1966-73 290", 304", 343", 360", 390", 401" V8 ENGINES

GENERAL SPECIFICATIONS

Year	Displ. Cu. Ins.	Carburetor	HP at RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore	Stroke
1966-69	290"	2-Bbl.	200 @ 4600	285 @ 2800	9.0-1	3.750"	3.28"
		4-Bbl.	225 @ 4700	300 @ 3200	10.0-1	3.750"	3.28"
1967-69	343"	2-Bbl.	235 @ 4400	345 @ 2600	9.0-1	4.08"	3.28"
		4-Bbl.	280 @ 4800	365 @ 3000	10.2-1	4.08"	3.28"
1968-69	390"	4-Bbl.	315 @ 4600	425 @ 3200	10.2-1	4.165"	3.57"
1970	304"	2-Bbl.	210 @ 4400	305 @ 2800	9.0-1	3.750"	3.44"
	360"	2-Bbl.	245 @ 4400	365 @ 2400	9.0-1	4.080"	3.44"
		4-Bbl.	290 @ 4800	395 @ 3200	10.0-1	4.080"	3.44"
	390"	4-Bbl.	325 @ 5000	420 @ 3200	10.0-1	4.165"	3.574"
		4-Bbl.	340 @ 5100	430 @ 3600	10.0-1	4.165"	3.574"
1971	304"	2-Bbl.	210 @ 4400	300 @ 2600	8.4-1	3.750"	3.440"
	360"	2-Bbl.	245 @ 4400	365 @ 2600	8.5-1	4.080"	3.440"
		4-Bbl.	285 @ 4800	390 @ 3200	8.5-1	4.080"	3.440"
	401"	4-Bbl.	330 @ 5000	430 @ 3400	9.5-1	4.165"	3.680"
1972-73	304"	2-Bbl.	150 @ 4200	245 @ 2500	8.3-1	3.750"	3.440"
	360"	2-Bbl.	175 @ 4000	285 @ 2400	8.3-1	4.080"	3.44"
		4-Bbl.	195 @ 4400	295 @ 2900	8.3-1	4.080"	3.44"
		4-Bbl. ①	**220@4400**	**315@3100**	**8.3-1**	**4.080"**	**3.44"**
	401"	4-Bbl.	**225@4600**	**345@3300**	**8.5-1**	**4.165"**	**3.68"**

► *NET HORSEPOWER & TORQUE NOTE — Horsepower and Torque figures given for 1972 and later are NET. NET Horsepower and Torque represent power at the flywheel when the engine is installed in the vehicle, with wide open throttle and all systems operating such as; air cleaner, exhaust system, water pump, generator, oil pump and air conditioning.*

MODEL IDENTIFICATION

SERIAL NUMBER

1966-67 – Stamped on plate attached to right hand wheelhouse panel under hood.

1968-73 – Stamped on plate located on upper left hand corner of instrument panel. It is also located on a lable affixed to left front door on 1970-73 models.

1966

American (290" 2-Bbl.)	C-100001
(290" 4-Bbl.)	D-100001

1967

American (290" 2-Bbl.)	C-100001
(290" 4-Bbl.)	D-100001
(343" 4-Bbl.)	X-100001
Rebel (290" 2-Bbl.)	H-100001
(343" 2-Bbl.)	J-100001
(343" 4-Bbl.)	K-100001
Ambassador (290" 2-Bbl.)	N-100001
(343" 2-Bbl.)	R-100001
(343" 4-Bbl.)	Q-100001
Marlin (290" 2-Bbl.)	U-100001
(343" 2-Bbl.)	V-100001
(343" 4-Bbl.)	W-100001

1968-73 engines use thirteen digit number. Fourth digit identifies series, seventh digit identifies engine as follows:

1968-69

Fourth Digit	Model	Seventh Digit	Engine
0	Rambler	H	290" 2-Bbl.
1	Rebel	N	290" 4-Bbl.
3	AMX	S	343" 2-Bbl.
7	Javelin	Z	343" 4-Bbl.
8	Ambassador	W	390" 4-Bbl.

