

2800 cc V6

IDENTIFICATION CODING

ENGINE IDENTIFICATION

Engine may be identified by the official Vehicle Identification Number. Number is stamped on metal tab fastened to instrument panel close to windshield on drivers side of car and visible from outside. The Identification number contains eleven digits. Example: 9H25Z100001. The first digit establishes model year and fifth digit engine identification.

Engine	VIN Code
2800 cc.....Z

ENGINE REMOVAL

See *Engine Removal* at end of *ENGINE* Section.

CYLINDER HEAD & MANIFOLDS

INTAKE MANIFOLD

Removal - 1) Remove air cleaner and negative battery cable. Drain cooling system. Remove hose from water outlet and bypass hose from intake manifold to thermostat housing rear cover. Remove distributor cap and wires as an assembly.

2) Mark location of rotor and distributor housing, and remove distributor. Remove fuel line and filter and rocker arm covers. Remove intake manifold nuts and bolts and remove intake manifold assembly.

Installation - 1) Apply sealing compound to joining surfaces and position gasket on block. Tab on right bank cylinder head gasket must fit into cutout of manifold gasket.

2) Install sealing compound to retaining bolt bosses on intake manifold. Install manifold on cylinder block. Install bolts and nuts, then tighten in sequence shown in *Fig. 1*. A special tool (T72C-6519) is required to torque one of the intake manifold bolts. Install parts in reverse order.

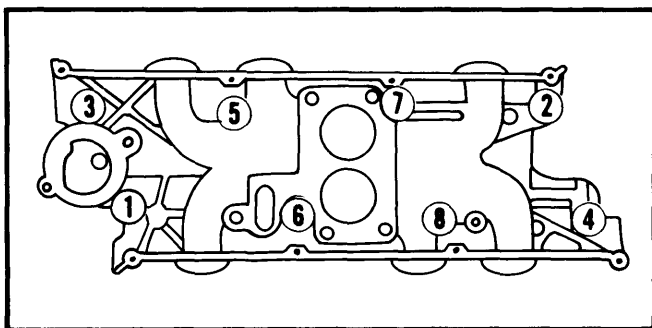


Fig. 1 Intake Manifold Tightening Sequence

CYLINDER HEAD

Removal - Remove intake manifold. Remove rocker arm shaft by loosening two bolts at a time in sequence. Remove oil baffles and push rods and keep in proper sequence for later installation in original location. Remove exhaust manifold. Remove cylinder head bolts and lift cylinder head from block.

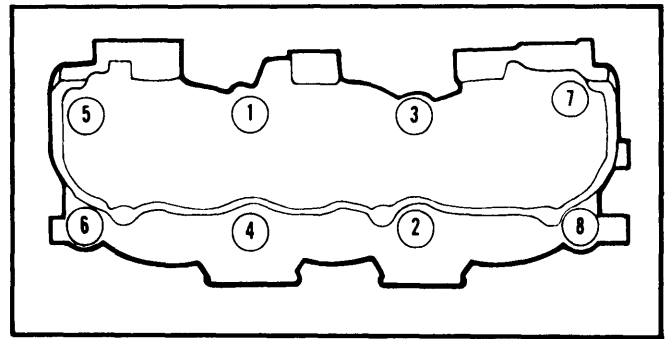


Fig. 2 Cylinder Head Tightening Sequence

Installation - Clean old gasket material from cylinder head and block. Install new cylinder head gaskets on block. Be sure that "TOP" and "FRONT" markings on gaskets are properly positioned. Left and right bank gaskets are different. Position cylinder heads on block, guiding them over positioning studs. Install bolts and tighten in sequence shown in *Fig. 2*. Install other components previously removed.

VALVES

VALVE ARRANGEMENT

I-E-I-E-I (Left bank, front to rear).

I-E-I-E-I (Right bank, front to rear).

VALVE GUIDE SERVICING

To ream guides for installation of valves with oversize stems, always use reamers in sequence and always reface valve seat after valve guide is reamed. Valve stems are available in .008", .016" and .032" oversize.

VALVE STEM OIL SEALS

Cup or umbrella type seals used on all valves. Install seals with cup side down.

VALVE SPRINGS

Removal - Remove rocker arm cover and spark plug on cylinder to be serviced. Install air line with adapter in spark plug hole. Remove rocker arm shaft and both push rods on cylinder to be serviced. Use suitable spring compressor (T72C-6565) to compress spring and remove retainer locks, spring retainer and valve springs. Remove and discard valve stem seal.

