

It's easily the best thing to come out of Dearborn since the 1932 V-8 Model B roadster. But for all Ford's talk of Total Performance, it's still clear that the Mustang has been designed and built to a price. The necessity of meeting cost goals meant that it had to share a maximum number of components with other models in the Ford line. Out of this situation sprang the advantage of an extremely wide availability of options for the Mustang, selected from the Falcon, Fairlane and Galaxie series. Briefly, it gives the customer a choice of four engines, three clutches, seven transmissions, two drive-shafts, four brake systems, four wheel types and three wheel sizes, three suspension systems, and three steering systems. This seems slightly overwhelming until one remembers that only certain combinations are authorized, for either technical or commercial reasons. But it's still very impressive and approaches the Tempest's profusion of power team options. In two departments Ford even has the lead on Pontiac. Disc brakes are optional on the Mustang, and an independent rear end will be homologated and made available in small series for racing purposes.

Lee Anthony Iacocca, vice president and general manager of Ford Division, sees the Mustang first of all as a family car, which meant that it had to have four seats, with better rear seat accommodation than is offered in the "two-plus-two" category. It's also aimed at a not-clearly-defined market consisting of customers looking for a not-clearly-defined combination of luxury and status. In addition to all this, the Mustang is intended as a sports car (or sporty car).

The project was initiated in 1961 following the increased acceptance of sports car features in family cars, such as stick shifts and bucket seats, and after strong indications of an undiminished public demand for the pre-1958 two-seater Thunderbird. The basic specification of the Mustang was laid down after extensive market research, just as in the case of the Edsel some years ago, but in contrast with the Edsel the Mustang is hitting the showrooms at the right time—while the GT (and pseudo-GT) craze is still in high gear. While the term Gran Turismo really sums up everything that Ford wanted this car to be, they are to be congratulated

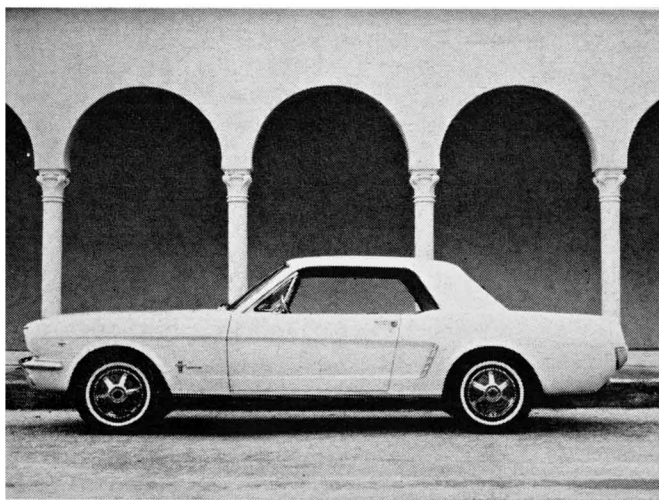
## **Road Research Report:**

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### **FORD MUSTANG**

Ford combines selected components from other models under a new body shell and makes a strong bid for its share of the GT market





A rakish windshield indicates the sporty character of the Mustang, and the sleek, squared-off body does not betray the presence of a genuine rear seat. Both soft and hard-tops leave sufficient headroom for the rear seat passengers, and interior width will allow two Tessie O'Sheas to be comfortably seated in front. Well-styled bumpers do not add to the overall length but may offer inadequate protection.

for not sticking those initials on the Mustang, in the manner of models which served only to render them meaningless, such as the defunct Studebaker Avanti and the popular Dodge Dart GT.

The Mustang design was entrusted to Jack Prendergast as executive engineer under the direction of Hans Matthias, chief engineer of the Ford Division. The Mustang was built up on a basic platform steel frame with galvanized structural members and torque boxes. The frame was designed to carry all the mechanical elements on the under-side and all the body components on top. Structural rigidity was assured by a strong propeller shaft tunnel stretching from the toeboard to the rear axle kick-up, plus cross-ribs and reinforcements. The platform is so stiff that the chassis can be driven without a body.

The body panels are welded to the platform, forming an integral all-steel structure of light weight (during the entire design stage, weight control was held to strict tolerances). The engine compartment is formed by full-depth side members welded to the front side rails at the bottom and to the cowl at the rear. Across the front, the box is completed by a one-piece stamping with a deep rectangular channel-section at the top. The front fenders are simply bolted on to this structure. The frame design is the same for both hard-tops and convertibles, but certain underbody members use heavier-gauge steel on convertibles to compensate for the absence of a roof.

Front suspension has been lifted directly from the Falcon, and consists of an upper wishbone, a single lower control arm with a stay extending to the front, an anti-roll bar, and a coil spring enclosing a telescopic shock absorber located on top of the upper wishbone. The top spring mounting is part of the engine compartment, and a rubber bump stop is mounted on a separate bracket attached to the frame side member.

