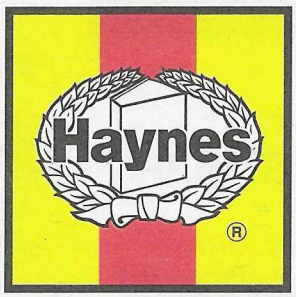

Yamaha VMX1200 V-Max

Service and Repair Manual

by Matthew Coombs

(4072 - 288)

Models covered

Yamaha VMX1200 V-Max. 1198cc. 1985 to 2003

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The Yamaha Motor Company

The Yamaha name can be traced back to 1889, when Torakusu Yamaha founded the Yamaha Organ Manufacturing Company. Such was the success of the company, that in 1897 it became Nippon Gakki Limited and manufactured a wide range of reed organs and pianos.

During World War II, Nippon Gakki's manufacturing base was utilised by the Japanese authorities to produce propellers and fuel tanks for their aviation industry. The end of the war brought about a huge public demand for low cost transport and many firms decided to utilise their obsolete aircraft tooling for the production of motorcycles. Nippon Gakki's first motorcycle went on sale in February 1955 and was named the 125 YA-1 Red Dragonfly. This machine was a copy of the German DKW RT125 motorcycle, featuring a single cylinder two-stroke engine with a four-speed gearbox. Due to the outstanding success of this model the motorcycle operation was separated from Nippon Gakki in July 1955 and the Yamaha Motor Company was formed.

The YA-1 also received acclaim by winning two of Japan's biggest road races, the Mount Fuji Climbing race and the Asama Volcano race. The high level of public demand for the YA-1 led to the development of a whole series of two-stroke singles and twins.

Having made a large impact on their home market, Yamahas were exported to the USA in 1958 and to the UK in 1962. In the UK the signing of an Anglo-Japanese trade

agreement during 1962 enabled the sale of Japanese lightweight motorcycles and scooters in Britain. At that time, competition between the many motorcycle producers in Japan had reduced numbers significantly and by the end of the sixties, only the big-four which are familiar with today remained.

Yamaha Europe was founded in 1968 and based in Holland. Although originally set up to market marine products, the Dutch base is now the official European Headquarters and distribution centre. Yamaha motorcycles are built at factories in Holland, Denmark, Norway, Italy, France, Spain and Portugal. Yamahas are imported into the UK by Yamaha Motor UK Ltd, formerly Mitsui Machinery Sales (UK) Ltd. Mitsui and Co. were originally a trading house, handling the shipping, distribution and marketing of Japanese products into western countries. Ultimately Mitsui Machinery Sales was formed to handle Yamaha motorcycles and outboard motors.

Based on the technology derived from its motorcycle operation, Yamaha have produced many other products, such as automobile and lightweight aircraft engines, marine engines and boats, generators, pumps, ATVs, snowmobiles, golf cars, industrial robots, lawnmowers, swimming pools and archery equipment.

Two-strokes first

Part of Yamaha's success was a whole string of innovations in the two-stroke world. Autolube engine lubrication, torque induction, multi-ported engines, reed valves and power valves kept their two-strokes at the forefront of technology. Many advances were achieved with the use of racing as a development laboratory. They went to the USA in the late 1950s with an air-cooled 250cc twin but didn't hit the GPs until the early 1960s when Fumio Ito scored a hat-trick of sixth places in the Isle of Man TT, the Dutch TT and the Belgian GP. This experiment gave rise to the idea of the over-the-counter racer, an idea that became reality in the TD1, the first in an unmatched series of two-stroke racers that were the standard issue for privateers at national and international level for years and helped Yamaha develop their road engines. While privateers raced the twins, Yamaha built the outrageously complicated vee-four 250 for Phil Read and followed it with a vee-four 125 that Bill Ivy lapped the Isle of Man on at over 100mph! When the FIM regulations were changed to limit the smaller GP classes to two cylinders, these exotic bikes died but set the scene for an unparalleled dynasty of mass-produced racers based on the same technology as the road bikes.

In the 1960s and 70s the two-stroke engined YAS3 125, YDS1 to YDS7 250 and YR5 350 formed the core of Yamaha's range. By the mid-70s they had been superseded by the RD (Race-Developed) 125, 250, and 350 range of two-stroke twins, featuring improved 7-port engines with reed valve induction. Braking was improved by the use of an hydraulic brake on the front wheel of DX models, instead of the drum arrangement used previously, and cast alloy wheels were available as an option on later RD models. The RD350 was replaced by the RD400 in 1976.

Running parallel with the RD twins was a range of single-cylinder two-strokes. Used in a variety of chassis types, the engine was used in the popular 50 cc FS1-E moped, the V50 to 90 step-thrus, RS100 and 125, YB100 and the DT trail range.

The TD racers got water-cooling in 1973 to become the TZs, the most successful and numerous over-the-counter racers ever built. That same year, Jarno Saarinen became the first rider to win a 500cc GP on a four-cylinder two-stroke on the new in-line four which was effectively a pair of TZs side-by-side. TZs won everywhere – including the Daytona 200 and 500 races when overbored to 351cc. A 700cc TZ also appeared, one year later taken out to 750cc. Steve Baker won the first Formula 750 world title – one of the precursors of Superbike – on one in 1977. The following year Kenny Roberts won Yamaha's first world 500 title and would be succeeded by Wayne Rainey and Eddie Lawson before Mick Doohan and the NSR500 took over.

