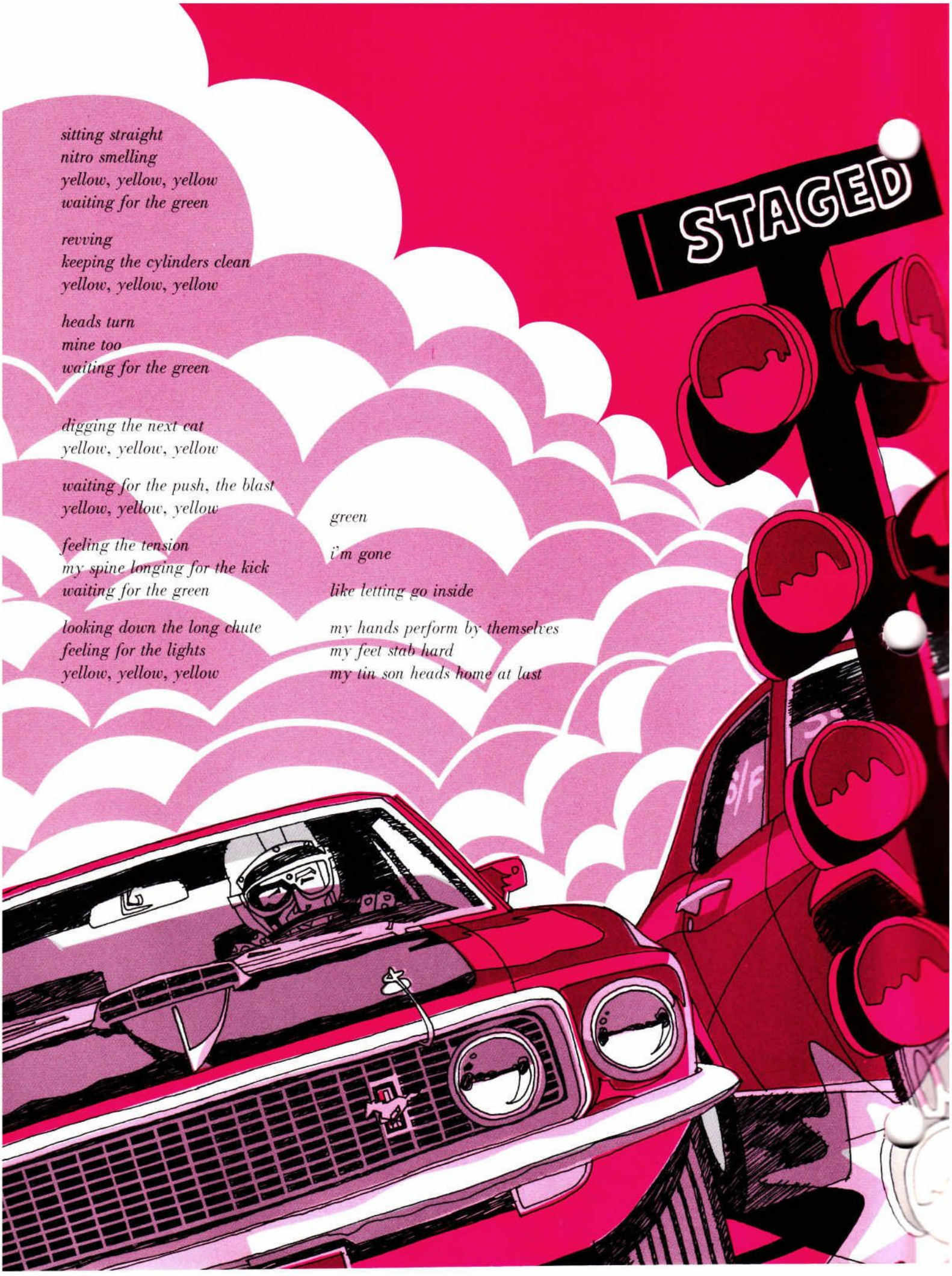
MUSCLE PARTS

A NEW CONCEPT IN STAGED PERFORMANCE

FORD
MERCURY



sitting straight
nitro smelling
yellow, yellow, yellow
waiting for the green

revving
keeping the cylinders clean
yellow, yellow, yellow

heads turn
mine too
waiting for the green

digging the next cat
yellow, yellow, yellow

waiting for the push, the blast
yellow, yellow, yellow

feeling the tension
my spine longing for the kick
waiting for the green

looking down the long chute
feeling for the lights
yellow, yellow, yellow

green

i'm gone

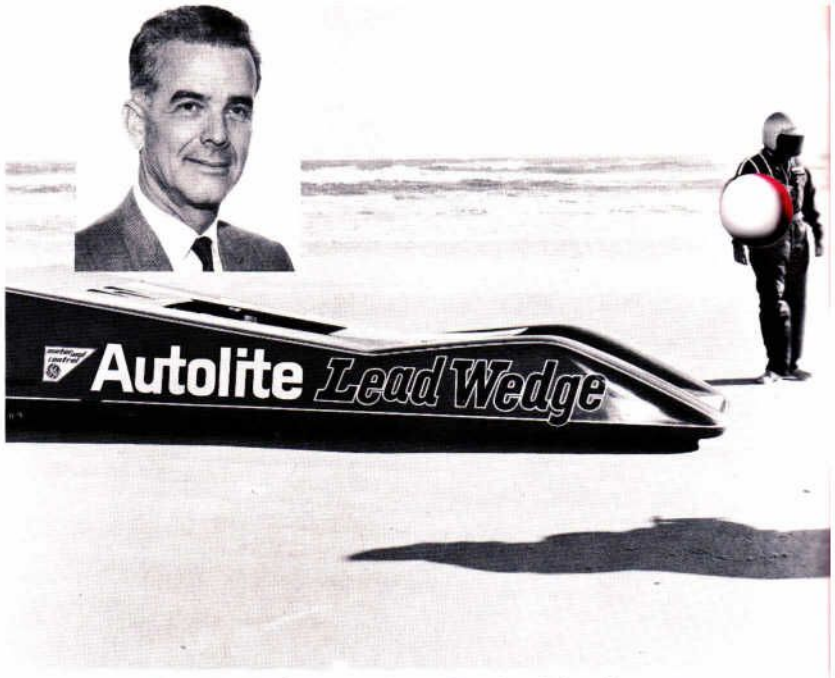
like letting go inside

my hands perform by themselves
my feet stab hard
my tin son heads home at last

WHERE IT'S AT

STAGED PERFORMANCE

...what it's all about!



Danny Eames—Autolite Performance Parts Merchandising Manager

Staged Performance is...

. . . BEGINNING AT THE BEGINNING

Every screamer begins with a standard passenger car engine. It's the American Way. Everybody builds hot parts for it, which they'll gladly sell you. Everybody tells you how to ream it, balance it, blow it, inject it, twist its tail until it wails. But nobody tells you how to do it from scratch . . . in detail . . . by steps. Nobody tells you that you can invest a ton and only get a pound of performance . . . if you buy the wrong pieces. So Ford got the idea . . . to do it. And did. We tell it all, straight out.

. . . HEARING YOU

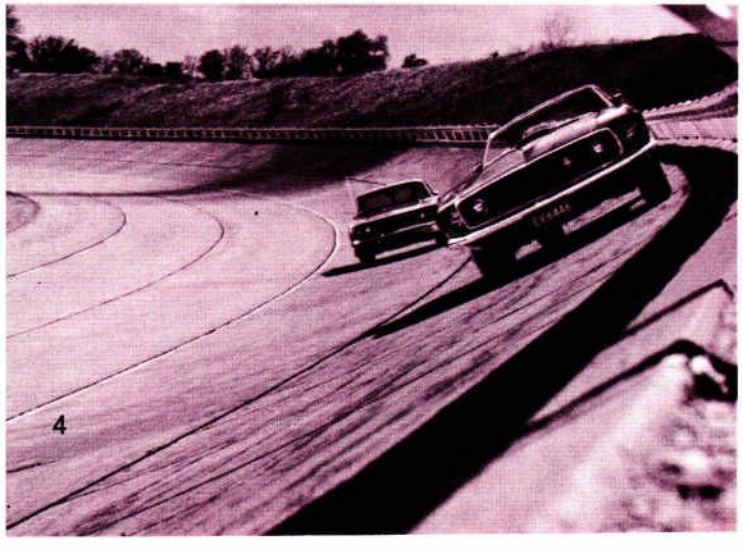
You said, "How do you do it? Where are the kind of good pieces for our Muscle Cars that Ford wins with at LeMans, Daytona, Riverside, Pomona and Indy?"—and we say, "At your Ford, Lincoln-Mercury or speed shop dealer." That's right. While you weren't looking, we stocked their shelves with the good stuff. And to make sure you don't confuse them, we named 'em MUSCLE PARTS. Because, like we said, "Staged Performance says it . . . like it never was said before." Staged Performance puts the capital "M" in Muscle.

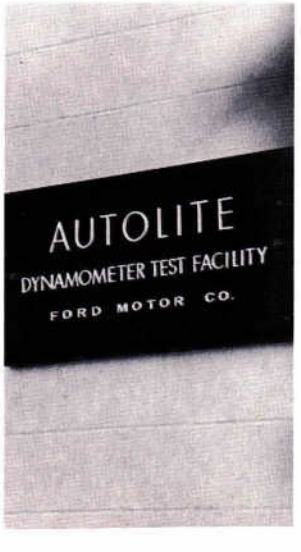
. . . FACTORY ENGINEERED MUSCLE PARTS

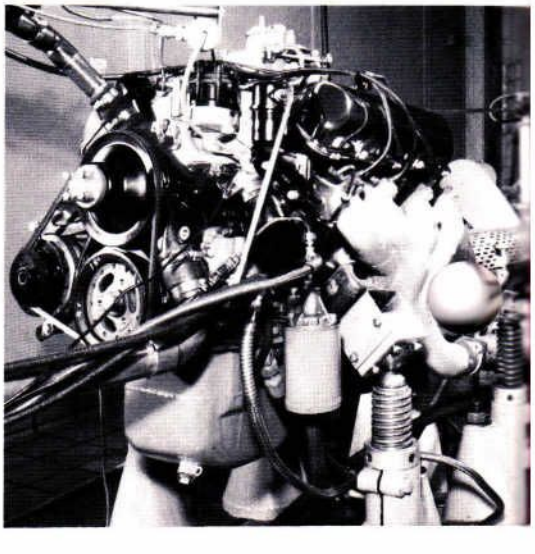
Ford performance engineers developed Muscle Parts. We took what we had learned around the world and applied it to our stockers. For openers, to save you bucks, we searched the parts bins for regular service parts that might do the job. If they didn't, we designed new pieces. We hung 'em together and rung them out on the track. Some blew up. So we bolted, beat, bent and dyno-tested. We run 'em and reworked them. We gouged, ground, flattened and fitted 'em . . . and ran the some more. We didn't quit until we had bulletproof piec across the board for our 289, 302, 351, 390, 427 and 428 mills. Staged Performance is the hot setup.

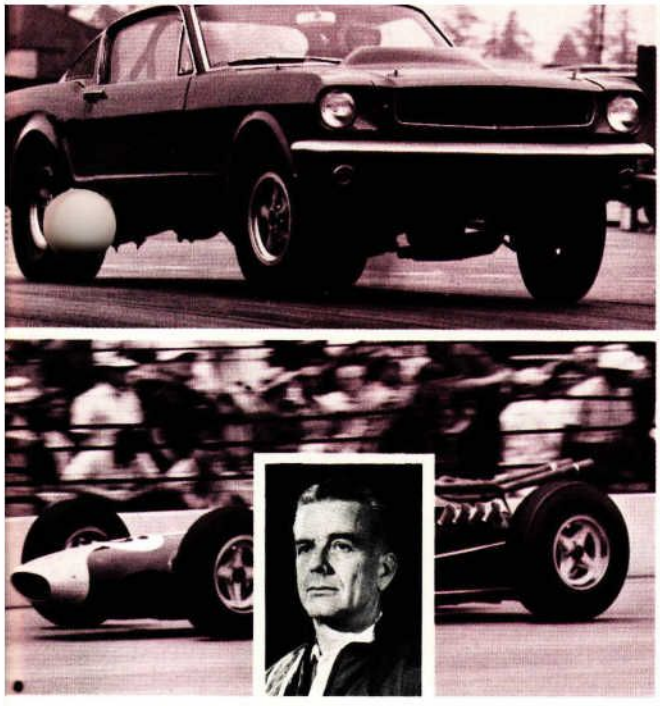
. . . FINDING WHAT YOU'RE LOOKING FOR

In this book, you'll find each engine in its own section. You don't have to read the whole book to find yours. But it wouldn't hurt. 'Cause you'll find the fundamental nitty-gritty's of performance . . . modification tips and blueprinting specs . . . the straight steer to "snuff 'em out" chassis and accessory mods . . . how to order . . . and how much competition coin it will take to build you some Muscle. Staged Performance is finding where you want to go . . . and getting there.









Doing Their Thing

Ak Miller—Ford Performance Advisor

. . . DANNY EAMES AND AK MILLER

Danny Eames is Autolite-Ford Performance Parts Merchandising Manager. The title says it. He deals in the pieces. The good stuff that turns your stocker into a screamer. Performance turns him on. He talks it to everyone he meets, and proves out new ideas himself. Like at Indianapolis, where he entered one of the first rear-engined machines in 1949. Like at Bonneville, where he wired some regular production high performance Autolite batteries together and hooked them up to an ex-torpedo motor. He called it a Lead Wedge and set a world record for electric vehicles of 138.862 mph in 1968. In between he has set more driving records, in more kinds of machines, than any other living driver. He knows what's happening in racing. He knows you want the good stuff.

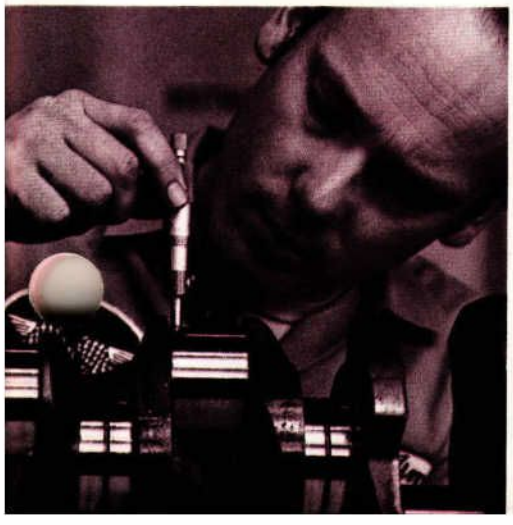
So, he developed Staged Performance. Fire up, and prepare to "march on 'em." With this book, you're covered.

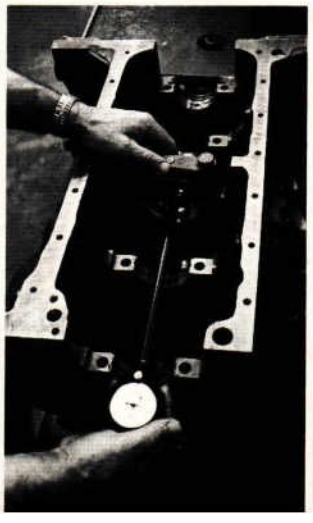
Ak Miller is Ford's Performance Advisor. Which tells you right off he's some kind of expert. And he is. Maybe the original Hot Rod Hero. He was running the ol' Ford flathead way back in 1934 when there were no strips or fancy tracks. He's been turning wrenches, mystifying onlookers, exploding myths, dyno-testing and annihilating the competition ever since. Ak co-founded the world's oldest hot rod club, and started the first Bonneville speed trials during his term as president of the Southern California Timing Association. He helped start the National Hot Rod Association, and currently serves as Vice President. He's raced everything from Pan Am's in Mexico to Pikes Peak in Colorado (where he holds the record of six straight wins in sports cars) and just about anything else with four wheels and a hairy mill. So we gave him a load of Muscle Parts and said, "See if they make it happen."

Ak's verdict was, they do . . . MUSCLE is Boss. Engineering's "fit & function" program of bolting complete packages of HP parts to stockers, and then checking them on the dyno, test track and actual practice gives you proven Muscle building parts in multi-stage steps. In the words of the ol' Bonneville runner . . . MUSCLE is the message.

. . . KEEPING YOU INFORMED

This book . . . and the Muscle Parts described . . . are just the beginning of a new approach to total performance at Ford. We're continuously developing new Muscle Parts and they'll soon be available. We will keep you informed in "Shop Tips," a monthly technical publication available from Autolite through Ford and Lincoln-Mercury Dealers. Autolite's National Service Department has also just published a big 100-page high performance book. It's the ultimate word on High Performance Engine fundamentals and operating principles. See page 78 for full details.





4V CID

12.5 CR

btdc

EFI

a = m|f

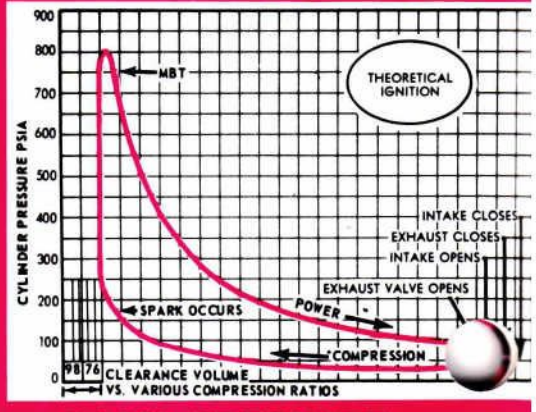
MOMENTUM

RPM

NITRO

Inertia

1320



BASIC PRESSURE VOLUME DIAGRAM

224

TRIMETHYLPENTANE

550 ft. bs.

THE NITTY GRITTY OF PERFORMANCE

KNOWING WHY...MAKES IT HAPPEN

Performance is getting there before the other guy. It's as simple as that. Screaming down the strip and snuffing out whatever is running in the next lane. Production stockers must perform too, but they also must do a lot of other things. Like start at −20°F, run cool at high temperatures, operate economically at low noise and vibration levels, etc. Achieving one characteristic often means sacrificing another. So design compromises are necessary. When you turn a stocker into a screamer, the idea is to make no compromise except for low E.T.'s. One wailin' mill looks about like the rest. So why is one a maximill? Why do certain setups always seem to shut down the other guys?

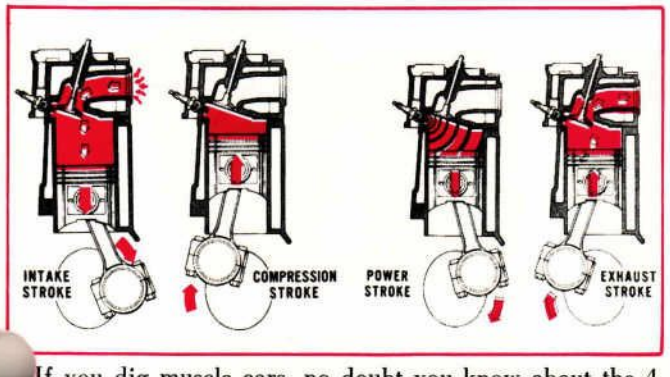
Running the good stuff is part of it. But there's more. 'Cause lots of drivers have the same pieces. However, the ones that consistantly win happen to have something in common. They're hip on how to hang the pieces together. They know *why* certain modifications work. They've dug into the nitty gritty of performance. That's what this section is about . . . understanding performance fundamentals.

Maybe you're a Hubie Platt or Don Nicholson, and don't feel you have much to learn here. Maybe. But more likely you've some bucks to exchange for the pieces to make your machine a screamer. Solid. But before you plunk down your competition coin, be sure you know *why* you're bolting on your muscle mods. We want you to use 'em correctly. Put the wrong pieces together and you may get muscled to trackside by guys who know what's happening.

IT'S ELEMENTARY

Under the hood; that's where everybody looks to see what makes a screamer squawk. But performance is more than a big hairy mill. True, the engine is the guts of performance, but all that power has to get to the ground. So performance mods also must include good stuff for the transmission, rear axle, wheels, tires, and various suspension components. Here is an elementary introduction to performance to assist in selecting Muscle Parts.

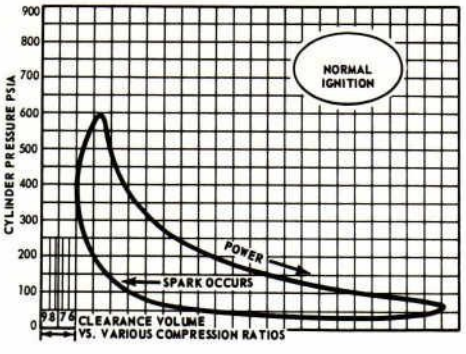
THE ENGINE



If you dig muscle cars, no doubt you know about the 4-cycle, internal combustion engine. How it sucks in an air/fuel mixture on the *intake* stroke; squeezes it tightly on the *compression* stroke; ignites it on the *power* stroke; and scavenges gases on the *exhaust* stroke. But do you know what actually produces power? It's pressure. Fantastically high, almost instantaneous pressure created by scorching temperatures that expand burning gases when the compressed air/fuel mixture is ignited. The pressure forces the piston downward and its reciprocating motion is changed to rotating motion at the crankshaft.

This process is illustrated by the theoretical pressure-volume (p/v) diagram on page 6. All engine design is directed towards achieving this ideal graph. But design compromises, friction, heat loss, etc., prevent this from occurring. The diagram for normal ignition looks something like this.

Moving leftward at the bottom represents compression. Note that pressure rises as volume decreases. Then ignition occurs. Pressure rises almost instantaneously at the beginning of the power stroke. The pressure drops during the power stroke, then the exhaust valve opens. As the pistons move upward to force out gases on the exhaust stroke, the pressure doesn't change because the exhaust valve is open. Likewise, pressure doesn't increase on the intake stroke, as the intake valve opens to allow the air/fuel mixture to rush in and fill the void left by the piston. However, as the piston starts upward on the compression stroke, the intake valve closes and the air/fuel mixture volume decreases (compresses) as another cycle begins.

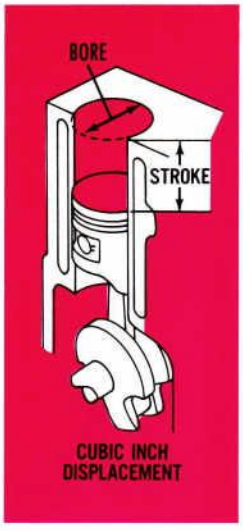


WORKING UNDER PRESSURE

Peak pressure in the average stock engine reaches about 1,000 psi just after the piston starts its downward power stroke. That's a momentary force of nearly 10,000 pounds on the top of a 3.5″ dia. piston. This force determines an engine's performance potential in terms of WORK and POWER. *Work* is measured in foot-pounds. It is calculated by multiplying the "average" force that pressure creates during the power stroke, times the distance the piston moves. *Power* is the rate, or speed, at which work is done. Which gets us right to the core of what separates a stocker from a performance mill . . . TIME.

Production engines must operate under great extremes of operating conditions . . . but all that is wanted from a screamer is all the power you can get, right NOW. To produce a long, strong p/v power curve, such things as combustion chamber design, spark plugs, flame travel, ignition, air/fuel mixture, compression, valves and cam grind must be considered. Let's examine them one at a time.

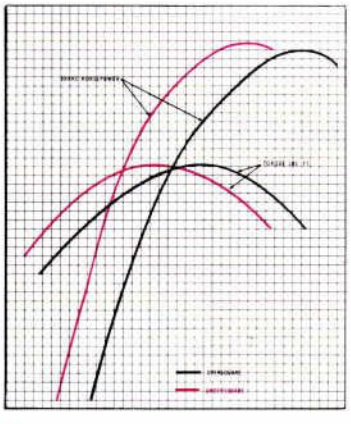
Cubic Inch Displacement



In sports, the good "big" man invariably beats the good "little" man. And with engines, the ones big in "cubes" (CID) put out more power than smaller mills, other things being equal. It's simply a matter of being able to breathe a bigger air/fuel mixture, which leads to higher compression pressures. CID is the total "swept" volume of all cylinders . . . the volume displaced by pistons as they move between top-dead-center (TDC) and bottom-dead-center (BDC). It's calculated by multiplying piston Bore x Bore x Stroke x 0.7854 x the number of cylinders.

BORE (piston dia.) and STROKE (distance piston moves up and down) are good indicators of engine performance potential. Increasing either, or both, increases CID and thus power. If the cylinders are bored out, then of course, oversize pistons must be installed. The stroke is changed by installing a crankshaft with longer throws. Special "stroker" kits are also available. They generally include: oversize pistons and a crank with a longer stroke. However, unless the cam and carburetion are also modified, boring and stroking usually only increase low and mid-range power.

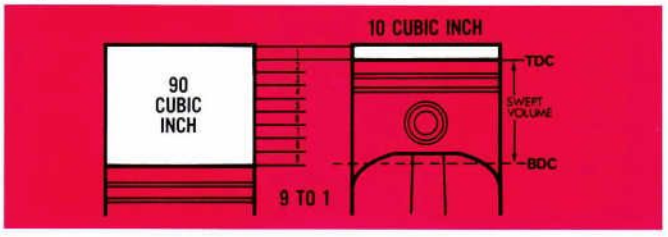
Engines with equal bore and stroke dimension are called "square." Increasing the bore over the stroke (an "oversquare" engine) increases torque at high rpm. Increasing the stroke over the bore results in an "under-square" engine that develops peak torque at lower rpm. Torque drops off near mid-range as horsepower continues to rise because volumetric efficiency decreases at higher rpm. This is essentially a problem of valve timing where there is less time to get a clean, *full* air/fuel charge into the cylinder and less time to get rid of the power-depleted exhaust gases. This results in less force being exerted on the piston. However, the rate of doing this work increases with higher revs, thus the horsepower continues to rise.



How Bore and Stroke affect torque and horsepower

Compression Ratio

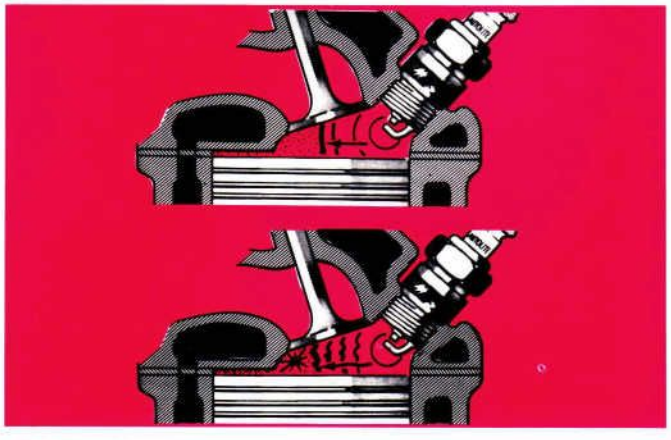
The p/v charts show that as the piston moves upward on the compression stroke, the pressure gradually increases until ignition. The cylinder volume at bottom-dead-center (BDC) compared to the volume at top-dead-center (TDC) is called the compression ratio. It's a measure of how tightly the air/fuel mixture is compacted before ignition, i.e., the pressure in the cylinder. The higher the pressure *before* ignition . . . the higher the pressure *after* ignition—which translates into more power. So packing the mixture more tightly under higher pressure with higher compression ratios is another way to get more power from an engine.



9.0:1 Compression Ratio

However, this technique must be limited because gasoline tends to "detonate" when compression gets to a certain point. Detonation is the spontaneous explosion caused by too high temperatures and pressures in front of the flame front that moves through the combustion chamber after ignition. Detonation should be avoided because it burns valves, pistons and plugs, and places excessive loads on bearings. A fast, but smooth burning flame front can be achieved with gasolines of sufficient "octane" rating. Engines with a compression ratio of 9.0:1 (equivalent to compressing 90 cubic inches down to 10 cubic inches) use regular fuel having an octane rating of about 95. Premium fuel (100 octane) must be used with compression ratios of around 10.0:1. Most street strip engines are limited to a compression ratio of about 12.5:1 because they require approximate 105 octane gas, which is about the highest superpremium available from the pump.

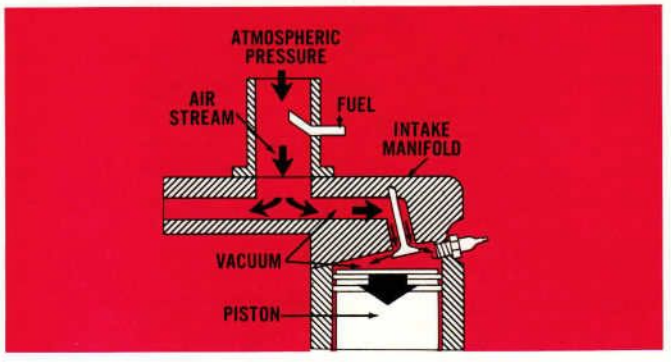
Most of the space into which the air/fuel mixture is compressed (combustion chamber) is located in the cylinder head. Therefore, "milled" heads, thinner head gaskets, or "domed" pistons are common methods to increase compression ratio and power.



Carburetion

Power-ability starts with breathe-ability . . . and that's what carburetion is all about—getting air and fuel in the proper mixture to the cylinders. The more exotic part of this "induction" system is the carburetor and intake manifold. The carburetor mixes air and fuel by means of several systems, or

circuits, that operate under various conditions from idle to full power. Stripped of its apparent complexity, however, the carburetor is nothing more than a tube or barrel through which an air stream passes and picks up droplets of fuel. Atmospheric pressure causes the air stream, when it pushes in to take the place of the vacuum created by the downward intake stroke of the pistons.



Consuming all the oxygen in the air achieves maximum power from the air/fuel mixture. Ideally, it takes 14.8-parts of air to burn 1-part of fuel. A number of conditions, however, prevent ideal burning. Therefore, the mixture must be enriched by mixing more fuel (about 12.0 or 13.0:1 ratio) to assure complete combustion of all the oxygen. Air/fuel ratios can be quickly changed by using different sized "main" metering jets available for this purpose.

The size, shape and number of intake passages affect the kind of air/fuel mixture you can get into the combustion chamber. Increasing the size and number of carburetor barrels (venturis) increases the rate (in cfm, cubic-feet/minute) at which an air/fuel charge can be fed into the cylinders. Several small diameter venturis are better than a couple of large venturis. For a given engine size, the air flow speed is faster in a small venturi. When you stomp the accelerator and open extra barrels, the higher air flow speed avoids "flat" spots for more instantaneous response.

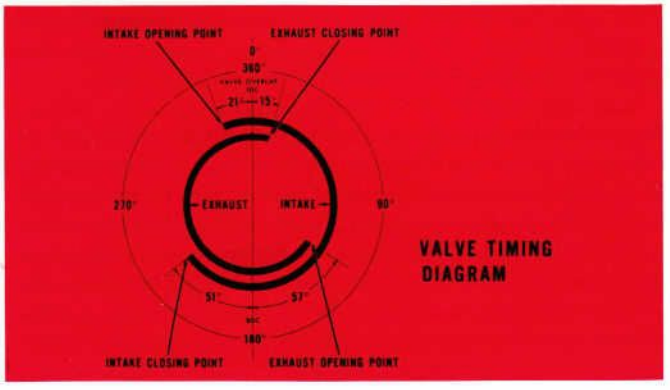
Scoops of various types that "ram" air into the carburetor also increase performance. It isn't so much the increased pressure that produces extra power, but the temperature of the air. The cooler outside air is more dense, and thus contains more power-producing oxygen. Scooping up cool, outside air and ramming it down the carburetor throat increases horsepower about 7%.

Special intake manifold designs, such as the "high riser," feature gently curved runners that reduce air flow restriction to increase breathing capacity. Smoothing and polishing such items as manifold runners, cylinder head valve ports and combustion chambers also reduces air flow restriction for maximum performance.

Also important, but often overlooked, is the necessity of maintaining adequate fuel pressure at the carburetor at all times. Oversize fuel lines, fittings and electric fuel pumps help here.

CAM AND VALVE TIMING

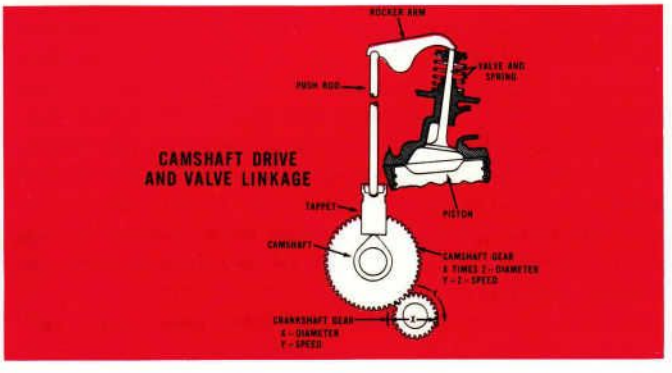
The cam via the valve train mechanism operates the intake and exhaust valves. To obtain peak performance, the intake valve must open in time to let the maximum volume of air/fuel mixture into the cylinder on the intake stroke. Likewise, the exhaust valve must open in time to purge the maximum volume of residual gases from the cylinder on the exhaust stroke. Conversely, they must also close soon enough to produce maximum compression and power. Obviously, valve timing has a big effect on how well an engine breathes. Timing is expressed in degrees of CRANKSHAFT rotation. Each stroke takes 180° of crankshaft rotation, or a total of 720° for the complete four cycles. The cam rotates at one-half crankshaft speed; thus, one cam revolution equals two crankshaft revolutions. This makes it possible for each cam lobe to open and close a valve once during 360° of CAM rotation, while the crank is making four strokes during 720° of rotation.



The shape of the camshaft lobe determines the rate at which the valves open and close, the length of time they remain open (duration) and how fast they open (lift). These specs together with valve head diameters relate directly to engine breathing.

At low rpm's this isn't much of a problem. As rpm's increase, the intake and exhaust gases do not start to flow as soon as the valves open, nor do the valves open instantaneously. High rpm's also mean there is less time for the gases to enter and exit the cylinders. Valves therefore, must be opened and closed before strokes are completed. This results in both valves being open at the same time; a condition called "overlap." High performance cams may have overlap in excess of 90° and a total valve opening duration over 300°. Cams of this design produce significant power increases at high rpm's, but tend to cause a slight power loss and rough operation at low rpm's.

Like the pistons and connecting rods, valve train components move with a reciprocating (back and forth) motion. They continuously accelerate from zero velocity to a high speed and back to zero again. The weight of a part, multiplied by the velocity at which the cam accelerates the part , exerts an "inertia" force. Increasing its speed increases its inertia force, which is equivalent to increasing its weight. Thus,



higher and higher rpm's have the effect of adding great weight to valve train components.

Special lightweight pieces, such as hollow-stem valves, are often used for high performance operation. Dual or "stiff" valve springs are sometimes needed above 5000 rpm to quickly close the valves and prevent valve "float." (Valves not fully seating or closing between strokes.) As rpm's approach 6000, mechanical, or solid, lifters are used to more effectively prevent float. At high rpm's hydraulic lifters have trouble maintaining zero lash (no clearance) in the valve train. They "pump up" and destroy valve train adjustment. Solid lifters are noisier because they require valve lash (about 0.020" clearance) but they resist valve float. Either pinned or threaded rocker arm studs should be used for high rpm operation to withstand the added stress at these revs.

Cams and valves present almost an infinite number of variables to achieve improved performance. You must use common sense to tune your cam timing with your carburetion and porting. Hot cams need plenty of fuel to feed them. So don't hook them up with one small 4-barrel and insufficient porting. If you don't have this, you'd better add more carburetion and bigger heads before you touch the cam. And don't forget the exhaust side. Wild, long-duration cams can't do the job if the exhaust gases aren't scavenged efficiently.

EXHAUST PRESSURE

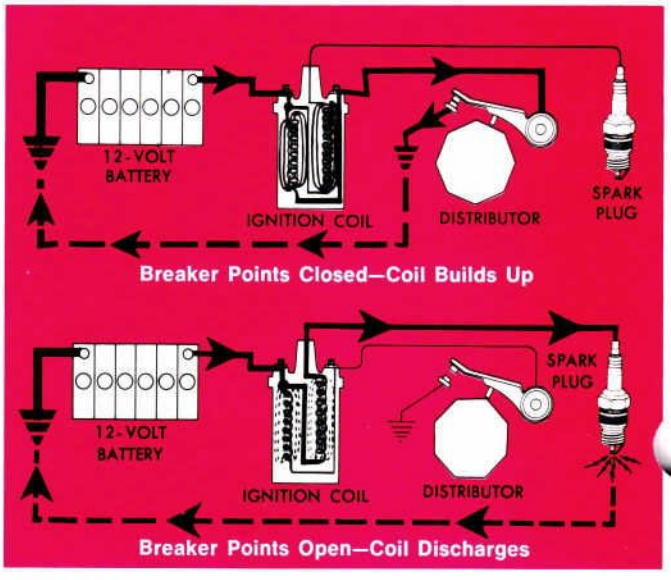
Sharp corners and small passages restrict the flow of exhaust gases just as they do intake gases. Any force the piston must exert to help push gases from the cylinders, subtracts from the power output of the engine. When more air is fed into the engine via multi-barrel carburetors and manifolds, provisions must be made to exhaust more gases. Dual, "tuned" exhaust headers do this most effectively. They are made of steel tubing and feature gently curved passages to reduce back pressure. They are also cut to a length that "tunes" them to the pulses of exhaust gases exiting the cylinders. This gives a slight "suction" to the exhaust ports that scavenges, or draws gases out, instead of the pistons pushing it all out.

IGNITION

Peak performance also depends upon burning the highly compressed air/fuel mixture in the shortest possible time to obtain the highest possible temperatures and pressures. The voltage necessary to jump the spark plug air gap for a strong hot spark and fast combustion increases as the compression ratio goes up. The coil has less (saturation) time to produce high voltage surges at increased revs. Replacing the single breaker point with dual breaker points increases saturation time. Instead of *one* breaker point firing all eight cylinders, one of the dual points opens the circuit and the other point closes the circuit. This increases cam dwell 7°-8° (which connects the coil to the battery for a longer time) thereby letting the coil build up a stronger magnetic field to produce hotter, higher voltage at the plug. Dual breaker points feature specially calibrated springs that reduce point bounce at high rpm's. This prevents erratic coil build-up and contributes to a stronger magnetic field.

Performance engines with their higher compression temperatures require spark plugs of the correct "heat range." Heat range is an indication of a plug's ability to dissipate heat. The lower the number the colder the plug. For peak performance, plugs must be cool enough to prevent pre-ignition, but hot enough to resist fouling. Hot-running engines need "cold" plugs to better dissipate heat. For instance, a street engine might use an Autolite BF-42, while on the strip a BF-32 should be used. See page 17 for Autolite heat range chart.

Use of steel or copper core spark plug wires, rather than the carbon-impregnated resistance type that suppresses radio and TV interference on production cars, assists in getting a hotter spark. It utilizes both the starting (capacitive) and the trailing (inductive) end of the spark to fire and sustain the spark. A radio suppression kit should be used for the street.



CLUTCH

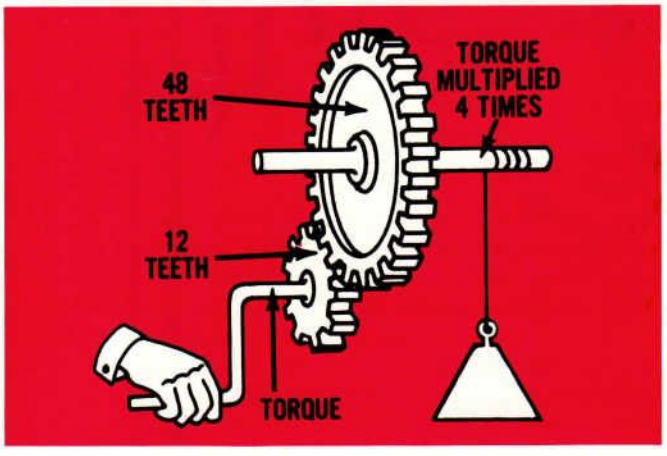
The clutch couples the engine to the manual transmission. It must be designed to handle high torque loads and control slipping at the high rpm's where gears are shifted. Generally this consists of beefier parts and stiffer springs. Most performance cars have this type installed at the factory. If you're adding muscle to a stocker without a heavy duty clutch, make sure you put one in. As an extra margin of safety, a heavier clutch housing (scattershield) is recommended.

TRANSMISSION

Muscle cars almost exclusively use three- or four-speed manual transmissions. Manual boxes afford great flexibility to meet a wide range of driving conditions. And they'll generally run a lower E.T. than an autoshifter. However, E.T.'s are more consistent with hydros because the possibility of missing a shift is eliminated. Automatics are a good compromise for a smooth-running street-strip car.

Transmissions, regardless of type, multiply engine torque. Internal combustion engines have very little torque at low rpm's. They don't really put out till revs get near the top end. So, a small tranny gear turns a larger gear to multiply torque. Torque multiplying power, or ratio, can be determined by counting the number of teeth on each gear. Higher ratios mean greater torque multiplication.

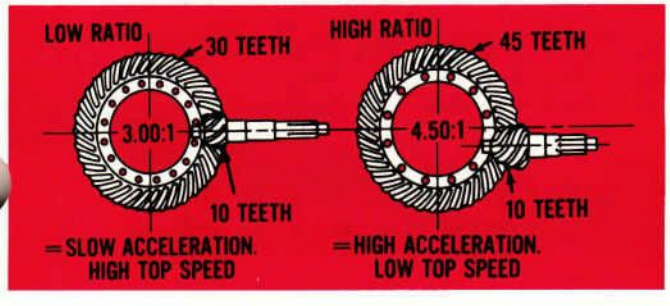
Low engine torque combined with car weight require first gear ratios of about 3.00:1 to set the car in motion. As car speed increases, less torque multiplication is needed. The transmission is successively shifted thru gears until "high" (1.00:1 ratio) is reached and engine power efficiently moves the car.



Engines achieve peak performance by maintaining rpm's where maximum power output occurs. A tachometer is a handy accessory to indicate engine rpm, and thus proper shift points. Each shift to a higher gear momentarily drops the revs because of the ratio spread between gears. The closer the ratios, the easier it is to maintain the desired rpm. This is what makes 4-speeds superior to 3-speeds; the ratios are closer together. Optional "close ratio" gear sets are available for drag competition. However, acceleration suffers below 20 mph with "close ratios" if first gear is not high enough. For maximum acceleration, choose a tranny with a numerically high first gear.

REAR AXLE

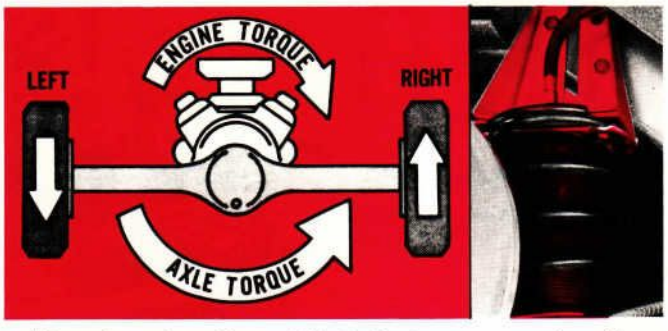
Choosing rear axle gears is often a difficult decision. They multiply engine torque at all times, whereas transmissions multiply torque in all gears except high. You can change tranny gears to meet conditions, but once your axle set is in, that's it. A good gear for highway cruising won't blast you off the line, and vice versa. So compromises must be made, or you can use two gear sets; one for the street and one for the strip. Ford offers ratios from 2.75:1 to 5.67:1. Numerically low ratios give less torque multiplication and acceleration, but greater top speed and economy. Conversely, numerically high gear ratios twist out greater acceleration, but a lower top speed. As a rule, ratios above 4.0:1 are not practical on the "street" and should only be used in competition machines.



The earth-quaking torque put out by performance engines often causes rear wheel spin with standard axles. Two friction types of "locking" axles are available on production cars; Limited Slip (constant load type) and Traction-Lok (variable load type). They distribute torque to both rear wheels, so that if one wheel wants to spin, power is transferred to the opposite wheel, thereby maintaining full power at BOTH wheels. The ultimate in locking axles is the "Detroit Locker" no-spin differential. Instead of a clutch pack (used in factory lockers), it uses a steel pin device that moves up a ramp and positively locks the rear axles together. Regardless of axle type, the correct ratio for lowest E.T.'s is one that flashes the trap lights with the engine rpm at peak power ouput.

TRACTION

To get maximum performance, all the engine's power must "get to the ground." Peak acceleration occurs when *both* wheels are *equally* loaded and delivering power just to the point of slipping. Because engine torque tends to lift the right rear wheel, special air lift springs can be used to counteract this force. Pumping up the right air lift bag has the effect of adding weight to the right wheel. This equalizes the loads for better traction and maximum acceleration. The same effect can be achieved by setting up the suspension to push down on the left front and right rear wheel to counteract engine torque.