1970

Fourth Digit	Model	Seventh Digit	Engine
0	Hornet	H	304" V8 2-Bbl.
1	Rebel	N	360" V8 2-Bbl.
3	AMX	P	360" V8 4-Bbl.
7	Javelin	X	390" V8 4-Bbl.
8	Ambassador		

1971-73

Fourth Digit	Model	Seventh Digit	Engine
0	Hornet	H	304" V8 2-Bbl.
1	Matador	N	360" V8 2-Bbl.
4	Gremlin	P	360" V8 4-Bbl.
7	Javelin	Z	401" V8 4-Bbl.
8	Ambassador		

ENGINE IDENTIFICATION 1966-67

Code number stamped on a plate on right bank cylinder head cover identifies engine model and year.

① ② ③
809 H 27

① - Year and month of production. First digit indicates year: **8** (1966); **9** (1967). Second and third digits indicate month: **01** (January); **02** (February); **03** (March); etc.
② - Type of engine I **H** (290" 2-Bbl.); **N** (290" 4-Bbl.); **Z** (343" 4-Bbl.).
③ - Day of manufacture.

1966-73 290", 304", 343", 360", 390", 401" V8 ENGINES (Cont.)

SPECIAL ENGINE MARKS

The following marks, stamped under Engine Code Number, indicate special equipment or deviations from standard specifications.

Three Letter Group (Early) - Early models use letters "A", "B", "C", for all engines as follows:
First Letter - Size of bore.
Second Letter - Size of main bearings.
Third Letter - Size of connecting rod bearings.
A - Standard.
B - .010" Undersize.
C - .010" Oversize.

One Or Two Letter Group (Late) - Later models use letters "B", "M", "P", "PM" for all engines as follows:
B - .010" oversize cylinder bore.
M - .010" undersize main bearings.
P - .010" undersize connecting rod bearings.
PM - .010" undersize main and connecting rod bearings.

1968-73 Models—Have one or two letter code stamped on boss directly above oil filter. Coded as follows: Code is same as "Late" group above but letter **C** has been added to indicate .010" oversize cam shaft block-bores.

ENGINE REMOVAL

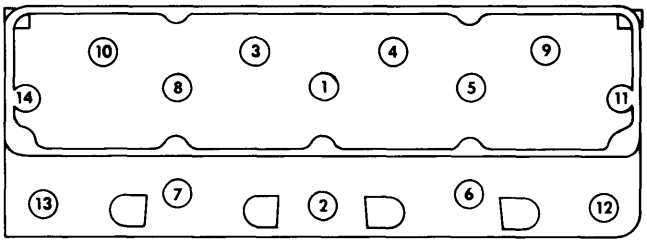
See Engine Removal at end of ENGINE Section.

INTAKE MANIFOLD

Installation – Apply thin coat of sealing compound to both sides of gaskets. Install end seals and apply sealing compound. Position gaskets on cylinder heads and install manifold. Install retaining bolts and tighten to specification.

CYLINDER HEAD

Installation – Apply a thin coat of sealing compound to both sides of head gaskets. *NOTE – Do not apply sealer to cylinder block or cylinder head.* Wire brush threads of cylinder head bolts. Cylinder block has locating dowels on both banks for aligning and holding cylinder head and gasket in position during installation. Tighten head bolts evenly in sequence shown in illustration. Initially tighten to 80 ft. lbs., then tighten to specification. *NOTE – It is not necessary to retorque heads on 360" and 401" engines.*



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CYLINDER HEAD TIGHTENING SEQUENCE