The air-cooled single and twin cylinder RD road bikes were eventually replaced by the LC series in 1980, featuring liquid-cooled engines, radical new styling, spiral pattern cast wheels and cantilever rear suspension (Yamaha's Monoshock). Of all the LC models, the RD350LC, or RD350R as it was later known, has made the most impact in the market. Later models had YPVS (Yamaha Power Valve System) engines, another first for Yamaha – this was essentially a valve located in the exhaust ports which was electronically operated to alter port timing to achieve maximum power output. The RD500LC was the largest two-stroke made by Yamaha and differed from the other LCs by the use of its vee-four cylinder engine.

With the exception of the RD350R, now manufactured in Brazil, the LC range has been discontinued. Two-stroke engined models have given way to environmental pressure, and thus with a few exceptions, such as the TZR125 and TZR250, are used only in scooters and small capacity bikes.

The distinctive paintwork and trim of the RD models

The Four-strokes

Yamaha concentrated solely on two-stroke models until 1970 when the XS1 was produced, their first four-stroke motorcycle. It was perhaps Yamaha's success with two-strokes that postponed an earlier move into the four-stroke motorcycle market, although their work with Toyota during the 1960s had given them a sound base in four-stroke technology.

The XS1 had a 650 cc twin-cylinder SOHC engine and was later to become known as the XS650, appearing also in the popular SE custom form. Yamaha introduced a three cylinder 750 cc engine in 1976, fitted in a sport-tourer frame and called the XS750, TX750 in the USA . The XS750 established itself well in the sport tourer class and remained in production with very few changes until uprated to 850 cc in 1980.

Other four-strokes followed in 1976, with the introduction of the XS250/360/400 series twins. The XS range was strengthened in 1978 by the four-cylinder XS1100.

The 1980s saw a new family of four-strokes, the XJ550, 650, 750 and 900 Fours. Improvements over the XS range amounted to a slimmer DOHC engine unit due to the relocation of the alternator behind the cylinders, electronic ignition and uprated braking and suspension systems. Models were available mainly in standard trim, although custom-styled Maxims were produced especially for the US market. The XJ650T was the first model from Yamaha to have a turbo-charged engine. Although these early XJ models have now been discontinued, their roots live on in the XJ600S and XJ900S Diversion (Seca II) models.

The XS650 led the way for Yamaha's four-stroke range

The FZR prefix encompasses the pure sports Yamaha models. With the exception of the 16-valve FZR400 and FZR600 models, the FZ/FZR750 and FZR1000 used 20-valve engines, two exhaust valves and three inlet

Yamaha's XS750 was produced from 1976 to 1982 and then uprated to 850 cc

valves per cylinder. This concept was called Genesis and gave improved gas flow to the combustion chambers. Other features of the new engine were the use of down-draught carburetors and the engine's inclined angle in the frame, plus the change to liquid-cooling. Lightweight Deltabox design aluminium frames and uprated suspension improved the bikes's handling. The Genesis engine lives on in the YZF750 and 1000 models.

The Genesis concept was the basis of Yamaha's foray into four-stroke racing, first with a bike known simply as 'The Genesis', an FZ750 motor in a TT Formula 1 bike with which the factory attempted to steal the Honda RVF750's thunder at important events like the Suzuka 8 Hours and the Bol d'Or although they never fielded it for a whole World Championship season. That had to wait for the advent of the World Superbike Championship, although there was no full works team until 1995, instead it was left to individual importers to support teams. It was the Australian Dealer Team Yamaha which scored the factory's first World Superbike win in the series debut year of 1988. The rider? Mick Doohan. Slightly, embarrassingly, it was the steel framed FZ750 rather than the FZR homologation special that won races. The OW01 was a race winner, mainly in the hands of Fabrizio Pirovano, the factory's most successful Superbike racer with ten victories, but national success in the UK, Japan, and in the Daytona 200 has not been translated into World Championships for any of Yamaha's 750s.

The vee-twin engine has been the mainstay of the XV Virago range. Since 1981 XVs have been produced in 535, 700, 750, 920, 1000 and 1100 engine sizes, all using the same basic air-cooled sohc vee-twin engine. Other uses of vee engines have been in the XZ550 of the early 1980s, the XVZ12 Venture and the mighty VMX-12 V-Max.

A new family of four-strokes was released in 1980 with the introduction of the XJ range

Yamaha has always been a sporting-orientated company whose motto could be 'Racing Improves the Breed', so it's no surprise that the latest generation of lightweight sportsters are at the cutting edge of performance on and off the track. The R6 won more races than any other machine in the inaugural year of the World Supersports Championship, the R7 won a race in its debut year in World Superbike in the hands of the mercurial Noriyuki Haga, and the mighty 1000cc R1 ended Honda's domination of the Isle of Man F1 TT when David Jefferies won three races in a week in 1999.

In Grand Prix racing, the factory took several years to get over the shock of Wayne Rainey's crippling accident. and first 500cc win since the American's enforced retirement didn't come until 1998 when Simon Crafar won at Donington Park. For 1999, Yamaha refocussed their ambitions and signed Italian superstar Max Biaggi plus Spanish trier Carlos Checa for the works team, while dashing young Frenchman Regis Laconi and tough little Aussie Gary McCoy rode for the WCM satellite team. Both teams got a win in the '99 season and with a new TZ250 being developed for 2000 it looks as if Yamaha's spirit of competition will go on unabated into the new Millenium.

The XV535 Virago vee-twin

Maximum Velocity

Not many bikes that are launched with all the styling cues of a 30-year old cult then go on to have a model life of 20 years. In fact, I can only think of one: the V-Max. The inspiration for the meanest of machines came from the American hot-rod and drag-racing scene, the sort of cars featured in the classic movie *American Graffiti*. Hence the complete fixation with acceleration and almost total lack of interest in cornering ability. Check out the massive (dummy) air-intake scoops, polished cylinder-head fin edges and chrome exhausts illustrating the flow of gases through the musclebound 145 bhp V4 motor. The motor started life as the motive power for the Ventura full-dress tourer. Check out the disc rear wheel carrying what was, at the bike's 1985 launch, motorcycling's biggest tyre – a 150/90-15. Suspension? Twin rear shocks and spindly looking forks. The name V-Max comes from science and engineering where in mathematics the letter 'V' is used for velocity and the subscript 'max' is used for maximum; hence V-Max equals maximum velocity.

