5.0 L, 5.7 L, & 7.4 L

INDUSTRIAL GASOLINE ENGINE

Owner/Operators Manual

A GM *Powertrain* Product
by Great Lakes Power Center, Inc.
Wood Dale, IL

A Subsidiary of Power Great Lakes, Inc. TM

SECTION 6A5B

V8 ENGINES
5.0L (305 CID) RPO L03, VIN H
5.7L (350 CID) RPO L05, VIN K
7.4L (454 CID) RPO L19, VIN N

CAUTION: On vehicles equipped with Supplemental Inflatable Restraint (SIR), refer to CAUTIONS in Section 9J under "ON-VEHICLE SERVICE" and the SIR Component and Wiring Location view in Section 9J before performing service on or around SIR components or wiring. Failure to follow CAUTIONS could result in possible air bag deployment, personal injury, or otherwise unneeded SIR system repairs.

NOTICE: Always use the correct fastener in the correct location. Use the correct fastener part number to replace a fastener. If the correct fastener part number is not available, a fastener of equal size and strength may be used. Do not use a fastener that is stronger when the correct fastener part number is not available in the following applications:

- *Some bolts are designed to permanently stretch, and if a stronger fastener is used, the part will not be tightened correctly. These permanently stretching bolts will be called out. The correct part number fasteners must be used to replace this type of fastener because there is no available equivalent.*
- *Other bolts are designed to break if over tightened to prevent part damage. Using a stronger fastener may cause part damage to occur. Fasteners that need to be replaced when removed will be called out. The correct tightening specification and sequence must be used when installing fasteners. Part or system damage may occur if the above instructions are not followed.*

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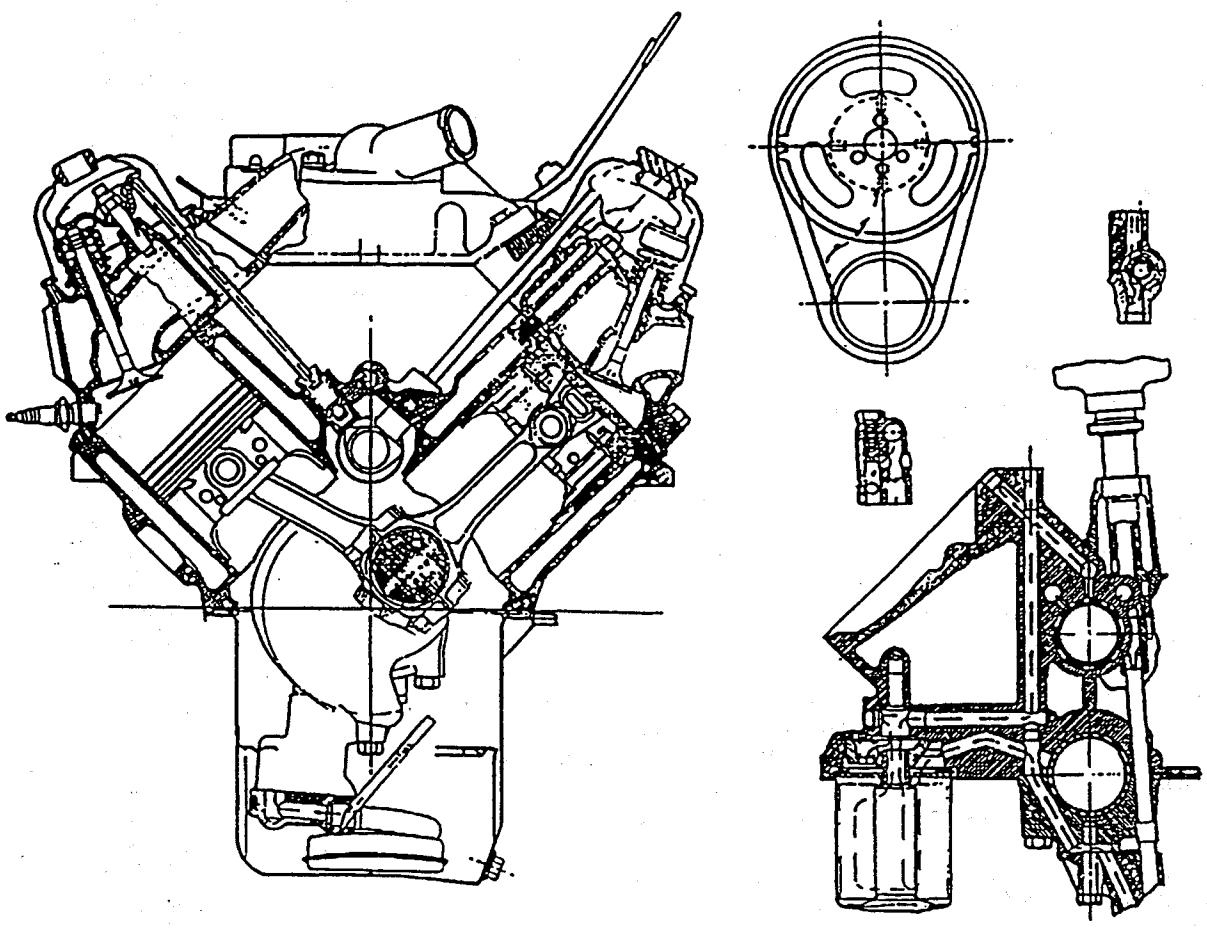

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Figure 2—Lubrication Diagram (5.0L and 5.7L Engines)

GENERAL DESCRIPTION

The engines covered in this section are 90-degree V8 type, overhead valve, liquid cooled, with cast iron block and cylinder heads.

The camshaft is supported by five plain type bearings and is chain driven. Motion from the camshaft is transmitted to the valves by hydraulic lifters, pushrods, and ball-pivot type rocker arms. Heavy Duty 5.7L exhaust valve guides and all 7.4L valve guides are pressed in.

The crankshaft is supported by five precision insert type bearings, with crankshaft thrust taken at the number five (rear) bearing.

The connecting rods are forged steel, with precision insert type crankpin bearings. The piston pins are a press fit in the connecting rods.

The pistons are cast aluminum alloy. The piston pins are a floating fit in the pistons.

The gear-type oil pump is driven through an extension shaft from the distributor driveshaft which is gear driven from the camshaft. The oil is drawn from the engine oil pan through a pickup screen and tube. Pressurized oil is delivered through internal passages to the camshaft and crankshaft to lubricate the bearings. Oil under pressure flows from the hydraulic lifters through the pushrod to lubricate the rocker arm and ball pivot. This provides valve lash take-up from the lifters. Lubrication diagrams are shown in figures 1, 2, and 3.

ENGINE IDENTIFICATION

Two basic types of engines, with three different displacements, are covered in this section.

The first type is the "small block" engine, which is available in 5.0L (305 CID) and 5.7L (350 CID) displacements.

The second type is the 7.4L (454 CID) engine, which is sometimes referred to as the "Mark" engine.

To determine the displacement of the engine, use the vehicle identification number (VIN) of the vehicle the engine was removed from. Refer to "Engine Specifications" at the end of this section. If the VIN is not avail-

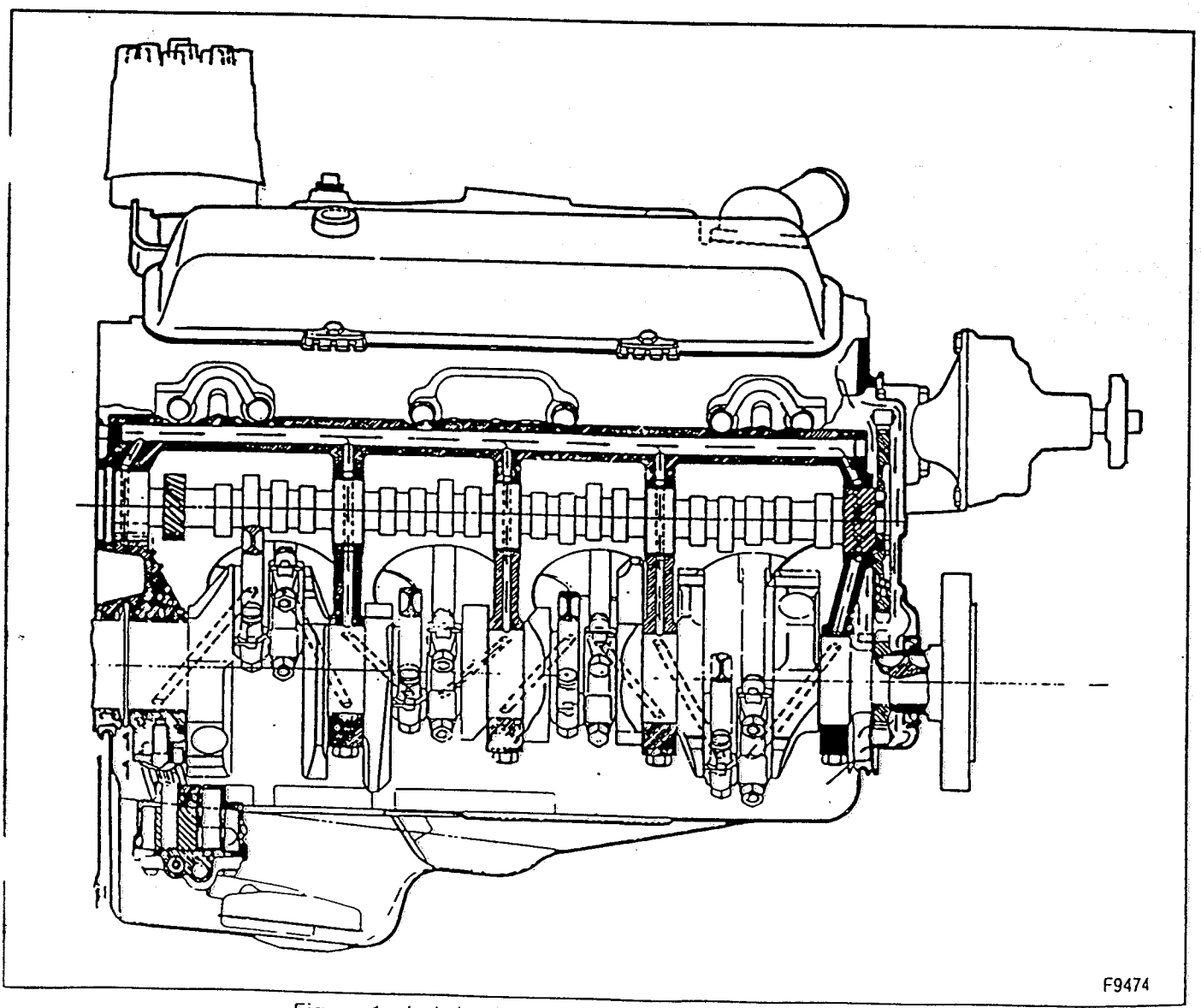

Figure 1—Lubrication Diagram (5.0L and 5.7L Engines)

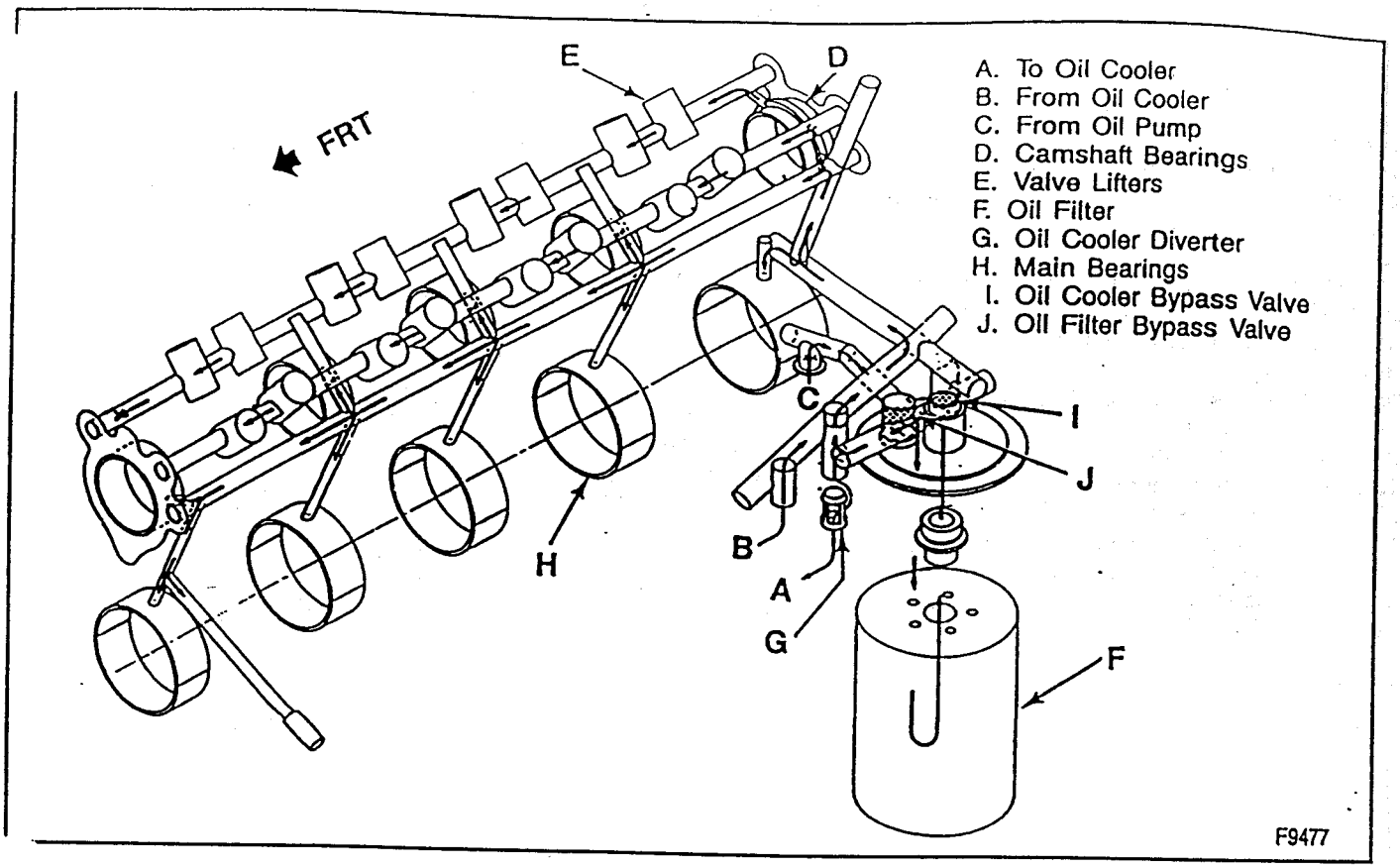

Figure 3—Lubrication Diagram (7.4L Engines)

able, the bore and stroke of the engine involved can be measured and compared against "Engine Specifications" to determine the engine model; or, with "Mark" engines, the engine displacement (in liters) is cast into each side of the cylinder block.

Refer to Section 0A in the proper on-vehicle Truck Service Manual identification information. Refer to figures 4 through 11 for engine component identification.

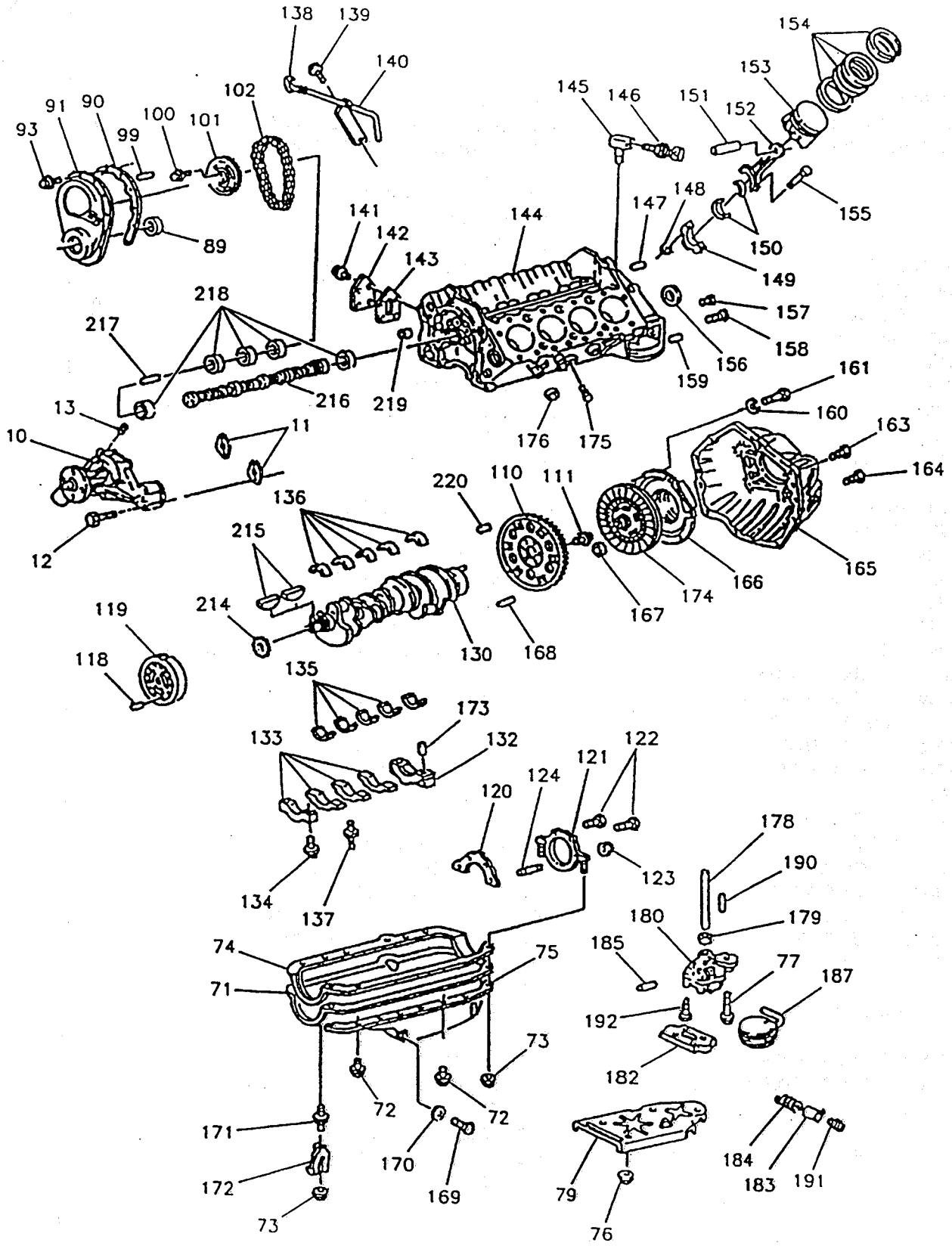

Figure 4—Cylinder Block and Components (5.0L and 5.7L Engines)

10 COOLANT PUMP
11 COOLANT PUMP GASKET
12 COOLANT PUMP BOLT
13 PLUG
71 OIL PAN
72 BOLT
73 NUT
74 OIL PAN GASKET
75 REINFORCEMENT
76 OIL PAN DEFLECTOR
77 OIL PUMP BOLT
79 OIL PAN DEFLECTOR
89 CRANKSHAFT FRONT OIL SEAL
90 FRONT COVER GASKET
91 FRONT COVER
93 FRONT COVER BOLT
99 PIN
100 CAMSHAFT SPROCKET BOLT
101 CAMSHAFT SPROCKET
102 TIMING CHAIN
110 FLYWHEEL
111 FLYWHEEL BOLT
118 GROOVE PIN
119 TORSIONAL DAMPER
120 REAR SEAL RETAINER GASKET
121 CRANKSHAFT REAR SEAL RETAINER
122 REAR SEAL RETAINER SCREW
123 REAR SEAL RETAINER NUT
124 REAR SEAL RETAINER STUD
130 CRANKSHAFT
132 REAR MAIN BEARING CAP
133 MAIN BEARING CAP
134 MAIN BEARING CAP BOLT
135 LOWER MAIN BEARING INSERT
136 UPPER MAIN BEARING INSERT
137 MAIN BEARING CAP STUD
138 OIL LEVEL INDICATOR
139 BOLT
140 OIL LEVEL INDICATOR TUBE
141 BOLT
142 FUEL PUMP OPENING COVER
143 FUEL PUMP OPENING COVER GASKET
144 ENGINE BLOCK
145 FITTING
146 OIL PRESSURE AND FUEL PUMP SWITCH SENSOR
147 PLUG
148 NUT
149 CONNECTING ROD BEARING CAP
150 CONNECTING ROD BEARING
151 PISTON PIN
152 CONNECTING ROD
153 PISTON
154 PISTON RINGS
155 CONNECTING ROD BOLT
156 EXPANSION CUP PLUG
157 PLUG
158 DRAIN PLUG
159 DOWEL PIN
160 LOCK WASHER
161 CLUTCH COVER AND PRESSURE PLATE BOLT
163 BOLT
164 CLUTCH FORK BALL STUD
165 CLUTCH HOUSING
166 CLUTCH PRESSURE PLATE COVER
167 CLUTCH PILOT BEARING
168 FLYWHEEL DOWER PIN
169 OIL PAN DRAIN PLUG
170 GASKET
171 OIL PAN STUD
172 CLAMP (AUTOMATIC TRANSMISSION ONLY)
173 SPRING PIN
174 CLUTCH DRIVEN PLATE
175 PLUG
176 EXPANSION CUP PLUG
178 OIL PUMP DRIVE SHAFT
179 RETAINER
180 OIL PUMP
182 OIL PUMP COVER
183 OIL PRESSURE REGULATOR VALVE
184 REGULATOR VALVE SPRING
185 SPRING STOP RETAINING PIN
187 PICK-UP SCREEN AND PIPE
190 PIN
191 REGULATOR VALVE SPRING STOP PLUG
192 BOLT
214 CRANKSHAFT SPROCKET
215 WOODRUFF KEY
216 CAMSHAFT
217 PIN
218 CAMSHAFT BEARINGS
219 OIL PRESSURE PLUG
220 GROOVE PIN

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Figure 5—Cylinder Block and Components (5.0L and 5.7L Engines) - Legend

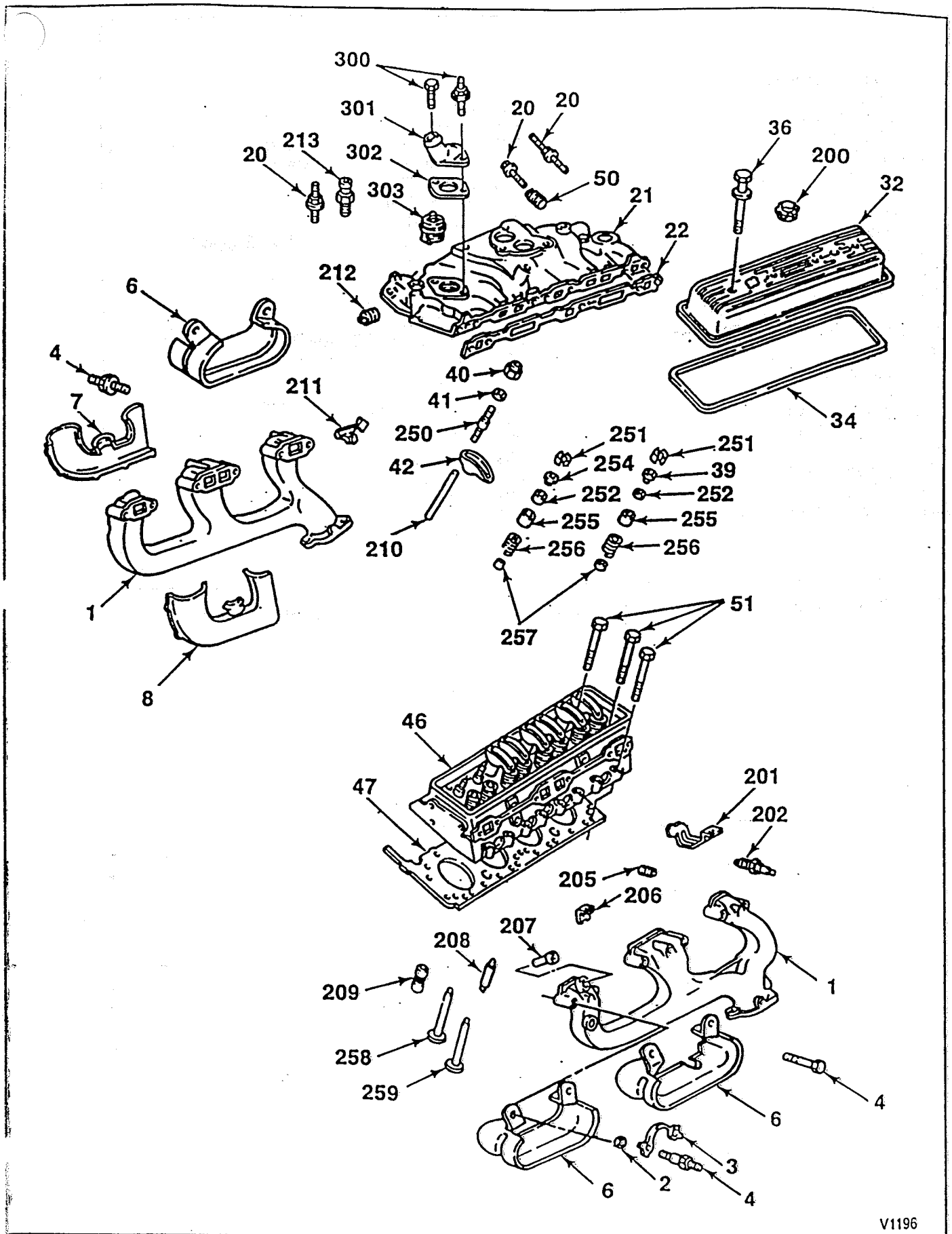

Figure 6—Cylinder Head, Manifolds, and Components (5.0L and 5.7L Engines)

1. Exhaust Manifold
2. Washer
3. Exhaust Manifold Lock
4. Bolt/Stud
6. Heat Shield
7. Outer Heat Stove
8. Inner Heat Stove
20. Bolt/Stud
21. Intake Manifold
22. Intake Manifold Gasket
32. Rocker Arm Cover
34. Rocker Arm Cover Gasket
36. Rocker Arm Cover Bolt
39. Inlet Valve Spring Cap
40. Rocker Arm Nut
41. Rocker Arm Ball
42. Rocker Arm
46. Cylinder Head
47. Cylinder Head Gasket
50. Plug
51. Cylinder Head Bolts
200. Oil Filler Cap
201. Spark Plug Wire Retainer Support
202. Spark Plug
205. Plug
206. Spark Plug Wire Support
207. Air Injection Pipe Extension
208. Dowel Pin
209. Valve Lifter
210. Pushrod
211. Spark Plug Wire Retainer Support
212. Drain Plug
213. Coolant Temperature Sensor
250. Rocker Arm Stud
251. Valve Stem Key
252. Valve Stem Oil Seal (O-Ring)
254. Exhaust Valve Rotator
255. Valve Stem Oil Shield
256. Valve Spring with Damper
257. Valve Stem Oil Seal
258. Exhaust Valve
259. Inlet Valve
300. Bolt/Stud
301. Coolant Outlet
302. Gasket
303. Thermostat

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Figure 7—Cylinder Head, Manifolds, and Components (5.0L and 5.7L Engines) - Legend

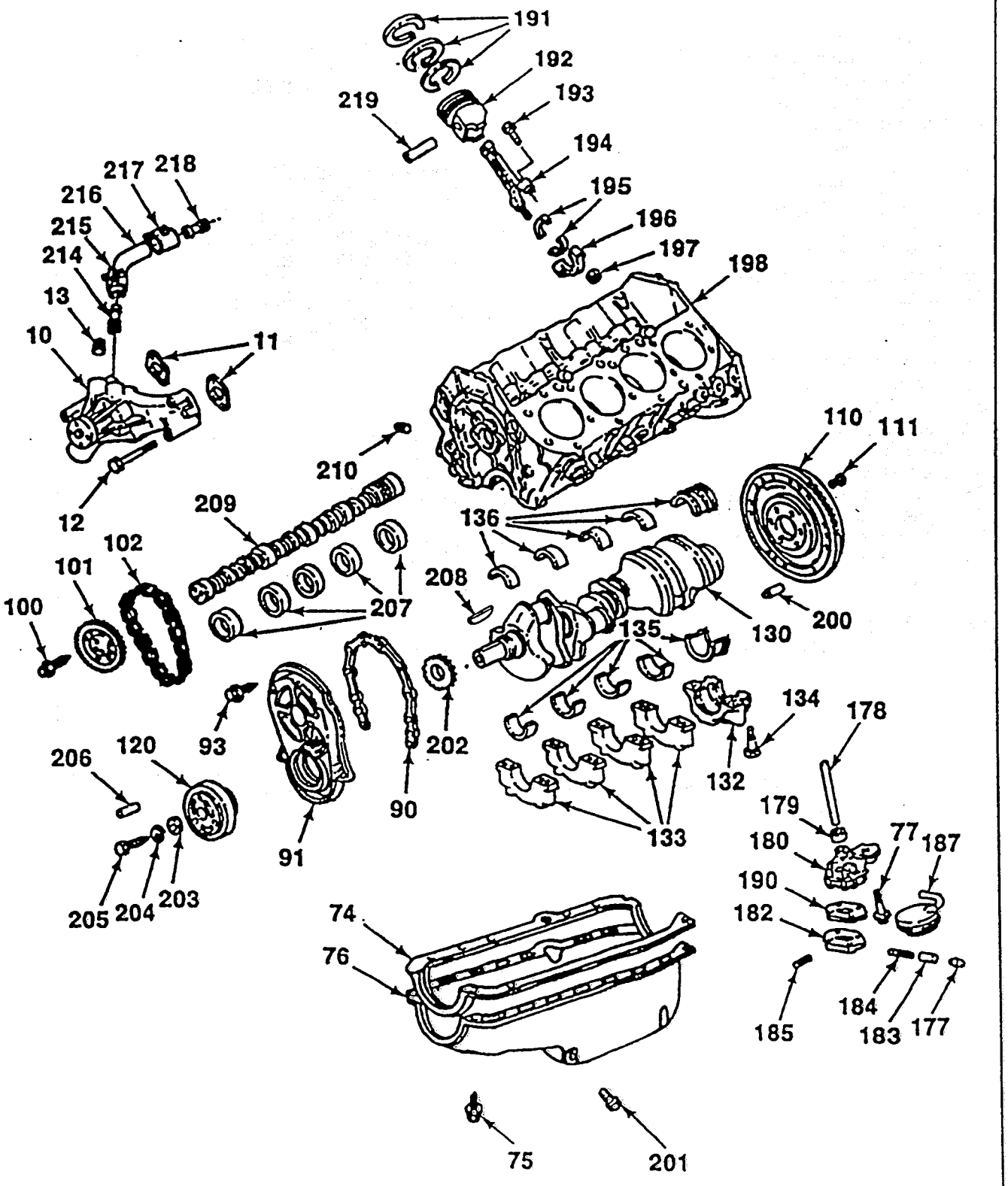

Figure 8—Cylinder Block and Components (7.4L Engine)

10. Coolant Pump
11. Coolant Pump Gasket
12. Coolant Pump Bolt
13. Coolant Pump Plug
74. Oil Pan Gasket
75. Oil Pan Bolt
76. Oil Pan
77. Oil Pump Bolt
90. Front Cover Gasket
91. Front Cover
93. Front Cover Bolt
100. Camshaft Sprocket Bolt
101. Camshaft Sprocket
102. Timing Chain
110. Flywheel
111. Flywheel Bolt
120. Torsional Damper
130. Crankshaft
132. Rear Main Bearing Cap
133. Main Bearing Cap
134. Main Bearing Cap Bolt
135. Lower Main Bearing Insert
136. Upper Main Bearing Insert
177. Regulator Valve Spring Retainer
178. Oil Pump Driveshaft
179. Connector
180. Oil Pump Body
182. Oil Pump Cover
183. Oil Pressure Regulator Valve
184. Oil Pressure Regulator Valve Spring
185. Spring Retaining Pin
187. Pick-up Screen and Pipe
190. Gasket
191. Piston Rings
192. Piston
193. Connecting Rod Bolt
194. Connecting Rod
195. Connecting Rod Bearing
196. Connecting Rod Bearing Cap
197. Connecting Rod Nut
198. Engine Block
200. Engine Balance Groove Pin
201. Oil Pan Drain Plug
202. Crankshaft Sprocket
203. Washer
204. Spring Lock Washer
205. Bolt
206. Engine Balance Groove Pin
207. Camshaft Bearings
208. Woodruff Key
209. Camshaft
210. Drain Plug
214. Nipple
215. Clamp
216. Hose
217. Clamp
218. Nipple
219. Piston Pin

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Figure 9—Cylinder Block and Components (7.4L Engine) - Legend

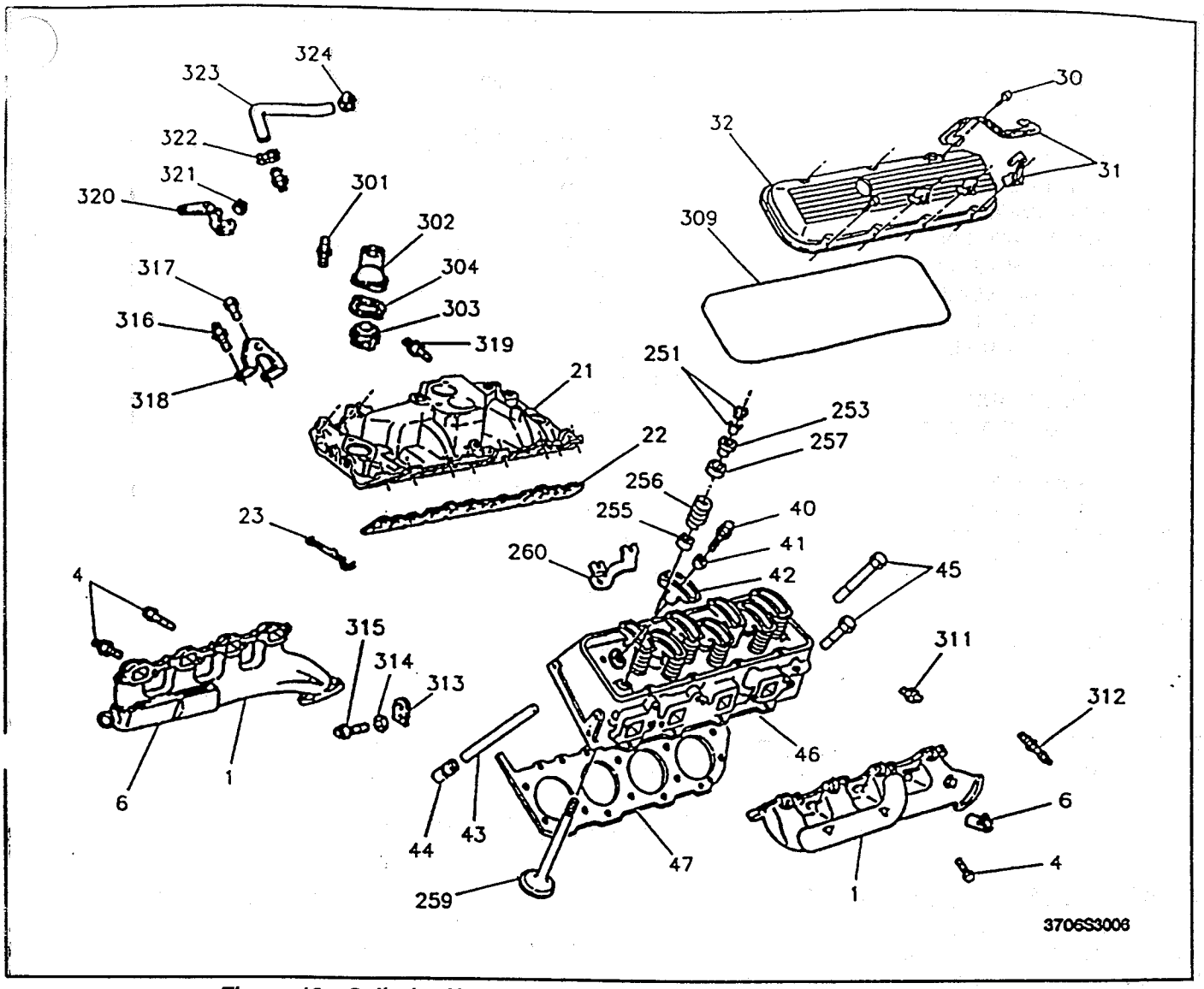

Figure 10—Cylinder Head, Manifolds, and Components (7.4L Engine)

1	EXHAUST MANIFOLD
4	BOLT/STUD
6	HEAT SHIELD ASSEMBLY
21	INTAKE MANIFOLD
22	INTAKE MANIFOLD GASKET
23	INTAKE MANIFOLD SEAL
30	ROCKER COVER BOLT
31	SUPPORT, SPARK PLUG WIRES
32	ROCKER ARM COVER
40	ROCKER ARM BOLT
41	ROCKER ARM BALL
42	ROCKER ARM
44	HYDRAULIC LIFTER
45	CYLINDER HEAD BOLT
46	CYLINDER HEAD
47	CYLINDER HEAD GASKET
251	VALVE STEM KEY
253	VALVE SPRING CAP
255	VALVE SPRING ROTATOR
256	VALVE SPRING
257	VALVE STEM OIL SEAL
259	INTAKE VALVE
260	PUSHROD GUIDE
301	STUD
302	COOLANT OUTLET
303	THERMOSTAT
304	GASKET
309	ROCKER COVER GASKET
311	COOLANT TEMPERATURE SENSOR
312	SPARK PLUG
313	ENGINE LIFT BRACKET
314	SPRING LOCK WASHER
315	BOLT
316	STUD
317	BOLT
318	ENGINE LIFT BRACKET
319	STUD
320	EGR ELECTRONIC VACUUM REGULATOR SOLENSOID VALVE BRACKET
321	NUT
322	CLAMP
323	HOSE
324	CLAMP
325	NIPPLE

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Figure 11—Cylinder Head, Manifolds, and Components (7.4L Engine) - Legend

DISASSEMBLY OF THE ENGINE

TOOLS AND SHOP EQUIPMENT

A clean, well lit work area should be available. Other necessary equipment includes: a suitable parts cleaning tank, compressed air supply, trays to keep parts and fasteners organized, and an adequate set of hand tools. An approved engine repair stand will help prevent personal injury or damage to engine components.

