

17. Intake manifold
18. Rocker arms, pedestals and pushrods
 - Keep all valve train parts in order so they may be reinstalled in the same locations and with the same mating surfaces as when removed.
19. Cylinder head bolts and heads

**Clean**

- All gasket mating surfaces
- Cylinder head bolt holes in block

**Inspect**

- For inspection and overhaul procedures, refer to Group 6A, General Engine Mechanical.

**Install or Connect**

1. Clean threads in cylinder block using appropriate tap.
2. Cylinder head gasket on block.
3. Cylinder head.
4. Apply thread sealer GM P/N 1052080, Loctite 592, Fel Pro TST or equivalent on bolt threads.
5. Cylinder head bolts.

NOTICE: This engine uses special torque to yield head bolts. This design bolt requires a special tightening procedure. Failure to follow the given procedure will cause head gasket failure and possible engine damage.

6. Torque cylinder head bolts to 34 N·m (25 lbs. ft.) per sequence shown in Figure 19.

**Important**

Should you reach 81 N·m (60 lbs. ft.) at any time in Steps 7 and 8, you should stop at this point. **DO NOT** complete the balance of the 90° turn on this bolt.

7. Tighten each bolt 1/4 turn (90°) in sequence.
8. Tighten each bolt an additional 1/4 (90°) in sequence.
9. Rocker arms and pushrods
 - Be sure to place components in their original location
10. Intake manifold
11. Valve covers
12. Left exhaust manifold
13. A/C compressor bracket bolt
14. Right exhaust manifold
15. Power steering pump and bracket
16. Generator and bracket
17. Top radiator hose
18. Fuel line and wiring connector
19. Heater hoses
20. Exhaust crossover pipe
21. Vacuum lines and electrical connections
22. Crankcase ventilation pipe

23. T.V. and accelerator cables (cruise control cable if equipped)
24. Mass air flow sensor and air intake duct
25. Negative battery cable
26. Engine coolant

**Inspect**

- Oil and coolant level
- Fluid leaks

CYLINDER HEAD**E Carline**

See Figures 18 and 19

**Remove or Disconnect**

1. Negative battery cable
2. Drain engine coolant
3. Serpentine belt
4. Relieve fuel pressure in fuel rail. See Section 6C for proper procedure.
5. Generator electrical connections and generator
6. Bypass hose from intake
7. Electrical connections from intake and cylinder head
8. Upper radiator hose
9. Air intake duct from throttle body
10. Vacuum connector block
11. PCV and vapor canister vacuum line
12. Rear engine lift bracket
13. Front spark plug wire harness
14. Throttle cables at throttle body
15. Heater hose from water outlet
16. Fuel rail supply & return lines
17. Intake bolts, intake manifold and manifold gaskets
18. **FRONT CYLINDER HEAD:**
 - Cooling fan
 - Oil level indicator tube & indicator
 - Front exhaust manifold bolts and manifold
- REAR CYLINDER HEAD:**
 - Multi-pin connector from C³I unit
 - 2 upper heat shield to cowl screws
 - Throttle cable bracket from cylinder head
 - Belt tensioner/power steering pump bracket & pump from cylinder head
 - Raise car and suitably support. See Section 0A.
 - 2 lower heat shield screws and heat shield
 - C³I bracket from manifold studs
 - Heater tube from manifold studs
 - Exhaust manifold to crossover bolts
 - O² sensor connection
 - Exhaust manifold bolts, studs and manifold
 - Lower car
19. Valve cover nuts & cover
20. Rocker arm bolts & studs
21. Rocker arms, pedestals and guides

! Important

- Store components in order so they can be reassembled in the same location and with the same mating surfaces as when removed.

22. Cylinder head bolts
23. Cylinder head

🧼 Clean

- All gasket mating surfaces
- Cylinder head bolt holes in block with appropriate tap

🔍 Inspect

- For inspection and overhaul procedures, refer to Group 6A, General Engine Mechanical.

↔ Install or Connect

1. Cylinder head gasket on block
2. Cylinder head
3. Apply thread sealer GM P/N 1052080, Loctite 592, Fel Pro TST or equivalent on bolt threads.

NOTICE: This engine uses special torque to yield head bolts. This design bolt requires a special tightening procedure. Failure to follow the given procedure will cause head gasket failure and possible engine damage.

