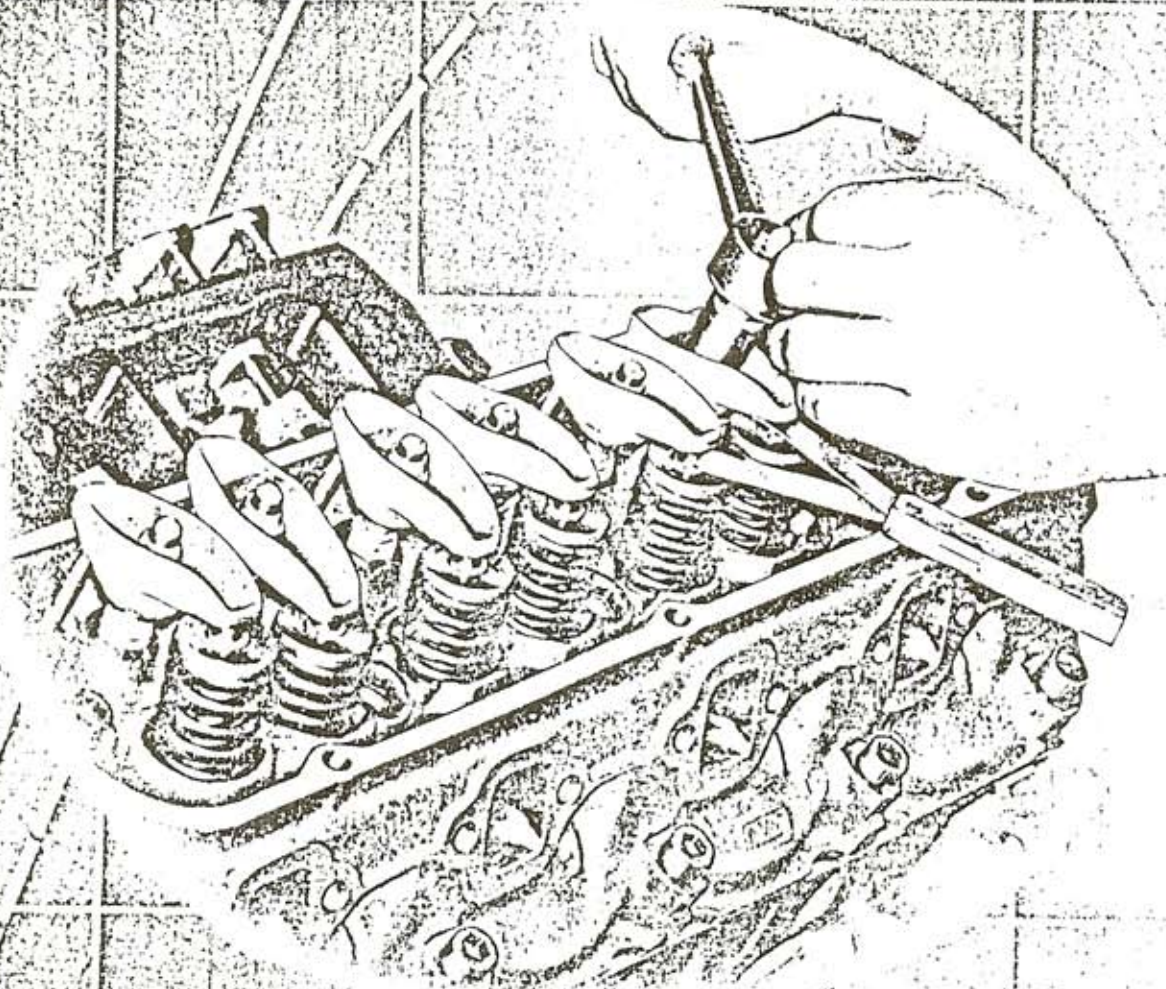




ROAD RACING THE FORD 289 HIGH PERFORMANCE ENGINE

SPECIAL COMPONENTS & SPECIFICATIONS
GROUP 2 SEDAN & GT 40



COPY No. 33

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INTRODUCTION

This booklet is designed for owners of Ford's high-performance 289 cubic-inch engine, especially those who utilize this version of the 289 for road racing circuits and are interested in obtaining even greater performance and durability.

The introduction of new performance components, specifications, and installation tolerances contained herein are written for experienced personnel and not intended as a step-by-step instruction guide.

All parts contained in this booklet may be obtained from:
Shelby - American
6501 West Imperial Hwy.
Los Angeles, California 90009
Attention:
Mr. Lew Spencer
Competition Sales Manager

289 CUBIC-INCH V-8 ENGINE

Since the development of Ford's 289 cubic-inch V-8 engine in 1963, it has become one of the most popular competition engines to enter the world of racing.