Tires that take a bigger "bite" also improve traction. Extra wide "cheaters" or "slicks" put a much larger footprint on the road than standard boots. Many look alike, but there are important differences. Some are strictly for the track and will not give good traction on wet highways. Others can be used on or off the track, while still others are strictly for the street. Composition and tread design (or lack of tread) usually determine how slicks are used. A couple of things to remember: (1) A big, wide tire is better than a little, wide tire because it has a larger footprint, and (2) Always select a tire for *traction*—not to get a larger or smaller diameter to compensate for the wrong gear ratio.

ROADABILITY

Roadability is essentially a matter of handling. A number of chassis items are available to improve over-all street/strip performance . . . "quick ratio" steering gears for more responsive steering control; disc brakes to improve braking at high temperatures; heavy duty springs, shocks and stabilizer bars to limit wander, bounce and roll; and bronze suspension linkage bushings, special rear axle pinion bumpers, leaf spring clamps, and traction bars to control wheel-hop and axle wind-up on acceleration.


MODIFICATION TIPS,
BLUEPRINTING SPECS...
AND ALL THAT STUFF

CARBURETION

Engines are basically air pumps. The more air and fuel you cram into them, the more power they produce. That's why we say power-ability starts with breathe-ability. Cam timing, valve sizes, and combustion chamber design all affect breathing, but the easiest way to improve a stocker's breathing is by modifying the carburetor and intake manifold. That's because production carburetion setups are a compromise between power and economy.

AIR/FUEL RATIO

The first compromise is lean vs. rich air/fuel ratios. Lean air/fuel ratios around 16.0:1 are okay for cruising economy, but will never do for maximum power. Peak power only occurs when the fuel burns all the oxygen in the air. This requires a ratio between 12.0 and 13.0:1.

Most stockers have a ratio around 14.0:1. This can be modified by recalibrating the carb by changing the main jets. (NOTE: Do not drill jets to increase their size because the tool marks will not let them flow fuel properly.) Essentially it's a matter of trial and error. Temperatures and differences in altitude affect pressure that in turn affects the best ratio for max-power. High altitudes require leaner jetting, the sea level richer mixtures. Generally, start with a 0.002 larger (richer) jet (See pages 20-21) to see if this improves performance. If so, continue in 0.001 increment jet changes to arrive at peak performance. If 0.002 richer jet didn't improve performance in beginning, try a 0.001 leaner (smaller) jet, and continue in this direction to see if it improves your machine's sock. Secondary jets can usually be changed by installing new metering jets, or a metering body plate (See pages 20-21). However, they have less effect than main jets, and then *only* at full throttle. Idle mixture has practically *no* effect on performance and shouldn't be changed.

MORE CUBIC FEET PER MINUTE

Jetting improves performance, but the way to make your mill really hum a strong tune is to increase air flow capacity. Many multi-barrel setups are available—large 2-bbl jobs, big 4-holers, 3 2-bbl carbs and dual quads. Two things must be kept in mind: (1) Several small barrels (venturis) are better than a couple of large venturis. That's because air flow is faster in smaller diameter venturi. Opening extra barrels on acceleration increases the total cross-sectional area. This increases capacity, but momentarily decreases air flow speed; commonly called a "flat spot." This can be a problem with large diameter venturis, but is eliminated with smaller venturis. (2) Don't "over-carburet." Too many cfm will give you a continuous flat spot until you get to the top of your power curve, and then add very little to peak performance.

289-302-351 INDUCTION

The 600 cfm 4-bbl Holley and high riser manifold setup recommended for the small blocks adds lots of extra breathing capacity, but not *too* much. It more than doubles the stock 289-302 2-bbl carbs 280-290 cfm capacity and greatly increases the production 4-holer's 470-480 cfm rating. For 351 CID mills, it likewise significantly increases their stock ratings of 350 cfm and 470 cfm for the 2-bbl and 4-bbl carburetors respectively.

390-428 INDUCTION

Factory 390 2V's flow 350 cfm and 390 4V's pump out 595 cfm. Stock 428 4V Cobra Jet mills use big Holleys rated at 735 cfm. This big breather does the job so good that it doesn't need replacement on the modified 428 CJ. The 735 cfm is also used on "muscled" 390's.

427 INDUCTION

The big muscle mill comes with a 780 cfm—4-bbl carb from the factory. 1966 and later models used a medium riser manifold that has the same breathing capacity and horsepower output as the earlier high riser job. A medium riser 8-bbl setup also was available with a pair of 652 cfm carburetors. When installed on the optional 427 tunnel port manifold and heads they put out earth-quaking performance.

CARBURETOR TIPS FOR MAXIMUM PERFORMANCE

1. For best results when changing jets to obtain an air/fuel ratio around 13 to 1, use an air/fuel ratio meter. If done by trial and error, try .002 rich or lean as a starter.
2. Elevation affects jet sizes. Higher elevations call for leaner jets—'cause lower density air at higher altitudes requires less fuel.
3. Block the manifold heat riser. This diverts heat away from the air/fuel mixture. This results in a cooler, more dense mixture that contains more power-producing oxygen.
4. Observe specified float settings. High float settings enrich mixture, and low ones lean it out.
5. Be sure the progressive mechanical or vacuum linkage that actuates secondaries functions correctly or overcarburetion on the low end may cause your mill to fall on its face.
6. If heads or manifold have been milled, make sure mating ports match up. If not, file to smooth out for better flow.
7. To maintain 5-7 psi fuel pressure from starting line thru the traps, mount electric fuel pumps near fuel tank. Also use over-size lines AND fittings. A 3/8" dia. is good up to 600 horses.

CAMSHAFTS

CAMSHAFTRY

Sooner or later (usually sooner) performance talk gets around to, "What grind are you running?" More romance and speculation surrounds camshaftry than any other muscle modification.

Any number of cams are supposed to exterminate all opposition, turn thousands of revolutions . . . over and above the call of duty, or twist out torque that literally shears bolts off the rear wheels. All this talk is good, since it serves to focus attention on the importance of doing a lobotomy on your stocker by switching to a HP grind. And in this area, most enthusiasts would rather switch than fight.

But before switching, separate fact from fiction. It takes no magician to grind lobes that provide gobs of lift, duration and overlap—that is, lift valves higher, open them quicker, and hold open for longer periods of time. The problem is selecting a cam compatible with carburetion and specific driving application. Essentially, this is a matter of choosing gears and tire sizes that allow your engine to operate in its peak power range, and then matching a cam to it. Grinding a cam to ideally suit all three cam design elements requires compromises.

DURATION

Keeping valves open for longer periods (duration) gives them more time to do their respective jobs. It's especially applicable to intake valves. Opening the intake valve at high rpm while the piston is still on the exhaust stroke lets the moving column of air in the manifold rush in and overcome the upward force of the piston. About time the air slams into the piston, the piston starts downward to fill the cylinder. Getting the air flow started early gives a supercharging effect. Longer duration works well at high rpm for significant horsepower gains, but not at low speeds. Air isn't moving fast enough in the manifold at low rpm's and the piston actually pushes air back out the intake valve affecting idle and low speed performance. Keeping the exhaust valve open longer during intake stroke assists in scavenging "used" gases.

OVERLAP

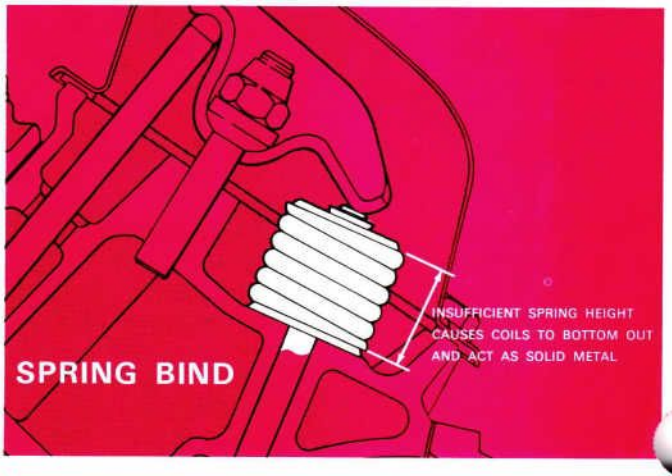
This is the period that both intake and exhaust valves are open. Its primary function is scavenging exhaust gases by taking advantage of pressure differentials that exist at TDC. At high rpm's the intake gases travel fast enough to actually help push out the exhaust gases. This fills the cylinder with a "cleaner" air/fuel mixture that develops more power. However, at low speeds the intake air isn't moving fast enough to do a complete job of purging the exhaust gases and a diluted air/fuel mixture gives less power.

LIFT

Valve lift is a big factor in engine breathing because the more the valve lifts off its seat the more opening there is for gases to pass by. Total lift is a function of cam lobe height and rocker arm ratio. A 0.341" lobe and 1.76 ratio rockers would give you a "theoretical" lift of 0.600". The actual lift varies a little because of clearances and stack-ups in the valve train.

Increasing lift over stock figures causes two conditions that must be checked. First, is "spring bind." High lift cams may move the valve so far that the stock spring coils bottom out. Special, stiffer HP springs and increased spring height eliminate this problem. Second, is piston-to-valve clearance. If valves move far enough, they may hit pistons. This can be corrected by machining new or oversize "eyebrows" in the top of the piston to maintain at least 0.080" clearance on intakes and 0.100" on exhausts.

All of these factors have been carefully weighed by Ford in designing cams. Each one assures a proven reliable cam that will give the ultimate in desired performance . . . and at a very economical price.



CAMSHAFT TIPS FOR MAXIMUM PERFORMANCE

1. When replacing a cam, it's good practice to install new related components such as tappets, springs, retainers, etc. Generally, new tappets are only necessary if the 0.002" crown on the cam end is worn flat. Be sure spring height and pressure meet specifications.
2. Never use hydraulic lifters with a mechanical cam, or solid lifters with hydraulic cam as the ramps are not designed for them to be interchangeable.
3. Replace timing chain and gears to assure proper timing.
4. Always be sure there's adequate clearance between valve and piston head.
5. Use cams of mild or medium duration and overlap with automatic transmission equipped cars.
6. Always use lots of lubricant such as Ford Oil Conditioner (Part No. C2AZ-19579-A). It contains zinc phosphate additives to resist scoring or scuffing on wearing surfaces when installing new cam or valve train components.
7. Good cams, especially the hotter grinds, should always be complemented with improved carburetion and exhaust mods.

COMPRESSION

COMPRESSION'S THE DIFF

Performance mills often vary in component design, but one thing they all have in common is high compression. So it's natural to think of adding compression to put extra muscle in your stocker. The added compression creates higher working pressures and greater heat, which in turn, extracts more power from the air/fuel mixture.

The most popular and least expensive routes to more compression are thinner, steel head gaskets and/or milling cylinder heads or block. Deck or casting thickness, valve-to-piston clearance, etc. limit the amount of metal that can be milled off. From 0.010″ to 0.040″ is common with most modern engines. Milling heads or block also requires milling of intake manifold to maintain correct port alignment and good gasket sealing.

Special "domed" or "pop-up" pistons can also be installed to increase compression ratio. Piston-to-valve clearance should always be checked with new pistons.

CHECKING CYLINDER HEAD CC

Since compression ratio compares cylinder volume at BDC to TDC volume, knowing the exact volume can assist in adding to the compression ratio. The chart shows how many thousandths must be milled from the head to reduce combustion chamber volume by one cc.

The combustion chamber's irregular shape requires a special cc-graduated burette or flask filled with mineral oil or automatic transmission fluid to measure its volume. They are available at any drug store. Two methods can be used. (1) Tilt the engine on its side. Move piston to TDC (compression stroke with both valves closed) and pour oil into chamber through spark plug hole. The amount of oil it takes to fill the chamber to the BEGINNING of the threads is the total volume of the combustion chamber above the piston. (2) If heads are disassembled, lay them flat with chambers up and valves installed. Lay a clear piece of plastic that has been pierced with a small hole over the chamber. Seal plastic to head with grease. Measure combustion chamber volume by filling it through the hole.

Cylinder Head and Intake Manifold Milling Charts

CHART I
AMOUNT OF STOCK TO REMOVE TO ASSURE CORRECT MATING OF PORTS.

ENGINE (CU. IN. DISP.)	CYLINDER HEAD (INCHES)	INTAKE MANIFOLD	
		SIDES (INCHES)	BOTTOM (INCHES)
221-260 289-302 351	.010	.010	.014
	.020	.020	.028
	.030	.030	.042
	.040	.040	.057
352-390 406-427 428	.010	.012	.017
	.020	.025	.034
	.030	.037	.052
	.040	.049	.069
	.050	.062	.086

CHART II
AMOUNT OF STOCK TO MILL THAT WILL REDUCE COMBUSTION CHAMBER VOLUME BY ONE CUBIC CENTIMETER. (1 C.C.)

CYLINDER HEAD IDENTIFICATION	PRODUCTION YEARS	RECOMMENDED DEPTH OF MILL (INCHES)
289, Small Chamber	1963—64	.0065
289-302, Large Chamber	1965—68	.0060
289-351, (GT-40) Race	1965—68	.0055
352-390 HP	1960—61	.0070
390 GT	1965—68	.0050
406 HP	1962—63	.0060
427, Low, Medium, Hi-Riser	1963—68	.0050
427 Tunnel Port	1967	.0050
427 Tunnel Port	1968	.0045
427 SOHC	1966—68	.0030
428 CJ	1968	.0050

GT = Grand Turismo; HP = High Performance; CJ = Cobra Jet; SOHC = Single Overhead Cam

COMPRESSION TIPS FOR MAXIMUM PERFORMANCE

1. Never add compression to an engine not in top condition.
2. When milling heads, also reface and reseat the valves.
3. Do not mill heads in excess of 0.050″.
4. Check valve clearances. Pay particular attention to clearance between valve head and piston at TDC. Cams with more overlap require more clearance. A good rule of thumb is: 0.080″ for intakes and 0.100″ on exhausts.
5. Set valve spring heights to minimum specifications.
6. Install factory replacement head gaskets.
7. Extra compression is particularly desirable with "wild" cams because they tend to close valves later on compression stroke, which in turn, reduces working pressure and power output.

IGNITION

THE HIGH REV WORLD OF 5000 AND BEYOND

Ignition is essentially a matter of spark timing to burn the air/fuel mixture in a manner to extract maximum power. This is highly critical as rpm's increase because there's less and less time to get the job done. Stock ignition does a good job in the 2500-3000 rpm range in which it's designed to operate most of the time . . . and continues to do so up to around 5000 rpm. At these high revs, engines really put out the sock, and the ignition system needs a few modifications . . . like dual points, steel core spark plug cable, "cooler" plugs, and recalibrated distributor advance timing curve . . . or else all the induction goodies, wild cams and headers in the world won't make your stocker a screamer.

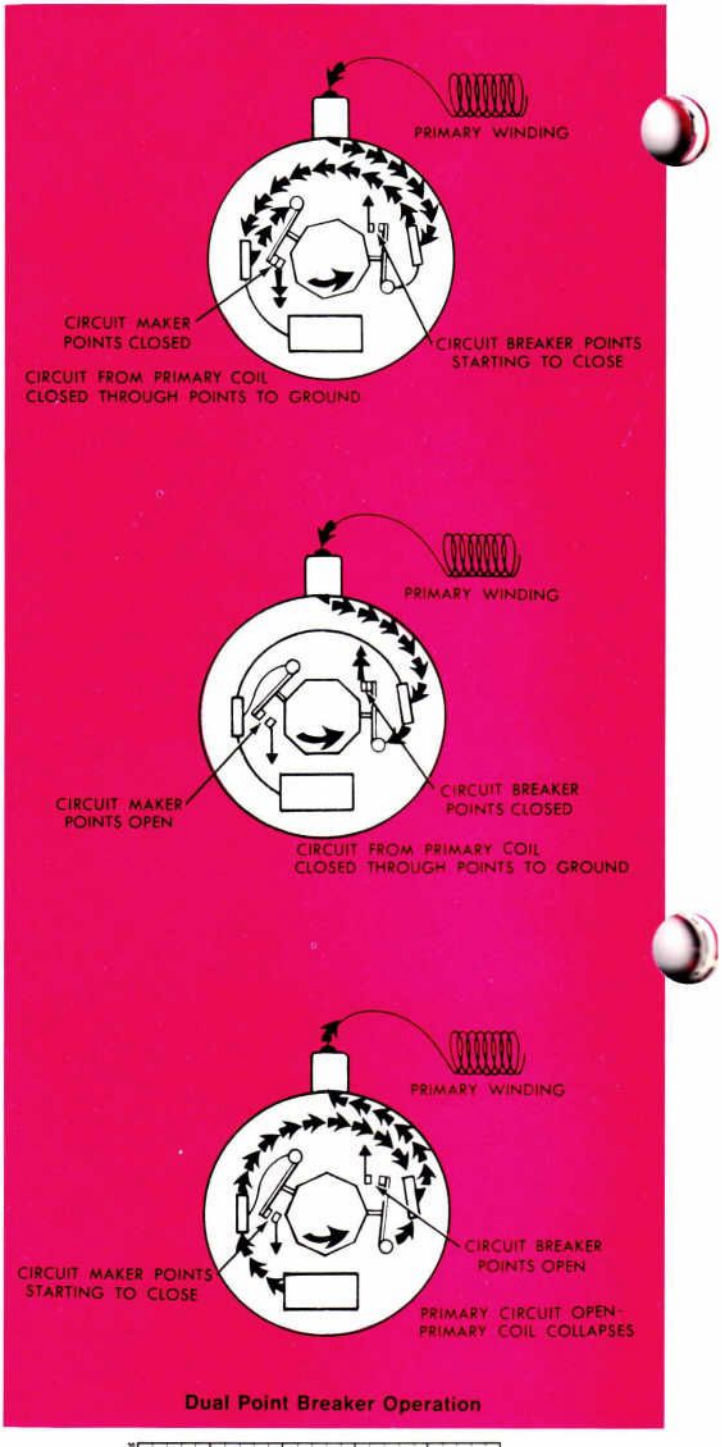
DUAL POINT DISTRIBUTOR AND TIMING

The spark plug gap is the business end of the ignition system. But don't think of it just as a gap, because something IS there . . . AIR. Air resists voltage, forcing current to jump the gap. And the resistance increases as compression goes up. However, high voltages overcome this resistance by changing the atoms of air to electrically charged particles called *ions*. Sharp edged electrodes and narrow gaps assist ionization, but the big stick is high voltage. Replacing resistance-type spark plug cable with steel core cable supplies a little more voltage, but it takes a dual point distributor to provide the really high voltages above 5000 rpm.

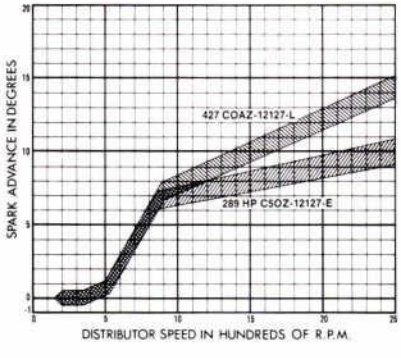
It utilizes two sets of breaker points instead of the single set used in stock distributors. One set closes the circuit and the other set opens the circuit. This increases the effective cam dwell angle from about 27° to 34°. The coil builds up voltage for ignition at each cylinder during dwell when the points are closed. Therefore, the additional 7°-8° of cam rotation gives the coil more time to build up voltage. Spring tensions in dual point distributors have been specially calibrated to resist "point bounce" at high revs. Point bounce causes high speed missing, which dual points smooth out.

Most stock distributors use a dual "vacuum" and "centrifugal" spark advance mechanism to fire the air/fuel mixture earlier as the engine turns faster. Only the centrifugal is used on dual point distributors because that's what advances the spark under *full* throttle conditions. Vacuum works only on *part* throttle and is of no use for performance. The centrifugal weights and spring tensions have been carefully calibrated to give an appropriate performance shape to the rise in the advance curve. Reshaping weights and tailoring spring length or tension normally isn't recommended. Unless performed by an expert, it will create more problems than it will solve. Changing initial advance from the normally stock 6° to 10°-12° will give desired extra advance for peak performance. Never exceed *total* advance specifications.

When properly adjusted, Ford's dual point distributors take care of ignition needs in excess of 6500 rpm . . . while offering complete reliability and minimum service.



Dual Point Breaker Operation



Stock Dual Point Distributor Curves

SPARK PLUG HEAT RANGE

Combustion chamber temperatures greatly affect spark plug efficiency. Air/fuel ratios, exhaust back-pressure and especially compression and spark advance influence these temperatures. Plugs must be selected to maintain a temperature of at least 750° at the tip to burn off *fouling* deposits that accumulate during low speed operation. At the same time plugs can not get hotter than 1750°, or the tip will "glow" and cause *pre-ignition*. Because operating temperatures vary from engine to engine, Autolite plugs are designed in several "heat ranges." Heat range indicates how fast the plug dissipates heat.

Hot plugs feature long insulator noses that slowly dissipate heat from the tip . . . up the insulator . . . through the gasket . . . then down through the shell and out the cylinder head. Cold-running engines normally use hotter plugs because they remain hot enough to burn off fouling deposits.

Cold plugs, on the other hand, feature a short insulator nose. Heat travels a shorter path, so they dissipate quicker. Under full throttle and high speeds they stay cool enough to avoid pre-ignition.

The Autolite plug specified at the factory has undergone many hours of dyno testing to assure it will operate under wide extremes of conditions . . . and then some. The degree of engine modification . . . epecially compression ratio and spark advance . . . determine how many steps you should drop down to a colder plug. A spark advance of 5-8 degrees ahead of factory specs together with a compression ratio increase of one or two ratios, might call for TWO steps colder plugs to prevent pre-ignition at the top end. A good rule of thumb to follow in selecting a plug heat range is to start with the coldest plug under consideration. This allows as wide a margin as possible to guard against pre-ignition. Test it. If it runs clean, keep it in. If it fouls, move up the heat range one plug at a time.

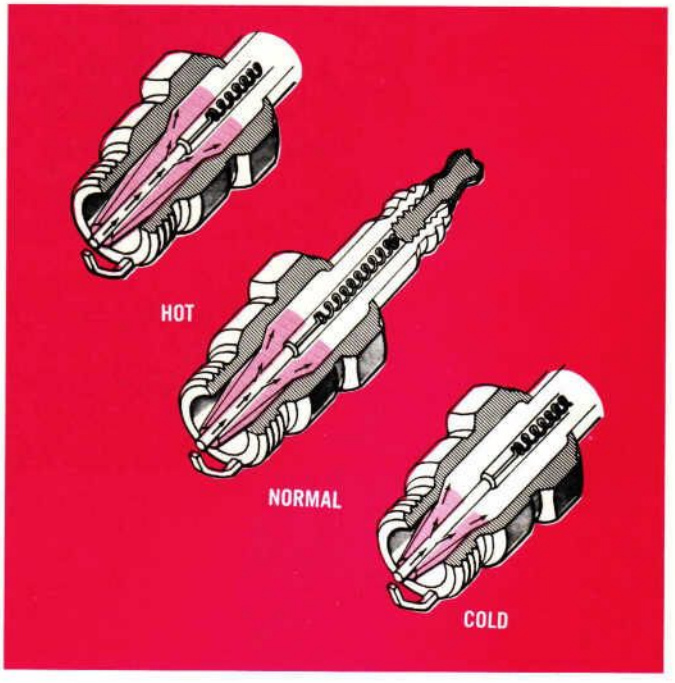
To check plugs, run your machine up through the gears at wide open throttle to 80-100 mph, then shift into neutral, cut the ignition off clean, and stop. This will give you a top-end reading and avoid fouling from coasting down with the engine running. The side electrode should be slightly bluish and the insulator tip a light brown or straw color. No soot or excessive white deposits should exist, except maybe a little up between the insulator and shell.

If the plug is too hot, the side electrode will be burned black. The insulator will be chalk white. If pre-ignition occurred, fine silver beads will probably be spotted on the insulator. Bad pre-ignition will show bigger beads. If the plug is too cold, there will be soot on the tip and perhaps oil in bad cases.

It should be emphasized that the air/fuel mixture has nothing to do with plug selection. If the mixture is right, combustion should be clean and plug temperature will depend on compression and spark advance. Lean mixtures, however, make the plug run hotter. Rich mixtures run cooler. It's next to impossible to determine if a plug's condition is due to heat range or air/fuel mixture. They should be checked separately; the air/fuel mixture first.

				
Heat Range	**Thread Size**	**Standard Gap**	**Power Tip**	**Racing Gap**
HOT	18MM TAPERED SEAT	BTF6	BF82	—
		—	BF42-BTF42	—
		BTF3-BTF31	BF32	—
		—	BF22	—
COLD		BTF1	BF12	—
		—	—	BF703
		BF601	—	BF603
		—	—	BF403
		—	—	BF203
HOT	14MM TAPERED SEAT	—	AF52	—
		—	AF42	—
		AF3	AF32	—
		AF2	AF22	—
		AF1	AF12	—
COLD		AF901	—	—
		AF701	—	AF503
		AF501	—	AF303
		—	—	AF103

AUTOLITE SPARK PLUG HEAT RANGE CHART



DRAG STRIP TIPS

Manual transmission machines can usually use about two steps colder plugs than stock. That's because you can keep plugs clean at the starting line by revving up.

Automatic transmission cars should only run about one step cooler. That's because the engine lugs a bit on the line as you rev-up to get some torque with the brakes on. If the carburetion's a little rich, you're sure to foul up. They clean up right away in low gear, but by then you've probably lost a small part of a second that just might get you shut down.

CAMSHAFT SPECIFICATIONS

Part Number	Lifter & Lash	Intake Open	Intake Close	Duration	Exhaust Open	Exhaust Close	Duration	Max. Lift at Valve	Overlap	Remarks
C9OZ-6250-C	Hydraulic	36° BTC 16° ATC	74° ABC 20° ABC	290°	84° BBC 32° BBC	26° ATC 28° BTC	290°	0.470″	62°	Street & Strip Use 1.60:1 rati rocker arms. Fits 289-302-351
C3OZ-6250-C	Mechanical 0.018″ Int. 0.020″ Exh.	46° BTC 12° ATC	84° ABC 26° ABC	310°	94° BBC 36° BBC	36° ATC 22° BTC	310°	0.450″	82°	Street & Strip. Use 1.60:1 ratio rocker arms. Fits 289-302-351
C7FE-6250-A	Mechanical 0.020″ Int. 0.025″ Exh.	52° BTC 6° BTC	86° ABC 30° ABC	318°	82° BBC 40° BBC	42° ATC 4° BTC	304°	0.510″	94°	Strip only. Use 1.60:1 ratio rocker arms. Fits 289-302-351
C6OZ-6250-B	Hydraulic	18° BTC 30° ATC	72° ABC 22° ABC	270°	82° BBC 28° BBC	28° ATC 24° BTC	290°	0.481″	46°	Street or Strip for 390's*. Use 1.73 non-adj. rocker arms.
C8AX-6250-C	Hydraulic	24° BTC 22° ATC	78° ABC 30° ABC	282°	82° BBC 34° BBC	34° ATC 18° BTC	296°	0.500″(1.73) 0.509″(1.76)	58°	Strip, Marginal Street. Use either 1.73 non-adj. or 1.76 adj. rocker arms. Fits 390*, 406*, 427 & 428
C3AZ-6250-AA	Mechanical 0.025″	40° BTC 16° ATC	86° ABC 30° ABC	306°	88° BBC 33° BBC	38° ATC 19° BTC	306°	0.500″	78°	Street & Strip. Use 1.76 adj. rocker arms. Fits 390*, 406*, 427 & 428
C4AE-6250-B	Mechanical 0.025″	56° BTC 0° BTC	88° ABC 28° ABC	324°	88° BBC 31° BBC	56° ATC 3° ATC	324°	0.500″	112°	Strip, Marginal Street. Use 1.76 adj. rocker arms. Fits 390*, 406*, 427 & 428
C8AX-6250-D	Mechanical 0.025″	60° BTC 13° BTC	90° ABC 39° ABC	330°	94° BBC 47° BBC	56° ATC 5° ATC	330°	0.600″	116°	Strip & Track only. Engine must be set up for high rpm operation. Use 1.76 ratio adj. rocker arms. Requires special valve train parts. Fits 390*, 406*, 427 & 428

NOTE: The camshaft valve timing figures in "black" reflect actual valve movement, and not just theoretical camshaft lobe readings. They are useful in comparing the relative performance characteristics of different cams. The figures in "red" are taken at 0.100″ **tappet** lift. This is an arbitrary reference point on the cam lobe where the rate of movement can easily be read with a dial indicator. This is useful to check the cam with a degree wheel when it's installed in the engine. It should be emphasized that the "red" figures are "tappet" lift and not "valve" lift and therefore do not reflect rocker arm ratios.

*1962 and earlier 390 blocks and all 406 blocks (except '63) require additional camshaft thrust plate C3AZ-6269-A, Spacer C3AZ-6265-A, Crankshaft Sprocket C4AZ-6306 Camshaft Sprocket C3AZ-6256-A, Timing Chain B8A-6268-A, Timing Gear Key 73357-S, and 2 Bolts 380041-S.

HEAD/MANIFOLD/CARBURETOR SETUPS

HEAD	INTAKE MANIFOLD			CARBURETOR						REMARKS
	Part Number	Type	Port Size	Part Number	CFM	Type	Venturi Size Pri.	Venturi Size Sec.	Throttle Bore	
351—C9OZ-6049-F	289-302 C9OZ-9424-D 351 C9OZ-9424-E	4V Aluminum Hi Riser	1.16 x 1.94	C8AZ-9510-AD	600	Center Pivot	1¼	1 5/16	1 9/16	289-302-351 Good all-around performance
Cobra Jet 428 C8OZ-6049-K	C6AZ-9424-H	4V Med. Riser, Dual Plane, Aluminum		C9AZ-9510-N	735		1⅜	1 7/16	1 11/16	390-428 Good all-around performance
Medium Riser 427 C5AZ-6049-C	C6AZ-9424-M	4V Med. Riser, Offset, Equal Runner, Dual Plane	1.24 x 1.94	C5AF-9510-BU	780	Center Pivot	1⅜	1 7/16	1 11/16	427 Good all-around performance
	C5AZ-9424-G	8V Med. Riser, Dual Plane, Aluminum		C8OF-9510-AC (Front) C8OF-9510-AD (Rear	652 652	Short Bowl	1 5/16	1⅜	1 11/16	
	C8AX-9424-A	8V Med. Riser, Aluminum Single Plane								
High Riser 427 C4AE-6049-F	C4AE-9425-G	4V High Riser, Dual Plane, Aluminum	1.24 x 2.60	C5AF-9510-BU	780	Center Pivot	1⅜	1 7/16	1 11/16	427 Strip or Track
	C4AE-9425-F	8V High Riser, Dual Plane, Aluminum		C5AF-9510-BU (Front) C5AF-9510-BT (Rear)	780 780	Short Bowl	1⅜	1 7/16	1 11/16	427 Strip or Track Marginal street use
Tunnel Port 427 C8AX-6049-A	C8AX-9424-B	4V Tunnel Port, Single Plane, Aluminum	2.05 x 2.20	C5AF-9510-BU	780	Center Pivot	1⅜	1 7/16	1 11/16	427 Strip or Track only
	C7OE-9424-B	8V Tunnel Port, Dual Plane, Over/Under Aluminum		C6AZ-9510-AH 2 Req'd (Front & Rear)	715	Short Bowl	1 5/16	1⅜	1 11/16	427 Good all-around performance
	C7OE-9424-A	8V Tunnel Port, Single Plane, Aluminum		C8OF-9510-AC (Front) C8OF-9510-AD (Rear)	652 652	Short Bowl	1 5/16	1⅜	1 11/16	427—Strip or Track Not recommended for street
				C5AF-9510-BU (Front) C5AF-9510-BT (Rear)	780 780	Short Bowl	1⅜	1 7/16	1 11/16	427—Full Race—Strip or Track Not recommended for street

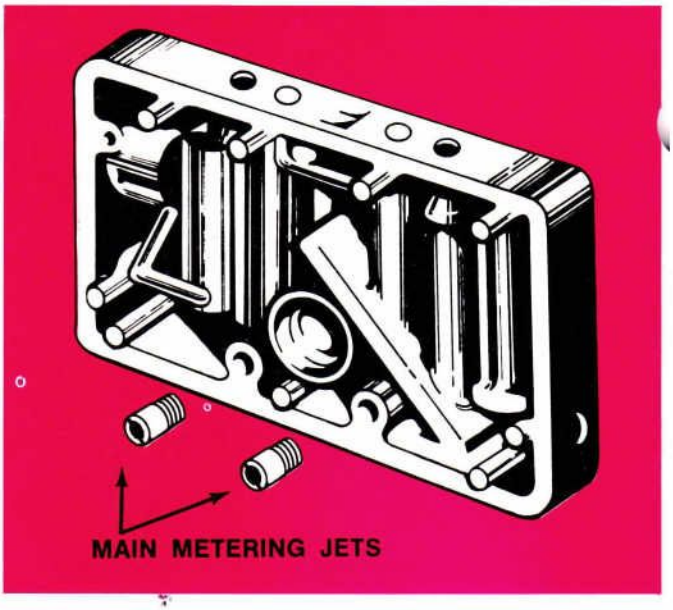
Single plane manifolds for 4V induction consist of one large plenum chamber that feeds alleight cylinders. The runners are short and direct to each cylinder for minimum breathing restriction at high revs. This doesn't give even suction pulses, but this isn't too important at the high rpm's where this setup works most effectively. 8V single plane manifolds are very similar except for a "balance tube" between the front and rear carburetor plenums that cushions out the uneven suction pulses. This has the effect of making the manifold one big plenum chamber. However, the front carburetor feeds the front four cylinders and the rear carburetor the rear cylinders.Single plane manifolds generally don't perform well on the "street" or with automatic transmissions. They're strictly for all-out competition vehicles.

Dual plane manifolds for both 4V and 8V induction have two plenum chambers, one higher than the other. The higher level feeds one bank of cylinders (the right side for instance) and the lower level the other (left) bank of cylinders. With this arrangement, each section feeds a bank of four cylinders at 180° intervals of crankshaft rotation —thus, this is often called a 180° manifold. 4V and 8V manifolds differ only in the fact that a wall divides the plenum into front and rear chambers. The front carburetor feeds the front four cylinders and the rear carburetor feeds the rear four cylinders. Passages tend to be longer and more curvy than single plane designs. This minimizes flow disturbances and gives good low-speed response and mid-range torque. Thus dual plane manifolds provide good all-around performance for the street as well as the strip.

HOLLEY METERING JETS

MAIN METERING JETS

Main jets are threaded into the main metering body for ease of installation and replacement. They are available under Holley basic part number 22R-40, followed by a suffix "Jet Number." For example, 22R-40-85 has an approximate restriction size of 0.100" diameter. All sizes are shown for reference use only. Actual control of size is by flow check. In all instances, a higher stamped number indicates a greater average flow rate.

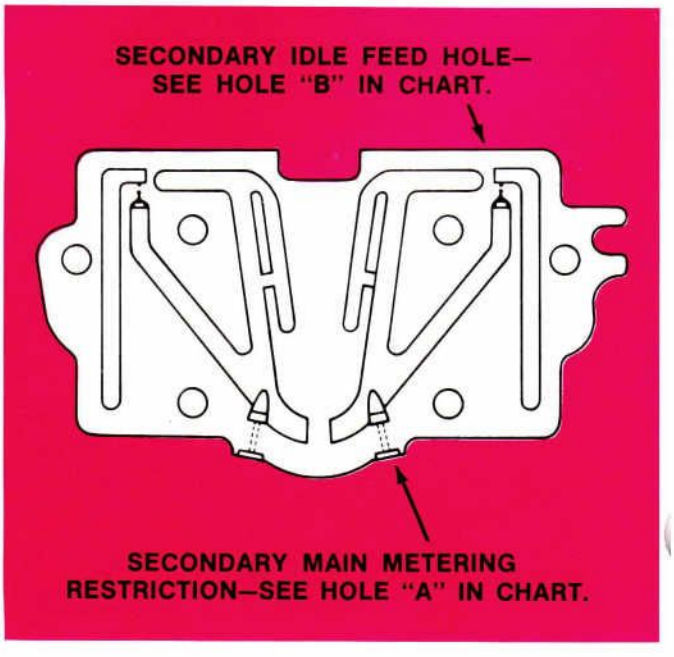


MAIN METERING JET CHART

Jet No.	Drill Size	Jet No.	Drill Size	Jet No.	Drill Size	Jet No.	Drill Size	Jet No.	Drill Size	Jet No.	Drill Size
45	.045	55	.054	64	.064	73	.079	82	.093	90	.104
47	.047	56	.055	65	.065	74	.081	83	.094	91	.105
48	.048	57	.056	66	.066	75	.082	84	.099	92	.105
49	.048	58	.057	67	.068	76	.084	85	.100	93	.105
50	.049	59	.058	68	.069	77	.086	86	.101	94	.108
51	.050	60	.060	69	.070	78	.089	87	.103	95	.118
52	.052	61	.060	70	.073	79	.091	88	.104	96	.118
53	.052	62	.061	71	.076	80	.093	89	.104	97	.125
54	.053	63	.062	72	.079	81	.093				

SECONDARY METERING BODY

Many Holley high performance carburetors use a secondary metering body with drilled restrictions rather than removable secondary jets. If oversized restrictions are desired, replace with a larger body rather than drilling the original oversize. The chart at the top of page 21 lists secondary metering bodies (Holley Basic Part Number 34R-2007). Order by suffix dash numbers following the part number. Example: 34R-2007-14 has a 0.098" main metering restriction and a 0.070" idle feed hole. The diagram illustrates the secondary main metering restriction (A) and the secondary idle feed hole (B).



SEE CHART ABOVE RIGHT

SECONDARY METERING BODY CHART

Part No.	Main Hole A	Idle Hole B	Part Stamped	Part No.	Main Hole A	Idle Hole B	Part Stamped
34R-2007-3	.055	.026	3	34R-2007-16	.067	.029	16
34R-2007-4	.059	.026	4	34R-2007-17	.073	.040	17
34R-2007-5	.063	.026	5	34R-2007-18	.064	.028	18
34R-2007-6	.070	.026	6	34R-2007-19	.070	.028	19
34R-2007-7	.052	.026	7	34R-2007-20	.070	.031	20
34R-2007-8	.067	.026	8	34R-2007-21	.081	.040	21
34R-2007-9	.067	.031	9	34R-2007-22	.076	.028	22
34R-2007-10	.076	.026	10	34R-2007-23	.067	.028	23
34R-2007-11	.079	.031	11	34R-2007-24	.079	.035	24
34R-2007-12	.076	.031	12	34R-2007-25	.086	.043	25 25
34R-2007-13	.064	.031	13	34R-2007-26	.089	.043	26
34R-2007-14	.098	.070	14	34R-2007-27	.089	.040	27
34R-2007-15	.094	.070	15				

CUBIC INCH DISPLACEMENT CHART

The cubic inch displacement for one cylinder can be obtained from the following chart by moving down the "bore" column to the engine's "stroke." To obtain total engine displacement, multiply this figure by the number of cylinders.

EXAMPLE: Ford 302 engine . . . 3.00" stroke, 4.00" bore = 37.69 cubic inches per cylinder, multiplied by 8 (cylinders) = 301.52 or 302 CID. To convert to cubic centimeters, divide cylinder volume (37.69) by 0.061 = 617.87 cubic centimeters per cylinder.

Stroke \ Bore	3 1/2	3 9/16	3 5/8	3 11/16	3 3/4	3 13/16	3 7/8	3 15/16	4.00	4 1/16	4 1/8	4 3/16	4 1/4	4 5/16	4 3/8
2.5	24.05	24.91	25.80	26.69	27.61	28.53	29.48	30.44	31.41	32.40	33.41	34.43	35.46	36.51	37.58
2.6	25.01	25.90	26.83	27.75	28.71	29.67	30.66	31.65	32.67	33.70	34.74	35.80	36.88	37.97	39.08
2.7	25.97	26.90	27.86	28.82	29.82	30.81	31.84	32.87	33.92	34.99	36.08	37.18	38.30	39.43	40.58
2.8	26.93	27.90	28.89	29.89	30.92	31.95	33.02	34.09	35.18	36.29	37.41	38.56	39.72	40.89	42.09
2.87	27.61	28.59	29.62	30.64	31.69	32.75	33.84	34.94	36.06	37.20	38.35	39.52	40.71	41.92	43.14
2.94	28.28	29.29	30.34	31.38	32.47	33.55	34.67	35.79	36.94	38.10	39.29	40.48	41.70	42.94	44.19
3.00	28.86	29.89	30.96	32.03	33.13	34.23	35.37	36.53	37.69	38.88	40.09	41.31	42.55	43.81	45.09
3.1	29.82	30.89	31.99	33.09	34.23	35.38	36.55	37.74	38.95	40.18	41.42	42.69	43.97	45.28	46.60
3.2	30.78	31.89	33.02	34.16	35.34	36.52	37.73	38.96	40.21	41.47	42.76	44.07	45.39	46.74	48.10
3.25	31.26	32.38	33.54	34.69	35.89	37.09	38.32	39.57	40.84	42.12	43.43	44.75	46.10	47.47	48.85
3.3	31.74	32.88	34.05	35.23	36.44	37.66	38.91	40.18	41.46	42.77	44.40	45.44	46.81	48.20	49.60
3.38	32.51	33.68	34.88	36.08	37.33	38.57	39.86	41.15	42.47	43.81	45.17	46.54	47.94	49.39	50.81
3.4	32.71	33.88	35.09	36.30	37.55	38.80	40.09	41.40	42.72	44.07	45.43	46.82	48.23	49.66	51.11
3.44	33.09	34.27	35.50	36.72	37.99	39.26	40.56	41.88	43.22	44.58	45.97	47.37	48.80	50.24	51.71
3.5	33.67	34.87	36.12	37.36	38.65	39.94	41.27	42.61	43.98	45.36	46.77	48.20	49.65	51.12	52.61
3.56	34.25	35.47	36.74	38.00	39.31	40.62	41.98	43.34	44.73	46.14	47.57	49.02	50.50	51.99	53.51
3.6	34.63	35.87	37.15	38.43	39.76	41.08	42.45	43.83	45.23	46.66	48.11	49.57	51.07	52.58	54.11
3.62	34.82	36.07	37.36	38.64	39.98	41.31	42.69	44.07	45.49	46.92	48.37	49.85	51.35	52.87	54.41
3.64	35.02	36.27	37.56	38.86	40.20	41.54	42.92	44.32	45.74	47.18	48.64	50.13	51.63	53.16	54.72
3.66	35.21	36.47	37.77	39.07	40.42	41.77	43.16	44.56	45.99	47.44	48.91	50.40	51.92	53.46	55.02
3.68	35.40	36.67	37.97	39.29	40.64	41.99	43.39	44.81	46.24	47.70	49.17	50.68	52.20	53.75	55.32
3.69	35.50	36.77	38.08	39.39	40.75	42.11	43.51	44.93	46.37	47.83	49.31	50.81	52.34	53.89	55.47
3.7	35.59	36.87	38.18	39.50	40.86	42.22	43.63	45.05	46.49	47.95	49.44	50.95	52.48	54.04	55.62
3.75	36.07	37.36	38.70	40.03	41.41	42.79	44.22	45.66	47.12	48.60	50.11	51.64	53.19	54.77	56.37
3.78	36.36	37.66	39.01	40.35	41.74	43.14	44.57	46.02	47.50	48.99	50.51	52.05	53.62	55.21	56.82
3.8	36.56	37.86	39.21	40.57	41.96	43.36	44.81	46.27	47.75	49.25	50.78	52.33	53.90	55.50	57.12
3.87	37.23	38.56	39.94	41.31	42.74	44.16	45.63	47.12	48.63	50.16	51.71	53.29	54.90	56.52	58.17
3.9	37.52	38.86	40.25	41.63	43.07	44.51	45.99	47.48	49.00	50.55	52.11	53.71	55.32	56.96	58.62
3.94	37.90	39.26	40.66	42.06	43.51	44.96	46.46	47.97	49.51	51.07	52.65	54.26	55.89	57.54	59.23
4.00	38.48	39.86	41.28	42.70	44.17	45.65	47.17	48.70	50.26	51.84	53.45	55.08	56.74	58.42	60.13

BLUEPRINTING SPECIFICATIONS AND MODIFICATIONS FOR ALL ENGINES REGARDLESS OF CAM USED

"Blueprinting" refers to the process required to provide the precision, reliability and durability necessary for high performance operation. All-out competition machines demand it, while it's a good idea for less potent cars. Generally, it involves engine disassembly, cleaning in degunking fluid, removing burrs and scratches, Magnafluxing, trueness checks, and taking advantage of dimensional tolerances on parts and fits (either on the high or low side) to obtain maximum performance. The following chart provides some of the more critical specifications and modifications.

