

# Designed for speed : three automobiles by Ferrari

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Designed for Speed: Three Automobiles by Ferrari



THE MUSEUM OF MODERN ART, NEW YORK



*The nearer the automobile approaches its utilitarian ends, the more beautiful it becomes. That is, when the vertical lines (which contrary to its purpose) dominated at its debut, it was ugly, and people kept buying horses. Cars were known as "horseless carriages." The necessity of speed lowered and elongated the car so that the horizontal lines, balanced by the curves, dominated: it became a perfect whole, logically organized for its purpose, and it was beautiful.*

—Fernand Léger "Aesthetics of the Machine:  
The Manufactured Object, The Artisan, and the Artist," 1924

**H**igh-performance sports and racing cars represent some of the ultimate achievements of one of the world's largest industries. Few objects inspire such longing and acute fascination. As the French critic and theorist Roland Barthes observed, "I think that cars today are almost the exact equivalent of the great Gothic cathedrals: I mean the supreme creation of an era, conceived with passion by unknown artists, and consumed in image if not in usage by a whole population which appropriates them as a purely magical object." Unlike most machines, which often seem to have an antagonistic relationship with people, these are intentionally designed for improved handling, and the refinement of the association between man and machine. The automobile is exceptional for it is an extension of ourselves, a superior means of movement that can evoke intense, personal emotions.

In comparison with the average passenger automobile, the racing car epitomizes the motorcar's primary function, movement. The racer represents a means of transportation in one of its most undiluted forms, while the design of the family sedan is the result of varied and not necessarily homogeneous

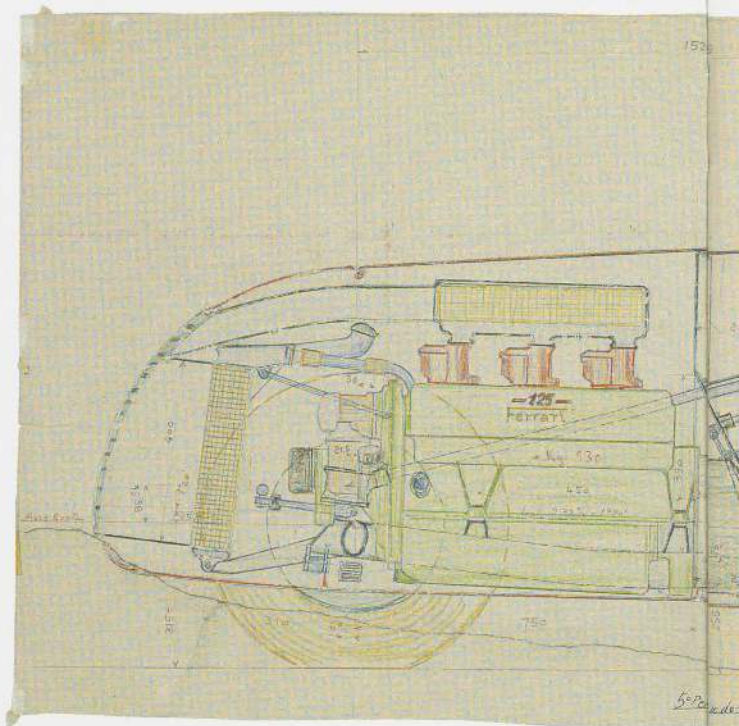
Archive  
MoMA  
1668

Gioachino Colombo.  
Section of Bodywork  
with Driver for 125  
car, 1945.  
Colored pencil on  
print.  
Lent by Autocritica  
Documentazione,  
Roma  
Photo: Mali Olaturji

concerns, including marketing, comfort, cost, and utility. Often, the result is a car with a box-like appearance as performance is sacrificed for more mundane concerns such as sufficient amount of space for luggage and leg room. In contrast, racing cars such as those

built to compete on the Formula One circuit are machines made entirely for speed. Their performance is limited only by technological constraints, safety considerations, and the rules set forth by the sanctioning body of the sport. Aerodynamics plays a determining role in the design of such cars, and so motion is communicated in the designs of these most sculptural of automobiles by the horizontal lines and sleek curves that have been meticulously shaped to maximize speed.

It is said that auto racing has existed since the second automobile was built, but organized professional car racing became a successful spectator sport only after World War II. The establishment in 1950 of the World Driving Championship, dubbed Formula One, took place at a time when the mass-







The Ferrari 166MM in the 16th Mille Miglia race, 1949.

and increasing affluence in the United States and Europe during the 1950s and 1960s led to a deemphasis of the racing aspects of the production sports car. The split between the two classes of automobile grew larger as the production sports car became a machine increasingly intended for indulgence, not competition. Nevertheless, interest in racing continued to flourish. It is estimated that well over twenty thousand organized auto races took place last year in the United States.

The popularity of auto racing and sports cars is a manifestation of the twentieth-century obsession with speed, which is seen as a defining element of progress. "Speed," the Futurist F. T. Marinetti wrote,

equals "scorn of obstacles, desire for the new and unexplored. Modernity, hygiene." In our culture, the attainment of higher speeds represents advancement in almost every element of our lives. The supersonic jet and ever faster microchips are among the most revered artifacts of our culture. Far removed from ordinary experience, the excitement of auto racing elicits an admiring fascination with the implausible, while the cars themselves evoke visceral emotions.