Naturally, Americans with their culture of straight-line racing loved the V-Max. Yamaha said it would cover the standing quarter-mile in 11 seconds and promptly hired top drag artists Jay 'Pee Wee' Gleason who got it up the strip in 10.32 seconds to make the V-Max the fastest accelerating production vehicle in the world. Cycle World magazine backed up Yamaha's figures when their test bike posted 10.41 seconds with a terminal velocity of 126.82 mph in the hands of vastly experienced drag racer Dale Walker. Yamaha America launched their 1985 model range to the press at the Laguna Seca race track resulting in one memorable summing up of the V-Max's handling characteristics as having 'all the precision of a puppy on a leash.'

The real surprise was that the Europeans also went for the V-Max in a big way. The fact they got the chance was largely down to Jean-Claude Olivier, boss of the French Yamaha importers. He was convinced the bike would be a major seller in France and persuaded Japan to sell the V-Max there as early as 1986, the first non-American market for the bike and still a stronghold of the cult of the V-Max. Unfortunately, some countries had voluntary power limits of 100 or 125 bhp, so that motor had to be emasculated.

What was cut off the V-Max was its V-Boost. This clever little acronym was designed to do the job of the turbocharger which the designers initially wanted to fit to give the bike its massive top-end power. Each cylinder has an individual inlet from its downdraught carburettor, but the tracts between the two left cylinders and the two right cylinders are linked with butterfly valves, isolating them below 6000 rpm. At higher revs, a servomotor starts to open the butterfly valves until at 8000 rpm the valves are fully open and each cylinder is sucking on two carbs. The result is shattering acceleration.

Unfortunately, the restricted non-V-Boost V-Max models that came to Europe from 1986 were mere shadows of the real thing so most potential owners turned to the grey market to source full-power machines. Those imports spread the cult of the V-Max and it is still going strong. Full-power bikes only came into the UK from 1996 after five years of restricted models.

Evidence of just how right the original design was comes from the almost total lack of modifications over the bike's lifetime. Apart from cosmetic tinkering with wheel and mirror designs, the only change of note was the uprating of the front fork tube diameter for the 1993 model year from 40 to 43 mm along with the equally welcome improvement in brake caliper specification from twin- to four-piston. The restricted, non-V-Boost model ceased production in 2000.

However, the standard specification is almost irrelevant because once a V-Max rolls out of the showroom it very, very rarely stays standard for long. Any gathering of V-Maxs will have an eye-watering collection of paint schemes, chromed parts, turbos, loud pipes and other tuning parts. Proof of the lasting appeal of the Max comes from the prices of used bikes; even the oldest model commands a good price. When you buy one just make sure it's got V-Boost or it ain't a real V-Max.

The 2002 VMX1200 V-Max

Acknowledgements

Our thanks are due to SMC of Southampton who supplied the machine featured in the illustrations throughout this manual. We would also like to thank Mitsui Machinery Sales (UK) Ltd for permission to reproduce certain illustrations used in this manual, NGK Spark Plugs (UK) Ltd for supplying the colour spark plug condition photographs, the Avon Rubber Company for supplying information on tyre fitting and Draper Tools Ltd for some of the workshop tools shown.

Thanks are also due to Julian Ryder who wrote the introduction 'Yamaha – musical instruments to motorcycles' and to Yamaha Motor (UK) Ltd. who supplied model photographs.

About this manual

The aim 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; it provides information and procedures for routine maintenance and servicing; and it offers diagnostic and repair procedures to follow when trouble occurs.

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

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

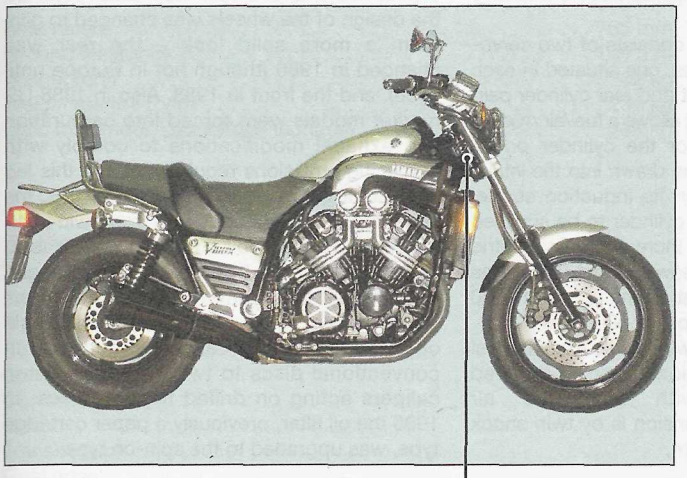
We take great pride in the accuracy of information given in this manual, but motorcycle manufacturers make alterations and design changes during the production run of a particular motorcycle of which they do not inform us. No liability can be accepted by the authors or publishers for loss, damage or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

