YAMAHA

XV V-Twins

(XV535, 700, 750, 920, 1000 & 1100 Viragos)

1981 to 1994 □ 535cc □ 699cc □ 748cc □ 920cc □ 981cc □ 1063cc

Owners Workshop Manual

Haynes

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Yamaha XV535 through 1100 Owners Workshop Manual

by Alan Ahlstrand and John H Haynes

Member of the Guild of Motoring Writers

Models covered:

USA: Yamaha XV535 Virago. 535cc. 1987 through 1990 and 1993 through 1994
Yamaha XV535S Virago. 535cc. 1994
Yamaha XV700 Virago. 699cc. 1984 through 1987
Yamaha XV750 Virago. 748cc. 1981 through 1983 and 1988 through 1994
Yamaha XV920 Virago. 920cc. 1982 and 1983
Yamaha XV920R (chain drive). 920cc. 1981 and 1982
Yamaha XV1000 Virago. 981 cc. 1984 and 1985
Yamaha XV1100 Virago. 1063cc. 1986 through 1994

UK: Yamaha XV535. 535cc. 1988 through 1994
Yamaha XV535S. 535cc. 1994
Yamaha XV750SE Special. 748cc. 1981 through 1983
Yamaha XV750 Virago. 748cc. 1992 through 1994
Yamaha TR1 (chain drive). 981 cc. 1981 through 1985
Yamaha XV1000 Virago. 981 cc. 1986 through 1989
Yamaha XV1100 Virago. 1063 cc. 1989 through 1994

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We take great pride in the accuracy of information given in this manual, but motorcycle manufacturers make alterations and design changes during the production run of a particular motorcycle of which they do not inform us. No liability can be accepted by the authors or publishers for loss, damage or injury caused by any errors in, or omissions from, the information given.

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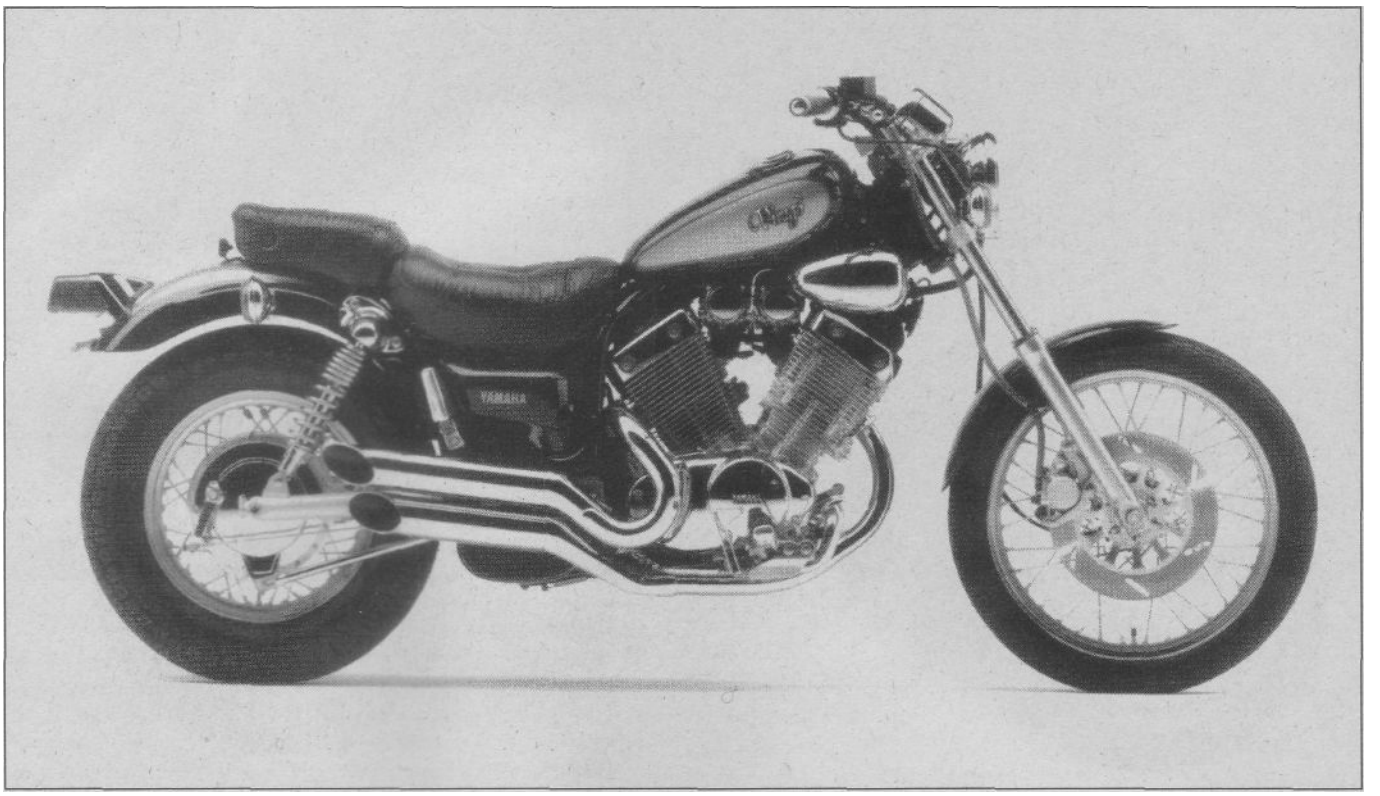
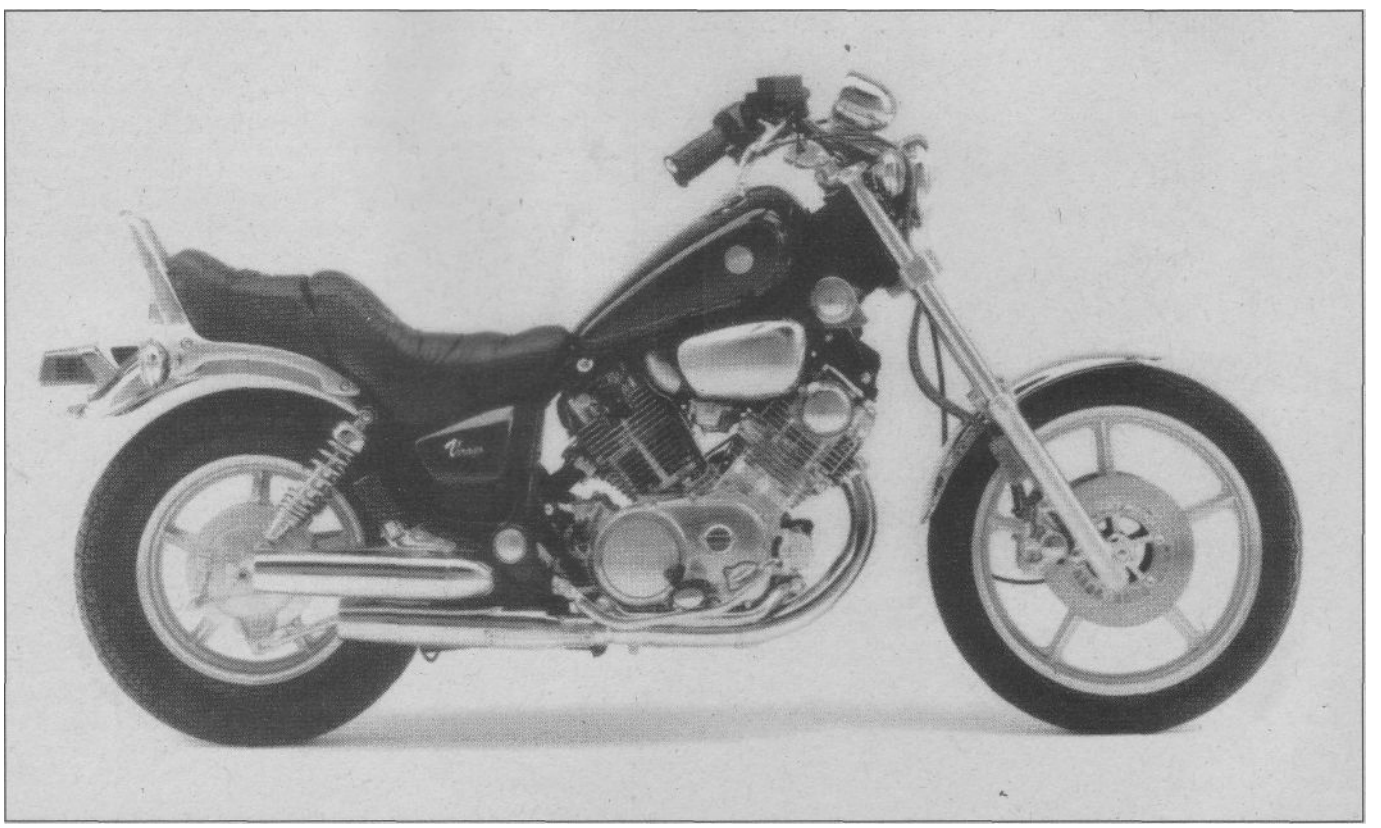
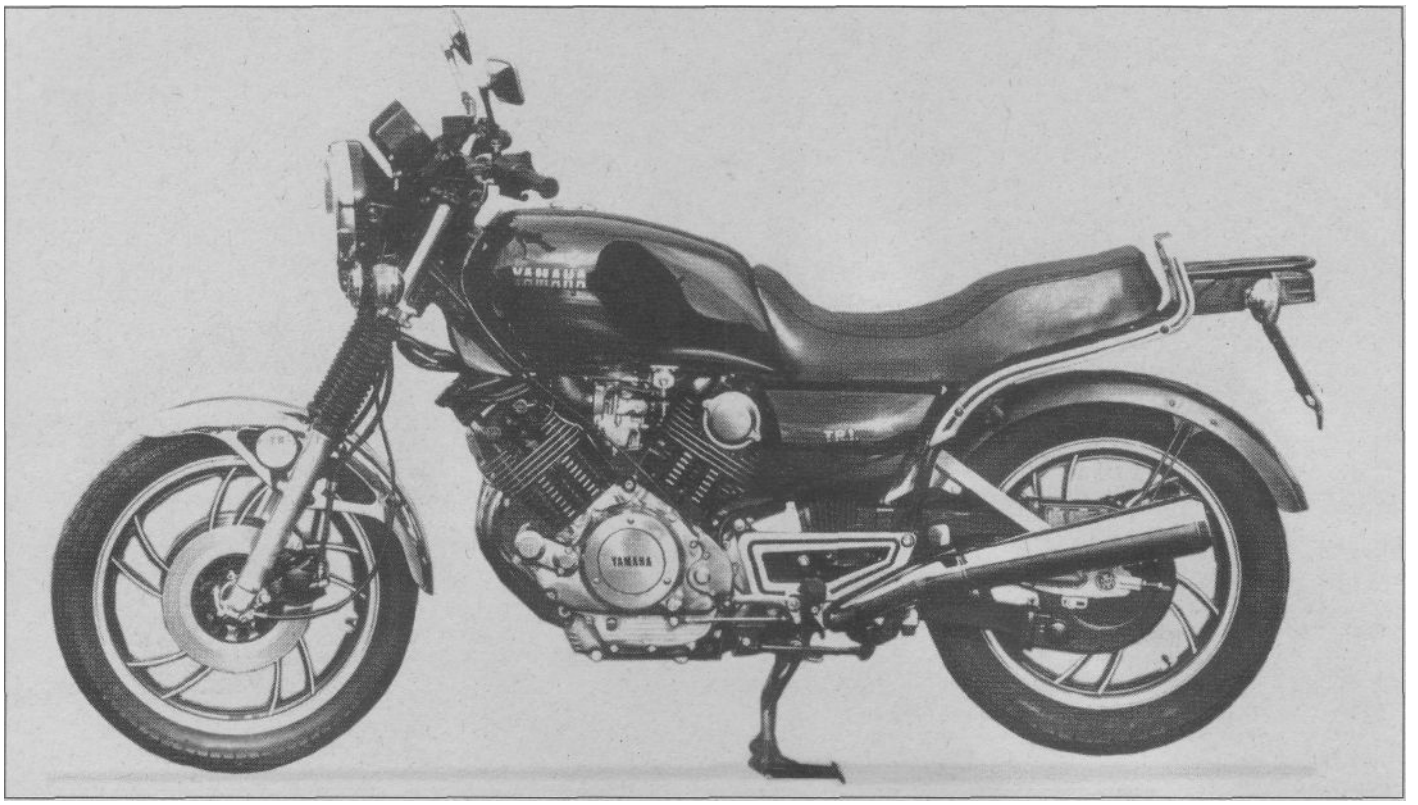


The 1994 XV535S model



The 1985 XV700 Virago model



The TR1 model

The 1994 XV1100 Virago 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 vehicle 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 labor 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.

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 vehicle 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 Yamaha XV

The Yamaha XV (Virago) series are highly successful and popular cruiser-style motorcycles.

The engine on all models is an air-cooled, V-twin with overhead camshafts. .

Fuel is delivered to the cylinders by two Hitachi or Mikuni carburetors; XV535, XV1000 and XV1100 models use an electric fuel pump.

The front suspension uses a pair of conventional forks, adjustable by varying the fork air pressure on some models. Fork damping is adjustable on XV920 J models.

The rear suspension on 1981 through 1983 models uses a single shock absorber and coil spring. Later models use twin rear shock absorbers with concentric coil springs. Spring preload is adjustable on all XV700 through 1100 models; shock absorber damping is adjustable on 1984 and later XV700 through 1100 models.

The front brake uses a single or dual disc; a drum brake is used at the rear.

Shaft final drive is used on most of the bikes covered in this manual. Some models use an unusual chain drive system, with the chain completely enclosed in housings and running in a bath of grease.

Identification numbers

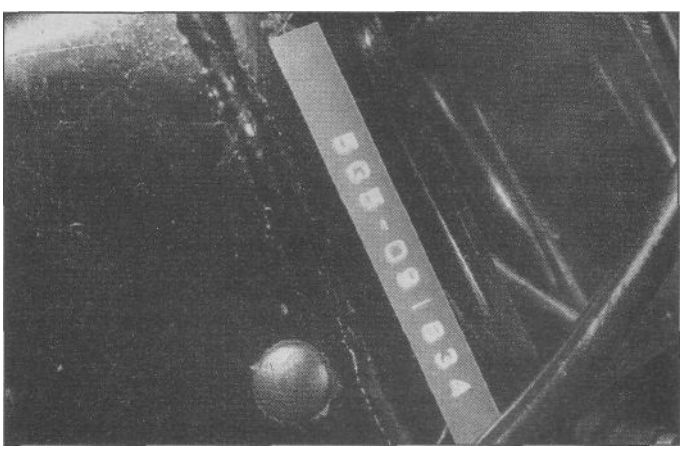
The frame serial number is stamped into the right side of the frame and printed on a label affixed to the frame. The engine number is stamped into the right upper side of the crankcase. Both of these numbers should be recorded and kept in a safe place so they can be furnished to law enforcement officials in the event of a theft.

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

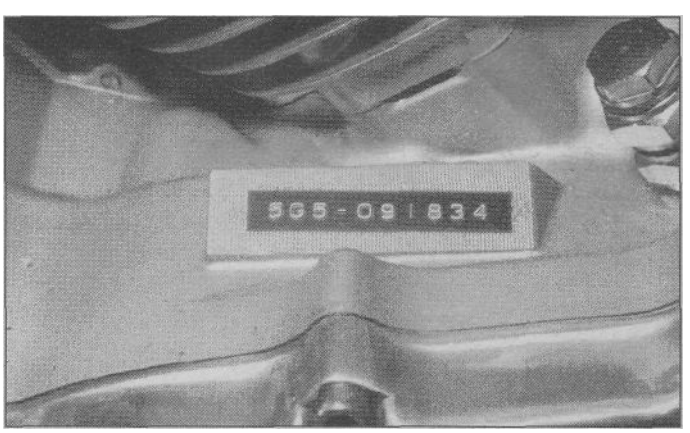
The models covered by this manual are as follows:
XV535, 1987 through 1990 US
XV535, 1993 and 1994 US
XV535, 1988 through 1994 UK
XV700,1984 through 1987 US
XV750, 1981 through 1983 and 1988 through 1994 US
XV750, 1981 through 1983 UK, 1992 through 1994 UK
XV920, 1981 through 1983 US
XV1000 shaft drive, 1984 and 1985 US,
1986 through 1989 UK
XV1000 chain drive (TR1), 1981 through 1985 UK
XV1100, 1986 through 1994 US, 1989 through 1994 UK

Identifying engines and model years

The procedures in this manual identify the bikes by model year. To determine which model year a given machine is, look for the following identification codes in the engine and frame numbers:



The frame number is stamped in the right side of the frame and is also displayed on a decal



The engine number is stamped in the right side of the crankcase

Year	Code
XV535 models	
1987and 1988 US	2GV
1989 and 1990 US	3JC1/3JC2
1993 US	3JC7/3JC8
1994 US	
XV535	3JCA, 3JCB
XV535S	3JCB, 3JCD
1988 UK	3BT1
1989 UK	3BT2/3BT5
1990 UK	3BTC/3BT8
1991 UK	3BTE/3BTF
1992 UK	3BTK/3BTM
1993 UK	3BTR/3BTT
1994 UK	
XV535	4KU2/3BTW
XV535S	4KU4 (flat handlebar)
XV535S	3BTV/3BTY (upright handlebar)
XV700 models	
1984	42W/42X
1985	56E/56F
1986 and 1987	1RM/1RV/1RR/1TU
XV750 models	
1981 through 1983 US	
XV750 H, J, K	4X7
XV750 MK	20X
1988 U S	3AL/3CM
1989 US	3JL1/3JL2
1990 US	3JL4/3JL5
1991 US	3JL7/3JL8
1992 US	3JUV3JLB
1993 US	3JLD/3JLE
1994 US	3JLG/3JLH
1981 through 1983 UK	5G5
1992 and 1993 UK	4FY1
1994 UK	4FY4
XV920 models	
1981 and 1982 chain drive	5H1
1982 shaft drive	10L
1983 shaft drive	
XV920 K	24M
XV920 MK	27Y
XV1000 models	
1984 US	42G/42H
1985 US	56V/56W
1981 UK	5A8
1982 through 1985 UK	19T
1986 and 1987 UK	2AE
1988 and 1989 UK	3DR1
XV1100 models	
1986 and 1987 US	1TE/1TA
1988 US	3CF/3CG
1989 US	3JK1/3JK2
1990 US	3JK4/3JK5
1991 US	3JK7/3JK8
1992 US	3JKB/3JKC
1993 US	3JKA/3JKE
1994 US	3JKG/3JKH
1989 and 1990 UK	3LP1
1991 UK	3LP2
1992 and 1993 UK	3LP4
1994 UK	3LP8

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 wrecking yard (breaker) for direct comparison.

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

General specifications

XV535 models

1987 and 1988 US models

Wheelbase	1511 mm (59.5 inches)
Overall length	2210 mm (87.0 inches)
Overall width	815 mm (32.1 inches)
Overall height	1100 mm (43.3 inches)
Seat height	700 mm (27.6 inches)
Ground clearance (minimum)	145 mm (5.7 inches)
Weight (with oil and full fuel tank)	
US except California	185 kg (408 lbs)
California	186 kg (410 lbs)

1989-on US models

Wheelbase	1520 mm (59.8 inches)
Overall length	2225 mm (87.6 inches)
Overall width	810 mm (31.9 inches)
Overall height	1110 mm (43.7 inches)
Seat height	720 mm (28.3 inches)
Ground clearance (minimum)	160 mm (6.3 inches)
Weight (with oil and full fuel tank)	
US except California	195 kg (430 lbs)
California	196 kg (432 lbs)

1988 UK models

Wheelbase	1520 mm (59.8 inches)
Overall length	2225 mm (87.6 inches)
Overall width	810 mm (31.9 inches)
Overall height	1100 mm (43.3 inches)
Seat height	700 mm (27.6 inches)
Ground clearance (minimum)	160 mm (6.3 inches)
Weight (with oil and full fuel tank)	188 kg (415 lbs)

1989-on UK models

Wheelbase	1520 mm (59.8 inches)
Overall length	2285 mm (90.0 inches)
Overall width	
Flat handlebar	725 mm (88.6 inches)
Upright handlebar	810 mm (31.9 inches)
Overall height	
Flat handlebar	1070 mm (42.1 inches)
Upright handlebar	1110 mm (43.7 inches)
Seat height	720 mm (28.3 inches)
Ground clearance (minimum)	160 mm (6.3 inches)
Weight (with oil and full fuel tank)	195 kg (430 lbs)

XV700 and US XV1000 models

Wheelbase	1525 mm (60.0 inches)
Overall length	2235 mm (88.0 inches)
Overall width	840 mm (33.1 inches)
Overall height	1170 mm (46.1 inches)
Seat height	715 mm (28.1 inches)
Ground clearance (minimum)	145 mm (5.7 inches)
Weight (with oil and full fuel tank)	
1984 and 1985 XV700 models	225 kg (496 lbs)
1986 and 1987 XV700 models	229 kg (505 lbs)
XV1000 models	236 kg (520 lbs)

XV750 models (1981 through 1983)

Wheelbase	1520 mm (59.8 inches)
Overall length	2230 mm (87.8 inches)
Overall width	
US models	805 mm (31,7 inches)
UK models	840 mm (33.1 inches)
Overall height	
US models	1160 mm (45.7 inches)
UK models	1210 mm (47.6 inches)
Seat height	not specified
Ground clearance (minimum)	145 mm (5.7 inches)
Weight (dry)	
US models	225 kg (496 lbs)
UK models	211 kg (465 lbs)

XV750 models (1988-on US)

Wtieelbase	1525 mm (60.0 inches)
Overall length	2285 mm (90.0 inches)
Overall width	840 mm (33.1 inches)
Overall height	1190 mm (46.9 inches)
Seat height	715 mm (28.1 inches)
Ground clearance (minimum)	145 mm (5.7 inches)
Weight	Not specified

XV750 models (1992-on UK)

Wheelbase	1525 mm (60.0 inches)
Overall length	2285 mm (90.0 inches)
Overall width	840 mm (33.1 inches)
Overall height	1190 mm (46.9 inches)
Seat height	715 mm (28.1 inches)
Ground clearance (minimum)	145 mm (5.7 inches)
Weight	
1992 and 1993 models	235 kg (518 lbs)
1994 models	236 kg (520 lbs)

XV920 J models

Wheelbase	1520 mm (59.8 inches)
Overall length	2220 mm (87.4 inches)
Overall width	840 mm (33.1 inches)
Overall height	1205 mm (47.4 inches)
Seat height	Not specified
Ground clearance (minimum)	145 mm (5.7 inches)
Weight	225 kg (496 lbs)

XV920 K and MK models

Wheelbase	1520 mm (59.8 inches)
Overall length	2230 mm (87.8 inches)
Overall width	805 mm (31.7 inches)
Overall height	1160 mm (45.7 inches)
Seat height	Not specified
Ground clearance (minimum)	145 mm (5.7 inches)
Weight	235 kg (518 lbs)

XV920 RH and RJ models

Wheelbase	1540 mm (60.6 inches)
Overall length	2260 mm (89.0 inches)
Overall width	930 mm (36.6 inches)
Overall height	1170 mm (46.1 inches)
Seat height	Not specified
Ground clearance (minimum)	140 mm (5.5 inches)
Weight	224 kg (493 lbs)

XV1000 models (1981 through 1985 UK TR1)

Wheelbase	1540 mm (60.6 inches)
Overall length	2265 mm (89.2 inches)
Overall width	730 mm (28.7 inches)
Overall height	1170 mm (46.1 inches)
Seat height	Not specified
Ground clearance (minimum)	140 mm (5.5 inches)
Weight	220 kg (485 lbs)

XV1100 models (1986-on)

Wheelbase	1525 mm (60.0 inches)
Overall length	
US models	2235 mm (88.0 inches) •
UK models	2285 mm (90.0 inches)
Overall width	840 mm (33.1 inches)
Overall height	
1986 and 1987	1170 mm (46.1 inches)
1988-on	1190 mm (46.9 inches)
Seat height	715 mm (28.1 inches)
Ground clearance (minimum)	145 mm (5.7 inches)
Weight (with oil and full fuel tank)	
US models	239 kg (527 lbs)
UK models	240 kg (529 lbs)

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 organized 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 wrench 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 chiseled off or removed with a special nut breaker, available at tool stores.

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 aluminum), 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 (i.e. cylinder head bolts, engine case bolts, etc.) must be loosened or tightened in a 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 would 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 cupcake or muffin tin is ideal for this purpose, since each cavity can hold the bolts and nuts from a particular area (i.e. engine case bolts, valve cover bolts, engine mount bolts, etc.). A pan of this type is especially helpful when working on assemblies with very small parts (such as the carburetors and the valve train). 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.

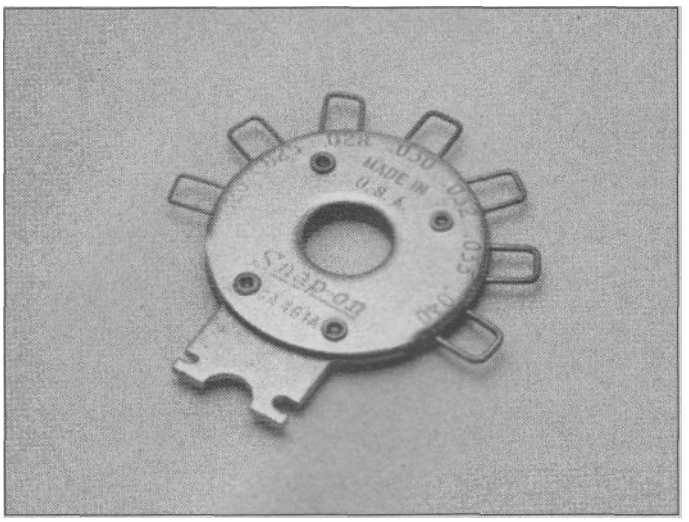
Many times these gaskets are coated with a liquid or paste type gasket sealing compound before assembly. Age, heat and pressure can sometimes cause the two parts to stick together so tightly that they are very difficult to separate. In most cases, the part can be loosened by striking it with a soft-faced hammer near the mating surfaces. A regular 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 apart components, 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.

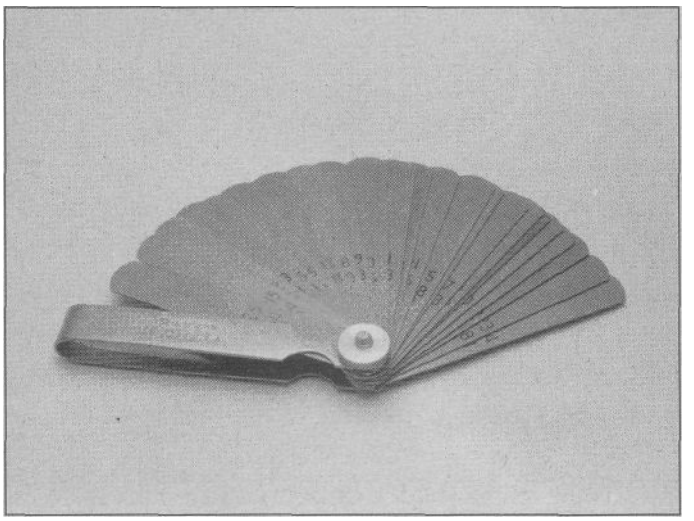
After the parts are separated, the old gasket must be carefully scraped off and the gasket surfaces cleaned. Stubborn gasket material can be soaked with a gasket remover (available in aerosol cans) to soften it so it can be easily scraped off. A scraper can be fashioned from a piece of copper tubing 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

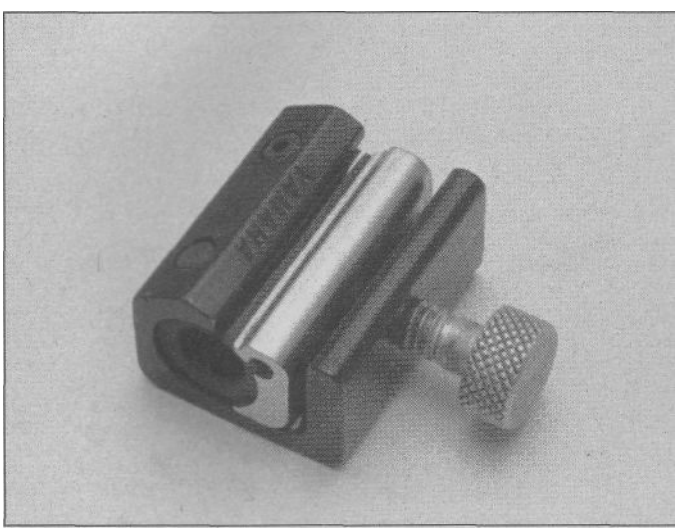
Hose removal precautions closely parallel gasket removal precautions. Avoid scratching or gouging the surface that the hose mates against or the connection may leak. Because of various chemical reactions, the rubber in hoses can bond itself to the metal spigot that the hose fits over. To remove a hose, 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.



Spark plug gap adjusting tool

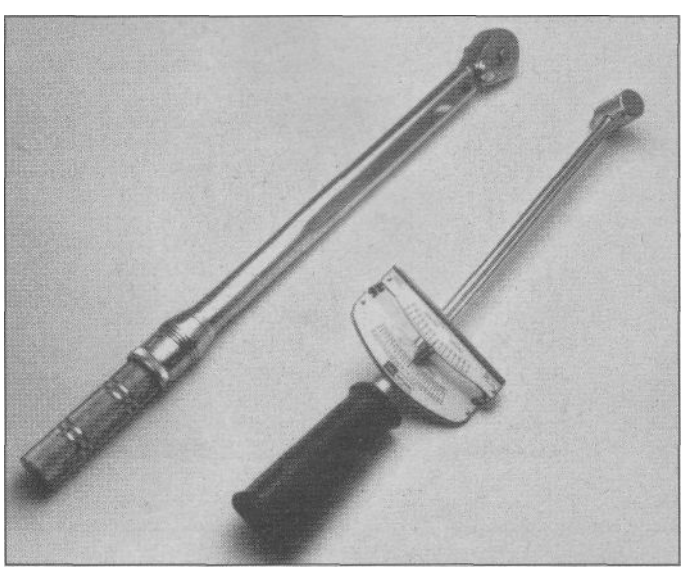


Feeler gauge set



Control cable pressure luber

Hand impact screwdriver and bits



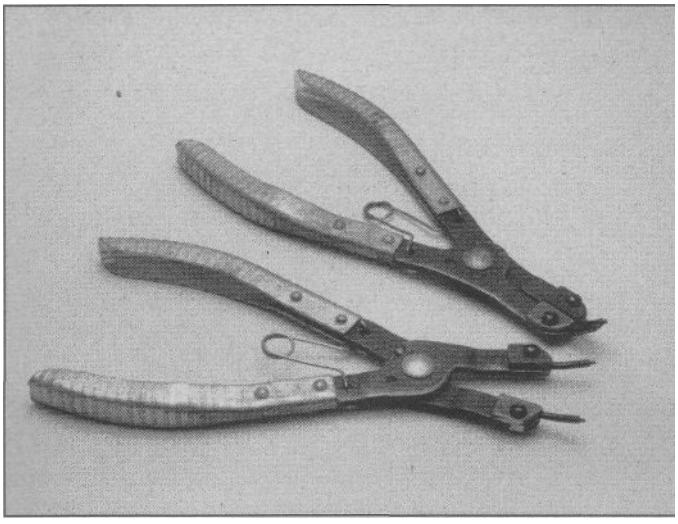
Torque wrenches (left - click type; right - beam type)

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

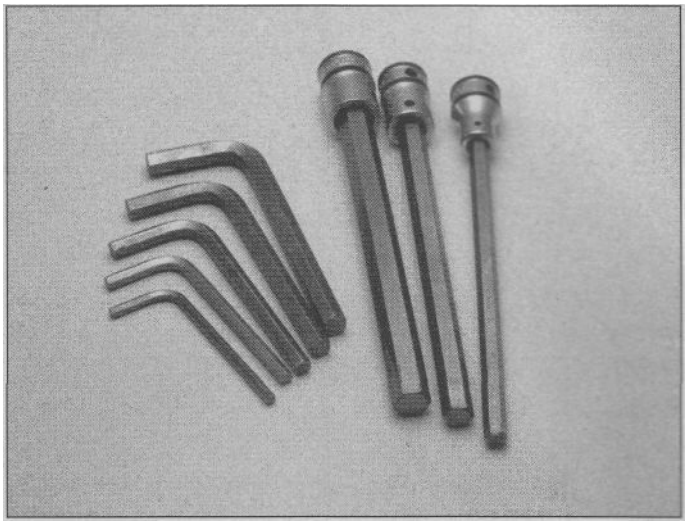
Tools

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 spiraling costs of routine maintenance and repair, it is a wise one.

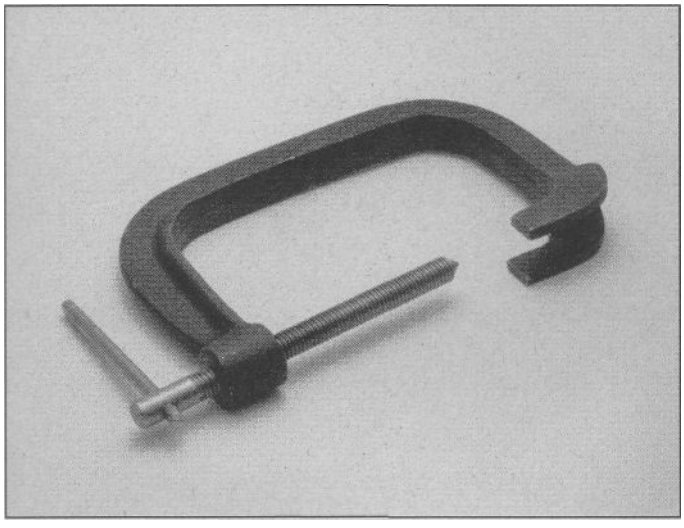
To help the owner decide which tools are needed to perform the tasks detailed in this manual, the following tool lists are offered: Maintenance and minor repair, Repair and overhaul and Special. The newcomer to practical mechanics should start off with the Maintenance and minor repair tool kit, which 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 set 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.



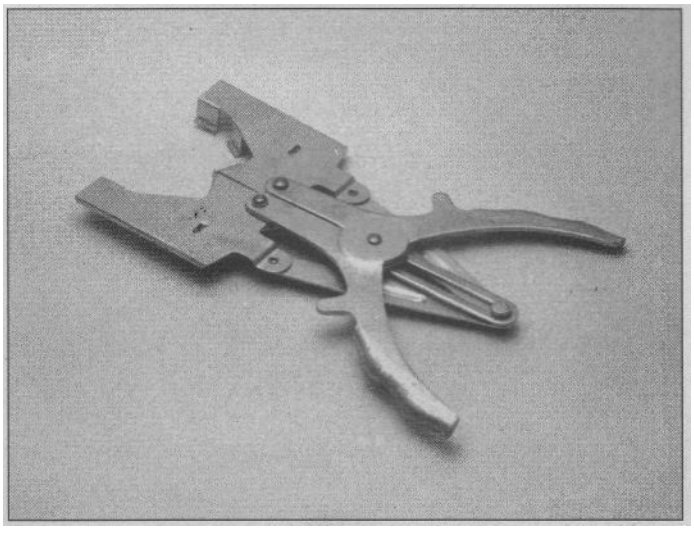
Snap-ring pliers (top - external; bottom - internal)



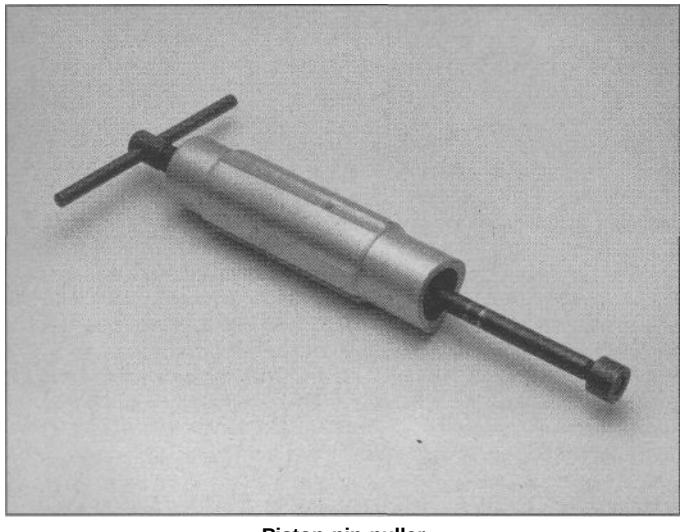
Allen wrenches (left) and Allen head sockets (right)



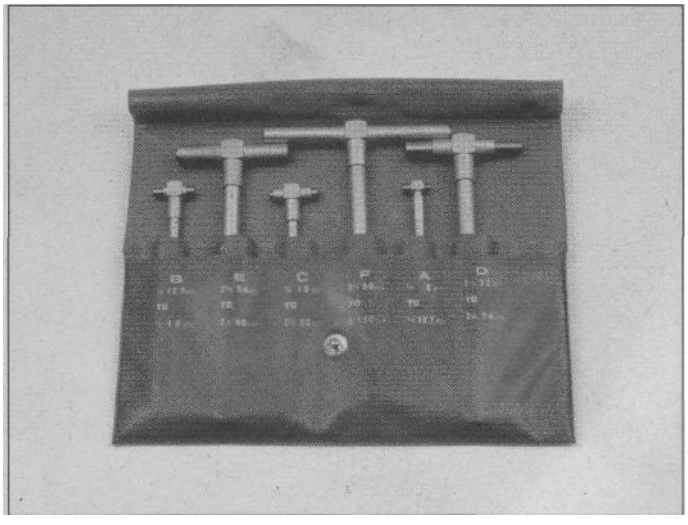
Valve spring compressor



Piston ring removal/installation tool

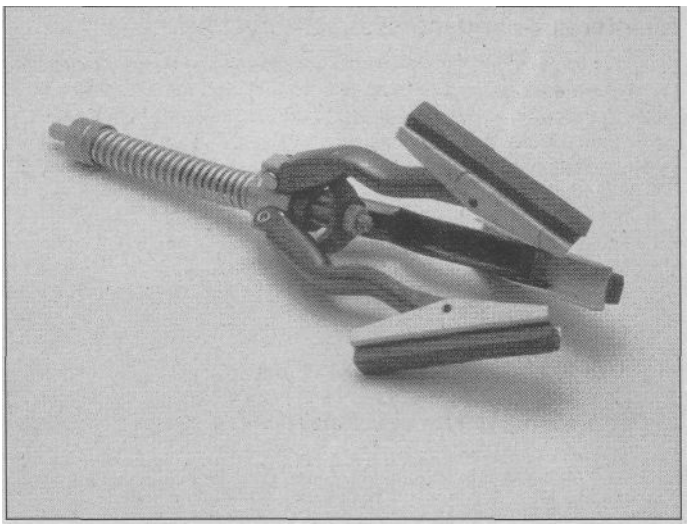


Piston pin puller

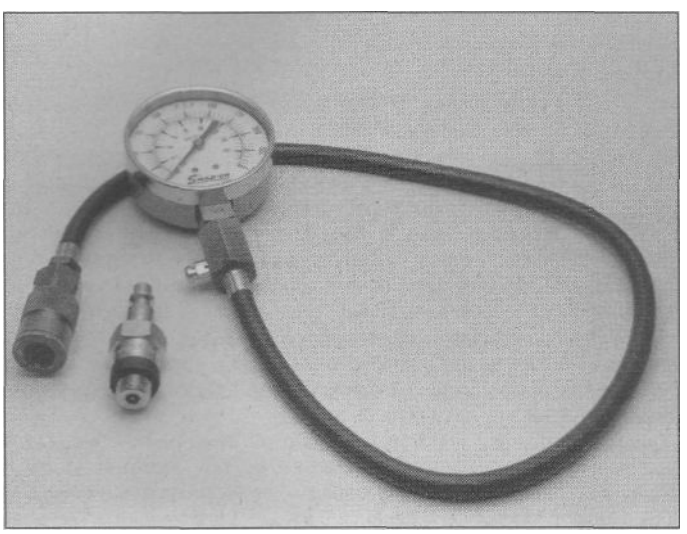


Telescoping gauges

0-to1-inch micrometer



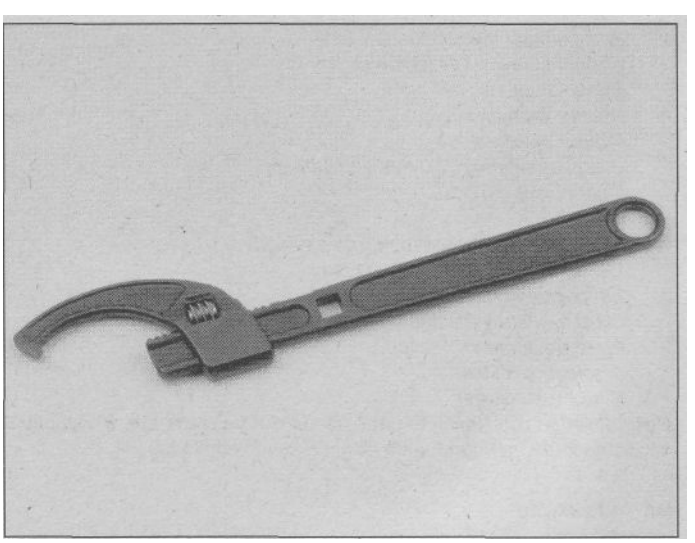
Cylinder surfacing hone



Cylinder compression gauge

Dial indicator set

Multimeter (volt/ohm/ammeter)



Adjustable spanner

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 wrenches (box end and open end combined in one wrench); while more expensive than open-ended ones, they offer the advantages of both types of wrench.

Combination wrench set (6 mm to 22 mm)
Adjustable wrench -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. 2x6 in)
Allen (hex) wrench set (4 mm to 12 mm)
Combination (slip-joint) pliers - 6 in
Hacksaw and assortment of blades
Tire pressure gauge
Control cable pressure luber
Grease gun
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).

Socket set(s)
Reversible ratchet
Extension - 6 in
Universal joint
Torque wrench (same size drive as sockets)
Ball pein hammer - 8 oz
Soft-faced hammer (plastic/rubber)
Standard screwdriver (1/4 in x 6 in)
Standard screwdriver (stubby - 5/16 in)
Phillips screwdriver (No. 3x8 in)
Phillips screwdriver (stubby - No. 2)
Pliers - locking
Pliers - lineman's
Pliers - needle nose
Pliers - snap-ring (internal and external)
Cold chisel - 1/2 in
Scriber
Scraper (made from flattened copper tubing)
Center punch
Pin punches (1/16, 1/8, 3/16 in)
Steel rule/straightedge - 12 in
Pin-type spanner wrench
A selection of files
Wire brush (large)

Note: Another tool which is often 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 (i.e. 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 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.

Valve spring compressor
Piston ring removal and installation tool
Piston pin puller
Telescoping gauges
Micrometers) and/or dial/Vernier calipers
Cylinder surfacing hone
Cylinder compression gauge
Dial indicator set
Multimeter
Adjustable spanner
Manometer or vacuum gauge set
Small air compressor with blow gun and tire chuck

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 savings 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 set 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, wrenches 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 vise 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 authorized disposal site or service station. Plastic jugs 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 filler 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 paint work 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 wrenches 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 tire to a pressure above the recommended maximum. Apart from over stressing the carcase and wheel rim, in extreme cases the tire 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 wrench, 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 gasoline (petrol) is highly flammable. Never smoke or have any kind of naked flame 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 gasoline (petrol) vapor, which in a confined space is highly explosive. Never use gasoline (petrol) as a cleaning solvent. Use an approved safety solvent.

Always disconnect the battery ground (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. Gasoline (petrol) vapor comes into this category, as do the vapors 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 vapors.

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 ground (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 grounded (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 vapor. 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 can also be used to remove gum and varnish from carburetor jets and other orifices.

Carburetor *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 colored 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, a s 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 weights (viscosity ratings) of from 5 to 80. The recommended weight of the oil depends on the seasonal temperature and the demands on the engine. Light oil is used in cold climates and under light load conditions; heavy 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.

Gas (petrol) additives perform several functions, depending on their chemical makeup. They usually contain solvents that help dissolve gum and varnish that build up on carburetor and intake parts. They also serve to break down carbon deposits that form on the inside surfaces of the combustion chambers. Some additives contain upper cylinder lubricants for valves and piston rings.

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 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 gasoline 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 cement is an adhesive locking compound 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 utilize a chemical or abrasive cleaner to help remove the top layer of oxidized (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

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Engine doesn't start or is difficult to start

1 Starter motor does not rotate

1 Engine kill switch Off.
2 Fuse blown. Check fuse block (Chapter 8).
3 Battery voltage low. Check and recharge battery (Chapter 8).
4 Starter motor defective. Make sure the wiring to the starter is secure. Test starter relay (Chapter 8). If the relay is good, then the fault is in the wiring or motor.
5 Starter relay faulty. Check it according to the procedure in Chapter 8.
6 Starter switch not contacting. The contacts could be wet, corroded or dirty. Disassemble and clean the switch (Chapter 8).
7 Wiring open or shorted. Check all wiring connections and harnesses to make sure that they are dry, tight and not corroded. Also check for broken or frayed wires that can cause a short to ground (see wiring diagram, Chapter 8).
8 Ignition switch defective. Check the switch according to the procedure in Chapter 8. Replace the switch with a new one if it is defective.
9 Engine kill switch defective. Check for wet, dirty or corroded contacts. Clean or replace the switch as necessary (Chapter 8).

2 Starter motor rotates but engine does not turn over

1 Starter motor clutch defective. Inspect and repair or replace (Chapter 8).
2 Damaged idler or starter gears. Inspect and replace the damaged parts (Chapter 2).

3 Starter works but engine won't turn over (seized)

Seized engine caused by one or more internally damaged components. Failure due to wear, abuse or lack of lubrication. Damage can include seized valves, valve lifters, camshaft, pistons, crankshaft, connecting rod bearings, or transmission gears or bearings. Refer to Chapter 2 for engine disassembly.

4 No fuel flow

1 No fuel in tank.
2 Fuel tap vacuum hose (if equipped) broken or disconnected.
3 Tank cap air vent obstructed. Usually caused by dirt or water. Remove it and clean the cap vent hole.
4 Inline fuel filter clogged. Replace the filter (Chapter 1).
5 Electric fuel pump not working (if equipped). Test it according to the procedures in Chapter 8.
6 Fuel line clogged. Pull the fuel line loose and carefully blow through it.
7 Inlet needle valve clogged. For both of the valves to be clogged, either a very bad batch of fuel with an unusual additive has been used, or some other foreign material has entered the tank. Many times after a machine has been stored for many months without running, the fuel turns to a varnish-like liquid and forms deposits on the inlet needle valves and jets. The carburetors should be removed and overhauled if draining the float chambers doesn't solve the problem.

5 Engine flooded

1 Fuel level too high. Check and adjust as described in Chapter 3.
2 Inlet needle valve worn or stuck open. A piece of dirt, rust or other debris can cause the inlet needle to seat improperly, causing excess fuel to be admitted to the float bowl. In this case, the float chamber should be cleaned and the needle and seat inspected. If the needle and seat are worn, then the leaking will persist and the parts should be replaced with new ones (Chapter 3).
3 Starting technique incorrect. Under normal circumstances (i.e., if all the carburetor functions are sound) the machine should start with little or no throttle. When the engine is cold, the choke should be operated and the engine started without opening the throttle. When the engine is at operating temperature, only a very slight amount of throttle should be necessary. If the engine is flooded, turn the fuel tap off and hold the throttle open while cranking the engine. This will allow additional air to reach the cylinders. Remember to turn the fuel tap back on after the engine starts.

6 No spark or weak spark

1 Ignition switch Off.
2 Engine kill switch turned to the Off position.
3 Battery voltage low. Check and recharge battery as necessary (Chapter 8).
4 Spark plug dirty, defective or worn out. Locate reason for fouled plug(s) using spark plug condition chart and follow the plug maintenance procedures in Chapter 1.
5 Spark plug cap or secondary (HT) wiring faulty. Check condition. Replace either or both components if cracks or deterioration are evident (Chapter 4).
6 Spark plug cap not making good contact. Make sure that the plug cap fits snugly over the plug end.
7 Igniter defective. Check the unit, referring to Chapter 4 for details.
8 Pickup coil(s) defective. Check the unit(s), referring to Chapter 4 for details.
9 Ignition coil(s) defective. Check the coils, referring to Chapter 4.
10 Ignition or kill switch shorted. This is usually caused by water, corrosion, damage or excessive wear. The switches can be disassembled and cleaned with electrical contact cleaner. If cleaning does not help, replace the switches (Chapter 8),
11 Wiring shorted or broken between:

a) Ignition switch and engine kill switch (or blown fuse)
b) Igniter and engine kill switch
c) Igniter and ignition coil
d) Ignition coil and plug
e) Igniter and pickup coil(s)

Make sure that all wiring connections are clean, dry and tight. Look for chafed and broken wires (Chapters 4 and 8).

7 Compression low

1 Spark plug loose. Remove the plug and inspect the threads. Reinstall and tighten to the specified torque (Chapter 1).
2 Cylinder head not sufficiently tightened down. If a cylinder head is suspected of being loose, then there's a chance that the gasket or head is damaged if the problem has persisted for any length of time. The head nuts and bolts should be tightened to the proper torque in the correct sequence (Chapter 2).
3 Improper valve clearance. This means that the valve is not closing completely and compression pressure is leaking past the valve. Check and adjust the valve clearances (Chapter 1).
4 Cylinder and/or piston worn. Excessive wear will cause compression pressure to leak past the rings. This is usually accompanied by worn rings as well. A top end overhaul is necessary (Chapter 2).
5 Piston rings worn, weak, broken, or sticking. Broken or sticking piston rings usually indicate a lubrication or carburetion problem that causes excess carbon deposits or seizures to form on the pistons and rings. Top end overhaul is necessary (Chapter 2).
6 Piston ring-to-groove clearance excessive. This is caused by excessive wear of the piston ring lands. Piston replacement is necessary (Chapter 2).

7 Cylinder head gasket damaged. If one of the heads is allowed to become loose, or if excessive carbon build-up on a piston crown and combustion chamber causes extremely high compression, the head gasket may leak. Retorquing the head is not always sufficient to restore the seal, so gasket replacement is necessary (Chapter 2).
8 Cylinder head warped. This is caused by overheating or improperly tightened head nuts and bolts. Machine shop resurfacing or head replacement is necessary (Chapter 2).
9 Valve spring broken or weak. Caused by component failure or wear; the spring(s) must be replaced (Chapter 2).
10 Valve not seating properly. This is caused by a bent valve (from over-revving or improper valve adjustment), burned valve or seat (improper carburetion) or an accumulation of carbon deposits on the seat (from carburetion or lubrication problems). The valves must be cleaned and/or replaced and the seats serviced if possible (Chapter 2).

8 Stalls after starting

1 Improper choke action. Make sure the choke lever (XV535) or choke cable (all others) is getting a full stroke and staying in the out position.
2 Ignition malfunction. See Chapter 4.
3 Carburetor malfunction. See Chapter 3.
4 Fuel contaminated. The fuel can be contaminated with either dirt or water, or can change chemically if the machine is allowed to sit for several months or more. Drain the tank and float bowls (Chapter 3).
5 Intake air leak. Check for loose carburetor-to-intake joint connections, loose or missing vacuum gauge access port cap or hose, or loose carburetor top (Chapter 3).
6 Engine idle speed incorrect. Turn throttle stop screw until the engine idles at the specified rpm (Chapter 1).

9 Rough idle

1 Ignition malfunction. See Chapter 4.
2 Idle speed incorrect. See Chapter 1.
3 Carburetors not synchronized. Adjust carburetors with vacuum gauge or manometer set as described in Chapter 1.
4 Carburetor malfunction. See Chapter 3.
5 Fuel contaminated. The fuel can be contaminated with either dirt or water, or can change chemically if the machine is allowed to sit for several months or more. Drain the tank and float bowls (Chapter 3).
6 Intake air leak. Check for loose carburetor-to-intake joint connections, loose or missing vacuum gauge access port cap or hose, or loose carburetor top (Chapter 3).
7 Air cleaner clogged. Service or replace air filter element (Chapter 1).

Poor running at low speed

10 Spark weak

1 Battery voltage low. Check and recharge battery (Chapter 8).
2 Spark plug fouled, defective or worn out. Refer to Chapter 1 for spark plug maintenance.
3 Spark plug cap or high tension wiring defective. Refer to Chapters 1 and 4 for details on the ignition system.
4 Spark plug cap not making contact.
5 Incorrect spark plug. Wrong type, heat range or cap configuration. Check and install correct plugs listed in Chapter 1. A cold plug or one with a recessed firing electrode will not operate at low speeds without fouling.
6 Igniter defective. See Chapter 4.
7 Pickup coil(s) defective. See Chapter 4.
8 Ignition coil(s) defective. See Chapter 4.

11 Fuel/air mixture incorrect

1 Pilot screw(s) out of adjustment (Chapters 1 and 3).
2 Pilot jet or air passage clogged. Remove and overhaul the carburetors (Chapter 3).
3 Air bleed holes clogged. Remove carburetor and blow out all passages (Chapter 3).
4 Air cleaner clogged, poorly sealed or missing.
5 Air cleaner-to-carburetor boot poorly sealed. Look for cracks, holes or loose clamps and replace or repair defective parts.
6 Fuel level too high or too low. Adjust the floats (Chapter 3).
7 Fuel tank air vent obstructed. Make sure that the air vent passage in the filler cap is open.
8 Carburetor intake joints loose. Check for cracks, breaks, tears or loose clamps or bolts. Repair or replace the rubber boots.

12 Compression low

1 Spark plug loose. Remove the plug and inspect the threads. Reinstall and tighten to the specified torque (Chapter 1).
2 Cylinder head not sufficiently tightened down. If the cylinder head is suspected of being loose, then there's a chance that the gasket and head are damaged if the problem has persisted for any length of time. The head nuts and bolts should be tightened to the proper torque in the correct sequence (Chapter 2).
3 Improper valve clearance. This means that the valve is not closing completely and compression pressure is leaking past the valve. Check and adjust the valve clearances (Chapter 1).
4 Cylinder and/or piston worn. Excessive wear will cause compression pressure to leak past the rings. This is usually accompanied by worn rings as well. A top end overhaul is necessary (Chapter 2).
5 Piston rings worn, weak, broken, or sticking. Broken or sticking piston rings usually indicate a lubrication or carburetion problem that causes excess carbon deposits or seizures to form on the pistons and rings. Top end overhaul is necessary (Chapter 2).
6 Piston ring-to-groove clearance excessive. This is caused by excessive wear of the piston ring lands. Piston replacement is necessary (Chapter 2).
7 Cylinder head gasket damaged. If a head is allowed to become loose, or if excessive carbon build-up on the piston crown and combustion chamber causes extremely high compression, the head gasket may leak. Retorquing the head is not always sufficient to restore the seal, so gasket replacement is necessary (Chapter 2).
8 Cylinder head warped. This is caused by overheating or improperly tightened head nuts and bolts. Machine shop resurfacing or head replacement is necessary (Chapter 2).
9 Valve spring broken or weak. Caused by component failure or wear; the spring(s) must be replaced (Chapter 2).
10 Valve not seating properly. This is caused by a bent valve (from over-revving or improper valve adjustment), burned valve or seat (improper carburetion) or an accumulation of carbon deposits on the seat (from carburetion, lubrication problems). The valves must be cleaned and/or replaced and the seats serviced if possible (Chapter 2).

13 Poor acceleration

1 Carburetors leaking or dirty. Overhaul the carburetors (Chapter 3).
2 Timing not advancing. The pickup coil(s) or the igniter may be defective. If so, they must be replaced with new ones, as they can't be repaired.
3 Carburetors not synchronized. Adjust them with a vacuum gauge set or manometer (Chapter 1).
4 Engine oil viscosity too high. Using a heavier oil than that recommended in Chapter 1 can damage the oil pump or lubrication system and cause drag on the engine.

5 Brakes dragging. Usually caused by debris which has entered the brake piston sealing boot, or from a warped disc or bent axle. Repair as necessary (Chapter 6).

Poor running or no power at high speed

14 Firing incorrect

1 Air filter restricted. Clean or replace filter (Chapter 1).
2 Spark plug fouled, defective or worn out. See Chapter 1 for spark plug maintenance.
3 Spark plug cap or secondary (HT) wiring defective. See Chapters 1 and 4 for details of the ignition system.
4 Spark plug cap not in good contact. See Chapter 4.
5 Incorrect spark plug. Wrong type, heat range or cap configuration. Check and install correct plugs listed in Chapter 1. A cold plug or one with a recessed firing electrode will not operate at low speeds without fouling.
6 Igniter defective. See Chapter 4.
7 Ignition coil(s) defective. See Chapter 4. ,

15 Fuel/air mixture incorrect

1 Main jet clogged. Dirt, water or other contaminants can clog the main jets. Clean the fuel tap filter, the float bowl area, and the jets and carburetor orifices (Chapter 3).
2 Main jet wrong size. The standard jetting is for sea level atmospheric pressure and oxygen content.
3 Throttle shaft-to-carburetor body clearance excessive. Refer to Chapter 3 for inspection and part replacement procedures.
4 Air bleed holes clogged. Remove and overhaul carburetors (Chapter 3).
5 Air cleaner clogged, poorly sealed, or missing.
6 Air cleaner-to-carburetor boot poorly sealed. Look for cracks, holes or loose clamps, and replace or repair defective parts.
7 Fuel level too high or too low. Adjust the float(s) (Chapter 3).
8 Fuel tank air vent obstructed. Make sure the air vent passage in the filler cap is open.
9 Carburetor intake joints loose. Check for cracks, breaks, tears or loose clamps or bolts. Repair or replace the rubber boots (Chapter 3).
10 Fuel tap clogged. Remove the tap and clean it (Chapter 1).
11 Fuel line clogged. Pull the fuel line loose and carefully blow through it.

16 Compression low

1 Spark plug loose. Remove the plug and inspect the threads. Reinstall and tighten to the specified torque (Chapter 1).
2 Cylinder head not sufficiently tightened down. If a cylinder head is suspected of being loose, then there's a chance that the gasket and head are damaged if the problem has persisted for any length of time. The head nuts and bolts should be tightened to the proper torque in the correct Sequence (Chapter 2).
3 Improper valve clearance. This means that the valve is not closing completely and compression pressure is leaking past the valve. Check and adjust the valve clearances (Chapter 1).
4 Cylinder and/or piston worn. Excessive wear will cause compression pressure to leak past the rings. This is usually accompanied by worn rings as well. A top end overhaul is necessary (Chapter 2).
5 Piston rings worn, weak, broken, or sticking. Broken or sticking piston rings usually indicate a lubrication or carburetion problem that causes excess carbon deposits or seizures to form on the pistons and rings. Top end overhaul is necessary (Chapter 2).
6 Piston ring-to-groove clearance excessive. This is caused by excessive wear of the piston ring lands. Piston replacement is necessary (Chapter 2).
7 Cylinder head gasket damaged. If a head is allowed to become loose, or if excessive carbon build-up on the piston crown and combustion chamber causes extremely high compression, the head gasket may leak. Retorquing the head is not always sufficient to restore the seal, so gasket replacement is necessary (Chapter 2).
8 Cylinder head warped. This is caused by overheating or improperly tightened head nuts and bolts. Machine shop resurfacing or head replacement is necessary (Chapter 2).
9 Valve spring broken or weak. Caused by component failure or wear; the spring(s) must be replaced (Chapter 2).
10 Valve not seating properly. This is caused by a bent valve (from over-revving or improper valve adjustment), burned valve or seat (improper carburetion) or an accumulation of carbon deposits on the seat (from carburetion or lubrication problems). The valves must be cleaned and/or replaced and the seats serviced if possible (Chapter 2).

17 Knocking or pinging

1 Carbon build-up in combustion chamber. Use of a fuel additive that will dissolve the adhesive bonding the carbon particles to the crown and chamber is the easiest way to remove the build-up. Otherwise, the cylinder head will have to be removed and decarbonized (Chapter 2).
2 Incorrect or poor quality fuel. Old or improper grades of fuel can cause detonation. This causes the piston to rattle, thus the knocking or pinging sound. Drain old fuel and always use the recommended fuel grade.
3 Spark plug heat range incorrect. Uncontrolled detonation indicates the plug heat range is too hot. The plug in effect becomes a glow plug, raising cylinder temperatures. Install the proper heat range plug (Chapter 1).
4 Improper air/fuel mixture. This will cause the cylinder to run hot, which leads to detonation. Clogged jets or an air leak can cause this imbalance. See Chapter 3.

18 Miscellaneous causes

1 Throttle valve doesn't open fully. Adjust the cable slack (Chapter 1).
2 Clutch slipping. May be caused by a cable that is improperly adjusted or loose or worn clutch components. Refer to Chapter 2 for cable replacement and clutch overhaul procedures.
3 Timing not advancing.
4 Engine oil viscosity too high. Using a heavier oil than the one recommended in Chapter 1 can damage the oil pump or lubrication system and cause drag on the engine.
5 Brakes dragging. Usually caused by debris which has entered the brake piston sealing boot, or from a warped disc or bent axle. Repair as necessary.

Overheating

19 Engine overheats

1 Engine oil level low. Check and add oil (Chapter 1).
2 Wrong type of oil. If you're not sure what type of oil is in the engine, drain it and fill with the correct type (Chapter 1).
3 Air leak at carburetor intake joints. Check and tighten or replace as necessary (Chapter 3).
4 Fuel level low. Check and adjust if necessary (Chapter 3).
5 Worn oil pump or clogged oil passages. Replace pump or clean passages as necessary.
6 Clogged external oil lines (if equipped). Remove and check for foreign material (see Chapter 2).
7 Carbon build-up in combustion chambers. Use of a fuel additive

that will dissolve the adhesive bonding the carbon particles to the piston crowns and chambers is the easiest way to remove the build-up. Otherwise, the cylinder heads will have to be removed and decarbonized (Chapter 2).

20 Firing incorrect

1 Spark plug fouled, defective or worn out. See Chapter 1 for spark plug maintenance.
2 Incorrect spark plug (see Chapter 1).
3 Faulty ignition coil(s) (Chapter 4).

21 Fuel/air mixture incorrect

1 Main jet clogged. Dirt, water and other contaminants can clog the main jets. Clean the fuel tap filter, the float bowl area and the jets and carburetor orifices (Chapter 3).
2 Main jet wrong size. The standard jetting is for sea level atmospheric pressure and oxygen content.
3 Air cleaner poorly sealed or missing.
4 Air cleaner-to-carburetor boot poorly sealed. Look for cracks, holes or loose clamps and replace or repair.
5 Fuel level too low. Adjust the float(s) (Chapter 3).
6 Fuel tank air vent obstructed. Make sure that the air vent passage in the filler cap is open.
7 Carburetor intake joints loose. Check for cracks, breaks, tears or loose clamps or bolts. Repair or replace the rubber boots (Chapter 3).

22 Compression too high

1 Carbon build-up in combustion chamber. Use of a fuel additive that will dissolve the adhesive bonding the carbon particles to the piston crown and chamber is the easiest way to remove the build-up. Otherwise, the cylinder head will have to be removed and decarbonized (Chapter 2).
2 Improperly machined head surface or installation of incorrect gasket during engine assembly.

23 Engine load excessive

1 Clutch slipping. Can be caused by damaged, loose or worn clutch oonents. Refer to Chapter 2 for overhaul procedures.
Engine oil level too high. The addition of too much oil will cause pressurization of the crankcase and inefficient engine operation. Check Specifications and drain to proper level (Chapter 1).
3 Engine oil viscosity too high. Using a heavier oil than the one ʳecommended in Chapter 1 can damage the oil pump or lubrication system as well as cause drag on the engine.
4 Brakes dragging. Usually caused by debris which has entered the brake piston sealing boot, or from a warped disc or bent axle. Repair as necessary.

24 Lubrication inadequate

1 Engine oil level too low. Friction caused by intermittent lack of lubrication or from oil that is overworked can cause overheating. The oil provides a definite cooling function in the engine. Check the oil level (Chapter 1).
2 Poor quality engine oil or incorrect viscosity or type. Oil is rated not only according to viscosity but also according to type. Some oils are not rated high enough for use in this engine. Check the Specifications section and change to the correct oil (Chapter 1).
3 Camshaft or journals worn. Excessive wear causing drop in oil pressure. Replace cam, bushing or cylinder head. Abnormal wear could be caused by oil starvation at high rpm from low oil level or improper viscosity or type of oil (Chapter 1).
4 Crankshaft and/or bearings worn. Same problems as paragraph 3. Check and replace crankshaft and/or bearings (Chapter 2).

25 Miscellaneous causes

Modification to exhaust system. Most aftermarket exhaust systems cause the engine to run leaner, which make them run hotter. When installing an accessory exhaust system, always rejet the carburetors.

Clutch problems

26 Clutch slipping

1 Friction plates worn or warped. Overhaul the clutch assembly (Chapter 2).
2 Steel plates worn or warped (Chapter 2).
3 Clutch spring(s) broken or weak. Old or heat-damaged spring(s) (from slipping clutch) should be replaced with new ones (Chapter 2).
4 Clutch release mechanism defective. Replace any defective parts (Chapter 2).
5 Clutch boss or housing unevenly worn. This causes improper engagement of the plates. Replace the damaged or worn parts (Chapter 2).

27 Clutch not disengaging completely

1 Clutch lever play excessive (see Chapter 1). Clutch cable improperly adjusted (see Chapter 1).
2 Clutch plates warped or damaged. This will cause clutch drag, which in turn will cause the machine to creep. Overhaul the clutch assembly (Chapter 2).
3 Usually caused by a sagged or broken spring(s). Check and replace the spring(s) (Chapter 2).
4 Engine oil deteriorated. Old, thin, worn out oil will not provide proper lubrication for the discs, causing the clutch to drag. Replace the oil and filter (Chapter 1).
5 Engine oil viscosity too high. Using a thicker oil than recommended in Chapter 1 can cause the plates to stick together, putting a drag on the engine. Change to the correct viscosity oil (Chapter 1).
6 Clutch housing seized on shaft. Lack of lubrication, severe wear or damage can cause the housing to seize on the shaft. Overhaul of the clutch, and perhaps transmission, may be necessary to repair the damage (Chapter 2).
7 Clutch release mechanism defective. Worn or damaged release mechanism parts can stick and fail to apply force to the pressure plate. Overhaul the release mechanism (Chapter 2).
8 Loose clutch boss nut. Causes housing and boss misalignment putting a drag on the engine. Engagement adjustment continually varies. Overhaul the clutch assembly (Chapter 2).

Gear shifting problems

28 Doesn't go into gear or lever doesn't return

1- Clutch not disengaging. See Section 27.
2 Shift fork(s) bent or seized. Often caused by dropping the machine or from lack of lubrication. Overhaul the transmission (Chapter 2).

3 Gear(s) stuck on shaft. Most often caused by a lack of lubrication or excessive wear in transmission bearings and bushings. Overhaul the transmission (Chapter 2).
4 Shift cam binding. Caused by lubrication failure or excessive wear. Replace the cam and bearing (Chapter 2).
5 Shift lever return spring weak or broken (Chapter 2).
6 Shift lever broken. Splines stripped out of lever or shaft, caused by allowing the lever to get loose or from dropping the machine. Replace necessary parts (Chapter 2).
7 Shift mechanism pawl broken or worn. Full engagement and rotary movement of shift drum results. Replace shaft assembly (Chapter 2).
8 Pawl spring broken. Allows pawl to float, causing sporadic shift operation. Replace spring (Chapter 2).

29 Jumps out of gear

1 Shift fork(s) worn. Overhaul the transmission (Chapter 2).
2 Gear groove(s) worn. Overhaul the transmission (Chapter 2).
3 Gear dogs or dog slots worn or damaged. The gears should be inspected and replaced. No attempt should be made to service the worn parts.

30 Overshifts

1 Pawl spring weak or broken (Chapter 2).
2 Shift drum stopper lever not functioning (Chapter 2).

Abnormal engine noise

31 Knocking or pinging

1 Carbon build-up in combustion chamber. Use of a fuel additive that will dissolve the adhesive bonding the carbon particles to the piston crown and chamber is the easiest way to remove the build-up. Otherwise, the cylinder head will have to be removed and decarbonized (Chapter 2).
2 Incorrect or poor quality fuel. Old or improper fuel can cause detonation. This causes the pistons to rattle, thus the knocking or pinging sound. Drain the old fuel and always use the recommended grade fuel (Chapter 1).
3 Spark plug heat range incorrect. Uncontrolled detonation indicates that the plug heat range is too hot. The plug in effect becomes a glow plug, raising cylinder temperatures. Install the proper heat range plug (Chapter 1).
4 Improper air/fuel mixture. This will cause the cylinders to run hot and lead to detonationrClogged jets or an air leak can cause this imbalance. See Chapter 3.

32 Piston slap or rattling

1 Cylinder-to-piston clearance excessive. Caused by improper assembly. Inspect and overhaul top end parts (Chapter 2).
2 Connecting rod bent. Caused by over-revving, trying to start a badly flooded engine or from ingesting a foreign object into the combustion chamber. Replace the damaged parts (Chapter 2).
3 Piston pin or piston pin bore worn or seized from wear or lack of lubrication. Replace damaged parts (Chapter 2).
4 Piston ring(s) worn, broken or sticking. Overhaul the top end (Chapter 2).
5 Piston seizure damage. Usually from lack of lubrication or overheating. Replace the pistons and bore the cylinders, as necessary (Chapter 2).
6 Connecting rod upper or lower end clearance excessive. Caused by excessive wear or lack of lubrication. Replace worn parts.

33 Valve noise

1 Incorrect valve clearances. Adjust the clearances by referring to Chapter 1.
2 Valve spring broken or weak. Check and replace weak valve springs (Chapter 2).
3 Camshaft, bushing or cylinder head worn or damaged. Lack of lubrication at high rpm is usually the cause of damage. Insufficient oil or failure to change the oil at the recommended intervals are the chief causes.

34 Other noise

1 Cylinder head gasket leaking.
2 Exhaust pipe leaking at cylinder head connection. Caused by improper fit of pipe(s) or loose exhaust flange. All exhaust fasteners should be tightened evenly and carefully. Failure to do this will lead to a leak.
3 Crankshaft runout excessive. Caused by a bent crankshaft (from over-revving) or damage from an upper cylinder component failure. Can also be attributed to dropping the machine on either of the crankshaft ends.
4 Engine mounting bolts or nuts loose. Tighten all engine mounting bolts and nuts to the specified torque (Chapter 2).
5 Crankshaft bearings worn (Chapter 2).
6 Camshaft chain tensioner(s) defective. Replace according to the procedure in Chapter 2.
7 Camshaft chain, sprockets or guides worn (Chapter 2).

Abnormal driveline noise

35 Clutch noise

1 Clutch housing/friction plate clearance excessive (Chapter 2).
2 Loose or damaged clutch pressure plate and/or bolts (Chapter 2).

36 Transmission noise

1 Bearings worn. Also includes the possibility that the shafts are worn. Overhaul the transmission (Chapter 2).
2 Gears worn or chipped (Chapter 2).
3 Metal chips jammed in gear teeth. Probably pieces from a broken clutch, gear or shift mechanism that were picked up by the gears. This will cause early bearing failure (Chapter 2).
4 Engine oil level too low. Causes a howl from transmission. Also affects engine power and clutch operation (Chapter 1).

37 Final drive noise

1 Chain not adjusted properly (if equipped) (Chapter 1).
2 Engine sprocket or rear sprocket loose (chain drive models). Tighten fasteners (Chapter 5).
3 Sprocket(s) worn (chain drive models). Replace sprocket(s). (Chapter 5).
4 Rear sprocket warped (chain drive models). Replace (Chapter 5).
5 Wheel coupling (cush drive) worn (chain drive models). Replace coupling (Chapter 5).
6 Final drive oil level low (shaft drive models).
7 Final drive gear lash out of adjustment (shaft drive models).
8 Final drive gears damaged or worn (shaft drive models).

Abnormal frame and suspension noise

38 Front end noise

1 Low fluid level or improper viscosity oil in forks. This can sound like spurting and is usually accompanied by irregular fork action (Chapter 5).
2 Spring weak or broken. Makes a clicking or scraping sound. Fork oil, when drained, will have a lot of metal particles in it (Chapter 5).
3 Steering head bearings loose or damaged. Clicks when braking. Check and adjust or replace as necessary (Chapter 5).
4 Fork triple clamps loose. Make sure all triple clamp pinch bolts are tight (Chapter 5).
5 Fork tube bent. Good possibility if machine has been dropped. Replace tube with a new one (Chapter 5).
6 Front axle or axle clamp bolt loose. Tighten them to the specified torque (Chapter 6).

39 Shock absorber noise

1 Fluid level incorrect. Indicates a leak caused by defective seal. Shock will be covered with oil. Replace shock (Chapter 5).
2 Defective shock absorber with internal damage. This is in the body of the shock and can't be remedied. The shock must be replaced with a new one (Chapter 5).
3 Bent or damaged shock body. Replace the shock with a new one (Chapter 5).

40 Brake noise

1 Squeal caused by pad shim not installed or positioned correctly (Chapter 6).
2 Squeal caused by dust on brake pads. Usually found in combination with glazed pads. Clean using brake cleaning solvent (Chapter 6).
3 Contamination of brake pads. Oil, brake fluid or dirt causing brake to chatter or squeal. Clean or replace pads (Chapter 6).
4 Pads glazed. Caused by excessive heat from prolonged use or from contamination. Do not use sandpaper, emery cloth, carborundum cloth or any other abrasive to roughen the pad surfaces as abrasives will stay in the pad material and damage the disc. A very fine flat file can be used, but pad replacement is suggested as a cure (Chapter 6).
5 Disc warped. Can cause a chattering, clicking or intermittent squeal. Usually accompanied by a pulsating lever and uneven braking. Replace the disc (Chapter 6).
6 Drum brake linings worn or contaminated. Can cause scraping or squealing. Replace the shoes (Chapter 6).
7 Drum brake linings warped or worn unevenly. Can cause chattering. Replace the linings (Chapter 6).
8 Brake drum out of round. Can cause chattering. Replace brake drum (Chapter 6).
9 Loose or worn wheel bearings. Check and replace as needed (Chapter 6).

Oil level indicator light comes on

41 Engine lubrication system

1 Yamaha XV700 through 1100 models use an oil level light rather than an oil pressure light.
2 Engine oil level low. Inspect for leak or other problem causing low oil level and add recommended oil (Chapters 1 and 2).

42 Electrical system

1 Oil level switch defective. Check the switch according to the procedure in Chapter 8. Replace it if it's defective.
2 Oil level indicator light circuit defective. Check for pinched, shorted, disconnected or damaged wiring (Chapter 8).

Excessive exhaust smoke

43 White smoke

1 Piston oil ring worn. The ring may be broken or damaged, causing oil from the crankcase to be pulled past the piston into the combustion chamber. Replace the rings with new ones (Chapter 2).
2 Cylinders worn, cracked, or scored. Caused by overheating or oil starvation. If worn or scored, the cylinders will have to be rebored and new pistons installed. If cracked, the cylinder block will have to be replaced (see Chapter 2).
3 Valve oil seal damaged or worn. Replace oil seals with new ones (Chapter 2).
4 Valve guide worn. Perform a complete valve job (Chapter 2).
5 Engine oil level too high, which causes the oil to be forced past the rings. Drain oil to the proper level (Chapter 1).
6 Head gasket broken between oil return and cylinder. Causes oil to be pulled into the combustion chamber. Replace the head gasket and check the head for warpage (Chapter 2).
7 Abnormal crankcase pressurization, which forces oil past the rings. Clogged breather or hoses usually the cause (Chapter 2).

44 Black smoke

1 Air cleaner clogged. Clean or replace the element (Chapter 1).
2 Main jet too large or loose. Compare the jet size to the Specifications (Chapter 3).
3 Choke stuck, causing fuel to be pulled through choke circuit (Chapter 3).
4 Fuel level too high. Check and adjust the float level as necessary (Chapter 3).
5 Inlet needle held off needle seat. Clean the float bowls and fuel line and replace the needles and seats if necessary (Chapter 3).

45 Brown smoke

1 Main jet too small or clogged. Lean condition caused by wrong size main jet or by a restricted orifice. Clean float bowl and jets and compare jet size to Specifications (Chapter 3).
2 Fuel flow insufficient. Fuel inlet needle valve stuck closed due to chemical reaction with old fuel. Float level incorrect. Restricted fuel line. Clean line and float bowl and adjust floats if necessary.
3 Carburetor intake manifolds loose (Chapter 3).
4 Air cleaner poorly sealed or not installed (Chapter 1).

Poor handling or stability

46 Handlebar hard to turn

1 Steering stem locknut too tight (Chapter 5).
2 Bearings damaged. Roughness can be felt as the bars are turned from side-to-side. Replace bearings and races (Chapter 5).
3. Races dented or worn. Denting results from wear in only one position (e.g., straight ahead), from a collision or hitting a pothole or from dropping the machine. Replace races and bearings (Chapter 5).
4 Steering stem lubrication inadequate. Causes are grease getting

hard from age or being washed out by high pressure car washes. Disassemble steering head and repack bearings (Chapter 5).
5 Steering stem bent. Caused by a collision, hitting a pothole or by dropping the machine. Replace damaged part. Don't try to straighten the steering stem (Chapter 5).
6 Front tire air pressure too low (Chapter 1).

47 Handlebar shakes or vibrates excessively

1 Tires worn or out of balance (Chapter 1 or 6).
2 Swingarm bearings worn. Replace worn bearings by referring to Chapter 6.
3 Rim(s) warped or damaged. Inspect wheels for runout (Chapter 6).
4 Wheel bearings worn. Worn front or rear wheel bearings can cause poor tracking. Worn front bearings will cause wobble (Chapter 6).
5 Handlebar clamp bolts or bracket nuts loose (Chapter 5).
6 Steering stem or fork clamps loose. Tighten them to the specified torque (Chapter 5).
7 Motor mount bolts loose. Will cause excessive vibration with increased engine rpm (Chapter 2).

48 Handlebar pulls to one side

1 Frame bent. Definitely suspect this if the machine has been dropped. May or may not be accompanied by cracking near the bend. Replace the frame (Chapter 5).
2 Wheel out of alignment. Caused by improper location of axle spacers or from bent steering stem or frame (Chapter 5).
3 Swingarm bent or twisted. Caused by age (metal fatigue) or impact damage. Replace the swingarm (Chapter 5).
4 Steering stem bent. Caused by impact damage or by dropping the motorcycle. Replace the steering stem (Chapter 5).
5 Fork leg bent. Disassemble the forks and replace the damaged parts (Chapter 5).
6 Fork oil level uneven. Check and add or drain as necessary (Chapter 5).

49 Poor shock absorbing qualities

1 Too hard:
a) Fork oil level excessive (Chapter 5).
b) Fork oil viscosity too high. Use a lighter oil (see the Specifications in Chapter 1).
c) Fork tube bent. Causes a harsh, sticking feeling (Chapter 5).
d) Shock shaft or body bent or damaged (Chapter 5).
e) Fork internal damage (Chapter 5).
f) Shock internal damage.
g) Tire pressure too high (Chapters 1 and 6).
2 Too soft:
a) Fork or shock oil insufficient and/or leaking (Chapter 5).
b) Fork oil level too low (Chapter 5).
c) Fork oil viscosity too light (Chapter 5).
d) Fork springs weak or broken (Chapter 5).

Braking problems

50 Front brakes are spongy, don't hold

1 Air in brake line. Caused by inattention to master cylinder fluid level or by leakage. Locate problem and bleed brakes (Chapter 6).
2 Pad or disc worn (Chapters 1 and 6).
3 Brake fluid leak. See paragraph 1.
4 Contaminated pads. Caused by contamination with oil, grease, brake fluid, etc. Clean or replace pads. Clean disc thoroughly with brake cleaner (Chapter 6).
5 Brake fluid deteriorated. Fluid is old or contaminated. Drain system, replenish with new fluid and bleed the system (Chapter 6).
6 Master cylinder internal parts worn or damaged causing fluid to bypass (Chapter 6).
7 Master cylinder bore scratched by foreign material or broken spring. Repair or replace master cylinder (Chapter 6).
8 Disc warped. Replace disc (Chapter 6).

51 Brake lever or pedal pulsates

1 Disc warped. Replace disc (Chapter 6).
2 Axle bent. Replace axle (Chapter 5).
3 Brake caliper bolts loose (Chapter 6).
4 Brake caliper shafts damaged or sticking, causing caliper to bind. Lube the shafts or replace them if they are corroded or bent (Chapter 6).
5 Wheel warped or otherwise damaged (Chapter 6).
6 Wheel bearings damaged or worn (Chapter 6).
7 Brake drum out of round. Replace brake drum (Chapter 6).

52 Brakes drag

1 Master cylinder piston seized. Caused by wear or damage to piston or cylinder bore (Chapter 6).
2 Lever balky or stuck. Check pivot and lubricate (Chapter 6).
3 Brake caliper binds. Caused by inadequate lubrication or damage to caliper shafts (Chapter 6).
4 Brake caliper piston seized in bore. Caused by wear or ingestion of dirt past deteriorated seal (Chapter 6),
5 Brake pad damaged. Pad material separated from backing plate. Usually caused by faulty manufacturing process or from contact with chemicals. Replace pads (Chapter 6).
6 Pads improperly installed (Chapter 6).
7 Rear brake pedal free play insufficient (Chapter 1).
8 Rear brake springs weak. Replace brake springs (Chapter 6).

Electrical problems

53 Battery dead or weak

1 Battery faulty. Caused by sulfated plates which are shorted through sedimentation or low electrolyte level. Also, broken battery terminal making only occasional contact (Chapter 8).
2 Battery cables making poor contact (Chapter 8).
3 Load excessive. Caused by addition of high wattage lights or other electrical accessories.
4 Ignition switch defective. Switch either grounds/earths internally or fails to shut off system. Replace the switch (Chapter 8).
5 Regulator/rectifier defective (Chapter 8).
6 Stator coil open or shorted (Chapter 8).
7 Wiring faulty. Wiring grounded or connections loose in ignition, charging or lighting circuits (Chapter 8).

54 Battery overcharged

1 Regulator/rectifier defective. Overcharging is noticed when battery gets excessively warm or boils over (Chapter 8).
2 Battery defective. Replace battery with a new one (Chapter 8).
3 Battery amperage too low, wrong type or size. Install manufacturer's specified amp-hour battery to handle charging load (Chapter 8).

Chapter 1
Tune-up and routine maintenance

Contents

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Specifications

XV535

Engine

Spark plugs	
Type	NGK BP7ES or ND W22EP-U
Gap	0.7 to 0.8 mm (0.028 to 0.032 inch)
Valve clearances (COLD engine)	
Intake	0.07 to 0.12 mm (0.003 to 0.005 inch)
Exhaust	0.12 to 0.17 mm (0.005 to 0.007 inch)
Engine idle speed	1150 to 1250 rpm
Cylinder compression pressure (at sea level)	
Standard	10.75 Bars (156 psi)
Maximum	11.78 Bars (171 psi)
Minimum	9.78 Bars (142 psi)
Maximum difference between cylinders	0.96 Bars (14 psi)
Carburetor synchronization	
Vacuum at idle speed	230 mm Hg (9.06 inch Hg)
Maximum vacuum difference between cylinders	10 mm Hg (0.39 inch Hg)
Cylinder numbering (from rear to front of bike)	1-2

Miscellaneous

Brake pedal position	38 mm (1.5 inch) above the top of the footpeg
Shift pedal position	50 to 60 mm (2.0 to 2.4 inches) above the top of the footpeg
Freeplay adjustments	
Throttle grip	2 to 5 mm (0.08 to 0.20 inch)
Clutch lever	2 to 3 mm (0.08 to 0.12 inch)
Front brake lever	2 to 5 mm (0.08 to 0.20 inch)
Rear brake pedal	20 to 30 mm (0.8 to 1.2 inches)
Battery electrolyte specific gravity	1.280 at 20-degrees C (68-degrees F)
Minimum tire tread depth*	1 mm (0.04 inch)
Tire pressures (cold)	
Front	
1987 and 1988 US, all UK models	1.93 Bars (28 psi)
1989 and later US models	1.99 Bars (29 psi)
Rear	
Up to 90 kg (198 lbs)	
1987 and 1988 US, all UK models	2.2 Bars (32 psi)
1989 and later US models	2.27 Bars (33 psi)
Above 90 kg (198 lbs) or high speed riding	2.48 bars (36 psi)

Torque specifications

Oil drain plug	43 Nm (31 ft-lbs)
Oil filter cover bolts	10 Nm (7.2 ft-lbs)
Spark plugs	12.5 Nm (9 ft-lbs)
Steering head bearing ring nuts	
Initial torque	38 Nm (27 ft-lbs)
Final torque	10 Nm (7.2 ft-lbs)
Steering stem bolt	54 Nm (39 ft-lbs)
Valve adjuster locknuts	14 Nm (10 ft-lbs)
Rocker cover bolts	10 Nm (7.2 ft-lbs)
Final drive filler and drain plugs	23 Nm (17 ft-lbs)

Recommended lubricants and fluids

Fuel type	
US	Unleaded
UK	Regular
Fuel capacity	
1987 and 1988 models	
Total	8.6 liters (2.3 US gal, 1.9 Imp gal)
Reserve	2.0 liters (0.5 US gal, 0.4 Imp gal)
1989 and later models	
Total	13.5 liters (3.6 US gal, 3.0 Imp gal)
Reserve	2.5 liters (0.7 US gal, 0.5 Imp gal)
Engine/transmission oil	
Type	API grade SE or SF

Viscosity	
Consistently below 15 degrees C (60 degrees F)	SAE 10W30
Consistently above 5 degrees C (40 degrees F)	SAE 20W40
Capacity	
With filter change	2.8 liters (3.0 US qt, 5.0 Imperial pt)
Oil change only	2.6 liters (2.7 US qt, 4.6 Imperial pt)
Brake fluid	DOT 4
Final gear	
Type	SAE 80 API GL-4 hypoid gear oil
Capacity	0.19 liters (0.2 US qt, 0.34 Imp pt
Wheel bearings	Medium weight, lithium-based multi-purpose grease
Swingarm pivot bearings	Medium weight, lithium-based multi-purpose grease
Cables and lever pivots	Chain and cable lubricant or 10W30 motor oil
Sidestand/centerstand pivots	Chain and cable lubricant or 10W30 motor oil
Brake pedal/shift lever pivots	Chain and cable lubricant or 10W30 motor oil
Throttle grip	Multi-purpose grease or dry film lubricant

'In the UK, tread depth must be at least 1 mm over 3/4 of the tread breadth all the way around the tire, with no bald patches.

1981 through 1983 XV750 through 1000 models and all TR1

Engine

Spark plugs	
Type	NGK BP7ES or ND W22EP-U
Gap	0.7 to 0.8 mm (0.028 to 0.032 inch)
Valve clearances (COLD engine)	
Intake	0.10 mm (0.004 inch)
Exhaust	0.15 mm (0.006 inch)
Engine idle speed	950 to 1050 rpm
Cylinder compression pressure (at sea level)	
XV750 and TR1	Not specified
XV920	9.30 Bars (135 psi) at 300 rpm
Carburetor synchronization	
Vacuum at idle speed	180 +/-10 mm Hg (7.09 +/- 0.4 inch Hg)
Maximum vacuum difference between cylinders	10 mm Hg (0.4 inch Hg)
Cylinder numbering (from rear to front of bike)	1-2

Miscellaneous

Brake pedal position	Not specified
Shift pedal position	Not specified
Freeplay adjustments	
Throttle grip	Not specified
Clutch lever	2 to 3 mm (0.08 to 0.12 inch)
Front brake lever	5 to 8 mm (0.20 to 0.30 inch)
Rear brake pedal	20 to 30 mm (0.8 to 1.2 inches)
Battery electrolyte specific gravity	1.280 at 20-degrees C (68-degrees F)
Minimum tire tread depth*	1 mm (0.04 inch)

Tire pressures (cold)

XV750, XV920 K and MK

Front	
Up to 90 kg (198 lbs) load	1.79 Bars (26 psi)
90 to 160 kg (198 to 353 lbs) load	1.93 Bars (28 psi)
High speed riding	2.20 Bars (32 psi)
Rear	
Up to 90 kg (198 lbs)	1.93 Bars (28 psi)
90 to 160 kg (198 to 353 lbs)	2.48 bars (36 psi)
High speed riding	2.20 Bars (32 psi)

XV920J

Front	
Up to 90 kg (198 lbs) load	1.79 Bars (26 psi)
90 to 213 kg (198 to 470 lbs) load	1.93 Bars (28 psi)
High speed riding	2.20 Bars (32 psi)
Rear	
Up to 90 kg (198 lbs)	1.93 Bars (28 psi)
90 to 213 kg (198 to 470 lbs)	2.76 bars (40 psi)
High speed riding	2.48 Bars (36 psi)

Tire pressures (cold) (continued)

XV920RH and RJ

Front	
Up to 90 kg (198 lbs) load	1.79 Bars (26 psi)
90 to 213 kg (198 to 470 lbs) load	1.93 Bars (28 psi)
High speed riding	1.93 Bars (28 psi)
Rear	
Up to 90 kg (198 lbs)	1.93 Bars (28 psi)
90 to 213 kg (198 to 470 lbs)	2.20 bars (32 psi)
High speed riding	2.20 Bars (32 psi)

TR1 (XV1000 chain drive) models

Front	
Up to 90 kg (198 lbs) load	1.79 Bars (26 psi)
90 to 201 kg (198 to 443 lbs) load	1.93 Bars (28 psi)
High speed riding	1.93 Bars (28 psi)
Rear	
Up to 90 kg (198 lbs)	1.93 Bars (28 psi)
90 to 201 kg (198 to 443 lbs)	2.20 bars (32 psi)
High speed riding	2.20 Bars (32 psi)

Torque specifications

Oil drain plug	43 Nm (31 ft-lbs)
Oil filter cover bolts	10 Nm (7.2 ft-lbs)
Spark plugs	14 Nm (10 ft-lbs)
Steering head bearing ring nuts	
Initial torque	25 Nm (18 ft-lbs)
Final torque	Back off 1/4 turn
Steering stem bolt	
XV920J, K, MK	54 Nm (39 ft-lbs)
All others	50 Nm (36 ft-lbs)
Valve adjuster locknuts	27 Nm (19 ft-lbs)
Rocker cover bolts	10 Nm (7.2 ft-lbs)
Final drive filler and drain plugs	23 Nm (17 ft-lbs)

Recommended lubricants and fluids

Engine/transmission oil	
Type	API grade SE or SF
Viscosity	
Consistently below 15 degrees C (60 degrees F)	SAE 10W30
Consistently above 5 degrees C (40 degrees F)	SAE 20W40
Capacity	
With filter change	3.1 liters (3.3 US qt, 5.46 Imperial pt)
Oil change only	3.0 liters (3.2 US qt, 5.28 Imperial pt)
Brake fluid	DOT 4
Final gear	
Type	SAE 80 API GL-4 hypoid gear oil
Capacity	0.20 liters (6.76 US fl oz, 7.04 Imp fl oz
Wheel bearings	Medium weight, lithium-based multi-purpose grease
Swingarm pivot bearings	Medium weight, lithium-based multi-purpose grease
Cables and lever pivots	Chain and cable lubricant or 10W30 motor oil
Sidestand/centerstand pivots	Chain and cable lubricant or 10W30 motor oil
Brake pedal/shift lever pivots	Chain and cable lubricant or 10W30 motor oil
Throttle grip	Multi-purpose grease or dry film lubricant

**In the UK, tread depth must be at least 1 mm over 3/4 of the tread breadth all the way around the tire, with no bald patches.*

1984 and later models

Engine

Spark plugs	
Type	NGK BP7ES or ND W22EP-U
Gap	0.7 to 0.8 mm (0.028 to 0.032 inch)
Valve clearances (COLD engine)	
Intake	0.07 to 0.12 mm (0.003 to 0.005 inch)
Exhaust	0.12 to 0.17 mm (0.005 to 0.007 inch)
Engine idle speed	950 to 1050 rpm

Cylinder compression pressure (at sea level)	
Standard	10.75 Bars (156 psi)
Maximum	11.78 Bars (171 psi)
Minimum	8.8 Bars (128 psi)
Maximum difference between cylinders	0.96 Bars (14 psi)
Carburetor synchronization	
Vacuum at idle speed	180 +/-10 mm Hg (7.09 +/- 0.4 inch Hg)
Maximum vacuum difference between cylinders	10 mm Hg (0.4 inch Hg)
Engine idle speed	950 to 1050 rpm
Cylinder numbering (from rear to front of bike)	1-2

Miscellaneous

Brake pedal position	20 mm (0.8 inch) above bottom of footpeg
Shift pedal position	Not specified
Freeplay adjustments	
Throttle grip	Not specified
Clutch lever	2 to 3 mm (0.08 to 0.12 inch)
Front brake lever	5 to 8 mm (0.20 to 0.30 inch)
Rear brake pedal	20 to 30 mm (0.8 to 1.2 inch)
Battery electrolyte specific gravity	1.280 at 20-degrees C (68-degrees F)
Minimum tire tread depth*	1 mm (0.04 inch)
Tire pressures (cold)	
Front	
Up to 90 kg (198 lbs) load	1.79 Bars (26 psi)
90 kg to maximum load	1.93 Bars (28 psi)
High speed riding	2.20 Bars (32 psi)
Rear	
Up to 90 kg (198 lbs)	1.93 Bars (28 psi)
90 to 160 kg (198 to 353 lbs)	2.48 bars (36 psi)
160 kg (353 lbs) to maximum load	2.76 Bars (40 psi)
High speed riding	2.48 Bars (36 psi)

Torque specifications

Oil drain plug	43 Nm (31 ft-lbs)
Oil filter cover bolts	10 Nm (7.2 ft-lbs)
Spark plugs	20 Nm (14 ft-lbs)
Steering head bearing ring nuts	
Initial torque	50 Nm (36 ft-lbs)
Final torque	3 Nm (2.2 ft-lbs)
Steering stem nut	110 Nm (80 ft-lbs)
Valve adjuster locknuts	27 Nm (19 ft-lbs)
Rocker cover bolts	10 Nm (7.2 ft-lbs)
Final drive filler and drain plugs	23 Nm (17 ft-lbs)

Recommended lubricants and fluids

Engine/transmission oil	
Type	API grade SE or SF
Viscosity	
Consistently below 15 degrees C (60 degrees F)	SAE 10W30
Consistently above 5 degrees C (40 degrees F)	SAE 20W40
Capacity	
With filter change	3.1 liters (3.3 US qt, 5.46 Imperial pt)
Oil change only	3.0 liters (3.2 US qt, 5.28 Imperial pt)
Brake fluid	DOT 4
Final gear	
Type	SAE 80 API GL-4 hypoid gear oil
Capacity	0.20 liters (6.76 US fl oz, 7.04 Imp fl oz
Wheel bearings	Medium weight, lithium-based multi-purpose grease
Swingarm pivot bearings	Medium weight, lithium-based multi-purpose grease
Cables and lever pivots	Chain and cable lubricant or 10W30 motor oil
Sidestand/centerstand pivots	Chain and cable lubricant or 10W30 motor oil
Brake pedal/shift lever pivots	Chain and cable lubricant or 10W30 motor oil
Throttle grip	Multi-purpose grease or dry film lubricant

**In the UK, tread depth must be at least 1 mm over 3/4 of the tread breadth all the way around the tire, with no bald patches.*

1 Yamaha XV Routine maintenance intervals

Routine maintenance intervals

Note: *The pre-ride inspection outlined in the owner's manual covers 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 fuel level and inspect for leaks
Check the operation of both brakes - also check the front brake fluid level and look for leakage
Check the tires for damage, the presence of foreign objects and correct air pressure
Check the throttle for smooth operation and correct freeplay
Check the operation of the clutch - make sure the freeplay is correct
Make sure the steering operates smoothly, without looseness and without binding
Check for proper operation of the headlight, taillight, brake light, turn signals, indicator lights and horn
Make sure the sidestand (and centerstand, if equipped) returns to its fully up position and stays there under spring pressure
Make sure the engine kill switch works properly

After the initial 600 miles/1000 km

Perform all of the daily checks plus:
Check/adjust the carburetor synchronization
Adjust the valve clearances
Change the final gear oil (if equipped)
Check/adjust the drive chain slack (if equipped)
Change the engine oil and oil filter
Check the tightness of all fasteners
Check the steering
Check/adjust clutch freeplay
Check the front brake fluid level
Inspect brake pads and shoes
Check/adjust the brake pedal position
Check the operation of the brake light
Check the operation of the sidestand switch
Lubricate the clutch cable, throttle cable(s) and speedometer cable

Every 300 miles/500 km

Check/adjust the drive chain slack (if equipped)

Every 4000 miles/6000 km or 6 months

Change the engine oil
Clean the air filter element and replace it if necessary
Adjust the valve clearances
Clean and gap the spark plugs
Lubricate the clutch cable, throttle cable(s) and speedometer cable
Check/adjust throttle cable free play
Check/adjust the idle speed
Check/adjust the carburetor synchronization
Check the front brake fluid level
Adjust front brake free play
Check the brake disc(s) and pads
Check the rear brake shoes for wear
Check/adjust the brake pedal position
Check the operation of the brake light
Lubricate the clutch and brake lever pivots
Lubricate the shift/brake pedal pivots and the sidestand/centerstand pivots
Check the steering
Check the front forks for proper operation and fluid leaks
Check the tires, wheels and wheel bearings
Check the battery electrolyte level and specific gravity; inspect the breather tube
Check the exhaust system for leaks and check the tightness of the fasteners
Check the cleanliness of the fuel system and the condition of the fuel lines and vacuum hoses
Inspect the crankcase ventilation system
Check the operation of the sidestand switch
Check and adjust clutch cable free play

Every 12,000 km/8,000 miles or 12 months

All of the items above plus:
Change the engine oil and oil filter
Replace the spark plugs
Check final gear oil level (if equipped)

Every 18,000 km/12,000 miles

Repack the swingarm bearings

Every 24,000 km/15,000 miles or two years

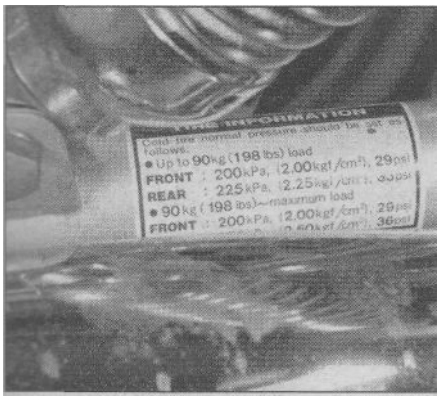
Change the final gear oil (if equipped)
Clean and lubricate the steering head bearings

Every 50,000 km/30,000 miles

Replace the drive chain (if equipped)

Every two years

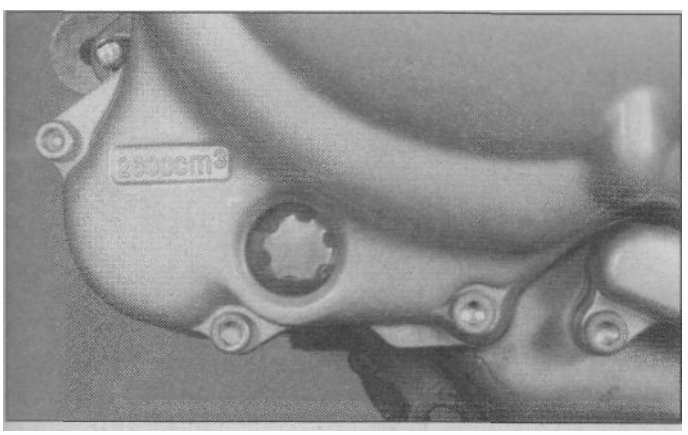
Replace the brake master cylinder and caliper seals and change the brake fluid
Every four years
Replace the brake hose(s)



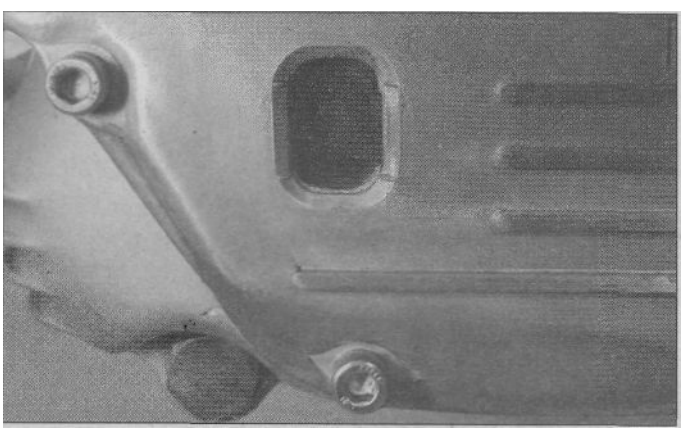
2.3a Decals at various locations on the motorcycle include such information as tire pressures ...

2.3b ... special precautions for air-adjustable front forks ...

2.3c ... and drive chain service procedures



3.3a Check the oil level in the window (this is an XV535)...



3.3b ... and this is an XV920 (other 700 through 1100 models similar)

2 Introduction to tune-up and routine maintenance

Refer to illustrations 2.3a, 2.3b and 2.3c

This Chapter covers in detail the checks and procedures necessary for the tune-up and routine maintenance of your motorcycle. Section 1 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 such 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 own maintenance, these lists outline the procedures and checks that should be done on a routine basis.

Maintenance information is printed on labels attached to the motorcycle **(see illustrations).** If the information on the labels differs from that included here, use the information on the label.

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 include 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 maintenance routine 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 the 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 comprehensive guides to the performance of the work. They explain in detail each of the routine inspections and maintenance procedures on the check list. References 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, especially around the oil filter, spark plugs, cylinder head covers, side covers, carburetors, etc. Cleaning will help ensure that dirt does not contaminate the engine and will allow you to detect wear and damage that could otherwise easily go unnoticed.

3 Fluid levels - check

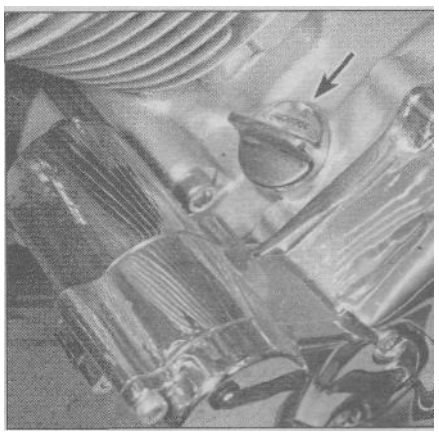
Engine oil

Refer to illustrations 3.3a, 3.3b, 3.4a and 3.4b

1 Run the engine and allow it to reach normal operating temperature. **Caution:** *Do not run the engine in an enclosed space such as a garage or shop.*

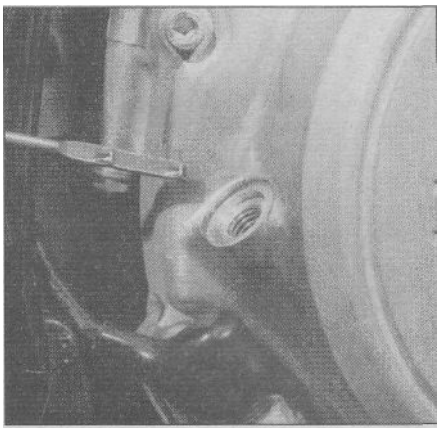
2 Stop the engine and allow the machine to sit undisturbed for about five minutes.

3 Hold the motorcycle level. With the engine off, check the oil level in the window located at the lower part of the right crankcase cover. The oil level should be between the Maximum and Minimum level marks next to the window **(see illustrations).**

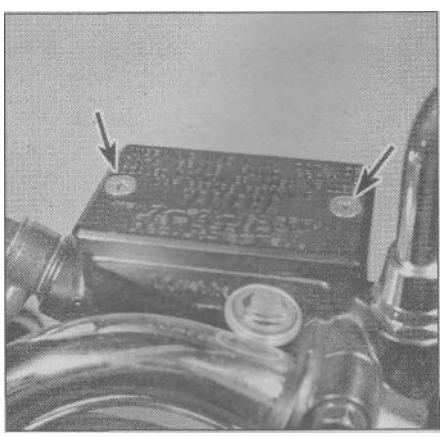


3.4a Remove the filler plug (arrow)...

3.4b ... and add oil to bring up the level in the window

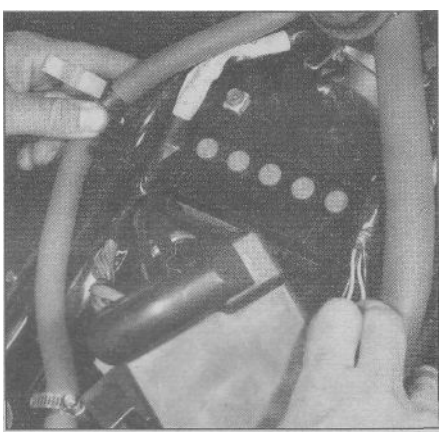


3.7 Brake fluid should be above the Lower line in the window



3.9 To add fluid, remove the cover screws (arrows) and lift off the cover and diaphragm

4.4a Unclip the fuel hoses and move them aside ...



4.4b ... then remove the securing strap and lift off the battery cover

4 If the level is below the Minimum mark, remove the oil filler cap from the left side of the crankcase and add enough oil of the recommended grade and type to bring the level up to the Maximum mark **(see illustrations).** Do not overfill.

Brakefluid

Refer to illustrations 3.7 and 3.9

5 In order to ensure proper operation of the hydraulic disc brake, the fluid level in the master cylinder reservoir must be properly maintained,

6 With the motorcycle held level, turn the handlebars until the top of the master cylinder is as level as possible.

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

8 If the level is low, the fluid must be replenished. Before removing the master cylinder cover, cover the fuel tank to protect it from brake fluid spills (which will damage the paint) and remove all dust and dirt from the area around the cover.

9 To replace brake fluid, remove the screws **(see illustration)** and lift off the cover and rubber diaphragm. **Note:** *Do not operate the front brake with the cover removed.*

10 Add new, clean brake fluid of the recommended type until the level is above the inspection window. Do not mix different brands of brake fluid in the reservoir, as they may not be compatible.

11 Reinstall the rubber diaphragm and the cover. Tighten the screws evenly, but do not overtighten them.

12 Wipe any spilled fluid off the reservoir body and reposition and tighten the brake lever and master cylinder assembly if it was moved.

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

4 Battery electrolyte level/specific gravity - check

Refer to illustrations 4.4a, 4.4b, 4.5a, 4.5b, 4.5c and 4.8

Caution: Be *extremely careful when handling or working around the battery. The electrolyte is very caustic and an explosive gas (hydrogen) is given off when the battery is charging.* **Note:** *The first Steps describe battery removal. If the electrolyte level is known to be sufficient it won't be necessary to remove the battery.*

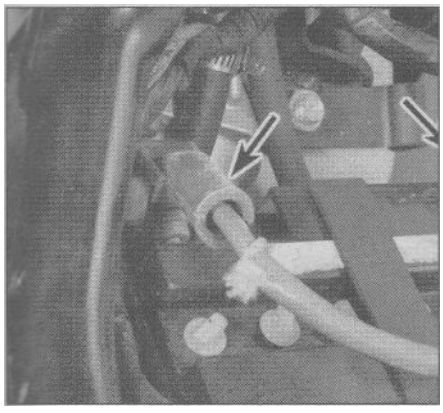
1 This procedure applies to batteries that have removable filler caps, which can be removed to add water to the battery. If the original equipment battery has been replaced by a sealed maintenance-free battery, the electrolyte can't be topped up.

2 Remove the seat (see Chapter 7).

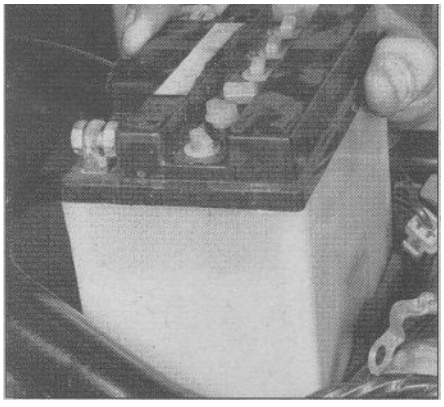
3 If necessary for access to remove the battery, remove the side covers (see Chapter 7).

4 If you're working on an XV535 equipped with an upper fuel tank, detach the fuel hoses from their clips and move them aside. Remove the securing strap and battery cover **(see illustrations).**

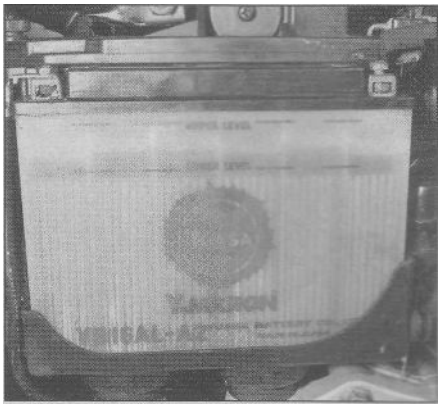
5 Remove the screws securing the battery cables tothe battery terminals (remove the negative cable first, positive cable last) (see



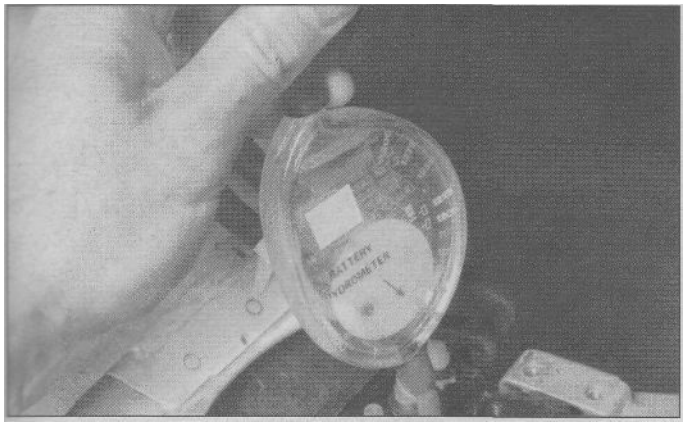
4.5a Pull back the plastic caps (arrows) and undo the terminal screws (negative first, then positive)



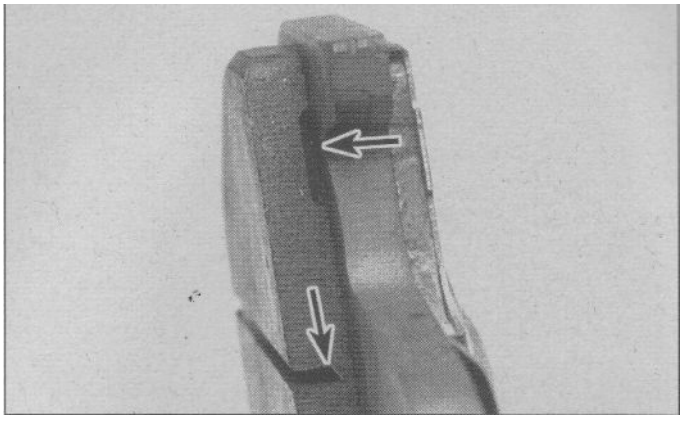
4.5b Lift the battery out



4.5c The electrolyte level should be **between the marks on the battery** case



4.8 Check the specific gravity with a hydrometer



5.2 The caliper on chain drive models has a pad inspection window

illustration). Remove the battery securing strap if you haven't already done so and pull the battery straight up to remove it **(see illustration).** The electrolyte level will now be visible through the translucent battery case - it should be between the Upper and Lower level marks **(see illustration).**

6 If the electrolyte is low, remove the cell caps and fill each cell to **the** upper level mark with distilled water. **Note:** *Some models have a long-life battery equipped with only one filler plug. Do not use tap water (except in an emergency), and do not overfill. The cell holes are quite small, so it may help to use a plastic squeeze bottle with a small spout to add the water. If the level is within the marks on the case, additional water is not necessary.*

7 Next, check the specific gravity of the electrolyte in each cell with **a** small hydrometer made especially for motorcycle batteries. These are available from most dealer parts departments or motorcycle accessory stores.

8 Remove the caps, draw some electrolyte from the first cell into the hydrometer **(see illustration)** and note the specific gravity. Compare the reading to the Specifications listed in this Chapter. **Note:** *Add 0.004 points to the reading for every 10-degrees F above 20-degrees C (68-degrees F) - subtract 0.004 points from the reading for every 10-degrees below 20-degrees C (68-degrees F). Return the electrolyte to the appropriate cell and repeat the check for the remaining cells. When the check is complete, rinse the hydrometer thoroughly with clean water.*

9 If the specific gravity of the electrolyte in each cell is as specified, the battery is in good condition and is apparently being charged by the machine's charging system.

10 If the spepific gravity is low, the battery is not fully charged. This may be due to corroded battery terminals, a dirty battery case, a malfunctioning charging system, or loose or corroded wiring connections. On the other hand, it may be that the battery is worn out, especially if the machine is old, or that infrequent use of the motorcycle prevents normal charging from taking place.

11 Be sure to correct any problems and charge the battery if necessary. Refer to Chapter 8 for additional battery maintenance and charging procedures.

12 On models without a battery cover, secure the battery with the strap **(see illustration 4.5a).** Install the battery cell caps, tightening them securely. Reconnect the cables to the battery, attaching the positive cable first and the negative cable last. Make sure to install the insulating boot over the terminals.

13 Install the battery cover (if equipped) and secure it with the strap.

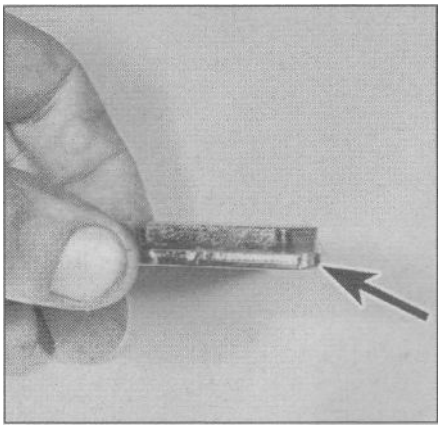
14 Install all components removed for access. Be very careful not to pinch or otherwise restrict the battery vent tube, as the battery may build up enough internal pressure during normal charging system operation to explode.

5 Brake pads and shoes - wear check

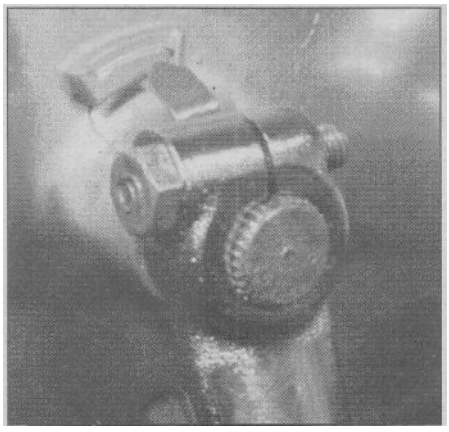
Refer to illustrations 5.2, 5.3 and 5.6

1 The front brake pads should be checked at the recommended intervals and replaced with new ones when worn beyond the limit listed in this Chapter's Specifications. Always replace pads **in** complete sets; if the front brake has two calipers, replace all foir at the same time.

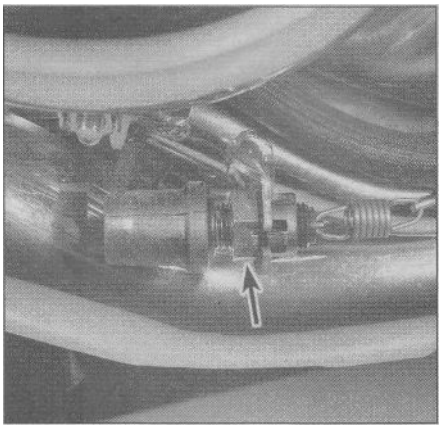
2 To check the front brake pads on chain drive models, flic the inspection window on the back of the caliper (see illustration) f the pads are worn nearly to the red line, replace them (see Chac:



5.3 If the raised corner of the pad backing metal (arrow) is close to the disc, the pad is worn and the full set of pads must be replaced (pad removed for clarity)



5.6 If the pointer is near the end of its travel with the brake pedal depressed, replace the shoes



6.6a Hold the switch so it won't rotate and rotate the nut (arrow) (this is an XV535)...

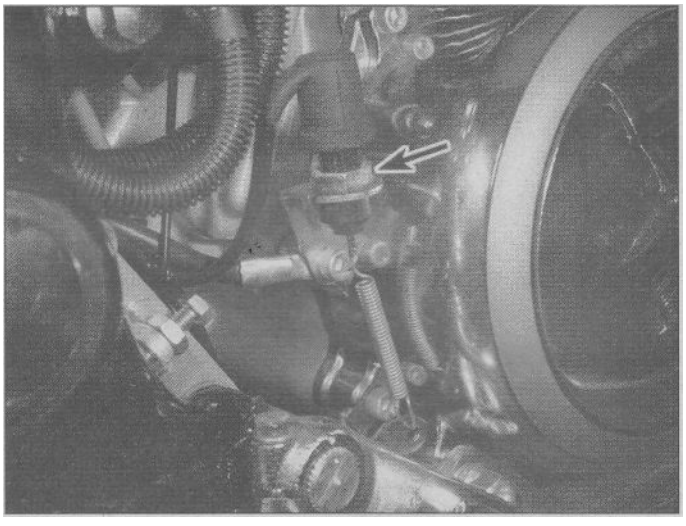
3 On models so equipped, remove the pad cover **(see illustration 2.9a in Chapter 6, Part B).** Reach up and operate the brake lever while you look at the back of the caliper. If the pad wear indicator is close to the disc **(see illustration),** the pads are worn excessively and must be replaced with new ones (see Chapter 6).

4 On XV535 models, remove the rubber plug from the back of the caliper. Look through the hole and inspect the pads. If the pads are worn near the wear limit listed in the Chapter 6 Specifications, replace them.

5 On models without an inspection window or a pad cover, squeeze the front brake lever and look at the edges of the pads. If the pads are worn to near the wear limit listed in the Chapter 6 Specifications, replace them (see Chapter 6).

6 To check the rear brake shoes, press the brake pedal firmly while you look at the wear indicator on the brake panel **(see illustration).** If the indicator pointer is close to the end of its travel, replace the shoes (see Chapter 6).

7 If the pads are in good condition, reinstall the covers (if equipped). The words "Uncover for pad service" stamped in the pad covers may be upside down when the cover is installed. This doesn't mean the cover is upside down.



6.6b ... and this is an XV1100 (700 through 1000 models similar)

6 Brake system - general check

Refer to illustrations 6.6a and 6.6b

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

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 6).

3 Make sure all brake fasteners are tight. Check the brake pads and shoes for wear (see Section 5) and make sure the fluid level in the front brake reservoir is correct (see Section 3). Look for leaks at the hose connections and check for cracks in the hose(s). If the lever or pedal is spongy, bleed the brakes as described in Chapter 6.

4 Make sure the brake light operates when the brake lever is depressed.

5 Make sure the brake light is activated just before the rear brake takes effect.

6 If adjustment is necessary, hold the switch so it won't rotate and turn the adjusting nut on the switch body **(see illustrations)** until the brake light is activated when required. If the switch doesn't operate the brake lights, check it as described in Chapter 8.

7 The front brake light switch is not adjustable. If it fails to operate properly, replace it with a new one (see Chapter 8).

7 Brake lever and pedal position and play - check and adjustment

Frontbrakes

Refer to illustration 7.2

1 The front brake lever must have the amount of free play listed in this Chapter's Specifications to prevent brake drag.

2 Operate the lever and check free play. If it's not correct, loosen the adjuster locknut, turn the adjuster to bring free play within the Specifications and tighten the locknut **(see illustration).**

Rearbrakes

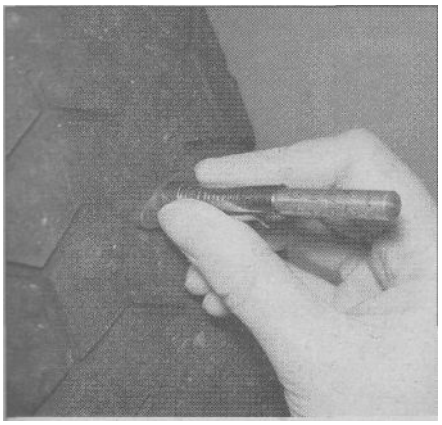
Refer to illustrations 7.4a and 7.4b

3 The rear brake pedal should be positioned below the top of the footpeg the distance listed in this Chapter's Specifications.

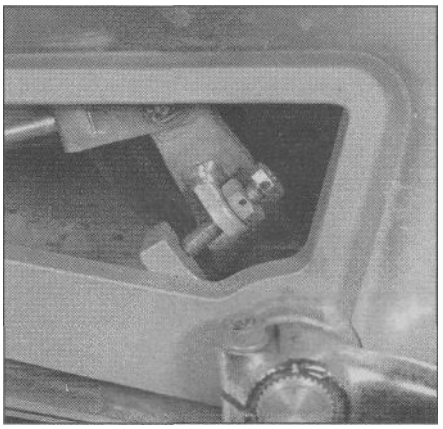
4 To adjust the position of the pedal, loosen the locknut on the adjuster, turn the adjuster to set the pedal position and tighten the locknut **(see illustrations).**

5 Check pedal freeplay and compare it to the value listed in this Chapter's Specifications. Adjust if necessary by turning the nut at the rear end of the brake cable or rod.

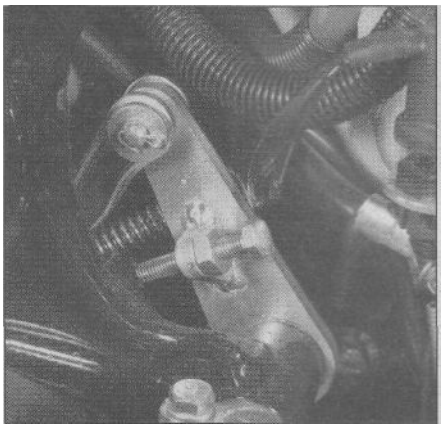
6 If necessary, adjust the brake light switch (see Section 6).



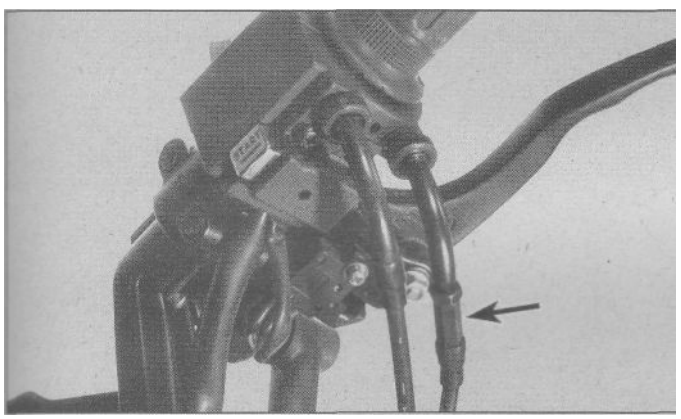
7.2 Loosen the locknut and turn the screw to change brake lever freeplay



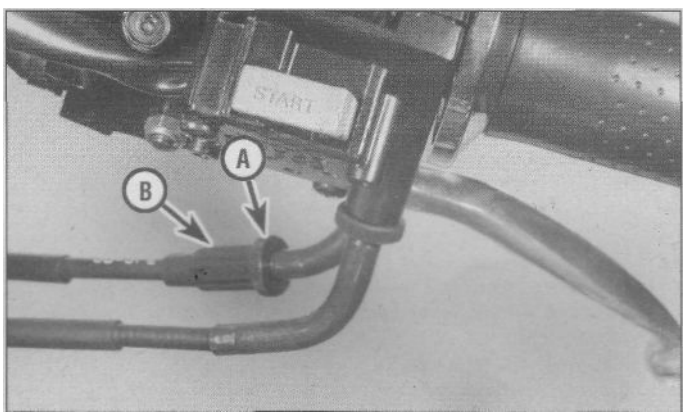
7.4a Loosen the locknut and turn the bolt to change brake pedal freeplay (this is an XV920)...



7.4b ... and this is an XV1100 (other models similar)



8.4 Check tire pressures with an accurate gauge



9.3 Loosen the lockwheel (A) and turn the adjuster (B) to change freeplay (dual-cable model shown)

8 Tires/wheels - general check

Refer to illustration 8.4

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

Check the tires carefully for cuts, tears, embedded nails or other sharp objects and excessive wear. Operation of the motorcycle with excessively worn tires is extremely hazardous, as traction and handling are directly affected. Measure the tread depth at the center of the tire and replace worn tires with new ones when the tread depth is less than specified.

3 Repair or replace punctured tires as soon as damage is noted. Do not try to patch a torn tire, as wheel balance and tire reliability may be impaired.

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

5 The cast wheels used on some models are virtually maintenance free, out they should be kept clean and checked periodically for cracks and other damage. Never attempt to repair damaged cast wheels; they must be replaced with new ones.

6 Check the valve stem locknuts to make sure they are tight. Also, make sure the valve stem cap is in place and tight. If it is missing, install a new one made of metal or hard plastic.

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

Throttle check

1 Make sure the throttle grip rotates easily from fully closed to fully open with the front wheel turned at various angles. The grip should return automatically from fully open to fully closed when released. If the throttle sticks, check the throttle cable(s) for cracks or kinks in the housings. Also, make sure the inner cables are cfean and well-lubricated.

2 Check for a small amount of freeplay at the grip and compare the freeplay to the value listed in this Chapter's Specifications. If adjustment is necessary, adjust idle speed first (see Section 19).

Single cable models

Refer to illustration 9.3

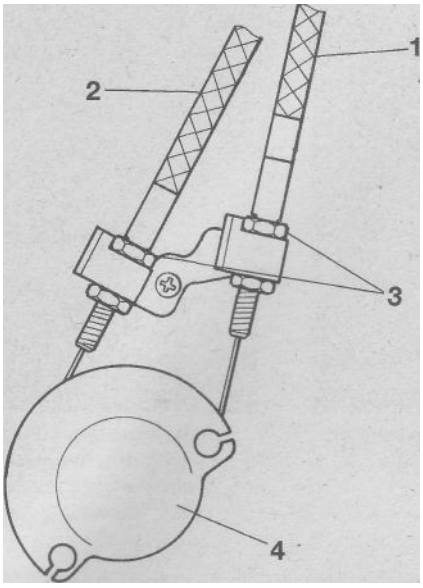
3 Loosen the lockwheel at the throttle grip **(see illustration).** Turn the adjuster to give a slight amount of freeplay, then tighten the lockwheel.

Dual cable models

Refer to illustration 9.9

4 These models use two throttle cables - an accelerator cable and a decelerator cable. Initial freeplay adjustments are made at the carburetor end of the cable.

5 Remove the seat, and if necessary, the side covers (see Chapter 7).



9.9 Loosen the locknuts and adjust the accelerator and decelerator cables

1	*Accelerator cable*	*3*	*Locknuts*
2	*Decelerator cable*	*4*	*Throttle pulley*

6 If you're working on an XV535 model, remove the upper fuel tank (see Chapter 3) or the top cover (see Chapter 7).

7 On all except XV535 models, remove the fuel tank (see Chapter 3).

8 Make sure the locknuts at the handlebar throttle cable adjusters are tight **(see illustration 9.3).**

9 At the carburetors, loosen the cable locknuts **(see illustration).**

10 Turn the locknuts on the decelerator cable to set freeplay to zero, then tighten the locknuts.

11 Loosen the accelerator cable locknuts, then turn them to bring freeplay at the throttle grip within the range listed in this Chapter's Specifications. Once freeplay is correct, tighten the locknuts.

12 To make fine adjustments, loosen the locknut on the handlebar cable adjuster **(see illustration 9.3).** Turn the adjuster until the desired freeplay is obtained, then retighten the lockwheel.

13 Make sure the throttle grip is in the fully closed position.

14 Make sure the throttle linkage lever contacts the idle adjusting screw when the throttle grip is in the closed throttle position. **Warning:** *Turn the handlebars all the way through their travel with the engine idling. Idle speed should not change. If it does, the cables may be routed incorrectly. Correct this condition before riding the bike.*

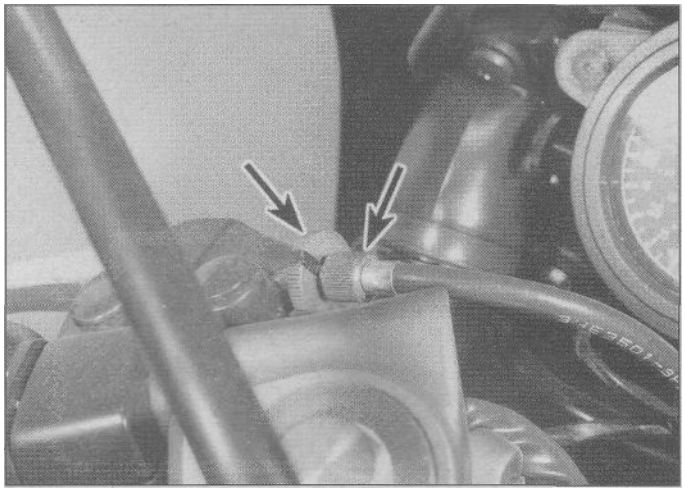
10 Clutch - check and adjustment

Refer to illustration 10.3

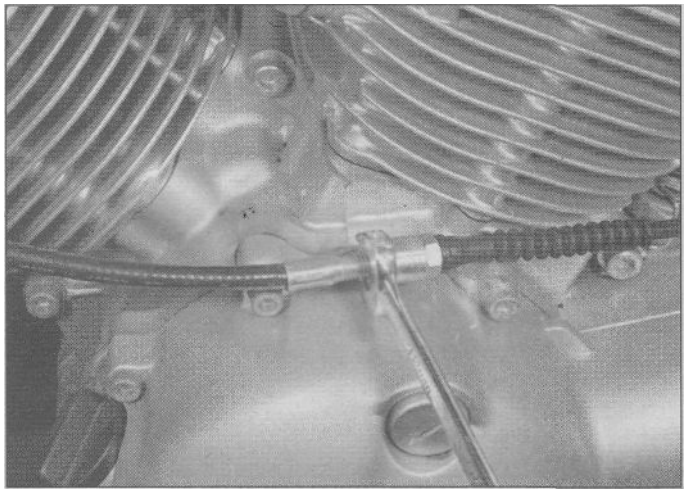
1 Correct clutch freeplay is necessary to ensure proper clutch operation and reasonable clutch service life. Freeplay normally changes because of cable stretch and clutch wear, so it should be checked and adjusted periodically.

2 Clutch cable freeplay is checked at the lever on the handlebar. Slowly pull in on the lever until resistance is felt, then note how big the gap is between the lever and its pivot bracket. Compare this distance with the value listed in this Chapter's Specifications. Too little freeplay might result in the clutch not engaging completely. If there is too much freeplay, the clutch might not release fully.

3 Normal freeplay adjustments are made at the dutch lever by loosening the lockwheel and turning the adjuster until the desired freeplay is obtained **(see illustration).** Always retighten the lockwheel once the adjustment is complete.



10.3 Normal clutch cable adjustments are made at the handlebar - loosen the clutch cable lockwheel (left arrow) and turn the adjuster (right arrow); tighten the lockwheel after adjustment



10.5 The XV535 clutch cable can be adjusted at the bracket on the side of the engine

4 If freeplay can't be adjusted at the handlebar, check the initial adjustment at the engine.

XV535models

Refer to illustration 10.5

5 Loosen the locknuts at the clutch cable bracket on the engine **(see illustration).** Turn the nuts to achieve, the correct freeplay, then tighten them.

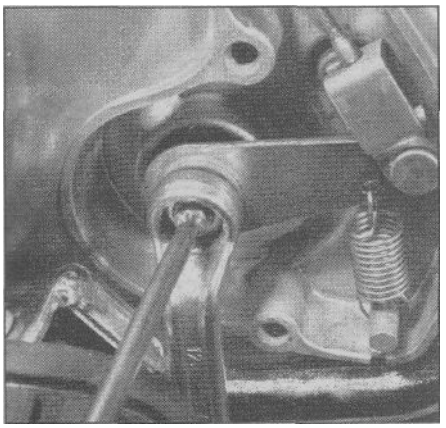
6 If necessary, make fine adjustments at the handlebar adjuster (see Step 3).

XV700through1100models

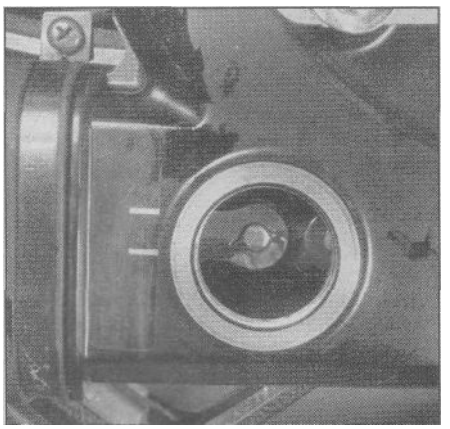
Refer to illustration 10.8

7 Remove the cover from the clutch adjuster on the left side of the engine.

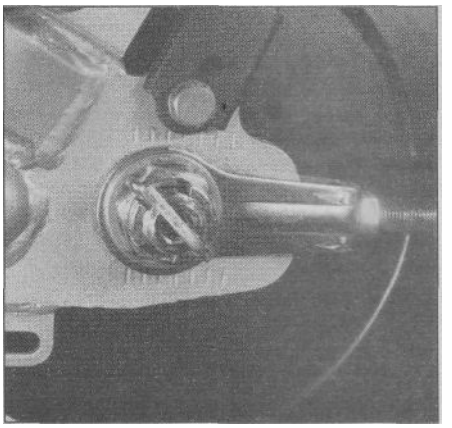
8 Loosen the locknut and turn the adjuster screw clockwise until it seats lightly, then back it out 1/4 turn and tighten the locknut **(see illustration). Caution:** *Don't operate the clutch while the locknut is loose.*



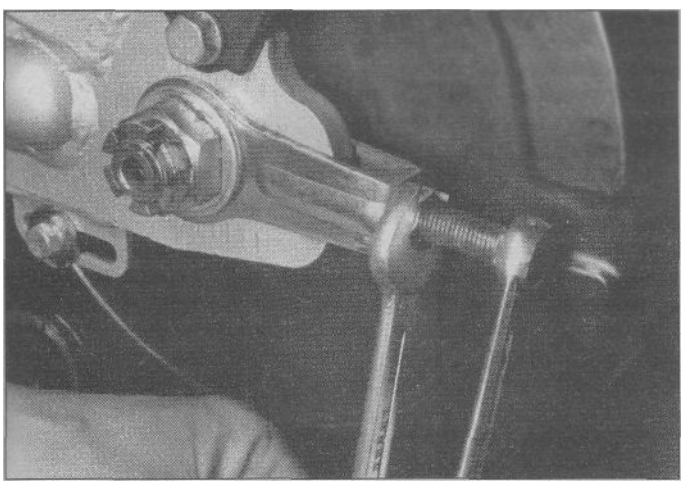
10.8 The XV700 through 1100 can be adjusted with a screw on the side of the engine



11.3 Look through the viewing hole to measure chain slack



11.8 Remove the cotter pin and loosen the axle nut; the vertical lines in the frame below the nut are used for chain adjustment



11.9 Loosen and hold the locknut and turn the adjusting bolt to adjust chain slack

All models

9 Recheck freeplay at the clutch lever and make further adjustments (if necessary) with the adjuster at the lever. If freeplay still can't be adjusted within the Specifications, the cable may be stretched or the clutch may be worn. Refer to Chapter 2 for inspection and repair procedures.

11 Drive chain and sprockets (chain drive models) - check, adjustment and lubrication

1 The drive chain on models so equipped is completely enclosed in a housing and operates in grease, so periodic lubrication isn't necessary. If the chain appears dry during inspection, refer to Chapter 5 and remove it for inspection.

Check

Refer to illustration 11.3

2 To check the chain, place the bike on its centerstand and shift the transmission into Neutral. Make sure the ignition switch is off.

3 Pry the cover from the large hole at the lower front of the rear sprocket housing **(see illustration).**

4 Push up on the bottom run of the chain and measure the slack. Do this every inch or so along the chain until you find the tightest point.

5 Pry the chain up and down and measure its movement, then compare your measurements to the value listed in this Chapter's Specifications. If the bike is equipped with a scale next to the viewing hole (see illustration **11.3),** the center pins of the chain should stay between the marks. As wear occurs, the chain will actually stretch, which means adjustment usually involves removing some slack from the chain.

6 The chain should be replaced at the specified mileage interval (see Chapter 5).

Adjustment

Refer to illustrations 11.8 and 11.9

7 If you haven't already done so, rotate the rear wheel until the chain is positioned with the least amount of slack present.

8 Remove the cotter pin from the axle nut and loosen the nut **(see illustration).**

9 Loosen and back-off the locknuts on the adjuster bolts (see **illustration).**

10 Turn the axle adjusting nut on both sides of the swingarm until the proper chain tension is obtained (get the adjuster on the chain side close, then set the adjuster on the opposite side). 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 5).

11 When the chain has the correct amount of slack, make sure the marks on the adjusters correspond to the same relative marks on each side of the swingarm. Tighten the axle nut to the torque listed in the Chapter 6 Specifications, then install a new cotter pin and bend it properly. If necessary, turn the nut an additional amount to line up the cotter pin hole with the castellations in the nut - don't loosen the nut to do this.

12 Tighten the chain adjuster locknuts securely.

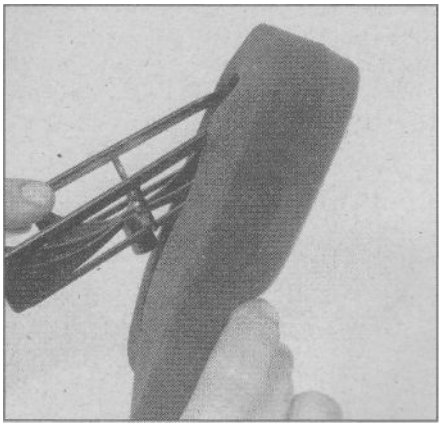
12 Final drive oil (shaft drive models) - check and change

1 Final drive oil level should be checked and changed at intervals specified in Section 1.

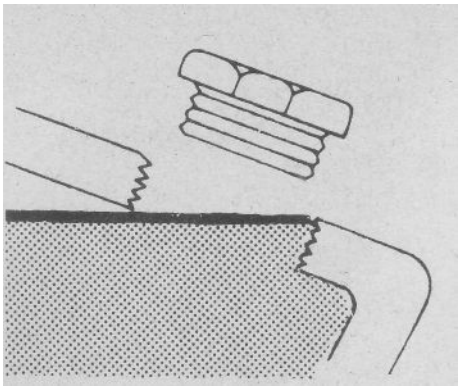
Check

Refer to illustrations 12.3, 12.4a and 12.4b

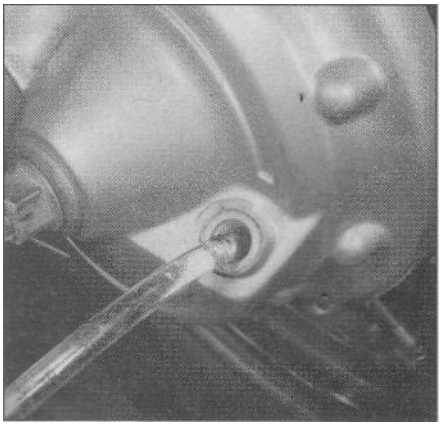
2 Support the bike securely in a level position. **Warning:** *The final drive unit may be hot enough to cause burns. Wait until the final drive unit is cool to the touch before checking the level.*



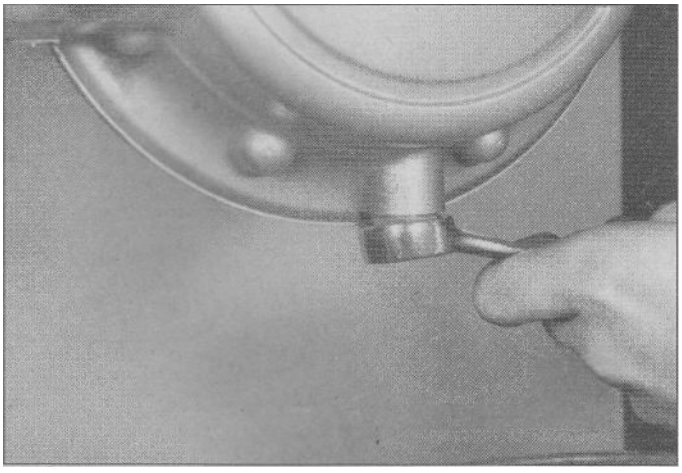
12.3 Remove the filler plug to check final drive oil level



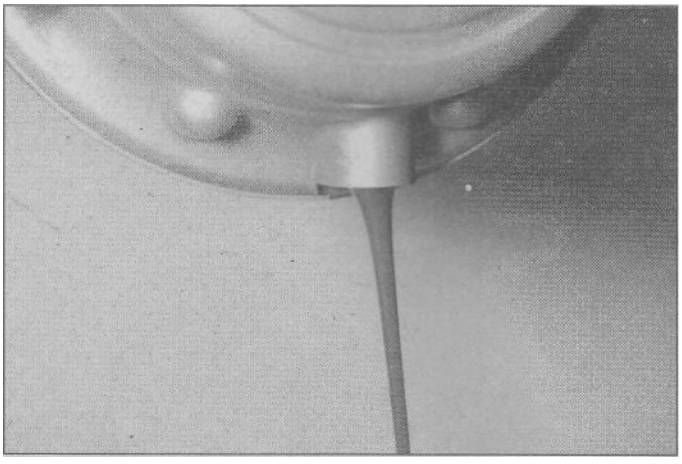
12.4a The oil should be even with the top of the filler hole



12.4b Add oil through the filler hole



12.7a Remove the drain plug ,



12.7b . . . and let the oil drain into a pan, then clean the plug threads and reinstall it

3 Remove the filler plug from the final drive housing **(see illustration).**

4 Look inside the hole and check the oil level. It should be even with the top of the hole **(see illustration).** If it's low, add oil of the type listed in this Chapter's Specifications with a funnel or hose **(see illustration),** then reinstall the filler plug and tighten it to the torque listed in this Chapter's Specifications.

Oilchange

Refer to illustrations 12.7a and 12.7b

5 Ride the bike to warm the oil so it will drain completely. **Warning:** *Be careful not to touch hot components (including the oil); they may be hot enough to cause burns.*

6 Remove the filler plug **(see illustration 12.3).**

7 Remove the drain plug and let the oil drain for 10 to 15 minutes **(see illustrations).**

8 Clean the drain plug, reinstall it and tighten it to the torque listed in this Chapter's Specifications.

9 Fill the final drive unit to the correct level with oil of the type listed in this Chapter's Specifications **(see illustrations 12.4a and 12.4b).**

10 Install the filler plug and tighten it to the torque listed in this Chapter's Specifications.

13 Engine oil/filter - change

Refer to illustrations 13.4a, 13.4b, 13.4c, 13.5a through 13.5c, 13.6a, 13.6b, 13.7 and 13.13

1 Consistent routine oil and filter changes are the single most important maintenance procedure you can perform on a motorcycle. The oil not only lubricates the internal parts of the engine, transmission and clutch, but it also acts as a coolant, a cleaner, a sealant, and a protectant. Because of these demands, the oil takes a terrific amount of abuse and should be replaced' Often with new oil of the recommended grade and type. Saving a little money on the difference in cost between a good oil and a cheap oil won't pay off if the engine is damaged.

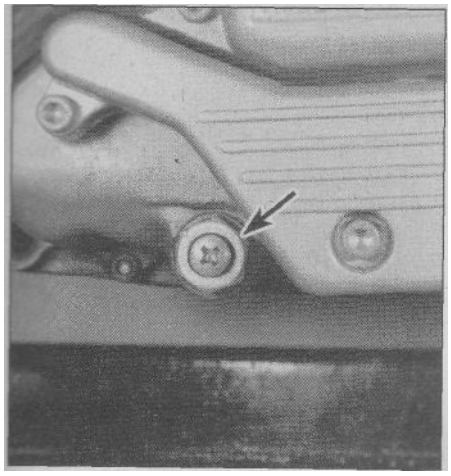
2 Before changing the oil and filter, warm up the engine so the oil will drain easily. Be careful when draining the oil, as the exhaust pipes, the engine, and the oil itself can cause severe burns.

3 Support the motorcycle securely over a clean drain pan. Remove the oil filler cap to vent the crankcase and act as a reminder that there is no oil in the engine.

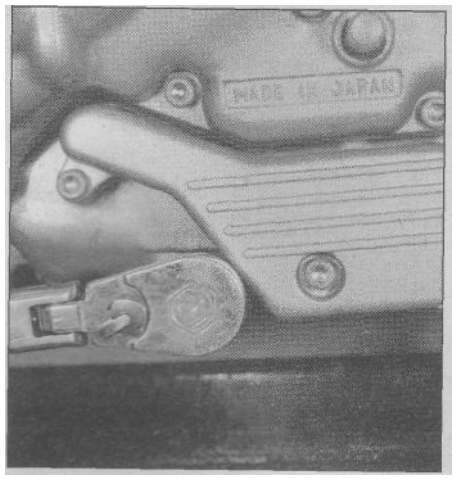
4 Next, remove the drain plug from the engine **(see illustrations)** and allow the oil to drain into the pan **(see illustration).** Discard the sealing washer on the drain plug; it should be replaced whenever the plug is removed.

5 Remove the Allen bolts and take off the filter cover **(see illustrations).**

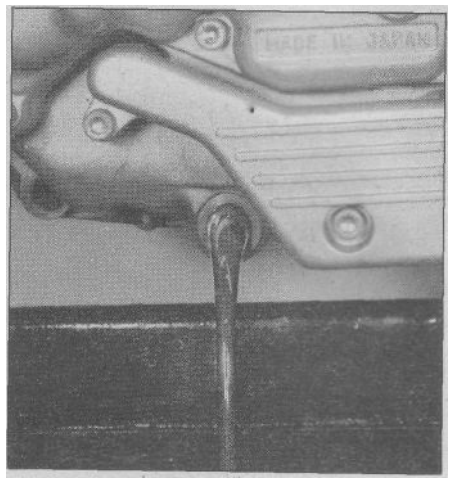
6 Remove the filter element from the engine **(see illustrations).**



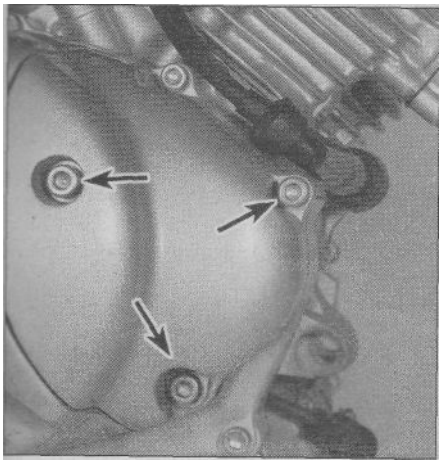
13.4a The oil drain plug (arrow) is located on the left side of the engine (XV535 shown; others similar)



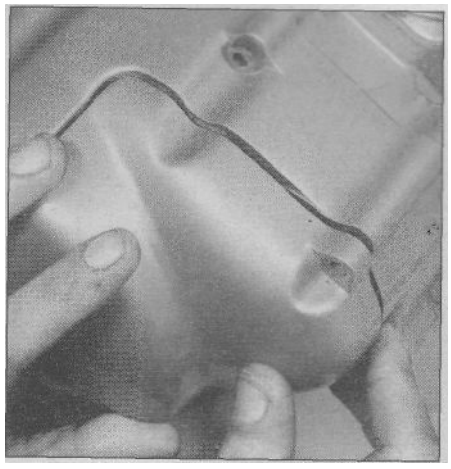
13.4b Loosen the drain plug with a socket...



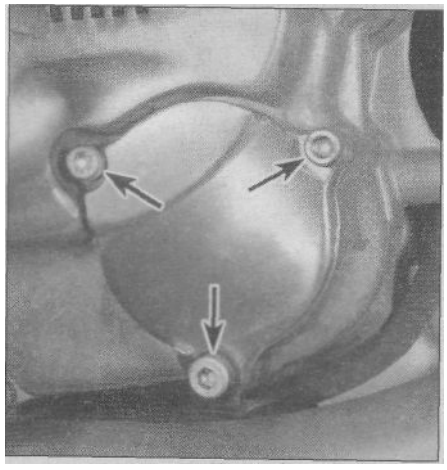
13.4c ... and let the oil drain into a pan



13.5a On XV535 models, remove the Allen bolts (arrows) ...

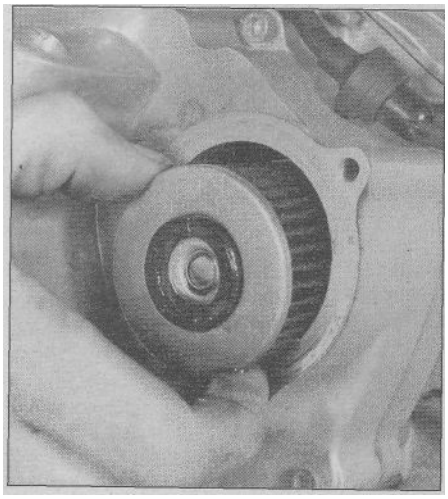


13.5b ... and remove the cover

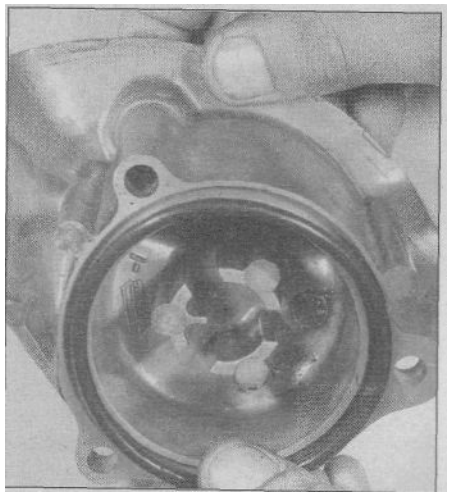


13.5c On XV700 through 1100 models, remove the Allen bolts (arrows)...

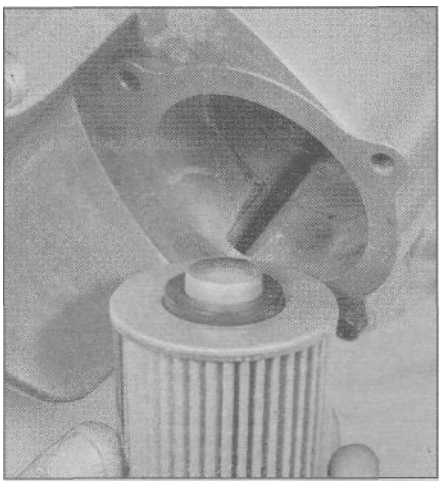
13.6a ... and remove the cover together with its two O-rings



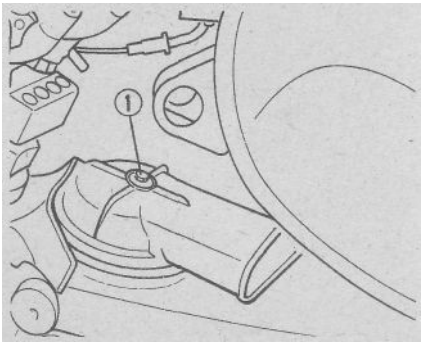
13.6b Pull the filter element out of the engine



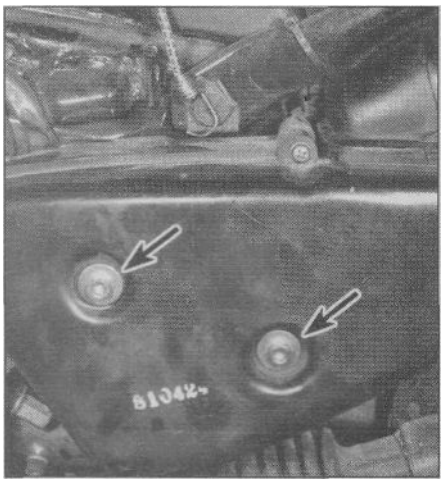
13.7 On XV535 models, remove the 0-ring from the groove in the cover



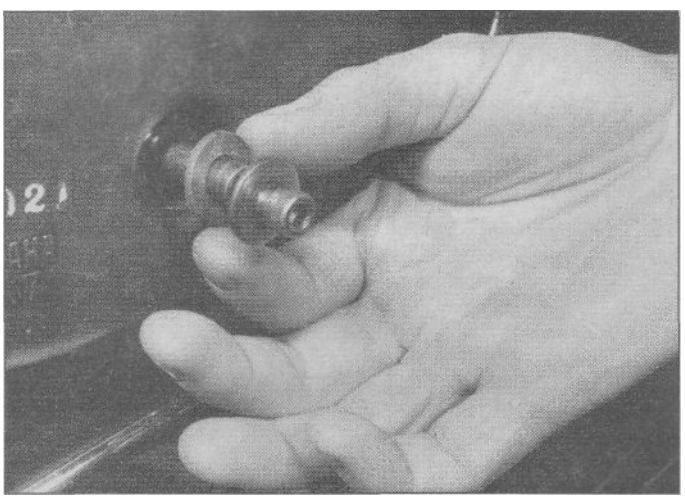
13.13 Make sure the washer is in position on the inner end of the filter element



14.2 Remove the screw (1), then lift the housing cover



14.5a Remove the case cover bolts (arrows)...



14.5b ... be careful not to lose the spacer tubes and washers

7 If you're working on an XV535 model, remove the O-ring from its groove in the cover **(see illustration).**

8 If you're working on an XV700 through 1100 model, remove one O-ring from the groove in the cover and another from the shoulder on the cover **(see illustration 13.6a).**

9 Clean the filter cover and housing with solvent or clean rags. Make sure the holes in the filter bolt are clear. Wipe any remaining oil off the filter sealing area of the crankcase.

10 Clean the components and check them for damage. If any damage is found, replace the damaged part(s).

11 Check the condition of the drain plug threads and the sealing washer.

12 Install a new O-ring in the cover groove (XV535) or in the groove and against the cover shoulder (XV700-1100) **(see illustration 13.6a or 13.7).**

13 Make sure the rubber seal is in place **(see illustration),** then install the filter element in the cover. Install the cover on the engine and tighten the Allen bolts to the torque listed in this Chapter's Specificatidns.

14 Slip a new sealing washer over the crankcase drain plug, then install and tighten it to the torque listed in this Chapter's Specifications. Avoid overtightening, as damage to the engine case will result.

15 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 the oil is very metallic colored, then the engine is experiencing wear from break-in (new engine) or from insufficient lubrication. If there are flakes or chips of metal in the oil, then something is drastically wrong internally and the engine will have to be disassembled for inspection and repair.

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

17 If the inspection of the oil turns up nothing unusual, refill the crankcase to the proper level with the recommended oil and install the filler cap. 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 Maximum mark. Check around the drain plug and filter housing for leaks.

18 The old oil drained from the engine cannot be reused in its present state and should be disposed of. 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.

14 Air filter element - servicing

XV535 models

Refer to illustration 14.2

1 Remove the top cover (see Chapter 7) or upper fuel tank (see Chapter 3).

2 Remove the cover screw and lift off the housing cover **(see illustration).** Inspect the cover O-ring and replace it if it's damaged or deteriorated.

3 Lift out the filter element.

1981 through 1983 and all TR1 models

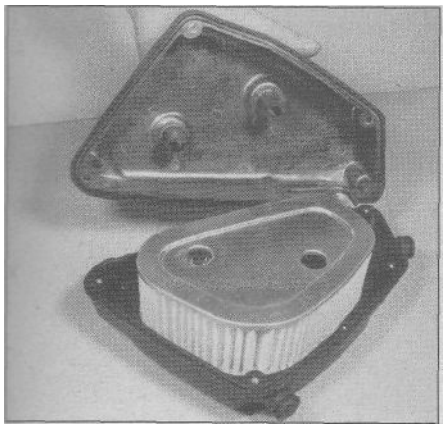
Refer to illustrations 14.5a, 14.5b, 14.6, 14.7a and 14.7b

4 Remove the left side cover (see Chapter 7).

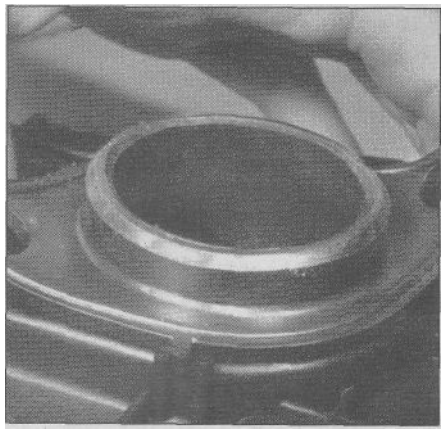
5 Remove the Allen bolts and detach the air filter housing from the motorcycle **(see illustrations).**

6 Lay the housing on a workbench. Remove the screws that hold the halves of the assembly together, then separate them and lift out the element **(see illustration).**

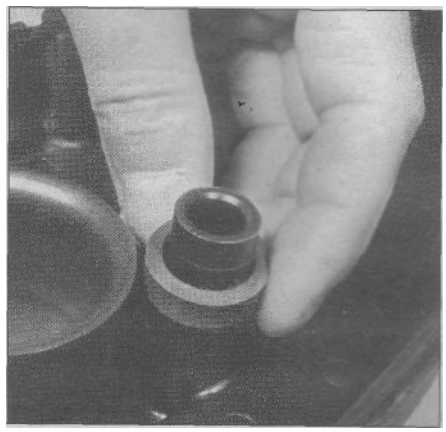
7 Check the filter housing-to-frame seal and the seals inside the filter housing for deterioration or brittleness **(see illustrations).** Replace the seals as necessary.



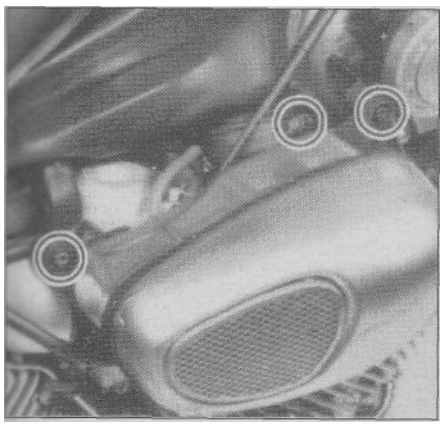
14.6 Separate the housing halves and take the filter element out



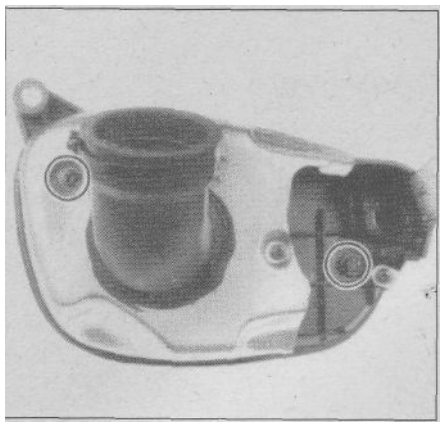
14.7a Check the seal between the filter housing and the frame . . .



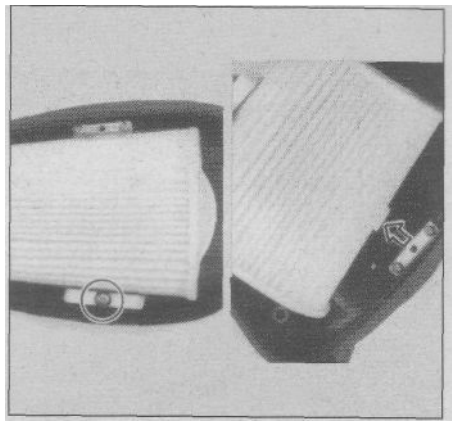
14.7b . . . and the seals inside the filter housing; replace them if they're deteriorated or brittle



14.9 Loosen the clamp bolt and remove the Allen bolts, then detach the air filter case from the motorcycle



14.10a Remove the cover from the inside of the case



14.10b Remove the filter element retaining screw, detach the mounting tab and lift out the element

1984 and later XV700 through 1100 models

Refer to illustrations 14.9, 14.10a and 14.10b

8 Remove the fuel tank (see Chapter 3).

9 Loosen the air duct clamp bolt and remove the mounting bolts, then take the air filter case off the motorcycle **(see illustration).**

10 Remove the air filter case cover **(see illustration).** Remove the element mounting screw and take the element out **(see illustration).**

All models

11 Tap the element on a hard surface to shake out dirt.' If compressed air is available, use it to clean the element by blowing from the inside out. If the element is extremely dirty or torn, or if dirt can't be blown or tapped out, replace it with a new one.

12 Reinstall the filter by reversing the removal procedure. Make sure the element is seated properly in the filter housing before installing the cover.

13 Install all components removed for access.

15 Cylinder compression - check

1 Among other things, poor engine performance may be caused by leaking valves, incorrect valve clearances, a leaking head gasket, or worn pistons, rings and/or cylinder walls. A cylinder compression check will help pinpoint these conditions and can also indicate the presence of excessive carbon deposits in the cylinder heads.

2 The only tools required are a compression gauge and a spark plug wrench. 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.

4 Support the bike securely so it can't be knocked over during this procedure.

5 Remove the spark plugs (see Section 16, if necessary). Work carefully - don't strip the spark plug hole threads and don't burn your hands.

6 Disable the ignition by unplugging the primary wires from the coils (see Chapter 4). Be sure to mark the locations of the wires before detaching them.

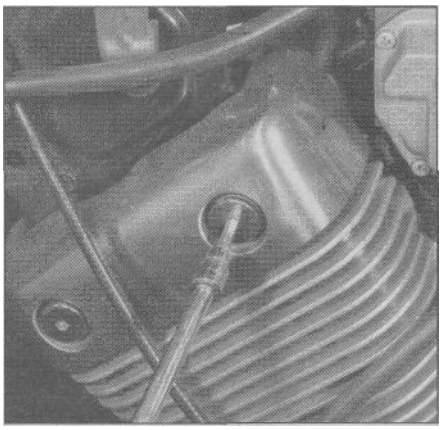
7 Install the compression gauge in one of the spark plug holes.

8 Hold or block the throttle wide open.

9 Crank 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. Repeat the procedure for the other cylinder and compare the results to the value listed in this Chapter's Specifications.

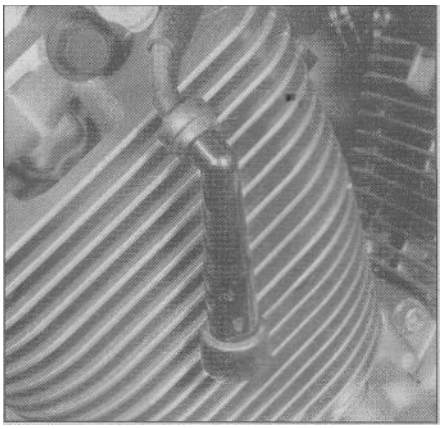
10 If the compression in both cylinders built up quickly and evenly to the specified amount, you can assume the engine upper end is in reasonably good mechanical condition. Worn or sticking piston rings and worn cylinders will produce very little initial movement of the gauge needle, but compression will tend to build up gradually as the engine spins over. Valve and valve seat leakage, or head gasket leakage, is indicated by low initial compression which does not tend to build up.

11 To further confirm your findings, add a small amount of engine oil

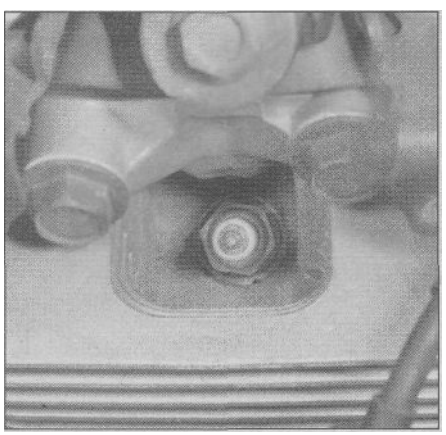


16.2 On XV535 models, remove the Allen bolts and lift off the cylinder head side covers

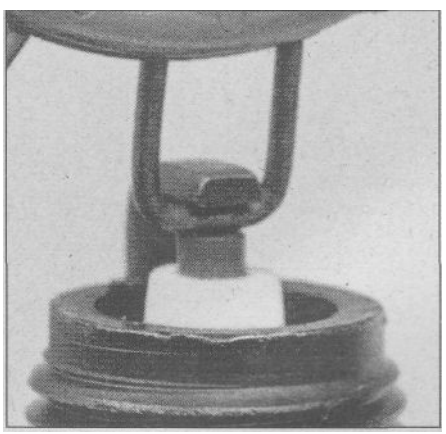
16.3a Twist and pull the spark plug caps to detach them from the plugs . . .



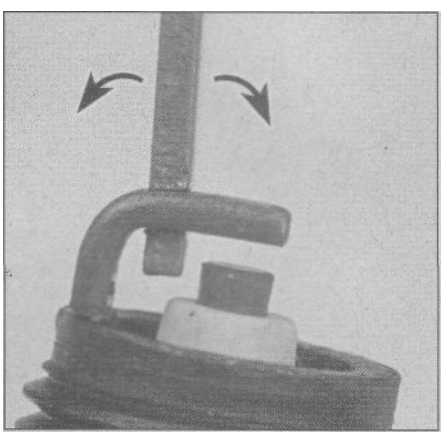
16.3b . . . check the rubber seals for brittleness and the plastic for cracks



16.3c The spark plugs are inside wells in the cylinder heads, so you'll need a socket with a rubber insert to grip the plug



16.7a Spark plug manufacturers recommend using a wire type gauge when checking the gap - if the wire doesn't slide between the electrodes with a slight drag, adjustment is required



16.7b To change the gap, bend the side electrode only, as indicated by the arrows, and be very careful not to crack or chip the ceramic insulator surrounding the center electrode

to each cylinder by inserting the nozzle of a squirt-type oil can through the spark plug holes. The oil will tend to seal the piston rings if they are leaking. Repeat the test for the other cylinder.

12 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 valves or the head gasket. Leakage past the valves may be due to insufficient valve clearances, burned, warped or cracked valves or valve seats or valves that are hanging up in the guides.

13 If compression readings are considerably higher than specified, the combustion chambers are 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 or valves. Remove the cylinder head and carefully decarbonize the combustion chambers (see Chapter 2).

16 Spark plugs - replacement

Refer to illustrations 16.2, 16.3a, 16.3b, 16.3c, 16.7aand 16.7b

1 Make sure your spark plug socket is the correct size before attempting to remove the plugs.

2 If you're working on an XV535 model, remove the cylinder head side covers **(see illustration).**

3 Disconnect the spark plug caps from the spark plugs **(see illustrations).** If available, use compressed air to. blow any accumulated debris from around the spark plugs. Remove the plugs **(see illustration).**

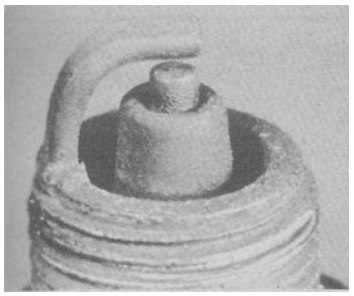
4 Inspect the electrodes for wear. Both the center and side electrodes should have square edges and the side electrode should be of uniform thickness. Look for excessive deposits and evidence of a cracked or chipped insulator around the center electrode. Compare your spark plugs to the color spark plug reading chart. Check the threads, the washer and the ceramic insulator body for cracks and other damage.

5 If the electrodes are not excessively worn, and if the deposits can be easily removed with a wire brush, the plugs can be regapped and reused (if no cracks or chips are visible in the insulator). If in doubt concerning the condition of the plugs, replace them with new ones, as the expense is minimal.

6 Cleaning spark plugs by sandblasting is permitted, provided you clean the plugs with a high flash-point solvent afterwards.

7 Before installing new plugs, make sure they are 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 gauge to cheGk the gap **(see illustration).** 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 each plug.

For a COLOR version of this spark plug diagnosis page, please see the inside rear cover of this manual



CARBON DEPOSITS

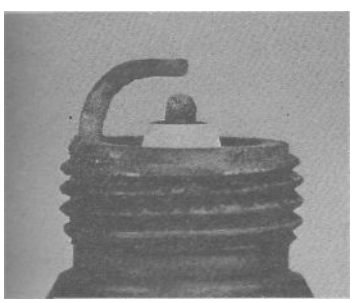
Symptoms: Dry sooty deposits indicate a rich mixture or weak ignition. Causes misfiring, hard starting and hesitation.

Recommendation: Check for a clogged air cleaner, high float level, sticky choke and worn ignition points. Use a spark plug with a longer core nose for greater anti-fouling protection.

OIL DEPOSITS

Symptoms: Oily coating caused by poor oil control. Oil is leaking past worn valve guides or piston rings into the combustion chamber. Causes hard starting, misfiring and hesition.

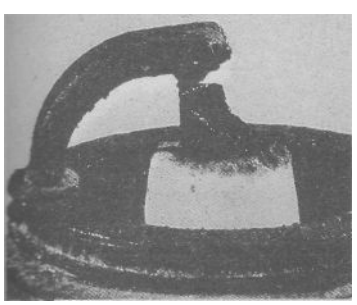
Recommendation: Correct the mechanical condition with necessary repairs and install new plugs.



TOO HOT

Symptoms: Blistered, white insulator, eroded electrode and absence of deposits. Results in shortened plug life.

Recommendation: Check for the correct plug heat range, over-advanced ignition timing, lean fuel mixture, intake manifold vacuum leaks and sticking valves. Check the coolant level and make sure the radiator is not clogged.



PREIGNITION

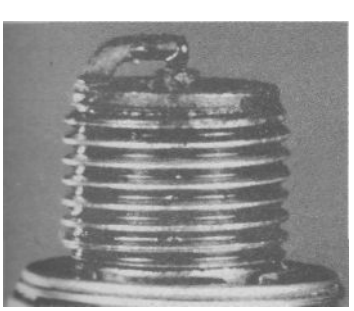
Symptoms: Melted electrodes. Insulators are white, but may be dirty due to misfiring or flying debris in the combustion chamber. Can lead to engine damage.

Recommendation: Check for the correct plug heat range, over-advanced ignition timing, lean fuel mixture, clogged cooling system and lack of lubrication.

HIGH SPEED GLAZING

Symptoms: Insulator has yellowish, glazed appearance. Indicates that combustion chamber temperatures have risen suddenly during hard acceleration. Normal deposits melt to form a conductive coating. Causes misfiring at high speeds.

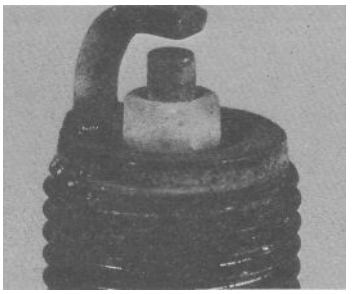
Recommendation: Install new plugs. Consider using a colder plug if driving habits warrant.



GAP BRIDGING

Symptoms: Combustion deposits lodge between the electrodes. Heavy deposits accumulate and bridge the electrode gap. The plug ceases to fire, resulting in a dead cylinder.

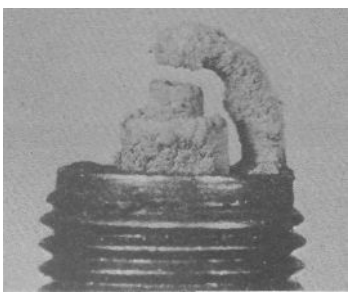
Recommendation: Locate the faulty plug and remove the deposits from between the electrodes.



NORMAL

Symptoms: Brown to grayish-tan color and slight electrode wear. Correct heat range for engine and operating conditions.

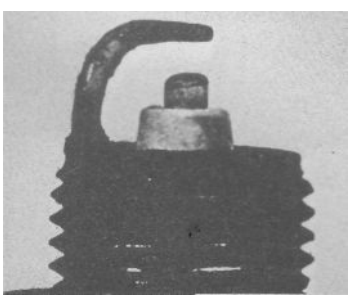
Recommendation: When new spark plugs are installed, replace with plugs of the same heat range.



ASH DEPOSITS

Symptoms: Light brown deposits encrusted on the side or center electrodes or both. Derived from oil and/or fuel additives. Excessive amounts may mask the spark, causing misfiring and hesitation during acceleration.

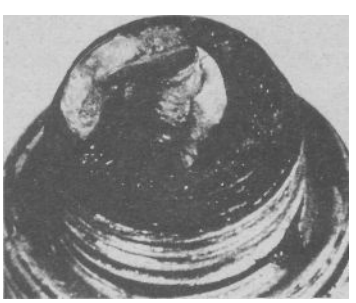
Recommendation: If excessive deposits accumulate over a short time or low mileage, install new valve guide seals to prevent seepage of oil into the combustion chambers. Also try changing gasoline brands.



WORN

Symptoms: Rounded electrodes with a small amount of deposits on the firing end. Normal color. Causes hard starting in damp or cold weather and poor fuel economy.

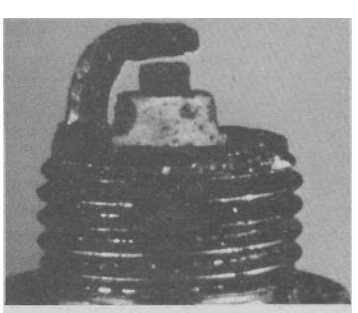
Recommendation: Replace with new plugs of the same heat range.



DETONATION

Symptoms: Insulators may be cracked or chipped. Improper gap setting techniques can also result in a fractured insulator tip. Can lead to piston damage.

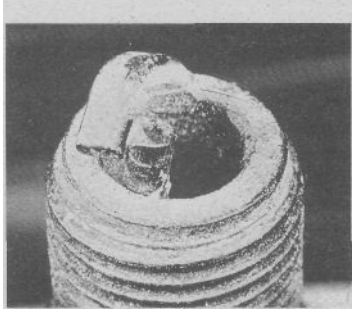
Recommendation: Make sure the fuel anti-knock values meet engine requirements. Use care when setting the gaps on new plugs. Avoid lugging the engine.



SPLASHED DEPOSITS

Symptoms: After long periods of misfiring, deposits can loosen when normal combustion temperature is restored by an overdue tune-up. At high speeds, deposits flake off the piston and are thrown against the hot insulator, causing misfiring.

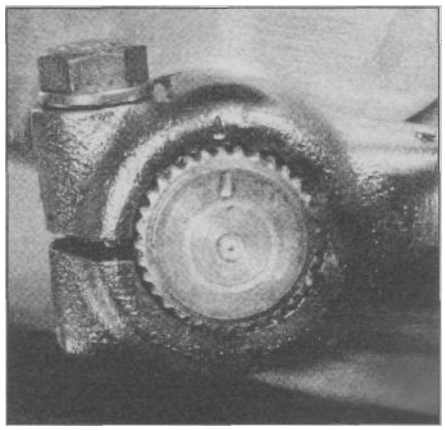
Recommendation: Replace the plugs with new ones or clean and reinstall the originals.



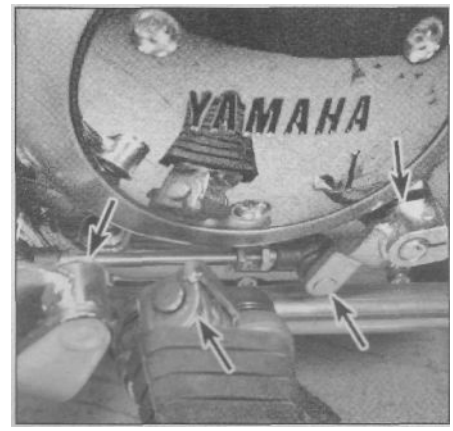
MECHANICAL DAMAGE

Symptoms: May be caused by a foreign object in the combustion chamber or the piston striking an incorrect reach (too long) plug. Causes a dead cylinder and could result in piston damage.

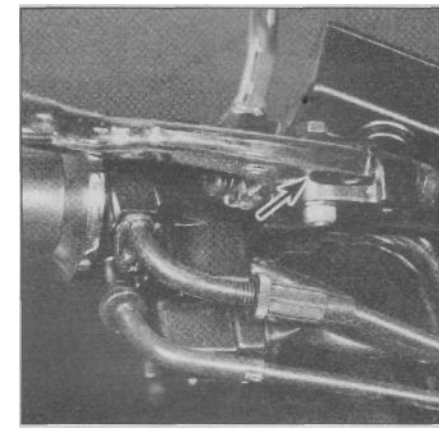
Recommendation: Remove the foreign object from the engine and/or install the correct reach plug.



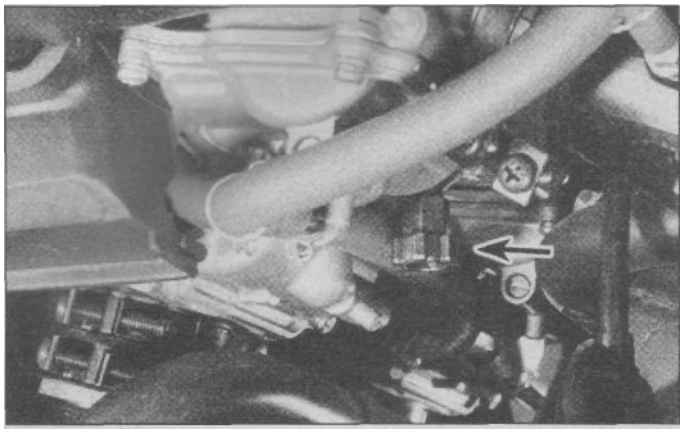
17.2a Lubricate the brake pedal pivot...



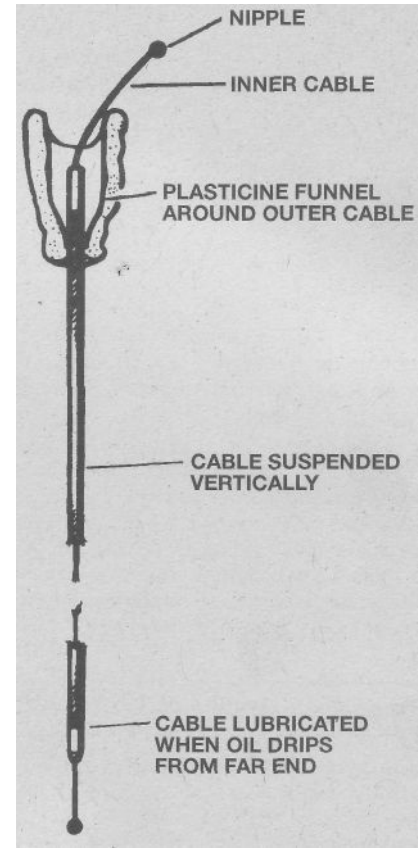
17.2b ... the footpeg and shift linkage pivots (arrows) - XV1100 shown ...



17.2c ... and the brake and clutch lever pivots (brake lever shown; clutch lever similar)



17.3a Lubricating a cable with a pressure lube adapter (make sure the tool seats around the inner cable)



17.3b Oiling a control cable with a funnel

8 Since the cylinder head is made of aluminum, which is soft and easily damaged, thread the plugs into the heads by hand. Since the plugs are recessed, slip a short length of hose over the end of the plug to use as a tool to thread it into place. The hose will grip the plug well enough to turn it, but will start to slip if the plug begins to cross-thread in the hole - this will prevent damaged threads and the accompanying repair costs.

9 Once the plugs are finger tight, the job can be finished with a socket. If a torque wrench is available, tighten the spark plugs to the torque listed in this Chapter's Specifications. If you do not have a torque wrench, tighten the plugs finger tight (until the washers bottom on the cylinder head) then use a wrench to tighten them an additional 1/4 to 1/2 turn. Regardless of the method used, do not over-tighten them.

10 Reconnect the spark plug caps and reinstall the air ducts.

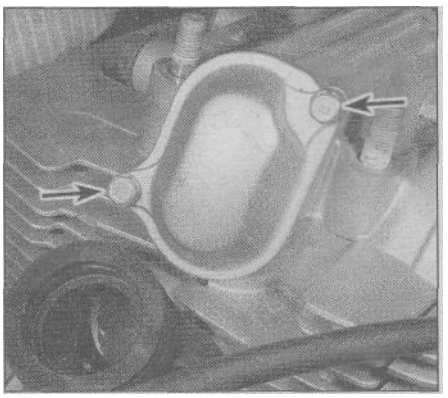
17 Lubrication - general

Refer to illustrations 17.2a, 17.2b, 17.2c, 17.3a and 17.3b

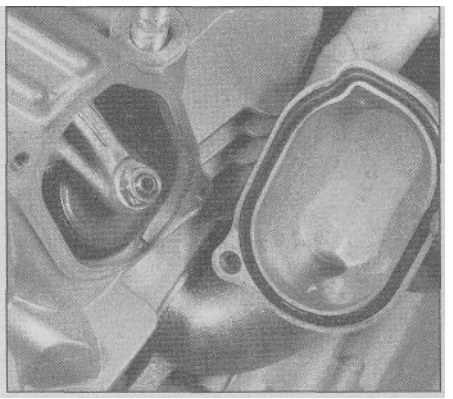
1 Since the controls, cables and various other components of a motorcycle are exposed to the elements, they should be lubricated periodically to ensure safe and trouble-free operation.

2 The' footpegs, clutch and brake lever, brake pedal, shift lever and sidestand/centerstand pivots should be lubricated frequently **(see illustrations).** 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).*

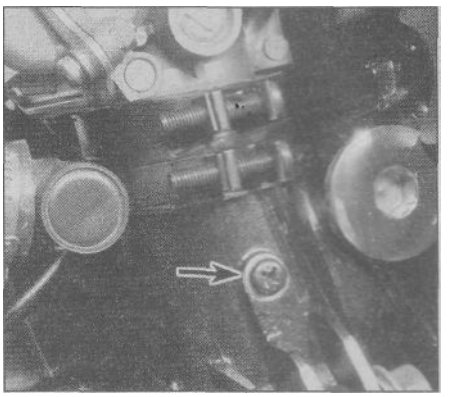
3 To lubricate the throttle and choke cables, disconnect the cable(s) at the lower end, then lubricate the cable with a pressure lube adapter **(see illustration).** If you don't have one, disconnect both ends of the cable and use a funnel **(see illustration).** See Chapter 3, Part B for the choke cable removal procedure (XV535 models don't have a choke cable). **Note:** *Yamaha recommends that the throttle twist grip be*



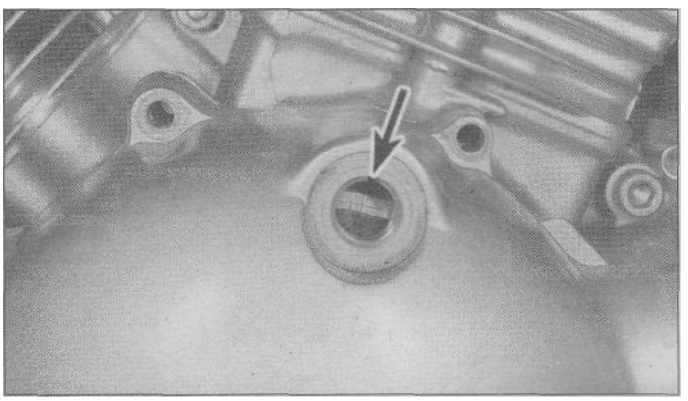
18.7a Remove the cover bolts (arrows)...



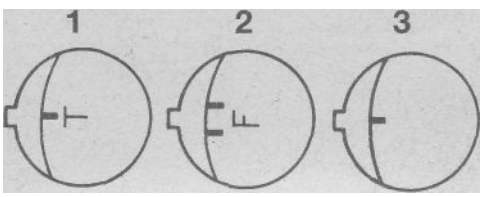
18.7b ... and lift the cover off



18.8 Unscrew the timing plug (upper arrow) and the crankcase cover plate (lower arrow)



18.9a The timing mark for the rear cylinder is the line next to the "T" on the alternator rotor; align it with the notch inside the hole (arrow)



18.9b XV535 timing marks

1 Rear cylinder top dead center mark
2 Frornt cylinder firing range mark
3 Front cylinder top dead center mark

removed and lubricated whenever the throttle cables are lubricated. Refer to the handlebar switch removal section of Chapter 8.

4 The speedometer cable should be removed from its housing and lubricated with motor oil or cable lubricant.

5 Refer to Chapter 5 for the swingarm needle bearing and rear suspension linkage lubrication procedures.

18 Valve clearances - check and adjustment

1 The engine must be completely cool for this maintenance procedure, so let the machine sit overnight before beginning.

2 Disconnect the cable from the negative terminal of the battery. Remove the spark plugs (see Section 16) so the crankshaft is easier to turn.

3 Lift or remove the seat (see Chapter 7).

XV535 models

Refer to illustrations 18.7a, 18.7b, 18.8, 18.9a, 18.9b, 18.11 and 18.14

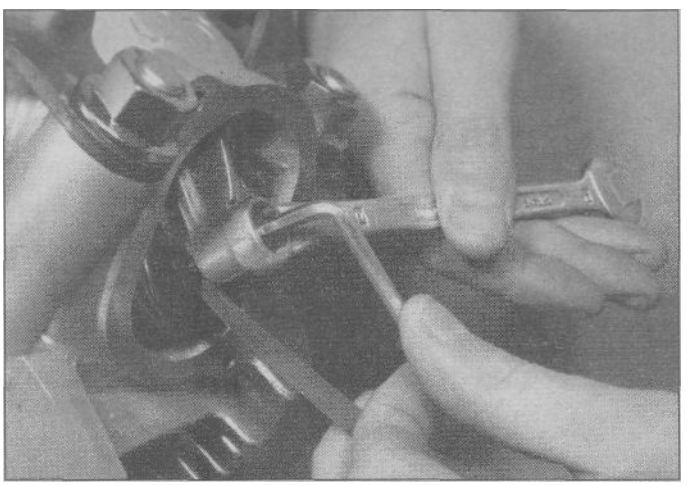
4 If you're working on an early model without an upper fuel tank, remove the top cover (see Chapter 7).

5 If you're working on a later model with an upper fuel tank, remove it (see Chapter 3).

6 Remove the left and right front side cover (see Chapter 3). Remove the left side cover bracket and the left side cover bracket/electrical component board.

7 Remove the rocker covers **(see illustrations).**

8 Remove the timing plug and the crankcase cover plate **(see illustration).**

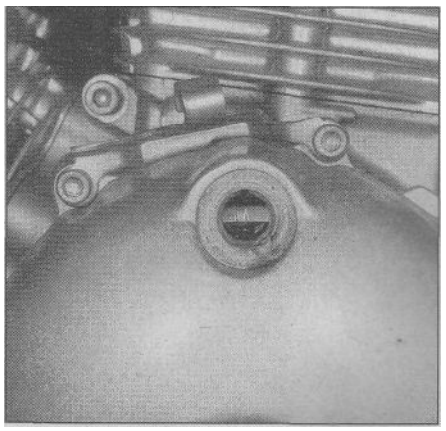


18.11 Measure valve clearance with a feeler gauge; hold the locknut with a box wrench (ring spanner) and turn the adjusting screw with an Allen wrench or screwdriver

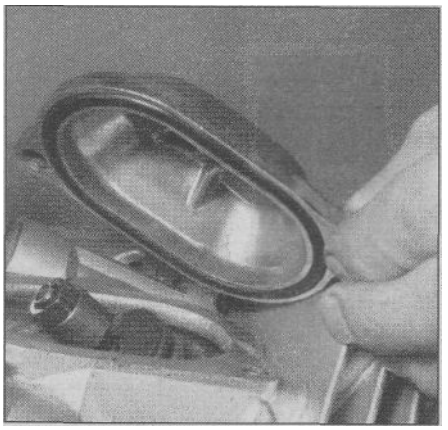
9 Turn the crankshaft clockwise with a socket on the turning bolt (located inside the crankcase cover plate). Watch the edge of the alternator rotor (visible through the timing plug hole) and stop turning when the line next to the T mark is aligned with the notch inside the hole **(see illustrations).** This places the rear cylinder at top dead center (TDC) on its compression stroke.

10 With the engine in this position, both of the valves for the rear cylinder can be checked.

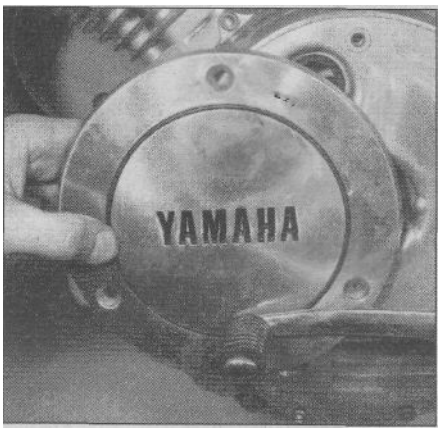
11 Start with the intake valve clearance. Insert a feeler gauge of the thickness listed in this Chapter's Specifications between the rocker arm and valve stem **(see illustration).** Pull the feeler gauge out slowly -



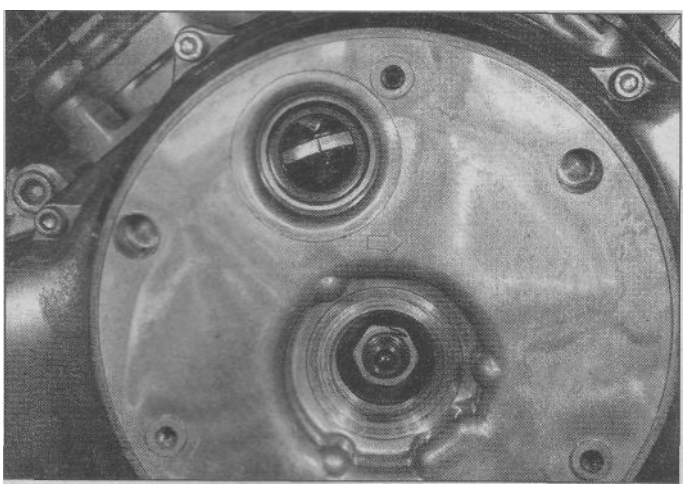
18.14 The single line on the edge of the alternator rotor is the top dead center mark for the front cylinder



18.22 Lift off the rocker cover



18.23 Remove the crankcase outer cover



18.24a The timing mark for the rear cylinder is the line next to the "T" on the alternator rotor; align it with the pointer inside the hole

you should feel a slight drag. If there's no drag, the clearance is too loose. If there's a heavy drag, the clearance is too tight.

12 To adjust the clearance, loosen the rocker arm locknut with a box wrench (ring spanner) **(see illustration 18.11).** Turn the adjusting screw with a screwdriver or Allen wrench to change the clearance, then tighten the locknut.

13 Recheck the clearance with the feeler gauge to make sure it didn't change when you tightened the locknut. Readjust it if necessary.

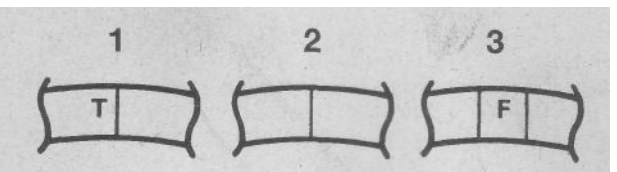
14 Turn the engine clockwise to align the front cylinder's timing mark with the notch in the timing window **(see illustration 18.9b and the accompanying illustration).** With the timing mark aligned, wiggle the front cylinder's rocker arms. There should be a slight amount of cleararjjje between the rocker arms and valve stems. If the rocker arms are tight,- the front piston is on its exhaust stroke, not its compression stroke. Rotate the crankshaft one full turn, line up the timing mark again, then wiggle the rocker arms to be sure the front cylinder is on the compression stroke.

15 Perform Steps 11 through 13 above on the front cylinder rocker arms to adjust the front cylinder's valve clearances.

16 Check the O-rings on the rocker covers, timing plug and crankcase cover plate and replace them if they're flattened, broken or have been leaking.

17 install the rocker covers and tighten their bolts to the torque listed in this Chapter's Specifications.

18 Install all components removed for access.



18.24b XV700 through 1100 timing marks

1 Rear cylinder top dead center mark
2 Front cylinder top dead center mark
3 Rear cylinder firing range mark

XV700through1000models

Refer to illustrations 18.22, 18.23, 18.24a and 18.24b

19 Remove the seat (see Chapter 7) and the fuel tank (see Chapter 3)-

20 If you're working on a 1981 through 1983 model, remove the side covers if they block access to the tappet covers.

21 If you're working on a 1984 or later model, remove the air filter housing (see Section 14) and the mixture control valve case (see Chapter 3).

22 Remove the rocker covers **(see illustration).**

23 Remove the alternator cover from the left side of the engine **(see illustration).**

24 Turn the crankshaft clockwise with a socket on the turning bolt (located inside the crankcase cover plate). Watch the edge of the alternator rotor (visible through the timing plug hole) and stop turning when the line next to the T mark is aligned with the pointer inside the hole **(see illustrations).** This places the rear cylinder at top dead center (TDC) on its compression stroke.'

25 Perform Steps 10 through 15 above to adjust the valve clearances on both cylinders.

26 Check the O-rings on the rocker covers and alternator cover and replace them if they're flattened, broken or have been leaking.

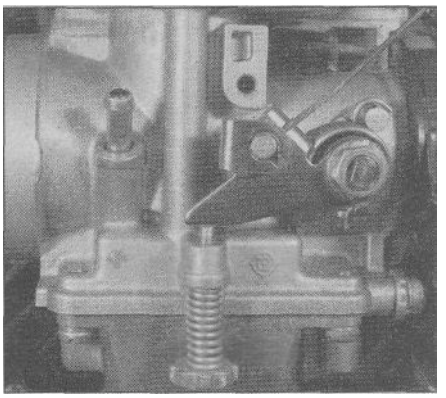
27 Install the rocker covers and tighten their bolts to the torque listed in this Chapter's Specifications.

28 Install all components removed for access.

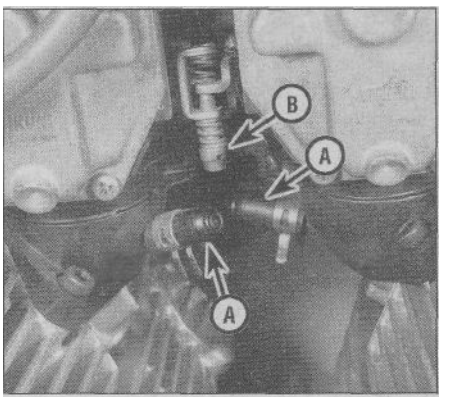
19 Idle speed - check and adjustment

Refer to illustration 19.3

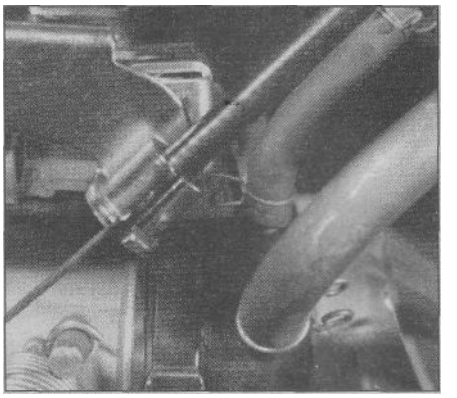
1 The idle speed should be checked and adjusted before and after the carburetors are synchronized and when it is obviously too high or too low. Before adjusting the idle speed, make sure the valve clearances and spark plug gaps are correct. Also, turn the handlebars



19.3 Turn the throttle stop screw to set idle speed (1981 through 1987 XV700 through 1100 shown; XV535 and 1988-on XV750 and 1100 similar)



20.7 Remove the rubber caps and connect the vacuum gauges or manometer to the fittings (A); turn the synchronizing screw (B) to obtain even vacuum readings (XV535 shown; others similar)



20.9 Disconnect the smaller ho^e **from the front carburetor's intake joint and connect one of the vacuum gauges or manometer tubes to the fitting**

back-and-forth and see if the idle speed changes as this is done. If it does, the accelerator cable may not be adjusted correctly, or it 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. Support the motorcycle securely and make sure the transmission is in Neutral.

3 Turn the throttle stop screw **(see illustration),** until the idle speed listed in this Chapter's Specifications is obtained.

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 5 for additional carburetor information.

20 Carburetor synchronization - check and adjustment

Warning: *Gasoline 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 class B type fire extinguisher on hand.*

1 Carburetor synchronization is simply the process of adjusting the carburetors so they pass the same amount of fuel/air mixture to each cylinder. This is done by measuring the vacuum produced in each cylinder. Carburetors that are out of synchronization will result in decreased fuel mileage, increased engine temperature, less than ideal throttle response and higher vibration levels.

2 To properly synchronize the carburetors, you will need some sort of vacuum gauge setup, preferably with a gauge for each cylinder, or a mercury manometer, which is a calibrated tube arrangement that utilizes columns of mercury to indicate engine vacuum. You'll also need an auxiliary fuel tank, since the bike's fuel tank must be removed for access to the vacuum fittings and synchronizing screws.

3 A manometer can be purchased from a motorcycle dealer or accessory shop and should have the necessary rubber hoses supplied with it for hooking into the vacuum hose fittings on the carburetors.

4 A vacuum gauge setup can also be purchased from a dealer or fabricated from commonly available hardware and automotive vacuum gauges.

5 The manometer is the more reliable and accurate instrument, and for that reason is preferred over the vacuum gauge setup; however, since the mercury used in the manometer is a liquid, and extremely toxic, extra precautions must be taken during useand storage of the instrument.

6 Because of the nature of the synchronization procedure and the need for special instruments, most owners leave the task to a dealer service department or a reputable motorcycle repair shop.

XV535models

Refer to illustration 20.7

7 Remove the vacuum caps from the intake joint fittings **(see illustration).** Connect the vacuum gauges or manometer to the fittings.

1981through1983models

Refer to illustration 20.9

8 Remove the seat (see Chapter 7). If necessary for access, detach the fuel tank and raise it slightly, leaving the fuel hoses connected (see Chapter 3).

9 Disconnect the smaller hose from the front carburetor's intake joint **(see illustration).** Remove the rubber cap from the vacuym fitting on the rear carburetor's intake joint, then connect the vacuum gauges or manometer to the hose fitting and vacuum fitting.

1984through1987XV700models

10 Remove the seat (see Chapter 7). Detach the fuel tank at the rear and raise it slightly, leaving the fuel hoses connected..

11 Turn the fuel tap to the PRI position.

12 Disconnect the smaller hose from the front carburetor's intake joint **(see illustration 20.9).** Remove the rubber cap from the vacuum fitting on the rear carburetor's intake joint, then connect the vacuum gauges or manometer to the hose fitting and vacuum fitting.

1984through1987XV1000and1100models

13 Remove the seat (see Chapter 7).

14 Remove the mixture control valve case cover (see Chapter 3). Disconnect the mixture control valve vacuum hose at the T-fitting and connect one of the manometer tubes or vacuum gauges to the fitting.

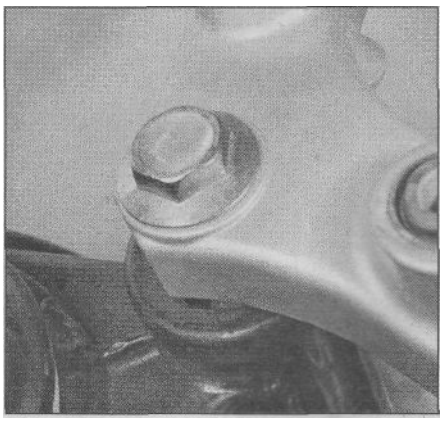
15 Remove the rubber cap from the vacuum fitting o%_tbe rear carburetor's intake joint and connect the other vacuurrNgauge or manometer tube to it.

1988andlatermodels

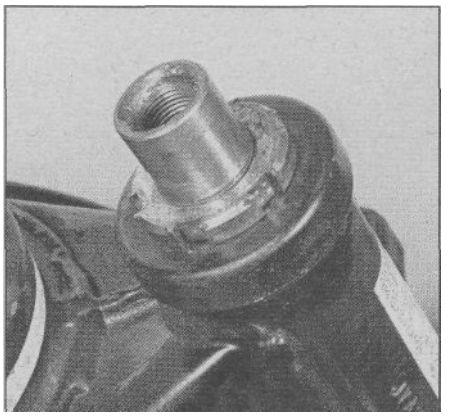
16 Remove the seat (see Chapter 7) and the fuel tank (see Chapter 3). Connect an auxiliary fuel source.

17 If you're working on an 1100 model, remove the left side cover.

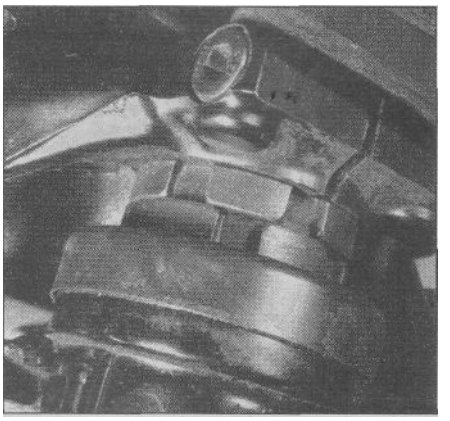
18 Disconnect the smaller hose from the front carburetor's intake joint. Remove the rubber cap from the vacuum fitting on the rear carburetor's intake joint, then connect the vacuum gauges or manometer to the hose fitting and vacuum fitting.



23.10 Remove the steering stem bolt and lift off the upper triple clamp



23.11 Turn the ring nut to adjust steering head bearing play



23.17 Loosen the upper ring nut and adjust steering head bearing play with the lower ring nut

Allmodels

19 Start the engine and let it run until it reaches normal operating temperature.

20 Make sure there are no leaks in the vacuum gauge or manometer setup, as false readings will result.

21 Start the engine and make sure the idle speed is correct. If it isn't, adjust it (see Section 19).

22 The vacuum readings for both of the cylinders should be the same, or at least within the tolerance listed in this Chapter's Specifications. If the vacuum readings vary, adjust as necessary.

23 To perform the adjustment, synchronize the carburetors by turning the synchronizing screw, as needed, until the vacuum is identical or nearly identical for both cylinders **(see illustration 20.9).** Snap the throttle open and shut 2 or 3 times, then recheck the adjustment and readjust as necessary,

24 When the adjustment is complete, recheck the vacuum readings and idle speed, then stop the engine. Remove the vacuum gauge or manometer and reinstall all parts removed for access.

21 Crankcase ventilation system - inspection

Inspect the hose that runs from the ventilation fitting on the top of the engine to the air filter case. Make sure it's securely attached. Replace the hose if it's cracked or deteriorated.

22 Exhaust system - check

1 Periodically check all of the exhaust system joints for leaks and loose fasteners. If tightening the clamp bolts fails to stop any leaks, replace the gaskets with new ones (a procedure which requires disassembly of the system).

2 The exhaust pipe flange nuts at the cylinder heads are especially prone to loosening, which could cause damage to the head. Check them frequently and keep them tight.

23 Steering head bearings - check, adjustment and lubrication

1 All XV535 models and 1981 through 1983 models use ball bearings in the steering head. 1984 and later models are equipped with tapered roller type steering head bearings. Both types can become dented, rough or loose during normal use of the machine. In extreme cases, worn or loose steering head bearings can cause steering wobble that is potentially dangerous.

Check

2 To check the bearings, support the motorcycle securely and block the machine so the front wheel is in the air.

3 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.

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

XV535 models

Refer to illustrations 23.10 and 23.11

5 Remove the headlight lens (see Chapter 8). Label and disconnect the wiring connectors inside the headlight body. Remove the two bolts that secure the headlight assembly to the lower triple clamp and pull the assembly (together with the turn indicator brackets) down out of the way.

6 Remove the upper triple clamp bolts, together with the cable guides (see Chapter 5).

7 Remove the brake master cylinder (see Chapter 6).

8 Remove the safety clips, nuts and washers that secure the handlebar brackets to the upper triple clamp (see Chapter 5). Lift the handlebar and bracket assembly away from the motorcycle. Separate the indicator light assembly from the handle bracket and lower it out of the way.

9 Unbolt the speedometer bracket and move the speedometer out of the way (see Chapter 8).

10 Remove the steering stem nut and the upper triple clamp **(see illustration).**

11 Loosen the steering head ring nut all the way **(see illustration).**

12 Attach the ring nut wrench to a torque wrench so they form a right angle. Tighten the ring nut to the initial torque listed in this Chapter's Specifications, then loosen it all the way again.

13 Retighten the ring nut to the final torque listed in this Chapter's Specifications.

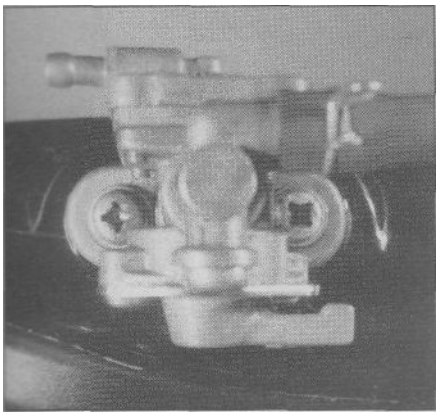
14 Turn the steering from lock to lock and check for binding. If there is any, remove the bearings for inspection (see Chapter 5).

15 If the steering operates properly, reinstall all parts previously removed. Tighten the steering stem nut, triple clamp bolts and handlebar nuts to the torques listed in the Chapter 5 Specifications.

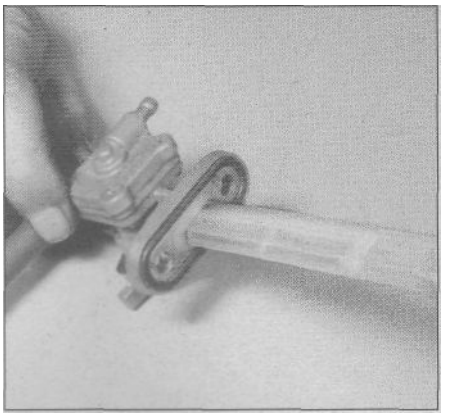
1981 through 1983 XV750 through 1000 models

Refer to illustration 23.17

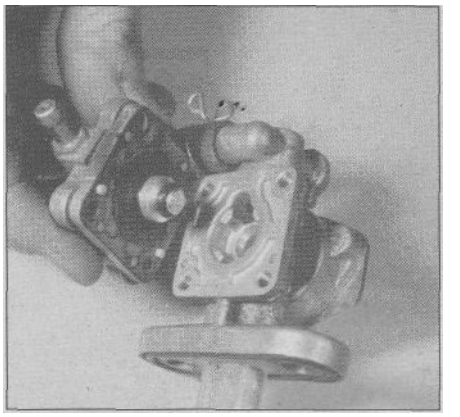
16 Loosen the pinch bolt that passes through the rear side of the upper triple clamp.



25.6 **The fuel tap is secured to the tank by two screws**



25.7 Examine and **clean the filter stack**



25.8 Inspect the fuel tap diaphragm

17 Beneath the upper triple clamp are two ring nuts (see **illustration).** Loosen the upper one with a spanner wrench (C-spanner) so the lower nut is free to turn.

18 Tighten the lower ring nut a little at a time just enough to remove any front-to-rear play in the steering head. **Caution:** *Don't overtighten* the *nut.*

19 To check the adjustment, place the handlebars in their center position, then move them all the way to right and left. With the front wheel off the ground, the handlebar should move all the way from center to the left or right stop with just a tap. If it takes more effort than this. the bearings are too tight.

1984 and later XV700 through 1000 models

20 Remove the seat (see Chapter 7) and the fuel tank (see Chapter 3).

21 Remove the lower screw from the headlight assembly.

22 Loosen the upper triple clamp bolts (see Chapter 5). This allows the necessary vertical movement of the steering stem in relation to the fofk tubes.

23 Remove the handlebars and upper triple clamp (see Chapter 5).

24 Remove the lockwasher from the ring nuts.

25 Use a ring nut wrench (Yamaha tool no. YU-33975/part no. 90890-01430 or equivalent) to remove the upper ring nut.

26 Carefully tighten the lower ring nut to the initial torque listed in this Chapter's Specifications, then loosen it all the way and retighten to the final torque listed in this Chapter's Specifications.

27 Turn the steering from lock to lock and check for binding. If there is any, remove the bearings for inspection (see Chapter 7).

28 If the steering operates properly, install the upper ring nut. Tighten the upper ring nut with fingers so its slots align with those of the lower ring nut (don't allow the lower ring nut to turn). If necessary, use the ring nut wrench to keep the lower ring nut from turning while you tighten the upper ring nut.

29 Install the lockwasher with its tabs in the ring nut slots.

30 Recheck the steering head bearings for play as described above, if necessary, repeat the adjustment procedure. Reinstall all parts previously removed. Tighten the steering stem nut and triple clamp boltsto the torques listed in the Chapter 5 Specifications.

Lubrication

31 Periodic cleaning and repacking of the steering head bearings is recommended by the manufacturer. Refer to Chapter 5 for steering head bearing lubrication and replacement procedures.

24 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:

Sparkplugs
Engine oil drain plug
Oil filter cover bolt and drain plug
Gearshift pedal (and linkage, if equipped)
Footpegs, sidestand and centerstand (if equipped)
Engine mounting bolts
Shock absorber or rear suspension unit mounting bolts
Front axle (or axle nut) and axle pinch bolt
Rear axle nut

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

25 Fuel system - check and filter cleaning or replacement

Warning: *Gasoline 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 ofl immediately with soap and-water. When you perform any kind of work on the fuel system, wear safety glasses and have a class B type fire extinguisher on hand.*

1 Check the fuel tank, the tank breather hose, the fuel tap, the lines and the carburetors for leaks and evidence of damage.

2 If carburetor gaskets are leaking, the carburetors should be disassembled and rebuilt (see Chapter 5).

3 If the fuel tap is leaking, tightening the screws may help. If leakage persists, the tap should be disassembled and repaired or replaced with a new one.

4 If the fuel lines are cracked or otherwise deteriorated, replace them with new ones.

Fueltapfiltercleaning

Refer to illustrations 25.6, 25.7 and 25.8

5 Remove the fuel tank (see Chapter 3).

6 Remove the fuel tap screws and detach it from the tank **(see illustration).**

7 Clean the filter stack **(see illustration).** If it's torn or can't be cleaned completely, replace it.

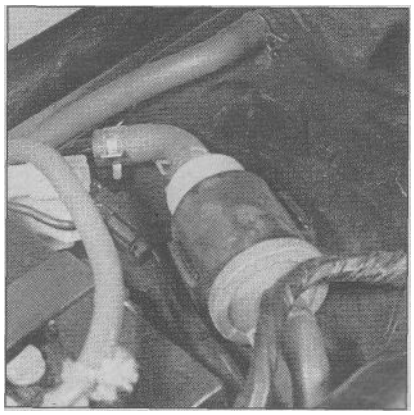
8 Remove the screws and inspect the fuel tap diaphragm **(see illustration).** If it's torn, cracked or brittle, replace it.

9 Reverse Steps 5 through 8 to assemble and install the fuel tap.

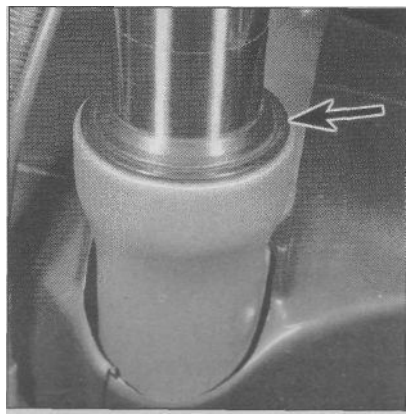
In-linefilterreplacement

Refer to illustration 25.11

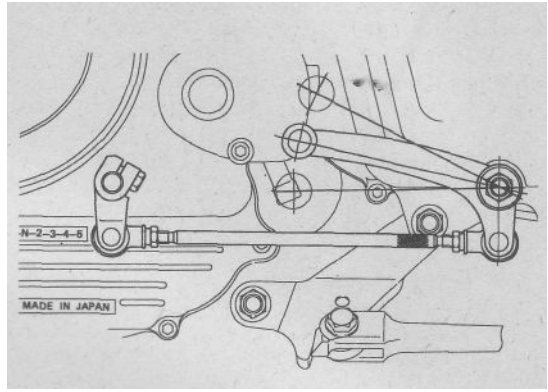
10 Remove the fuel tank (see Chapter 5).



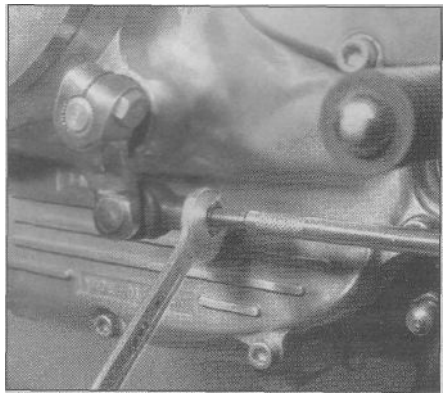
25.11 Loosen the clamp and disconnect the hose at each end of the **filter, then remove it from** its bracket



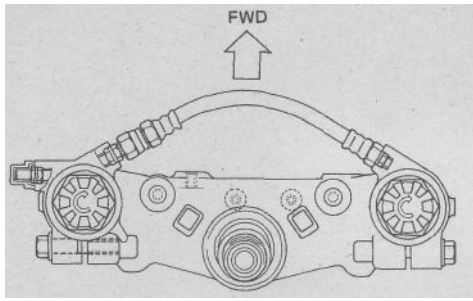
26.3 Check above and below the fork seals (arrow) for signs of oil leakage



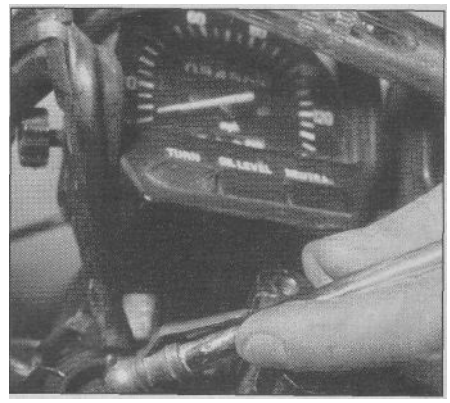
27.3 The linkage arms should be at right angles to the rod



27.4 Loosen the locknuts and rotate the rod to change its length; on some models, the front nut has left-hand threads (loosens clockwise)



28.6a If there's an air hose between the forks, add air through the air charging valve on the side



28.6b Use an accurate gauge when measuring fork air pressure

11 Disconnect the lines from the filter and remove it from its bracket **(see illustration).**

12 Install a new filter and reconnect the lines.

26 Suspension - check

Refer to illustration 26.3

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

2 While standing alongside the motorcycle, lock 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 5.

3 Carefully inspect the area around the fork seals for any signs of fork oil leakage **(see illustration).** If leakage is evident, the seals must be replaced as described in Chapter 5.

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

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

6 Support the bike securely so it can't be knocked over during this procedure. Grab the swingarm on each side, just ahead of the axle. Rock the swingarm 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 bolt or shafts are tight. If they're tight but movement is still noticeable, the swingarm will have to be removed and the bearings replaced as described in Chapter 5.

7 Inspect the tightness of the rear suspension nuts and bolts (refer to the Chapter 5 Specifications).

27 Shift linkage adjustment

Refer to illustrations 27.3 and 27.4

1 Models with a rear set shift linkage can be adjusted by changing the length of the linkage rod.

2 If you're working on an XV535 model, measure shift pedal height and compare it to the value listed in this Chapter's Specifications.

3 Check the alignment of the shift pedal arm and the arm at the other end of the linkage with the linkage rod. The two arms should be at right angles to the rod **(see illustration).**

4 To adjust, loosen the locknuts and turn the linkage rod to change its length, then tighten the locknuts **(see illustration). Note:** *On some models the front nut has left-hand threads (loosens clockwise).*

28 Suspension adjustments

1 Suspension settings can be adjusted on some models. **Note:** *The forks must be in good condition with seals that don't leak in order to make accurate adjustments.* Warning: *The front fork air pressure, the fork- damping settings (if equipped) and the rear shock absorber settings (twin-shock models) must be even to prevent unstable handling.*

2 On 1981 through 1983 models, front fork air pressure is

adjustable. On XV920 models, front fork damping is also adjustable. rear suspension unit damping and air pressure are adjustable.

3 On 1984 and later XV700 and 750 models, front fork air pressure and rear spring preload are adjustable.

4 On 1984 and later XV1000 and 1100 models, front fork air pressure is adjustable. Rear spring preload and rear shock absorber damping are also adjustable.

1981 through 1983 models

Refer to illustrations 28.6a, 28.6b, 28.6c, 28.8, 28.9a and 28.9b

5 Support the bike securely so it can't be knocked over during this procedure. Raise the front wheel off the ground.

6 On models with separate air charging valves mounted in the tops of the forks, remove the rubber cap from each front fork. If there's an air hose connecting the two forks **(see illustration),** remove the plastic cap from the air charging valve. Measure fork air pressure with an accurate gauge **(see illustrations).**

7 To reduce air pressure, hold down the pirj. *i{* the center of the air charging valve with a small screwdriver or similar tool. To add air, use a hand pump. Don't use a compressor or a service station air hose; they will add air too quickly.

8 If you're working on an XV920J model, turn the damping adjuster knob on each fork to change the setting **(see** illustration).

9 Remove the air valve cap from the rear suspension unit's remote adjuster and check air pressure with an accurate gauge (see **illustration).'** Add or remove air as needed. If necessary, change the damping setting by turning the adjuster knob. If there's excessive freeplay in the knob, remove the seat and correct it with the cable adjusters **(see illustration).**

Front fork	Rear shock absorber		Loading condition			
Air pressure	Air pressure	Damping adjuster	Solo rider	With passenger	With accessory equipments	With accessory equipments and passenger
0.4 ~ 0.8 kg/cm^2 (5.7-11.4 psi)	1.0 ~ 2.0 kg/cm^2 (14.2 -28.4 psi)	1 ~3	O-			
	3.0 ~ 4.0 kg/cm^2 (42.7 - 56.9 psi)	3,4		O		
		4,5			O	
0.8 ~ 1.2 kg/cm^2 (11.4 ~ **17.1** psi)	4,0 kg/cm^2 (56.9 psi)	6				O

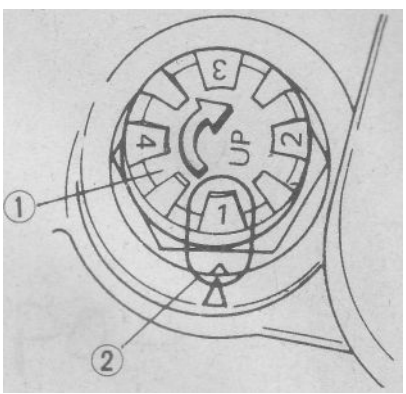
XV750SE, H and J models

Front fork	Rear shock absorber		Loading condition			
Air pressure	Air pressure	Damping adjuster	Solo rider	With passenger	With accessory equipments	With accessory equipments and passenger
0.4 - 0.8 kg/cm^2 (5.7-11.4 psi)	1.0-2.0 kg/cm^2 (14.2-28.4 psi)	1,2	O			
	2.0 ~ 3.0 kg/cm^2 (28.4-42.7 psi)	2,3		O		
0.6 -1.0 kg/cm^2 (8.5 -14.2 psi)	3.0 - 4.0 kg/cm^2 (42.7 - 56.9 psi)	4,5			O	
0.8 ~ 1.2 kg/cm^2 **(11.4-17.1** psi)	4.0 kg/cm^2 (56.9 psi)	5,6				O

XV920 RH, RJ and TRI models

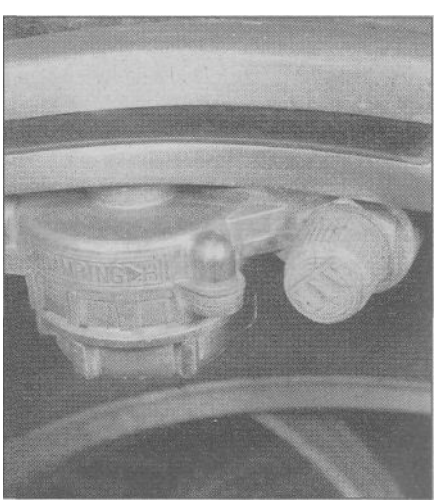
Front fork		Rear shock absorber		Loading condition			
Air pressure	Damping adjuster	Air pressure	Damping adjuster	Solo rider	With passenger	With accessory equipments	With accessory equipments and passenger
39.2 - 78.5 kPa (0.4-0.8 kg/cm^2, 5.7 - 11 psi)	1	98.1 - 196 kPa (1.0-2.0 kg/cm^2, 14-28 psi)	1,2,3	O			
	2	196~294kPa (2.0~3.0 kg/cm^2, 28-43 psi)	3,4		O		
	3	294 - 392 kPa (3.0 - 4.0 kg/cm^2, 43-57 psi)	4,5			O	
78.5- **118** kPa 10.8-1.2 kg/cm^2, 11-17 psi)	4	392 kPa (4.0 kg/cm^2, 57 psi)	6				O

28.6c Suspension settings (1981 through 1983 models)

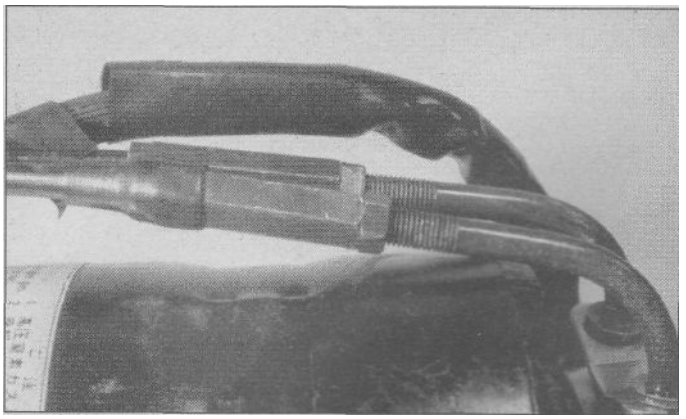


28.8 XV920J fork damping is adjusted with a knob on top of each fork

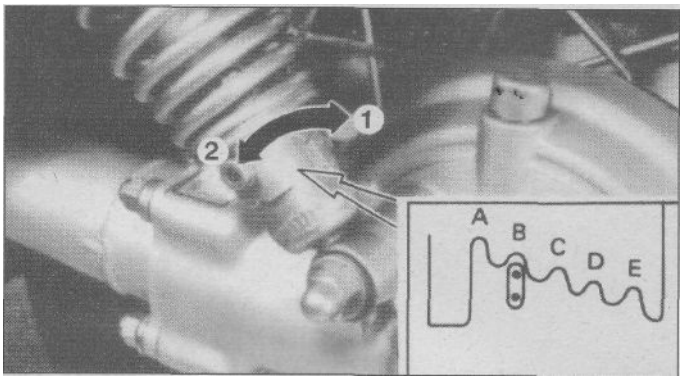
1 Adjusting knob
2 Index mark



28.9a Air pressure and damping for the rear suspension unit on 1981 through 1983 models are adjusted with this unit



28.9b Take up excessive freeplay with the **cable adjusters**



28.12a Adjust rear spring preload on 1984 and later XV700 and 750 models with the adjuster on the bottom of each shock absorber

Front fork		Rear shock absorber		Loading condition			
Air pressure		Spring seat	Damping adjuster	Solo rider	With passenger	With accessories, and equipment	With accessories, equipment, and passenger
1	39.2 ~ 78.5 kPa (0.4-0.8 kg/cm^2, 5.7-11.4 psi)	**1 - 2**	1 - 2	**O** ,			
2	39.2 ~ 78.5 kPa (0.4-0.8 kg/cm^2, 5.7-11.4 psi)	**3 - 5**	2 - 3		**O**		
3	58.8 - 98.1 kPa (0.6-1.0 kg/cm^2, 8.5-14.2 psi)	**3 - 5**	3 - 4			**O**	
4	78.5-117.7 kPa (0.8-1.2 kg/cm^2, 11.4-17.1 psi)	**5**	4				**O**

28.12b Suspension settings (1984 and later models)

1984andlatermodels

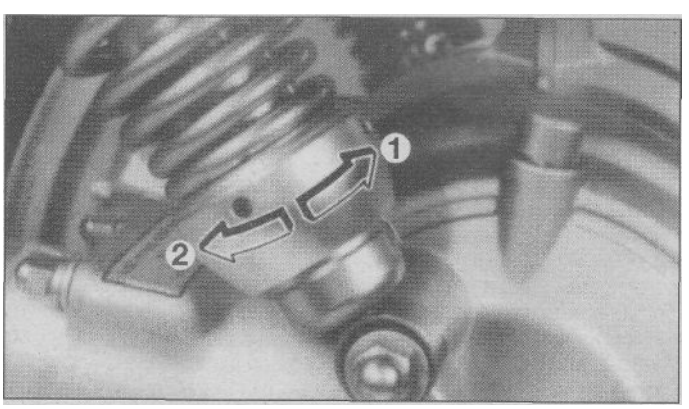
Refer to illustrations 28.12a, 28.12b, 28.13a and 28.13b

10 Remove the air valve cap from the side of the fork and check air pressure with an accurate gauge.

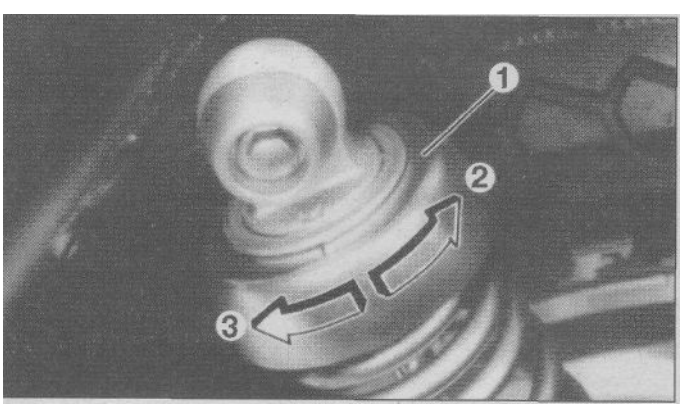
11 To reduce fork air pressure, hold down the pin in the center of the air charging valve with' a small screwdriver or similar tool. To add air, use a hand pump. Don't use a compressor or a service station air hose; they will add air too quickly.

12 If you're working on an XV700 or 750, adjust rear spring preload by turning the adjuster on the bottom of each shock absorber **(see illustrations).**

13 If you're working on an XV1000 or 1100, turn the adjuster at the bottom of each shock absorber to set spring preload **(see illustration).** Turn the adjuster at the top of each shock to adjust damping **(see illustration). Note:** *Don't leave the damping adjuster between positions or it will automatically adjust to the stiffest setting.*



28.13a Adjust rear spring preload on 1984 and later XV1000 and 1100 models with the adjuster on the bottom of each shock absorber



28.13b Adjust rear shock absorber damping on 1984 and later XV1000 and 1100 models with the adjuster on the top of each shock absorber

Chapter 2 Part A
Engine, clutch and transmission (XV535 models)

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Specifications

General

Bore x stroke	76 x 59 mm (2.992 x 2.323 inches)
Displacement	535 cc
Compression ratio	9.0 to 1

Camshafts

Lobe height	
Intake (standard)	39.73 mm (1.564 inch)
Intake (limit)	39.63 mm (1.560 inch)
Exhaust (standard)	39.77 mm (1.566 inch)
Exhaust (limit)	39.67 mm (1.562 inch)
Base circle	
Intake (standard)	32.22 mm (1.269 inch)
Intake (limit)	31.22 mm (1.229 inch)
Exhaust (standard)	32.30 mm (1.272 inch)
Exhaust (limit)	31.30 mm (1.232 inch)
Bearing oil clearance	0.020 to 0.061 mm (0.0008 to 0.0024 inch)
Journal diameter	27.96 to 27.98 mm (1.100 to 1.102 inch)
Bearing bore	28.00 to 28.02 mm (1.102 to 1.103 inch)
Camshaft runout limit	0.03 mm (0.0012 inch)

Cylinder head, valves and valve springs

Cylinder head warpage limit	0.03 mm (0.0012 inch)
Valve stem bend limit	0.03 mm (0.0012 inch)
Valve head diameter	
Intake	36.9 to 37.1 mm (1.453 to 1.461 inch)
Exhaust	31.9 to 32.1 mm (1.256 to"1.264 inch)
Valve stem diameter	
Intake	6.975 to 6.990 mm (0.274 to 0.275 inch)
Exhaust	6.960 to 6.975 mm (0.273 to 0.274 inch)
Valve head edge thickness (intake and exhaust)	
Standard	1.0 to 1.4 mm (0.04 to 0.06 inch)
Limit	0.7 mm (0.028 inch)
Valve guide inside diameter (intake and exhaust)	
Standard	7.000 to 7.012 mm (0.275 to 0.276 inch)
Limit	7.05 mm (0.278 inch)
Valve seat width (intake and exhaust)	
Standard	1.0 to 1.2 mm (0.04 to 0.05 inch)
Limit	1.4 mm (0.055 inch)
Valve face width (intake and exhaust)	2.3 mm (0.09 inch)
Valve inner spring free length (intake and exhaust)	
Standard	39.9 mm (1.571 inch)
Limit	37.7 mm (1.48 inch)
Valve inner spring installed length (intake and exhaust)	34.1 mm (1.343 inch)
Valve inner spring compressed pressure at installed length	9.5 to 11.1 kg (21.0 to 24.5 lbs)
Valve inner spring bend limit	1.7 mm (0.067 inch)
Valve outer spring free length (intake and exhaust)	
Standard	43.6 mm (1.717 inch)
Limit	41.4 mm 1.630 inch)
Valve outer spring installed length (intake and exhaust)	37.1 mm (1.46 inch)
Valve outer spring compressed pressure at installed length	18.7 to 21.9 kg (41.2 to 48.3 lbs)
Valve outer spring bend limit	1.9 mm (0.075 inch)

Cylinders

Bore diameter	75.98 to 76.02 mm (2.991 to 2.993 inch)
Bore measuring point	40 mm (1.57 inch) from top of cylinder
Taper and out-of-round limit	0.05 mm (0.002 inch)
Pistons	
Piston diameter	
Standard	75.92'to 75.97 mm (2.989 to 2.991 inches)
First oversize	76.50 mm (3,012 inches)
Second oversize	77.00 mm (3.031 inches)
Diameter measuring point	3.5 mm (0.14 inch) from bottom of skirt

Piston-to-cylinder clearance	
Standard	0.035 to 0.055 mm (0.0014 to 0.0022 inch)
Limit	0.1 mm (0.004 inch)
Ring side clearance	
Top ring	
Standard	0.03 to 0.07 mm (0.001 to 0.003 inch)
Limit	0.12 mm (0.005 inch)
Second ring	
Standard	0.02 to 0.06 mm (0.0008 to 0.0024 inch)
Maximum	0.12 mm (0.005 inch)
Oil ring	Not specified
Ring thickness	
Top ring	1.2 mm (0.05 inch)
Middle ring	1.5 mm (0.06 inch)
Oil ring (spacer and rails)	2.5 mm (0.10 inch)
Ring end gap (standard)	
Top and second rings	0.30 to 0.45 mm (0.012 to 0.018 inch)
Oil ring	0.2 to 0.8 mm (0.008 to 0.031 inch)
Ring end gap (limit)	
Top ring	0.7 mm (0.028 inch)
Second ring	0.8 mm (0.031 inch)
Oil ring	Not specified
Ring width	
Top ring	2.9 mm (0.11 inch)
Second ring	3.2 mm (0.13 inch)
Oil ring	3.1 mm (0.12 inch)

Crankshaft, connecting rods and bearings

Main bearing oil clearance	0.020 to 0.052 mm (0.0008 to 0.0020 inch)
Connecting rod side clearance	0.27 to 0.42 mm (0.011 to 0.017 inch)
Connecting rod bearing oil clearance	0.026 to 0.052 mm (0.001 to 0.002 inch)
Crankshaft runout limit	0.03 mm (0.0012 inch)

Oil pump

Inner to outer rotor clearance limit	0.17 mm (0.007 inch)
Outer rotor to housing clearance limit	0.08 mm (0.003 inch)

Clutch

Friction plate thickness	
Standard	2.9 to 3.1 mm (0.114 to 0.122 inch)
Minimum	2.6 mm (0.102 inch)
Steel plate thickness	1.5 to 1.7 mm (0.060 to 0.067 inch)
Steel plate warpage limit	0.2 mm (0.008 inch)
Pushrod bend limit	0.5 mm (0.02 inch)
Spring length	
Standard	39.5 mm (1.56 inch)
Minimum	38.5 mm (1.52 inch)

Transmission

Driveshaft and mainshaft runout limit	0.06 mm (0.0024 inch)

Torque specifications

Alternator cover bolts	10 Nm (7.2 ft-lbs)
Alternator rotor bolt	see Chapter 8
Cam chain damper stopper bolts	10 Nm (7.2 ft-lbs)
Cam chain tensioner bolts	12 Nm (8.7 ft-lbs)
Cam chain tensioner cap	20 Nm (14 ft-lbs)
Cam sprocket bolt	55 Nm (40 ft-lbs)
Camshaft retainer bolts	20 Nm (14 ft-lbs)
Cam sprocket cover bolts	10 Nm (7.2 ft-lbs)
Camshaft segment (5 mm screw)	4 Nm (2.9 ft-lbs)
Clutch adjuster locknut	8 Nm (5.8 ft-lbs)
Clutch boss nut	70 Nm (50 ft-lbs) (4)
Clutch cover bolts	10 Nm (7.2 ft-lbs)
Clutch pressure plate screws	8 Nm (5.8 ft-lbs)

Torque specifications (continued)

Clutch push lever screw	12 Nm (8.7 ft-lbs)
Connecting rod nuts	36 Nm (25 ft-lbs) (2)
Crankcase bolts (6 mm)	10 Nm (7.2 ft-lbs)
Crankcase bolts (8 mm)	24 Nm (17 ft-lbs)
Crankcase studs (8 mm)	13 Nm (9.4 ft-lbs)
Crankcase studs (10 mm)	20 Nm (14 ft-lbs)
Cylinder bolt	10 Nm (7.2 ft-lbs)
Cylinder head bolts (8 mm)	20 Nm (14 ft-lbs)
Cylinder head nuts (8 mm)	35 Nm (25 ft-lbs)
Cylinder head flange nuts (8 mm)	20 Nm (14 ft-lbs)
Cylinder head side cover bolts	10 Nm (7.2 ft-lbs)
Driveaxle bearing retainer screws	25 Nm (18 ft-lbs) (3)
Middle drive gear assembly bolts	25 Nm (18 ft-lbs)
Middle drive gear locknut	120 Nm (85 ft-lbs) (3)
Oil passage housing bolts	10 Nm (7.2 ft-lbs)
Oil pump bolts	7 Nm (5.1 ft-lbs)
Primary drive gear nut	70 Nm (50 ft-lbs) (4)
Rocker arm cover bolts	10 Nm (7.2 ft-lbs)
Rocker arm shaft holding bolts	20 Nm (14 ft-lbs) (1)
Shift lever	22 Nm (16 ft-lbs) (4)

1 Use new sealing washers.
2 Apply molybdenum disulfide grease to the threads and nut surfaces; follow special tightening procedures in the text.
3 Stake after installation.
4 Use a new lockwasher.