Special tools are illustrated throughout this section and listed at its end. These tools (or their equivalents) are specially designed to quickly and safely accomplish the operations for which they are intended. The use of these tools will also minimize possible damage to engine components.

Some precision measuring tools are required for inspection of certain critical components. Torque wrenches will be necessary for correct assembly of various parts.

ACCESSORY REMOVAL

This manual assumes that the engine accessories have been removed. These accessories may include one or more of the following:

- Power Steering Pump
- Distributor
- AIR System Pump
- Generator
- Air Conditioning Compressor
- EGR Valve and Emission Control Equipment
- Cooling Fan

It is beyond the scope of this section to detail the many different accessory installations. Refer to the proper on-vehicle Truck Service Manual for this information.

Diagrams of emission and vacuum hose routings, wiring harness routing, accessory drive belt layout, etc., should be made before removing accessories.

CLEANING

Remove the engine accessories before cleaning to provide better access to the engine's exterior surfaces. After removing the TBI unit, distributor, etc., cover the openings with tape to prevent the entry of coolant, solvent, and dirt.

Methods used to clean the engine will depend on what equipment is available. Steam cleaning, pressure washing, or solvent cleaning are some acceptable methods. Allow the engine to dry before beginning the work.

It is important that the engine be as clean as possible to prevent dirt from entering critical areas during disassembly.

DRAINING THE ENGINE

[←→] Remove or Disconnect

1. Oil pan drain plug. Allow the oil pan to drain.
2. Oil filter.

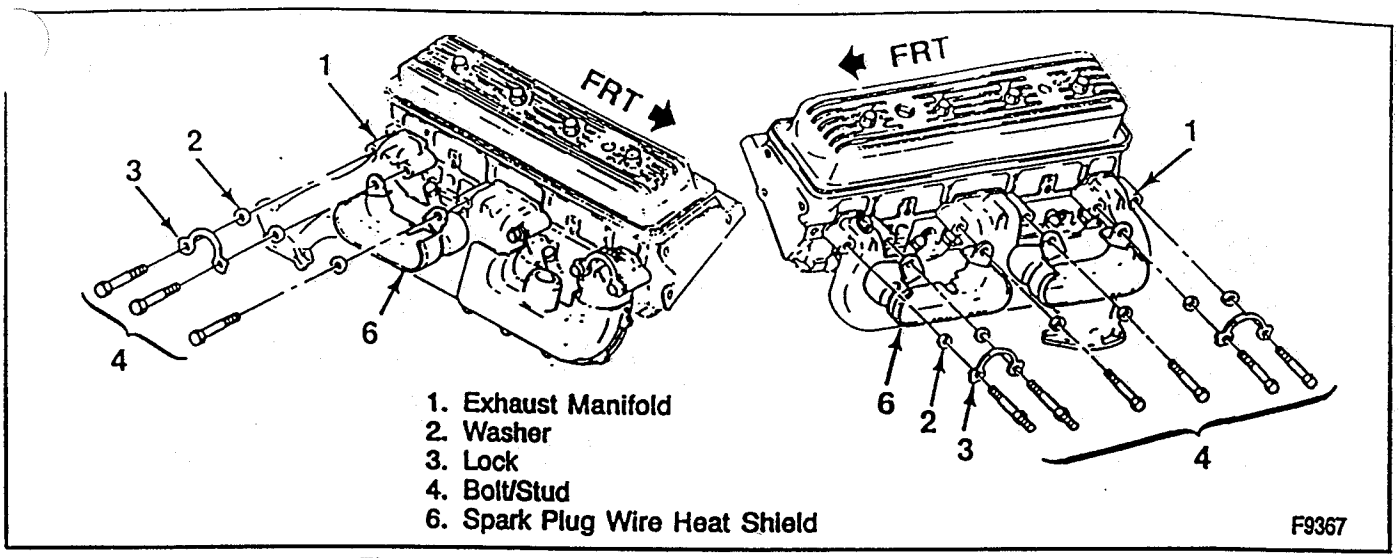


Figure 12—Exhaust Manifold (5.0L and 5.7L Engines)

3. Block drain plugs. Allow the coolant to drain.

Install or Connect

NOTICE: For steps 1 and 2, refer to "Notice" on page 6A5B-1.

1. Oil pan drain plug.

Tighten

- Oil pan drain plug to 22 N.m (16 lbs. ft.) 5.0L/5.7L Engines).
- Oil pan drain plug to 28 N.m (20 lbs. ft.) (7.4L Engines).

2. Block drain plugs.

Tighten

- Block drain plugs to 22 N.m (16 lbs. ft.) (5.0L/5.7L Engines).
- Block drain plugs to 12 N.m (112 lbs. in.) (7.4L Engine).

EXHAUST MANIFOLD REMOVAL

Remove or Disconnect (Figures 12 and 13)

1. Oil dipstick tube.
   - On 5.0L and 5.7L engines, bend back the tab washers (3).
2. Bolts and studs (4).
3. Tab washers (3) and washers (2).
4. Heat shields (6).
5. Exhaust manifold (1). Use care not to damage the AIR system injection tubes (if used).

COOLANT PUMP REMOVAL

Remove or Disconnect (Figures 14 and 15)

1. Bolts (12).
2. Coolant pump (10).
3. Gaskets (11).
4. Bypass hose and clamps (7.4L engines).

INTAKE MANIFOLD REMOVAL

Remove or Disconnect (Figures 16 and 17)

1. Bolts (19) and studs (20).
2. Intake manifold (21).
   - Pull the intake manifold up.

NOTICE: Do not attempt to loosen the manifold by prying under the gasket surface with any tool.

3. Gaskets (22).
4. Seals (23) (7.4L engines).

ROCKER ARM COVER REMOVAL

Remove or Disconnect (Figures 18 and 19)

1. Bolts (30 or 36).
2. Rocker arm covers (32). If the rocker arm cover sticks to the cylinder head, try bumping the end of the cover with a rubber mallet. If the cover will not come loose, carefully pry until loose. DO NOT DISTORT THE SEALING FLANGE.
3. Gaskets (34).

VALVE TRAIN COMPONENT REMOVAL

Remove or Disconnect (Figures 20 through 26)

Tools Required:
J 3049-A Valve Lifter Remover (Plier Type)
J 9290-01 Valve Lifter Remover (Slide Hammer Type)

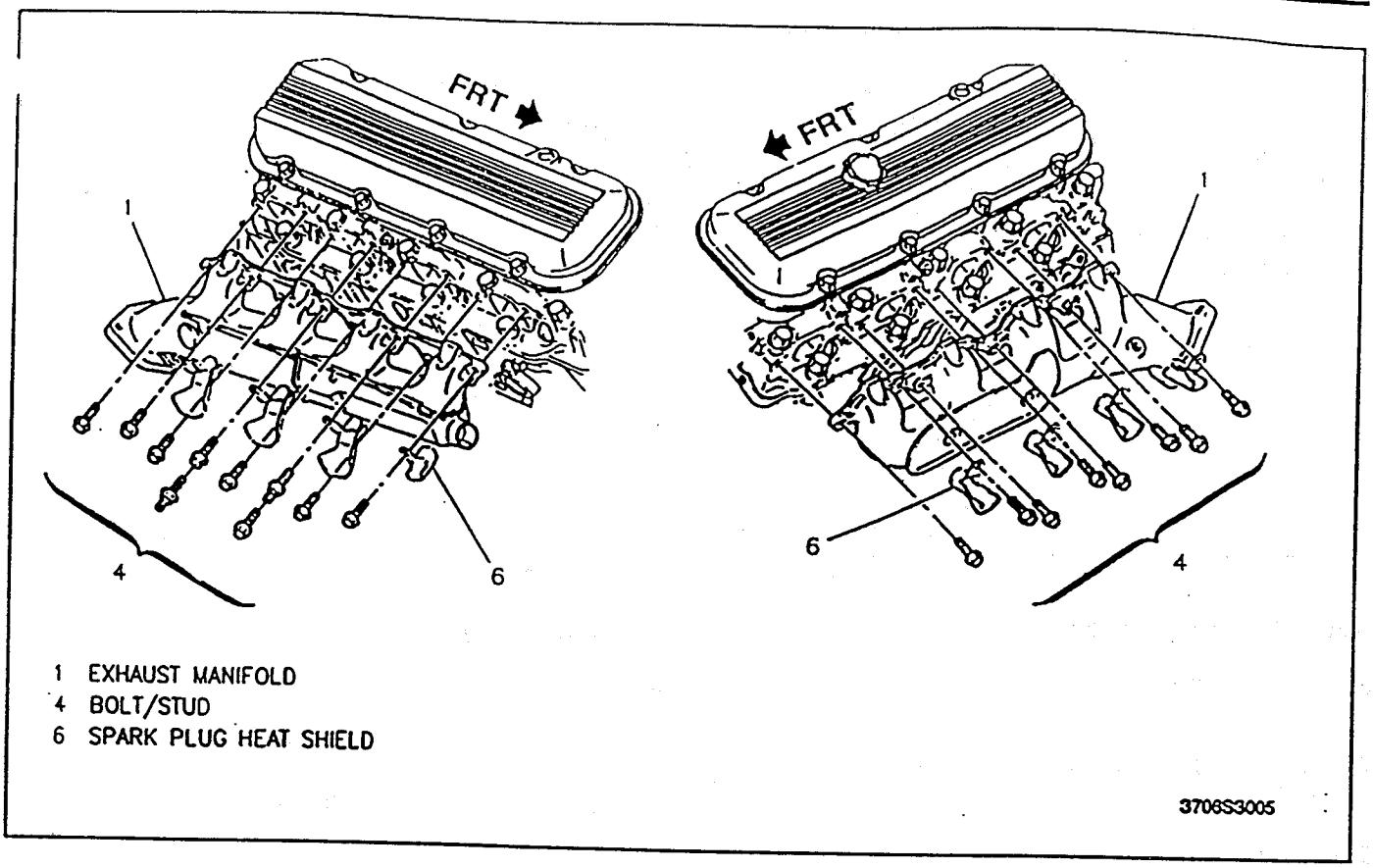


Figure 13—Exhaust Manifold (7.4L Engines)

1. Nuts (40) (5.0L and 5.7L engines) or bolts (40) (7.4L engines), balls (41), rocker arms (42), and pushrods (43 or 210).
   - On 7.4L engines, the exhaust valve pushrods are longer than the intake valve pushrods.
   - Every effort should be made to ensure that these mating parts are installed in their original locations during assembly. A simple valve train component organizer rack can be made from a piece of wood, as shown in figure 24.

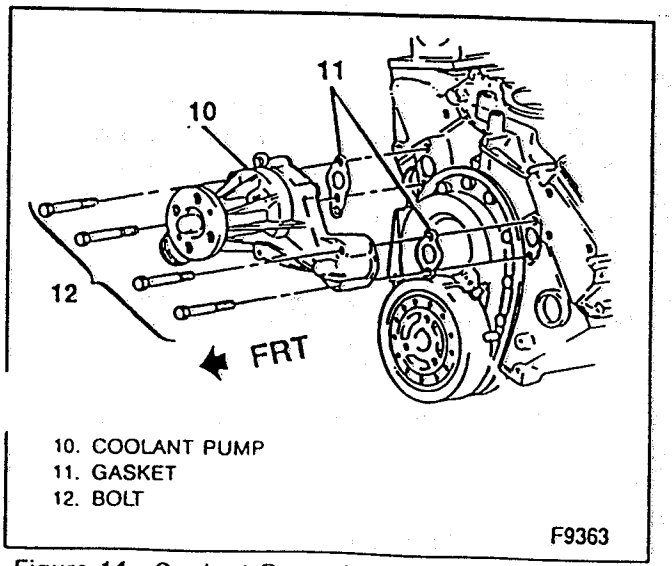


Figure 14—Coolant Pump (5.0L and 5.7L Engines)

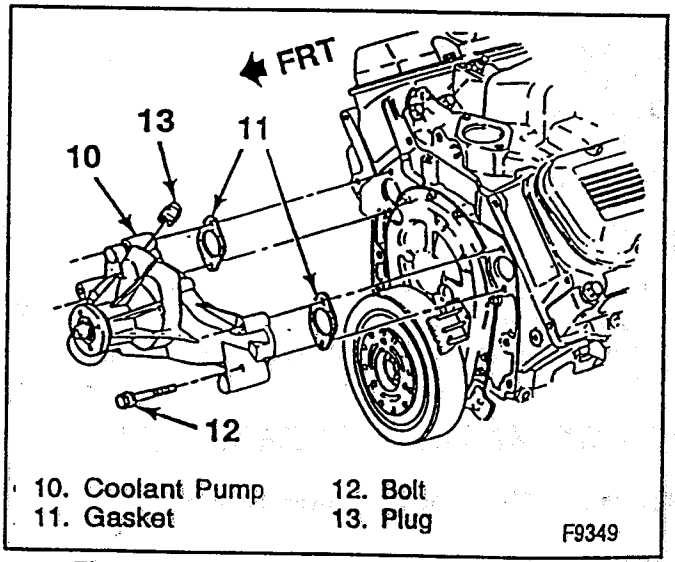


Figure 15—Coolant Pump (7.4L Engines)

2. Hydraulic lifters (44 or 209).
   - Remove the lifters one at a time using a magnet. Place the lifters in the organizer rack, or tag them in some way to ensure they can be returned to the valve lifter bore from which they were removed.
   - Some lifters may be stuck in their bores due to gum or varnish deposits. These lifters can be removed using either J 3049-A (figure 25) or J 9290-01 (figure 26).

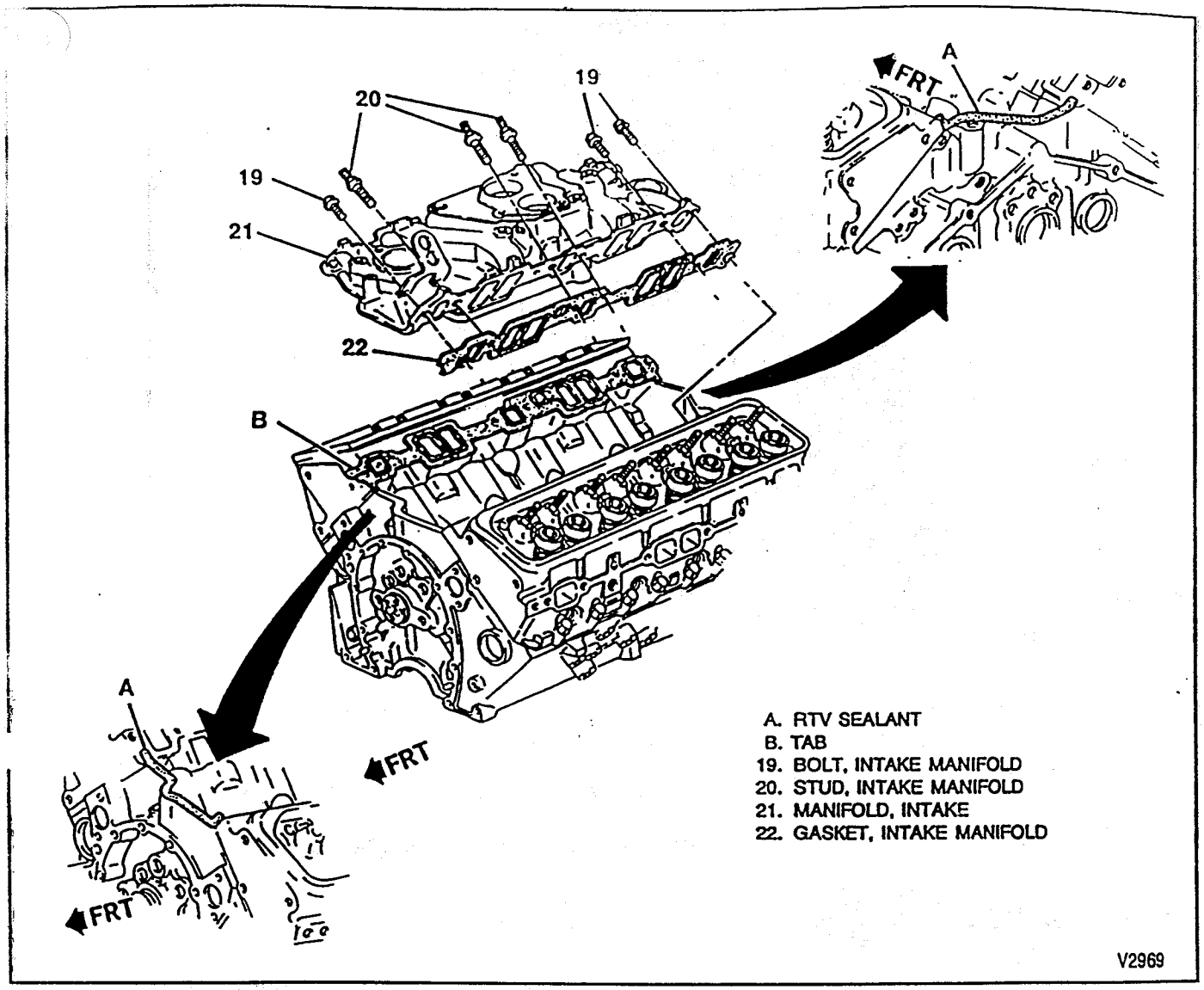


Figure 16—Intake Manifold (5.0L and 5.7L Engines)

CYLINDER HEAD REMOVAL

Remove or Disconnect (Figures 20 through 23)

1. Bolts (45 or 51).
2. Cylinder heads (46). Use care when handling the cylinder heads, to prevent damage to the gasket sealing surfaces.
3. Gaskets (47).

TORSIONAL DAMPER REMOVAL

Remove or Disconnect (Figure 27)

Tool Required:
J 39046 Torsional Damper Puller and Installer

1. Crankshaft pulley.
2. Torsional damper retaining bolt and washer.
3. Torsional damper. Use J 39046 (figure 27).

OIL PAN REMOVAL

Remove or Disconnect (Figures 28, 29, and 30)

1. Oil pan bolts (72 or 75), nuts (73, 5.0L and 5.7L only), and clips.
2. Oil pan (71 or 76).
3. Gasket (74).
4. Oil pan deflector nuts (76) (figure 29).

OIL PUMP REMOVAL

Remove or Disconnect (Figures 28 and 30)

1. Bolts.
2. Oil pump, with drive shaft and connector.

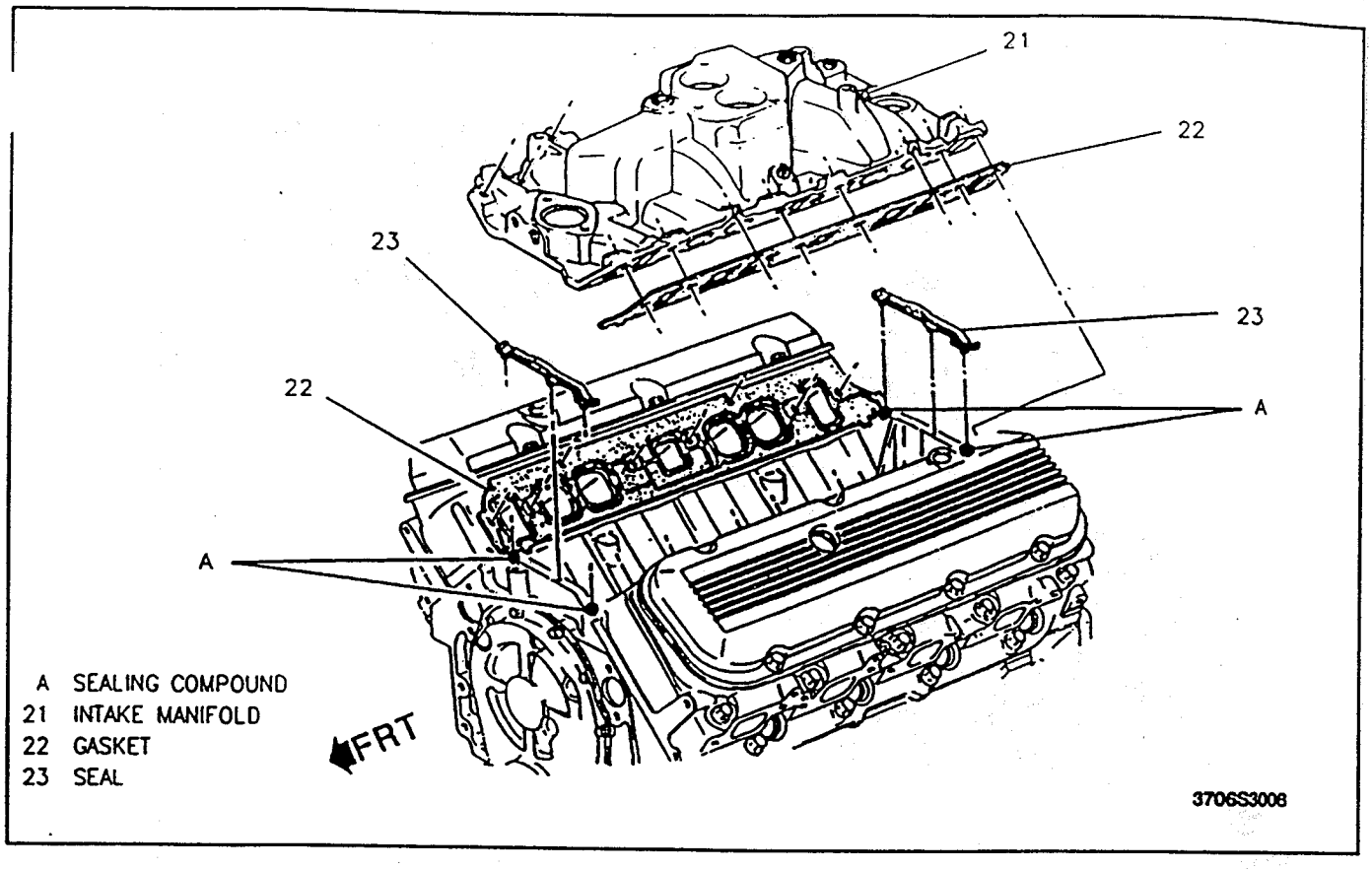


Figure 17—Intake Manifold (7.4L Engines)

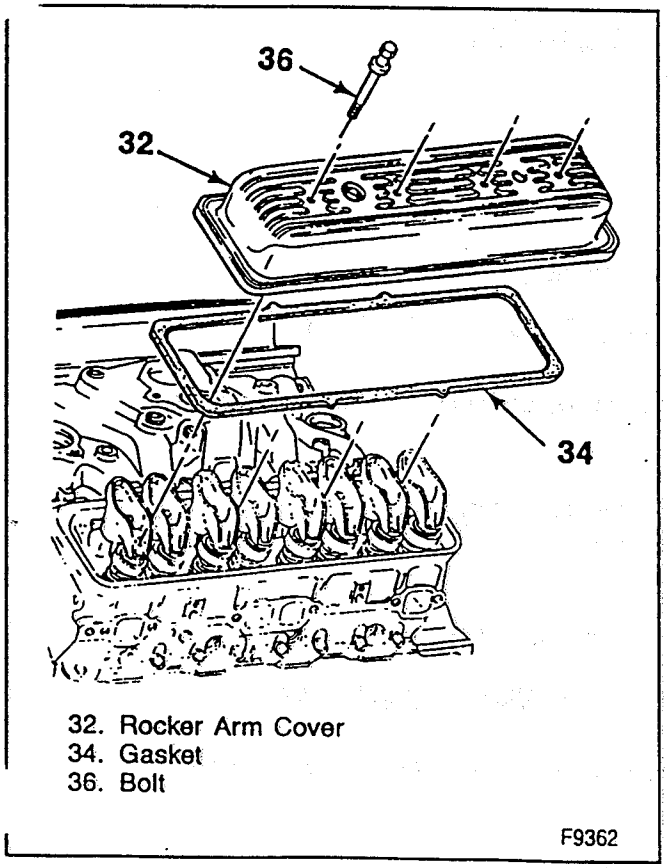


Figure 18—Rocker Arm Cover (5.0L and 5.7L Engines)

FRONT COVER REMOVAL

Remove or Disconnect (Figure 31)

1. Bolts (93).
2. Front cover (91).
3. Gasket (90).

TIMING CHAIN AND CAMSHAFT SPROCKET REMOVAL

Remove or Disconnect (Figure 32)

- Timing chain free play. If the chain can be moved back and forth in excess of 16 mm (5/8 inch), make a note that the timing chain should be replaced during assembly (figure 32).

1. Bolts (100).
2. Camshaft sprocket (101) and timing chain (102) together.

CAMSHAFT REMOVAL

Remove or Disconnect (Figure 33)

- Camshaft.
  - A. Install three 5/16-18 bolts 100-125 mm (4-5 inches) long into the camshaft tapped holes. Use these bolts to handle the camshaft.
  - B. Pull the camshaft from the block.
  - C. Use care to prevent damage to the camshaft and bearings.

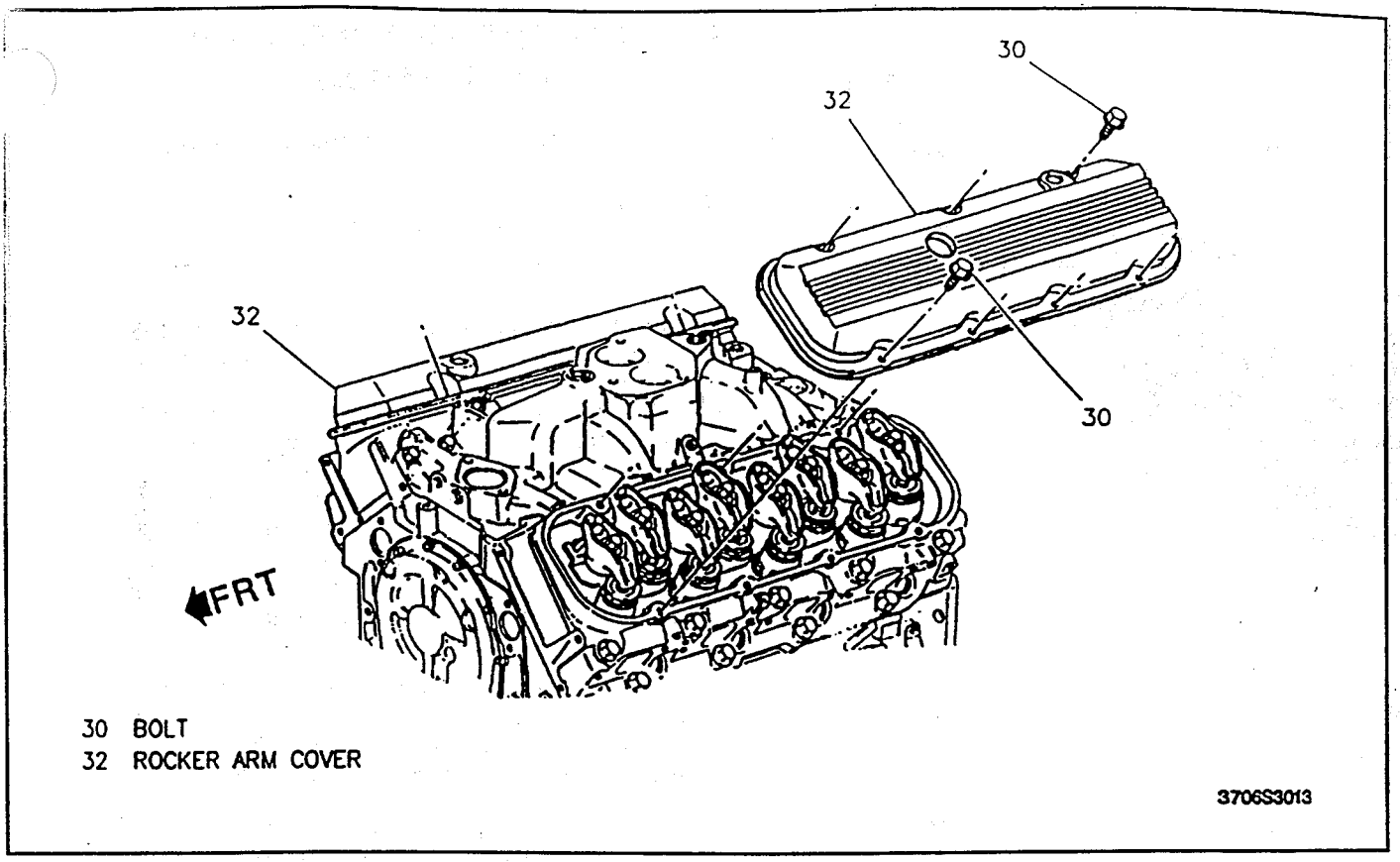


Figure 19—Rocker Arm Cover (7.4L Engines)

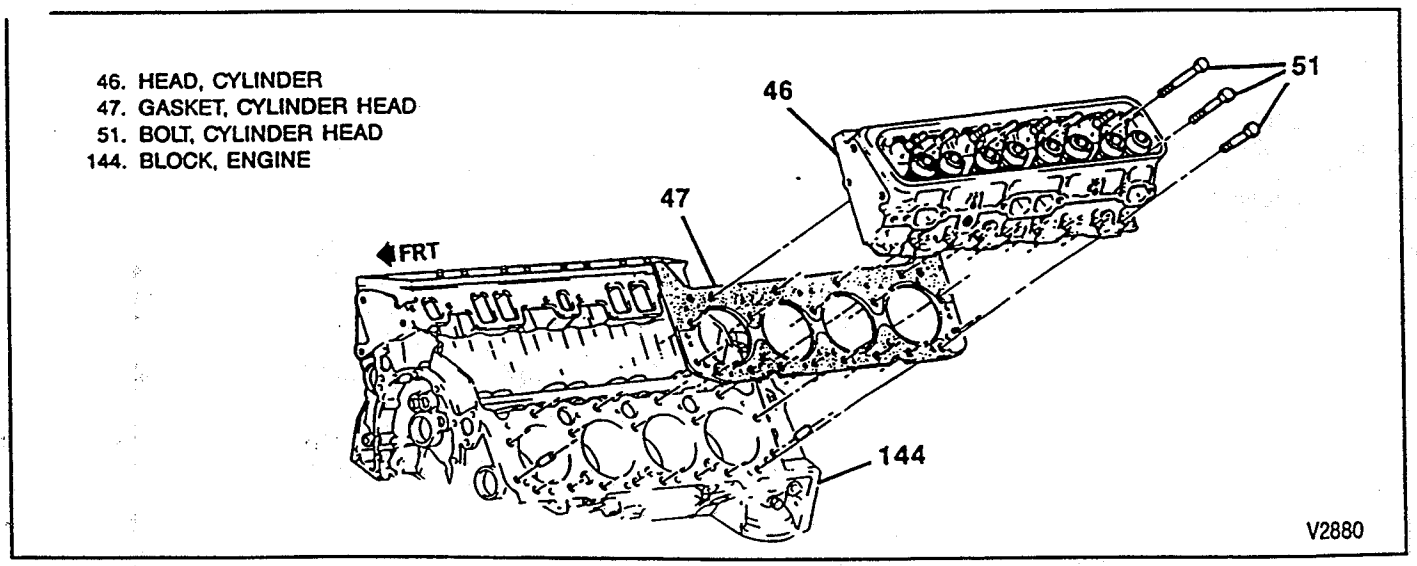


Figure 20—Cylinder Head (5.0L and 5.7L Engines)

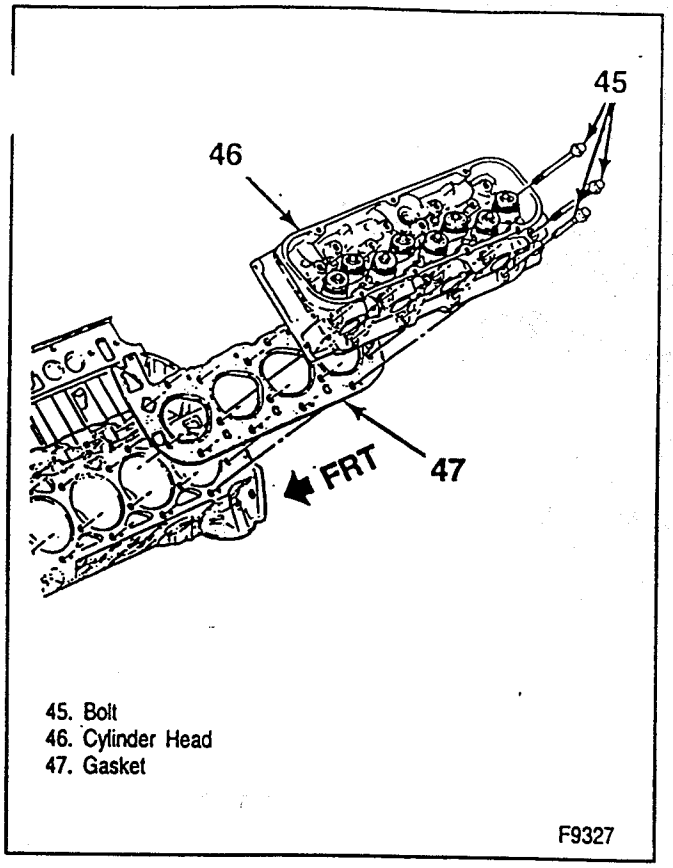


Figure 21—Cylinder Head (7.4L Engines)

PISTON AND CONNECTING ROD REMOVAL

Remove or Disconnect (Figures 34 and 35)

Tool Required:
J 5239 Connecting Rod Guide Set

1. Ridge (or deposits) at the top of the cylinder as follows:
   A. Turn the crankshaft until one piston is at the bottom of its stroke. Place a soft cloth on top of the piston.
   B. Using the manufacturer's directions, install a ridge reamer into the top of the cylinder (figure 34). Perform the cutting operation.
   C. After the ridge and/or deposits are removed, remove the ridge reamer. Turn the crankshaft until the piston is at the top of its stroke. Remove the cloth and cuttings.
   D. Repeat this procedure for each piston.
2. Connecting rod caps as follows:
   A. Make note of the arrangement of the connecting rod markings, to ensure they will be returned to their proper position during assembly. Mark the connecting rods with a scratch awl if necessary.
   B. Remove the connecting rod bolt nuts.
   C. To avoid mismatching the connecting rods and connecting rod caps, remove only one connecting rod cap at a time. Place the piston at the bottom of its stroke.

