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 or steps.

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

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

References to the left or right side of the 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 Honda V45/65 Sabre & Magna (VF700, 750 & 1100 V-Fours)

The first Honda V-Four engine, introduced in 1982 in a 750 cc (45 cu in) capacity, was widely regarded as a milestone of motorcycle engineering. Its 90° V configuration allowed for a lighter engine which was more compact, yet more powerful than any previous Honda 750 cc engine. Because of the inherent balancing characteristics of a V-engine, as well as the rubber mountings, it is also an unusually smooth and quiet engine compared with the more conventional in-line, air-cooled counterparts in production at the time.

The 750 cc engine was superceded in 1984 by a shorter-stroke 700 cc model, designed to fall below the heavyweight motorcycle import tariff imposed on machines imported into the US. The 700 cc engine continued for the remaining years of the Sabre, but a return was made to the 750 cc unit in 1988 for the last year of the Magna's production. All models imported into the UK were of 750 cc capacity.

An 1100 cc (65 cu in) engine was introduced in 1983 for the US market.

There are two distinctly different models, the Sabre (known as the Sport in the UK) and the Magna (known as the Custom in the UK). The Sabre differs from the Magna in having Honda's Pro-Link rear suspension and sophisticated electronic instrumentation. Conversely, Magna models are custom-styled, with high handlebars, teardrop tank and a stepped seat. The Magnas have conventional twin-shock rear suspension.

Both Sabre and Magna have appeared in 700, 750 and 1100 cc engine sizes during the model run, and have received a number of improvements and modifications. Owners are therefore advised to refer to the table under *'Identification numbers'* to establish the exact model year of their machine before carrying out any of the procedures given in the main text of the manual.

Identification numbers

The frame serial number is stamped into the right side of the steering head and the VIN (Vehicle Identification Number) appears on the left side of the steering head; on 1987 and 1988 700/750 Magna models, it is attached to the right frame top tube under the fuel tank. The engine number is stamped into the right upper side of the crankcase, directly above the clutch unit.

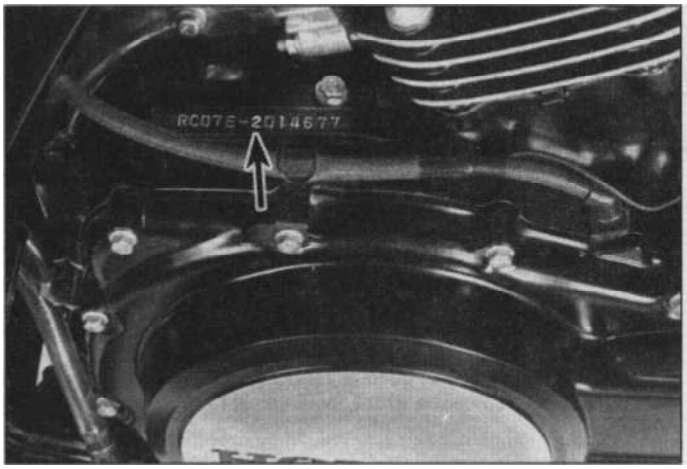
A label attached to the right or left frame tube under the side cover, or attached to the rear fender top surface under the seat, gives the color code of the machine. The carburetor identification number appears on the carburetor body casting, just above the float chamber joint. Emission control information (US models only) is given on a label attached to the right lower frame tube on models through 1986, or to the right upper frame tube on later models.

All serial 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.

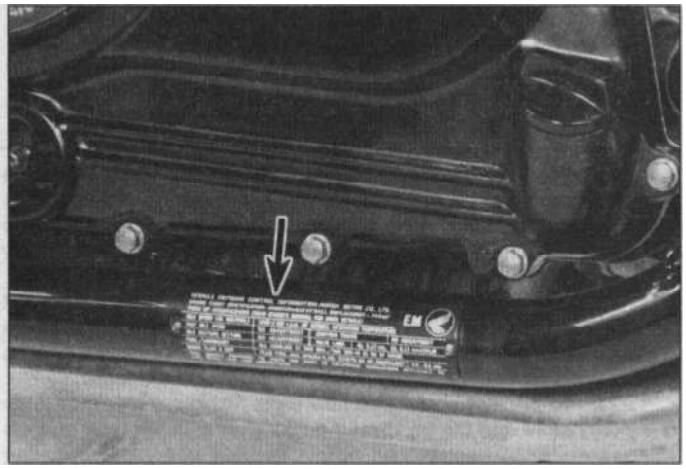
The frame serial number, engine serial number, carburetor identification number and color code should also be kept in a handy place (such as with your driver's license) so they are always available when purchasing or ordering parts for your machine.