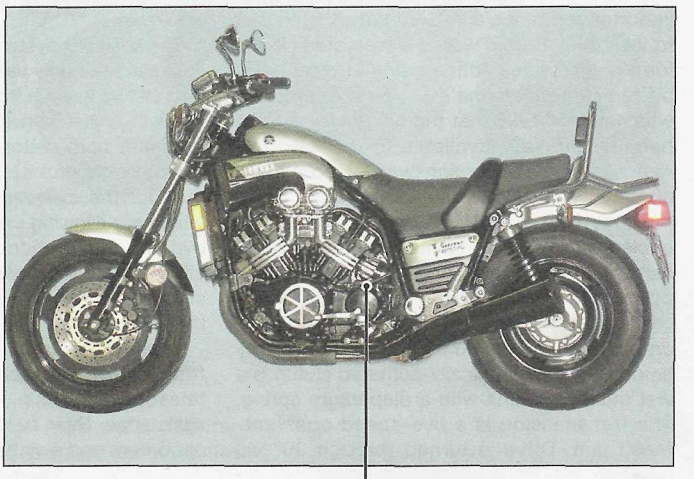
Frame and engine numbers

The frame serial number is stamped into the right-hand side of the steering head. The engine number is stamped into the top of the crankcase on the left-hand side of the engine at the back. 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.

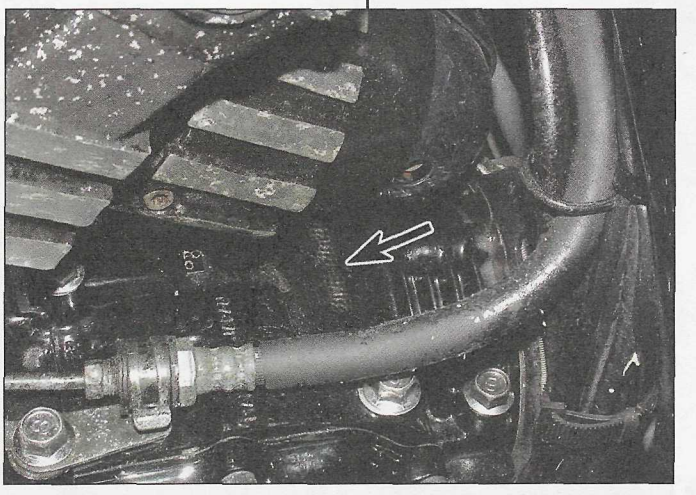
The frame and engine serial numbers should also be kept in a handy place (such as with your driver's licence) so they are always available when purchasing or ordering parts for your machine.

Where differences occur procedures in this manual identify models by whether they are full power or restricted power, or by production year (e.g. 2000 or 2001).





The frame number is stamped into the right-hand side of the steering head



The engine number is stamped into the top of the crankcase on the left-hand side of the engine

Buying spare 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 franchised or main dealer and the parts/accessories store – differ in the type of parts they carry. While dealers can obtain every single genuine part for your motorcycle, the accessory store is usually limited to normal high wear items such as brake pads, spark plugs and cables, and to tune-up parts and various engine gaskets, etc. Rarely will an accessory outlet have major suspension components, camshafts, transmission gears, or engine cases.

Used parts can be obtained from breakers yards for roughly half the price of new ones, but you can't always be sure of what you're getting. Once again, take your worn part to the breaker for direct comparison, or when ordering by mail order make sure that you can return it if you are not happy.

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

Model development

The V-Max was launched in the United States and Canada in late 1984 (even though it was designated a 1985 model), and was only initially available in Europe as an unofficial grey import. When it was officially imported to France and Germany in 1986 and to the UK in 1991 it was in a restricted power form only, the restriction being implemented by removing Yamaha's V-Boost system. It was not until 1996 that the full power version became officially available in the UK. The restricted power version was discontinued after the year 2000.

The V-Max has a V-four cylinder liquid-cooled engine. Drive to the double overhead camshafts which actuate the four valves per cylinder is by chain from the middle of the crankshaft. A balancer shaft running off the crankshaft makes the engine incredibly smooth. The hydraulically-actuated clutch is a wet multi-plate unit with a diaphragm spring. The transmission is a five-speed constant-mesh unit. Drive is turned through 90° via middle gear shafts, with final drive to the rear wheel by shaft running inside the swingarm.

Fuel is pumped to the engine from the under-seat fuel tank via four Mikuni carburettors, one for each cylinder. The ignition system is fully electronic.

The V-Boost system consists of two servo-controlled butterfly valves, one situated in each duct between each front and rear cylinder pair. When the valve is open it allows a fuel/air mixture from the carburettor for the cylinder on its compression stroke to be drawn into the intake duct for the cylinder on its induction stroke, effectively allowing one cylinder to be supplied by two carburettors, increasing volumetric efficiency and therefore power output. The valves start to open at a pre-set engine speed of 6000 rpm, and become fully open at 8000 rpm.

The engine sits in a twin-cradle tubular steel frame. Front suspension is by oil-damped telescopic forks with adjustable air assistance. Rear suspension is by twin shock absorbers and swingarm.

The front brake system has twin hydraulic calipers, and the rear brake system has a single hydraulic caliper.

Despite the length of its production run, the V-Max has changed very little. Early in its life the design of the wheels was changed to give them a more solid look – the rear was changed in 1986 (though not in Europe until 1988), and the front in 1988. Also in 1988 US market models were forced into carburation and exhaust modifications to comply with tightening emissions regulations, and this led to a very slight reduction in power. In 1990 the ignition system was upgraded from twin pick-up coils to single coil and from analogue to digital. In 1993 the front forks were changed from 40 mm to 43 mm. At the same time the front brakes were upgraded from single opposed piston calipers acting on conventional discs to twin opposed piston calipers acting on drilled floating discs. In 1995 the oil filter, previously a paper cartridge type, was upgraded to the spin-on type.

