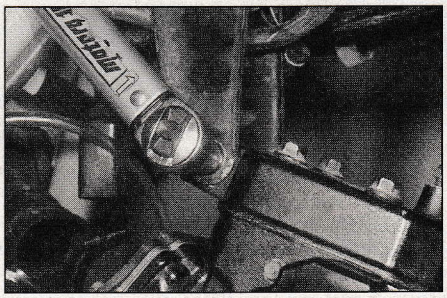
5.24a Slacken the engine mounting bolt under the engine . . .



5.24b . . . and at the front of the crankcases



5.24c Slacken the swinging arm pivot nut . . .



5.24d . . . and the cylinder head bracket bolt nuts

23 Unbolt the engine bashplate (early models) or protection bar (later models) from the bottom of the frame.

24 Slacken the two engine mounting bolts, the swinging arm pivot bolt and the three cylinder head bracket bolts **(see illustrations)**.

25 Withdraw the two engine mounting bolts.

26 Pull the swinging arm pivot shaft far enough out to the right-hand side to clear the crankcase lugs; don't remove it fully because the swinging arm will drop **(see illustration)**. On 200 models, remove the rear wheel (see Chapter 7) and remove the suspension linkage tie rod-to-rocker arm pivot bolt to enable the drive chain to be fully removed.

27 Remove the three cylinder head bracket bolts and the two brackets.

28 Make a final check to ensure that all wires and hoses are disconnected.

29 With the aid of an assistant, lift the engine out of the frame from the right-hand side **(see illustration)**.

Installation

Refer to illustration 5.34

30 Prior to installing the engine, check the condition of the headed bushes in the crankcase rear mounting lugs. If there is excessive play between the swinging arm pivot shaft and the bushes, they are worn and must be renewed. Lift the engine in from the right-hand side.

31 Fit the swinging arm pivot first, remembering to loop the drive chain over it first on 200 models. Refit the two engine mounting bolts in their original locations. The front engine mounting bolt is installed from the left-hand side and the lower bolt and the swinging arm pivot, are installed from the right-hand side.

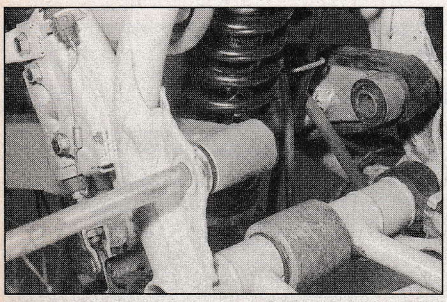
32 Fit the cylinder head brackets and bolts.

33 Tighten the nuts on all mounting bolts to the specified torque in the following order:

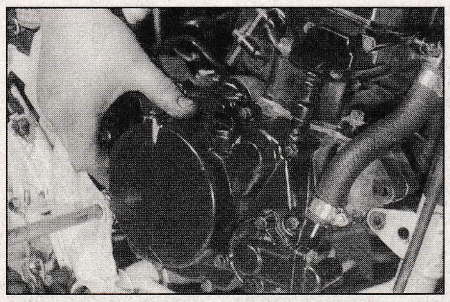
a) Swinging arm pivot
b) Engine mounting bolts
c) Cylinder head bracket bolts

34 The remainder of the installation procedure is a direct reversal of the removal sequence, noting the following points:

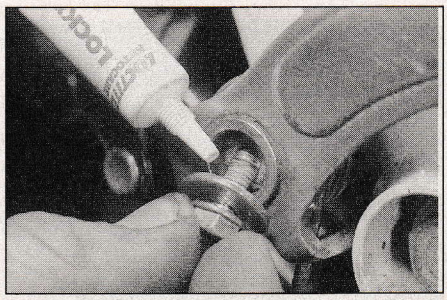
a) Tighten all nuts and bolts to the specified torque settings (where given).
b) Make sure all wiring is correctly routed and retained by all the relevant clips and ties.
c) Apply a drop of thread locking compound to the brake pedal mounting bolt. Install the bolt and tighten it to the torque listed in this Chapter's Specifications ***(see illustration)****.*
d) On 125 models, reconnect the drive chain master link so that the closed end of the spring clip is facing in the normal direction of chain travel. On all models, adjust the drive chain tension as described in Chapter 1.
e) Fill the transmission oil and cooling systems (see Chapter 1).



5.26 Pull the swinging arm pivot shaft out far enough to clear the crankcase lugs (engine removed for clarity)



5.29 Lift the engine out of the frame from the right-hand side



5.34 Apply thread locking compound to the brake pedal bolt threads

f) *Swiftly reconnect the oil feed pipe to prevent oil loss, then bleed the oil pump as described in Section 12.*
g) *Check the adjustment of the throttle, choke, clutch and oil pump cables as described in Chapter 1.*
h) *Start the engine and check for signs of coolant/oil leakage.*

6 Engine disassembly and reassembly - general information

Note: *Refer to the "Maintenance techniques, tools and working facilities" in the Introductory pages of this manual for further information.*

Disassembly

1 Before disassembling the engine, the external surfaces of the unit should be thoroughly cleaned and degreased. This will prevent contamination of the engine internals, and will also make working a lot easier and cleaner. A high flash-point solvent, such as paraffin can be used, or better still, a proprietary engine degreaser. Use old paintbrushes and toothbrushes to work the solvent into the various recesses of the engine casings. Take care to exclude solvent or water from the electrical components and intake and exhaust ports. **Warning:** *The use of petrol as a cleaning agent should be avoided because of the risk of fire.*

2 When clean and dry, arrange the unit on the workbench, leaving a suitable clear area for working. Gather a selection of small containers and plastic bags so that parts can be grouped together in an easily identifiable manner. Some paper and a pen should be on hand to permit notes to be made and labels attached where necessary. A supply of clean rag is also required.

3 Before commencing work, read through the appropriate section so that some idea of the necessary procedure can be gained. When removing various engine components it should be noted that great force is seldom required, unless specified. In many cases, a component's reluctance to be removed is indicative of an incorrect approach or removal method. If in any doubt, re-check with the text.

4 When disassembling the engine, keep "mated" parts together (including gears, KIPS valves, etc. that have been in contact with each other during engine operation). These "mated" parts must be reused or replaced as an assembly.

5 Engine/transmission disassembly should be done in the following general order with reference to the appropriate Sections.

Remove the cylinder head
Remove the cylinder barrel
Remove the piston
Remove the right-hand engine cover
Remove the clutch
Remove the kickstart assembly
Remove the external gearshift mechanism
Remove the alternator rotor
Separate the crankcase halves
Remove the crankshaft
Remove the transmission shafts/gears
Remove the shift drum and forks
Remove the balancer shaft (see note in Section 21)

Reassembly

6 Reassembly is accomplished by reversing the general disassembly sequence.

7 Cylinder head - removal, inspection and installation

Caution: *The engine must be completely cool before beginning this procedure or the cylinder head may become warped.*
Note: *This procedure can be performed with the engine in the frame. If the engine has already been removed, ignore the preliminary steps which don't apply.*

Removal

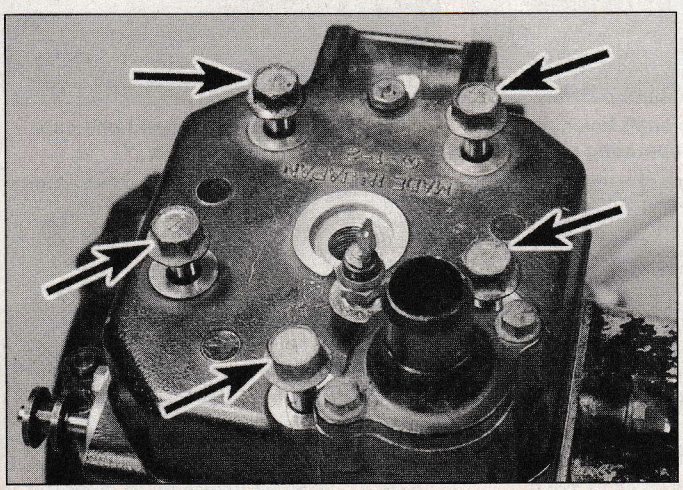
Refer to illustrations 7.7 and 7.8

1 Drain the coolant as described in Chapter 1.
2 Remove the right-hand side panel and battery cover. Disconnect the battery negative lead.
3 Remove the exhaust system as described in Chapter 4.
4 Disconnect the coolant temperature sender wire and the coolant hose at the thermostat housing on the cylinder head **(see illustration 5.9)**.
5 Pull off the spark plug cap and remove the spark plug.
6 Remove the engine mounting bolt which locates the cylinder head to the cylinder head brackets.
7 Slacken the five cylinder head bolts evenly in a criss-cross sequence and remove them **(see illustration)**. Note that the coolant bleed bolt at the rear of the head can be left in situ.
8 Lift off the cylinder head and the cylinder head gasket. It may be necessary to give the head a very gentle tap with a soft-faced hammer to free it **(see illustration)**.

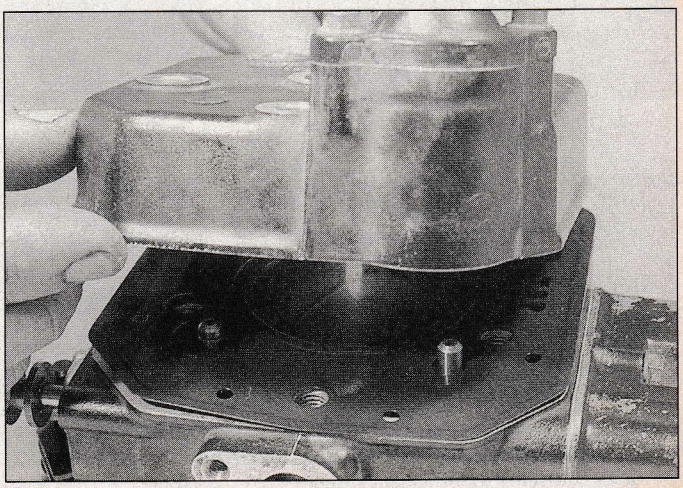
Inspection

Refer to illustration 7.11

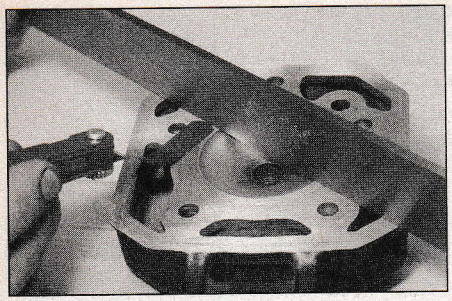
9 Using a hardwood, brass or aluminium scraper (to avoid damage to the underlying metal), scrape off all traces of carbon from the piston crown and combustion chamber area. With the bulk of carbon removed, use a brass wire brush, then finish off with metal polish.
10 Check that the coolant passages in the head are free of corrosion.
11 Ensure the gasket surface of the cylinder head is clean. Using a precision straightedge and a feeler gauge, check the head gasket mating



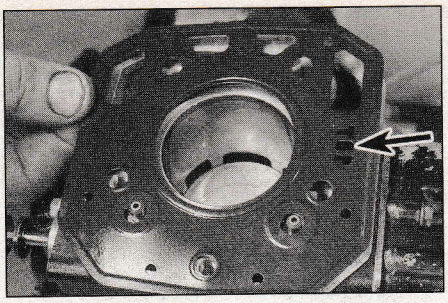
7.7 Remove the five bolts (arrows) . . .



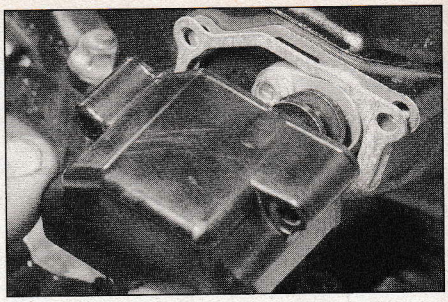
7.8 . . . to free the cylinder head



7.11 Check the cylinder head for warpage with a straightedge and feeler gauge



7.13 When fitting a new head gasket, note the word TOP (arrow) which should be to the left of the cylinder



8.2 Remove the three cover mounting bolts and withdraw the KIPS lever cover

surface for warpage. Lay the straightedge across the head in several places, and try to insert a feeler gauge under it on each side of the combustion chamber **(see illustration)**. The gauge should be the same thickness as the cylinder head warp limit in this Chapter's Specifications. If the gauge slides under the straightedge, the head is warped and must be machined flat or, if the warpage is excessive, renewed.

Installation

Refer to illustration 7.13

12 Ensure the cylinder head and cylinder mating surfaces are clean .

13 Fit a new head gasket. Note that the gasket has the word TOP stamped into it; this should be on the left-hand side of the engine and the letters should read correctly **(see illustration)**.

14 Fit the cylinder head bolts and tighten them finger-tight.

15 Working in a criss-cross pattern, tighten the cylinder head bolts to approximately half the specified torque setting given in the Specifications. Then go around in the same sequence and tighten the bolts to the full specified torque setting.

16 Install the cylinder head bracket bolt and tighten its nut to the torque listed in the Specifications.

17 Connect the coolant hose to the thermostat housing and securely tighten its clamp.

18 Connect the wiring connector to the coolant temperature sender.

19 Install the exhaust system (see Chapter 4).

20 Install the spark plug and tighten it to the specified torque.

21 Fill and bleed the cooling system as described in Chapter 1.

22 Reconnect the battery negative lead and install the battery cover and side panel.

8 KIPS - disassembly, inspection and reassembly

Disassembly

Valves

Refer to illustrations 8.2, 8.3a, 8.3b, 8.4, 8.5a, 8.5b, 8.5c and 8.6

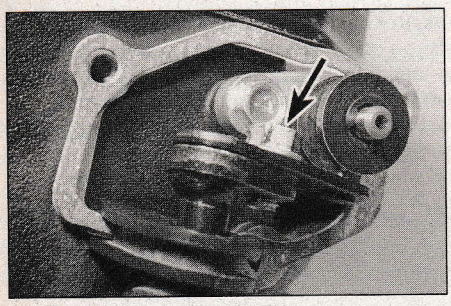
1 Remove the cylinder head as described in Section 7.

2 Remove the three bolts holding the lever cover to the top right-hand side of the cylinder barrel and pull the cover off **(see illustration)**.

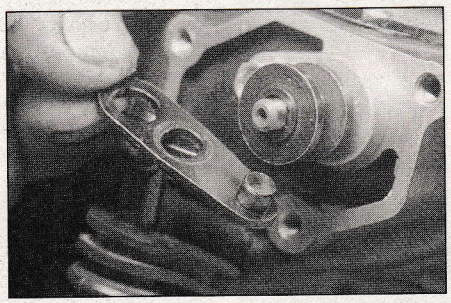
3 On 125 models, remove the shaft lever mounting bolt and take the shaft lever off the shaft. On 200 models, remove the shaft lever nut, noting that it has a left-hand thread and is thus slackened clockwise, then take the lever off the shaft. On both models, make note of how the lever fits over the shaft and how the small projection at its thin end engages the valve operating rod pulley **(see illustrations)**.

4 Remove the bolt to free the right-hand end cap from the cylinder **(see illustration)**.

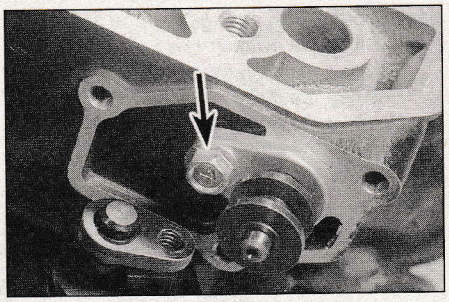
5 Remove the O-ring and valve guide from each valve, then lift the valves up sufficiently to allow the operating rod to be withdrawn **(see illustrations)**.



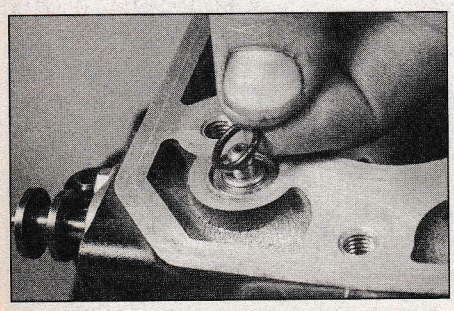
8.3a Remove the shaft lever mounting bolt (arrow) . . .



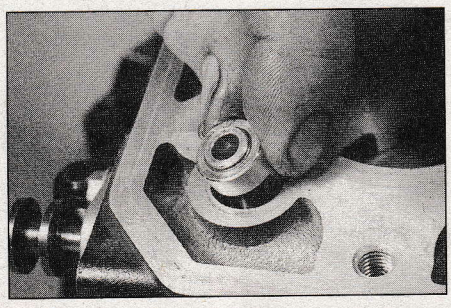
8.3b . . . and remove shaft lever, noting how it engages valve operating rod pulley



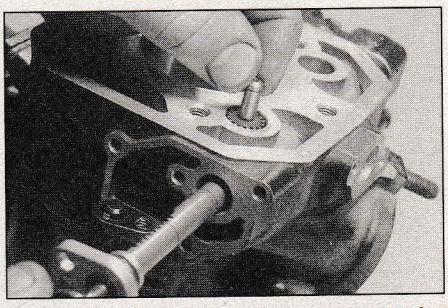
8.4 Remove the right-hand end cap mounting bolt



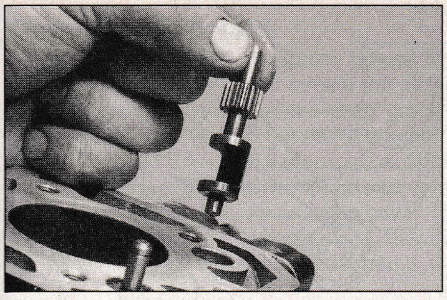
8.5a Remove KIPS valve O-ring . . .



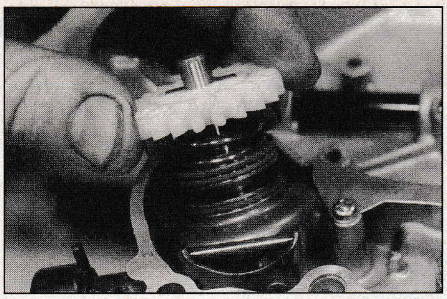
8.5b . . . and guide from each valve . . .



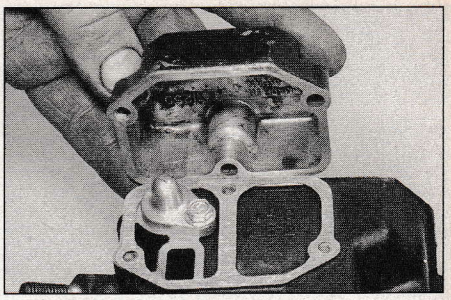
8.5c . . . then lift valves up to clear rod and remove rod



8.6 Once rod is clear of valves they can be removed



8.8 KIPS operating mechanism is removed as an assembly



8.12 KIPS resonator chamber is secured by three bolts; always renew its gasket on installation

6 Once the rod has been removed, the valves can be lifted out of their bores in the cylinder barrel **(see illustration)**.