NOTE - If air pressure fails to hold valve closed, remove cylinder head for inspection of valve seat.

Installation - Install new valve stem seal, valve spring (close coils toward cylinder head) and spring retainer. Compress spring and install retainer locks. Apply Lubriplate to both ends of push rod, rocker arm (valve and push rod ends) and valve stem tip. Install push rods, making sure lower end of each rod is positioned in lifter push rod cup. Install other parts previously removed.

VALVE SPRING INSTALLED HEIGHT

Spring ends must be square within $\frac{3}{4}$ ". Installed height of valve spring must not exceed specifications. Measure height

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from surface of cylinder head pad to underside of spring retainer. If height is greater than specified ($1\frac{37}{64}$ - $1\frac{39}{64}$ "), install spacer on head under spring to bring height within limits.

CAUTION — Do not install spacers unless necessary.

ROCKER ARM ASSEMBLY

Removal — Remove spring washer and pin from each end of shaft. Slide rocker arms, springs, and shaft supports off shaft. Mark parts for reassembly in original locations.

Installation — Install a spring washer and pin on one end of shaft. Coat shaft with heavy engine oil and install parts in same sequence. Oil holes in rocker arm shaft must point down (notch on front face of shaft must be down). Shaft end plugs must be installed with cup side out. Install remaining spring washer and pin.

VALVE LASH ADJUSTMENT

1) Place finger on adjusting screw of intake valve rocker arm for cylinder No. 5. Rotate engine until valve just begins to open. Camshaft is now in correct position to adjust valves on No. 1 cylinder. Set valve lash to specifications on both valves.

NOTE — Insert feeler gauge between rocker arm and valve stem tip and move gauge from front of tip toward rear of tip (not in and out).

2) Adjust valves of remaining cylinders in firing order (1-4-2-5-3-6) by positioning camshaft according to table.

Adjust Both Valves For Cylinder No.	Intake Valve Just Opening For Cylinder No.
1.....	5
4.....	3
2.....	6
5.....	1
3.....	4
6.....	2

Valve Lash Clearance

Engine	Intake (Cold)	Exhaust (Cold)
2800 cc	① .016"	② .018"

- ① — Slight drag. Very tight with .017" feeler gauge.
- ② — Slight drag. Very tight with .019" feeler gauge.

PISTONS, PINS & RINGS

See Oil Pan Removal at end of ENGINE Section.

PISTON & ROD ASSEMBLY

NOTE — New pistons must be installed in same cylinders for which they were fitted and used pistons in same cylinder from which they were removed.

Removal — 1) With cylinder head and oil pan removed, use a suitable ridge cutter to remove any ridge or deposits on upper end of cylinder bore.

NOTE — Piston must be at bottom of stroke and covered with cloth to collect cuttings.

2) Inspect connecting rods and caps for cylinder identification and mark as necessary. Remove rod cap and push piston and rod assembly out top of cylinder block. Use care not to nick crankshaft journal or cylinder wall. Reinstall cap on connecting rod.

Installation — 1) Lightly coat cylinder bores, pistons, and rings with engine oil. Ensure that ring gaps are properly spaced. See Fig. 3. Install ring compressor on piston and install each piston and rod assembly in its own bore.

NOTE — Notch on piston head must face front of engine. Connecting rod numbers should be on left side of engine. See Fig. 4.

2) Guide connecting rod onto crankshaft journal while tapping piston head with hammer handle to seat connecting rod against crankshaft. Check bearing clearances, install rod caps and tighten.