Auto racing has always served a practical purpose as a means for manufacturers to develop and test new features and materials that may eventually be incorporated into passenger automobiles. The high cost of sponsoring a racing team is offset by innovations achieved through such research and development. The safety and performance features of the contemporary family car include elements originally introduced for racing, such as rear-view mirrors (first used at the Indianapolis 500), seat belts, disc brakes, turbocharging, fuel injection, and numerous material and structural improvements.

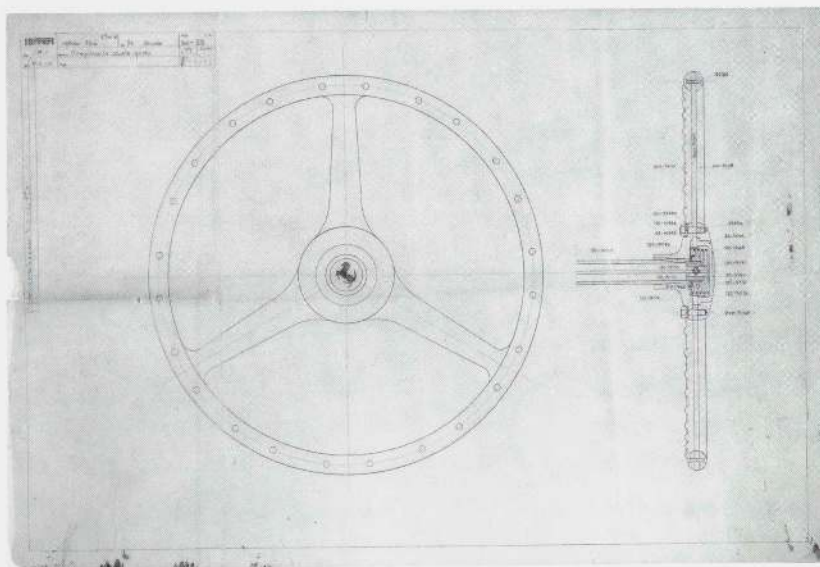
At Ferrari, the distinction between racing cars and production automobiles has always been blurred. In 1947 Enzo Ferrari, founder of the company, produced the 166MM, his first genuine production car, in a small factory in Maranello, near his home town of Modena in the north of Italy. Until his death in 1988, he oversaw all aspects of the company from his office only a few feet away from the racing practice track. It was his uncommon vision that was responsible for the manufacturer's particular emphasis on competition. In his autobiography, *The Enzo Ferrari Story*, he wrote, "A motor race is the final act in the labor of the car maker." Today the company continues to employ more than three hundred people both in England and Italy as part of its Formula One team. Ferrari is unique in Formula One racing in that it builds its own chassis and engines for its

The 1993 Ferrari F40  
in the Misano GT race.  
Photo: Studio 83



racing cars, whereas all other teams purchase their engines from other manufacturers. The result has been a record of success unmatched by any other automobile manufacturer.

To help finance the high costs of designing and producing racing cars, Enzo Ferrari reluctantly began manufacturing two-door sports cars for sale. Not surprisingly, these vehicles designed for road use were often only thinly disguised versions of a particular class of racing car. In their book *Sports and Classic Cars*, Griffith Borgeson and Eugene Jaderquist wrote, "The lessons learned in competition have been applied to production cars with great benefit to their performance, but at considerable expense to the factory. Ferrari can take justifiable pride in making the world's finest and fastest sports car. He has paid dearly for the distinction." Since many of the production-car manufacturing techniques were similar to the time-consuming methods used to produce racing components, the sales inventory was always small. For both his racing and road automobiles, Ferrari stressed high performance and speed, often at the expense of comfort, luxury, and practicality.



Ferrari S.p.A.  
Drawing of Steering  
Wheel for 166MM, 1950.  
Pencil on vellum.  
Lent by Ferrari S.p.A.  
Photo: Mali Olatunji

Ferrari F1 no. 641/2,  
1990.  
Italian Grand Prix, 1990  
Photo: Pat Behar



*We say that the world's magnificence has been enriched by a new beauty; the beauty of speed. A racing car whose hood is adorned with great pipes, like serpents of explosive breath — a roaring car that seems to ride on grapeshot — is more beautiful than the Victory of Samothrace.*