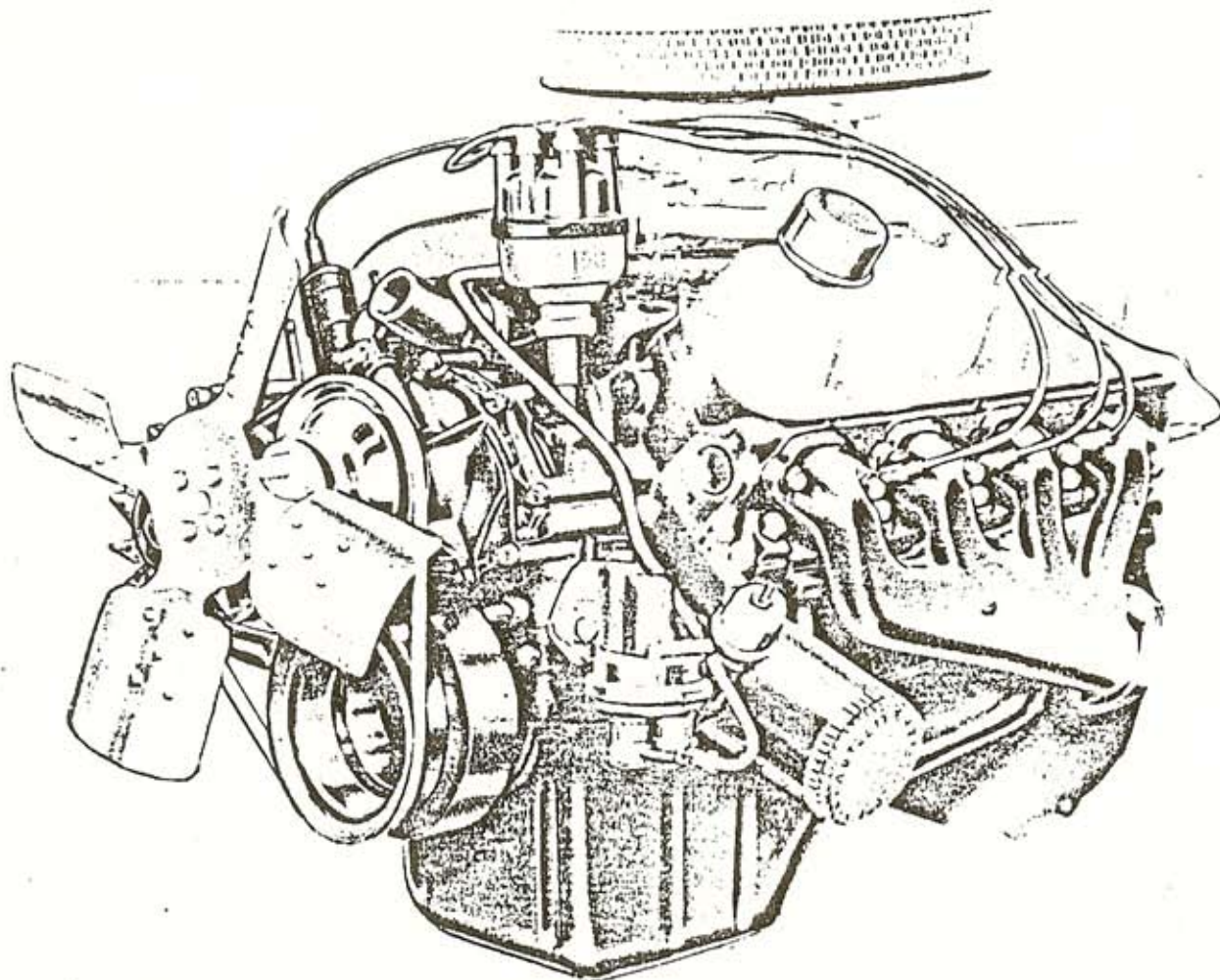
There are three versions of Ford's basic 289 cubic-inch engine — the 200 horsepower, the 225 horsepower and the 271 horsepower. The 271 horsepower version differs from the lower two economy engines by having beefier rods, hotter cam, special four-barrel carburetor, solid lifters, high efficiency exhaust headers, etc. This engine is used as the basic power for the Shelby Mustang GT-350, Ford GT-40 and many other race cars.

The new racing engine components men-

tioned on the following pages are designed to update the 271 horsepower version of the 289 cubic-inch engine.

The 8-cylinder high-performance 289 CID engine puts out 0.95 horsepower per cubic-inch, and weighs only two pounds per horsepower. The bore is an even four inches and the stroke is 2.87. The very high bore-to-stroke ratio provides other advantages which include a low piston speed, reduced frictional losses, and the use of large overhead valves to promote good breathing characteristics.

The torque peak is 312 lbs. ft. at 3400 rpm. Compression ratio is 10.5:1, and the engine is fed by a four-venturi carburetor.



PREPARING THE 289 CID HIGH PERFORMANCE ENGINE FOR SEDAN RACING

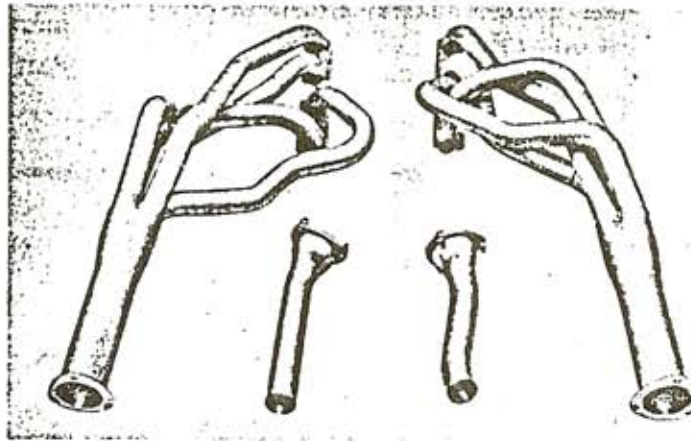
SPECIAL EXHAUST HEADERS

The kit includes 289 sedan exhaust headers which are specially tuned to provide maximum efficiency and reduce back pressure.

