HONDA Come ride with us.

VFR

DUAL Evolution

PGM-FI & CBS

PGM-FUEL INJECTION & DUAL COMBINED BRAKE SYSTEM

VFR - 981 - E

Introduction

First introduced in 1986, Honda's ever-popular VFR750F has regularly been hailed as one of the finest all-round motorcycles in the 750cm³ class—or most any other class for that matter. Unlike many other single-purpose sports bikes, the VFR750F succeeded in bringing together a combination of smooth and strong performance, quick and confident handling, peerless comfort in almost any riding situation, and superb quality of execution that has won it singular praise in motorcycle publications the world over—and a dedicated following of riders who will settle for nothing less.

Almost unique in its Super Sport touring orientation, the VFR750F has always sidestepped the 'hard-core,' performance-first image of the racer-replica superbikes (and their accompanying discomforts) for a more mature, rider-focused approach to the joys of Super Sport motorcycling. A sporty machine with all-round appeal, the VFR750F has found wide acceptance from a broad cross-section of riders who appreciate not only top performance, but also the effortless handling and long-term comfort that it has consistently offered.

In 1990, the VFR750F was fitted with a more compact engine and an eye-catching cast aluminium Pro-Arm single-sided swingarm, which gave it a distinctively high-tech look while offering precise handling and the added benefit of easier rear wheel maintenance. 1994 saw the VFR completely re-dressed in striking new aerodynamic bodywork that took many of its styling cues from Honda's remarkable NR to more strongly emphasize the VFR750F's sporty character.

Introduction

Unchanged since then, the VFR750F has gradually come to be regarded as a bit conservative, and while its overall performance has always been strong, its image has lost a bit of its high-tech appeal as other new machines have come to the fore. Thus, ‘VFR’ fans have been patiently waiting for a radical change in both design and performance that would still maintain the ‘user-friendly’ nature for which the VFR750F has become well-known and loved.

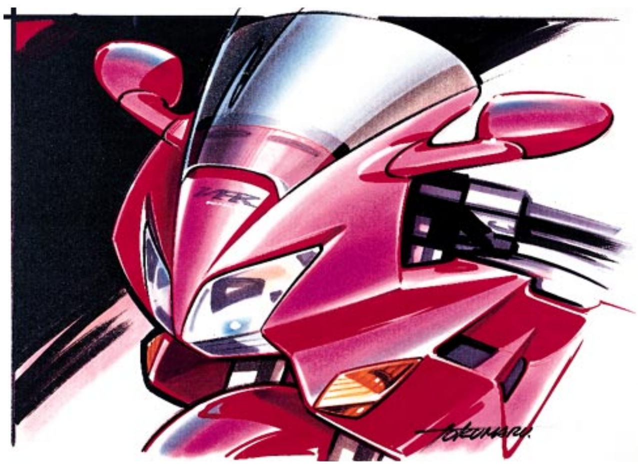
Now, for 1998, that long-awaited change has finally come. The VFR blasts back into the limelight driven by the same dynamic, high-tech fuel-injected engine powering Honda’s RVF Superbike racers to victory around the world. Featuring a lightweight and rigid new ‘pivotless’ frame similar to that first introduced on Honda’s new VTR1000F Firestorm, the VFR’s aggressive, high-tech new look provides an unmistakable forewarning of exhilarating rides to come. With these and other exciting new features, this new-generation VFR is a rolling show-case of Honda’s finest motorcycle technology and as such is certain to re-establish itself as the standard of comparison in its class for years to come.

Styling Concept

With the aggressive look of its new dual multi-reflector headlight staring forward in a look of aggressive determination, the VFR's sleekly aerodynamic new bodywork gives dramatic emphasis to its well-established image of speed and unsurpassed quality.

Advanced Air Management Design

Featuring approximately the same frontal area as the current design, but with a significantly reduced coefficient of drag and superior wind protection for both rider and pillion passenger, the fairing's front cowl incorporates a large central air vent that directs air under the windscreen to raise the height of the air stream hitting the rider at higher speeds.



Styling Concept

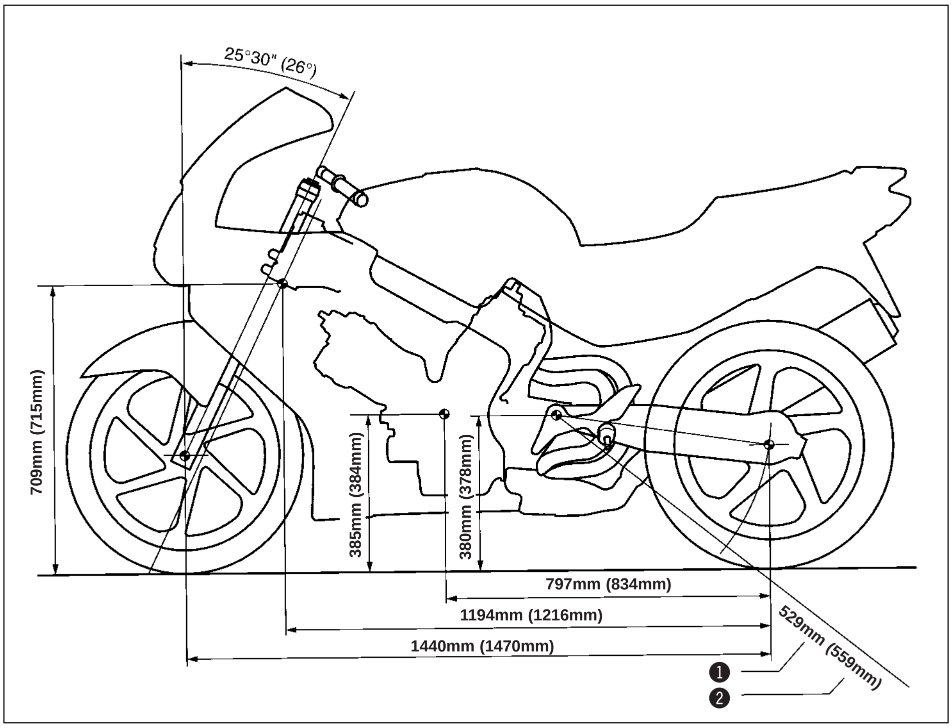
The fairing's new design maintains the VFR's same highly praised riding position in the location of its seat, handlebar and foot pegs, while the fuel tank's knee grips and step area were made slimmer for enhanced wind protection and greater comfort. The front indicators were also integrated into the overall design and are located at either side of the base of the headlight. The VFR's new, larger front fender is modeled after the aerodynamic units currently used on the CBR1100XX Super Blackbird and the CBR600F. Its longer nose and deeper valances combine to contribute greatly reduced air resistance for lighter, more responsive high-speed handling in tune with the VFR's uniquely versatile character.

Dimension Comparison

❶ *New VFR*

❷ *Current Model*

Dimension Comparison

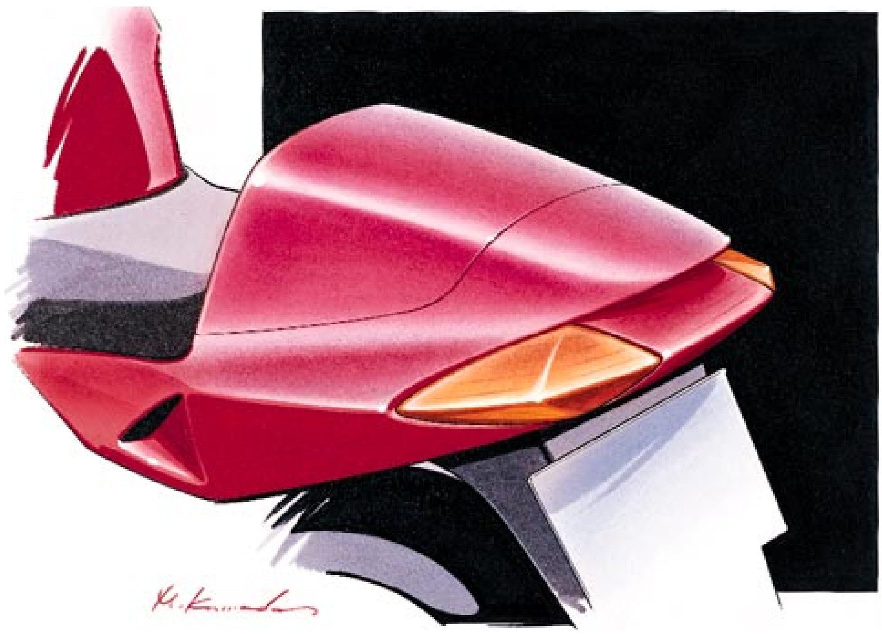


Styling Concept

In an innovative system first introduced on the VTR1000F, the full fairing's side panels feature large vents that were specially designed to pull air through the VFR's all-new side-mounted twin radiators. This design maximizes cooling efficiency by taking advantage of the large difference in air pressure between the higher-pressure fairing cavity and much lower-pressure outer fairing surface.