The procedures in this manual identify the bikes by production year. If this is not known, it can be determined from the engine and frame serial numbers as shown in the chart on the next page.

Frame number location on steering head right side



Engine number location on crankcase top surface



Emission Control label location (models through 1986)

		Engine number	Frame number
US models (except California)			
VF750S (1982)	RC07E-2000066 to 2015996	RC070-CM000036 to 012083	
VF750S (1983)	RC07E-2100018 to 2115544	RC070-DM100006 to 108632	
VF700S (1984)	RC22E-2000008 to 2005978	RC220-EM000007 to 005012	
VF700S (1985)	RC22E-2100001 to 2103668	RC220-FM100001 to 102800	
VF750C (1982)	RC07E-4000046 to 4029232	RC071-CM000033 to 027062	
VF750C (1983)	RC07E-4100013 to 4124548	RC071-DM100011 to 122819	
VF700C (1984)	RC21E-2000021 to 2016382	RC210-EM000002 to 014552	
VF700C (1985)	RC21E-2100016 to 2110238	RC210-FM100006 to 108900	
VF700C (1986)	RC21E-2200005 to 2209873	RC210-GM200003 to 208928	
VF700C (1987)	RC21E-2300015 to 2304999	RC210-HM300007 to 303508 or HA305001 to 310415	
VF750C (1988)	RC07E-4600001 on	RC280-JA100001 on	
VF1100S (1984)	SC17E-2000001 to 2008727	SC170-EM000001 to 010029	
VF1100S (1985)	SC17E-2100001 on	SC170-FA100001 on	
VF1100C (1983)	SC12E-2000039 to 2018597	SC120-DM000029 to 017677	
VF1100C (1984)	SC12E-2100001 to 2116075	SC120-EA100001 to 117064	
VF1100C (1985)	SC12E-2200001 to 2208055	SC120-FA200006 to 208465	
VF1100C (1986)	SC12E-2300020 to 2304336	SC120-GM300101 to 304425	
US California models			
VF750S (1982)	As above	As above	
VF750S (1983)	As above	As above	
VF700S (1984)	RC22E-2002575 to 2006097	RC221-EM000006 to 001081	
VF700S (1985)	RC22E-2100001 to 2103285	RC221-FM100001 to 100863	
VF750C (1982)	As above	As above	
VF750C (1983)	As above	As above	
VF700C (1984)	RC21E-2000019 to 2018662	RC211-EM000003 to 002300	
VF700C(1985)	RC21E-2100022 to 2108674	RC211-FM100007 to 101325	
VF700C (1986)	RC21E-2200011 to 2210193	RC211-GM200001 to 201250	
VF700C(1987)	RC21E-2300020 to 2303889	RC211-HM300006 to 300514 or HA305003to311015	
VF750C (1988)	RC07E-4600001 on	RC281-JA100001 on	
VF1100S (1984)	SC17E-2000001 to 2009087	SC170-EA100004 to 117067	
VF1100S (1985)	SC17E-2100001 on	SC170-FA100001 on	
VF1100C (1983)	As above	As above	
VF1100C (1984)	SC12E-2102298 to 2114635	SC120-EA100004 to 117067	
VF1100C (1985)	SC12E-2200001 to 2206580	SC120-FA200001 to 206845	
VF1100C (1986)	SC12E-2300001 to 2302532	SC120-GM301306 to 302625	
UK models			
VF750S-C (1982-84)	RC07E-2007411 to 2020350	RC07-2000034 to 2008149	
VF750C-H (1987)	RC07E-4501116 to 4501315	RC28-2000607 to 2000806	
VF750C-J (1988)	RC07E-4604226 on	RC28-2100005 on	