PERFORMANCE IMPROVEMENT

Provides increased horsepower and imparts improved performance at high rpm levels.

Part Number S1MR-9428-B



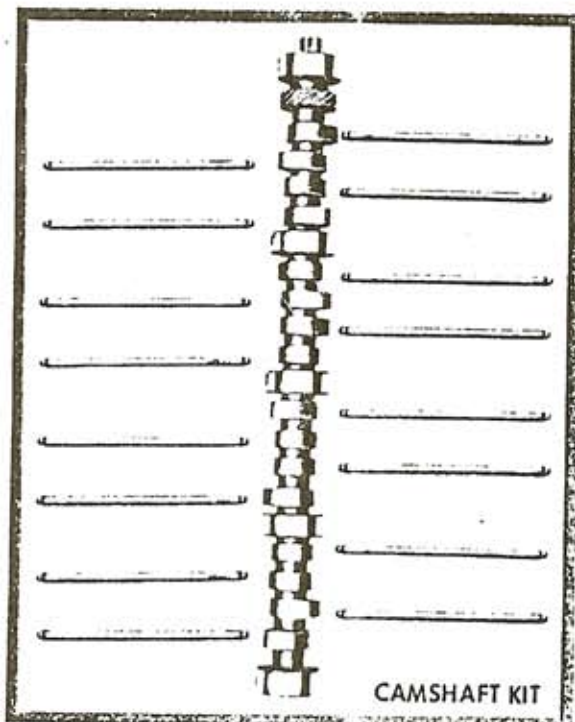
SPECIAL CAMSHAFT KIT

This kit includes camshaft and 16 push rods to be used with the regular production high-performance tappets of your 271 horsepower engine. For details see the parts list on page 6.

PERFORMANCE IMPROVEMENT

Camshaft provides superior breathing due to increased cam duration revised timing and higher valve toss speed. Increases output up to 6800 rpm with a toss speed of approximately 7500 rpm when used in conjunction with the Part No. C7MR-6049-A, cylinder head kit. This camshaft kit is especially suited for road racing.