The VFR's large-volume fuel tank features a smoothly curved design with indents for the knees ensuring optimum riding comfort and positioning ease under most riding conditions; qualities that have enjoyed a long tradition in the design of the VFR. The rear seat cowl features a sleek, almost shark-like line terminating in a wide, uniquely designed taillight lens that cleanly integrates the turn indicators into its attractively modern form. The VFR's detachable rear seat cowl projects an aggressive 'solo machine' look that conceals a broad, comfortable perch for pillion passengers.

Bolt-on rear hand grips feature a dual-injection nylon composition that provides a comfortable hand hold for pillion passengers.



Colouring Concept

The new VFR's three colour variations give unmistakable expression to its long-held image of dynamic power and performance while emphasizing its bodywork's impressive look of speed and unequalled balance of sports riding enjoyment.

- A bright, solid red grabs attention with a heart-pumping look of excitement that provides a perfect match for the VFR's renowned Super Sports image.

- In black, the new VFR projects an imposing look of power and performance.

- Finally, a deep, high-tech metallic silver accentuates the fairing's curves with the subtle play of light and shadow, projecting an image of blistering performance and incomparable quality.

All three solid colour variations provide maximum visual impact with few graphics to detract from the bodywork's simple, attractive form.

Colours

- Italian Red
- Mute Black Metallic
- Sparkling Silver Metallic

Engine

The engine powering the all-new VFR is essentially the same 90° V4 engine introduced in the RC45/RVF in 1994 and used successfully in Superbike racing the world over. Emphasizing major reductions in size, weight and friction, this new larger bore and longer stroke 781cm³ engine delivers a large boost in torque and an increase in top speed over the current model that ensures greater flexibility in most riding situations.

The new engine's side-mounted gear-driven valvetrain makes possible closer cylinder spacing and eliminates one crankshaft journal for more compact overall dimensions and significant reductions in weight and internal friction. Spring-loaded split gears within the compact gear train also help reduce mechanical noise.

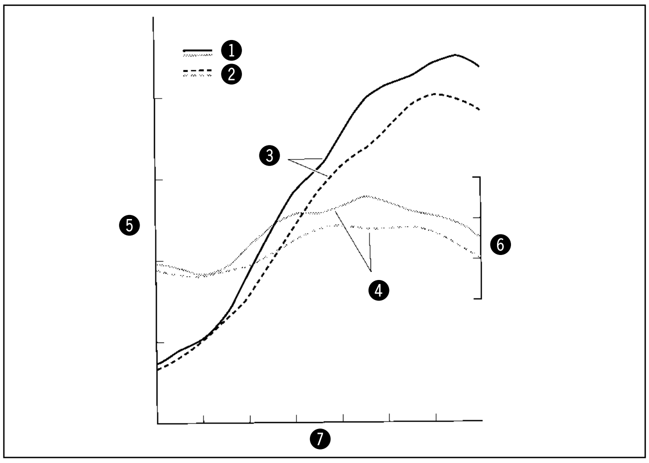
Engine Performance Comparison

❶ *New VFR*
❷ *Current model*
❸ *Power Curve*
❹ *Torque Curve*
❺ *Power Output (kW)*
❻ *Torque (Nm)*
❼ *Engine Speed (rpm x 1,000)*

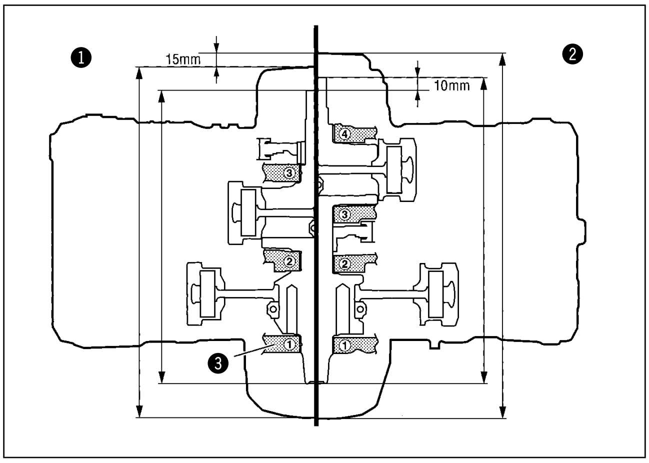
Engine Width Comparison (showing crankshaft journals)

❶ *New VFR*
❷ *Current Model*
❸ *Journal*

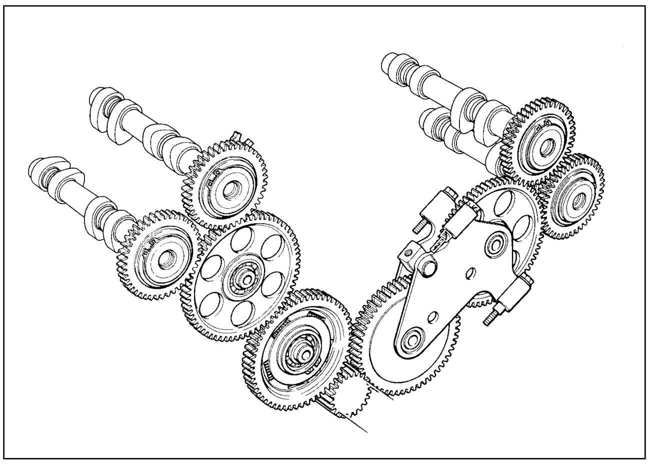
Engine Performance Comparison



Engine Width Comparison



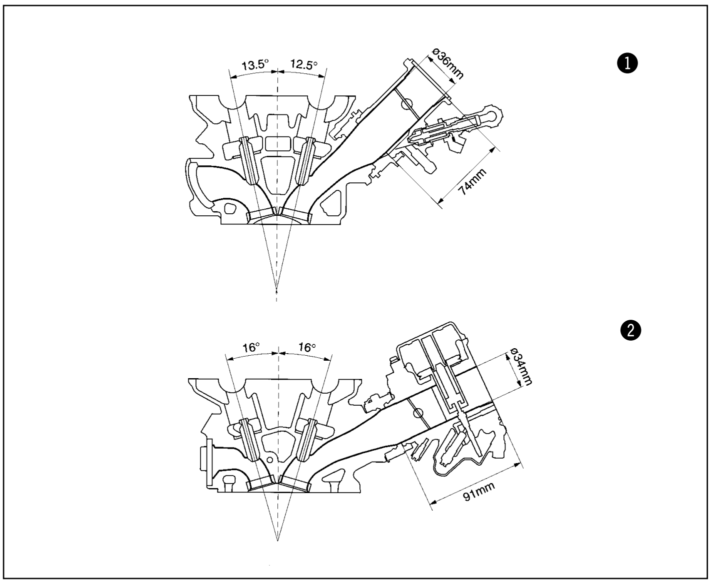
Cam Gear Train



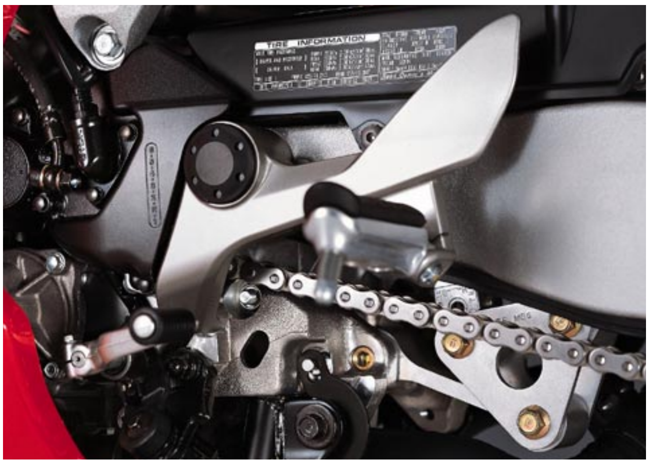
Besides its larger displacement, another major difference from the engine powering the RC45 is the VFR's longer-stroke 180° crank-shaft, which was specially designed to offer a smoother, wider range of performance in order to provide a more VFR-like feeling of torquey acceleration for everything from Super Sport to touring riding.