1 General information

The engine/transmission unit is an air-cooled V-twin. The valves are operated by overhead camshafts which are chain driven off the crankshaft. The engineAransmission assembly is constructed from aluminum alloy. The crankcase is divided vertically.

The crankcase incorporates a wet sump, pressure-fed lubrication system which uses a gear-driven oil pump and an oil filter mounted in the right-hand side of the crankcase.

Power from the crankshaft is routed to the transmission via the clutch, which is of the coil spring, wet multi-plate type and is gear-driven off the crankshaft. The transmission is a five-speed, constant-mesh unit.

2 Operations possible with the engine in the frame

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

Starter motor
Alternator
Starter clutch
Cam sprockets
Clutch and primary drive gear
Oil pump
External shift linkage

3 Operations requiring engine removal

It is necessary to remove the engine/transmission assembly from the frame to gain access to the following components:

' *Cylinder heads, rocker arms and camshafts*
Cam chains and lower (crankshaft) sprockets
Oil pump

The crankcase halves must be separated to gain access to the following components:

Crankshaft, connecting rods and bearings
Transmission shafts
Shift cam and forks

4 Major engine repair - general note

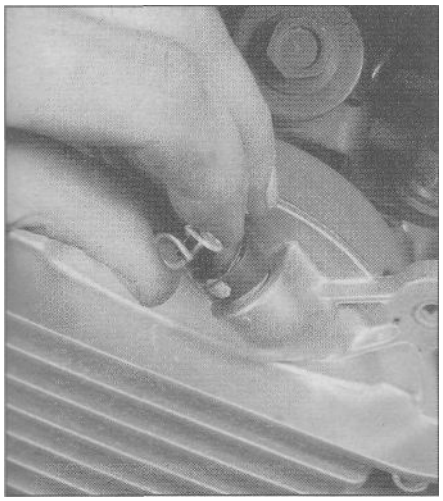
1 It is not always easy to determine when or if an engine should be completely overhauled, as a number of factors must be considered.

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 oil and filter changes, as well as other required maintenance, will most likely give many miles of reliable service. Conversely, a neglected engine, or one which has not been broken in properly, may require an overhaul very early in its life.

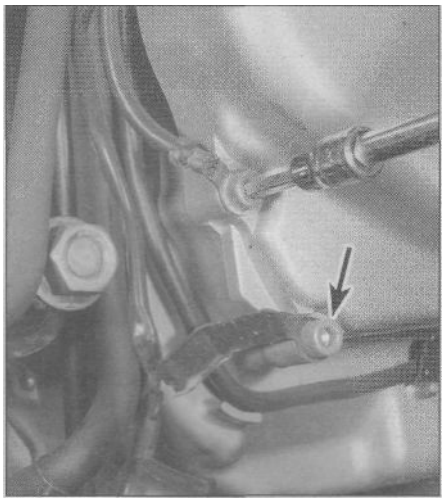
3 Exhaust smoke and excessive oil consumption are both indications that piston rings and/or valve guides are in need of attention. Make sure oil leaks are not responsible before deciding that the rings and guides are bad. Refer to Chapter 1 and perform a cylinder compression check to determine for certain the nature and extent of the work required.

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

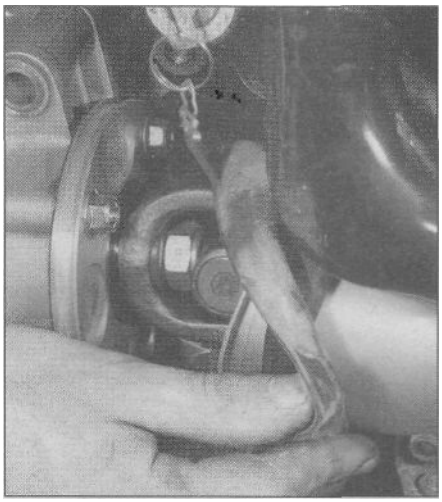
5 Loss of power, rough running, excessive valve train noise and high fuel consumption rates may also point to the need for an overhaul, especially if they are all present at the same time. If a complete tune-up



5.16 Squeeze the hose clamp and pull the breather hose off its fitting



5.18 Remove the Allen bolt and disconnect the ground wire, then loosen the Allen bolts that secure wiring harness retainers (arrows; two of four bolts shown) and release the harness from the retainers



5.21 Pull the driveshaft rubber boot away from the middle gear

does not remedy the situation, major mechanical work is the only solution.

6 An engine overhaul generally involves restoring the internal parts to the specifications of a new engine. During an overhaul the piston rings are replaced and the cylinder walls are bored and/or honed. If a rebore is done, then new pistons are also required. The main and connecting rod bearings are generally replaced with new ones and, if necessary, the crankshaft is also replaced. Generally the valves are serviced as well, since they are usually in less than perfect condition at this point. While the engine is being overhauled, other components such as the carburetors and the starter motor can be rebuilt also. The end result should be a like-new engine that will give as many trouble free miles as the original.

7 Before beginning the engine overhaul, read through all of the related procedures to familiarize 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.

8 Most work can be done with typical shop 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 doesn't pay to install worn or substandard parts.

9 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 done with the aid of an assistant to avoid damage or injury that could occur if the engine is dropped. A hydraulic floor jack should be used to support and lower the engine if possible (they can be rented at low cost).*

Removal

Refer to illustrations 5.16, 5.18, 5.21, 5.24 and 5.25a through 5.25f

1 Support the bike securely so it can't be knocked over during this procedure. Place a support under the swingarm pivot and be sure the motorcycle is safely braced.

2 Remove the top cover and upper fuel tank (if equipped) (see Chapter 3).

3 Remove the left front side cover and its bracket (see Chapter 7).

4 Remove the right front side cover (see Chapter 7). Unbolt the electrical component board that's mounted beneath the cover, then disconnect the electrical connectors and carburetor hoses and remove the cover mounting plate (see Chapter 7).

5 Drain the engine oil (see Chapter 1).

6 Remove the carburetors (see Chapter 3) and plug the intake openings with clean shop towels.

7 Remove the exhaust system (see Chapter 3).

8 Disconnect the brake light switch wires (see Chapter 8).

9 Unscrew the rear brake adjuster all the way, then remove the spring and brake rod (see Chapter 6).

10 Check for alignment marks on the shift shaft and shift lever (see Section 20). If they aren't visible, make your own marks with a sharp punch. Loosen the pinch bolt and slip the shift lever off the shaft.

11 Remove the shift pedal and left footpeg bracket as an assembly (see Chapter 7).

12 Remove the right footpeg bracket (see Chapter 7).

13 Remove the sidestand (see Chapter 7).

14 Remove the sidestand switch (see Chapter 8).

15 Remove the cylinder head side covers from the front and rear cylinders, then disconnect the spark plug wires (HT leads) (see Spark plugs - replacement in Chapter 1).

16 Disconnect the crankcase ventilation hose from the rear cylinder head **(see illustration).**

17 Disconnect the clutch cable (see Section 15).

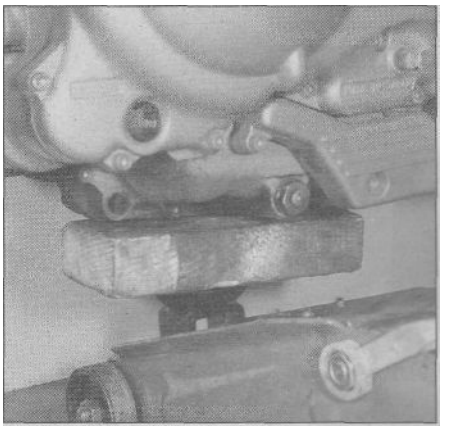
18 Disconnect the ground wire from the right rear of the engine **(see illustration).** Loosen the right crankcase cover (clutch cover) Allen bolts and free the starter motor wiring harness from the retainers along the bottom of the crankcase.

19 Remove the horn (see Chapter 8).

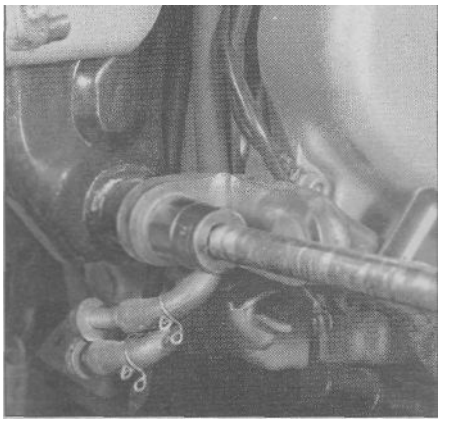
20 Pull back the ignition coil cover and disconnect the primary (low tension) electrical connectors (see Chapter 4, part A.)

21 Pull the rubber driveshaft boot away from the engine **(see illustration).**

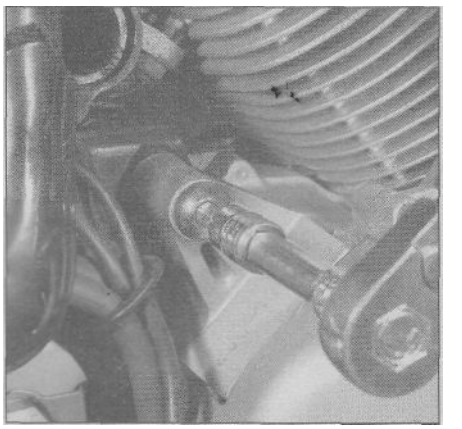
22 Remove the alternator cover. Remove the stator and pick-up coil assembly (see Chapter 8).



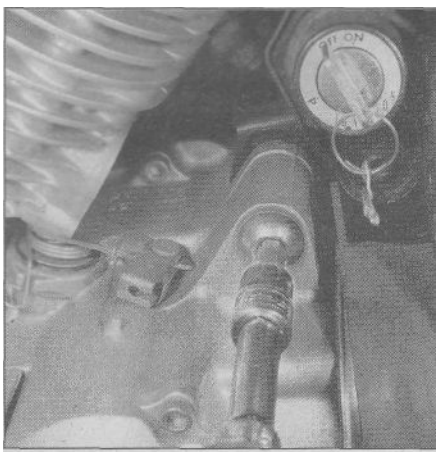
5.24 Support the engine with a jack and a block of wood



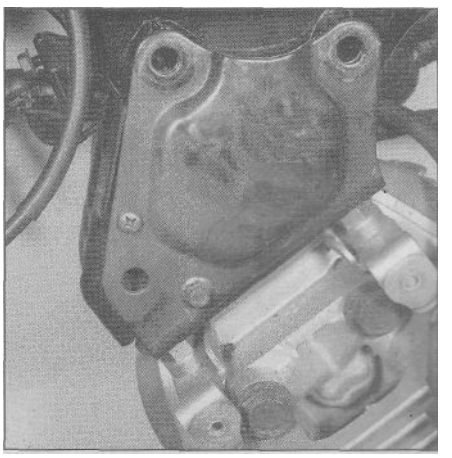
5.25a Remove the lower rear mounting bolt...



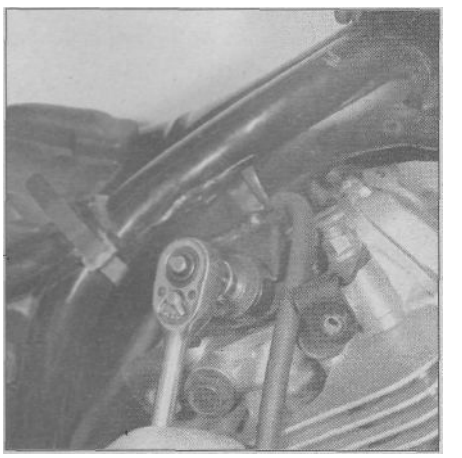
5.25b ... and the upper rear mounting bolts...



5.25c ... (there's an upper rear mounting bolt on each side of the engine)



5.25d Unbolt the front cylinder head bracket from the frame



5.25e Unbolt the rear cylinder head mounting brackets from the frame ...

23 Remove the starter motor (see Chapter 8).

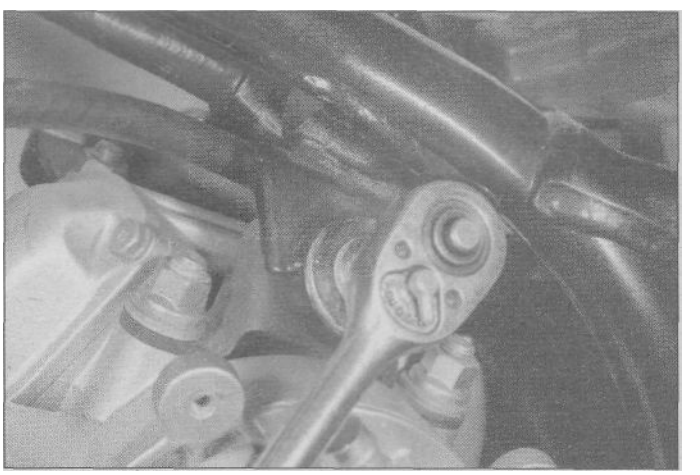
24 Support the engine with a jack and wood block **(see illustration).** Make sure the support is still in position under the swingarm pivot and that the bike is still securely braced.

25 Remove the engine mounting bolts at the lower rear of the crankcase, upper rear of the crankcase and at the top of each cylinder **(see illustrations).**

26 Disconnect both battery cables from the battery. **Warning:** *Always disconnect the negative cable first and reconnect it last to prevent a battery explosion.*

27 Make sure no wires or hoses are still attached to the engine assembly. **Warning:** *The engine is heavy and may cause injury if it falls. Be sure it's securely supported. Have an assistant help you steady the engine on the jack as you remove it.*

28 Slowly and carefully lower the engine assembly to the floor, then guide it out from under the right side of the bike.



5.25f ... (there's one on each side of the engine)

Installation

29 Installation is the reverse of removal. Note the following points:

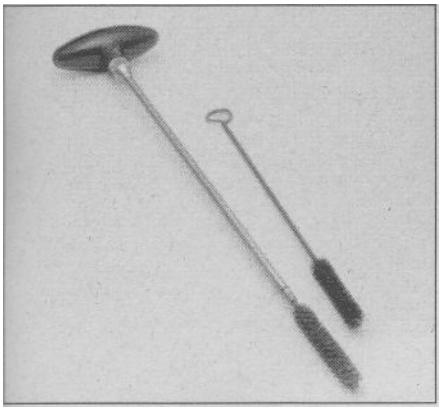
a) Don't tighten any of the engine mounting bolts until they all have been installed.

b) Use new gaskets at all exhaust pipe connections.

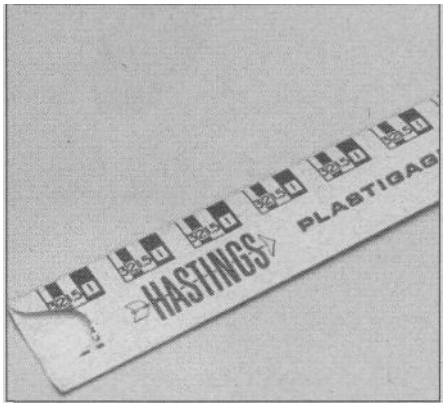
c) Tighten the engine mounting bolts securely.

d) Adjust the rear brake rod, clutch cable and throttle cable(s) following the procedures in Chapter 1 and Chapter 2.

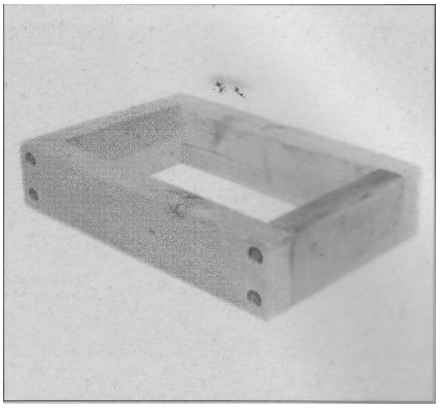
e) Be sure to refill the engine oil before starting the engine.



6.2a A selection of brushes is required for cleaning holes and passages in the engine components



6.2b Type HPG-1 Plastigage is needed to check the connecting rod oil clearances



6.3 An engine stand can be made from **short lengths of lumber and lag** bolts **or nails**

6 Engine disassembly and reassembly - general information

Refer to illustrations 6,2a, 6.2b and 6.3

1 Before disassembling the engine, clean the exterior with a degreaser and rinse it with water. A clean engine will make the job easier and prevent the possibility of getting dirt into the internal areas of the engine.

2 In addition to the precision measuring tools mentioned earlier, you will need a torque wrench, a valve spring compressor, oil gallery brushes, a piston ring removal and installation tool, a piston ring compressor and a clutch holder tool (which is described in Section 16). Some new, clean engine oil of the correct grade and type, some engine assembly lube (or moly-based grease), a tube of Yamaha Quick Gasket (part no. 11001-05-01) or equivalent, and a tube of RTV (silicone) sealant will also be required. Although it may not be considered a tool, some Plastigage (type HPG-1) should also be obtained to use for checking connecting rod bearing oil clearances **(see illustrations).**

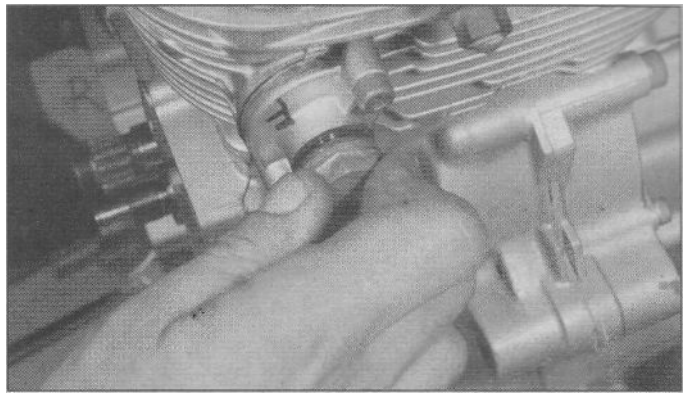
3 An engine support stand made from short lengths of lumber bolted together will facilitate the disassembly and reassembly procedures **(see illustration).** The perimeter of the mount should be just big enough to accommodate the crankcase when it's laid on its side for removal of the crankshaft and transmission components. If you have an automotive-type engine stand, an adapter plate can be made from a piece of plate, some angle iron and some nuts and bolts. The adapter plate can be attached to the engine mounting bolt holes.

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

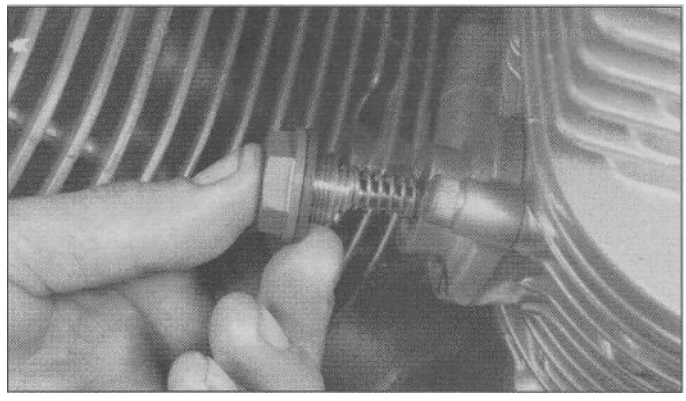
5 Engine/transmission disassembly should be done in the following general order with reference to the appropriate Sections.

Remove the cylinder heads
Remove the camshafts
Remove the rocker arms
Remove the cylinders
Remove the pistons
Remove the idle gears
Remove the clutch
Remove the oil pump
Remove the external shift mechanism
Remove the middle driven gear
Separate the crankcase halves
Remove the crankshaft and connecting rods
Remove the shift cam/forks
Remove the transmission shafts/gears

6 Reassembly is accomplished by reversing the general disassembly sequence.



7.1a Loosen the tensioner cap bolt with a socket or wrench, then unscrew it from the engine (if you're removing both tensioners at the same time, it's a good idea to label them F for front and R for rear cylinder)...



7.1b . . . then withdraw the cap bolt, sealing washer and spring

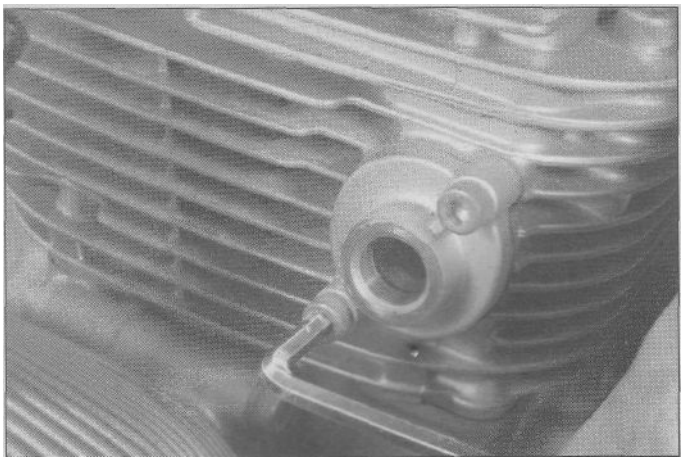
7 Camshaft chain tensioners - removal and installation

Removal

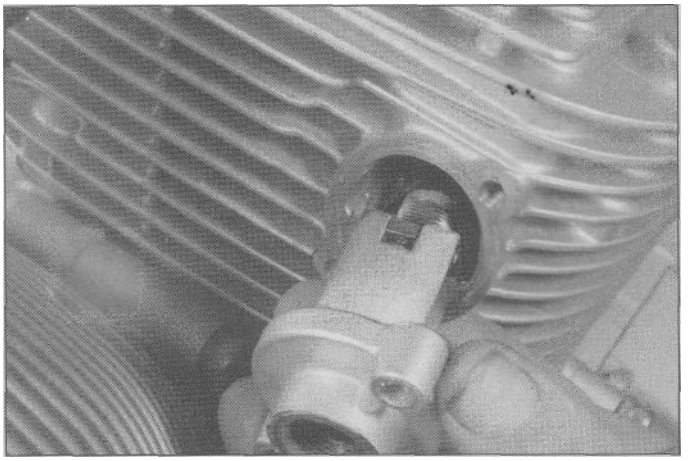
Refer to illustrations 7.1a, 7.1b, 7.2a and 7.2b

Caution: *Once you start to remove the tensioner bolts, you must remove the tensioner all the way and reset it before tightening the bolts. The tensioner extends and locks in place, so if you loosen the bolts partway and then retighten them, the tensioner or cam chain will be damaged.*

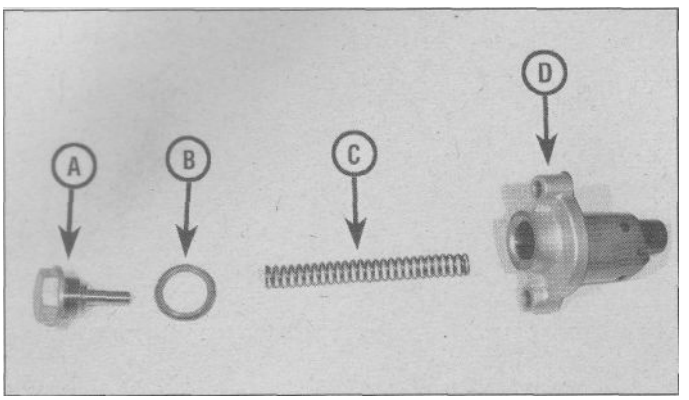
1 Remove the tensioner cap bolt and spring while the tensioner is still installed on the engine **(see illustrations).**



7.2a Remove the **tensioner Allen bolts ,**

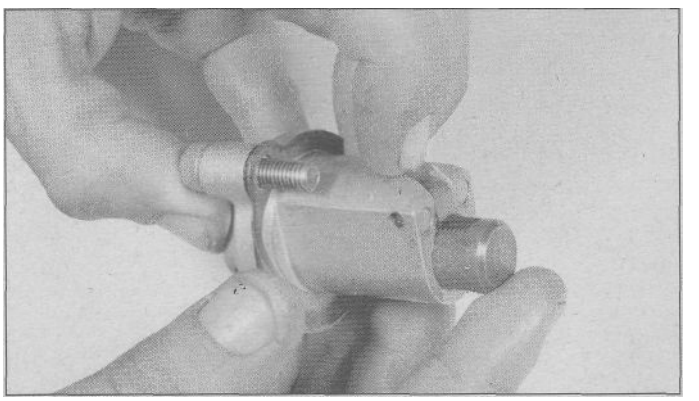


7.2b . . . and remove the tensioner and gasket from the engine



7.3 Tensioner details

a) Cap bolt
b) Sealing washer
c) Spring
d) Tensioner body



7.4 Lift the latch and compress the tensioner piston into the body

2 Remove the tensioner mounting bolts and take it off the engine **(see illustrations).**

Installation

Refer to illustrations 7.3 and 7.4

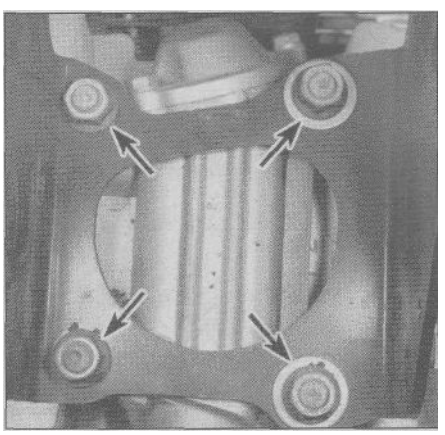
3 Check the sealing washer on the cap bolt for cracks or hardening **(see illustration).** It's a good idea to replace this washer whenever the tensioner cap is removed.

4 Release the one-way cam on the chain tensioner and compress the tensioner piston into the tensioner body **(see illustration).**

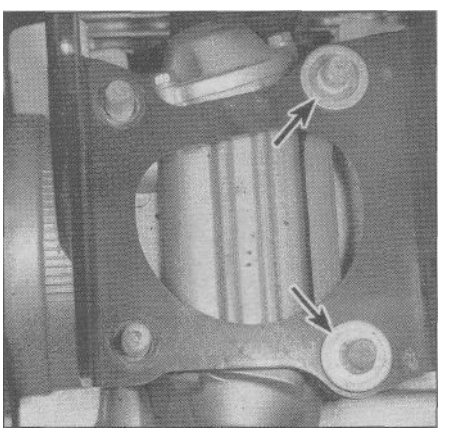
5 Turn the tensioner so the one-way cam is up and install the tensioner on the cylinder, using a new gasket **(see illustration 7.2b).**

6 Tighten the mounting bolts to the torque listed in this Chapter's Specifications.

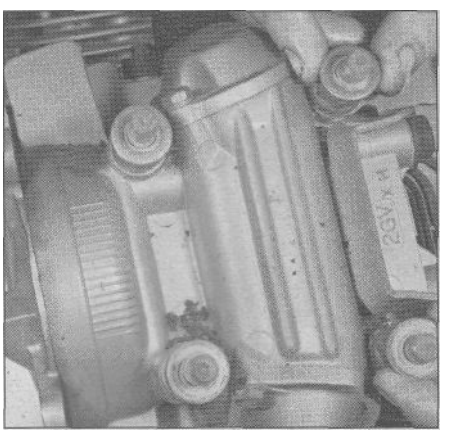
7 Install the tensioner spring, sealing washer and cap. **(see illustration 7.1b).** Tighten the cap to the torque listed in this Chapter's Specifications.



8.3a Remove four nuts (arrows); the front of the engine is at the bottom of the illustration . . .



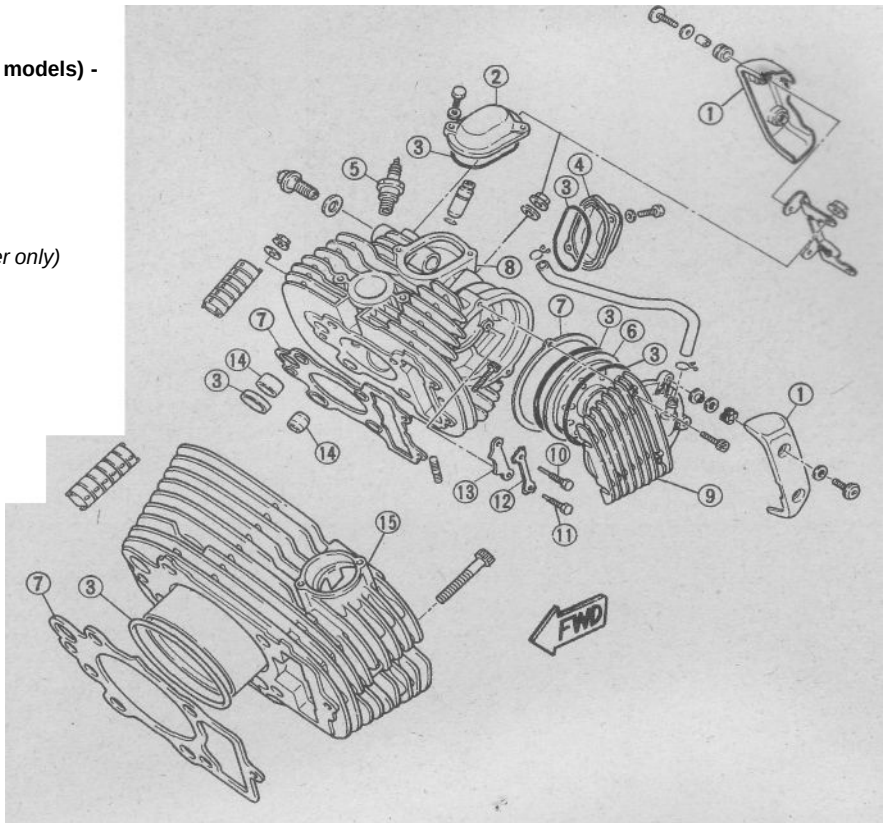
8.3b . . . and two washers (arrows), then lift off the engine mounting bracket...

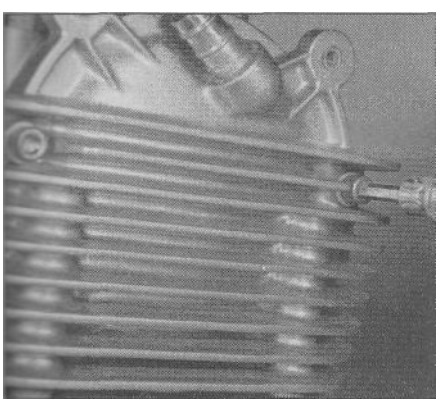


8.3c . . . and remove the four washers from beneath the bracket

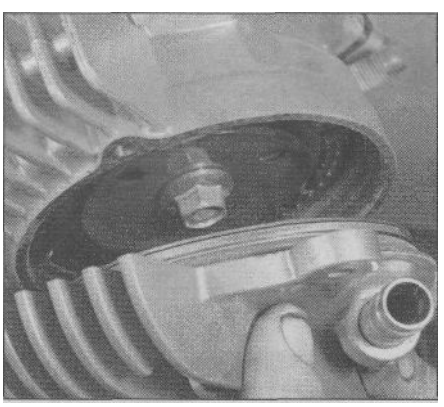
8.4a Cylinder head and cylinder (XV535 models) - exploded view

1) *Cylinder head side cover*
2) *Intake rocker arm cover*
3) *O-ring*
4) *Exhaust rocker arm cover*
5) *Spark plug*
6) *Oil baffle plate (rear cylinder only)*
7) *Gasket*
8) *Cylinder head (rear shown)*
9) *Cam sprocket cover*
10) *Long retainer bolt*
11) *Short retainer bolt*
12) *Lockwasher*
13) *Retainer*
14) *Dowel*
15) *Cylinder (rear shown)*

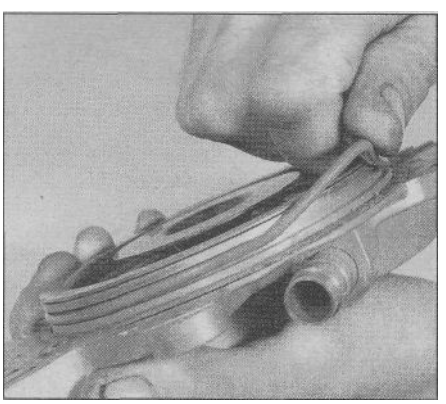




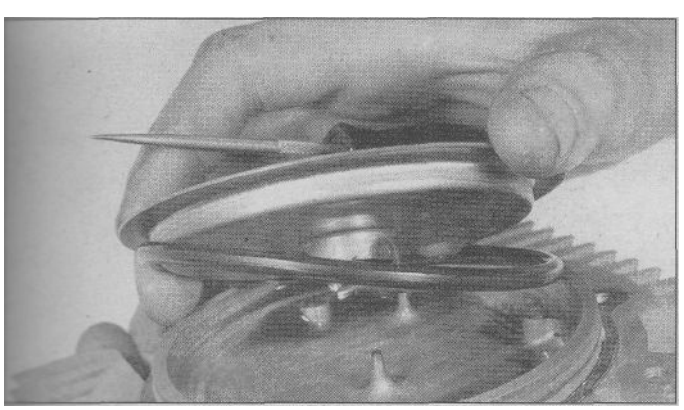
8.4b Remove both Allen bolts . . .



8.4c . . . and take the cam sprocket cover off the cylinder head



8.4d Use a pointed tool to remove the O-ring from the cam sprocket cover . . .



C4e . . . and on the rear cylinder, remove the oil baffle plate and its O-ring

8 Cylinder heads, camshafts and rocker arms - removal, inspection and installation

Cylinder head removal

Refer to illustrations 8.3a, 8.3b, 8.3c, 8.4a through 8.4e and 8.5

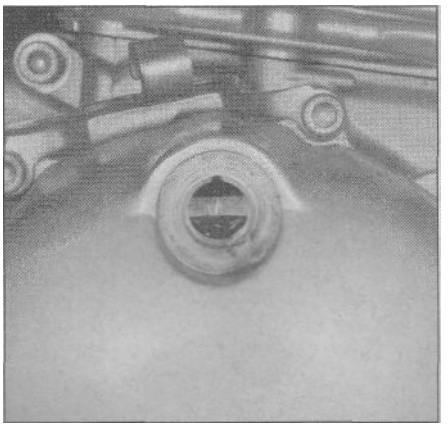
1 Remove the engine from the frame (see Section 5).

2 Remove the ignition coil mounting bracket and ignition coils from the rear cylinder (see Chapter 4).

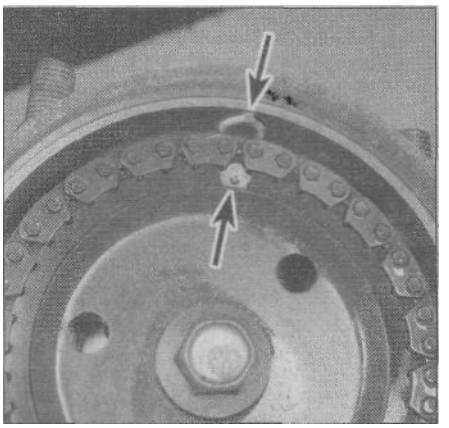
3 Remove the engine mounting bracket, its washers and nuts from the front cylinder head **(see illustrations).**

4 Remove the Allen bolts and take off the cam sprocket cover (see **illustrations).** Stuff clean shop towels into the opening below the sprocket so nothing is accidentally dropped into it.

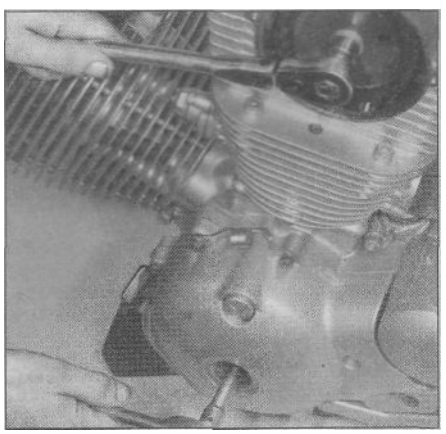
8.5 Unbolt the rocker arm covers and take them off, together with their O-rings



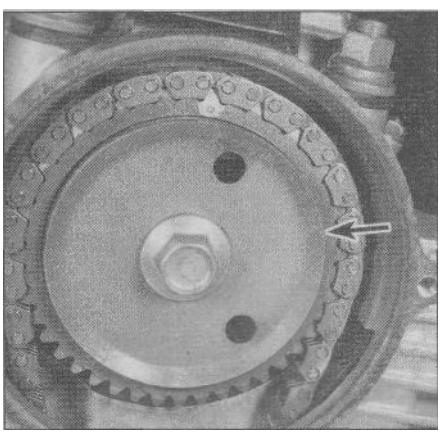
8.6a The line next to the T mark on the alternator rotor should be aligned with the notch in the timing window



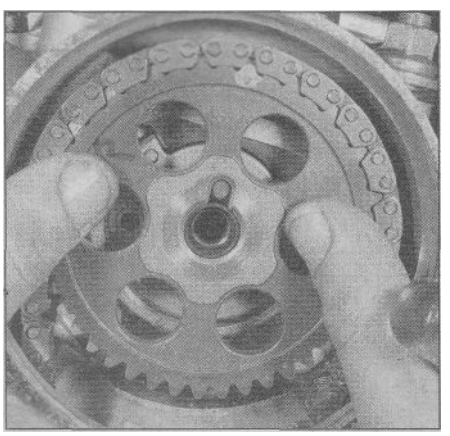
8.6b The punch mark on the sprocket should be aligned with the arrowhead cast in the cylinder head (arrows)



8.9 Hold the crankshaft turning bolt with a socket and loosen the camshaft sprocket bolt with another socket or a box wrench (ring spanner)



8.11 The* oil baffle plate (arrow) is used on the rear cylinder only



8.12 Label the rear cylinder's cam sprocket with an "R", then slide it off - make sure the dowel doesn't fall out of the camshaft

5 Remove the rocker arm covers and their O-rings from the exhaust side and intake side of the cylinder **(see illustration).**

Rear cylinder

Refer to illustrations 8.6a, 8.6b, 8.9, 8.11, 8.12, 8.13, 8.14a, 8.14b, 8.14c, 8.14d, 8.15a, 8.15b, 8.16a, 8.16b and 8.16c

6 Turn the engine so the rear cylinder is at top dead center on its compression stroke (see Valve clearance - adjustment in Chapter 1). When the rear cylinder is on its compression stroke, the line on the alternator rotor with a T mark next to it will be aligned with the notch in the timing window **(see illustration).** Also, the camshaft sprocket mark will be aligned with the mark inside the sprocket housing on the cylinder head **(see illustration).**

7 Remove the cam chain tensioner for the rear cylinder (see Section 7).

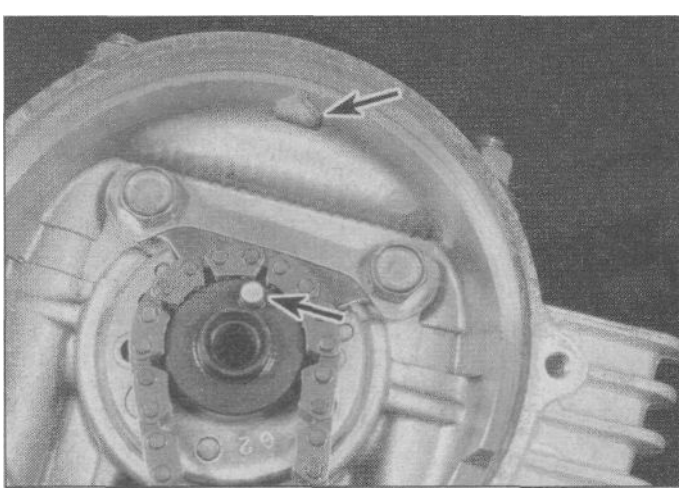
8 Place a piece of wire where you can reach it easily during the next steps.

9 Hold the engine from turning with a socket on the crankshaft turning bolt **(see illustration).** If the engine is in the frame, you can also keep it from turning by shifting the transmission into gear and having an assistant hold the rear brake on.

10 While you hold the engine from turning, loosen the camshaft sprocket bolt **(see illustration 8.9).**

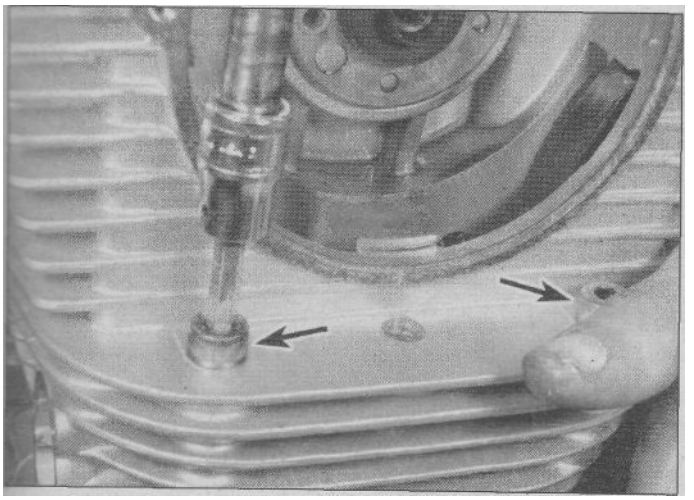
11 Unscrew the sprocket bolt and remove the oil baffle plate **(see illustration).**

12 Label the sprocket "R" (for rear cylinder) and slide it off the camshaft **(see illustration).** Make sure the camshaft dowel doesn't fall out ofthe camshaft.

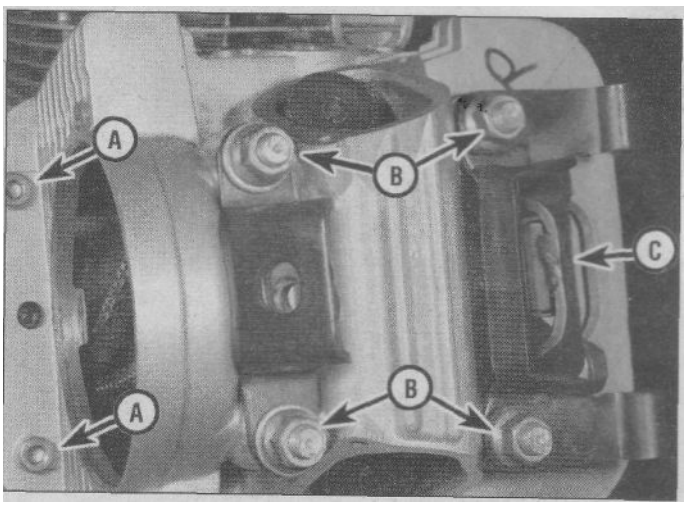


8.13 Once the sprocket is removed, drape the cam chain over the camshaft

13 Drape the cam chain over the end of the camshaft **(see illustration).** At this point, the camshaft dowel should be aligned with the pointer cast in the cylinder head.

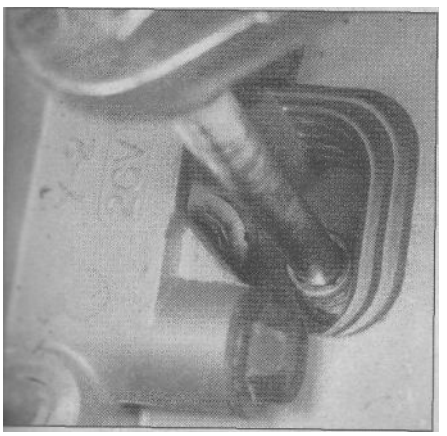


8.14a The cylinder heads are secured by two Allen bolts (arrows)...

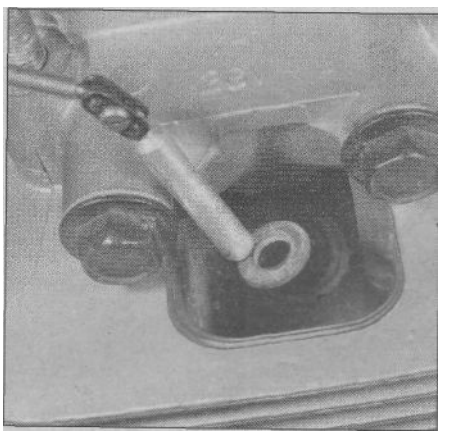


8.14b ... and five nuts ...

a) Allen bolts *c) Nut (in spark plug well)*
b) Nuts

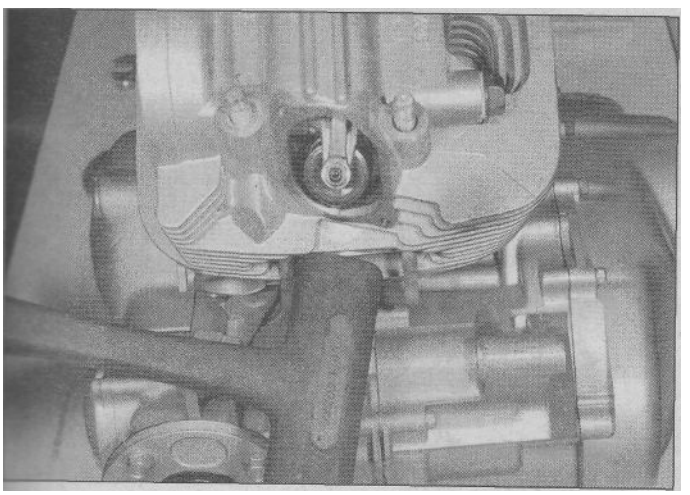


8.14c Use a socket and extension to remove the nut in the spark plug well...

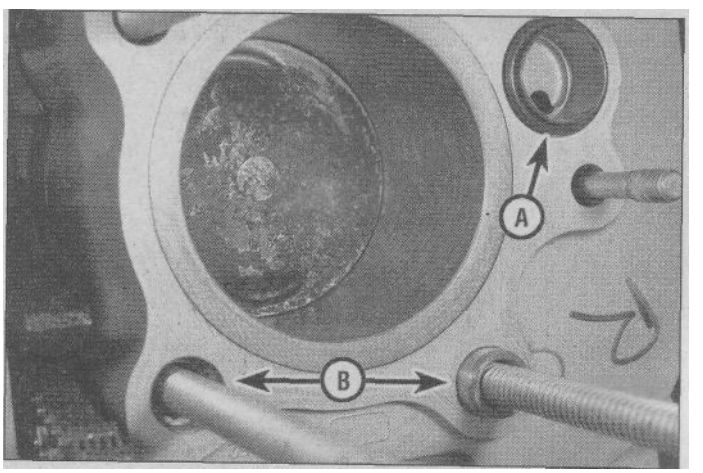


8.14d ... and pull its washer out with a magnet

8.15a Lift the cylinder head off



8.15b If the head is stuck, tap it with a soft-faced mallet (don't tap against the cooling fins or they'll break)

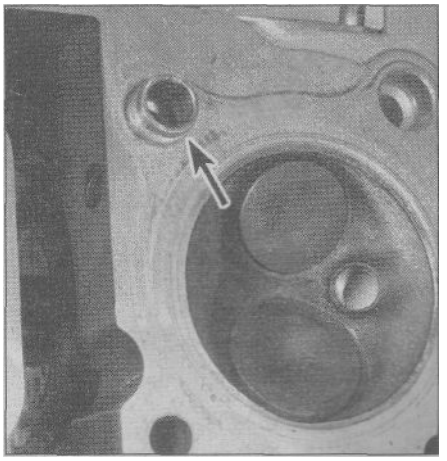


8.16a There are three dowels, one with an O-ring (A) and two that fit around studs (B)...

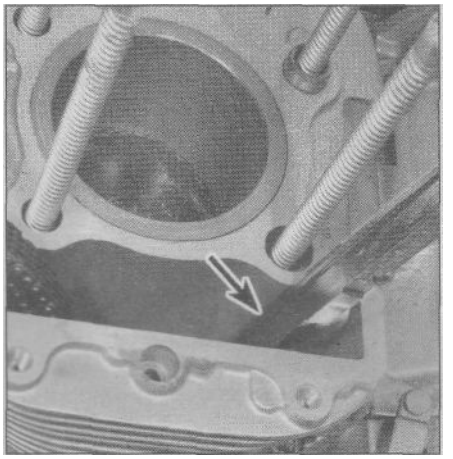
14 Loosen the cylinder head nuts and bolts evenly in several stages (see illustrations). Remove the nuts, washer, bolts and engine mounting brackets.

15 Lift the cylinder head off the studs **(see illustration).** If it's stuck, tap it gently with a rubber or plastic mallet, being careful not to break the cooling fins **(see illustration).** Don't pry against the gasket surfaces or they will be gouged.

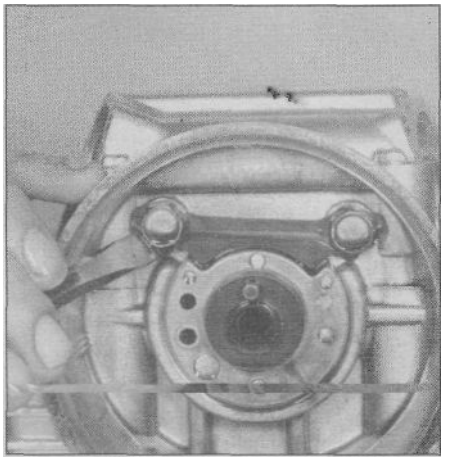
16 Remove the O-ring, dowels and exhaust side chain damper (see **illustrations).** Tie up the cam chain with wire.



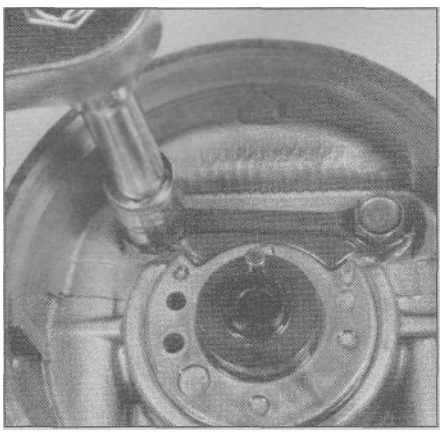
8.16b ... if they're not in the cylinder, they may have remained in the head (arrow)



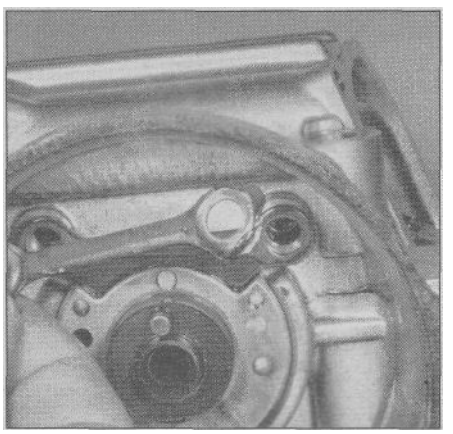
8.16c Lift out the exhaust side chain damper (arrow)



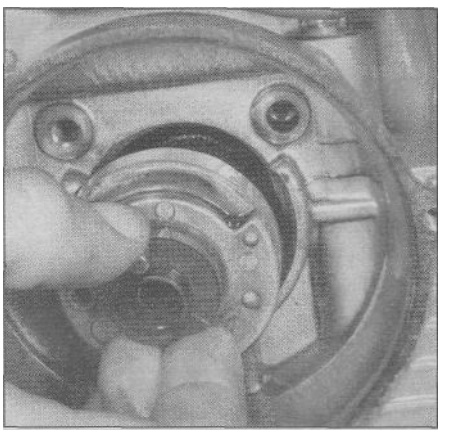
8.22a Flatten the lockwasher tabs with a hammer and chisel (take care not to strike the cylinder head)...



8.22b ... undo the retainer bolts ...



8.22c ... and remove the lockwasher



8.23a Pull the camshaft and bushing out of the head ...

17 Check the cylinder head gasket and the mating surfaces on the cylinder head and block for leakage, which could indicate warpage. Refer to Section 10 and check the flatness of the cylinder head.

18 Clean all traces of old gasket material from the cylinder head and block. Be careful not to let any of the gasket material fall into the crankcase, the cylinder bores or the oil passages.

Front cylinder

19 Repeat Steps 6 through 18 to remove the front cylinder head, noting that the front camshaft sprocket doesn't have an oil baffle and that the front engine mounting bracket was removed in Step 3.

Camshaftremoval

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

Note: *You may need a 10 mm bolt for this procedure.*

20 If you haven't already done so, remove the rocker arm covers (see illustrations 8.4c and 8.5).

21 Loosen the rocker arm locknuts and back off the adjusters.

22 Flatten the tabs on the camshaft bolt lockwasher **(see illustration).** Remove the bolts, lockwasher and retainer **(see illustrations).**

23 Try to pull the camshaft out with fingers **(see illustration).** If it doesn't come easily, thread a 10 mm bolt into the end of the camshaft and use it as a handle to pull out the camshaft. Once the camshaft is out, remove the bushing **(see illustrations).**

8.23b ... and take the bushing off the camshaft

Rockerarmremoval

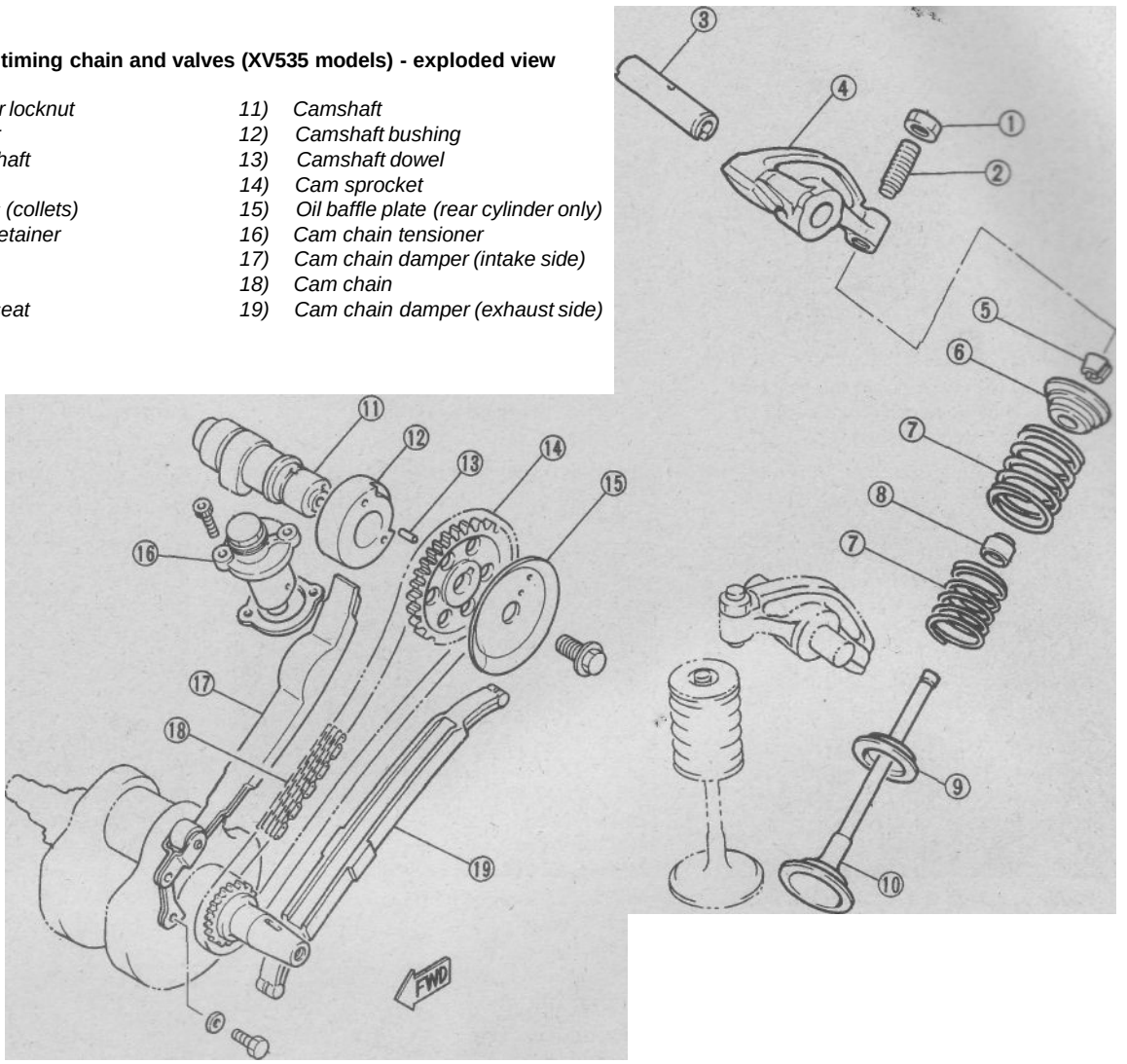
Refer to *illustrations 8.25a, 8.25b, 8.26a, 8.26b, 8.26c and 8.27*

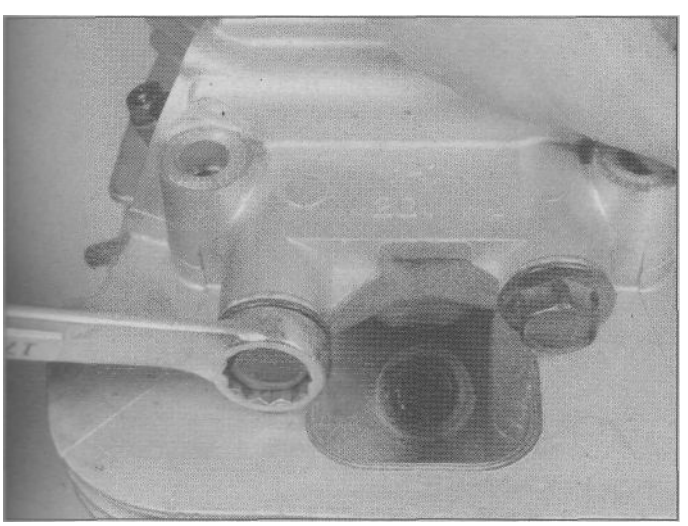
24 Remove the camshaft (see Steps 20 through 23).

25 Remove the rocker arm shaft retaining bolts and sealing washers **(see illustrations).**

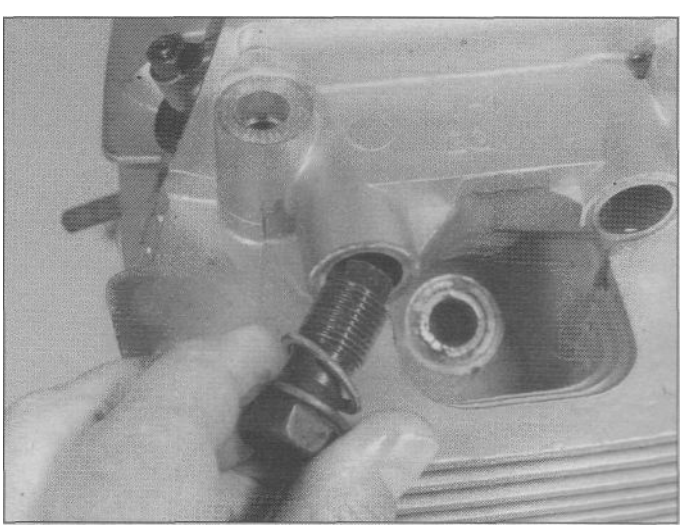
8.23c Camshaft, timing chain and valves (XV535 models) - exploded view

1) Valve adjuster locknut
2) Valve adjuster
3) Rocker arm shaft
4) Rocker arm
5) Valve keepers (collets)
6) Valve spring retainer
7) Valve springs
8) Oil seal
9) Valve spring seat
10) Valve
11) Camshaft
12) Camshaft bushing
13) Camshaft dowel
14) Cam sprocket
15) Oil baffle plate (rear cylinder only)
16) Cam chain tensioner
17) Cam chain damper (intake side)
18) Cam chain
19) Cam chain damper (exhaust side)

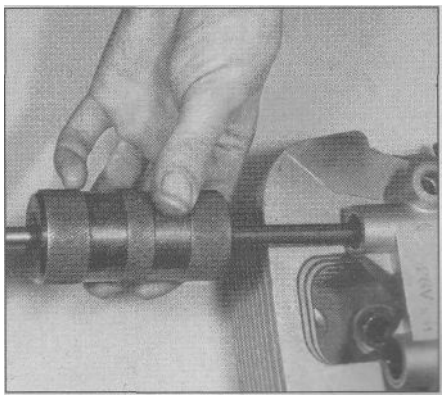




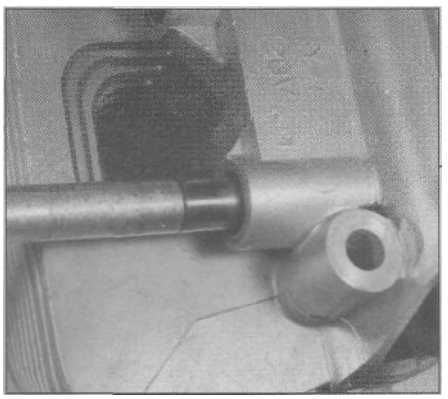
8.25a Remove the rocker arm shaft retaining bolts .



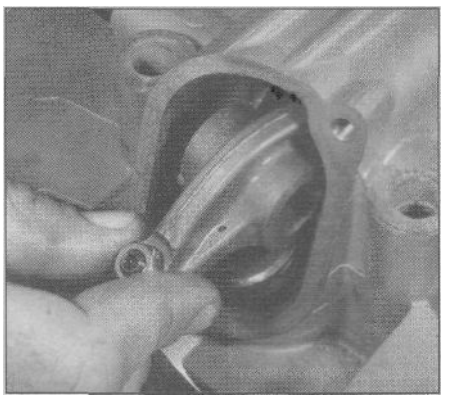
8.25b . . . and their sealing washers



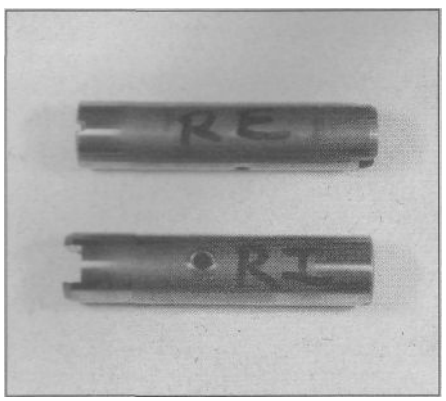
8.26a A slide hammer like this one is the **easiest way to remove the** rocker shafts



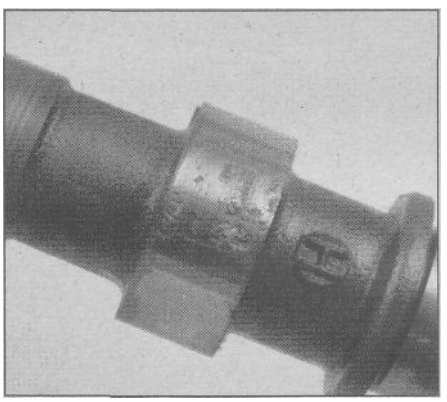
8.26b Pull the shaft partway out.



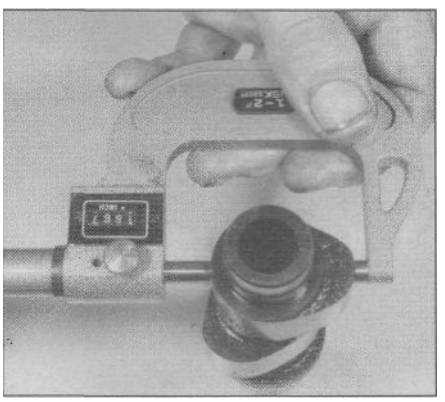
8.26c ... then remove the rocker arm



8.27 Label the shafts according to cylinder (front or rear) and side (intake or exhaust)



8.29a Check the lobes of the camshaft for wear - here's a good example of damage which will require replacement (or repair) of the camshaft



8.29b Measure the height of the cam lobes with a micrometer

26 Thread a slide hammer into the end of the rocker shaft **(see illustration).** If you don't have one, use along bolt, a large flat washer and a short piece of pipe. Rap the pipe against the washer to pull the rocker shaft out of the rocker arm. Once the rocker shaft clears the rocker arm, take the rocker arm out **(see illustrations).**

27 Remove the remaining rocker shaft and arm, then label them according to cylinder and position (for example, rear intake and rear exhaust) **(see illustration).**

Camshaft, chain and cam sprocket inspection

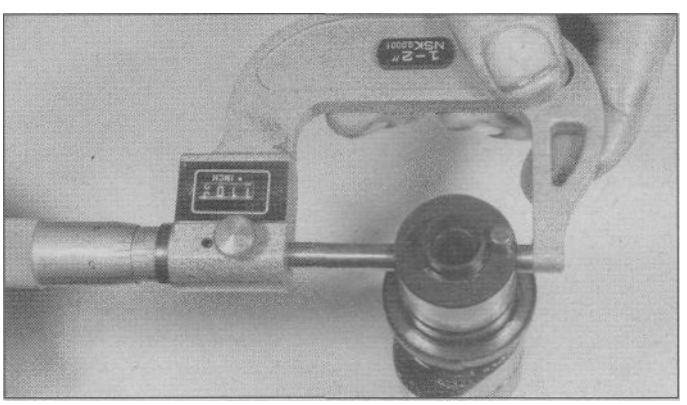
Refer to illustrations 8.29a,. 8.29b, 8.30 and 8.32

Note: *Before replacing camshafts because of damage, check with local machine shops specializing in motorcycle engine work. It may be possible for cam lobes to be welded, reground and hardened, at a cost far lower than that of a new camshaft. If the bearing surfaces in the cylinder head are damaged, it may be possible for them to be bored out to accept bearing inserts. Due to the cost of a new cylinder head it is recommended that all options be explored before condemning it as trash!*

28 Inspect the cam bearing surfaces of the head. Look for score marks, deep scratches and evidence of spalling (a pitted appearance).

29 Check the camshaft lobes for heat discoloration (blue appearance), score marks, chipped areas, flat spots and spalling **(see illustration).** Measure the height of each lobe with a micrometer **(see illustration)** and compare the results to the minimum lobe height listed in this Chapter's Specifications. If damage is noted or wear is excessive, the camshaft must be replaced.

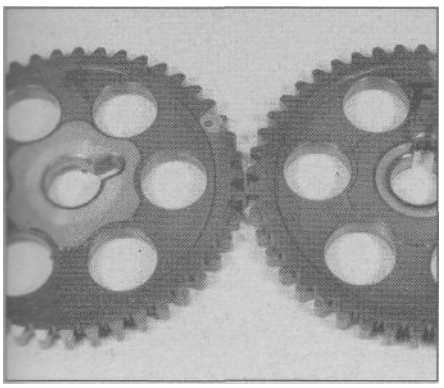
30 Next, check the camshaft bearing oil clearances. Measure the outer diameter of the camshaft journals and the inner diameter of the bearing surface in the cylinder head and the camshaft bushing **(see illustration).** Subtract the journal diameter from the bearing or bushing bore diameter to obtain the clearance. If it's greater than that listed in this Chapter's Specifications, replace the cylinder head, bushing or camshaft, whichever is worn.



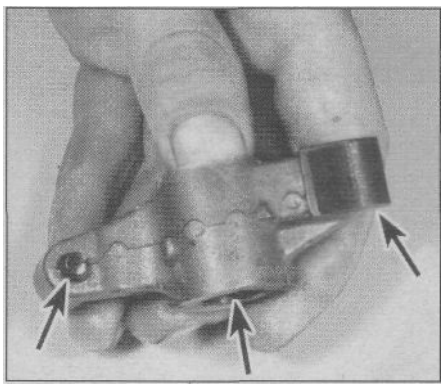
8.30 Measure the camshaft journal diameter with a micrometer and compare it to the diameter of the bushing or the bearing surface in the cylinder head

31 Check the visible portion of the cam chain for obvious wear or damage. Except in cases of oil starvation, the chain wears very little. If the chain has stretched excessively, which makes it difficult to maintain proper tension, replace it with a new one (see Section 17).

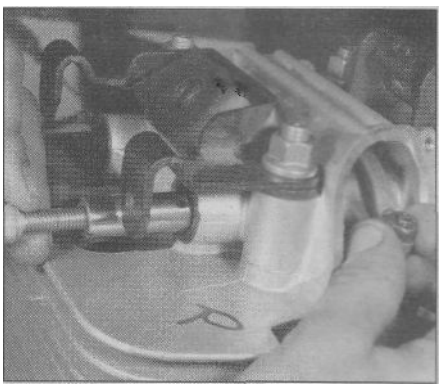
32 Check the cam sprockets for wear, cracks and other damage, replacing them if necessary **(see illustration).** If the sprockets are worn, the chain is also worn, and also the sprocket on the crankshaft (which can only be remedied by replacing the crankshaft). If wear this



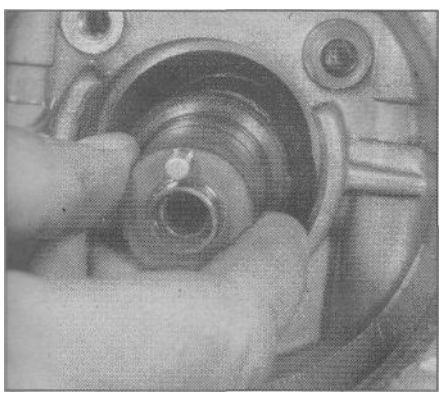
8.32 Check the sprockets for wear and damage



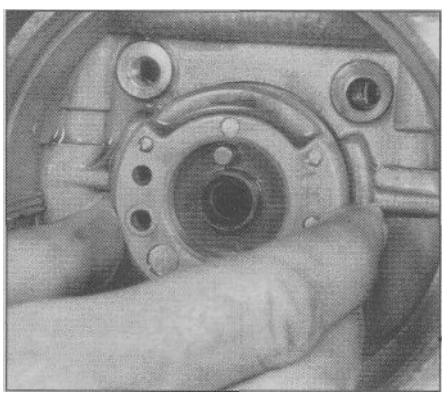
8.34 Check rocker arms for wear on the adjuster surface, inside the bore and on the cam contact surface (arrows)



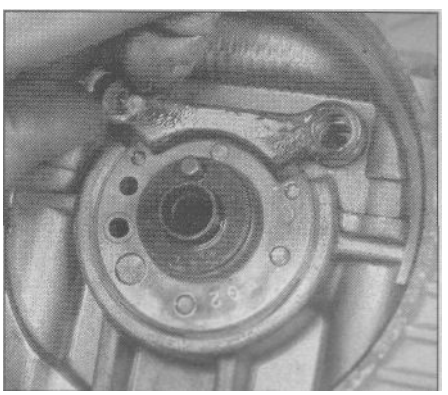
8.36 Hold the rocker arm in the installed position and install the shaft, using a bolt



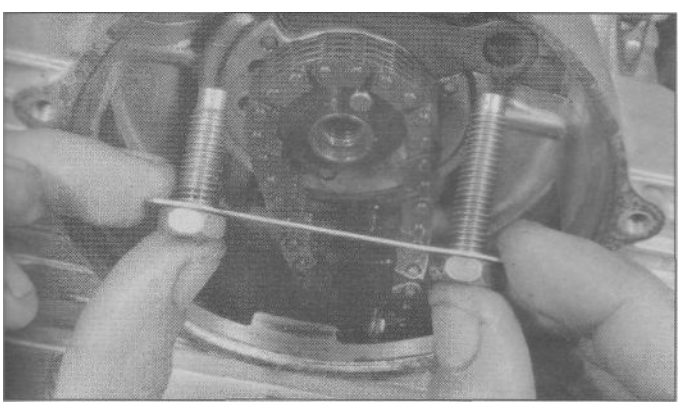
8.40a Slide the camshaft into its bearing in the cylinder head ...



8.40b ... then install the bushing and align it as shown



8.41a Install the retainer...



8.41b ... and the lockwasher and bolts; the long bolt goes on the exhaust side and the short bolt on the intake side

severe is apparent, the entire engine should be disassembled for inspection.-

13 Check the cam chain damper for wear or damage. If it is worn or damaged, the chain may be worn out or improperly adjusted. Refer to Section 17 for cam chain replacement.

Rockerarminspection

Refer to illustration 8.34

34 Clean all of the components with solvent and pry them off. Blow though the oil passages in the rocker arms with compressed air, if available. Inspect the rocker arm faces for pits, spalling, score marks and rough spots **(see illustration).** Check the rocker arm-to-shaft contact areas and the adjusting screws, as well. Look for cracks in each rocker arm. If the faces of the rocker arms are damaged, the rocker arms and the camshafts should be replaced as a set.

35 Measure the diameter of the rocker arm shafts, in the area where the rocker arms ride, and the inside diameter of the rocker arms. Calculate the difference and compare the results with this Chapter's Specifications. If the clearance is beyond the specified limits, replace them as a set.

Rockerarminstallation

Refer to illustration 8.36

36 Coat the rocker shafts and the rocker arm bores with clean engine oil. Thread a bolt into the threads in the end of the exhaust rocker shaft to use as a handle. Position the exhaust rocker shaft partway into its hole with the threaded end facing out **(see illustration).** Install the exhaust rocker arm and slide the shaft into the rocker arm. Don't install the holding bolt yet.

37 Repeat Step 36 to install the intake rocker arm.

Camshaftinstallation

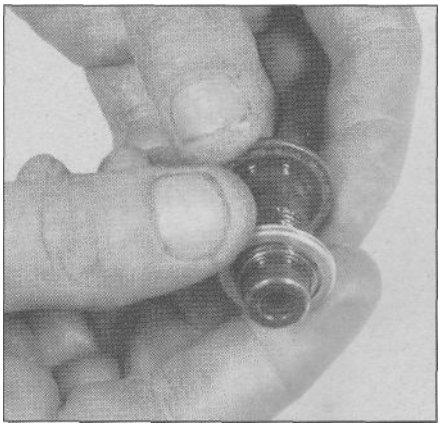
Refer to illustrations 8.40a, 8.40b, 8.41a, 8.41b, 8.42a, 8.42b and 8.42c

38 Apply a light coat of engine assembly lube or moly-based grease to the camshaft journals. Position the camshaft bushing on the camshaft.

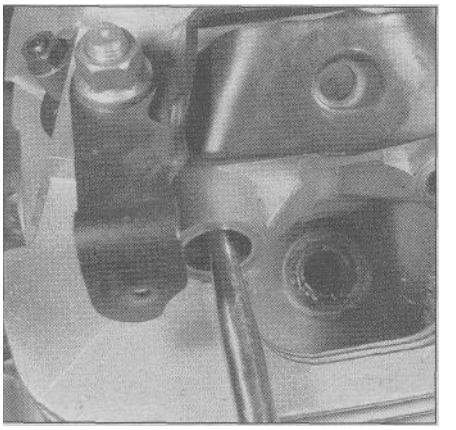
39 Apply a light coat of engine assembly lube or moly-based grease to the cam lobes.

40 Slide the camshaft into the cylinder head, then install the bushing **(see illustrations).** Don't let the bushing tilt sideways and jam in its bore. Position the bushing cutout flush with the cylinder head and align the camshaft dowel with the timing mark **(see illustration 8.13).**

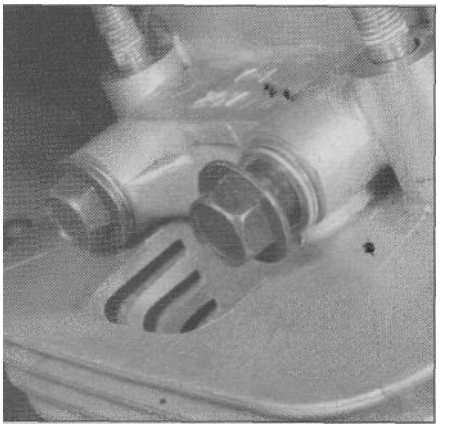
41 Install the retainer **(see illustration).** Install a new lockwasher and the retainer bolts (the exhaust side bolt is longer than the intake side bolt) **(see illustration).** Tighten the bolts to the torque listed in this



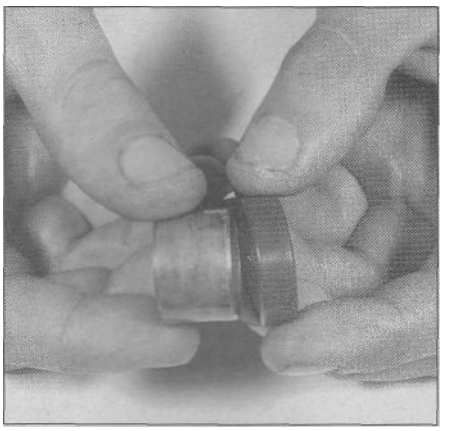
8.42a Install new sealing washers on the rocker shaft bolts



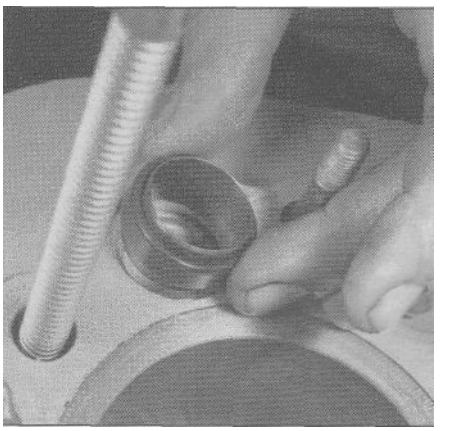
8.42b Use a screwdriver to position the rocker shafts so the bolts will line up with them



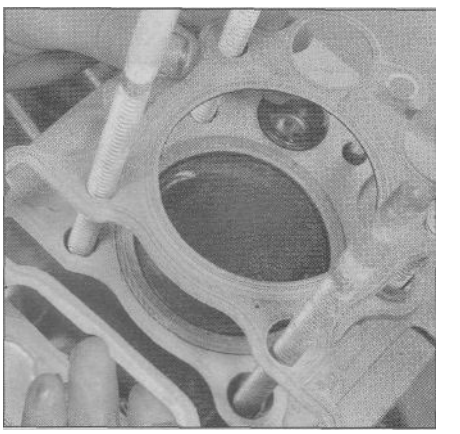
8.42c Install the bolts with their sealing washers and tighten them to the torque listed in this Chapter's Specifications



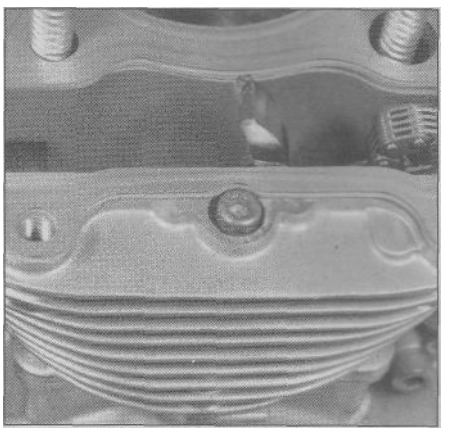
8.44a Slip the O-ring **onto the large dowel..**



8.44b ... and install the large dowel and two small dowels in their bores ...

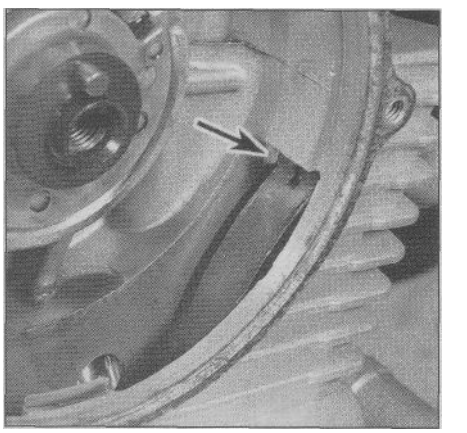


8.44c ... and install the head gasket over the studs and dowels



8.45 Install the exhaust side cam chain damper in its slot with the UP mark (arrow) up

8.46a As you lower the head onto the studs, move the cam chain and damper aside so they don't obstruct installation of the head



8.46b Slip the exhaust side chain damper into its notch (arrow) as the head is lowered into position

Chapter's Specifications, then bend the lockwasher tabs against the bolt heads.

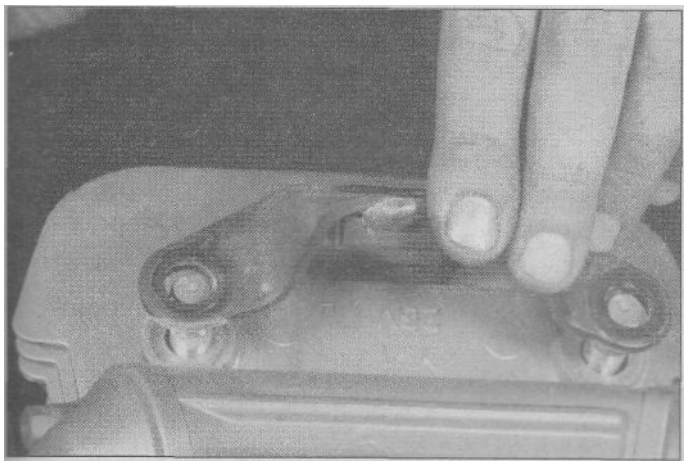
42 Install new sealing washers on the rocker arm holding bolts **(see illustration).** Use a screwdriver to position the ends of the rocker shafts so the bolts will align with them **(see illustration),** then install the bolts with their sealing washers and tighten them to the torque listed in this Chapter's Specifications **(see illustration).**

Cylinder head installation

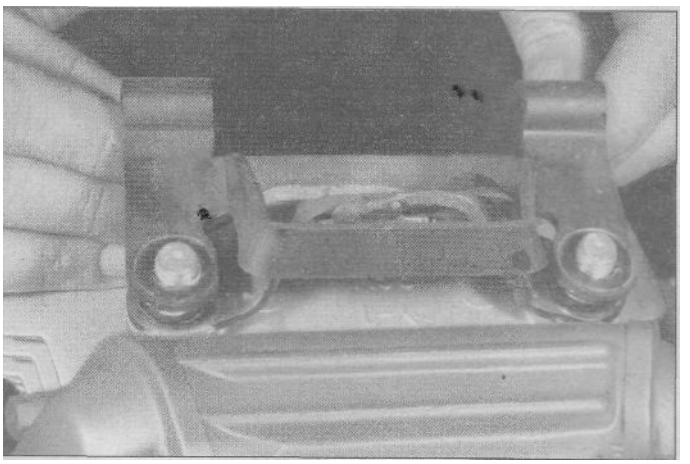
Rear cylinder head

Refer to illustrations 8.44a, 8.44b, 8.44c, 8.45, 8.46a, 8.46b, 8.47a, 8.47b, 8.47c, 8.47d,8.50, 8.57a, 8.57b, 8.57c and 8.57'd

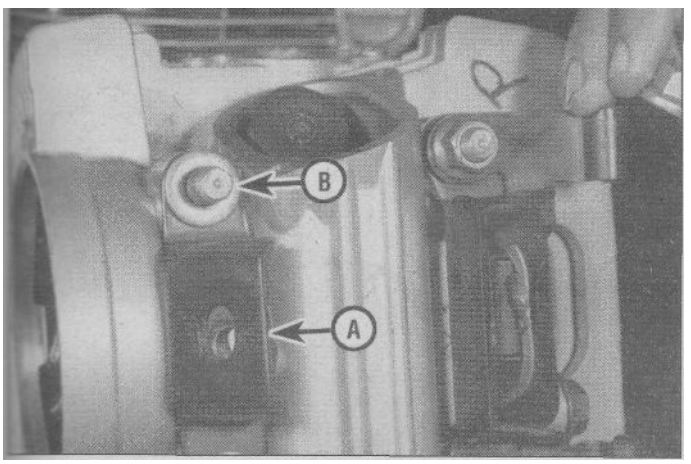
43 If both cylinder heads have been removed, install the rear cylinder head first. '



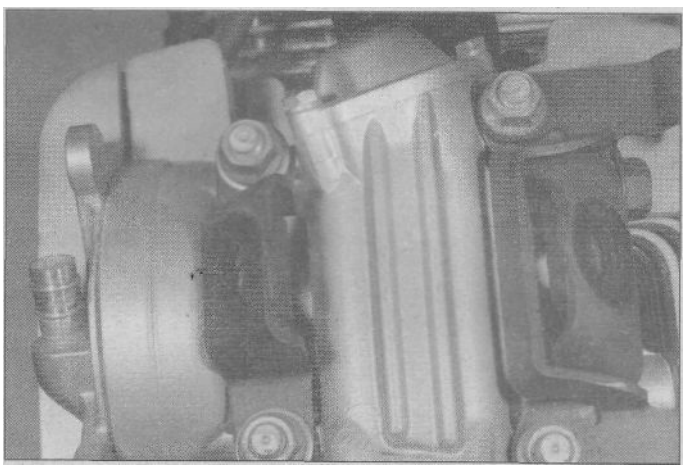
8.47a install the engine mounting bracket on the right side of the rear cylinder head ...



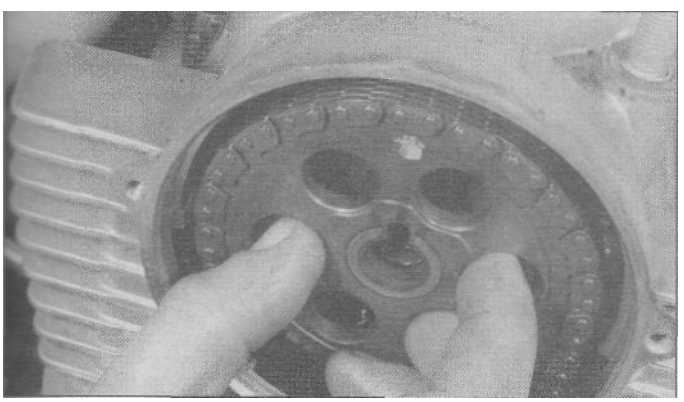
8.47b ... install the cylinder head cover bracket next and thread two of the short nuts onto the studs on top of the cover bracket...



8.47c ... On the left side of the engine, install the engine mounting bracket (A) and two thin washers (B), then install two short nuts ...



8.47d ... **the installed brackets should look like this**



8.50 Fit the cam sprocket into the chain so its dowel hole will align with the camshaft dowel

44 Install the O-ring on the large dowel and install the two smaller dowels, then install the new head gasket on top of the cylinder **(see illustrations).** Never reuse the old head gasket and don't use any type oilgasketsealant.

45 Install the cam chain damper on the exhaust side (if removed) with its UP mark up **(see illustration).**

46 Position the cylinder head on the studs and guide the cam chain damper through the slot in the cylinder head **(see illustration).** Be sure the upper end of the cam chain damper fits into the. notch in the bottom of the cylinder head **(see illustration).**

47 Install the cylinder head bolts and nuts together with the engine mounting brackets and cylinder head cover bracket **(see illustrations).** Four of the shorter nuts go on the rear cylinder head; the longer nuts and the remaining four short nuts go on the front cylinder head. Tighten the bolts and nuts evenly in several stages, in a criss-cross pattern, to the torque listed in this Chapter's Specifications.

48 Make sure the camshaft locating dowel is aligned with the mark on the cylinder head **(see illustration 8.13).**

49 If you're working on the rear cylinder head, make sure the line on the timing rotor with a T mark next to it aligns with the notch in the timing window **(see illustration 8.6a).** If it's necessary to turn the crankshaft, hold the timing chain up while you're turning so it doesn't fall off the crankshaft sprocket and become jammed.

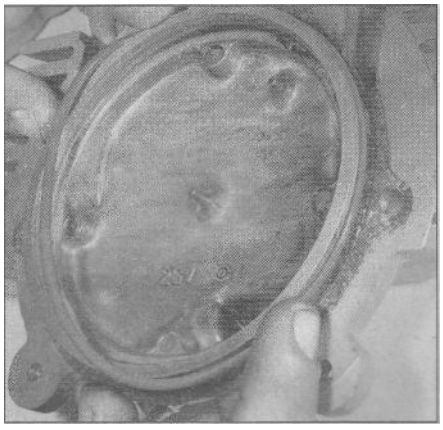
50 Engage the camshaft sprocket with the timing chain so its dowel hole aligns with the dowel **(see illustration).** Slip the sprocket onto the camshaft over the dowel.

51 Install the oil baffle plate with its concave side out, away from the sprocket **(see illustration 8.11).**

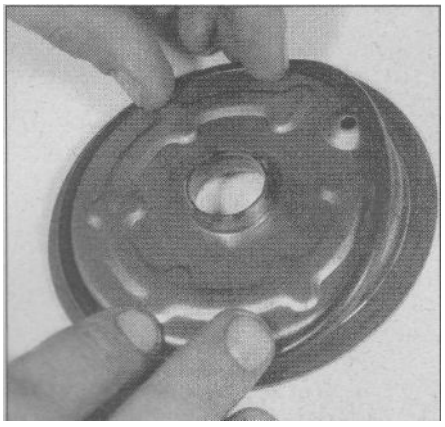
52 Turn the cam sprocket clockwise far enough to remove all slack in the cam chain, but no farther. Insert a finger in the tensioner hole and push against the chain damper. Make sure the timing marks on the cam sprocket and crankshaft are aligned correctly (see illustrations 8:6a and 8.6b).

53 With the marks correctly aligned, tighten the cam sprocket bolt to the torque listed in this Chapter's Specifications.

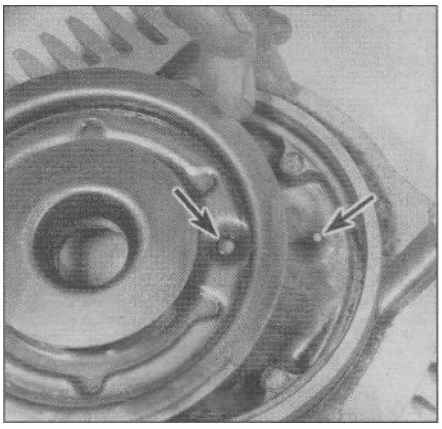
54 Install the cam chain tensioner (see Section 7).



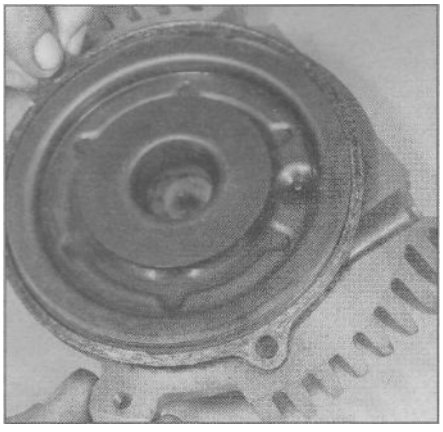
8.57a Install a new O-ring on the cam **sprocket cover . ..**



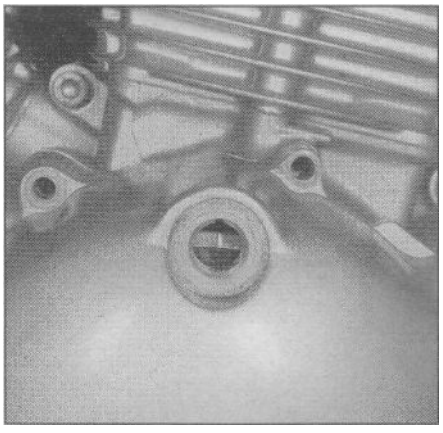
8.57b . . . and one on the oil baffle plate



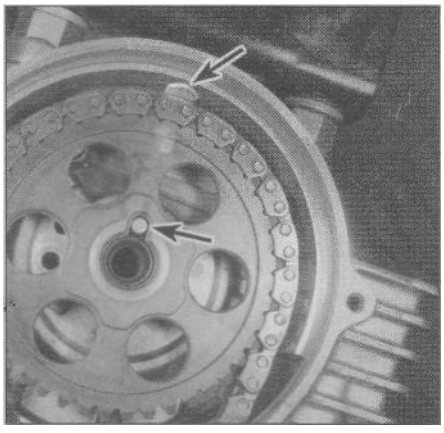
8.57c Align the hole in the oil baffle plate with the locating pin in the cover (arrows)...



8.57d . . . then press the plate into the cover and install a new gasket



8.58a The line without a T mark next to it must be aligned with the notch in the timing window . . .



8.58b . . . and the camshaft dowel must be aligned with the pointer cast in the cylinder head (arrows)

55 Adjust the valve clearances (see Chapter 1).
56 Install the rocker arm covers with new O-rings. Install the intake rocker arm cover with its ridge up (see Valve clearance - adjustment in Chapter 1).
57 Install the oil baffle and cam sprocket cover, using new O-rings **(see illustrations).**

Front cylinder head

Refer to illustrations 8.58a, 8.58b and 8.59a through 8.59e

58 Repeat Steps 44 through 46 to install the front cylinder head, noting that the slot in the timing rotor must be aligned with the crankcase pointer when the camshaft dowel is aligned with the cylinder head mark **(see illustrations).**
59 Install the washers, cylinder head nuts and bolts and engine mounting bracket **(see illustrations).**
60 Repeat Steps 48 through 57 to finish installing the cylinder head, noting that there is *no* oil baffle on the sprocket or in the cam sprocket cover.
61 Install the ignition coils and their bracket (see Chapter 4).

Both cylinder heads

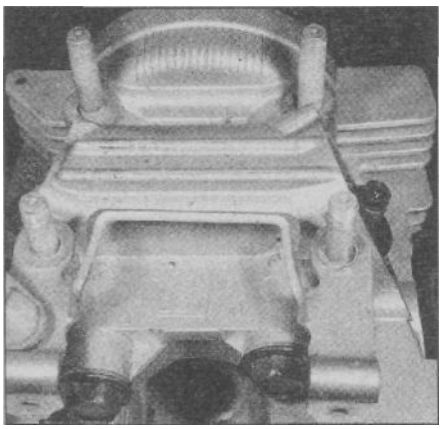
62 Change the engine oil (see Chapter 1).
63 The remainder of installation is the reverse of the removal steps.

9 Valves/valve seats/valve guides - servicing

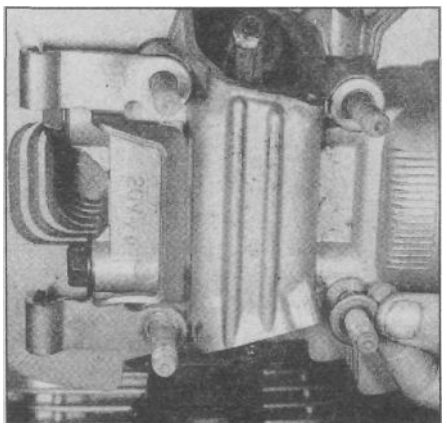
1 Because of the complex nature of this job and the special tools and equipment required, servicing of the valves, the valve seats and the valve guides (commonly known as a valve job) is best left to a professional.
2 The home mechanic can, however, remove and disassemble the head, do the initial cleaning and inspection, then reassemble and deliver the head to a dealer service department or properly equipped motorcycle repair shop for the actual valve servicing. Refer to Section 8 for those procedures.
3 The dealer service department will remove the valves and springs, recondition or replace the valves and valve seats, replace the valve guides, check and replace the valve springs, spring retainers and keepers/collets (as necessary), replace the valve seals with new ones and reassemble the valve components.
4 After the valve job has been performed, the head will be in like-new condition. When the head is returned, be sure to clean it again very thoroughly before-installation on the engine to remove any metal particles or abrasive grit that may still be present from the valve service operations. Use compressed air, if available, to blow out all the holes and passages.

10 Cylinder head and valves - disassembly, inspection and reassembly

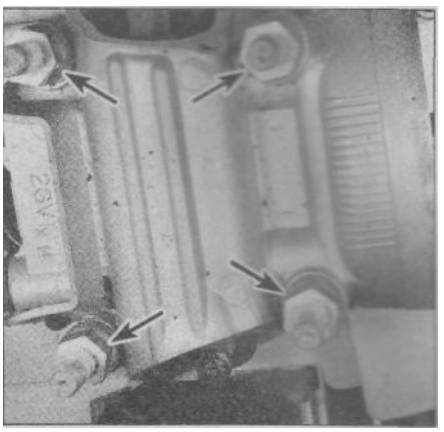
1 As mentioned in the previous Section, valve servicing and valve guide replacement should be left to a dealer service department or motorcycle repair shop. However, disassembly, cleaning and inspection of the valves and related components can be done (if the necessary special tools are available) by the home mechanic. This way



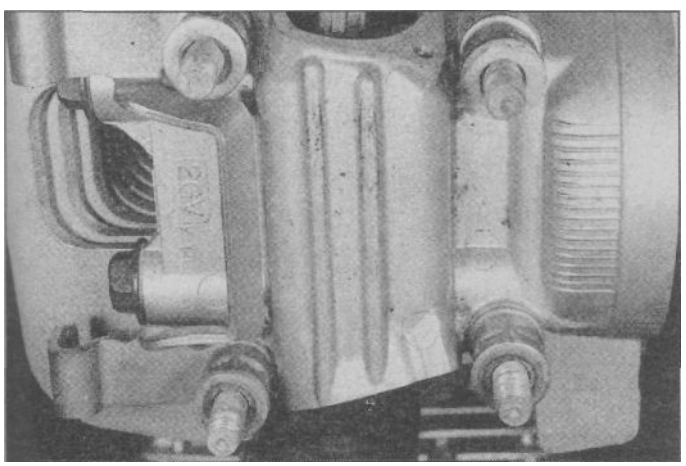
8.59a On the left side of the front cylinder head, install the cylinder head cover bracket...



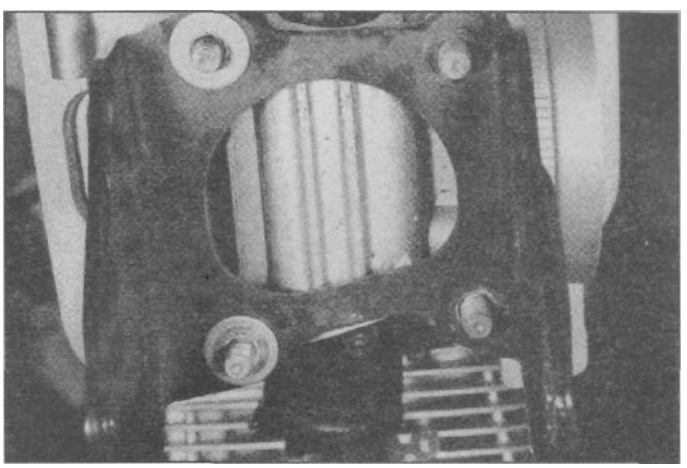
8.59b ... install two washers on the right side ...



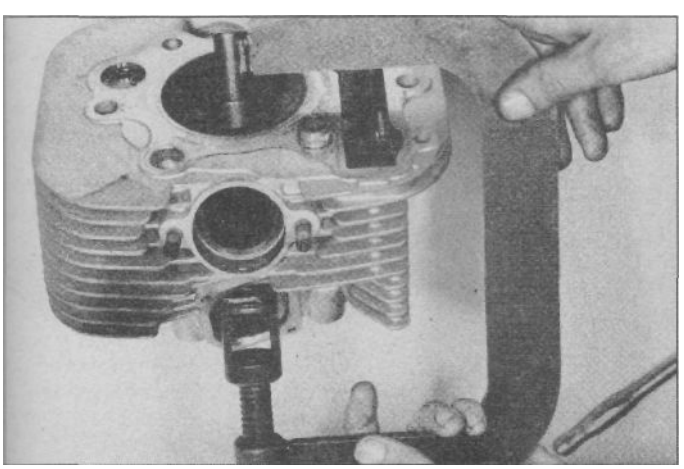
8.59c ... and install the four long nuts (arrows) on top of the bracket and washers (tighten the cylinder head nuts and bolts at this point)



8.59d Install four thick washers over the long nuts ...



8.59e ... install the mounting bracket, then install two thin washers on the left studs; install the remaining four thin nuts and tighten to the torque listed in this Chapter's Specifications



10.7a Compress the valve springs with a spring compressor ...

no expense is incurred if the inspection reveals that service work is not required at this time.

2 To properly disassemble the valve components without the risk of damaging them, a valve spring compressor is absolutely necessary. This special tool can usually be rented, but if it's not available, have a dealer service department or motorcycle repair shop handle the entire process of disassembly, inspection, service or repair (if required) and reassembly of the valves.

Disassembly

Refer to illustrations 10.7a through 10.7g and 10.9

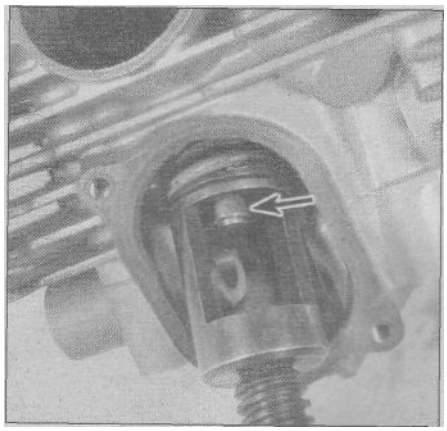
3 Remove the camshafts and rocker arms if you haven't already done so (see Section 8). Store the components in such a way that they can be returned to their original locations without getting mixed up.

4 Before the valves are removed, scrape away any traces of gasket material from the head gasket sealing surface. Work slowly and do not nick or gouge the soft aluminum of the head. Gasket removing solvents, which work very well, are available at most motorcycle shops and auto parts stores.

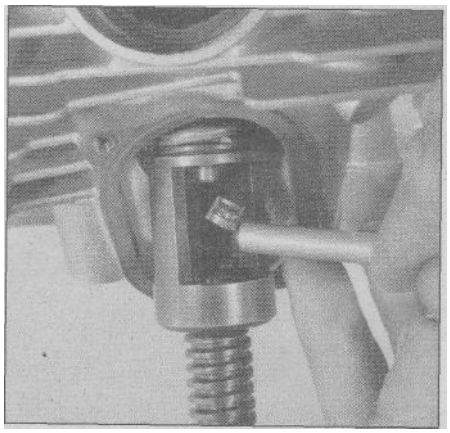
5 Carefully scrape all carbon deposits out of the combustion chamber area. A hand held wire brush or a piece of fine emery cloth can be used once the majority of deposits have been scraped away. Do not use a wire brush mounted in a drill motor, or one with extremely stiff bristles, as the head material is soft and may be eroded away or scratched by the wire brush.

6 Before proceeding, arrange to label and store the valves along with their related components so they can be kept separate and reinstalled in the same valve guides they are removed from (labeled plastic bags work well for this).

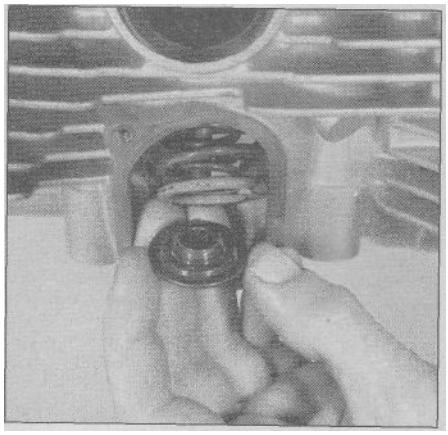
7 Compress the valve spring on the first valve with a spring compressor, then remove the keepers/collets and the upper spring seat from the valve assembly **(see illustrations).** Do not compress the springs any more than is absolutely necessary. Carefully release the valve spring compressor and remove the spring and the valve from the



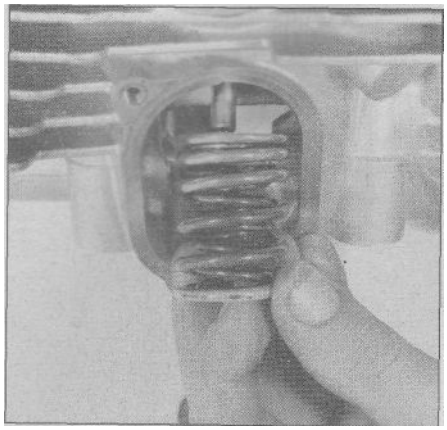
10.7b ... until the keepers/collets are exposed



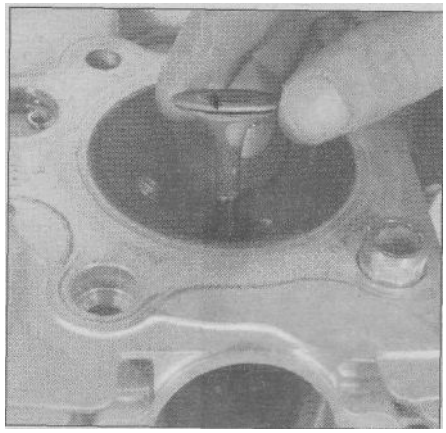
10.7c Remove the keepers/collets with a magnet



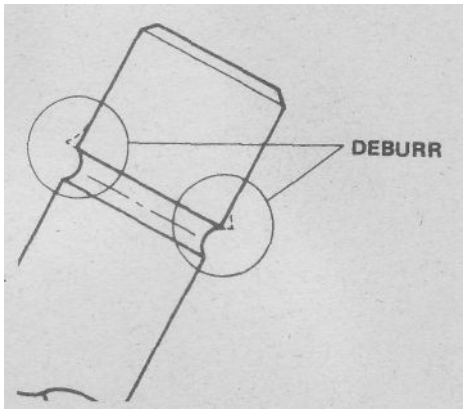
10.7d Release the spring pressure and remove the spring retainer ...



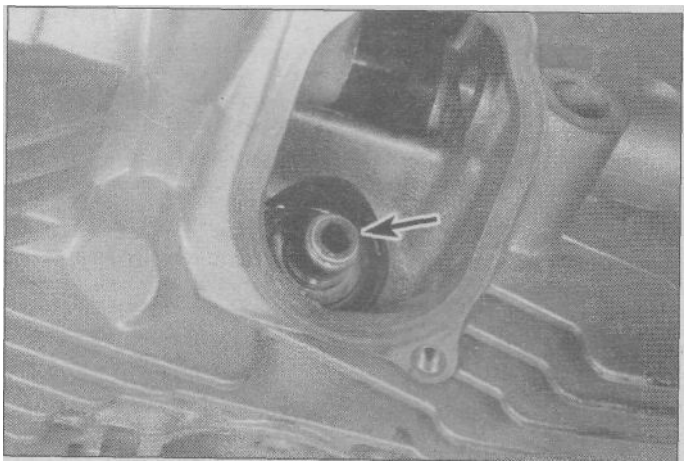
10.7e ... and the springs



10.7f Pull the valve into the combustion chamber, but don't force it



10.7g If the valve binds in the guide, deburr the area above the keeper groove



10.9 Pull the valve stem seal (arrow) off the valve guide

head **(see illustration),** if the valve binds in the guide (won't pull through), push it back into the head and deburr the area around the keeper/collet groove with a very fine file or whetstone **(see illustration).**

8 Repeat the procedure for the remaining valves. Remember to keep the parts for each valve together so they can be reinstalled in the same location.

9 Once the valves have been removed and labeled, pull off the valve stem seals **(see illustration)** with pliers and discard them (the old seals should never be reused), then remove the lower spring seats.

10 Next, clean the cylinder head with solvent and dry it thoroughly. Compressed air will speed the drying process and ensure that all holes and recessed areas are clean.

11 Clean all of the valve springs, keepers/collets, retainers and spring seats with solvent and dry them thoroughly. Do the parts from one valve at a time so that no mixing of parts between valves occurs.

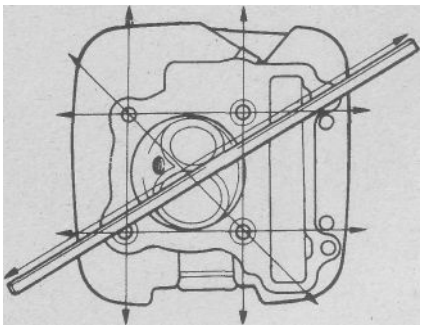
12 Scrape off any deposits that may have formed on the valve, then use a motorized wire brush to remove deposits from the valve heads and stems. Again, make sure the valves do not get mixed up.

Inspection

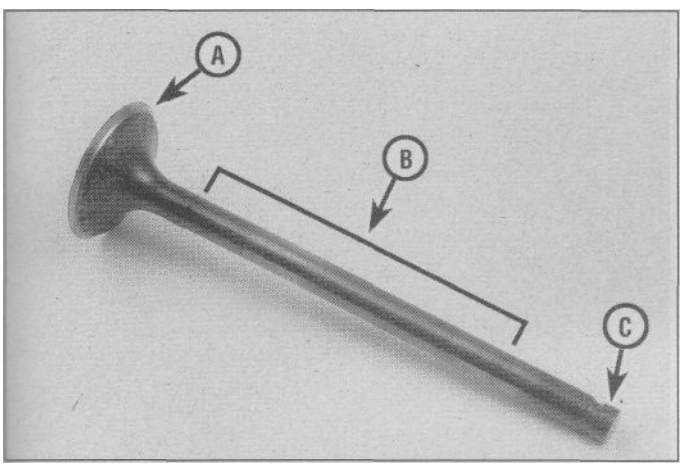
Refer to illustrations 10.14, 10.16, 10.17, 10.18a, 10.18b 10 19aand 10.19b

13 Inspect the head very carefully for cracks and other damage. If cracks are found, a new head will be required. Check the cam bushing surfaces for wear and evidence of seizure. Check the camshafts and rocker arms for wear as well (see Section 9).

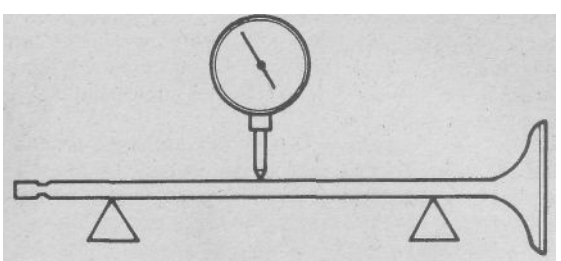
14 Using a precision straightedge and a feeler gauge, check the head gasket mating surface for warpage **(see illustration).** Lay the straightedge lengthwise, across the head and diagonally (corner-to-corner), intersecting the head bolt holes, and try to slip a feeler gauge under it, on either side of each combustion chamber. The gauge should be the same thickness as the cylinder head warp limit listed in this Chapter's Specifications. If the feeler gauge can be inserted between the head and the straightedge, the head is warped and must



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



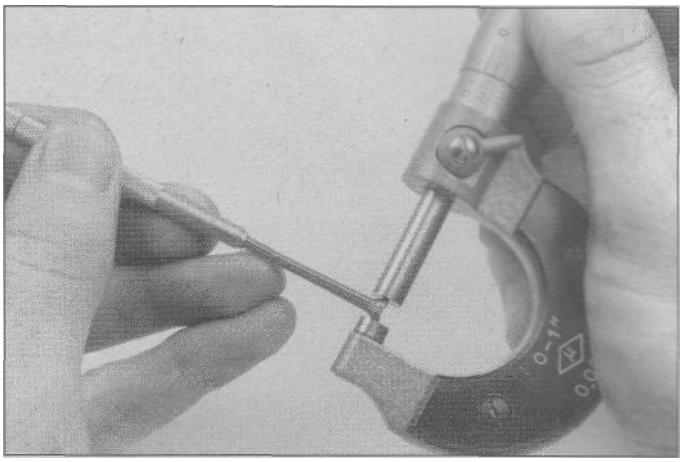
10.17 Check the valve face (A), stem (B) and keeper/collet groove (C) for signs of wear and damage



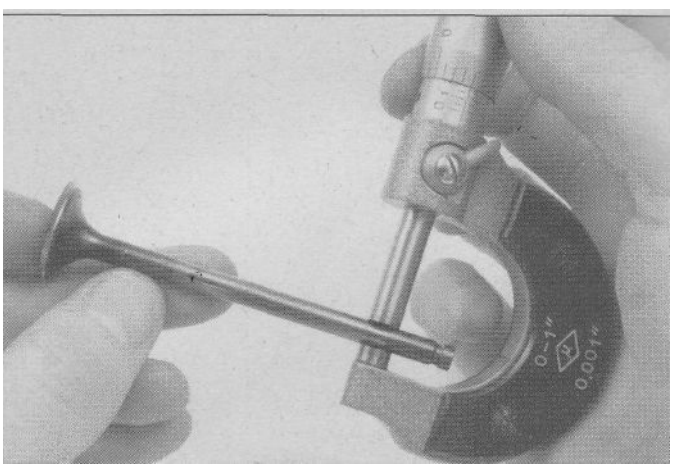
10.18b Check the valve stem for bends with a V-block (or blocks, as shown here) and a dial indicator

either be machined or, if warpage is excessive, replaced with a new one. Minor surface imperfections can be cleaned up by sanding on a surface plate in a figure-eight pattern with 400 or 600 grit wet or dry sandpaper. Be sure to rotate the head every few strokes to avoid removing material unevenly.

15 Examine the valve seats in each of the combustion chambers. If they are pitted, cracked or burned, the head will require valve service that's beyond the scope of the home mechanic. Measure the valve seat width and compare it to this Chapter's Specifications. If it is not



10.16 Measure the valve guide inside diameter with a small hole **gauge, then measure the hole gauge with a micrometer**



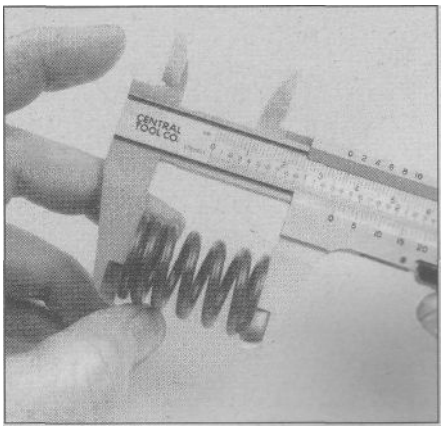
10.18a Measure the valve stem diameter with a micrometer

within the specified range, or if it varies around its circumference, valve service work is required.

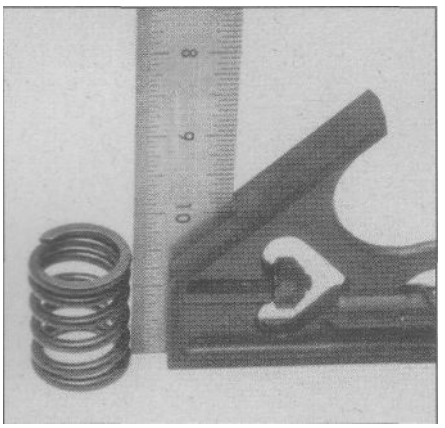
16 Clean the valve guides to remove any carbon buildup, then measure the inside diameters of the guides (at both ends and the center of the guide) with a small hole gauge and a 0-to-1-inch micrometer **(see illustration).** Record the measurements for future reference. These measurements, along with the valve stem diameter measurements, will enable you to compute the valve stem-to-guide clearance. This clearance, when compared to the Specifications, will be one factor that will determine the extent of the valve service work required. The guides are measured at the ends and at the center to determine if they are worn in a bell-mouth pattern (more wear at the ends). If they are, guide replacement is an absolute must.

17 Carefully inspect each valve face for cracks, pits and burned spots. Check the valve stem and the keeper/collet groove area for cracks **(see illustration).** Rotate the valve and check for any obvious indication that it is bent. Check the end of the stem for pitting and excessive wear and make sure the bevel is the specified width. The presence of any of the above conditions indicates the need for valve servicing.

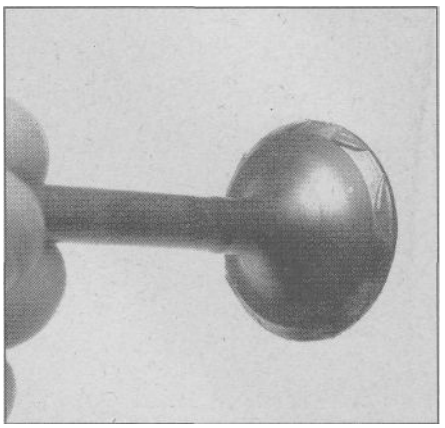
18 Measure the valve stem diameter **(see illustration).** By subtracting the stem diameter from the valve guide diameter, the valve stem-to-guide clearance is obtained. If the stem-to-guide clearance is greater than listed in this Chapter's Specifications, the guides and valves will have to be replaced with new ones. Also check the valve stem for bending. Set the valve in a V-block with a dial indicator touching the middle of the stem (see illustration). Rotate the valve and



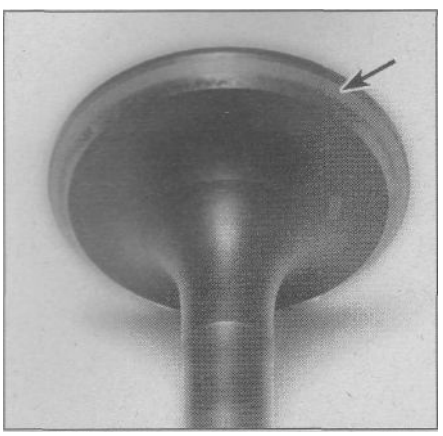
10.19a Measure the free length of the valve springs



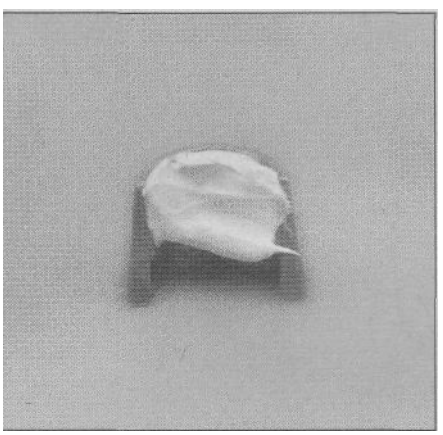
10.19b Check the valve springs for squareness



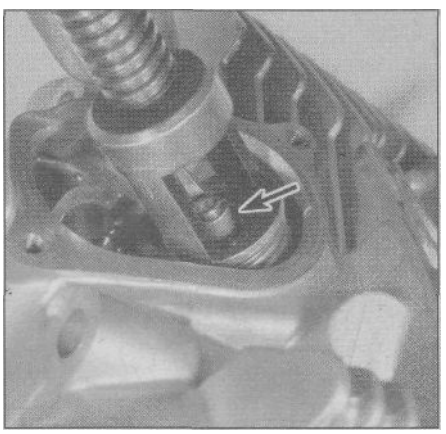
10.23 Apply the lapping compound very sparingly, in small dabs, to the valve face only



10.24 After lapping, the valve face should have a uniform, unbroken contact pattern (arrow)



10.28a A small dab of grease will hold the keepers/collets in place on the valve while the spring is released



10.28b With the keepers/collets secure in their grooves (arrow), release the spring compressor

note the reading on the gauge. If the stem runout exceeds the value listed in this Chapter's Specifications, replace the valve.

19 Check the end of each valve spring for wear and pitting. Measure the free length **(see illustration)** and compare it to this Chapter's Specifications. Any springs that are shorter than specified have sagged and should not be reused. Stand the spring on a flat surface and check it for squareness **(see illustration).**

20 Check the spring retainers and keepers/collets for obvious wear and cracks. Any questionable parts should not be reused, as extensive damage will occur in the event of failure during engine operation.

21 If the inspection indicates that no service work is required, the valve components can be reinstalled in the head.

Reassembly

Refer to illustrations 10.23, 10.24, 10.28a and 10.28b

22 Before installing the valves in the head, they should be lapped to ensure a' positive seal between the valves and seats. This procedure requires coarse and fine valve lapping compound (available at auto parts stores) and a valve lapping tool. If a lapping tool is not available, a piece of rubber or plastic hose can be slipped over the valve stem (after the valve has been installed in the guide) and used to turn the valve.

23 Apply a small amount of coarse lapping compound to the valve face **(see illustration),** then slip the valve into the guide. **Note:** *Make sure the valve is installed in the correct guide and be careful not to get any lapping compound on the valve stem.*

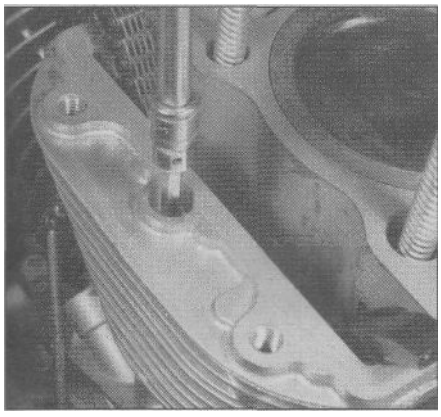
24 Attach the lapping tool (or hose) to the valve and rotate the tool between the palms of your hands. Use a back-and-forth motion rather than a circular motion. Lift the valve off the seat and turn it at regular intervals to distribute the lapping compound properly. Continue the lapping procedure until the valve face and seat contact area is of uniform width and unbroken around the entire circumference of the valve face and seat **(see illustration).**

25 Carefully remove the valve from the guide and wipe off all traces of lapping compound. Use solvent to clean the valve and Wipe the seat area thoroughly with a solvent soaked cloth.

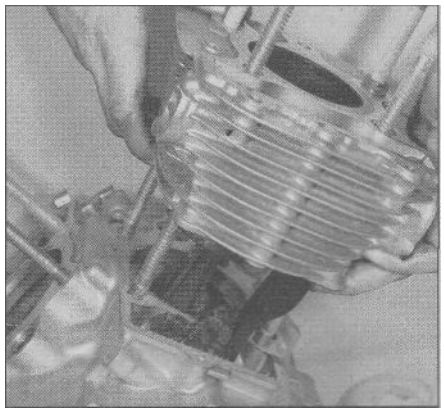
26 Repeat the procedure with fine valve lapping compound, then repeat the entire procedure for the remaining valves.

27 Lay the spring seats in place in the cylinder head, then install new valve stem seals on each of the guides **(see illustration 10.9).** Use an appropriate size deep socket to push the seals into place until they are properly seated. Don't twist or cock them, or they will not seal properly against the valve stems. Also, don't remove them again or they will be damaged.

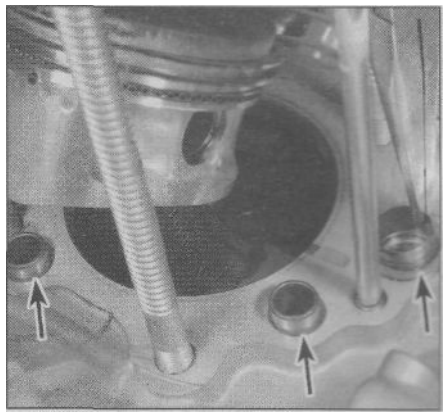
28 Coat the valve stems with assembly lube or moly-based grease, then install one of them into its guide. Next, install the springs and retainers, compress the springs and install the keepers/collets. **Note:** *Install the springs with the tightly wound coils at the bottom (next to the spring seat).* When compressing the springs with the valve spring compressor, depress them only as far as is absolutely necessary to slip the keepers/collets into place. Apply a small amount of grease to the keepers/collets **(see illustration)** to help hold them in place as the pressure is released from the springs. Make certain that the keepers/collets are securely locked in their retaining grooves **(see illustration).**



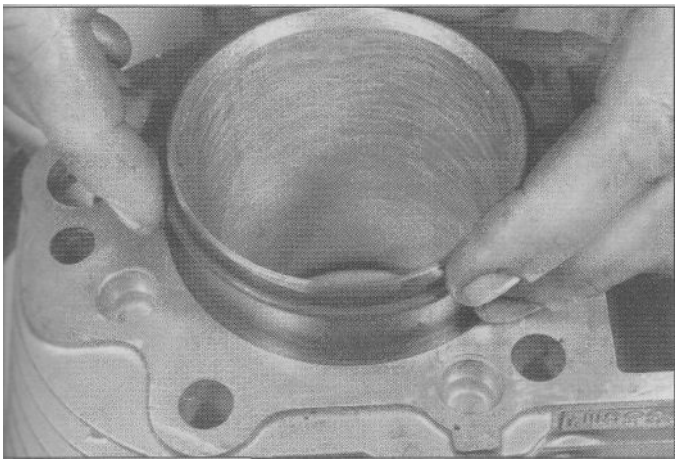
11.2 Remove the single Allen bolt that secures the cylinder to the crankcase



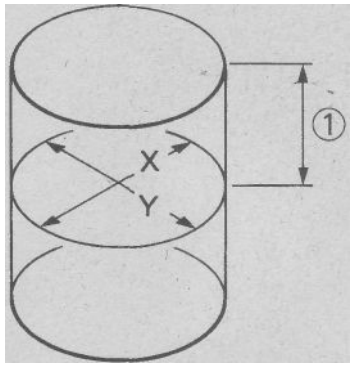
11.3a Lift the cylinder straight up off the studs



11.3b Note the locations of the three dowels (arrows); the large dowel has **an O-ring**



11.4 Remove the O-ring from the base of the cylinder



11.7 Measure the cylinder bore at the specified distance from the top of the cylinder (1); measure parallel to the crankshaft centerline, then at right angles to it

29 Support the cylinder head on blocks so the valves can't contact the workbench top, then very gently tap each of the valve stems with a soft-faced hammer. This will help seat the keepers/collets in their grooves.

30 Once all of the valves have been installed in the head, check for proper valve sealing by pouring a small amount of solvent into each of the valve ports. If the'solvent leaks past the valve(s) into the combustion chamber area, disassemble the valve(s) and repeat the lapping procedure, then reinstall the valve(s) and repeat the check. Repeat the procedure until a satisfactory seal is obtained.

11 Cylinders - removal, inspection and installation

Removal

Refer to illustrations 11.2, 11.3a, 11.3b and 11.4

1 Following the procedure given in Section 8, remove the cylinder head.

2 Remove the cylinder bolt **(see illustration).**

3 Lift the cylinder straight up to remove it **(see illustration).** If it's stuck, tap around its perimeter with a soft-faced hammer, taking care not to break the cooling fins. Don't attempt to pry between the cylinder and the crankcase, as you will ruin the sealing surfaces. As you lift, note the location of the dowel pins and O-ring **(see illustration).** Be careful not to let these drop into the engine.

4 Stuff clean shop towels around the pistons and remove the gasket **(see illustration)** and all traces of old gasket material from the surfaces of the cylinder, cylinder head and crankcase. Remove the O-ring from the base of the cylinder **(see illustration).**

Inspection

Refer to illustrations 11.7 and 11.10

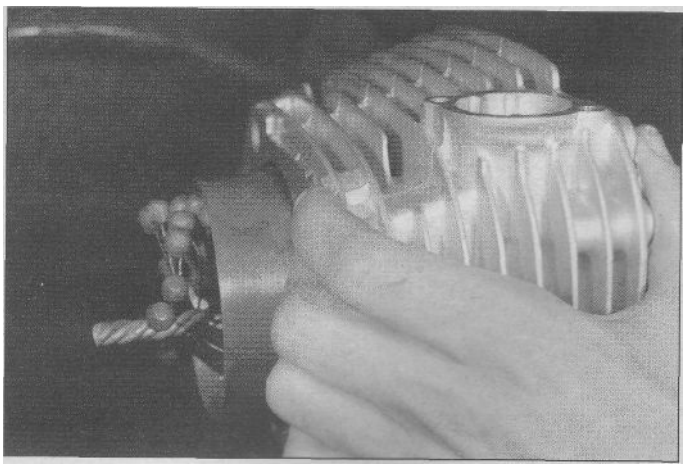
5 Don't attempt to separate the liner from the cylinder.

6 Check the cylinder wall carefully for scratches and score marks.

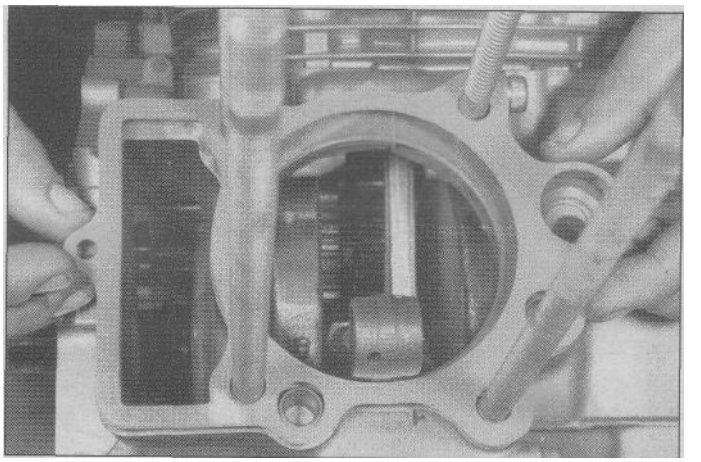
7 Using the appropriate precision measuring tools, check each cylinder's diameter. Measure parallel to the crankshaft axis and across the crankshaft axis, at the depth from the top of the cylinder listed in this Chapter's Specifications **(see illustration).** Average the two measurements and compare the results to this Chapter's Specifications. If the cylinder walls are tapered, out-of-round, worn beyond the specified limits, or badly scuffed or scored, have them rebored and honed by a dealer service department or a motorcycle repair shop. If a rebore is done, oversize pistons and rings will be required as well.

8 As an alternative, if the precision measuring tools are not available, a dealer service department or motorcycle repair shop will make the measurements and offer-advice concerning servicing of the cylinders.

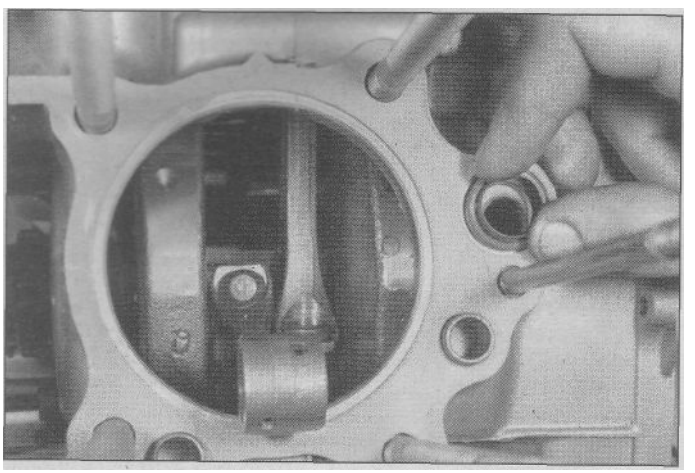
9 If they are in reasonably good condition and not worn to the outside of the limits, and if the piston-to-cylinder clearances can be maintained properly (see Section 12), then the cylinders do not have to be rebored; honing is all that is necessary.



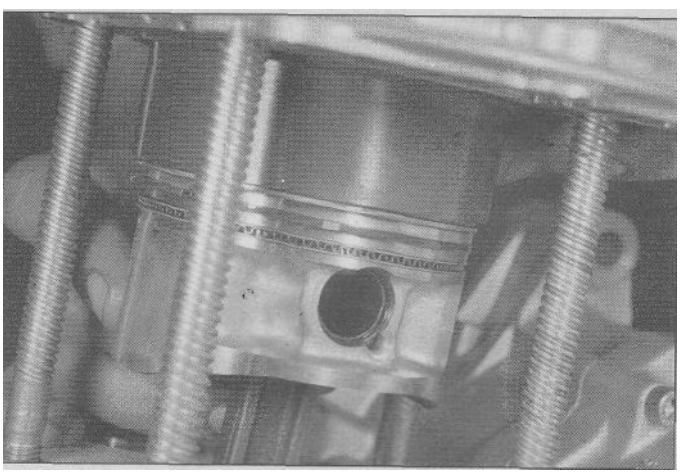
11.10 Move the hone rapidly **up-and-down without stopping**



11.13a Place the cylinder base gasket in position



11.13b Make sure the two small dowel pins are in position and install the large dowel pin with its O-ring



11.15 If you're experienced and very careful, you can install the cylinder over the piston rings without a compressor, but a compressor will make the job easier

10 To perform the honing operation you will need the proper size flexible hone with fine stones, or a "bottle brush" type hone, plenty of light oil or honing oil, some shop towels and an electric drill motor. Hold the cylinder block in a vise (cushioned with soft jaws or wood blocks) when performing the honing operation. Mount the hone in the drill motor, compress the stones and slip the hone into the cylinder. Lubricate the cylinder thoroughly, turn on the drill and move the hone up and down in the cylinder at a pace which will produce a fine Crosshatch pattern on the cylinder wall with the Crosshatch lines intersecting at approximately a 60-degree angle **(see illustration).** Be sure to use plenty of lubricant and do not take off any more material than is absolutely necessary to produce the desired effect. Do not withdraw the hone from the cylinder while it is running. Instead, shut off the drill and continue moving the hone up and down in the cylinder until it comes to a complete stop, then compress the stones and withdraw the hone. Wipe the oil out of the cylinder and repeat the procedure on the remaining cylinder. Remember, do not remove too much material'from the cylinder wall. If you do not have the tools, or do not desire to perform the honing operation, a dealer service department or motorcycle repair shop will generally do it for a reasonable fee.

11 Next, the cylinders must be thoroughly washed with warm soapy water to remove all traces of the abrasive grit produced during the honing operation. Be sure to run a brush through the bolt holes and flush them with running water. After rinsing, dry the cylinders thoroughly and apply a coat of light, rust-preventative oil to all machined surfaces.

Installation

Refer to illustrations 11.13a, 11.13b and 11.15

12 Lubricate the cylinder bore and piston with plenty of clean engine oil.

13 Install a new O-ring around the base of the cylinder (see illustration 11.4b). Place a new cylinder base gasket on the crankcase **(see illustration).** Install a new O-ring on the large dowel pin, install it in its bore and make sure the two small dowel pins are in position **(see illustration).**

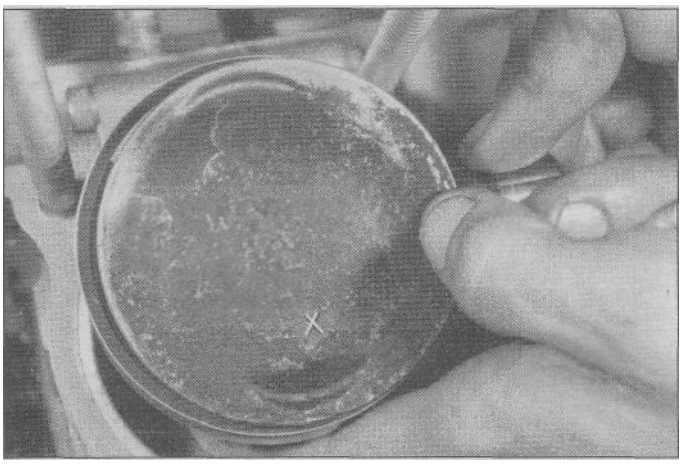
14 Attach a piston ring compressor to the piston and compress the piston rings. A large hose clamp can be used instead - just make sure it doesn't scratch the piston, and don't tighten it too much.

15 Install the cylinder block over the pistons and carefully lower it down until the piston crown fits into the cylinder liner **(see illustration).** While doing this, pull the camshaft chain up, using a hooked tool or a piece of coat hanger. Also keep an eye on the cam chain guide to make sure it doesn't wedge against the cylinder. Push down on the cylinder, making sure the piston doesn't get cocked sideways, until the bottom of the cylinder liner slides down past the piston rings. A wood or plastic hammer handle can be used to gently tap the cylinder down, but don't use too much force or the piston will be damaged.

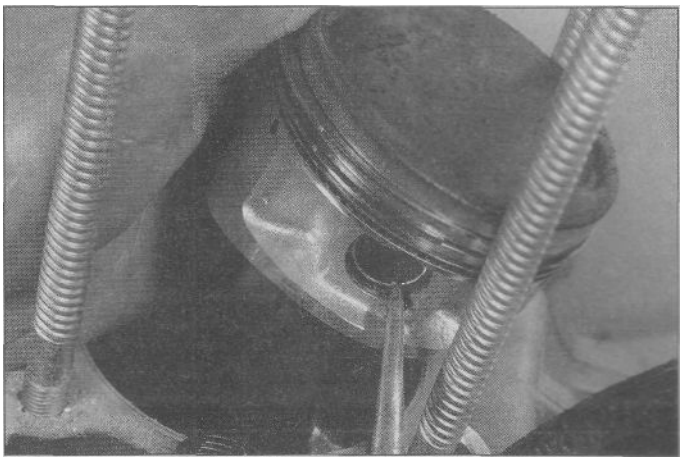
16 Remove the piston ring compressor or hose clamp, being careful not to scratch the piston.

17 Repeat the procedure to install the remaining cylinder.

18 The remainder of installation is the reverse of removal.



12.3a The EX mark on top of the piston faces the exhaust side of the cylinder (front side of the front cylinder, rear side of the rear cylinder)



12.3b Wear eye protection while pulling the circlips out; reach **into the removal notch with needle-nosed pliers to grasp the circlip**

12 Pistons - removal, inspection and installation

1 The pistons are attached to the connecting rods with piston pins that are a slip fit in the pistons and rods.

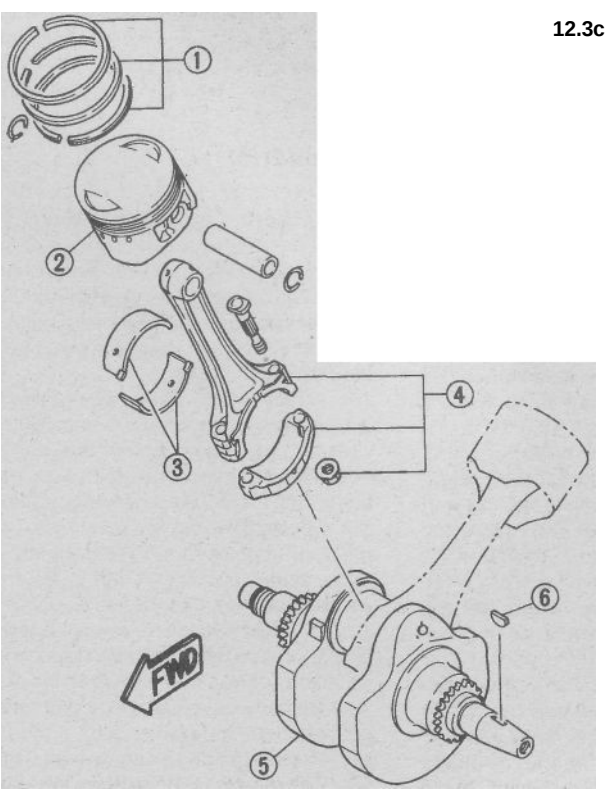
2 Before removing the pistons from the rods, Stuff a clean shop towel into each crankcase hole, around the connecting rods. This will prevent the circlips from falling into the crankcase if they are inadvertently dropped.

Removal

Refer to illustrations 12.3a, 12.3b, 12.3c, 12.4a and 12.4b

3 Using a sharp scribe, scratch the location of each piston (front or rear cylinder) into its crown (or use a felt pen if the piston is clean enough). Each piston should also have an EX mark on its crown; this mark faces the exhaust side of the cylinder when the piston is installed **(see illustration).** If not, scribe an arrow into the piston crown before removal. Support the first piston, grasp the circlip'with a pointed tool or needle-nose pliers and remove it from the groove **(see illustrations).**

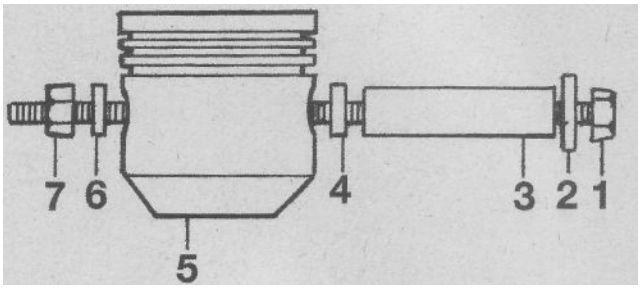
4 Push the piston pin out from the opposite end to free the piston from the rod **(see illustration).** You may have to deburr the area around the groove to enable the pin to slide out (use a triangular file for this procedure). If the pin won't come out, remove the remaining circlip. Fabricate a piston pin removal tool from threaded stock, nuts, washers and a piece of pipe **(see illustration).** Repeat the procedure for the other piston.



12.3c Connecting rods and pistons (XV535 models) exploded view

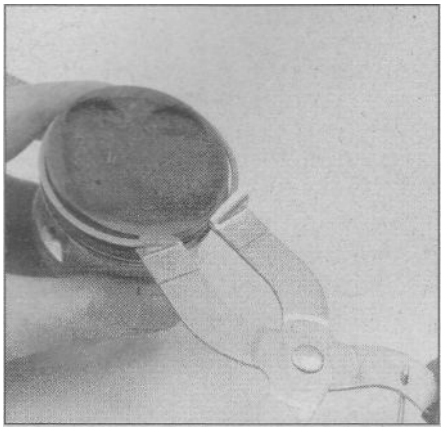
1} Piston rings
2) Piston
3) Connecting rod bearings
4) Connecting rod
5) Crankshaft
6) Woodruff key (for alternator rotor)

12.4a Push the piston pin partway out, then grasp it and pull it the rest of the way

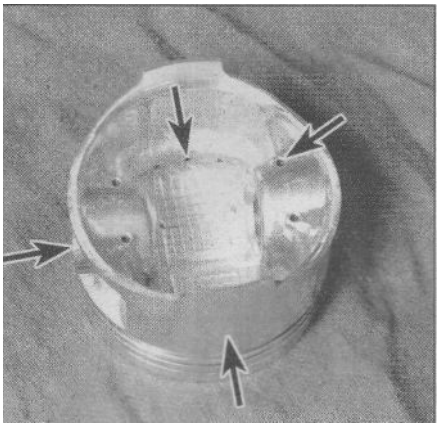


12.4b The piston pins should come out with hand pressure - if they don't, this removal tool can be fabricated from readily available parts

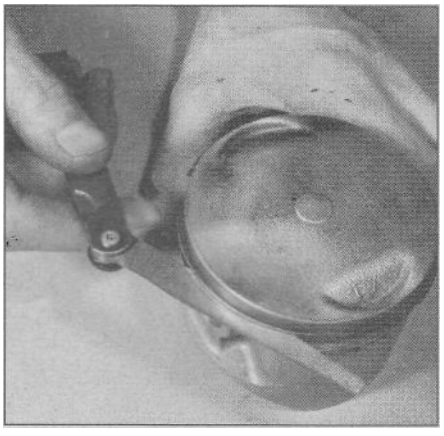
1) Bolt
2) Washer
3) Pipe (A)
4) Padding (A)
5). Piston
6) Washer (B)
7) Nut(B)
A Large enough for piston pin to fit inside
B Small enough to fit through piston pin bore



12.6 Remove the piston rings with a ring removal and installation tool



12.11 Check the piston pin bore and the piston skirt for wear, and make sure the internal holes are clear (arrows)



12.13 Measure ring side clearance with a feeler gauge

Inspection

Refer to illustrations 12.6, 12.11, 12.13, 12.14 and 12.15

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

6 Using a piston ring installation tool, carefully remove the rings from the pistons **(see illustration).** Do not nick or gouge the pistons in the process.

7 Scrape all traces of carbon from the tops of the pistons. 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 motor to remove deposits from the pistons; the piston material is soft and will be eroded away by the wire brush.

8 Use a piston ring groove cleaning tool to remove any carbon deposits from the ring grooves. If a tool is not available, a piece broken off the 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.

9 Once the deposits have been removed, clean the pistons with solvent and dry them thoroughly. Make sure the oil return holes below the oil ring grooves are clear.

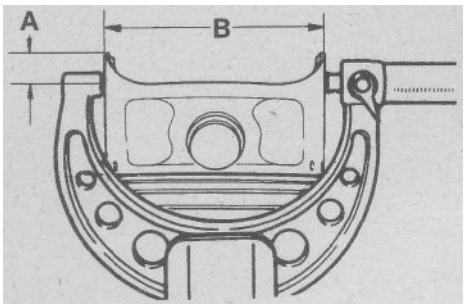
10 If the pistons are not damaged or worn excessively and if the cylinders are not rebored, new pistons will not be necessary. Normal piston wear appears as even, vertical wear on the thrust surfaces of the piston and slight looseness of the top ring in its groove. New piston rings, on the other hand,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

11 Carefully inspect each piston for cracks around the skirt, at the pin bosses and at the ring lands **(see illustration).**

12 Look for scoring and scuffing on the thrust faces of the skirt, holes in the piston crown 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. The oil pump should be checked thoroughly. A hole in the piston crown, an extreme to be sure, is an indication that abnormal combustion (pre-ignition) was occurring. Burned areas at the edge of the piston crown are usually evidence of spark knock (detonation). If any of the above problems exist, the causes must be corrected or the damage will occur again.

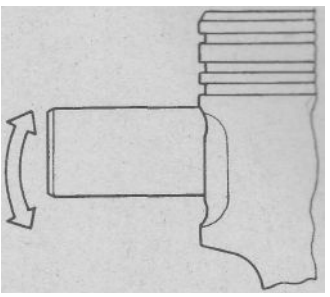
13 Measure the piston ring-to-groove clearance by laying a new piston ring in the ring groove and slipping a feeler gauge in beside it **(see illustration).** Check the clearance at three or four locations around the groove. Be sure to use the correct ring for each groove; they are different. If the clearance is greater than specified, new pistons will have to be used when the engine is reassembled.

14 Check the piston-to-bore clearance by measuring the bore (see Section 13) and the piston diameter. Make sure that the pistons and cylinders are correctly matched. Measure the piston across the skirt on the thrust faces at a 90-degree angle to the piston pin, at the distance from the bottom of the skirt listed in this Chapter's Specifications **(see illustration).** Subtract the piston diameter from the bore diameter to

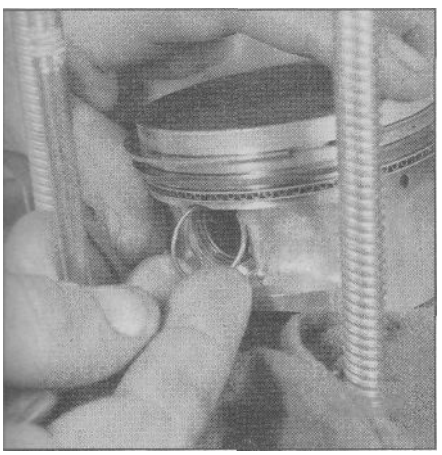


12.14 Measure the piston diameter with a micrometer

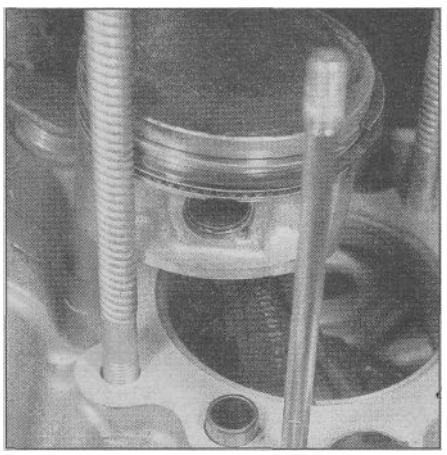
A Specified distance from bottom of piston
B Piston diameter



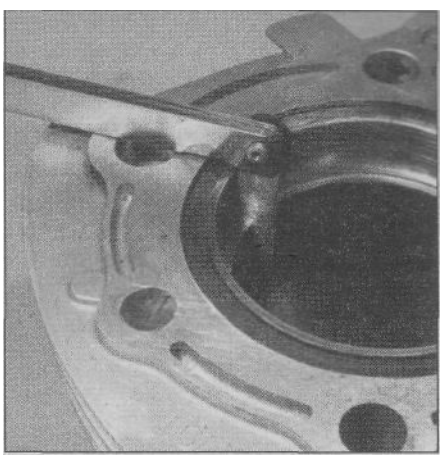
12.15 Slip the pin into the piston and try to wiggle it back-and-**forth; if it's loose, replace the piston and pin**



12.17a Slip the circlip into its bore with its gap away from the removal notch in the piston ...



12.17b ... and push the circlip all the way into its groove; make sure it's securely seated



13.3 Measure ring end gap with a feeler gauge

obtain the clearance, if it is greater than specified, the cylinders will have to be rebored and new oversized pistons and rings installed. If the appropriate precision measuring tools are not available, the piston-to-cylinder clearances can be obtained, though not quite as accurately, using feeler gauge stock. Feeler gauge stock comes in 12-inch lengths and various thicknesses and is generally available at auto parts stores. To check the clearance, select a feeler gauge of the same thickness as the piston clearance listed in this Chapter's Specifications and slip it into the cylinder along with the appropriate piston. The cylinder should be upside down and the piston must be positioned exactly as it normally would be. Place the feeler gauge between the piston and cylinder on one of the thrust faces (90-degrees to the piston pin bore). The piston should slip through the cylinder (with the feeler gauge in place) with moderate pressure. If it falls through, or slides through easily, the clearance is excessive and a new piston will be required. If the piston binds at the lower end of the cylinder and is loose toward the top, the cylinder is tapered, and if tight spots are encountered as the feeler gauge is placed at different points around the cylinder, the cylinder is out-of-round. Repeat the procedure for the remaining pistons and cylinders. Be sure to have the cylinders and pistons checked by a dealer service department or a motorcycle repair shop to confirm your findings before purchasing new parts.

15 Apply clean engine oil to the pin, insert it into the piston and check for freeplay by rocking the pin back-and-forth **(see illustration).** If the pin is loose, new pistons and pins must be installed.

16 Refer to Section 13 and install the rings on the pistons.

Installation

Refer to illustrations 12.17a and 12.17b

17 Install the pistons in their original locations with the EX marks toward the exhaust sides. Lubricate the pins and the rod bores with clean engine oil. Install new circlips in the grooves in the inner sides of the pistons (don't reuse the old circlips). Push the pins into position from the opposite side and install new circlips. Compress the circlips only enough for them to fit in the piston. Make sure the clips are properly seated in the grooves **(see illustrations).**

13 Piston rings - installation

Refer to illustrations 13.3, 13.5, 13.9a, 13.9b, 13.11a, 13.11b, 13.12 and 13.15

1 Before installing the new piston rings, the ring end gaps must be checked.

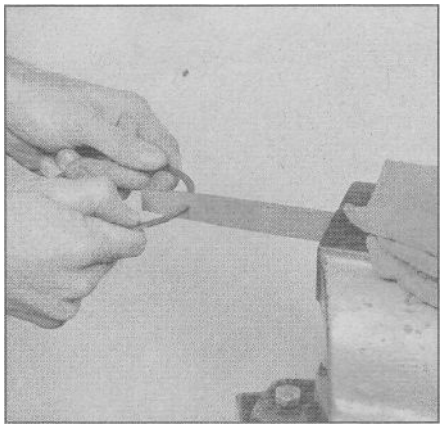
2 Lay out the pistons and the new ring sets so the rings will be matched with the same piston and cylinder during the end gap measurement procedure and engine assembly.

3 Insert the top (No. 1) ring into the bottom of the first cylinder and square it up with the cylinder walls by pushing it in with the top c piston **(see illustration).** The ring should be about one inch above **the** bottom edge of the cylinder. To measure the end gap, slip **a fee** - gauge between the ends of the ring and compare the measurement to this Chapter's Specifications.

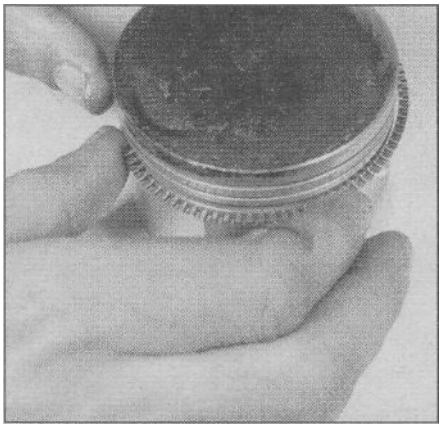
4 If the gap is larger or smaller than specified, double check to make sure that you have the correct rings before proceeding.

5 If the gap is too small, it must be enlarged or the ring **ends may** come in contact with each other during engine operation, **which can** cause serious damage. The end gap can be incr-
ends very carefully with a fine file (see illustration) ,'.~e- z^~:——: this operation, file only from the outside in.

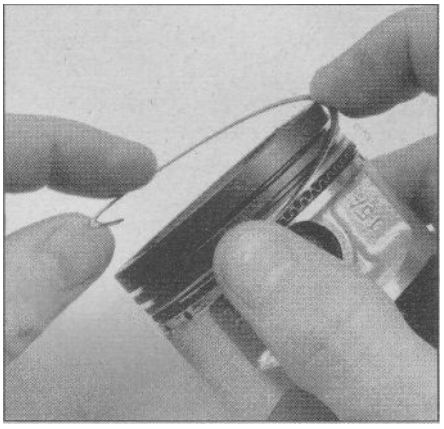
6 Excess end gap is not critical unless it is **greater than 0.040 in.**



13.5 If the end gap is too small, clamp a file in a vise and file the ring ends (from the outside in only) to enlarge the gap slightly

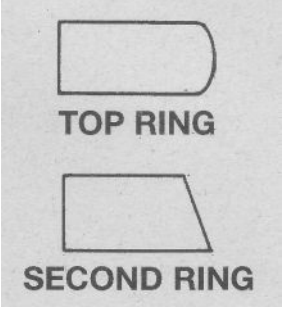


13.9a Install the oil ring expander first



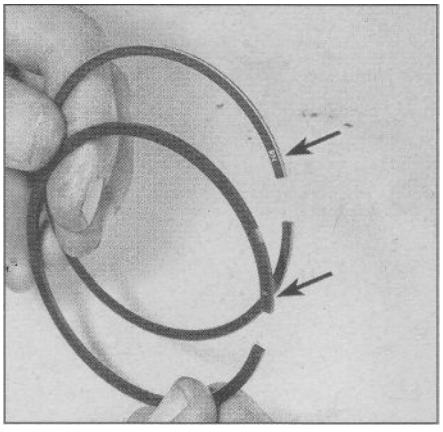
13.9b Installing an oil ring side rail - don't use a ring installation tool to do this

13.11a Install the middle ring with its identification mark up

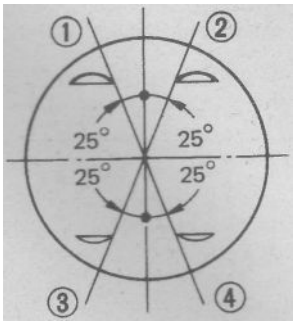


13.11b The top and middle rings can be identified by their profiles

Top ring *Middle ring*



13.12 The top and middle rings have identification marks (arrows); these must be up when the rings are installed



13.15 Arrange the ring gaps like this

1) Top compression ring *3) Oil ring upper rail*
2) Oil ring lower rail *4) Second compression ring*

(1 mm). Again, double check to make sure you have the correct rings for your engine.

7 Repeat the procedure for each ring that will be installed in the first cylinder and for each ring in the remaining cylinder. Remember to keep the rings, pistons and cylinders matched up.

8 Once the ring end gaps have been checked/corrected, the rings can be installed on the pistons.

9 The oil control ring (lowest on the piston) is installed first. It is composed of three separate components. Slip the expander into the groove, then install the upper side rail **(see illustrations).** Do not use a piston ring installation tool on the oil ring side rails as they may be damaged. Instead, place one end of the side rail into the groove between the spacer expander and the ring land. Hold it firmly in place and slide a finger around the piston while pushing the rail into the groove. Next, install the lower side rail in the same manner.

10 After the three oil ring components have been installed, check to make sure that both the upper and lower side rails can be turned smoothly in the ring groove.

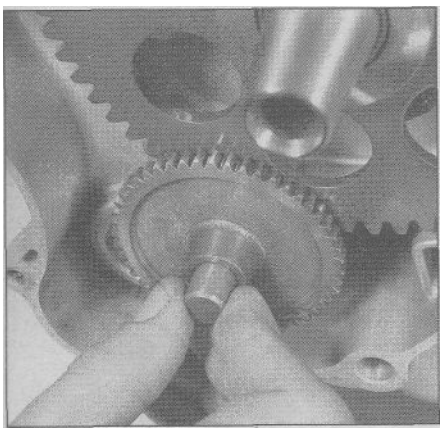
11 Install the second (middle) ring next **(see illustration).** Do not mix the top and middle rings. They can be identified by their profiles **(see illustration),** as well as the fact that the top ring is thinner than the middle ring.

12 To avoid breaking the ring, use a piston ring installation tool and make sure that the identification mark is facing up **(see illustration).** Fit the ring into the middle groove on the piston. Do not expand the ring any more than is necessary to slide it into place.

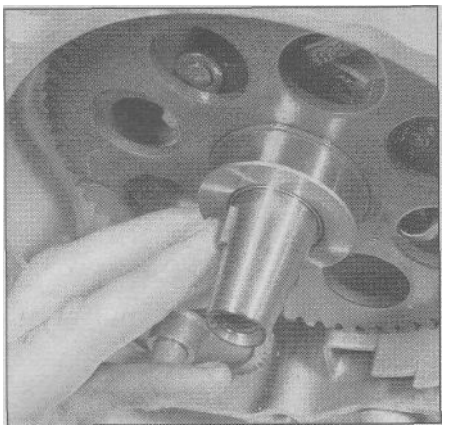
13 Finally, install the top ring in the same manner. Make sure the identifying mark is facing up.

14 Repeat the procedure for the remaining piston and rings. Be very careful not to confuse the top and second rings.

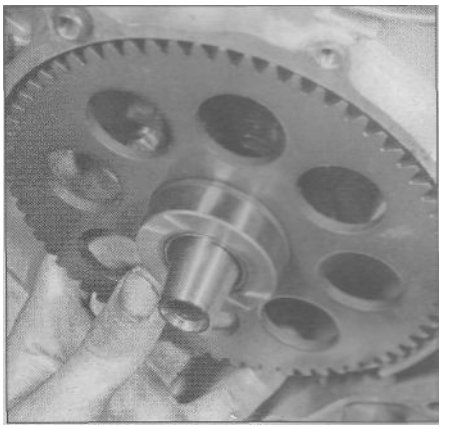
15 Once the rings have been properly installed, stagger the end gaps, including those of the oil ring side rails **(see illustration).**



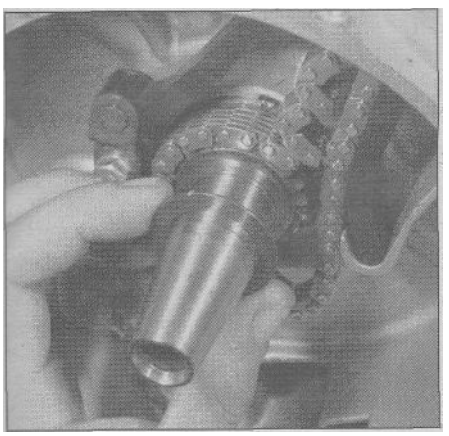
14.2 Pull off the shaft and no. 1 idler gear



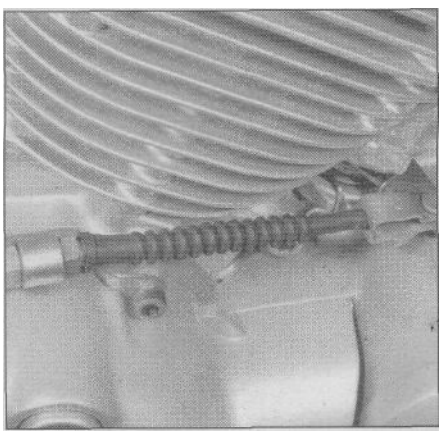
14.3a Pull out the Woodruff key...



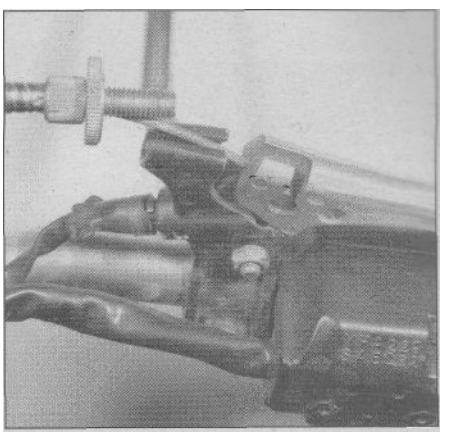
14.3b .. .take the no. 2 idler gear off the crankshaft...



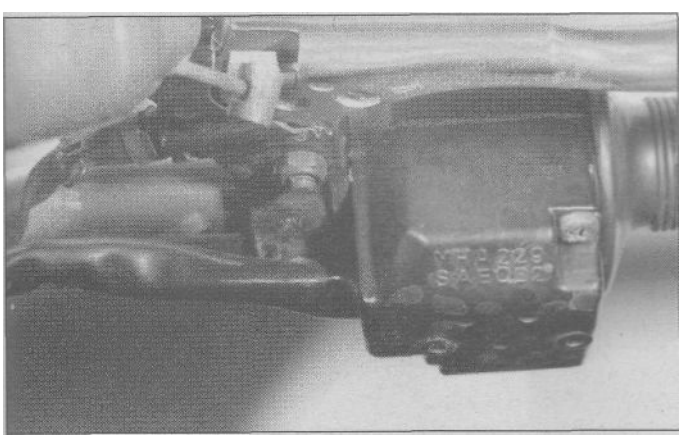
14.3c ... and locate the washer (it may have stuck to the back of the no. 2 idler gear)



15.1 Remove the cotter pin, disconnect the cable from the release lever and loosen the locknuts



15.2a Loosen the free-play adjuster all the way, align its slot with the cable and pull the cable out of the adjuster .



15.2b ... then pivot the cable out of the lever slot and lower its end out of the lever

14 Idler gears - removal, inspection and installation

Refer to illustrations 14.2, 14.3a, 14.3b and 14.3c

1 Remove the alternator rotor and starter clutch (see Chapter 8).

2 Remove the no. 1 idler gear and its shaft **(see illustration).**

3 Remove the Woodruff key from the crankshaft and pull off the no. 2 idler gear **(see illustrations).** The washer behind the gear will fall as it's removed, so be careful not to lose it **(see illustration).**

4 Check the gears for cracks, chips, or damaged teeth. Replace them as a set if problems are found.

5 Installation is the reverse of the removal steps. Make sure the Woodruff key is in its slot **(see illustration 14.3a).**

15 Clutch cable - replacement

Refer to illustrations 15.1, 15.2a and 15.2b

1 Pull out the cotter pin and remove the clevis pin from the lower end of the clutch cable **(see illustration).** Loosen the locknuts and detach the cable from the bracket on the engine.

2 Loosen the cable locknut and adjuster at the handlebar **(see illustration).** Disconnect the cable from the clutch lever **(see illustration).**

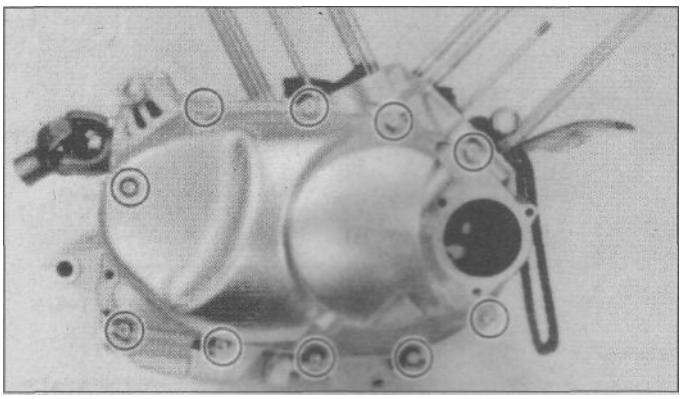
3 Installation is the reverse of the removal steps. Adjust the clutch free-play (see Chapter 1).

16 Clutch and primary gears - removal, inspection and installation

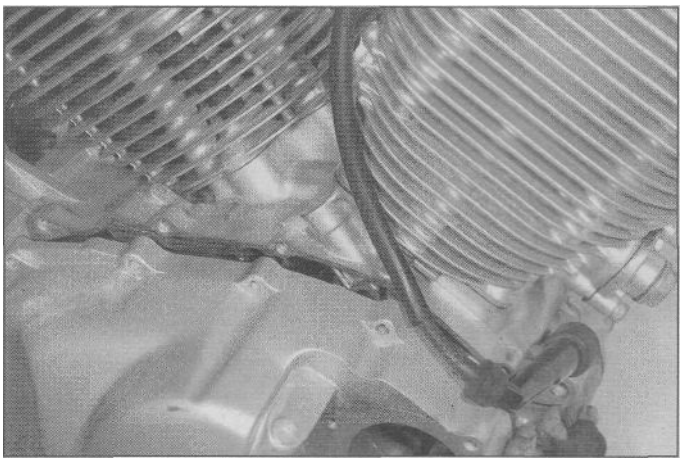
Removal

Refer to illustrations 16.2a, 16.2b, 16.2c, 16.2d, 16.3, 16.4a, 16.4b. 16.5a, 16.5b, 16.5c, 16.6a, 16.6b, 16.7a through 16.7e, 16.8, 16.9a. 16.9b, 16.10a, 16.10b, 16.11a, 16.11b, 16.11c, 16.12a and 16.12b

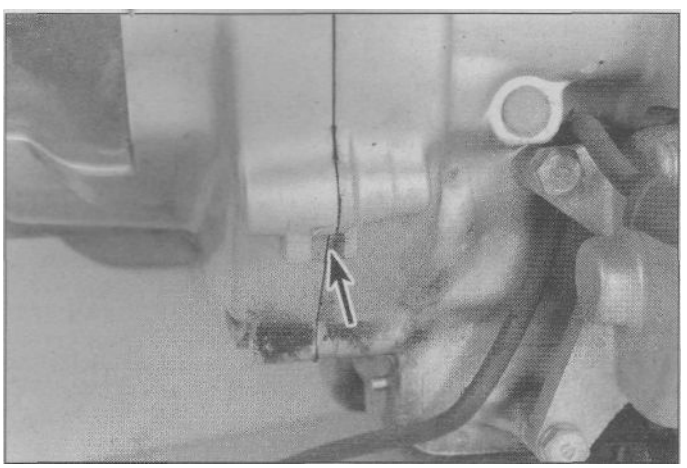
1 Drain the engine oil and remove the oil filter (see Chapter 1).



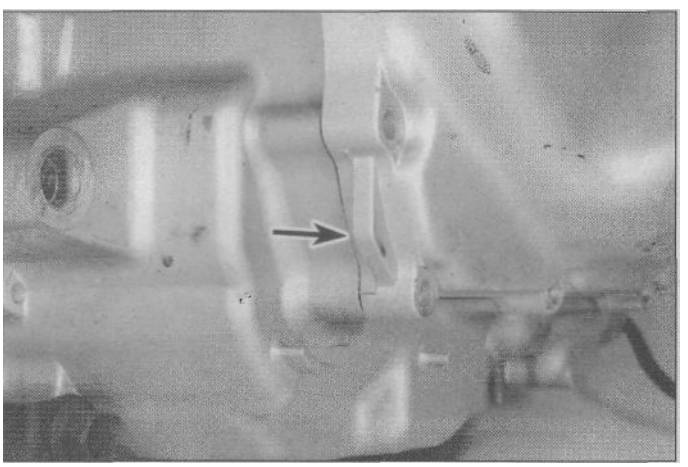
16.2a Loosen the cover bolts **1/4** turn **at** a **time in a criss-cross pattern;** note that some **of the bolts secure** wiring harness **retainers**



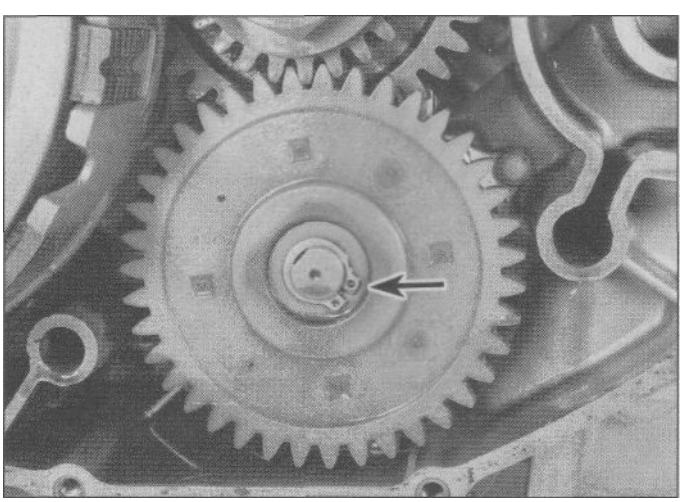
16.2b Separate the clutch cover from the crankcase .



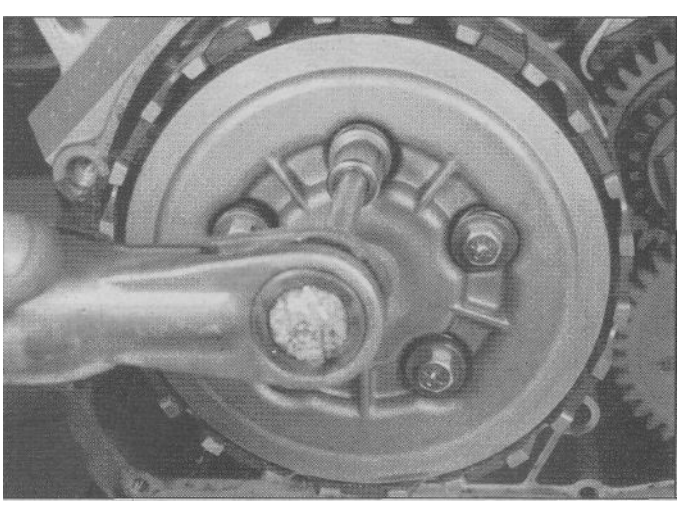
16.2c ... if it's difficult to remove, use the pry points at the front...



16.2d ... and at the rear



16.3 Remove the snap-ring (arrow) and take off the oil pump driven gear

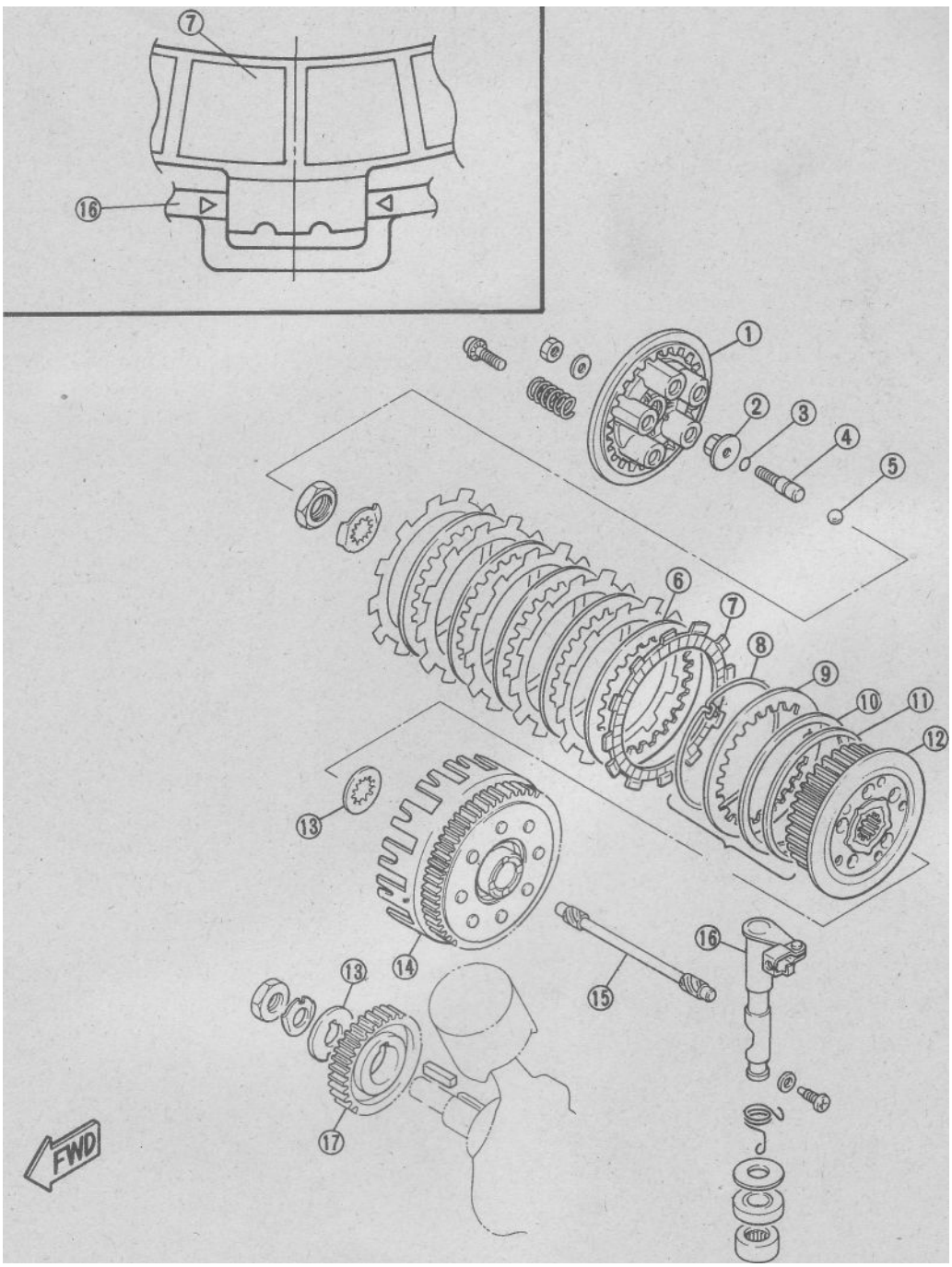


16.4a Loosen the clutch spring bolts evenly

2 Loosen the right-hand crankcase cover bolts in a criss-cross pattern, 1/4 turn at a time **(see illustration).** Once they're all loose, remove the bolts and take the cover off **(see illustration).** If it's stuck, pry gently at the two pry points **(see illustrations).** Don't pry anywhere else or the gasket surface may be damaged.

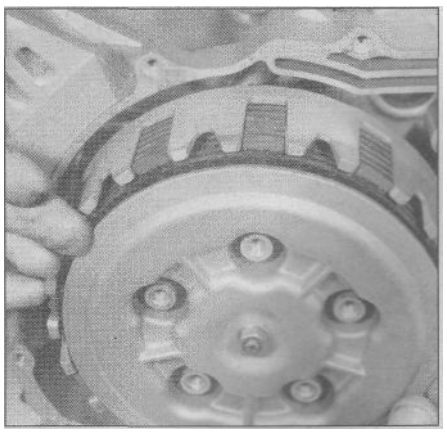
3 Remove the snap-ring and take off the oil pump driven gear **(see illustration).**

4 Loosen the pressure plate screws evenly in a criss-cross pattern, then remove the screws and springs **(see illustrations).**

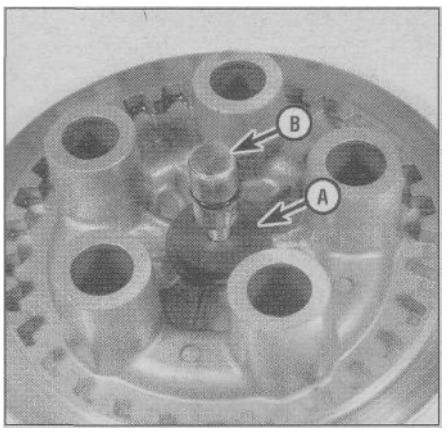


16.4b Clutch (XV535 models) exploded view

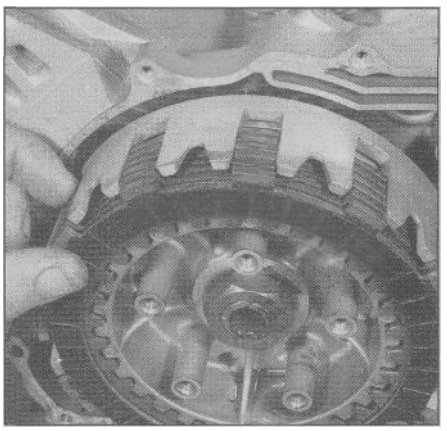
1) *Pressure plate*
2) *Push plate*
3) *O-ring*
4) *Short pushrod*
5) *Steel ball*
6) *Metal plates*
7) *Friction plates*
8) *Wire circlip*
9) *Clutch damper plate*
10) *Seat spring*
11) *Seat plate*
12) *Clutch boss*
13) *Retaining plate*
14) *Clutch housing*
15) *Long pushrod*
16) *Push lever assembly*
17) *Primary drive gear*



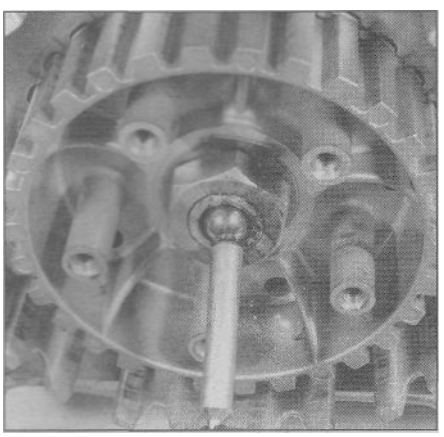
16.5a Take off the pressure **plate ...**



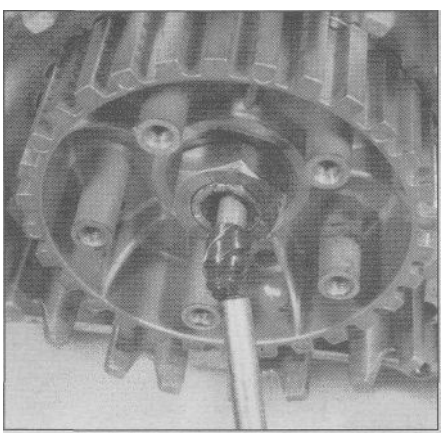
16.5b ... together with the push piece (A) and short pushrod (B)



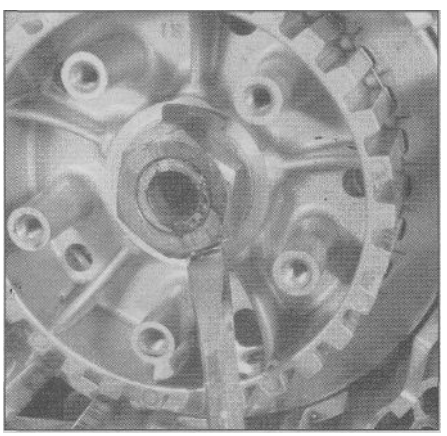
16.5c The friction plates and metal plates can be removed as a set



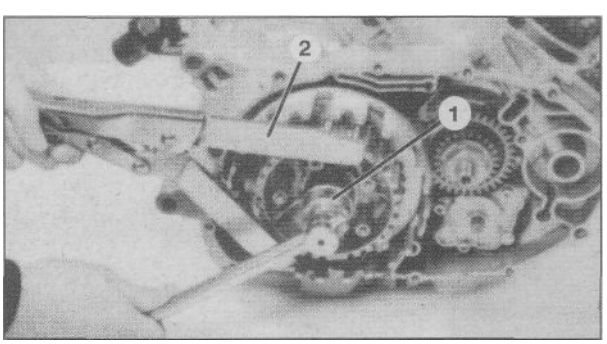
16.6a Pull out the steel ball with a magnet...



16.6b ... then pull out the long pushrod

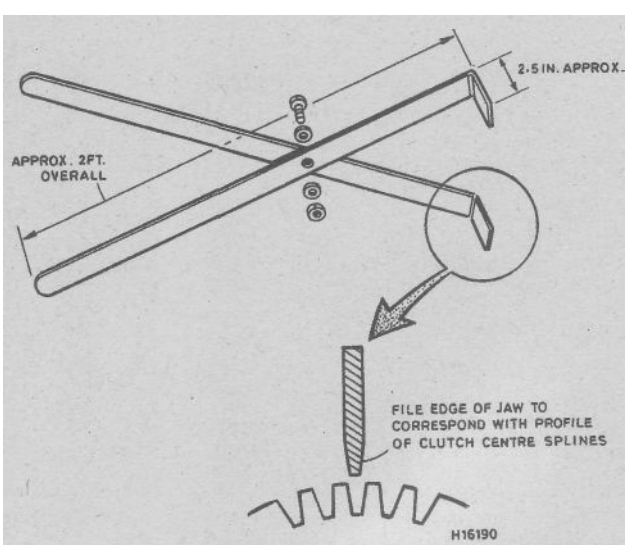


16.7a Bend back the lockwasher



16.7b You'll need a tool to keep the clutch hub from turning; this is the Yamaha special tool...

1) Clutch boss nut *2) Holding tool*

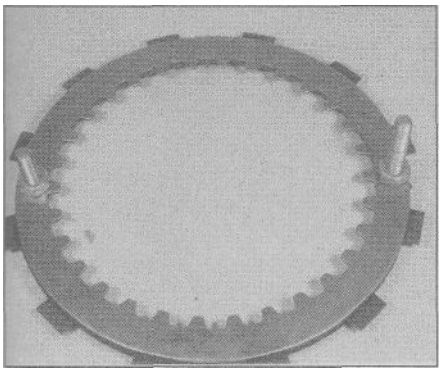


16.7c ... or you can make your own tool from steel strap

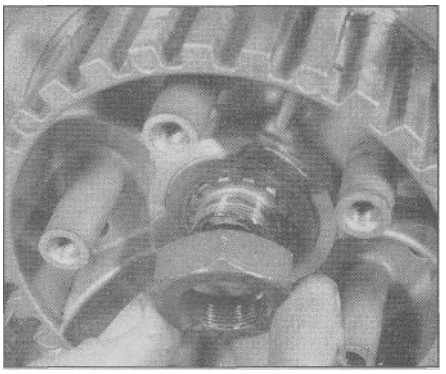
5 Remove the pressure plate, then take off the friction plates and metal plates as a set **(see illustrations).**

6 Remove the steel ball and the long pushrod **(see illustration).**

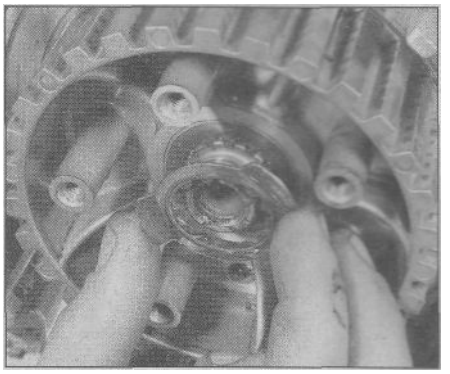
7 Bend back the lockwasher on the clutch boss nut **(see illustration).** Loosen the nut, using a special holding tool (Yamaha tool no. YM-91402, part no. 90890-04086 or equivalent) to prevent the clutch housing from turning **(see illustration).** An alternative to this tool can be fabricated from some steel strap, bent at the ends and bolted together in the middle **(see illustration).** You can also make a holding tool by drilling through a steel plate and friction plate and bolting them together **(see illustration).** Slip the bolted plates into their normal installed position to lock the clutch housing artd clutch boss together. To keep the engine from turning, wedge a rag between the teeth of the primary drive gear and the driven gear on the clutch housing. Once the nut is loose, remove it **(see illustration).**



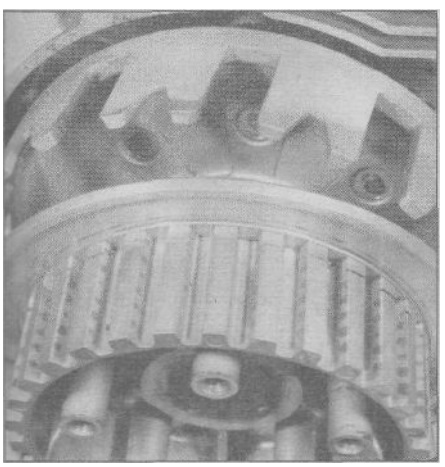
16.7d A holding tool can also be made by bolting an old metal plate and friction plate together



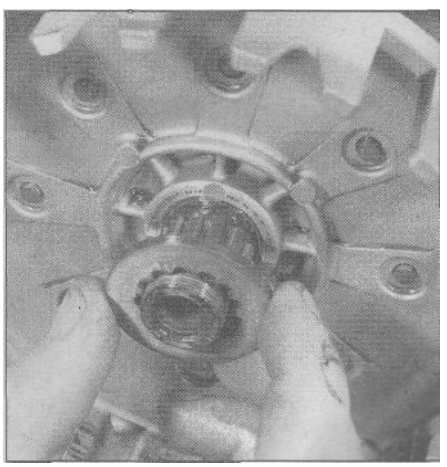
16.7e Remove the nut...



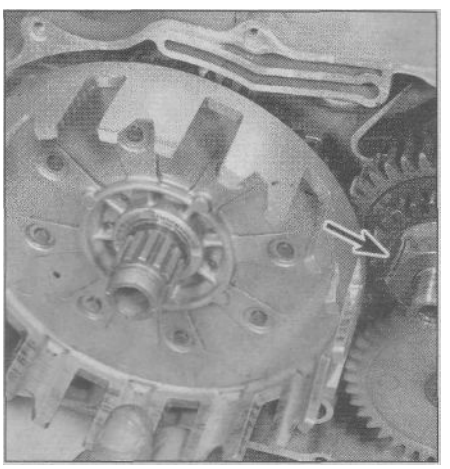
16.8 ... and the lockwasher



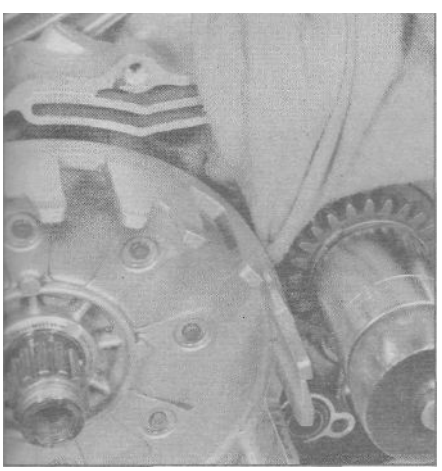
16.9a Pull the clutch boss off...



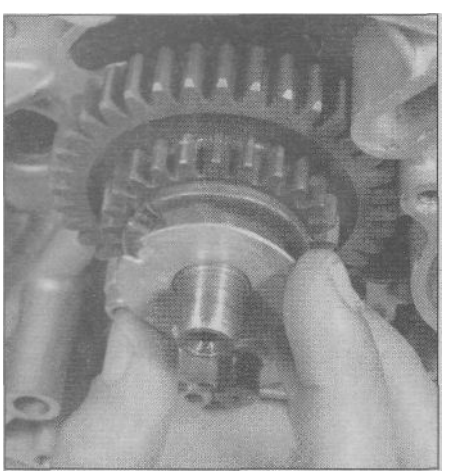
16.9b ... and remove the holding plate



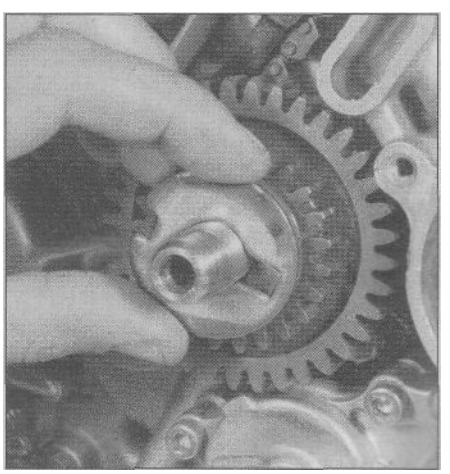
16.10a Bend back the lockwasher (arrow)...



16.10b ... then wedge a rag between the drive and driven gears to keep them from turning and loosen the nut



16.11a Remove the lockwasher ...



16.11b ... the retaining plate ...

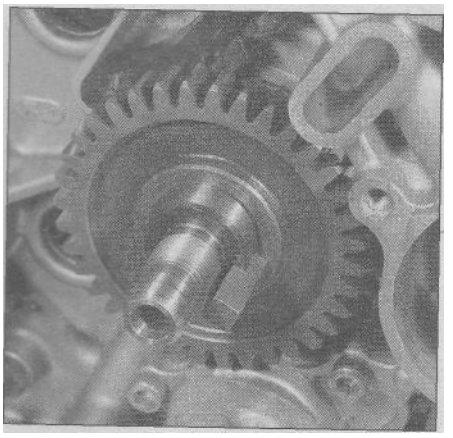
8 Remove the lockwasher and discard it **(see illustration).** Use a new one during installation.

9 Remove the clutch boss and holding plate **(see illustrations).**

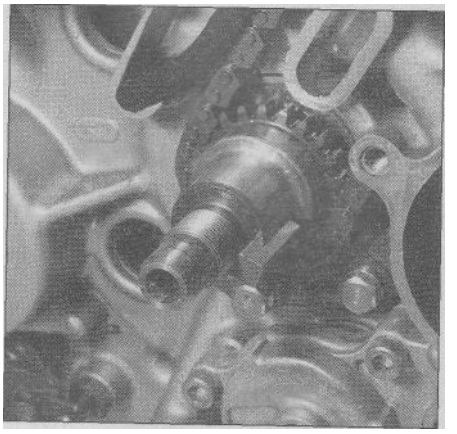
10 Bend back the lockwasher from the nut that secures the primary drive gear **(see illustration).** Wedge a rag between the driven gear and drive gear teeth to keep the gears from turning, then loosen the nut **(see illustration).** Once the nut is loose, slide the clutch housing/driven gear off and remove the nut.

11 Remove the lockwasher, retaining plate and oil pump drive gear **(see illustrations).**

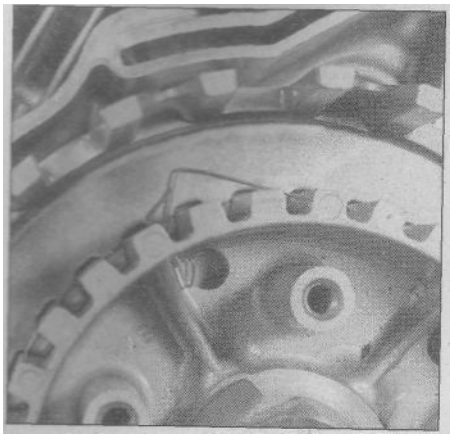
16.11c . . . the oil pump drive gear. .



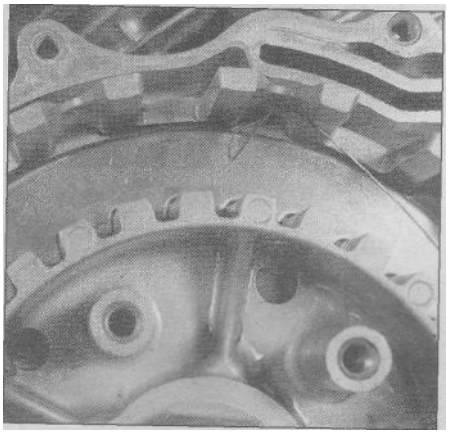
16.12a . . . the primary drive gear . . .



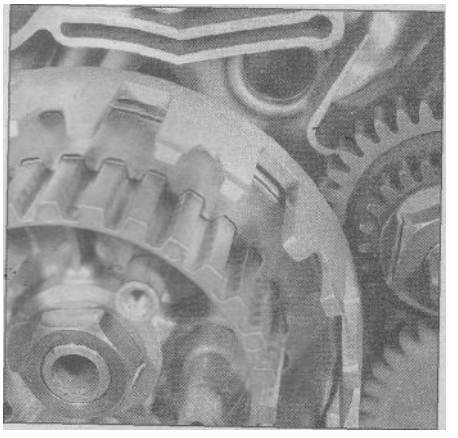
16.12b . . . and the Woodruff key



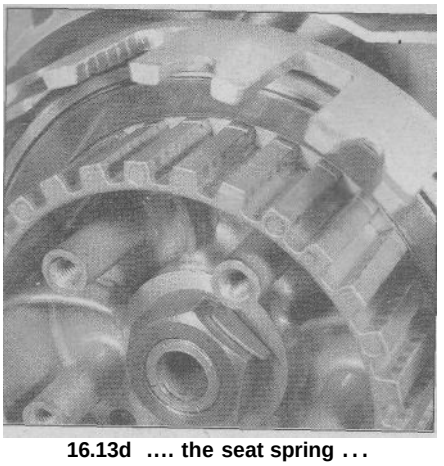
16.13a Pull one end of the wire circlip out of its hole in the clutch boss . . .



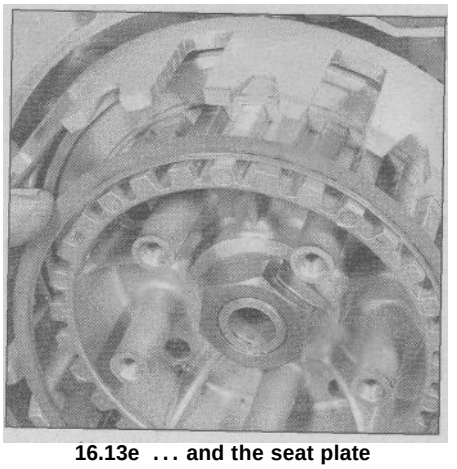
16.13b . . . and work the circlip out of its groove



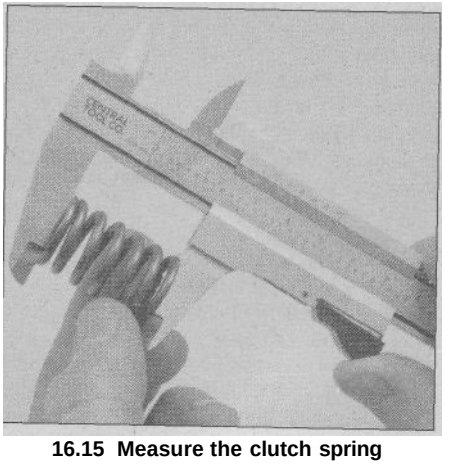
16.13c Pull off the clutch damper plate . . .



16.13d .... the seat spring . . .



16.13e . . . and the seat plate



16.15 Measure the clutch spring free length

12 Remove the primary drive gear and Woodruff key **(see illustrations).**

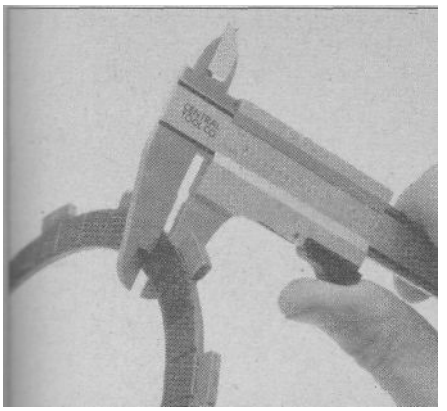
Inspection

Refer to illustrations 16.13a through 16.13e, 16.15, 16.16 and 16.17

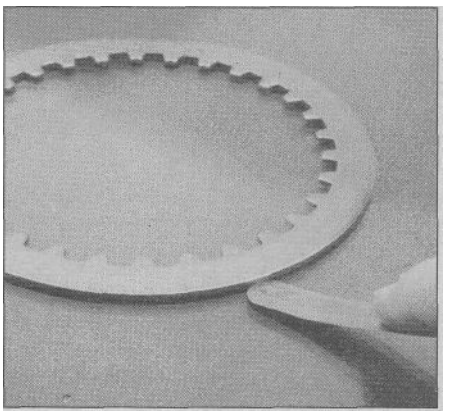
13 If the clutch has been chattering (juddering), remove the wire ring and the steel plate, seat spring and seat plate that make up the clutch damper **(see illustrations).** These parts need not be removed if the clutch hasn't been chattering.

14 Examine the splines on both the inside and the outside of the clutch boss. If any wear is evident, replace the clutch boss with a new one.

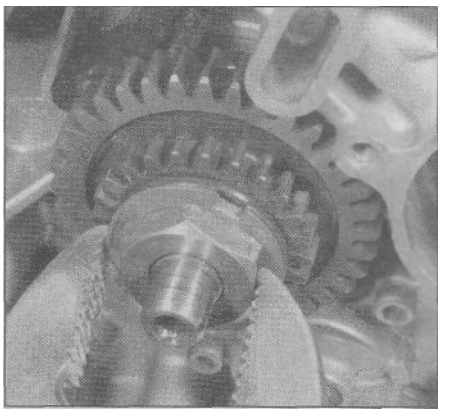
15 Measure the free length of the clutch springs **(see illustration).** Replace the springs as a set if any one of them is not within the values listed in this Chapter's Specifications.



16.16 Measure the thickness of the friction plates

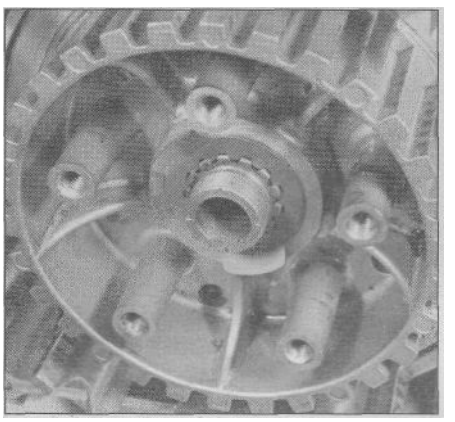


16.17 Check the metal plates for warpage

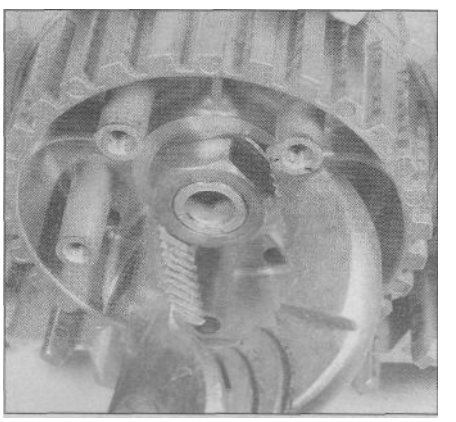


16.28 With the nut tightened to the specified torque, bend the lockwasher against one of the flats

'6.29 Install the oil pump driven gear and secure it with a new snap-ring



16.30 Install the clutch boss lockwasher



16.31 Once the nut is tightened to the specified torque, bend the lockwasher against the nut

16 If the lining material of the friction plates smells burnt or if it's glazed, new parts are required. If the metal clutch plates are scored or discolored, they must be replaced with new ones. Measure the thickness of each friction plate (see illustration) and compare the results to this,Chapter's Specifications. Replace the friction plates as a setifanyarenearthewearlimit.

17 Lay the metal plates, one at a time, on a perfectly flat surface such as a piece of plate glass) and check for warpage by trying to slip a gauge between the flat surface and the plate (see illustration). The feeler gauge should be the same thickness as the warpage limit listed in this Chapter's Specifications. Do this at several places around the plate's circumference. If the feeler gauge can be slipped under the plate, it is warped and should be replaced with a new one.

18 Check the tabs on the friction plates for excessive wear and mushroomed edges. They can be cleaned up with a file if the deformation is not severe.

19 Check the edges of the slots in the clutch housing for indentations made by the friction plate tabs. If the indentations are deep they can prevent clutch release, so the housing should be replaced with a new one. If the indentations can be removed easily with a file, the life of the housing can be prolonged to an extent.

20 Check the teeth on the primary drive gear and driven gear for wear or damage and replace them if defects are found. The driven gear is replaced together with the clutch housing.

21 Check the pressure plate and push plate for wear and damage. Replace any worn or damaged parts.

22 Check the pushrods and the steel ball for wear or damage and replace them if defects are visible. Install a new O-ring on the short pushrod (see illustration 16.5b).

23 Check the bearing surface in the center of the clutch housing and replace the clutch housing if it's worn or damaged.

24 Clean all traces of old gasket material from the clutch cover and its mating surface on the crankcase.

Installation

Refer to illustrations 16.28, 16.29, 16.30, 16.31, 16.34, 16.35, 16.37a, 16.37b, 16,38a, 16.38b and 16.38c

25 Install the primary drive gear Woodruff key, then install the primary drive gear, oil pump drive gear and" retaining plate (see illustrations 16.11b, 16.11c, 16.12a and 16.12b).

26 Install a new lockwasher on the retaining plate. Make sure the lockwasher tabs fit into the notches in the retaining plate, then install the nut.,

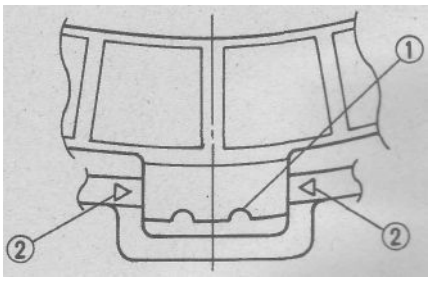
27 Coat the clutch housing bearing surface with clean engine oil, then slip the clutch housing onto the crankshaft (see illustration 16.10a).

28 Wedge a rag between the primary drive gear and the driven gear on the clutch housing so they can't turn, then tighten the nut to the torque listed in this Chapter's Specifications. Bend the lockwasher against the nut to hold it (see illustration).

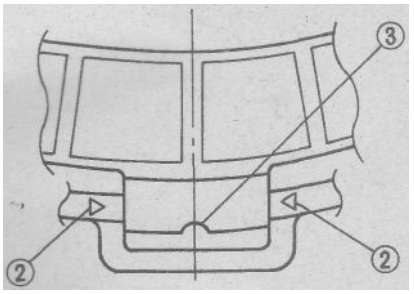
29 Install the oil pump driven gear and secure it with the snap-ring (see illustration).

30 Install the clutch holding plate, then the clutch boss (see illustrations 16.9b and 16.9a). Install a new lockwasher (see illustration). Install the nut with its recessed side toward the clutch boss and tighten it slightly (see illustration 16.7e).

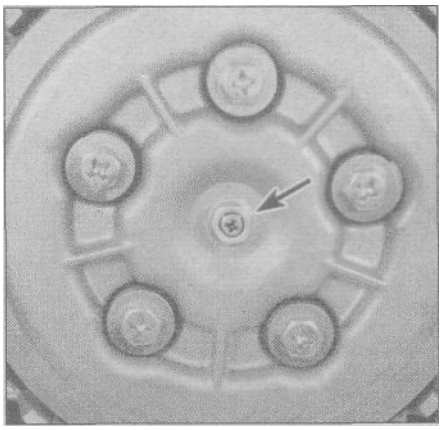
31 • Hold the clutch boss and housing from turning with one of the methods described in Step 7. Tighten the clutch boss nut to the torque listed in this Chapter's Specifications, then bend the lockwasher against the nut to secure it (see illustration).



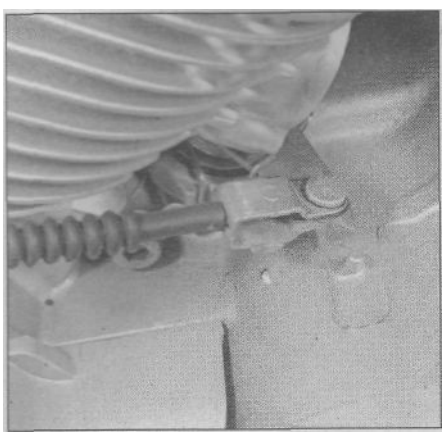
16.34 On models so equipped, align the **double notches in** the friction **plates (1) with the marks** on the clutch housing **(2) .**



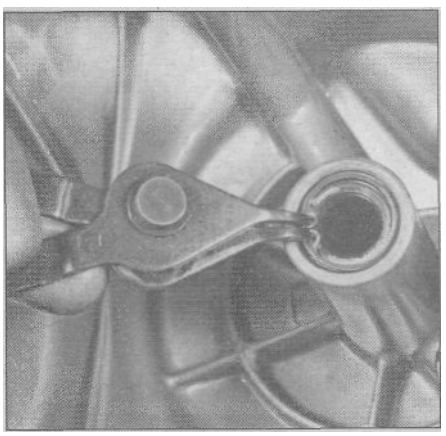
16.35 . . . if tight friction plates impede clutch movement, align the single notches (3) with the marks (2)



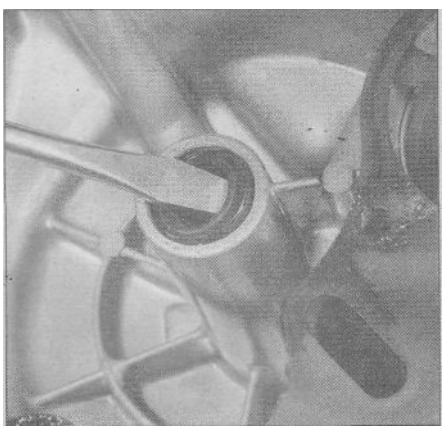
16.37a Loosen the adjuster locknut (arrow)



16.37b Align the clutch lever mark with the mark on the crankcase



16.38a Remove the snap-ring ,



16.3&b . . . **and pry out the seal**

32 If you removed the clutch damper, reverse Step 13 to install it. The OUTSIDE mark on the seat spring faces out (away from the engine). Make sure the wire ring is securely seated in its groove in the clutch boss.

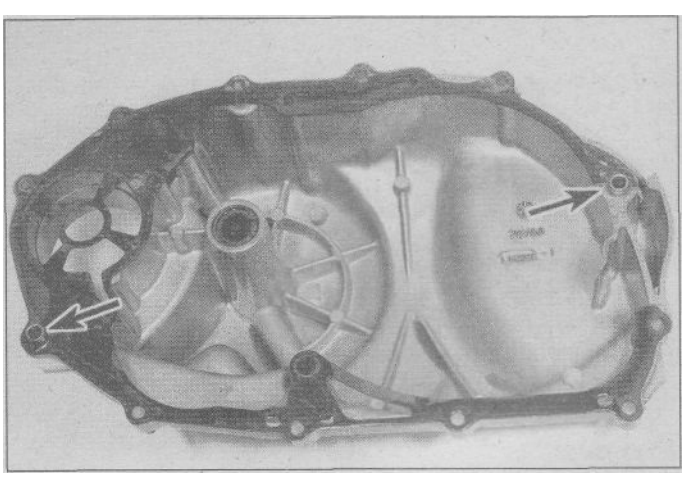
33 Coat the pushrods and steel ball with multipurpose grease. Install the long pushrod and ball in the engine and the short pushrod in the pressure plate **(see illustrations 16.6b, 16.6a and 16.5b).**

34 Coat one of the friction plates with engine oil and install it in the clutch housing so its double notch aligns with the embossed marks on the clutch housing **(see illustration).** If there aren't any visible marks on the clutch housing, align the double notches on all of the friction plates with each other. Engage the tabs on the friction plate with the slots in the clutch housing.

35 Coat a metal plate with engine oil and install it on top of the friction plate with its rounded side in. Continue to install alternate friction and metal plates, coated with engine oil (a friction plate is the last one installed). Align the double notch on each remaining friction plate with the clutch housing marks (if equipped) or with the double notches on the previously installed friction plates. **Note:** ***If*** *any of the friction plates fit tightly in the clutch housing, remove all of the friction and metal plates, then reinstall them so the single notches are aligned with the clutch housing marks* ***(see illustration).***

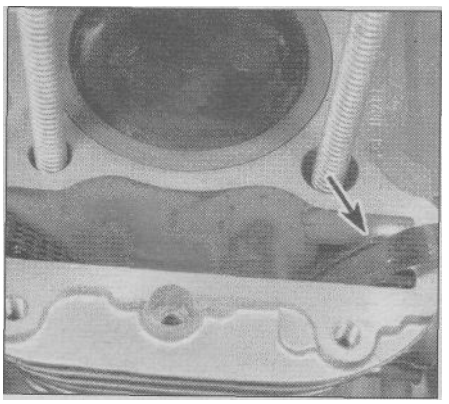
36 Install the pressure plate, springs and screws. Tighten the screws evenly in a criss-cross pattern to the torque listed in this Chapter's Specifications.

37 Loosen the locknut on the clutch mechanism freeplay adjuster **(see illustration).** Push the lever by hand toward the front of the engine as far as it will go, then note the positions of the lever mark and the match mark on the crankcase **(see illustration).** If they aren't aligned, turn the adjuster in or out until they are, then tighten the locknut.

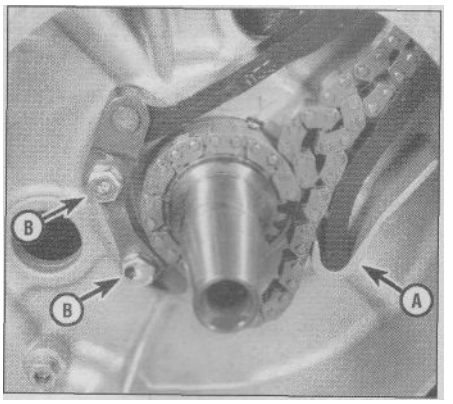


16.38c Make sure the dowels are in position (arrows) and install the gasket

38 Remove the snap-ring and pry the seal out of the clutch cover **(see illustrations).** Tap in a new seal with a socket the same diameter as the seal, then install a new snap-ring. Make sure the clutch cover dowels are in position and install a new gasket **(see illustration).**

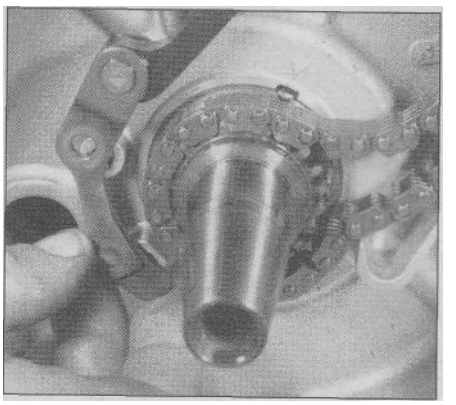


17.2a Lift out the exhaust side chain damper (arrow)...

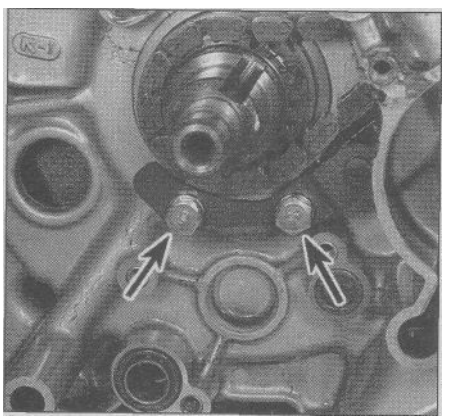


17.2b ... the bottom end fits into a slot in the crankcase

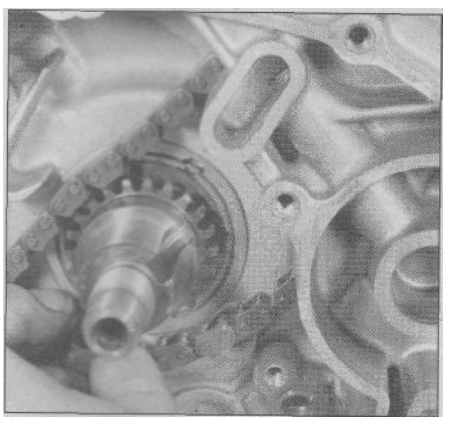
a) Chain damper slot
b) Intake side chain damper bolts



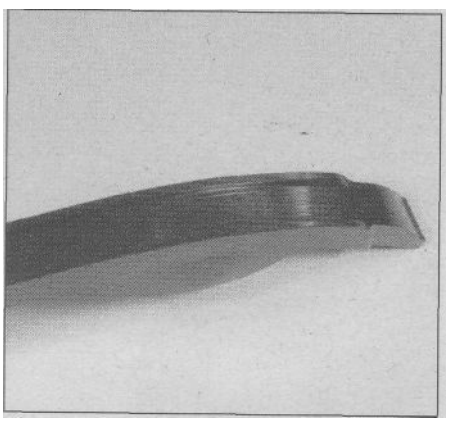
17.5 Take the intake side chain guide off the crankcase



17.9 Remove the exhaust side chain damper bolts (arrows) and lift the chain damper out



17.10 Slip the chain off the sprocket and remove it



17.12 Check the friction surface of each damper for wear or scoring

39 Install the clutch cover over the dowels, then install and finger-tighten the bolts. Four of the bolts retain wiring harness clamps.

40 Tighten the bolts in stages, using a criss-criss pattern, to the torque listed in this Chapter's Specifications.

41 Install a new oil filter (see Chapter 1).

42 Fill the crankcase with the recommended type and amount of engine oil (see Chapter 1).

43 The remainder of installation is the reverse of the removal steps.

17 Cam chains and dampers - removal, inspection and installation

Removal

1 Remove the cylinder head (see Section 8).

Rear cylinder

Refer to illustrations 17.2a, 17.2b and 17.5

2 Lift the exhaust side chain damper out of its slot **(see illustrations).**

3 Remove the alternator and starter clutch (see Chapter 8).

4 Remove the idler gears (see Section 14).

5 Unbolt the intake side cam chain damper and lift it out **(see illustration 17.2b)** and the accompanying illustration).

6 Slip the cam chain off the crankshaft sprocket and remove it.

Front cylinder

Refer to illustrations 17.9 and 17.10

7 Remove the clutch and primary gears (see Section 16).

8 Lift the intake side chain damper out of its slot.

9 Unbolt the exhaust side cam chain damper and lift it out **(see illustration).**

10 Slip the cam chain off the crankshaft sprocket and remove it **(see illustration).**

Inspection

Refer to illustration 17.12

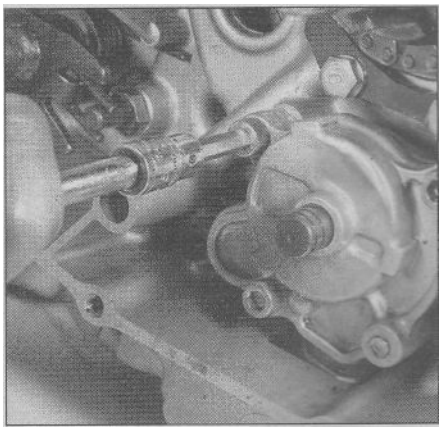
11 Check the chain for binding and obvious damage. If these conditions are visible, or if the chain appears to be stretched, replace it.

12 Check the dampers for deep grooves, cracking and other obvious damage and replace them if necessary **(see illustration).**

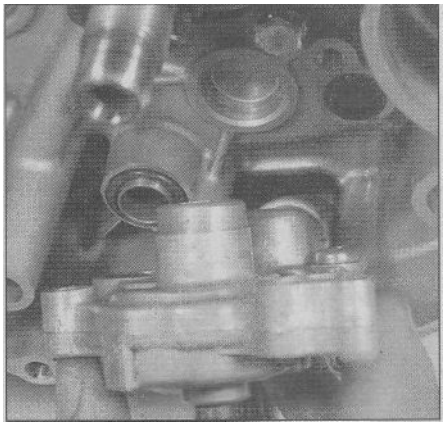
13 Check the sprocket teeth for wear or damage. Replace the cam sprockets if undesirable conditions are found. The entire crankshaft must be replaced if the crankshaft sprockets are worn or damaged.

Installation

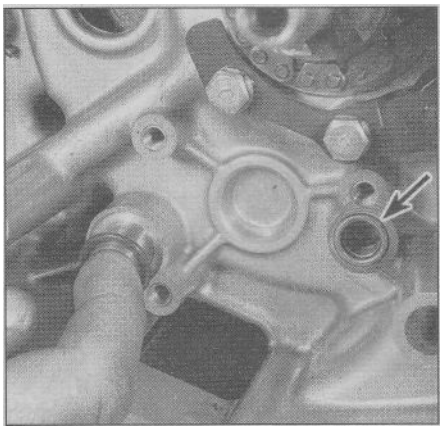
14 Installation is the reverse of the removal steps. Be sure to align the timing marks on the crankshaft sprocket and cam sprocket as described in Section 8.



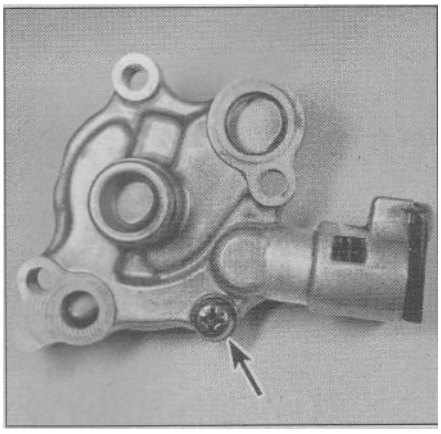
18.2a Remove the oil pump mounting bolts ...



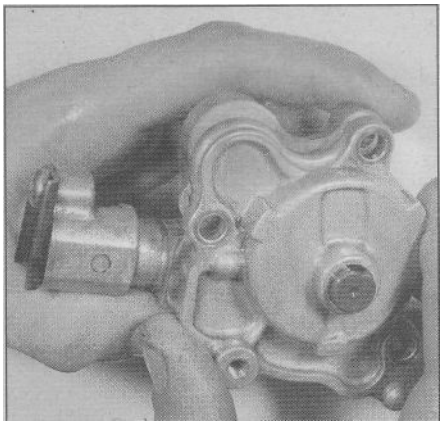
18.2b ... and take the pump off...



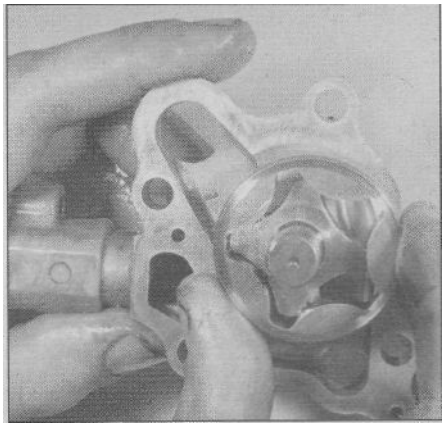
18.3 ... then remove the dowel with O-ring and separate O-ring (arrow)



18.5a The cover screw (arrow) may be tight enough to require an impact driver



18.5b Lift off the cover ...



18.6a ... the outer rotor .

18 Oil pump - removal, inspection and installation

Note: *The oil pump can be removed with the engine in the frame.*

Removal

Refer to illustrations 18.2a, 18.2b and 18.3

1 Remove the oil pump driven gear and the clutch (see Section 19).

2 Remove the oil pump mounting bolts and remove the pump **(see illustrations).**

3 Remove the oil pump dowel and O-rings **(see illustration).**

Disassembly,inspectionandreassembly

Refer to illustrations 18.5a, 18.5b, 18.6a, 18.6b, 18.6c, 18.8a, 18.8b, 18.9a through 18.9e and 18.10

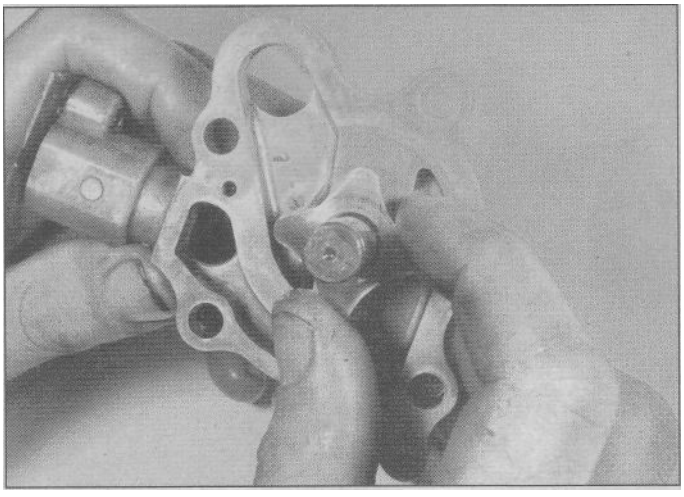
4 Wash the oil pump in solvent, then dry it off.

5 Remove the pump housing screw (use an impact driver if it's tight) **(see illustration).** Lift off the housing **(see illustration).'**

6 Lift off the rotors **(see illustrations).**

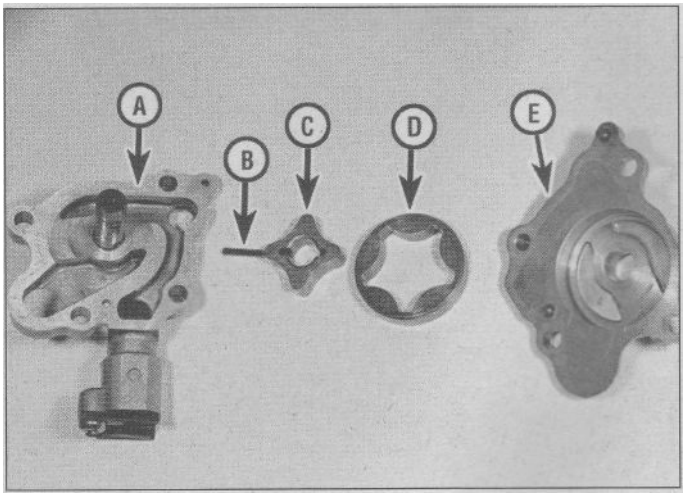
7 Check the pump body and rotors for scoring and wear. If any damage or uneven or excessive wear is evident, replace the pump (individual parts aren't available). If you are rebuilding the engine, it's a good idea to install a new oil pump.

8 Measure the clearance between the inner and outer rotors and between the outer rotor and housing **(see illustrations).** Replace the pump if the clearance is excessive.



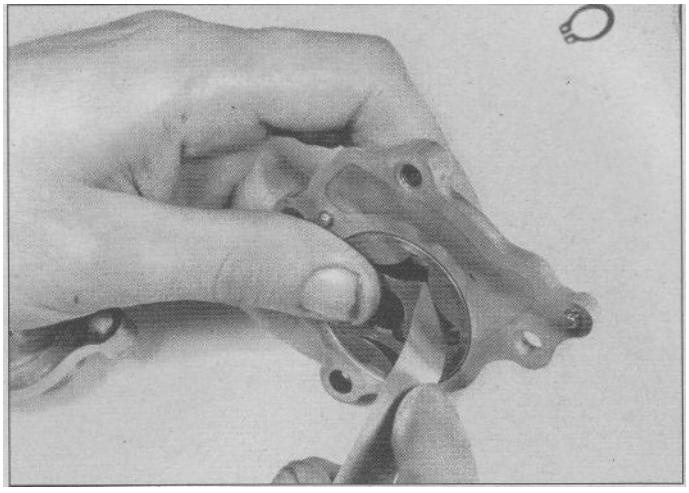
18.6b ... and the inner rotor

9 Remove the screw and retaining plate, then take out the spring and relief valve **(see illustrations).** Check the valve for scoring or other damage and check the spring for weakness. Replace the oil pump if any of the relief valve parts are in doubtful condition.

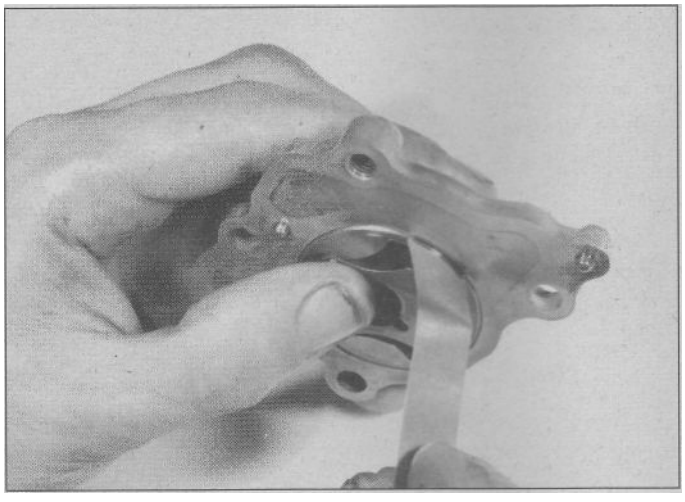


18.6c Pump body and rotors

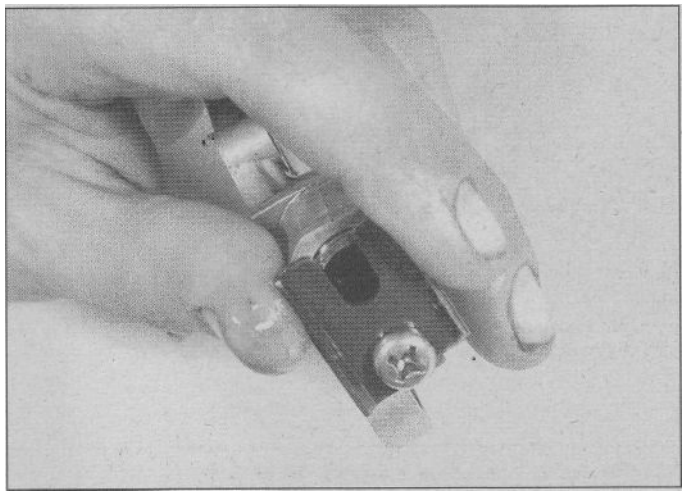
A) Pump body
B) Drive pin
C) Inner rotor
D) Outer rotor



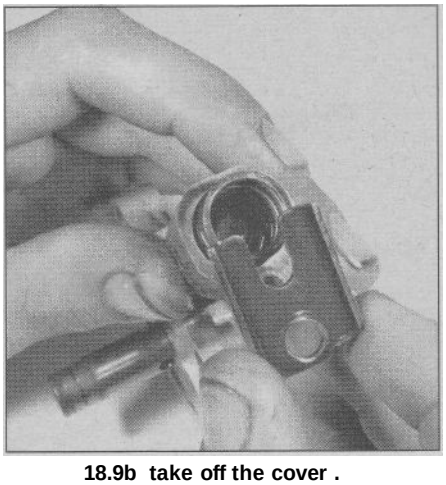
18.8a Measure the tip clearance between the inner and outer rotors



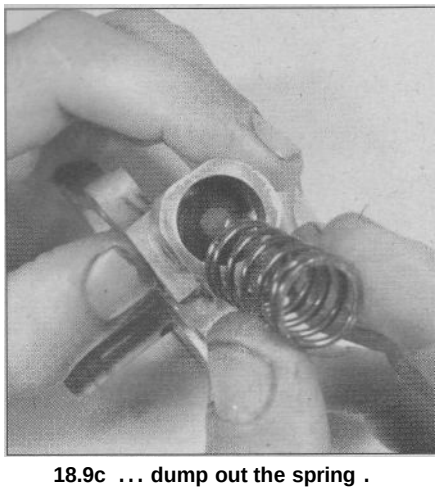
18.8b ... and the clearance between the outer rotor **and housing**



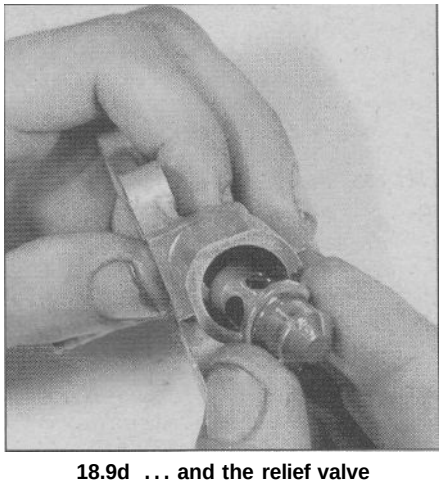
18.9a Remove the screw (use an impact driver if it's tight)...



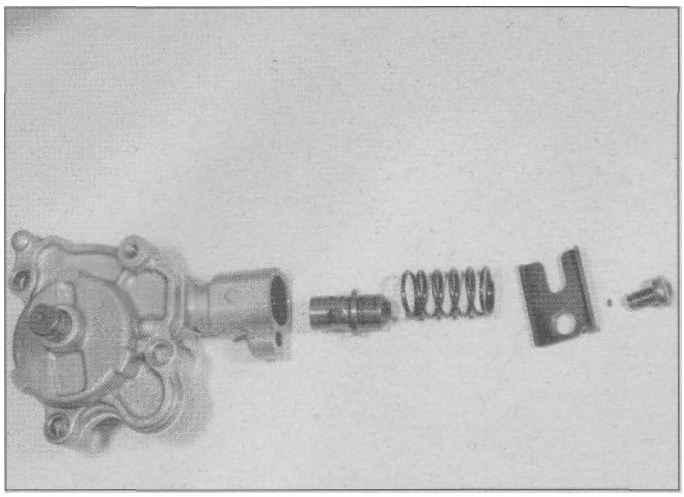
18.9b take off the cover .



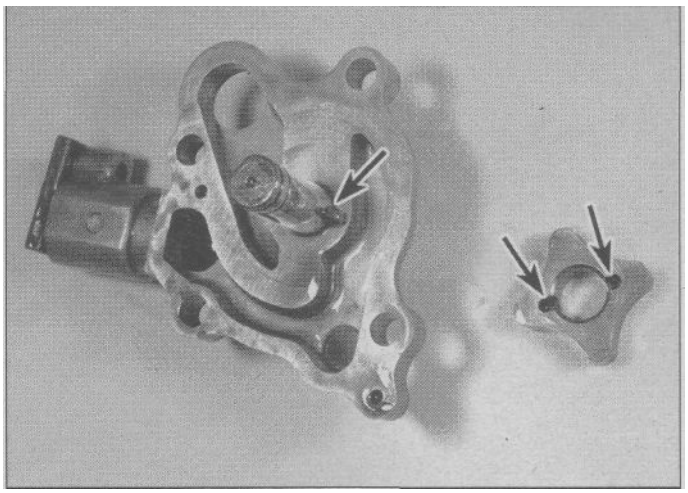
18.9c ... dump out the spring .



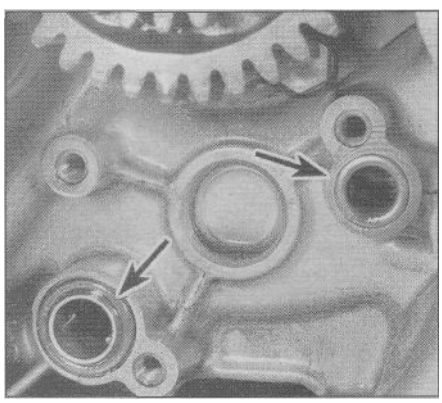
18.9d ... and the relief valve



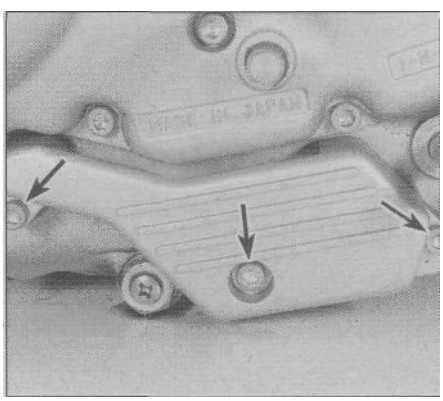
18.9e Relief valve components



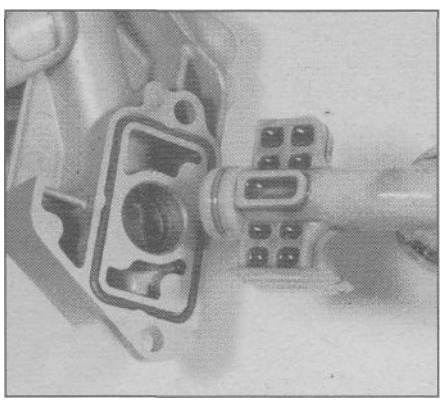
18.10 Be sure the drive pin aligns with the slot in the inner rotor (arrows)



18.12 Be sure the dowel pin and O-rings (arrows) are in position; pour engine oil into the passages before installing the oil pump



19.1 Remove the Allen bolts (arrows) and take off the oil passage housing



19.2a Pull the strainer out of the housing . . .

10 If the pump is good, reverse the disassembly steps to reassemble it. Make sure the pin is centered in the rotor shaft so it will align with the slot in the inner rotor **(see illustration).**

Installation

Refer to illustration 18.12

11 Before installing the pump, prime it by pouring oil into it while turning the shaft by hand - this will ensure that it begins to pump oil quickly. **Caution:** *Also pour oil into the crankcase oil passages to prevent engine damage on start-up.*

12 Installation is the reverse of removal, with the following additions:

a) Be sure the dowel and O-rings are in position ***(see illustration).***

b) Tighten the pump mounting bolts to the torque listed in this Chapter's Specifications.

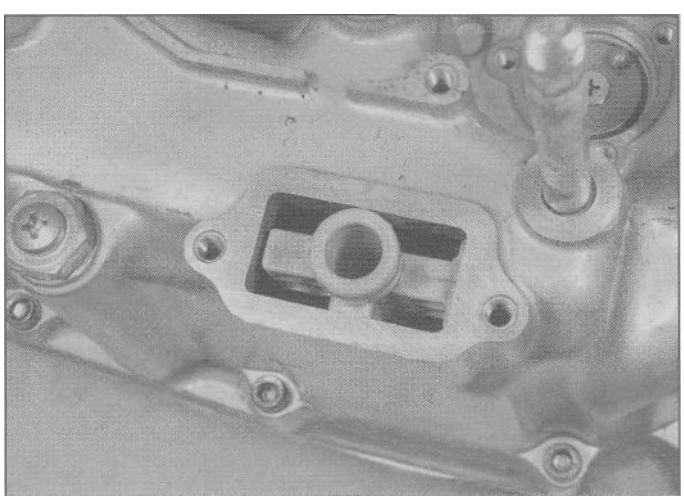
19 Oil strainer - removal, inspection and installation

Refer to illustrations 19.1, 19.2a, 19.2b, 19.4a, 19.4b and 19.5

1 Drain the engine oil (see Chapter 1) and unbolt the oil passage housing from the engine **(see illustration).**

2 Take the oil passage housing off. If the strainer comes out with the housing, pull them apart **(see illustration).** If it stays in the engine, pull it out **(see illustration).**

3 Check all parts for visible wear or damage. If the strainer is so clogged it can't be cleaned, replace it.

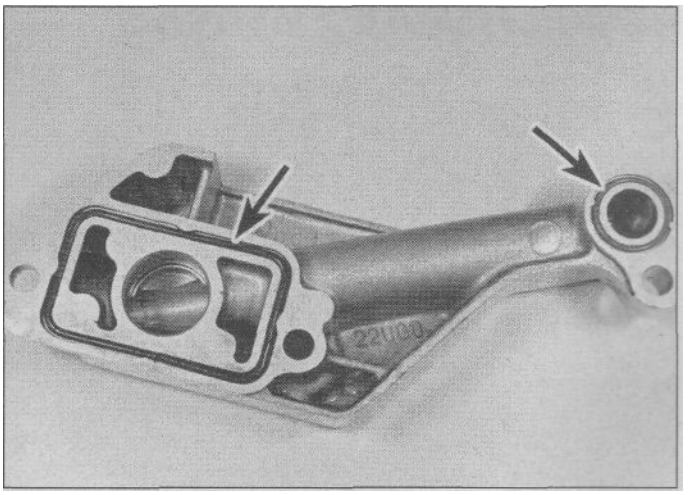


19.2b . . . or out of the engine

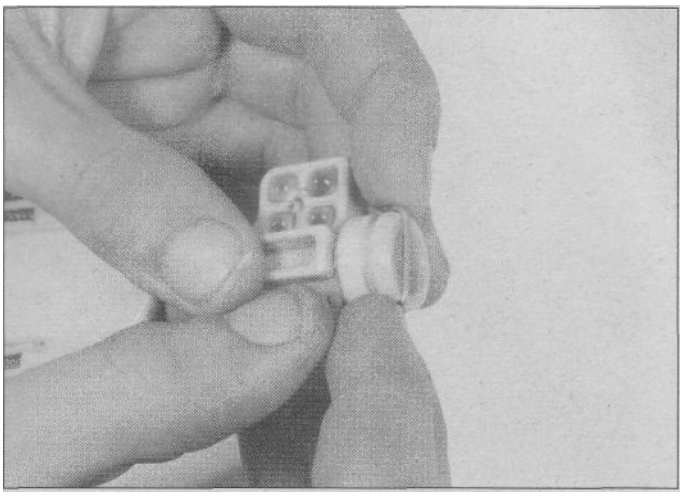
4 Remove the O-rings and install new ones **(see illustrations).**

5 Push the strainer into the oil passage housing **(see illustration).**

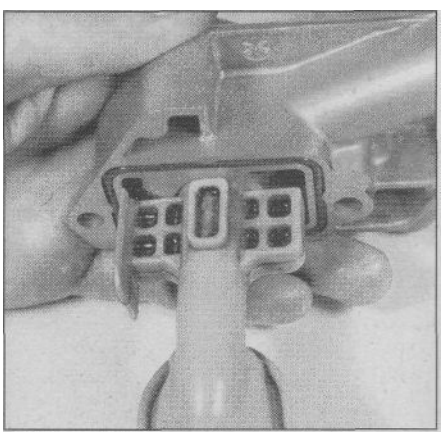
6 Installation is the reverse of the removal steps. Make sure the end of the strainer engages its tab in the far side of the crankcase. Tighten the oil passage housing bolts to the torque listed in this Chapter's Specifications. Fill the engine oil.