VALVES

Engine & Valve	Head Diam.	Face Angle	Seat Angle	Seat Width	Stem Diameter	Stem Clearance	Valve Lift
290"-304"							
1966-72 Int.	1.787"	29°	30°	.055-.065"	.3715-.3725"	.001-.003"	.425"
Exh.	1.406"	44°	45°	.040-.060"	.3715-.3725"	.001-.003"	.425"
343"-360"-390"							
401" – 1967-72							
Int.	① 2.000"	29°	30°	.055-.065"	.3715-.3725"	.001-.003"	.425"
Exh.	② 1.625"	44°	45°	.040-.060"	.3715-.3725"	.001-.003"	③ .425"
304" – 1973 Int.	1.787"	29°	30°	.040-.060"	.3715-.3725"	.001-.003"	.425"
Exh.	1.406"	44°	44.5°	.040-.060"	.3715-.3725"	.001-.003"	.425"
360" – 1973 Int.	2.025"	29°	30°	.040-.060"	.3715-.3725"	.001-.003"	.425"
Exh.	1.680"	44°	44.5°	.040-.060"	.3715-.3725"	.001-.003"	.425"
401" – 1973 Int.	2.025"	29°	30°	.040-.060"	.3715-.3725"	.001-.003"	.457"
Exh.	1.680"	44°	44.5°	.040-.060"	.3715-.3725"	.001-.003"	.457"

① – 1968-72 2.025".

② – 1971-72 1.680".

③ – High performance camshaft valve lift – .477", 1970-72 .457".

VALVE ARRANGEMENT

E-I-I-E-E-I-I-E (front to rear, both banks).

VALVE GUIDE SERVICING

Guides are integral part of cylinder head. If valve stem clearance becomes excessive due to guide wear, guides must be reamed to next oversize, and oversize valves installed.

CHECKING VALVE STEM CLEARANCE

Use dial indicator to measure sideplay at end of valve stem with valve 1/16" off its seat.

VALVE STEM SEALS

1965-72 – There are none used on engines with standard camshafts. Valve spring retainer assembly incorporates an oil deflector which is serviced as an assembly only. Replace when valves are serviced.

1966-73 290", 304", 343", 360", 390", 401" V8 ENGINES (Cont.)

1973 – Plastic valve stem seals are used on each valve stem and should be replaced whenever seals become deteriorated or valve service is performed.

VALVE SPRINGS

Engine	Free Length	PRESSURE (LBS.)	
		Valve Closed	Valve Open
All			
1966-67	2.813"	85-93 @ 1.813"	189-203 @ 1.406"
1968-70	2.813"	85-93 @ 1.813"	193-207 @ 1.391"
401"			
1970	2.234"	90-98 @ 1.813"	183-195 @ 1.359"
All			
1971	2.688"	90-98 @ 1.813"	183-195 @ 1.359"
1972-73	①	80-88 @ 1.813"	210-226 @ 1.359"

① – Information not available.

VALVE SPRING INSTALLATION

Install with closed end of spring down. On some later models springs are evenly coiled and may be installed with either end to the cylinder head.

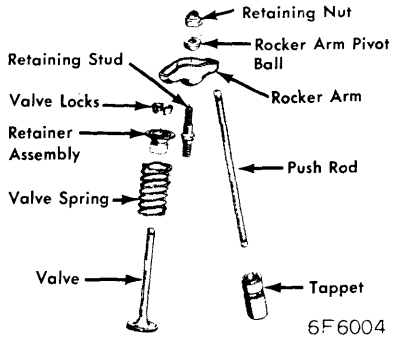
VALVE SPRING INSTALLED HEIGHT

Measure from spring seat on head to underside of spring retainer. *See "Valve Closed" spring length in specification table.*

ROCKER ARM ASSEMBLY

ALL ENGINES (Exc. 1973 304")

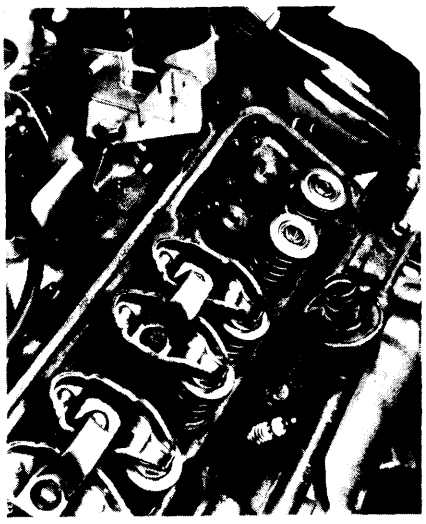
Rocker arms are individually mounted on studs threaded into cylinder head. Oil for rocker arms flows through the hollow pushrods. Rocker arms and pushrods are held in alignment by slot where pushrods pass through cylinder head. A contact pattern on pushrods where they touch cylinder head is normal. When installing rocker arms, retaining nut on stud should be tightened until bottomed.