Part Number S7MR-6250-A



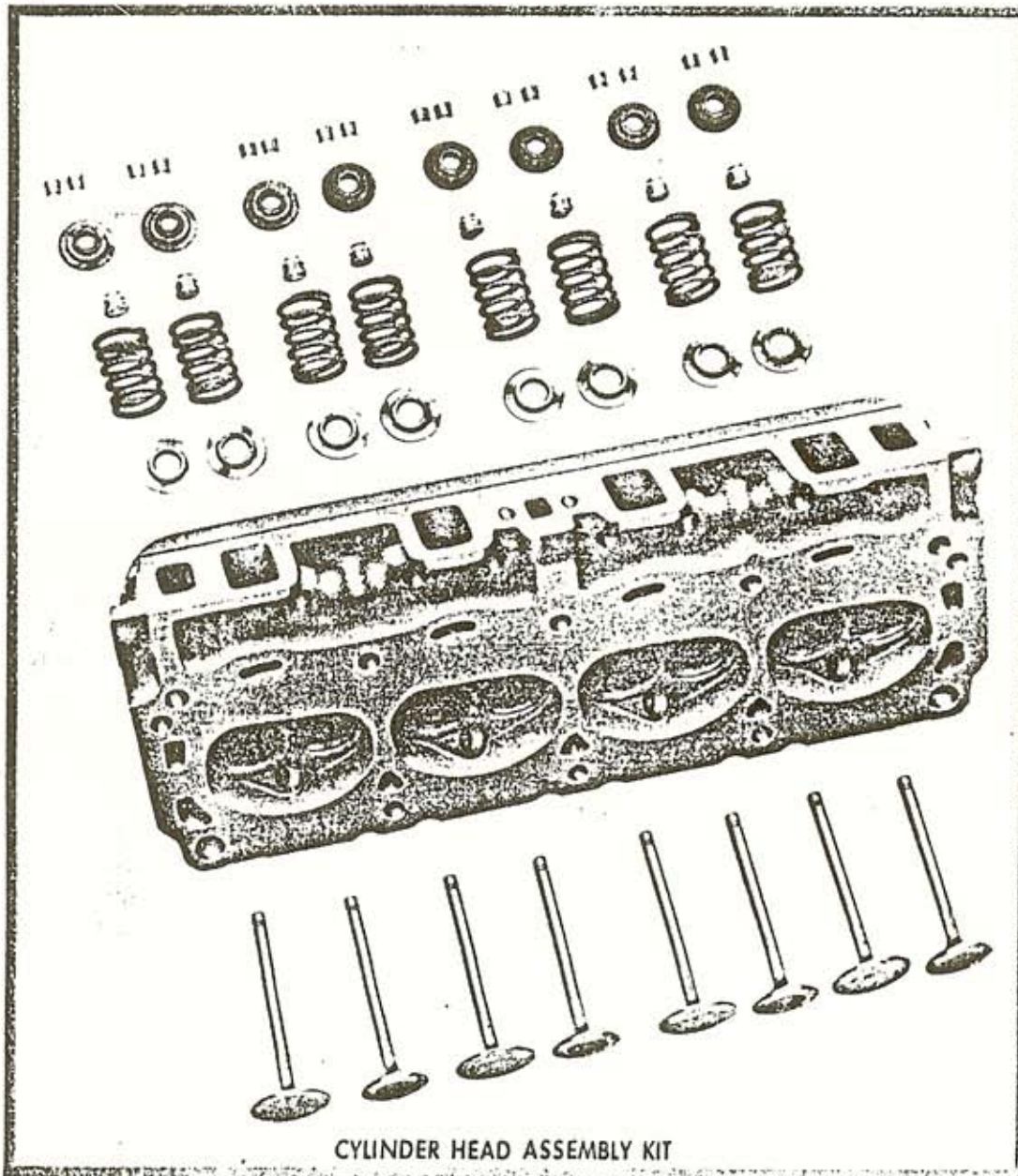
SPECIAL CYLINDER HEAD KIT

The kit includes fully modified 289 CID cylinder heads for sedan racing needs; larger 1.875" intake and 1.625" exhaust valves. Springs, retainers, teflon valve stem seals, etc., are furnished. Cylinder heads should be used with the specified steel head gaskets shown in parts list on page 6.

PERFORMANCE IMPROVEMENT

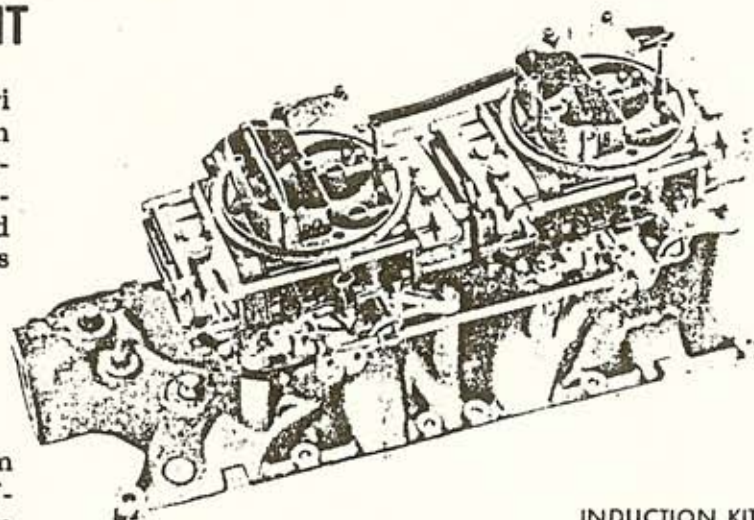
Output increases when used in conjunction with high-performance camshaft and induction system. This power increase is accomplished through improved porting, revised combustion chamber and increased valve size.

Part Number S7MR-6049-A



SPECIAL INDUCTION KIT

This kit contains two 4-venturi carburetors on a cast-aluminum high-riser manifold. Also included is an air cleaner assembly, progressive linkage and gaskets. For details see the parts list on page 6.



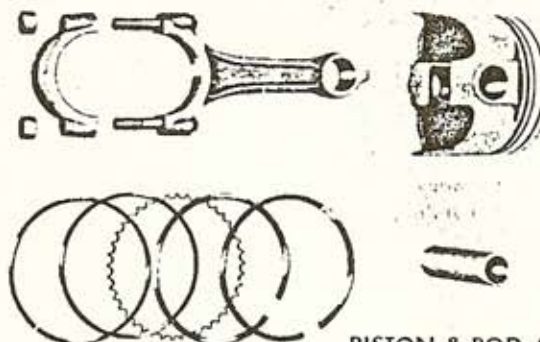
INDUCTION KIT

PERFORMANCE IMPROVEMENT

Increases output at maximum rpm; progressive linkage affords smooth operation throughout the entire rpm range. Large ports and long runners plus half-moon floats create excellent results for road racing.

Part Number C6ZZ-6B068-A

SPECIAL PISTON KIT



PISTON & ROD ASSEMBLY KIT

Kit includes eight racing pistons, eight piston pins, eight connecting rods, rings and bearings. This kit should be used with the cylinder head kit C7MR-6049-A. For details see parts list on page 6. Use C5OE-6211-H or J or C6FE-6211-A connecting rod bearings in conjunction with the above Piston and Rod Assembly Kit. Choose bearings to insure proper selective fit. Present high-performance crankshaft must be rebalanced with a 760 gram bobweight when using this kit.

PERFORMANCE IMPROVEMENT

Each piston is fabricated from extruded aluminum and cam ground. Connecting rods are fatigue tested at 7000 rpm. These pistons when used with the heads shown on page 4 (which have larger combustion chambers than the 289 high-performance engine) provide a compression ratio of 10.5:1.