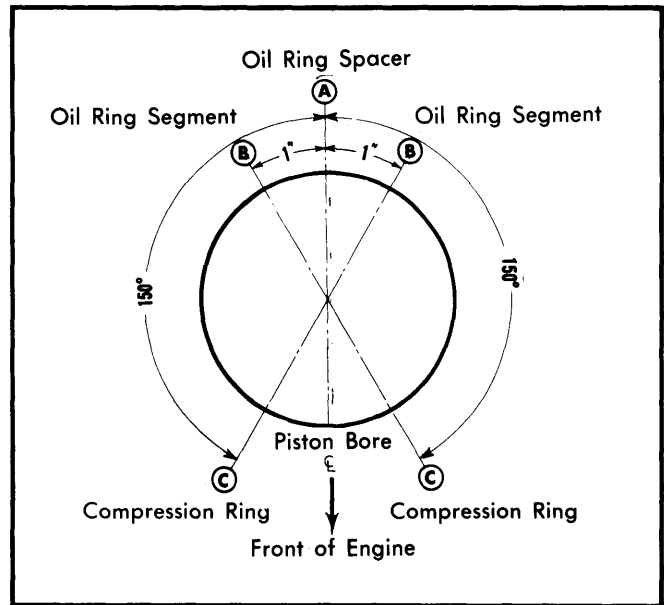


Fig. 3 Piston Ring Gap Spacing

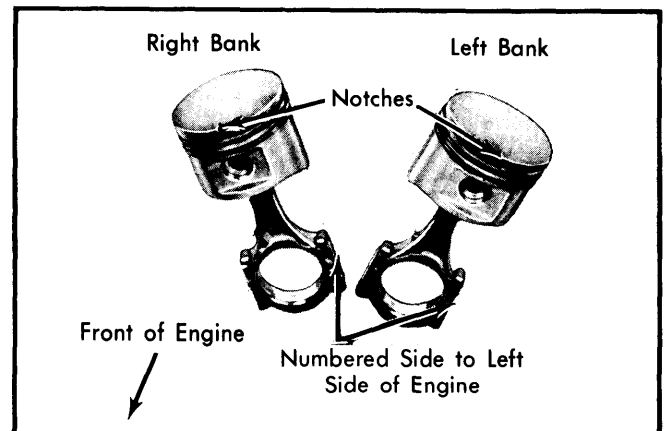


Fig. 4 Pistons and Connecting Rods Correctly Assembled

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FITTING PISTONS

Measure piston at centerline of piston pin bore 90° to pin bore axis. Measure cylinder bore at right angles to centerline of crankshaft, below ring travel. If piston clearance is not within specifications, pistons are available in .020" oversize.

PISTON PINS

Pins are a press fit in connecting rod. Use suitable tool and arbor press for removal and installation. See Fig. 5. Piston pin should be centered in pin bore of piston.

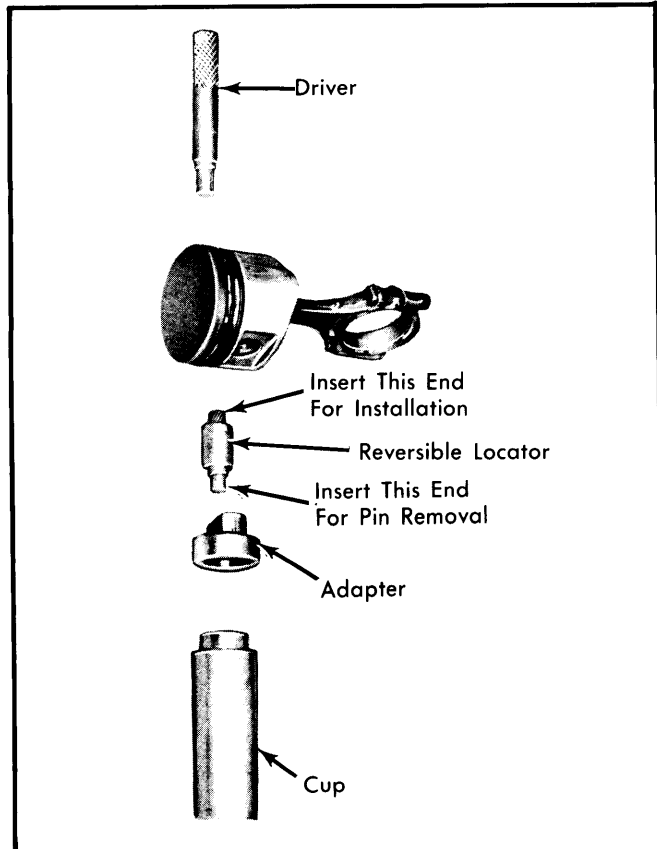


Fig. 5 Tool Set Up for Piston Pin Removal and Installation

CRANKSHAFT & ROD BEARINGS

MAIN & CONNECTING ROD BEARINGS

NOTE — Following procedures are with oil pan and oil pump removed.

Connecting Rod Bearings — After ensuring rod caps are marked for cylinder identification, remove rod caps. Use Plastigage method to check for proper bearing clearances. If not within specifications, new bearings must be installed. New bearings are available in .001" and .002" undersizes. Selective fitting is required for each connecting rod. A standard bearing may be used in combination with a .001" or .002" undersize bearing. Coat bearing surfaces with oil, install rod cap and tighten.