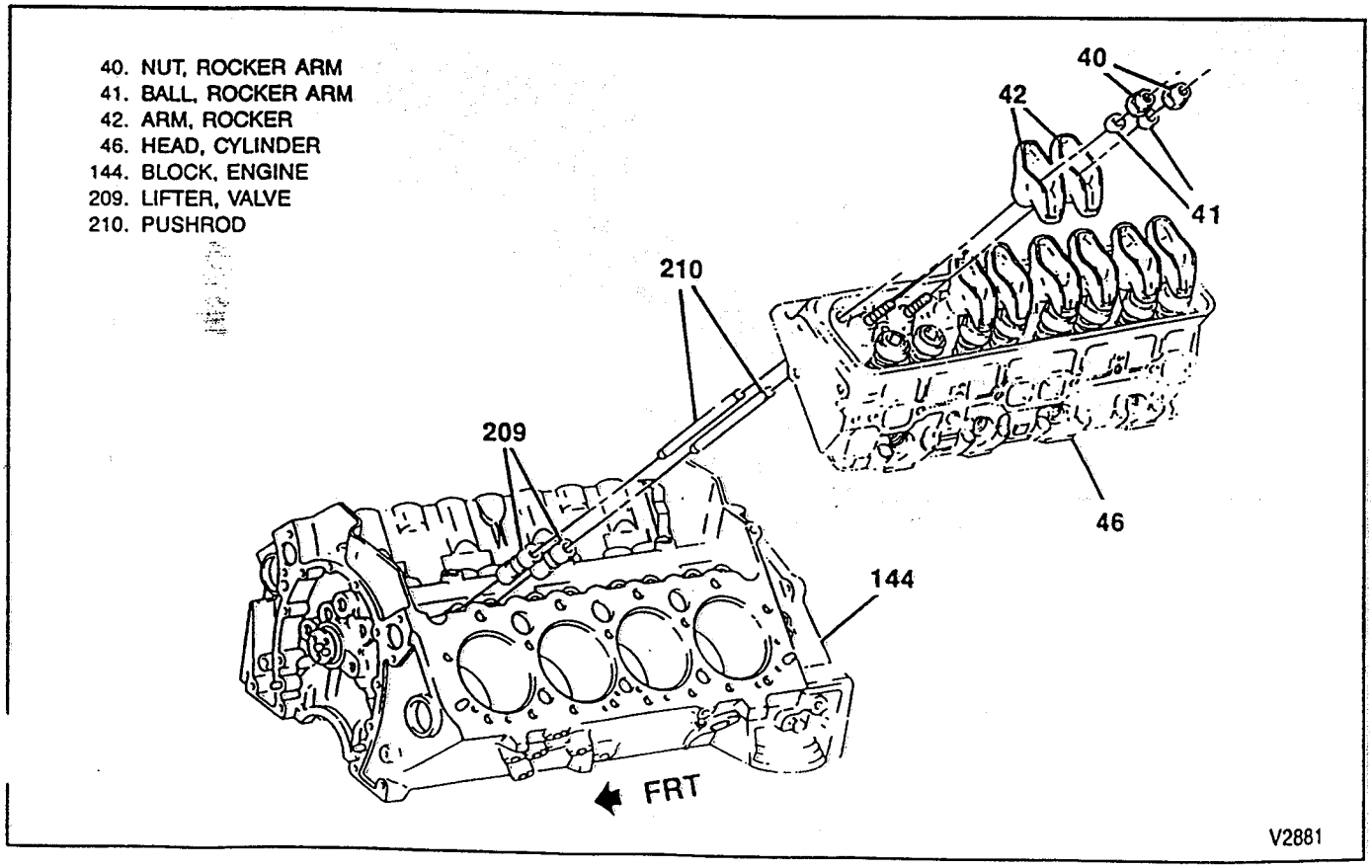


Figure 22—Valve Train Components (5.0L and 5.7L Engines)

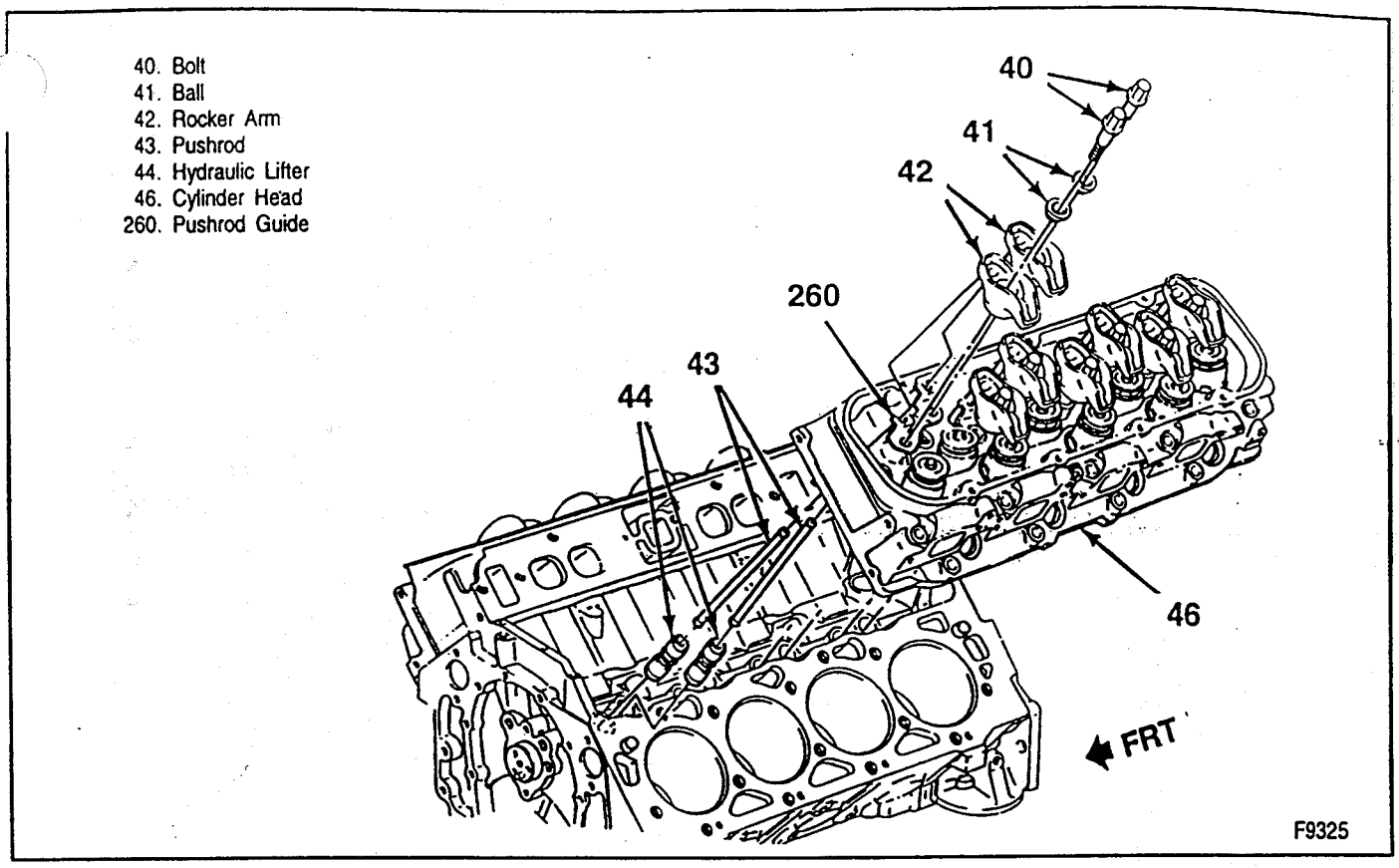


Figure 23—Valve Train Components (7.4L Engines)

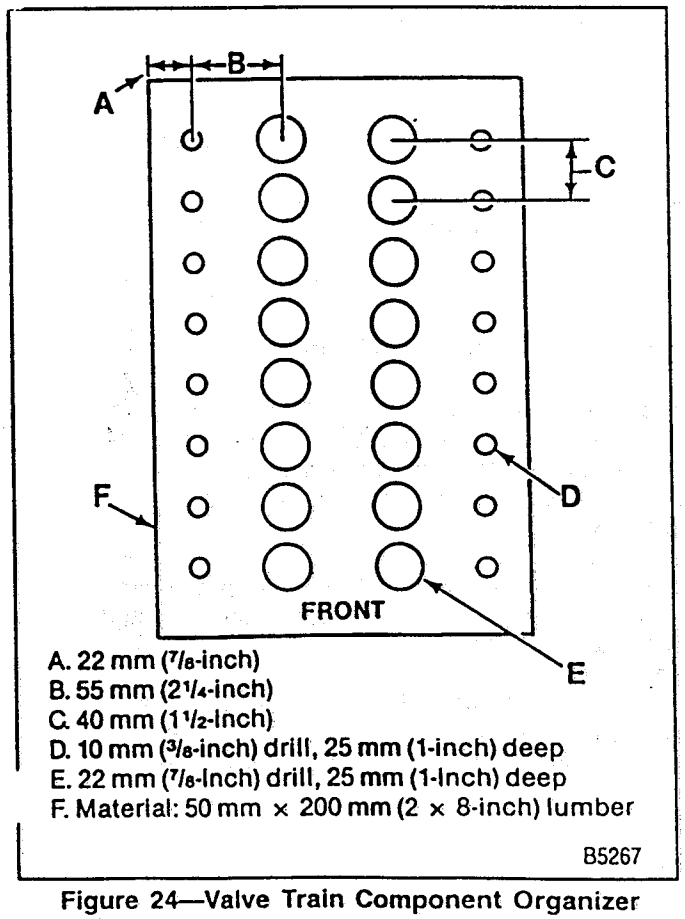


Figure 24—Valve Train Component Organizer

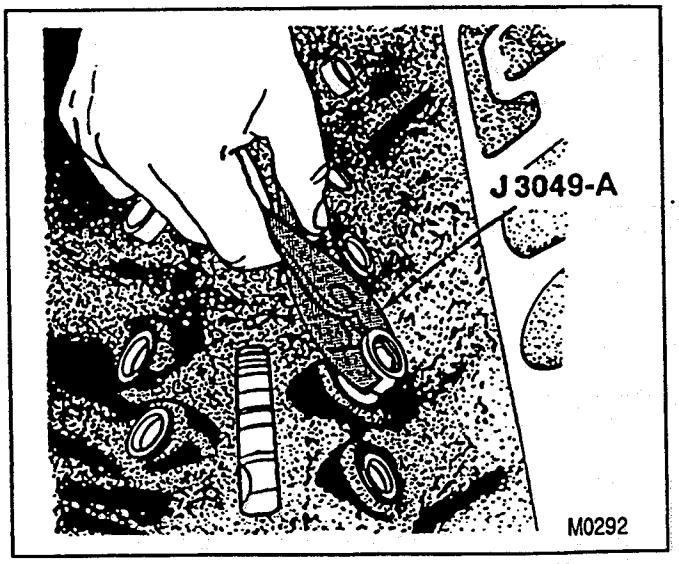


Figure 25—Removing the Hydraulic Lifter

D. Remove the connecting rod cap.
E. Install J 5239 onto the connecting rod bolts. Use of the specified guide set will prevent the connecting rod from scratching the bore or crankshaft journal during the removal process. The tool will also prevent the rod bearing half from falling out of the connecting rod during removal.

3. Connecting rod and piston from the block.
   A. Push on the guide rod (item A, figure 35) to push the piston and connecting rod out.

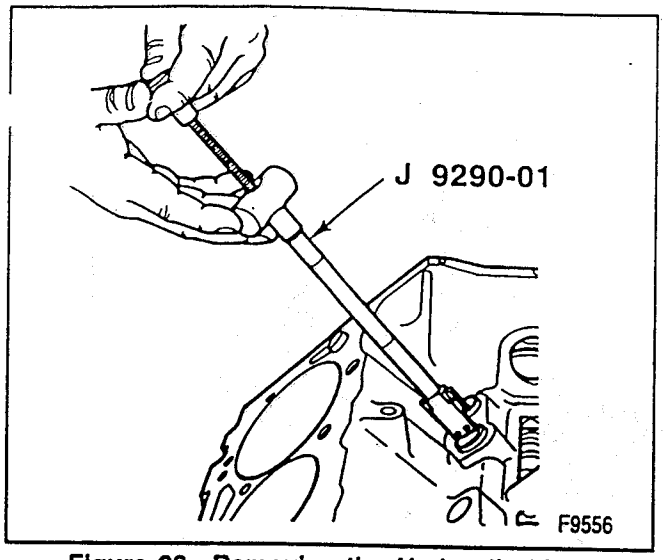


Figure 26—Removing the Hydraulic Lifter

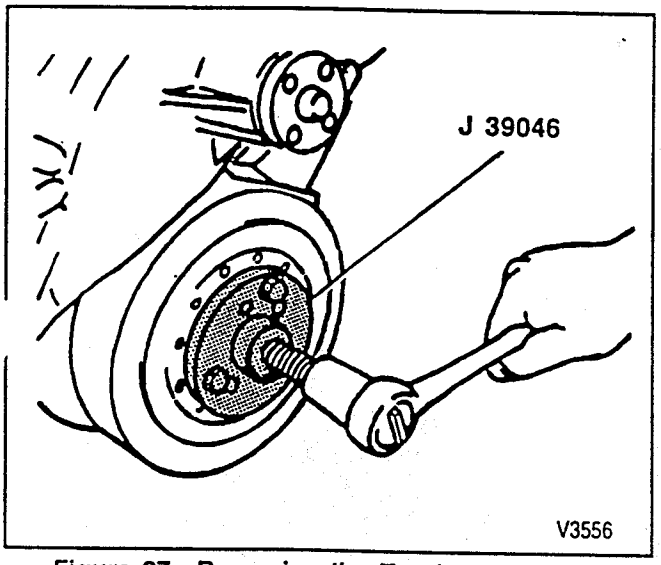


Figure 27—Removing the Torsional Damper

B. Use the guide rod to prevent the connecting rod from scoring the cylinder bore.
C. Install the connecting rod cap onto the connecting rod. Do not tighten.
D. Repeat this procedure on the remaining piston and connecting rod assemblies.

FLYWHEEL REMOVAL

Remove or Disconnect (Figures 36 and 37)

1. Bolts (111).
2. Flywheel (110A or 110B).

CRANKSHAFT REAR OIL SEAL RETAINER REMOVAL (5.0L and 5.7L ENGINES)

Remove or Disconnect (Figure 38)

1. Screws (80) and nuts (81).
2. Seal retainer (82).
3. Gasket (84).

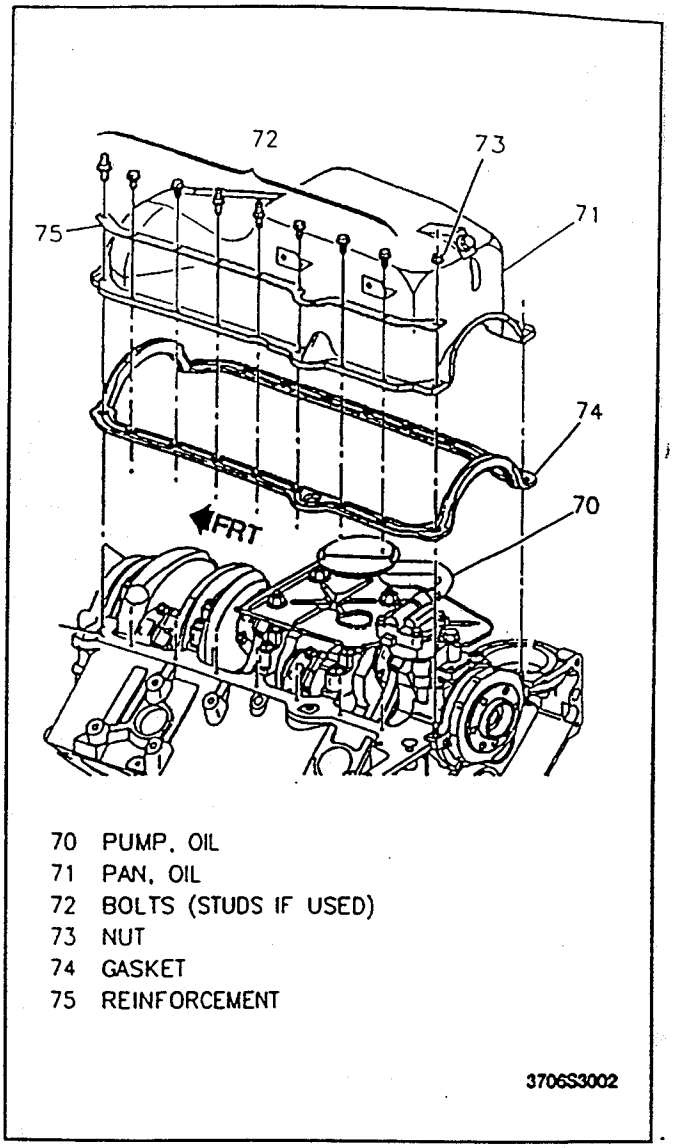


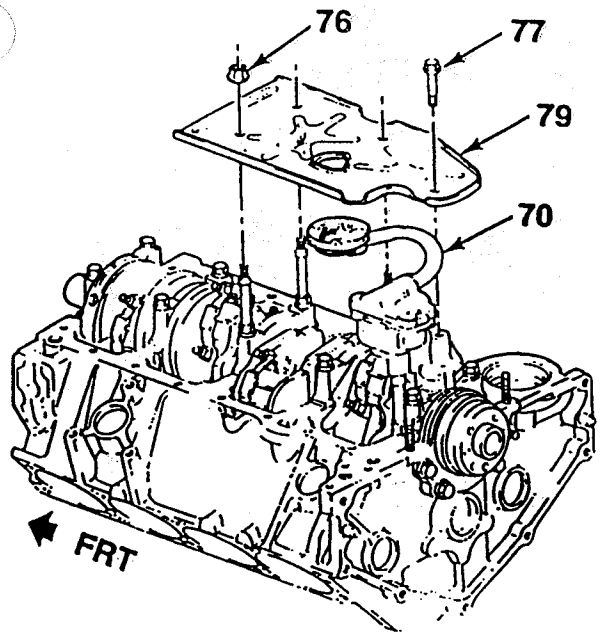
Figure 28—Oil Pan (5.0L and 5.7L Engines)

CRANKSHAFT REMOVAL

Remove or Disconnect (Figure 39)

- Check the main bearing caps for location markings. Mark the caps if necessary. The caps must be returned to their original locations with the orientation arrow pointing forward during assembly.

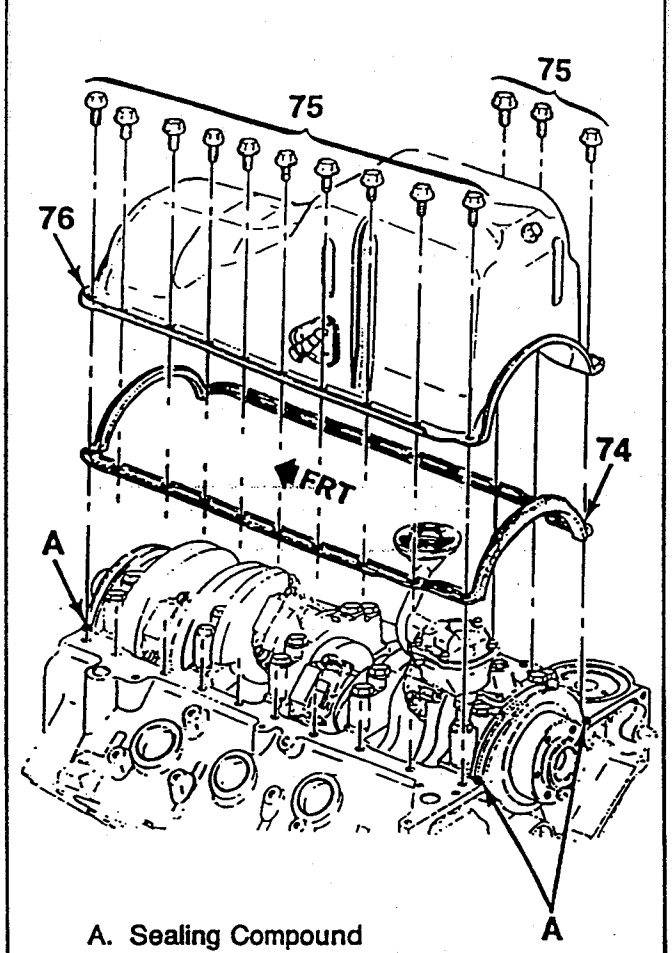
1. Bolts (134).
2. Main bearing caps (132 and 133).
3. Crankshaft. Lift the crankshaft straight up. Use care to avoid damage to the crankshaft journals and thrust flange surfaces.
4. Rear seal (131).
5. Main bearing inserts (135 and 136). If the main bearings are to be reused, mark them to ensure they are installed in their original positions before removal.



70. Oil Pump
76. Nut
77. Bolt
79. Oil Pan Baffle

F9365

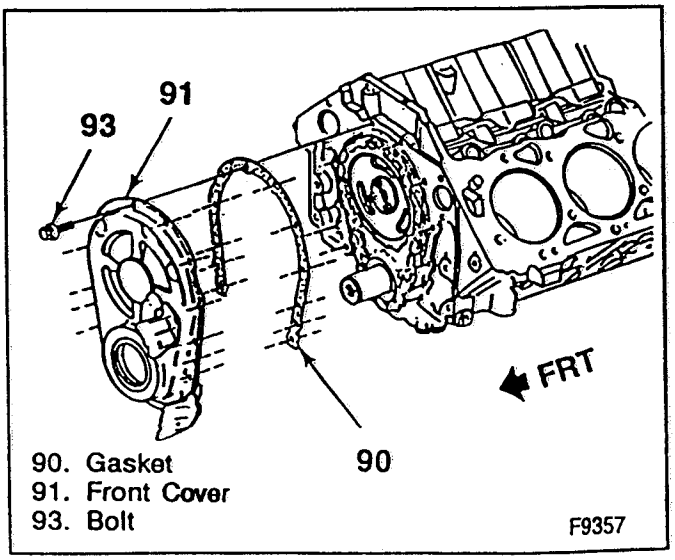
Figure 29—Oil Pan Deflector (5.0L and 5.7L Engines)



A. Sealing Compound
74. Gasket
75. Bolt
76. Oil Pan

F9331

Figure 30—Oil Pan (7.4L Engines)



90. Gasket
91. Front Cover
93. Bolt

F9357

Figure 31—Front Cover

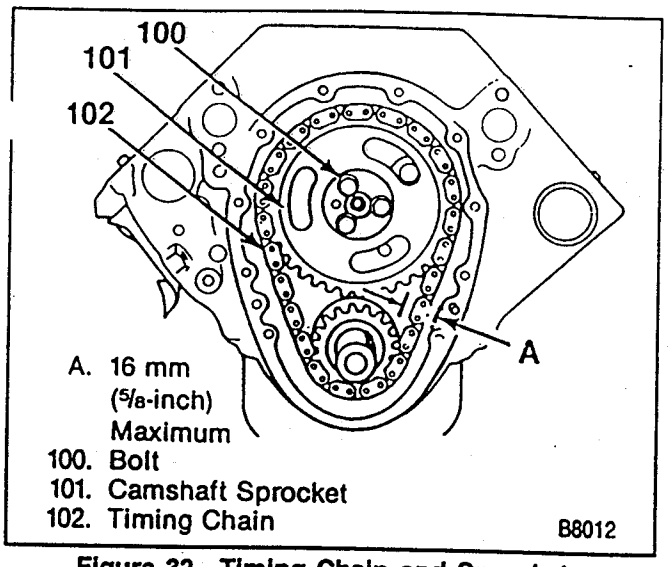


Figure 32—Timing Chain and Sprockets

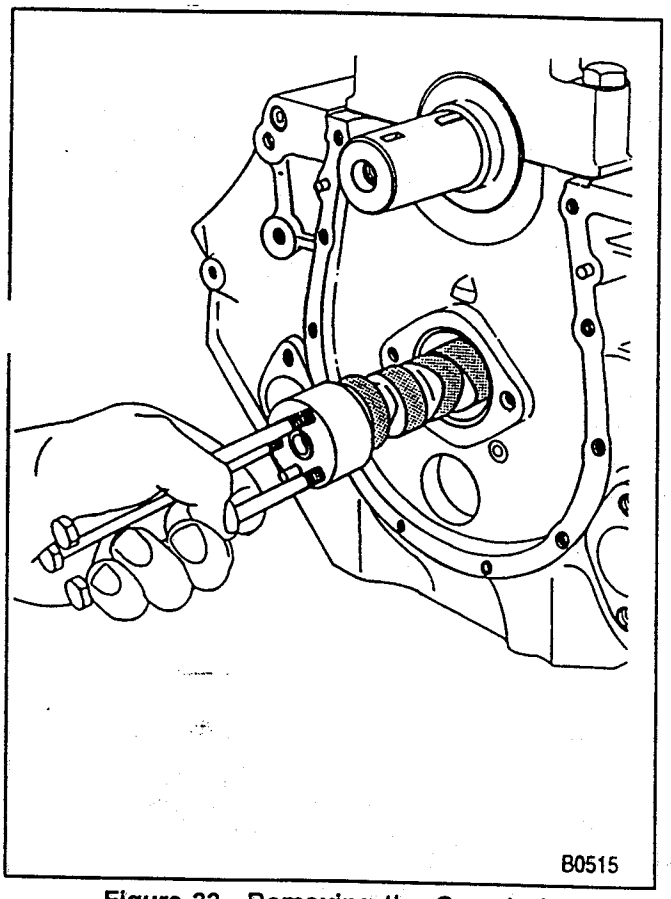


Figure 33—Removing the Camshaft

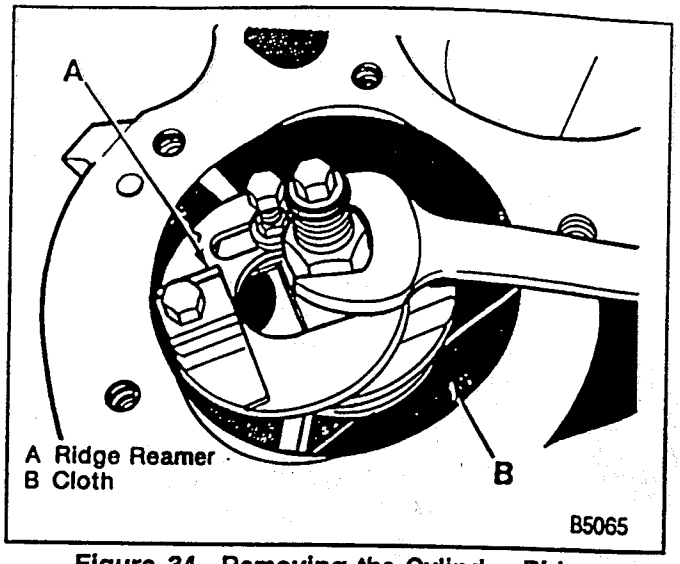


Figure 34—Removing the Cylinder Ridge

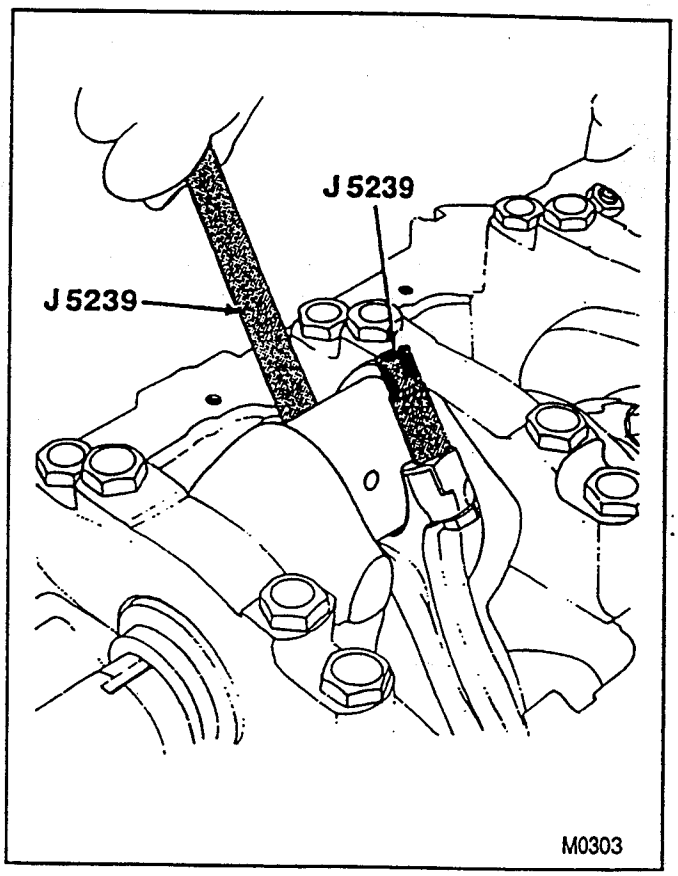
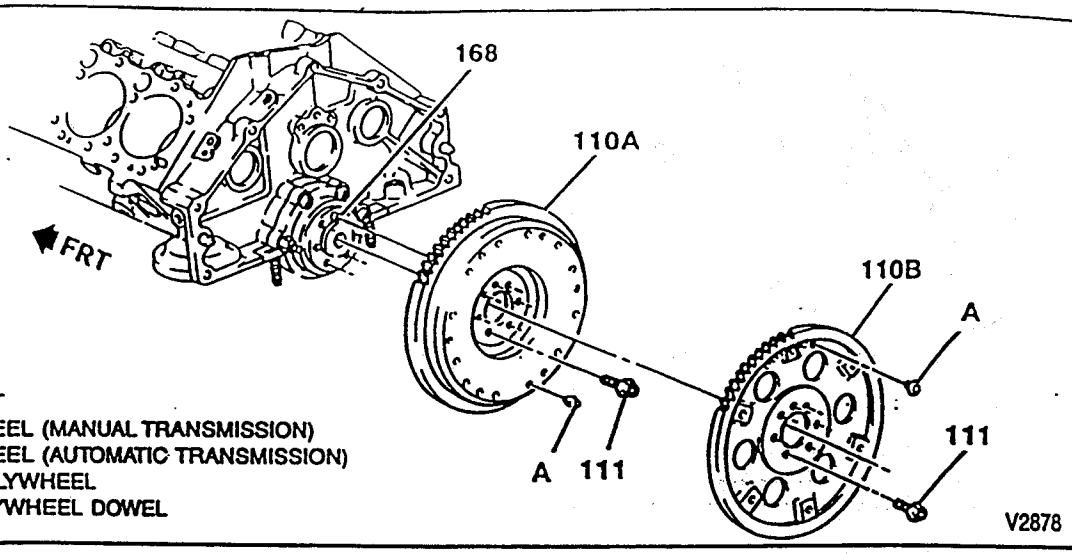
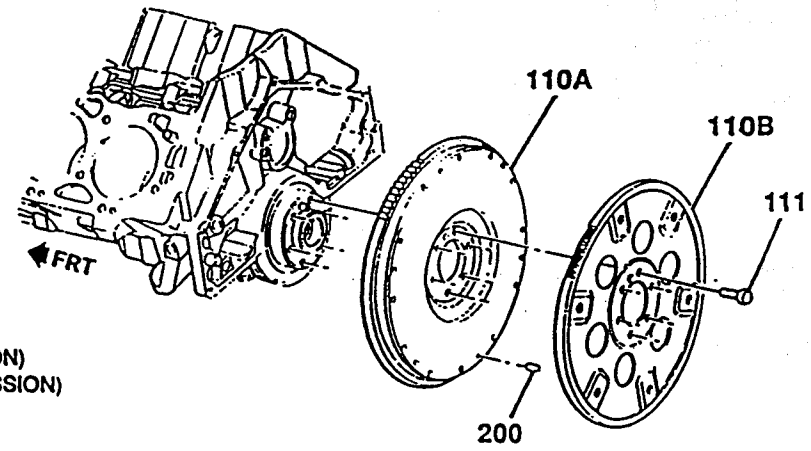


Figure 35—Removing the Piston and Connecting Rod



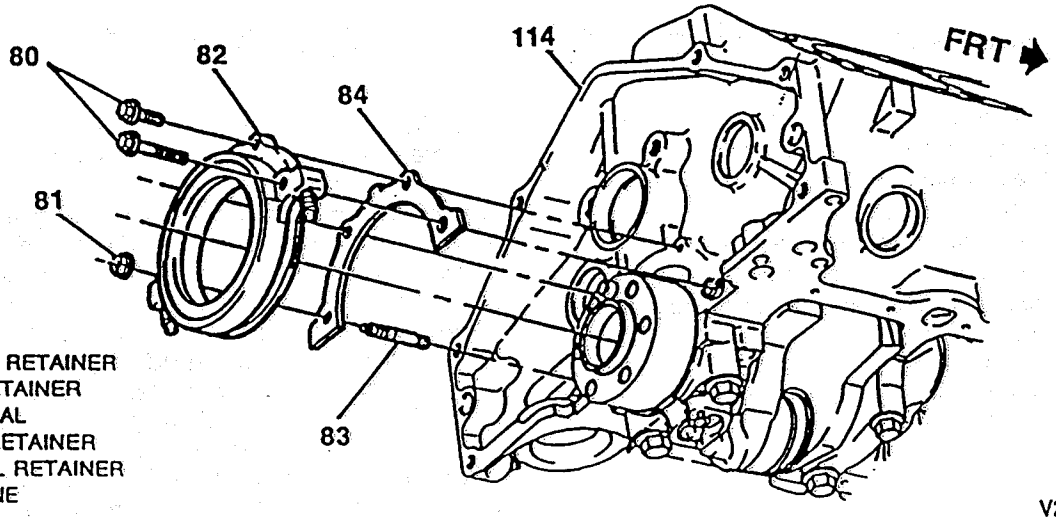
A. WEIGHT
110A. FLYWHEEL (MANUAL TRANSMISSION)
110B. FLYWHEEL (AUTOMATIC TRANSMISSION)
111. BOLT, FLYWHEEL
168. PIN, FLYWHEEL DOWEL

Figure 36—Flywheel (5.0L and 5.7L Engines)



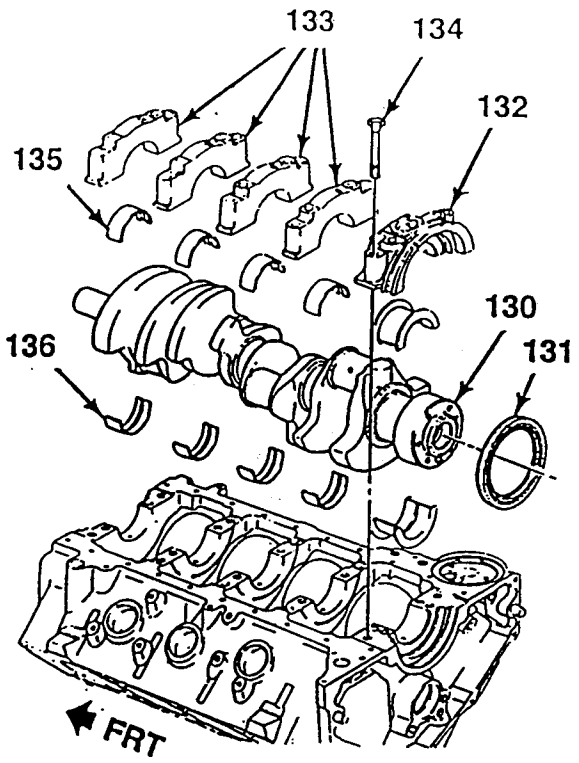
110A. FLYWHEEL (MANUAL TRANSMISSION)
110B. FLYWHEEL (AUTOMATIC TRANSMISSION)
111. BOLT, FLYWHEEL
200. PIN, ENGINE BALANCE GROOVE

Figure 37—Flywheel (7.4L Engines)



80. SCREW, SEAL RETAINER
81. NUT, SEAL RETAINER
82. RETAINER, SEAL
83. STUD, SEAL RETAINER
84. GASKET, SEAL RETAINER
114. BLOCK, ENGINE

Figure 38—Crankshaft Rear Oil Seal Retainer (5.0L and 5.7L Engines)



130. Crankshaft
131. Rear Seal
132. Rear Main Bearing Cap
133. Main Bearing Cap
134. Bolt
135. Lower Main Bearing Insert
136. Upper Main Bearing Insert

F9332

Figure 39—Crankshaft and Components (7.4L Engines)

CLEANING, INSPECTION, AND REPAIR

A solvent tank large enough to hold the larger engine parts will be needed along with various bristle brushes and a gasket scraper. A source of compressed air will be helpful in the cleaning operations.