Performance data

Full power (V-Boost) models

Maximum power
Claimed . . . . . .145 bhp (108 kW) @ 8000 rpm

Maximum torque
Claimed . . . . . .75.9 lbf ft (103 Nm) @ 3000 rpm

Top speed
Estimated . . . . . .146 mph (235 km/h)

Acceleration
Time taken to cover a 1/4 mile from a standing start . . .11.5 secs
Terminal speed after 1/4 mile . . . . . .116 mph (186 km/h)

Average fuel consumption *
Miles per Imp gal, miles per litre,
litres per 100 km . . . . . .30.6 mpg, 6.7 mpl, 9.2 l/100 km

Fuel tank range
Based on average fuel consumption rate
Main tank . . . . . .91 miles (146 km)
Reserve tank . . . . . .20 miles (32 km)

Restricted power models

Maximum power
Claimed . . . . . .95 bhp (70.8 kW) @ 8000 rpm

Maximum torque
Claimed . . . . . .74.5 lbf ft (85.5 Nm) @ 3000 rpm

Top speed
Estimated . . . . . .140 mph (225 km/h)

Performance data sourced from Motor Cycle News road test features. See the MCN website for up-to-date biking news.

Bike spec

Dimensions and weights

Overall length	2300 mm
Overall width	795 mm
Overall height	1160 mm
Wheelbase	1590 mm
Seat height	765 mm
Ground clearance	145 mm
Weight (dry)	262 kg
Weight (on the road)	281 kg
Max. load (rider, passenger, luggage)	209 kg

Engine

Type	Four-stroke V-four
Capacity	1198 cc
Bore	76.0 mm
Stroke	66.0 mm
Compression ratio	10.5 to 1
Cooling system	Liquid cooled
Clutch	Wet multi-plate, diaphragm spring
Transmission	Five-speed constant mesh
Final drive	Shaft
Camshafts	DOHC, chain-driven
Fuel system	4 x 35 mm Mikuni CV carburettors
Exhaust system	Four-into-two
Ignition system	Electronic (analogue to 1992, digital thereafter)

Chassis

Frame type	Tubular steel cradle
Rake and Trail	29°, 119 mm
Fuel tank	
Capacity (including reserve)	15.0 litres
Reserve volume	3.0 litres
Front suspension	
Type	
1985 to 1992 models	40 mm oil-damped telescopic forks
1993 to 2003 models	43 mm oil-damped telescopic forks
Travel – all models	140 mm
Adjustment – all models	Air pressure
Rear suspension	
Type	Twin shock absorbers, Steel swingarm
Travel (at axle)	100 mm
Adjustment	Spring pre-load, rebound damping
Wheels	Cast alloy (front 18 inch, rear 15 inch)
Tyres	
Front	110/90-V18
Rear	150/90-V15
Front brake	
1985 to 1992 models	Twin 282 mm discs with single opposed-piston calipers
1993 to 2003 models	Twin 298 mm floating discs with twin opposed-piston calipers
Rear brake	Single 282 mm disc with single opposed-piston caliper

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.

Asbestos

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

Fire

- Remember at all times that petrol is highly flammable. Never smoke or have any kind of naked 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 petrol vapour, which in a confined space is highly explosive. Never use petrol as a cleaning solvent. Use an approved safety solvent.
- Always disconnect the battery earth terminal before working on any part of the fuel or electrical system, and never risk spilling fuel on to a hot engine or exhaust.
- It is recommended that a fire extinguisher of a type suitable for fuel and electrical fires is kept handy in the garage or workplace at all times. Never try to extinguish a fuel or electrical fire with water.

Fumes

- Certain fumes are highly toxic and can quickly cause unconsciousness and even death if inhaled to any extent. Petrol vapour comes into this category, as do the vapours from certain solvents such as trichloroethylene. Any draining or pouring of such volatile fluids should be done in a well ventilated area.
- When using cleaning fluids and solvents, read the instructions carefully. Never use materials from unmarked containers - they may give off poisonous vapours.
- Never run the engine of a motor vehicle in an enclosed space such as a garage. Exhaust fumes contain carbon monoxide which is extremely poisonous; if you need to run the engine, always do so in the open air or at least have the rear of the vehicle outside the workplace.

The battery

- Never cause a spark, or allow a naked light near the vehicle's battery. It will normally be giving off a certain amount of hydrogen gas, which is highly explosive.
- Always disconnect the battery 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, evenwhen 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 vapour. Also ensure that the appliances meet national safety standards.
- A severe electric shock can result from touching certain parts of the electrical system, such as the spark plug wires (HT leads), when the engine is running or being cranked, particularly if components are damp or the insulation is defective. Where an electronic ignition system is used, the secondary (HT) voltage is much higher and could prove fatal.

Remember...

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

Note: *The daily (pre-ride) checks outlined in the owner's manual covers those items which should be inspected on a daily basis.*

Engine/transmission oil level check

Before you start:

✔ Take the motorcycle on a short run to allow it to reach normal operating temperature.

Caution: Do not run the engine in an enclosed space such as a garage or workshop.

✔ Stop the engine and support the motorcycle on its centrestand. Allow it to stand undisturbed for a few minutes to allow the oil level to stabilise.

✔ Make sure the motorcycle is on level ground.

Bike care:

● If you have to add oil frequently, check whether you have any oil leaks from the engine joints, oil seals and gaskets. If not, the engine could be burning oil, in which case there will be white smoke coming out of the exhaust – (see *Fault Finding*).