VALVE PUSHROD & ROCKER ARM ASSEMBLY

1973 304" ENGINE

Rocker arms pivot on bridged pivot assemblies which are secured to cylinder head by cap screws. See illustration.



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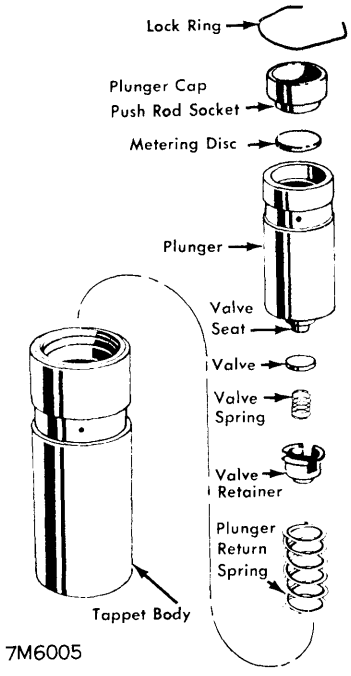
ROCKER ARM ASSEMBLY (1973 304")

HYDRAULIC LIFTERS

►*HYDRAULIC LIFTER ASSEMBLY CAUTION:* Special hydraulic lifters are used, and have an internal metering system which meters oil to hollow pushrod. These lifters are not interchangeable with other lifters.

See illustration for arrangement of parts.



HYDRAULIC VALVE LIFTER ASSEMBLY

Testing - Fill lifter body with kerosene and assemble lifter without snap ring. Check leakdown rate with suitable tester. Normal lifter should require 10-45 seconds to leak down when filled with kerosene (.125" travel with 50 lb. load).

Installation - Install lifters WITHOUT an oil charge. They will fill themselves after 3-8 minutes of engine operation.

1966-73 290", 304", 343", 360", 390", 401" V8 ENGINES (Cont.)

PISTONS, PINS, RINGS						
	PISTONS	PINS		RINGS		
Engine	①Clearance	Piston Fit	Rod Fit	Rings	End Gap	Side Clearance
290" & 304" 1966-71	.001-.0018"	.0003-.0005"	②	1 & 2 3	.010-.020" .015-.055"	.002-.004" .000-.005"
343" & 360" 1967-71	.0012-.002"	.0003-.0005"	②	1 & 2 3	.010-.020" .015-.055"	.002-.004" .000-.005"
390" & 401" 1968-71	.0010-.0018"	.0003-.0005"	②	1 & 2 3	.010-.020" .015-.055"	.002-.004" .000-.005"
304" 1972-73	.0010-.0018"	.0003-.0005"	②	1 & 2 3	.010-.020" .010-.025"	.0015-.0035" .0011-.008"
360" 1972-73	.0012-.002"	.0003-.0005"	②	1 & 2 3	.010-.020" .015-.045"	.0015-.0035" .000-.007"
401" 1972-73	.0010-.0018"	.0003-.0005"	②	1 & 2 3	.010-.020" .015-.055"	.0015-.0035" .000-.007"

① – Measured at center line of piston pin.
② – Press Fit to 2000 Lbs.

PISTON PIN REPLACEMENT

Pin must be a tight press fit in connecting rod.

Removal - Use a suitable tool (Rambler Tool J-21872) and an arbor press, being careful not to damage piston.

Installation - Press pin into connecting rod using a minimum of 2000 lbs. pressure. Center pin in rod ± 1/32'.

PISTON & ROD INSTALLATION

Single notch or pair of notches on rim of piston head must face front of engine. Cylinder number on rod and bearing cap go together and toward outside of cylinder bank in which assembly installed (oil squirt hole in rods toward inside of engine for lubrication of opposite bank cylinder walls).