Precision measuring tools will be required for the inspection procedure. These include: micrometers, cylinder bore gage, feeler gages, dial indicator set, etc. The inspection work, performed with the proper methods and tools, is most important. The rebuilt engine cannot be expected to perform properly if parts worn beyond acceptable limits are reused.

NOTICE: The following is recommended gasket cleaning procedure for General Motors engine components. Carefully remove all gasket material from the part using a plastic or wood scraper. Use Loctite brand "Chisel Gasket Remover" (P/N 4MA) or equivalent. Do not use any other method or technique to remove gasket material from a part. Do not use abrasive pads, sand paper or power tools to clean gasket surfaces. These methods of cleaning can damage the part. Abrasive pads also produce a fine grit that the oil filter cannot remove from the oil. This grit is abrasive and has been known to cause internal engine damage.

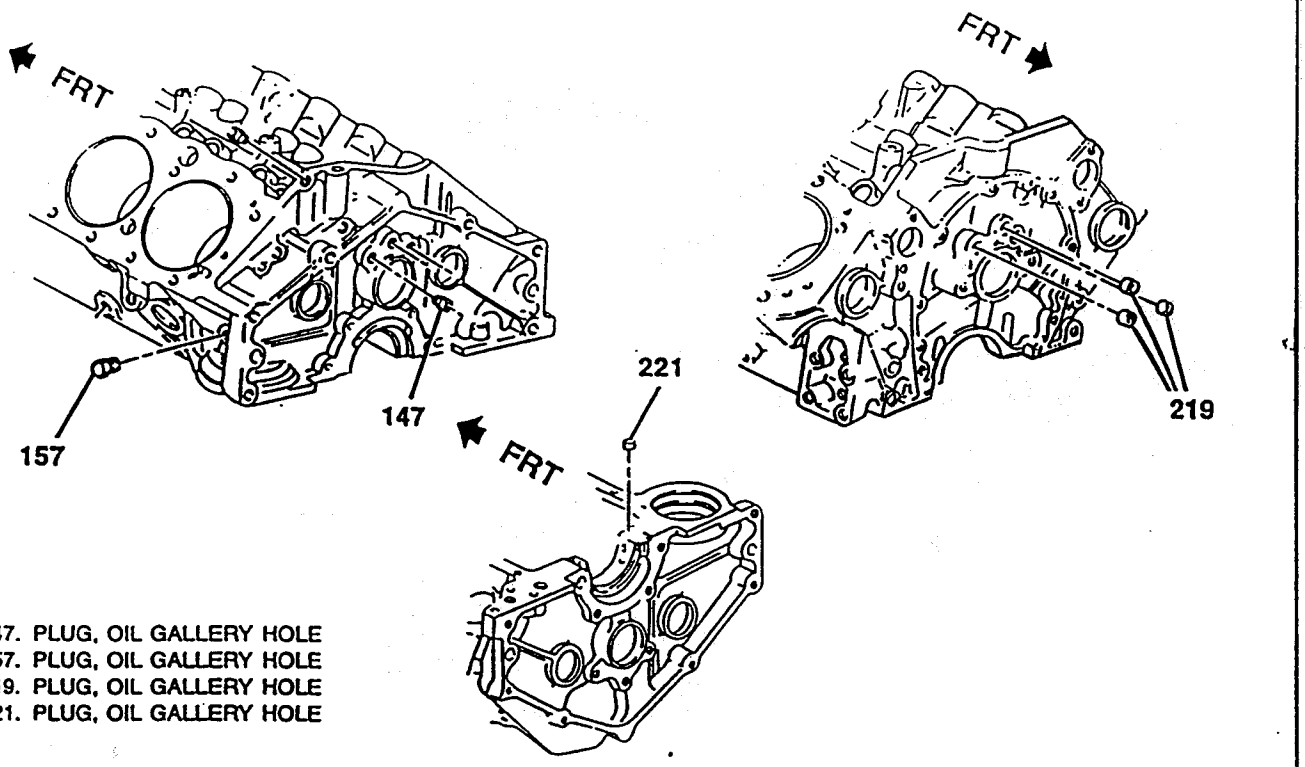


Figure 40—Engine Block Oil Gallery Hole Plugs (5.0L and 5.7L Engines)

NOTICE: If the engine is damaged internally and needs to be rebuilt, make sure all foreign material is completely flushed out of the cooling system. Vehicles equipped with an oil cooler should also be flushed out. Failure to rid the oil or cooling system of debris can result in engine damage to the rebuilt engine.

CYLINDER BLOCK

Clean (Figures 40, 41, and 42)

Disassemble

- Cooling jacket plugs.
  1. Obtain a suitable self-threading screw.
  2. Drill a hole into the plug.
  3. Install the self-threading screw.
  4. Remove jacket plugs.
     - Oil gallery screw plugs.

Clean (Figures 40, 41, and 42)

Sealing material from mating surfaces.
Boil cylinder block in caustic solution.
— Flush with clean water or steam.

- Cylinder bores.
- Oil galleries and passages (figures 40 and 42).
- Scale deposits from the coolant passages.
- Spray or wipe cylinder bores and machined surfaces with engine oil.

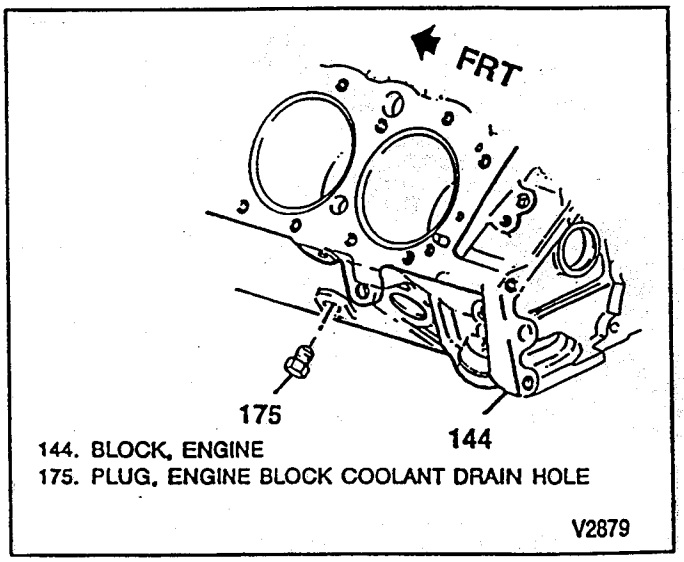
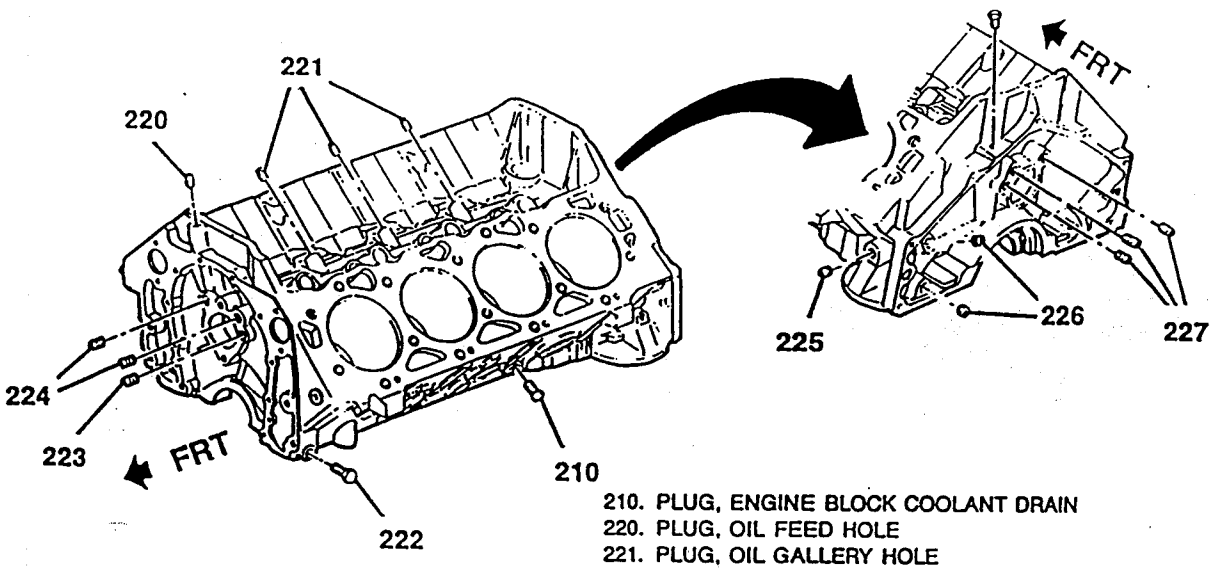


Figure 41—Engine Block Coolant Drain Hole Plug (5.0L and 5.7L Engines)

Inspect

1. All expansion plugs for poor fit or leakage.
2. Hydraulic lifter bores for deep scratches and varnish deposits.
3. Block for cracks.
   - Cylinder walls.
   - Coolant jackets.
   - Main bearing webs.
   - Engine mount bosses.
4. Main bearing bores and main bearing caps.



210. PLUG, ENGINE BLOCK COOLANT DRAIN
220. PLUG, OIL FEED HOLE
221. PLUG, OIL GALLERY HOLE
222. PLUG, OIL GALLERY HOLE
223. PLUG, OIL GALLERY HOLE
224. PLUG, OIL GALLERY HOLE
225. PLUG, OIL GALLERY HOLE
226. PLUG, OIL GALLERY HOLE
227. PLUG, OIL GALLERY HOLE

V2888

Figure 42—Engine Block Oil Gallery Hole and Coolant Drain Hole Plugs (7.4L Engines)

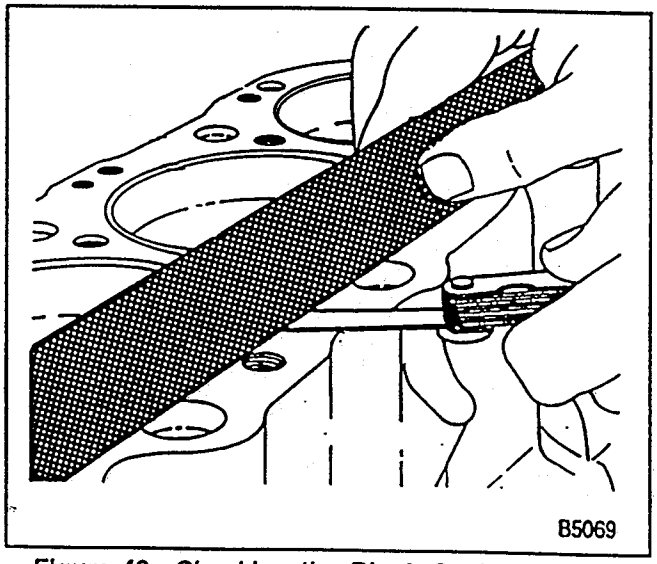


Figure 43—Checking the Block Gasket Surface

- All main bearing bores should be round and uniform in inside diameter (ID) at all bearing supports.
- The area where the main bearing inserts contact the main bearing bore should be smooth.
- If a main bearing cap is damaged and requires replacement, replace it as outlined later.

Measure (Figure 43)

- Head gasket surface distortion. Use a straight edge and feeler gage to check for flatness of the milled surface at the top of the cylinder block. The surface must be flat (within 0.10 mm {0.004 inch}) to ensure proper head gasket sealing.

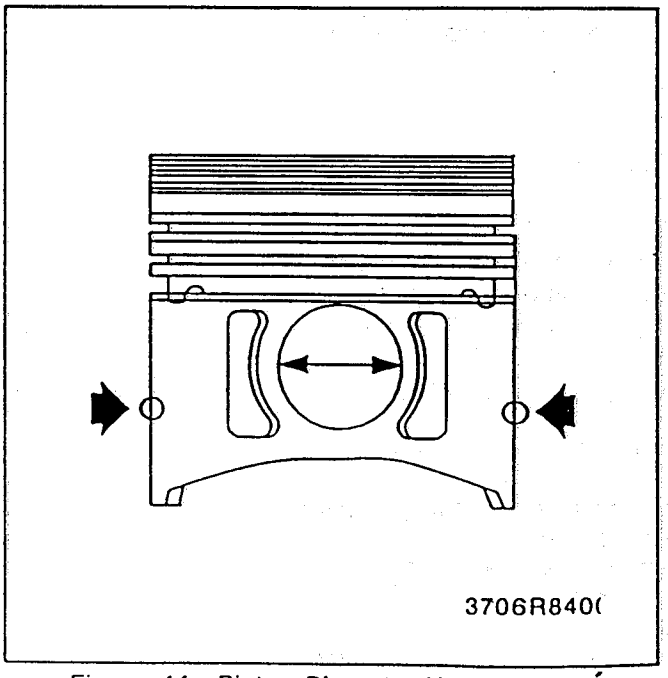


Figure 44—Piston Diameter Measurement

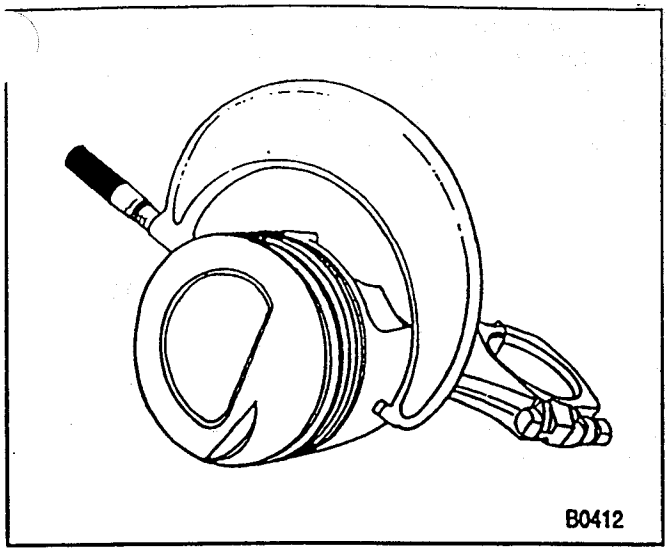


Figure 45—Measuring Piston Diameter

MAIN BEARING CAP REPLACEMENT

Install or Connect

1. New main bearing cap. The arrow on the main bearing cap faces the front of the engine (opposite the flywheel).

NOTICE: Refer to "Notice" on page 6A5B-1.

2. Main bearing cap bolts.

Tighten

- Bolts to "Specifications."

Measure

- Main bearing vertical ID (inside diameter). Use an inside micrometer.
- This dimension should be the same as the other main bearing bore vertical diameters.

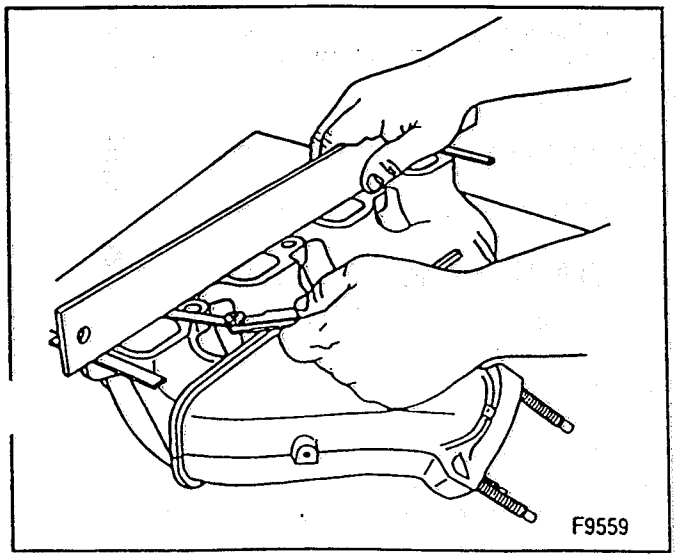


Figure 46—Checking Alignment of Manifold Flanges

CYLINDER BORES

Inspect

- Cylinder bores for scoring and other damage.

Measure

- Cylinder out of round and taper. Refer to SECTION 6A.

Cylinder Bore Reconditioning

Refer to SECTION 6A.

PISTON AND CONNECTING ROD ASSEMBLIES

For disassembly, cleaning, inspection, and assembly of these components, refer to SECTION 6A.

Measure (Figures 44 and 45)

- Piston pin diameter and pin to piston clearance.
- Piston to bore clearance and fit pistons as outlined.

PISTON SELECTION

1. Check the used piston to cylinder bore clearance, as follows:
   A. Cylinder bore diameter. Use a telescoping bore gage, located 65 mm (2 1/2 inches) below the top of the cylinder bore (figure 44).
   B. Piston diameter. Measure the skirt at a right angle to the piston pin hole (figure 45).

Important

- Measure piston diameter at 20° C (70° F).

   C. Subtract the piston diameter from the cylinder bore diameter to determine piston to bore clearance.
   D. Locate the piston to bore clearance refer to "Engine Specifications." Determine if the piston to bore clearance is in the acceptable range.

Important

- Each connecting rod and bearing cap should be marked, beginning at the front of the engine. Cylinders 1, 3, 5, and 7 are the right bank and 2, 4, 6, and 8 are the left bank (when viewed from the front of the engine). The numbers on the connecting rod and bearing cap must be on the same side when installed in the cylinder bore. If a connecting rod is ever transposed from one block or cylinder to another, new connecting rod bearings should be fitted and the connecting rod should be numbered to correspond with the new cylinder number. On 7.4L engines the rod is not symmetrical and the outside always faces out.

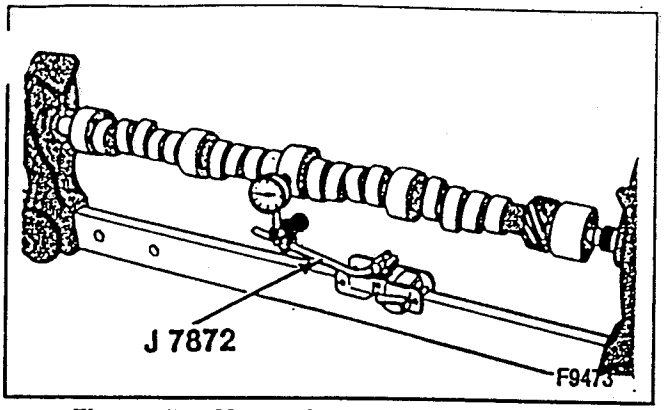


Figure 47—Measuring Camshaft Run-Out

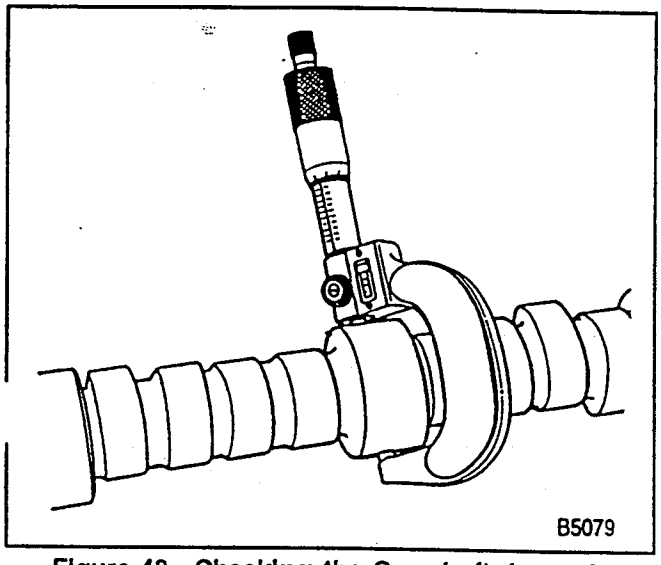


Figure 48—Checking the Camshaft Journals

Measure

- Ring end gap and ring clearance. Refer to Section 6A.

Inspect

- Ring fit. Refer to Section 6A.

INTAKE AND EXHAUST MANIFOLD

Clean

- Old pieces of gasket from the gasket surfaces.
- Excessive carbon build-up in the exhaust passages of the intake manifold.
- Scale and deposits from the coolant passages of the intake manifold.
- EGR passage (if used) of excessive carbon deposits.

Inspect (Figure 46)

- Manifolds for cracks, broken flanges, and gasket surface damage.
- Alignment of exhaust manifold flanges. Use a straight edge and feeler gage (figure 46). If the flanges do not align, the manifold is warped and should be replaced or resurfaced.
- AIR system injection tubes for damage. Replace as needed.

CAMSHAFT

Important

- Do not attempt to repair the camshaft. Replace it if damaged.
- Whenever the camshaft needs to be replaced, a new set of valve lifters must also be installed.

Inspect

- Camshaft distributor gear teeth.
- Bearing surfaces and lobes for wear.
- Sprocket.
- Keyway and threads.
  - — Galling
  - — Gouges
  - — Overheating (Discoloration)

Measure (Figures 47 and 48)

Tool Required:
J 7872 Dial Indicator (or equivalent)

- Camshaft runout (figure 47). Mount the camshaft in V-blocks or between centers. Using J 7872, check the intermediate camshaft journal. If runout on 5.0/5.7L engines exceeds 0.0254 mm (0.002 inch) and on 7.4L engines 0.0635 mm (0.0025 inch), the camshaft is excessively bent and should be replaced along with the camshaft bearings.
- Camshaft journal out-of-round. Use a micrometer (figure 46). If the journals are more than 0.00254 mm (0.001 inch) out-of-round, replace the camshaft.
- Camshaft journal diameter. Use a micrometer (figure 48). The proper diameter is listed in "Engine Specifications."

CAMSHAFT BEARINGS

Refer to SECTION 6A for replacement procedures.

TIMING CHAIN AND SPROCKETS

Inspect

- Sprockets for chipped teeth and wear.
- Timing chain for damage.
- It should be noted that excessively worn sprockets will rapidly wear a new chain. Likewise, an excessively worn chain will rapidly wear a new set of sprockets

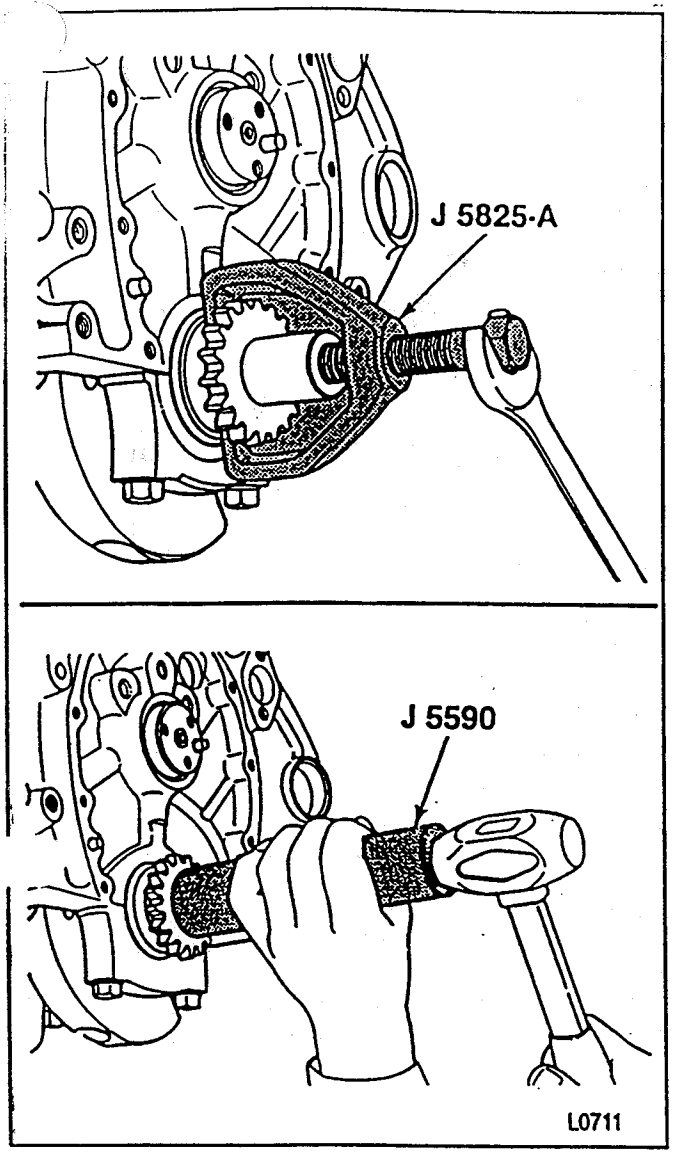


Figure 49—Crankshaft Sprocket Replacement (5.0L and 5.7L Engines)

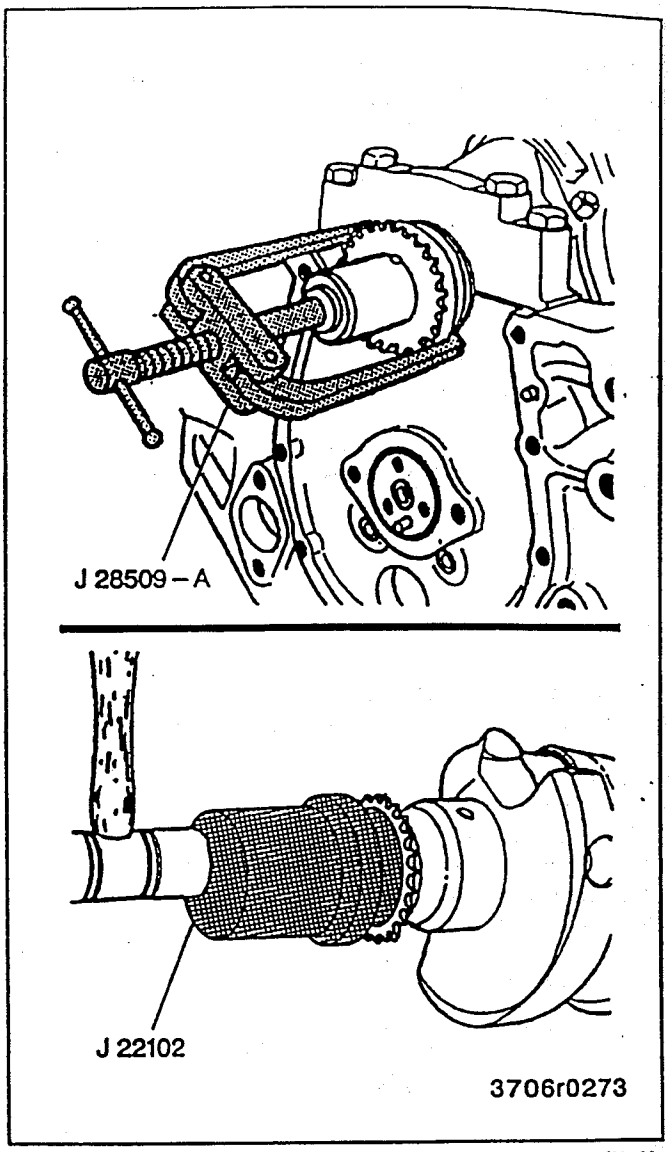


Figure 50—Crankshaft Sprocket Replacement (7.4L Engines)

CRANKSHAFT SPROCKET REPLACEMENT

Disassemble (Figures 49 and 50)

Tools Required:
J 5825 Crankshaft Sprocket Puller
J 28509-A Crankshaft Sprocket Puller

1. Crankshaft sprocket. On 5.0L and 5.7L engines, use J 5825 (figure 49). On 7.4L engines, use J 28509-A (figure 50).
2. Key, if necessary.

Assemble (Figures 49 and 50)

Tools Required:
J 5590 Crankshaft Sprocket Installer
J 22102 Crankshaft Sprocket Installer

1. Key, if removed.
2. Crankshaft sprocket. Use J 5590 (5.0L and 5.7L engines) or J 22102 (7.4L engines). Make sure the timing mark faces outside

FRONT COVER

Clean

- Old gasket from the gasket surfaces.

Inspect

- Timing marker for damage.
- Front cover for damage, dents, or cracks.

Disassemble

- Crankshaft front seal. Pry the seal out with a screwdriver. If the front cover is off the engine, push the seal out by hitting it with a screwdriver from the inside of the cover to the outside.

Assemble

1. Crankshaft front seal. Use J 35468 (5.0L and 5.7L engines) or J 22102 (7.4L engines) (figure 51). The open end of the seal must be facing the inside of the front cover.
2. Lightly coat the seal lips with grease.

COOLANT PUMP

Clean

- All gasket mating surfaces. Be sure old gasket material is removed and free of oil or other foreign materials.

NOTICE: Do not immerse the pump in solvent. The solvent may enter the pump's permanently lubricated bearings and cause premature bearing failure.

Inspect

- Coolant pump shaft for rotation and end play. The shaft and fan hub should turn straight and smoothly. If the hub wobbles or the shaft is noisy or feels "lumpy" when turned, replace the coolant pump. If the shaft end play exceeds 0.381 mm (0.015 inch), replace the coolant pump.
- Coolant pump body at the drain (weep) hole. Slight staining around the weep hole is normal. Replace the coolant pump only if coolant is dripping from the weep hole while the engine is running or while the system is pressurized.

OIL PAN AND ROCKER ARM COVERS

Clean

- Parts in solvent. Remove all sludge and varnish.
- Old gaskets from the gasket surfaces.

Inspect

- Gasket flanges for bending or damage.
- Rubber grommets and parts on the rocker arm cover for deterioration.
- Oil pan for rock damage or cracks.
- Oil pan deflector for lack of fit.
- Drain plug threads for stripping.

OIL PUMP

Disassemble (Figures 52 and 53)

1. Oil pump driveshaft (178) and connector (179).
2. Cover screws (186).
3. Cover (182) and gasket (190) (7.4L engines).
   - Mark the gear teeth so the pump gears can be installed with the same gear teeth indexed.
4. Drive gear and shaft (181).
5. Idler gear (188).

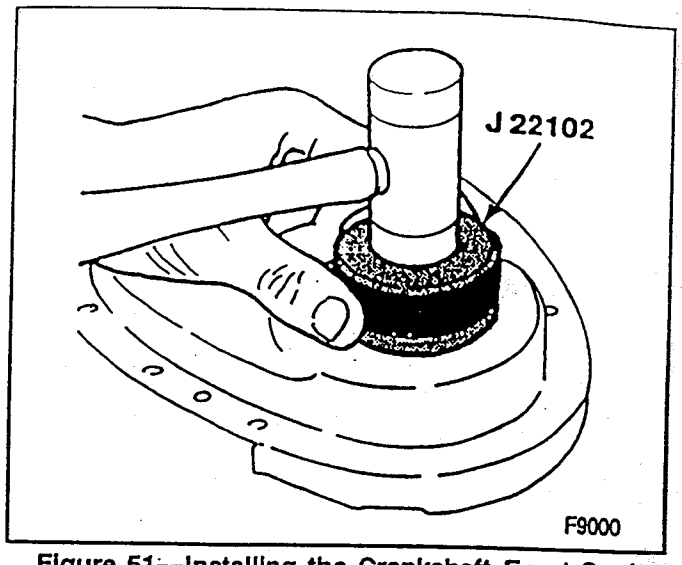


Figure 51—Installing the Crankshaft Front Seal

6. Spring retaining pin (185).
7. Spring (184).
8. Pressure relief valve (183).
9. Pickup screen and pipe (187).
   - Do not remove the pickup screen and pipe unless replacement is required. The 7.4L engine uses a pickup pipe and screen that are welded to the oil pump assembly and must be ground off for replacement.
   - The pickup pipe is press fit in the pump body to seal it and welded to retain it (7.4L engines only).
   - Do not try to remove the screen from the pipe. The pickup screen and pipe are only serviced as an assembly.

Clean

- All parts in clean solvent and blow dry with compressed air.