As can be expected, the front suspension in its stock form is pretty flabby, but fortunately a "handling package" is available. It comprises such helpful items as heavy-duty coil springs, special shock absorbers, a larger-diameter anti-roll bar, 6.50 x 14 tires (instead of 6.50 x 13) on 5½-inch wide rims, and a quicker steering box (with a ratio of 16 to one instead of 20 to one). Actually, the handling package becomes indispensable for anything but the most uninspired driving and ought to have been made standard in the first place. This is especially true of the steering, as the "quick" ratio feels slow and the slow one is far and away too slow. The 16-to-one ratio will alarm no one by the rapidity of its response, but there will no doubt be a demand for an ultra-quick steering box, as the standard one demands 4½ turns lock to lock, the quick steering takes 3½, and the sports car driver will want about 2½ (with the Mustang's 38-ft turning circle).

Even if the "quick" steering is a little slow, the road feel is quite good, the power steering and its reduced feedback notwithstanding. Reactions to road unevenness in the wheel are very slight, and vibrations are not so much felt as hinted at. And if the response is lagging, the car is obedient enough once the front wheels have been pointed in the right direction.

Rear suspension is also based on the standard Falcon, with different forward spring mountings and beefed-up rubber bump stops. The leaf springs which were adequate with Falcon engine torque began to give trouble with axle tramp and spring wind-up during development with the 289-cu in Mustang V-8, so the springs were beefed up too. But both Matthias and Prendergast remain adamant that there's no need for torque rods or any other aid to axle location. We are not perfectly in agreement with this, as leaf springs tend to be

flexible in directions other than intended, and if they are to be made rigid enough for a high-performance car, it's difficult to obtain spring rates low enough for acceptable ride comfort. Evidence of this difficulty shows up in the Mustang on the first gentle bumps. The front springs oscillate at a much higher frequency than the rear ones, giving the sort of ride one gets in a small boat hitting choppy waves head-on. The poop stays more or less put while the bow is bobbing in excitement. On the Mustang, the front and rear suspensions (in standard form) are absolutely not attuned to each other.

The good thing about leaf springs is that any change in their behavior is gradual, and consequently easily controlled and corrected by the driver. And from the manufacturer's point of view, they make for a very inexpensive rear end. The shock absorbers are sharply angled, but the Ford press releases are incorrect in stating that this type of mounting reduces side sway. It has no effect on sway whatsoever—its value lies in reducing lateral axle movements in relation to the chassis.

We did not get an opportunity to test the independent rear suspension. Its design resembles that of the Mustang I (*C/D* December 1962) in having four transverse and semi-trailing links, with narrow-diameter inclined coil springs. This suspension is of very advanced design (by Roy Lunn) and modified only by Ford Division's requirements for installation on the production Mustang. The wheels can be given adequate wheel travel and still have negative camber at all times, and spring rates can be set to suit a wide variety of driving conditions.

Roll center height with the independent rear suspension will probably be about 5 in., as on the Mustang I, as against 7.5 in. on the rigid-axle model. Mustangs fitted with the independent rear end will have modified front suspension setups to raise the roll center from 1.7 in. to 2.6 in.

Even in standard form the Mustang has less nose-dive than any other American-built Ford passenger car, but this is due more to the low center of gravity than to improvements in suspension design. The low



Mustang grille design seems a poor disguise for an air intake, and frontal appearance is marred by gaps between body panels.

center of gravity also contributes to reduce body roll, but on a 200-ft diameter circle, the car leans over just like a little Thunderbird. On high-speed curves, the roll is not objectionable.