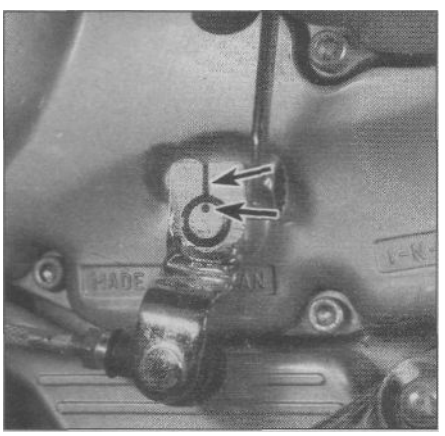
19.4a Install new O-rings in the oil passage housing (arrows)



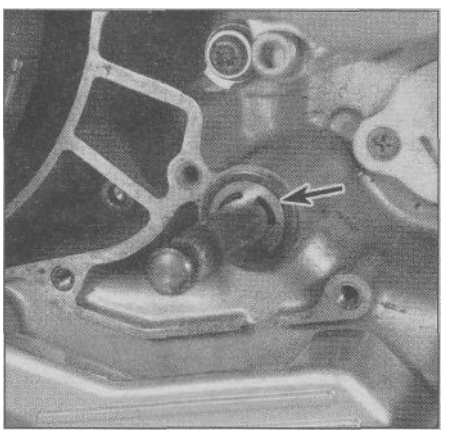
19.4b . . . and on the strainer



19.5 Push the strainer into the oil passage housing until it seats securely



20.2 There should be a punch mark next to the **shift lever slot (arrows); if not, make your own**



20.8a Remove the circlip (arrow)...

20 External shift mechanism - removal, inspection and installation

Shiftleverandpedal

Refer to illustration 20.2

1 Support the bike securely so it can't be knocked over during this procedure.

2 Look for a punch mark on the end of the lever shaft **(see illustration).** This should align with the groove in the lever. If you can't find it, make your own punch mark so the lever can be realigned correctly during installation.

3 Remove the lever pinch bolt **(see illustration 20.2).** Pull the lever off the shaft, together with the linkage rod.

4 If it's necessary to separate the shift pedal from the footpeg assembly, remove the assembly as described in Chapter 7.

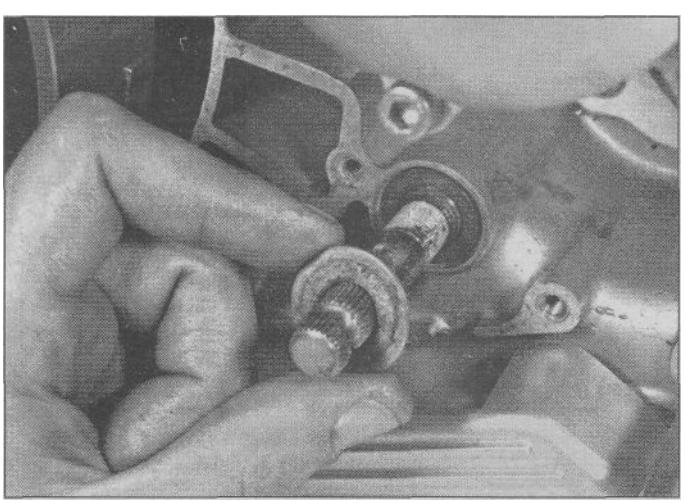
5 Installation is the reverse of removal. Adjust the linkage as needed with the nuts on the linkage shaft (see Chapter 1).

Shiftmechanismremoval

Refer to illustrations 20.8a, 20.8b, 20.9a, 20.9b, 20.9c and 20.10

6 Disconnect the shift lever from the shaft (Steps 1 through 3).

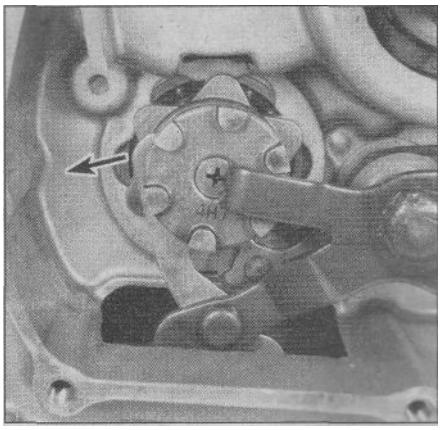
7 Remove the clutch housing/primary driven gear (see Section 16).



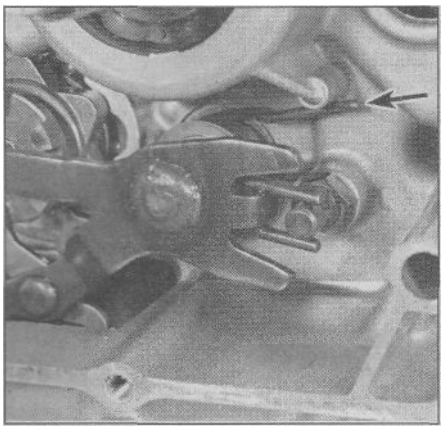
20.8b . . . **and the washer**

Remove the alternator cover (see Chapter 8).

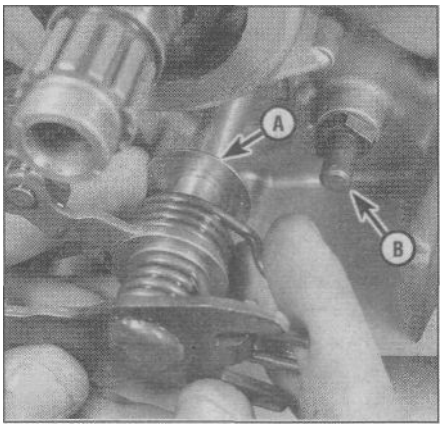
8 Remove the circlip and washer from the shift shaft **(see illustrations).**



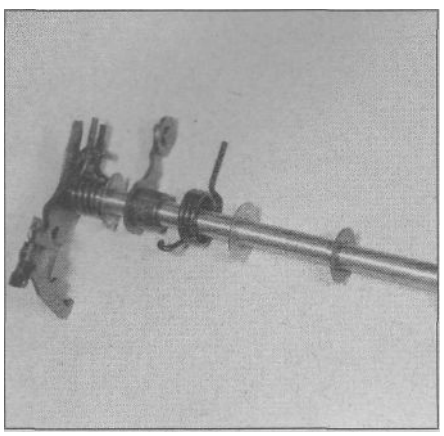
20.9a Pull the stopper lever in the **direction shown by the arrow . . .**



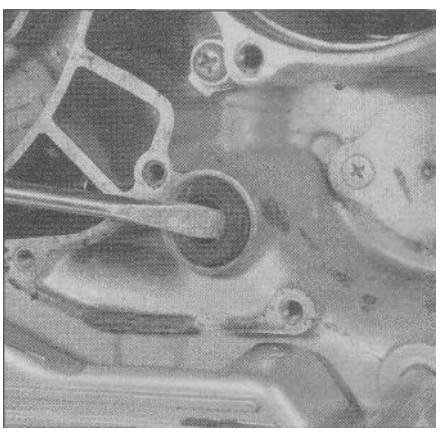
20.9b . . . and unhook the torsion spring (arrow) from its post



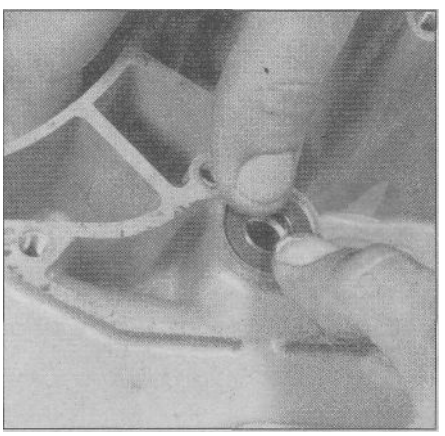
20.9c Pull the shift shaft out, taking care not to lose the washer (A); check the guide bar (B) for looseness



20.10 Put the washers and circlip back on the shaft so they won't be lost



20.15a Pry the shift shaft seal out of the crankcase . . .



20.15b . . . press a new seal in with fingers or a socket the same diameter as the seal

9 Pull on the stopper lever to disengage it from the shift cam and unhook the torsion spring from its post **(see illustrations).** Slide the shift shaft and stopper lever out of the crankcase **(see illustration).** Keep track of the washer on the shift shaft so it isn't lost.

10 Reassemble the components on the shaft to keep them in order **(see illustration).**

Shiftmechanisminspection

Refer to illustrations 20.15a and 20.15b

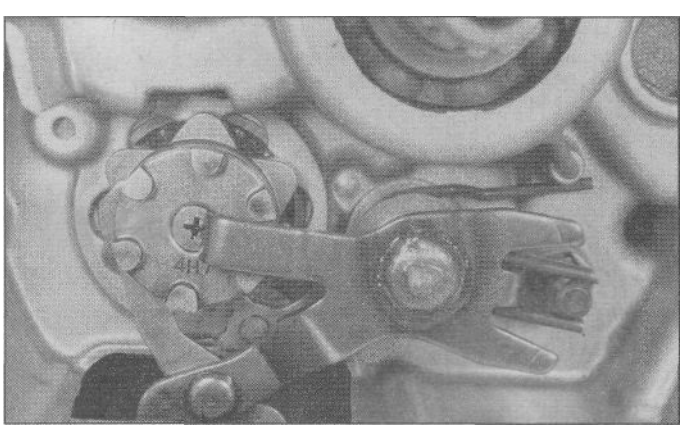
11 Inspect the shift shaft guide bar **(see illustration 20.9c).** If it's worn or damaged, replace it. If it's loose, bend back its lockwasher, unscrew it, reinstall it with a new lockwasher and tighten it securely. Bend the new lockwasher against the nut to secure it.

12 Check the shift shaft for bends and damage to the splines. If the shaft is bent, you can attempt to straighten it, but if the splines are damaged it will have to be replaced. Inspect the pawls and springs on the shift shaft and replace the shaft if they're worn or damaged.

13 Check the condition of the stopper lever and spring. Replace the stopper lever if it's worn where it contacts the shift cam. Replace the spring if it's distorted.

14 Inspect the pins on the end of the shift cam. If they're worn or damaged, you'll have to disassemble the crankcase to replace the shift cam.

15 Inspect the shift shaft seal and replace it if it's worn or damaged **(see illustrations).** It's a good idea to replace the seal whenever the shift shaft is removed.

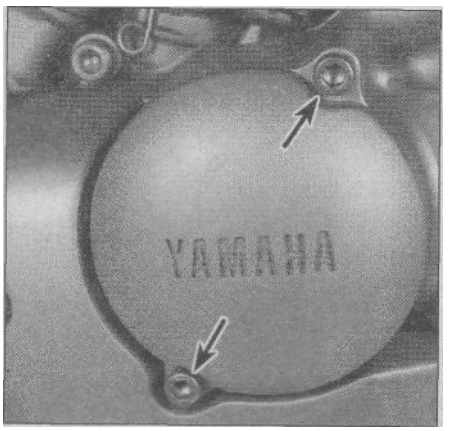


20.16 The external shift linkage should look like this when it's installed

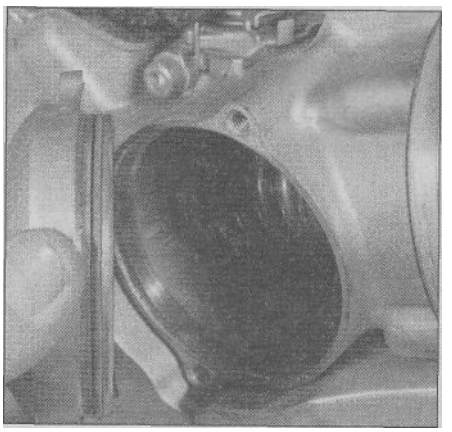
Installation

Refer to illustration 20.16

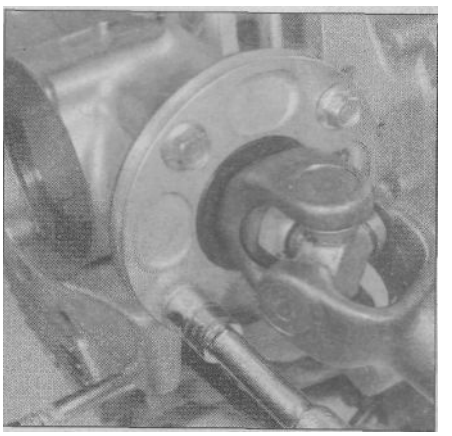
16 Remove the circlip and smaller washer from the shift shaft. Be sure the larger washer is on the shift shaft, then install the shift shaft and stopper lever in the crankcase. Engage the stopper lever with the shift cam and position the torsion spring against its post **(see illustration).**



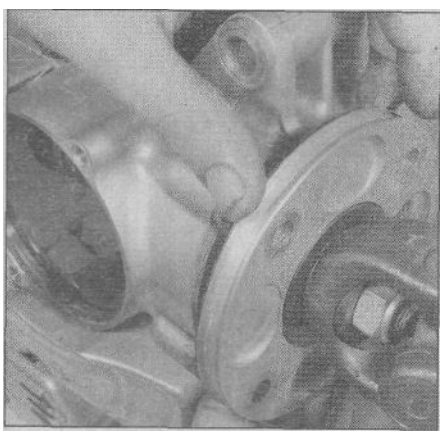
21.2a Remove the Allen bolts (arrows)...



21.2b ... and take the middle driven gear case off

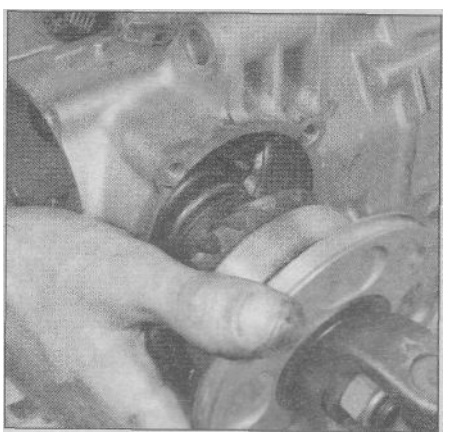


21.3a Remove four bolts ...



21.3b ... pull the middle driven gear back from the crankcase ...

21.3c ... pull out the shims and write down their locations ...



21.3d ... then pull the assembly out of the engine

17 Install the plain washer and circlip on the other end of the shift shaft **(see illustrations 20.8b and 20.8a),**

18 The remainder of installation is the reverse of the removal steps.

19 Adjust the shift pedal position (see Chapter 1).

20 Check the engine oil level and add some, if necessary (see Chapter 1).

21 Middle driven gear - removal, inspection and installation

Removal

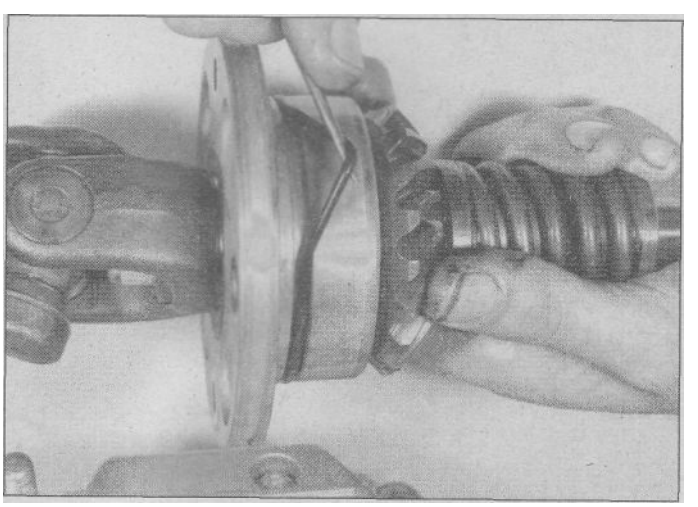
Refer to illustrations 21.2a, 21.2b, 21.3a, 21.3b, 21.3c, 21.3d, 21.4 and 21.9

1 Remove the engine from the frame (see Section 5).

2 Unbolt the middle gear case from the engine **(see illustrations).**

3 Remove four bolts that secure the bearing housing to the case **(see illustration).** Remove the bearing housing and any shims, writing down the number and location of the shims for use during installation **(see illustrations).**

4 Remove the O-ring from the bearing housing **(see illustration).**



21.4 Remove the O-ring from the housing with a pointed tool

Inspection

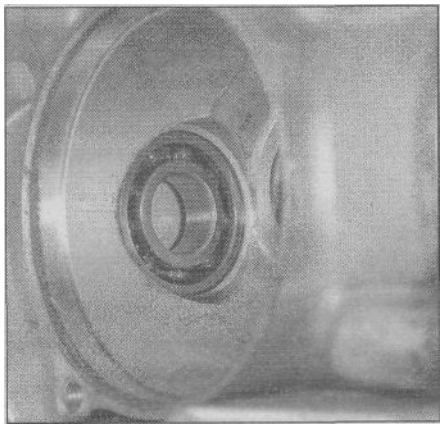
5 Check the universal joint and ball bearing on the middle driven shaft for looseness or stiff movement.

6 Check the shaft splines and the teeth of the middle driven gear for wear or damage.

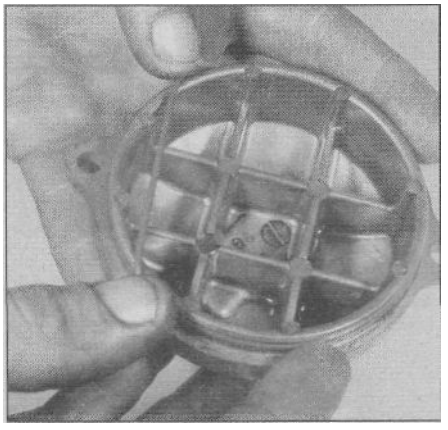
7 Check the damper spring for looseness or obvious damage such as breakage.

8 If any of the above conditions exist, have the middle driven gear disassembled and repaired by a Yamaha dealer or other qualified motorcycle repair shop.

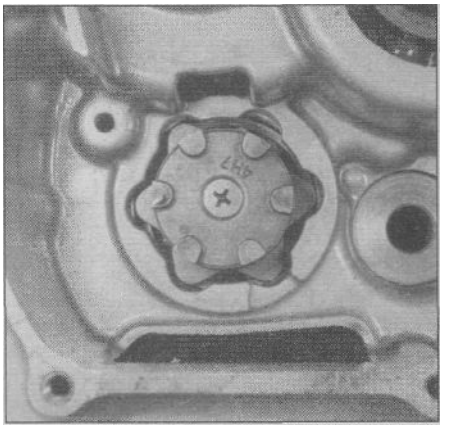
9 Spin the middle driven gear bearing in the crankcase with fingers



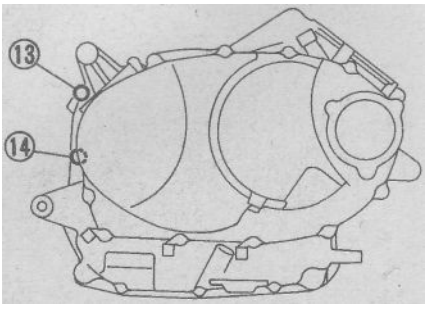
21.9 Inspect the ball bearing in the engine; have it replaced if it's worn or damaged



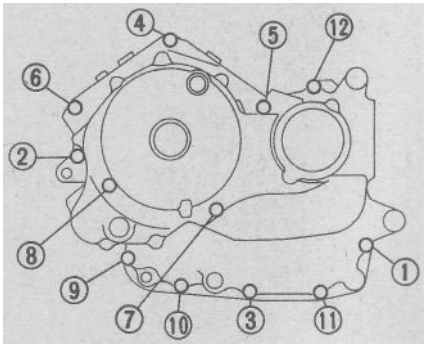
21.10 Install a new O-ring on the middle driven gear case



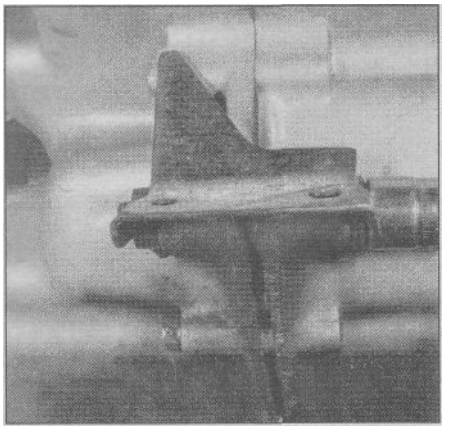
22.8 Position the shift cam so it aligns with the notches in the crankcase



22.9a Loosen the crankcase bolts in sequence, starting with the highest numbered bolts (in the right side of the crankcase)...



22.9b ... and working to the lowest (in the left side of the crankcase)



22.9c The engine protector bracket is bolted to the front of the crankcase

and check for looseness, excessive noise or rough movement **(see illustration).** If these conditions are found, have the bearing replaced by a Yamaha dealer or other qualified motorcycle repair shop.

Installation

Refer to illustration 21.10

10 Installation is the reverse of the removal steps, with the following additions:

a) If the middle driven gear was disassembled, have gear lash adjusted by a Yamaha dealer or other qualified motorcycle repair shop. If not, reinstall the shims in their original positions,

bj Use new O-rings on the bearing housing and middle driven gear case **(see illustration).**

22 Crankcase - disassembly and reassembly

1 To examine and repair or replace the crankshaft, middle driveshaft, connecting rods, bearings, or transmission components, the crankcase must be split into two parts.

Disassembly

Refer to illustrations 22.8, 22.9a, 22.9b, 22.9c, 22.10a,. 22.10b, 22.10c, 22.10d, 22.11a, 22.11b and 22.12

2 Remove the cylinder heads, cylinders, pistons and cam chains (see Sections 8,11,12 and 17).

3 Remove the alternator (Chapter 8) and pick-up coil (Chapter 4).

4 Remove the clutch and primary gears, oil pump and idler gears (see Sections 16,18 and 14).

5 Remove the external shift linkage (see Section 20).

6 Remove the middle driven gear (see Section 21).

7 Remove the oil strainer (see Section 19).

8 The shift cam must be positioned so it doesn't hang up on the crankcase when separating the halves **(see illustration).** Rotate it to the correct position if necessary.

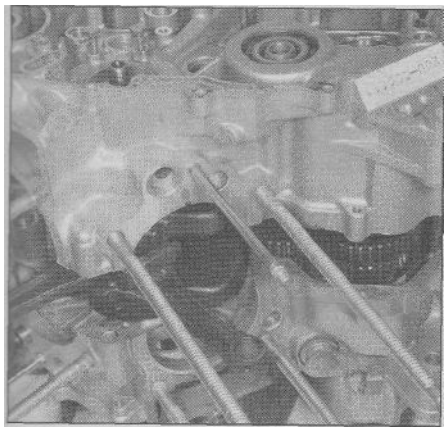
9 Remove the crankcase bolts in the reverse of the tightening sequence (start with the highest-numbered bolt and work to the lowest) **(see illustrations).** Note that one bolt secures the engine protector bracket **(see illustration).**

10 Carefully separate the crankcase halves **(see illustration).** As you lift, pry gently and evenly at the pry points around the crankcase seam **(see illustrations).** Tap alternately on the transmission shafts, front engine mounting boss and shift cam. If the halves won't separate easily, make sure all fasteners have been removed. Don't pry against the crankcase mating surfaces or they'll leak.

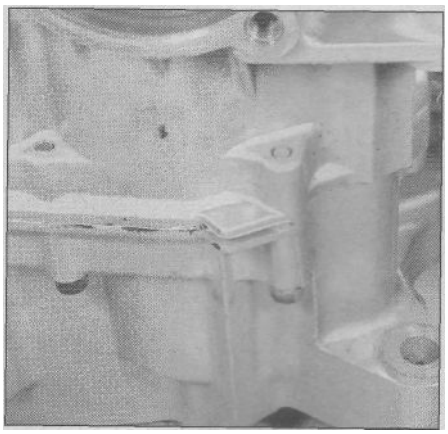
11 Look for the O-ring and dowels **(see illustrations).** If they're not in one of the crankcase halves, locate them.

12 If the right crankcase half needs to be replaced, remove the oil baffle **(see illustration).** Otherwise, it can be left in position.

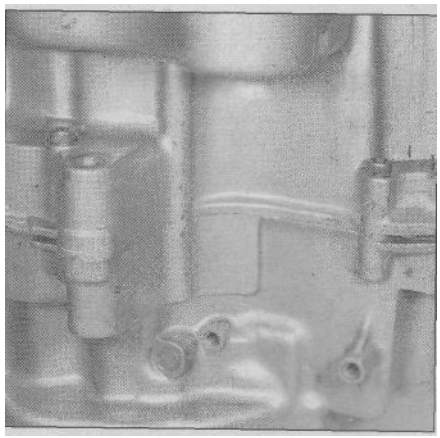
13 Refer to Sections 24 through 28 for information on the internal components of the crankcase.



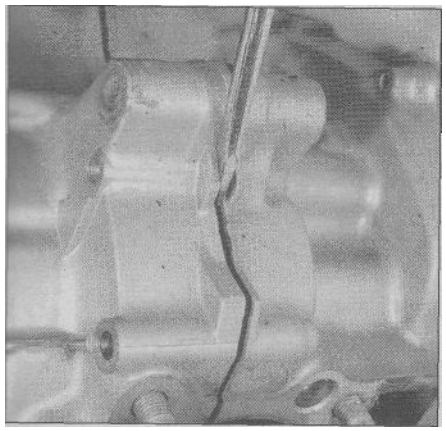
22.10a Lift the right crankcase half off the left half...



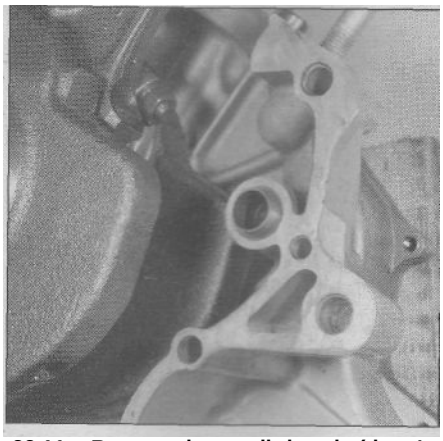
22.10b ... prying gently at **the pry points if necessary .. .**



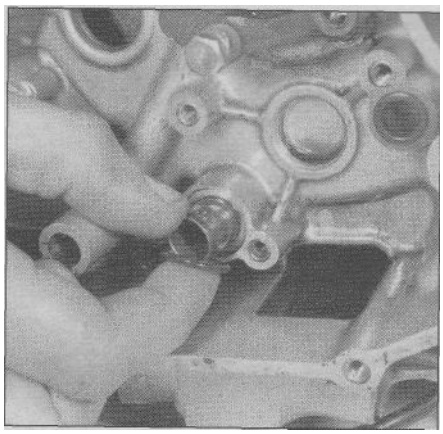
22.10c ... (these are spaced around the crankcase)



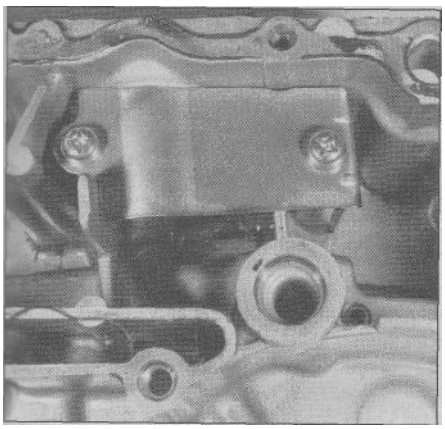
22.10d ... insert a screwdriver in each pry point and apply gentle pressure



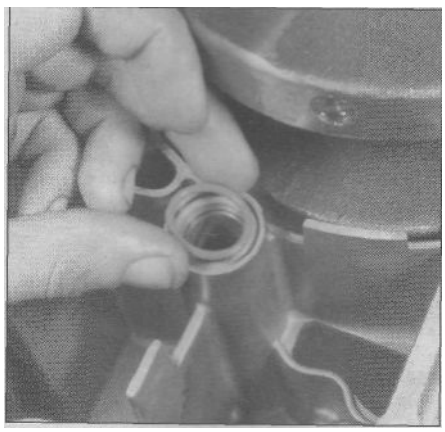
22.11a Remove the small dowels (there's one at each end of the **crankcase)...**



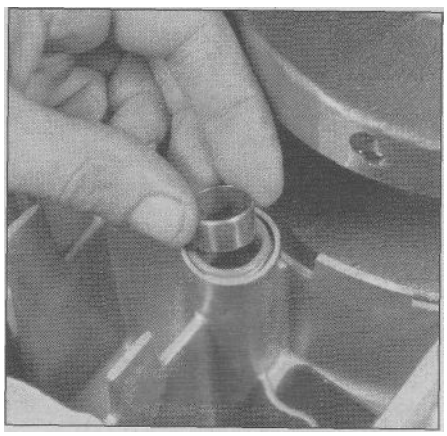
22.11b ... and the large dowel with its O-ring



22.12 The oil baffle plate can be left in position unless the crankcase half is to be replaced



22.15a Install a **new O-ring .**



22.15b ... the large dowel and the two small dowels

Reassembly

Refer to illustrations 22.15a and 22.15b

14 Make sure the crankshaft and transmission shafts are correctly positioned in the upper crankcase half (see Sections 25 and 28).

15 Remove all traces of sealant from the crankcase mating surfaces. Be careful not to let any fall into the case as this is done. Check to make sure the large dowel (with a new O-ring) and the two small dowels are in place **(see illustrations).**

16 Pour some engine oil over the transmission gears, the crankshaft main bearings and the shift cam. Also pour oil into the exposed internal oil passages. Don't get any oil on the crankcase mating surfaces.

17 Apply a thin, even bead of Yamaha Bond or Quick Gasket sealant (part no. ACC-11001-05-01) or equivalent to the crankcase mating surfaces. **Caution:** *Don't apply an excessive amount of sealant.*

18 Check the position of the shift cam. Make sure it's **turned** won't obstruct assembly of the cases **(see illustration 22.8).**

19 Carefully assemble the crankcase halves over the d:

Caution: *The crankcase halves should fit together completely without being forced. If they're slightly apart, DO NOT force them together by tightening the crankcase bolts.*

20 Install the crankcase bolts in their holes **(see illustrations 22.9a and 22.9b).** Bolts 1 through 12 have steel washers.

21 Tighten the bolts in numerical order, starting with the lowest-numbered bolt and working to the highest. Tighten all bolts to the torque listed in this Chapter's Specifications. **Note:** *There are different torque settings for the 8mm bolts and the 6mm bolts.*

22 Turn the mainshaft and the transmission driveshaft to make sure they turn freely. Also make sure the crankshaft turns freely. Rotate the shift cam by hand to make sure the transmission shifts into the different gear positions.

23 The remainder of assembly is the reverse of disassembly.

24 Be sure to refill the engine oil (see Chapter 1).

23 Crankcase components - inspection and servicing

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

2 Remove any oil passage plugs that haven't already been removed. All oil passages should be blown out with compressed air.

3 All traces of old gasket 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.

4 If any damage is found that can't be repaired, replace the crankcase halves as a set.

24 Main and connecting rod bearings - general note

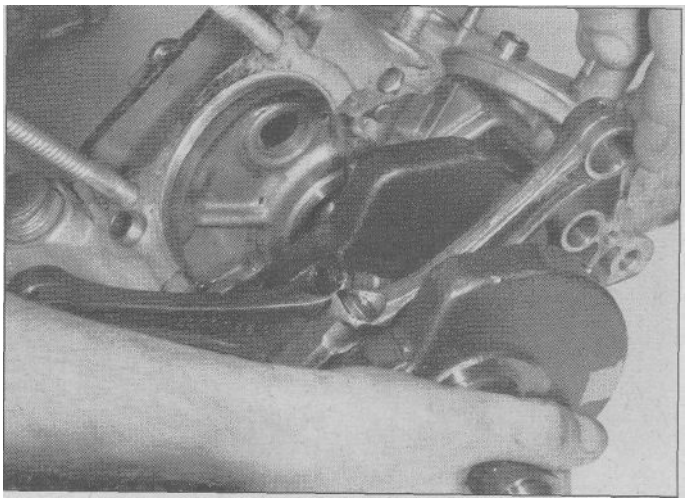
1 Even though main and connecting rod bearings are generally replaced with new ones during the engine overhaul, the old bearings should be retained for close examination as they may reveal valuable information about the condition of the engine.

2 Bearing failure occurs mainly because of lack of lubrication, the presence of dirt or other foreign particles, overloading the engine and/or corrosion. Regardless of the cause of bearing failure, it must be corrected before the engine is reassembled to prevent it from happening again.

3 When examining the bearings, remove the rod bearings from the connecting rods and caps and lay them out on a clean surface in the same general position as their location on the crankshaft journals. This will enable you to match any noted bearing problems with the corresponding side of the crankshaft journal. The main bearings are pressed into the crankcase halves and are only removed if they need to be replaced.

4 Dirt and other foreign particles get into the engine in a variety of ways. It may be left in the engine during assembly or it may pass through filters or breathers. It may get into the oil and from there into the bearings. Metal chips from machining operations and normal engine wear are often present. Abrasives are sometimes left in engine components after reconditioning operations such as cylinder honing, especially when parts are not thoroughly cleaned using the proper cleaning methods. Whatever the source, these foreign objects often end up imbedded in the soft bearing material and are easily recognized. Large particles will not imbed in the bearing and will score or gouge the bearing and journal. The best prevention for this cause of bearing failure is to clean all parts thoroughly and keep everything spotlessly clean during engine reassembly. Frequent and regular oil and filter changes are also recommended.

5 Lack of lubrication or lubrication breakdown has a number of interrelated causes. Excessive heat (which thins the oil), overloading (which squeezes the oil from the bearing face) and oil leakage or throw off (from excessive bearing clearances, worn oil pump or high engine speeds) all contribute to lubrication breakdown. Blocked oil passages will also starve a bearing and destroy it. When lack of lubrication is the cause of bearing failure, the bearing material is wiped or extruded from the steel backing of the bearing. Temperatures may increase to the point where the steel backing and the journal turn blue from overheating.



25.2 Lift the crankshaft and connecting rods out of the crankcase

6 Riding habits can have a definite effect on bearing life. Full throttle low speed operation, or lugging the engine, puts very high loads on bearings, which tend to. squeeze out the oil film. These loads cause the bearings to flex, which produces fine cracks in the bearing face (fatigue failure). Eventually the bearing material will loosen in pieces and tear away from the steel backing. Short trip driving leads to corrosion of bearings, as insufficient engine heat is produced to drive off the condensed water and corrosive gases produced. These products collect in the engine oil, forming acid and sludge. As the oil is carried to the engine bearings, the acid attacks and corrodes the bearing material.

7 Incorrect bearing installation during engine assembly will lead to bearing failure as well. Tight fitting bearings which leave insufficient bearing oil clearances result in oil starvation. Dirt or foreign particles trapped behind a bearing insert result in high spots on the bearing which lead to failure.

8 To avoid bearing problems, clean all parts thoroughly before reassembly, double check all bearing clearance measurements and lubricate the new bearings with engine assembly lube or moly-based grease during installation.

25 Crankshaft and main bearings - removal, inspection, main bearing selection and installation

Crankshaftremoval

Refer to illustration 25.2

1 Separate the crankcase halves (see Section 22).

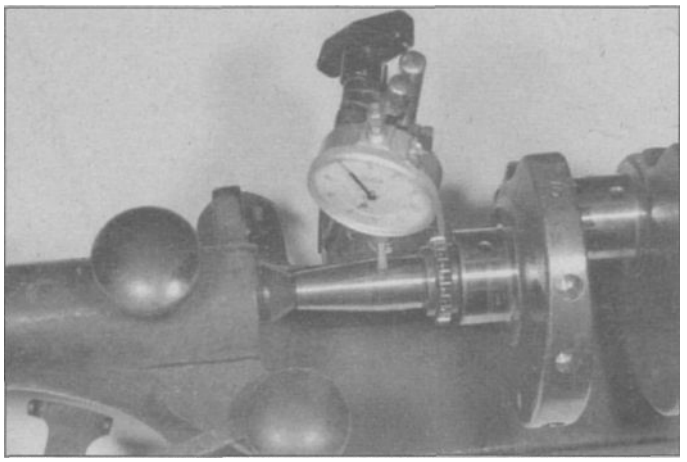
2 Lift the crankshaft out, together with the connecting rods, and set them on a clean surface **(see** illustration).

Inspection

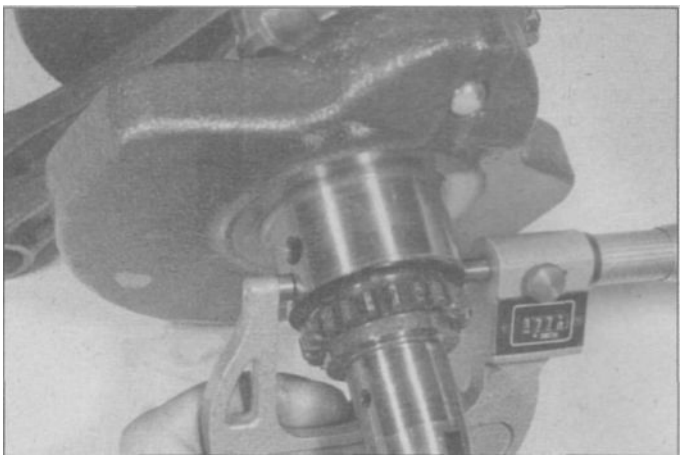
Refer to illustration 25.6

3 If you haven't already done so, mark and remove the connecting rods from the crankshaft (see Section 26).

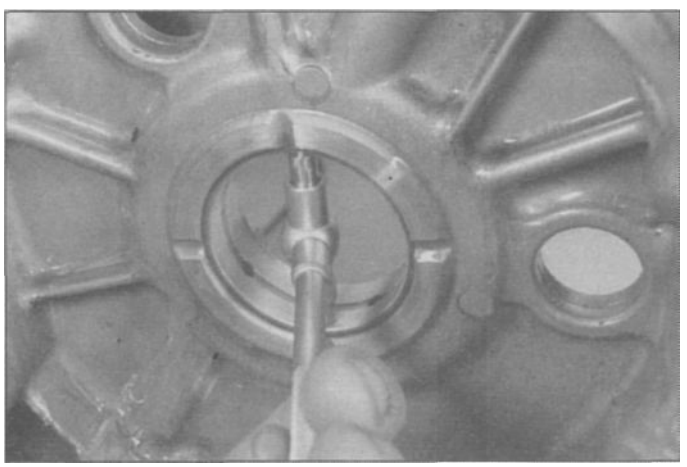
4 Clean the crankshaft with solvent, using a rifle-cleaning brush to scrub out the oil passages. If available, blow the crank dry with compressed air. Check the main and connecting rod journals for uneven wear, scoring and pits. Rub a copper coin across the journal



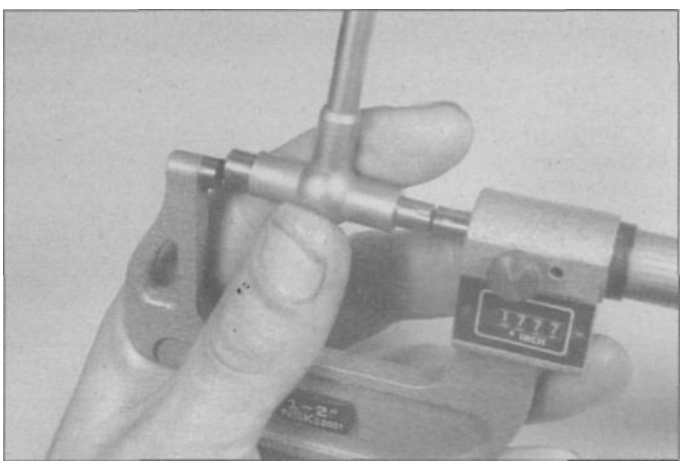
25.6 Place the crankshaft in V-blocks or a holding fixture and check for runout with a dial indicator



25.7a Measure journal diameter with a micrometer



25.7b Measure main bearing diameter with a hole gauge . . .



25.7c . . . then measure the gauge diameter with a micrometer

several times - if a journal picks up copper from the coin, it's too rough. Replace the crankshaft.

5 Check the camshaft chain sprockets on the crankshaft for chipped teeth and other wear. If any undesirable conditions are found, replace the crankshaft. Check the chains as described in Section 17. Check the rest of the crankshaft for cracks and other damage. It should be magnafluxed to reveal hidden cracks - a dealer service department or motorcycle machine shop will handle the procedure.

6 Set the crankshaft on V-blocks and check the runout with a dial indicator touching the alternator and clutch mounting surfaces **(see illustration).** Compare your findings with this Chapter's Specifications. If the runout exceeds the limit, replace the crank.

Main bearing selection

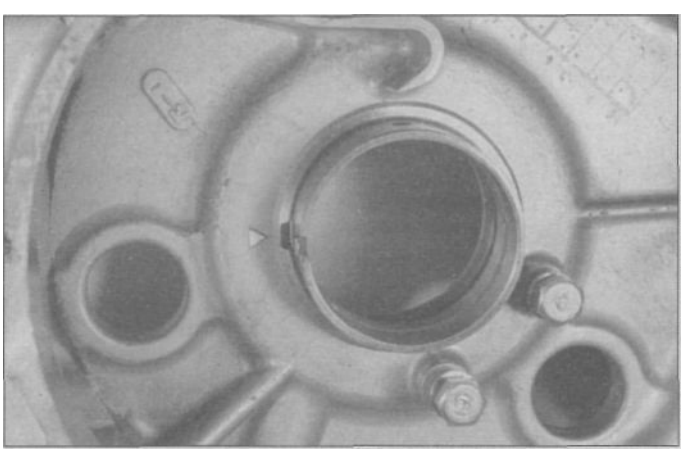
Note: *This procedure requires precision measuring equipment, a press and a special Yamaha tool. If you don't have the necessary equipment, have the procedure done by a dealer service department or motorcycle repair shop.*

Refer to illustrations 25.7a, 25.7b, 25.7c, 25.10, 25.11a, 25.11b, 25.11c and 25.11d

7 Measure the diameter of the main bearing journals with a micrometer **(see illustration).** Measure the inside diameter of the main bearings with a hole gauge and micrometer **(see illustrations).** The difference between the two measurements is bearing clearance.

8 The clearance should be within the range listed in this Chapter's Specifications.

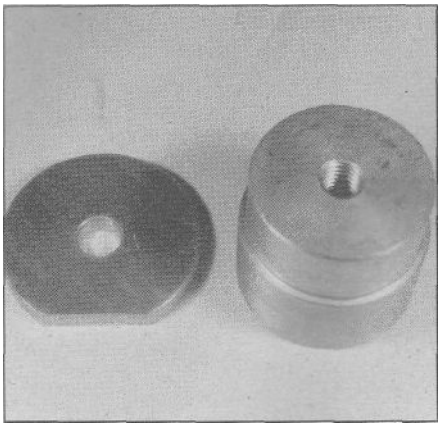
9 If clearance is greater than the service limit listed in this Chapter's Specifications and new bearings don't solve the problem, replace the crankshaft.



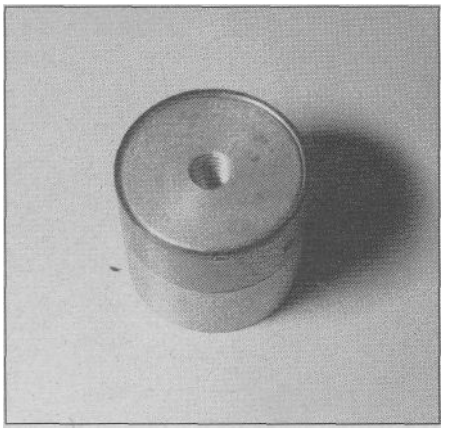
25.10 Press the main bearing out; apply pressure from the side opposite the locating tab

10 If the clearance is greater than the service limit listed in this Chapter's Specifications but journal diameter is within specifications, press the main bearings out of their bores **(see illustration).**

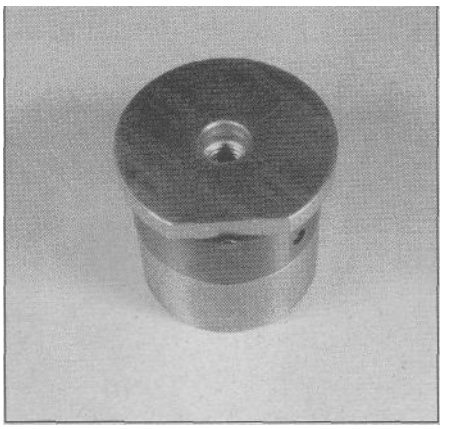
11 Measure the diameter of the bearing bores in the crankcase halves with a micrometer. If they're greater than the maximum listed in this Chapter's Specifications, replace the crankcase halves as a set. If



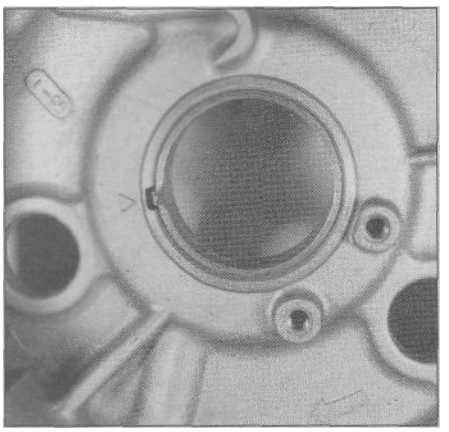
25.11a This special Yamaha tool is used to press in the main bearings ...



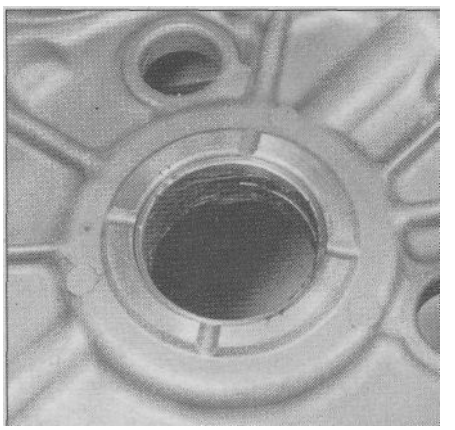
25.11b ... the bearing fits over the support...



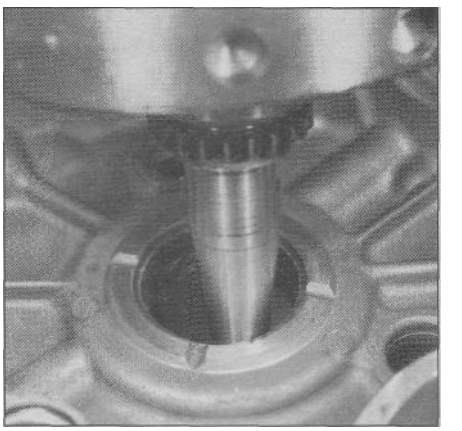
25.11c ... and the plate fits on top of the support with its flat aligned with the bearing locating tab; a handle is threaded into the support to contact the press ram



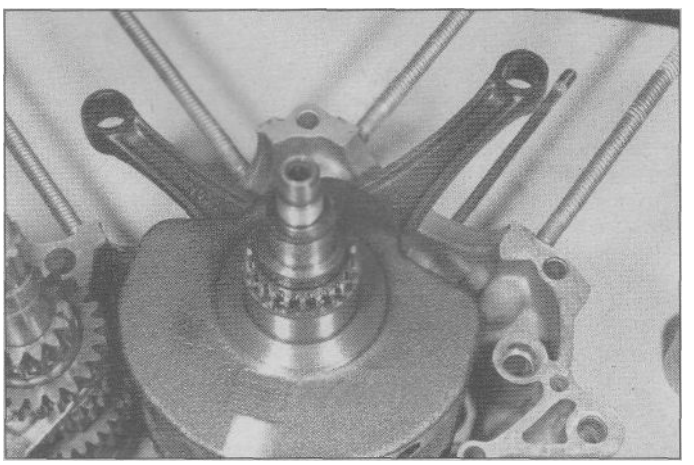
25.11 d Align the locating tab with the notch and press the bearing into its bore



25.14 Coat the bearing with assembly lube or moly-based grease



25.15a Guide the crankshaft into the main bearing ...



25.15b ... and position the connecting rods so they're aligned with the cylinders

they're within the specified limits, refer to this Chapter's Specifications for the bearing color code and install new bearings **(see illustrations)** (the color is painted on the edge of the bearing).

12 If any crank journal is out-of-round or tapered or the bearing clearance is beyond the limit listed in this Chapter's Specifications with new bearings, replace the crankshaft.

Installation

Refer to illustrations 25.14, 25.15a and 25.15b

13 Install the connecting rods on the crankshaft at this point if they were removed (see Section 26).

14 Lubricate the bearings with engine assembly lube or moly-based grease **(see illustration).**

15 Carefully lower the crankshaft into place **(see illustration).** Align the connecting rods with the cylinders **(see illustration).**

16 Assemble the case halves (see Section 22) and check to make sure the crankshaft and the transmission shafts turn freely.

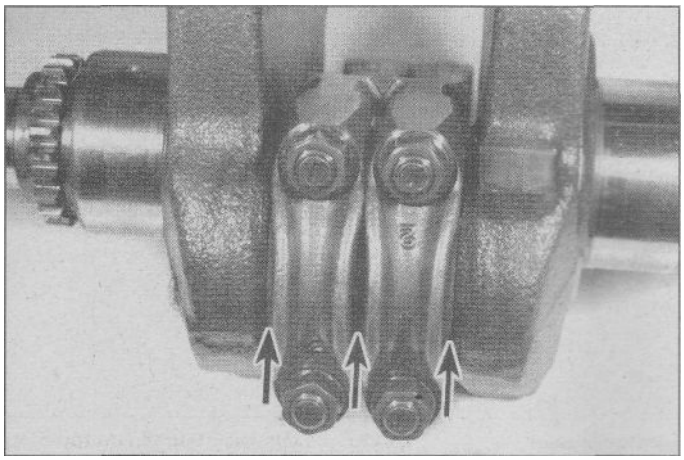
26 Connecting rods and bearings - removal, inspection, bearing selection and installation

Removal

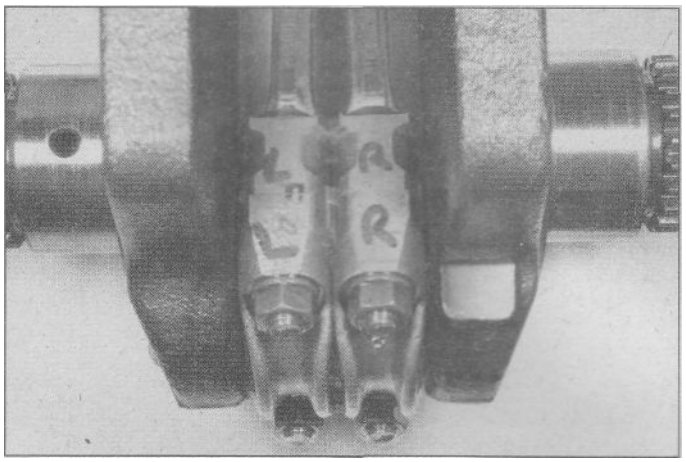
Refer to illustrations 26.1, 26.2, 26.3a and 26.3b

1 Before removing the connecting rods from the crankshaft, insert a feeler gauge between the crankshaft and the big end of each connecting rod and between the two connecting rods and measure the side clearance **(see illustration).** If the clearance on any rod is greater than that listed in this Chapter's Specifications, that rod will have to be replaced with a new one.

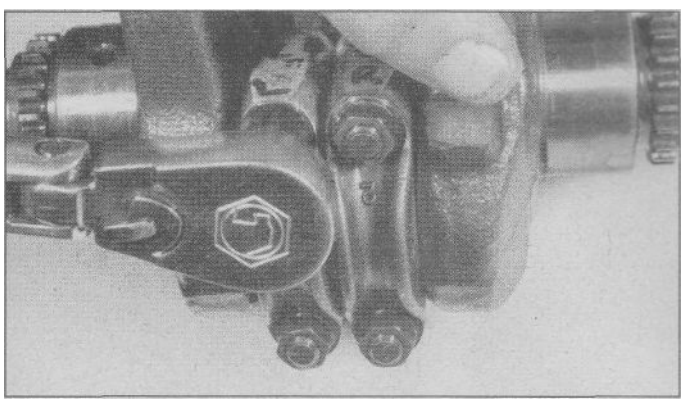
2 Using a center punch or felt pen, mark the position of each rod



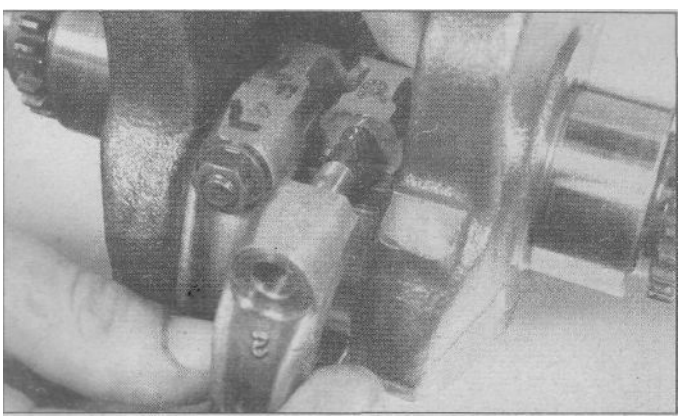
26.1 Measure big end play between the two rods and between the rods and crankshaft



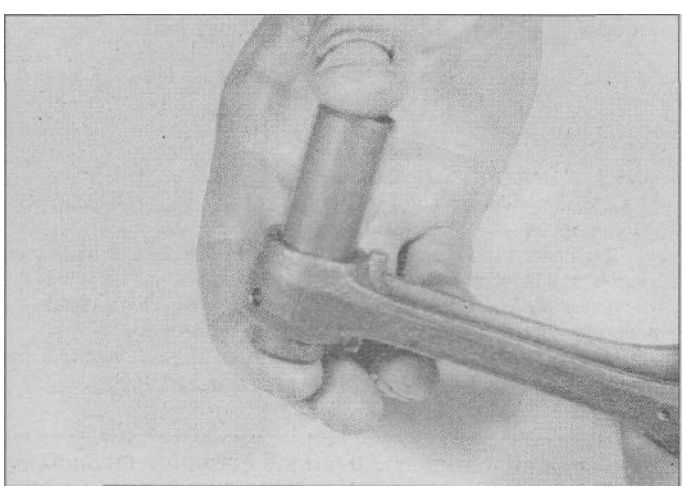
26.2 Label the rods and caps according to their position on the crankshaft (left or right)



26.3a Undo the connecting rod nuts



26.3b . . . and take off the caps



26.5 Slip the piston pin into the rod and rock it back-and-forth to check for looseness

and cap, relative to its position on the crankshaft (left or right) **(see illustration).**

3 Unscrew the bearing cap nuts, separate the cap from the rod, then detach the rod from the crankshaft **(see illustrations).** If the cap is stuck, tap on the ends of the rod bolts with a sofMaced hammer to free them.

4 Roll the bearing inserts sideways to separate them from the rods and caps. Keep them in order so they can be reinstalled in their original locations. Wash the parts in solvent and dry them with compressed air, if available.

Inspection

Refer to illustration 26.5

5 Check the connecting rods for cracks and other obvious damage. Lubricate the piston pin for each rod, install it in the proper rod and check for play **(see illustration).** If it wobbles, replace the connecting rod and/or the pin.

6 Examine the connecting rod bearing inserts. If they are scored, badly scuffed or appear to have been seized, new bearings must be installed. Always replace the bearings in the connecting rods as a set. If they are badly damaged, check the corresponding crankshaft journal. Evidence of extreme heat, such as discoloration, indicates that lubrication failure has occurred. Be sure to thoroughly check the oil pump and pressure relief valves as well as ail oil holes and passages before reassembling the engine.

7 Have the rods checked for twist and bending at a dealer service department or other motorcycle repair shop.

Connectingrodbearingselection

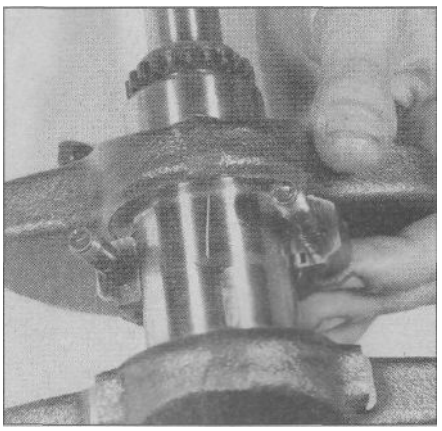
Refer to illustrations 26.11, 26.13, 26.18a, 26.18b and 26.18c

8 If the bearings and journals appear to be in good condition, **check** the oil clearances as follows:

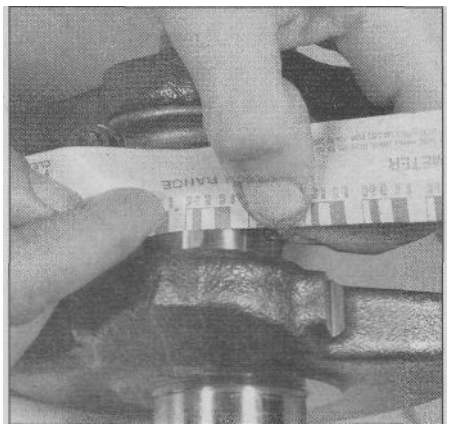
9 Start with the rod for one cylinder. Wipe the bearing **inserts and** the connecting rod and cap clean, using a lint-free cloth.

10 Install the bearing inserts in the connecting **rod and cap. Make** sure the tab on the bearing engages with the **no1**

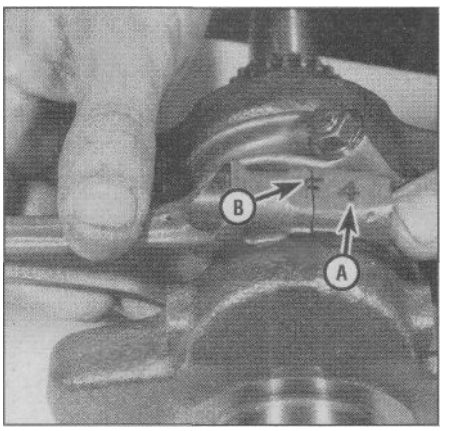
11 Wipe off the connecting rod journal **with a lint-tree**



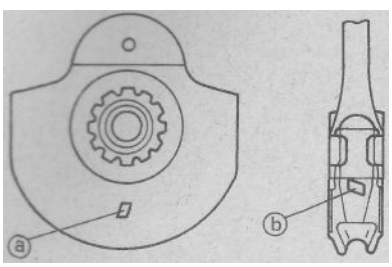
26.11 Lay a strip of Plastigage on the journal, parallel to the crankshaft centerline



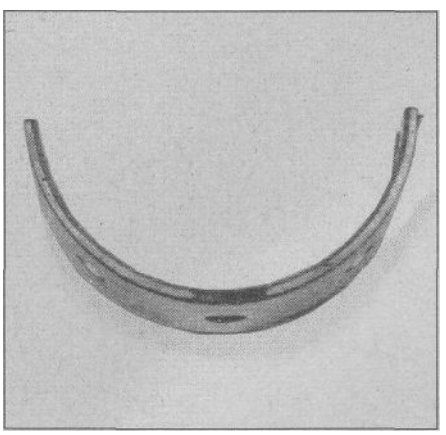
26.13 Place the Plastigage scale next to the flattened Plastigage to measure the bearing clearance



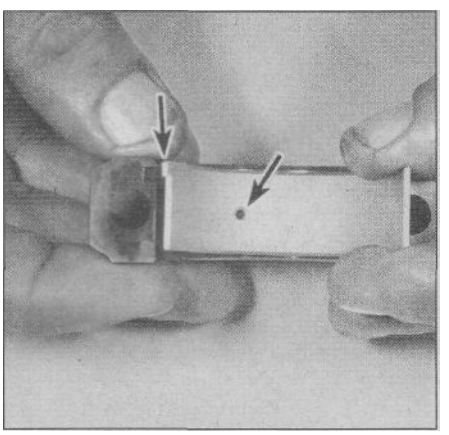
26.18a The number on the connecting rod (A) is used for bearing selection; the letter (B) is used to align the cap and rod during reassembly



26.18b The number on the rod is used together with the number on the crankshaft to select rod bearings



26.18c The color code is painted on the side of the bearing



26.20a Be sure the tab fits in the notch and the oil hole in the upper bearing aligns with the oil hole in the connecting rod (arrows)

strip of Plastigage (type HPG-1) across the top of the journal, parallel with the journal axis **(see illustration).**

12 Position the connecting rod on the journal, then install the rod cap and nuts. Tighten the nuts to the torque listed in this Chapter's Specifications, but don't allow the connecting rod to rotate at all.

13 Unscrew the nuts and remove the connecting rod and cap from the journal, being very careful not to disturb the Plastigage.. Compare the width of the crushed Plastigage to the scale printed in the Plastigage envelope to determine the bearing oil clearance **(see illustration).**

14 If the clearance is within the range listed in this Chapter's Specifications and the bearings are in perfect condition, they can be reused. If the clearance is greater than the wear limit, replace the bearing inserts with new inserts that have the same color code, then check the clearance once again. Always replace all of the inserts at the same time.

15 The clearance should be within the range listed in this Chapter's Specifications.

16 If the clearance is greater than the maximum clearance listed in this Chapter's Specifications, measure the diameter of the connecting rod journal with a micrometer. Yamaha doesn't provide diameter or wear limit specifications, but by measuring the diameter at a number of points around the journal's circumference, you'll be able to determine whether or not the journal is out-of-round. Take the measurement at each end of the journal to determine if the journal is tapered.

17 If any journal is tapered or, out-of-round or bearing clearance is beyond the maximum listed in this Chapter's Specifications (with new bearings), replace the crankshaft.

18 Each connecting rod has a 3 or 4 stamped on it in ink **(see illustration).** Subtract this number from the connecting rod journal number on the crankshaft to get a bearing number **(see illustration).** For example, the number on the connecting rod shown in the accompanying illustration is 4. The corresponding number for that connecting rod's journal, stamped into the crankshaft, is 2. Subtracting 2 from 4 produces 2, which is the bearing number for that journal'. According to the accompanying chart, bearing no. 2 is color-coded black **(see illustration).** The color codes are painted on the edges of the bearings **(see illustration).**

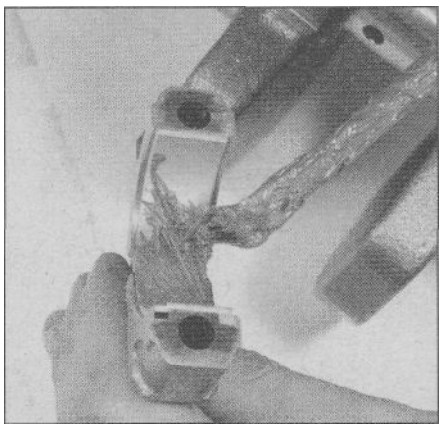
19 Repeat the bearing selection procedure for the remaining connecting rods.

Installation

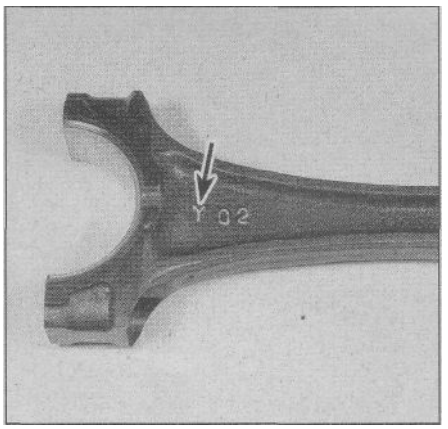
Refer to illustrations 26.20a, 26.20b, 26.21a, 26.21b and 26.22

20 Wipe off the bearing inserts, connecting rods and caps. Install the inserts into the rods and caps, using your hands only, making sure the tabs on the inserts engage with the notches in the rods and caps **(see illustration).** When all the inserts are installed, lubricate them with engine assembly lube or moly-based grease **(see illustration).** Don't get any lubricant on the mating surfaces of the rod or cap.

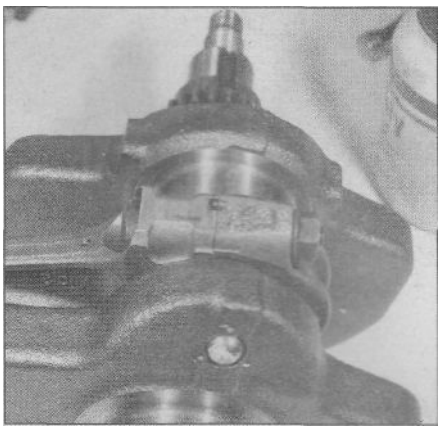
21 Assemble each connecting rod to its proper journal, referring to the previously applied cylinder numbers. Make sure the Y mark on the rod is toward the outside of the engine **(see illustration).** Also, the



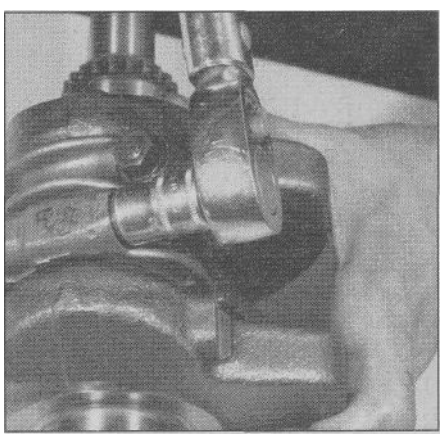
26.20b Coat the bearings with assembly lube or moly-based grease



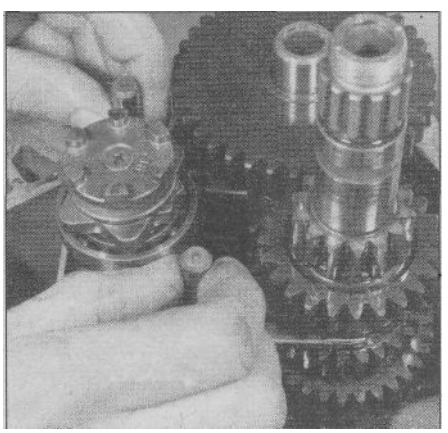
26.21a The Y mark on the connecting rod (arrow) faces the outside of the engine



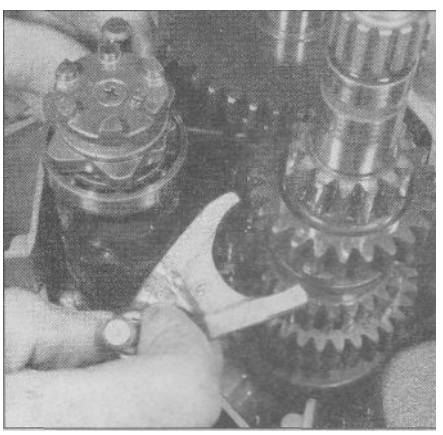
26.21b If the halves of the letter stamped on the rod and cap don't fit together perfectly, the wrong cap is on the rod (or the cap is on backwards)



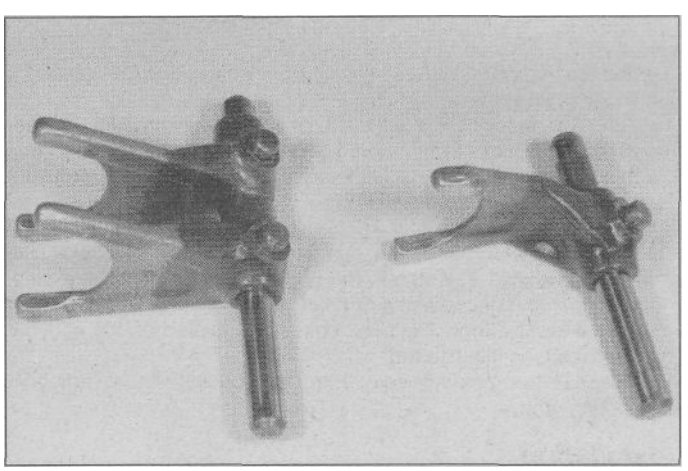
26.22 Tighten to the specified torque in stages (see text)



27.2a Lift the guide bars out...



27.2b ... and disengage the forks from the gear grooves



27.3 Reassemble the forks and guide bars so they don't get mixed up

letter present at the rod/cap seam on one side of the connecting rod should fit together perfectly when the rod and cap are assembled **(see illustration).** If it doesn't, the wrong cap is on the rod. Fix this problem before assembling the engine any further.

22 When you're sure the rods are positioned correctly, lubricate the threads of the rod bolts and the surfaces of the nuts with molybdenum disulfide grease and tighten the nuts to the torque listed in this Chapter's Specifications **(see illustration). Note:** Snug *both nuts evenly, then tighten them to the specified torque in a continuous motion. If you must stop tightening between 32 and 36 Nm (22 and 25 ft-lbs), loosen the nuts to a torque less than 32 Nm (22 ft-lbs), then retighten them to the specified torque in one continuous motion.*

23 Turn the rods on the crankshaft. If either of them feels tight, tap on the bottom of the connecting rod caps with a hammer - this should relieve stress and free them up. If it doesn't, recheck the bearing clearance.

24 As a final step, recheck the connecting rod side clearances (see Step 1). If the clearances aren't correct, find out why before proceeding with engine assembly.

27 Shift cam and forks - removal, inspection and installation

Removal

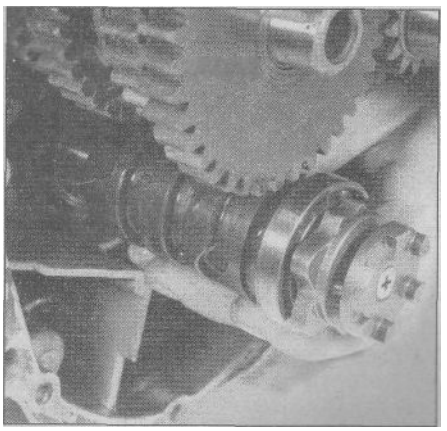
Refer.to illustrations 27.2a, 27.2b, 27.3 and 27.4

1 Remove the engine and separate the crankcase halves (see Sections 5 and 22).

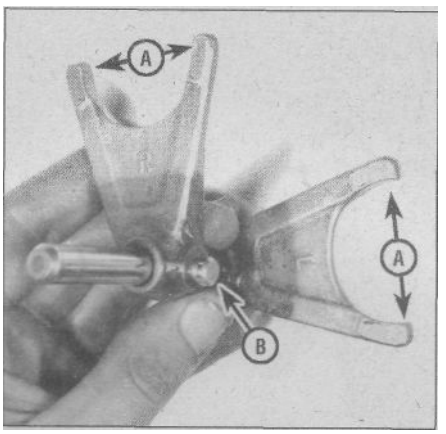
2 Pull the guide bars out and disengage the shift forks from the gear grooves **(see illustrations).**

3 As soon as they're removed, reassemble the guide bars and forks so they can be reinstalled in their correct positions (see illustration)

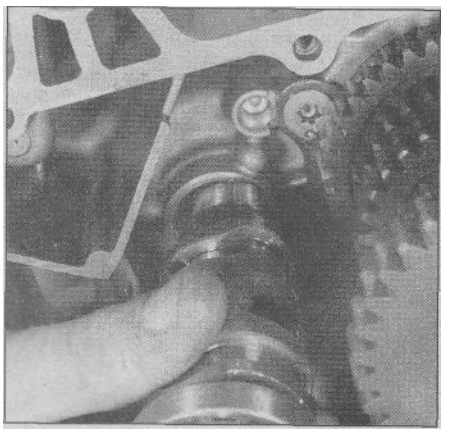
4 Pull the shift cam out of the case **(see illustration).**



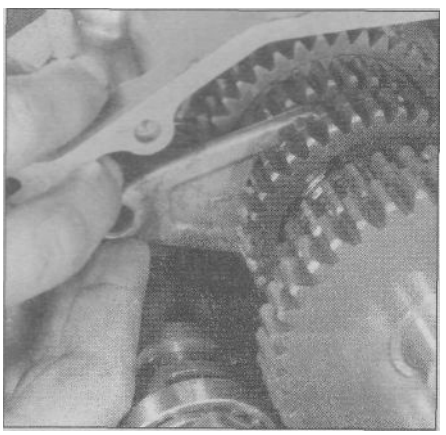
27.4 Pull the shift cam out of its bore in **the crankcase**



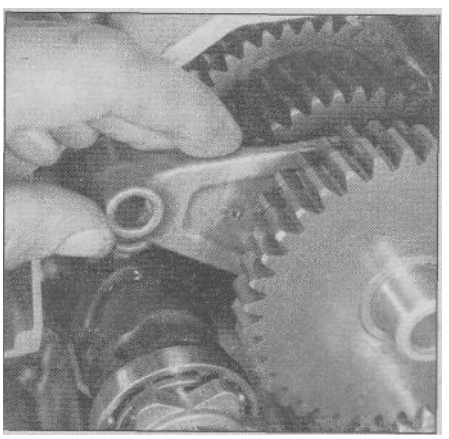
27.5 Check for wear at the fork tips (A) and guide pins (B)



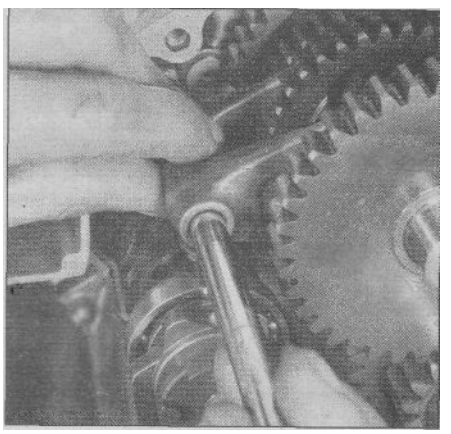
27.8a Oil the end of the shift cam and slip it into its bore in the crankcase



27.8b Position the shift fork marked L in the left-hand gear groove with its letter facing the right side of the engine .



27.8c . . . place the shift fork marked R in the groove next to the fork marked L . . .



27.8d . . . install the longer guide bar through the two forks . . .

Inspection

Refer to illustration 27.5

5 Check the edges of the grooves in the shift cam for signs of excessive wear. Check the pin on each shift cam for wear and damage **(see illustration).** If undesirable conditions are found, replace the shift cam.

6 Check the shift forks for distortion and wear, especially at the fork tips **(see illustration 27.5).** If they are discolored or severely worn they are probably bent. If damage or wear is evident, check the shift fork groove in the corresponding gear as well. Inspect the guide pins and the shaft bore for excessive wear and distortion and replace any defective parts with new ones.

7 Check the shift fork guide bars for evidence of wear, galling and other damage **(see illustration 27.5).** Make sure the shift forks move smoothly on the bar. If the bar is worn or bent, replace it with a new one.

Installation

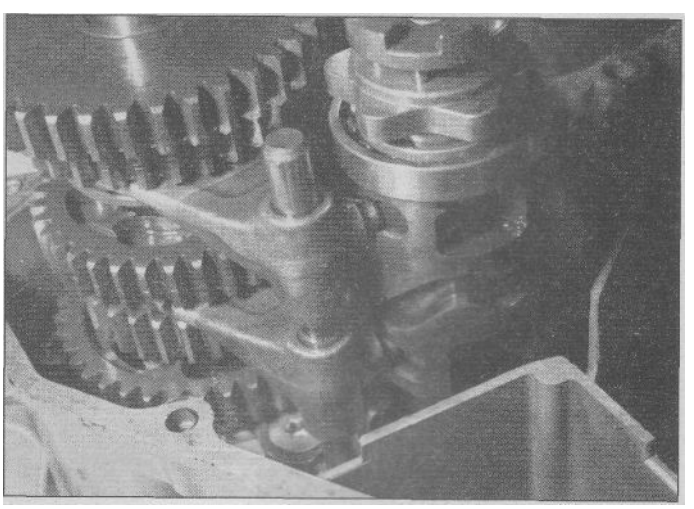
Refer to illustrations 27.8a through 27.8h

8 Installation is the reverse of removal, noting the following points:

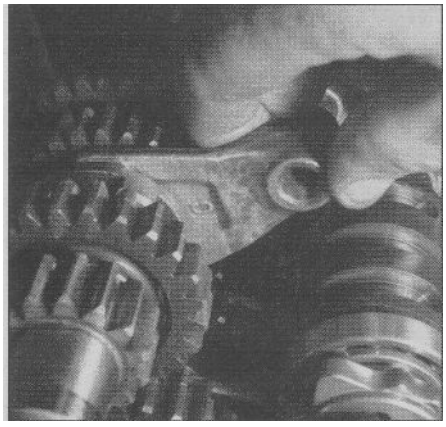
a) Lubricate all parts with engine oil before installing them.

b) Use the numbers and letters on the forks to position them correctly. The forks are numbered from one to three, starting from the left side of the engine. The numbers face the left side of the engine when the forks are installed. The letters L, C and R (left, center and right) also indicate fork position **(see illustrations).** *The letters face the right side of the engine when installed,*

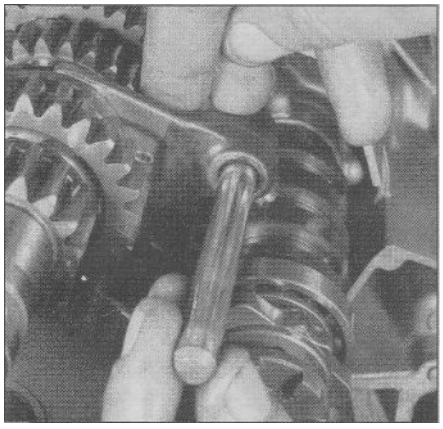
c) Engage the follower pin on each shift fork with the shift cam as you pass the guide bar through the fork. Position the shift cam and forks in the neutral position **(see illustrations).**



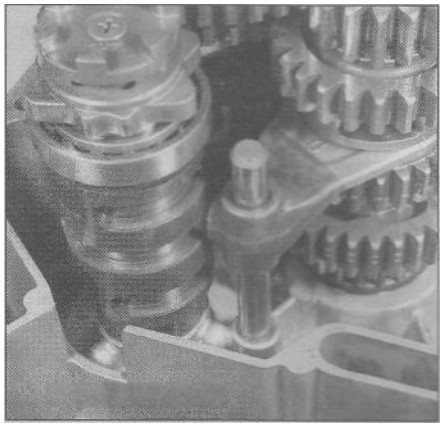
27.8e . . . (the assembled forks should look like this)



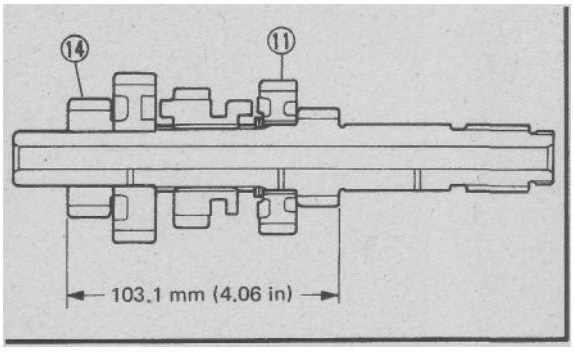
27.8f Install the shift fork marked C in its groove with the letter facing the right side of the engine ...

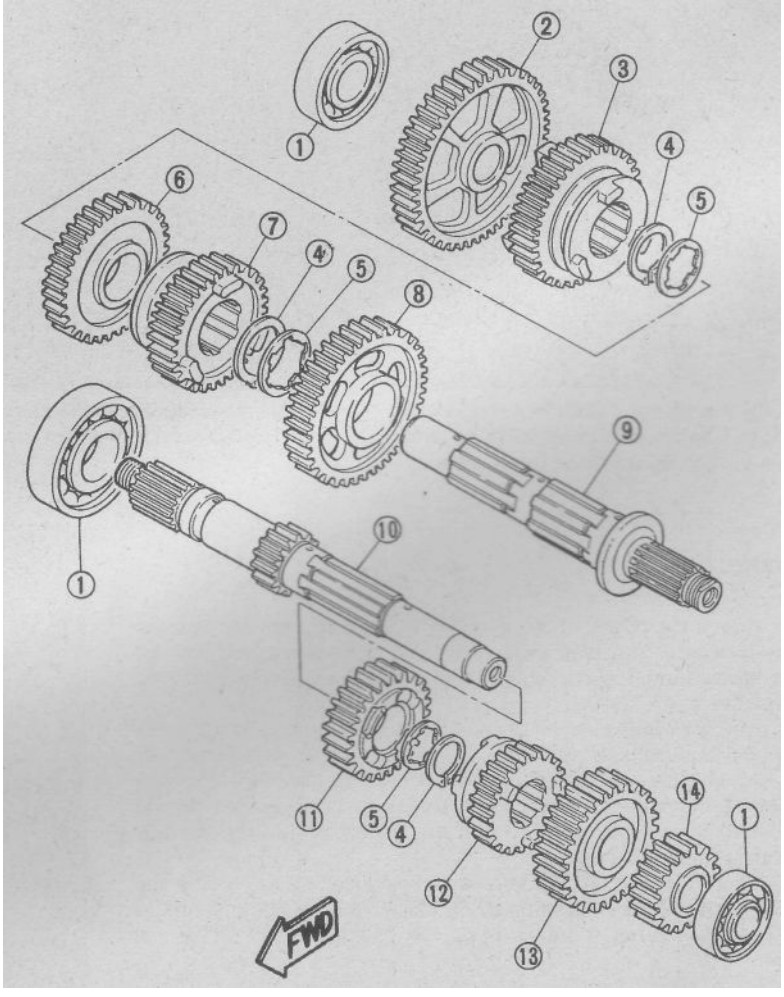


27.8g ... and install the shorter guide bar through the fork...



27.8h ... (the assembled fork and guide **bar should look like this)**





28.3a Transmission gears and shafts (XV535 models)

1) *Bearing*
2) *First wheel gear*
3) *Fourth wheel gear*
4) *Snap-ring*
5) *Thrust washer*
6) *Third wheel gear*
7) *Fifth wheel gear*
8) *Second wheel gear*
9) *Driveaxle*
10) *Main axle*
11) *Fourth pinion gear*
12) *Third pinion gear*
13) *Fifth pinion gear*
14) *Second pinion gear*

28 Transmission shafts and middle drive gear - removal, disassembly, inspection, reassembly and installation

Refer to illustrations 28.3a, 28.3b, 28.4, 28.5a, 28.5b, 28.6, 28.7, 28.8a, 28.8b, 28.9, 28.10a, 28.10b, 28.10c, 28.106, 28.11a, 28.11b, 28.11c, 28.12a and 28.12b

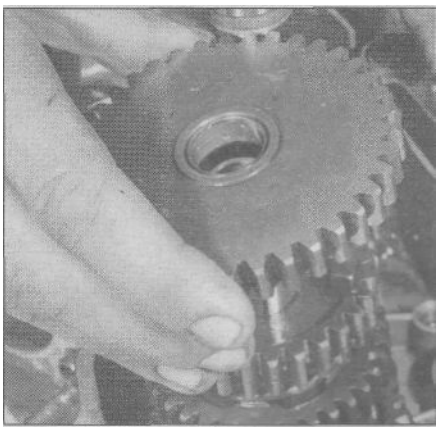
Removalanddisassembly

Driveaxle and middle drive gear

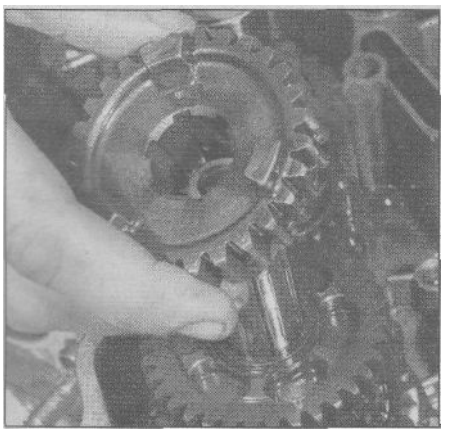
1 Remove the engine and separate the crankcase halves (see Sections 5 and 22).

2 Remove the shift drum and forks (see Section 27).

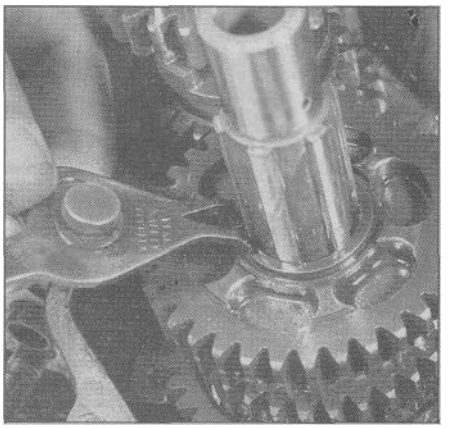
3 Remove the first wheel gear **(see illustrations). Note:** *Place the*



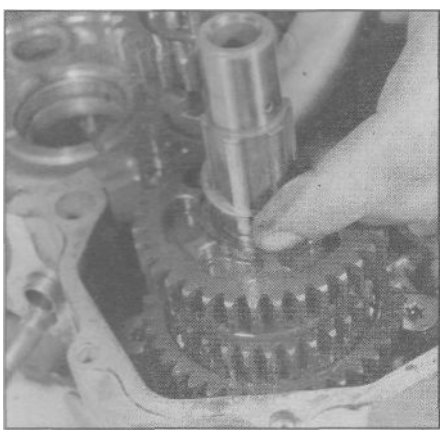
28.3b Remove first wheel gear



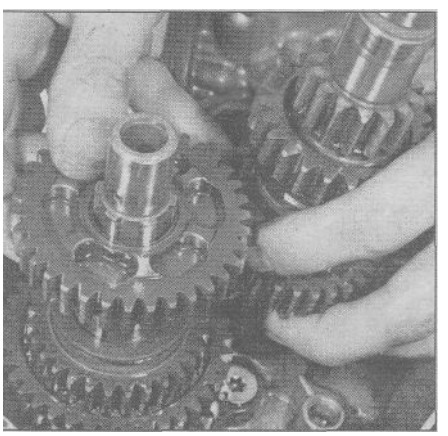
28.4 Take the fourth wheel gear off the driveaxle



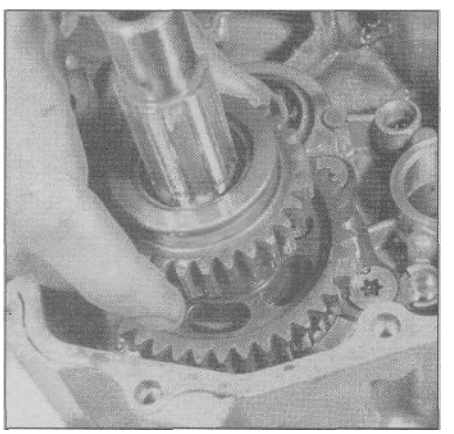
28.5a Remove the snap-ring . . .



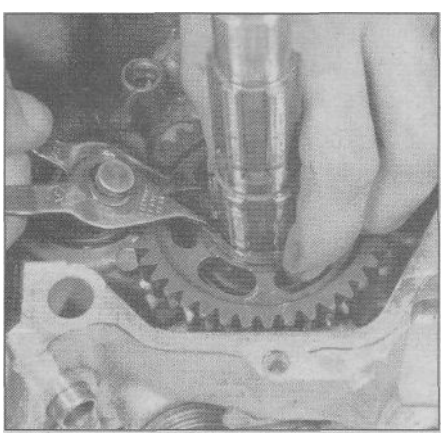
28.5b . . . and the thrust washer



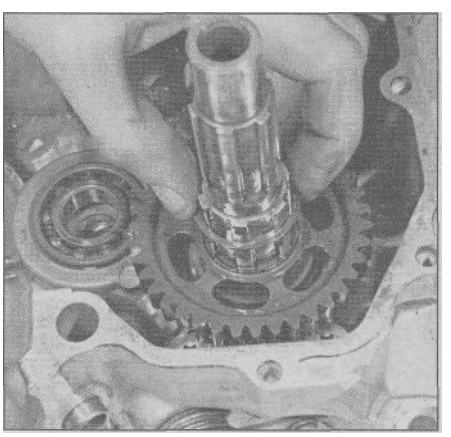
28.6 Remove the third wheel gear and main axle assembly together



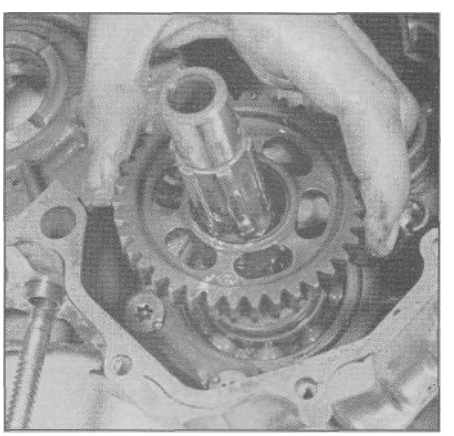
28.7 Remove the fifth wheel gear



28.8a Remove the snap-ring ,



28.8b . . . and the thrust washer



28.9 Remove the second wheel gear

gears on a rod in order as they are removed so they can be reassembled in the same order and facing in the same direction.

4 Remove the fourth wheel gear **(see illustration).**

5 Remove the snap-ring and thrust washer **(see illustrations).**

6 Remove the third wheel gear and main axle assembly together **(see illustration).**

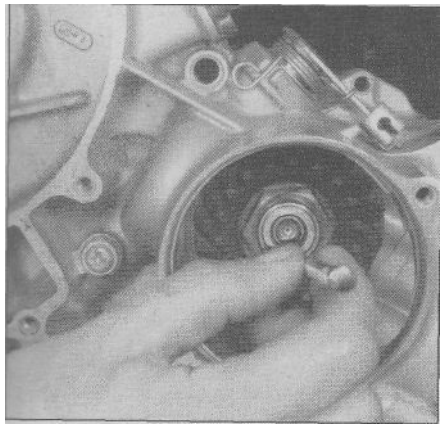
7 Remove the fifth wheel gear **(see illustration).**

8 Remove the snap-ring and thrust washer **(see illustrations).**

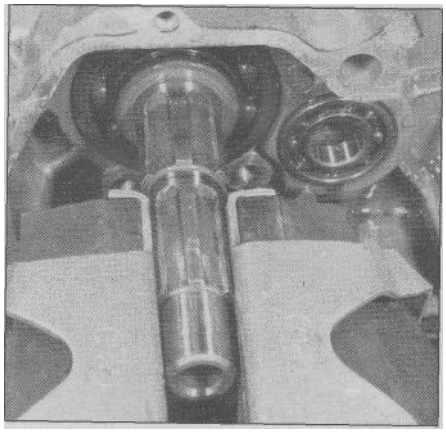
9 Remove the second wheel gear **(see illustration).**

10 The driveaxle and middle drive gear can be left in the crankcase unless they or their ball bearing need to be replaced. If any of these parts are worn or damaged, bend back the staked portion of the middle drive gear locknut **(see illustration).** Secure the driveaxle in a soft-jawed vise, then remove the locknut and lift the driveaxle out of the bearing **(see illustrations).**

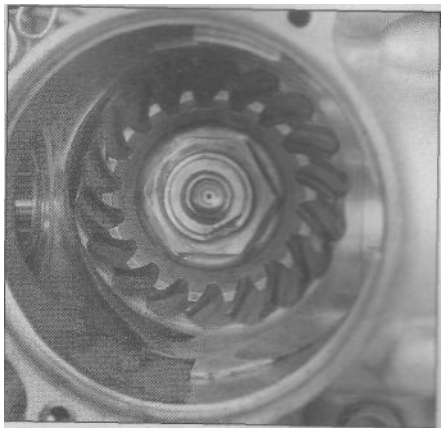
11 If the bearing needs to be replaced, undo its four retaining screws with a no. 30 Torx bit and remove the two retainers **(see illustrations). Caution:** *The screws are staked in place. Don't use anything other than*



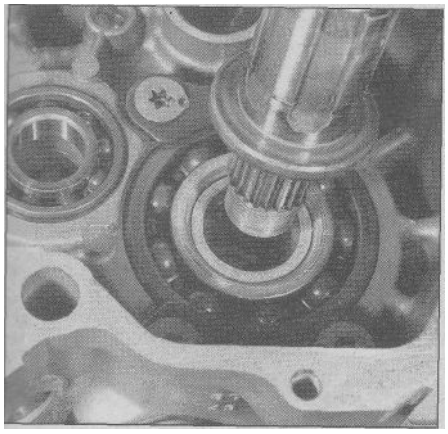
28.10a Bend back the staked portion of the locknut with a hammer and punch or small chisel



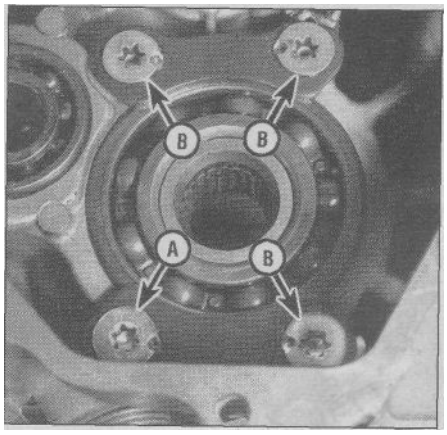
28.10b Place the driveaxle in a vise with padded jaws to prevent damage to the splines ...



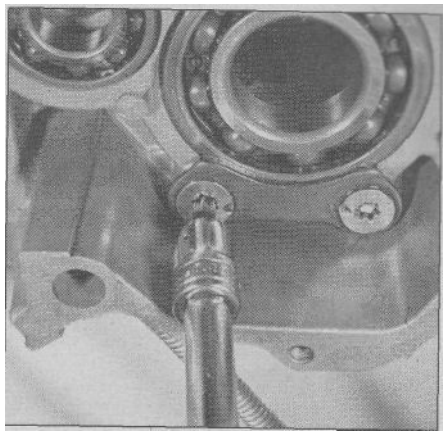
28.10c ... remove the locknut..



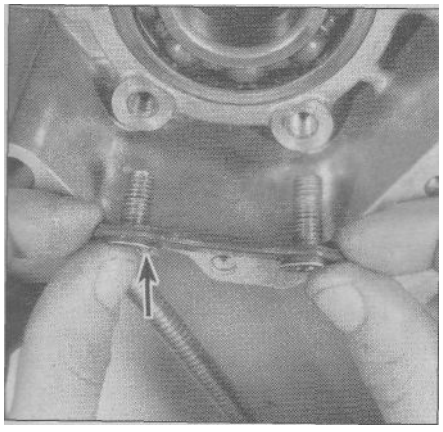
28.1Od ... and lift the driveaxle out of the crankcase



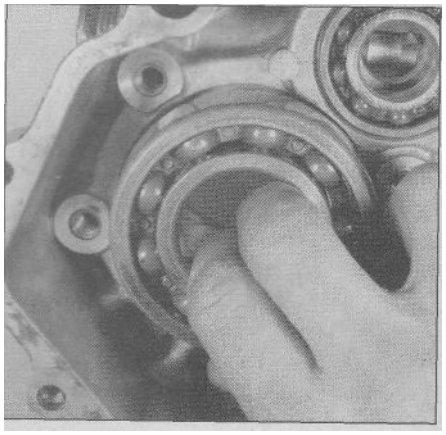
28.11a If the bearing needs to be replaced, remove one short retainer screw (A) and three longer screws (B)...



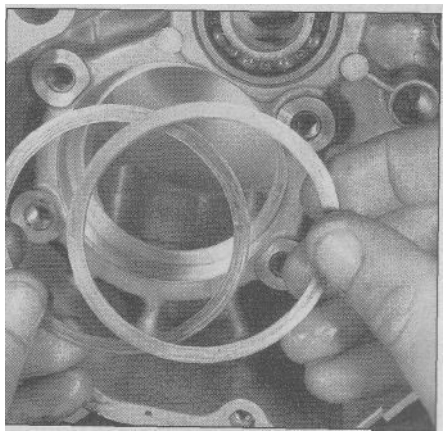
28.11b ... be sure to use the proper Torx bit to prevent rounding out the screw heads



28.11c Remove the screws and retainers, noting the location of the short screw (arrow)



28.12a Lift the bearing out of its bore (if it's tight, tap it out from the other side)...



28.12b ... and lift out the shims; keep these with the bearing so they can be reinstalled

the correct bit to loosen them or they'll be rounded out. Note that one of the screws is shorter than the other three **(see illustration).** Be sure to reinstall it in the correct location or the clutch release mechanism will be obstructed.

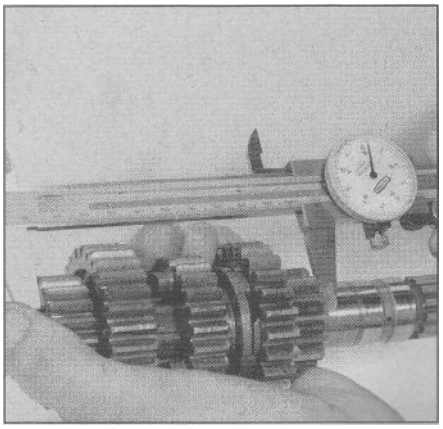
12 Lift the bearing out of its bore, then remove the shims **(see** illustrations). Keep the shims with the bearing so the correct number can be reinstalled.

Main axle

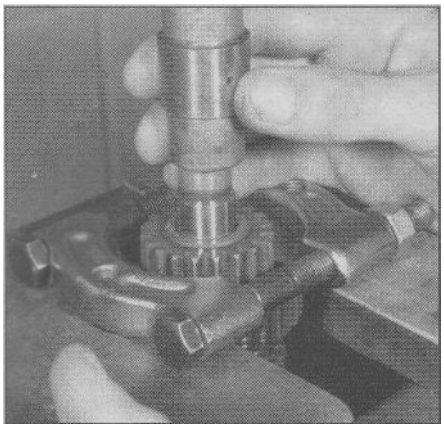
Refer to illustrations 28.13, 28.14a, 28.14b, 28.15a, 28.15b 28 16a 28.16b and 28.16c

Note: *Disassembly and reassembly of the main axle require a hydraulic press.*

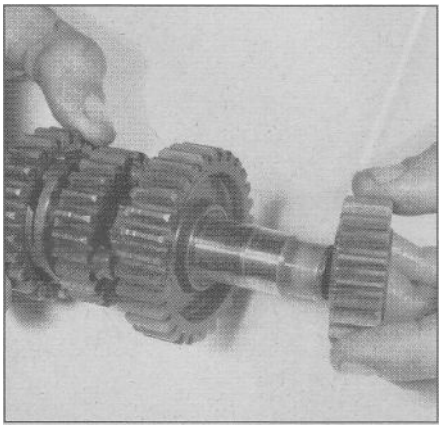
13 Before disassembly, measure the length of the gearset on the



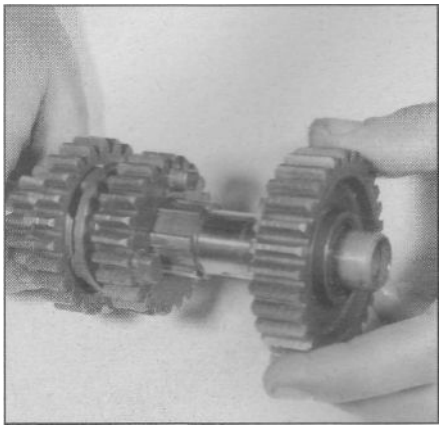
28.13 Measure the length of the gearset on the main axle assembly and compare to the Specifications



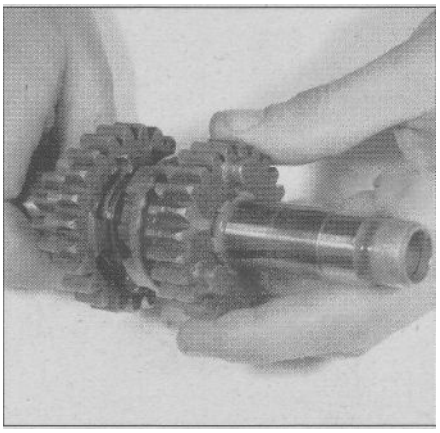
28.14a Press the main axle out of second pinion gear until it's loose . . .



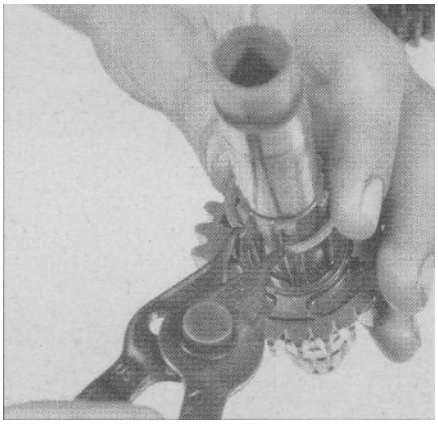
28.14b . . . then remove the gear from the shaft



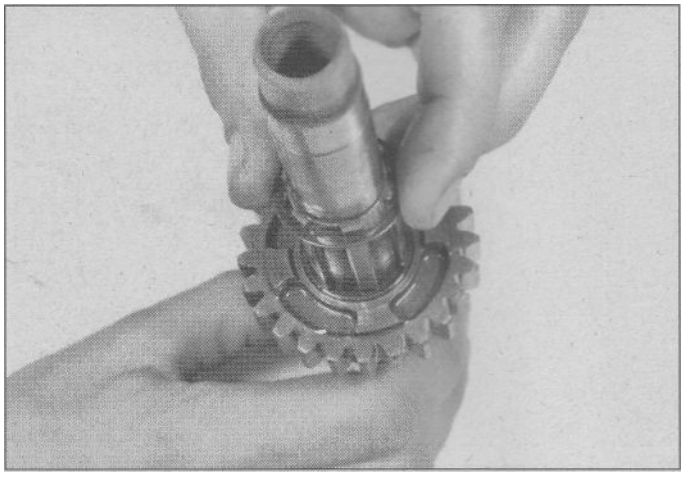
28.15a Take off fifth pinion gear. ..



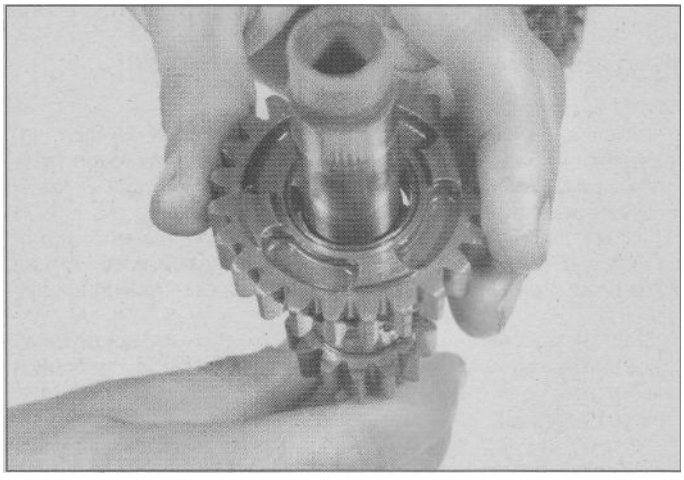
28.15b . . . and third pinion gear



28.16a Remove the snap-ring .



28.16b . . . the thrust washer . . .



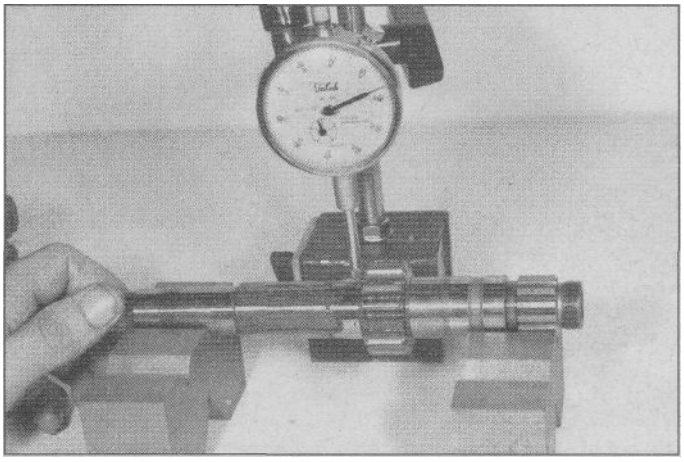
28.16c . . . and fourth pinion gear

main axle **(see illustration).** The length is determined by how far the gears are pressed onto the shaft. Compare it to the value in illustration 28.3a.

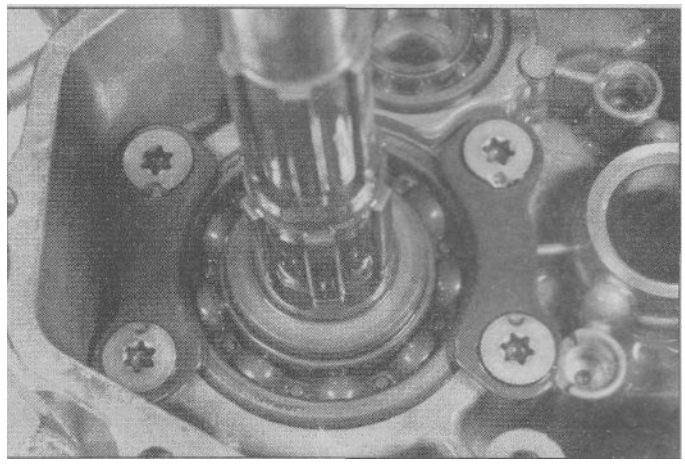
14 Place the main axle in a press with a bearing splitter behind second pinion gear **(see illustration).** Press the main axle out of second pinion gear. Once the gear is loose, take it off the shaft **(see illustration).**

15 Take fifth pinion gear off the shaft **(see illustration),** then take off third pinion gear **(see illustration).**

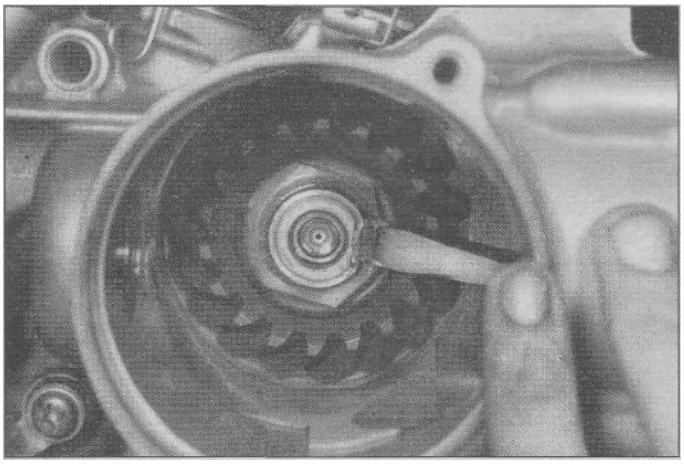
16 Remove the snap-ring and thrust washer, then take off fourth pinion gear **(see illustrations).**



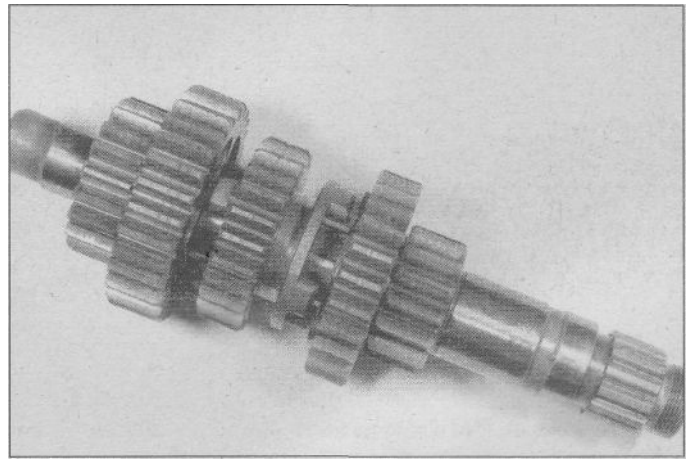
28.21 Check the shafts for runout with V-blocks and a dial indicator



28.22a Stake the bearing retainer screws . . .



28.22b . . . and the middle drive gear locknut



28.23a The assembled main axle should look like this

Inspection

Refer to illustration 28.21

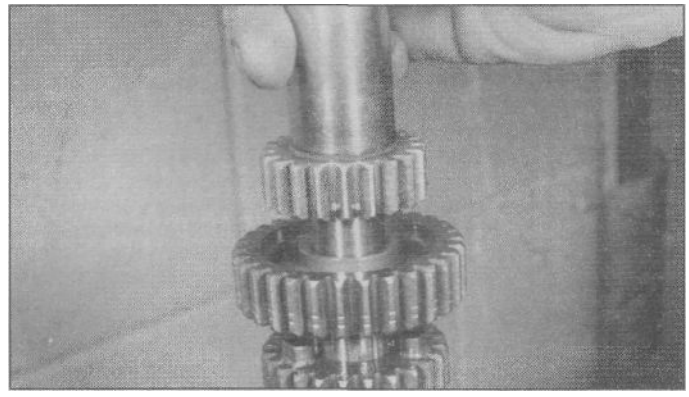
17 Wash all of the components in clean solvent and dry them off. Rotate the ball bearing on the shaft, feeling for tightness, rough spots and excessive looseness and listening for noises. If any of these conditions are found, replace the bearing with a press.

18 Check the ball bearing that was removed from the other end of the shaft and replace it if it has any of the conditions described in Step 6. The bearing should also be replaced if oil has been leaking from its seal.

19 Check the gear teeth for cracking and other oovious damage. Check the gear bushings and the surface in the inner diameter of each gear for scoring or heat discoloration. If the gear or bushing is damaged, replace it.

20 Inspect the dogs and the dog holes in the gears for excessive wear. Replace the paired gears as a set if necessary.

21 Place the shafts in V-blocks and check runout with a dial indicator **(see illustration).** Replace the shaft if runout exceeds the value listed in this Chapter's Specifications.



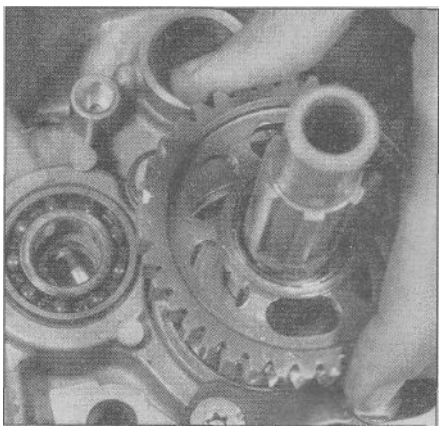
28.23b Press second pinion gear onto the shaft until the gearset is the specified length

Assemblyandinstallation

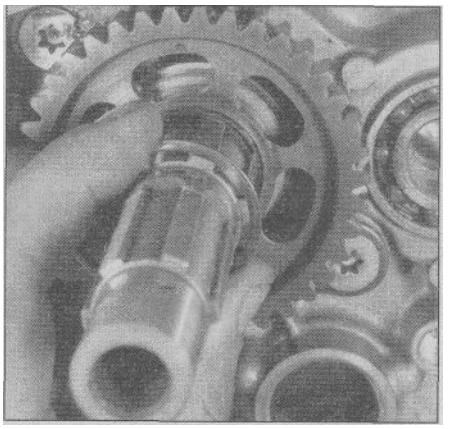
Refer to illustrations 28.22a, 28.22b, 28.23a, 28.23b, 28.24a, 28.24b, 28.24c, 28.24d, 28.25, 28.26a and 28.26b

22 If the middle gear and driveaxle were removed, reverse the removal steps to install them. Be sure the short screw goes in the correct hole **(see illustration 28.11a).** Stake the screws **(see illustration).** Install a new locknut, tighten it to the torque listed in this Chapter's Specifications and stake it **(see illustration).**

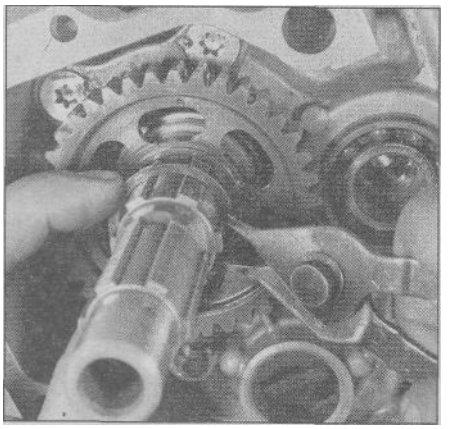
23 Reverse Steps 15 and 16 to assemble the main axle **(see illustration).** Press second pinion gear onto the shaft **(see illustration 28.23a and the accompanying illustration).**



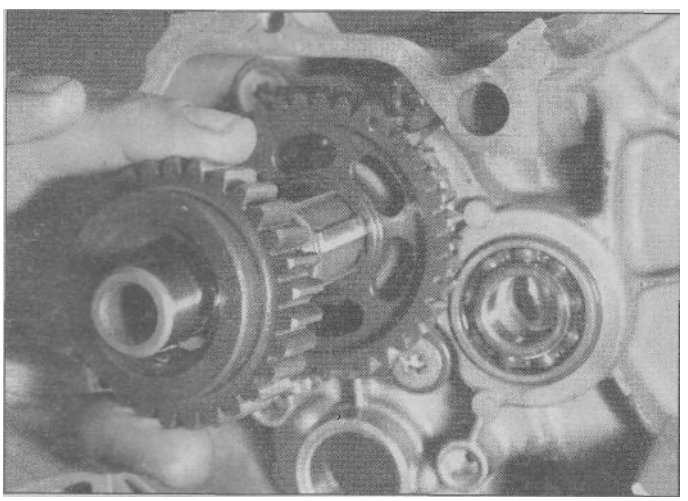
28.24a Install second wheel gear



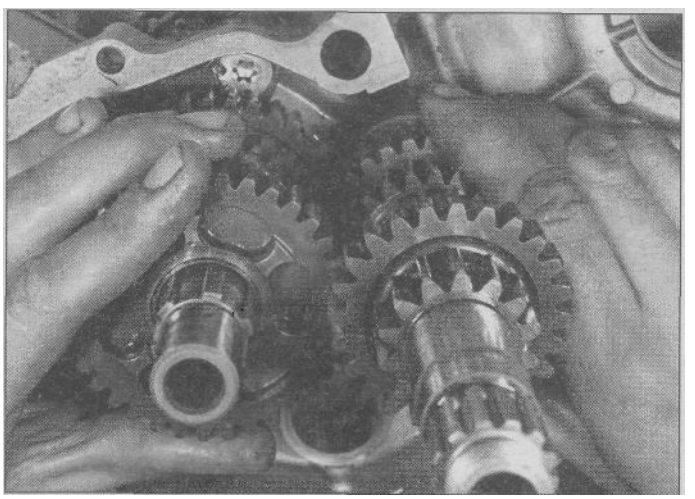
28.24b ... the thrust washer ...



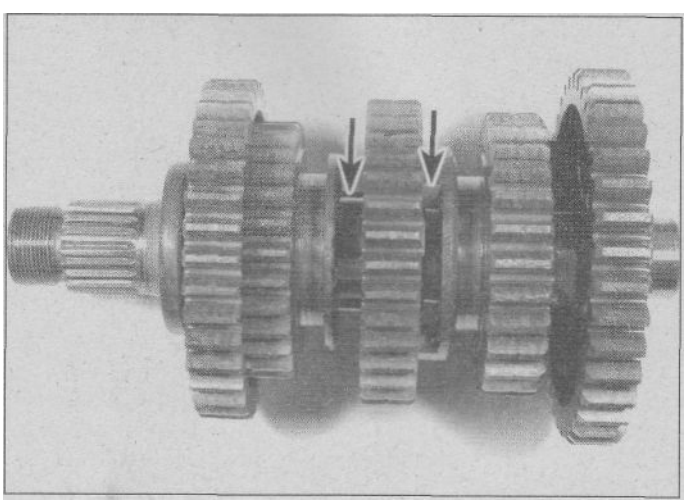
28.24c ... the snap-ring ...



28.24d ... **and fifth wheel gear**



28.25 Install third wheel gear on the main axle at the same time you install the driveaxle in its bearing



28.26a When the gears are in the neutral position, the gear dogs (arrows) are not engaged with the slots in the gears next to them and the gears can be turned independently of each other (driveaxle shown)

24 Install the second wheel gear, thrust washer, snap-ring and fifth wheel gear on the driveaxle **(see illustrations).**

25 Install the third wheel gear and main axle together **(see illustration).**

26 Reverse Steps 3 through 5 to complete assembly. The assembled gears should be in the neutral position **(see illustrations).**

27 The remainder of installation is the reverse of the removal steps.

29 Initial start-up after overhaul

1 Make sure the engine oil level is correct, then remove the spark plugs from the engine. Place the engine kill switch in the Off position and unplug the primary (low tension) wires from the coils.

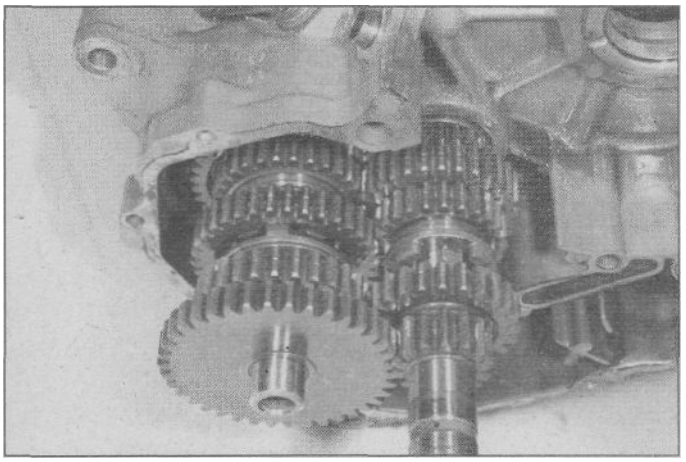
2 Turn on the key switch and crank the engine over with the starter several times to build up oil pressure. Reinstall the spark plugs, connect the wires and turn the switch to On.

3 Make sure there is fuel in the tank, then turn the fuel tap to the On position and operate the choke.

4 Start the engine and allow it to run at a moderately fast idle until it reaches operating temperature.

5 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 30 for the recommended break-in procedure.

6 Upon completion of the road test, and after the engine has cooled down completely, recheck the valve clearances (see Chapter 1).



28.26b The assembled gears and shafts should look like this

30 Recommended break-in procedure

1 Any rebuilt engine needs time to break-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 oil has circulated throughout the engine and any new parts installed have started to seat.

2 Even greater care is necessary if the engine has been rebored or a new crankshaft has been installed. In the case of a rebore, the engine will have to be broken in as if the machine were new. This means greater use of the transmission and a restraining hand on the throttle until at least 500 miles have been covered. There's no point in keeping to any set speed limit - the main idea is to keep from lugging the engine and to gradually increase performance until the 500 mile 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, which Yamaha provides for new motorcycles, can be used as a guide:

a) 0 to 90 miles (0 to 150 km): Keep engine speed below 3,000 rpm. *Turn off the engine after each hour of operation and let it cool for 5 to 10 minutes. Vary the engine speed and don't use full throttle.*

b) 90 to 300 miles (150 to 500 km): Don't run the engine for long periods above 4,000 rpm. Rev the engine freely through the gears, but don't use full throttle.

c) 300 to 600 miles (500 to 1000 km): Don't use full throttle for prolonged periods and don't cruise at speeds above 5,000 rpm.

d) At 600 miles (1,000 km): Change the engine oil and filter. Full throttle can be used after this point.

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.

Notes

Chapter 2 Part B
Engine, clutch and transmission (XV700-1100 models)

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Specifications

XV700 and XV750 models

General

Bore x stroke	
XV700	80.2x69.2 mm (3.16x2.72 inches)
XV750	83.0 x 69.2 mm (3.268 x 2.72 inches)
Displacement	
XV700	699 cc
XV750	748 cc
Compression ratio	
1981 though 1983	8.7 to 1
1984-on	9.0 to 1

Camshafts

Lobe height	
Intake	39.17 mm (1.5421 inch)
Exhaust	39.20 mm (1.5433 inch)
Base circle	
1981 through 1983	
Intake	32.00 mm (1.2598 inch)
Exhaust	32.00 mm (1.2598 inch)
1984-on	
Intake	32.23 mm (1.2689 inch)
Exhaust	32.36 mm (1.2701 inch)
Bearing oil clearance	0.020 to 0.061 mm (0.0008 to 0.0024 inch)
Journal diameter (1981 through 1983)	
Rear cylinder	24.976 to 24.980 mm (0.9830 to 0.9835 inch)
Front cylinder	23.976 to 23.9809 mm (0.9435 to 0.9440 inch)
Journal diameter (1984-on)	24.96 to 24.98 mm (0.9432 to 0.9440 inch)
Bearing bore (1981 through 1983)	
Rear cylinder	25.000 to 25.021 mm (0.9843 to 0.9851 inch)
Front cylinder	24.000 to 24.021 mm (0.9448 to 0.9456 inch)
Bearing bore (1984-on)	25.00 to 25.021 mm (0.9448 to 0.9456 inch)
Camshaft runout limit	0.03 mm (0.0012 inch)
Rocker arm inside diameter	14.000 to 14.018 mm (0.5511 to 0.5518 inch)
Rocker arm shaft diameter	13.975 to 13.990 mm (0.5501 to 0.5507 inch)
Rocker arm to shaft clearance	0.010 to 0.043 mm (0.0004 to 0.0017 inch)

Cylinder head, valves and valve springs

Cylinder head warpage limit	0.03 mm (0.0012 inch)
Valve stem bend limit	0.03 mm (0.0012 inch)
Valve head diameter	
Intake	43.0 to 43.02 mm (1.690 to 1.698 inch)
Exhaust	37.0 to 37.2 mm (1.460 to 1.468 inch)
Valve stem diameter	
Intake	7.975 to 7.990 mm (0.311 to 0.314 inch)
Exhaust	7.960 to 7.975 mm (0.3134 to 0.3140 inch)
Valve head edge thickness limit	1.3+/-0.2 mm (0.051 +/- 0.008 inch)
Valve guide inside diameter	8.000 to 8.012 mm (0.3150 to 0.3155 inch)
Valve seat width limit	1.3 +/- 0.1 mm (0.051 +/- 0.004 inch)
Valve face width	2,1 mm (0.083 inch)
Valve inner spring free length	45.3 mm (1.783 inch)
Valve inner spring installed length	38.0 mm (1.496 inch)
Valve inner spring bend limit	2.0 mm (0.0787 inch)
Valve outer spring free length	44.6 mm (1.756 inch)
Valve outer spring installed length	40.0 mm (1.575 inch)
Valve outer spring bend limit	2.0 mm (0.0787 inch)

Cylinders

Bore diameter (XV700)	
Standard	80.2 mm (3.157 inches)
Limit	80.3 mm (3.161 inches)
Bore diameter (XV750)	
Standard	83.0 mm (3.267 inches)
Limit	83.1 mm (3.272 inches)

Bore measuring point	
Through 1987	Top, center and bottom of cylinder
1988-on	35 mm (1.38 inch) from top of bore
Taper and out-of-round limit	0.05 mm (0.002 inch)
Pistons	
Piston diameter (XV700)	
Standard	80.135 to 80.185 mm (3.155 to 3.157 inches)
First oversize	80.50 mm (3.17 inches)
Second oversize	81.00 mm (3.19 inches)
Piston diameter (XV750)	
Standard	82.95 to 82.97 mm (3.266 to 3.267 inches)
First oversize	83.50 mm (3.278 inches)
Second oversize	84.00 mm (3.307 inches)
Diameter measuring point	9.5 mm (0.37 inch) from bottom of skirt
Piston-to-cylinder clearance	0.040 to 0.060 mm (0.0014 to 0.0022 inch)
Ring side clearance (1981 through 1983)	
Top and second rings	0.04 to 0.08 mm (0.0016 to 0.0031 inch)
Oil ring	Not specified
Ring side clearance (1984-on)	
Top ring	0.04 to 0.08 mm (0.0016 to 0.0031 inch)
Second ring	0.03 to 0.07 mm (0.0012 to 0.0028 inch)
Oil ring	Zero to 0.04 mm (zero to 0.0016 inch)
Ring thickness (1981 through 1983)	Not specified
Ring thickness (1984-on)	
Top and second rings	1.2 mm (0.05 inch)
Oil ring (spacer and rails)	2.5 mm (0.10 inch)
Ring end gap (1981 through 1983)	
Top and second rings	0.3 to 0.5 mm (0.0118 to 0.0197 inch)
Oil ring	0.3 to 0.9 mm (0.0118 to 0.0351 inch)
Ring end gap (1984-on)	
Top and second rings	0.20 to 0.40 mm (0.008 to 0.016 inch)
Oil ring	0.2 to 0.7 mm (0.0078 to 0.0276 inch)
Ring width (1981 through 1983)	Not specified
Ring width (1984-on)	
Top ring	3.2 mm (0.126 inch)
Second ring	3.6 mm (0.142 inch)
Oil ring	2.8 mm (0.110 inch)

Crankshaft, connecting rods and bearings

Connecting rod side clearance	0.370 to 0.474 mm (0.0146 to 0.0187 inch)
Connecting rod bearing oil clearance	0.030 to 0.054 mm (0.0012 to 0.0021 inch)
Crankshaft runout limit	0.02 mm (0.0008 inch)

Oil pump (1981 through 1983)

Inner to outer rotor clearance	0.03 to 0.09 mm (0.0012 to 0.0035 inch)
Crankshaft rotor thickness	6 mm (0.236 inch)
Transmission rotor thickness	4 mm (0.157 inch)

Oil pump (1984-on)

Inner to outer rotor clearance	0.03 to 0.09 mm (0.0012 to 0.0035 inch)
Outer rotor to housing clearance	0.03 to 0.08 mm (0.0012 to 0.0031 inch)
Rotor to straightedge clearance	0.03 to 0.09 mm (0.0012 to 0.0035 inch)

Clutch

Friction plate thickness	
Standard	2.9 to 3.1 mm (0.116 to 0.124 inch)
Minimum	2.8 mm (0.11 inch)
Steel plate thickness	1.5 to 1.7 mm (0.059 to 0.067 inch)
Steel plate warpage limit	0.1 mm (0.004 inch)
Pushrod bend limit	0.5 mm (0.02 inch)
Spring length	
Standard	41.2 mm (1.622 inch)
Minimum	40.2 mm (1.582 inch)

Transmission

Driveaxle and mainshaft runout limit	0.08 mm (0.0031 inch)

Torque specifications

Alternator cover bolts	10 Nm (7.2 ft-lbs)
Alternator cover screws	7 Nm (5.1 ft-lbs)

Torque specifications (continued)

Alternator rotor nut	See Chapter 8
Cam chain damper bolt	8 Nm (5.8 ft-lbs)
Cam chain damper bolt locknut	12 Nm ((8.7 ft-lbs)
Cam chain tensioner bolts	10 Nm (7.2 ft-lbs)
Cam sprocket bolt	55 Nm (40 ft-lbs)
Cam sprocket cover bolts	10 Nm (7.2 ft-lbs)
Camshaft retainer bolts	20 Nm (14 ft-lbs)
Clutch push screw locknut	12 Nm (8.7 ft-lbs)
Clutch boss nut	70 Nm (50 ft-lbs) (4)
Clutch cover bolts	10 Nm (7.2 ft-lbs)
Clutch pressure plate screws	8 Nm (5.8 ft-lbs)
Connecting rod nuts	48 Nm (35 ft-lbs) (2)
Crankcase bolts (6 mm)	10 Nm (7.2 ft-lbs)
Crankcase bolts (10 mm)	39 Nm (28 ft-lbs)
Cylinder bolts	10 Nm (7.2 ft-lbs)
Cylinder nuts (12 mm)	
First stage	50 Nm (36 ft-lbs) (3)
Second stage	64 Nm (46 ft-lbs)
Cylinder head bolts (8 mm)	20 Nm (14 ft-lbs)
Cylinder head nuts (10 mm)	40 Nm (29 ft-lbs)
Intermediate gear stopper plate bolts	10 Nm (7.2 ft-lbs)
Oil line union bolts	20 Nm (14 ft-lbs) (1)
Oil pump bolts	10 Nm (7.2 ft-lbs)
Oil pump chain cover bolts	10 Nm (7.2 ft-lbs)
Oil pump sprocket bolts	12 Nm (8.7 ft-lbs)
Primary drive gear nut	110 Nm (80 ft-lbs) (4)
Rocker arm cover bolts	10 Nm (7.2 ft-lbs)
Rocker arm shaft holding bolts	38 Nm (27 ft-lbs) (1)
Shift fork guide bar stopper screws	7 Nm (5.1 ft-lbs) (5)
Shift pedal pinch bolt	10 Nm (7.2 ft-lbs)

1 Use new sealing washers.
2 Apply molybdenum disulfide grease to the threads and nut surfaces; follow special tightening procedure in the text.
3 Apply engine oil to the threads.
4 Use a new lockwasher.
5 Apply Loctite Stud 'n' Bearing Mount or equivalent to the threads.

XV920 models

General

Bore x stroke	92.0 x 69.2 mm (3.622 x 2.72 inches)
Displacement	920 cc
Compression ratio	8.3 to 1

Camshafts and rocker arms

Lobe height	
Intake	39.17 mm (1.5421 inch)
Exhaust	39.20 mm (1.5433 inch)
Base circle (intake and exhaust)	32.00 mm (1.2598 inch)
Bearing oil clearance	0.020 to 0.054 mm (0.0008 to 0.0021 inch)
Journal diameter	
RH and RJ models	
Rear cylinder	23.967 to 23.980 mm (0.9435 to 0.9440 inch)
Front cylinder	24.967 to 24.980 mm (0.9483 to 0.9491 inch)
J, K, MK models (both cylinders)	24.96 to 24.98 mm (0.9432 to 0.9440 inch)
Bearing bore	
RH and RJ models	
Rear cylinder	24.000 to 24.021 mm (0.9448 to 0.9456 inch)
Front cylinder	25.000 to 25.021 mm (0.9843 to 0.9851 inch)
J, K, MK models	25.00 to 25.021 mm (0.9448 to 0.9456 inch)
Camshaft runout limit	0.03 mm (0.0012 inch)
Rocker arm inside diameter	14.000 to 14.018 mm (0.5511 to 0.5518 inch)
Rocker arm shaft diameter	13.975 to 13.990 mm (0.5501 to 0.5507 inch)
Rocker arm to shaft clearance	0.010 to 0.043 mm (0.0004 to 0.0017 inch)

Cylinder head, valves and valve springs

Cylinder head warpage limit	0.03 mm (0.0012 inch)
Valve stem bend limit	0.03 mm (0.0012 inch)

Valve head diameter	
RH models	
Intake	43.0 to 43.02 mm (1.690 to 1.698 inch)
Exhaust	37.0 to 37.2 mm (1.460 to 1.468 inch)
J, K, MK models	
Intake	47.0 to 47.2 mm (1.850 to 1.858 inch)
Exhaust	39.0 to 39.2 mm (1.540 to 1.548 inch)
Valve stem diameter	
Intake	7.975 to 7.990 mm (0.311 to 0.314 inch)
Exhaust	7.960 to 7.975 mm (0.3134 to 0.3140 inch)
Valve head edge thickness limit	1.3 +/-0.2 mm (0.051 +/- 0.008 inch)
Valve guide inside diameter	8.000 to 8.012 mm (0.3150 to 0.3155 inch)
Valve seat width limit	1.3 +/- 0.1 mm (0.051 +/- 0.004 inch)
Valve face width	2.1 mm (0.083 inch)
Valve inner spring free length	45.3 mm (1.783 inch)
Valve inner spring installed length	38.0 mm (1.496 inch)
Valve inner spring bend limit	2.0 mm (0.0787 inch)
Valve outer spring free length	44.6 mm (1.756 inch)
Valve outer spring installed length	40.0 mm (1.575 inch)
Valve outer spring bend limit	2.0 mm (0.0787 inch)

Cylinders

Bore diameter	
Standard	92.0 mm (3.622 inches)
Limit	Not specified
Bore measuring point	Top, center and bottom of cylinder
Taper and out-of-round limit	0.05 mm (0.002 inch)
Pistons	
Piston diameter	
Standard	92.0 mm (3.622 inches)
First oversize	93.25 mm (3.67 inches)
Second oversize	93.50 mm (3.68 inche.s)
Diameter measuring point	14.6 mm (0.575 inch) from bottom of skirt
Piston-to-cylinder clearance	0.045 to 0.065 mm (0.0018 to 0.0026 inch)
Ring side clearance (J, K, MK models)	
Top ring	0.04 to 0.08 mm (0.0016 to 0.0031 inch)
Second ring	0.03 to 0.07 mm (0.0012 to 0.0028 inch)
Oil ring	Zero
Ring thickness (J, K, MK models)	
Top ring	1.5 mm (0.06 inch)
Second ring	2.0 mm (0.08 inch)
Oil ring (spacer and rails)	4.0 mm (0.16 inch)
Ring end gap (J, K, MK models)	
Top and second rings	0.20 to 0.40 mm (0.008 to 0.016 inch)
Oil ring	0.3 to 0.6 mm (0.0012 to 0.0024 inch)
Ring width (J, K, MK models)	
Top ring	3.8 mm (0.15 inch)
Second ring	4.0 mm (0.16 inch)
Oil ring	3.9 mm (0.15 inch)

Crankshaft, connecting rods and bearings

Connecting rod side clearance	0.370 to 0.474 mm (0.0146 to 0.0187 inch)
Connecting rod bearing oil clearance	0.030 to 0.054 mm (0.0012 to 0.0021 inch)
Crankshaft runout limit	0.02 mm (0.0008 inch)

Oil pump

Inner to outer rotor clearance	0.03 to 0.09 mm (0.0012 to 0.0035 inch)
Crankshaft rotor thickness	6 mm (0.236 inch)
Transmission rotor thickness	4 mm (0.157 inch)

Clutch

Friction plate thickness	
Standard	2.9 to 3.1 mm (0.116 to 0.124 inch)
Minimum	2.8 mm (0.11 inch)
Steel plate thickness	1.5 to 1.7 mm (0.059 to 0.067 inch)
Steel plate warpage limit	0.1 mm (0.004 inch)
Pushrod bend limit	0.5 mm (0.02 inch)
Spring length	
Standard	41.2 mm (1.622 inch)
Minimum	40.2 mm (1.582 inch)

Transmission

Driveaxle and mainshaft runout limit	0.08 mm (0.0031 inch)

Torque specifications

Alternator cover bolts	10 Nm (7.2 ft-lbs)
Alternator cover screws	7 Nm (5.1 ft-lbs)
Alternator rotor nut	See Chapter 8
Cam chain damper bolt	8 Nm (5.8 ft-lbs)
Cam chain damper bolt locknut	12 Nm ((8.7 ft-lbs)
Cam chain tensioner bolts	10 Nm (7.2 ft-lbs)
Cam sprocket bolt	55 Nm (40 ft-lbs)
Cam sprocket cover bolts	10 Nm (7.2 ft-lbs)
Camshaft retainer bolts	20 Nm (14 ft-lbs)
Clutch push screw locknut	12 Nm (8.7 ft-lbs)
Clutch boss nut	70 Nm (50 ft-lbs) (4)
Clutch cover bolts	10 Nm (7.2 ft-lbs)
Clutch pressure plate screws	8 Nm (5.8 ft-lbs)
Connecting rod nuts	48 Nm (35 ft-lbs) (2)
Crankcase bolts (6 mm)	10 Nm (7.2 ft-lbs)
Crankcase bolts (10 mm)	39 Nm (28 ft-lbs)
Cylinder bolts	10 Nm (7.2 ft-lbs)
Cylinder head 12 mm nuts	
First stage	50 Nm (36 ft-lbs) (3)
Second stage	64 Nm (46 ft-lbs)
Cylinder head bolts (8 mm)	20 Nm (14 ft-lbs)
Cylinder head nuts (10 mm)	40 Nm (29 ft-lbs)
Intermediate gear stopper plate bolts	10 Nm (7.2 ft-lbs)
Oil line union bolts	20 Nm (14 ft-lbs) (1)
Oil pump bolts	10 Nm (7.2 ft-lbs)
Oil pump chain cover bolts	10 Nm (7.2 ft-lbs)
Oil pump sprocket bolts	12 Nm (8.7 ft-lbs)
Primary drive gear nut	110 Nm (80 ft-lbs) (4)
Rocker arm cover bolts	10 Nm (7.2 ft-lbs)
Rocker arm shaft holding bolts	38 Nm (27 ft-lbs) (1)
Shift fork guide bar stopper screws	7 Nm (5.1 ft-lbs) (5)
Shift pedal pinch bolt	10 Nm (7.2 ft-lbs)

7 Use new sealing washers.
2 Apply molybdenum disulfide grease to the threads and nut surfaces; follow special tightening procedure in the text.
3 Apply engine oil to the threads.
4 Use a new lockwasher.
5 Apply Loctite Stud 'n' Bearing Mount or equivalent to the threads.

XV1000 models

General

Bore x stroke	95.0 x 69.2 mm (3.74 x 2.72 inches)
Displacement	981 cc
Compression ratio	8.3 to 1

Camshafts

Lobe height	
Intake	39.17 mm (1.5421 inch)
Exhaust	39.20 mm (1.5433 inch)
Base circle	
Intake	32.17 mm (1.2665 inch)
Exhaust	32.27 mm (1.2705 inch)
Bearing oil clearance	0.020 to 0.061 mm (0.0008 to 0.0024 inch)
Journal diameter	24.96 to 24.98 mm (0.9432 to 0.9440 inch)
Bearing bore	25.00 to 25.021 mm (0.9448 to 0.9456 inch)
Camshaft runout limit	0.03 mm (0.0012 inch)
Rocker arm inside diameter	14.000 to 14.018 mm (0.5511 to 0.5518 inch)
Rocker arm shaft diameter	13.975 to 13.990 mm (0.5501 to 0.5507 inch)
Rocker arm to shaft clearance	0.010 to 0.043 mm (0.0004 to 0.0017 inch)

Cylinder head, valves and valve springs

Cylinder head warpage limit	0.03 mm (0.0012 inch)
Valve stem bend limit	0.03 mm (0.0012 inch)
Valve head diameter	
Intake	47.0 to 47.02 mm (1.850 to 1.858 inch)
Exhaust	39.0 to 39.2 mm (1.540 to 1.562 inch)

Valve stem diameter	
Intake	7.975 to 7.990 mm (0.311 to 0.314 inch)
Exhaust	7.960 to 7.975 mm (0.3134 to 0.3140 inch)
Valve head edge thickness limit	1.3 +/- 0.2 mm (0.051 +/- 0.008 inch)
Valve guide inside diameter	8.000 to 8.012 mm (0.3150 to 0.3155 inch)
Valve seat width limit	1.3 +/- 0.1 mm (0.051 +/- 0.004 inch)
Valve face width	2.1 mm (0.083 inch)
Valve inner spring free length	45.3 mm (1.783 inch)
Valve inner spring installed length	38.0 mm (1.496 inch)
Valve inner spring bend limit	2.0 mm (0.0787 inch)
Valve outer spring free length	44.6 mm (1.756 inch)
Valve outer spring installed length	40.0 mm (1.575 inch)
Valve outer spring bend limit	2.0 mm (0.0787 inch)

Cylinders

Bore diameter	
Standard	95.0 mm (3.740 inches)
Limit	95.1 mm (3.744 inches)
Bore measuring point	Top, center and bottom of cylinder
Taper and out-of-round limit	0.05 mm (0.002 inch)
Pistons	
Piston diameter	
Standard	94.945 to 94.965 mm (3.738 to 3.739 inches)
First oversize	95.50 mm (3.76 inches)
Second oversize	96.00 mm (3.78 inches)
Diameter measuring point	14.6 mm (0.575 inch) from bottom of skirt
Piston-to-cylinder clearance	0.045 to 0.065 mm (0.0018 to 0.0026 inch)
Ring side clearance	
Top ring	0.04 to 0.08 mm (0.0016 to 0.0031 inch)
Second ring	0.03 to 0.07 mm (0.0012 to 0.0028 inch)
Oil ring	Zero
Ring thickness	
Top and second rings	1.5 mm (0.06 inch)
Oil ring (spacer and rails)	3.8 mm (0.15 inch)
Ring end gap	
Top and second rings	0.30 to 0.50 mm (0.012 to 0.020 inch)
Oil ring	0.3 to 0.9 mm (0.012 to 0.035 inch)
Ring width	
Top ring	3.8 mm (0.15 inch)
Second ring	4.0 mm (0.16 inch)
Oil ring	3.9 mm (0.153 inch)

Crankshaft, connecting rods and bearings

Connecting rod side clearance	0.370 to 0.474 mm (0.0146 to 0.0187 inch)
Connecting rod bearing oil clearance	0.030 to 0.054 mm (0.0012 to 0.0021 inch)
Crankshaft runout limit	0.02 mm (0.0008 inch)

Oil pump

Inner to outer rotor clearance	0.03 to 0.09 mm (0.0012 to 0.0035 inch)
Outer rotor to housing clearance	0.03 to 0.08 mm (0.0012 to 0.0031 inch)
Rotor to straightedge clearance	0.03 to 0.09 mm (0.0012 to 0.0035 inch)

Clutch

Friction plate thickness	
Standard	2.9 to 3.1 mm (0.116 to 0.124 inch)
Minimum	2.8 mm (0.11 inch)
Steel plate thickness	1.5 to 1.7 mm (0.059 to 0.067 inch)
Steel plate warpage limit	0.1 mm (0.004 inch)
Pushrod bend limit	0.5 mm (0.02 inch)
Spring length	
Standard	41.2 mm (1.622 inch)
Minimum	40.2 mm (1.582 inch)

Transmission

Driveaxle and mainshaft runout limit	0.08 mm (0.0031 inch)

Torque specifications

Alternator cover bolts	10 Nm (7.2 ft-lbs)
Alternator cover screws	7 Nm (5.1 ft-lbs)
Alternator rotor nut	See Chapter 8

Torque specifications (continued)

Cam chain damper bolt	8 Nm (5.8 ft-lbs)'
Cam chain damper bolt locknut	12 Nm ((8.7 ft-lbs)
Cam chain tensioner bolts	10 Nm (7.2 ft-lbs)
Cam sprocket bolt	55 Nm (40 ft-lbs)
Cam sprocket cover bolts	10 Nm (7.2 ft-lbs)
Camshaft bushing bolts	20 Nm (14 ft-lbs)
Clutch push screw locknut	12 Nm (8.7 ft-lbs)
Clutch boss nut	70 Nm (50 ft-lbs) (4)
Clutch cover bolts	10 Nm (7.2 ft-lbs)
Clutch pressure plate screws	8 Nm (5.8 ft-lbs)
Connecting rod nuts	48 Nm (35 ft-lbs) (2)
Crankcase bolts (6 mm)....	10 Nm (7.2 ft-lbs)
Crankcase bolts (10 mm)	39 Nm (28 ft-lbs)
Cylinder bolts	10 Nm (7.2 ft-lbs)
Cylinder head bolts (8 mm)	20 Nm (14 ft-lbs)
Cylinder head nuts (10 mm)	35 Nm (25 ft-lbs)
Cylinder head nuts (12 mm)	50 Nm (36 ft-lbs)
Intermediate gear stopper plate bolts	10 Nm (7.2 ft-lbs)
Oil line union bolts	20 Nm (14 ft-lbs) (1)
Oil pump bolts	10 Nm (7.2 ft-lbs)
Oil pump chain cover bolts	10 Nm (7.2 ft-lbs)
Oil pump sprocket bolts	12 Nm (8.7 ft-lbs)
Primary drive gear nut	110 Nm (80 ft-lbs) (4)
Rocker arm cover bolts	10 Nm (7.2 ft-lbs)
Rocker arm shaft holding bolts	38 Nm (27 ft-lbs) (1)
Shift fork guide bar stopper screws	7 Nm (5.1 ft-lbs) (5)
Shift pedal pinch bolt	10 Nm (7.2 ft-lbs)

1 Use new sealing washers.
2 Apply molybdenum disulfide grease to the threads and nut surfaces; follow special tightening procedure in the text.
3 Apply engine oil to the threads.
4 Use a new lockwasher.
5 Apply Loctite Stud 'n' Bearing Mount or equivalent to the threads.

XV1100 models

General

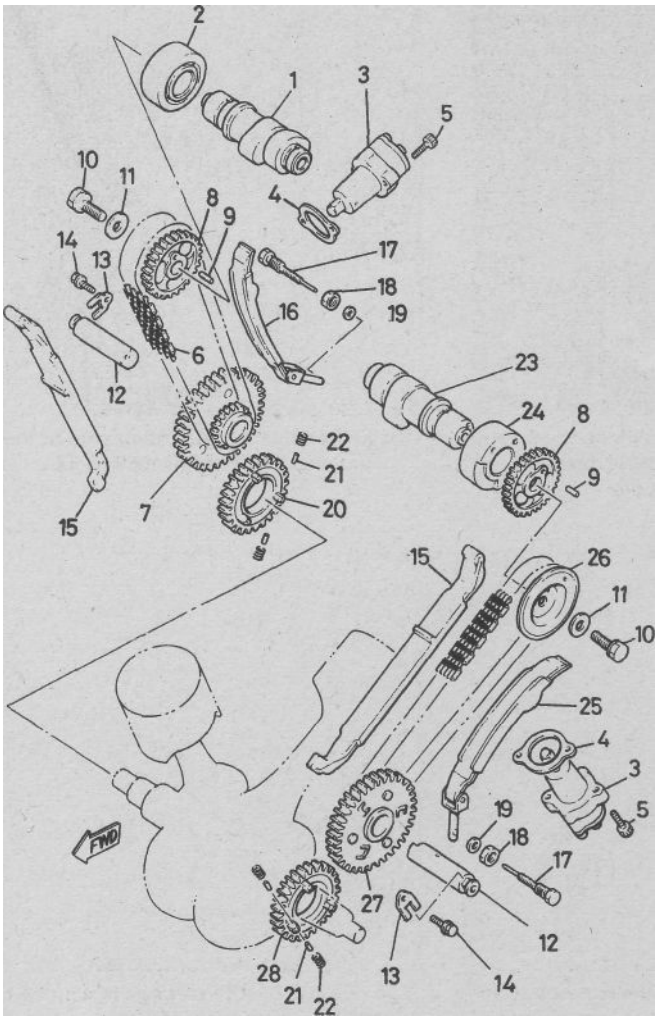
Bore x stroke	95.0 x 75.0 mm (3.74 x 2.95 inches)
Displacement	1063cc
Compression ratio	8.3 to 1

Camshafts

Lobe height	
Intake	39.17 mm (1.5421 inch)
Exhaust	39.20 mm (1.5433 inch)
Base circle	
intake	32.17 mm (1.2665 inch)
Exhaust	32.27 mm (1.2705 inch)
Bearing oil clearance	0.020 to 0.061 mm (0.0008 to 0.0024 inch)
Journal diameter	24.96 to 24.98 mm (0.9432 to 0.9440 inch)
Bearing bore	25.00 to 25.021 mm (0.9483 to 0.9451 inch)
Camshaft runout limit	0.03 mm (0.0012 inch)
Rocker arm inside diameter	14.000 to 14.018 mm (0.5511 to 0.5518 inch)
Rocker arm shaft diameter	13.975 to 13.990 mm (0.5501 to 0.5507 inch)
Rocker arm to shaft clearance	0.010 to 0.043 mm (0.0004 to 0.0017 inch)

Cylinder head, valves and valve springs

Cylinder head warpage limit	0.03 mm (0.0012 inch)
Valve stem bend limit	0.03 mm (0.0012 inch)
Valve head diameter	
Intake	47.0 to 47.02 mm (1.850 to 1.858 inch)
Exhaust	39.0 to 39.2 mm (1.540 to 1.562 inch)
Valve stem diameter	
Intake	7.975 to 7.990 mm (0.311 to 0.314 inch)
Exhaust	7.960 to 7.975 mm (0.3134 to 0.3140 inch)
Valve head edge thickness limit	1.3 +/- 0.2 mm (0.051 +/- 0.008 inch)
Valve guide inside diameter	8.000 to 8.012 mm (0.3150 to 0.3155 inch)
Valve seat width limit	1.3 +/- 0.1 mm (0.051 +/- 0.004 inch)



7.1b Camshaft, cam chains and tensioners

1	*Front cylinder camshaft*	15	*Chain guide*
2	*Camshaft bearing*	16	*Tensioner side chain guide*
3	*Cam chain tensioner*	17	*Pivot shaft*
4	*Gasket*	18	*Nut*
5	*Bolt*	19	*Washer*
6	*Cam chain*	20	*Drive pinion*
7	*Intermediate gear*	21	*Pin*
8	*Camshaft sprocket*	22	*Spring*
9	*Pin*	23	*Rear cylinder camshaft*
10	*Bolt*	24	*Camshaft bearing*
11	*Washer*	25	*Tensioner blade*
12	*Gear spindle*	26	*Oil baffle plate*
13	*retaining plate*	27	*intermediate gear*
14	*Bolt*	28	*Drive pinion*

Installation

Refer to illustration 5.23

23 Installation is the reverse of removal. Note the following points:

a) If you're working on a shaft drive model, engage the driveshaft with the swingarm as the engine is moved into position. Some models have a viewing port in the swingarm, covered by a plug **(see illustration).**

b) Don't tighten any of the engine mounting fasteners until they all have been installed.

c) Use new gaskets at all exhaust pipe connections.

d) Tighten the engine mounting bolts (and stud, if equipped) securely.

e) Adjust the rear brake rod, clutch cable and throttle cable(s) following the procedures in Chapter 1 and Chapter 3.

f) Be sure to refill the engine oil before starting the engine.

6 Engine disassembly and reassembly - general information

Refer to illustrations 6.2a, 6.2b and 6.3

1 Before disassembling the engine, clean the exterior with a degreaser and rinse it with water. A clean engine will make the job easier and prevent the possibility of getting dirt into the internal areas of the engine.

2 In addition to the precision measuring tools mentioned earlier, you will need a torque wrench, a valve spring compressor, oil gallery brushes, a piston ring removal and installation tool, a piston ring compressor and a clutch holder tool (which is described in Section 17). Some new, clean engine oil of the correct grade and type, some engine assembly lube (or moly-based grease), a tube of Yamaha Quick Gasket (part no. 11001-05-01) or equivalent, and a tube of RTV (silicone) sealant will also be required. Although it may not be considered a tool, some Plastigage (type HPG-1) should also be obtained to use for checking connecting rod bearing oil clearances **(see illustrations).**

3 An engine support stand made from short lengths of lumber bolted together will facilitate the disassembly and reassembly procedures **(see illustration).** The perimeter of the mount should be just big enough to accommodate the crankcase when it's laid on its side for removal of the crankshaft and transmission components. If you have an automotive-type engine stand, an adapter plate can be made from a piece of plate, some angle iron and some nuts and bolts. The adapter plate can be attached to the engine mounting bolt holes.

4 When disassembling the engine, keep "mated" parts together (including gears, cylinders, pistons, 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 heads
Remove the camshafts
Remove the rocker arms
Remove the cylinders
Remove the pistons
Remove the clutch and primary gear
Remove the alternator rotor and starter clutch (see Chapter 8)
Remove the oil pump
Remove the external shift mechanism
Remove the cam chains and intermediate gears
Separate the crankcase halves
Remove the crankshaft and connecting rods
Remove the shift cam/forks
Remove the transmission shafts/gears
Remove the oil pressure relief valve

6 Reassembly is accomplished by reversing the general disassembly sequence.

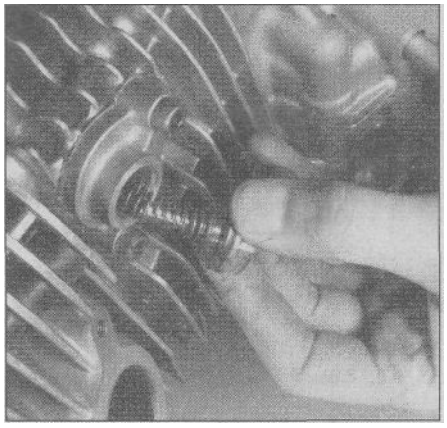
7 Camshaft chain tensioners - removal and installation

Removal

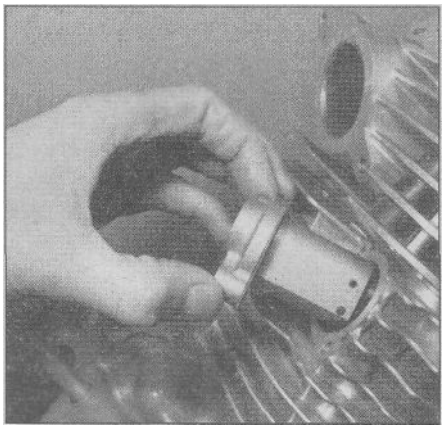
Refer to illustrations 7.1a, 7.1b, 7.2a and 7.2b

Caution: *Once you start to remove the tensioner bolts, you must remove the tensioner all the way and reset it before tightening the bolts. The tensioner extends and locks in place, so if you loosen the bolts partway and then retighten them, the tensioner or cam chain will be damaged.*

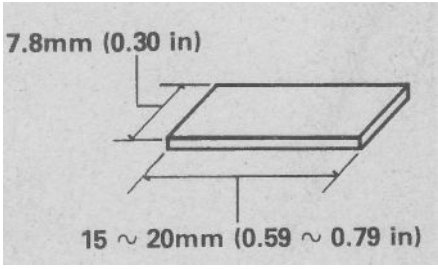
1 If you're working on a model with Type A tensioners, remove the Allen bolts and take the tensioner off **(see illustrations).**



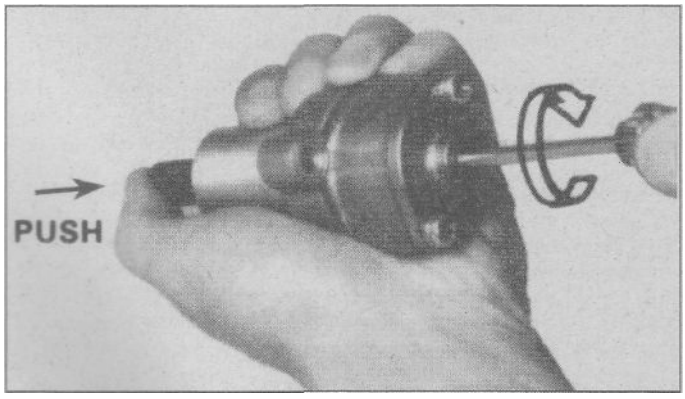
7.2a If the engine has Type B tensioners, unscrew the tensioner from the body and take it out



7.2b Remove the Allen bolts and take the tensioner body out of the cylinder



7.3 Cam chain tensioner keeper dimensions



7.5 Turn the screwdriver clockwise while pushing the tensioner piston into the body

2 If you're working on a model with hex-head (Type B) tensioners, remove the tensioner cap bolt and spring while the tensioner is still installed on the engine **(see illustration).** Remove the tensioner body Allen bolts and take it off the engine **(see illustration).**

Installation

Type A tensioners

Refer to illustrations 7.3 and 7.5

3 Fabricate a keeper tool from steel 1 mm (0.039 inch) thick **(see illustration).**

4 Pry the rubber plug out of the tensioner,

5 Insert a small screwdriver and turn it clockwise while pushing the tensioner piston into the tensioner **(see illustration).** When the piston is all the way in, hold it there, remove the screwdriver and install the keeper tool to hold the tensioner in position.

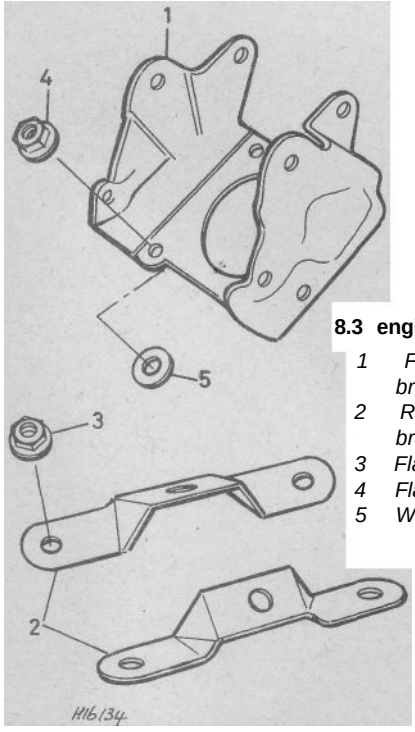
6 Install the tensioner on the engine, using a new gasket. Tighten the mounting bolts to the torque listed in this Chapter's Specifications. Remove the keeper tool and install the rubber plug.

Type B tensioners

7 Install the tensioner body on the cylinder, using a new gasket, and tighten its mounting bolts to the torque listed in this Chapter's Specifications.

8 Check the sealing washer on the cap bolt for cracks or hardening. It's a good idea to replace this washer whenever the tensioner cap is removed.

9 Release the one-way cam on the chain tensioner and compress the tensioner piston into the tensioner body (see Part A of this Chapter). Install the tensioner on the cylinder, using a new gasket.



8.3 engine mounting brackets

1 Front cylinder mounting bracket
2 Rear cylinder mounting bracket
3 Flange nuts (short)
4 Flange nuts (long)
5 Washers

10 Install the tensioner spring, sealing washer and cap. Tighten the cap to the torque listed in this Chapter's Specifications.

8 Cylinder heads, camshafts and rocker arms - removal, inspection and installation

Cylinderheadremoval

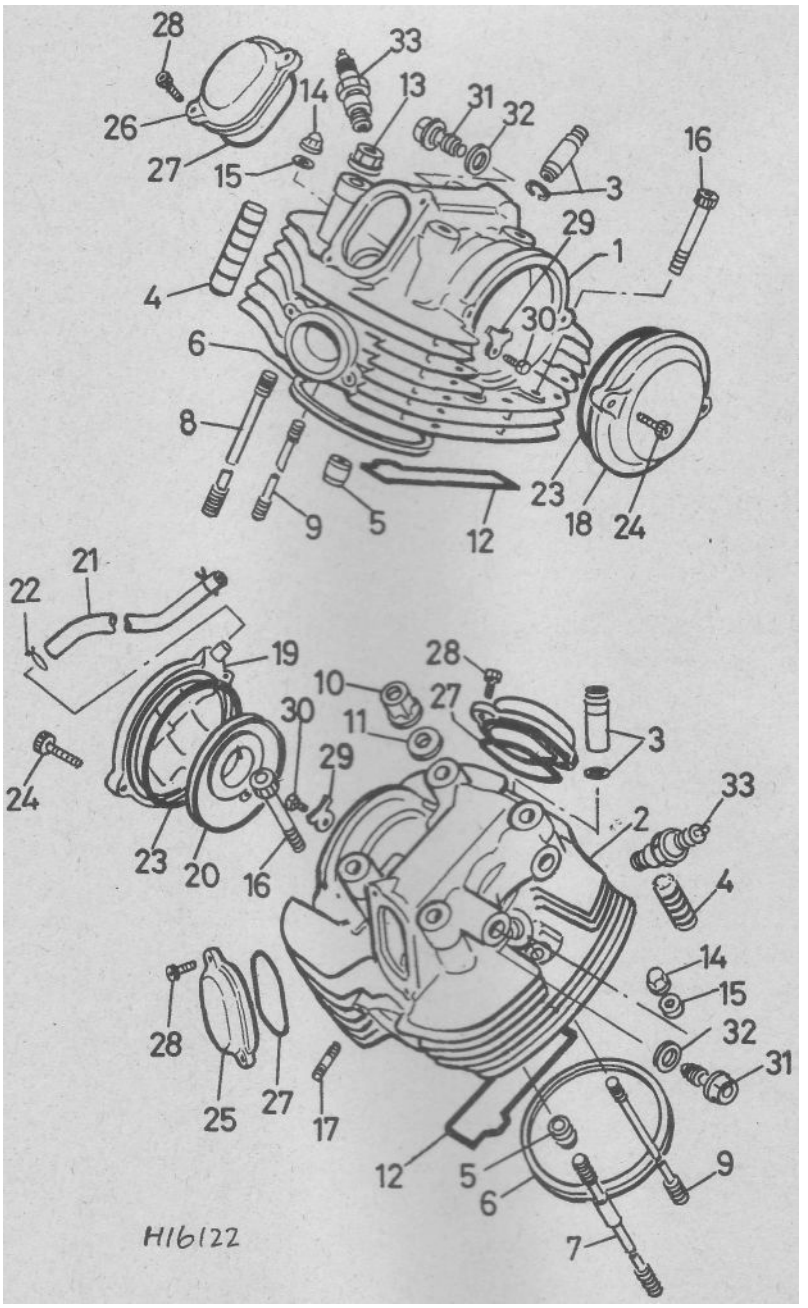
Refer to illustrations 8.3, 8.4a, 8.4b, 8.4c and 8.5

1 Remove the engine from the frame (see Section 5).

2 Remove the ignition coil mounting bracket and ignition coils from the front cylinder (see Chapter 4). Remove the carburetors, intake joints and air induction pipes (if equipped) (see Chapter 3).

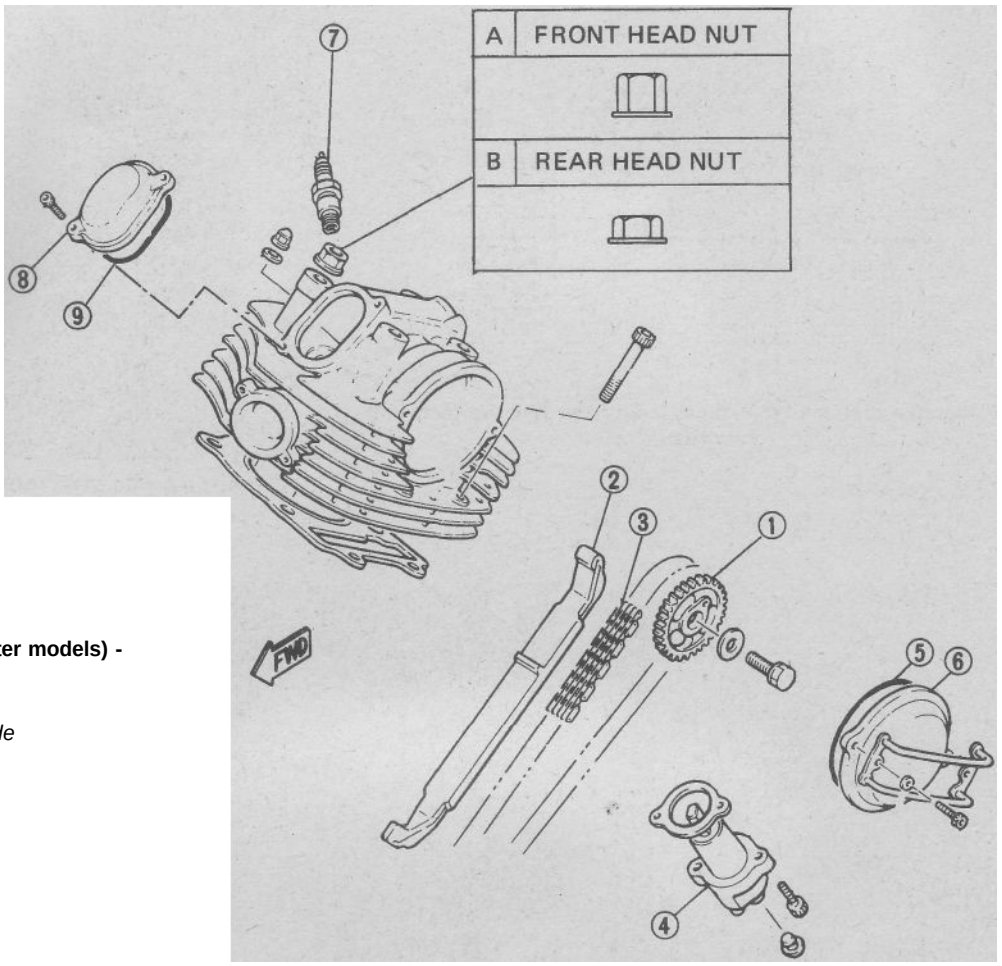
3 Remove the engine mounting bracket, its washers and nuts from the front cylinder head **(see illustration).**

4 Remove the Allen bolts and take off the cam sprocket cover **(see illustrations).** Stuff clean shop towels into the opening below the sprocket so nothing is accidentally dropped into it.



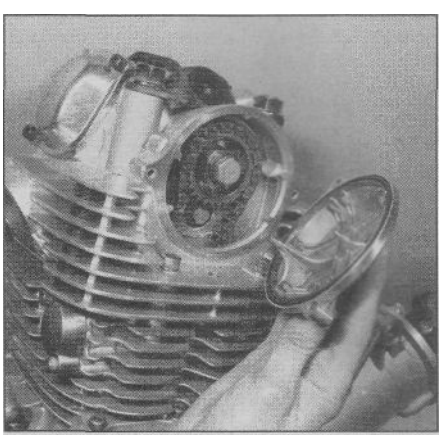
8.4a Cylinder heads (1981 through 1983 models) - exploded view

1 *Front cylinder head*
2 *Rear cylinder head*
3 *Valve guide and snap-ring*
4 *Damping block*
5 *Locating dowel*
6 *Head gasket*
7 *Front cylinder stud*
8 *Rear cylinder stud*
9 *Stud*
10 *Nut*
11 *Copper washer*
12 *Cam chain tunnel O-ring*
13 *Nut*
14 *Domed nut*
15 *Washer*
16 *Bolt*
17 *Exhaust mounting stud*
18 *Cam chain sprocket cover*
19 *Cam chain sprocket cover*
20 *Oil baffle plate*
21 *Crankcase vent hose*
22 *Hose clamp*
23 *O-ring*
24 *Bolt*
25 *Rocker arm cover*
26 *Rocker arm cover*
27 *O-ring*
28 *Bolt*
29 *Lockwasher*
30 *Bolt*
31 *Oil pipe union bolt*
32 *Sealing washer*
33 *Spark plug*

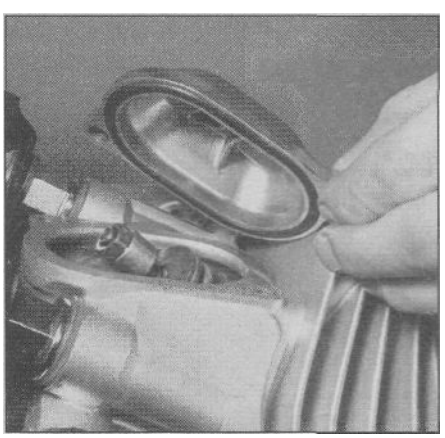


8.4b Cylinder heads (1984 and later models) - exploded view

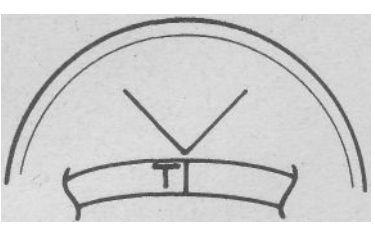
1 Cam sprocket
2 Front cam chain guide
3 Cam chain
4 Cam chain tensioner
5 O-ring
6 Cam sprocket cover
7 Spark plug
8 Rocker arm cover
9 O-ring



8.4c Remove the cam sprocket cover; use a new O-ring on installation



8.5 Remove the rocker arm cover; use a new O-ring on installation



8.6a Align the line next to the T mark with the pointer

5 Remove the rocker arm covers and their O-rings from the exhaust side and intake side of the cylinder **(see illustration).**

Rear cylinder

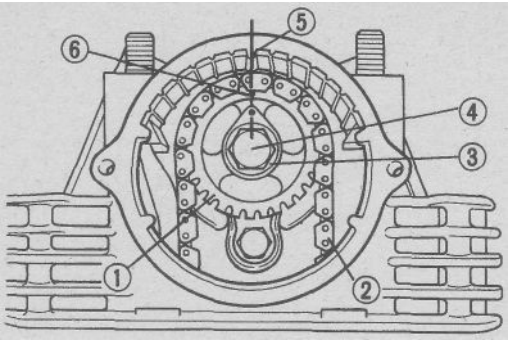
Referto illustrations 8.6a, 8.6b, 8.13,8.14a, 8.14b, 8.15a, 8.15b, 8.16 and 8.17

6 Turn the engine so the rear cylinder is at top dead center on its compression stroke (see *Valve clearance - adjustment* in Chapter 1). When the rear cylinder is on its compression stroke, the line on the alternator rotor with a T mark next to it will be aligned with the notch in the timing window **(see illustration).** Also, the camshaft sprocket mark will be aligned with the mark inside the sprocket housing on the cylinder head **(see illustration).**

7 Remove the cam chain tensioner for the rear cylinder (see Section 7).

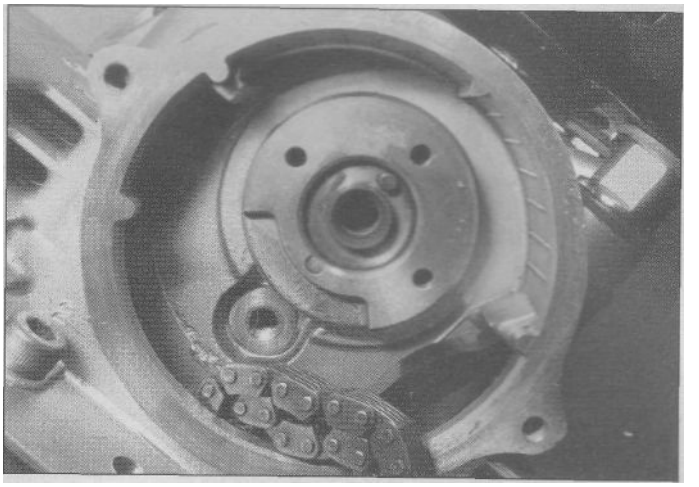
8 Place a piece of mechanic's wire where you can reach it easily during the next steps.

9 Hold the engine from turning with a socket on the alternator rotor bolt. If the engine is in the frame, you can also keep it from turning by

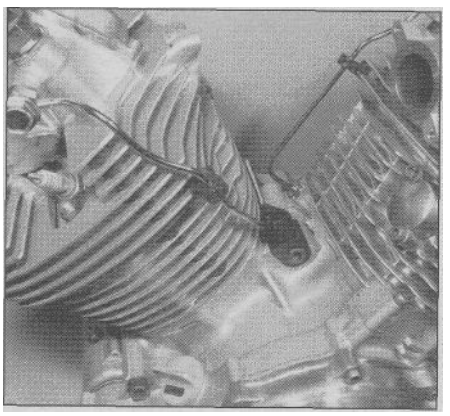


8.6b Align the cast pointer in the cylinder head with the sprocket timing mark

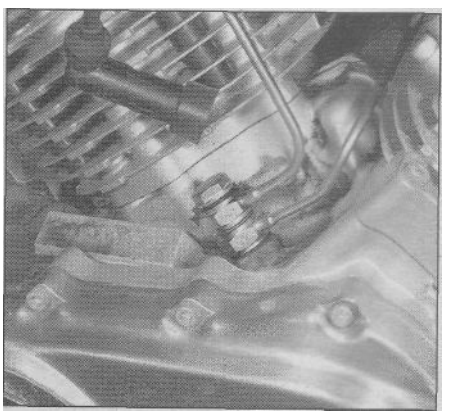
1 Cam sprocket
2 Cam chain
3 Washer
4 Sprocket bolt
5 Cast pointer
6 Sprocket timing mark



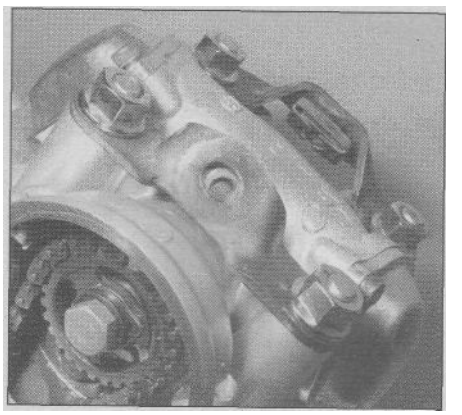
8.13 Drape the cam chain over the cylinder head to keep it on the crankshaft sprocket; tie it up with wire if necessary



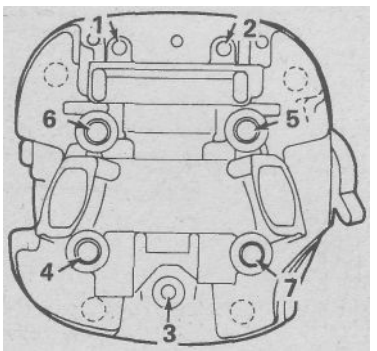
8.14a Remove the oil pipe union bolt at the cylinder head . . .



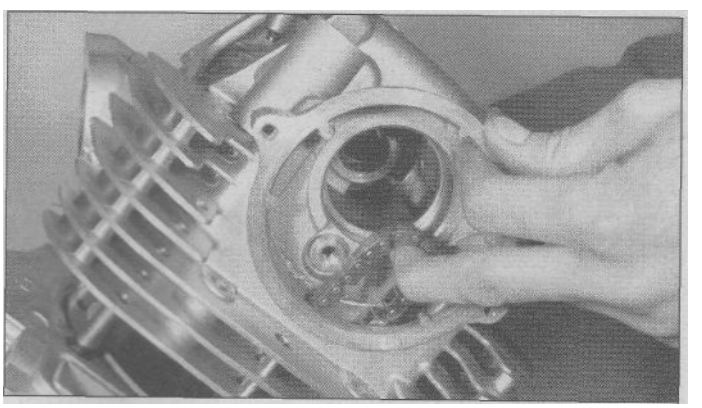
8.14b . . . and at the crankcase; use new sealing washers on installation



8.15a Four of the rear cylinder head nuts also secure the engine mounting brackets



8.15b Cylinder head nut LOOSENING sequence



8.16 Support the cam chain while you lift the head off the studs

shifting the transmission into gear and having an assistant hold the rear brake on.

10 While you hold the engine from turning, loosen and unscrew the camshaft sprocket bolt.

11 Slide the sprocket off the camshaft, making sure the camshaft dowel doesn't fall out of the camshaft.

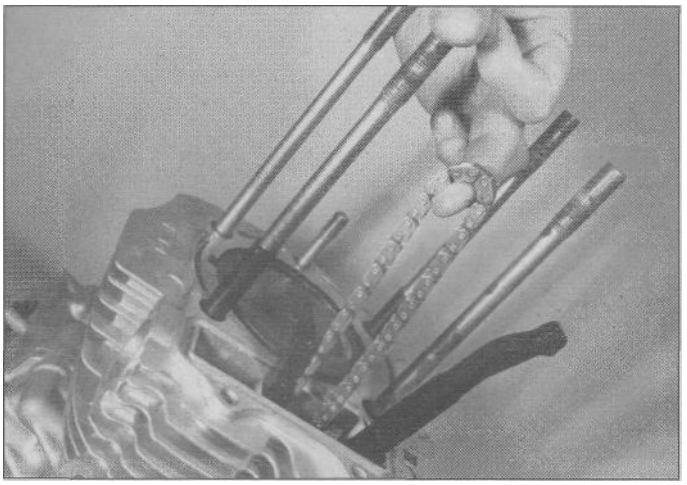
12 Disengage the sprocket from the chain. Label the sprocket "R" (for rear cylinder) and set it aside.

13 Drape the cam chain over the cylinder head **(see illustration).** At this point, the camshaft dowel should be aligned with the pointer cast in the cylinder head.

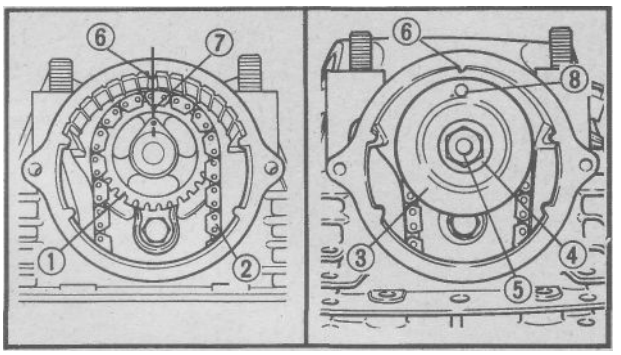
14 Remove the external oil line **(see illustrations).**

15 Loosen the cylinder head nuts and bolts evenly in several stages **(see** illustrations). Remove the nuts, washers, bolts and engine mounting brackets.

16 Hold the cam chain and lift the cylinder head off the studs **(see illustration).** If it's stuck, tap it gently with a rubber or plastic mallet, being careful not to break the cooling fins. Don't pry against the gasket

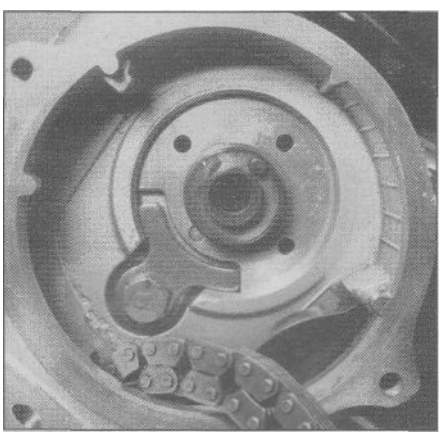


8.17 Keep the cam chain supported and lift the front side chain damper out

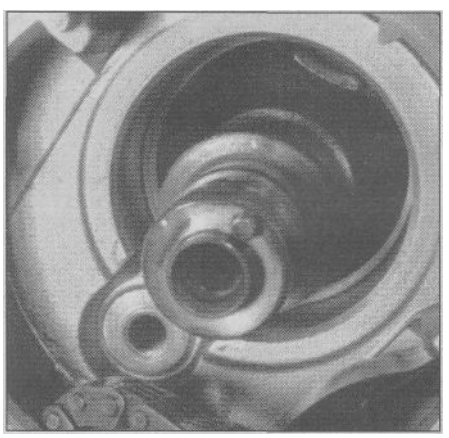


8.20 Align the cast pointer in the cylinder head with the sprocket timing mark and the oil baffle hole

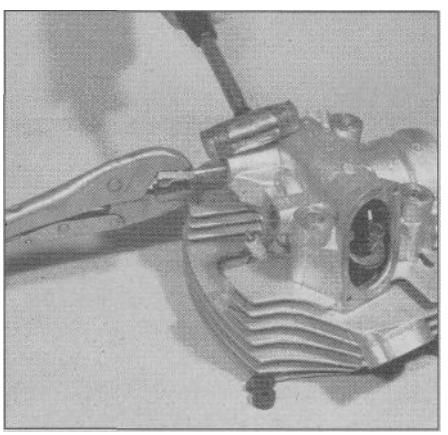
1 Cam sprocket
2 Cam chain
3 Oil baffle
4 Washer
5 Sprocket bolt
6 Cast pointer
7 Sprocket timing mark
8 Oil baffle hole



8.23 With the camshaft dowel aligned with the cast pointer in the cylinder head, unbolt the retainer



8.24 Slowly remove the camshaft from the head; be careful not to nick or gouge the bearing surfaces



8.27a Tap against the Vise Grips to withdraw the bolt and rocker shaft

surfaces or they will be gouged.

17 Remove the dqwels and front side chain damper **(see illustration).** Support the cam chain so it doesn't drop down off the lower sprocket.

18 Check the cylinder head gasket (and the separate O-ring around the cam chain tunnel on 1981 through 1983 models) and the mating surfaces on the cylinder head and cylinder for leakage, which could indicate warpage. Refer to Section 10 and check the flatness of the cylinder head.

19 Clean all traces of old gasket material from the cylinder head and the top of the cylinder. Be careful not to let any of the gasket material fall into the crankcase, the cylinder bore or the oil passages.

Frontcylinder

Refer to illustration 8.20

20 Repeat Steps 6 through 19 to remove the front cylinder head, noting that the front camshaft sprocket has an oil baffle. The hole in the baffle should be aligned with the cast pointer when the rear cylinder is at TDC on its compression stroke **(see illustration).**

Camshaftremoval

Refer to illustrations 8.23 and 8.24

21 If you haven't already done so, remove the rocker arm covers (see illustrations 8.4b, 8.4c and 8.5).

22 Loosen the rocker arm locknuts and back off the adjusters.

23 Remove the bolt and camshaft retainer plate **(see illustration).**

24 Remove the camshaft **(see illustration).**

Rockerarmremoval

Refer to illustrations 8.27a and 8.27b

25 Remove the camshaft (see Steps 21 through 24).

26 Remove the rocker arm shaft retaining bolt and sealing washer.

27 Thread a slide hammer into the end of the rocker shaft. If you don't have one, use a long bolt and a pair of Vise Grips **(see illustration).** Thread the bolt into the rocker arm, grip it with the Vise Grips, then tap against the Vise Grips with a hammer to pull the rocker shaft out. Once the rocker shaft clears the rocker arm, take the rocker arm out **(see illustration).**

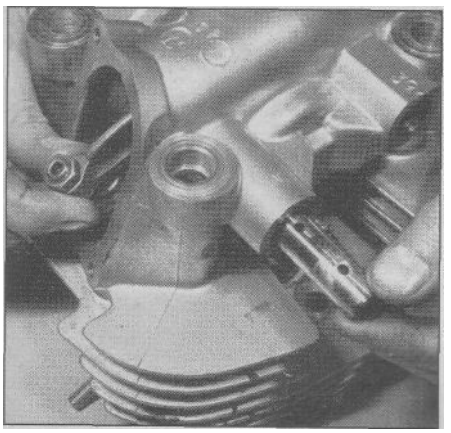
28 Remove the remaining rocker shaft and arm, then label them according to cylinder and position (for example, rear intake and rear exhaust).

Camshaft,chainandcamsprocketinspection

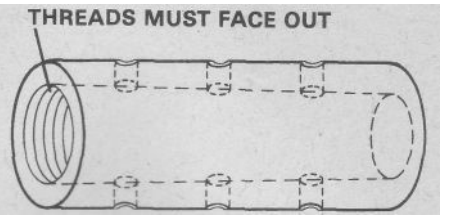
29 This is the same as for XV535 models. Refer to Part A of this Chapter for procedures and to this Chapter's Specifications.

Rockerarmandshaftinspection

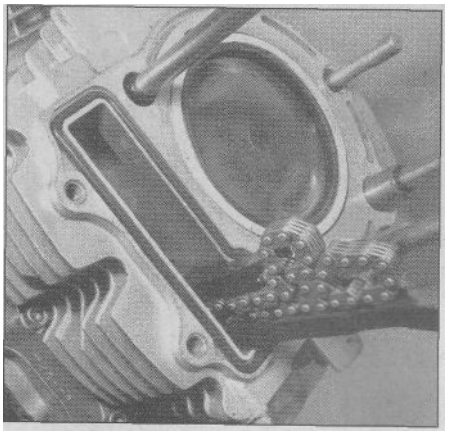
30 This is the same as for XV535 models. Refer to Part A of this Chapter for procedures and to this Chapter's Specifications.



8.27b When the rocker shaft is partway out, remove the rocker arm



8.35 Be sure the **threads face out when the shaft is** installed, **or there will be no** way to grip and remove **the shaft**



8.38 Early models have an O-ring (separate from the head gasket) around the cam chain tunnel

Camshaftinstallation

31 Apply a light coat of engine assembly lube or moly-based grease to the camshaft journals. Position the camshaft bushing on the camshaft.

32 Apply a light coat of engine assembly lube or moly-based grease to the cam lobes.

33 Slide the camshaft into the cylinder head, then install the bushing **(see illustrations 8.24 and 8.23).** Don't let the bushing tilt sideways and jam in its bore. Align the bushing cutout with the retainer bolt hole and align the camshaft dowel with the timing mark **(see illustration 8.23).**

34 Install the retainer **(see illustration 8.23).** Tighten the bolt to the torque listed in this Chapter's Specifications.

Rockerarmandshaftinstallation

Refer to illustration 8.35

35 Coat the rocker shafts and the rocker arm bores with clean engine oil. Thread a bolt into the threads in the end of the exhaust rocker shaft to use as a handle. Position the exhaust rocker shaft partway into its hole with the threaded end facing out **(see illustration).** Install the exhaust rocker arm and slide the shaft into the rocker arm. Repeat this procedure to install the intake rocker arm.

36 Install the retaining bolt with a new sealing washer in the left hole (as you face the cylinder head). The right hole is for the oil line union bolt.

Cylinderheadinstallation

Rear cylinder head

Refer to illustrations 8.38, 8.41 and 8.44

37 If both cylinder heads have been removed, install the rear cylinder head first.

38 Install the dowels and the new head gasket on top of the cylinder **(see illustrations 8.4b and 8.4c).** If you're working on a 1981 through 1983 model, install the O-ring in the groove around the cam chain tunnel **(see illustration).** Never reuse the old head gasket and don't use any type of gasket sealant.

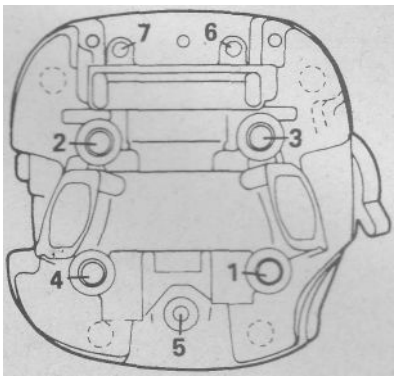
39 Install the front side cam chain damper (if removed).

40 Position the cylinder head on the studs and guide the cam chain damper through the cam chain tunnel **(see illustration 8.16).**

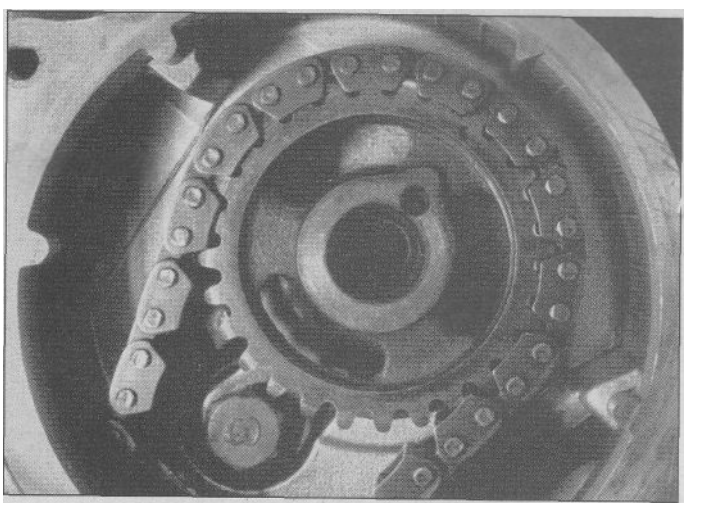
41 Install the cylinder head bolts and nuts together with the engine mounting brackets **(see illustration 8.15a).** Four of the shorter nuts go on the rear cylinder head; the longer nuts and the remaining four short nuts go on the front cylinder head. Tighten the bolts and nuts evenly in several stages, in the specified sequence, to the torque listed in this Chapter's Specifications **(see illustration).**

42 Make sure the camshaft locating dowel is aligned with the mark on the cylinder head **(see illustration 8.23).**

43 Make sure the line on the timing rotor with a T mark next to it aligns with the notch in the timing window **(see illustration 8.6a).** If it's necessary to turn the crankshaft, hold the timing chain up while you're turning so it doesn't fall off the crankshaft sprocket and become jammed.

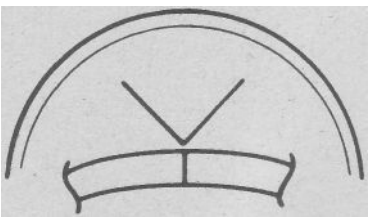


8.41 Cylinder head nut and bolt TIGHTENING sequence

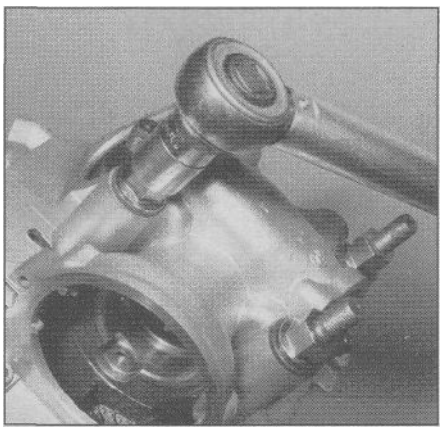


8.44 Align the dimple in the sprocket with the cast pointer in the cylinder head

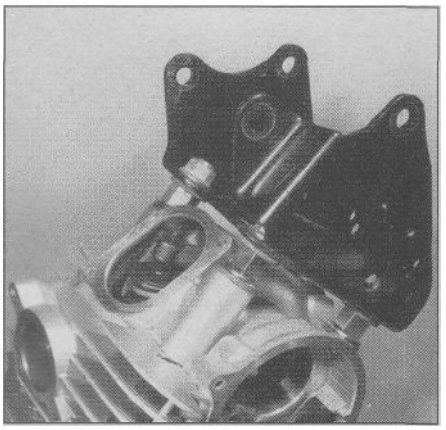
44 Engage the camshaft sprocket with the timing chain so its dowel hole aligns with the dowel. Slip the sprocket onto the camshaft over the dowel. The dimple in the sprocket should be aligned with the pointer on the cylinder head **(see illustration).**



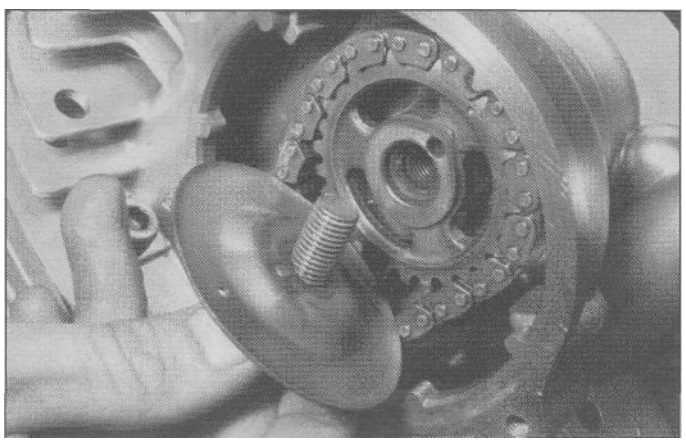
8.51 Crankshaft timing mark for front cylinder



8.52a The longer nuts go on the front cylinder head . . .



8.52b . . . and the front engine mounting bracket fits on the studs



8.53 Install the oil baffle next to the front cylinder's cam sprocket, facing in the direction shown

45 Turn the cam sprocket clockwise far enough to remove all slack in the front run of the cam chain, but no farther. Insert a finger in the tensioner hole and push against the chain damper. Make sure the timing marks on the cam sprocket and crankshaft are aligned correctly **(see illustrations 8.6a and 8.6b).**

46 With the marks correctly aligned, install the washer and cam sprocket bolt and tighten to the torque listed in this Chapter's Specifications.

47 Install the cam chain tensioner (see Section 7).

48 Adjust the valve clearances (see Chapter 1).

49 Install the rocker arm covers with new O-rings.

50 Install the cam sprocket cover, using a new O-ring.

Frontcylinderhead

Refer to illustrations 8.51, 8.52a, 8.52b and 8.53

51 Repeat Steps 38 through 40 to install the front cylinder head, noting that the slot in the timing rotor must be aligned with the crankcase pointer when the camshaft dowel is aligned with the cylinder head mark **(see illustration).**

52 Install the washers, cylinder head nuts and bolts and engine mounting bracket **(see illustrations).**

53 Repeat Steps 42 through 51 to finish installing the cylinder head, noting that there is an oil baffle on the sprocket **(see illustration).**

54 Install the ignition coils and their bracket (see Chapter 4).

Bothcylinderheads

55 Change the engine oil (see Chapter 1).

56 The remainder of installation is the reverse of the removal steps.

9 Valves/valve seats/valve guides - servicing

1 Because of the complex nature of this job and the special tools and equipment required, servicing of the valves, the valve seats and the valve guides (commonly known as a valve job) is best left to a professional.

2 The home mechanic can, however, remove and disassemble the head, do the initial cleaning and inspection, then reassemble and deliver the head to a dealer service department or properly equipped motorcycle repair shop for the actual valve servicing. Refer to Section 8 for those procedure's.

3 The dealer service department will remove the valves and springs, recondition or replace the valves and valve seats, replace the valve guides, check and replace the valve springs, spring retainers and keepers/collets (as necessary), replace the valve seals with new ones and reassemble the valve components.

4 After the valve job has been performed, the head will be in like-new condition. When the head is returned, be sure to clean it again very thoroughly before installation on the engine to remove any metal particles or abrasive grit that may still be present from the valve service operations. Use compressed air, if available, to blow out all the holes and passages.

10 Cylinder head and valves - disassembly, inspection and reassembly

These procedures are the same as for XV535 models. Refer to Part A of this Chapter for procedures and Part B for specifications.

11 Cylinders - removal, inspection and installation

Removal

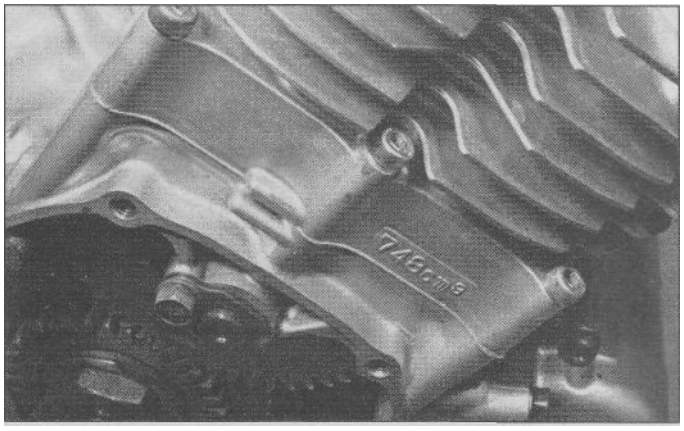
Refer to illustrations 11.2, 11.3 and 11.4

1 Following the procedure given in Section 8, remove the cylinder head.

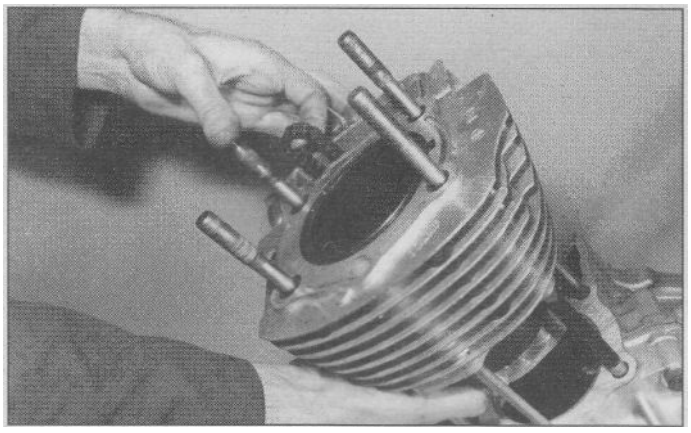
2 Remove the cylinder bolts **(see illustration).**

3 Lift the cylinder straight up to remove it, supporting the cam chain as you do so **(see illustration).** If it's stuck, tap around its perimeter with a soft-faced hammer, taking care, not to break the cooling fins. Don't attempt to pry between the cylinder and the crankcase, as you will.ruin the sealing surfaces. As you lift, note the location of the dowel pins and O-ring. Be careful not to let these drop into the engine.

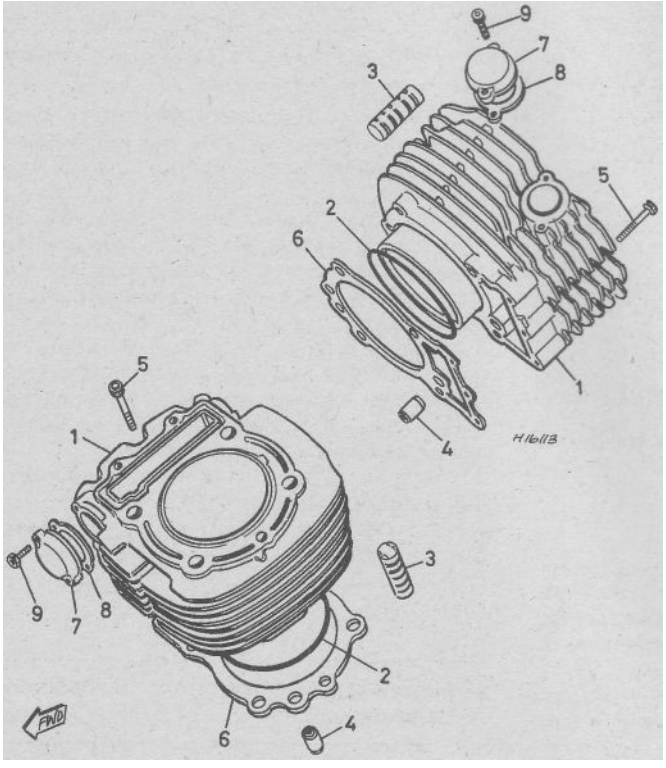
4 Stuff clean shop towels around the pistons and remove the gasket and all traces of old gasket material from the surfaces of the



11.2 Remove the three Allen bolts to detach the cylinder from the crankcase



11.3 Support the timing chain and pull the cylinder off the studs



11.4 Cylinder (XV700-1100 models) - exploded view

1 *Cylinder*
2 *O-ring*
3 *Damping block*
4 *Locating dowel*
5 *Bolt*
6 *Cylinder base gasket*
7 *Cover*
8 *Gasket*
9 *Bolt*

cylinder, cylinder head and crankcase. Remove the O-ring from the oase of the cylinder **(see illustration). Note:** *Don't remove the rubber sleeves from the cylinder studs.*

Inspection

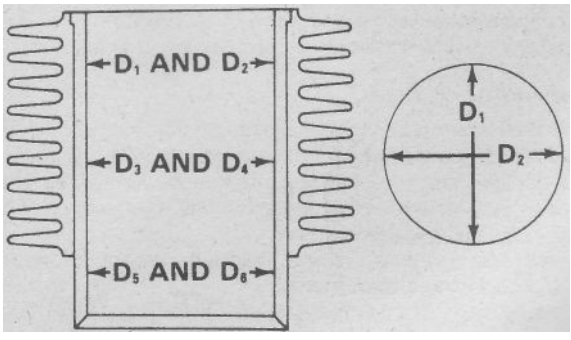
Refer to illustration 11.7

5 Don't attempt to separate the liner from the cylinder.

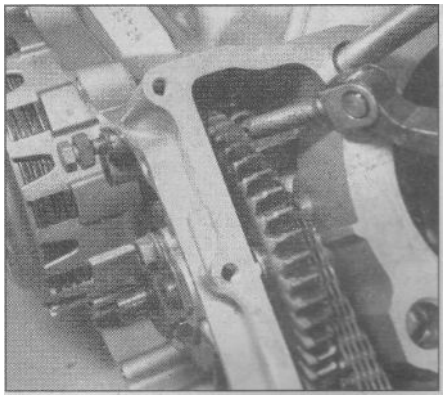
6 Check the cylinder wall carefully for scratches and score marks.

7 Using the appropriate precision measuring tools, check each cylinder's diameter. Measure parallel to the crankshaft axis and across the crankshaft axis, at the depth from the top of the cylinder listed in this Chapter's Specifications **(see illustration).** Average the two measurements and compare the results to this Chapter's Specifications. If the cylinder walls are tapered, out-of-round, worn beyond the specified limits, or badly scuffed or scored, have them rebored and honed by a dealer service department or a motorcycle repair shop. If a rebore is done, oversize pistons and rings will be required as well.

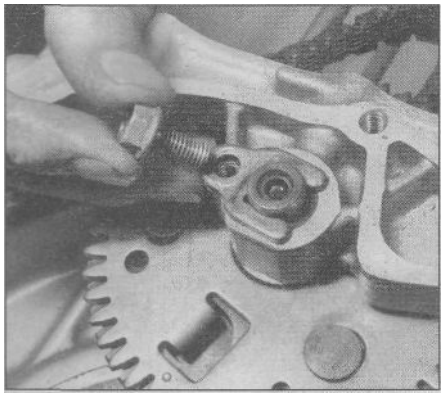
8 As an alternative, if the precision measuring tools are not available, a dealer service department or motorcycle repair shop will



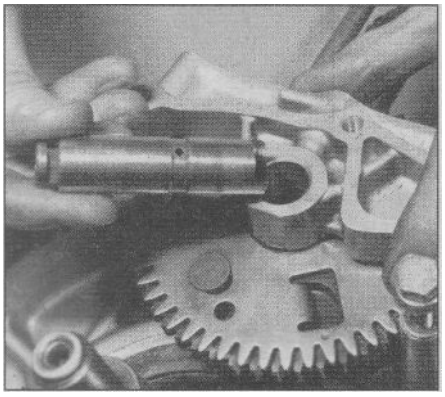
11.7 On 1981 through 1987 models, measure the cylinder diameter at the top, center and bottom of the bore; on **1988 and later models, measure at the specified** distance from **the top of the bore**



14.3 Remove the bolt and **locknut and lift the cam chain** damper **out**



14.4a Remove the bolt and pull out the retaining plate . . .



14.4b . . . then pull out the spindle and remove the intermediate gear

make the measurements and offer advice concerning servicing of the cylinders.

9 If they are in reasonably good condition and not worn to the outside of **the limits,** and if the piston-to-cylinder clearances can be maintajned properly (see Section 12), then the cylinders do not have to be **rebored;** honing is all that is necessary.

To perform the honing operation refer to Chapter 2, Part A.

Installation

11 Lubricate the cylinder bore and piston with plenty of clean engine oil.

12 Install a new O-ring around the base of the cylinder **(see illustration 11.4).** Place a new cylinder base gasket on the crankcase. Install a new O-ring on the large dowel pin, install it in its bore and make sure the two small dowel pins are in position.

13 Attach a piston ring compressor to the piston and compress the piston rings. A large hose clamp can be used instead - just make sure it doesn't scratch the piston, and don't tighten it too much. **Note:** *If you're experienced and very careful, you can install the cylinder without using a ring compressor, but the compressor will make the job easier and reduce the chance of breaking a ring,*

14 Install the cylinder block over the pistons and carefully lower it down until the piston crown fits into the cylinder liner **(see illustration 11.3).** While doing this, pull the camshaft chain up, using a hooked tool or a piece of coat hanger if necessary. Also keep an eye on the cam chain guide to make sure it doesn't wedge against the cylinder. Push down on the cylinder, making sure the piston doesn't get cocked sideways, until the bottom of the cylinder liner slides down past the piston rings. A wood or plastic hammer handle can be used to gently tap the cylinder down, but don't use too much force or the piston will be damaged.

15 Remove the piston ring compressor or hose clamp, being careful not to scratch the piston.

16 Repeat the procedure to install the remaining cylinder.

17 The remainder of installation is the reverse of removal.

12 Pistons - removal, inspection and installation

Removal, inspection and installation procedures for the pistons are the same as for XV535 models. Refer to Part A of this Chapter for procedures and this Chapter's Specifications.

13 Piston rings - installation

Piston ring installation procedures are the same as for XV535 models. Refer to Part A of this Chapter for procedures and to this Chapter's Specifications.

14 Cam chains and intermediate gears - removal, inspection and installation

Removal

Refer to illustrations 14.3, 14.4a and 14.4b

1 Remove the engine (see Section 5).

2 Remove the cylinder head(s) and cylinder(s) (see Sections 8 and 11).

3 If you're working on the front cylinder, remove the retaining bolt and lift out the rear cam chain damper **(see illustration).**

4 Remove the bolt and stopper plate **(see illustration).** Pull out the spindle, then remove the intermediate gear and timing chain **(see illustration).** Label the parts (F for front cylinder or R for rear cylinder).

5 If you're working on the rear cylinder, remove the retaining bolt and lift out the rear cam chain damper.

Inspection

6 Thoroughly clean all parts in solvent and blow them dry with compressed air.

7 Check the cam chain(s) for obvious wear and damage and replace it if these conditions are found. Note how far the cam chain tensioner has extended; if it's near the end of its travel, the cam chain is stretched and should be replaced. **Note:** *If the chain is replaced, the intermediate gear and its drive gear on the crankshaft should also be replaced. Replacing only one of the components will cause rapid wear of the other two.*

8 Check the intermediate gear(s) for worn or damaged teeth and replace them if these conditions are found. The two plates that make up the gear should move separately from each other against the pressure of the three springs built into the gear, then return to their original relationship by spring pressure. If the plates don't move separately or don't return, replace the intermediate gear. Also replace the gear if the springs are loose or damaged.

9 Check the chain dampers for deep grooves or separation from the steel backing and replace them if these conditions are found.

Installation

Refer to illustration 14.10

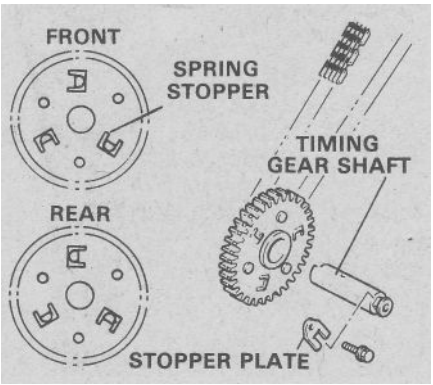
10 If the intermediate gears weren't marked for location during removal, identify the front and rear cylinder intermediate gears by the location of the spring stoppers **(see illustration).**

Rearcylinder

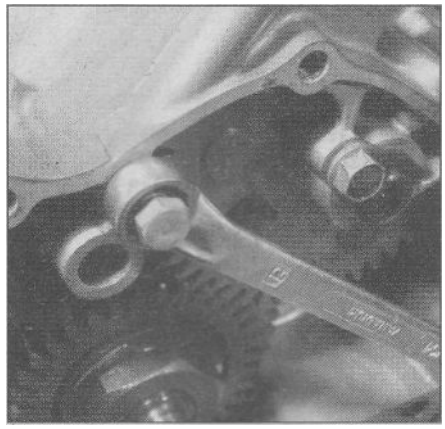
Refer to illustrations 14.11, 14.12, 14.13, 14.15a, 14.5b and 14.16

11 Install the rear cam chain damper. Tighten its bolt to the torque listed in this Chapter's Specifications, then tighten the locknut against the crankcase to secure the bolt **(see illustration).**

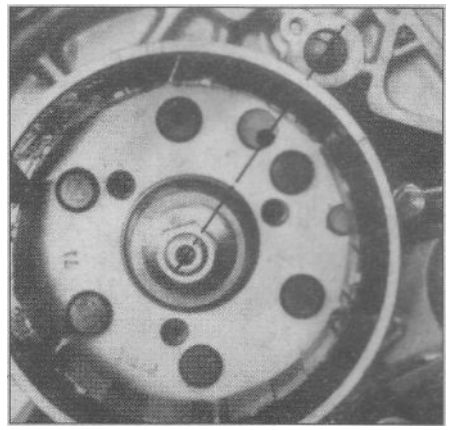
12 **Note:** *This procedure assumes the alternator rotor is installed on*



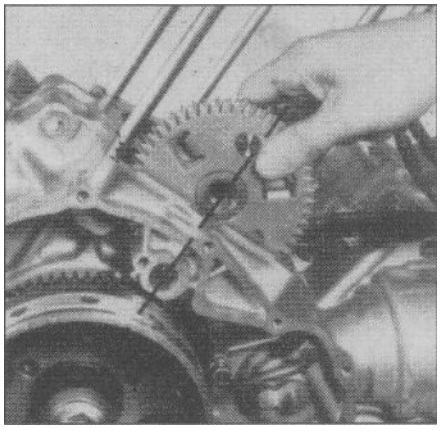
14.10 The correct locations of the intermediate gears can be determined by looking at the spring stoppers



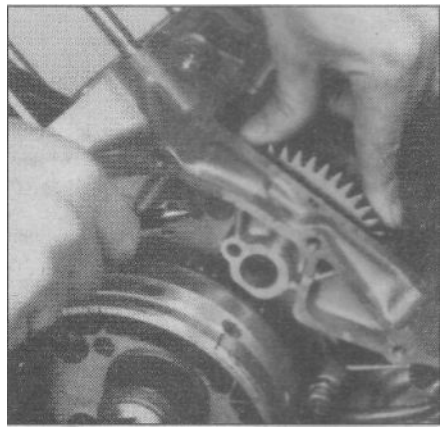
14.11 Tighten the chain guide bolt to the specified torque, then tighten the locknut to the specified torque to secure the bolt (front cylinder shown)



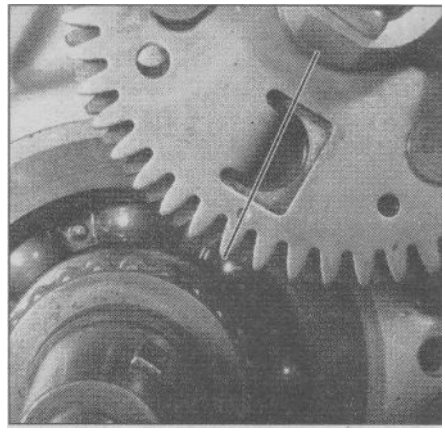
14.12 Align the sighting hole in the alternator rotor with the centerlines of the crankshaft and the intermediate gear spindle hole



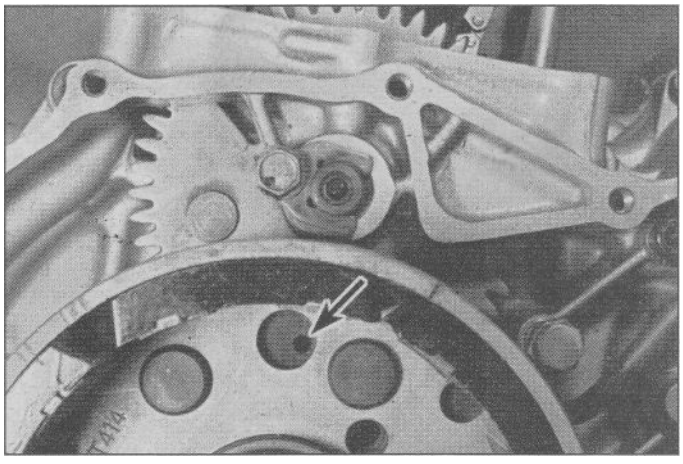
14.13 With the cam chain on the sprocket teeth of the gear, lower the gear into position



14.15a Pry the two plates of the intermediate gear into alignment with a punch inserted through the alignment holes



14.15b The alignment mark on the gear must be aligned with the crankshaft keyway



14.16 With the alternator rotor installed, look through the sighting hole (arrow) to make sure the intermediate gear alignment mark is positioned correctly

the engine. If it isn't, ignore the steps which don't apply. Align the sighting hole in the alternator rotor with the centerlines of the crankshaft and the intermediate gear spindle hole **(see illustration).**

13 Place the cam chain on the sprocketteeth of the intermediate gear. Position the intermediate gear in light contact with its drive gear on the crankshaft **(see illustration).**

14 There's an alignment hole in each of the plates that make up the intermediate gear. The holes are used to align the gear teeth on each plate with each other when the intermediate gear is installed. The holes are slightly offset from each other when the intermediate gear is not installed.

15 Insert a center punch through the offset holes in the two plates. Use a prying motion to align the holes (which will align the gear teeth on the two plates) **(see illustration).** Hold the plates in the aligned position and mesh the intermediate gear with the crankshaft drive gear so the timing marks on the gears are aligned **(see illustration).**

16 Install the spindle'in the intermediate gear and secure it with the stopper plate and bolt **(see illustration).** Look through the sighting hole in the alternator rotor to be sure the intermediate gear and timing gear holes are correctly aligned.

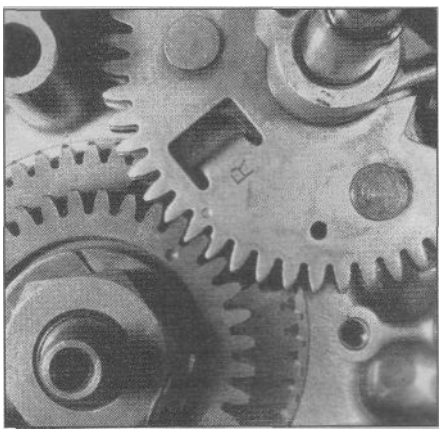
17 Make sure the cam chain is still engaged with the sprocket on the intermediate gear and support it so it won't fall off (tie it to part of the engine with wire).

Frontcylinder

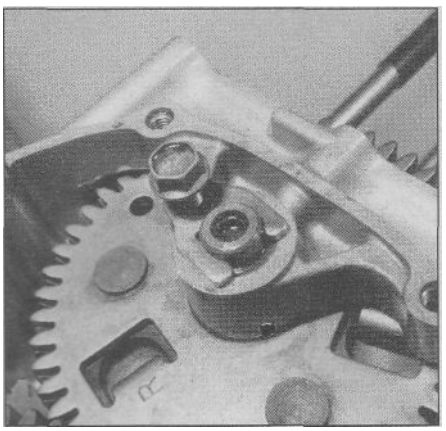
Refer to illustrations 14.19 and 14.20

18 Place the cam chain on the sprocket teeth of the intermediate gear. Position the intermediate gear in light contact with its **drive gear** on the crankshaft.

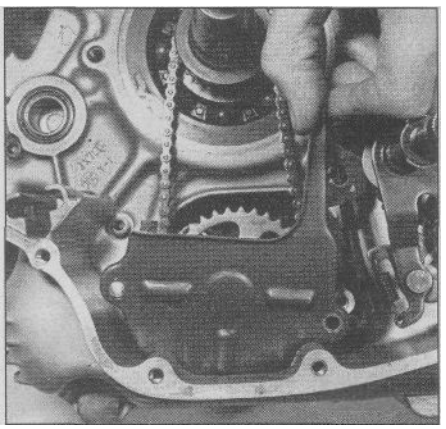
19 Align the teeth on the front cylinder's intermediate gear as



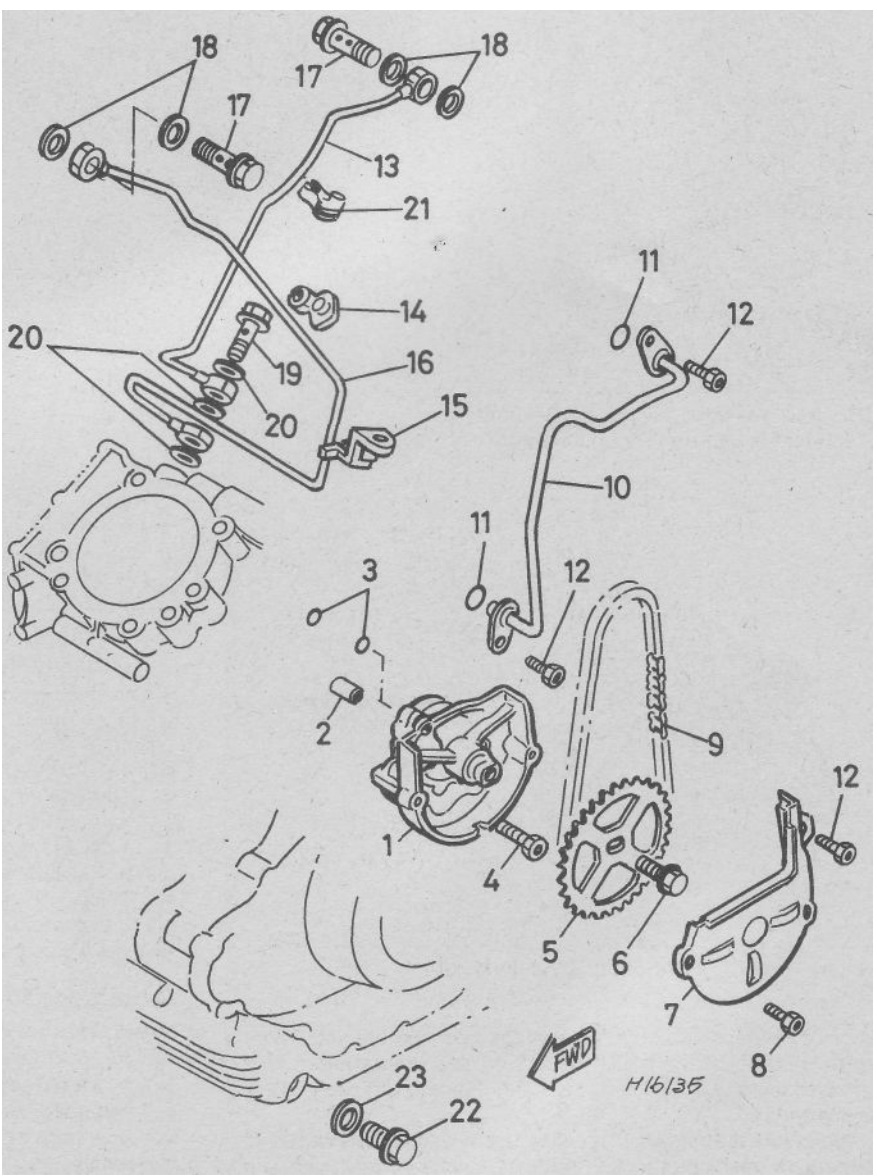
14.19 The alignment mark on the front cylinder's intermediate gear must align with the mark on the drive gear



14.20 Install the stopper plate and tighten the bolt to the specified torque

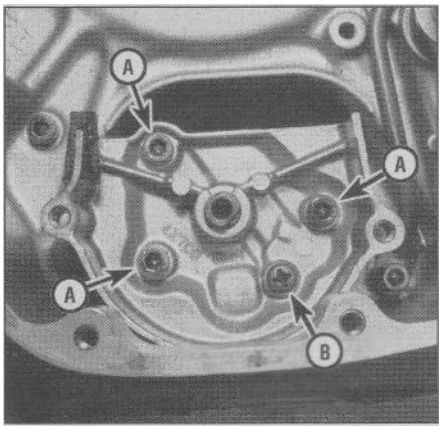


15.2 Remove the oil pump chain cover

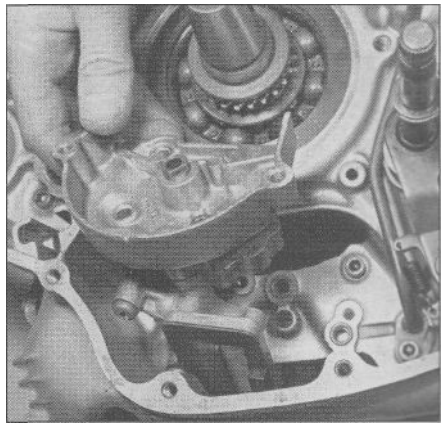


15.3 Oil pump and delivery pipes (XV700-1100 models) - exploded view

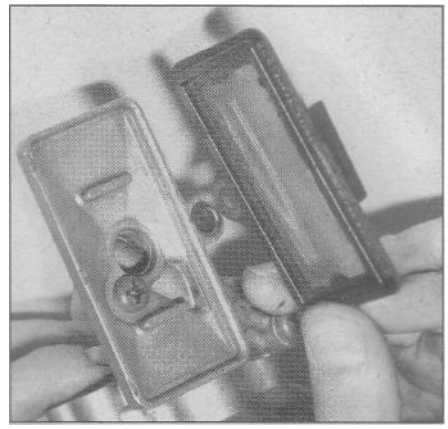
1 *Oil pump*
2 *Locating dowel*
3 *O-rings*
4 *Pump mounting bolt*
5 *Driven sprocket*
6 *Sprocket bolt*
7 *Oil pump chain cover*
8 *Chain cover bolt*
9 *Oil pump chain*
10 *Oil feed pipe*
11 *O-rings*
12 *Bolts*
13 *Rear cylinder oil feed pipe*
14 *Pipe guide*
15 *Mounting bracket*
16 *Front cylinder oil feed pipe*
17 *Union bolts*
18 *Sealing washers*
19 *Union bolt*
20 *Sealing washers*
21 *Pipe guide*
22 *Oil drain bolt*
23 *Sealing washer*



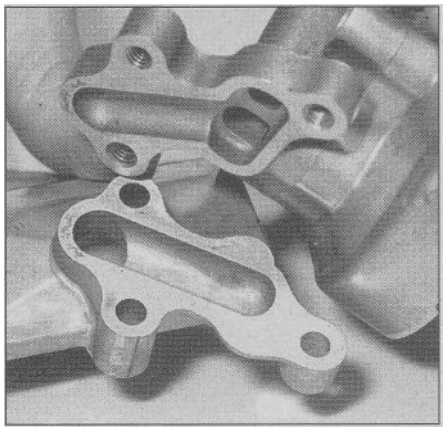
15.4a Remove the Allen bolts (A) to detach the pump; the screw (B) holds the pump together'



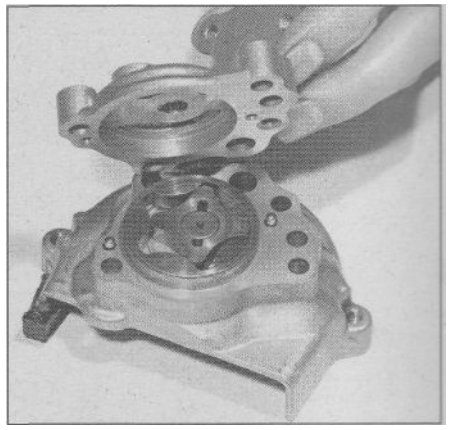
15.4b Pull the pump out of the engine, taking care not to damage the strainer screen



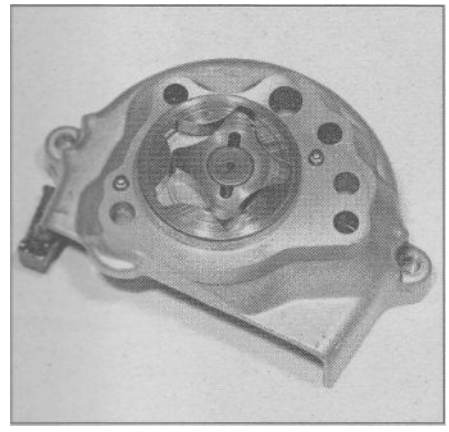
15.6a Separate the strainer screen from the pick-up



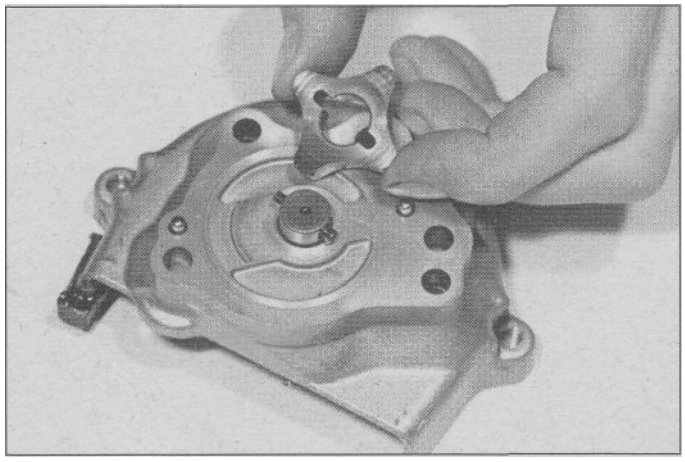
15.6b Remove three Phillips screws and detach the pick-up from the pump



15.7a Lift off the rotor housing .



15.7b . . . the outer rotor .



15.7c . . . and the inner rotor

described in Steps 13 and 14 above, then engage the gear with its drive pinion so the timing marks are aligned **(see illustration).**

20 Install the spindle and secure it with the retaining plate and bolt **(see illustration).**

21 Make sure the cam chain is still engaged with the sprocket on the intermediate gear, then install the front cylinder's rear cam chain damper **(see illustrations 14.3 and 14.11).** Tighten the bolt and locknut to the torque listed in this Chapter's Specifications.

All models

22 The remainder of installation is the reverse of the removal steps.

15 Oil pump and pick-up - removal, inspection and installation

Removal

Refer to illustrations 15.2. 15.3. 15.4a and 15.4b

1 Remove the alternator rotor and starter clutch (see Chapter 8).

2 Unbolt the oil pump chain cover and take it off **(see illustration).**

3 Unbolt the oil pump driven sprocket and separate it from the pump **(see** illustration). Lift the chain off the crankshaft sprocket.

4 Unbolt the oil pump and pull **it** away from the engine, taking care not to damage the strainer screen on the pick-up **(see illustrations).** Remove the pump dowel and two O-rings.

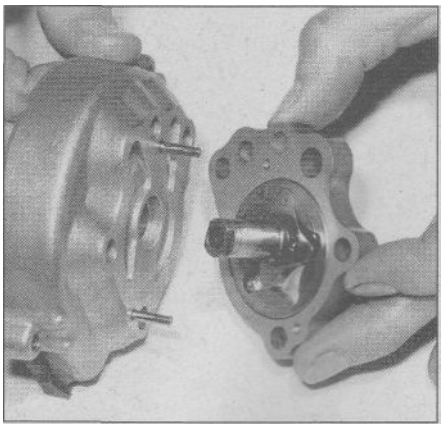
Disassembly,inspectionandreassembly

Refer to illustrations 15.6a, 15.6b, 15.7a through 15.7f, 15.9a, 15.9b, 15.13a, 15.13b and 15.13c

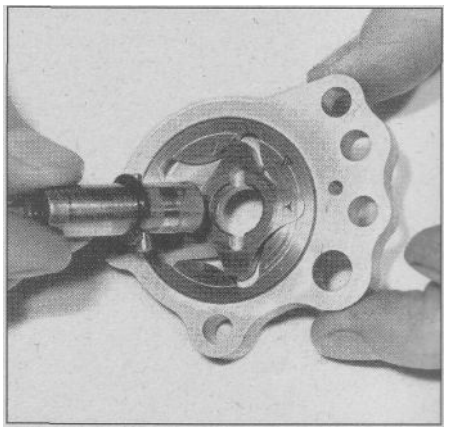
5 Wash the oil pump in solvent, then dry it off.

6 Separate the strainer screen from the pickup **(see illustration).** Remove three screws and detach the pick-up from the pump **(see illustration).**

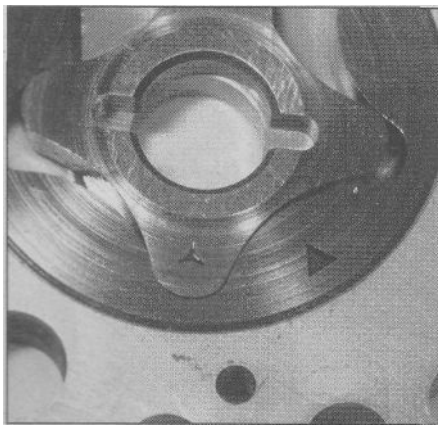
7 Remove the screw that holds the pump housings together. Lift off the housings and both sets of rotors **(see illustrations).**



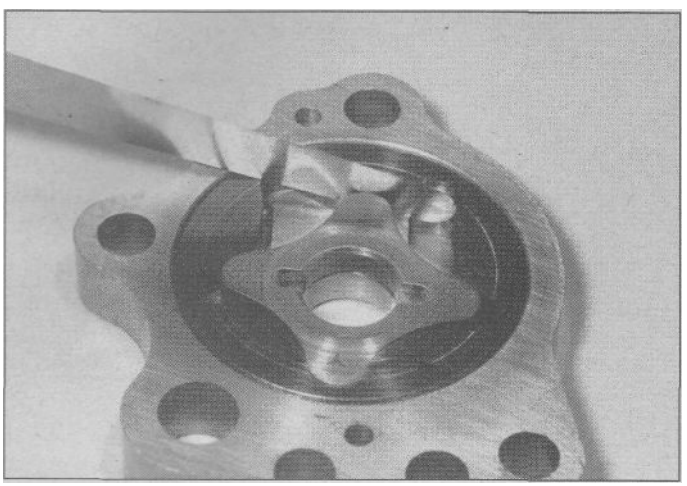
15.7d Lift off the remaining rotor housing and oil pump shaft...



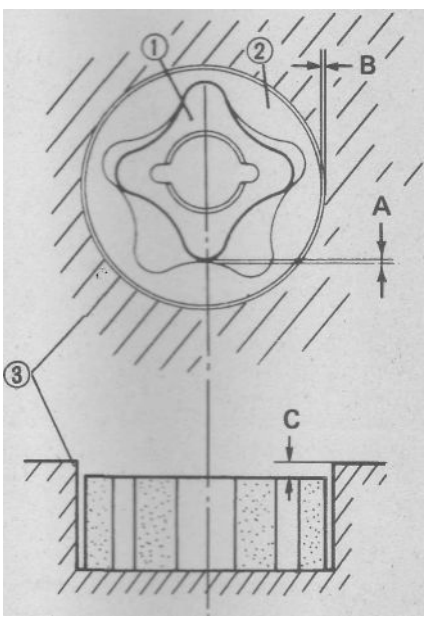
15.7e ... and separate the shaft from the rotors



15.7f Note the marks on the rotors; they must face **in the same direction when the pump is assembled .**

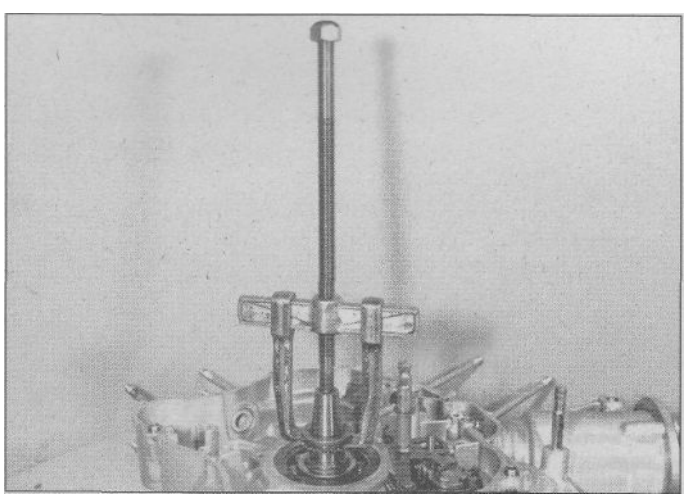


15.9a Measure oil pump clearances with a feeler gauge



15.9b Oil pump **measurement points**

1	*Inner rotor*	*B*	*Outer rotor to housing clearance*
2	*Outer rotor*	*C*	*Side clearance*
3	*Pump housing*		
A	*Inner to outer rotor clearance*		



15.13a Remove the oil pump sprocket from the crankshaft with a puller (the sprocket must be replaced with a **new one whenever it's removed)**

8 Check the pump body and rotors for scoring and wear. If any damage or uneven or excessive wear is evident, replace the pump (individual parts aren't available). If you are rebuilding the engine, it's a good idea to install a new oil pump.

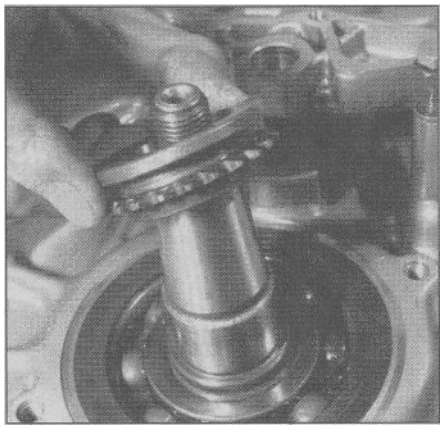
9 Measure the clearance between the inner and outer rotors and between the outer rotor and housing **(see illustrations).** Replace the pump if the clearance is excessive.

10 Lay a straightedge across the pump body and measure the side clearance between the rotors and straightedge with a feeler gauge (see illustration 15.9b). Replace the pump if the clearance is excessive.

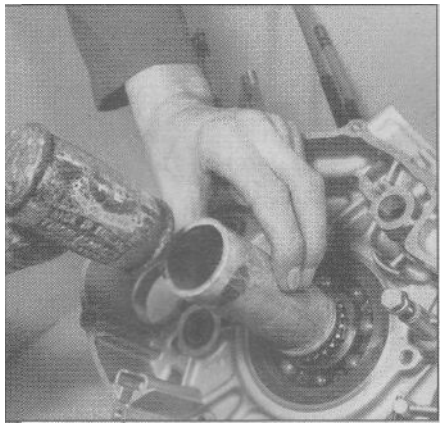
11 If the pump is good, reverse the disassembly steps to reassemble it. Make sure the pins are centered in the rotor shaft so they will align with the slots in the inner rotors.

12 Inspect the oil pump drive chain and sprockets. Replace all three components as a set if any one of them is worn or damaged.

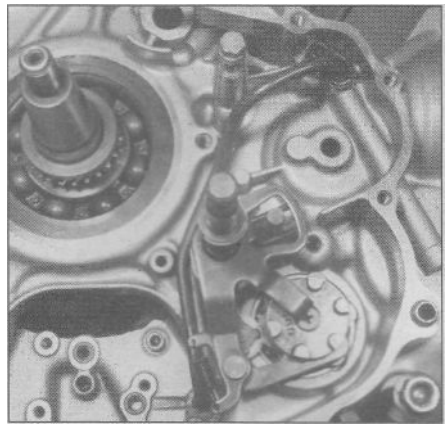
13 To replace the oil pump drive sprocket, remove it from the crankshaft with a puller **(see illustration). Note:** *Removal will damage the sprocket It must be replaced with a new one if it's removed from the crankshaft.* Position the new sprocket on the crankshaft with the teeth toward the crankcase **(see illustration),** then drive it all the way on with a hammer and a piece of pipe **(see illustration).**



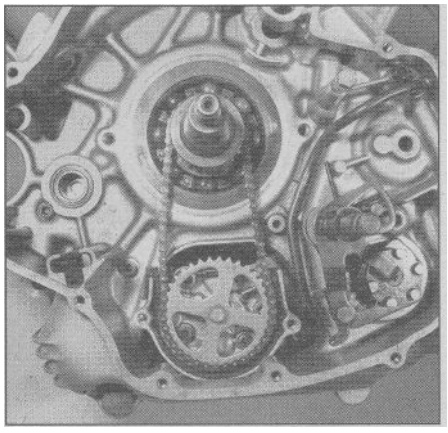
15.13b Place the new sprocket on the crankshaft with its teeth toward the crankcase ...