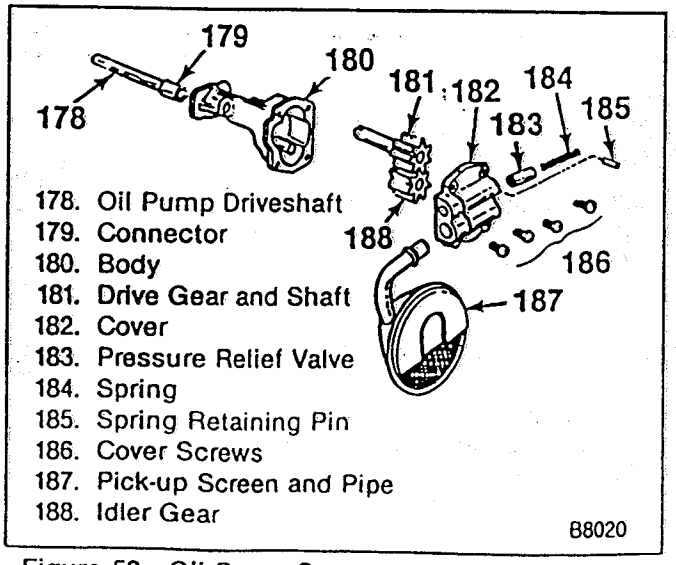
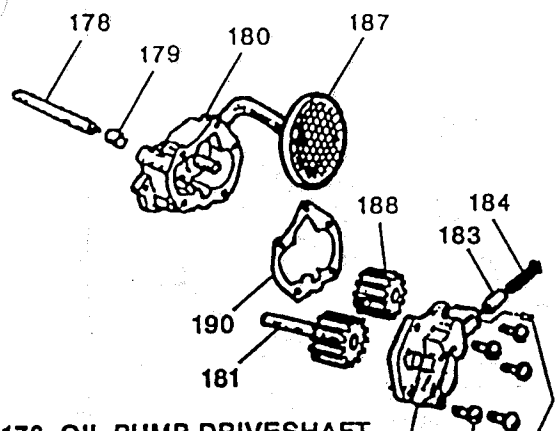


Figure 52—Oil Pump Components (5.0L and 5.7L Engines)



178 OIL PUMP DRIVESHAFT
179 CONNECTOR
180 BODY
181 DRIVE GEAR AND SHAFT
182 COVER
183 PRESSURE RELIEF VALVE
184 SPRING
185 SPRING RETAINING PIN
186 COVER SCREWS
187 PICK-UP SCREEN AND PIPE
188 IDLER GEAR
190 GASKET

3806S3065

Figure 53—Oil Pump Components (7.4L Engines)

Inspect

- Pump body (180) and cover (182) for cracks or other damage.
- Gears (181 and 188) for wear.
- Drive gear and shaft (181) for lack of fit in the pump body (180).
- Inside of the cover (182) for wear that would permit oil to leak past the ends of the gears. The pump gears, cover, and body are not serviced separately. If the parts are damaged or worn, replace the entire oil pump assembly.
- Pressure relief valve (183) for fit. The regulator valve should slide freely in its bore without sticking or binding (figures 52 and 53).

Assemble (Figures 52, 53, and 54)

Tool Required:
J 21882 Pickup Tube and Screen Installer (5.0L and 5.7L engines)

1. Pressure relief valve (183).
2. Spring (184).
3. Spring retaining pin (185).
4. Drive gear and shaft (181).
5. Idler gear (188) in the pump body (180) with the smooth side of the gear toward the pump cover opening. Index the marks made during disassembly.

NOTICE: Refer to "Notice" on page 6A5B-1.

6. Cover (182), gasket (190) (7.4L engines), and screws (186).

Tighten

- Screws (186) to 12 N.m (106 lbs. in.).
- Turn the driveshaft by hand to check for smooth operation.

NOTICE: Be careful of twisting, shearing, or collapsing the pipe while installing it in the pump.

7. Pickup screen and pipe (187) (if removed) (figure 54).
   A. If the pickup screen and pipe assembly was removed, it should be replaced with a new part. Loss of press fit condition could result in an air leak and loss of oil pressure.
   B. Mount the oil pump in a soft jawed vise.

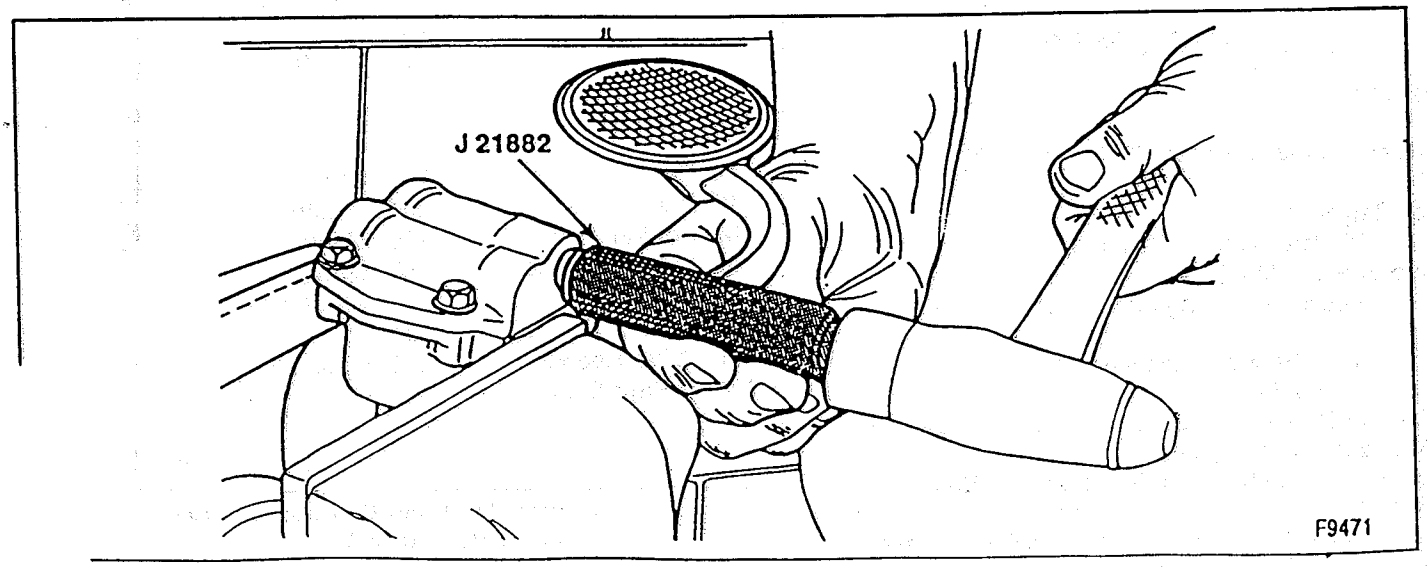


Figure 54—Installing the Oil Pump Pickup Tube and Screen (5.0L and 5.7L Engines)

C. Apply sealer to the end of the pipe.
D. Tap the pickup screen and pipe into place, using J 21882 (5.0L and 5.7L engines), and a hammer.
E. The pump screen must be parallel with the bottom of the oil pan. The screen of the oil pump is about 1/4 inch from the bottom of the pan.

8. Oil pump driveshaft (178) and connector (179).

VALVE TRAIN COMPONENTS

PUSHRODS, ROCKER ARMS, BALLS, AND NUTS

Clean

- Parts in solvent. Blow dry with compressed air.
- Make sure the oil passages in the pushrods are clear.
- Rocker arms and balls at their mating surfaces. These surfaces should be smooth and free from scoring or other damage.
- Rocker arm areas that contact the valve stems and the sockets that contact the pushrods. These areas should be smooth and free of damage and wear.
- Rocker arm nuts or bolts.
  - — The 5.0L and 5.7L engines use prevailing torque nuts. At least 6.2 N.m (55 lbs. in.) of torque should be required to thread the nuts onto the rocker arm studs. If not, it is possible that the nut(s) could back off during engine operation causing a loss of lash and valve train noise.
  - — The 7.4L engine uses a bolt to retain the rocker arm, ball, and pushrod guide to the cylinder head. Inspect rocker arm bolts for signs of cracking at the bolt shoulder. Replace if necessary.
- Check pushrods for bending. Roll the pushrod on a flat surface to determine if it is bent. Replace if necessary.
- Check ends of the pushrods for scoring or roughness.

HYDRAULIC LIFTERS

Refer to SECTION 6A.

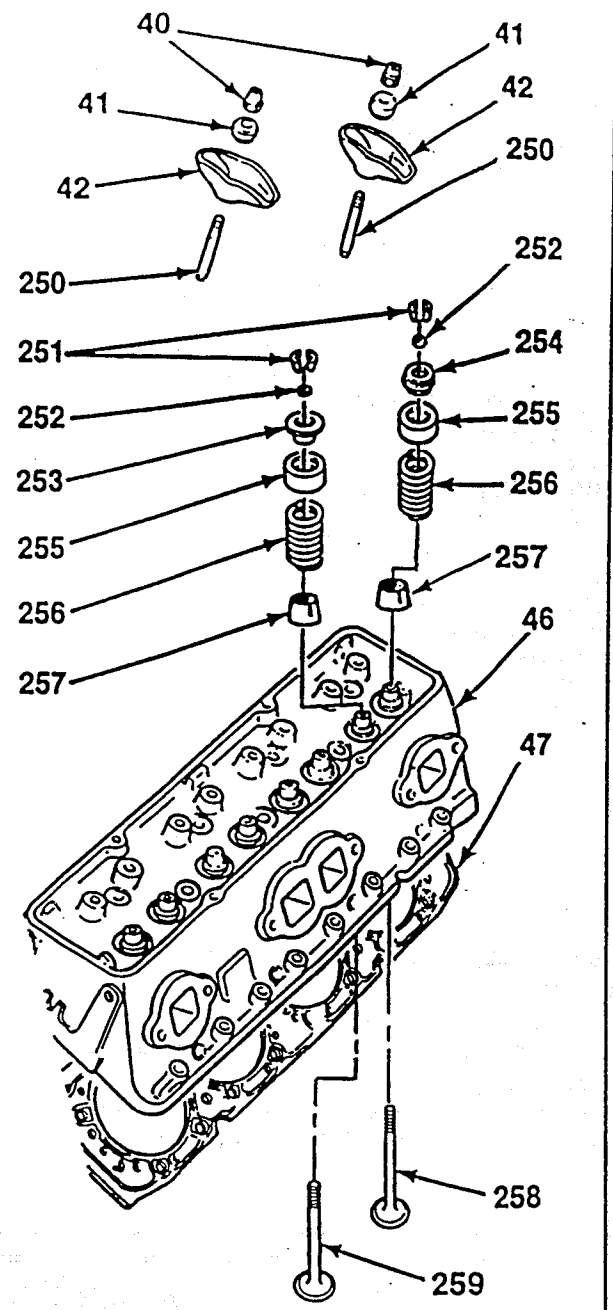
CYLINDER HEAD

DISASSEMBLY

Disassemble (Figures 55, 56, and 57)

Tool Required:
J 8062 Valve Spring Compressor

1. Valve keepers (251).
   A. Compress the springs (256) with J 8062 (figure 57).
   B. Remove the valve keepers (251).
   C. Remove J 8062.
2. Caps (253), shields (255), springs with dampers (256), and rotators (254).
3. O-ring seals (252) (if used) and seals (257).
4. Valves (258 and 259). Place them in a rack so they can be returned to their original position at assembly



40. Nut
41. Ball
42. Rocker Arm
46. Cylinder Head
47. Gasket
250. Rocker Arm Stud
251. Valve Keeper
252. O-Ring Seal
253. Cap
254. Rotator
255. Shield
256. Spring with Damper
257. Seal
258. Exhaust Valve
259. Intake Valve

Figure 55—Cylinder Head and Components (5.0L and 5.7L Engines)

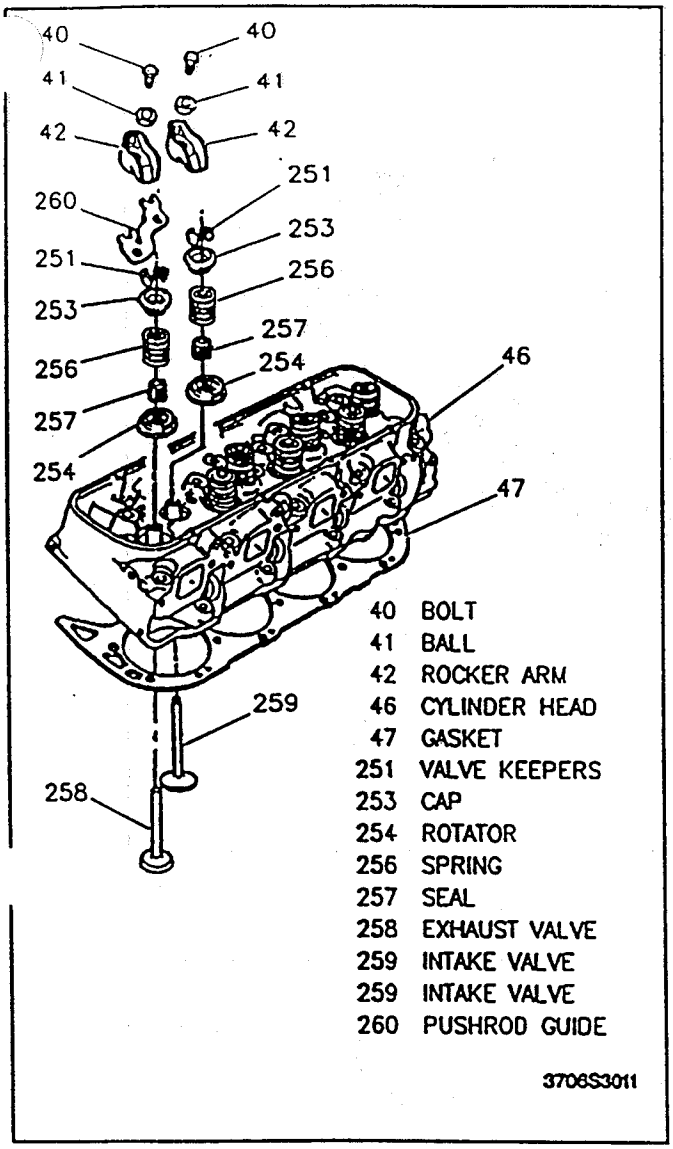


Figure 56—Cylinder Head and Components (7.4L Engines)

CLEANING AND INSPECTION

Refer to SECTION 6A and perform the following:

Measure

- Valve stem clearance.
- Valve spring tension and free length.

Other information outlined includes:

- Valve and seat grinding.
- Valve guide reaming.

ROCKER ARM STUD REPLACEMENT (5.0L AND 5.7L ENGINES)

Tools Required:
J 5802-01 Stud Remover
J 5715 Reamer (0.0762 mm (0.003-inch) oversize) or
J 6036 Reamer (0.3302 mm (0.013-inch) oversize)
J 6880 Stud Installer

Rocker arm studs that have damaged threads or are loose in cylinder heads should be replaced. New studs are available in 0.003-inch and 0.013-inch oversize.

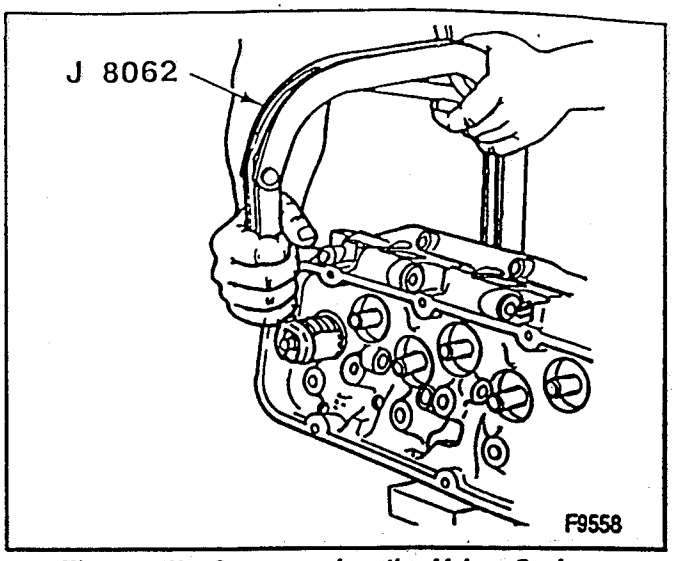


Figure 57—Compressing the Valve Springs

1. Place J 5802-01 over the stud to be removed. Install a nut and flat washer. Remove the stud by turning the nut (figure 58).
2. Ream the hole to the proper size for the replacement oversize stud. Use J 5715 for 0.0762 mm (0.003-inch) oversize studs; J 6036 for 0.3302 mm (0.013-inch) oversize studs (figure 59).
3. Coat lower end (press-fit area) of stud with hypoid axle lubricant. Drive the stud into place with a hammer and J 6880. Stud is installed to proper depth when the tool bottoms on the cylinder head (figure 60).

ASSEMBLY (5.0L AND 5.7L ENGINES)

Assemble (Figures 55 and 61)

Tools Required:
J 8062 Valve Spring Compressor
J 23738-A Valve Seal Leak Detector

1. Valves (258 and 259).
   - Lubricate the valve stems with engine oil.
   - Insert the valves into the proper guides.
2. Seals (257). Install the seals over the valve stems and seat them against the head.
3. Springs with dampers (256).
4. Shields (255).
5. Caps (253) (intake valves only).
6. Rotators (254) (intake and exhaust valves on 5.7L H.D.and exhaust valve only on 5.0L and 5.7L engines).
   - Compress the valve spring, using J 8062 (figure 55). Compress the spring enough so the lower valve stem groove can be clearly seen.
7. O-ring seals (252) and valve keepers (251).
   A. Push a new O-ring seal onto the valve stem. The seal must be installed on the stem's lower groove. Make sure the seal is flat and not twisted.
   B. Apply a small amount of grease to the area of the upper valve stem groove. Assemble the two valve keepers using the grease to hold the keys in place. Make sure the keepers seat properly in the groove

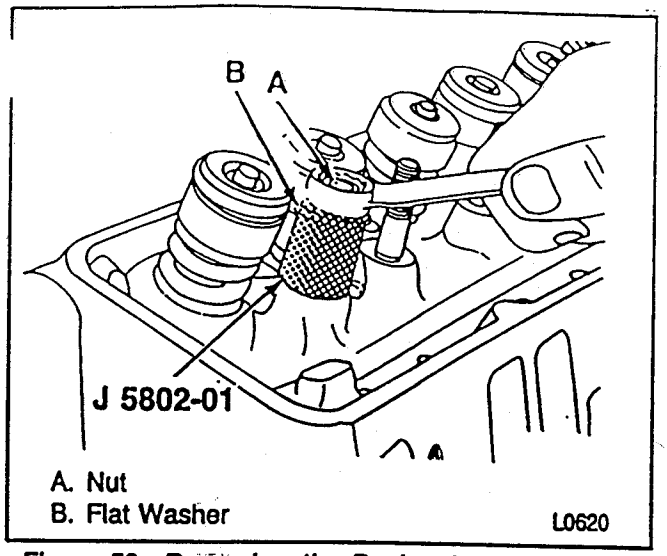


Figure 58—Removing the Rocker Arm Stud (5.0L and 5.7L Engines)

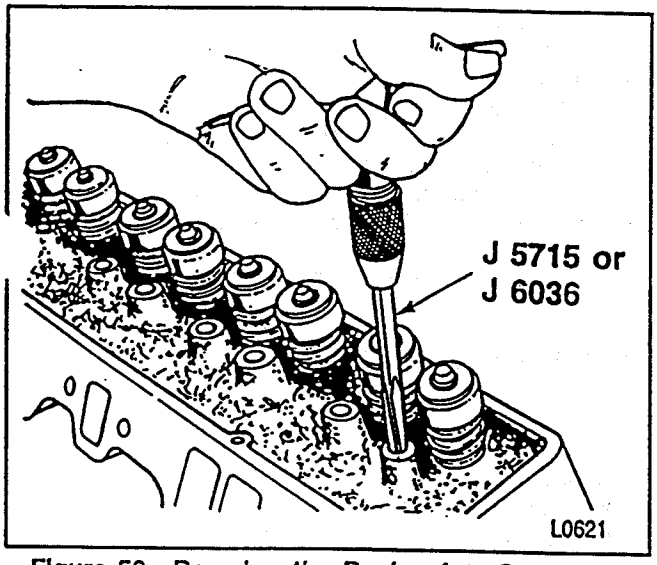


Figure 59—Reaming the Rocker Arm Stud Bore (5.0L and 5.7L Engines)

C. Release the compressor tool. Make sure the valve keepers stay in place.
D. Repeat the preceding steps on the remaining valves.
E. Check each seal, using J 23738-A (figure 61). Place the adapter cup over the shield. Operate the vacuum pump. Observe the vacuum pump gage. No air should be able to leak past the seal. If the seal will not hold a vacuum, it may have been damaged or improperly installed.

Measure (Figures 62 and 63)

- Valve spring installed height of each valve spring as follows:

1. Use a narrow, thin scale. A cutaway scale (figure 62) may be helpful.

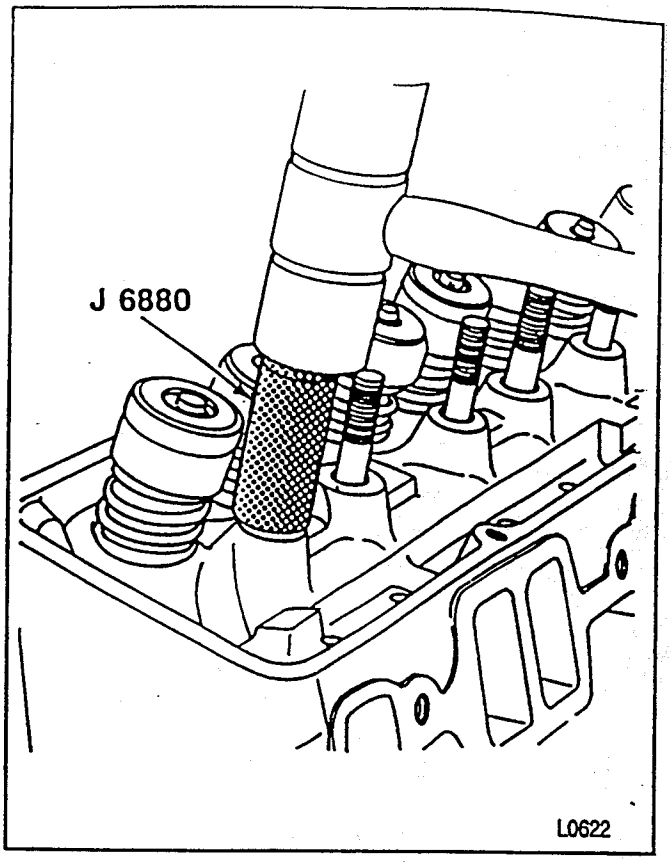


Figure 60—Installing the Rocker Arm Stud (5.0L and 5.7L Engines)

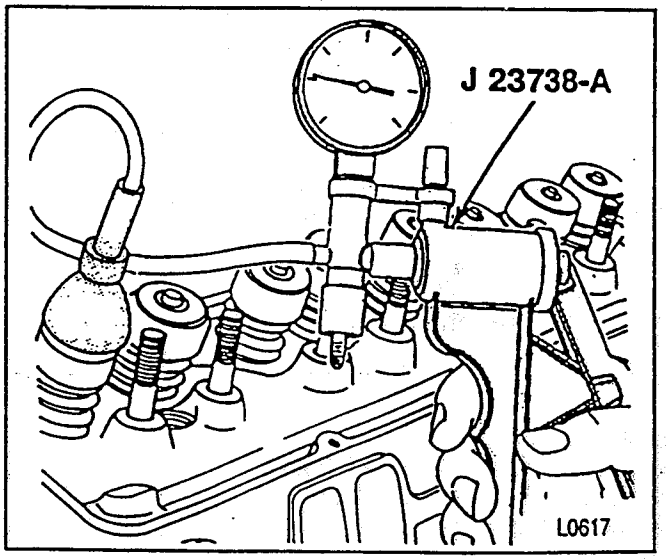
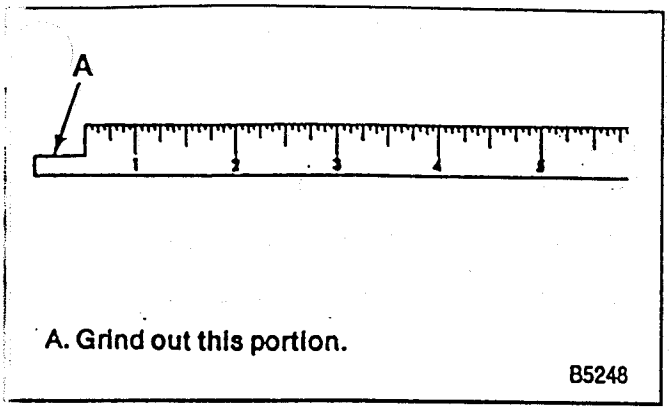


Figure 61—Checking the Valve Seal (5.0L and 5.7L Engines)

2. Measure from the valve shim or spring seat to the top of the shield (255) (figure 63).
3. If this measurement exceeds the amount given in "Engine Specifications," install valve spring seat shims of sufficient thickness (between the spring and cylinder head) to give the desired measurement. NEVER shim the spring so as to give an installed height under the specified amount.



A. Grind out this portion.

Figure 62—Cutaway Scale

ASSEMBLY (7.4L ENGINES)

Assemble (Figures 56 and 57)

Tool Required:
J 8062 Valve Spring Compressor

1. Valves (258 and 259).
   A. Lubricate the valve stems with engine oil.
   B. Insert the valve into the proper guide.
2. Rotators (254).
3. Seals (257).
   A. Lubricate the seals with engine oil.
   B. Push the seals into place.
4. Valve springs with dampers (256).
   Caps (253).
   Valve keepers (251).
   A. Compress the valve spring using J 8062 (figure 57). Compress the spring until the valve stem groove can be seen.
   B. Apply a small amount of grease to the area of the valve stem groove.
   C. Assemble the valve keepers, using the grease to hold the keys in place. Make sure the keepers seat properly in the groove.
   D. Release the compressor tools. Make sure the valve keepers stay in place.
   E. Repeat this procedure on the remaining valves.

Measure (Figures 62 and 63)

- Valve spring installed height of each valve spring.
  1. Use a narrow, thin scale. A cutaway scale (figure 62) may be helpful.
  2. Measure from the spring seat to the top of the valve spring (figure 63).
  3. If this measurement exceeds the amount given in "Engine Specifications," install valve spring seat shims of sufficient thickness (between the spring and cylinder head) to give the desired measurement. NEVER shim the spring so as to give an installed height under the specified amount.

THERMOSTAT AND COOLANT OUTLET

Disassemble (Figures 64 and 65)

1. Bolts (24) or studs (20).
2. Coolant outlet (21).

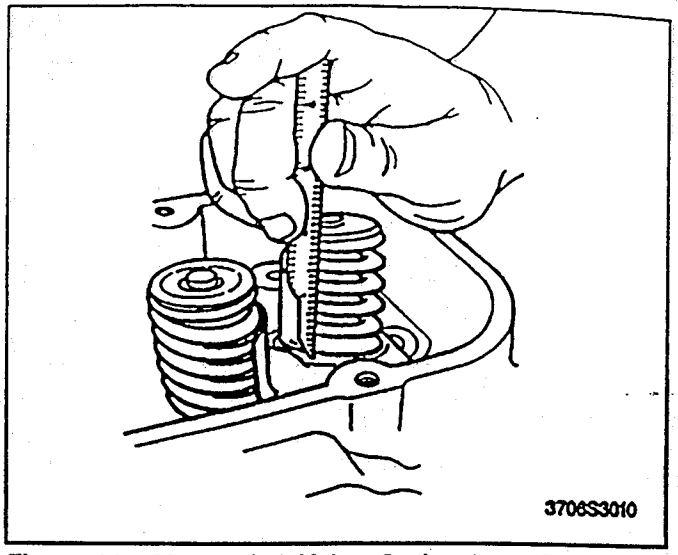
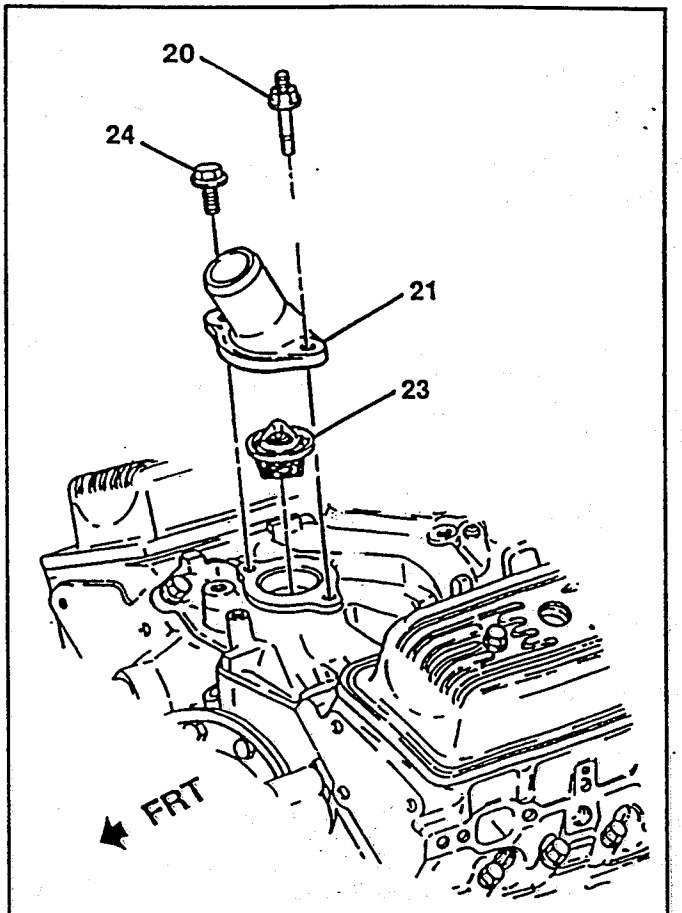
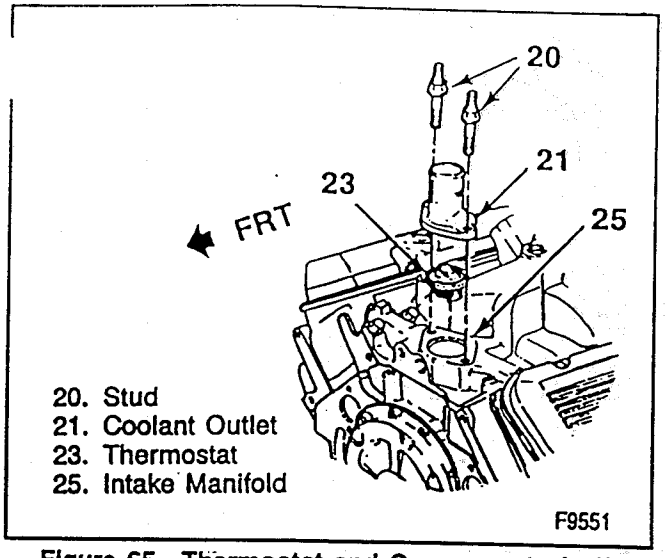


Figure 63—Measuring Valve Spring Installed Height



20. STUD, COOLANT OUTLET
21. OUTLET, COOLANT
23. THERMOSTAT
24. BOLT, COOLANT OUTLET

Figure 64—Thermostat and Components (5.0L and 5.7L Engines)



20. Stud
21. Coolant Outlet
23. Thermostat
25. Intake Manifold

Figure 65—Thermostat and Components (7.4L Engines)

3. Thermostat (23).

Inspect

- Coolant outlet for cracks.

Thermostat Check

Refer to SECTION 6B1 in the proper on-vehicle Light Truck Service Manual.

Install or Connect (Figures 64 and 65)

NOTICE: Do not install thermostat assembly without rubber O-ring. Omitting rubber O-ring may result in poor engine warm-up and reduced heater performance.

1. Thermostat (23) with rubber O-ring.
2. Coolant outlet (21).

NOTICE: Refer to "Notice" on page 6A5B-1.

3. Bolts (24) or studs (20).

Tighten

- Bolts (24) or studs (20) to specifications.
  - — 5.0L and 5.7L engines: 28 N.m (21 lbs. ft.).
  - — 7.4L engines: 40 N.m (30 lbs. ft.).

TORSIONAL DAMPER

Inspect

- Torsional damper weight for signs of shifting on the hub. Replace as needed.
- Area of the torsional damper hub shaft which contacts the crankshaft front seal for roughness or nicks. Replace the damper if this condition exists.

CRANKSHAFT AND BEARINGS

Clean

- Crankshaft with solvent.
- Blow all sludge from the oil passages with compressed air.
- Main bearing inserts. Wipe free of oil with a soft cloth.
- Seal running surfaces with a non-abrasive cleaner.

Inspect

- Crankshaft for cracks. Use the magnaflux method, if available.
- Crankpins, main bearing journals, and thrust surfaces for scoring, nicks, or damage caused by lack of lubrication.
- Main bearing inserts for scoring or other damage.

In general, the lower inserts (except the #1 bearing) show greater wear and the most distress from fatigue. If, upon inspection, the lower insert is suitable for use, it can be assumed that the upper insert is also satisfactory. If the lower insert shows evidence of wear or damage, both the upper and lower inserts must be replaced.

Measure (Figures 66 and 67)

- Main bearing and connecting rod journal diameters (figure 66). Compare with "Engine Specifications." Grind or replace the crankshaft if necessary.
- Main bearing and connecting rod journals for taper and out-of-round (figure 66). If the journals are tapered or out-of-round more than 0.0254 mm (0.001 inch), grind or replace the crankshaft.
- Crankshaft run-out (figure 67).
  - A. Mount the crankshaft in V-blocks on main journals 1 and 5.
  - B. Use a dial indicator to measure the crankshaft runout, as shown in figure 67.
  - C. If the main journals are misaligned, the crankshaft is bent and must be replaced, along with the main bearings.

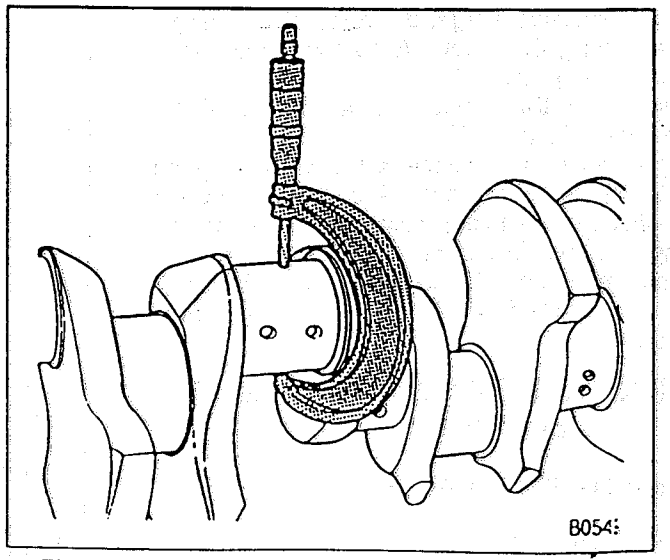


Figure 66—Measuring the Crankshaft Journals

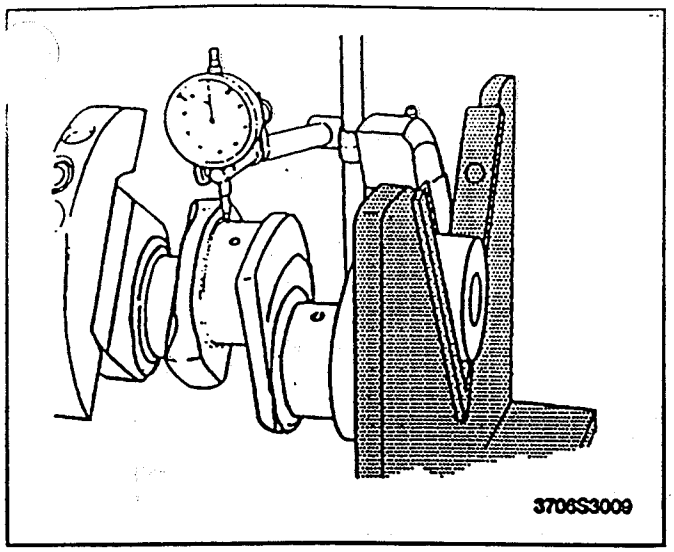


Figure 67—Checking Crankshaft Run-Out

Crankshaft Bearing Availability

Crankshaft main and connecting rod bearings are available in 0.0254 mm (0.001 inch), 0.0508 mm (0.002 inch), 0.2540 mm (0.010 inch), and 0.5080 mm (0.020-inch) undersizes.