A large-volume aircleaner, smooth, straight, short-throw downdraft intake ports, steeper 26° valve angles and the latest in map-type digitally programmed ignitions all contribute to the new engine's exceptional power potential. The VFR's strong, light-action hydraulic clutch uses eight 125mm friction plates for a wider, more effective surface area to stand up to the V4 engine's enormous torque. This feeds through a reworked, smoother- shift-ing six-speed transmission. Since the new engine was intended to be incorporated as the central stressed member of the VFR's all-new 'pivotless' frame, its castings were designed for extra strength around their various attachment points, especially at the rear where the crankcase provides a direct mount for the swingarm. Another casting attached to the rear of the lower case provides a solid mount for the VFR's footpeg gear, side and centre stands, and the pivot arm for the suspension's progressive Delta-Link, all of which would normally be attached to the lower portion of the frame in a conventional design.

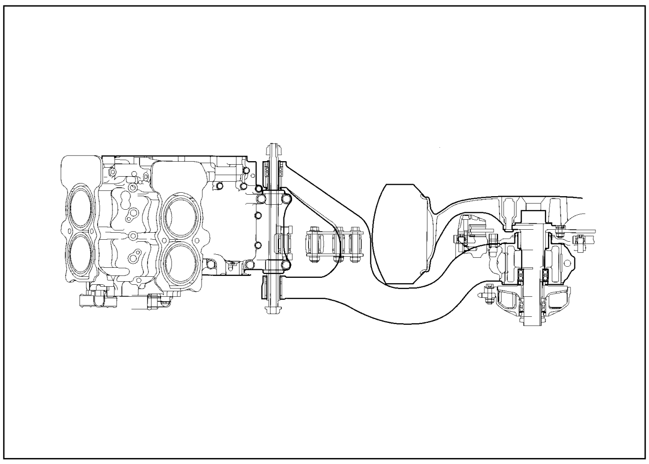
Cylinder Head Comparison



Cylinder Head Comparison (Cross-Section)
❶ *New VFR*
❷ *Current Model*



Swingarm Assembly Cross-Section



New Metal Composite Cylinder Sleeves

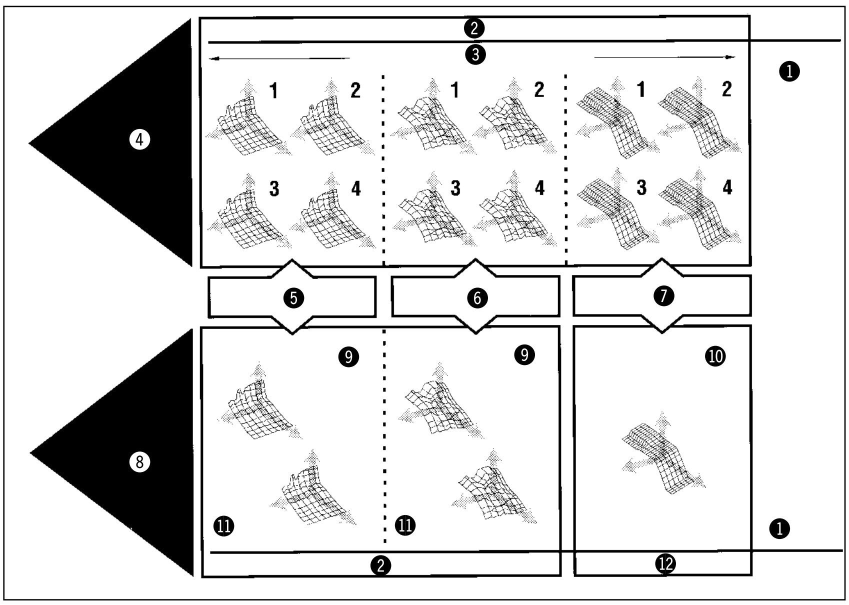
The VFR's engine also features new metal composite cylinder sleeves like those used in the RVF/RC45 that are at least 2kg lighter than their steel counterparts. Formed of sintered aluminium powder impregnated with ceramic and graphite, these advanced sleeves also offer exceptional durability, while transmitting heat more effectively than conventional steel sleeves. The three-ring pistons themselves feature a 'slipper' design that minimizes sidewall surface area contact for reduced frictional losses, and a new LUB-Coat solid lubricant coating that minimizes the potential for piston and sleeve surface scorching, while further cutting down on power-robbing friction.

Computer-Controlled Programmed Fuel Injection (PGM-FI)

The VFR's computer-controlled Programmed Fuel Injection (PGM-FI) system is based on the system developed, like its engine, for Honda's RC45 Superbike racer.

Featuring a simplified design that uses fewer parts, this new system provides ultra-precise fuel metering for optimal performance over a wide range of operating conditions and the lowest possible emissions. The four injector throttle bodies feature large 36mm bores to ensure optimal airflow.

PGM-FI Fuel Injection System Comparison



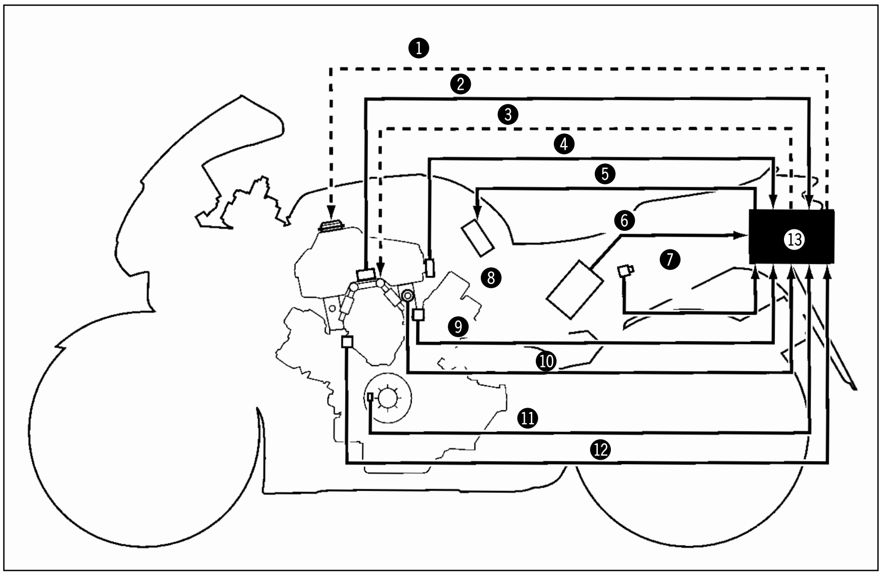
PGM-FI Fuel Injection System Comparison

❶ *Component*
❷ *Electronic Control Unit*
❸ *Independent Cylinder Mapping*
❹ *New VFR*
❺ *Intake Pressure Map*
❻ *Throttle Position Map*
❼ *Ignition Timing Map*
❽ *RVF (RC45)*
❾ *Front Cylinders*
❿ *All Cylinders*
⓫ *Rear Cylinders*
⓬ *Igniter*

The system's Electronic Control Unit (ECU) is also integrated with the VFR's new map-type electronic ignition into a single compact unit, and even the ACG output was increased from 364W to 463W to ensure strong, reliable operation.

The intake system's large-volume aircleaner features a newly developed dual air intake duct that optimizes the flow of air into the aircleaner by using a solenoid to keep one of the ducts closed during low-speed operation and only opening it as speeds—and the need for larger volumes of air—increase. An electronic fuel pump is built into the large, 21-litre fuel tank to ensure a steady flow of fuel to the injectors.