Part Number S7MR-6109-A

PART NUMBERS FOR SPECIAL 289 CID V-8 ENGINE SEDAN RACING

NAME	QUANTITY REQUIRED	PART NUMBER
CYLINDER HEAD KIT	1	S7MR-6049-A
Head Assembly, Cylinder	2	C6FE-6049-A
Valve, Exhaust	8	C6FE-6505-A
Valve, Intake	8	C6FE-6507-A
Spring - Valve	16	C2AE-6A511-C
Retainer - Valve Spring	16	C6FE-6514-A
Seat - Valve Spring	16	C7FE-6A536-A
Key - Valve Spring	32	7HA-6518-A1
Seal Assembly - Valve Stem	16	C5FE-6A517-B
Gasket, Cylinder Head L.H.	1	C6FE-6083-B
Gasket, Cylinder Head R.H.	1	C6FE-6051-B
Bolt, Cylinder Head Long	10	377530-S
Bolt, Cylinder Head Short	10	377531-S
PISTON AND ROD ASSEMBLY KIT	1	S7MR-6109-A
Piston and Rod Assembly	8	C7FE-6100
Piston	8	C6FE-6100-A
Ring - Upper Compression	8	C6FE-6150-A
Ring - Lower Compression	8	C6FE-6152-A
Segment - Piston Oil Control	16	C6FE-6159-A
Spacer - Piston Oil Control	8	C6FE-6161-A
Rod Assembly - Connecting	8	C6FE-6200-A
Pin - Piston	8	C7FE-6135-A
CAMSHAFT KIT	1	S7MR-6250-A
Camshaft	1	C7FE-6250-A
Rod Assembly - Valve Push	16	C6FE-6565-A
INDUCTION KIT	1	C6ZZ-6B068-A
Manifold Assembly	1	
Carburetor - Primary	1	
Carburetor - Secondary	1	
Gasket - Carburetor	2	C7AE-9447-A
Bolt, Hex Head	12	378484-S
Bracket - Fuel Filter	1	
Elbow - 1/8 Pipe	1	
Filter - Fuel	1	C5UE-9155-A
Hose - Fuel Tube to Filter	1	C1AE-9C323-A
Clamp - Hose	6	376545-S2
Tube Assembly - Fuel Pump to Carburetor	1	
Hose - Carburetor Fuel	2	
Nut - No. 10-32 Lock	1	34656-S8
Fitting - Transmission Vacuum	1	380612-S
Plug - 3/8 Pipe	1	372175-S
Elbow - 3/8 Tubing	1	353277-A2-S
Hose - Crankcase Ventilation	1	
Clamp - Hose	2	97332-S2
Tube - Carburetor Secondary Balance	1	C2AE-9F564-A
Gasket - Air Cleaner	2	C3AE-9673-A
Linkage - Carburetor - Front	1	C2SE-9E544-A
Pin - Snap	2	377519-S
Trunnion - Carburetor Throttle	1	C3AE-9C760-A
Nut - Linkage	1	34079-S8
Rod Assembly - Carburetor, Throttle	1	
Gasket - Intake Manifold	2	C6FE-9439-A
Seal - Intake Manifold Front	1	C5DE-9A425-A
Seal - Intake Manifold Rear	1	C5DE-9A425-A
EXHAUST HEADERS	2	SM1R-9428-B

NOTE: A C6FE-6600-A high pressure oil pump is also recommended.

SPECIFICATIONS

	MODIFIED ENGINE
Compression pressure psi.....	170-190
Engine idle rpm	600-800

CYLINDER BLOCK

Main bearing clearance0020-.0025
------------------------------	-------------

CRANKSHAFT AND FLYWHEEL

End play .....	.004-.008
Crankshaft bobweight using piston and rod assembly kit	760 grams
Runout - starter ring gear - lateral - after assembly to crankshaft. ....	.040 total indicator reading
Damper press fit on crankshaft .....	.001 minimum
Fit of pilot bearing in crankshaft - camshaft bearing clearance .....	.001-.003
Runout of flywheel face at clutch periphery after assembly to crankshaft (standard). ....	.010 total indicator reading
Backlash between flywheel ring gear and master starter pinion at 7.02 center distance. ....	.009-.022

PISTON - RINGS - RODS

Install corresponding grade size piston in each respective grade size cylinder bore	
Piston to bore clearance as measured at "W" dimension on piston (6110) and cylinder block assembly (6010) .....	.005-.006
Top of block to top of piston ("Z" dimension below surface of block, see frame 10) .....	.0195-.0365
Piston pin to piston clearance .....	.006-.008

NOTE: Oil ring - expander gap to be in line with pin bore of piston and segment gaps staggered within .75 to 1.25 each side of expander gap. Compression rings - ring gaps to be 150° each side of expander gap. Ink marking on rings to appear to the left of gap when viewed from front and assembled on piston. Second compression ring to have inside chamfer assembled up with respect to dome of piston. Dome of piston to be assembled to outside of engine.

Connecting rod bearing vertical assembled clearance (actual) select for. ....	.002-.0025
Side clearance of rod with crank pin, total 2 rods .....	.022-.032

SPECIFICATIONS CONTINUED

CAMSHAFT - VALVES

Camshaft thrust plate to be installed with oil groove facing front of engine.