—Filippo Tommaso Marinetti, *Manifesto of Futurism*, 1909



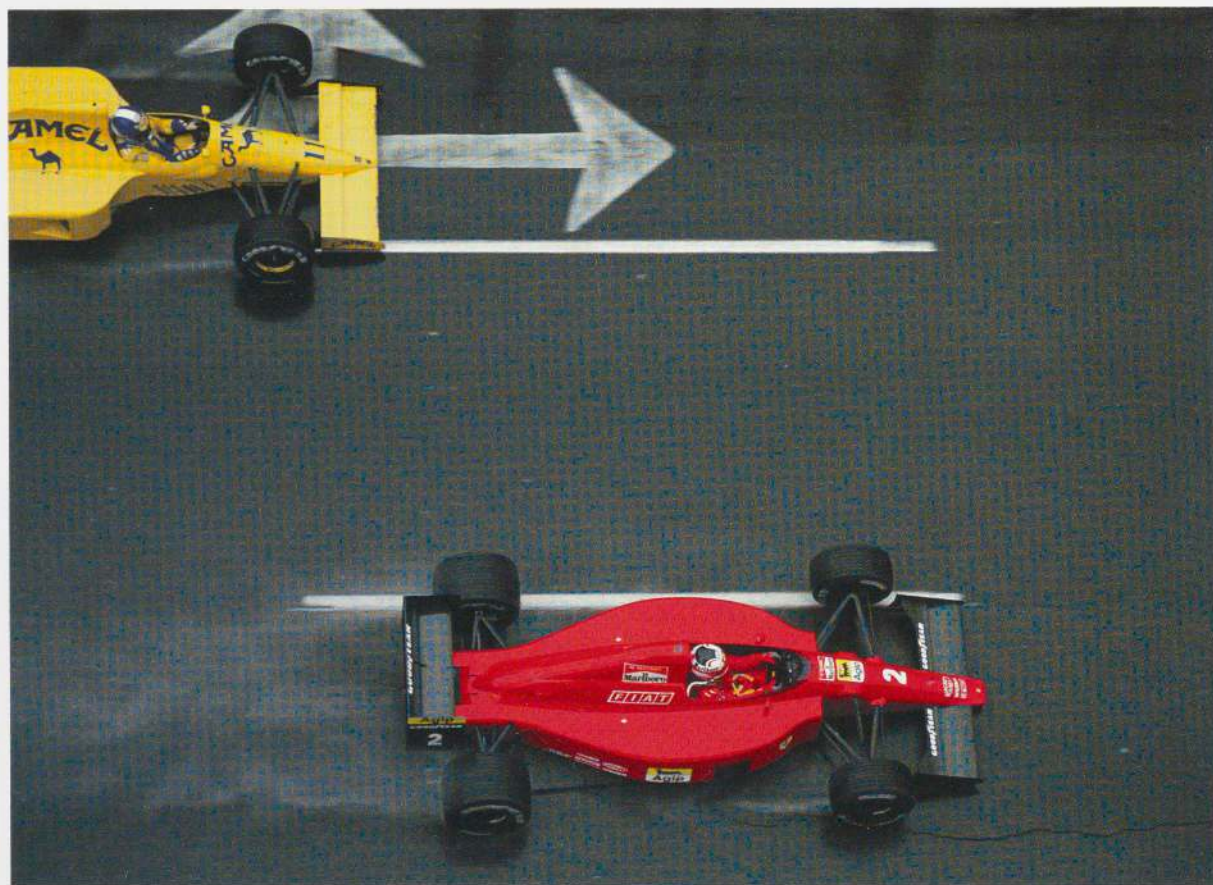
## Formula One

Throughout its forty-three year history the Formula One racing car has been the pinnacle of automotive design and performance. Painstakingly engineered to move faster, handle better, and stop more quickly than any other automobile, it is the most technologically rational and complex type of motorcar. Innovation and experimentation are constant, stimulated by the desire to win.

The Formula One circuit consists of sixteen Grand Prix races held throughout the world each season (though not presently in the United States). The American equivalent of this type of racing, the Indy car circuit — named for the famous Indianapolis 500 race held each Memorial Day at the Indianapolis Speedway — features cars similar in appearance, but different in many respects. To



Ferrari F1 no. 641/2, 1990. Photo: Roberto Vacirca



encourage competition, rules established by the sanctioning body of Indy car racing limit the use of new technologies by wealthy sponsors. The result is tighter restrictions on the design of the cars and the performance enhancements available to the teams. Consequently, the American Indy car is a less technologically complex machine than the mainly European Formula One ("F1") car.

Ferrari F1 no. 641  
(earlier version),  
1990.  
Phoenix, Arizona,  
1990  
Photo: George  
Tiedemann

The clarity of the F1's purpose—to transport a single individual around a road circuit as swiftly as possible—allows for a narrow, projectile form of unusual purity and simplicity. The graceful shape of the Ferrari 1990 F1 racer, designed by John Barnard, was essentially determined by laws of physics, specifically aerodynamics. But although extensive testing is done in a wind tunnel, that can serve only to check a predetermined design. The car's pleasing and extraordinarily sculptural silhouette is not only a product of rational decisions, but also a result of the designer's intuitive aesthetic.

Barnard, one of the most successful and celebrated racing car designers, readily admits that the rule in auto racing is: if it wins, even if it looks like an "orange crate," then that "is the way to go." But he also asks, "What is the point of designing a car if it doesn't look right?" He cites an old racing adage, "if it looks right, it is right": it will perform more efficiently than something awkward and clumsy in appearance. The 1990 Ferrari F1, in common with all of Barnard's designs, stands out among F1 cars for the satisfying manner in which lines and curves are completed. The overall harmony and elegance of the shape can be seen throughout, but in particular in the automobile's plan and in the bulbous contours, surrounding the radiator air intakes, that function to improve aerodynamics.

The challenge for the designer of the F1 is to engineer the car so that it holds the road at speeds that exceed two hundred miles per hour. To achieve this, the car is designed like an airplane wing, but instead of producing lift, the shape pushes the car down. This downforce can quadruple the cars' weight at high speeds, which becomes particularly useful when the driver is cornering and attempting to maintain speed. The chassis body, which covers the driver and the moving parts like a tight skin, is engineered to allow rushing air to flow over the body in a manner that maintains the greatest stability while cooling the engine and brakes and generating as little drag, or resistance, as possible. The wings in the front and back of the car are responsible for creating some of the downforce, and are adjusted for the characteristics of specific race courses. The underbody is flat and hovers just above

revving of the engine, reduces the driver's fatigue, and enhances his ability to concentrate on the race.