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS							
	MAIN BEARINGS				CONNECTING ROD BEARINGS		
Engine	① Journal Diam.	② Clearance	Thrust Bearing	Crankshaft Endplay	Journal Diam.	Clearance	Sideplay
290" & 343" 1966-69	2.7469-2.7489"	.001-.002"	No.3	.003-.008"	2.0934-2.0955"	.001-.002"	.009-.015"
390" 1966-69	2.7469-2.7489"	.001-.002"	No.3	.003-.008"	2.2492-2.2471"	.001-.002"	.009-.015"
304", 360" & 390" 1970-73	2.7474-2.7489"	.001-.002"	No.3	.003-.008"	2.0955-2.0934"	.001-.002"	③.009-.015"
401" 1971	2.7474-2.7489"	.001-.002"	No.3	.003-.008"	2.2485-2.2471"	.001-.002"	.009-.015"
401" 1972-73	2.7474-2.7489"	.001-.002"	No.3	.003-.008"	2.2485-2.2464"	.001-.002"	.006-.018"

① – Rear Main 2.7464-2.7479"
② – Rear Main Clearance .002-.003"
③ – 1972-73 Models .006-.018".

OIL PAN REMOVAL

See Oil Pan Removal at end of ENGINE Section.

CRANKSHAFT REAR OIL SEAL REPLACEMENT

Upper and lower seals may be replaced without removing crankshaft. Lip of seals when installed must face front of engine. Lubricant bearing and lip of seals with engine oil. Lubricate back side of seals with soap. *NOTE - Seal surface of crankshaft is knurled to prevent leakage. DO NOT attempt to remove this finish.*

ENGINE FRONT COVER REPLACEMENT

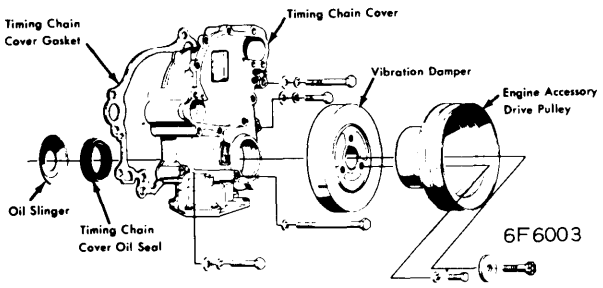
To remove front cover, drain cooling system and remove lower radiator hose and bypass hose from cover. Remove

1966-73 290", 304", 343", 360", 390", 401" V8 ENGINES (Cont.)

distributor, fuel pump, alternator belts, fan and hub assembly, and vibration damper. Remove power steering pump and air conditioning compressor and swing them aside without disconnecting the hoses. Take out bolts and remove cover. Remove lower dowel pin from cylinder block. When installing cover, insert oil pan bolts only and use them to pull cover into alignment with upper dowel. Drive lower dowel through cover into correct hole in cylinder block. Install remaining bolts and tighten to 20-30 ft. lbs.

CRANKSHAFT FRONT SEAL REPLACEMENT

Cover must be removed to replace seal (seal is installed from back of cover).



FRONT COVER

CAMSHAFT & BEARINGS

Camshaft bearings are step-bored (largest at front, smallest at rear) for easy removal and installation of camshaft.

CAMSHAFT END THRUST

No thrust plate. Rear of camshaft sprocket runs against front of cylinder block. Helical cut or oil pump and distributor drive gear holds camshaft sprocket against cylinder block for zero endplay with engine running.

CHECKING CAM LOBE LIFT

Check with dial indicator to specifications listed in Camshaft Table.