Valve lash setting — intake	.020
— exhaust	.025
Camshaft bearing clearance	.001-.003
Camshaft end play	.0005-.0055
Intake valve opens	52° BTC at .0125 tappet lift
Intake valve closes	86° ABC at .0125 tappet lift
Exhaust valve opens	82° BBC at .0155 tappet lift
Exhaust valve closes	42° ATC at .0155 tappet lift
Valve lift	.507"
Cam duration — intake	318°
Cam duration — intake	304°
Cam overlap	94°
Valve spring installed height	1.81
Valve spring loads — valve closed	85-95 lbs. at 1.82
— valve open	270-280 lbs. at 1.32

ENGINE ELECTRICAL

Distributor gear backlash	.003-.005
Distributor shaft end play when installed	.004-.025
Distributor timing	12° + 3° BTC 750 rpm
Manifold vacuum	15" Hg minimum at 750 rpm

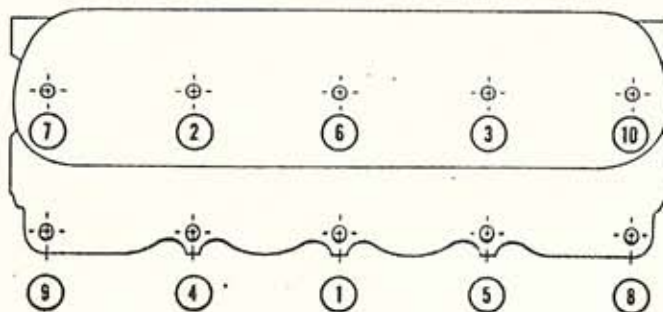
(For installation of electrical equipment refer to model year affected *Electrical Equipment Installation Manual.*)

TORQUE SPECIFICATIONS

Torque limits

Main bearing cap bolts 70-80 ft.-lb.

CYLINDER HEAD BOLTS



Tighten cylinder head bolts in the numerical sequence shown above. Torquing of all cylinder bolts in the above sequence to be progressively increased in twelve steps:

1st step, torque to 20 ft.

2nd step, recheck all bolts to verify correct tightening limitation

TORQUE SPECIFICATIONS CONTINUED

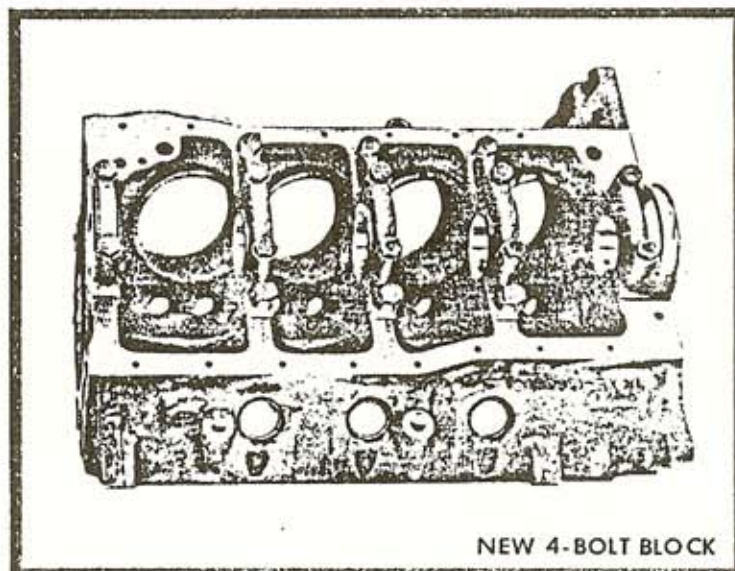
- 3rd step, torque to 40 ft.
 4th step, recheck all bolts to verify correct tightening limitation
 5th step, torque to 50 ft.
 6th step, recheck all bolts to verify correct tightening limitation
 7th step, torque to 60 ft.
 8th step, recheck all bolts to verify correct tightening limitation
 9th step, torque to 70 ft.
 10th step, recheck all bolts to verify correct tightening limitation
 11th step, torque to 80 ft.
 12th step, recheck all bolts to verify correct tightening limitation