Note: *Unless specifically mentioned in this manual, the information given for the 1982 750 Sabre applies to the UK VF750S-C, and that for the 1987 and 1988 700/750 Magnas applies to the UK VF750C-H and C-J respectively.*

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

Wheelbase	
1982 750 Sabre model	1562 mm (61.5 in)
1983 through 1985 700/750 Sabre models	1570 mm (61.8 in)
1982 through 1984 700/750 Magna models	1540 mm (60.6 in)
1985 and 1986 700 Magna models	1565 mm (61.6 in)
1987 and 1988 700/750 Magna models	1660 mm (65.4 in)
1100 Sabre models	1590 mm (62.6 in)
1100 Magna models	1595 mm (62.8 in)
Overall length	
700/750 Sabre models	2245 mm (88.4 in)
1982 through 1984 700/750 Magna models	2190 mm (86.2 in)
1985 and 1986 700 Magna models	2220 mm (87.4 in)
1987 and 1988 700/750 Magna models	2360 mm (92.9 in)
1100 models	2280 mm (89.8 in)
Overall width	
1982 through 1984 700/750 Sabre models	830 mm (32.7 in)
1985 700 Sabre model	800 mm (31.5 in)
1982 through 1984 700/750 Magna models	815 mm (32.1 in)
1985 and 1986 700 Magna models	850 mm (33.5 in)
1987 and 1988 700/750 Magna models	800 mm (31.5 in)
1100 Sabre models	790 mm (31.1 in)
1983 and 1986 1100 Magna models	810 mm (31.9 in)
1984 and 1985 1100 Magna models	825 mm (32.5 in)
Overall height	
1982 and 1983 750 Sabre models	1165 mm (45.9 in)
1984 and 1985 700 Sabre models	1160 mm (45.7 in)
1982 through 1984 700/750 Magna models	1195 mm (47.0 in)
1985 and 1986 700 Magna models	1200 mm (47.2 in)
1987 and 1988 700/750 Magna models	1155 mm (43.9 in)
1100 Sabre models	1185 mm (46.7 in)
1983 and 1986 1100 Magna models	1210 mm (47.6 in)
1984 and 1985 1100 Magna models	1230 mm (48.4 in)
Seat height	
1982 and 1983 750 Sabre models	780 mm (30.7 in)
1984 and 1985 700 Sabre models	790 mm (31.1 in)
1982 through 1984 700/750 Magna models	760 mm (29.9 in)
1985 and 1986 700 Magna models	740 mm (29.1 in)
1987 and 1988 700/750 Magna models	705 mm (27.8 in)
1100 Sabre models	820 mm (32.3 in)
1100 Magna models	800 mm (31.5 in)
Ground clearance	
1982 and 1983 750 Sabre models	135mm (5.3 in)
1984 and 1985 700 Sabre models	145 mm (5.7 in)
1982 through 1984 700/750 Magna models	165 mm (6.5 in)
1985 and 1986 700 Magna models	150 mm (5.9 in)
1987 and 1988 700/750 Magna models	152 mm (6.0 in)
1100 Sabre models	145 mm (5.7 in)
1100 Magna models	155 mm (6.1 in)
Weight (with oil and full fuel tank)	
700/750 models	Approx 243 kg (535 lb)
1100 Sabre models	268 kg (591 lb)
1100 Magna models	265 kg (584 lb)

Maintenance techniques, tools and working facilities

Basic maintenance techniques

There are a number of techniques involved in maintenance and repair that will be referred to throughout this manual. Application of these techniques will enable the amateur mechanic to be more efficient, better 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 crisscross 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.

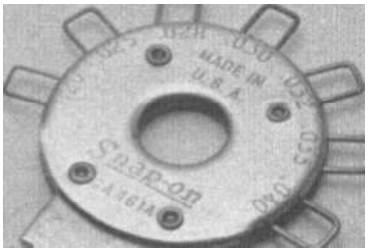
Avoid using a screwdriver or bar to pry apart components, as they can easily mar the gasket sealing surfaces of the parts (which must remain smooth). If prying is absolutely necessary, use a piece of wood, but keep in mind that extra clean-up will be necessary if the wood splinters.