To achieve the greatest power with the least weight, the F1 is made primarily by hand, with the most advanced, lightweight materials available, including multiple carbon fiber combinations, aluminum alloys, and titanium. Much of the technology is borrowed from the aerospace industry where the use of such materials was pioneered. "When at the end of a Grand Prix race, a constructor dismantles a car that has won a place and finds its components at the limit of their endurance through wear and tear, then may he truly claim that he has followed the new formula and followed it indeed to

the limit of human foresight and endeavor," wrote Enzo Ferrari. The diminishing of weight, however, reduces the car's durability to a finely calculated degree, and many parts need to be rebuilt after every race. The engine has a particularly short life span of only about 310 to 370 miles before a complete rebuilding is needed. Even such highly stressed and crucial elements as piston heads are carved out in nonessential areas to reduce weight. Ironically, the extremely intricate F1 automobile is a modern piece of hand craftsmanship that is regarded as the definitive symbol of a manufacturing industry which is highly automated.

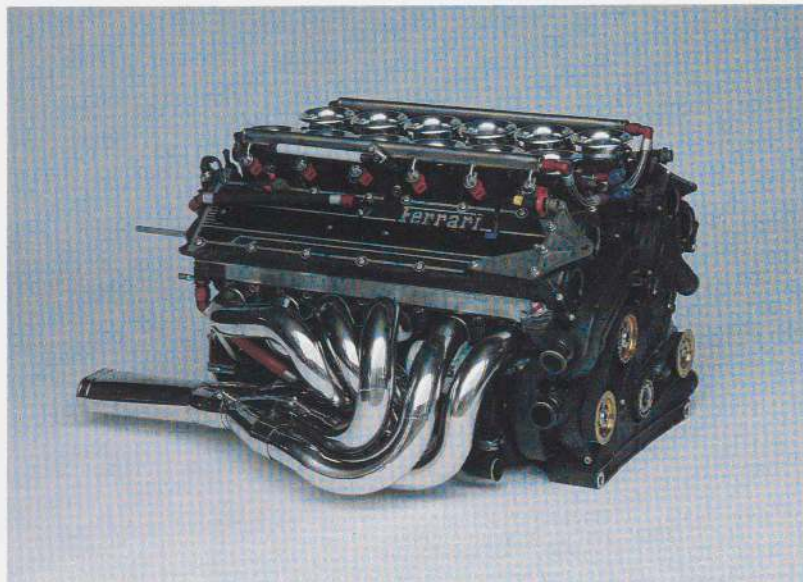
The advertisements that appear on the Ferrari F1 are muted in appearance in comparison with those seen on other contemporary Formula One cars. These decals are an aesthetic compromise, which while a financial necessity, diminish the visibility of the pure form of the car. Like some sort of rolling billboard or Pop-art pastiche, these logos further enhance the level of visual excitement associated with the sport, and mimic on the car's surface the complexity of the intricate inner workings of the automobiles. Paid for by sponsors, many of whom participate in producing the specialized parts of the cars and the high octane gasoline they require, the advertisements help defray the costs of fielding a competitive team. It is ironic, however, that some of the most expensive and

Ferrari S.p.A.  
Piston with Connecting  
Rod for Engine of the  
F1, 1990.  
Aluminum alloy and  
titanium.  
Mfr.: Ferrari S.p.A.  
Photo: Mali Olatunji





Ferrari F1 no. 641/2,  
1990.  
Photo: Bernard Asset



Ferrari S.p.A.  
Engine no. 037 for the F1,  
1990.  
Cast iron and aluminum  
alloy.  
Photo: Lucio Garofalo

Ferrari S.p.A.  
Drawing of Engine no. 037  
for the F1, 1990.  
Ink on vellum.  
Lent by Ferrari S.p.A.  
Photo: Mali Olatunji

## Vehicle: Formula One

**Body material:** composite with monocoque chassis in  
honeycomb with carbon fibers and kevlar

**Years produced:** 1990

**Number of cars produced:** 1

**Top speed:** approximately 210 mph

**Engine:** V12 cylinders at 65 degrees

Type: 036

Bore x stroke: 3.31 x 2.07"

Displacement: 213.46 cubic inches

Power: 680 horsepower

Torque: not available

**Valve gear and maximum BHP:** gear driven D.O.H.C.

5 valves per cylinder; 3 inlet

**Gearbox:** longitudinal with 7 gears and reverse

Type: electrically controlled semi-automatic

## Dimensions:

wheelbase: 112.4"

length: 175.59"

width: 83.86"

height: 39.37"

**Curb weight:** 1,108 lbs.

## Suspension:

front: unequal length wishbones; pushrod operated coil  
spring over shock absorber

rear: upper wishbone; lower trapezoidal link; push-rod  
operated coil spring over shock absorber