4. Torque cylinder head bolts to 34 N·m (25 lbs. ft.) per sequence in Figure 19

! Important

- Should you reach 81 N·m (60 lbs. ft.) at any time in Steps 5 and 6, you should stop at this point. **DO NOT** complete the balance of the 90° turn on this bolt.

5. Tighten each bolt 1/4 turn (90°) in sequence.
6. Tighten each bolt an additional 1/4 turn (90°) in sequence.
7. Pushrods, rocker arms, pedestals and guides
8. Rocker arm bolts and studs to 60 N·m (45 lbs. ft.)
9. Valve cover and valve cover nuts
10. **FRONT CYLINDER HEAD**

- Exhaust manifold and bolts. Tighten to 50 N·m (37 lbs. ft.)
- Oil Level indicator tube and indicator
- Cooling fan

REAR CYLINDER HEAD

- Raise car & suitably support. See Section 0A.
- Exhaust manifold & bolts. Tighten to 50 N·m (37 lbs. ft.).
- O² sensor connection
- Exhaust manifold to crossover bolts
- Heater tube
- C³I bracket
- Spark plug wires
- Heat shield to cowl with 2 screws

- Lower car.
- Two (2) upper heat shield attaching screws
- Multi-pin connector to C³I unit
- Belt tensioner/power steering pump bracket to cylinder head
- Throttle cable bracket & cylinder head

11. Intake manifold gaskets and manifold
12. Manifold bolts to 44 N·m (32 lbs. ft.) in sequence shown in Figure 13.
13. Fuel lines
14. Throttle cables to throttle body
15. Front spark plug wire harness
16. Rear engine lift bracket
17. PCV and vapor canister vacuum lines
18. Vacuum connector block
19. Air intake duct to throttle body
20. Upper radiator hose
21. Electrical connections to manifold and cylinder head items
22. Bypass hose to intake manifold
23. Generator and generator electrical connections
24. Serpentine belt. See Figures 3 & 4.
25. Fill cooling system.
26. Negative battery cable

🔍 Inspect

- For proper completion of repairs
- For proper coolant and oil levels
- For fluid, exhaust and vacuum leaks

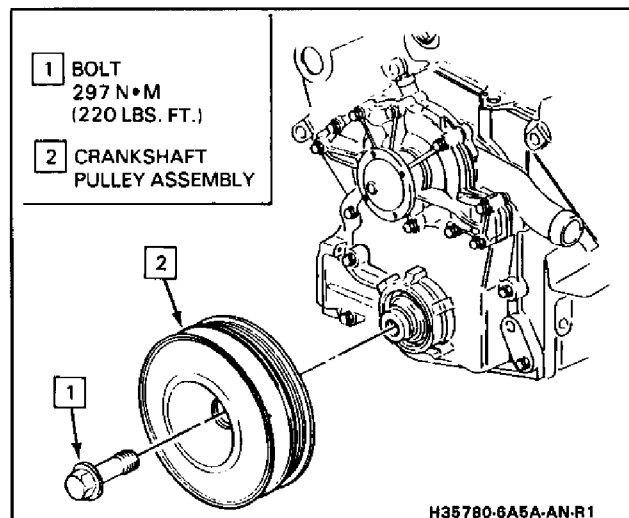


Figure 20 Crankshaft Balancer

CRANKSHAFT BALANCER

See Figure 20

! Important

- The balancer is serviced as an assembly. Do not attempt to separate pulley from balancer hub.

↔ Remove or Disconnect

1. Negative battery cable

2. Serpentine belt
3. Raise car and suitably support, see Section 0A.
4. Right front wheel and tire assembly
5. Inner fender splash shield (right side)
6. Balancer bolt
7. Crankshaft balancer

↔ Install or Connect

1. Crankshaft balancer
 - Lubricate seal surface with engine oil
2. Balancer bolt

⌚ Tighten

- Balancer bolt to 297 N·m (219 lbs. ft.)
3. Inner fender splash shield
 4. Right front wheel and tire assembly
 5. Lower car.
 6. Serpentine belt. See Figures 3 and 4.
 7. Negative battery cable