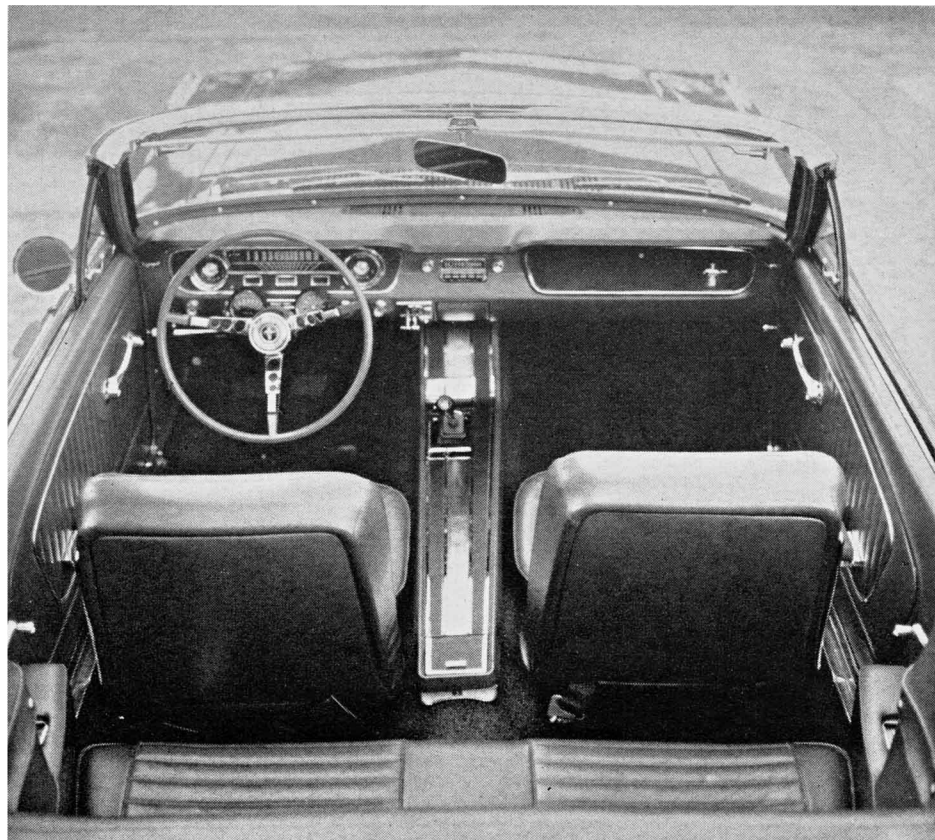
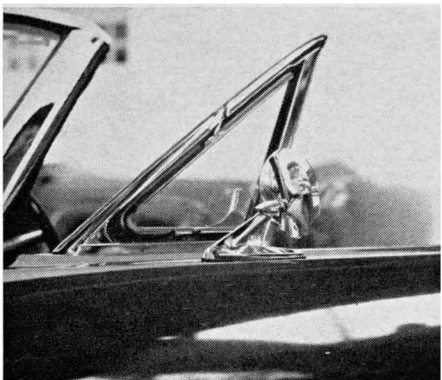
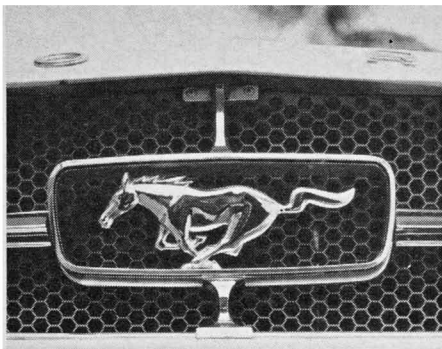
We would not have expected the Mustang with its standard chassis to handle well. As a matter of fact, it is not bad. The car is so well balanced that it can be driven very hard and remain fairly stable and well in control. It has some initial understeer, seems perfectly neutral at normal speeds, and ultimately oversteers.

The basic engine for the Mustang is the 170-cu in Falcon six—a piece of machinery about as exciting as a dish of babyfood. It develops 101 bhp at 4400 rpm and has a maximum torque of 156 lbs-ft at 2400 rpm, and can be combined with Ford's three-speed manual transmission with non-synchro first gear, Ford's four-speed manual all-synchro gearbox, or the new three-speed Cruise-O-Matic. The 200-cu in six is not available on the Mustang, neither is the 221-cu in V-8; the next step is the 260-cu in Fairlane engine, which develops 164 bhp at 4400 rpm and has a maximum torque of 258 lbs-ft at 2200 rpm with a compression ratio of 8.8-to-one. Our test car had the 289-cu in version, with 9.0-to-one compression, four-barrel carburetor, and 210 horsepower.

What most enthusiasts will want is the high-performance version of the 289-cu in engine, which differs considerably from the standard 289. The Fairlane series is derived in its entirety from a lightweight cast iron V-8 designed by George F. Stirrat in 1958/59 and introduced in 221-cu in form in 1961. It weighed only 450 pounds complete, and had very compact dimensions: 8.93 in high, 16.36 in wide, and 20.84 in long.

Crankshaft design for this engine became the subject of a special study. The crank is made of precision-cast alloy iron and runs in five main bearings. About 70% of the total unbalanced couple is balanced by counterweights on the crankpin webs, and the remaining 30% is balanced by two external counterweights—one mounted in front of the timing sprocket and the other integrally with the flywheel. In most previous passenger car applications of this engine, the fourth harmonic unbalance occurs beyond the normal speed range. But on the high-performance 289 the fourth harmonic comes within its 7000-rpm range, so the vibration damper developed for the Indianapolis engine, with enlarged rubber contact areas and tuned for higher crankshaft speeds, was adapted. The high-performance 289 also has the cross-bolted crankcase from the Indy engine, plus a number of special design features such as high-tensile strength connecting rods, copper-lead alloy bearing shells, chrome-plated valve stems, mechanical valve lifters, and a high-lift, high-overlap camshaft. The cylinder heads give a compression ratio of 10.5-to-one, and the air intake system consists of a low-restriction air cleaner, an opera-throat four-barrel carburetor, and direct manifold passages. The exhaust system boasts individual headers merging into twin tail pipes. Power output is an impressive 271 bhp at 6000 rpm with a maximum torque of 312 lbs-ft at 3400 rpm. Naturally this unit can be tuned still further for racing purposes by such patent medicines as Dr. Shelby's Cobra Elixir (or imitations available from your local Performance Drugstore). Over 300 bhp may be reached without impairing engine reliability. Specific output of the hottest production model Mustang engine is 0.95 bhp per cu in, as against 0.73 for the standard 289-cubic-inch power unit.