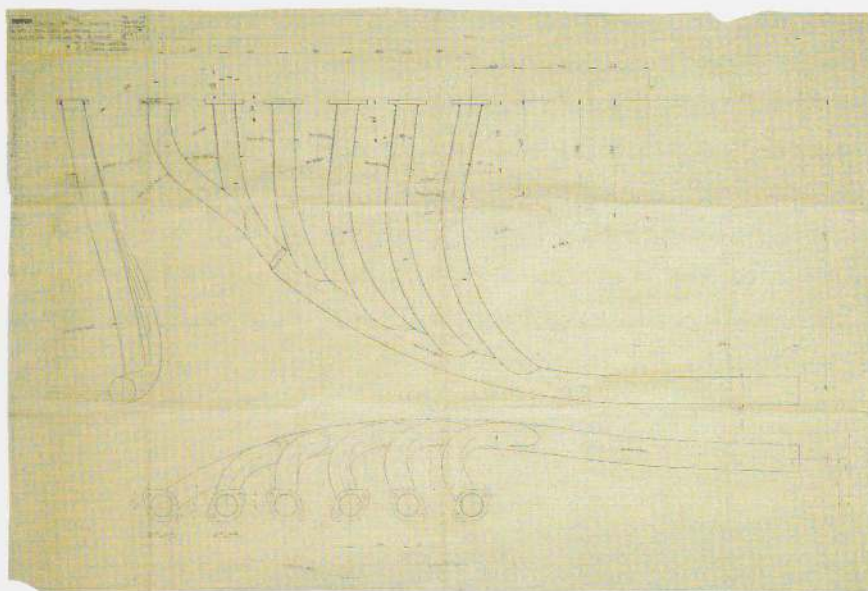
**Steering type:** rack and pinion

## Wheel size:

front: 11.75 x 13"

rear: 16 x 13"





Ferrari S.p.A.  
Drawing for Exhaust  
Manifold for 166MM.  
Pencil on vellum.  
Lent by Ferrari S.p.A.

Ferrari 166MM with  
Barchetta Body,  
1949.  
Mfr.: Ferrari S.p.A.  
Lent by Jacques  
Swaters

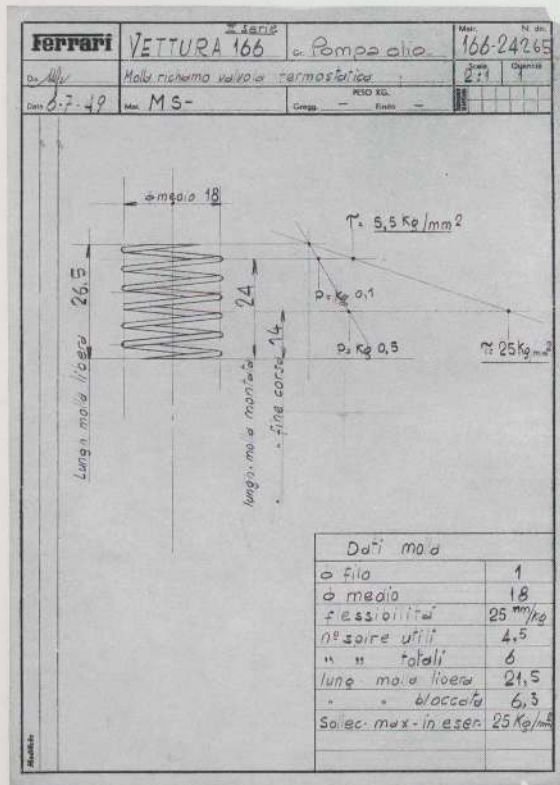
The beautiful silhouette and contours of the 166MM Barchetta make it a splendid example of the influential Italian school of car design, whose products were described in the United States in the fifties as having a "continental look." This style was known for its sculptural qualities; it featured soft curves, finished lines, and a lightness of appearance. In 1951 Arthur Drexler, former director of the Department of Architecture and Design of The Museum of Modern Art, wrote of the Cisitalia "202" GT in the Museum's collection, "The body is slipped over its chassis like a dust jacket over a book." The overall harmony and fluidity of the car's design was in direct contrast to the more rectangular style popular in the United States at the time.

Designed by Carlo Felice Bianchi Anderloni for the coach builders Carrozzeria Touring, all of the bodies produced for the Barchetta were crafted by hand at the workshop. The shaping of the metal

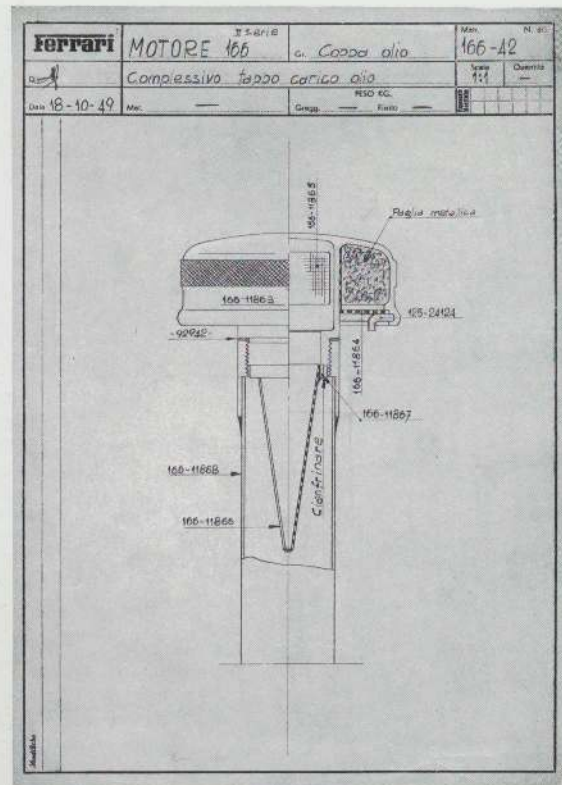


sheets into the appropriate form was accomplished by placing a wooden lattice-type mold underneath the steel, which was then pounded by a number of workmen, starting at either end of the car. Delightfully, this technique resulted in cars that are all slightly different, unique in shape, and rarely symmetrical. The body supplied by the coach builder was then attached to the rolling chassis and engine manufactured separately by Ferrari.