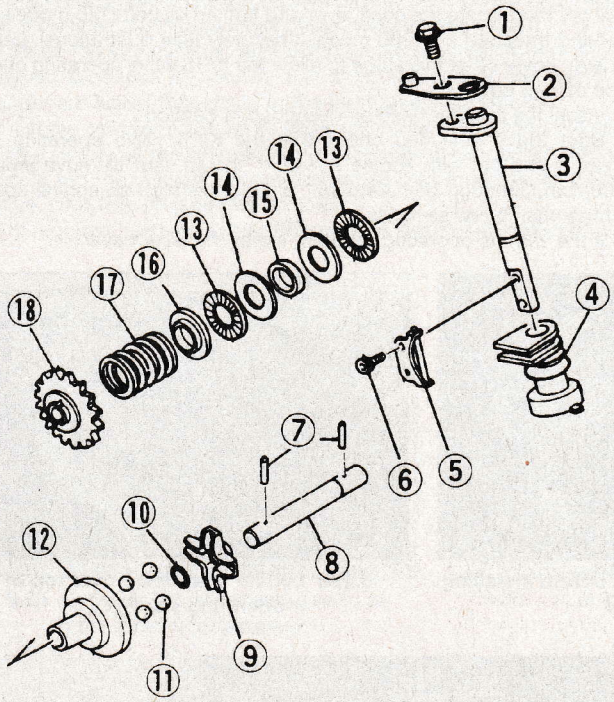
Operating mechanism

Refer to illustration 8.8

7 The KIPS operating mechanism is housed in the engine right-hand cover and is driven off the primary drive gear. Remove the cover as described in Section 10, Steps 1 through 10.

8 The operating mechanism will remain in the engine cover. To release it, turn the external operating shaft to the right and pull the mechanism free **(see illustration)**.

9 To free the external operating shaft from the engine cover, remove the two Allen screws from the end of the shaft and remove the shaft lever. Remove the small cross-head screw from the top of the shaft housing on the outside of the engine cover, pull out the pin beneath this screw, and extract the operating shaft with its rubber dust boot from the engine cover.



8.14a KIPS operating mechanism and shaft

1 *Operating shaft top lever bolt (125 model only)*
2 *Operating shaft top lever*
3 *Operating shaft*
4 *Dust boot*
5 *Operating shaft bottom lever*
6 *Allen bolts*
7 *Pins*
8 *Rod*
9 *Ball ramp plate*
10 *O-ring*
11 *Steel balls*
12 *Ball holder*
13 *Thrust bearings*
14 *Spacers*
15 *Collar*
16 *Spring seat*
17 *Spring*
18 *Drive gear*

Inspection

Valves

Refer to illustration 8.12

10 Remove any carbon deposits from the valves with a soft scraper.

11 Remove any carbon deposits from the valve bores in the cylinder barrel.

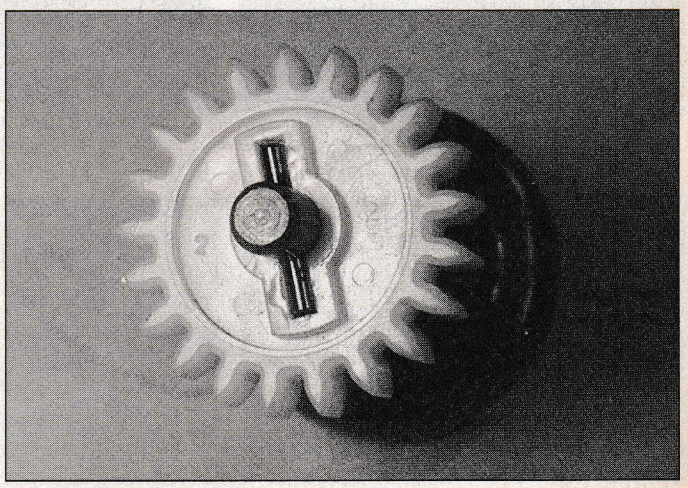
12 It is not strictly necessary to remove the resonator chamber on the left-hand side of the cylinder barrel, but if there is a lot of carbon in the cylinder head and KIPS valves it is advisable to decoke the chamber as well; the chamber is secured by three Allen bolts **(see illustration)**. The end cap beneath the resonator chamber locates the left-hand end of the KIPS valve operating rod; it is not necessary to remove it.

13 If the oil seal set in the right-hand end cap requires renewal, pry off the circlip to free the operating rod pulley, followed by the second circlip, then slide the end cap off the rod. Using a small flat-bladed screwdriver, pry the oil seal out of the housing. Press the new seal into the end cap and apply a smear of high melting-point grease to its lip. Install the end cap on the operating rod, then refit the pulley ensuring the circlips locate in the rod grooves.

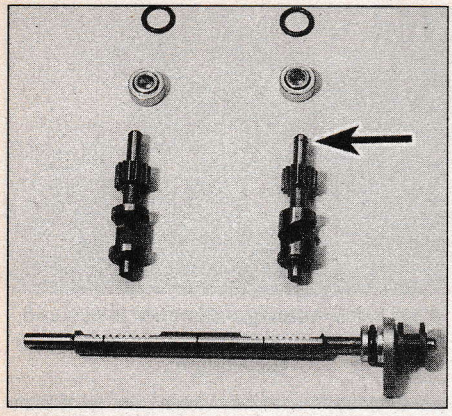
Operating mechanism

Refer to illustrations 8.14a and 8.14b

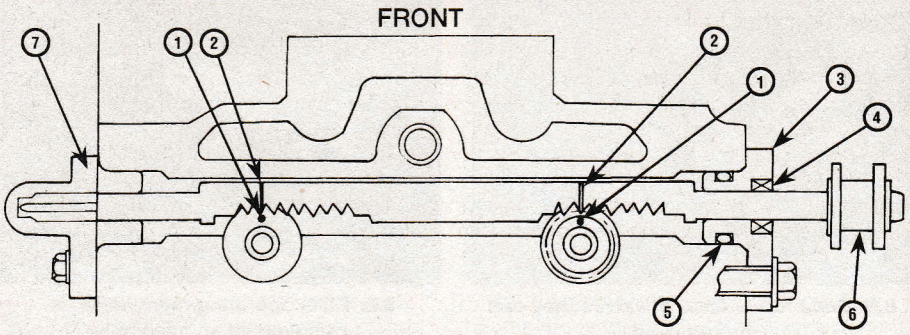
14 The operating mechanism incorporates a ball and ramp type clutch assembly, which only permits operation of KIPS when engine speed reaches 6,500 rpm. The mechanism can be dismantled for detailed inspection of the components if required **(see illustration)**. On reassembly apply molybdenum disulphide grease to the mechanism rod and ensure the rod pins locate in the drive gear and ball ramp cutouts **(see illustration)**.



8.14b If operating mechanism was dismantled, ensure pin engages correctly with drive pin



8.17 KIPS valve component parts; right-hand valve is identified by groove (arrow)



8.20a KIPS valve and operating rod synchronisation

1 Punch mark (125 model) or chamfered tooth (200 model)
2 Operating shaft groove
3 Right-hand end cap
4 Oil seal
5 O-ring
6 Pulley
7 Left-hand end cap

15 If the operating mechanism rod bearings require replacement, they must be extracted from their bores in the crankcase and engine cover using a blind-hole bearing puller. Press the new bearing in using a drift which bears only on the bearing's outer race.

16 The oil seal set in the operating shaft aperture in the engine cover can be levered out if it requires replacement.

Reassembly

Valves

Refer to illustrations 8.17, 8.20a, 8.20b, 8.22, 8.23a, 8.23b and 8.23c

17 Lubricate the KIPS valve spindles and pinions with two-stroke oil, then slip them into their bores in the cylinder barrel. **Note:** *The valves are handed: the right-hand valve has an identifying groove around the top of its upper journal* ***(see illustration)***.

18 Lubricate the bearing surfaces of the valve operating rod with two-stroke oil and install it in the head. Lift the KIPS valves to allow the rod to pass fully into the cap on the left-hand side of the cylinder barrel.

19 Install the right-hand end cap mounting bolt and tighten it securely.

20 The valves must be synchronised with the operating rod by lining up the punch mark (125 models) or chamfered tooth (200 models) on the top of each valve with the grooves in the valve operating rod **(see illustration)**. Set this position by lifting the valves and pulling the rod fully to the right-hand side; the valves should now be lowered so that their punch marks are facing forwards, in exact alignment with the operating rod grooves **(see illustration)**. When the synchronisation is correct, push the operating rod pulley in and out and check that the valves revolve smoothly.

21 Lubricate the valve guides with two-stroke oil and install them on top of the valves. **Note:** *The guides are mounted with the small projections that locate their O-rings facing upwards.* New O-rings can then be located on top of the valve guides.

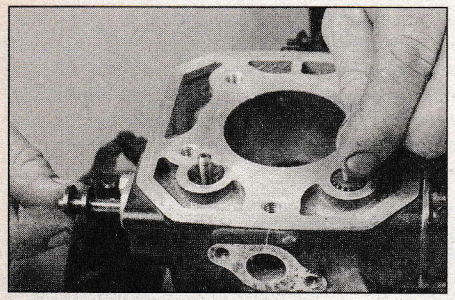
22 Install a new gasket **(see illustration)**.

23 Push the valve operating rod as far to the left (into the cylinder) as it will go, then locate the shaft lever and tighten its bolt (125 models) or left-hand threaded nut (200 models) securely (see illustrations). Leave the lever cover off at this stage to allow the KIPS valve operating check to be carried out.

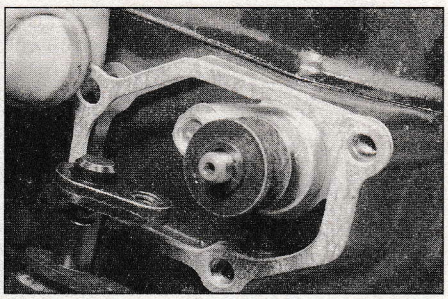
24 Install the cylinder head as described in Section 7.

25 Start the engine and check that the KIPS valve operating rod moves in and out with engine speed. It should start to move around 6,500 rpm, although be careful not to hold this high an engine speed for more than a few seconds.

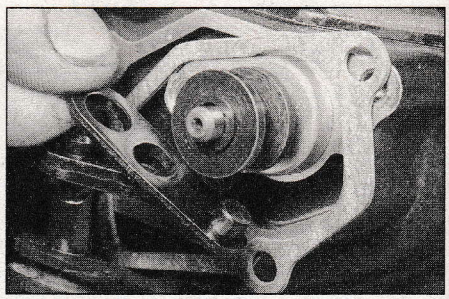
26 If the valve is operating properly, install the lever cover.



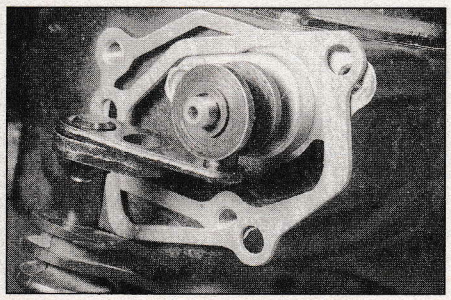
8.20b Pull operating rod fully to the right and lift KIPS valves to synchronise their punch marks with rod grooves



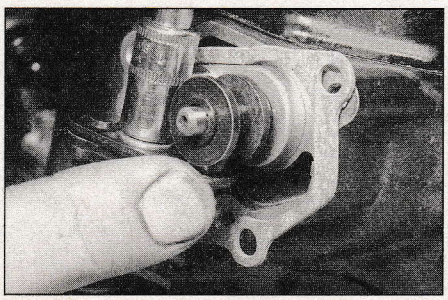
8.22 Install a new gasket before installing shaft lever



8.23a Locate shaft lever over top of operating shaft . . .



8.23b . . . and locate lever's boss into pulley on operating rod . . .



8.23c . . . and push the rod fully to the left before tightening lever mounting bolt

Operating mechanism

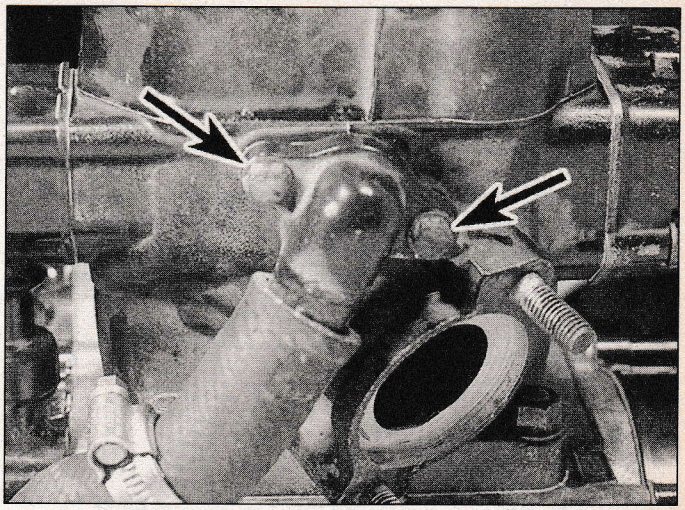
27 Apply molybdenum disulphide grease to the operating shaft and insert it in the engine cover. Locate the alignment pin into the engine cover so that it aligns with the shaft groove and fit the cross-head screw. Fit the shaft lever to the end of the shaft and tighten the two Allen screws securely. Slide the rubber dust boot down onto the engine cover.
28 Apply transmission oil to the operating mechanism rod ends and insert it into its bearing in the engine cover; turn the operating shaft to the left to engage the mechanism and operating shaft lever.
29 Install the engine cover as described in Section 10.

9 Cylinder barrel and piston - removal, inspection and installation

Removal

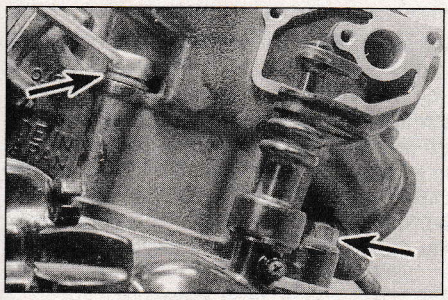
Refer to illustrations 9.7, 9.8a, 9.8b, 9.9, 9.12, 9.13a, and 9.13b

1 Remove the fuel tank (see Chapter 4).
2 Disconnect the clutch and tachometer cables at their lower ends as described in Section 5.
3 Remove the exhaust system (see Chapter 4).
4 Remove the cylinder head bracket as described in Section 5 and remove the cylinder head as described in Section 7.
5 Remove the carburettor as described in Section 5, noting that the throttle cable can remain attached.
6 Remove the KIPS valve lever cover on the upper right-hand side of the cylinder barrel and disconnect the operating shaft lever from the operating rod pulley (see Section 8).
7 Remove its two bolts and separate the coolant elbow from the front of the cylinder barrel **(see illustration)**. Recover the gasket.
8 Undo the four cylinder base bolts, slackening them evenly and in a diagonal sequence to prevent distortion. The two at the rear of the cylinder are higher than those at the front **(see illustrations)**.
9 Lift the cylinder barrel off its studs taking care to support the piston when it is free of the cylinder and remove the base gasket. You may have to tap the cylinder a couple of times with a soft-faced hammer before it will free off **(see illustration)**.
10 If required, dismantle the KIPS valve as described in Section 8.

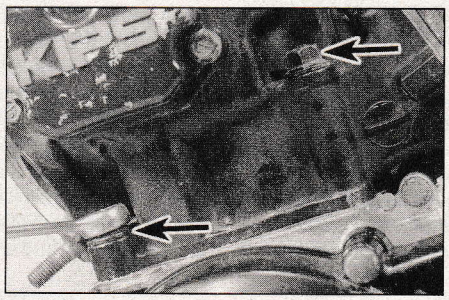


9.7 Remove bolts (arrows) to free coolant elbow from front of cylinder

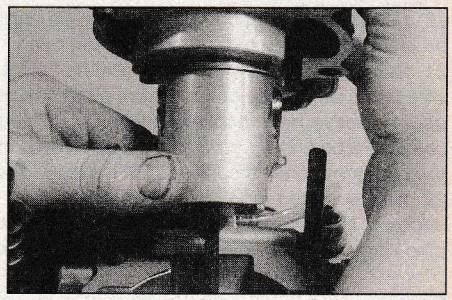
11 Before removing the piston, stuff some clean rag into the crankcase mouth to prevent any small parts falling into the crankcases.
12 Remove one of the piston pin circlips **(see illustration)**.
13 Push the piston pin out from the opposite end to free the piston from the connecting rod. You may have to deburr the area around the groove to enable the pin to slide out (use a triangular file for this procedure). If the pin is tight, push it out using a suitable tool, taking care not to damage the piston. Lift the piston off the connecting rod and slip the needle-roller bearing out of the small-end of the connecting rod **(see illustrations)**.
14 The piston rings are removed by holding the piston in both hands, and gently prising the ring ends apart with the thumb nails until the rings can be lifted out of their grooves and onto the piston lands, one side at a time. The second piston ring on 200 models has an expander ring behind it - gently prise this apart with your fingers to remove it from the piston.



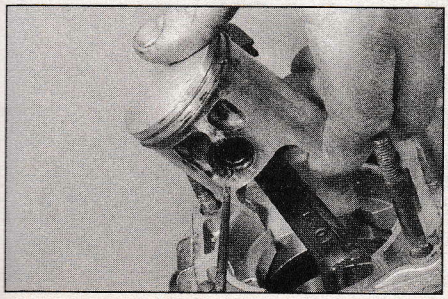
9.8a Cylinder barrel retaining nuts on right-hand side (arrows) . . .



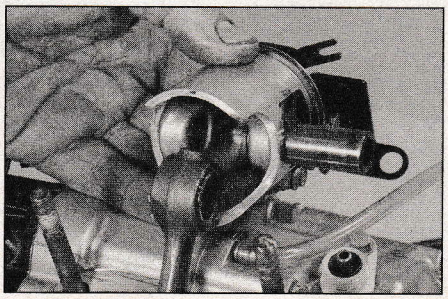
9.8b . . . and left-hand side (arrows)



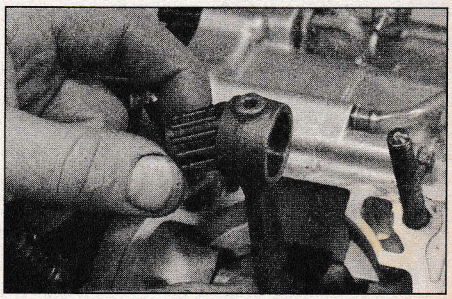
9.9 Lift cylinder off while supporting piston



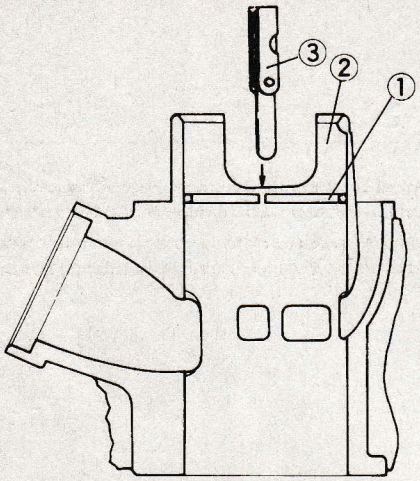
9.12 Remove one piston pin circlip



9.13a Push piston pin out and remove piston . . .



9.13b . . . and small-end bearing



9.16 Piston ring installed end gap measurement

1 Piston ring 2 Cylinder bore 3 Feeler gauge

Inspection

Piston rings

Refer to illustration 9.16

15 Before installing new rings, their end gaps must be checked. Note that high-revving two strokes like the KMX are hard on piston rings and it is advised to renew them as a matter of course during an overhaul.

16 Insert the top ring into the bottom of the cylinder bore and square it up with the cylinder walls by pushing it in with the top of the piston. To measure the end gap, slip a feeler gauge between the ends of the ring and compare with the Specifications **(see illustration)**.

17 If the gap is larger or smaller than specified, double check to make sure that you have the correct ring before proceeding.

18 Repeat the procedure for the second ring.

19 Inspect the expander ring fitted to the second ring groove on 200 models. If damaged, renew the piston rings as a set.

Piston

Refer to illustration 9.28

20 Before the inspection process can be carried out, the piston must be cleaned and the old piston rings removed.

21 Scrape all traces of carbon from the top of the piston. A hand-held wire brush or a piece of fine emery cloth can be used once most of the deposits have been scraped away. Do not, under any circumstances, use a wire brush mounted in a drill to remove deposits from the piston; the piston material is soft and will be eroded away by the wire brush.