PGM-FI System



PGM-FI System

❶ *Air intake duct control*
❷ *Intake air temperature sensor*
❸ *Injection control*
❹ *Intake manifold pressure sensor*
❺ *Fuel pump control*
❻ *12V power supply*
❼ *Barometric pressure sensor*
❽ *Battery*
❾ *Camshaft pulsar*
❿ *Throttle Sensor*
⓫ *Crankshaft pulsar*
⓬ *Coolant temperature sensor*
⓭ *ECU*

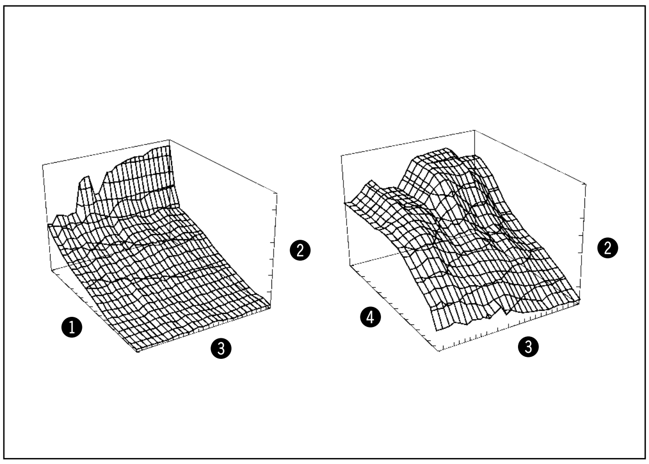
PGM-FI Fuel Injection Programming Maps

❶ *Intake Manifold Pressure*
❷ *Injection Interval*
❸ *Engine Speed (rpm)*
❹ *Throttle Position*

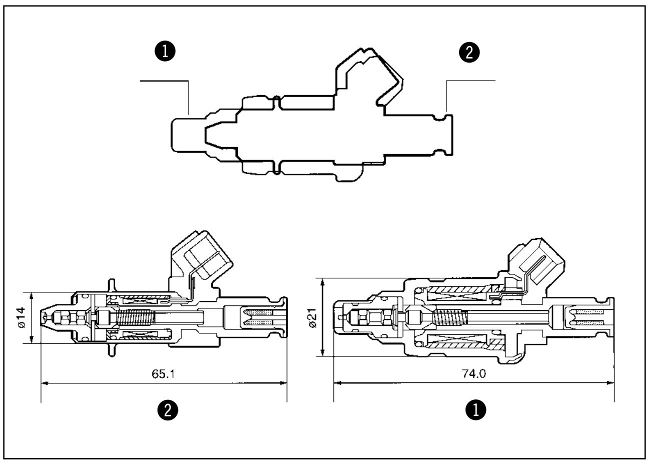
Fuel Injector Comparison

❶ *RC45*
❷ *New VFR*

PGM-FI Fuel Injection Programming Maps



Fuel Injector Comparison

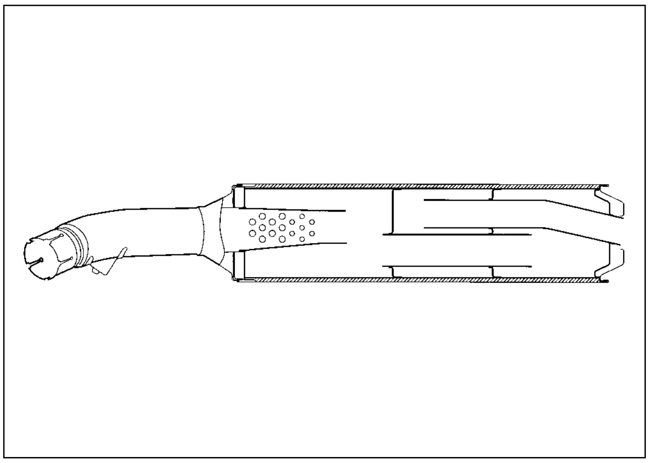


Low-Emissions Air Injection System
Similar in concept to systems recently introduced in several Honda on-road machines, the VFR features a new solenoid-controlled air injection system that shoots a stream of fresh air into each exhaust port during its exhaust stroke to extend the combustion of unburned gases into the exhaust port for more complete combustion and reduced exhaust emissions.

These cleaner burning exhaust gases empty into a 4-into-2-into-1 exhaust system that terminates in a large 6.5-litre stainless steel canister-style silencer like the two mounted on the CBR1100XX Super Blackbird.

This system is further expanded upon in the low-emissions version of the VFR, which features an innovative new Honda Evolutional Catalyzing System (HECS3) that was specially developed for release in Germany and Switzerland (refer to attached article).

Exhaust Silencer Cross-Section



High-Efficiency Dual Radiator Cooling System

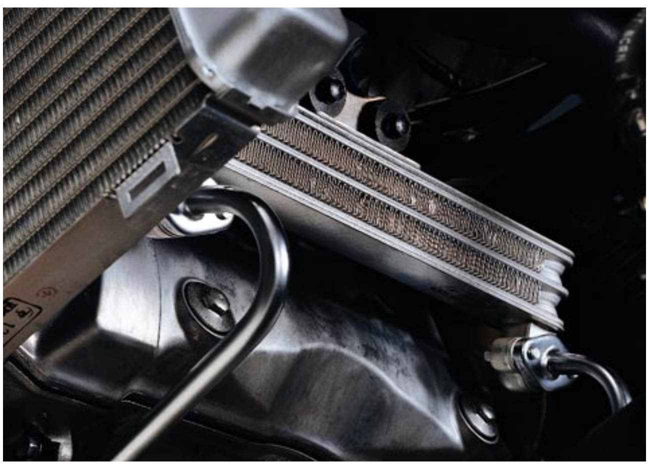
One of the VFR's most interesting new features is its new dual-radiator cooling system. Turning away from the conventional single radiator that has till now been mounted behind the front wheel, the new VFR features two radiators mounted on either side of the front of the engine, much like the system introduced on this year's VTR1000F. This new positioning offers several unique design advantages. First, the area behind the front wheel is freed of a major obstruction in air flow, permitting a steady stream of cooling air to better reach the front and rear cylinder banks and the exhaust system. The same lack of a space-consuming radiator here also provides more freedom in determining the best placement of the more compact engine and the optimal wheelbase length, since the front wheel can now be positioned closer to the engine. Likewise, front cylinder maintenance is also made infinitely easier.

The designs of the fairing's side cowls also play an integral part in the air flow through the radiators and their subsequent cooling capacity. At speed, the air flowing across the fairing's large radiator ports creates low pressure zones that literally pull air through the radiators from the higher pressure cavity behind the front wheel.

To illustrate the effectiveness of this design, removing the cowls would cause air of the same relative pressure to rush over both surfaces of the radiator cores rather than through them, resulting in a drastic reduction in their cooling capability.

A large, thermostat-activated fan is mounted on the inside surface of the left-side radiator to ensure that the radiator is able to do its job if engine temperatures should ever rise at low operating speeds, such as those experienced in stop-and-go city traffic. In such cases, the fan automatically switches on to pull cool air directly in from the side and into the fairing cavity, away from the rider.

Further ensuring optimal cooling efficiency, the VFR also features a compact oil cooler mounted under the steering head, where its positioning immediately above and behind the front wheel permits it to catch a direct, unimpeded blast of cooling air.



New 'Pivotless' Twin-Spar Frame

Following in the development path pioneered by the VTR1000F, the new VFR features an all-new 'pivotless' frame that achieves the ultimate in simplicity, strength and light weight by eliminating a fundamental area of stress and weight in conventional frame designs: the swingarm pivot plates. Rather than being mounted to these plates in a conventional frame configuration, the swingarm is mounted directly to the new, specially designed pivot castings at the back of the engine cases. By eliminating the need for the frame's pivot plates and conventional downtubes, the new frame achieves a weight loss of fully 3.5kg compared to the already lightweight frame used in the current VFR750F, yet it maintains the same high degree of strength and rigidity.