The process of designing the car was meticulously executed, with numerous pencil drawings for



Ferrari S.p.A.  
Drawing for Recall  
Spring of Oil Pump of  
the 166MM, 1949.  
Pencil on vellum.  
Lent by Ferrari S.p.A.  
Photo: Mali Olatunji



Ferrari S.p.A.  
Drawing for Cap for  
Oil Pan of the 166MM,  
1949.  
Pencil on vellum.  
Lent by Ferrari S.p.A.  
Photo: Mali Olatunji

every piece of the engine and chassis. Frequently these drawings were done at full scale and included the design of even the simplest spring or valve. Before Enzo Ferrari would approve the body design by Touring, he was presented with a modest wood model and sketches that were the only indication of the future appearance of the car.

For its day, the 166MM's top speed of over 120 miles per hour was a remarkable engineering achievement, and by today's standard represents performance found only in top quality production cars. In comparison to the later F1 or F40, however, this relatively slow speed required little knowledge of aerodynamics. The early Barchetta displays only a primitive understanding of the effects of wind, drag, or downforce. The overall shape is essentially an aesthetic solution removed from the restrictions of function and determined by a desire to create a beautiful form.

### **Vehicle: 166 Mille Miglia**

**Body material:** Steel

**Years produced:** 1948–1953

**Number of cars produced:** 47

**Top speed:** 1948–131 mph

1949–1953–137 mph

**Engine:** V12 cylinder at 60 degrees

Type: 166

Bore x stroke: 2.36" x 2.31"

Displacement: 121.74 cubic inches

Power: 140 horsepower at 6600 RPM

1953 166MM–160 horsepower at 7200 RPM

Torque: not available

**Valve gear and max BHP:** not available

**Gearbox:** 5 gears and reverse

Type: helical gears

#### **Dimensions:**

wheelbase: 86.61"

length: 140.94"

width: 55.51"

height: 34.65"

**Curb weight:** 1,697 lbs.

#### **Suspension:**

front: flexible parallelogram

with transversal leaf springs

rear: solid rear differential

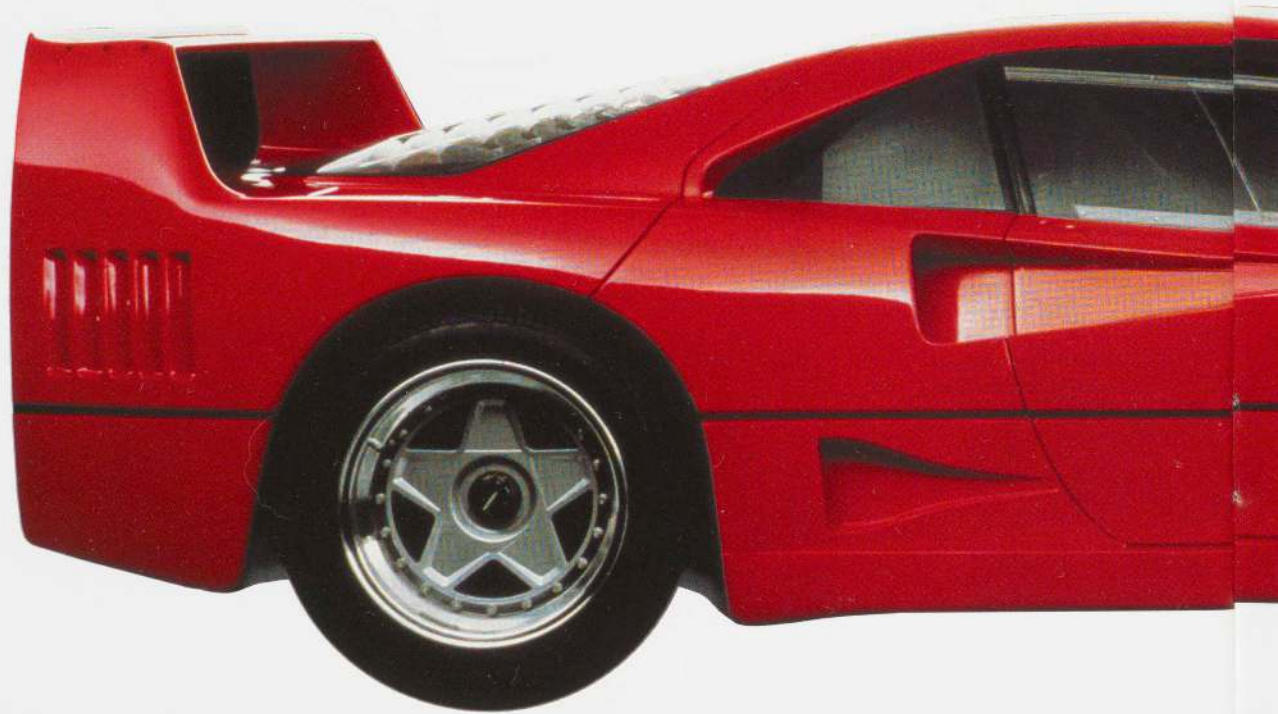
with longitudinal leaf springs

**Steering type:** parallelogram with worm screw

steering box (Ackerman type)