🔍 Inspect

- For proper completion of repair
- For oil leaks at front crankshaft seal

TIMING CHAIN COVER

See Figure 21

↔ Remove or Disconnect

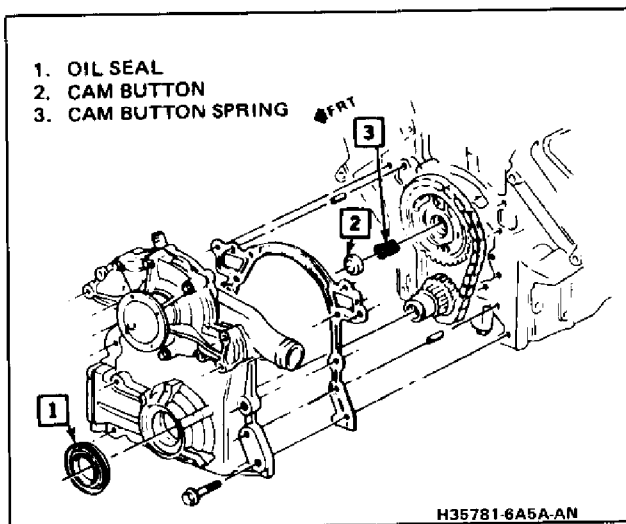


Figure 21 Timing Chain Cover

1. The following:
 - Engine coolant
 - Lower radiator hose
 - Heater return hose
 - Engine oil
3. Serpentine belt.
4. Front clamp on coolant bypass hose
5. Balancer bolt and balancer
6. Electrical connections at:
 - Camshaft sensor

- Crankshaft sensor
 - Oil pressure sender
7. Timing chain cover to cylinder block attaching bolts
 8. Timing chain cover to oil pan bolts
 9. Timing chain cover

🔍 Inspect

- Timing chain for overall "in and out" movement. Should not exceed 25.4mm (one inch).
- Sprockets for wear

🧼 Clean

- Gasket mating surfaces at timing chain cover, and cylinder block.
 - If oil pan gasket is excessively swollen, the oil pan must be removed and the gasket replaced.

↔ Install or Connect

1. Gaskets at cylinder block
2. Timing chain cover
3. Timing chain cover bolts with sealer applied to threads and torque to specification
4. Electrical connections
5. Balancer and bolt and torque to 297 N·m (219 lbs. ft.)
6. Lower radiator hose
7. Heater hose
8. Coolant bypass hose
9. Fill cooling system. See Section 6B.

🔍 Inspect

- For proper completion of repair
- For external fluid leaks

FRONT COVER OIL SEAL

Tool Required:

J 35354 Seal Installer

↔ Remove or Disconnect

1. Crankshaft balancer and bolt
2. Pry out old seal with a screwdriver
 - Use care to avoid damage to seal bore or seal contact surfaces.

↔ Install or Connect

1. Oil seal using J 35354 seal installer
2. Coat outside seal surface of crankshaft balancer with GM 1050169 lubricant or equivalent
3. Crankshaft balancer and bolt

⌚ Tighten

- Bolt to 297 N·m (219 lbs. ft.)

🔍 Inspect

- Oil leaks
- Proper installation of serpentine belt

OIL FILTER ADAPTER & PRESSURE VALVE

See Figures 22 and 23

Remove or Disconnect

1. Timing chain cover
2. Four bolts holding oil filter adapter to front cover
3. Oil filter adapter, gasket, oil pressure valve and spring

Clean

- Parts in suitable solvent & dry
- Inspect oil pressure valve for burrs
- Gasket surfaces

Install or Connect

1. Spring into front cover
2. Oil pressure valve into front cover
3. Oil filter adapter and a new gasket
4. Bolts and tighten to 33 N·m (24 lbs. ft.)
5. Front cover