22 Use a piston ring groove cleaning tool to remove any carbon deposits from the ring grooves. If a specialised tool is not available, a piece broken off an old ring will do the job. Be very careful to remove only the carbon deposits. Do not remove any metal and do not nick or gouge the sides of the ring grooves.

23 Once the deposits have been removed, clean the piston with solvent and dry it thoroughly.

24 If the piston is not damaged or worn excessively, a new one will not be necessary. Normal piston wear appears as even, vertical wear on the thrust surfaces of the piston and slight looseness of the top ring in its groove. New piston rings, on the other hand, should always be used when an engine is rebuilt.

25 Carefully inspect the piston for cracks around the skirt, at the piston pin bosses and at the ring lands.

26 Look for scoring and scuffing that are evidence of piston seizure on the thrust faces of the skirt, and burned areas at the edge of the crown. If the skirt is scored or scuffed, the engine may have been suffering from overheating and/or abnormal combustion, which caused excessively high operating temperatures. A hole in the piston crown, an extreme to be sure, is an indication that abnormal combustion (pre-ignition) was occurring. Crumbling around what look like pin pricks at the edge of the piston crown are usually evidence of detonation. If any of the above problems exist, the causes must be corrected or the damage will occur again.

27 Measure the piston ring-to-groove clearance of the second ring only by laying a new piston ring in the ring groove and slipping a feeler gauge in beside it. Check the clearance at three or four locations around the groove. Be sure to use the correct ring for each groove; they are different. If the clearance is greater than the service limit, a new piston will have to be used when the engine is reassembled.

28 Calculate the piston-to-bore clearance by measuring the bore (see Step 31) and the piston diameter. Measure the piston across the skirt on the thrust faces at a 90° angle to the piston pin, 5 mm (1/4 in) up from the bottom of the skirt **(see illustration)**. Subtract the piston diameter from the bore diameter to obtain the clearance. If it is greater than specified, a new piston will be needed.

Small-end bearing

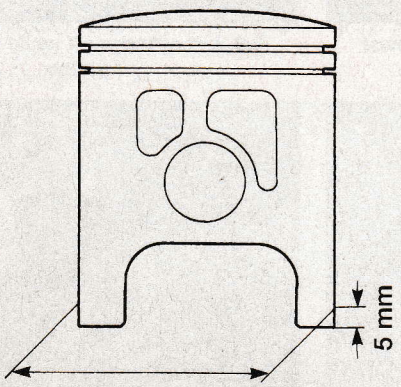
29 Slip the bearing into the connecting rod eye and push the piston pin through the bearing. Hold the rod steady and feel for movement between it and the pin. If movement is felt, renew the pin and/or bearing and check again. If new parts do not get rid of the movement the connecting rod will have to be renewed as described in Section 20.

Cylinder barrel

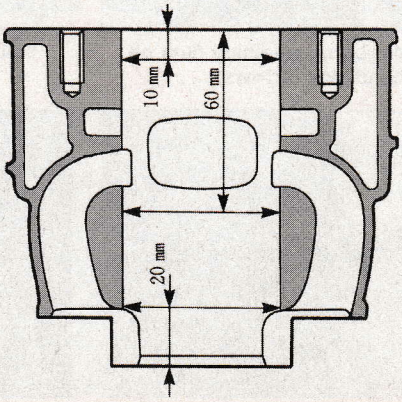
Refer to illustration 9.31

30 The bore is plated with a substance called Nikasil. This means the cylinder cannot be rebored or even honed, so if the bore is scored or otherwise damaged the cylinder barrel must be renewed or replated. This sort of damage is normally caused by a catastrophic seizure.

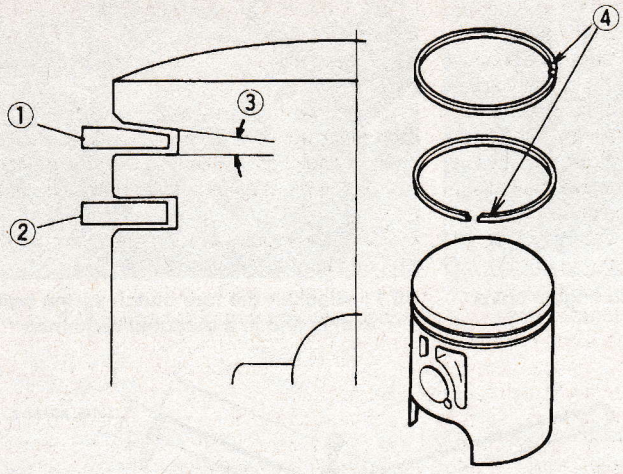
31 Using the appropriate precision measuring tools, check the bore inside diameter at the three specified distances down the bore **(see illustration)**, parallel to the crankshaft axis and at 90° to it; a total of six readings will be obtained. If the bore exceeds the service limits for diameter, taper and ovality, the cylinder barrel must be renewed.



9.28 Piston diameter is measured the specified distance from the bottom of the skirt

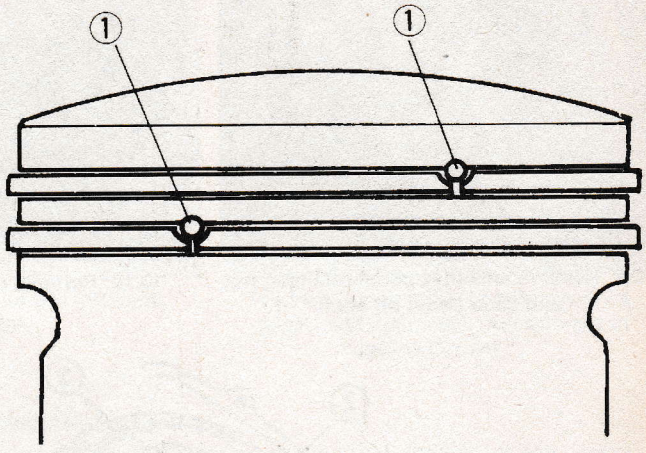


9.31 Cylinder bore measurement points



9.32 Piston ring profiles

1 Top ring
2 Second ring
3 Tapered angle of top ring groove
4 "N" marking on top surface



9.33 Pistons ring ends locate with locating pin (1) in piston grooves

Installation

Refer to illustrations 9.32, 9.33, 9.34, 9.36 and 9.38

32 Before installing the piston rings note that the top and second rings have different cross-sections **(see illustration)** and both rings are marked with an "N" on their top surfaces.

33 Note that the ends of the rings abut a locating pin in each ring groove **(see illustration)**. If installing the rings by hand first locate one end of the top ring against its pin in the ring groove then spread the ring as little as you have to do to slip it into the groove. Note that the expander ring fitted to the second groove on 200 models, should be installed by hand prior to installing the second compression ring.

34 Fit a new circlip into its groove in the piston pin boss. Apply two-stroke oil to the small-end needle roller bearing and insert it into the connecting rod eye. Lower the piston onto the rod, noting that the arrow in its crown must face forwards, and insert the piston pin into the piston from the side opposite the newly installed circlip **(see illustration)**. **Note:** *If installation is difficult it may help to heat the piston gently (a rag soaked in hot water works well) before pressing the piston pin into place.*

35 Fit a new circlip to secure the piston pin. **Note:** *The circlips must be installed in their grooves so that their openings don't line up with the cutouts in the piston bosses.*

36 Slip a new base gasket over the cylinder studs **(see illustration)**. Check that the dowel pins are in place over the two right-hand studs; the left-hand studs do not have dowel pins. Lubricate the piston, piston rings and cylinder bore with two-stroke oil.

37 If you have a piston ring clamp install it at this stage. If not, feed the rings into the barrel by hand, taking care that their ends remain correctly positioned in relation to the locating pins. Lower the cylinder barrel partway down over its studs and remove any rag used to pad the crankcase mouth. When fully seated on its base gasket install the four barrel retaining nuts and tighten them evenly in a diagonal sequence to the specified torque setting. Turn the engine over gently on the kickstarter and check that the piston moves smoothly up and down its bore.

38 Refit all remaining components in a reverse of the removal procedure, using new gaskets at the coolant elbow and KIPS lever cover **(see illustration)**. Refill the cooling system (see Chapter 1).

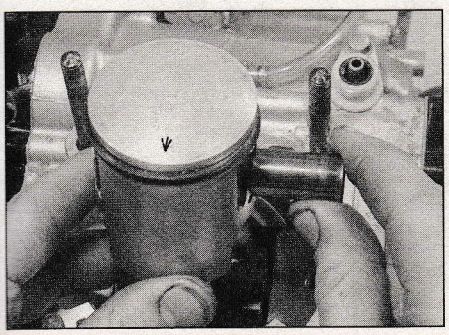
10 Clutch - removal, inspection and installation

Note: *This procedure can be performed with the engine in the frame. If the engine has already been removed, ignore the preliminary steps which don't apply.*

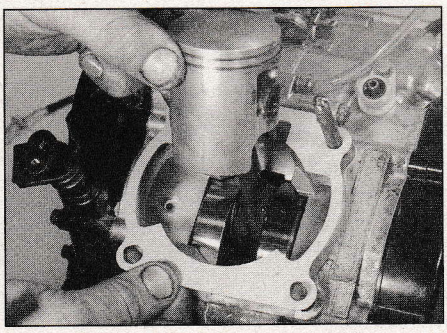
Removal

Refer to illustrations 10.3, 10.10, 10.11, 10.15a and 10.15b

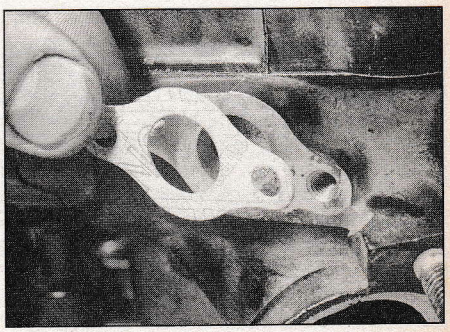
1 Drain the transmission oil as described in Chapter 1.
2 Drain the coolant as described in Chapter 1.
3 Remove the kickstart pedal **(see illustration)**.
4 Detach the clutch cable at the engine end (see Section 5).
5 Detach the brake pedal as described in Section 5.
6 Slacken its clamp and pull off the coolant hose from the front of the



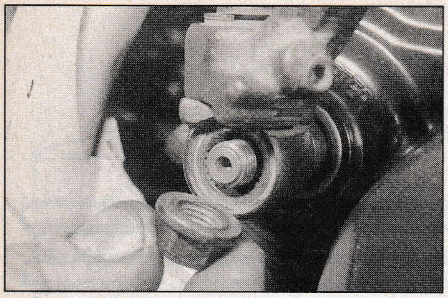
9.34 Piston has an arrow on its crown which is installed pointing forward



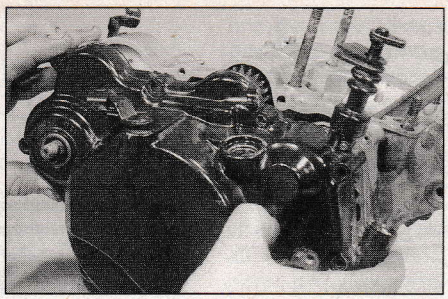
9.36 Fit a new base gasket



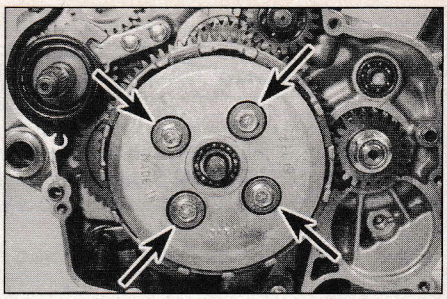
9.38 Renew the gasket between the coolant elbow and the cylinder barrel



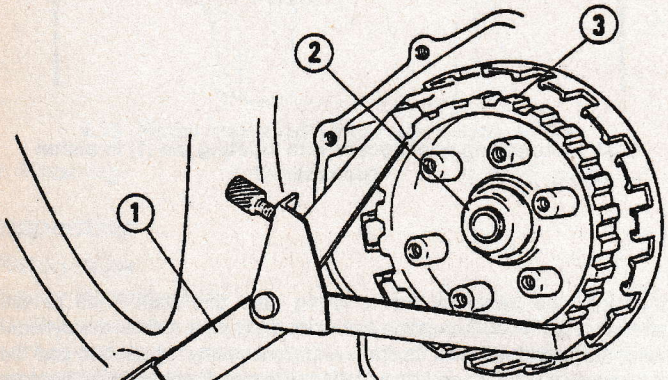
10.3 Remove kickstart pedal retaining nut and slide pedal off shaft



10.10 Remove right side engine cover

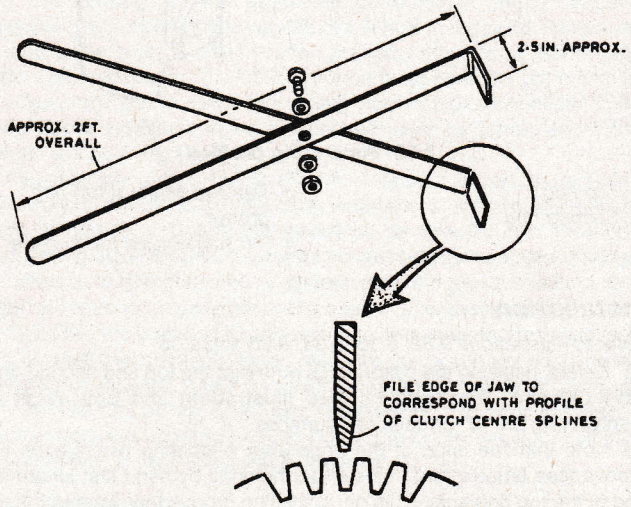


10.11 Slacken the four clutch spring bolts evenly and in a diagonal sequence



10.15a Kawasaki clutch holding tool (Pt No. 57001-1243) - 200 models

1 Tool *2 Nut* *3 Clutch nut*



10.15b Home-made clutch holding tool - 200 models

cylinder barrel to the elbow on the engine right-hand cover.

7 Remove the three bolts (two long, one short) that secure the water pump cover. Swing the cover away from the engine noting that it can remain attached to the coolant hose that runs from the bottom of the radiator. Peel off the pump cover gasket.

8 Remove the KIPS valve lever cover and shaft lever (see Section 8).

9 Remove the transmission oil filler cap, providing access to the engine cover bolt behind it.

10 Remove the Allen bolts that hold the right-hand cover to the crankcase and pull the cover off the crankcase. **Note:** *The clutch release shaft inside the cover may catch on the clutch pusher piece, preventing removal of the cover. If this happens, rotate the clutch shaft lever at the top of the casing rearwards.* Make note of the bolt locations in the cover - their lengths differ. If the two dowel pins are loose in the crankcase or cover retrieve them and place with the cover **(see illustration)**.

11 Remove the four clutch spring bolts, the washers behind them and the springs **(see illustration)**.

12 Lift out the pressure plate, together with its thrust bearing, pusher piece and coil spring.

13 Remove the clutch friction plates and plain steel plates as a set.

14 On all 200 models, and 125 models (engine no MX125AE013437 onwards), an anti-judder spring and spring seat are fitted inboard of the inner friction plate. Remove them with the clutch plates.

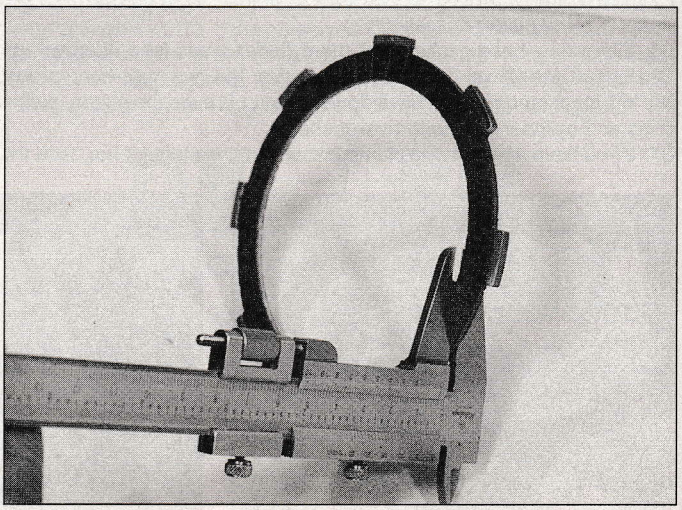
15 On 125 models, remove the circlip from the mainshaft end and withdraw the clutch centre. On 200 models, remove the nut from the mainshaft end to withdraw the clutch centre, noting that the engine must either be locked through the transmission to hold the mainshaft stationary whilst the nut is slackened, or by a clutch holding tool used to lock the clutch centre and outer drum **(see illustrations)**.

16 Remove the wave washer and splined thrust washer from the mainshaft and withdraw the outer drum.

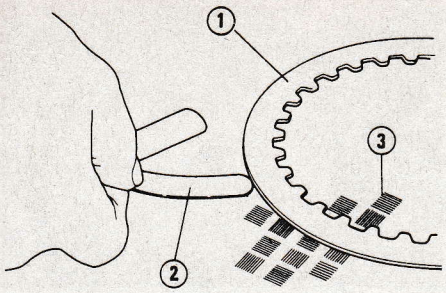
Inspection

Refer to illustrations 10.17, 10.18 and 10.22

17 After an extended period of service the clutch friction plates will wear and promote clutch slip. Measure the thickness of each friction plate using a vernier caliper **(see illustration)**. If any plate has worn to or beyond the service limit given in the Specifications, the friction plates must be replaced as a set. Check the friction plates for warpage as described below.

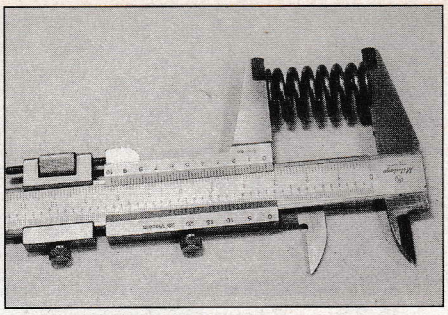


10.17 Measure clutch friction plate thickness

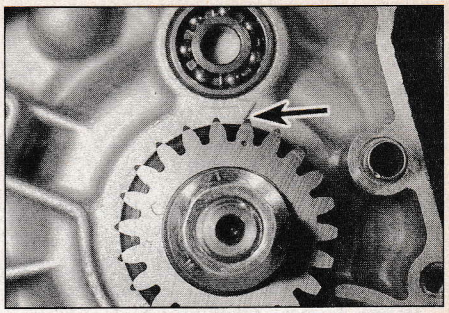


10.18 Checking for clutch plate warpage

1 Clutch plate
2 Feeler gauge
3 Perfectly flat surface



10.22 Measure free length of clutch springs



10.24a Punch mark on primary drive gear must align with cast triangle in casing (arrow) . . .

18 The plain plates should not show any signs of excess heating (blueing). Check for warpage using a flat surface and feeler gauges **(see illustration)**. If any plate exceeds the maximum permissible warp limit, or shows signs of blueing, all the plain plates must be replaced as a set.

19 Inspect the clutch assembly for burrs and indentations on the edges of the protruding tangs of the friction plates and their corresponding slots in the edge of the outer drum. Similarly check for wear between the inner tongues of the plain plates and the slots in the clutch centre. Wear of this nature will cause clutch drag and slow disengagement during gear changes, since the plates will snag when the pressure plate is lifted. With care, a small amount of wear can be corrected by dressing with a fine file, but if this is excessive the worn components can be replaced.

20 On models so equipped, inspect the anti-judder spring and seat for signs of wear or distortion and replace if necessary.

21 Inspect the mainshaft and outer drum centre bearing surfaces for signs of wear and damage. If any component shows signs of wear or damage, it must be replaced.

22 Measure the free length of each clutch spring **(see illustration)**. If any one has settled to or beyond the service limit, the clutch springs must be replaced as a set.

