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Yamaha News
YAMAHA
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Special feature issue

The '82 Motorcycle Line-up

The new '82 motorcycle models which were unveiled during the Paris Motor Show and the Yamaha USA Dealer Show in early October, have already opened a lot of eyes on the international motorcycle scene. The new technical features adopted in these models, including the turbo system, are sure to meet the needs of the customer better than ever before. In this issue we will present a complete report on the technical highlights of these models.

Yamaha Introduces "Tomorrow's Motorcycle" Today!

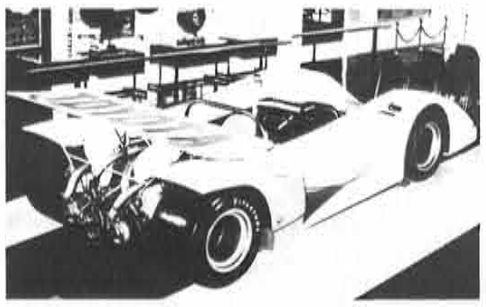
Yamaha is leading the world's motorcycle industry into the nineteen-eighties by being the first manufacturer to say clearly that the changing times of the new decade are calling for a new set of criteria for evaluating motorcycles besides just their horsepower and cubic capacity. Yamaha backs these words with the introduction of the new '82 line-up including the brand-new XZ550 and the XJ650T. The combination of horsepower, compact design, completely modern technology and styling puts Yamaha far ahead in the race to provide the customer with "Tomorrow's Motorcycle" Today!

The experimental XJ650 Turbo under a wind tunnel test

'82 NEW MODELS' TECHNICAL FEATURES

turbo system XJ650T

The Yamaha XJ650T continues the company's theme for the nineteen-eighties of socially responsible machines that combine horsepower with fuel economy and easy handling. And the combination is achieved by the production line use of one of the biggest steps forward in motorcycle technology ..... the turbocharger.
Yamaha built its first turbocharged engine almost a dozen years ago - a 5,000 cc V8 for a Toyota racing car which debuted in July, 1970. Then, in December last year, Yamaha released details of its first turbocharged motorcycle. It was an XS1100-based design exercise that featured a turbocharger in conjunction with computer-controlled fuel injection.



The XS1100, however, was hardly a power unit which needed turbocharging! Therefore, the lessons learned were applied to the middleweight production "Turbo" motorcycle ..... the 1982 Yamaha XJ650T.
Basis of the XJ650T is the familiar XJ650 four-cylinder power unit, which itself made history by being the lightest, most compact "four" on the motorcycle market. It is a well-proven and super-tough engine, well able to withstand the added stresses of forced induction.
The result of turbocharging the XJ650 is to provide a 650cc middleweight motorcycle with the horsepower and torque of a 900! Light-weight, easy-handling, good brakes, small and compact but with enough horsepower to deal with anything on the highway!
An added benefit of turbocharging is better fuel efficiency. At wide throttle openings, the engine performs like a 900 cc unit but at low engine speeds it operates like a normal 650 with less fuel consumption.
Trully the best of both worlds - superbike horsepower with middleweight fuel consumption.
As well as turbocharging, the new XJ650T incorporates a number of other distinctive features.
The engine utilizes the Yamaha Induction Control System, already proven on certain of the normally-aspirated XJ series, which gives another 10% increase in fuel efficiency. The transistorized ignition with its electronic governor has been modified to meet the particular demands of turbocharging, incorporating effective boost control and anti-knock measures.
The combined effect of all these improvements has greatly increased a turbocharging effect.

Turbo unit, location, lubrication

The turbocharger unit is subjected to exhaust temperatures of around 800°C; it is therefore positioned behind the crankcases and below the swingarm pivot, well away from the rider and the fuel system. The turbo unit itself, a Mitsubishi TC03-06A, is the world's smallest and can spin safely up to 210,000 rpm. The shaft linking the exhaust turbine to the intake compressor is pressure-lubricated from the crankshaft's main oil gallery; an additional scavenging pump retrieves the oil from the turbo unit, ensuring a constant, adequate flow.

Exhaust manifold, wastegate, mufflers

The exhaust system has an inner wall of stainless steel from the header pipes to the turbocharger. A patented exhaust manifold links the #1 and #4 exhaust pipes together and the #2 and #3 pipes together before they enter the turbocharger; this design provides even exhaust pulsing to drive the turbine and results in greater midrange torque. A wastegate in the manifold bleeds off excess exhaust pressure to prevent too much boost in the intake. The left-side muffler receives the exhaust gas from the turbo unit, and the right-side muffler handles the excess exhaust from the wastegate.

Carbs, fuel pump, regulator

Turbo systems that use one carburetor with an intake manifold invariably suffer from mixture distribution problems; the carb must be tuned for the leanest cylinder, resulting in excessive fuel consumption and exhaust emissions. The Yamaha system, however, uses four 30 mm carbs, allowing precise tuning for each cylinder. The carbs are sealed against the outside atmosphere, and the float bowls are vented to intake air pressure to provide normal fuel flow. The fuel is supplied by a fuel pump that is cable-driven from the camshaft, and a regulator diverts excess fuel back to the fuel tank.

Reed valve, surge tank, relief valve

Yamaha has largely eliminated "turbo lag", a phenomenon which afflicts conventional turbo systems when the throttle is snapped open at low engine speeds. Since the turbo unit is spinning too slowly to provide an adequate air supply, a conventional turbo suffers a vacuum in the intake tract and hesitates before building speed. Yamaha's system, however, provides fresh air directly from the air cleaner to the surge tank through a reed-valve-controlled passage; the engine can build speed freely until the turbo unit resumes its pressurizing effect and closes the reed valve. Another notable feature in the surge tank is a poppet-type relief valve that backs up the wastegate in preventing excess boost in the intake side.

Electronic vacuum advance, knock sensor

The electronic ignition system has two rather notable new features: an electronic vacuum advance and a "knock" sensor. The electronic vacuum advance mechanism senses the vacuum in the intake tract and sends this information to the electric ignition governor unit; this unit then adjusts the ignition timing advance to produce maximum torque. The knock sensor picks up the resonance of knock, or detonation, and transmits a signal to the electric governor unit. The electric governor slowly retards the ignition timing until the knock ceases. Hence, the ignition system is constantly providing the proper advance for maximum torque while preventing the undesirable knock prevalent in conventional turbocharged engines.

Crank, rods, pistons, etc.

To deal with the increased power of a turbocharged induction system, the crankshaft main-bearing journals have been cross-drilled to provide added lubrication. The connecting rods have a special oil hole which directs cooling oil onto the bottom of the pistons. The crowns of the pistons are 30% thicker than standard units. An oil cooler prevents deterioration of the lubricating properties of the oil. The clutch and transmission have been beefed up to handle the increased torque.