The correct oil

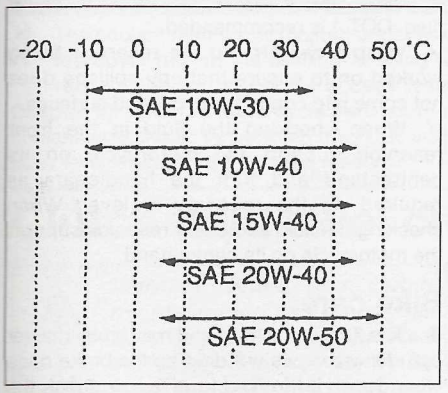
● Modern, high-revving engines place great demands on their oil. It is very important that the correct oil for your bike is used.

● Always top up with a good quality oil of the specified type and viscosity and do not overfill the engine.

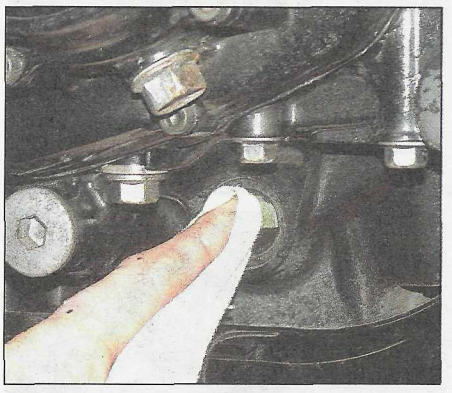
Caution: Do not use chemical additives or oils with a grade of CD or higher, or use oils labelled "ENERGY CONSERVING II". Such additives or oils could cause clutch slip.

Oil type	API grade SE, SF or SG
Oil viscosity	SAE 10W30 or 10W40*

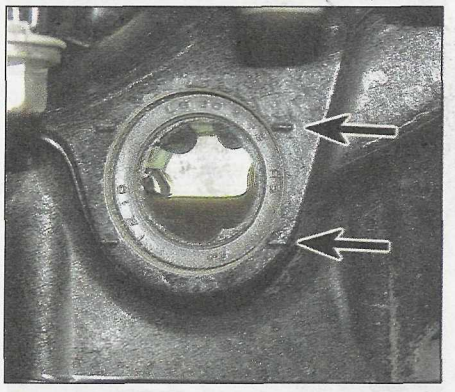
***If you are using the motorcycle constantly in extreme conditions of heat or cold, other more suitable viscosity ranges may be used – refer to the viscosity table to select the oil best suited to your conditions. Yamaha actually recommend using a 20W40 oil if the motorcycle is not used in temperatures below 5°C, or 10W30 oil if the motorcycle is not used in temperatures above 15°C. Using a 10W40 oil ensures the motorcycle can be used over a wider range of temperatures without having to change grade. Do not use a 10W50 oil as it can cause the clutch to slip.*



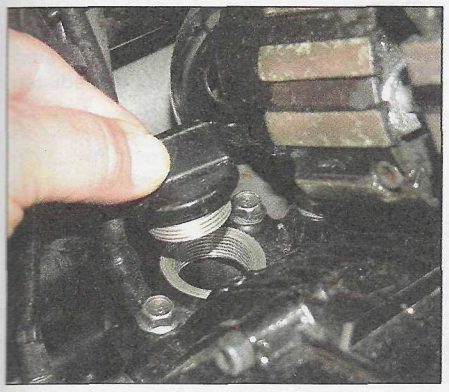
Oil viscosity table; select the oil best suited to the conditions



1 Wipe the oil level inspection window so that it is clean – it is located on the right-hand side of the engine, above the exhaust pipe.

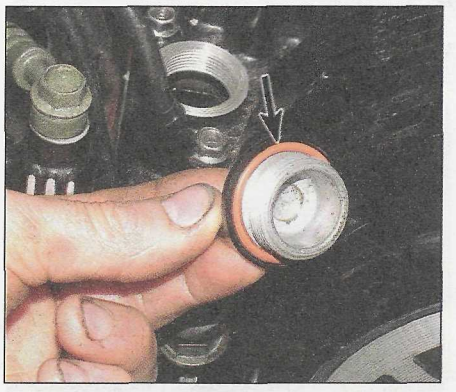


2 With the motorcycle vertical, the oil level should lie between the maximum and minimum level lines (arrowed) next to the window.



3 If the level is on or below the minimum line, unscrew the oil filler cap from the crankcase – it is located on the right-hand side behind the clutch cover.

4 Using a suitable funnel if necessary, top up the engine with the recommended grade and type of oil to bring the level up to the maximum line on the inspection window. Do not overfill.



5 Check the condition of the filler cap O-ring (arrowed) and replace it with a new one if it is damaged, deformed or deteriorated. Make sure the cap is secure.

Brake fluid level checks

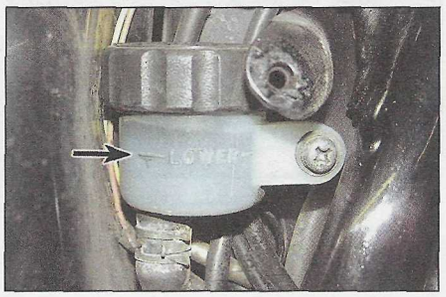
◀ FRONT BRAKE FLUID LEVEL

1 The front brake fluid level is visible through the window in the reservoir body – it must be above the LOWER level line (arrowed).

2 If the level is on or below the LOWER line, undo the two reservoir cover screws (arrowed) and remove the cover and diaphragm.

3 Top up with new clean DOT 4 hydraulic fluid, until the level is above the LOWER level line. Do not overfill and take care to avoid spills (see **Warning** above).

4 Ensure that the diaphragm is correctly seated before installing the cover. Secure the reservoir cover with its screws.



1 Remove the right-hand side panel (see Chapter 8). The rear brake fluid level is visible through the reservoir body – it must be above the LOWER level line (arrowed).