BLUEPRINTING SPECIFICATIONS

CRITICAL DIMENSIONS

	289-302 351	390, 428 427
Piston skirt clearance	0.004"	0.007"
Rod bearing clearance	0.002"-0.003"	0.0025"-0.003"
Main bearing clearance	0.001"-0.0025"	0.0025"-0.003"
Rod end play clearance	0.014"-0.024"	0.025"
Crankshaft end play clearance	0.004"-0.008"	0.004"-0.008"
Wrist pin clearance	0.0003"-0.0005"	0.0007"-0.0009"
Valve seat and face angle:		
Intake	45°	30° 45° (390 only)
Exhaust	45°	45°
Valve seat width:		
Intake	0.035" outer edge (strip) 0.070" outer edge (street)	0.035" outer edge (strip) 0.070" outer edge (street)
Exhaust	0.050" outer edge (strip) 0.080" outer edge (street)	0.050" outer edge (strip) 0.080" outer edge (street)
Hand hone cylinder wall	Approximately 5 minutes per cylinder with 150-180 grit stone.	
Piston pin offset (right)	0.0575"-0.0675"	0.0575"-0.0675" (428-390 only)
Deck height clearance	0.015"	0.015"-0.025"

CRITICAL BOLT TORQUES (FT-LBS)

		289-302	289 H P 351	390-428	427
Bolt-cylinder head	Step 1	50	55	70	90
	Step 2	60	65	80	100
	Step 3	65-72	95-100	80-90	100-110
Bolt-intake manifold		23-25	23-25	32-35	32-35
Bolt-connecting rod		19-24	40-45	40-45 (390) 53-58 (428)	53-58
Bolt-main bearing		60-70	95-105	95-105	—
Cross bolt-main bearing†		—	—	—	42
Vertical bolt-main bearing†		(†See page 62 for sequence)			105
Bolt-rocker arm shaft		—	—	40-45	40-45
Stud-rocker arm		30-35	30-35	—	—

DISTRIBUTOR CURVE AND IGNITION

STOCK DUAL POINT DISTRIBUTOR CURVES

Small Blocks (C5OZ-12127-E)

Distributor rpm	250	500	1000	1500	2000	2500
Distributor degrees	0°	¾°	7°	8°	9°	10°

Large Blocks (C0AZ-12127-L)

Distributor degrees	0°	1¾°	7¾°	10°	12¼°	14½°

Initial advance 10°-12°. Breaker point gap 0.018"-0.022"

Install BF-32, BF-22, BTF-1, or BF-601 spark plugs, depending upon heat range required. Gap at 0.025"-0.035".

Note: Distributor degrees ½ crankshaft degrees. 25° dwell for each point. 32°-34° total dwell. Maximum safe advance is 38°. If pre-ignition or detonation occurs, retard as necessary.

CARBURETION AND FUEL SYSTEM

Revise stock primary and secondary jetting to obtain optimum performance. If running without an air cleaner, an increase of three or four sizes should do the trick. Temperature, altitude, humidity, etc. determines exact amount of increase.

Install electric fuel pump as near as possible to fuel tank, and oversize lines and fittings; ⅜" diameter is good up to 600 horsepower. Set pump to deliver 5½-6 psi at fuel filter. Use highest octane fuel available.

BALANCE

Dynamically balance complete engine assembly to counteract differences in static weights of individual components.

GENERAL MODIFICATIONS

Headers—Should be fabricated from lightweight steel—should be installed to achieve optimum scavaging of exhaust gases.

Piston-to-valve clearance—Should be checked as follows: AUTOMATIC TRANS—Exhaust - 0.100", intake - 0.070". MANUAL TRANS—Exhaust - 0.120", Intake - 0.090". Check with feeler gauge that equals valve lash, plus clearance. For example 0.025" lash and 0.120" clearance requires 0.145" feeler gauge. Insert between valve stem and rocker arm. Turn engine over by hand. If valve doesn't hit piston, you have proper clearance.

Lubrication—Should include deep sump oil pan, special oil pickup and low restriction oil filter and high volume pump if vehicle is used in all-out competition.

Transmission—Should be modified as follows to aid power shifting: Remove teeth from second and third gear blocker rings. Remove handle retaining bolts in shift tower and install flat washer, then reinstall bolts. This compresses rubber to nearly solid condition.

Suspension—Should be beefed by: Installing clamps on rear springs (two clamps, front and rear) and putting a spacer under the rubber pinion nose bumper, elevating it about ½-inch below bumper plate. Install heavy duty shocks and traction bars. This should eliminate wheel hop.

Rear axle—Should be filled with Ford high performance lube (Part No. C2AZ-19580-D). For maximum traction install a Detroit Locker or production Traction Lok or Limited Slip differential and gear ratio to rev engine at maximum power thru last timing light.

STAGED PERFORMANCE . . .

A step-by-step guide to systematic performance modifications

PERFORMANCE LEVELS

"Staged" performance operates around a simple premise; namely, that you want to give your machine more sock and you've got the bucks to make it happen. Maybe it's mild; like adding a 4-bbl induction setup for better acceleration. Or something wild; like a high lift, long duration mechanical cam—special heads, valves and pistons—high ratio locking axle—traction bars—slicks, etc. Or, is it in between? No matter what turns you on, Staged Performance kits will do the job for you. Because we specifically designed them to certain desired performance levels.

Choosing a performance level should be your first step, keeping in mind plain truth number 1 . . . adding more horsepower usually means spending more money. For most engines, we have three kits; each one representing a successively higher performance level over the stock engine. We call them . . . . IMPRESSOR . . . . CONTROLLER . . . . DOMINATOR.

IMPRESSOR KITS

These kits generally include induction goodies, a HP hydraulic cam and valve train pieces, hot ignition setup and headers. Strictly bolt-on stuff. As our first performance level, this kit might be considered a "sleeper." Until you get on it. Then its big horsepower increase over stock tells you exactly what it is . . . the Impressor.

CONTROLLER KITS

Except for minor valve train differences, Controller Kits for the most part include all the pieces of Impressor Kits . . . PLUS bigger cylinder heads, "pop-up" pistons and in some cases, optional valves. About all it takes to develop this extra muscle is a few more tech specs and your Impressor Kit wrench. Heavy on this one, however, does more than just impress; it makes you . . . the Controller.

DOMINATOR KITS

Except for minor valve train differences, Dominator Kits usually include all the pieces of Controller Kits . . . Plus a gutsy grind mechanical cam. This big stick adds the really big muscle to your machine. The kind of sock that tells the other guy: Big Breather Is Watching You . . . the Dominator.

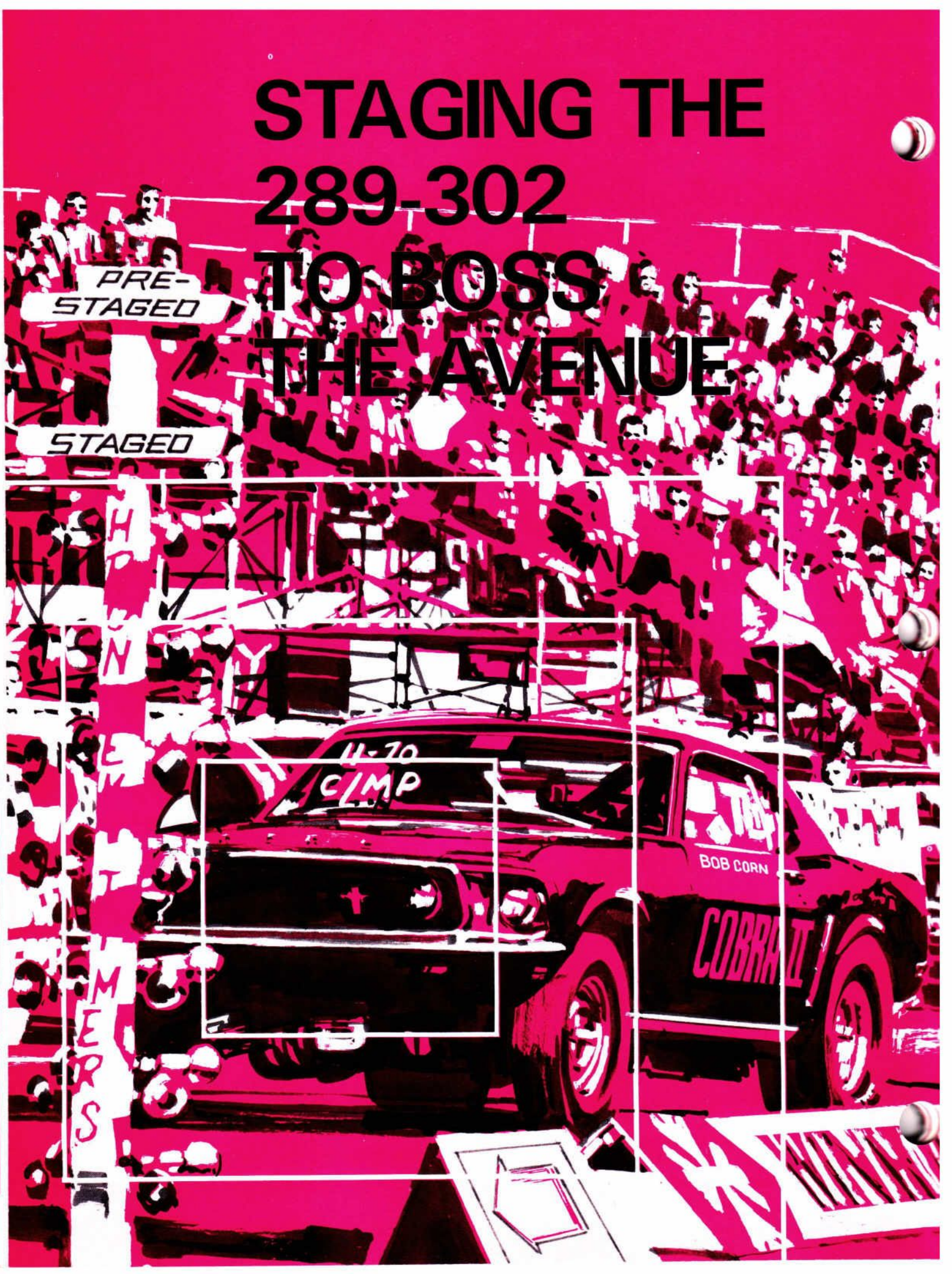
HORSEPOWER RATINGS

Incremental horsepower ratings are shown for each stage of modification, and a *total* rating for each kit. These figures came from actual dyno tests, but are true ONLY if *all* the parts for that performance level kit are installed. They don't necessarily indicate how much horsepower increase can be expected if the stages are installed separately. Don't try to short-cut the system. Take Ak's advice, "Install all recommended kit parts for a performance level and you'll add the total horsepower rating to your engine."

KIT INSTALLATION

The first page of each engine section shows all the stages, performance levels, kit horsepower ratings and parts for that engine. Wherever possible, parts for the Impressor Kits are also used in Controller and Dominator Kits. This makes it more economical to start at a lower performance level (if you don't have the bucks to go all the way right now) and add the hard stuff later. The installation information that follows each chart starts with the Impressor Kit, tells you how to add the Controller Kit and finally the Dominator Kit. Want to get on it with a Dominator Kit right now? Check the chart at the beginning of each section to see what steps you can skip. Finally, it should be noted that the installation information doesn't attempt to cover every single nut and bolt, or service procedure. Space doesn't permit a detailed discussion. Only the most important information is covered.

STAGING THE 289-302 TO BOSS THE AVENUE



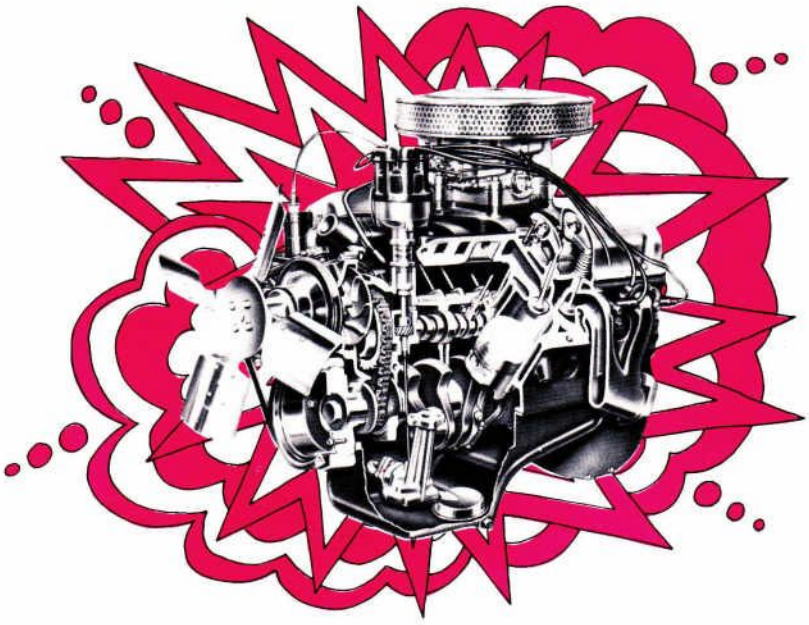
289-302 MUSCLE MODS

289-302 MUSCLE KITS . . . To Turn On Our "Little Ol' Whine Makers"

(EXCEPT BOSS 302 ENGINES)

	IMPRESSOR KIT		Added	CONTROLLER KIT		Added	DOMINATOR KIT		Added
	Part Number	Description	HP	Part Number	Description	HP	Part Number	Description	HP
STAGE 1			31			31			31
Carburetor	C8AZ-9510-AD	4V 600 cfm		C8AZ-9510-AD	4V 600 cfm		C8AZ-9510-AD	4V 600 cfm	
Manifold	C9OZ-9424-D	Alum. Hi-Riser		C9OZ-9424-D	Alum. Hi-Riser		C9OZ-9424-D	Alum. Hi-Riser	
Air Cleaner	C5ZZ-9600-W	360° inlet		C5ZZ-9600-W	360° inlet		C5ZZ-9600-W	360° inlet	
Man. Gasket	C3AZ-9433-H	289 intake							
STAGE 2			40			40			59
Cam	C9OZ-6250-C	Hyd.		C9OZ-6250-C	Hyd.		C7FE-6250-A	Mech.	
Tappets	C9OZ-6500-A	Hyd.		C9OZ-6500-A	Hyd.		C3OZ-6500-A	Solid	
Valve Spring	C9OZ-6513-C			C9OZ-6513-A	351 Stock		C3AZ-6513-B	390 GT	
Retainers	See Page 29			C9OZ-6514-D			C9OZ-6514-D		
Keepers				C9ZZ-6518-A	Hardened		C9ZZ-6518-A	Hardened	
Spring Shim	B3Q-6515-A	0.030"		—			—		
Valve Stem Seal	C7AZ-6571-B			C7AZ-6571-B			C7AZ-6571-B		
Push Rod	—			C9OZ-6565-B	Late 302		C9OZ-6565-F	302 Hardened	
Rocker Arm	—			C6OZ-6564-B	Rail		C2OZ-6564-A	289 HP	
Rocker Fulcrum	—			C2OZ-6A528-C					
Rocker Arm Stud	—			—			C3OZ-6A527-B	Threaded	
Rocker Stud Nut	—			—			C2DZ-6A529-A		
Deflector	—			—			C9OZ-6524-B		
Deflector Jam Nut	—			—			45218-S8		
Guide Plate	—			—			C9OZ-6A564-B		
Dual Point Dist.	C5OZ-12127-E	289 HP		C5OZ-12127-E	289 HP		C5OZ-12127-E	289 HP	
Spark Plug Wire	C4OZ-12259-C	Steel Core		C4OZ-12259-C	Steel Core		C4OZ-12259-C	Steel Core	
Balancer Damper	See Page 33			See Page 33			See Page 33		
Spacer w/counter-weight	—			—			C3OZ-6A360-A	289 HP	
Timing Chain Sprocket	—			—			C3OZ-6306-A	289 HP	
STAGE 3			15			15			15
Headers	Non-Ford Part	Steel Tube		Non-Ford Part	Steel Tube		Non-Ford Part	Steel Tube	
STAGE 4						32			32
Heads				C9OZ-6049-F	351		C9OZ-6049-F	351	
Intake Valve	—			C9OZ-6507-A	351		C9OZ-6507-A	351	
Exhaust Valve	—			C9OZ-6505-A	351		C9OZ-6505-A	351	
Pistons				C9OZ-6108-AA	Pop-up R.H.		C9OZ-6108-AA	Pop-up R.H.	
				C9OZ-6109-B	Pop-up L.H.		C9OZ-6109-B	Pop-up L.H.	
Rings				C9OZ-6148-A			C9OZ-6148-A		
Cylinder Head Gasket				C8OZ-6051-B	289		C8OZ-6051-B	289	
Intake Manifold Gasket Kit				C9OZ-9433-A	351		C9OZ-9433-A	351	
Cylinder Head Bolts				C8OZ-6065-A	7/16-14 x 2.26		C8OZ-6065-A	7/16-14 x 2.26	
Cylinder Head Bolts				C8OZ-6065-B	7/16-14 x 3.88		C8OZ-6065-B	7/16-14 x 3.88	
STAGE 5 (Optional)						7			7
Exhaust Valves GT-40 Type				C9OZ-6505-AA	1.625 dia. head		C9OZ-6505-AA	1.625 dia. head	
Intake Valves GT-40 Type				C9OZ-6507-AA	1.875 dia. head		C9OZ-6507-AA	1.875 dia. head	
STAGE 6 (Optional to convert 289 to 302)									11
Crankshaft							C8AZ-6303-A	302	
Balance Damper							C9ZZ-6316-A	302	
Bearings (Crankshaft)							C3AZ-6333-P	upper	
							C3AZ-6333-AA	lower	
							C3AZ-6337-P	upper center	
							C3AZ-6337-AA	lower center	
							C3AZ-6333-R	upper front	
Rods							C9OZ-6200-B	302 heavy duty	
Bearings (Con Rod)							C3OZ-6211-M	289 HP	
Flywheel							(Basic No. 6375)	Select to match starter gear	
TOTAL INCREMENTAL HORSEPOWER INCREASE OVER STOCK 289-2V ENGINE			86			125			155

THE STOCK BLOCK 289-302 SMALL BLOCKS



You're looking at one of Ford's hairiest, highest-revving production small blocker ever, the 289 high performance mill. Rated at 271 bhp @ 6000 rpm, it can snuff out just about any competitor in its class. Of course, it has good stuff like a solid lifter cam, but basically it has the same pieces as two less lively versions—a 2V rated at 200 bhp @ 4400 rpm and a 4V version at 225 bhp @ 4800 rpm.

Two newer, more advanced small block engines, the 302 and 351, have replaced the 289. Many components from the newer mills can be used for increased performance on 289's. This is especially true of the bigger, free breathing 351 heads. Although, essentially a small block, the 351 has enough differences to be considered in a separate section beginning on page 34. The 302, however, is a first cousin of the 289 and will be covered with it.

302 . . . FIRST COUSIN OF THE 289

The 302 is an improved, advanced version of the 289. The larger displacement comes from a 3.00" stroke compared to the 289's 2.87". Bore dimension is 4.00" for both engines. Cylinder bores were extended slightly on the bottom end to give better piston stability, but the block height remains the same for both engines. The 302 combustion chambers feature an improved design incorporating smoother wall contours and a new spark plug location for better flame travel. Reliability and durability were improved with: Stronger crankshaft material; new lightweight pistons with thick overhead ribs; shorter, more rigid connecting rods; hardened SAE 1010 steel caps on exhaust valve stem tips of '69 engines. The 1968 302-2V was rated at 210 bhp @ 4400 rpm and the '69 version at 220 bhp @ 4400 rpm. The 302-4V puts out 235 bhp at 4800 rpm.

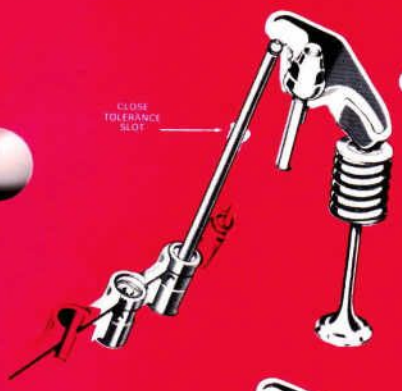
ROCKER ARMS AFFECT MODIFICATIONS

To make sure you get the right parts and install them correctly, always check the valve train rocker arms.

All 289 engines built after 1966½, except the 4V 271 bhp mill, and all 302 and 351 engines use "rail" rocker arms. Early 289 engines and the 289 high performance mill use conventional rocker arms.

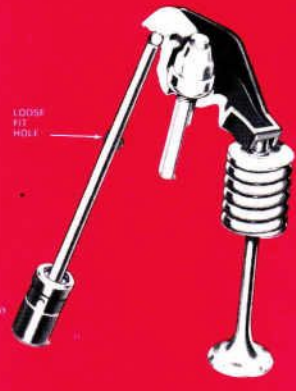
The push rod for conventional rockers passes through a close tolerance slot in the cylinder head. This keeps the push rod aligned with the rocker at high rpms. Push rods for rail rocker arms pass through a loose-fit round hole in the cylinder head. The "lips" or edges of the rail rocker arm maintain sufficient alignment for hydraulic cams. The extreme high rpms possible with mechanical cams, however, require installation of a special guide plate to maintain alignment and prevent rockers from bouncing off the ends of the push rods. Conventional rocker arms should also be used with mechanical cams. They do not have the "lips" of rail rockers and will avoid excessive valve stem tip wear at high rpm. For high performance operation, a rocker arm oil deflector is used with mechanical cams and recommended with hydraulics.

	289 SPECIFICATIONS			302 SPECIFICATIONS	
	2V 200 bhp	4V 225 bhp	4V 271 bhp	2V 220 bhp	4V 235 bhp
Displacement	289 Cu. In.	289 Cu. In.	289 Cu. In.	302 Cu. In.	302 Cu. In.
Bore & Stroke (Inches)	4.00 x 2.87	4.00 x 2.87	4.00 x 2.87	4.00 x 3.00	4.00 x 3.00
Compression Ratio	9.3:1	10.0:1	10.5:1	9.5:1	10.5:1
Brake Horsepower	200 @ 4400	225 @ 4800	271 @ 6000	220 @ 4400	235 @ 4800
Maximum Torque	282 @ 2400	305 @ 3200	312 @ 3400	300 @ 2600	318 @ 3200
Valve Lifters	Hydraulic	Hydraulic	Mechanical	Hydraulic	Hydraulic
Carburetion	2-bbl 280 cfm	4-bbl 470 cfm	4-bbl 480 cfm	2-bbl 290 cfm	4-bbl 470 cfm
Crankshaft	Nodular Iron	Nodular Iron	High Nodular Iron	Nodular Iron	Nodular Iron
Connecting Rods	Forged Steel	Forged Steel	Forged Steel w/⅜" bolt	Forged Steel	Forged Steel
Pistons	Aluminum Autothermic	Aluminum Autothermic	Aluminum Autothermic	Aluminum Autothermic	Aluminum Autothermic
Intake Valves (1.780")	Steel w/Aluminized Head	Steel w/Aluminized Head	Steel w/Aluminized Head	Steel w/Aluminized Head	Steel w/Aluminized Head
Exhaust Valves (1.450")	Cast Austenitic	Cast Austenitic	Forged Steel	Cast Austenitic	Cast Austenitic

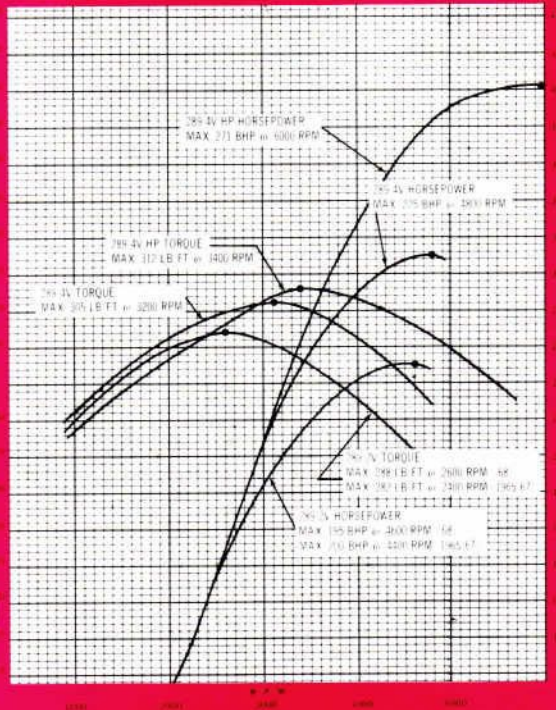


CONVENTIONAL ROCKER ARM

CONVENTIONAL ROCKER ARM WITH MECHANICAL CAM



RAIL ROCKER ARM



NOTE: 289 shown, 302 similar

IMPRESSOR KIT . . .

86 Horsepower Increase

STAGE 1

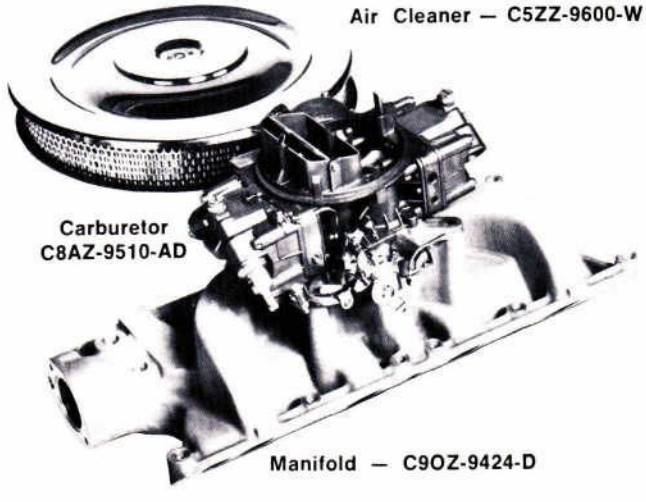
"Bolt on" 31 Horsepower With 4-barrel 600 cfm Carburetor and Hi-Riser Manifold

Like Ak said, "Power-ability starts with breathe-ability." So the straight steer for a quick trip is to INHALE IT! This free-breathing induction setup really gulps it all up. A big Holly 4V carb, Part No. C8AZ-9510-AD, flow rated at 600 cu. ft./min. sits atop a lightweight aluminum manifold, Part No. C9OZ-9424-D. The carburetor features "center pivot" floats that prevent fuel starvation while cornering. The manifold's 180° high riser design achieves the ultimate in fuel/air distribution through gently curved, balanced runners to each intake part. These pieces work so well together that this setup is recommended at every performance level.

A low restriction, chrome 360° inlet air cleaner, Part No. C5ZZ-9600-W should also be installed. The manifold is drilled/tapped for throttle linkage bracket. Stock linkage is used. Some cars may require modification. For maximum performance the carburetor may have to be recalibrated as described on pages 13 and 20-21.

Horsepower output begins improving at 3000 rpm and increases to a maximum gain of 31 bhp at 4500 rpm. There is an insignificant power loss at low rpms. Obviously, this induction kit can be installed by itself. However, it's highly recommended that the Stage 2 performance cam also be installed to achieve full potential of its breathing capacity.

(NOTES: (1) The carburetor, manifold, air cleaner and attaching parts are available as Induction Kit C8DZ-6B068-A for 1968 289 engines, and C6AZ-6B068-A for 1963-67 289 engines. (2) If you are modifying a 289/302 4-Holer, the high riser C9OZ-9424-D manifold can be used with your stock 4V carburetor. This setup increases output 37 bhp @ 4500 rpm with the stock cam only.



IMPRESSOR KIT . . . STAGE 2

Hydraulic Cam Adds 40 Horsepower

To take advantage of the big breathing abilities of the Stage 1 induction kit, we now install HYDRAULIC CAM C9OZ-6250-C that opens the valves higher and longer. This is a smooth, quiet hydraulic cam that works equally well with manual or automatic transmissions, for improved "street" performance. It achieves a peak gain of 40 bhp at 5500 rpm. This is a 1000 rpm gain over the stock cam.

When you compare this with the cam's cost, you see each pony only costs about 70¢ . . . a mighty tough price to beat.

C9OZ-6250-C Camshaft Specifications

Lifter Type Rocker Arm Type Rocker Arm Ratio	Hydraulic Pedestal—Adjustable 1.60:1	
	INTAKE	EXHAUST
TIMING		
Checking Clearance	0.100"	0.100"
Opens	0° Cam Tappet Lift 36° BTC 16° ATC	0° Cam Tappet Lift 84° BBC 32° BBC
Closes	74° ABC 20° ABC	26° ATC 28° BTC
Overlap	62°	62°
Duration	290°	290°
VALVES		
Head Diameter (Max.)	1.78"	1.45"
Angle of Seat and Face	45°	45°
Lift (Max. at Valve)	0.470"	0.470"
SPRINGS*		
Outer Valve Closed (Max.)	Impressor 78 lbs. @ 1.66" Controller 83 lbs. @ 1.79"	78 lbs. @ 1.66" 83 lbs. @ 1.79"
Outer Valve Open (Max.)	Impressor 235 lbs. @ 1.88" Controller 215 lbs. @ 1.34"	235 lbs. @ 1.88" 215 lbs. @ 1.34"
Inner Valve Closed (Max.)	Damper Only	
Inner Valve Open (Max.)	Damper Only	

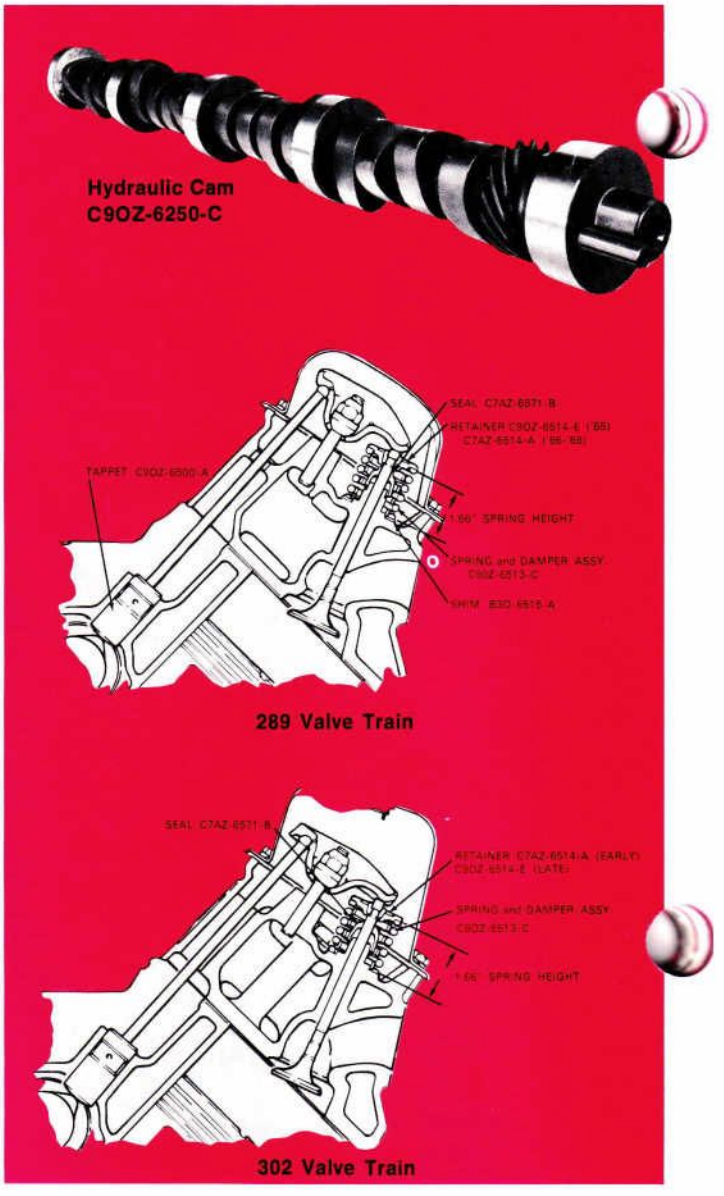
C3OZ-6250-C Camshaft Specifications

Lifter Type Rocker Arm Type Rocker Arm Ratio	Solid Pedestal Mounted—Adjustable 1.60:1	
	INTAKE	EXHAUST
TIMING		
Checking Clearance	0.100"	0.100"
Opens	0° Cam Tappet Lift 46° BTC 12° ATC	0° Cam Tappet Lift 94° BBC 36° BBC
Closes	84° ABC 26° ABC	36° ATC 22° BTC
Overlap	82°	82°
Duration	310°	310°
VALVES		
Head Diameter (Max.)	1.78"	1.45"
Angle of Seat and Face	45°	45°
Lift (Max. at Valve)	0.450"	0.450"
SPRINGS*		
Outer Valve Closed (Max.)	Impressor 78 lbs. @ 1.66" Controller 83 lbs. @ 1.79"	78 lbs. @ 1.66" 83 lbs. @ 1.79"
Outer Valve Open (Max.)	Impressor 235 lbs. @ 1.88" Controller 215 lbs. @ 1.34"	235 lbs. @ 1.88" 215 lbs. @ 1.34"
Inner Valve Closed (Max.)	Damper Only	
Inner Valve Open (Max.)	Damper Only	

*Spring pressure is "nominal" at indicated spring height with damper removed.

NOTE: If you want to wind another 500 revs into the 6000 plus range, install the stock 289 high performance (mechanical) CAM C3OZ-6250-C. It has the same performance characteristics as the hydraulic cam. Of course, this cam requires SOLID LIFTER TAPPETS C3OZ-6500-A. If engine has rail rocker arms (and heads with round push rod hole, instead of slot), the rail rockers should be replaced with CONVENTIONAL ROCKER ARMS C2OZ-6564-A, HARDENED 289 PUSH RODS C2OZ-6565-B, and RETAINER C9OZ-6514-E. Also install GUIDE PLATES C9OZ-6A564-B, SPRING & DAMPER ASSY. C9OZ-6513-C, and THREADED ROCKER ARM STUDS C3OZ-6A527-B, after milling 0.230" off rocker arm stud boss. If the engine has conventional rocker arms and the "slotted" push rod guide holes in the cylinder head, the guide plates and hardened push rods are not required.

NOTE: It may be necessary to remove 0.030" from the valve end of the rocker arm slot to obtain rocker arm stud clearance with higher lift mechanical cams.



NOTE: HYDRAULIC-TAPPET ADJUSTMENT is usually performed with stock setups in order to have the lifter plunger operate near the middle of its possible travel. This is achieved by collapsing the tappet and adjusting the rocker arm to obtain a 0.117" clearance between the rocker arm and valve stem tip. This results in a clearance area between the top of the plunger and the end of the lifter body. At high rpm's and oil pressure, the plunger may be forced into this area. If the oil doesn't drain quickly enough at high rpm's this condition which is usually called "pump-up" (not a completely accurate description) may destroy valve train lash. The extra-strong retaining ring in the end of the special high performance C9OZ-6500-A tappet permits elimination of the clearance within the tappet so the plunger can operate at the top of its travel against the retainer. This high performance tappet is adjusted as follows:

With engine cold and No. 1 piston on TDC at the end of the compression stroke, adjust the intake and exhaust valve clearance for No. 1 cylinder. Loosen the rocker arm stud nut until there is end clearance in the push rod, then tighten the nut to just remove all the push rod-to-rocker arm clearance. This may be determined by rotating and/or moving the push rod with the fingers as the stud nut is tightened. When the push rod-to-rocker arm clearance has been eliminated, tighten the stud nut an additional one-sixteenth turn to place the hydraulic lifter plunger in the desired operating range.

Repeat this procedure for the remaining sets of valves, turning the crankshaft with an auxiliary starter switch ¼ turn at a time in the direction of rotation, while adjusting the valves in the firing order sequence (1-5-4-2-6-3-7-8).

This procedure requires two complete turns of the crankshaft.

Operate the engine and check for rough engine idle or a noisy lifter(s). Valve clearance set too tight will cause rough engine idle, and valve clearance set too loose will cause a noisy lifter(s).

OTHER MODIFICATIONS REQUIRED

The higher lift and extended rpm range of the C9OZ-6250-C cam moves the valves further off their seats and at higher speeds. This puts greater stress on all valve train components. As a consequence, make the following changes.

TAPPETS C9OZ-6500-A (16 req'd) should be installed for maximum service life. These hydraulic lifters are machined from a special material that is compatible with this cam to keep wear to a minimum. They feature a plunger retainer ring that allows the tappet plunger to operate at its full extended length, thereby resisting "pump-up" at high rpm.

VALVE SPRING and DAMPER ASSY. C9OZ-6513-C (16 req'd) should be installed to control valve float at higher rpm's. These are stiffer springs that are designed to give proper spring pressure at installed height of 1.66".

The special springs have fewer coils than stock springs. This enables the spring to be compressed to a smaller height, which is necessary to accommodate increased valve movement because of the cam's greater lift. If these special springs are not used, a "spring bind" condition may develop as explained on Page 14.

NOTE: Minor differences in production valve trains since 1965 require the following retainers and shims to achieve the 1.66" installed spring height. Of course, previous modifications (such as valve jobs) may have changed valve train geometry enough to require extra shimming. VALVE RETAINERS C9OZ-6514-E (16 req'd) should be installed in all 1965 engines. They are specially hardened for longer wear. They have been machined to achieve the 1.66" spring height when used with 0.030" thick SHIMS B3Q-6515-A (16 req'd). One shim is all that should be necessary with 1965 engines.

All 1966 engines must use VALVE RETAINERS C7AZ-6514-A (16 req'd). It's likewise a specially designed and hardened retainer for high performance use. A few early 1966 engines must use the B3Q-6515-A SHIMS to get correct installed spring height of 1.66".

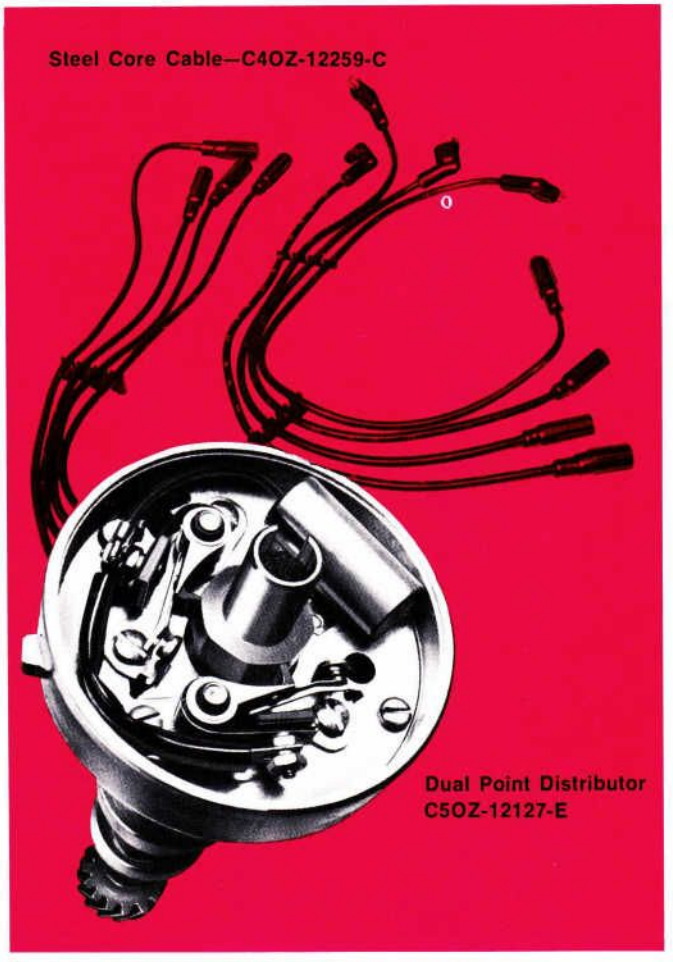
Special retainers and shims are not required on 1967-68 289 engines. Regular production parts can be used with these engines.

VALVE STEM SEALS C7AZ-6571-B (16 req'd) should be installed in 289-302 engines to control oil consumption on acceleration and deceleration, and provide necessary clearance.

289-302 VALVE TRAIN DIFFERENCES

All 302's are built with rail rocker arms. Installed spring height of 1.66" is approximately the same for 1968 and 1969. However, engines built before 10-21-68 use one-piece valve stem retainers. 302's built after the above date have two-piece retainers, to encourage valve rotation for better cooling. Specially hardened steel caps also fit over valve stems for increased durability. This changed the valve stem length, which also necessitated a longer push rod.

To maintain correct installed spring height, and to avoid a "spring bind" condition with the higher lift cam, early 302 engines use stock RETAINER C7AZ-6514-A (16 req'd). Late 302 engines use RETAINER C9OZ-6514-E (16 req'd). *All* 302 engines should use the same specially stiffened SPRING and DAMPER ASSY. C9OZ-6513-C (16 req'd) as recommended for the 289 engines.



CRANKSHAFT VIBRATION DAMPER

A new balance damper must be installed for engine dynamic balance at the higher rpm of C9OZ-6250-C cam. See page 33 for details.

PISTON-TO-VALVE CLEARANCE

Early 1965 289 engines used straight "flat top" pistons. Late 1965 engines used flat top pistons with "eyebrows" flycut in the top for valve clearance. If high lift cam C9OZ-6250-C is installed in an early 1965 engine, machine eyebrows in the piston to provide a minimum piston-to-valve clearance of 0.100". Later type pistons should not have to be reworked.

DUAL POINT DISTRIBUTOR

Since the new hydraulic cam develops usable horsepower in the 5500 rpm range, a dual point distributor C5OZ-12127-E should be installed to give the coil more time to build up voltage. This is a mechanical advance distributor (no vacuum advance) that is used in the 289 (271 bhp) engine.

For maximum performance adjust initial advance from stock 6° to 10°. Do not exceed 38° total advance. Install Autolite BF-32 plugs.

SOLID STEEL CORE CABLE

Maximum voltage can be delivered to the spark plugs by installing steel core wiring cable, kit C4OZ-12259-C. It includes 8 spark plug cables and the high tension wire from the coil to distributor. Since this wiring doesn't use special resistance materials to control radio interference, a radio suppression kit C4AZ-18827-A is recommended for "street" application.

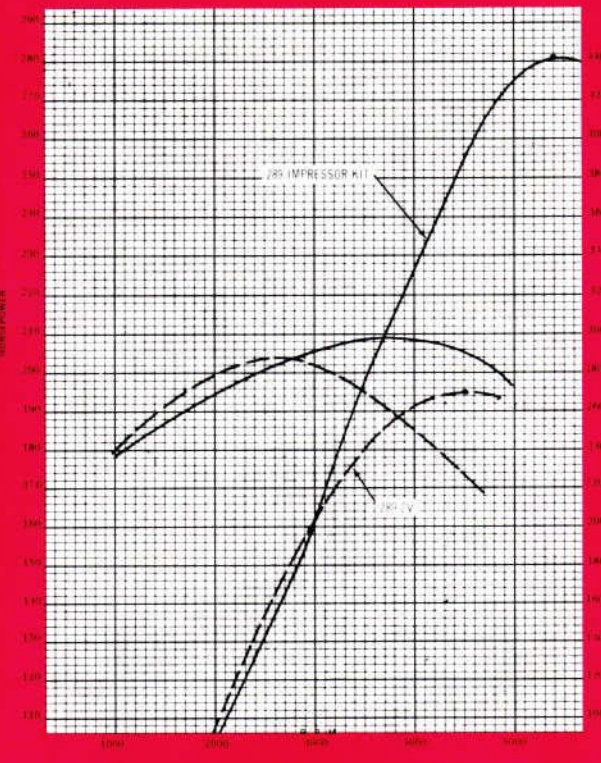
IMPRESSOR KIT

STAGE 3

Tube Type Headers Tune Exhaust Ports For 15 More Horses

TUBE TYPE HEADERS

Having provided our 289 with the ability to *inhale* a bigger breath of "good air" with improved induction and a hotter cam, the next logical step is to *exhale* the increased load of "bad" exhaust air more efficiently. A set of steel tube headers will do the trick. They are available from a number of companies. Not only will they reduce "back pressure," but they will actually give a slight "suction" or scavenging to the exhaust ports. This, of course, *draws* gases out of the cylinder instead of having the piston *push* it out. This adds about 15 bhp at 5000 rpm.



IMPRESSOR KIT . . .