XJ650T

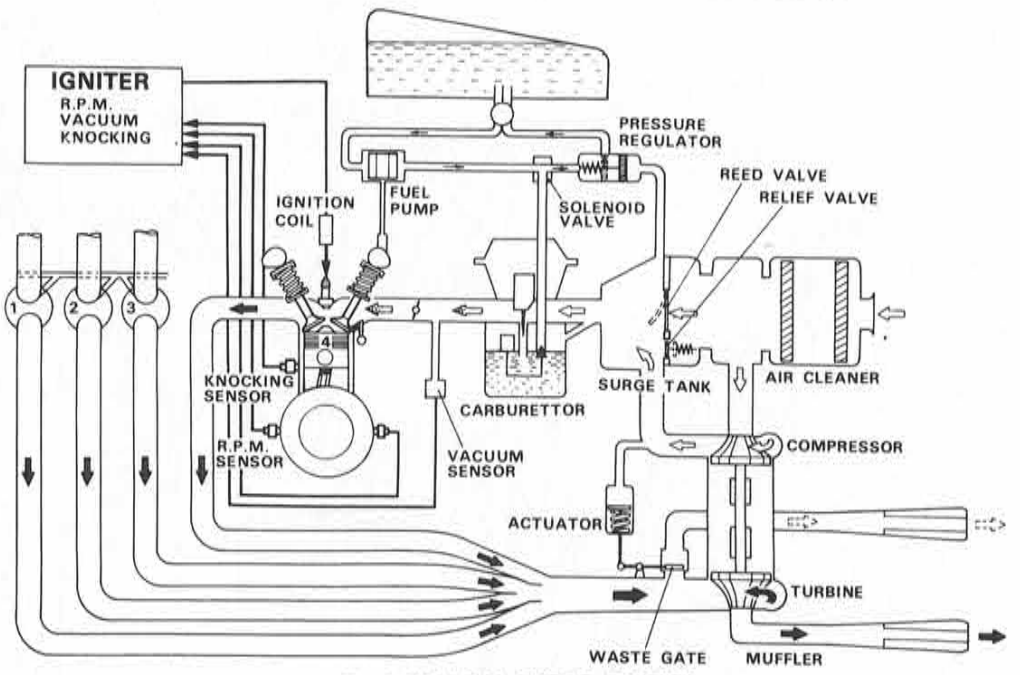


Fig. 1 YAMAHA TURBO SYSTEM

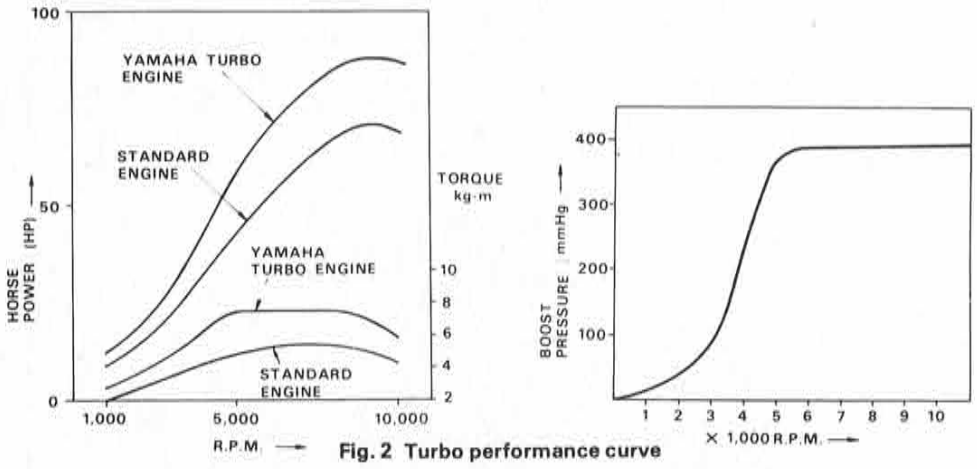


Fig. 2 Turbo performance curve

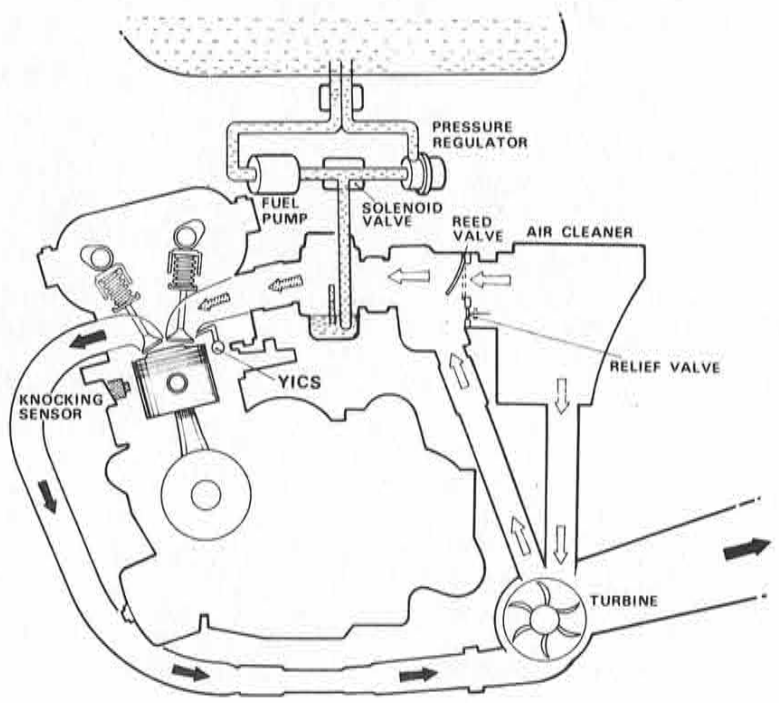
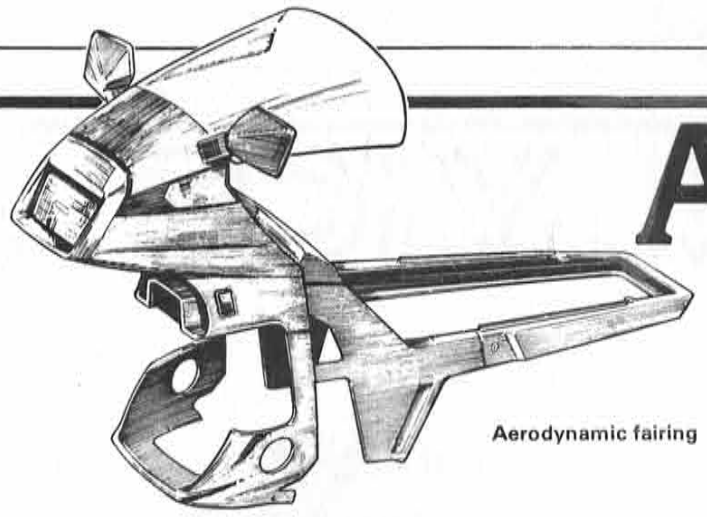
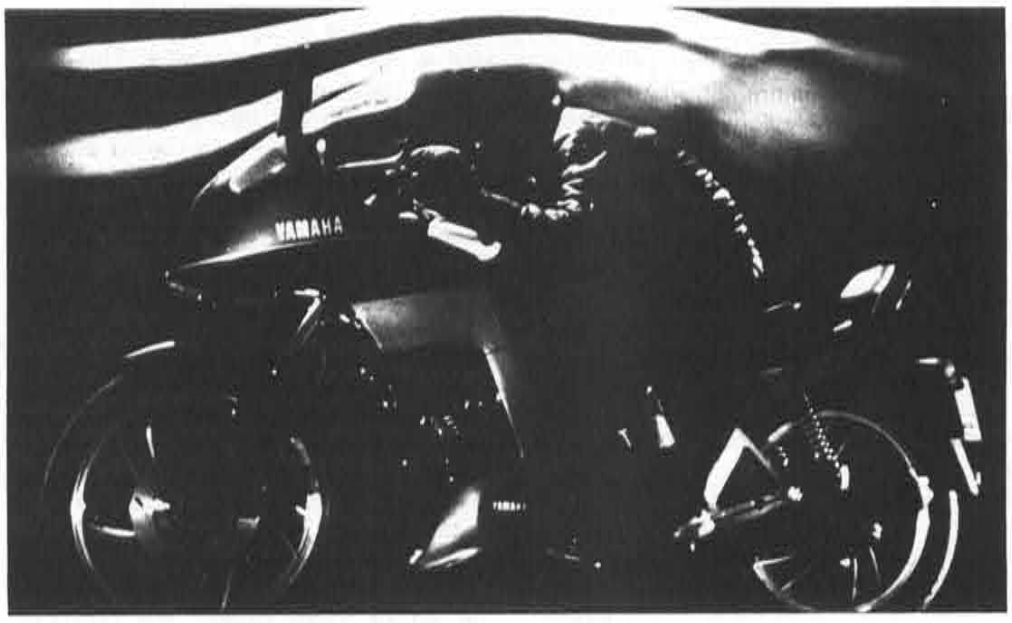


Fig.3 Turbocharging function



Aerodynamic fairing

Aerodynamics XJ650T



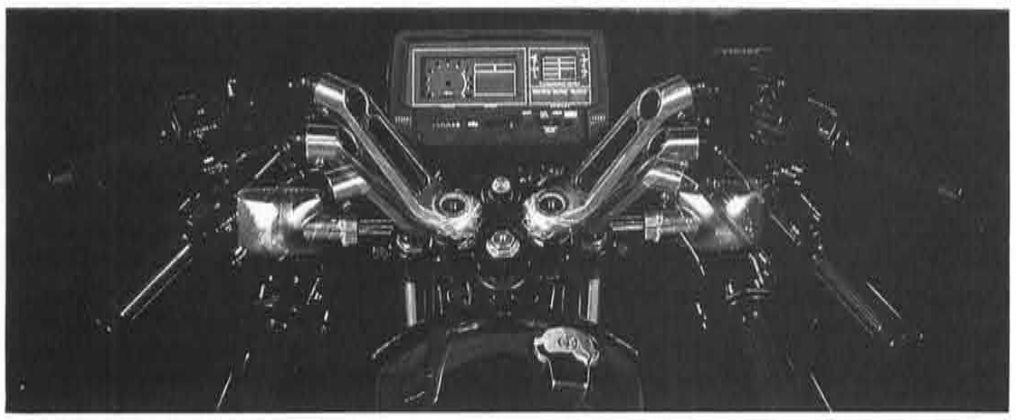
The fairings on Yamaha's innovative new models represent more than just handsome cosmetics. Indeed, from their inception to their final rendering, form was designated secondary to function. So while they're certainly great to look at, they're simply stunning to ride: They cut through the air with considerably less drag than a unfaired machine while keeping the rider comfortable and protected from the elements as well.

Two of the most important aerodynamic factors in designing a fairing are wind resistance and front wheel lift force. Through extensive wind-tunnel testing, Yamaha engineers crafted a fairing for the Turbo 650 which significantly reduces these effects. Every component down to the rearview mirrors was designed with aerodynamic efficiency in mind. The coefficient of drag, a measurement of wind resistance, is among the lowest in the world for a road machine. A reduction of about 10% was achieved in front wheel lift force over a similar machine not equipped with a fairing.

In addition to presenting an aerodynamically slippery shape, the fairing serves to direct wind around the rider's anatomy rather than into it. The tank and seat cowling is smoothly sculptured to provide a comfortable, natural riding position while the wind is diverted around the rider's legs and knees. The leading edge of the fairing provides a stable air pocket in front of and around the rider's torso and arms. The windscreen is shaped to direct the airstream over the rider's helmet. Since the rider is not required to resist the buffeting of the wind, he is much less subject to fatigue.

The construction of the fairing and its components benefit greatly from Yamaha's vast experience in the field of boat manufacturing. The main parts of the fairing are constructed of fiberglass-reinforced plastic, a strong, lightweight material which has been developed extensively by Yamaha. The acrylic windscreen is fastened to the fairing with polycarbonate screws which allow the screen to detach easily upon impact, and the screen has a transparent molding around its entire edge. The front turn signals, integrated into the front of the fairing, are highly visible from the front and sides of the machine.

Adjustability

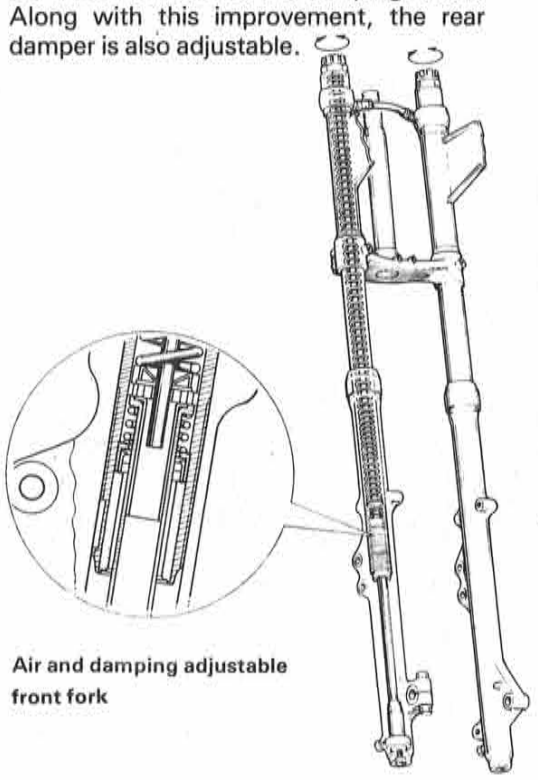


Motorcycles and people come in a variety of sizes and shapes. Unfortunately, people of a certain size or shape don't always match up with the size and shape of the motorcycle they wish to own. This prevents these people from riding in the comfort and style they prefer. This year, Yamaha has begun to deal with this problem with adjustable footpegs, brake pedal, gearshift pedal and handlebars. This year, more people than ever can ride a Yamaha.

There are two types of adjustable handlebars; one offers three positions and the other six. The three-position bars provide a grip-height and bend adjustment. By removing a bolt and loosening a pinch bolt, the end of each bar may be removed from its serrated joint and shifted either higher or lower from the standard position. The six-position bars feature a width adjustment in conjunction with the above three positions. The lower part of each bar may be removed from the serrated connection at the handlecrown and fitted in either of two places to alter the distance between the grips.

The footpegs, brake pedal and gearshift pedal can be moved to anywhere within 30mm forward or 20mm rearward of the standard position by loosening the bolts which hold them to the frame. To maintain the proper distance between the left footpeg and the shift pedal, the end of the pedal can be removed and reinstalled on its arm in one of three positions. The brake pedal pivots on the footpeg mounting bolt, so the proper relationship always exists; the brake pedal linkage and the brake-rod-to-cam-arm joint are adjustable to maintain the correct brake free play.

The newly designed front suspension system features an air assisted coil/oil damper cushion unit to soften or absorb the shock and impact coming from the road surface more smoothly. Both forks are linked to increase the damping effect. Along with this improvement, the rear damper is also adjustable.



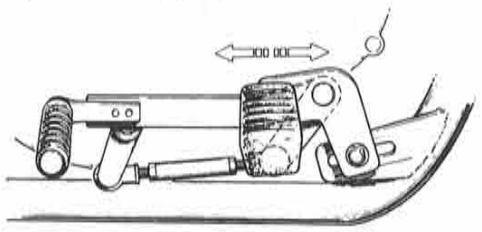
Air and damping adjustable front fork

XV920 VIRAGO/XJ750 MAXIM

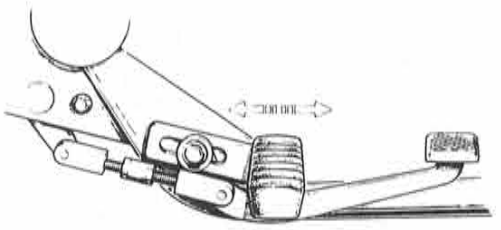
XV920 VIRAGO

XJ750 MAXIM

Adjustable footpeg & gearshift pedal



Adjustable footpeg & brake pedal



'82 NEW MODELS' TECHNICAL FEATURES

V-Twin L/C (Liquid-cooled 70° V-twin) YICS XZ550

The all-new 70° V-Twin engine is liquid-cooled to maintain the best operating temperature range. The cooling system features an aluminum-corrugate radiator which is extremely light and exhibits excellent heat-dissipating characteristics. An automatically activated electric fan pulls air through the radiator in heavy-traffic situations. The system has an automotive-type expansion and recovery tank which makes airspace in the radiator unnecessary and virtually eliminates coolant loss on even the hottest days. A thermostat mounted in the engine block provides quick warmups and stable coolant temperature. (Fig. 1)

The induction system on this machine features downdraft carburetion. The 36 mm venturis are positioned so that the incoming air takes a virtually straight path through the carbs and the intake manifolds to the combustion chambers; intake efficiency is remarkably high. An accelerator pump is installed in the carburetor assembly to eliminate hesitation when the throttle is opened at low engine speeds. A fuel pump delivers gas from the tank to the float bowls, and a regulator sends excess fuel through a circuit back to the fuel tank. (Fig. 3)

Each cylinder head has dual overhead camshafts, and each camshaft acts directly on top of the valves; there are no pushrods or rocker arms. Each cylinder has four valves, two intake and two exhaust, instead of one intake and one exhaust valve. By using two slightly smaller valves in place of each large valve, port area is significantly increased. This provides a much greater volume of mixture and exhaust flow. In addition, the smaller, lighter valves are easier to control at high engine speeds; the valves can follow the cam profiles more closely to resist "floating" and allow a 9,500 rpm redline. (Fig. 4)

