

# SHOP TIPS

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Technical parts and service information published by the Autolite-Ford Parts Division and distributed by Ford and Lincoln-Mercury dealers to assist servicemen in Service Stations, Independent Garages and Fleets.

**Learn All About...FORD'S 428 COBRA JET SUPER STOCK ELIMINATOR CHAMP at 1968 WINTERNATIONALS**

**PLUS... 427 SOHC Engine and 427 Tunnel-Port Heads Available...**

(see page 15)



# PERFORMANCE CORNER



## UNDER THE HOOD

Having detailed how to get the most out of Ford's famous, long time winner—the 427 wedge (January 1968 Shop Tips, "Modifying the 427 for Street/Strip"), Performance Corner now takes you inside an all new Ford high performance engine . . . the 428 Cobra Jet.

### WE WANT TO HEAR FROM YOU!

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Be sure and file this and future bulletins for ready reference. If you have any suggestions for additional information that you would like to see included in this publication, please write to: Autolite-Ford Parts Division of Ford Motor Company, Merchandising Services Dept., P.O. Box 3000, Livonia, Michigan 48151.

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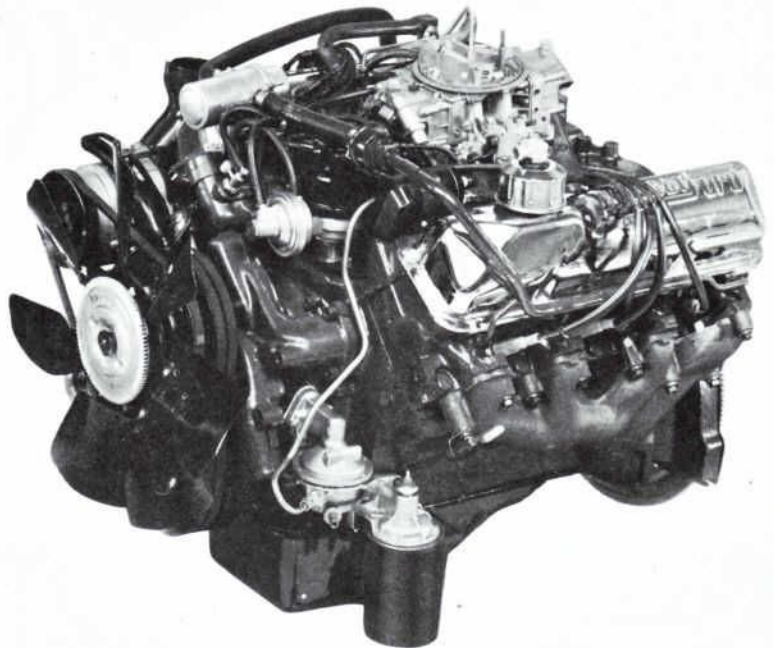


Figure 1—428 Cobra Jet

The 428 Cobra Jet answers the call for a reliable, streetable high performance engine, yet one that can be economically modified, from readily available factory parts, into a consistent winner at the track. Ford Stock Vehicles calls it, "A real bread-and-butter high performance engine." The 428 Cobra Jet is all that . . . and more.

In absolute showroom condition—that's with stock engine, chassis and tires—the 428 Cobra Jet turns the quarter mile in about 13.5 seconds e.t. and 106 mph. A street/production setup, that runs like that, ought to be a potent performer when modified. And it is, as already proven

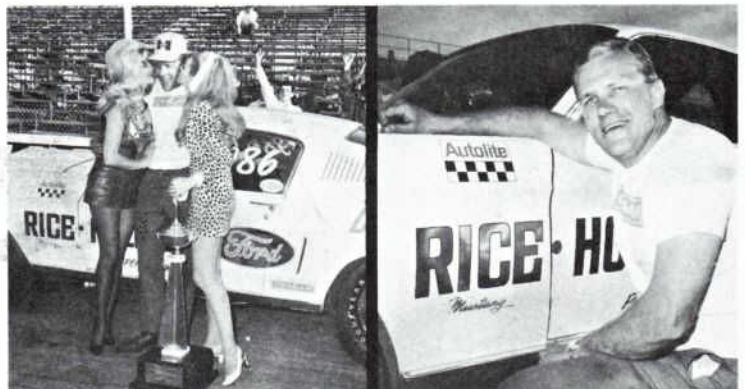


Figure 2—Al Joniec Wins Super Stock Eliminator Title at 1968 NHRA Winternationals with 428 Cobra Jet Powered Mustang



# VENOM from FORD ... 428 COBRA JET

by the 1968 Winternationals record book. Al Joniec, driving a specially prepared Mustang with a 428 Cobra Jet, took first place in SS/E class. And do you know who finished second?

Hubert Platt, that's who, driving another 428 Cobra Jet powered Mustang. Al Joniec then came right back and beat all other Super Stock class winners to become *Super Stock Eliminator* of the 1968 Winternationals. He also set a record of 11.49 seconds e.t. and top speed of 120.6 mph. And that was against the largest field of super stockers ever assembled. On its very first try, the 428 Cobra Jet not only makes Ford competitive in stock and super stock classes ... it's a winner!

Al and Hubert will have to keep their engines finely tuned, however, if they want to continue winning, because every performance buff can now get the same high performance parts, that they used, from Ford. That's right. A whole host of factory high performance parts are available to *everyone*—beginning right now! The 428 Cobra Jet brings trophy winning runs within the reach of all—which should make for sensational competition at the tracks.

Yet the production 428 Cobra Jet is quiet, easily street-driven and economical to buy and operate ... especially in comparison to many other exotic performance engines—most of which are out of reach of most performance enthusiasts. But not the 428 Cobra Jet.

Beginning April 1, the 428 Cobra Jet will be optional in 1968 Mustangs, Cougars, Fairlanes and Montegos. And plenty of high performance parts will also be available to modify the 428 Cobra Jet.

**NOTE:** Some modifications may affect the new car warranty. If you plan to modify the 428 Cobra Jet, be sure to discuss this situation with your Ford or Lincoln Mercury dealer. Of course, the warranty does not apply to any engine that is used in a competitive event, defined in the warranty as: "Competitive events shall be defined as formal or informal time trials, competition with any other vehicle, or any abnormal application of stress to the vehicle or the components thereof in a competitive situation."

As you can see, there's good reason to call the 428 Cobra Jet a "bread-and-butter" performance engine. Here's a high volume, regular production engine that can turn in amazing performance right off the showroom floor, yet can be modified into a fully competitive strip winner. Let's see what

makes the production 428 Cobra Jet such a potent performer, discuss the parts that can be used on other Ford big-inch wedges, and explain how to modify the 428 Cobra Jet for the strip.

## PRODUCTION 428 COBRA JET ENGINE

The 428 Cobra Jet (C.J.) is built around the 428 Thunderbird engine introduced in 1966 Fords and Thunderbirds. Only Ford models continue to use it for 1968, as 1968 Thunderbirds use the new 429 engine. However, except for the engine block, little similarity exists between the 428 Thunderbird and 428 Cobra Jet engines. Ford took the 428 Thunderbird engine block design, carefully selected a number of already mass-produced parts, and added some new high performance parts to come up with the 428 C.J. Costs were thus kept to a minimum.

This also accounts for Ford's ability to offer the 428 C.J. as a regular production option, rather than a limited production high performance engine. And as we will discuss under modifying the 428 C.J., this also allows the use of many 427 high performance parts. The following chart lists some of the more important specifications for the production 428 C.J.