Main Bearings — 1) Position jack under counterweight adjoining bearing being checked so weight of crankshaft will

not compress Plastigage and provide an erroneous reading. With all bearing caps (other than one being checked) tight, check clearances using Plastigage method.

NOTE — If rear bearing is to be replaced, engine must be removed from vehicle.

2) If clearances are excessive, a .001" or .002" undersize bearing may be used in combination with a standard bearing. If .002" undersize bearings are used on more than one journal, they must be positioned in cylinder block rather than bearing cap.

NOTE — Always replace bearings in pairs. Never use a new bearing in combination with a used bearing.

3) If use of a standard and .002" undersize combination does not bring bearing clearance within specifications, crankshaft will have to be refinished and undersized bearings installed.

4) Remove all upper main bearings (except rear main) by inserting suitable tool (6331-E) in oil hole of crankshaft journal and rotating crankshaft clockwise to roll bearing from engine. Oil new upper bearing and insert plain (unnotched) end between crankshaft and indented (or notched) side of block. Rotate bearing into place. Install all main bearing caps with arrows pointing toward front of engine.

THRUST BEARING ALIGNMENT

Install all bearing caps except thrust bearing cap and tighten. Install thrust bearing cap with bolts finger tight. Pry crankshaft to front of engine and hold forward while prying thrust bearing cap to rear. Hold crankshaft forward and tighten bolts on thrust bearing cap. Check crankshaft endplay.

REAR MAIN BEARING OIL SEAL

Removal — Remove transmission, clutch pressure plate and disc (if equipped), flywheel, flywheel housing and rear plate. Remove old seal using two sheet metal screws. See Fig. 6.

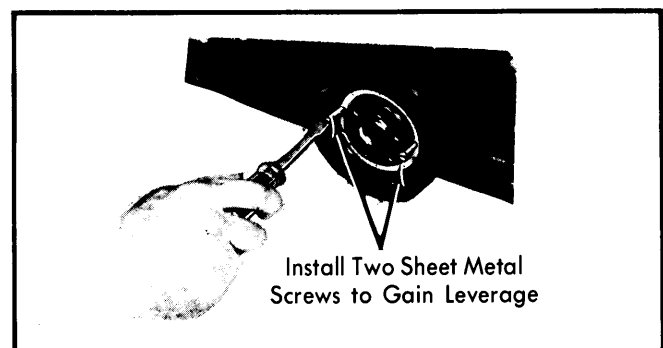


Fig. 6 Rear Main Oil Seal Removal

Installation — Coat seal to cylinder block surface of oil seal with oil. Coat seal contact surface of oil seal and crankshaft with Lubriplate. Start seal in recess and install with suitable tool (T72C-6165-A). Drive seal into position until firmly seated. Reinstall parts previously removed.

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CAMSHAFT

ENGINE FRONT COVER

Removal — Drain cooling system and crankcase. Remove radiator, fan shroud and oil pan. Remove A/C compressor and bracket (if equipped), alternator, thermactor pump, drive belts, fan and water pump. Remove drive pulley from crankshaft. Remove front cover bolts and cover. If front cover plate gasket needs replacement, remove two screws and plate. Remove guide sleeves from cylinder block (if necessary).

Installation — 1) Clean all gasket mating surfaces. Apply suitable sealing compound to block and back side of front cover plate. Position gasket and front cover plate on cylinder block.

2) Temporarily install four front cover screws to position gasket and cover plate, then install and tighten two cover plate attaching screws. Remove alignment bolts and fit new seal rings to guide sleeves (no sealer used).

3) Insert sleeves in block with chamfered side of sleeve toward front cover. Apply suitable sealer to front cover gasket and position gasket on front cover and front cover on block. Use suitable tool (T74P-6019-A) inserted in front cover oil seal to align cover. Install bolts and tighten.

4) Coat new seal with Lubriplate. Slide suitable tool (T74P-6700-A) and seal onto crankshaft. Drive seal in until tool butts against front cover. Replace other parts previously removed.

FRONT COVER OIL SEAL

Seal may be replaced with front cover installed on vehicle. Proceed as follows:

1) Drain cooling system and remove radiator, crankshaft pulley and water pump drive belt. Use suitable puller (1175-AB) to remove seal. See Fig. 7.