2 If the level is on or below the LOWER line, unscrew the reservoir cap, and remove the diaphragm plate and diaphragm.

3 Using a suitable funnel that is spotlessly clean, top up with new clean DOT 4 hydraulic fluid until the level is above the LOWER level line. Do not overfill and take care to avoid spills (see **Warning** above).

4 Ensure that the diaphragm is correctly seated before installing the plate and cap.

Warning: Brake hydraulic fluid can harm your eyes and damage painted surfaces, so use extreme caution when handling and pouring it and cover surrounding surfaces with rag. Do not use fluid that has been standing open for some time, as it is hygroscopic (absorbs moisture from the air) which can cause a dangerous loss of braking effectiveness.

Before you start:

✔ The front master cylinder reservoir is integral with the master cylinder on the right-hand handlebar. The rear master cylinder reservoir is located behind the right-hand side panel.

✔ Make sure you have the correct hydraulic fluid. DOT 4 is recommended.

✔ Wrap a rag around the reservoir being worked on to ensure that any spillage does not come into contact with painted surfaces.

✔ When checking the fluid in the front reservoir support the motorcycle on its centrestand and turn the handlebars as required so the reservoir is level. When checking the fluid in the rear reservoir support the motorcycle on its centrestand.

Bike care:

- The fluid in the front and rear brake master cylinder reservoirs will drop as the brake pads wear down. If the fluid level is low check the brake pads for wear (see Chapter 1).
- If either fluid reservoir requires repeated topping-up there could be a leak somewhere in the system, which must be investigated immediately.
- Check for signs of fluid leakage from the hydraulic hoses and/or brake system components – if found, rectify immediately (see Chapter 7).
- Check the operation of both brakes before taking the machine on the road; if there is evidence of air in the system (spongy feel to lever or pedal), it must be bled (see Chapter 7).

◀ REAR BRAKE FLUID LEVEL

Coolant level check

Warning: DO NOT remove the radiator pressure cap to add coolant. Topping up is done via the coolant reservoir tank filler. DO NOT leave open containers of coolant about, as it is poisonous.

Before you start:

✔ Make sure you have a supply of coolant available (a mixture of 50% soft or distilled water and 50% corrosion inhibited ethylene glycol anti-freeze is needed – do not use hard water).

✔ Always check the coolant level when the engine is COLD. If the engine has been running allow it cool down fully before checking the level.

✔ Support the motorcycle on its centrestand. Make sure the motorcycle is on level ground.

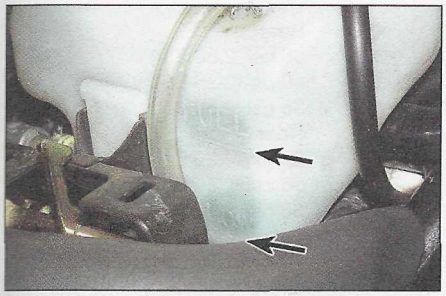
✔ Remove the top cover (see Chapter 8).

Bike care:

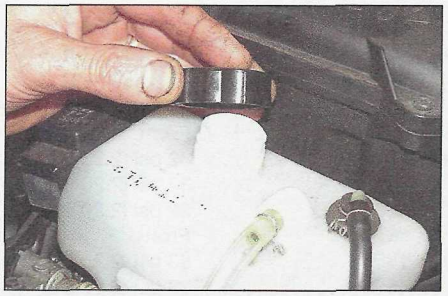
● Use only the specified coolant mixture. It is important that anti-freeze is used in the system all year round, and not just in the winter. Do not top the system up using only water, as the system will become too diluted.

● Do not overfill the reservoir tank. If the coolant is significantly above the FULL level line at any time, the surplus should be siphoned or drained off to prevent the possibility of it being expelled out of the overflow hose.

● If the coolant level falls steadily, check the system for leaks (see Chapter 1). If no leaks are found and the level continues to fall, it is recommended that the machine be taken to a Yamaha dealer for a pressure test.



1 The coolant reservoir is located under the top cover behind the air filter housing – remove the top cover for access (see Chapter 8). With the motorcycle vertical, the coolant level should lie between the FULL and LOW level lines (arrowed) on the reservoir.



2 If the coolant level is on or below the LOW line, unscrew the reservoir filler cap.

3 Top the reservoir up with the recommended coolant mixture to the FULL level line, using a suitable funnel if necessary. Fit the cap. Install the top cover (see Chapter 8).

Clutch fluid level check

Warning: Brake and clutch hydraulic fluid can harm your eyes and damage painted surfaces, so use extreme caution when handling and pouring it and cover surrounding surfaces with rag. Do not use fluid that has been standing open for some time, as it is hygroscopic (absorbs moisture from the air) which can cause a loss of clutch effectiveness.

Before you start:

✔ The clutch master cylinder reservoir is integral with the master cylinder on the left-hand handlebar.

✔ Make sure you have the correct hydraulic fluid. DOT 4 is recommended.

✔ Wrap a rag around the reservoir to ensure that any spillage does not come into contact with painted surfaces.

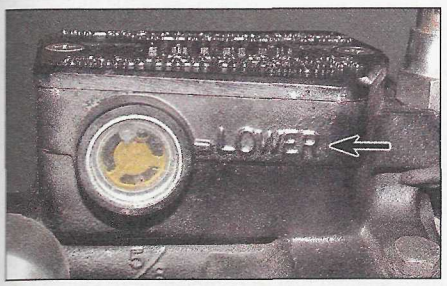
✔ When checking the fluid in the reservoir support the motorcycle on its centrestand and turn the handlebars as required so the reservoir is level.

Bike care:

● If the fluid reservoir requires repeated topping-up there could be a leak somewhere in the system, which must be investigated immediately.