In the Mustang, the 289 in stock form gives bushy-tailed performance and encourages enterprising driving methods, greatly aided by the precise gate and well-chosen ratios and excellent synchromesh of the four-



Lively emblem is well chosen and well executed with framing to match grille outline. The door vent panes and rear light units are gracefully integrated with the body design as a whole. All Mustangs have bucket-type front seats, and the convertible also displays the "rally pac" clock and tachometer. The lack of elbow room in the rear seat can be seen, as the padded ashtray shelves are located too far forward to permit their use as armrests.

speed transmission. American manufacturers, be it GM, Ford or Chrysler, are really spoiling us with their faultless synchro systems, and the bad examples from abroad are becoming harder and harder to endure.

For some obscure reason, the 260-cu in V-8 can only be supplied with the 3-speed all-synchro transmission (or the 3-speed automatic). The 289 comes with either the 4-speed manual or the 3-speed automatic and the all-synchro four-speed gearbox is mandatory with the high-performance V-8.

Floor-control is used for all transmissions; a rugged lever with a large spherical knob for the manual options and a T-handle for the automatic. This new automatic, designated the C-4, was introduced on the 1964 Fairlane and Mercury Comet series. The selector quadrant has six positions: P-R-N-D<sub>1</sub>-D<sub>2</sub>-L. Starting off in D<sub>1</sub> gives first gear, while D<sub>2</sub> does not engage low gear so as to reduce the risk of wheelspin on slippery surfaces. L position works as a hold switch for low gear. The lever can be moved to L at any speed, but over about 15 mph it engages intermediate instead of low, and braking effect is mainly dependent upon the good old friction materials.

The C-4 consists of an 11¼-in diameter torque converter with a maximum torque multiplication of 2.40-to-one (at stall) and an input torque capacity of 275

lbs-ft. The converter works in combination with two sets of planetary gears engaged by one-way disc clutches and locked by brake bands, with a 2.46-to-one first and a 1.46-to-one intermediate. Full-throttle shift points are about 40 and 70 mph, but acceleration is improved by holding Low up to 50 mph. There's no intermediate hold device. Reverse ratio is 2.20 to one. The C-4 automatic weighs only 145 lbs complete, mainly because the main castings are made of aluminum.

Both three-speed manual transmissions have greater mechanical efficiency than the automatic, and the all-synchro version (as used with the 260 V-8) is pleasant enough to use. But why Ford won't supply a synchro-mesh first with the less powerful six-cylinder engine, which needs bottom gear more frequently, is a mystery to us. True, the torque of the 170 six is so substantial as to make second-gear starts relatively easy, but that doesn't explain why 6-cylinder Mustang drivers have to learn double-clutching before they can engage first gear while in motion. Possibly Ford's market research indicates that everybody who is interested in acceleration buys a V-8 and four-on-the-floor. And those second-gear starts, by the way, have been made possible by using a lower shorter intermediate gear than the all-synchro three-speed box:

*(Text continued on page 126, Specifications overleaf.)*

# Road Research Report: Ford Mustang

**Manufacturer:** Ford Motor Company, Rotunda Drive, Dearborn, Michigan  
**Planned annual production:** 250,000  
**Price as tested:** To be announced.

## ENGINE:

Water-cooled V-8, cast iron block, 5 main bearings  
 Bore x Stroke . . . . . 4.00 x 2.87 in, 101.6 x 72.9 mm  
 Displacement . . . . . 289 cu in, 4727 cc  
 Compression ratio . . . . . 9.0 to one  
 Carburetion . . . . . Single 4-barrel Ford  
 Valve gear . . . . . Pushrod-operated overhead valves, hydraulic lifters  
 Valve diameter . . . . . Intake 1.662-1.677 in, exhaust 1.457-1.442 in  
 Valve lift . . . . . Intake 0.368 in, exhaust 0.380 in  
 Valve timing:  
 Intake opens . . . . . 20° BTC  
 Intake closes . . . . . 66° ABC  
 Exhaust opens . . . . . 56° BBC  
 Exhaust closes . . . . . 20° ATC  
 Electrical system . . . . . 12-Volt, 55 Amp-hr battery  
 Power (SAE) . . . . . 210 bhp @ 4400 rpm  
 Torque . . . . . 300 lbs-ft @ 2400 rpm  
 Specific power output . . . . . 0.73 bhp per cu in, 44.5 bhp per liter  
 Usable range of engine speeds . . . . . 1000-5000 rpm  
 Fuel recommended . . . . . Regular  
 Mileage . . . . . 12-20 mpg  
 Range on 16-gallon tank . . . . . 192-320 miles