Installation

Refer to illustrations 10.24a, 10.24b, 10.25, 10.26a, 10.26b, 10.27a, 10.27b, 10.29a to 10.29d, 10.30, and 10.31a to 10.31c

23 Remove all traces of gasket from the crankcase and right-hand cover mating surfaces.

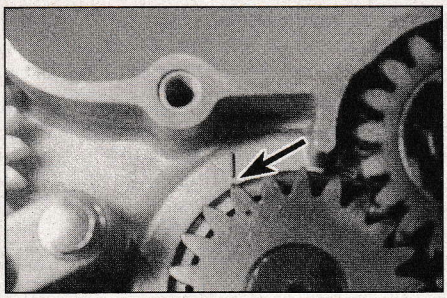
24 Before installing the outer drum check the balancer shaft timing. The punch mark on the face of the primary drive gear must align exactly with the triangular mark cast in the casing, and the punch mark on the balancer shaft gear must align exactly with the triangular mark cast in the top of the crankcase **(see illustrations)**. Rotate the crankshaft and balancer shafts to align these marks if necessary.

25 With the balancer timing set as described above, apply oil to the bearing surface of the outer drum and slide it into position over the mainshaft **(see illustration)**. Its teeth must engage those of the primary gear, balancer shaft idler gear and kickstart idler gear. Rotate the engine a couple of times to make sure that the balancer timing marks line up before proceeding.

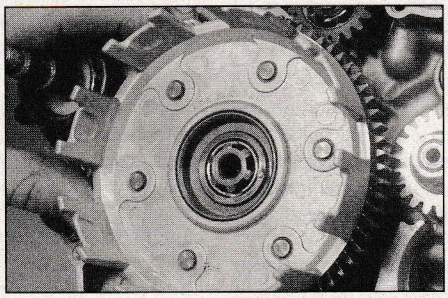
26 Install the splined thrust washer with its flat side facing inwards, followed by the wave washer **(see illustrations)**.

27 Install the clutch centre on the mainshaft **(see illustration)**. On 125 models, secure it with a new circlip **(see illustration)**. On 200 models, install the washer (concave side facing inwards) and the hub nut. Lock

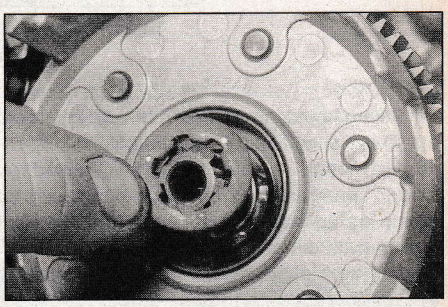
2



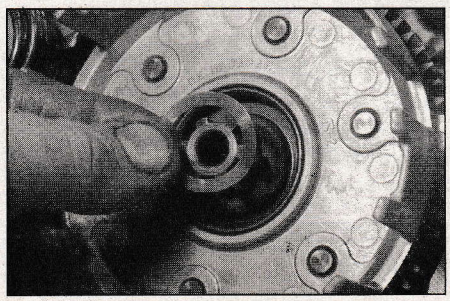
10.24b . . . as must punch mark on balancer shaft gear (arrow)



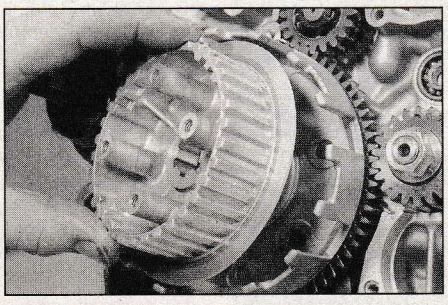
10.25 Install the clutch outer drum over the mainshaft



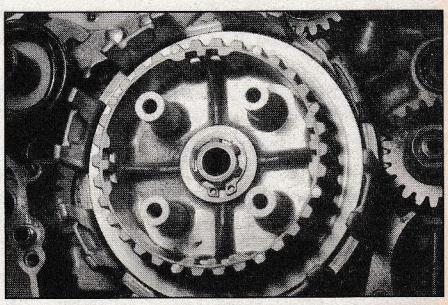
10.26a Install the splined thrust washer . . .



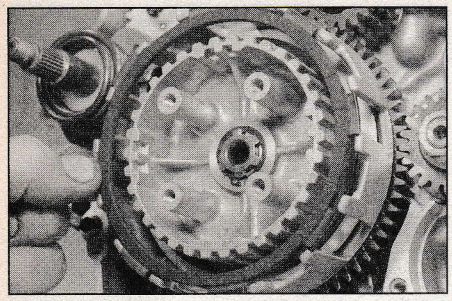
10.26b . . . and wave washer on the mainshaft



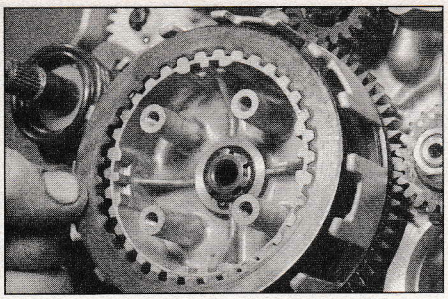
10.27a Slide the clutch centre onto the mainshaft . . .



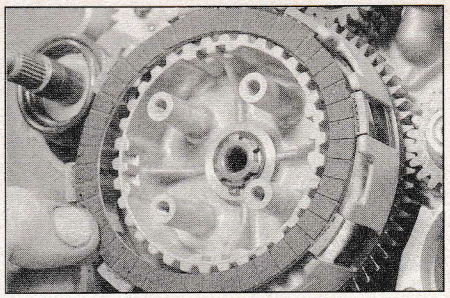
10.27b . . . and secure with a new circlip on 125 models



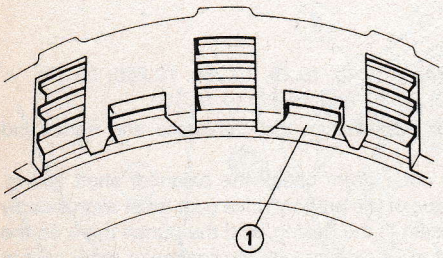
10.29a Install a friction plate first (note narrow friction plate on models with anti-judder spring) . . .



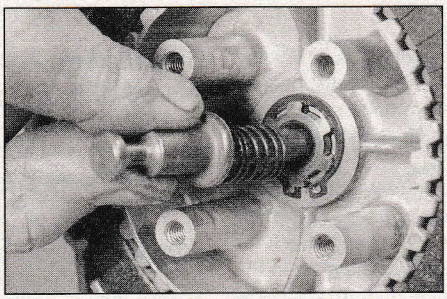
10.29b . . . followed by the plain . . .



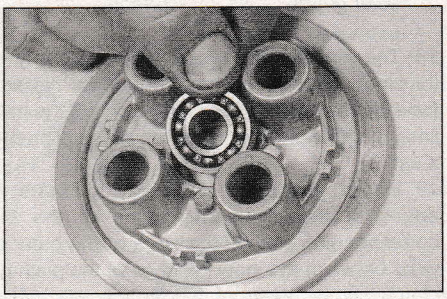
10.29c . . . and friction plates in an alternate order



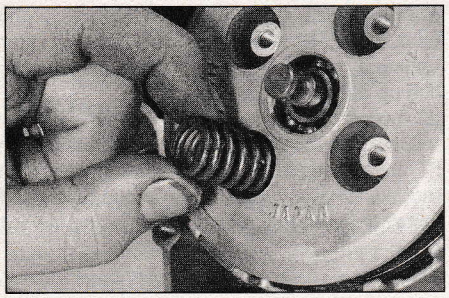
10.29d The outermost friction plate tangs (1) must engage the shallow slots in the outer drum



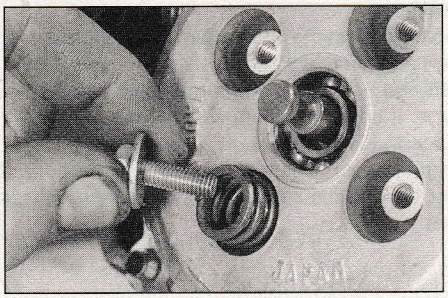
10.30 Insert coil spring and pusher piece in mainshaft end



10.31a Thrust bearing is a press fit in pressure plate



10.31b Install clutch pressure plate springs . . .



10.31c . . . followed by the washers and bolts

the assembly using the method employed on removal and tighten the nut to the specified torque setting.

28 On models so equipped, install the spring seat followed by the anti-judder spring with its concave side facing out, ie if you think of the spring as a section of a cone then the point of that cone would be facing into the centre of the engine.

29 Fit the friction and plain plates alternately into the clutch, noting that on models with the anti-judder spring the innermost friction plate has a larger internal diameter to fit over the spring and its seat **(see illustrations)**. On all models, the very last friction plate to be fitted must have its tangs engaged with the shallow slots in the outer drum **(see illustration)**. **Note:** *If new plates are being installed, cost them with transmission oil prior to installation.*

30 Install the pusher piece and its spring into the mainshaft end **(see illustration)**. Apply molybdenum disulphide grease to the working surface of the pusher piece.

31 Lubricate the clutch thrust bearing with transmission oil and install the clutch pressure plate **(see illustration)**. Install the springs, washers and pressure plate bolts, tightening the bolts evenly in a diagonal sequence to the specified torque setting **(see illustrations)**.

32 Check that the dowel pins are in position in the crankcase or cover, and place a new gasket over them. Check the condition of the kickstart shaft oil seal in the cover; if it shows signs of oil leakage or damage to its sealing lip, prise it out of the cover and press in a new oil seal. **Note:** *It is advisable to wrap tape around the splines of the kickstart shaft to protect the oil seal as the cover is installed.* Reinstall the engine right-hand cover making sure the water pump gear retained in the cover meshes with the primary drive pinion as the cover is offered up and that the clutch release shaft engages the pusher piece end (holding the clutch shaft lever rearwards should ensure this).

33 Tighten the cover Allen bolts progressively working in a diagonal pattern until all are secure.

34 Install the KIPS exhaust valve shaft lever and cover as described in Section 8.

35 Reconnect the clutch cable and adjust it (see Chapter 1).

36 Refill the transmission with oil as described in Chapter 1.

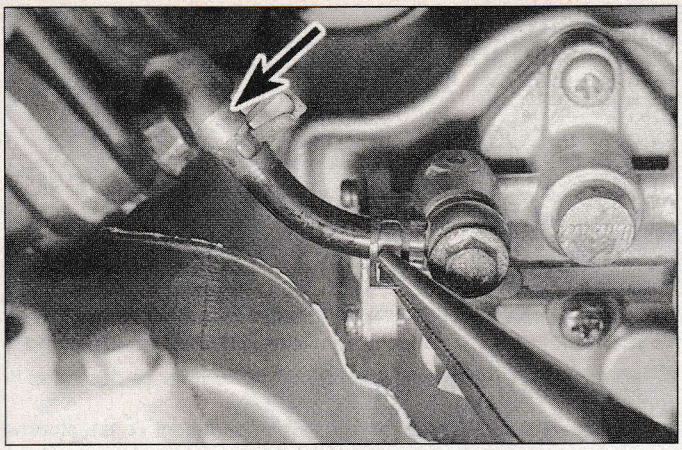
37 Install the water pump cover using a new gasket and reconnect the coolant hose from the cylinder barrel. Refill and bleed the cooling system as described in Chapter 1.

38 Remove any tape used to protect the cover oil seal and install the kickstarter pedal, tightening its retaining nut securely.

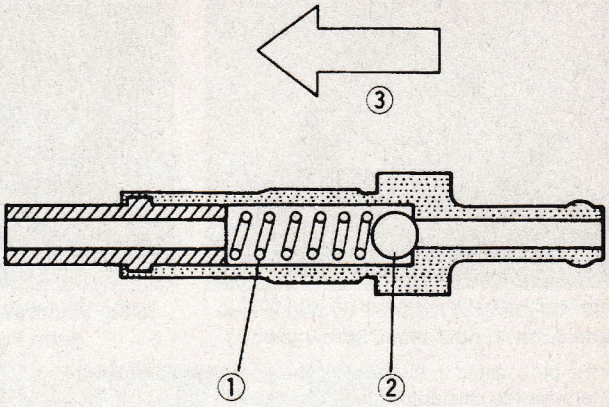
39 Install the brake pedal and brake light switch (see Section 5).

11 Clutch cable - replacement

1 Slacken the lower cable adjuster locknut and detach the inner cable from the clutch arm **(see illustration 5.14)**. Free the outer cable



12.3 Oil delivery pipe runs between pump banjo union and intake stub; check valve (arrow) locates in intake stub union



12.7 Check valve components

1 Coil spring 2 Steel ball 3 Direction of oil flow

from its mounting bracket.

2 Work back along the cable, freeing it from any relevant retaining clips while noting the correct routing of the cable.

3 Detach the cable trunnion from the underside of the handlebar lever and withdraw the inner cable via the slot in the adjuster.

4 Install the new cable making sure it is correctly routed, well lubricated and retained by all necessary clips.

5 Adjust the cable as described in Chapter 1.

12 Oil pump - output check, bleeding, removal and installation

Output check

Refer to illustrations 12.3 and 12.7

Warning: *This check must be carried out in a well-ventilated area, preferably outside.*

1 If the pump output is suspected of being incorrect, first check the cable synchronisation as described in Chapter 1. If this checks out correctly the pump may be faulty; check its output as described below.

2 The pump output check requires that the oil delivery pipe be disconnected from the engine and directed into a measuring vessel. Since this leaves the engine without lubrication, the fuel tank must be drained, and a mix of petrol and two-stroke oil (petroil) in the ratio of 20:1 poured in the tank, in a quantity sufficient for the duration of the test.

3 Release its clips and pull the oil delivery pipe off the intake stub and banjo union on the pump, then pull the one-way valve out of the intake stub **(see illustration)**. Plug the hole in the intake stub with a suitably-sized bung (a 6 mm thread diameter screw will do).

4 Attach a length of pipe, approximately 200 mm long, to the oil pump banjo union output stub and prime it with two-stroke oil using a syringe. Insert the check valve in the free end of the pipe.

5 Start the engine and have an assistant hold the throttle open so that it idles at 2000 rpm.

6 Place the end of the pipe in a measuring vessel and hold the oil pump lever fully open for exactly three minutes at this engine speed. Stop the engine after three minutes and measure the oil collected. The pump and check valve are operating correctly if the output is between 3.6 and 4.2 cc of oil on 125 models, and between 2.8 and 3.4 cc of oil on 200 models.

7 If the output is below specification, clean the one-way valve with an aerosol solvent (do not use a compressed air line) and re-run the test. The purpose of the check valve is to prevent oil flow to the inlet stub when the engine is not running; the arrow indicates the normal direction of oil flow **(see illustration)**. If the output is still below specification after cleaning the valve, run the test again with the valve turned around the other way - no oil should pass through the valve, if it does it is confirmed faulty. If the check valve functions correctly and there is no sign of oil leakage from the oil pump, the pump should be renewed; repairs are not possible.

8 In the unlikely event that oil pump output exceeds the specification and excessive exhaust smoke coupled with oily deposits have been noticed, take the motorcycle to a Kawasaki dealer for advice.

Bleeding

9 Whenever the oil pump pipes are disturbed the pump must be bled of air on reassembly. Prime disconnected pipes with two-stroke oil applied with a syringe prior to connecting them to their unions.

10 Bleed air from the oil feed pipe (between the oil tank and pump) by backing off the bleed screw at the top of the pump body **(see illustration 12.17)** until oil flow from the screw is free from air bubbles. The transparent oil feed pipe allows you to check that there are no air bubbles still locked in the pipe. Tighten the bleed screw on completion.

11 Bleed air from the oil delivery pipe (that which connects the pump to the intake stub) by running the engine at 2000 rpm, and holding the pump lever fully open, until no more air bubbles are seen in the transparent oil pipe. On completion check the amount of oil in the tank and top up if necessary.

Removal

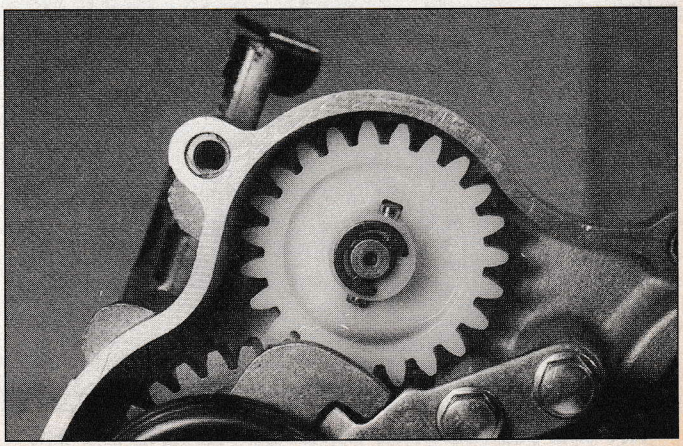
Note: *The oil pump can be removed with the engine in the frame. If the engine has been removed, ignore the steps which don't apply.*

Refer to illustrations 12.14 and 12.17

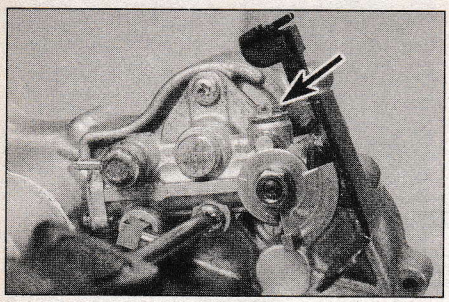
12 Remove the clutch as described in Section 10.

13 Remove the kickstarter shaft as described in Section 14.

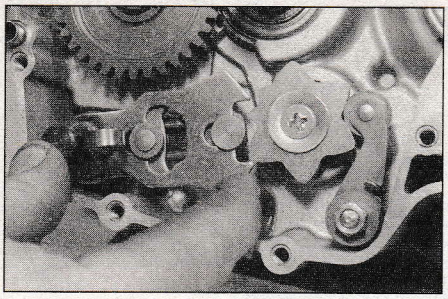
14 Remove the circlip that holds the nylon oil pump gear on the pump shaft and remove the gear. Extract the drive pin from the shaft noting



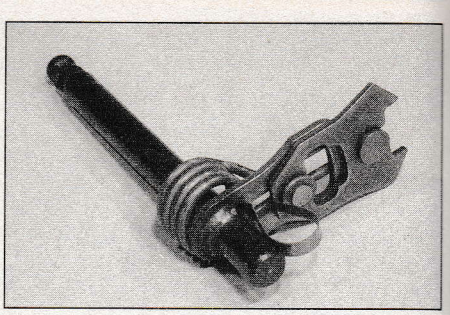
12.14 Oil pump drive pinion is secured by a circlip and pin



12.17 Oil pump is retained by two cross-head screws; note bleed screw (arrow)



13.3a Withdraw the shift shaft with shift drum cam in this position



13.3b Shift shaft assembly comprises mechanism arm and shaft return spring

how the pin locates in the back of the gear **(see illustration)**.

15 Remove the carburettor (see Chapter 4).

16 Release its spring clip and disconnect the oil feed pipe from its pump union. Plug the end of the oil feed pipe with a suitably-sized bolt to prevent oil loss from the tank. Remove the banjo union bolt to release the oil delivery pipe from the pump body. Bend back the tag on the pump lever to free the operating cable.

17 Remove the two oil pump mounting bolts and take off the oil pump **(see illustration)**.

Installation

18 Install the oil pump in a reverse of the removal procedure, noting the following.

a) Use a new gasket on the pump body.
b) Use new sealing washers on each side of the oil delivery pipe banjo union and tighten the union bolt to the specified torque.
c) Operating lever tag must securely clamp the oil pump cable.
d) Check the oil pump cable synchronisation (see Chapter 1).
e) Top up the transmission oil (see Chapter 1).
f) Bleed the oil pump and pipes (see above).