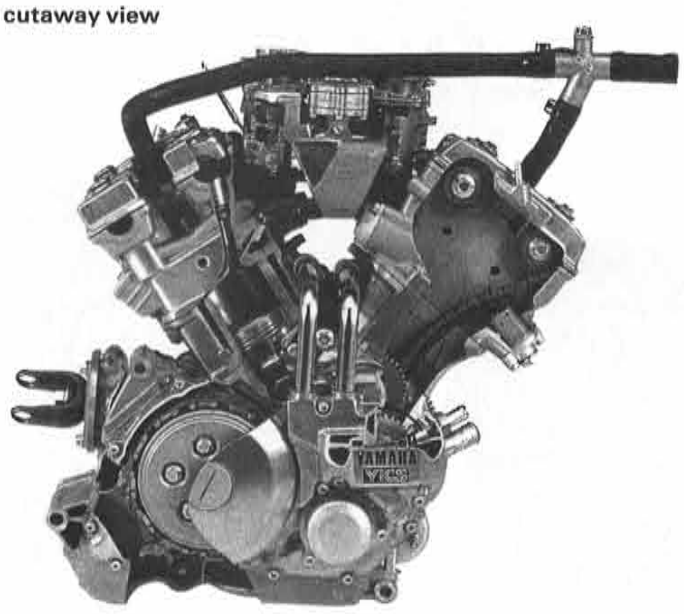
YICS (Yamaha Induction Control System)

To increase fuel economy through more efficient combustion, the engine is equipped with the patented Yamaha Induction Control System (YICS). In this configuration, the YICS consists of a chamber linked to the intake manifold by a tube. Upon intake, the vacuum in the manifold creates a vacuum in the chamber; when the intake valve closes, the chamber draws in some air-fuel mixture. When the intake valve reopens, the mixture in the chamber shoots back out through the angled tube and into the cylinder, mixing with and swirling the main intake charge. The swirling charge is then compressed and ignited, burning more completely and producing more power than that of a conventional engine. (Fig. 2)

The brand-new XZ550 comes in all these technical improvements, together with the newly designed hang-support type Monocross frame which is light yet rigid. (Fig. 5)

XZ550

XZ550 engine cutaway view



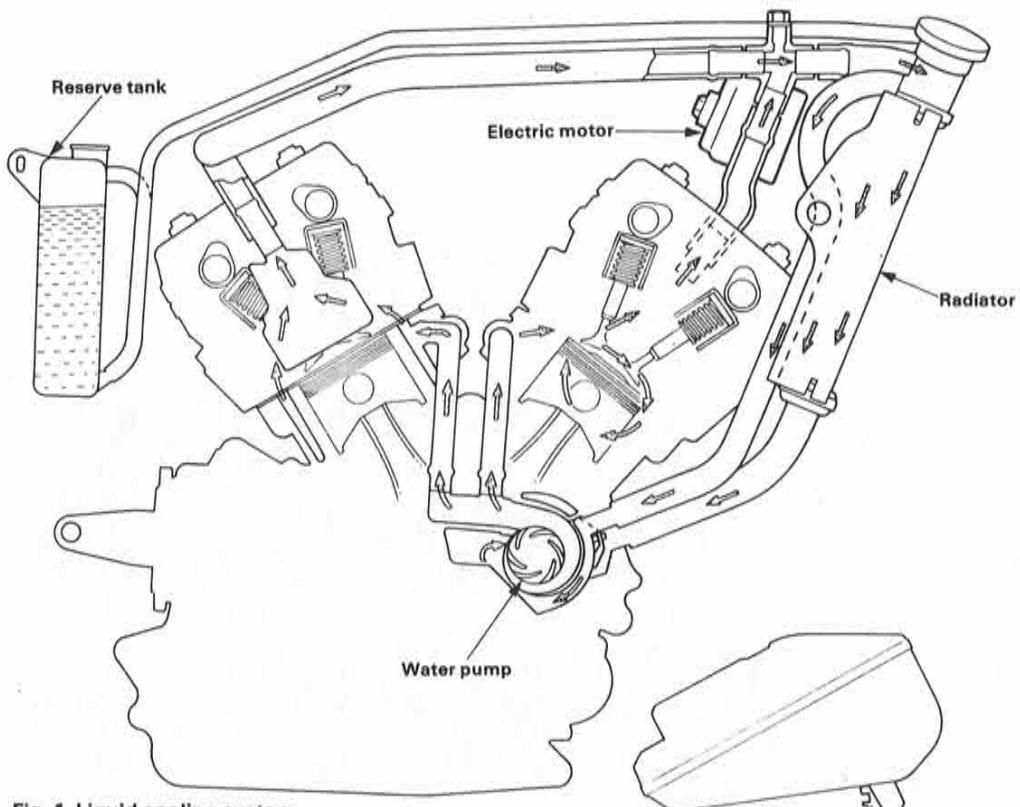


Fig. 1 Liquid cooling system

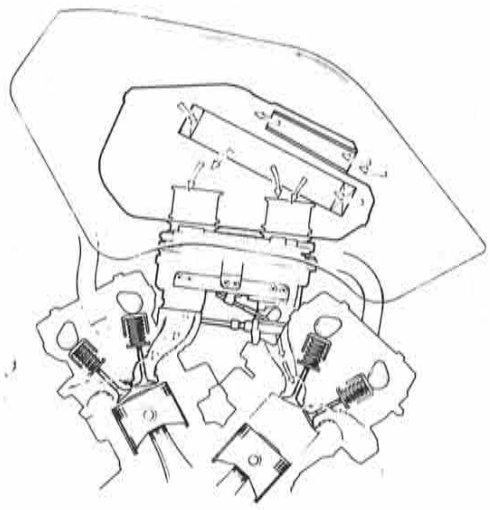


Fig. 3 Large-capacity air cleaner and down-draft carb

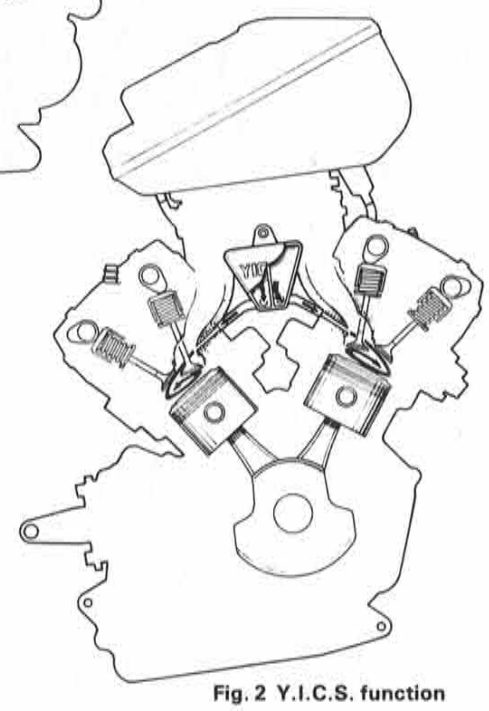


Fig. 2 Y.I.C.S. function

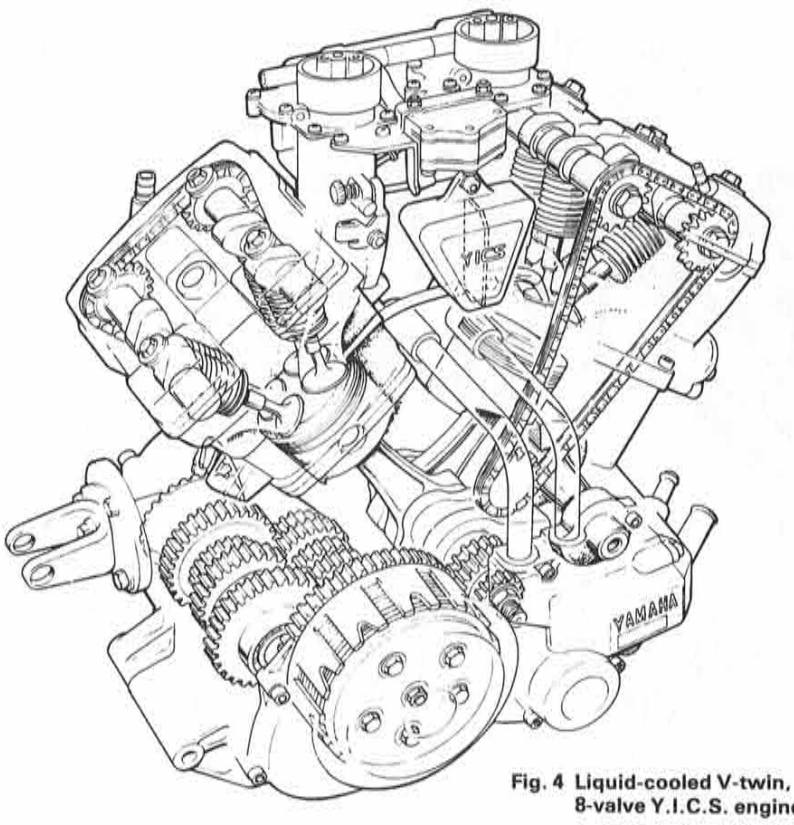


Fig. 4 Liquid-cooled V-twin, DOHC, 8-valve Y.I.C.S. engine

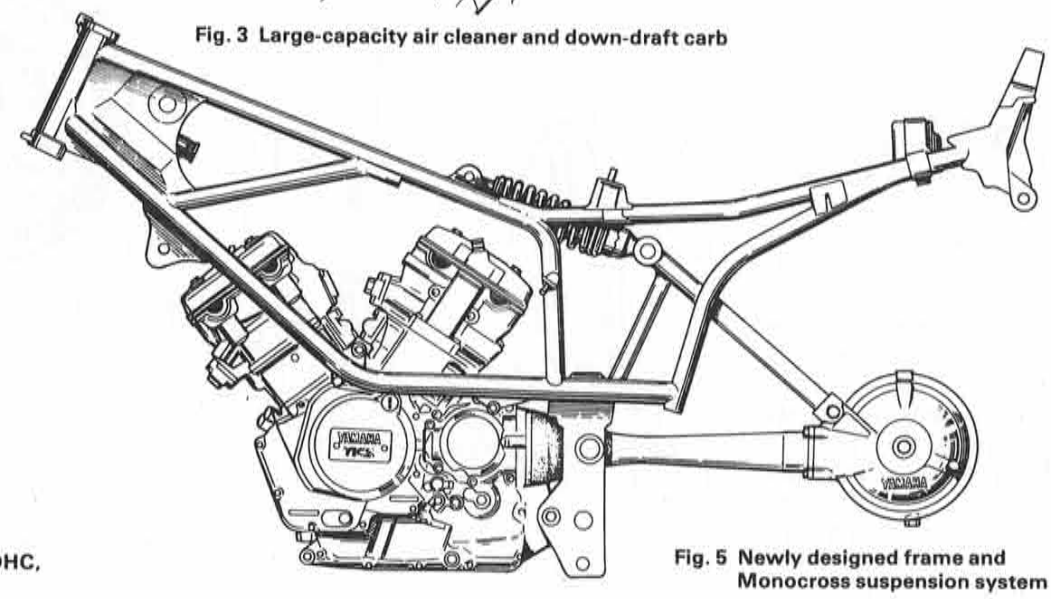
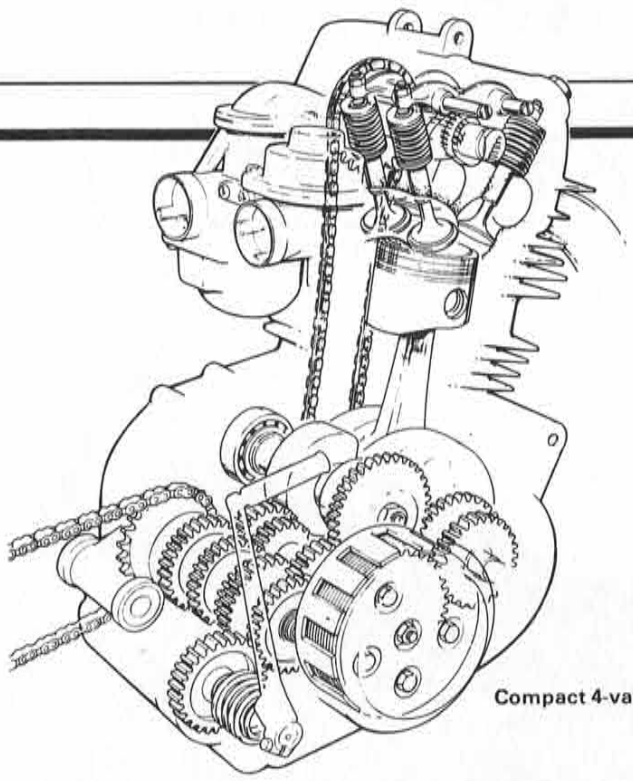


Fig. 5 Newly designed frame and Monocross suspension system

YDLS XT550

(The Yamaha Duo Intake System)