Total Incremental HP Increase . . . 86

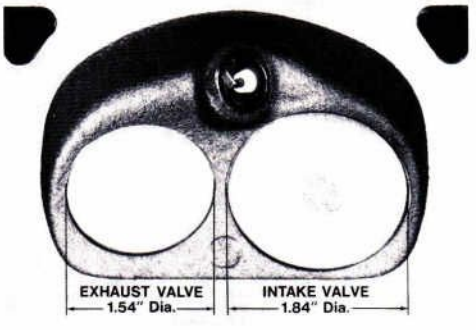
Well there you have it. Three relatively simple modifications that will net you about 86 horsepower. It should be emphasized again that each stage should be carried out *completely* to achieve best performance and horsepower indicated. That's the way we designed each performance level . . . as a *complete* kit. The torque and horsepower curves show how much can be GAINED over stock 289-2V *when the engines are dyno-tuned and mechanically sound.*

CONTROLLER KIT. . .

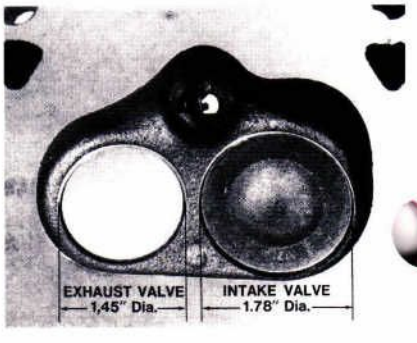
118-125 Horsepower Increase

STAGE 4

Add 32 More Sock With 351 Free-breathing Heads

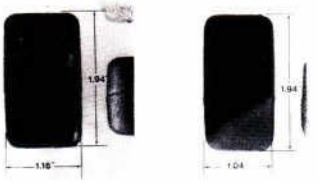


351 Combustion Chamber



289-302 Combustion Chamber

351 CYLINDER HEADS C9OZ-6049-F (2 req'd) with their bigger ports, larger valves and "domed" combustion chambers will really let your 289 breathe. "Pop-up" pistons, of course, must be installed to keep the compression ratio around 10.5:1, because of the 351's larger combustion chambers. The dyno shows these heads increase horsepower throughout the speed range, with a peak gain of 32 bhp at 5500 rpm. That's with production 351 EXHAUST VALVES C9OZ-6505-A (8 req'd) and 351 INTAKE VALVES C9OZ-6507-A (8 req'd). Install the optional Stage 5 GT-40 type



valves and you can jump another 7 horses to 125 horsepower at the Controller performance level. NOTE: If you want to go the CONTROLLER route, try to arrange your budget to do it all at one time. If you go just IMPRESSOR *first*, differences between the 289 and 351 heads require some Stage 2 valve train changes. Stage 1 and Stage 3 remain unchanged.

VALVE TRAIN CHANGES (STAGE 2)

RAIL ROCKER ARMS C6OZ-6564-B (16 req'd) and ROCKER ARM FULCRUMS C2OZ-6A528-C (16 req'd) must replace the conventional rocker arms in 1965 and early 1966 engines. 351 heads, like 1966½ and later 289 heads, use rail rocker arms. The rail rocker arm design is necessary to keep the push rods aligned as explained on page 26.

PUSH RODS C9OZ-6565-B (16 req'd) designed for late 1969 302 engines must be installed to accommodate the 0.100" longer valves used in the 351 engine.

VALVE SPRING & DAMPER ASSY. C9OZ-6513-A (16 req'd) should be installed to control valve float at higher rpm's. These are stock 351 springs that will give a proper spring height of 1.79" and avoid spring bind.

RETAINERS C9OZ-6514-D (16 req'd) should be installed. They are a specially hardened, one-piece design for high performance operation.

KEEPERS C9ZZ-6518-A (32 req'd) are a special hardened design and should be installed for high performance durability.

(NOTE: 289 (271 HP) ENGINES ONLY—The guide plate and threaded rocker arm studs shown on page 27 and page 33, plus 302 HARDENED PUSH RODS C9OZ-6565-F (16 req'd) must be installed with Controller Kit, because of the higher rpm range of the solid cam if the stock mechanical cam C3OZ-6250-C is retained.)

POP-UP PISTONS

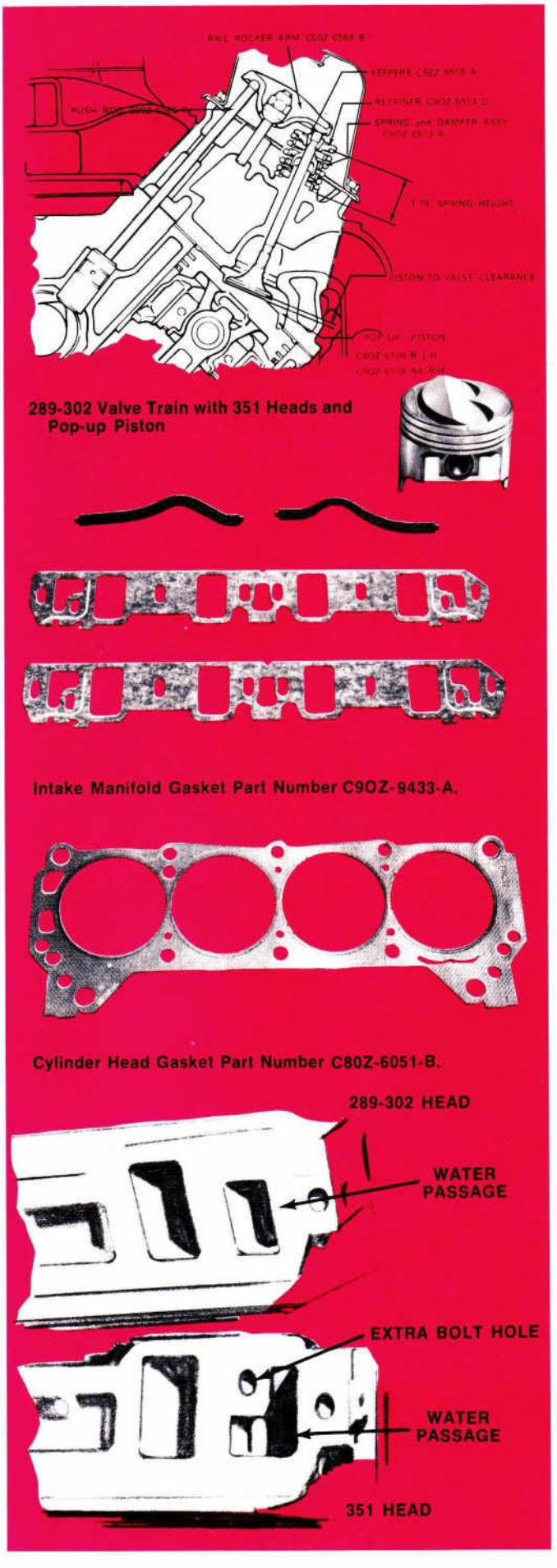
PISTON (L.H.) C9OZ-6109-B (4 req'd) and (R.H.) C9OZ-6108-AA (4 req'd) must be installed to compensate for the larger 351 combustion chambers. These "pop-up" pistons decrease cylinder volume about 10 cc. and will increase compression to about 10.5:1. Use PISTON RING C9OZ-6148-A.

GASKETS AND HEAD BOLTS

INTAKE MANIFOLD GASKET Kit C9OZ-9433-A (1 req'd) contains 351 gaskets and must be installed to avoid a water leak around the water outlet orifice in the 351 head. Discard the 289-302 gasket.

CYLINDER HEAD GASKET C8OZ-6051-B (2 req'd), which is a 289 head gasket, should be installed. Discard the 351 gasket packaged with the heads.

CYLINDER HEAD BOLTS C8OZ-6065-A (10 req'd) and C8OZ-6065-B (10 req'd) must be installed. They measure 7/16-14 x 2.26" and 7/16-14 x 3.88" respectively. They are specially designed UBS bolts with washers integral with the hex-head. The extra washer area under the head prevents brinelling that may occur because the 351 has 1/2 bolt hole and the 289 block is threaded for 7/16.



CONTROLLER KIT...

STAGE 5

You Have the Option of Increasing Controller Performance Another 7 Horses With Larger GT-40 Type Valves.

INTAKE VALVES C9OZ-6507-AA (8 req'd) and EXHAUST VALVES C9OZ-6505-AA (8 req'd) from the Stage 5 Dominator Kit may be installed. The seats must be reworked as explained on page 33 to accept these larger GT-40 type valves.

DUAL POINT DISTRIBUTOR should continue to use an initial advance of 10°. Do not exceed 38° total advance.

CARBURETOR may have to be recalibrated as described on pages 13 and 20-21.

DOMINATOR KIT...

144-155 Horsepower Increase

A solid lifter mechanical cam for 289-302 mills accounts for most of the horsepower increase of the Dominator Kit over the Controller. Therefore, we will take a new look at the valve train parts of Stage 2. Some optional mods will also be covered: The Stage 5 GT-40 type valves and the Stage 6 Stroker Kit to convert a 289 to a 302. Stages 1, 3 and 4 remain unchanged.

STAGE 2 (Revisited)

To Install Mechanical Cam That Boosts Horsepower 59 Over Stock

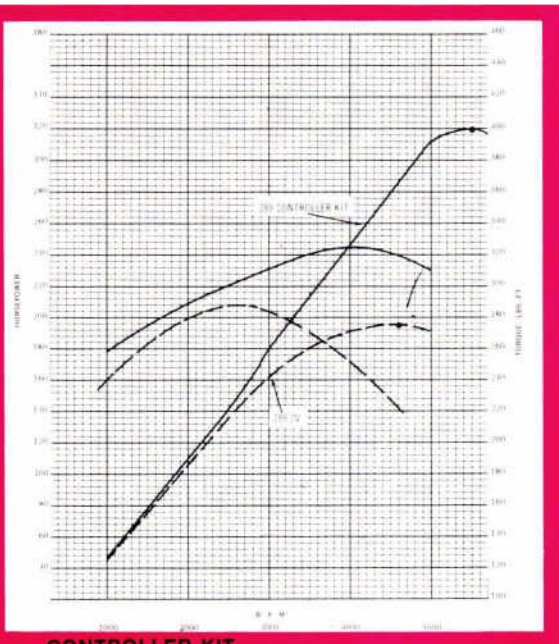
MECHANICAL CAM

Solid lifter cam C7FE-6250-A features the big numbers to really let your 289-302 whine. This is Ford's famous "LeMans" cam and is recommended only for manual transmission-equipped machines: Maximum torque of 280 lb-ft occurs at 4000 rpm. Horsepower increases throughout power range and achieves a peak gain of 59 bhp @ 6000 rpm.

VALVE TRAIN COMPONENTS

SOLID LIFTER TAPPETS C3OZ-6500-A (16 req'd) should be installed with the mechanical cam. 390 GT VALVE SPRING and DAMPER ASSY. C3AZ-6513-B (16 req'd) and RETAINERS C9OZ-6514-D (16 req'd) should be installed to obtain spring height of 1.82". Specially hardened KEEPERS C9ZZ-6518-A (32 req'd) are also recommended. Hardened 302 PUSH RODS C9OZ-6565-F (16 req'd) must also be installed because the rods may rub on the GUIDE PLATES C9OZ-6A564-B (16 req'd) required for effective alignment at high rpm's. The guide plate fits under THREADED ROCKER ARM STUDS C3OZ-6A527-B (16 req'd) and NUTS C2DZ-6A529-A (16 req'd) that should replace the pressed-in type. This additional high performance durability is necessary because the mechanical cam revs to the 6500 rpm range. The rocker arm bosses must be milled 0.230" to accommodate the threaded studs and guide plates. CONVENTIONAL (non-rail) ROCKER ARMS C2OZ-6564-A (16 req'd) from the 289 high performance mill must be used for efficient and durable valve train operation at high rpm's. NOTE: It may be necessary to remove 0.030" from the valve end of the rocker arm slot to obtain rocker arm stud clearance with higher lift mechanical cam.

DEFLECTOR C9OZ-6524-B (16 req'd) and JAM NUT 45218-S8 (16 req'd) should be installed to provide adequate oiling for the rocker arm at high rpms. The high revs cause high pressures that tend to squirt oil out of the push rod the rocker arm and miss the fulcrum of the rocker arm. The deflector interferes and drops oil into rocker fulcrum area for cooling and lubrication.



CONTROLLER KIT
Total Incremental Horsepower Increase . . . 125

Mechanical Cam
Part Number C7FE-6250-A

C7FE-6250-A Camshaft Specifications

Lifter Type	Solid			
Rocker Arm Type	Pedestal Mounted—Adjustable			
Rocker Arm Ratio	1.60:1			
	INTAKE		EXHAUST	
TIMING				
Checking Clearance	0.100"		0.100"	
Opens	0° Cam	Tappet Lift	0° Cam	Tappet Lift
Closes	52° BTC	6° BTC	82° BBC	40° BBC
Overlap	86° ABC	30° ABC	42° ATC	4° BTC
Duration	94°		94°	
	318°		304°	
VALVES				
Head Diameter (Max.)	351 1.84"	GT 40 Type 1.875"	351 1.54"	GT 40 Type 1.625"
Angle of Seat and Face	45°	30°	45°	45°
Lift (Max. at Valve)	0.510"		0.510"	
SPRINGS*				
Outer Valve Closed (Max.)	85 lbs. @ 1.82"		85 lbs. @ 1.82"	
Outer Valve Open (Max.)	268 lbs. @ 1.32"		268 lbs. @ 1.32"	
Inner Valve Closed (Max.)	Damper Only			
Inner Valve Open (Max.)	Damper Only			

*Spring pressure is "nominal" at indicated spring height with damper removed.

DISTRIBUTOR—Recalibrate dual point distributor by adjusting initial advance to 12°. Do not exceed 38° total advance.

CARBURETOR may have to be recalibrated for maximum performance as described on pages 13 and 20-21.

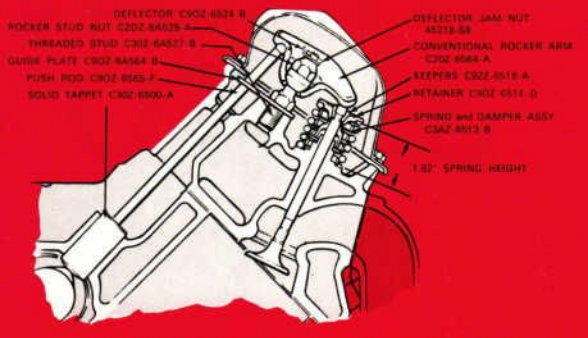
ENGINE BALANCE

The increased rpm capability of high performance cams require engine balance modifications to reduce torsional vibrations to an acceptable level as follows: The 289 HP engine balance is okay at high revs and requires no special parts. The 289-2V and -4V engines require DAMPER (289 HP) C5OZ-6316-A, COUNTERWEIGHT (289 HP) C3OZ-6A360 and a "thinner" TIMING CHAIN SPROCKET C3OZ-6306-A because the 289 high performance counterweight is thicker than the stock 289-2V, -4V part.

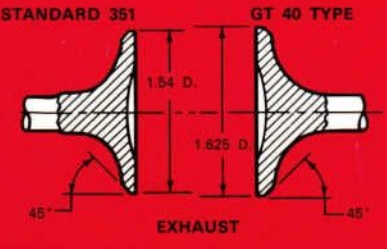
302's require DAMPER (Boss 302) C9ZZ-6316-A, COUNTERWEIGHT (289 HP) C3OZ-6A360-A and the thinner TIMING CHAIN SPROCKET C3OZ-6306-A. The 1969 302 engine only also requires 1968 302 crankshaft pulleys. See your Ford or Lincoln-Mercury Dealer's Master Parts Catalog, Group 6316 and 6A316 for correct A/C, Power Steering, etc. pulley for your car.

RECOMMENDED 289 AND 302 HIGH PERFORMANCE PARTS

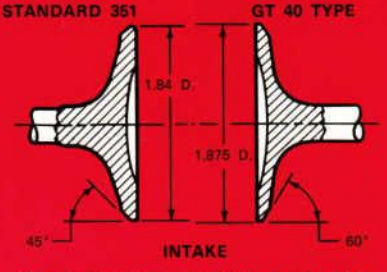
If a 289-2V or 289-4V is being modified, the better durability of the 289 high performance engine's lower end can be achieved by installing the following 289 HP parts: CRANKSHAFT C3OZ-6303-B, CONNECTING ROD C3OZ-6200-C, DAMPER C5OZ-6316-C, ROD BEARING C3OZ-6211-M and appropriate FLYWHEEL (Basic No. 6375) for either manual or automatic transmission, with teeth count to match the starter gear. The 302 lower end durability can be improved by installing CONNECTING ROD C9OZ-6200-B and 289 HP ROD BEARING C3OZ-6211-M.



289-302 Valve Train with Mechanical Cam



GT-40 Part Number C9OZ-6505-AA



GT-40 Part Number C9OZ-6507-AA

STAGE 5

7 Horses from GT-40 Type Valves (Optional)

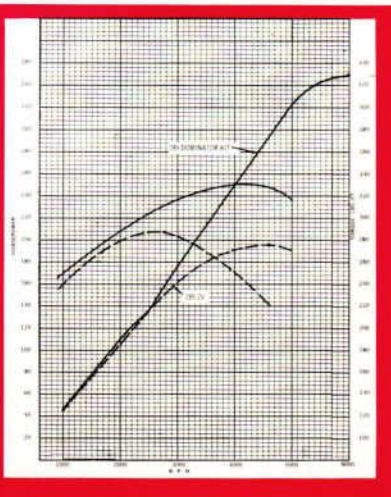
The installation of GT-40 Type Valves, with hard chromed stems and swirl polished heads, increase horsepower output 7 bhp at 5500 rpm. However, they require the reworking of the head seats. The INTAKE VALVES C9OZ-6507-AA (8 req'd) have a larger head diameter (1.875") than production valves (1.84"), and the seat angle is 30° instead of 45°. This may necessitate a valve spring shim after machining the head seats to achieve correct installed height 1.82". The shape of the valve stem at the head is also different to improve flow characteristics. EXHAUST VALVES C9OZ-6505-AA (8 req'd) have a head diameter of 1.625" compared to 1.54" for 351 production valves.

DOMINATOR KIT . . .

STAGE 6

Optional Stroker Kit Produces 11 Horsepower–289 only

By "stroking" a 289 engine to a 302 mill, a peak horsepower gain of 155 can be obtained at 6000 rpm as shown on the chart. Of course, the main component here is a 302 crank, which changes the 289 stroke from 2.87" to 3.00". The rest of the parts required are shown in Stage 6 under Dominator Kit on page 25. It's important to install the harmonic balancer and flywheel because the 289-302 engines are EXTERNALLY balanced. The compact crank doesn't permit internal balancing on crankshaft throws.

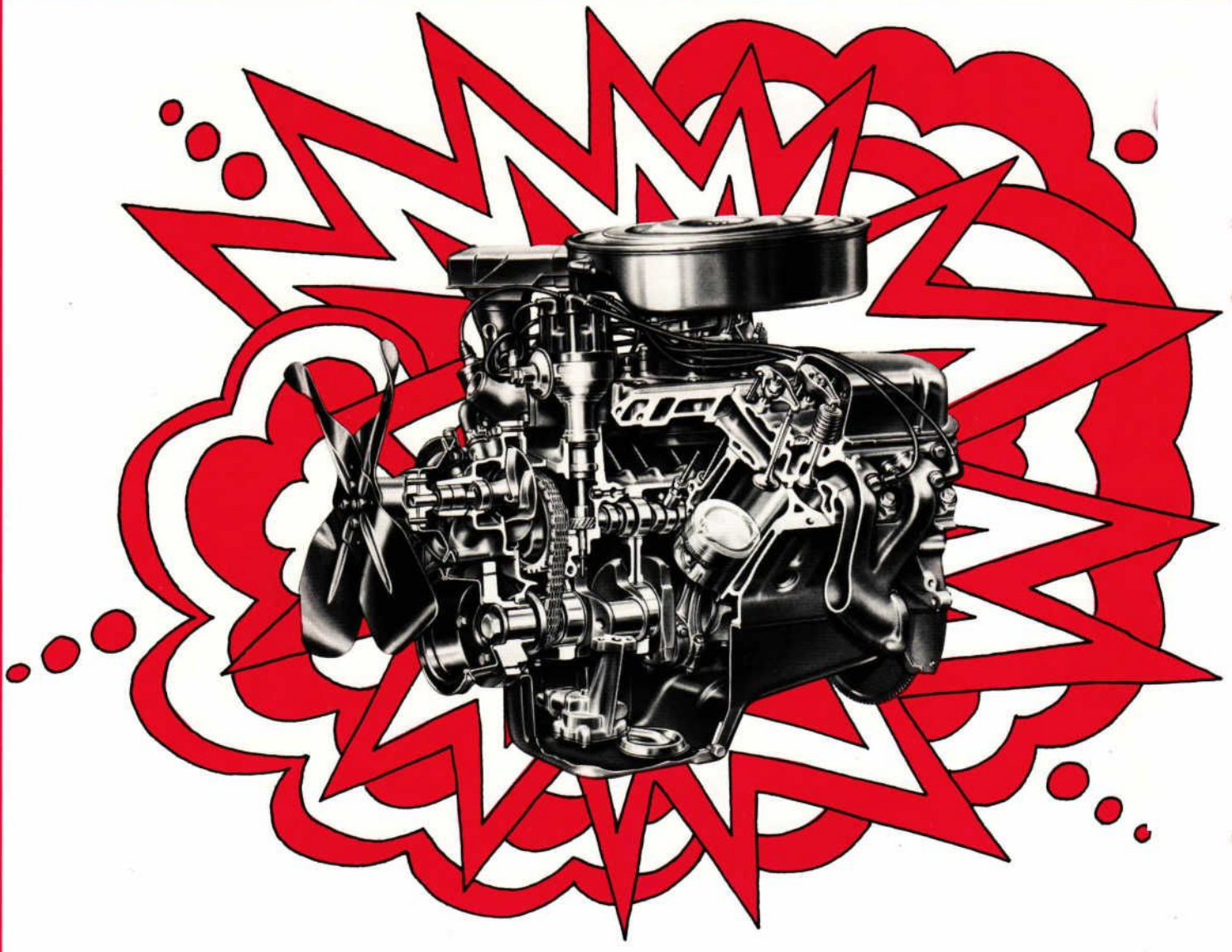


DOMINATOR KIT
Total Incremental Horsepower Increase . . . 155

STAGING THE 351 TO REV 6001

351 MUSCLE MODS

	CONTROLLER KITS			DOMINATOR KIT		
	Part Number	Description	Added HP	Part Number	Description	Added HP
STAGE 1			34			34
Carburetor	C8AZ-9510-AD	4V 600 cfm		C8AZ-9510-AD	4V 600 cfm	
Manifold	C9OZ-9424-E	Alum. Hi-Riser		C9OZ-9424-E	Alum. Hi-Riser	
Spacer	C2AZ-9A589-E	¼" Thick		C2AZ-9A589-E	¼" Thick	
Air Cleaner	C5ZZ-9600-W	360° inlet		C5ZZ-9600-W	360° inlet	
STAGE 2			34			47
Cam	C9OZ-6250-C	Hyd.		C7FE-6250-A	Mechanical	
Tappets	C9OZ-6500-A	Hyd.		C3OZ-6500-A	Solid	
Valve Spring & Damper	C9OZ-6513-A	351 Stock		C3AZ-6513-B	390 GT	
Retainers	C9OZ-6514-D	One Piece		C9OZ-6514-D	One Piece	
Keepers	C9ZZ-6518-A	Hardened		C9ZZ-6518-A	Hardened	
Rocker Arm	—			C2OZ-6564-A	Conventional	
Rocker Arm Stud	—			C3OZ-6A527-B	Threaded	
Rocker Arm Nut	—			C2DZ-6A529-A		
Guide Plate	—			C9OZ-6A564-B		
Push Rod	—			C9OZ-6565-G	Hardened	
Rocker Arm Deflector	—			C9OZ-6524-B		
Deflector Jam Nut	—			45218-S8		
Balance Damper	—			C9ZZ-6316-B	Boss 302	
Oil Slinger	—			C9ZZ-6310-A	Boss 302	
Spark Plug Cable	C4OZ-12259-C	Steel Core		C4OZ-12259-C	Steel Core	
Dual Point Distributor	Non-Ford Part			Non-Ford Part		
Oil Pump Spring	C5AZ-6670-A	240 6-Cyl.		C5AZ-6670-A	240 6-Cyl.	
Oil Pump Cup	C9OZ-6A616-A	240 6-Cyl.		C9OZ-6A616-A	240 6-Cyl.	
STAGE 3			15			15
Headers	Non-Ford Part	Steel Tube		Non-Ford Part	Steel Tube	
STAGE 4 (Optional)						11
Exhaust Valves	—			C9OZ-6505-AA	GT40 1.625 dia. head	
Intake Valves	—			C9OZ-6507-AA	GT40 1.875 dia. head	
TOTAL INCREMENTAL HORSEPOWER INCREASE OVER STOCK 351-2V ENGINE			83			107



351 INCHES OF INSTANT GO

MORE PUNCH PER POUND

This is the largest of Ford's small-block V-8's, featuring precision thin-wall casting and shell-molded components for a good bhp-to-weight ratio. The 351-4V only weighs approximately 65 lbs. more than the 302-4V, yet puts out 55 more horsepower. This makes the 351 an ideal "street" mill, as handling is greatly improved by virtue of better weight distribution over the front wheels.

NOT JUST A STROKED 289

Dimensionally, the 351 (4.00 x 3.50″) appears to be a stroked 289 (4.00″ x 2.87″), especially because bore spacing (4.38″) is identical. But it's not. It's an all new engine. Some block dimensions were maintained to make more parts, such as heads, interchangeable. Valve train and cam bearings are also similar enough so you can use the same cams in 289-302-351 mills. But, there are important differences.

351 FEATURES

The longer stroke necessitated a higher block deck height than 289-302 engines, plus longer push rods and connecting rods. The lower end is beefier with bigger bearings to handle the 351's increased torque and horsepower.

Breathe-ability, of course, produces power-ability. Tall (1.94″) and wide (1.16″) intake ports let the 351 do what it does best . . . breathe. 351 heads were designed on a flow box to assure a high air velocity . . . between 270 and 280 feet/second @ 4000 rpm . . . to scrub liquid fuel from port walls for better fuel distribution and instant mid-range response. Intake valves are 0.060″ larger than 289's and exhausts are 0.080″ bigger. The heads also feature long, smooth runners and combustion chambers modelled after the GT-40 design.

CONTROLLER KIT...

83 Horsepower Increase

STAGE 1

"Wrench On" 34 Ponies With 600 cfm Four-Holer and Aluminum Hi-Riser Manifold

If you've got a wrench, you can get a quick and easy 34 horsepower boost for your competition coin with these induction goodies. Horsepower increases throughout the entire range with a peak gain of 34 bhp @ 5000 rpm. CARBURETOR C8AZ-9510-AD is a big 4-holer that features "center pivot" floats to prevent fuel starvation while cornering. It has 1¼" primary and 1-5/16" secondary venturis that will pack your 351 with fiery fumes at the rate of 600 cu. ft./min. For maximum power, the carburetor may have to be recalibrated as described on pages 13 and 20-21. A "Universal" Throttle Lever for rod or cable linkage (Manual or Automatic) may also be required on some cars.

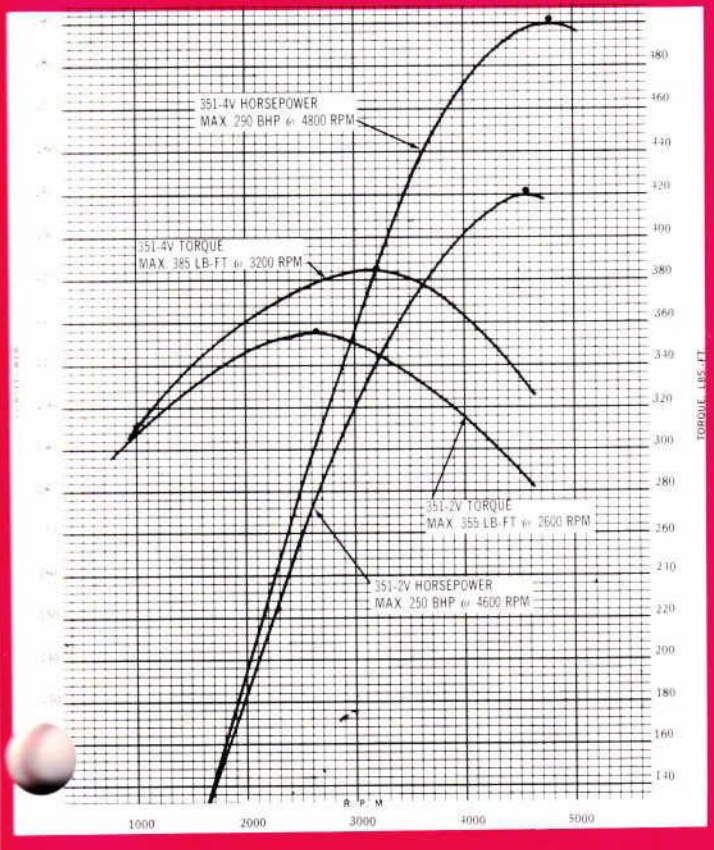
INTAKE MANIFOLD C9OZ-9124-E is a true high riser, aluminum design. Its gently curved, 180° balanced runners deliver a smooth, uninterrupted air/fuel flow to each port. Only a 5 cfm spread exists between runners versus a 21 cfm difference for the stock cast iron job.

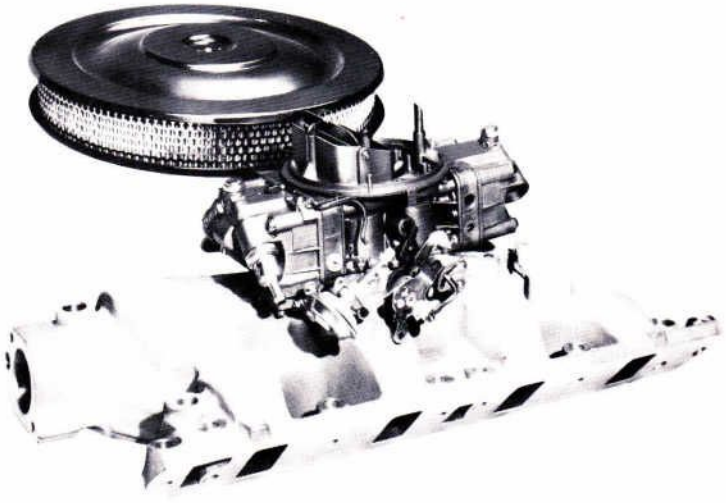
AIR CLEANER ASSEMBLY C5ZZ-9600-W is also recommended. Its low restriction 360° inlet design assists high velocity air flow.

CARBURETOR SPACER C2AZ-9A589-E, which is thinner than the stock part, should be installed to avoid interference with the hood.

351 SPECIFICATIONS

	2V 250 bhp	4V 290 bhp
Displacement	351 Cu. In.	351 Cu. In.
Bore & Stroke (Inches)	4.00 x 3.50	4.00 x 3.50
Compression Ratio	9.5:1	10.7:1
Brake Horsepower	250 @ 4600	290 @ 4800
Maximum Torque	355 @ 2600	385 @ 3200
Valve Lifters	Hydraulic	Hydraulic
Carburetion	2-bbl 350 cfm	4-bbl 470 cfm
Crankshaft	Nodular Iron	Nodular Iron
Connecting Rods	Forged	Forged
Pistons	Aluminum Autothermic	Aluminum Autothermic
Intake Valves (1.840")	1047 Steel w/Aluminized Head	1047 Steel w/Aluminized Head
Exhaust Valves (1.540")	21-4N Forged Steel w/Aluminized Head	21-4N Forged Steel w/Aluminized Head





4V Carburetor C8AZ-9510-AD High Riser Manifold C9OZ-9424-E Air Cleaner Assembly C5ZZ-9600-W

CONTROLLER KIT . . .
STAGE 2
Hydraulic Stick Pops For 34 BHP

HYDRAULIC CAM C9OZ-6250-C is for the guy who wants a stick with the right numbers for high performance, AND smooth quiet operation with little maintenance. Its grind is similar to the stock cam used in the 289 (271 HP) mill, so you know it can pop the valves open, keep 'em open, and close 'em quick. As can be expected, it really comes on strong for a peak gain of 34 bhp @ 5000 rpm. It works equally well with both manual and automatic transmissions. *(NOTE: If you want to extend the rpm range another 500 revs, the 289 HP MECHANICAL CAM C3OZ-6250-C can be installed. It has the same performance characteristics as the hydraulic cam. However, SOLID TAPPETS C3OZ-6500-A (16 req'd), THREADED ROCKER ARM STUDS C3OZ-6A527-B (16 req'd), GUIDE PLATES C9OZ-6A564-B (16 req'd), 390 GT SPRING and DAMPER ASSY. C3AZ-6513-B (16 req'd), RETAINERS C9OZ-6514-D (16 req'd), Hardened PUSH RODS C9OZ-6565-G (16 req'd), DEFLECTOR C9OZ-6524-B (16 req'd), JAM NUT 45218-S8 (16 req'd), and CONVENTIONAL ROCKER ARMS C2OZ-6564-A (16 req'd) and ROCKER ARM STUD NUTS C2DZ-6A529-A (16 req'd) must also be installed. NOTE: It may be necessary to remove 0.030" from the valve end of the rocker arm slot to obtain rocker arm stud clearance with the higher lift mechanical cams.*

OTHER MODIFICATIONS REQUIRED

The higher lift and extended rpm range of the C9OZ-6250-C cam moves the valves further off their seats and at higher speeds. This puts greater stress on all valve train components. As a consequence, make the following changes.

VALVE TRAIN

HYDRAULIC TAPPETS C9OZ-6500-A (16 req'd) should be installed for maximum service life if the 0.002 crown on the cam end of the original tappet has worn flat. These lifters have been machined from a special material that is compatible with this cam to keep wear to a minimum.

VALVE SPRING and DAMPER ASSY. C9OZ-6513-A (16 req'd) should be installed to control valve float at higher rpm on those engines which do not already have the spring with a damper assy. These are stock 351 springs that will give the proper spring height of 1.79", and avoid a "spring bind" condition. SHIMS B3Q-6515-A will be required to achieve proper spring height.

RETAINERS C9OZ-6514-D (16 req'd) are a specially hardened one piece design for high performance use. The production sleeves must be deleted with installation of these retainers.

KEEPERS C9ZZ-6518-A (32 req'd) are specially hardened keys, and should be installed for high performance use.

DEFLECTOR C9OZ-6524-B (16 req'd) and JAM NUT 45218-S8 (16 req'd), though not mandatory, are recommended with the hydraulic cam.

OIL PUMP MODIFICATION

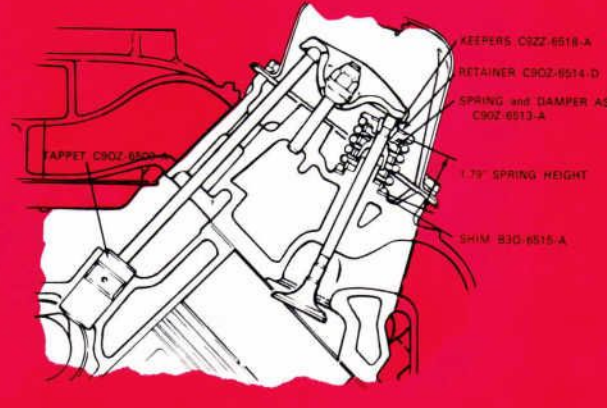
Additional oil pressure for high rpm operation can be obtained by installing a stiffer spring in the oil pump relief valve. Perform this modification by drilling a small hole in the plug cup and threading in a wood screw. Pry out the cup. Use care not to damage the aluminum housing. Also, be careful not to get hit by the cup as it's removed, because it's under great spring pressure. Install RELIEF VALVE SPRING C5AZ-6670-A and new CUP C9OZ-6A616-A.

Hydraulic Cam—C9OZ-6250-C

C9OZ-6250-C Camshaft Specifications

Lifter Type	Hydraulic	
Rocker Arm Type	Pedestal Mounted—Positive Stop, Non-Adjustable	
Rocker Arm Ratio	1.60:1	
	INTAKE	EXHAUST
TIMING		
Checking Clearance	0.100"	0.100"
Opens	0° Cam Tappet Lift 36° BTC 16° ATC	0° Cam Tappet Lift 84° BBC 32° BBC
Closes	74° ABC 20° ABC	26° ATC 28° BTC
Overlap	62°	62°
Duration	290°	290°
VALVES		
Head Diameter (Max.)	1.84"	1.54"
Angle of Seat and Face	45°	45°
Lift (Max. at Valve)	0.470"	0.470"
SPRINGS*		
Outer Valve Closed (Max.)	83 lbs. @ 1.79"	83 lbs. @ 1.79"
Outer Valve Open (Max.)	215 lbs. @ 1.34"	215 lbs. @ 1.34"
Inner Valve Closed (Max.)	Damper Only	
Inner Valve Open (Max.)	Damper Only	

*Spring pressure is "nominal" at indicated spring height with damper removed.



351 Valve Train with Hydraulic Cam

DUAL POINT DISTRIBUTOR

A dual point distributor is recommended to give the coil more time to build up voltage, because of the higher-revving cam. However, the C5OZ-12127-E and dual point distributor used in 289-302 engines will not fit in a 351 mill. So, a non Ford dual point distributor (available from many sources) is recommended. Recalibrate the distributor curve by adjusting initial advance to 10°. Do not exceed 38° total advance.

CARBURETOR

For maximum power it may also be necessary to recalibrate the carburetor as described on pages 13 and 20-21.

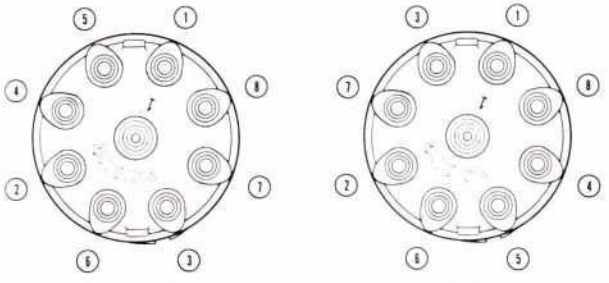
SOLID STEEL CORE WIRING

STEEL CORE WIRING KIT C4OZ-12259-C will deliver maximum voltage to the spark plugs. The kit includes 8 spark plug cables and the high tension wire from the coil to distributor. Since this wiring doesn't use special resistance materials to control radio interference, a radio suppression kit C1AZ-18827-A is recommended for the "street."

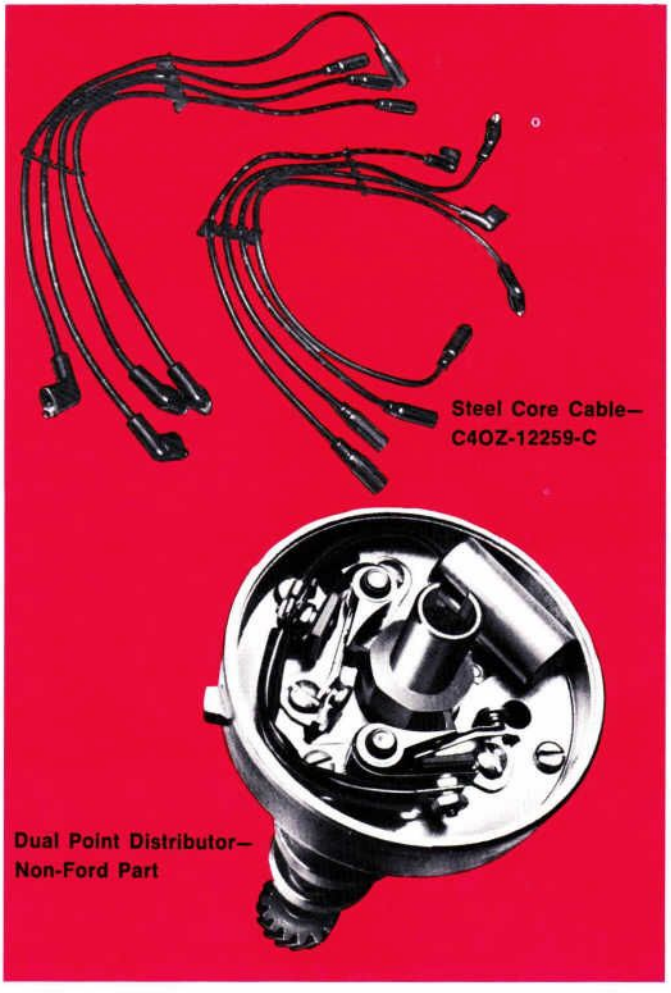
(NOTE: The production 351 engine has a different firing order [1-3-7-2-6-5-4-8] than the 289-302 engines [1-5-4-2-6-3-7-8].)

When the 289-302 cam (C3OZ-6500-A, C9OZ-6250-C, or C7FE-6250-A) is installed in a 351 engine, change the secondary wiring in the distributor cap to the 289-302 firing order *1-5-4-2-6-3-7-8*.

Firing Order



289-302 351



Steel Core Cable—
C4OZ-12259-C

Dual Point Distributor—
Non-Ford Part

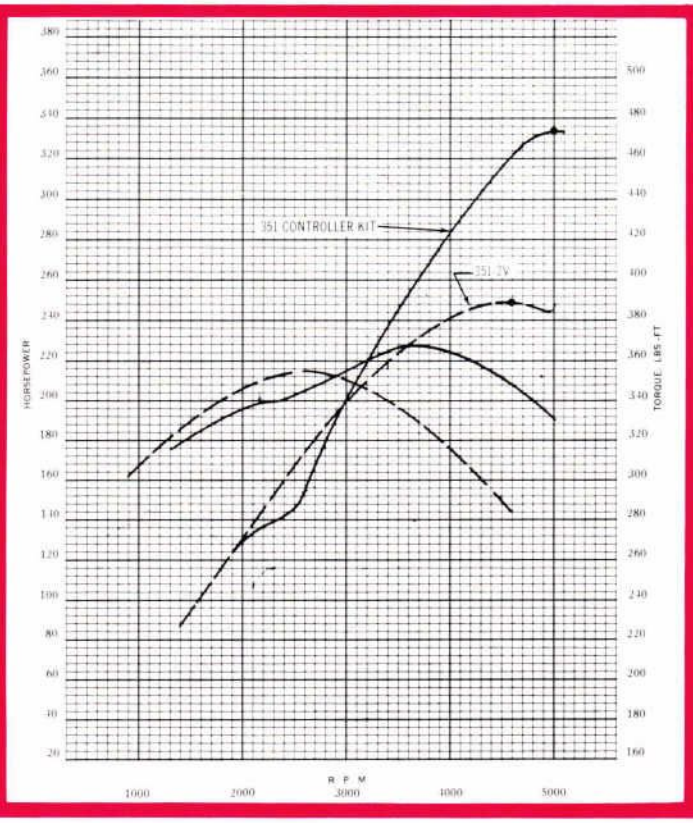
CONTROLLER KIT . . .
STAGE 3
Tube Type Headers Relieve Back Pressure to Net You 15 More Horsepower

TUBE TYPE HEADERS

The 351's production cast iron exhaust manifolds compare favorably with "headers" on the dyno. But nothing does the job like a set of lightweight steel tube headers available from several sources. They improve scavenging of exhaust gases throughout the power range, netting a peak gain of 15 horsepower @ 5000 rpm.

CONTROLLER KIT . . .
Total Incremental HP Increase . . . 83

As you can see, about all it takes is a wrench to stuff your 351 with 83 more horsepower. But make sure you install *all* the parts. Your machine won't look much different . . . just turn on with instant response when challenged by the unwary.



DOMINATOR KIT . . .

107 Horsepower Increase

STAGE 2 (Revisited)

To Install "Big Stick" That Stomps Out 47 BHP Gain

MECHANICAL CAM

MECHANICAL CAM C7FE-6250-A is about the biggest stick you can drop into your 351. Sometimes called the "LeMans" cam it features a grind that gets the most out of the big-breathing 351 heads. Maximum torque occurs @ 4500 rpm. Horsepower starts increasing @ 3500 rpm and stomps out a peak gain of 47 bhp @ 5500 rpm. This cam is only recommended for use with manual transmissions. Its installation also requires some Stage 2 valve train changes. Stages 1 and 3 remain unchanged.

VALVE TRAIN COMPONENTS

SOLID LIFTER TAPPETS C3OZ-6500-A (16 req'd) must be installed with the mechanical cam. These tappets are machined from special metal that's compatible with the cam to minimize cam scuffing. VALVE SPRING and DAMPER ASSY. C3AZ-6513-B (16 req'd) which are from the 390 GT, must be installed to control valve float and avoid "spring bind," while maintaining proper spring height of 1.82". Specially hardened RETAINER C9OZ-6514-D (16 req'd) and KEEPERS C9ZZ-6518-A (32 req'd) are needed for high-rev operation. Discard the production parts.