13 Gearshift external mechanism - removal, inspection and installation

Note: *The gearshift mechanism components can be removed with the engine in the frame. If work is being carried out with the engine removed ignore the preliminary steps.*

Removal

Refer to illustrations 13.3a, 13.3b, 13.4 and 13.5

1 Remove the clutch as described in Section 10.

2 Remove the engine sprocket cover and gear lever as described in Section 5.

3 Turn the shift drum cam so that its neutral detent (ie the shallow lobe) is facing in the 10 o'clock position (doing so helps the jaws of the shift mechanism arm clear the shift drum cam when the shift shaft is removed). Pull out the shift shaft, complete with the mechanism arm and shaft return spring. There is no need to further disassemble the shift shaft unless you are replacing a damaged component or broken return spring **(see illustrations)**.

4 Remove the gear positioning lever nut, followed by the shouldered collar, the lever itself, its return spring and the washer **(see illustration)**.

5 Remove the cross-head screw that retains the shift drum cam, noting that you may need to use an impact driver. Remove the shift drum cam, the concave washer behind it, noting which way round it fits, and the Woodruff key that locates the shift drum cam on the shift drum **(see illustration)**.

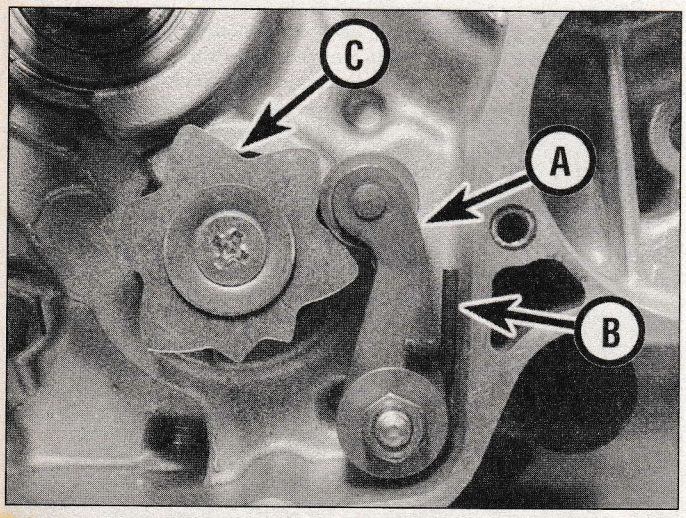
Inspection

6 Inspect the gearshift shaft return spring for damage and renew it if necessary. Check the security of its anchor post in the crankcase **(see illustration 13.13)**. If it's loose, unscrew it, apply a few drops of thread locking compound to the threads, reinstall the post and tighten it to the specified torque setting.

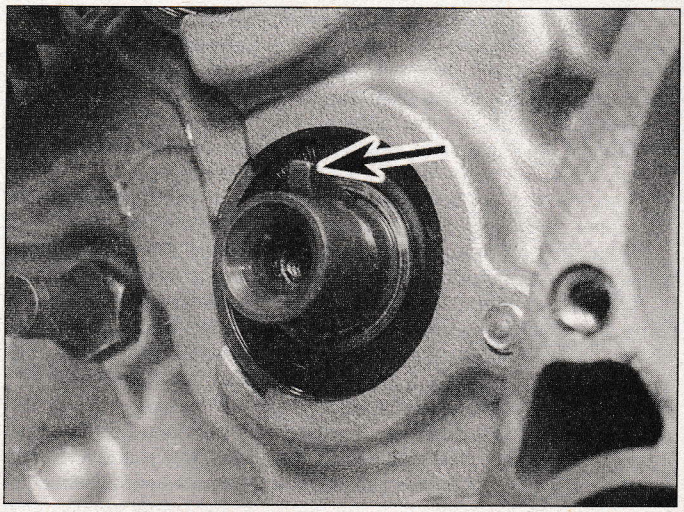
7 Check the shift shaft for straightness; if bend as the result of the motorcycle falling on its gear lever, it may be possible to straighten the shaft. Check the operation of the shift mechanism arm and its leaf spring.

8 Check for wear of the arm tips where they contact the shift drum cam - severe wear here will lead to poor gear selection. Similarly, inspect the corresponding working surface of the shift drum cam.

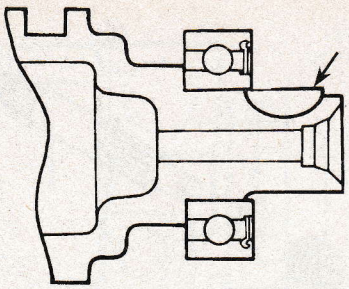
9 Check the gear positioning lever return spring for damage and renew if necessary. Inspect the lever roller and corresponding lobes on the shift drum cam for wear.



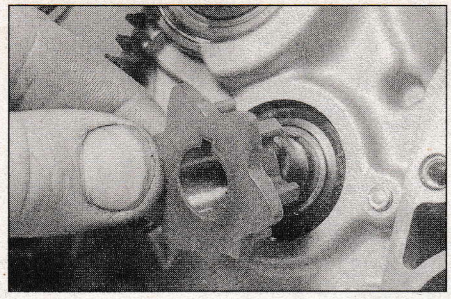
13.4 Gear positioning lever (A), its return spring (B) and shift drum cam (C)



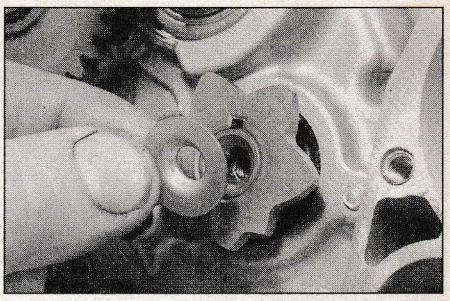
13.5 Remove Woodruff key (arrow) from shift drum cutout



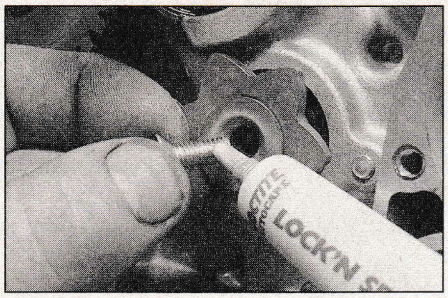
13.10 Correct positioning of shift drum Woodruff key



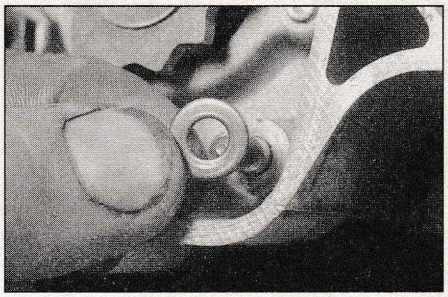
13.11a Install the shift drum cam over Woodruff key . . .



13.11b . . . followed by its concave washer



13.11c Apply thread locking compound to the threads of the cam retaining screw



13.12a Install washer on gear positioning lever shaft . . .

Installation

Refer to illustrations 13.10, 13.11a, 13.11b, 13.11c, 13.12a, 13.12b, 13.12c, 13.12d, 13.12e and 13.13

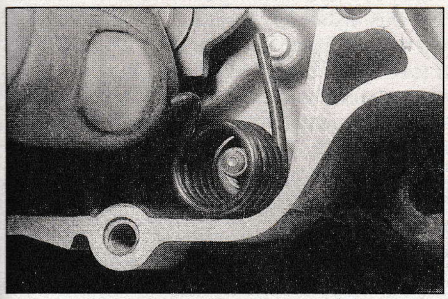
10 Ensure the shift drum is positioned so that the Woodruff key cutout is uppermost. Install the Woodruff key in the cutout so that its inner edge locates under the inner race of the bearing and its top edge is horizontal **(see illustration)**.

11 Install the shift drum cam so that its slot meshes with the Woodruff key and fit the concave washer **(see illustrations)**. Apply a drop of non permanent thread locking compound to the shift drum cam screw threads and tighten it securely **(see illustration)**.

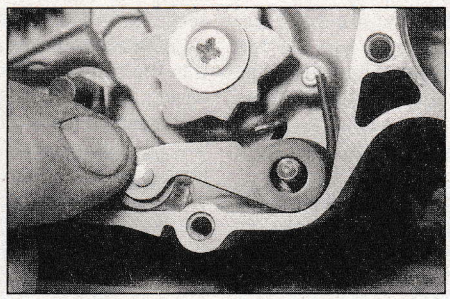
12 Reassemble the gear positioning lever components **(see illustrations)** and tighten the lever nut to the specified torque setting.

Note: *The long tang on the inner end of the spring locates between raised areas of the crankcase casting and the small hook on the outer end locates in the cutout in the gear positioning lever.*

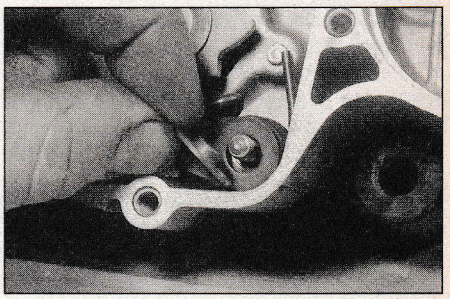
13 Clean the face of the shift shaft oil seal set in the left-hand side of the crankcase and smear its lip with grease. Wrap tape around the splines of the shift shaft to prevent them damaging the oil seal as it passes through, and install the shift shaft. The return spring legs must fit over the anchor pin set in the crankcase **(see illustration)** and the shift cam must be positioned to allow the mechanism arm claws to pass over it (see Step 3).



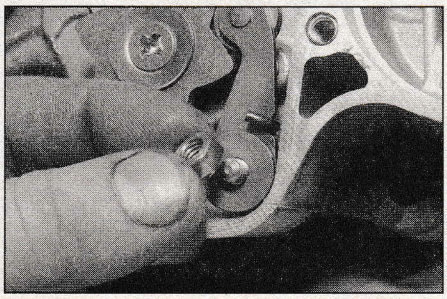
13.12b . . . followed by the spring (locating its long tang between the protrusions on crankcase casting)



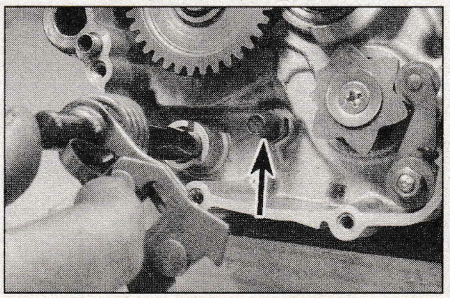
13.12c Install the lever on the shaft and locate the short tang of the spring with the cutout on the front edge of lever . . .



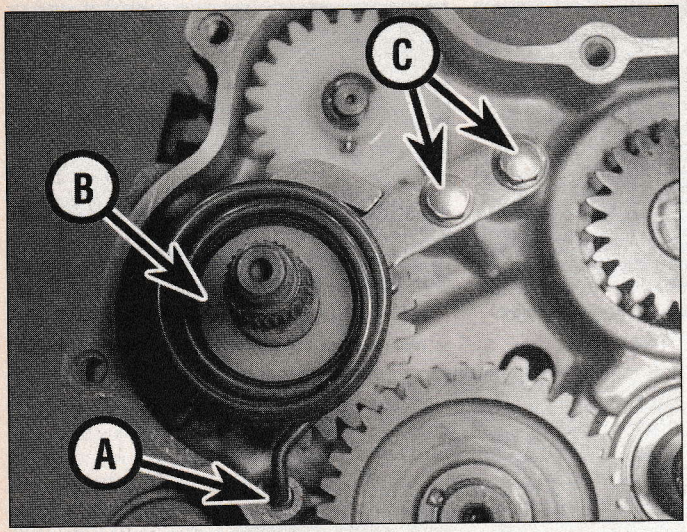
13.12d . . . then fit the shouldered collar with its smaller diameter collar facing inwards . . .



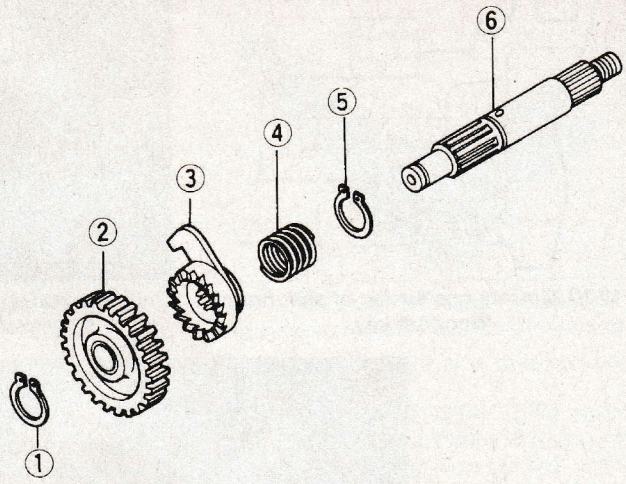
13.12e . . . move the lever into position on the shift drum cam and install the nut



13.13 Shift shaft return spring legs must fit over anchor post (arrow)



14.2 Kickstart shaft return spring tang locates in hole in crankcase (A), guide (B) fits inside return spring, guide plate is retained by two bolts (C)



14.4 Kickstart shaft detail

1 Circlip
2 Drive gear
3 Ratchet
4 Coil spring
5 Circlip
6 Shaft

14 Remove the tape from the shift shaft splines. Fit the gear lever, aligning the previously made match marks, and tighten its pinch bolt. Check that all gears locate correctly before fitting the remaining components. In the neutral position, denoted by the gear positioning lever contact with the shallow detent of the shift drum cam, the transmission mainshaft must turn freely from the countershaft (sprocket).
15 Install all components in a reverse of the removal procedure and replenish the transmission oil (see Chapter 1).

14 Kickstart mechanism - removal, inspection and installation

Removal

Refer to illustrations 14.2, 14.4, 14.5a, 14.5b and 14.5c

1 Remove the clutch as described in Section 10.
2 Pull the kickstarter return spring tang out of its locating hole in the crankcase and remove the spring and its plastic guide **(see illustration)**.
3 Remove its two mounting bolts and lift away the guide plate **(see illustration 14.2)**.
4 Pull the kickstart shaft out of the crankcase. To disassemble the shaft, remove the circlip from the inner end of the shaft then slide off the drive gear, ratchet and spring **(see illustration)**. A second circlip locates in the shaft groove.
5 To remove the kickstarter idler gear from the crankcase, remove its outer circlip, the idler gear and the inner circlip **(see illustrations)**.

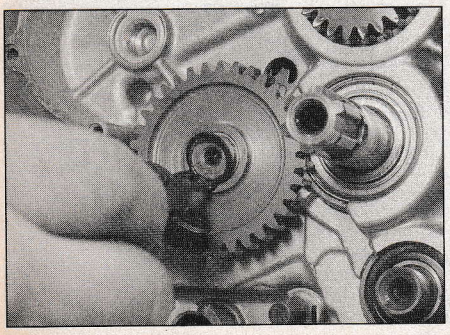
Inspection

6 Problems with the kickstart lever not returning are normally due to the return spring being bent or broken. Inspect it carefully, and check the other components for bending or damage and wear.

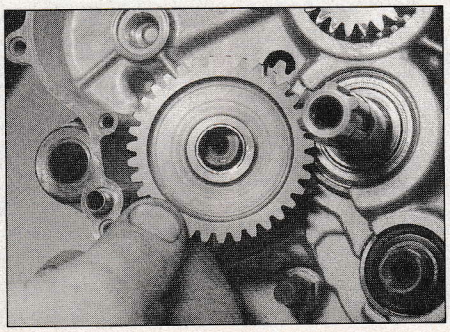
Installation

Refer to illustrations 14.7, 14.9a, 14.9b, 14.10a, 14.10b and 14.11

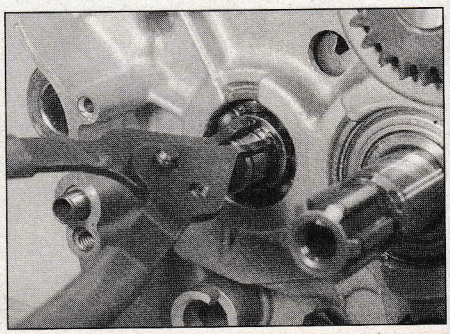
7 Install a new circlip into its shaft groove in the idler gear shaft. Install the idler gear with its flat face inwards, followed by a new circlip **(see illustration)**.
8 If the kickstart shaft components were dismantled, fit the coil spring and ratchet to the shaft so that the spring butts against the shaft circlip (renew this circlip if it was disturbed). Note that the ratchet must be installed on the shaft so that the notch cut in its body aligns exactly with the hole in the shaft **(see illustration 14.9)**. Install the drive gear, having applied molybdenum disulphide grease to its bearing surface, and mesh its teeth with those of the ratchet. Secure with a new circlip.
9 Install the kickstart shaft assembly in the crankcase, meshing the drive gear and idle gear teeth. Install the guide plate so that the hook on the end of the guide plate is positioned in the centre of the hook on the ratchet **(see illustration)**. Apply a drop of non permanent thread locking compound to the kick guide mounting bolts before tightening them **(see illustration)**.



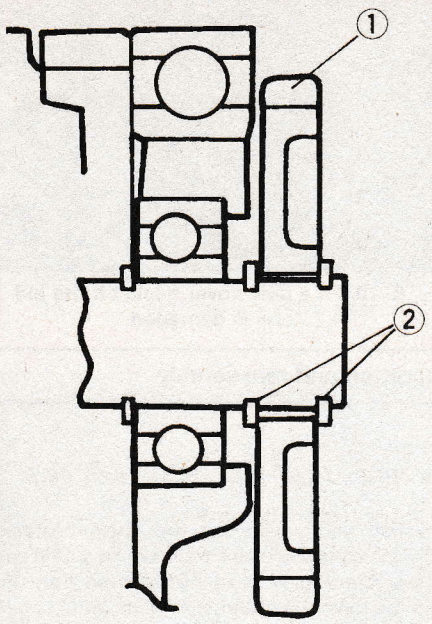
14.5a Remove kickstart idler gear outer circlip . . .



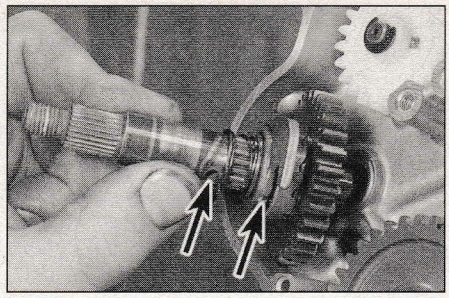
14.5b . . . the idler gear itself . . .



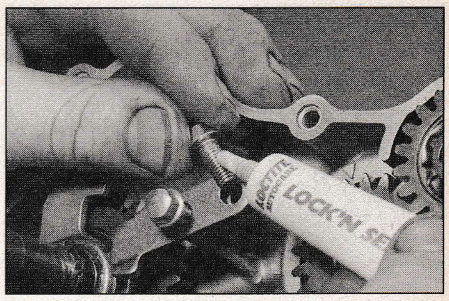
14.5c . . . and the inner circlip



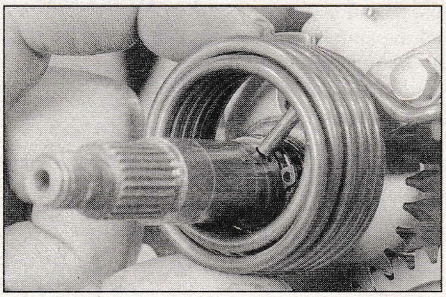
14.7 Kickstart idle gear (1) is installed with its flat side against the crankcase. Idle gear is located on shaft by circlips (2)



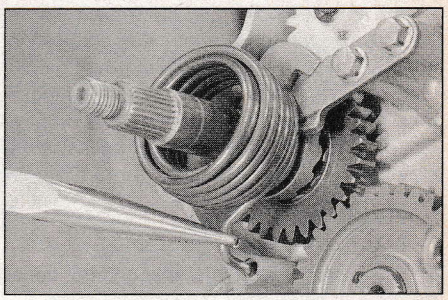
14.9a Install assembled kickstart shaft in crankcase; note ratchet notch and shaft hole alignment (arrows)



14.9b Apply thread locking compound to the threads of the two guide plate bolts



14.10a Install spring's inner tang in hole in shaft . . .