Compact 4-valve engine

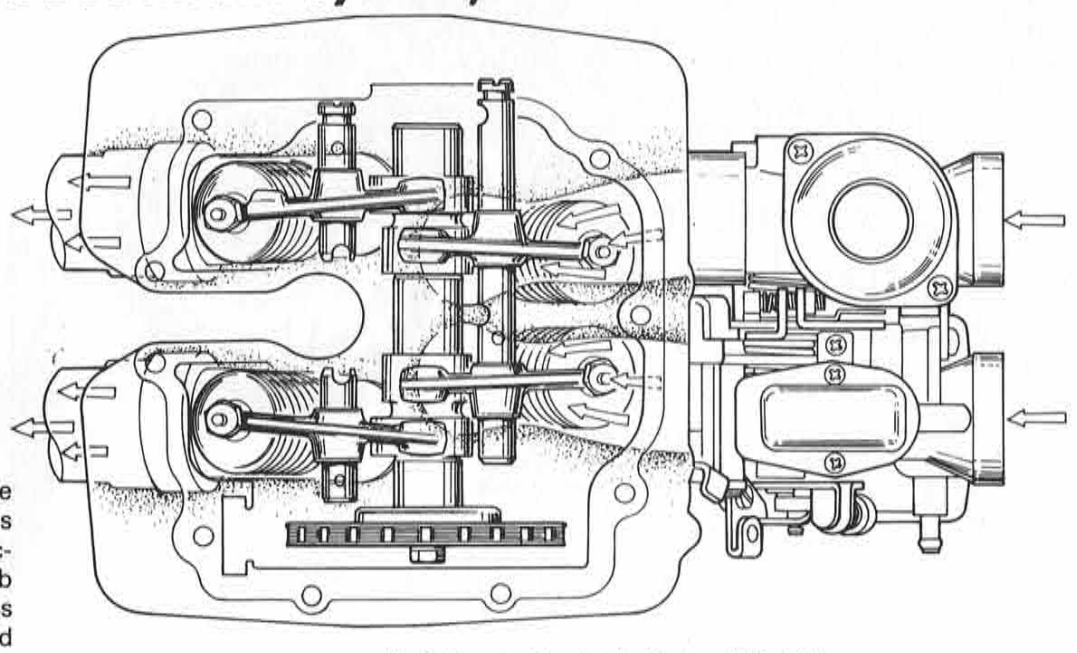


Fig. 1 Yamaha Duo Intake System (Y.D.I.S.)

This system features two carburetors: A cable-operated-slide type functions as the primary carb, and a vacuum-controlled-slide type provides a secondary bore. The engine has a 4-valve head, and each carb has its own intake port and valve. Although each carb bore and intake port is smaller than that of a more conventional engine, their combined area is about 20% greater than a single, larger carb and intake layout. Flow efficiency of both the intake and exhaust sides is substantially improved.

From idle to about half throttle, the primary carb supplies the air-fuel mixture, and almost the entire intake charge enters through just one valve; since the 4-valve layout offsets the intake ports relative to the cylinder-bore axis, a strong YICS-type swirl is produced in the low-to-medium rpm range. Combustion efficiency is significantly enhanced, resulting in improved fuel economy. In addition, the single small bore provides excellent low- and medium-speed throttle response due to the high air velocity in the venturi. This eliminates the need for a mechanical accelerator pump, allowing minimal carb height and ample room for the Monocross rear suspension. As the throttle is turned from half to wide open, a linkage between the carburetors gradually opens the secondary-carb butterfly. The vacuum-controlled slide in the secondary carb opens as engine demand builds, providing superb mid-range smoothness. With both slides fully open, the engine receives more mixture and produces more power than a regular single-carb machine. (Fig. 1)

The brand-new XT550 which has been developed, based on the Paris-Dakar Rally winning XT500, features this new system.

Included in other new technical features are the tank-in-frame design, decompressor and DC lighting system as well. (Fig. 2, 3 & 4)

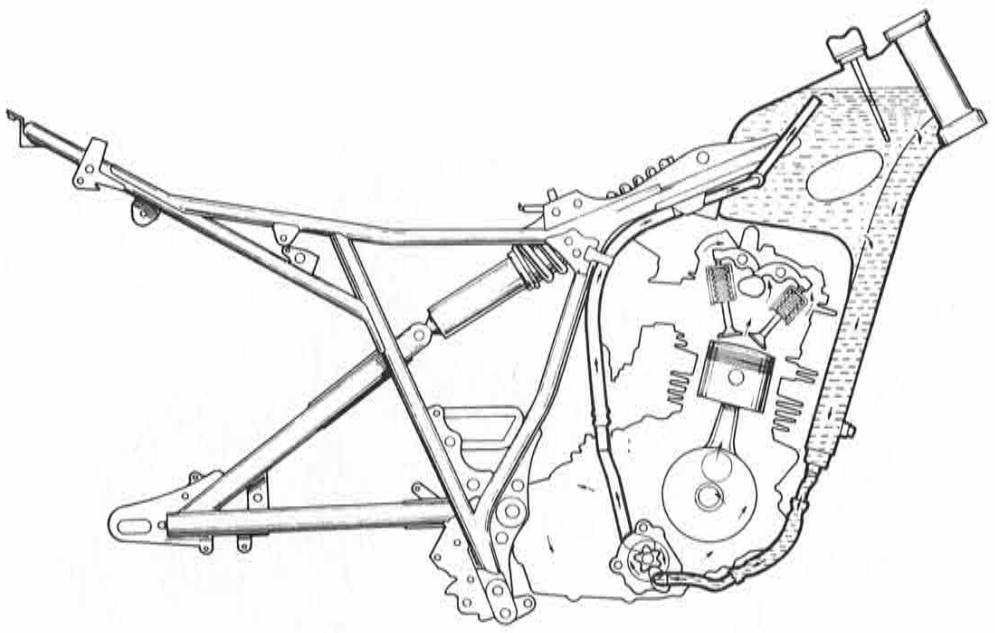


Fig. 2 Tank-in-frame design and lubrication system

XT550

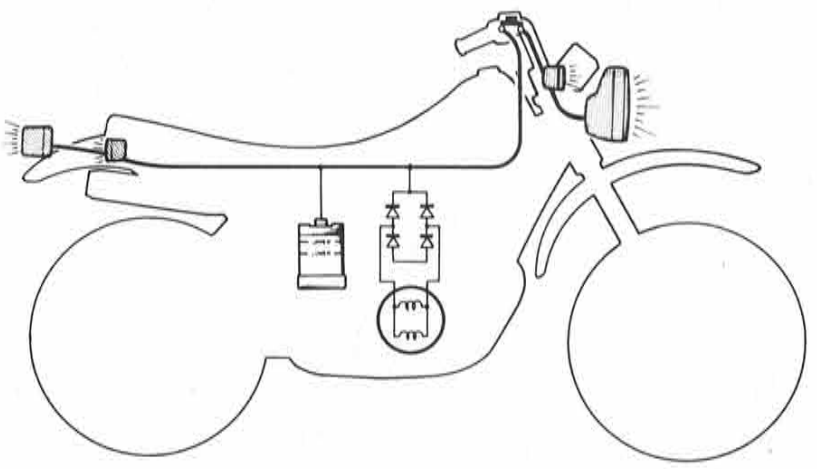
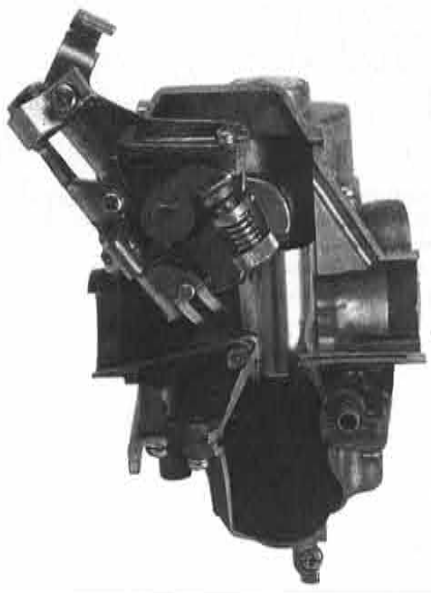
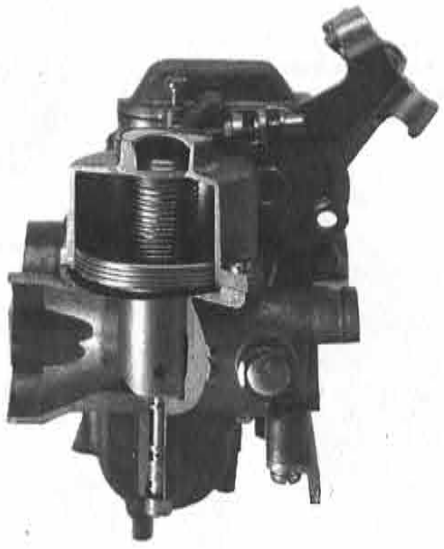


Fig. 3 12V DC lighting system

VM type



BS type



Two carburetors: One is a VM type (cable-operated slide type) and the other a BS type (vacuum-controlled slide type).

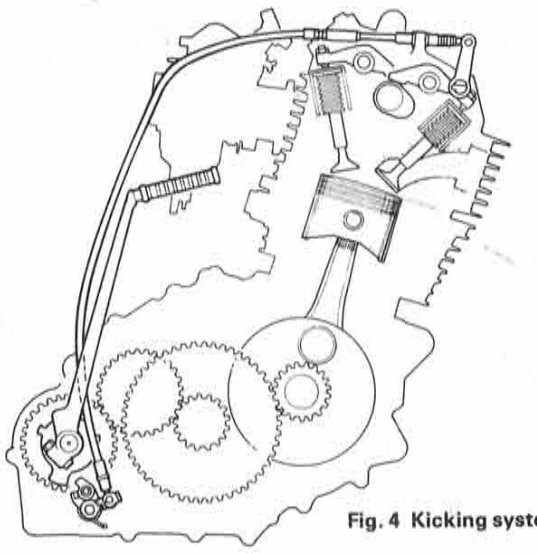
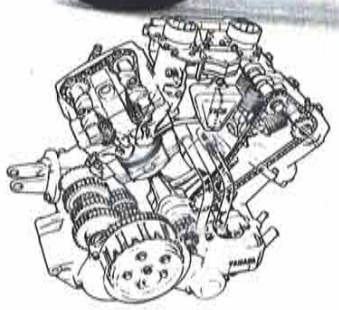


Fig. 4 Kicking system & decompressor

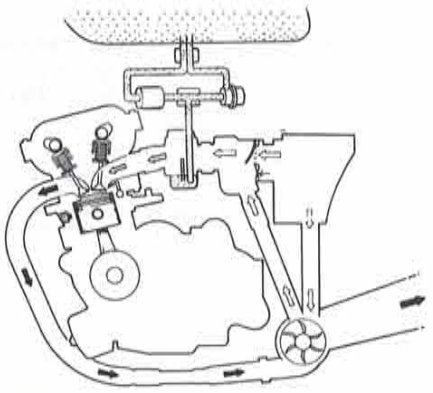
'82 YAMAHA LIN

XZ550R
4st. DOHC V-twin, 552cc, 64.4PS @9,500rpm, 5-speed, 196 kg



Liquid-cooled V-twin 8-valve engine

- Yamaha's Powerful New 70° V-Twin Liquid-Cooled Engine
- DOHC 8-valve with YICS
- Shaft Drive
- Adjustable Monocross Suspension and Trailing Axle Front Forks
- Lightweight, Exceptional Handling with Deep Banking Angle



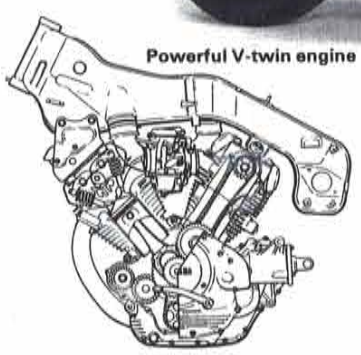
Yamaha turbo system

XJ650T
4st. DOHC four, 653cc Turbo, 85PS, 5-speed, 225kg

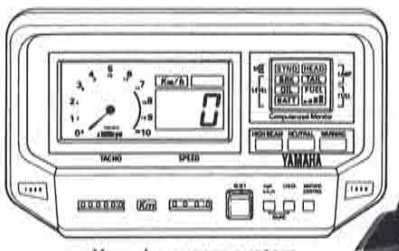
- Yamaha's Exclusive New Turbo-Charging System with YICS, Anti-Knock Sensor Device and Reed Valve
- Wind-Tunnel Designed and Tested Aerodynamic Fairing
- Computerized Monitor System
- Dual Front Disc Brakes
- Exceptional Handling and Performance