**Wheel size:** 5.5 x 15"

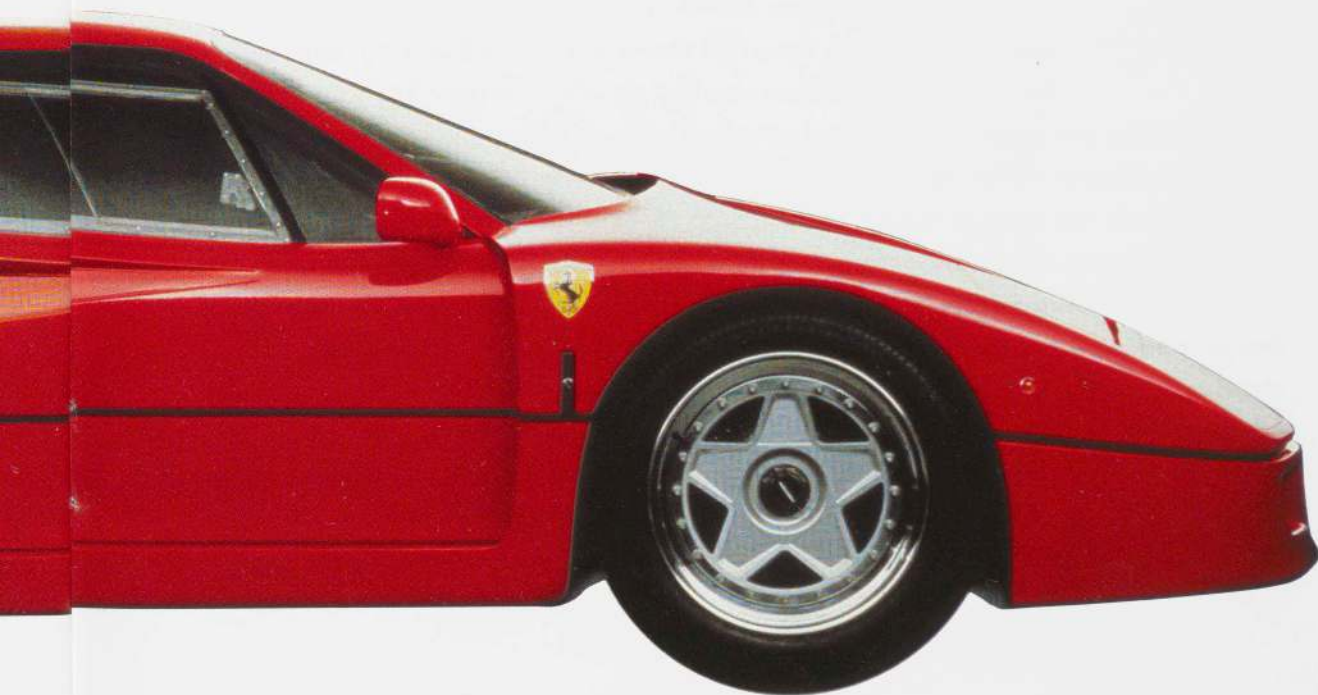
Optional for 1953–6.40 x 15"



## F40

The F40, produced in limited numbers by Ferrari between 1987 and 1992, was, at the time of its introduction, the closest a production sports car had come to achieving the high performance of an F1 racer. The automobile was engineered and promoted to be the crowning technological achievement of the company and was the fastest and most sophisticated motorcar available for general purchase and road use.

Designated the F40 to commemorate Enzo Ferrari's roughly forty years of racing and car production, it was the direct descendent of a racing car, the "GTO evoluzione" produced by Ferrari and intended for Group B class auto racing. The production F40, which gave birth to a recently designated



Ferrari F40, 1987–1992. Mfr.: Ferrari S.p.A.



Ferrari "GTO  
evoluzione", 1986.  
Mfr.: Ferrari S.p.A.  
Photo: Lucio Garofalo

category known as "supercars," resembles the "GTO" in shape, size, and performance characteristics and presents a complex combination of racing elements engineered to enhance performance, but modified for normal road use in a passenger car. This automobile presented a number of interesting problems for both manufacturer and designer, most notably the question of how to create a motorcar that would be capable of extraordinary speeds of over two hundred miles per hour, yet still be safe and maneuverable in much slower traffic.

While most production automobiles require three to four years for development, from the car's inception to the finished product, the coach builder Pininfarina, one of Italy's most renowned, was given only a few months to design the exterior body of the F40, which subsequently borrows much of its appearance from the "GTO evoluzione." Its raw, aggressive triangular shape echoes that of a racing car rather than the more elegant and softened appearance of most luxury high-performance cars. The major challenge to be faced in designing the exterior was to create a body that produced suitable downforce at high speeds, and provided enough air intakes to cool the enormous turbocharged engine.