	TREAD SIZE	INSTALLATION TORQUE
Bolt — Rocker Arm Cover to Cylinder Head	1/4-20	3-5 ft.-lb.
Clamp — Water Bypass Hose		15-20 in.-lb.
Bolt — Oil Pan	1/4-20	7-9 ft.-lb.
	5/16-18	9-11 ft.-lb.
Bolt — Oil Pump Cover	1/4-20	9-12 ft.-lb.
Bolt — Pressure Plate to Flywheel	5/16-18	12-20 ft.-lb.
Bolt — Cam Sprocket to Camshaft	3/8-16	40-45 ft.-lb.
Nut — Rocker Arm Adjusting (to be checked with Tappet on Base Circle Turn Valve — Rocker Arm Adjusting Nut Counter Clockwise for Torque Specification	3/8-24	55-180 in.-lb.
Bolt — Flywheel to Crankshaft	7/16-20	75-85 ft.-lb.
Bolt — Main Bearing Cap	7/16-14	65-75 ft.-lb.
Plug — Oil Pan Drain	1/2-20	15-20 ft.-lb.
Bolt — Crankshaft Damper to Crankshaft	5/8-18	70-90 ft.-lb.
Spark Plug	18mm	15-25 ft.-lb.
Oil Filter Cartridge	Tighten 1/2 turn after gasket contact	
Insert — Oil Filter Mounting — to Block	1-1/16-12	60-100 ft.-lb.
Bolt — Exhaust Manifold to Cylinder Head	3/8-16	15-20 ft.-lb.
Nut — Carburetor Mounting	5/16-24	12-15 ft.-lb.
Stud — Carburetor Mounting	5/16-18	4-7 ft.-lb.
Bolt — Distributor Hold - Down	5/16-18	12-15 ft.-lb.
Bolt — Intake Manifold	5/16-18	12-15 ft.-lb.
Bolt — Front Cover	5/16-18	12-15 ft.-lb.
Nut — Connecting Rod	3/8-24	40-45 ft.-lb. Ref

The following general installation torque specifications apply to any engine operation not listed above.

THREAD SIZE	TORQUE FT.-LB.	THREAD SIZE	TORQUE FT.-LB.
1/4-20	6-9	7/16-14	45-50
1/4-28	6-9	7/16-20	50-60
1/4" Pipe	12-17		
5/16-18	12-15	1/2-13	60-70
5/16-24	15-18	1/2-20	70-80
3/8-16	20-25	9/16-18	85-95
3/8-24	30-35	5/8-18	130-145
3/8" Pipe	23-28		

UPDATING THE GT-40 OHV 289 CID V-8 ENGINE



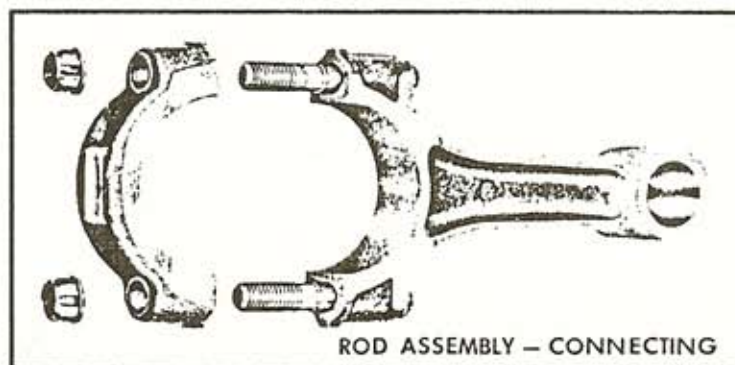
NEW 4-BOLT BLOCK

This section of the booklet is written specifically for owners of the 289 cubic-inch GT-40 engine — particularly those who are interested in updating their current engines.

The standard engine in your Ford GT-40 is a 289 cubic-inch 90° V-8. The original version of this powerplant developed 375 bhp. at 6800 rpm. The bore and stroke are 4.00" x 2.87" and the compression ratio is 10.50:1.

The components listed on the following pages are designed primarily to update the engine for increased durability and performance.

This new engine block provides beefed-up main webs and pan rail. It also incorporates four-bolt main bearing caps in the center three positions for improved durability.



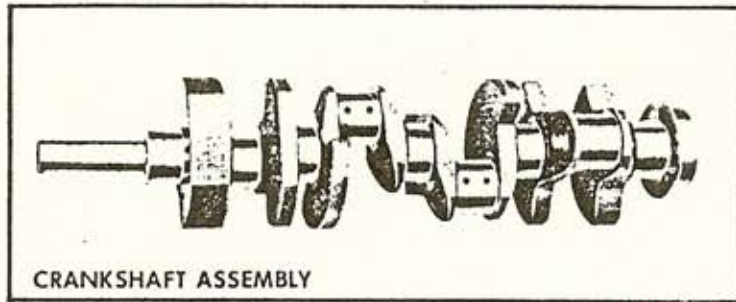
ROD ASSEMBLY — CONNECTING

The new connecting rod assembly has been fatigue tested at 7000 rpm.