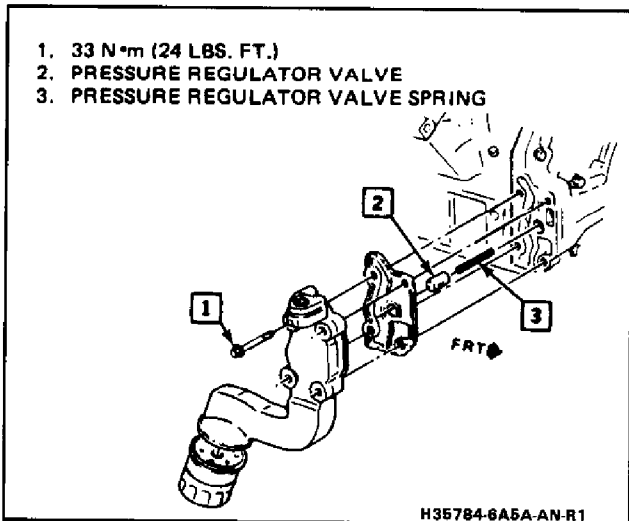


Figure 22 Oil Filter Adapter & Oil Pressure Valve-E Carline

TIMING CHAIN AND SPROCKETS

See Figure 24

Remove or Disconnect

1. With timing chain cover removed, align timing marks on sprockets so that they are as close together as possible.
2. Timing chain dampner
3. Camshaft sprocket bolts
4. Camshaft sprocket and chain
5. Crankshaft sprocket

Clean

- Timing chain
- Sprockets

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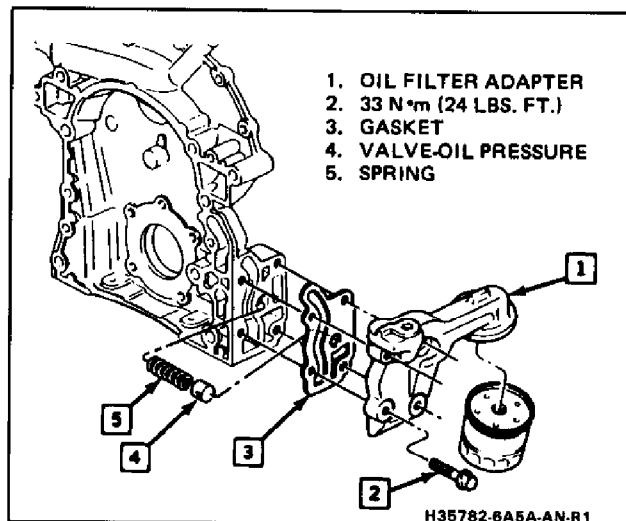


Figure 23 Oil Filter Adapter & Oil Pressure Valve-A, C, & H Carline

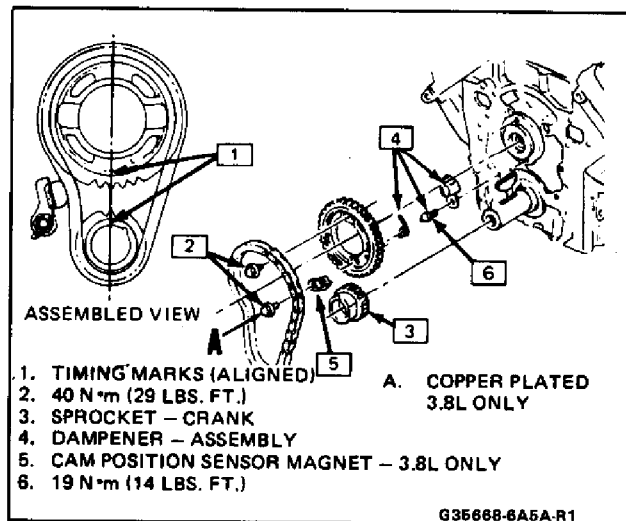


Figure 24 Timing Chain and Sprockets

Inspect

All components for wear and/or damage.

Important

If the pistons have not been moved in the engine, go to Step 8, otherwise Step 6.

6. Turn crankshaft so that number one piston is at top dead center.
7. Turn camshaft so, with sprocket temporarily installed, timing mark is straight down.
8. Assemble timing chain on sprockets with timing marks in their closest together position.

Install or Connect


1. Timing chain and sprocket.
2. Camshaft sprocket bolts and torque to specification
3. Camshaft thrust button and spring.
4. Timing chain dampener.
5. Timing chain cover.