THREADED ROCKER ARM STUDS C3OZ-6A527-B (16 req'd) and ROCKER STUD NUT C2DZ-6A529-A (16 req'd) which are standard on the 289 (271 HP) mill, should replace the pressed-in type that are standard on the 351. Before installing the high performance rocker arm studs, the rocker stud bosses must be milled 0.230" to accommodate tapping for the screw-in studs and GUIDE PLATE C9OZ-6A564-B (16 req'd). The guide plate is necessary to align the push rods because the production "rail" rocker arms must be replaced by non-rail CONVENTIONAL ROCKER ARMS C2OZ-6564-A (16 req'd) for efficient and durable valve train operation at high revs. HARDENED PUSH RODS C9OZ-6565-G (16 req'd) should be installed. These are specially hardened 302 pieces for durability to resist wear when they rub against the guide plates. Set valve lash to specifications shown on page 18. NOTE: It may be necessary to remove 0.030" from the valve end of the rocker arm slot to obtain rocker arm stud clearance with the higher lift mechanical cam.

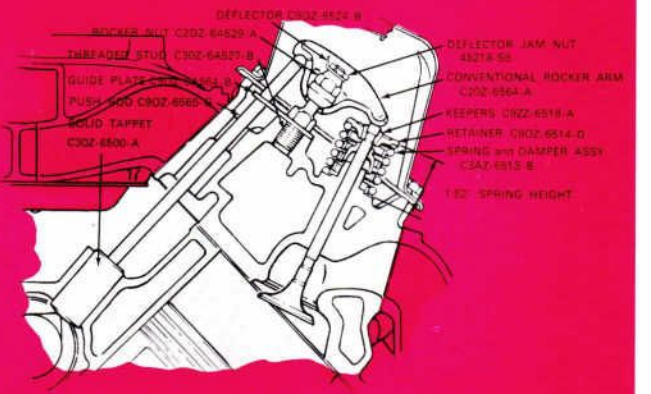
DEFLECTOR C9OZ-6524-B (16 req'd) and JAM NUT 45218-S8 (16 req'd) should be installed to provide adequate oiling for the rocker arm at high rpm's. The high revs cause high oil pressures that tend to squirt oil out of the push rod at the rocker arm and miss the fulcrum of the rocker arm. The deflector interferes and drops oil into the rocker fulcrum area for cooling and lubrication.

Mechanical Cam—C7FE-6250-A

C7FE-6250-A Camshaft Specifications

Lifter Type	Solid	
Rocker Arm Type	Pedestal Mounted—Adjustable	
Rocker Arm Ratio	1.60:1	
	INTAKE	EXHAUST
TIMING		
Checking Clearance	0.100" Tappet Lift	0.100" Tappet Lift
Opens	0° Cam 52° BTC	0° Cam 82° BBC
Closes	6° BTC 86° ABC	40° BBC 42° ATC
Overlap	30° ABC 94°	4° BTC 94°
Duration	318°	304°
VALVES		
Head Diameter (Max.)	351 1.84" GT 40 Type 1.875"	351 1.54" GT 40 Type 1.625"
Angle of Seat and Face	45° 30°	45° 45°
Lift (Max. at Valve)	0.510"	0.510"
SPRINGS*		
Outer Valve Closed (Max.)	85 lbs. @ 1.82"	85 lbs. @ 1.82"
Outer Valve Open (Max.)	268 lbs. @ 1.32"	268 lbs. @ 1.32"
Inner Valve Closed (Max.)	Damper Only	
Inner Valve Open (Max.)	Damper Only	

*Spring pressure is "nominal" at indicated spring height with damper removed.



351 Valve Train with Mechanical Cam

ENGINE BALANCE

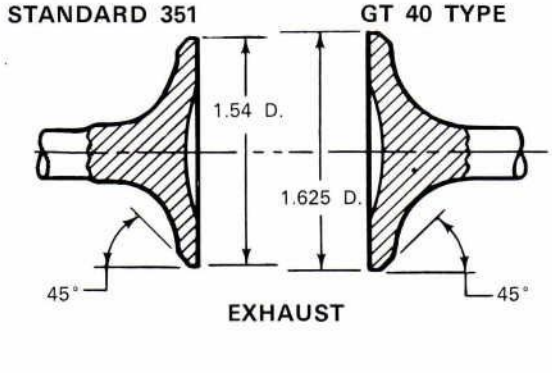
The higher rpm's possible with the mechanical cam require engine balance modifications to reduce torsional vibrations to acceptable level. These vibrations can be corrected by installing a Boss 302 CRANKSHAFT DAMPER C9ZZ-6316-B and OIL SLINGER C9ZZ-6310-A. The engine must be dynamically balanced.

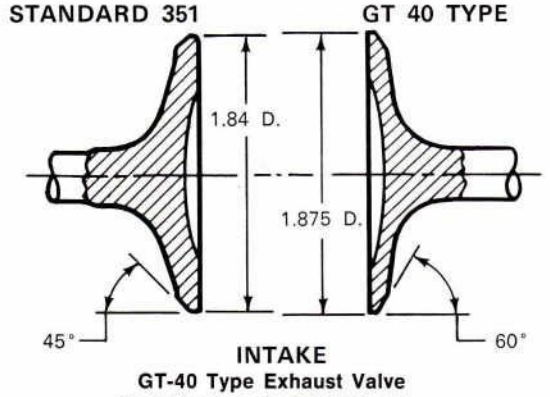
DOMINATOR KIT . . .

STAGE 4

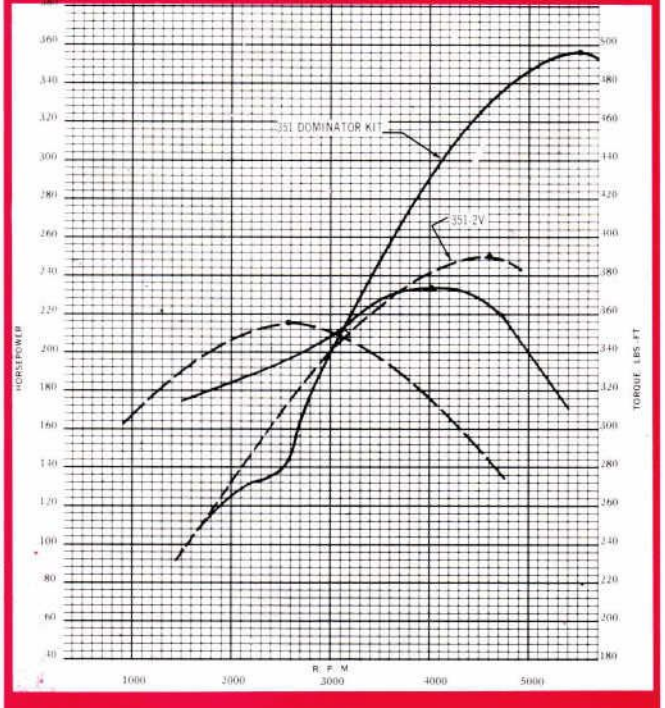
(Optional) 11 Horses From GT-40 Type Valves

The installation of GT-40 valves adds 11 bhp @ 4500-5000 rpm. However, they require reworked head seats. The INTAKE VALVES C9OZ-6507-AA (8 req'd) have a 1.875" head diameter compared to the 1.84" diameter of the production 351 valves. The seat angle is 30° instead of 45° for stock 351 valves. This may necessitate a valve spring shim after machining head seats to achieve correct installed height of 1.82". The shape of the valve stem at the head is also different to improve flow characteristics. EXHAUST VALVES C9OZ-6505-AA (8 req'd) have a head diameter of 1.625" compared to 1.54" for production 351 valves.





GT-40 Type Exhaust Valve
Part Number C9OZ-6505-AA
GT-40 Type Intake Valve
Part Number C9OZ-6507-AA

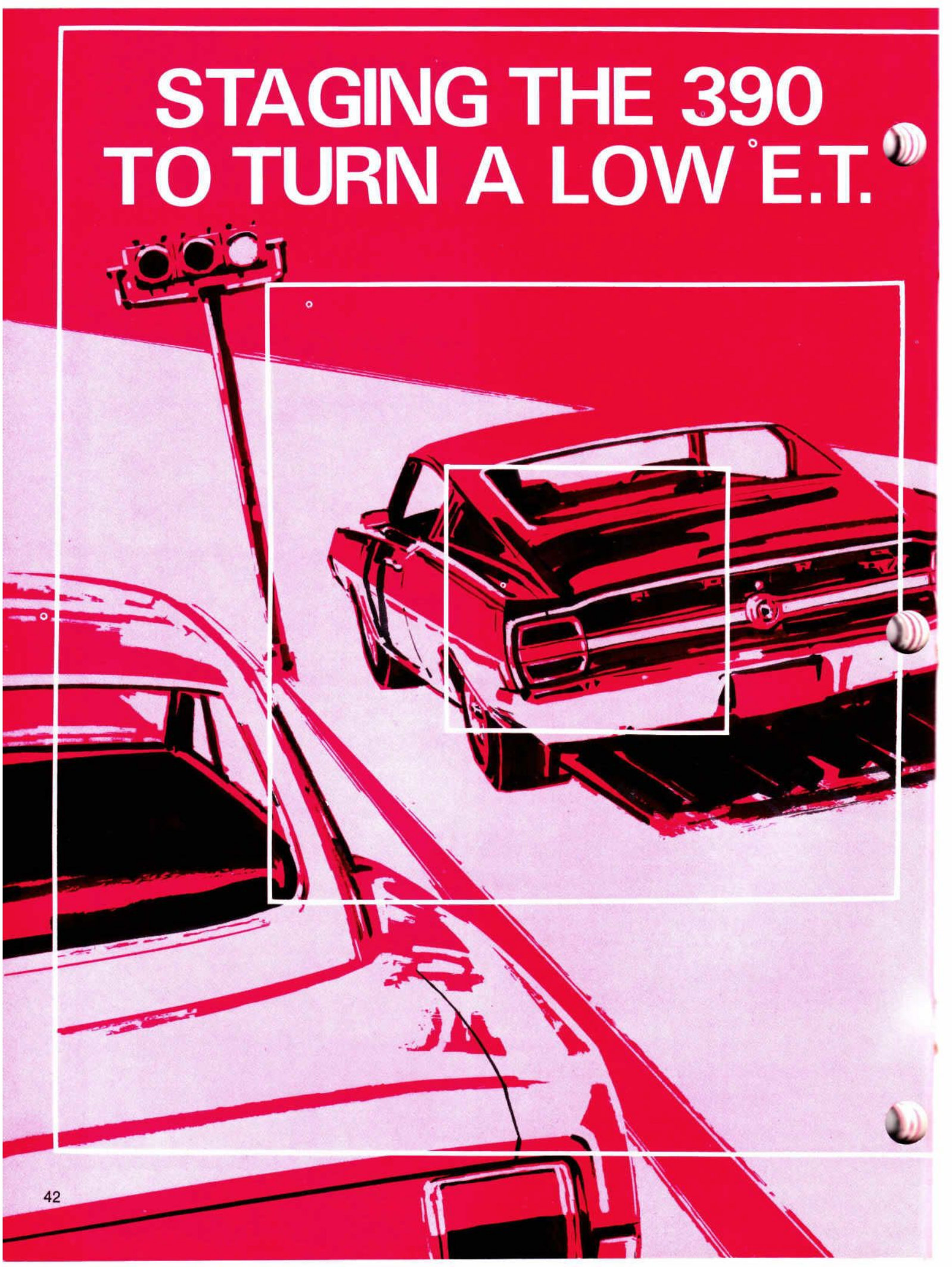


DOMINATOR KIT . . .

Total Incremental HP Increase . . . 107

It takes a little more than just a wrench to drop in the good stuff that snuffs out the competition. But not much. Just a little machining that any competent shop can perform. And look at what happens to the power curves. They really reach out.

STAGING THE 390 TO TURN A LOW E.T.

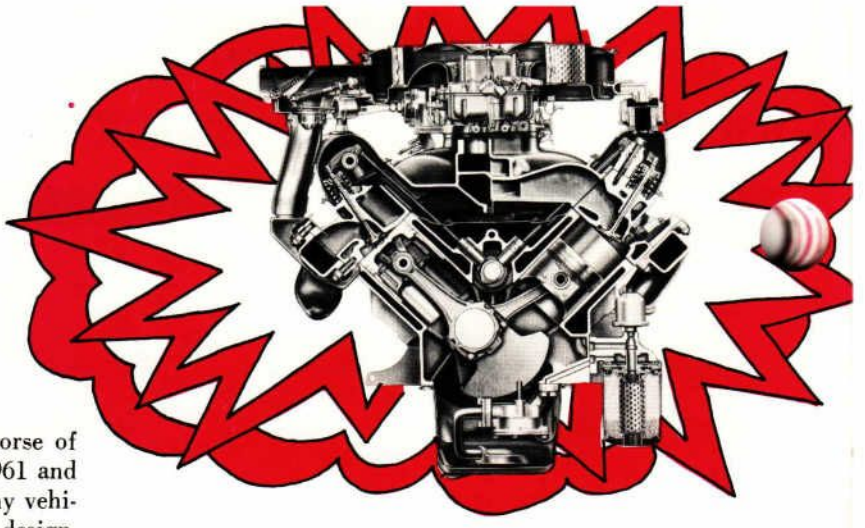


MUSCLE MODS FOR QUICK-TRIPPING 390's

	IMPRESSOR KIT			CONTROLLER KIT			DOMINATOR KIT		
	Part Number	Description	Added HP	Part Number	Description	Added HP	Part Number	Description	Added HP
STAGE 1			17			17			17
Carburetor	C9AZ-9510-N	4V 735 cfm		C9AZ-9510-N	4V 735 cfm		C9AZ-9510-N	4V 735 cfm	
Intake Manifold	C6AZ-9424-H	4V Aluminum		C6AZ-9424-H	4V Aluminum		C6AZ-9424-H	Aluminum	
	C8OZ-9424-B	4V Cast Iron		C8OZ-9424-B	4V Cast Iron		C8OZ-9424-B	4V Cast Iron	
†See note									
STAGE 2			35			48			56
Camshaft	C6OZ-6250-B	Hyd. 428		C8AX-6250-C	Hyd.		C3AZ-6250-AA	Mech. 427	
							C4AE-6250-B	Mech. (opt.)	66*
							C8AX-6250-D	Mech. (opt.)	82**
Tappets	C8AZ-6500-B	Hyd. 428 S/CJ		C8AZ-6500-B	Hyd. 428 S/CJ		C4AZ-6500-B	Mech. 427	
Push Rods	C4TZ-6565-D	0.060" short		C4TZ-6565-D	0.060" short		B8AZ-6565-C	427	
				C4TZ-6565-B	390 stock (opt.)				
				B8AZ-6565-C	427 (opt.)				
Valve Springs	C8AZ-6513-B	428		C8AZ-6513-B	428		C8AZ-6513-B	428	
Retainers	C3AZ-6514-A	428		C3AZ-6514-A	428		C3AZ-6514-A	428	
Keepers	B8A-6518-A	428		B8A-6518-A	428		B8A-6518-A	428	
Rocker Arms				B8A-6564-B	1.76 adj. (opt.)		B8A-6564-B	427 1.76 adj.	
Distributor	C0AZ-12127-L	427 dual point		C0AZ-12127-L	427 dual point		C0AZ-12127-L	427 dual point	
Spark Plug Cable	C5AZ-12259-C	Steel Core		C5AZ-12259-C	Steel Core		C5AZ-12259-C	Steel Core	
†See Note									
STAGE 3			15			15			15
Headers	Non-Ford Part	Steel Tube		Non-Ford Part	Steel Tube		Non-Ford Part	Steel Tube	
Exhaust Manifold (opt.)	C8OZ-9430-C	R.H. 428		C8OZ-9430-C	R.H. 428		Not Recommended		
	C8OZ-9431-B	L.H. 428		C8OZ-9431-B	L.H. 428		Not recommended		
STAGE 4			21			21			31
Cylinder Heads	C8OZ-6049-K	428		C8OZ-6049-K	428		C8OZ-6049-K	428	
Pistons				C9OZ-6108-Y	R.H. Pop-up (opt.)	31*	C9OZ-6108-Y	R.H. Pop-up	
				C9OZ-6109-A	L.H. Pop-up (opt.)		C9OZ-6109-A	L.H. Pop-up	
				(POP-UP PISTONS AVAILABLE AUGUST 1969)					
Rings				C1AZ-6148-A	390 Stock		C1AZ-6148-A	390 stock	
Connecting Rod	C6AZ-6200-C	390 Police Int.		C6AZ-6200-C	390 Police Int.		C5AZ-6200-D	427	
Rod Bearing		390 Stock			390 Stock		C5AZ-6211-G	427	
Intake Valves	C9OZ-6507-U	428 stock		C9OZ-6507-U	428 stock		C8AX-6507-A	428 Lightweight	
Exhaust Valves	C9OZ-6505-N	428 stock		C9OZ-6505-N	428 stock		C8AX-6505-A	428 Lightweight	
Head Gasket	C3AZ-6051-B	Steel		C3AZ-6051-B	Steel		C8AZ-6051-A	428	
Also recommended:									
H.D. Oil Pump	C9ZZ-6600-A	428		C9ZZ-6600-A	428		C9ZZ-6600-A	428	
Oil Pan w/Baffle	C8AX-6675-A	7-qt. Deep Sump		C8AX-6675-A	7-qt. Deep Sump		C8AX-6675-A	7-qt. Deep Sump	
Oil Pickup	C5AE-6622-B	5/8" I.D.		C5AE-6622-B	5/8" I. D.		C5AE-6622-B	5/8" I. D.	
Windage Tray	C9ZZ-6687-A	428		C9ZZ-6687-A	428		C9ZZ-6687-A	428	
STAGE 5 (Optional 410 Stroker Kit)						10**			
Crankshaft				C9ZZ-6303-A	428 Super CJ				
Connecting Rod				C5AZ-6200-D	427				
Pistons				C6MY-6108-AB	410 Mercury				
Rings				C6AZ-6148-E					
Flywheel				C9ZZ-6375-B	428 Manual Trans.				
				C9OZ-6375-B	428 Auto. Trans.				
Vibration Damper				C8AZ-6316-C	428 Super CJ				
Vibration Damper Spacer/Counterweight				C9ZZ-6359-A	428 Super CJ				
TOTAL INCREMENTAL HORSEPOWER INCREASE OVER STOCK 390-4V ENGINE			88			101			119
				(with opt. Pop-up Pistons) pistons available Aug. '69		111*	(with C9AE-6250-B)		129*
				(with Stroker Kit)		111**	(with C8AX-6250-D)		145**

†Note—See Text Copy For Additional Parts Required For Special Application

THE STOCK 390



ITS BEEN AROUND

Meet the durable one. The quiet, powerful workhorse of Ford engines . . . the 390. It came on the scene in 1961 and has been used in virtually every Ford Motor Company vehicle since that time. Because of its inherently good design, later engines such as the 427 and 428 were built around the basic 390. The 427 "wedge" is essentially a bored-out, beefed-up 390. The 428 is a bored *and* stroked 390 with some added engineering refinements.

BIG BLOCK DIMENSION COMPARISON

ENGINE	BORE	STROKE
390	4.05″	3.78″
427	4.23″	3.78″
428	4.13″	3.98″

Each engine was designed for a particular job. Now you can design *your* 390 to do *your* job—by using the interchangeable parts that have come with these later engines.

FACTORY FEATURES

Deep-Block Construction—Cylinder block cast of durable, reliable, chrome-alloy iron extends well below the crankshaft center line for extra strength and rigidity. The 390-cubic-inch V-8s are a low-friction design with well "oversquare" dimensions in which the piston stroke is shorter than the cylinder diameter. This makes for a slower piston speed resulting in less wear, yet allowing maximum power output in the medium to high rpm range.

Crankshaft—Crankshafts are precision-molded nodular iron castings with large bearing surfaces. The unusually large overlap of main and crankpin journals contributes to greater rigidity. Torsional vibration damper, rubber-floated and mounted on front end of crankshaft, counteracts torsional vibrations.

Slipper-Type Pistons—Piston sides are cut away for reduced friction and more rapid dissipation of heat. Pistons are aluminum-alloy with embedded expansion struts. Tin-plating of pistons prevents scuffing during initial break-in.

Connecting Rods—Connecting rods are high-strength pyramid type, spreading at the base, with forged I-beam construction and separately forged caps.

390 4V AND 4V GT

Since the 390 has been in production several years, many minor changes have been made. The basic engines we are talking about modifying in this section are the 390 4V and 390 4V GT produced since 1966.

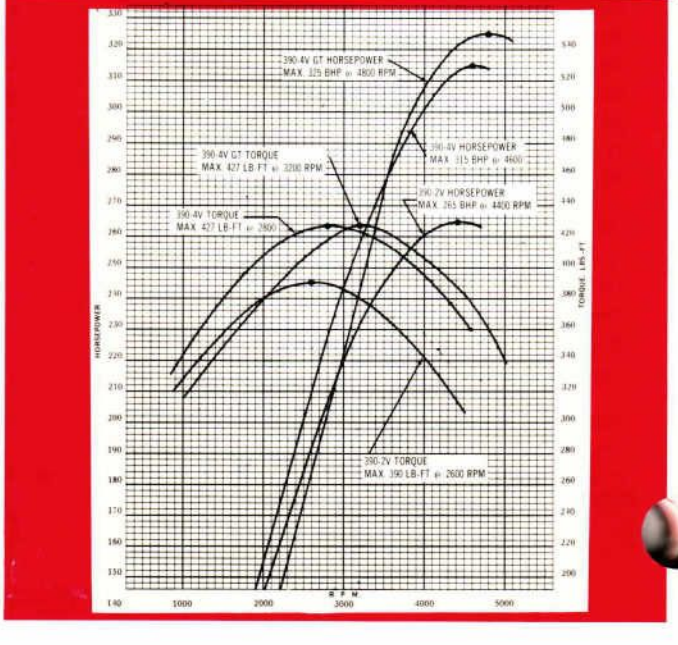
The standard 390 4V engine is rated at 315 bhp @ 4600 rpm. Carburetion is through a Ford 446 cfm 4-barrel and a cast iron, low-profile manifold. The compression ratio of 10.5:1 requires premium fuel. Any high performance cam modification to this engine requires new valve springs, retainers and keepers as the stock valve train is not designed for the high rpm's encountered in performance mills.

The 390 4V "GT" engine is rated at 325 bhp @ 4800 rpm. It is a cross between the standard 390 and the 428 Cobra Jet. Carburetion is through a big Holley 4V, rated at 600 cfm, and a cast iron, medium rise manifold. It uses the same cam and valve train as the 428 CJ.

The standard 390 2V engine is not specifically discussed for modifications because it's primarily an economy engine. It's Ford 2-barrel carburetor flows 351 cfm and uses regular fuel because the pistons give a lower compression ratio (9.5:1) than 4V engines. That's why the 390 2V is only rated at 265 bhp @ 4400 rpm. If modified for performance, 4V pistons and other pieces from this engine must be installed. Note: A few premium fuel 2V 390's have been built with the higher 10.5:1 4V pistons installed.

390 4V SPECIFICATIONS

	Standard 4V	4V "GT"
Displacement	390 Cu. In.	390 Cu. In.
Bore & Stroke (inches)	4.50 x 3.78	4.50 x 3.78
Compression Ratio	10.5:1	10.5:1
Brake Horsepower	315 @ 4600 rpm	325 @ 4800 rpm
Maximum Torque (lb.-ft.)	427 @ 2800 rpm	427 @ 3200 rpm
Carburetion	Ford 4V 446 cfm	Holley 4V 600 cfm
Crankshaft	Nodular Iron	Nodular Iron
Connecting Rods	Forged Steel	Forged Steel
Pistons	Aluminum Autothermic	Aluminum Autothermic
Intake Valves (2.037″)	Steel w/Aluminized Head	Steel w/Aluminized Head
Exhaust Valves (1.566″)	Cast Austenitic Steel	Cast Austenitic Steel



IMPRESSOR KIT...

88 Horsepower Increase

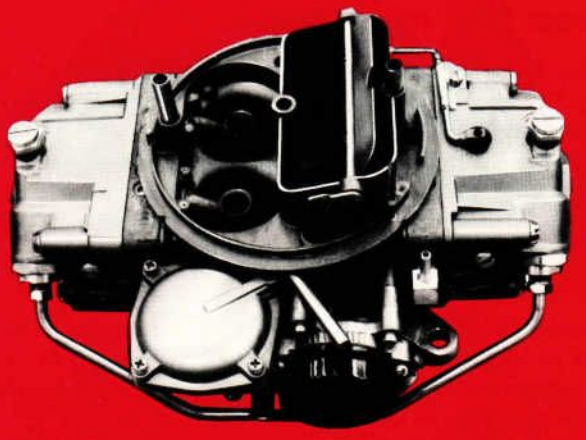
STAGE 1

"Bolt On" 17 Horses With 4-barrel 735 cfm Carburetor and Aluminum Manifold

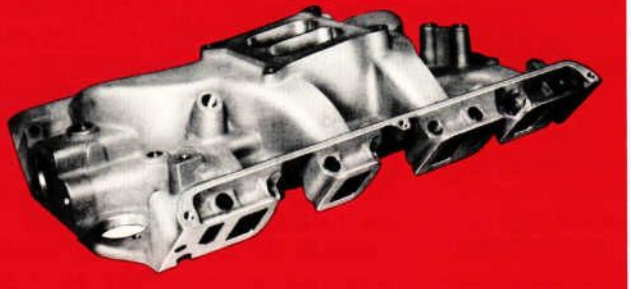
Let's get some good air inside the engine where it can do some good. The factory carburetor is okay for stock performance, but can't cut it when we start to build for the future. So our first step in Stage 1 is to drop on a big 4V Holley CARBURETOR C9AZ-9510-N. When you open its big doors your 390 can gobble up 735 cfm of the good air. This carburetor features "center pivot" floats that prevent fuel starvation while cornering. For maximum performance, the carburetor may have to be recalibrated as described on pages 13 and 20-21.

To make sure the good mixture from the big Holley gets good treatment on its way to the cylinders, install ALUMINUM INTAKE MANIFOLD C6AZ-9424-H. This is similar to the manifold used on 428 Police Interceptors. It has the same 180°, dual plane design as the cast iron version for good low to mid-range response. Of course it provides better breathing, it's lighter and costs a little more. If you don't mind carrying around the extra iron, you can save some coin by installing the stock 428 CAST IRON INTAKE MANIFOLD C8OZ-9424-B which is almost as good.

Horsepower output with this induction setup starts improving at 3500 rpm and increases to a maximum gain of 17 bhp @ 4500 rpm.



4V 735 cfm Carburetor C9AZ-9510-N



Aluminum Intake Manifold C6AZ-9424-H

ADDITIONAL PARTS REQUIRED WITH ABOVE CARBURETOR AND MANIFOLD

PART NUMBER	DESCRIPTION	REMARKS AND WHY REQUIRED
C5ZZ-9600-W	Air Cleaner	Use if necessary to clear hood
370970-S8	Air Cleaner Stud	Not supplied with carburetor
C8AZ-9A589-G	Carburetor Spacer	Thinner than stock because of higher intake manifold
C6AZ-6869-A	Road Draft Tube Cover	Use on pre-emission designed Vehicles
COAE-6A632-A	Draft Tube Gasket	Use on pre-emission designed Vehicles
C5AZ-8555-A	Water By-pass Tube	Press-fit design can't be interchanged with manifolds
C6AZ-6A630-D	Intake Manifold Baffle	Use w/C6AZ-9424-H Alum. Manifold
C8AZ-6A630-B	Intake Manifold Baffle	Use w/C8OZ-9424-B Iron Manifold
C6AZ-9433-B	Intake Manifold Gaskets	Use with either manifold
C6AZ-6052-A	Cylinder Head Plug	To plug hole if engine not equipped with emission control (8 req'd)

IMPRESSOR KIT
STAGE 2

CJ 428 Hydraulic Cam Adds 35 Horses— (Except "GT" 390's)

Now that you have big doors on top, let's do some remodeling inside. ("GT" 390 owners can sit this one out. You already have the CJ 428 cam and valve train pieces inside.) Owners of standard 390 4V's, however, can get an additional 35 horsepower @ 5000 rpm with 428 CJ HYDRAULIC CAM C6OZ-6250-B. This ol' smoothie works equally well with sticks and automatics.

OTHER MODIFICATIONS REQUIRED

Installation of the 428 CJ production cam requires some valve train modifications to standard 390 4V's. (You "GT" 390 owners can continue watching, as you already have these pieces as regular production parts.)

VALVE SPRING AND DAMPER ASSY. C8AZ-6513-B (16 req'd) should be installed to keep valves down where they belong at higher rpms. These CJ 428 springs will resist valve float and give proper spring pressure at installed height of 1.82".

RETAINERS C3AZ-6514-A (16 req'd) and KEEPERS B8A-6518-A (32 req'd) from the 428 CJ should also be installed for high performance operation.

NOTE: With installation of the above parts, the standard 390 4V is now identical as the "GT" 390. No additional reference to differences will be made in this kit.

TAPPETS C8AZ-6500-B (16 req'd) should be installed if originals have the 0.002" crown worn flat at the cam end and thus need replacement. These hydraulic lifters are from the 428 Super CJ and feature a high strength socket for improved high performance durability.

PUSH RODS C4TZ-6565-D (16 req'd) must be installed to maintain correct valve train geometry. They are 0.060" shorter than stock push rods. The shorter push rods must be installed because of the 0.030" that must be milled off the 428 heads in Stage 4 and the 0.020" thinner head gasket used to obtain a 10.7:1 compression ratio. This decreases distance from the cam's center to the rocker arm shaft's center by 0.050".

NOTE: 1966-67 ENGINES ONLY

CRANKSHAFT DAMPER C6AZ-6312-A must be installed on 1966-67 engines to maintain engine balance at high rpms. The new damper also requires TIMING POINTER C9AZ-6023-A (on 1966-67 engines without air conditioning) or TIMING POINTER C5AZ-6023-A (on 1966-67 engines with air conditioning) and ALTERNATOR ARM C7AZ-10145-A (on 1966-67 engines with air conditioning or Thermactor).

DUAL POINT DISTRIBUTOR

Since hydraulic cam C6OZ-6250-B develops horsepower in the 5000 rpm range, DUAL POINT DISTRIBUTOR COAZ-12127-L is recommended to get the last ounce of performance from your Impressor Kit. This is a 427 mechanical advance distributor (no vacuum advance). So, plug the vacuum line from the manifold. The factory curve is shown on pages 16 and 22. For maximum performance, adjust the stock 6° initial advance to 10° Do not exceed 38° total advance. Install Autolite BF-32 plugs.

428 CJ Hydraulic Cam C6OZ-6250-B

C6OZ-6250-B CAMSHAFT SPECIFICATIONS

Lifter Type Rocker Arm Type Rocker Arm Ratio	Hydraulic Shaft Mounted—Non-Adjustable 1.73:1	
	INTAKE	**EXHAUST**
TIMING	0.100"	0.100"
Checking Clearance	0° Cam Tappet Lift	0° Cam Tappet Lift
Opens	18° BTC 30° ATC	82° BBC 28° BBC
Closes	72° ABC 22° ABC	28° ATC 24° BTC
Overlap	46°	46°
Duration	270°	290°
VALVES		
Head Diameter (Max.)	2.097"	1.660"
Angle of Seat & Face	30°	45°
Lift (Max. at Valve)	0.500"	0.500"
SPRINGS		
Outer Valve Closed (Max.)	90 lbs. @ 1.82"	90 lbs. @ 1.82"
Outer Valve Open (Max.)	285 lbs. @ 1.32"	285 lbs. @ 1.32"
Inner Valve Closed (Max.)	Damper Only	
Inner Valve Open (Max.)	Damper Only	

Solid Steel Core Cable C5AZ-12259-C

Dual Point Distributor COAZ-12127-L

SOLID STEEL CORE CABLE

Maximum voltage can be delivered to the spark plugs by installing SOLID STEEL CORE CABLE C5AZ-12259-C. This kit contains cable for 8 spark plugs and the high tension wire from the coil to distributor. Since this "cable" wiring doesn't contain special resistance materials to control radio interference, RADIO SUPPRESSION KIT C4AZ-18827-A is recommended for "street" use.

STAGE 3

NOTE: Installation of 428 heads on 390 blocks requires either tube-type headers or 428 cast iron manifolds.

Tube Type Headers Add 15 Horsepower

Bigger exit tubes are a must if you want to push a lot of mixture in the top of your 390. Headers will add about 15 bhp @ 5000 rpm. Tube type headers come in a variety of shapes and sizes. But the criteria for good ones is very simple; separate tubes for each exhaust valve, equal length from valve to collector, and maximum efficient diameter for good exhaust flow. The headers that will best "tune" your 390 will observe these basic dimensions:

STEEL TUBE HEADER DIMENSIONS

PRIMARY PIPES		COLLECTORS	
Length	36″	Length	12″ Manual 16″ Automatic
Inside Diameter	2″	Inside Diameter	3½″

OPTIONAL CAST IRON MANIFOLDS

If you don't have the coin to go the steel tube headers route, you can get just about as much improvement (5 bhp increase over stock 390 manifold) in scavenging exhaust gases with a set of cast iron EXHAUST MANIFOLDS C8OZ-9430-C (R.H.) and C8OZ-9431-B (L.H.). They are specially designed for the 428 Cobra Jet heads of Stage 4. When installed with the 428 heads they can be used with any big block engine.

STAGE 4

21 More Horses; It's All In Your Heads

428 COBRA JET HEADS

To complete the Impressor Kit and really let the other guy know "big breather is watching you" install 428 CJ CYLINDER HEADS C8OZ-6049-K (2 req'd) on your 390. These bigger, better breathing heads will let you install 428 CJ valves that are larger than the stock 390's. 428 CJ INTAKE VALVES C9OZ-6507-U (8 req'd) have a 2.097″ head diameter and 428 CJ EXHAUST VALVES C9OZ-6505-N (8 req'd) have a 1.660″ head diameter compared to the stock 390's valve diameters of 2.037″ and 1.566″ respectively.

UPPING THE COMPRESSION RATIO

If you install 428 CJ heads on your 390 without any changes, you'll find that because of their larger chamber size the compression ratio has fallen to about 9.6:1. To raise the compression ratio to the 428's 10.7:1, mill 0.030″ off the heads and install STEEL HEAD GASKETS C3AZ-6051-B (2 req'd). These gaskets are 0.020″ thinner than the gaskets that come with the heads (which should be discarded). This modification has the effect of reducing head thickness a total of 0.050″, thus boosting compression ratio. The end result is a 21 bhp gain @ 5200 rpm.

Milling the cylinder heads means you must also mill the intake manifold, to keep all ports in proper alignment. Take 0.030″ off each mounting surface and 0.042″ from the bottom of the manifold.

Cast Iron Exhaust Manifold C8OZ-9430-C (R.H.) C8OZ-9431-B (L.H.)

Cylinder Head C8OZ-6049-K
Intake Valve C9OZ-6507-U, Exhaust Valve C9OZ-6505-N

Steel Shim Head Gasket C3AZ-6051-B

P.I. Connecting Rod C6AZ-6200-C

IMPRESSOR KIT

TOUGHER RODS

Added durability for your higher revving 390 can be had by installing CONNECTING RODS C6AZ-6200-C (8 req'd). These high strength forged rods were originally used in 390 Police Interceptor engines.

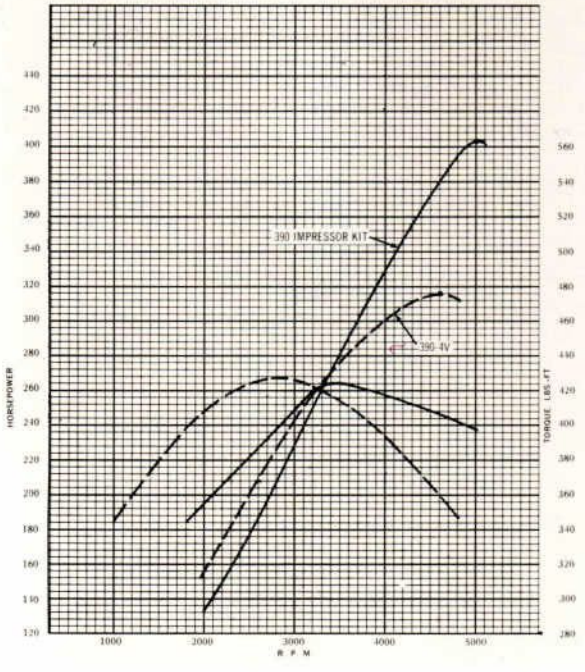
LOGICAL LUBE MODS TO PROTECT YOUR BUCKS

If you want to make sure there's something slick between the metal at high revs, it's logical to install these pieces: From the 428 CJ, install WINDAGE TRAY C9ZZ-6687-A. It fits around the crankshaft throws to resist crankcase wind currents from aerating the oil. DEEP SUMP OIL PAN C8AX-6675-A also assists in resisting oil frothing. Its deep sump design contains more oil (7-qts. with filter) for cooler operation and keeps oil further away from crank throws. It also has a scraper (that must be slightly bent to fit with windage tray baffles) that resists surging of oil around the crankshaft to further minimize frothing. To reach down into the deep sump pan, OIL PICKUP C5AE-6622-B must be installed. Not only is it extra long, but it has a big 5/8-inch I.D. to provide unobstructed oil flow at high rpms. The final step in protecting your bucks is to install HEAVY DUTY OIL PUMP C9ZZ-6600-A. It keeps the slick stuff flowing at 22 gallons per minute under 70-80 psi at 4000 rpm.

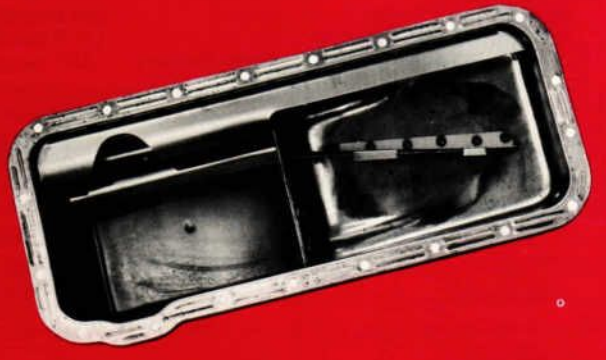
IMPRESSOR KIT

Total Incremental HP Increase 88

What started out as a docile 390, is now mostly 428 CJ. To see what that means, just look at the torque and horsepower curves. If they don't reach out far enough for you, maybe you should take a look at our Controller and Dominator Kits.



428 Windage Tray Baffle C9ZZ-6687-A



Deep Sump Oil Pan C8AX-6675-A

Deep Sump Oil Pickup C5AE-6622-B

Heavy Duty Oil Pump C9ZZ-6600-A

CONTROLLER KIT

111 Horsepower Increase

The 390 Controller Kit uses all the good pieces from 390 Impressor Kits, except for the addition of a stiffer-grind hydraulic cam. There's also a couple of options. The first is "pop-up" pistons to increase the compression ratio, when the 428 heads are installed on a 390 block. This eliminates having to mill the heads, which is especially handy if you plan to drop in a mechanical cam later on. The second is an optional Stage 5 that has the pieces to convert your 390 into 410 cubes of mean, get out of the gate go-power. Stages 1 and 3 remain unchanged, so we'll revisit Stages 2 and 4.

STAGE 2 (Revisited)

To Add 48 Horses With Big Street 'n Strip Hydraulic Cam

You can really give your 390, with the 735 cfm Holley on top, somewhere to go with HYDRAULIC CAM C8AX-6250-C. It adds 48 bhp @ 5500 rpm over the stock 390 4V cam. It works best with a stick shift, but can be coupled to an automatic. For maximum strip performance with an automatic, install a high slip angle convertor (non-Ford Part). This may be a little rough on the street, but it helps make you a weekend winner. Continue to use the Impressor Kit valve train pieces, unless you install the optional "pop-up" pistons in Stage 4. Then, instead of the 0.060" shorter 390 push rods, install the standard length 390 push rods.

NOTE: If you want to get a head start on your Dominator Kit, and increase valve lift from 0.500" to 0.509", install the 427 ADJUSTABLE ROCKER ARMS B8A-6564-B (16 req'd). Their 1.76 ratio compared to the stock 390's non-adjustable ratio of 1.73 accounts for the additional lift. You also must use 427 PUSH RODS B8AZ-6565-C (16 req'd). They have a ball on the tappet end and a socket or cup on the rocker arm end into which the adjusting screw seats. 390 push rods have a ball on both ends.

If you use the non-adjustable, shaft-mounted rocker arms, correct valve train clearance is designed into the system. However, if you use the adjustable, shaft-mounted rocker arms with hydraulic lifters, the following adjustment must be made to assure the lifter operates in the middle of its travel.

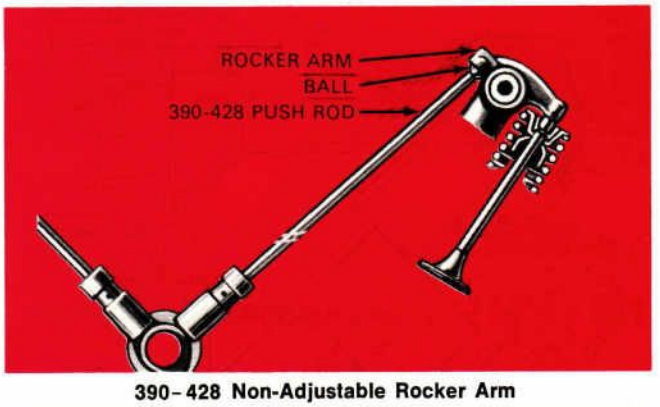
Position the No. 1 piston on TDC at the end of the compression stroke. Bleed the hydraulic lifter for each valve to the fully compressed position. Adjust the locking nut on the end of the rocker arm to obtain a clearance of 0.110"-0.210" at the valve. Repeat this procedure for each cylinder by turning the crankshaft a ¼-turn at a time in the direction of rotation, while adjusting the valves in the firing order (1-5-4-2-6-3-7-8).

Operate the engine and check for rough engine idle or noisy lifter(s). Tight valve clearance causes rough engine idle. Loose valve clearance causes noisy lifter(s).

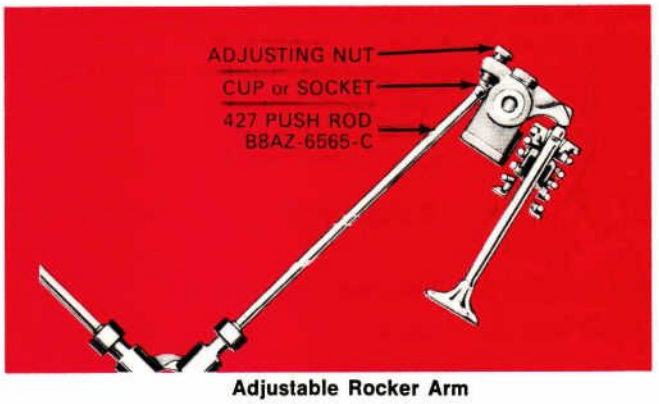
Hydraulic Cam C8AX-6250-C

C8AX-6250-C CAMSHAFT SPECIFICATIONS

Lifter Type Rocker Arm Type Rocker Arm Ratio	Hydraulic Shaft Mounted Non-Adjustable or Adjustable. 1.73:1 Non-Adj. 1.76:1 Adj.	
	INTAKE	EXHAUST
TIMING	0.100"	0.100"
Checking Clearance	0° Cam Tappet Lift	0° Cam Tappet Lift
Opens	24° (BTC) 22° (ATC)	82° (BBC) 34° (BBC)
Closes	78° (ABC) 30° (ABC)	34° (ATC) 18° (BTC)
Overlap	58° 40°	58° 40°
Duration	282° 188°	296° 196°
VALVES		
Head Diameter (Max.)	2.097"	1.660"
Angle of Seat & Face	30°	45°
Lift (Max. at Valve)	0.500" (1.73)	0.500" (1.73)
SPRINGS	0.509" (1.76)	0.509" (1.76)
Outer Valve Closed (Max.)	90 lbs. @ 1.82"	90 lbs. @ 1.82"
Outer Valve Open (Max.)	305 lbs. @ 1.32"	305 lbs. @ 1.32"
Inner Valve Closed (Max.)	Damper Only	
Inner Valve Only (Max.)	Damper Only	



390-428 Non-Adjustable Rocker Arm



Adjustable Rocker Arm

STAGE 4 (Revisited)

For Optional "Pop-up" Piston That Adds 10 Horsepower

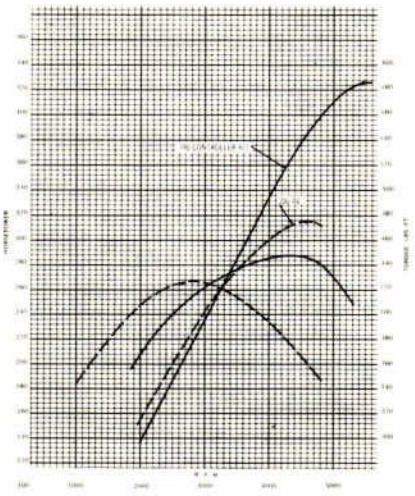
If you plan to install the Dominator Kit later, you can get a head start by using the "pop-up" pistons discussed for that kit on page 51 in your Controller Kit at this point. They will increase the compression ratio to 10.7:1 without having to mill the 428 cylinder heads. By not milling your heads now, you won't have to replace them later if you go the Dominator route. Install the standard 390 PUSH RODS C4TZ-6565-B (16 req'd) with the non-milled heads, "pop-up" pistons, the regular steel gaskets that come with the heads, and hydraulic cam. The "pop-up" pistons give 10 more horsepower at 5200 rpm than the milled heads (21 bhp) for a total increase of 31 bhp @ 5200 rpm.