XV1000R
4st. SOHC V-twin, 981cc, 70PS @6,500rpm, 5-speed, 220 kg

- Powerful 75° V-Twin Engine
- Monocross Suspension with Fully Adjustable Air and Damping
- Adjustable Air Front Forks
- Grease Bath Chain Case



Powerful V-twin engine

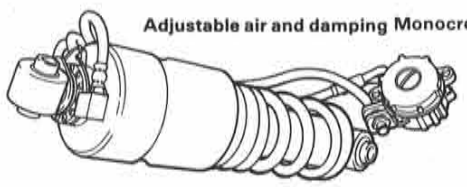


Yamaha cycom system

US model

XV920 VIRAGO
4st. SOHC V-twin, 920cc, 65PS @6,500 rpm, 5-speed, 225 kg

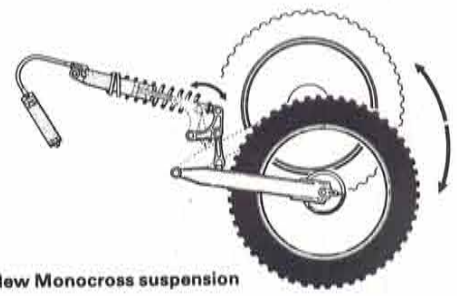
- New 75° V-Twin Engine with More Torque, More Power
- Shaft Drive
- New Computerized Monitor System with Digital Readout
- Adjustable Air and Damping Leading Axle Front Forks
- Monocross Rear Suspension with Adjustable Air and Damping
- Fully Adjustable Aluminum Handlebars



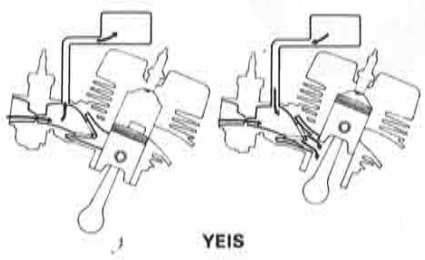
Adjustable air and damping Monocross suspension

YZ250
2st. Liquid-cooled single, 246cc, 41PS @8,250rpm, 5-speed, 103 kg

- High Performance Two-Stroke Liquid-Cooled Engine with Yamaha Power Valve System
- Long-Travel, Fully Adjustable New Monocross Suspension System
- Long-Travel Adjustable Leading Axle Front Suspension System
- New Integrated Seat and Tank Design



New Monocross suspension



YEIS

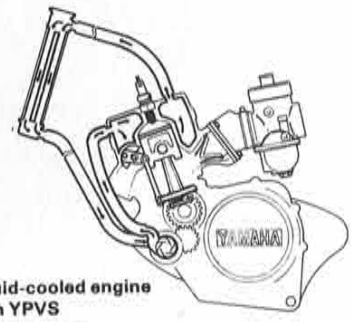
IT175
2st. single, 171cc, 6.2PS @6,000rpm, 6-speed, 99kg

- High Performance Two-Stroke Engine with YEIS
- Long-Travel New Monocross Suspension
- New Larger-Diameter Long-Travel Front Forks
- Newly Designed Long Seat

Photo: US Spec.

YZ80
2st. Liquid-cooled single, 79cc, 19.5PS @12,250rpm, 6-speed, 63 kg

- High Performance Two-Stroke Liquid-Cooled Engine with YEIS
- Newly Designed Monocross Rear Suspension
- Long-Travel Front Suspension
- Newly Designed Tank and Seat



Liquid-cooled engine with YPVS (YZ125/YZ250)

E-UP

Introduced here is the '82 Yamaha line-up with a number of significant improvements to meet the needs of customers better.

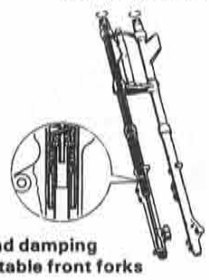
1981 No. 10 Yamaha News

XJ1100 MAXIM

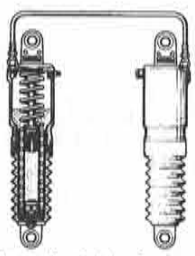
4st. DOHC four, 1101cc,
92PS @8,000 rpm, 5-speed, 257 kg

US model

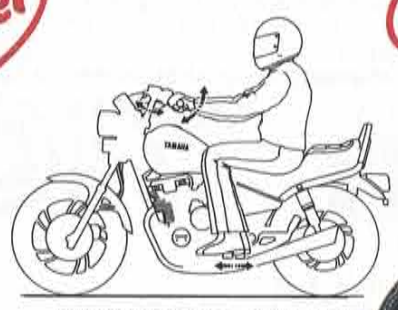
- Powerful 1100cc Four-Cylinder Engine
- Computerized Monitor System
- New Fully Adjustable Aluminum Handlebars
- Unified Brake System
- Newly Designed Fully Adjustable Front and Rear Suspension Systems



Air and damping adjustable front forks



Damping adjustable air suspension



Adjustable footpegs, pedals, and handlebars

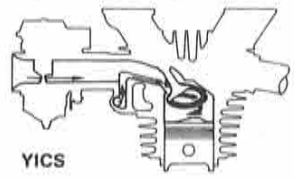
XS400 MAXIM

4st. DOHC twin, 399cc, 40PS
@9,500rpm, 5-speed, 169 kg

*This model is only for U.S. market.

US model

- New Narrow DOHC Twin-Cylinder Engine with YICS & Balancer
- Monocross Rear Suspension
- Low Seat Height
- Electric Starter
- Spiral Cast Wheels



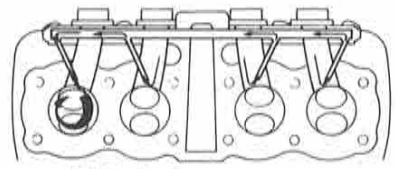
YICS

US model

XJ750 MAXIM

4st. DOHC four, 748cc,
76PS @9,000 rpm, 5-speed, 220 kg

- In-line Four-Cylinder Engine with YICS and Shaft Drive
- Fully Adjustable Handlebars and Footrests
- Fully Adjustable Front and Rear Suspension Systems
- Computerized Monitor System
- Low Seat Height



YICS In-line four-cylinder engine

RD350

2st. Liquid-cooled twin, 347cc, 47PS
@8,500rpm, 6-speed, 143 kg

- Powerful Liquid-Cooled Twin Engine
- Monocross Rear Suspension
- Dual-Disc Brake (Front)
- European Styling

Photo: Canada Spec.

SR125

4st. SOHC single, 124cc,
12PS @8,500 rpm, 5-speed, 104 kg

- SOHC Engine with Balancer
- Electric Starter
- Low Seat Height
- Economical and Pleasant

YT175

2st. single, 171cc,
15PS @7,000rpm, 5-speed, 119kg

- Year-Round Work/Fun Machine
- Powerful 171cc Torque Induction Engine with Autolube
- Telescopic Front Suspension
- Front Drum and Rear Disc Brakes
- Five-speed Semi-automatic Transmission
- Durable Corded Tires

RD80LC

2st. Liquid-cooled single, 79cc,
8.5PS @6,500 rpm, 6-speed, 78 kg

- Super Sports Styling with Fairing and Under Cowl
- New Liquid-Cooled Engine with 6-speed Transmission
- New Integrated Seat and Tank Design
- Built-in Tail Lamp and Storage Compartment with Lock

RX80

2st. single, 79cc, 7.5PS @6,500 rpm,
5-speed, 81 kg

- Powerful Torque Induction Engine with Air Duct Cylinder-Head
- Easy-to-Read Instrument
- Newly Designed Sporty Tank and Seat
- New Cast Wheels
- Front Disc Brake

XT550

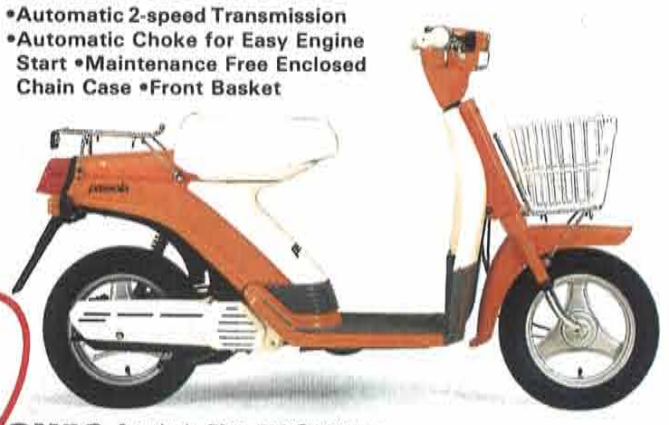
4st. SOHC single, 558cc, 38PS
@6,500rpm, 5-speed, 130 kg

- New SOHC Four-Valve Single Cylinder Four-stroke Engine with Balancer
- Newly Designed Dual Intake and Exhaust System
- Monocross Suspension
- Automatic Decompressor
- Long-Travel Leading Axle Air Adjustable Front Forks
- Light weight

SA50

2st. single, 49cc, 2.8PS @6,000rpm,
2-speed automatic, 51kg

- Automatic 2-speed Transmission
- Automatic Choke for Easy Engine Start
- Maintenance Free Enclosed Chain Case
- Front Basket



XT125

4st. SOHC single, 124cc,
12PS @9,000 rpm, 5-speed, 98 kg

- Four-Stroke SOHC Single-Cylinder Engine with Balancer
- 5-speed Transmission
- Monocross Suspension
- Long-Travel Leading Axle Front Suspension
- Lightweight

DT125LC

2st. Liquid-cooled single, 123cc,
16.2PS @7,000 rpm, 6-speed, 96 kg

- High Performance 2st. Liquid-Cooled Engine with YEIS and Counter Balancer
- Closed Ratio 6-speed Transmission
- New Integrated Seat and Tank Design
- Long-Travel Front Forks and Monocross Rear Suspension

European Model

CV80

2st. single, 79cc, 5PS @6,000rpm,
V-belt automatic drive, 79kg

- Clean and Easy Operation
- Comfortable Ride
- Electric Starter
- Autolube
- Fully Automatic Transmission
- Functional and Attractive Instrument Panel
- Convenient Storage Box and Rear Carrier

'82 NEW MODELS' TECHNICAL FEATURES

DOHC Twin YICS

XS400 MAXIM

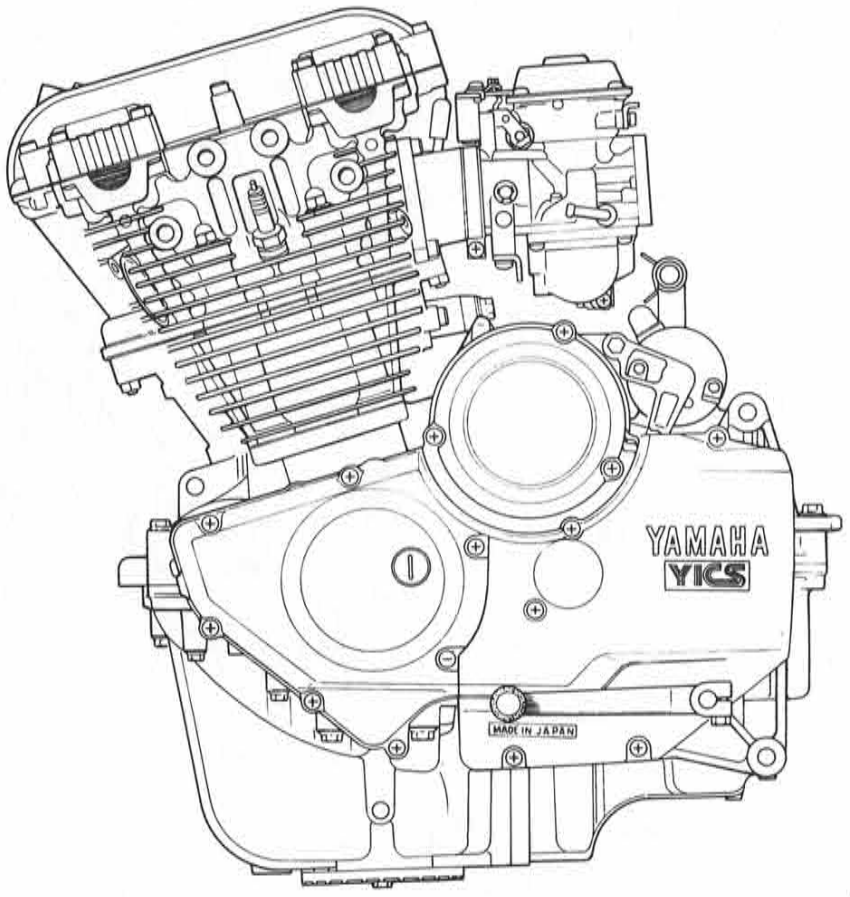
This new engine features a 180° crankshaft, a gear-driven balancer system, DOHC valve train, and chamber-type YICS. The existing SOHC twin engine also has high potential but the new DOHC engine has further expanded the range of high speed performance. At the same time, stroke is increased by 1mm to 53.4mm (bore 69mm) to give out a full 399cc. Peak speed is also increased to 9,500 rpm while max. power output is raised to 40ps (over 100ps/liter). This is the highest power output delivered by a twin engine in this class.