 **Inspect**

- For proper completion of repair
- For fluid leaks
- For pulley alignment

CAMSHAFT

See Figures 24 & 25

 **Remove or Disconnect**

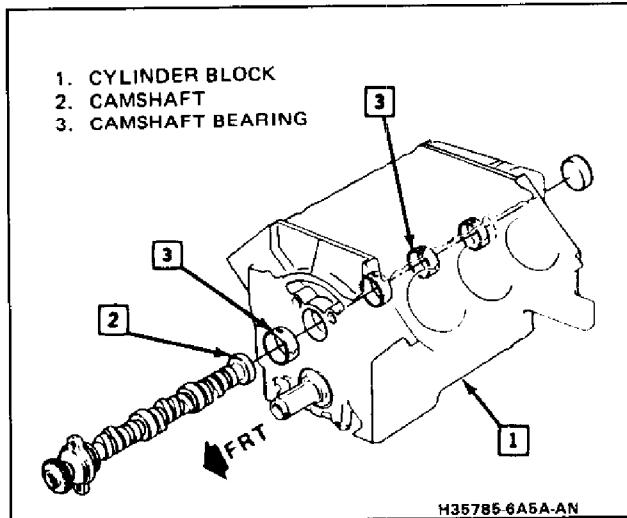


Figure 25 Camshaft

1. Negative battery cable
2. Engine
3. Intake manifold
4. Valve covers
5. Rocker arms
6. Push rods
7. Valve lifters
8. Balancer assembly
9. Timing chain cover

 **Important**

- Align the timing marks of camshaft and crankshaft sprockets (to avoid burring the camshaft journals by the crankshaft).
10. Timing chain and sprockets
 11. Camshaft

 **Important**

- When removing or installing camshaft, avoid marring the bearing surfaces.

 **Inspect**

- For inspection of camshaft, overhaul of lifters, and replacement of camshaft bearings, refer to Group 6A, General Engine Mechanical.

 **Install or Connect**

1. Camshaft
2. Timing chain and sprockets

3. Timing chain cover
4. Balancer assembly
5. Valve lifters

- Before installation, dip the bottoms of the lifters in P/N 1052365 camshaft and lifters prelude or equivalent.


6. Push rods
7. Rocker arms
8. Valve covers
9. Intake manifold
10. Engine
11. Negative battery cable

 **Inspect**

- For proper completion of repair
- For fluid leaks

OIL PAN

See Figures 26 and 27

 **Remove or Disconnect**

1. Negative battery cable
2. Raise car and suitably support. See Section 0A.
3. Engine oil
4. Transaxle converter cover
5. Starter motor, see Section 6D.
5. Oil filter
6. Oil pan retaining bolts
7. Oil pan
8. Old oil pan gasket and discard
 - The formed rubber oil pan gasket cannot be re-used.