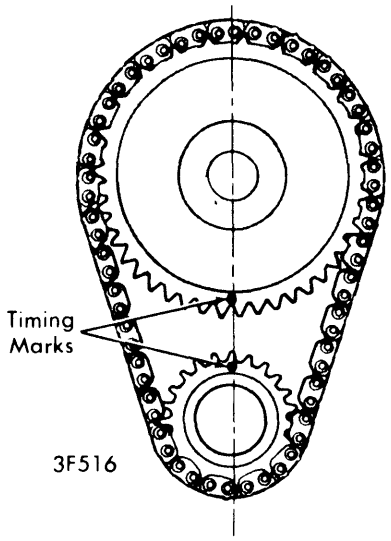
CHECKING VALVE TIMING

Preparation For Test - Remove rocker arm cover and spark plugs. Turn crankshaft to bring No. 6 piston to TDC of compression stroke (No. 1 piston will be on TDC on exhaust stroke in overlap position). Rotate crankshaft 90° counterclockwise, then install dial indicator on No. 1 intake rocker arm pushrod end and zero the indicator.

Testing - Crank engine in a clockwise direction until dial indicator reads .020" in either direction. At this point, the milled mark on vibration damper should be in line with the TDC or zero mark on timing chain cover. If more than ½" variation in either direction, check timing chain for stretch. If chain deflection exceeds ½", replace chain.

CAMSHAFT			
Engine	**Journal Diam.**	**Clearance ①**	**Lobe Lift**
All 1966-69	.....	.001-.003"	Int. .265" Exh. .265"
304"-360" 1970	.....	.001-.003"	Int. .265" Exh. .265"
401" 1970	.....	.001-.003"	Int. .287" Exh. .287"
304"-360" 1971-73	.....	.001-.003"	Int. .266" Exh. .266"
401" 1971-73	.....	.001-.003"	Int. .286" Exh. .286"

① — With Engine Running.



VALVE TIMING MARKS

ENGINE OILING

Crankcase Capacity - 4 qts., 5 qts. with filter change.

Oil Filter Replacement – Replace every 4000 to 6000 miles. When installing, tighten only by hand.

Oil Pressure – 13 lbs. minimum at 600 RPM, 60 lbs. maximum on 1965 through early 1967 engines. 75 lbs. maximum on late 1967 and 1968-73 engines.

Oil Pressure Regulator - In oil pump body. Not adjustable.

ENGINE OILING SYSTEM

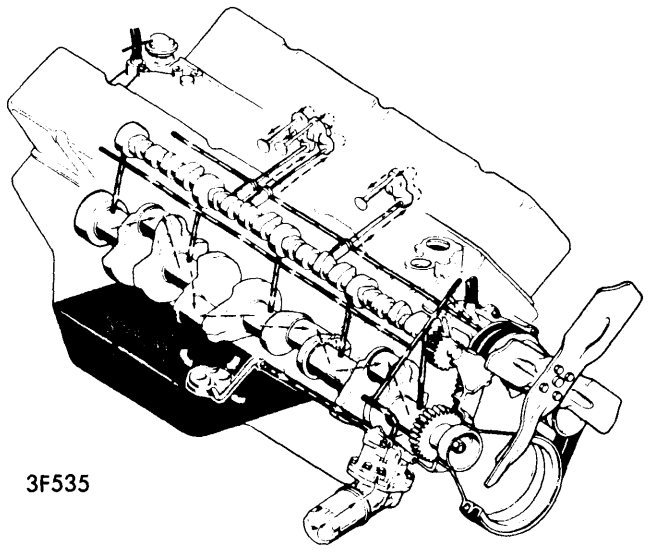
Oil is drawn from oil pan into gallery at lower right side of engine, then through a hole in timing chain cover and into oil pump. From pump, oil goes through full-flow filter, back into timing chain cover and into main gallery, which is drilled from lower right corner of block up front wall of

1966-73 290", 304", 343", 360", 390", 401" V8 ENGINES (Cont.)

block to intersect with two valve tappet galleries. From right bank valve tappet gallery, oil goes down drilled passages to camshaft and crankshaft bearings.