CRANKSHAFT REAR OIL SEAL RETAINER (5.0L AND 5.7L ENGINES)

Disassemble (Figure 68)

- Crankshaft rear oil seal. Insert a screwdriver into the notches provided in the seal retainer and pry the seal out (figure 68).

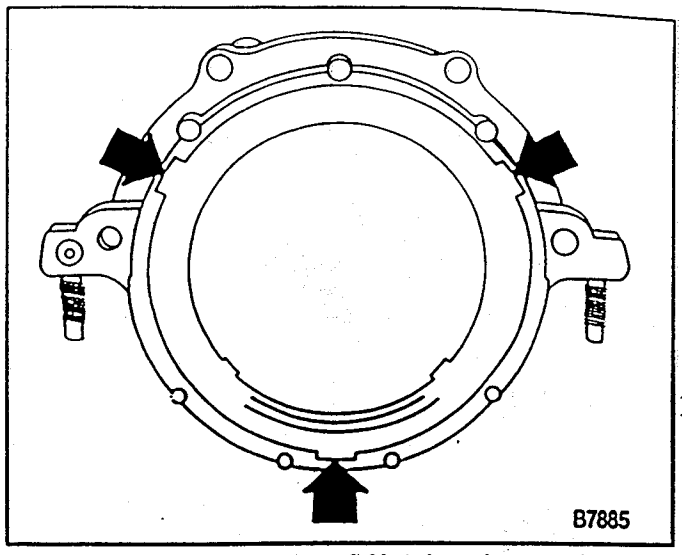


Figure 68—Seal Removal Notches (5.0 and 5.7L Engines)

Clean

- All traces of old gasket from the retainer.

Inspect

- Retainer for cracks, porosity, and damage to the sealing surfaces.

Important

- Install the new crankshaft rear oil seal with the proper tool after the retainer is assembled to the engine, as outlined later.

ASSEMBLY OF THE ENGINE

PRIOR TO ASSEMBLY

The importance of cleanliness during the assembly procedure cannot be overstressed. Dirt will cause premature wear of the rebuilt engine.

Lubricate all moving parts lightly with engine oil or engine assembly lubricant (unless specified otherwise) during assembly. This will provide initial lubrication when the engine is started.

CRANKSHAFT AND MAIN BEARING INSTALLATION

Main bearings are the precision insert type and do not use shims for adjustment. If clearances are excessive, a new bearing will be required. Service bearings are available in standard size and 0.0254 mm (0.001), 0.0508 mm (0.002 inch), 0.2540 mm (0.010 inch), and 0.5080 mm (0.020 inch) undersize. 0.2286 mm (0.009 inch) is available for 5.0L and 5.7L engines only.

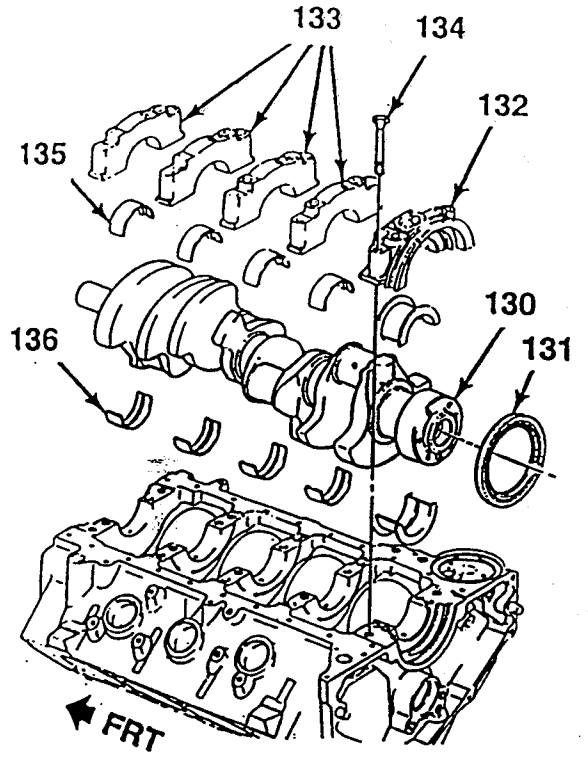
Selective fitting of both rod and main bearing inserts is necessary to obtain close tolerances. For this reason you may use, for example, one half of a 0.0254-mm (0.001-inch) undersize insert which will decrease the clearance 0.0127 mm (0.0005-inch) from using a full standard bearing.

UNDERSIZE MAIN JOURNALS (5.0L AND 5.7L ENGINES)

- On 5.0L and 5.7L engines, when a production crankshaft cannot be precision fit by the method described previously, it is then ground 0.2286-mm (0.009-inch) undersize ON ONLY THOSE MAIN JOURNALS THAT CANNOT BE PROPERLY FITTED. ALL JOURNALS WILL NOT NECESSARILY BE GROUND. A 0.2286-mm (0.009-inch) undersize bearing or 0.2540-mm (0.010-inch) undersize bearing will then be used for precision fitting in the same manner as previously described.

OVERSIZE REAR MAIN BEARING THRUST FACES (5.0L AND 5.7L ENGINES)

- Some 5.0L and 5.7L production engines may have rear main bearings that are 0.2032 mm (0.008-inch) wider than standard across the thrust faces.
- The crankshaft on these engines can be identified by ".008"stamped on the rear counterweight.



130. Crankshaft
131. Rear Seal
132. Rear Main Bearing Cap
133. Main Bearing Cap
134. Bolt
135. Lower Main Bearing Insert
136. Upper Main Bearing Insert

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Figure 69—Crankshaft and Components (7.4L Engines)

- If the rear main bearings are replaced, they must have the proper distance between thrust faces to obtain correct crankshaft end play.

Install or Connect (Figures 69, 70, and 71)

NOTICE: For steps 4 and 5, refer to "Notice" on page 6A5B-1.

1. Upper main bearing inserts to the block.

Important

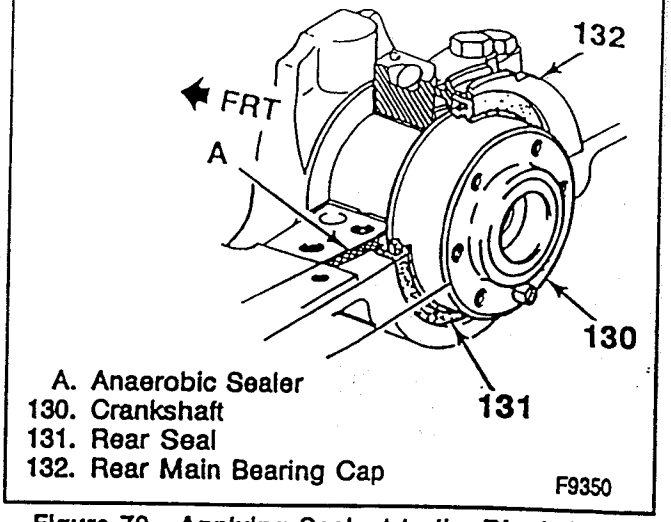
- If any undersized bearings are used, make sure they are fitted to the proper journals.

1. Crankshaft.

Lower main bearing inserts to the main bearing caps.

Measure

- Main bearing clearance. Refer to SECTION 6A.
- Apply engine oil to the main bearing inserts.



A. Anaerobic Sealer
130. Crankshaft
131. Rear Seal
132. Rear Main Bearing Cap

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Figure 70—Applying Sealant to the Block (7.4L Engines)

3. Main bearing caps (except rear cap) and bolts to the block.

Tighten

- Main bearing cap bolts to specifications.
  - — 5.0L and 5.7L engines:
    - Outer bolts on #2, #3, and #4 main bearing caps: 95 N.m (70 lbs. ft.).
    - All others: 110 N.m (80 lbs. ft.).
  - — 7.4L engines: 135 N.m (100 lbs. ft.).

4. Rear main bearing cap and bolts to the block.
   - On 7.4L engines, apply anaerobic sealing compound to the rear bearing cap sealing face or to the rear bearing cap channel of the engine block, from the corner of the rear thrust bearing pocket to the edge of the channel as shown in figure 70. Do not allow any sealant on either crankshaft or rear oil seal.

Tighten

- Rear main bearing cap bolts temporarily to 4 N.m (35 lbs. in.).

Measure (Figure 71)

- Crankshaft end play, as follows:

A. Firmly thrust the crankshaft first rearward then forward. This will line up the rear main bearing and crankshaft thrust surfaces.

NOTICE: Refer to "Notice" on page 6A5B-1.

Tighten

- Rear main bearing cap bolts to specifications:
  - — 5.0L and 5.7L engines: 110 N.m (80 lbs. ft.).
  - — 7.4L engines: 135 N.m (100 lbs. ft.).

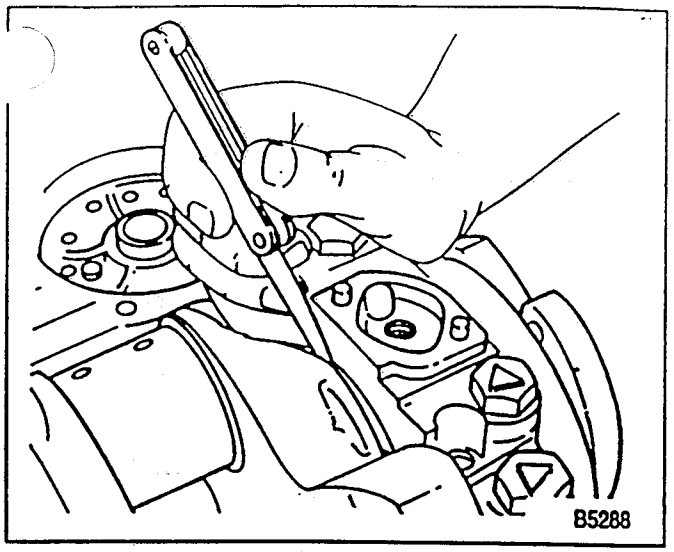


Figure 71—Measuring Crankshaft End Play

B. With the crankshaft wedged forward, measure at the front end of the rear main bearing with a feeler gage (figure 71). The proper clearance is 0.0508-0.1524 mm (0.002-0.006-inch) (5.0L and 5.7L engines) or 0.0508-0.2540 mm (0.002-0.010-inch) (7.4L engines).

C. On 5.0L and 5.7L engines, if correct end play cannot be obtained, make sure the correct size rear main bearing has been installed. Production engines may have rear main bearings that are 0.2032 mm (0.008 inch) wider across the thrust faces than standard, as explained previously.

Inspect

- Crankshaft for binding. Try turning the crankshaft to check for binding. If the crankshaft does not turn freely, loosen the main bearing cap bolts on one cap at a time until the tight bearing is located. Burrs on the bearing cap, foreign matter between the insert and the block or the bearing cap, or a faulty insert could cause a lack of clearance at the bearing.
  — A bent crankshaft could cause binding. Make sure the steps outlined above have been performed before suspecting a bent crankshaft.

CRANKSHAFT REAR OIL SEAL INSTALLATION (7.4L ENGINES)

Install or Connect

Tool Required:
J 38841 Seal Installer

- Crankshaft rear oil seal.

A. Make sure the crankshaft rear chamfer is free of grit, loose rust, and burrs. Correct as needed.
B. Lubricate the inner and outer diameter of the seal with engine oil.
C. Install the seal on J 38841.
D. Position J 38841 against the crankshaft. Thread the attaching screws into the tapped holes in the crankshaft.
E. Tighten the screws securely with a screwdriver. This will ensure the seal is installed squarely over the crankshaft.
F. Turn the handle until it bottoms.
G. Remove J 38841.

CRANKSHAFT REAR OIL SEAL AND RETAINER INSTALLATION (5.0L AND 5.7L ENGINES)

Install or Connect (Figures 72 and 73)

Tool Required:
J 35621 Seal Installer

- Whenever the seal retainer is removed, a new retainer gasket and crankshaft rear oil seal must be installed.

1. Gasket (84) to the block. It is not necessary to use sealant to hold the gasket in place.
2. Seal retainer (82).

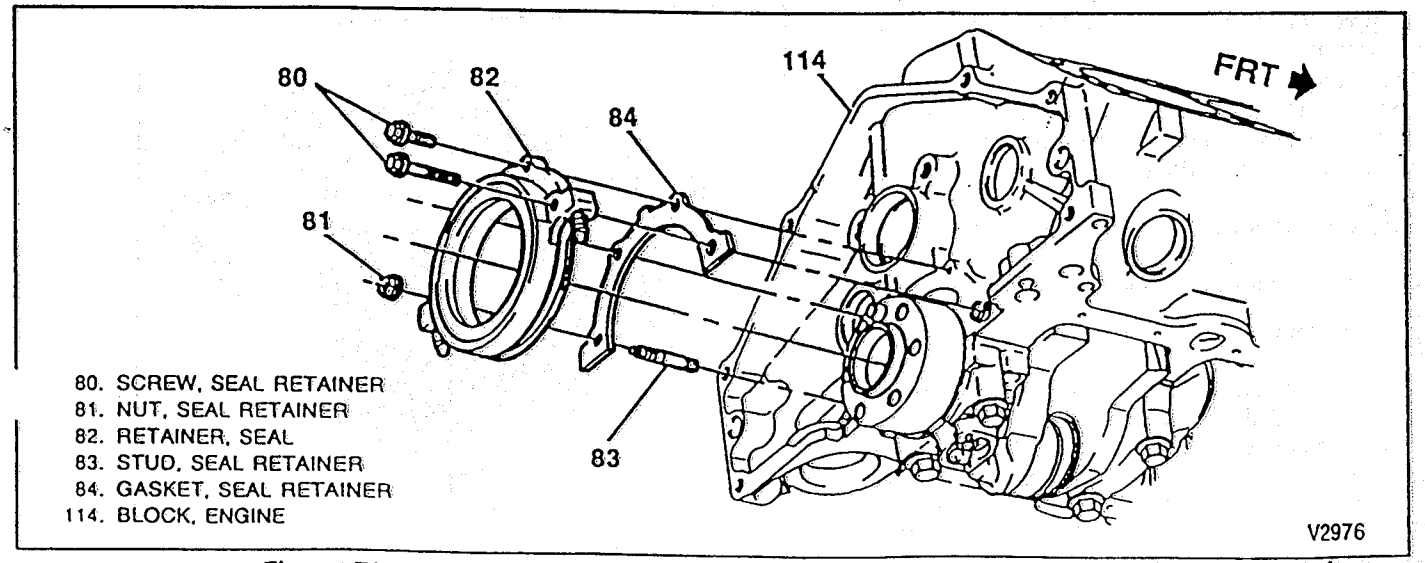


Figure 72—Crankshaft Rear Oil Seal Retainer (5.0L and 5.7L Engines)

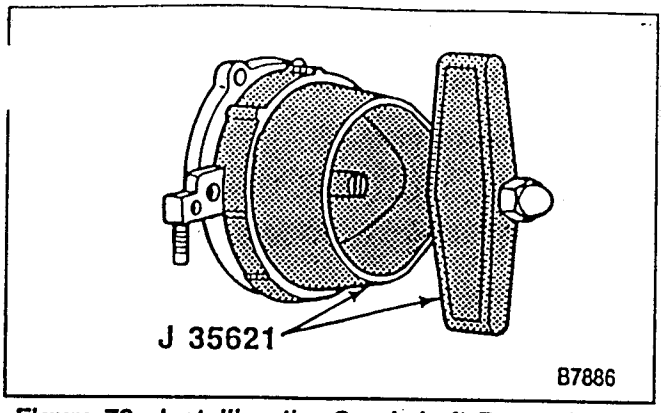


Figure 73—Installing the Crankshaft Rear Oil Seal (5.0L and 5.7L Engines)

NOTICE: Refer to "Notice" on page 6A5B-1.

3. Screws (80) and nuts (81).

Tighten

- Screws (80) and nuts (81) to 15 N.m (11 lbs. ft.).

4. Crankshaft rear oil seal (figure 73).
   A. Make sure the crankshaft rear chamfer is free of grit, loose rust, and burrs. Correct as needed.
   B. Lubricate the inner and outer diameter of the seal with engine oil.
   C. Install the seal on J 35621.
   D. Position J 35621 against the crankshaft. Thread the attaching screws into the tapped holes in the crankshaft.
   E. Tighten the screws securely with a screwdriver. This will ensure the seal is installed squarely over the crankshaft.
   F. Turn the handle until it bottoms.
   G. Remove J 35621.

CAMSHAFT, TIMING CHAIN, AND SPROCKET INSTALLATION

Install or Connect (Figures 74 and 75)

- Coat the camshaft lobes and journals with Engine Oil Supplement (GM P/N 1052367) or equivalent.

1. Camshaft (figure 74).
   - Use three 5/16-18 bolts 100-125 mm (4-5 inches) long threaded into the camshaft's tapped holes to handle the camshaft.
   - Use care to avoid damaging the camshaft bearings.
   - Remove the three bolts after installation.
2. Timing chain to the camshaft sprocket.
3. Camshaft sprocket and timing chain to the engine.

Important

- Align the timing marks on the camshaft sprocket and crankshaft sprocket (figure 75).

4. Camshaft sprocket bolts. Use the bolts to draw the camshaft sprocket onto the camshaft. DO NOT ATTEMPT TO HAMMER THE CAMSHAFT SPROCKET ONTO THE CAMSHAFT. DOING SO MAY DISLODGE THE REAR CAMSHAFT PLUG.

NOTICE: Refer to "Notice" on page 6A5B-1.

Tighten

- Camshaft sprocket bolts to specifications.
  — 5.0L and 5.7L engines: 28 N.m (21 lbs. ft.).
  — 7.4L engines: 26 N.m (20 lbs. ft.).

Measure

- Timing chain free play. The free play should not exceed 16 mm (5/8 inch).

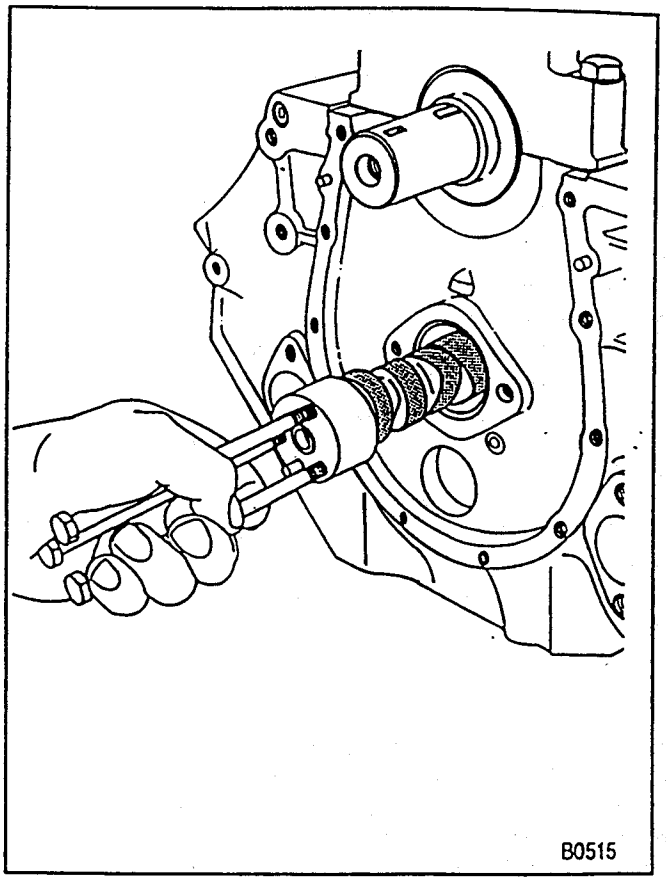


Figure 74—Installing the Camshaft

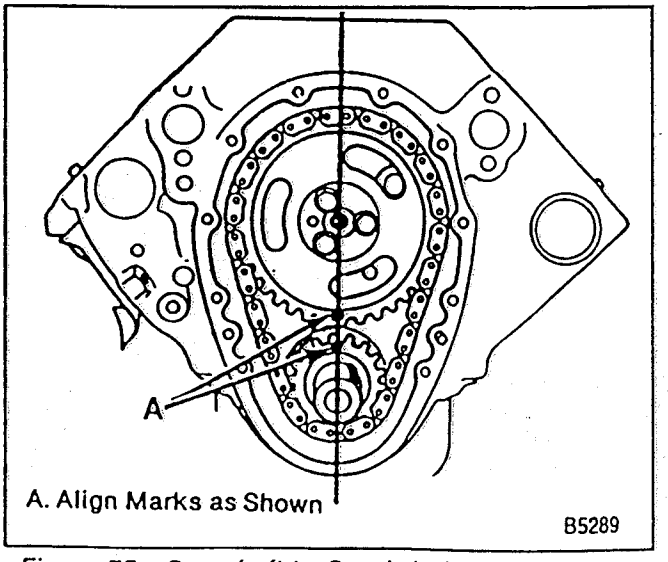


Figure 75—Camshaft-to-Crankshaft Timing Marks

FRONT COVER INSTALLATION

Install or Connect (Figure 76)

- Lubricate the lips of the crankshaft front oil seal with engine oil.

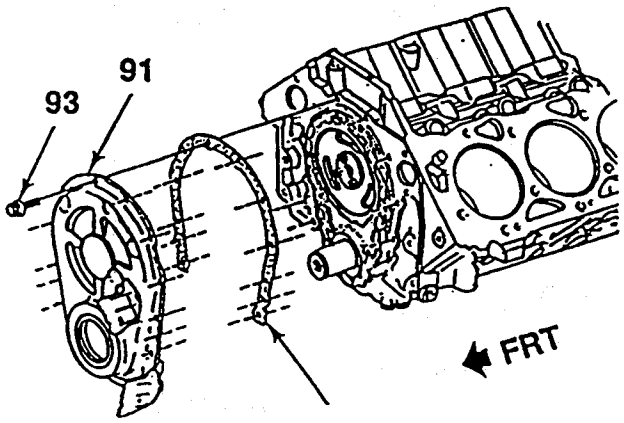
1. Gasket (90).
2. Front cover (91).

NOTICE: Refer to "Notice" on page 6A5B-1.

3. Bolts (93).

Tighten

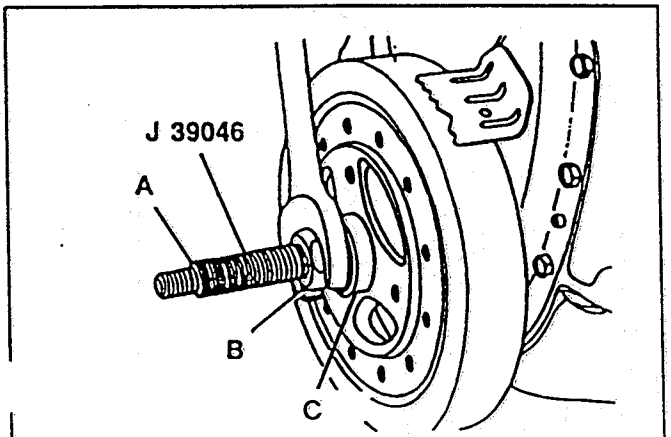
- Bolts (93) to specifications:
  - — 5.0L and 5.7L engines: 11 N.m (97 lbs. in.).
  - — 7.4L engines: 11 N.m (97 lbs. in.).



90. Gasket
91. Front Cover
93. Bolt

F9357

Figure 76—Front Cover



A. INSTALLATION STUD
B. NUT
C. WASHER AND BEARING

L0707

Figure 77—Installing the Torsional Damper

TORSIONAL DAMPER INSTALLATION

Install or Connect (Figure 77)

Tools Required:
J 39046 Torsional Damper Puller and Installer

1. Crankshaft key.

NOTICE: The inertial weight section of the torsional damper is assembled to the hub with a rubber type material. The correct installation procedures (with the proper tool) must be followed or movement of the inertial weight section of the hub will destroy the tuning of the torsional damper.

2. Stud (item A, figure 77) to the crankshaft. Thread the stud fully into the tapped hole in the crankshaft.
3. Torsional damper over the end of the stud. Align the keyway in the torsional damper shaft with the crankshaft key.
   - Use a small amount of RTV sealant to seal the keyway to crankshaft joint.
4. Bearing, washer, and nut (figure 77).
   A. Turn the nut to pull the torsional damper into place.
   B. Remove the tool.

NOTICE: Refer to "Notice" on page 6A5B-1.

5. Torsional damper bolt and washer.

Tighten

- Bolt to specifications.
  - — 5.0L and 5.7L engines: 95 N.m (70 lbs. ft.).
  - — 7.4L engines: 149 N.m (110 lbs. ft.).

PISTON AND CONNECTING ROD INSTALLATION

CONNECTING ROD BEARING SELECTION

Connecting rod bearings are the precision insert type and do not use shims for adjustment. DO NOT FILE RODS OR ROD CAPS. If clearances are excessive, install a new bearing. Service bearings are available in standard size and 0.0254-mm (0.001-inch) and 0.0508-mm (0.002-inch) undersize for use with new and used standard size crankshafts, and in 0.2540-mm (0.010-inch) and 0.020-inch undersize for use with reconditioned crankshafts.

On production 5.0L and 5.7L engines, it is possible to find a 0.2540-mm (0.010-inch) undersize bearing. These are used in manufacturing for selective fitting.

Selective fitting of both rod and main bearing inserts is necessary to obtain close tolerances. For this reason you may use, for example, one half of a standard insert with one half of a 0.2504-mm (0.001-inch) undersize insert which will decrease the clearance 0.0127 mm (0.0005-inch) from using a full standard bearing.

Install or Connect (Figures 78 through 81)

Tools Required:
J 5239 Connecting Rod Guide Set
J 8037 Ring Compressor

- Lubricate the cylinder walls lightly with engine oil.
- Make sure the piston is installed in its matching cylinder.

1. Connecting rod bearing inserts.
   A. Make sure the inserts are the proper size.
   B. Install the inserts in the connecting rod and connecting rod cap.
2. Piston and connecting rod to the proper bore.
   A. With the connecting rod cap removed, install J 5239 onto the connecting rod bolts.
   B. Locate the piston ring end gaps as shown in figure 78 (5.0L and 5.7L engines) or figure 79 (7.4L engines).
   C. Lubricate the piston and rings with engine oil.
   D. Without disturbing the ring end gap location, install J 8037 over the piston (figure 80).
   E. Use a hammer handle to tap the piston down into its matching bore.
      - On 5.0L and 5.7L engines, the notch in the piston crown (figure 78) must face the front of the engine.
      - On 7.4L engines, the dimple must face the front of the block (figure 81).
   F. While tapping the piston into its bore, guide the connecting rod into position on the crankpin, using J 5239. Hold the ring compressor against the block until all rings have entered the cylinder bore.

Important

- Each connecting rod and bearing cap should be marked, beginning at the front of the engine. Cylinder 1, 3, 5 and 7 are the right bank and 2, 4, 6, and 8 are the left bank (when viewed from the front of the engine). The numbers on the connecting rod and bearing cap must be on the same side when installed in the cylinder bore. If a connecting rod is ever transposed from one block or cylinder to another, new connecting rod bearings should be fitted and the connecting rod should be numbered to correspond with the new cylinder number.

NOTICE: Refer to "Notice" on page 6A5B-1.

3. Connecting rod cap with bearing insert and nut.

Measure

- Connecting rod bearing clearance. Refer to SECTION 6A. Then apply engine oil to the connecting rod bearing.

Tighten

- Connecting rod bolt nuts to specifications.
  — 5.0L and 5.7L engines: 61 N.m (45 lbs. ft.).
  — 7.4L engines: 61 N.m (45 lbs. ft.).

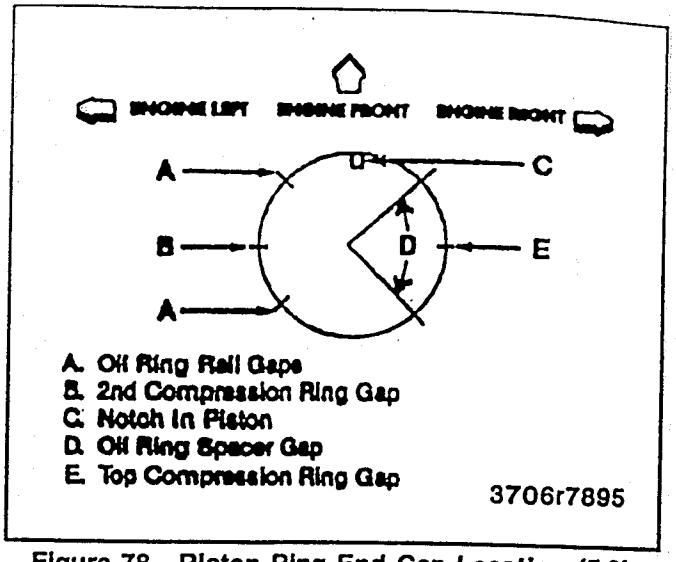


Figure 78—Piston Ring End Gap Location (5.0L and 5.7L Engines)

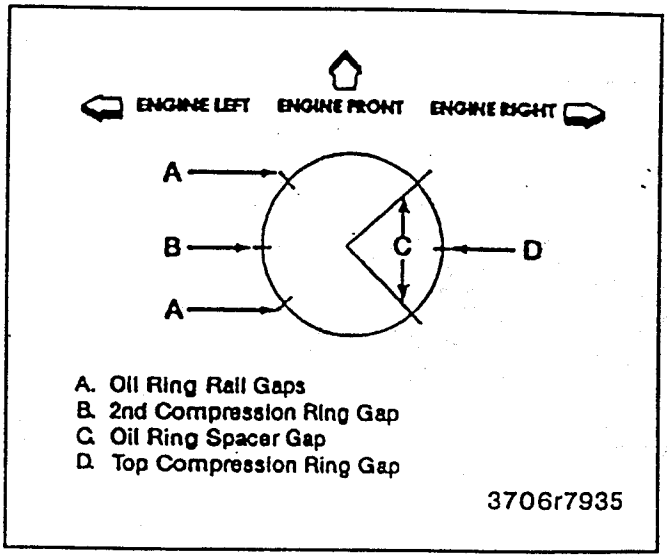


Figure 79—Piston Ring End Gap Location (7.4L Engines)

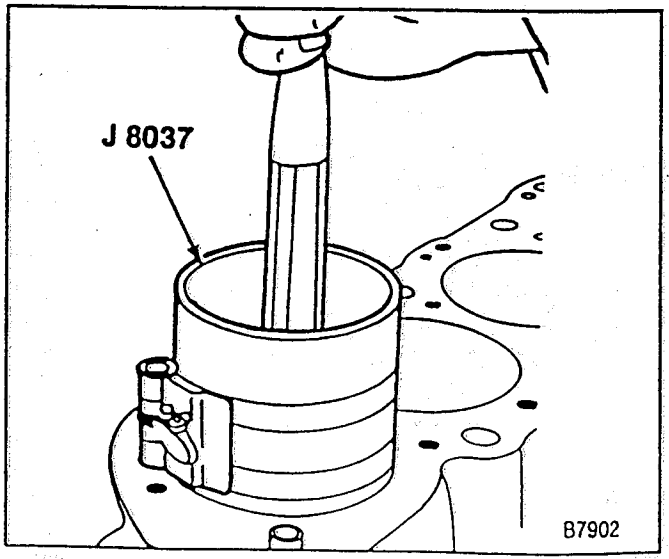


Figure 80—Installing the Piston

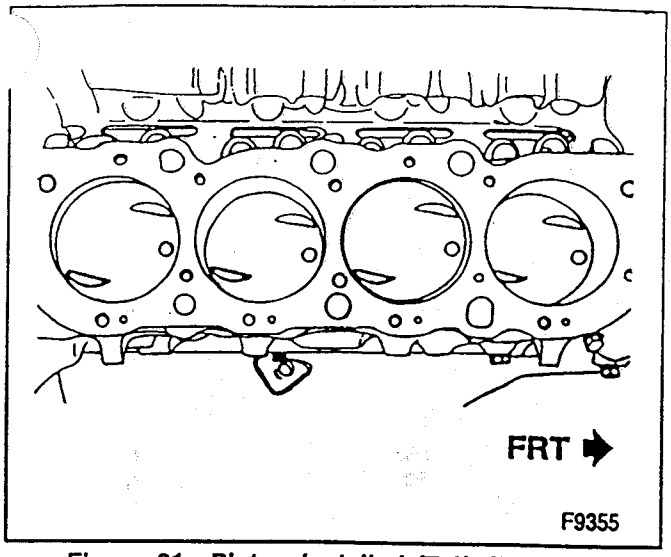


Figure 81—Piston Installed (7.4L Engines)

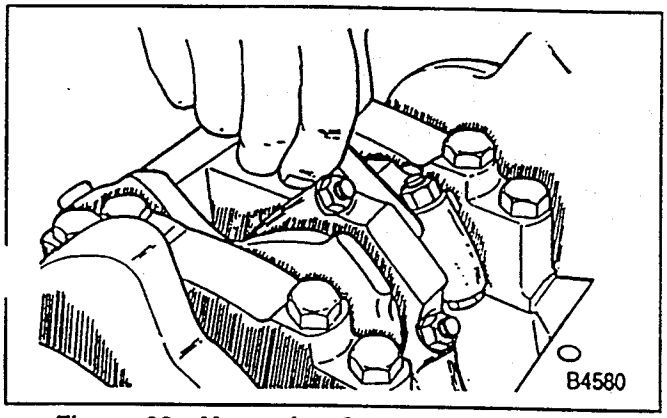


Figure 82—Measuring Connecting Rod Side Clearance

Measure (Figure 82)

- Connecting rod side clearance. Use a feeler gage between the connecting rods (figure 82). The proper clearance is as follows:
  - —5.0L and 5.7L engines: 0.1524-0.3556-mm (0.006-0.014-inch).
  - —7.4L engines: 0.3302-0.5842-mm (0.013-0.023-inch).