### 1968 428-4V COBRA JET

Type	8-Cyl. 90 V OHV
Displacement	428 Cu. In.
Bore	4.13
Stroke	3.98
Compression Ratio	10.7:1
Brake Horsepower @ Specified rpm	335 @ 5600
Maximum Torque (lb. ft.) @ Specified rpm	445 @ 3400
Idle rpm (Adjust with lights on)	
Manual Transmission	700-750
Automatic Transmission	650-700
Valve Lifters	Hydraulic
Fuel	Premium
Carburetor	735 Cfm 4V
Spark Plug	Autolite BF-32
Spark Plug Gap	0.028"-0.032"
Firing Order	1-5-4-2-6-3-7-8
Distributor Point Gap	0.017"
Ignition Timing (BTDC) (Vac disconnected)	
Manual Transmission	6°
Automatic Transmission	6°
Valves	
Intake	Solid Stem 2.097" Dia.
Exhaust	Solid Stem 1.660" Dia.



1st.—Al Joniec, 1968 Winternationals SS/E



2nd.—Hubert Platt, 1968 Winternationals SS/E



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## UNDER THE HOOD

### 428 C.J. BLOCK

The 428 C.J. features a controlled microstructure, improved cast iron block. This is the same type of alloy cast iron that is used in 427 blocks, to provide higher strength characteristics. Standard 2-bolt main bearing caps are used (Fig. 3), instead of the cross-bolted main bearing caps employed in the 427. Cross-bolted bearings contribute to durability in high speed, long distance races and in certain dragsters, such as the super-charged fuel eliminators. However, they aren't necessary for the type of operating conditions for which the 428 C.J. was designed: street use or "stock" and "super stock" drag competition. And of course, it should be noted that the 428 C.J. only winds up to the 5,000-6,000 rpm range, as opposed to the 7,000-plus range of the 427. The 428 Cobra Jet is basically a street engine, but one that can be modified to run in the classes which the average performance buff can afford—the stock and super stock classes—and 2-bolt bearing caps provide plenty of strength for this usage.

Dimensionwise, the 428 C.J. block is identical to the 428 Thunderbird engine, and similar to other big-block Fords. Cylinder heads, intake manifold, oil pan, and the like, all bolt right on without any machining. The oil pump shown in Figure 3 is the heavy duty type used in the 428 Police Interceptor engine and is geared for high output.

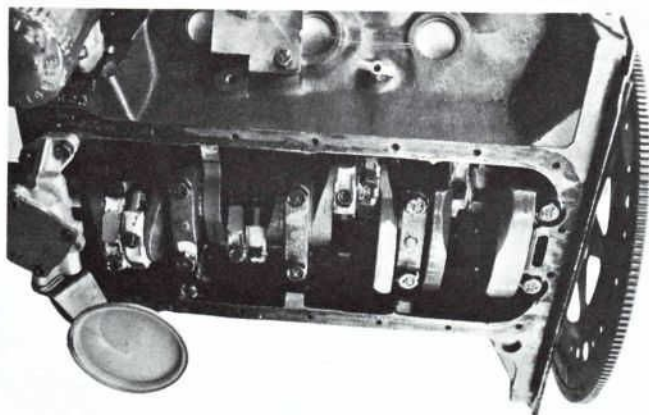


Figure 3—428 Cobra Jet Block

### 428 C.J. CRANKSHAFT

The crankshaft (Fig. 4) is made of "nodular controlled" cast iron, with high strength characteristics. The bearing journals are drilled to provide good lubrication during high rpm, high load conditions. The oil groove in the middle of each connecting rod journal is only recommended for the strip and will be covered under the modification section. The groove does not appear on production crankshafts.

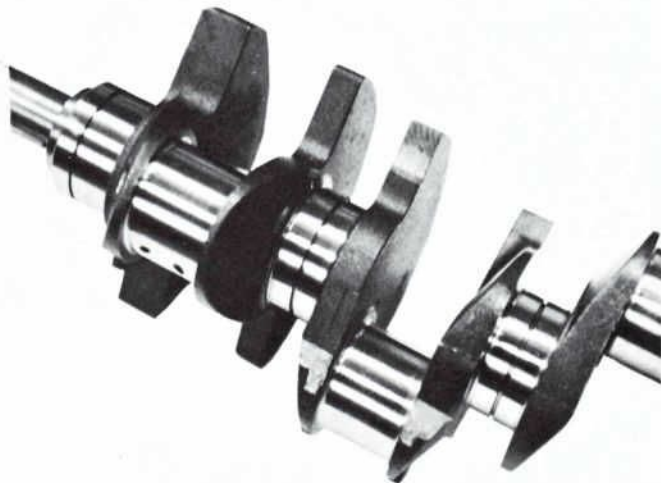


Figure 4—428 C.J. Crankshaft

Main bearing journal diameters and connecting rod bearing journal diameters are identical to 427 journals. However, instead of the special thin-wall type bearings used in the 427, standard type steel-backed, copper/lead insert bearings are used in the production 428 Cobra Jet. Use of the thin-wall type bearings will be covered under modifications.

By comparing the bore and stroke dimensions (Fig. 5) of Ford's big-block engines, it can be seen that no other crankshaft can be used in the 428 C.J. unless special rods and pistons are also used.

### BORE AND STROKE COMPARISONS

Engine	Bore	Stroke
352 CID	4.00"	3.50"
390 CID	4.05"	3.78"
406 CID	4.13"	3.78"
427 CID	4.23"	3.78"
<b>428 CID</b>	<b>4.13"</b>	<b>3.98"</b>
429 CID	4.36"	3.59"

Figure 5—Critical Dimensions—Big Block Ford V-8's

# VENOM from FORD ... 428 COBRA JET

## 428 C.J. CONNECTING RODS

The connecting rods (Fig. 6) are a special high strength type used in 428 Police Interceptor engines. Bearing caps are retained with a larger 11/32" diameter bolt and nut. Forged steel 427 type rods that retain the bearing cap with a bolt, instead of a bolt and nut design are also used in the 428 C.J.



Figure 6—428 C.J. Connecting Rod

## 428 C.J. PISTONS

Figure 7 illustrates the "dished with eyebrows" type piston used in the production 428 C.J. The piston is cast aluminum and is attached to the connecting rod with a full floating pin and locked in with two retainers. The "dished" piston has the effect of slightly increasing the combustion chamber volume and lowering the compression ratio. The eyebrows provide clearance for the valves when the piston is near the top of its

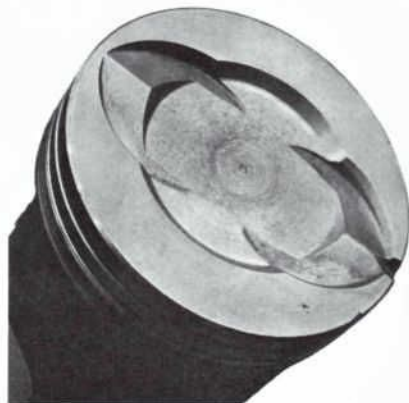


Figure 7—428 "Dished with Eyebrows" Piston

stroke. With most Ford cams, the critical area is 6°-8° after TDC. Two sets of eyebrows are cut in the piston so that the piston may be used in either the right or left bank. This piston gives a compression ratio of 10.7:1 and a maximum of 11.0:1. A high performance piston is also available: A "flat top with eyebrows" type provides a compression ratio of 11.6:1. It will be discussed in detail, under modifications.