OIL FILTER

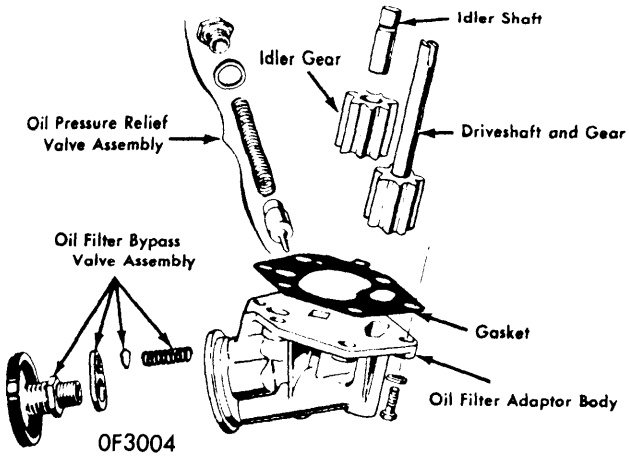
Full-flow type mounted on lower right side of timing chain cover, accessible from below. Bypass valve is in filter adapter, allows oil to flow through system if filter is clogged.



ENGINE OILING SYSTEM

OIL PUMP

With oil pump cover and gasket removed, gears should extend .0025-.0065" above pump body. A clearance of .002-.004" should exist between gears and walls of gear cavity opposite point of gear mesh. *NOTE - To insure self-priming, oil pump must be filled with petrolatum before installing cover. DO NOT use grease of any type.*



OIL PUMP ASSEMBLY

TIGHTENING SPECIFICATIONS

Location	Torque (Ft. Lbs.)
Cylinder Head (1966-69)	90-100
(1970-73)	105-115
Intake Manifold	40-45
Exhaust Manifold	30-35
Oil Pan (¼"-20)	7-8
(5/16"-18)	10-12
Main Bearing	95-105
Connecting Rod (All Except 401")	27-30
(401")	35-40
Flywheel (Or Flex Plate)	100-110
Vibration Damper (1966-67)	45-55
(1968-72)	50-60
Camshaft Sprocket	25-35
Rocker Arm Studs	65-70
Rocker Arm Retaining Stud Nut	20-25
Engine Front Cover	20-30
Thermostat Housing	10-15
Water Pump	*45-50 INCH LBS.*
Oil Pump	*48-60 INCH LBS.*
Engine Front Mount-to-Block	25-30
Engine Rear Mount-to-Case	30-35

ENGINE NOTES

► ***1973 PUSH ROD GUIDE CHANGE:*** **A new push rod guide kit which eliminates cylinder head replacement due to excessive guide wear is available. To install, remove rocker arm covers and rocker arms of cylinder affected by push rod guide wear. Remove rocker arm studs and discard. Install push rod guides and new studs. Tighten studs to 65 ft. lbs. and replace rocker arms and rocker covers.**

►*1971 304", 360" & 401" V8, IMPROVED ENGINE VALVE SPRING:* Part No. 3213609 used in production on 304" engine starting with engine code 4020H15, 360" & 401" engines starting with engine code 311 (N-P-Z) 16.

►*1967-72 ALL V8 ENGINES OIL PUMP INLET (PICK-UP) TUBE ASSEMBLY REPLACEMENT)* Certain types of internal engine damage may cause metal chips and dirt to lodge in pick-up tube screen. A new assembly should be replaced after engine repair due to difficulty in cleaning old assembly properly.

►*1971-72 ENGINES WITH MANUAL TRANSMISSIONS CRANKSHAFT PILOT BUSHING OIL WICK:* Part No. 3212687 (Group 1.043) has been added to the crankshaft assembly of engines built with 309 (A,E) 07 & 309 (H-N-P-Z) 21 (Kenosha) and 308 (A,E) 28 (Brampton). The wick may be installed in prior engines (after soaking in oil), to improve reliability of the pilot bushing.

►*1970 360" & 401" V8 NEW NYLON VALVE STEM OIL DEFLECTOR:* Change to improve engine oil economy, starting with engine code number 303 (H-N-P-X-Y). The valve spring retainer and oil deflector (nylon) assemblies, Part No. 3185148 (Group 1.084), may be used as standard service replacement on all 1970 V8 engines. All 390" engines with codes 209 (X-Y) 19 might require machining of the valve guides prior to installation of the nylon assemblies.