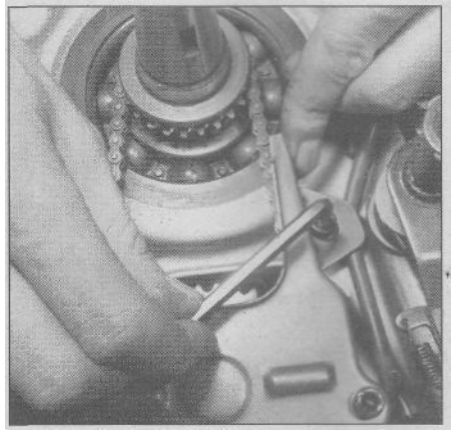
15.13c ... and drive the sprocket all the way on with a hammer and piece of pipe



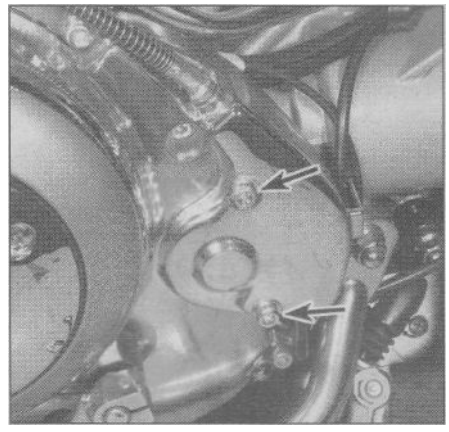
15.15 Make sure the dowel and both O-rings are in position



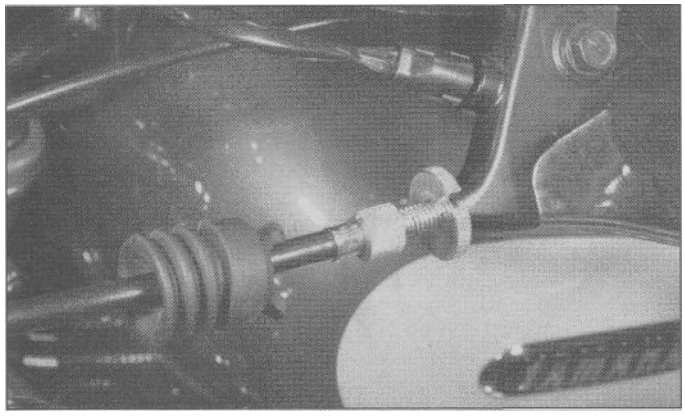
15.17 Install the chain on the drive sprocket, engage it with the driven sprocket and bolt the driven sprocket to the oil pump



15.18 Push the arm of the chain cover against the chain to tension it and tighten the cover bolts



16.1 Remove the Allen bolts (arrows) and take the cover off the release mechanism



16.2 Loosen the cable adjuster at the handlebar, then slide the cable out of the slot and free it from the lever

Installation

Refer to illustrations 15.15, 15.17 and 15.18

14 Before installing the pump, prime it by pouring oil into it while turning the shaft by hand - this'will ensure that it begins to pump oil quickly. **Caution:** *Also pour oil into the crankcase oil passages to prevent engine damage on start-up.*

15 Be sure the oil feed pipe, dowel and O-rings are in position **(see illustration).**

16 Position the pump on the engine and tighten its mounting bolts to the torque listed in this Chapter's Specifications.

17 Slip the chain over the crankshaft sprocket. Engage the chain with the oil pump driven sprocket, then install the sprocket on the pump **(see illustration).** Install the sprocket bolt and tighten it to the torque listed in this Chapter's Specifications.

18 Install the chain cover loosely. Push it against the chain to tension it, then tighten the cover bolts to the torque listed in this Chapter's Specifications **(see illustration).**

19 The remainder of installation is the reverse of the removal steps.

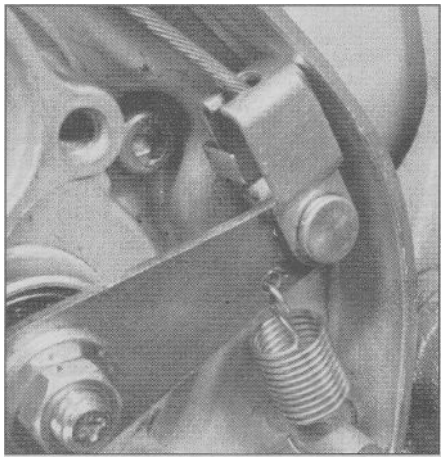
16 Clutch cable replacement and release mechanism removal and installation

Clutchcablereplacement

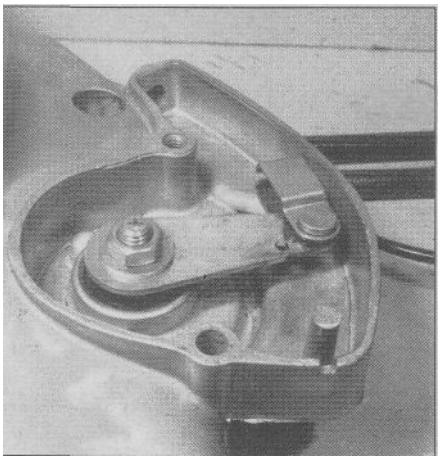
Refer to illustrations 16.1, 16.2 and 16.3

1 Remove the cover from the release mechanism on the left side of the engine **(see illustration).**

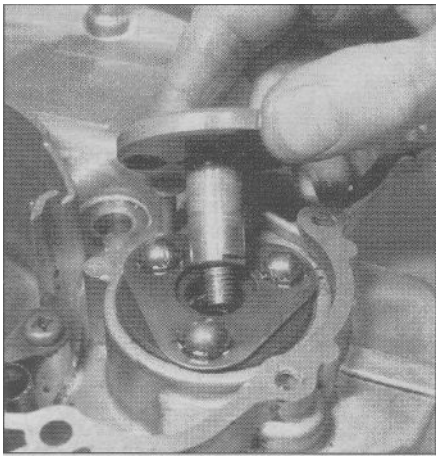
2 Loosen the cable locknut and adjuster **at** the handlebar (see **illustration).** Disconnect the cable from the clutch lever.



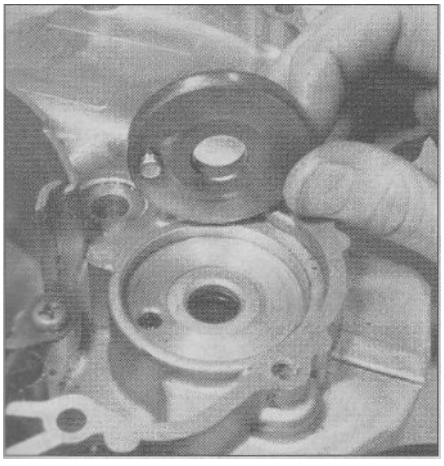
16.3 Bend back the metal tang on the lever bracket and slip the end of the cable out of the lever bracket



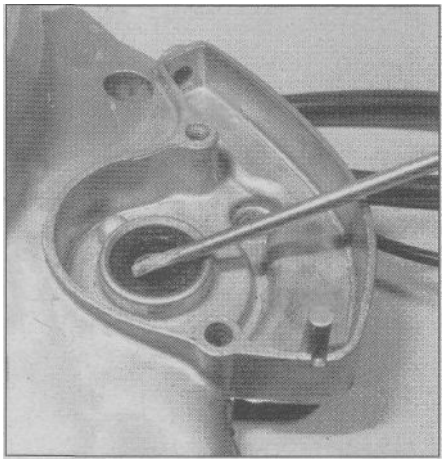
16.9 Unhook the spring and remove the nut from the operating lever



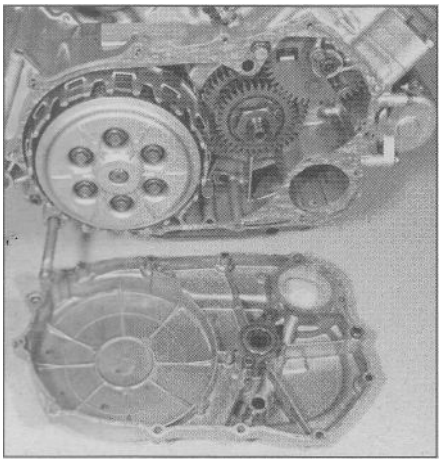
16.10a Lift out the push screw .



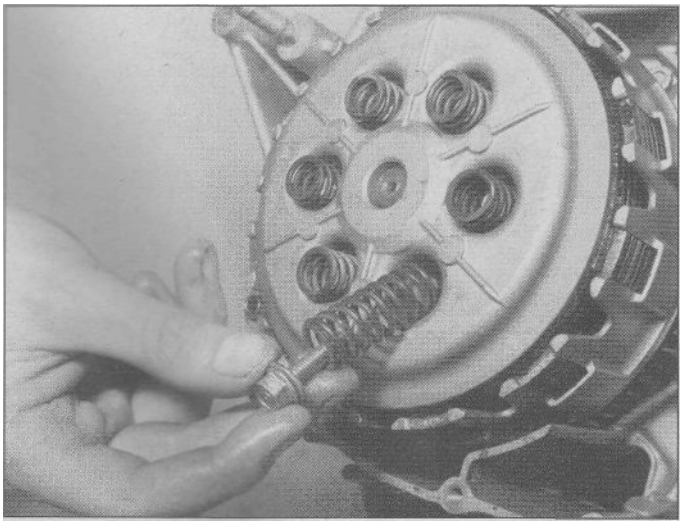
16.10b . . . and the thrust housing; the locating pin on the thrust housing fits into a hole in the alternator cover



16.11 Pry out the old oil seal and install a new one



17.3 Remove the clutch cover; note the locations of the dowels



17.4a Remove the pressure plate screws, washers and springs...

3 Bend back the metal tang and disconnect the lower end of the clutch cable from the release lever **(see illustration).**

4 Attach a piece of string (somewhat longer than the clutch cable) to one end of the cable. Free the cable from any retainers and remove it from the motorcycle, pulling the string with it. The string will remain in position and act as a guide to route the cable correctly during installation.

5 Installation is the reverse of the removal steps. If you're installing a new cable, attach the string to it and pull the cable into position with the string so it's routed correctly.

6 Adjust the clutch free-play (see Chapter 1).

Releasemechanismremovalandinstallation

Refer to illustrations 16.9, 16.10a, 16.10b and 16.11

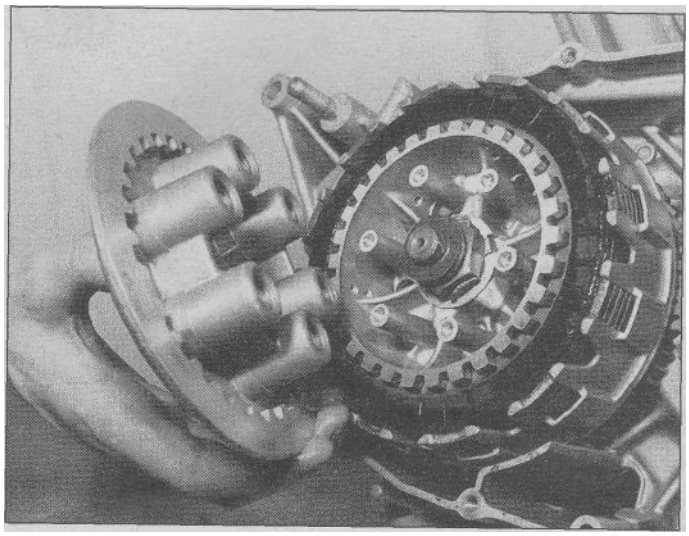
7 Disconnect the clutch cable at the engine (see above).

8 Remove the alternator cover (see Chapter 8).

9 Remove the nut and detach the clutch operating lever from the push screw **(see illustration).**

10 Remove the push screw, ball retainer and thrust housing from the alternator cover **(see illustrations).**

11 Pry the release mechanism oil seal out of the alternator cover **(see illustration).** Install a new one. It should go in with thumb pressure, but if necessary, tap it in with a hammer and a socket the same diameter as the seal.



17.4b . . . then take off the pressure plate

12 Installation is the reverse of the removal steps.
13 Adjust clutch free-play (see Chapter 1).

17 Clutch and primary gears - removal, inspection and installation

Removal

Refer to illustrations 17.3, 17.4a, 17.4b, 17.4c, 17.6. 17.7a. 17.7b 17.8, 17.9a through 17.9d, 17.11a, 17.11b, 17.12a, 17.12b and ***17.13***

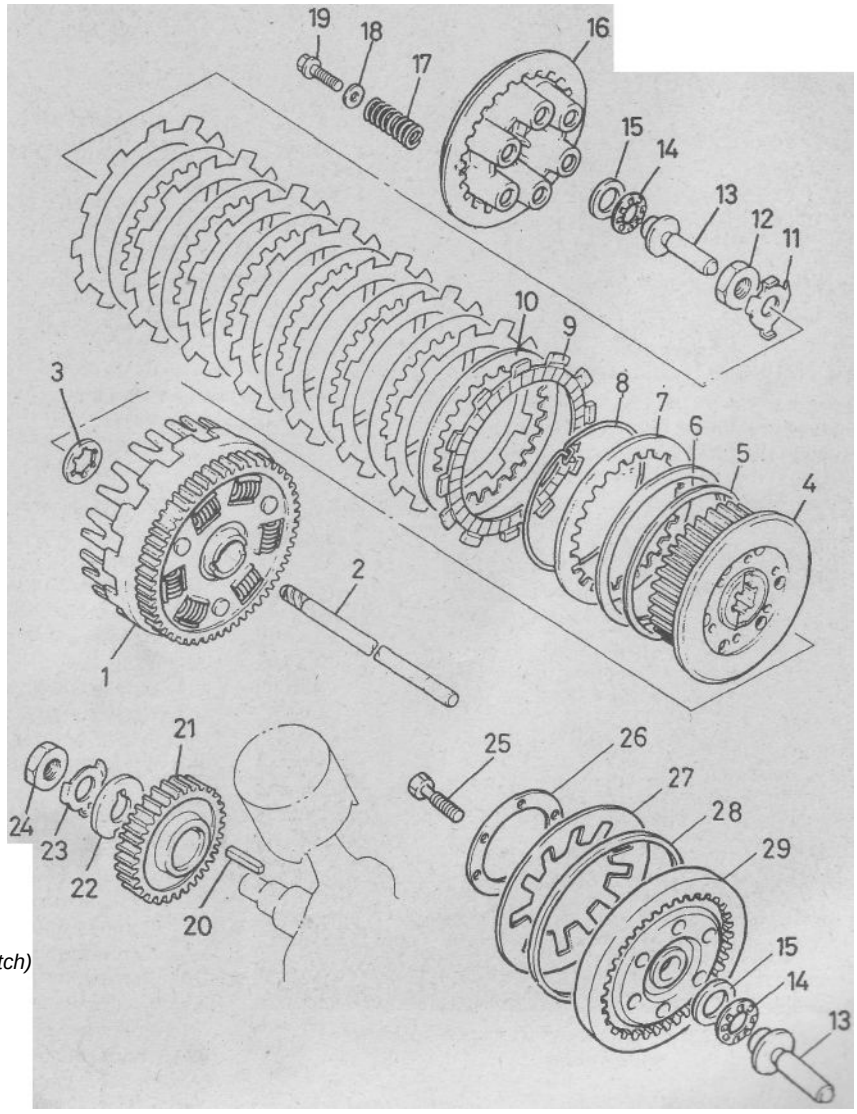
1 Drain the engine oil and remove the oil filter (see Chapter 1).

2 Remove the footpeg and brake pedal, then loosen the right-hand crankcase cover bolts in a criss-cross pattern, 1/4 turn at a time.

3 Once the bolts are all loose, remove the bolts and take the cover off **(see illustration).** If it's struck, pry gently at the pry points around the cover. Don't pry anywhere else or the gasket surface may be damaged.

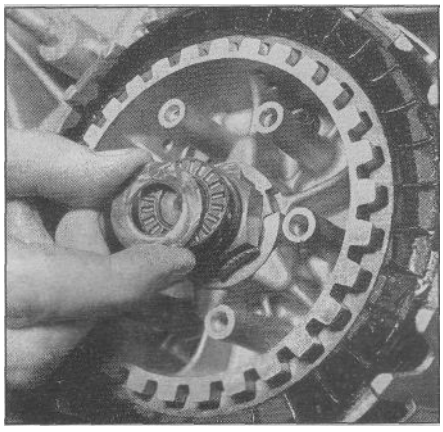
4 If you're working on a coil spring clutch, loosen the pressure plate screws evenly in a criss-cross pattern, then remove the screws and springs and take off the pressure plate **(see illustrations).**

5 If you're working on a diaphragm spring clutch, remove the bolts. plate washer, clutch spring, spring seat and pressure plate **(see illustration 17.4c).**

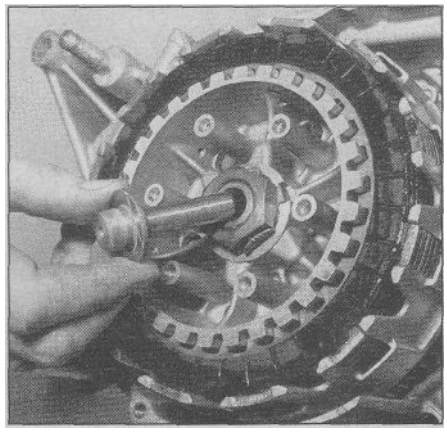


17.4c Clutch (XV700-1100 models) - exploded view

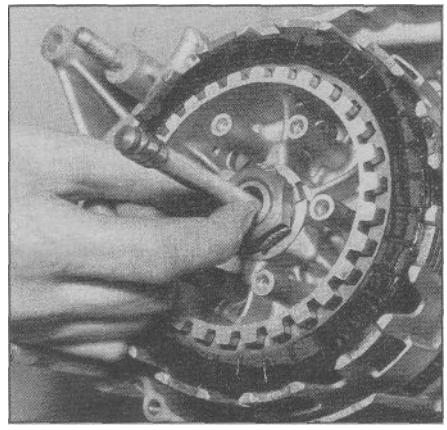
1 *Clutch housing*
2 *Pushrod*
3 *Thrust washer*
4 *Clutch boss*
5 *Seat plate*
6 *Seat spring*
7 *Metal plate*
8 *Wire ring*
9 *Friction plates*
10 *Metal plates*
11 *Lockwasher*
12 *Nut*
13 *Push piece*
14 *Thrust bearing*
15 *Thrust washer*
16 *Pressure plate (coil spring clutch)*
17 *Spring (coil spring clutch)*
18 *Washers (coil spring clutch*
19 *Pressure plate screws*
20 *Woodruff key*
21 *Primary gear*
22 *Special washer*
23 *Lockwasher*
24 *Nut*
25 *Bolts (diaphragm spring clutch)*
26 *Plate washer (diaphragm spring clutch)*
27 *Diaphragm spring (diaphragm spring clutch)*
28 *Spring seat (diaphragm spring clutch)*
29 *Pressure plate (diaphragm spring clutch)*



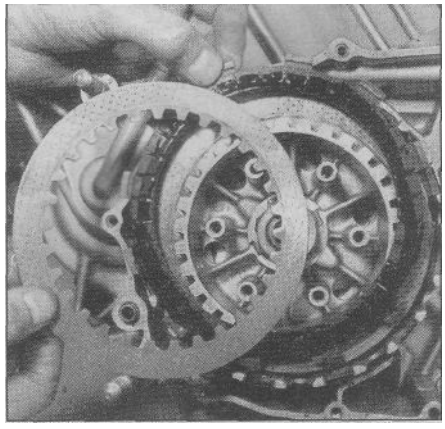
17.6 Remove the thrust washer and thrust bearing



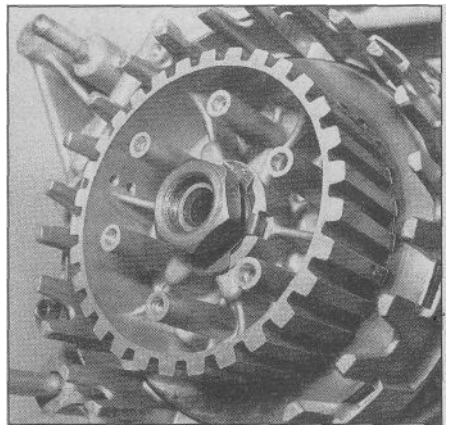
17.7a Remove the push piece . . .



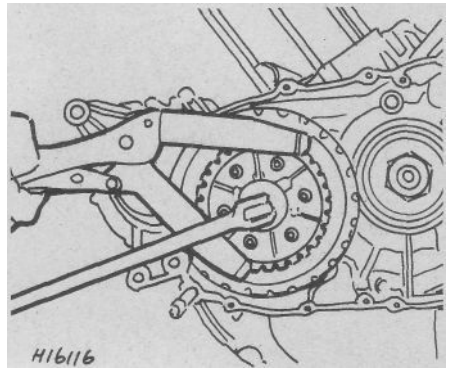
17.7b . . . and the pushrod



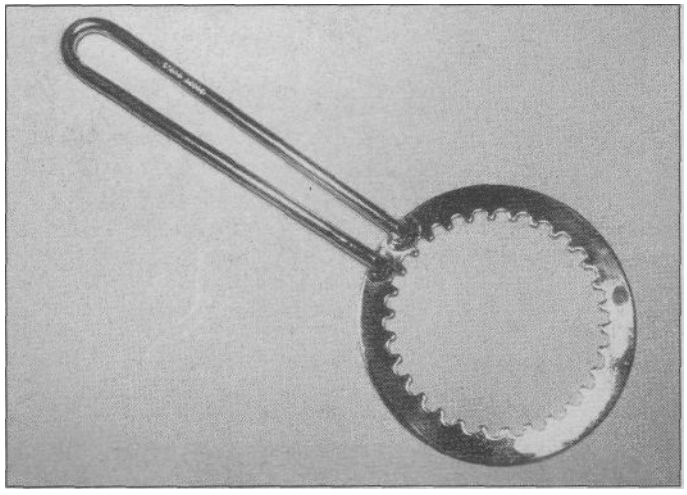
17.8 Remove the clutch plates



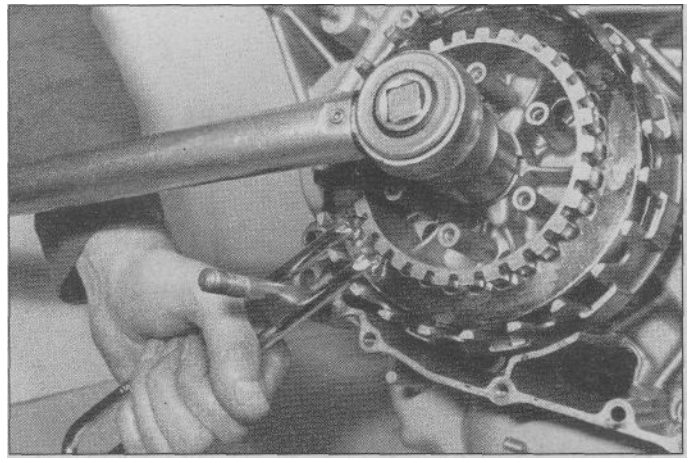
17.9a Bend the lockwasher tab away from the nut



17.9b You'll need a tool to keep the clutch from turning; this is one type of Yamaha special tool . . .



17.9c . . . this is another type



17.9d Hold the clutch housing so it won't turn and loosen the nut

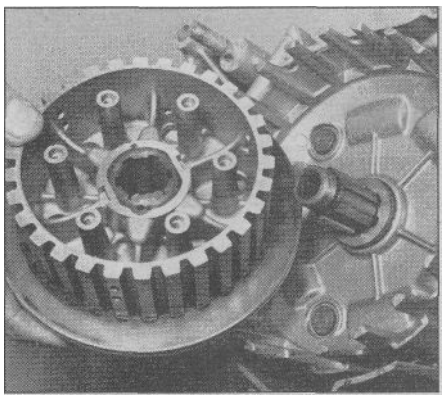
6 Remove the thrust washer and thrust bearing **(see illustration).**

7 Remove the push piece and pushrod **(see illustrations).**

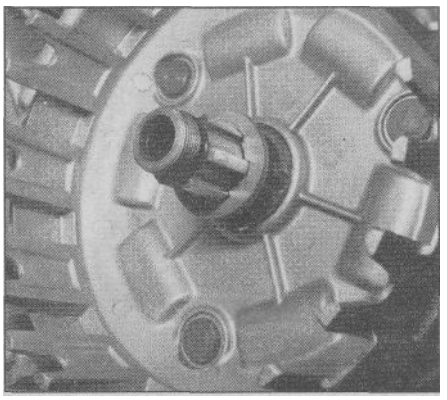
8 Remove the clutch plates (a friction plate comes off first, followed by a steel plate, then alternating friction and steel plates) **(see illustration).**

9 Bend back the lockwasher on the clutch boss nut **(see illustration).** Loosen the nut, using a special holding tool (Yamaha tool no. YM-91402, part no. 90890-04086 or equivalent) to prevent the clutch housing from turning **(see illustrations).** An alternative to these tool can be fabricated from some steel strap, bent at the ends and bolted together in the middle (see Part A of this Chapter). You can also make a holding tool by drilling through a steel plate and friction plate and bolting them together (see Part A of this Chapter). Slip the bolted plates into their normal installed position to lock the clutch housing and clutch boss together. To keep the engine from turning, wedge a rag between the teeth of the primary drive gear and the driven gear on the clutch housing. Once the nut is loose, remove it.

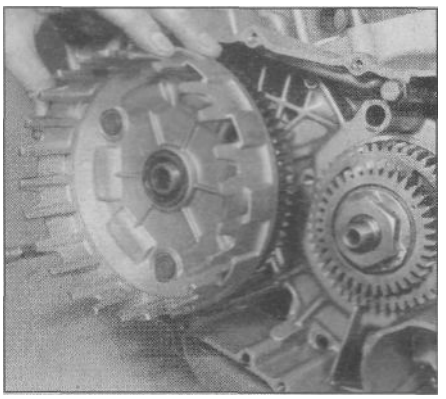
10 Remove the lockwasher and discard it. Use a new one during installation.



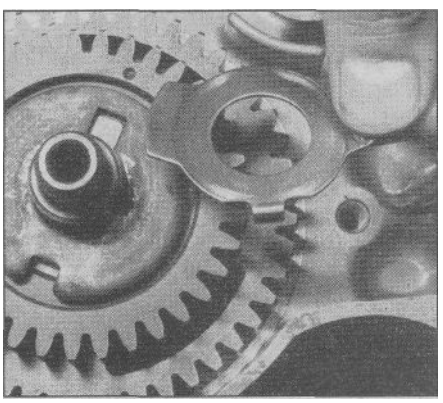
17.11a Remove the clutch boss . . .



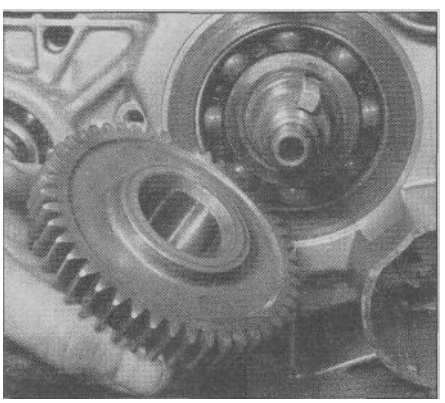
17.11b . . . and the thrust washer



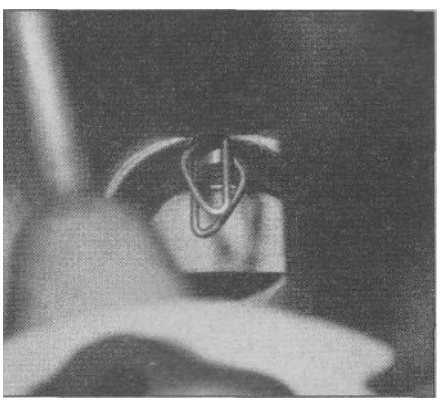
17.12a With the primary gear nut loose. **slide off the clutch boss, then remove** the **primary gear nut . . .**



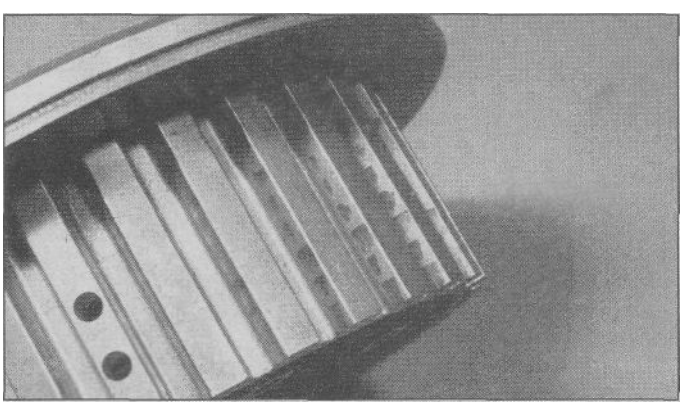
17.12b . . . the lockwasher and the special washer



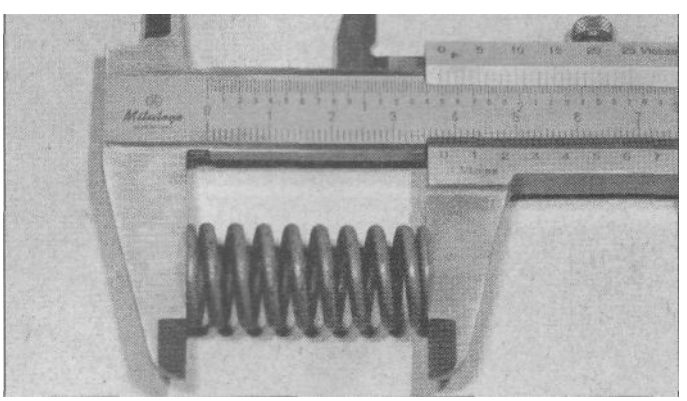
17.13 Take the primary drive gear and Woodruff key off the crankshaft



17.14 Push the ends of the wire ring through the hole in the clutch boss



17.15 Inspect the clutch boss splines



17.16 Measure the free length of the clutch springs (coil spring models)

11 Remove the clutch boss and thrust washer **(see illustrations).**

12 Bend back the lockwasher from the nut that secures the primary drive gear. Wedge a rag between the driven gear and drive gear teeth to keep the gears from turning, then loosen the nut. Once the nut is loose, slide the clutch housing/driven gear off and remove the nut, lockwasher and special washer **(see illustrations).**

13 Remove the primary drive gear and Woodruff key **(see illustration).**

Inspection

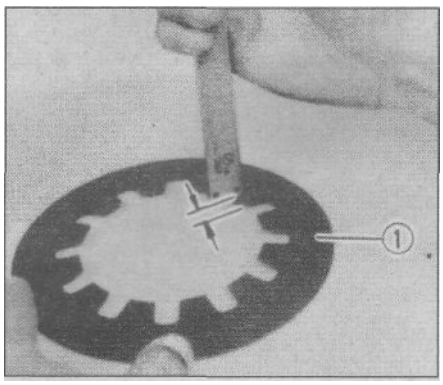
Refer to illustrations 17.14, 17.15, 17.16, 17.17a, 17.17b, 17.18, 17.19, 17.21, 17.22, 17.23 and 17.24

14 If the clutch has been chattering (juddering), remove the wire ring **(see illustration).** Remove the steel plate, seat spring and seat plate that make up the clutch damper **(see illustration 17.4c).** These parts need not be removed if the clutch hasn't been chattering.

15 Examine the splines on both the inside and the outside of the clutch boss **(see illustration).** If any wear is evident, replace the clutch boss with a new one.

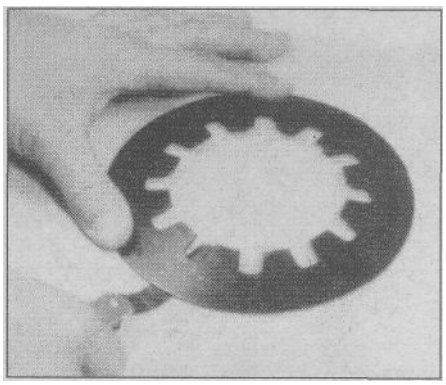
16 If you're working on a coil spring clutch, measure the free length of the clutch springs **(see illustration).** Replace the springs as a set if any one of them is not within the values listed in this Chapter's Specifications.

17 If you're working on a diaphragm spring clutch, measure the free

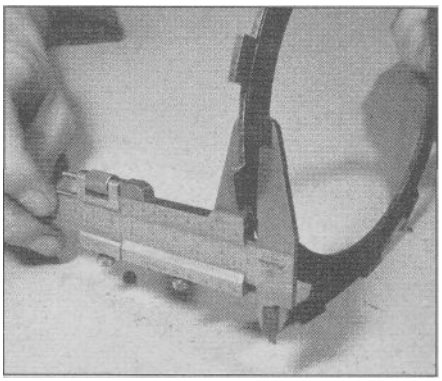


17.17a Measure the free height of the diaphragm spring with a vernier catiper . . .

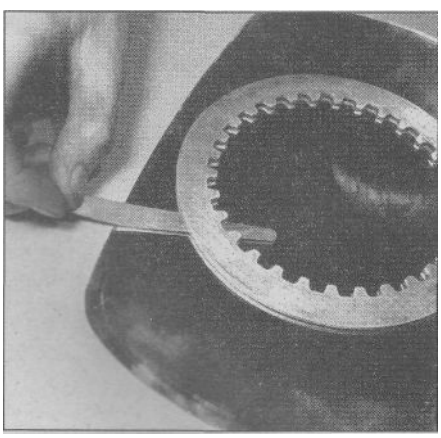
1 Diaphragm spring



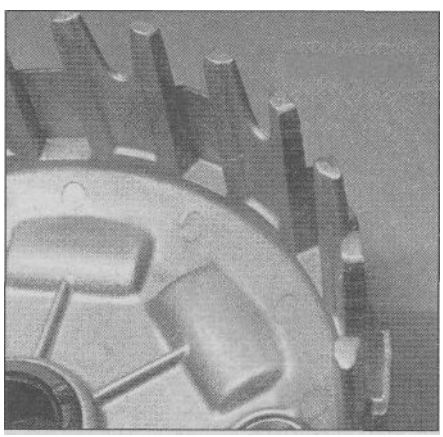
17.17b . . . and check it for warpage with a feeler gauge



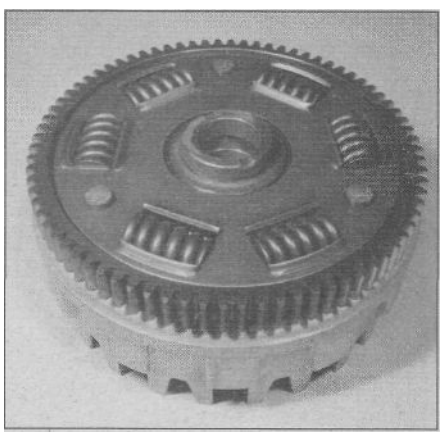
17.18 Check the amount of wear on each clutch friction plate



17.19 Check the metal **plates for warpage** with a feeler gauge



17.21 Check the slots in the clutch housing for uneven wear



17.22 Check the driven gear teeth for wear or damage

height and warpage of the diaphragm spring **(see illustrations).** Replace the spring if it's sagged or warped.

18 If the lining material of the friction plates smells burnt or if it's glazed, new parts are required. If the metal clutch plates are scored or discolored, they must be replaced with new ones. Measure the thickness of each friction plate (see illustration) and compare the results to this Chapter's Specifications. Replace the friction plates as a set.if any are near the wear limit.

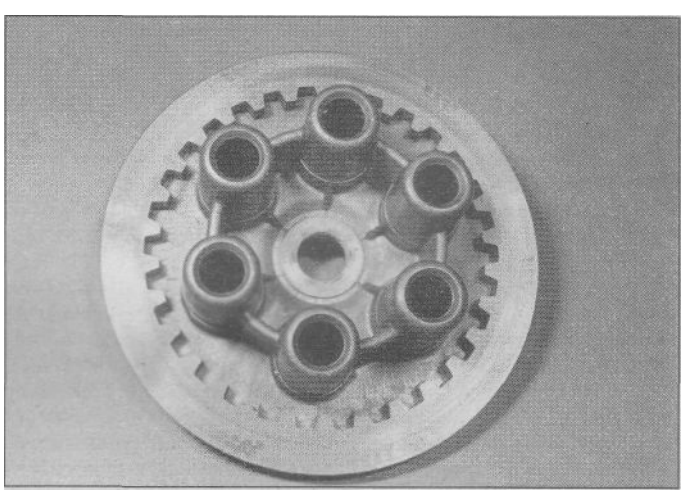
19 Lay the metal plates, one at a time, on a perfectly flat surface (such as a piece of plate glass) and check for warpage by trying to slip a gauge between the flat surface and the plate (see illustration). The feeler gauge should be the same thickness as the warpage limit listed in this Chapter's Specifications. Do this at several places around the plate's circumference. If the feeler gauge can be slipped under the plate, it is warped and should be replaced with a new one.

20 Check the tabs on the friction plates for excessive wear and mushroomed edges. They can be cleaned up with a file if the deformation is not severe.

21 Check the edges of the slots in the clutch housing for indentations made by the friction plate tabs **(see illustration).** If the indentations are deep they can prevent clutch release, so the housing should be replaced with a new one. If the indentations can be removed easily with a file, the life of the housing can be prolonged to an extent.

22 Check the teeth on.the primary drive gear and driven gear for wear or damage and replace them if defects are found. The driven gear is replaced together with the clutch housing **(see illustration).**

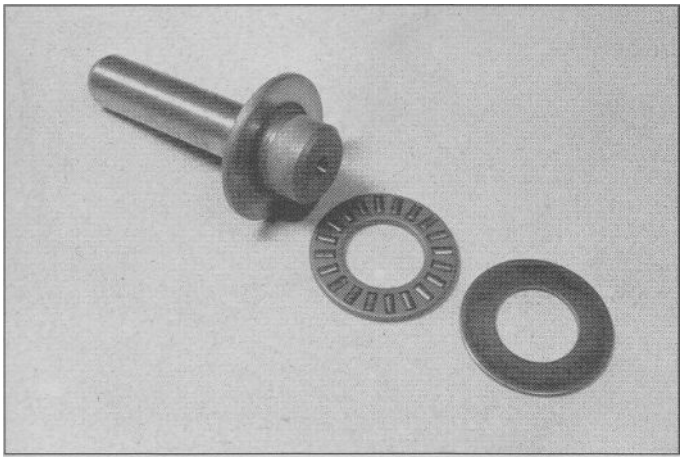
Check the bearing surface in the center of the clutch housing and replace the clutch housing if it's worn or damaged.



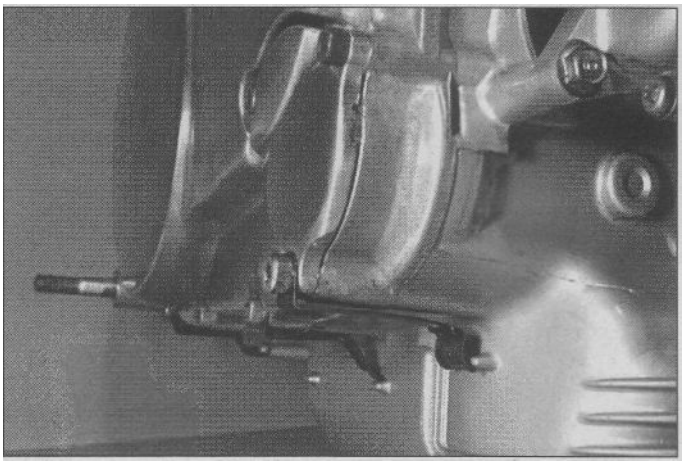
17.23 Check the pressure plate for wear and damage (coil spring pressure plate shown)

23 Check the pressure plate for wear and damage **(see illustration).** Replace any worn or damaged parts.

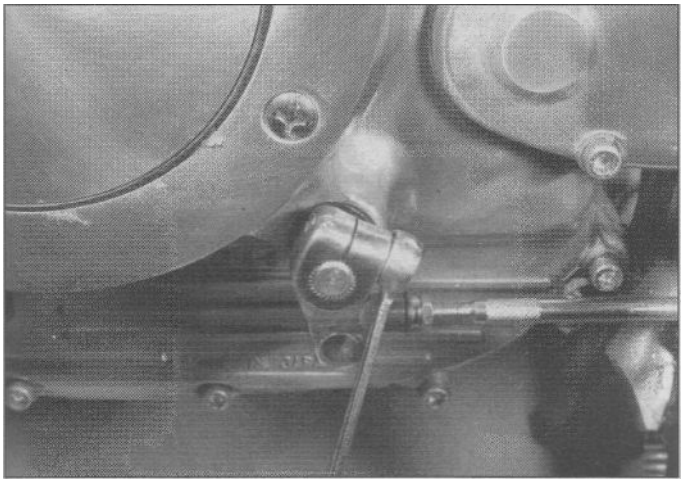
24 Check the push piece, thrust bearing and washer for wear or damage **(see illustration).** Check the pushrod, especially at the ends. Replace any parts that show wear or damage.



17.24 Check the push piece, thrust bearing and washer for wear and damage



17.38 Several of the bottom clutch cover bolts secure wiring harness clips



18.3 Loosen the pinch bolt and detach the shift lever from the shift shaft (rearset shift linkage shown)

25 Clean all traces of old gasket material from the clutch cover and ts mating surface on the crankcase.

Installation

Refer to illustration 17.38

26 Install the primary drive gear Woodruff key, then install the primary drive gear **(see illustration 17.13).**

27 Install the special washer and a new lockwasher on the primary drive gear. Make sure the lockwasher tabs fit into the notches in the special washer **(see illustration 17.12b),** then install the nut.

28 Coat the clutch housing bearing surface with clean engine oil, then slip the clutch housing onto the crankshaft **(see illustration 17.12a).**

29 Wedge a rag between the primary drive gear and the driven gear on the clutch housing so they can't turn, then tighten the primary drive gear nut to the torque listed in this Chapter's Specifications. Bend the lockwasher against the nut.

30 Install the thrust washer, then the clutch boss **(see illustrations 17.11b and 17.11a).** Install a new lockwasher. Install the nut with its recessed side toward the clutch boss and tighten it slightly **(see illustration 17.9a).**

31 Hold the clutch boss and housing from turning with one of the methods described in Step 9. Tighten the clutch boss nut to the torque *listed* in this Chapter's Specifications, then bend the lockwasher against the nut to secure it.

32 If you removed the clutch damper, reverse Step 14 to install it. If there's an OUTSIDE mark on the seat spring, face it out (away from the engine). Make sure the wire ring is securely seated in its groove in the clutch boss.

33 Coat one of the friction plates with engine oil and install it in the clutcTi housing. Engage the tabs on the friction plate with the slots in the clutch housing.

34 Coat a metal plate with engine oil and install it on top of the friction plate with its rounded side in. Continue to install alternate friction and metal pfates, coated with engine oil (a friction plate is the last one installed).

35 Coat the pushrod with multi-purpose grease and install it in the engine **(see illustration 17.7b).**

36 If you're working on a coil spring clutch, install the pressure plate, springs and screws. Tighten the screws evenly in a criss-cross pattern to the torque listed in this Chapter's Specifications.

37 If you're working on a diaphragm spring clutch, install the pressure plate, spring seat, spring and plate washer **(see** illustrtion 17.4c). Install the plate washer bolts and tighten them evenly, in a criss-cross pattern, to the torque listed in this Chapter's Specifications.

38 Install the clutch cover over the dowels and a new gasket, then install and finger-tighten the bolts. Some of the bolts along the bottom retain wiring harness clamps **(see illustration).**

39 Tighten the bolts in stages, using a criss-criss pattern, to the torque listed in this Chapter's Specifications.

40 Install a new oil filter and fill the crankcase with the recommended type and amount of engine oil (see Chapter 1).

41 The remainder of installation is the reverse of the removal steps.

18 External shift mechanism - removal, inspection and installation

Shiftleverandpedal

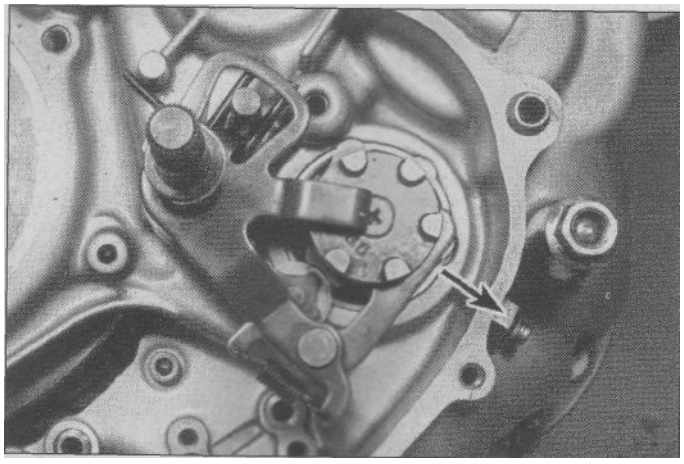
Refer to illustration 18.3

1 Support the bike securely so it can't be knocked over during this procedure.

2 Look for a punch mark on the end of the lever shaft. This should align with the groove in the lever or pedal. If you can't find it, make your own punch mark so the lever or pedal can be realigned correctly during installation.

3 Remove the lever or pedal pinch bolt **(see illustration).** Pull the lever or pedal off the shaft, together with the linkage rod.

4 Installation is the reverse of removal. Adjust the linkage (if equipped) as needed with the nuts on the linkage shaft (see Chapter 1).



18.7a Pull the lever in the **direction of the arrow until it clears the shift cam, then** slide the shift **mechanism out of the engine**

18.7b Remove the C-clip at each end of the shaft and slide the parts off for inspection

Shiftmechanismremoval

Refer to illustrations 18.7a and 18.7b

5 Disconnect the shift lever from the shaft (Steps 1 through 3).

6 Remove the alternator cover (see Chapter 8).

7 Pull the lever on the shift mechanism away from the shift cam, then slide the shift mechanism out of the crankcase **(see illustrations).**

Shiftmechanisminspection

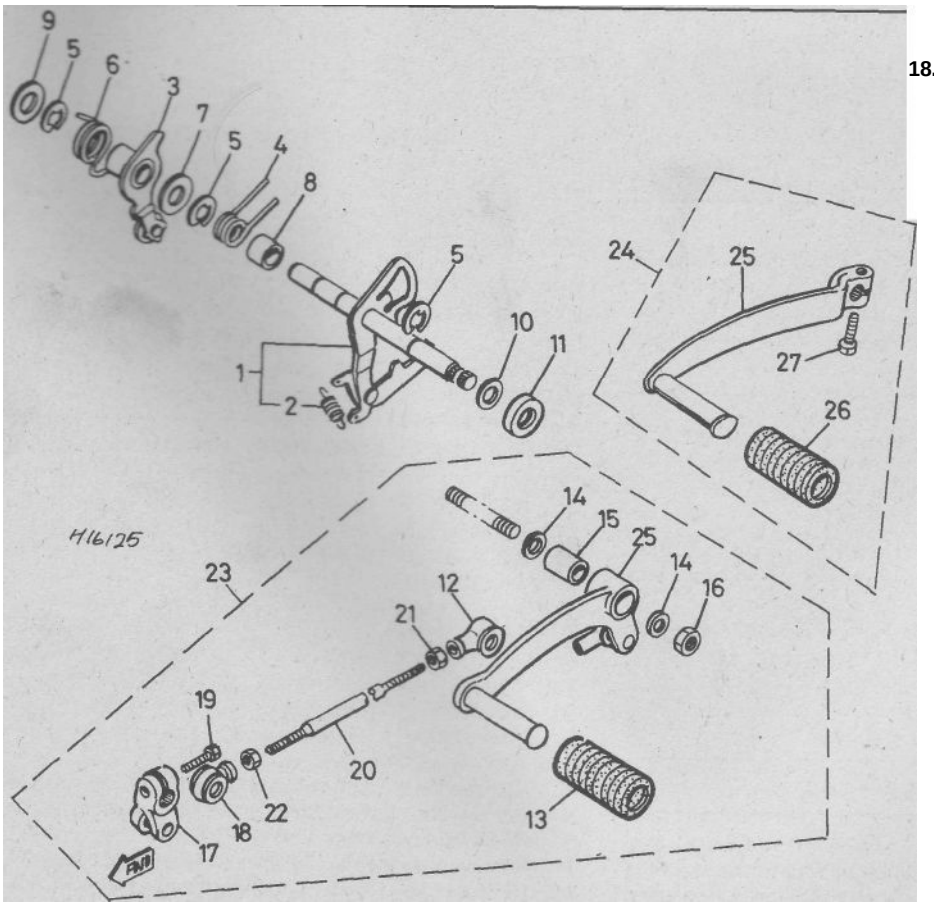
Refer to illustrations 18.9, 18.11 and 18.13

8 Inspect the shift shaft guide bar in the crankcase. If it's worn or damaged, replace it. If it's loose, bend back its lockwasher, unscrew it, reinstall it with a new lockwasher and tighten it securely. Bend the new lockwasher against the nut to secure it.

9 Remove the C-clips from each end of the shift shaft, then separate the components from the shaft **(see illustration).**

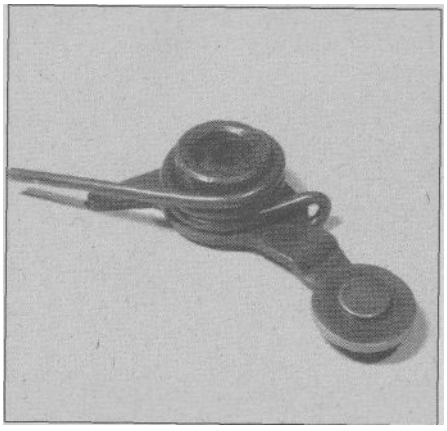
10 Check the shift shaft for bends and damage to the splines. If the shaft is bent, you can attempt to straighten it, but if the splines are damaged it will have to be replaced. Inspect the pawls and springs on the shift shaft and replace the shaft if they're worn or damaged.

11 Check the condition of the stopper lever and spring **(see illustration).** Replace*the stopper lever if it's worn where it contacts

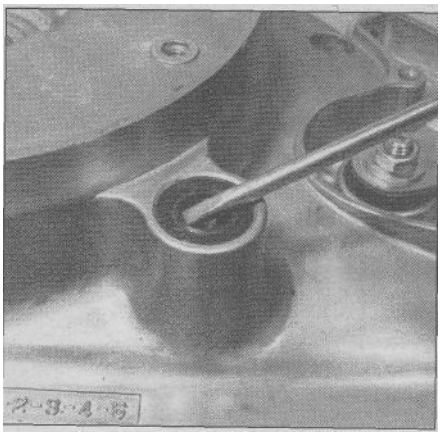


18.9 External shift mechanism (XV700-1100 models) - exploded view

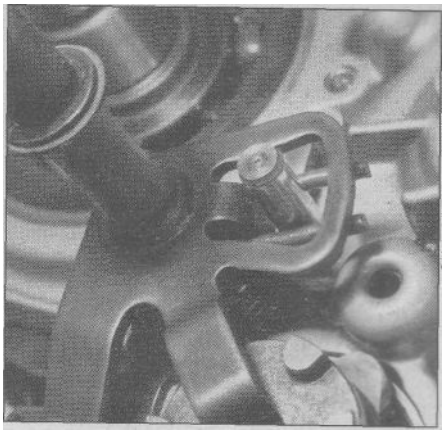
1 Shift arm and shaft
2 Return spring
3 Stopper lever
4 Shaft return spring
5 C-clip
6 Stopper lever spring
7 Washer
8 Bushing (if equipped)
9 Washer
10 Washer
11 Oil seal
12 Rear boot
13 Pedal pad
14 Thrust washer
75 Bushing
16 Nut
17 Linkage end piece
18 Front boot
19 Pinch bolt
20 Linkage rod
21 Rear adjusting nut
22 Front adjusting nut
23 Shift pedal and linkage - rearset type
24 Shift pedal - direct type
25 Shift pedal
26 Pedal pad
27 Pinch bolt



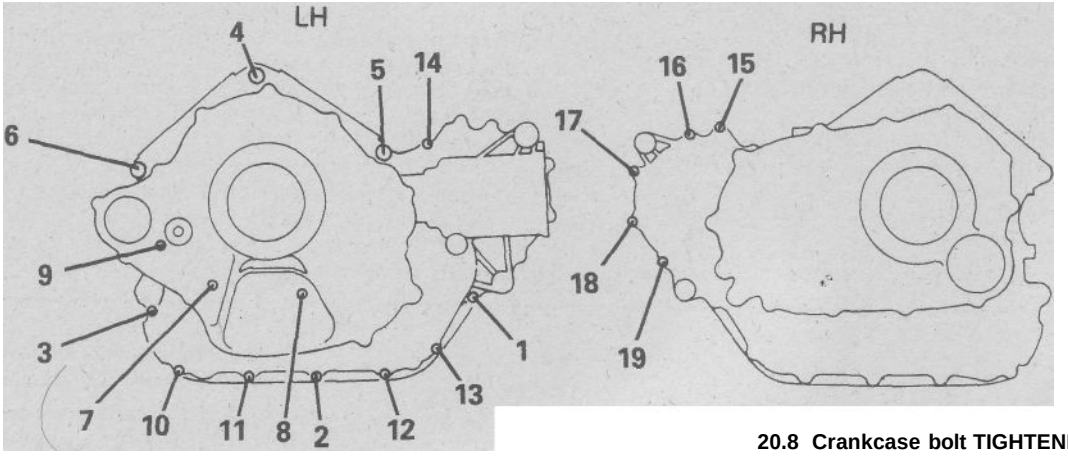
18.11 Check the stopper arm roller and spring for wear and damage



18.13 Pry the oil seal out of the cover and tap a new one in



18.15 The legs of the shaft return spring should be on either side of the shift shaft guide bar



20.8 Crankcase bolt TIGHTENING sequence

the shift cam. Replace the spring if it's distorted.

12 Inspect the pins on the end of the shift cam. If they're worn or damaged, you'll have to disassemble the crankcase to replace them.

13 Pry the shift pedal oil seal out of the alternator cover **(see illustration).** Install a new seal so its open side will face into the engine when the cover is installed. You should be able to push the new seal in with thumbs, but if it won't go, tap it in with a hammer and a socket the same diameter as the seal.

14 Reassemble the shift mechanism components on the shaft.

Installation

Refer to illustration 18.15

15 Be sure the washers are on the shift shaft, then install the shift shaft in the crankcase. Engage the stopper lever with the shift cam and position the torsion spring against its post **(see illustration).**

16 The remainder of installation is the reverse of the removal steps.

17 Adjust the shift pedal position (see Chapter 1).

18 Check the engine oil level and add some, if necessary (see Chapter 1).

19 Middle gears and shafts (shaft drive models)

The middle driveshaft and middle driven shaft on these models are mounted in the left crankcase casting. Access to the shafts is gained by splitting the crankcase. Removal of the shafts for inspection is a complicated procedure which requires a number of special tools. For this reason, removal and disassembly of the shafts should be done by a Yamaha dealer or other qualified repair shop.

You can probably save considerable money on labor charges by removing the engine and doing most of the engine disassembly yourself. However, be sure to check with the shop first'to find out how much disassembly to do. Some shops may not be willing to work on a partially disassembled engine.

20 Crankcase - disassembly and reassembly

1 To examine and repair or replace the crankshaft, middle drive and driven shafts, connecting rods, bearings, or transmission components, the crankcase must be split into two parts.

Disassembly

Refer to illustrations 20.8, 20.9 and 20.10a through 20.10d

2 Remove the cylinder heads, cylinders, pistons and cam chains (see Sections 8, 11, 12 and 14).

3 Remove the alternator, starter motor and starter drive (see Chapter 8).

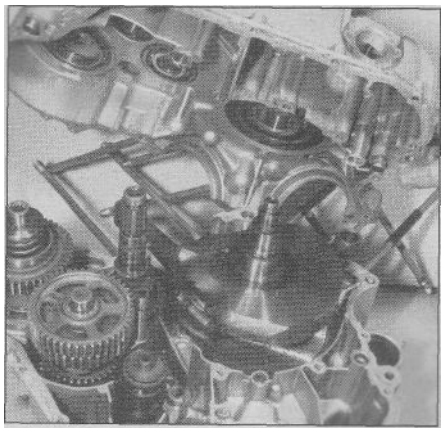
4 Remove the oil level switch and neutral switch (see Chapter 8).

5 Remove the oil pump and oil feed line (see Section

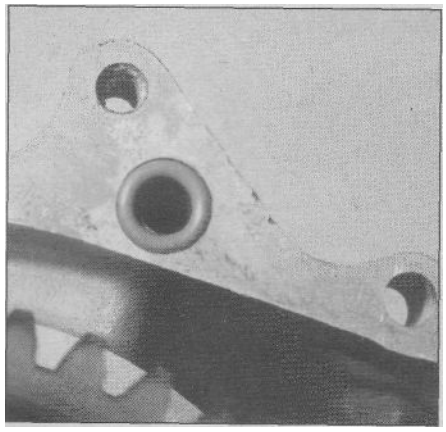
6 Remove the clutch and primary gear (see Section 1 7

7 Remove the external shift linkage (see Section 18).

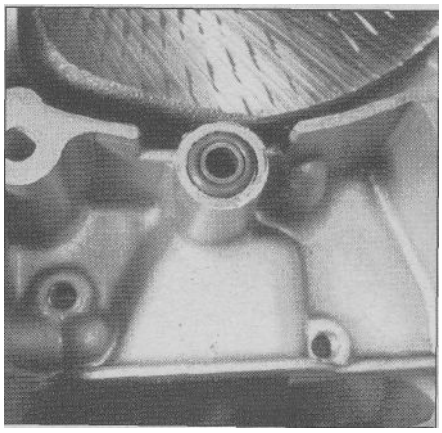
8 Remove the crankcase bolts in the reverse of the tightening sequence (start with the highest-numbered bolt and work to the lowest) **(see illustration).**



20.9 With all fasteners removed, lift the right crankcase half off the left crankcase half



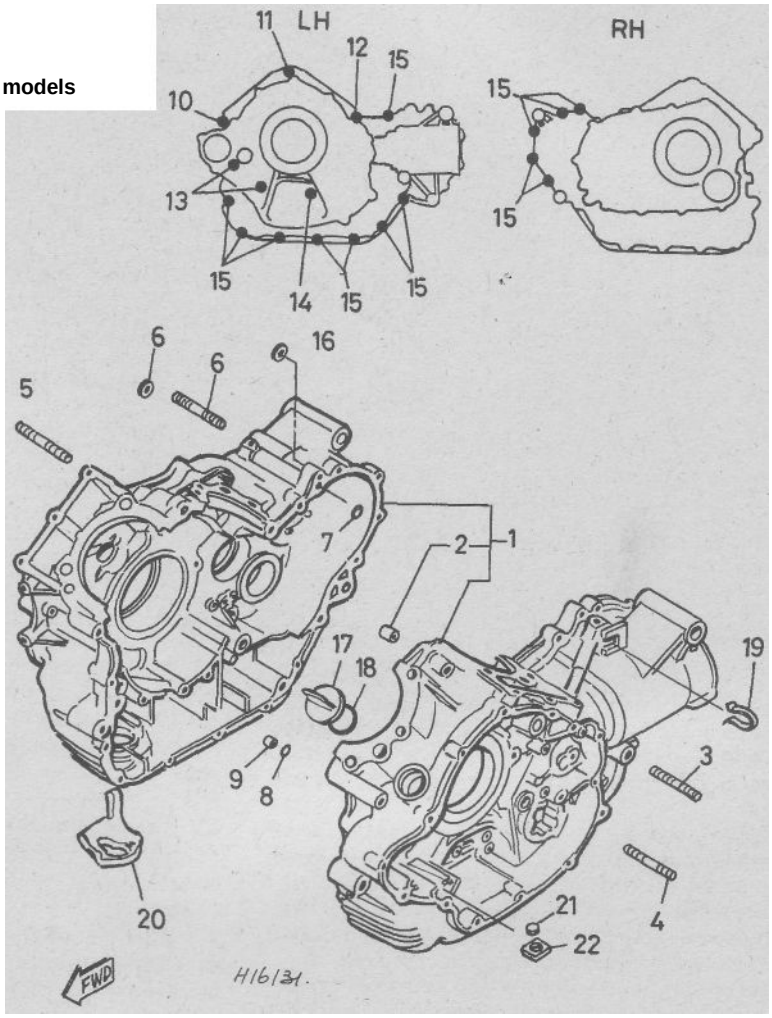
20.10a Locate the orange O-ring



20.10b . . . and the black O-ring

20.10c Crankcase halves - shaft drive models

1 Crankcase halves
2 Dowels
3 Stud
4 Stud
5 Stud
6 Stud
7 O-ring
8 O-ring
9 Dowel
10 Bolt
11 Bolt
12 Bolt
13 Bolt
14 Bolt
15 Bolt
16 Sealing washer
17 Oil filler plug
18 O-ring
19 Clamp
20 Protector plate
21 Plug
22 Grommet



9 Carefully lift the right crankcase half away from the left crankcase half **(see illustration).** As you lift, pry gently and evenly at the pry points around the crankcase seam. Tap alternately on the transmission shafts. If the halves won't separate easily, make sure all fasteners have been removed. Don't pry against the crankcase mating surfaces or they'll leak.

10 Look for the O-rings and dowels **(see illustrations).** If they're not in one of the crankcase halves, locate them.

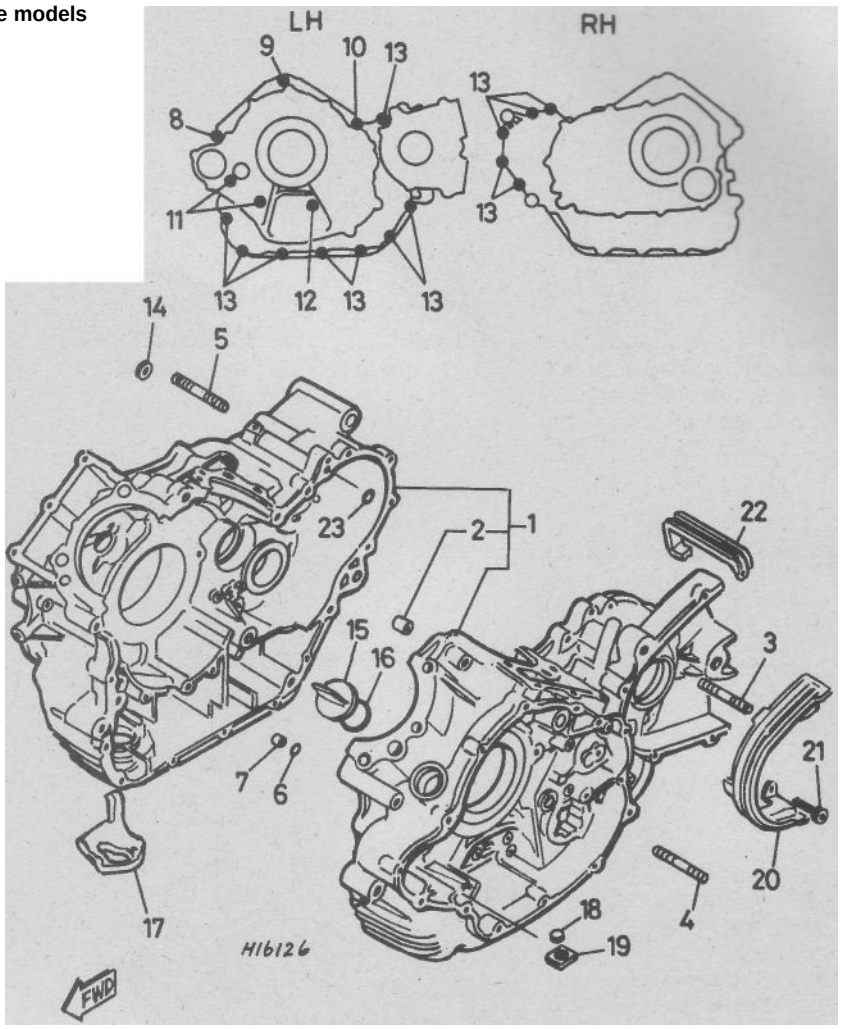
11 Refer to Sections 21 through 25 for information on the internal components of the crankcase.

Reassembly

12 Make sure the crankshaft and transmission shafts are correctly positioned in the left crankcase half (see Sections 23 and 26). Make sure the shift cam is correctly aligned with the neutral switch (see Section 26).

20.1 Od Crankcase halves - chain drive models

1 *Crankcase halves*
2 *Dowels*
3 *Stud*
4 *Stud*
5 *Stud*
6 *O-ring*
7 *Dowel*
8 *Bolt*
9 *Bolt*
10 *Bolt*
11 *Bolts*
12 *Bolt*
13 *Bolts*
14 *Sealing washer*
15 *Oil filler plug*
16 *O-ring*
17 *Protective plate*
18 *Plug*
19 *Grommet*
20 *Sprocket guard*
21 *Bolts*
22 *Clamp*



13 Remove all traces of sealant from the crankcase mating surfaces. Be careful not to let any fall into the case as this is done. Check to make sure the dowels are in place in the right crankcase half **(see illustration 20.10c and 20.10d).** Also make sure the orange and black O-rings are in place in their grooves **(see illustrations 20.10a and 20.10b).**

14 Pour some engine oil over the transmission gears, the crankshaft main bearings and the shift cam. Also pour oil into the exposed internal oil passages. Don't get any oil on the crankcase mating surfaces.

15 Apply a thin, even bead of Yamaha Bond or Quick Gasket sealant (part no. ACC-11001-05-01) or equivalent to the crankcase mating surfaces. **Caution:** *Don't apply an excessive amount of sealant.*

16 Carefully assemble the crankcase halves over the dowels. **Caution:** *The crankcase halves should fit together completely without being forced. If they're slightly apart, DO NOT force them together by tightening the crankcase bolts.*

17 Install the crankcase bolts in their holes **(see illustration 20.8).**

18 Tighten the bolts in numerical order, starting with the lowest-numbered bolt and working to the highest. Tighten all bolts to the torque listed in this Chapter's Specifications. **Note:** *There are different :orque settings for the 10mm bolts and the 6mm bolts.*

19 Turn the mainshaft and the transmission driveshaft to make sure they turn freely. Also make sure the crankshaft turns freely. Rotate the shift cam by hand to make sure the transmission shifts into the different gear positions.

20 The remainder of assembly is the reverse of disassembly.

21 Be sure to refill the engine oil (see Chapter 1).

21 Crankcase components - inspection and servicing

Refer to illustrations 21.4a, 21.4b, 21.4c, 21.5a, 21.5b, 21.6a ***and*** *21.6b*

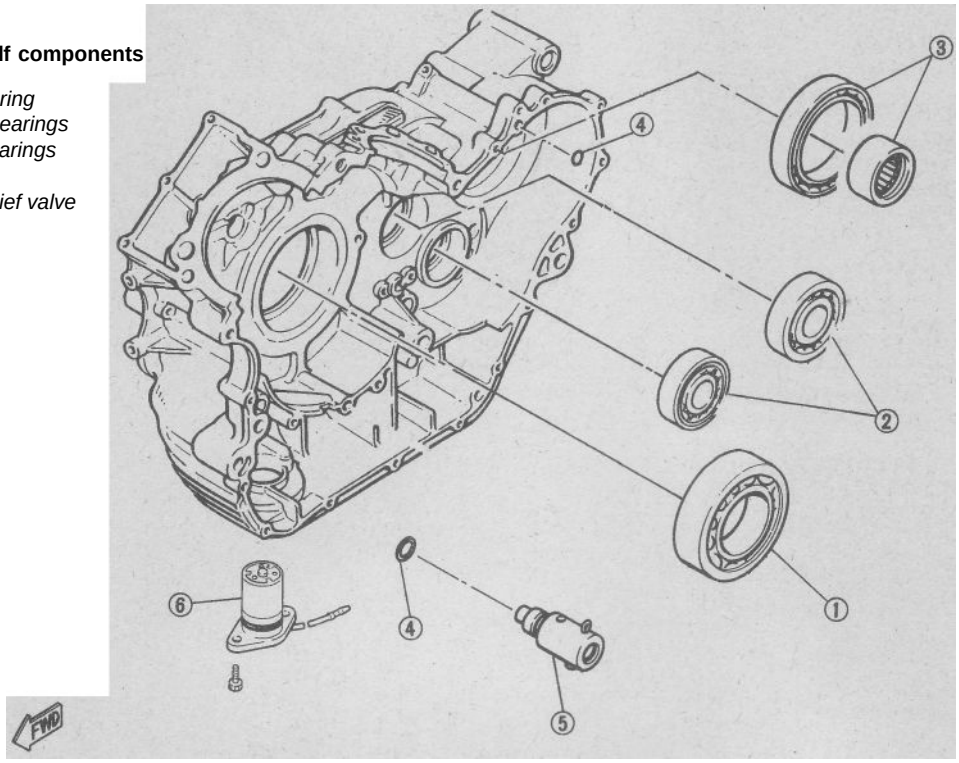
1 After the crankcases have been separated and the crankshaft, shift cam and forks and transmission components removed, the crankcases should be cleaned thoroughly with new solvent and dried with compressed air.

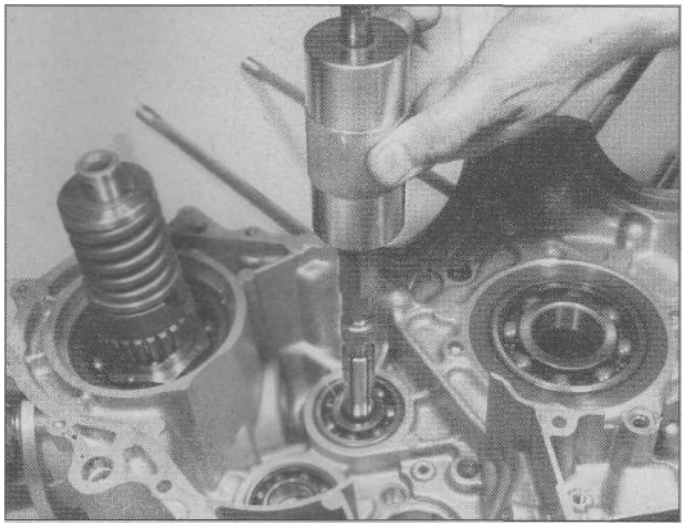
2 Remove any oil passage plugs that haven't already been removed. All oil passages should be blown out with compressed air.

3 All traces of old gasket 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. If any damage is found that can't be repaired, replace the crankcase halves as a set.*

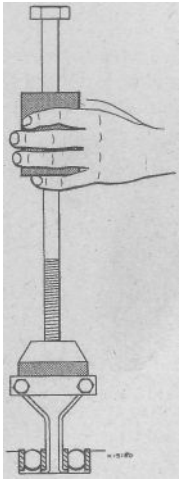
21.4a Right crankcase half components

7 Crankshaft bearing
2 Transmission bearings
3 Middle gear bearings
4 O-ring
5 Oil pressure relief valve
6 Oil level switch





21.4b Use a slide hammer to remove the bearings if they don't lift out easily . . .



21.4c . . . the slide hammer's puller attachment fits behind the bearing like this

4 Spin the bearings in the crankcase halves **(see illustration)** with fingers and check for looseness, roughness or excessive noise. Replace the bearings if these conditions are found. Remove the bearings with fingers, or if necessary, with a slide hammer **(see illustrations).**

5 Remove the oil seal from behind the transmission mainshaft bearing in the left side of the crankcase **(see illustration).** Make sure the oil passages behind the seal is clear and the bearing bore is clean **(see illustration),** then tap in a new oil seal.

6 Set the new bearings in their bores, then tap them into position with a bearing driver or a socket that bears against the bearing outer race **(see illustrations). Note:** *Special equipment is required for access to the middle gear bearings.*

22 Oil pressure relief valve - removal, inspection and installation

Refer to illustrations 22.3, 22.4 and 22.6

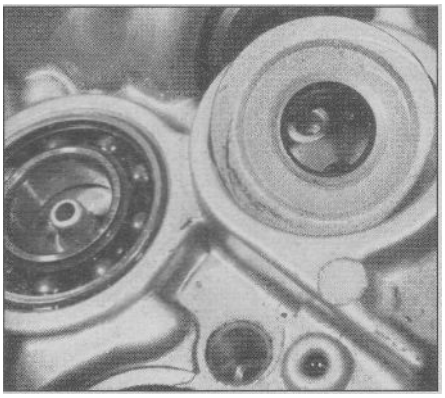
1 Disassemble the crankcase (see Section 20).

2 Work the oil pressure relief valve out of the crankcase (it's held in by an O-ring) **(see illustration 21.4a).**

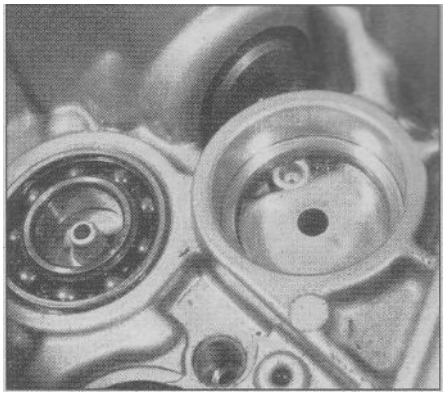
3 Push the plunger into the relief valve and check for free movement **(see illustration).** If the valve sticks, perform Steps 4 and 5 to disassemble and inspect it.

4 Straighten the cotter pin and pull it out **(see illustration).** Remove the spring retainer, spring and plunger.

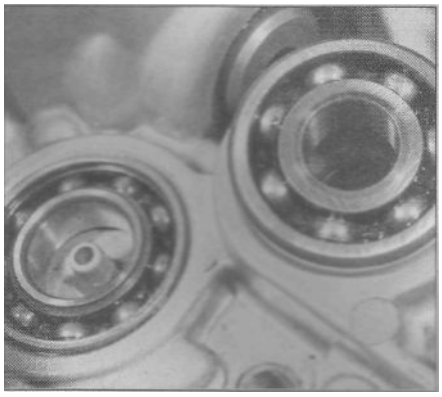
5 Check all parts for wear and damage. Clean the parts thoroughly, reassemble the valve and recheck its movement. If the valve still sticks,



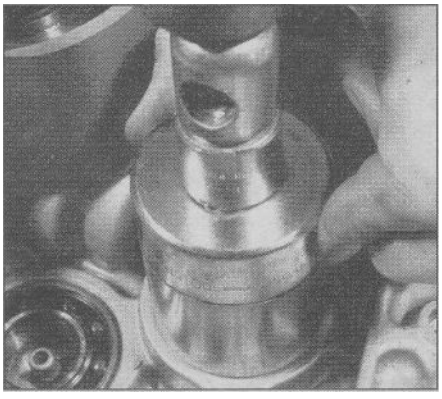
21.5a Pry the oil seal out of the bearing bore . . .



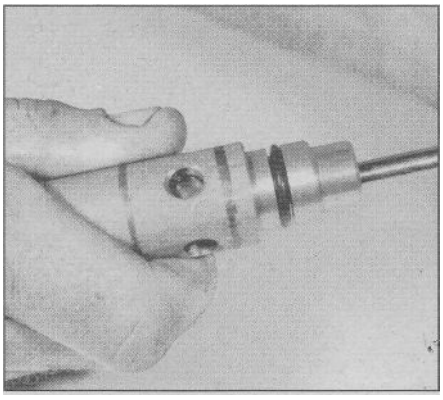
21.5b . . . make sure the oil passage is clear and tap in a new seal



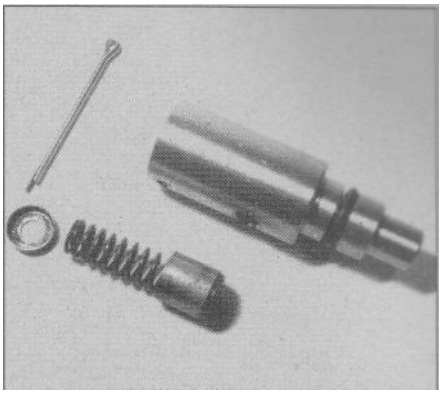
21.6a Push the bearing sU<wyhl into its housing . . .



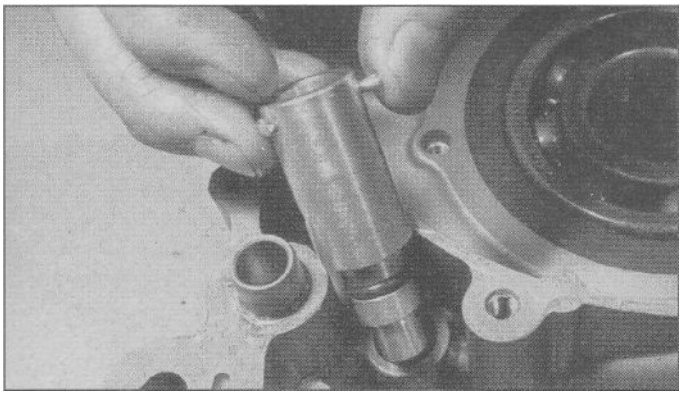
21.6b . . . then drive it all the way in with a bearing driver or socket that bears against the outer race of the bearing



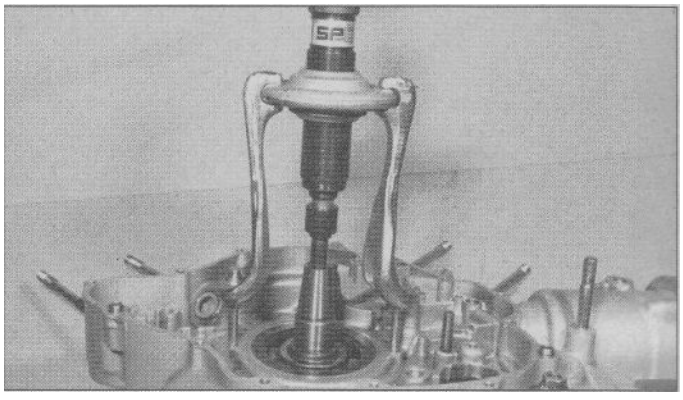
22.3 Push in on the relief valve plunger to make sure it moves freely



22.4 Check the relief valve parts for wear or damage



22.6 Coat the new O-ring with engine oil and work the relief valve back into its bore



23.3a Use a puller like this one to push the crankshaft out of the bearing

replace it. **Caution:** *If you reuse the relief valve, install a new cotter pin before installing the relief valve in the engine.*

6 Install a new O-ring on the valve **(see illustration).** Coat the O-ring with engine oil and work the valve back into its bore in the crankcase.

23 Crankshaft and main bearings - removal, inspection, main bearing replacement and installation

Note: *The crankshaft is a tight interference fit in its ball bearing in the left crankcase half. Special tools are required for removal and installation. Substitutes for the Yamaha factory tools are described and illustrated in this Section, but even these may be difficult to obtain. If you don't have the proper tools or substitutes, don't try to drive the crankshaft out or back in. Take the left crankcase half to a Yamaha dealer or other qualified shop for crankshaft removal and installation.*

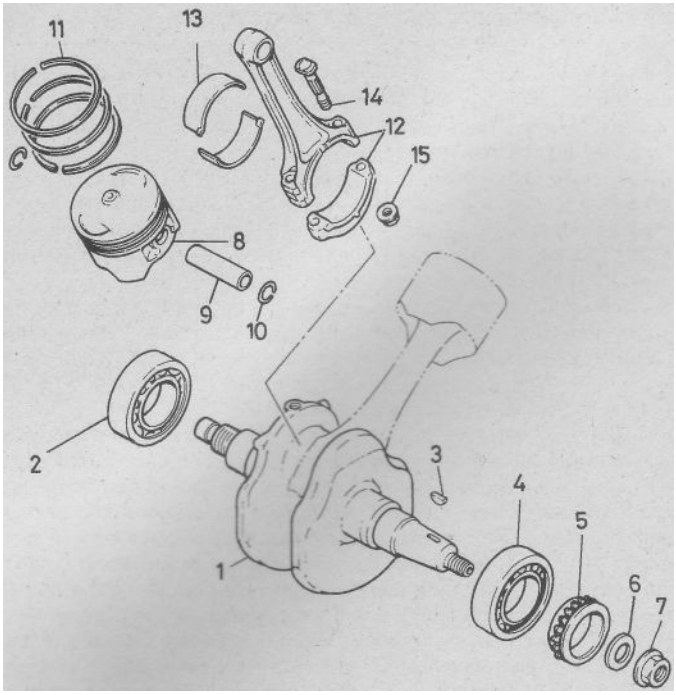
Crankshaft removal

Refer to illustrations 23.3a and 23,3b

1 Separate the crankcase halves (see Section 20).

2 Remove the oil pump drive sprocket from the crankshaft (see Section 15).

3 Attach a puller to the crankshaft and push it out of the main bearing **(see illustrations). Caution:** *Support the crankshaft as it's removed so it doesn't fall.*



23.3b Crankshaft details

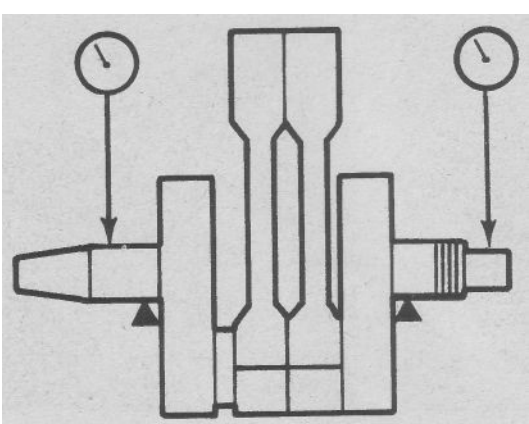
1	*Crankshaft*	*9*	*Piston pin*
2	*Right main bearing*	*10*	*Circlip*
3	*Woodruff key*	*11*	*Piston rings*
4	*Left main bearing*	*12*	*Connecting rod*
5	*Oil pump drive sprocket*	*13*	*Connecting rod bearings*
6	*Washer*	*14*	*Connecting rod studs*
7	*Nut*	*15*	*Connecting rod nuts*
8	*Piston*		

Inspection

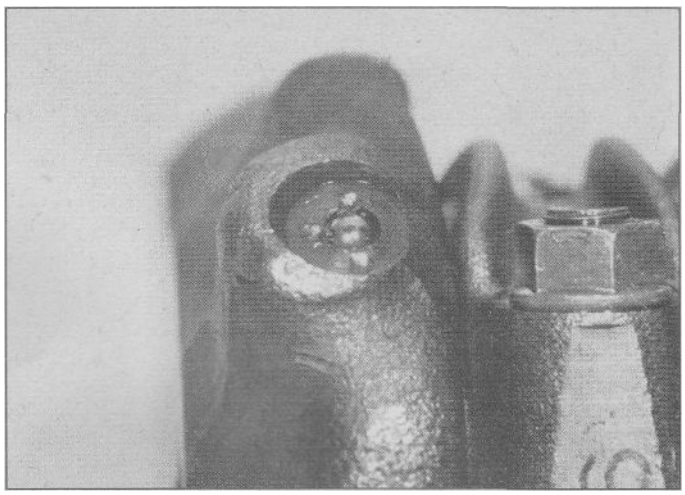
Refer to illustrations 23.5 and 23.7

4 If you haven't already done so, mark and remove the connecting rods from the crankshaft (see Section 25).

5 Clean the crankshaft with solvent, using a rifle-cleaning brush to scrub out the oil passages. Make sure the oil passage plugs are tight **(see illustration).** Check the crankshaft for cracks and other damage.



23.7 Check crankshaft runout with a pair of dial indicators



23.5 Make sure the oil passage plugs are tight

It should be magnafluxed to reveal hidden cracks - a dealer service department or motorcycle machine shop will handle the procedure.

6 If available, blow the crank dry with compressed air. Check the main and connecting rod journals for uneven wear, scoring and pits. Rub a copper coin across the journal several times - if a journal picks up copper from the coin, it's too rough. Replace the crankshaft.

7 Set the crankshaft on V-blocks and check the runout with a dial indicator touching the alternator and primary drive gear mounting surfaces **(see illustration).** Compare your findings with this Chapter's Specifications. If the runout exceeds the limit, replace the crankshaft.

Main bearing inspection and replacement

Refer to illustration 23.8

8 The crankshaft rides in ball bearings which are pressed into steel sleeves in the aluminum case halves **(see illustration).**

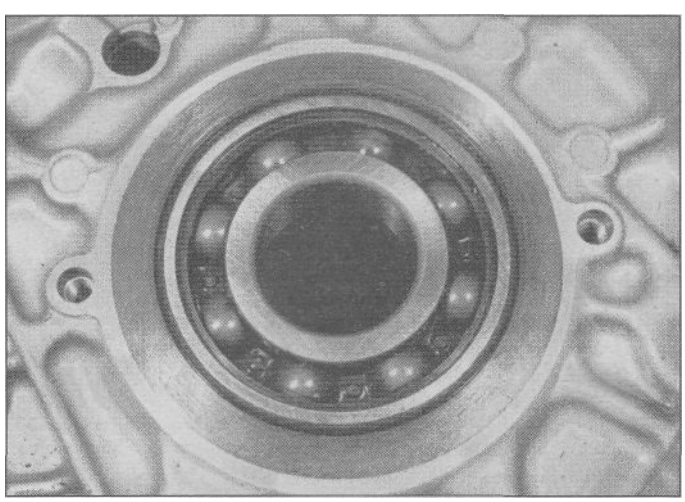
9 Spin the bearings with fingers and check for looseness, roughness or excessive noise. If the condition of the bearings is doubtful or definitely bad, have them pressed out and new ones pressed in by a Yamaha dealer or other qualified repair shop.

Installation

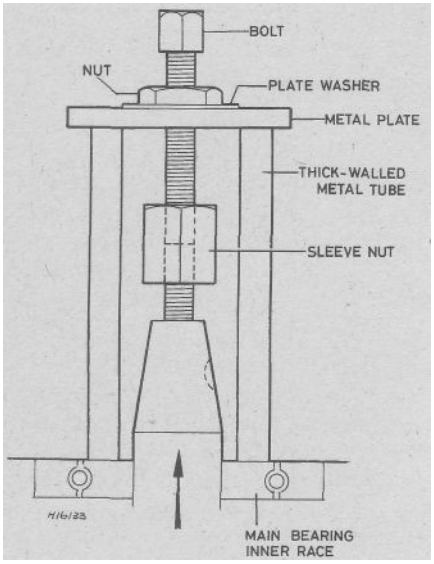
Refer to illustrations 23.11, 23.12, 23.13 and 23.14

10 Install the connecting rods on the crankshaft at this point if they were removed (see Section 25).

11 To pull the crankshaft into the ball bearing in the left crankcase half, you'll need a puller that can be attached to the threaded end of



23.8 The crankshaft bearings are mounted in steel sleeves



23.11 Set up a puller like this one to pull the crankshaft into the left main bearing

the crankshaft with a sleeve nut. This can be fabricated **(see illustration),** but the puller must apply force to the inner race of the ball bearing. A puller that's braced against the outer race of the ball bearing will transfer the installation force to the balls and retainers, damaging the bearing. The same thing will happen if the crankshaft is driven into the bearing with a hammer.

12 Carefully lower the crankshaft into the bearing until it stops **(see illustration).** Make sure the crankshaft isn't cocked sideways in the bearing.

13 Thread a sleeve nut onto the end of the crankshaft **(see illustration).** Install a thick-walled metal tube over the end of the crankshaft to act as a spacer. The tube must be large enough to fit over the crankshaft, but small enough that it rests on the inner race of the ball bearing.

14 Attach a puller to the sleeve nut with its plate resting on the metal tube **(see illustration).**

15 Tighten the puller bolt to pull the crankshaft into its bearing.

16 Remove the puller and align the connecting rods with the cylinders.

17 Assemble the case halves (see Section 20) and check to make sure the crankshaft and the transmission shafts turn freely.

24 Connecting rod bearings - general note

1 Even though connecting rod bearings are generally replaced with new ones during the engine overhaul, the old bearings should be retained for close examination as they may reveal valuable information about the condition of the engine.

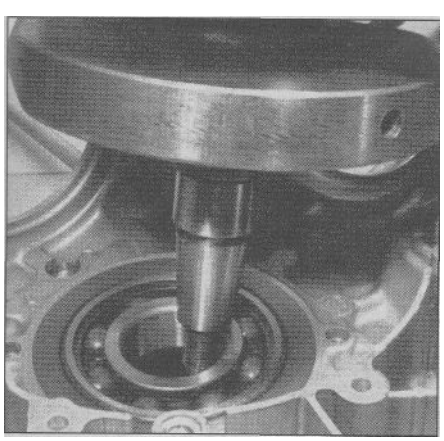
2 Bearing failure occurs mainly because of lack of lubrication, the presence of dirt or other foreign particles, overloading the engine and/or corrosion. Regardless of the cause of bearing failure, it must be corrected before the engine is reassembled to prevent it from happening again.

3 When examining the bearings, remove the rod bearings from the connecting rods and caps and lay them out on a clean surface in the same general position as their location on the crankshaft journals. This will enable you to match any noted bearing problems with the corresponding side of the crankshaft journal.

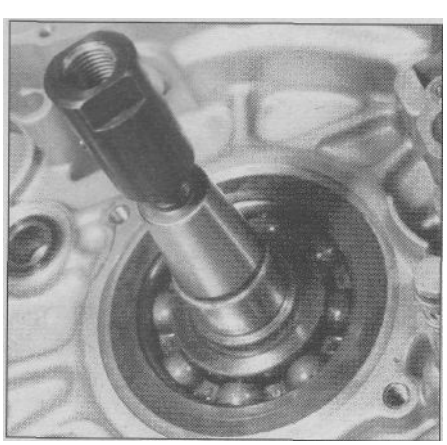
4 Dirt and other foreign particles get into the engine in a variety of ways. It may be left in the engine during assembly or it may pass through filters or breathers. It may get into the oil and from there into the bearings. Metal chips from machining operations and normal engine wear are often present. Abrasives are sometimes left in engine components after reconditioning operations such as cylinder honing, especially when parts are not thoroughly cleaned using the proper cleaning methods. Whatever the source, these foreign objects often end up imbedded in the soft bearing material and are easily recognized. Large particles will not imbed in the bearing and will score or gouge the bearing and journal. The best prevention for this cause of bearing failure is to clean all parts thoroughly and keep everything spotlessly clean during engine reassembly. Frequent and regular oil and filter changes are also recommended.

5 Lack of lubrication or lubrication breakdown has a number of interrelated causes. Excessive heat (which thins the oil), overloading (which squeezes the oil from the bearing face) and oil leakage or throw off (from excessive bearing clearances, worn oil pump or high engine speeds) all contribute to lubrication breakdown. Blocked oil passages will also starve a bearing and destroy it. When lack of lubrication is the cause of bearing failure, the bearing material is wiped or extruded from the steel backing of the bearing. Temperatures may increase to the point where the steel backing and the journal turn blue from overheating.

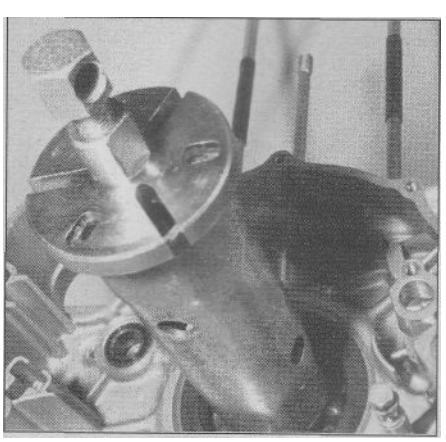
6 Riding habits can have a definite effect on bearing life. Full throttle low speed operation, or lugging (laboring) the engine, puts very high loads on bearings, which tend to squeeze out the oil film. These loads cause the bearings to flex, which produces fine cracks in the bearing face (fatigue failure). Eventually the bearing material will loosen in pieces and tear away from the steel backing. Short trip driving leads to corrosion of bearings, as insufficient engine heat is produced to drive



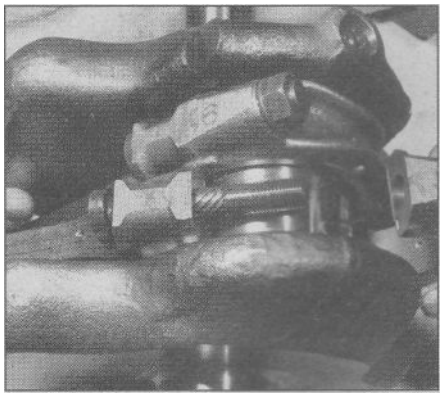
23.12 Push the crankshaft into the bearing as far as it will go (don't let it tilt sideways and jam)



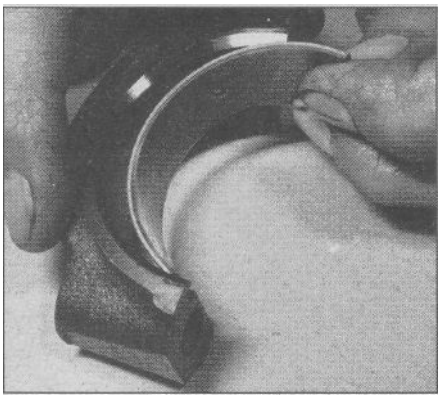
23.13 Thread a sleeve nut onto the end of the crankshaft



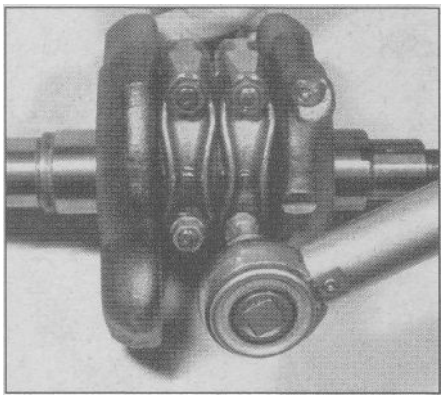
23.14 Place a thick metal tube over the crankshaft, then position the puller plate on top of it and thread the puller bolt into the sleeve nut



25.3 Remove the nuts and separate the cap from the connecting rod



25.10 Make sure the tab aligns with the notch; when installing the bearing upper half, make sure the oil holes in the bearing and connecting rod are aligned



25.12 Tighten the cap nuts to the specified torque in one continuous motion

off the condensed water and corrosive gases produced. These products collect in the engine oil, forming acid and sludge. As the oil is carried to the engine bearings, the acid attacks and corrodes the bearing material.

7 Incorrect bearing installation during engine assembly will lead to bearing failure as well. Tight fitting bearings which leave insufficient bearing oil clearances result in oil starvation. Dirt or foreign particles trapped behind a bearing insert result in high spots on the bearing which lead to failure.

8 To avoid bearing problems, clean all parts thoroughly before reassembly, double check all bearing clearance measurements and lubricate the new bearings with engine assembly lube or moly-based grease during installation.

25 Connecting rods and bearings - removal, inspection, bearing selection and installation

Removal

Refer to illustration 25.3

1 Before removing the connecting rods from the crankshaft, insert a feeler gauge between the crankshaft and the big end of each connecting rod and between the two connecting rods and measure the side clearance **(see illustration 26.1 in Part A of this Chapter).** If the clearance on any rod is greater than that listed in this Chapter's Specifications, that rod will have to be replaced with a new one.

2 Using a center punch or felt pen, mark the position of each rod and cap, relative to its position on the crankshaft (left or right) **(see illustration 26.2 in Part A of this Chapter). Note:** *The rear cylinder connecting rod may have one or two oil holes in the upper side of the big end (the front cylinder connecting rod on all models has one oil hole). Look at the rear cylinder connecting rod before removing the rods and determine whether it has one or two oil holes.*

3 Unscrew the bearing cap nuts, separate the cap from the rod, then detach the rod from the crankshaft **(see illustration 23.3b and the accompanying illustration).** If the cap is stuck, tap on the ends of the rod bolts with a soft-faced hammer to free them.

4 Roll the bearing inserts sideways to separate them from the rods and caps. Keep them in order so they can be reinstalled in their original locations. Wash the parts in solvent and dry them with compressed air, if available.

Inspection

5 Check the connecting rods for cracks and other obvious damage. Lubricate the piston pin for each rod, install it in the proper rod and check for play **(see illustration 26.5 in Part A of this Chapter).** If it wobbles, replace the connecting rod and/or the pin.

6 Examine the connecting rod bearing inserts. If they are scored, badly scuffed or appear to have been seized, new bearings must be installed. Always replace the bearings in the connecting rods as a set. If they are badly damaged, check the corresponding crankshaft journal. Evidence of extreme heat, such as discoloration, indicates that lubrication failure has occurred. Be sure to thoroughly check the oil pump and pressure relief valves as well as all oil holes and passages before reassembling the engine.

7 Have the rods checked for twist and bending at a dealer service department or other motorcycle repair shop.

Connectingrodbearingselection

Refer to illustrations 25.10, 25.12, 25.13 and 25.18a through 25.18d

8 If the bearings and journals appear to be in good condition, check the oil clearances as follows:

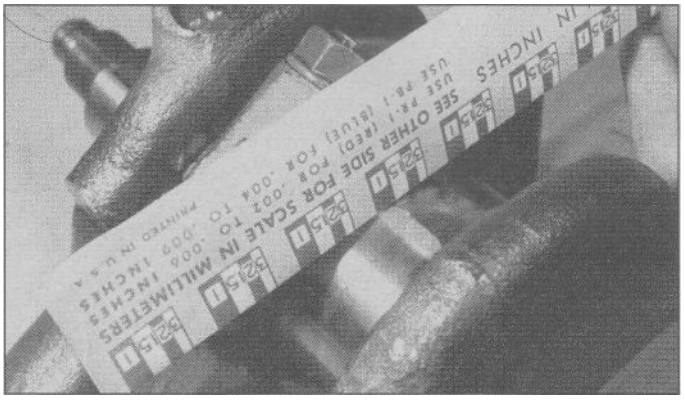
9 Start with the rod for one cylinder. Wipe the bearing inserts and the connecting rod and cap clean, using a lint-free cloth.

10 Install the bearing inserts in the connecting rod and cap **(see illustration).** Make sure the tab on the bearing engages with the notch in the rod or cap.

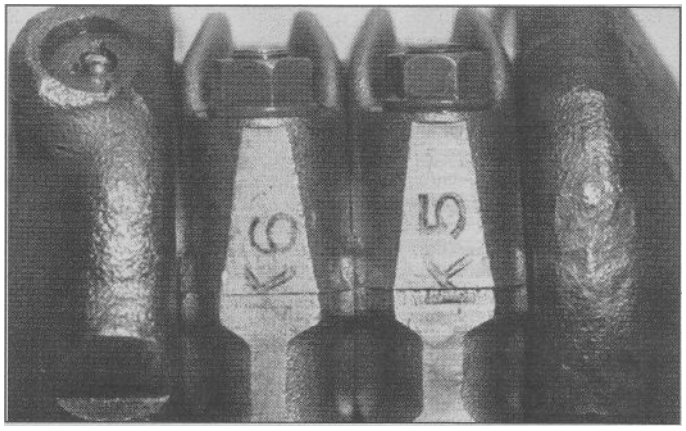
11 Wipe off the connecting rod journal with a lint-free cloth. Lay a strip of Plastigage (type HPG-1) across the top of the journal, parallel with the journal axis **(see illustration 26.11 in Part A of this Chapter).**

12 Position the connecting rod on the journal, then install the rod cap and nuts. Tighten the nuts to the torque listed in this Chapter's Specifications **(see illustration),** but don't allow the connecting rod to rotate at all.

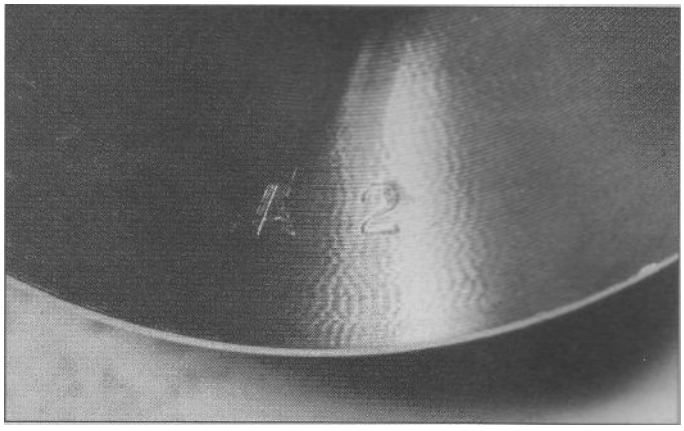
13 Unscrew the nuts and remove the connecting rod and cap from the journal, being very careful not to disturb the Plastigage. Compare the width of the crushed Plastigage to the scale printed in the Plastigage envelope to determine the bearing oil clearance **(see illustration).**



25.13 Place the Plastigage scale next to the flattened Plastigage to measure the bearing clearance



25.18a The number on each connecting rod is used for bearing selection; the letter is used to align the rod and cap



25.18b The letter on the crankshaft is used together with the **connecting rod number to select bearings**

14 If the clearance is within the range listed in this Chapter's Specifications and the bearings are in perfect condition, they can be reused. If the clearance is greater than the wear limit, replace the bearing inserts with new inserts that have the same color code, then check the clearance once again. Always replace all of the inserts at the same time.

15 The clearance should now be within the range listed in this Chapter's Specifications.

16 If the clearance is greater than the maximum clearance listed in this Chapter's Specifications, measure the diameter of the connecting rod journal with a micrometer. Yamaha doesn't provide diameter or wear limit specifications, but by measuring the diameter at a number of points around the journal's circumference, you'll be able to determine whether or not the journal is out-of-round. Take the measurement at each end of the journal to determine if the journal is tapered.

17 If any journal is tapered or out-of-round or bearing clearance is beyond the maximum listed in this Chapter's Specifications (with new bearings), replace the crankshaft.

18 Each connecting rod has a number stamped on it in ink **(see illustration).** Subtract this number from the connecting rod journal number on the crankshaft to get a bearing number **(see illustration).** For example, the number on the right connecting rod shown in the accompanying illustration is 5. The corresponding number for that connecting rod's journal, stamped into the crankshaft, is 2. Subtracting 2 from 5 produces 3, which is the bearing number for that journal. According to the accompanying chart, bearing no. 2 is color-coded black **(see illustration).** The color codes are painted on the edges of the bearings **(see illustration).**

19 Repeat the bearing selection procedure for the remaining connecting rods.

BEARING COLOR CODE	
No. 1	Blue
No. 2	Black
No. 3	Brown
No. 4	Green
No. 5	Yellow

25.18c Calculate the bearing number by subtracting the crankshaft number from the connecting rod number, then use the bearing number to select a color code

Installation

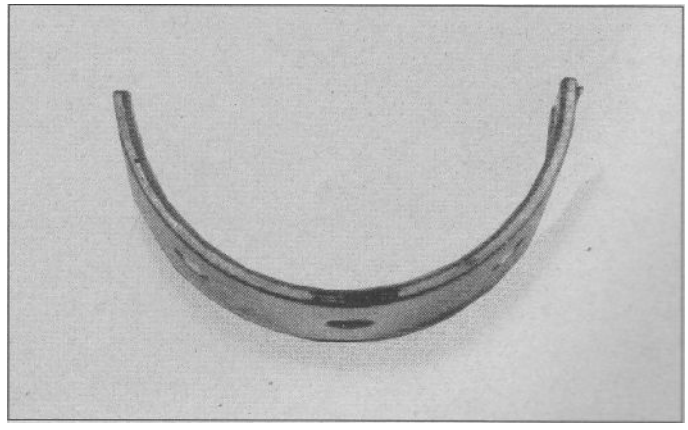
20 Wipe off the bearing inserts, connecting rods and caps. Install the inserts into the rods and caps, using your hands only, making sure the tabs on the inserts engage with the notches in the rods and caps (see **illustration 25.10).** When all the inserts are installed, lubricate them with engine assembly lube or moly-based grease. Don't get any lubricant on the mating surfaces of the rod or cap.

21 Assemble each connecting rod to its proper journal, referring to the previously applied cylinder numbers. Make sure the Y mark on each rod is toward the tapered end of the crankshaft. The letter present at the rod/cap seam on one side Of the connecting rod should fit together perfectly when the rod and cap are assembled **(see illustration 25.18a).** If it doesn't, the wrong cap is on the rod. Fix this problem before assembling the engine any further.

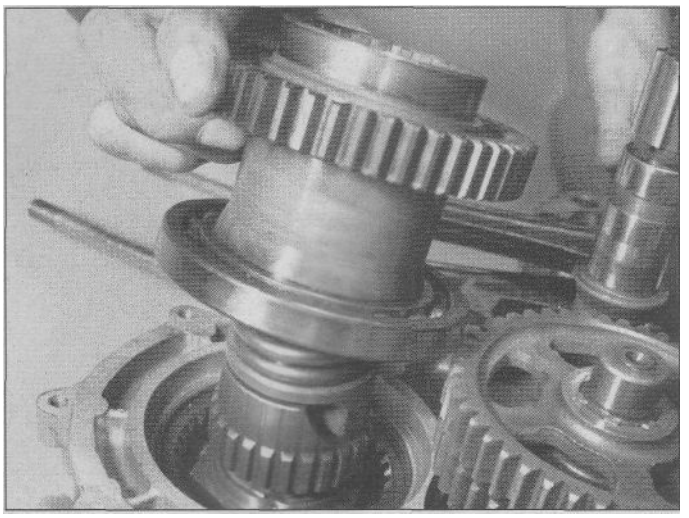
22 When you're sure the rods are positioned correctly, lubricate the threads of the rod bolts and the surfaces of the nuts with molybdenum disulfide grease and tighten the nuts to the torque listed in this Chapter's Specifications **(see illustration 25.12). Note:** Snug *both nuts evenly, then tighten them to the specified torque in a continuous motion. If you must stop tightening between 32 and 36 Nm (22 and 25 ft-lbs), loosen the nuts to a torque less than 32 Nm (22 ft-lbs), then retighten them to the specified torque in one continuous motion.*

23 Turn the rods on the crankshaft. If either of them feels tight, tap on the bottom of the connecting rod caps with a hammer - this should relieve stress and free them up. If it doesn't, recheck the bearing clearance.

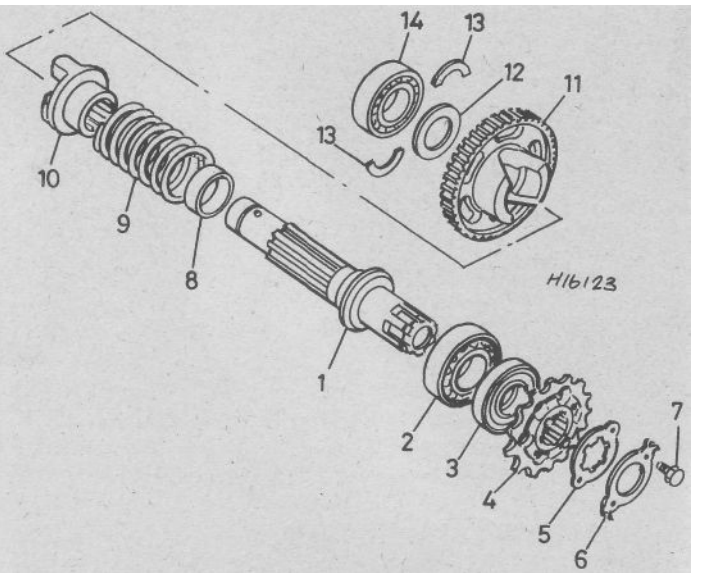
24 As a final step, recheck the connecting rod side clearances (see , Step 1). If the clearances aren't correct, find out why before proceeding with engine assembly.



25.18d The color codes, painted on the sides of the bearings, **identify bearing thickness**

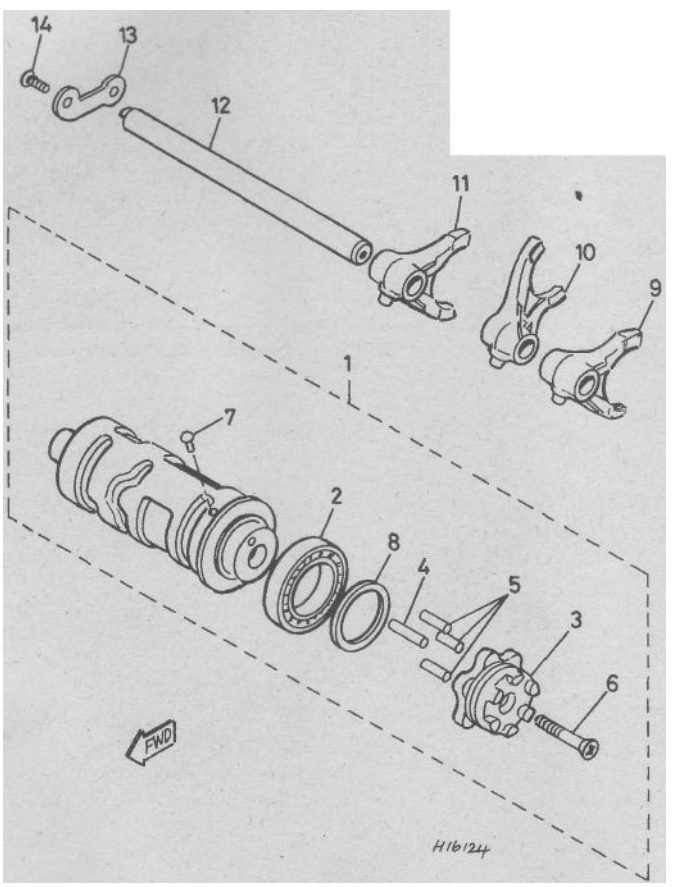


26.2 Lift the middle driven gear pinion off the middle gear driveshaft (shaft drive models)



26.3 Lift the shock absorber assembly out of the crankcase (chain drive models)

1	*Shock absorber shaft*	*8*	*Collar*
2	*Bearing*	*9*	*Spring*
3	*Oil seal*	*10*	*Spring end plate*
4	*Engine sprocket*	*11*	*Middle driven gear pinion*
5	*Splined lockwasher*	*12*	*Thrust washer*
6	*Tab washer*	*13*	*Spring retaining collars*
7	*Bolts*	*14*	*Bearing*



26.4 Shift cam and forks (XV700-1100 models) - exploded view

1	*Shift cam assembly*	*8*	*Washer*
2	*Shift cam bearing*	*9*	*Left shift fork*
3	*Cam plate*	*10*	*Center shift fork*
4	*Shift pin*	*11*	*Right shift fork*
5	*Shift pins*	*12*	*Shift fork guide bar*
6	*Screw*	*13*	*Stopper plate*
7	*Neutral pin*	*14*	*Screws*

26 Transmission shafts, shift cam and forks - removal, disassembly, inspection, reassembly and installation

Removal

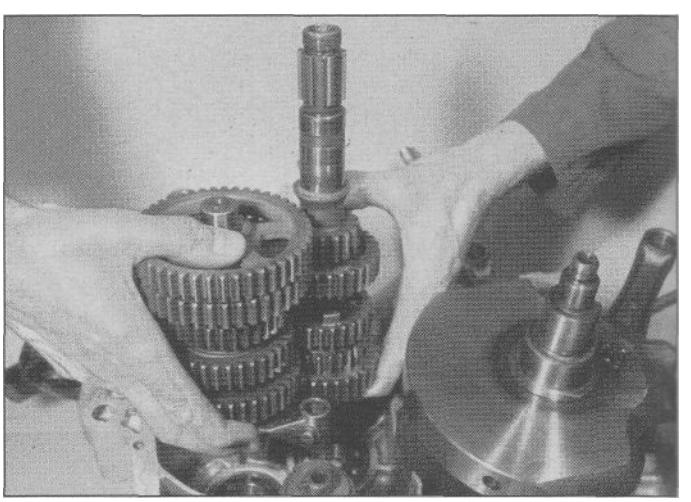
Refer to illustrations 26.2, 26.3, 26.4, 26.6 and 26.7

1 Remove the engine and separate the crankcase halves (see Sections 5 and 20).

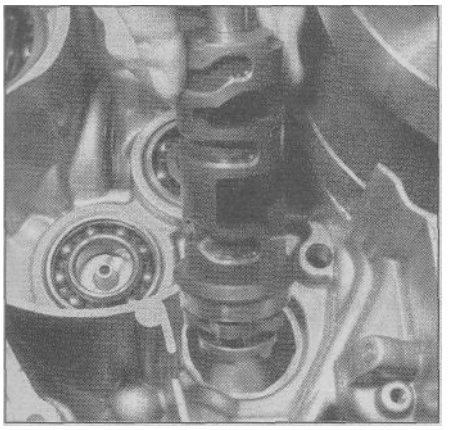
2 If you're working on a shaft drive model, lift the middle driven gear pinion off the middle drive gear shaft **(see illustration).**

3 If you're working on a chain drive model, remove the drive sprocket's shock absorber assembly from the crankcase **(see illustration).**

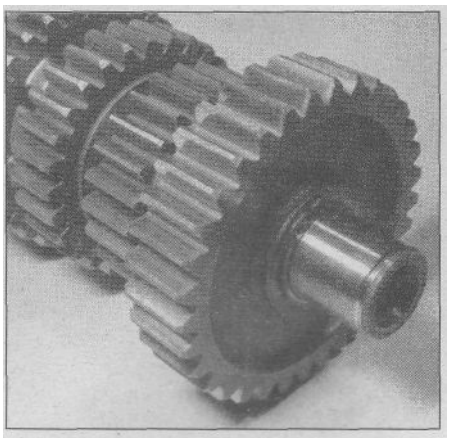
4 Pull the shift fork guide bar out of the forks and crankcase **(see**



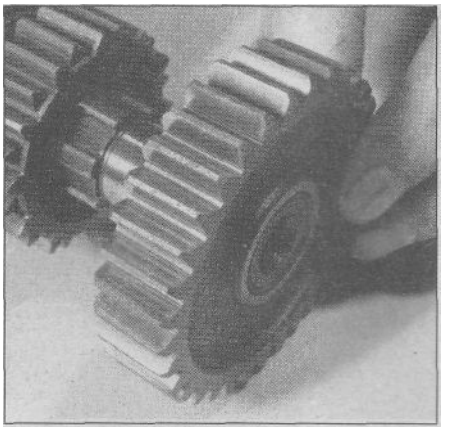
26.6 Lift the transmission shafts out of the crankcase together



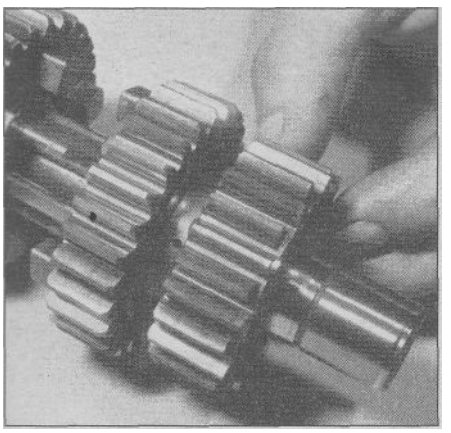
26.7 Lift the shift cam out of the crankcase



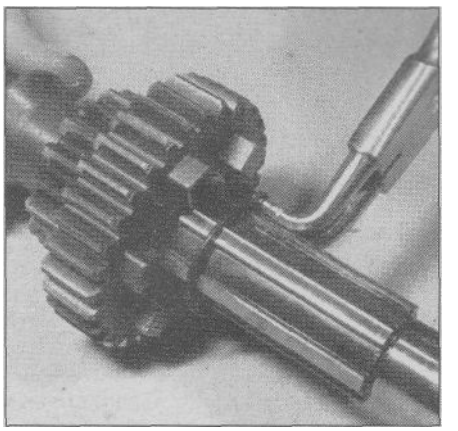
26.9a Remove the snap-ring and thrust washer ...



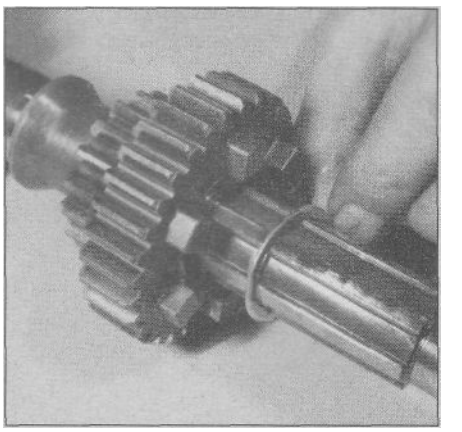
26.9b ... slide the fifth pinion gear off the mainshaft ...



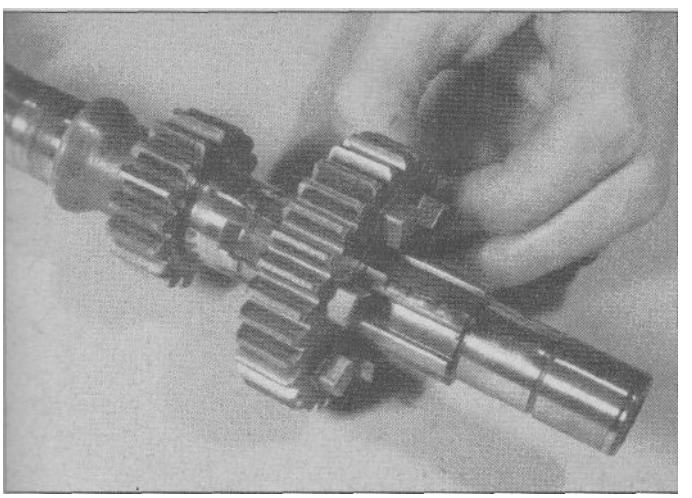
26.9c ... and slide second-third pinion gear off the shaft



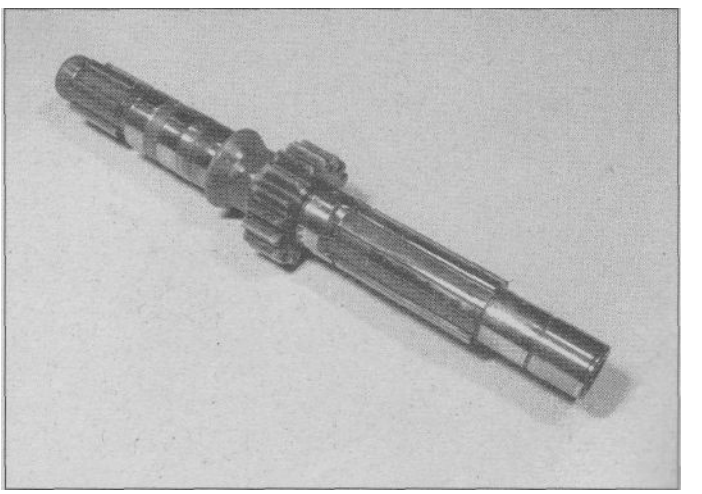
26.9d Remove the snap-ring ...



26.9e ... and the thrust washer ...



26.9f ... and slide off fourth pinion gear



26.9g First pinion gear is integral with the mainshaft

illustration).

5 Remove the two uppermost shift forks from the gear grooves.

6 Lift the transmission shafts out of the crankcase together **(see** illustration).

7 Lift the shift cam out of the crankcase **(see illustration).**

8 Reassemble the shift forks on the guide bar so you don't forget how they go **(see illustration 26.4).**

Transmissiondisassembly

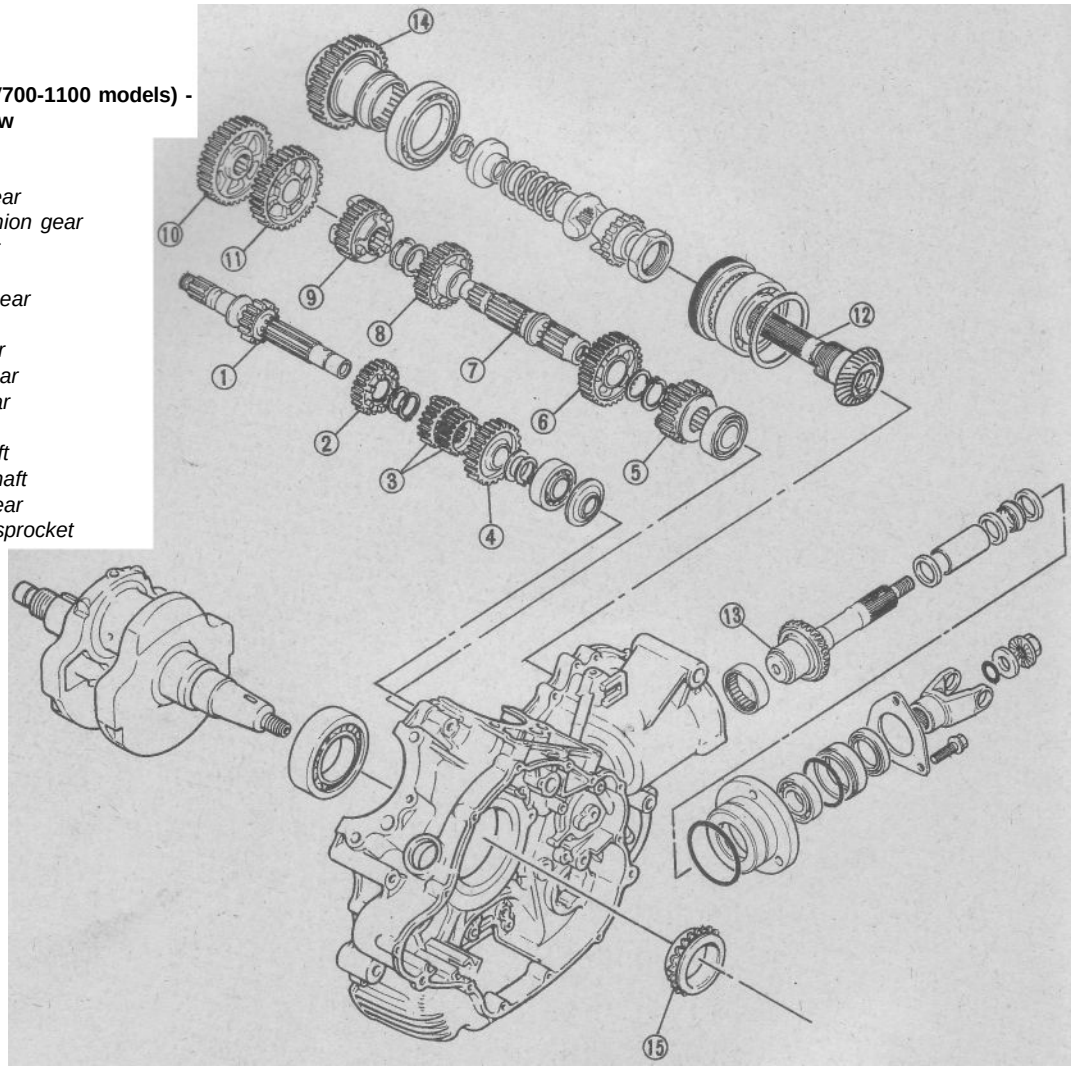
Mainshaft

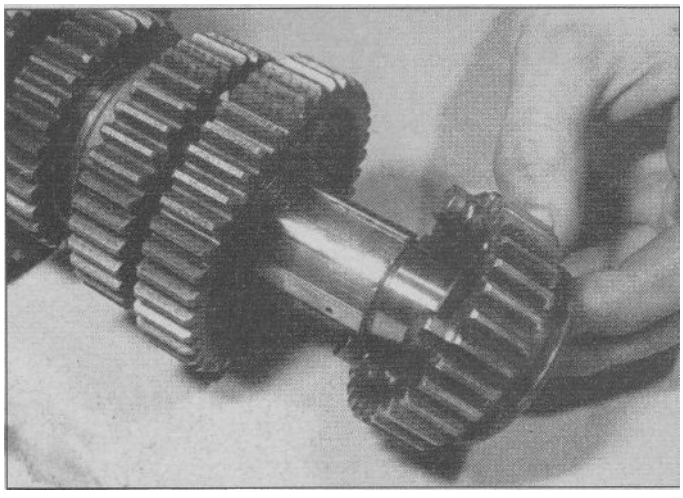
Refer to illustrations 26.9a through 26.9h

9 To disassemble the mainshaft, refer to the accompanying illustrations **(see illustrations).** Slide each gear onto a rod. such a wooden dowel or plastic pipe, as soon as it's removed from the shaft.

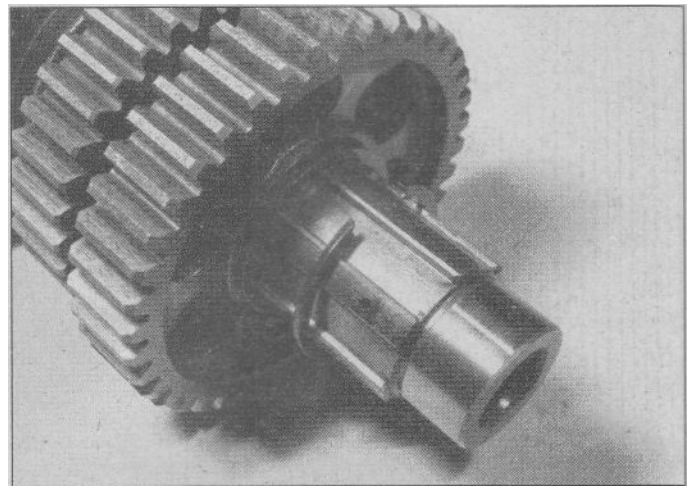
26.9h Transmission shafts (XV700-1100 models) - exploded view

1 *Mainshaft*
2 *Fourth pinion gear*
3 *Second-third pinion gear*
4 *Fifth pinion gear*
5 *Fifth wheel gear*
6 *Second wheel gear*
7 *Driveaxle*
8 *Third wheel gear*
9 *Fourth wheel gear*
10 *Middle drive gear*
11 *First wheel gear*
12 *Middle driveshaft*
13 *Middle driven shaft*
14 *Middle driven gear*
15 *Oil pump drive sprocket*

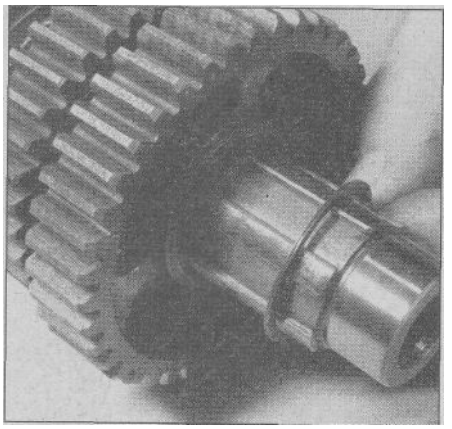




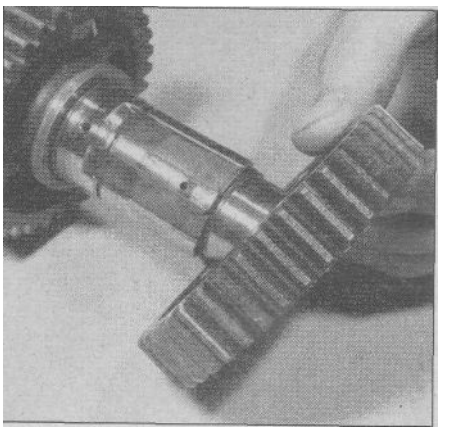
26.10a Slide the fifth wheel gear off the driveaxle



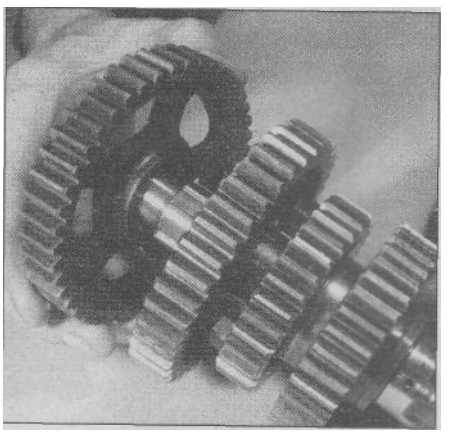
26.10b Remove the snap-ring ,



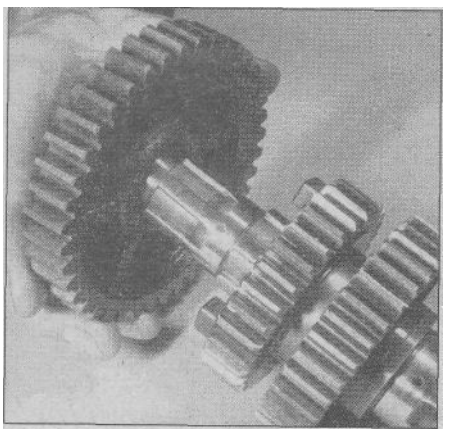
26.10c ... and the thrust washer ...



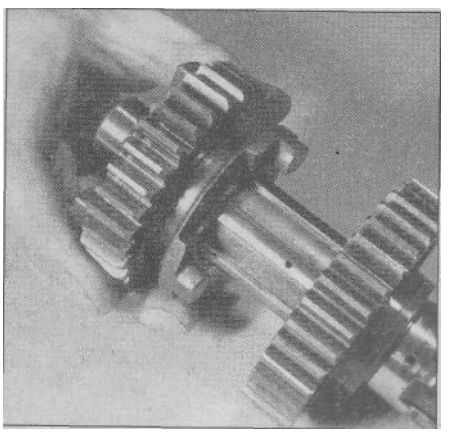
26.10d ... and slide second wheel gear off



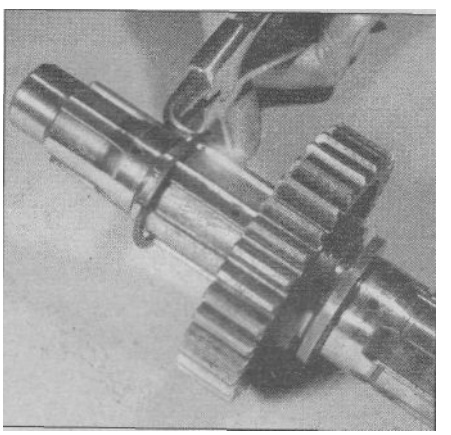
26,1 Oe At the other end of the driveaxle, slide off the middle drive gear ...



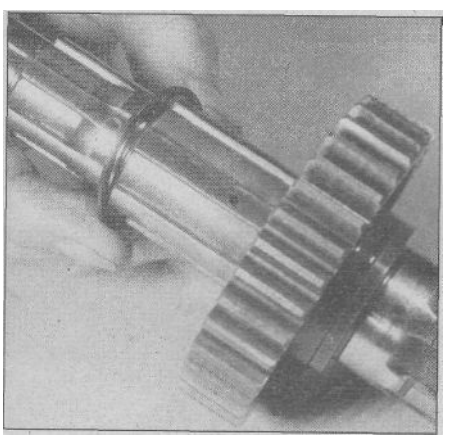
26.10f ... the first wheel gear ...



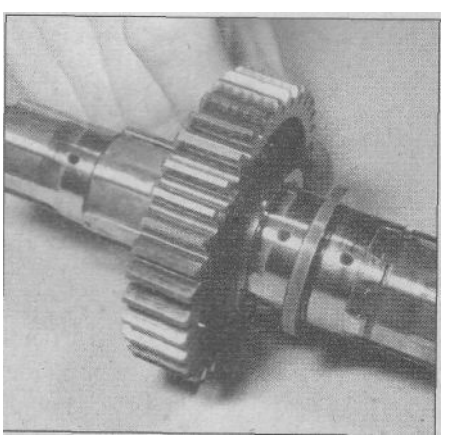
26.1 Og ... and the fourth wheel gear



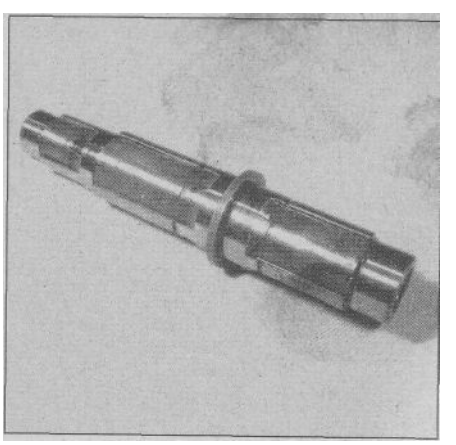
26.10h Remove the snap-ring ...



26.101 ... and the thrust washer ...



26.10J ... and the third wheel gear ...



26.10k ... from the driveaxle

Driveaxle

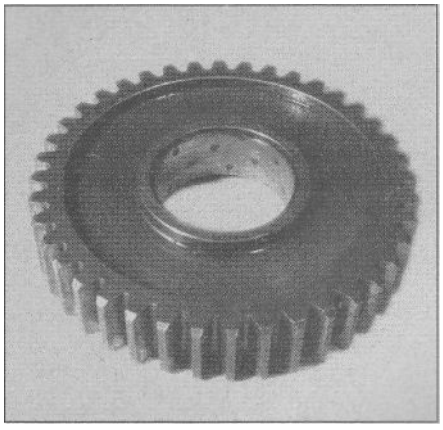
Refer to illustrations 26.10a through 26.10k

10 To disassemble the driveaxle, refer to the **accompanying illustrations.** Slide each gear onto a rod, such a wooden dowel or plastic pipe, as soon as it's removed from the shaft.

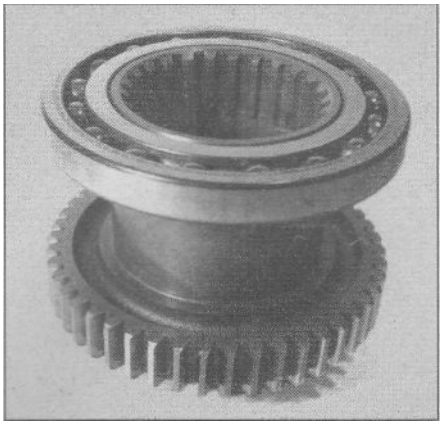
Inspection

Refer to illustrations 26.12, 26.15, 26.19 and 26.20

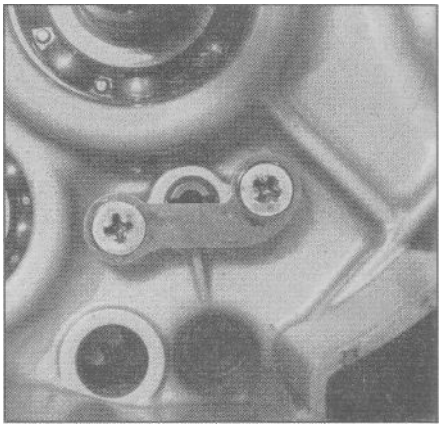
11 Wash all of the components in clean solvent and dry them off. Rotate the ball bearings in the left side of the transmission case, feeling for tightness, rough spots and excessive looseness and listening for



26.12 Check the gear bushings (if equipped) for wear or damage



26.15 Check the teeth, splines and bearing on the middle drive gear



26.19 The stopper plate can be left in position unless it's loose or the crankcases are to be replaced - if you remove it, use Loctite Stud 'n' Bearing Mount or equivalent on the screw threads

noises. If any of these conditions are found, replace the bearing with a blind hole puller **(see illustrations 21.4b and 21.4c).** Check the oil seal behind the mainshaft bearing; it's a good idea to replace it as a precaution (see Section 21).

13 Check the gear teeth for cracking and other obvious damage. Check the gear bushings and the surface in the inner diameter of each gear for scoring or heat discoloration **(see illustration).** If the gear or bushing is damaged, replace it.

13 Inspect the dogs and the dog holes in Hie gears for excessive wear. Replace the paired gears as a set if necessary.

14 Place the shaft in V-blocks and check runout with a dial indicator. Replace the shaft if runout exceeds the value listed in this Chapter's Specifications.

15 Ifyou're working on a shaft drive model, inspect the middle drive gear **(see illustration).** Replace the gear if the teeth or splines are worn or damaged. Replace the bearing if it's loose, rough or noisy.

16 Check the edges of the grooves in the shift cam for signs of excessive wear. Check the pins on the shift cam for wear and damage. If undesirable conditions are found, replace the shift cam.

17 Check the shift forks for distortion and wear, especially at the fork tips **(see illustration 27.5 in Part A of this Chapter).** If they are discolored or severely worn they are probably bent. If damage or wear is evident, check the shift fork groove in the corresponding gear as well. Inspect the guide pins and the shaft bore for excessive wear and distortion and replace any defective parts with new ones.

18 Check the shift fork guide bar for evidence of wear, galling and other damage. Make sure the shift forks move smoothly on the bar. If the bar is worn or bent, replace it with a new one.

19 Check the stopper plate in the crankcase for looseness **(see illustration).** If the plate is loose, remove its screws and apply thread locking compound (Loctite Stud 'n' Bearing Mount or equivalent) to the threads. Reinstall the screws and tighten them to the torque listed in this Chapter's Specifications.

20 Check the bearing on the shift cam for looseness, noise or rough movement. If its condition is in doubt, remove the cam plate to replace the bearing **(see** illustration). **Note:** *The cam plate screw may be very tight. Use an impact driver to remove it It's* a *good idea to make sure there's a replacement screw in stock at your local Yamaha dealer before removing the old screw.*

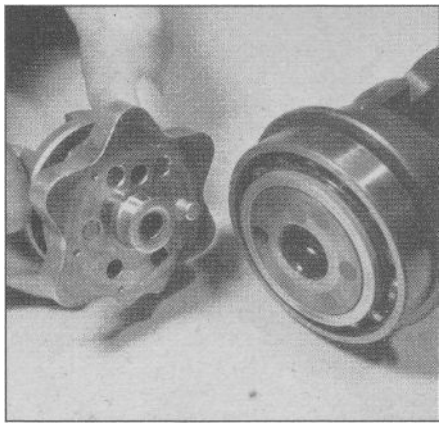
Assemblyandinstallation

Refer to illustrations 26.21, 26.22, 26.25, 26.26, 26.27a and 26.27b

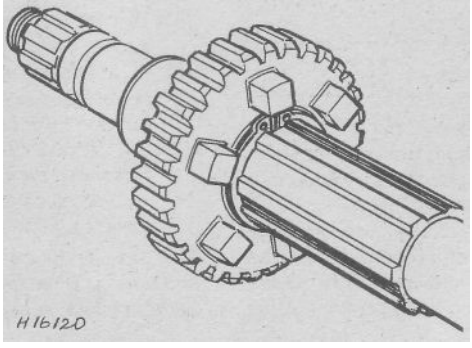
21 Assemble the transmission shafts by reversing the disassembly steps. Install the snap-rings with the sharp edges toward the gears they're retaining, and their rounded edges away from the gears. Coat all parts with clean engine oil during assembly. Position the ends of the snap-rings correctly **(see illustration).**

22 Install the shift cam in the crankcase **(see illustration 26.7).** Install the neutral switch (see Chapter 8) and engage the shift cam with it **(see illustration).**

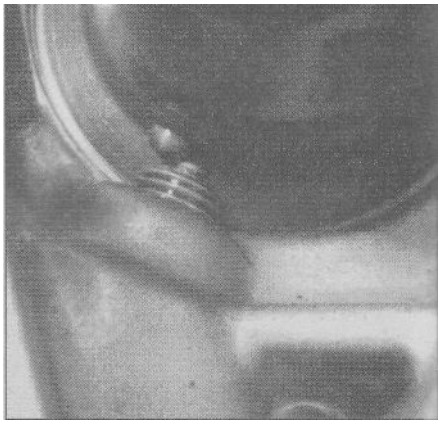
23 Mesh the gears on both transmission shafts and position the shift fork on the fifth pinion gear. Use the numbers on the forks to position



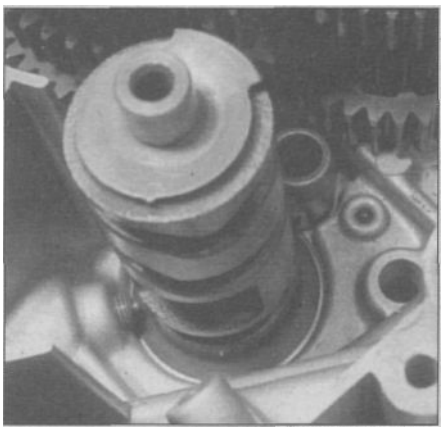
26.20 Remove the cam plate if necessary to remove the shift cam bearing



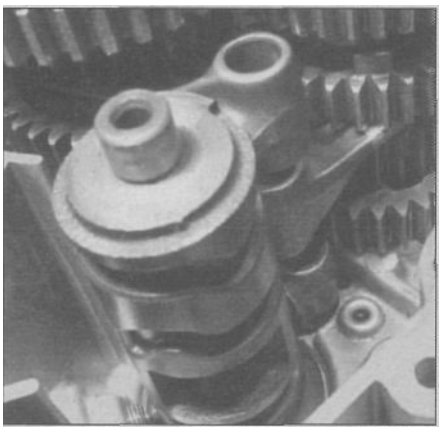
26.21 Install the snap-rings with their ends in the correct position



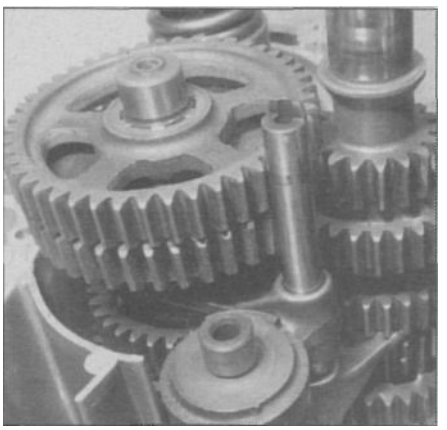
26.22 Install the neutral switch, then turn the shift cam to align with it



26.25 Engage the pin on the fifth pinion gear shift fork with the groove in the shift cam



26.26 Install the remaining two shift forks and engage their pins with the shift cam grooves



26.27a Slide the guide bar through the forks . . .

them correctly. The forks are numbered from one to three, starting from the left side of the engine.

24 Install the transmission shafts and fifth pinion gear shift fork as an assembly **(see illustration 26.6).**

25 Engage the shift fork pin with the shift cam (see **illustration).**

26 Install the remaining two shift forks in their gear grooves and engage their pins with the shift cam **(see illustration).**

27 Slide the shift fork guide bar through the forks **(see illustration).** Turn the guide bar so its flat is aligned with the middle-drive gear teeth **(see illustration).**

28 The remainder of installation is the reverse of the removal steps.

26.27b . . . and align its flat with the teeth of the middle drive gear

27 Initial start-up after overhaul

1 Make sure the engine oil level is correct, then remove the spark plugs from the engine. Place the engine kill switch in the Off position and unplug the primary (low tension) wires from the coils.

2 Turn on the key switch and crank the engine over with the starter several times to build up oil pressure. Reinstall the spark plugs, connect the wires and turn the switch to On.

3 Make sure there is fuel in the tank, then turn the fuel tap to the On position and operate the choke.

4 Start the engine and allow it to run at a moderately fast idle until it reaches operating temperature.

5 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 28 for the recommended break-in procedure.

6 Upon completion of the road test, and after the engine has cooled down completely, recheck the valve clearances (see Chapter 1).

28 Recommended break-in procedure

1 Any rebuilt engine needs time to break-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 oil has circulated throughout the engine and any new parts installed have started to seat.

2 Even greater care is necessary if the engine has been rebored or a new crankshaft has been installed. In the case of a rebore, the engine will have to be broken in as if the machine were new. 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 lugging 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, which Yamaha provides for new motorcycles, can be used as a guide:

a) 0 to 90 miles (0 to 150 km): Keep engine speed below 3,000 rpm. Turn off the engine after each hour of operation and let it cool for 5 to 10 minutes. Vary the engine speed and don't use full throttle.

b) 90 to 300 miles (150 to 500 km): Don't run the engine for long periods above 4,000 rpm. Rev the engine freely through the gears, but don't use full throttle.

c) 300 to 600 miles (500 to 1000 km): Don't use full throttle for prolonged periods and don't cruise at speeds above 5,000 rpm.

d) At 600 miles (1,000 km): Change the engine oil and filter. Full throttle can be used after this point.

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.

Notes

Chapter 3 Part A
Fuel and exhaust systems (XV535 models)

Contents

	Section
Air induction system (1990-on US models) - inspection and component replacement	13
Air filter element - servicing	See Chapter 1
Carburetor overhaul - general information	5
Carburetors and intake joints - removal and installation	6
Carburetors - disassembly, inspection, cleaning and reassembly	7
Carburetors - fuel level adjustment	8
Evaporation control system (California models) - inspection and canister replacement	14
Exhaust system - removal and installation	10
Fuel pump and relay - replacement	12
Fuel pump - circuit check and fuel pump test	11
Fuel reserve switch - test	See Chapter 8
Fuel sender - replacement	See Chapter 8
Fuel system - check and filter replacement	See Chapter 1
Fuel tank - cleaning and repair	3
Fuel tank - removal and installation	2
General information	1
Idle fuel/air mixture adjustment - general information	4
Idle speed - check and adjustment	See Chapter 1
Throttle cables and grip - removal, installation and adjustment	9
Throttle operation/grip freeplay - check and adjustment	See Chapter 1

Specifications

Carburetor

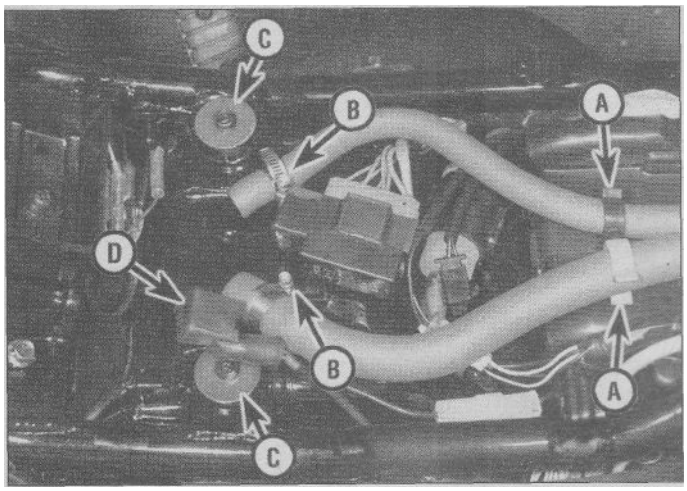
Type	Mikuni BDS34 (two)
Jet sizes	
Main jet	
1987 and 1988	135
1989 through 1993	
Front cylinder	137.5
Rear cylinder	135
1994 US	
Front cylinder	137.5
Rear cylinder	135
1994 UK and Canada	135
Main air jet	140
Jet needle/clip position	
1987 and 1988 US and Canada	
Front cylinder	5DZ7-1
Rear cylinder	5DZ8-1
1990 through 1993 US and Canada	
Front cylinder	5DZ17-1
Rear cylinder	5DZ18-1
1994 US	
Front cylinder	5DZ17-1
Rear cylinder	5DZ18-1
1994 Canada	
Front cylinder	5DZ9-3
Rear cylinder	5DZ10-3
All UK	
Front cylinder	5DZ10-3
Rear cylinder	5DZ9-3
Main nozzle	Y-0
Pilot air jet no. 1	
1987 and 1988 US	60
All others	70
Pilot air jet no. 2	
1987 and 1988 US	160
All others	170
Pilot jet	
1987 and 1988 US	32.5
Ail others	35
Pilot screw	
1987 and 1988 US	Preset (not specified)
1990 through 1993 US and Canada	2-1/2 turns out
1994 US	2-1/2 turns out
1994 Canada, all UK	2 turns out
Valve seat size	1.5
Starter jet	
Except 1994 US	40
1994 US	35
Fuel level	13.5 to 14.5 mm (0.53 to 0.57 inch)

Fuel tank capacity

1987 and 1988 models	8.6 liters (2.3 US gal, 1.9 Imp gal), including reserve of 2.5 liters (0.7 US gal, 0.5 Imp gal)
1989-on models	13.5 liters (3.6 US gal, 3.0 Imp gal), including reserve of 2.5 liters (0.7 US gal, 0.5 Imp gal)

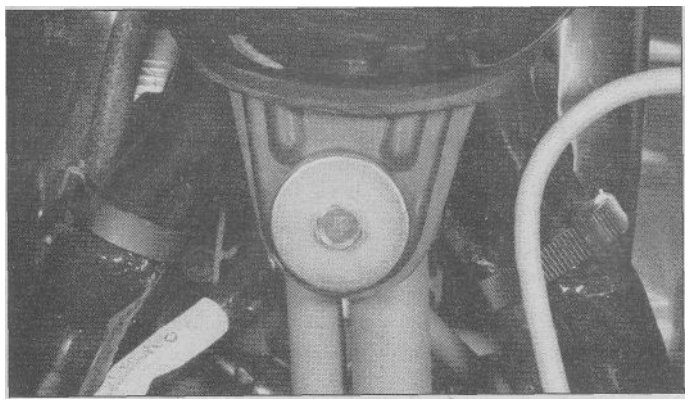
Tightening torques

Carburetor joint bolts	12 Nm (8.7 ft-lbs)
Exhaust pipe-to-cylinder head nuts	20 Nm (14 ft-lbs)
Exhaust pipe rear joint bolt	10 Nm (7.2ft-lbs)
Muffler/silencer chamber bolt and nut	20 Nm (14 ft-lbs)

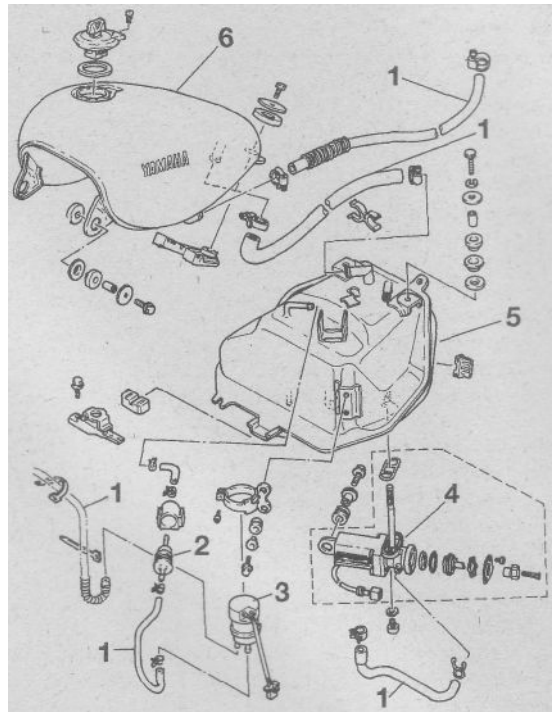


2.4a Release the fuel hoses from the clips on top of the battery cover

A Clips
B Hose clamps
C Tank mounting bolts
D Battery positive cable (always disconnect the negative cable first)

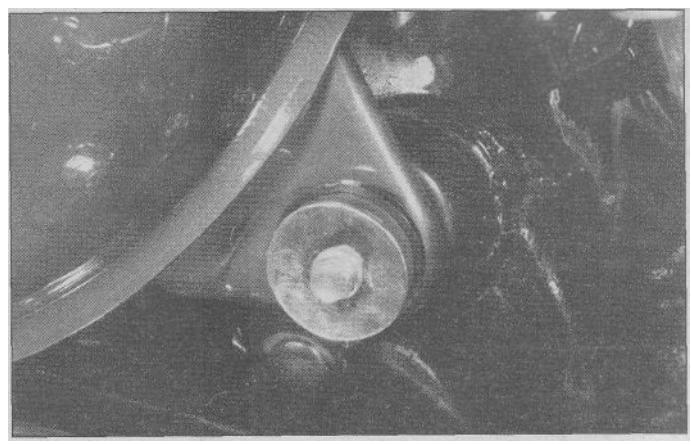


2.5a Remove the upper tank mounting bolt at the rear . . .



2.4b Fuel tanks and lines (models with upper fuel tank)

1 Fuel lines
2 Fuel filter
3 Fuel pump
4 Fuel tap
5 Lower fuel tank
6 Upper fuel tank



2.5b . . . and one on each side

1 General information

The fuel system consists of the fuel tank, the fuel tap and filter, the carburetors and the connecting lines, hoses and control cables and an electric fuel pump.

The carburetors used on these motorcycles are two Mikunis with butterfly-type throttle valves. For cold starting, an enrichment circuit is actuated by a choke lever mounted on the left side of the bike.

The exhaust system routes exhaust gases into a muffler/silencer chamber under the bike and then into twin exhaust pipes on the right side.

Many of the fuel system service procedures are considered routine maintenance items and for that reason are included in Chapter 1.

2 Fuel tank - removal and installation

Warning: *Gasoline (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 class B fires (flammable liquids) on hand.*

Upperfueltank

Refer to illustrations 2.4a, 2.4b, 2.5a, 2.5b, 2.6a and 2.6b

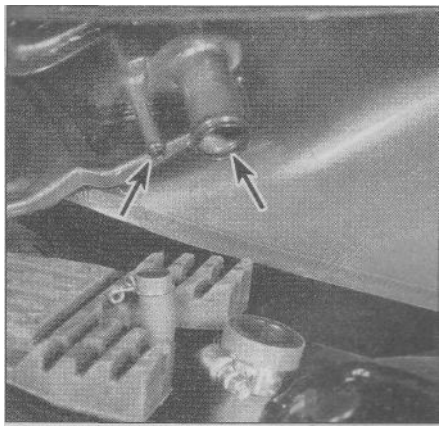
1 All models have a main fuel tank mounted beneath the seat. Later models also have an upper fuel tank mounted forward of the seat on top of the upper frame section in the traditional position (on early models, what looks like a fuel tank is actually a cover).

2 Support the bike securely so it can't be knocked over during this procedure.

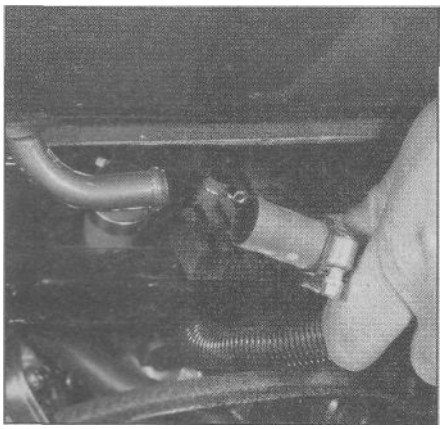
3 Remove the seat (see Chapter 7).

4 Free the fuel hoses from the clips on top of the battery cover, remove the cover and disconnect the negative cable from the battery **(see illustrations).**

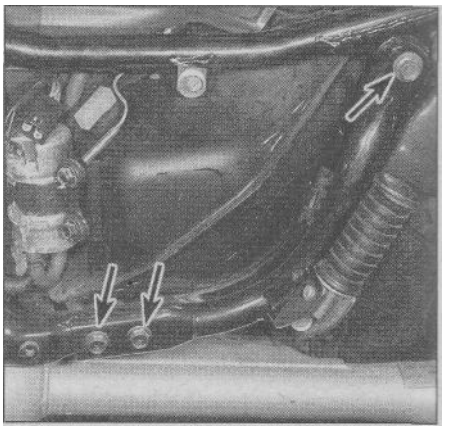
5 Remove the upper tank mounting bolts and washers (see **illustrations).** Remove the metal collars from inside the left and right rubber dampers, then remove all three dampers.



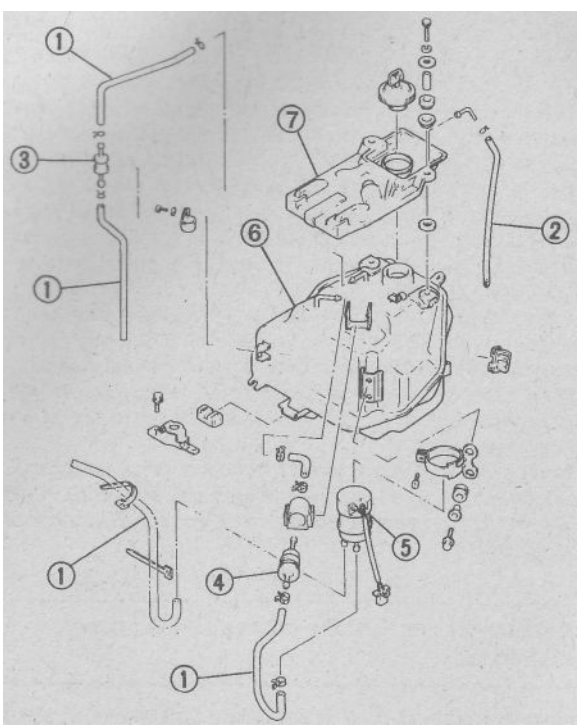
2.6a Lift the tank and disconnect the **hoses from the fittings (arrows) . . .**



2.6b . . . there's a fuel hose on each side



2.10 Remove the mounting bolts (arrows) and take off the footpeg bracket



2.11 Fuel tank and lines (models without upper fuel tank)

1 Vapor hoses
2 Breather hose
3 Rollover valve
4 Fuel filter
5 Fuel pump
6 Fuel tank
7 Rubber cover

6 Hold a pan under the fittings to catch drained fuel, lift the upper tank and disconnect the fuel hoses **(see illustrations).** Liff the tank off the bike. **Warning:** *Pour the drained fuel into a safe fuel storage container. Don't leave it in the drain pan.*

Main fuel tank

Refer to illustrations 2.10,2.11, 2.13, 2.14a and 2.14b

7 If you're working on a bike with an upper fuel tank, remove it. Disconnect the upper tank hoses from their fittings on the main tank (see illustrations 2.4a and 2.4b).

8 Remove the left side cover (see Chapter 7).

9 If you're working on a bike without an upper fuel tank, remove the fuel filler cap.

2.13 Work the drain fitting (arrow) free of the rubber cover and lift the cover out

10 Remove the left passenger footpeg bracket **(see illustration).**

11 Remove the fuel filter (see Chapter 1 and the accompanying illustration).

12 Disconnect the fuel pump electrical connector and the line that runs from the pump to the carburetors (see Section 12). If you plan to remove the fuel pump, this is a good time to do it; if not, it can be left attached to the tank.-

13 If you're working on a bike without an upper fuel tank, remove the rubber cover from the top of the main tank **(see illustration).**

14 Remove the tank mounting bolts and disengage the rubber dampers from the brackets **(see illustrations).**

15 Check to make sure all hoses and wires have been disconnected, then remove the tank through the left side of the frame.

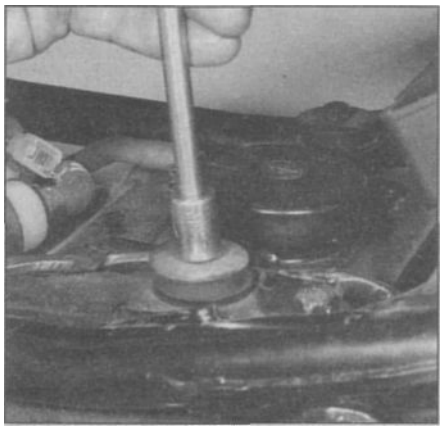
All models

16 Before installing the tank, check the condition of the hoses and rubber mounting dampers - if they're hardened, cracked, or show any other signs of deterioration, replace them.

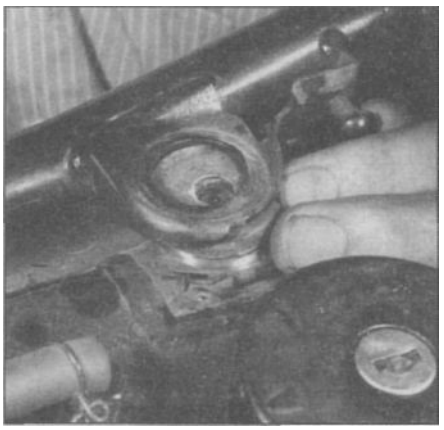
17 When replacing the tank, reverse the above procedure. Make sure the tank seats properly and does not pinch any control cables or wires.

3 Fuel tank - cleaning and repair

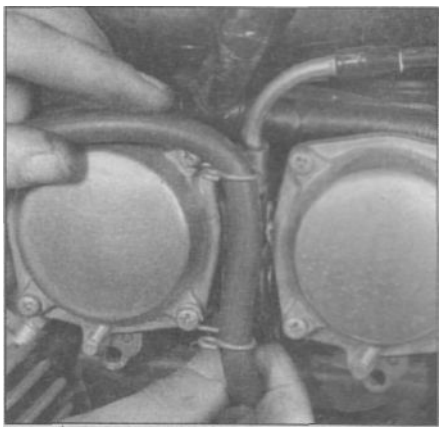
1 All repairs to the fuel tank should be carried out by a professional who has experience in this critical and potentially dangerous work.



2.14a Remove the mounting bolts . . .



2.14b . . . and detach the rubber dampers from the brackets



6.6 Free the hose from the retaining clips

Even after cleaning and flushing of the fuel system, explosive fumes can remain and ignite during repair of the tank.

2 If the fuel tank is removed from the vehicle, it should not be placed in an area where sparks or open flames could ignite the fumes coming out of the tank. Be especially careful inside garages where a natural gas-type appliance is located, because the pilot light could cause an explosion.

4 Idle fuel/air mixture adjustment - general information

1 Due to the increased emphasis on controlling motorcycle exhaust emissions, certain governmental regulations have been formulated which directly affect the carburetion of this machine. In order to comply with the regulations, the carburetors on some models have a metal sealing plug pressed into the hole over the pilot screw (which controls the idle fuel/air mixture) on each carburetor, so they can't be tampered with. These should only be removed in the event of a complete carburetor overhaul, and even then the screws should be returned to their original settings. The pilot screws on other models are accessible, but the use of an exhaust gas analyzer is the only accurate way to adjust the idle fuel/air mixture and be sure the machine doesn't exceed the emissions regulations.

2 If the engine runs extremely rough or blows black smoke at idle or continually stalls, and if a carburetor overhaul does not cure the problem, take the motorcycle to a Yamaha dealer service department or other repair shop equipped with an exhaust gas analyzer. They will be able to properly adjust the idle fuel/air mixture to achieve a smooth idle and restore low speed performance.

5 Carburetor overhaul - general information

1 Poor engine performance, hesitation, hard starting, stalling, flooding and backfiring are all signs that major carburetor maintenance may be required.

2 Keep in mind that many so-called carburetor problems are really not carburetor problems at all, but mechanical problems within the engine or ignition system malfunctions. Try to establish for certain that the carburetors are in need of maintenance before beginning a major overhaul.

3 Check the fuel filter, the fuel lines, the fuel tank breather hose(s), the rollover valve (models with evaporative emission control), the intake manifold hose clamps, the vacuum hoses, the air filter element, the cylinder compression, the spark plugs, the carburetor synchronization and the fuel pump before assuming that a carburetor overhaul is required.

4 Most carburetor problems are caused by dirt particles, varnish and other deposits which build up in and block the fuel and air passages. Also, in time, gaskets and O-rings shrink or deteriorate and cause fuel and air leaks which lead to poor performance.

5 When the carburetor is overhauled, it is generally disassembled completely and the parts are cleaned thoroughly with a carburetor cleaning-solvent and dried with filtered, unlubricated compressed air. The fuel and air passages are also blown through with compressed air to force out any dirt that may have been loosened but not removed by the solvent. Once the cleaning process is complete, the carburetor is reassembled using new gaskets, O-rings and, generally, a new inlet needle valve and seat.

6 Before disassembling the carburetors, make sure you have a carburetor rebuild kit (which will include all necessary O-rings and other parts), some carburetor cleaner, a supply of rags, some means of blowing out the carburetor passages and a clean place to work. It is recommended that only one carburetor be overhauled at a time to avoid mixing up parts.

7 Don't separate the carburetors from each other unless one of the joints between them is leaking. The carburetors can be overhauled completely without being separated, and reconnecting them properly can be difficult.

6 Carburetors and intake joints - removal and installation

Warning: *Gasoline (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 an extinguisher suitable for class B fires (flammable liquids) on hand.*

Removal

Refer to illustrations 6.6, 6.8, 6.9, 6.10a, 6.10b, 6.11a, 6.11b, 6.11c, 6.13a and 6.13b

1 Remove the seat (see Chapter 7).

2 If you're working on a model with an upper fuel tank, remove it (see Section 2).

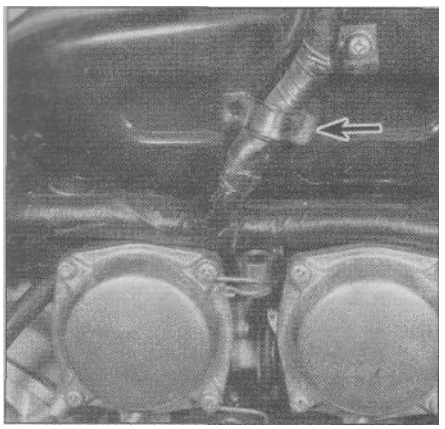
3 If you're working on a model without an upper fuel tank, remove the top cover (see Chapter 7).

4 Remove the left front side cover and its bracket (see Chapter 7).

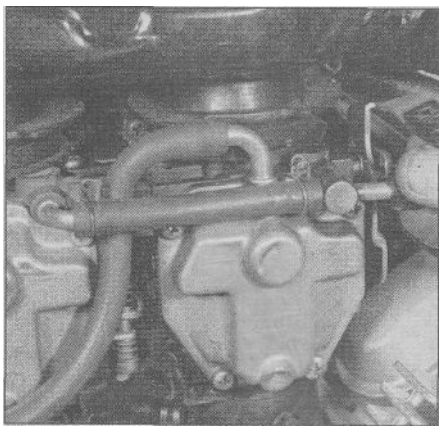
5 . Remove the right front side cover and the electrical component board beneath it (see Chapter 7).

6 Work the hose on the right side free of the clips (see illustration).

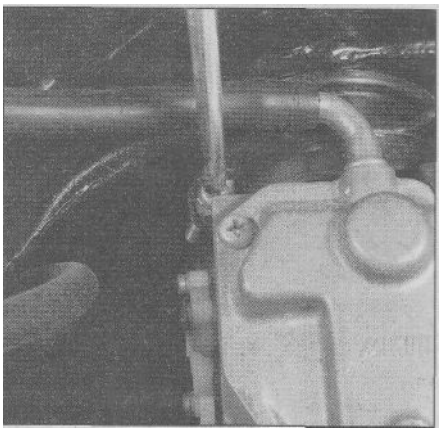
7 Disconnect the throttle cable from the pulley (see Section 9).



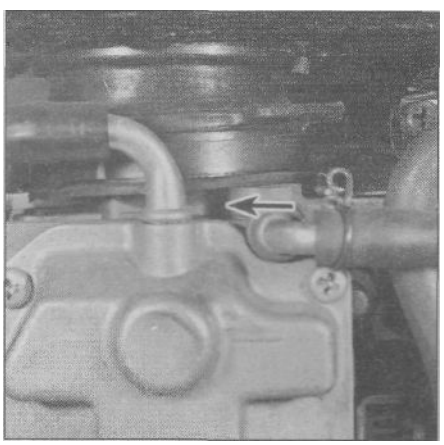
6.8 If this wiring harness obstructs removal, detach it from its clip (arrow) and move it out of the way



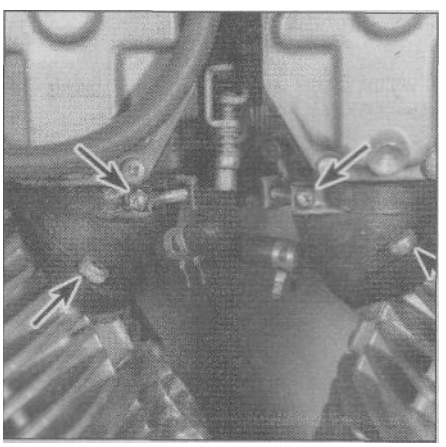
6.9 Loosen the clamp and pull the fuel line off the fitting



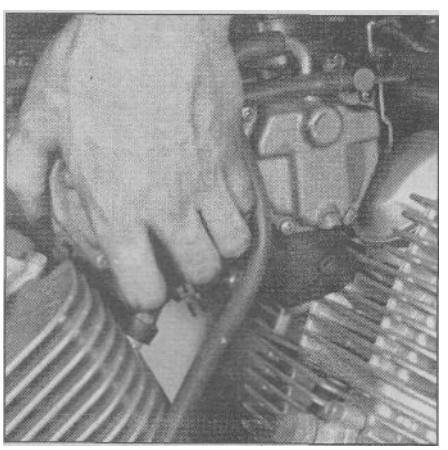
6.10a Loosen the clamping band screws on the air cleaner joints . . .



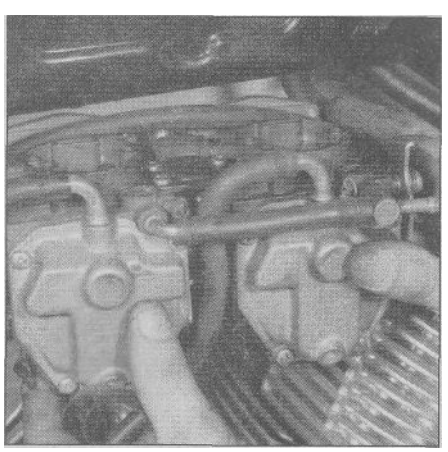
6.10b . . . insert a flat-bladed screwdriver between the joint and carburetor (arrow) and push the joint up into the air cleaner cavity



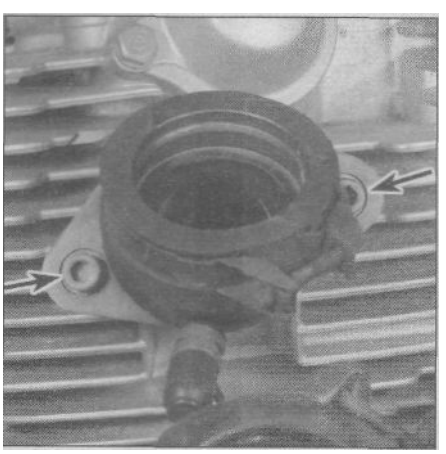
6.11 a Loosen the clamping band screws (upper arrows); an alternative method is to unbolt the intake joints from the cylinder head (lower arrows)



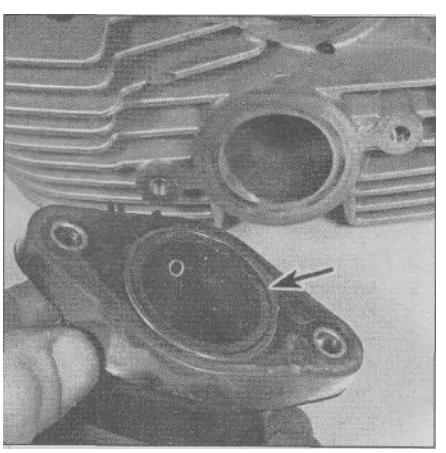
6.11 b Work the carburetors free of the intake joints (if they're still bolted to the engine)...



6.11c . . . and remove the carburetors from the left side of the bike



6.13a Remove the Allen bolts (arrows)



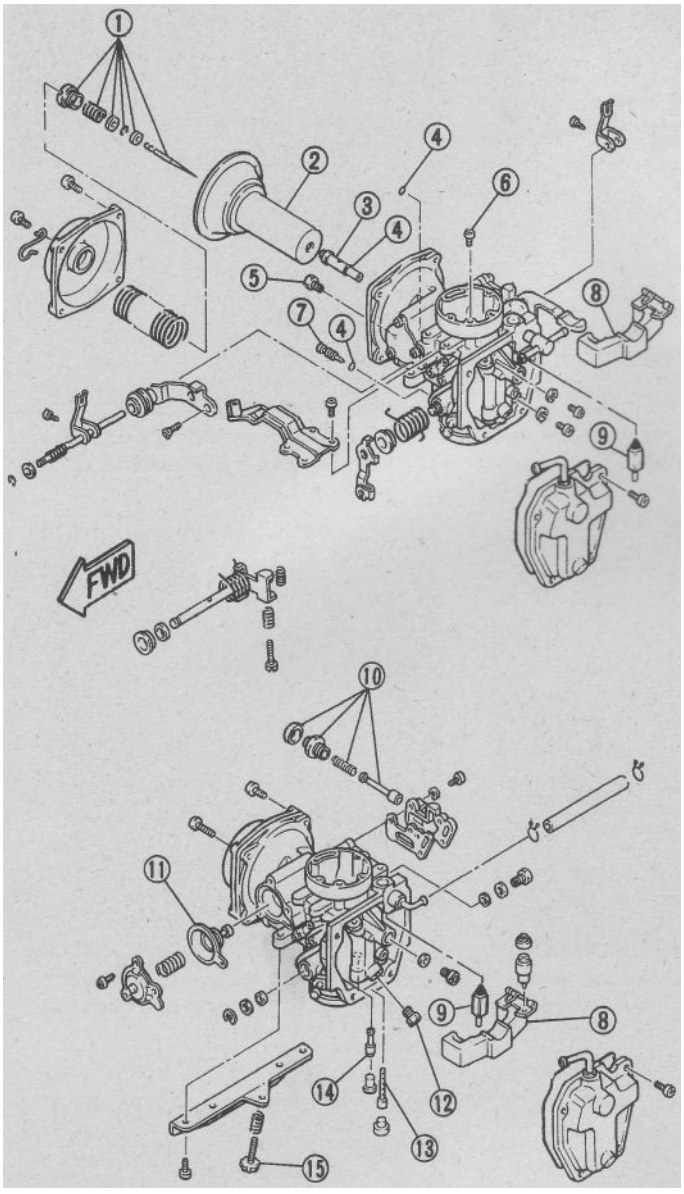
6.13b . . . and take the intake joints off; replace the O-rings (arrow)

8 The wiring harness on the right side may interfere with removal **(see illustration).** If it does, free it from its clip and move it aside. On 1991 and later UK models, disconnect the carburetor heater unit valve from each carburetor.

9 Disconnect the fuel inlet line from the carburetor fitting **(see illustration).**

10 Loosen the clamp screws and disconnect the air cleaner joints from the carburetors **(see illustrations).** Push the joints up off the carburetors with a screwdriver (they'll fold into the air cleaner cavity in the frame).

11 Loosen the screws on the carburetor joints **(see illustration).** Work the carburetors free of the joints and lift them out **(see**



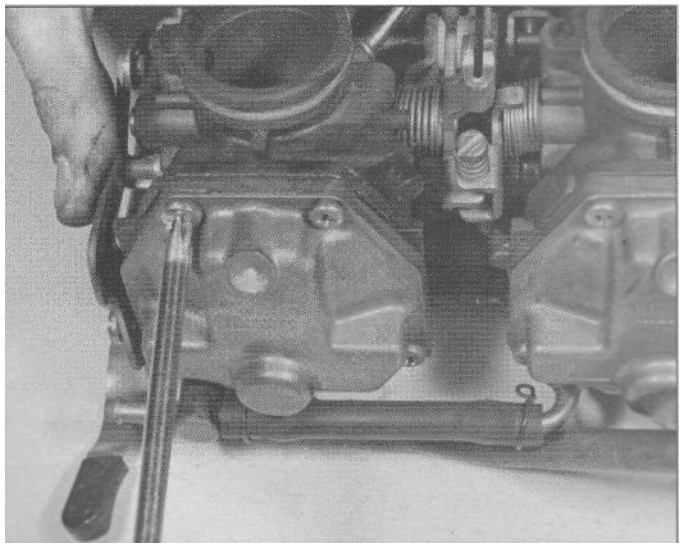
7.1 Carburetors (XV535 models) - exploded view

1 Jet needle assembly	*9 Needle valve*
2 Vacuum piston	*10 Choke plunger assembly*
3 Main nozzle	*11 Coasting enricher diaphragm*
4 O-ring	*12 Main jet*
5 No. 2 pilot air jet	*13 Main bleed pipe*
6 No. 1 pilot air jet	*14 Pilot jet*
7 Drain screw	*15 Throttle stop screw*
8 Float	

illustrations). Note: *You can also unbolt the joints from the cylinder heads and remove the carburetor assembly and joints together.*

12 After the carburetors have been removed, stuff clean rags into the joints or intake ports to prevent the entry of dirt or other objects.

13 Inspect the carburetor joints **(see illustration).** If they're cracked or brittle, replace them. The O-rings should be replaced whenever the joints are removed **(see illustration).**



7.2a Remove the float chamber cover screws and take off the cover . . .

Installation

14 Engage the carburetor assembly with the intake joints. Lightly lubricate the ends of the throttle cables (or cable) with multi-purpose grease and attach them to the throttle pulley. Make sure the accelerator cable (and decelerator cable if equipped) are in their proper positions. .•

15 Pull the air cleaner joints down from the air cleaner cavity and fit them over the carburetors.

16 Make sure the carburetor is seated securely in the intake joints and the air cleaner joints are fitted securely over the carburetors, then tighten the clamping band screws.

17 Adjust the throttle grip freeplay (see Chapter 1).

18 The remainder of installation is the reverse of the removal steps.

19 Check and, if necessary, adjust the idle speed and carburetor synchronization (see Chapter 1).

7 Carburetors - disassembly, inspection, cleaning and reassembly

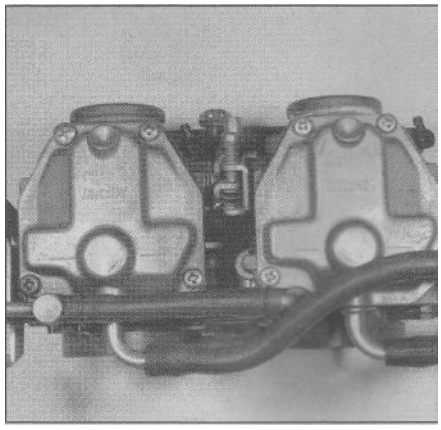
Warning: *Gasoline (petrol) is extremely flammable, so take extra precautions when you work on any part of the fuel system. Don't smoke or allow open flames or bare light bulbs near the work area, and don't work in a garage where a natural gas-type appliance (such as a water heater or clothes dryer) 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 class B type fires (flammable liquids) on hand.*

Disassembly

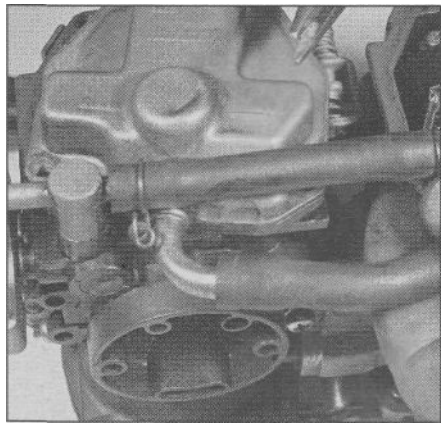
Refer to illustrations 7.1, 7.2a, 7.2b, 7.2c, 7.3a, 7.3b, 7.4a through 7.4e, 7.5a, 7.5b, 7.5c, 7.5d, 7.6a, 7.6b, 7.7a, 7.7b, 7.8a, 7.8b, 7.8c, 7.8d, 7.9a, 7.9b, 7.10a, 7.10b, 7.11a through 7.11e, 7.12a, 7.12b, 7.12c, 7.12d, 7.13a, 7.13b, 7.15a, 7.15b, 7.15c, 7.15d, 7.16a, 7.16b. 7.16c, 7.16d, 7.17 and 7.19

1 Remove the carburetors from the machine as described in Section 6. Set the assembly on a clean working surface. **Note:** *Work on one carburetor at a time to avoid getting parts mixed up (see **illustration).*** Most disassembly and cleaning procedures can be accomplished without separating the carburetors. If they **mu** separated, a surface plate will be needed to join them.

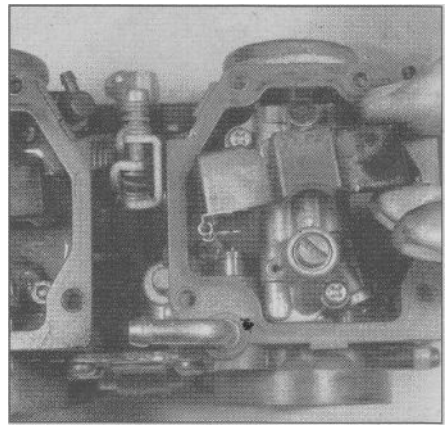
2 Remove the float chamber cover screws (see illustration). Take



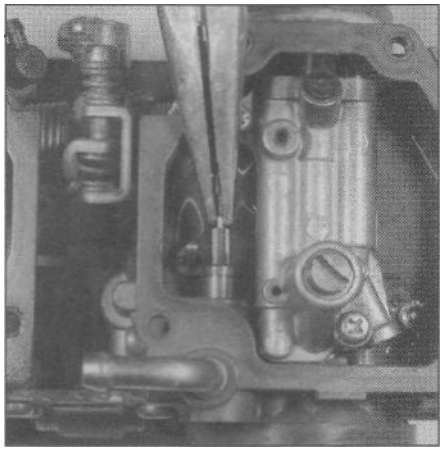
7.2b ... remove the other float chamber cover ...



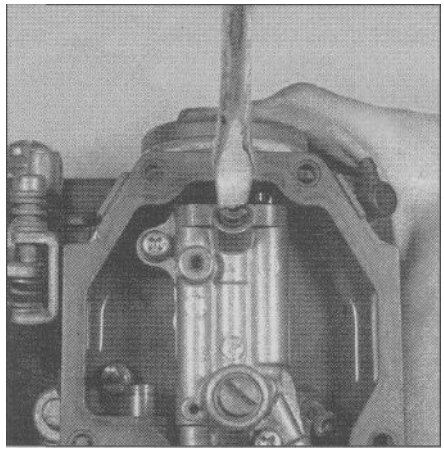
7.2c ... disconnect the fuel and vent lines and set them aside



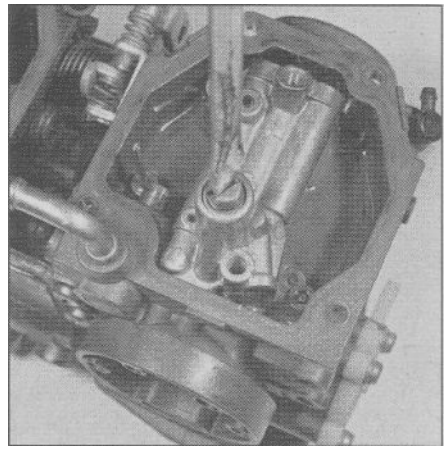
7.3a Pull out the float...



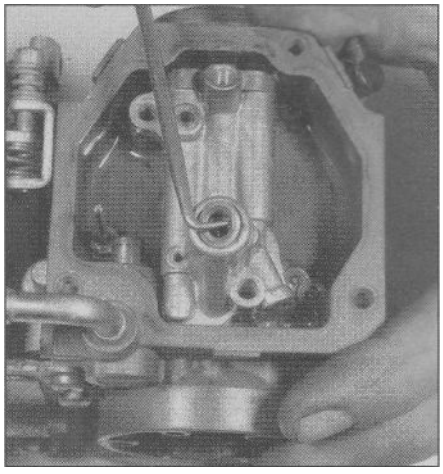
7.3b ... and lift out the needle valve



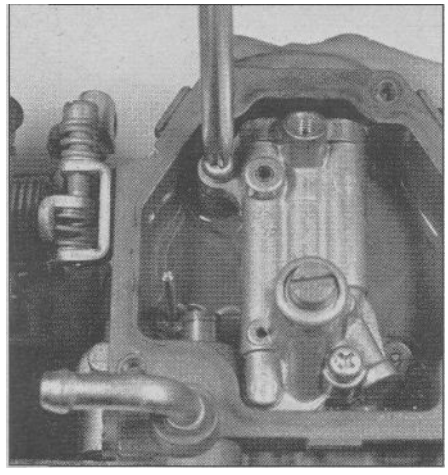
7.4a Unscrew the main Jet..,



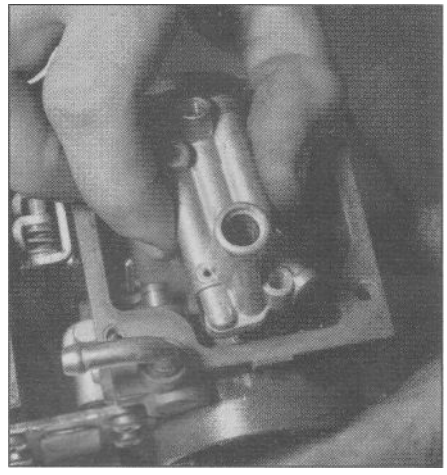
7.4b ... and the main nozzle holder ...



7.4c ... remove the O-ring with a pointed tool...



7.4d ... remove the jet block screws ...



7.4e ... then lift out the jet block and remove its gasket

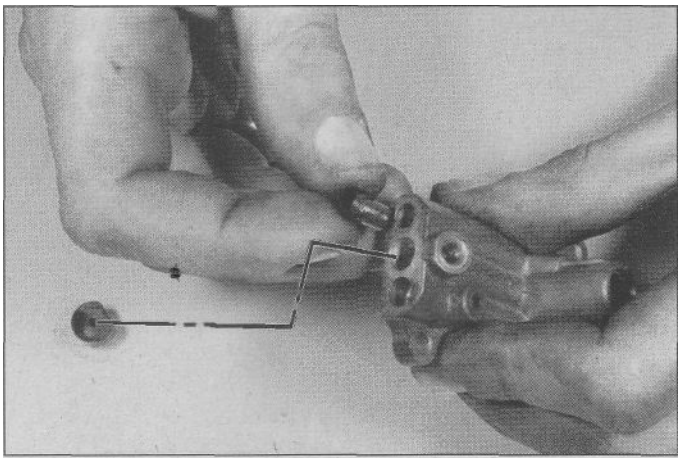
off both float chamber covers, the fuel lines and the vent lines **(see illustrations).**

3 Slide the float off its pivot pin and lift out the needle valve **(see illustrations).**

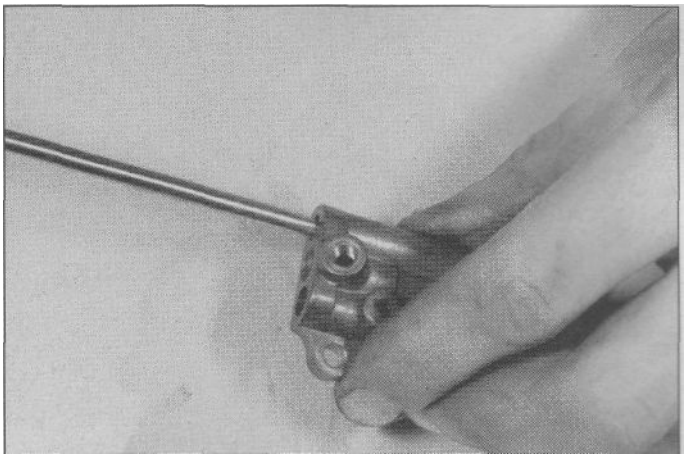
4 Unscrew the main jet, the jet block retaining screws and the main nozzle holder, then lift the jet block out **(see illustrations).**

5 Remove the two rubber plugs from the end of the jet block, then unscrew the pilot jet and main bleed pipe **(see illustrations).**

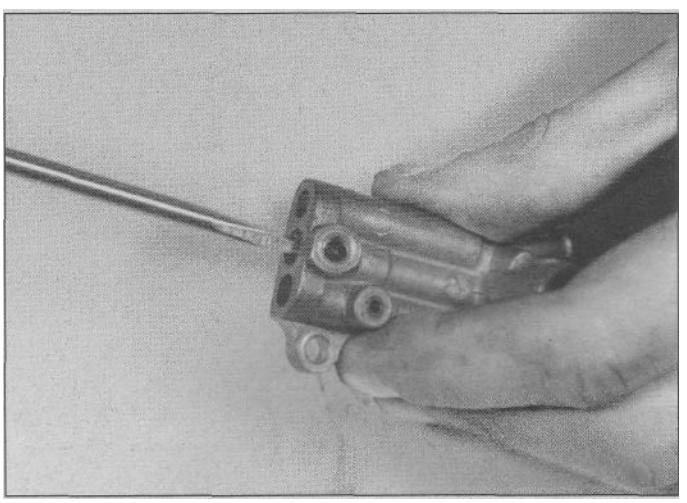
6 Remove the front carburetor's coasting enricher valve cover, spring and diaphragm **(see illustrations).**



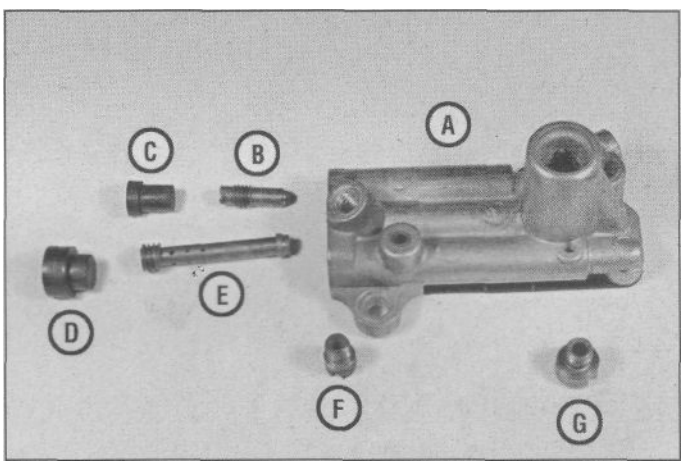
7.5a Pull the two rubber plugs out of their passages .



7.5b . . . unscrew the pilot jet . . .

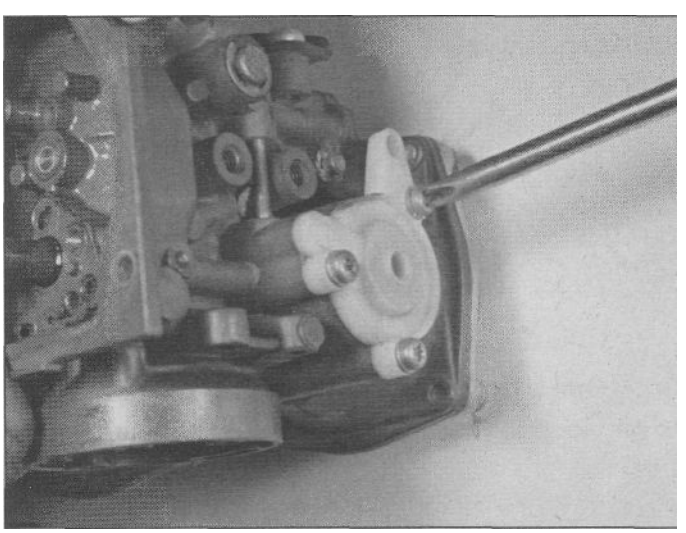


7.5c . . . and the main bleed pipe

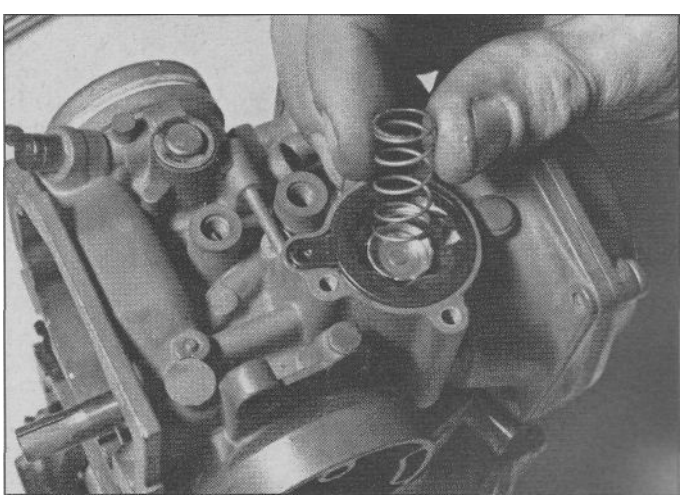


7.5d Jet block components

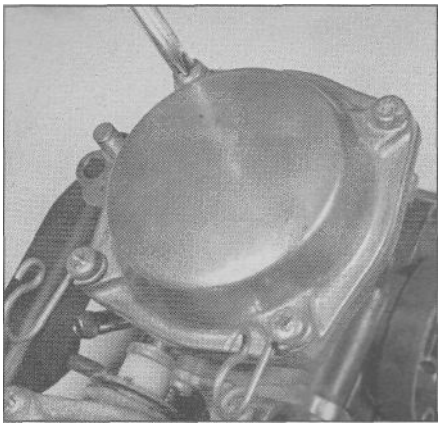
A	*Jet block*	*E*	*Main bleed pipe*
B	*Pilot jet*	*F*	*Main jet*
C	*Rubber plug*	*G*	*Main nozzle holder*
D	*Rubber plug*		



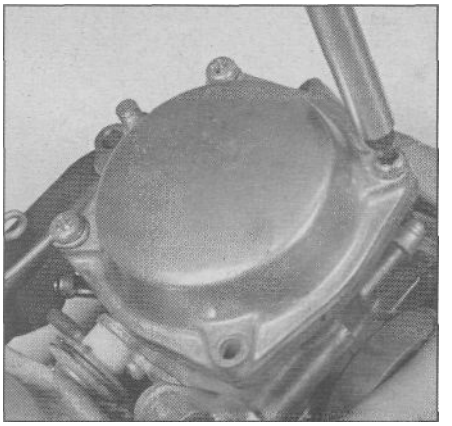
7.6a Remove the screws and lift off the coasting enricher valve cover . . .



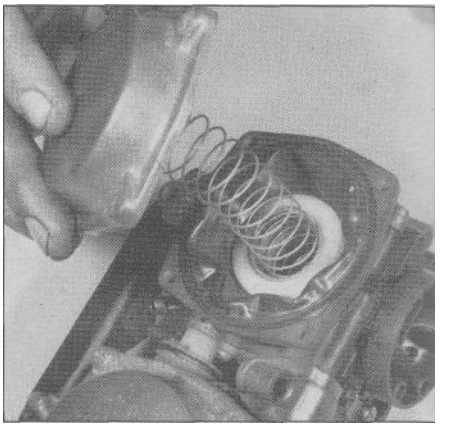
7.6b . . . then lift out the spring and diaphragm



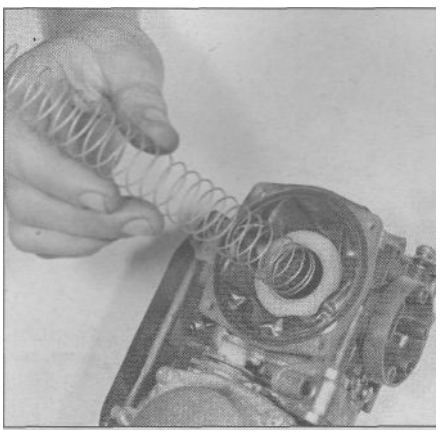
7.7a Note the locations of the hose **clips and remove the cover screws . ..**



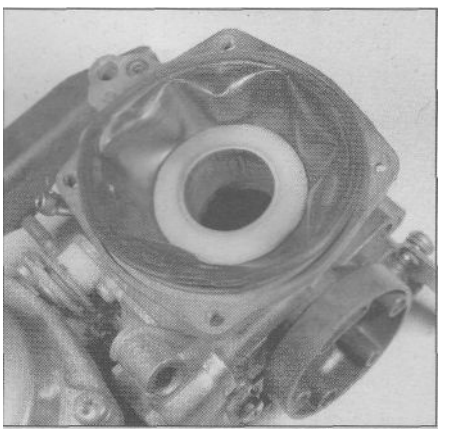
7.7b ... one of the screws requires a Torx bit



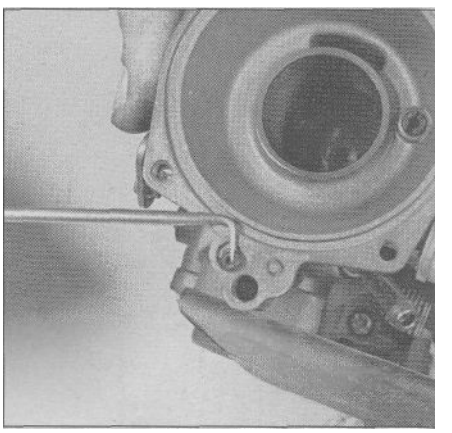
7.8a Lift off the cover ...



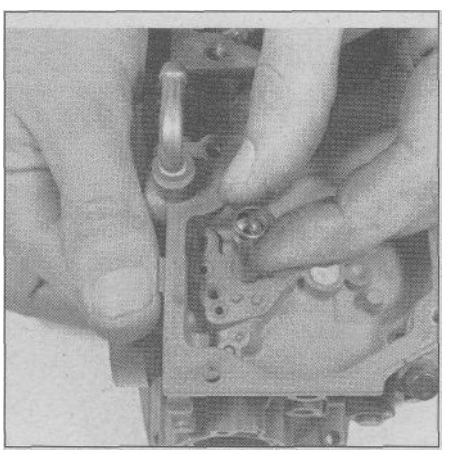
7.8b ... and remove the spring



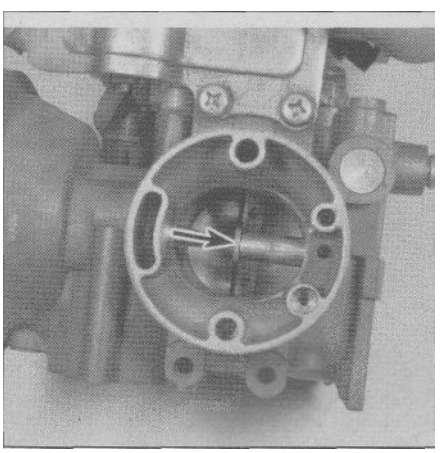
7.8c Carefully separate the diaphragm from the carburetor body without tearing it...



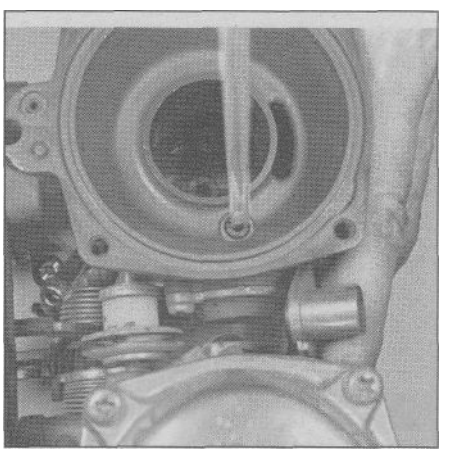
7.8d ... and remove the O-ring



7.9a Remove the O-ring from the main nozzle ...



7.9b ... then push the main nozzle into the throttle bore (arrow) and remove it



7.10a Unscrew the no. 2 pilot air jet from the vacuum chamber ...

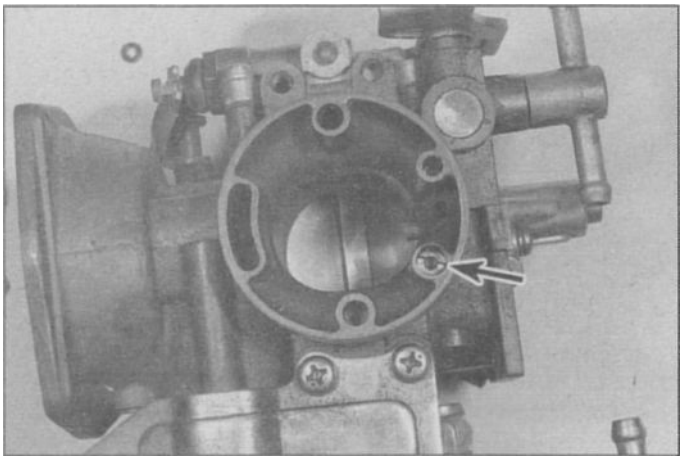
7 Remove the vacuum chamber cover screws **(see illustrations).** One of the screws requires a Torx bit (Yamaha US tool no. YU-05258/UK part no. 90890-05349).

8 Lift off the vacuum chamber cover and remove the spring **(see illustration).** Separate the vacuum piston diaphragm from the carburetor body, using care not to tear it, then remove the O-ring from the passage with a pointed tool **(see illustrations).**

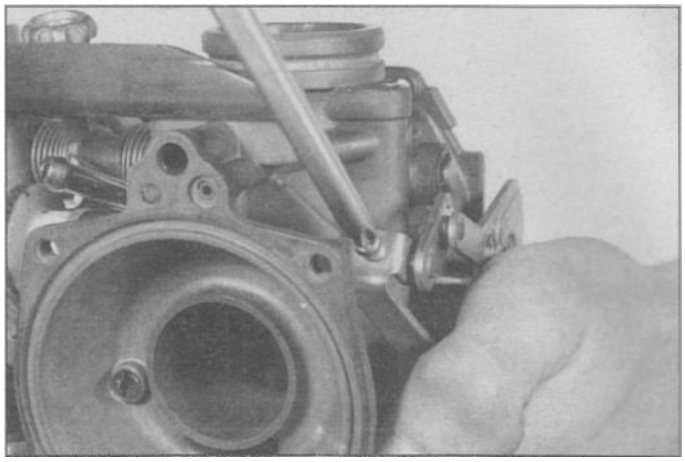
9 Push the main nozzle into the throttle bore, then remove the nozzle and its O-ring **(see illustrations).**

10 Unscrew the pilot air jets from the vacuum chamber (no. 2) and from the throttle bore (no. 1) **(see illustrations).**

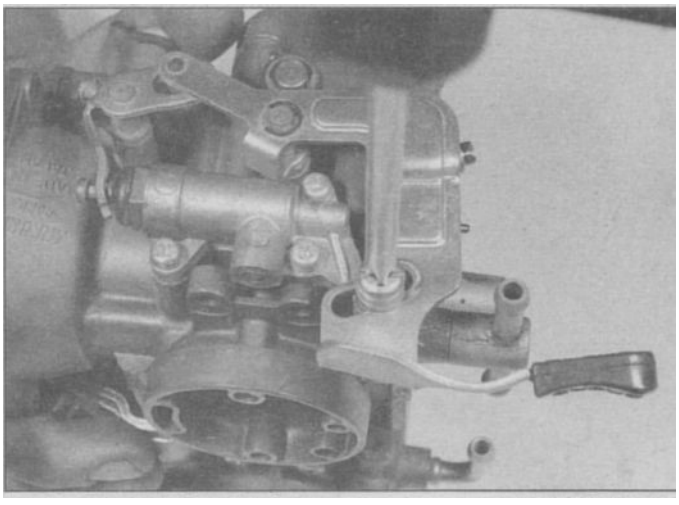
11 Loosen the two screws that secure the choke link **(see illustration).** Remove the pivot screw, retaining clip and washer and take off the choke lever **(see illustrations).**



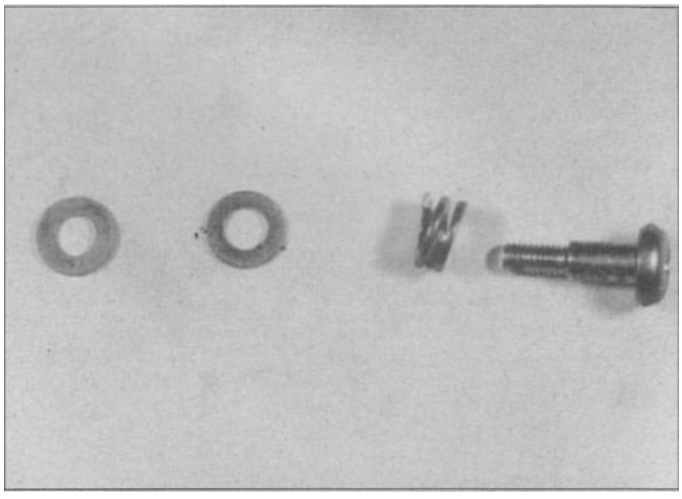
7.10b … and the no. 1 pilot air jet from the throttle bore (arrow)



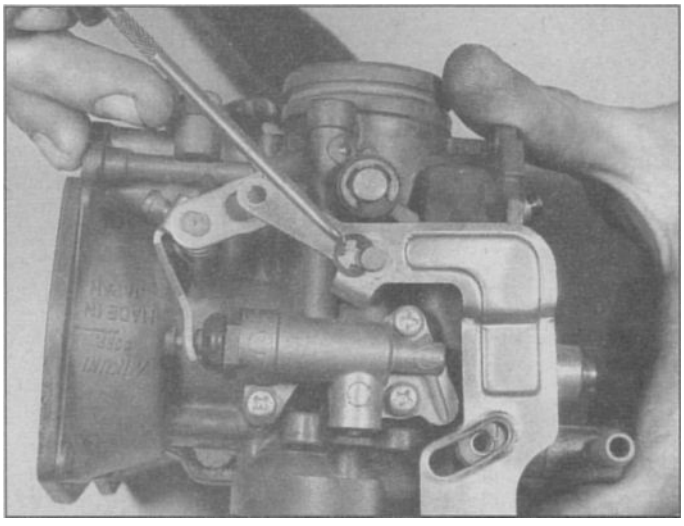
7.11a Loosen the choke link securing screws (there's one for each carburetor)…



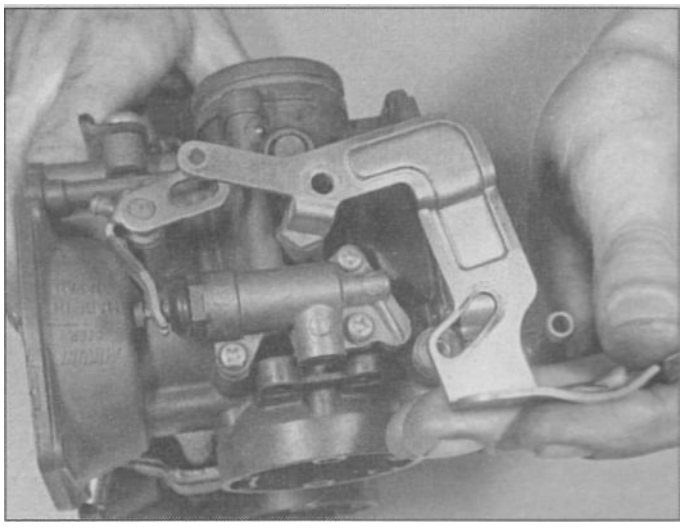
7.11b … remove the choke lever pivot screw .



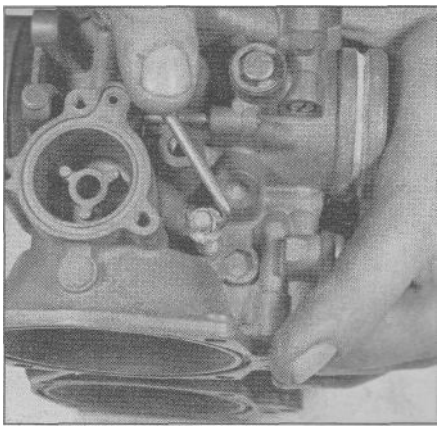
7.11c … its spring and washers



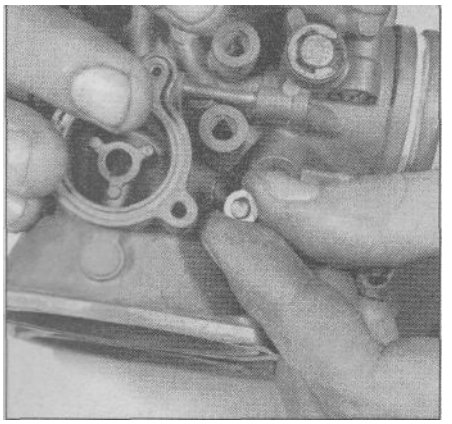
7.11d Remove the clip and washers …



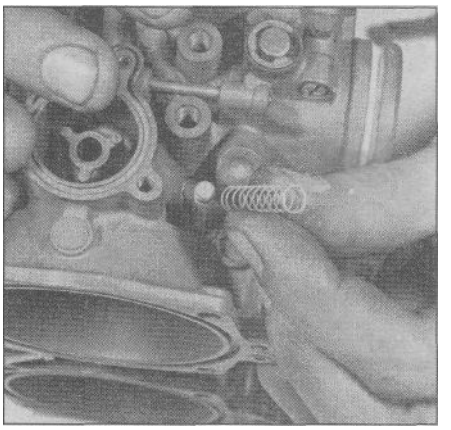
7.11e … and take off the choke lever



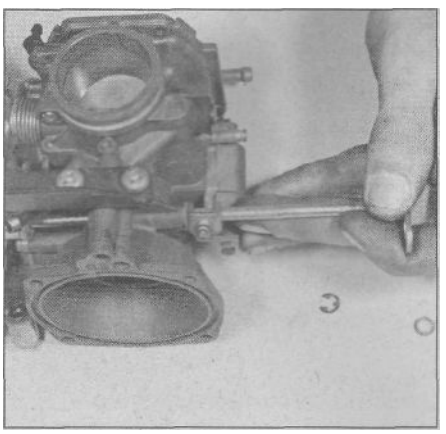
7.12a Remove the clip from the end of the choke link with a pointed tool...



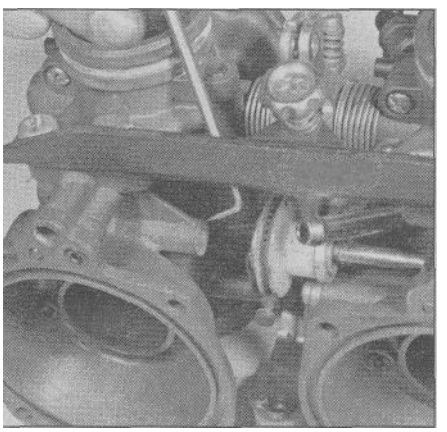
7.12b ... remove the spring retainer ...



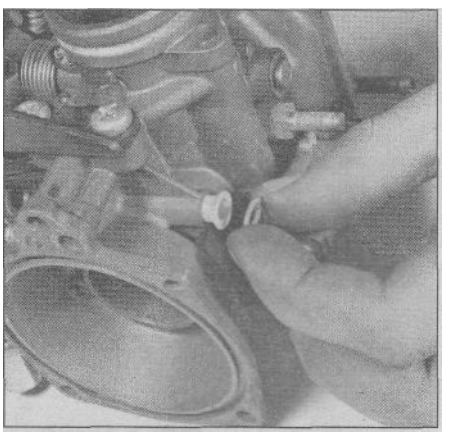
7.12c ... the spring .



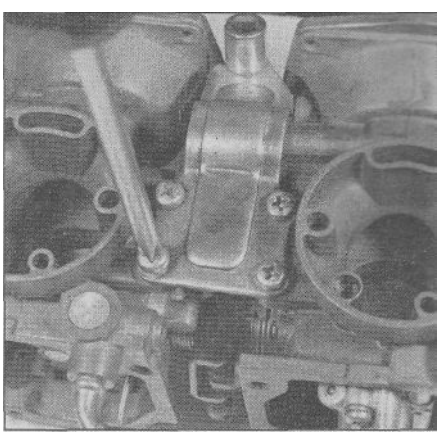
7.12d ... and pull out the choke link



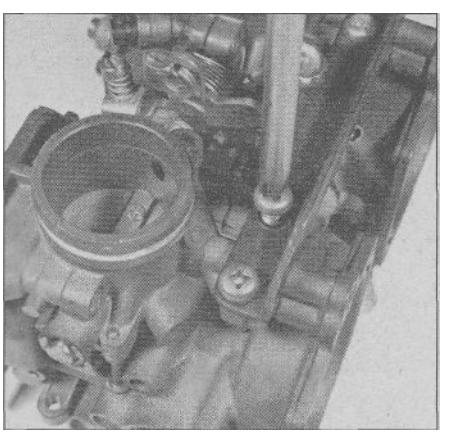
7.13a Pry the washer and bushing loose with a pointed tool...



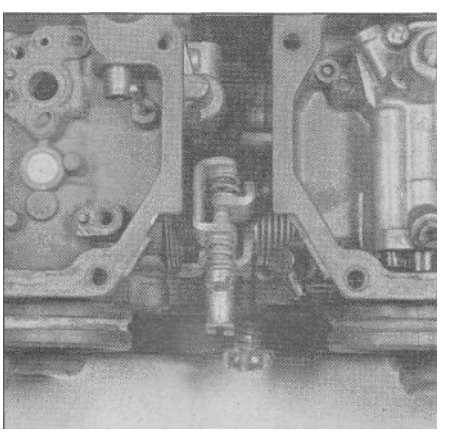
7.13b ... and remove them from the choke shaft passage



7.15a Detach the upper stay plate ...



7.15b ... and the lower stay plate ...



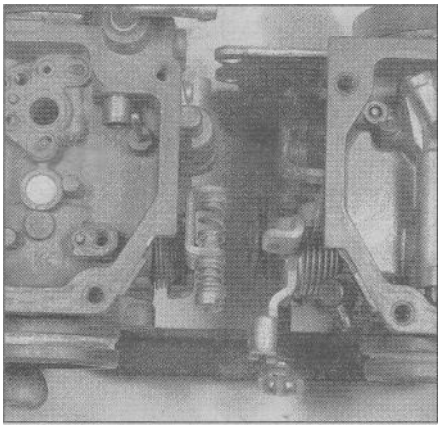
7.15c ... note carefully how the synchronizing screw fits in the linkage ...

12 Remove the clip, retainer, spring and choke link **(see illustrations).**

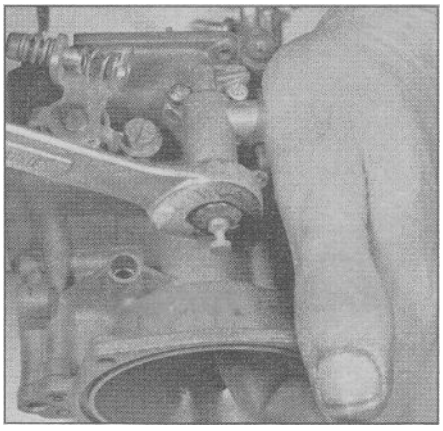
13 Remove the washer and choke link bushing from each carburetor **(see illustrations).**

14 This completes disassembly necessary to clean and inspect the jets and passages. One of the choke plunger assemblies and one of the coasting enrichers are located between the carburetors. To remove and inspect these, the carburetors must be separated as described in the following steps.

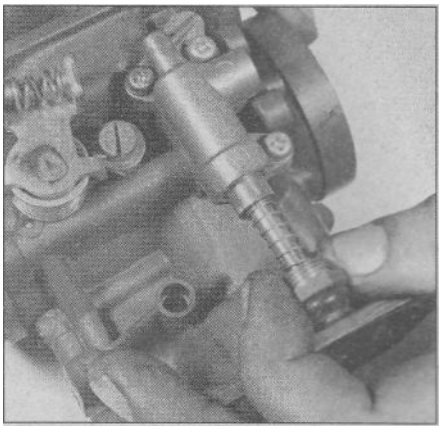
15 Remove two of the screws from the upper stay plate and two from the lower stay plate **(see illustrations).** Note how the synchronizing screw fits in the linkage, then pull the carburetors apart **(see illustrations).**



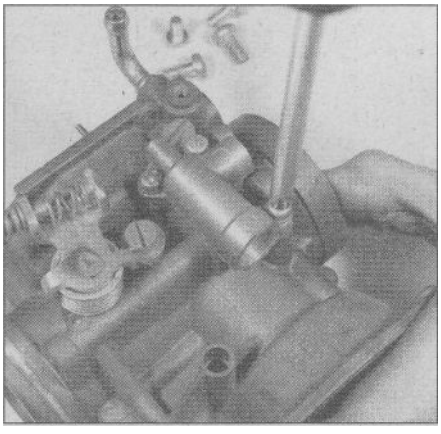
7.15d ... and pull the carburetors apart



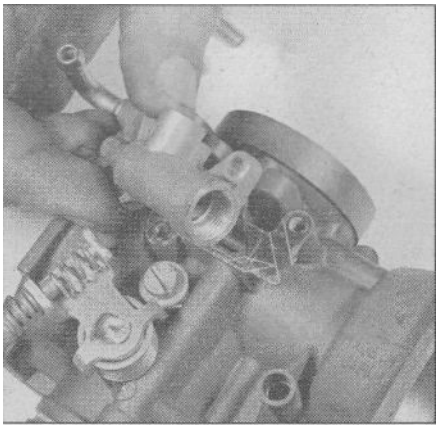
7.16a Unscrew the choke plunger ...



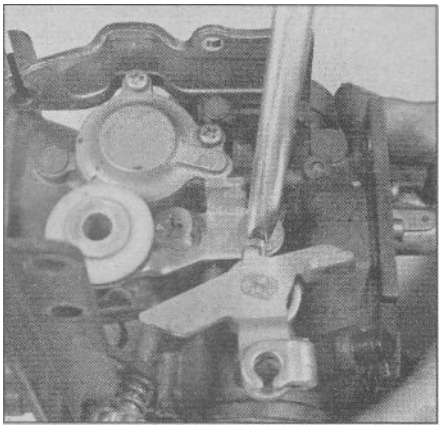
7.16b ... and take it out of the housing



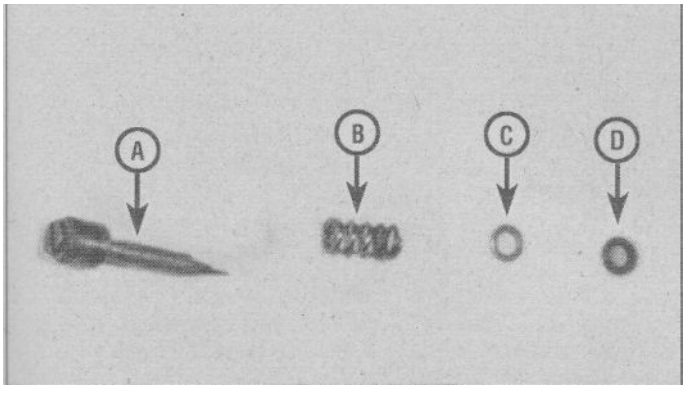
7.16c Remove the housing mounting screws ...



7.16d ... and take the housing and gasket off the carburetor body

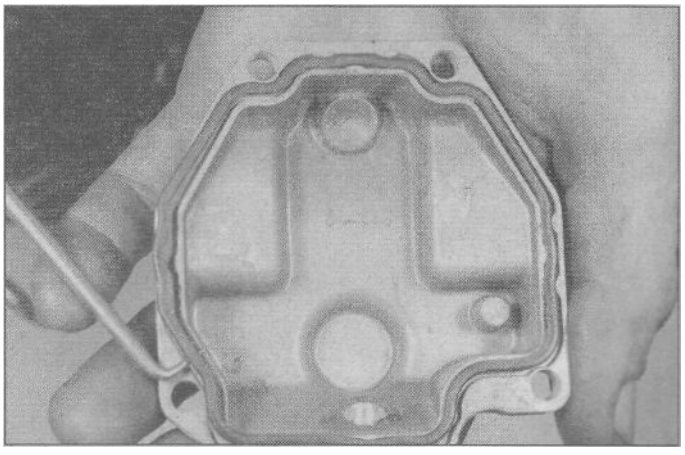


7.17 Remove two screws and take the throttle pulley assembly off



7.19 Pilot screw components

A	*Pilot screw*	*C*	*Washer*
B	*Spring*	*D*	*O-ring*



7.20 Remove the O-ring from each float chamber cover with a **pointed tool**

16 Remove the choke plunger and housing from the carburetor **(see illustrations).**

17 Remove the throttle pulley assembly **(see illustration).**

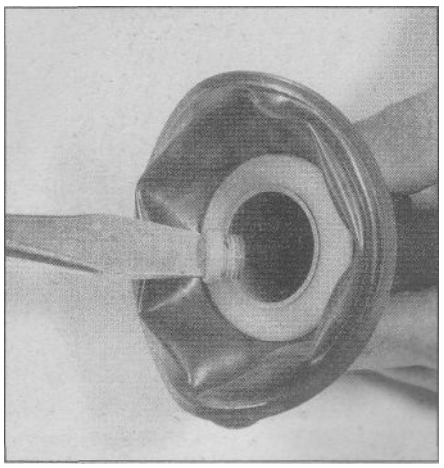
18 Remove the remaining coasting enricher (see illustrations 7.6a and 7.6b).

19 The pilot (idle mixture) screw is located in a passage in the carburetor body. On US models, this screw is hidden behind a plug which will have to be removed if the screw is to be taken out. To do this, drill a hole in the plug, being careful not to drill into the screw, then-pry the plug out or remove it with a small slide hammer. On all models, turn the pilot screw in, counting the number of turns until it bottoms lightly. Record that number for use when installing the screw. Now remove the pilot screw along with its spring, washer and O-ring **(see illustration).**

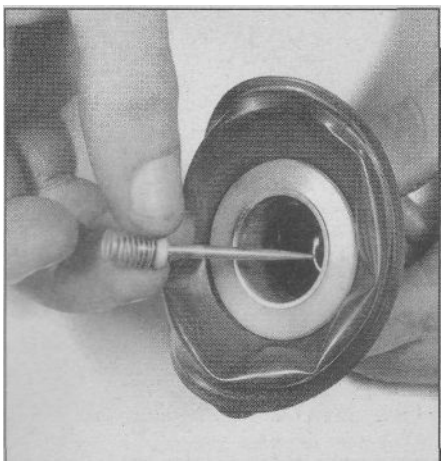
Inspection

Refer to illustrations 7.20, 7.26a, 7.26b, 7.26c and 7.28

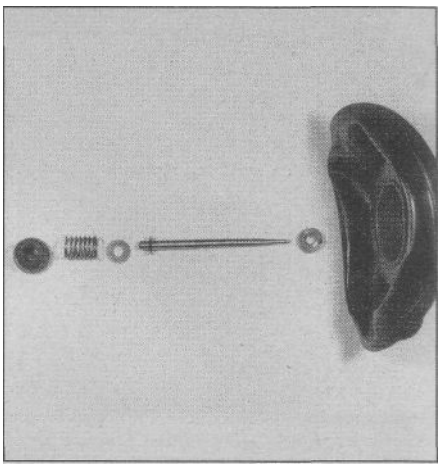
20 Remove the O-ring from each float chamber cover (see **illustration).**



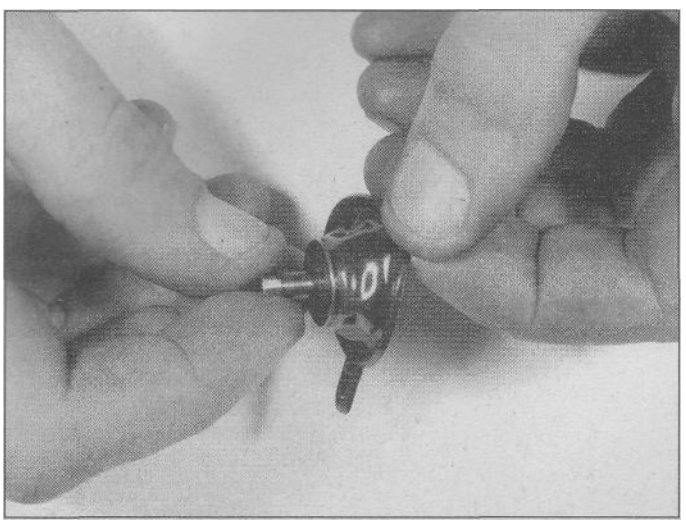
7.26a Remove the screw from inside the **vacuum piston . . .**



7.26b . . . and lift out the jet needle ,



7.26c . . . together with the spring, washer, clip and O-ring



7.28 Check the coasting enricher solenoid diaphragms for cracks or brittleness

21 Check the operation of the choke plunger. If it doesn't move smoothly, replace it, along with the return spring. Inspect the needle on the end of the choke plunger and replace it if it's worn.

22 Check the tapered portion of the pilot screw for wear or damage. Replace the pilot screw if necessary.

23 Check the carburetor body, float chamber cover and vacuum chamber cover for cracks, distorted sealing surfaces and other damage. If any defects are found, replace the faulty component, although replacement of the entire carburetor will probably be necessary (check with your parts supplier for the availability of separate components).

24 Check the diaphragm for splits, holes and general deterioration. Holding it up to a light will help to reveal problems of this nature.

25 Insert the vacuum piston in the carburetor body and see that it moves up-and-down smoothly. Check the surface of the piston for wear. If it's worn excessively or doesn't move smoothly in the bore, replace the carburetor.

26 Remove the screw that secures the jet needle in the vacuum piston **(see illustration).** Remove the jet needle, spring, washer, clip and O-ring **(see illustrations).** Check the jet needle for straightness by rolling it on a flat surface (such as a piece of glass). Replace it if it's bent or if the tip is worn.

27 Operate the throttle shaft, to make sure the throttle butterfly valve opens and closes smoothly. If it doesn't, replace the carburetor.

28 Check the coasting enricher diaphragm for tears or brittleness **(see illustration).** Replace them if their condition is in doubt.

29 Check the floats for damage. This will usually be apparent by the presence of fuel inside one of the floats. If the floats are damaged, they must be replaced. Check the float needle valve seating face; if a pronounced groove has formed on the taper, replace the needle valve. Also, check that the tip on the opposite end of the needle valve moves freely against spring pressure.

Cleaning

Caution: *Use only a petroleum based solvent for carburetor cleaning. Don't use caustic cleaners.*

30 Submerge the metal components in the solvent for approximately thirty minutes (or longer, if the directions recommend it).

31 After the carburetor has soaked long enough for the cleaner to loosen and dissolve most of the varnish and other deposits, use a brush to remove the stubborn deposits. Rinse it again, then dry it with compressed air. Blow out all of the fuel and air passages in the main body. **Caution:** *Never clean the jets or passages with a piece of wire or a drill bit, as they will be enlarged, causing the fuel and air metering rates to be upset.*

Reassembly

Refer to illustrations 7.32a, 7.32b and 7.32c

Caution: *When installing the jets, be careful not to over-tighten them - they're made of soft material and can strip or shear easily.*

Note: *When reassembling the carburetors, be sure to use the new O-rings, gaskets and other parts supplied in the rebuild kit.*

32 Assembly is the reverse of the disassembly steps, with the following additions.

a) When connecting the carburetors to each other, lay them on a surface plate while tightening the stay plate screws *to ensure proper alignment.*

b) When installing the choke plunger, align its screws with the dimples in the shaft ***(see illustration).***

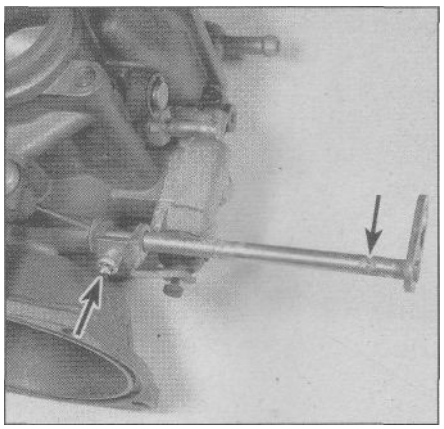
c) Align the slot in the main nozzle with the projection inside the jet block.

d) Align the projection on the jet needle washer with the hole in the vacuum piston.

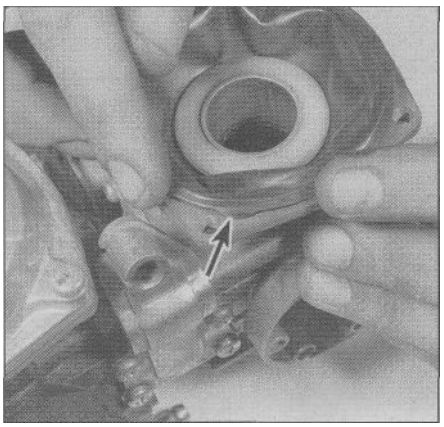
e) Align the protrusion on the vacuum piston diaphragm with the notch in the carburetor body ***(see illustration).***

f) Align the tab on the coasting enricher diaphragm with the slot in the carburetor body ***(see illustration).***

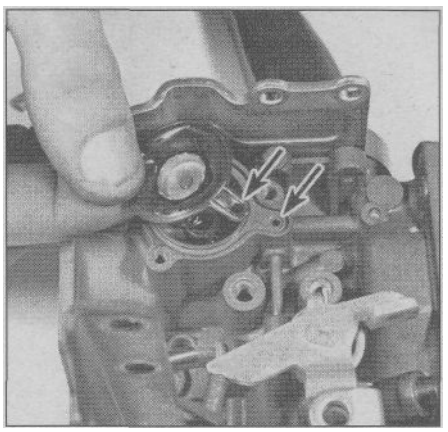
g) Install the carburetors (see Section 6) and check the fuel level (see Section 8).



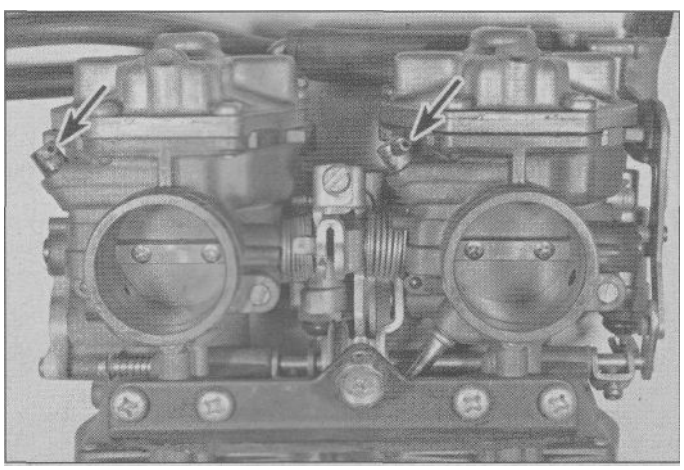
7.32a Align the choke shaft screws with the dimples in the shaft (arrows)



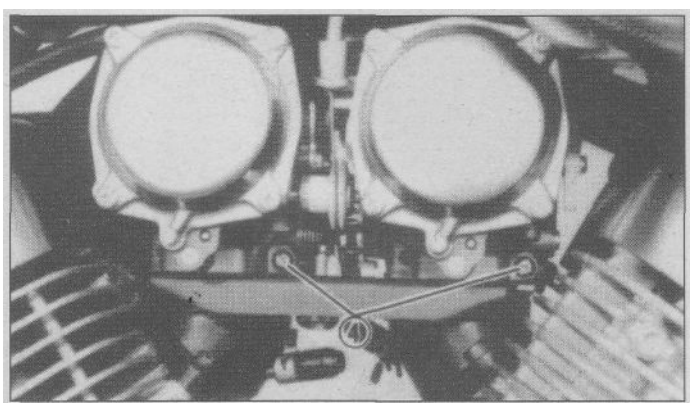
7.32b Align the protrusion in the diaphragm with the notch in the carburetor body (arrow)



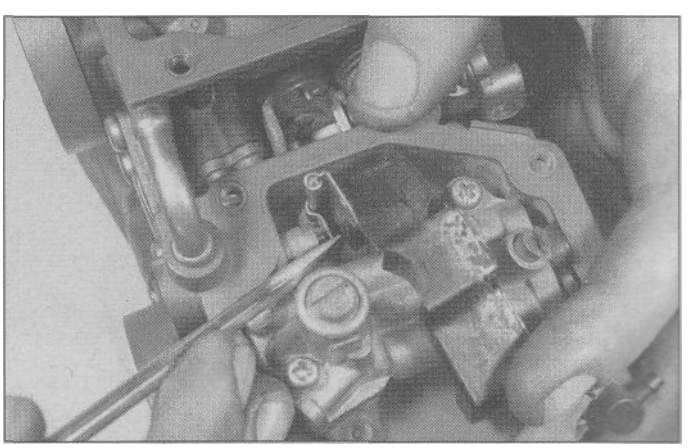
7.32c Align the tab on the coasting enricher diaphragm with the notch in the carburetor body (arrow)



8.3 Connect the tool to one of the drain fittings (arrows)



8.4 Loosen the float chamber drain screw



8.6 Bend the float tang to change fuel level

8 Carburetors - fuel level adjustment

Refer to illustrations 8.3, 8.4 and 8.6

Warning: *Gasoline (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 class B type fires (flammable liquids) on hand.*

1 Support the bike securely so it can't be knocked over during this procedure.

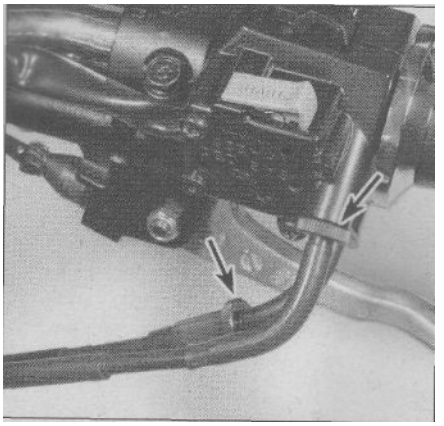
2 Place a floor jack under the bike and position it so the carburetors are vertical.

3 Attach Yamaha service tool no. YM-01312-A (part no. 90890-01312) to the drain fitting on the bottom of one of the carburetor float chambers (both will be checked) **(see illustration).** This is a clear plastic tube graduated in millimeters. An alternative is to use a length of clear plastic tubing and an accurate ruler. Hold the graduated tube (or the free end of the clear plastic tube) vertically against the float chamber cover.

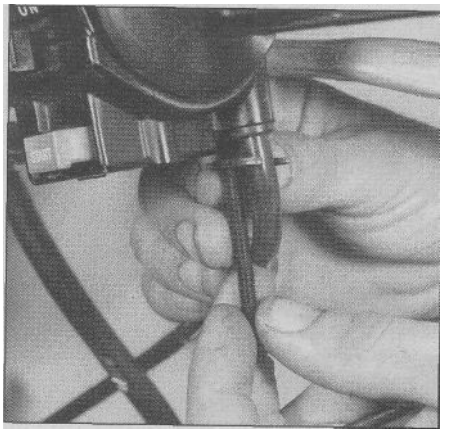
4 Unscrew the drain screw at the bottom of the float chamber a couple of turns **(see illustration),** then start the engine and let it idle - fuel will flow into the tube. Wait for the fuel level, to stabilize, then note how far the fuel level is below the line on the float chamber cover.

5 Measure the distance between the indicator line and the top of the fuel level in the tube or gauge. This distance is the fuel level - write it down on a piece of paper, tighten the drain screw, then move on to the other carburetor and check it the same way.