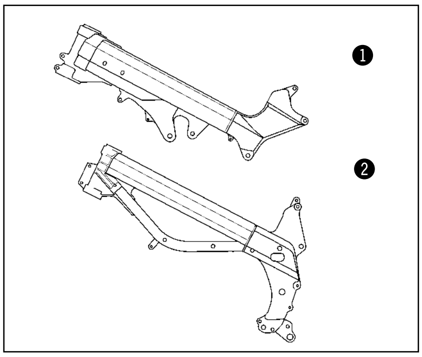
This ultra-lightweight new 'pivotless' frame is constructed of massive triple-box-section aluminium spars with welded-on cast engine hanger plates that anchor the cast steering head directly to the engine. At the rear, they merge into a large central casting that surrounds the rear cylinder head and provides a solid mount for the top-end of the rear damper and the bolt-on seat rail. Up front, the steering head's caster angle combines with the enhanced engine positioning made possible by the new side-mounted radiators to provide a shorter wheelbase for lighter, sportier handling and excellent straight-line stability.

Frame Configuration
❶ *New VFR*
❷ *Current Model*

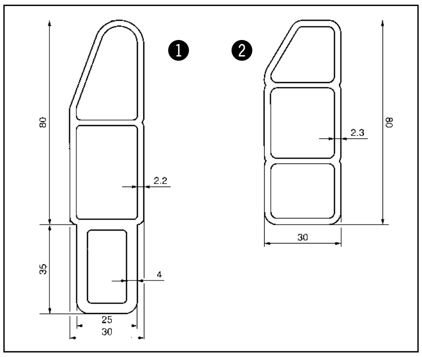
Frame Spar Cross-Section Comparison
❶ *New VFR*
❷ *Current Model*

Rear Suspension Mounting Bracket
❶ *Delta-Link*
❷ *Sidestand*
❸ *Anchor arm*
❹ *Centrestand*

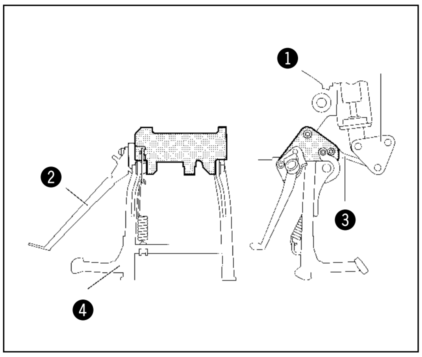
Frame Configuration

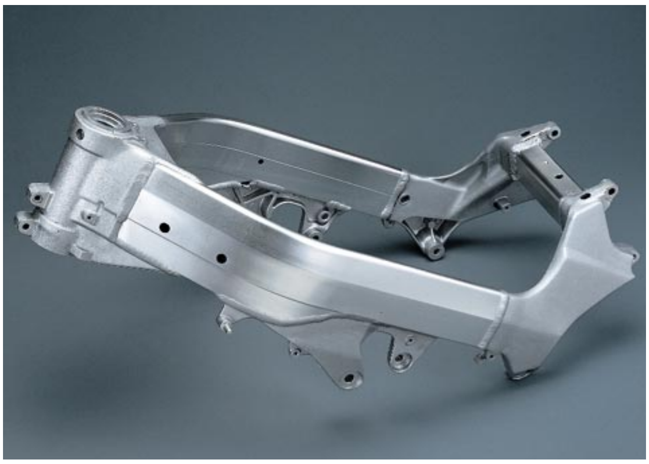


Frame Spar Cross-Section Comparison



Rear Suspension Mounting Bracket

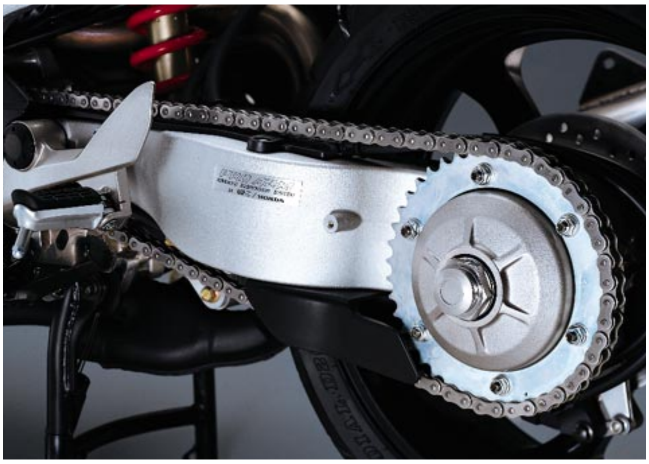




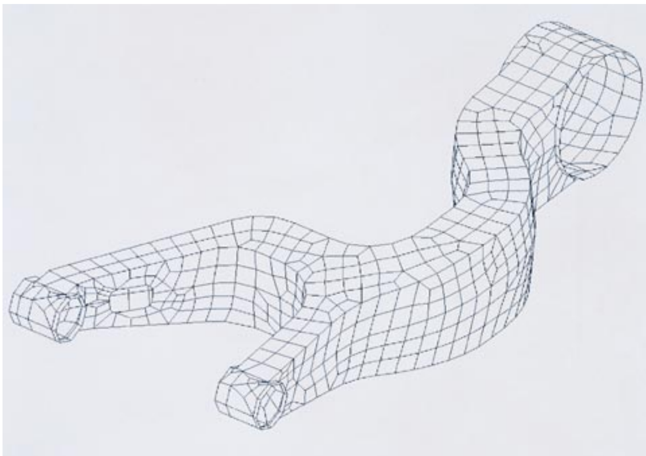
Crankcase-Mounted Pro-Arm; Advanced Delta-Link Rear Suspension

The central point of focus for the VFR's rear suspension and one highlight that consistently stands out from other motorcycles is without a doubt its large yet lightweight single-sided cast aluminium Pro-Arm swingarm. Rigid and reliable, it provides a solid mount for the rear sprocket and disc brake assembly while permitting remarkably fast rear wheel changes by way of four easy to remove bolts. Since the new VFR's Pro-Arm is now mounted directly to the rear of the engine, its enhanced lateral rigidity and isolation from the frame virtually eliminates the rear wheel's torsional stress on the frame and its effects on handling.

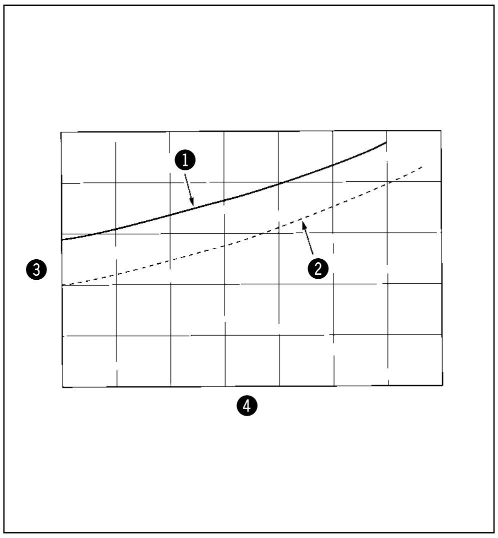
The swingarm's proven Pro-Link suspension system provides 120mm of progressive axle travel and is supported by a 40mm H.M.A.S. damper that offers adjustable spring preload and rebound damping. The system's Delta-Link is anchored, by way of an extension arm, directly to the cast aluminium bracket mounted on the rear of the lower engine case.



Pro-Arm



Ratio Curve



Ratio Curve

1 *New VFR*
2 *Current Model*
3 *Ratio*
4 *Axle Stroke*

H.M.A.S. Cartridge-Type Front Fork

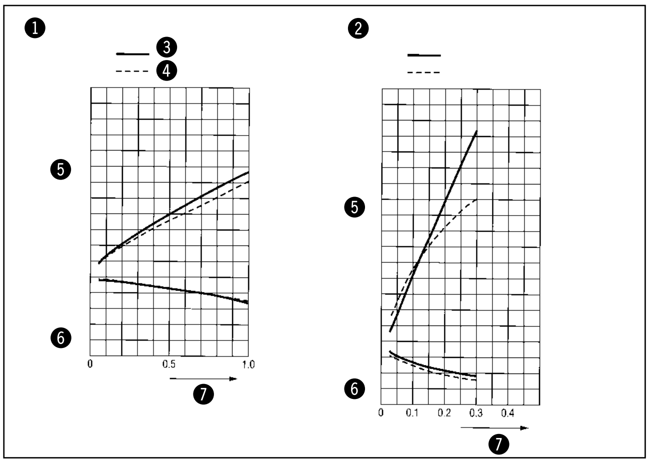
The VFR's rigid and responsive 41mm cartridge-type front fork features Honda's H.M.A.S. design for a confident balance of precise handling and compliant damping. Gripped at the top by aluminium clip-on handlebars and an elegant cast aluminium upper triple-clamp, these forks offer stepless spring preload adjustment and 120mm of smooth, progressive operation.