## 428 C.J. CYLINDER HEADS

Cylinder heads (Fig. 8) are cast iron with conventional rectangular intake ports, measuring 2.34" x 1.34". This is a significant increase over 390 heads (1.84" x 1.28") and even slightly larger than non-tunnel port 427 heads (2.06" x 1.34"). As can be expected, these large port dimensions greatly assist the free breathing capabilities of 428 C.J. engines. A check of the critical dimensions in Figure 5 reveals that this head will bolt directly on a 406 engine. However, no other heads will fit the 428 C.J. without first performing certain machining operations.

A steel shim head gasket is used between the cylinder heads and the block. Figure 9 illustrates the shape of the combustion chambers with the valves installed.



Figure 8—428 C.J. Cylinder Head



Figure 9—428 C.J. Cylinder Head with Valves Installed



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## UNDER THE HOOD

### 428 C.J. VALVES

Solid stem intake valves (Fig. 10) are used. They are made of a special silchrome alloy steel and feature big 2.097" diameter heads. Seat angle is 30°. Exhaust valves (Fig. 10) are also solid stem, but are made of forged steel. Seat angle is 45° and head diameter 1.660". These dimensions are somewhat larger than those for the standard 428 Thunderbird engine (2.022"—intake and 1.551"—exhaust) and contributes to improved breathing. The valve dimensions also compare favorably with the 427 non-tunnel port heads (2.195"—intake and 1.733"—exhaust). Lightweight valves are available for the 428 C.J. and will be discussed under modifications.



Figure 10—428 C.J. Intake and Exhaust Valves

### 428 C.J. CAMSHAFT

Two camshafts are used in the 428 C.J. The following chart (Fig. 11) contains complete specifications for each cam. Hydraulic valve lifter tappets are used with both of these cams. Production 428 C.J. engines also employ two types of rocker arms: the standard non-adjustable 1.73:1 ratio, and the adjustable 1.76:1 ratio used in 427 engines.



PRODUCTION CAMSHAFT SPECIFICATIONS				
	STREET		"STOCK" CLASS	
Camshaft Part Number	C60Z-6250-B1		C8AX-6250-C	
Lifter Type	Hydraulic		Hydraulic	
Rocker Arm Ratio	1.73:1 Non-Adj. 1.76:1 Adj.		1.73:1 Non-Adj. 1.76:1 Adj.	
<b>TIMING</b>	<b>Intake</b>	<b>Exhaust</b>	<b>Intake</b>	<b>Exhaust</b>
Checking Clearance	0°	0°	0° 0.100" lift	0° 0.100" lift
Opens (BTC) (BBC)	18° (BTC)	82° (BBC)	24° (BTC) 22° (ATC)	82° (BBC) 34° (BBC)
Closes (ABC) (ATC)	72° (ABC)	28° (ATC)	78° (ABC) 30° (ABC)	34° (ATC) 18° (BTC)
Overlap	46°	46°	58° 40°	58° 40°
Duration	270°	290°	282° 188°	296° 196°
<b>VALVES</b>				
Head Diameter (Max.)	2.097"	1.660"	2.097"	1.660"
Angle of Seat & Face	30°	45°	30°	45°
Lift (Max. at Valve)	0.481" (1.73) 0.487" (1.76)	0.490" (1.73) 0.495" (1.76)	0.500" (1.73) 0.509" (1.76)	0.500" (1.73) 0.509" (1.76)
<b>SPRINGS</b>				
Outer Valve Closed (Max.)	90 lbs. @ 1.82"	90 lbs. @ 1.82"	90 lbs. @ 1.82"	90 lbs. @ 1.82"
Outer Valve Open (Max.)	281 lbs. @ 1.32"	281 lbs. @ 1.32"	305 lbs. @ 1.32"	305 lbs. @ 1.32"
Inner Valve Closed (Max.)				
Inner Valve Only (Max.)		Damper Only Damper Only		Damper Only Damper Only

Figure 11—Camshaft Specification Chart

# VENOM from FORD ... 428 COBRA JET

## 428 C.J. INTAKE MANIFOLD

The intake manifold (Fig. 12) is a cast iron duplicate of the free-breathing aluminum manifold used on Police Interceptor 428's. Though the production setup is 4-bbl. induction system, it will be pointed out under modifications that any manifold which fits the 427, except 427 tunnel port engines, will also work on the 428 C.J.



Figure 12—428 C.J. Intake Manifold

## 428 C.J. CARBURETION

A 4-bbl. carburetor (Fig. 13) tops the intake manifold. It is flow rated at 735 cfm (cubic feet per minute). Primary jets are number 67's and secondary jets number 79. Manual transmission cars come with a C80Z-9510-AA carburetor. C80Z-9510-AB is used on cars with automatic transmissions. Because just about all the big-block manifolds fit the 428 C.J., there are a number of large 4-bbl. setups and multicarb units that can be used with the 428 in modified form.

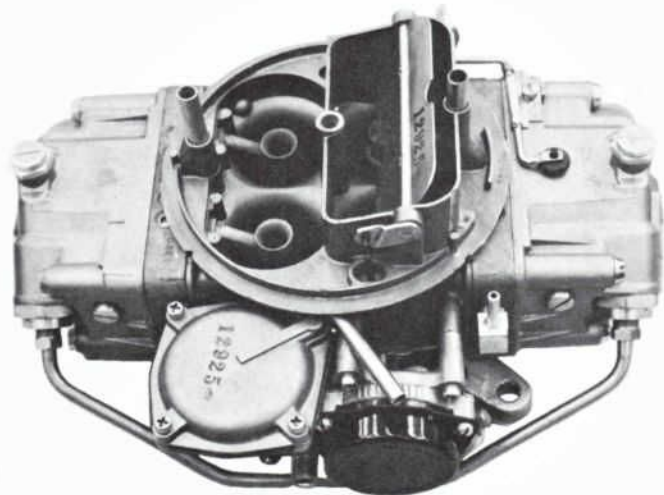


Figure 13—735 cfm 4V Carburetor

## 428 C.J. EXHAUST MANIFOLDS

New, low restriction, cast iron exhaust manifolds (Fig. 14) are used on the production 428 C.J. While these are more efficient than the standard type of exhaust manifold, they of course are still not as efficient as the special tube type "headers" for strip competition. The recommended dimensions for competition headers will be covered under modifications.



Figure 14—New, Low Restriction Exhaust Manifolds

## 428 C.J. IGNITION

### Distributor

A single point, dual-advance type distributor is used on the production 428 C.J. The ignition timing curve is:

Distributor rpm's	250	500	1000	1500	2000
Distributor degrees	0°	3°	10.5	12.5	14.5

Breaker point gap is set to 0.017" on both manual and automatic transmission equipped cars. A dual point, centrifugal advance 427 distributor is used for strip competition.



### Spark Plugs

Autolite BF-32 spark plugs are installed at the factory and gapped to 0.028"-0.032". BF-22, BF-12 and BTF-1 are recommended alternates, depending upon operating conditions.



# PERFORMANCE CORNER



## UNDER THE HOOD

### MODIFICATIONS

#### COLD AIR PACKAGE—MUSTANG/COUGAR ONLY

A special air cleaner package design (Fig. 15) comes only on Mustangs and Cougars. The door in the duct, at the right front of the air cleaner is actuated by the carburetor air temperature. It closes during engine warmup, much like the automatic choke, but when the engine carburetor air temperature reaches 130 F, the door opens.

Additionally, a door in the air cleaner cover is activated by intake manifold vacuum. When manifold depression reaches 5-inches of Mercury, the door opens and cold air is then directed through the functional hood air scoop (Fig. 16) into the carburetor.