## DRIVE TRAIN:

Clutch . . . . . 10-inch single dry plate  
 Transmission . . . . . 4-speed all-synchro  

Gear	Ratio	Over-all	mph/1000 rpm	Max mph
Rev	2.78	8.34	-8.7	-43.5
1st	2.78	8.34	8.7	43.5
2nd	1.93	5.79	12.6	63.0
3rd	1.36	4.09	17.8	88.0
4th	1.00	3.00	24.2	110
Final drive ratio				3.00 to one

## CHASSIS:

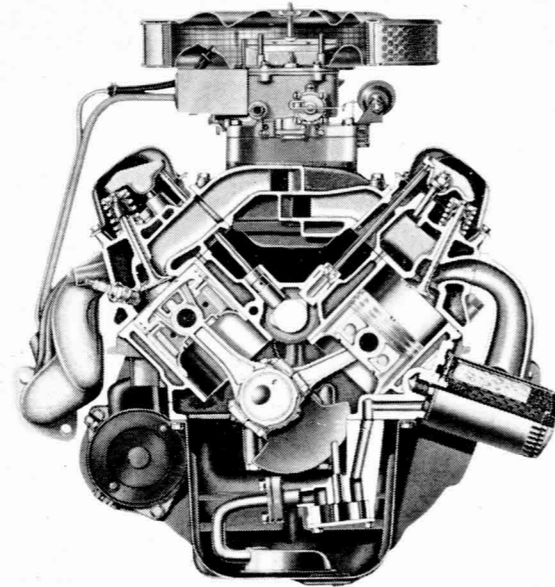
Platform frame, all-steel semi-integral body.  
 Wheelbase . . . . . 108 in  
 Track . . . . . F 56, R 56 in  
 Length . . . . . 181.6 in  
 Width . . . . . 68.2 in  
 Height . . . . . 51.0 in  
 Ground clearance . . . . . 5.2 in  
 Curb weight . . . . . 2861 lbs  
 Test weight . . . . . 3150 lbs  
 Weight distribution front/rear . . . . . 53/47%  
 Pounds per bhp (test weight) . . . . . 15.0  
 Suspension F: Ind., unequal-length wishbones and coil springs, anti-roll bar.  
 R: Rigid axle and semi-elliptic leaf springs.  
 Brakes . . . . . 10-in drums front and rear, 251.3 sq in swept area  
 Steering . . . . . Recirculating ball (16.0 to one ratio)  
 Turns lock to lock . . . . . 3 1/2  
 Turning circle . . . . . 38 ft  
 Tires . . . . . 6.50 x 13  
 Revs per mile . . . . . 865

## MAINTENANCE:

Crankcase capacity . . . . . 5 qts (incl filter)  
 Oil change interval . . . . . 6000 miles  
 Number of grease fittings . . . . . 3 (every 36,000 miles)

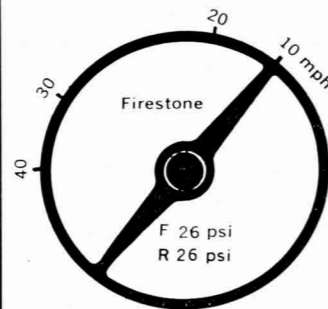
## ACCELERATION:

Zero to	Seconds
30 mph	2.2
40 mph	3.6
50 mph	6.1
60 mph	8.2
70 mph	11.9
80 mph	16.1
90 mph	21.0
100 mph	28.1
Standing quarter-mile	81.5 mph in 16.4



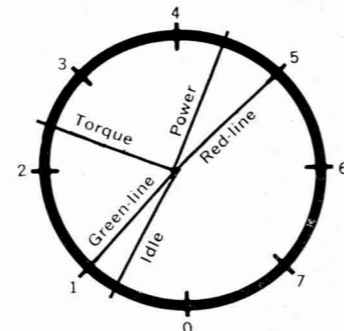
1/8 SCALE

## STEERING BEHAVIOR

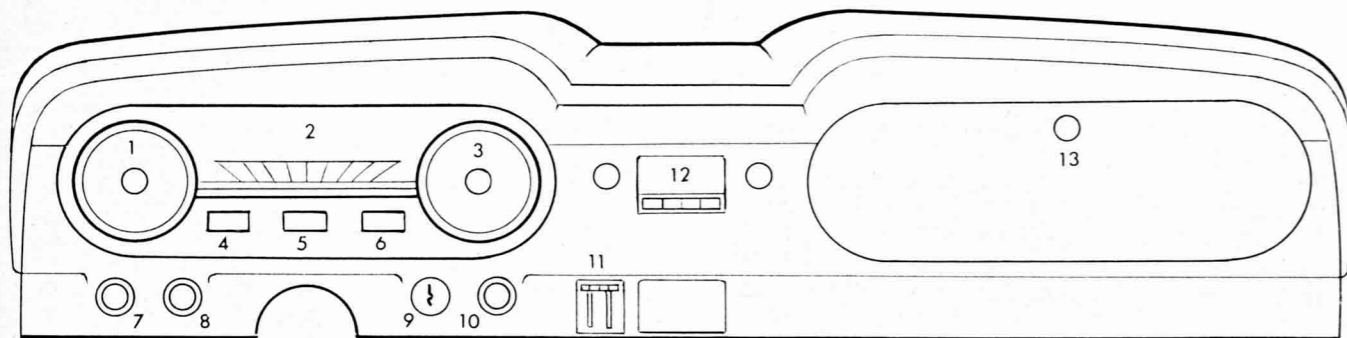


Wheel position to maintain 400-foot circle at speeds indicated.