Lightweight Wheels; Radial Tyres

The VFR rolls on lightweight, U-section cast aluminium wheels that project a modern image of strength and speed. The prominent side-mounted 5-spoke rear wheel features a sharp, new angular, high-tech design and a wider 5.5" rim to mount a wider body radial tyre. Its smaller, lighter damper inserts reliably absorb the shocks of sudden acceleration and downshifts.

Designed especially for high speeds coupled with responsive handling, the new VFR mounts a set of high-performance wide-profile radial tyres.

Suspension Damping Characteristics Comparison



Suspension Damping Characteristics Comparison

❶ *Front*
❷ *Rear*
❸ *New VFR*
❹ *Current Model*
❺ *Rebound*
❻ *Compression*
❼ *Velocity*

Dual Combined Brake System

First introduced on the 1993 CBR1000F and having undergone several stages of development on the 1996 ST1100 Pan-European CBS-ABS with TCS and this year's CBR1100XX Super Blackbird, Honda's innovative Dual Combined Brake System (Dual CBS) simultaneously engages both front and rear brakes when either the front brake lever or rear brake pedal is used. Although incorporating many of the same components as the system used on the CBR1100XX, this latest evolution of the Dual CBS was further refined and tuned for a superb balance of Super Sport braking characteristics and a more 'combined' feel that will appeal to a wide range of riders. Foot brake settings have also been fine-tuned to offer a more conventional feel of braking control that combines strong and stable stopping power and smooth, sporty cornering performance.

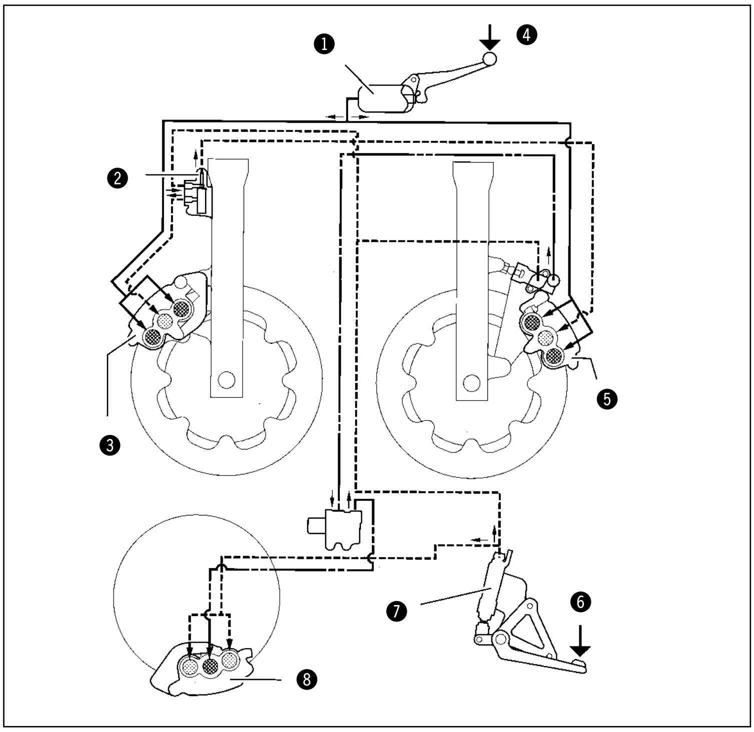
Compact Three-Piston Calipers
Like the system used on the CBR1100XX, the VFR's CBS features a set of three compact three-piston calipers controlled by two independent hydraulic systems. Differing slightly from the CBR is the arrangement of brake piston actuation. On the new VFR, the two outer pistons of the front calipers are controlled directly by the hand brake lever, and the centre piston of the rear caliper is controlled by the secondary master cylinder mounted on the left front fork bottom case. The outer pistons of the rear brake caliper and the centre pistons of the front calipers are directly operated by the foot brake pedal.

Brake Force-Actuated Servomechanism
Much like the simplified system featured on the CBR1100XX, when the front brake is engaged, the CBS's servomechanism uses the rotational torque exerted on the front calipers to pull the left-side caliper's torque arm bracket forward to directly actuate the secondary master cylinder.

Entirely new to the VFR's system, however, is that the secondary master cylinder is now an integral part of the torque arm casting, with its piston attached directly to a mount built into the left fork bottom case. The forward movement of the torque arm causes the secondary master cylinder to apply a corresponding amount of pressure to the centre piston of the rear brake caliper.
An inline proportional control valve (PCV) regulates this brake pressure in three stages of operation to ensure smoothly controlled response. Depending on which brake lever is engaged, this system delivers a wide, easily controlled range of braking force while offering the same front brake lever feel as a conventional brake system, yet with a more progressive range of rear brake control for an enhanced balance of braking capability. Because the two hydraulic systems are independent, any combiation of the foot pedal and the hand lever can be used without resulting in excessive braking force or other unusual responses.

New Compact Dual Combined Brake System
❶ *Hand brake master cylinder*
❷ *Delay valve*
❸ *Right front caliper*
❹ *Lever actuation*
❺ *Left front caliper*
❻ *Pedal actuation*
❼ *Foot brake master cylinder*
❽ *Rear caliper*

New Compact Dual Combined Brake System



Delay Valve for Smoother Operation

The system's integral delay valve smoothes front brake engagement to minimize front-end dive when using the foot brake to make minor speed corrections. Positioned between the foot brake's master cylinder and the centre pistons of the two front brake calipers, the delay valve first engages only the left-side front caliper to reduce the initial front wheel braking force by nearly half. As pedal pressure increases, the delay valve introduces pressure to the right-side front caliper, which rises from a preset level to match the pressure to the left-side caliper. The result is a feel of comfortable, even deceleration that begins at the rear, with little of the rapid forward dive that is usually brought on when the front brakes are suddenly applied. The delay valve offers enhanced control and more confident ease of operation over irregular road surfaces, such as slippery downhill grades and wet cobblestone roads.

Floating Brake Rotors

The VFR's 296 × 4.5mm floating front discs feature lightweight '7-star' aluminium inner rotors and a reduced number of floating disk inserts (down from the standard 10 or 12) to provide a lighter, more open look. The rear disc brake features a standard, single-piece 256mm rotor. A new sintered metal front brake pad material provides sportier braking performance while optimizing the balance of front and rear braking control.

Dual Multi-Reflector Headlight

The VFR's wide, integrated dual headlight features the latest in multi-reflector headlight design for clearly defined nighttime illumination and enhanced riding confidence.

The headlight's brilliant output is determined by the computer-designed shapes of its angular reflectors, which precisely focus their beams in an optimized illumination pattern without requiring a conventional headlight's thick faceted lens to bend the beam to fit. Both bulbs are now illuminated during both low beam and high beam operation. The headlight's clear, flush-surface 'cat-eyes' lens was specially molded to conform to the upper fairing's leading edge, while a regulation position lamp is mounted in the front bottom centre of the headlight unit. The VFR's large, newly designed front indicators feature greater transparency than standard units and are prominently mounted on the fairing shroud for maximum visibility. Its attractively designed taillight juts out from the end of the tail cowl in a broad, cleanly rounded form that integrates both rear indicators into its shapely design to provide a bright, high-visibility view from the rear.