Cold air contains more power-producing oxygen than warm air, so it increases 428 C.J. performance even farther.

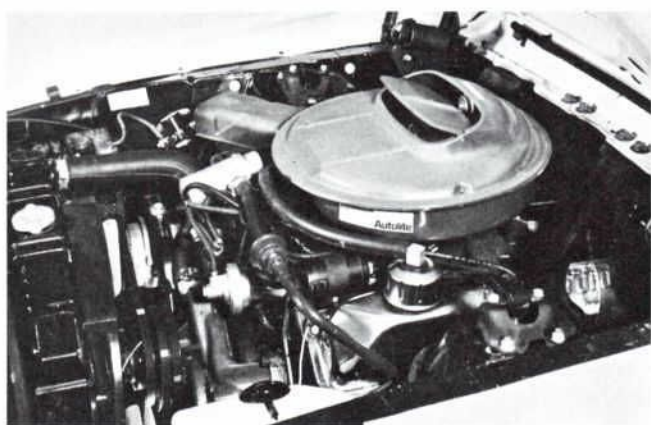


Figure 15—Cold Air Package Air Cleaner



Figure 16—Mustang Functional Hood Air Scoop

Modifications involving the 428 Cobra Jet will be covered under three general categories: (1) Using 428 C.J. components to modify earlier engines such as the 352, 390, 406 and 428, (2) Modifying the 428 to run in "stock" drag competition, and (3) Using certain 427 parts to run "super stock" drag competition.

#### MODIFYING WITH 428 COBRA JET PARTS

Many 428 Cobra Jet parts fit other Ford big-block engines because the 352, 390, 406, 427 and 428 are all based on the same general block design. Although bore and stroke dimensions may vary, bore *spacing* and main bearing journal diameter (2.438") are the same for all engines. Using 428 C.J. components in 352-428 engines may not necessarily make them strip winners, but it certainly should make them more *lively* street performers.

#### Crankshaft

The 428 C.J. crankshaft (Ford Part No. C6AZ-6303-B1) fits the standard 428 without any modifications. However, if production bore and stroke are to be maintained on the 406, then special rods are necessary, and rods and pistons are required for the 352 and 390.

**NOTE:** The 428 C.J. crankshaft is balanced with the flywheel *installed*. A statically unbalanced flywheel (weighted with 28.2 inch-ounces at the factory as shown in Figure 17) is necessary to obtain a dynamically balanced assembly. This should be taken into account anytime modifications involve the crankshaft, pistons or connecting rods.



Figure 17—Balance Weight on 428 C.J. Flywheel



# VENOM from FORD ... 428 COBRA JET

## Camshaft

Both of the 428 C.J. production cams (Ford Part No.'s C6OZ-6250-B1 and C8AX-6250-C) will fit any big-block Ford engine that uses a hydraulic cam. They work equally well with either manual or automatic transmissions. Both have excellent low to mid-range torque characteristics, with maximum torque occurring at 3400-3600 rpm. Remember, however, that both are designed for hydraulic lifter tappets only. Also, be sure to use *new* springs, retainers, etc. whenever a new camshaft is installed. This will assure that specified spring height and pressure specifications are met.

## Cylinder Heads

Cobra Jet 428 heads (Ford Part No. C8OZ-6049-F . . . Casting No. C8AE-6090-J) also fit all big-block Ford wedge engines. Their big intake port dimensions (Fig. 18) and larger valves (Fig. 19) provide better breathing characteristics on 352, 390, 406 and 428 engines.

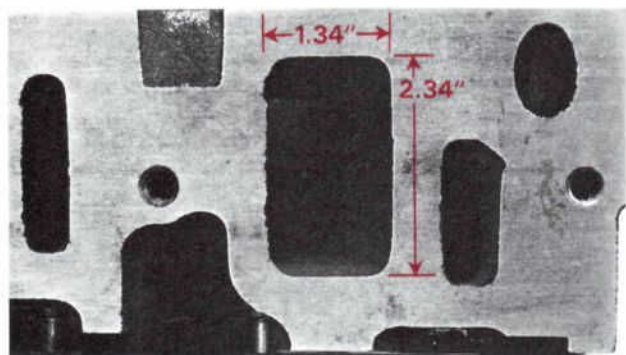


Figure 18—Large Intake Ports—428 Cylinder Head

## Intake Manifold

The production 428 C.J. *aluminum* intake manifold (Ford Part No. C6AZ-9424-H, casting number C7AE-9425-F) and the production *cast iron* manifold (Ford Part No. C8OZ-9424-A, casting number C8OE-9425-A) will bolt right on any 352 through 428 Ford wedge. It will improve the breathing of any of these engines and take a number of 4-bbl. carburetor setups.

## Carburetor

If you decide to use the 428 C.J. 735 cfm 4V carburetor, be sure to match it to the type of transmission used. C8OZ-9510-AA must be used with a *manual* transmission. C8OZ-9510-AB must be used with an *automatic* transmission. The type of carburetor can be identified by a metal tag on the carburetor body.

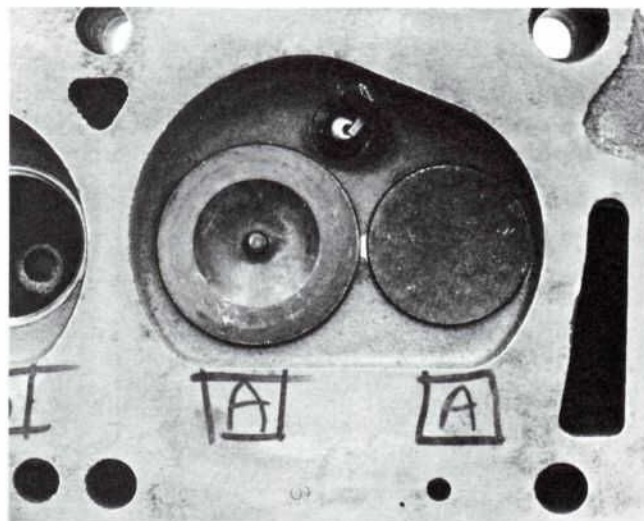


Figure 19—Large Valve Diameters—428 Cylinder Head

## MODIFYING THE 428 COBRA JET

One of the big advantages of the 428 Cobra Jet is that a long list of factory high performance parts can be used for modifications. And of course, installing factory Ford parts is the economical way to go; as you know if you have priced "special" low volume performance equipment. Equally important is the fact that Ford high performance equipment is designed to be compatible with other Ford components. And you can easily get them through any Ford or Lincoln Mercury dealer. As an example, here are some suggestions that will make 428 Cobra Jet powered Mustangs, Cougars, Fairlanes and Montegos run with the best in "stock" and "super stock" drag competition.

## 1968 NHRA DRAG RACE RULES

Before explaining how to modify a 428 C.J., let's first see exactly what constitutes a stock or super stock dragster.

In order that competition may be on an equal basis, dragsters are divided into several divisions by the National Hot Rod Association. Stock and super stock are the closest to a showroom or production car. Only limited degrees of engine, body and chassis modifications are allowed; as opposed to the "funny cars" that are practically completely reworked, or the "rail" dragsters that are all new vehicles and bear no resemblance to stock cars. Stock and super stock cars are divided into classes according to their weight-to-horsepower ratio. The following chart shows these classes for 1968 stock and super stock classes. To determine the class of a car, divide the car's shipping weight by the advertised horsepower (or the horsepower as factored by the NHRA).