Balancer-fitted twin is as narrow as a single

Primary design aim has been to make the power-unit as narrow, compact and light as possible, with specific emphasis being given to superior maintenance qualities as well.
Its width is only 40mm wider than that of the single SR500 engine. The generator is installed on the crankcase in the rear of the cylinder as is the case with XJ series. The adoption of a large-sized clutch has reduced the width of the clutch housing. The electric starter needs no kick crank. These improvements have resulted in such a narrow power-unit.
The narrow, compact power-unit is common to Yamaha's latest models. In addition, the crankcase cover features a flat design allowing for the best possible utilization of footing space so that riding comfort is increased. This allows a deeper leaning angle as well.
The gear driven balancer works to absorb the moment of inertia very effectively, thus reducing vibration to improve riding comfort.

YICS for better fuel economy and higher performance

The YICS has a function to produce a strong swirl of air/fuel mixture to fill the cylinder quickly, thus shortening combustion time to increase power output and reduce fuel consumption.
The XJ750 is the first model to adopt this system. On this 4-cylinder engine, each cylinder has a large and small sized induction passages.
All small-sized passages are linked to produce a swirl.
By this method, a difference in air pressure is produced in each induction system in accordance with the engine's speed, thus making the air/fuel mixture coming from the sub induction passage a strong jet stream.
On the other hand, the induction system of the new DOHC twin engine has a separate chamber on each side so that air/fuel mixture is compressed into the chamber by utilizing the induction momentum during compression stroke.
This compressed air/fuel mixture is taken out in the form of a jet stream by utilizing the negative pressure during induction stroke.
The passage leading to the chamber is smaller in diameter and the compressed air/fuel mixture is made into a jet stream by a kind of pumping action.
This jet stream is led into along the inner wall of the cylinder so that a strong swirl is produced.
The new engine is adopted in the '82 XS400, the chassis of which has the Monocross rear suspension system that is adjustable to six preload positions.
The needle-bearing swingarm pivot and the rear engine mount share the same large-sized bolt, increasing rigidity. The engine balancer negates the need for heavy frame gusseting to deal with excess vibration, and the engine serves as an integral frame member; both of these features contribute to the machine's light weight. (Fig. 3)



XS400 MAXIM (US MODEL)

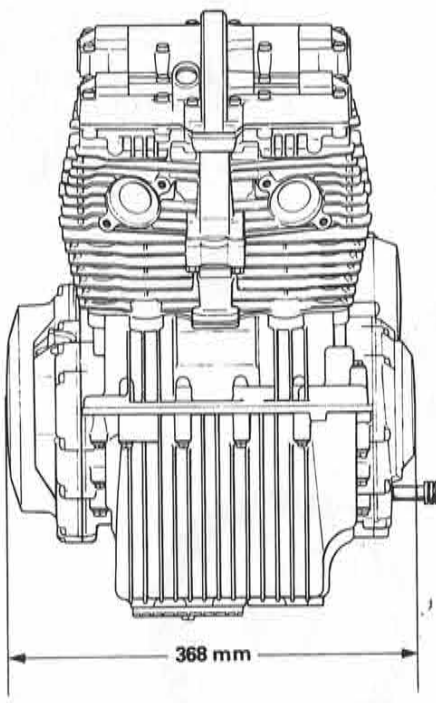


Fig. 2 Slim & compact twin engine

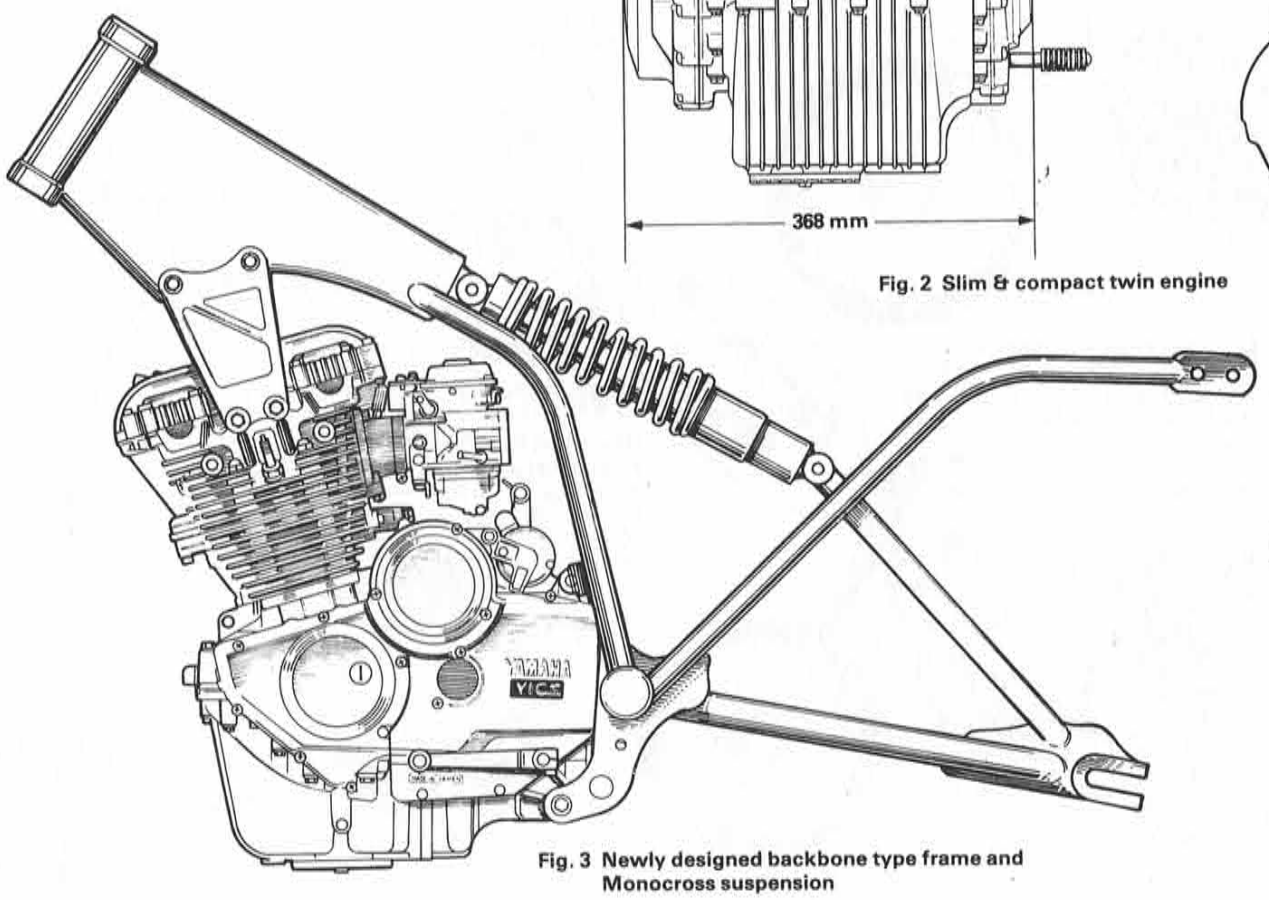


Fig. 3 Newly designed backbone type frame and Monocross suspension

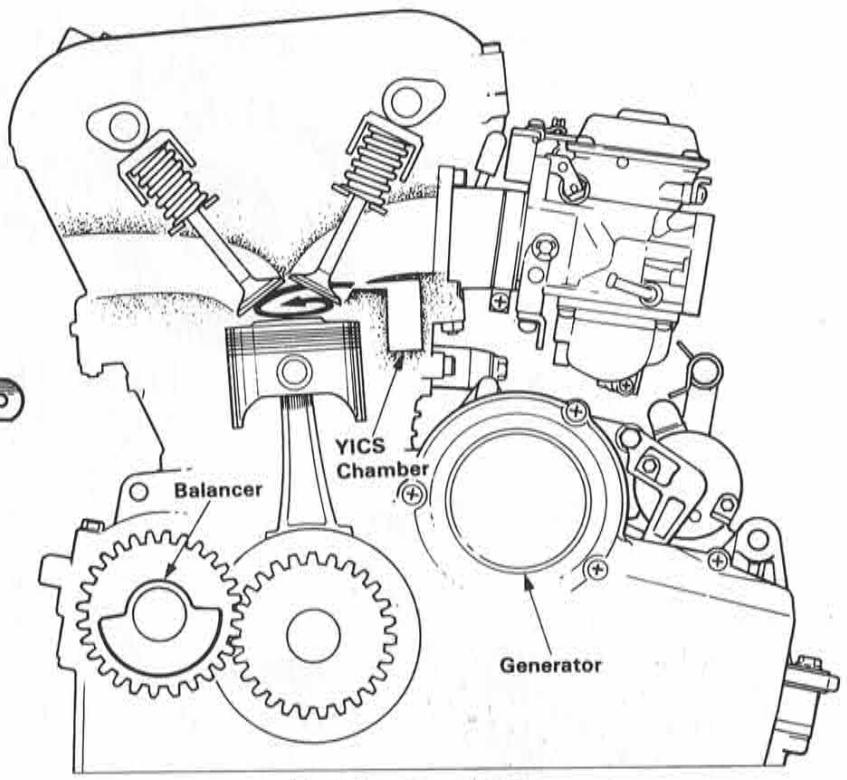
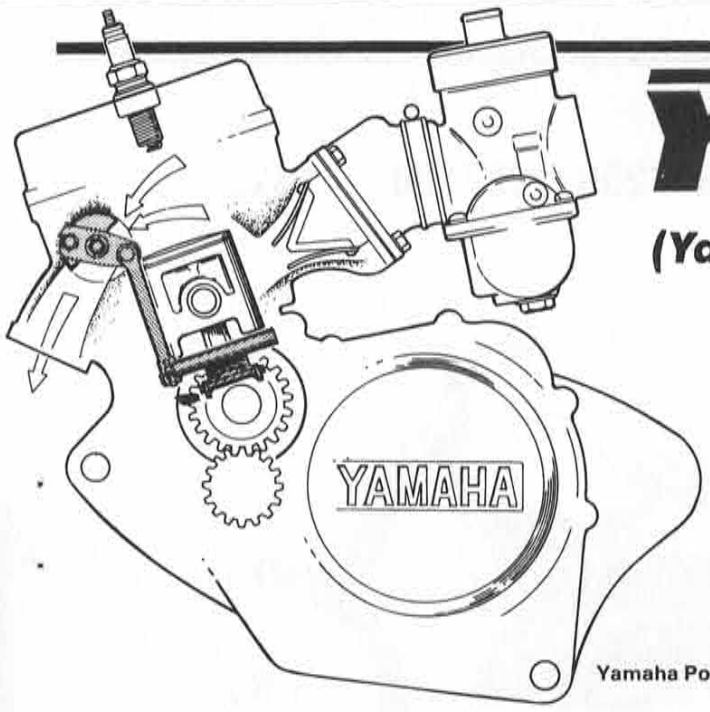


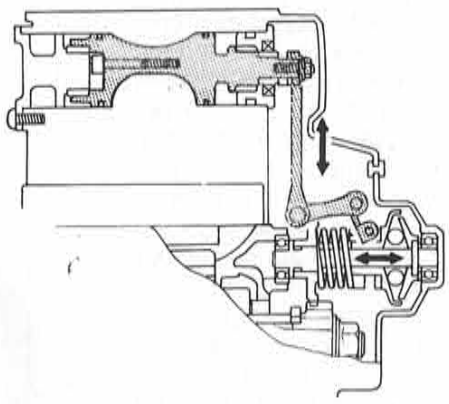
Fig. 1 Function of YICS



Yamaha Power Valve System (Y.P.V.S.)