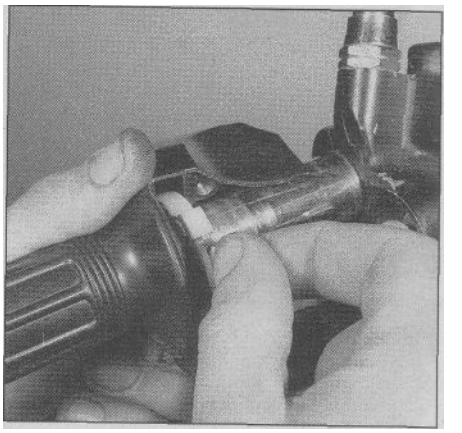
6 Compare your fuel level readings to the value listed in this Chapter's Specifications. If the fuel level in either carburetor is not correct, remove the float chamber cover and bend the tang up or down as necessary **(see illustration),** then recheck the fuel level. **Note:** *It isn't necessary to remove the carburetors from the motorcycle since the float chamber screws are accessible from the left side, but be sure the fuel valves turned off and the float chambers drained of fuel before doing so.*



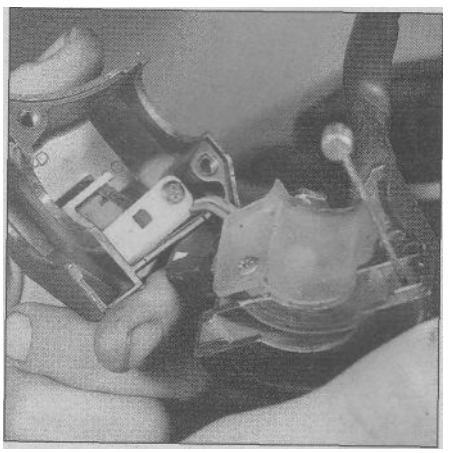
9.1 Loosen the throttle cable adjuster locknuts and loosen the adjusters (arrows)



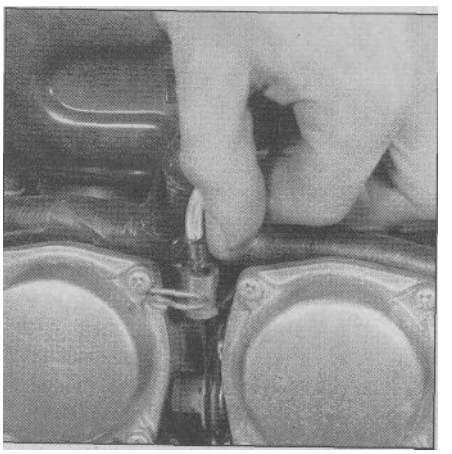
9.2 Remove the screw that secures the throttle cables to the housing



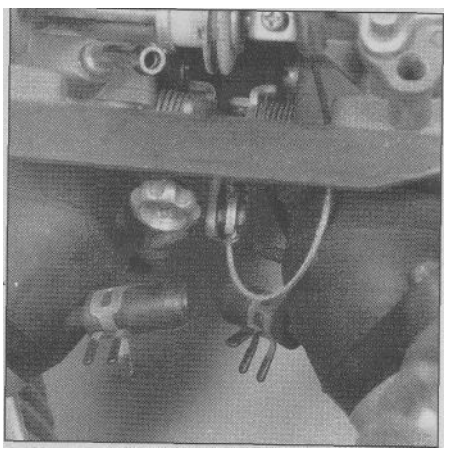
9.3a Slip the cable out of its groove .



9.3b ... and disengage the end from the pulley



9.4a Pull the end of the cable out of the socket and slip the cable sideways through the slot to disengage it...



9.4b ... then slide the end of the cable sideways out of the pulley

9 Throttle cables and grip - removal, installation and adjustment

Refer to illustrations 9.1, 9.2, 9.3a, 9.3b, 9.4a and 9.4b

Removal

1 Loosen the throttle cabfe(s) with the adjusters **(see illustration).**

2 Remove the throttle cable securing screw at the handlebar **(see illustration).**

3 Remove the handlebar switch mounting screws.. Separate the halves of the handlebar switch and detach the throttle cable(s) from the throttle grip pulley **(see illustrations).**

4 Detach the throttle cables from the throttle pulley at the carburetors **(see illustrations).** Remove the cables, noting how they are routed.

5 Slide the throttle grip off the handlebar.

Installation

6 Clean the handlebar and apply a light coat of multi-purpose grease.

7 Route the cable(s) into place, following the same route as noted n removal - the cables should pass behind the upper part of the right fork leg. Make sure they don't interfere with any other components and aren't kinked or bent sharply.

8 Lubricate the ends of the accelerator cable (and decelerator cable if equipped) with multi-purpose grease and connect them to the throttle pulleys at the carburetors and at the throttle grip.

Adjustment

9 Follow the procedure outlined in Chapter 1, Throttle operation/grip freeplay - check and adjustment, to adjust the cables.

10 Turn the handlebars back and forth to make sure the cables don't cause the steering to bind. With the engine idling, turn the handlebars back and forth and make sure idle speed doesn't change. If it does, find and fix the cause before riding the motorcycle.

10 Exhaust system - removal and installation

Removal

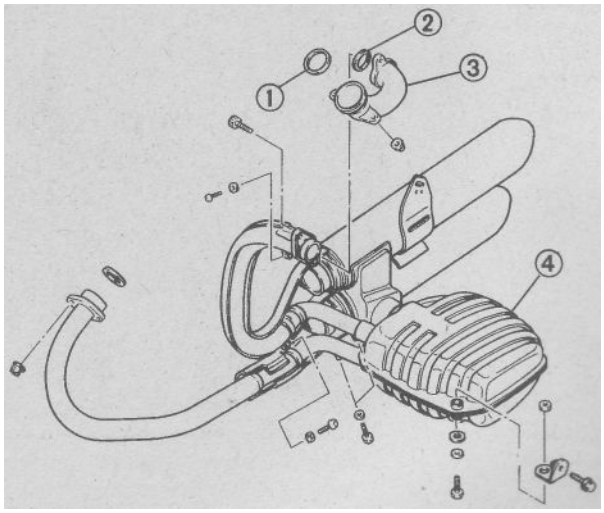
Refer to illustrations 10.2a, 10.2b, 10.3a, 10.3b, 10.4, 10.5 and 10.6

1 Support the bike securely so it can't be knocked over during this procedure.

2 Remove the nuts that secure the front exhaust pipe to the cylinder head **(see illustrations).**

3 Remove the Allen bolts and detach the rear exhaust pipe from the joint pipe at the cylinder head **(see illustration).** Remove the nuts and detach the joint pipe from the head **(see illustration).**

4 Unbolt the muffler/silencer bracket at the right passenger footpeg **(see illustration).**



10.2a Exhaust system (XV535 models) - exploded view

1 Exhaust pipe gaskets
2 Exhaust pipe-to-rear joint gasket
3 Joint pipe (rear cylinder)
4 Exhaust pipe assembly

5 Support the muffler/silencer chamber with a jack and unbolt it from the frame **(see illustration).** Lower the exhaust system away from the bike and take it out.

6 Installation is the reverse of removal, with the following additions:

*a) Use new gaskets at the cylinder head **(see illustration).***
b) Tighten all fasteners to the torque settings listed in this Chapter's Specifications.

11 Fuel pump - circuit check and fuel pump test

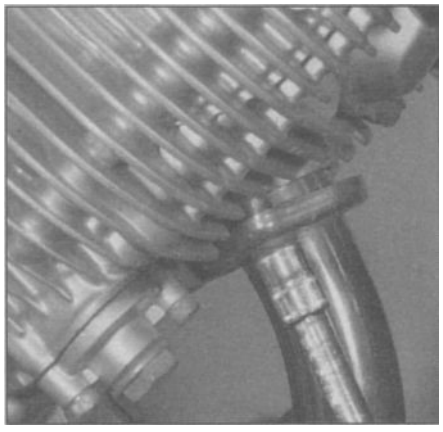
1 With the engine kill switch in the On position, the fuel pump should start and run for approximately five seconds after the ignition is switched on (with the fuel warning light on or off). It should shut off once the carburetor float chambers are full, then run again once the engine is started.

2 The fuel pump circuit consists of the pump, the pump relay, the igniter unit (which controls the fuel pump as well as ignition timing), the engine kill switch, the ignition switch, the main and ignition fuses, the battery and related wiring.

3 Lift the seat and prop it up.

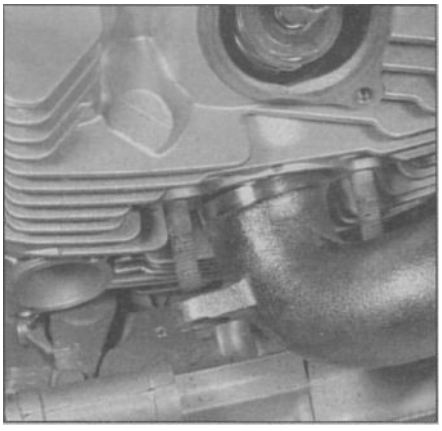
4 Check the battery condition and charge (see Chapter 1 and Chapter 8).

5 Check the main and ignition fuses, the ignition switch and the engine kill switch (see Chapter 8). Replace them if they're defective, then try the fuel pump again.

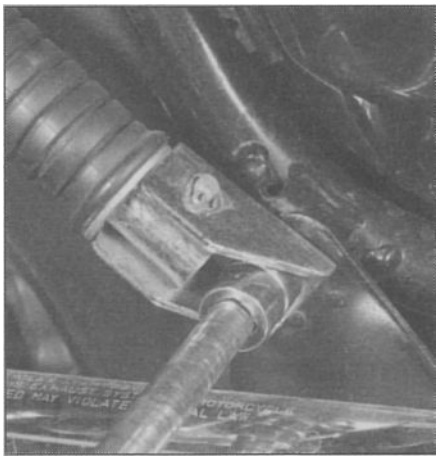


10.2b Detach the front exhaust pipe flange from the cylinder head

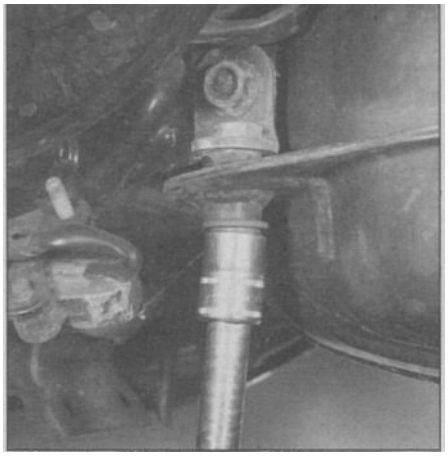
10.3a Remove the Allen bolts and disconnect the rear exhaust pipe from the joint...



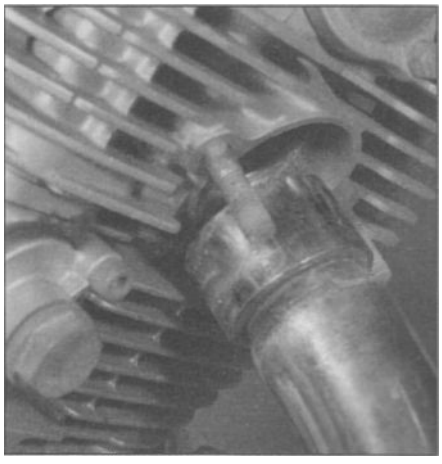
10.3b ... and remove the nuts that secure the rear joint to the cylinder head



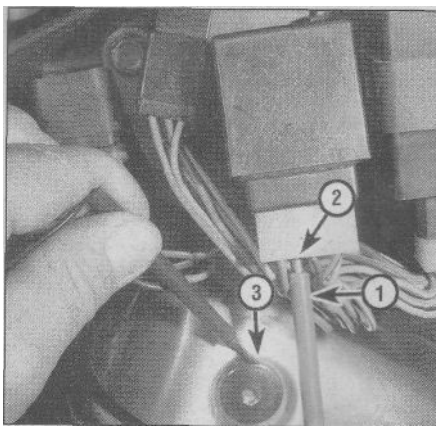
10.4 Unbolt the bracket at the right passenger footpeg



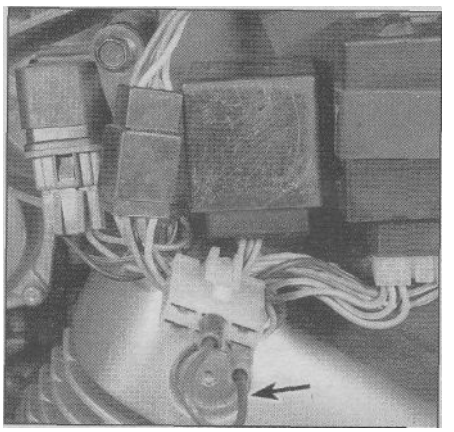
10.5 With the exhaust system supported, unbolt the muffler/silencer chamber



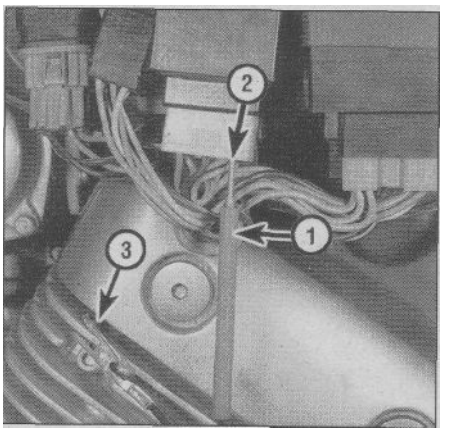
10.6 Use new gaskets for installation



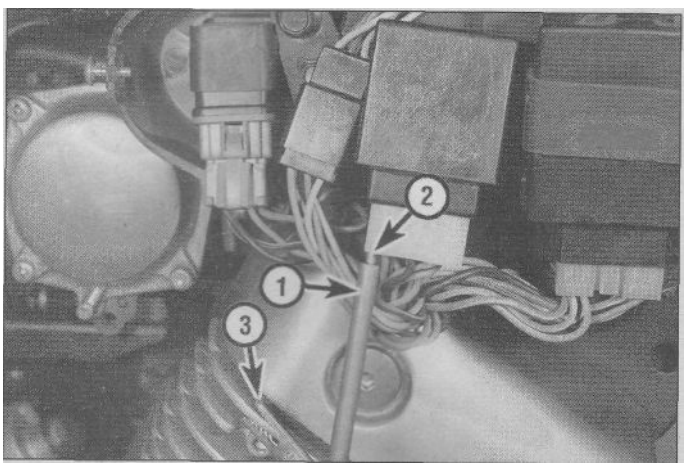
11.6 Connect the positive lead (1) of a 0-20 volt voltmeter to the red/white wire terminal of the connector (2) and the negative lead to ground/earth (3)



11.10 Connect a short jumper wire (arrow) between the red/white and blue/black wire terminals



11.11 Connect the voltmeter positive (1) lead to the back of the blue-black wire terminal (2) and the negative lead to ground/earth (3)



11.13 Connect the voltmeter positive lead (1) to the red/green wire terminal in the harness side of the connector (2) and the negative lead to ground/earth (3)

Pump won't run, fuel warning light off

Refer to illustrations 11.6, 11.10 and 11.11

6 If the pump won't run while the engine is running, or if it won't run for five seconds with the ignition switch On, the kill switch in Run and the fuel warning light off, check battery voltage to the pump. Disconnect the electrical connector at the relay and connect a 0-20 volt DC voltmeter between the red/white wire terminal in the harness and a good grounding/earthing point (bare metal on the engine) **(see illustration).**

7 Turn the ignition switch to On and the engine kill switch to Run, then push the Start switch. The voltmeter should indicate at least 12 volts.

8 If the reading is less than 12 volts, check the wiring in the fuel pump circuit for breaks or bad connections. Be sure to check the battery terminal connections and the battery ground/earth cable connection to the motorcycle.

9 If the reading is at least 12 volts, the wiring is good. Check the fuel reserve switch (see Chapter 8).

a) If the reserve switch is bad, replace it

b) If the pump won't run with the engine running, go to Step 10. If the pump won't run for five seconds with the ignition switch On and the kill switch in Run, go to Step 11.

10 Disconnect the electrical connector from the fuel pump relay **(see illustration).** Connect a short length of wire between the blue/black wire terminal and the red/white wire terminal in the harness side of the relay connector. With the ignition switch On and the kill switch in Run, push the Start and Reserve switches. The fuel pump should run.

a) If the fuel pump won't run, test it (see below).

b) If the fuel pump now runs, check the wiring and connections in the fuel pump circuit. If they're good, the fuel pump relay is probably defective. Replace it.

11 Reconnect the connector to the fuel pump relay. Insert the voltmeter positive probe into the back of the blue/black wire connector and connect the voltmeter negative lead to ground/earth (bare metal on the motorcycle) **(see'Illustration).** With the ignition switch On and the kill switch in Run, push the Start and Reserve switches. The voltmeter should indicate at least 11 volts.

a) If voltage is less than 11 volts, the fuel pump relay is probably defective. Replace it.

b) If voltage is 11 volts or more, check the wiring and connections in the fuel pump circuit. If they're good, the fuel pump is probably defective. Test it (see below).

Pump won't run, fuel warning light on

Refer to illustration 11.13

12 If the pump won't run for five seconds with the ignition switch On, the kill switch in Run and the fuel warning light on, check the fuel reserve switch (see Chapter 8).

a) If the fuel reserve switch is bad, replace it.

b) If the switch is good, go to Step 13.

13 Disconnect the electrical connector from the fuel pump relay **(see illustration).** Connect the positive lead of a 0-20 volt voltmeter to the red-green wire in the harness side of the connector and the negative voltmeter lead to a good grounding/earthing point (bare metal on the engine). With the ignition switch On and the engine kill switch in Run, push the start switch.

a) If it's less than 12 volts, check the wiring and connections in the fuel pump circuit.

b) If it's 12 volts or more, perform Step 11 above.

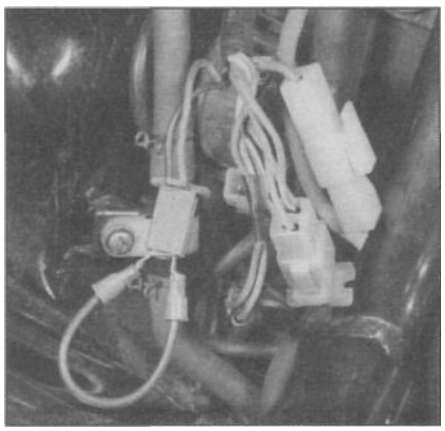
Pump won't shut off after 30 seconds

Refer to illustrations 11.14

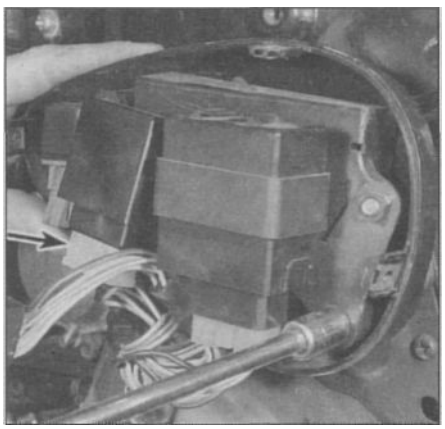
14 Disconnect the fuel sender electrical connector **(see illustration).** Connect the terminals in the harness side of the sender connector to each other with a short length of wire.

15 With the sender harness terminals connected to each other, connect the positive lead of a 0-20 volt voltmeter to the back side of the blue/black wire terminal in the fuel pump relay connector **(see illustration 11.11).** Connect the voltmeter negative lead to a good grounding/earthing point (bare metal on the engine).

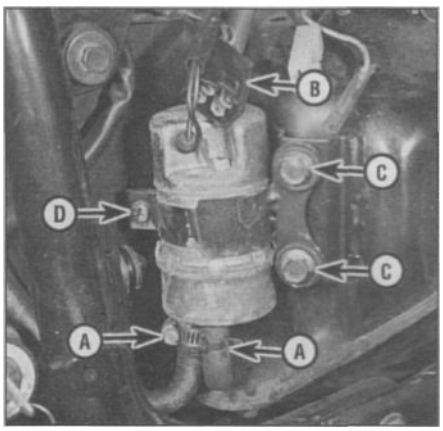
16 With the ignition switch On and the kill switch in Run, push the



11.14 Connect the terminals in the harness side of the fuel sender connector to each other with a short jumper wire



12.2 Disconnect the wiring connector and remove the fuel pump relay



12.5 Loosen the fuel line clamps (A), disconnect the connector (B), remove the mounting bolts (C) and take the pump out; loosen the clamp screw (D) to remove the pump from its bracket

Start switch and note the voltmeter reading.

a) If the reading is zero after about 30 seconds, the fuel sender is probably defective. Test it as described in Chapter 8.

b) If the reading is more than zero after about 30 seconds, check the wiring and connections in the fuel pump circuit. If they're good, the fuel pump relay is probably defective. Replace it.

Fuelpumptest

17 Disconnect the wiring connector from the fuel pump. Connect the pump directly to the battery with two lengths of wire (positive to blue/black; negative to black). If the pump doesn't run, replace it.

12 Fuel pump and relay - replacement

Fuelpumprelayreplacement

Refer to illustration 12.2

1 Remove the right front side cover (see Chapter 7).

2 Disconnect the wiring connector from the relay **(see illustration).**

3 Remove the relay from its mounting bracket, install a new one and reconnect the wiring connector.

Fuelpumpreplacement

Refer to illustration 12.5

4 Remove the left rear side cover (see Chapter 7).

5 Loosen the fuel line clamps and push the ends of the fuel lines off the pump fittings **(see illustration).**

6 Disconnect the pump electrical connector. Remove the mounting bolts and take the pump out (see illustration 12.5).

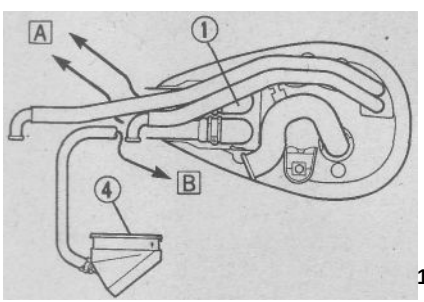
7 Loosen the clamp screw and slide the pump out of its bracket.

8 Installation is the reverse of the removal steps.

13 Air induction system (1990-on US models) - inspection and component replacement

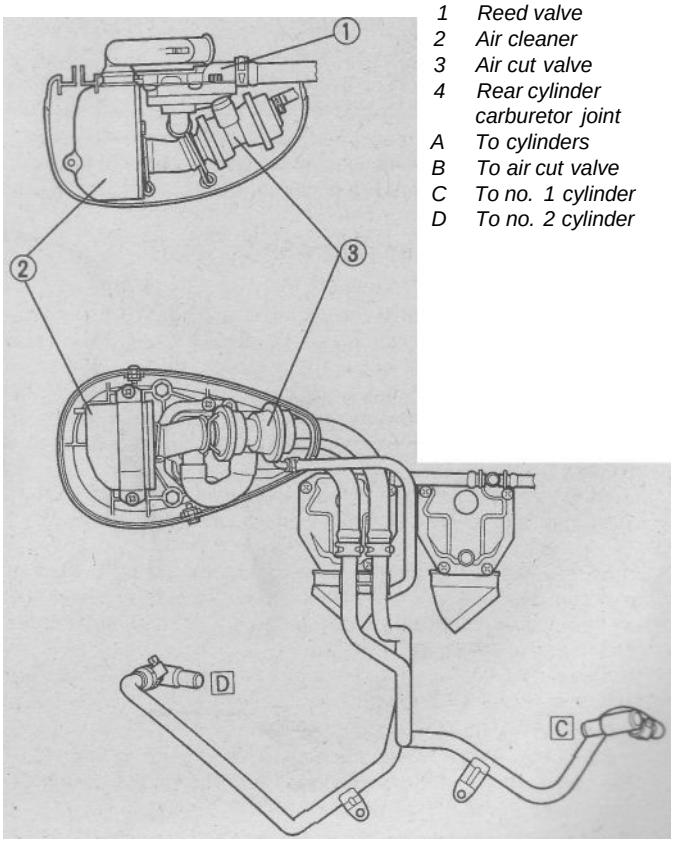
Refer to illustrations 13.1, 13.3a, 13.3b and 13.3c

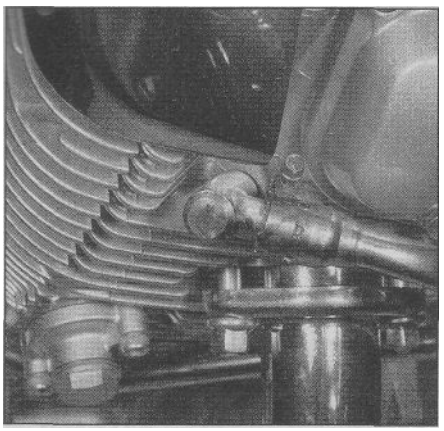
1 The air induction system uses exhaust gas pulses to suck fresh air into the exhaust ports, where it mixes with hot combustion gases. The additional oxygen provided by the fresh air allows combustion to continue for a longer time, reducing unburned hydrocarbons in the exhaust **(see illustration).** Reed valves allow the flow of air into the ports and prevent exhaust gas from flowing into the system. The air cut valve shuts off the flow of air into the system during deceleration to prevent backfiring.



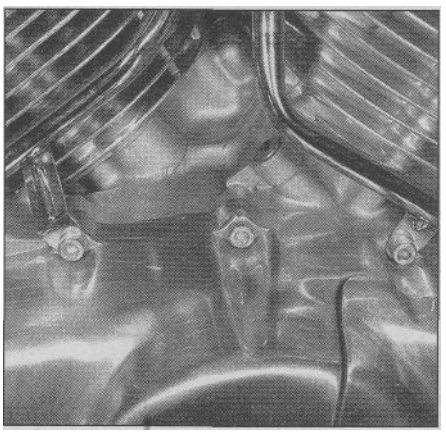
13.1 Air induction system details

1 Reed valve
2 Air cleaner
3 Air cut valve
4 Rear cylinder carburetor joint
A To cylinders
B To air cut valve
C To no. 1 cylinder
D To no. 2 cylinder

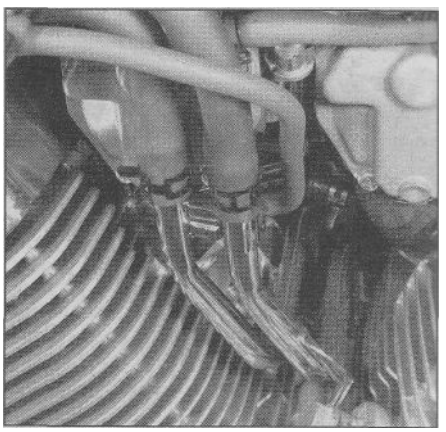




13.3a Pipe connections at the cylinder heads are secured by screw-type hose clamps



13.3b The pipes are attached to the right side of the engine with two Allen bolts (arrows)



13.3c Hose-to-pipe connections are secured by spring-type clamps

2 Check the hoses for loose connections, damage and deterioration. Tighten or replace loose or damaged hoses.

3 To replace system components, remove the left side cover (see Chapter 7). Disconnect the air hoses and the metal tubes **(see illustrations),** remove the mounting screws and take the assembly off the motorcycle **(see illustrations).**

4 Installation is the reverse of the removal steps.

14 Evaporation control system (California models) - inspection and canister replacement

Refer to illustration 14.1

1 The evaporation control system used on California models prevents fuel vapor from escaping into the atmosphere. When the engine isn't running, the vapor is stored in a canister, then routed into the combustion chambers for burning when the engine starts **(see** illustration).

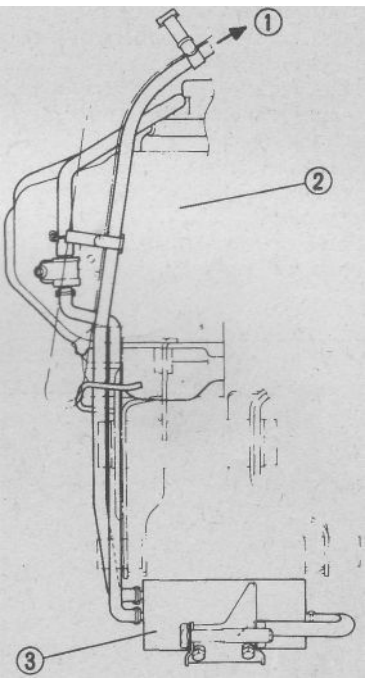
2 The hoses should be checked periodically for loose connections, damage and deterioration. Tighten or replace the hoses as needed.

3 To remove the canister, disconnect the hoses and remove the mounting bolts. To install it, bolt the canister to the motorcycle and reconnect the hoses.

Rollovervalve

4 The rollover valve allows passage of vapors to the canister when it's in its normal upright position. The valve is designed to block the flow of vapors if the motorcycle is rolled over.

5 To test the valve, disconnect its hoses and remove the mounting screw (see illustration 14.1). It should be possible to blow air through the valve when it's upright, but not when it's turned upside down. If the valve doesn't perform as described, replace



14.1 Evaporation control system details (California models)

1 To carburetor
2 Fuel tank
3 Canister

Chapter 3 Part B
Fuel and exhaust systems (XV700-1100 models)

Contents

	Section
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Carburetors - disassembly, inspection, cleaning and reassembly	7
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Mixture control valve (all 1981 through 1983 models; 1984 and 1985 XV700) - testing and replacement	14
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Throttle operation/grip freeplay - check and adjustment	See Chapter 1

Specifications

XV700 models

Fuel tank capacity

Total	12.5 liters (3.3 US gal, 2.7 Imperial gal)
Reserve	2.5 liters (0.6 US gal, 0.5 Imperial gal)

Carburetors

Type	Hitachi HSC40 (two)
Main jet	
Rear cylinder	128
Front cylinder	132
Main air jet	50
Jet needle	Y-32
Needle jet	3.2
Pilot air jet	190
Pilot jet	42
Pilot screw	Preset (turns out not specified)
Valve seat size	2.0
Starter jet	40
Fuel level:	0+/-1.0 mm (0+/- 0.039 inch)

Tightening torques

Carburetor joint bolts	10 Nm (7.2 ft-lbs)
Exhaust pipe-to-cylinder head nuts	20 Nm (14 ft-lbs)

XV750 models (1981 through 1983)

Fuel tank capacity

Total	12 liters (3.17 US gal, 2.64 Imperial gal)
Reserve	2.6 liters (0.67 US gal, 0.57 Imperial gal)

Carburetors

Type	Hitachi HSC40 (two)
Main jet	122
Main air jet	50
Jet needle (US models)	
Rear cylinder	Y-23
Front cylinder	Y-22
Jet needle (UK models)	
Rear cylinder	Y-21
Front cylinder	Y-20
Needle jet	Not specified
Pilot air jet	
US	185
UK	180
Pilot jet	41
Pilot screw	Preset (turns out not specified) REAR 3 1/2 F 1 3/8
Valve seat size	2.0
Starter jet	40
Fuel level	
Rear cylinder	1.0 +/- 1.0 mm (0.039 +/-0.039 inch)
Front cylinder	2.0 +/-1.0 mm (0.078 +/- 0.039 inch)

Tightening torques

Carburetor joint bolts	10 Nm (7.2 ft-lbs)
Exhaust pipe-to-cylinder head nuts	20 Nm (14 ft-lbs)

XV750 models (1988-on)

Fuel tank capacity

Total	14.5 liters (3.8 US gal, 3.2 Imperial gal)
Reserve	2.5 liters (0.65 US gal, 0.5 Imperial gal)

Carburetors

Type	Mikuni BST40 (two)
Main jet	122.5
Main air jet	80
Jet needle	5DL12
Needle jet	Y-4
Pilot air jet	60
Pilot jet	40
Pilot screw	Preset (turns out not specified)
Valve seat size	2.3
Starter jet	35
Fuel level	1.5 to 2.5 mm (0.6 to 1.0 inch)

Tightening torques

Carburetor joint bolts	10 Nm (7.2 ft-lbs)
Exhaust pipe-to-cylinder head nuts	20 Nm (14 ft-lbs)

XV920 shaft drive models

Fuel tank capacity

Total	14.5 liters (3.83 US gal, 3.19 Imperial gal)
Reserve	2.0 liters (0.53 US gal, 0.44 Imperial gal)

Carburetors

Type	Hitachi HSC40 (two)
Main jet	
Rear cylinder	126
Front cylinder	128
Main air jet	50
Jet needle	
Rear cylinder	Y-25
Front cylinder	Y-24
Needle jet	Not specified
Pilot air jet	
US	185
UK	180
Pilot jet	41
Pilot screw	Preset (turns out not specified)
Valve seat size	2.0
Starter jet	40

Fuel level	
Rear cylinder	1.0 +/-1.0 mm (0.039 +/- 0.039 inch)
Front cylinder	2.0 +/-1.0 mm (0.078 +/- 0.039 inch)

Tightening torques

Carburetor joint bolts	10 Nm (7.2 ft-lbs)
Exhaust pipe-to-cylinder head nuts	20 Nm (14 ft-lbs)

XV920 chain drive models

Fuel tank capacity

Total	19 liters (5.02 US gal, 4.18 Imperial gal)
Reserve	3.2 liters (0.84 US gal, 0.70 Imperial gal)

Carburetors

Type	Hitachi HSC40 (two)
Main jet	
Rear cylinder	126
Front cylinder	124
Main air jet	50
Jet needle	
Rear cylinder	Y-22
Front cylinder	Y-22
Needle jet	Not specified
Pilot air jet	18
Pilot jet	41
Pilot screw	Preset (turns out not specified)
Valve Seat size	2.0
Starter jet	40
Fuel level	
Rear cylinder	1.0 +/-1.0 mm (0.039 +/- 0.039 inch)
Front cylinder	2.0 +/-1.0 mm (0.078 +/- 0.039 inch)

Tightening torques

Carburetor joint bolts	10 Nm (7.2 ft-lbs)
Exhaust pipe-to-cylinder head nuts	20 Nm (14 ft-lbs)

XV1000 shaft drive models

Fuel tank capacity

Total	14.5 liters (3.8 US gal, 3.2 Imperial gal)
Reserve	3.0 liters (0.79 US gal, 0.66 Imperial gal)
Carburetors	
Type	Hitachi HSC40 (two)
Main jet	
Rear cylinder	124
Front cylinder	132
Main air jet	50
Jet needle	
Rear cylinder	Y-34
Front cylinder	Y-33
Needle jet	3.2
Pilot air jet	190
Pilot jet	40
Pilot screw	Preset (turns out not specified)
Valve seat size	2.0
Starter jet	40
Fuel level	0 +/-1.0 mm (0 +/- 0.039 inch)

Tightening torques

Carburetor joint bolts	10 Nm (7.2 ft-lbs)
Exhaust pipe-tojsylinder head nuts	20 Nm (14 ft-lbs)

XV1000 chain drive models (TR1)

Fuel tank capacity

Total	19 liters (5.02 US gal, 4.18 Imperial gal)
Reserve	3.8 liters (1.0 US gal, 0.84 Imperial gal)

Carburetors

Type	Hitachi HSC40 (two)

Main jet	
Rear cylinder	126
Front cylinder	124
Main air jet	50
Jet needle	
Rear cylinder	Y-21
Front cylinder	Y-20
Needle jet	Not specified
Pilot air jet	175
Pilot jet	43
Pilot screw	Preset (turns out not specified)
Valve seat size	2.0
Starter jet	40
Fuel level	
Rear cylinder	1.0 +/-1.0 mm (0.039 +/- 0.039 inch)
Front cylinder	2.0 +/-1.0 mm (0.078 +/- 0.039 inch)

Tightening torques

Carburetor joint bolts	10 Nm (7.2 ft-lbs)
Exhaust pipe-to-cylinder head nuts	20 Nm (14 ft-lbs)

XV1100 models (1986 and 1987)

Fuel tank capacity

Total	16.8 liters (4.43 US gal, 3.69 Imperial gal)
Reserve	3.0 liters (0.79 US gal, 0.66 Imperial gal)

Carburetors

Type	Hitachi HSC40 (two)
Main jet	
Rear cylinder	122
Front cylinder	128
Main air jet	50
Jet needle	Y-33
Needle jet	3.2
Pilot air jet	100
Pilot jet	40
Pilot screw	Preset (turns out not specified)
Valve seat size	1.4
Starter jet	40
Fuel level	0 +/-1.0 mm (0 +/- 0.039 inch)

Tightening torques

Carburetor joint bolts	10 Nm (7.2 ft-lbs)
Exhaust pipe-to-cylinder head nuts	20 Nm (14 ft-lbs)

XV1100 models (1988-on)

Fuel tank capacity

Total	16.8 liters (4.43 US gal, 3.69 Imperial gal)
Reserve	3.0 liters (0.79 US gal, 0.66 Imperial gal)

Carburetors

Type	Mikuni BST40 (two)
Main jet	
Rear cylinder	122.5
Front cylinder	125
Main air jet	80
Jet needle	5DL8
Needle jet	Y-4
Pilot air jet	
No. 1	60
No. 2	140
Pilot jet	40
Pilot screw	Preset (turns out not specified)
Valve seat size	1.5
Starter jet	35
Fuel level	1.5 to 2.5 mm (0.6 to 1.0 inch)

Tightening torques

Carburetor joint bolts	10 Nm (7.2 ft-lbs)
Exhaust pipe-to-cylinder head nuts	20 Nm (14 ft-lbs)

1 General information

The fuel system consists of the fuel tank, the fuel tap and filter, the carburetors and the connecting lines, hoses and control cables. XV1000 and XV1100 models use an electric fuel pump.

The carburetors used on these motorcycles are two Hitachis (1981 through 1987) or Mikunis (1988 and later) with butterfly-type throttle valves. For cold starting, an enrichment circuit is actuated by a choke lever mounted on the left side of the bike.

The exhaust system routes exhaust gases into a pair of mufflers (silencers) which are mounted on either side of the bike or both on the right side, depending on model.

Many of the fuel system service procedures are considered routine maintenance items and for that reason are included in Chapter 1.

2 Fuel tank - removal and installation

Warning: *Gasoline (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 class B fires (flammable liquids) on hand.*

Refer to illustration 2.3

1 Support the bike securely so it can't be knocked over during this procedure.

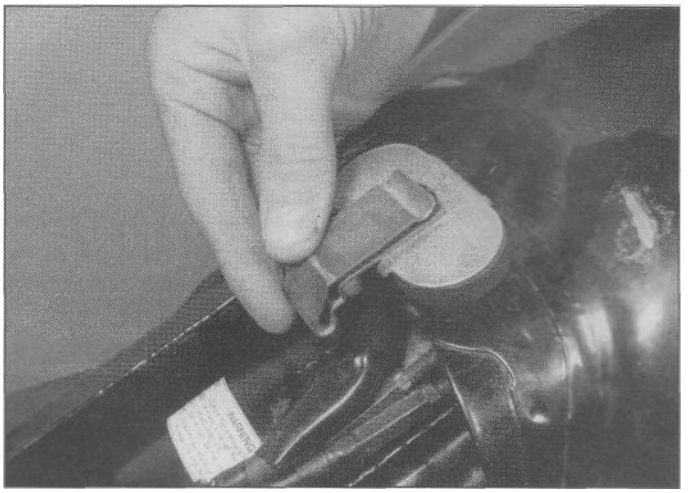
2 Remove the seat (see Chapter 7).

3 Detach the rear end of the tank from the motorcycle. If you're working on an early model, remove the clip **(see illustration).** If you're working on a later model, remove the bolt.

4 Pull the tank backward to separate it from its mounting dampers. Label and disconnect the hoses and wires and remove the tank from the motorcycle.

5 Before installing the tank, check the condition of the hoses and rubber mounting dampers - if they're hardened, cracked, or show any other signs of deterioration, replace them.

6 To install the tank, reverse the above procedure. Make sure the tank seats properly and does not pinch any control cables or wires.



2.3 On early models, remove the clip (shown) to detach the rear end of the tank; on later models, remove the mounting bolt

3 Fuel tank - cleaning and repair

1 All repairs to the fuel tank should be carried out by a professional who has experience in this critical and potentially dangerous work. Even after cleaning and flushing of the fuel system, explosive fumes can remain and ignite during repair of the tank.

2 If the fuel tank is removed from the vehicle, it should not be placed in an area where sparks or open flames could ignite the fumes coming out of the tank. Be especially careful inside garages where a natural gas-type appliance is located, because the pilot light could cause an explosion.

4 Idle fuel/air mixture adjustment - general information

1 Due to the increased emphasis on controlling motorcycle exhBust emissions, certain governmental regulations have been formulated which directly affect the carburetion of this machine. In order to comply with the regulations, the carburetors on some models have a metal sealing plug pressed into the hole over the pilot screw (which controls the idle fuel/air mixture) on each carburetor, so they can't be tampered with. These should only be removed in the event of a complete carburetor overhaul, and even then the screws should be returned to their original settings. The pilot screws on other models are accessible, but the use of an exhaust gas analyzer is the only accurate way to adjust the idle fuel/air mixture and be sure the machine doesn't exceed the emissions regulations.

2 If the engine runs extremely rough or blows black smoke at idle or continually stalls, and if a carburetor overhaul does not cure the problem, take the motorcycle to a Yamaha dealer service department or other repair shop equipped with an exhaust gas analyzer. They will be able to properly adjust the idle fuel/air mixture to achieve a smooth idle and restore low speed performance.

5 Carburetor overhaul - general information

1 Poor engine performance, hesitation, hard starting, stalling, flooding and backfiring are all signs that major carburetor maintenance may be required.

2 Keep in mind that many so-called carburetor problems are really not carburetor problems at all, but mechanical problems within the engine or ignition system malfunctions. Try to establish for certain that the carburetors are in need of maintenance before beginning a major overhaul.

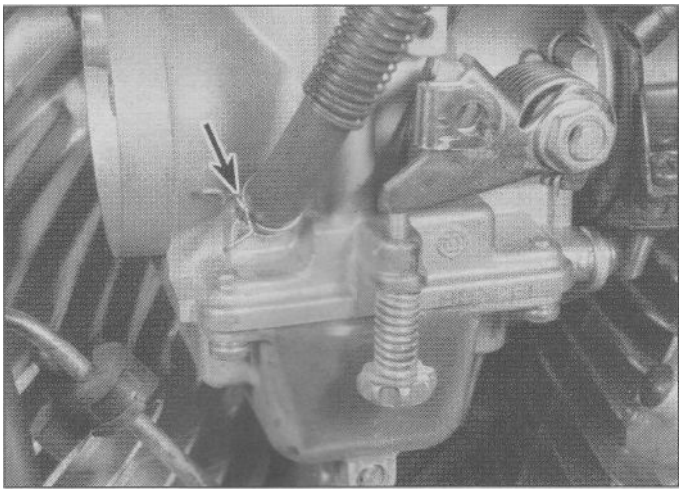
3 Check the fuel filter, the fuel lines, the fuel tank breather hose(s), the rollover valve (if equipped), the intake manifold hose clamps, the vacuum hoses, the air filter element, the cylinder compression, the spark plugs, the carburetor synchronization and the fuel pump before assuming that a carburetor overhaul is required.

4 Most carburetor problems are caused by dirt particles, varnish and other deposits which build up in and block the fuel and air passages. Also, in time, gaskets and O-rings shrink or deteriorate and cause fuel and air leaks which lead to poor performance.

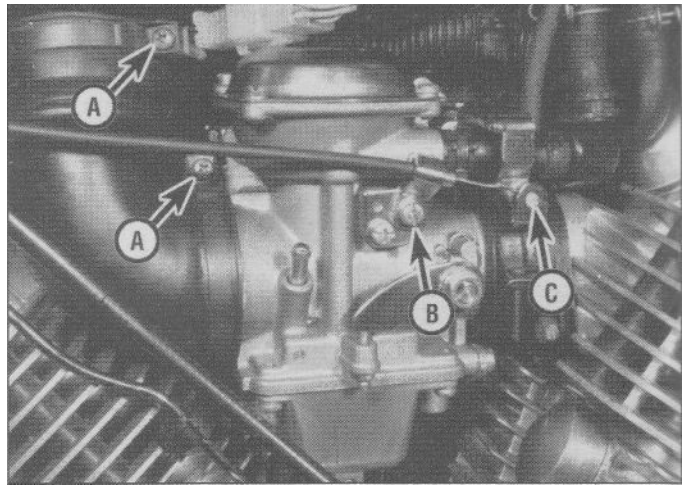
5 When the carburetor is overhauled, it is generally disassembled completely and the parts are cleaned thoroughly with a carburetor cleaning solvent and dried with filtered, unlubricated compressed air. The fuel and air passages are also blown through with compressed air to force out any dirt that may have been loosened but not removed by the solvent. Once the cleaning process is complete, the carburetor is reassembled using new gaskets, O-rings and, generally, a new inlet needle valve and seat.

6 Before disassembling the carburetors, make sure you have a carburetor rebuild kit (which will include all necessary O-rings and other parts), some carburetor cleaner, a supply of rags, some means of blowing out the carburetor passages and a clean place to work. It is recommended that only one carburetor be overhauled at a time to avoid mixing up parts.

7 • Don't separate the carburetors from each other unless one of the joints between them is leaking. The carburetors can be overhauled completely without being separated, and reconnecting them properly can be difficult.



6.3 Squeeze the clip (arrow) and slide it down the fuel line, then pry the fuel line off the fitting



6.4 Loosen the air hose clamp screws (A) and the choke cable retaining screw (B), then disconnect the choke cable (C) from the carburetor

6 Carburetors and intake joints - removal and installation

Warning: *Gasoline (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 an extinguisher suitable for class B fires (flammable liquids) on hand.*

Removal

Refer to illustrations 6.3, 6.4, 6.5a, 6.5b and 6.7

1 Lift or remove the seat as necessary (see Chapter 7) and remove the fuel tank (see Section 2). If you're working on a 1984 or later model, remove the mixture control valve case (see Chapter 7).

2 Disconnect the throttle and choke cables (see Section 9).

3 Disconnect the fuel inlet lines from the carburetor fittings **(see illustration).** Label and disconnect all hoses, vacuum lines and wires.

4 Loosen the clamp screws and disconnect the air cleaner hoses from the carburetors **(see illustration).** Detach the hoses from the air cleaner and carburetors and remove them from the motorcycle.

5 Loosen the clamp screws on the carburetor intake joints. Twist the carburetors clockwise to free them from the joints and lift them out **(see illustrations).**

6 After the carburetors have been removed, stuff clean rags into the joints or intake ports to prevent the entry of dirt or other objects.

7 Inspect the air cleaner hoses and carburetor intake joints. If they're cracked or brittle, replace them **(see illustration).**

Installation

8 Installation is the reverse of the removal steps, with the following additions:

a) Lightly lubricate the ends of the throttle cable(s) and the choke cable with multi-purpose grease and attach them to the throttle pulley and choke lever. Make sure the accelerator cable (and decelerator cable if equipped) are in their proper positions.

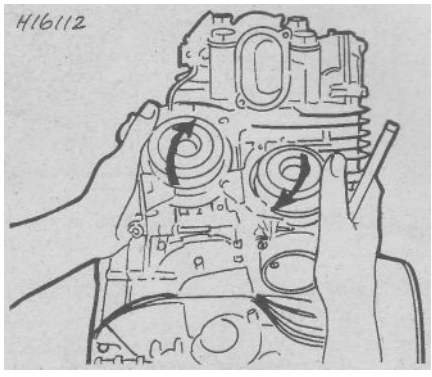
b) Make sure the carburetor is seated securely in the intake joints and the air cleaner hoses are fitted securely over the carburetors, then tighten the clamping band screws.

c) Adjust the throttle grip freeplay (see Chapter 1).

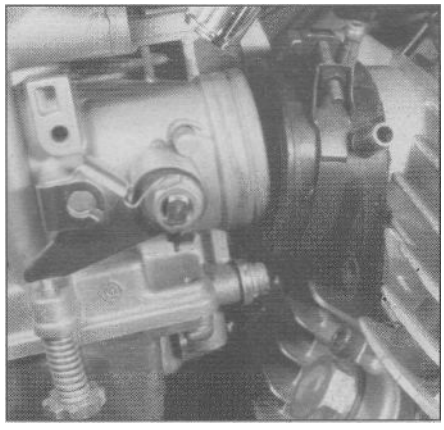
d) Check and, if necessary, adjust the idle speed and carburetor synchronization (see Chapter 1).

7 Carburetors - disassembly, inspection, cleaning and reassembly

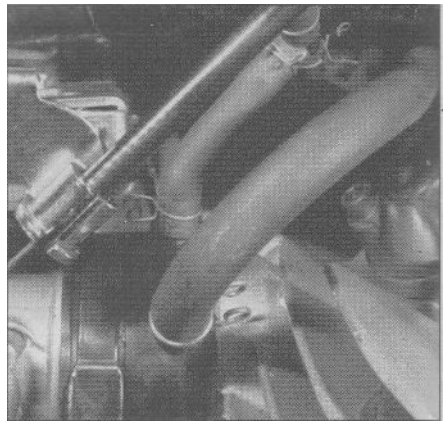
Warning: *Gasoline (petrol) is extremely flammable, so take extra precautions when you work on any part of the fuel system. Don't smoke or allow open flames or bare light bulbs near the work area, and don't*



6.5a Loosen the intake joint clamp screws and twist the carburetors clockwise . . .



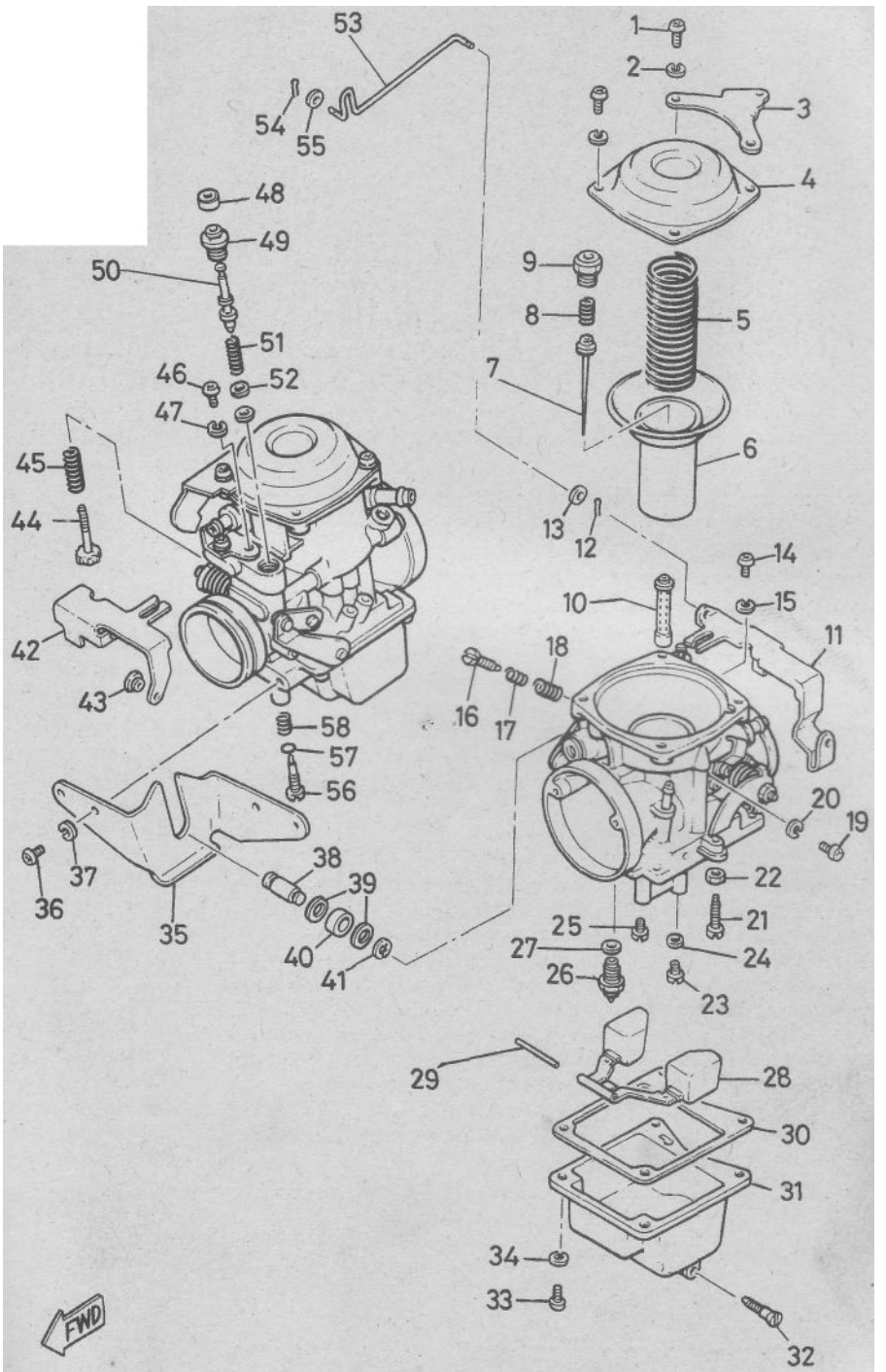
6.5b . . . to free them from the intake joints



6.7 Label and disconnect any vacuum hoses attached to the intake joints

7.1 Carburetors (XV700-1100,1981 through 1987 US and all UK models) - exploded view

1 Vacuum chamber cover screws
2 Lockwashers
3 Upper bracket
4 Vacuum chamber cover
5 Piston spring
6 Vacuum piston
7 Jet needle
8 Spring
9 Plastic Allen screw
10 Needle jet
11 Choke control plate
12 Cotter pin
13 Washer
14 Screw
15 Lockwasher
16 Pilot adjustment screw
17 Spring
18 Spring
19 Screw
20 Washer
21 Throttle stop screw {rear carburetor)
22 Locknut
23 Main jet
24 Sealing washer
25 Pilot jet
26 Needle valve and seat
27 Sealing washer
28 Floats
29 Float pivot pin
30 Gasket
31 Float chamber
32 Drain screw
33 Float chamber screws
34 Lockwashers
35 Lower bracket
36 Screws
37 Lockwashers
38 Throttle linkage pivot
39 Washers
40 Bushing
41 E-clip
42 Choke control plate
43 Bushing
44 Throttle stop screw
45 Spring
46 Screw
47 Lockwasher
48 Cap
49 Choke plunger retaining plug
50 Choke plunger
51 Spring
52 Washer
53 Choke linkage rod
54 Cotter pin
55 Washer
56 Pilot screw
57 O-ring
58 Spring



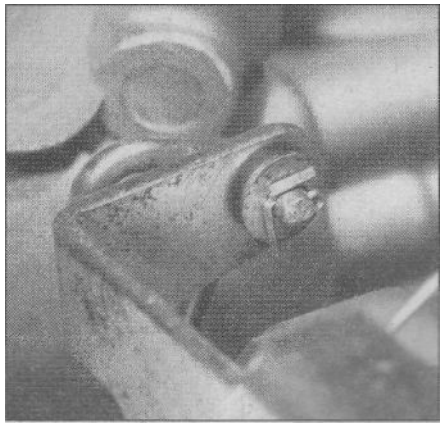
work in a garage where a natural gas-type appliance (such as a water heater or clothes dryer) is present. If you spill any fuel on your skin, rinse it off immediately with soap and water. When you perform any kirfd of work on the fuel system, wear safety glasses and have a fire extinguisher suitable for class B type fires (flammable liquids) on hand.

1981 through 1987 US and all UK models

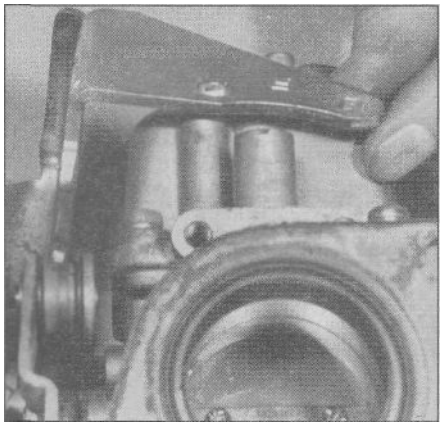
Disassembly

Refer to illustrations 7.1, 7.3, 7.4, 7.5a, 7.5b, 7.6, 7.7, 7.8, 7.9, 7.10, 7.11, 7.12a, 7.12b, 7.13, 7.14a, 7.14b and 7.15

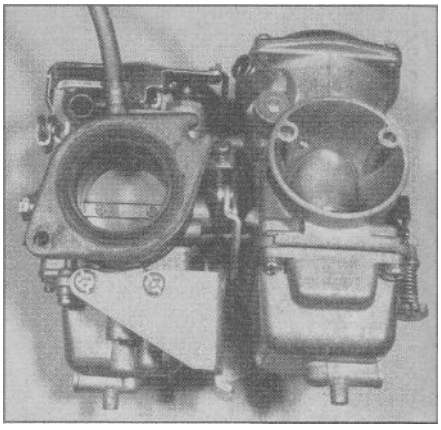
1 Remove the carburetors from the machine as described in Section 6. Set the assembly on a clean working surface. **Note:** *Work on one carburetor at a time to avoid getting parts mixed up* (see **illustration).** *Most disassembly and cleaning procedures can be accomplished without separating the carburetors.*



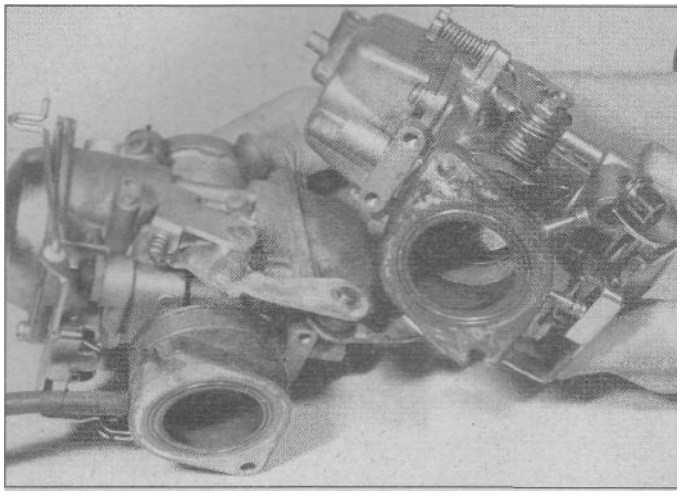
7.3 Remove the cotter pin and washer **and disconnect the choke linkage rod**



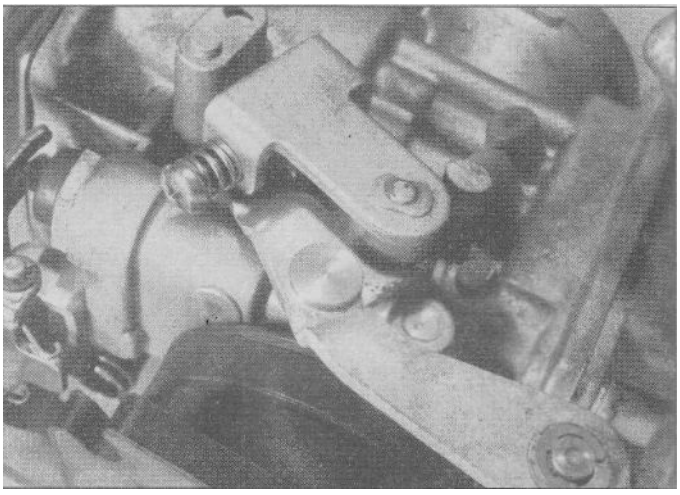
7.4 Remove the screws and detach the bottom bracket



7.5a Note carefully how the carburetors fit together...



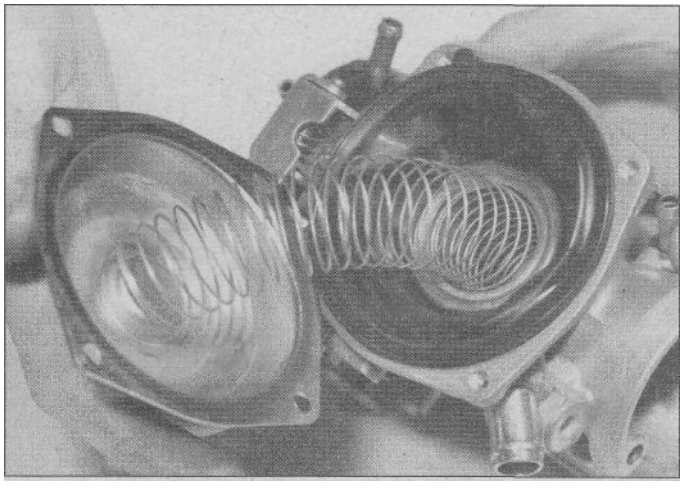
7.5b ... then pull them apart



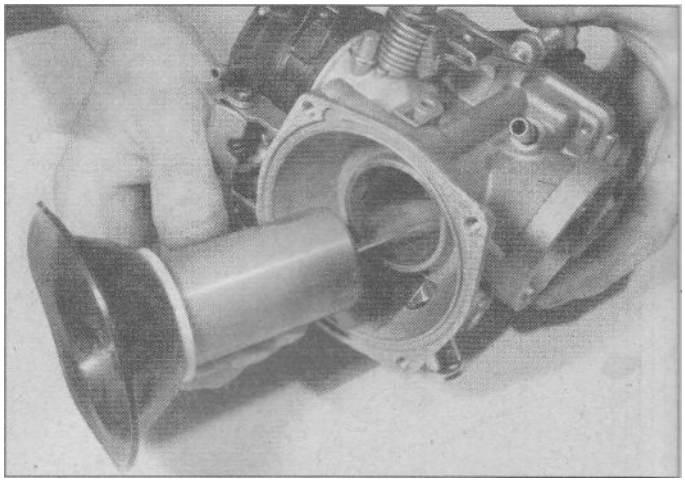
7.6 Remove the E-clip and separate the linkage assembly

2 Remove the screws and detach the top bracket from the carburetor assembly.
3 Remove the cotter pin and washer and disconnect the choke linkage rod from the left carburetor **(see illustration).**
4 Remove the screws and detach the bottom bracket **(see illustration).**

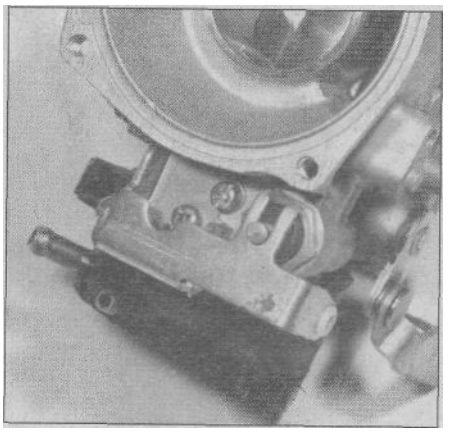
5 Carefully note how the carburetors fit together, then pull them apart **(see illustrations).**
6 Detach the E-clip from the center pivot of the throttle linkage and separate the two halves of the linkage assembly **(see illustration).**
7 Remove the vacuum chamber cover screws. Take off the cover and gasket and remove the piston spring **(see illustration).**



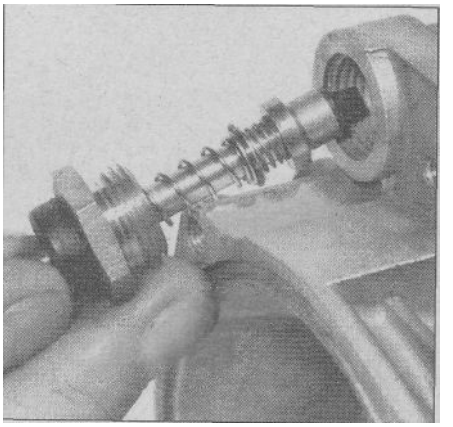
7.7 Remove the screws and lift off the vacuum chamber cover, spring and gasket



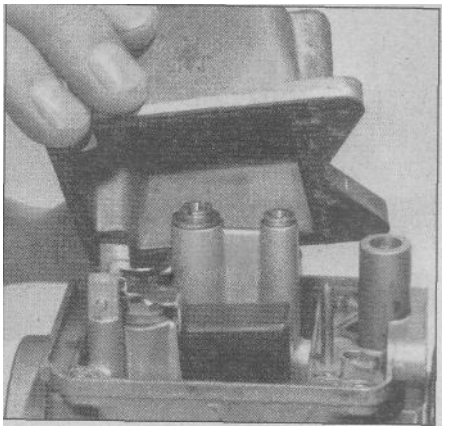
7.8 Slide the vacuum piston out of the carburetor



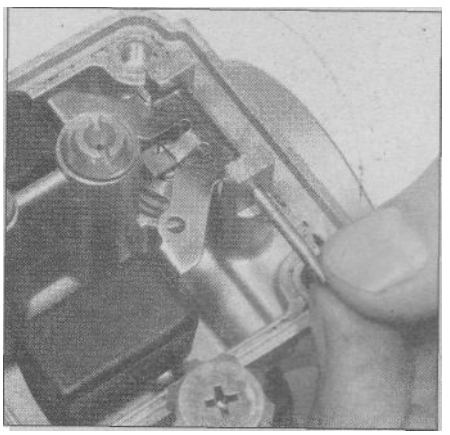
7.9 Slip the choke control plate fingers out of the groove in the choke plunger



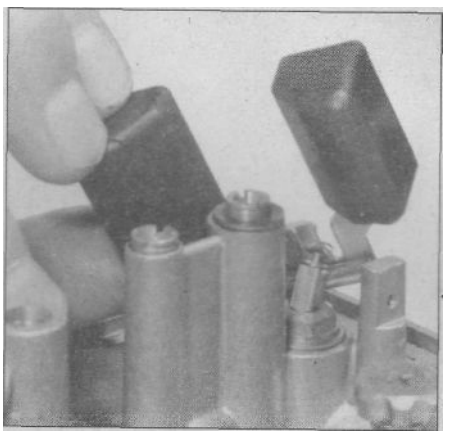
7.10 Unscrew the choke plunger cap and take the plunger out of the carburetor body



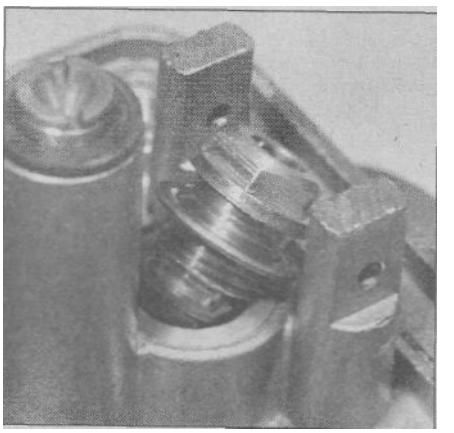
7.11 Remove the float chamber cover and gasket



7.12a Push the float pivot pin partway out with a thin punch, then pull it clear . . .



7.12b . . . and lift out the floats together with the needle valve



7.13 Unscrew the needle valve seat and remove it together with its sealing washer

8 Taking care not to tear the diaphragm, lift the piston and jet needle out of the carburetor **(see illustration).**

9 Detach the choke control plate and slip it out of its groove in the choke plunger **(see illustration).**

10 Unscrew the choke plunger from the carburetor **(see illustration).**

11 Remove the float chamber cover screws and lift off the cover and gasket **(see illustration).**

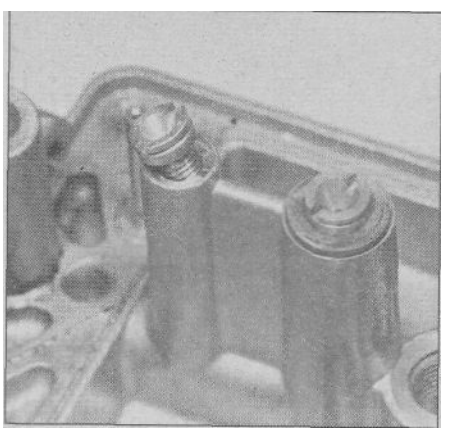
12 Slide the float off its pivot pin and lift out the float together with the needle valve **(see illustrations):**

13 Unscrew the needle valve seat and remove it, together with the sealing washer and filter cap **(see illustration).**

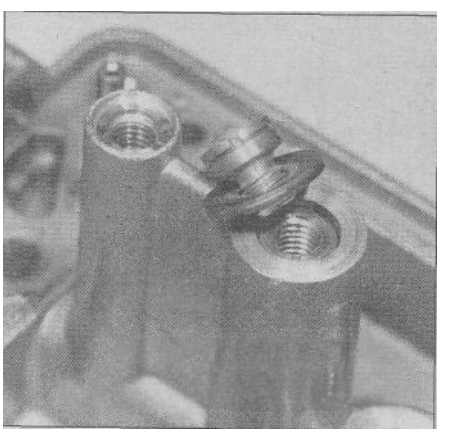
14 Make sure the screwdriver is an exact fit in the slot of the pilot jet, then unscrew it **(see illustration).** Unscrew the main jet and remove its' sealing washer **(see illustration).**

15 Turn the carburetor over and tap it on your hand so the needle jet slides down out of the carburetor body **(see illustration).** Remove the needle jet through the throttle bore.

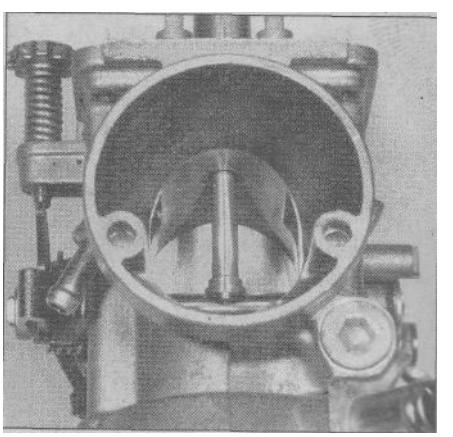
16 The pilot (idle mixture) screw is located in a passage in the



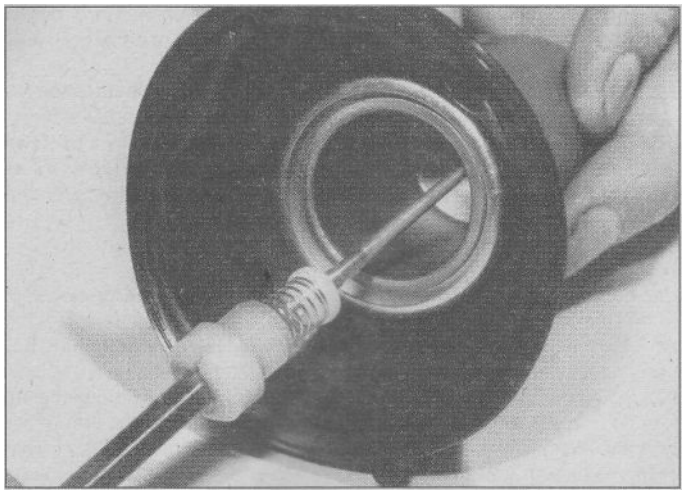
7.14a Unscrew the pilot jet . . .



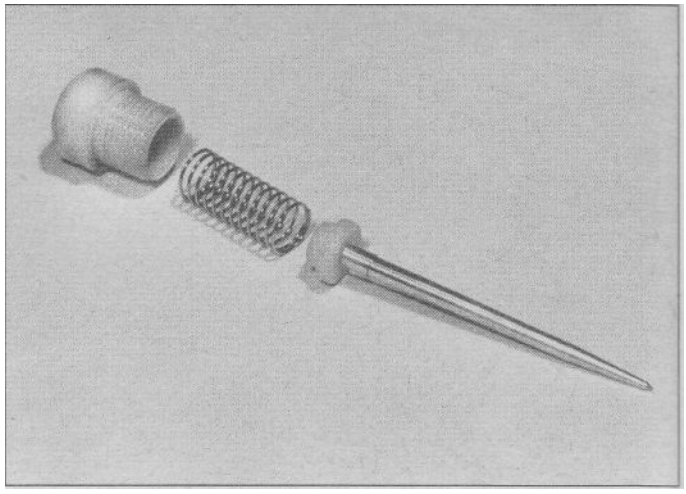
7.14b . . . and the main jet and sealing washer



7.15 Tap the carburetor in your hand to shake the needle jet free of its bore



7.17a Remove the plastic Allen screw, the spring and jet needle . . .



7.17b . . . then separate the components

carburetor body. On US models, this screw is hidden behind a plug which wili have to be removed if the screw is to be taken out. To do this, drill a hole in the plug, being careful not to drill into the screw, then pry the plug out or remove it with a small slide hammer. On all models, turn the pilot screw in, counting the number of turns until it bottoms lightly. Record that number for use when installing the screw. Now remove the pilot screw along with its spring, washer and O-ring **(see illustration 7.1).**

Inspection

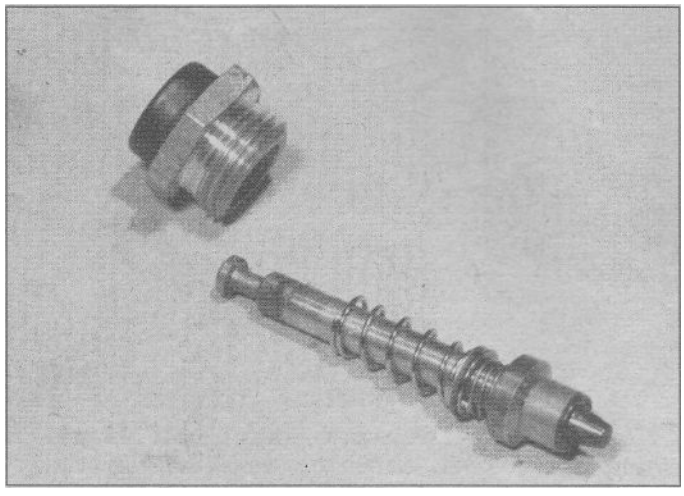
Refer to illustrations 7.17a, 7.17b, 7.17c, 7.18, 7.23, 7.24, 7.26 and 7.27

17 Remove the plastic Allen screw from inside the piston, then remove the jet needle and spring (see illustration). Separate the screw and spring from the jet needle **(see illustration).** Check the jet needle for straightness by rolling it on a flat surface (such as a piece of glass). Replace it if it's bent or if the tip is worn. Check the jet needle and the needle jet **(see illustration)** for wear where they contact each other and replace them if they're worn. Make sure the small holes in the needle jet are clear.

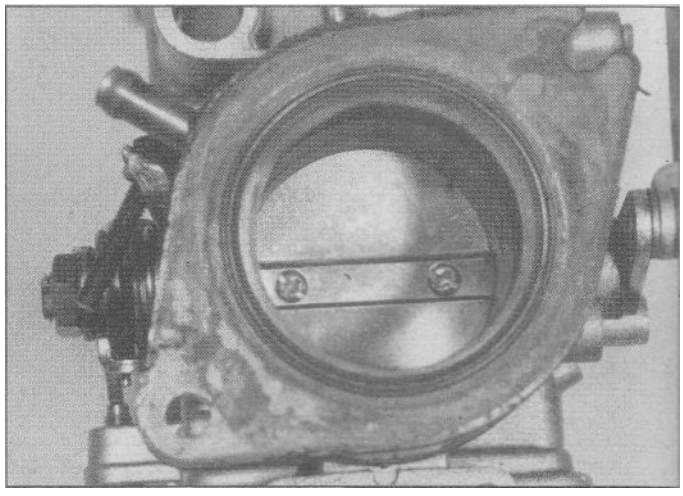
18 Check the operation of the choke plunger **(see illustration).** If it doesn't move smoothly, replace it,'along with the return spring. Inspect the needle on the end of the choke plunger and replace it if it's worn.

19 Check the tapered portion of the pilot screw for wear or damage. Replace the pilot screw if necessary.

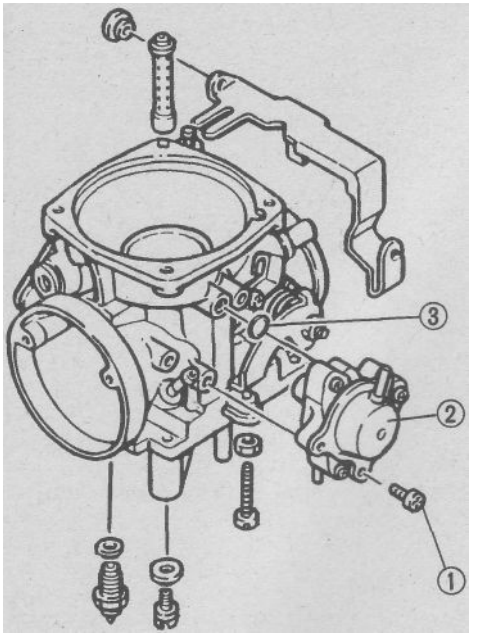
7.17c Check the needle jet for wear and clogged holes



7.18 Check the choke plunger for sticky operation and a worn needle



7.23 Check the throttle valve shaft and carburetor body for wear



7.24 Remove the screws (1), the coasting enricher (2) and the O-ring (3)

20 Check the carburetor body, float chamber cover and vacuum chamber cover for cracks, distorted sealing surfaces and other damage. If any defects are found, replace the faulty component, although replacement of the entire carburetor will probably be necessary (check with your parts supplier for the availability of separate components).

21 Check the diaphragm for splits, holes and general deterioration. Holding it up to a light will help to reveal problems of this nature.

22 Insert the vacuum piston in the carburetor body and see that it moves up-and-down smoothly. Check the surface of the piston,for wear. If it's worn excessively or doesn't move smoothly in the bore, replace the carburetor.

23 Operate the throttle shaft to make sure the throttle butterfly valve opens and closes smoothly **(see illustration).** If it doesn't, replace the carburetor.

24 If you're working on a 1986 or 1987 XV1100, remove the coasting enricher diaphragm and check it for tears or brittleness **(see illustration).** Replace it if its condition is in doubt.

25 Check the floats for damage. This will usually be apparent by the presence of fuel inside one of the floats. If the floats are damaged, they must be replaced.

26 Check the needle valve for wear or damage **(see illustration).** If there's a pronounced groove around the tip of the valve, replace it.

27 Check the needle valve seat for wear or damage **(see illustration).** Check the filter cap for clogging and clean or replace it as necessary. The sealing washer should be replaced whenever the needle valve seat is removed.

Cleaning

Caution: Use *only a petroleum based solvent for carburetor cleaning. Don't use caustic cleaners.*

28 Submerge the metal components in the solvent for approximately thirty minutes (or longer, if the directions recommend it).

29 After the carburetor has soaked long enough for the cleaner to loosen and dissolve most of the varnish and other deposits, use a brush to remove the stubborn deposits. Rinse it again, then dry it with compressed air. Blow out all of the fuel and air passages in the main body. **Caution:** A/ever *clean the jets or passages with a piece of wire or a drill bit, as they will be enlarged, causing the fuel and air metering rates to be upset*

Reassembly

Refer to illustration 7.30

Caution: *When installing the jets, be careful not to over-tighten them - they're made of soft material and can strip or shear easily.*

Note: When reassembling the carburetors, be sure to use the new O-rings, gaskets and other parts supplied in the rebuild kit.

30 Assembly is the reverse of the disassembly steps, with the following additions.

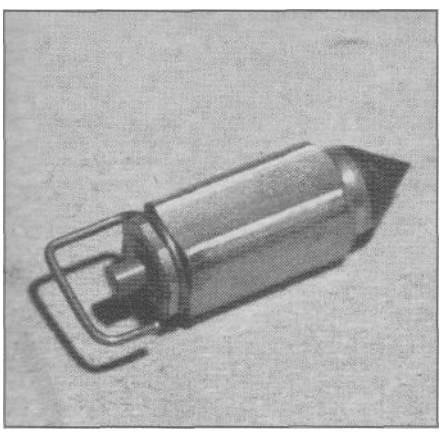
a) *Be sure the needle jet is pushed all the way into its bore. When you install the vacuum piston, be sure the jet needle fits into the needle jet.*
b) *Align the protrusion on the vacuum piston and diaphragm with the notch in the carburetor body* **(see illustration).**
c) *Install the carburetors (see Section 6) and check the fuel level (see Section 8).*

1988andlaterUSmodels

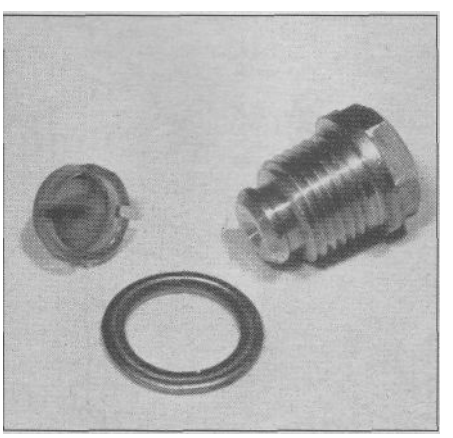
Disassembly

Refer to illustration 7.31

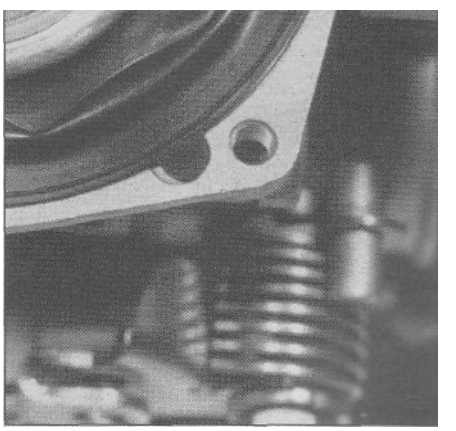
31 Remove the carburetors from the machine as described in Section 6. Set the assembly on a clean working surface. **Note:** *Work on one carburetor at a time to avoid getting parts mixed up* (see **illustration).** *The throttle valves, vacuum pistons and choke plungers can be removed and inspected without separating the carburetors.*



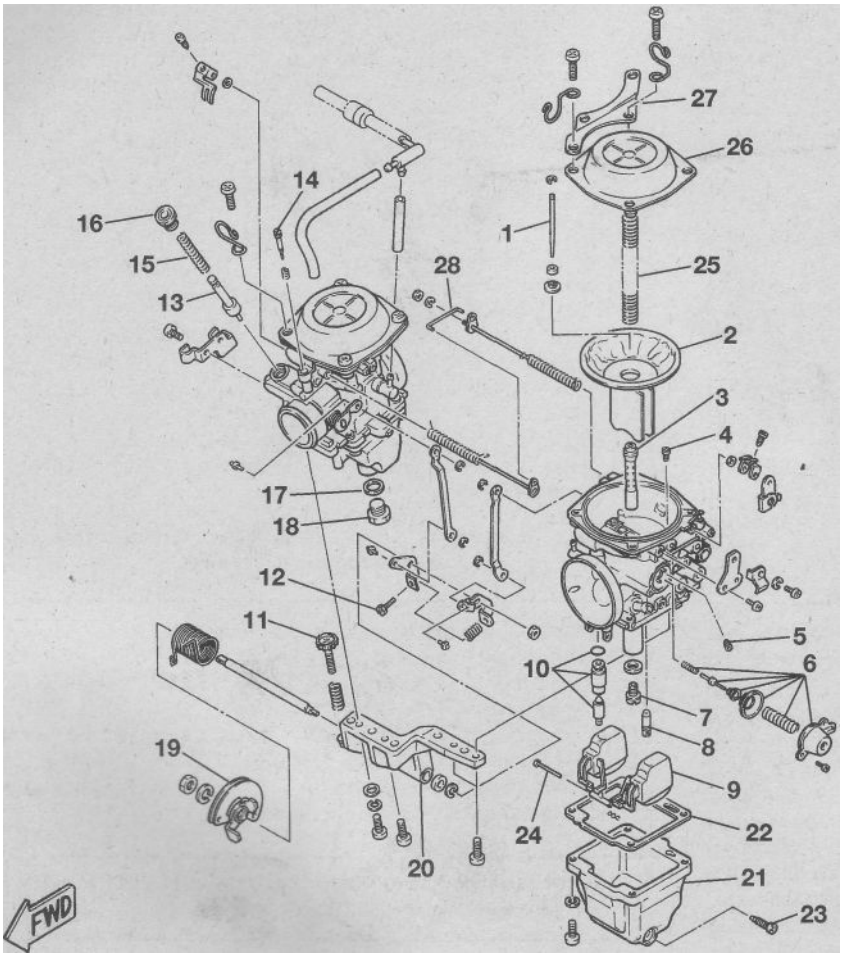
7.26 Check the needle valve for wear at the tip



7.27 Check the needle valve seat for wear; check the filter cap for clogging or tears; replace the sealing washer with a new one



7.30 Position the diaphragm tab in the notch



7.31 Carburetor (1987 and later US models) - exploded view

1 Jet needle
2 Vacuum piston
3 Needle jet
4 Pilot air jet no. 1
5 Pilot air jet no. 2
6 Coasting enricher assembly
7 Main jet
8 Pilot jet
9 Float
10 Needle valve and seat
11 Throttle stop screw
12 Synchronizing screw
13 Choke plunger
14 Pilot screw
15 Spring
16 Choke plunger cap
17 Sealing washer
18 Main jet
19 Throttle pulley
20 Bottom bracket
21 Float chamber
22 Gasket
23 Drain screw
24 Float pivot pin
25 Vacuum piston spring
26 Vacuum chamber cover
27 Top bracket
28 Choke link

32 Remove the screws and detach the top bracket.
33 Disconnect the choke link that fits between the choke shafts.
34 Carefully note how they're assembled, then remove the synchronizing screw and spring. Remove the nut and lockwasher from their locations on the throttle shaft next to the synchronizing screw and spring.
35 Remove its mounting screws and detach the throttle shaft assembly. Carefully note how they fit together, then detach the throttle levers and collar and separate the carburetors.
36 Working on one carburetor, remove the lever and washer at the end of the choke shaft, then remove the choke shaft and spring from the carburetor.
37 Remove the choke plunger nut, then remove the spring and choke plunger from the carburetor.
38 Remove the vacuum chamber cover screws. Carefully lift off the cover, taking care not to tear the diaphragm.
39 Remove the spring and the diaphragm, together with the vacuum piston.
40 Unscrew pilot air jet no. 1 from its bore underneath the diaphragm.
41 Remove the screws and detach the coasting enricher valve from the carburetor. Remove the large spring, diaphragm, holder, pusftrod and small spring from the coasting enricher housing.
42 Unscrew pilot air jet no. 2 from its bore in the coasting enricher housing.
43 Remove the float chamber cover screws, then detach the cover and gasket.
44 Push out the float pivot pin with a small-diameter punch (2 mm) and remove the floats.
45 Remove the screw and take out the needle valve seat.
46 Unscrew and remove the pilot jet and the main jet together with its washer. Remove the needle jet.

Inspection

47 Remove the spring seat from inside the piston, then remove the clip, ring and jet needle. Check the jet needle for straightness by rolling it on a flat surface (such as a piece of glass). Replace it if it's bent or if the tip is worn. Check the jet needle and the needle jet for wear where they contact each other and replace them if they're worn. Make sure the small holes in the needle jet are clear.
48 Check the operation of the choke plunger. If it doesn't move smoothly, replace it, along with the return spring. Inspect the needle on the end of the choke plunger and replace it if it's worn.
49 Check the carburetor body, float chamber coverand vacuum chamber cover for cracks, distorted sealing surfaces and other damage. If any defects are found, replace the faulty component, although replacement of the entire carburetor will probably be necessary (check with your parts supplier for the availability of separate components).
50 Check the diaphragm for splits, holes and general deterioration. Holding it up to a light will help to reveal problems of this nature.
51 Insert the vacuum piston in the carburetor body and see that it moves up-and-down smoothly. Check the surface of the piston for wear. If it's worn excessively or doesn't move smoothly in the bore, replace the carburetor.
52 Operate the throttle shaft to make sure the throttle butterfly valve opens and closes smoothly. If it doesn't, replace the carburetor.
53 Check the coasting enricher diaphragm for tears or brittleness. Replace it if its condition is in doubt.
54 Check the floats for damage. This will usually be apparent by the presence of fuel inside one of the floats. If the floats are damaged, they must be replaced.
55 Check the needle valve for wear or damage **(see illustration** 7.26). If there's a pronounced groove around the tip of the valve, replace it.

56 Check the needle valve seat for wear or damage. Check the filter cap for clogging and clean or replace it as necessary. The sealing washer should be replaced whenever the needle valve seat is removed.

Cleaning

57 Perform Steps 28 and 29 above to clean the carburetor components.

Reassembly

Caution: *When installing the jets, be careful not to over-tighten them - they're made of soft material and can strip or shear easily.*

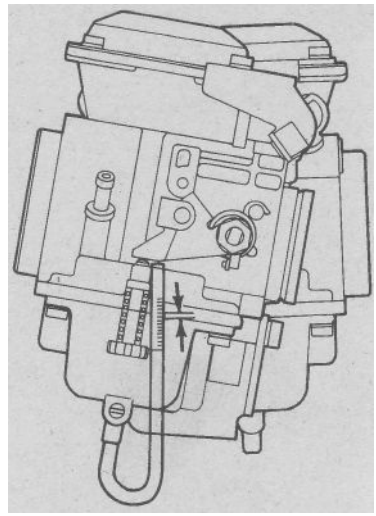
Note: When reassembling the carburetors, be sure to use the new O-rings, gaskets and other parts supplied in the rebuild kit.

58 Assembly is the reverse of the disassembly steps, with the following additions.

a) Be sure the needle jet is pushed all the way into its bore. When you install the vacuum piston, be sure the jet needle fits into the needle jet.

b) Align the protrusion on the vacuum piston and diaphragm with the notch in the carburetor body.

c) Install the carburetors (see Section 6) and check the fuel level (see Section 8).



8.3 A gauge like this or a clear tube and ruler can be used to measure fuel level

8 Carburetors - fuel level adjustment

Refer to illustration 8.3

Warning: *Gasoline (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 class B type fires (flammable liquids) on hand.*

1 Support the bike securely in an upright position so it can't be knocked over during this procedure.

2 Remove components as necessary for access to the float chamber drain screws.

3 Attach Yamaha service tool no. YM-01312 (UK part no. 90890-01312) to the drain fitting on the bottom of one of the carburetor float chambers (both will be checked) **(see illustration).** This is a clear plastic tube graduated in millimeters. An alternative is to use a length of clear plastic tubing and an accurate ruler. Hold the graduated tube (or the free end of the clear plastic tube) vertically against the float chamber cover.

4 Unscrew the drain screw at the bottom of the float chamber a couple of turns, then start the engine and let it idle - fuel will flow into the tube. Wait for the fuel level to stabilize, then note how far the fuel level is below the line on the float chamber cover.

5 Measure the distance between the indicator line and the top of the fuel level in the tube or gauge. This distance is the fuel level - write it down on a piece of paper, tighten the drain screw, then move on to the other carburetor and check it the same way.

6 Compare your fuel level readings to the value listed in this Chapter's Specifications. If the fuel level in either carburetor is not correct, remove the float chamber cover and bend the tang up or down as necessary, then recheck the fuel level.

9 Throttle cables and grip - removal, installation and adjustment

Refer to illustrations 9.1, 9.3a and 9.3b

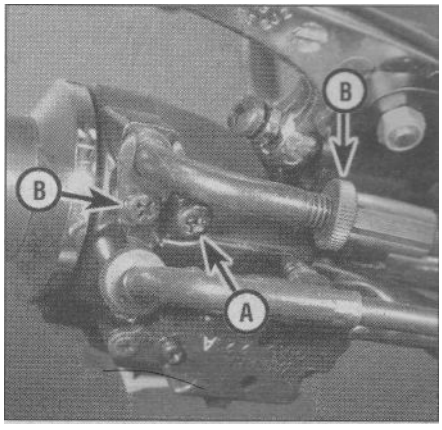
Removal

1 Loosen the throttle cable(s) with the adjusters and remove the throttle cable securing screw at the handlebar **(see illustration).**

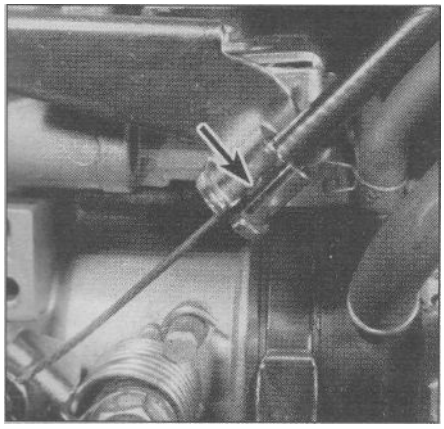
2 Remove the handlebar switch mounting screws. Separate the halves of the handlebar switch and detach the throttle cable(s) from the throttle grip pulley (see Chapter 8).

3 Detach the throttle cables from the throttle pulley at the carburetors **(see illustrations).** Remove the cables, noting how they are routed.

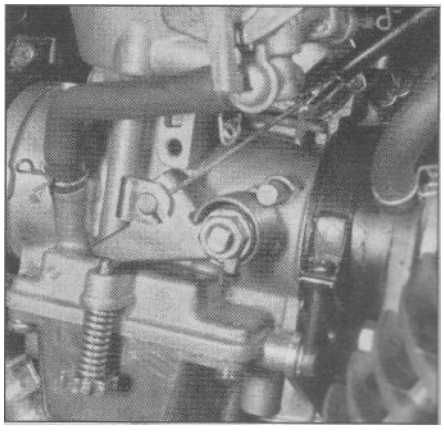
4 Slide the throttle grip off the handlebar.



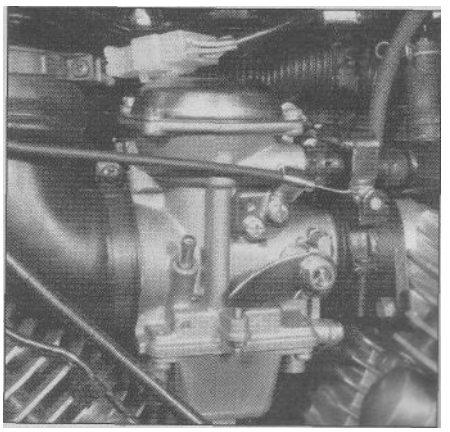
9.1 Loosen the cable locknuts (A) and turn the adjusters to create slack; remove the cable securing screw (B)



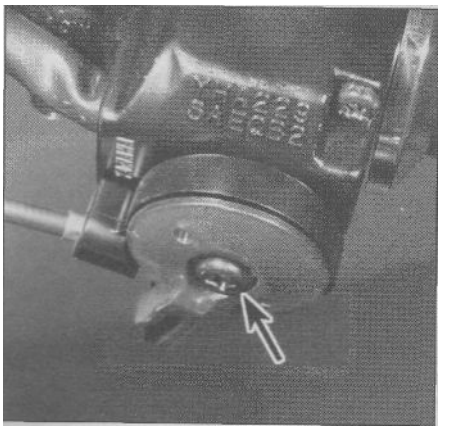
9.3a Pull the cable housing out of the bracket and slip the cable through the slot (arrow)...



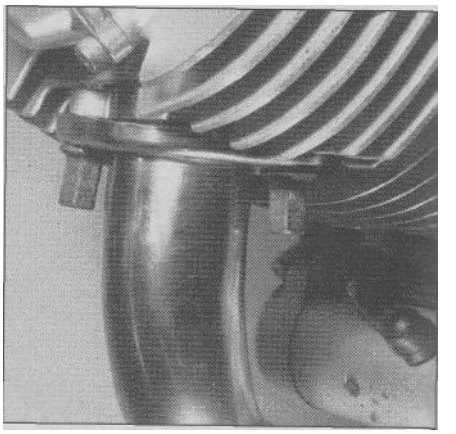
9.3b ... then align the cable with the slot in the throttle pulley fitting and slip the cable end out



10.1 Loosen the screw and detach the **cable housing from the** bracket



10.2 Remove the screw (arrow) and detach the choke lever



11.2 Remove the nuts that secure the flange plate to the cylinder head

Installation

5 Clean the handlebar and apply a light coat of multi-purpose grease.

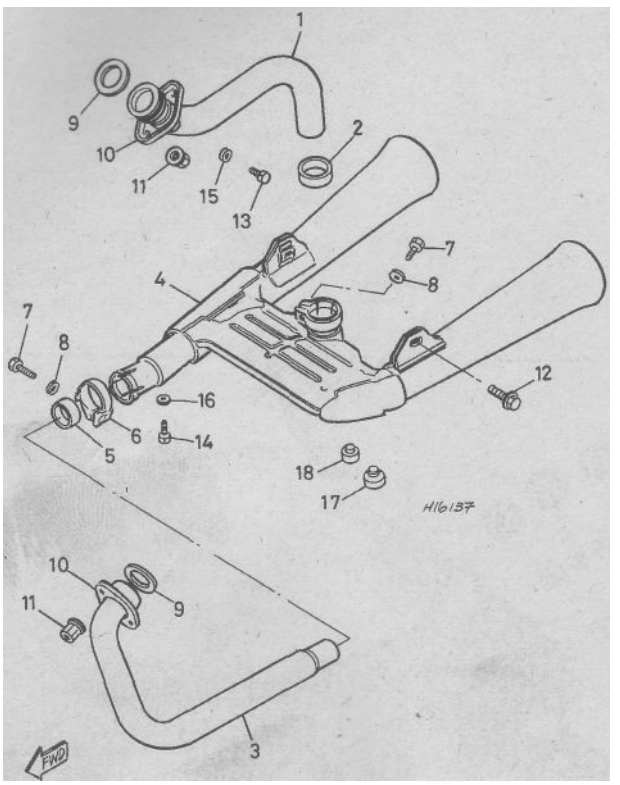
6 Route the cable(s) into place, following the same route noted on removal. Make sure they don't interfere with any other components and aren't kinked or bent sharply.

7 Lubricate the ends of the accelerator cable (and decelerator cable if equipped) with multi-purpose grease and connect them to the throttle pulleys at the carburetors and at the throttle grip.

Adjustment

8 Follow the procedure outlined in Chapter 1, Throttle operation/grip freeplay - check and adjustment, to adjust the cables.

9 Turn the handlebars back and forth to make sure the cables don't cause the steering to bind. With the engine idling, turn the handlebars back and forth and make sure idle speed doesn't change. If it does, find and fix the cause before riding the motorcycle.



11.3a Exhaust system (1981 through 1983 shaft drive models) exploded view

1	*Rear cylinder pipe*	*10.*	*Flange plate*
2	*Gasket*	*11*	*Nut*
3	*Front cylinder pipe*	*12*	*Bolt*
4	*Muffler/silencer pipe*	*13*	*Bolt*
5	*Gasket*	*14*	*Bolt*
6	*Clamp*	*15*	*Washer*
7	*Bolt*	*16*	*Washer*
8	*Washer*	*17*	*Rubber damper*
9	*Sealing ring*	*18*	*Rubber damper*

10 Choke cable - removal and installation

Refer to illustrations 10.1 and 10.2

1 Remove the choke cable bracket at the carburetors **(see illustration).** Align the cable with the slot in the lever and remove it from the lever.

2 Remove the choke lever securing screw at the handlebar **(see illustration).** Remove the lever and disconnect the choke cable from the pulley.

3 Installation is the reverse of the removal steps.

11 Exhaust system - removal and installation

Removal

Refer to illustrations 11.2, 11.3a, 11.3b and 11.3c

1 Support the bike securely so it can't be knocked over during this procedure.

2 Remove the nuts that secure the front exhaust pipe to the cylinder head **(see illustration).**

3 Support the exhaust system so it can't fall and remove the mounting fasteners **(see illustrations).** Lower the exhaust system away from the bike and take it out.

4 Installation is the reverse of removal, with the following additions:

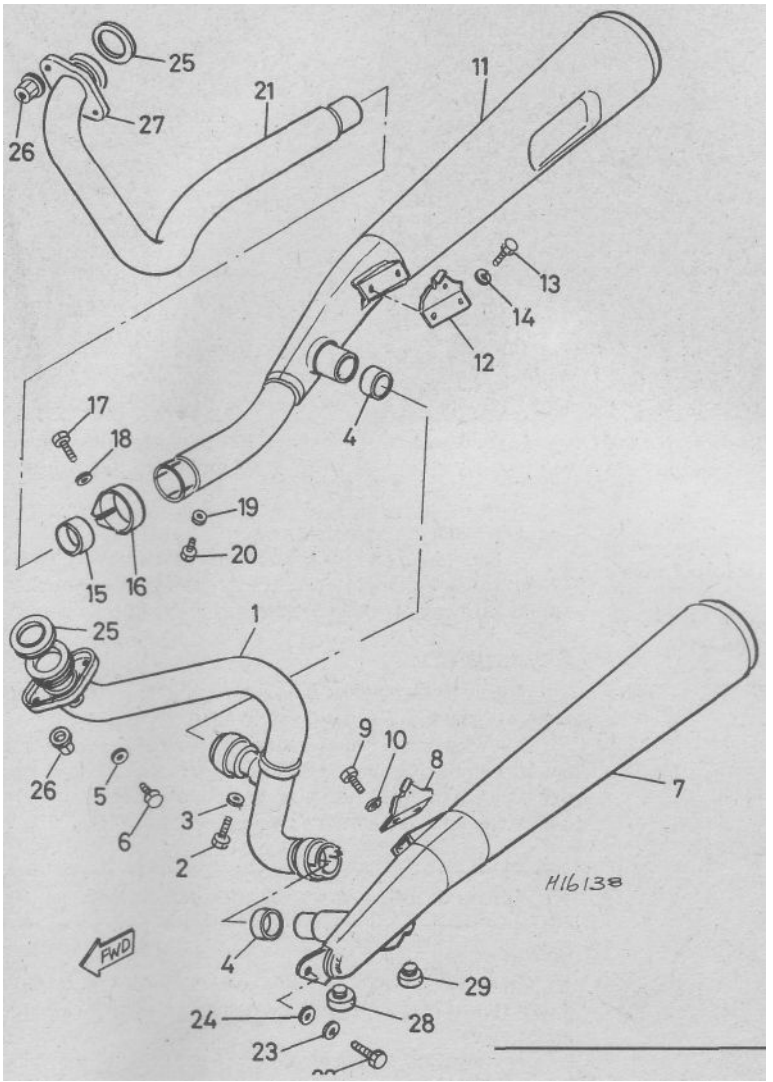
a) Use new gaskets at the cylinder head.

b) Tighten all fasteners to the torque settings listed in this Chapter's Specifications.

12 Fuel pump - circuit check and fuel pump test

Refer to illustration 12.2

1 With the engine kill switch in the On position, the fuel pump should start and run for approximately five seconds after the ignition is

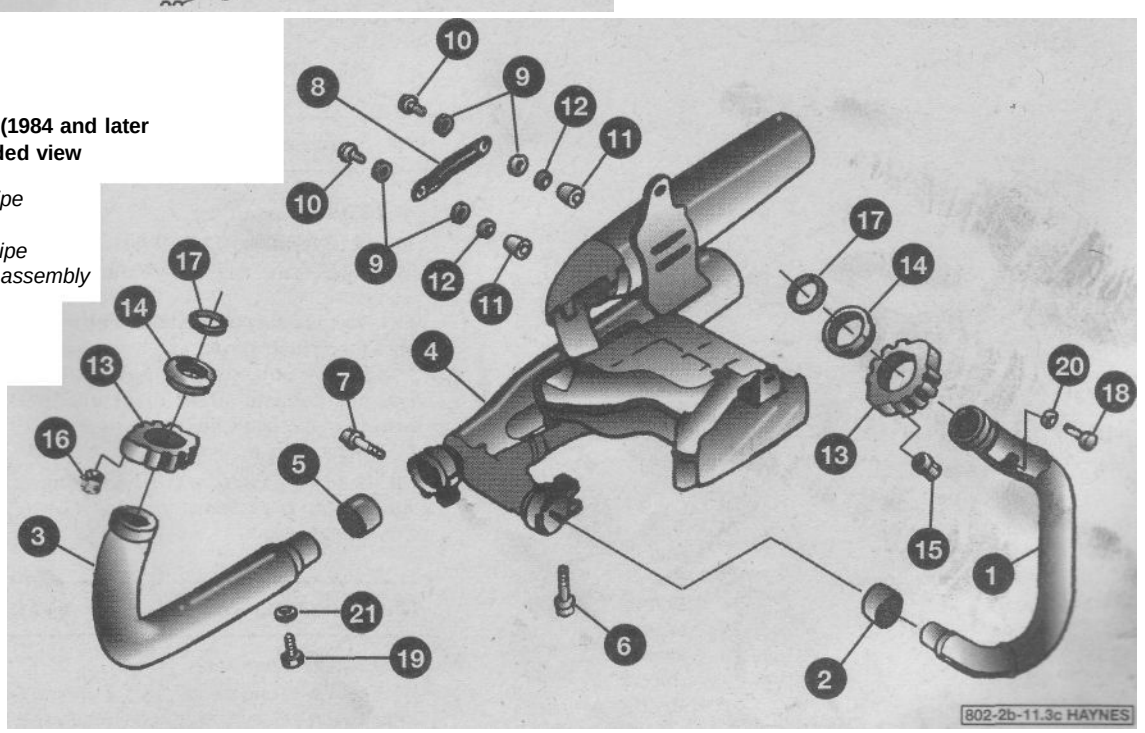


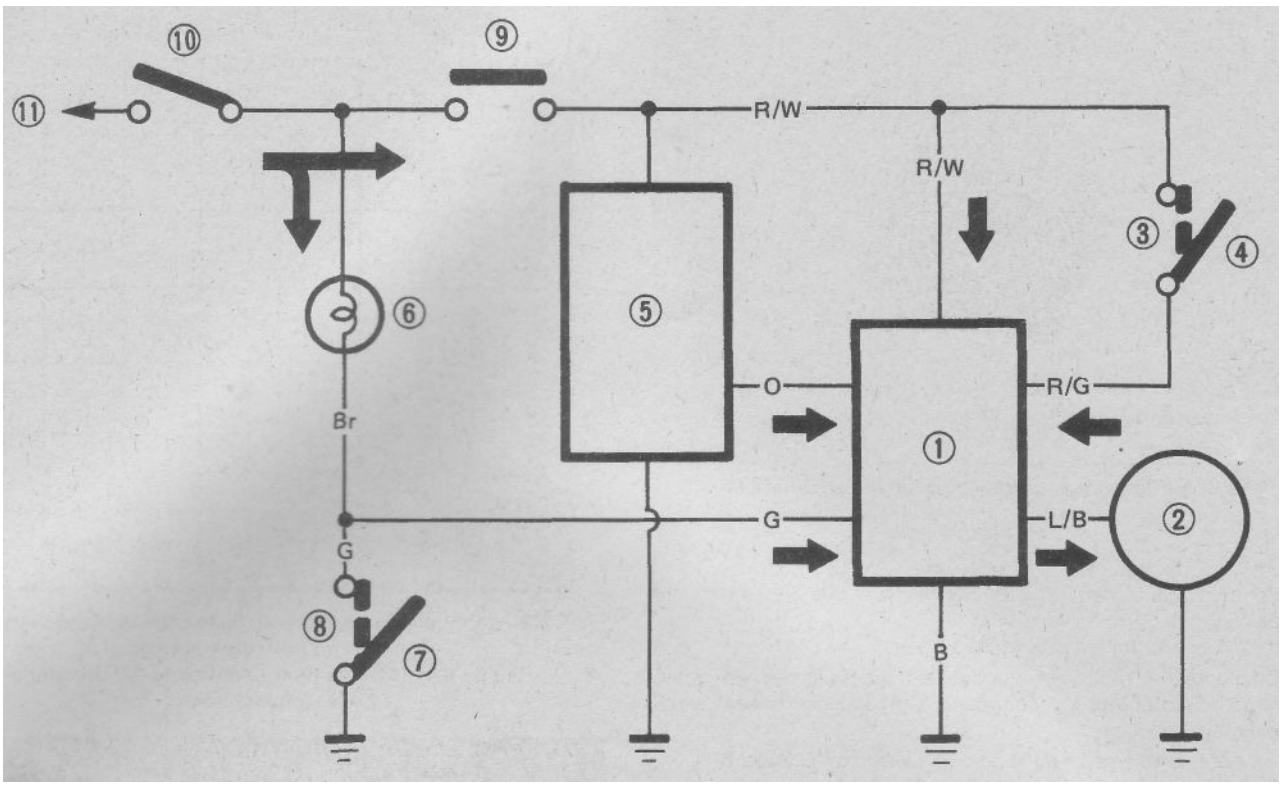
11.3b Exhaust system (1981 through 1983 chain drive models) - exploded view

1 Rear cylinder pipe
2 Bolt
3 Washer
4 Gasket
5 Washer
6 Bolt
7 . Left muffler/silencer
8 Mounting bracket
9 Bolt
10 Lockwasher
11 Right muffler/silencer
12 Mounting bracket
13 Bolt
14 Lockwasher
15 Gasket
16 Clamp
17 Bolt
18 Washer
19 Washer
20 Bolt
21 Front cylinder pipe
22 Bolt
23 Lockwasher
24 Washer
25 Sealing ring
26 Nut
27 Flange plate
28 Rubber damper
29 Rubber damper

11.3c Exhaust system (1984 and later models) - exploded view

1 Rear cylinder pipe
2 Sealing ring
3 Front cylinder pipe
4 Muffler/silencer assembly
5 Sealing ring
6 Bolt
7 Bolt
8 Muffler/silencer protector
9 Washers
10 Bolts
11 Covers
12 Washers
13 Flange plate
14 Ring
15 Nut
16 Nut
17 Gasket-





12.2 Fuel pump circuit

1 *Fuel pump controller*
2 *Fuel pump*
3 *Fuel reserve switch (Res position)*
4 *Fuel reserve switch (On position)*
5 *Igniter unit*
6 *Fuel warning light*
7 *Fuel sender (Full position)*
8 *Fuel sender (Empty position)*
9 *Engine kill switch*
10 *Ignition (main key) switch*
11 *To main fuse and battery*

switched on (with the fuel warning light on or off). It should shut off once the carburetor float chambers are full, then run again once the engine is started,

2 The fuel pump circuit consists of the pump, the pump controller, the igniter unit (which controls the fuel pump as well as ignition timing), the engine kill switch, the ignition switch, the main and ignition fuses, the battery and related wiring **(see illustration).**

3 Lift or remove the seat.

4 Check the battery condition and charge (see Chapter 1 and Chapter 8).

5 Check the main and ignition fuses, the ignition switch and the engine kill switch (see Chapter 8). Replace them if they're defective, then try the fuel pump again.

Pump won't run after engine is started

6 If the pump won't run while the engine is running, check battery voltage to the pump. Disconnect the fuel pump electrical connector and connect a 20-volt DC voltmeter between the blue/black wire terminal in the harness and a good grounding/earthing point (bare metal on the engine).

7 Turn the ignition switch to On and the engine kill switch to Run, then push the Start switch. The voltmeter should indicate more than 11 volts. If the reading is more than 11 volts, test the fuel pump (see Step 24 below).

8 If the reading is less than 11 volts, test the output voltage of the igniter's orange lead. To do this, check the spark output of the rear cylinder (see Chapter 4). If the spark will jump the specified gap, you can assume that the igniter output voltage is within specifications. Go to Step 10 below.

9 If the spark won't jump the specified gap, measure the igniter input voltage at the red wire **(see illustration 12.2).**

a) If it's at least 12 volts, the igniter may be defective. Check the ignition system as described in Chapter 4.

b) If there's no voltage at the red wire, check the engine kill switch, ignition main key switch and the main fuse. Check the wiring in the fuel pump circuit for breaks or bad connections. Be sure to check the battery terminal connections and the battery ground/earth cable connection to the motorcycle.

10 Make sure the fuel pump controller ground/earth wire is clean and tight. If it is, test the fuel pump controller (see Step 24 below).

Fuel pump doesn't run for five seconds when ignition is switched on

11 With the fuel reserve switch set to Res and the kill switch in the On position, switch on the ignition. If the fuel level in the carburetors is low, the pump should run for five seconds. If it doesn't, perform the following steps.

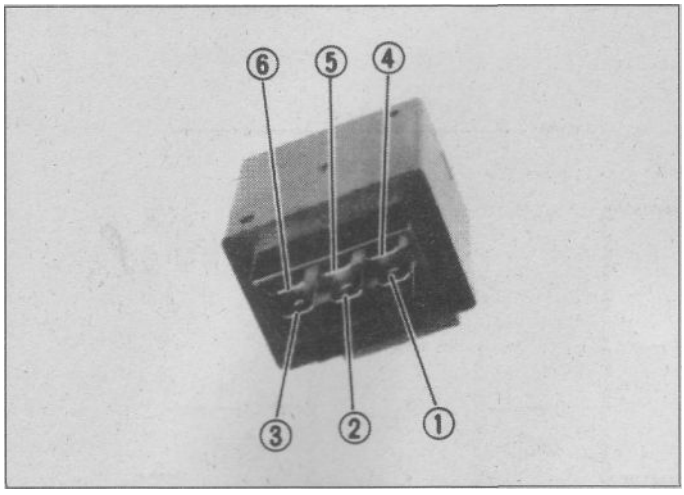
12 Place the ignition switch, kill switch and fuel reserve switch in the On position, but don't start the engine.

13 Check for voltage at the fuel pump (see Step 6 above).

a) If it's more than 11 volts, go to Step 14.

b) If it's less than 11 volts, go to Step 17.

14 Turn the fuel reserve switch to the Res position and recheck



12.27a Fuel pump controller terminal identification

voltage.

a) If it's still more than 11 volts, test the fuel pump (see Step 24 below).

b) If it's less than 11 volts, go to Step 15.

15 Connect a 0-20 volt voltmeter between the red/green wire at the fuel pump controller and a good ground/earth connection (bare metal on the motorcycle).

a) If there's no voltage, test the reserve switch (see Chapter 8).

b) If the reading is 12 volts, go to Step 16.

16 Make sure the fuel pump controller ground/earth wire (black) is clean and tightly connected. If this doesn't solve the problem, test the fuel pump controller (see Step 25 below).

17 If voltage at the fuel pump was less than 11 volts in Step 14, Connect the positive lead of a 0-20 volt voltmeter to the pump controller red/white wire and the negative lead to ground/earth.

a) If there's no voltage, check the ignition switch, kill switch, main fuse and battery (see Chapter 8).

b) If the reading is 12 volts, make sure the fuel pump controller ground/earth wire (black) is clean and tightly connected. If this doesn't solve the problem, test the fuel pump controller (see Step 25 below).

Fuel pump doesn't stop with warning light on

18 The fuel pump should stop running within 30 seconds if the fuel warning light comes on with the engine running. If it doesn't, perform Steps 19 through 23 below.

19 Disconnect the fuel pump electrical connector and connect a 20-volt DC voltmeter between the blue/black wire terminal in the harness and a good grounding/earthing point (bare metal on the engine) **(see illustration 12.2).**

20 Locate the green wire in the fuel sender connector.

21 Start the engine. Disconnect the green wire and note the reading on the voltmeter 30 seconds later.

a) If there's no voltage, check the fuel pump circuit wiring for breaks or bad connections. Repair as necessary.

b) If there's more than 11 volts, go to Step 22.

22 Test the fuel sender (see below).

a) If the resistance is not within the range listed in this Chapter's Specifications, replace the sender.

b) If the sender is good, go to Step 23.

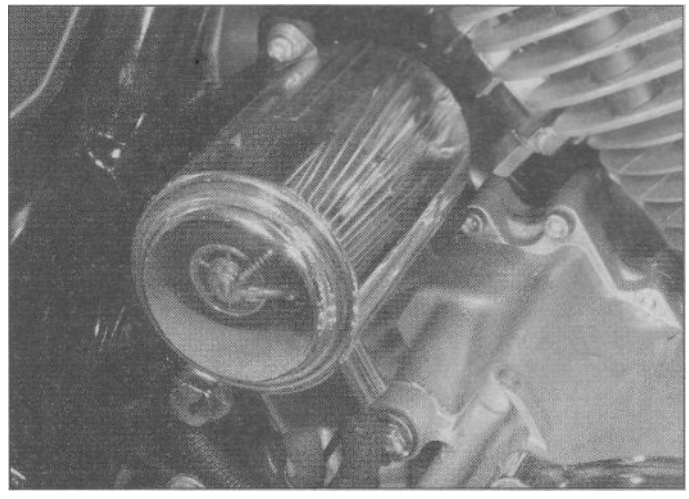
23 Make sure the fuel pump controller ground/earth wire is clean and tightly connected. Repair as necessary. If this doesn't solve the problem, test the fuel pump controller (see below).

Fuel pump test

24 Disconnect the wiring connector from the fuel pump. Connect the pump directly to the battery with two lengths of wire (positive to blue/black; negative to black). If the pump doesn't run, replace it.

Tester minus lead (Black) side	Tester plus lead (Red) side: ①	②	③	④	⑤	⑥
①		∞	∞	∞	∞	∞
②	300kΩ*		∞	∞	18kΩ	∞
③	1MΩ	∞		∞	300kΩ*	∞
④	∞	∞	∞		∞	∞
⑤	150kΩ*	∞	∞	∞		∞
⑥	2MΩ	∞	∞	∞	500kΩ	

12.27b Connect an ohmmeter between the indicated terminal pairs and note the readings
***Wait a few seconds after connecting the ohmmeter to take this reading.**



13.1 The fuel pump is located under this cover

Fuel pump controller test

Refer to illustrations 12.27a and 12.27b

25 Remove the seat (see Chapter 7).

26 Unplug the fuel pump controller and remove it.

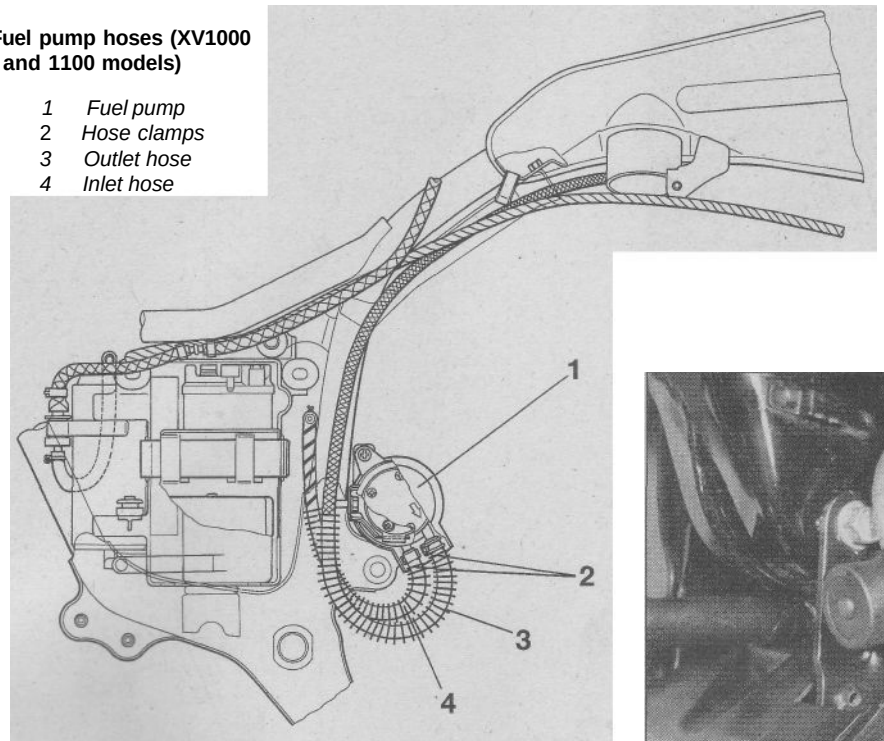
27 Connect an ohmmeter between the controller terminals in turn and measure the resistance **(see illustrations).** If the resistance is not as specified, replace the controller.

Fuel sender test

28 Remove the fuel tank (see Section 2).

29 Remove the screws and detach the sender from the tank.

30 Connect an ohmmeter to the terminals of the sender harness. Raise and lower the sender float and compare the resistance readings at various heights to the values listed in this Chapter's Specifications. If the readings are not as specified, replace the sender.



13.2 Fuel pump hoses (XV1000 and 1100 models)

1 Fuel pump
2 Hose clamps
3 Outlet hose
4 Inlet hose

13 Fuel pump - replacement

Refer to illustrations 13.1 and 13.2

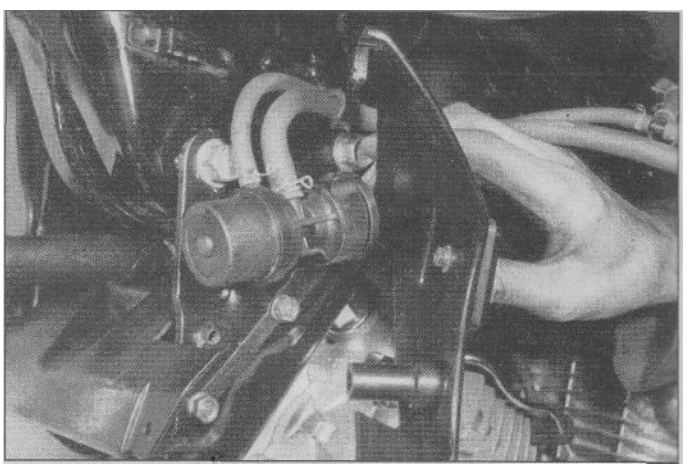
1 Remove the cover from the fuel pump **(see illustration).**
2 Loosen the fuel line clamps and push the ends of the fuel lines off the pump fittings **(see illustration).**
3 Disconnect the pump electrical connector. Remove the mounting bolts and take the pump out.
4 Installation is the reverse of the removal steps.

14 Mixture control valve (all 1981 through 1983 models and TR1; 1984 and 1985 XV700) - testing and replacement

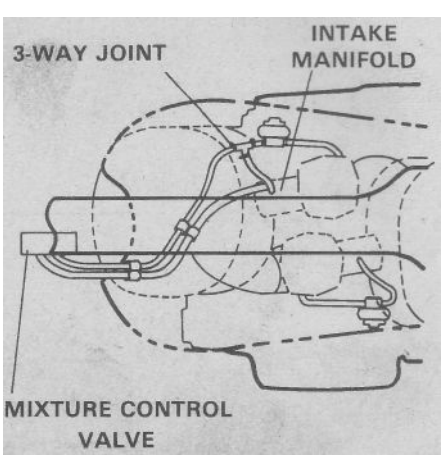
Testing

Refer to illustrations 14.1, 14.4a and 14.4b

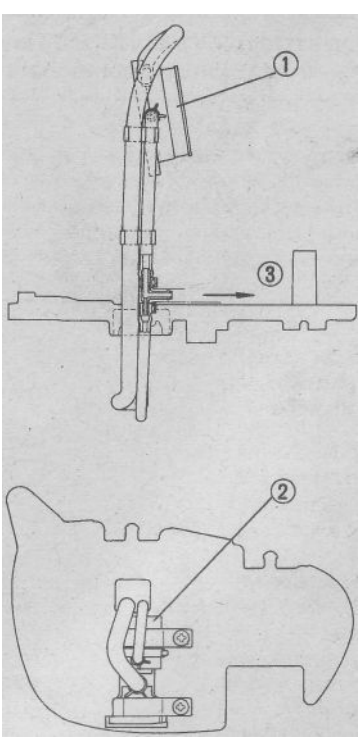
1 If you're working on a 1981 through 1983 model, unclip the plastic cowl for access to the mixture control valve **(see illustration).**



14.1 Remove the plastic cowl for access to the mixture control valve

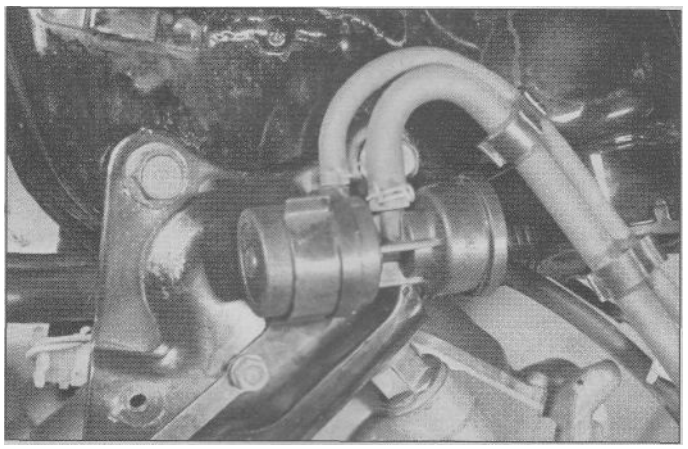


14.4a Mixture control valve hose routing (1981 through 1983 models)



14.4b Mixture control valve hose routing (1984 through 1987 XV700 models)

1 Carburetor intake joint
2 Mixture control valve
3 To fuel tap



14.5 Unclip the mixture control valve and disconnect its hoses

2 If you're working on a 1984 or 1985 XV700, remove the case cover (on the left side of the motorcycle between the cylinders).

3 Start the engine and let it idle. Hold a strip of paper next to the inlet side of the valve.

4 Raise engine speed to 5,000 rpm. The paper should be pulled toward the valve by air flow. If it isn't, check the vacuum hoses to the valve **(see illustrations).** If they're in good condition and properly connected, replace the valve.

Replacement

Refer to illustration 14.5

5 Detach the valve from its clip **(see illustration).** Label and disconnect the hoses.

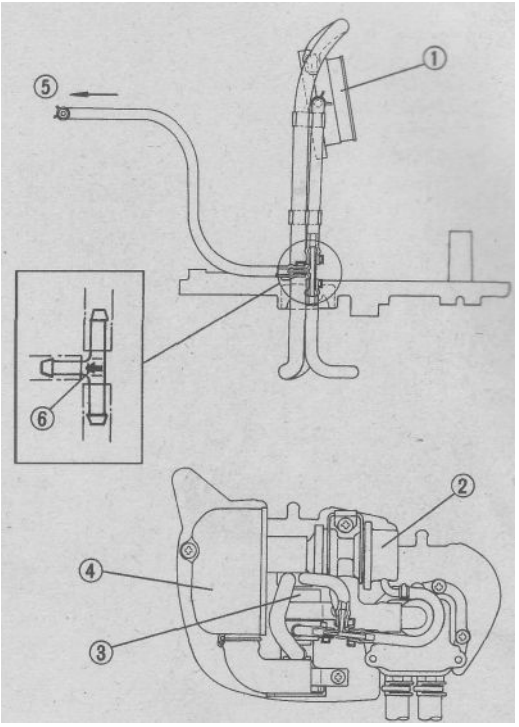
6 Attach the tioses to the valve and secure it in its clip.

15 Air induction system (XV1000, XV1100 and 1988 and later XV750) - inspection and component replacement

Refer to illustrations 15.2a, 15.2b and 15.2c

1 The air induction system uses exhaust gas pulses to suck fresh air into the exhaust ports, where it mixes with hot combustion gases. The additional oxygen provided by the fresh air allows combustion to continue for a longer time, reducing unburned hydrocarbons in the exhaust. Reed valves allow the flow of air into the ports and prevent exhaust gas from flowing into the system. The air cut valve shuts off the flow of air into the system during deceleration to prevent backfiring. The system uses a mixture control valve similar to that described in Section 14.

2 Check the hoses for loose connections, damage and deterioration **(see illustrations).** Tighten or replace loose or damaged hoses.

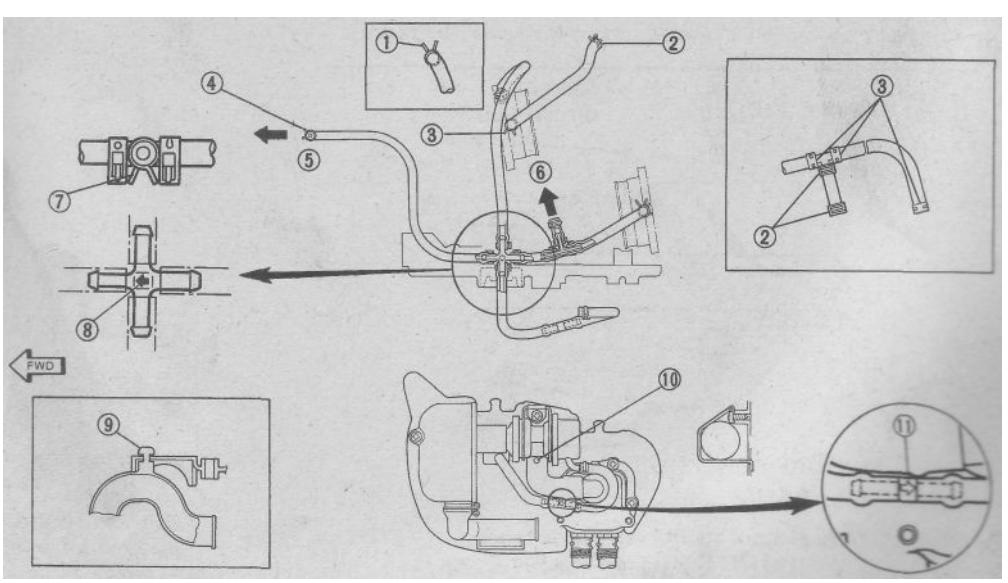


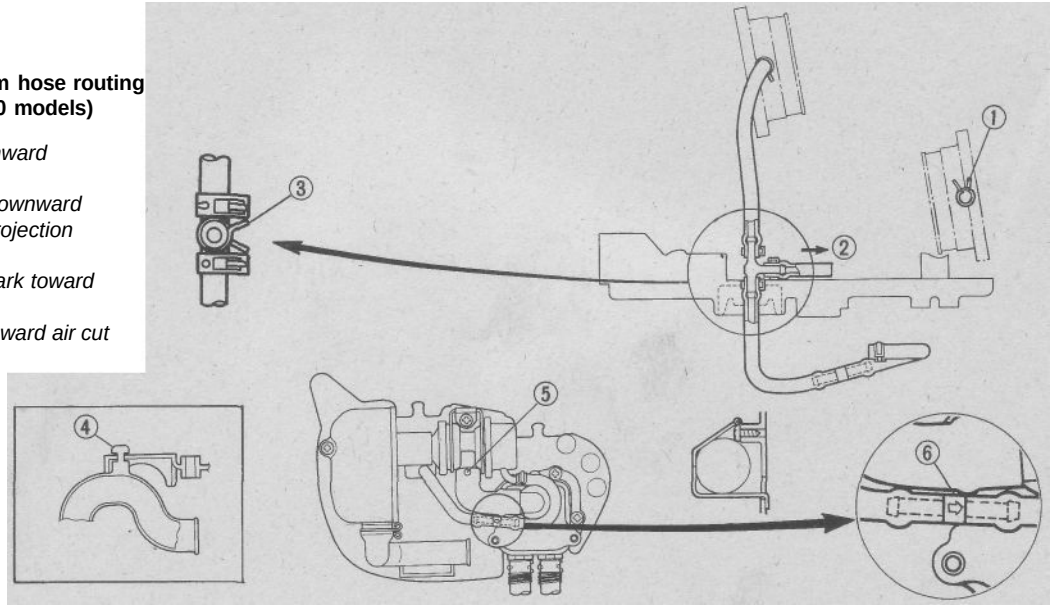
15.2a Air induction system hose routing (1984 and 1985 XV1000 models)

1 *Carburetor intake joint*
2 *Air cutoff valve*
3 *Mixture control valve*
4 *Air filter case*
5 *To pressure sensor*
6 *Arrow mark (toward pressure sensor)*

15.2b Air induction system hose **routing (1986 and later XV1100 models)**

1 *Face clamp ends downward*
2 *Face clamp ends outward*
3 *Face clamp ends inward*
4 *Face clamp ends toward front of motorcycle*
5 *To pressure seriSor*
6 *To coasting erlricher (1986 and 1987 models)*
7 *Face clamp ends downward*
8 *Face arrow mark toward pressuresenso.r*
9 *Place hose bend projection in square hole*
10 *Face white paint mark toward air cutoff valve*
11 *Face arrow mark toward air cut valve*





15.2c Air induction system hose routing (1988 and later XV750 models)

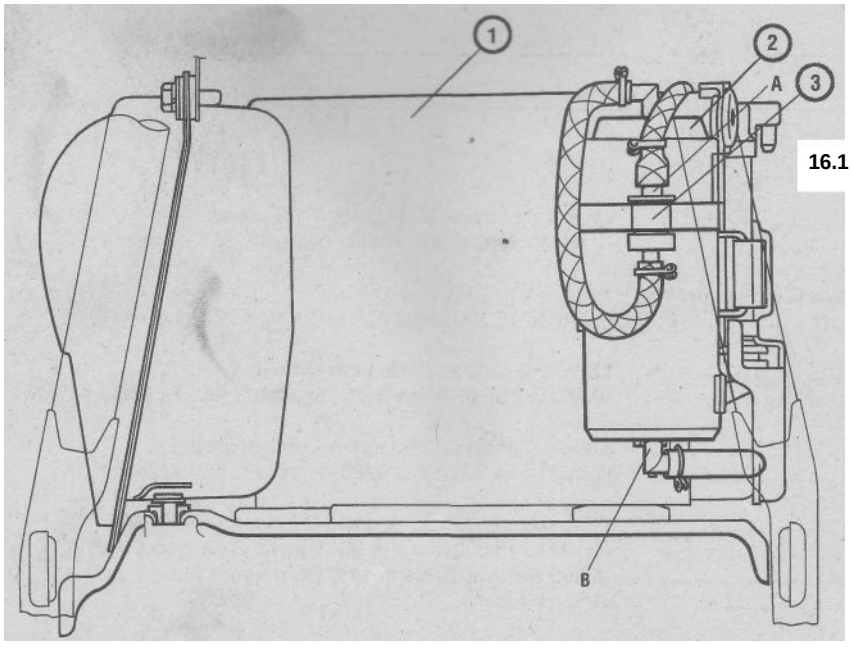
1 Face clamp ends inward
2 To fuel tap
3 Face clamp ends downward
4 Place hose bend projection in square hole
5 Face white paint mark toward air cut valve
6 Face arrow mark toward air cut valve

3 To replace system components, remove the left side cover. Disconnect the hoses, remove the mounting screws and take the assembly off the motorcycle.
4 To test the mixture control valve, refer to Section 14.
5 To inspect the reed valve, remove the Allen bolts and disassemble the reed valve case. Measure the height of the reed valves from the base. If it's not as listed in this Chapter's Specifications, replace the reed valve. Replace the reed valve assembly gasket if it's brittle, cracked or torn.
6 Installation is the reverse of the removal steps.

16 Evaporation control system (California models) - inspection and canister replacement

Refer to illustration 16.1

1 The evaporation control system used on California models prevents fuel vapor <from escaping into the atmosphere. When the engine isn't running, the vapor is stored in a canister, then routed into the combustion chambers for burning when the engine starts **(see illustration).**
2 The hoses should be checked periodically for loose connections, damage and deterioration. Tighten or replace the hoses as needed.
3 To remove the canister, disconnect the hoses and remove the mounting bolts. To install it, bolt the canister to the motorcycle and reconnect the hoses.



16.1 Evaporation control system (California models)

1 Battery case
2 Canister
3 Rollover valve
A Install rollover valve in the correct direction
B Insert canister tube into battery case slot

Chapter 4 Part A
Ignition system (XV535 models)

Contents

	Section
General information	1
Igniter - check, removal and installation	5
Ignition coils - check, removal and installation	3
Ignition system - check	2
Pick-up coil - check, removal and installation	4
Spark plugs - replacement	See Chapter 1

Specifications

Ignition coil

1987 through 1993 US models	
Primary resistance	3.8 to 4.6 ohms at 20-degrees C (68-degrees F)
Secondary resistance	10,600 to 16,800 ohms at 20-degrees C (68-degrees F)
1994 US models	
Primary resistance	3.6 to 4.8 ohms at 20-degrees C (68-degrees F)
Secondary resistance	11,200 to 15,200 ohms at 20-degrees C (68-degrees F)
1988 UK models	
Primary resistance	3.8 to 4.6 ohms at 20-degrees C (68-degrees F)
Secondary resistance	10,600 to 15,800 ohms at 20-degrees C (68-degrees F)
1989 through 1993 UK models	
Primary resistance	3.8 to 4.6 ohms at 20-degrees C (68-degrees F)
Secondary resistance	12,000 to 14,500 ohms at 20-degrees C (68-degrees F)
1994 UK models	
Primary resistance	3.8 to 4.6 ohms at 20-degrees C (68-degrees F)
Secondary resistance	10,100 to 15,800 ohms at 20-degrees C (68-degrees F)
Spark plug cap resistance (UK models)	10,000 ohms at 20-degrees C (68-degrees F)
Spark plug arcing distance	6 mm (1/4 inch)
Pick-up coil resistance	
1987 through 1993	140 to 170 ohms at 20-degrees C (68-degrees F)
1994	182 to 222 ohms at-degrees C (68-degrees F)
Ignition timing	Not adjustable

1 General information

This motorcycle is equipped with a battery operated, fully transistorized, breakerless ignition system. The system consists of the following components:

Pick-up coil
Igniter unit
Battery and fuse
Ignition coils
Spark plugs
Ignition (main), engine kill (stop), sidestand and neutral switches
Primary and secondary (HI) circuit wiring

The transistorized ignition system functions on the same principle as a breaker point DC ignition system with the pick-up coil and igniter performing the tasks previously associated with the breaker points and mechanical advance system. As a result, adjustment and maintenance of ignition components is eliminated (with the exception of spark plug replacement). Models through 1993 use two pick-up coils; 1994 and later models use a single pick-up coil.

Because of their nature, the individual ignition system components can be checked but not repaired. If ignition system troubles occur, and the faulty component can be isolated, the only cure for the problem is to replace the part with a new one. Keep in mind that most electrical parts, once purchased, can't be returned. To avoid unnecessary expense, make very sure the faulty component has been positively identified before buying a replacement part.

2 Ignition system - check

Refer to illustration 2.14

Warning: *Because of the very high voltage generated by the ignition system, extreme care should be taken when these checks are performed.*

1 If the ignition system is the suspected cause of poor engine performance or failure to start, a number of checks can be made to isolate the problem.

2 Make sure the engine kill switch is in the Run position. .

Enginewillnotstart

3 Disconnect one of the spark plug wires, connect the wire to a spare spark plug and lay the plug on the engine with the threads contacting the engine. If necessary, hold the spark plug with an insulated tool. Crank the engine over and make sure a well-defined, blue spark occurs between the spark plug electrodes. **Warning:** *Don't remove one of the spark plugs from the engine- to perform this check - atomized fuel being pumped out of the open spark plug hole could ignite, causing severe injury!*

4 If no spark occurs, the following checks should be made:

5 Unscrew a spark plug cap from a plug wire and lay the plug wire on the cylinder head. Crank the engine over and check for spark again. If a strong blue spark occurs between the end of the wire and the engine, the plug cap or plug is faulty. If not, go to the next steps.

6 Make sure all electrical connectors are clean and tight. Check all wires for shorts, opens and correct installation.

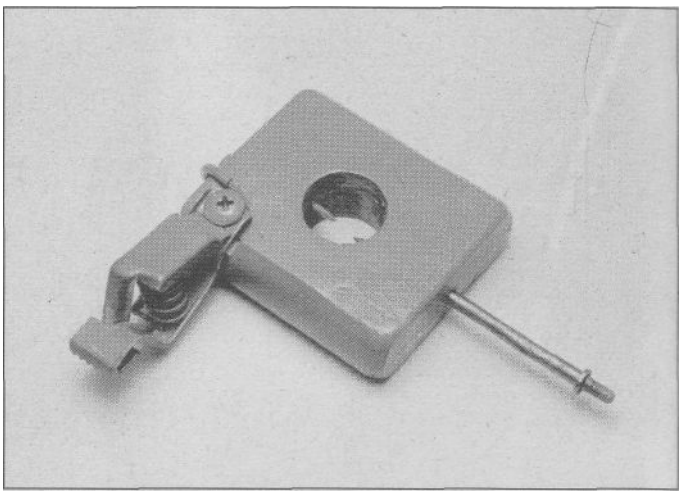
7 Check the battery voltage with a voltmeter and - on models equipped with batteries having removable filler caps - check the specific gravity with a hydrometer (see Chapter 1). If the voltage is less than 12-volts or if the specific gravity is low, recharge the battery.

8 Check the ignition fuse and the fuse connections. If the fuse is blown, replace it with a new one; if the connections are loose or corroded, clean or repair them.

9 Refer to Chapter 8 and check the ignition switch, engine kill switch, neutral switch and sidestand switch.

10 Refer to Section 3 and check the ignition coil primary and secondary resistance.

11 Refer to Section 4 and check the pick-up coil resistance.



2.14 A simple spark gap testing fixture can be made from a block of wood, a large alligator clip, two nails, a screw and a piece of wire

12 If the preceding checks produce positive results but there is still no spark at the plug, remove the igniter and have it checked by a Yamaha dealer service department or other repair shop equipped with the special tester required.

Enginestartsbutmisfires

13 If the engine starts but misfires, make the following checks before deciding that the ignition system is at fault.

14 The ignition system must be able to produce a spark across a six millimeter (1/4-inch) gap (minimum). A simple test fixture **(see illustration)** can be constructed to make sure the minimum spark gap can be jumped. Make sure the fixture electrodes are positioned six millimeters apart.

15 Connect one of the spark plug wires to the protruding test fixture electrode, then attach the fixture's alligator clip to a good engine ground/earth.

16 Crank the engine over (it may start and run on the remaining cylinder) and see if well-defined, blue sparks occur between the test fixture electrodes. If the minimum spark gap test is positive, the ignition coil for that cylinder is functioning properly. Repeat the check on the spark plug wire that is connected to the other coil. If the spark will not jump the gap during either test, or if it is weak (orange colored), refer to steps 5 through 11 of this.Section and perform the component checks described.

3 Ignition coils - check, removal and installation

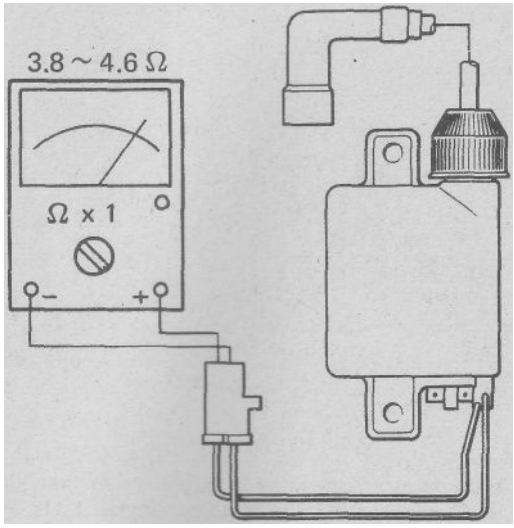
Check

Refer to illustrations 3.4 and 3.6

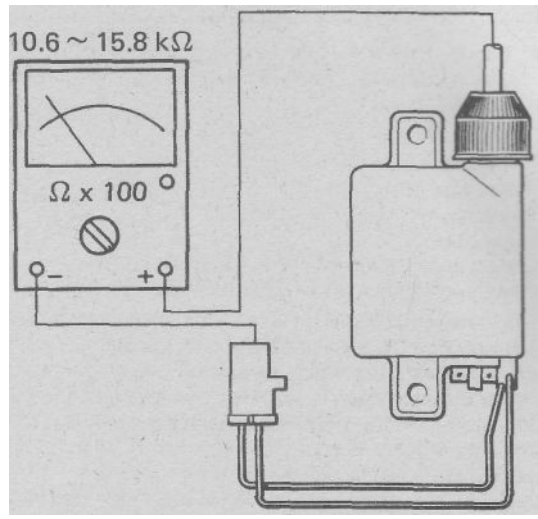
1 In order to determine conclusively that the ignition coils are defective, they should be tested by an authorized Yamaha dealer service department which is equipped with the special electrical tester required for this check.

2 However, the coils can be checked visually (for cracks and other damage) and the primary and secondary coil resistances can be measured with an ohmmeter. If the coils are undamaged, and if the resistances are as specified, they are probably capable of proper operation.

3 To check the coils for physical damage, they must be removed (see Step 9). To check the resistances, simply remove the ignition coil cover from the forward side of the front cylinder's mounting bracket, unplug the primary circuit electrical connectors from the coil(s) and remove the spark plug wire from the plug that is connected to the coil being



3.4 To test the coil primary resistance, connect the ohmmeter leads between the primary terminals in the coil connector



3.6 To test the coil secondary resistance, connect the ohmmeter between the spark plug wire (HT) terminal and one of the primary terminals

checked. Mark the locations of all wires before disconnecting them.

4 To check the coil primary resistance, attach one ohmmeter lead to one of the primary terminals and the other ohmmeter lead to the other primary terminal (see illustration).

5 Place the ohmmeter selector switch in the Rx1 position and compare the measured resistance to the value listed in this Chapter's Specifications.

6 If the coil primary resistance is as specified, check the coil secondary resistance by disconnecting either meter lead from the primary terminal connector and attaching it to the spark plug wire (HT) terminal **(see illustration).**

7 Place the ohmmeter selector switch in the Rx1000 position and compare the measured resistance to the values listed in this Chapter's Specifications.

8 If the resistances are not as specified, the coil is probably defective and should be replaced with a new one.

Removalandinstallation

Refer to illustrations 3.9 and 3.10

9 To remove the coils, refer to Chapter 4 and remove the upper fuel tank (later models) or Chapter 7 to remove the top cover (early models), then disconnect the spark plug wires from the plugs. After labeling them with tape to aid in reinstallation, unplug the coil primary circuit electrical connectors **(see illustration).**

10 Unbolt the cp.il bracket and remove it from the frame **(see illustration).** Remove the coil mounting bolts and take the coil(s) off the bracket.

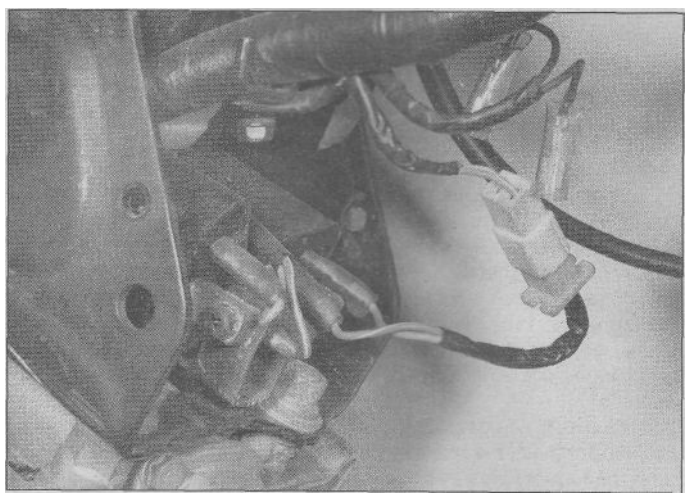
11 Installation is the reverse of removal. Make sure the primary circuit electrical connectors are attached to the proper terminals; use their wire colors for identification (see the *Wiring diagrams* at the end of the book).

4 Pick-up coil - check, removal and installation

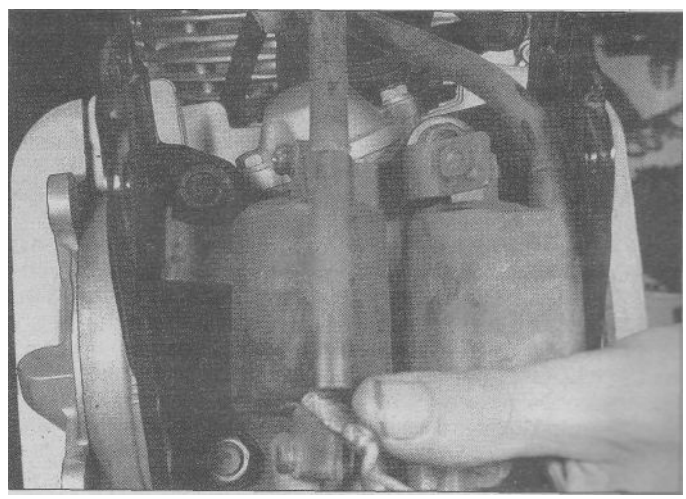
Check

Refer to illustrations 4.1a and 4.1b

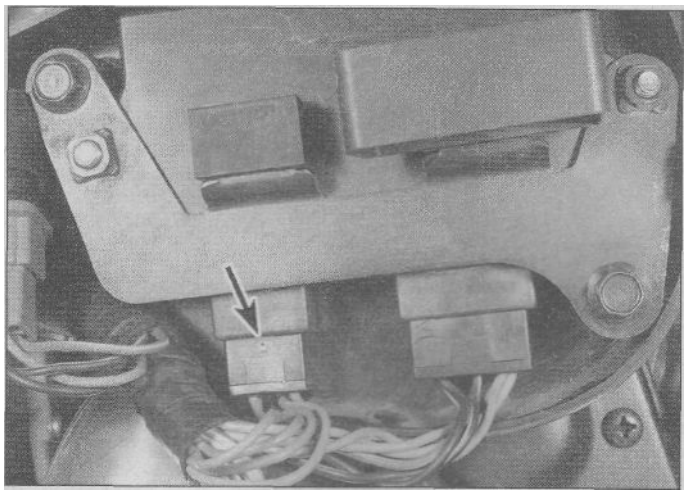
1 Remove the right front side cover (see Chapter 7). On 1987 through 1993 models, locate the four-pin pick-up coil wiring connector



3.9 Disconnect the coil primary connectors (arrows)



3.10 Unbolt the coil bracket and remove it together with the coils



4.1a The pick-up coil connector on 1987 through 1993 models is on the underside of the igniter at the rear (arrow); if necessary, remove the igniter for access

at the igniter **(see illustration).** On 1994 and later models, follow the gray and black wires from the igniter to the two-pin connector in the wiring harness **(see illustration).** Disconnect the connector. **Note:** On *1987 through 1993 models, it may be easier to remove the igniter for access to the connector (see Section 5).*

2 Make the test on the pick-up coil side of the connector. Probe the terminals in the connector with an ohmmeter and compare the resistance reading with the value listed in this Chapter's Specifications. On 1987 through 1993 models two tests are required: brown to green and red to blue.

3 If the pick-up coil(s) fail the above test, it must be replaced.

Removal

Refer to illustration 4.5

4 Remove the alternator cover from the left side of the engine (see Chapter 8).

5 Unscrew the mounting screws and remove the pick-up coil(s) **(see illustration).**

Installation

6 Installation is the reverse of the removal steps.

5 Igniter - check, removal and installation

Check

1 The igniter is checked by process of elimination (when all other possible causes have been checked and eliminated, the igniter **is** at fault). Because the igniter is expensive and can't be returned once purchased, consider having a Yamaha dealer test the ignition system before you buy a new igniter.

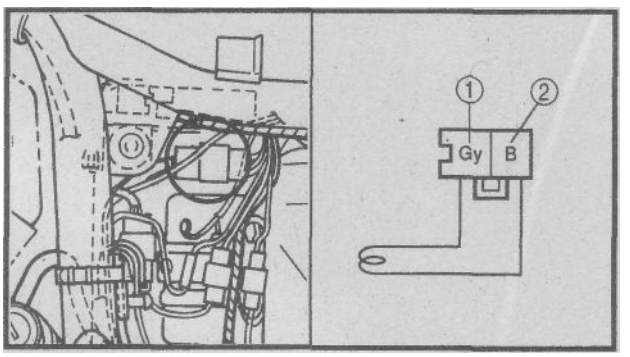
Removalandinstallation

Refer to illustration 5.3

2 Remove the right front side cover and the bracket inside it (see Chapter 7).

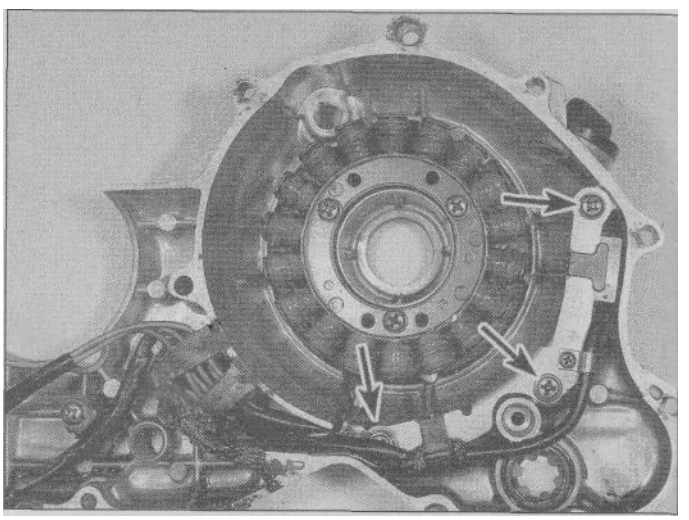
3 Slide the electrical component board off its mounting posts to detach it from the bracket. Turn the component board around so the igniter mounting screws are visible. Unplug the electrical connector, remove the mounting screws and take the igniter out **(see illustration).**

4 Installation is the reverse of the removal steps.

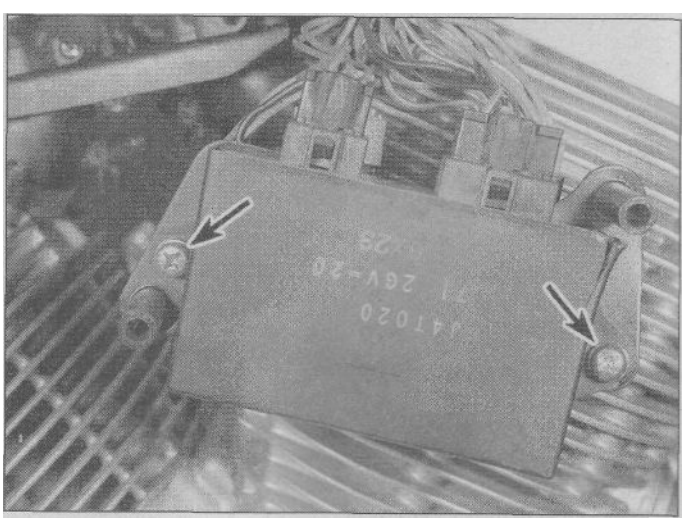


4.1b The pick-up coil connector on 1994 and later models is in the wiring harness; it can be identified by its wire colors

1 Gray *2 Black*



4.5 Pick-up coil mounting screws (arrows) - two-coil type shown



5.3 Unplug the connectors and remove the mounting screws (arrows) to detach the igniter from the component board

Chapter 4 Part B
Ignition system (XV700-1100 models)

Contents

	Sect/on
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Igniter - check, removal and installation	5
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Pick-up coils - check, removal and installation	4
Spark plugs - replacement	See Chapter 1
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Specifications

Ignition coil

1981 through 1983 models	
Primary resistance	2.7 ohms +/-15% at 20-degrees C (68-degrees F)
Secondary resistance	8500 ohms +/-15% at 20-degrees C (68-degrees F)
1984-on models	
Primary resistance	3.57 to 4.83 ohms at 20-degrees C (68-degrees F)
Secondary resistance	11,220 to 15,180 ohms at 20-degrees C (68-degrees F)

Spark plug cap resistance

All except TR1 models	5000 ohms at 20-degrees C (68-degrees F)
TR1 models	7000 ohms at 20-degrees C (68-degrees F)

Spark plug arcing distance ..... 6 mm (1/4 inch)

Pick-up coil resistance

Dual pick-up coils	124 to 186 ohms at 20-degrees C (68-degrees F)
Single pick-up coil	182 to 222 ohms at 20-degrees C (68-degrees F)

Pressure sensor output voltage ..... 3.00 +/-0.05 volts

Ignition timing ..... Not adjustable

1 General information

These motorcycles are equipped with a battery operated, fully transistorized, breakerless ignition system. The system consists of the following components:

Pick-up coil(s)
Igniter unit
Battery and fuse
Ignition coils
Spark plugs
Ignition (main), engine kill (stop), sidestand and neutral switches
Primary and secondary (HT) circuit wiring

The transistorized ignition system functions on the same principle as a breaker point DC ignition systenxwith the pick-up coil or coils and igniter performing the tasks previously associated with the breaker points and mechanical advance system. As a result, adjustment and maintenance of ignition components is eliminated (with the exception of spark plug replacement). Models through 1990 use two pick-up coils; 1991 and later models use a single pick-up coil.

Because of their nature, the individual ignition system components can be checked but not repaired. If ignition system troubles occur, and the faulty component can be isolated, the only cure for the problem is to replace the part with a new one. Keep in mind that most electrical parts, once purchased, can't be returned. To avoid unnecessary expense, make very sure the faulty component has been positively identified before buying a replacement part.

2 Ignition system - check

Warning: *Because of the very high voltage generated by the ignition system, extreme care should be taken when these checks are performed.*

1 If the ignition system is the suspected cause of poor engine performance or failure to start, a number of checks can be made to isolate the problem.

2 Make sure the engine kill switch is in the Run position.

Enginewillnotstart

3 Disconnect one of the spark plug wires, connect the wire to **a** spare spark plug and lay the plug on the engine with the threads contacting the engine. If necessary, hold the spark plug with an insulated tool. Crank the engine over and make sure a well-defined, blue spark occurs between the spark plug electrodes. **Warning:** *Don't remove one of the spark plugs from the engine to perform this check - atomized fuel being pumped out of the open spark plug hole could ignite, causing severe injury!*

4 If no spark occurs, the following checks should be made:

5 Unscrew a spark plug cap from a plug wire and lay the plug wire on the cylinder head. Crank the engine over and check for spark again. If a strong blue spark occurs between the end of the wire and the engine, the plug cap or plug is faulty. If not, go to the next steps.

6 Make sure all electrical connectors are clean and tight. Check all wires for shorts, opens and correct installation.

7 Check the battery voltage with a voltmeter and - on models equipped with batteries having removable filler caps - check the specific gravity with a hydrometer (see Chapter 1). If the voltage is less than 12-volts or if the specific gravity is low, recharge the battery.

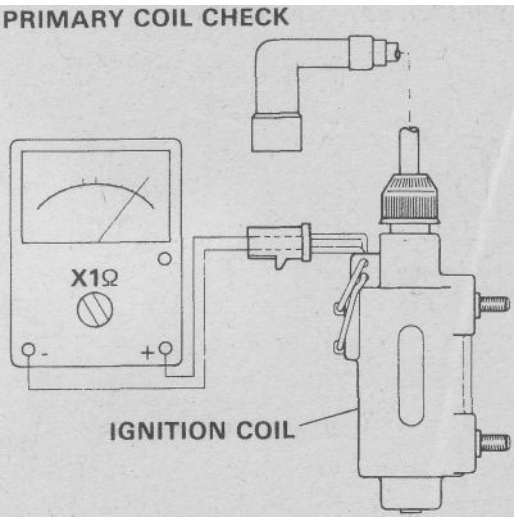
8 Check the ignition fuse and the fuse connections. If the fuse is blown, replace it with a new one; if the connections are loose or corroded, clean or repair them.

9 Refer to Chapter 8 and check the ignition switch, engine kill switch, neutral switch and sidestand switch.

10 Refer to Section 3 and check the ignition coil primary and secondary resistance.

11 Refer to Section 4 and check the pick-up coil resistance.

12 If the preceding checks produce positive results but there is still no spark at the plug, remove the igniter and have it checked by a Yamaha dealer service department or other repair shop equipped with the special tester required.



3.4 To test the coil primary resistance, connect the ohmmeter leads between the primary terminals in the coil connector

Enginestartsbutmisfires

13 If the engine starts but misfires, make the following checks before deciding that the ignition system is at fault.

14 The ignition system must be able to produce a spark across a six millimeter (1/4-inch) 'gap (minimum). A simple test fixture **(see illustration 2.14 in Part A of this Chapter)** can be constructed to make sure the minimum spark gap can be jumped. Make sure the fixture electrodes are positioned six millimeters apart.

15 Connect one of the spark plug wires to the protruding test fixture electrode, then attach the fixture's alligator clip to a good engine ground/earth.

16 Crank the engine over (it may start and run on the remaining cylinder) and see if well-defined, blue sparks occur between the test fixture electrodes. If the minimum spark gap test is positive, the ignition coil for that cylinder is functioning properly. Repeat the check on the spark plug wire that is connected to the other coil. If the spark will not jump the gap during either test, or if it is weak (orange colored), refer to steps 5 through 11 of this Section and perform the component checks described.

3 Ignition coils - check, removal and installation

Check

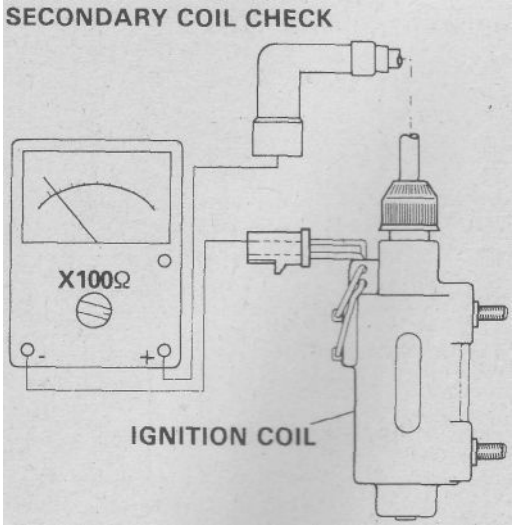
Refer to illustrations 3.4 and 3.6

1 In order to determine conclusively that the ignition coils are defective, they should be tested by an authorized Yamaha dealer service department which is equipped with the special electrical tester required for this check.

2 However, the coils can be checked visually (for cracks and other damage) and the primary and secondary coil resistances can be measured with an ohmmeter. If the coils are undamaged, and if the resistances are as specified, they are probably capable of proper operation.

3 To check the coils for physical damage, they must be removed (see Step 9). To check the resistances, simply remove the ignition coil cover from the forward side of the front cylinder's mounting bracket, unplug the primary circuit electrical connectors from the coil(s) and remove the spark plug wire from the plug that is connected to the coil being checked. Mark the locations of all wires before disconnecting them.

4 To check the coil primary resistance, attach one ohmmeter lead to one of the primary terminals and the other ohmmeter lead to the



3.6 To test the coil secondary resistance, **connect the ohmmeter between the spark plug wire (HT) terminal and one of the** primary **terminals**

other primary terminal (see illustration).

5 Place the ohmmeter selector switch in the Rx1 position and compare the measured resistance to the value listed in this Chapter's Specifications.

6 If the coil primary resistance is as specified, check the coil secondary resistance by disconnecting either meter lead from the primary terminal connector and attaching it to the spark plug wire (HT) terminal **(see illustration).**

7 Place the ohmmeter selector switch in the Rx1000 position and compare the measured resistance to the values listed in this Chapter's Specifications.

8 If the resistances are not as specified, the coil is probably defective and should be replaced with a new one.

Removal and installation

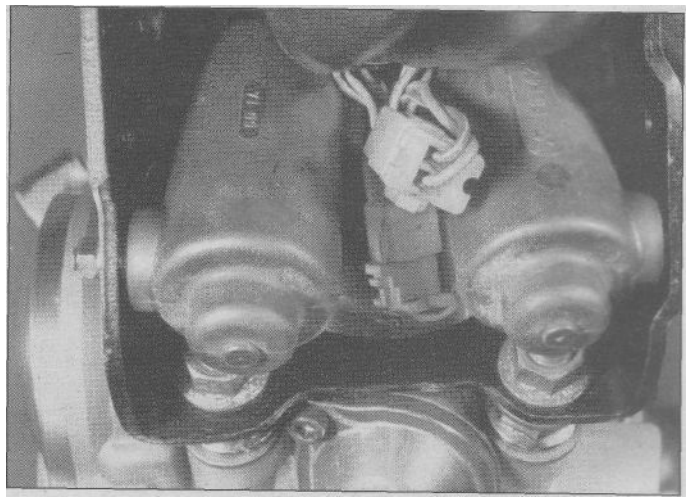
Refer to illustration 3.11

9 If you're working on an XV1000 or XV1100 model, remove the pressure sensor from the ignition coil cover located on top of the front cylinder's engine mounting bracket.

10 Remove the ignition coil cover, then disconnect the spark plug wires from the plugs. Label the primary circuit electrical connectors with tape to aid in reinstallation, then disconnect them.

11 Unbolt the coils from the engine mounting bracket and remove them **(see illustration).**

12 Installation is the reverse of removal. Make sure the primary circuit electrical connectors are attached to the proper terminals; use their wire colors for identification (see the Wiring diagrams at the end of the book).



3.11 Disconnect the coil primary connectors and remove the mounting nuts or bolts to separate them from the bracket

4 Pick-up coils - check, removal and installation

Check

Refer to illustration 4.3

1 If you're working on a 1981 through 1983 model, remove the fuel tank (see Chapter 3).

2 If you're working on a 1984 or later model, remove the seat, the left side cover and the luggage box (see Chapter 7).

3 On 1981 through 1990 models, locate the four-pin pick-up coil wiring connector at the igniter **(see illustration).** On 1991 and later models, follow the gray and black wires from the igniter to the two-pin connector in the wiring harness. Disconnect the connector.

4 Make the test on the pick-up coil side of the connector. Probe the terminals in the connector with an ohmmeter and compare the resistance reading with the value listed in this Chapter's Specifications. On 1981 through 1990 models two tests are required: brown to green (rear cylinder) and red to blue (front cylinder).

4.3 The igniter is mounted under the fuel tank on 1981 through 1983 models (shown) or forward of the rear fender on 1984 and later models

5 If the pick-up coil(s) fail the above test, it must be replaced.

Removal

6 Remove the alternator cover from the left side of the engine (see Chapter 8).

7 Unscrew the mounting screws and remove the pick-up coil(s) (see Chapter 8).

Installation

8 Installation is the reverse of the removal steps.

5 Igniter - check, removal and installation

Check

1 The igniter is checked by process of elimination (when **all other** possible causes have been checked and eliminated, the ignite- fault). Because the igniter is expensive and can't be returned purchased, consider having a Yamaha dealer test the before you buy a new igniter.

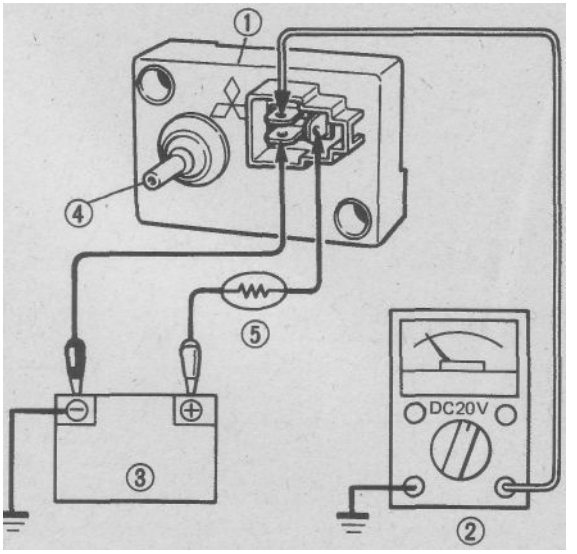
Removalandinstallation

1 If you're working on a 1981 through 1983 model, remove the fuel tank (see Chapter 3).
2 If you're working on a 1984 or later model, remove the seat, the left side cover and the luggage box (see Chapter 7).
3 Unplug the electrical connector, remove the mounting screws and take the igniter out **(see illustration 4.3).**
4 Installation is the reverse of the removal steps.

6 Pressure sensor (1984 and later XV1000 and XV1100 models) - testing, removal and installation

Refer to illustration 6.2

1 Remove the pressure sensor mounting screws. Disconnect the electrical connector and pressure hose and remove the pressure sensor from the ignition coil cover.
2 Connect a 12-volt battery and 180-ohm resistor to the pressure sensor **(see illustration).** Connect a 0-20 volt voltmeter between the pressure sensor and ground. Compare the output voltage to the value listed in this Chapter's Specifications. If it's incorrect, replace the pressure sensor.
3 Installation is the reverse of the removal steps.



6.2 Pressure sensor test connections

1 Pressure sensor
2 Voltmeter
3 Battery
4 Pressure hose fitting
5 180-ohm resistor

Chapter 5 Part A Steering, suspension and final drive (XV535 models)

Contents

	Section
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Specifications

Front suspension

Fork spring length	
1987 and 1988 US models	
Standard	531.6 mm (20.9 inches)
Minimum	526.6 mm (20.7 inches)
1990-on US models and all UK models	
Standard	546.6 mm (21.5 inches)
Minimum	541.6 mm (21.3 inches)
Fork oil capacity	228 cc (7.71 US fl oz, 8.03 Imp fl oz)
Fork oil level	176 mm (6.93 inches) below top of inner fork tube*

Rear suspension

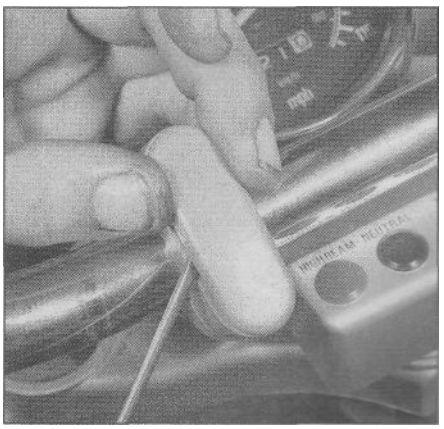
Rear spring free length	
1987 and 1988 US models	
Standard	266 mm (10.5 inches)
Minimum	261 mm (10.3 inches)
1990-on US models and all UK models	
Standard	237.5 mm (9.35 inches)
Minimum	232.2 mm (9.15 inches)
Rear spring installed length	229 mm (9.01 inches)
Swingarm endplay and side play limits	1 mm (0.04 inch)

**With spring removed and fork fully compressed.*

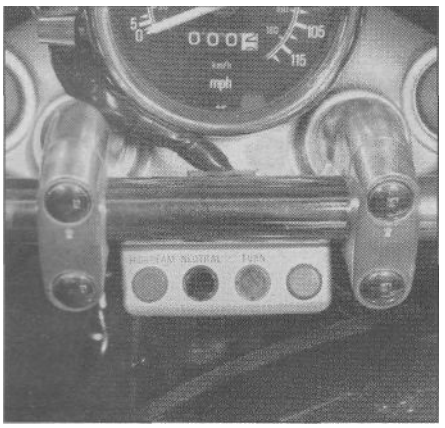
Torque specifications

Front forks	
Damperrod bolt	23 Nm (17ft-lbs)**
Upper triple clamp pinch bolts	20 Nm **(14 ft-lbs)**
Lower triple clamp pinch bolts	38 Nm (27 ft-lbs)
Handlebars and steering stem	
Handlebar bracket to steering stem nut	20 Nm (14 ft-lbs)
Handlebar to bracket clamp bolts	20 Nm (14 ft-lbs)
Steering stem bolt	54 Nm (39 ft-lbs)
Steering head bearing ring nut	see Chapter 1
Rear shock absorber upper bolts	20 Nm (14 ft-lbs)
Rear shock absorber lower bolts/nuts	30 Nm (22 ft-lbs)
Swingarm pivot shaft	75 Nm (54 ft-lbs)
Final drive unit to swingarm nuts	42 Nm (30 ft-lbs)

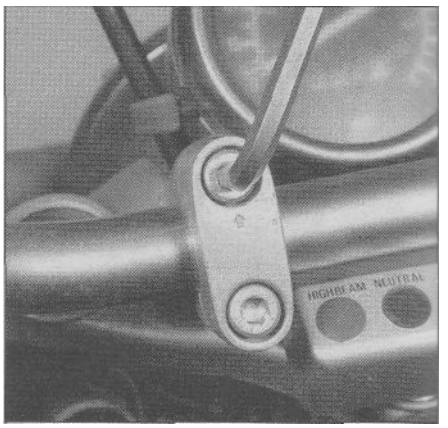
***Apply non-permanent thread locking agent to the bolt threads.*



2.2a On early models, pry off the **rubber cover...**



2.2b ... later models use a pair of plugs



2.2c Remove the Allen bolts to detach the handlebar brackets; the arrow cast in each bracket must face forward when the bracket is reinstalled

1 General information

The front forks are of the conventional coil spring, hydraulically-damped telescopic type.

The rear suspension consists of twin shock absorbers with coil springs and a swingarm.

Final drive is of the shaft type.

2 Handlebar - removal and installation

Refer to illustrations 2.2a, 2.2b, 2.2c and 2.5

1 The handlebar is a one-piece unit that's secured to the upper triple clamp by a pair of brackets.

2 To remove the handlebar from its brackets, pry out the rubber plug(s) and remove the bolts that secure the top half of each bracket **(see illustrations).** Lift the handlebar out.

3 If the handlebar must be removed for access to other components, such as the forks or the steering head, it's not necessary to disconnect the cables, wires or hoses, but it is a good idea to support the assembly with a piece of wire or rope, to avoid unnecessary strain on the cables, wires and the brake hose.

4 If the handlebar is to be removed completely, refer to Chapter 2 for clutch cable removal procedures, Chapter 6 for the brake master cylinder removal procedures, Chapter 3 for the throttle grip removal procedure and Chapter 8 for the switch removal procedure.

5 To remove a bracket from the upper triple clamp, pull out the safety clip and remove the nut and washers **(see illustration),** then lift the bracket out.

6 Check the handlebar and brackets for cracks and distortion and replace them if any undesirable conditions are found. If the brackets were removed, check their rubber mounts for brittleness or deterioration,

7 Installation is the reverse of the removal steps. Tighten the nuts and bolts to the torques listed in this Chapter's Specifications.

3 Fork oil change

Refer to illustrations 3.2, 3.3, 3.4a, 3.4b, 3.5, 3.8 and 3.9

1 Support the bike securely so it can't be knocked over during this procedure. The front wheel must be raised off the ground using a jack and wood support under the crankcase, or axle stands.

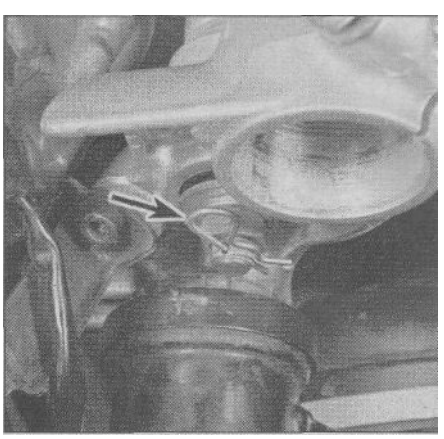
2 Remove the plastic fork caps **(see illustration).**

3 Loosen the upper triple clamp pinch bolts **(see illustration).**

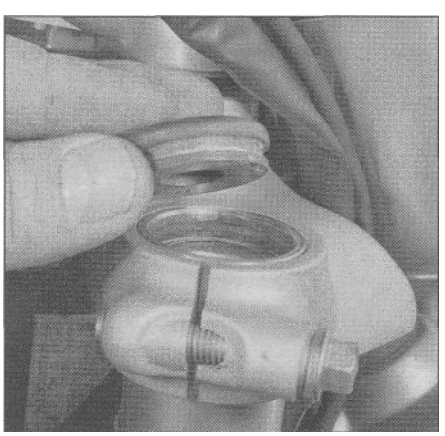
4 Press down the spring seat with a suitable tool (such as a large Phillips screwdriver). Remove the stopper ring, then slowly release the spring pressure and lift out the spring seat and spring **(see illustrations).**

5 Place a drain pan under the fork leg and remove the drain screw **(see illustration). Warning:** *Do not allow the fork oil to contact the tire, brake disc or pads. If it does, wash off the tire, clean the disc with brake system cleaner and replace the pads with new ones before riding the motorcycle.*

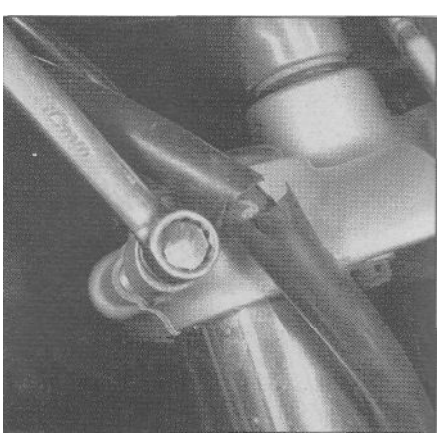
6 After most of the oil has drained, slowly compress and release the



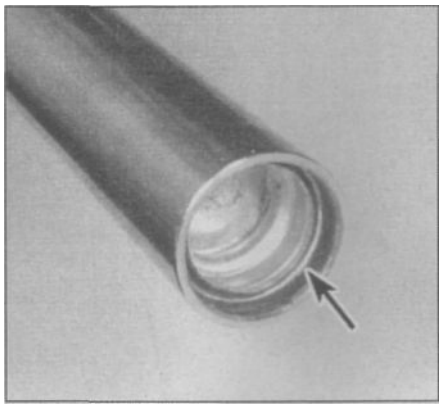
2.5 Pull out the clip (arrow) and remove the nut and washers to detach the bracket from the triple clamp



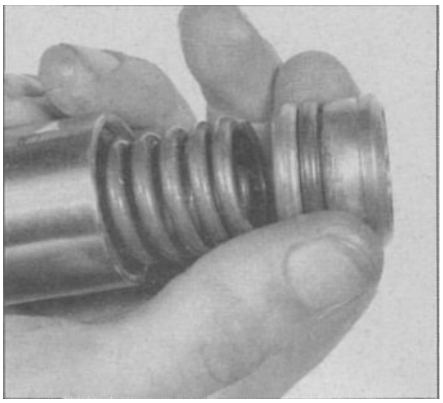
3.2 Remove the plastic cap from the fork



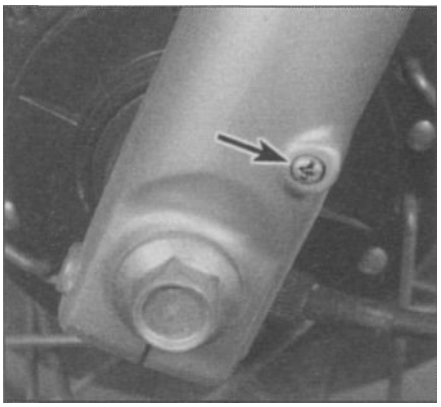
3.3 Loosen the upper triple clamp bolts



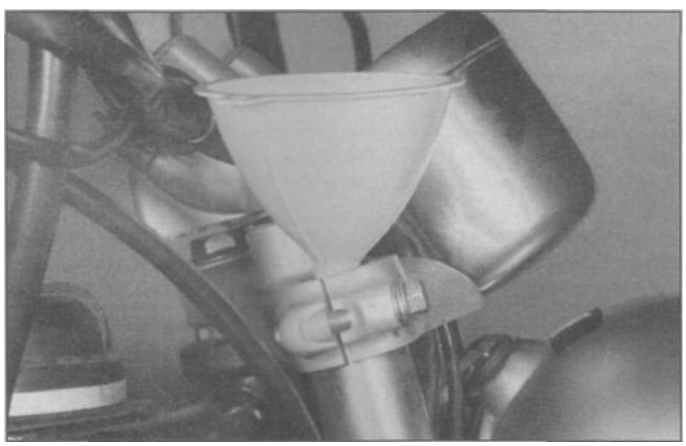
3.4a Press the spring seat down against the spring pressure and pry out the stopper ring (arrow) **...**



3.4b ... then remove the spring seat with its O-ring and the spring



3.5 Remove the fork drain screw (arrow)



3.8 Pour the specified amount of oil into the top of the fork

forks to pump out the remaining oil. An assistant will most likely be required to do this.

7 Check the drain screw gasket and spring seat O-ring for damage and replace them if necessary. Clean the threads of the drain screw with solvent and let it dry, then install the screw and gasket, tightening it securely.

8 Pour the type and amount of fork oil, listed in this Chapter's Specifications, into the fork tube through the opening at the top **(see illustration).**

9 Remove the jack from under the engine and slowly pump the forks a few times to purge the air. Measure the level of the oil in the fork with the fork fully compressed and without the spring in position **(see illustration).** Compare it to the value listed in this Chapter's Specifications. Add or remove oil as necessary.

10 Coat the O-ring on the spring seat with a thin layer of multi-purpose grease. Install the spring (with its closer-wound coils at the top), spring seat and stopper ring **(see illustrations 3.4b and 3.4a).**

11 Install the fork cap.

12 The remainder of installation is the reverse of the removal steps. Tighten all fasteners to the torque listed in this Chapter's Specifications.

4 Forks - removal and installation

Removal

Refer to illustrations 4.7a and 4.7b

1 Support the bike securely so it can't be knocked over during this procedure.

2 Place a jack under the engine and raise it slightly to lift the front tire off the ground.

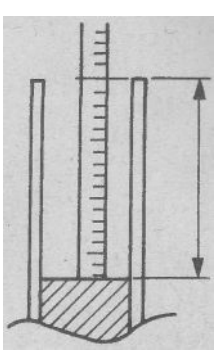
3 Remove the brake caliper and front wheel (see Chapter 6).

4 Remove the front fender (see Chapter 7).

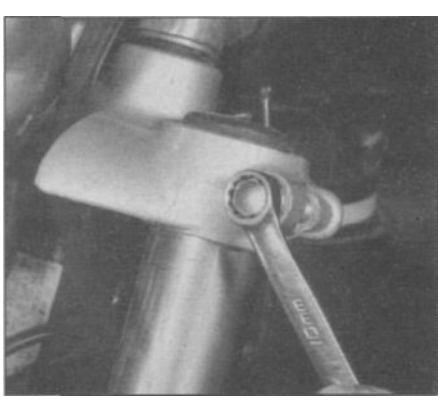
5 Remove any wiring harness clamps or straps from the fork tubes.

6 If the fork will be disassembled after removal, read through the disassembly procedure (see Section 5), paying special attention to the damper rod bolt removal steps. If you don't have the necessary special tool or a substitute for it, you can remove the damper rod bolt before the fork is disassembled, while the spring tension will keep the damper rod from spinning inside the fork tube.

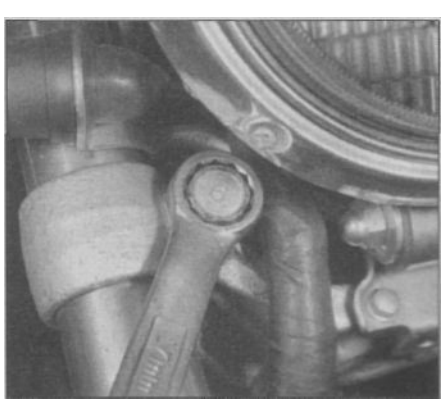
7 Loosen the upper and lower triple clamp bolts **(see illustrations),** then slide the fork tubes down and remove the forks from the motorcycle.



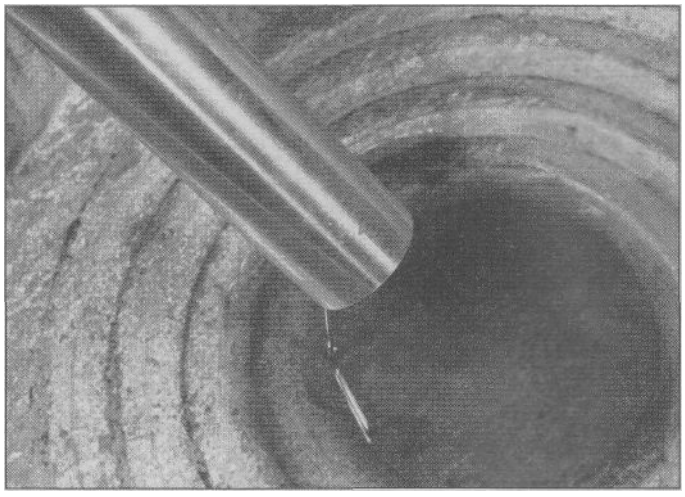
3.9 Measure fork oil level with the fork fully compressed and the spring removed



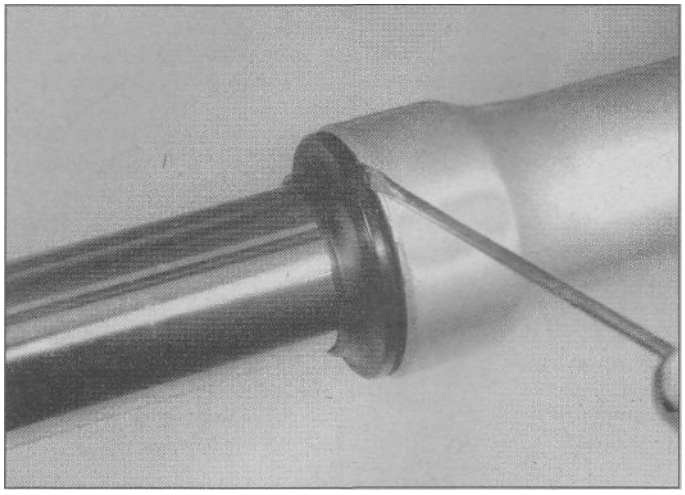
4.7a Loosen the upper triple clamp bolts...



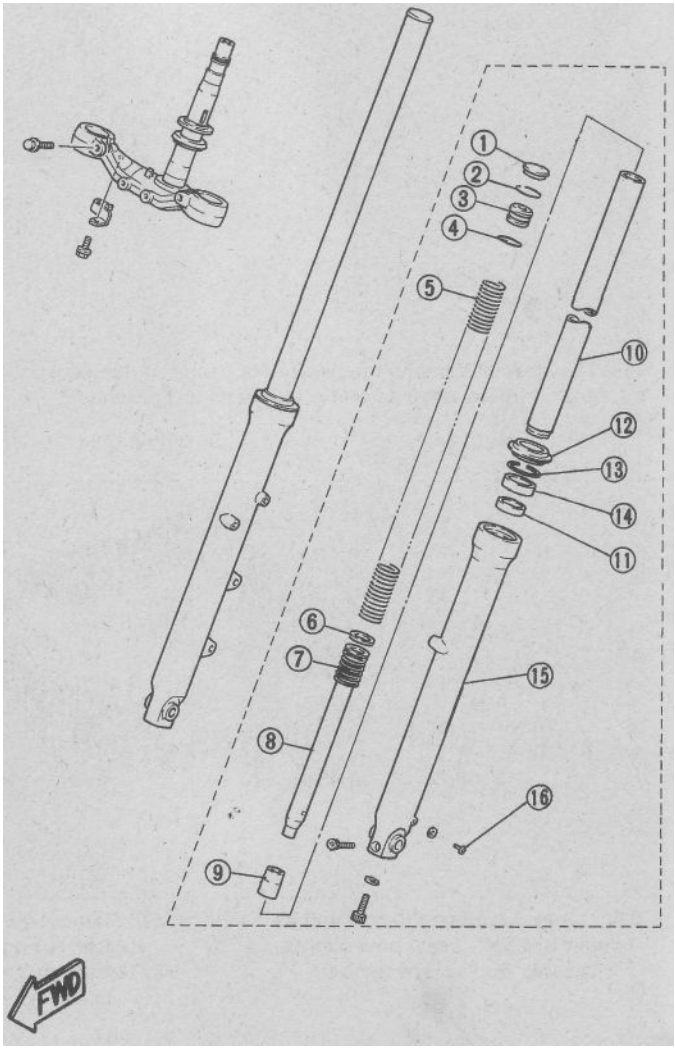
4.7b ... and the lower triple clamp bolts



5.3 Pour the fork oil into a container



5.4a Pry the dust seal out of the outer fork tube



5.4b Front fork (XV535 models) - exploded view

1	*Fork cap*	*9*	*Oil lock piece*
2	*Stopper ring*	*10*	*Inner fork tube*
3	*Spring seat*	*11*	*Outer tube bushing*
4	*O-ring*	*12*	*Dust cover*
5	*Fork spring*	*13*	*Retaining clip*
6	*Teflon ring*	*14*	*Oil seal*
7	*Rebound spring*	*15*	*Outer fork tube*
8	*Damper rod*	*16*	*Drain screw*

Installation

8 Slide each fork leg into the lower triple clamp.

9 Slide the fork legs up, installing the tops of the tubes into the upper triple clamp. Position the top of the fork tube so that it is level with the top surface of the upper triple clamp.

10 The remainder of installation is the reverse of the removal procedure. Tighten all fasteners to the torques listed in this Chapter's Specifications and the Chapter 6 Specifications.

11 Pump the front brake lever several times to bring the pads into contact with the disc.

5 Forks - disassembly, inspection and reassembly

Disassembly

Refer to illustrations 5.3, 5.4a, 5.4b, 5.5, 5.6a, 5.6b, 5.6c, 5.7 and 5.8

1 Remove the forks following the procedure in Section 4. Work on one fork leg at a time to avoid mixing up the parts.

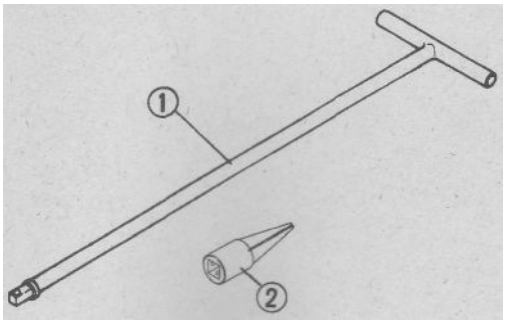
2 Remove the fork cap, stopper ring, spring seat and spring (see Section 3, Step 4).

3 Invert the fork assembly over a container and allow the oil to drain out **(see illustration).**

4 Pry the dust seal from the outer tube **(see illustrations).**

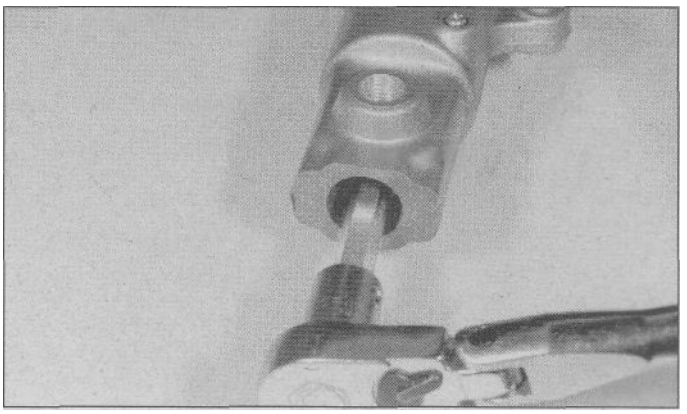
5 Pry the retaining ring from its groove in the outer tube **(see illustration).** Slide the dust seal and retaining ring off the inner fork tube.

5.5 Pry out the retaining ring

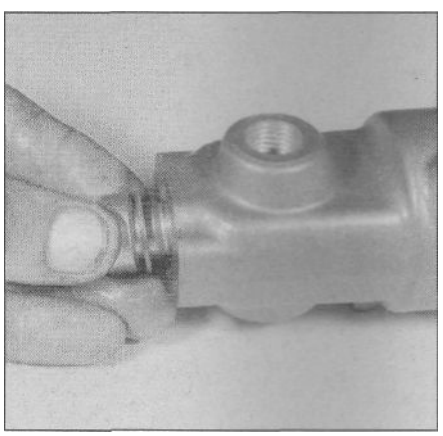


5.6a This special Yamaha tool is used to keep the damper rod from turning when its bolt is loosened or tightened

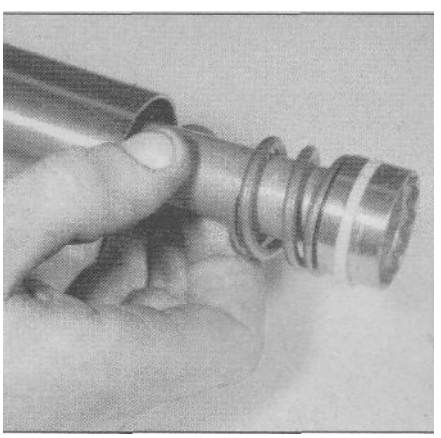
1 Handle *2 Adapter*



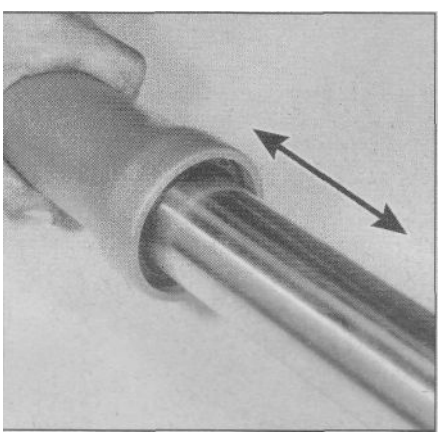
5.6b Loosen the damper rod bolt with an Allen wrench .



5.6c . . . and remove the bolt and its **copper washer - use** a **new** copper **washer during** reassembly



5.7 Remove the damper rod and the rebound spring - don't separate the Teflon ring from the damper rod unless you plan to replace it

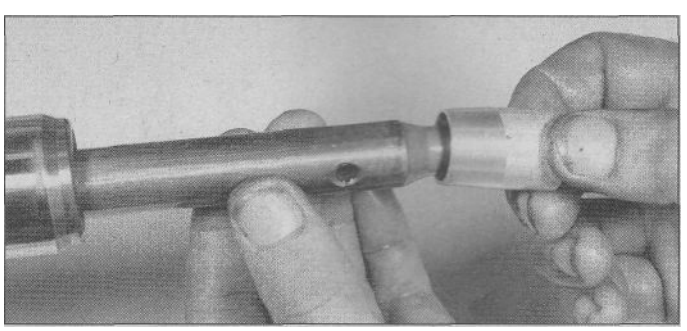


5.8 To separate the inner and outer fork tubes, pull them apart firmly several times - the slide hammer effect will pull the tubes apart

6 Prevent the damper rod **from** turning using a holding handle (Yamaha tool no. YM-01326, part no. 90890-01326) and adapter (Yamaha tool no. YM-01300-01, part no. 90890-01294) **(see illustration)** passed down through the fork inner tube to engage the damper rod head. Unscrew the Allen bolt at the bottom of the outer tube and remove the copper washer **(see illustrations). Note:** *If you don't have access to these tools, a piece of hardwood dowel can be used instead. Cut a taper on the end of the dowel to fit into the damper rod head. Another alternative is to loosen the damper rod bolt before removing the fork cap; the pressure of the fork spring will keep the damper rod from turning.*

7 Pull out the damper rod and the rebound spring **(see illustration).** Don't remove the Teflon ring from the damper rod unless a new one will be installed.

8 Hold the outer tube and yank the inner tube away from it, repeatedly (like a slide hammer), until the seal and outer tube guide bushing pop loose **(see illustration).**



5.14 Fit the oil lock piece onto the exposed end of the damper rod

9 Remove the oil seal and slide bushing from the inner tube, and the oil lock piece from the outer tube.

Inspection

10 Clean all parts in solvent and blow them dry with compressed air, if available. Check the inner and outer fork tubes, the guide bushing and the damper rod for score marks, scratches, flaking of the chrome and excessive or abnormal wear. Look for dents in the tubes and replace them if any are found. Check the fork seal seat for nicks, gouges and scratches. If damage is evident, leaks will occur around the seal-to-outer tube junction. Replace worn or defective parts with new ones.

11 Have the inner fork tube checked for runout at a dealer service department or other repair shop. **Warning:** *If it is bent, it should not be straightened; replace it with a new one.*

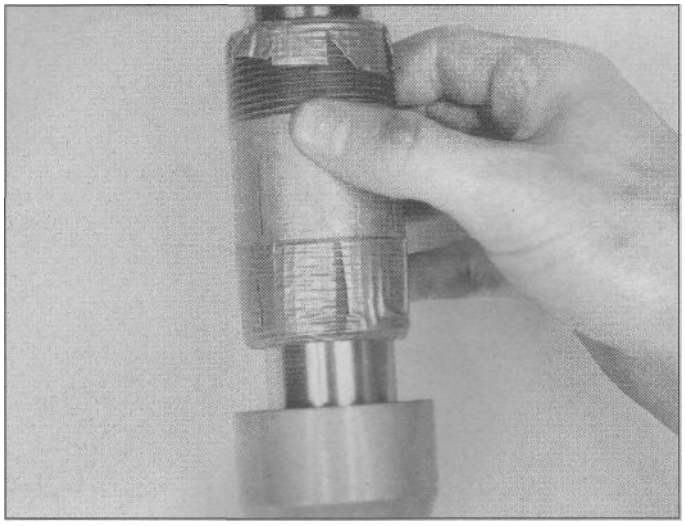
12 Measure the overall length of the long (fork) spring and check it for cracks and other damage. Compare the length to the minimum length listed in this Chapter's Specifications. If it's defective or sagged, replace both fork springs with new ones. Never replace only one spring.

Reassembly

Refer to illustrations 5.14, 5.17, 5.18, 5.19 and 5.20

13 Install the rebound spring on the damper rod. Install the damper rod in the inner fork tube, then let it slide slowly down until it protrudes from the bottom of the inner fork tube.

14 Install the oil lock piece over the end of the damper rod that protrudes from the fork tube **(see illustration).**



5.17 If you don't have the proper tool, a section of pipe can be used the same way the special tool would be used to install the outer tube guide bushing - as a slide hammer (be sure to tape the ends of the pipe so it doesn't scratch the fork tube)

15 Install the inner fork tube in the outer fork tube.

16 Apply non-permanent thread locking agent to the damper rod bolt, then install the bolt with its copper washer and tighten it to the torque listed in this Chapter's Specifications **(see illustration 5.6b).** Hold the damper rod from turning with the tool used in Step 6. **Note:** *If you didn t use the tool, tighten the damper rod bolt after the fork spring and cap bolt are installed.*

17 Slide the outer tube guide bushing down the inner tube. Using a special bushing driver (Yamaha tool no. YM-01367 and YM-8010, part nos. 90890-01367 and 90890-01370 or equivalent), drive the bushing into place until it's fully seated. If you don't have access to one of these tools, it is highly recommended that you take the assembly to a Yamaha dealer service department or other motorcycle repair shop to have this done. It is possible, however, to drive the bushing into place using a section of pipe and an old guide bushing **(see illustration).** Wrap tape around the ends of the pipe to prevent it from scratching the fork tube.

18 Lubricate the lips and the outer diameter of the oil seal with the recommended fork oil (see Chapter 1) and slide it down the inner tube, with the numbered side of the seal facing up. Drive the seal into place with the same tools used to drive in the slide bushing **(see illustration).** If you don't have access to these, it is recommended that you take the assembly to a Yamaha dealer service department or other motorcycle repair shop to have the seal driven in. If you are very careful, the seal can be driven in with a hammer and a drift punch. Work around the circumference of the seal, tapping gently on the outer edge of the seal until it's seated. Be careful - if you distort the seal, you'll have to disassemble the fork again and end up taking it to a dealer anyway!

19 Install the retaining ring, making sure the ring is completely seated in its groove **(see illustration).**

20 Install the dust seal, making sure it seats completely **(see illustration).** The same tool used to drive in the oil seal can be used for the dust seal.

21 Install the drain screw and a new gasket, if it was removed.

22 Add the recommended type and amount of fork oil (see Section 3).

23 Install the fork spring, with the closer-wound coils at the top.

24 Refer to Section 4 and install the spring seat, stopper ring and fork cap.

25 Install the fork by following the procedure outlined in Section 4. If you won't be installing the fork right away, store it in an upright position.

6 Steering head bearings - replacement

Removal

Refer to illustrations 6.5a, 6.5b, 6.6a, 6.6b, 6.6c, 6.7a, 6.7b, 6.7c, 6.7d and 6.8

1 If the steering head bearing check/adjustment (see Chapter 1) does not remedy excessive play or roughness in the steering head bearings, the entire front end must be disassembled and the bearings and races replaced with new ones.

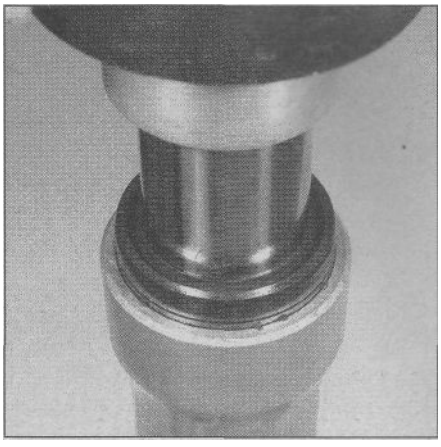
2 Refer to Section 4 and remove the front forks.

3 Remove the headlight lens (see Chapter 8) and disconnect the wiring connectors within the headlight body. Detach the headlight and turn signal assemblies from the lower triple clamp and move them out of the way.

4 Remove the safety clips, nuts and washers that secure the handlebar brackets to the triple clamp. Lift the handlebar and brackets up and support the handlebar to prevent strain on the cables and hoses.

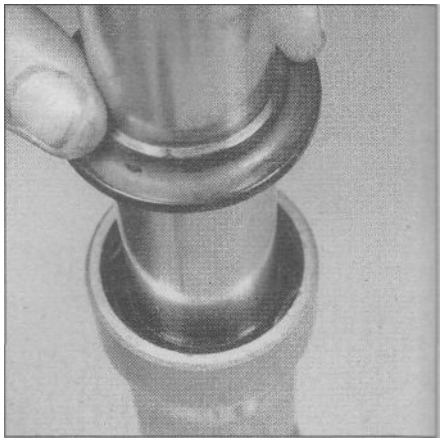
5 Unbolt the cable retainers and the brake hose retainer from the triple clamp **(see illustrations).** Detach the speedometer housing and bracket from the triple clamp and position them out of the way.

6 Remove the steering stem bolt and lift the upper triple clamp off the steering head **(see illustrations).**

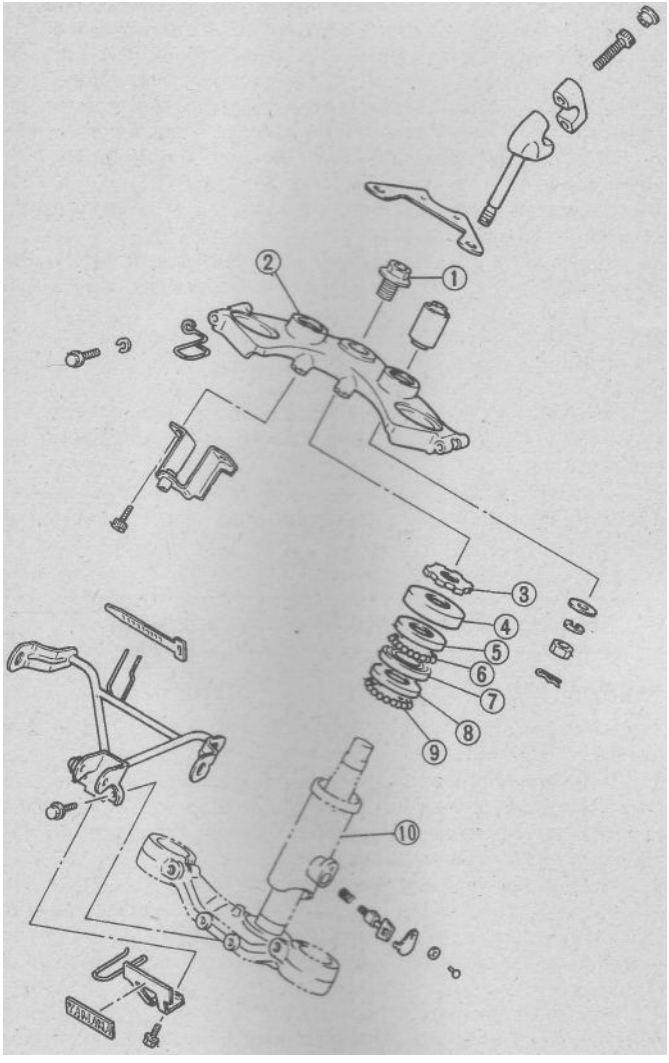


5.18 Use the same tool to drive the oil seal into position

5.19 Install the retaining ring and make sure it fits securely in its groove

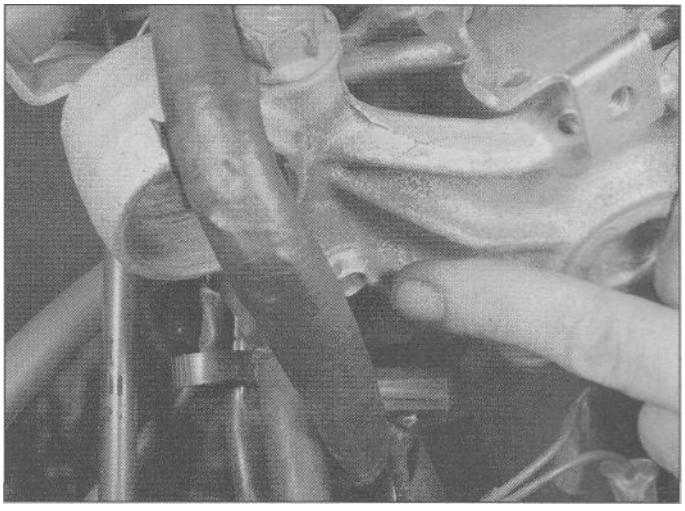


5.20 Slide the dust seal down the fork tube and tap it into position

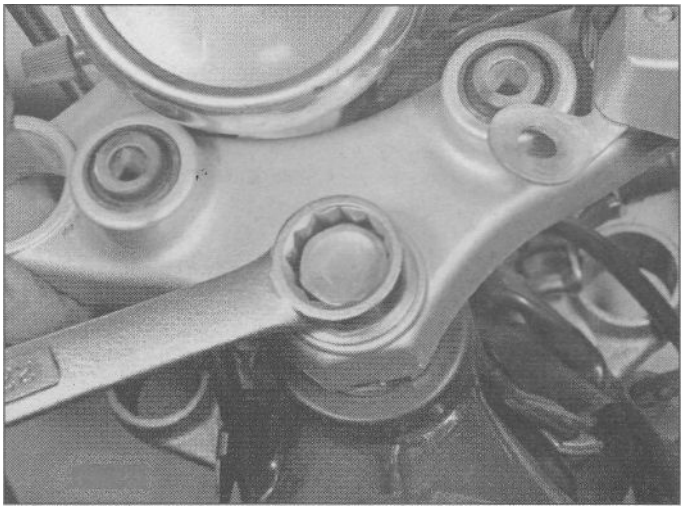


6.5a Steering head and bearings (XV535 models) - exploded view

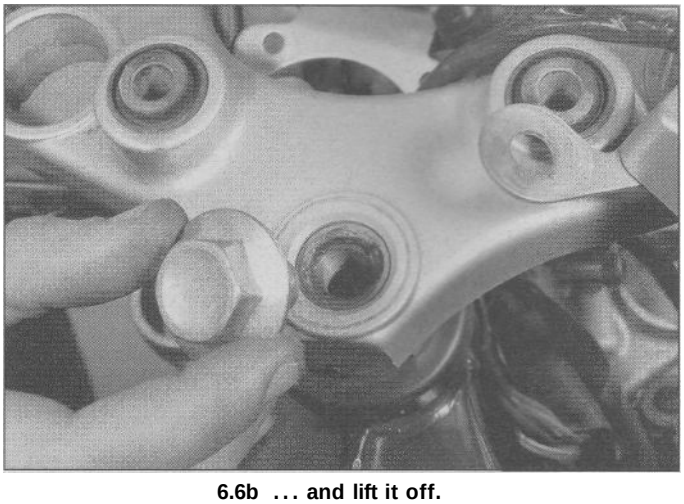
1	*Steering stem bolt*	*6*	*Steel balls (19 total)*
2	*Upper triple clamp*		*Upper bearing bottom race*
3	*Ring nut*	*8*	*Lower bearing top race*
4	*Bearing cover*	*9*	*Steel balls (19 total)*
5	*Upper bearing top race*	*10*	*Steering stem*



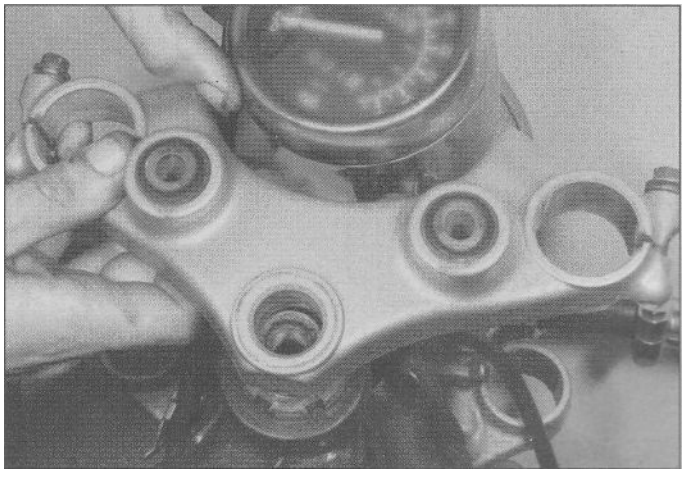
6.5b The brake hose retainer bolt is accessible from underneath the triple clamp



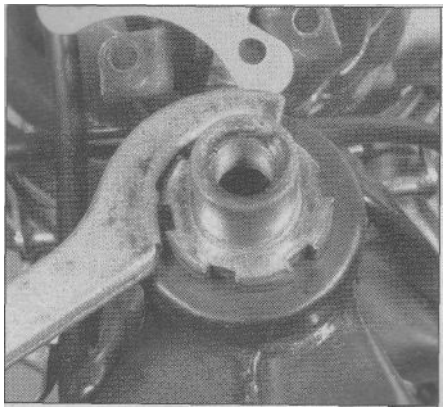
6.6a Undo the steering stem bolt with a box wrench (ring spanner)...



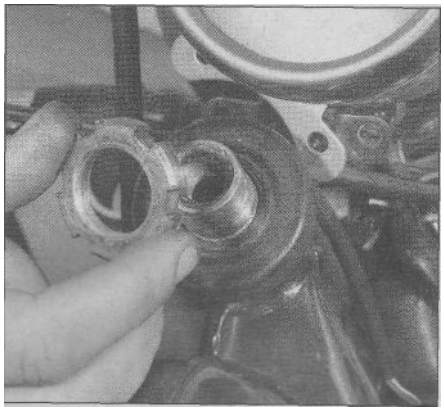
6.6b ... and lift it off.



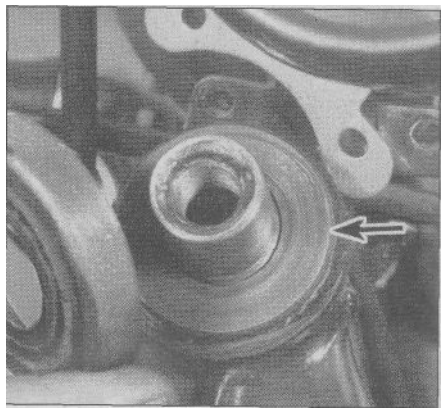
6.6c ... and lift off the upper triple clamp



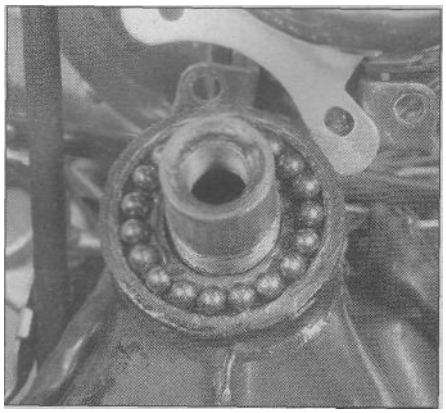
6.7a Loosen the ring nut with a ring nut wrench (C-spanner)



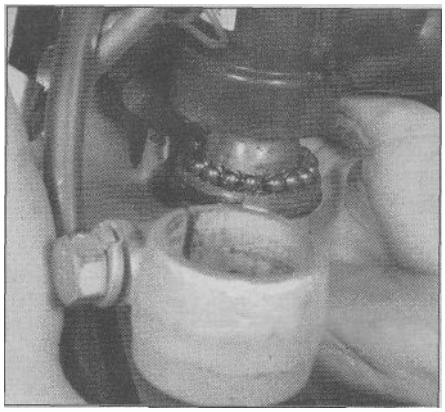
6.7b Take the ring nut off the steering stem



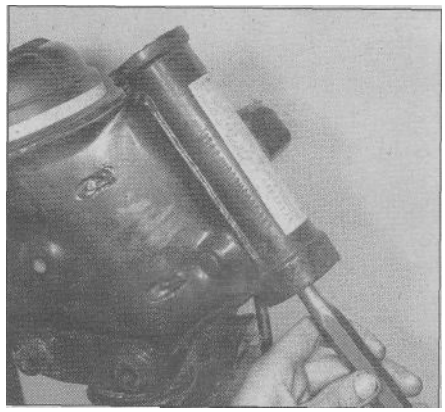
6.7c Lift off the bearing cover and the upper bearing top race (arrow)



6.7d Remove the 19 steel balls



6.8 Lower the steering stem and lower bearing balls out of the steering head



6.10a Insert a long punch or rod from below to tap out the upper bearing bottom race . . .

7 Remove the ring nut with a special wrench such as Yamaha tool YU-33975 (part no. 90890-01403) **(see illustration).** Remove the bearing cover, upper race and 19 steel balls **(see illustrations).**

8 Lower the steering stem partway out of the steering head and remove the 19 steel balls from the lower bearing **(see illustration).**

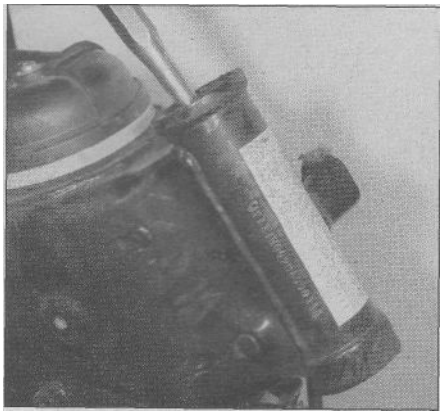
Inspection

Refer to illustrations 6.10a, 6.10b, 6.11a, 6.11b, 6.11c, 6.116, 6.13, 6.14a, 6.14b and 6.14c

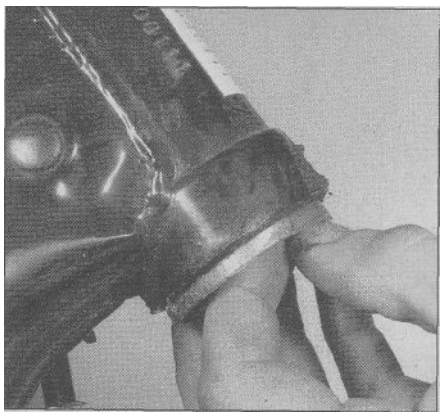
9 Check the bearings for wear. Look for cracks, dents, and pits in the races and flat spots, pitting or galling on the bearing balls. Replace any defective parts with new ones. If a new bearing is required, replace both bearings, their races and both dust seals as a set.

10 To remove the bearing races, drive them out of the steering head with a hammer and long rod or punch **(see illustrations).** A slide hammer with the proper internal-jaw puller will also work.

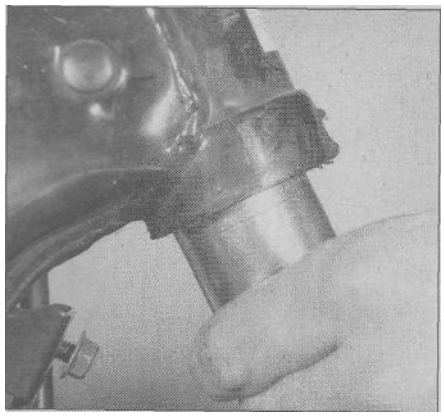
11 Since the races are an interference fit in the frame, installation will be easier if the new races are left overnight in a refrigerator. This will cause them to contract and slip into place in the frame with very little effort. When installing the races, tap them gently into place with a



6.10b . . . and from above to tap out the lower bearing top race

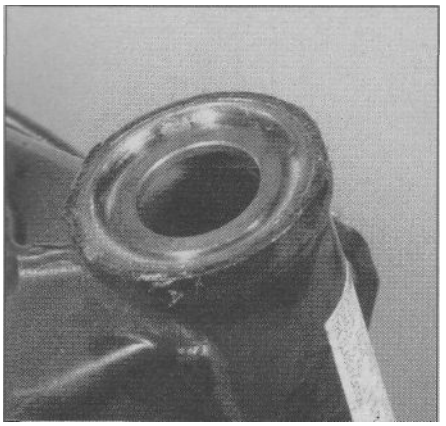


6.11a Position the lower bearing top race in the steering head . . .

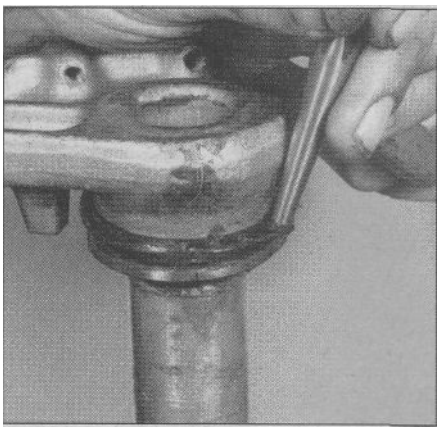


6.11b . . . and tap it into position with a socket just smaller in diameter than the race

6.11c Tap the upper bearing bottom race into position with the same tools . .

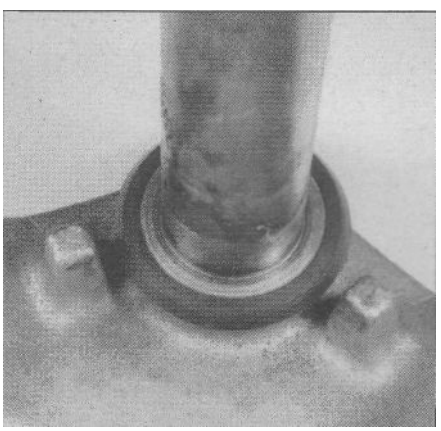


6.11d . . . **the race should look like this when installed**

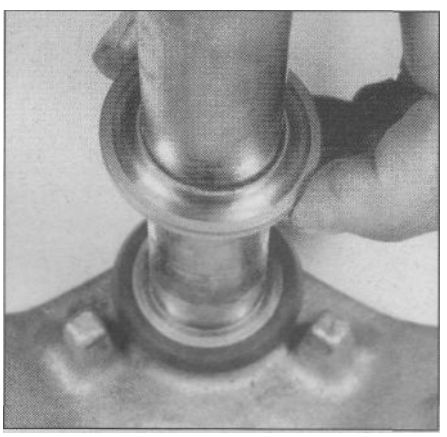


6.13 Tap the seal and lower bearing bottom race off the steering stem

6.14a Install a new seal with its concave side down . ..



6.14b . . . the seal should look like this when installed



6.14c Install the lower bearing bottom race with its groove up

hammer and punch or a large socket **(see illustrations).** Do not strike the bearing surface or the race will be damaged.

12 Inspect the steering stem/lower triple clamp for cracks and other damage. Do not attempt to repair any steering components. Replace them with new parts if defects are found.

13 Tap the seal and lower bearing race off the steering stem with a hammer and punch **(see illustration).** The seal will be ruined during this process, so don't remove it unless you plan to install a new one.

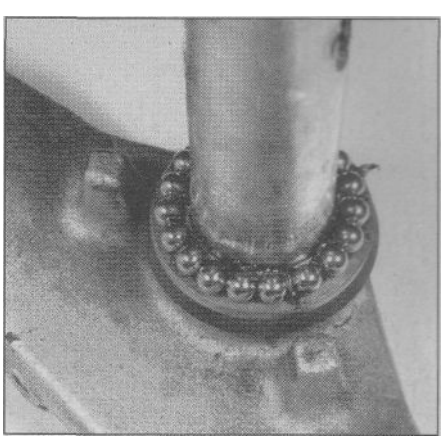
14 Install a new seal with its concave side down, then install the lower bearing bottom race **(see** illustrations).

Installation

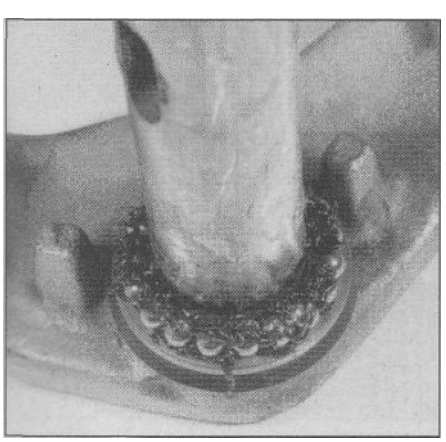
Refer to illustrations 6.15a, 6.15b, 6.16a, 6.16b, 6.16c, 6.17, 6.18a, 6.18b and 6.18c

15 Pack the lower bearing bottom race with high-quality bearing grease (preferably a moly-based grease). Stick 19 steel balls to the grease around the race, then add more grease **(see illustrations). Note:** *A small hand-operated grease gun will make this job easier.*

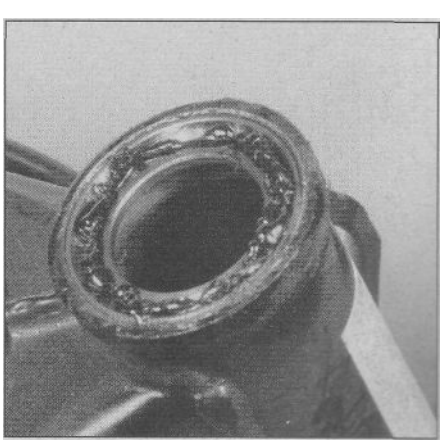
16 Pack the upper bearing and install the steel balls in the same way as for the lower bearing **(see illustrations).**



6.15a Pack the race with grease and install 19 steel balls . . .

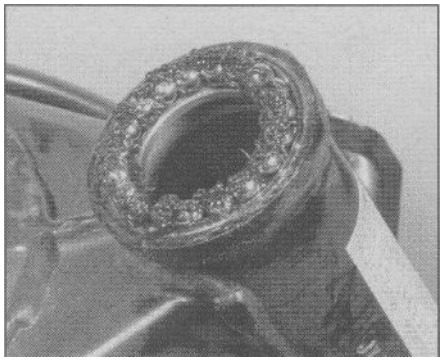


6.15b . . . then pack more grease on top of the balls

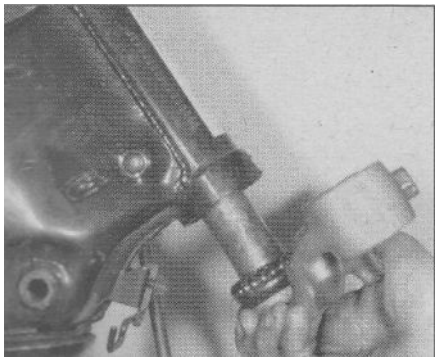


6.16a Apply a layer of grease to the upper **bearing bottom race** .. .

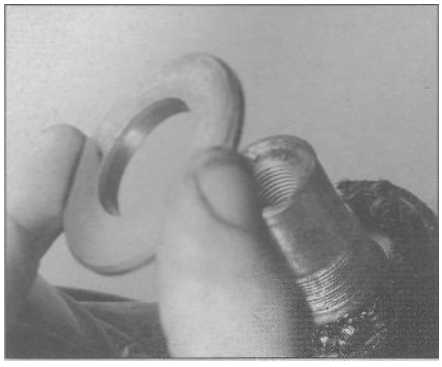
6.16b . .. **stick 19** steel balls to **the** grease .. .



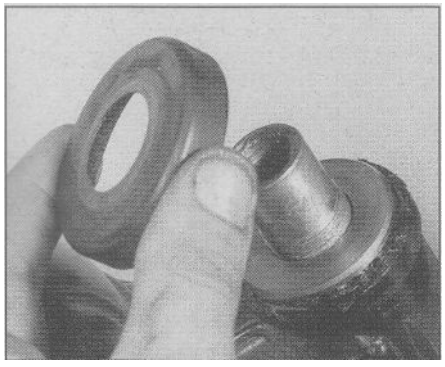
6.16c . . . then add more grease



6.17 Slip the steering stem into the steering head, taking care not to dislodge the steel balls



6.18a Install the upper bearing top race with its flat side up



6.18b Install the bearing cover over the race

6.18c Install the ring nut and adjust the bearings

17 Slip the steering stem into the steering head, taking care not to dislodge any of the bearing balls **(see illustration).**

18 Install the top race on top of the upper bearing balls, then install the bearing cover and the ring nut **(see illustrations).**

19 Refer to Chapter 1 and adjust the bearings.

20 The remainder of installation is the reverse of the removal steps.

7 Rear shock absorbers - removal, inspection and installation

Removal

Refer to illustrations 7.2, 7,3a, 7.3b and 7.4

1 Support the bike securely so it can't be knocked over during this procedure. Place a jack beneath the frame to lift the rear tire off the ground and support the swingarm so it can't drop.

2 Remove the cover from the top end of the shock absorber **(see illustration).** On models so equipped, remove the backrest (see Chapter 7).

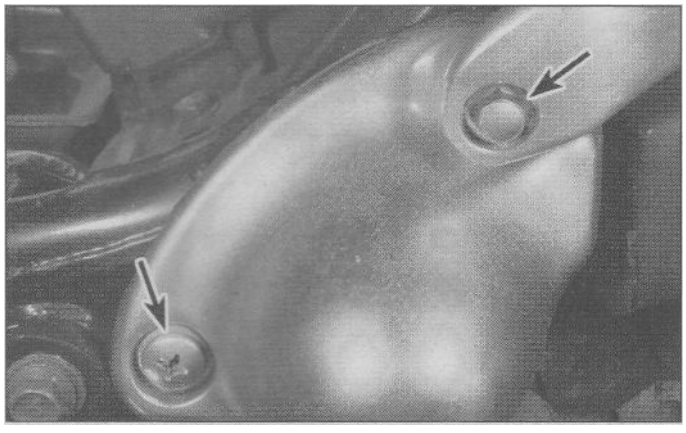
3 Unbolt the top end of the shock from the frame **(see illustrations).**

4 Remove the bolt that secures the lower end of the right shock or the nut that secures the lower end of the left shock **(see illustration).** Rotate" the top end of the shock toward the rear of the bike and take it off.

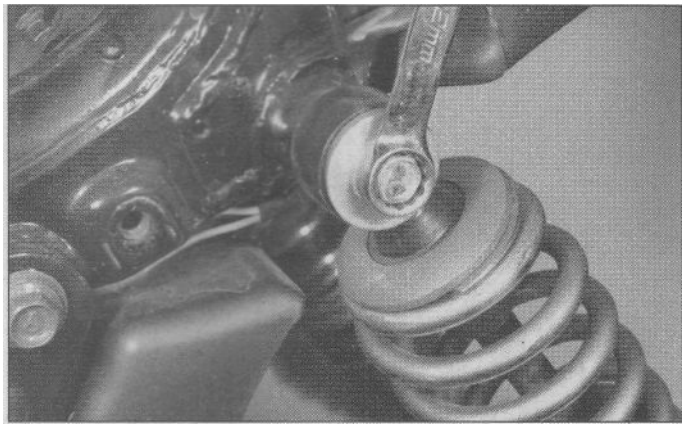
Inspection

Refer to illustration 7.6

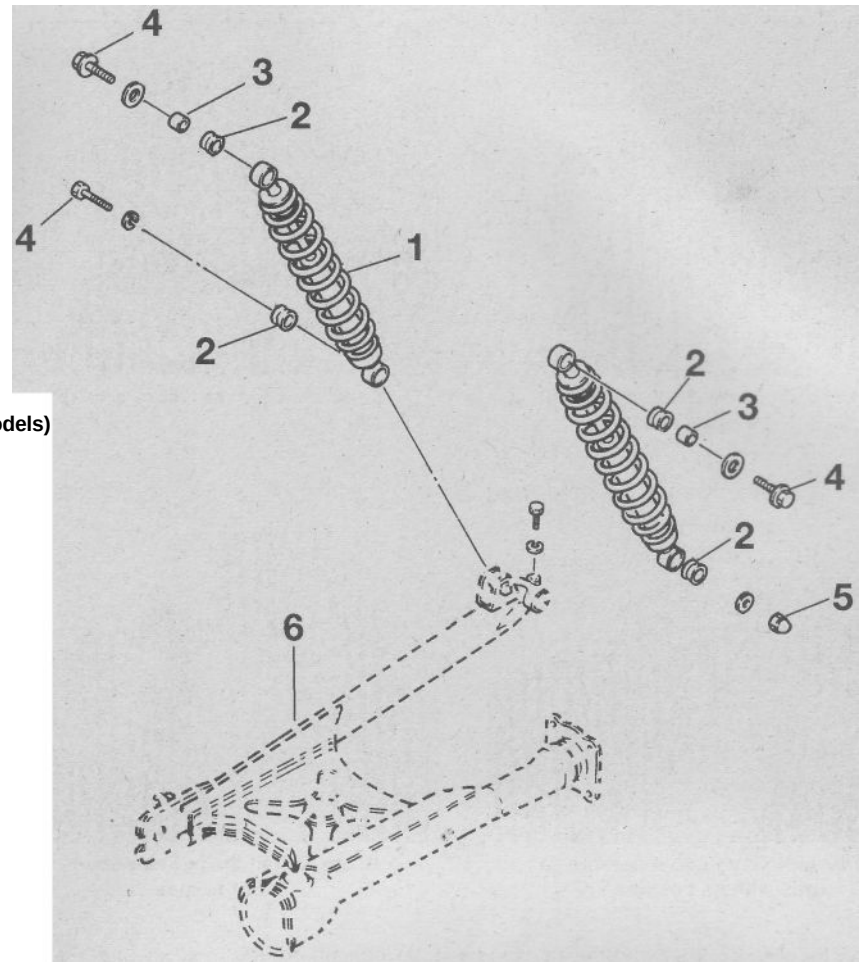
5 Check the shock for obvious physical damage and the coil spring



7.2 Remove the shock absorber cover fasteners (arrows); on some models one of the fasteners also secures the backrest



7.3a Remove the upper mounting bolt



7.3b Rear shock absorber details **(XV535 models)**

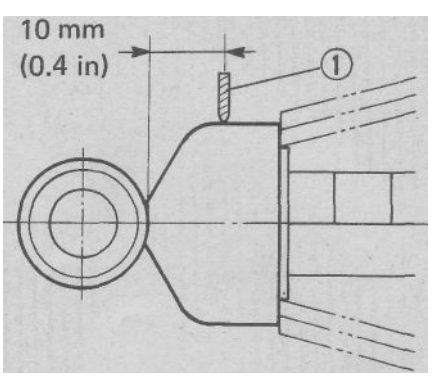
1 Shock absorber
2 Mounting bushings
3 Collars
4 Mounting bolts
5 Mounting nut flower left only)
6 Swingarm

for looseness or signs of fatigue; replace both shock absorbers as a pair if these conditions are found. Except for mounting bushings, replacement parts are not available.

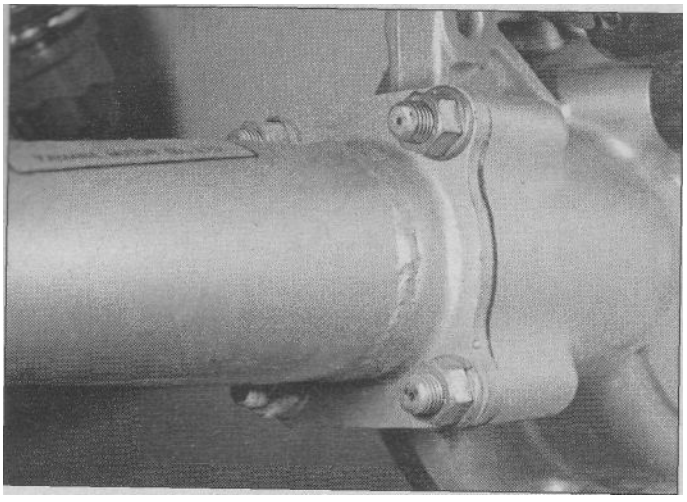
6 Check the shock for signs of oil or gas leaks and replace it if you find any. Yamaha specifies releasing the nitrogen gas pressure before throwing away the shock absorber. **Warning:** *Wear eye protection while drilling to prevent injury from flying metal chips. To release the gas pressure, drill a hole through the cylinder wall at a point 10 mm (0.4 inch) from the top of the nitrogen reservoir* **(see illustration).** *The hole should be 2 to 3 mm (0.08 to 0.12 inch) in diameter.*

7 Inspect the pivot hardware at the top and bottom of the shock and replace any worn or damaged parts.

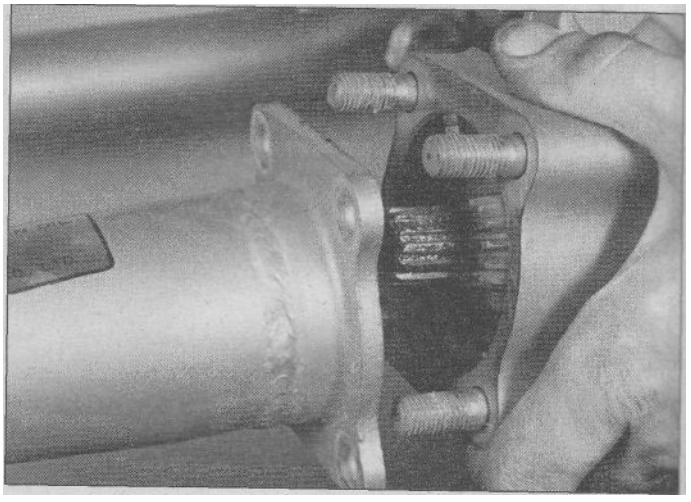
7.4 The bottom of the left shock absorber is secured by a nut



7.6 A hole must be drilled in the nitrogen reservoir before throwing the shock absorber away



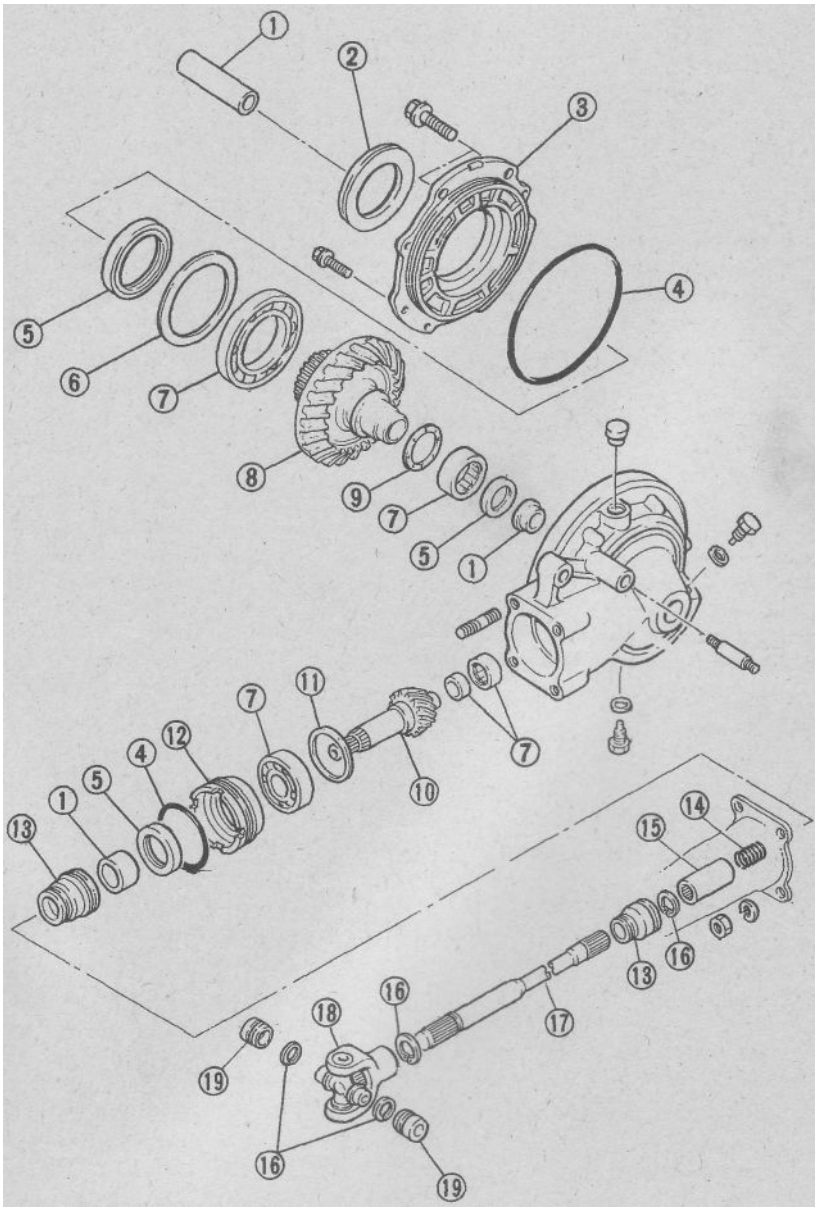
9.5a Remove the nuts and lockwashers . . .



9.5b . . . and take the final drive unit off the swingarm

9.5c Driveshaft and final drive unit (XV535 models) - exploded view

1 Collar
2 Dust seal
3 Bearing housing
4 O-ring
5 Oil seal
6 Ring gear shim
7 Bearing
8 Ring gear
9 Thrust washer
10 Drive pinion gear
11 Final drive gear shim
12 Bearing retainer
13 Boot
14 Spring
15 Coupling gear
16 Snap-ring
17 Driveshaft
18 Universal joint
19 Bearing



Installation

8 Coat the pivot points with a thin layer of multi-purpose lithium-based grease. Install the shock with the tightly would spring coils down. Tighten the top bolts, then the bottom right bolt, then the bottom left nut to the torques listed in this Chapter's Specifications.