14.10b . . . and its outer tang in the hole in the crankcase

10 Fit the return spring with its inner tang in the hole in the kickstarter shaft and its outer tang in the hole in the crankcase **(see illustrations)**.
11 Install the plastic return spring guide over the shaft and align its cutout with the inner spring tang **(see illustration)**.

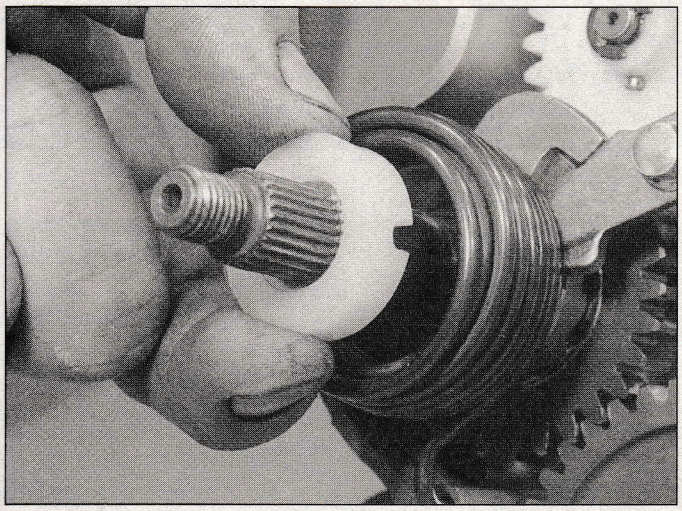
15 Alternator rotor and stator - removal and installation

Note: *To remove the alternator rotor use only the special Kawasaki rotor puller (Part No. 57001-252) or a pattern equivalent. Do not attempt to remove the rotor using any other method. The alternator rotor can be removed with the engine in the frame. If work is being carried out with the engine removed, ignore the preliminary steps which don't apply.*

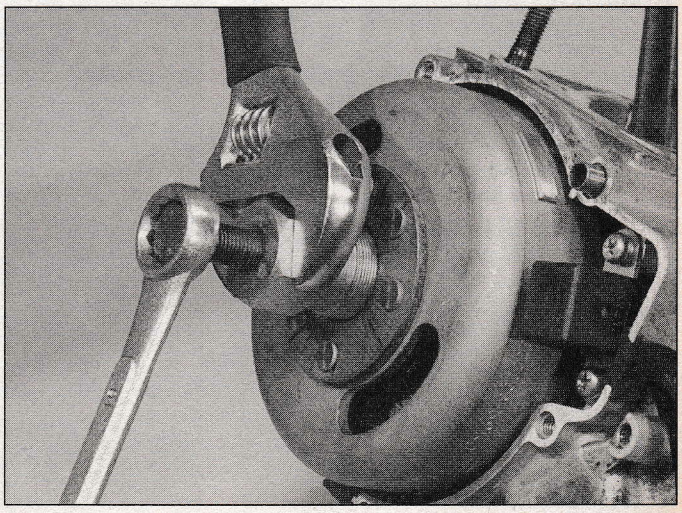
Removal

Refer to illustrations 15.3, 15.5a and 15.5b

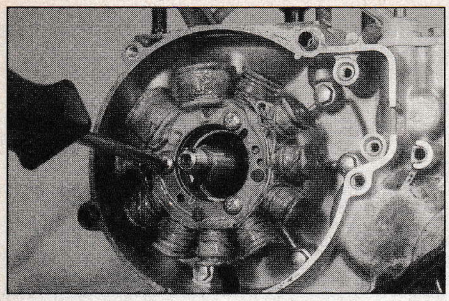
1 Remove the five bolts which retain the alternator cover and pull the cover off noting the two dowel pins. Note that the four cross-head screws in the middle of the cover need not be removed; these retain a noise damper to the inside of the cover.
2 A means must be found of preventing the crankshaft from rotating whilst the rotor nut is removed. A holding tool such as the Kawasaki flywheel holder (Part No. 57001-306) can be used in the slots cut in the rotor, although if using an alternative to this tool, make sure the tool pegs don't contact the stator coils inside the rotor. Alternatively, lock the engine through the transmission and apply the rear brake with the rear wheel in firm contact with the ground.
3 Screw the rotor puller into the centre of the flywheel, remembering that it has a left-hand thread, and tighten down the puller centre bolt to pull the rotor off the crankshaft taper. Remove the Woodruff key that locates the flywheel on the crankshaft **(see illustration)**.
4 If you want to remove the stator coil assembly completely, its wiring must be disconnected at the block connector under the fuel tank. Remove the fuel tank (see Chapter 4). Trace the alternator wiring up to



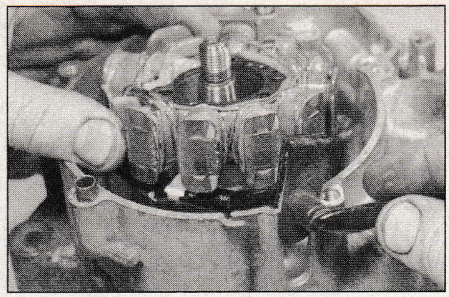
14.11 Return spring guide fits inside spring with cutout over spring tang



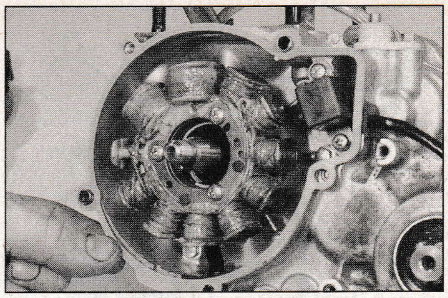
15.3 Use only the specified puller to remove alternator rotor



15.5a Stator is retained by three cross-head screws . . .



15.5b . . . and its wiring is held in a grommet set in the crankcase



15.12 Fit a new cover gasket if the old one is damaged

the connector, disconnect it and free it from any cable ties. Remove the engine sprocket cover and disconnect the wire from the neutral switch.

5 Remove the three cross-head screws that hold the stator. Remove the stator and the rubber wiring grommet in the bottom of the housing **(see illustrations)**. Note how the wiring fits around the alternator housing to ensure it is returned to its original routing on refitting.

6 The ignition system pickup coil is located in the top rear of the stator housing. See Chapter 5 for removal and installation of the coil.

Installation

Refer to illustration 15.12

7 Clean the crankshaft taper and nut threads, and remove any metal particles of swarf from the rotor magnets.

8 Install the stator and the wiring grommet in the crankcase and route the wiring back to the block connector. Tighten the stator screws.

9 Install the Woodruff key in the crankshaft taper.

10 Fit the rotor over the crankshaft taper, aligning its slot with the Woodruff key, and tap it gently with a soft-faced mallet to seat it on the taper. Install the rotor nut.

11 Prevent the crankshaft turning using the same method as employed on removal, and tighten the nut to the specified torque setting.

12 Refit the alternator cover and its gasket making sure the two dowel pins are in position. As the gasket doesn't form a liquid seal, you only need to replace it if it is damaged **(see illustration)**.

13 Install all remaining components in a reverse of the removal procedure. Ensure that the alternator/neutral switch wires are clamped clear of the engine sprocket.

16 Crankcase - separation and reassembly

Separation

Refer to illustrations 16.3a, 16.3b, 16.3c, 16.3d, 16.5a, 16.5b, 16.5c, 16.5d, 16.8 and 16.9

1 To access the crankshaft and connecting rod, main bearings, balancer shaft and transmission parts, the crankcase must be split in half.

2 To split the crankcases, the engine must be removed from the frame (see Section 5), and the following assemblies removed.

a) Cylinder head (see Section 7)
b) Cylinder and piston (see Section 8)
c) Clutch (see Section 10)
d) Kickstart shaft and idler gear (see Section 14)
e) Oil pump (see Section 12)
f) Gearshift mechanism components (see Section 13)
g) Alternator stator (see Section 15)
h) Engine sprocket , plus spacer and O-ring on early models (see Chapter 5)

3 Remove the circlip that retains the balancer shaft idler gear, followed by the washer, the gear itself and the washer behind it **(see illustrations)**.

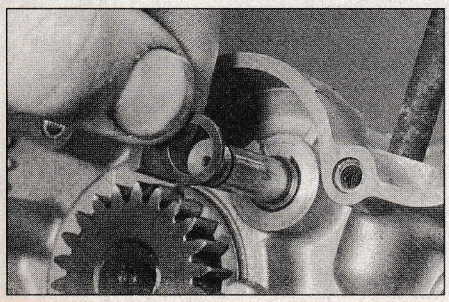
4 Remove the ignition pickup coil (see Chapter 5).

5 Immobilise the crankshaft assembly by placing two wooden blocks lengthways across the crankcase mouth and passing a round bar through the small-end eye. Protect the small-end by wrapping the bar in several layers of insulating tape. Remove the primary gear nut followed by the concave washer and the gear itself **(see illustrations)**.

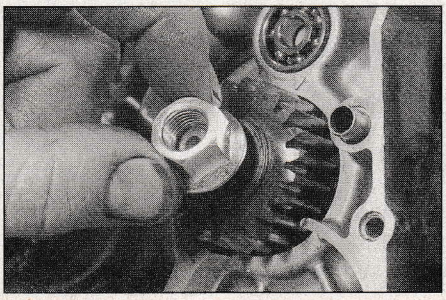
16.3a Remove circlip which retains balancer shaft idler gear . . .

16.3b . . . the outer washer . . .

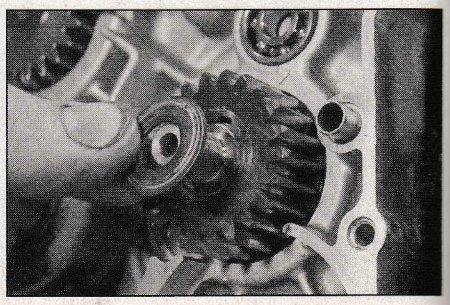
16.3c . . . the gear . . .



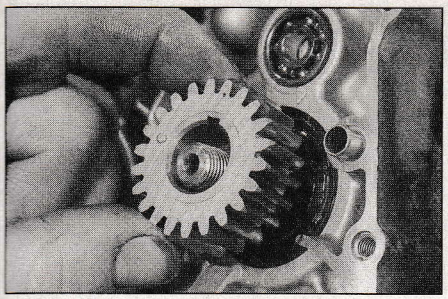
16.3d . . . and the inner washer



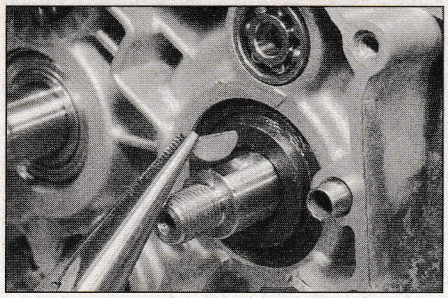
16.5a Remove the primary drive gear nut . . .



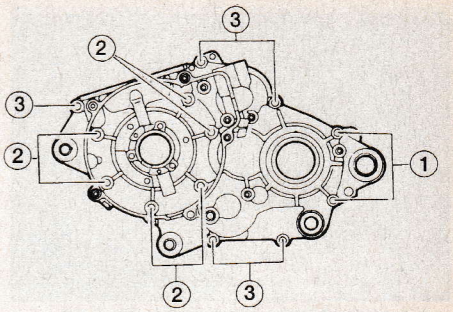
16.5b . . . followed by the concave washer . . .



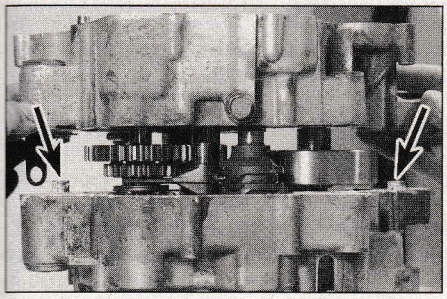
16.5c . . . and primary drive gear



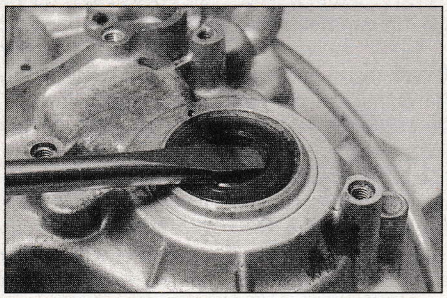
16.5d Remove the Woodruff key from the crankshaft end



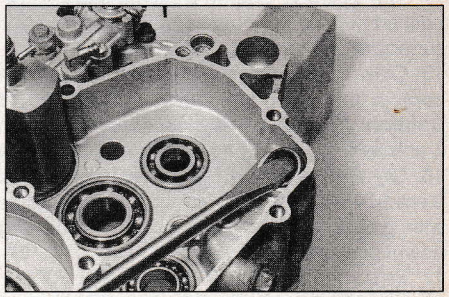
16.8 Crankcase bolt locations and lengths
1 75 mm 2 60 mm 3 50 mm



16.9 Note the position of the two dowel pins (arrows)



16.11a The transmission countershaft seal is removed from the outside . . .



16.11b . . . and all other seals are removed from the inside

Remove the Woodruff key that locates the gear on the crankshaft **(see illustration)** followed by the shouldered collar and its O-ring.

6 Unscrew the neutral switch from the left-hand crankcase half. Recover its washer.

7 Release its retaining bolt and extract the tachometer gear housing from the left-hand crankcase half top surface. Pull the tachometer drive out of the housing, together with its washer; rock the balancer shaft gear in the right-hand crankcase half forward and back to help the tachometer drive gear disengage.

8 Make a final check that all components have been removed which might hinder crankcase separation. Remove the 13 crankcase bolts, slackening them evenly in a diagonal sequence. Note that the six located in the alternator housing are 60 mm in length, the two just in front of the swinging arm pivot 75 mm long, and the remaining five in the periphery of the cases are 50 mm long **(see illustration)**.

9 Kawasaki advise that the engine is laid on its right-hand side and that the left-hand half is lifted off, leaving the crankshaft and transmission components in the right-hand half. However, on the machine featured in the stripdown for this manual the right-hand half was lifted off, leaving the components in the left-hand half. Whichever method is used, ensure that the crankcase is well supported on wooden blocks. A soft-faced mallet can be used to gently tap the crankcase halves in order to break the gasket seal, or alternatively, a flat-bladed screwdriver can be used at the two pry points provided by the manufacturer, one is under the swinging arm pivot and the other is under the front engine mounting. When the halves separate, retrieve the two dowel pins **(see illustration)**.

Reassembly

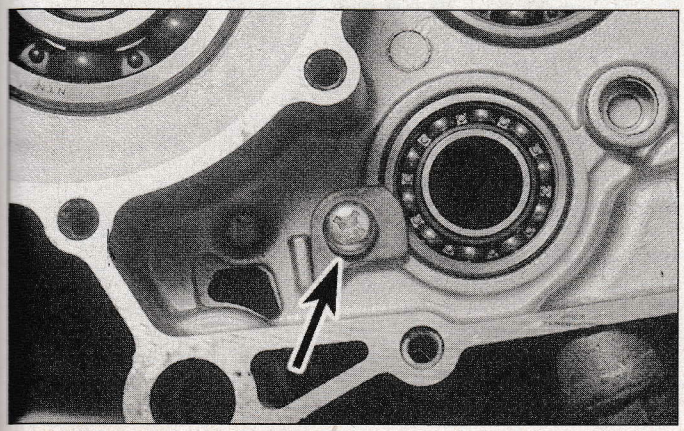
Refer to illustrations 16.11a, 16.11b, 16.12, 16.13, 16.14, 16.21a, 16.21b

10 Do not remove any bearings from the crankcase halves unless they are to be replaced.

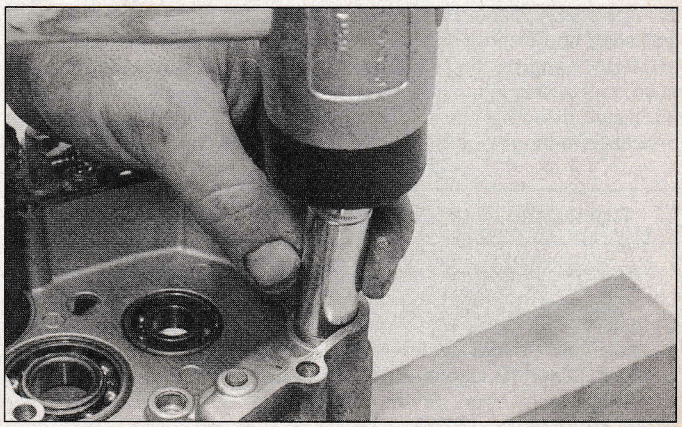
11 All oil seals should be renewed as a matter of course. Pry out the old seals using a flat-bladed screwdriver **(see illustrations)**.

12 If you have to remove any bearings, heat the crankcase area around the bearing with boiling water before tapping the bearing out of the case with a soft mallet. Note that only the shift drum bearing in the right crankcase half has a holding plate **(see illustration)**.

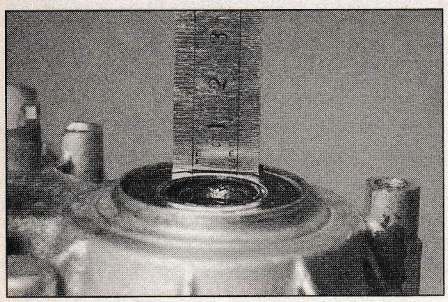
13 Press new oil seals into the crankcase halves using a suitably sized socket as a drift. All seals except one (see Step 14) are pushed in from the inside and should be flush with the surface of the casing **(see illustration)**.



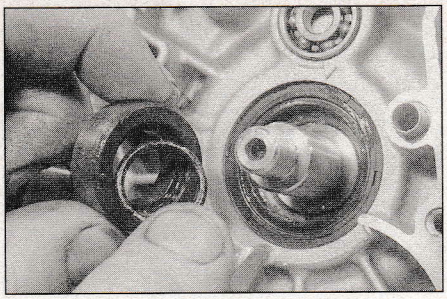
16.12 Shift drum bearing in right-hand crankcase half is retained by a plate (arrow)



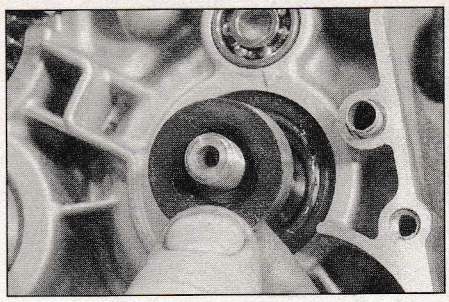
16.13 Press new oil seals into place using a suitably sized socket as a drift



16.14 Transmission countershaft seal is pressed in to a depth of 1.5 mm



16.21a Fit a new O-ring to the collar behind the primary gear . . .



16.21b . . . and refit collar over crankshaft

14 The gearbox output shaft oil seal in the left-hand crankcase is pushed in from the outside of the case so that it is 1.5 mm below the surface of the casing **(see illustration)**.

15 Clean the mating surfaces of the crankcase halves thoroughly and apply a thin layer of liquid gasket to one of the crankcase halves. **Caution:** *Don't apply excess sealant as it will be squeezed into the crankcase or gearbox housing when the two halves are assembled.*

16 Lay the right-hand crankcase half on its side, supported firmly on pieces of wood to prevent it from rocking. Lubricate the oil seal lips with grease and the bearings with clean engine oil. Ensure the two dowel pins are in place.