YPVS YZ250/125 YEIS YZ490/100/80

(Yamaha Power Valve System)



From the inception of the two-stroke engine, a severely limiting design factor has been the exhaust port timing. This timing, set by the height of the exhaust port, determines the nature of the engine's power characteristics. A low exhaust-port height provides good low-rpm power, but high-rpm performance suffers. Likewise, a relatively high exhaust port makes for the best high-rpm horsepower, but low-rpm power output is negligible. How can this inherent problem be resolved in a motocross engine, where good power is desirable at all engine speeds? Yamaha's brilliant answer is the Yamaha Power Valve System (YPVS).

The heart of YPVS is a valve located in the cylinder at the top of the exhaust port. The valve is shaped such that when rotated, it effectively raises and lowers the height of the port. A centrifugal governor mechanism controls the position of the valve. As the engine speeds up, the governor mechanism moves a rod-and-lever linkage that rotates the valve upward, out of the exhaust port; as engine speed decreases, the valve moves back down into the port. The system is entirely automatic, requiring no attention from the operator. Because of YPVS, good low-rpm torque and excellent high-rpm power is possible from the same engine. The engines that use YPVS this year, those in the YZ125 and the YZ250, also feature liquid-cooling. Hence, that beautiful power will be there from the first lap to the last, no matter how long a moto is. And an additional feature of YPVS is improved fuel economy because the combustion of the fuel mixture is more complete and efficient.

YEIS (Yamaha Energy Induction System)

This is also a kind of Yamaha-original fuel-saving engine system which has been developed to bring both better fuel economy and higher performance together especially over the low-to-medium speed range. In this system the intake passage has a special chamber to take in or let out the air so that the speed of intake stream is kept as constant as possible, thus holding fluctuations in negative pressure to a minimum. This eliminates a slump in torque, enabling the engine to reach the ultimate in performance over a wider range of speeds.

Its function is as follows:

This system utilizes a change in atmospheric pressure inside the intake passage to cause a change in atmospheric pressure in the chamber so that the intake stream is induced into or taken out of the chamber. Atmospheric pressure in the chamber drops lower than that in the intake passage while the intake valve is kept closed (Fig. 1). Then the intake stream is induced into the chamber through a throttle valve.

The intake valve opens to cause a negative pressure in the intake passage (Fig. 2) and the chamber lets the intake stream go. This intake stream joins the stream coming through the throttle valve and enters the cylinder.

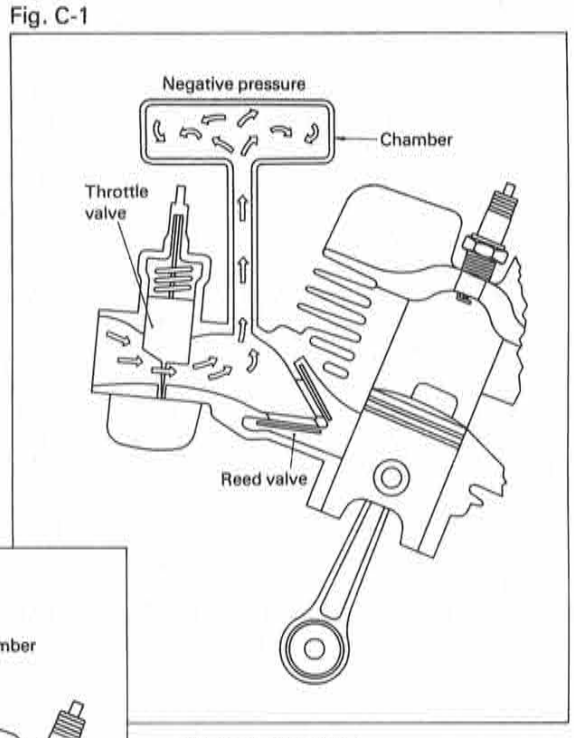
In short, the system functions to improve the intake efficiency, keeping as constant (flat) as possible the speed of the intake stream coming through the throttle valve and sucking fuel smoothly out of the carburetor so that the most efficient carburetor setting may be obtained for increased fuel economy.

Over what range of speeds is the maximum effect of this function obtained? This will be decided by the following factors:

* Chamber volume
* Diameter and length of a connecting pipe, etc.

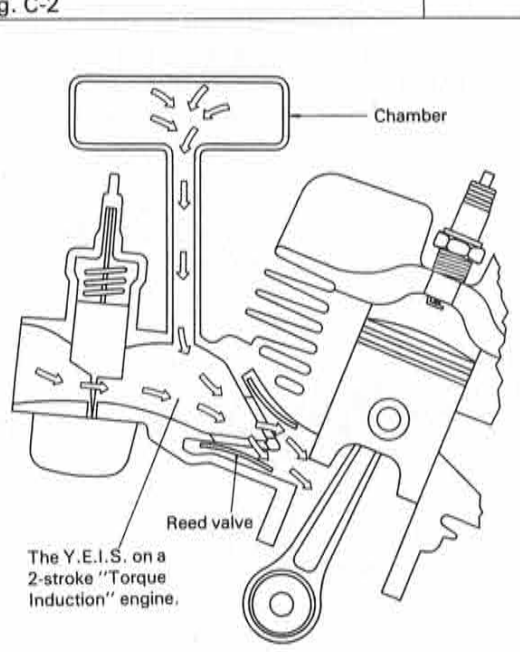
The new YZ80, the YZ100 and the YZ490 features the YEIS so that race performance is greatly increased.

Fig. C-1



YEIS: YZ490/100/80

Fig. C-2



The Y.E.I.S. on a 2-stroke "Torque Induction" engine.

YZ250

YZ100

YZ80

'82 NEW MODELS' TECHNICAL FEATURES

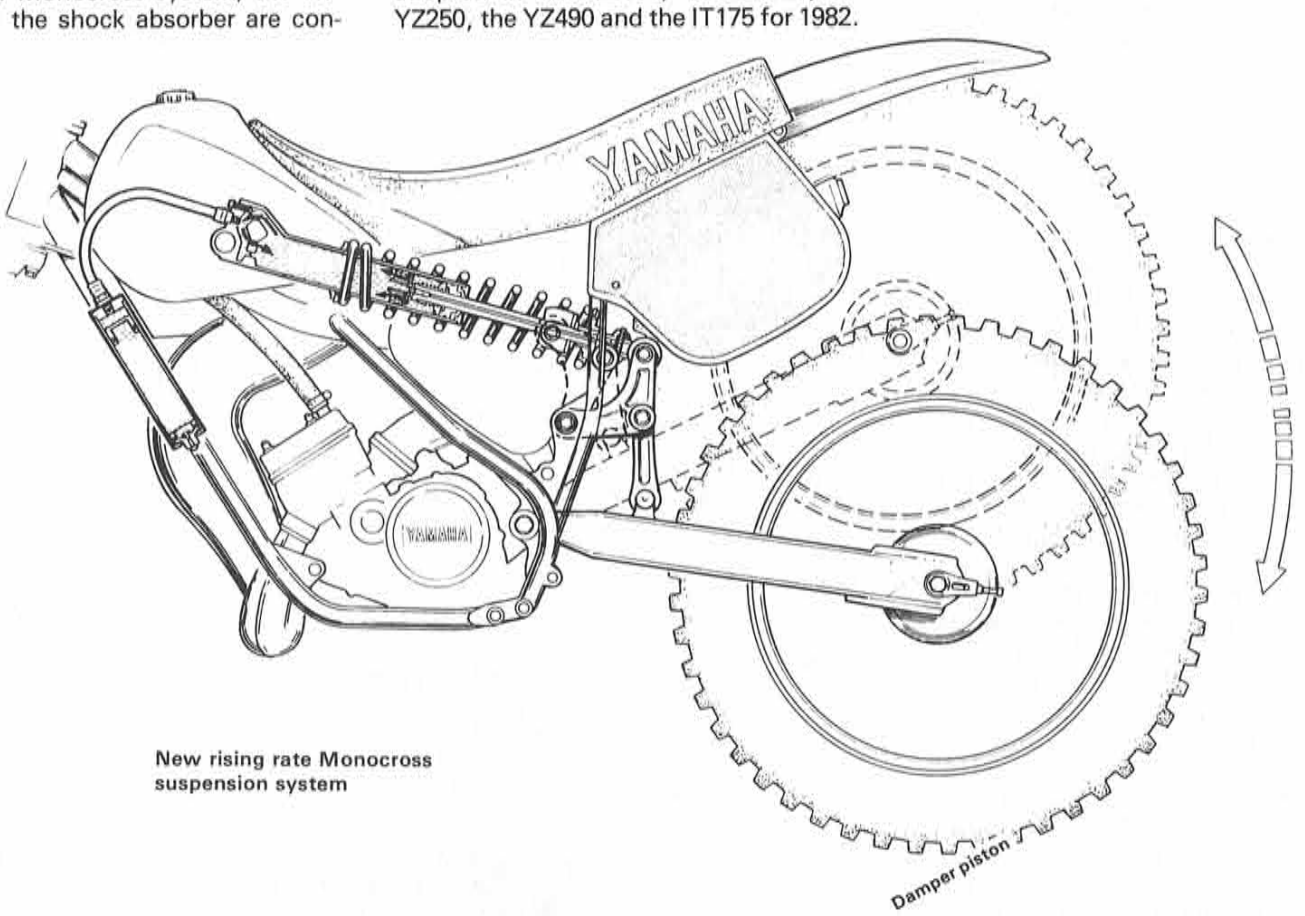
New Mono-Sus. YZ490/250/125/100 IT175

Yamaha is proud to reveal the greatest thing to happen to motocross rear suspension since Monocross was introduced in 1973: the new Monocross. Over the years, Monocross has steadily evolved to become more and more progressive. The configuration of the swingarm and associated frame parts were continually updated to provide softness and tractability at low speeds as well as resistance to bottoming off the tallest jumps. A true tapered-wire spring was developed for use on the Monocross. And once again, Yamaha leads the way in advanced suspension technology with this new compact, lightweight system featuring the purest rising-rate performance and the greatest adjustability ever. For 1982, the evolution of Monocross takes a great step forward.

On the new Monocross system, the swingarm and the shock absorber are connected by two arms. An I-shaped arm rises from the swingarm and joins an L-shaped arm which turns on a frame-mounted pivot. The L-shaped arm connects to the lower shock absorber mount. As the swingarm moves upward, the lever ratio of the swingarm on the shock absorber becomes increasingly smaller; that is, it becomes more and more difficult for the swingarm to compress the shock as the rear wheel travels farther upward. Hence, when the rear wheel encounters small bumps, the suspension is quite soft to provide a comfortable ride and excellent traction. When landing from jumps, however, the suspension superbly resists bottoming, helping to maintain control and traction.

The new Monocross suspension system that features the above advantages, is adopted in the YZ100, the YZ125, the YZ250, the YZ490 and the IT175 for 1982.

YZ490



New rising rate Monocross suspension system

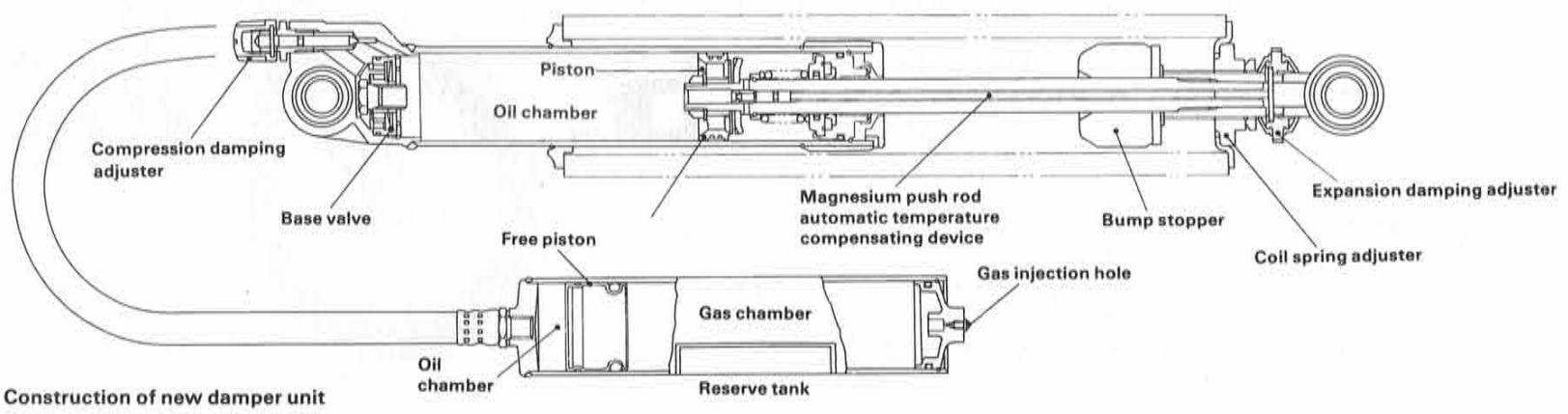
Separately adjustable expansion/compression damper unit

On a conventional type damper unit, when the expansion damping force is adjusted, the compression damping force is inevitably affected. The new damper unit on the rising rate Monocross suspension system has a special compression damping adjuster in addition to a conventional expansion damping adjuster.