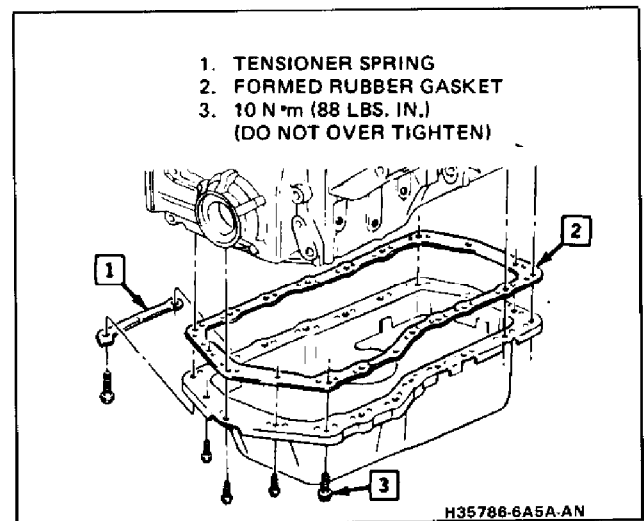


Figure 26 Oil Pan

 **Clean**

- Oil pan and cylinder block mating surfaces

 **Install or Connect**

1. New formed rubber oil pan gasket to oil pan flange.

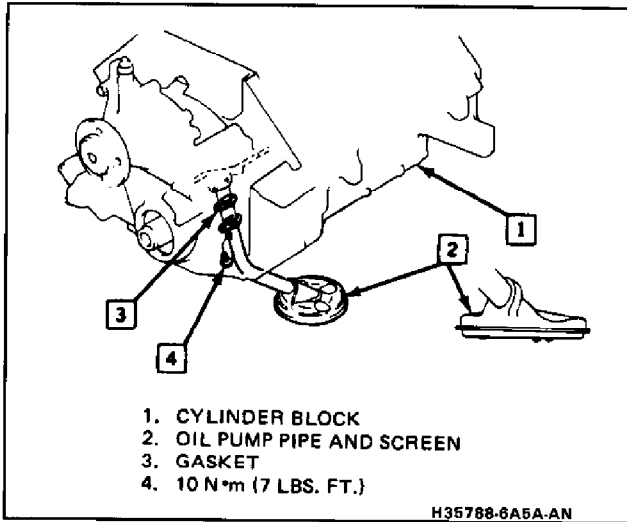


Figure 27 Oil Pump Pipe & Screen Assembly

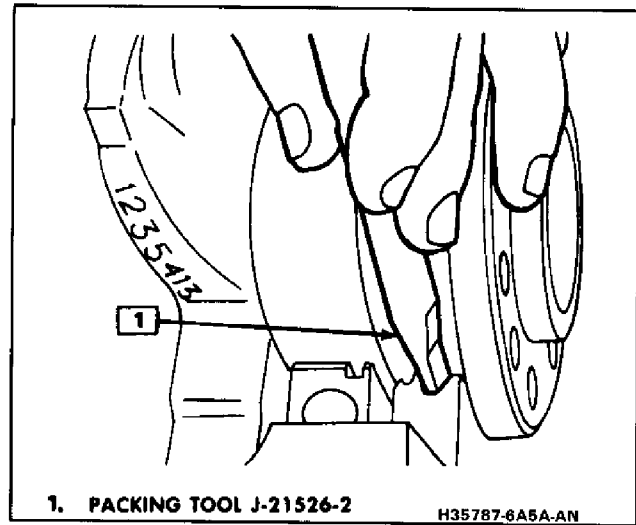


Figure 28 Packing Seal into Block

2. Oil pan and torque bolts to specifications
 - Do not over-tighten bolts or damage to the oil pan will occur, resulting in an oil leak.
3. Starter motor, see Section 6D
4. Transaxle converter cover
5. Lower car.
6. Engine oil
7. Negative battery cable



Inspect

- For proper completion of repair
- For proper oil level.
- For fluid leaks

REAR MAIN OIL SEAL

See Figures 28, 29 & 30

Tool Required:

- J 21526-1 Seal Packing Guide
- J 21526-2 Seal Packer
- J 21526-3 Bolt



Remove or Disconnect

1. Raise car and suitably support. See Section 0A.
2. Engine oil
3. Oil pan
4. Rear main bearing cap
5. Oil seal from bearing cap



Install or Connect

1. Insert packing tool J 21526-2 against one end of the seal in the cylinder block. Pack the old seal in until it is tight.
2. Repeat Step 1 on the other side of the seal.
3. Measure the amount the seal was driven up into the block on one side and add approximately 2 mm (1/16"). With a single edge razor blade, cut this amount off of the old lower seal. The bearing cap can be used as a holding fixture.
4. Install packing guide J 21526-1 onto cylinder block.

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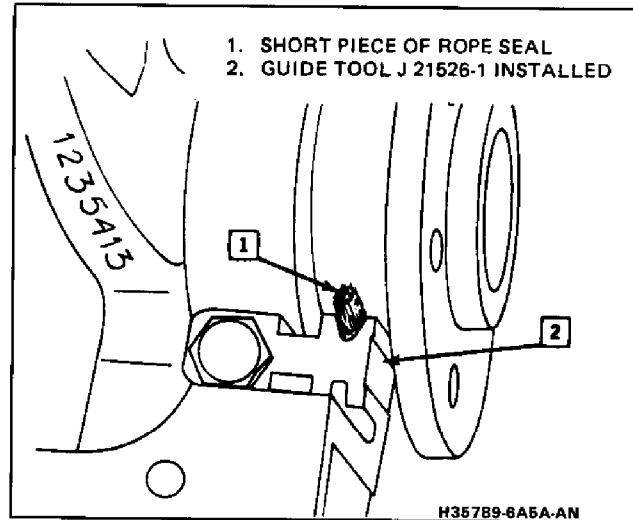