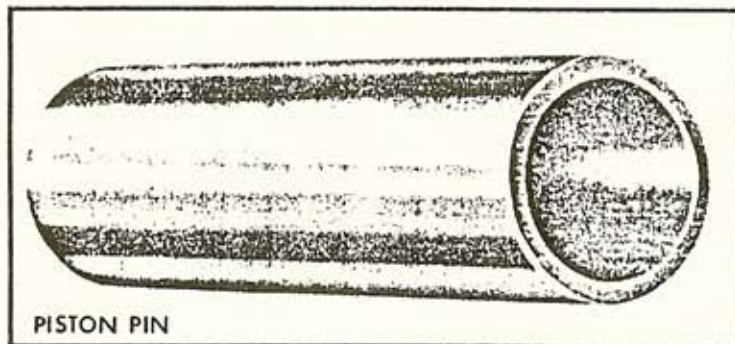


CAMSHAFT

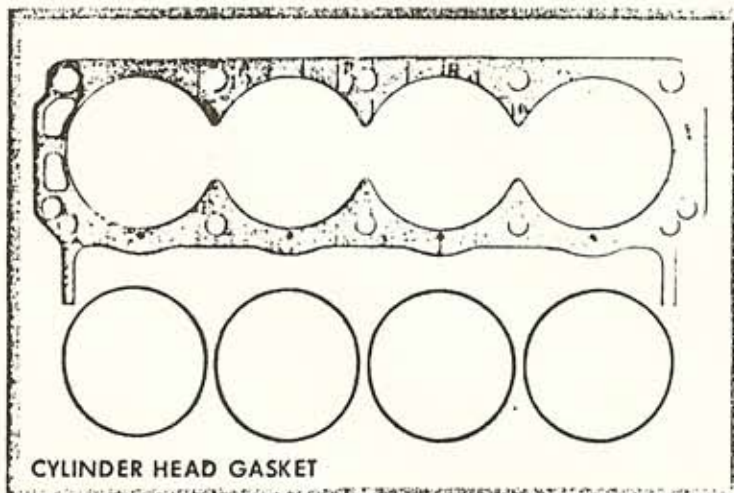
This is the same as the 1966 Le Mans camshaft, except it has new castings to insure uniform lobe hardness and machining.



This new crankshaft has revised counterweights to reduce main bearing loads.



The new piston pin is a cantilevered design for greater fatigue life.



This new head-gasket has metallic "O" rings with a periphery mattress.

PART NUMBERS FOR UPDATING THE GT-40 OHV 289 CID V-8 ENGINE

NAME	QUANTITY REQUIRED	PART NUMBER
BLOCK ASSEMBLY, CYLINDER	1	
Block - Cylinder	1	
Plug - Cup (to Plug Core Clean Out Holes)	6	376053-S
Plug - Main Oil Gallery Front	1	376301-S
Plug - Tappet Oil Gallery Front	2	376301-S
Plug - Tappet Oil Gallery Rear	3	87744-S
Plug - Tappet Oil Gallery Rear	3	87709-S
Plug - Tappet Crossover	1	376099-S
Dowel - Cylinder Head to Block	2	C2OE-6A008-A
Cap - Main Bearing Front	1	C6FE-6329-A
Cap - Main Bear. Intermediate Front and Rear	2	C5FE-6327-A
Cap - Main Bearing Center	1	
Cap - Main Bearing Rear	1	C6FE-6325-A
Bolt - 7/16-14 x 3.16 Hex Head	10	C2OE-6345-A
Bolt - 3/8	6	48007-S2
Washer - 3/8 Flat	6	377428-S2
Pin - 5/16 x .62 Dowel	6	377432-S
Dowel - Cylinder Block to Flywheel HSG	2	EAD-6397-A
Plug - 1/4-18 Pipe (Drain Hole)	2	374259-S8
Plug - 1/4-18 Pipe	2	87658-S
Plug - Camshaft Rear Bearing	1	C2OE-6266-A
Bearing - Camshaft Front	1	C2OE-6261-A
Bearing - Camshaft Front - Intermediate	1	C2OE-6267-A
Bearing - Camshaft Center	1	C2OE-6262-A
Bearing - Camshaft Rear Intermediate	1	C2OE-6270-A
Bearing - Camshaft Rear Intermediate	1	C2OE-6265-A
Plug - Distributor Oil Hole	1	EAA-66025-A
Pin - Crankshaft Rear Oil Seal	1	CODE-66336-A
GASKET, CYLINDER HEAD	2	
Seal, Combustion Chamber	8	
PISTON AND CONNECTING ROD ASSEMBLY	8	C7FE-6100-A
Piston	8	C7FE-6110-B
Ring - Upper Compression	8	C6FE-6150-A
Ring - Lower Compression	8	C6FE-6152-A
Segment - Piston Oil Control	16	C6FE-6159-A
Spacer - Piston Oil Control	8	C6FE-6161-A
Pin - Piston	8	C7FE-6135-A
Rod Assembly - Connecting	8	C7FE-6200-A
Rod - Connecting	8	C7FE-6205-A
Cap - Connecting Rod	8	C7FE-6210-A
Bolt - Connecting Rod	16	C5FE-6214-A
Nut - Connecting Rod	16	C5FE-6212-A
Camshaft	1	C7FE-6250-A
CRANKSHAFT ASSEMBLY	1	
Crankshaft	1	
Plug - Cup	8	377436-S
Retainer	8	380249-S
C' WEIGHT	1	
DAMPER ASSEMBLY - CRANKSHAFT VIBRATION	1	
Seat, Valve Spring	16	C7FE-6A536-A

TORQUE SPECIFICATIONS

Main Bearing (10-Bolts) — 7/16	75-85 ft.-lb.
(6-Bolts) — 3/8	35-40 ft.-lb.

(Refer to page 8-9 of this book for proper torquing of cylinder head)

Rod Bolt	45-50 ft.-lb.
Damper Press Fit on Crankshaft . . . . .	.001 minimum
Balance the Flywheel to	9.8 oz.-in. at 180° 26'
Crankshaft Bobweight	1780.9 grams

For all other specifications see pages 7, 8, 9.

Pages covering periodic improvements and updated specifications will be forwarded as available.