The F40 is an interesting combination of traditional and computer-aided approaches. Much of the design of the exterior was done quickly, with very little preliminary conceptual work, using full-size mockups in a wind tunnel, while the engine was designed at Ferrari using the most sophisticated computers. The engine is similar to a de-tuned F1 engine, and consequently the body must incorporate thirteen functional air intakes to help cool the engine at low speeds. The exterior body is similar to a racing car in that it uses advanced carbon fiber components for its skeletal frame which is enveloped with a lightweight, high-grade metal body. This solution allows for lightness and strength,

## Vehicle: F40

**Body material:** composite

**Years produced:** 1987-1992

**Number of cars produced:** 1,311

**Top speed:** 201 mph (199.5 mph w/catalysts)

**Engine:** V8 cylinders at 90 degrees

Type: F120A

Bore x stroke: 3.23 x 2.74"

Displacement: 179.18 cubic inches

Power: 478 horsepower at 7000 RPM

Torque: 414 lbs. ft.

**Valve gear and maximum BHP:** Belt driven D.O.H.C.

4 valves per cylinder

**Gearbox:** 5 gears and reverse

Type: manually controlled

## Dimensions:

wheelbase: 96.46"

length: 173.23"

width: 77.56"

height: 44.25"

**Curb weight:** 2,722.68 lbs.

**Suspension front and rear:** Independent suspension with coil springs and double acting hydraulic shock absorbers.

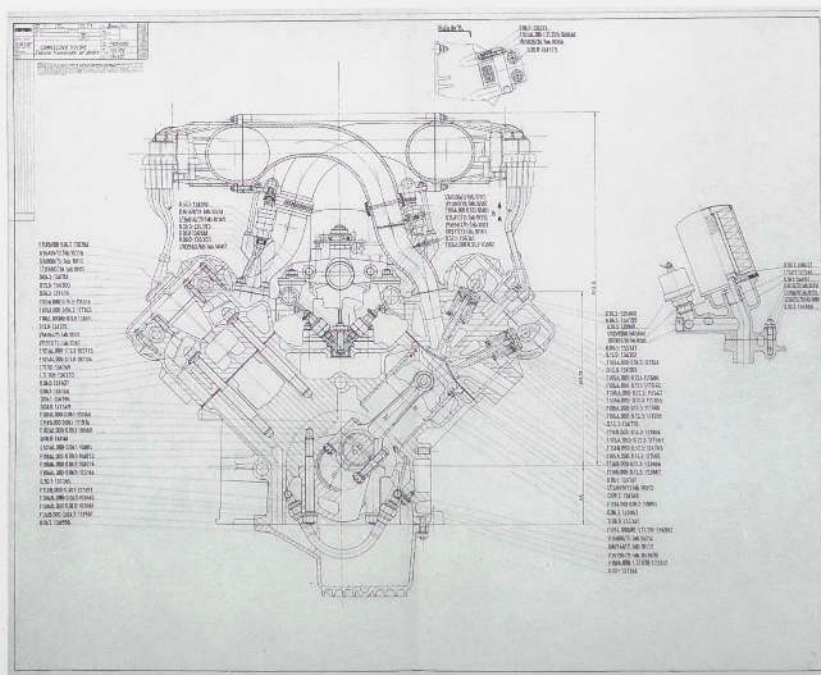
**Option:** ride height adjuster

**Steering type:** rack and pinion

**Wheel size:**

front: 8 x 17"

rear: 13 x 17"



Ferrari S.P.A.  
Section Drawing of  
the F40's Engine,  
1987.

Ink on mylar.  
Photo: Mali Olatunji

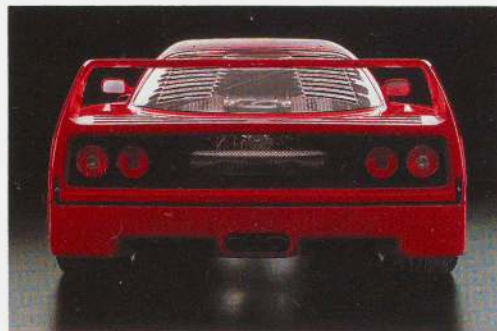
but manufacturing it is extremely labor-intensive and costly. Finally, the rear wing, which is often a cosmetic feature on production cars, is a functional necessity at the high speeds the F40 can attain.

Other features of the F40 further enhance the unique quality of this automobile as a type of production racing car. The suspension is fully adjustable so that the chassis can be raised, lowered, or raked, depending on the speed, improving aerodynamics and road-holding ability. The gas tank includes an interior spongelike mechanism that prevents the gasoline from stalling on one side of the tank during cornering. The enormous gas cap for quick refilling by a pit crew is a component commonly found on a racing car. The interior of the car lacks many of the appointments customarily included on such an expensive automobile. The dashboard features only limited instrumentation; it is covered with utilitarian grey felt (to reduce glare); the spartan doors are closed with the use of a rope instead of a handle; the air conditioning is minimal; there is no place for a radio; and there are stiff racing-type bucket seats, though these do come in three sizes, for owners of different heights.

Introduced a year before Enzo Ferrari's death, the F40 represents the culmination of his career and his ideal: to manufacture production cars with the technical rigor and performance standards of racing cars and make them available to the few sportsmen who appreciate and can afford the refined performance of this type of machine, even at the expense of luxury or comfort.

Christopher Mount  
Curatorial Assistant

Ferrari F40,  
1987–1992.  
Mfr.: Ferrari S.p.A.





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