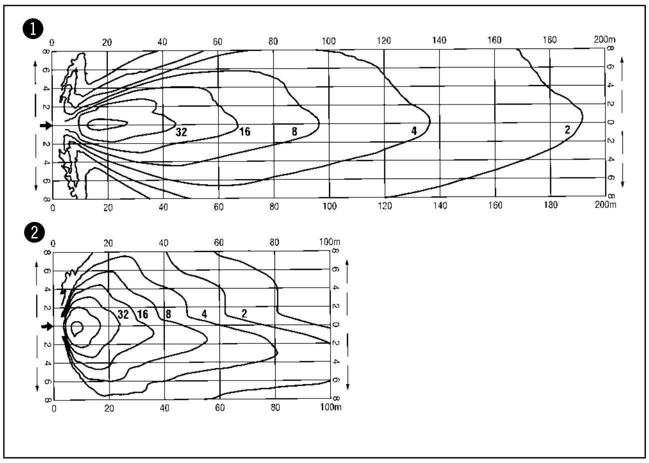
New VFR Headlight Illumination Area Comparison (Overhead View)

❶ *High Beam*
❷ *Low Beam*

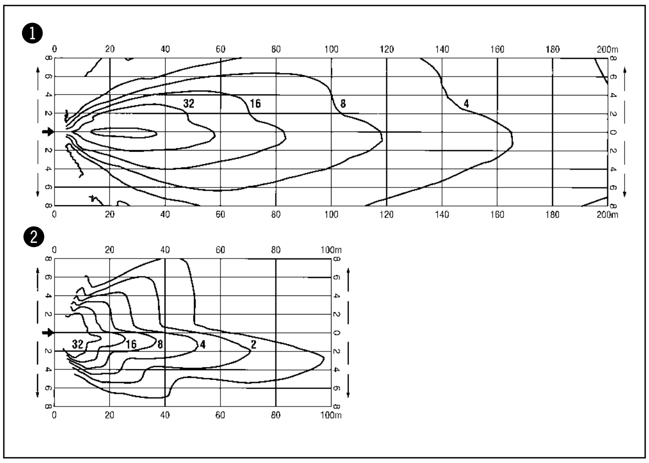
Current Model Headlight Illumination Area Comparison (Overhead View)

❶ *High Beam*
❷ *Low Beam*

New VFR Headlight Illumination Area Comparison (Overhead View)



Current Model Headlight Illumination Area Comparison (Overhead View)



High-Tech Meter Panel

The VFR's sleek, fairing-integrated meter panel provides an attractive, high-tech display of important operating information in the no-nonsense style of a jet fighter cockpit. With its large, black-face speedometer mounted to the left of the large, centrally positioned white-face tachometer, and indicator light arrayed across the bottom of the panel, the slim new, fully electronic panel features a large, high-visibility liquid crystal display of fuel level, coolant temperature, clock, odometer and trip meter readings. The handy dual-mode trip meter permits two different distances to be independently measured.

Solid Aluminium Components

The VFR has always projected a powerful, mechanical, high-tech look that exudes the highest quality in its attention to detail and the fit and finish of its componentry. Its impressive array of cast or forged aluminium parts include new aluminium brake pedal and shift lever pieces that replace the steel components mounted on the current model.

- The VFR's large-capacity 21-litre fuel tank provides an extended range of touring enjoyment between fillups and features a built-in electronic fuel pump to ensure a reliable flow of fuel to its new electronic fuel injection system.

- The VFR's detachable rear seat offers access to a compact storage space that can carry a 'U'-lock and other small necessities.

- Clutch and brake levers offer easy 4-position adjustment to comfortably fit a wide range of hands.

HONDA *Come ride with us.*

HECS3

HONDA EVOLUTIONAL CATALYZING SYSTEM

HECS3 - 9824 - E

Introduction

As the world grows more concerned about the effects of pollutants on the environment, many developed countries have instituted steadily stricter regulations to combat rising pollution levels, especially as they affect our water and the air we breath. Scheduled to take effect in 2001, Europe's planned EURO-2 emissions regulations are expected to be some of the strictest air pollution controls on record and will no doubt become a point of reference for pollution laws that may be introduced in other countries in the future. Though not yet finalized, its proposed limits on emissions of carbon monoxide (CO), hydrocarbons (HC) and nitrous oxides (NO_X) are expected to closely approximate Germany's pending Summer Smog Stage II regulations, and will be so strict that only catalytic converter-equipped vehicles will be permitted to operate in countries adopting the new regulations. Although these strict new regulations do not currently affect motorcycles and are directed mainly towards passenger cars, similar regulations concerning the emissions of motorcycles and other small engines can be expected to follow.

Honda has long been concerned with reducing pollution levels in the products it makes and has been a pioneer in the development of low-emissions engines and vehicles that still produce exceptionally high levels of performance. However, rather than settling for added-on devices that focus on the symptoms but often ultimately compromise other aspects of engine performance, Honda has always strived to find solutions to these problems at their source by thoroughly rethinking the fundamentals of combustion. Taking advantage of Honda's recently developed built-in air injection system and the precise fuel metering capability of its PGM-FI programmed fuel injection system, this advanced new emissions system incorporates oxygen sensors and a '3-way' catalytic converter to maintain peak combustion efficiency while reducing emissions to far below those called for by Europe's expected new regulations and likewise ensuring the highest long-term reliability.

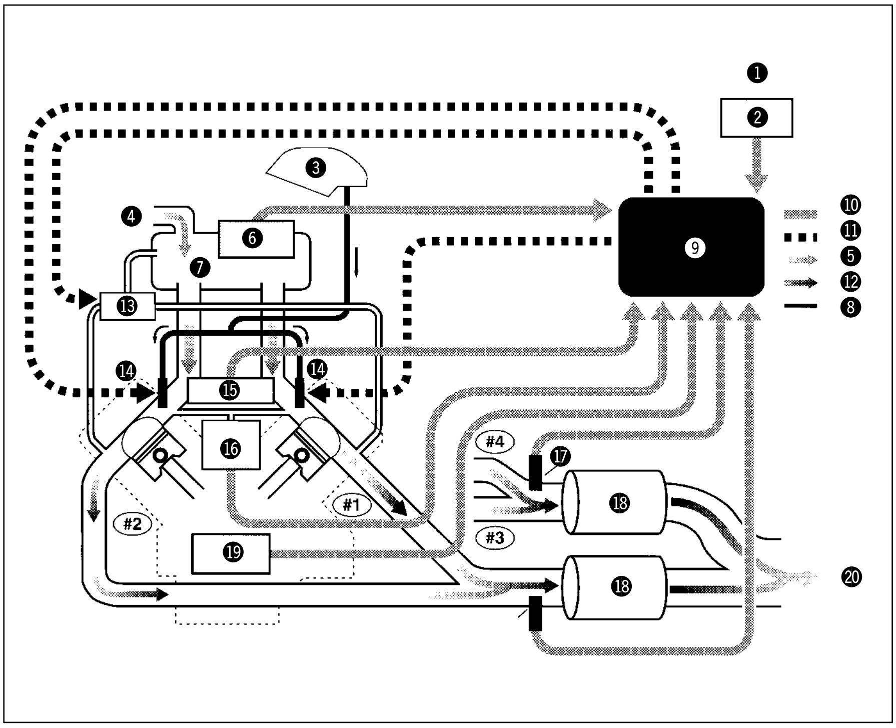
System Components

This high-performance emissions system combines Honda's built-in air injection system, an advanced digital electronic fuel injection system with oxygen sensors to monitor exhaust composition, and a 3-way catalytic converter to minimize emission levels while maintaining high performance and long-term reliability. The major components of the system are:

Digital Fuel Injection System
Essentially the same digital electronic system featured on several of Honda's standard models, the PGM-FI system's programmed ECU ensures precisely controlled delivery of the optimal amount of fuel required for all starting and riding conditions.

Air Injection System
Based on the direct air injection system used on several current models in the Honda lineup, this new solenoid-controlled system introduces a stream of fresh air from the aircleaner into the exhaust port just behind the exhaust valve. By delivering extra oxygen to the exhaust gases exiting the combustion chamber, the system prolongs the burning of the exhaust's residual fuel into the port for more complete combustion and reduced emissions of carbon monoxide and hydrocarbons. The volume of air injected into the port is determined by the velocity of the gases exiting the combustion chamber.
This simple system reduces carbon monoxide and hydrocarbon emissions to ensure complete compliance with Europe's current EURO-1 emissions regulations.