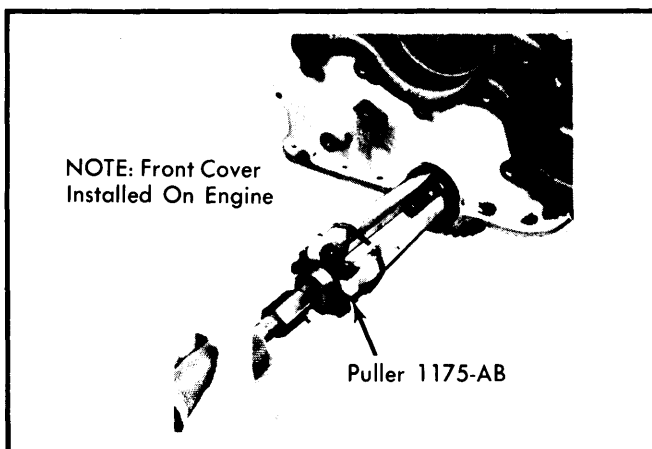


Fig. 7 Front Cover Oil Seal Removal

2) Coat new seal with Lubriplate. Slide suitable tool (T74P-6700-A) and seal onto crankshaft. Drive seal in until tool seats against front cover. Replace parts previously removed.

TIMING GEARS

NOTE — When checking backlash, remove valve spring load by loosening lash adjusting screws. Hold gear firmly against block.

Using a dial indicator, check that backlash between camshaft gear and crankshaft gear is .006-.010". If backlash exceeds specification, replace BOTH gears as follows:

Removal — Drain cooling system and crankcase. Remove radiator, oil pan and engine front cover. Remove water pump and drive belt. Remove camshaft gear retaining bolt and slide gear off camshaft. Use suitable gear puller and remove crankshaft gear.

Installation — Turn camshaft and crankshaft as necessary to align timing marks. See Fig. 8. Install camshaft gear. Install crankshaft gear with keyway up. Recheck timing marks to make sure they are still aligned. Replace components previously removed.

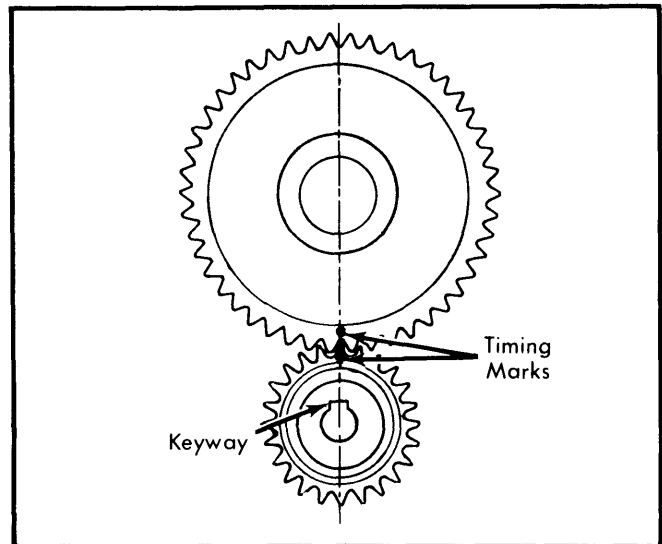


Fig. 8 Timing Gear Marks Aligned with Crankshaft Keyway Facing Up

CAMSHAFT

Removal — Remove engine front cover, intake manifold and alternator. Drain crankcase. Remove rocker arm shaft and push rods, marking rods for installation in original location. Remove oil pan, camshaft gear bolt and camshaft gear. Remove thrust plate and screws. Remove valve lifters using a magnet. Carefully remove camshaft from block.

Installation — Oil camshaft journals with engine oil and apply Lubriplate to cam lobes. Carefully install camshaft in engine. Install spacer ring (chamfered side toward camshaft), camshaft key and thrust plate (covering main oil gallery). Reverse removal procedure for remaining parts.

CAMSHAFT BEARINGS

Removal — With engine removed from vehicle, remove flywheel, camshaft and rear bearing bore plug. Use suitable collet and back-up nut assembled on expanding mandrel (T71P-6250-A) to remove bearings.

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Installation — Position new bearings at bearing bores and press into place using correct size expanding collet. Be sure to center pulling plate and puller screw to avoid damage to bearing. Align oil holes in cylinder block when bearings are installed. Install bearing bore plug and other parts previously removed. Front edge of No. 1 bearing must be installed .040-.060" below front face of cylinder block.