CONTROLLER KIT . . .

STAGE 5 (Optional)

Stroker Kit Converts 390 to 410 and Adds 10 bhp with Milled Heads

If you want to stick with your milled 428 heads, you can add 10 bhp @ 5000 rpm by stroking your 390 to 410 cubes. It's done by changing the stock 390 stroke from 3.78" to 3.98" with installation of 428 SUPER COBRA JET CRANKSHAFT C9ZZ-6303-A. Also install 427 CONNECTING ROD C5AZ-6200-D (8 req'd) (NOTE: 0.010" must be ground off each side of journal end of 427 rods to fit in 390 bore.), 428 FLYWHEEL C9ZZ-6375-B (Manual Trans.) or C9OZ-6375-B (Auto. Trans.), 428 VIBRATION DAMPER C8AZ-6316-C, and VIBRATION DAMPER SPACER (with counterweight) C9ZZ-6359-A. These parts are shown under the "Super" 428 Cobra Jet engine parts identification chart on page 54. Install 410 PISTONS C6MY-6108-AB (8 req'd) and RINGS C6AZ-6148-E from the Mercury 410 CID engine, that fit your 390 bore. Dynamically balance the engine.



CONTROLLER KIT

Total Incremental HP Increase 111

Now, that wasn't hard was it? A cam, popup pistons and some lower-end tough stuff and you add 111 bhp @ 5500 rpm. But if those torque and horsepower curves still don't look mean enough, move up to the Dominator Kit to see just how far you can go with a base 390 engine.

DOMINATOR KIT . . .

119 to 145 Horsepower Increase

All those extra horses come from the choice of solid lifter cams, and lightweight valves. Of course, at this performance level we also recommend the 427 connecting rod. And if you didn't install the optional "pop-up" pistons in the Controller Kit, now is the time to do so. Stages 1 and 3 remain unchanged, so lets revisit Stage 2 and Stage 4 again.

STAGE 2 (Revisited, One More Time)

To Add 56 to 82 Horsepower With Mechanical Cams

MECHANICAL CAM C3AZ-6250-AA is a reasonably priced grind that adds 56 bhp @ 5500 rpm over the stock 390 4V. And you can drive it on the street. It's from the stock medium riser 427 mill and features a 0.500" lift and 306° duration. Two more solid lifter cams are optional here.

MECHANICAL CAM C4AE-6250-B is an excellent strip cam that will add 66 bhp @ 6000 rpm. Its 0.500" lift and 324° duration make it a marginal street stick. Do not use with power brakes as the vacuum at engine idle is not sufficient to operate brakes satisfactorily. MECHANICAL CAM C8AX-6250-D is strictly a strip and track cam with its 0.600" lift and 330° duration. It will add 82 bhp @ 6500 rpm. If this cam is used, be sure the engine is set up to handle its high rpm potential. Installation of the mechanical cams requires the following valve train modifications.

Mechanical Cam C3AZ-6250-AA Adds 56 bhp @ 5500 rpm.

Mechanical Cam C4AE-6250-B Adds 66 bhp @ 6000 rpm.

Mechanical Cam C8AX-6250-D Adds 82 bhp @ 6500 rpm.

NOTE: See Page 18 For Full Cam Specifications

VALVE TRAIN MODIFICATIONS

ADJUSTABLE ROCKER ARMS B8A-6564-B (16 req'd) with a 1.76 ratio and 427 PUSH RODS B8AZ-6565-C should be installed now, if they weren't put in with the Controller Kit. The 427 push rods must be used, because they have a ball on one end and a socket or cup on the other end into which the adjusting screw seats. Push rods for non-adjustable rocker arms have a ball on both ends.

Stock 427 SOLID LIFTER TAPPETS C4AZ-6500-B (16 req'd) must be installed with all mechanical cams. Also install the following 428 CJ pieces: VALVE SPRING and DAMPER ASSY C8AZ-6513-B (16 req'd), KEEPERS B8A-6518-A (32 req'd) and RETAINERS C3AZ-6514-A (16 req'd) with mechanical cams C3AZ-6250-AA and C4AE-6250-B. T C8AX-6250-D requires the following special modifications.

SPECIAL MODIFICATIONS FOR C8AX-6250-D CAM

Because of the extreme 0.600" lift of this cam, a spring bind condition will result if stock parts are used. You can solve this problem by installing special high rpm performance push rods, springs, retainers, keepers and solid tappets (available from several sources such as Holman-Moody, Crane or Iskenderian). The tappets and push rods are lightweight, the springs are made of stiffer, smaller diameter wire so they can be compressed more, the keepers are specially hardened, and the retainers have been machined with an offset that allows about 0.100" additional valve movement without the spring bottoming out. The spring height and pressure should be set according to the specifications supplied with the parts.

A Piston-To-Valve Clearance check is always a good idea with high performance setups. This is especially important here because of the extreme high lift of these cams. Check as described under "General Modifications" section of the Blueprinting Specifications on page 22.

STAGE 4 (Revisited, One More Time)

To Add Some Tough Muscle Inside

428 CJ HEADS AND POP-UP PISTONS

This step was optional with 390 Controller Kit, but is mandatory with the Dominator Kit. Install 428 Cobra Jet CYLINDER HEADS C8OZ-6049-K (2 req'd). Do not mill them to decrease combustion chamber volume, so as to increase compression ratio to 10.7:1. Instead, use POP-UP PISTONS C9OZ-6108-Y R.H. (4 req'd) and C9OZ-6109-A L.H. (4 req'd), which use RINGS C1AZ-6148-A. (Note: These pistons will not be available until August, 1969.) Don't use the special, thinner steel head gaskets that were installed with "milled" heads. Instead, put in the regular HEAD GASKETS C8AZ-6051-A (2 req'd) that come with the 428 heads.

LIGHTWEIGHT VALVES

Lightweight valves will enable you to take full advantage of the breathing capabilities of the 428 heads and the high-revability of the mechanical cam and valve train pieces. Install lightweight, hollow stem INTAKE VALVES C8AX-6507-A (8 req'd) and lightweight, hollow stem, sodium filled EXHAUST VALVES C8AX-6505-A. Head diameters are identical to the stock 428 valves; 2.097"-intake and 1.660"-exhaust. Both are easily identifiable from standard 428 CJ valves, because both lightweight valves are chrome plated.

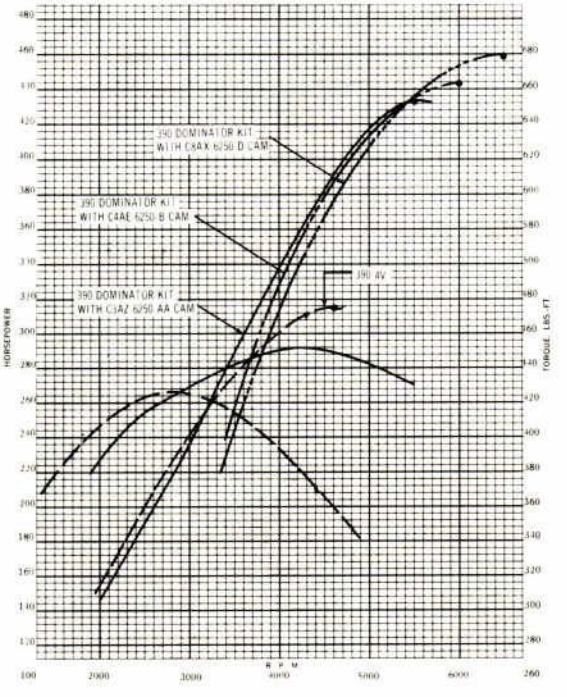
STRONGER 427 CONNECTING ROD

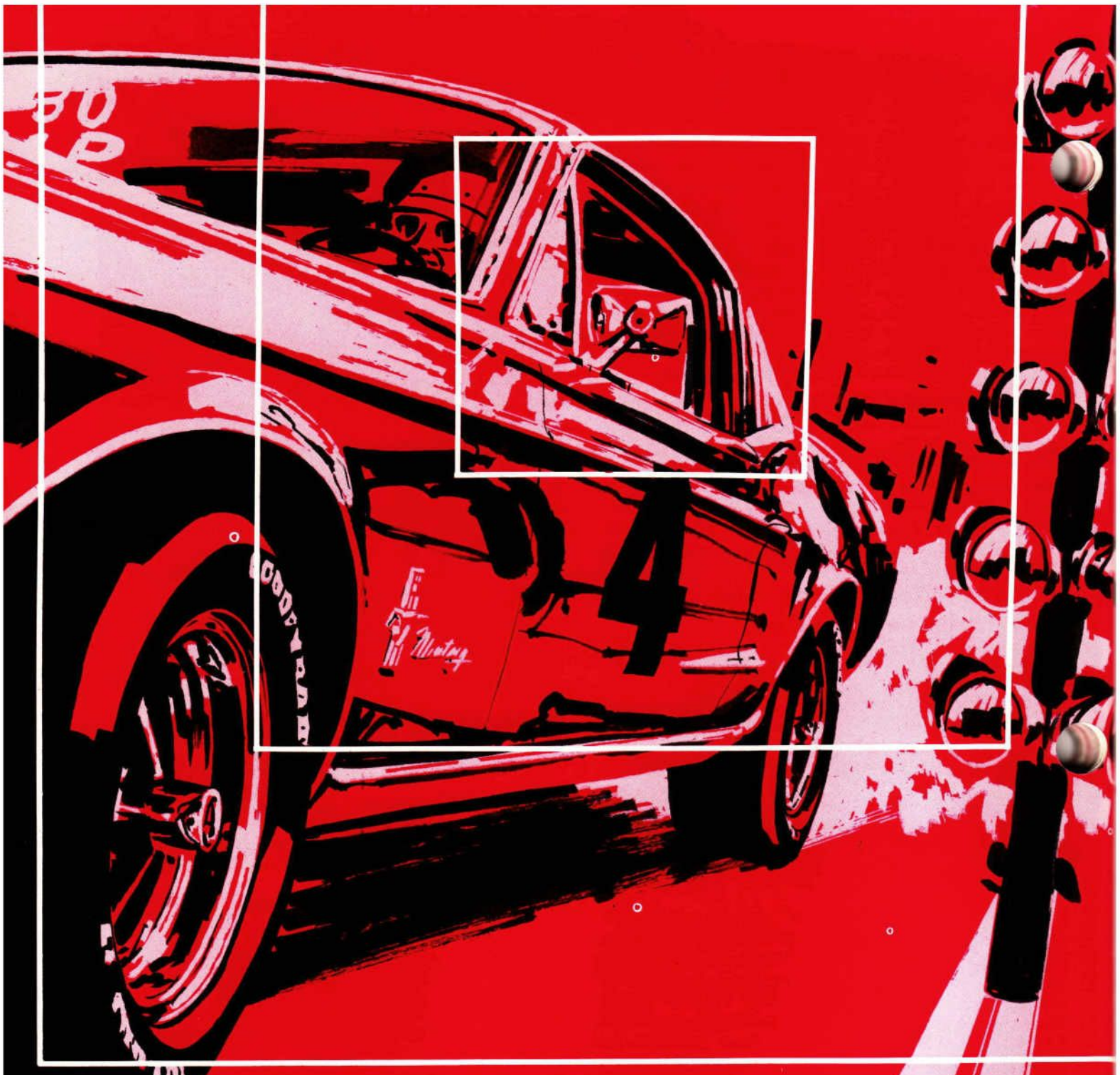
With all that high revving your 390 is now capable of, a little insurance is in order downstairs. Hang your lower-end together with 427 CONNECTING RODS C5AZ-6200-D (8 req'd). These "LeMans" type rods feature cap screws instead of the usual nut and bolt design to button the caps to the rod for unusually high rpm operation. See illustration on page 58. (Note: 0.010" must be ground off each side of journal end of 427 rod to fit in 390 bore.) Use ROD BEARINGS C5AZ-6211-G for added performance durability. Installation of 427 rod necessitate rebalancing the engine since they do not weigh the same as the stock 390 rods.

DOMINATOR KIT

Total Incremental HP Increase 119

Well, just look what a few 427 and 428 pieces do for your 390 torque and horsepower ratings. That's what we call some Muscle. Your 390 will never be the same. Use extra care when you hang it all together and get set to turn an extra low E.T.





STAGING THE 428 CJ TO GET OUT OF THE GATE

428 MUSCLE MODS FOR HOLE SHOOTING COBRA JETS

	IMPRESSOR KIT			CONTROLLER KIT			DOMINATOR KIT		
	Part Number	Description	Added HP	Part Number	Description	Added HP	Part Number	Description	Added HP
STAGE 1			6			6			6
Intake Manifold	C6AZ-9424-H	4V Aluminum		C6AZ-9424-H	4V Aluminum		C6AZ-9424-H	4V Aluminum	
STAGE 2			15			30			
Camshaft	C8AX-6250-C	Hyd.		C3AZ-6250-AA	Mech. 427		C4AE-6250-B	Mech.	40*
							C8AX-6250-D	Mech. (opt.)	56**
Tappets	C8AZ-6500-B	Hyd. Super CJ		C4AZ-6500-B	Solid 427		C4AZ-6500-B	Solid 427	
Push Rods	B8AZ-6565-C	427 (opt.)		B8AZ-6565-C	427		B8AZ-6565-C	427	
Rocker Arms	B8A-6564-B	1.76 adj. (opt.)		B8A-6564-B	1.76 adj.		B8A-6564-B	1.76 adj.	
Distributor	C0AZ-12127-L	427 dual point		C0AZ-12127-L	427 dual point		C0AZ-12127-L	427 dual point	
Spark Plug Cable	C5AZ-12259-C	Steel Core		C5AZ-12259-C	Steel Core		C5AZ-12259-C	Steel Core	
STAGE 3			15			15			15
Headers	Non-Ford Part	Steel Tube		Non-Ford Part	Steel Tube		Non-Ford Part	Steel Tube	
STAGE 4						10			10
Intake Valves		428 stock		C8AX-6507-A	Lightweight		C8AX-6507-A	Lightweight	
Exhaust Valves		428 stock		C8AX-6505-A	Lightweight		C8AX-6505-A	Lightweight	
Connecting Rods	C6AZ-6200-C	428 P.I.		C5AZ-6200-D	427		C5AZ-6200-D	427	
Piston Pins				C6AZ-6135-A	w/pop-ups		C6AZ-6135-A	w/pop-ups	
Piston Rings				C6AZ-6148-A			C6AZ-6148-A		
Pistons	See chart on page 54 for correct usage of standard 428 Cobra Jet pistons, crankshaft, flywheel, vibration damper, and damper spacer with Impressor Kit.			C8AZ-6110-A	L.H. Pop-Up (opt.)		C8AZ-6110-A	L.H. Pop-Up (opt.)	
				C8AZ-6110-B	R.H. Pop-Up (opt.)		C8AZ-6110-B	R.H. Pop-Up (opt.)	
							Non-Ford Part	Flat-Top Piston (opt.)	
Crankshaft Flywheel Vibration Damper Damper Spacer				See chart page 54 for correct usage of 428 Super Cobra Jet pistons, crankshaft, flywheel, vibration damper, and damper spacer w/counterweight with Controller and Dominator Kits.					
Also recommended:									
H.D. Oil Pump	C9ZZ-6600-A	428 S/CJ		C9ZZ-6600-A	428 S/CJ		C9ZZ-6600-A	428 S/CJ	
Oil Pickup	C5AE-6622-B	⅝" I. D.		C5AE-6622-B	⅝" I. D.		C5AE-6622-B	⅝" I. D.	
Oil Pan w/Baffle	C8AX-6675-A	7-qt. Deep Sump		C8AX-6675-A	7-qt. Deep Sump		C8AX-6675-A	7-qt. Deep Sump	
Windage Tray	C9ZZ-6687-A	428 Super CJ		C9ZZ-6687-A	428 Super CJ		C9ZZ-6687-A	428 Super CJ	
								w/Pop-Up Pistons	71*
TOTAL INCREMENTAL HORSEPOWER INCREASE OVER STOCK 428-4V ENGINE			36			51			
					w/Pop-Up Pistons	61		w/Pop-Up Pistons	87**
								w/C8AX-6250-D Cam and Flat-Top Pistons	79

BEGINNING AT THE BEGINNING

With the 428 Cobra Jet

The 428 "Thunderbird" engine came on the scene in 1966 to replace the 390 as the "heavy hauler" in Fords and Thunderbirds. It was quiet, lightweight for its displacement, and put out over 300 "advertised" horsepower. Seeing that this engine had potent performance possibilities, Ford performance engineers interchanged some parts from the ultra-hot 427, added some entirely new pieces, and came up with the 428 Cobra Jet.

INSIDE THE 428 COBRA JET

The 428 CJ features a controlled micro-structure, improved nodular cast iron block. 427 blocks use the same type of alloy cast iron to provide high strength characteristics. The crankshaft is also machined from nodular controlled cast iron, with main and rod journals identical to the 427 crank. Two different cranks are used to maintain balance with three differently weighted pistons. 1968 and 1969 engines built before 12-26-68 use a crank that maintains balance within tolerances with either a 680 gram or 692 gram piston. Engines built after 12-26-68 use a crank that balances with 712 gram pistons for better durability. All pistons are aluminum autothermic design. The rod is forged steel with caps retained with a nut and bolt design. 428 Cobra Jets coupled to 3.90 or 4.30 ratio rear axles use some different lower-end pieces as explained under "428 Super Cobra Jet". All 428 CJ cylinder heads feature large (2.34" x 1.34") rectangular ports and big valves (2.097" dia. head-intake, and 1.660" dia. head-exhaust) that provide excellent breathing.

A big Holley 4-bbl carburetor, flow rated at 735 cfm, sits atop a free-breathing cast iron manifold. Its short, smooth runners are designed in a dual plane 180° configuration just like the aluminum Police Interceptor version for efficient air/fuel mixture delivery to combustion chambers. This setup does such a great job that the only induction changes recommended for any of the 428 Muscle Kits is the substitution of the aluminum manifold to obtain better breathing and reduce weight up front.

428 "SUPER" COBRA JET

Super 428 Cobra Jets use the same pieces as standard 428 CJ's except for some different lower end goodies. The rod is the 427 forged type with cap screws for better durability. Two crankshafts are used; one with 692 gram pistons before 12-26-68, and another with 712 gram pistons after 12-26-68. This requires cranks with different balance weight, along with appropriate flywheel, damper and spacer counterweights to accomodate the different piston weights. Do not interchange Super Cobra Jet parts with each other, or with standard Cobra Jet pieces or imbalance will result.

Super CJ 428's also use an external oil cooler in front of the radiator. The 428 Super CJ components come standard when the vehicle is purchased with a 3.90:1 or 4.30:1 rear axle ratio. Thus, if you get an axle that lets you wind up in a short distance, you also get a bit stronger lower end. Here's how to identify these two engines so you won't run afoul when ordering or changing parts.

ENGINE IDENTIFICATION TAG CODES

Standard 428 Cobra Jet—418S, 419S, 420S and 421S

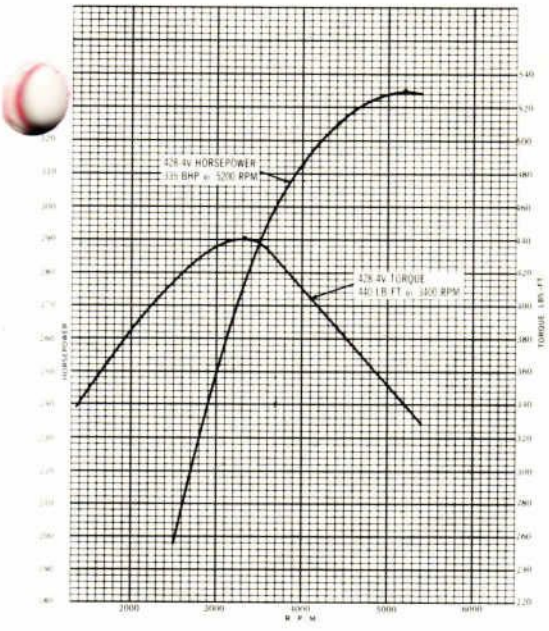
Super 428 Cobra Jet—422S, 423S, 424S and 425S

ENGINE PARTS IDENTIFICATION

Part Description	Standard CJ	Super CJ
Connecting Rod	C6AZ-6200-C	C9ZZ-6200-A (427 type w/cap screws)
Crankshaft	C9ZZ-6303-B (1968 and 1969 engines to 12-26-68) "IUB" stamped on #7 cheek Use piston "A" 680 grams or piston "B" 692 grams C9ZZ-6303-E (after 12-26-68) "IUB" stamped on #7 cheek; and or "A" stamped on #1 counterweight. Use piston "C" 712 grams	C9ZZ-6303-A (before 12-26-68) "IUA" stamped on #7 cheek. Use piston "D" 692 grams C9ZZ-6303-D (after 12-26-68) "IUA" stamped on #7 cheek; and or "B" stamped on #1 counterweight. Use piston "E" 712 grams
Piston	Piston "A" 680 grams C8OZ-6108-G (red) (before C8OZ-6108-H (blue) (11-13-68) Piston "B" 692 grams C9ZZ-6108-G (red) (11-13-68 C9ZZ-6108-H (blue) to 12-26-68 Piston "C" 712 grams C9ZZ-6108-Y (red) (after C9ZZ-6108-Z (blue) 12-26-68)	Piston "D" 692 grams C9ZZ-6108-A (red) (before C9ZZ-6108-B (blue) 12-26-68) Piston "E" 712 grams C9ZZ-6108-N (red) (after C9ZZ-6108-R (blue) 12-26-68)
Piston Rings	C6AZ-6148-A	C6AZ-6148-A
Flywheel— Manual Trans. Automatic Trans.	C8OZ-6375-A C6AZ-6375-B	C9ZZ-6375-B C9OZ-6375-B
Vibration Damper	C8AZ-6316-B	C8AZ-6316-C
Spacer, Crankshaft/ Vib Damper	B8AZ-6359-A	C9ZZ-6359-A (w/counterweight)

428 CJ SPECIFICATIONS

Displacement	428 Cu. In.
Bore & Stroke (inches)	4.13 x 3.98
Compression Ratio	10.7:1
Brake Horsepower @ rpm	335 @ 5600
Maximum Torque (lb. ft.)	445 @ 3400
Valve Lifters	Hydraulic
Carburetion	4-bbl 735 cfm
Crankshaft	Nodular Iron
Connecting Rods	Forged w/nut and bolt (Std CJ) Forged w/cap screw (Super CJ)
Pistons	Aluminum Autothermic
Intake Valves (2.097" Dia.)	Solid Stem
Exhaust Valves (1.660" Dia.)	Solid Stem



DISHED PISTONS come stock with 428 engines. Two sets of eyebrows are flycut in the top so they can be used in either right or left bank. They give a nominal compression ratio of 10.7:1, or a maximum of 11.0:1 when installed with a 0.015" thick steel head gasket, block deck height of 0.008", and a head volume of 68 cc. Dished pistons are recommended for all 428 Muscle Kits because they do not present any balance problems (when used in the correct combinations shown in the chart on page 51). Dished pistons must be used for "Stock" classes at strips under NHRA rules.

FLAT-TOP PISTONS are a suggested option in 428 Dominator Kits for those who want to run "Super Stock" under NHRA rules. They give a maximum compression ratio of 11.6:1 when used with a 0.015" thick steel head gasket, block deck height of 0.008", and head volume of 68 cc. Flat-tops require the engine to be dynamically balanced. They can be made from pop-up pistons by grinding off the top, or they are available from a number of performance parts specialists.

PISTONS FOR STREET 'N STRIP

DISHED PISTON FLAT-TOP PISTON POP-UP PISTON

POP-UP PISTONS are suggested options in 428 Controller and Dominator Kits. Right and left pistons must be used because of the unsymmetrical "domed" pop-up top. They give a nominal compression ratio of 12.5:1 and maximum of 13.5:1 with 0.015" thick steel head gasket, block deck height of 0.008", and head volume of 68cc. Pop-ups are not legal under NHRA rules for "Super Stock" classes, but can generally be used at strips running AHRA rules. Of course, they can be used in "modified" classes and they make a great street piston. Unless used with 428 C9ZZ-6303-B Crankshaft and 428 Police Interceptor C6AZ-6200-C Connecting Rod pop-up pistons require dynamic balancing of the engine.

VOLUMETRIC COMBUSTION CHAMBER SPECIFICATIONS (c.c.)

Piston	Piston Volume	Deck Ht. & Block	Cyl. Head	Head Gasket	TOTAL	Comp. Ratio
						Maximum
(Dished)	8.75(+)	12.00(+)	68.00	7.72	87.72	11.0:1
(Flat top)	1.25(+)	4.28(+)	68.00	7.72	80.00	11.6:1
(Pop-up)	—	8.72(−)	68.00	7.72	67.00	13.5:1

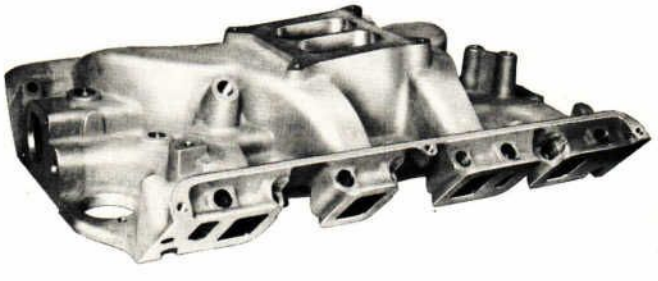
NOTE: The National Hod Rod Association (NHRA) and American Hot Rod Association (AHRA) piston rules were in effect at the time of printing. Always check your strip for the latest rules regulating sanctioned competition.

IMPRESSOR KIT

36 Horsepower Increase

STAGE 1 Lighten Up The Load

Your 428 Cobra Jet comes with a fantastically efficient free-breathing induction setup. About all you can do to improve performance is to (1) Get rid of 55 pounds by replacing the stock cast iron manifold with the lightweight ALUMINUM MANIFOLD C6AZ-9424-H. It has better high rpm breathing characteristics than the factory iron and adds 5 hp @ 5000 rpm. (2) For maximum performance it may be necessary to recalibrate the 735 cfm Holley as discussed on pages 13 and 20-21.



Aluminum Intake Manifold C6AZ-9424-H

IMPRESSOR KIT

STAGE 2 (Continued)

Hydraulic Cam Jiggles Valves for 15 Horsepower

HYDRAULIC CAM C8AX-6250-C is a smooth, high performance grind that adds 15 bhp @ 5000 rpm. over the stock cam. It works best with a stick-shift, but can be coupled with an automatic. For maximum strip performance with an automatic, install a high slip angle convertor (Non-Ford part). This may be a little rough on the street, but it will give you a lower E.T. on Sundays. Specifications for this cam are shown in the 390 section on Page 49.

Hydraulic Cam C8AX-6250-C

VALVE TRAIN MODIFICATIONS

HYDRAULIC TAPPETS C8AZ-6500-B (16 req'd) should be installed in standard 428 CJ's, if the 0.002" crown on the cam end of your production tappets has worn flat. They feature a high strength socket for improved high rpm operation. These tappets are regular production pieces on 428 Super CJ's, and you won't have to install them unless, of course, your original lifters have worn flat.

No other valve train modifications are required with the C8AX-6250-C cam. However, as an option, you can increase its valve lift from 0.500" to 0.509" by installing 427 ADJUSTABLE ROCKER ARMS B8A-6564-B (16 req'd). They have a 1.76 ratio compared to the stock non-adjustable rocker arm ratio of 1.73:1. You must also use 427 PUSH RODS B8AZ-6565-C (16 req'd) with the adjustable rockers. 427 push rods have a ball on one end and a socket or cup on the other, into which the adjusting screw seats, as shown on page 47. The stock 428 push rods have a ball at both ends.

TAPPET ADJUSTMENT is automatically taken care of if you use the shaft-mounted, non-adjustable rocker arms by designing necessary clearances into the system. However, if you use the 427 adjustable rocker arms, be sure and follow the adjustment procedure on page 49.

ADDITIONAL MODIFICATIONS

DUAL POINT DISTRIBUTOR COAZ-12127-L should be installed to get maximum power from your pieces in the 5000 rpm range. This centrifugal advance distributor from the 427 mill contains no vacuum advance, as does the production distributor. So, plug the vacuum line from the manifold. Adjust initial advance of the dual point distributor from the 6° stock to 10°. Do not exceed 38° total advance.

SOLID STEEL CORE CABLE C5AZ-12259-C should be installed to deliver maximum voltage to the spark plugs. This kit includes 8 spark plug cables and the high tension wire from the coil to the distributor. REMEMBER! These wires are the non-suppression type that do not contain resistance materials to control radio interference. SUPPRESSION KIT C4AZ-18827-A is recommended for "street" use.

STAGE 3

Open Up Your Exhausts For 15 Horses

Although your 428 CJ comes with low restriction cast iron exhaust manifolds, you can get more ponies with competition, steel tube headers. They are available from many sources, each with their own unique features . . . ease of installation . . . pipe sizes . . . type of construction . . . any, or all of these. What they do is reduce "back pressure" by scavenging exhaust gases more efficiently than the stock setup. This generally adds up to an additional 15 bhp @ 5000 rpm. The chart shows the dimensions that make it all happen.

STEEL TUBE HEADER DIMENSIONS

	Length	Pipe I.D.
Primary Pipe	36"	2"
Collectors	12" (Manual Trans.)	3½"
	16" (Auto. Trans.)	3½"

STAGE 4

Protecting Your Bucks

Let's stop here for a moment and consider a little protection for your Impressor bucks. You can take full advantage of the hotter cam and headers without worrying about losing everything by investing in some slick lubrication mods.

LUBRICATION SYSTEM MODIFICATIONS

Later model 428 CJ engines come with WINDAGE TRAY BAFFLE C9ZZ-6687-A as standard equipment. It fits around the crank throws and breaks up crankcase wind currents to keep them from aerating the oil. If you have an early 428, and won't be doing the kind of heavy running that should use a deep sump pan, then you can save some coin by just installing the windage tray baffle.

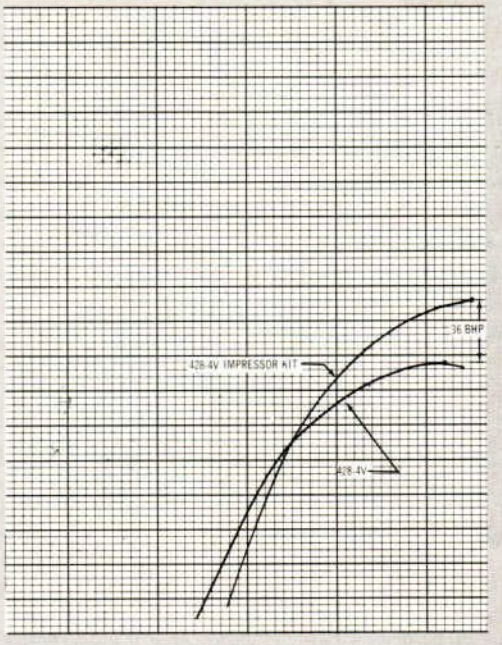
However, if you plan to lay a "hole shot" on the next lane, then plan to have the slick stuff working downstairs at all times. Install DEEP SUMP OIL PAN C8AX-6675-A with a bigger capacity (7-qts with filter) for cooler operating temperatures. It also keeps the oil farther away from the crankshaft throws and contains a scrapper, both of which help in resisting oil frothing. The scrapper must be slightly bent to fit with the windage tray. To reach down into the deep sump, OIL PICKUP C5AE-6622-B must be installed. Not only is it extra long, but it has a big ⅝-inch I.D. to give unobstructed oil flow at high rpms. The final step in protecting your bucks, is the installation of HEAVY DUTY OIL PUMP C9ZZ-6600-A. It zonks out 22 gallons per minute under 70-80 psi @ 4000 rpm.

These protector pieces are illustrated in the 390 section on page 48.

IMPRESSOR KIT

Total Horsepower Increase 36

Thanks to the great heads, manifold and carburetor that come stock with 428 mills, about all it takes to add 36 bhp @ 5000 rpm is some wrenches and a feeler gauge. Which isn't half bad considering what happens to the torque and horsepower curves. If you'd like to bend 'em a little higher and farther out, just hang on to your wrench. It's all you'll need to add a Controller Kit.



CONTROLLER KIT

51 to 61 Horsepower Increase

428 Controller Kits consist basically of replacing the Impressor Kit hydraulic cam with the stock 427 mechanical stick, adding some lightweight valves, plus some beefier lower-end stuff from the Super CJ. That's to give you some added durability for the higher revs and power output your 428 is now capable of. And if you want the really hot street setup, just add the Stage 4 optional "pop-up" pistons. Stages 1 and 3 remain unchanged so first, lets take another look at Stage 2 to see what it takes to drop in a mechanical cam in place of a hydraulic grind. Then, we'll tell how to add some good stuff to Stage 1.

STAGE 2 (Revisited)

To Install Mechanical Cam That Adds 30 Horsepower For Street or Strip

MECHANICAL CAM C3AZ-6250-AA is from the stock 427 mill, so you know its got the bumps to give your 428 jumps on the other guy. It works best with a manual transmission, but can be coupled to an automatic. For maximum strip performance, install a high slip angle convertor (Non-Ford part). This may be a little rough on the street, but will get you out of the gate a fraction sooner. It puts out 30 bhp @ 6000 rpm over the stock 428 cam, and 15 horses more than the Impressor Kit C8AX-6250-C hydraulic cam.

SOLID TAPPETS C1AZ-6500-B (16 req'd) must be installed to be compatible with the ramp design of the mechanical cams. If the engine is relative new, you can probably use the stock 428 valve springs, retainers, seals and keepers. If not, install new pieces. In any case, they must be assembled to obtain the specified pressure at the spring height indicated in the cam specification chart.


Mechanical Cam C3AZ-6250-AA

C3AZ-6250-AA CAMSHAFT SPECIFICATIONS

Lifter Type Rocker Arm Type Rocker Arm Ratio	Solid Shaft Mounted-Adjustable 1.76:1	
	INTAKE	EXHAUST
TIMING		
Checking Clearance	0° Cam / 0.100" Tappet Lift	0° Cam / 0.100" Tappet Lift
Opens	40° BTC / 16° ATC	88° BBC / 33° BBC
Closes	86° ABC / 30° ABC	38° ATC / 19° BTC
Overlap	78°	78°
Duration	306°	306°
VALVES		
Head Diameter (Max.)	2.097"	1.660"
Angle of Seat & Face	30°	45°
Lift (Max. at Valve)	0.500"	0.500"
SPRINGS		
Outer Valve Closed (Max.)	90 lbs. @ 1.82"	90 lbs. @ 1.82"
Outer Valve Open (Max.)	285 lbs. @ 1.32"	285 lbs. @ 1.32"
Inner Valve Closed (Max.)	Damper Only	
Inner Valve Open (Max.)	Damper Only	

*Spring pressures "nominal" at indicated installed height with damper removed.

CONTROLLER KIT

STAGE 2 Continued

ADDITIONAL MODIFICATIONS

ADJUSTABLE ROCKER ARMS B8A-6564-B (16 req'd) and PUSH RODS B8AZ-6565-C (16 req'd), both from the 427, should be installed at this point if they weren't installed for the Impressor Kit. Set the adjustable rocker arms for 0.025" lash (clearance) with the engine hot.

IGNITION initial timing should be set at 10° for maximum performance. Do not exceed 38° total advance.

CARBURETOR calibration may have to be changed for maximum performance as described on pages 13 and 20-21.

STAGE 4 (Revisited)

For Beefier Lower-End, Lightweight Valves, or To Add 10 Bhp With Optional Pop-Up Pistons

BEEFIER LOWER-END

If you're a 428 Super CJ owner, you can sit this part out, 'cause you already have the good stuff downstairs. But you standard CJ pilots had better give yourself some added protection against a sudden unglueing, in case you slip and don't maintain good touch on the controls with all that revving your mechanical cam can do. The idea is to add some super-good reciprocating muscle from the Super CJ.

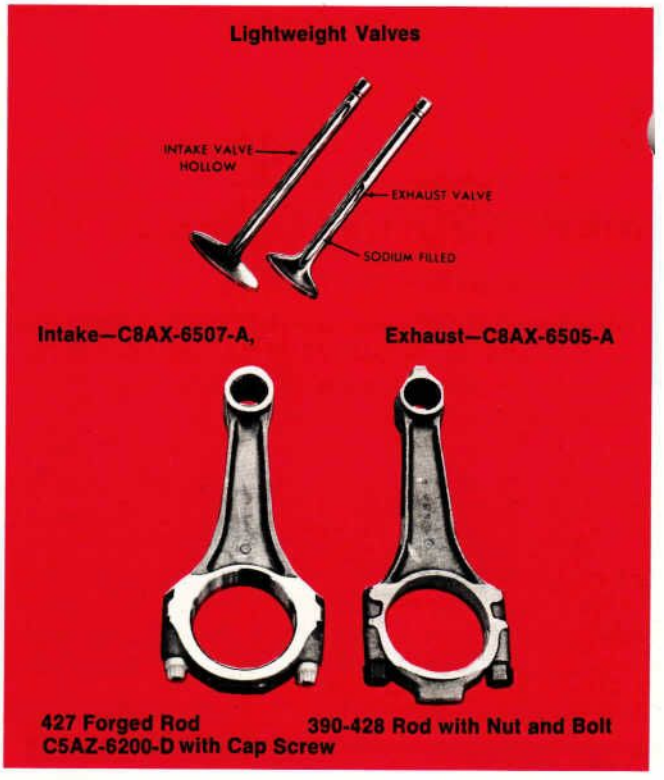
428 SUPER CJ's use 692 gram piston built before 12-26-68 and a heavier 712 gram piston after 12-26-68 for improved durability, as shown in the chart on page 54. This, of course requires two crankshafts with differently balanced crank throws to maintain dynamic balance. The parts must be used in the combinations shown, or imbalance will result. The later pieces are recommended: CRANKSHAFT C9ZZ-6303-D and PISTONS C9ZZ-6108-N (8 req'd). 427 FORGED CONNECTING ROD C5AZ-6200-D (8 req'd) must be used with above parts. The 427 rod provides better high performance durability because it buttons the cap to the rod with a cap screw instead of the nut and bolt design of 390-428 rods. FLYWHEEL C9ZZ-6375-B (manual trans.) or C9OZ-6375-B (auto. trans.), VIBRATION DAMPER C8AZ-6316-C, and COUNTERWEIGHT SPACER C9ZZ-6359-A must be used to maintain dynamic balance.

LIGHTWEIGHT VALVES

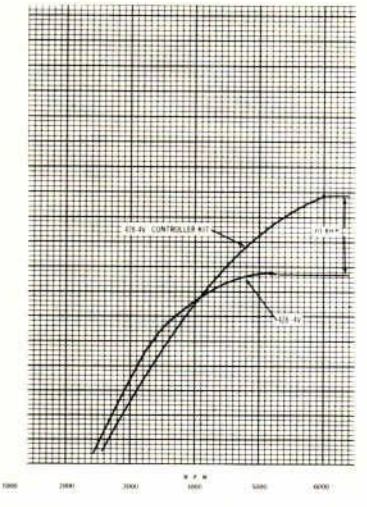
To reduce valve train weight at the higher rpm's capable with the mechanical cam, install special 428 lightweight valves. They have the same head diameters as stock 428 valves: Intake—2.097", Exhaust—1.660". LIGHTWEIGHT INTAKE VALVES C8AX-6507-A (8 req'd) are forged, hollow stem and chrome plated. LIGHTWEIGHT EXHAUST VALVES C8AX-6505-A (8req'd) are also chrome plated,hollow-stem forgings, but are filled with sodium to help dissipate heat.

OPTIONAL "POP-UP" PISTONS ADD 10 BHP

You can add 10 extra horses at this point with POP-UP PISTONS C8AZ-6110-A L.H. (4 req'd) and C8AZ-6110-B R.H. (4 req'd). You also need PISTON PINS C6AZ-6135-A (8 req'd) since they do not come with the pistons. Pop-ups give you a 12.5:1 compression ratio when installed as described on page 55. Of course, you must use super-



premium gas, but that's a small price to pay for all the super muscle-power you have at your disposal. These pop-up pistons were originally designed to balance with the 428 crankshaft C9ZZ-6303-B and rod C6AZ-6200-C. However, the later 428 Super CJ parts are recommended for use with this piston. That means this setup will have to be dynamically balanced.



CONTROLLER KIT

Total Horsepower Increase 51-61

As you can see from the torque and horsepower curves, the C3AZ-6250-AA mechanical cam rattles out the sounds of gutsy performance. And then the pop-up pistons add a nice hump at the top end. But the important thing here is not to forget the Stage 4 Impressor Kit lubrication mods and the 428 Super CJ pieces. They really let you stretch your mill coming out of the gate.

DOMINATOR KIT

71 to 87 Horsepower Increase

8 Dominator Kits contain all the Controller Kit pieces, except for the substitution of a hotter mechanical cam (that's more strip than street) and some optional goodies: pop-up pistons, flat-top pistons and our wildest mechanical cam to run with the flat topper for "super stock" competition. Stages 1 and 3 remain unchanged, so let's take one last look-see at Stages 2 and 4.

STAGE 2 (Revisited, One More Time)

To Add More Mechanical Muscle

MORE STRIP THAN STREET CAM ADDS 50 HORSES WITH POP-UP PISTONS

MECHANICAL CAM C4AE-6250-B features a 0.500" lift and 324° duration, making it perfectly at home on the 1320. But it's definitely streetable. It comes on strongest in the 6000-7000 rpm range. When used with the Stage 4 pop-up pistons, it adds 50 bhp over the stock hydraulic cam and dished pistons, or 20 horses over the C3AZ-6250-AA mechanical cam. About 10 of this 20 horsepower increase is due to the pop-up pistons. This cam is recommended for stick shifts only. Do not use with power brakes as engine vacuum at idle isn't sufficient to operate brakes satisfactorily. See page 18 for cam specifications.

STRIP TRIPPER CAM ADDS 58 HORSES WITH FLAT-TOP PISTONS, OR 66 BHP WITH POP-UPS.

MECHANICAL CAM C8AX-6250-D, with its 0.600" lift and 330° duration, opens valves farther and holds them open longer than any other Muscle cam. It idles rough, sounds bad, and gives the pumper-upper boys goose bumps . . . you'll love it. Normally, this cam puts out about 16 horsepower more than the C4AE-6250-B. However, the lower compression ratio of the flat-top piston drops the combined increase down to 8 horsepower (50 vs. 58 over stock setup). This is due to the fact that 1-point of compression ratio is worth about 7-10 horsepower. This is evident when the pop-up piston replaces the flat-top, and the horsepower jumps 8 ponies for a total gain of 66 bhp @ 6500 rpm. See page 18 for cam specifications.

ADDITIONAL MODIFICATIONS

VALVE TRAIN parts for these cams are identical to those described on pages 50-51 for the 390 engine.

IGNITION initial timing should be changed from 10° for Controller Kits to 12°. Do not exceed 38° total advance.

CARBURETOR may have to be recalibrated for maximum performance as described on pages 13 and 20-21.