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.

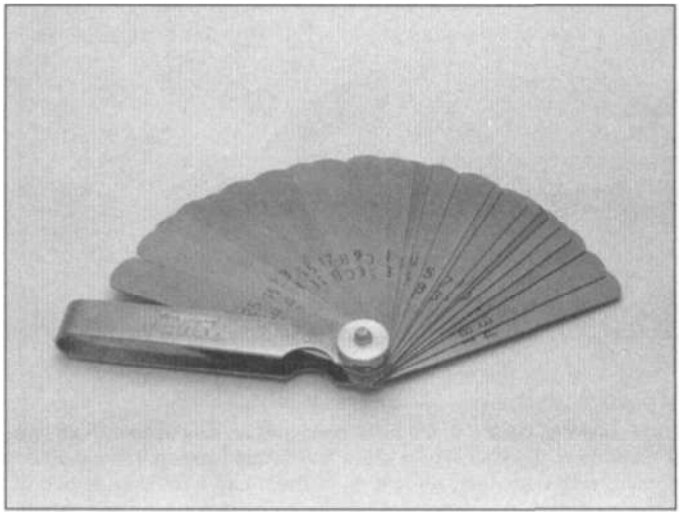
Hose removal tips

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.

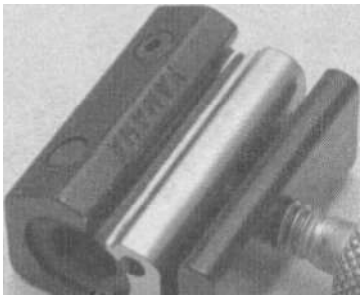
If a hose clamp is broken or damaged, do not reuse it. Also, do not reuse hoses that are cracked, split or torn.