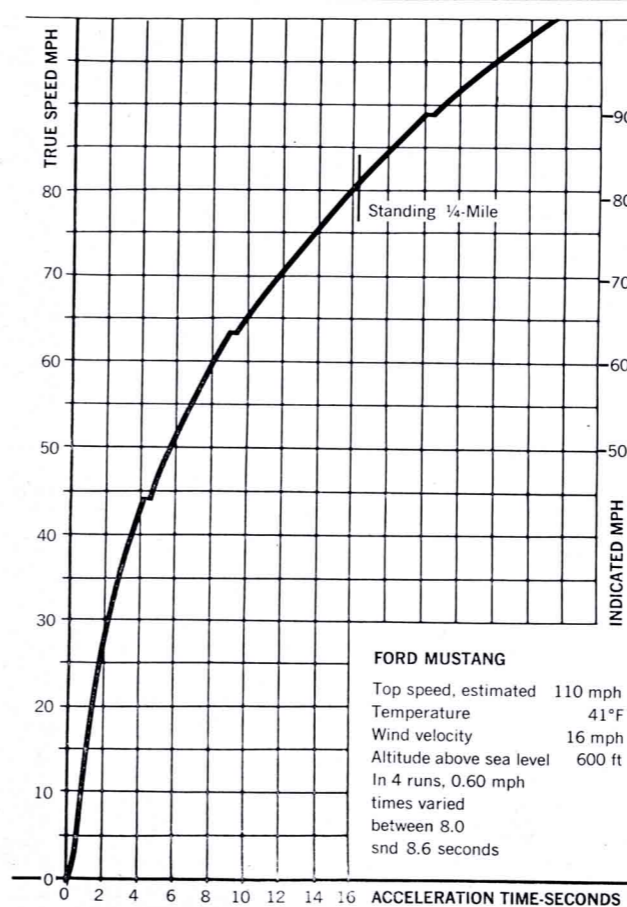
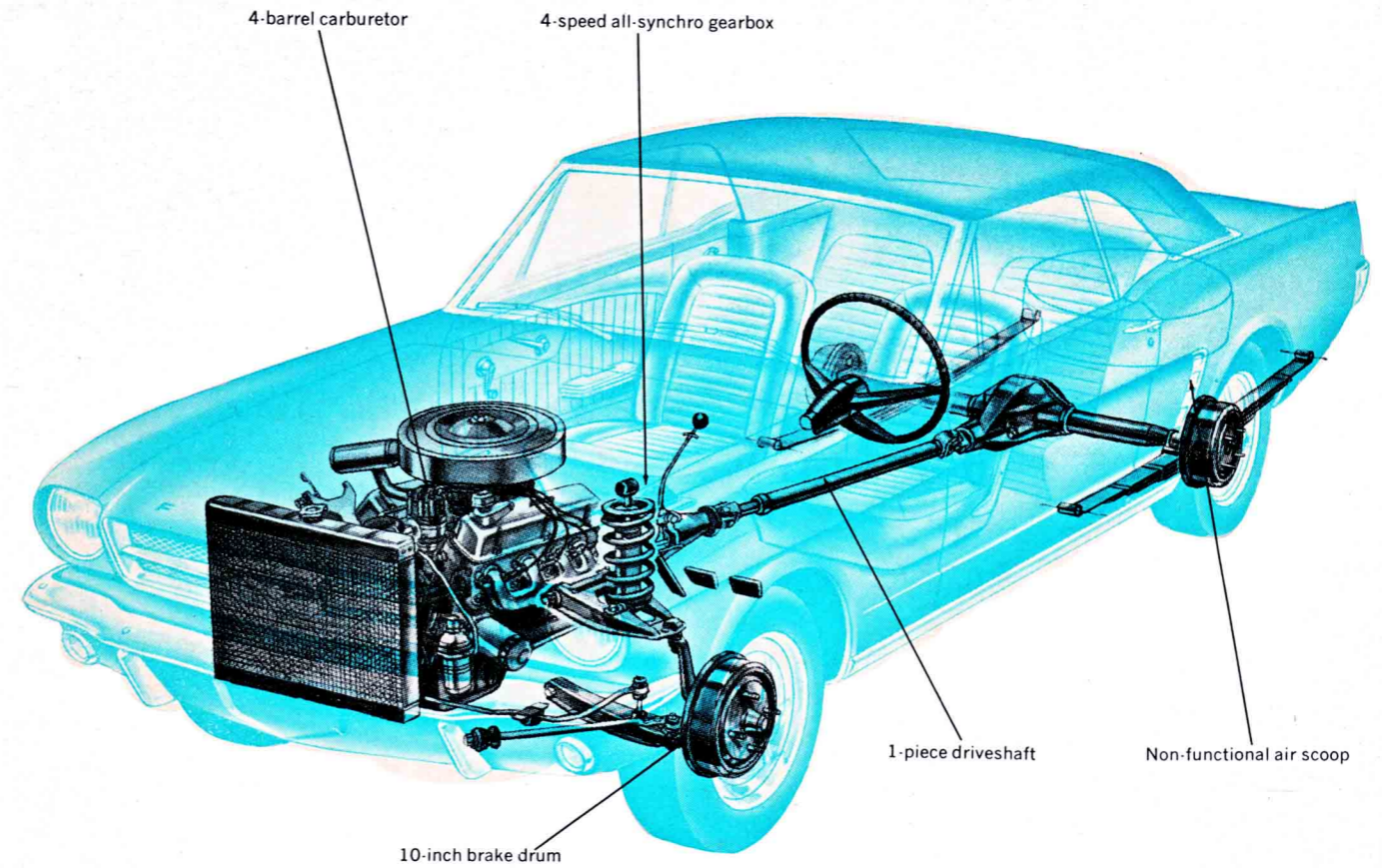
## ENGINE FLEXIBILITY