OIL PUMP INSTALLATION

Install or Connect

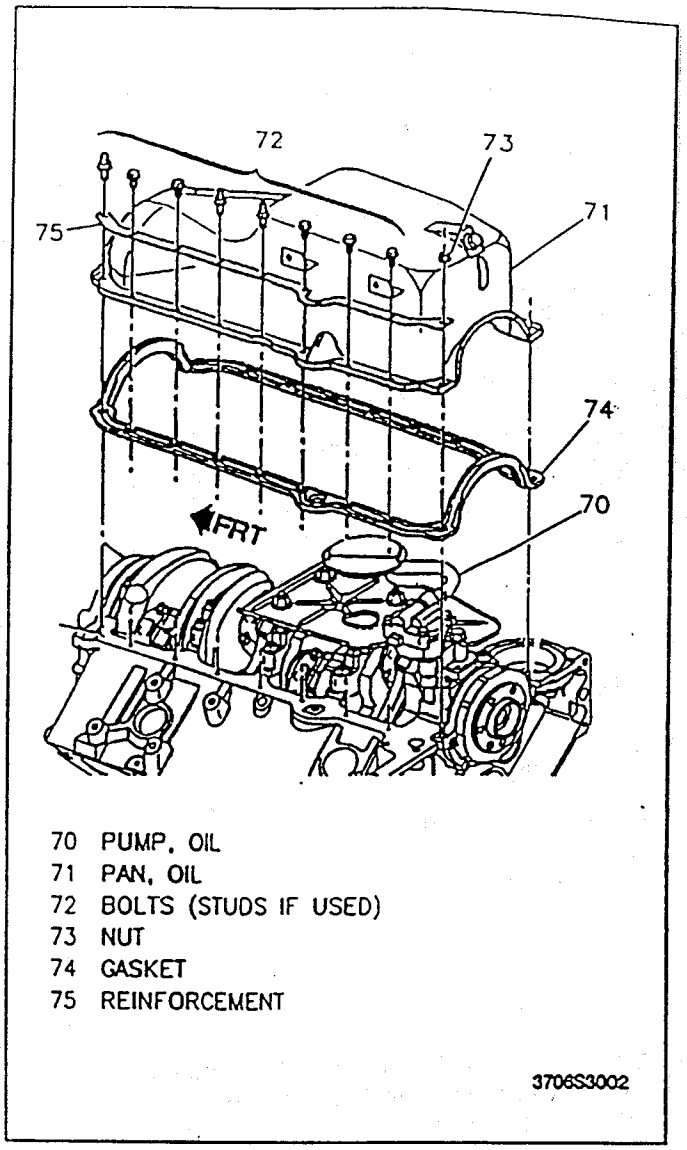
1. Oil pump with connector and oil pump driveshaft.

NOTICE: Refer to "Notice" on page 6A5B-1.

2. Oil pump to main bearing cap bolt.

Tighten

- Bolt to 90 N.m (65 lbs. ft.).



70 PUMP, OIL
71 PAN, OIL
72 BOLTS (STUDS IF USED)
73 NUT
74 GASKET
75 REINFORCEMENT

Figure 83—Oil Pan (5.0L and 5.7L Engines)

OIL PAN INSTALLATION

5.0L AND 5.7L ENGINES

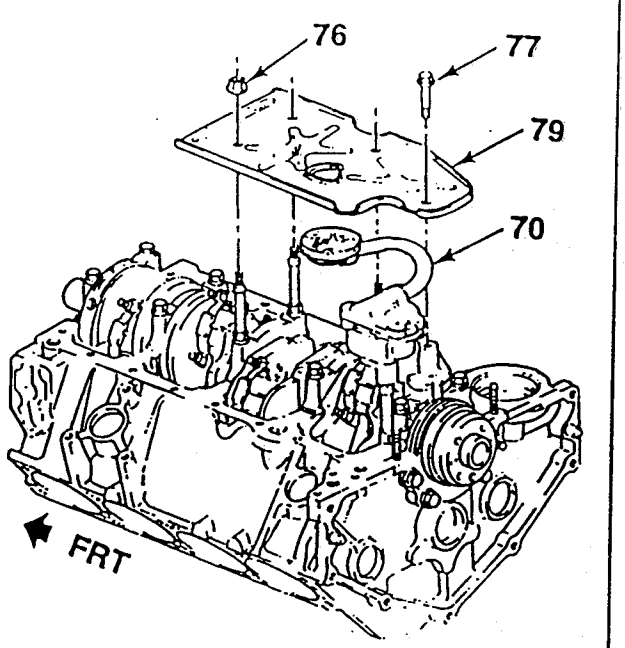
Install or Connect (Figures 83 and 84)

- Apply RTV sealer (GM P/N 12346141) or equivalent to the front cover to block joint and crankshaft rear seal retainer to block joint.

1. Oil pan gasket (74) to the oil pan (71).
2. Oil pan deflector nuts (76) (figure 84).
3. Oil pan (71) to the engine.
4. Oil pan bolts (72), nuts (73), and reinforcements (75).

Tighten

- Oil pan bolts (72) to 11 N.m (97 lbs. in.).
- Oil pan nuts (73) to 22 N.m (16 lbs. ft.).
- Oil pan deflector nuts (76) to 36 N.m (27 lbs. ft.).



70. Oil Pump
76. Nut
77. Bolt
79. Oil Pan Baffle

Figure 84—Oil Pan Deflector (5.0L and 5.7L Engines)

7.4L ENGINES

Install or Connect (Figure 85)

- Apply RTV sealer (GM P/N 12346141) or equivalent in four places where the front and rear main bearing caps meet the engine block as shown in figure 85.

1. Gasket (74) to the block.
2. Oil pan (76). Make sure the gasket stays in place.

NOTICE: Refer to "Notice" on page 6A5B-1.

3. Bolts (75).

Tighten

- Bolts to 22 N.m (16 lbs. ft.).

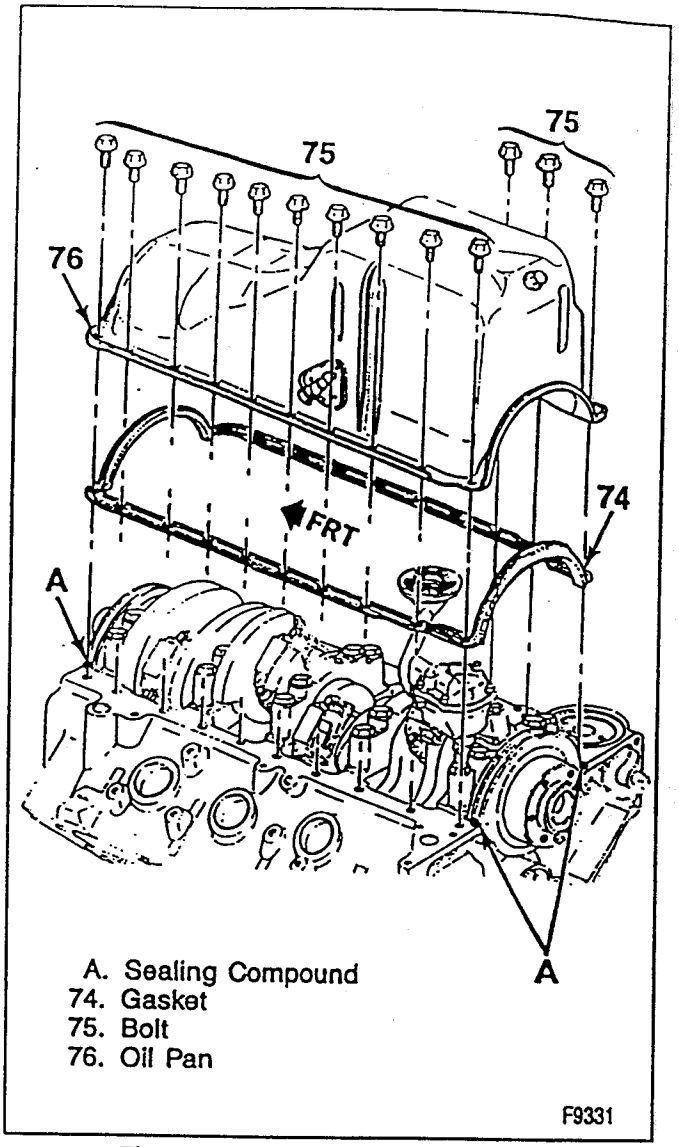
CYLINDER HEAD INSTALLATION

Clean

- Gasket surfaces on block and cylinder head.

Install or Connect (Figures 86 through 91)

1. Head gasket.
   - Use no sealer on engines using a composition gasket.
   - Place the gasket in position over the dowel pins with the bead up.



A. Sealing Compound
74. Gasket
75. Bolt
76. Oil Pan

Figure 85—Oil Pan (7.4L Engines)

2. Cylinder head. Carefully guide the cylinder head into place over the dowel pins and head gaskets.
3. Cylinder head bolts. Coat the threads of the bolts with sealing compound (Loctite #592 or equivalent) and install finger tight.

Tighten

- Bolts in three steps using the sequence shown in figures 90 or 91 until the proper torque is reached:
  - — 5.0L and 5.7L engines:
    - A. The first sequence to 35 N.m (25 lbs. ft.).
    - B. The second sequence to 60 N.m (45 ft. lbs).
    - C. The final torque sequence to 90 N.m (65 lbs. ft.).
  - — 7.4L engines:
    - A. The first sequence to 40 N.m (30 lbs. ft.).
    - B. The second sequence to 80 N.m (60 ft. lbs).
    - C. The final torque sequence to 115 N.m (85 lbs. ft.).

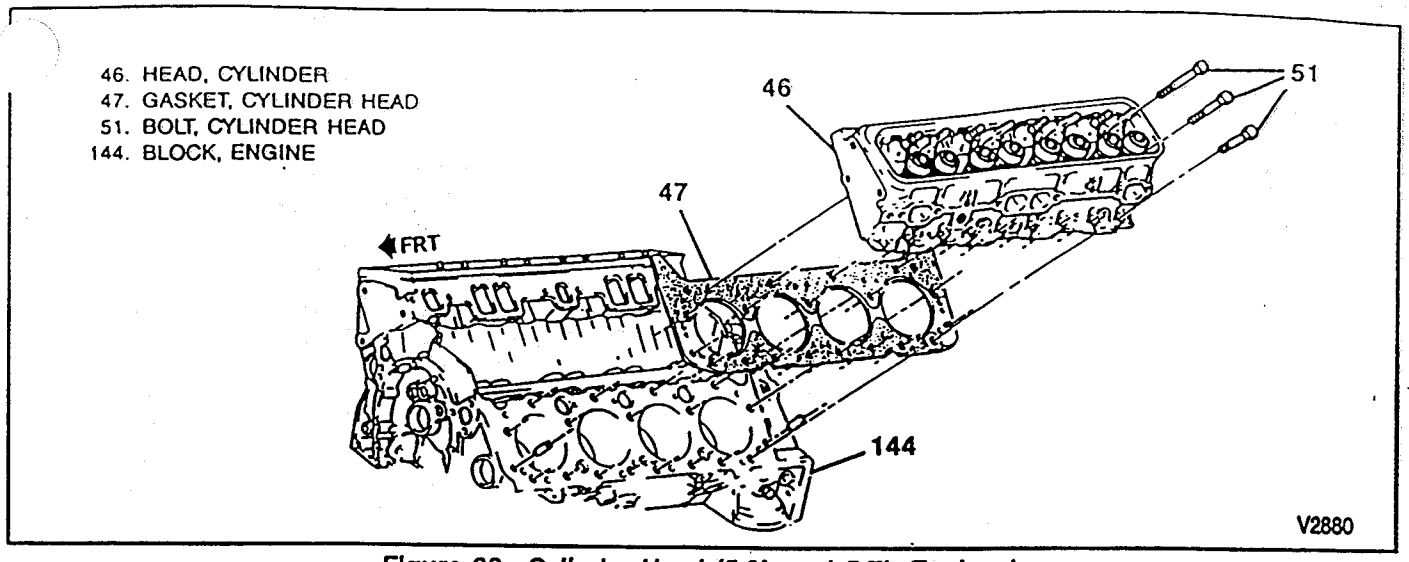


Figure 86—Cylinder Head (5.0L and 5.7L Engines)

VALVE TRAIN COMPONENT INSTALLATION

Important

- Replace all hydraulic lifters if a new camshaft is installed.

Install or Connect (Figures 88 and 89)

- Lubricate the hydraulic lifter bodies with Engine Oil Supplement (GM P/N 1052367) or equivalent.

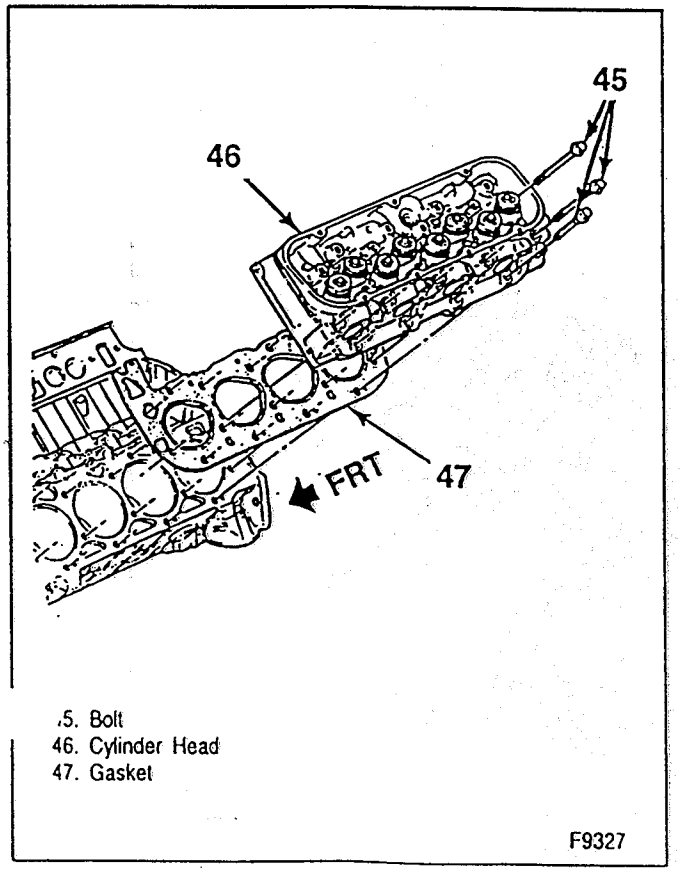


Figure 87—Cylinder Head (7.4L Engines)

- Lubricate the feet of the lifters with "Moly Kote."

1. Hydraulic lifters (44 or 209) to the block.
2. Pushrods (43 or 210). Seat the pushrods into the socket in the hydraulic lifters.
   - The 7.4L engine uses different length intake and exhaust pushrods. The exhaust valve pushrods are longer than the intake valve pushrods.
   - Coat the mating surfaces of the rocker arms (42) and balls (41) with "Moly Kote" or equivalent.
3. Pushrod guides (260), 7.4L engines only.
4. Rocker arms (42).
5. Balls (41).

NOTICE: Refer to "Notice" on page 6A5B-1.

6. Nuts (40), on 5.0L and 5.7L engines or bolts (40) on 7.4L engines.

Tighten

- Bolts (40) to 54 N.m (40 lbs. ft.), 7.4L engines only.

Adjust

- Valves (5.0L and 5.7L engines only).
- No valve adjustment is required for 7.4L engines after tightening the rocker arm bolts to 54 N.m (40 lbs. ft.).

VALVE ADJUSTMENT

5.0L and 5.7L ENGINES

1. Remove the rocker arm covers.
2. Crank the engine until the mark on the torsional damper lines up with the center or "0" mark on the timing tab (figure 92). The engine must be in the number one firing position. This may be determined by placing fingers on the number one cylinder's valves as the mark on the damper comes near the "0" mark on the crankcase front cover. If the valves

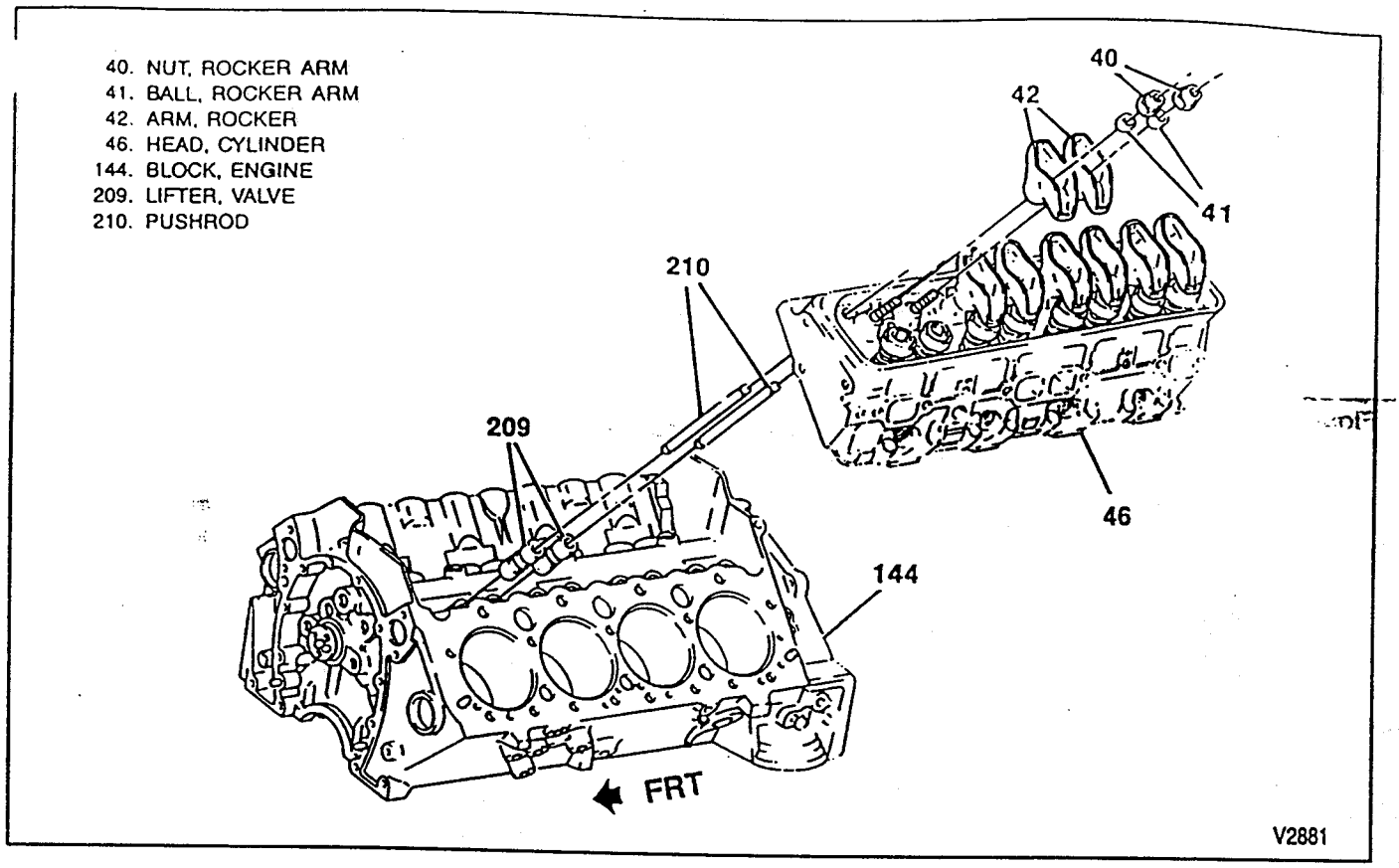


Figure 88—Valve Train Components (5.0L and 5.7L Engines)

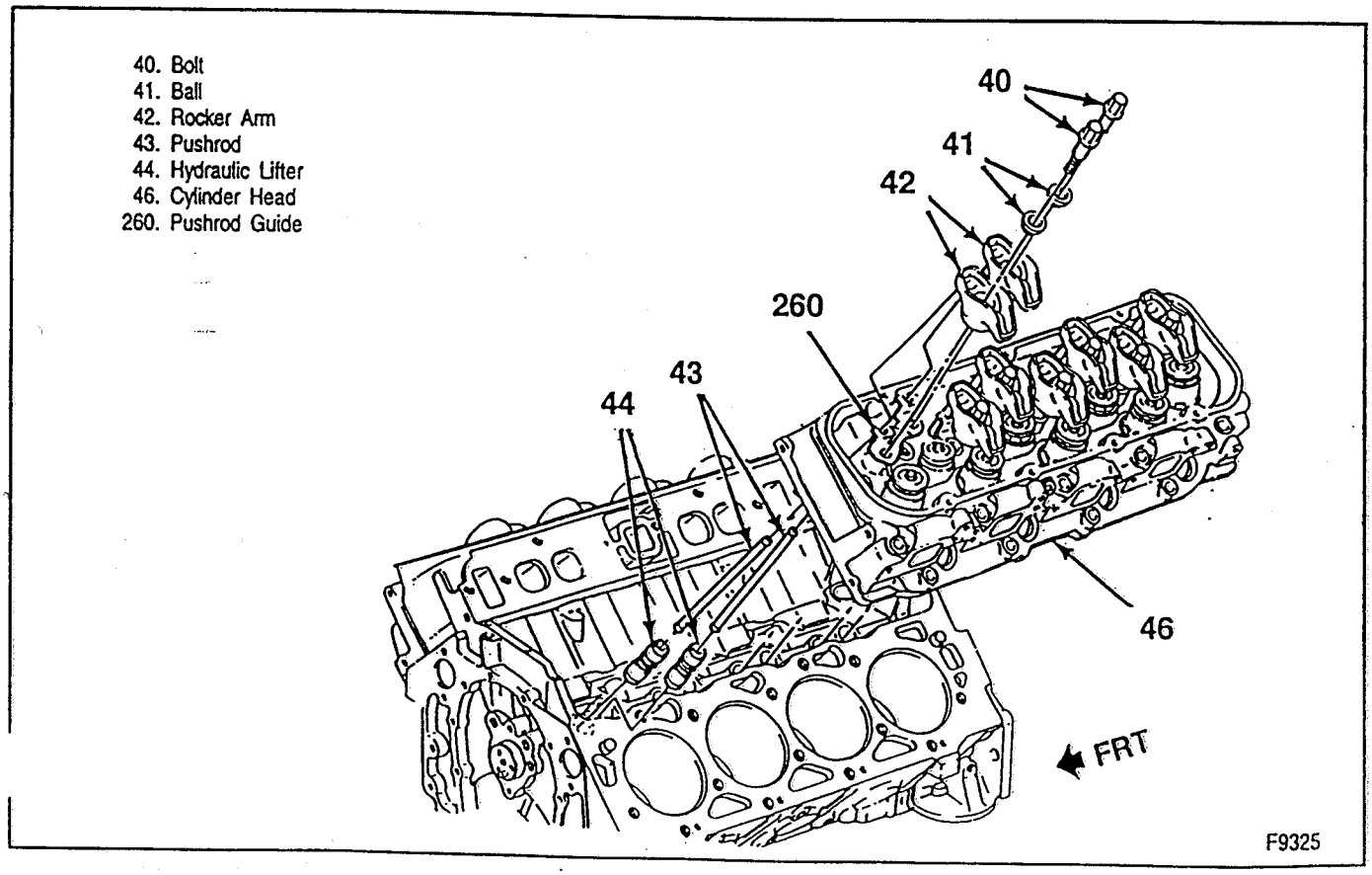


Figure 89—Valve Train Components (7.4L Engines)

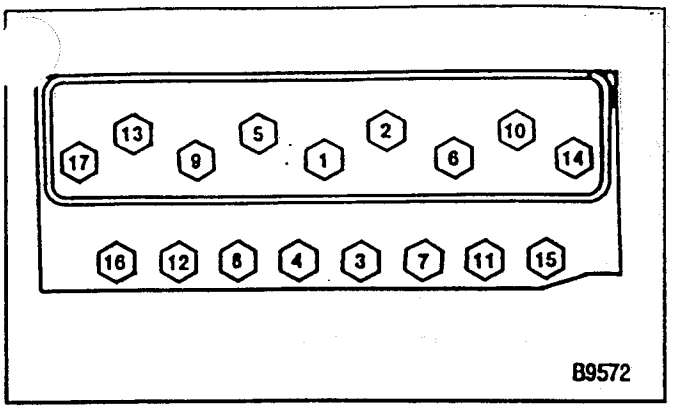


Figure 90—Cylinder Head Bolt Tightening Sequence (5.0L and 5.7L Engines)

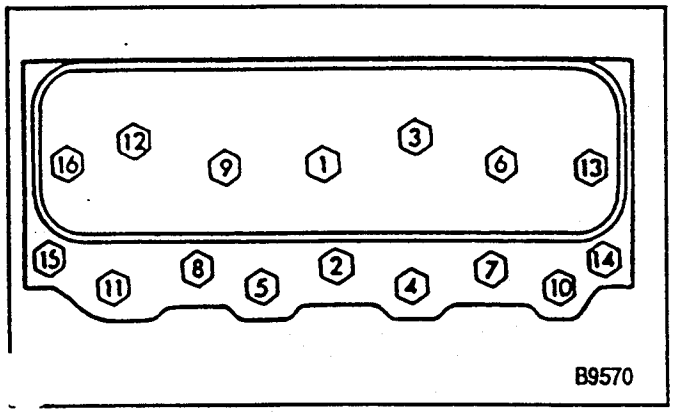


Figure 91—Cylinder Head Bolt Tightening Sequence (7.4L Engines)

are not moving, the engine is in the number one firing position. If the valves move as the mark comes up to the timing tab, the engine is in the number six firing position and should be turned over one more time to reach the number one position.

3. With the engine in the number one firing position as determined above, the following valves may be adjusted:
   - Exhaust - 1, 3, 4, 8
   - Intake - 1, 2, 5, 7

   (Even numbered cylinders are the left bank; odd numbered cylinders are the right bank, when viewed from the front of the engine.)
4. Back out the adjusting nut until lash is felt at the pushrod then turn in the adjusting nut until all lash is removed. This can be determined by rotating the pushrod while turning the adjusting nut (figure 93). When the play has been removed, turn the adjusting nut in as follows:

   - 5.0L and 5.7L engines: One full turn.

   Crank the engine one revolution until the pointer "0" mark and torsional damper mark are again in alignment. This is the number six firing position. With the engine in this position the following valves may be adjusted:

   - Exhaust - 2, 5, 6, 7
   - Intake - 3, 4, 6, 8

INTAKE MANIFOLD INSTALLATION

5.0L AND 5.7L ENGINES

Install or Connect (Figures 94 and 95)

1. Gaskets (22) to the cylinder heads.
   - Make sure the tab and/or arrow faces the front of the engine. The side stamped "This Side Down" must face the cylinder head.
2. RTV sealant to the front and rear intake manifold sealing surfaces on the block as follows:
   - Refer to figure 94.
   - Apply a 5 mm (3/16-inch) bead of RTV sealer (GM P/N 1052289 or equivalent) on the front and rear of the block. Extend the bead 13 mm (1/2 inch) up each cylinder head to seal and retain the gaskets.
3. Intake manifold (21) to the engine.

NOTICE: Refer to "Notice" on page 6A5B-1.

4. Intake manifold bolts (19) and studs (20).

Tighten

- Bolts (19) and studs (20) to 47 N·m (35 lbs. ft.) using the tightening sequence shown in figure 95.

7.4L ENGINES

Install or Connect (Figures 96 and 97)

1. Gaskets (22) to the cylinder heads.
   - Apply a 5 mm (3/16-inch) spot of RTV sealer (GM P/N 1052289 or equivalent) on the front and rear of the block in four places as shown in figure 96.
2. Seals (23) to the block.

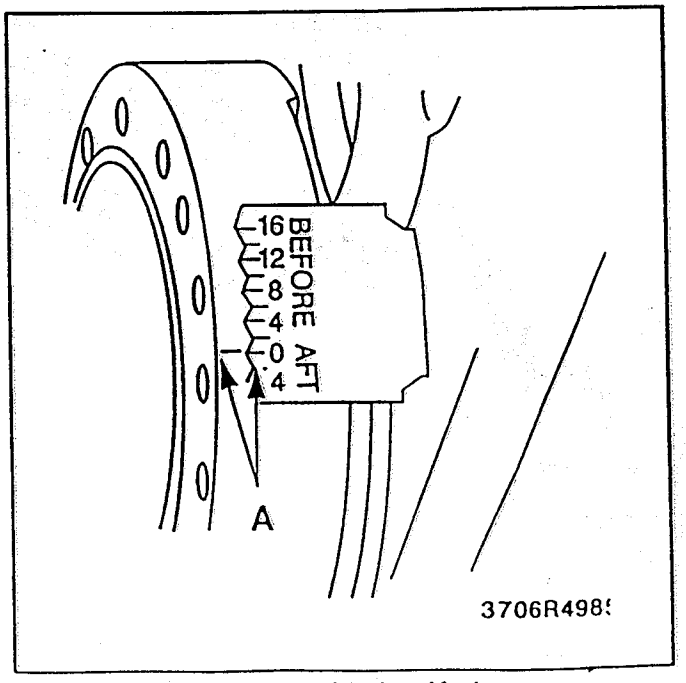


Figure 92—Timing Marks

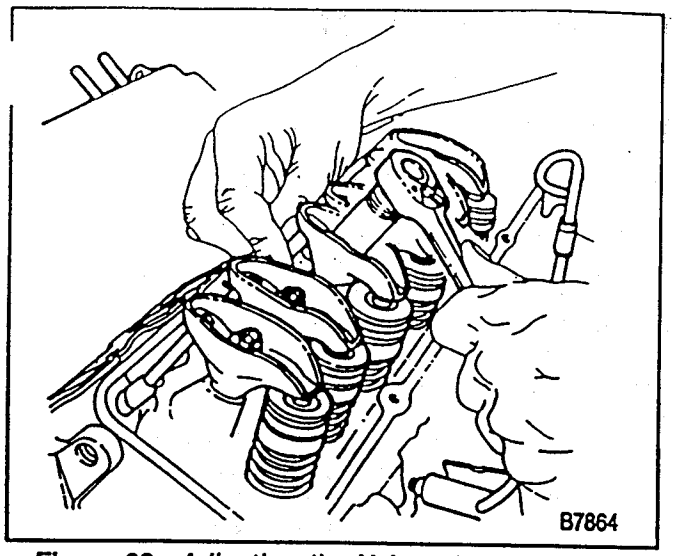


Figure 93—Adjusting the Valves (5.0L and 5.7L Engines)

3. Intake manifold (21).

NOTICE: Refer to "Notice" on page 6A5B-1.

4. Bolts (20).

Tighten

- Bolts (20) to 40 N.m (30 lbs. ft.). Use the tightening sequence shown in figure 97.

ROCKER ARM COVER INSTALLATION

Install or Connect (Figures 98 and 99)

1. Gaskets (34).
2. Rocker arm covers (32).

NOTICE: Refer to "Notice" on page 6A5B-1.

3. Bolts.

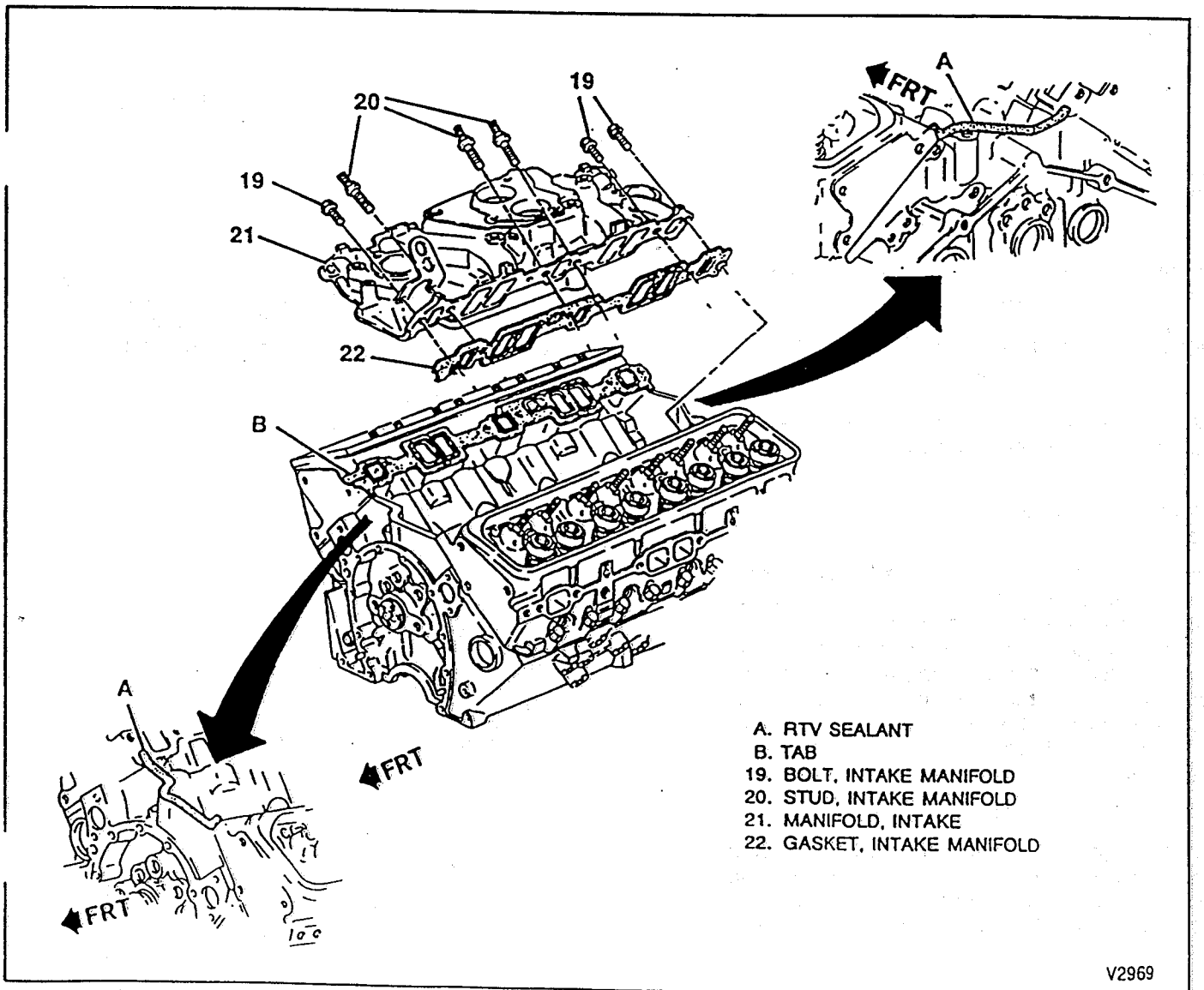


Figure 94—Intake Manifold (5.0L and 5.7L Engines)

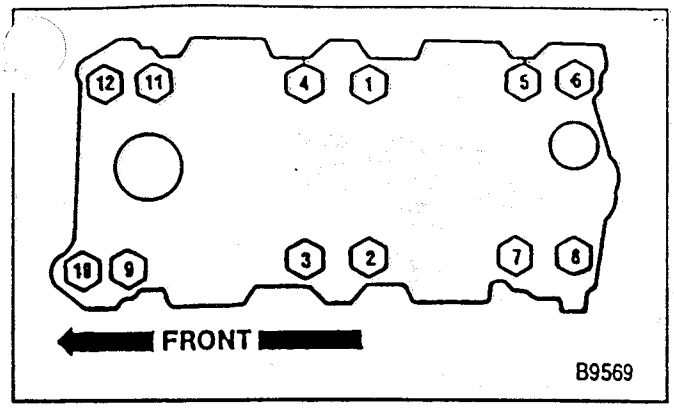


Figure 95—Intake Manifold Bolt Tightening Sequence (5.0L and 5.7L Engines)

Tighten

- Bolts to specification:
  - — 5.0L and 5.7L engines: 10 N·m (89 lbs. in.).
  - — 7.4L engines: 8 N·m (70 lbs. in.).

EXHAUST MANIFOLD INSTALLATION

Install or Connect (Figures 100 and 101)

1. Exhaust manifold (1).
   Spark plug wire heat shields (6).

NOTICE: Refer to "Notice" on page 6A5B-1.

3. Washers (2), tab washers (3), (5.0L and 5.7L engines), and bolts/studs (4).

Tighten

- Bolts/studs to specifications:
  - — 5.0L and 5.7L engines:
    - Two center bolts: 36 N·m (26 lbs. ft.).
    - Outside bolts: 28 N·m (20 lbs. ft.).
    - Bend the tab washers against the bolt heads.
  - — 7.4L engines: 54 N·m (40 lbs. ft.).