8 Swingarm bearings - check

1 Refer to Chapter 6 and remove the rear wheel, then refer to Section 7 and remove the rear shock absorbers.
2 Grasp the rear of the swingarm with one hand and place your other hand at the junction of the swingarm and the frame. Try to move the rear of the swingarm from side-to-side. Any wear (play) in the bearings should be felt as movement between the swingarm and the frame at the front. The swingarm will actually be felt to move forward and backward at the front (not from side-to-side). If any play is noted, the bearings should be replaced with new ones (see Section 11).
3 Next, move the swingarm up and down through its full travel. It should move freely, without any binding or rough spots. If it does not move freely, refer to Section 10 for servicing procedures.

9 Driveshaft and final drive - removal, inspection and installation

Removal

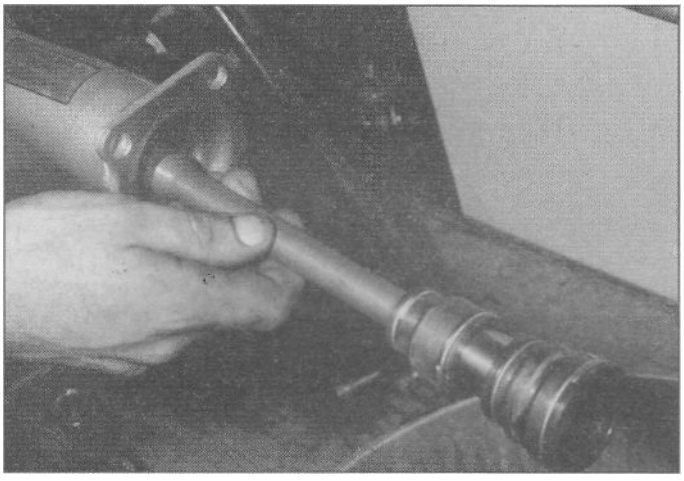
Refer to illustrations 9.5a, 9.5b, 9.5c, 9.6, 9.7, 9.8a, 9.8b and 9.9

1 Support the bike securely so it can't be knocked over during this procedure.
2 Remove the exhaust system (see Chapter 3).
3 Remove the rear wheel (see Chapter 6).
4 Remove the rear shock absorbers (see Section 7).
5 Remove the nuts and lockwashers and detach the final gear assembly from the swingarm (see **illustrations).**
6 Remove the spring from the end of the driveshaft **(see illustration).**
7 Slide the driveshaft out of the swingarm **(see illustration).**
8 Slide the boot and coupling gear off the driveshaft **(see illustrations).**
9 Slide the forward boot up the driveshaft slightly, remove the snap-ring and slide the forward boot off **(see illustration).**

Inspection

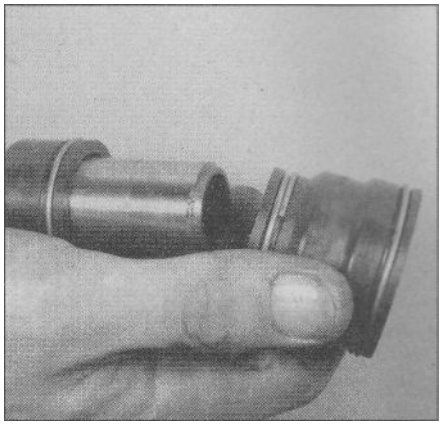
10 Thoroughly clean the driveshaft and related parts with solvent. Wipe the final gear assembly clean with a rag moistened in solvent.
11 Check all parts for obvious wear or damage and replace any worn or damaged parts.

9.6 Take out the spring

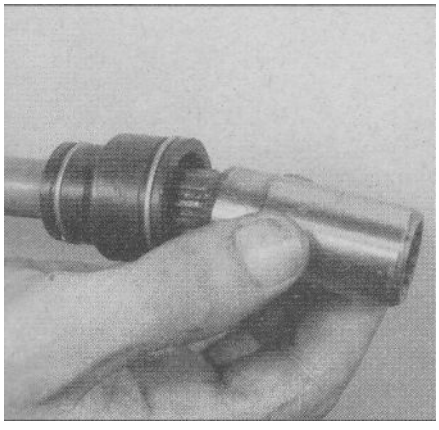


9.7 Pull the driveshaft backward and take it out of the swingarm

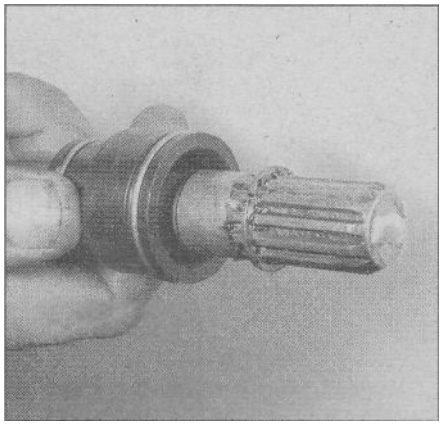
12 The final drive unit requires special tools to measure and adjust gear backlash. The procedure is complicated and should be done by a dealer service department or other qualified shop. Rotate the pinion shaft (the one that mates with the driveshaft) by hand. The ring gear splines (the part that mates with the rear wheel) should rotate smoothly. If rotation feels rough or jerky or if it's noisy, have the final drive unit disassembled and inspected.



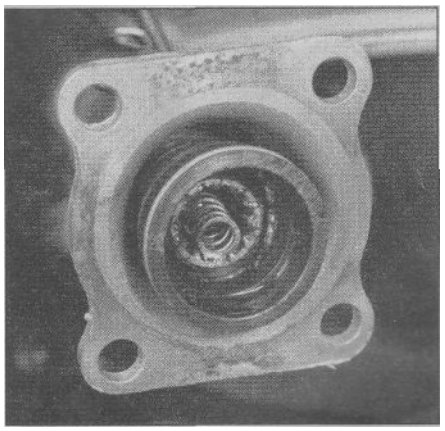
9.8a Slide the boot off the coupling gear



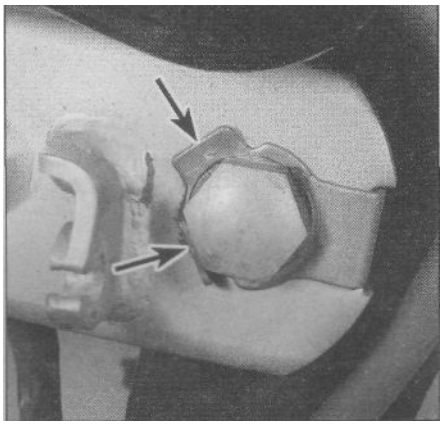
9.8b Slide the coupling gear off the shaft



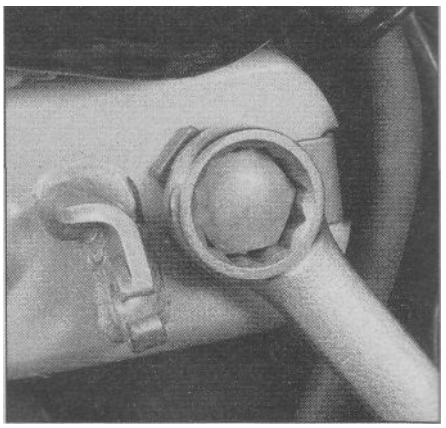
9.9 Remove the snap-ring, then slide the forward boot off



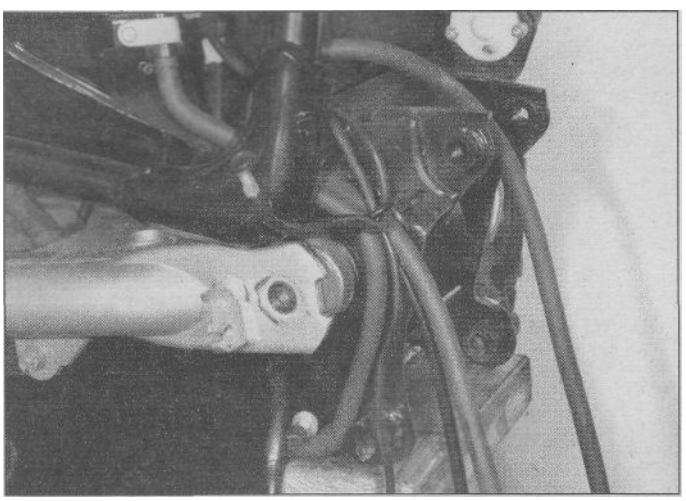
9.13 Be sure the spring is in position before installing the final drive unit



10.6a Bend back the lockwasher tabs (arrows)...



10.6b ... and remove the pivot shaft



10.8a Pull the swingarm back to remove it

Installation

Refer to illustration 9.13

13 Installation is the reverse of the removal steps, with the following additions: .

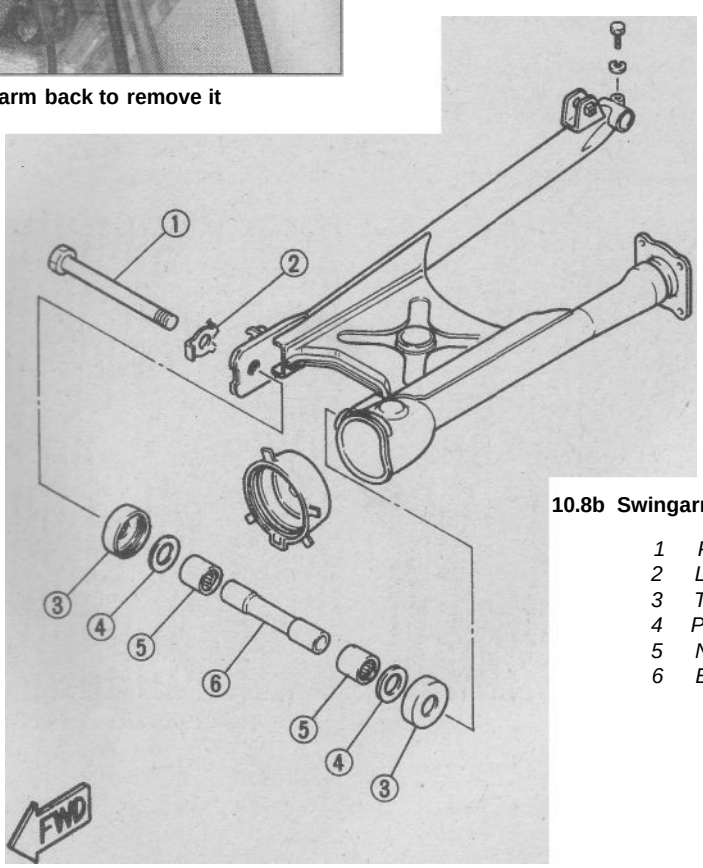
a) Lubricate the driveshaft splines with multi-purpose lithium-based grease.

b) Apply silicone sealant to the mating surfaces of the swingarm and final drive unit.

c) Make sure the spring is in place in the end of the driveshaft (see **illustration).**

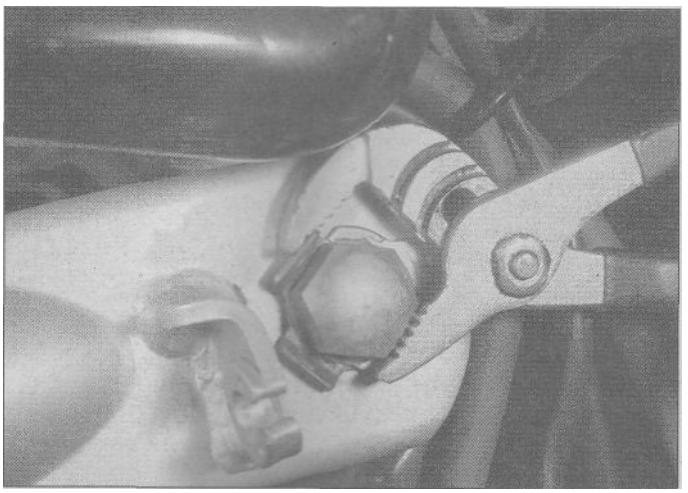
d) Use new lockwashers and tighten the final drive-to-swingarm nuts to the torque listed in this Chapter's Specifications.

e) Check the oil level in the final drive unit and top up as needed (see Chapter 1).

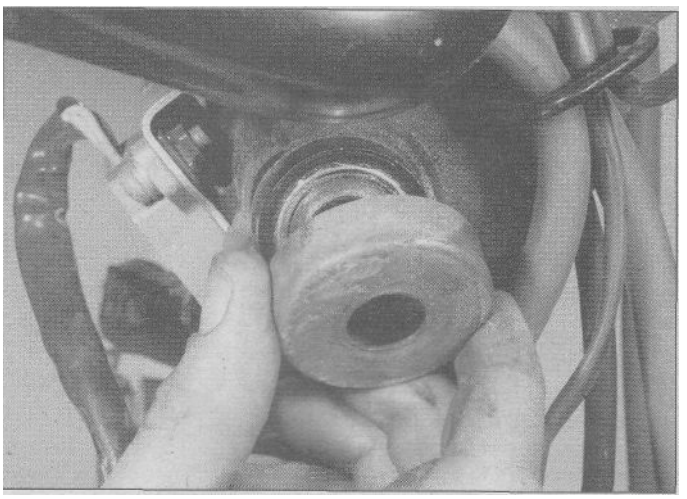


10.8b Swingarm (XV535 **models) - exploded view**

1 Pivot shaft
2 Lockwasher
3 Thrust cover
4 Plain washer
5 Needle roller bearing
6 Bushing



10.9 Bend the lockwasher tabs against the head of the pivot shaft



11.2 Pry the thrust cover loose and pull it off

10 Swingarm - removal and installation

Refer to illustrations 10.6a, 10.6b, 10.8a, 10.8b and 10.9

1 Support the bike securely so it can't be knocked over during this procedure.

2 Remove the exhaust system (see Chapter 3).

3 Remove the rear wheel and disconnect the rear brake pedal and rod, noting that the cable must be detached from its slot in the swingarm (see Chapter 6).

4 Remove the rear shock absorbers (see Section 7).

5 Remove the right rear side cover (see Chapter 7).

6 Bend back the tabs on the lockwasher that secures the swingarm pivot shaft head (see illustration). Unscrew the swingarm pivot shaft and take it out (see illustration).

7 Remove the final gear assembly and driveshaft (see Section 9).

8 Pull the swingarm off the motorcycle **(see illustrations).**

9 Installation is the reverse of the removal steps, with the following additions:

a) Apply multi-purpose lithium grease to the driveshaft splines.

b) Install the swingarm without the driveshaft, then install the driveshaft as described in Section 9.

c) Use a new lockwasher and be sure its tab engages the slot in the swingarm. Tighten the pivot shaft to the torque listed in this Chapter's Specifications, then bend the lockwasher against the flats on the shaft head **(see illustration).**

11 Swingarm bearings - inspection and replacement

Refer *to illustrations 11.2, 11.3 and 11.4*

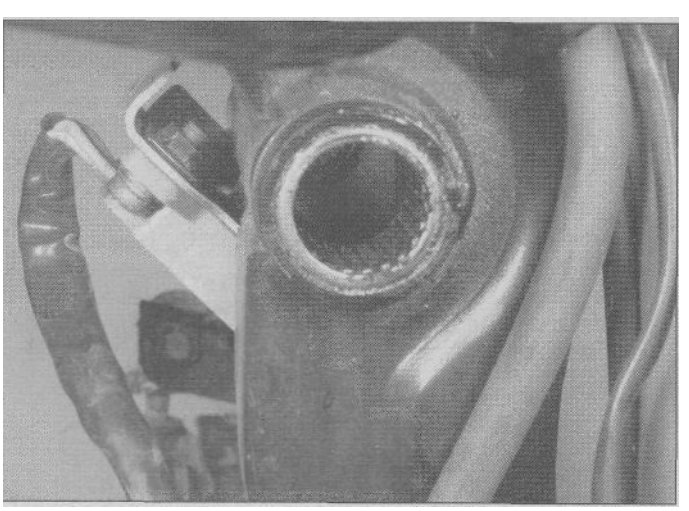
1 Remove the swingarm (see Section 10).

2 Pry off the thrust cover and remove the plain washer from each side of the frame **(see illustration).**

3 Slide the bushing out **(see illustration).**

4 Inspect the bearings **(see illustration).** If they're dry, lubricate them with lithium base waterproof wheel bearing grease. If they're worn or damaged, take the motorcycle to a Yamaha dealer or motorcycle repair shop for bearing replacement.

11.3 Pull out the bushing



11.4 **The bearings may require a blind hole puller for removal**

Notes

Chapter 5 Part B
Steering, suspension and final drive (XV700-1100 models)

Contents

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Steering head bearings (1984 and later models) - replacement	5
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Swingarm bearings - check	11
Swingarm bearings - inspection and replacement	15
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Specifications

Front suspension

Fork spring length	
1981 through 1983 XV750	635 mm (25.0 inches)
XV920J, K and MK	624.7 mm (24.6 inches)
XV920 RH, RJ and TR1	577.5 mm (22.7 inches)
1984 and 1985 models (except TR1)	508 mm (20.0 inches)
1986-on models	513 mm (20.2 inches)
Fork oil capacity (US)	
1981 through 1983 XV750	278 cc (9.40 US fl oz, 9.78 Imp fl oz)
XV920J	303 cc (10.24 US fl oz, 10.66 Imp fl oz)
XV920 K and MK	290 cc (9.80 US fl oz, 10.20 Imp fl oz)
XV920 RH, RJ and **TR1**	264 cc (8.92 US fl oz, 9.30 Imp fl oz)
1984 and 1985 XV700	389 cc (13.1 US fl oz, 13.7; Imp fl oz)
1986-on XV700 and 750	396 cc (13.4 US fl oz, 13.9 Imp fl oz)
1984-on XV1000 and 1100	372 cc (12.6 US fl oz, 13.1 Imp fl oz)

Fork oil level (US)	
1981 through 1983 models	Not specified
XV700, XV750, XV1000	155 mm (6.1 inches) below top of inner fork tube*
XV1100	179 mm (7.0 inches) below top of inner fork tube*
Fork oil capacity (UK)	
1981 through 1983 XV750	278 cc (9.40 US.fl oz, 9.78 Imp fl oz)
XV920J	303 cc (10.24 US fl oz, 10.66 Imp fl oz)
XV920Kand MK	290 cc (9.80 US fl oz, 10.20 Imp fl oz)
XV920 RH, RJ and TR1	264 cc (8.92 US fl oz, 9.30 Imp fl oz)
1986 and later models	396 cc (13.4 US fl oz, 13.9 Imp fl oz)
Fork oil level (UK)	
1981 through 1983 models	Not specified
1992-on XV750, 1994 XV1100	155 mm (6.1 inches) below top of inner fork tube*
1986 through 1993 XV1000 and 1100	179 mm (7.0 inches) below top of inner fork tube*

Rear suspension

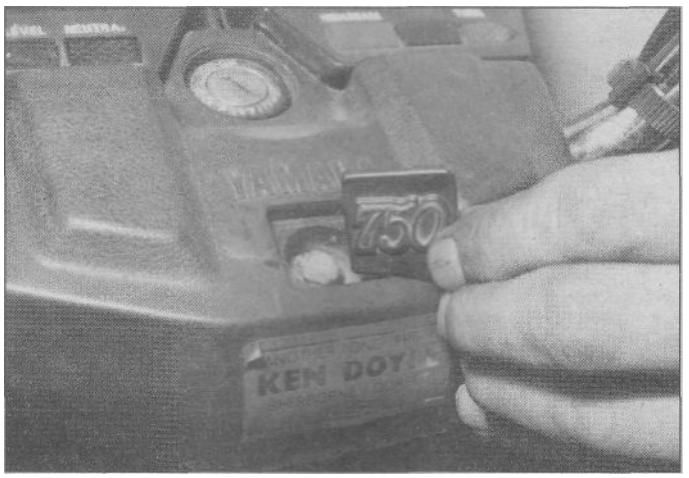
Rear spring free length	
1981 through 1983 XV750	167 mm (6.57 inches)
XV920 J, K, MK	168.5 mm (6.63 inches)
XV920 RH, RJ and TR1	172 mm (6.77 inches)
1984 and 1985 models (except TR1)	223 mm (8.78 inches)
1986-onXV700andXV750	224.5 mm (8.83 inches)
1986-onXV1100	216.5 mm (8.5 inches)
Rear spring sag limit	5 mm (0.20 inch)
Swingarm end play and side play limits	1 mm (0.04 inch)

**With spring removed and fork fully compressed.*

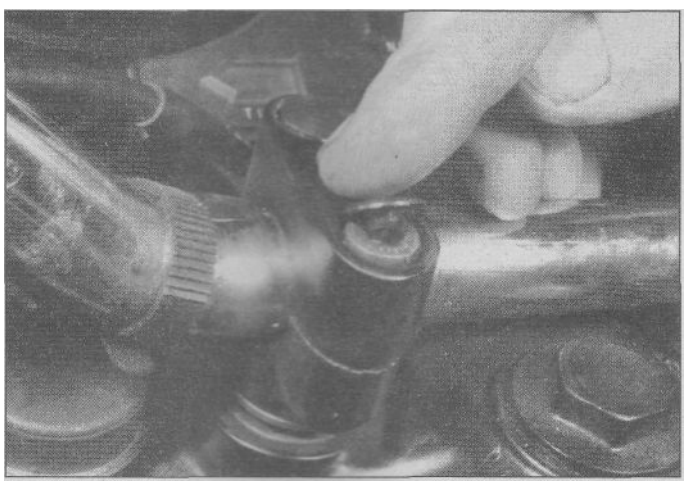
Torque specifications

1981 through 1983 models	
Front forks	
Damper rod bolt	20 Nm (14 ft-lbs)**
Triple clamp pinch bolts	20 Nm (14 ft-lbs)
Handlebars and steering stem	
Handlebar bracket to upper triple clamp nuts (XV920J only)	23 Nm (17 ft-lbs)
Handlebar pinch bolts (XV920J only)	
Inner sections	30 Nm (22 ft-lbs)
Outer sections	13 Nm (9 ft-lbs)
Steering stem bolt	
XV920 J, K, MK	50 Nm (36 ft-lbs)
All others	54 Nm (39 ft-lbs)
Steering head bearing ring nut	see Chapter 1
Rear suspension unit pivot bolt	45 Nm (32.5 ft-lbs)
Swingarm pivot bolt	78 Nm (56 ft-lbs)
Final drive unit to swingarm nuts	43 Nm (31 ft-lbs)
1984-on models	
Front forks	
Damper rod bolt	23 Nm (17 ft-lbs)**
Upper triple clamp pinch bolts	20 Nm (14 ft-lbs)
Lower triple clamp pinch bolts	23 Nm (17 ft-lbs)
Cap bolt	23 Nm (17 ft-lbs)
Handlebars and steering stem	
Handlebar bracket to upper triple clamp nuts	
All except 1988-on XV750	not specified
1988-onXV750	59 Nm (43 ft-lbs)
Handlebar pinch bolts	20 Nm (14 ft-lbs)
Steering stem nut	110 Nm (80 ft-lbs)
Steering head bearing ring nut	see Chapter 1
Rear shock absorber upper bolts	20 Nm (14 ft-lbs)
Rear shock absorber lower bolts/nuts	30 Nm (22 ft-lbs)
Swingarm pivot shafts	
Left pivot shaft	100 Nm (72 ft-lbs)
Right pivot shaft	
All except 1988-on XV750	5.5 Nm (4 ft-lbs)
1988-on XV750	6 Nm (4.3 ft-lbs)
Right pivot shaft nut	100 Nm (72 ft-lbs)
Final drive unit to swingarm nuts	
All except 1988-on XV750	43 Nm (32 ft-lbs)
1988-on XV750	42 Nm (30 ft-lbs)

***Apply non-permanent thread locking agent to the bolt threads.*



2.2a Pry up the bolt cover, then **remove the handlebar** cover bolt **and cover**



2.2b Remove the trim caps **from the handlebar** bracket Allen **bolts**

1 General information

The front forks are of the conventional coil spring, hydraulically-damped telescopic type. Fork air pressure is adjustable on all except 1984 and later XV700 and XV750 models.

The rear suspension on 1981 through 1983 models consists of a single shock absorber with concentric coil spring and a swingarm. Suspension damping and shock absorber air pressure are adjustable.

The rear suspension on 1984 and later models consists of twin shock absorbers with concentric coil springs and a swingarm.

Chain final drive is used on XV920 RH, RJ and RK models, as well as on 1981 through 1985 XV1000 **(TR1)** models sold in the UK. All other motorcycles covered in this Chapter use shaft final drive.

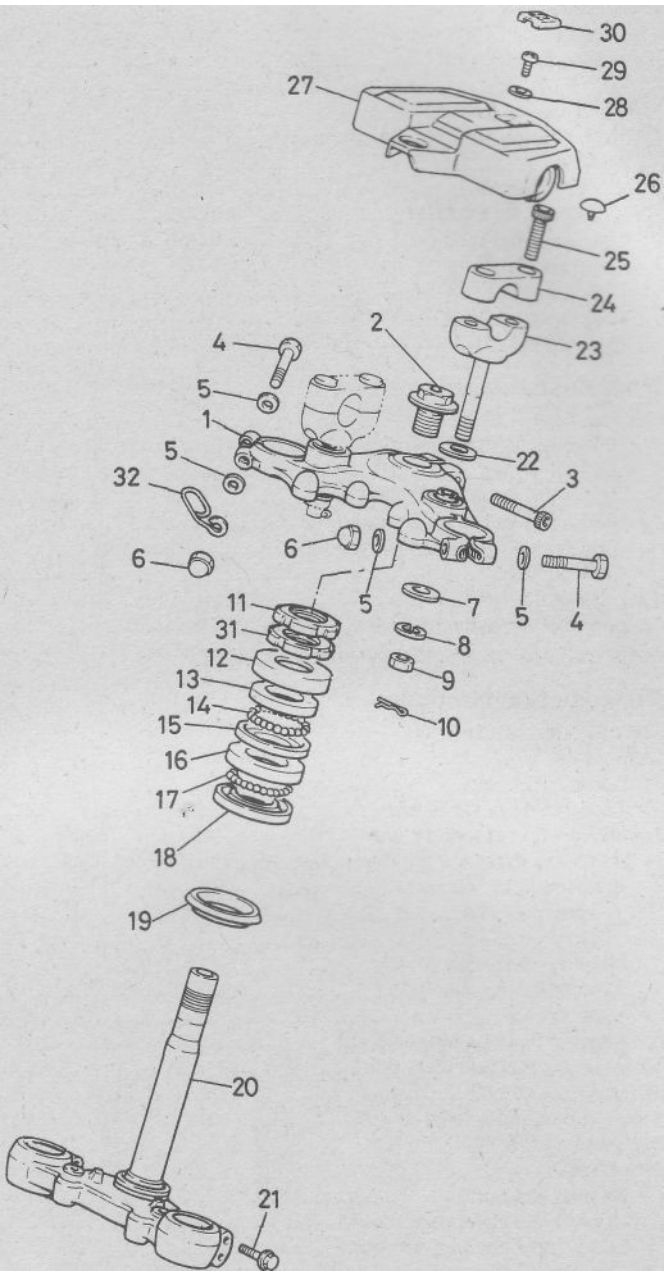
2 Handlebar(s) - removal and installation

All models except XV920J

Refer to illustrations 2.2a through 2.26, 2.7a and 2.7b

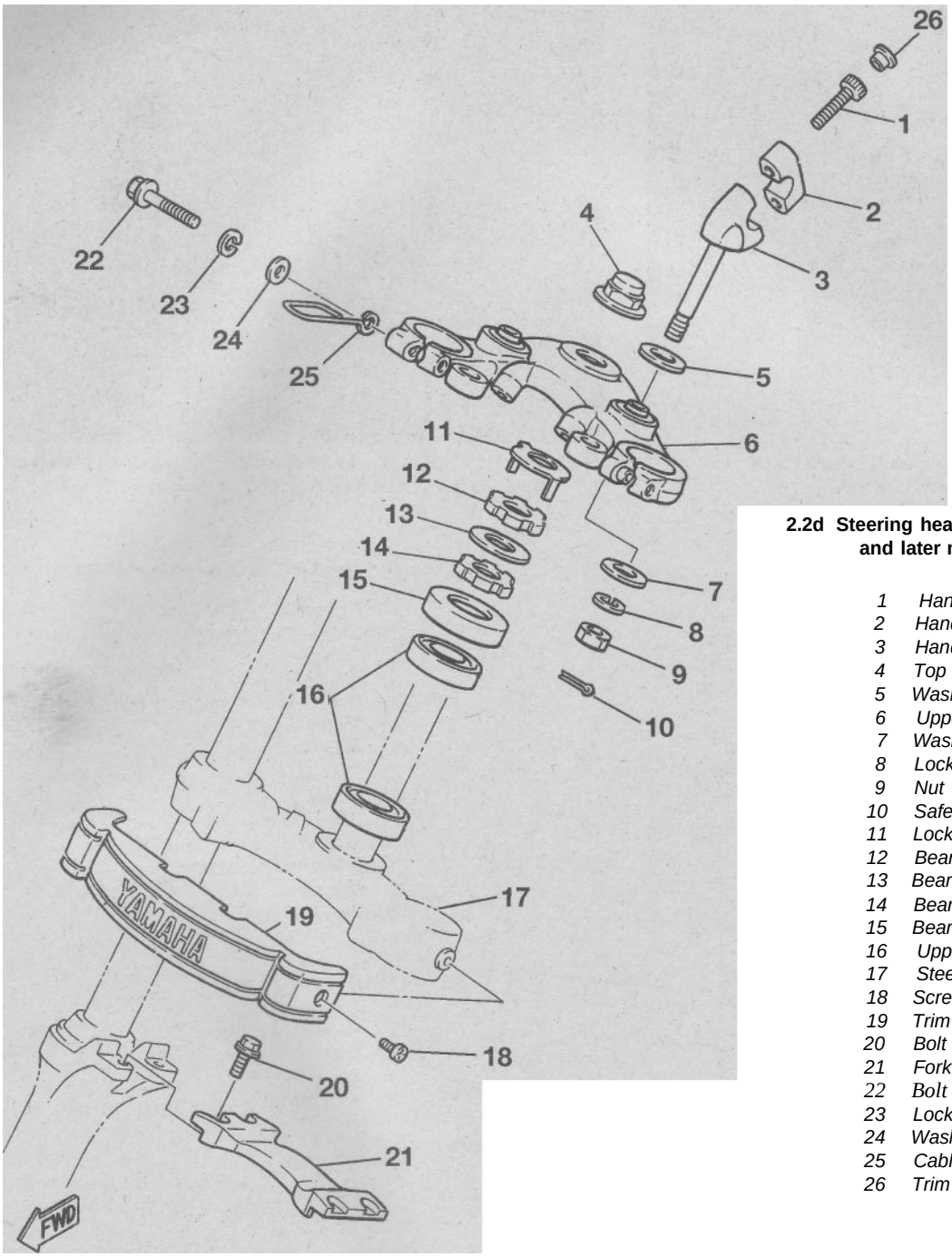
1 The handlebar is a one-piece unit that's secured to the upper triple clamp by a pair of brackets.

2 To remove the handlebar from its brackets, remove the trim cover (if equipped) and remove the bolts that secure the top half of each bracket **(see illustrations).** Lift the handlebar out.



2.2c Steering head and handlebar brackets (1981 through 1983 models except XV920J) - exploded view

1 Upper triple clamp
2 Top bolt
3 Steering stem pinch bolt
4 Fork pinch bolt
5 Washer
6 Nut
7 Washer
8 Lockwasher
9 Nut
10 Safety clip
11 Bearing locknut
12 Bearing cover
13 Upper bearing top race
14 Upper bearing balls
15 Upper bearing bottom race
16 Lower bearing top race
17 Lower bearing balls
18 Lower bearing bottom race
19 Dust seal
20 Steering stem/lower triple clamp
21 Bolt
22 Washer
23 Handlebar bracket (lower half)
24 Handlebar bracket (upper half)
25 Bolt
26 Plug (chain drive models only)
27 Handlebar cover
28 Washer
29 Screw or bolt
30 Trim cover
31 Bearing ring nut
32 Cable guide



2.2d Steering head and handlebar brackets (1984 and later models) - exploded view

1 *Handlebar bracket bolt*
2 *Handlebar bracket (upper half)*
3 *Handlebar bracket (lower half)*
4 *Top nut*
5 *Washer*
6 *Upper triple clamp*
7 *Washer*
8 *Lockwasher*
9 *Nut*
10 *Safety clip*
11 *Lockwasher*
12 *Bearing locknut*
13 *Bearing washer*
14 *Bearing ring nut*
15 *Bearing cover*
16 *Upper and lower bearings*
17 *Steering stem/lower triple clamp*
18 *Screw*
19 *Trim*
20 *Bolt*
21 *Fork brace*
22 *Bolt*
23 *Lockwasher*
24 *Washer*
25 *Cable guide*
26 *Trim cap*

3 If the handlebar must be removed for access to other components, such as the forks or the steering head, it's not necessary to disconnect the cables, wires or hoses, but it is a good idea to support the assembly with a piece of wire or rope, to avoid unnecessary strain on the cables, wires and the brake hose.

4 If the handlebar is to be removed completely, refer to Chapter 2 for clutch cable removal procedures, Chapter 6 for the brake master cylinder removal procedures, Chapter 3 for the throttle grip removal procedure and Chapter 8 for the switch removal procedure.

5 To remove a bracket from the upper triple clamp, pull out the safety clip and remove the nut, lockwasher and washer, then lift the bracket out.

6 Check the handlebar and brackets for cracks and distortion and replace them if any undesirable conditions are found. If the brackets were removed, check their rubber mounts for brittleness or deterioration.

7 Installation is the reverse of the removal steps, with the following additions:

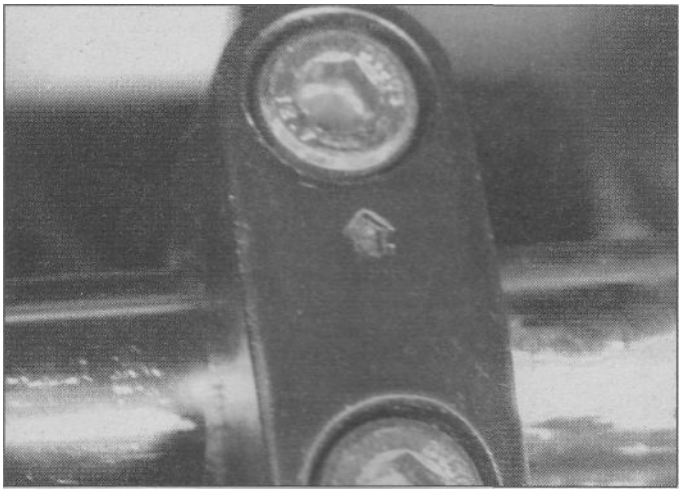
a) Make sure the arrow cast in the top half of each bracket points forward **(see illustration).**

b) Align the dot on the handlebar with the gap in the bracket **(see illustration).** *Tighten the nuts and bolts to the torques listed in this Chapter's Specifications and be sure the gaps at the front and rear of each bracket are even.*

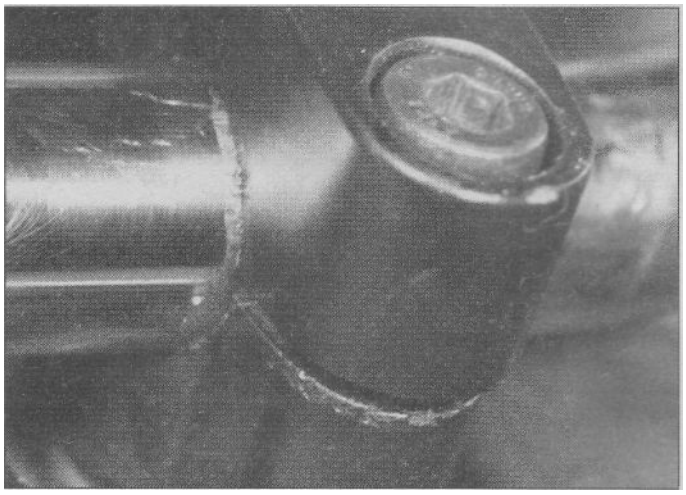
XV920J models

Refer to illustrations 2.8 and 2.10

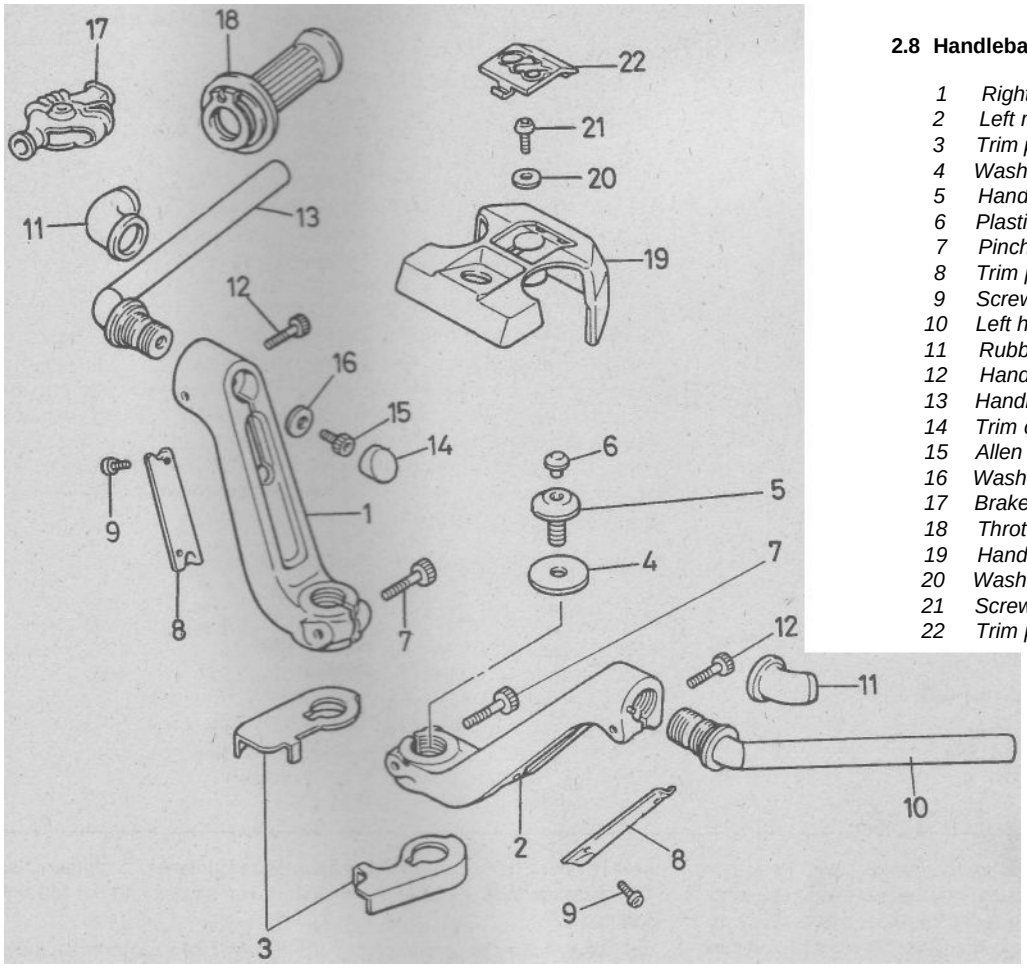
8 Pry the trim piece out of the handlebar cover, then remove the



2.7a The arrow mark on each handlebar bracket must point to the front of the motorcycle



2.7b Align the dot on the handlebar with the gap in the bracket; the gaps at front and back of the bracket must be even



2.8 Handlebars (XV920J) - exploded view

1 Right mounting bracket
2 Left mounting bracket
3 Trim plates
4 Washer
5 Handlebar riser retaining bolt
6 Plastic cap
7 Pinch bolt
8 Trim plate
9 Screw
10 Left handlebar
11 Rubber boot
12 Handlebar pinch bolt
13 Handlebar
14 Trim cap
15 Allen bolt
16 Washer
17 Brake lever cover
18 Throttle grip
19 Handlebar cover
20 Washer
21 Screw
22 Trim piece

screw, the washer and the cover **(see illustration).**

9 Pry the plastic caps out of the handlebar riser retaining bolts, then remove the retaining bolts and washers and loosen the pinch bolts.

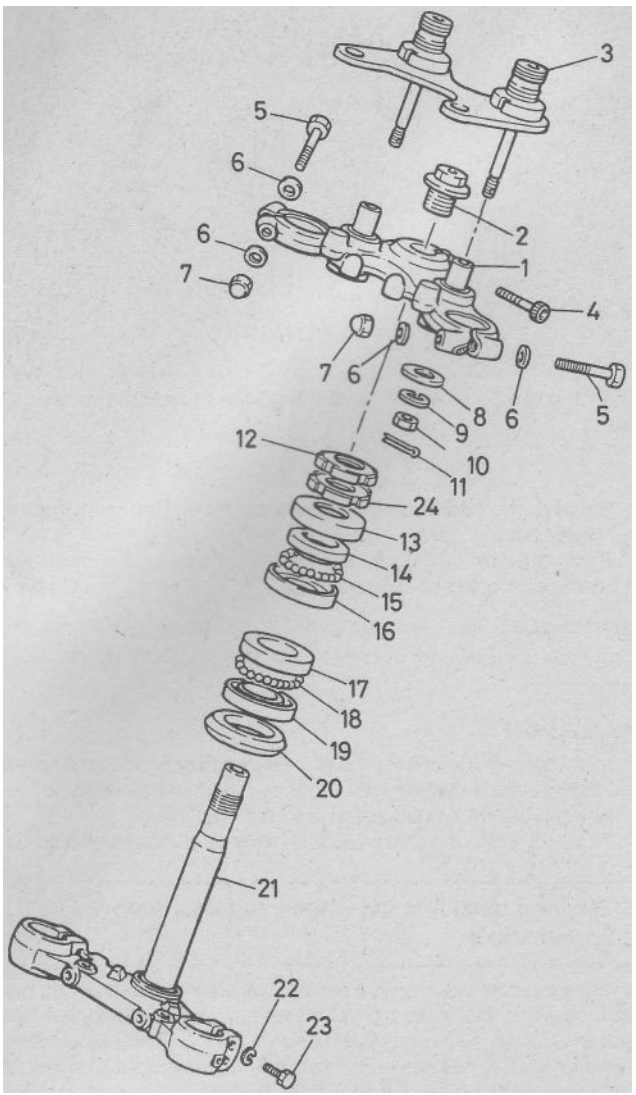
10 Lift the handlebars off the mounting bracket **(see illustration).**

11 If the handlebar must be removed for access to other components, such as the forks or the steering head, it's not necessary to disconnect the cables, wires or hoses, but it is a good idea to support the assembly with a piece of wire or rope, to avoid unnecessary strain on the cables, wires and the brake hose.

12 If the handlebar is to be removed completely, refer to Chapter 2 for clutch cable removal procedures, Chapter 6 for the brake master cylinder removal procedures, Chapter 3 for the throttle grip removal procedure and Chapter 8 for the switch removal procedure.

13 To remove the brackets from the upper triple clamp, pull out the safety clips and remove the nuts, lockwashers and washers (see **illustration 2.10),** then lift the bracket out.

14 Check the handlebar and bracket for cracks and distortion and replace them if any undesirable conditions are found.



2.10 Steering head and handlebar bracket (XV920J) - exploded view

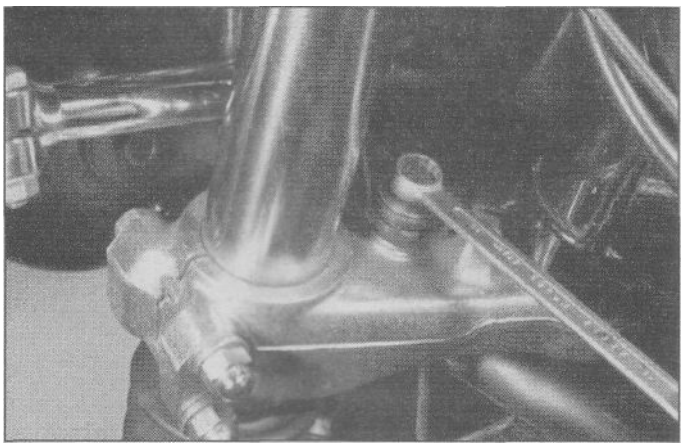
1	*Upper triple clamp*	*14*	*Upper bearing top race*
2	*Top bolt*	*15*	*Upper bearing balls*
3	*Handlebar bracket*	*16*	*Upper bearing bottom race*
4	*Steering stem inch bolt*	*17*	*Lower bearing top race*
5	*Fork pinch bolt*	*18*	*Lower bearing balls*
6	*Washer*	*19*	*Lower bearing bottom race*
7	*Nut*	*20*	*Dust seal*
8	*Washer*	*21*	*Steering stem/lower triple clamp*
9	*Lockwasher*	*22*	*Lockwasher*
10	*Nut*	*23*	*Bolt*
11	*Safety clip*	*24*	*Bearing ring nut*
12	*Locknut*		
13	*Bearing cover*		

15 Installation is the reverse of the removal steps, with the following additions:

a) Adjust the handlebar position (see Section 3).
b) Tighten the nuts and bolts to the torques listed in this Chapter's Specifications.

3 Handlebar adjustment (XV920J models)

1 There are two handlebar adjustments: the risers can be rotated on the bracket to one of three positions, and the handlebars themselves can be raised or lowered to one of three positions.



4.13a Unbolt the headlight brackets from the lower triple clamp . . .

2 To adjust the risers, refer to Section 2 and detach the handlebars from their bracket. Place the risers in one of the three adjustment positions, then refer to Section 2 and install the risers.

3 To adjust the handlebars, remove the trim caps from the tops of the risers **(see illustration 2.8).** Loosen the Allen bolts that secure the handlebars in the risers and loosen the pinch bolts. Pull the handlebars out of the risers far enough to rotate them to one of the three adjustment positions, then push the handlebars all the way back in.

4. Tighten the Allen bolts to the torque listed in this Chapter's Specifications and install the trim caps. **Warning:** *Don't adjust the risers or the handlebars to any position other than the three positions provided; this could cause loss of steering control.*

4 Steering head bearings (1981 through 1983 models) - replacement

1 Ball bearings are used in the steering head of 1981 through 1983 models. If the steering head bearing check/adjustment (see Chapter 1) does not remedy excessive play or roughness in the steering head bearings, the entire front end must be disassembled and the bearings and races replaced with new ones.

Removal(allmodelsexceptXV920J)

2 Remove the front wheel (see Chapter 6).

3 Refer to Section 7 and remove the front forks.

4 Disconnect the negative cable from the battery to prevent an accidental short circuit while disconnecting electrical wiring.

5 Cover the fuel tank with a blanket to prevent damage.

6 Remove the handlebar and place it back out of the way. It shouldn't be necessary to disconnect the cables or brake hose, but if necessary, remove tie wraps to allow slack in the cables. Also, make sure the master cylinder stays upright to prevent fluid leakage.

7 Remove the headlight lens (see Chapter 8) and disconnect the wiring connectors within the headlight body.

XV750 models

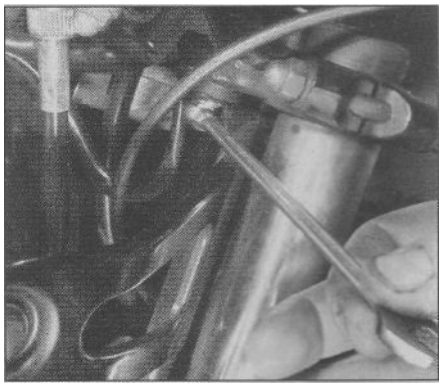
8 Remove the single screw that controls vertical adjustment of the headlight.

9 Unscrew the speedometer cable from the speedometer and remove two Allen bolts that secure the instrument bracket. Pull the headlight assembly and instrument cluster forward, away from the upper triple clamp.

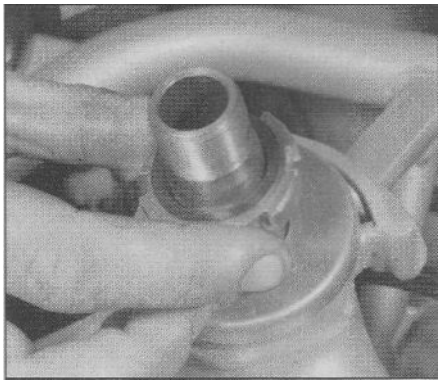
10 Remove the fuse holder cover and detach the fuse holder from the lower triple clamp.

11 Remove the left horn (see Chapter 8), then detach the brake hose from its retaining clip on the horn mounting bracket.

12 Disconnect the wires from the right horn, then detach the horn mounting bracket from the lower triple clamp.



4.13b ... and remove the nuts that **secure the headlight brackets** and **instrument cluster to the upper** triple clamp



5.10a Remove the washer and the lower ring nut

5.10b Remove the bearing cover

XV920 and XV1000 (TR1) models

Refer to illustrations 4.13a and 4.13b

13 Unbolt the headlight brackets from the lower triple clamp **(see illustration).** Remove the nut that attaches the top of each headlight bracket to the instrument cluster studs at the upper triple clamp **(see illustration).**

14 Disconnect the speedometer cable and electrical connectors from the instrument cluster, then lift the cluster clear of the triple clamp and pull the headlight assembly forward out of the way.

15 Remove the fuse holder and the horn, then unbolt the brake hose joint from the lower triple clamp without disconnecting any hydraulic lines.

All models

16 Check the steering stem and lower triple clamp to make sure nothing is still attaching them to the motorcycle.

17 The bearing balls may fall out and be lost during the next steps. It's a good idea to place a blanket on the floor to prevent them from bouncing and rolling. Try to catch the balls with a magnet as the steering stem is lowered. This will be easier if an assistant is available.

18 Loosen the steering stem pinch bolt and remove the top bolt **(see illustration 2.2c).** Lift the upper triple clamp away from the steering stem.

19 Remove the steering stem locknut with a spanner wrench (C-spanner).

20 Remove the bearing ring nut with the spanner wrench (C-spanner). Remove the upper bearing top race and collect the 19 bearing balls with a magnet.

21 Slowly lower the lower triple clamp away from the steering head until the lower bearing balls are exposed. Try to catch them with the magnet (there are 19).

22 Lower the steering stem out of the steering head.

Removal(XV920J)

23 Remove the front wheel (see Chapter 6).

24 Refer to Section 7 and remove the front forks.

25 Disconnect the negative cable from the battery to prevent an accidental short circuit while disconnecting electrical wiring.

26 Cover the fuel tank with a blanket to prevent damage.

27 Detach the handlebar risers from the bracket on the upper triple clamp and lace them back out of the way (see Section 3). It shouldn't be necessary to disconnect the cables or brake hose, but if necessary, remove tie wraps to allow slack in the cables. Also, make sure the master cylinder stays upright to prevent fluid leakage.

28 Remove the headlight lens (see Chapter 8) and disconnect the wiring connectors within the headlight body.

29 Remove the plastic trim piece from the lower triple clamp, then unbolt the headlight bracket from the lower triple clamp.

30 Remove the instrument cluster (see Chapter 8).

31 Remove the top bolt and the upper triple clamp **(see illustration 2.10).** Move the headlight assembly out of the way.

32 Remove the fuse holder, horns and brake hose joint from the lower triple clamp.

33 Perform Steps 16 through 22 above to remove the steering stem and bearings from the steering head.

Inspection

This is the same as for XV535 models. Refer to Part A of this Chapter.

Installation

34 Installation of the bearings and steering stem in the steering head is the same as for XV535 models. Refer to Part A of this Chapter.

35 Refer to Chapter 1 and adjust the bearings.

36 The remainder of installation is the reverse of the removal steps.

5 Steering head bearings (1984 and later models) - replacement

1 Tapered roller bearings are used in the steering head of 1984 and later models. If the steering head bearing check/adjustment (see Chapter 1) does not remedy excessive play or roughness in the steering head bearings, the entire front end must be disassembled and the bearings and races replaced with new ones.

Removal

Refer to illustrations 5.10a, 5.10b, 5.11a and 5.11b

2 Remove the front wheel (see Chapter 6).

3 Refer to Section 7 and remove the front forks.

4 Disconnect the negative cable from the battery to prevent an accidental short circuit while disconnecting electrical wiring.

5 Cover the fuel tank with a blanket to prevent damage.

6 Remove the handlebar and place it back out of the way. It shouldn't be necessary to disconnect the cables or brake hose, but if necessary, remove tie wraps to allow slack in the cables. Also, make sure the master cylinder stays upright to prevent fluid leakage.

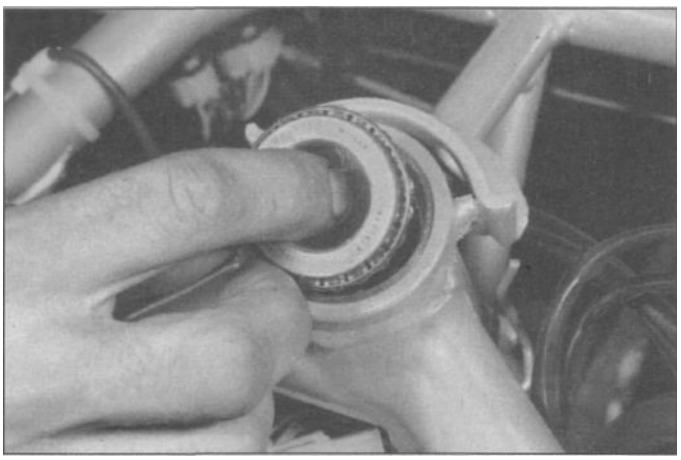
7 Remove the headlight lens (see Chapter 8) and disconnect the wiring connectors within the headlight body. Remove the headlight assembly mounting bolts, one inside the headlight body and two that attach the headlight body and brake hose joint to the lower triple clamp. Move the headlight assembly out of the way.

8 Disconnect the instrument cluster electrical connectors.

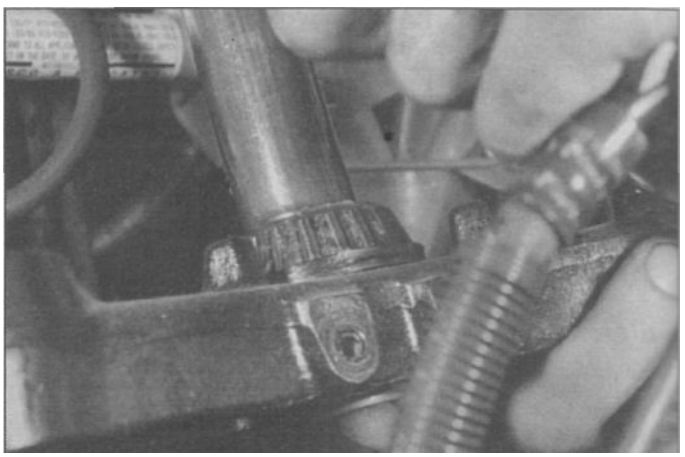
9 Remove the steering stem nut and lift off the upper triple clamp, together with the instrument cluster **(see illustration 2.2d).**

10 Remove the lockwasher, bearing locknut and second washer from the steering stem. Remove the lower ring nut and bearing cover **(see illustrations).**

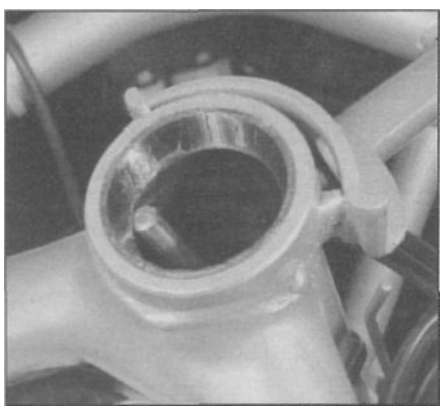
11 Remove the upper bearing **(see illustration),** then lower the steering stem and lower triple clamp assembly out of the steering head **(see illustration).** If it's stuck, tap gently on top of the steering stem with a plastic mallet or a hammer and a wood block.



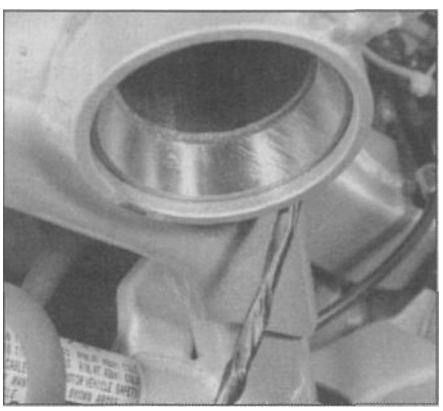
5.11 a Lift the upper bearing out of the steering head . . .



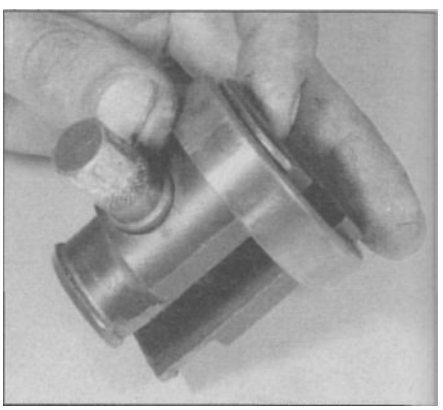
5.11 b . . . and lower the steering stem out of the steering head



5.14 Drive **out the upper race from below with a punch**



5.15a The lower race may not leave room for a punch to be placed against it . . .



5.15b . . . so instead, insert a special tool like this one into the race and expand it so **it grips the race securely...**

Inspectionandinstallation

Refer to illustrations 5.14, 5.15a, 5.15b, 5.15c, 5.18 and 5.20

12 Clean all the parts with solvent and dry them thoroughly, using compressed air, if available. If you do use compressed air, don't let the bearings spin as they're dried - it could ruin them. Wipe the old grease out of the frame steering head and bearing races.

13 Examine the races in the steering head for cracks, dents and pits. If even the slightest amount of wear or damage is evident, the races should be replaced with new ones.

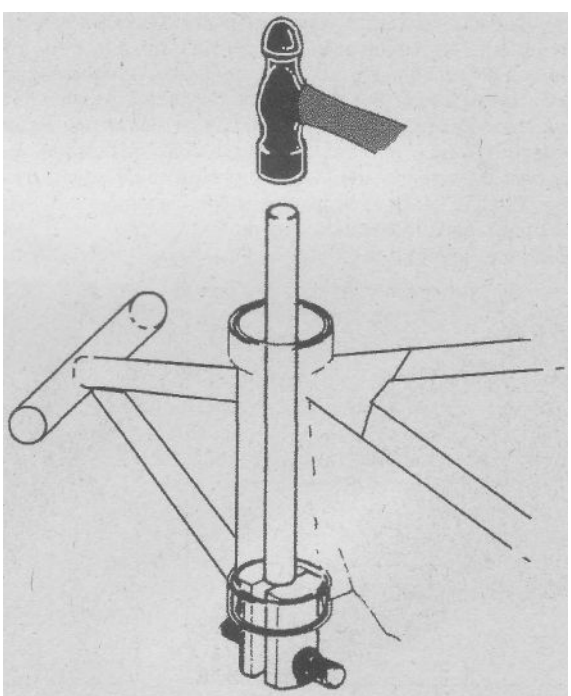
14 To remove the upper race, drive it out of the steering head from below with a hammer and punch (see illustration). A slide hammer with the proper internal-jaw puller will also work.

15 The lower race can be removed in the same way as the upper race if there's enough room for the punch to bear against the race. If there isn't, use a puller tool which can hook the race and be locked into position **(see illustrations).** Tap against the tool with a hammer and punch to drive the race and tool out of the steering head **(see illustration).**

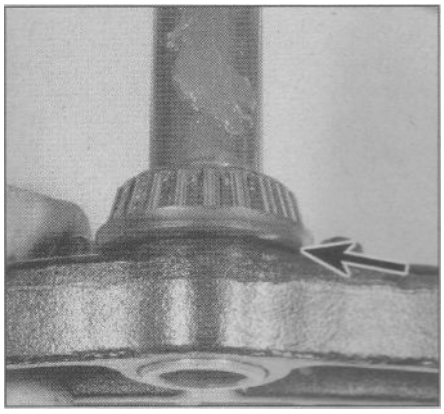
16 Since the races are an interference fit in the frame, installation will be easier if the new races are left overnight in a refrigerator. This will cause them to contract and slip into place in the frame with very little effort. When installing the races, tap them gently into place with a hammer and punch or a large socket. Do not strike the bearing surface or the race will be damaged.

17 Check the bearings for wear. Look for cracks, dents, pits in or flat spots on the bearing rollers. Replace any defective parts with new ones. If a new bearing is required, replace both of them as a set.

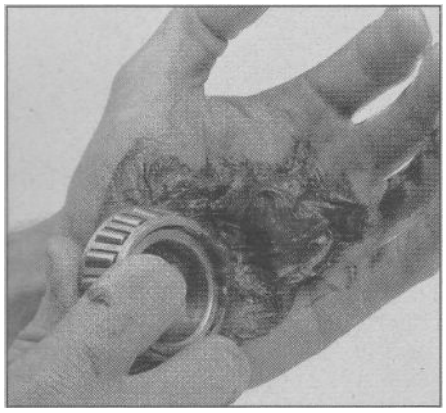
18 Don't remove the lower bearing unless it, or the grease seal beneath it, must be replaced **(see illustration).** Remove the bearing



5.15c . . . then drive out the tool and race together with a hammer and punch

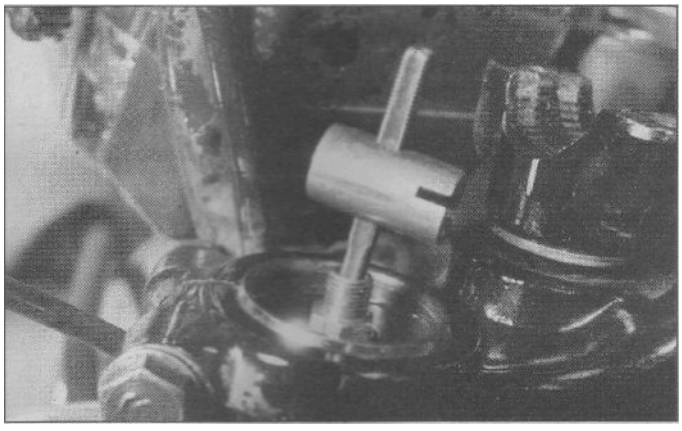


5.18 Remove the lower bearing and its **grease seal (arrow)** if they **need to be replaced**



5.20 Work the grease completely into the rollers

6.2 Remove the plastic cap from the fork



6.4 Unscrewing the air valve core **on models with separate air valves will** provide an **opening to add fork oil**

from the steering stem with a bearing splitter and puller setup. These can be rented. Tap the lower bearing on with a hammer and piece of pipe the same diameter as the bearing inner race. Don't tap against the rollers or roller cage or the bearing will be ruined. As an alternative, take the steering stem to a Yamaha dealer or motorcycle repair shop and have the old bearing pressed off and a new one pressed on.

19 Inspect the steering stem lower triple clamp for cracks and other damage. Don't attempt to repair any steering components. Replace them with new parts if defects are found.

20 Pack the bearings with high-quality grease (preferably a moly-based grease) **(see illustration).** Coat the outer races with grease also.

21 Insert the steering stem/lower triple clamp into the steering head. Install the upper bearing and lower ring nut. Refer to Chapter 1 and adjust the bearings.

22 The remainder of installation is the reverse of the removal steps.

6 Fork oil change

Refer to illustrations 6.2, 6.4, 6.5a, 6.5b, 6.6, 6.7, 6.9, 6.12 and 6.14

1 Support the bike securely so it can't be knocked over during this procedure. Place it on the centerstand (if equipped). The front wheel must be raised off the ground using a jack and wood support under the crankcase, or with axle stands.

2 On all except XV920J models, remove the plastic fork caps **(see illustration).**

3 On all except XV700 models, press on the air valve with a small screwdriver or similar tool to release the fork air pressure.

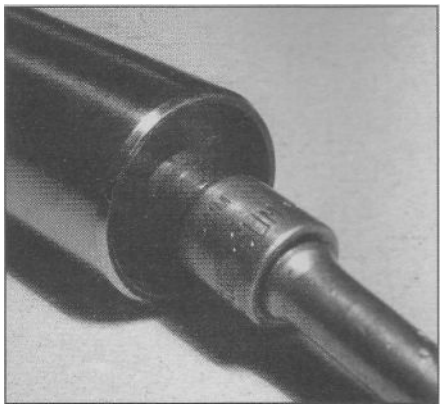
4 If you're working on an XV920 K or MK, the easiest way to make an opening for the new fork oil is to unscrew the air valve core with a core removal tool **(see illustration).** As an alternative, unscrew the air valve itself.

5 If you're working on a 1981 through 1983 XV750, a chain drive XV920 or a TR1, press down the spring seat with a socket that will fit over the air valve. Use an extension-on the socket so you can grip it **(see illustration).** Remove the stopper ring, then slowly release the spring pressure and lift out the spring seat and spring **(see illustration).**

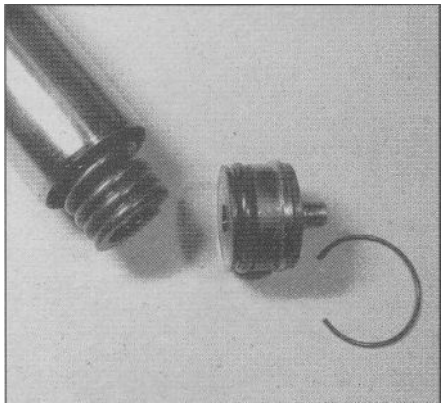
6 Loosen the upper triple clamp pinch bolts **(see illustration).**

7 If you're working on an XV920J, unscrew the fork cap **(see illustration).**

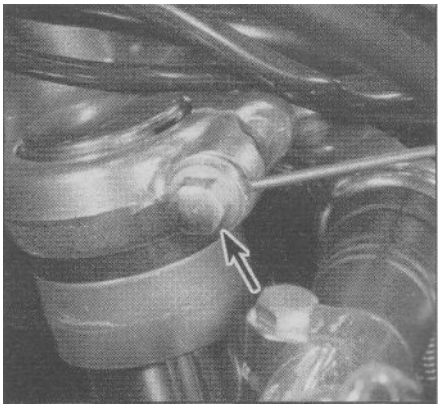
8 On all other models, unscrew the fork cap with an Allen bolt bit.



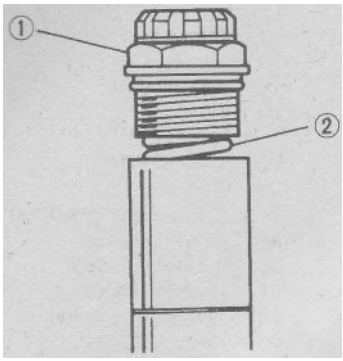
6.5a Push the fork cap down against the spring pressure with an extension and a socket big enough to fit over the air valve



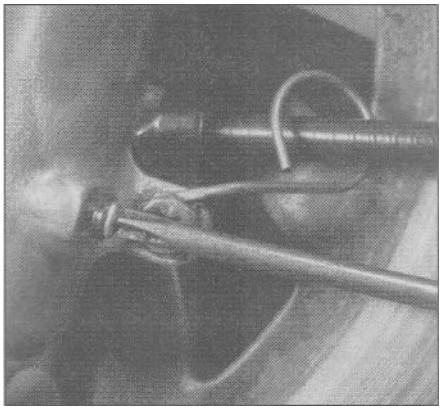
6.5b Remove the retainer, then remove the fork cap and spring



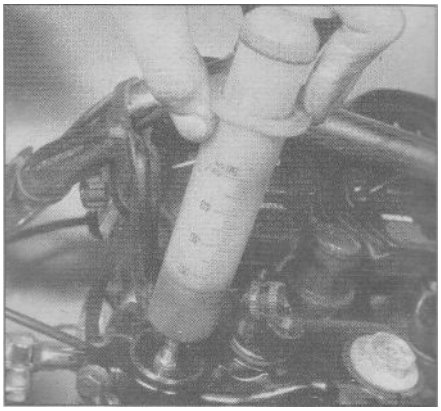
6.6 Loosen the upper triple clamp bolts (arrow); 1994 1100 model shown



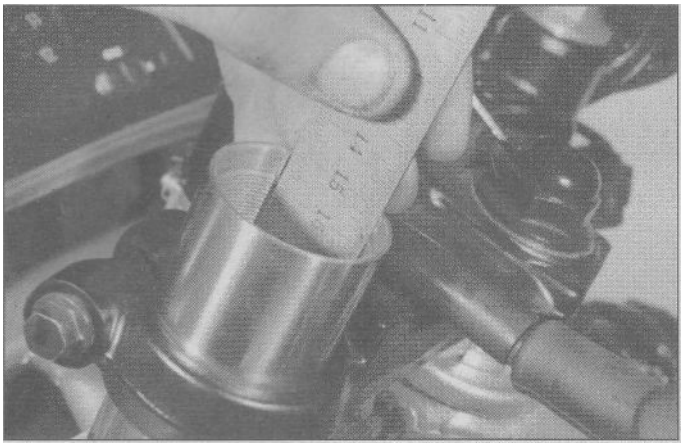
6.7 On XV920J models, unscrew the fork cap; it should sit like this before it's installed - if it sits higher, reposition the end of the damping adjusting rod



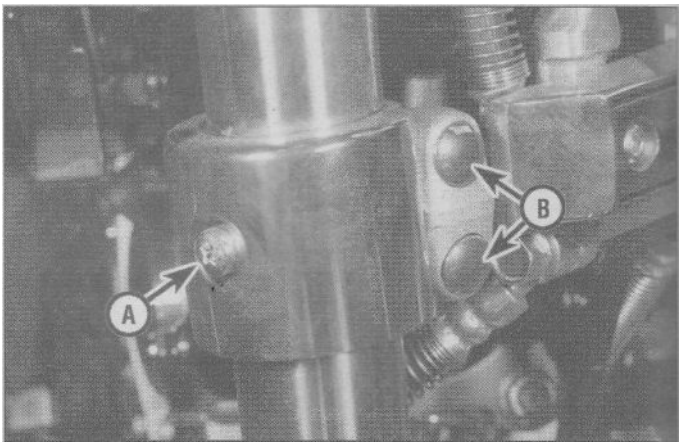
6.9 Remove the drain screw from the bottom of the fork leg



6.12 Add the specified amount of fork oil



6.14 Pour the specified amount of oil into the top of the fork - on later models, measure the oil level and adjust it as needed



7.7a Remove the trim screw (A); remove the trim caps (B), then loosen the lower triple clamp bolts

Note: *If you don't have an Allen bolt bit of the correct size, use a bolt with a head size that fits into the fork cap. Turn the bolt with locking pliers.*

9 Place a drain pan under the fork leg and remove the drain screw **(see illustration). Warning:** *Do not allow the fork oil to contact the tire, brake disc or pads. If it does, wash off the tire, clean the disc with brake system cleaner and replace the pads with new ones before riding the motorcycle.*

10 After most of the oil has drained, slowly compress and release the forks to pump out the remaining oil. An assistant will most likely be required to do this.

11 Check the drain screw gasket and spring seat O-ring (if equipped) for damage and replace them if necessary. Clean the threads of the drain screw with solvent and let it dry, then install the screw and gasket, tightening it securely.

12 Pour the type and amount of fork oil, listed in this Chapter's Specifications, into the fork tube through the opening at the top **(see illustration).**

13 Remove the jack from under the engine and slowly pump the forks a few times to purge the air.

14 If fork oil level is specified for the bike you're working on, measure the level of the oil in the fork with the fork fully compressed and without the spring in position **(see illustration).** Compare it to the value listed in this Chapter's Specifications. Add or remove oil as necessary, then install the spring.

15 If you're working on a 1981 through 1983 XV750, coat the O-ring on the spring seat with a thin layer of multi-purpose grease. Install the spring seat and stopper ring **(see illustrations 3.4a and 3.4b in Part A of this Chapter).**

16 If you're working on an XV920J, install the cap bolt assembly (see **illustration 6.7). Caution:** *The cap bolt should sit as shown in the illustration before you try to screw it in. If it sits higher, the damping adjusting rod is out of position. Turn the cap bolt so the bottom end* ***at*** *the damping adjusting rod engages the semicircular hole in the top o' the damper rod inside the fork. Forcing the cap bolt in when it sits too high will ruin the damping adjuster.*

17 On all other models, install the fork cap and tighten it to the torque listed in this Chapter's Specifications.

18 The remainder of installation is the reverse of the removal steps. Tighten all fasteners to the torque listed in this Chapter's Specifications.

19 On models with air valves, adjust fork air pressure (see Chapter 1).

7 Forks - removal and installation

Removal

Refer to illustrations 7.7a through 7.7e

1 Support the bike securely so it can't be knocked over during this procedure. Place it on the centerstand (if equipped).

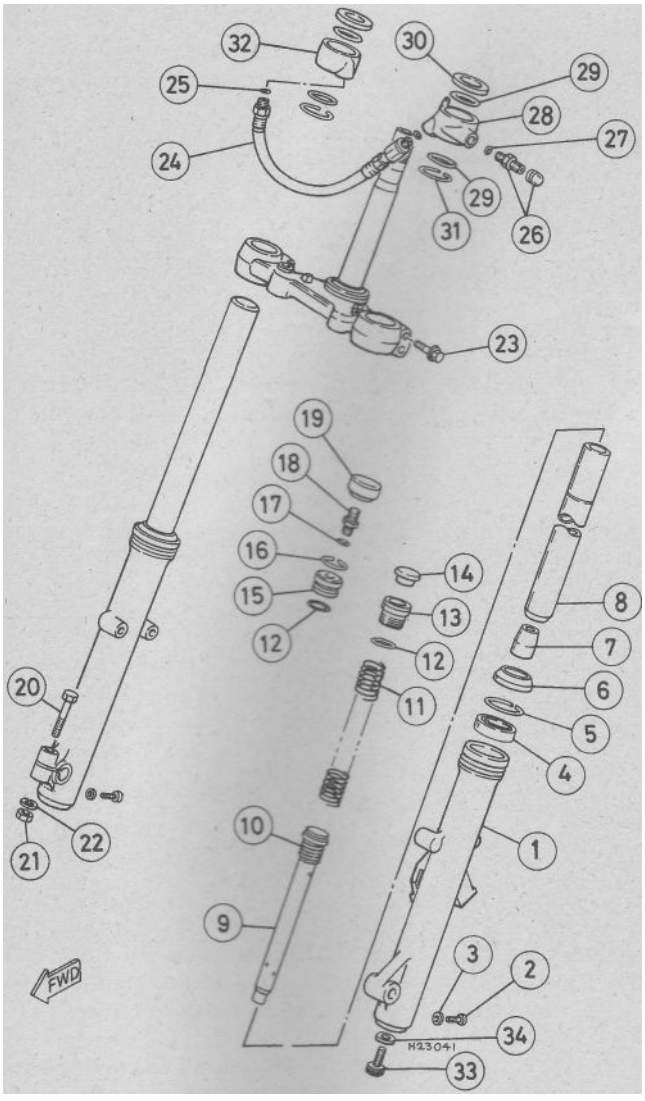
2 Place a jack under the engine and raise it slightly to lift the fron: tire off the ground.

3 Remove the brake caliper and front wheel (see Chapter 6).

4 Remove the front fender (see Chapter 7).

5 Remove any wiring harness clamps or straps from the fork tubes.

6 If the fork will be disassembled after removal, read through the disassembly procedure (see Section 8), paying special attention to the damper rod bolt removal steps. If you don't have the necessary specia

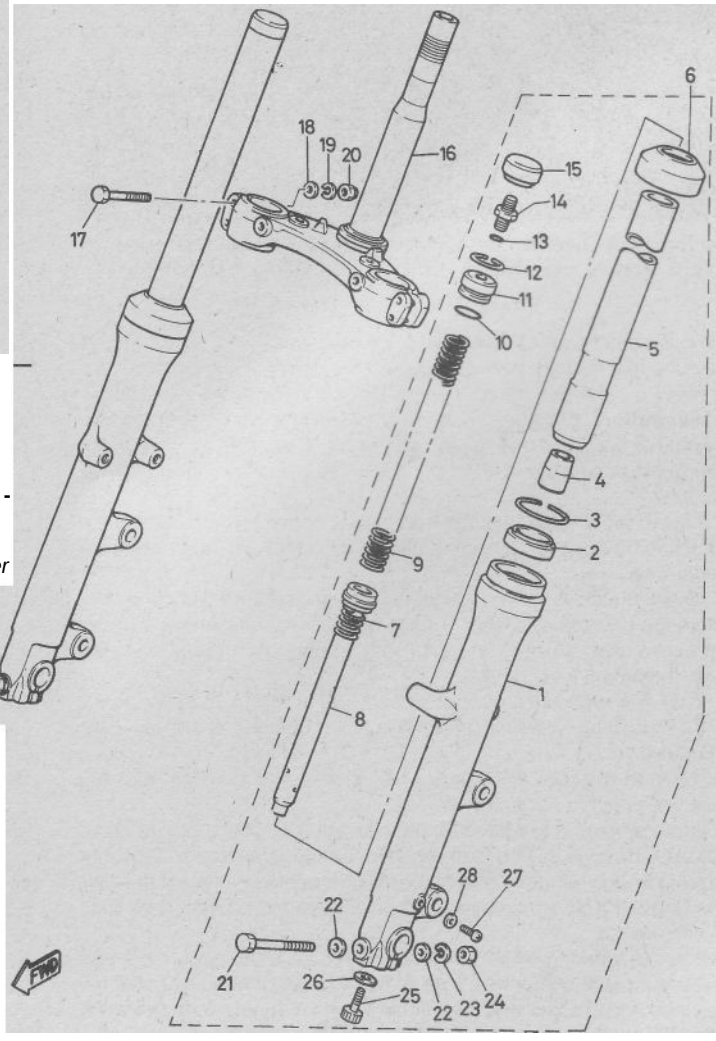


7.7b Front forks (XV750 and XV920 K and MK models) - exploded view

1	*Outer fork tube*	17	*O-ring (XV750)*
2	*Drain screw*	18	*Air valve (XV750)*
3	*Gasket*	19	*Cap (XV750)*
4	*Oil seal*	20	*Bolt*
5	*Retainer*	21	*Nut*
6	*Dust seal*	22	*Lockwasher*
7	*Damper rod seat*	23	*Bolt*
8	*Inner fork tube*	24	*Air charging hose (XV920)*
9	*Damper rod*	25	*O-ring (XV920)*
10	*Rebound spring*	26	*Air valve (XV920)*
11	*Fork spring*	27	*O-ring (XV920)*
12	*O-ring (XV920)*	28	*Left air hose union*
13	*Top bolt (XV920)*	29	*O-ring (XV920)*
14	*Plastic cap (XV920)*	30	*Seal (XV920)*
15	*Fork cap (XV750)*	31	*Retainer (XV920)*
16	*Retainer (XV750)*	32	*Right air hose union*

tool or a substitute for it, you can remove the damper rod bolt before the fork is disassembled, while the spring tension will keep the damper rod from spinning inside the fork tube. This is also a good time to loosen the fork top bolt (if equipped), as it will eliminate the need to clamp the fork tube in a vise after it's removed.

7 Loosen the upper triple clamp bolts **(see illustration 6.5b).** Remove the trim cover and loosen the lower triple clamp bolts **(see illustrations),** then slide the fork tubes down and remove the forks from the motorcycle.

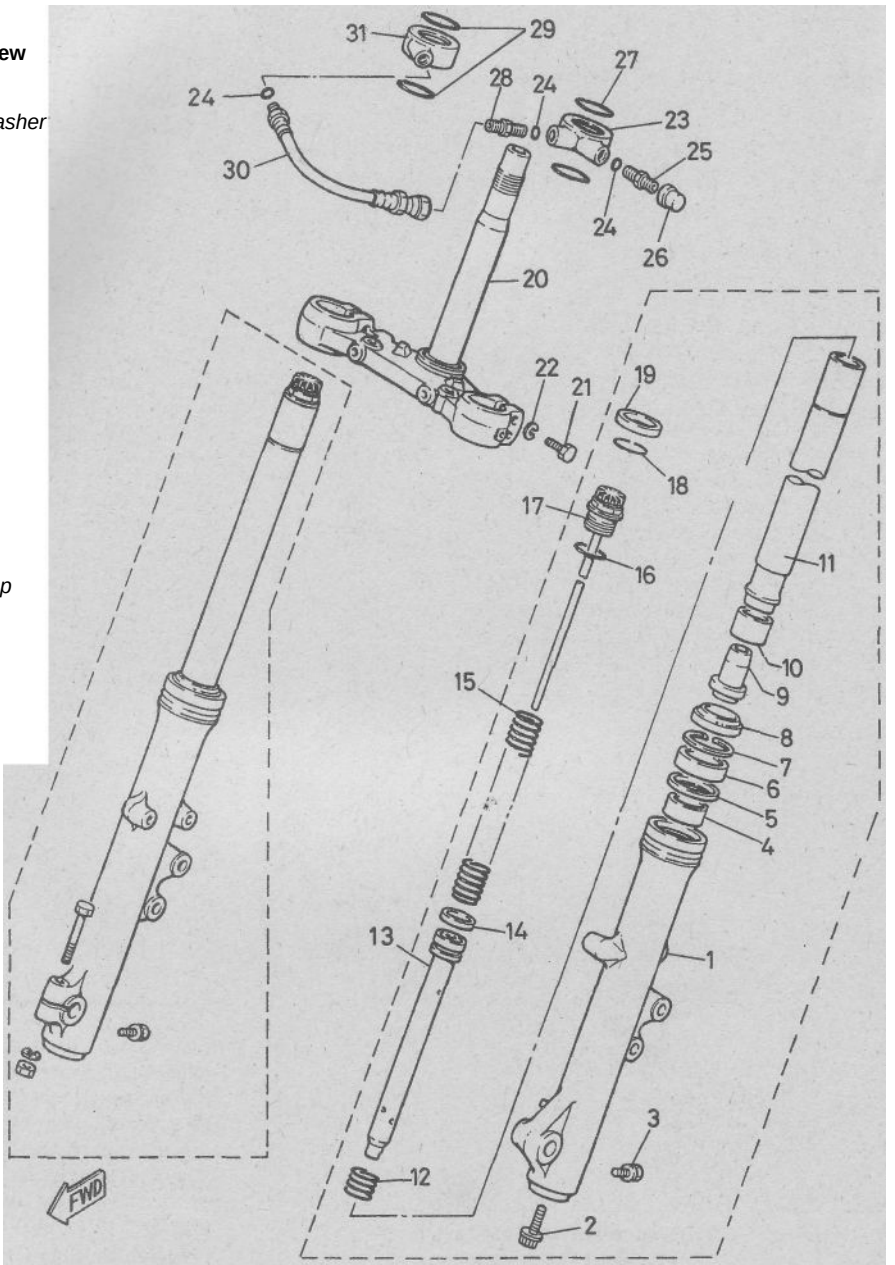


7.7c Front forks (chain drive XV920 and XV1000/TR1 models) - exploded view

1	*Outer fork tube*	16	*Steering stem/lower triple clamp*
2	*Oil seal*	17	*Bolt*
3	*Retainer*	18	*Washer*
4	*Damper rod seat*	19	*Lockwasher*
5	*Inner fork tube*	20	*Nut*
6	*Dust seal*	21	*Bolt*
7	*Rebound spring*	22	*Washer*
8	*Damper rod*	23	*Lockwasher*
9	*Spring*	24	*Nut*
10	*O-ring*	25	*Damper rod bolt*
11	*Top plug*	26	*Copper washer*
12	*Retainer*	27	*Drain plug*
13	*O-ring*	28	*Gasket*
14	*Air valve*		
15	*Cap*		

7.7d Front forks (XV920J) - exploded view

1 Outer fork tube
2 Damper rod bolt and copper washer
3 Drain plug and gasket
4 Upper bushing
5 Spacer
6 Oil seal
7 Retainer
8 Dust seal
9 Damper rod seat
10 Lower bushing
11 Inner fork tube
12 Rebound spring
13 Damper rod
14 Teflon ring
15 Fork spring
16 O-ring
17 Cap bolt
18 Retainer
19 Rubber spacer
20 Steering stem/lower triple clamp
21 Bolt
22 Lockwasher
23 Left air hose union
24 O-ring
25 Air charging valve
26 Valve cap
27 O-ring
28 Hose fitting
29 O-ring
30 Air charging hose
31 Right hose union



Installation

8 Slide each fork leg into the lower triple clamp.

9 Slide the fork legs up, installing the tops of the tubes into the upper triple clamp. Position the top of the fork tube so that it is level with the top surface of the upper triple clamp.

10 The remainder of installation is the reverse of the removal procedure. Tighten all fasteners to the torques listed in this Chapter's Specifications and the Chapter 6 Specifications.

11 Pump the front brake lever several times to bring the pads into contact with the disc.

8 Forks - disassembly, inspection and reassembly

Disassembly

Refer to illustrations 8.2, 8.5a, 8.5b, 8.6a, 8.6b, 8.7 and 8.8

Note: *The following procedures apply to 1981 through 1983 XV750 models, XV920 K, MK, RH and RJ models and the 1982 through 1985 XV1000 (TR1). The forks used on XV920J models, as well as on all 1984 and later models except the TRI, require a press, special tools ana procedures for disassembly, including heating the outer fork tube with a torch. Fork overhaul on these models should be done by a Yamaha dealer service department or other qualified repair shop.*

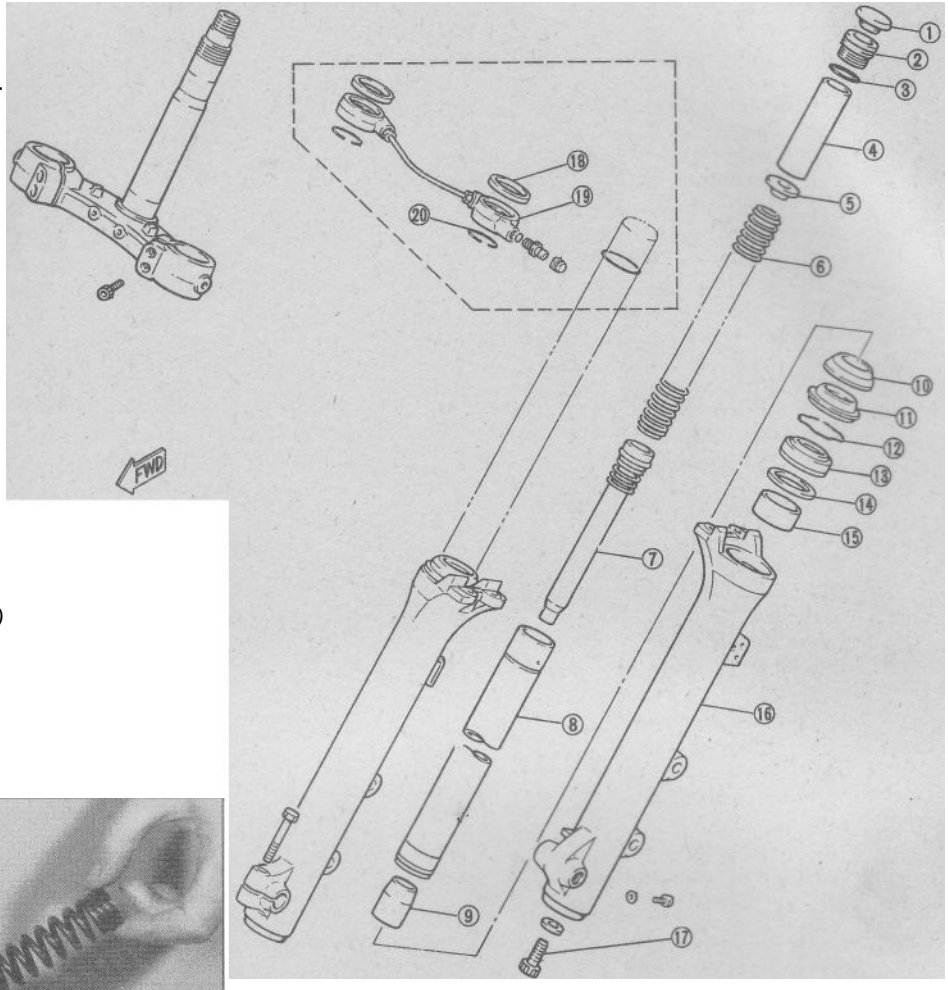
1 Remove the forks following the procedure in Section 6. Work on one fork leg at a time to avoid mixing up the parts.

2 On all except XV920K and MK models, remove the fork cap, stopper ring, spring seat and spring **(see illustrations 6.5a, 6.5b and the accompanying illustration).**

3 If you're working on an XV920K or MK, unscrew the top bolt with an Allen bolt bit. **Note:** *If you don't have an Allen bolt bit of the correct size, use a bolt with a head size that Jits into the top bolt. Turn the bolt with locking pliers.*

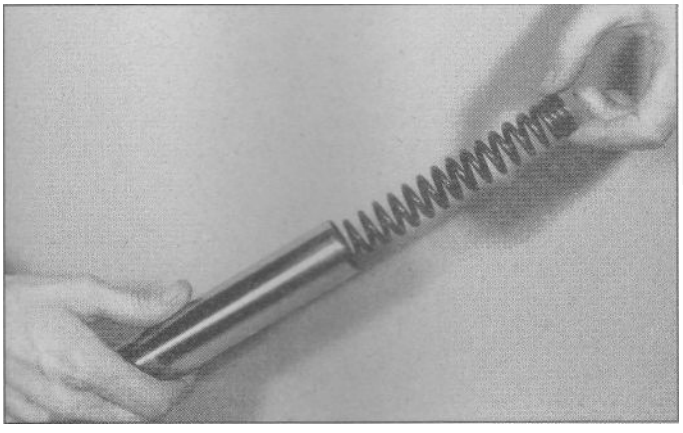
4 Invert the fork assembly over a container and allow the oil to drain out.

5 Prevent the damper rod from turning using a holding handle (Yamaha tool no. YM-01326, part no. 90890-01326) and adapter (Yamaha tool no. YM-01300-01, part no. 90890-01294) **(see illustration)**



7.7e Front forks (1984 and later models) - exploded view

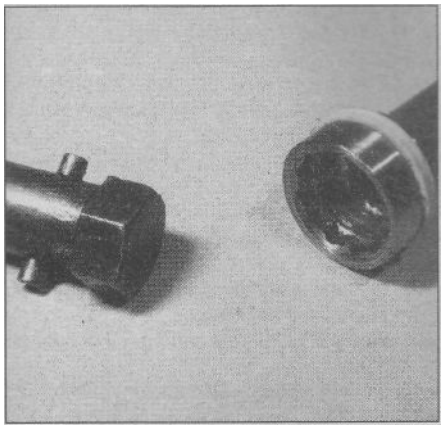
1 *Plastic cap*
2 *Cap bolt*
3 *O-ring*
4 *Spacer*
5 *Spring seat*
6 *Fork spring*
7 *Damper rod*
8 *Inner fork tube*
9 *Taper spindle*
10 *Dust seal cover*
11 *Dust seal*
12 *Retainer*
13 *Oil seal*
14 *Washer*
15 *Guide bushing*
16 *Outer fork tube*
17 *Damper rod bolt*
18 *Rubber spacer (except XV700)*
19 *Air joint bracket (except XV700)*
20 *Stopper ring (except XV700)*



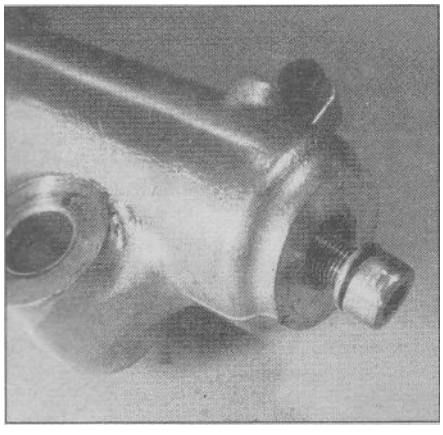
8.2 Remove the **fork spring**

passed down through the fork inner tube to engage the damper rod head. Unscrew the Allen bolt at the bottom of the outer tube and remove the copper washer **(see illustration). Note:** *If you don't have access to these tools, a piece of hardwood dowel can be used instead. Cut a taper on the end of the dowel to fit into the damper rod head. Another alternative is to loosen the damper rod bolt before removing the fork cap; the pressure of the fork spring will keep the damper rod from turning.*

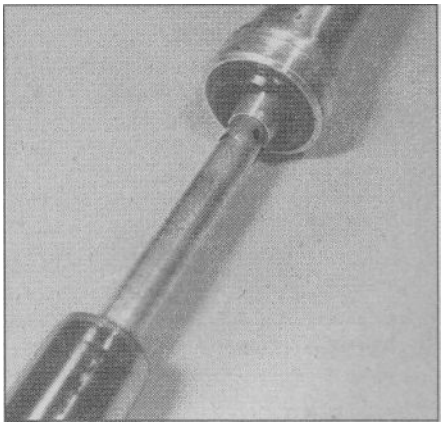
6 Pull the inner fork tube out of the fork leg and separate the damper rod seat from the damper rod **(see illustrations).**



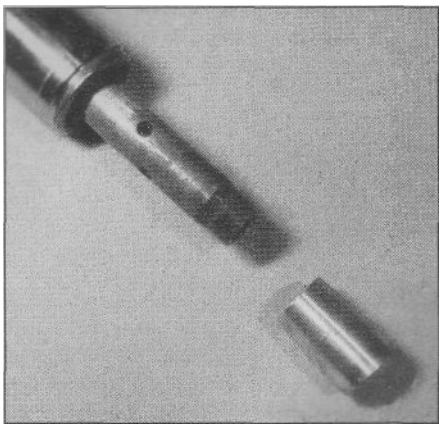
8.5a The damper rod can be prevented from turning with a tool like this; its hex fits into the top end of the damper rod



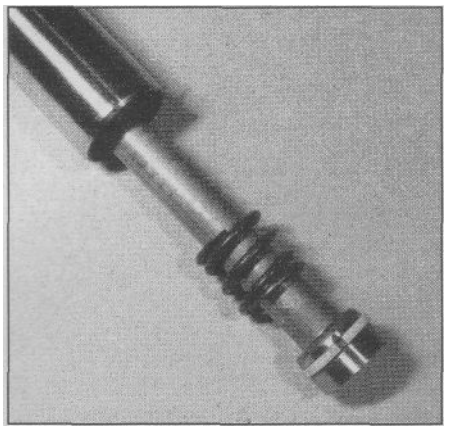
8.5b Remove the damper rod bolt and its copper washer



8.6a Pull the upper fork tube out of the lower tube

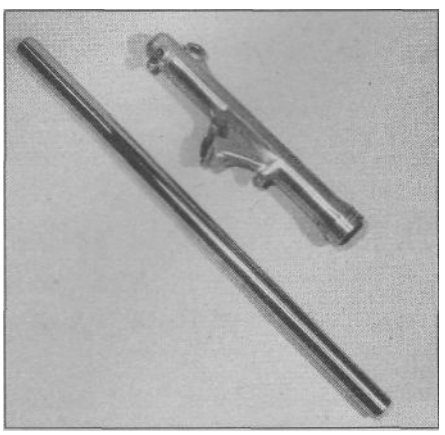


8.6b Take the damper rod seat off the damper rod

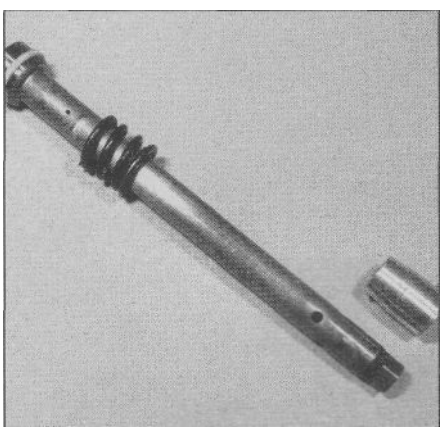


8.7 Remove the damper rod and rebound spring from the inner fork tube

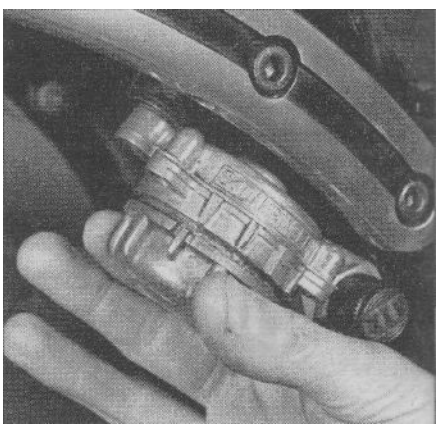
8.8 Pry the oil seal out of the lower fork tube



8.9a Inspect the inner and outer fork tubes; they must be replaced if worn or damaged



8.9b Check the damper rod, its seat and the rebound spring for wear or damage



9.1a The remote adjuster handle should turn freely

7 Pull out the damper rod and the rebound spring **(see illustration).** Don't remove the Teflon ring from the damper rod unless a new one will be installed.

8 Carefully pry the oil seal from the fork leg **(see illustration).**

Inspection

Refer to illustrations 8.9a and 8.9b

9 Clean all parts in solvent and blow them dry with compressed air, if available. Check the inner and outer fork tubes, the damper rod and its seat for score marks, scratches, flaking of the chrome and excessive or abnormal wear (see illustrations). This type of fork doesn't use bushings; the inner fork tube rubs directly against the inner surface of the fork leg. If the inner tube fits loosely in the outer tube, the outer tube is probably worn; if so, replace it. Look for dents in the tubes and replace them if any are found. Check the fork seal seat for nicks, gouges and scratches. If damage is evident, leaks will occur around the seal-to-outer tube junction. Replace worn or defective parts with new ones.

10 Have the inner fork tube checked for runout at a dealer service department or other repair shop. **Warning:** *If it is bent, it should not be straightened; replace it with a new one.*

11 Measure the overall length of the long spring and check it for cracks and other damage. Compare the length to the minimum length listed in this Chapter's Specifications. If it's defective or sagged, replace both fork springs with new ones. Never replace only one spring.

Reassembly

12 Install the rebound spring on the damper rod. Install the damper rod in the inner fork tube, then let it slide slowly down until it protrudes from the bottom of the inner fork tube.

13 Install the damper rod seat over the end of the damper rod that protrudes from the fork tube **(see illustration 8.6b).**

14 Install the inner fork tube in the outer fork tube.

15 Apply non-permanent thread locking agent to the damper rod bolt, then install the bolt with its copper washer and tighten it to the torque listed in this Chapter's Specifications. Hold the damper rod from turning with the tool used in Step 5. **Note:** *If you didn't use the tool, tighten the damper rod bolt after the fork spring and cap bolt are installed.*

16 Lubricate the lips and the outer diameter of the oil seal with the recommended fork oil (see Chapter 1) and slide it down the inner tube, with the closed side of the seal facing up. Drive the seal into place with the same tools used to drive in the slide bushing **(see illustration 5.18 in Part A of this Chapter).** If you don't have access to these, it is recommended that you take the assembly to a Yamaha dealer service department or other motorcycle repair shop to have the seal driven in. If you are very careful, the seal can be driven in with a hammer and a drift punch. Work around the circumference of the seal, tapping gently on the outer edge of the seal until it's seated. Be careful - if you distort the seal, you'll have to disassemble the fork again and end up taking it to a dealer anyway!

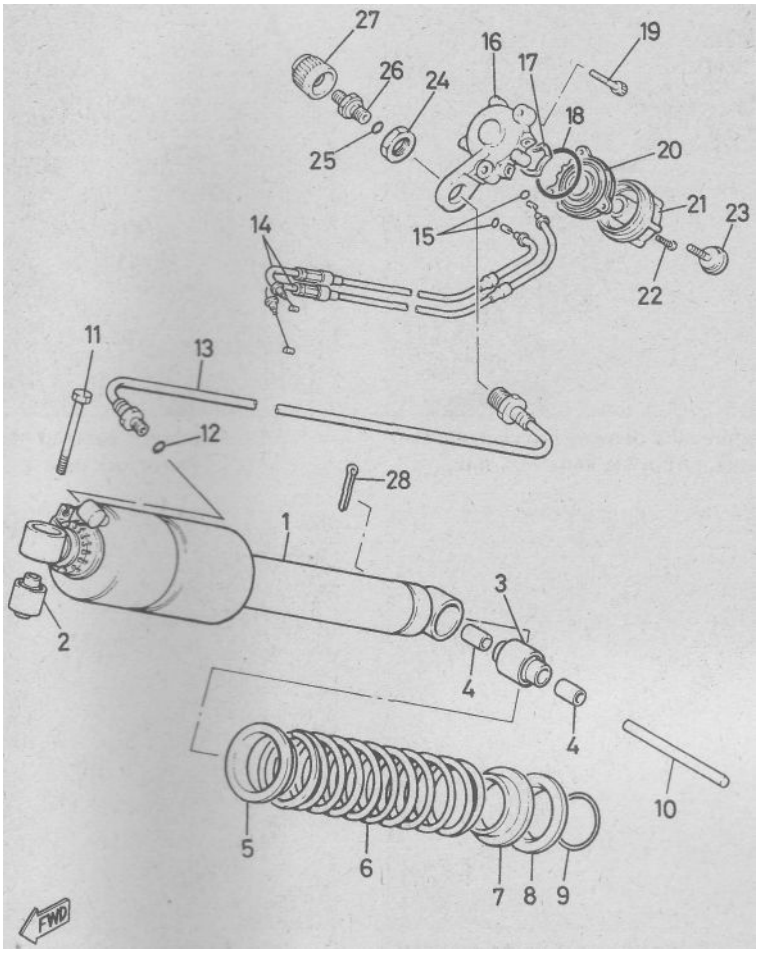
17 Install the dust seal, making sure it seats completely. The same tool used to drive in the oil seal can be used for the dust seal.

18 Install the drain screw and a new gasket, if it was removed.

19 Add the recommended type and amount of fork oil (see Section 3).

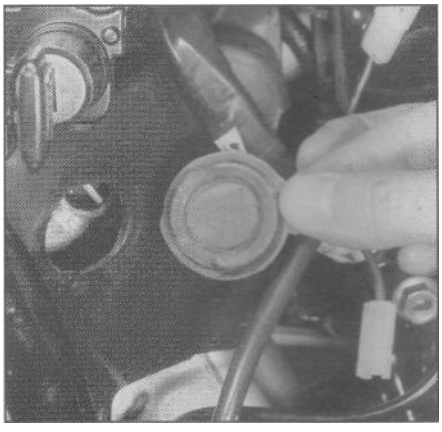
20 Install the fork spring, with the closer-wound coils at the top.

21 Refer to Section 6 and install the spring seat, stopper ring and fork cap or cap bolt.

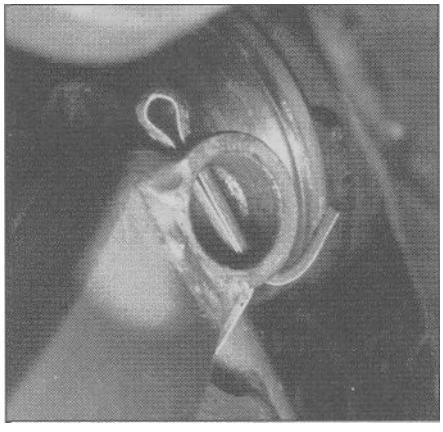


9.1b Rear suspension unit (1981 through 1983 models) - exploded view

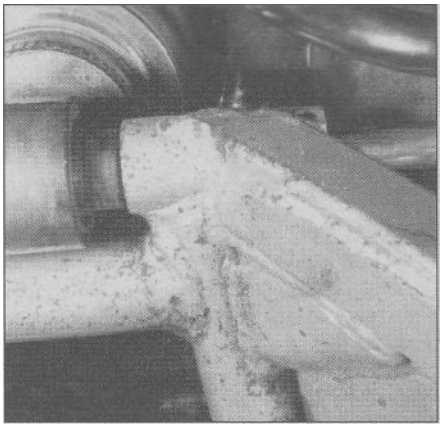
1 *Shock absorber*
2 *Upper bushing*
3 *Lower bushing*
4 *Sleeves*
5 *Upper spring seat*
6 *Spring*
7 *Lower spring seat*
8 *Seating ring*
9 *Retaining ring*
10 *Attachment pin*
11 *Pivot bolt*
12 *O-ring*
13 *Air hose*
14 *Control cables*
15 *O-rings*
16 *Remove adjuster unit upper half*
17 *Seal*
18 *O-ring*
19 *Allen bolt*
20 *Remote adjuster unit lower half*
21 *Remote adjuster handle*
22 *Screw*
23 *Screw*
24 *Nut*
25 *O-ring*
26 *Air charging valve*
27 *Cap*
28 *Cotter pin*



9.3a Remove the rubber cover. . .



9.3b . . . and remove the cotter pin



9.4 Tap the attachment pin out

22 Install the fork by following the procedure outlined in Section 7. If you won't be installing the fork right away, store it in an upright position.

9 Rear suspension unit (1981 through 1983 and all TR1 models) - inspection, removal and installation

Removal

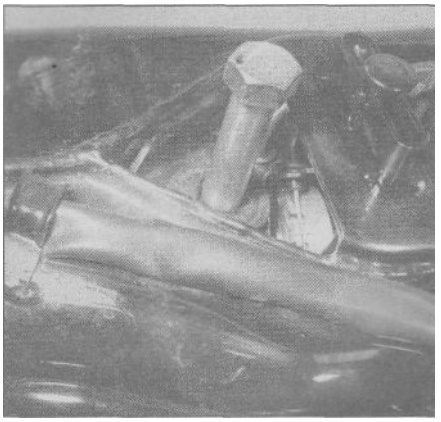
Refer to illustrations 9.1a, 9.1b,.9.3a,9.3b, 9.4, 9.6 and 9.7

1 Lift or remove the seat. Check for loose mountings and for visible wear or damage. Look for oil leaks. Turn the remote adjuster handle and make sure it rotates freely **(see illustrations).** If the suspension unit is to be removed, press down on the air valve core with a small screwdriver or similar tool and release the air pressure.

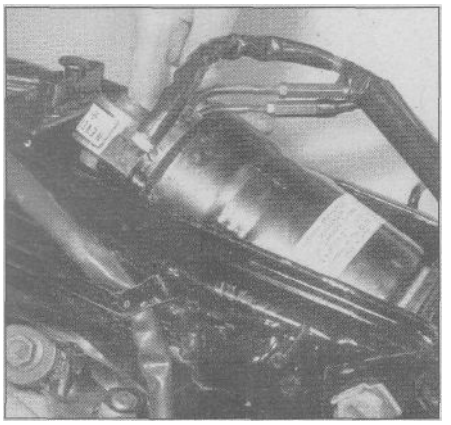
2 Remove the fuel tank (see Chapter 3) and the rear wheel (see Chapter 6).

3 On the right side of the bike, remove the rubber cover to expose the end of the attachment pin that secures the suspension unit to the swingarm **(see illustration).** Remove the cotter pin from the attachment pin **(see illustration).**

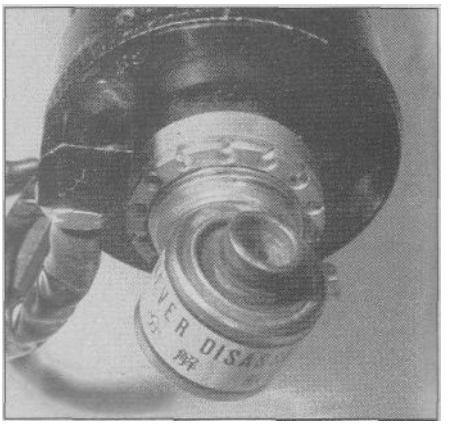
4 Tap the attachment pin out with a soft metal drift and hammer **(see illustration). Note:** *If the attachment pin won't comeout easily, soak it with penetrating oil and allow time for the oil to work. If necessary, support the other side of the swingarm with a wood block while tapping the attachment pin out.*



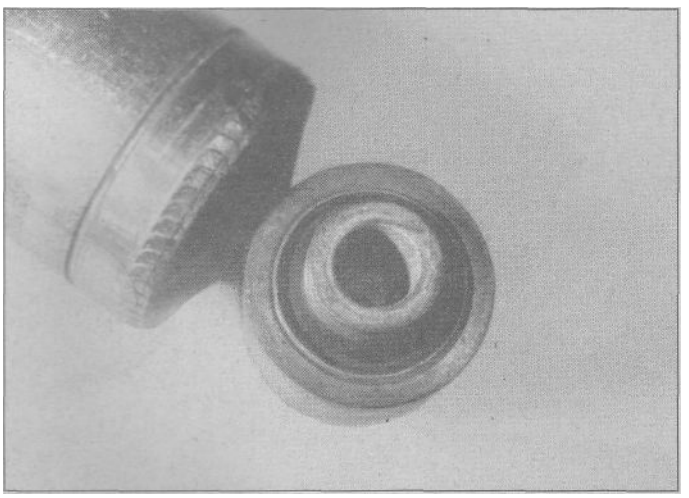
9.6 Remove the pivot bolt



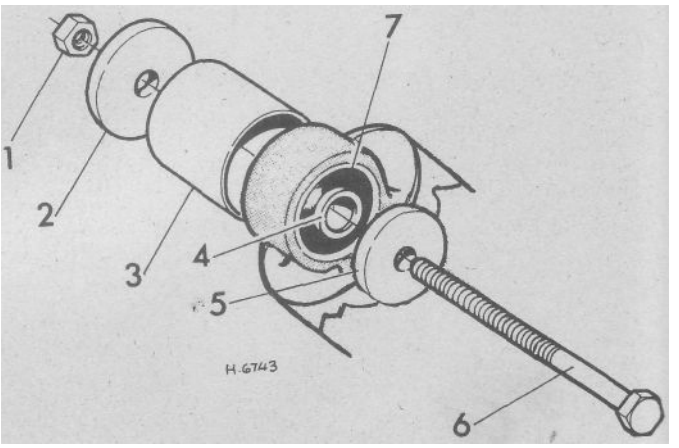
9.7 Guide the suspension unit out of the frame



9.10 The adjuster ring should turn freely



9.12a Check the bushings and the metal sleeves for wear and damage



9.12b Fabricated bushing removal tool

1 High-strength nut
2 Thick washer
3 Metal tube (large enough for the bushing to fit inside)
4 Bushing sleeve
5 Thick washer
6 High-strength bolt
7 Bushing

5 Remove the two Allen bolts that secure the remote adjuster to the frame. Don't disconnect the cables or the air hose from the adjuster; free them from any clips and place them alongside the suspension unit so they won't be in the way during removal.

6 At the top of the suspension unit, remove the pivot bolt that attaches it to the frame (see illustration).

7 Lift the suspension unit and remove it rearward **(see illustration).**

Inspection

Refer to illustrations 9.10, 9.12a, 9.12b, 9.13 and 9.15

8 If the remote adjuster won't turn freely, remove its center screw and the three small screws and take it apart for cleaning. **Note:** *If the screws won't turn easily, don't try to force them or the heads may be stripped out. Apply plenty of penetrating oil and give it time to work. Once the assembly is apart, inspect its O-ring (it's a good idea to replace it as a matter of course). Pack the housing with multi-purpose lithium based grease, then assemble the adjuster.*

9 Check the cables for damage such as kinked or dented housings and replace them if they're damaged. If the cables move stiffly, lubricate them (see Chapter 1). If this doesn't help, replace them.

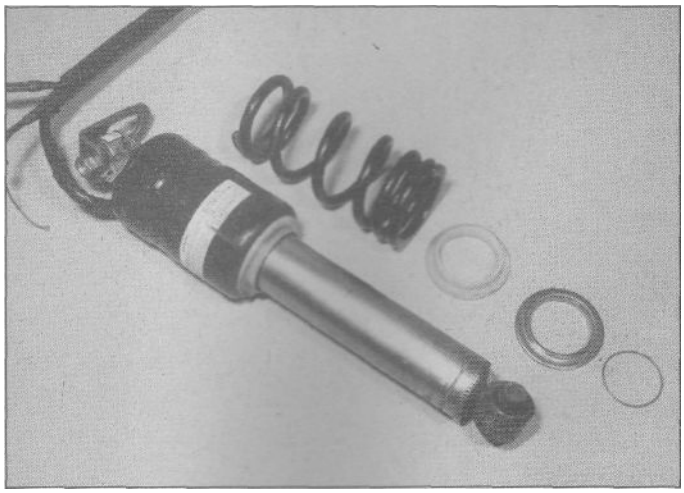
10 Check the suspension unit for obvious wear or damage that may have been missed while it was on the bike. If it's leaking air or oil, replace it. The adjuster ring should turn freely **(see illustration);** if it's stiff, apply penetrating oil and work it back and forth until it loosens up. **Warning:** *The suspension unit contains compressed nitrogen gas and requires special disposal procedures for safety. Refer to Part A of this Chapter for the safe disposal method.*

11 Check for air leaks by applying soapy water to the air hose connections, then adding a small amount of air through the charging valve with a hand pump. If bubbles appear, there's a leak. The most likely cause is a failed O-ring. If the hose or charging valve leak, replace them.

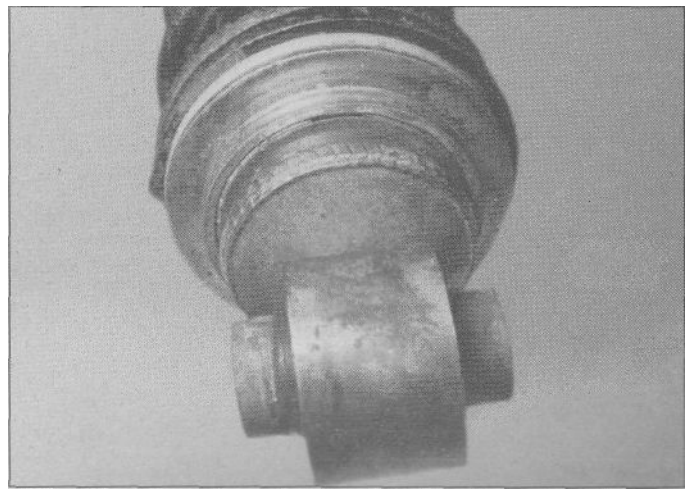
12 Inspect the mounting bushings at the end of the suspension unit **(see illustration).** If they're deteriorated or if the rubber has separated from the metal, replace them. A puller tool can be fabricated from a bolt, nut, washers and a piece of tubing **(see illustration).** It may be more practical to have the bushings pressed out and new ones pressed in by a dealer service department. **Caution:** *Don't try to hammer the bushings out. This will place side loads on the suspension unit and damage it.*

13 To remove the spring from the suspension unit, compress it with a coil spring compressor designed for suspension springs. These can be rented from tool rental centers. **Warning:** The *spring is powerful. Don't try to compress it with makeshift tools or it may slip and cause injury.* With the spring compressed, remove the retaining clip, seating ring and lower spring seat **(see illustration).**

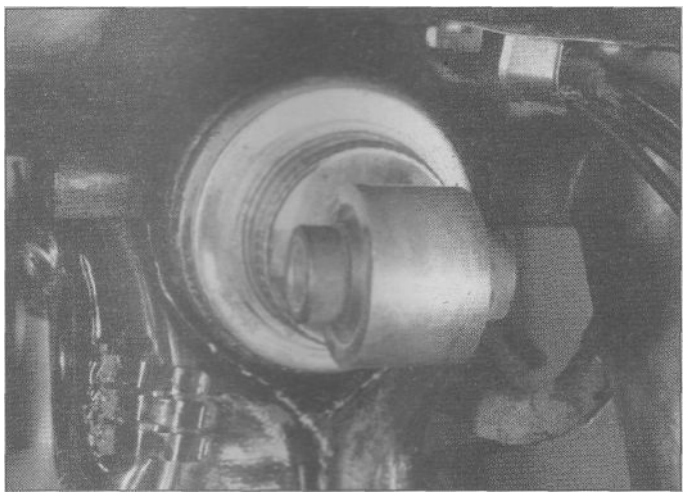
14 Measure the free length of the spring and compare it to the value listed in this Chapter's Specifications, If it's sagged, replace it. Check the seating ring, spring seat and retaining ring for wear or damage and



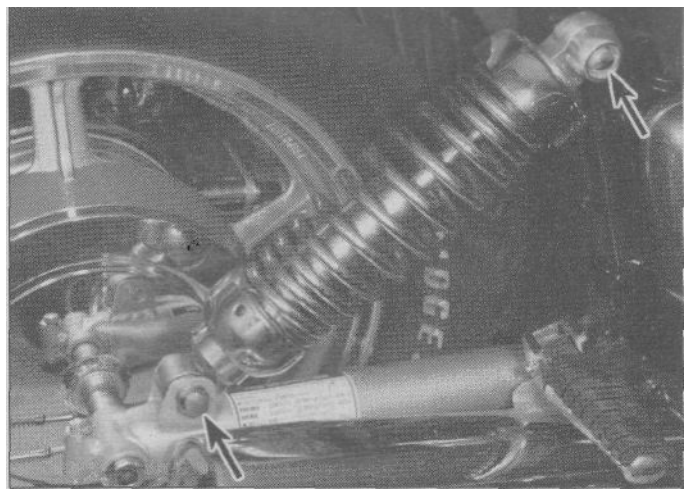
9.13 The spring can be detached from the suspension unit



9.15 Secure the spring seat with the retaining clip, making sure the clip seats securely in its groove



9.17 Make sure the cables and hose are clear of the suspension unit and secure them in their clips



10.2a The right shock absorber is secured by bolts at the top and bottom (arrows); the left shock absorber is secured by a bolt at the top and a nut at the bottom

replace them as necessary. Make sure the retaining ring groove in the suspension unit is free of buns.

15 Install the spring on the suspension unit so its closely wound coils will be downward when the unit is installed on the bike. Compress the spring with the special tool, then install the seating ring and spring seat. Install the retaining ring and make sure it's securely seated in its groove **(see illustration).** Release the spring tension and remove the compressor.

Installation

Refer to illustration 9.17

16 Guide the suspension unit into position. Coat the shaft of the pivot bolt with a thin layer of multi-purpose grease (but keep the grease off the bolt threads), then install the bolt and tighten it to the torque listed in this Chapter's Specifications.

17 'Place the remote adjuster near its installed position. Route the cables and air hose so they're clear of the suspension unit and install them in the clips **(see illustration).** Make sure the cable sheath is in position.

18 Coat the attachment pin with anti-seize compound, and install it in the frame and suspension unit. Install a new cotter pin and bend the ends.

19 The remainder of installation is the reverse of the removal steps.

10 Rear shock absorbers (1984 and later models) - removal, inspection and installation

Removal

Refer to illustrations 10.2a and 10.2b

1 Support the bike securely so it can't be knocked over during this procedure. Place a jack beneath the frame to lift the rear tire off the ground and support the swingarm so it can't drop.

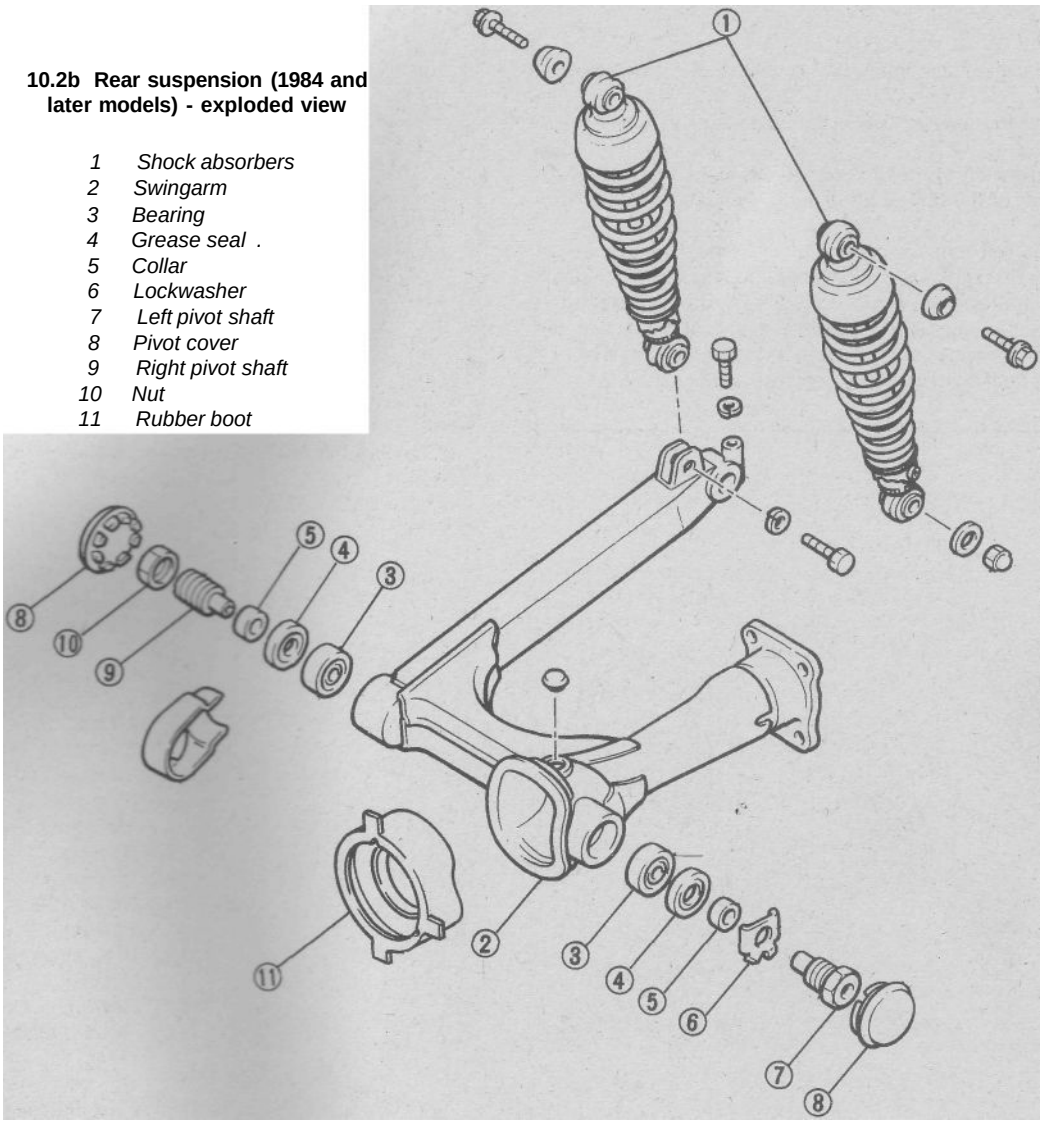
2 Unbolt the top end of the shock from the frame **(see illustrations).**

3 Remove the bolt that secures the lower end of the right shock or the nut that secures the lower end of the left shock. Rotate the top end of the shock toward the rear of the bike and take it off.

Inspection

4 Check the shock for obvious physical damage and the coil spring for looseness or signs of fatigue; replace both shock absorbers as a pair if these conditions are found. Except for mounting bushings, replacement parts are not available.

5 Check the shock for signs of oil or gas leaks and replace it if you find any.



10.2b Rear suspension (1984 and later models) - exploded view

1 Shock absorbers
2 Swingarm
3 Bearing
4 Grease seal .
5 Collar
6 Lockwasher
7 Left pivot shaft
8 Pivot cover
9 Right pivot shaft
10 Nut
11 Rubber boot

6 Inspect the pivot hardware at the top and bottom of the shook and replace any worn or damaged parts.

Installation

7 Coat the pivot points with a thin layer of multi-purpose lithium-based grease. Install the shock with the tightly wound spring coils downward. Tighten the top bolts, then the bottom right bolt, then the bottom left nut to the torques listed in this Chapter's Specifications.

11 Swingarm bearings - check

1 Refer to Chapter 6 and remove the rear wheel, then refer to Section 9 to detach the lower end of the suspension unit or Section 10 to remove the rear shock absorbers.

2 Grasp the rear of the swingarm with one hand and place your other hand at the junction of the swingarm and the frame. Try to move the rear of the swingarm from side-to-side. Any wear (play) in the bearings should be felt as movement between the swingarm and the frame at the front. The swingarm will actually be felt to move forward and backward at the front (not from side-to-side). If any play is noted, the bearings should be replaced with new ones (see Section 12).

3 Next, move the swingarm up and down through its full travel. It should move freely, without any binding or rough spots. If it does **not** move freely, refer to Sections 14 and 15 for servicing procedures.

12 Driveshaft and final drive (shaft drive models) - removal, inspection and installation

Removal

Refer to illustration 12.7a and 12.7b

1 Support the bike securely so it can't be knocked over during this procedure.

2 Remove the exhaust system (see Chapter 3).

3 Remove the rear wheel (see Chapter 6).

4 If you're working on a 1981 through 1983 model, remove **ttJ** attachment pin to separate the lower end of the suspension unit frc~ the swingarm (see Section 9).

5 If you're working on a 1984 or later model, remove the left rear shock absorber (see Section 10).

6 Remove the nuts and lockwashers that secure the final drive urn to the swingarm. If you're working on a 1981 through 1983 mode*, remove the single bolt and nut as well.

7 Pull the final gear assembly away from the swingarm, **together** with the driveshaft **(see illustrations).**

Inspection

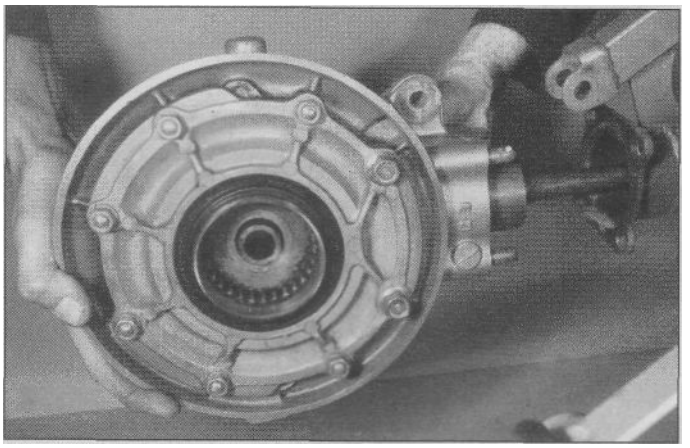
Refer to illustrations 12.10a and 12.10b

8 Wipe the final gear assembly clean with a rag moistened in solvent.

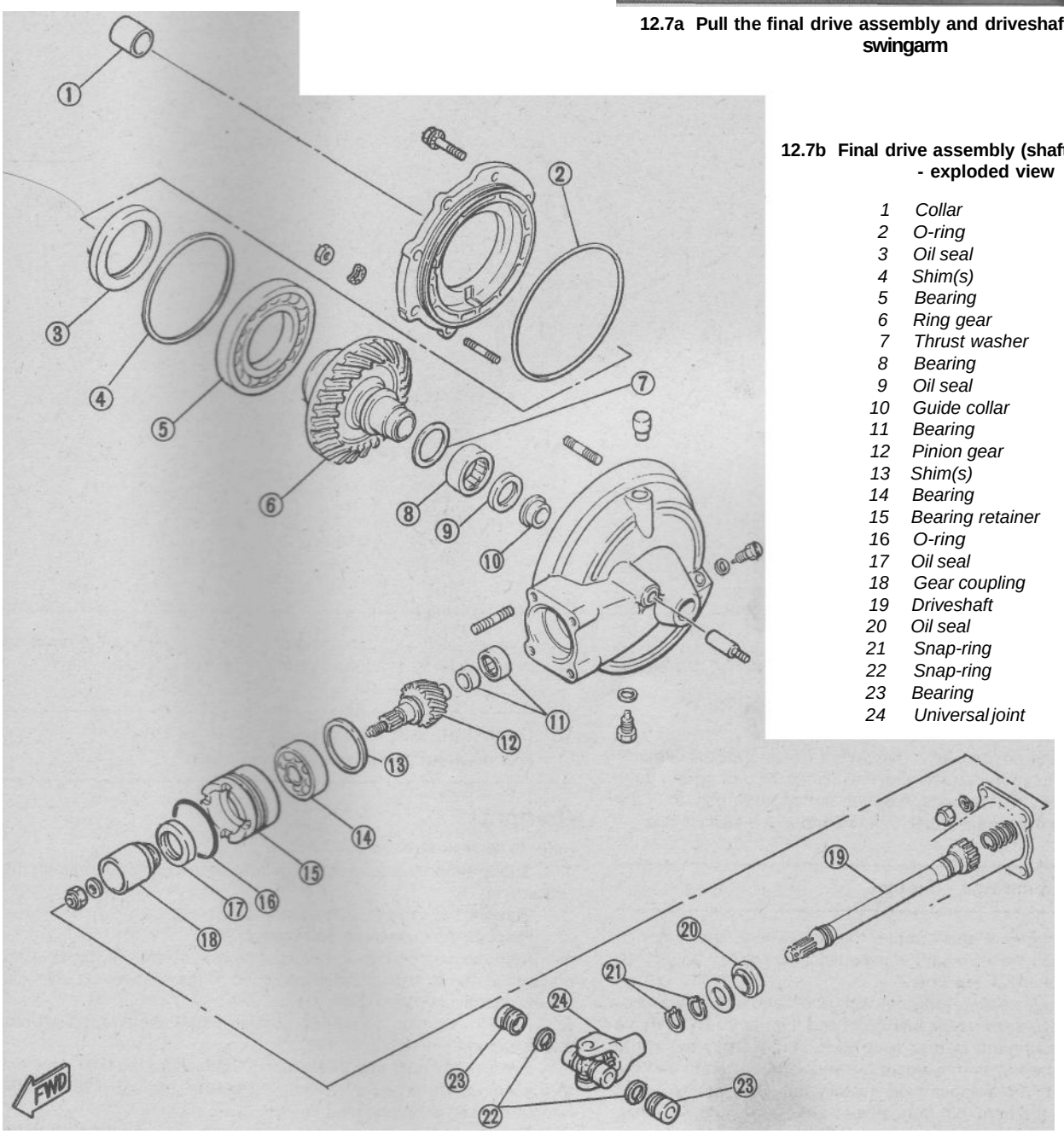
9 Check all parts for obvious wear or damage and replace any worn or damaged parts.

10 Check the driveshaft splines for step wear. Make sure the snap-ring at the rear end of the driveshaft is securely seated in its groove **(see illustrations).**

11 The final drive unit requires special tools to measure and adjust gear backlash. The procedure is complicated and should be done by a dealer service department or other qualified shop. Rotate the driveshaft by hand. The ring gear splines (the part that mates with the rear wheel) should rotate smoothly. If rotation feels rough or jerky or if it's noisy, have the final drive unit disassembled and inspected.

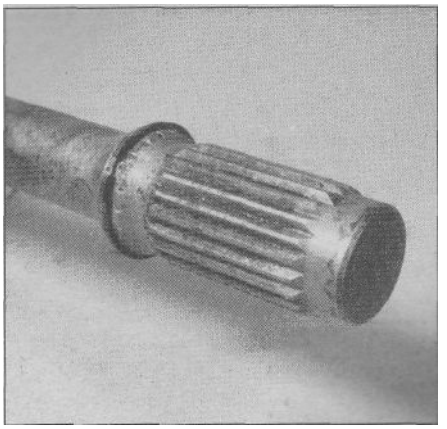


12.7a Pull the final drive assembly and driveshaft clear of **the swingarm**

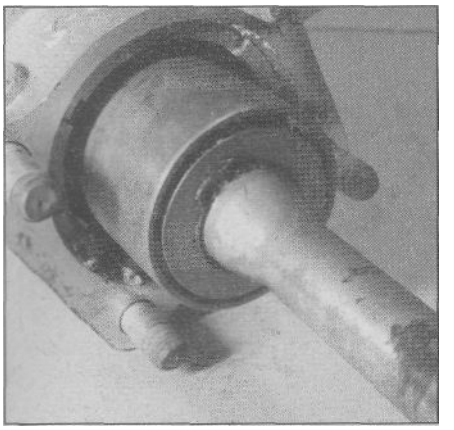


12.7b Final drive assembly (shaft drive models) - exploded view

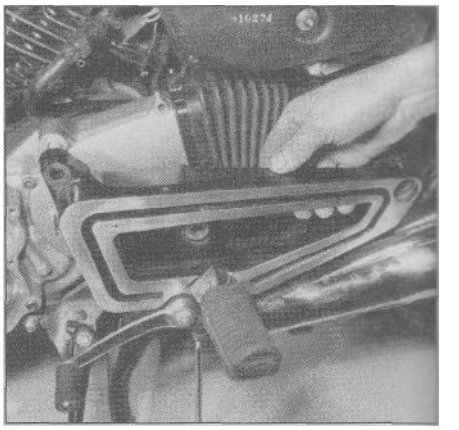
1 Collar
2 O-ring
3 Oil seal
4 Shim(s)
5 Bearing
6 Ring gear
7 Thrust washer
8 Bearing
9 Oil seal
10 Guide collar
11 Bearing
12 Pinion gear
13 Shim(s)
14 Bearing
15 Bearing retainer
16 O-ring
17 Oil seal
18 Gear coupling
19 Driveshaft
20 Oil seal
21 Snap-ring
22 Snap-ring
23 Bearing
24 Universal joint



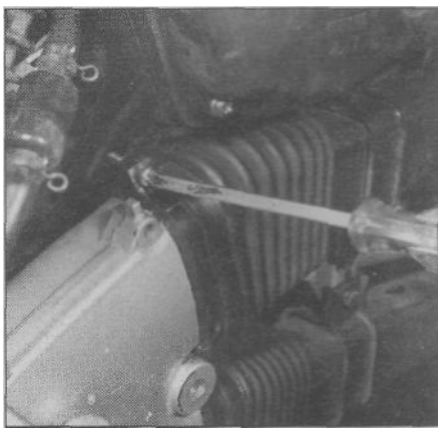
12.10a Check the driveshaft splines **for step wear**



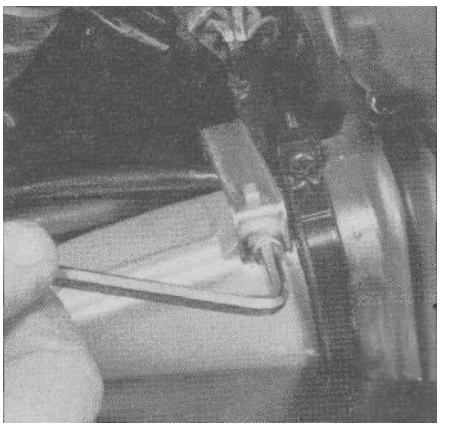
12.10b Make sure the snap-ring is securely located in its groove



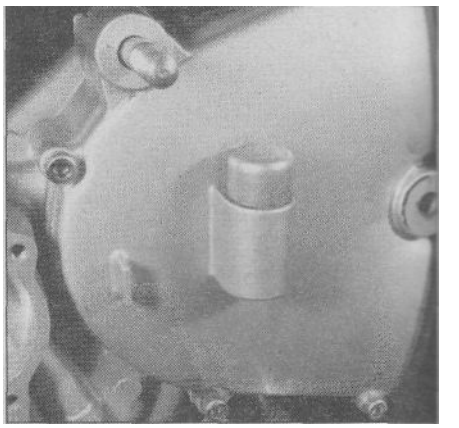
13.3 Remove the left footpeg bracket, together with the muffler/silencer



13.4 Loosen the screws on the chain case clamps



13.5a Loosen the cover bolts with an Allen wrench . . .



13.5b . . . evenly, in a criss-cross pattern

Installation

12 Installation is the reverse of the removal steps, with the following additions:

a) Lubricate the driveshaft splines with multi-purpose lithium-based grease.
b) Apply silicone sealant to the mating surfaces of the swingarm and final drive unit.
c) Use new lockwashers and tighten the final drive-to-swingarm nuts to *the torque listed in this Chapter's Specifications.*
d) Check the oil level in the final drive unit and top up as needed (see Chapter 1).

13 Drive chain, sprockets and coupling bearing (chain drive models) - removal, inspection and installation

Note: *Removal of the drive chain requires that it be separated with a chain breaker. If you don't have this tool, it may be less expensive to have the work done by a dealer service department than to buy it.*

Removal

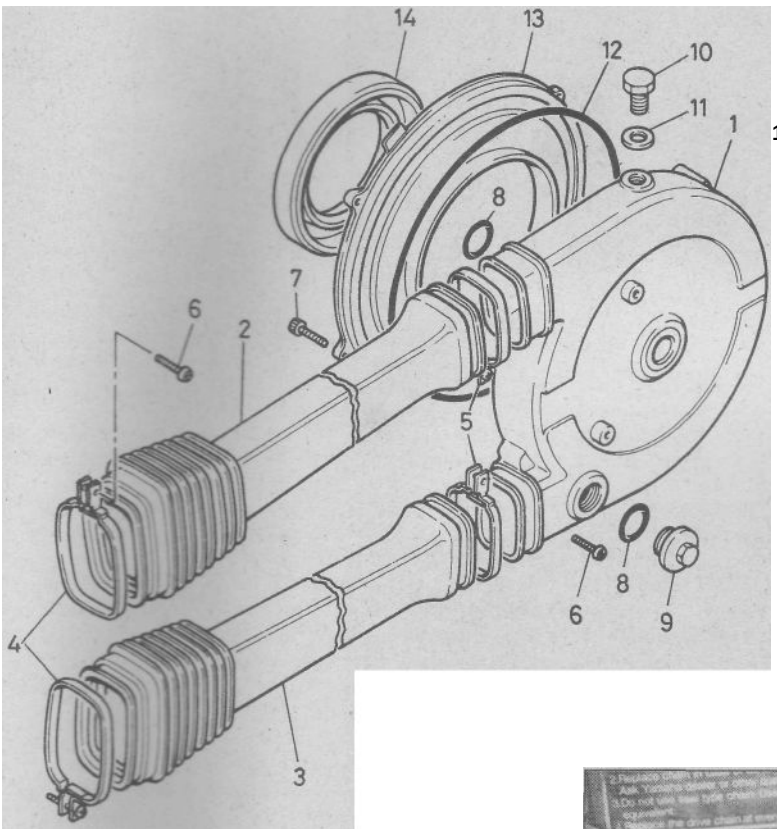
Refer to illustrations 13.3, 13.4, 13.5a, 13.5b, 13.5c, 13.8 and 13.9

1 Remove the rear wheel (see Chapter 6).
2 Remove the shift pedal pinch bolt.
3 Loosen the clamp that secures the left muffler/silencer to the front exhaust pipe. Remove the nut and bolt that secure the left front footpeg bracket to the motorcycle, then remove the bracket together with the left muffler/silencer **(see illustration).**
4 Loosen the clamp screws and slide the upper and lower chain cases backward away from the engine sprocket housing **(see illustration).**
5 Remove the Allen bolts and detach the sprocket housing from the engine **(see illustrations). Caution:** *The housing may be stuck to the engine with sealant. If it's difficult to remove, make sure all fasteners have been removed. Don't pry against gasket surfaces or they will* be *gouged. Tap gently around the edge of the cover to free it.*
6 At this point, it's necessary to disconnect the chain. For acces, loosen the clamp and detach the lower chain case from the rear sprocket housing. Turn the rear sprocket until you locate the soft link, then use the chain breaker tool to separate it.
7 Lift the chain off the front sprocket and turn the rear sprocket while pulling the chain out of the cases.
8 Loosen the clamp and detach the upper chain case from the rear sprocket housing. Unbolt the chain cases from the swingarm and remove them **(see illustration).**
9 Remove two bolts, lockwashers and plain washers and detach the rear sprocket housing from the motorcycle **(see illustration).**
10 Remove five Allen bolts and detach the sprocket retaining ring from the rear sprocket housing. **Caution:** *If the retaining ring is stuck in the sprocket housing, pry it gently and evenly to free it. Don't let it tilt sideways while prying or it may crack.*
11 Once the retaining ring is free, remove its O-ring.

Inspection

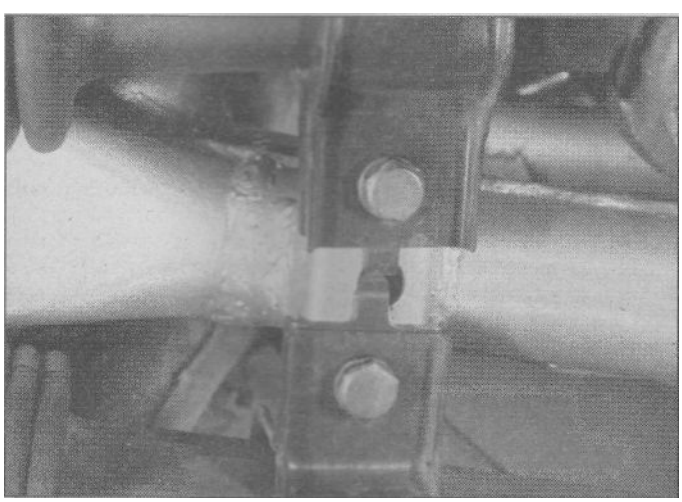
Refer to illustrations 13.12 and 13.16

12 Check the sprockets for wear or damage **(see illustration).** Refer to Steps 18 and 19 below and replace the sprockets if wear or damage can be seen. Note: *The chain and both sprockets should be replaced as a set, even if only one component is visibly defective. Installing a*

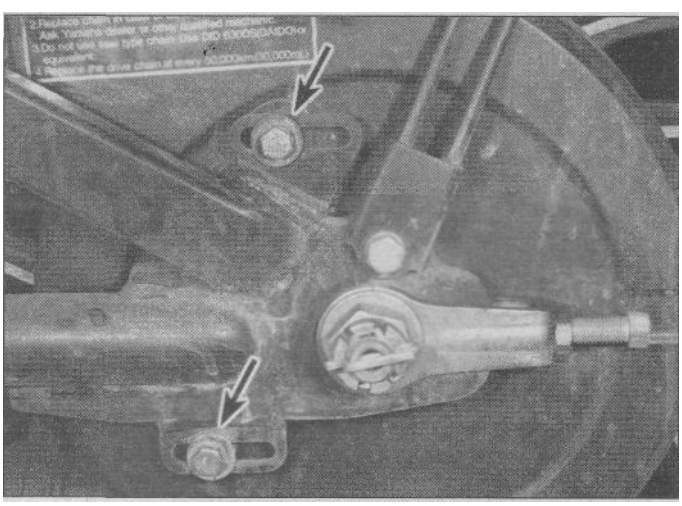


13.5c Final drive housing (chain drive models) - exploded view

1 *Rear sprocket housing*
2 *Upper chain case*
3 *Lower chain case*
4 *Front chain case clamps*
5 *Rear chain case clamps*
6 *Clamp screws*
7 *Sprocket housing cover bolts*
8 *O-ring*
9 *Access plug*
10 *Filler plug*
11 *Sealing washer*
12 *O-ring*
13 *Sprocket retaining ring*
14 *Grease seal*



13.8 These two bolts secure the chain cases to the swingarm



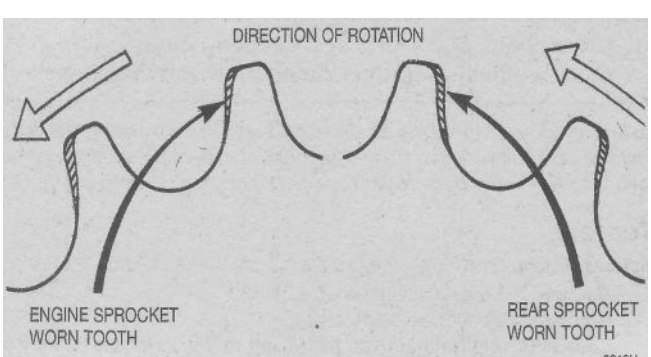
13.9 Remove the bolts, lockwashers and washers (arrows) to detach the rear sprocket housing from the frame

new chain on worn sprockets or a worn chain on new sprockets will accelerate wear of the new components.

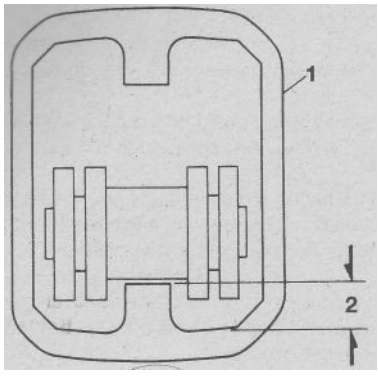
13 Check the sprocket retaining ring oil seal for wear and replace it as necessary.

14 Clean all parts thoroughly with solvent. Be sure to remove all old grease from the chain and from inside the chain cases.

15 Place the chain[1] on a clean flat surface and stretch it out straight. Squeeze the chain links together, keeping the chain in a straight line. Measure the length of the chain. Secure one end of the chain to the flat surface, then pull it out straight and measure its length again. If the difference between the two measurements is more than one-quarter inch per foot of chain length, replace the chain. **Note:** *Do not use an Cl-ang chain. The O-rings will be damaged by being pulled through the grease in the chain cases and sprocket housings.*

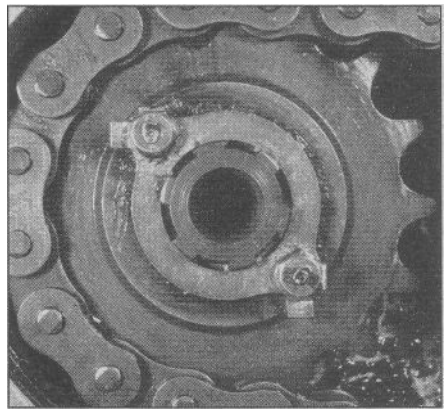


13.12 Check the sprockets in the areas indicated to see if they are worn excessively

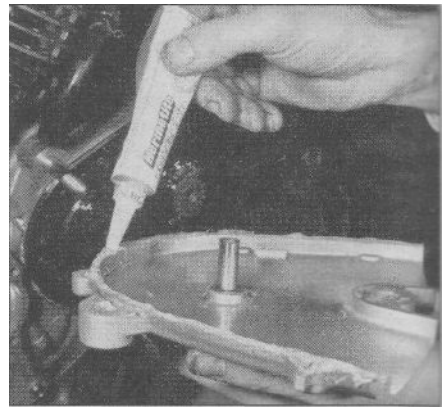


13.16 Chain case internal rib measurement

1 Chain case *2 Rib height*



13.18 The engine sprocket is secured by two bolts and a lockwasher



13.35 Coat the mating surface of the engine sprocket housing with silicone sealant

16 Check the chain cases for cracks or.brittleness and replace as necessary. Measure the height of the internal ribs and compare it to the value listed in this Chapter's Specifications **(see illustration).** If the ribs are worn, replace the chain cases.

17 Check the sprocket housings for cracks or other damage and replace as necessary. Make sure the breather on the engine sprocket housing is clear of obstructions.

Sprocketreplacement

Refer to illustration 13.18

18 To replace the engine sprocket, flatten the tabs on the lockwashers and remove the sprocket bolts **(see illustration).** Slide the sprocket off and install the new one. Install a new lockwasher, tighten the bolts to the torque listed in this Chapter's Specifications, then bend the lockwasher tabs against the bolts.

19 To replace the rear sprocket, loosen the lockwasher tabs (see **illustration 6.5c in Chapter 6, Part B).** Remove the nuts ana lockwashers and lift off the sprocket. Install the new sprocket and *nev,* lockwashers. Tighten the sprocket evenly, in a criss-cross pattern tc the torque listed in this Chapter's Specifications, then bend the lockwasher tabs against the nuts.

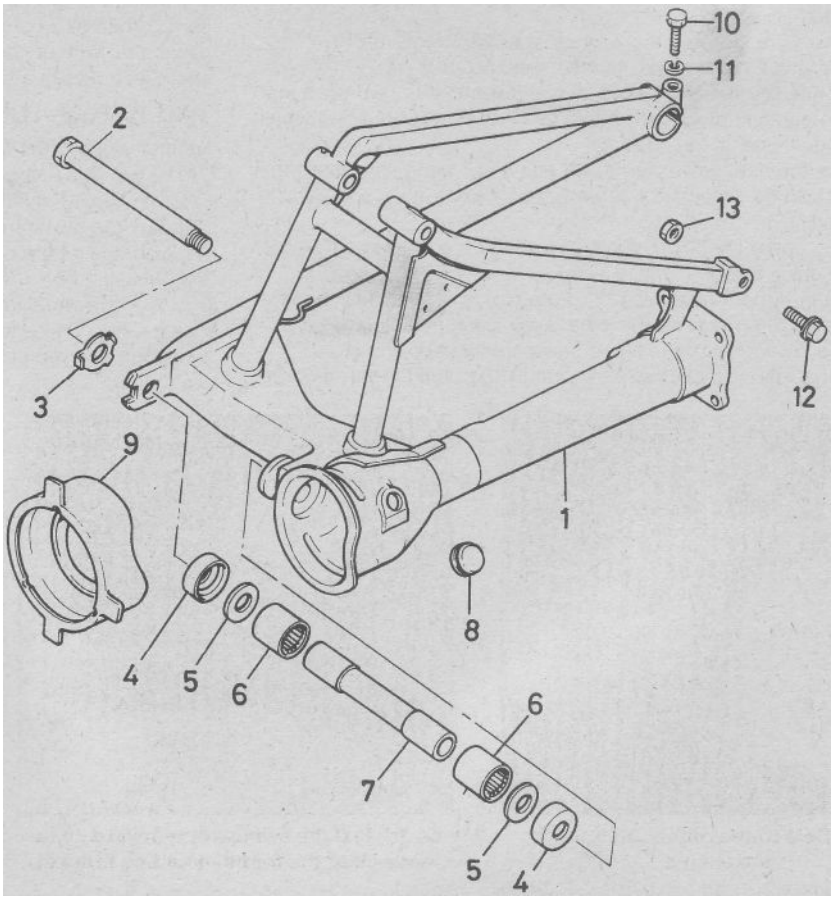
Couplingbearingreplacement

20 Remove the bearing snap-ring from the coupling **(see illustration 6.5c in Chapter 6, Part B).**

21 Pry out the grease seal and remove the spacer.

14.7a Swingarm (1981 through 1983 shaft drive models) - exploded view

7 Swingarm
2 Pivot bolt
3 Lockwasher
4 Dust cap
5 Thrust washer
6 Bearing
7 Bushing
8 Viewing plug
9 Rubber boot
10 Axle pinch bolt
11 Lockwasher
12 Final drive housing bolt
13 Nut



14.7b The pivot bolt head on **1981** through **1983 shaft drive models** is secured by a lockwasher

22 Lift out the bearing. If it **won't come** easily, tap it out from the wheel side of the coupling toward **the sprocket** side.
23 Pack a new bearing with **grease and** tap it in from the sprocket side. Use a bearing driver or a **socket that** bears against the bearing outer race.
24 Install the spacer and tap in **a new** grease seal with its open side toward the bearing.
25 Install the snap-ring.

Installation

Refer to illustration 13.35

26 To keep the chain from falling on the ground and picking up small bits of dirt as it's installed, place clean rags, newspaper or cardboard on the ground under the chain run.
27 Apply a light coat of the grease specified for the chain (see Chapter 1) to the O-ring on the sprocket retaining ring.
28 Assemble the rear sprocket and retainer to the rear sprocket housing. Be careful not to push the large O-ring out of position when installing the retainer in the housing.
29 Thread the chain into the top opening in the housing onto the sprocket. Turn the sprocket and work the chain around and out the bottom opening.
30 Slip the upper and lower chain cases over the chain, then tie the ends of the chain together with wire.
31 Slide the upper chain case onto the rear sprocket housing and tighten its clamp. Don't slide the lower chain case on yet; leave a gap between the lower chain case and the rear sprocket housing.
32 Turn the rear sprocket so the ends of the chain are in the gap between the lower chain case and the rear sprocket. This will provide access to reconnect the chain permanently.
33 Install the chain cases and rear sprocket housing on the bike, engaging the chain with the engine sprocket, and tighten their mounting bolts loosely.
34 Install the soft link and connect the chain with a chain installation tool. Slide the lower chain case onto the rear sprocket housing and tighten its clamp.
35 Clean all sealant from the mating surfaces of the engine sprocket cover and the engine. Coat the cover surface with silicone sealant **(see illustration),** then install it on the engine. Tighten the bolts evenly, in a criss-cross pattern.
36 The remainder of installation is the reverse of the removal steps.
37 Adjust the chain tension (see Chapter 1) before you tighten the chain case and rear sprocket housing bolts.
38 Add the specified grease to the rear sprocket housing filler hole (see Chapter 1).
39 Test ride the motorcycle and check for leaks.

14 Swingarm - removal, inspection and installation

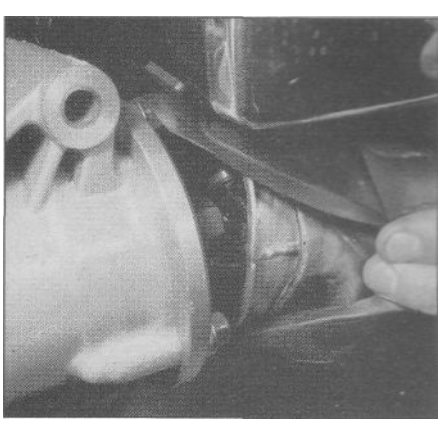
Removal

1 Support the bike securely so it can't be knocked over during this procedure.
2 Remove the exhaust system (see Chapter 3).
3 Remove the rear wheel (see Chapter 6).
4 Remove the rear suspension unit or shock absorbers (see Section 9 or Section 10).
5 If you're working on a shaft drive model, remove the final drive assembly (see Section 12).
6 If you're working on a chain drive model, the final drive assembly (chain cases and rear sprocket housing) can be removed together with the swingarm or removed from the motorcycle first. If you're removing the swingarm to inspect or replace the bearings, remove the engine sprocket cover and detach the engine sprocket from the engine, but leave the rest of the final drive assembly (chain cases and rear sprocket housing) attached to the swingarm (see Section 13).

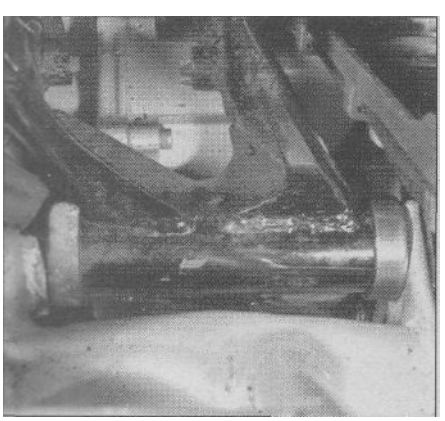
1981 through 1983 models

Refer to illustrations 14.7a through 14.7d, 14.8a and 14.8b

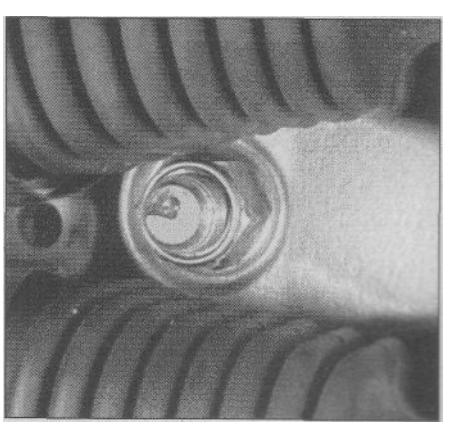
7 If you're working on a shaft drive model, bend back the lockwasher tabs that secure the head of the swingarm pivot bolt **(see illustration).** Support the swingarm and remove the pivot bolt **(see illustration).** Separate the rubber boot from the engine **(see illustration)** and remove the swingarm from the motorcycle **(see illustration).**
8 If you're working on a chain drive model, remove the nut and plain washer from the swingarm pivot bolt **(see illustrations).** Support the swingarm and remove the pivot bolt, then remove the swingarm from the motorcycle.



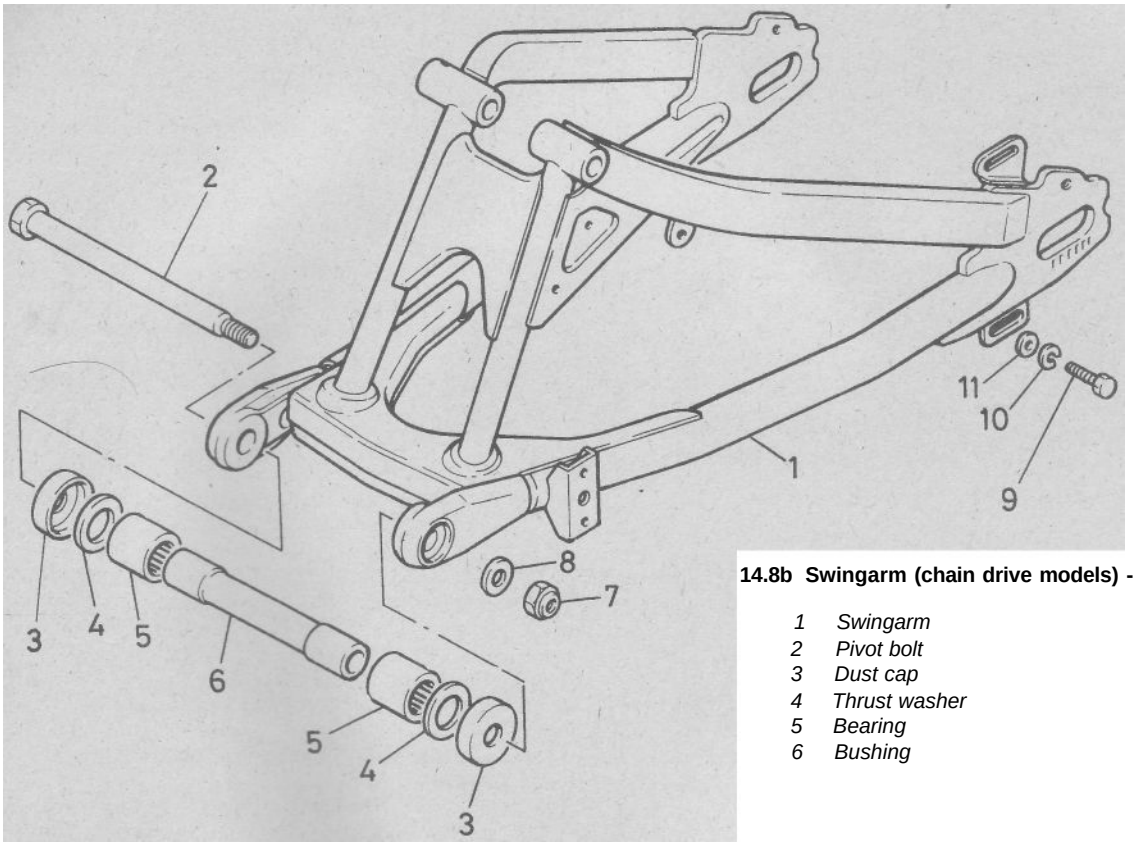
14.7c Detach the rubber boot from the engine



14.7d Pull the swingarm rearward so its ends clear the frame mounting bracket

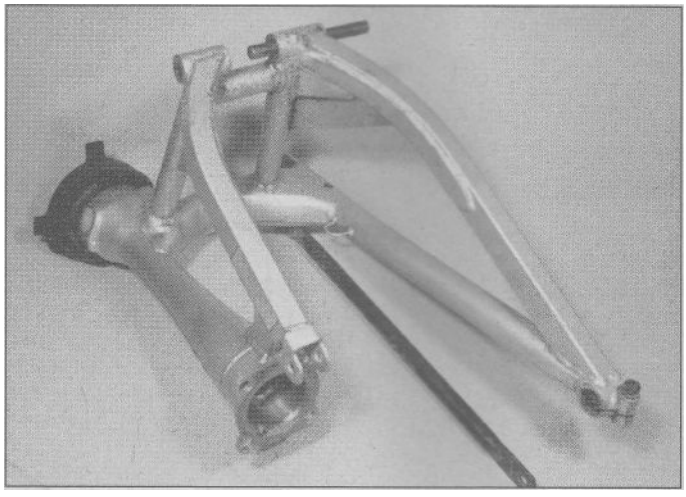


14.8a The pivot bolt on chain drive models is secured by a nut and plain washer

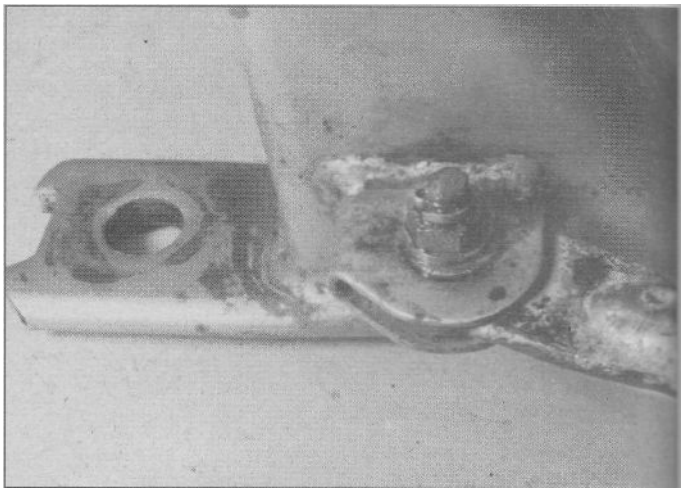


14.8b Swingarm (chain drive models) - exploded view

1	*Swingarm*	*7*	*Pivot bolt nut*
2	*Pivot bolt*	*8*	*Washer*
3	*Dust cap*	*9*	*Bolt*
4	*Thrust washer*	*10*	*Lockwasher*
5	*Bearing*	*11*	*Washer*
6	*Bushing*		



14.12 Check the swingarm for cracks and bending



14.13 If the pivot bolt holes are worn to an oval shape, replace the swingarm

1984 and later models

9 Pry off the pivot cover on each side of the swingarm **(see illustration 10.2b).**

10 Support the swingarm. On the left side, flatten the lockwasher tabs and unscrew the pivot shaft. On the right side, remove the nut and the pivot shaft.

11 Detach the swingarm boot from the engine and remove the swingarm.

Inspection

Refer to illustrations 14.12, 14.13 and 14.14

12 Check the swingarm for obvious damage, such as cracks or bending and replace it as necessary **(see illustration).**

13 Check the swingarm mounting holes for ovaling **(see illustration).**

14 Check the rubber boot for cracks or deterioration and replace **as** necessary **(see illustration).**

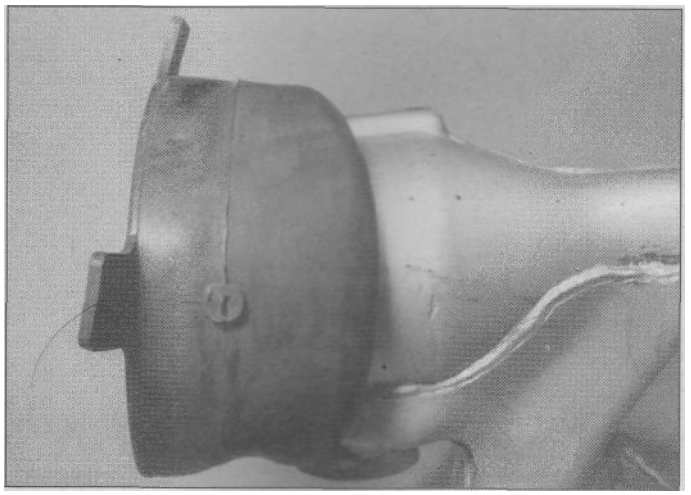
15 Refer to Section 15 and inspect the swingarm bearings. If you're working on a 1981 through 1983 model, calculate the swingarm side clearance.

Installation

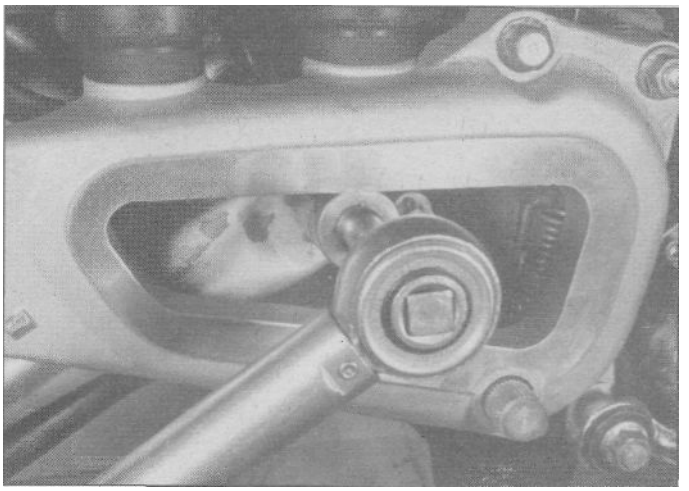
Refer to illustration 14.16

16 Installation is the reverse of the removal steps, with the following additions:

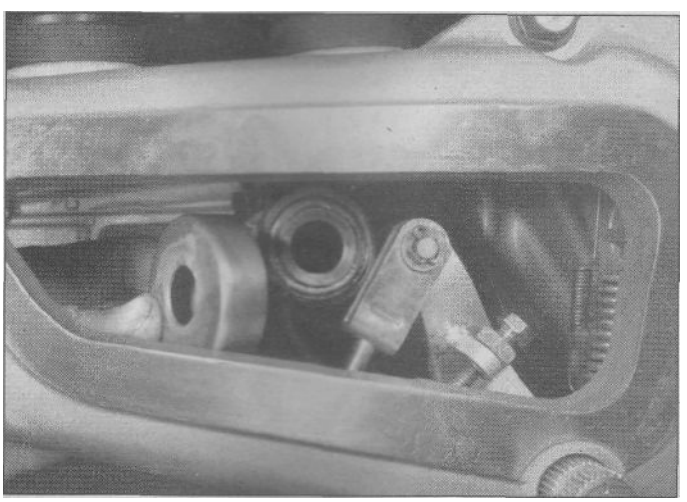
a) Use a new lockwasher and be sure its tab engages the slot in the swingarm.



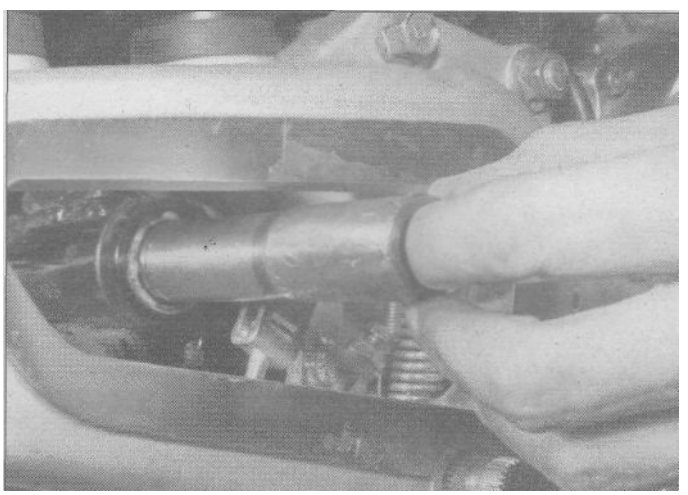
14.14 Check the rubber boot for hardness or cracks



14.16 Tighten the pivot bolt, then bend the lockwasher tabs against the bolt head



15.2 Pry the dust caps off the frame



15.3 Pull out the bushing

b) Tighten the pivot bolt, nut or shafts to the torque listed in this Chapter's Specifications (see illustration). *On 1984 and later models, tighten the right side, then the left side. On all shaft drive models, bend the lockwasher against the flats on the shaft head or nut* **(see illustration 10.2b or 14.7b).**

c) If you're working on a 1981 through 1983 shaft drive model, remove the viewing plug from the left side of the swingarm so you can see the end of the dhveshaft when aligning it with the engine.

15 Swingarm bearings - inspection and replacement

1 Remove the swingarm (see Section 10).

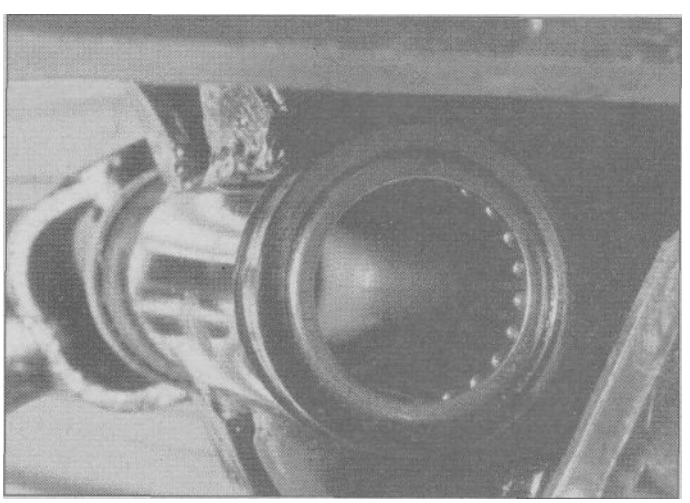
1981 through 1983 models

Refer to illustrations 15.2, 15.3, 15.4, 15.5, 15.6 and 15.7

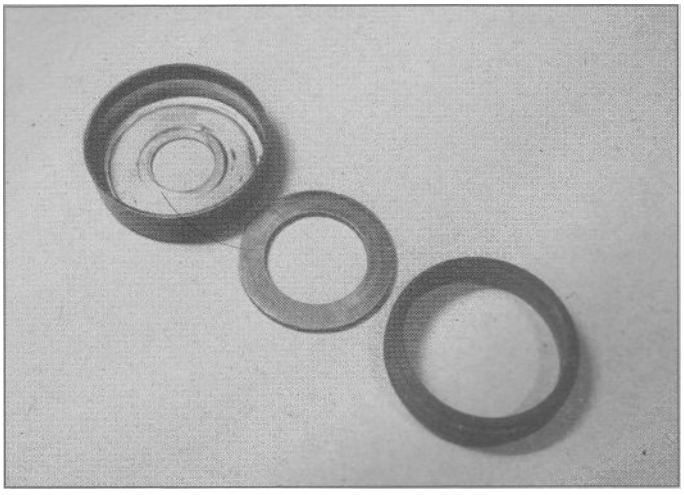
2 Pry off the thrust cover and remove the plain washer from each side of the frame **(see illustration).**

3 Slide the bushing out **(see illustration).**

4 Inspect the bearings **(see illustration).** If they're dry, lubricate them with lithium base waterproof wheel bearing grease. If they're worn or damaged, it's best to take the motorcycle to a Yamaha dealer or motorcycle repair shop for bearing replacement. The bearings can be tapped out with a long rod inserted from the opposite side of the bike, but they'll be ruined in the process. The new bearings will also be ruined when they're tapped in unless you have a drift that fits precisely inside the bearings and also has a shoulder that will apply pressure to the circumference of the bearing.



15.4 Clean the needle roller bearings and check them or wear and damage



15.5 Check the dust cap, thrust washer and seal for wear and damage

5 Check the dust caps, thrust washers and seals for wear or damage and replace them as necessary **(see illustration).**

6 Calculate the swingarm side clearance. Measure the length of the bushing and the frame crossmember **(see illustration).** Measure the thickness of the two thrust washers. Add the thickness of both thrust washers to the frame crossmember length, then subtract this total from the length of the bushing to obtain the side clearance; that is, side clearance = A - (B1 + B2 + C). Compare the measurement to the value listed in this Chapter's Specifications. If the measured clearance is excessive, replace the thrust washers or bushing, whichever is most worn.

7 Lubricate the insides of the dust caps with multi-purpose lithium grease **(see illustration).**

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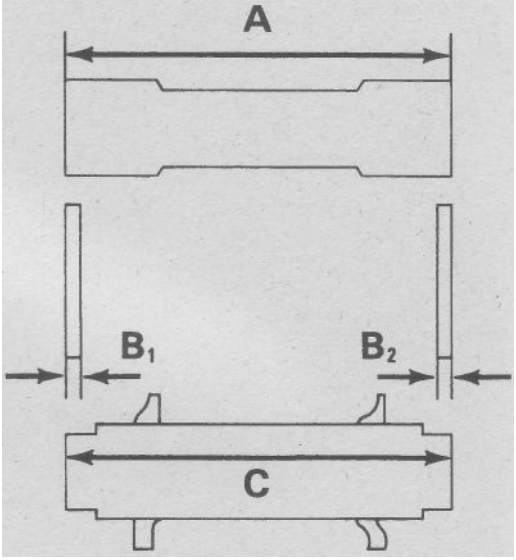
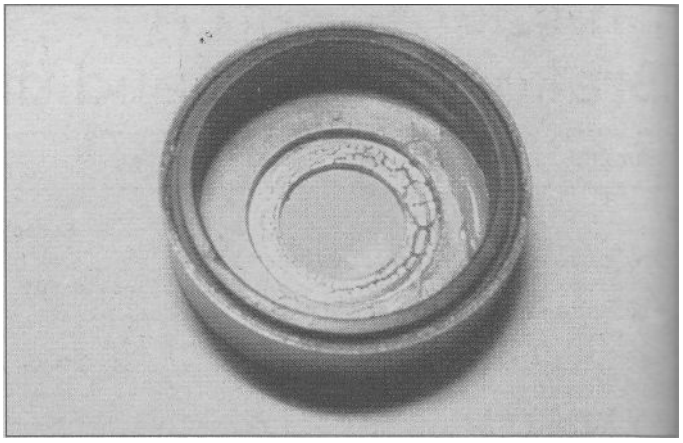
8 Remove the bearing collars, then pry the grease seals out **(see illustration 10.2b).** Rotate the bearings with a finger and check them for roughness or looseness. If the bearings need to be replaced, remove them with a blind hole puller and slide hammer.

9 Pack the new bearings with waterproof wheel bearing grease, then tap them into position with a bearing driver or socket that bears against the bearing outer race. **Note:** *If you don't have the necessary puller and slide hammer, it may be less expensive to have a dealer service department replace the bearings than to rent the tools.*



15.6 Swingarm side clearance measurement (1981 through 1983 models)

A Bushing length
B1 Thrust washer thickness
B2 Thrust washer thickness
C Frame mounting point length



15.7 Grease the inside of each dust cap

Chapter 6 Part A
Brakes, wheels and tires (XV535 models)

Contents

	Section
Brake caliper - removal, overhaul and installation	3
Brake check	See Chapter 1
Brake disc - inspection, removal and installation	4
Brake hose - inspection and replacement	7
Brake light switches - check and adjustment	See Chapter 1
Brake pads -replacement	2
Brake system bleeding	8
Front brake master cylinder - removal, overhaul and installation	5
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General information	1
Rear drum brakes - removal, overhaul and installation	6
Rear wheel - removal and installation	12
Tubed tires - general information	14
Wheel bearings - inspection and maintenance	13
Wheels and tires - general check	See Chapter 1
Wheels - alignment check	10
Wheels - inspection and repair	9

Specifications

Brakes

Brake fluid type	See Chapter 1
Front brake disc thickness	
Standard	5.0 mm (0.20 inch)
Minimum*	4.5 mm (0.18 inch)
Disc runout limit	0.15 mm (0.006 inch)
Front brake pad thickness (new)	6.2 mm (0.26 inch)
Wear limit	0.8 mm (0.03 inch)
Rear brake drum inside diameter	
Standard	200 mm (7.87 inches)
Maximum	201 mm (7.91 inches)
Rear brake shoe lining thickness	
Standard	4 mm (0.16 inch)
Minimum	2 mm (0.08 inch)

**Refer to marks stamped into the disc (they supersede information printed here)*

Wheels and tires

Wheel runout	
Radial (up-and-down)	2.0 mm (0.08 inch)
Axial (side-to-side)	2.0 mm (0.08 inch)
Tire pressures	See Chapter 1
Tire sizes	
Front	3.00S-19 4PR
Rear	140/90-15M/C 70S

Torque specifications

Caliper lower mounting bolt (to bracket)	18 Nm (13 ft-lbs)
Caliper bracket bolts (to fork leg)	35 Nm (25 ft-lbs)
Front axle	58 Nm (42 ft-lbs)
Front axle pinch bolt	20 Nm (14 ft-lbs)
Brake disc mounting bolts	20 Nm (14 ft-lbs)*
Union (banjo fitting) bolts	26 Nm (19 ft-lbs)
Master cylinder mounting bolts	9 Nm (6.5 ft-lbs)
Rear axle nut	
1987 and 1988 models	105 Nm (75 ft-lbs)
1989-on models	107 Nm (77, ft-lbs)
Rear axle pinch bolt	16 Nm (11 ft-lbs)
Rear wheel clutch hub bolts	
1987 and 1988 models	69 Nm. (50 ft-lbs)
1989-on models	62 Nm (45 ft-lbs)
Brakerod nuts	20 Nm (14 ft-lbs)**

**Use new lockwashers.*
***Use new cotter pins.*

1 General information

The models covered in this Chapter are equipped with a hydraulic disc brake at the front and a mechanical drum brake at the rear.

Ail XV535 models are equipped with wire spoke wheels and tubed tires.

Caution: *Disc brake components rarely require disassembly. Do not disassemble components unless absolutely necessary. If any hydraulic brake line connection in the system is loosened, the entire system should be disassembled, drained, cleaned and then properly filled and bled upon reassembly. Do not use solvents on internal brake components. Solvents will cause seals to swell and distort. Use only clean brake fluid, brake cleaner or alcohol for cleaning. Use care when working with brake fluid as it can injure your eyes and it will damage painted surfaces and plastic parts.*

2 Brake pads - replacement

Warning: *The dust created by the brake system may contain asbestos, which is harmful to your health. Never blow it out with compressed air and don't inhale any of* ***it.*** *An approved filtering mask should be worn when working on the brakes.*

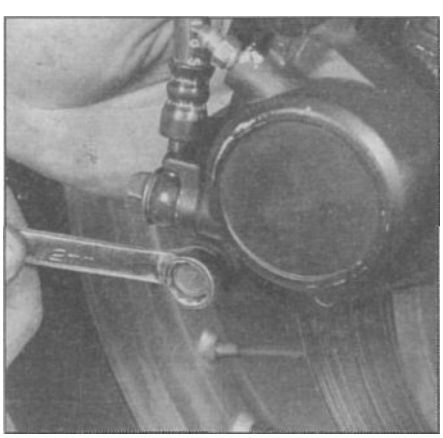
Refer to illustrations 2.2a, 2.2b, 2.3a, 2.3b, 2.3c, 2.6a and 2.6b

1 Support the bike securely so it can't be knocked over during this procedure.

2 Remove the caliper lower mounting bolt **(see illustration).** Rotate the caliper up to expose the pads **(see illustration).**

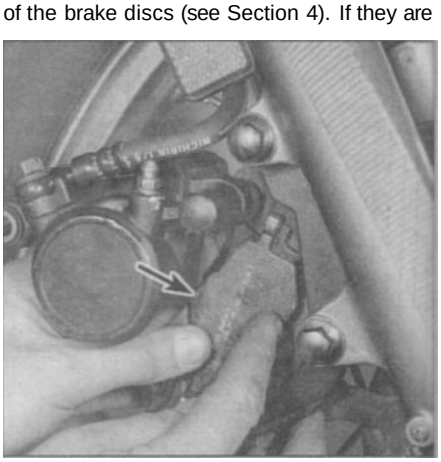
3 Remove the pads and pad springs **(see illustrations).** Measure the amount of friction material left on the pads and replace them as a pair if worn, fouled with oil or damaged in any way.

4 Check the condition of the brake discs (see Section 4). If they are

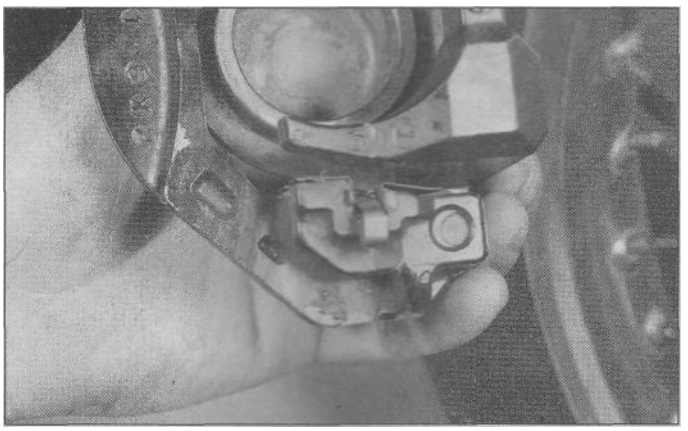


2.2a Remove the lower mounting bolt from the caliper . . .

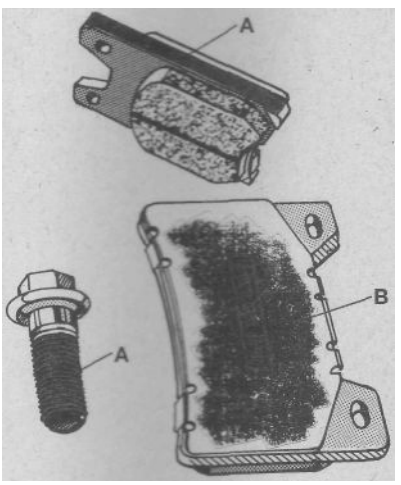
2.2b . . . and pivot the caliper up to expose the pads



2.3a Remove the pads; the rounded edge of each pad (arrow) faces the rear of the motorcycle

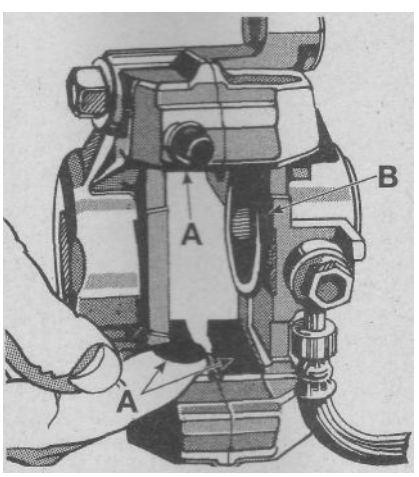


2.3b Remove the **pad springs**



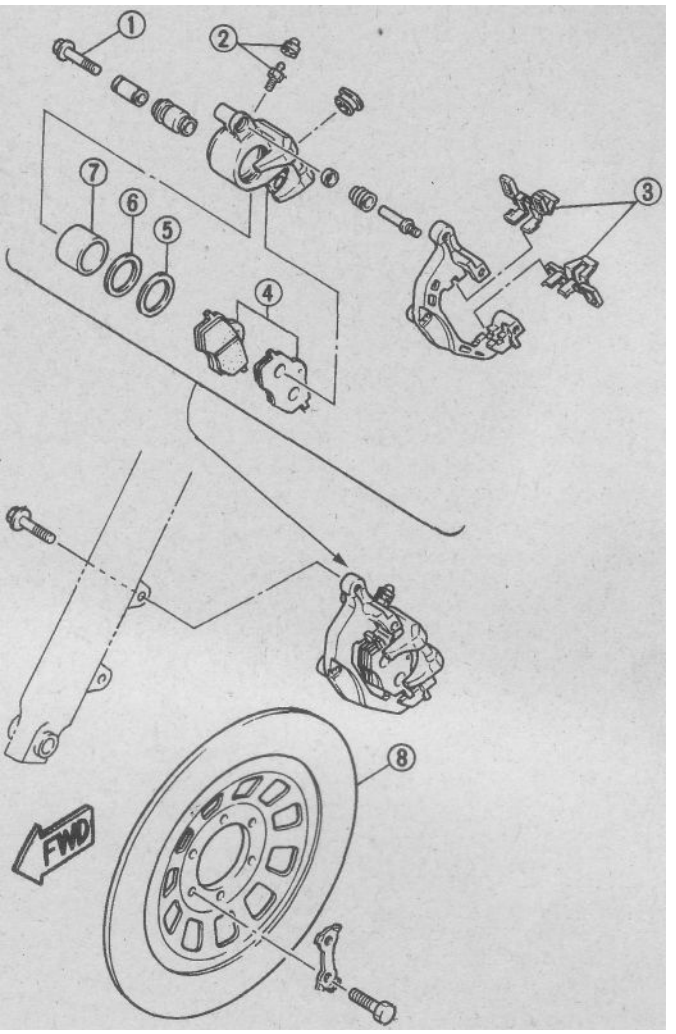
2.6a Special lubricants are required in the UK (and recommended anywhere salt is used on the roads) to prevent corrosion

A Apply Duckhams Copper 10 or equivalent to the shaded areas
B Apply Shin-Etsu G-40M or equivalent silicone grease to the shaded areas



2.6b Apply the recommended lubricants to the pad friction areas inside the caliper and to the exposed portion of the caliper pistons

A Duckhams Copper 10
B Shin-Etsu G-40M or equivalent silicone grease



2.3c Front brake caliper (XV535 models) - exploded view

1	*Caliper mounting bolt*	*5*	*Dust seal*
2	*Bleed valve and cap*	*6*	*Piston seal*
3	*Pad springs*	*7*	*Piston*
4	*Pads*	*8*	*Brake disc*

in need of machining or replacement, follow the procedure in that Section to remove them. If they are okay, deglaze them with sandpaper or emery cloth, using a swirling motion.

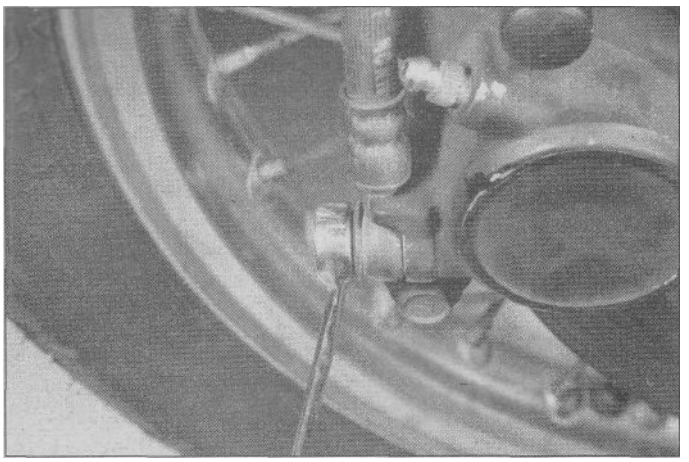
5 Remove the cover and diaphragm from the master cylinder reservoir and siphon out some fluid. Push the pistons into the caliper as far as possible, while checking the master cylinder reservoir to make sure it doesn't overflow. If you can't depress the pistons with thumb pressure, try using a C-clamp (G-clamp). If the piston sticks, remove the caliper and overhaul it as described in Section 3.

6 **Warning:** *This step is necessary to ensure that the pads move freely in the calipers. Because a large amount of salt is used on roads in the UK, special lubrication of the pads and calipers is required. Before installing the pads on UK models, apply a thin film of Duckhams Copper 10 or equivalent to the following areas* **(see illustrations).**

a) To the edges of the metal backing on the brake pads
b) To the areas of the caliper where the pads rub
c) To the threads of the caliper mounting bolts.

Apply a thin film of Shin-Etsu G-40M or equivalent silicone grease to the following:

d) Exposed areas of the caliper pistons
e) The areas sf the pad backing plates that contact the piston:



3.2a Unscrew the banjo bolt; there's a sealing washer on each side of the fitting

Caution: *Don't use too much Copper 10. Make sure no Copper 10 contacts the brake discs or the pad friction surfaces.*

7 Install the pads and springs in the caliper. The rounded edge of the pad faces the rear of the motorcycle **(see illustration 2.3a).**

8 Refill the master cylinder reservoir (see Chapter 1) and install the diaphragm and cover.

9 Operate the brake lever several times to bring the pads into contact with the disc. Check the operation of the brakes carefully before riding the motorcycle.

3 Brake caliper - removal, overhaul and installation

Warning: *If a caliper indicates the need for an overhaul (usually due to leaking fluid or sticky operation), all old brake fluid should be flushed from the system. Also, the dust created by the brake system may contain asbestos, which is harmful to your health. Never blow it out with compressed air and don't inhale any of it. An approved filtering mask should be worn when working on the brakes. Do not, under any circumstances, use petroleum-based solvents to clean brake parts. Use brake cleaner or denatured alcohol only!*

Removal

Refer to illustrations 3.2a, 3.2b and 3.3

1 Support the bike securely so it can't be knocked over during this procedure.

2 Disconnect the brake hose from the caliper. Remove the brake hose banjo fitting bolt and separate the hose from the caliper **{see illustrations).** Discard the sealing washers. Place the end of the hose in a container and operate the brake lever to pump out the fluid. Once this is done, wrap a clean shop rag tightly around the hose fitting to soak up any drips and prevent contamination.

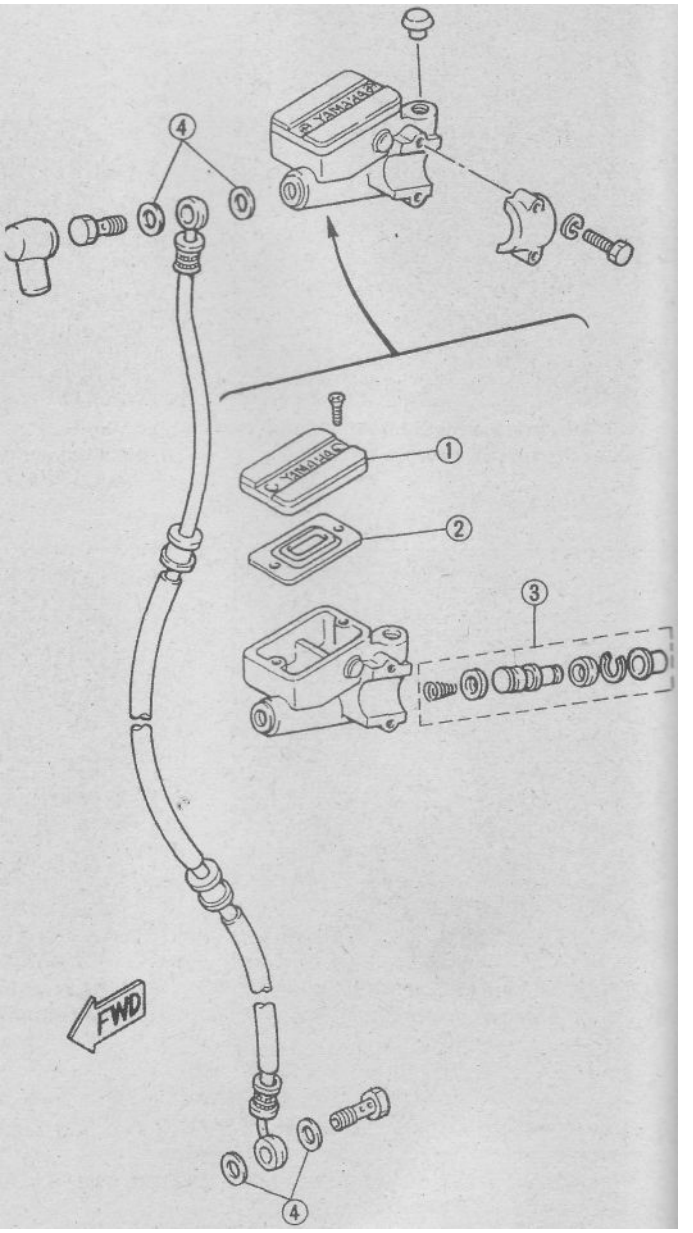
3 Unscrew the caliper mounting bolts and separate the caliper from the front fork **(see illustration).**

Overhaul

Refer to illustrations 3.5a, 3.5b, 3.7 and 3.8

4 Clean the exterior of the caliper with denatured alcohol or brake system cleaner.

5 Place a few rags between the piston and the caliper frame to act as a cushion, then use compressed air, directed into the fluid inlet, to remove the piston **(see illustration 2.3c and the accompanying illustrations).** Use only enough air pressure to ease the piston out of the bore. If a piston is blown out, even with the cushion in place, it may be damaged. **Warning:** *Never place your fingers in front of the piston in an attempt to catch or protect it when applying compressed air, as serious injury could occur.*



3.2b Master cylinder and brake line (XV535 models) - exploded view

1	*Reservoir cover*	*3*	*Piston assembly and-sphn:*
2	*Diaphragm*	*4*	*Sealing washers*

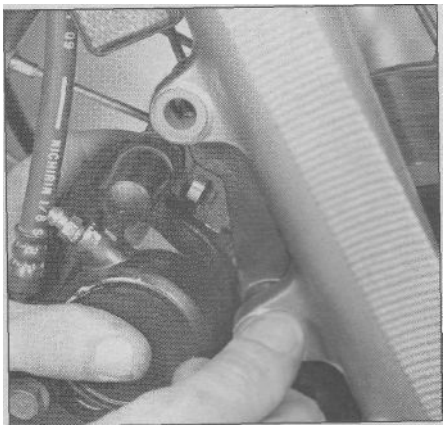
6 **If** compressed air isn't available, reconnect the caliper to t^{h}-brake hose and pump the brake lever until the piston is free.

7 Using a wood or plastic tool, remove the dust seal (see **illustration).** Metal tools may damage the bore.

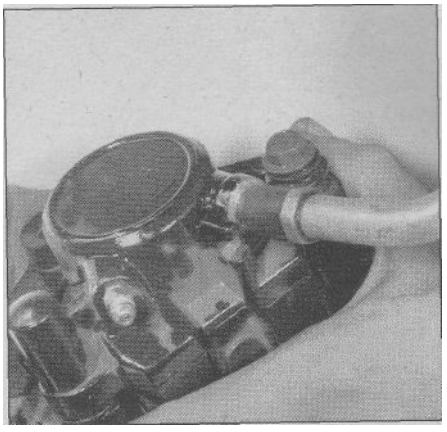
8 Using a wood or plastic tool, remove the piston seal from the groove in the caliper bore **(see illustration).**

9 Clean the piston and the bore with denatured alcohol, clean brake fluid or brake system cleaner and blow dry them with filtered unlubricated compressed air. Inspect the surfaces of the piston for nicks and burrs and loss of plating. Check the caliper bore, too. If surface defects are present, the caliper must be replaced. If the caliper is in bad shape, the master cylinder should also be checked.

10 Lubricate the piston seal with clean brake fluid and install it in its

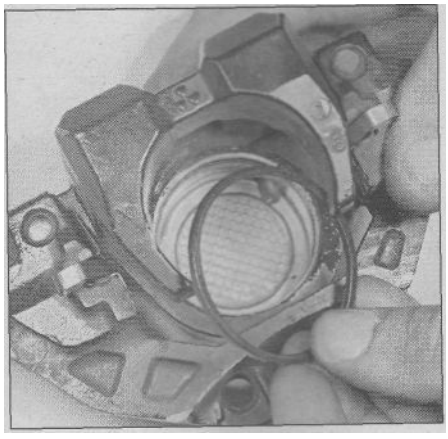


3.3 Remove the mounting **bolts and separate the caliper from** the **fork leg**

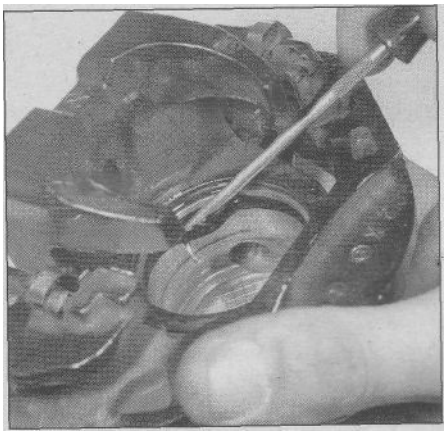


3.5a Carefully blow air into the fluid outlet to push the piston out; keep your fingers out of the way to prevent injury

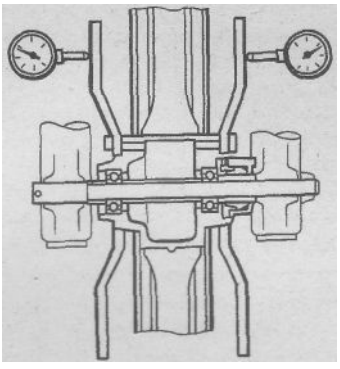
3.5b Remove the piston from the bore



3.7 Remove the dust seal **with fingers or a wood or plastic tool**



3.8 Remove the piston seal from its groove (a toothpick can be used as a removal tool)



4.3 Position a dial indicator against the disc and spin the wheel to measure runout

groove in the caliper bore. Make sure it isn't twisted and seats completely.

11 Lubricate the dust seal with clean brake fluid and install it in its groove, making sure it seats correctly.

12 Lubricate the piston with clean brake fluid and install it into the caliper bore. Using your thumbs, push the piston all the way in, making sure it doesn't get cocked in the bore.

13 The caliper body should be able to slide in relation to its mounting bracket. If it's seized or stiff in operation, remove the caliper-to-bracket lower bolt and slide the body off the bracket's slider pin. Inspect the slider pin and lower bolt for wear and coat them with high-temperature disc brake grease. If the dust boots are split or cracked, replace them with new ones.

Installation

14 Install the caliper, tightening the mounting bolts to the torque listed in this Chapter's Specifications.

15 Connect the brake hose to the caliper, using new sealing washers on each side of the fitting. The neck of the hose union should fit between the two cast lugs on the caliper body. Tighten the banjo fitting bolt to the torque listed in this Chapter's Specifications.

16 Fill the master cylinder with the recommended brake fluid (see Chapter 1) and bleed the system (see Section 8). Check for leaks.

17 Check the operation of the brakes carefully before riding the motorcycle.

4 Brake disc - inspection, removal and installation

Inspection

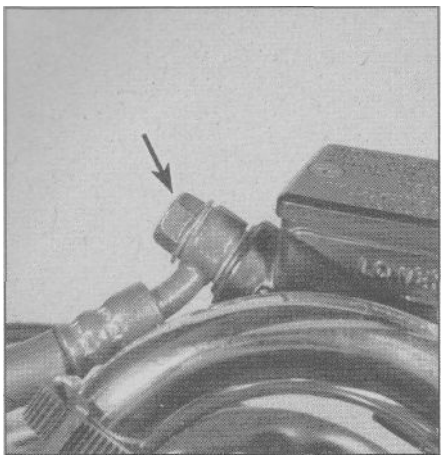
Refer to illustration 4.3

1 Support the bike securely so it can't be knocked over during this procedure.

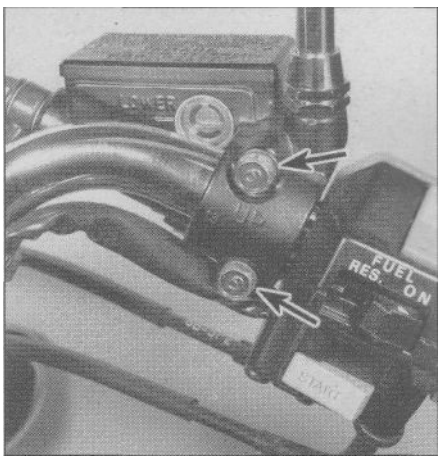
2 Visually inspect the surface of the disc for score marks and other damage. Light scratches are normal after use and won't affect brake operation, but deep grooves and heavy score marks will reduce braking efficiency and accelerate pad wear. If the disc is badly grooved it must be machined or replaced.

3 To check disc runout, mount a dial indicator to the fork leg with the plunger on the indicator touching the surface of the disc about 1/2-inch from the outer edge **(see illustration).** Slowly turn the wheel and watch the indicator needle, comparing your reading with the limit listed in this Chapter's Specifications or stamped on the disc itself. If the runout is greater than allowed, check the hub bearings for play (see Chapter 1). If the bearings are worn, replace them and repeat this check. If the disc runout is still excessive, it will have to be replaced.

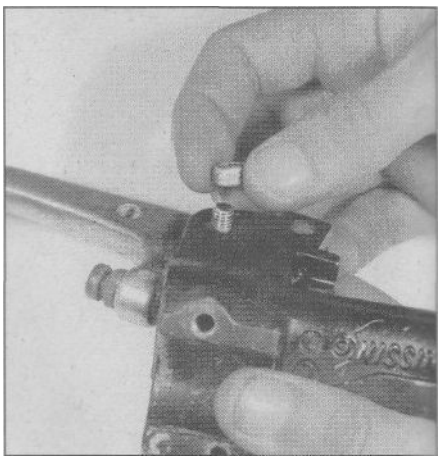
4 The disc must not be machined or allowed to wear down to a thickness less than the minimum allowable thickness, listed in this Chapter's Specifications. The thickness of the disc can be checked with a micrometer. If the thickness of the disc is less than the minimum allowable, it must be replaced.



5.5 Unscrew the banjo bolt (arrow); there's a sealing washer on each side of the fitting



5.6 Remove the mounting bolts (arrows); note the position of the UP mark, which must be upright when the master cylinder is installed



5.7a Remove the locknut from the lever pivot bolt...

Removal

5 Remove the wheel (see Section 11 for front wheel removal or Section 12 for rear wheel removal). **Caution:** *Don't lay the wheel down and allow it to rest on the disc - the disc could become warped. Set the wheel on wood blocks so the disc doesn't support the weight of the wheel.*

6 Mark the relationship of the disc to the wheel, so it can be installed in the same position. Bend back the lockwasher tabs and remove the bolts that retain the disc to the wheel **(see illustration** 2.3c). Loosen the bolts a little at a time, in a criss-cross pattern, to avoid distorting the disc. Once all the bolts are loose, take the disc off.

7 Take note of any paper shims that may be present where the disc mates to the wheel. If there are any, mark their position and be sure to include them when installing the disc.

Installation

8 Position the disc on the wheel, aligning the previously applied match marks (if you're reinstalling the original disc). Make sure the arrow (stamped on the disc) marking the direction of rotation is pointing in the proper direction.

9 Apply a non-hardening thread locking compound to the threads of the bolts. Install the bolts with new lockwashers, tightening them a little at a time, in a criss-cross pattern, until the torque listed in this Chapter's Specifications is reached. Clean off all grease from the brake disc using acetone or brake system cleaner.

10 Install the wheel.

11 Operate the brake lever several times to bring the pads into contact with the disc. Check the operation of the brakes carefully before riding the motorcycle.

5 Front brake master cylinder - removal, overhaul and installation

1 If the master cylinder is leaking fluid, or if the lever does not produce a firm feel when the brake is applied, and bleeding the brakes does not help, master cylinder overhaul is recommended. Before disassembling the master cylinder, read through the entire procedure and make sure that you have the correct rebuild kit. Also, you will need some new, clean brake fluid of the recommended type, some clean rags and internal snap-ring pliers. **Note:** *To prevent damage to the paint from spilled brake fluid, always cover the top cover or upper fuel tank when working on the master cylinder.*

2 **Caution:** *Disassembly, overhaul and reassembly of the brake master cylinder must be done in a spotlessly clean work area to avoid contamination and possible failure of the brake hydraulic system components.*

Removal

Refer to illustrations 5.5 and 5.6

3 Loosen but do not remove the screws holding the reservoir cover in place **(see illustration 3.2b).**

4 Disconnect the electrical connectors from the brake light switch (see Chapter 8).

5 Pull back the rubber boot (if equipped), loosen the banjo fitting bolt **(see illustration)** and separate the brake hose from the maste' cylinder. Wrap the end of the hose in a clean rag and suspend the hose in an upright position or bend it down carefully and place the open end in a clean container. The objective is to prevent excessive loss of brake fluid, fluid spills and system contamination.

6 Remove the master cylinder mounting bolts **(see illustration)** and separate the master cylinder from the handlebar. **Caution:** *Do not tip the master cylinder upside down or brake fluid will run out.*

Overhaul

Refer to illustrations 5.7a, 5.7b, 5.7c, 5.9, 5.10a and 5.10b

7 Remove the locknut and unscrew the brake lever pivot bolt (see **illustrations).** Remove the lever and its return spring **(see illustration).**

8 Detach the top cover and the rubber diaphragm, then drain the brake fluid into a suitable container. Remove the splash plate from the bottom of the reservoir (if equipped), then wipe any remaining fluid out of the reservoir with a clean rag.

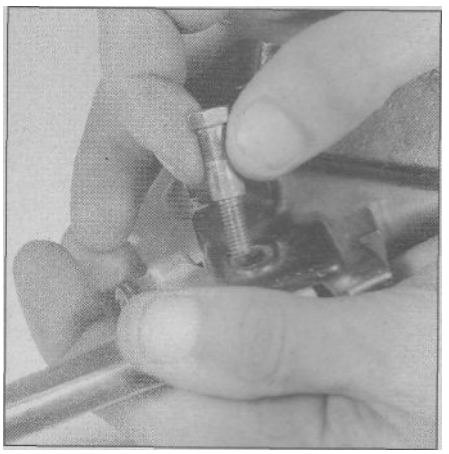
9 Carefully remove the rubber dust boot from the end of the piston **(see illustration).**

10 Using snap-ring pliers, remove the snap-ring **(see** illustration) and slide out the piston assembly and the spring **(see illustration).** Lay the parts out in the proper order to prevent confusion during reassembly.

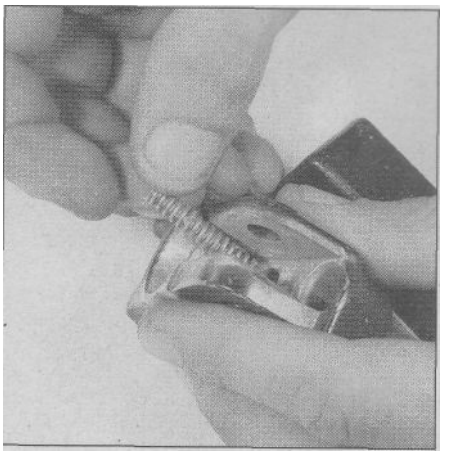
11 Clean all of the parts with brake system cleaner (available at motorcycle dealerships and auto parts stores), isopropyl alcohol or clean brake fluid. **Caution:** *Do not, under any circumstances, use a petroleum-based solvent to clean brake parts. If compressed air is available, use it to dry the parts thoroughly (make sure it's filtered and unlubricated). Check the master cylinder bore for corrosion, scratches, nicks and score marks. If damage is evident, the master cylinder must be replaced with a new one. If the master cylinder is in poor condition, then the calipers should be checked as well.*

12 The dust seal, piston assembly and spring are included in the rebuild kit. Use all of the new parts, regardless of the apparent condition of the old ones.

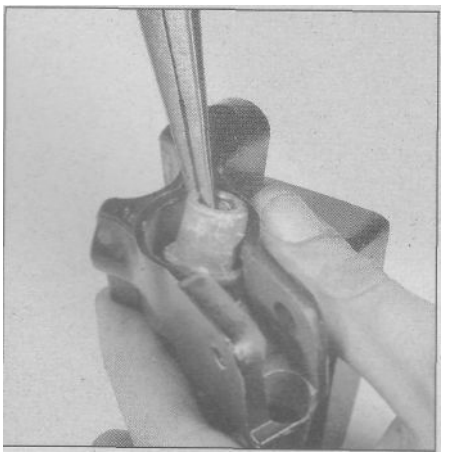
13 Before reassembling the master cylinder, soak the piston and the



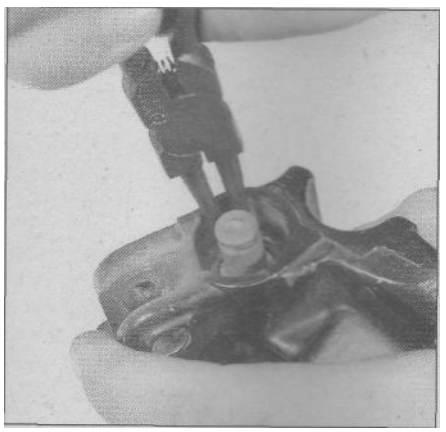
5.7b ... **and** unscrew the bolt



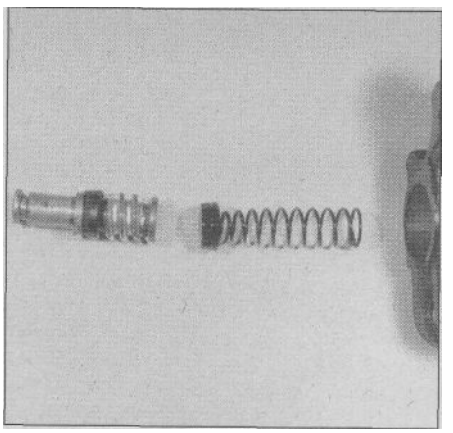
5.7c Remove the lever spring



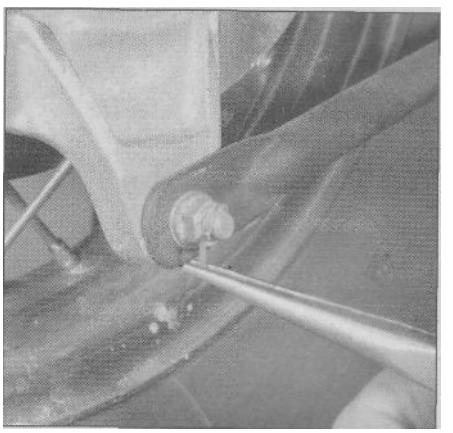
5.9 Remove the rubber boot



5.10a Remove the snap-ring from **the bore**



5.10b Piston component details



6.2a Remove the cotter pin and nut and detach the brake rod from the brake panel...

rubber cup seals in clean brake fluid for ten or fifteen minutes. Lubricate the master cylinder bore with clean brake fluid, then carefully insert the piston and related parts in the reverse order of disassembly. Make sure the lips on the cup seals do not turn inside out when they are slipped into the bore.

14 Depress the piston, then install the snap-ring (make sure the snap-ring is properly seated in the groove). Install the rubber dust boot (make sure the lip is seated properly in the piston groove).

Installation

15 Attach the master cylinder to the handlebar, making sure the UP mark is upright, and tighten the bolts to the torque listed in this Chapter's Specifications.

16 Connect the brake hose to the master cylinder, using new sealing washers. Tighten the banjo fitting bolt to the torque listed in this Chapter's Specifications. Fill the master cylinder with the recommended brake fluid (see Chapter 1), then refer to Section 8 and bleed the air from the system.

6.2b ... **and from the swingarm**

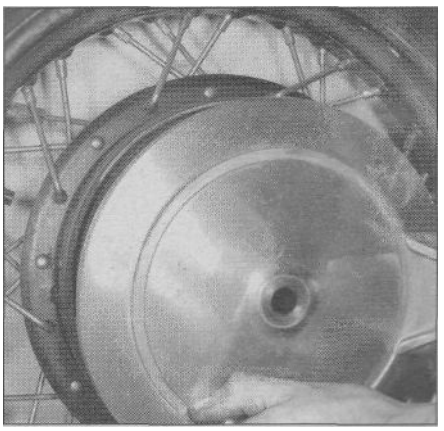
6 Rear drum brakes - removal, overhaul and installation

Shoeremoval

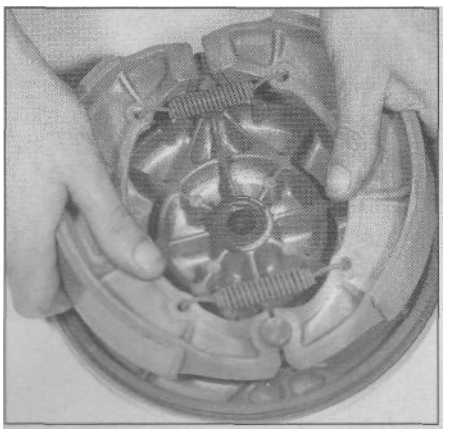
Refer to illustrations 6.2a, 6.2b, 6.3, 6.4a and 6.4b

1 Before you start, inspect the rear brake wear indicator (see Chapter 1).

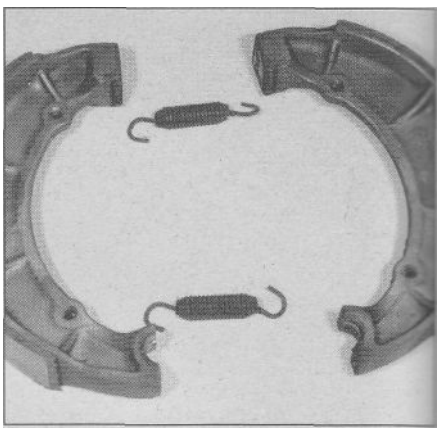
2 Disconnect the rear brake rod **(see illustrations).** Disconnect the brake cable-from the lever (see Step 13). Remove the rear wheel (see Section 12).



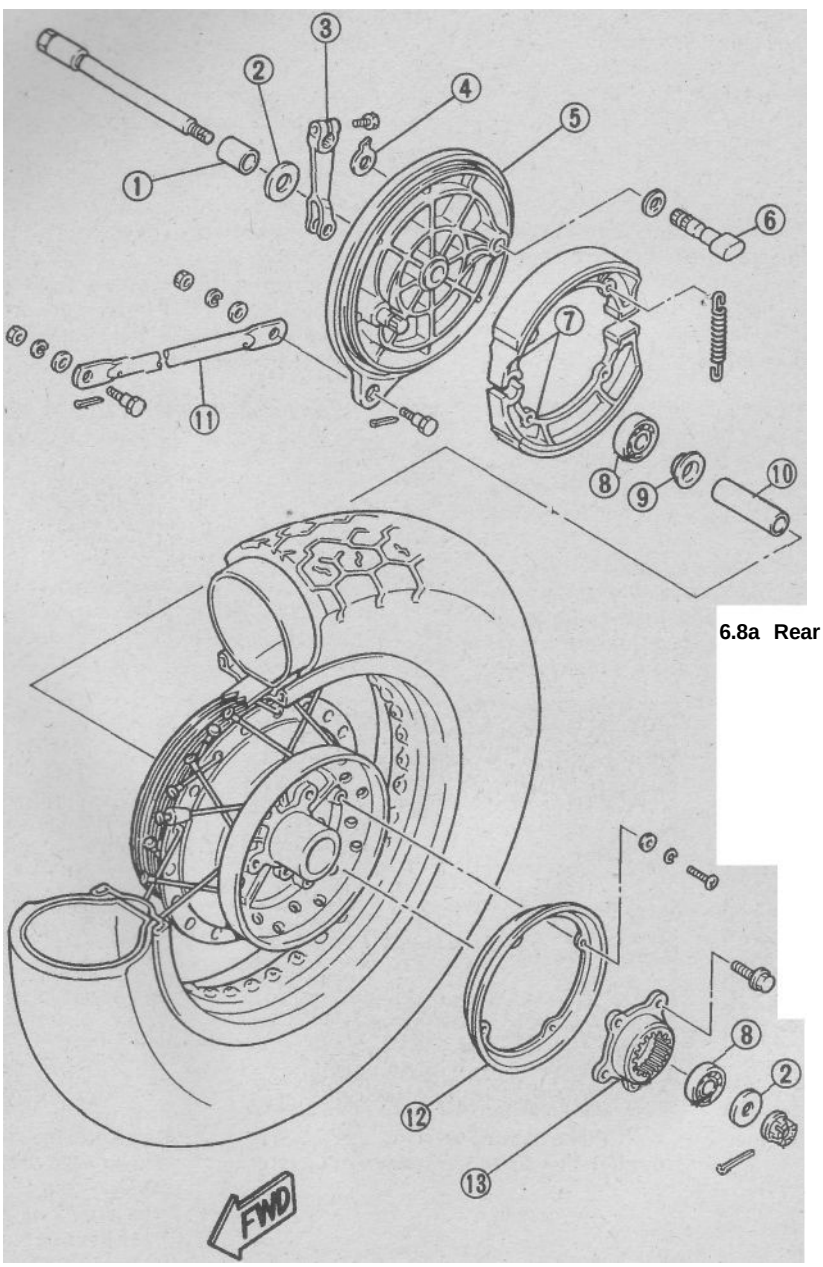
6.3 Remove the brake panel from the wheel



6.4a Fold the shoes in a V to release spring tension, then remove them from the panel

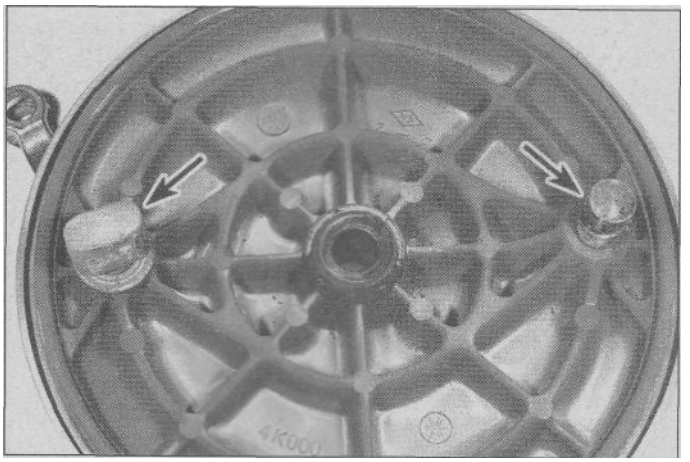


6.4b Rear brake shoes and springs

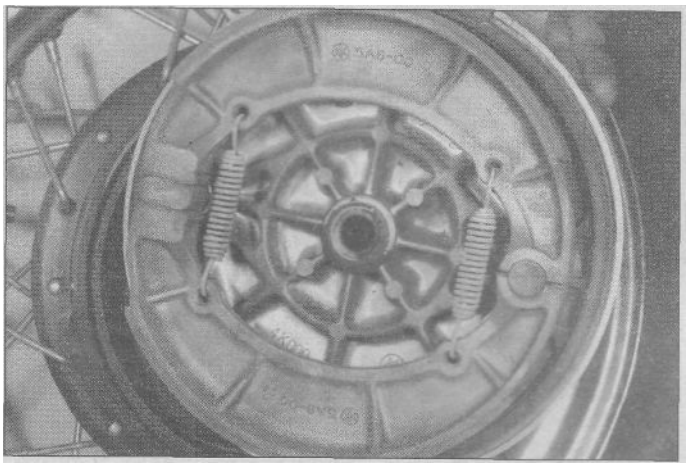


6.8a Rear wheel and brake (XV535 models) exploded view

1 *Short spacer*
2 *Washer*
3 *Rear brake lever*
4 *Brake wear indicator*
5 *Brake panel*
6 *Brake cam*
7 *Brake shoes*
8 *Rear wheel bearing*
9 *Collar*
10 *Long spacer*
11 *Brake rod*
12 *Hub dust seal*
13 *Clutch hub*



6.8b Check the brake cam **and pivot post (arrows) for wear** or **damage**



6.12 The assembled brake panel should look like this

3 Lift the brake panel out of the wheel **(see illustration).**

4 Fold the shoes toward each other to release the spring tension **(see illustration).** Remove the shoes and springs from the brake panel **(see illustration).**

Shoeinspection

Refer to illustrations 6.8a and 6.8b

5 Check the linings for wear, damage and signs of contamination from road dirt and water. If the linings are visibly defective, replace them.

6 Measure the thickness of the lining material (just the lining material, not the metal backing) and compare with the value listed in this Chapter's Specifications. Replace the shoes if the lining material is worn to less than the minimum.

7 Check the ends of the shoes where they contact the brake cam and pivot post. Replace the shoes if there's visible wear.

8 Check the brake cam and pivot post for wear and damage. If necessary, make match marks on the cam and cam lever, then remove the pinch bolt, lever, wear indicator pointer, seal and cam **(see illustrations).**

9 Check the brake drum (inside the wheel) for wear or damage. Measure the diameter at several points with a brake drum micrometer (or have this done by a Yamaha dealer). If the measurements are uneven (indicating the brake drum is out of round) or if there are scratches deep enough to snag a fingernail, have the drum turned (skimmed) by a dealer to correct the surface. If the drum has to be turned (skimmed) beyond the wear limit to remove the defects, replace it.

10 Check the brake cam for looseness in the brake panel hole. If it feels loose, replace the brake cam or panel, whichever is worn.

Shoeinstallation

Refer to illustration 6.12

11 Apply high-temperature brake grease to the ends of the springs, the cam and the pivot post.

12 Hook the springs to the shoes. Position the shoes in a V on the panel, then fold them down into position (see illustration 6.4a). Make sure the ends of the shoes fit correctly against the cam and on the pivot post **(see** illustration).

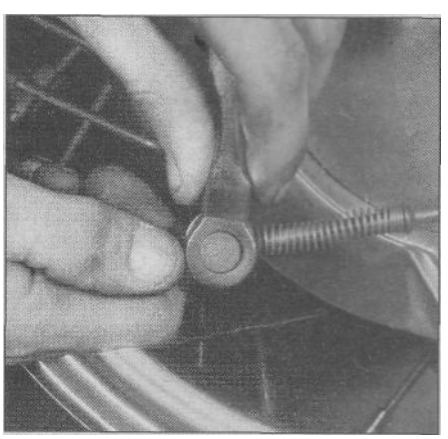
Rearbrakecableandreturnspringremovaland installation

Refer to illustrations 6.13, 6.14 and 6.15

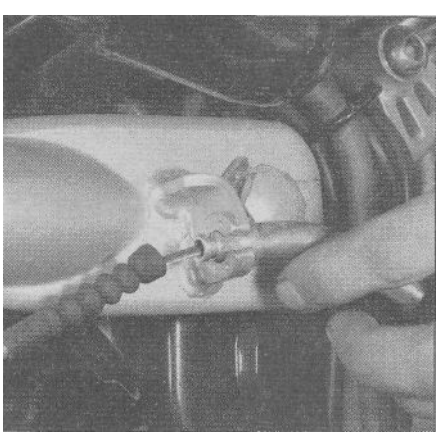
13 Push the brake lever forward and unscrew the adjuster nut **(see illustration).**

14 Pull the cable forward, then slide it out of the slot to free it from the swingarm bracket **(see illustration).**

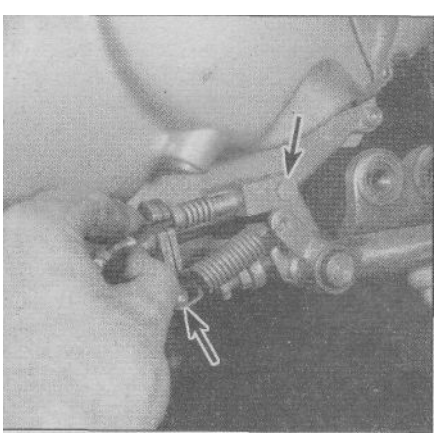
15 Slide the cable out of the forward bracket **(see illustration).** Remove the cotter pin and clevis pin and detach the cable from the pedal arm.



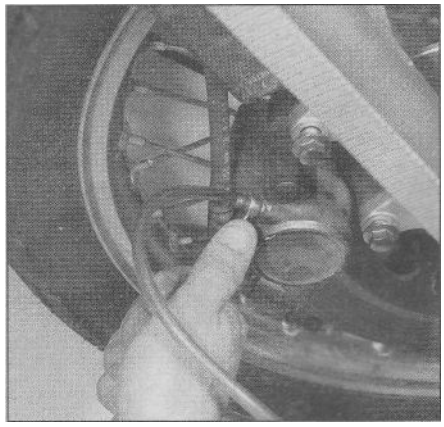
6.13 Unscrew the adjusting nut from the rear end of the brake cable



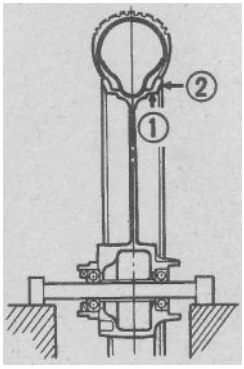
6.14 Pull the cable forward, then slide it through the slot in the swingarm bracket



6.15 Slide the cable through the slot in the forward bracket, then remove the cotter pin and clevis pin (upper arrow) to free it; unhook the brake pedal spring from its post (lower arrow), then from the pedal arm

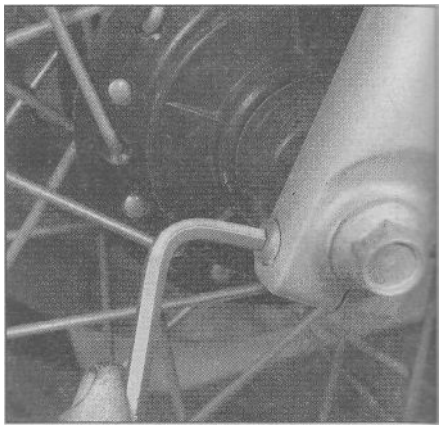


8.5 Place a box wrench (ring spanner) over the bleed valve, then connect a length of clear plastic tubing to the valve



i.2 Measure wheel runout with a dial indicator, if one is available

1 Radial (up-and-down) runout
2 Axial (side-to-side) runout



11.3a Loosen the axle pinch bolt,

16 To remove the pedal spring, unhook it from its post, then from the pedal arm.
17 Installation is the reverse of the removal steps. Adjust the rear brake (see Chapter 1).

7 Brake hose - inspection and replacement

Inspection

1 Once a week, or if the motorcycle is used less frequently, before every ride, check the condition of the brake hose.
2 Twist and flex the rubber hoses **(see illustration 3.2b)** while looking for cracks, bulges and seeping fluid. Check extra carefully around the areas where the hoses connect with the banjo fittings, as these are common areas for hose failure.
3 Inspect the metal banjo fittings connected to brake hoses. If the fittings are rusted, scratched or cracked, replace them.

Replacement

4 The brake hose has a banjo fitting on each end of the hose. Cover the surrounding area with plenty of rags and unscrew the union bolt on either end of the hose. Detach the hose from any clips that may be present **(see illustration 3.2b)** and remove the hose.
5 Position the new hose, making sure it isn't twisted or otherwise strained, between the two components. Install the union bolts, using new sealing washers on both sides of the fittings, and tighten them to the torque listed in this Chapter's Specifications.
6 Flush the old brake fluid from the system, refill the system with the recommended fluid (see Chapter 1) and bleed the air from the system (see Section 8). Check the operation of the front brake carefully before riding the motorcycle.

8 Brake system bleeding

Refer to illustration 8.5

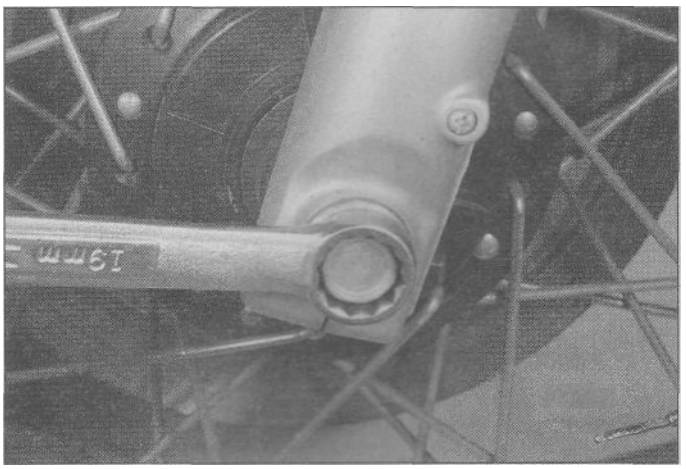
1 Bleeding the brake is simply the process of removing all the air bubbles from the brake fluid reservoirs, the lines and the brake calipers. Bleeding is necessary whenever a brake system hydraulic connection is loosened, when a component or hose is replaced, or when the master cylinder or caliper is overhauled. Leaks in the system may also allow air to enter, but leaking brake fluid will reveal their presence and warn you of the need for repair.

2 To bleed the brakes, you will need some new, clean brake fluid of the recommended type (see Chapter 1), a length of clear vinyl or plastic tubing, a small container partially filled with clean brake fluid, some rags and a wrench to fit the brake caliper bleeder valves.
3 Cover the top cover or upper fuel tank and other painted components to prevent damage in the event that brake fluid is spilled.
4 Remove the reservoir cap or cover and slowly pump the brake lever a few times, until no air bubbles can be seen floating up from the holes at the bottom of the reservoir. Doing this bleeds the air from the master cylinder end of the line. Reinstall the reservoir cap or cover.
5 Slip a box wrench (ring spanner) over the caliper bleed valve **(see illustration).** Attach one end of the clear vinyl or plastic tubing to the bleed valve and submerge the other end in the brake fluid in the container.
6 Remove the reservoir cover and check the fluid level. Do not allow the fluid level to drop below the lower mark during the bleeding process.
7 Carefully pump the brake lever three or four times and hold it while opening the caliper bleeder valve. When the valve is opened, brake fluid will flow out of the caliper into the clear tubing and the lever will move toward the handlebar.
8 Retighten the bleed valve, then release the brake lever gradually. Repeat the process until no air bubbles are visible in the brake fluid leaving the caliper and the lever-is firm when applied. **Note:** *Remember to add fluid to the reservoir as the level drops. Use only new, clean brake fluid of the recommended type. Never re-use the fluid lost during bleeding.*
9 Replace the reservoir cover, wipe up any spilled brake fluid and check the entire system for leaks. **Note:** *If bleeding is difficult, it may be necessary to let the brake fluid in the system stabilize for a few hours (it may be aerated). Repeat the bleeding procedure when the tiny bubbles in the system have settled out.*

9 Wheels - inspection and repair

Refer to illustration 9.2

1 Clean the wheels thoroughly to remove mud and dirt that may interfere with the inspection procedure or mask defects. Make a general check of the wheels and tires as described in Chapter 1.
2 Support the bike securely so it can't be knocked over during this procedure. Place a jack beneath the engine to raise the front wheel off the ground, or beneath the frame to raise the rear wheel off the ground. Attach a dial indicator to the fork slider or the swingarm and position the stem against the side of the rim. Spin the wheel slowly and check the side-to-side (axial) runout of the rim, then compare your readings with the value listed in this Chapter's Specifications **(see illustration).** In order to accurately check radial runout with the dial indicator, the wheel would have to be removed from the machine and the tire removed from the wheel. With the axle clamped in a vise, the wheel



11.3b ... and unscrew the axle

can be rotated to check the runout.

3 An easier, though slightly less accurate, method is to attach a stiff wire pointer to the fork or the swingarm and position the end a fraction of an inch from the wheel (where the wheel and tire join). If the wheel is true, the distance from the pointer to the rim will be constant as the wheel is rotated. Repeat the procedure to check the runout of the rear wheel. **Note:** *If wheel runout is excessive, refer to the appropriate Section in this Chapter and check the wheel bearings very carefully before replacing the wheel or paying to have it trued.*

4 The wheels should also be visually inspected for cracks, flat spots on the rim, bent spokes and other damage.

5 Tap the spokes with a metal screwdriver blade or similar tool and listen to the sound. If the spoke makes a "clunk" or low-pitched sound, it's loose. Refer to Chapter 1 for spoke tightening procedures.

6 If damage is evident, or if runout in either direction is excessive, the wheel will have to be trued or. if damage is severe, replaced with a new one.

10 Wheels - alignment check

1 Misalignment of the wheels, which may be due to a cocked rear wheel or a bent frame or triple clamps, can cause strange and possibly serious handling problems. If the frame or triple clamps are at fault, repair by a frame specialist or replacement with new parts are the only alternatives.

2 To check the alignment you will need an assistant, a length of string or a perfectly straight piece of wood and a ruler graduated in 1/64 inch increments. A plumb bob or other suitable weight will also be required.

3 Support the motorcycle in a level position, then measure the width of both tires at their widest points. Subtract the smaller measurement from the larger measurement, then divide the difference by two. The result is the amount of offset that should exist between the front and rear tires on both sides.

4 If a string is used, have your assistant hold one end of it about half way between the floor and the rear axle, touching the rear sidewall of the tire.

5 Run the other end of the string forward and pull it tight so that it is roughly parallel to the floor. Slowly bring the string into contact with the front sidewall of the rear tire, then turn the front wheel until it is parallel with the string. Measure the distance from the front tire sidewall to the string.

6 Repeat the procedure on the other side of the motorcycle. The distance from the front tire sidewall to the string should be equal on both sides.

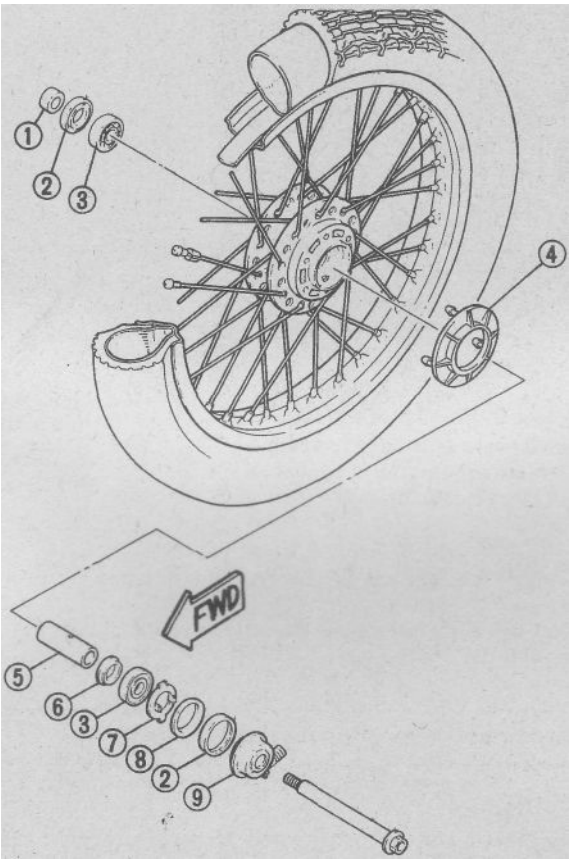
7 - As was previously pointed out, a perfectly straight length of wood may be substituted for the string. The procedure is the same.

8 If the distance between the string and tire is greater on one side, or if the rear wheel appears to be cocked, refer to Chapter 5, Swingarm bearings - check, and make sure the swingarm is tight.

9 If the front-to-back alignment is correct, the wheels still may be out of alignment vertically.

10 Using the plumb bob, or other suitable weight, and a length of string, check the rear wheel to make sure it is vertical. To do this, hold the string against the tire upper sidewall and allow the weight to settle just off the floor. When the string touches both the upper and lower tire sidewalls and is perfectly straight, the wheel is vertical.

11 Once the rear wheel is vertical, check the front wheel in the same manner. If both wheels are not perfectly vertical, the frame and/or major suspension components are bent.



11.4 Front wheel details (XV535 models)

1	*Collar*	*6*	*Spacer flange*
2	*Grease seal*	*7*	*Speedometer clutch*
3	*Bearing*	*8*	*Speedometer clutch retainer*
4	*Hub cover*	*9*	*Speedometer drive unit*
5	*Spacer*		

11 Front wheel - removal and installation

Removal

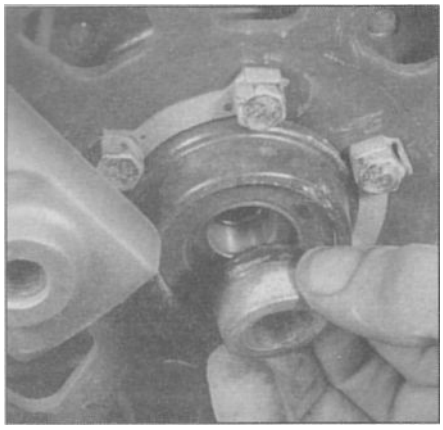
Refer to illustrations 11.3a, 11.3b, 11.4, 11.5a and 11.5b

1 Support the bike securely so it can't be knocked over during this procedure. Raise the front wheel off the ground by placing a floor jack, with a wood block on the jack head, under the engine.