STAGE 4 (Revisited, One More Time)

For Optional Pistons

FLAT-TOP PISTONS

Flat-Top pistons are recommended with the C8AX-6250-D cam to give your 428 the ultimate get out of the gate muscle power for "super stock." As described on page 55, they presently are not available from Ford, but they are made by grinding the tops off of pop-up pistons. Flat-Top Pistons are available from several specialty performance shops.

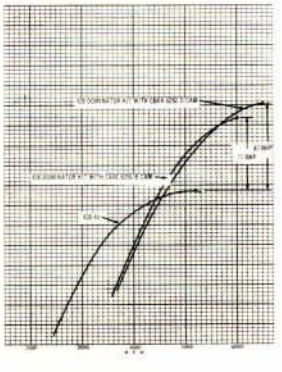
POP-UP PISTONS

These are the same optional pop-up pistons described on page 58 for the Controller Kit and all information applies to the Dominator Kit.

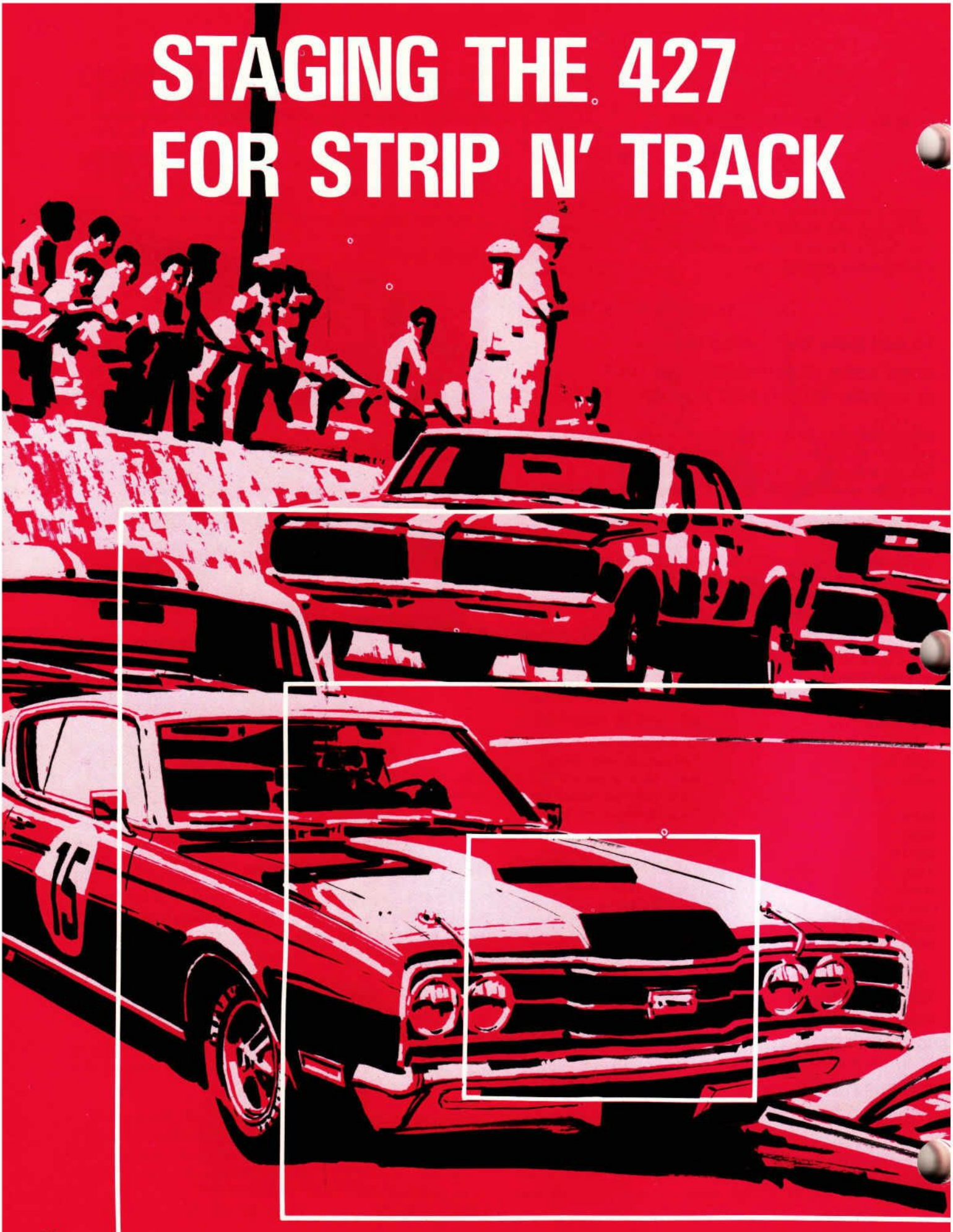
DOMINATOR KIT

Total Horsepower Increase 71 to 87

Well we've gone about as far as you can go with a 428 CJ. The torque and horsepower curves just plain hump out of sight. You've got the kind of muscle that will blast your 428 CJ out of the hole with the heavies.



STAGING THE 427 FOR STRIP N' TRACK



CAMS, CARBS AND OTHER GOOD STUFF FOR 427...MEDIUM RISER... HIGH RISER...TUNNEL PORT ENGINES

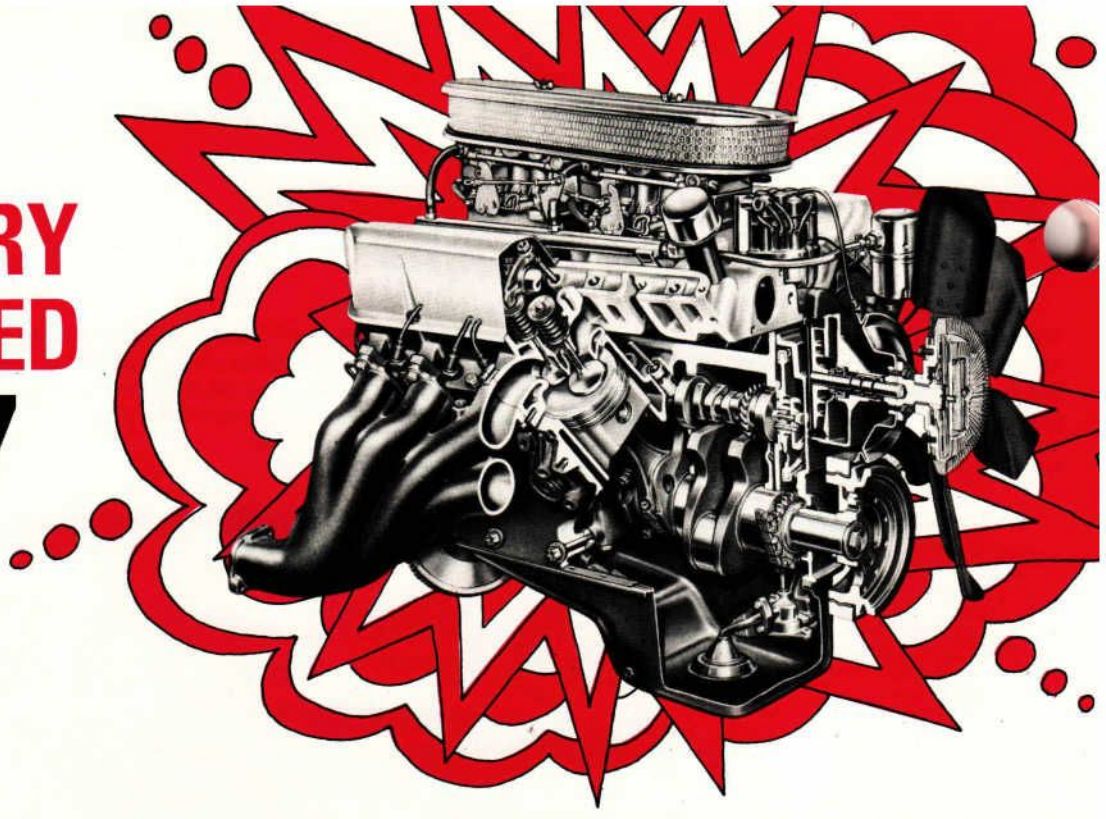
Staging the 427 for strip n' track may not be a completely accurate title for this section. 427's certainly wail the best, but frankly, you can't improve upon factory performance like you can with other stock engines. That, of course, is because the 427 was designed and built for high performance. A fact proven by its consistant wins on strips and tracks around the world since its introduction in 1963. So, instead of giving you a complete "Staged" kit build up, pages 60-65 cover some of the super good Muscle Parts available for 427 medium riser, high riser and tunnel port mills.

	MEDIUM RISER		HIGH RISER		TUNNEL PORT	
Part	Part Number	Description	Part Number	Description	Part Number	Description
4-BARREL						
Carburetor	C5AF-9510-BU	4V, 780 cfm	C5AF-9510-BU	4V, 780 cfm	C5AF-9510-BU	4V, 780 cfm
Intake Manifold	C6AZ-9424-M	4V, Med. Riser, Offset Equal Runner, Dual Olane	C4AE-9425-G	4V, Hi Riser, Dual Plane	C8AX-9424-B	4V, Tunnel Part, Single Plane
2—4-BARREL						
Carburetors	C8OF-9510-AC C8OF-9510-AD	4V, 652 cfm (front) 4V, 652 cfm (rear)	C5AF-9510-BU C5AF-9510-BT	4V, 780 cfm (front) 4V, 780 cfm (rear)	C5AF-9510-BU C5AF-9510-BT or C8OF-9510-AC C8OF-9510-AD	4V, 780 cfm (front) 4V, 780 cfm (rear) or 4V, 652 cfm (front) 4V, 652 cfm (rear)
Intake Manifold	C5AZ-9424-G or C8AX-9424-A	8V, Med. Riser, Dual Plane 8V, Med. Riser, Single Plane	C4AE-9425-F	8V, Hi Riser, Dual Plane	C7OE-9424-A	8V, Tunnel Part, Single Plane
Carburetors	———		———		C6AZ-9510-AH	4V, 715 cfm (front & rear)
Intake Manifold	———		———		C7OE-9424-B	8V, Tunnel Part, Dual Plane over/under
Cylinder Head	C5AZ-6049-C		C4AE-6049-F		C8AX-6049-A	
Intake Valves	C5AZ-6507-N	Hollow stem (2.195")	C5AZ-6507-N	Hollow stem (2.195")	C8AX-6507-B	Hollow stem (2.250")
Exhaust Valves	C5AZ-6505-N	Sodium filled (1.733")	C5AZ-6505-N	Sodium filled (1.733")	C5AZ-6505-N	Sodium filled (1.733")
Rocker Stand		Stock	C3AE-6531-A			Stock
Rocker Stand Bolt		Stock	C3AE-6527-A			Stock
Rocker Arm						
Drip Pan		Stock	C4AE-6524-B			Stock

COMMON PARTS

Part	Part Number	Description
Camshaft	C3AZ-6250-AA C4AE-6250-B C8AX-6250-D	Solid lifter—Street Solid lifter—Street or strip Solid lifter—Strip or track only
Valve Springs	C3AZ-6513-B ISKY, Crane or HM	Street or strip cams Strip or track cam only
Push Rods	B8AX-6565-C ISKY, Crane or HM	Street or strip cams Strip or track cam only
Retainers	C3AZ-6514-A ISKY, Crane or HM	Street or strip cams Strip or track cam only
Keepers	B8A-6518-A ISKY, Crane or HM	Street or Strip cam Strip or Track only
Tappets (solid)	C4AZ-6500-B ISKY, Crane or HM	Street or Strip Strip or Track only
Rocker Arms	B8A-6564-B	1.76 ratio adjustable
Piston and Pin Assembly Piston without Pin	C5AZ-6108-A C9AZ-6108-M C8AX-6110-A	10.5:1 Std. "eyebrow" piston 12.5:1 Piston w/standard Ring 12.5:1 Piston w/upper Dyke Ring
Piston Rings	C5AZ-6148-A C8AX-6150-A	Std. Type Dyke Ring
Piston Pin	C5AZ-6135-A	Std. full floating type
Connecting Rod Connecting Rod Bolt	C5AZ-6200-D C7OE-6200-A C7OE-6214-A	Forged "Lemans" type Forged 7000 rpm type (avail. Sept. '69) Service bolt for C7OE-6200-A rod (avail. Aug. '69)
Crankshaft (with stock 1.758-1.752 Wide Journals) Crankshaft (with 1.838-1.832 Wide Journals)	C5AZ-6303-C C9AZ-6303-D	(avail. Oct. '69) Use with C7OE-6200-A rod
Main Bearings	C5AZ-6333-AA C5AZ-6333-AB C5AZ-6337-AA C5AZ-6337-AB	Lower Upper (Center) Lower (Center) upper
Connecting Rod Bearings (with C7OE-6200-A rod) (with C7OE-6200-A rod)	C5AZ-6211-G C9AX-6211-E C9AX-6211-F	With C5AZ-6200-D rod Red—0.0755"-0.0750" thick (avail. Aug. '69) Blue—0.0759"-0.0754" thick (avail. Aug. '69)
Oil Pump	C3AZ-6600-B	
Oil Pump Pickup and Screen	C5AE-6622-B	
Deep Sump Oil Pan	C8AX-6675-A	7 qt. capacity w/Baffle plate
Flywheel	C5AZ-6375-P	
Damper	C3AZ-6312-F	
Head Gaskets—R.H. (0.020 thick stainless steel) Head Gaskets—L.H. (0.020 thick.stainless steel) Head Gasket (0.015" thick steel)	C3AE-6051-BS C4AE-6051-BS C3AZ-6051-B	
Intake Gasket (Stock—without Blocked Heat Passage) Medium Riser Only Intake Gasket (with Blocked Heat Passage Medium Riser Only) Intake Gasket (with Blocked Heat Passage) Tunnel Port Only Intake Gasket (with Blocked Heat Passage) High Riser Only Intake Gasket—Front (Cork—use with milled heads) Intake Gasket—Rear (Cork—use with milled heads)	C3AZ-9433-G C5AE-9439-A C8AZ-9441-C C3AE-9439-A C4AE-9A425-A (avail. Aug. '69) C4AE-9A424-A (avail. Aug. '69)	 2 Req'd

FACTORY MUSCLED 427



3 FACTORY VERSIONS

The vast majority of 427's come with a mechanical cam in either 4-bbl or 2-4bbl carburetion. These mills can be run on the street, but basically are competition engines. A strictly street 4-bbl version with a hydraulic cam was available in 1968. It had a nodular iron crankshaft, but otherwise had most of the features described below for the mechanical cam engine. If modified for strip or track, be sure and install a forged crank along with a mechanical cam, solid tappets, adjustable 1.76 ratio rocker arms, etc.

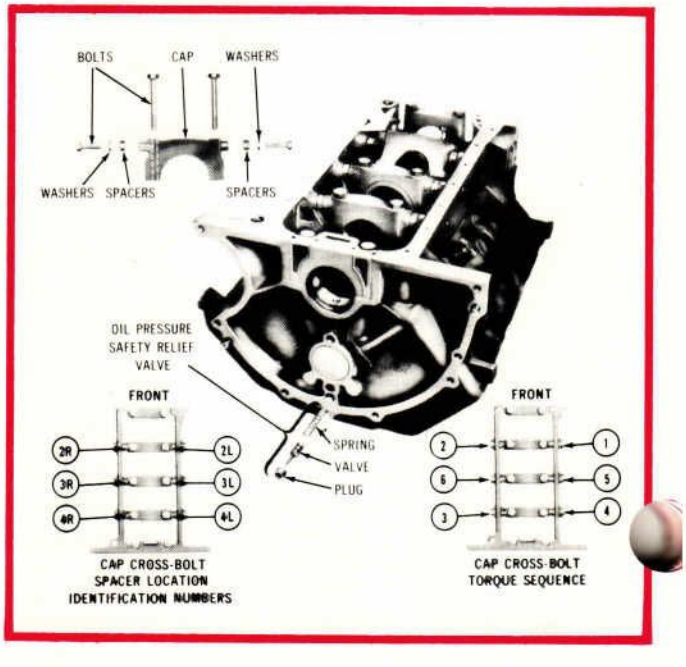
BULLETPROOF FEATURES

427's are one of the most potent and reliable mass-produced performance mills ever built. The deep, super-strong "Y" shaped block is precision cast from alloy iron . . . reinforced for precise bearing alignment and greater rigidity with Ford-pioneered "cross-bolted" main bearing caps . . . large oil galleys keep something slick between metal at all times . . . and an oil pressure safety relief valve helps prevent excessively high oil pressure during cold engine start-up.

A forged steel crankshaft, with special steel-back copper-lead alloy replaceable bearing inserts, withstands the 427's high torque output. Impact-extruded pistons and special forged-steel connecting rods . . . together with precision ground, high lift cam and lightweight valve train components lets the 427 operate easily in the ultra-high 7000 rpm range.

427 SPECIFICATIONS

Displacement	427 Cu. In.
Bore & Stroke	4.23 x 3.78
Compression Ratio	11.1:1 (Mech Cam) 10.9:1 (Hyd Cam)
Brake Horsepower	390 @ 5600 rpm 4V (Hyd Cam) 410 @ 5600 rpm 4V (Mech Cam) 425 @ 6000 rpm 8V
Maximum Torque	460 @ 3200 rpm 4V (Hyd Cam) 476 @ 3400 rpm 4V (Mech Cam) 480 @ 3700 rpm 8V
Valve Lifters	Solid (Mech Cam) Hydraulic (4V Hyd Cam)
Carburetion	4V 780 cfm 2-4V 652 cfm each
Crankshaft	Forged Steel (Mech Cam) Nodular Iron (Hyd Cam)
Connecting Rods	Forged Steel
Pistons	Extruded Aluminum
Intake Valves (2.097")	Alloy Steel w/Aluminized Head
Exhaust Valves (1.660")	Forged Steel w/Chrome Plated Stem and Silichrome Top



427 MANIFOLDS, CAMS AND COMMON PARTS

427 MANIFOLDS

427 mills are generally identified by three basic types of intake manifolds. The first 427's in 1963 were low risers with non-machined combustion chambers. 1964 427's featured "high riser" manifolds with high ports in the cylinder head and long, straight passages from the carburetor plenum to the valves at the fully-machined combustion chamber. With practically no curve in the runners, the air/fuel mixture has practically a straight shot to the cylinders. This gives a very smooth, efficient air flow. The long runners also cause a "ram supercharging" effect as the longer passages contain a heavier mass of air flowing to the cylinders. This is especially effective at high rpms as this heavier air mass maintains its speed after the piston slows down at the end of its suction, or intake stroke. These mills can generally be identified by a special bubble or scoop required because of a clearance problem with the hood.

The 427 "medium riser" manifold engine came on the scene in 1966. Head ports and manifold passages were recontoured to match a new entrance angle that shaved 2-3 inches off its height compared to the high riser. This eliminated the need for a special hood scoop. Clever design techniques resulted in no losses in breathing efficiency or horsepower in the important mid-range "street" rpms, and performance fell off only slightly at high revs.

The revolutionary 427 "tunnel port" head and manifold engine became optional in 1968. Tunnel ports feature large, round ports that come straight out of the valve instead of curving around pushrod guides. The round passages are ideal for high performance, as gas flowing at high speed tends to "wire-draw" into a circle. Thus, rectangular runners don't flow their full theoretical cross-sectional area. But tunnel ports do. For a comparable cross-section, they also have less "skin friction" resulting in less drag on the air/fuel mixture. Tunnel port setups can be identified by "sleeves" in the intake ports of the manifold through which the push rods pass.

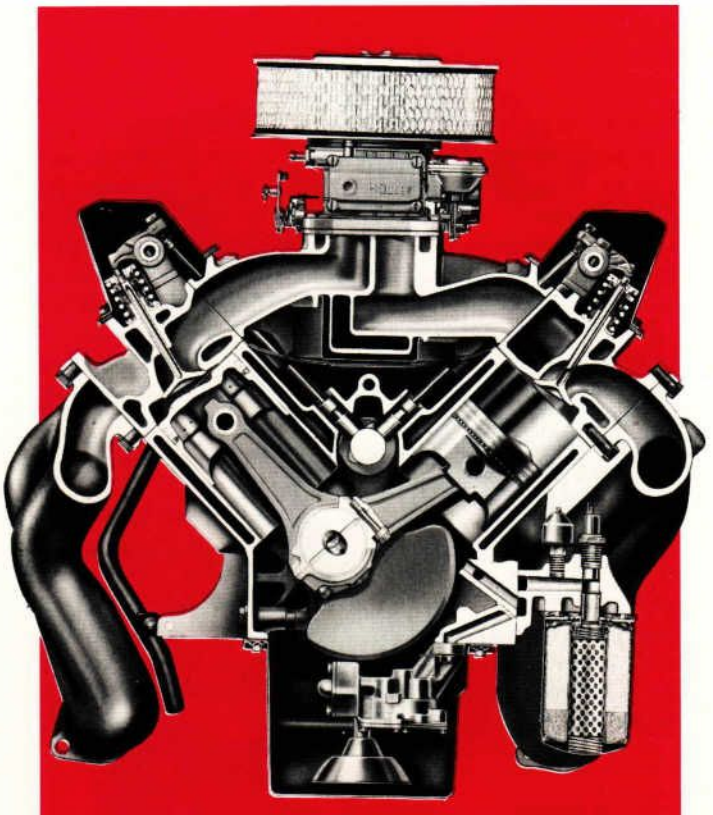
Each cylinder head requires a special manifold because of port differences. This is obvious with the round tunnel port passages. It's not so obvious with the rectangular medium and high riser manifolds. But differences do exist and correct parts must be used when performing modifications.

427 CAMSHAFTS

Three camshafts are recommended for 427 mills: C3AZ-6250-AA, C4AE-6250-B and C8AX-6250-D. Complete specifications for these mechanical grinds are shown on page 18.

C3AZ-6250-AA—This is the service cam with a grind identical to the production stick used on all medium riser 427 mills. That's what we recommend it for, since it's definitely a streetable grind even with its 0.500" lift and 304° duration. The 2nd and 4th bearing journals are grooved so it can be used with "side oiler" 427 engines.

C4AE-6250-B—This grind features a valve lift of 0.500" and 324° duration. That's a bit rough for the street, but it's



427 8V Dual Plane High Riser

definitely streetable. So we recommend it with medium and high riser 427's. It operates best in the 6000-7000 rpm range, making it an excellent strip and track cam. It's not recommended with power brakes as engine vacuum at idle isn't sufficient to operate brakes satisfactorily.

C8AX-6250-D—This big stick's whopping 0.600" lift and 330° duration makes it strictly a full race strip and track cam. It will turn your mill to the 7000 plus range. So we only recommend it for engines that have been properly set up to handle these extremely high rpms. You can use it in a medium riser, but most likely you'll find it works best in a high riser or tunnel port 427.

VALVE TRAIN

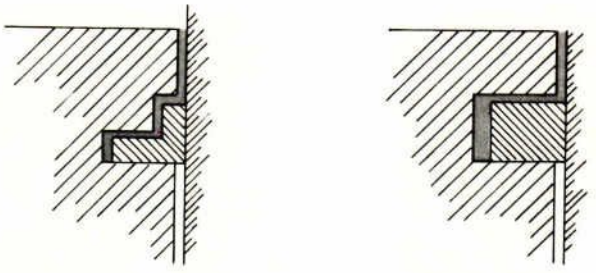
Production 427 VALVE SPRINGS C3AZ-6513-B (16 req'd), RETAINERS C3AZ-6514-A (16 req'd), PUSH RODS B8AZ-6565-C (16 req'd), and SOLID TAPPETS C4AZ-6500-B (16 req'd) can be used with the C3AZ-6250-AA cam. They can also be used with the C4AE-6250-B grind. Special lightweight parts (available from many sources such as Holman-Moody, Crane or Isky) ARE MANDATORY with the C8AX-6250-D stick because of its extreme lift and high rpm capability. Be sure adequate piston-to-valve clearance of 0.120" on exhausts and 0.090" on intake valves is maintained.

High riser 427's use ROCKER STAND C3AE-6531-A, ROCKER STAND BOLTS C3AE-6527-A and ROCKER ARM DRIP PAN C4AE-6524-B. Medium riser and tunnel ports use stock pieces.

PISTONS AND RODS

PISTONS

Three pistons are available for 427's. PISTON C5AZ-6108-A (8 req'd) is a "pop up" design that gives a compression ratio of 10.5:1 when used with stock heads and gaskets. It uses conventional rings and is recommended for "street" engines. Two pistons are available that will give a 12.5:1 compression ratio when used with steel shim head gaskets, a 90 cc head volume and a block deck height of 0.025". The first is PISTON C9AZ-6108-M (8 req'd). It is a "pop up" design and uses conventional rings. The second is PISTON C8AX-6110-A (8 req'd). It's identical to the first piston, but features an upper "Dyke" compression ring that provides extra wearability.



DYKE RING CONVENTIONAL RING

"Dyke" rings require very little time to seat and need to be replaced less often than conventional rings in order to maintain maximum performance.

CONNECTING RODS

Two connecting rods are available for 427's. The first is Ford's famous forged toughie CONNECTING ROD C5AZ-6200-D (8 req'd). It will stay with you just about anywhere your 427 will go. For very serious racers who will be running over 7000 rpm, and demand the best regardless of cost, CONNECTING ROD C70E-6200-A (8 req'd) is available. Wider bearing caps require special CRANKSHAFT C9AZ-6303-D, or the stock crankshaft journals to be widened to 1.838"-1.832" and use of special CONNECTING ROD BEARINGS C9AX-6211-E (Red .0755"-.0750") C9AX-6211-F (Blue .0759"-.0754"). CONNECTING ROD BOLT C7OE-6214-A comes with the 7000 rpm rod.

COMMON PARTS

The remaining common parts shown on page 61 can be used in all 427 engines except as noted.

MODIFYING 427 MEDIUM RISER

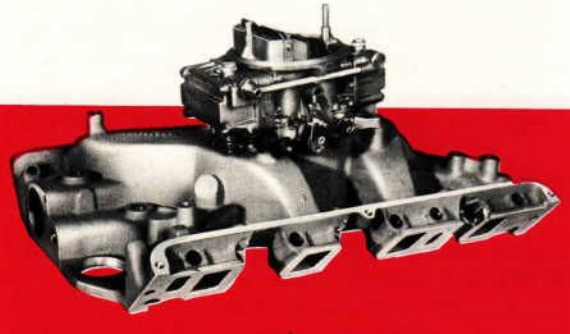
CARBURETION

4V—This setup features a dual plane, equal runners offset MANIFOLD C6AZ-9424-M. A big Holley 4-bbl carburetor C5AF-9510-BU, rated at 780 cfm is offset on top to provide equal runners for tuned induction. The dual plane configuration gives excellent low-end torque, yet remains a strong breather at higher rpms.

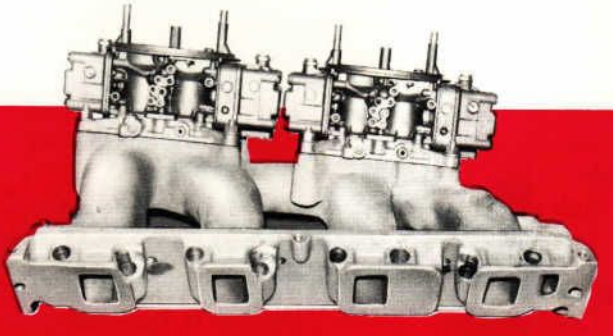
8V—Two induction setups are available here: A 2-4V single plane MANIFOLD C8AX-9424-A (providing optimum breathing capacity at high rpms) and a 2-4V dual plane MANIFOLD C5AZ-9424-G (providing good low-end torque). Both setups use two 4-bbl Holley CARBURETORS C8OF-9510-AC (front) and C8OF-9510-AD (rear), each rated at 652 cfm for a total of 1304 cfm.

CYLINDER HEAD

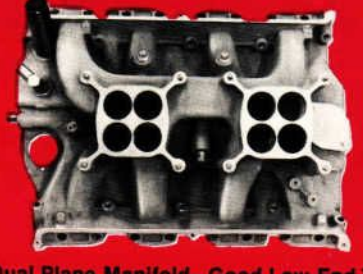
Cylinder head C5AZ-6049-C must be used with the medium riser manifold to match up ports. This excellent all-around performance head features fully machined combustion chambers and large rectangular intake ports measuring 1.34" x 2.06". Minimum NHRA volume for this head is 86 cc's. Lightweight, hollow stem intake valves (2.195" dia. head) C5AZ-6507-N and lightweight sodium-filled exhaust valves (1.733" dia. head) C5AZ-6505-N are recommended.



4V Dual Plane Induction—Good All-Around Performance



2-4V Single Plane Induction—Good High-RPM Performance



2-4V Dual Plane Manifold—Good Low-End Torque

Medium Riser Cylinder Head and Lightweight Valves

MODIFYING 427 HIGH RISER

CARBURETION

4V—This setup features a lightweight aluminum, dual plane MANIFOLD C4AE-9425-G. It develops excellent low-end torque via 1.24″ x 2.60″ ports and extra-long, gently curved runners. It uses the same CARBURETOR C5AF-9510-BU, a big Holley rated at 780 cfm, as the medium riser. This 4V setup is an excellent strip 'n track performer.

8V—This tall and terrible 2-4V setup nearly matches the tunnel port in breathing capacity. The MANIFOLD C4AE-9425-F is a dual plane type and made of aluminum for lightweight. A pair of 4V Holley CARBURETORS C5AF-9510-BU (front) and C5AF-9510-BT (rear), each rated at 780 cfm (1560 total cfm), sit up top. This is an exceptional strip-track performer. Hood modifications may be necessary for air cleaner installation on some models . . . or for cool air intake goodies.

CYLINDER HEAD

Cylinder head C4AE-6049-F (not shown) must be used with the high riser manifold to effectively match up ports. Flow rates run a close second to tunnel port heads. It is recommended primarily for strip and track use. It has fully machined combustion chambers and large rectangular intake ports that measure 1.34″ x 2.72″. Minimum NHRA volume for this head is 86 cc's. Lightweight, hollow stem intake valves (2.195″ dia. head) C5AZ-6507-N and lightweight, sodium-filled exhaust valves (1.733″ dia. head) C5AZ-6505-N are recommended.

MODIFYING 427 TUNNEL PORT

CARBURETION

4V—The 427 tunnel port uses our biggest breathing 4-holer MANIFOLD C8AX-9424-B. Its single plane, lightweight aluminum design makes it ideal for high rpm performance. Port sizes blend from a nearly round 2.05″ to a 2.20″ diameter, providing more area than similarly dimensioned rectangular ports. Areas between runners have been cast solid to eliminate need for valley cover. This tunnel port setup uses the Holley 4-bbl CARBURETOR C5AF-9510-BU, rated at 780 cfm.

8V—Three different carburetor and two intake manifold combinations are available:

Single plane, aluminum 2-4V tunnel port MANIFOLD C7OE-9424-A, with big nearly round 2.05″ x 2.20″ ports, can be used with two carburetor setups. The first uses a pair of 780 cfm 4V Holley CARBURETORS C5AF-9510-BU (front) and C5AF-9510-BT (rear). This 1560 cfm induction kit is the ultimate in full-race equipment for strip and track. If a little less cfm is desired, a pair of 652 4V Holley CARBURETORS C8OF-9510-AC (front) and C8OF-9510-AD (rear), for a total of 1304 cfm can be used. Neither of the above setups are recommended for the street.

Dual plane, over/under tunnel port MANIFOLD C7OE-9424-B (not shown) with big round ports measuring from 2.05″ to 2.20″ is recommended with two 715 cfm 4V Holley CARBURETORS C6AZ-9510-AH (front and rear). This big 1430 cfm induction kit is basically for the strip or track, but is streetable.

4V Dual Plane High Riser—Good Low-End Torque

8V Dual Plane High Riser—
Good Strip or Track Performer

4V Single Plane Tunnel Port—
Excellent High-RPM Breathing

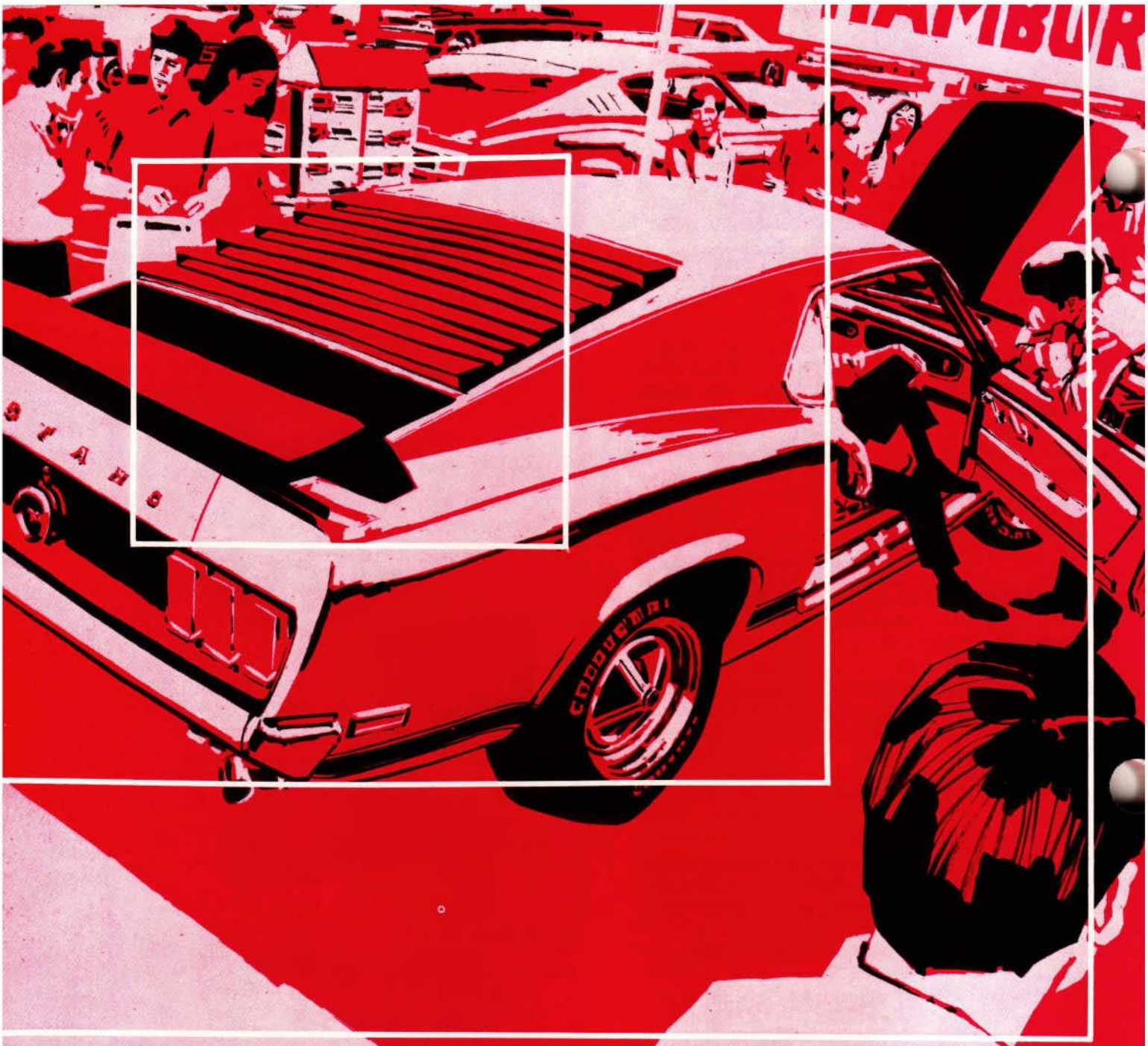
8V Single Plane Tunnel Port—Strip or Track Only

427 Tunnel Port Head w/Lightweight Valves

CYLINDER HEAD

Special tunnel port heads C8AX-6049-A with nearly round intake ports measuring 2.17″ x 2.34″ is mandatory to match up with the special configuration of the tunnel port manifolds. Tunnel port heads can move a significantly greater volume of air and fuel into the combustion chamber at high rpms. Head chambers are fully machined for maximum volumetric efficiency. Minimum NHRA chamber volume for this head is 88 cc's. Lightweight, hollow stem intake valves (2.250″ dia. head) C8AX-6507-B, and lightweight sodium filled exhaust valves (1.733″ dia. head) C5AZ-6505-N are required with this head.

FORGED CRANKSHAFT C5AZ-6303-C MANDATORY WITH TUNNEL PORTS



BITS 'N PIECES

ENGINE

AIR FILTERS

These kits allow more air to drop in, without sacrificing engine cleanliness. The shape is designed for correct air flow in all 4V and 2-4V induction setups.

VALVE ROCKER ARM COVER

Functional die-cast Aluminum Covers C9ZZ-6582-B carry the "428 Cobra Jet" name in bright letters and insignia to let under-the-hood "eyeballers" know you're running the hot setup. Use chrome oil cap C2SZ-6766-B (pre-emission vehicles) or C8AZ-6766-B (emission vehicles).

AUTOLITE STAINLESS STEEL CORE SPARK PLUG CABLE

Wherever "steel-core" spark plug cable is specified, be sure and use the best there is . . . Autolite "STEELDUCTOR SILICONE" High Temperature cable.

Silicone-sheathed Steelductor has 7 strands of .013" stainless steel wire, an inner core of high-dielectric-strength silicone insulation, and a fiberglass reinforcing inner braid. It is recommended for installation in engine compartments that run higher than normal temperatures. NOTE: Numbers listed are *Autolite*, not Ford P&A numbers.

STEELDUCTOR SILICONE CABLE AND CONNECTORS

Parts Required	Part Number
"Steelductor Silicone" Cable (100-foot roll)	7SH
"Steelductor Silicone" Cable (1000-foot roll)	7SH-M
Silicone Spark Plug Cover (24 per package)	5198
Silicone Right Angle Boot and Right Angle Spark Plug Connector (Package of 20 each)	5438

2-4V Carburetion Air Cleaner—C5MY-9600-B

Single 4V Carburetion Air Cleaner—C5OZ-9600-W

"Cobra-Jet" Rocker Arm Cover—C9ZZ-6582-B

Silicone Right Angle Boot and Right Angle Spark Plug Connector

Autolite "Steelductor Silicone" Cable—Hot Tip for Hot Engines

Silicone Spark Plug Cover

HIGH PERFORMANCE ENGINE DRIVE BELTS

Here is a brand new line of engine drive belts from Autolite . . . specifically designed for high performance applications! Every major race that has been won by Ford since Daytona has been won using this belt. It is constructed of 100% Polyester cord, which is stronger and retains its shape better than conventional construction. The base or "inner circle" of the belt is lighter in weight, and tends to stay seated in the pulley groove rather than be affected by centrifugal force at high rpm's.

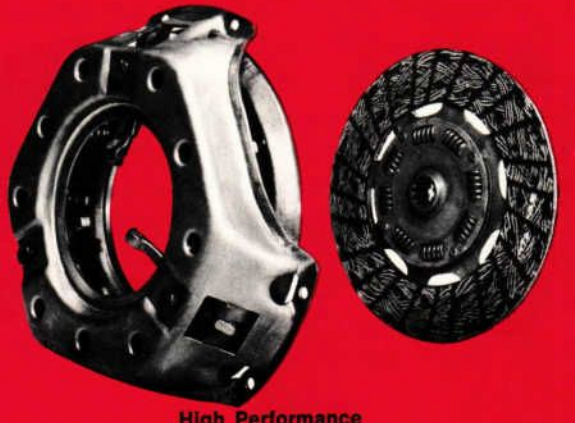
"Hi-Trac" racing drive belts are available in a full line for all engines through Autolite, Ford or Lincoln-Mercury Dealers.

Ford "Hi-Trac" Racing Drive Belt

DRIVE LINE

CLUTCH AND PRESSURE PLATE FOR SMALL SERIES ENGINES

It won't do much good to build a giant up front if you can't get it all back to the wheels. This heavy-duty clutch and pressure plate combo will do the trick for all the small engines. The pressure plate is designed to release easily at high rpm's, yet keep its bite.



High Performance Clutch and Pressure Plate—C3OZ-7A537-A (289-302 1963-67) C8OZ-7A537-A (289-302 1968)

REAR AXLE GEARS . . . "STREETABLE TO UNBEATABLE"

Ratios from 2.75 to 5.67 make these factory gears about as versatile as any available on the market. NOTE: For all applications, the 9″ gear replaces the 8¾″ gear used in production vehicles, and the 8″ gear replaces the 7¾″ gear used in production vehicles. It may be necessary to grind the carrier to obtain ring gear clearance on high numerical ratios.

AVAILABLE REAR AXLE GEARS*, **

PART NUMBER	RATIO	RING GEAR SIZE	PART NUMBER	RATIO	RING GEAR SIZE
C4AZ-4209-AE	5.67	9″	B7AZ-4209-L	3.50	9″
C4AZ-4209-AD	5.43	9″	C4AZ-4209-Y	3.40	9″
C4AZ-4209-AC	5.14	9″	B8AZ-4209-C	3.25	9″
C4AZ-4209-AB	4.86	9″	C4AZ-4209-V	3.10	9″
C4AZ-4209-AA	4.71	9″	C7AZ-4209-J	2.75	9″
C3UZ-4209-C	4.57	9″.	C3OZ-4209-D	3.80	8″
C3AZ-4209-H	4.44	9″	C4OZ-4209-J	3.50	8″
C8OZ-4209-B	4.30	9″	C4DZ-4209-D	3.25	8″
B7AZ-4209-K	4.11	9″	C4OZ-4209-H	3.00	8″
C8OZ-4209-A	3.91	9″	C4OZ-4209-K	2.79	8″
B7AZ-4209-N	3.89	9″			

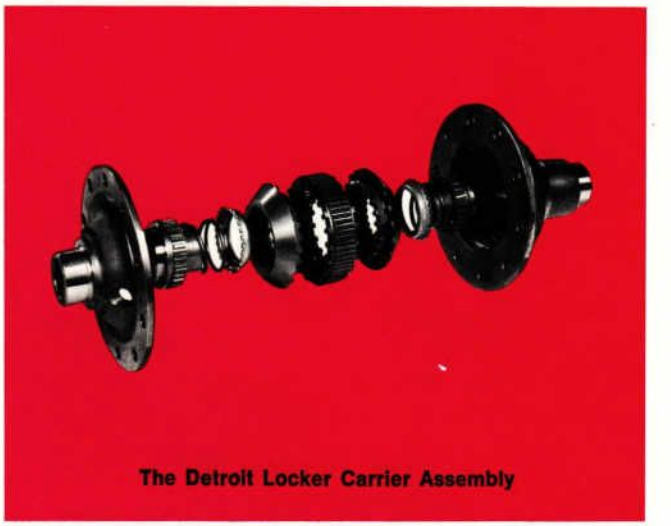
*Limited-slip differentials require the use of 5½ pints of special C2AZ-19580-D lube.

**When replacing a gear set with ½"-20 holes, 10 C3AZ-4216-A bolts are required.

THE UNBEATABLE "DETROIT LOCKER" NO-SPIN DIFFERENTIAL KIT!

The ultimate companion to your new set of gears, the incomparable "Detroit Locker" gets it all down to the ground! Kit includes complete carrier assembly unit.

When determining which locker will fit with the rear axle you are using, count the spline teeth on the end of the axle shaft and measure the inside diameter of the carrier gear bearing. Use this with the chart to select the correct locker.



The Detroit Locker Carrier Assembly

"DETROIT LOCKER" ASSEMBLIES

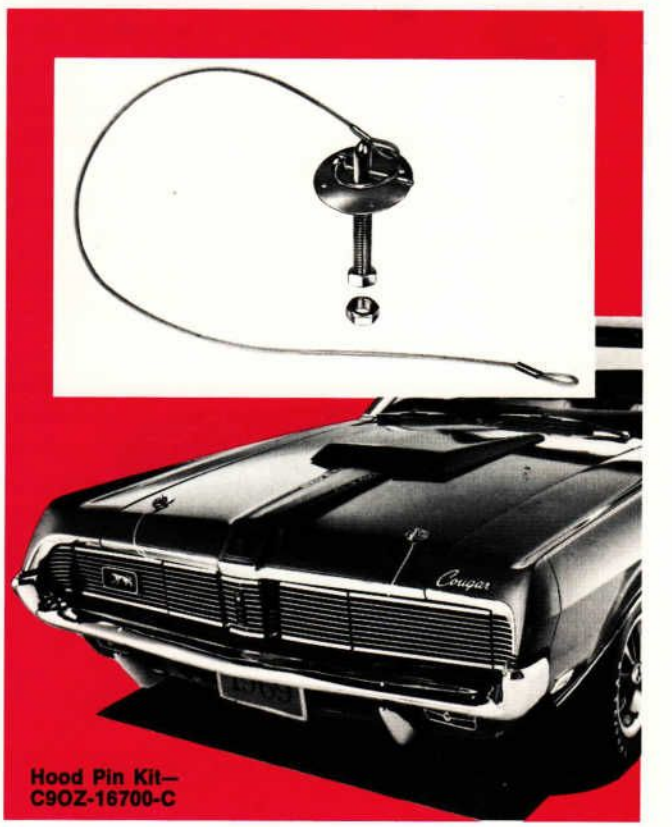
PART NUMBER	DESCRIPTION	APPLICATION
C3AZ-4880-B	Use w/31-spline axle shaft—9" ring gear and $1^{25}/_{32}$" I.D. differential bearing.	All—1963-69
S1MS-4880-B	Use w/28-spline axle shaft—8" ring gear.	All—1965-69
S1MS-4880-A	Use w/28-spline axle shaft—$8^{3}/_{4}$" or 9" ring gear and $1^{1}/_{2}$" I. D. differential bearing	All—1965-69
S2MS-4880-C	Use w/28-spline axle shaft—$8^{3}/_{4}$" or 9" ring gear and $1^{25}/_{32}$" I. D. differential bearing.	All—1965-69

WHEN SELECTING YOUR GEARS . . .