The expansion damping adjustments are made as before, with a ring-type adjuster near the lower shock mount. The compression damping adjustment is made by turning a knob next to the steering head. Beneath the front part of the fuel tank. As before, the shock has a remote reservoir to keep damping performance consistent throughout the longest motos.

The new damper unit enables the rider to set the damping force so that it best fits the road surface condition.

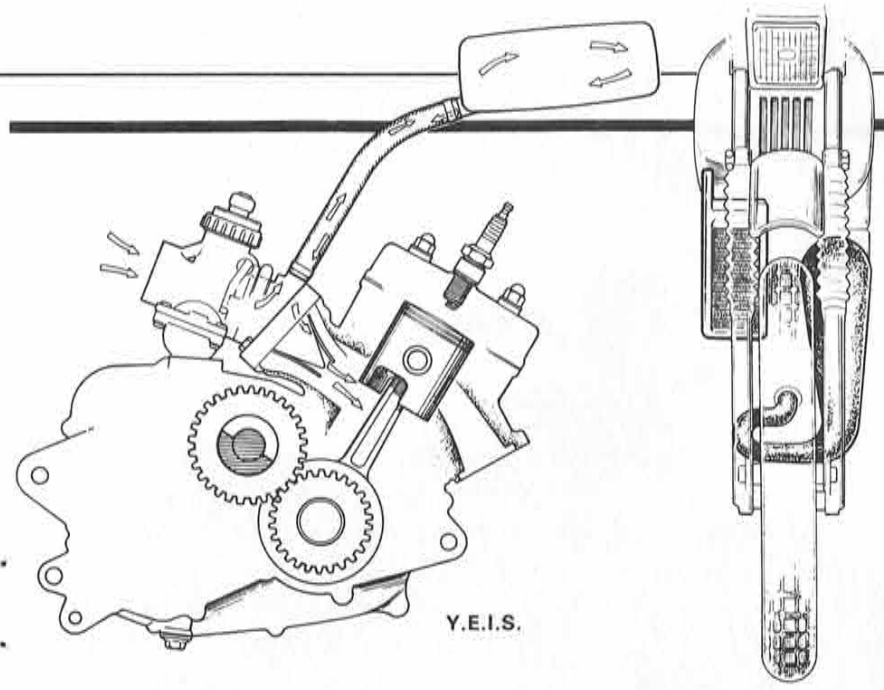
The new YZ125, YZ250 and YZ490 features this improved damper unit to increase their race performance.



Construction of new damper unit

IT175

YZ125



L/C YEIS DT125LC/RD80LC

DT125LC

The water-cooling system is a very effective means to help increase the performance of the engine. In order to reach an even higher level in the 2-stroke engine's performance, Yamaha has adopted a water-cooling system in the TZ production racer series. The Yamaha RD250LC and RD350LC have been developed around Yamaha's long proven water-cooled 2-stroke engine technology.
This technology has already been applied to the 4-stroke engine as well, giving birth to the high performance V-Twin. At the same time another advance has been made in the field of 2-stroke technology, in the form of a compact water-cooled single cylinder engine. Higher performance is inevitably accompanied by an increase in heat. The water-cooling system is an effective solution to this problem. The new water-cooling system has a compact, lightweight aluminum radiator together with a water pump for forced cooling so that the maximum of cooling efficiency can be obtained. The recovery tank which needs no water supply maintenance, has a water level check window for extra ease of maintenance. In addition, the system has a separate water temperature gauge. You know the temperature is correct, as long as the pointer stays within the green zone. The cooling water contains a long life coolant at a ratio of 5 : 5 so it can be used effectively even in cold places. The water-cooling system needs no cooling fins. This means a considerable reduction in total weight, which makes the advantage of this lightweight single cylinder engine even greater.

YEIS for better fuel economy and higher performance

The YEIS functions to keep the intake pulse from carburetor to engine as constant as possible and hold fluctuations in carburetion to a minimum so that both high performance and fuel economy are brought together.
This system makes up for any slump in torque especially over the low to medium speed range so that higher power output is developed smoothly over the high speed range. The YEIS, carburetor, ignition system and exhaust system are carefully set to give fuel economy that is much better than that of competitive models.

Single-shaft balancer to reduce vibration

Another significant improvement is a single-shaft balancer. The primary moment of inertia which is produced by 50% weight crank web equivalent to the reciprocating mass over the con-rod, is offset by the secondary moment produced by the 50% weight balancer rotating at the same speed as the crankshaft but in the inverse direction. The balancer is gear driven for higher reliability. On this 2-stroke engine, the balancer is installed above the transmission and it is driven by a drive gear on the right end of the crankshaft. All these improvements are adopted in the '82 DT125LC which features the slim, lightweight semi-double cradle tubular construction and the Monocross suspension system.
The RD80LC also has this system.

4-st. Single With Balancer XT200/125

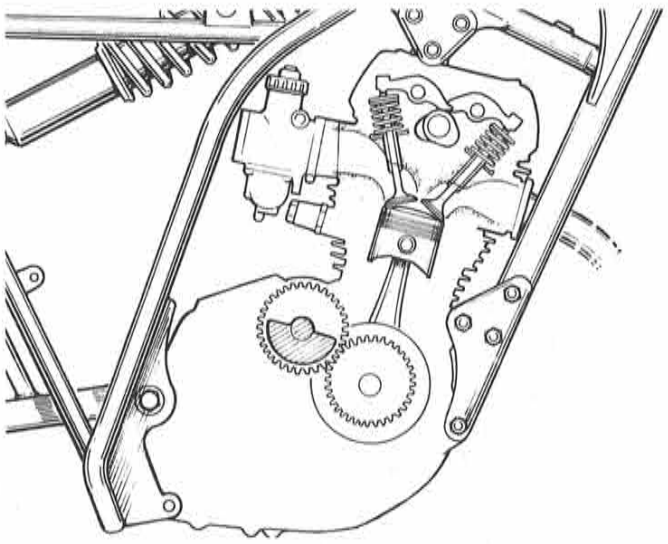
The new 4-stroke SOHC single cylinder engine features a compact, lightweight construction incorporating a newly designed balancer mechanism. It has plenty of torque for the smoother development of power especially over the medium speed range while it ensures ease of handling as well as outstanding fuel economy and increased riding comfort.
The basic design is the same as that of the already popular SR250 and XT250. The SOHC system is chain driven and the Yamaha original dual dome type combustion chamber makes full use of the squash area so that plenty of torque is developed. The better heat dissipating alumi. alloy cylinderhead is built as one piece with the head cover, giving the engine a slim, compact design.

Single-shaft balancer for lower vibration

Greater torque fluctuations are inherent in the construction of a 4-stroke single cylinder engine. This causes more vibration especially over the high speed range.
Yamaha's new 4-stroke single cylinder engine incorporates a special balancer mechanism to offset the imbalance in the engine's reciprocating mass so that vibration is decreased and riding comfort is increased over the entire speed range. This balancer mechanism features a single shaft design which is gear driven from the crankshaft. Its construction is very simple and needs virtually no maintenance.
The balancer works to offset the inertia moment of the engine's reciprocating mass, that is, the weight equivalent to the engine's reciprocating mass is equaly shared by the crank web and the balancer which rotate at the same speed but in opposite directions. This method effectively offsets the inertia moment to hold vibration to a minimum.
The new engine is adopted in the '82 XT125 and the XT200, so that now the application of a 4-stroke single cylinder design has expanded to include the lightweight class.

XT200

XT125



'82 NEW MODELS' TECHNICAL FEATURES

CYCOM

XV920 VIRAGO
XJ1100 MAXIM
XJ750 MAXIM/650T

Cycom System

XV920 VIRAGO

XJ750 MAXIM

Last year Yamaha introduced the motorcycle world to computer technology with the Seca 750's Computerized Monitor System. It was so well received that the system appears on several models this year. Yamaha has long realized that the very essence of motorcycling is the feeling of unity between man and machine, the sensation of the two entities becoming one; this sensation is enhanced through better communication between motorcycle and rider. This year, Yamaha takes yet another step forward in communication technology with the unveiling of the world's first electronic, full-sized, liquid crystal display speedometer and tachometer.

The speedometer provides a digital readout of the machine's speed in miles per hour or, at the push of a button, kilometers per hour. A cable delivers the raw information to the meter, and an electronic circuit converts that information to the appropriate digits on the LCD panel. The figure indicated on the panel is much more quickly and easily read than that of a conventional, pointer-type speedometer.

The tachometer has a dial configuration much like that of a conventional meter, with numbers around its face to indicate engine speed. But as the engine is started and its speed increases, the face of the tach begins to fill with LCD graphics; each graphic represents 250-rpm increments. The tach responds instantly and accurately, precisely marking the speed of the powerplant. At idle, a button can be pushed to convert the 10,000 rpm scale to a 2,000-rpm scale. Each graphic then represents 50 rpm, allowing for exact idle setting.

The speedometer and tachometer are mounted in a panel with the Computerized Monitor System. Hence, from one source the rider can check his engine speed, road speed, sidestand status, brake fluid level, engine oil level, battery fluid level, headlight, taillight, and brakelight condition, and fuel level. The self-checking function of the monitor is extended to the meters. If the check button is held down through the cycling of the monitored areas, the speedometer then begins to display figures from 0 to full scale, and the tach displays its graphics from 0 to full scale. The entire system thereby ensures the rider that it is working properly.

This ultra-modern system is adopted in the '82 XV920 VIRAGO, XJ750 MAXIM and XJ1100 MAXIM. The system is a distinctive break-through innovation for the future. It is an example of Yamaha's advanced electronic technology which has been developed by taking every conceivable riding condition into consideration. It is designed to work well even at extremely low temperatures from − 30°C to 60°C. It will maintain its adequate function for five years or longer. The cover is made of nonreflective glass to allow for easy riding even under direct rays of the sun. With this system, Yamaha will lead the world's motorcycle industry into the nineteen-eighties!

DRIVE COMPUTER

In addition to the above-mentioned Computerized Monitor System and digital readout system, Yamaha announces another big step in its unique CYCOM technology — world's first drive computer system for motorcycles. This system will also help to enhance the feeling of unity between man and machine. Yamaha's CYCOM technology will continue to extend the range of application for motorcycles.

The system provides 10 different functions as follows:

1. Clock: Function is continued as long as the battery is connected.
2. Tripmeter (distance traveled): This meter continues to record your Punch in your projected trip distance before you start and this meter counts down the remaining distance. At a touch it tells you how far you are from your destination.
4. Remaining fuel: Take a reading to find out how much fuel remains in your tank. Remaining fuel is shown in 0.5 lit. units.
5. Instantaneous mileage reading: This display instantly tells you your fuel consumption per hour at a given speed.
6. Distance that can be covered with remaining fuel: This display calculates the distance you can travel based on your remaining fuel and running speed at the time of reading.
7. Total running time: This display tells you how long you have been running, including standing time with the ignition key in the "On" position.
8. Average running speed: This reading is calculated from the distance on your tripmeter divided by the total running time.
9. Fuel consumption: Consumption is shown in 0.5 liter units from last full tank.
10. Average mileage: This display calculates your average mileage from the distance on your tripmeter and the fuel consumption reading.

In order to take advantage of all ten of these functions, all you have to do is fill up your tank at the beginning of a trip and reset the measurement on "0", then punch in the projected distance you will be covering on your trip.

As you are riding you can take any reading you want by use of a switch on the right handlegrip, so you never have to take your hands from the handlegrips. The system is arranged as pictured. All displays are liquid crystal type. The clock incorporates the Yamaha original Y.NIC oscilator which has been developed with the special needs of a motorcycle in mind, such as the range of operating temperatures. The Y.NIC is less affected by temperature than quartz crystal, so you always get an accurate reading. The drive computer system aroused a big, sensation when it was exhibited during the '81 Tokyo Motor Show.

**The non-reflecting meter panel is completely sealed.
The Drive Computer now shows the time (9 : 40).
Ten different kinds of information are displayed here.
Arranged above it is the Computerized Monitor System.**

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