CAMSHAFT END THRUST

Rocker arm shaft assembly must be loosened sufficiently to free camshaft. Push camshaft toward rear of engine and install dial indicator so point is on camshaft sprocket bolt. Zero indicator. Position screwdriver between camshaft gear and block, pull camshaft forward and release. If end play is excessive, replace thrust plate.

CAUTION — Do not attempt to pry camshaft back and forth with valve train load on camshaft.

CAM LOBE LIFT

Check lift of each camshaft lobe in consecutive order as follows:

- 1) Remove rocker arm shaft assembly and make sure each push rod is in valve lifter socket. Install dial indicator so ball socket adapter of indicator rests on end of push rod and in same plane as push rod movement. With an auxiliary starter switch connected to starter solenoid and ignition switch "OFF", bump crankshaft until tappet is on base circle of camshaft lobe (push rods lowest point).
- 2) Zero dial indicator and continue to rotate crankshaft until push rod is in fully raised position (highest indicator reading). Compare total lift from indicator readings with specifications. If lift on any lobe is .005" less than specifications, valve lifters are operating on worn lobes.

ENGINE OILING

Crankcase Capacity — 5 quarts which includes ½ quart with filter replacement.

Oil Filter — Change filter at first oil change and at alternate oil changes after that.

Normal Oil Pressure (Hot) — 40-60 psi @ 2000 RPM.

Pressure Regulator Valve — In pump body, not adjustable.

ENGINE OILING SYSTEM

The V6 engine is pressure fed by a rotor type oil pump, which filters all oil through a full flow filter before entering engine. An oil gallery supplies oil to crankshaft main bearings, from there through slanted passages in crankshaft to connecting rod journals. Connecting rod big ends have a squirt hole which sprays oil on thrust side of cylinder bores. Oil from the oil gallery also feeds camshaft main bearings, which have grooves 180° of their circumference. From these grooves, passages lead to distributor drive gear and rocker arm shafts.

OIL PUMP

Disassembly — Remove pick-up tube and screen assembly from pump housing. Remove cover and lift out two-piece rotor assembly. Drill a small hole and insert self-threading sheet metal screw into oil pressure relief valve plug and remove plug. Remove spring and valve.

Reassembly — Clean, inspect (see specifications) and oil all parts. Install relief valve, spring and new plug in oil pump housing. Install plug with flat side pointing out and spread plug in housing using a drift. Install inner and outer rotors and shaft assembly in housing with dot reference marks up. Install cover and pick-up tube assembly.

Oil Pump Specifications

Application	Specification
Outer Race-to-Housing Clearance.....	.001-.013"
Rotor Endplay004" Max.
Shaft-to-Housing Clearance.....	.0015-.0030"
Relief Valve-to-Bore Clearance0015-.0030"
Relief Valve Spring Pressure	13.6-14.7 Lbs. @ 1.39"