HECS 3 Honda Evolutional Catalyzing System



HECS3 - 9826 - E

HECS 3
Honda Evolutional Catalyzing System

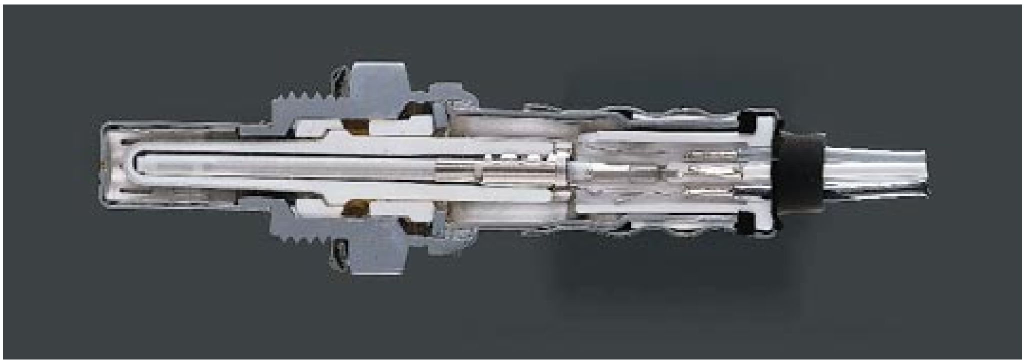
❶ *Ambient Air Pressure*
❷ *Barometric Pressure Sensor*
❸ *Fuel*
❹ *Air Intake*
❺ *Air Flow*
❻ *Intake Air Temperature Sensor*
❼ *Aircleaner Box*
❽ *Fuel Flow*
❾ *PGM-FI/Ignition Unit*
❿ *Sensor Inputs*
⓫ *PGM-FI Outputs*
⓬ *Exhaust Flow*
⓭ *Solenoid Valve*
⓮ *Injector*
⓯ *Throttle Sensor*
⓰ *Intake Manifold Pressure Sensor*
⓱ *O_2 Sensor*
⓲ *Metal Catalyzer*
⓳ *Coolant Temperature Sensor*
⓴ *Cleaner Exhaust Gas*

Stainless Steel Exhaust System

The stainless steel exhaust system features narrower diameter tubing than that used on the standard model. This specially designed system combines with the air injection system to quickly raise the temperature of the catalytic converter elements for optimal operation. The catalyzer is installed just behind the final exhaust pipe junction in the system's 4-into-2-into-1 configuration, and feeds into the single tube extending to the system's silencer. This modified system ensures that the catalyzer's temperature quickly reaches its optimum level of over 300°C, and stably maintains the catalyzer within this most effective temperature range.

Electronic Exhaust Sensors

A pair of electronic sensors are installed immediately behind the first two junctions of the exhaust pipes (in the above-noted 4-into-2-into-1 sytem), where they constantly measure the fluctuating oxygen levels in the engine's exhaust gases. Their digital output is monitored by the fuel injection system's CPU, which instantly calculates combustion efficiency and corrects the intake's air/fuel mixture accordingly. This 'O_2 feedback' system maintains the air/fuel mixture within a predesignated tolerance range that is centred on the optimal ratio for the most efficient combustion.



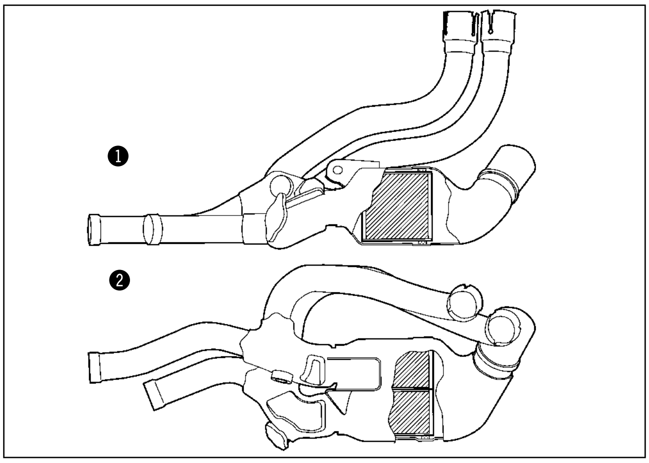
System Components

This optimal 14.7:1 air/fuel ratio is determined by a precise balance between the resulting emissions of hydrocarbons (HC) and carbon monoxide (CO) on one hand and nitrous oxides (NO_X) on the other. If this ratio increases, HC and CO output will fall, but NO_X emissions will rise correspondingly. Conversely, if the air-to-fuel ratio falls below this figure, NOX output will be reduced, but HC and CO emissions will quickly rise. Thus, to achieve the most effective and efficient low-emissions operation, a precise balance of minimal emissions for all three pollutants must be maintained.

Constantly monitoring exhaust output for the ideal 14.7:1 air/fuel ratio, the 'O_2 feedback' system minutely modulates the amount of fuel passing through the injectors, enrichening the mixture when the measured ratio climbs too high and leaning it out slightly when the ratio falls too low. In this way peak combustion efficiency is precisely maintained through a wide range of operating conditions.
The sensors themselves are standard automotive- type Isolated Ground Heated Zirconia Exhaust Gas Oxygen Sensors.

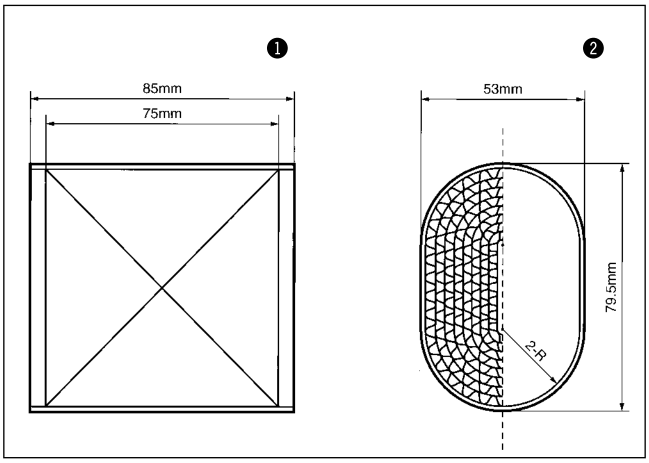
'3-Way' Catalyzer
The final component in the low-emissions system is the catalyzer unit installed in the exhaust system immediately after the final 2-into-1 junction. This compact unit contains a dual oval '3-way' catalytic converter element that completes the system's operation by minimizing the emissions of CO, HC and NO_X.

Exhaust System Comparison
(showing catalyzer placement)



Exhaust System Comparison
❶ *Side view*
❷ *Top view*

Catalyzer Dimensions



Specifications		VFR (ED-type)
Engine		Liquid-cooled 4-stroke 16-valve DOHC 90° V-4
Bore × Stroke		72 × 48mm
Displacement		781cm^3
Compression Ratio		11.6 : 1
Carburation		Electronic direct fuel injection
Max. Power Output		106PS/10,500rpm (95/1/EC) (78kW/10,500min^{-1})
		110PS/10,500rpm (DIN) (81kW/10,500min^{-1})
Max. Torque		8.1kg-m/8,500rpm (95/1/EC) (79Nm/8,500min^{-1})
		8.4kg-m/8,500rpm (DIN) (82Nm/8,500min^{-1})
Ignition		Computer-controlled digital transistorized with electronic advance
Starter		Electric
Transmission		6-speed
Final Drive		'O'-ring sealed chain
Dimensions	(L×W×H)	2,095 × 735 × 1,190mm
Wheelbase		1,440mm
Seat Height		805mm
Ground Clearance		130mm
Fuel Capacity		21 litres
Wheels	Front	17 × MT3.50 'U'-section 6-spoke cast aluminium
	Rear	17 × MT5.50 'U'-section 5-spoke cast aluminium
Tyres	Front	120/70 ZR17 (58W)
	Rear	180/55 ZR17 (73W)
Suspension	Front	41mm H.M.A.S. cartridge-type telescopic fork with stepless preload adjustment, 120mm axle travel
	Rear	Pro-Link with 7-step preload and stepless rebound-adjustable gas-charged H.M.A.S. damper, 120mm axle travel
Brakes	Front	296 × 4.5mm dual discs with Combined 3-piston calipers and sintered metal pads
	Rear	256 × 6mm disc with Combined 3-piston caliper and sintered metal pads
Dry Weight		208kg

VFR - 9829 - E

All specifications are provisional and subject to change without notice.