# PERFORMANCE CORNER



## UNDER THE HOOD

### NHRA STOCK and SUPER STOCK CLASSIFICATION GUIDE

Classes		Weight-to-Power Ratio
MANUAL Transmission	AUTOMATIC Transmission	Lbs. per Advertised Horsepower
<b>SUPER STOCK</b>		
SS/A	SS/AA	0.00 to 5.99 lbs.
SS/B	SS/BB	6.00 to 6.99 lbs.
SS/C	SS/CA	7.00 to 7.69 lbs.
SS/D	SS/DA	7.70 to 8.69 lbs.
SS/E	SS/EA	8.70 to 9.47 lbs.
SS/F	SS/FA	9.50 lbs. or more
<b>STOCK</b>		
A/S	A/SA	8.00 to 8.49 lbs.
B/S	B/SA	8.50 to 8.99 lbs.
C/S	C/SA	9.00 to 9.49 lbs.
D/S	D/SA	9.50 to 9.99 lbs.
E/S	E/SA	10.00 to 10.49 lbs.
F/S	F/SA	10.50 to 10.99 lbs.
G/S	G/SA	11.00 to 11.49 lbs.
H/S	H/SA	11.50 to 11.99 lbs.
I/S	I/SA	12.00 to 12.49 lbs.
J/S	J/SA	12.50 to 12.99 lbs.
K/S	K/SA	13.00 to 13.99 lbs.
L/S	L/SA	14.00 to 14.99 lbs.
M/S	M/SA	15.00 to 15.99 lbs.
N/S	N/SA	16.00 to 16.99 lbs.
O/S	—	17.00 to 18.99 lbs.
P/S	—	19.00 to 20.99 lbs.
Q/S	—	21.00 to 22.99 lbs.
R/S	—	23.00 to 24.99 lbs.
T/S	—	25.00 to 26.99 lbs.
U/S	—	27.00 lbs. or more

### MODIFYING THE 428 C.J. FOR "STOCK" COMPETITION

This class allows the fewest modifications. Most engine components must be production or dimensionally equivalent. However, the engine can be blueprinted, as may the cam. In other words, a new cam can be used, but it must agree dimensionally with the production cam. By the way, the preferred cam for stock class competition is C8AX6250-C. A dual point, centrifugal advance 427 distributor is permissible along with exhaust "headers". A complete list of suggested modifications is shown in the chart on page 14.

### MODIFYING THE 428 C.J. FOR "SUPER STOCK" COMPETITION

Basically, super stock classes allow: non-production camshaft, lightweight valves and valve train components, special pistons are allowed if the piston conforms to the production design, an intake manifold that is of the same general configuration as the production manifold, dual point distributor, headers and several other modifications as shown in the chart on page 14. Farther on is a more detailed explanation of these modifications. They also apply to stock class cars where applicable.

#### Blueprinting

As with all competition engines, the first step is to completely disassemble the engine, clean all parts in degunking fluid, check for and remove all burrs, scratches or cracks, and then Magnaflux the block. Check the bottom end for trueness. If necessary, have it line-bored to be sure everything about the crankshaft centerline is within specifications. Upon assembly, be sure to adhere to the clearance, torque and balance specifications shown in the Blueprinting Specification Chart shown on page 14.

#### Pistons

Special "flat top with eyebrows" type forged aluminum pistons (Fig. 20) are recommended for super stock competition. These pistons feature a slipper type skirt for greater strength and provide a compression ratio 11.6:1 when used with a combustion chamber that has a total volume (cyl. head, gasket, deck clearance and piston) of 80.00 c.c. Deck clearance should be 0.008" below the top of the block. The following chart illustrates important specifications for the production and performance pistons.

#### VOLUMETRIC COMBUSTION CHAMBER SPECIFICATIONS (c.c.)

Piston	Piston Volume	Deck Ht. & Block	Cyl. Head	Head Gasket	TOTAL	Comp. Ratio
(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

Individually fit each piston to a cylinder. Then mark or stamp the piston to show the cylinder number for which the piston was fitted. Piston skirt clearance should be 0.007"-0.009", measured evenly with the pin boss and perpendicular to the piston pin. Fit the full floating type pins to each connecting rod with a clearance of 0.0007" to 0.0009". Use stock Ford piston pin retainers (Ford Part No. C3AZ-6140-B).





Figure 20—"Flat top" Performance Piston

### Connecting Rods

Install forged-steel 427 connecting rods (Ford Part No. C5AZ-6200-D). Both the 427 connecting rod and the 428 Police Interceptor rods are used in the 428 Cobra Jet, even though there is a 0.200" difference in these engines' stroke dimensions. This is possible, of course, because the rod is connected 0.200" nearer the top of the 428 piston than to the 427 piston. Check to see that the rod is free from all burrs and pits. Polish the full length of the shank to remove all surface irregularities. When assembled to the crankshaft, rod side clearance should be a minimum of 0.030"-0.035". Since the production specification is 0.010"-0.020", it will be necessary to machine the inner facing surfaces of the rods.

### Crankshaft

Install a production 428 C.J. crankshaft (Ford Part No. C6AZ-6303-B1). It should be balanced, Magnafused and checked for straightness. To provide improved lubrication under high load conditions, a 3/64" radius groove may be cut in the center of each connecting rod journal (Fig. 21). Be sure the edges of the groove are free from all burrs.

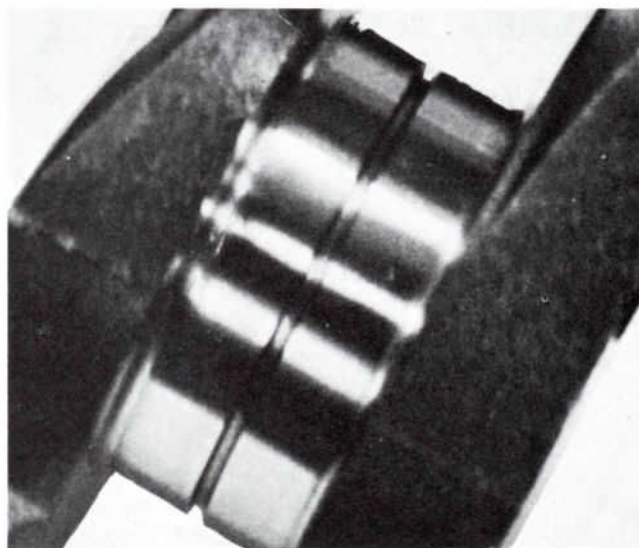


Figure 21—Oil Reservoir Groove in Connecting Rod Journal

### Balancing

Remember that the 428 C.J. crankshaft must be balanced with the flywheel *installed*. This is explained on page 8, under "Crankshaft". The connecting rod assembly must also be balanced before attaching it to the crankshaft. The critical balance weights shown on page 14, are for *production parts only*. If other than factory installed parts are used, NEW balance weights must be determined.

### Bearings

Install thin-wall type 427 main and connecting rod bearings. Thin-wall bearings have the clearances built-in, so the journals don't have to be ground to get the 0.003"-0.0035" clearance for competition engines. That 0.003"-0.0035" specification applies to both main and connecting rod bearings. For street applications, drop the clearance down to 0.0025" to 0.003". Ford Part Numbers for the main bearings are C5AZ-6333-AA (lower) and C5AZ-6337-AB (upper). Center main bearing part numbers are C5AZ-6337-AA (lower) and C5AZ-6337-AB (upper). Ford Part Number C5AZ-6211-G is the one to order for the connecting rod insert bearing.