. . . the following set of formulas will help you predict your rpm through the lights or at any given speed, using different tire sizes and axle ratios.

To Find . . .	Multiply and Divide . . .
Gear Ratio	$\frac{\text{RPM x Tire Diameter x 2.96}}{\text{1000 x MPH}}$
Tire Diameter	$\frac{\text{MPH x (Ratio x 1000) x .34}}{\text{Engine RPM}}$
Speed (in mph)	$\frac{\text{RPM x Tire Diameter x 2.96}}{\text{1000 x Ratio}}$
RPM	$\frac{\text{MPH x 340}}{\text{Tire Diameter}}$

NOTE: Tire Diameter is in *inches*



Hood Pin Kit—
C9OZ-16700-C

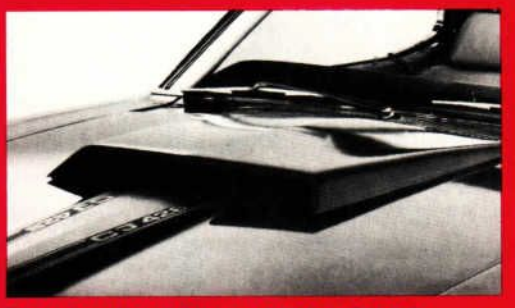
BODY

HOOD PIN KIT (Available August 1969)

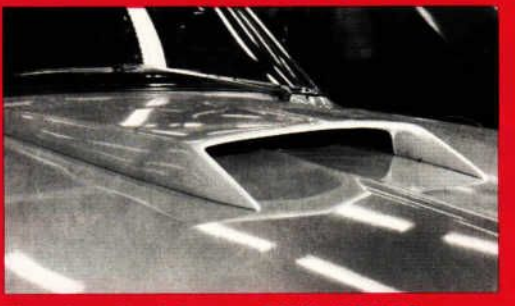
Keep it down in front! This kit will secure the hood of any Mustang, Cougar, Fairlane, Montego or Comet so that you don't get any surprises in the stretch. Kit includes all necessary hardware for installation. Plastic-covered steel cable prevents loss of klik-pins.

HOOD SCOOPS

Here are two scoops that can be functional . . . or just for looks. The C9ZZ-16C630-C scoop is a wide fiberglass job. The C9WY-16C630-B scoop is a narrower type. They both can be used on Mustang, Cougar, Fairlane, Montego and Comet from 1965-69. NOTE: Scoops may require a little trimming for best fit. Scoops may be attached with epoxy cement or with metal screws, depending on the degree of finish desired.



Fiberglass Hood Scoop C9ZZ-16C630-C



Fiberglass Hood Scoop C9WY-16C630-B

FRONT SPOILER

Here is a goodie that breaks up air flow under the car and decreases drag at the rear of the car. Used on the winning Trans-Am Mustangs, it provides increased aerodynamic stability at higher speeds. The black finish can be left as is, or repainted to match or contrast with your present paint scheme. 1969 Mustang uses part number C9ZZ-63001A74-A, while 1969 Cougars use part number C9WY-65001A74-A.

Front Spoiler—
Trans-Am Trick

REAR SPOILER

This rear spoiler is an inverted airfoil which exerts a downward force in proportion to speed of air flow. This keeps the rear end of the car where it should be, and offsets the tendency of the roof line to create lift. Made of styrofoam-sandwich fiberglass, it is extremely light and strong. The black finish can be painted to match or contrast with your present paint scheme. For all 1969 Cougars (C9WY-6544210-A), Mustangs (C9ZZ-6344210-A) and Cyclones (C9GY-6344210-A).

Rear Spoiler

"SPORTS SLATS" FOR MUSTANG ONLY

The hairy look . . . with some function, too! These back-glass louvers will provide your rear-seat passengers with protection against the direct rays of the sun. They install over the existing rear glass, and can be easily "popped up" to clean the glass. Paint the "racing black" finish to match your car, or leave it as is. Part number C9ZZ-6344268-A for all 1969 Mustangs.

Sports Slats for 1969 Mustang C9ZZ-6344268-A

"SUN" GAUGES

If you want to know what's going on under there, Sun provides the gauges that'll tell you! Mix or match the gauges shown here for that dyno look with maximum confidence.

Mounting bezels are available in one-, two- or three-gauge versions, and are heavily chrome-plated for durability and good looks.

GAUGES (Available August 1969)

TYPE	PART NUMBER
Water Temperature	D0AZ-10B944-A
Oil Pressure	D0AZ-10B944-B
Voltmeter	D0AZ-10B944-C
Ammeter	D0AZ-10B944-D
Vacuum	D0AZ-10B944-E

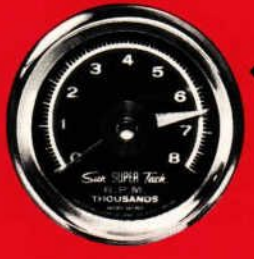
TYPE	PART NUMBER
One Gauge	D0AZ-10B946-A
Two Gauges	D0AZ-10B946-B
Three Gauges	D0AZ-10B946-C

TACHOMETERS

And now for the one "big eye" that will become a familiar friend to you on the track. The rule here is "whatever turns you on," because tachs we've got!

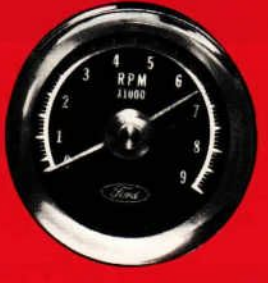
8000 RPM HOOD-MOUNTED TACH—We slam-tested this tach, tried to steal it, left it out in the cold and wet, and generally tried to destroy it! It wouldn't cut out. It is calibrated to 8000 rpm, and is easy to install. Allows instant viewing ALL MODELS . . . Part Number C9AZ-17A326-A.

Sun Gauges for the Dyno Look



Sun "Super" 8000 RPM —C4AZ-17A326-A

Ford 6000 RPM with 4", 100° Face— C6AZ-17A326-D



Ford 9000 RPM with 250° Face— C6AZ-17A326-G

Ford 6000 RPM (6-Cylinder)—C8AZ-17A326-A

Ford 6000 RPM (8-Cylinder)—C8AZ-17A326-B

Ford 8000 RPM (8-Cylinder)—C8AZ-17A326C

SUSPENSION

FRONT STABILIZER BAR

Stiffen up that front suspension with this 1″ steel bar specially hardened, calibrated-rate rubber bushings, and mounting brackets. Improves cornering and reduces front end sway. Bolt-on installation for 1965-69 Mustangs.

FRONT STABILIZER BAR

Parts Required	For 1965/66 Mustang	For 1967/69 Mustang
Bar	S1MS-5482-A	C9ZZ-5482-E
Bracket	C0DD-5486-A	C7ZZ-5486-A
Insulator	C0AA-5493-A	C9ZZ-5493-A

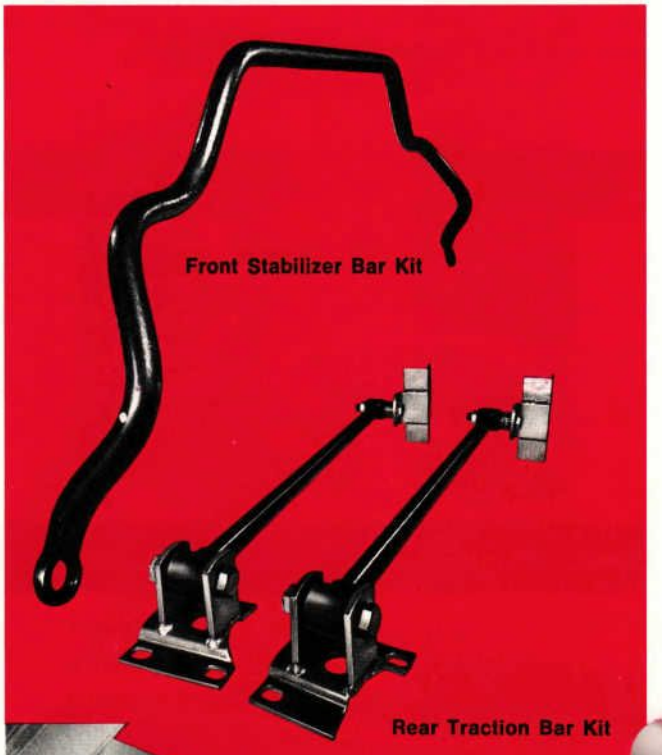
Keep those rear wheels on the ground, where they can do the most good! All the power in the world won't help if they're up in the blue most of the time. This bolt-on kit provides solid footing for all Mustangs from 1965 to 1969. Kit includes two traction bars and necessary installation parts and instructions.

REAR TRACTION BARS

Part Number	Application
S2MK-18127-A	1965/66 Mustang
S7MK-18127-A	1967/69 Mustang

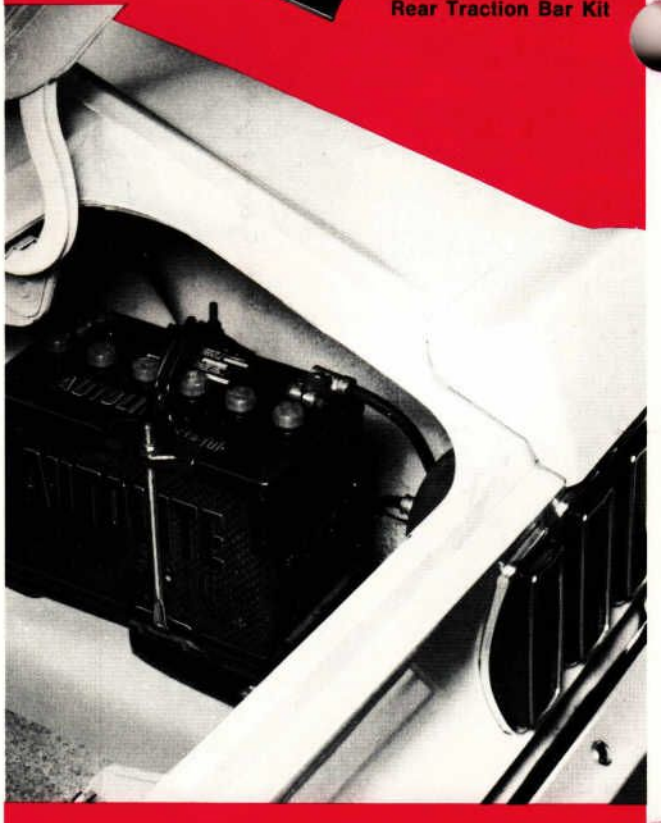
REAR-MOUNTED BATTERY

Here's the way to get that heavy battery into a position where it'll provide you with extra traction. The special parts listed below, plus some nuts and bolts, are required to move your battery from the standard position back to the right rear corner of the trunk. Now you can make that extra weight work *for* you.



Front Stabilizer Bar Kit

Rear Traction Bar Kit



Rear-Mounted Battery in Position

PARTS LIST FOR REAR-MOUNTED BATTERY

DESCRIPTION OF PART	For 1969 Fairlane Montego	For 1969 Mustang	For 1969 Cougar
Battery	HVU-29-HR	HVU-29-HR	HVU-29-HR
Cable (Batt to Relay) (Includes installation instructions)	C9OZ-14300-A	C9ZZ-14300-A	C9ZZ-14300-A
(Batt to Ground)	C2RZ-14300-G	C2RZ-14300-G	C2RZ-14300-G
(Engine to Ground)	C2RZ-14431-A	C2RZ-14431-A	C2RZ-14431-A
Terminal	C9ZZ-14450-A	C9ZZ-14450-A	C9ZZ-14450-A
Cover (Batt Terminal Insulator)	C9ZZ-14227-A	C9ZZ-14277-A	C9ZZ-14277-A
Bracket (Spare Wheel Mounting)	C7AZ-6247076-A	C7AZ-6247076-A	C7AZ-6247076-A
Vent Kit (Battery Emission)	BB-28	BB-28	BB-28
Tray Assembly (Battery)	C9OZ-10732-A	C9ZZ-10732-B	C9WY-10732-A
Reinforcement (Battery Support Bracket)	Not Required	C9ZZ-10A674-A	C9ZZ-10A674-A
Reinforcement (Battery Support Bracket)	Not Required	C9ZZ-10A710-A	C9ZZ-10A710-A
Reinforcement (Battery Tray Support)	Not Required	C9ZZ-10679-A	C9WY-10679-A

NOTE: Complete installation drawings, including extra nuts and bolts needed for installation, are included in the C9OZ-14300-A Battery-To-Relay cable box.

HOW TO ORDER MUSCLE PARTS

The High Performance Parts described in this brochure are available for Ford Motor Company 289, 302, 351, 390, 427 and 428 CID engines. The parts are listed by part number and can be purchased from any authorized Ford or Lincoln-Mercury dealership.

NOTE TO DEALERS

All of the part numbers in this brochure have regular depot classifications (A, AA, B, C, CY, V, VY, etc.) and should be ordered in the usual manner for each class of item.

REQUESTS FOR INFORMATION

All requests for special information or assistance regarding Muscle Parts should be referred to:

Ford Motor Company
Autolite-Ford Parts Division
P. O. Box 3000
Livonia, Michigan 48151
Attention: Customer Relations Section

The staff assigned to handle your inquiries is organized as a "company-wide clearing house" to give you prompt, accurate and complete answers.

Many of these questions can be answered on the spot. Others, because of their technical involvement, may require a little time and the help of our engineering or marketing specialists. (The Customer-Relations Section has direct-line contact with the persons who will be able to answer these more difficult questions.) If your inquiry can't be answered immediately, you can be certain that it will be followed up regularly until the information you need is obtained.

MUSCLE PARTS WARRANTY

The special parts or special applications described in this brochure are not available as factory installed equipment but only as service items with which the Purchaser may accomplish individualized dress-up and high-performance modifications of his vehicle. Accordingly, the following warranty, and limitation of vehicle warranty, are applicable:

"The Selling Dealer warrants to the Purchaser that the Selling Dealer, at his place of business and using new Ford parts or Authorized Remanufactured Ford parts, will repair or replace, free of charge including related labor, any part of any Ford special or special application dress-up or high-performance service part or accessory that is found to be defective in factory material or workmanship in normal use and service within a period of 90 days from the date of delivery to the Purchaser or until it has been in service for 4,000 miles, whichever occurs first.

If the Selling Dealer has ceased to do business or the Purchaser is travelling or has moved to a different locality, replacements or repairs may be made by any authorized dealer of Ford.

Unauthorized modifications and alterations or improper repairs made by dealers or other sources are not the responsibility of Ford. If, in the reasonable judgment of Ford, any such modification, alteration or repair adversely affects the vehicle's reliability, stability or over-all performance the vehicle warranty may not apply to parts and components so affected."

EMISSION CONTROLS

Federal law prohibits the removal or adverse modification of any part of federally required, factory installed emission control systems on a car or truck prior to its retail sale.

In addition, California law prohibits highway operation of a car or truck unless it has properly installed and operating emission control systems. Check the law of your home state.

The description and specifications contained in this book were in effect at the time the publication was approved for printing. The Ford Motor Company, whose policy is one of continuous improvement, reserves the right to discontinue models at any time, or to change specifications or design without notice and without incurring obligation.

Autolite Ford

VOL. 69 MP-1000 LITHO IN U.S.A.

MUSCLE PARTS PRICE LIST

Parts are listed sequentially by "basic" part number. The description is for reference only, to help identify where or how the part is used. TO STAGE ENGINES IN THIS BOOK. The parts listed may be used for other applications not shown here.

Suggested List Price	Part Number	Description
		SPARK PLUGS
1.15	Autolite AF-1	Standard Gap Spark Plug (14mm)
1.15	Autolite AF-2	Standard Gap Spark Plug (14mm)
1.15	Autolite AF-3	Standard Gap Spark Plug (14mm)
1.20	Autolite AF-12	Power Tip Spark Plug (14mm)
1.20	Autolite AF-22	Power Tip Spark Plug (14mm)
1.20	Autolite AF-32	Power Tip Spark Plug (14mm)
1.15	Autolite AF-42	Power Tip Spark Plug (14mm)
1.15	Autolite AF-52	Power Tip Spark Plug (14mm)
1.15	Autolite AF-103	Racing Gap Spark Plug (14mm)
1.15	Autolite AF-303	Racing Gap Spark Plug (14mm)
1.15	Autolite AF-501	Standard Gap Spark Plug (14mm)
1.15	Autolite AF-503	Racing Gap Spark Plug (14mm)
1.15	Autolite AF-701	Standard Gap Spark Plug (14mm)
1.15	Autolite AF-901	Standard Gap Spark Plug (14mm)
1.20	Autolite BF-12	Power Tip Spark Plug (18mm)
1.20	Autolite BF-22	Power Tip Spark Plug (18mm)
1.15	Autolite BF-32	Power Tip Spark Plug (18mm)
1.15	Autolite BF-42	Power Tip Spark Plug (18mm)
1.15	Autolite BF-82	Power Tip Spark Plug (18mm)
1.57	Autolite BF-203	Racing Gap Spark Plug (18mm)
1.57	Autolite BF-403	Racing Gap Spark Plug (18mm)
1.15	Autolite BF-601	Standard Gap Spark Plug (18mm)
1.57	Autolite BF-603	Racing Gap Spark Plug (18mm)
1.57	Autolite BF-703	Racing Gap Spark Plug (18mm)
1.15	Autolite BTF-1	Standard Gap Spark Plug (18mm)
1.15	Autolite BTF-3	Standard Gap Spark Plug (18mm)
1.15	Autolite BTF-6	Standard Gap Spark Plug (18mm)
1.15	Autolite BTF-31	Standard Gap Spark Plug (18mm)
1.15	Autolite BTF-42	Standard Gap Spark Plug (18mm)
		WIRE
96.00	7SH (Autolite)	100-foot roll Steelductor Silicone Cable
960.00	7SHM (Autolite)	1000-foot roll Steelductor Silicone Cable
9.60	5198 (Autolite)	Silicone Spark Plug Cover (Pkg of 24)
13.20	5438 (Autolite)	Silicone Right Angle Boot and Spark Plug Connector (Pkg of 20 each)
		BATTERY
46.25	HVU-29-HR	Autolite Heavy Duty, 85 Ampere-Hour, 90 Plates
		REAR MOUNTED BATTERY VENT KIT
—	BB-28	
		RING AND PINION GEAR SETS
60.95	B7AZ-4209-K	4.11 ratio, 9" ring gear
60.95	B7AZ-4209-L	3.50 ratio, 9" ring gear
60.95	B7AZ-4209-N	3.89 ratio, 9" ring gear
60.95	B8AZ-4209-C	3.25 ratio, 9" ring gear
126.90	C3AZ-4209-H	4.44 ratio, 9" ring gear
60.95	C3OZ-4209-D	3.80 ratio, 8" ring gear
65.60	C3UZ-4209-C	4.57 ratio, 9" ring gear
126.90	C4AZ-4209-V	3.10 ratio, 9" ring gear
126.90	C4AZ-4209-Y	3.40 ratio, 9" ring gear
126.90	C4AZ-4209-AA	4.71 ratio, 9" ring gear
126.90	C4AZ-4209-AB	4.86 ratio, 9" ring gear
126.90	C4AZ-4209-AC	5.14 ratio, 9" ring gear
126.90	C4AZ-4209-AD	5.43 ratio, 9" ring gear
126.90	C4AZ-4209-AE	5.67 ratio, 9" ring gear
60.95	C4DZ-4209-D	3.25 ratio, 8" ring gear
55.90	C4OZ-4209-H	3.00 ratio, 8" ring gear
55.90	C4OZ-4209-J	3.50 ratio, 8" ring gear
55.90	C4OZ-4209-K	2.79 ratio, 8" ring gear
60.95	C7AZ-4209-J	2.75 ratio, 9" ring gear
65.50	C8OZ-4209-A	3.91 ratio, 9" ring gear
65.50	C8OZ-4209-B	4.30 ratio, 9" ring gear
		"DETROIT LOCKER" DIFFERENTIAL
187.15	S1MS-4880-A	All 1965-69 models. Use with 28 spline axle shaft, 8¾" or 9" ring gear and 1½" I.D. bearing.
178.75	S1MS-4880-B	All 1965-69 models. Use with 28 spline axle shaft and 8" ring gear.
178.75	S2MS-4880-C	All 1965-69 models. Use with 28 spline axle shaft, 8¾" or 9" ring gear, 1²⁵⁄₃₂" I.D. bearing.
191.20	C3AZ-4880-B	All 1963-69 models. Use with 31 spline axle shaft, 9" ring gear and 1²⁵⁄₃₂" I.D. bearing.
		FRONT STABILIZER BAR
15.00	C9ZZ-5482-E	1967-69 Mustang
30.00	S1MS-5482-A	1965-66 Mustang
		FRONT STABILIZER BAR BRACKET
.33	C0DD-5486-A	1965-66 Mustang
2.45	C7ZZ-5486-A	1967-69 Mustang
		FRONT STABILIZER BAR INSULATOR
1.00	C0AA-5493-A	1965-66 Mustang
1.05	C9ZZ-5493-A	1967-69 Mustang
		ENGINE TIMING POINTER
.21	C5AZ-6023-A	1966-67 390 CID w/air conditioning
.34	C9AZ-6023-A	1966-67 390 CID without air conditioning

Suggested List Price	Part Number	Description
		CYLINDER HEAD
168.55	C4AE-6049-F	427 High Riser
55.55	C5AZ-6049-C	427 Medium Riser
189.50	C8AX-6049-A	427 Tunnel Port
56.70	C8OZ-6049-K	428 Cobra Jet, (also used on 390)
56.10	C9OZ-6049-F	351 "W" (used on 289, 302)
		CYLINDER HEAD GASKET
3.10	C3AE-6051-BS	427 R.H. Stainless Steel 0.020" thick
2.80	C3AZ-6051-B	390-427-428 Steel 0.015" thick
3.10	C4AE-6051-BS	427 L.H. Stainless Steel 0.020" thick
1.40	C8AZ-6051-A	390-428
3.30	C8OZ-6051-B	289-302
		CYLINDER HEAD EMISSION CONTROL PLUG
.34	C6AZ-6052-A	390 CID engines without emission control
		CYLINDER HEAD BOLT
.30	C8OZ-6065-A	7⁄16-14 x 2.26" (351 "W" head to 289-302 block)
.30	C8OZ-6065-B	7⁄16-14 x 3.88" (351 "W" head to 289-302 block)
		INDUCTION KIT
117.90	C6AZ-6B068-A	1963-67 289-302 models. 600 cfm Carb and 4V High Riser Manifold
117.90	C8DZ-6B068-A	1968-69 289-302 models. 600 cfm Carb and 4V High Riser Manifold
		PISTON AND PIN ASSEMBLY
19.35	C5AZ-6108-A	427, 10.5:1 compression, standard rings
11.00	C6MY-6108-AB	410 Mercury (To stroke 390)
11.75	C8OZ-6108-G	428 (red) 680 grams (Standard CJ)
11.75	C8OZ-6108-H	428 (blue) 680 grams (Standard CJ)
11.75	C9ZZ-6108-A	428 (red) 692 grams (Super CJ)
11.75	C9ZZ-6108-B	428 (blue) 692 grams (Super CJ)
11.75	C9ZZ-6108-G	428 (red) 692 grams (Standard CJ)
11.75	C9ZZ-6108-H	428 (blue) 692 grams (Standard CJ)
11.40	C9ZZ-6108-N	428 (red) 712 grams (Super CJ)
11.40	C9ZZ-6108-R	428 (blue) 712 grams (Super CJ)
11.40	C9ZZ-6108-Y	428 (red) 712 grams (Standard CJ)
11.40	C9ZZ-6108-Z	428 (blue) 712 grams (Standard CJ)
16.15	C9OZ-6108-Y	390 R.H. Pop-Up (Avail. Aug. '69)
11.00	C9OZ-6108-AA	289-302 R.H. Pop-Up
20.85	C9AZ-6108-M	427, 12.5:1 Pop-Up with standard rings
16.15	C9OZ-6109-A	390 L.H. Pop-UP (Avail. Aug. '69)
10.00	C9OZ-6109-B	289-302 L.H. Pop-Up
		PISTON
19.65	C8AZ-6110-A	428 L.H. Pop-Up
19.65	C8AZ-6110-B	428 R.H. Pop-Up
19.65	C8AX-6110-A	427, 12.5:1 Pop-Up with Dyke ring
		PISTON PIN
1.60	C5AZ-6135-A	427 Pop-Up piston
1.10	C6AZ-6135-A	428 Pop-Up piston
		PISTON RINGS
9.55	C1AZ-6148-A	390 Standard ring set
10.75	C5AZ-6148-A	427 Standard ring set
10.65	C6AZ-6148-A	428 Standard ring set
9.60	C6AZ-6148-E	410 Mercury (For 390 Stroker Kit)
9.35	C9OZ-6148-A	289-302 Standard ring set
		UPPER "DYKE" PISTON RING
7.60	C8AX-6150-A	427 Upper "Dyke" Compression Ring
		CONNECTING ROD
11.10	C3OZ-6200-C	289 High Performance
10.55	C5AZ-6200-D	427 (Fits 390-428)
10.85	C6AZ-6200-C	390-428 Police Interceptor
65.00	C7OE-6200-A	427 Forged Steel 7000 rpm (Avail. Sept. '69)
8.30	C8AZ-6200-A	302
11.50	C9OZ-6200-B	289 with 302 Stroker
10.50	C9ZZ-6200-A	428 Super CJ
		CONNECTING ROD BEARINGS
1.00	C3OZ-6211-M	289-302
1.10	C5AZ-6211-G	427 (Fits 390-428)
1.50	C9AX-6211-E	427 (Use with C7OE-6200-A rod) (Avail. Aug. 69)
1.50	C9AX-6211-F	427 (Use with C7OE-6200-A rod) (Avail. Aug. '69)
		CONNECTING ROD BOLT
—	C7OE-6214-A	Use with C7OE-6200-A rod (Avail. Aug. '69)
		CAMSHAFT
47.70	C3AZ-6250-AA	Mechanical 427 stock (Fits 390-428)
26.30	C3OZ-6250-C	Mechanical 289 High Performance (Fits 289-302-351)
47.10	C4AE-6250-B	Mechanical 427 (Fits 390-428)
29.50	C6OZ-6250-B	Hydraulic 428 stock (Used with 390 Impressor)
27.55	C7FE-6250-A	Mechanical (Fits 289-302-351)
30.90	C8AX-6250-C	Hydraulic (Used with 390-428)
47.10	C8AX-6250-D	Mechanical (Fits 390-427-428)
27.35	C9OZ-6250-C	Hydraulic (Fits 289-302-351)

Suggested List Price	Part Number	Description
		CAMSHAFT SPROCKET
5.85	C8AZ-6256-A	To adapt cams to early 390 and 406's
		SPACER
.33	C3AZ-6265-A	To adapt cams to early 390 and 406's
		TIMING CHAIN
8.65	B8A-6268-A	To adapt cams to early 390 and 406's
		CAMSHAFT THRUST PLATE
1.10	C3AZ-6269-A	To adapt cams to early 390 and 406's
		CRANKSHAFT
103.75	C3OZ-6303-B	289 High Performance
101.90	C5AZ-6303-C	427 Forged Steel (Avail. Oct. '69)
98.50	C8AZ-6303-A	302
87.35	C9ZZ-6303-A	428 Super CJ (Use with 692 gram piston)
87.35	C9ZZ-6303-B	428 Standard CJ (Use with 680 or 692 gram piston)
87.35	C9ZZ-6303-D	428 Super CJ (Use with 712 gram piston)
87.35	C9ZZ-6303-E	428 Standard CJ (Use with 712 gram piston)
160.00	C9AZ-6303-D	427 Use with C7OE-6200-A
		CRANKSHAFT SPROCKET
6.00	C3OZ-6306-A	289 HP (Use on 289-302 to balance Dominator Kit)
3.75	C4AZ-6306-A	To adapt cams to early 390 and 406's
		OIL SLINGER
.66	C9ZZ-6310-A	351
		CRANKSHAFT VIBRATION DAMPER AND PULLEY ASSEMBLY
35.45	C3AZ-6312-F	427
42.60	C6AZ-6312-A	390 1966-67 engines only
		CRANKSHAFT VIBRATION DAMPER
16.90	C5OZ-6316-C	289 High Performance
12.95	C8AZ-6316-A	289 (with 302 Stroker)
12.95	C8AZ-6316-B	428 Standard CJ
35.45	C8AZ-6316-C	428 Super CJ (Also used on 390 with 410 Stroker)
22.75	C9ZZ-6316-B	302 Boss (Used to balance 289-302-351 Dominator Kit)
		CRANKSHAFT BEARINGS
1.30	C3AZ-6333-AA	289 with 302 stroker
1.30	C3AZ-6333-P	289 with 302 stroker
1.40	C3AZ-6333-R	289 with 302 stroker
2.60	C5AZ-6333-AA	427 lower
2.60	C5AZ-6333-AB	427 upper
		CRANKSHAFT BEARINGS—CENTER
3.30	C3AZ-6337-AA	289 with 302 stroker
3.30	C3AZ-6337-P	289 with 302 stroker
5.00	C5AZ-6337-AA	427 lower
5.00	C5AZ-6337-AB	427 upper
		CRANKSHAFT SPACER
1.60	B8AZ-6359-A	428 Standard CJ
8.60	C9ZZ-6359-A	428 Super CJ (includes counterweight) also fits 390
		CRANKSHAFT SPACER COUNTERWEIGHT
2.70	C3OZ-6A360-A	289 High Performance (Use with 289-302 Dominator Kit)
		FLYWHEEL
36.25	C5AZ-6375-P	427
14.40	C6AZ-6375-B	428 Standard CJ (Automatic)
59.50	C8OZ-6375-A	428 Standard CJ (Manual)
14.40	C9OZ-6375-B	428 Super CJ (Automatic) (Fits 390)
37.30	C9ZZ-6375-B	428 Super CJ (Manual) (Fits 390)
		TAPPETS (LIFTERS)
1.65	C3OZ-6500-A	Solid 289 High Performance (Fits 302-351)
1.55	C4AZ-6500-B	Solid 427 (Fits 390-428)
3.10	C8AZ-6500-B	Hyd. 428 Super CJ (Fits 390)
3.10	C9OZ-6500-A	Hyd. 289-302-351
		EXHAUST VALVE
15.15	C5AZ-6505-N	427 Lightweight
15.30	C8AX-6505-A	428 Lightweight (Fits 390)
4.80	C9OZ-6505-N	428 Stock (Fits 390)
2.15	C9OZ-6505-A	351 Stock (Fits 289-302)
4.80	C9OZ-6505-AA	351 GT-40 Type (Fits 289-302)
		INTAKE VALVE
4.55	C5AZ-6507-N	427 Lightweight
13.35	C8AX-6507-A	428 Lightweight (Fits 390)
13.35	C8AX-6507-B	427 Lightweight (Tunnel Port)
1.70	C9OZ-6507-A	351 Stock (Fits 289-302)
2.70	C9OZ-6507-AA	351 GT-40 Type (Fits 289-302)
2.50	C9OZ-6507-U	428 Stock (Fits 390)
		VALVE SPRING
1.65	C3AZ-6513-B	390 GT (For 289-302-351 Dominator Kit)
1.70	C8AZ-6513-B	428 Stock (Fits 390)
1.65	C9OZ-6513-A	351 (Fits 289-302)
1.75	C9OZ-6513-C	289-302
		VALVE RETAINER
.24	C3AZ-6514-A	390-427-428
.26	C7AZ-6514-A	389 (1966), 302 (before 10-21-68)
.24	C9OZ-6514-D	289-302-351
.24	C9OZ-6514-E	289 (1965), 302 (after 10-21-68)

Suggested List Price	Part Number	Description
		SPRING SHIM
.21	B3Q-6515-A	289-302-351
		VALVE KEEPERS
.08	B8A-6518-A	390-427-428
.10	C9ZZ-6518-A	289-302-351 Hardened
		ROCKER ARM OIL DEFLECTOR
3.10	C4AE-6524-B	427 High Riser
.50	C9OZ-6524-B	289-302-351
		ROCKER STAND BOLT
.79	C3AE-6527-A	427 High Riser
		ROCKER ARM STUD
.93	C3OZ-6A527-B	289 HP Threaded (For 289-302-351)
		ROCKER SEAT (Fulcrum)
.22	C2OZ-6A528-C	289-302
		ROCKER STUD NUT
.25	C2DZ-6A529-A	Use with C3OZ-6A527-B stud
		ROCKER STAND
6.85	C3AE-6531-A	427 High Riser
		ROCKER ARM
2.45	B8A-6564-B	427 Adj., 1.76 ratio (Fits 390-428)
1.35	C2OZ-6564-A	289 High Performance Conventional
1.00	C6OZ-6564-B	289-302 Rail Type
		PUSH ROD GUIDE PLATE
.45	C9OZ-6A564-B	289-302-351
		PUSH ROD
1.05	B8AZ-6565-C	427 ball and socket
.53	C2OZ-6565-B	289 Hardened
.53	C4TZ-6565-B	390-428 stock
1.80	C4TZ-6565-D	390 0.060" shorter than standard
.55	C9OZ-6565-B	302-late (Fits 289-302)
.60	C9OZ-6565-F	302 Hardened (Fits 289-302)
.71	C9OZ-6565-G	351 Hardened
		VALVE STEM SEAL
.14	C7AZ-6571-B	289-302-351
		VALVE COVER
16.20	C9ZZ-6582-B	428 Cobra Jet
		OIL PUMP
18.95	C3AZ-6600-B	427
16.50	C9ZZ-6600-A	390, 428
		OIL PUMP PLUG
.10	C9OZ-6A616-A	To modify 351 oil pump
		OIL PICKUP
5.60	C5AE-6622-B	For deep sump pan. Fits all big block pumps
		INTAKE MANIFOLD BAFFLE
1.60	C6AZ-6A630-D	390 Use with C6AZ-9424-H aluminum manifold
2.80	C8AZ-6A630-B	390 Use with C8OZ-9424-B iron manifold
		DRAFT TUBE GASKET
.27	C0AE-6A632-A	390 Use with pre-emission vehicles
		OIL PUMP SPRING
.34	C5AZ-6670-A	To modify 351 oil pump
		OIL PAN
43.70	C8AX-6675-A	Deep Sump
		CRANKCASE WINDAGE TRAY
3.90	C9ZZ-6687-A	428 (Fits 390)
		CHROME BREATHER CAP
2.65	C2SZ-6766-B	Use with pre-emission vehicles
2.30	C8AZ-6766-B	Use with emission equipped vehicles
		ROAD DRAFT TUBE COVER
2.90	C6AZ-6869-A	390 Use with pre-emission vehicles
		CLUTCH DISC PRESSURE PLATE
50.45	C3OZ-7A537-A	289-302(1963-67)
50.45	C8DZ-7A537-A	289-302(1968)
		WATER BY-PASS TUBE
.38	C5AZ-8555-A	390
		INTAKE MANIFOLD
115.85	C5AZ-9424-G	427 2-4V Medium Riser, Dual Plane
95.95	C6AZ-9424-H	390-427-428, 4V Medium Riser, Dual Plane
95.95	C6AZ-9424-M	427 4V Medium Riser, Dual Plane
172.00	C7OE-9424-A	427 2-4V Tunnel Port, Single Plane
172.00	C7OE-9424-B	427 2-4V Tunnel Port, Dual Plane
150.80	C8AX-9424-A	427 2-4V Medium Riser, Single Plane
39.05	C8AX-9424-B	427 4V Tunnel Port, Single Plane
44.50	C8OZ-9424-B	390-428 Cast Iron
80.00	C9OZ-9424-D	289-302
83.20	C9OZ-9424-E	351

Suggested List Price	Part Number	Description
	INTAKE MANIFOLD GASKET	
.30	C4AE-9A424-A	427 Rear (Cork—use with milled heads) (Avail. Aug. '69)
	INTAKE MANIFOLD	
132.70	C4AE-9425-F	427 2-4V High Riser, Dual Plane
97.10	C4AE-9425-G	427 4V High Riser, Dual Plane
	INTAKE MANIFOLD GASKET	
.30	C4AE-9A425-A	427 Front (Cork—use with milled heads) (Avail. Aug. '69)
	EXHAUST MANIFOLD	
41.30	C8OZ-9430-C	428 R.H. Cast Iron
41.30	C8OZ-9431-B	428 L.H. Cast Iron
	INTAKE MANIFOLD GASKET	
2.65	C3AZ-9433-G	427 Medium Riser
2.20	C3AZ-9433-H	289-302
2.35	C6AZ-9433-B	390-428
2.35	C9OZ-9433-A	351 (Fits 289-302 with 351 head)
1.55	C3AE-9439-A	427 High Riser with blocked heat passage
1.55	C5AE-9439-A	427 Medium Riser with blocked heat passage
2.90	C8AZ-9441-C	427 Tunnel Port with blocked heat passage
	CARBURETOR	
60.00	C5AF-9510-BT	780 cfm 4V—427
60.00	C5AF-9510-BU	780 cfm 4V—427
59.10	C6AZ-9510-AH	715 cfm 4V—427
55.40	C8AZ-9510-AD	600 cfm 4V—289-302-351
55.40	C8OF-9510-AC	652 cfm 4V—427
55.40	C8OF-9510-AD	652 cfm 4V—427
59.05	C9AZ-9510-N	735 cfm 4V—390
	CARBURETOR TO MANIFOLD SPACER	
6.40	C2AZ-9A589-E	351
6.20	C8AZ-9A589-G	390
	CARBURETOR AIR CLEANER	
28.95	C5MY-9600-B	2-4V
29.85	C5ZZ-9600-W	4V
	ALTERNATOR ADJUSTING ARM	
1.30	C7AZ-10145-A	390, 1966-67 models with A/C or Thermactor
	REINFORCEMENT BRACKET	
.71	C9ZZ-10A674-A	Front—For rear mounted battery
.72	C9WY-10679-A	Tray—For rear mounted battery (1969 Cougar)
.71	C9ZZ-10679-A	Tray—For rear mounted battery (1969 Mustang)
.71	C9ZZ-10A710-A	Rear –For rear mounted battery
	REAR MOUNTED BATTERY TRAY ASSEMBLY	
6.85	C9OZ-10732-A	1969 Fairlane-Montego
6.85	C9WZ-10732-A	1969 Cougar
6.85	C9ZZ-10732-B	1969 Mustang
	GAUGES (Avail. Aug. '69)	
18.75	D0AZ-10B944-A	Water Temperature
14.95	D0AZ-10B944-B	Oil Pressure
13.75	D0AZ-10B944-C	Voltmeter
15.65	D0AZ-10B944-D	Ammeter
15.65	D0AZ-10B944-E	Vacuum
	GAUGE MOUNTING BEZELS	
1.50	D0AZ-10B946-A	One gauge
2.25	D0AZ-10B946-B	Two gauges
3.50	D0AZ-10B946-C	Three gauges
	DISTRIBUTOR	
40.45	C0AZ-12127-L	427 dual point
31.80	C5OZ-12127-E	289 dual point

Suggested List Price	Part Number	Description
	SOLID STEEL CORE WIRE KIT	
11.50	C4OZ-12259-C	289-302-351
11.50	C5AZ-12259-C	390-427-428
	REAR MOUNTED BATTERY TERMINAL COVER	
.43	C9ZZ-14227-A	All models
	REAR MOUNTED BATTERY CABLE	
2.60	C2RZ-14300-G	Battery to ground
33.00	C9OZ-14300-A	Battery to relay (1969 Fairlane-Montego) (Includes installation instructions)
28.00	C9ZZ-14300-A	Battery to relay (1969 Mustang-Cougar) (Includes installation instructions)
2.20	C2RZ-14431-A	Engine to ground
	REAR MOUNTED BATTERY TERMINAL	
1.65	C9ZZ-14450-A	All models
	HOOD SCOOP	
28.65	C9WY-16C630-B	Wide scoop
28.65	C9ZZ-16C630-C	Narrow scoop
	HOOD PIN KIT	
6.05	C9OZ-16700-C	All models (Avail. Aug. '69)
	TACHOMETER	
58.10	C4AZ-17A326-A	Sun "Super" 8000 rpm
29.95	C6AZ-17A326-D	Ford 6000 rpm
47.00	C6AZ-17A326-G	Ford 9000 rpm
42.00	C8AZ-17A326-A	Ford 6000 rpm flat face (6-cyl)
42.00	C8AZ-17A326-B	Ford 6000 rpm flat face (8-cyl)
42.00	C8AZ-17A326-C	Ford 8000 rpm flat face (8-cyl)
60.25	C9AZ-17A326-A	Ford 8000 rpm hood mounted
	TRACTION BAR	
36.10	S2MK-18127-A	1965-66 Mustang
36.10	S7MK-18127-A	1967-69 Mustang
	SUPRESSION KIT	
7.90	C4AZ-18827-A	All 8-cyl engines with steel core wiring
	OIL CONDITIONER	
1.25	C2AZ-19579-A	Use with installation of new cams
	DIFFERENTIAL LUBE	
6.50	C2AZ-19580-D	Use with locking differentials
	FRONT SPOILER	
27.50	C9ZZ-63001A74-A	1969 Mustang
30.00	C9WY-65001A74-A	1969 Cougar
	REAR SPOILER	
103.45	C9GY-6344210-A	1969 Montego Cyclone
107.95	C9ZZ-6344210-A	1969 Mustang
107.95	C9WY-6544210-A	1969 Cougar
	BACK GLASS LOUVERS (SPORTS SLATS)	
210.00	C9ZZ-6344268-A	1969 Mustang
	SPARE WHEEL MOUNTING BRACKET	
.93	C7AZ-6247076-A	For rear mounted battery
	OIL DEFLECTOR NUT	
.02	45218-S8	To attach oil deflector to rocker stud
	AIR CLEANER STUD	
.06	370970-S8	
	THRUST PLATE BOLT	
.18	380041-S	To adapt cams to early 390 and 406's
	TIMING GEAR KEY	
.14	73357-S	To adapt cams to early 390 and 406's

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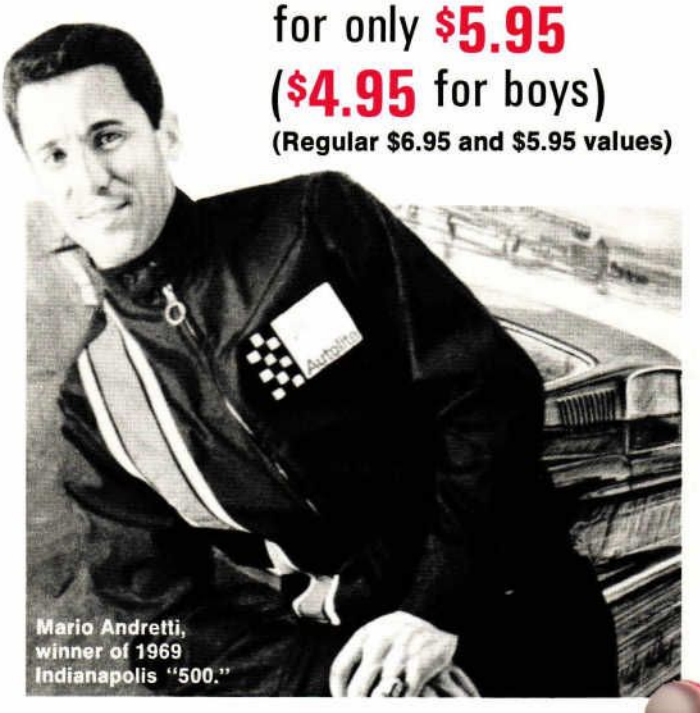

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