RPM in thousands

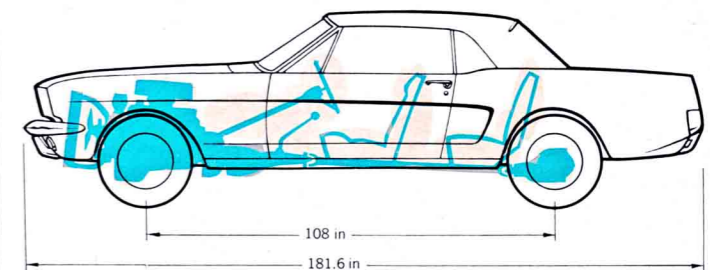
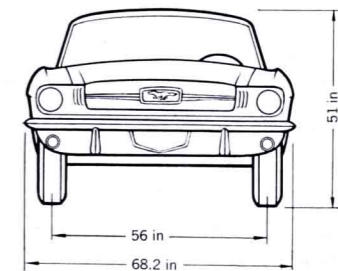


(1) Fuel gauge, (2) Speedometer, (3) Temperature gauge, (4) Oil pressure warning light, (5) Odometer, (6) Generator warning light, (7) Windshield wiper, (8), Light switch, (9) Ignition key and starter, (10) Cigarette lighter, (11) Heater and defroster controls, (12) Radio controls (13) Glove box.



## FORD MUSTANG

Top speed, estimated 110 mph  
 Temperature 41°F  
 Wind velocity 16 mph  
 Altitude above sea level 600 ft  
 In 4 runs, 0.60 mph times varied between 8.0 and 8.6 seconds



## HI FI AND ELECTRONICS

TAPE Recorders, Hi-Fi Components, Sleep Learning Equipment. Tapes Universal Values Free Catalog. Dressner, Dept. 13, 1523 SCI Jericho Turnpike, New Hyde Park, N.Y.

## PATENTS

INVENTIONS: Ideas developed for Cash/Royalty sales. Raymond Lee, 2104G Bush Bldg., N.Y. 36.

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I Made \$40,000.00 Year by Mailorder! Helped others make money! Start with \$10.00—Free Proof. Torrey, Box 3566-N, Oklahoma City 6, Oklahoma.

SEEKING Part time business to match your ambition? Write: E & R Stamp Shop, 50E Gerald Rd., Rantoul, Ill. (61866).

## MISCELLANEOUS

WANTED Quicksilver, Platinum, Silver, Gold, Ores Analyzed. Free circular. Mercury Terminal, Norwood, Massachusetts.

PUSHBUTTON processing machine for reversal color movie. Daylight, portable—and inexpensive. Illustrated literature US \$1.00 (deductible at order). Termomeccanica Romana, Via Festo Avieno, 104-15, Rome, Italy.

HOME-TYPING: \$65 week possible! Instruction booklet, \$1. Rutward, 3097 Bryant, Columbia Station, Ohio.

TRANSISTORIZED Products Importers catalog, \$1.00, Intercontinental, CPO 1717, Tokyo, Japan.