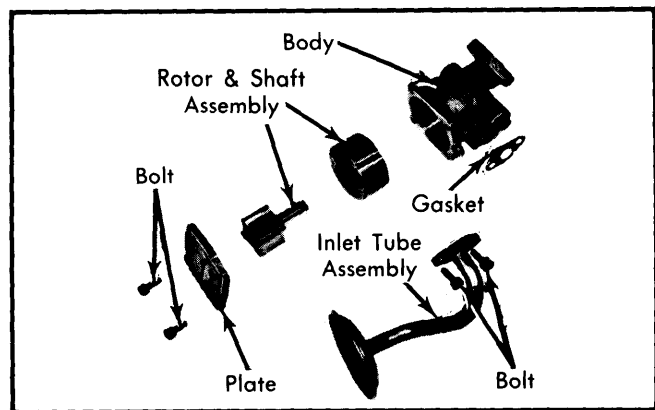


Fig. 9 Exploded View of Oil Pump Assembly

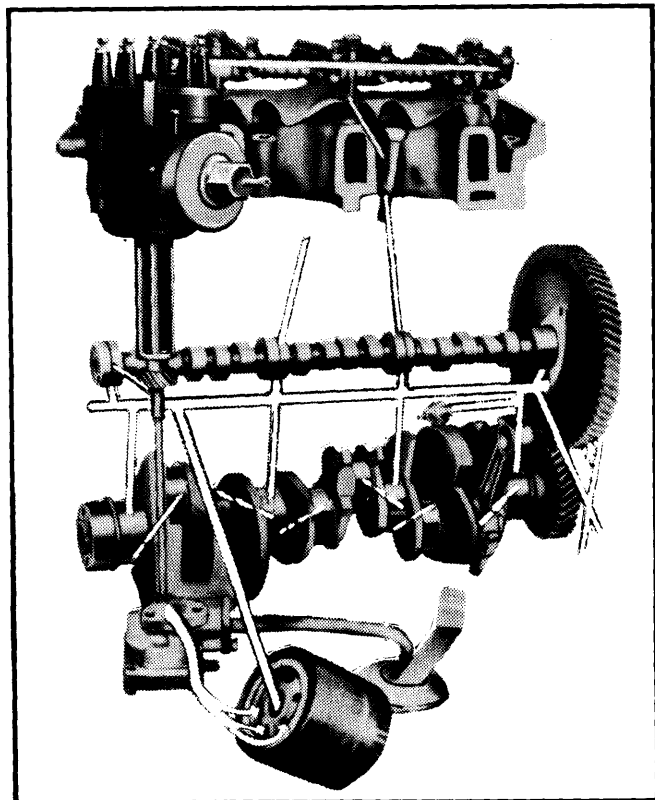


Fig. 10 Engine Oiling System

Ford Motor Co. V6 Engines

2800 cc V6 (Cont.) ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

Engine	Net HP At RPM	Torque (Ft. Lbs. at RPM)	Compr. Ratio	Bore	Stroke	Displ. Cu. Ins.
2800 cc	102 @ 4400	138 @ 3200	8.7-1	3.65"	2.70"	169

VALVES

Engine & Valve	Head Diam.	Face Angle	Seat Angle	Seat Width	Stem Diameter ①	Stem Clearance	Valve Lift
2800 cc Int.	1.570"	44°	45°	.060-.079"	.3159-.3167"	.0008-.0025"	.373"
Exh.	1.269"	44°	45°	.060-.079"	.3149-.3156"	.0018-.0035"	.373"

① Available in .008", .016" and .032" Oversize

CAMSHAFT

Engine	Journal Diam.	Clearance ①	Lobe Lift
2800 cc			
No. 1	1.6501"	.0010-.0026"	.2555"
No. 2	1.6351"		
No. 3	1.6201"		
No. 4	1.6051"		

① — End play is .0008-.004".

VALVE SPRINGS

Engine	Free Length	PRESSURE (LBS.)	
		Valve Closed	Valve Open
2800 cc	1.91"	60-68@1.585"	138-149@1.222"

PISTONS, PINS, RINGS

Engine	PISTONS	PINS		RINGS		
	Clearance	Piston Fit	Rod Fit	Rings	End Gap	Side Clearance
2800 cc	.0011-.0019"	.0003-.0006"	Press Fit	Comp. Oil	.015-.023" .015-.055"	.0020-.0033" Snug

CRANKSHAFT MAIN & CONNECTING ROD BEARINGS

Engine	MAIN BEARINGS				CONNECTING ROD BEARINGS		
	Journal Diam.	Clearance	Thrust Bearing	Crankshaft End Play	Journal Diam.	Clearance	Side Play
2800 cc	2.2433-2.2441"	.0008-.0015"	No. 3	.004-.008"	2.1252-2.1260"	.0006-.0016"	.004-.011"

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs.	Application	Ft. Lbs.
Camshaft Gear.....	30-36	Main Bearing Cap.....	65-75
Camshaft Thrust Plate.....	12-15	Oil Pan.....	7-10
Connecting Rod Cap.....	21-25	Water Pump.....	7-9
Crankshaft Damper.....	92-103	Engine Front Cover.....	12-15
Cylinder Head..... ①		Oil Pump.....	12-15
Exhaust Manifold.....	20-30	Rocker Arm Shaft.....	43-49
Flywheel.....	47-51	① — Step one 40 ft. lbs., step two 50 ft. lbs., step three 65-80 ft. lbs.	
Fuel Pump.....	17-21	② — Step one 6 ft. lbs., step two 11 ft. lbs., step three 16 ft. lbs., step four 15-18 ft. lbs. Retorque to final value after engine has been operated.	
Intake Manifold			
Bolt or Nut..... ②			
Stud.....	10-12		