Torque the rod bearings to 58 foot-pounds and the main bearings to 105 foot-pounds. Tighten in increments of 10 foot-pounds. This is no place to see how fast you can get the job completed, so easy does it. If you apply pressure and the bolt doesn't feel right, STOP, and find out why. Check for burrs or nicks that can cause binding. If a bolt suddenly seems to tighten too easily, there's a good chance it's beginning to fatigue. That can mean an unnecessary tear-down, so take it easy when assembling the engine.



# PERFORMANCE CORNER



## UNDER THE HOOD

### Camshaft

Ford Part Number C8AX-6250-D identifies just about the wildest grind ever offered by Ford. It's a long duration job (330°) and features a whopping 0.600" lift. Complete specifications are shown in the following chart.

CAMSHAFT SPECIFICATIONS		
Camshaft Part Number	C8AX-6250-D	
Lifter Type	Mechanical	
Rocker Arm Ratio	1.76:1 Adjustable	
<b>TIMING</b>	<b>INTAKE</b>	<b>EXHAUST</b>
Checking Clearance	0° 0.100" lift	0° 0.100" lift
Opens	60° (BTC) 13° (BTC)	94° (BBC) 47° (BBC)
Closes	90° (ABC) 39° (ABC)	56° (ATC) 5° (ATC)
Overlap	116°	116°
Duration	330°	330°
<b>VALVES</b>		
Head Diameter (Max.)	2.097"	1.660"
Angle of Seat & Face	30°	45°
Lift (Max. with lash, at valve)	0.600"	0.600"
<b>SPRINGS</b>	Recommend Holman & Moody Spring Kit	
Outer Valve Closed (Max.)	Spring pressure and installed spring height specifications included with kit	
Outer Valve Open (Max.)		
<b>NOTE:</b> Timing and lift specifications must be those found at the Cam when checking clearances are set as specified above.		

Special Holman and Moody valve springs, lightweight push-rods, retainers and *solid* lifters are recommended with this cam. Your Ford or Lincoln Mercury dealer can help you obtain these parts.

If the special Holman and Moody valve spring retainers are *not* used, 0.100" must be milled off the top of the cylinder head valve guide bosses. This is to prevent an interference condition due to the ultra high lift (0.600") characteristics of the cam.

If Ford parts are used, install mechanical valve lifter tappets (Ford Part No. C4AZ-6500-B), adjustable rocker arms (Ford Part No. B8A-6564-B), push rods (Ford Part No. B8AZ-6565-C) and springs (Ford Part No. C5AZ-6513-A). Note: Heavier Holman and Moody springs are preferred for strip use.

### Cylinder Head and Valves Cylinder Head

Assemble the production cylinder heads (Ford Part No. C8OZ-6049-F, Casting No. C8AE-6090-J) to the block with steel shim head gaskets (Ford Part No. C6AZ-6051-A). These heads have a cylinder head volume of 68 c.c. (minimum) in stock form. The gaskets account for 7.72 c.c.

### Lightweight Valves

Install special lightweight, hollow stem intake valves (Ford Part No. C8AX-6507-B and lightweight, hollow stem, sodium-filled exhaust valves (Ford Part No. C8AX-6505-B). Head diameter of the intake valve is 2.097" and the exhaust valve diameter is 1.660". Both valves are easily identifiable from the standard 428 C.J. valves because the lightweight valves are both chrome plated, as shown in Figure 22.



Figure 22—Lightweight Valves



# VENOM from FORD ... 428 COBRA JET

The face angle of the intake valve should be 30°, as well as the corresponding valve seat on the cylinder head. The valve seat width should be 0.035" at the outer edge of the valve for *strip* competition. For street use, the width should be 0.070".

The face angle of the exhaust valve should be 45°, and the corresponding valve seat on the head. The valve seat width should measure 0.050", at the outer edge of the valve, for *strip* competition. The width can be increased to 0.080" for street use only.

## Piston to Valve Clearance

With the camshaft in place with the timing chain, etc., and the pistons, rods, crankshaft and heads assembled to the block, check the piston-to-valve clearance. Again, this is a **MUST** operation!

The absolute minimum piston-to-valve clearance is 0.120". Because the clearance is 0.120" and the valve lash is 0.025", a feeler gauge of 0.145" inserted between the valve stem and rocker arm can be used to check the clearance. Manually, turn engine over twice. If the piston does not hit the valve, you have the proper minimum clearance. Check all eight cylinders. Pistons may have to be flycut around the eyebrows, in some cases, to provide adequate clearance.

## Induction Intake Manifold

Any manifold that fits a 427, except the 427 tunnel port unit, can be used on the 428 C.J. However, to take advantage of the "ram air" arrangement on the Mustang, aluminum 4V manifold (Ford Part No. C6AZ-9424-M, Casting No. C7AE-9425-C) is recommended. It's a low profile, single plane type manifold. It features offset, equal length balanced runners that provide excellent free breathing characteristics.

## Carburetor

Install the production 735 cfm 4-bbl. carburetor (Ford Part No. C8OZ-9510-AA (manual trans.) or -AB (auto. trans.)). Use of this carburetor doesn't require any modification to the accelerator linkage.

When running without an air cleaner, it usually takes some experimentation with the jets to obtain the optimum air/fuel ratio. However, the exact mixture is a function of temperature, altitude, humidity, etc. As a starter, it's recommended that jetting begin with number 79's in the main metering (primary) jets, and with 67's in the secondary jets.

## Exhaust Manifold (Headers)

Install a set of smooth, lightweight, tube-type "headers" to help exhaust the increased volume of air/fuel charge and exhaust gases being handled by the engine through the previous modifications. This step alone usually adds from 10 to 15 horsepower over the standard exhaust system.

Here are some critical dimensions to assist in fabricating a good set of headers:

Material I.D. ....	2"
Head face to Collector .....	36"
	or as short as possible
Collector I.D. ....	3½"
Extension from Collector .....	12"-16"

## Ignition

1. Replace the production Autolite spark plug (BF-32) with one of the following Autolite spark plugs, depending on operating conditions: BF-22, BF-12 or BTF-1. Gap to 0.028"-0.032".
2. Be sure to replace the single point distributor that comes on the 428 C.J. from the factory with the 427 dual point, centrifugal advance distributor. Use the following curve for maximum performance.

Distributor rpm's	250	750	1000	2000	3000
Distributor degrees					
(auto.)	0°	2½°	4°	8°	13°
(manual)	0°	1½°	2½°	6°	10°

## Lubrication

The production oil pump (Ford Part No. COAE-6600-C) which is a heavy duty type from the 428 Police Interceptor engine is recommended for most applications. However, the 427 pump (Ford Part No. C3AZ-6600-B) has a little greater capacity and can be used if desired. However, a special oil pickup (Ford Part No. C5AE-6622-B) and a deep sump 9 qt. oil pan (Ford Part No. C5AE-6675-N) are recommended. This added capacity keeps oil away from crankshaft throws. With the deep sump oil pan you can run 9-quarts of oil, with filter. An Autolite (FL-11) low restriction filter (Ford Part No. C8AE-6714-B) is also recommended.