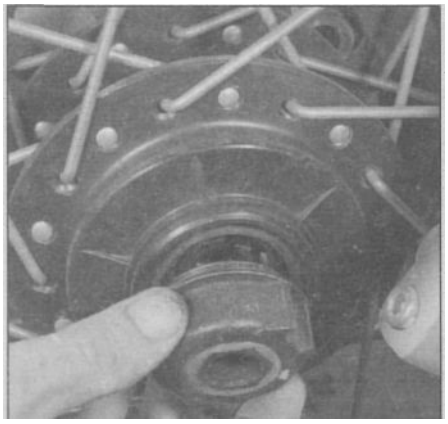
2 Disconnect the speedometer cable from the drive unit (see Chapter 8).

3. Loosen the axle pinch bolt and unscrew the axle **(see illustrations).**

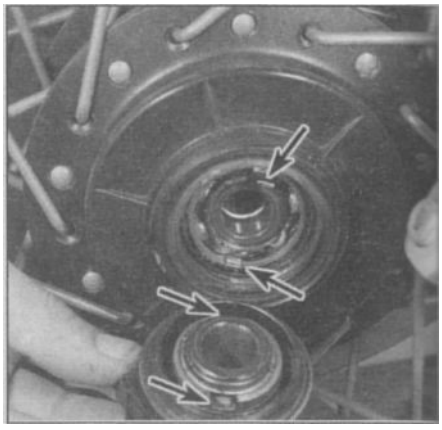
4 Support the wheel, then pull out the axle **(see illustration)** and carefully lower the wheel away from the forks.



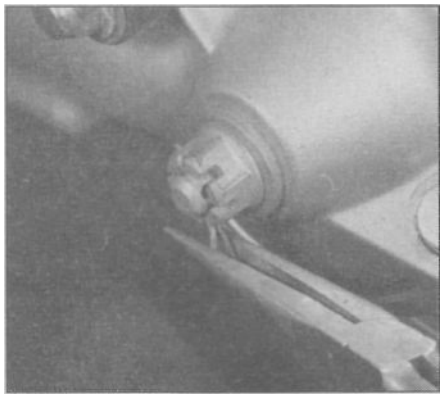
11.5a Remove the collar from the right side . . .



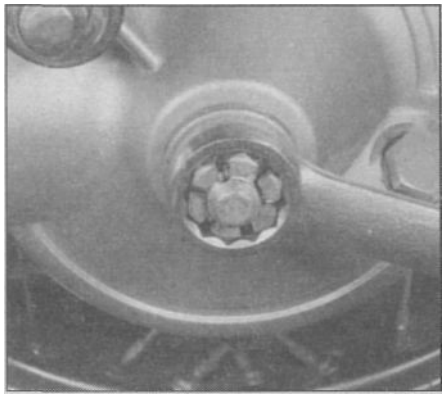
11.5b . . . and the speedometer drive unit from the left side



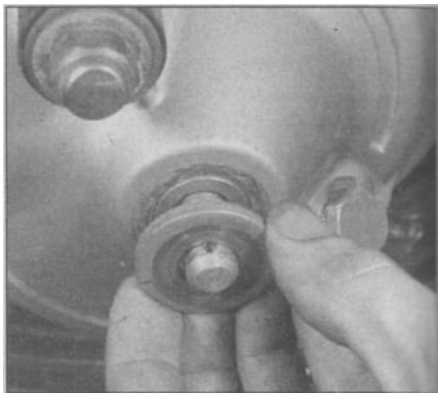
11.8 Be sure the speedometer drive unit **notches align with the speedometer clutch lugs (arrows)**



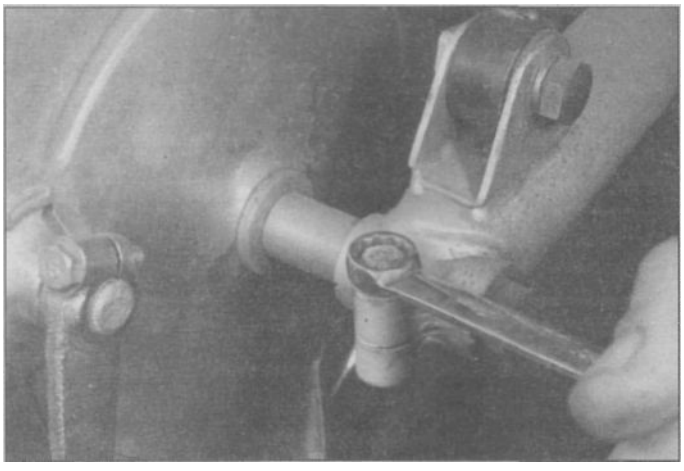
12.3a Straighten the cotter pin **and pull it out...**



12.3b . . . unscrew the axle nut.



12.3c . . . and remove the washer



12.4 Loosen the axle pinch bolt

5 Remove the collar from the right side and the speedometer drive unit from the left side (see illustrations). Set the wheel aside. Caution: *Don't lay the wheel down and allow it to rest on the brake disc - the disc could become warped. Set the wheel on wood blocks so the disc doesn't support the weight of the wheel.* Note: *Don't operate the front brake lever with the wheel removed.*

Inspection

6 Roll the axle on a flat surface such as a piece of plate glass, If it's bent at all, replace it. If the axle is corroded, remove the corrosion with fine emery cloth.

7 Check the condition of the wheel bearings (see Section 13).

Installation

Refer to illustration 11.8

8 Installation is the reverse of removal. Apply a thin coat of grease to the seal lip, then slide the axle into the hub. Slide the wheel place. Make sure the lugs in the speedometer drive clutch line up . the notches in the speedometer drive unit (see illustration). Make the protrusion on the inner side of the left fork fits into the notch in the! speedometer drive unit.

9 Slip the axle into place, then tighten the axle to the torque listed in this Chapter's Specifications. Tighten the axle pinch bolt to the torquej listed in this Chapter's Specifications.

10 Apply the front brake, pump the forks up and down several times and check for binding and proper brake operation.

12 Rear wheel - removal and installation

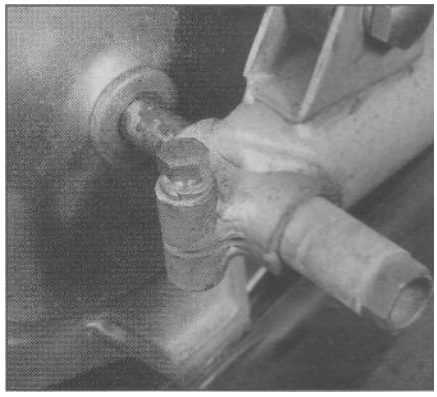
Refer to illustrations 12.3a, 12.3b, 12.3c, 12.4 and 12.5a through 12.5e

Removal

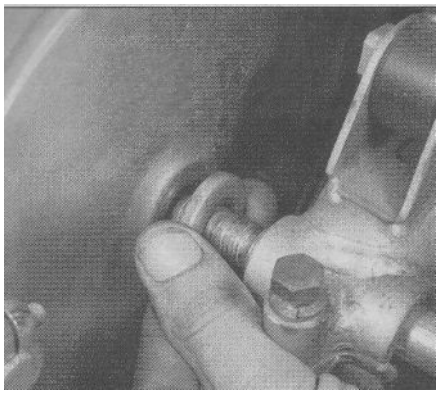
1 Support the bike securely so it can't be knocked over during this procedure.

2 Detach the rear brake rod from the brake panel and the cabtel from the brake lever (see Section 6).

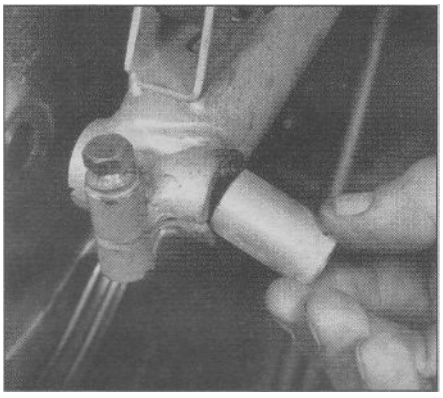
3 Remove the cotter pin from the axle nut, then remove the nut andl washer (see illustrations).



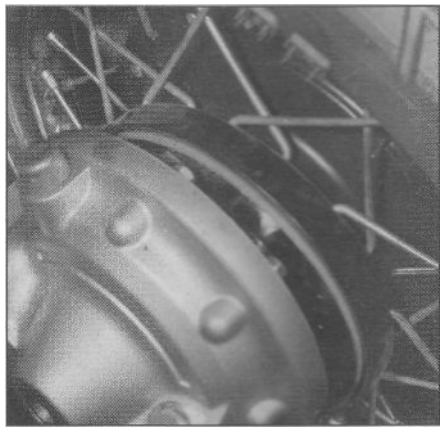
12.5a Pull the axle out. . .



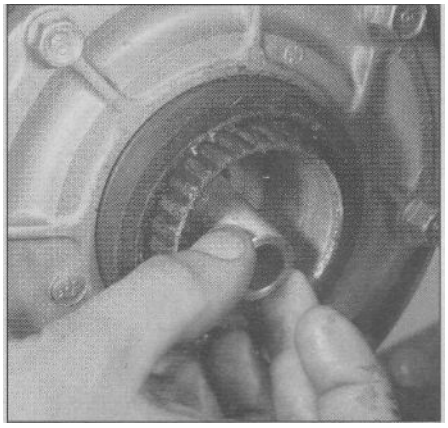
12.5b . . . remove the washer . . .



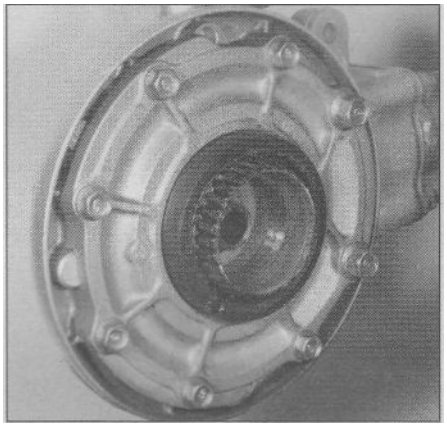
12.5c . . . and the short spacer



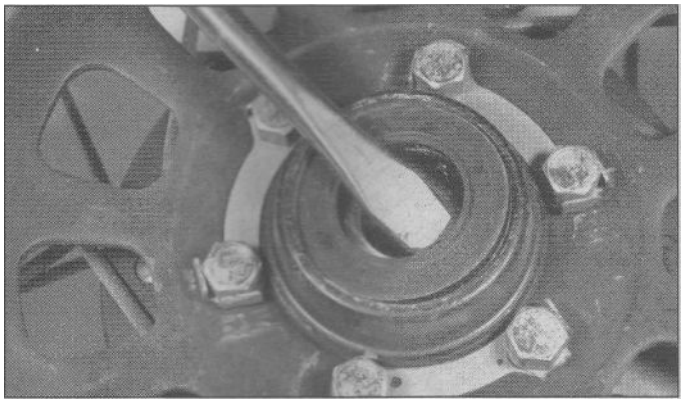
12.5d Separate the wheel from **the final drive . . .**



12.5e . . . and remove the long spacer



12.8 Be sure the long spacer is in place before installing the wheel



13.3 Pry out the grease seal on **the brake disc side of the wheel**

4 Loosen the axle pinch bolt **(see illustration).**

5 Support the wheel, slide the axle out and remove the washer and short spacer **(see illustrations).** Pull the wheel to the right and remove it from the final drive assembly, then remove the long spacer **(see illustrations 6.8b and the accompanying illustrations).**

6 Before installing the wheel, check the axle for straightness by rolling it on a flat surface such as a piece of plate glass (if the axle is corroded, first remove the corrosion with fine emery cloth). If the axle is bent at all, replace it.

7 Check the condition of the wheel bearings (see Section 13).

Installation

Refer to illustration 12.8

8 Installation is the reverse of the removal steps, with the following additions:

a) Apply a light coat of multi-purpose lithium-based grease to the lips of the oil seals and to the splines on the final drive and wheel hub.

b) Be sure the long spacer is in place before installing the wheel (see **illustration).**

c) Tighten the axle nut to the torque listed in this Chapter's Specifications. Install a new cotter pin, tightening the axle nut an additional amount, if necessary, to align the hole in the axle with the castellations on the nut.

d) Tighten the axle pinch bolt to the torque listed in this Chapter's Specifications.

9 Adjust the bear brake (see Chapter 1) and check its operation carefully before riding the motorcycle.

13 Wheel bearings - inspection and maintenance

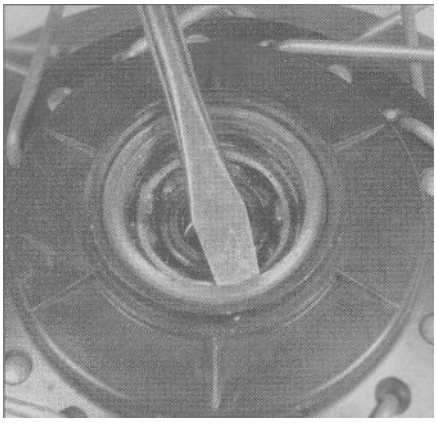
1 Support the bike securely so it can't be knocked over during this procedure and remove the wheel. See Section 11 (front wheel) or 12 (rear wheel).

2 Set the wheel on blocks so as not to allow the weight of the wheel to rest on the brake disc or hub.

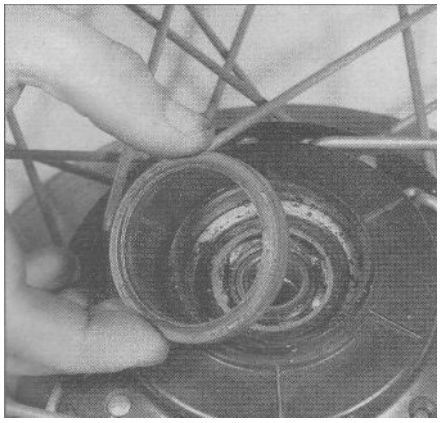
Frontwheelbearings

Refer to illustrations 13.3, 13.4a, 13.4b, 13.4c, 13.4d, 13.5, 13.6, 13.7, 13.10a, 13.10b, 13.10c, 13.11a, 13.11b, 13.12a, 13.12b and 13.12c

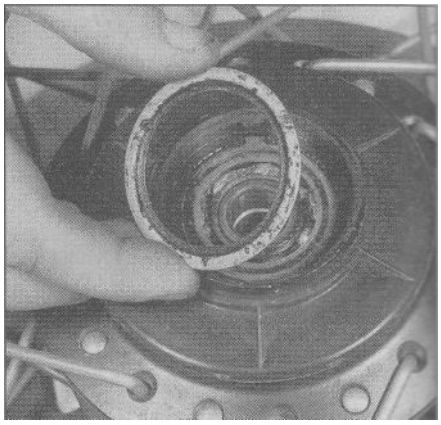
3 From the right side of the wheel, lift out the collar (if you haven't already done so - **see illustrations 11.4 and 11.5a),** then pry out the grease sea! **(see illustration).**



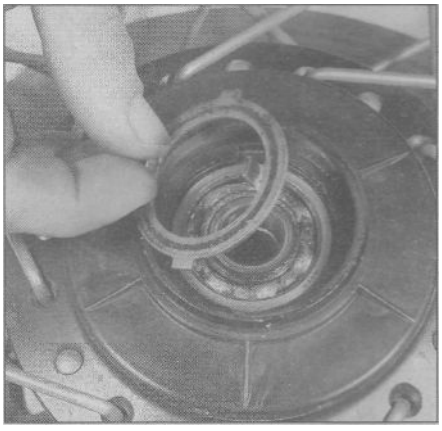
13.4a Pry the grease seal loose . . .



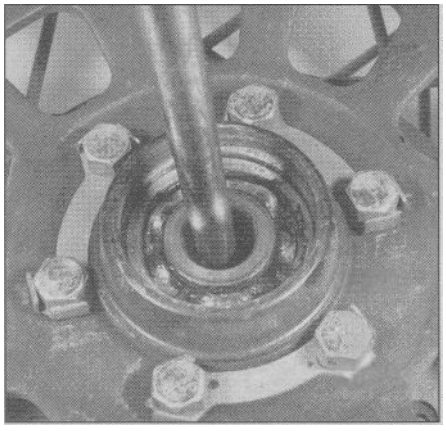
13.4b . . . and lift it out



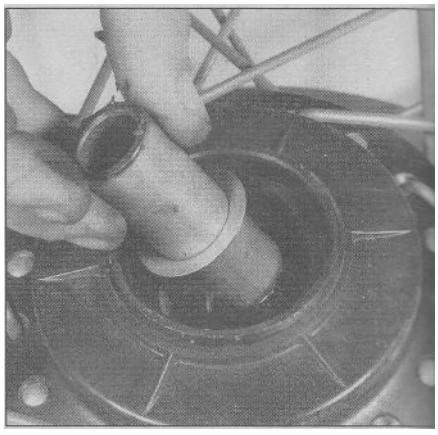
13.4c Lift out the speedometer clutch retainer . . .



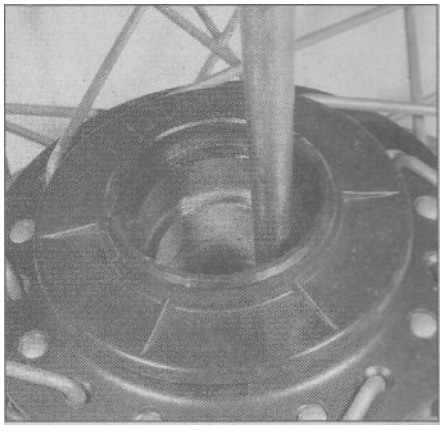
13.4d . . . and the speedometer clutch



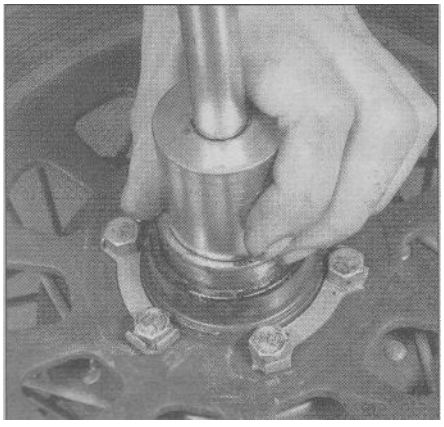
13.5 Drive out the opposite bearing with a long rod



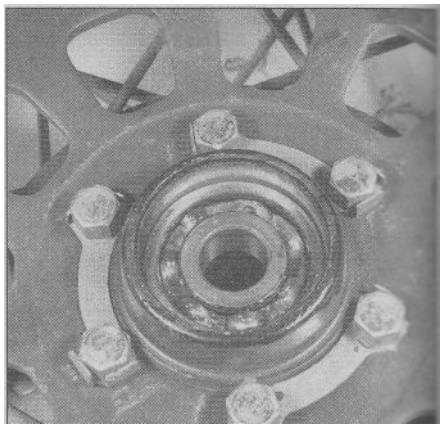
13.6 Lift out the spacer



13.7 Drive out the remaining bearing



13.10a Drive in the bearing with a socket or bearing driver that contacts the outer race . . .



13.10b The installed bearing should loc like this

4 From the left side of the wheel, lift out the speedometer drive unit (if you haven't already done so - **see illustration 11.5b),** then pry out the grease seal **(see illustration).** Lift out the speedometer clutch retainer and speedometer clutch **(see illustrations).**

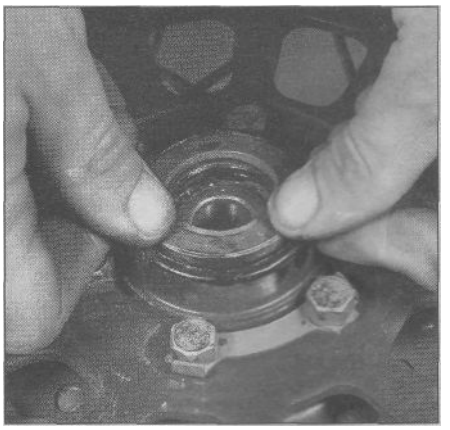
5 Using a metal rod (preferably a brass drift punch) inserted through the center of the hub bearing, tap evenly around the inner race of the opposite bearing to drive it from the hub **(see illustration).**

6 Turn the wheel over and remove the bearing spacer **(see illustration).**

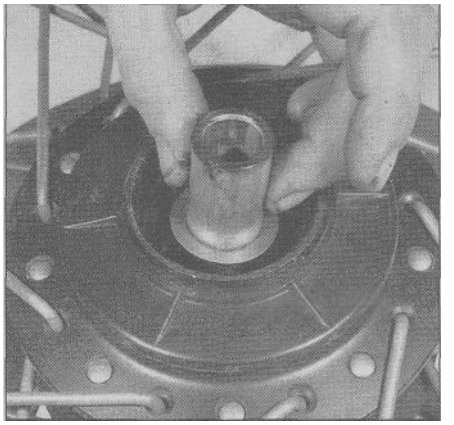
7 Turn the wheel back over and remove the remaining bearing using the same technique **(see illustration).**

8 Clean the bearings with a high flash-point solvent (one which won't leave any residue) and blow them dry with compressed air (don't let the bearing spin as you dry them). Apply a few drops of oil to the bearing. Hold the outer race of the bearing and rotate the inner race - if the bearing doesn't turn smoothly, has rough spots or is noisy, replace it with a new one.

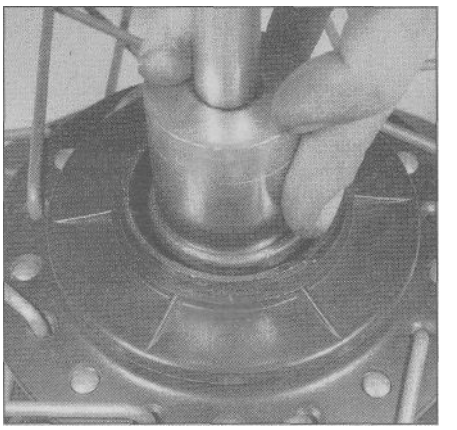
9 If the bearing checks out okay and will be re-used, wash it in solvent once again and dry it, then pack the bearing with high-quality bearing grease.



13.10c Install the grease seal **with its closed** side out

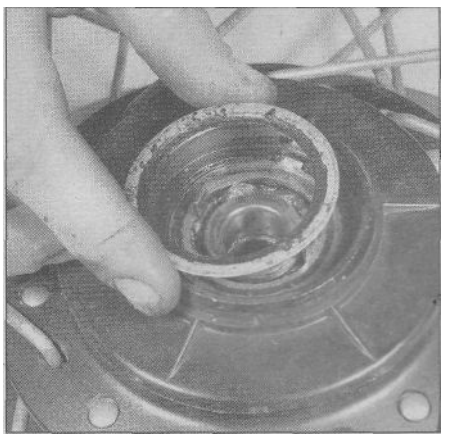


13.11a Install the spacer

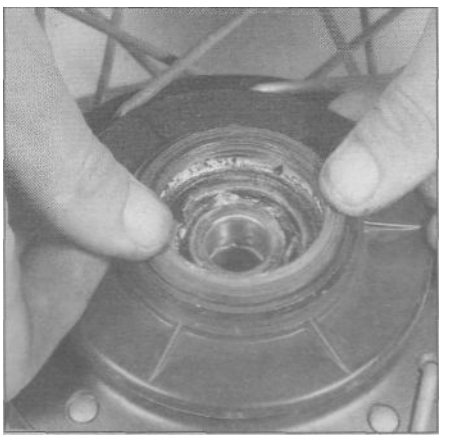


13.11b Drive in the remaining bearing

13.12a Install the speedometer clutch . . .



13.12b . . . and its retainer



13.12c Install the remaining grease seal

10 Thoroughly clean the hub area of the wheel. Install the bearing into the recess in the hub, with the marked or sealed side facing out. Using a bearing driver or a socket large enough to contact the outer race of the bearing, drive it in **(see illustration)** until it's completely seated **(see illustration).** Install a new grease seal on top of the bearings with its closed side out **(see illustration).** It should be possible to push the seal in with even finger pressure, but if necessary use a seal driver, large socket or a flat piece of wood to drive the seal into place.

11 Turn the wheel over and install the bearing spacer and bearing, driving the bearing into place as described in Step 10 **(see illustrations).**

12 Install the speedometer clutch and retainer on the left side of the wheel, then install the grease seal **(see illustrations).**

13 Install the speedometer drive unit, making sure the lugs in the speedometer clutch align with the notches in the gear **(see illustration 11.8).**

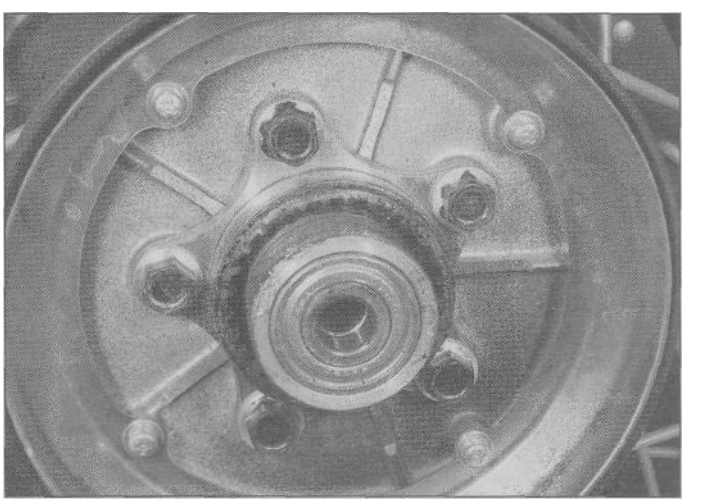
14 Clean off all grease from the brake disc using acetone or brake system cleaner.

15 Make sure the collar is in place **(see illustration 11.5a)** and install the wheel.

Rear wheel bearings

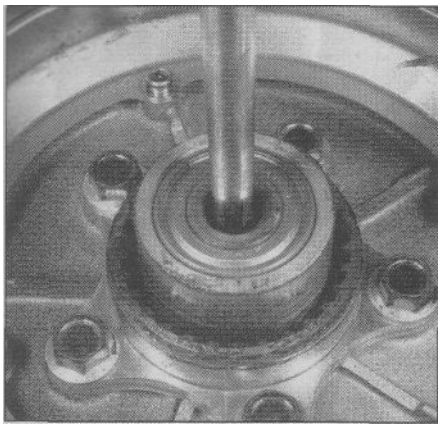
Refer to illustrations 13.16a through 13.161

16 If necessary for inspection, the dust seal and clutch hub can be detached from the wheel **(see illustration 6.8b and the accompanying illustrations).** The rear wheel bearings can be removed and installed with these parts in place.

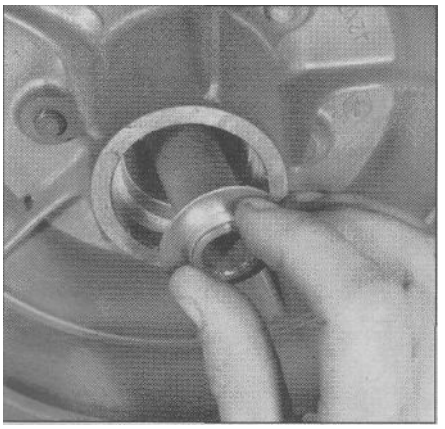


13.16a The dust seal is secured by four screws and the clutch hub by five bolts

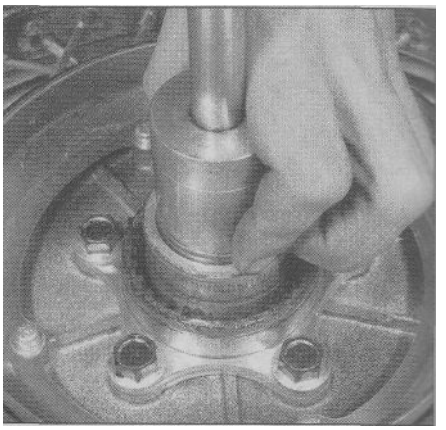
17 Rear wheel bearing removal, inspection and installation are generally the same as for front wheel bearings (see Steps 5 through 11 above and the accompanying illustrations). On installation, be sure to install the spacer and its collar between the bearings. Apply non-permanent thread locking agent to the threads of the clutch hub bolts and tighten them to the torque listed in this Chapter's Specifications.



13.16b Drive out the bearings with a long rod



13.16c Lift out the spacer and collar (be sure to reinstall both during assembly)



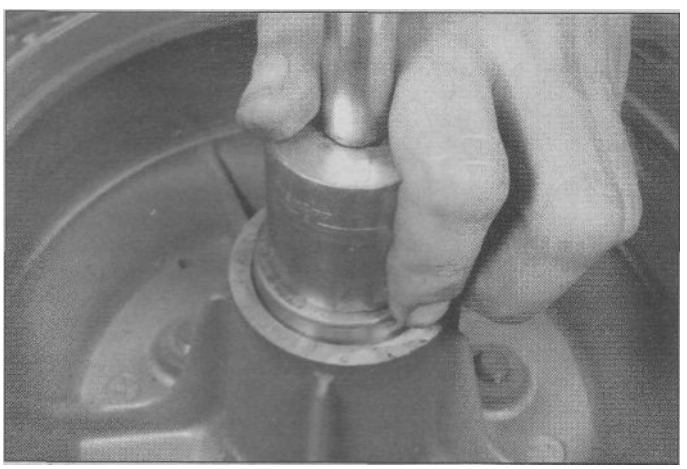
13.16d Drive the clutch hub side bearing into position with a bearing driver or socket that bears on the outer race

14 Tubed tires - general information

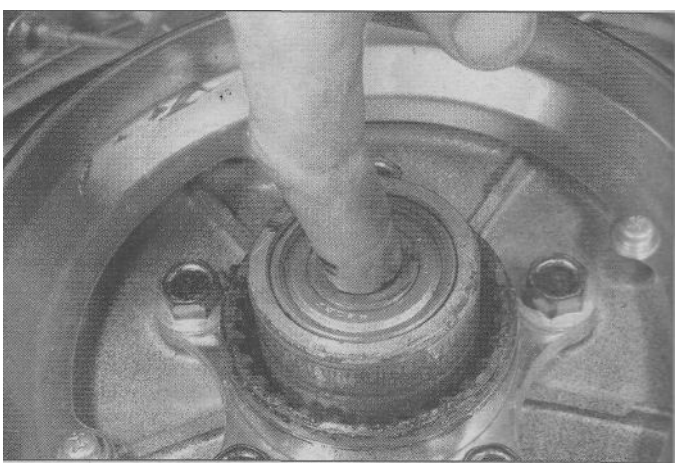
1 Tires with tubes are used as standard equipment on this motorcycle. They are generally easier to change than tubeless tires.

2 Before changing a tire yourself, check with your local dealership or repair shop to find out the labor charge for changing a tire. Although the procedure is not complicated, it is time-consuming, and for safety, it must be done correctly. For these reasons, it may be more practicai to have the job done. Watching a professional technician do the job before attempting it yourself can provide valuable information.

3 The accompanying illustrations can be used to replace a tubec tire in an emergency.

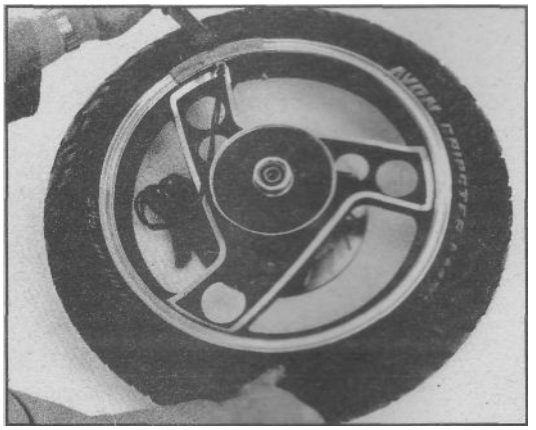


13.16e Make sure the spacer and **collar are in place, then drive in the bearing** on **the opposite side**



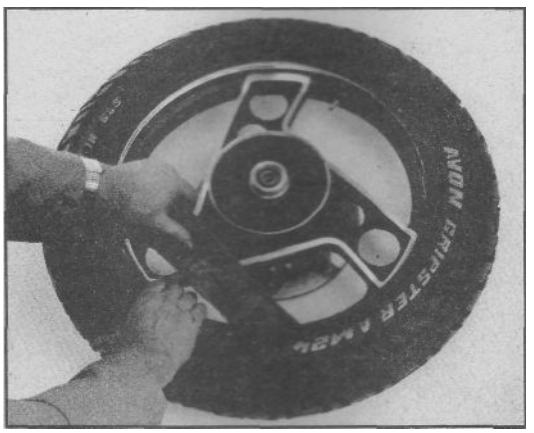
13.16f Spin the bearings with a finger to make sure they turn easily

TIRE CHANGING SEQUENCE - TUBED TIRES

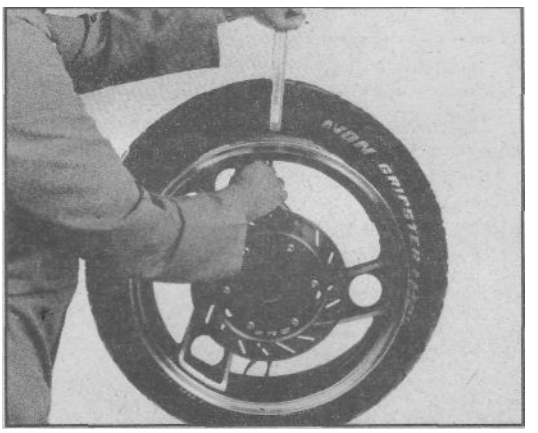


A Deflate tire. After pushing tire beads away from rim flanges push tire bead into well of rim at point opposite valve. Insert tire lever next to valve and work bead over edge of rim.

B Use two levers to work bead over edge of rim. Note use of rim protectors



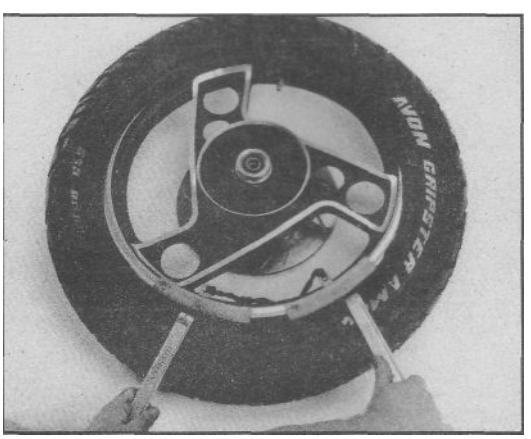
C Remove inner tube from tire



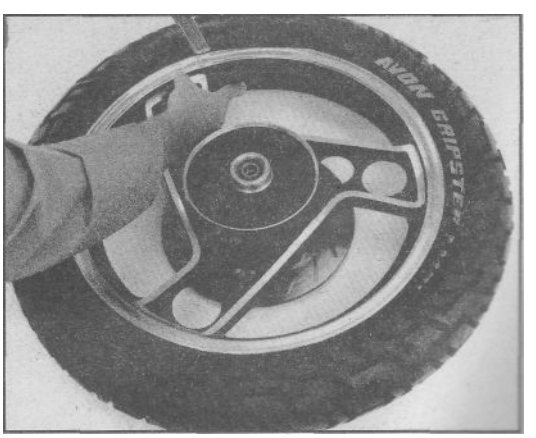
D When first bead is clear, remove tire as shown

E To install, partially inflate inner tube and insert in tire

F Work first bead over rim and feed valve through hole in rim. Partially screw on retaining nut to hold valve in place.



G Check that inner tube is positioned correctly and work second bead over rim using tire levers. Start at a point opposite valve.



H Work final area of bead over rim while pushing valve inwards to ensure that inner tube is not trapped.

Notes

Chapter 6 Part B
Brakes, wheels and tires (XV700-1100 models)

Contents

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Brake system bleeding	8
Front brake master cylinder - removal, overhaul and installation	5
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Rear drum brakes - removal, overhaul and installation	6
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Wheel bearings - inspection and maintenance	13
Wheels - alignment check	10
Wheels and tires - general check	See Chapter 1
Wheels - inspection and repair	9

Specifications

Brakes

Brake fluid type	See Chapter 1
Front brake disc thickness	
1981 through 1983XV750	
Standard	7 mm (0.28 inch)
Minimum*	6.5 mm (0.256 inch)
XV920 K and MK	Not specified
All others	
Standard	5.0 mm (0.20 inch)
Minimum*	4.5 mm (0.18 inch)
Disc runout limit	0.15 mm (0.006 inch)
Front brake pad thickness	
1981 through 1983 XV750	
New	5.7 mm (0.224 inch)
Wear limit	1.2 mm (0.047 inch)
XV920K, MK	Not specified
XV920 RH, RJ, RK	
New	11.0 mm (0.433 inch)
Wear limit	6.0 mm (0.236 inch)
XV1000 chain drive (TR1)	
New	6.5 mm (0.256 inch)
Wear limit	1.5 mm (0.059 inch)
1984-on (except 1994 UK)	
New	5.5 mm (0.217 inch)
Wear limit	0.5 mm (0.020 inch)
1994 UK	
New	6.1 mm (0.24 inch)
Wear limit	0.8 mm (0.03 inch)

Brakes (continued)

Rear brake drum inside diameter	
1981 through 1983XV750	
Standard	180 mm (7.087 inch)
Maximum	Not specified
All others	
Standard	200 mm (7.87 inches)
Maximum	201 mm (7.91 inches)
Rear brake shoe lining thickness	
Standard	4 mm (0.16 inch)
Minimum	2 mm (0.08 inch)

*Refer *to marks stamped into the disc (they supersede information printed here)*

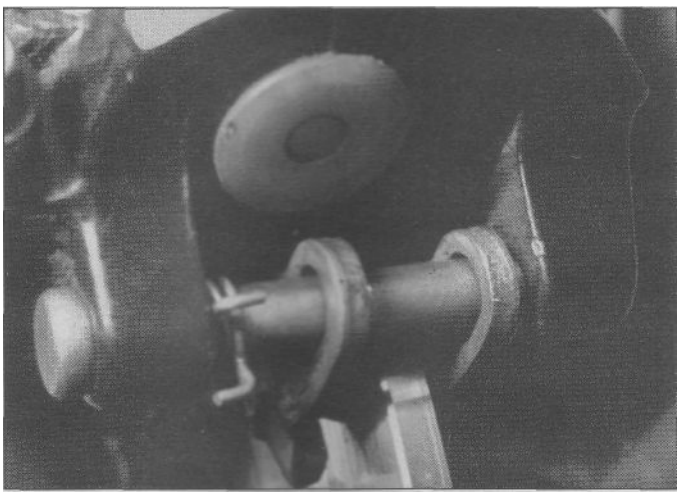
Wheels and tires

Wheel runout	
Radial (up-and-down)	2.0 mm (0.08 inch)
Axial (side-to-side)	2.0 mm (0.08 inch)
Tire pressures	See Chapter 1
Tire sizes	
1981 through 1983 XV750 and XV920 shaft drive models	
Front	3.50H 19 4PR
Rear	130/90 16 67H
XV920 and XV1000 chain drive models	
Front	3.25H19 4PR
Rear	120/90 18 65H
1984 and later models	
Front	100/90 19 57H
Rear (except 1994 UK)	140/90 15 70H
Rear (1994 UK)	140/90 15 M/C 70H

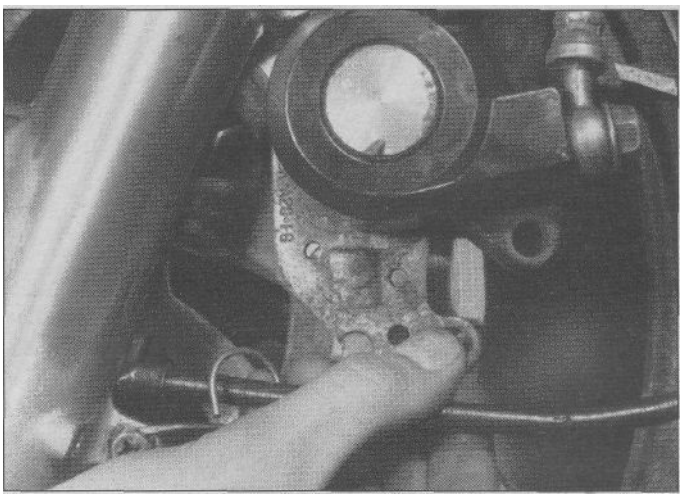
Torque specifications

1981 through 1983 models	
Front axle nut	
XV750	107 Nm (77 ft-lbs)*
XV920J, K, MK	110 Nm (80 ft-lbs)*
XV920 RH, RJ, RK	107 Nm (77 ft-lbs)*
Front axle pinch bolt	20 Nm (14 ft-lbs)
Rear axle nut	107 Nm (77 ft-lbs)*
Rear brake torque link nuts	20 Nm (14 ft-lbs)*
Brake disc mounting bolts	20 Nm (14 ft-lbs)**
Caliper mounting bolts	
XV920J	35 Nm (25 ft-lbs)
All other 1981 through 1983 models	26 Nm (19 ft-lbs)
Fluid hose union bolts	26 Nm (19 ft-lbs)
Caliper bleed valve	6 Nm (4.3 ft-lbs)
Master cylinder clamp bolts	9 Nm (6.5 ft-lbs)
Rear brake cam lever bolt	9 Nm (6.5 ft-lbs)
1984-on models	
Front axle or axle nut	
XV700, XV1100	105 Nm (75 ft-lbs)*
XV750	
US	110 Nm (80 ft-lbs)
UK	107 Nm (77 ft-lbs)
Front axle pinch bolt	20 Nm (14 ft-lbs)
Rear axle nut	105 Nm (75 ft-lbs)*
Rear brake torque link nuts	20 Nm (14 ft-lbs)*
Brake disc mounting bolts	20 Nm (14 ft-lbs)
Caiiper mounting bolts	
All except 1994 UK models	35 Nm (25 ft-lbs)
1994 UK models	Not specified
Fluid hose union bolts	26 Nm (19 ft-lbs)
Caliper bleed valve	6 Nm (4.3 ft-lbs)
Master cylinder clamp bolts	9 Nm (6.5 ft-lbs)
Rear brake cam lever bolt	9 Nm (6.5 ft-lbs)

**Use new cotter pins.*
***Use new lockwashers.*



2.2 On 1981 through 1983 XV750 and XV920 K and MK models, remove the coil **spring,** then **pull out the pad pin . . .**



2.3a . . . and lower the pads out of the caliper

1 General information

The models covered in this Chapter are equipped with a hydraulic disc brake at the front and a mechanical drum brake at the rear. Several different front brake designs are used, varying according to model. They may be equipped with wire spoke wheels and tubed tires or alloy wheels and tubetess tires.

Caution: *Disc brake components rarely require disassembly. Do not disassemble components unless absolutely necessary. If any hydraulic brake line connection in the system is loosened, the entire system should be disassembled, drained, cleaned and then properly filled and bled upon reassembly. Do not use solvents on internal brake components. Solvents will cause seals to swell and distort. Use only clean brake fluid, brake cleaner or alcohol for cleaning. Use care when working with brake fluid as it can injure your eyes and it will damage painted surfaces and plastic parts.*

2 Brake pads - replacement

Warning: *The dust created by the brake system may contain asbestos, which is harmful to your health. Never blow it out with compressed air and don't inhale any of it. An approved filtering mask should be worn when working on the brakes.*

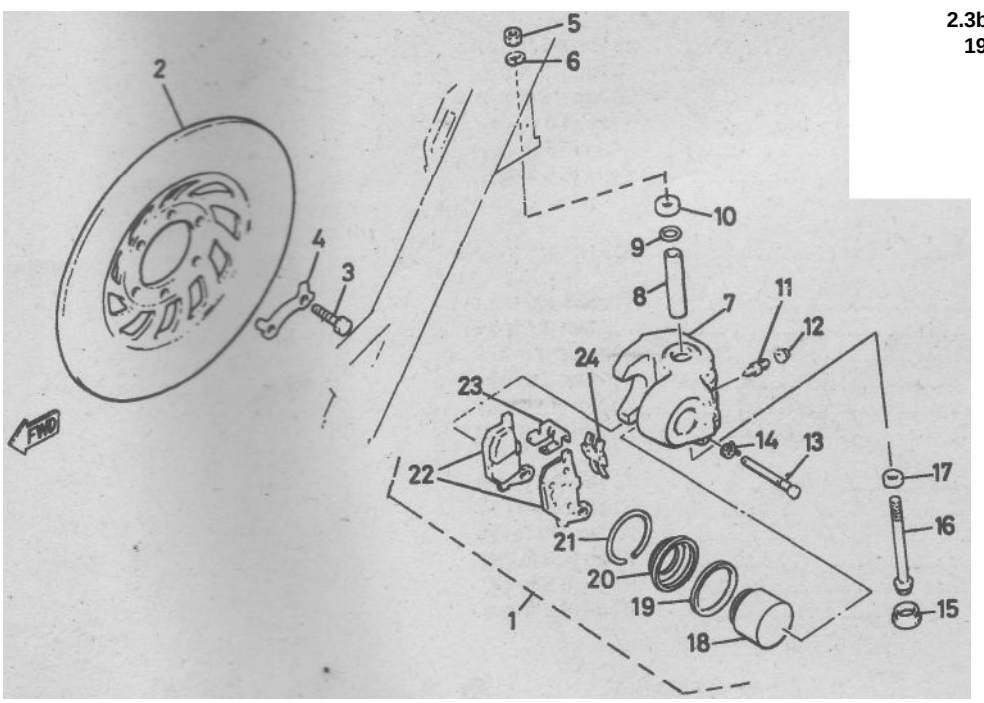
1981through1983XV750;XV920K,XV920MK

Refer to illustrations 2.2, 2.3a and 2.3b

1 Support the bike securely so it can't be knocked over during this procedure.

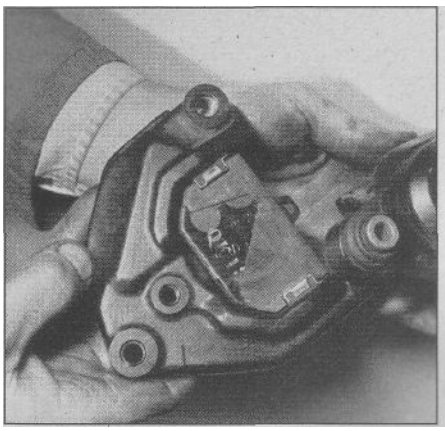
2 Remove the coil spring from the pad retaining pin at the bottom of the caliper, then pull out the pin **(see illustration).**

3 Lower the pads'out of the caliper **(see illustrations).**

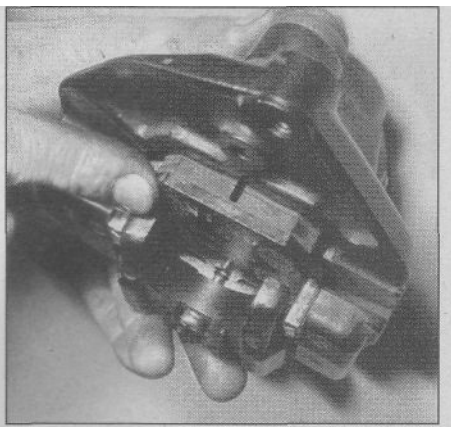


2.3b Front brake caliper (1981 through 1983 XV750, XV920K and XV920 MK models) - exploded view

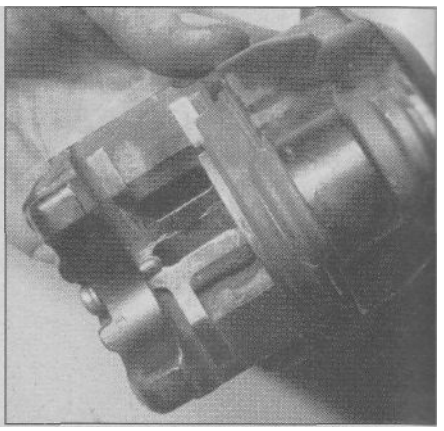
1 Caliper assembly
2 Brake disc
3 Disc mounting bolts
4 Lockwashers
5 Nut
6 Lockwasher
7 Caliper body
8 Pivot sleeve
9 O-ring
10 Washer
11 Bleed valve
12 Bleed valve dust cap
13 Pad retaining pins
14 Spring
15 Cap
16 Pivot bolt
17 Washer
18 Piston
19 Piston seal
20 Dust seal
21 Retaining ring
22 Brake pads
23 Pad retainer
24 Anti-rattle spring



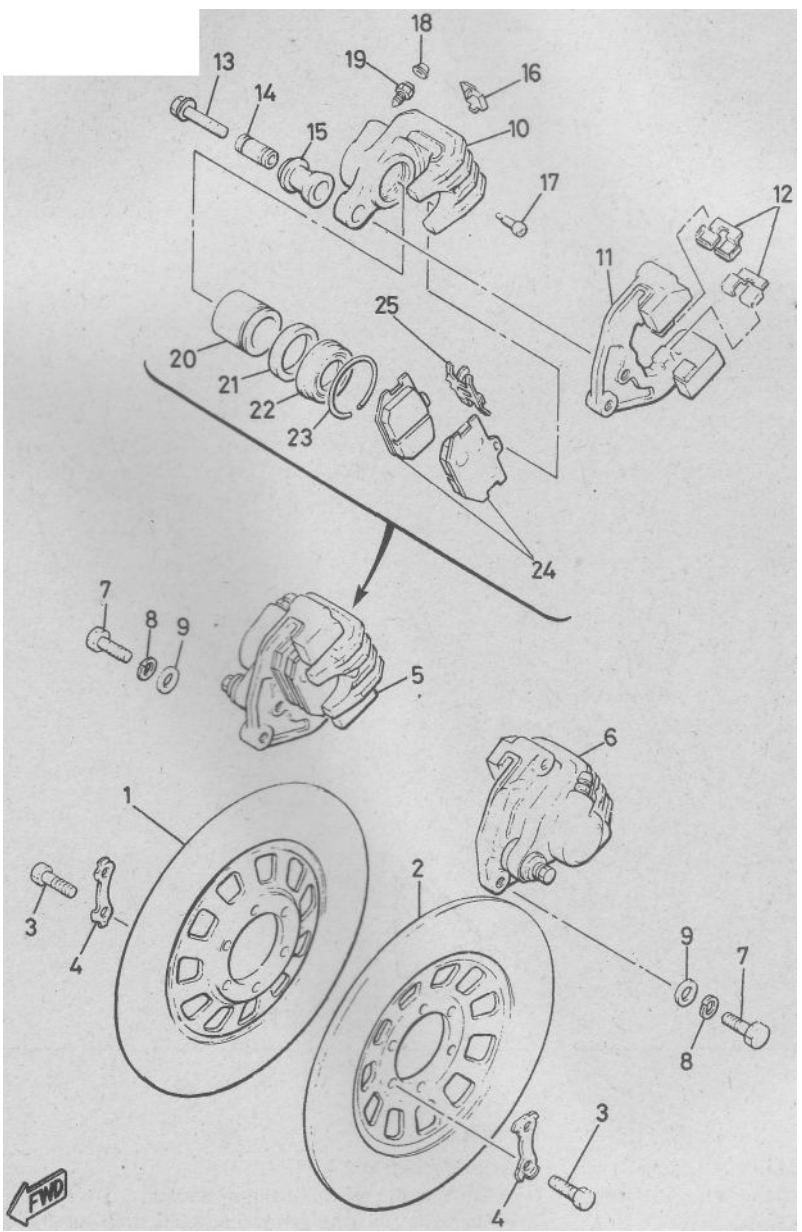
2.4a On chain drive XV920 and TR1 models, remove the bolt and detach the caliper from the bracket...



2.4b ... remove the brake pad retaining screw and the pads



2.5a Remove the anti-rattle spring

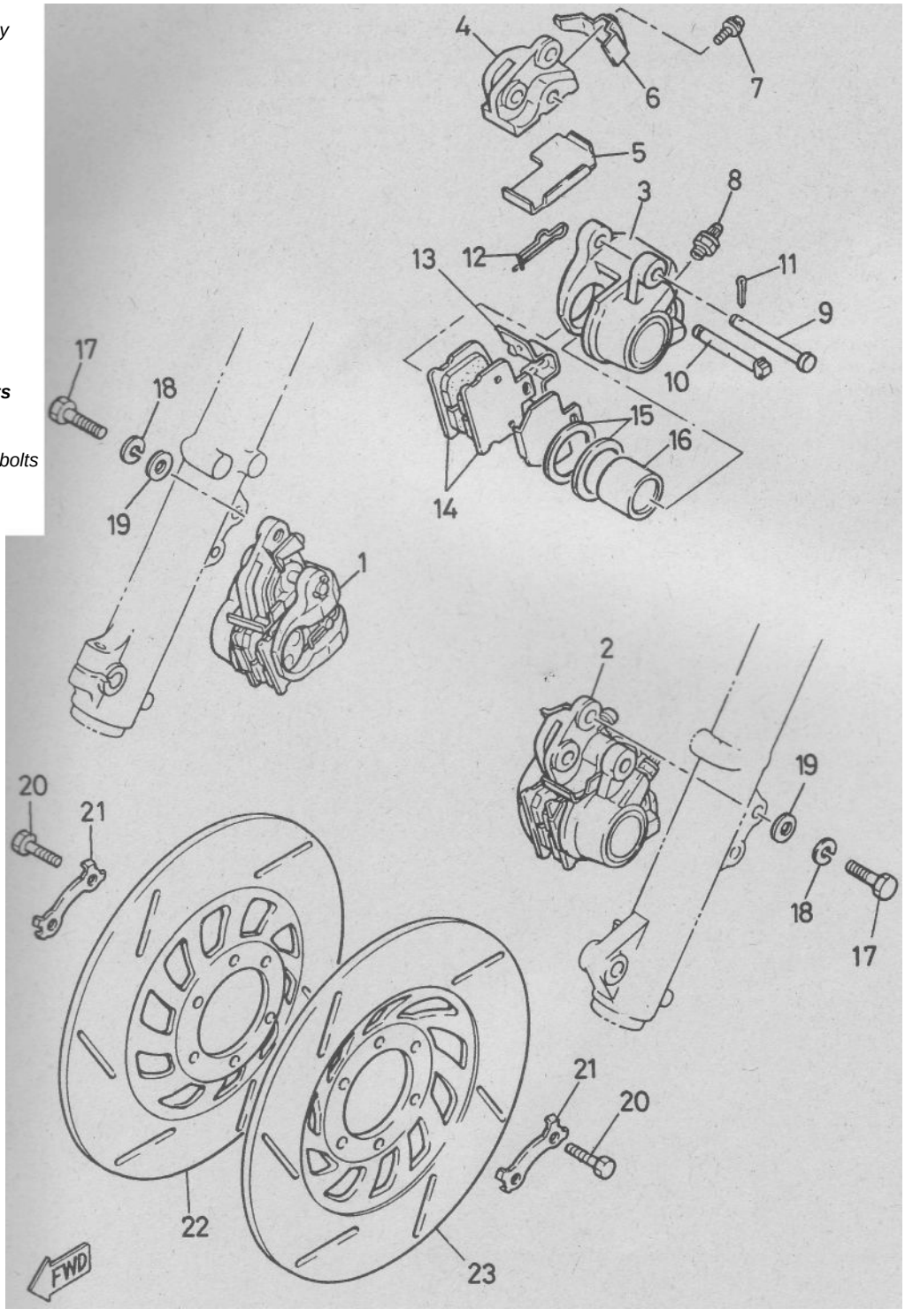


2.5b Front brake caliper (XV920 chain drive and TR1 models) - exploded view

1 *Right brake disc*
2 *Left brake disc*
3 *Disc mounting bolts*
4 *Lockwashers*
5 *Right caliper assembly*
6 *Left caliper assembly*
7 *Caliper mounting bolts*
8 *Lockwashers*
9 *Washers*
10 *Caliper body*
11 *Caliper bracket*
12 *Anti-rattle shim*
13 *Caliper-to-bracket bolt*
14 *Sleeve*
15 *Boot*
16 *Inspection window*
17 *Pad retaining screw*
18 *Bleed valve cap*
19 *Bleed valve*
20 *Piston*
21 *Piston seal*
22 *Dust seal*
23 *Retaining ring*
24 *Brake pads*
25 *Anti-rattle spring*

2.7 Front brake caliper (XV920J) - exploded view

7 Right caliper assembly
2 Left caliper assembly
3 Caliper body
4 Mounting bracket
5 Shim
6 Retaining plate
7 Screw
8 Bleed valve and cap
9 Pad retaining pin
10 Pad retaining pin
11 Cotter pin
12 Spring clip
13 Anti-rattle spring
14 Brake pads
15 Piston seals
16 Piston
*17 Caliper mounting **bolts***
18 Lockwashers
19 Washers
*20 Brake disc **mounting** bolts*
27 Lockwashers
22 Right brake
23 Left brake disc



XV920chaindrivemodelsandTR1

Refer to illustrations 2.4a, 2.4b, 2.5a and 2.5b

4 Remove the single bolt that secures the caliper body to its bracket **(see illustration).** Remove the single screw that secures the pads, then lift the caliper off the bracket to expose the pads **(see illustration).**

5 Note carefully which pad is on which side of the disc, then remove the anti-rattle spring and the pads **(see illustrations).**

XV920J

Refer to illustration 2.7,

6 Remove the front wheel (see Section 11).

7 Remove the pad pin clips, then pull out the pad pins **(see illustration).**

8 Remove the anti-rattle spring, pads and shim.

1984 and later models (except 1994 UK)

Refer to illustrations 2.9a and 2.9b

9 Remove the pad cover **(see illustration).** Remove the pad pin clips, then pull out the pad pins and remove the anti-rattle spring **(see illustration).**

10 Pull out the pads.

1994 UK models

Refer to illustration 2.11

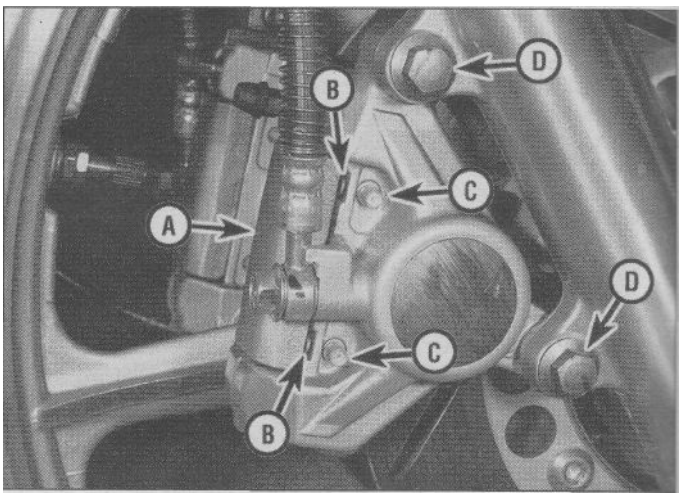
11 Remove the lower caliper bolt and pivot the caliper upward **(see illustration).**

12 Remove the pad spring and pull out the pads.

All models

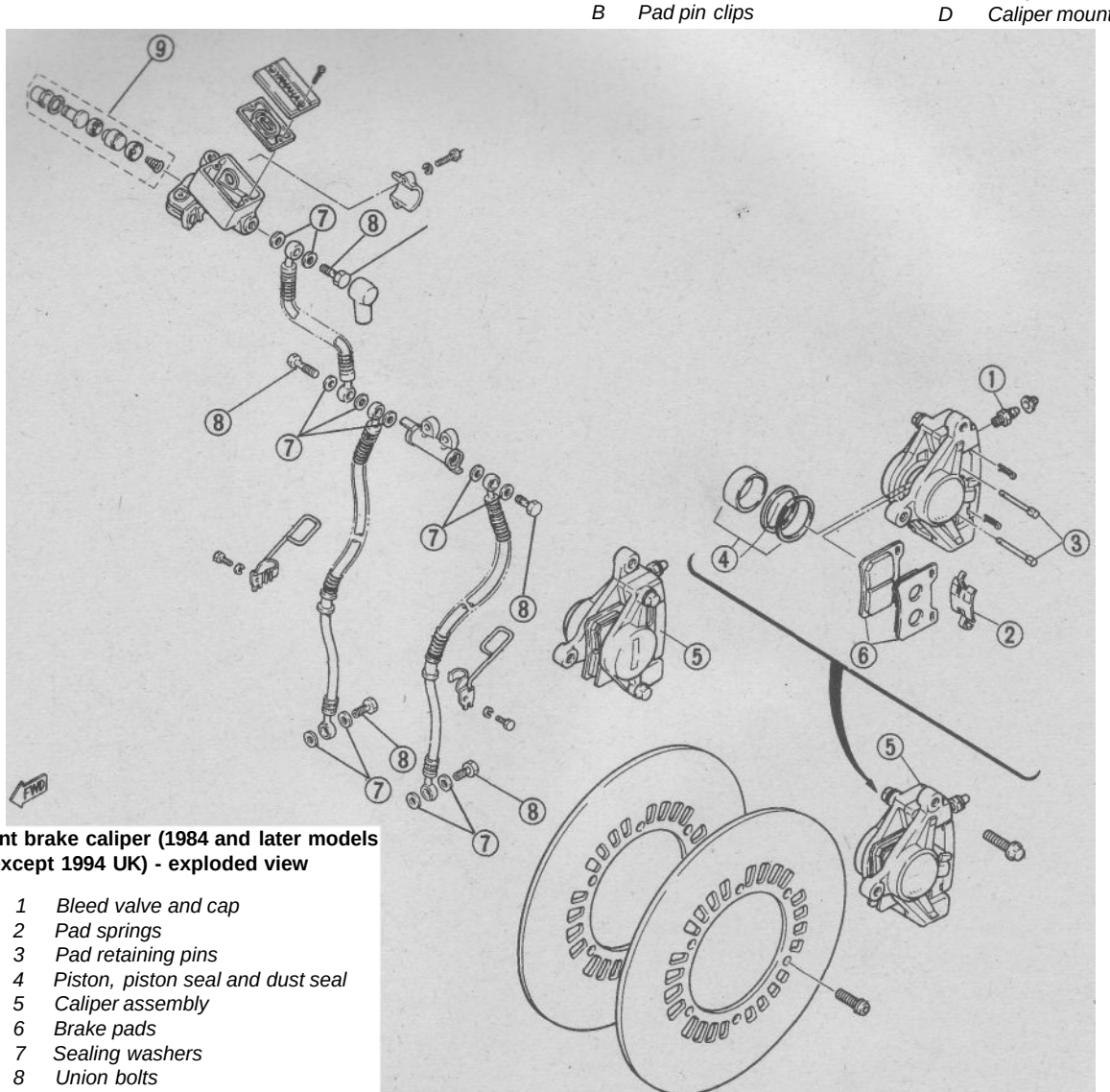
13 Measure the amount of friction material left on the pads and replace them as a pair if worn, fouled with oil or damaged in any way. If you're working on a 1994 UK model, replace the pads if the grooves in the friction material are worn away.

14 Check the condition of the brake discs (see Section 4). If they are in need of machining or replacement, follow the procedure in that Section to remove them. If they are okay, deglaze them with sandpaper or emery cloth, using a swirling motion.



2.9a Caliper mounting details (1984 and later models except 1994 UK)

A Pad cover
B Pad pin clips
C Pad pins
D Caliper mounting bolts



2.9b Front brake caliper (1984 and later models except 1994 UK) - exploded view

1 Bleed valve and cap
2 Pad springs
3 Pad retaining pins
4 Piston, piston seal and dust seal
5 Caliper assembly
6 Brake pads
7 Sealing washers
8 Union bolts
9 Master cylinder piston assembly

15 Connect a length of rubber or plastic tubing to the caliper bleed valve and place the other end in a container. Open the bleed valve and push the pistons into the caliper as far as possible; displaced brake fluid will flow through the tubing into the container. If you can't depress the pistons with thumb pressure, try using a C-clamp (G-clamp). If the piston sticks, remove the caliper and overhaul it as described in Section 3. Once the pistons are pressed in, close the bleed valve, remove the tubing and install the bleed valve cap.

16 Warning: *This step is necessary to ensure that the pads move freely in the calipers. Because a large amount of salt is used on roads in the UK, special lubrication of the pads and calipers is required. Before installing the pads on UK models, apply a thin film of Duckhams Copper 10 or equivalent to the following areas* (see **illustrations 2.6a and 2.6b in Part A of** this Chapter):

a) To the edges of the metal backing on the brake pads
b) To the areas of the caliper where the pads rub
c) To the threads of the caliper mounting bolts.

Apply a thin film of Shin-Etsu G-40M or equivalent silicone grease to the following:

d) Exposed areas of the caliper pistons
e) The areas of the pad backing plates that contact the pistons.

Caution: *Don't use too much Copper 10. Make sure no Copper 10 contacts the brake discs or the pad friction surfaces.*

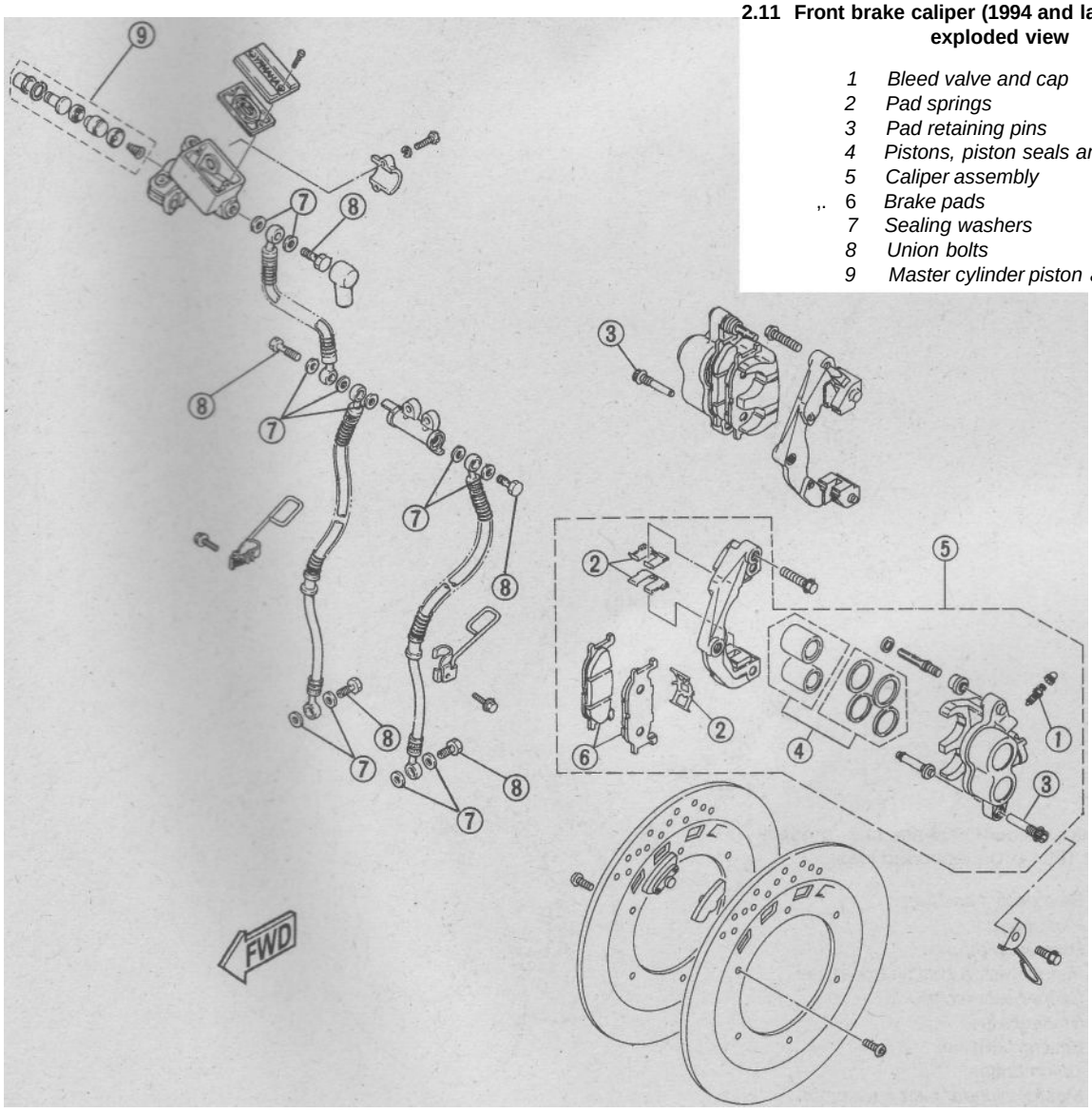
17 Install the pads and springs in the caliper. The rounded edge of the pad faces the rear of the motorcycle **(see illustration 2.3a).**

18 Check fluid level in the master cylinder reservoir (see Chapter 1) and add fluid if necessary.

19 Operate the brake lever several times to bring the pads into contact with the disc. Check the operation of the brakes carefully before riding the motorcycle.

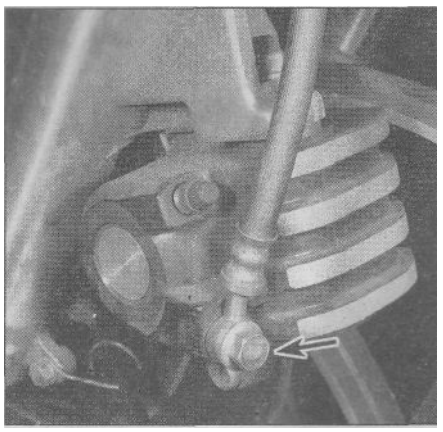
3 Brake caliper - removal, overhaul and installation

Warning: *If a caliper indicates the need for an overhaul (usually due to leaking fluid or sticky operation), all old brake fluid should be flushed from the system. Also, the dust created by the brake system may contain asbestos, which is harmful to your health. Never blow it out with compressed air and don't inhale any of it. An approved filtering mask should be worn when working on the brakes. Do not, under any circumstances, use petroleum-based solvents to clean brake parts. Use brake cleaner or denatured alcohol only!*

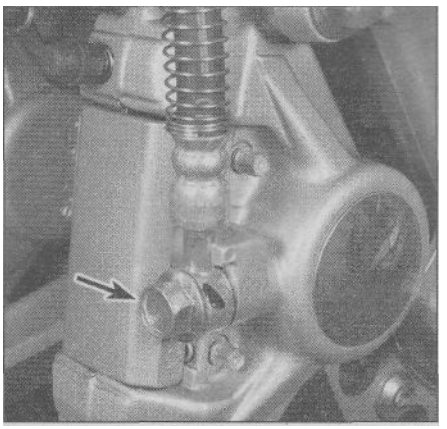


2.11 Front brake caliper (1994 and later UK models) - exploded view

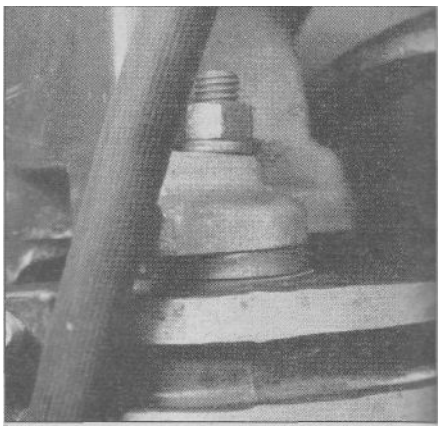
1 Bleed valve and cap
2 Pad springs
3 Pad retaining pins
4 Pistons, piston seals and dust seals
5 Caliper assembly
6 Brake pads
7 Sealing washers
8 Union bolts
9 Master cylinder piston assembly



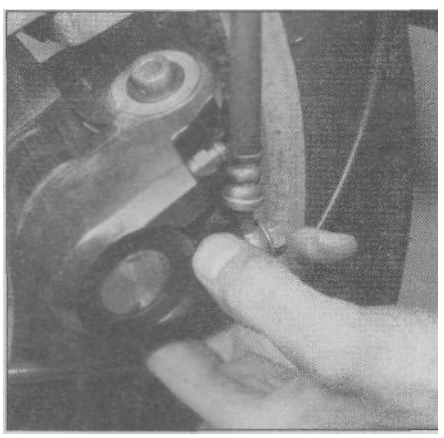
3.2a Remove the union bolt (arrow); this type of caliper is used on 1981 through 1983 shaft drive models . . .



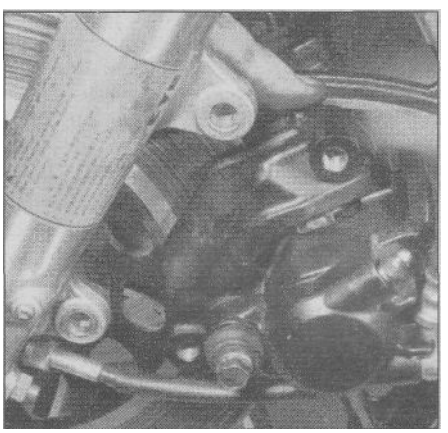
3.2b . . . and this type is used on 1984 and later models (except 1994 UK)



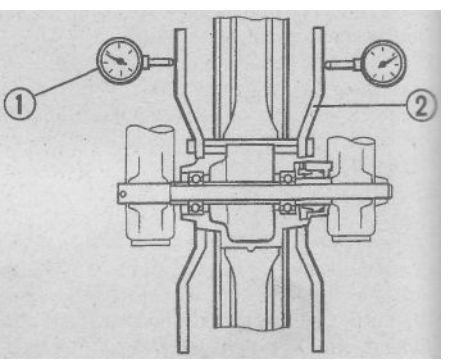
3.3a If you're working on a 1981 through 1983 XV750, an XV920K or an XV920 MK, remove the nut and washer . . .



3.3b . .. and slide the caliper off the pivot post



3.4 Remove the caliper mounting bolts and detach the caliper from the fork



4.3 Set up a dial indicator (1) to measure runout of the brake disc(s) (2)

Removal

Refer to illustrations 3.2a, 3.2b, 3.3a, 3.3b and 3.4

1 Support the bike securely so it can't be knocked over during this procedure.

2 Remove the union bolt from the brake hose banjo fitting and separate the hose from the caliper **(see illustrations).** Discard the sealing washers. Place the end of the hose in a container and operate the brake lever to pump out the fluid. Once this is done, wrap a clean shop rag tightly around the hose fitting to soak up any drips and prevent contamination.

3 If you're working on a 1981 through 1983 XV750, an XV920K, or an XV920MK, remove the nut and lockwasher from the top of the caliper, then slide the caliper down out of the bracket in the fork leg **(see illustrations).**

4 On all other models, unscrew the caliper mounting bolts and separate the caliper from the front fork (see **illustration).**

Overhaul

5 Clean the exterior of the caliper with denatured alcohol or brake system cleaner.

6 Place a few rags between the piston and the caliper frame to act as a cushion, then use compressed air, directed into the fluid inlet, to remove the piston(s) **(see illustration 2.3c in Part A of this Chapter and illustrations 2.3b, 2.5b, 2.7, 2.9b and 2.11).** Use only enough air pressure to ease the piston out of the bore. If a piston is blown out, even with the cushion in place, it may be damaged. **Warning:** *Never place your fingers in front of the piston in an attempt to catch orprotec: it when applying compressed air, as serious injury could occur.*

7 If compressed air isn't available, reconnect the caliper to the brake hose and pump the brake lever until the piston is free.

8 Using a wood or plastic tool, remove the dust seal. Metal tools may damage the bore.

9 Using a wood or plastic tool, remove the piston seal from the groove in the caliper bore.

10 Clean the piston and the bore with denatured alcohol, clean brake fluid or brake system cleaner and blow dry them with filtered, unlubricated compressed air. Inspect the surfaces of the piston for nicks and burrs and loss of plating. Check the caliper bore, too. If surface defects are present, the caliper must be replaced. If the caliper is in bad shape, the master cylinder should also be checked.

11 Lubricate the piston seal with clean brake fluid and install it in **its** j groove in the caliper bore. Make sure it isn't twisted and sea:s completely.

12 Lubricate the dust seal with clean brake fluid and install it in its groove, making sure it seats correctly.

13 Lubricate the piston with clean brake fluid and install it into **the** caliper bore. Using your thumbs, push the piston all the way in, making sure it doesn't get cocked in the bore.

14 On bracket-mounted calipers, the caliper body should be able to slide in relation to its mounting bracket. If it's seized or stiff - operation, lubricate the friction points or slide pins with hig^- temperature disc brake grease. If the dust boots are split or crackec. replace them with new ones.

Installation

15 Install the caliper, tightening the mounting bolts or nut to the torque listed in this Chapter's Specifications.

16 Connect the brake hose to the caliper, using new sealing washers on each side of the fitting. The neck of the hose union should fit between the two cast lugs on the caliper body. Tighten the banjo fitting bolt to the torque listed in this Chapter's Specifications.

17 Fill the master cylinder with the recommended brake fluid (see Chapter 1) and bleed the system (see Section 8). Check for leaks.

18 Check the operation of the brakes carefully before riding the motorcycle.

4 Brake disc - inspection, removal and installation

Inspection

Refer to illustration 4.3

1 Support the bike securely so it can't be knocked over during this procedure.

2 Visually inspect the surface of the disc for score marks and other damage. Light scratches are normal after use and won't affect brake operation, but deep grooves and heavy score marks will reduce braking efficiency and accelerate pad wear. If the disc is badly grooved it must be machined or replaced.

3 To check disc runout, mount a dial indicator to the fork leg with the plunger on the indicator touching the surface of the disc about 1/2-inch from the outer edge (see **illustration).** Slowly turn the wheel and watch the indicator needle, comparing your reading with the limit listed in this Chapter's Specifications or stamped on the disc itself. If the runout is greater than allowed, check the hub bearings for play (see Chapter 1). If the bearings are worn, replace them and repeat this check. If the disc runout is still excessive, it will have to be replaced.

4 The disc must not be machined or allowed to wear down to a thickness less than the minimum allowable thickness, listed in this Chapter's Specifications. The thickness of the disc can be checked with a micrometer. If the thickness of the disc is less than the minimum allowable, it must be replaced.

Removal

5 Remove the wheel (see Section 11 for front wheel removal or Section 12 for rear wheel removal). **Caution:** *Don't lay the wheel down and allow it to rest on the disc - the disc could become warped. Set the wheel on wood blocks so the disc doesn't support the weight of the wheel.*

6 Mark the relationship of the disc to the wheel, so it can be installed in the same position. Bend back the lockwasher tabs (1981 through 1983 models) and remove the bolts that retain the disc to the wheel **(see illustration** 2.3b, **2.5b, 2.7, 2.9b or 2.11).** Loosen the bolts a little at a time, in a criss-cross pattern, to avoid distorting the disc. Once all the bolts are loose, take the disc off.

7 Take note of any paper shims that may be present where the disc mates to the wheel. If there are any, mark their position and be sure to include them when installing the disc.

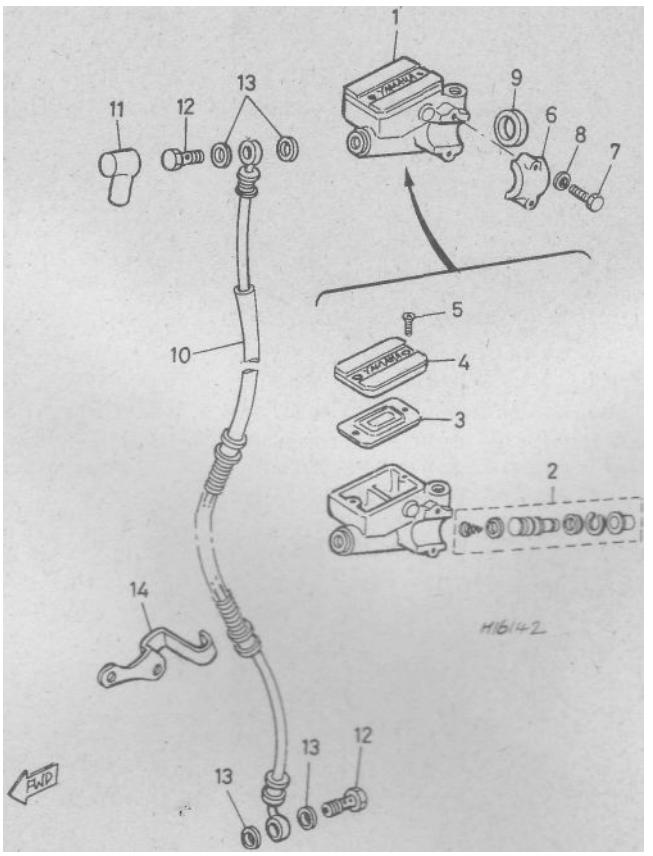
Installation

8 Position the disc on the wheel, aligning the previously applied matchmarks (if you're reinstalling the original disc). Make sure the arrow (stamped on the disc) marking the direction of rotation is pointing in the proper direction.

9 Apply a non-hardening thread locking compound to the threads of the bolts. Install the bolts with (use new lockwashers on 1981 through 1983 models), tightening them a little at a time, in a criss-cross pattern, until the torque listed in this Chapter's Specifications is reached. Clean off all grease from the brake disc using acetone or brake system cleaner.

10 Install the wheel.

11 Operate the brake lever several times to bring the pads into contact with the disc. Check the operation of the brakes carefully before riding the motorcycle.



5.3a Master cylinder (1981 through 1983 XV750, XV920K and **XV920MK models) - exploded view**

1	*Master cylinder body*	*8*	*Lockwashers*
2	*Piston assembly*	*9*	*Ring (XV750 only)*
3	*Diaphragm*	*10*	*Brake hose*
4	*Reservoir cover*	*11*	*Rubber boot*
5	*Screws*	*12*	*Union bolt*
6	*Handlebar clamp*	*13*	*Sealing washers*
7	*Bolts*	*14*	*Hose guide*

5 Front brake master cylinder - removal, overhaul and installation

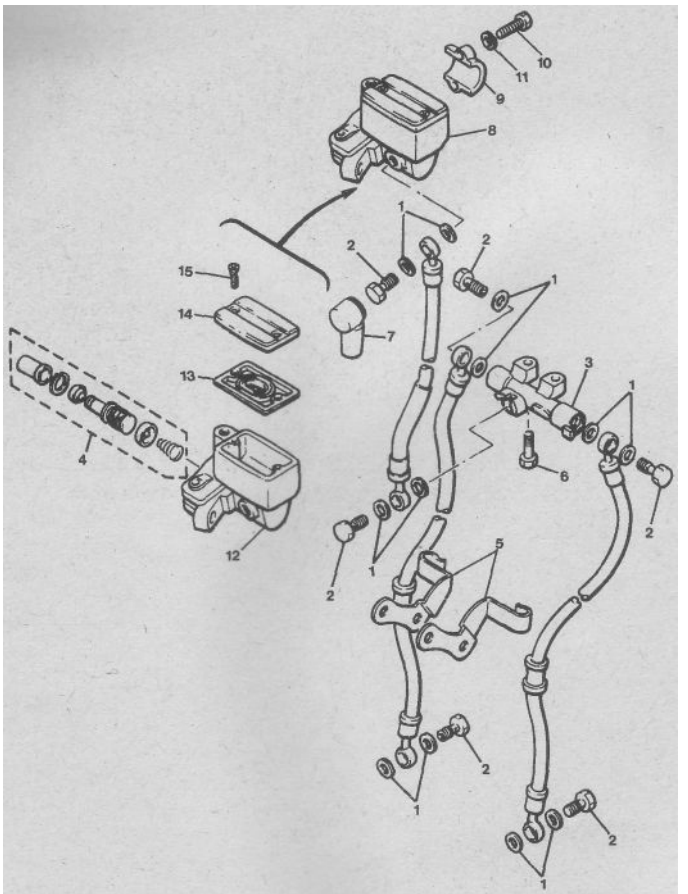
1 If the master cylinder is leaking fluid, or if the lever does not produce a firm feel when the brake is applied, and bleeding the brakes does not help, master cylinder overhaul is recommended. Before disassembling the master cylinder, read through the entire procedure and make sure that you have the correct rebuild kit. Also, you will need some new, clean brake fluid of the recommended type, some clean rags and internal snap-ring pliers. **Note:** *To prevent damage to the paint from spilled brake fluid, always cover the fuel tank when working on the master cylinder.*

2 **Caution:** *Disassembly, overhaul and reassembly of the brake master cylinder must be done in a spotlessly clean work area to avoid contamination and possible failure of the brake hydraulic system components.*

Removal

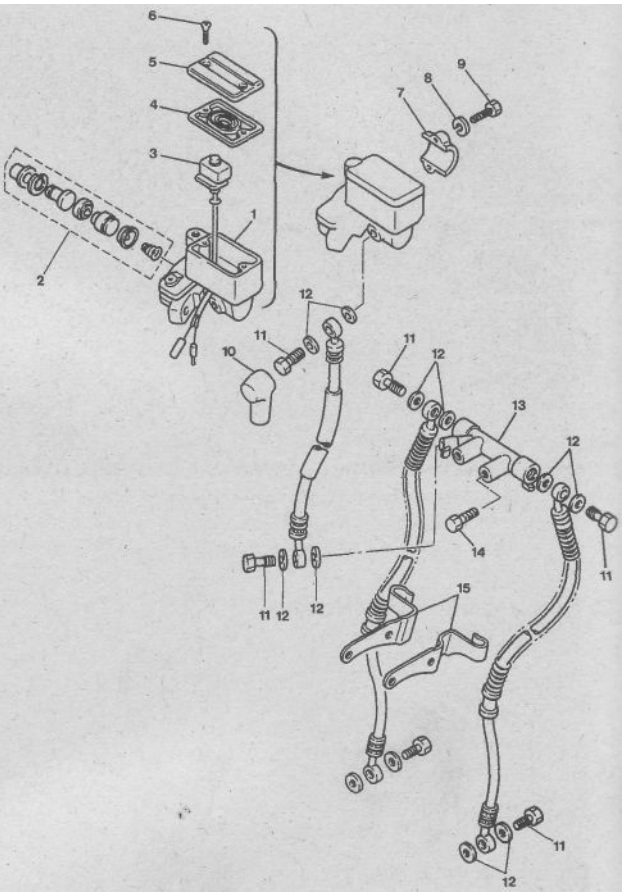
Refer to illustrations 5.3a, 5.3b and 5.3c

3 Loosen but do not remove the screws holding the reservoir cover in place **(see the accompanying illustrations,** illustration 2.9b **or illustration** 2.11).



5.3b Master cylinder (chain drive XV920 and TR1 models) exploded view

1	*Sealing washers*	9	*Handlebar clamp*
2	*Union bolts*	10	*Bolts*
3	*Hose joint*	11	*Lockwashers*
4	*Piston assembly*	12	*Master cylinder body*
5	*Hose guides*	13	*Diaphragm*
6	*Bolt*	14	*Reservoir cover*
7	*Rubber boot*	15	*Screws*
8	*Master cylinder assembly*		



5.3c Master cylinder (XV920J models) - exploded view

1	*Master cylinder body*	9	*Bolts*
2	*Piston assembly*	10	*Rubber boot*
3	*Sensor unit*	11	*Union bolts*
4	*Diaphragm*	12	*Sealing washers*
5	*Reservoir cover*	13	*Hose joint*
6	*Screws*	14	*Bolt*
7	*Handlebar clamp*	15	*Hose guides*
8	*Lockwashers*		

4 Disconnect the electrical connectors from the brake light switch (see Chapter 8).

5 Pull back the rubber boot (if equipped), loosen the banjo fitting bolt and separate the brake hose from the master cylinder. Wrap the end of the hose in a clean rag and suspend the hose in an upright position or bend it down carefully and place the open end in a clean container. The objective is to prevent excessive loss of brake fluid, fluid spills and system contamination.

6 Remove the master cylinder mounting bolts and separate the master cylinder from the handlebar. Caution: *Do not tip the master cylinder upside down or brake fluid will run out.*

Overhaul

7 This is the same as for XV535 models. Refer to Part A of this Chapter and illustration 2.9b, 2.11, 5.3a, 5.3b or 5.3c.

Installation

8 Attach the master cylinder to the handlebar, making sure the UP mark is upright, and tighten the bolts to the torque listed in this Chapter's Specifications.

9 Connect the brake hose to the master cylinder, using new sealing washers. Tighten the banjo fitting bolt to the torque listed in this Chapter's Specifications. Fill the master cylinder with the recommended brake fluid (see Chapter 1), then refer to Section 8 and bleed the air from the system.

6 Rear drum brakes - removal, overhaul and installation

Shoeremoval

Refer to illustrations 6.4, 6.5a, 6.5b and 6.5c

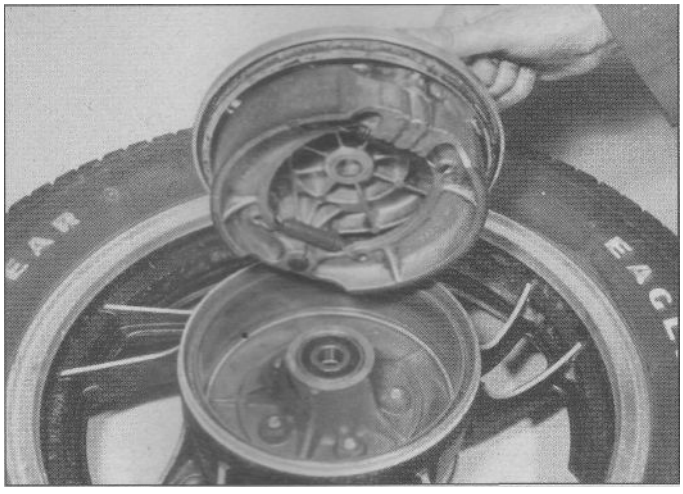
1 Before you start, inspect the rear brake wear indicator (sea Chapter 1).

2 Support the bike securely so it can't be knocked over during this procedure.

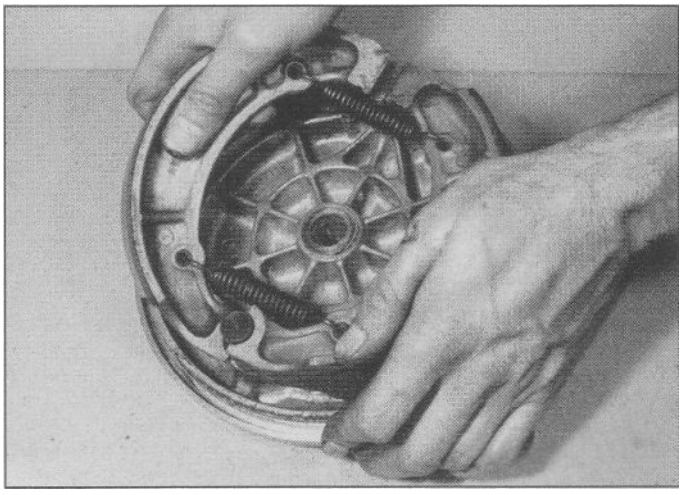
3 Remove the rear wheel (see Section 12).

4 Lift the brake panel out of the wheel (see illustration).

5 Fold the shoes toward each other to release the spring tension (see illustration). Remove the shoes and springs from the brake panel (see illustrations).



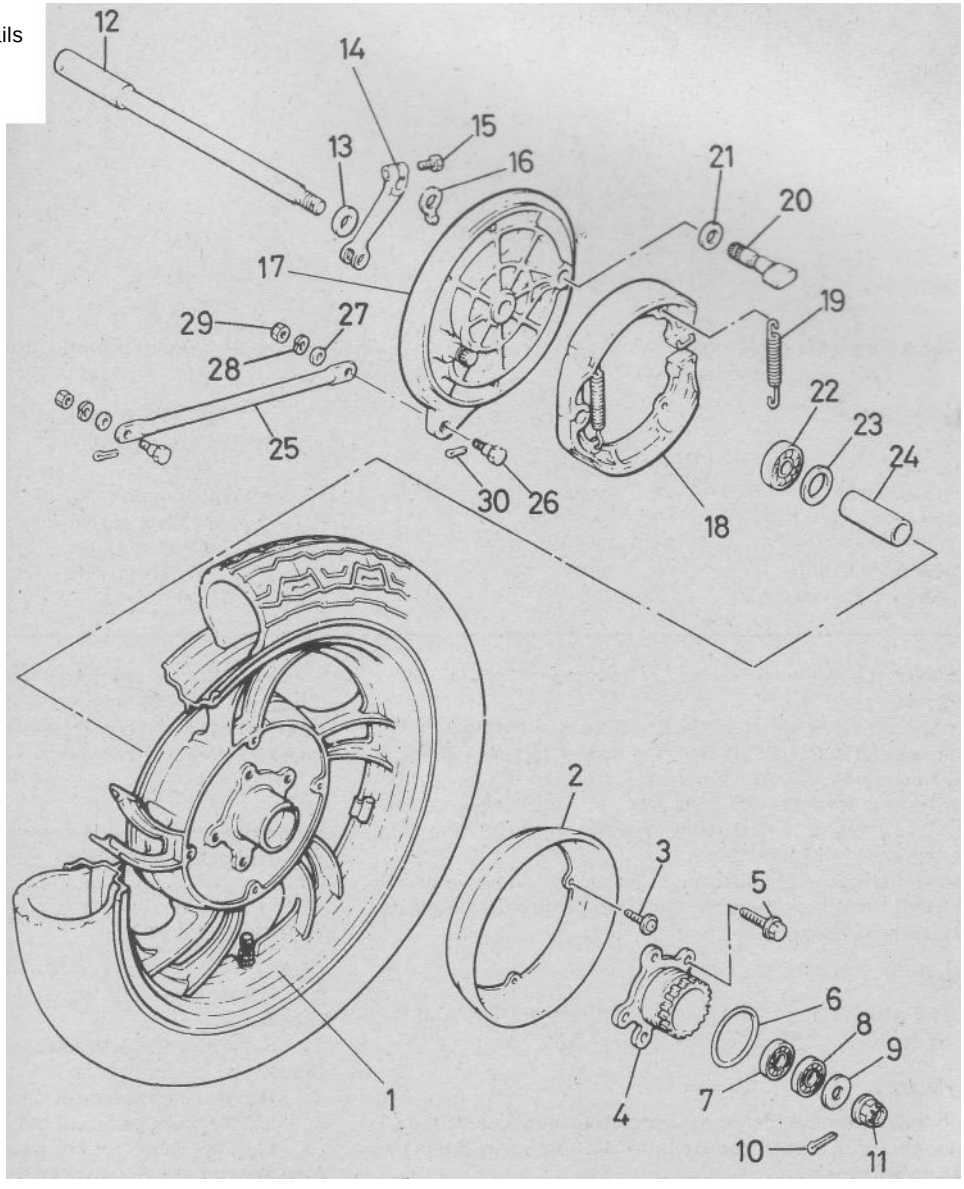
6.4 Lift the rear brake **panel out of the wheel**

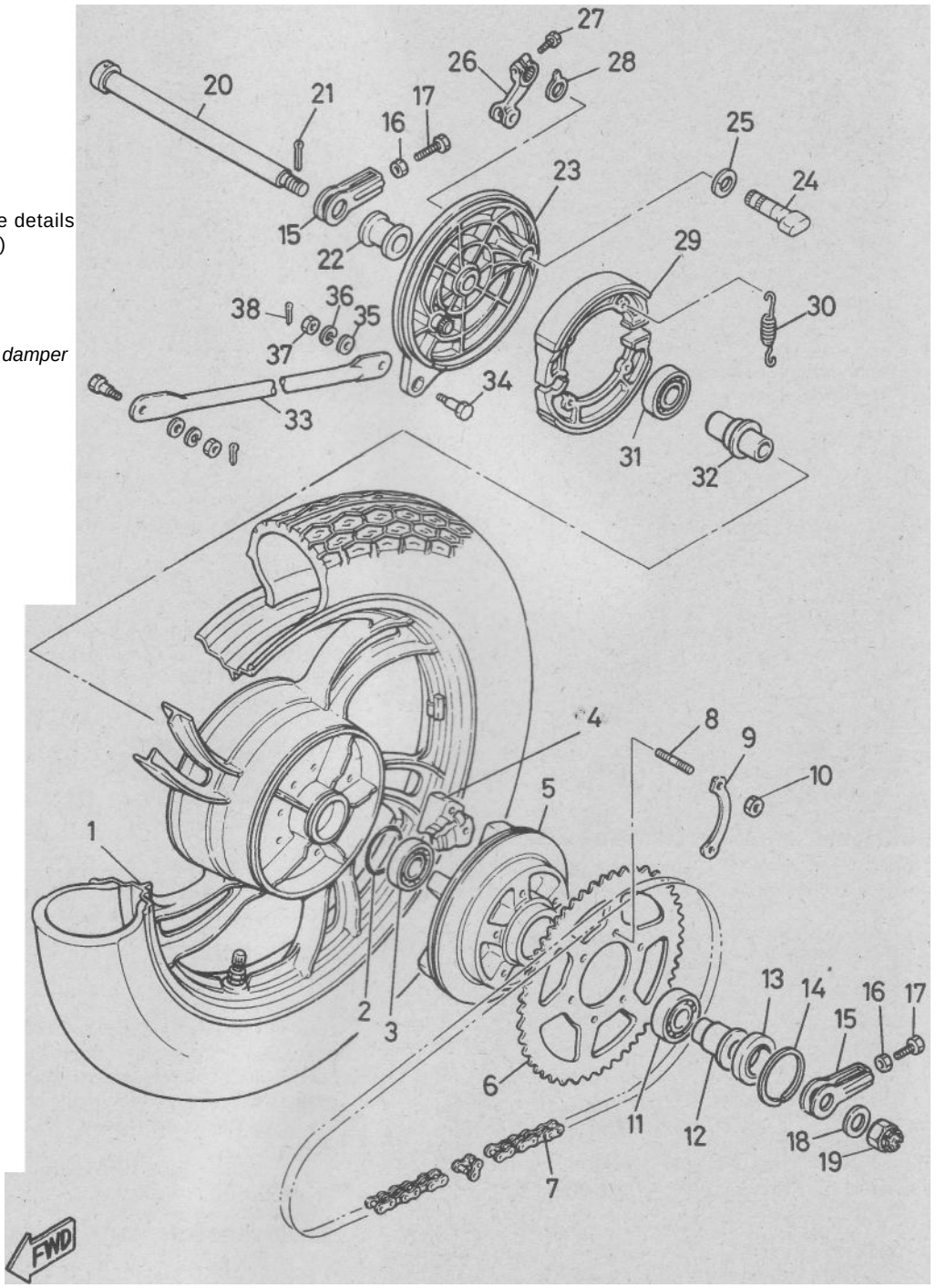


6.5a Fold the shoes together to detach them from the brake panel

6.5b Rear wheel and brake details (shaft drive models)

1 Rearwheel
2 Dust seal
3 Screw and washer
4 Drive pinion
5 Bolts
6 O-ring
7 Left wheel bearing
8 Left wheel bearing
9 Washer
10 Cotter pin
11. Castellated nut
12 Axle
13 Washer
14 Brake lever
15 Pinch bolt
16 Wear indicator plate
17 Brake panel
18 Brake shoe
19 Return spring
20 Brake cam
21 Washer
22 Right wheel bearing
23 Washer
24 Spacer
25 Torque link
26 Bolts
27 Washers
28 Lockwashers
29 Nuts
30 Cotter pin





6.5c Rear wheel and brake details (shaft drive models)

1 Rear wheel
2 O-ring
3 Left wheel bearing
4 Coupling (cush drive) damper
5 Coupling
6 Sprocket
7 Drive chain
8 Sprocket stud
9 Lockwasher
10 Nut
11 Coupling bearing
12 Left spacer
13 Oil seal
14 Snap-ring
15 Chain adjuster
16 Locknut
17 Adjusting bolt
18 Washer
19 Castellated nut
20 Axle
21 Cotter pin
22 Right spacer
23 Brake panel
24 Brake cam
25 Washer
26 Brake lever
27 Pinch bolt
28 Wear indicator plate
29 Brake shoes
30 Return springs
31 Right bearing
32 Spacer
33 Torque link
34 Bolt
35 Washer
36 Lockwasher
37 Nut
38 Cotter pin

Shoe inspection

Refer to illustrations 6.8a, 6.8b and 6.8c

5 Check the linings for wear, damage and signs of contamination from road dirt and water. If the linings are visibly defective, replace them.

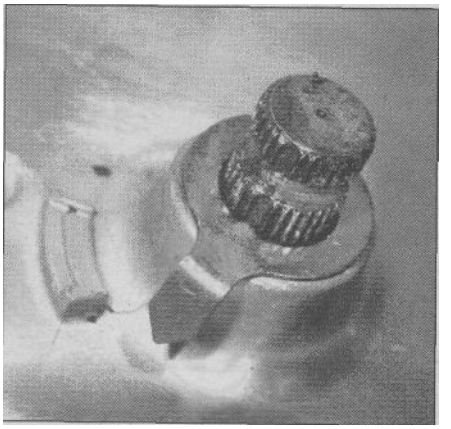
6 Measure the thickness of the lining material (just the lining material, not the metal backing) and compare with the value listed in this Chapter's Specifications. Replace the shoes if the lining material is worn to less than the minimum.

7 Check the ends of the shoes where they contact the brake cam and pivot post. Replace the shoes if there's visible wear.

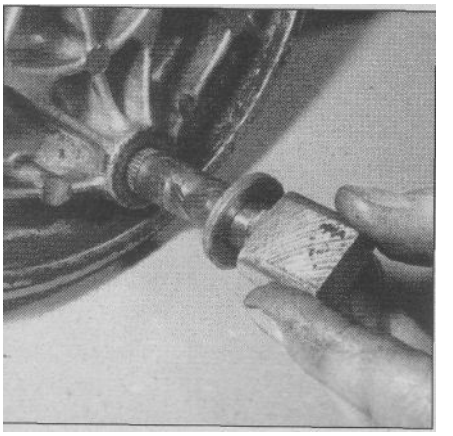
8 Check the brake cam and pivot post for wear and damage. If necessary, make match marks on the cam and cam lever, then remove the pinch bolt, lever, wear indicator pointer, seal and cam (see illustrations).

9 Check the brake drum (inside the wheel) for wear or damage Measure the diameter at several points with a brake drum micrometer for have this done by a Yamaha dealer). If the measurements are uneven (indicating the brake drum is out of round) or if there are scratches deep enough to snag a fingernail, have the drum turned (skimmed) by a dealer to correct the surface. If the drum has to be turned (skimmed) beyond the wear limit to removethe defects, replace it.

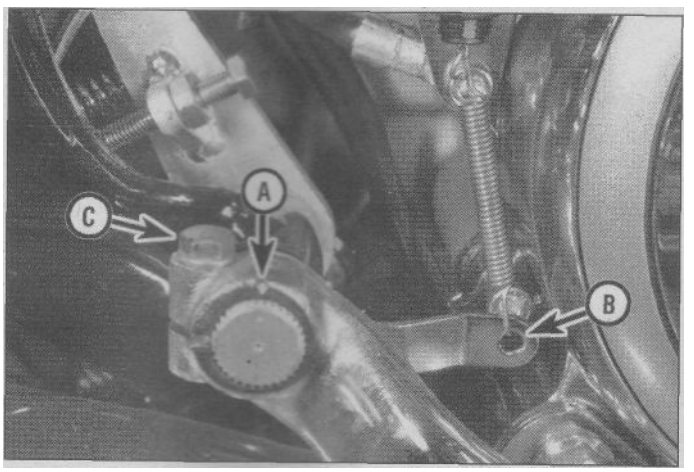
6.8a Loosen the pinch bolt and **remove the brake** lever. . .



6.8b . . . remove the wear indicator pointer . . .



6.8c . . . and withdraw the cam from the brake panel



6.16 Note the position of **the alignment marks (A), unhook the brake light switch** spring **(B) and loosen the pinch bolt (C)**

7.2 Remove the union bolts (A); note the position of the banjo fitting neck next to the cast lug (B)

10 Check the brake cam for looseness in the brake panel hole. If it feels loose, replace the brake cam or panel, whichever is worn.

11 Reverse Step 8 to install the brake lever and cam.

Shoeinstallation

12 Apply high-temperature brake grease to the ends of the springs, the cam and the pivot post.

13 Hook the springs to the shoes. Position the shoes in a V on the panel, then fold them down into position **(see illustration 6.5a).** Make sure the ends of the shoes fit correctly against the cam and on the pivot post **(see illustration 6.4).**

Rearbrakepedalremovalandinstallation

Refer to illustration 6.16

14 Remove the cotter pin and clevis pin and detach the brake rod from the pedal arm. Unhook the pedal return spring.

15 Look for match marks on the pedal and shaft. If they aren't there, make your own.

16 Unhook the brake light switch spring from the pedal **(see illustration).** Loosen the pedal pinch bolt and slide the pedal off the shaft.

17 Installation is the reverse of the removal steps. Adjust the rear brake (see Chapter 1).

7 Brake hoses - inspection and replacement

Inspection

Refer to illustration 7.2

1 Once a week, or if the motorcycle is used less frequently, before every ride, check the condition of the brake hose.

2 Twist and flex the rubber hose(s) **(see illustration 2.9b, 2.11, 5.3a, 5.3b or 5.3c)** while looking for cracks, bulges and seeping fluid. Check extra carefully around the areas where the hoses connect with the banjo fittings, as these are common areas for hose failure **(see illustration).**

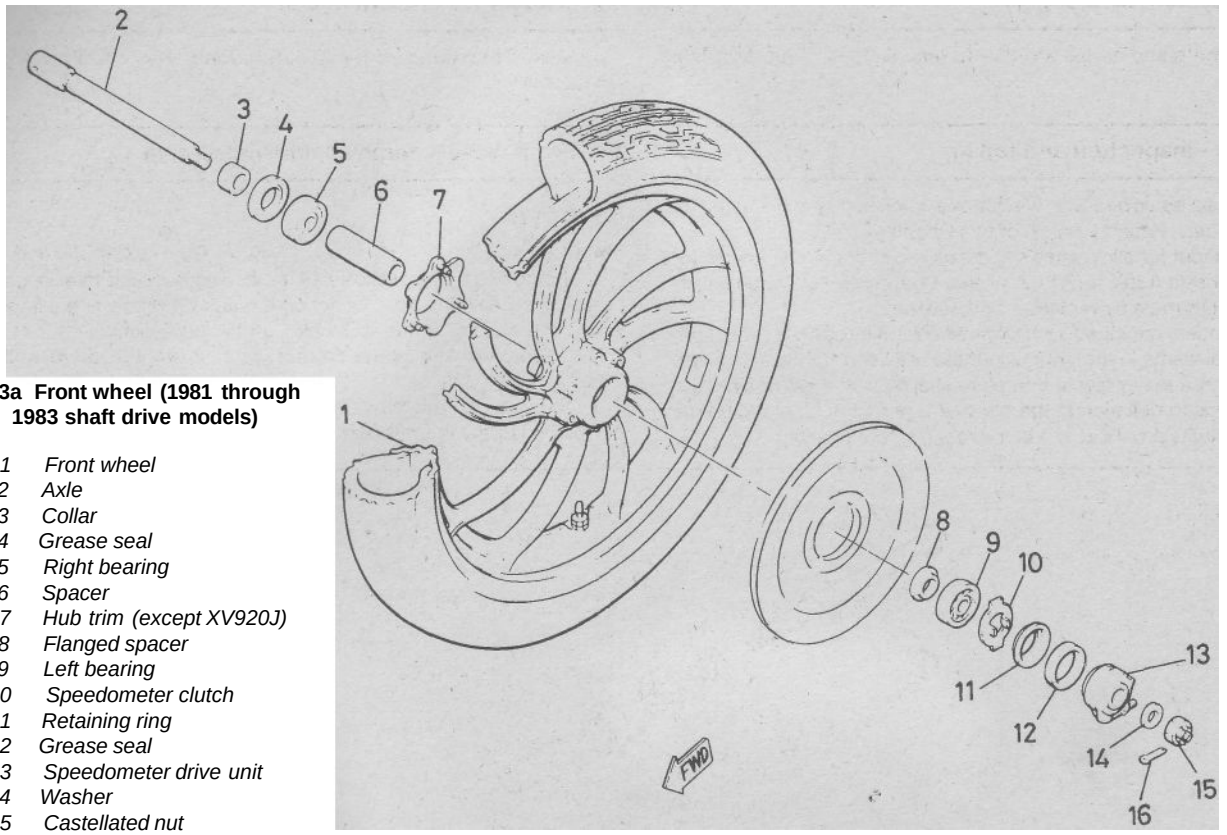
3 Inspect the metal banjo fittings connected to brake hoses. If the fittings are rusted, scratched or cracked, replace them.

Replacement

4 Brake hoses have a banjo fitting on each end. Cover the surrounding area with plenty of rags and unscrew the union bolt on either end of the hose. Detach the hose from any clips that may be present and remove the hose.

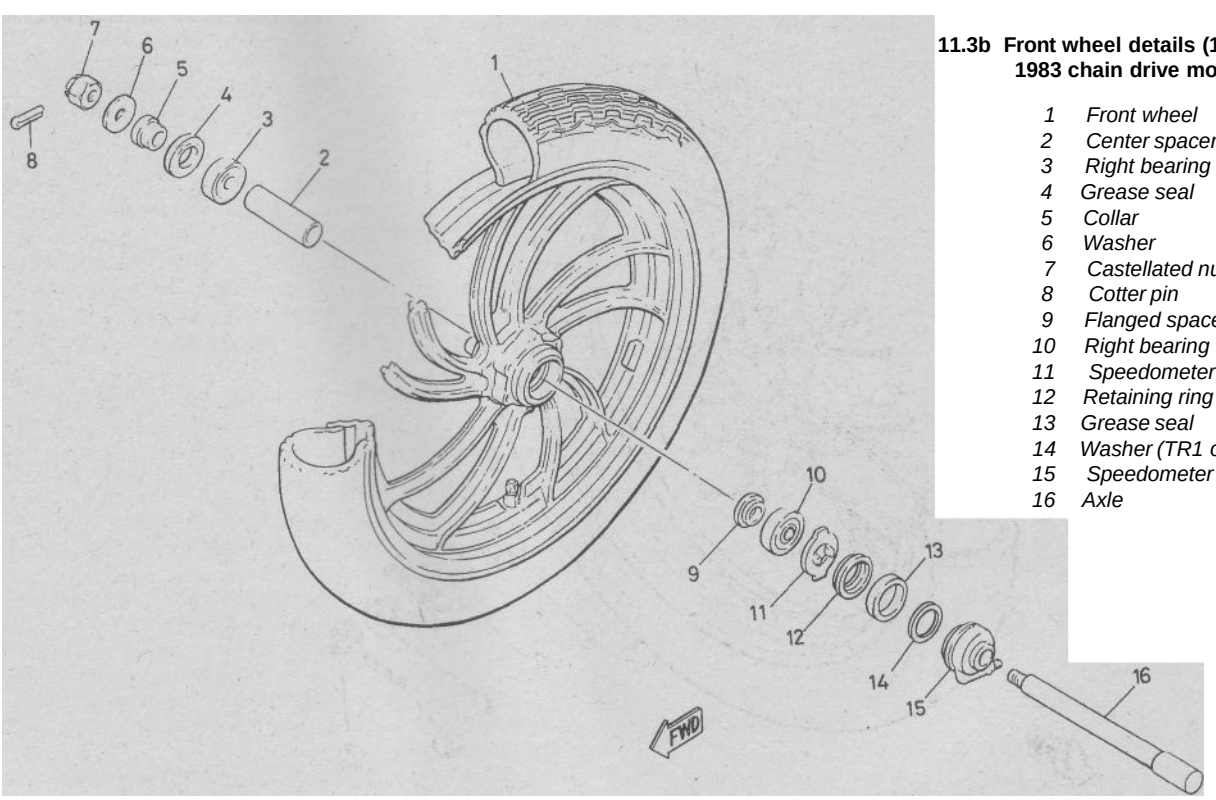
5 Position the new hose, making sure it isn't twisted or otherwise strained, between the two components. Make sure the neck of the hose union fits between the two cast lugs on the caliper body or on the clockwise side of the cast lug in the hose joint **(see illustration 7.2).** Install the union bolts, using new sealing washers on both sides of the fittings, and tighten them to the torque listed in this Chapter's Specifications.

6 Flush the old brake fluid from the system, refill the system with the recommended fluid (see Chapter 1) and bleed the air from the system (see Section 8). Check the operation of the front brake carefully before riding the motorcycle.



11.3a Front wheel (1981 through 1983 shaft drive models)

1 *Front wheel*
2 *Axle*
3 *Collar*
4 *Grease seal*
5 *Right bearing*
6 *Spacer*
7 *Hub trim (except XV920J)*
8 *Flanged spacer*
9 *Left bearing*
10 *Speedometer clutch*
11 *Retaining ring*
12 *Grease seal*
13 *Speedometer drive unit*
14 *Washer*
15 *Castellated nut*
16 *Cotter pin*



11.3b Front wheel details (1981 through 1983 chain drive models)

1 *Front wheel*
2 *Center spacer*
3 *Right bearing*
4 *Grease seal*
5 *Collar*
6 *Washer*
7 *Castellated nut*
8 *Cotter pin*
9 *Flanged spacer*
10 *Right bearing*
11 *Speedometer clutch*
12 *Retaining ring*
13 *Grease seal*
14 *Washer (TR1 only)*
15 *Speedometer drive unit*
16 *Axle*

8 Brake system bleeding

This is the same as for XV535 models. Refer to Part A of this Chapter.

9 Wheels - inspection and repair

1 For models equipped with wire spoke wheels, this is the same as for XV535 models. Refer to Part A of this Chapter.

2 Wheel runout for alloy wheels is measured in the same way as for wire spoke wheels (refer to Part A of this Chapter). Alloy wheels with excessive runout must be replaced with new ones.

2 Since models equipped with alloy wheels usetubeless tires, look very closely for dents in the area where the tire bead contacts the rim. Dents in this area may prevent complete sealing of the tire against the rim, which leads to deflation of the tire over a period of time. If damage is evident, the wheel will have to be replaced with a new one.

10 Wheels - alignment check

This is the same as for XV535 models. Refer to Part A of this Chapter.

11 Front wheel - removal and installation

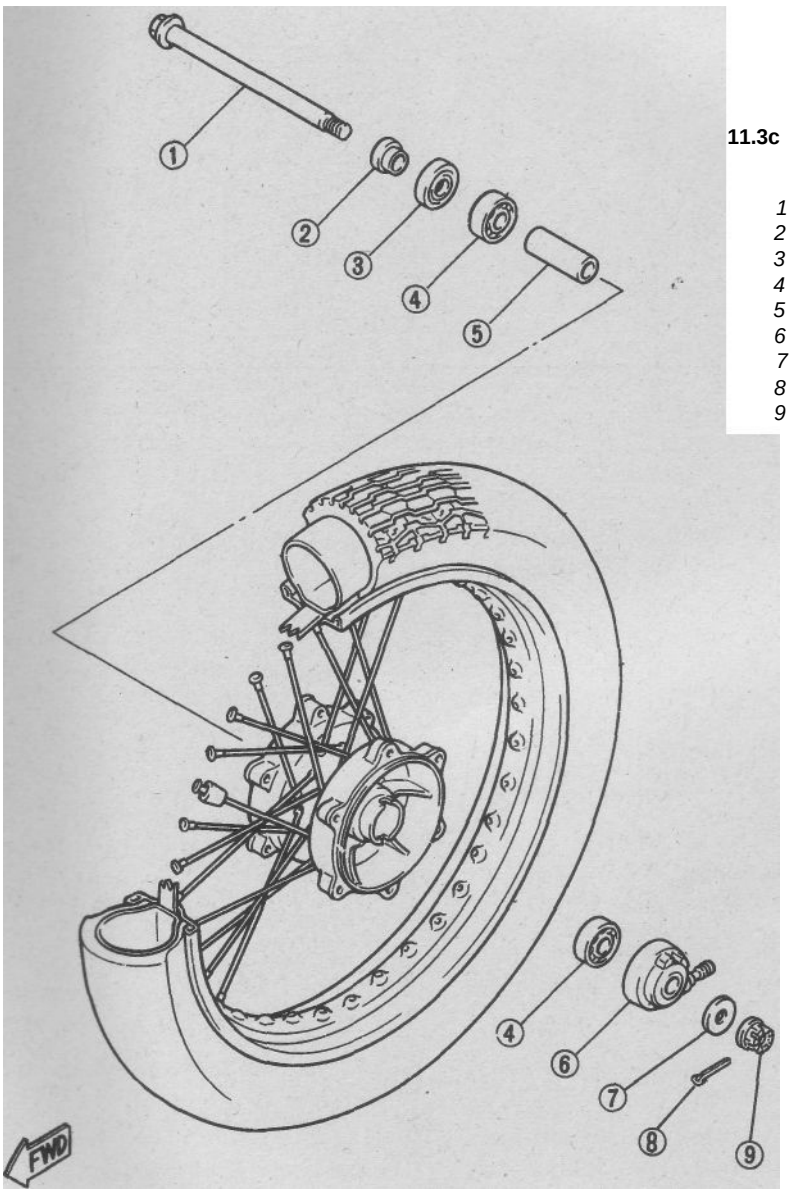
Removal

Refer to illustrations 11.3a, 11.3b, 11.3c, 11.4a, 11.4b, 11.5a and 11.5b

1 Support the bike securely so it can't be knocked over during this procedure. Raise the front wheel off the ground by placing a floor jack, with a wood block on the jack head, under the engine.

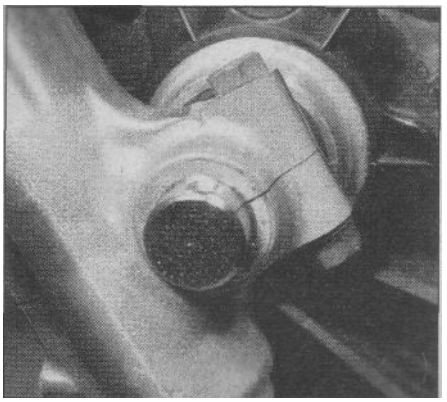
2 Disconnect the speedometer cable from the drive unit (see Chapter 8).

3 The axle on early models is secured by a nut. Remove the cotter pin and unscrew the nut **(see illustrations).** The axle on later models

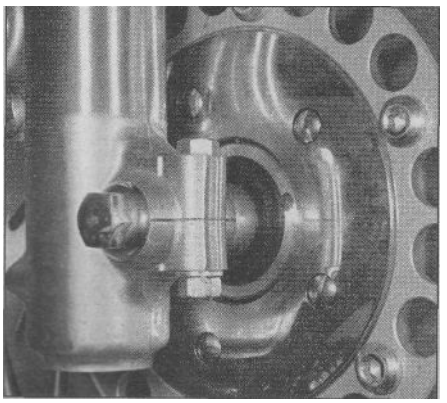


11.3c Front wheel details (1984 and later models) - wire wheel shown

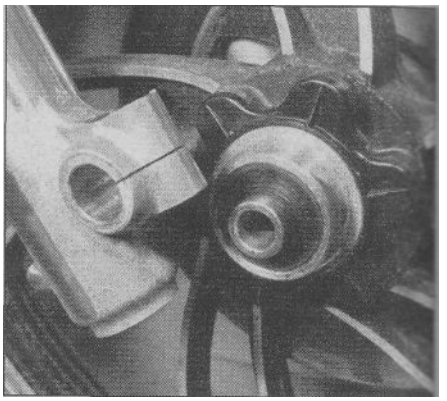
1 Axle
2 Collar
3 Grease seal
4 Wheel bearing
5 Spacer
6 Speedometer drive unit
7 Washer (early models)
8 Cotter pin (early models)
9 Castellated nut (early models)



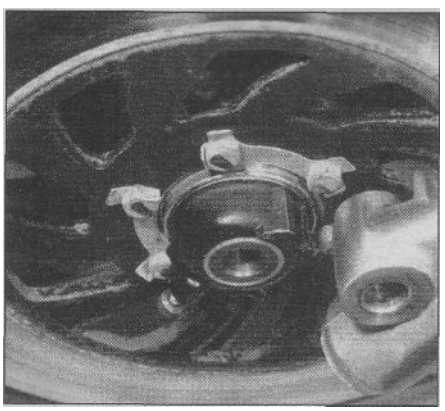
11.4a Remove the nut and pinch bolt; if the axle has a round head like this one, insert a bar through the removal hole and **pull it out...**



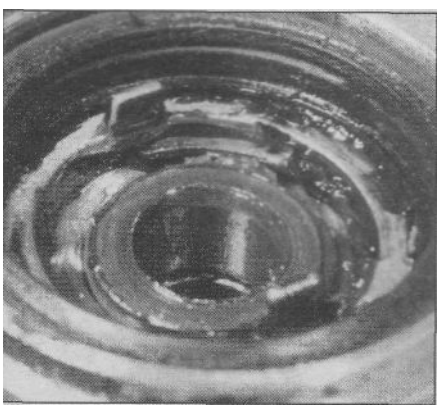
11.4b ... if the axle has a hex head like this one, unscrew it



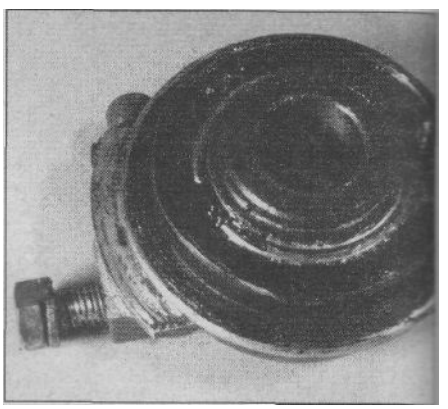
11.5a Remove the collar.



11.5b ... and the speedometer drive unit



11.8a Make sure the dogs on the speedometer clutch ...



11.8b ... engage the slots in the drive unit

threads directly into the left fork leg.

4 Support the wheel. Loosen the axle pinch bolt. If the axle has a round head **(see** illustration), slip a bar through the removal hole and twist and pull the axle to remove it. If the axle has a hex head, unscrew the axle **(see** illustration).

5 Carefully lower the wheel away from the forks. Remove the collar from the right side and the speedometer drive unit from the left side **(see illustrations).** Set the wheel aside. **Caution:** *Don't lay the wheel down and allow it to rest on the brake disc - the disc could become warped. Set the wheel on wood blocks so the disc doesn't support the weight of the wheel.* **Note:** *Don't operate the front brake lever with the wheel removed.*

Inspection

6 Roll the axle on a flat surface such as a piece of plate glass. If it's bent at all, replace it. If the axle is corroded, remove the corrosion with fine emery cloth.

7 Check the condition of the wheel bearings (see Section 13).

Installation

Refer to illustrations 11.8a and 11.8b

8 Installation is the reverse of removal. Apply a thin coat of grease to the seal lip, then slide the axle into the hub. Slide the wheel into place. Make sure the lugs in the speedometer drive clutch line up with the notches in the speedometer drive unit **(see illustrations).** Make sure the protrusion on the inner side of the left fork fits into the notch in the speedometer drive unit **(see illustration 11.5b).**

9 Slip the axle into place, then tighten the axle or axle nut to the torque listed in this Chapter's Specifications. If the axle is secured by a nut, install a new cotter pin. Tighten the axle pinch bolt to the torque listed in this Chapter's Specifications.

10 Apply the front brake, pump the forks up and down several times and check for binding and proper brake operation.

12 Rear wheel - removal and installation

Refer to illustrations 12.2a, 12.2b, 12.3, 12.4, 12.5, 12.6 and 12.10

Removal

1 Support the bike securely so it can't be knocked over during *t'* procedure.

2 Detach the torque link from the brake panel and the brake **rodl** from the brake lever **(see illustration 6.5b or 6.5c and the accompanying illustrations).**

3 Remove the cotter pin from the axle nut, then remove the nut **arxjl** washer **(see illustration).**

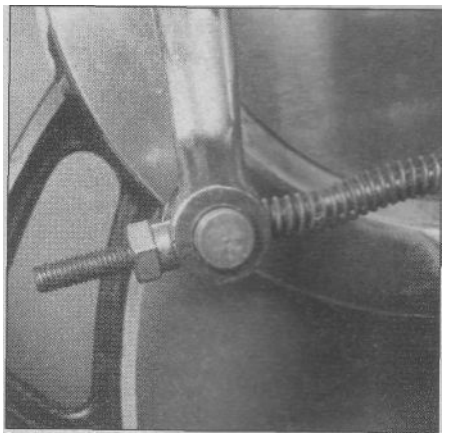
4 Loosen the axle pinch bolt **(see illustration).**

5 Support the wheel, slide the axle out and remove the washer **(see illustration).**

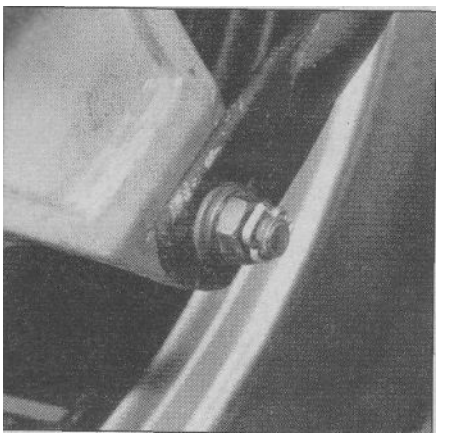
6 On chain drive models, remove the spacer that fits between the j brake panel and the swingarm **(see illustration).**

7 Pull the wheel to the right and remove it from the final **drivel** assembly.

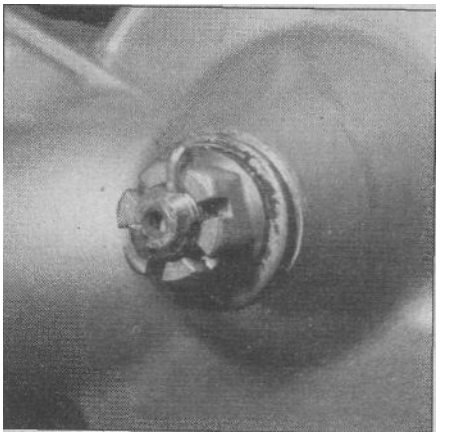
8 Before installing the wheel, check the axle for straightness **by]** rolling it on a flat surface such as a piece of plate glass (if the axle ts corroded, first remove the corrosion with fine emery cloth). If the axle is bent at all, replace it.



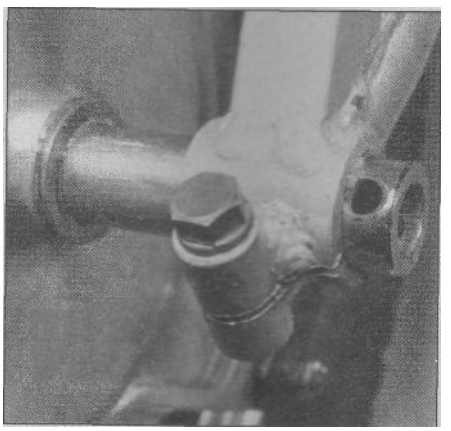
12.2a Unscrew the nut and **disconnect the brake rod**



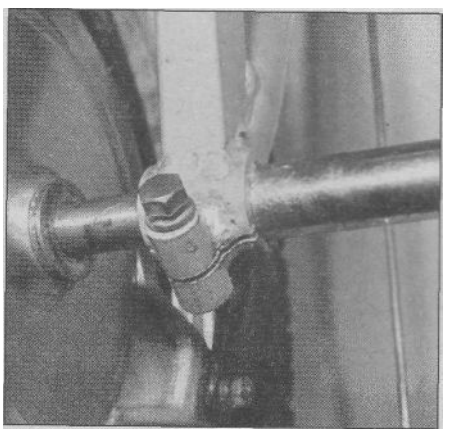
12.2b Remove the cotter pin, washer and nut and disconnect the brake rod



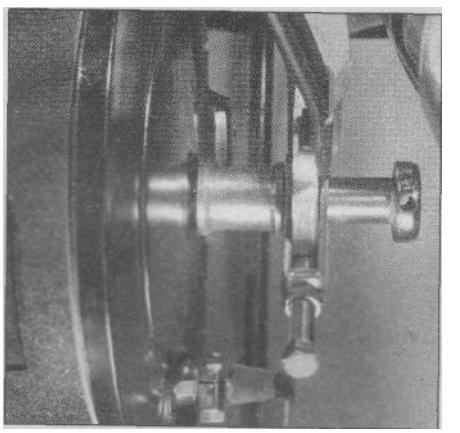
12.3 Remove the cotter pin and nut



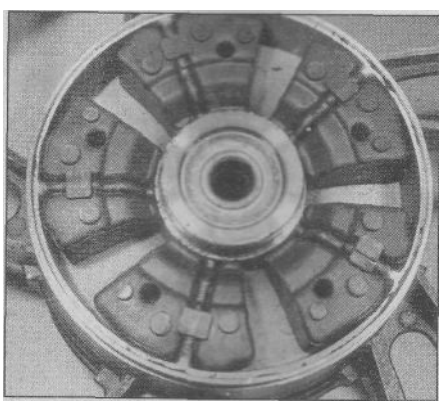
12.4 Loosen the axle pinch **bolt (if** equipped)



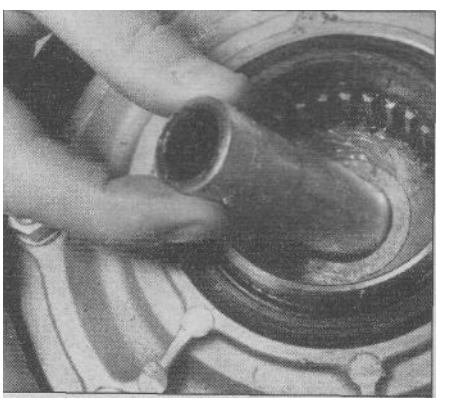
12.5 Pull out the axle



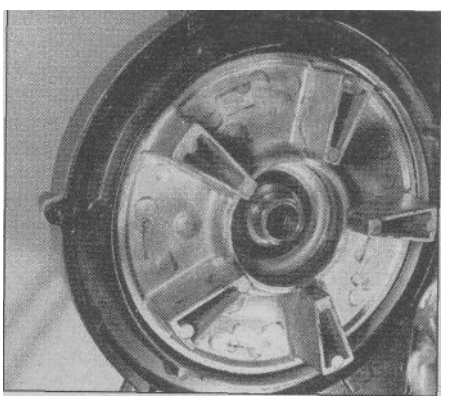
12.6 On chain drive models, remove the spacer that fits between the brake panel and the swingarm



12.10 On chain drive models, replace the coupling dampers with new ones if they're deteriorated, worn or brittle



12.11a On shaft drive models, be sure the long spacer is in position before installing the wheel



12.11b On chain drive models, align the vanes in the rear wheel coupling with the gaps between the coupling dampers

9 Check the condition of the wheel bearings (see Section 13).

10 If you're working on a chain drive model, inspect the rubber coupling dampers **(see illustration).** If they're deteriorated, brittle or worn, pull them out of the wheel and install new ones.

Installation

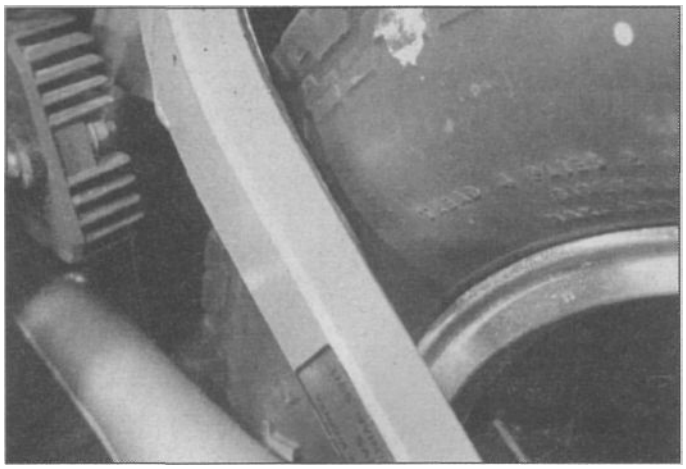
Refer to illustrations 12.11a, 12.11b and 12.11c

11 Installation is the reverse of the removal steps, with the following additions:

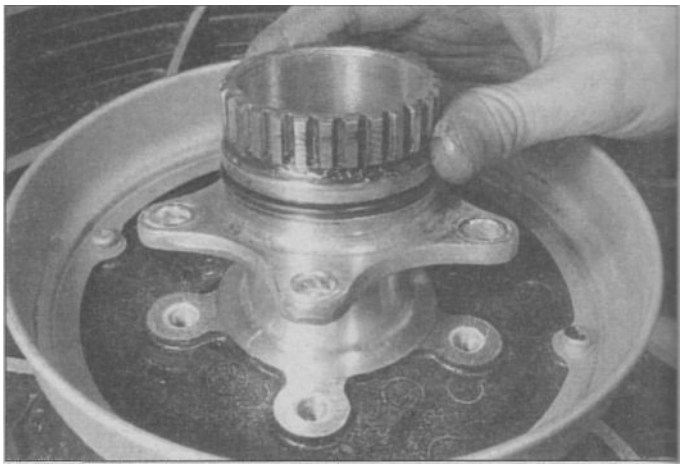
a) Apply a light coat of multi-purpose lithium-based grease to the lips of the oil seals and to the splines on the final drive and wheel hub.

b) If you're working on a shaft drive model, be sure the long spacer is in place before installing the wheel **(see illustration).**

c) If you're working on a chain drive model, align the vanes on the coupling with the gaps between the rubber coupling dampers **(see illustration).**



12.11c Make sure the tire clears the swingarm



13.4 If necessary, unbolt the clutch hub and remove it

d) Tighten the axle nut to the torque listed in this Chapter's Specifications. Install a new cotter pin, tightening the axle nut an additional amount, if necessary, to align the hole in the axle with the castellations on the nut.

e) Tighten the axle pinch bolt to the torque listed in this Chapter's Specifications.

f) Make sure the tire clears the swingarm **(see illustration).**

11 Adjust the rear brake (see Chapter 1) and check its operation carefully before riding the motorcycle.

13 Wheel bearings - inspection and maintenance

1 Support the bike securely so it can't be knocked over during this procedure and remove the wheel. See Section 11 (front wheel) or 12 (rear wheel).

2 Set the wheel on blocks so as not to allow the weight of the wheel to rest on the brake disc or hub.

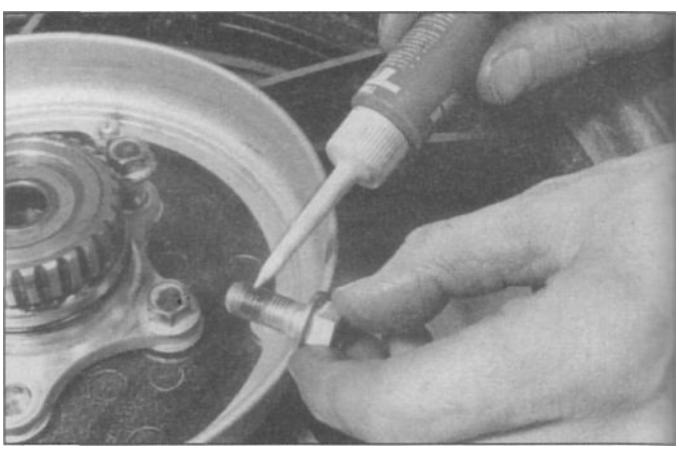
Frontwheelbearings

3 Removal, inspection and installation of the front wheel bearings is the same as for XV535 models (see Part A of this Chapter). Refer to **illustration 11.3a, 11.3b or 11.3c** and the Part B Specifications.

Rearwheelbearings

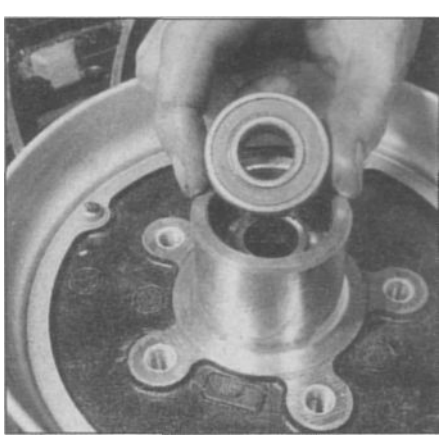
Refer to illustrations 13.4 and 13.5a through 13.5e

4 If necessary for inspection, the dust seal and clutch hub can be detached from the wheel **(see illustration 12.3 and the accompanying illustration).** The rear wheel bearings can be removed and installed these parts in place.

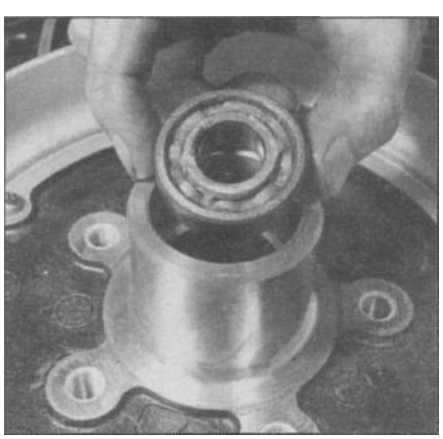


13.5a Use non-permanent thread locking agent on the threads of the clutch hub bolts

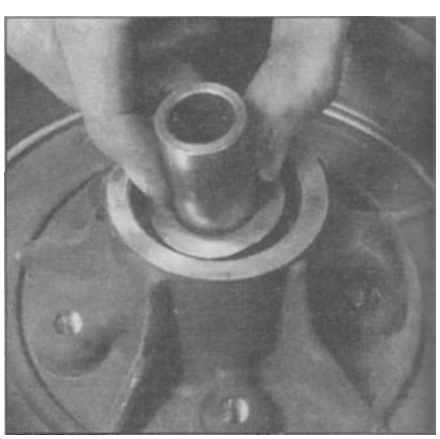
5 Rear wheel bearing removal, inspection and installation **an** generally the same as for front wheel bearings (see part A of tr - Chapter and the accompanying illustrations). On installation, be sure I install the spacer and its collar between the bearings. Apply no-permanent thread locking agent to the threads of the clutch hub bolts **(see illustration)** and tighten them securely.



13.5b Drive the two bearings out of the let side of the hub with a long bar . . .



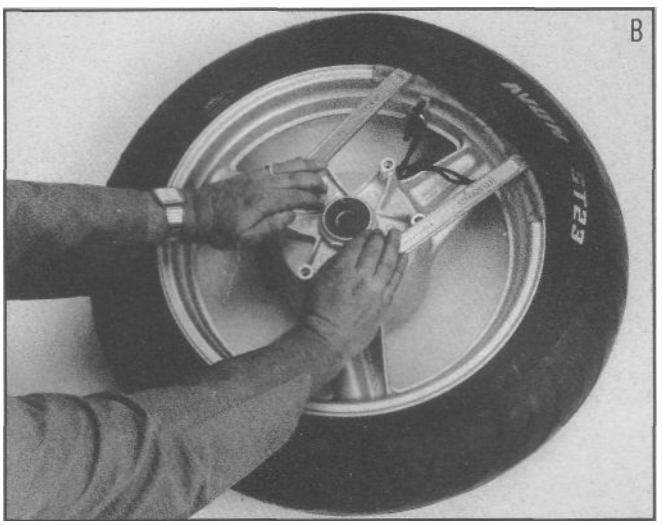
13.5c . . . and use the same tool to remove the single bearing from the right side



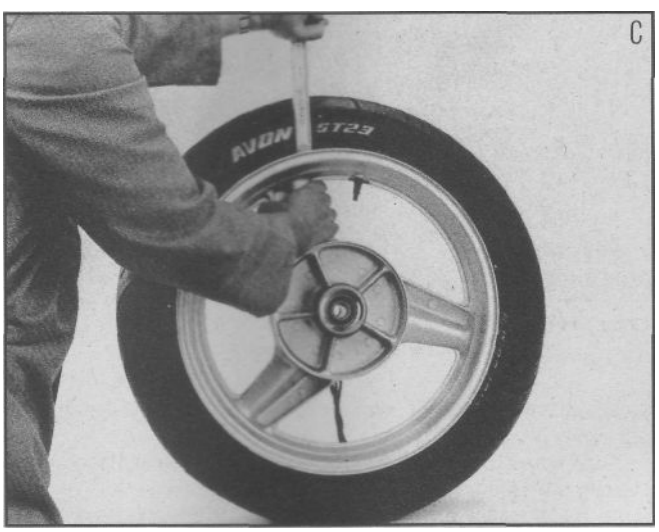
13.5d Remove the spacer and collar from the hub

TIRE CHANGING SEQUENCE - TUBELESS TIRES

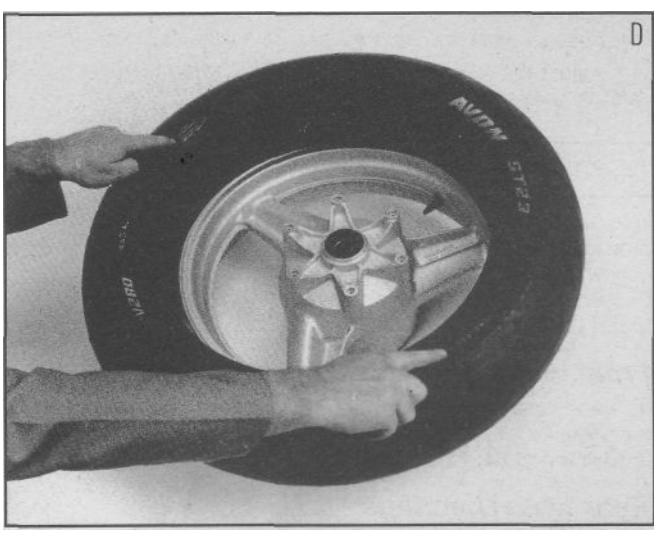
Deflate tire. After releasing beads, push tire bead into well of rim at point opposite valve. Insert lever next to valve and work bead over edge of rim.



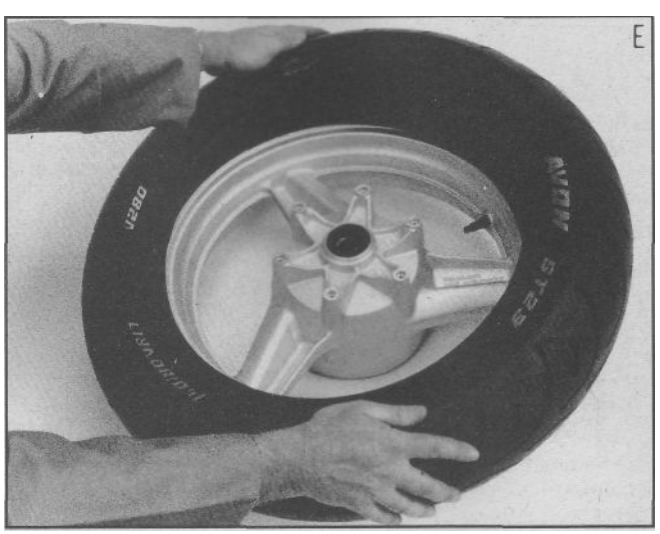
Use two levers to work bead over edge of rim. Note use of rim protectors.



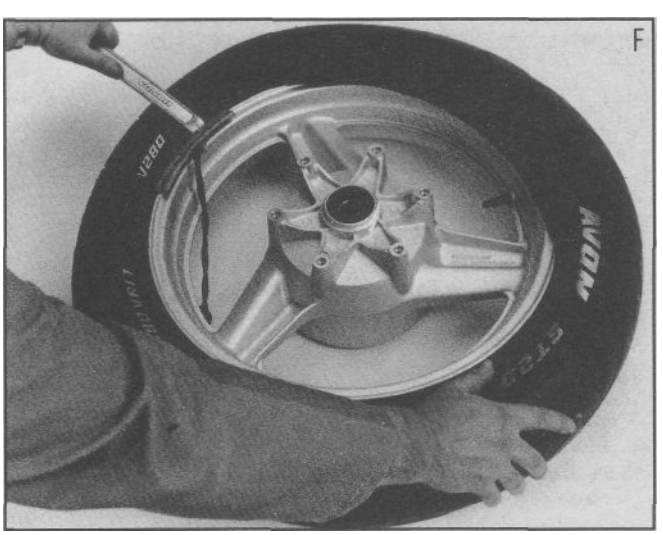
When first bead is clear, remove tire as shown.



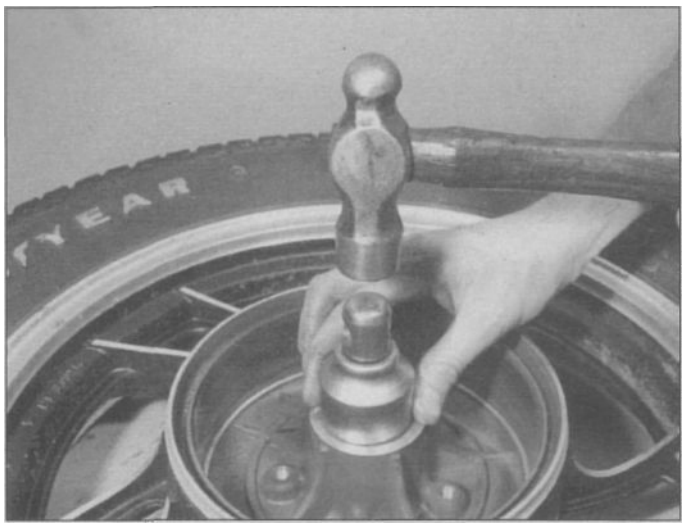
Before installing, ensure that tire is suitable for wheel. Take note of any sidewall markings such as direction of rotation arrows.



Work first bead over the rim flange.



Use a tire lever to work the second bead over rim flange.



13.5e Drive in new bearings with a bearing driver or a socket the same diameter as the bearing outer race

14 Tires - general information

Tubed tires

1 Tires with tubes are used on models equipped with wire spoke wheels. Information and tire changing procedures for tubed tires *are* provided in Part A of this Chapter.

Tubeless tires

2 Tubeless tires are used as standard equipment on models with cast wheels. They are generally safer than tube-type tires but if problems do occur they require special repair techniques.

3 The force required to break the seal between the rim and the bead of the tire is substantial, and is usually beyond the capabilities of an individual working with normal tire irons.

4 Also, repair of the punctured tire and replacement on the wheel rim requires special tools, skills and experience that the average do-it-yourselfer lacks.

5 For these reasons, if a puncture or flat occurs with a tubeless tire, the wheel should be removed from the motorcycle and taken to a dealer service department or a motorcycle repair shop for repair or replacement of the tire. The accompanying illustrations can be used to replace a tubeless tire in an emergency.

Chapter 7 Part A
Frame and bodywork (XV535 models)

Contents

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Footpegs and pads - removal and installation	3
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Front fender/mudguard - removal and installation	11
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Sidestand - removal and installation	6
Top cover - removal and installation	8

1 General information

The XV535 models use a steel frame composed of round-section tubing and a pressed steel backbone which incorporates the air cleaner housing.

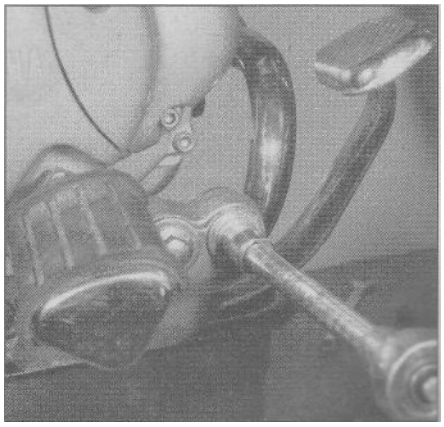
Fenders and covers are steel, either painted or chrome plated.

2 Frame - inspection and repair

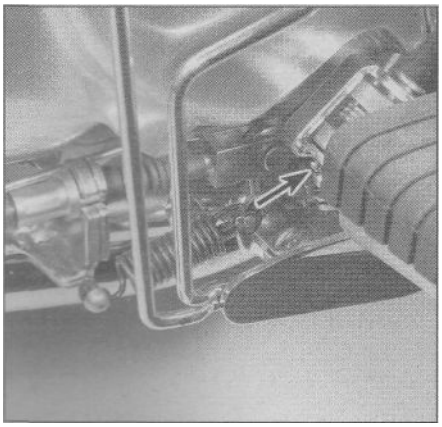
1 The frame should not require attention unless accident damage has occurred. In most cases, frame replacement is the only satisfactory remedy for such damage. A few frame specialists have the jigs and other equipment necessary for straightening the frame to the required standard of accuracy, but even then there is no simple way of assessing to what extent the frame may have been overstressed.

2 After the machine has accumulated a lot of miles, the frame should be examined closely for signs of cracking or splitting at the welded joints. Corrosion can also cause weakness at these joints. Loose engine mount bolts can cause ovaling or fracturing of the mounting tabs. Minor damage can often be repaired by welding, depending on the extent and nature of the damage.

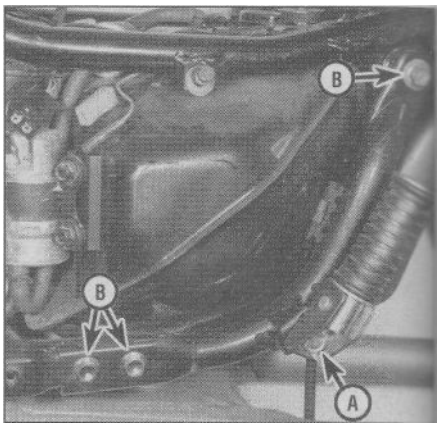
3 Remember that a frame which is out of alignment will cause handling problems. If misalignment is suspected as the result of an accident, it will be necessary to strip the machine completely so the frame can be thoroughly checked.



3.5 Remove the footpeg mounting bolts (early models)

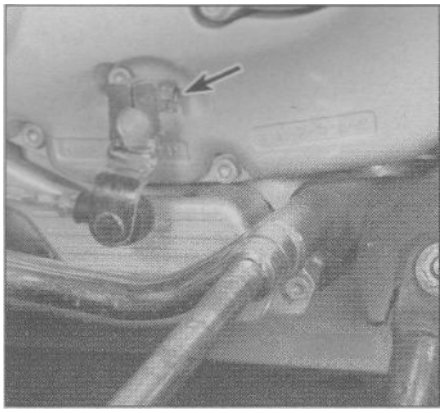


3.6 Remove the clip, washer and clevis pin (arrow)

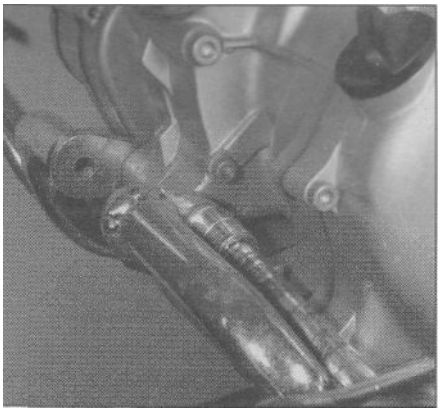


3.7 The rear footpegs are bolted to the brackets; the brackets are bolted to the frame

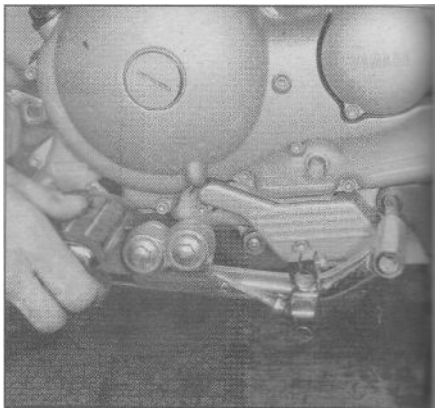
A Footpeg mounting bolt
B Bracket bolts



3.8a Make sure there are match marks on the shift shaft and lever, then loosen the pinch bolt (arrow); remove the rear mounting nut...



3.8b ... and front mounting bolt...



3.8c ... and detach the bracket from the motorcycle

3 Footpegs and pads - removal and installation

Refer to illustrations 3.5, 3.6, 3.7, 3.8a, 3.8b, 3.8c, 3.8d, 3.9a, 3.9b and 3.9c

1 The front footpegs are mounted on a bracket that also serves to protect the engine. The rear footpegs are mounted on brackets bolted to the frame.

2 To remove a front or reaffootpeg pad on early models, work the rubber pad off the end of the footpeg. The pad is a tight fit, so this may be difficult. Cutting off the old pad, then heating the new pad in hot yvater and lubricating it with soap, will make the job easier.

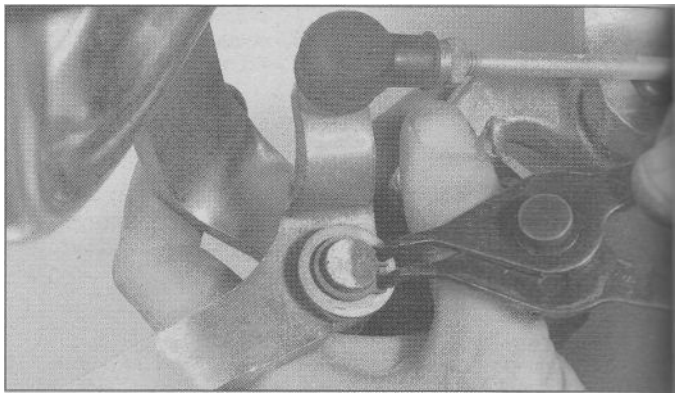
3 To replace a front footpeg pad on later models, remove the pad securing nuts from the underside of the footpeg and lift the pad off. Install the new pad and tighten the nuts securely.

4 To replace a rear footpeg pad on later models, remove the pad securing screws and lift it off. Install the new pad and tighten the screws securely.

5 To remove a front footpeg assembly (footpeg and pivot bracket), remove the bolts that secure the pivot bracket to the main bracket **(see illustration).**

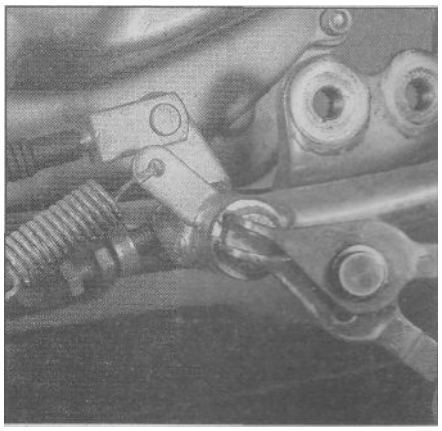
6 To remove a front footpeg, remove the cotter pin, collar and clevis pin and separate the footpeg from the pivot bracket **(see illustration).**

7 To remove a left rear footpeg assembly, unbolt the pivot bracket from the main bracket **(see illustration).** To remove a right rear footpeg assembly, support the exhaust system and unbolt the footpeg from the frame (the same bolt also secures an exhaust bracket).

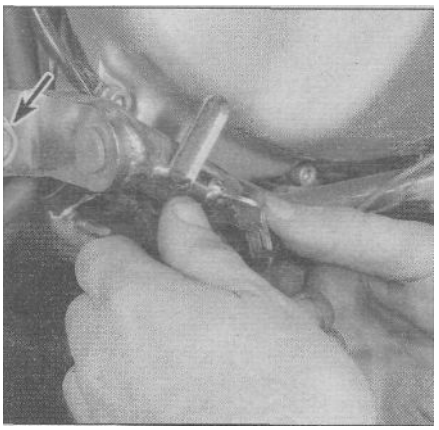


3.8d Remove the snap-ring to separate the shift pedal from the bracket

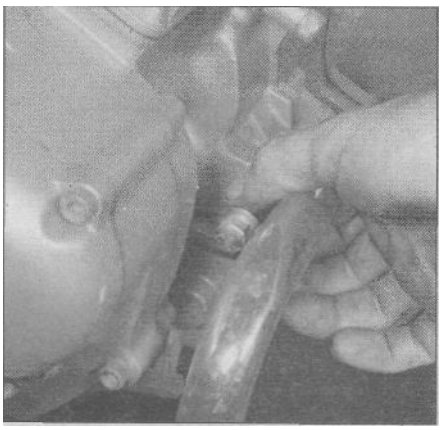
8 To remove the left front footpeg bracket, check for match *marks* on the shift shaft and lever. Make your own marks if there aren't any. so the shift lever can be reinstalled in the correct orientation to the shaft. Loosen the shift lever pinch bolt **(see illustration)** and remove the bracket mounting bolt and nut **(see illustrations).** Take the bracket off, turn it over and remove the snap-ring to separate the shift pedal from the bracket **(see illustrations).**



3.9a Detach the pedal return **spring, disconnect the brake** cable and **remove the snap-ring to detach** the brake **pedal from the** bracket

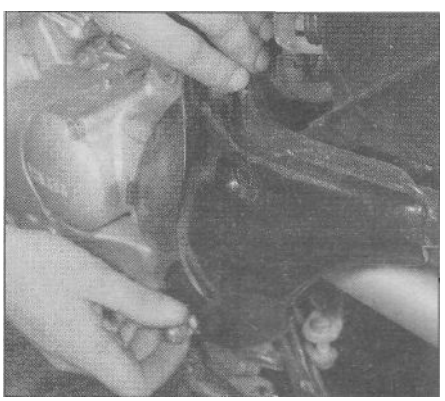


3.9b Follow the wiring harness from the brake light switch and disconnect the connector; remove the mounting nut (arrow)...

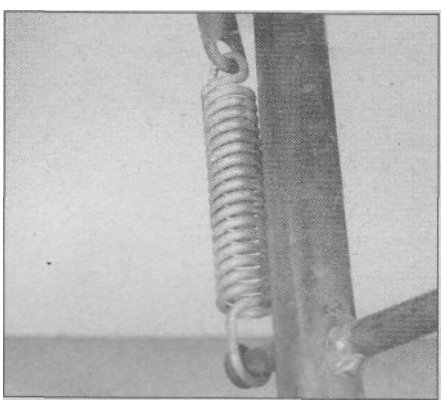


3.9c ... and the mounting bolt at the front

4.2a Remove the nut **at** the **bottom ...**



4.2b ... and the bolt at the top to detach the lower left frame cover from the frame



5.1 Make sure the sidestand spring is in good condition and correctly installed

9 To remove the right front footpeg bracket, disconnect the electrical connector for the brake light switch (see Chapter 8). Detach the brake cable from the slots on the assembly (see Chapter 6). If you're going to remove the brake pedal, disconnect its return spring and remove the pedal snap-ring **(see illustration).** Remove the nut at the rear of the bracket and the bolt at the front and take the assembly off **(see illustrations).**

10 Installation is the reverse of removal. Lubricate the footpeg pivots (early models) (see Chapter 1).

4 Lower left frame cover - removal and installation

Refer to illustrations 4.2a and 4.2b

1 The lower left frame cover is secured by a nut at the bottom and a bolt at the top.

2 To remove the cover, remove the nut and the bolt and lift it off **(see illustrations).**

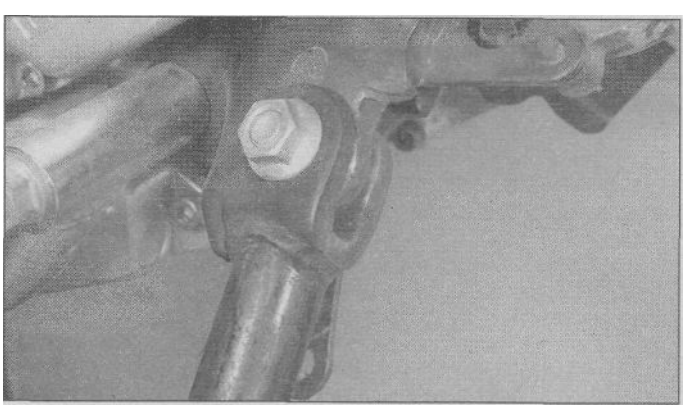
3 Installation is the reverse of the removal steps.

5 Sidestand -maintenance

Refer to illustration 5.1

1 The sidestand is attached to a bracket on the frame. An extension spring(s) anchored to the bracket ensures that the stand is held in the extended or retracted position **(see illustration).**

2 Make sure the pivot bolt is tight and the extension spring is in good condition and not overstretched. An accident is almost certain to occur if the stand extends while the machine is in motion.



6.2 Remove the sidestand pivot nut and slide it off the post

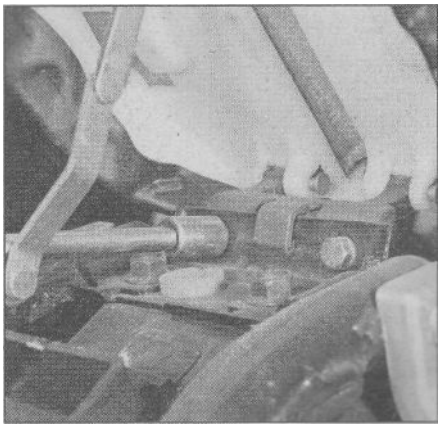
6 Sidestand - removal and installation

Refer to illustration 6.2

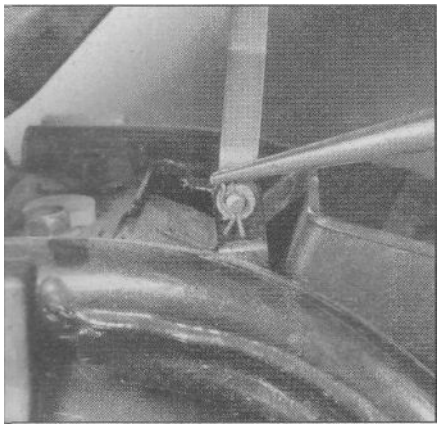
1 Support the bike securely so it can't be knocked over during this procedure.

2 Unhook the sidestand spring **(see illustration 5.1).** Remove the pivot nut and take the sidestand off the pivot shaft **(see illustration).**

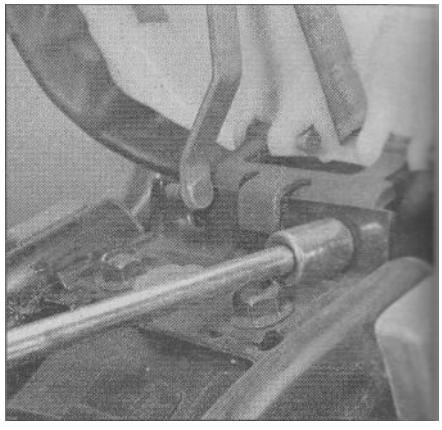
3 Installation is the reverse of the removal steps.



7.1 Remove one of the mounting bolts . . .

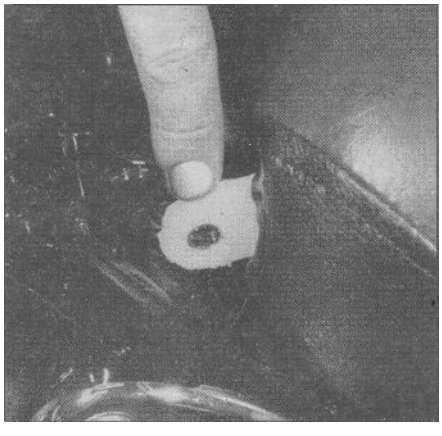


7.2a . . . pull out the clip, remove the washer and separate the support from its bracket...

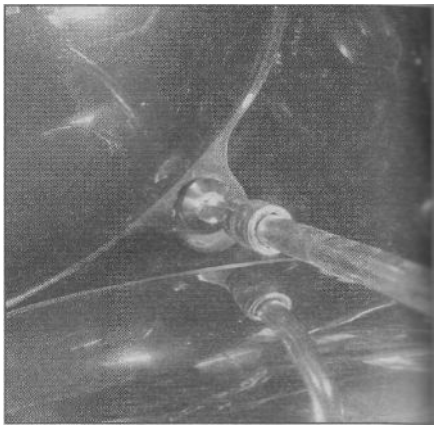


7.2b . . . then remove the other mounting bolt to detach the seat

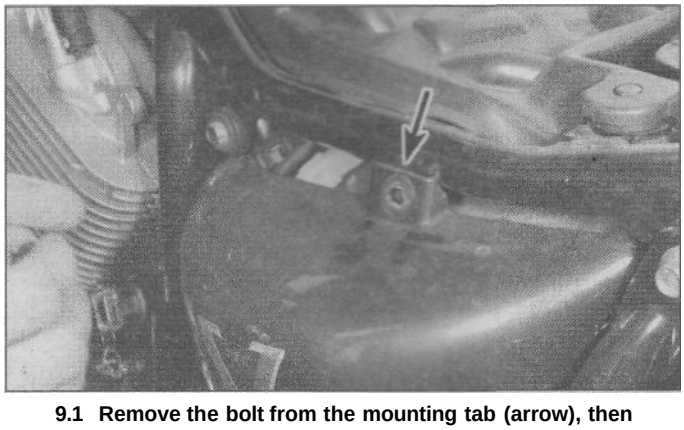
7.4 Lift the passenger seat off...



7.5 . . . and remove the mounting bolts to detach the rider's seat



8.2 Remove the front mounting bolt on **each side and detach the rear of the top cover from the bike**



9.1 Remove the bolt from the mounting tab (arrow), then disengage the cover tabs from the slot and grommet

7 Seat - removal and installation

Singleseat

Refer to illustrations 7.1, 7.2a and 7.2b

1 Unlock and lift the seat and remove one of the mounting bolts **(see illustration).**

2 Remove the clip, washer and clevis pin, then remove the remaining mounting bolt **(see** illustrations).

3 Installation is the reverse of the removal steps.

Dualseat

Refer to illustrations 7.4 and 7.5

4 Unlock the passenger seat and lift it off the motorcycle **(see illustration).**

5 Unbolt the rider's seat (there's one bolt on each side at the rear) **(see illustration).** Disengage it from the hole in the frame and lift it off

6 Installation is the reverse of the removal steps. Engage the tab front of the rider's seat with the hole in the frame.

8 Top cover - removal and installation

Refer to illustration 8.2

1 A top cover is used on models that don't have an upper fuel t a n k .

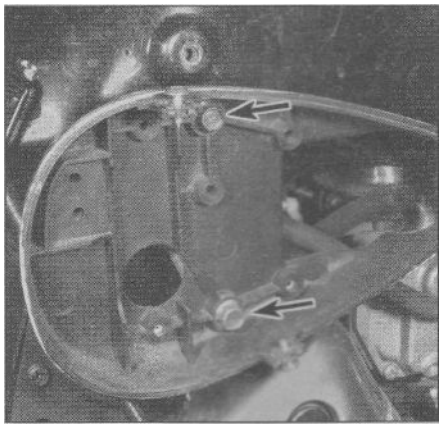
2 To remove the cover, lift the seat. Undo one mounting bolt on each side at the front **(see illustration).** Slide the cover backwards to unhook it from the frame and lift it off.

3 Installation is the reverse of the removal steps. Be sure the mounting collars and grommets are in place on the front mountings and that the rear mounting peg engages the grommet.

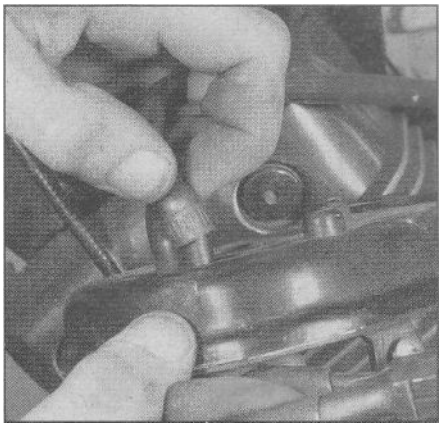
9 Side covers - removal and installation

Refer to illustrations 9.1, 9.2a, 9.2b, 9.3a and 9.3b

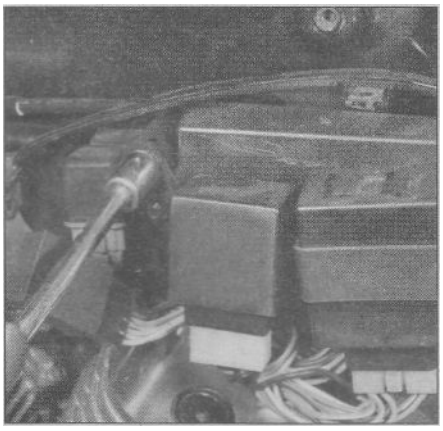
1 To remove a rear side cover, lift or remove the seat and undo the mounting bolt at the top **(see illustration).** Disengage the tab at the



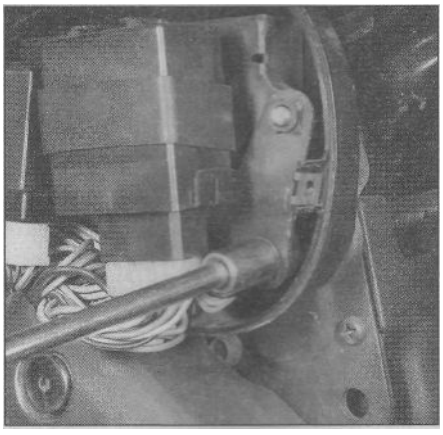
9.2a Remove the mounting bolts (arrows). . .



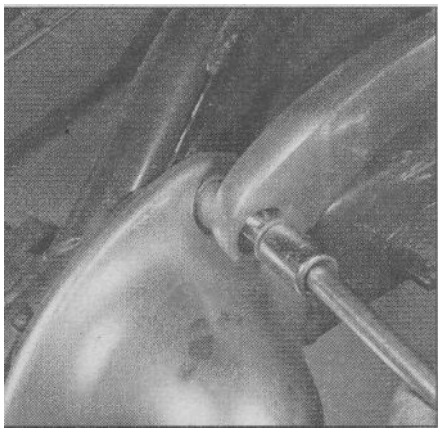
9.2b . . . and pull the hoses (if equipped) off the fittings on the back side of the bracket



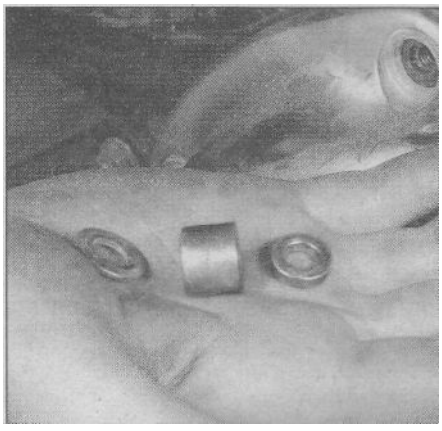
9.3a Remove the mounting bolt at the upper rear . . .



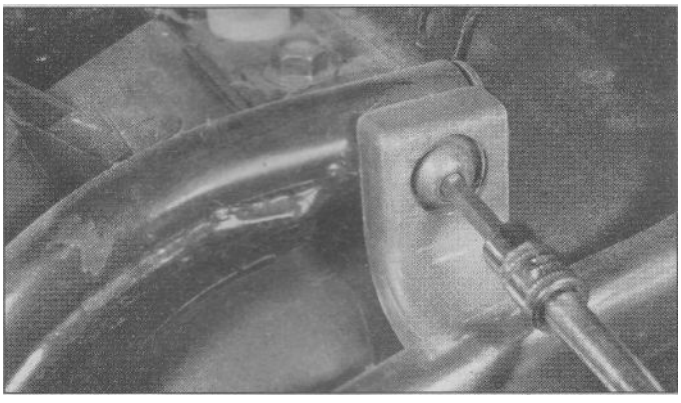
9.3b . . . and at the lower front



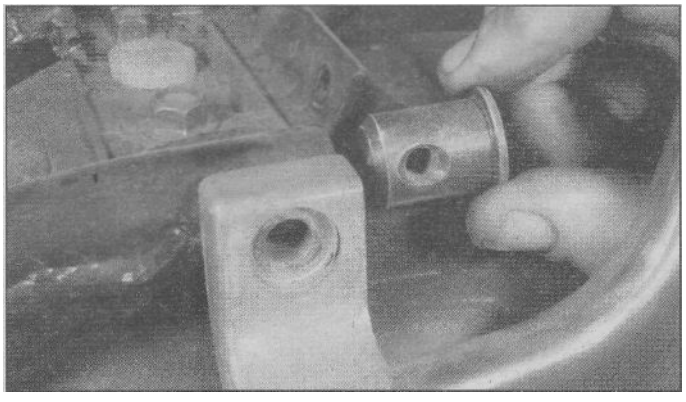
10.1a Remove the backrest mounting bolts on each side . . .



10.1b . . . don't lose the washer and spacers



10.2a Remove the mounting bolt at the rear on each side . . .



10.2b . . . these thread into special nuts that fit inside the frame tubes

rear from the slot and the tab at the front from the grommet.

2 To remove either of the front side covers, remove the screws around the edge of the cover and lift it off. To remove the left mounting bracket, undo its bolts **(see illustration).** Disconnect the carburetor hoses from the back side of the bracket (if equipped). Take the bracket off, complete with the air induction system components (if equipped) **(see illustration).**

3 To remove the right bracket, disconnect the electrical connectors from the components mounted on it. Undo the mounting bolts and take the bracket off **(see illustrations).**

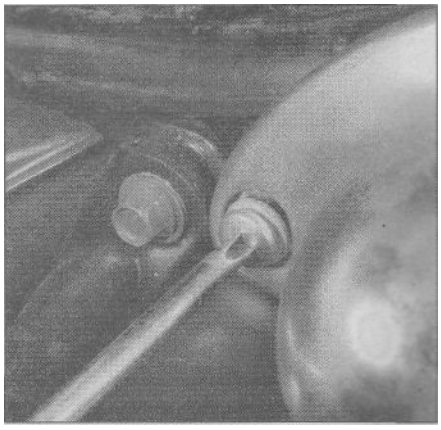
4 Installation is the reverse of the removal steps.

10 Backrest and shock absorber cover - removal and installation

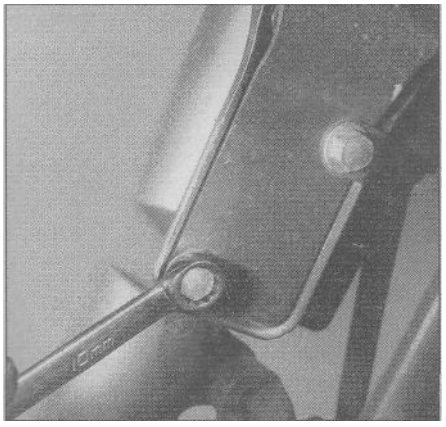
Refer to illustrations 10.1a, 10.1b, 10.2a, 10.2b and 10.3

1 If you're working on a model with a backrest, lift the seat and remove the forward mounting screw on each side, then remove the washer and spacers **(see illustrations).**

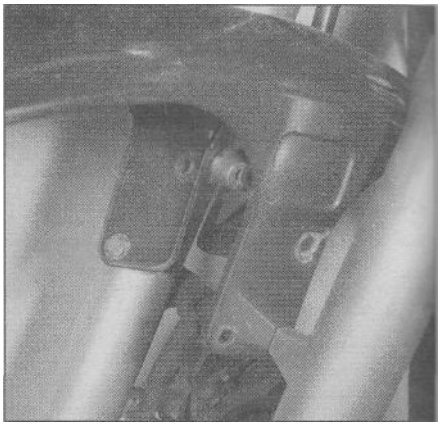
2 Remove the Allen bolt and special nut at the rear of the backrest on each side and detach it from the motorcycle **(see illustrations).**



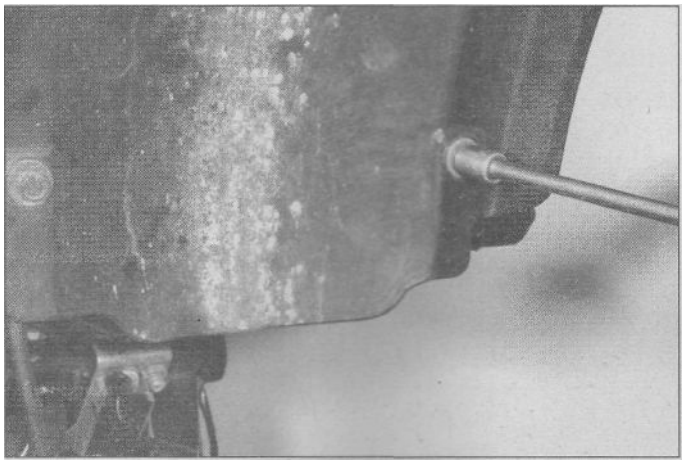
10.3 Remove the screw and washer to **detach the shock absorber cover**



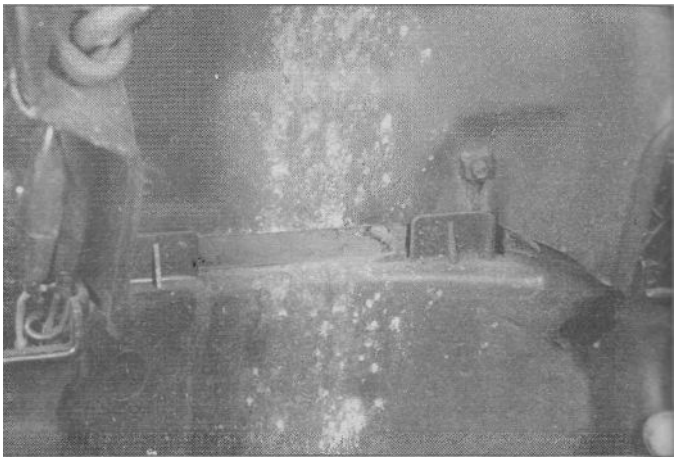
11.2a The fender mounting bolts are accessible from inside the fender



11.2b Lift the fender off toward the front **of the motorcycle**



12.3a Unbolt the inner rear fender **panel at the bottom . . .**



12.3b . . . and disengage the tabs at the top

3 The shock absorber covers are retained by two screws and washers on each side. On models with a backrest, the rear screw forms the backrest front mounting (see illustration).

4 Installation is the reverse of the removal steps.

11 Front fender/mudguard - removal and installation

Refer to illustrations 11.2a and 11.2b

1 If the upper fender/mudguard bolts will come all the way out without striking the wheel rim, it won't be necessary to remove the front wheel. If they won't, remove the front wheel (see Chapter 6).

2 Unbolt the fender/mudguard from the forks and take it off **(see illustrations).** Note that one left fender/mudguard bolt secures the speedometer cable retainer and one right fender/mudguard bolt secures the brake hose retainer.

3 Installation is the reverse of the removal steps. Tighten the bolts securely.

12 Rear fender/mudguard - removal and installation

Refer to illustrations 12.3a and 12.3b

1 Lift the seat (single seat models) or remove it (dual seat models) (see Section 7).

2 Remove the screw at the bottom of the toolbox and disengage the rear end of the toolbox from the tab on top of the fender.

3 Unbolt the inner rear fender/mudguard panel from the frame **(see illustration).** Disengage the tabs at the top of the panel from the rear fender and take the panel out **(see illustration).**

4 Follow the wiring harnesses for the brake/taillights and rear turn signals forward to their connectors. These are all single cpnnectors, so labeling them will speed re-connection.

5 Remove the fender/mudguard mounting bolts and take it off the motorcycle.

6 Installation is the reverse of the removal steps.

Chapter 7 Part B
Frame and bodywork (XV700-1100 models)

Contents

	Section
Footpegs and pads - removal and installation	3
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Front fender/mudguard - removal and installation	8
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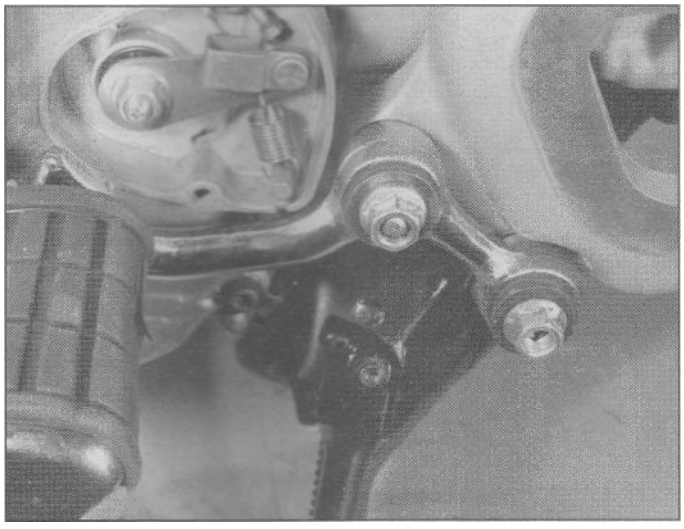
Rear fender/mudguard - removal and installation	9
Seat - removal and installation	4
Side covers - removal and installation	7
Sidestand and centerstand - maintenance	5
Sidestand and centerstand - removal and installation	6



3.2a On early shaft **drive models, the front footpeg brackets** are **secured by two nuts**

1 General information

1981 through 1983 models use a pressed steel backbone frame with a bolt-on rear section made of round-section steel tubing. The frame on later models is similar, but the rear section is welded to the backbone.

Fender/mudguards are steel, either painted or chrome plated.

2 Frame - inspection and repair

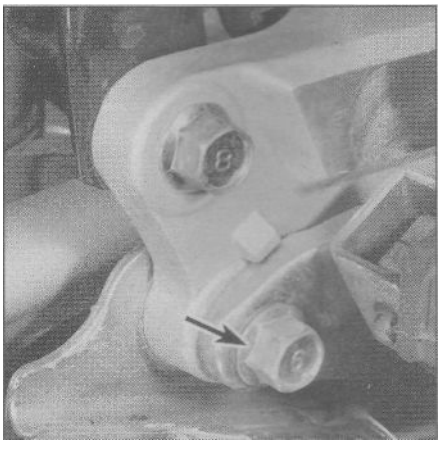
This is the same as for XV535 models. Refer to Part A of this Chapter.

3 Footpegs and pads - removal and installation

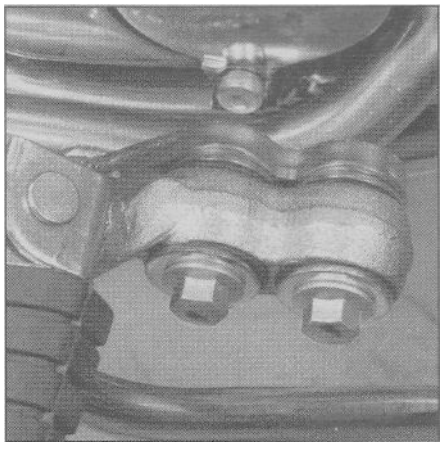
Refer to illustrations 3.2a, 3.2b, 3.2c and 3.2d

1 To remove a footpeg from its pivot bracket, remove the cotter pin, clevis pin and torsion spring and separate the footpeg from the bracket.

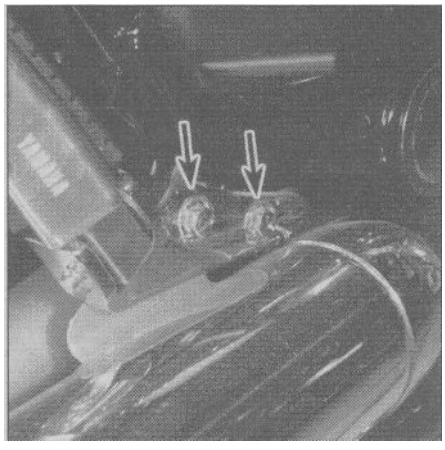
2 To remove a footpeg assembly on shaft drive models, unbolt the pivot bracket from the main bracket **(see illustrations).** If you're



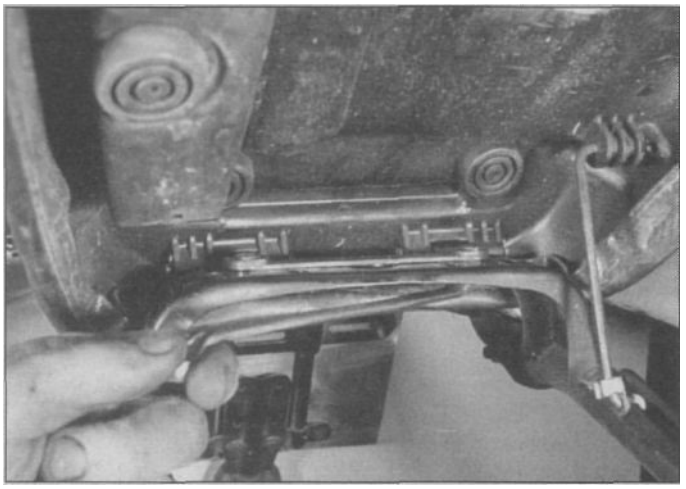
3.2b The right rear footpeg bracket bolt on early shaft drive models (arrow) also secures the muffler/silencer bracket



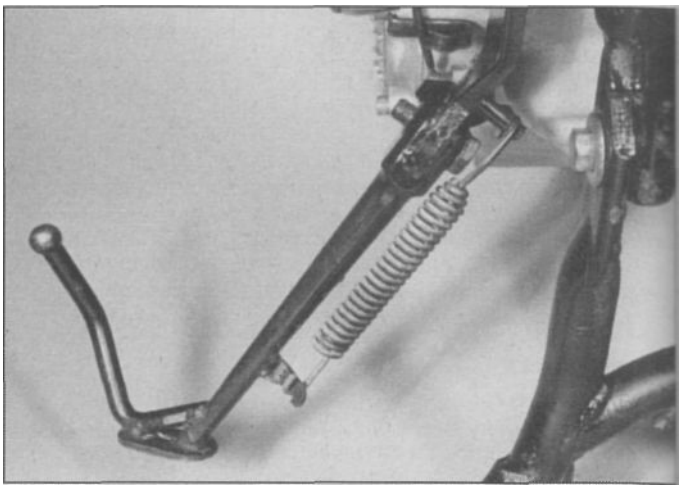
3.2c The front footpeg pivot brackets on later shaft drive models are secured by two bolts



3.2d The passenger footpeg pivot brackets on later shaft drive models are secured by two bolts (arrows)



4.1 Remove one mounting nut, detach the prop rod and remove the other mounting nut



5.1a The sidestand spring must be properly connected and in good condition

removing the right rear footpeg assembly on an early shaft drive model, support the exhaust system and unbolt the footpeg from the frame (the same boit also secures an exhaust bracket).

3 To remove a footpeg assembly on chain drive models, remove the pivot bracket nut and washer from the inside of the alloy bracket.

4 Installation is the reverse of removal. Lubricate the footpeg pivots (see Chapter 1).

4 Seat - removal and installation

Refer to illustration 4.1

1 If you're working on a hinged seat, unlock and lift the seat and remove one of the mounting nuts **(see illustration).** Detach the prop rod, then remove the remaining mounting nut.

2 If the seat is secured by clips, unlock it, then detach it from the clips.

3 If you're working on a bolted seat (1984 and later models), remove the bolts (one on each side at the front of the seat). Detach the rear of the seat from its bracket and lift it off.

4 Installation is the reverse of the removal steps.

5 Sidestand and centerstand - maintenance

Refer to illustrations 5.1a and 5.1b

1 The sidestand (and centerstand on models so equipped) is attached to the frame. An extension spring(s) anchored to the bracket ensures that the stand is held in the extended or retracted position **(see illustrations).**

2 Make sure the pivot bolt or nuts are tight and the extension spring is in good condition and not overstretched. An accident is almost certain to occur if the stand extends while the machine is in motion.

6 Sidestand and centerstand - removal and installation

1 Support the bike securely so it can't be knocked over during this procedure.

2 Unhook the spring **(see illustration 5.1a or 5.1b).** Remove the pivot bolt or nuts and take the stand off the pivot shaft(s).

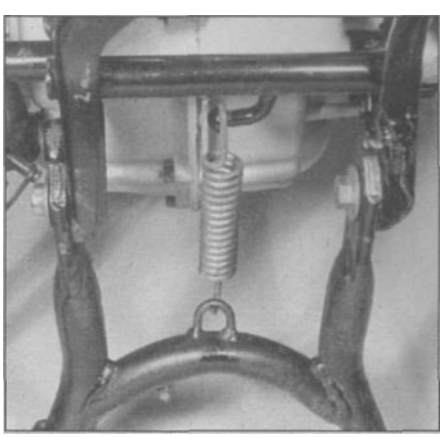
3 Installation is the reverse of the removal steps.

7 Side covers - removal and installation

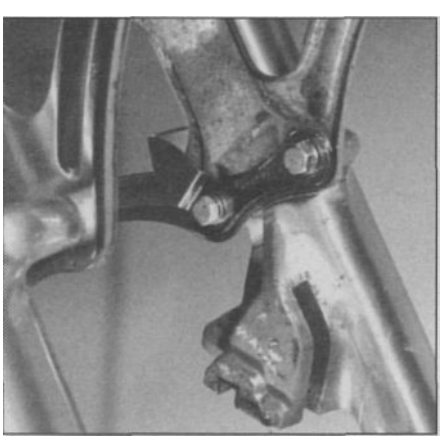
1 Side covers on all models are secured by rubber grommets. In some cases, posts fit into the grommets; in other cases, a slot in the edge of the cover fits into a slot in the grommet.

2 To remove a side cover, pull it gently to disengage the cover from the grommets. **Caution:** *Don't force the cover loose. If it won't come easily, make sure you're pulling in the right direction.*

3 Installation is the reverse of the removal steps.



5.1b . . . the centerstand spring must also be properly connected and in good condition



8.1 Remove the fender/mudguard mounting bolts

8.2 Slip the speedometer cable out of the guide

8 Front fender/mudguard - removal and installation

Early models

Refer to illustrations 8.1 and 8.2

1 The front fender/mudguard on early models is bolted to the forks **(see illustration).** If the upper fender/mudguard bolts will come all the way out without striking the wheel rim, it won't be necessary to remove the front wheel. If they won't, remove the front wheel (see Chapter 6).

2 Disconnect the lower end of the speedometer cable from the drive unit and slip the cable out of the guide **(see illustration).**

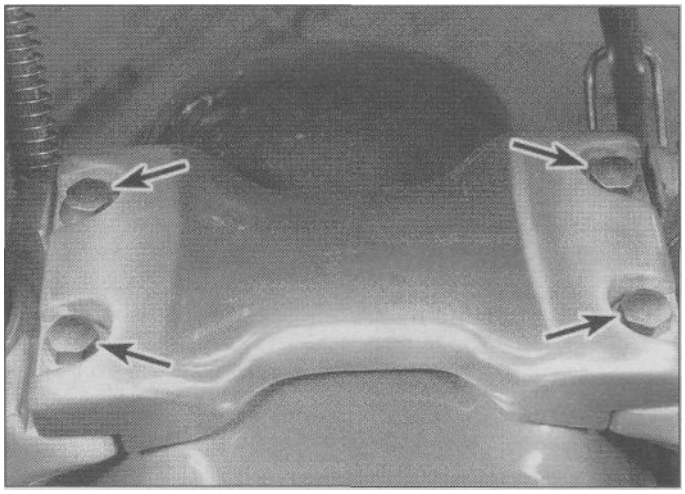
3 Unbolt the fender/mudguard from the forks and take it off.

Later models

Refer to illustration 8.4

4 Remove the fork brace bolts and lift off the fork brace **(see illustration).** Unbolt the fender/mudguard and remove it from the motorcycle.

5 Installation is the reverse of the removal steps. Tighten the bolts securely.



8.4 On later models, remove the fork brace bolts (arrows)

9 Rear fender/mudguard - removal and installation

Refer to illustration 9.2

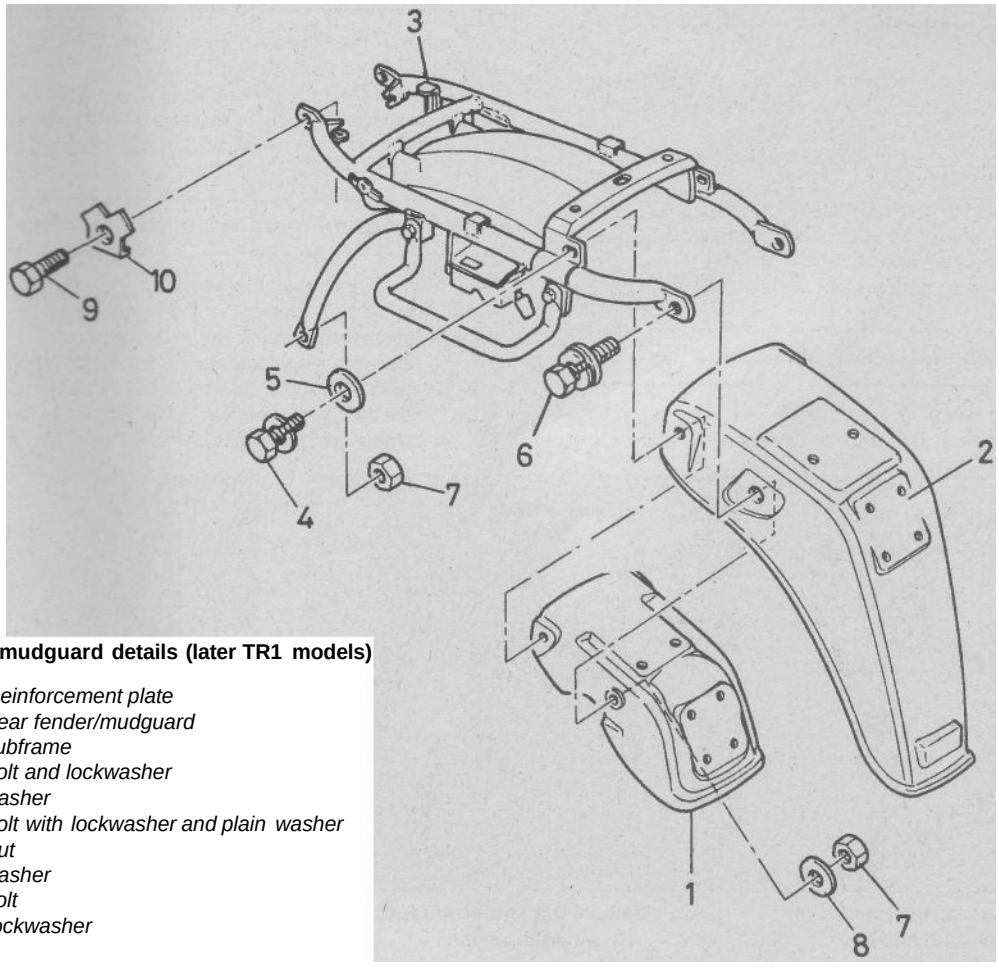
1 Remove the seat (see Section 4) and the rear wheel (see Chapter 6).

2 If you're working on a fender/mudguard that's bolted to the swingarm, remove the bolts and take the fender/mudguard out.

3 Unbolt the fender/mudguard (and lower front fender/mudguard panel, if equipped) from the frame **(see illustration).** On models with backrests, the backrest is secured by some of the fender/mudguard bolts.

4 Follow the wiring harnesses for the brake/taillights and rear turn signals to their connectors and disconnect them.

5 Installation is the reverse of the removal steps.



9.2 Rear fender/mudguard details (later TR1 models)

1 Reinforcement plate
2 Rear fender/mudguard
3 Subframe
4 Bolt and lockwasher
5 Washer
6 Bolt with lockwasher and plain washer
7 Nut
8 Washer
9 Bolt
10 Lockwasher

Notes

Chapter 8 Part A
Electrical system (XV535 models)

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Specifications

Battery type ..... 12 v, 12 Ah

Fuse specifications

Main	
1987 through 1990 models	20 amps
1991-on models	30 amps
All others	
1987 through 1990 models	10 amps
1991-on models	15 amps

Charging system

Statorcoil resistance	0.34 to 0.42 ohms
Charging system output	14 to 15 volts at 5,000 rpm

Starter

Starter commutator diameter	
Standard	28 mm (1.1 inch)
Minimum	27 mm (1.06 inch)
Mica undercut	1.6 mm (0.063 inch)
Starter brush length	
Standard	12.0 mm (0.47 inch)
Minimum	5.0 mm (0.20 inch)

Bulb specifications (US models)

Headlight	65/60W
Tail/brake lights	8/27W
Rear turn signals	27W
Front turn signals	8W
Speedometer light	
1987 through 1993	3W
1994	3.4W
Turn signal indicator	3W
Neutral indicator	3W
High beam indicator	1.7W

Bulb specifications (UK models)

Headlight	60/55W
Tail/brake lights	5/21
Turn signals	21W
Speedometer light	3W
Turn Signal indicator	3W
Neutral indicator	3W
High beam indicator	1.7W
Parking light	3.4W

Carburetor heater resistance ..... 5 to 6 ohms at 20-degrees C (68-degrees F)

Torque specifications

Alternator rotor bolt	80 Nm (58 ft-lbs)
Statorcoil screws	7 Nm (5.1 ft-lbs)*
Alternator cover bolts	10 Nm (7.2 ft-lbs)
Starter mounting bolts	10 Nm (7.2 ft-lbs)
Starter clutch body bolts	20 Nm (14 ft-lbs)**

**Apply non-permanent thread locking agent to the threads.*
***Apply non-permanent thread locking agent to the threads and stake the bolts.*

1 General information

The machines covered by this manual are equipped with a 12-volt electrical system.

The charging system on XV535 models uses a rotor with permanent magnets that rotates around a stator coil of copper wire. This produces alternating current, which is converted to direct current by the regulator/rectifier. The regulator/rectifier also controls the charging system output.

An electric starter mounted to the front of the engine is standard equipment. The starter on early models has four brushes; the starter on later models has two brushes. The starting system includes the motor, the battery, the relay and the various wires and switches. If the engine kill switch and the ignition (main key) switch are both in the On position, the circuit relay allows the starter motor to operate only if the transmission is in Neutral (Neutral switch on) or the clutch lever is pulled to the handlebar (clutch switch on) and the sidestarfd is up (sidestand switch on).

Note: *Keep in mind that electrical parts, once purchased, can't be returned. To avoid unnecessary expense, make very sure the faulty component has been positively identified before buying a replacement part.*

2 Electrical troubleshooting

A typical electrical circuit consists of an electrical component, the switches, relays, etc. related to that component and the wiring and connectors that hook the component to both the battery and the frame. To aid in locating a problem in any electrical circuit, complete wiring diagrams of each model are included at the end of this Chapter.

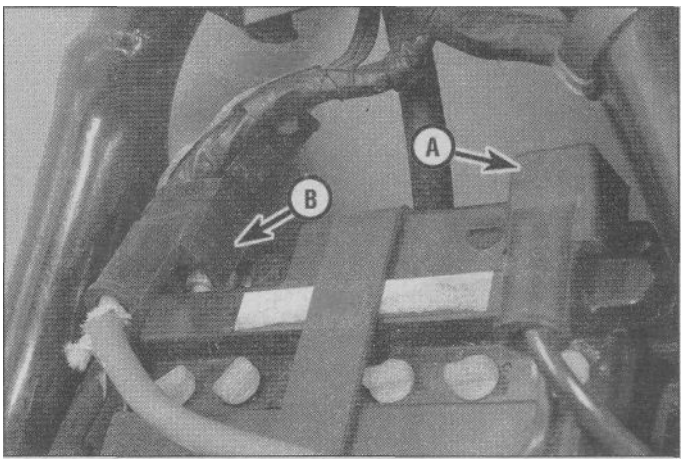
Before tackling any troublesome electrical circuit, first study the appropriate diagrams thoroughly to get a complete picture of what makes up that individual circuit. Trouble spots, for instance, can often be narrowed down by noting if other components related to that circuit are operating properly or not. If several components or circuits fail at one time, chances are the fault lies in the fuse or ground/earth connection, as several circuits often are routed through the same fuse and ground/earth connections.

Electrical problems often stem from simple causes, such as loose or corroded connections or a blown fuse. Prior to any electrical troubleshooting, always visually check the condition of the fuse, wires and connections in the problem circuit. Intermittent failures can be especially frustrating, since you can't always duplicate the failure when it's convenient to test. In such situations, a good practice is to clean all connections in the affected circuit, whether or not they appear to be good. All of the connections and wires should also be wiggled to check for looseness which can cause intermittent failure.

If testing instruments are going to be utilized, use the diagrams to plan where you will make the necessary connections in order to accurately pinpoint the trouble spot.

The basic tools needed for electrical troubleshooting include a test light or voltmeter, a continuity tester (which includes a bulb, battery and set of test leads) and a jumper wire, preferably with a circuit breaker incorporated, which can be used to bypass electrical components. Specific checks described later in this Chapter may also require an ohmmeter.

Voltage checks should be performed if a circuit is not functioning properly. Connect one lead of a test light or voltmeter to either the negative battery terminal or a known good ground. Connect the other lead to a connector in the circuit being tested, preferably nearest to the battery or fuse. If the bulb lights, voltage is reaching that point, which means the part of the circuit between that connector and the battery is problem-free. Continue checking the remainder of the circuit in the same manner. When you reach a point where no voltage is present, the problem lies between there and the last good test point. Most of the time the problem is due to a loose connection. Keep in mind that some circuits only receive voltage when the ignition key is in the On position.



3.4 Always disconnect the negative battery cable first and reconnect it last to prevent sparks which could cause the battery to explode; be sure to reinstall the terminal covers for the same reason

A Negative cable *B Positive cable*

One method of finding short circuits is to remove the fuse and connect a test light or voltmeter in its place to the fuse terminals. There should be no load in the circuit (it should be switched off). Move the wiring harness from side-to-side while watching the test light. If the bulb lights, there is a short to ground/earth somewhere in that area, probably where insulation has rubbed off a wire. The same test can be performed on other components in the circuit, including the switch.

A ground/earth,check should be done to see if a component is grounded properly. Disconnect the battery and connect one lead of a self-powered test light (continuity tester) to a known good ground. Connect the other lead to the wire or ground/earth connection being tested. If the bulb lights, the ground/earth is good. If the bulb does not light, the ground/earth is not good.

A continuity check is performed to see if a circuit, section of circuit or individual component is capable of passing electricity through it. Disconnect the battery and connect one lead of a self-powered test light (continuity tester) to one end of the circuit being tested and the other lead to the other end of the circuit. If the bulb lights, there is continuity, which means the circuit is passing electricity through it properly. Switches can be checked in the same way.

Remember that all electrical circuits are designed to conduct electricity from the battery, through the wires, switches, relays, etc. to the electrical component (light bulb, motor, etc.). From there it is directed to the frame (ground) where it is passed back to the battery. Electrical problems are basically an interruption in the flow of electricity from the battery or back to it.

3 Battery - inspection and maintenance

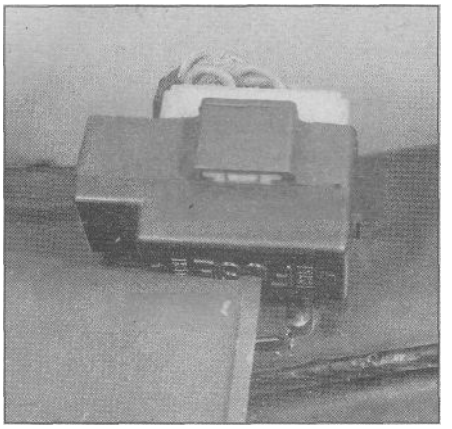
Refer to illustration 3.4

1 Most battery damage is caused by heat, vibration, and/or low electrolyte levels, so make sure the battery is securely mounted, check the electrolyte level frequently and make sure the charging system is functioning properly.

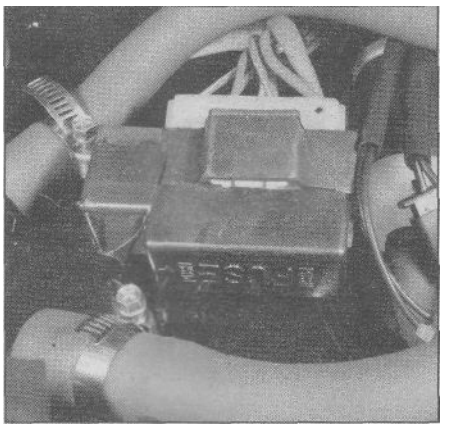
2 Refer to Chapter 1 for electrolyte level aYid specific gravity checking procedures.

3 Check around the base inside of the battery for sediment, which is the result of sulfation caused by low electrolyte levels. These deposits will cause internal short circuits, which can quickly discharge the battery. Look for cracks in the case and replace the battery if either of these conditions is found.

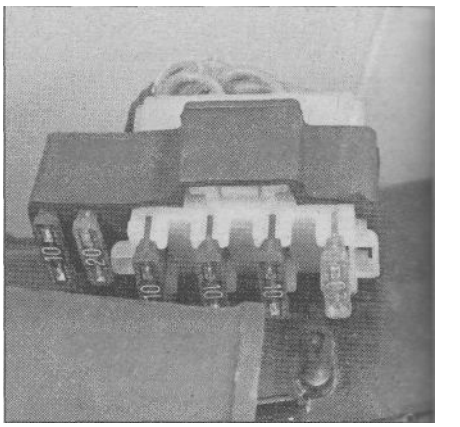
4 Check the battery terminals and cable ends for tightness and corrosion. If corrosion is evident, remove the cables from the battery **(see illustration)** and clean the terminals and cable ends with a wire



5.1a The main and accessory fuses are located in a fuse block under the seat (this is an early model)...



5.1b ... and this is a later model



5.1c Lift the cover for access to the fuse (early model shown)

brush or knife and emery paper. Reconnect the cables and apply a thin coat of petroleum jelly to the connections to slow further corrosion.

5 The battery case should be kept clean to prevent current leakage, which can discharge the battery over a period of time (especially when it sits unused). Wash the outside of the case with a solution of baking soda and water. Do not get any baking soda solution in the battery cells. Rinse the battery thoroughly, then dry it.

6 If acid has been spilled on the frame or battery box, neutralize it with the baking soda and water solution, dry it thoroughly, then touch up any damaged paint. Make sure the battery vent tube is directed away from the frame and is not kinked or pinched.

7 If the motorcycle sits unused for long periods of time, disconnect the cables from the battery terminals. Refer to Section 4 and charge the battery approximately once every month.

4 Battery - charging

1 If the machine sits idle for extended periods or if the charging system malfunctions, the battery can be charged from an external source.

2 To properly charge the battery, you will need a charger of the correct rating, a hydrometer, a clean rag and a syringe for adding distilled water to the battery cells.

3 The maximum charging rate for any battery is 1/10 of the rated amp/hour capacity. As an example, the maximum charging rate for a 12 amp/hour battery would be 1.2 amps and the maximum charging rate for a 14 amp/hour battery would be 1.4 amps. If the battery is charged at a higher rate, it could be damaged.

4 Do not allow the battery to be subjected to a so-called quick charge (high rate of charge over a short period of time) unless you are prepared to buy a new battery.

5 When charging the battery, always remove it from the machine and be sure to check the electrolyte level before hooking up the charger. Add distilled water to any cells that are low.

6 Loosen the cell caps, hook-up the battery charger leads (red to positive, black to negative), cover the top of the battery with a clean rag, then, and only then, plug in the battery charger. Warning: *Remember, the gas escaping from a charging battery is explosive, so keep open flames and sparks well away from the area. Also, the electrolyte is extremely corrosive and will damage anything it comes in contact with.*

7 Allow the battery to charge until the specific gravity is as specified (refer to Chapter 1 for specific gravity checking procedures). The charger must be unplugged and disconnected from the battery when making specific gravity checks, if the battery overheats or gases excessively, the charging rate is too high. Either disconnect the charger or lower the charging rate to prevent damage to the battery.

8 It's time for a new battery if:

a) One or more of the cells is significantly lower in specific gravity than the others after a long slow charge.
b) The battery as a whole doesn't seem to want to take a charge.
c) Battery voltage won't increase.
d) The electrolyte doesn't bubble.
e) The plates are white (indicating sulfation) or debris has accumulated in the bottom of a cell.
f) The plates or insulators are warped or buckled.

9 When the battery is fully charged, unplug the charger first, then disconnect the leads ffom the battery. Install the cell caps and wipe any electrolyte off the outside of the battery case.

5 Fuses - check and replacement

Refer to illustrations 5.1a, 5.1b and 5.1c

1 The fuse block is located beneath the top cover (early models) or the seat (later models) **(see illustrations)**. It contains a 20-amp or 30-amp main fuse, spare fuses and accessory fuses **(see illustration)** Fuse functions and ratings are listed in this Chapter's Specifications. Fuse ratings are marked on the fuses.

2 If you have a test light, all of the fuses can be checked without removing them. Turn the ignition key to the On position, connect one end of the test light to a good ground, then probe each terminal on top of the fuse. If the fuse is good, there will be voltage available at both terminals. If the fuse is blown, there will only be voltage present at one of the terminals.

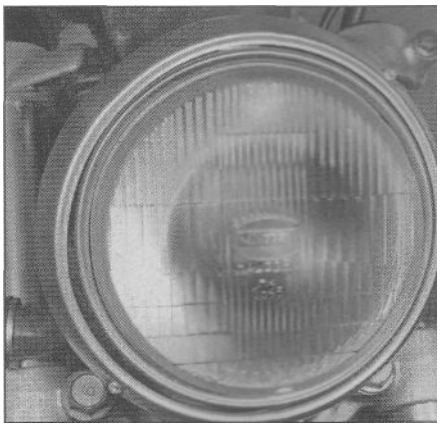
3 The fuses can also be tested with an ohmmeter or self-powered test light. Remove the fuse and connect the tester to the ends of the fuse. If the ohmmeter shows continuity or the test lamp lights, the fuse is good. If the ohmmeter shows infinite resistance *or* the test lamp stays out, the fuse is blown.

4 The fuses can be removed and checked visually. If you can't pull the fuse out with your fingertips, use a pair of needle-nose pliers. A blown fuse is easily identified by a break in the element.

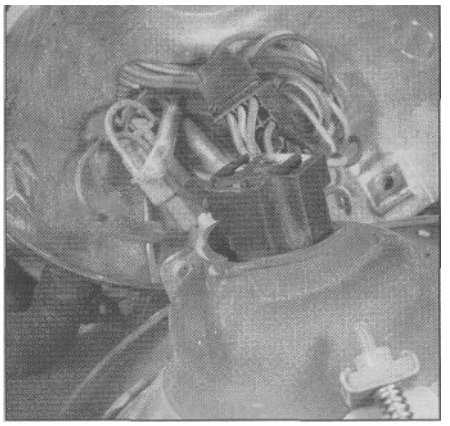
5 If a fuse blows, be sure to check the wiring harnesses very carefully for evidence of a short circuit. Look for bare wires and chafed, melted or burned insulation. If a fuse is replaced before the cause is located, the new fuse will blow immediately.

6 Never, under any circumstances, use a higher rated fuse or bridge the fuse block terminals, as damage to the electrical system could result.

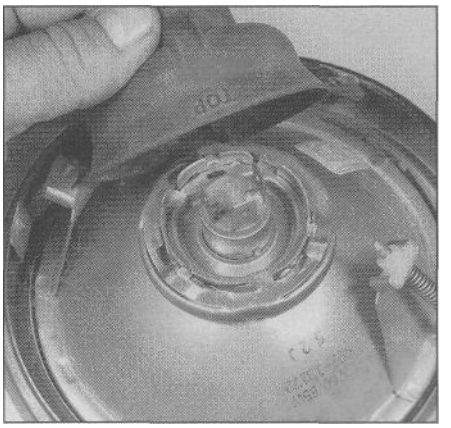
7 Occasionally a fuse will blow or cause an open circuit for no obvious reason. Corrosion of the fuse ends and fuse block terminals may occur and cause poor fuse contact. If this happens, remove the corrosion with a wire brush or emery paper, then spray the fuse end and terminals with electrical contact cleaner.



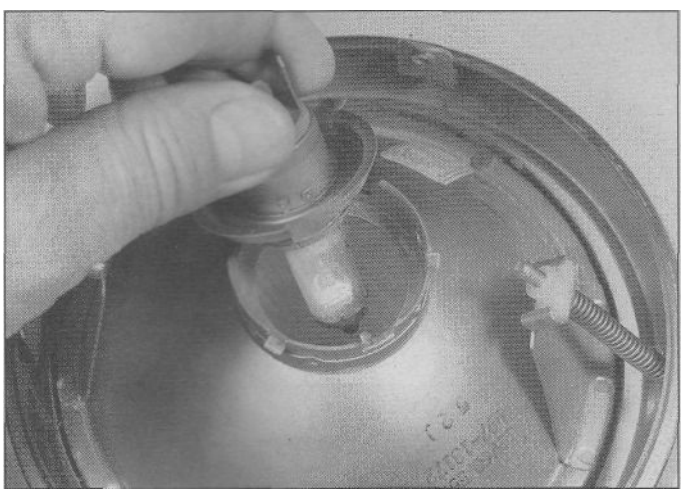
7.1a Remove the **headlight cover screws** (arrows) **.. .**



7.1b . . . tilt the cover out of the headlight assembly and disconnect the wiring connector



7.2a Unscrew the retainer,



7.2b . . . and lift the bulb out; don't touch the glass on the new bulb

6 Lighting system - check

1 The battery provides power for operation of the headlight, taillight, brake light, license plate light, instrument and warning lights. If none of the lights operate, always check battery voltage before proceeding. Low battery voltage indicates either a faulty battery, low battery electrolyte level or a defective charging system. Refer to Chapter 1 for battery checks and Sections 26 and 27 for charging system tests. Also, check the condition of the fuses and replace any blown fuses with new ones.

Headlight

2 If the headlight is out when the engine is running (US models) or it won't switch on (UK models), check the fuse first with the key or switch On (see Section 5), then unplug the electrical connector for the headlight and use jumper wires to connect the bulb directly to the battery terminals (see Section 7). If the light comes on, the problem lies in the wiring or one of the switches in the circuit. Refer to Section 16 for the switch testing procedures, and also the wiring diagrams at the end of this Chapter.

Taillight/licenseplatelight

3 If the taillight fails to work, check the bulbs and the bulb terminals first, then check for battery voltage at the taillight electrical connector. If voltage is present, check the ground/earth circuit for an open or poor connection.

4 If no voltage is indicated, check the wiring between the taillight and the ignition switch, then check the switch. On UK modeis, check the lighting switch as well.

Brakelight

5 See Section 12 for the brake light switch checking procedure.

Neutralindicatorlight

6 If the neutral light fails to operate when the transmission is in Neutral and the key switch is On, check the fuses and the bulb (see Section 14 for bulb removal procedures). If the bulb and fuses are in good condition, check for battery voltage at the connector attached to the neutral switch on the left side of the engine. If battery voltage is present, refer to Section 18 for the neutral switch check and replacement procedures.

7 If no voltage is indicated, check the wiring between the switch and the bulb for open circuits and poor connections.

7 Headlight bulb - replacement

Refer to illustrations 7.1a, 7.1b, 7.2a and 7.2b

Warning: *If the bulb has just burned out, allow it to cool. It will be hot enough to burn your fingers.*

1 Remove the headlight cover screws **(see illustration).** Tilt the cover forward out of the headlight assembly and disconnect the electrical connector **(see illustration).**

2 Turn the bulb retainer counterclockwise (anti-clockwise) **(see illustration).** Remove the bulb **(see illustration).**

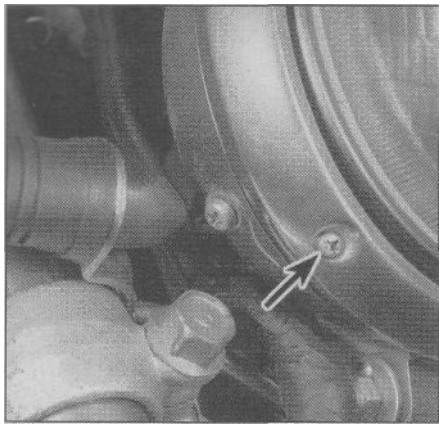
3 When installing the new bulb, reverse the removal procedure. Be sure not to touch the bulb glass with your fingers - oil from your skin will cause the bulb to overheat and fail prematurely. If you do touch the bulb, wipe it off with a clean rag dampened with rubbing alcohol.

4 The parking light bulb holder (auxiliary light) on UK models is a push fit in the grommet set in the rear of the reflector. Access may be possible via the cutout in the headlight housing, but if not remove the headlight as described in Step 1. Twist the bulb counterclockwise (anti-clockwise) to release it from its bulb holder.

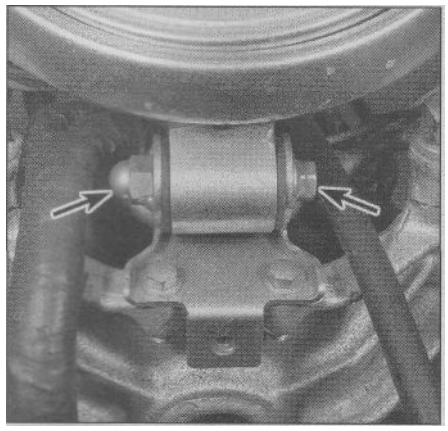
8 Headlight aim - check and adjustment

Refer to illustration 8.3

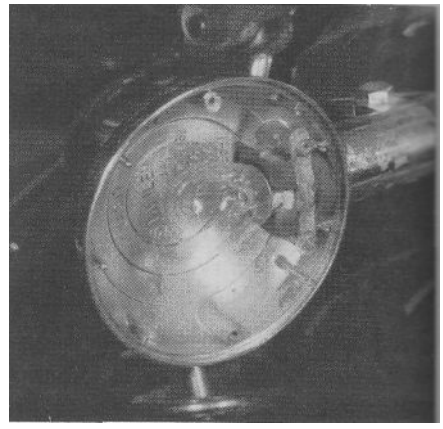
1 . An improperly adjusted headlight may cause problems for oncoming traffic or provide poor, unsafe illumination of the road ahead. Before adjusting the headlight, be sure to consult with local traffic laws and regulations.



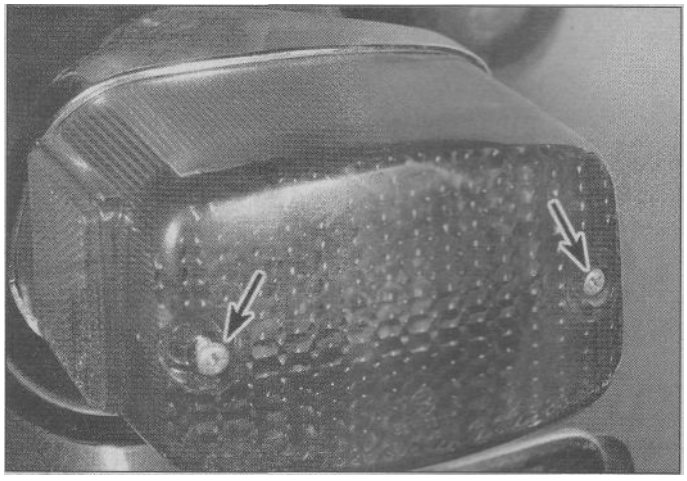
8.3 The headlight adjusting screws are located on either side of the headlight assembly; the vertical adjusting screw is at the lower right (arrow); the horizontal adjusting screw is at the upper left



9.2 Remove the pivot bolt and nut at the bottom (arrows) and the mounting bolt inside the headlight assembly



10.2 Press the bulb into the socket and **turn it counterclockwise (anti-clockwise to remove**



10.5 Remove the lens screws (arrows) and take off the lens

10.6 Press the bulbs into their sockets and turn counterclockwise (anti-clockwise) to remove

2 The headlight beam can be adjusted both vertically and horizontally. Before performing the adjustment, make sure the fuel tank is at leasi half full and have an assistant sit on the seat.

3 The horizontal adjusting screw is at the upper left of the headlight cover **(see illustration).** The vertical adjusting screw is located at the lower right.

9 Headlight assembly - removal and installation

Refer to illustration 9.2

1 Remove the headlight cover (see Section 7). If you're planning to take the headlight assembly completely off the motorcycle, disconnect the electrical connectors inside the headlight assembly. If you're just removing the assembly for access to the speedometer, the connectors can be left attached.

2 Remove the mounting bolt inside the headlight cover and the pivot bolt at the bottom **(see illustration).** Slide the assembly down and forward so the mounting grommet can clear the post, then take the assembly off the motorcycle.

3 Installation is the reverse of the removal steps.

10 Turn signals and tail/brake light bulbs - replacement

Turnsignalbulbs

Refer to illustration 10.2

1 To replace a turn signal bulb, remove the screws that hold the lens to the turn signal housing and take off the lens.

2 Push the bulb in and turn it counterclockwise (anti-clockwise) to remove it **(see illustration).**

3 Check the socket terminals for corrosion and clean them if necessary. Line up the pins on the new bulb with the slots in the socket, push in and turn the bulb clockwise until it locks in place.

Note: *The pins on US model front turn signal bulbs are offset so they can only be installed one way. It is a good idea to use a paper towel or dry cloth when handling the new bulb to prevent injury if the bulb should break and to increase bulb life.*

4 Position the lens on the housing and install the screws. Be careful not to overtighten them or the lens will crack.

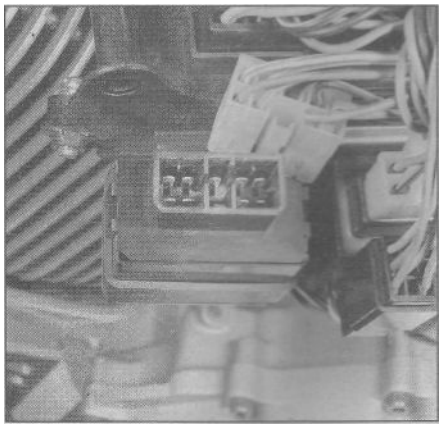
Tail/brakelightbulbs

Refer to illustrations 10.5 and 10.6

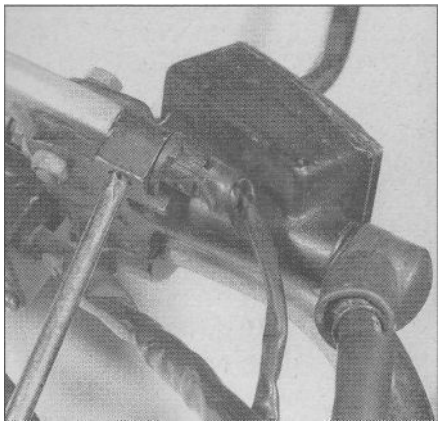
5 Remove the lens screws and take the lens off **(see illustration).**

6 . Push the bulb in and turn it counterclockwise (anti-clockwise) to remove it **(see illustration).**

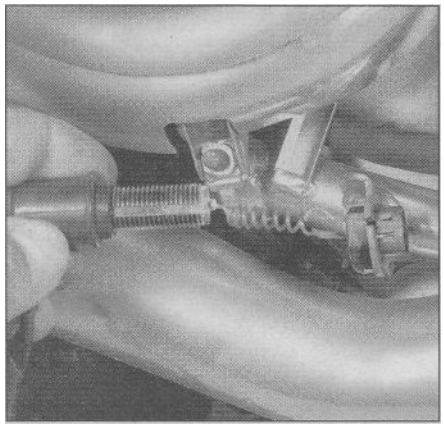
7 Perform Steps 3 and 4 above to install the bulb, noting that the pins are offset.



11.3 The turn signal relay/cancel unit is located behind the right front side cover; it's part of the relay assembly and can be identified by its wire colors



12.5 To remove the brake light switch, insert a tool into the hole under the bracket and release the retainer



12.8 Disconnect the brake light switch spring, loosen the locknut and compress the prongs to detach the switch from the bracket

11 Turn signal circuit - check

Refer to illustration 11.3

1 The battery provides power for operation of the signal lights, so if they do not operate, always check the battery voltage and specific gravity first. Low battery voltage indicates either a faulty battery, low electrolyte level or a defective charging system. Refer-to Chapter 1 for battery checks and Sections 26 and 27 for charging system tests. Also, check the fuses (see Section 5).

2 Most turn signal problems are the result of a burned out bulb or corroded socket. This is especially true when the turn signals function properly in one direction, but fail to flash in the other direction. Check the bulbs and the sockets (see Section 10).

3 If the bulbs and sockets check out okay, remove the right front side cover and check for power at the turn signal relay in the relay assembly **(see illustration)** with the ignition On. Refer to the Wiring diagrams at the end of the book to identify the power source terminal.

4 If the relay is okay, check the wiring between the turn signal relay and the turn signal lights (see the wiring diagrams at the end of the book).

5 If the wiring checks out okay, replace the turn signal relay.

12 Brake light switches - check and replacement

Circuitcheck

1 Before checking any electrical circuit, check the fuses (see Section 5).

2 Using a test light connected to a good ground, check for voltage at the brake light switch. If there's no voltage present, check the wire between the switch and the fuse box (see the wiring diagrams at the end of this Chapter).

3 If voltage is available, touch the probe of the test light to the other terminal of the switch, then pull the brake lever or depress the brake pedal - if the test light doesn't light up, replace the switch.

4 If the test light does light, check the wiring between the switch and the brake lights (see the wiring diagrams at the end of this Chapter).

Switchreplacement

Front brake lever switch

Refer to illustration 12.5

5 The switch slides into the handle pivot and is secured by a prong **(see illustration).** Disconnect the electrical connector. Insert a small screwdriver or probe into the release hole on the underside of the lever bracket, press up on the retaining prong and pull out the switch.

6 Installation is the reverse of the removal procedure. The brake lever switch isn't adjustable.

Rear brake pedal switch

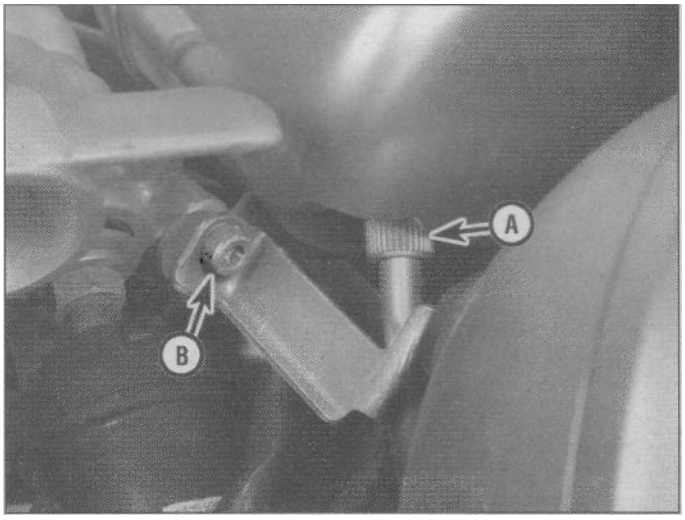
Refer to illustration 12.8

7 Unplug the electrical connector in the switch harness.

8 Unhook the switch spring **(see illustration).**

9 Compress the retainer prongs and slide the switch out of the bracket **(see illustration 12.8).**

10 Install the switch by reversing the removal procedure, then adjust the switch by following the procedure described in Chapter 1.



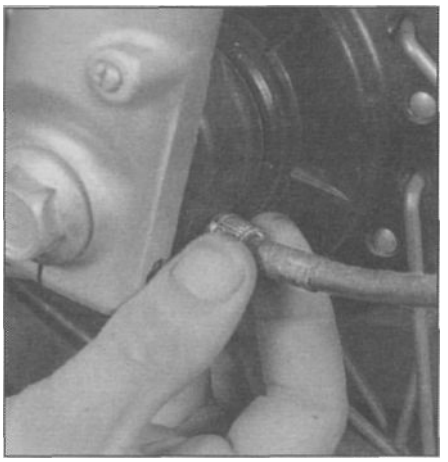
13.1 Unscrew the speedometer cable from the speedometer (A); note the mounting bracket attachment (B)...

13 Speedometer and cable - removal and installation

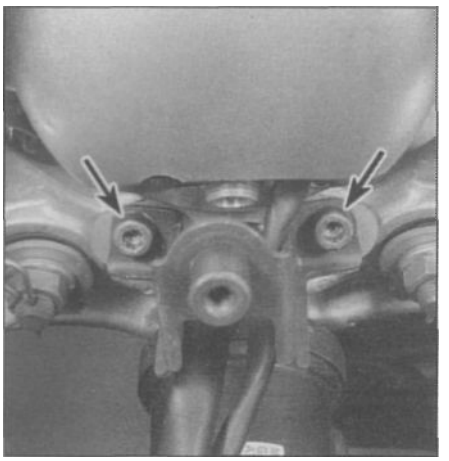
Speedometercableremoval

Refer to illustrations 13.1 and 13.2

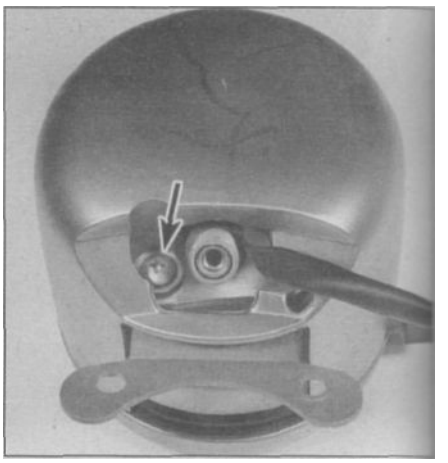
1 Unscrew the speedometer cable end and pull the cable from the speedometer **(see illustration).** If necessary for access, lower the headlight assembly (see Section 9).



13.2 . . . **and from the drive unit on the left fork leg**



13.4 Remove the speedometer mounting nuts...



13.5 . . . and the mounting screws, then detach the speedometer from the housing l

2 Note how it's routed, then unscrew the speedometer cable from the drive gear at the left front fork **(see illustration).**

Speedometer removal

Refer to illustrations 13.4 and 13.5

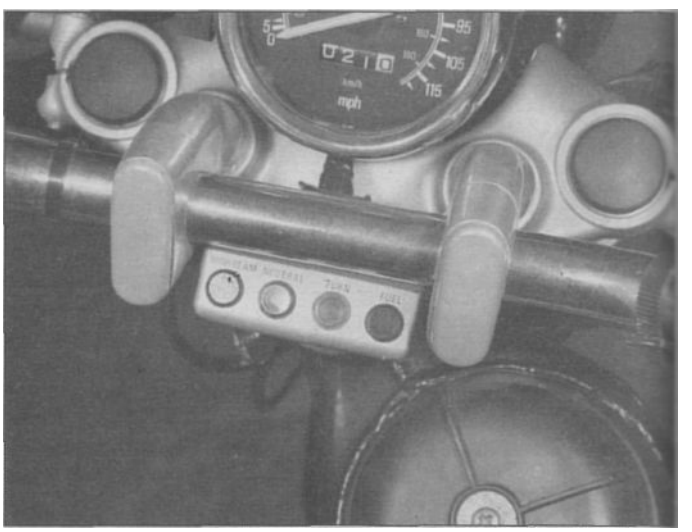
3 Disconnect the cable from the speedometer **(see illustration 13.1).**

4 Remove the Allen bolts and washers and detach the speedometer housing bracket **(see illustration).**

5 Lift the speedometer away from the bracket and turn it over. Remove the self-tapping screw and detach the speedometer from the housing **(see illustration).** Follow the speedometer wiring harness to its connector (inside a rubber cover below the speedometer) and disconnect it.

Installation

6 Installation is the reverse of the removal procedure. Be sure the speedometer cable and wiring harness are routed so it doesn't cause the steering to bind or interfere with other components. The squared-off ends of the cable must fit into their spindles in the speedometer and drive gear.



14.1 The warning lights are contained in this housing

14 Instrument and warning light bulbs - replacement

Warninglightbulbs

Refer to illustrations 14.1 and 14.3

1 The warning light bulbs are beneath a cover located behind and beneath the handlebar **(see illustration).**

2 For access to the bulbs, remove the handlebar (see Chapter 5). The cables, wiring and brake hoses can be left attached; just support the handlebar so no components are strained.

3 Remove the screws and lift off the cover **(see illustration).** Pull the bulb out and install a new one.

4 Install the cover and the handlebar. Tighten the handlebar fasteners to the torque listed in the Chapter 5 Specifications.

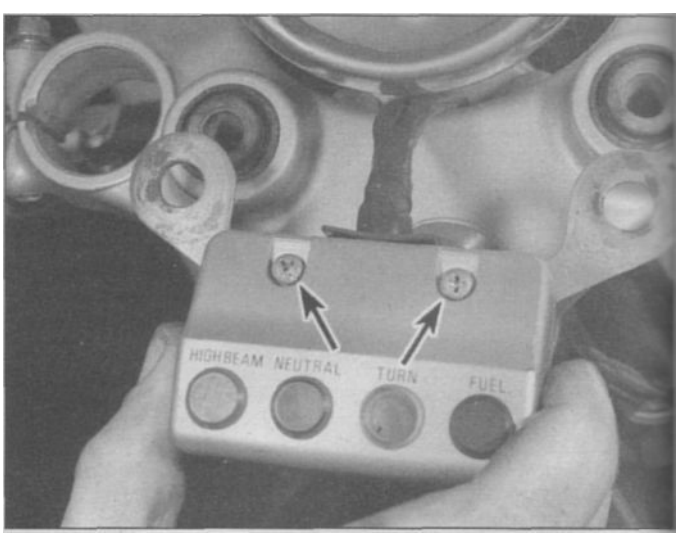
Speedometerlightbulb

Refer to illustrations 14.6a and 14.6b

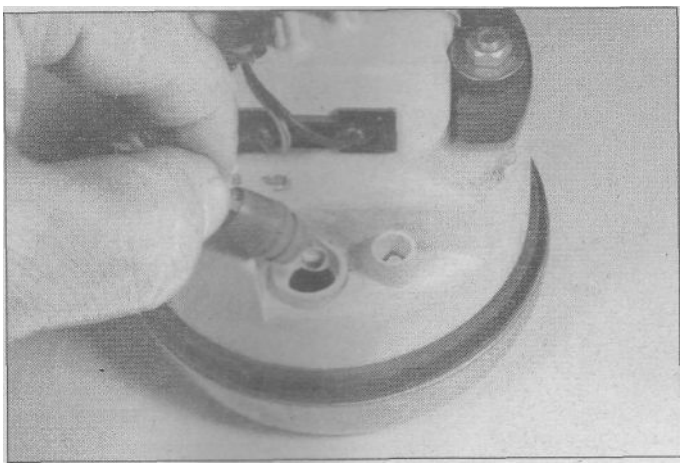
5 Remove the speedometer from the housing (see Section 13).

6 Pull the rubber socket out of the back of the speedometer **(see illustration),** then pull the bulb out of the socket **(see illustration).** If the socket contacts are dirty or corroded, they should be scraped clean and sprayed with electrical contact cleaner before new bulbs are installed.

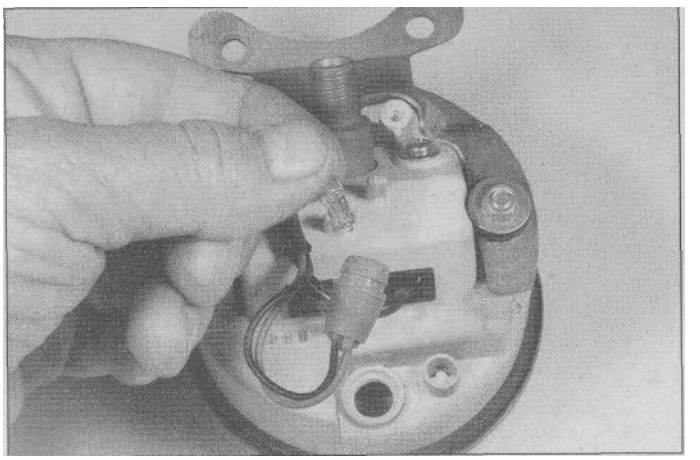
7 Carefully push the new bulb into position, then push the socket into the speedometer.