COOLANT PUMP INSTALLATION

Install or Connect (Figures 102 and 103)

1. Gaskets (11).
2. Coolant pump (10).

NOTICE: Refer to "Notice" on page 6A5B-1.

3. Bolts (12).

Tighten

- Bolts (12) to 40 N·m (30 lbs. ft.).

4. Bypass hose and clamps (7.4L engine).

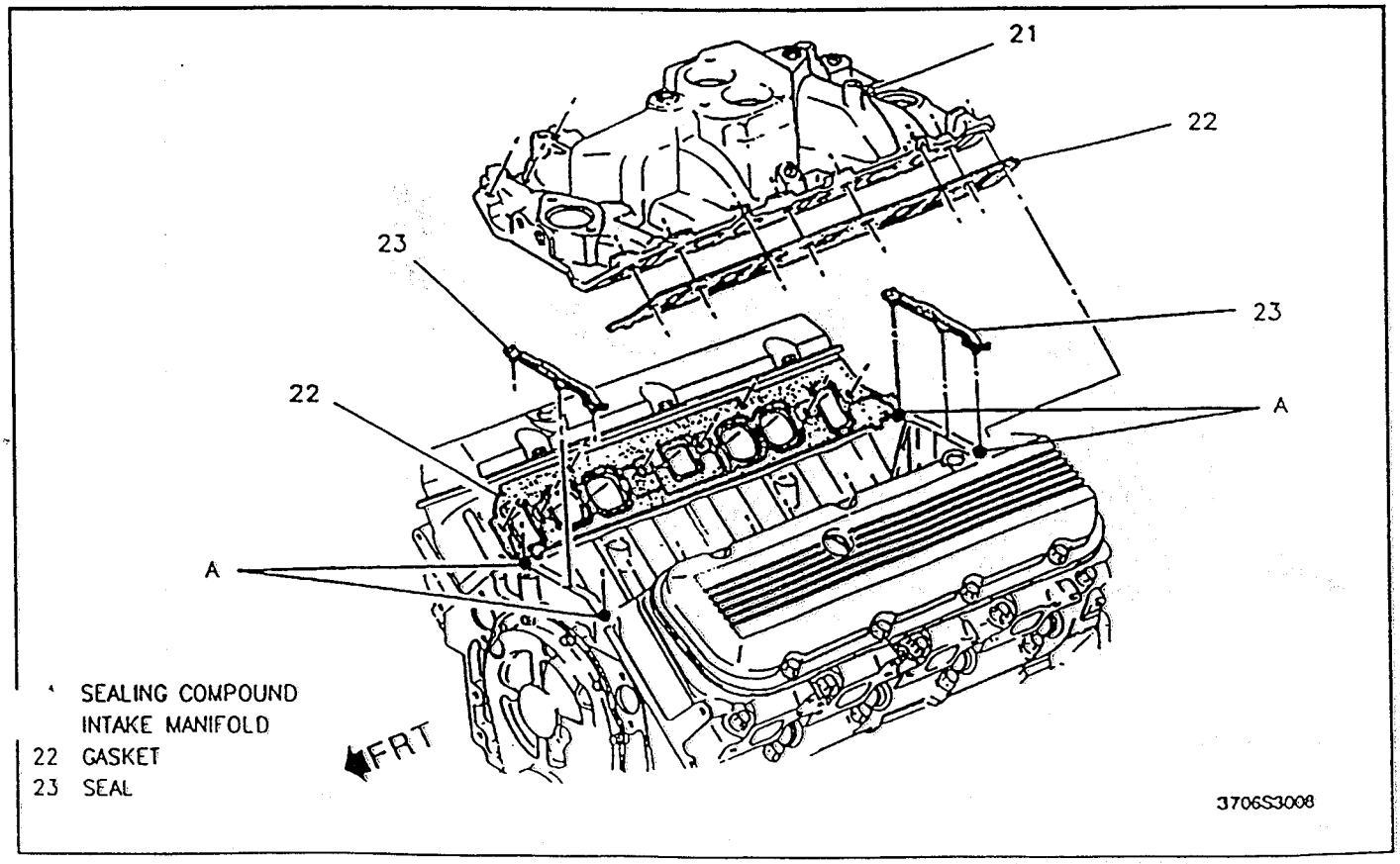


Figure 96—Intake Manifold (7.4L Engines)

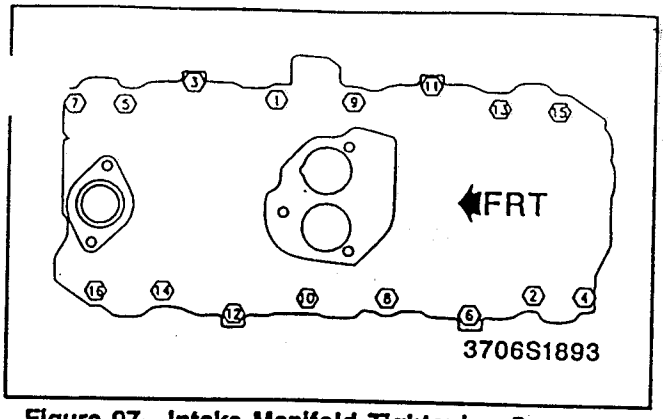


Figure 97—Intake Manifold Tightening Sequence (7.4L Engines)

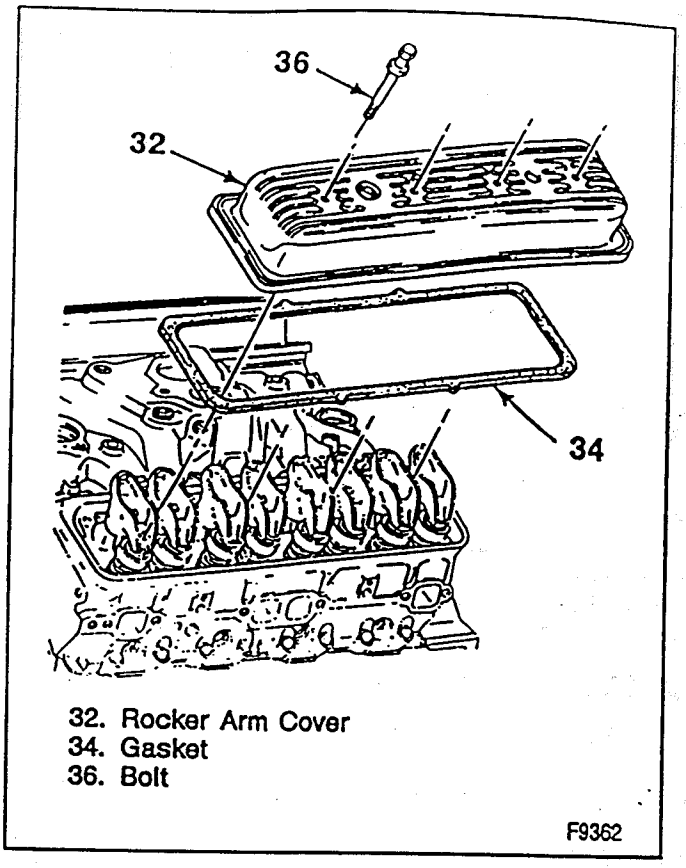
FLYWHEEL INSTALLATION

Install or Connect (Figure 36 and 37)

1. Flywheel (110A or 110B).

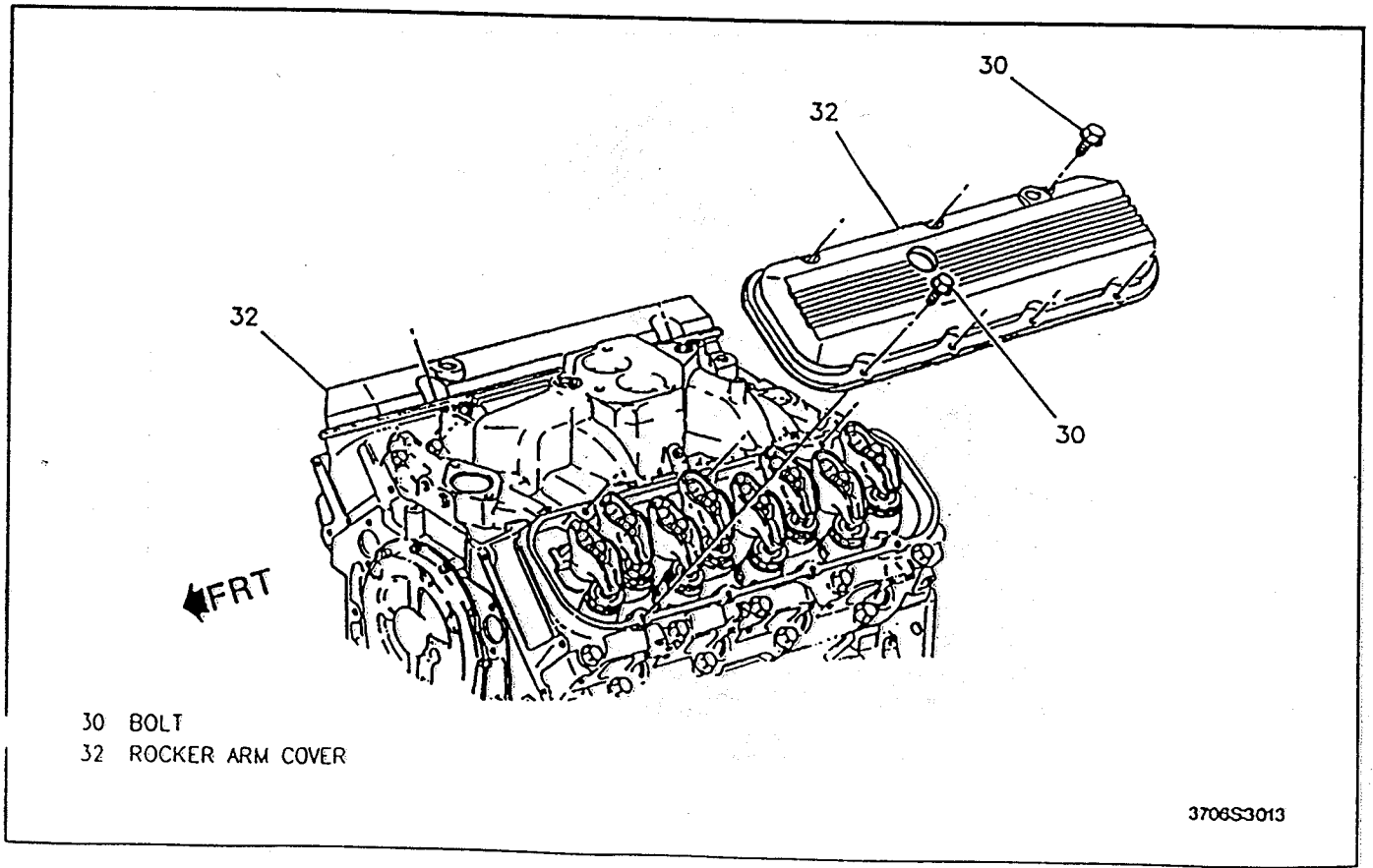
NOTICE: Refer to "Notice" on page 6A2B-1.

2. Flywheel bolts (111).



32. Rocker Arm Cover
34. Gasket
36. Bolt

Figure 98—Rocker Arm Cover Installation (5.0L and 5.7L Engines)



30 BOLT
32 ROCKER ARM COVER

Figure 99—Rocker Arm Cover Installation (7.4L Engines)

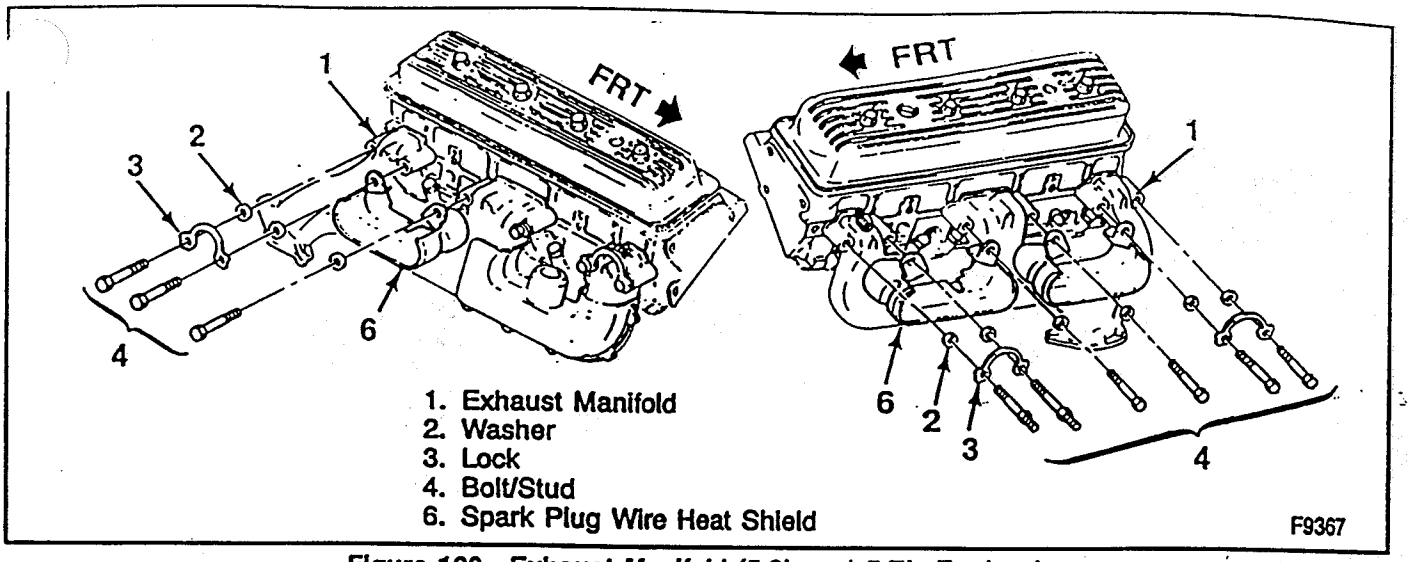


Figure 100—Exhaust Manifold (5.0L and 5.7L Engines)

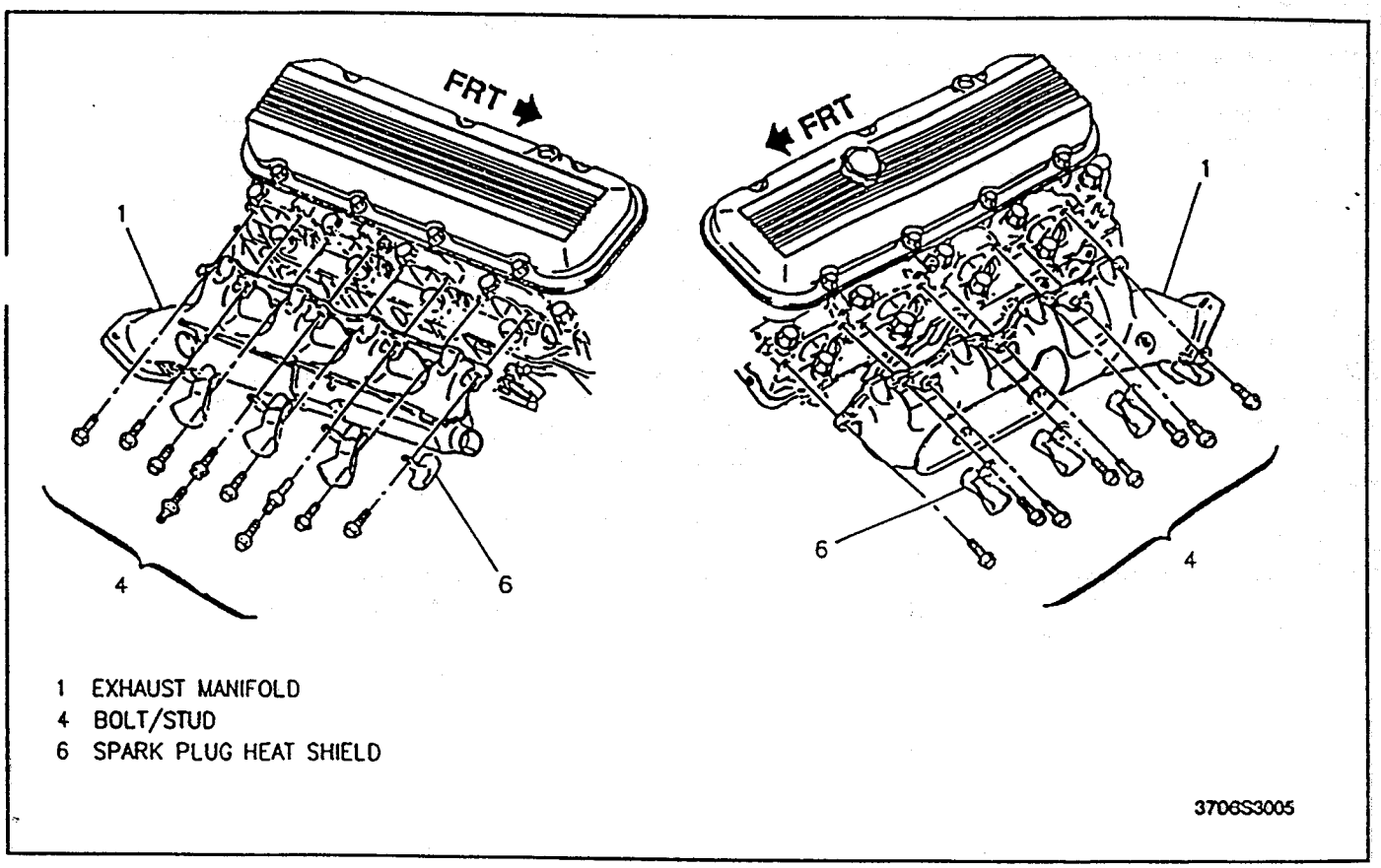


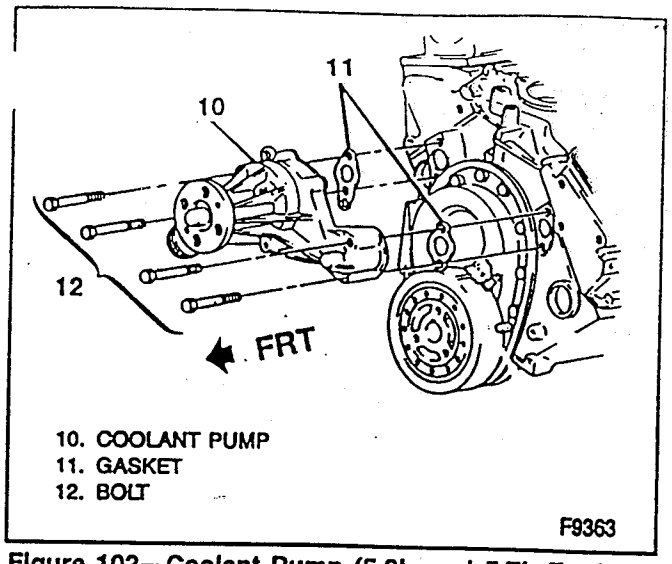
Figure 101—Exhaust Manifold (7.4L Engines)

Tighten

- Bolts (111) to 100 N.m (74 lbs. ft.) (5.0L/5.7L Engines).
- Bolts (111) to 90 N.m (66 lbs. ft.) (7.4L Engines).

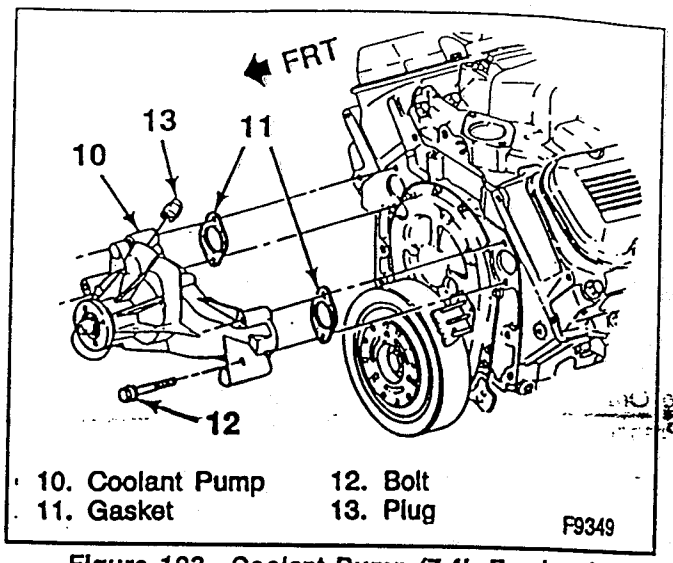
ENGINE ACCESSORY INSTALLATION

Install the engine accessories (TBI unit, distributor, oil filter, generator, etc.) as directed in the proper on-vehicle Truck Service Manual. Connect all vacuum hoses and electrical equipment the same way as removed.



10. COOLANT PUMP
11. GASKET
12. BOLT

Figure 102—Coolant Pump (5.0L and 5.7L Engines)



10. Coolant Pump
11. Gasket
12. Bolt
13. Plug

Figure 103—Coolant Pump (7.4L Engines)

ENGINE SET-UP AND TESTING

- After overhaul, the engine should be tested before installation in the vehicle. If a suitable test stand is not available, the following procedure can be used after the engine is installed in the vehicle.

1. Fill the crankcase with the proper quantity and grade of oil.

Important

- If a new camshaft or hydraulic lifters was installed, add Engine Oil Supplement (GM P/N 1052367) or equivalent to the engine oil.

2. Fill the coolant system with the proper coolant. Refer to SECTION 6B1.

Important

- Whenever the cooling system is serviced or drained for service procedures, 2 coolant sealant pellets, (GM P/N 3634621) or equivalent, must be added to the cooling system.
- The pellets must be added to the radiator or the pressurized coolant reservoir..list2—Pellets must be crushed prior to installation.
- Do not place pellets into a non-pressurized coolant recovery reservoir. On these systems, the pellets must be added to the radiator.
- The sealant pellets may leave a film on the sides of pressurized and non-pressurized coolant recovery reservoirs. This film is normal.

3. With the ignition "OFF," or disconnected, crank the engine several times. Listen for any unusual noises or evidence that any parts are binding.
4. Start the engine and listen for unusual noses.
5. Run the engine speed at about 1000 rpm until the engine is at operating temperature.
6. Listen for improperly adjusted valves or sticking lifters, and other unusual noises.
7. Check for oil and coolant leaks while the engine is running.
8. Use the proper on-vehicle Truck Service Manual or Emission Control Label for adjustment of the ignition timing.

SPECIFICATIONS

ENGINE SPECIFICATIONS (5.0L/5.7L)

All Specifications are in INCHES unless otherwise noted.

GENERAL DATA:					
Type				V8	
Displacement				5.0L (305 CID)	5.7L (350 CID)
RPO (VIN Code)				L03 (H)	L05 (K)
Bore				3.736	4.00
Stroke				3.480	
Compression Ratio				9.1:1	*
Firing Order				1-8-4-3-6-5-7-2	
Oil Pressure (Minimum)				6 PSI @ 1000 RPM; 18 PSI @ 2000 RPM; 24 PSI @ 4000 RPM	
CYLINDER BORE:					
Diameter				3.7350-3.7385	3.9995-4.0025
Out Of Round	Production			0.001 (Maximum)	
	Service			0.002 (Maximum)	
Taper	Production	Thrust Side		0.0005 (Maximum)	
		Relief Side		0.001 (Maximum)	
	Service			0.001 (Maximum)	
PISTON:					
Clearance	Production			0.0007-0.0021	
	Service Limit			0.0027 (Maximum)	
PISTON RING:					
COMPRESSION	Groove Clearance	Production	Top	0.0012-0.0032	
			2nd		
		Service Limit		Hi Limit Production ± 0.001	
	Gap	Production	Top	0.010-0.020	
			2nd	0.018-0.026	
		Service Limit		Hi Limit Production ± 0.010	
OIL	Groove Clearance	Production		0.002-0.007	
		Service Limit		Hi Limit Production ± 0.001	
	Gap	Production		0.010-0.030	
		Service Limit		Hi Limit Production ± 0.010	
PISTON PIN:					
Diameter				0.9270-0.09271	
Clearance In Piston	Production			0.0004-0.0008	
	Service Lmit			0.001 (Maximum)	
Fit In Rod				0.0008-0.0016 Interference	

*8.3:1 (Over 8500-lb. GVW)
9.1:1 (Under 8500-lb. GVW)

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SPECIFICATIONS

ENGINE SPECIFICATIONS (5.0L/5.7L) (Cont.)

All specifications are in INCHES unless otherwise noted.

DISPLACEMENT:			5.0L (305 Cu. In.)	5.7L (350 Cu. In.)
CRANKSHAFT:				
Main Journal	Diameter	#1	2.4484-2.4493	
		#2, #3, #4	2.4481-2.4490	
		#5	2.4479-2.4488	
	Taper	Production	0.0002 (Maximum)	
		Service Limit	0.001 (Maximum)	
	Out Of Round	Production	0.0002 (Maximum)	
		Service Limit	0.001 (Maximum)	
Main Bearing Clearance	Production	#1	0.0008-0.0020	
		#2, #3, #4	0.0011-0.0023	
		#5	0.0017-0.0032	
	Service Limit	#1	0.0010-0.0015	
		#2, #3, #4	0.0010-0.0025	
		#5	0.0025-0.0035	
Crankshaft End Play			0.002-0.006	
Crankpin	Diameter		2.0988-2.0998	
	Taper	Production	0.0005 (Maximum)	
		Service Limit	0.001 (Maximum)	
	Out Of Round	Production	0.0005 (Maximum)	
		Service Limit	0.001 (Maximum)	
Rod Bearing Clearance	Production		0.0013-0.0035	
	Service Limit		0.003 (Maximum)	
Rod Side Clearance			0.006-0.014	
CAMSHAFT:				
Lobe Lift ±0.002	Intake		0.2336	0.2565
	Exhaust		0.2565	0.2690
Journal Diameter			1.8682-1.8692	
VALVE SYSTEM:				
Lifter			Hydraulic	
Rocker Arm Ratio			1.50:1	
Valve Lash		Intake	One Turn Down From Zero Lash	
		Exhaust		
Face Angle (Intake & Exhaust)			45°	
Seat Angle (Intake & Exhaust)			46°	
Seat Runout (Intake & Exhaust)			0.002 (Maximum)	
Seat Width		Intake	1/32-1/16	
		Exhaust	1/16-3/32	
Stem Clearance	Production	Intake	0.0010-0.0027	
		Exhaust	0.0010-0.0027	
	Service	Intake	High Limit Production +0.001	
		Exhaust	High Limit Production +0.002	
Valve Spring (Outer)	Free Length		2.03	
	Pressure lbs. @ in.	Closed	76-84 lbs. @ 1.70"	
		Open	194-206 lbs. @ 1.25"	
	Installed Height ±1/32"		1 23/32	
Valve Spring Damper	Free Length		1.86	
	Approx. # of Coils		4	

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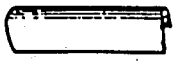
SPECIAL TOOLS

1.  J 39046

2.  J 8062

3.  J 21882

4. 5.  J 35468 J 22102

6.  J 8037

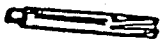
7.  J 5239

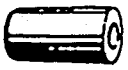
8.  J 23738-A

9.  J 9290-01

10.  J 3049-A

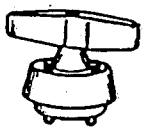
11.  J 5802-01

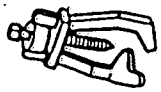
12. 13.  J 5715 J 6036

14.  J 6880

15.  J 5825-A

16.  J 5590

17. 18.  J 35621 J 38841

19.  J 28509-A

1. TORSIONAL DAMPER REMOVER AND INSTALLER
2. VALVE SPRING COMPRESSOR
3. OIL PUMP PICK-UP TUBE INSTALLER (5.0 AND 5.7L ENGINES)
4. CRANKSHAFT SEAL INSTALLER (5.0L AND 5.7L ENGINES)
5. CRANKSHAFT SEAL INSTALLER (7.4L ENGINE)
6. PISTON RING COMPRESSOR
7. GUIDE SET
8. VACUUM PUMP
9. HYDRAULIC LIFTER REMOVER (SLIDE HAMMER TYPE)
10. HYDRAULIC LIFTER REMOVER (PLIER TYPE)
11. STUD REMOVER (5.0L AND 5.7L ENGINES)
12. REAMER (0.003-INCH OVERSIZE)
13. REAMER (0.013-INCH OVERSIZE)
14. STUD INSTALLER (5.0L AND 5.7L ENGINES)
15. CRANKSHAFT SPROCKET PULLER (5.0L AND 5.7L ENGINES)
16. CRANKSHAFT SPROCKET INSTALLER
17. CRANKSHAFT REAR OIL SEAL INSTALLER (5.0L AND 5.7L ENGINES)
18. CRANKSHAFT REAR OIL SEAL INSTALLER (7.4L ENGINE)
19. CRANKSHAFT SPROCKET PULLER (7.4L ENGINE)

F9528

SPECIFICATIONS (CONT.)

FASTENER TIGHTENING SPECIFICATIONS (5.0L AND 5.7L ENGINES)

Item	N·m	Lbs. Ft.	Lbs. In.
Camshaft Sprocket Bolts	28	21	—
Connecting Rod Bolt Nuts	61	45	—
Coolant Outlet Bolts	28	21	—
Coolant Pump Bolts	40	30	—
Crankshaft Rear Oil Seal Retainer Screws and Nuts	15	11	—
Cylinder Head Bolts (In Sequence)	90	65	—
Engine Block Drain Plug	22	16	—
Exhaust Manifold Bolts			
Center Two Bolts	36	26	—
All Other Bolts	28	20	—
Flywheel Bolts	100	74	—
Flywheel Housing Bolts	44	32	—
Front Cover Bolts	11	—	97
Intake Manifold Bolts (In Sequence)	47	35	—
Main Bearing Cap Bolts			
Outer Bolts on #2, #3, and #4 Caps	95	70	—
All Others	110	80	—
Oil Filter Bypass Valve Bolts	26	20	—
Oil Pan Baffle Nuts (H.D. 5.7L Only)	36	27	—
Oil Pan Bolts	11	—	97
Oil Pan Drain Plug	22	16	—
Oil Pan Nuts	22	16	—
Oil Pan Studs to Oil Seal Retainer or Engine Block	2	—	15
Oil Pump Bolt	90	65	—
Oil Pump Cover Bolts	12	—	106
·er Arm Cover Bolts	10	—	89
·nal Damper Bolt	95	70	—

(7.4L ENGINES)

Item	N·m	Lbs. Ft.	Lbs. In.
Camshaft Sprocket Bolts	26	20	—
Connecting Rod Bolt Nuts	61	45	—
Coolant Outlet Bolts	40	30	—
Coolant Pump Bolts	40	30	—
Cylinder Head Bolts (In Sequence)	115	85	—
Engine Block Drain Plug	12	—	112
Exhaust Manifold Bolts	54	40	—
Flywheel Bolts	90	66	—
Flywheel Housing Bolts	40	30	—
Front Cover Bolts	12	—	106
Intake Manifold Bolts (In Sequence)	40	30	—
Main Bearing Cap Bolts	135	100	—
Oil Pan Bolts	22	16	—
Oil Pan Drain Plug	28	20	—
Oil Pump Bolt	90	65	—
Oil Pump Cover Bolts	12	—	106
Rocker Arm Bolts	54	40	—
Rocker Arm Cover Bolts	8	—	70
Torsional Damper Bolt	149	110	—

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SPECIFICATIONS

ENGINE SPECIFICATIONS (7.4 L) (CONT.)

All Specifications are in INCHES unless otherwise noted.

DISPLACEMENT:			7.4L
CRANKSHAFT:			
Main Journal	Diameter	#1, #2, #3, #4, #5	2.7482-2.7489
	Taper	Production	0.0004 (Maximum)
		Service Limit	0.001 (Maximum)
	Out Of Round	Production	0.0004 (Maximum)
		Service Limit	0.001 (Maximum)
Main Bearing Clearance	Production	#1, #2, #3, #4	0.0017-0.0030
		#5	0.0025-0.0038
	Service Limit	#1, #2, #3, #4	0.0010-0.0030
		#5	0.0025-0.0040
Crankshaft End Play			0.005-0.011
Crankpin	Diameter		2.1990-2.1996
	Taper	Production	0.0005
		Service Limit	0.001
	Out Of Round	Production	0.0005
		Service Limit	0.001
Rod Bearing Clearance	Production		0.0011-0.0029
	Service Limit		0.003 (Maximum)
Rod Side Clearance			0.0013-0.023
CAMSHAFT:			
Lobe Lift ± 0.002	Intake		0.2487
	Exhaust		0.2537
Journal Diameter			1.9477-1.9497
VALVE SYSTEM:			
Lifter			Hydraulic
Rocker Arm Ratio			1.70:1
Valve Lash		Intake	Net Lash
		Exhaust	
Face Angle (Intake & Exhaust)			45°
Seat Angle (Intake & Exhaust)			46°
Seat Runout (Intake & Exhaust)			0.002 (Maximum)
Seat Width		Intake	1/32-1/16
		Exhaust	1/16-3/32
Stem Clearance	Production	Intake	0.0010-0.0027
		Exhaust	0.0012-0.0029
	Service	Intake	High Limit Production +0.001
		Exhaust	High Limit Production +0.002
Valve Spring	Free Length		2.15
	Pressure lbs. @ in.	Closed	76-84 lbs. @ 1.838-in.
		Open	205-225 lbs. @ 1.408-in.
	Installed Height ± 1/32"		1.838 in.

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SPECIFICATIONS

ENGINE SPECIFICATIONS (7.4L)

All Specifications are in INCHES unless otherwise noted.

GENERAL DATA:				
Type				V8
Displacement				7.4L (454 CID)
RPO				L19
Bore				4.25
Stroke				4.00
Compression Ratio				7.9:1
Firing Order				1-8-4-3-6-5-7-2
Oil Pressure (Minimum)*				10 psi @ 600 RPM Minimum; 25 psi @ 2000 RPM
CYLINDER BORE:				
Diameter				4.2500-4.2507
Out Of Round	Production			0.001 (Maximum)
	Service			0.002 (Maximum)
Taper	Production	Thrust Side		0.0005 (Maximum)
		Relief Side		0.001 (Maximum)
	Service			0.001 (Maximum)
PISTON:				
Clearance	Production			0.0018-0.0030
	Service Limit			0.0036 (Maximum)
PISTON RING:				
COMPRESSION	Groove Clearance	Production	Top	0.0012-0.0029
			2nd	0.0012-0.0029
		Service Limit		Hi Limit Production +0.001
	Gap	Production	Top	0.010-0.018
			2nd	0.016-0.024
		Service Limit		Hi Limit Production + 0.010
OIL	Groove Clearance	Production		0.0050-0.0065
		Service Limit		Hi Limit Production + 0.001
	Gap	Production		0.010-0.030
		Service Limit		Hi Limit Production + 0.010
PISTON PIN:				
Diameter				0.98945-0.98965
Clearance In Piston	Production			0.0002-0.0007
	Service Lmit			0.001 (Maximum)
Fit In Rod				0.0031-0.0021 Interference

*Measure on a "Warm Engine." Pressures will be higher on a cold engine.

T2370