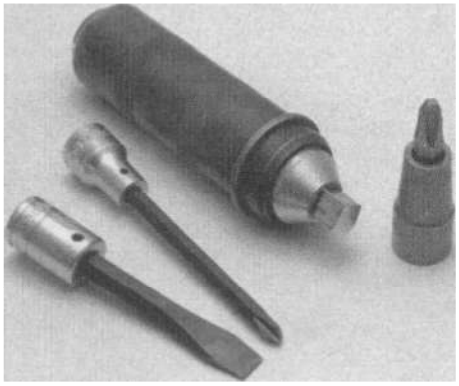
Spark plug gap adjusting tool



Feeler gauge set



Control cable pressure luber



Hand impact screwdriver and bits

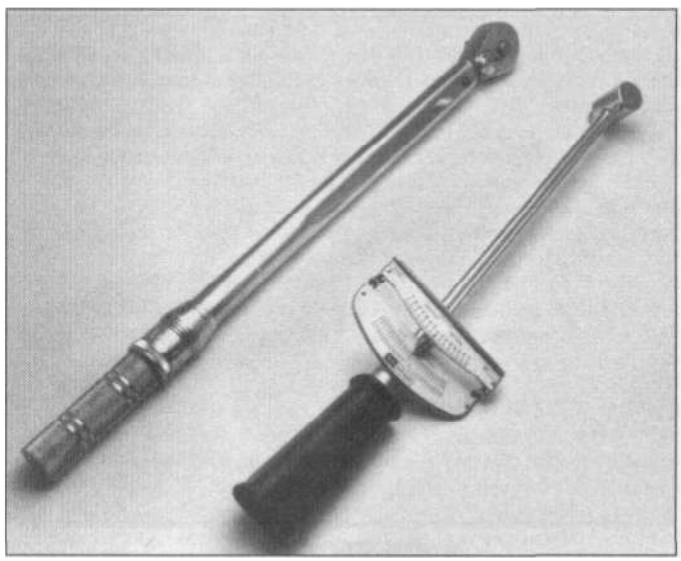
Tools

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

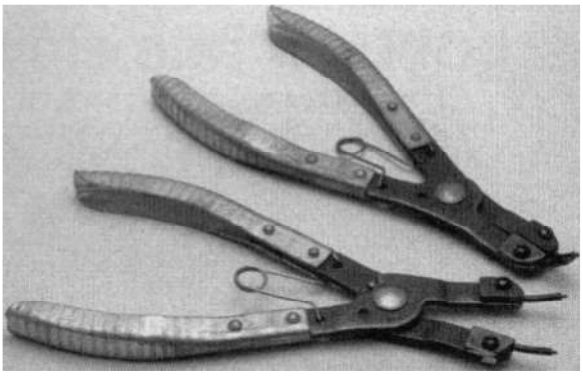
To help the owner decide which tools are needed to perform the tasks detailed in this manual, the following tool lists are offered: Maintenance and minor repair, Repair and overhaul and Special. The newcomer to practical mechanics should start off with the Maintenance and minor repair tool kit, which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

Maintenance and minor repair tool kit

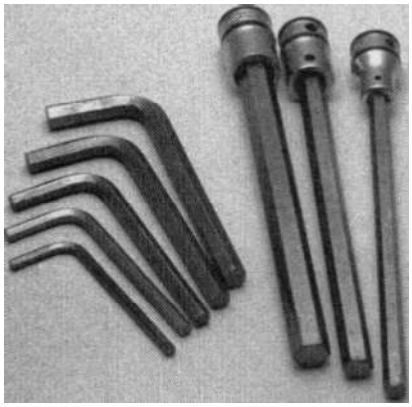
The tools in this list should be considered the minimum required for performance of routine maintenance, servicing and minor repair work. We recommend the purchase of combination wrenches (box end



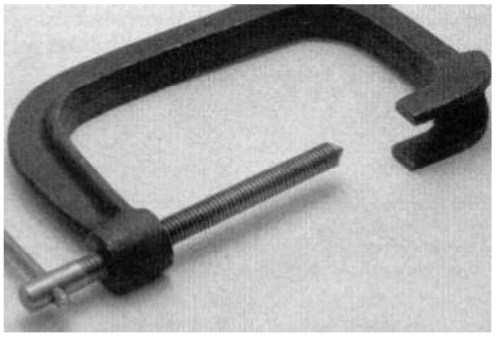
Torque wrenches (left - click type; right - beam type)



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

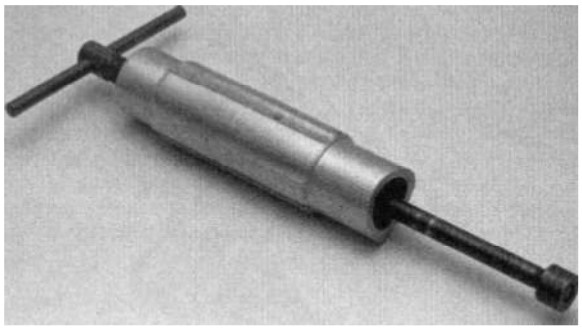


Alien wrenches (left) and Alien head sockets (right)