## 428 COBRA JET DRAG STRIP MODIFICATIONS

PRODUCTION	"C" STOCK	"E" SUPERSTOCK
<b>ENGINE</b>		
Head—C80Z-6049-F (Part No.) C8AE-6090-J (Casting No.)	Same	Same
Manifold Intake Aluminum—Part No. C6AZ-9424-H, Casting No. C7AE-9425-F Cast Iron—Part No. C80A-9424-A, Casting No. C80E-9425-A	Same	Aluminum, Offset 427, C7AE-9425-C (Casting No.) C6AZ-9424-M (Part No.)
Carburetor (735 CFM) C80Z-9510-AA (Man.) C80Z-9510-AB (Auto.)	Same	Same
Camshaft Hydraulic C60Z-6250-B1 C8AX-6250-C (D.S.O. No.)	Hydraulic C8AX-6250-C (D.S.O. No.) (282°-296°-58°-0.509°) 427 Type C5AZ-6513-A	Solid Lifter C8AX-6250-D (D.S.O. No.) (330°-330°-116°-.600)
Valve Spring	Same	Same
Rocker Arm—Non Adj. 1.73:1 (B8AZ-6564-C) Adj. 1.76:1 (B8A-6564-B)	Adjustable 1.76:1 B8A-6564-B	Crane or H-M type Spring/Retainer/Pushrod & Tappet Adjustable 1.76:1 B8A-6564-B
Valve-Exhaust—C3AZ-6505-E	Same	Lightweight-Sodium filled C8AX-6505-B (D.S.O. No.)
Valve-Intake C3AZ-6507-AJ	Same	Lightweight-Hollow Stem C8AX-6507-B (D.S.O. No.)
Lifter Hydraulic—C3DZ-6500-B	C4TZ-6500-A	Crane-Lightweight or C4AZ-6500-B 427 type
Piston Cast Aluminum C6AZ-6108-AJ	Forged-Dished/Eyebrows 11.0:1 C.R.	Forged—Flat Top/Eyebrows 11.6:1 C.R.
Rings—C6AZ-6148-A	Moly type	Moly type
Rod—P.I. type C6AE-6200-F 427 Type C5AZ-6200-D	427 Type C5AZ-6200-D	427 Type C5AZ-6200-D
Crankshaft—C6AZ-6303-B1	Same	Same
Oil Pan—C60Z-6675-A	Deep Sump-9 qt. C5AE-6675-N (D.S.O. No.)	Same
Oil Pickup—C60Z-6622-A	C5AE-6622-C for 9 qt. pan (D.S.O. No.)	Same
Oil Filter—C1AZ-6731-A	Low Resistance—C8AE-6714-B (D.S.O. No.)	Same
Distributor—C80Z-12127-D	Dual Point 427 Type 10° manual, 13° Auto. @ 3000 RPM 38° Total—C5AZ-12127-E	Same
Exhaust System	Jardine & Doug's Type Headers 2" I.D. 36" or short as possible Pipes 3 1/2" Collector 12" long (Manual) 16" long (Auto.)	Same
Vibration Damper	Heavy Duty 427 Type	Same
Compression Ratio 10.7:1	11.0:1 C.R.	11.6:1 C.R.
<b>VEHICLE</b>		
Clutch	Production Auto. & Manual	Heavy Duty #2650 type
Transmission 2.32—1.69—1.29 Ratios	Production/Blocker Rings cut & Line lock	Same
Rear End—3.89:1—no locker	4.44:1/242L Detroit Auto. Locker	4.71:1/242L Detroit Auto. Locker
Suspension	32" traction bar—right side. Single link bar— left side, Stock and Superstock Auto. trans.	32" traction bars both sides. Stock and Superstock 4-spd manual trans.
Shocks	Heavy Duty type	Same
Tires—F70 Firestone	8.90 x 14 size (7" Tread)	10.50 x 15 size
<b>SHIPPING WEIGHT</b>		
AMA's Mustang Fastback #3267	Same	Same
Hardtop #3243	Same	Same
<b>PERFORMANCE ¼ MILE</b>		
13.5-13.6 sec. ET	NHRA Winternationals	NHRA Winternationals
106-107 MPH	12.46 Sec. ET-115.8 mph	11.49 sec. ET-120.6 mph

**NOTE:** If part numbers do not appear in the regular Ford Master Parts Catalogs, they usually can be located by using the *latest* Ford and Lincoln-Mercury Master Cross Reference List. D.S.O. part numbers should be ordered on form FD-419-M, and marked "Special Order High Performance Parts."

### BLUEPRINTING SPECIFICATION CHART

#### Critical Dimensions

Piston skirt clearance	0.007"—0.009"
Rod bearing clearance	0.003"—0.0035"
Main bearing clearance	0.003"—0.0035"
Rod side clearance	0.030"—0.035"
Wrist pin clearance	.0007"—.0009"
Valve seat and face angle—intake	30°
—exhaust	45°
Valve seat width—intake	.035" at outer edge of valve (drag competition only, .070" for street use)
—exhaust	.050" at outer edge of valve (drag competition only, .080" for street use)
Hand hone cylinder wall	Approx. 5 minutes per cylinder with 150-180 grit stone.

#### Distribution Curve (C5AZ-12127-E Assy—427 Centrifugal) 12° Initial

Distributor RPMs	250	750	1000	2000	3000
Distributor degrees	Auto. 0°	2 1/2°	4°	8°	13°
Distributor	Manual 0°	1 1/2°	2 1/2°	6°	10°

Maximum safe full advance—38° If pre-ignition  
or detonation prevails, retard lead as necessary

**Note:** Distributor degrees are 1/2 crankshaft degrees. 25° dwell/each point. 32°-34° total dwell.

#### Critical Bolt Torques

Bolt—cylinder head	100 Ft. Lbs. Tighten in following steps: 30, 50, 70, 85 and 100 ft. lbs. max.**
Bolt—intake manifold	28 Ft. Lbs.
Bolt—connecting rod	58 Ft. Lbs.
Cross bolt—main bearing cap	42 Ft. Lbs.
Vertical bolt—main bearing cap	105 Ft. Lbs.
Bolt—rocker shaft hold down	50 Ft. Lbs.

\*\*Refer to shop manual for cylinder head and cross bolt torque sequences.

#### Balance (Production Parts)

Critical static weights:	
Piston (production)	680 gms.
Connecting rod (production)	768 gms.—pin end 238 gms. —crank end 530 gms.
Weight of oil in crankshaft end	15 gms.
Have dynamic balancing performed.	



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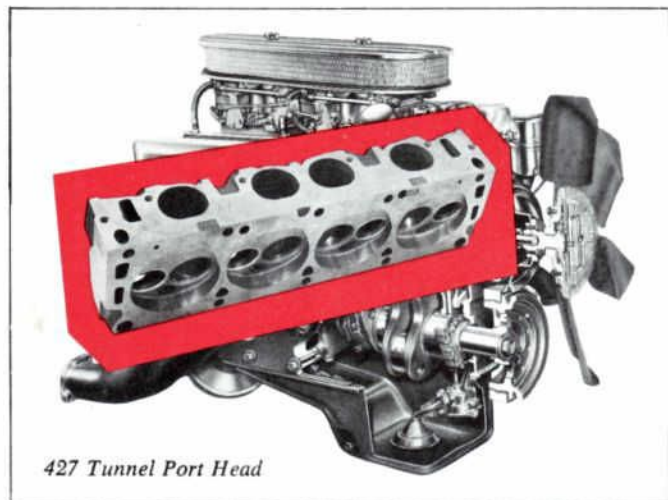
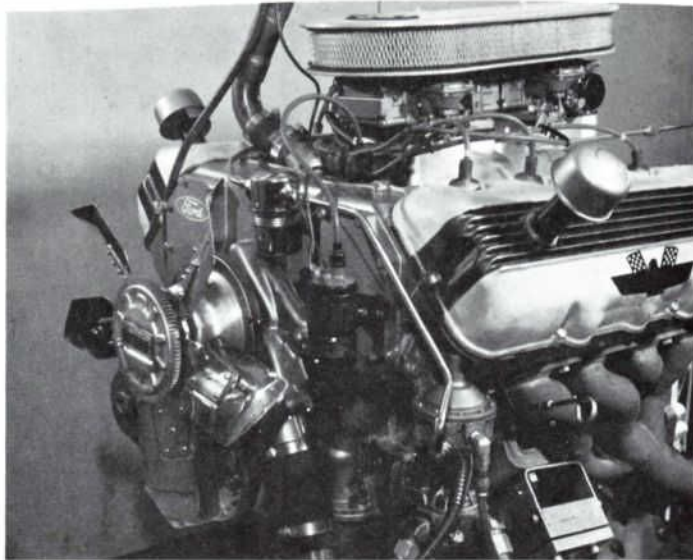
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**4V Model Ford Part Number C6AE-6007-363S**