14.3 With the handlebar removed, remove the cover screws (arrows), lift off the cover and pull the bulb out of the socket



14.6a Pull the bulb socket out of the speedometer .



14.6b . . . and pull the bulb out of the socket

Switch Position	Lead Color		
	R	Br	L
ON	○——	○——	○
OFF			
P	○——	○	

15.3a Continuity table for the ignition switch (US models)

Switch Position	Lead Color			
	R	Br	L	L/R
ON	○——	○	○——	○
OFF				
P	○——		——	○

15.3b Continuity table for the ignition switch (UK models)

15 Ignition main (key) switch - check and replacement

Check

Refer to illustration 15.3

1 Lift the seat (single seat models) or remove the seat (dual seat models) (see Chapter 7).

2 Follow the wiring harness from the ignition switch to the connector and disconnect it.

3 Using an ohmmeter, check the continuity of the terminal pairs indicated in the accompanying table **(see illustrations).** Continuity should exist between the terminals connected by a solid line when the switch is in the indicated position. **Note:** *Connect the ohmmeter to the switch side of the connector, not the wiring harness side.*

4 If the switch fails any of the tests, replace it.

Replacement

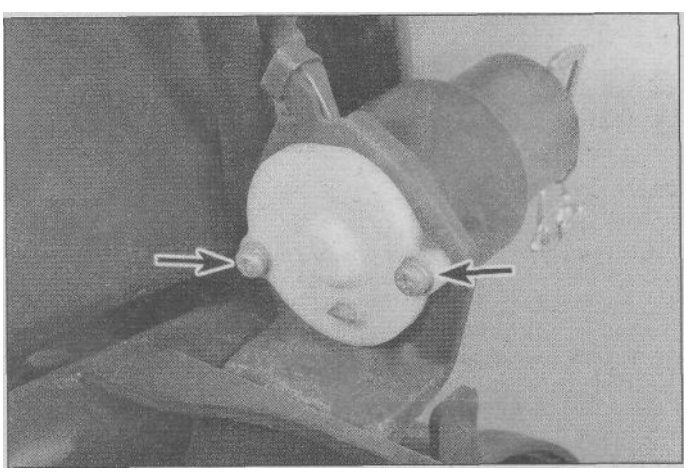
Refer to illustration 15.6

5 Disconnect the electrical connector, if you haven't already done so. Free the wiring harness from any clips or retainers.

6 Remove the screws and separate the switch from the bracket **(see illustration).** These are accessible from the right side of the motorcycle with a ratchet handle, long extension, swivel and Phillips screwdriver bit. If you don't have these tools, remove the battery and battery case for access.

7 Attach the new switch to the bracket and tighten the screws securely.

8 The remainder of installation is the reverse of the removal procedure.



15.6 Remove the ignition main (key) switch mounting screws (arrows)

16 Handlebar switches - check

Refer to illustration 16.4

1 Generally speaking, the switches are reliable and trouble-free. Most troubles, when they do occur, are caused by dirty or corroded contacts, but wear and breakage of internal parts is a possibility that

should not be overlooked. If breakage does occur, the entire switch and related wiring harness will have to be replaced with a new one, since individual parts are not usually available.

2 The switches can be checked for continuity with an ohmmeter or a continuity test light. Always disconnect the battery negative cable, which will prevent the possibility of a short circuit, before making the checks.

3 Trace the wiring harness of the switch in question and unplug the electrical connectors.

4 Using the ohmmeter or test light, check for continuity between the terminals of the switch harness with the switch in the various positions **(see illustration).** Continuity should exist between the terminals connected by a solid line when the switch is in the indicated position.

5 If the continuity check indicates a problem exists, refer to Section 17, remove the switch and spray the switch contacts "with electrical contact cleaner. If they are accessible, the contacts can be scraped clean with a knife or polished with crocus cloth. If switch components are damaged or broken, it will be obvious when the switch is disassembled.

"LIGHTS"Switch (UK)

	R/Y	L	L/B
OFF			
PO	○——	——○	
ON	○——	——○	——○

"HORN" Switch

Switch Position	Lead Color	
	P	B
OFF		
ON	○——	——○

"ENGINE STOP" Switch

Switch Position	Lead Color	
	R/W	R/B
OFF		
RUN	○——	——○

"FUEL" (Reserve) Switch

Switch Position	Lead Color	
	R/W	R/G
ON		
RES	○——	——○

"LIGHTS" (Dimmer) switch

Switch Position	Lead Color		
	Y	L/B	G
HI	○——	——○	
LO		○——	——○

"TURN" Switch

Switch Position		Lead Color				
		Ch	Br/W	Dg	Y/R	B
L		○——	——○		○——	——○
N	L	○——	——○			
	OFF					
	R		○——	——○		
R			○——	——○	○——	——○

"PASS" Switch (UK)

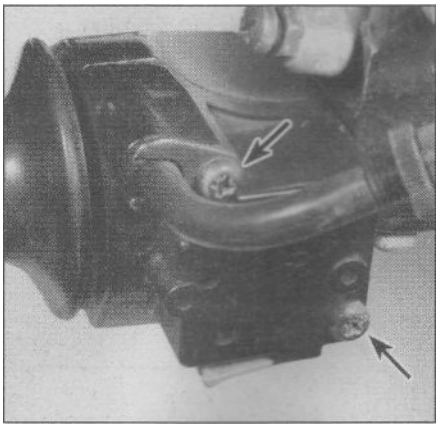
	Y	R/Y
OFF		
ON	○——	——○

"START" Switch

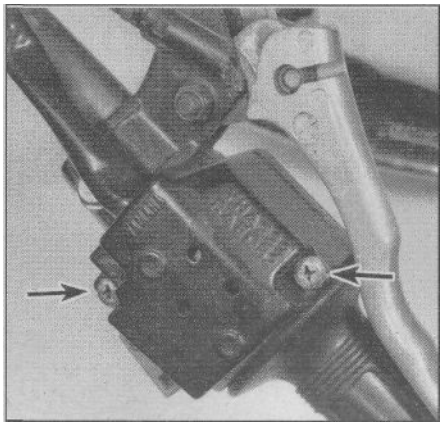
Switch Position	Lead Color			
	R/Y	L/B	L/W	B
OFF	○——	——○		
ON			○——	——○

US models only

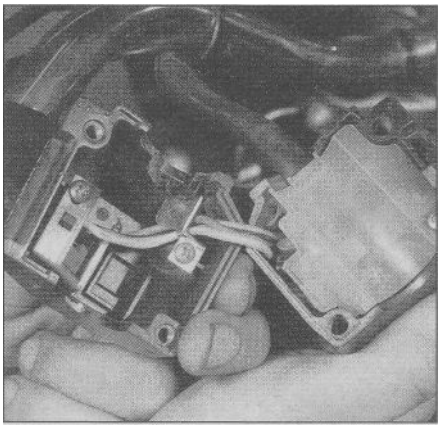
16.4 Continuity table for the handlebar switches



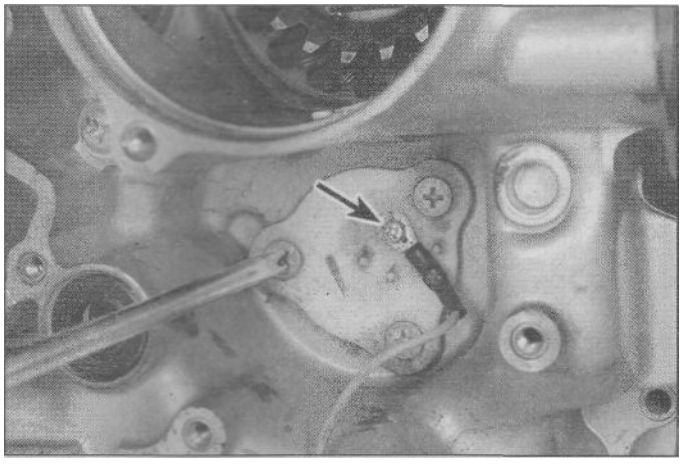
17.1a The handlebar switches are held together by screws (arrows); this is the throttle side . . .



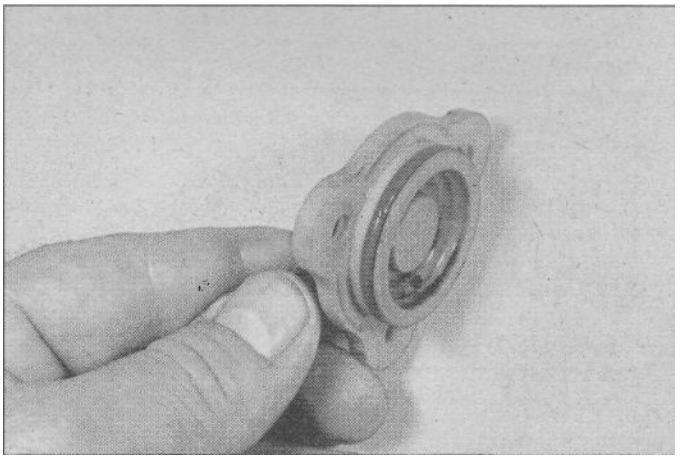
17.1b . . . the clutch side switches are also held together by screws (arrows)



17.1c Separate the switch halves for access to the individual switches



18.5a Loosen the **small screw (arrow) and disconnect the wire;** remove **the three mounting screws . . .**



18.5b . . . and take the switch out of the engine; replace the O-ring with a new one

17 Handlebar switches - removal and installation

Refer to illustrations 17.1a, 17.1b and 17.1c

1 The handlebar switches are composed of two halves that clamp around the bars. They are easily removed for cleaning or inspection by taking out the clamp screws and pulling the switch halves away from the handlebars **(see illustrations).**

2 To completely remove the switches, the electrical connectors in the wiring harness should be unplugged.

3 When installing the switches, make sure the wiring harnesses are properly routed to avoid pinching or stretching the wires.

18 Neutral switch - check and replacement

Check

1 Make sure the transmission is in neutral.

2 Remove the lower left frame cover (see Chapter 7). Locate the switch harness (it has a single connector with sky blue wires), then unplug the connector.

3 Connect the terminal in the harness side of the'connector to ground/earth (bare metal on the motorcycle frame) with a short length of wire.

a) If the light stays out, check the bulb and the wiring between the ignition switch and neutral switch.

b) If the neutral indicator light comes on, the neutral switch may be bad. Connect an ohmmeter between the terminal in the switch side of the connector and ground. Shift through the gears. The ohmmeter should indicate continuity (low resistance) in neutral and no continuity (infinite resistance) in all other gears. If not, replace the neutral switch.

Replacement

Refer to illustrations 18.5a and 18.5b

4 Remove the alternator cover (see Section 28).

5 Loosen the small screw on the switch and detach the wire **(see illustration).** Remove the switch mounting screws and detach the switch from the crankcase **(see illustration).** Remove the O-ring and install a new one.

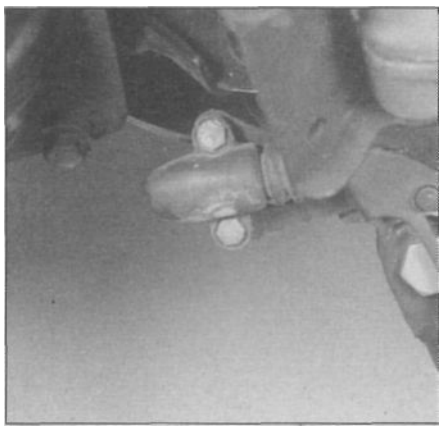
6 Installation is the reverse of the removal steps.

19 Sidestand switch - check and replacement

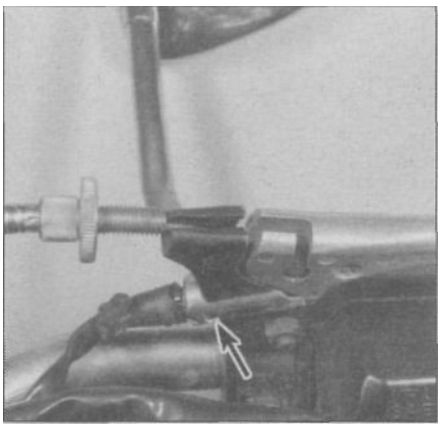
Check

1 Support the bike securely so it can't be knocked over during this procedure.

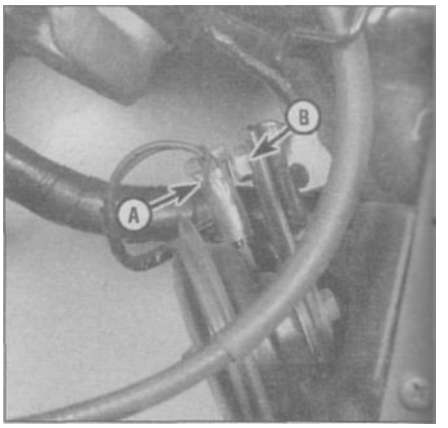
2 . Follow the wiring harness from the switch to the connector, then unplug the connector. Connect the leads of an ohmmeter to the wire terminals. With the sidestand in the up position, there should be continuity through the switch (little or no resistance).



19.5 Sidestand switch mounting screws



20.4 Insert a pointed tool into the hole (arrow), compress the prong and pull out the clutch switch



21.1 Disconnect the horn wires (A) and **remove the bracket bolt (B)"**

3 With the sidestand in the down position, the meter should indicate infinite resistance.
4 If the switch fails either of these tests, replace it.

Replacement

Refer to illustration 19.5

5 With the sidestand in the up position, unscrew the two screws and remove the switch **(see illustration).** Disconnect the switch electrical connector.
6 Installation is the reverse of the removal procedure.

20 Clutch switch - check and replacement

Check

1 Disconnect the electrical connector from the clutch switch.
2 Connect an ohmmeter between the terminals in the clutch switch. With the clutch lever pulled in, the ohmmeter should show continuity (little or no resistance). With the lever out, the ohmmeter should show infinite resistance.
3 If the switch doesn't check out as described, leplace it.

Replacement

Refer to illustration 20.4

4 If you haven't already done so. disconnect the wiring connector. Insert a pointed tool into the mounting hole, compress the prong and pull the switch out **(see** illustration).
5 Installation is the reverse of removal.

21 Horn - check and replacement

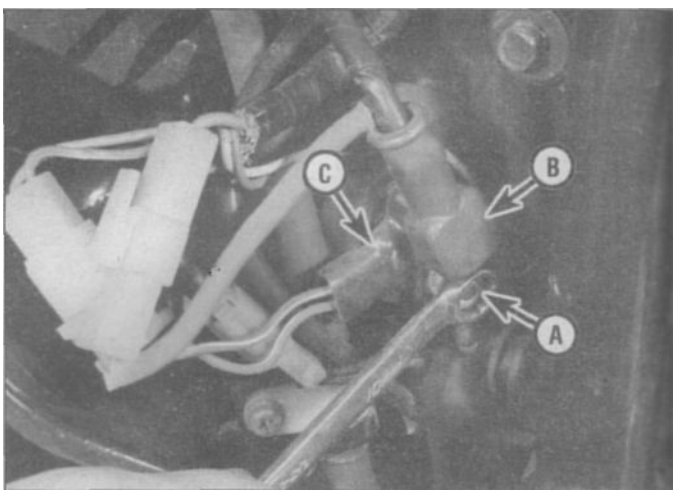
Check

Refer to illustration 21.1

1 Disconnect the electrical connectors from the horn **(see illustration).** Using two jumper wires, apply^battery voltage directly to the terminals on the horn. If the horn sounds, check the switch (see Section 17) and the wiring between the switch and the horn (see the wiring diagrams at the end of this Chapter).
2 If the horn doesn't sound, replace it.

Replacement

3 Unbolt the horn bracket from the frame **(see illustration 21.1**) and detach the electrical connectors.



22.4 Disconnect the cable that runs to the starter

A Cable to starter
B Cable from battery positive terminal
C Two-wire connector

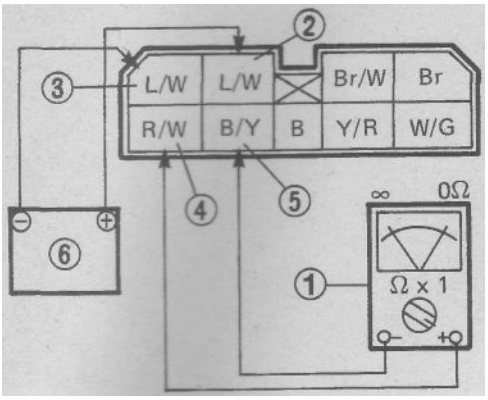
4 Unbolt the horn from the bracket and transfer the bracket to the new horn.
5 Installation is the reverse of removal.

22 Starter relay - check and replacement

Refer to illustration 22.4

Check

1 Remove the seat (see Chapter 7). Disconnect the battery negative cable.
2 Make sure the battery is fully charged and the relay wiring connections are clean and tight. Corrosion can build up enough to prevent current flow and still not be readily visible, so it's best to disconnect the cables from the terminals and give the cable ends and terminal studs a thorough cleaning. Also disconnect the two-wire connectors and clean the terminals.
3 Reconnect the wires to the starter relay.
4 **Warning:** *Make sure the transmission is in neutral for this step.* Pull back the protective cover and disconnect the cable that runs from the relay to the starter motor **(see illustration).** Connect a heavy-gauge jumper wire (the same gauge or heavier than the starter relay



23.2 Starting circuit cut-off relay test

1 *Ohmmeter*
2 *Blue/white terminal*
3 *Blue/white terminal*
4 *Red/white terminal (red/black on 1994 models)*
5 *Black/yellow terminal*
6 *12-volt battery*

cables) directly from the battery positive terminal to the disconnected end of the cable. Warning: *Make the connection at the battery first and at the cable last; sparks are likely to occur, and if they occur near the battery they could cause it to explode.*

a) If the starter motor cranks, the problem is somewhere in the starting circuit, possibly in the starter relay. Go to Step 5.
b) If the starter doesn't crank, remove and inspect it (see Sections 24 and 25).

5 If the starter cranks when the relay is bypassed, disconnect the two-wire connector **from** the relay **(see illustration 22.4).** Connect a jumper wire from the relay side of the red/white wire to the battery positive terminal. Connect another jumper wire from the blue/white wire to ground/earth (bare metal on the motorcycle frame).

a) If the relay clicks and the starter motor cranks, the relay is good. Test the cut-off relay (see Section 23) and check the starter circuit wiring for breaks or bad connections (see the Wiring diagrams at the end of the book).
b) If the relay doesn't click, it's probably bad. Replace it.

Replacement

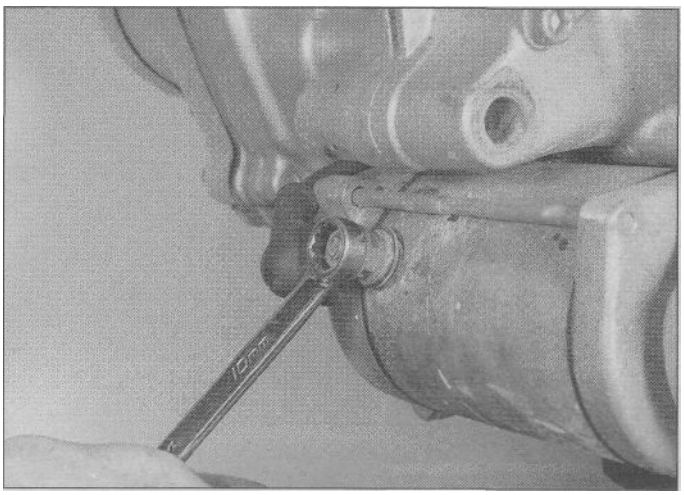
6 Disconnect the cable from the negative terminal of the battery.
7 Detach the battery positive cable, the starter cable and electrical connector from the relay **(see illustration 22.4).**
8 Slide the relay off its mounting tabs.
9 Installation is the reverse of removal. Reconnect the negative battery cable after all the other electrical connections are made.

23 Starting circuit cut-off relay - check and replacement

Check

Refer to illustration 23.2

1 Remove the right front side cover and locate the relay assembly **(see illustration 11.3).**
2 Connect an ohmmeter between the terminals in the relay that connect to the blue/white wires in the wiring harness **(see illustration).** The ohmmeter should show infinite resistance. **Note:** *The terminals in the relay are very close together. Use thin probes to make the ohmmeter connection.*
3 Set the ohmmeter aside and connect a 12-volt battery between the terminals for the black/yellow and red/white wires (black/yellow and red/black on 1994 models) in the relay **(see illustration 23.2).** The motorcycle's battery will work if it's charged. **Note:** *The terminals inside the relay are very close together. Use two wires with small insulated alligator clips at each end to connect the relay terminals to the battery. Make the last connection at the battery negative terminal.*
4 Reconnect the ohmmeter probes to the terminals for the blue-white wires. The ohmmeter should now show continuity (little or no resistance).
5 Disconnect and reconnect the battery (detach and reattach the alligator clip at the battery negative terminal). The ohmmeter should show continuity whenever the battery is connected and no continuity whenever it's disconnected. If not, replace the relay assembly.



24.2 Remove the nut and disconnect the cable

Replacement

6 Remove the right front side cover if you haven't already done so (see Chapter 7).
7 Disconnect the relay assembly's wiring connector **(see illustration 11.3).** Slip the relay assembly off its mounting tabs.
8 Installation is the reverse of the removal steps.

24 Starter motor - removal and installation

Refer to illustration 24.2

Removal

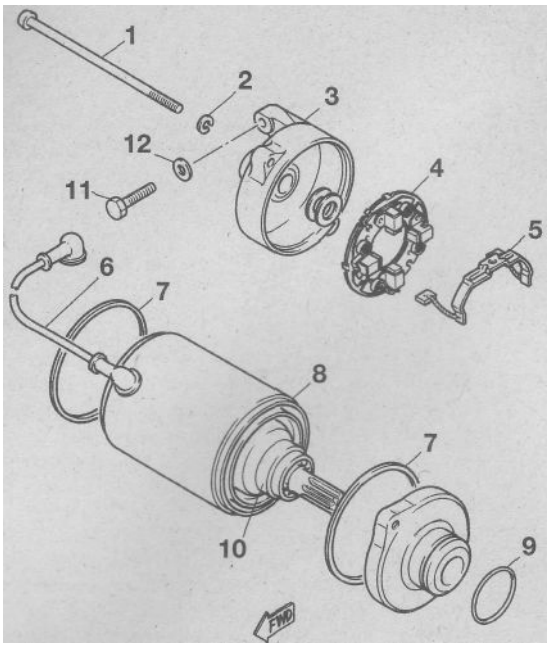
1 Disconnect the cable from the negative terminal of the battery.
2 Pull back the rubber cover, remove the nut retaining the starter cable to the starter and disconnect the cable **(see illustration).**
3 Remove the starter mounting bolts.
4 Lift the end of the starter up a little bit and slide the starter out of the engine case.
5 Check the condition of the. O-ring on the end of the starter and replace it if necessary. Also check the starter pinion gear and the driven gear inside the engine for chipped or worn teeth.

Installation

6 Apply a little engine oil to the O-ring and install the starter by reversing the removal probedure. Tighten the starter mounting bolts to the torque listed in this Chapter's Specifications.

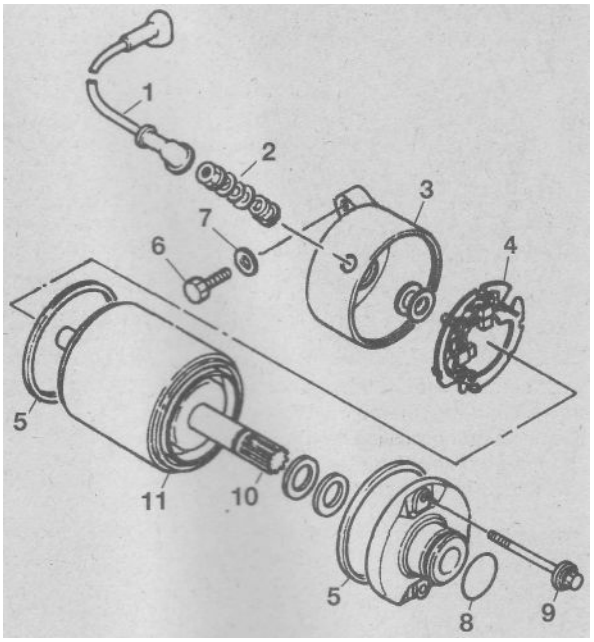
25 Starter motor - disassembly, inspection and reassembly

1 Remove the starter motor (see Section 24).



25.2 Four-brush starter motor - exploded view

1	*Through-bolt*	6	*Cable*
2	*Lockwasher*	7	*O-rings*
3	*Brush end cover*	8	*Starter housing*
4	*Brush plate*	9	*O-ring*
5	*Plastic brush housing*	10	*Armature*



25.5 Two-brush starter - exploded view

1	*Cable*	7	*Washer*
2	*Terminal nuts and washers*	8	*O-ring*
3	*Brush end cover _,*	9	*Through-bolt*
4	*Brush plate*	10	*Armature*
5	*O-ring*	11	*Starter housing*
6	*Mounting bolt*		

Disassembly

Four-brush starter

Refer to illustration 25.2

2 Mark the position of the housing to each end cover. Remove the two through-bolts and their lockwashers and detach both end covers **(see illustration).**

3 Remove the nut and push the terminal bolt through the starter housing, then reinstall the washers and nut on the bolt so you don't forget how they go. Pull the armature out of the housing and remove the brush plate.

4 Remove the two brashes with the plastic holder from the housing.

Two-brush starter

Refer to illustration 25.5

5 Mark the position of the housing to each end cover. Remove the two through-bolts and detach both end covers **(see illustration).**

6 Remove the shims and brush plate from the brush housing after the terminal bolt nut and washers have been removed - note he exact order of the washers.

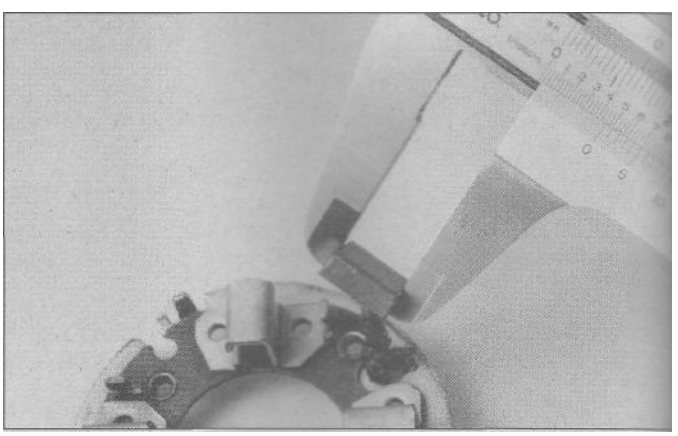
7 Pull the armature out of the housing (toward the pinion gear side).

Inspection

Refer to illustrations 25.8, 25.9, 25.10a, 25.10b, 25.11, 25.12 and 25.18

8 The parts of the starter motor that most likely will require attention are the brushes. Measure the length of the brushes and compare the results to the brush length listed in this Chapter's Specifications **(see illustration).** If any of the brushes are worn beyond the specified limits, replace the brush holder assembly with a new one. If the brushes are not worn excessively, cracked, chipped, or otherwise damaged, they may be re-used.

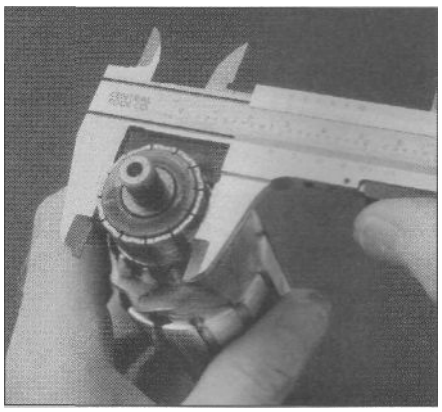
9 Inspect the commutator **(see illustration)** for scoring, scratches



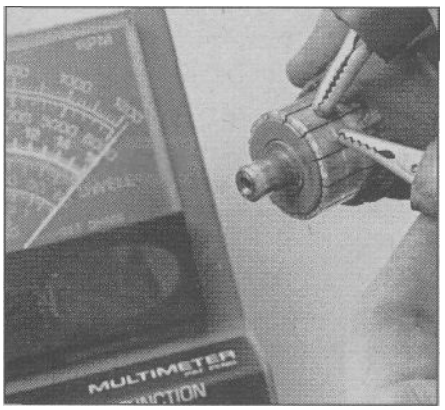
25.8 Measure the length of **the brushes and compare the length of the shortest brush with the length listed in this Chapter's Specifications (four-brush starter shown; twp-brush model similar)**

and discoloration. The commutator can be cleaned and polished with crocus cloth, but do not use sandpaper or emery paper. After cleaning wipe away any residue with a cloth soaked in an electrical system cleaner or denatured alcohol. Measure the commutator diameter and compare it to the diameter listed in this Chapter's Specifications. If it is less than the service limit, the motor must be replaced with a new one

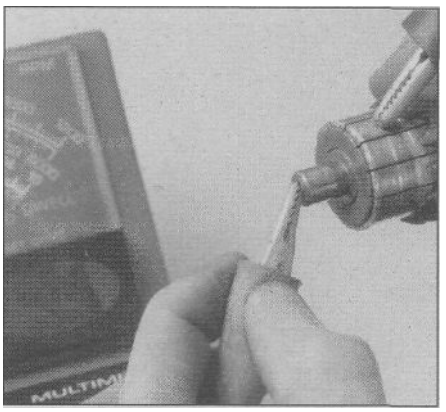
10 Using an ohmmeter or a continuity test light, check for continuity between the commutator bars **(see illustration).** Continuity should exist between each bar and all of the others. Also, check for continuity between the commutator bars and the armature shaft **(see illustration).** There should be no continuity between the commutator and the shaft. If the checks indicate otherwise, the



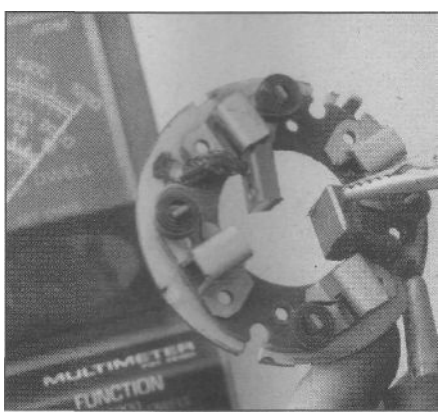
25.9 Check the commutator for cracks and discoloring, then measure **the diameter and** compare **it with the minimum** diameter listed **in this Chapter's Specifications**



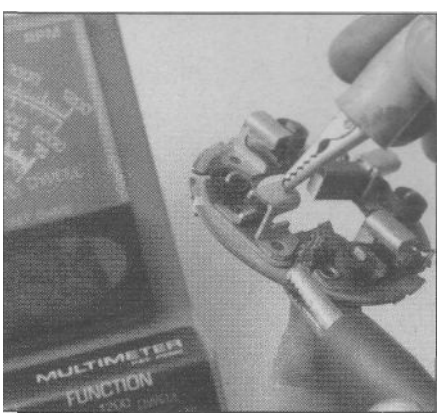
25.10a Continuity should exist between the commutator bars



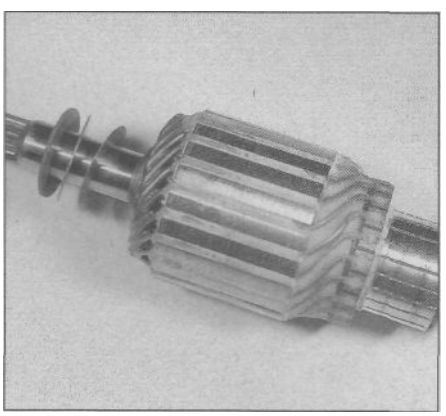
25.10b There should be no continuity between the commutator bars and the armature shaft



25.11 There should be almost no resistance (0 ohms) **between the brushes and the brush plate**



25.12 There should be no continuity between the brush plate and the brush holders (the resistance reading should be infinite)



25.18 Be sure the shims and washers are in place on both ends of the armature shaft

armature is defective.

11 Check for continuity between the brush plate and the brushes **(see illustration).** The meter should read close to 0 ohms. If it doesn't, the brush plate has an open and must be replaced.

12 Using the highest range on the ohmmeter, measure the resistance between the brush holders and the brush plate **(see illustration).** The reading should be infinite. If there is any reading at all, replace the brush plate. <

13 Check the starter pinion gear for worn, cracked, chipped and broken teeth. If the gear is damaged or worn, replace the starter motor.

Reassembly

Four-brush starter

14 Install the plastic brush holder into the housing. Make sure the terminal bolt and washers are assembled in their original order. Tighten the terminal nut securely.

15 Detach the brush springs from the brush plate (this will make armature installation much easier). Install the brush plate into the housing, routing the brush leads into the notches in the plate. Make sure the tongue on the brush plate fits into the notch in the housing.

16 Install the brushes into their holders and slide the armature into place. Install the brush springs.

Two-brush starter

17 Reinstall the brush plate in the end housing **(see illustration 25.5).**

All models

18 Install any washers that were present on the end of the armature shaft **(see illustration).**

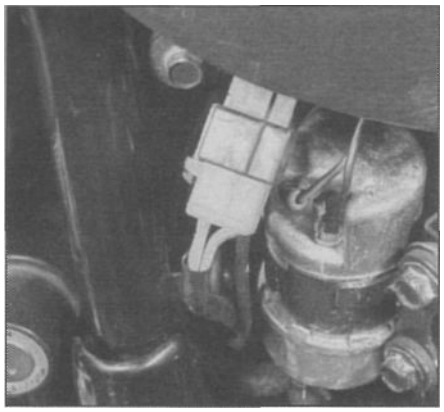
19 Install the end covers, aligning the previously applied match marks (be sure to install the large O-rings between the starter housing and end covers). Install the O-rings and washers (if equipped) on the two through-bolts, then install the through-bolts and tighten them securely.

26 Charging system testing - general information and precautions

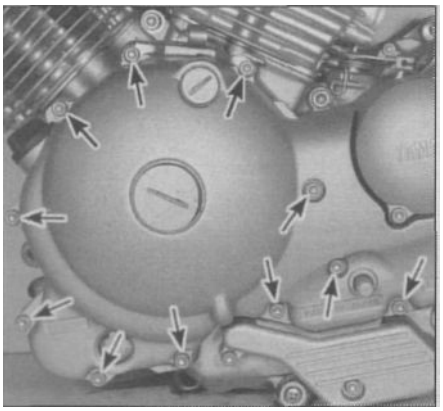
1 If the performance of the charging system is suspect, the system as a whole should be checked first, followed by testing of the individual components (the alternator and the voltage regulator/rectifier). **Note:** *Before beginning the checks, make sure the battery is fully charged and that all system connections are clean and tight.*

2 Checking the output of the charging system and the performance of the various components within the charging system requires the use of special electrical test equipment. A voltmeter or a multimeter are the absolute minimum tools required. In addition, an ohmmeter is generally required for checking the remainder of the system.

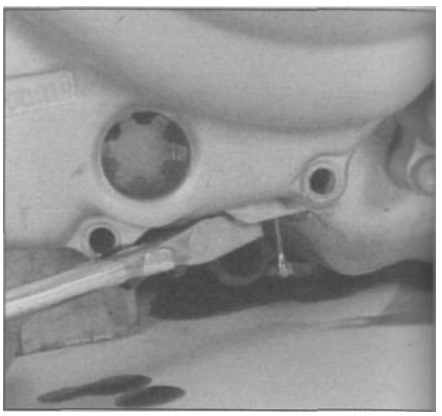
3 When making the checks, follow the procedures carefully to prevent incorrect connections or short circuits, as irreparable damage to electrical system components may result if short circuits occur.



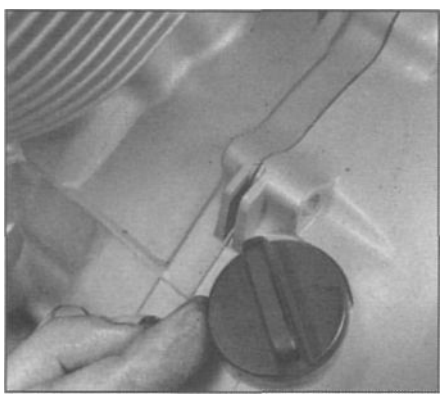
27.7 Measure stator coil resistance between 1 and 2,1 and 3, then 2 and 3



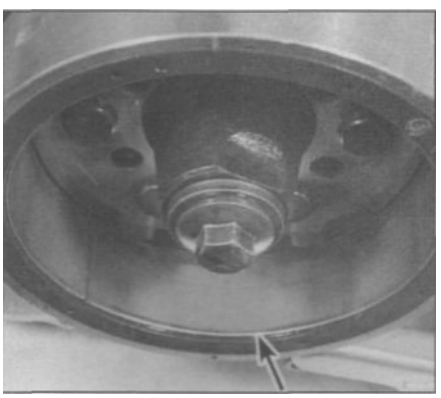
28.1a Remove **the cover bolts (arrows)...**



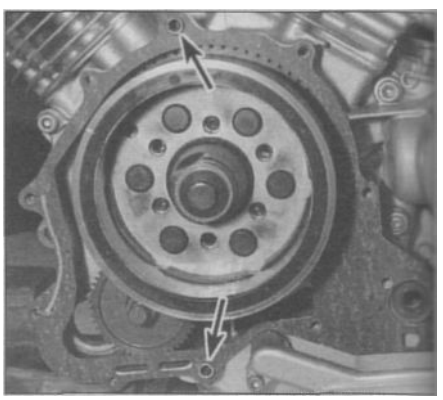
28.1b ... and pry gently at the pry points (not between the gasket surfaces); there **: one at the bottom ...**



28.1c ... **and another at the top**



28.3 Be sure there are no metal fragments stuck to the rotor magnets (arrow)



28.4 **Slip a new gasket over the dowels (arrows)**

Because of the special tools and expertise required, it is recommended that the job of checking the charging system be left to a dealer service department or a reputable motorcycle repair shop.

27 Charging system - output test

Refer to illustration 27.7

Caution: *Never disconnect the battery cables from the battery while the engine is running. If the battery is disconnected, the alternator and regulator/rectifier will be damaged.*

1 To check the charging system output, you will need a voltmeter or a multimeter with a voltmeter function.

2 The battery must be fully charged (charge it from an external source if necessary) and the engine must be at normal operating temperature to obtain an accurate reading.

3 Attach the positive (red) voltmeter lead to the positive (+) battery terminal and the negative (black) lead to the battery negative (-) terminal. The voltmeter selector switch (if equipped) must be in a DC volt range greater than 15 volts.

4 Start the engine.

5 The charging system output should be within the range listed in this Chapter's Specifications.

6 Follow the wiring harness from the upper side of the alternator cover (on the left side of the engine) to the electrical connector and disconnect the connector.

7 Connect an ohmmeter between each pair of terminals in the connector (the side that runs back to the alternator, not the wiring harness side) (see illustration). Note the reading.

8 If the reading is not within the range listed in this Chapter's Specifications, replace the stator (see Section 28).

9 If the reading is within the Specifications, refer to the wiring diagrams at the end of the book and check the charging circuit for breaks or poor connections. If the wiring is good, replace the regulator/rectifier (see Section 28).

28 Alternator cover, stator, rotor and regulator/rectifier - removal and installation

Cover

Refer to illustrations 28.1a, 28.1b, 28.1c, 28.3, 28.4 and 28.5

1 Loosen the alternator cover mounting bolts evenly in a criss-cross pattern and remove the cover (see illustrations).

2 Clean all traces of old gasket sealer from the cover and its mating surface on the engine.

3 Make sure there are no metal particles stuck to the rotor magnets (see illustration).

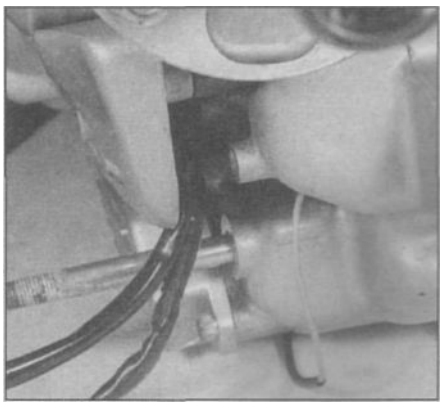
4 Position a new gasket over the dowels (see illustration).

5 Guide the wiring harnesses through the opening at the back of the cover (see illustration). Install the cover and tighten the Allen bolts evenly, in a criss-cross pattern, to the torque listed in this Chapter's Specifications.

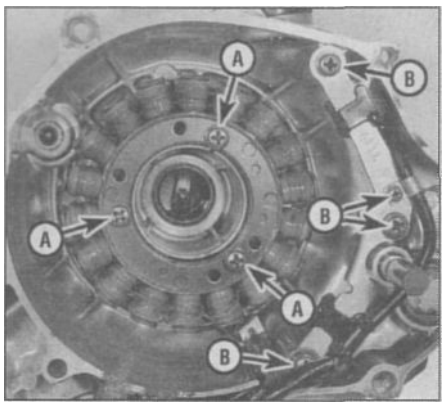
Stator

Refer to illustration 28.7

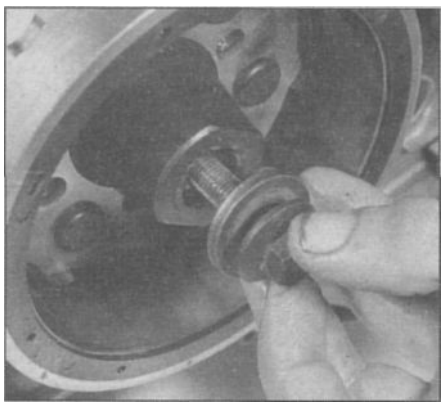
6 Remove the alternator cover as described above.



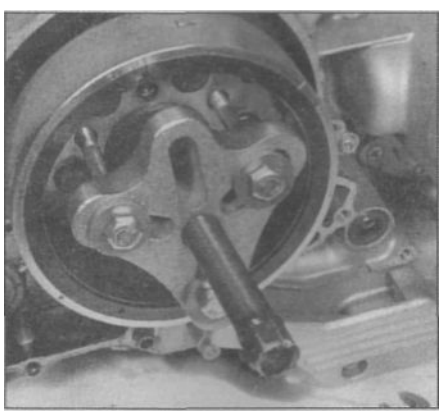
28.5 Guide the wiring harness out through the back of **the** cover



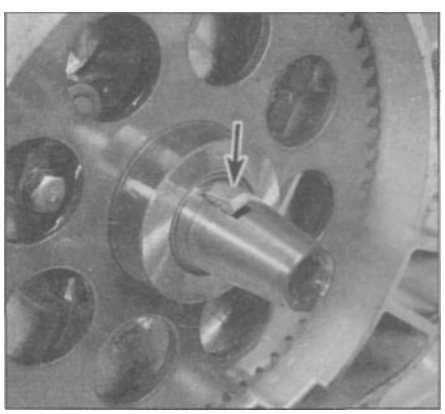
28.7 Remove the screws (A) to detach the stator; the other screws (B) secure the ignition pick-up coil and its wiring harness



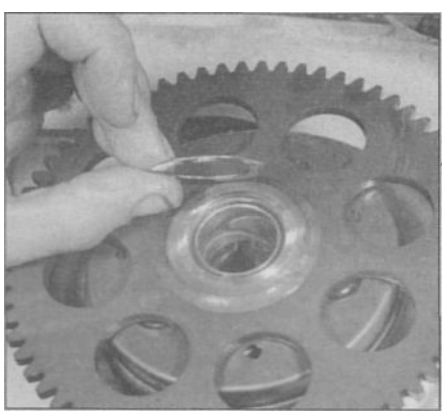
28.10 Loosen the rotor bolt with a socket, then unscrew the bolt and remove the washer



28.11a Use a tool like **this one to separate the rotor from the crankshaft.**



28.11 b . . . then take the rotor off and lift the Woodruff key (arrow) out of its slot



28.11c If you remove the starter driven gear, be sure to reinstall the thrust washer behind it

7 Remove the stator screws and take the stator out **(see illustration).**

8 Installation is the reverse of the removal steps. Tighten the stator screws securely.

Rotor

Refer to illustrations 28.10, 28.11a, 28.11b and 28.11c

9 Remove the alternator cover as described above.

10 Shift the transmission into gear and have an assistant apply the rear brake. Remove the rotor bolt and washer **(see illustration).**

11 Thread a rotor puller such as Yamaha tool no. YM-01080 (part no. 90890-01080) into the rotor **(see illustration).** Remove the rotor from the end of the crankshaft and take the Woodruff key out of its slot **(see illustration).** If necessary, slide the starter driven gear off the crankshaft and remove its thrust washer **(see illustration).**

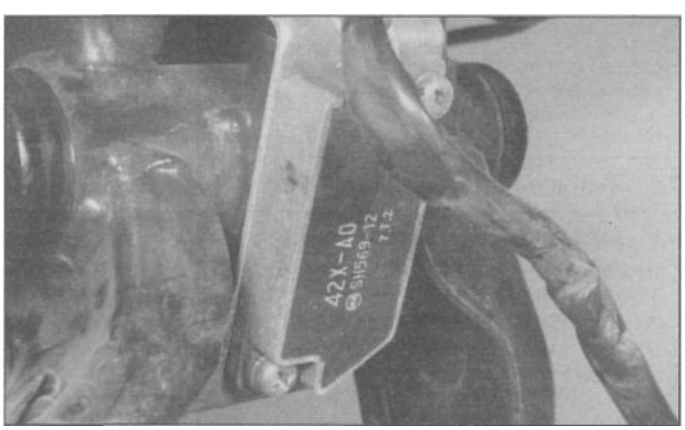
12 Installation is the reverse of the removal steps. Be sure to reinstall the Woodruff key. **Caution:** *Make sure no metal objects have stuck to the magnets inside the rotor. Tighten the rotor bolt to the torque listed in this Chapter's Specifications.*

Regulator/rectifier

Refer to illustration 28.13

13 On 1987 and 1988 models, the regulator/rectifier unit is mounted on the rear underside of the frame **(see illustration).** On 1989 and later models, it is retained to the inside of the finned cover, just to the rear of the lower left frame cover.

14 Follow the wiring harness from the regulator/rectifier to the connector. Disconnect the electrical connector and remove the regulator/rectifier mounting screws.



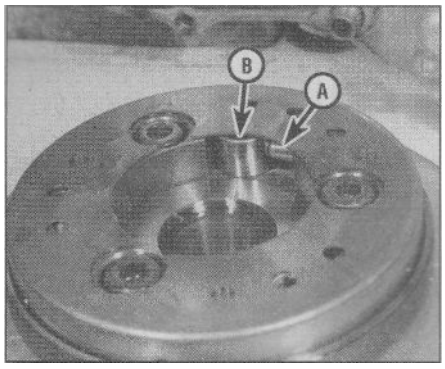
28.13 The regulator/rectifier on early models is mounted on the lower rear portion of the frame

15 Installation is the reverse of the removal steps. On later models, one of the mounting screws secures a ground/earth wire.

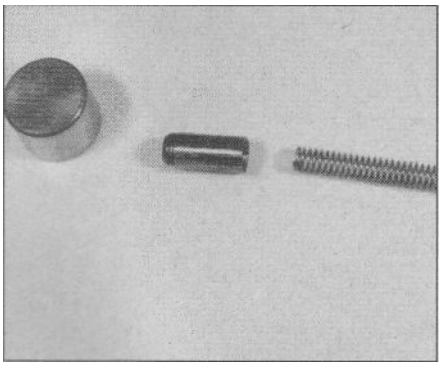
29 Starter clutch - removal, inspection and installation

Refer to illustrations 29.3a, 29.3b and 29.6

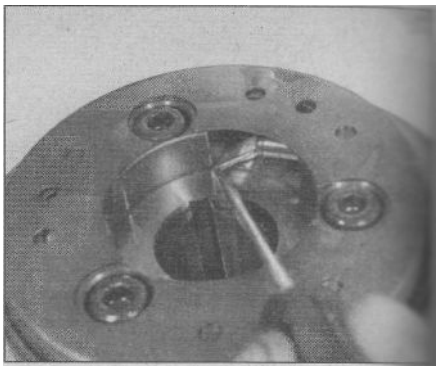
1 Remove the alternator rotor (see Section 28) and turn it over. Pull the starter idler gear and its shaft out of the engine case, then take the large starter driven gear and its washer off the end of the crankshaft.



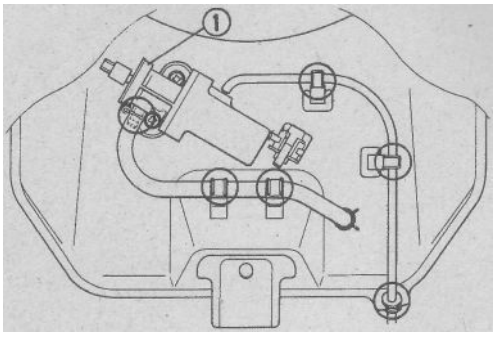
29.3a Compress the pin and spring (A) and remove the roller (B)...



29.3b ... then remove the pin and spring from their bore



29.6 Press the pin and spring into their bore with a pointed tool and install the roller



30.2 Free the wiring harness and hose, remove the screws and remove the fuel tap (1) from the tank

2 Place the large starter driven gear in the starter clutch and try to turn it. It should turn freely in one direction and not at all in the other. If it turns both ways or neither way, remove the idler gear and disassemble the starter clutch for inspection.

3 Compress the pin against its internal spring with a pointed tool and take out the roller (see illustration). Remove the pin and spring (see illustration).

4 Remove the remaining two pins, rollers and springs in the same way.

5 Check all parts for wear and damage and replace parts with these conditions. If the starter clutch needs to be replaced, unstake the ends of its three bolts inside the alternator rotor and unscrew them to separate the starter clutch body from the rotor. Position the new starter clutch on the rotor and apply non-permanent thread locking agent to the threads of the bolts. Install the bolts, tighten them to the torque listed in this Chapter's Specifications and stake their ends on the inside of the rotor.

6 Position the spring inside one of the pins. Place the spring and pin in their bore, compress the pin against the spring with a pointed tool (see illustration) and install the roller.

7 Install the remaining springs, pins and rollers in the same way.

8 The remainder of installation is the reverse of the removal steps. When installing the starter driven gear, don't forget to install the thrust washer first (see illustration 28.11c).

30 Fuel tap solenoid (1989 and later models) - removal, testing and installation

Refer to illustration 30.2

1 Remove the main fuel tank (see Chapter 3). Pour the fuel into an approved container.

2 Free the wiring harness and hose from their clips, remove the screws and detach the fuel tap from the tank **(see illustration)**.

3 Disconnect the hose from the fuel nozzle and connect a length of clean rubber hose in its place.

4 Turn the fuel tap lever to On and try to blow air into the hose. It should go through. If it doesn't, replace the fuel tap.

5 Connect a 12-volt battery (the motorcycle's battery will work) to the solenoid wire terminals (positive to black/yellow; negative to black. Try to blow air into the hose again. It shouldn't be possible with the battery connected to the solenoid. If air will go through, replace the solenoid.

31 Carburetor heater (1994 UK models) - testing

1 Follow the wiring harness from the heater unit at the carburetor assembly to the thermoswitch (it can be identified by its wire color). Remove the thermoswitch from the wiring harness.

2 Immerse the thermoswitch in a container of water (suspend it so it doesn't touch the sides or bottom of the container).

3 Connect an ohmmeter to the thermoswitch wires and heat the water. Note the ohmmeter readings as the water heats, then cools down.

a) Zero to 17+1- 5-degrees C (32 to 63 +/- 9-degrees F) - continuity (little or no resistance)
b) 17 +/- 5 to 70-degrees C (63 +/- 9 to 158-degrees F) - no continuity (infinite resistance)
c) 70 to 11 +/- 3-degrees C (158 to 52 +/- 5-degrees F) - no continuity
d) Less than 11 +/- 3-degrees C (52 +/- 5-degrees F) - continuity

4 If the thermoswitch doesn't give the readings described, replace it.

5 Disconnect the wiring from the heater unit at the carburetor assembly. Connect an ohmmeter to the terminal on the heater unit note the reading and compare it to the value listed in this Chapter's Specifications. If the resistance reading is not with the specified range replace the heater unit.

32 Wiring diagrams

Prior to troubleshooting a circuit, check the fuses to make sure they're in good condition. Make sure the battery is fully charged and check the cable connections.

When checking a circuit, make sure all connectors are clean, with no broken or loose terminals or wires. When unplugging a connector don't pull on the wires - pull only on the connector housings themselves.

Refer to the table in Chapter 9 for the wire color codes.

Chapter 8 Part B
Electrical system (XV700-1100 models)

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Specifications

Battery type

XV700, XV750	12 V, 16 Ah
XV920, XV1000, XV1100	12 V, 20 Ah
Fuse specifications	
1981 through 1983 models	
Main	
XV920J, K, MX, TR1	30 amps
All others	20 amps
Headlamp	15 amps
Tail/brake lights	10 amps
Turn signals	15 amps
Ignition	10 amps

1984 and 1985 models
- Main ..... 20 amps
- Headlight ..... 15 amps
- Turn signals ..... 15 amps
- Ignition ..... 10 amps
- Tail/brake lights ..... 10 amps

1986 and later models
- Main ..... 30 amps
- Headlight ..... 15 amps
- Turn signals ..... 15 amps
- Ignition ..... 10 amps
- Tail/brake lights ..... 10 amps

Charging system

Statorcoil resistance ..... 0.5 ohms+/ 10 percent at 20-degrees C (68-degrees F)
Charging system output ..... 14.3 to 15.3 volts at 2,000 rpm

Starter

Starter commutator diameter
- Standard ..... 28 mm (1.1 inch)
- Minimum ..... 27 mm (1.06 inch)
- Mica undercut ..... 0.5 mm (0.02 inch)

Starter brush length
- Standard ..... 12.5-1-/- 5 mm (0.492 +/- 0.02 inch)
- Minimum ..... 5.5 mm (0.217 inch)

Starter clutch spring clip turning force
- Idle gear ..... 2.2 to 2.5 kg (4.9 to 5.5 lbs)
- Starter gear ..... 2.0 to 2.3 kg (4.4 to 5.1 lbs)

Bulb specifications (1981 through 1983 models)

Headlight 60/55W
Tail/brake lights
- TR1 ..... 5/21W
- All others 8/27W

Turn signals
- TR1 ..... 21W
- All others 27W

Running light (XV920J only) 8W
License plate light
- XV750, XV920 K, MK 8W
- XV920J 3.8W

Warning lights 3.4W
Pilot light (UK only) 3.4W

Bulb specifications (1984 and later US models)

Headlight 60/55W
Tail/brake lights 8/27W
Turn signals/running lights 27W
Instrument and warning lights 4W

Bulb specifications (1984 and later UK models)

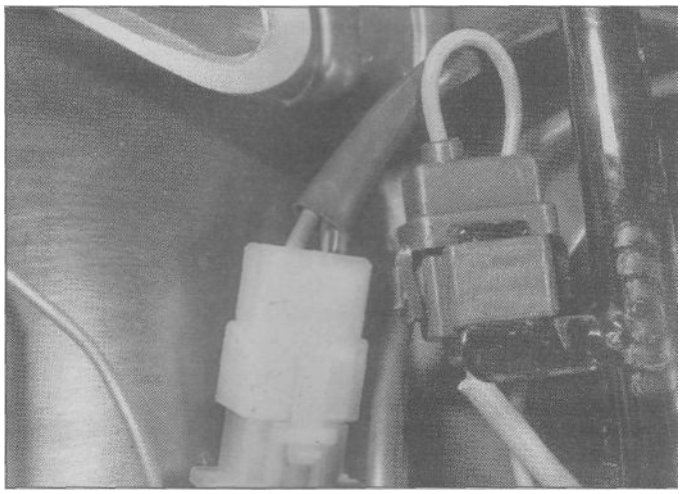
Headlight 60/55W
Tail/brake lights 5/21W
Parking light 4W
Turn signals 21W
Instrument and warning lights 3W

Torque specifications

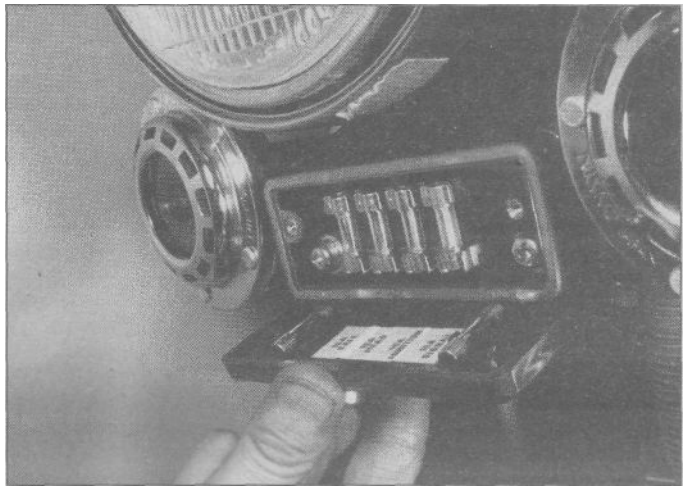
Alternator rotor nut
- 1981 through 1983 models ..... 155 Nm (112 ft-lbs)
- 1984 and later models ..... 175 Nm (125 ft-lbs)

Alternator cover bolts ..... 7 Nm (5.1 ft-lbs)
Starter mounting bolts ..... 10 Nm (7.2 ft-lbs)
Starter solenoid nuts ..... 8 Nm (5.8 ft-lbs)*
Drive lever cover bolts ..... 10 Nm (7.2 ft-lbs)
Drive lever collar screw ..... 10 Nm (7.2 ft-lbs)*

**Apply non-permanent thread locking agent to the threads.*
***Apply non-permanent thread locking agent to the threads and stake the bolts.*



5.1 The main fuse is **located beneath the seat; separate the halves of** the fuse **holder to expose the fuse**



5.2 The accessory fuse block on 1981 through 1983 models is behind a cover on the front of the lower triple clamp

1 General information

The machines covered by this manual are equipped with a 12-volt electrical system.

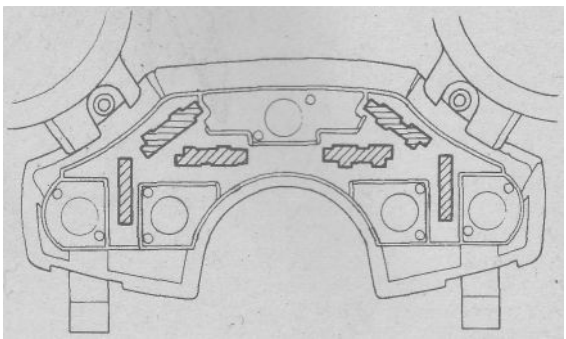
The charging system models uses a rotor with permanent magnets that rotates around a stator coil of copper wire. This produces alternating current, which is converted to direct current by the regulator/rectifier. The regulator/rectifier also controls the charging system output..

An electric starter mounted to the front of the engine is standard equipment. The starter on all models has two brushes and uses reduction gears. The starting system includes the motor, the battery, the relay and the various wires and switches. If the engine kill switch and the ignition (main key) switch are both in the On position, the circuit relay allows the starter motor to operate only if the transmission is in Neutral (Neutral switch on) or the clutch lever is pulled to the handlebar (clutch switch on) and, on all US models and later UK models, the sidestand is up (sidestand switch on).

Note: Keep *in mind that electrical parts, once purchased, can't be returned. To avoid unnecessary expense, make very sure the faulty component has been positively identified before buying a replacement part.*

2 Electrical troubleshooting

This is the same as for XV535 models. Refer to Part B of this Chapter.



5.3 The accessory fuse block on 1984 and later models is beneath the warning light panel

3 Battery - inspection and maintenance

These procedures are the same as for XV535 models, except that the XV920J has a long-life battery. This battery has a single filler hole for the electrolyte and a sensor that indicates electrolyte level and activates a warning light on the instrument panel when it drops too low.

If the sensor isn't working properly, put on eye protection and rubber gloves and remove,. Jt from the battery. Clean the sensor thoroughly with water, then sand any corrosion from its surface and reinstall it. **Warning:** *Battery electrolyte is diluted sulfuric acid. It can cause burns and eye injury. Don't let it touch your skin.*

4 Battery - charging

This is the same as for XV535 models. Refer to Part A of this Chapter.

5 Fuses - check and replacement

Refer to illustrations 5.1, 5.2 and 5.3

1 The main fuse on all XV700 through 1100 models is located beneath the seat **(see illustration).**

2 The fuse block on 1981 through 1983 models is behihd a cover on the lower triple clamp **(see illustration).**

3 The fuse block on 1984 and later models is located under the warning light panel **(see-illustration).**

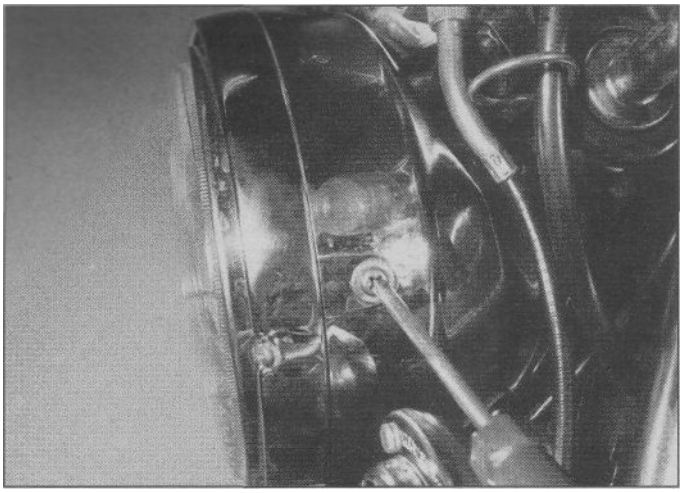
4 The fuse block contains spare fuses and accessory fuses. Fuse functions and ratings are listed in this Chapter's Specifications. Fuse ratings are marked on the fuses.

5 If you have a test light, the accessory fuses can be checked without removing them. Turn the ignition key to the On position, connect one end of the test light to a good ground, then probe each terminal on top of the fuse. If the fuse is good, there will be voltage available at both terminals. If the fuse is blown, there will only be voltage present at one of the terminals.

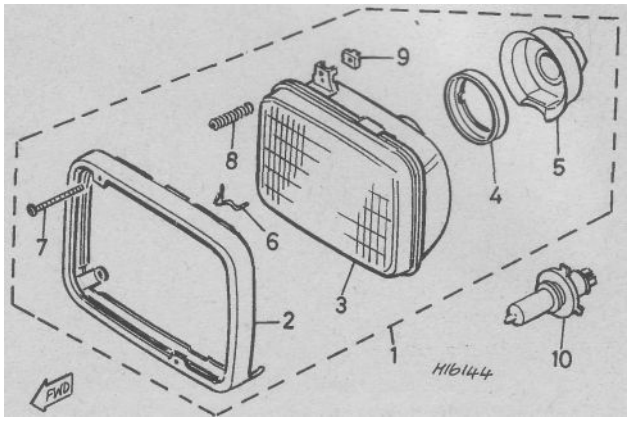
6 The fuses' can also be tested with an ohmmeter or self-powered test light. Remove the fuse and connect the tester to the ends of the fuse. If the ohmmeter shows continuity or the test lamp lights, the fuse is good. If the ohmmeter shows infinite resistance or the test lamp stays out, the fuse is blown.

7 The fuses can be removed and checked visually. If you can't pull the fuse out with your fingertips, use a pair of needle-nose pliers. A blown fuse is easily identified by a break in the element.

8 If a fuse blows, be sure to check the wiring harnesses very



7.1a Remove the headlight cover screws .



7.1b . . . on XV920J models, don't confuse them with the adjuster screws

1	*Headlamp assembly*	*6*	*Spring clip*
2	*Rim*	*7*	*Adjusting screw*
3	*Reflector*	*8*	*Spring*
4	*Bulb retaining ring*	*9*	*Nut*
5	*Cover*	*10*	*Headlamp bulb*

carefully for evidence of a short circuit. Look for bare wires and chafed, melted or burned insulation. If a fuse is replaced before the cause is located, the new fuse will blow immediately.

9 Never, under any circumstances, use a higher rated fuse or bridge the fuse block terminals, as damage to the electrical system could result.

10 Occasionally a fuse will blow or cause an open circuit for no obvious reason. Corrosion of the fuse ends and fuse block terminals may occur and cause poor fuse contact. If this happens, remove the corrosion with a wire brush or emery paper, then spray the fuse end and terminals with electrical contact cleaner.

6 Lighting system - check

1 The battery provides power for operation of the headlight, taillight, brake light, license plate light, instrument and warning lights. If none of the lights operate, always check battery voltage before proceeding. Low battery voltage indicates either a faulty battery, low battery electrolyte level or a defective charging system. Refer to Chapter 1 for battery checks and Sections 26 and 27 for charging system tests. Also, check the condition of the fuses and replace any blown fuses with new ones.

Headlight

2 If the headlight is out when the engine is running (US models) or it won't switch on (UK models), check the fuse first with the key or switch On (see Section 5), then unplug the electrical connector for the headlight and use jumper wires to connect the bulb directly to the battery terminals (see Section 7). If the light comes on, the problem lies in the wiring or one of the switches in the circuit. Refer to Section 17 for the switch testing procedures, and also the wiring diagrams at the end of this Chapter.

Taillight/licenseplatelight

3 If the taillight fails to work, check the bulbs and the bulb terminals first, then check for battery voltage at the taillight electrical connector. If voltage is present, check the ground/earth circuit for an open or poor connection.

4 If no voltage is indicated, check the wiring between the taillight and the ignition switch, then check the switch. On UK models, check the lighting switch as well.

Brakelight

5 See Section 12 for the brake light switch checking procedure.

Neutralindicatorlight

6 If the neutral light fails to operate when the transmission is in Neutral and the key switch is On, check the fuses and the bulb (see Section 14 for bulb removal procedures). If the bulb and fuses are in good condition, check for battery voltage at the connector attached to the neutral switch on the left side of the engine. If battery voltage is present, refer to Section 18 for the neutral switch check and replacement procedures.

7 If no voltage is indicated, check the wiring between the switch and the bulb for open circuits and poor connections.

7 Headlight bulb - replacement

Refer to illustrations 7.1a, 7.1b, 7.1c, 7.2a, 7.2b and 7.5

Warning: *If the bulb has just burned out, allow it to cool. It will be hot enough to burn your fingers.*

1 Remove the headlight cover screws **(see illustrations).** Tilt the cover forward out of the headlight assembly and disconnect the electrical connector **(see illustration).**

2 On models so equipped, turn the bulb retainer counterclockwise (anti-clockwise) **(see illustration).** Remove the bulb **(see illustration).**

3 On models with a wire bulb retainer, unclip the retainer and remove the bulb.

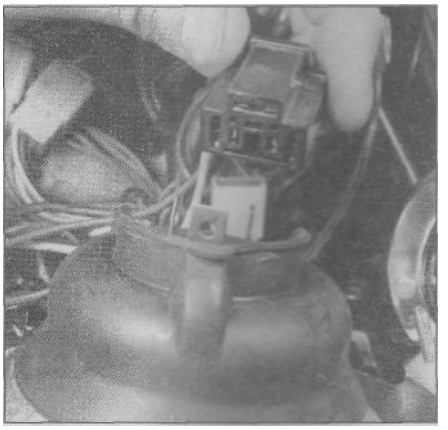
4 When installing the new bulb, reverse the removal procedure. Be sure not to touch the bulb glass with your fingers - oil from your skin will cause the bulb to overheat and fail prematurely. If you do touch the bulb, wipe it off with a clean rag dampened with rubbing alcohol.

5 The parking light bulb holder (auxiliary light) on UK models is either a push fit in the grommet set in the rear of the reflector or has a bayonet-type socket **(see illustration).** Access may be possible via the cutout in the headlight housing, but if not remove the headlight as described in Step 1. Twist the bulb counterclockwise (anti-clockwise) to release it from its bulb holder.

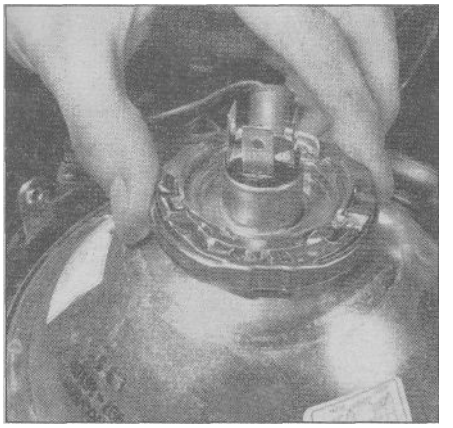
8 Headlight aim - check and adjustment

1 An improperly adjusted headlight may cause problems for oncoming traffic or provide poor, unsafe illumination of the road ahead. Before adjusting the headlight, be sure to consult with local traffic laws and regulations.

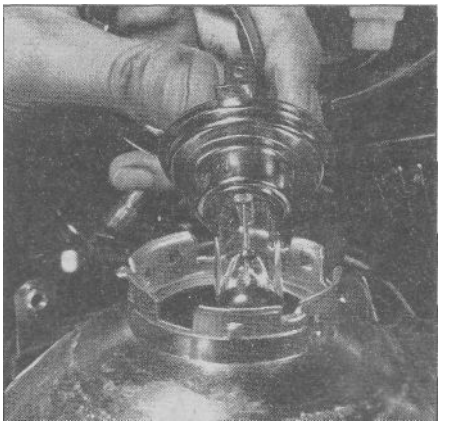
2 The headlight beam can be adjusted both vertically and horizontally. Before performing the adjustment, make sure the fuel tank is at least half full and have an assistant sit on the seat.



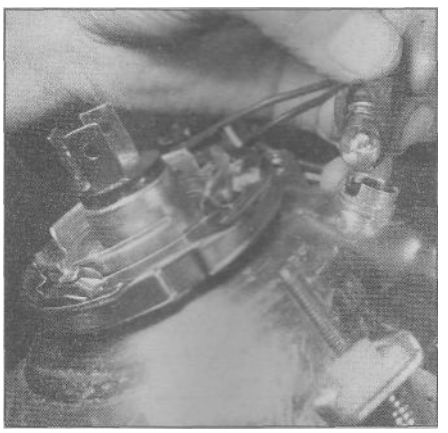
7.1c Tilt the headlight cover **forward, remove the rubber** dust **cover and unplug the connector**



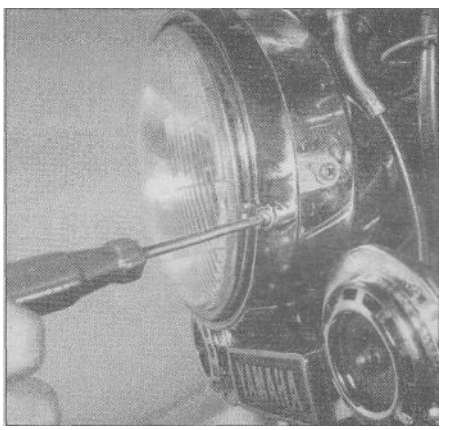
7.2a If the headlight bulb is secured by a retainer ring, turn it counterclockwise (anti-clockwise) arid remove it . . .



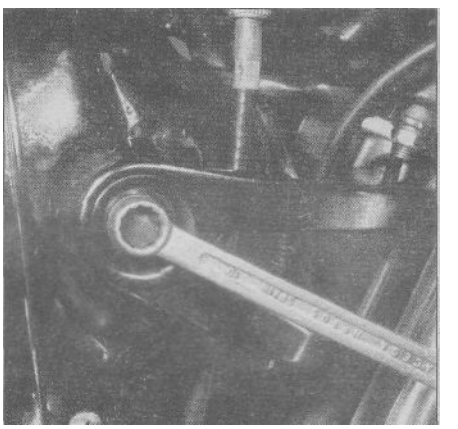
7.2b . . . then lift out the bulb (but make sure it has cooled first)



7.5 UK models have a **parking light bulb in the headlight reflector**



8.3 Horizontal adjustment is controlled by a screw



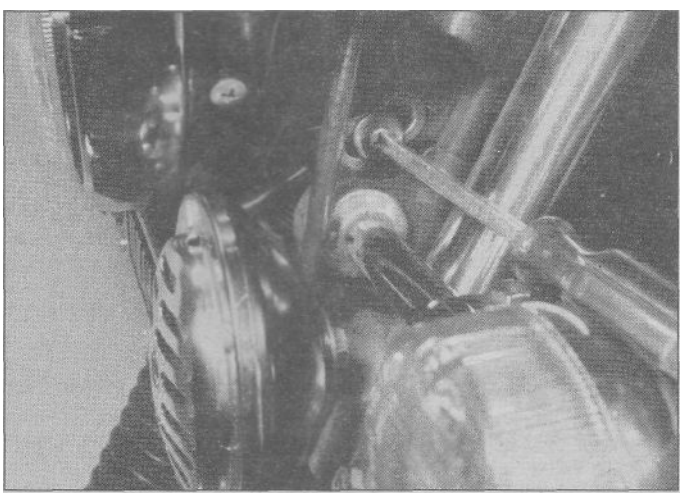
8.5a To make vertical adjustments on chain drive models, loosen the mounting bolts . . .

1981through1983models

Refer to illustrations 8.3. 8.5a and 8.5b

3 Turn the Phillips screw to change horizontal adjustment **(see illustration 7.1b or the accompanying illustration).**

4 If you're working on an XV920J model, turn the adjusting screw in the lower edge of the retaining ring to change vertical adjustment.



8.5b . . . **and the securing screw, then tilt the headlight assembly as needed and retighten the fasteners**

5 If you're working on an XV920 RH or RJ or a TR1, loosen the mounting bolts and securing screw, then pivot the headlight assembly to change vertical adjustment **(see illustrations).**

6 If you're working on an XV750 or XV920 K or MK, loosen the securing screw at the bottom of the headlight assembly and use the pivot at the top of the assembly to change headlight adjustment.

1984andlatermodels

7 The horizontal adjusting screw is at the upper left of the headlight cover. The vertical adjusting screw is located at the lower right. Turn the screws to change adjustment as needed.

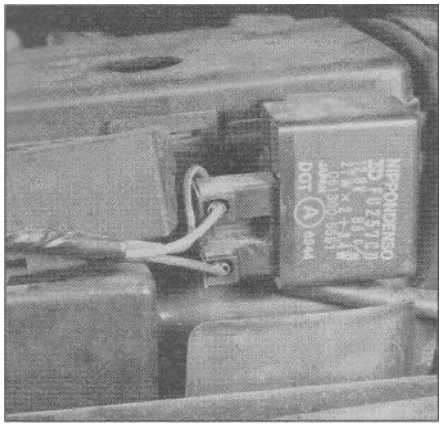
9 Headlight assembly - removal and installation

1981through1983models

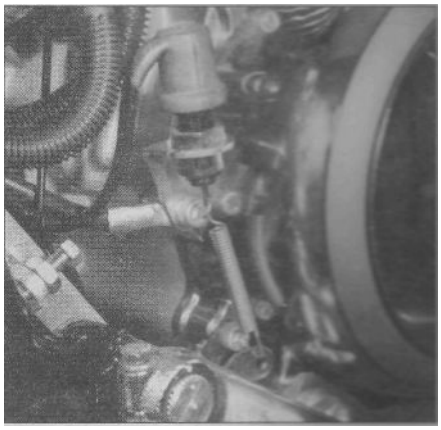
1 Remove the headlight cover (see Section 7). If you're planning to take the headlight assembly completely off the motorcycle, disconnect any electrical connectors inside the headlight assembly.

2 If you're working on an XV750, XV920K or XV920MK, Remove the two mounting bolts, collars and grommets that secure the headlight assembly brackets. Remove the pivot bolt at the top of the headlight assembly and take the assembly off.

3 If you're working on an XV920 RH, XV920 RJ or TR1, remove the mounting bolts and securing screws and take the assembly off **(see illustrations 8.5a and 8.5b).**

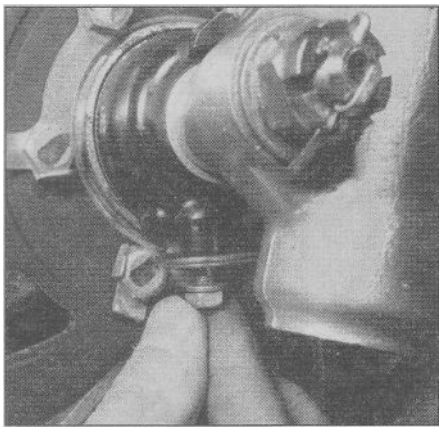


11.3 The turn signal relay on 1981 through 1983 models is a separate unit

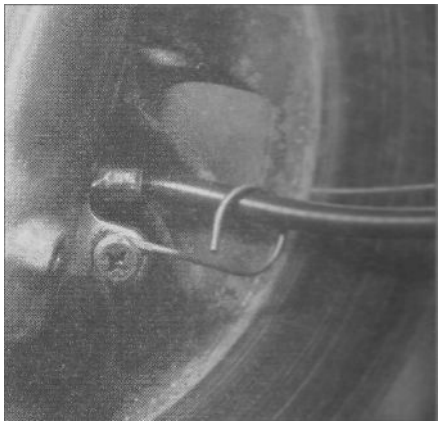


12.7 Disconnect the electrical connector and the spring, then either remove the nut from the bracket or unscrew the switch from the nut

13.1 Unscrew the cable nut from the base of the speedometer



13.2a On models so equipped, remove the speedometer cable retainer bolt



13.2b Detach the speedometer cable from the guide (remove **the guideif**necessary)

13.2cOnmodelswithoutaretainingbolt, unscrew the cable from the drive unit

4 If you're working on an XV920J, remove the mounting bolt and nut on each side and take the assembly off.

5 Installation is the reverse of the removal steps. Be sure to reinstall all washers, lockwashers, grommets and collars.

1984andlatermodels

6 This is the same as for XV535 models, described in Part A of this Chapter. Note that the two lower mounting bolts also secure the brake hose union.

10 Turn signals and tail/brake light bulbs - replacement

Procedures are the same as for XV535 models, although the shapes of the taillight lenses differ slightly. Refer to Part A of this Chapter.

11 Turn signal circuit - check

Refer to illustration 11.3

1 The battery provides power for operation of the signal lights, so if they do not operate, always check the battery voltage and specific gravity first. Low battery voltage indicates either a faulty battery, low electrolyte level or a defective charging system. Refer to Chapter 1 for battery checks and Sections 26 and 27 for charging system tests. Also, check the fuses (see Section 5).

2 Most turn signal problems are the result of a burned out bulb or corroded socket. This is especially true when the turn signals function properly in one direction, but fail to flash in the other direction. Check the bubs and the sockets (see Section 10).

3 If the bulbs and sockets check out okay, check for power at the **turn signal relay with the ig**nition On. On 1981 through 1983 models, this is a separate unit **(see illustration).** On 1984 and later models, it' incorporated into the relay assembly. Refer to the Wiring diagrams at the end of the book to identify the correct relay and its power source terminal.

4 If the relay is okay, check the wiring between the turn signal relay and the turn signal lights (see the Wiring diagrams at the, end of the book).

5 If the wiring checks out okay, replace the turn signal rela

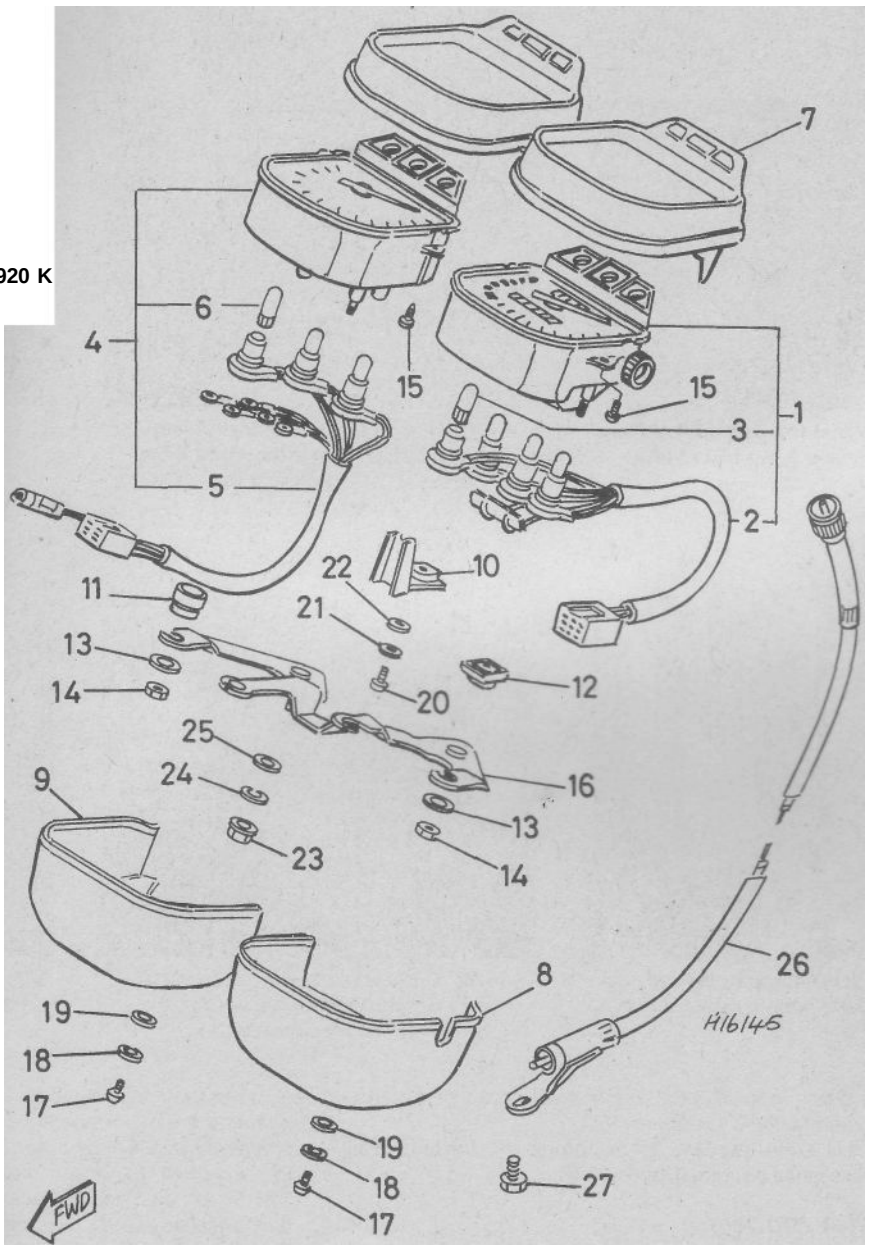
12 Brake light switches - check and replacement

Circuitcheck

1 Before checking any electrical circuit, check the fuses (see Section 5).

2 Using a test light connected to a good ground, check for voltage at the brake light switch. If there's no voltage present, check the wire between the switch and the fuse box (see the Wiring diagrams at the end of the book).

3 If voltage is available, touch the probe of the test light to the othe



13.4a Instrument cluster (XV750, XV920 K and MK) - exploded view

1 *Speedometer*
2 *Wiring harness*
3 *Bulb*
4 *Tachometer*
5 *Wiring harness*
6 *Bulb*
7 *Instrument top cover*
8 *Speedometer lower cover*
9 *Tachometer lower cover*
10 *Bracket*
11 *Grommet*
12 *Rubber damper*
13 *Washer*
14 *Nut*
15 *Screw*
16 *Mounting bracket*
17 *Screw*
18 *Lockwasher*
19 *Washer*
20 *Screw*
21 *Lockwasher*
22 *Washer*
23 *Nut*
24 *Lockwasher*
25 *Washer*
26 *Speedometer cable*
27 *Bolt*

terminal of the switch, then pull the brake lever or depress the brake pedal - if the test light doesn't light up, replace the switch.

4 If the test light does light, check the wiring between the switch and the brake lights (see the wiring diagrams at the end of this Chapter).

Switchreplacement

Front brake lever switch

5 This is the same as for XV535 models. Refer to Part A of this Chapter.

Rear brake pedal switch

Refer to illustration 12.7

6 Unplug the electrical connector in the switch harness.

7 Unhook the switch spring (see illustration).

8 Either compress the retainer prongs and slide the switch and its adjusting nut out of the bracket or unscrew the switch completely from the adjusting nut **(see illustration 12.7).**

9 Install the switch by reversing the removal procedure, then adjust the switch by following the procedure described in Chapter 1.

13 Speedometer and cable - removal and installation

Speedometercableremoval

Refer to illustrations 13.1, 13.2a and 13.2b

1 Unscrew the speedometer cable end and pull the cable from the speedometer **(see illustration).** If necessary for access, lower the headlight assembly (see Section 9).

2 Note how it's routed, then detach the speedometer cable from the drive gear at the left front fork. On early XV750 models, remove the cable retaining bolt and detach the cable from the guide **(see illustration).** On all others, unscrew the knurled nut from the speedometer drive unit **(see illustration).**

Speedometerremoval

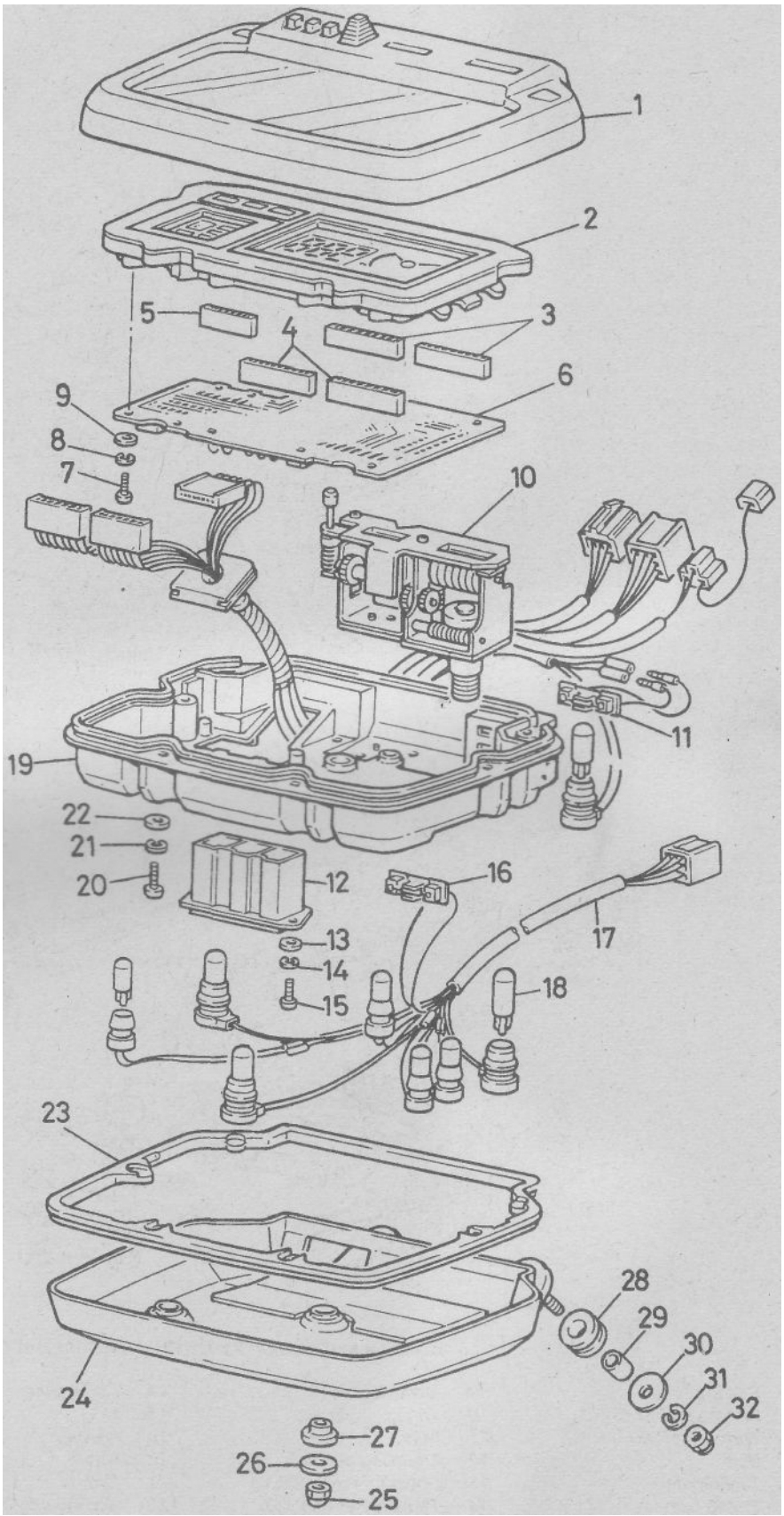
Refer to illustrations 13.4a, 13.4b, 13.4c and 13.6

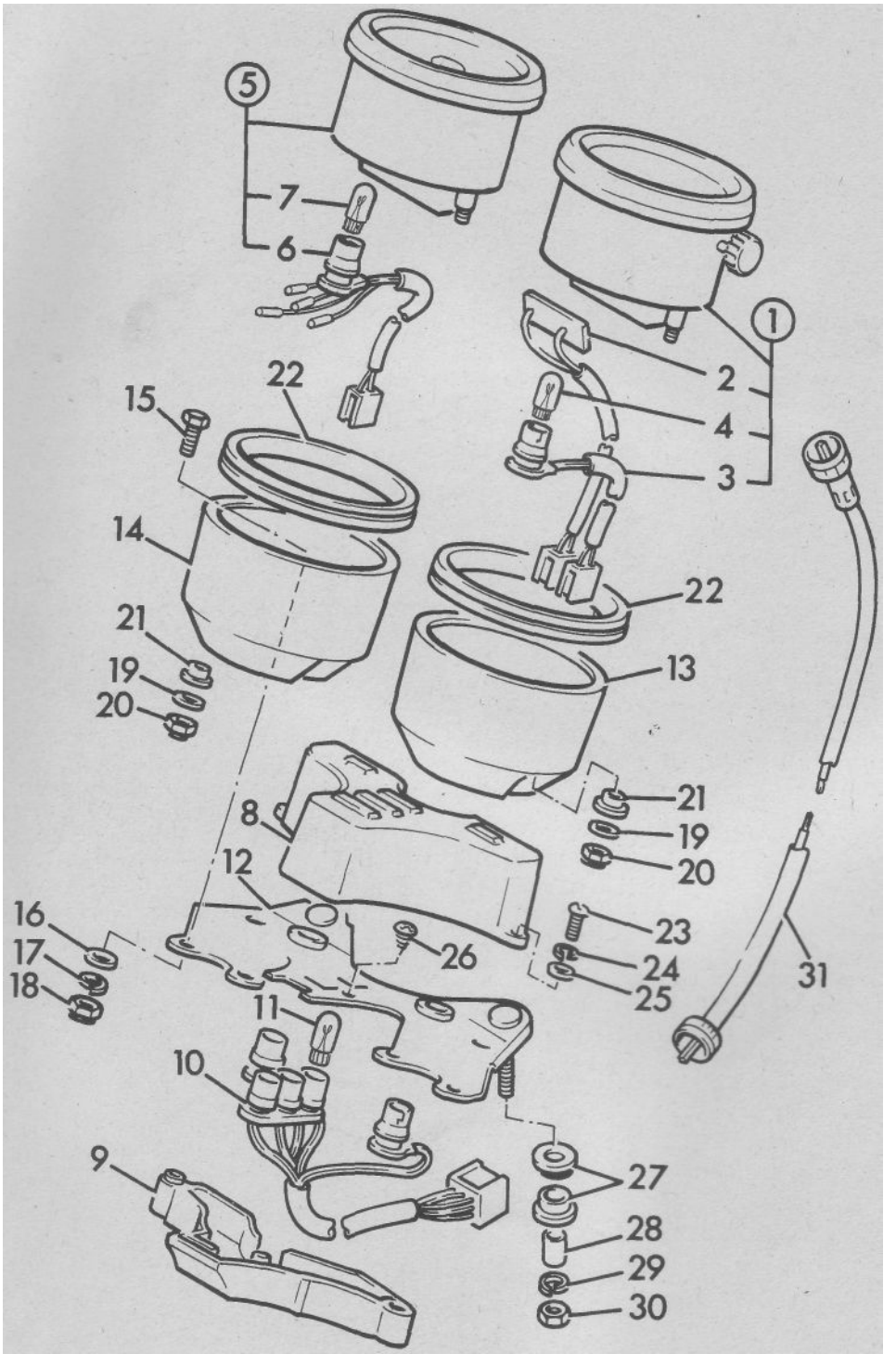
3 Disconnect the cable from the speedometer **(see illustration 13.1).**

4 Remove the mounting fasteners and detach the speedometer housing or instrument cluster **(see illustrations).**

13.4b Instrument cluster (XV920J) exploded view

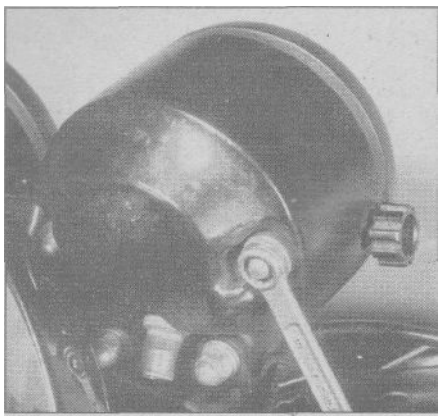
1 Top cover
2 Display panel
3 LCD unit
4 LCD unit
5 LCD unit
6 Circuit board
7 Screw
8 Lockwasher
9 Washer
10 Odometer
11 Sender unit
12 Pilot box
13 Washer
14 Lockwasher
15 Screw
16 Sender unit
17 Wiring harness
18 Bulb
19 Lower cover
20 Screw
21 Lockwasher
22 Washer
23 Rubber seal
24 Mounting bracket
25 Nut
26 Washer
27 Grommet
28 Grommet
29 Collar
30 Washer
31 Lockwasher
32 Nut



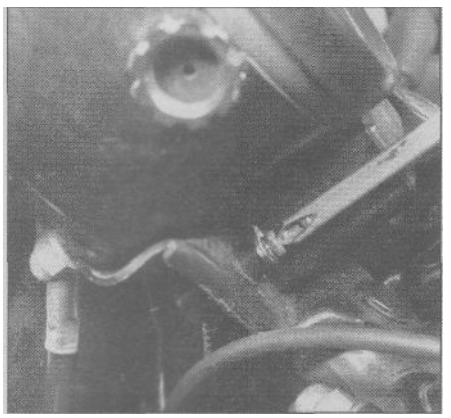


13.4c Instrument cluster (XV920 RH, XV920 RJ and TR1)

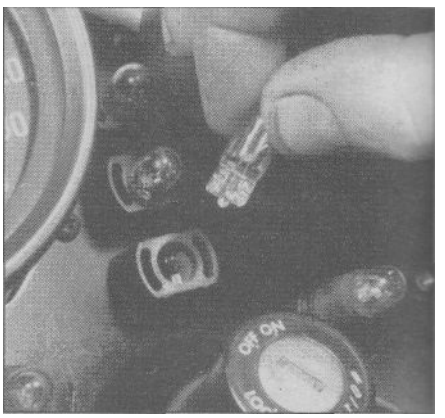
1	*Speedometer*	*9*	*Lower cover*	*17*	*Lockwasher*	*25*	*Washer*
2	*Distance sensor*	*10*	*Wiring*	*18*	*Nut*	*26*	*Screw*
3	*Wiring harness*	*11*	*Bulb*	*19*	*Washer*	*27*	*Rubber damper*
4	*Bulb*	*12*	*Mounting bracket*	*20*	*Nut*	*28*	*Collar*
5	*Tachometer*	*13*	*Speedometer housing*	*21*	*Grommet*	*29*	*Lockwasher*
6	*Wiring harness*	*14*	*Tachometer housing*	*22*	*Sealing ring*	*30*	*Nut*
7	*Bulb*	*15*	*Bolt*	*23*	*Screw*	*31*	*Speedometer cable*
8	*Warning light cover*	*16*	*Washer*	*24*	*Lockwasher*		



13.6 Remove the speedometer securing nut and lift the speedometer out



14.1a Remove the warning light cover screws and lift off the cover . . .



14.1b . . . and pull the bulb from the socket

5 If you're working on a 1981 through 1983 XV750, an XV920J, or an XV920 K or MK, disassemble the cluster as necessary for access to speedometer,

6 If you're working on an XV920 RH, XV920 RJ or TR1. remove the nut, washer and grommet from the back of the speedometer housing and remove the speedometer **(see illustration).**

7 If you're working on a 1984 or later model, lift the speedometer away from the bracket and turn it over. Remove the self-tapping screw and detach the speedometer from the housing **(see illustration 13.5** in **Part A of this Chapter).** Follow the speedometer wiring harness to its connector (inside a rubber cover below the speedometer) and disconnect it.

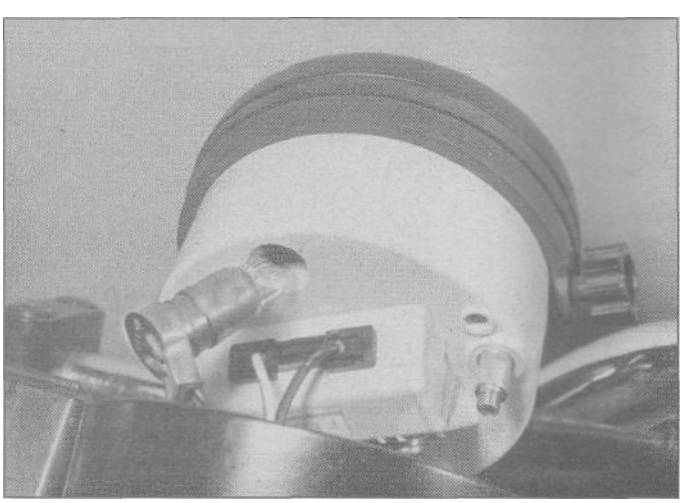
Installation

8 Installation is the reverse of the removal procedure. Be sure the speedometer cable and wiring harness are routed so it doesn't cause the steering to bind or interfere with other components. The squared-off ends of the cable must fit into their spindles in the speedometer and drive gear.

14 Instrument and warning light bulbs - replacement

Refer to illustrations 14.1a, 14.1b and 14.3

1 To replace a warning light bulb on an XV920 RH, XV920 RJ or TR1, remove the warning light cover screws **(see** illustration). Pull the bulb outof its socket **(see illustration),** push in a new one and install the cover.



14.3 On chain drive models, remove the instrument and pull the bulb socket from its underside, then pull the bulb from the socket

2 To replace an instrument light bulb on an XV920 RH, XV920 RJ or TR1, remove the speedometer or tachometer (see Section 13). Pull the bulb socket from the back of the instrument, pull the bulb out of the socket and push in a new one. Reinstall the instrument.

3 To replace bulbs on an XV920J, remove the instrument cluster from its mounting bracket (see Section 13). Pull the bulb socket from the bottom of the instrument cluster **(see illustration),** pull the bulb out of the socket and push in a new one. Reinstall the instrument cluster.

4 To replace bulbs on an XV750, XV920K or XV920 MK, remove the cluster partway and remove the lower cover (see Section 13). Pull the bulb socket from the bottom of the instrument, pull the bulb out of the socket and push in a,new one. Reinstall the instrument cluster.

15 Ignition main (key) switch - check and replacement

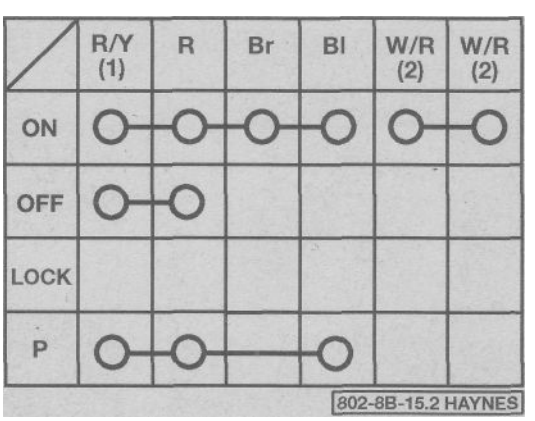
Check

Refer to illustration 15.2

1 Follow the wiring harness from the ignition switch (on the upper triple clamp) to the connector and disconnect it.

2 Using an ohmmeter, check the continuity of the terminal pairs indicated in the accompanying table **(see illustration).** Continuity should exist between the terminals connected by a solid line when the switch is in the indicated position. **Note:** *Connect the ohmmeter to the switch side of the connector, not the wiring harness side.*

3 If the switch fails any of the tests, replace it.



15.2 Ignition (main key) switch continuity diagram

1 XV920J, 1984-on 1000 and XV1100 only
2 XV920J only

Switch position	Wire color							
	R	Br/Y	Br	Dg	Br/W	Ch	Y/R	B
ON	O—O			O—O		O	O—O	
OFF		O—O						

16.2 Hazard switch terminals **(1984-on XV1000 and XV1100)**

Replacement

4 Disconnect the electrical connector, if you haven't already done so. Free the wiring harness from any clips or retainers.

5 Place the key in the unlocked position and remove the mounting bolts from the underside of the switch.

6 Attach the new switch to the bracket and tighten the bolts securely.

7 The remainder of installation is the reverse of the removal procedure.

16 Handlebar switches - check

Refer to illustration 16.2

1 Switch testing procedures are the same as for XV535 models (see Part A of this Chapter).

2 Continuity diagrams are the same as for XV535 models **(see illustration 16.4** in **Part A** of **this Chapter),** except for the engine kill switch (both terminals have red/white wires) and the hazard switch used on XV1000 and XV1100 models **(see illustration).**

17 Handlebar switches - removal and installation

This is the same as for XV535 models. Refer to Part A of this Chapter.

18 Neutral switch - check and replacement

Check

Refer to illustration 18.2

1 . Make sure the transmission is in neutral.

2 Locate the switch harness **(see illustration),** then unplug the connector.

3 Connect the terminal in the harness side of the connector to ground/earth (bare metal on the motorcycle frame) with a short length of wire.

a) If the light stays out, check the bulb and the wiring between the ignition switch and neutral switch.

b) If the neutral indicator light comes on, the neutral switch may be bad. Connect an ohmmeter between the terminal in the switch side of the connector and ground. Shift through the gears. The ohmmeter should indicate continuity (low resistance) in neutral and no continuity (infinite resistance) in all other gears. If not, replace the neutral switch.

Replacement

Refer to illustration 18.4

4 Loosen the small screw on the switch and detach the wire **(see illustration 18.2).** Unscrew the switch from the crankcase **(see illustration).** Remove the sealing washer and install a new one.

5 Installation is the reverse of the removal steps.

19 Sidestand switch - check and replacement

Testing and replacement procedures are the same as for XV535 models. Refer to Part A of this Chapter.

20 Clutch switch - check and replacement

Testing and replacement procedures are the same as for XV535 models. Refer to Part A of this Chapter.

21 Horn - check and replacement

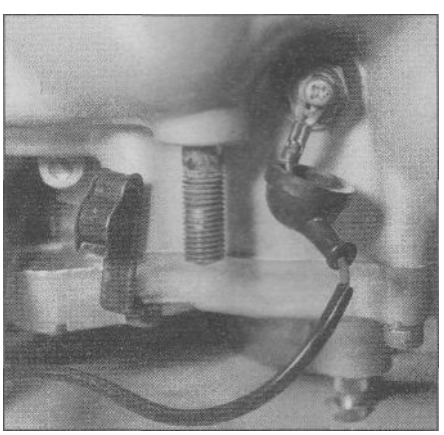
These models use two horns, mounted at the front of the motorcycle. Testing and replacement procedures are the same as for XV535 models. Refer to Part A of this Chapter.

22 Starter relay - check and replacement

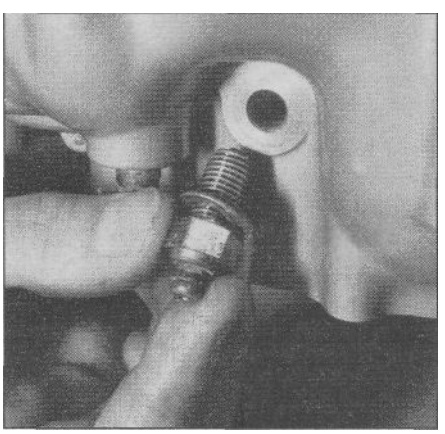
Refer to illustration 22.2

1 An external starter relay is used on 1981 through 1983 models, as well as 1984 and 1985 XV700 models.

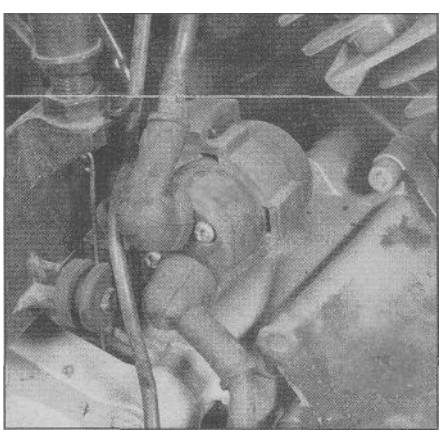
2 Testing and replacement procedures are the same as for XV535 models (see Part A of this Chapter). The relay is mounted on the right side of the motorcycle **(see illustration).**



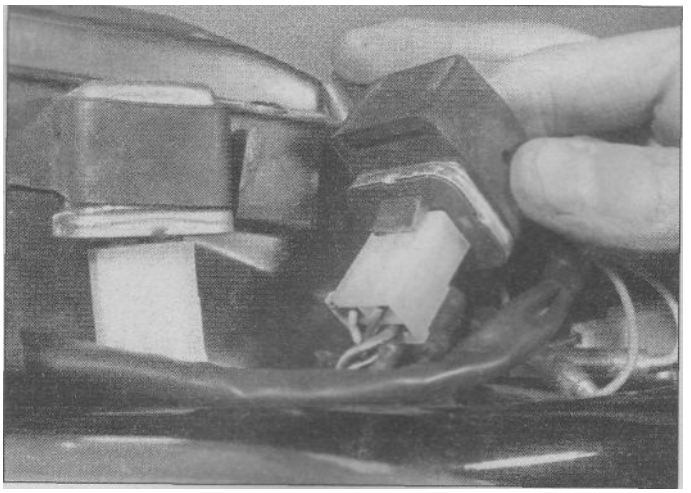
18.2 The neutral switch is screwed into the left crankcase half; the screw that secures its wire is beneath a rubber cover



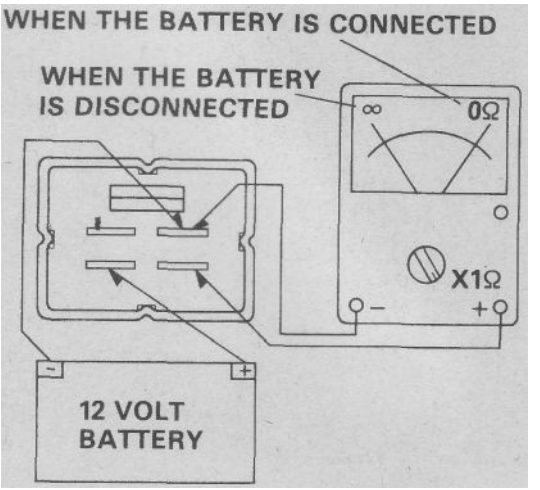
18.4 Unscrew the switch; use a new sealing washer on installation



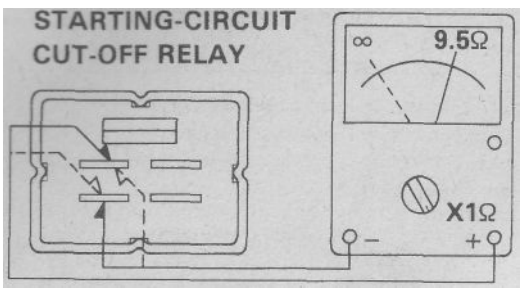
22.2 The relay is mounted on the right side of the motorcycle; pull back the rubber covers to expose the terminal nuts



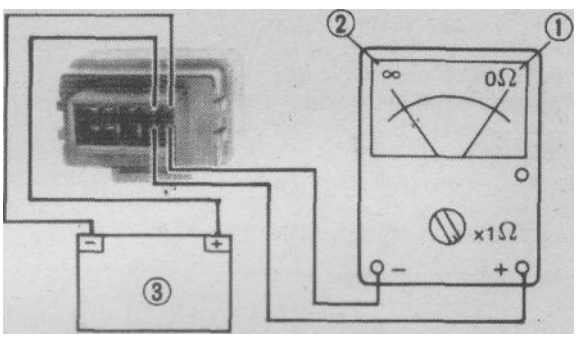
23.1 The starting circuit cutoff **relay is located beneath the seat (early XV750 shown);** it can **be identified by its wire colors**



23.2 Cutoff relay test connections (1981 through 1983 models)



23.3 Cutoff relay diode test connections (1981 through 1983 models)



23.5 Cutoff relay test connections (1984 and later models)

23 Starting circuit cut-off relay - check and replacement

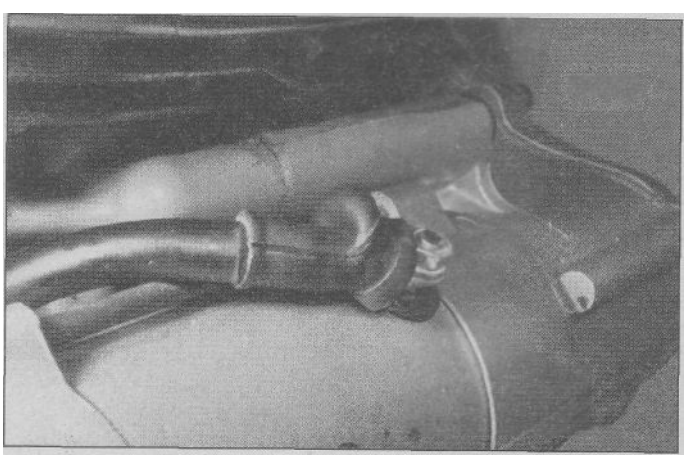
Refer to illustration 23.1

1 Lift or remove the seat (see Chapter 7) and remove the relay **(see illustration).**

1981 through 1983 models

Refer to illustrations 23.2 and 23.3

2 Connect an ohmmeter and 12-volt battery to the relay terminals **(see illustration).** The ohmmeter should indicate continuity (little or no resistance) while the battery is connected, and infinite resistance (no continuity) when the battery is disconnected.



24.2 Pull back the cover, remove the nut and disconnect the starter cable

3 Disconnect the battery and connect the ohmmeter between the coil winding terminals **(see illustration).** Note the ohmmeter reading, then switch the ohmmeter leads. The ohmmeter should indicate very high resistance in one direction and very low resistance in the other direction.

4 If the relay doesn't perform as described, replace it.

1984 and later models

Refer to illustration 23.5

5 Connect an ohmmeter and 12-volt battery to the relay terminals **(see illustration).** The ohmmeter should indicate continuity (little or no resistance) while the battery is connected, and infinite resistance (no continuity) when the battery is disconnected.

6 If the relay doesn't perform as described, replace it.

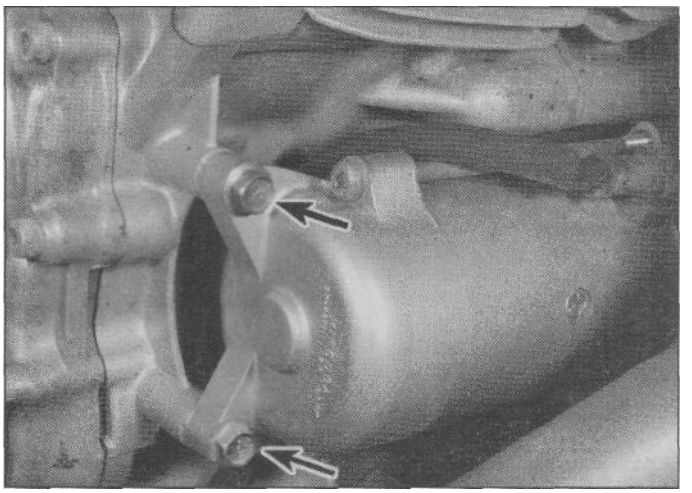
24 Starter motor - removal and installation

Refer to illustrations 24.2, 24.3 and 24.4

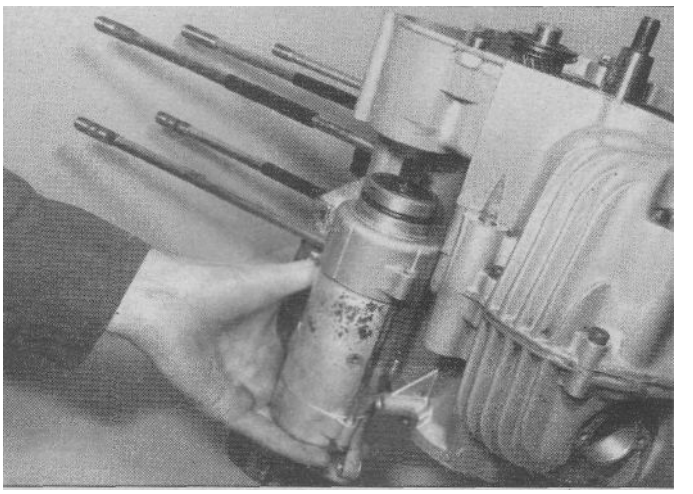
Removal

1 Disconnect the cable from the negative terminal of the battery.

2 Pull back the rubber cover, remove the nut retaining the starter cable to the starter and disconnect the cable **(see illustration).**



24.3 Remove the mounting bolts (arrows)



24.4 Pull the starter motor out of the crankcase

3 Remove the starter mounting bolts **(see illustration).**

4 Lift the end of the starter up a little bit and slide the starter out of the engine case **(see illustration).**

5 Check the condition of the O-ring on the end of the starter and replace it if necessary. Also check the starter pinion gear and the driven gear inside the engine for chipped or worn teeth.

Installation

6 Apply a little engine oil to the O-ring and install the starter by reversing the removal procedure. Tighten the starter mounting bolts to the torque listed in this Chapter's Specifications.

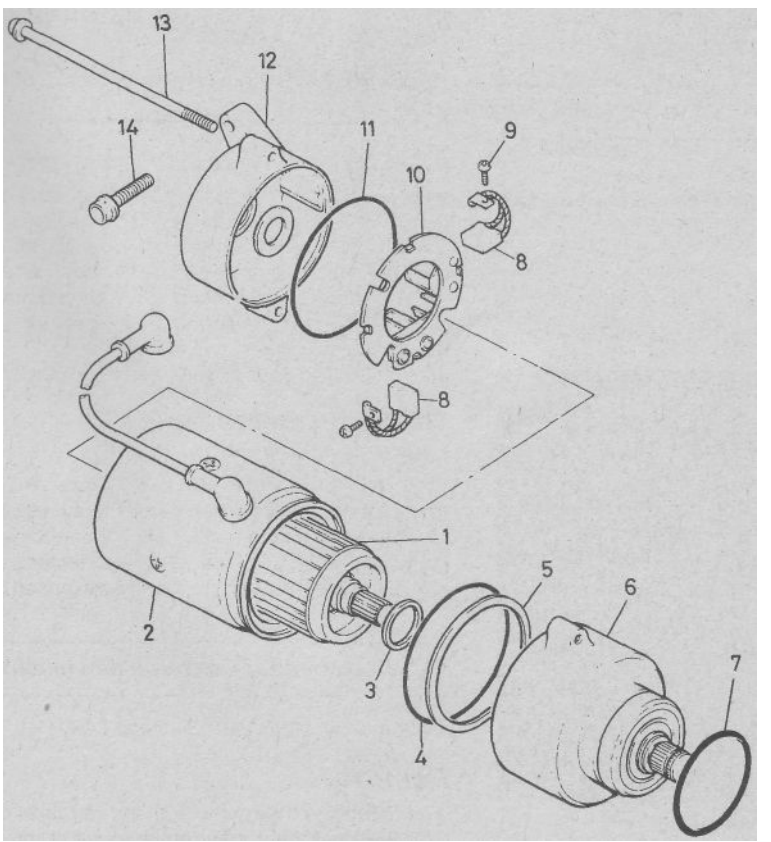
25 Starter motor - disassembly, inspection and reassembly

Refer to illustrations 25.2, 25.3a and 25.3b

1 Remove the starter motor (see Section 24).

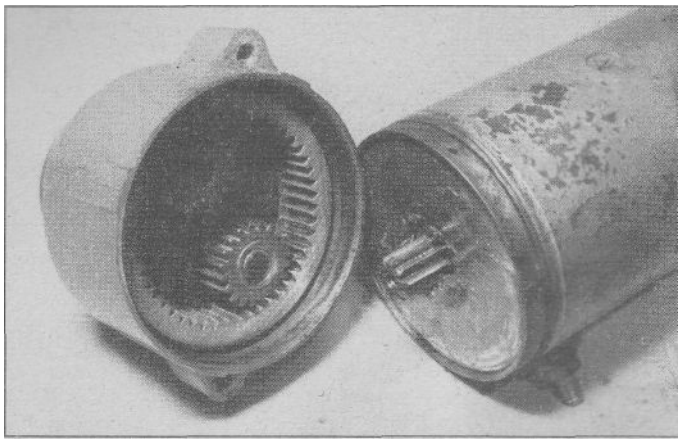
2 All XV700 through 1100 models use a two-brush, reduction gear starter **(see illustration).**

3 Disassembly, inspection and assembly procedures are generally the same as for XV535 models (refer to Part A of this Chapter). In addition, check the reduction gears and bushings for wear and

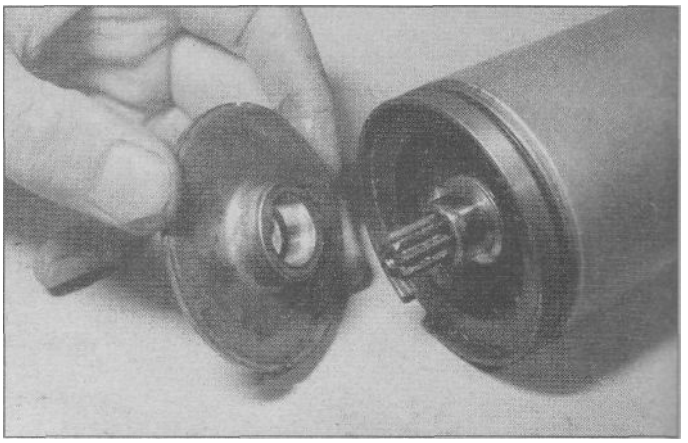


25.2 Starter motor - exploded view

1 *Armature*
2 *Starter housing*
3 *Washer*
4 *O-ring*
5 *Washer*
6 *Drive gear*
7 *O-ring*
8 *Brushes (early design shown; later design similar)*
9 *Screws (early design brushes)*
10 *Brush plate*
11 *O-ring*
12 *End cover*
13 *Through bolt*
14 *Mounting bolt*



25.3a Check the reduction gears for wear or damage . . .



25.3b . . . and check the bushing inside the gear end plate

damage **(see illustrations).** The gears aren't available separately, so the starter will have to be replaced if they're worn or damaged.

26 Charging system testing - general information and precautions

1 If the performance of the charging system is suspect, the system asa whole should be checked first, followed by testing of the individual components (the alternator and the voltage regulator/rectifier). **Note:** *Before beginning the checks, make sure the battery is fully charged and that all system connections are clean and tight.*

2 Checking the output of the charging system and the performance of the various components within the charging system requires the use of special electrical test equipment. A voltmeter or a multimeter are the absolute minimum tools required. In addition, an ohmmeter is generally required for checking the remainder of the system.

3 When making the checks, follow the procedures carefully to prevent incorrect connections or short circuits, as irreparable damage to electrical system components may result if short circuits occur. Because of the special tools and expertise required, it is recommended that the job of checking the charging system be left to a dealer service department or a reputable motorcycle repair shop.

27 Charging system - output test

Caution: *Never disconnect the battery cables from the battery while the engine is running. If the battery is disconnected, the alternator and regulator/rectifier will be damaged.*

1 To check the charging system output, you will need a voltmeter or a multimeter with a voltmeter function.

2 The battery must be fully charged (charge it from an external source if necessary) and the engine must be at normal operating temperature to obtain an accurate reading.

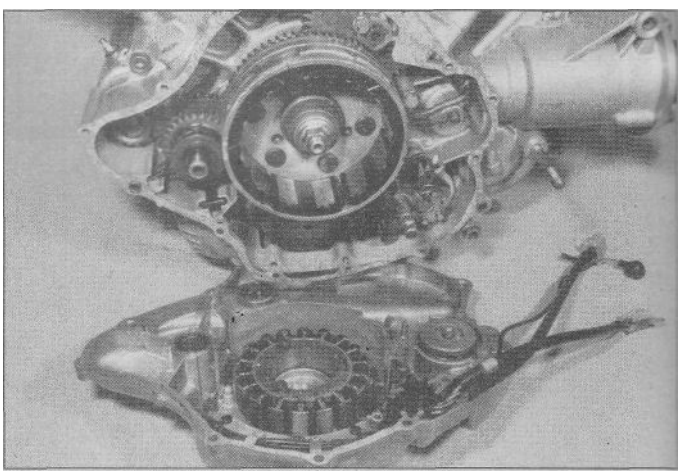
3 Attach the positive (red) voltmeter lead to the positive (+) battery terminal and the negative (black) lead to the battery negative (-) terminal. The voltmeter selector switch (if equipped) must be in 0-to-20 DC volt range.

4 Start the engine.

5 The charging system output should be within the range listed in this Chapter's Specifications. Stop the engine as soon as the voltage reading has been obtained, and turn the ignition key switch Off.

6 Follow the wiring harness from the alternator cover (on the left side of the engine) to the electrical connector and disconnect the connector containing the three white wires.

7 Connect the probes of an ohmmeter set to the R x 1 range between each pair of white wires in the connector (the side that runs back to the alternator, not the wiring harness side). Note the reading of all three tests.



28.2 Note the locations of the locating dowels as you remove the cover

8 If each reading is not within the range listed in this Chapter's Specifications, replace the stator (see Section 28).

9 If the reading is within the Specifications, refer to the Wiring diagrams at the end of the book and check the charging circuit for breaks or poor connections. If the wiring is good, replace the regulator/rectifier (see Section 28). **Note:** *No test details are providec by the manufacturer for the regulator/rectifier unit. If the stator coils and wiring check out OK, the regulator/rectifier is probably defective.*

28 Alternator cover, stator, rotor and regulator/rectifier - removal and installation

Cover

Refer to illustrations 28,2 and 28.6

1 Remove the outer crankcase cover from the left side of the engine. Refer to Chapter 2 and disconnect the clutch cable at the engine. Remove the left footpeg assembly if necessary for access.

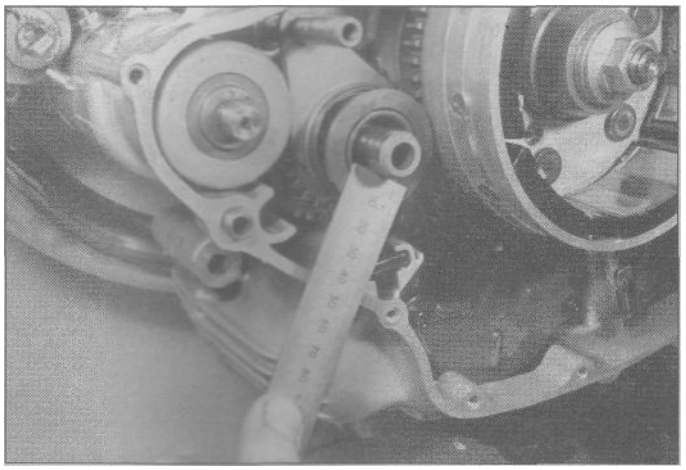
2 Loosen the alternator cover mounting bolts evenly in a criss-cross pattern and remove the cover **(see illustration).**

3 Clean all traces of old gasket sealer from the cover and its matin: surface on the engine. •

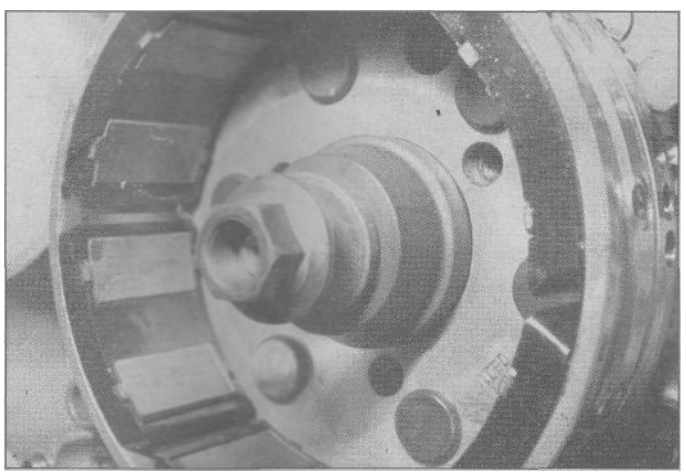
4 Make sure there are no metal particles stuck to the rotor magnets

5 Position a new gasket over the dowels.

6 On XV1000 models, XV1100 models and 1986 and later XV70C and XV750 models, hold the starter clutch thrust collar in with a flat steel ruler or similar tool **(see illustration).**



28.6 Hold the thrust collar in with a flat steel ruler or similar tool while installing the cover



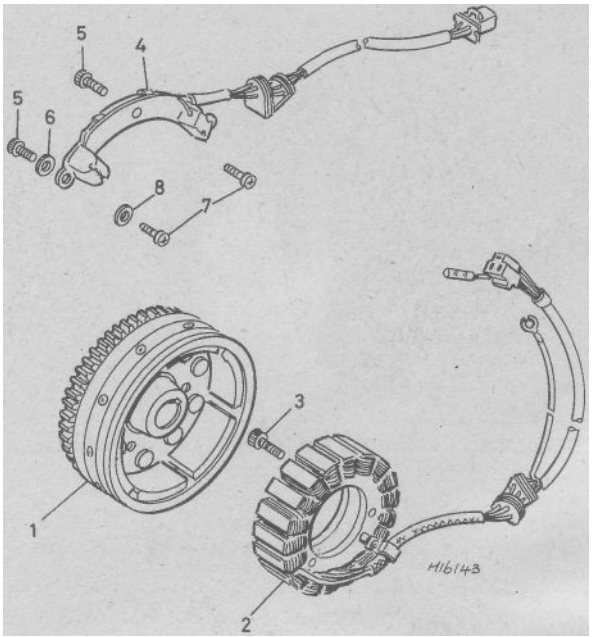
28.11 Remove the rotor retaining nut and washer

Install the cover and tighten the Allen bolts evenly, in a criss-cross pattern, to the torque listed in this Chapter's Specifications.

Stator

Refer to illustration 28.8

7 Remove the alternator cover as described above.



28.8 Alternator rotor and stator details

1	*Rotor*	*5*	*Pickup coil screws*
2	*Stator*	*6*	*Washers*
3	*Bolt*	*7*	*Pickup coil screws (alternate locations)*
4	*Pickup coils (dual pickup model shown)*	*8*	*Washers*

8 Remove the stator screws and take the stator out **(see illustration).**

9 Installation is the reverse of the removal steps. Tighten the stator screws securely.

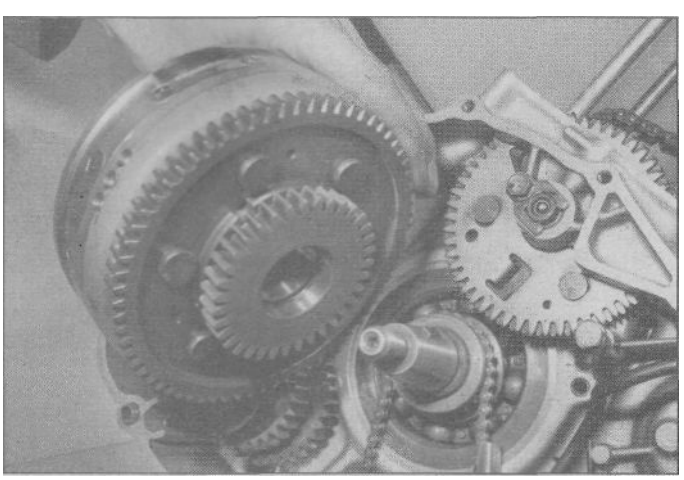
Rotor

Refer to illustrations 28.11, 28.12a, 28.12b, 28.13a, 28.13b and 28.13c

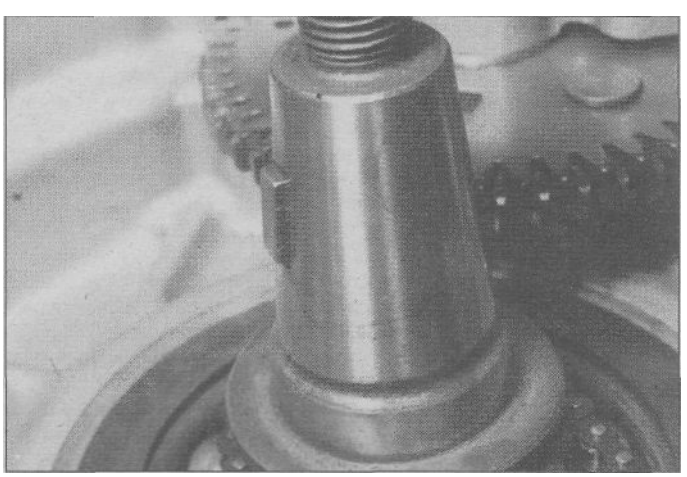
10 Remove the alternator cover as described above.

11 Shift the transmission into gear and have an assistant apply the rear brake. Remove the rotor nut and washer **(see illustration).**

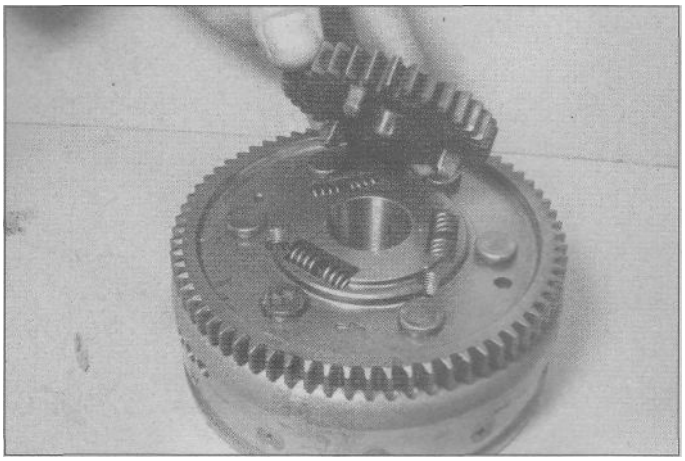
12 Thread a rotor puller such as Yamaha tool no. YU-33270 into the rotor. Remove the rotor from the end of the crankshaft and take the Woodruff key out of its slot **(see illustrations). Note:** *Don't take the intermediate gear off the back of the rotor unless the gear or rotor is to be replaced.*



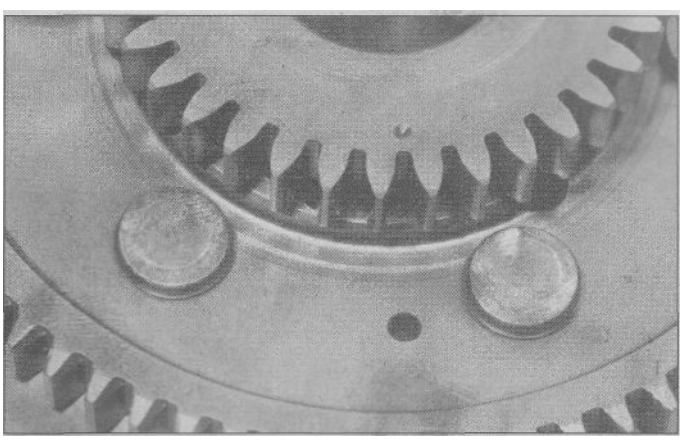
28.12a Take off the rotor together with the intermediate gear



28.12b Remove the Woodruff key from the crankshaft



28.13a The legs on the intermediate gear fit into the gaps between the rotor springs

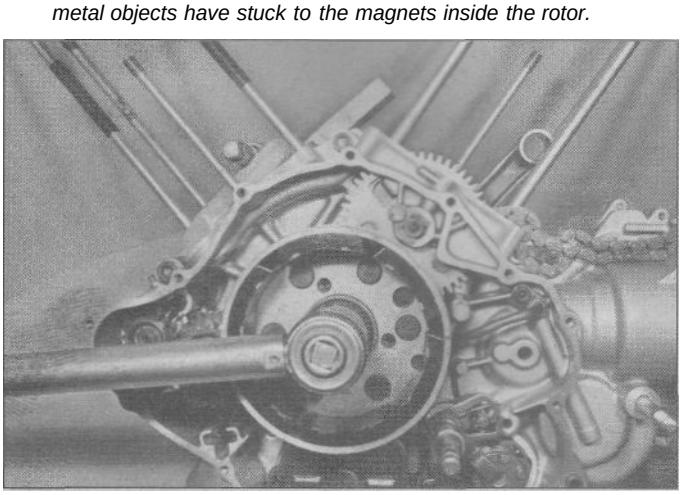


28.13b Make sure the mark on the gear aligns with the hole in the rotor

13 Installation is the reverse of the removal steps, with the following additions:

a) If the intermediate gear was removed from the back of the rotor, position the three pairs of rotor springs with gaps between them and press the gear into position. Make sure its alignment mark is lined up with the sighting hole in the rotor **(see illustrations).**

b) Be sure to reinstall the Woodruff key. **Caution:** *Make sure no metal objects have stuck to the magnets inside the rotor.*



28.13c Tighten the rotor nut to the specified torque

c) Aligning the rotor and intermediate gear must be done in a specific way. Refer to the timing gear installation procedures in Part B of Chapter 2.

d) Tighten the rotor nut to the torque listed in this Chapter's Specifications **(see illustration).**

Regulator/rectifier

Refer to illustration 28.14

14 On 1981 through 1983 models, the regulator/rectifier unit is mounted on the rear subframe **(see illustration).** On 1984 and later models, it is mounted inboard of the luggage box behind the left side cover.

15 Follow the wiring harness from the regulator/rectifier to the connector. Disconnect the electrical connector and remove the regulator/rectifier mounting fasteners.

16 Installation is the reverse of the removal steps.

29 Oil level switch - removal, check and installation

Refer to illustrations 29.3a and 29.3b

Removal

1 Drain the engine oil (see Chapter 1).

2 The oil level switch is mounted in the bottom of the crankcase. Note how its wiring harness is routed, then unplug the electrical connector.

3 Remove the cover, then-unscrew the switch **(see illustrations).**

Check

4 Connect an ohmmeter between the terminals of the switch harness. With the switch in its normal installed position, the ohmmete[r] should indicate infinite resistance.

5 Turn the switch upside down. The ohmmeter should now reac zero ohms.

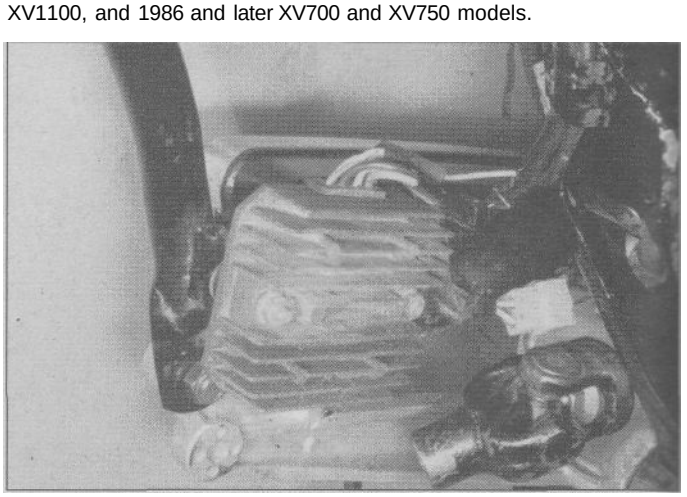
6 If the ohmmeter doesn't give the correct indication in Step 4 or 5 replace the switch.

Installation

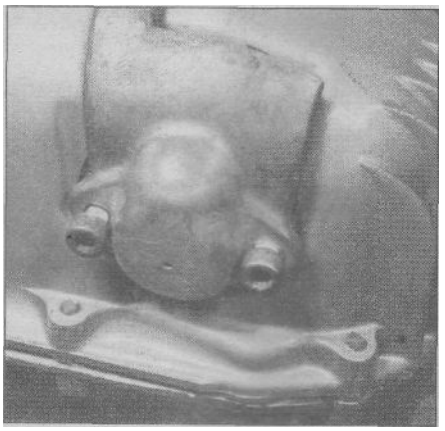
7 Installation is the reverse of the removal steps. Use a new sealing washer and tighten the switch to the torque listed in this Chapter's Specifications.

30 Starter clutch - removal, inspection and installation

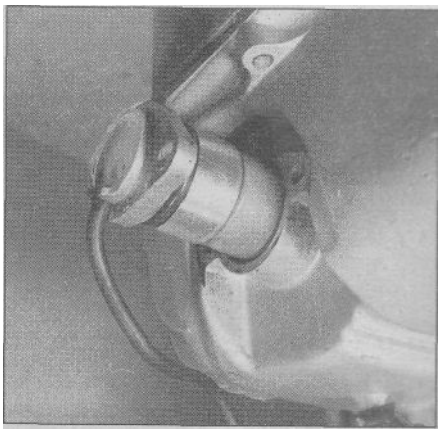
1 Two different starter clutch designs are used, one on 1981 through 1985 XV750, XV700 and XV920 models, the other on XV100C XV1100, and 1986 and later XV700 and XV750 models.



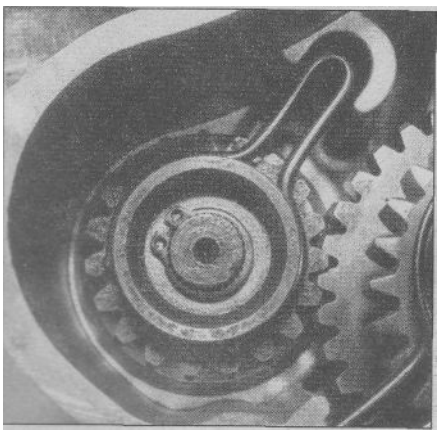
28.14 The voltage regulator/rectifier on 1981 through 1983 models is mounted on the rear subframe



29.3a Remove the oil level switch cover . . .



29.3b .. .and unscrew the switch from the crankcase



30.3 The spring clips must fit into the notches in the crankcase

Removal

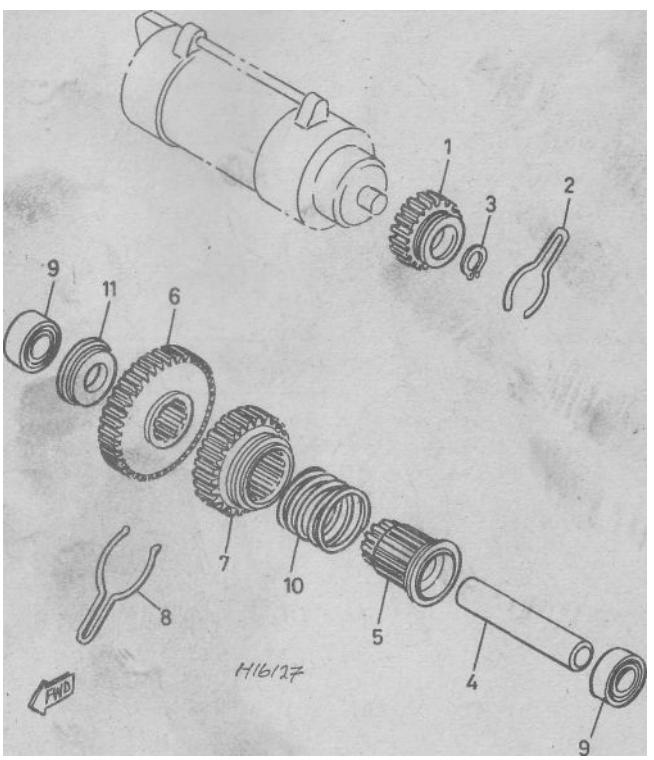
2 Remove the starter motor (see Section 24) and the alternator cover (see Section 28).

XV920 and 1981 through 1985 XV700 and XV750 models

Refer to illustrations 30.3 and 30.4

3 Remove the snap-ring and the spring clip **(see illustration).**

4 Remove the starter motor gear, idler wheel, compression spring, idler shaft, the remaining spring clip, two more idler,gears and the washer (see illustration).



30.4 Starter clutch details (1981 through 1985 XV700 and XV750; XV920)

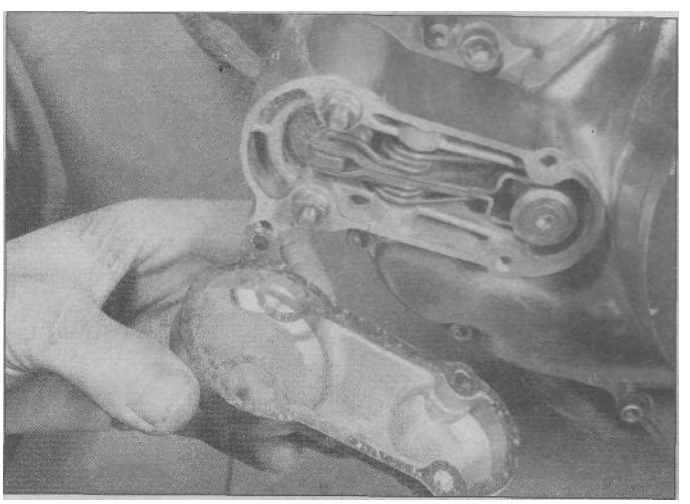
1	*Starter motor pinion*	7	*Outer idler gear*
2	*Spring clip*	8	*Spring clip*
3	*Snap-ring*	9	*Thrust collars*
4	*Shaft*	10	*Spring*
5	*Idler wheel*	11	*Collar*
6	*Inner idler gear*		

XV1000, XV1100 and 1986 and later XV700 and XV750 models

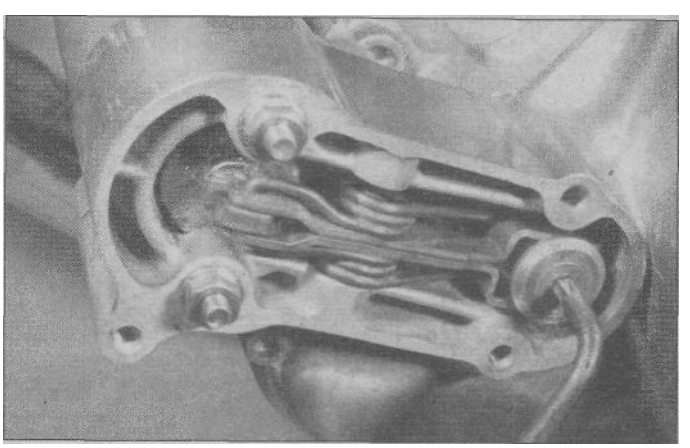
Refer to illustrations 30.5, 30.6, 30.7*, 30.10a, 30.10b and 30.11*

5 Remove the drive lever cover and gasket **(see illustration).**

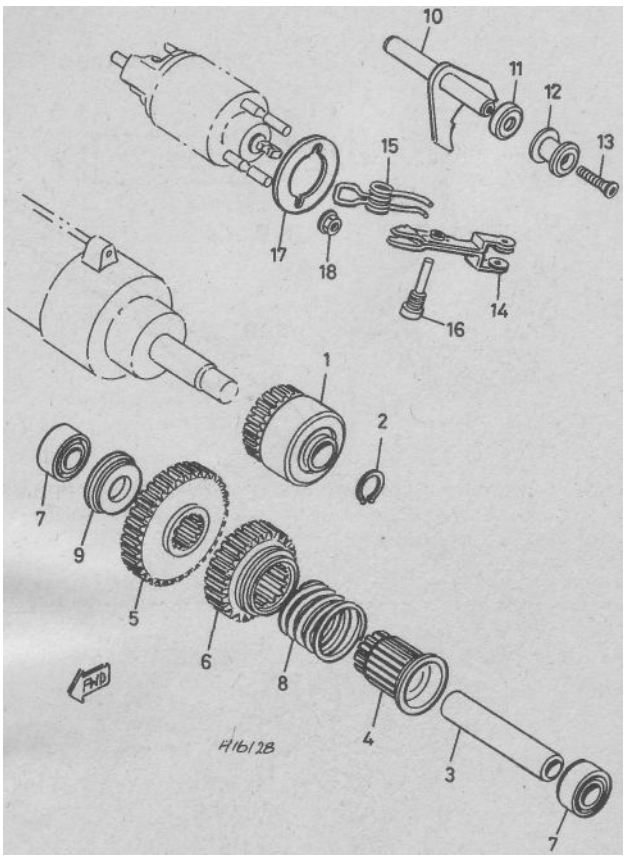
6 Loosen the drive lever collar screw **(see illustration).**



30.5 Remove the drive lever cover and gasket



30.6 Loosen the collar screw



30.7 Starter clutch details (XV1000, XV1100 and 1986 and later XV700 and XV750 models)

1	*Starter clutch*	*10*	*Drive lever shaft*
2	*Snap-ring*	*11*	*Oil seal*
3	*Shaft*	*12*	*Collar*
4	*Starter wheel*	*13*	*Screw*
5	*Inner idler gear*	*14*	*Drive lever*
6	*Outer idler gear*	*15*	*return spring*
7	*Thrust collar*	*16*	*Pivot bolt*
8	*Spring*	*17*	*Gasket*
9	*Collar*	*18*	*Nut*

7 Remove the thrust collar **(see illustration).** Remove the O-ring, shaft, starter wheel, spring, outer idler gear, inner idler gear and remaining thrust collar.

8 Remove the snap-ring, starter clutch and remaining snap-ring.

9 Remove the drive lever collar screw **(see illustration 30.6).**

10 Remove the two solenoid securing nuts. Remove the solenoid screws, pull the solenoid out and remove the gasket **(see** illustrations).

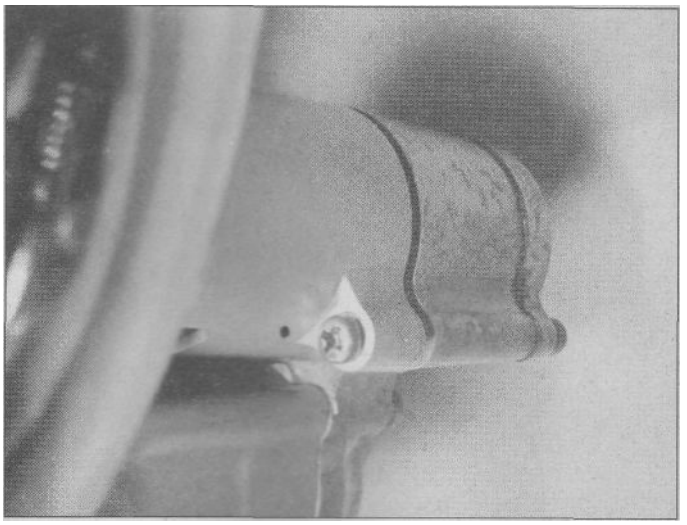
11 Remove the drive lever pivot bolt, then remove the drive lever, collar and spring **(see illustration).**

Inspection

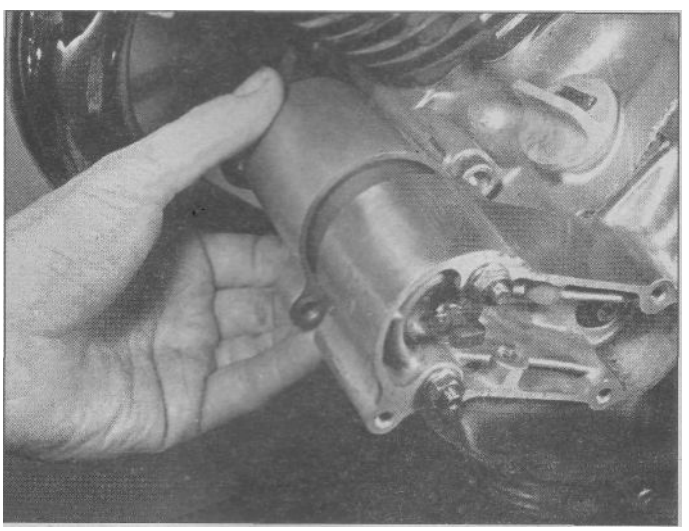
Refer to illustrations 30.12a, 30.12b, 30.13a, 31,13b and 30.13c

12 If you're working on a 1981 through 1985 XV700, XV750 or XV920 model, clean the starter clutch components and check them for wear and damage **(see illustration).** Replace any worn or damaged parts. Place the spring clips in position and try to rotate them. If the turn easily, replace them. If you're in doubt about their condition, pull on them with a spring scale and measure the force required to rotate them **(see illustration).** If it's less than the value listed in this Chapter's Specifications, replace them.

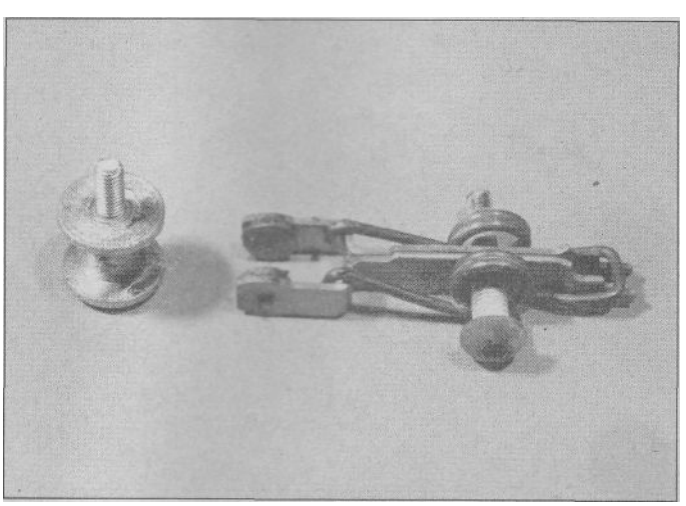
13 If you're working on a 1986 or later XV700 or XV750, an XV1000 or an XV1100 model, clean the drive assembly components and check



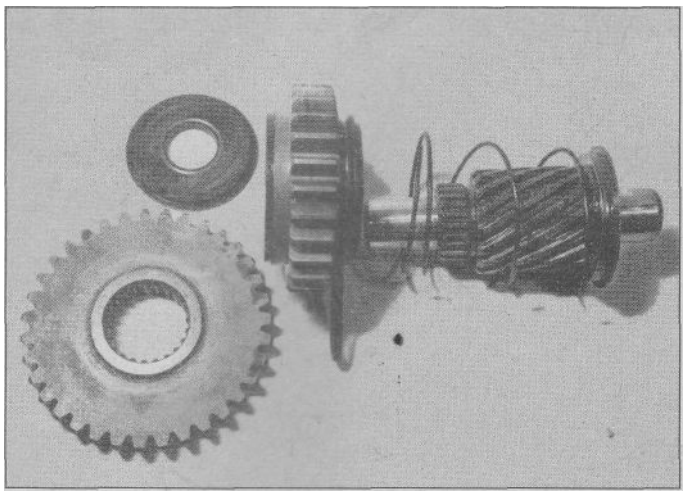
30.10a Remove the solenoid **screws and nuts .,**



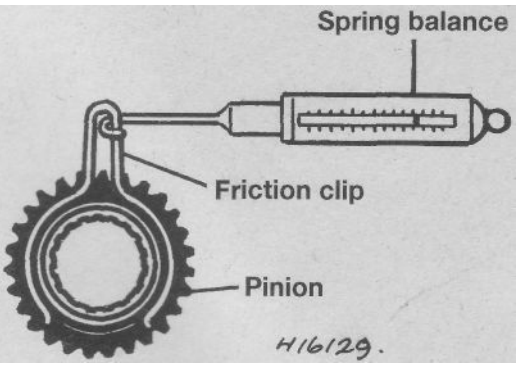
30.10b . . . then remove **the cover and remove the solenoid**



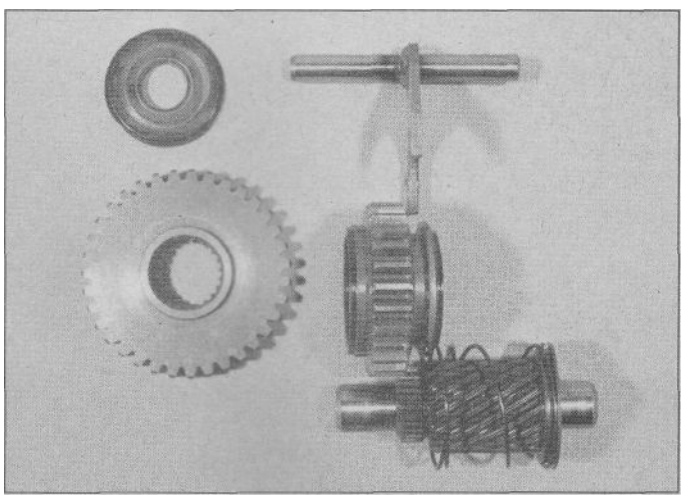
30.11 Remove the pivot and starter drive lever



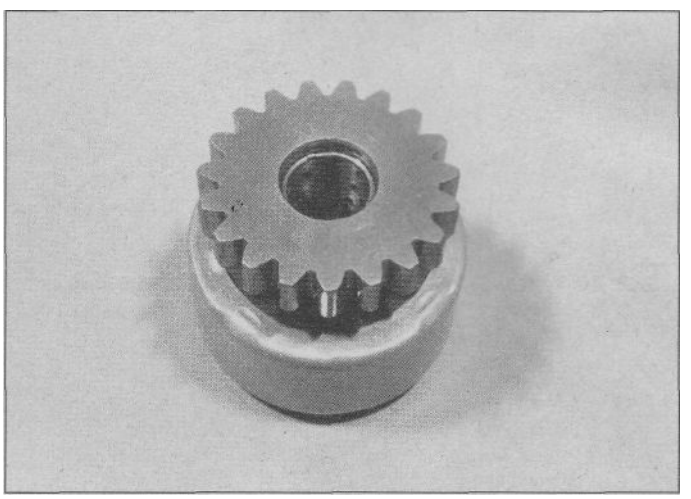
30.12a Check the components for wear and damage (XV920 and 1981 through 1985 XV700 and XV750)



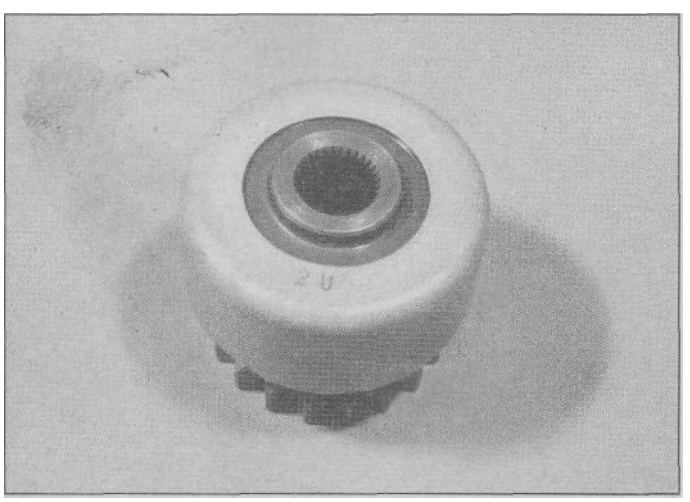
30.12b Measure the tightness of the spring clips by rotating them with a spring scale; replace them if they turn too easily



30.13a Check the components for wear and damage (XV1000, XV1100 and 1986 and later XV700 and XV750 models)



30.13b Check the bushing in the starter clutch for wear or damage . . .



30.13c . . . also inspect the clutch splines

them for wear or damage **(see illustration).** Replace worn or damaged parts. Check the starter clutch splines and bushing for wear or damage and replace the starter clutch if problems are found **(see illustrations).**

Installation

1981 through 1985 XV700, XV750 and XV920 models

14 Install the washer and the idler gears and center them over the idler shaft bushing.

15 Install the outer idler gear and spring clip. Position the end of the spring clip in its channel in the crankcase.

16 Insert the shaft through the idler gears.

17 Install the spring on the idler wheel, then install them on the shaft.

18 Install the starter motor gear and secure it with the snap-ring.

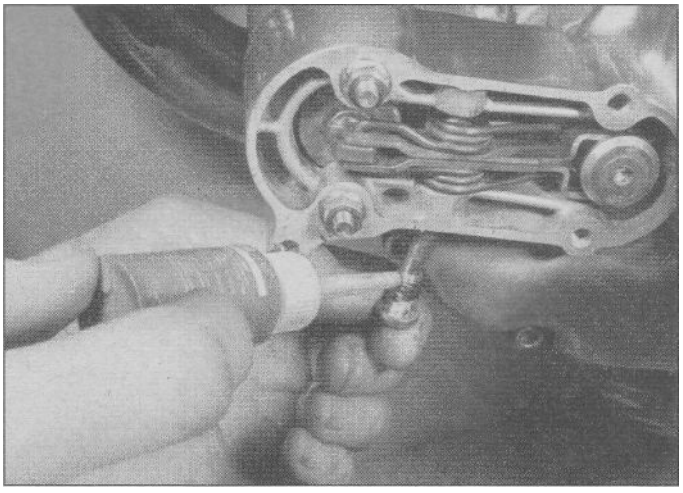
19 Install the remaining spring clip and place its end in the crankcase notch **(see illustration 30.3).**

XV1000, XV1100, and 1986 and later XV700 and XV750 models

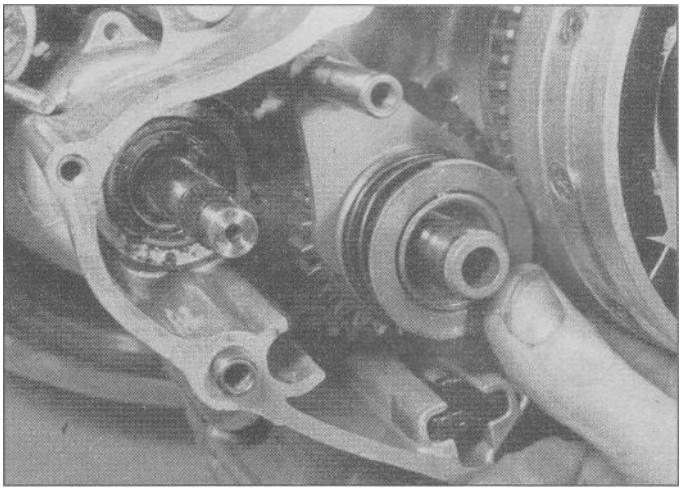
Refer to illustrations 30.21, 30.23 and 30.24

20 Install the gasket and starter solenoid. Install the solenoid screws and nuts.

21 Position the drive lever collar and spring on the alternator cover.



30.21 Appiy non-permanent thread locking agent to the threads of the pivot bolt



30,23 Install the starter drive assembly

Apply non-permanent thread locking agent to the pivot bolt, then install it and tighten it securely **(see illustration).**

22 Install the starter motor (see Section 24).

23 Install the thrust collar, idler gear, drive lever shaft, idler gear, spring, starter wheel, shaft and thrust collar **(see illustration).**

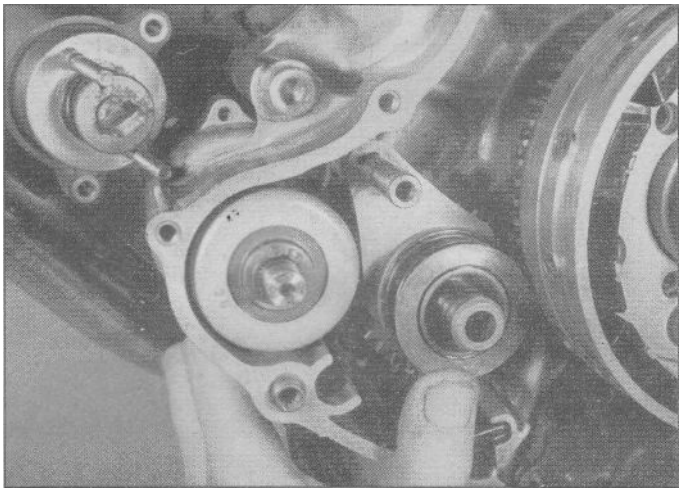
24 Install the snap-ring, starter clutch and second snap-ring **(see illustration).**

25 Install the alternator cover (see Section 28).

All models

26 The remainder of installation is the reverse of the removal steps.

27 Fill the engine with oil (see Chapter 1).



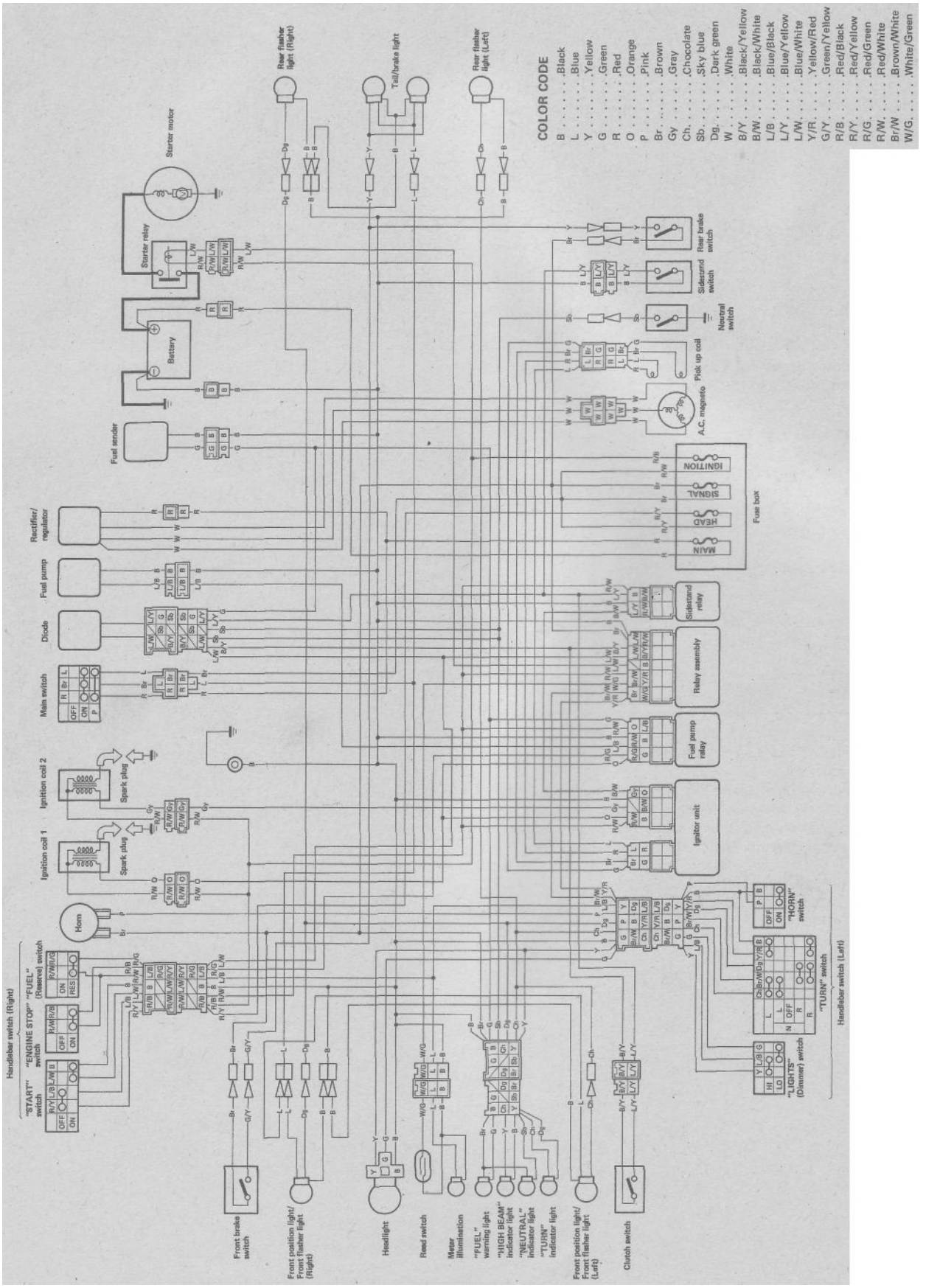
30.24 Install the snap-ring, starter clutch and second snap-ring

31 Wiring diagrams

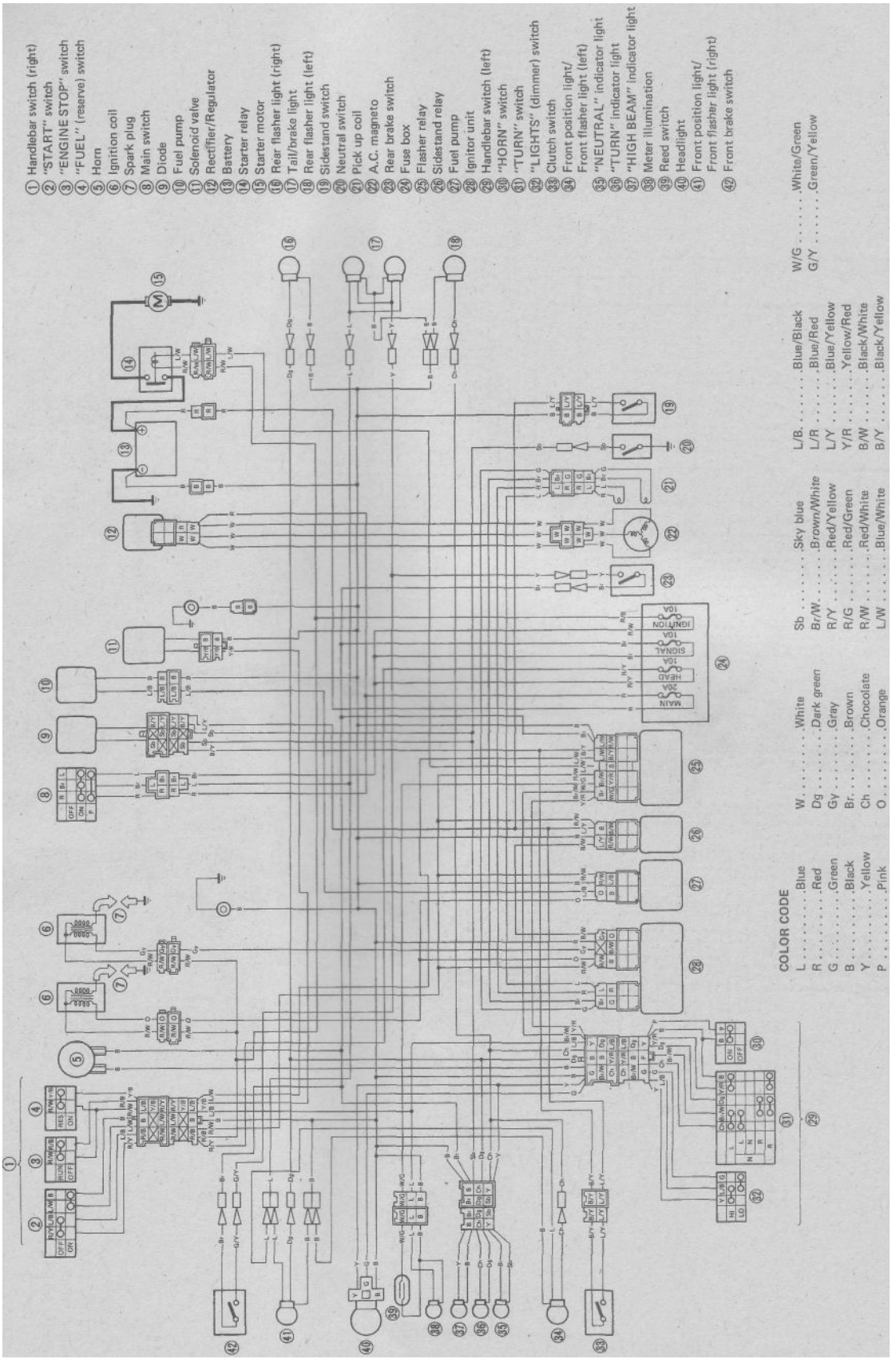
Prior to troubleshooting a circuit, check the fuses to make sure they're in good condition. Make sure the battery is fully charged and check the cable connections.

When checking a circuit, make sure all connectors are clean, with no broken or loose terminals or wires. When unplugging a connector, don't pull on the wires - pull only on the connector housings themselves.

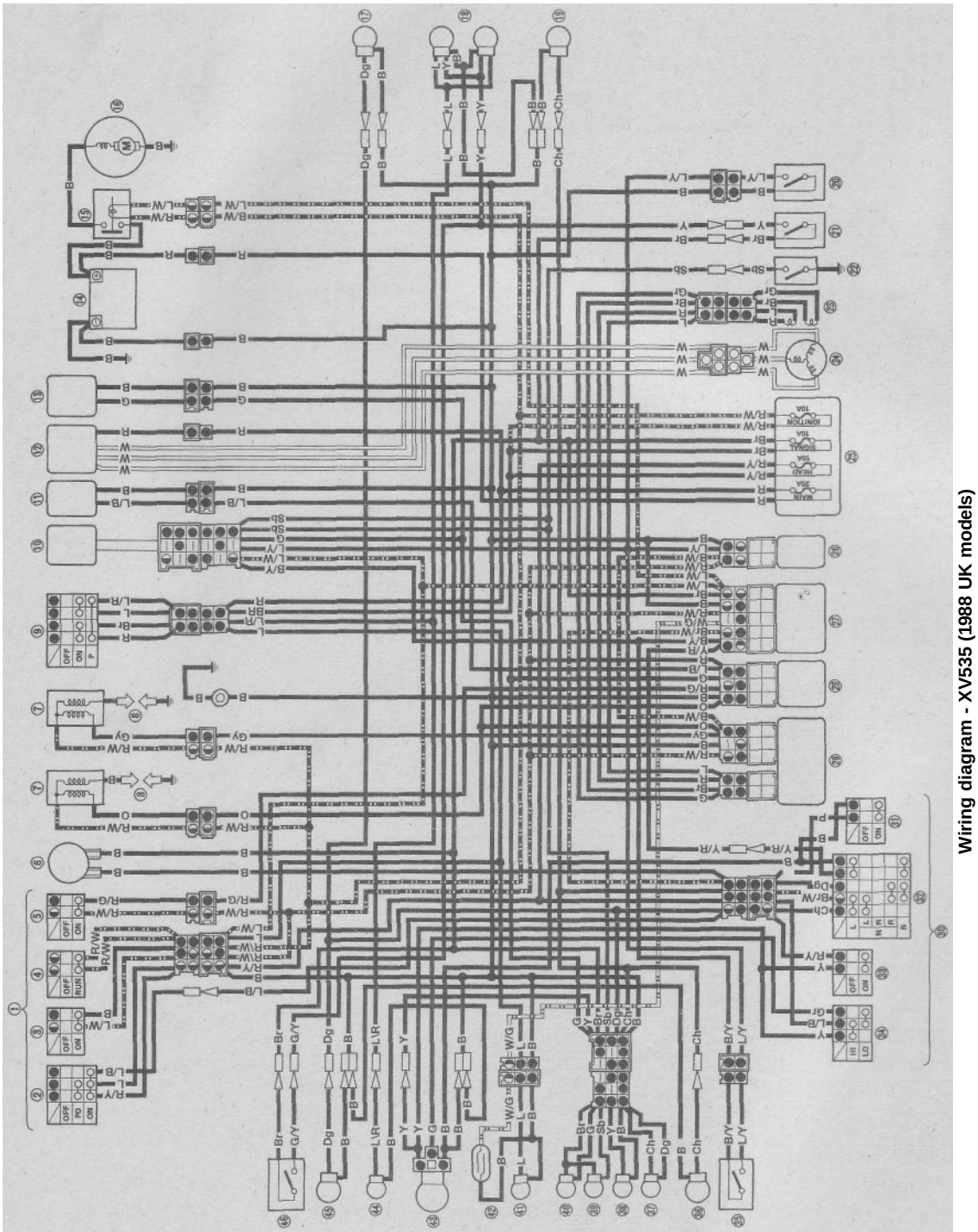
Refer to the accompanying table for the wire color codes.



Wiring diagram - XV535 (1987 and 1988 US models)

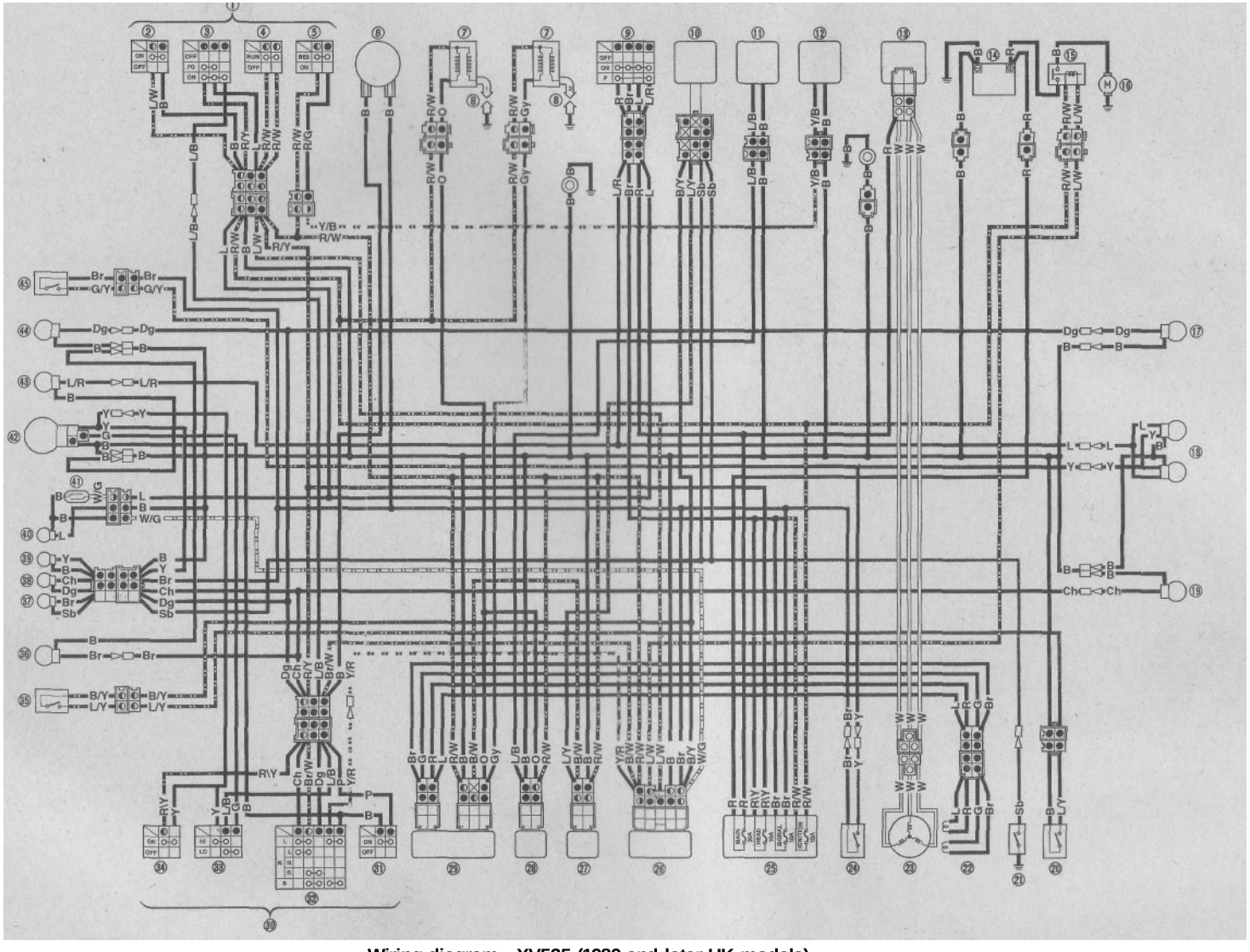


Wiring diagram - XV535 (1989 and later US models)



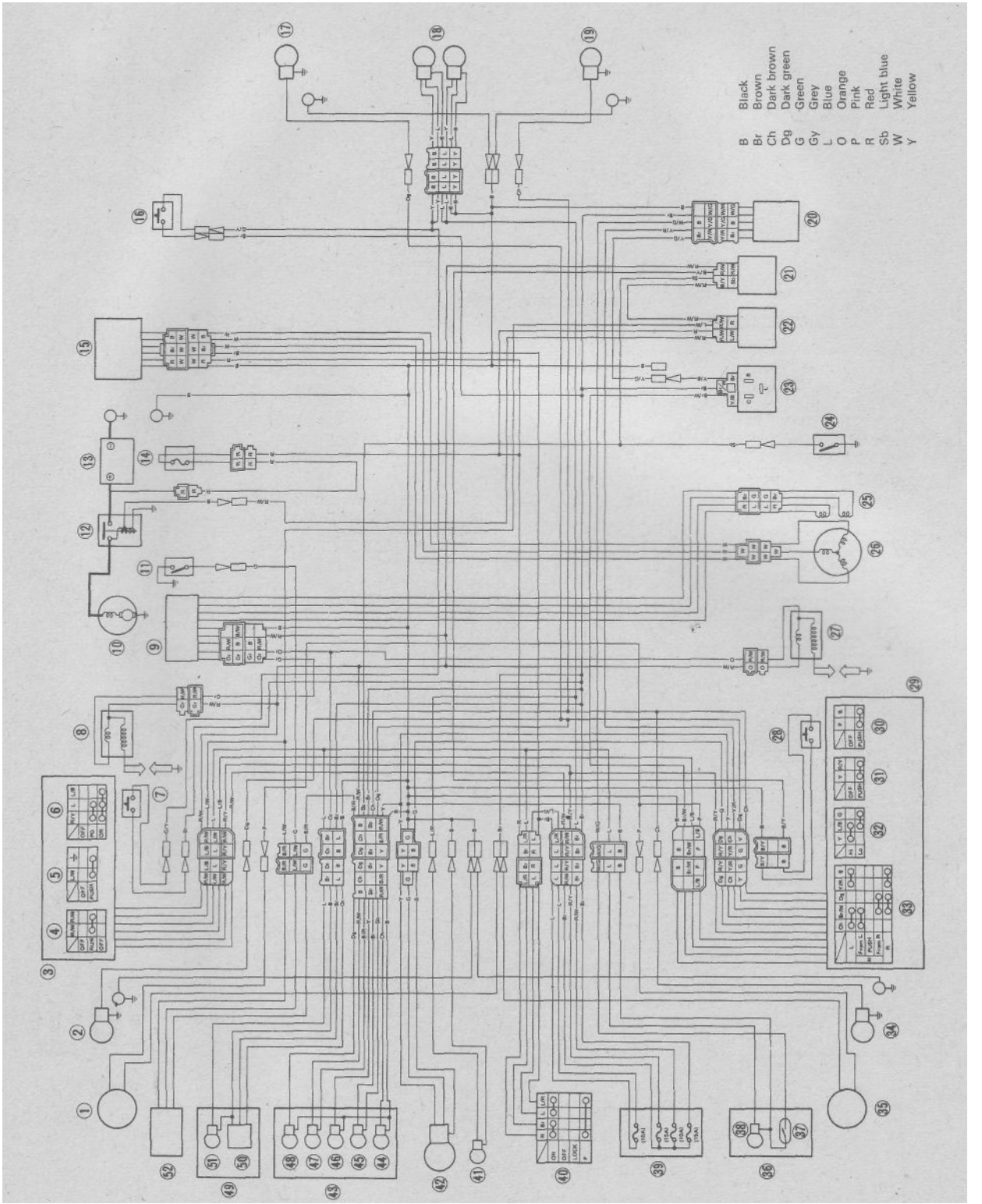
Wiring diagram - XV535 (1988 UK models)

1 *Right handlebar switch*
2 *Lighting switch*
3 *Start switch*
4 *Engine kill switch*
5 *Fuel switch*
6 *Horn*
7 *Ignition coil*
8 *Sparkplug*
9 *Main switch*
10 *Diode*
11 *Fuel pump*
12 *Rectifier/regulator*
13 *Fuel sender*
14 *Battery*
15 *Starter relay*
16 *Starter motor*
17 *Right rear turn signal*
18 *Tail/brake light*
19 *Left rear turn signal*
20 *Sidestand relay*
21 *Rear brake switch*
22 *Neutral switch*
23 *Pickup coil*
24 *Alternator*
25 *Fuse block*
26 *Sidestand relay*
27 *Relay assembly*
28 *Fuel pump relay*
29 *Igniter unit*
30 *Left handlebar switch*
31 *Horn switch*
32 *Turn signal switch*
33 *Passing switch*
34 *Dimmer switch*
35 *Clutch switch*
36 *Left front turn signal*
37 *Turn signal indicator light*
38 *High beam indicator light*
39 *Neutral indicator light*
40 *Fuel warning light*
41 *Gauge illumination*
42 *Reed switch*
43 *Headlight*
44 *Marker light*
45 *Right front turn signal*
46 *Front brake switch*



Wiring diagram - XV535 (1989 and later UK models)

1	*Right handlebar switch*	10	*Diode*	19	*Left rear turn signal*	28	*Fuel pump*	37	*Neutral indicator light*
2	*Start switch*	11	*Fuel pump*	20	*Sidestand switch*	29	*Igniter unit*	38	*Turn signal indicator light*
3	*Lighting switch*	12	*Solenoid valve*	21	*Neutral switch*	30	*Left handlebar switch*	39	*High beam indicator light*
4	*Engine kill switch*	13	*Rectifier/regulator*	22	*Pickup coil*	31	*Horn switch*	40	*Gauge illumination*
5	*Fuel switch*	14	*Battery*	23	*Alternator*	32	*Turn signal switch*	41	*Reed switch*
6	*Horn*	15	*Starter relay*	24	*Rear brake switch*	33	*Dimmer switch*	42	*Headlight*
7	*Ignition coil*	16	*Starter motor*	25	*Fuse block*	34	*Passing switch*	43	*Marker light*
8	*Spark plug*	17	*Right rear turn signal*	26	*Turn signal relay*	35	*Clutch switch*	44	*Right front turn signal*
9	*Main switch*	18	*Tail/brake light*	27	*Sidestand relay*	36	*Left front turn signal*	45	*Front brake switch*



1 Horn
2 Front right-hand turn signal
3 Right-hand handlebar switch
4 Engine kill switch
5 Starter switch
6 Lighting switch
7 Front brake switch
8 Ignition coil
9 TCI unit
10 Starter motor
11 Oil level switch
12 Starter solenoid
13 Battery
14 Main fuse
15 Regulator/rectifier
16 Rear brake switch
17 Rear right-hand turn signal
18 Tail/stop lamp
19 Rear left-hand turn signal
20 Turn signal cancelling unit
21 Starter circuit cut-out relay
22 Starter relay
23 Turn signal relay
24 Neutral switch
25 Pickup coil
26 Alternator
27 Ignition coil
28 Clutch switch
29 Left-hand handlebar switch
30 Horn switch
31 Headlamp flash switch
32 Dip switch
33 Turn signal switch
34 Front left-hand turn signal
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36 Speedometer
37 Distance sensor
38 Meter light
39 Fuse box
40 Ignition switch
41 Headlamp
42 Parking lamp
43 Pilot lamp box
44 Left-hand turn signal warning fight
45 Neutral light
46 High beam warning light
47 Oil level warning light
48 Right-hand turn signal warning light
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50 Tachometer unit
51 Meter light
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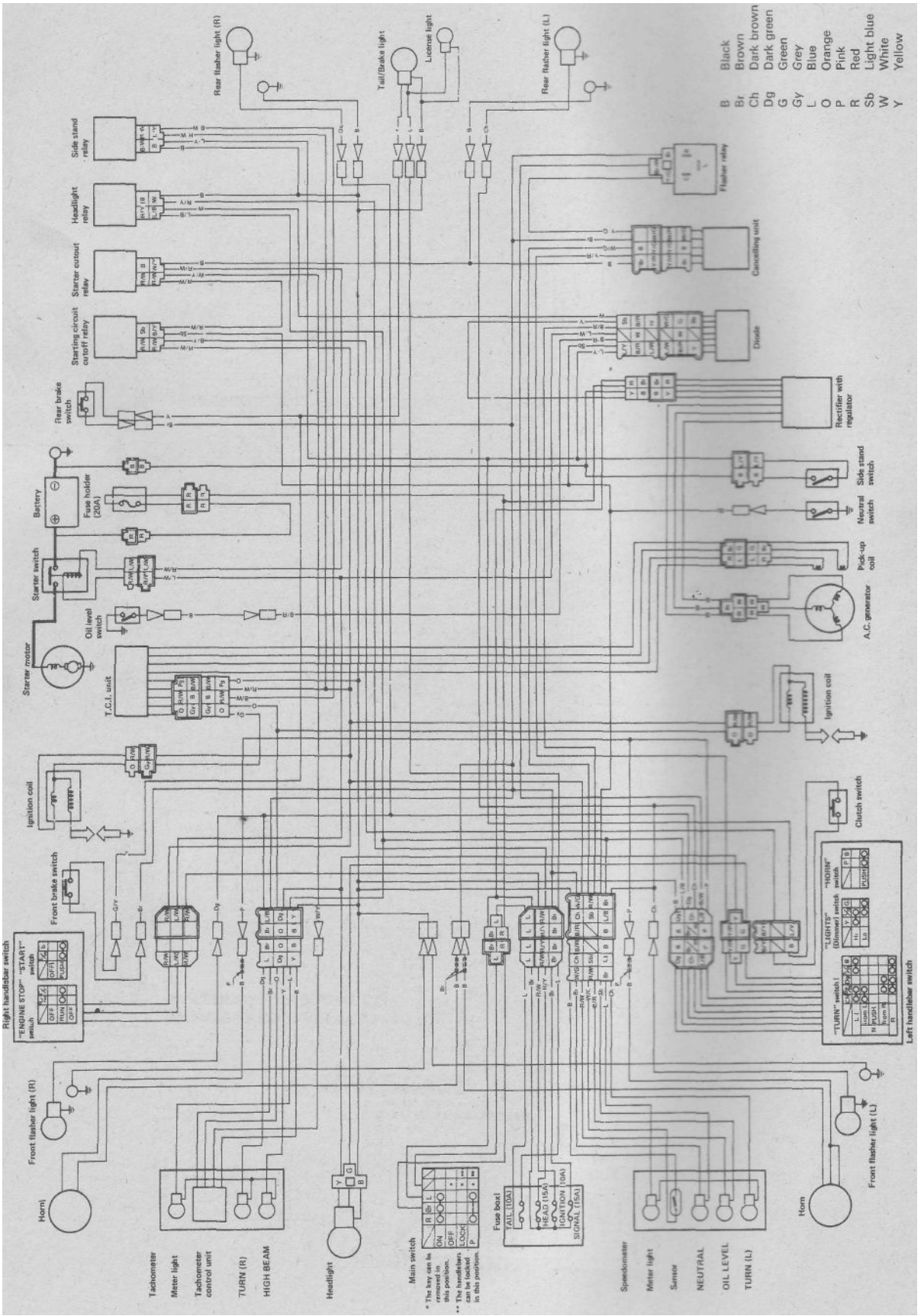
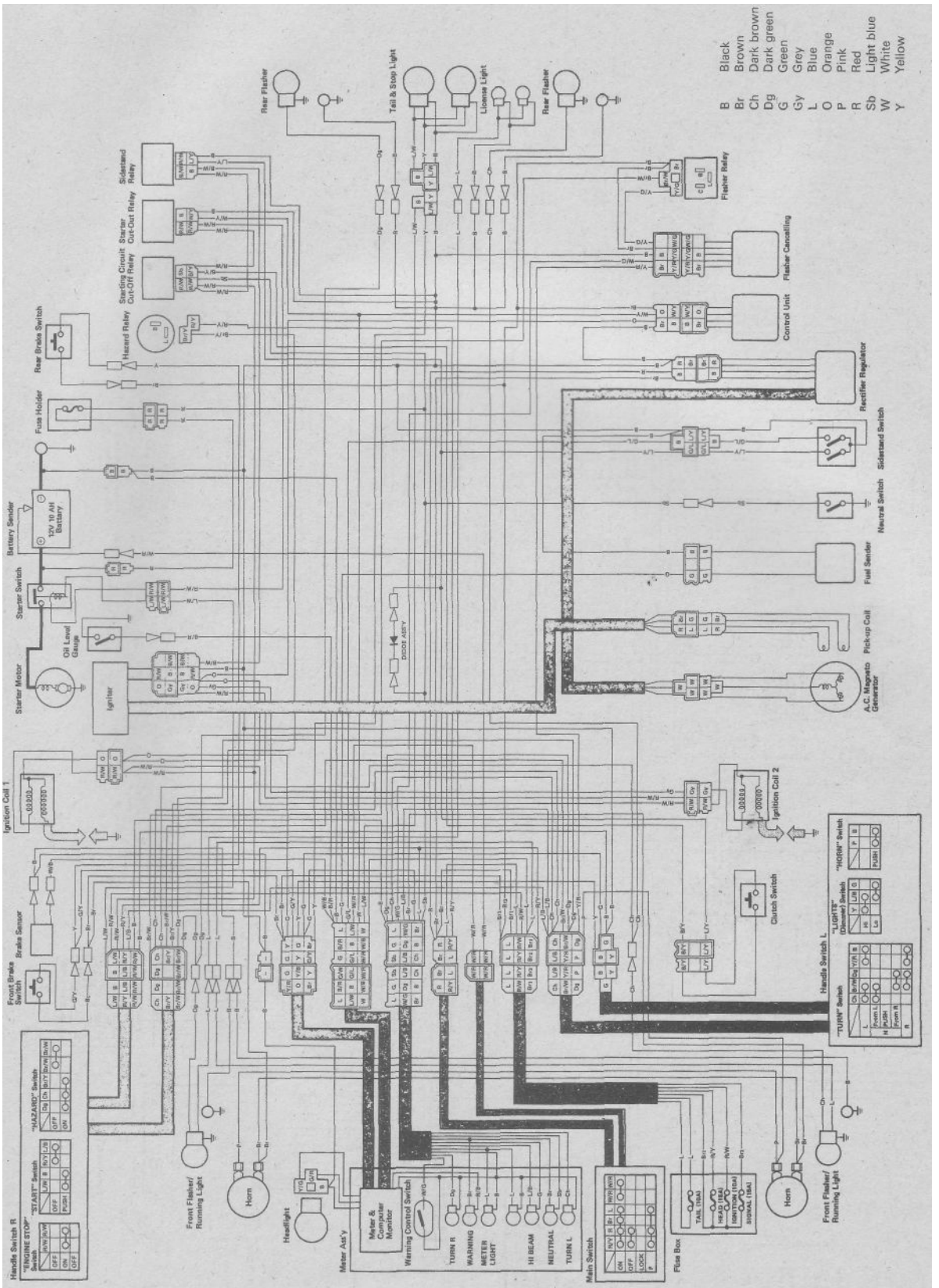
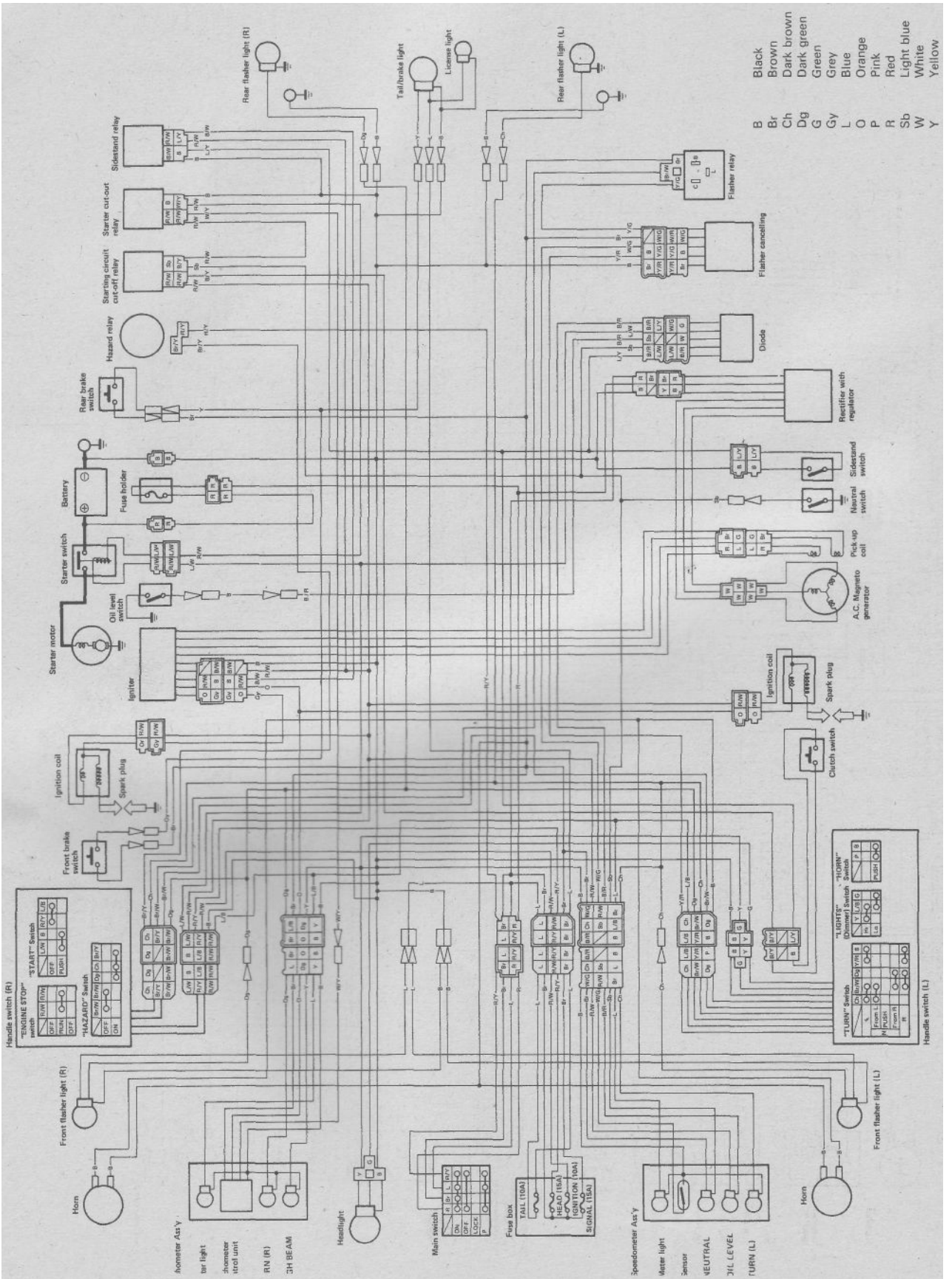
Wiring diagram - XV750 SE and TR1 models



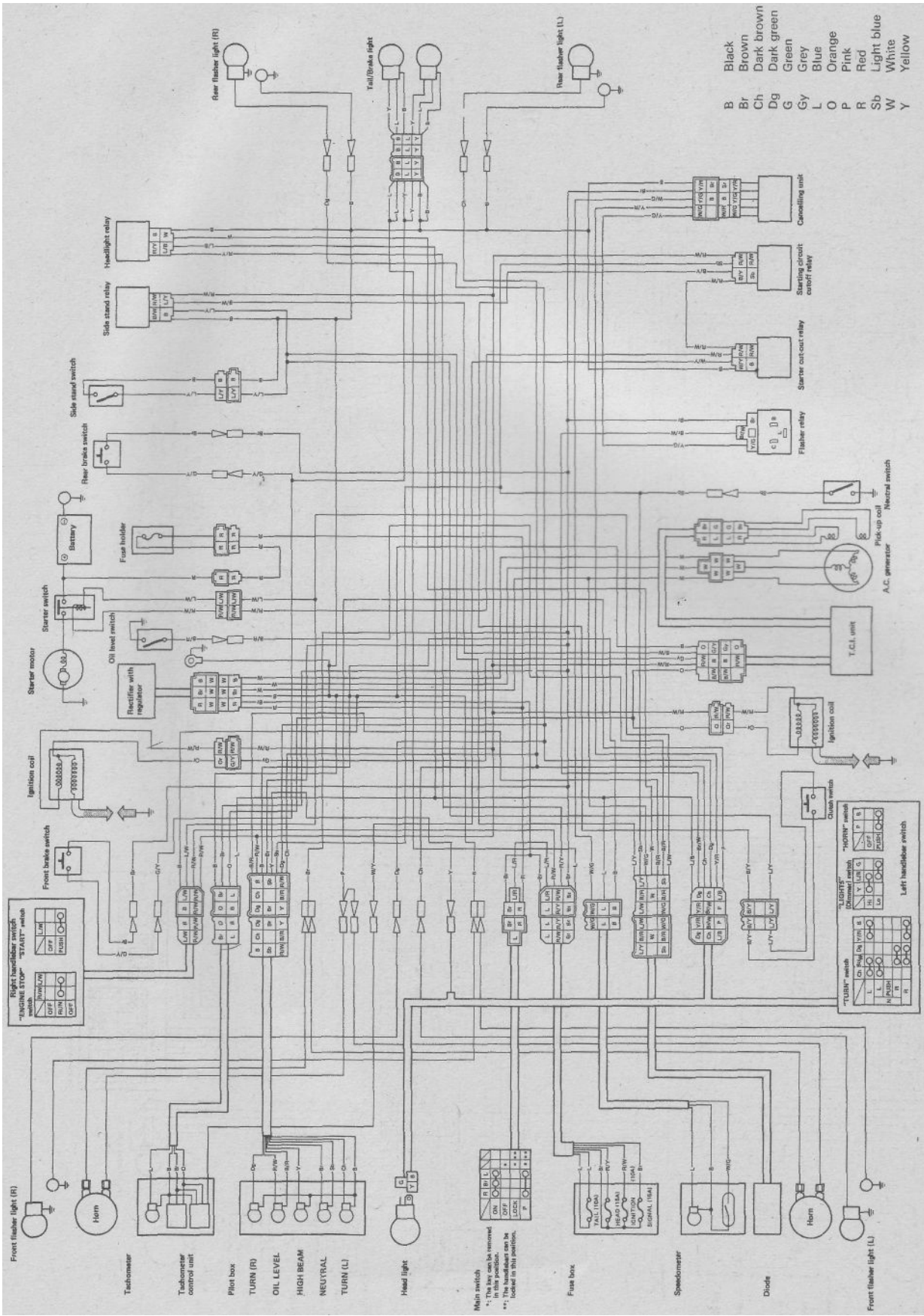
Wiring diagram - XV750H, J, K and MK models



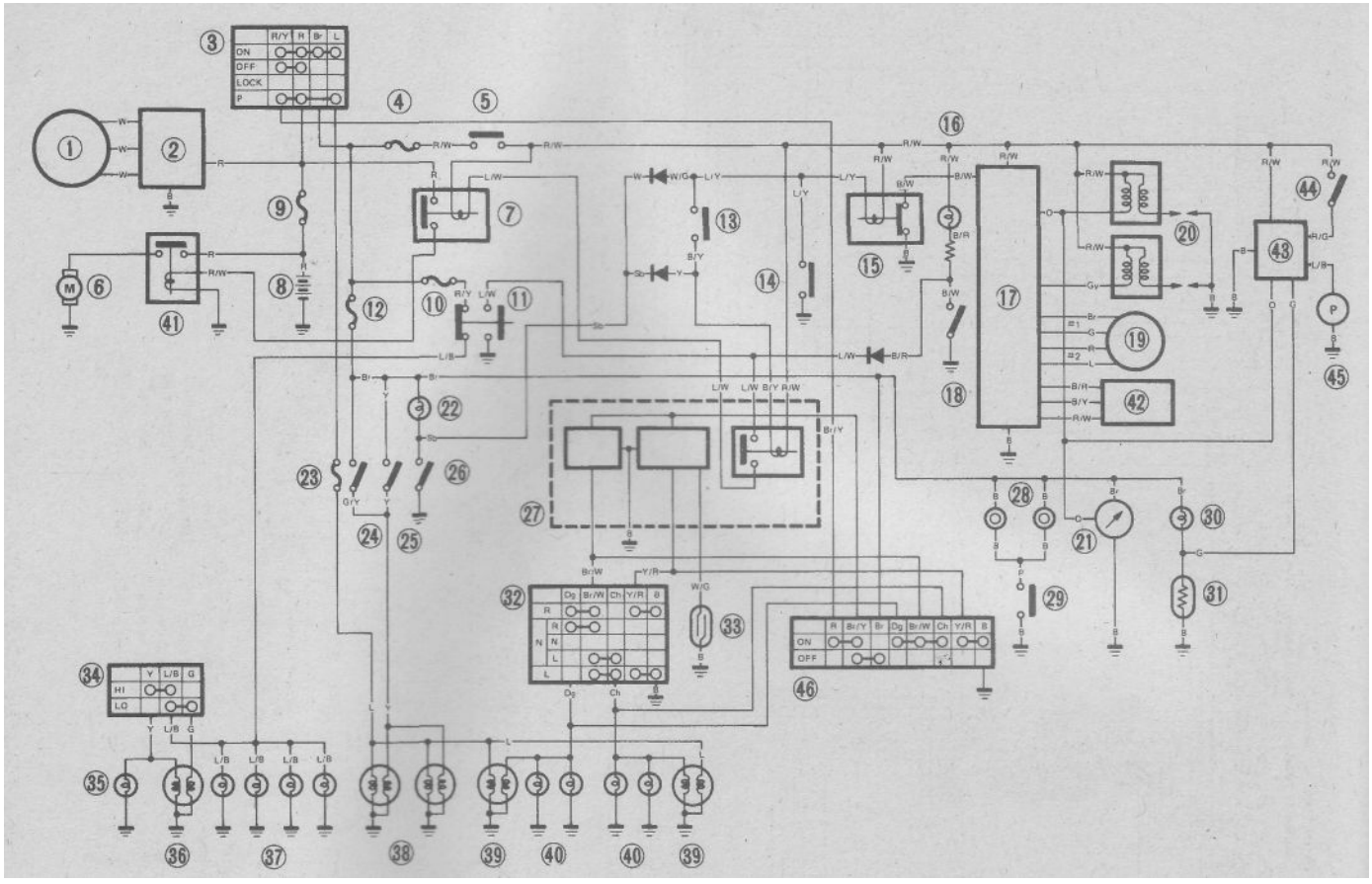
Wiring diagram - XV920 J model



Wiring diagram - XV920K and MK models

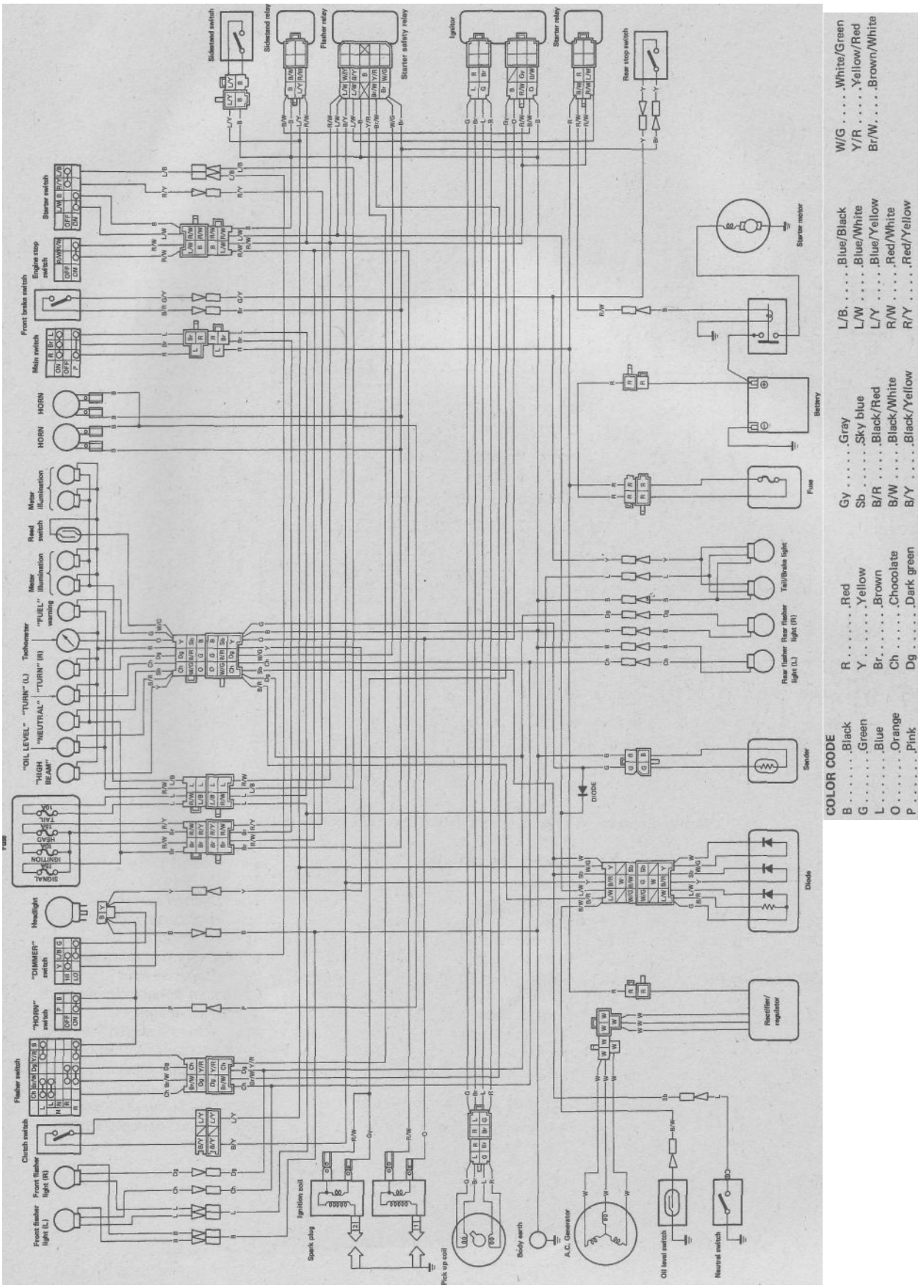


Wiring diagram - XV920 RH and RJ models

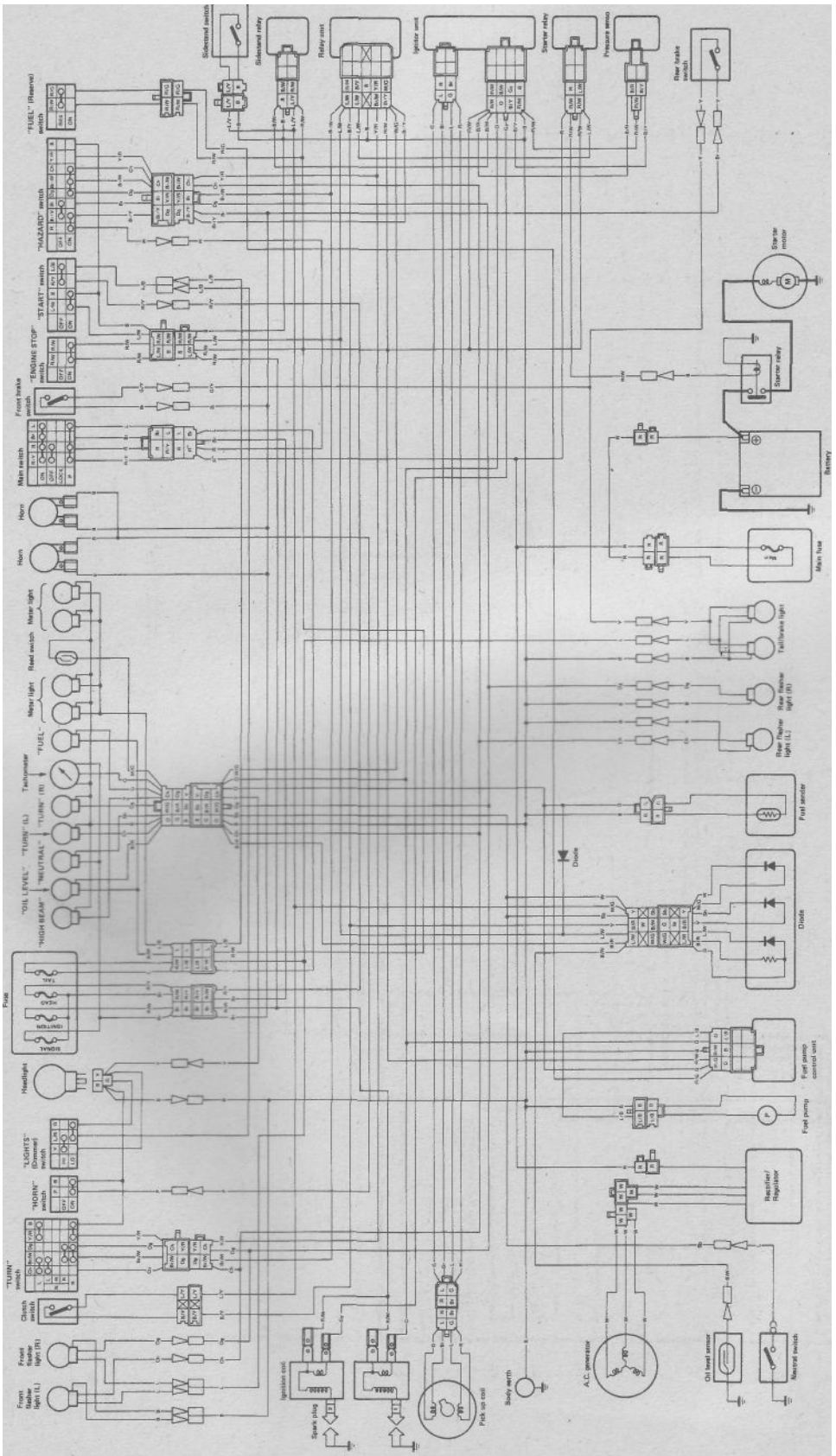


Wiring **diagram** - **XV700 and 1000 (1984 and 1985 US models)**

1 *Alternator*
2 *Rectifier/regulator*
3 *Main key switch*
4 *Ignition fuse*
5 *Engine kill switch*
6 *Starter motor*
7 *Starter relay (XV700) or solenoid switch (XV1000)*
8 *Battery*
9 *Main fuse*
10 *Headlight fuse*
11 *Starter switch*
12 *Signal fuse*
13 *Clutch switch*
14 *Sidestand switch*
15 *Sidestand relay*
16 *Oil level indicator light*
17 *Igniter unit*
18 *Oil level switch*
19 *Pickup coil*
20 *Ignition coil*
21 *Tachometer*
22 *Neutral indicator light*
23 *Tail fuse*
24 *Front brake switch*
25 *Rear brake switch*
26 *Neutral switch*
27 *Relay assembly*
28 *Horn*
29 *Horn switch*
30 *Fuel warning indicator light*
31 *Fuel sender*
32 *Flasher switch*
33 *Reed switch*
34 *Dimmer switch*
35 *High beam indicator light*
36 *Headlight*
37 *Instrument illumination light*
38 *Tail/brake light*
39 *Turn signal indicator light*
40 *Flasher light*
41 *Solenoid switch (XV1000)*
42 *Pressure sensor (XV1000)*
43 *Fuel pump controller (XV1000)*
44 *Reserve switch (XV1000)*
45 *Fuel pump (XV1000)*
46 *Hazard switch (XVI000)*



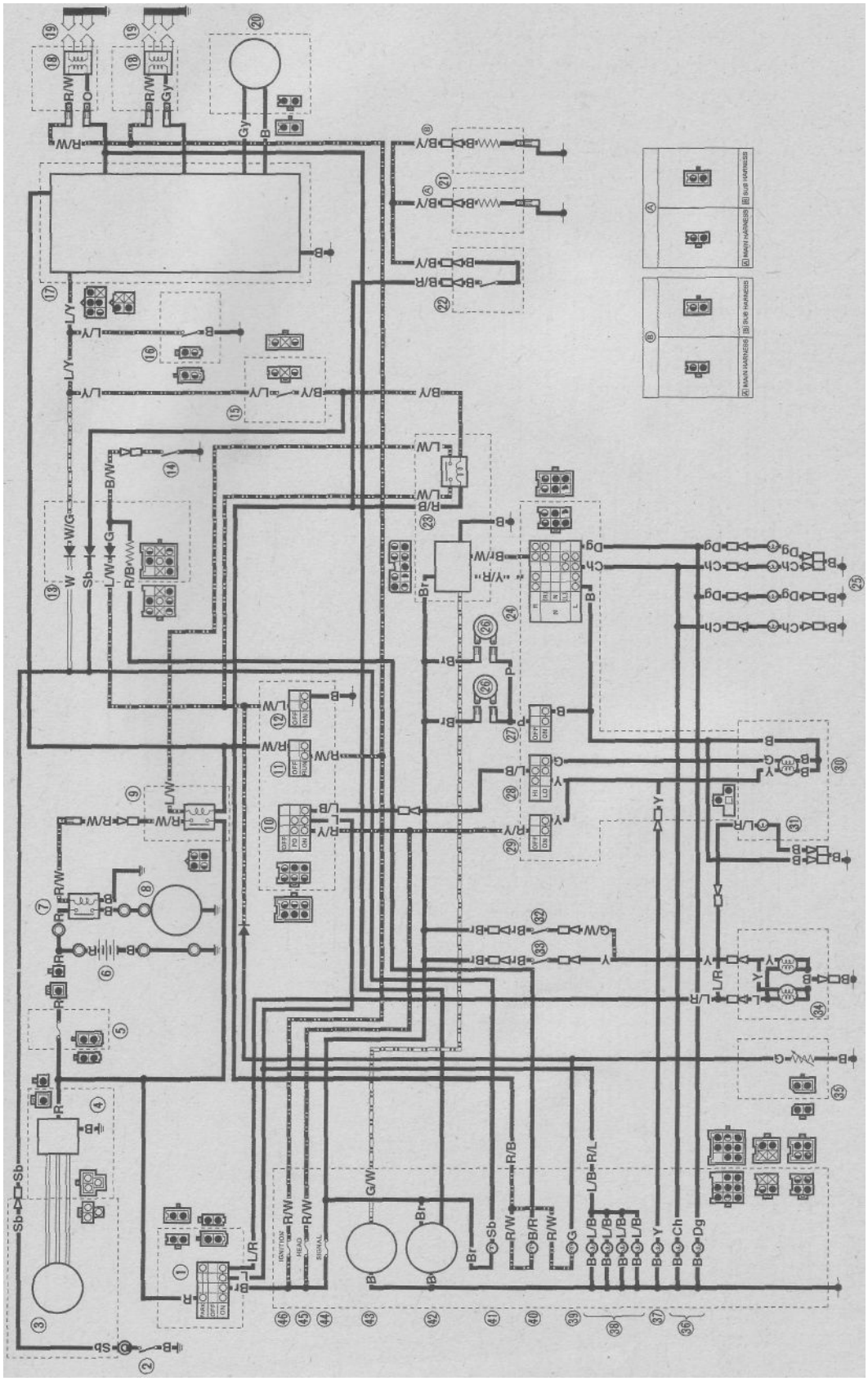
Wiring diagram (1986 and later US XV700 and XV750 models)



COLOR CODE

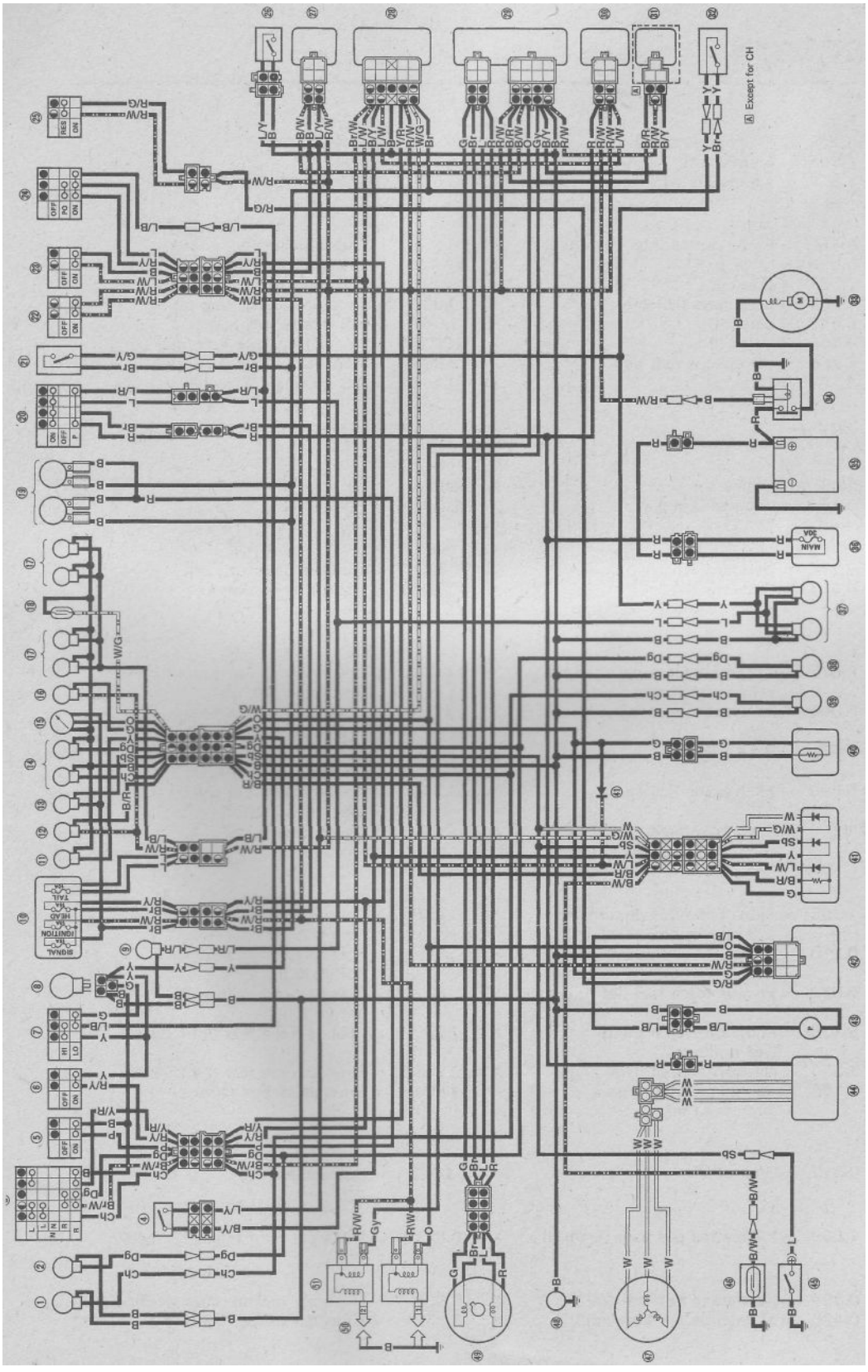
B	Black	B/Y	Black/Yellow
L	Blue	B/R	Black/Red
Dg	Dark green	B/W	Black/White
Br	Brown	L/B	Blue/Black
Sb	Sky blue	L/Y	Blue/Yellow
Y	Yellow	Y/R	Yellow/Red
R	Red	R/W	Red/White
Gy	Gray	R/Y	Red/Yellow
G	Green	G/Y	Green/Yellow
P	Pink	W/G	White/Green
W	White	Br/W	Brown/White
O	Orange	Br/Y	Brown/Yellow

Wiring diagram (1986 and later US XV1100 models)



Wiring diagram (1992 and later UK XV750 models)

7 *Main switch*
2 *Neutral switch*
3 *Alternator*
4 *Rectifier regulator*
5 *Main fuse*
6 *Battery*
7 *Solenoid relay*
8 *Starter motor*
9 *Starting circuit cutoff relay*
10 *Lighting switch*
11 *Engine kill switch*
12 *Start switch*
13 *Diode*
14 *Oil level switch*
15 *Clutch switch*
16 *Sidestand switch*
17 *Igniter unit*
18 *Ignition coil*
19 *Sparkplug*
20 *Pickup coil*
21 *Carburetor heater*
22 *Thermoswitch*
23 *Relay unit*
24 *Turn signal switch*
25 *Flasher light*
26 *Horn*
27 *Horn switch*
28 *Dimmer switch*
29 *Passing switch*
30 *Headlight*
31 *Auxiliary light*
32 *Front brake switch*
33 *Rear brake switch*
34 *Tail/brake light*
35 *Fuel sender*
36 *Turn signal indicator light*
37 *High beam indicator light*
38 *Instrument light*
39 *Fuel level indicator light*
40 *Oil level indicator light*
41 *Neutral indicator light*
42 *Tachometer*
43 *Speedometer*
44 *Signal fuse*
45 *Headlight fuse*
46 *Ignition fuse*
A *Main harness*
B *Sub-harness*



Wiring diagram (1986 and later XV1000 and 1100 UK models)

1 *Left front turn signal*
2 *Right front turn signal*
3 *Turn signal switch*
4 *Clutch switch*
5 *Horn switch*
6 *Passing switch*
7 *Dimmer switch*
8 *Headlight*
9 *Auxiliary light*
10 *Fuse block*
11 *High beam indicator light*
12 *Oil level indicator light*
13 *Neutral indicator light*
14 *Turn indicator light*
15 *Tachometer*
16 *Fuel warning indicator light*
17 *Instrument illumination*
18 *Reed switch*
19 *Horn*
20 *Main switch*
21 *Front brake switch*
22 *Engine kill switch*
23 *Start switch*
24 *Lighting switch*
25 *Fuel reserve witch*
26 *Sidestand switch*
27 *Sidestand relay*
28 *Relay assembly*
29 *Igniter unit*
30 *Starter relay*
31 *Pressure sensor*
32 *Rear brake switch*
33 *Starter motor*
34 *Solenoid switch*
35 *Battery*
36 *Main fuse*
37 *Tail/brake light*
38 *Right rear turn signal*
39 *Left rear turn signal*
40 *Fuel sender*
41 *Diode*
42 *Fuel pump control unit*
43 *Fuel pump*
44 *Rectifier/regulator*
45 *Neutral switch*
46 *Oil level switch*
47 *Alternator*
48 *Body earth (ground)*
49 *Pickup coil*
50 *Sparkplug*
51 *Ignition coil*

Conversion factors

Length (distance)

Inches (in)	X	25.4	= Millimetres (mm)	X	0.0394	= Inches (in)
Feet (ft)	X	0.305	= Metres (m)	X	3.281	= Feet (ft)
Miles	X	1.609	= Kilometres (km)	X	0.621	= Miles

Volume (capacity)

Cubic inches (cu in; in^3)	X	16.387	= Cubic centimetres (cc; cm^3)	X	0.061	= Cubic inches (cu in; in^3)
Imperial pints (Imp pt)	X	0.568	= Litres (l)	X	1.76	= Imperial pints (Imp pt)
Imperial quarts (Imp qt)	X	1.137	= Litres (l)	X	0.88	= Imperial quarts (Imp qt)
Imperial quarts (Imp qt)	X	1.201	= US quarts (US qt)	X	0.833	= Imperial quarts (Imp qt)
US quarts (US qt)	X	0.946	= Litres (l)	X	1.057	= US quarts (US qt)
Imperial gallons (Imp gal)	X	4.546	= Litres (l)	X	0.22	= Imperial gallons (Imp gal)
Imperial gallons (Imp gal)	X	1.201	= US gallons (US gal)	X	0.833	= Imperial gallons (Imp gal)
US gallons (US gal)	X	3.785	= Litres (l)	X	0.264	= US gallons (US gal)

Mass (weight)

Ounces (oz)	X	28.35	= Grams (g)	X	0.035	Ounces (oz)
Pounds (lb)	X	0.454	= Kilograms (kg)	X	2.205	= Pounds (lb)

Force

Ounces-force (ozf; oz)	X	0.278	= Newtons (N)	X	3.6	= Ounces-force (orf; oz)
Pounds-force (lbf; lb)	X	4.448	= Newtons (N)	X	0.225	= Pounds-force (lbf; lb)
Newtons (N)	X	0.1	= Kilograms-force (kgf; kg)	X	9.81	= Newtons (N)

Pressure

Pounds-force per square inch (psi; lbf/in^2; lb/in^2)	X	0.070	= Kilograms-force per square centimetre (kgf/cm^2; kg/cm^2)	X	14.223	= Pounds-force per square inch (psi; lbf/in^2; lb/in^2)
Pounds-force per square inch (psi; lbf/in^2; lb/in^2)	X	0.068	= Atmospheres (atm)	X	14.696	= Pounds-force per square inch (psi; lbf/in^2; lb/in^2)
Pounds-force per square inch (psi; lbf/in^2; lb/in^2)	X	0.069	= Bars	X	14.5	= Pounds-force per square inch (psi; lbf/in^2; lb/in^2)
Pounds-force per square inch (psi; lbf/in^2; lb/in^2)	X	6.895	= Kilopascals (kPa)	X	0.145	= Pounds-force per square inch (psi; lbf/in^2; lb/in^2)
Kilopascals (kPa)	X	0.01	= Kilograms-force per square centimetre (kgf/cm^2; kg/cm^2)	X	98.1	= Kilopascals (kPa)

Torque (moment of force)

Pounds-force inches (lbf in; lb in)	X	1.152	= Kilograms-force centimetre (kgf cm; kg cm)	X	0.868	= Pounds-force inches (lbf in; lb in)
Pounds-force inches (lbf in; lb in)	X	0.113	= Newton metres (Nm)	X	8.85	= Pounds-force inches (lbf in; lb in)
Pounds-force inches (lbf in; lb in)	X	0,083	= Pounds-force feet (lbf ft; lb ft)	X	12	= Pounds-force inches (lbf in; lb in)
Pounds-force feet (lbf ft; lb ft)	X	0.138	= Kilograms-force metres (kgf m; kg m)	X	7.233	= Pounds-force feet (lbf ft; lb ft)
Pounds-force feet (lbf ft; lb ft)	X	1.356	= Newton metres (Nm)	X	0.738	= Pounds-force feet (lbf ft; lb ft)
Newton metres (Nm)	X	0.102	= Kilograms-force metres (kgf m; kg m)	X	9.804	= Newton metres (Nm)

Power

Horsepower (hp)	X	745.7	= Watts (W)	X	0.0013	= Horsepower (hp)

Velocity (speed)

Miles per hour (miles/hr; mph)	X	1.609	= Kilometres per hour (km/hr; kph)	X	0.621	= Miles per hour (miles/hr; mph)

*Fuel consumption**

Miles per gallon, Imperial (mpg)	X	0.354	= Kilometres per litre (km/l)	X	2.825	= Miles per gallon, Imperial (mpg)
Miles per gallon, US (mpg)	X	0.425	= Kilometres per litre (km/l)	X	2.352	= Miles per gallon, US (mpg)

Temperature

Degrees Fahrenheit = (°C x 1.8) + 32

Degrees Celsius (Degrees Centigrade; °C) = (°F - 32) x 0.56

**It is common practice to convert from miles per gallon (mpg) to litres/100 kilometres (1/100km), where mpg (Imperial) x 1/100 km = 282 and mpg (US) x 1/100 km = 235*

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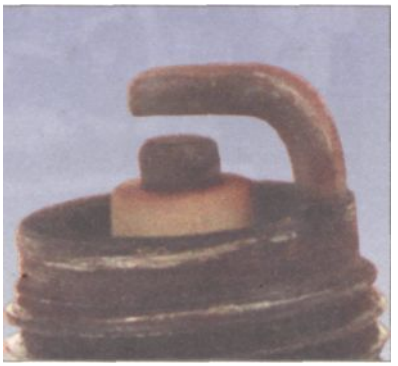
Common spark plug conditions



NORMAL

Symptoms: Brown to grayish-tan color and slight electrode wear. Correct heat range for engine and operating conditions.
Recommendation: When new spark plugs are installed, replace with plugs of the same heat range.

WORN

Symptoms: Rounded electrodes with a small amount of deposits on the firing end. Normal color. Causes hard starting in damp or cold weather and poor fuel economy.
Recommendation: Plugs have been left in the engine too long. Replace with new plugs of the same heat range. Follow the recommended maintenance schedule.

CARBON DEPOSITS

Symptoms: Dry sooty deposits indicate a rich mixture or weak ignition. Causes misfiring, hard starting and hesitation.
Recommendation: **Make sure the** plug has **the correct heat** range. Check for a **clogged** air **filter or** problem in the fuel system or engine management system. Also check for ignition system problems.

ASH DEPOSITS

Symptoms: Light brown deposits encrusted on the side or center electrodes or both. Derived from oil and/or fuel additives. Excessive amounts may mask the spark, causing misfiring and hesitation during acceleration.
Recommendation: If excessive deposits accumulate over a short time or low mileage, install new valve guide seals to prevent seepage of oil into the combustion chambers. Also try changing gasoline brands.

OIL DEPOSITS

Symptoms: Oily coating caused by poor oil control. Oil is leaking past worn valve guides or piston rings into the combustion chamber. Causes hard starting, misfiring and hesitation.
Recommendation: Correct the mechanical condition with necessary repairs and install new plugs.

GAP BRIDGING

Symptoms: Combustion deposits lodge between the electrodes. Heavy deposits accumulate and bridge the electrode gap. The plug ceases to fire, resulting in a dead cylinder.
Recommendation: Locate the faulty plug and remove the deposits from between the electrodes.

TOO HOT

Symptoms: Blistered, white insulator, eroded electrode and absence of deposits. Results in shortened plug life.
Recommendation: Check for the correct plug heat range, over-advanced ignition timing, lean fuel mixture, intake manifold vacuum leaks, sticking valves and insufficient engine cooling.

PREIGNITION

Symptoms: Melted electrodes. Insulators are white, but may be dirty due to misfiring or flying debris in the combustion chamber. Can lead to engine damage.
Recommendation: Check for the correct plug heat range, over-advanced ignition timing, lean fuel mixture, insufficient engine cooling and lack of lubrication.

HIGH SPEED GLAZING

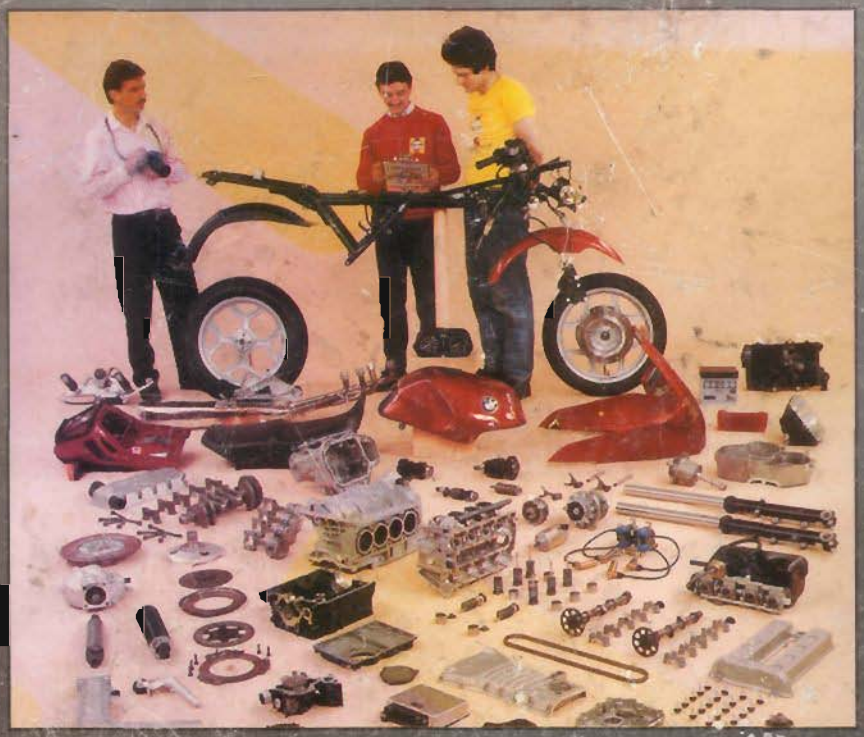
Symptoms: Insulator has yellowish, glazed appearance. Indicates that combustion chamber temper-' atures have risen suddenly during hard acceleration. Normal deposits." melt to form a conductive coating. Causes misfiring at high speeds.
Recommendation: Install new plugs. Consider using a colder plug if driving habits warrant.

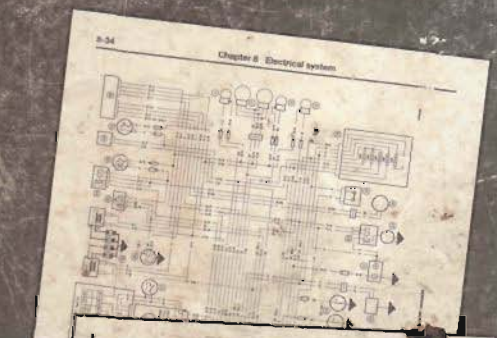
DETONATION

Symptoms: Insulators may be cracked or chipped. Improper gap setting techniques can also result in a fractured insulator tip. Can lead to piston damage.
Recommendation: Make sure the fuel anti-knock values meet engine requirements. Use care when setting the gaps on new plugs. Avoid lugging the engine.

MECHANICAL DAMAGE

Symptoms: May be caused by a foreign object in the combustion chamber or the piston striking an incorrect reach (too long) **plug.** Causes a dead cylinder **and could** result in piston damage.
Recommendation: **Repair the** mechanical damage. **Remove the** foreign object from **the engine** and/or install the **correct reach** plug.





Models covered by this manual:

535cc: Yamaha XV535 and XV535S - US 1987 to 1994, and UK 1988 to 1994
699cc: Yamaha XV700 Virago - US 1984 to 1987
748cc: Yamaha XV750 Virago - US 1981 to 1983, and 1988 to 1994
748cc: Yamaha XV750SE Special - UK 1981 to 1983, and XV750 Virago - UK 1992 to 1994
920cc: Yamaha XV920 Virago (inc. XV920R chain) - US 1981 to 1983
981cc: Yamaha XV1000 Virago - US 1984 to 1985
981cc: Yamaha TR1 - UK 1981 to 1985, and XV1000 Virago - UK 1986 to 1989
1063cc: Yamaha XV1100 Virago - US 1986 to 1994, UK 1989 to 1994

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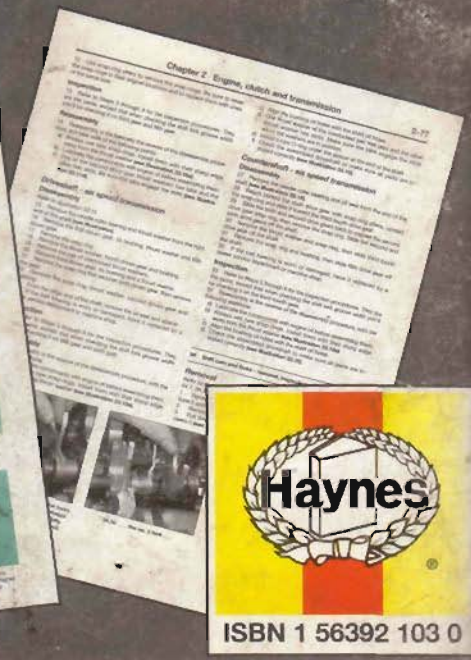

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