17 Install the crankshaft (see Section 20) the gearbox mainshaft and countershaft (see Section 19), the shift drum, the shift rod with its three shift forks (see Section 18), and the balancer shaft into the right-hand crankcase half.

18 Lubricate the oil seal lips with grease and the bearings with engine oil in the left-hand crankcase half, then lower it gently into place. You may have to tap it gently around the crankshaft main bearing area with a soft mallet. Check the alignment of the crankshaft and transmission shafts constantly as you fit the left-hand crankcase half.

19 Install all 13 crankcase bolts **(see illustration 16.8)** and secure them finger-tight at this stage.

20 First tighten the six 60 mm bolts around the main bearings, then the five 50 mm bolts and finally the two 75 mm bolts. Check that all shafts revolve freely - if they don't, disassemble the crankcases for inspection.

21 Install a new O-ring into the shouldered collar and install it over the crankshaft **(see illustrations)**. Install the Woodruff key in the crankshaft and locate the primary gear on the crankshaft. Install the concave washer so that the dished side faces in towards the gear (if you think of the washer as a section of the surface of a cone then that cone should be pointing out of the engine). Install the primary gear nut, immobilise the crankshaft and tighten the nut to the torque in this Chapter's Specifications.

22 Install the balancer idler gear with the washers either side and secure with the circlip.

23 Install the neutral switch with its washer. Install the ignition pickup coil (see Chapter 5).

24 Apply molybdenum disulphide grease to the tachometer drive gear and shaft and insert it into the casing; move the balancer shaft back and forth to engage the gear teeth. Install the washer over the shaft and push the housing into place. Secure with its retaining bolt.

25 Install the other assemblies listed in Step 2 of this Section as described in the relevant Sections.

17 Crankcase - inspection

1 After the crankcases have been separated and the crankshaft and transmission components have been removed, the crankcases should be cleaned thoroughly with solvent and dried with compressed air.

2 All traces of old sealant should be removed from the mating surfaces. Minor damage to the surfaces can be cleaned up with a fine sharpening stone or grindstone. **Caution:** *Be very careful not to nick or gouge the crankcase mating surfaces or leaks will result.* Check both crankcase halves very carefully for cracks and other damage.

3 Small cracks or holes in aluminium castings may be repaired with an epoxy resin adhesive as a temporary measure. Permanent repairs can only be effected by argon-arc welding, and only a specialist in this process is in a position to advise on the economy or practical aspect of such a repair. If any damage is found that can't be repaired, replace the crankcase halves as a set.

4 Damaged threads can be economically reclaimed by using a diamond section wire insert, of the Helicoil type, which is easily fitted after drilling and re-tapping the affected thread. Most motorcycle dealers and small engineering firms offer a service of this kind.

5 Sheared bolts can usually be removed with screw extractors, which consist of a tapered, left-hand thread screws of very hard steel. These are inserted into a pre-drilled hole in the stud, and usually succeed in dislodging the most stubborn stud or screw. If a problem arises which seems beyond your scope, it is worth consulting a professional engineering firm before condemning an otherwise sound casing. Many of these firms advertise regularly in the motorcycle press.

6 The condition of the ball races that serve as main bearings and support the transmission shafts, the shift drum and the balancer shaft has to be judged by feel and sound.

7 Clean the bearings in solvent but don't spin them until they have been lubricated with clean engine oil.

8 Spin each bearing by hand. If any bearing is noisy, has any rough spots, sticks, or does not spin smoothly, replace it.

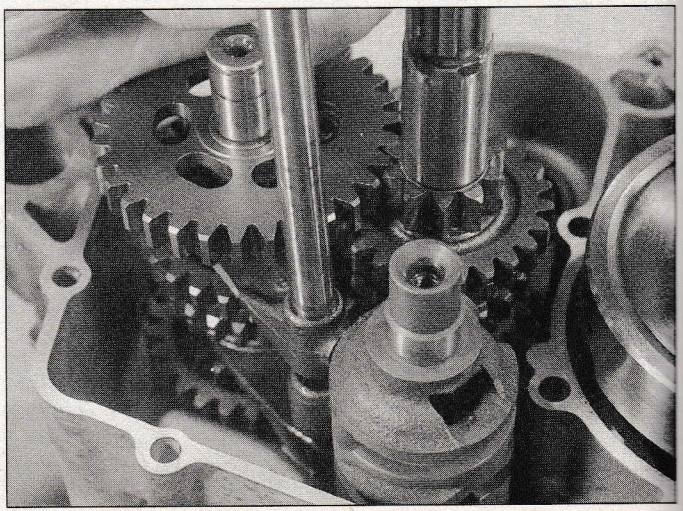
18 Shift drum and forks - removal, inspection and installation

Removal

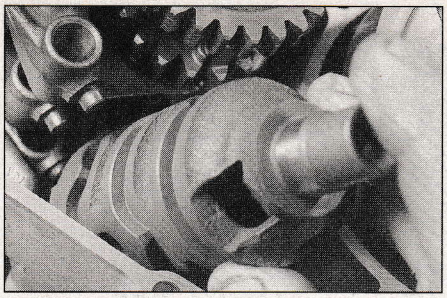
Refer to illustrations 18.2, 18.3 and 18.4

1 Separate the crankcases as described in Section 16.

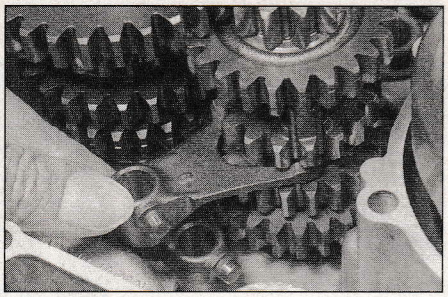
2 Pull the shift rod out of the crankcase **(see illustration)**.



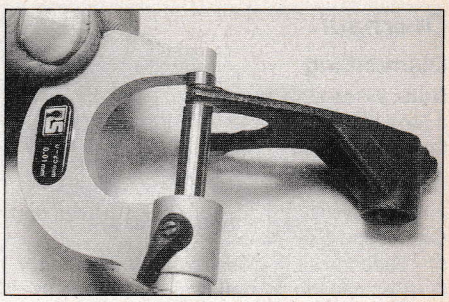
18.2 Remove the shift fork rod



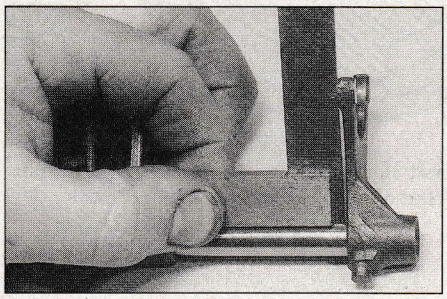
18.3 Disengage the shift fork guide pins from the shift drum and remove the drum



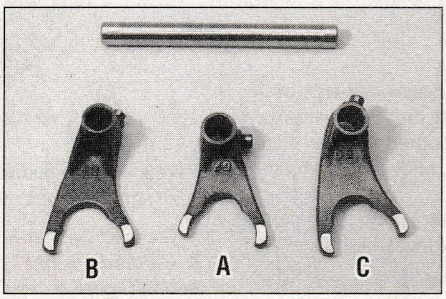
18.4 Remove the three shift forks



18.6 Measuring the shift fork ear thickness



18.7 Check forks for bending with a precision square



18.10 Shorter fork (A) locates with mainshaft; fork on left (B) locates with countershaft 6th gear, and fork on right (C) locates with countershaft 5th gear

18.12 Disc fits over neutral contact pin in the end of shift drum - note locating hole in disc

3 Disengage the shift fork guide pins from the shift drum and pull the drum out of the crankcase along with the neutral contact disc on the left-hand end of the drum **(see illustration)**.

4 Remove the shift forks and slip them back onto their rod as a guide to their positions in the crankcase **(see illustration)**.

Inspection

Refer to illustrations 18.6 and 18.7

5 The shift forks and shaft should be closely inspected to ensure that they are not badly damaged or worn.

6 Measure the shift fork ear thickness. If worn beyond its service limit the shift fork must be replaced **(see illustration)**. Check the width of the corresponding transmission gear grooves.

7 Inspect the forks for bending, the forks should be perpendicular to the axis of the shift rod **(see illustration)**.

8 The shift fork shaft can be checked for trueness by rolling it along a perfectly flat surface. A bent shaft will cause difficulty in selecting gears and make the gearshift action heavy. If the shaft is bent it must be replaced.

9 Measure the width of the shift drum grooves and selector fork guide pins. If any component is worn beyond the service limit or shows signs of damage it must be replaced.

Installation

Refer to illustrations 18.10 and 18.12

10 Apply transmission oil to the shift fork ears and fit them into their grooves on the gears. Note that all three forks are different **(see illustration)**. The mainshaft fork is in centre position on the rod and is much shorter than the other two forks; it locates with the mainshaft 3rd/4th gear. The countershaft left-hand fork locates with the sixth gear groove and its ears are offset from the rod bore; the countershaft right-hand fork locates with the fifth gear and its ears are central with the rod bore.

11 Apply a little transmission oil to the shift rod, pass it through the shift forks and locate it in the crankcase.

12 Fit the neutral disc over the contact pin in the left-hand end of the shift drum **(see illustration)**.

13 Lubricate the drum with transmission oil and install it in the crankcase, locating the fork guide pins in its tracks.

14 Reassemble the crankcases as described in Section 16.

19 Transmission shafts - removal, overhaul and installation

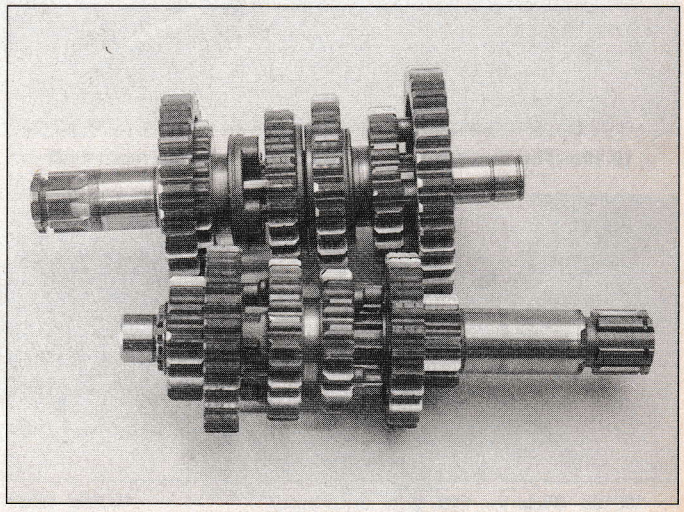
Removal

Refer to illustration 19.3

1 Separate the crankcase halves as described in Section 16.

2 Remove the shift drum and forks as described in Section 18.

3 Lift the mainshaft and countershaft out of the crankcase together, with their gears meshed **(see illustration)**.



19.3 Lift both transmission shafts out of the cases together with their gears meshed

Overhaul

Dismantling

Note: *When disassembling the transmission shafts, place the parts on a long rod or thread a wire through them to keep them in order and facing the proper direction.*

Mainshaft

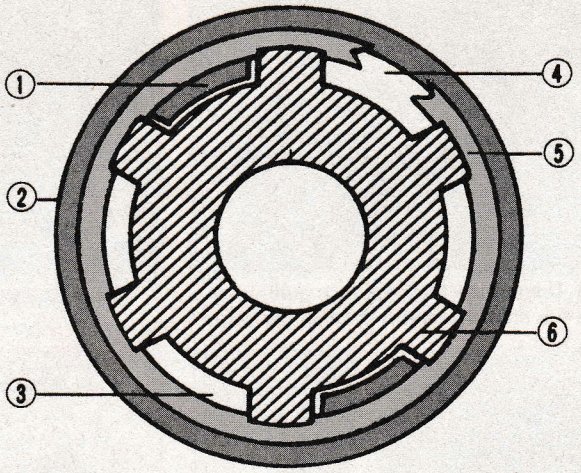
4 Remove the circlip from the left-hand end of the shaft and slide off the second gear pinion.
5 Slide the sixth gear pinion off the shaft.
6 Remove the second circlip, and slide third/fourth gear pinion off the shaft.
7 Remove the third circlip and slide the toothed washer off the shaft followed by fifth gear pinion. First gear pinion is integral with the mainshaft.

Countershaft

8 Remove the circlip from the right-hand (non-splined) end of the shaft and slide off the first gear pinion, followed by the fifth gear pinion.
9 Remove the second circlip, and slide the toothed washer off the shaft, followed by third and fourth gear pinions and another toothed washer.
10 Remove the third circlip and slide the sixth gear pinion off the shaft.
11 Remove the fourth circlip and slide the toothed washer off the shaft followed by the second gear pinion.

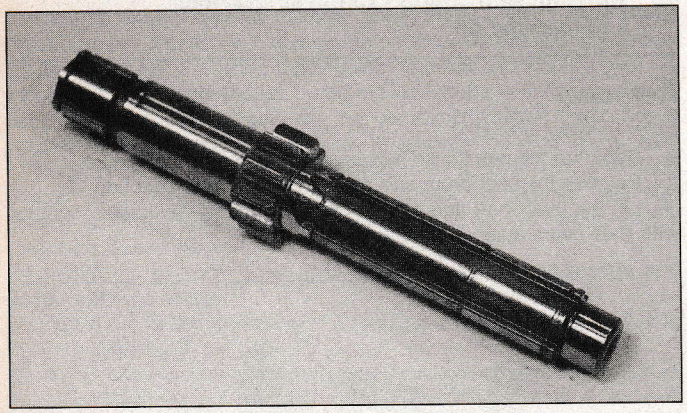
Inspection

12 Wash all of the components in solvent and dry them thoroughly.
13 Check the gear teeth for cracking and other obvious damage. Check the inner diameter of each gear for scoring or heat discoloration. If the gear is damaged, replace it.
14 Inspect the dogs and the dog holes in the gears for excessive wear. Replace the paired gears as a set if necessary.
15 The shafts are unlikely to sustain damage unless the engine has seized, placing an unusually high loading on the transmission, or the machine has covered a very high mileage. Check the surface of each shaft, especially where a pinion turns on it, and replace the shaft if it has scored or picked up. Check the shafts for trueness by setting them up in V-blocks and measuring any runout with a dial gauge. Damage of any kind can only be cured by replacement.
16 Measure the width of the shift fork grooves on the third/fourth gear pinion off the mainshaft and the fifth and sixth gear pinions of the countershaft. If they are outside the service limits given in the Specifications at the start of this Chapter, replace the gear pinion. If the gear grooves are worn, the shift fork ears will likely have a similar amount of wear (see Section 18).
17 Check the ball bearings that support the shafts in the crankcases as described in Section 17. If necessary, renew them as described in Section 16.



19.18 Transmission shaft circlip opening must align with a shaft groove, but must not align with toothed washer tangs

1 Toothed washer tangs
2 Toothed washer
3 Shaft groove
4 Circlip opening
5 Circlip
6 Shaft



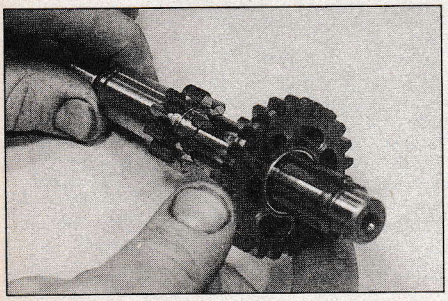
19.19a The first gear pinion is integral with the mainshaft

Reassembly

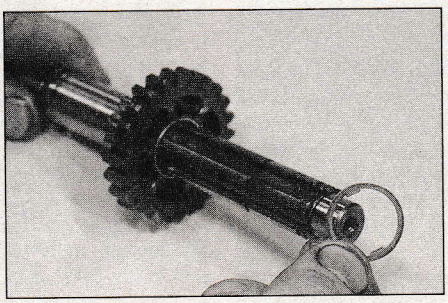
Mainshaft

Refer to illustrations 19.18, 19.19a, 19.19b, 19.20a, 19.20b, 19.21a, 19.21b, 19.22, 19.23a and 19.23b

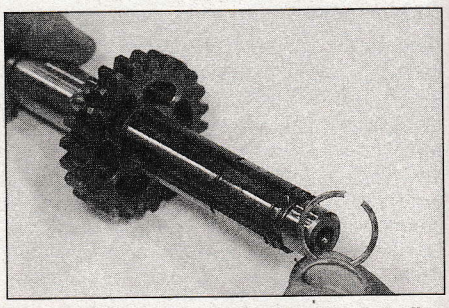
18 When assembling the mainshaft, always use new circlips. Align circlips so that their openings line up with a groove in the shaft, and align the toothed washers so that so that none of their inner teeth line up with an adjacent circlip's opening **(see illustration)**.
19 The 1st gear pinion is integral with the mainshaft **(see illustration)**. Hold the shaft by its left-hand end, and slide fifth gear pinion onto the shaft with its dog holes facing away from first gear pinion **(see illustration)**.
20 Slide a toothed washer up against the fifth gear pinion and secure with the circlip in the shaft groove **(see illustrations)**.



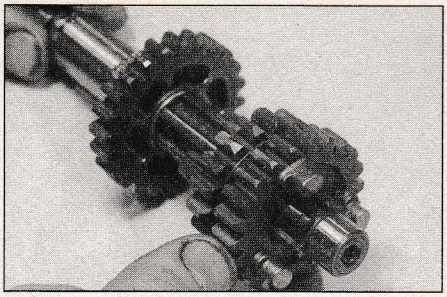
19.19b Slide the fifth gear onto input shaft with its dog holes away from the first gear



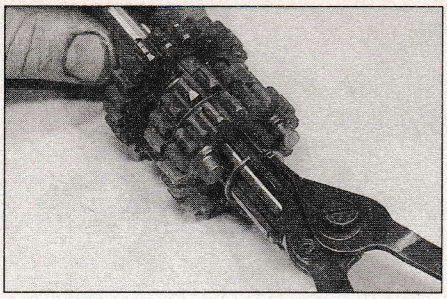
19.20a Slide toothed washer over input shaft . . .



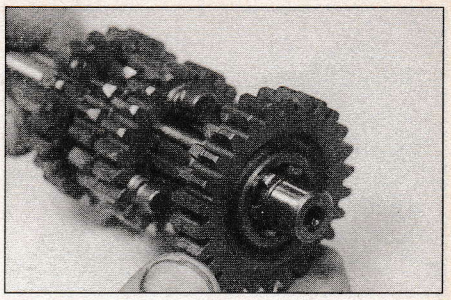
19.20b . . . and secure with a new circlip



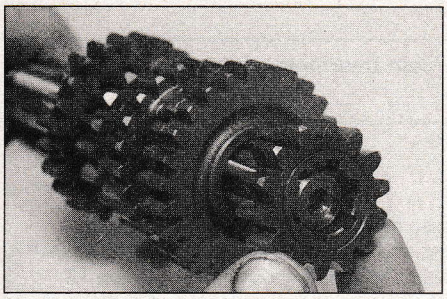
19.21a Fit third/fourth gear pinion with 17 tooth gear facing fifth gear . . .



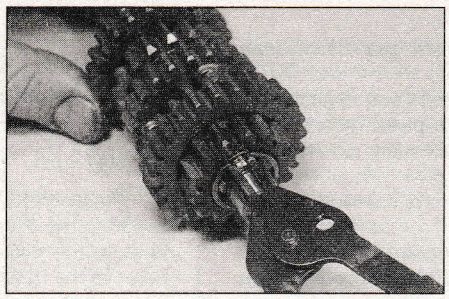
19.21b . . . and secure it with a circlip



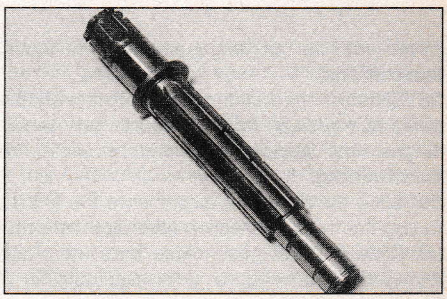
19.22 Slide on sixth gear pinion on with dog engagement holes facing fourth gear



19.23a Slide the second gear pinion on with its groove outermost . . .