● Check for signs of fluid leakage from the hydraulic hose and clutch release mechanism components – if found, rectify immediately (see Chapter 2).

● Check the operation of the clutch before taking the machine on the road; if there is evidence of air in the system (spongy feel to the lever) it must be bled (see Chapter 2).



1 The clutch fluid level is visible through the window in the reservoir body – it must be above the LOWER level line (arrowed). If the level is on or below the LOWER line, undo the two reservoir cover screws and remove the cover and diaphragm.

2 Top up with new clean DOT 4 hydraulic fluid, until the level is above the LOWER level line. Do not overfill and take care to avoid spills (see Warning above).

3 Ensure that the diaphragm is correctly seated before installing the cover. Secure the reservoir cover with its screws.

Tyre checks

The correct pressures:

- The tyres must be checked when **cold**, not immediately after riding. Note that incorrect tyre pressures will cause abnormal tread wear and unsafe handling. Low tyre pressures may cause the tyre to slip on the rim or come off.
- Use an accurate pressure gauge. Many forecourt gauges are wildly inaccurate. If you buy your own, spend as much as you can justify on a quality gauge.
- Proper air pressure will increase tyre life and provide maximum stability and ride comfort.

Tyre care:

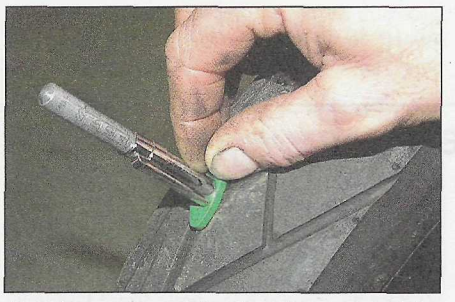
- Check the tyres carefully for cuts, tears, embedded nails or other sharp objects and excessive wear. Operation of the motorcycle with excessively worn tyres is extremely hazardous, as traction and handling are directly affected.
- Check the condition of the tyre valve and ensure the dust cap is in place.
- Pick out any stones or nails which may have become embedded in the tyre tread.
- If tyre damage is apparent, or unexplained loss of pressure is experienced, seek the advice of a tyre fitting specialist without delay.

Tyre tread depth:

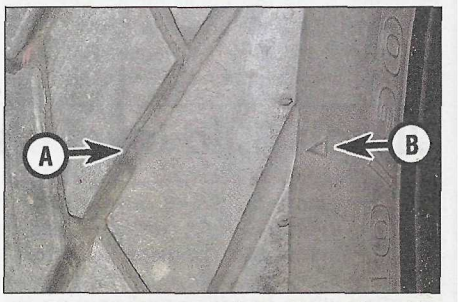
- At the time of writing UK law requires that tread depth must be at least 1 mm over 3/4 of the tread breadth all the way around the tyre, with no bald patches. Many riders, however, consider 2 mm tread depth minimum to be a safer limit. The latest recommendation from Yamaha is a minimum of 1.6 mm. German law requires a minimum of 1.6 mm.
- Many tyres now incorporate wear indicators in the tread. Identify the location marking on the tyre sidewall to locate the indicator bar and replace the tyre if the tread has worn down to the bar.

US market models – 1985 to 1992	**Front**	**Rear**
Rider only or total loads (including rider) up to 90 kg	34 psi (2.35 Bar)	36 psi (2.50 Bar)
Rider and passenger or total loads over 90 kg	34 psi (2.35 Bar)	40 psi (2.75 Bar)
High speed riding	34 psi (2.35) Bar	36 psi (2.50 Bar)
US market models – 1993 to 2003	**Front**	**Rear**
Rider only or total loads (including rider) up to 90 kg	32 psi (2.20 Bar)	32 psi (2.20 Bar)
Rider and passenger or total loads over 90 kg	32 psi (2.20 Bar)	36 psi (2.50 Bar)
High speed riding	32 psi (2.20 Bar)	36 psi (2.50 Bar)
Europe market models	**Front**	**Rear**
Rider only or total loads (including rider) up to 90 kg	33 psi (2.25 Bar)	33 psi (2.50 Bar)
Rider and passenger or total loads over 90 kg	33 psi (2.25 Bar)	36 psi (2.50 Bar)
High speed riding	33 psi (2.25 Bar)	36 psi (2.50 Bar)

1 Remove the dust cap from the valve and check the tyre pressures when **cold**. Do not forget to fit the cap.



2 Measure tread depth at the centre of the tyre using a depth gauge.



3 Tyre tread wear indicator bar (A) and its location marking (B) (usually either an arrow, a triangle or the letters TWI).

Suspension, steering and final drive checks

Suspension and Steering:

- Check that the front and rear suspension operates smoothly without binding (Chapter 1) and is adjusted as required (Chapter 6).
- Check that the steering moves smoothly from lock-to-lock.

Final drive:

- Check for signs of oil leakage around the final drive housing. If any is evident, check the final drive oil level (Chapter 1).

Legal and safety checks

Lighting and signalling:

- Take a minute to check that the headlight, tail light, brake light, licence plate light (where fitted), instrument lights and turn signals all work correctly.
- Check that the horn sounds when the button is pressed.
- A working speedometer graduated in mph is a statutory requirement in the UK.

Safety:

- Check that the throttle grip rotates smoothly and snaps shut when released, in all steering positions.
- Check that the brake lever and pedal, clutch lever and gearchange lever operate smoothly.
- Check that the engine shuts off when the kill switch is operated. Check the starter interlock circuit (Chapter 1).
- Check that sidestand return spring holds the stand securely up when retracted.

Fuel:

- This may seem obvious, but check that you have enough fuel to complete your journey. If you notice signs of fuel leakage – rectify the cause immediately.