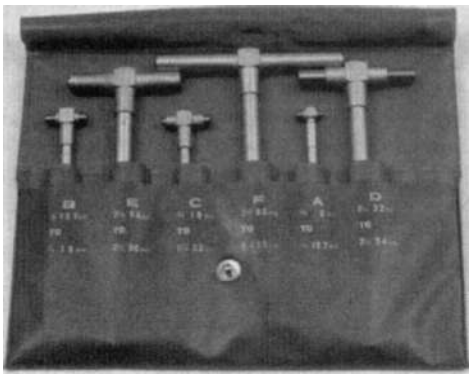


Valve spring compressor

Piston ring removal/installation tool

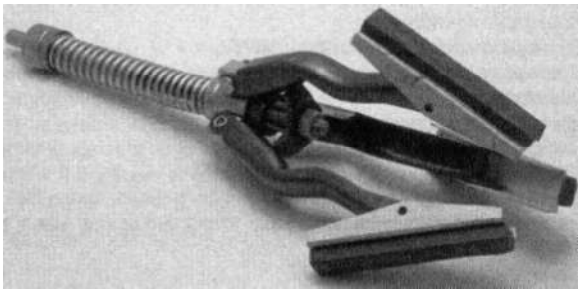


Piston pin puller

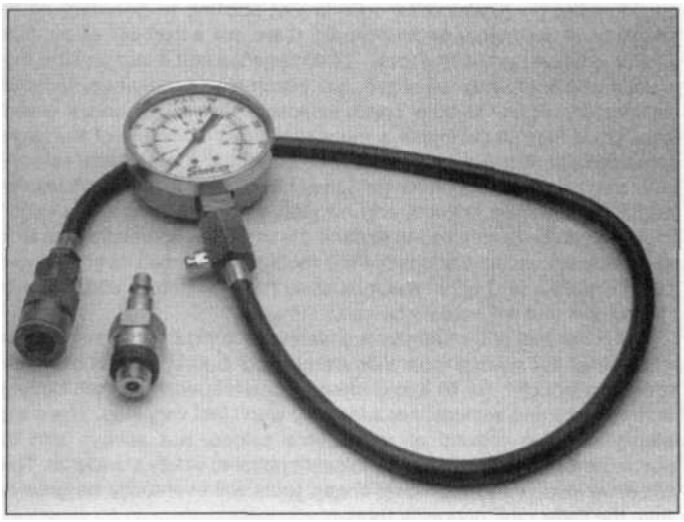


Telescoping gauges

0-to 1-inch micrometer

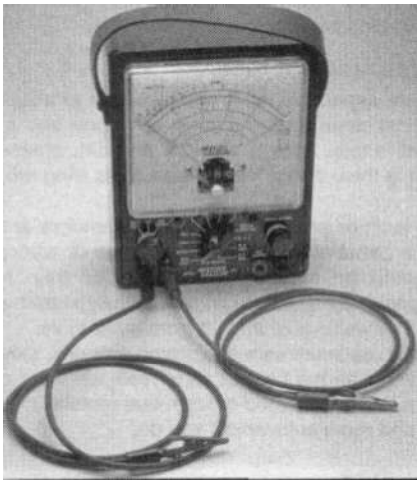


Cylinder surfacing hone

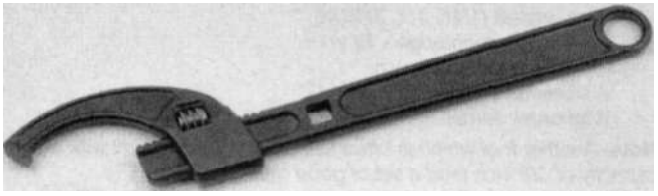


Cylinder compression gauge

Dial indicator set



Multimeter (volt/ohm/ammeter)



Adjustable spanner

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. 2 6 in)
Alien (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 si e)
Safety goggles
Drain pan
Work light ith 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).

Alternator rotor removal tool
Socket set(s)
Reversible ratchet
Extension - 6 in
Universal joint
Torque wrench (same si e drive as sockets)
Ball pein hammer - 8o
Soft-faced hammer (plastic/rubber)
Standard screwdriver (1/4 in x 6 in)
Standard screwdriver (stubby - 5/16 in)
Phillips screwdriver (No. 3 8 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 (such as old antifreeze containers) are ideal for this purpose.

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

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

Safety first

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

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

Essential DOs and DON'Ts

DON'T start the engine without first ascertaining that the transmission is in neutral.
DON'T suddenly remove the pressure cap from a hot cooling system - cover it with a cloth and release the pressure gradually first, or you may get scalded by escaping coolant.
DON'T attempt to drain oil until you are sure it has cooled sufficiently to avoid scalding you.
DON'T grasp any part of the engine or exhaust system without first ascertaining that it is cool enough not to burn you. **DON'T** allow brake fluid or antifreeze to contact the machine's 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 ha ardous 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, as well as other areas where high friction, high temperature lubrication is required. It is available in a number of viscosities (weights) for various applications.

Motor oil, of course, is the lubricant specially formulated for use in the engine. It normally contains a wide variety of additives to prevent corrosion and reduce foaming and wear. Motor oil comes in various 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.