19.23b . . . and secure with a new circlip



19.25a Take the bare countershaft . . .

21 Slide the third/fourth gear pinion onto the shaft making sure that the third gear dogs engage with the fifth gear pinion holes. The third gear has 17 teeth as opposed to the fourth gear's 22 teeth. Secure the gear with a circlip, locating it in the shaft groove **(see illustrations)**.

22 Slide the sixth gear pinion onto the shaft with its dog engagement holes facing the fourth gear pinion **(see illustration)**.

23 Slide the second gear pinion onto the shaft; there is a groove on one side of the gear that should face to the left. Secure the gear with a circlip, locating it in the shaft groove **(see illustrations)**.

Countershaft

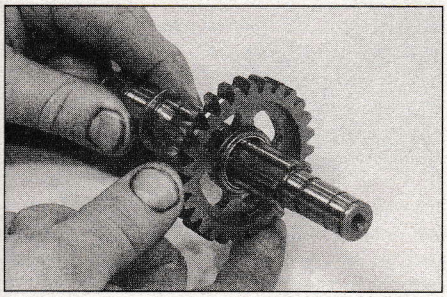
Refer to illustrations 19.25a through 19.25d, 19.26a, 19.26b, 19.27a, 19.27b, 19.28a, 19.28b, 19.28c, 19.29, 19.30a and 19.30b

24 When assembling the countershaft, always use new circlips. Align circlips so that their openings line up with a groove in the shaft, and align the toothed washers so that none of their inner teeth line up with an adjacent circlip's opening **(see illustration 19.18)**.

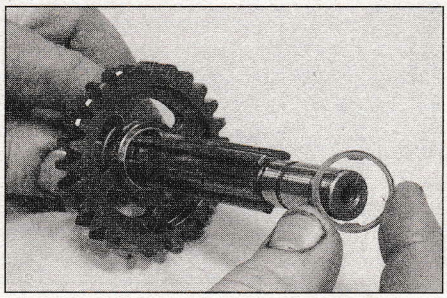
25 Hold the shaft by its left-hand (engine sprocket) end and slide the second gear pinion onto the shaft with the flat side of the gear facing the shaft collar **(see illustrations)**. Slide on a toothed washer and secure it with a circlip, locating it in the shaft groove **(see illustrations)**.

26 Slide sixth gear pinion onto the shaft with its shift fork groove facing away from second gear pinion. Secure it with a circlip in the shaft groove **(see illustrations)**.

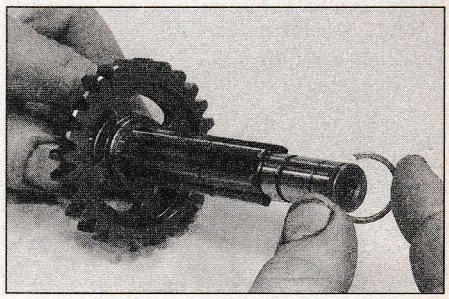
27 Slide a toothed washer onto the shaft followed by fourth gear



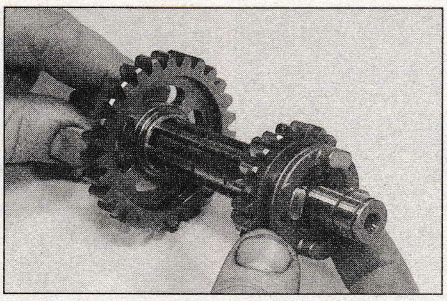
19.25b . . . and slide on second gear pinion with flat slide against shaft collar . . .



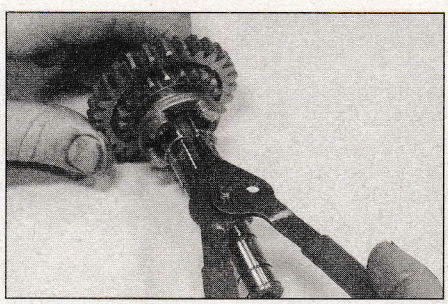
19.25c . . . followed by a toothed washer . . .



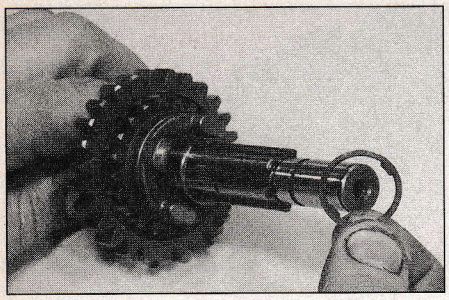
19.25d . . . and a new circlip



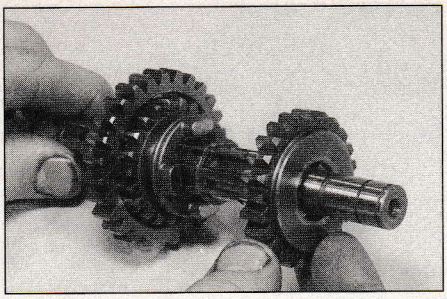
19.26a Slide on sixth gear pinion with fork groove facing away from second gear . . .



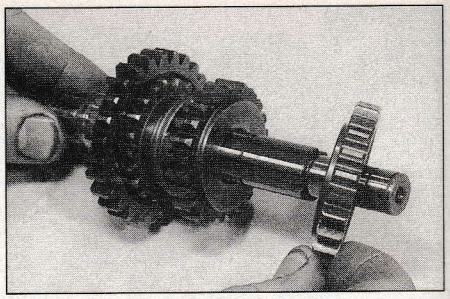
19.26b . . . and secure with a new circlip



19.27a Slide a toothed washer on . . .



19.27b . . . followed by fourth gear pinion with its holes facing sixth gear pinion



19.28a Slide on third gear pinion with its holes facing away from fourth gear . . .

pinion with its dog engagement holes facing sixth gear pinion **(see illustrations)**.

28 Slide the third gear pinion onto the shaft with its dog engagement holes facing away from the fourth gear pinion, followed by a toothed washer and secure them with a circlip in the shaft groove **(see illustrations)**.

29 Slide the fifth gear pinion onto the shaft with its shift fork groove facing the third gear pinion **(see illustration)**.

30 Slide the first gear pinion onto the shaft with its flat side facing outwards and secure with a circlip in the shaft groove **(see illustrations)**.

Installation

Refer to illustration 19.33

31 Prior to installation, check that all gears rotate or slide freely on their shafts.

32 Lubricate the gears and shafts with transmission oil.

33 Mesh the gears together and install both transmission shafts into the crankcase as a single unit **(see illustration)**.

34 Install the shift drum and forks as described in Section 18.

35 Reassemble the crankcases as described in Section 16.

20 Crankshaft and main bearings - removal, inspection and installation

Removal

Refer to illustration 20.7

1 Separate the crankcase halves as described in Section 16.

2 Remove the shift forks and shift drum as described in Section 18.

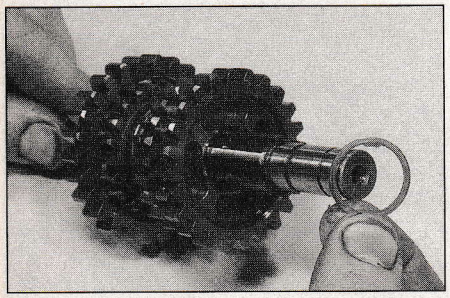
3 Remove the transmission shafts as described in Section 19.

4 Remove the crankshaft from the crankcases. **Caution:** *If the crankshaft is a firm fit in the crankcase half, do not resort to drifting it free, such action could cause flywheel misalignment - have a Kawasaki dealer press the crankshaft out using the special tool.*

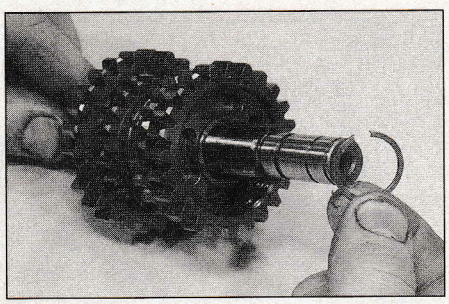
5 The main bearings may stay on the shaft or remain in the crankcases. Gentle local heating of the cases may be necessary to remove them. Place the case in a sink of very hot water or pour hot water over the outside of the case around the main bearing area. The bearing may drop out under its own weight or when the casing is tapped faced down on a wooden surface.

6 If either main bearing remains on the crankshaft, you'll need a special puller to extract it.

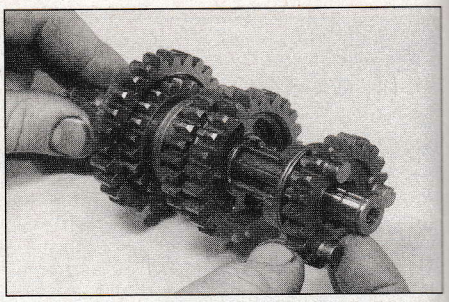
7 Pry the main bearing oil seals out of the crankcases once the bearings have been removed **(see illustration)**.



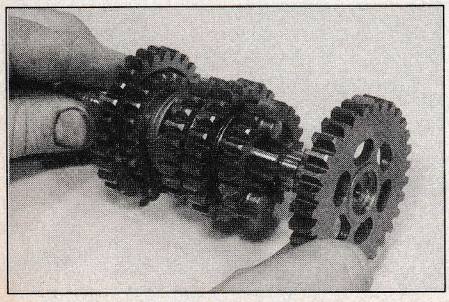
19.28b . . . followed by a toothed washer . . .



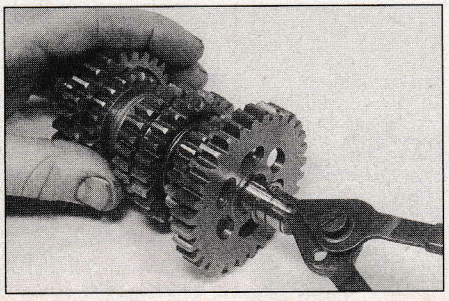
19.28c . . . and secure them with a new circlip



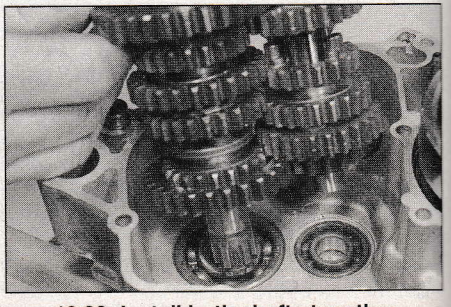
19.29 Slide fifth gear pinion on with its fork groove facing the third gear pinion



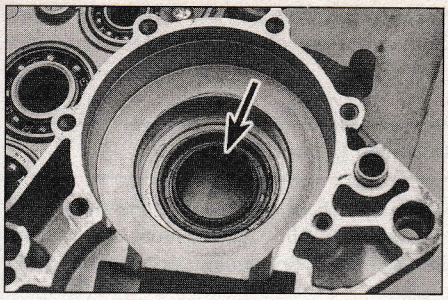
19.30a Slide first gear pinion onto the shaft with its flat slide facing outwards . . .



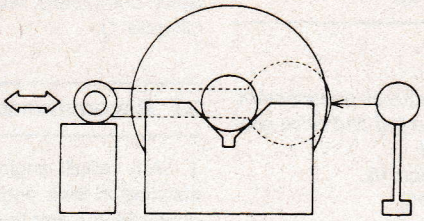
19.30b . . . and secure with a new circlip



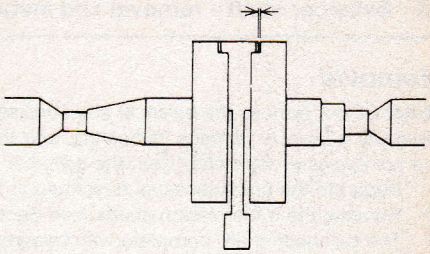
19.33 Install both shafts together



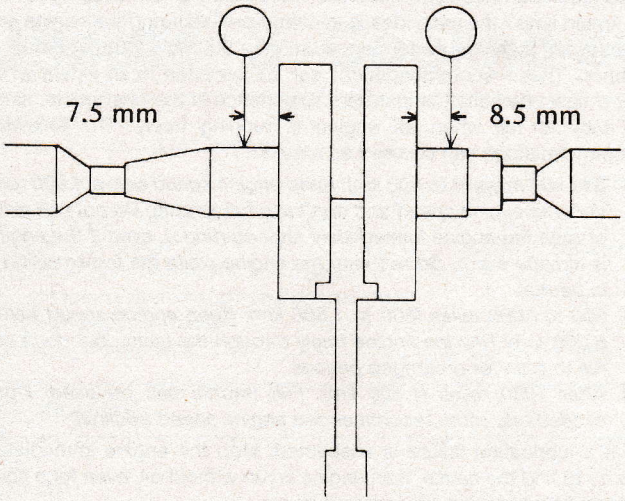
20.7 Pry main bearing oil seals (arrow) out of crankcases



20.10 Measure big-end radial clearance with V-blocks and a dial gauge



20.11 Measure axial clearance with feeler gauges



20.12 Dial gauge positions for crankshaft runout check

Inspection

Main bearing check

8 Check the main bearings in the same way as the other ball races in the crankcases (see Section 17). Note that you do not have to remove the bearings from the cases to check them, but any time the crankcases are split you should take the opportunity to replace the main bearing oil seals.

Connecting rod checks

Refer to illustrations 20.10 and 20.11

9 If the connecting rod big-end bearing is failing, there will be a pronounced knock that is most noticeable when the engine is working hard. The usual causes of big-end failure are normal wear or failure of the lubrication supply. In the case of lubrication failure, the knocking will appear very suddenly and get worse very quickly.

10 Check big-end bearing radial clearance by setting the crankshaft at BTDC on V-blocks with the dial gauge placed against the big-end **(see illustration)**. Push the rod towards the gauge and take a reading then pull it away from the gauge and take a reading. The difference between the readings is the big-end radial clearance. If the clearance is outside the service limit listed in this Chapter's Specifications the crankshaft should be taken to an expert for dismantling and further examination of the connecting rod, big-end bearing and crankpin.

11 Measure big-end axial clearance (side clearance) with feeler gauges **(see illustration)**. If side clearance is excessive the crankshaft should be renewed.

Runout check

Refer to illustration 10.12

12 Set the crankshaft up as shown **(see illustration)** and measure the amount of runout by placing a dial gauge at the specified distance from the flywheel, and rotating the crankshaft slowly. If the difference is outside the service limit given in this Chapter's Specifications the crankshaft is misaligned.

13 It is possible to true a crankshaft, but this work is of a highly specialised nature and requires equipment and skill not likely to be available to the average owner. If the crankshaft/con rod assembly needs to be disassembled, for instance to replace the con-rod or crankpin, the work should be entrusted to a specialist company.

Installation

Refer to illustrations 20.14, 20.15a and 20.15b

14 Press new main bearing oil seals into the crankcases from the inside, using a suitably sized socket as a drift **(see illustration)**.

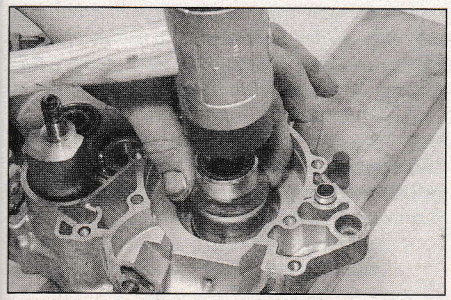
15 Apply high melting-point grease to the sides of the main bearings which face the oil seals, and install them in the crankcases. You may have to heat the cases slightly before gently tapping the bearings home with a soft-faced mallet **(see illustrations)**.

16 Lubricate the oil seal lips generously with engine oil before installing the crankshaft into the right-hand crankcase half.

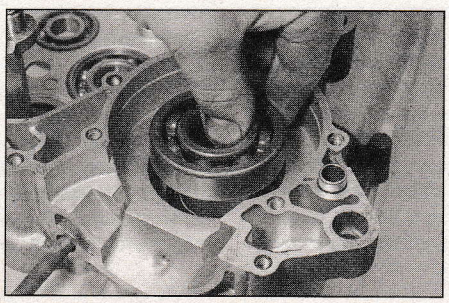
17 Install the transmission shafts as described in Section 19.

18 Install the shift drum and forks as described in Section 18.

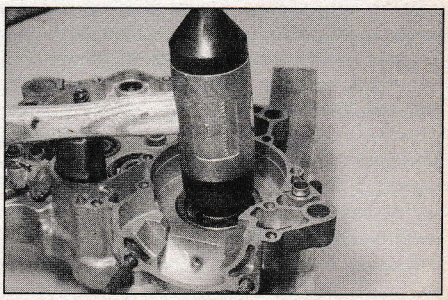
19 Reassemble the crankcases as described in Section 16.



20.14 Install new main bearing oil seals using a suitably sized socket as drift



20.15a Install main bearings in crankcase . . .



20.15b . . . tapping them home with a soft-faced mallet

21 Balancer shaft - removal and installation

Removal

Note: *Do not remove the balancer shaft unless it requires replacement. Removal is likely to damage its bearing, and the bearing and drive gear are not available separately from the balancer shaft.*

1 Separate the crankcases as described in Section 16.
2 Remove the transmission shafts (see Section 19).
3 The balancer shaft, complete with bearing and drive gear must be pressed out of the right-hand crankcase half.

Installation

4 Installation of the balancer shaft is best left to a Kawasaki dealer unless access is available to the installing tool (Pt. No. 57001-1227). This tool is especially shaped to put pressure on the bearing outer race only, and thus prevent damage to the tachometer drive worm on the balancer shaft end.
5 Reassemble the crankcases as described in Section 16. Note the procedure for timing the balancer and primary drive gear in Section 10.

22 Initial start-up after overhaul

1 Make sure the engine oil, transmission oil and coolant levels are correct (see Chapter 1).
2 Make sure there is fuel in the tank, then turn the fuel tap to the ON position and operate the choke.
3 Start the engine and allow it to run at a moderately fast idle until it reaches operating temperature.
4 Check carefully for oil leaks and make sure the transmission and controls, especially the brakes, function properly before road testing the machine. Refer to Section 23 for the recommended running-in procedure.
5 Upon completion of the road test, and after the engine has cooled down completely, recheck the transmission oil and coolant levels (see Chapter 1).

23 Recommended break-in procedure

1 Any rebuilt engine needs time to run-in, even if parts have been installed in their original locations. For this reason, treat the machine gently for the first few miles to make sure any new parts installed have started to seat.
2 Even greater care is necessary if the engine has been fitted with new piston rings or a new crankshaft. This means greater use of the transmission and a restraining hand on the throttle until at least 500 miles (800 km) have been covered. There's no point in keeping to any set speed limit - the main idea is to keep from labouring the engine and to gradually increase performance until the 500 mile (800 km) mark is reached. These recommendations can be lessened to an extent when only a new crankshaft is installed. Experience is the best guide, since it's easy to tell when an engine is running freely. The following recommendations can be used as a guide.

a) *0 to 500 miles (0 to 800 km): Keep engine speed below 4,000 rpm. Vary the engine speed and don't use full throttle. Do not pull away or race the engine immediately after starting it, even if the engine is already warm. Do not race the engine while the transmission is in neutral.*
b) *500 to 1000 miles (800 to 1,600 km): Keep engine speed below 6,000 rpm. Rev the engine freely through the gears, but don't use full throttle for prolonged periods.*
c) *After 1000 miles (1,600 km): Full throttle can be used. Don't exceed maximum recommended engine speed (redline).*

3 If a lubrication failure is suspected, stop the engine immediately and try to find the cause. If an engine is run without oil, even for a short period of time, severe damage will occur.