## MUSTANG RRR

(Continued from page 43)

	Non-synchro	All-synchro
1st	3.29	2.79
2nd	1.83	1.70
3rd	1.00	1.00

Understandably, the four-speed transmission also has different ratios depending on whether it's coupled to a "170" six or a "289" V-8:

	170 Six	289 V-8
1st	3.16	2.78
2nd	2.21	1.93
3rd	1.41	1.36
4th	1.00	1.00

For the six-cylinder engines, the driveshaft is a shortened version of the Falcon's; for the V-8 models it's a shortened Fairlane shaft. Final drives are lifted freely from other lines—with six-cylinder engines the ring gear and pinion are standard Falcon, with 260 and 289 V-8s they are standard Fairlane, and with the high-performance "289" they are of Galaxie origin.

The differential housing for the Falcon gears is made of malleable iron with an integral carrier—the other models use a pressed steel housing with removable differential carrier. Ford's Equa-Lock limited-slip differential will be optional with all power-team combinations.

Standard tire size is 6.50 x 13, with 6.50 x 14 optional. The body panels are made to allow 15-in tires to be used, and 15-inch wheels are available with the "handling package". These are steel disc wheels with 5 1/2-in wide rims (available in black only).

We were able to drive some other Mustangs to get a reliable basis of comparison between the different models. There was no high-performance version when we blew the dust off the more interesting parts of Ford's proving grounds at Dearborn and Romeo, Michigan, but Ford expects its performance to rival that of the Pontiac GTO. We did, however, get complete performance figures on the 260 V-8 with automatic transmission, and the standard 289 V-8 with four-speed:

	260 Automatic	289 4-speed
0-30 mph	3.6 sec	2.2 sec
0-60 mph	11.6	8.2
0-90 mph	32.0	21.0
Top speed	105 mph	110 mph

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CD-564

The small difference in top speed is due partly to the gearing (both cars had 3.00 to one final drives), partly to aerodynamic drag. The drag co-efficient of the Mustang is no better than that of the standard Fairlane (although it has considerably less frontal area).

Styling the Mustang was a job that Gene Bordinat entrusted to Joseph Oros, chief stylist of the Ford Division, who joined the company in 1946 and has been responsible for some of the more noticeable styling changes in Ford cars over the years. He studied design in Sweden as a young man, came to GM styling in 1939 and worked in the Cadillac studio for many years. Today he heads a group of about 125 exterior stylists (Damon Woods is in charge of interiors and only has a 100-man staff). We can well understand Ford management's wish to give the Mustang a distinctive or possibly unique appearance, but the result strikes us as inexplicably amateurish. There is a non-functional air scoop along the body sides and a clumsy, protruding grill between the single headlamps. The hood lands on the grille with a fit that reminds us of the lid on one of our mother's more experienced saucepans, and the grille side panels have an air of scatterbrained afterthought. The wheel covers are more-than-slightly reminiscent of the ill-fated Avanti. Better preparation for future improvement could hardly be devised. On the credit side, let's mention the bumper treatment and the tail lights, which are very neatly contrived and blended with their surroundings.

The most attractive thing about the Mustang is its handy size and sensible proportions. The driving position is suitable for most people, but nearly all would prefer to see the steering wheel closer to the windshield so as to obviate the need for pushing the seat all the way back (4.5-in of travel) to be able to drive with straight arms, as this encroaches on the rear seat legroom. With the front seats in a middle position, rear seat legroom is acceptable, and the car qualifies as a genuine four-seater on all counts. Well, there is one thing. Elbow room in the back is a bit tight, and there are no arm-rests on the sides of the bench seat. Seat height, especially in front, is just about right, and all the controls are easy to reach and use. All the pedals, including the accelerator, are of the pendant type, and heel-and-toeing is no problem.

The speedometer has a horizontal dial with a needle and is accurate

within one or two percent, and a tachometer is available as part of the optional "rally pac" (their spelling), comprising a clock and a tach in a twin-pod housing with black camera-case finish that straddles the steering column, just aft of the instrument panel.

The Mustang brakes depend on engine size for drum diameter: 9-in with six-cylinder units, 10-in with V-8s. An optional power booster reduces pedal pressure by over 50%, but the brakes have nothing like adequate fade resistance—four consecutive complete stops from 80 mph reduces braking efficiency drastically. We were not able to test the disc-braked version but wish to applaud Ford Division for seeing the necessity of making discs optional.

It's interesting to contemplate briefly the progress made at Ford since the 1957 T-bird. The Mustang seats two more persons within a 6.0-in longer wheelbase and an 0.2-in greater overall length. The Mustang is 0.5-in lower and more than 400 lbs lighter (curb weights are 3323

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lbs against 2861). The engine is fractionally smaller (289 cu in vs the T-bird's 292) but will run on regular fuel while the older car needed premium gasoline. On top of that, the Mustang averages 16.6 mpg against 13.7 for the old 'bird.

The Mustang constitutes an entirely new and separate line of Ford cars (bringing the total up to five, not counting the products of the Lincoln-Mercury Division). It will be produced exclusively in a factory within the River Rouge plant. Its production capacity is not stated, but Ford aims to sell about a quarter-of-a-million Mustangs in its first 12-month period on the market. With the versatility of this design and the plentiful options, the demand might even exceed that figure.

**clp**

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