**8V Model Ford Part Number C6AE-6007-359J**

These engines include the bell housing, flywheel, water pump and carburetor. They do not include: exhaust headers, starter, fan blade, alternator, clutch or fuel pump. Although electric fuel pumps are usually used with these engines, a 6-8 pound mechanical fuel pump is available under Ford Part Number C7AE-9350-E.

427 SOHC engine



427 Tunnel Port Head

### FORD 427 ENGINE WITH TUNNEL PORT HEADS

Here are the revolutionary cylinder heads you've heard about. Large, round ports that come straight out of the valve, instead of curving around pushrod guides. Give your 427 wedge, the edge with these big breathing heads from Ford . . . in either of two ways.

- (1) Buy a complete 427 engine assembly *with* the tunnel port heads *installed*; OR
- (2) Buy the heads only (and the special intake manifold) and install them on your 427 engine.

**NOTE:** Tunnel port heads should only be used on 427 engines that use a forged crankshaft (Ford Part No. C5AZ-6303-C).

#### FORD PART NUMBERS

427 Engine with Tunnel Port Heads . . . C70E-6007-T-361-A  
427 Tunnel Port Heads (only) . . . C8AX-6049-A ('68 model)

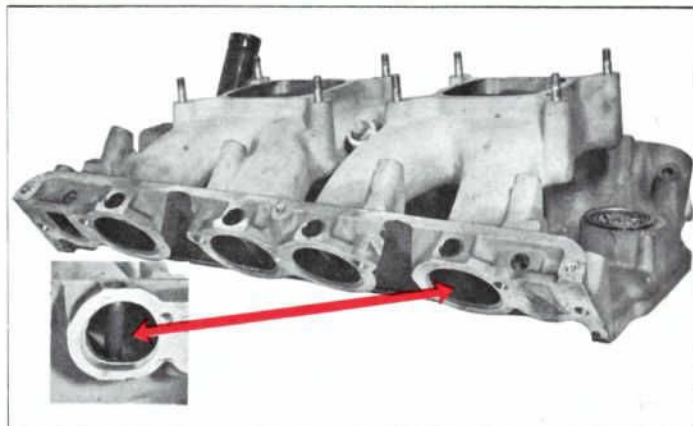
### FORD 427 MANIFOLD FOR TUNNEL PORT HEADS

The following intake manifolds are to be used with the 427 tunnel port heads. They feature special push rod "sleeves", positioned in the intake ports that make the fantastic free-breathing characteristics of the tunnel port heads possible.

8V single plane manifold (Ford Part Number C70E-9424-A)

8V over/under manifold (Ford Part Number C70E-9424-B)

Special intake manifold



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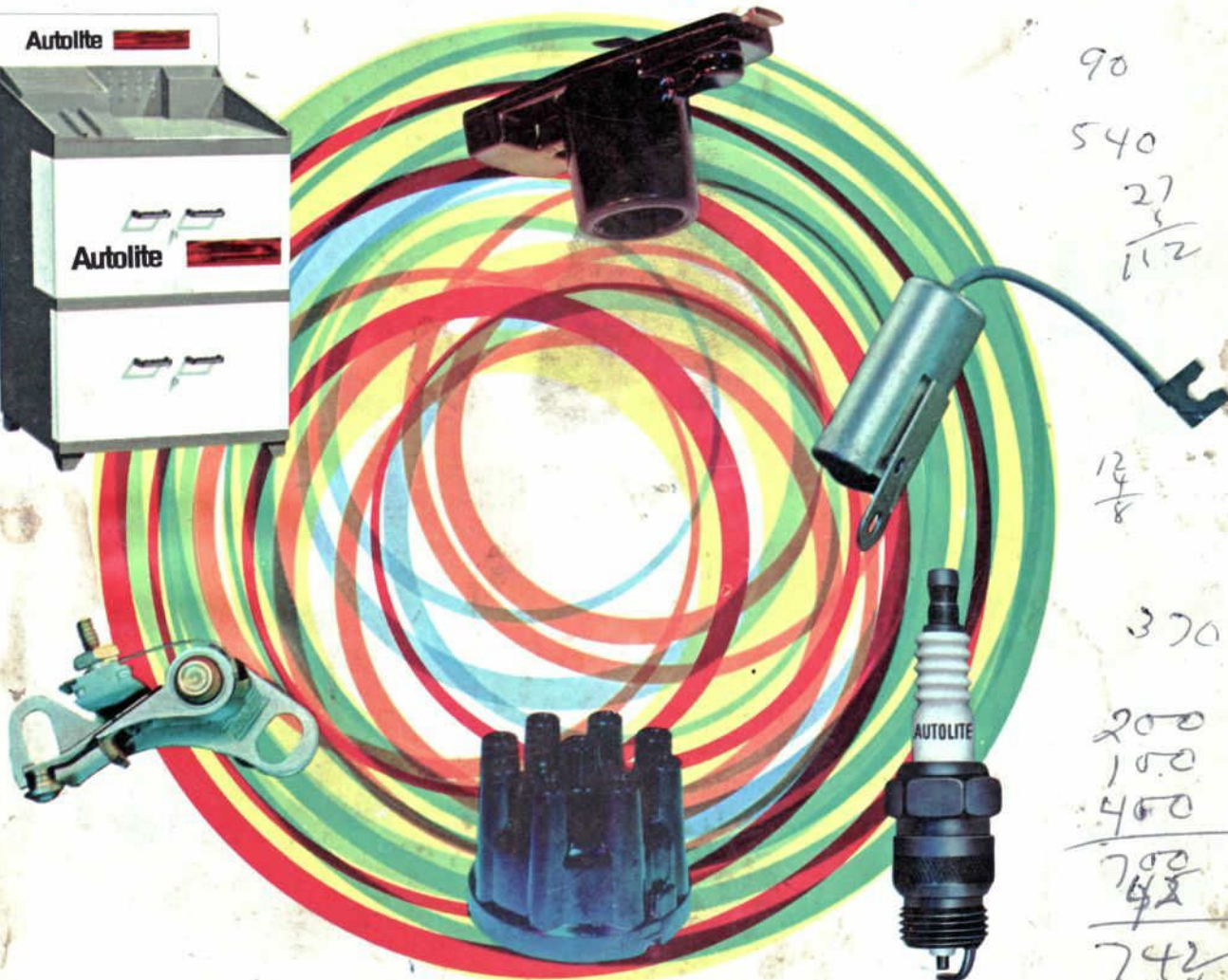
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