Figure 29 Guide Tool Installed

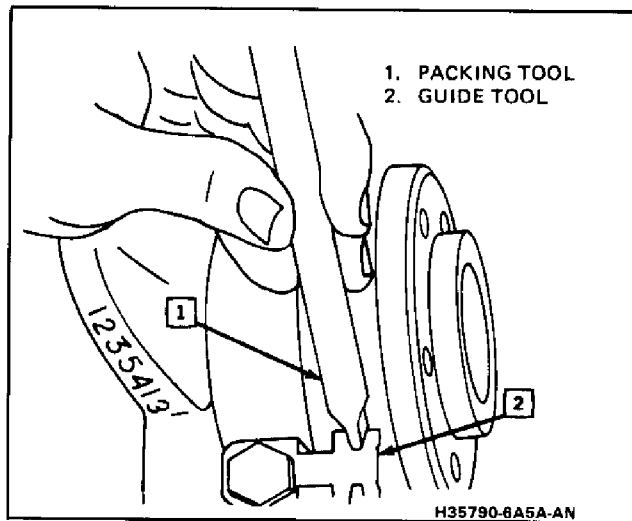


Figure 30 Packing Short Pieces of Rope Seal into Guide Tool & Cylinder Block

5. Using the packing tool, work the short pieces of seal into the guide tool and pack into the cylinder block until the tool hits the built in stop.
 - A small amount of oil on the pieces of seal may be helpful when packing into the cylinder block.
6. Repeat Step 5 on the other side.
7. Remove guide tool.
8. Install new rope seal in the bearing cap. See Section 6A.
9. Main bearing cap. Tighten to specifications.
10. Bearing cap side seals
11. Oil pan and new gasket
12. Add oil

Inspect

- Oil leaks
- Proper oil level

OIL PUMP PIPE AND SCREEN ASSEMBLY

See Figures 26 and 27

Remove or Disconnect

1. Oil pan
2. Oil pump pipe and screen assembly attaching bolts

Clean

- Screen and housing with solvent and blow dry.
- Gasket mating surfaces on pipe flange and cylinder block.

Install or Connect

1. Oil pump pipe and screen with new gasket and tighten bolts to specification.
2. Oil pan

Inspect

- For proper completion of repair
- For fluid leaks

TESTING OIL PRESSURE

Tool required:

J 25087 Oil Pressure Test Kit

- If low oil pressure is suspected, the pressure can be checked on the car.
1. Check oil level.
 2. Raise car and remove oil filter.
 3. Assemble plunger valve in the large hole of the tester base and the hose in the small hole of the tester base. Connect gage to the end of the hose.
 4. Insert the flat side of the rubber plug, for ease of installation, in the by-pass valve without depressing the by-pass valve itself.
 5. Install the tester on filter mounting pad.
 6. Start engine to check overall pressure, sender switch, or noisy lifters. Engine should be at operating temperature before checking oil

pressure. Pressure should be 255 kPa (37 psi) @ 2600 rpm.

7. If adequate oil pressure is indicated, check pressure sending switch.
8. If a low reading is indicated, depress the valve on tester base to isolate the oil pump and/or its components from the lubricating system. An adequate reading at this time would indicate a good pump and the previous low pressure was due to worn bearings etc. A low reading while depressing the valve would indicate a faulty pump.

OIL PUMP

See Figures 31 thru 34

Remove or Disconnect

1. Front cover from engine
2. Remove oil filter adapter, pressure regulator valve & spring
3. Remove oil pump cover attaching screws & cover
4. Remove gears

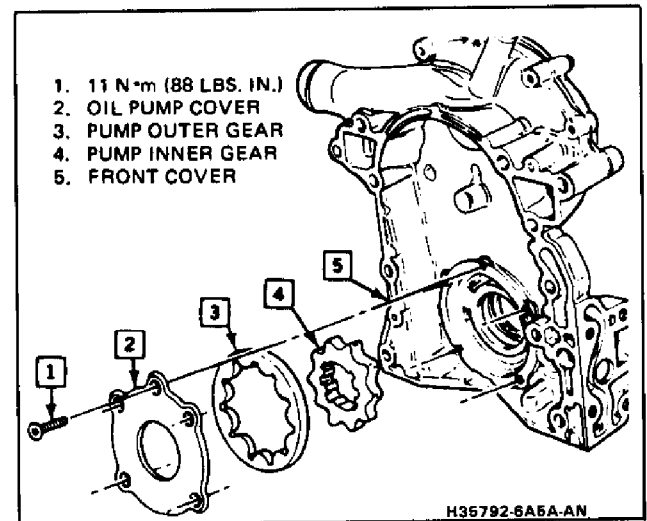


Figure 31 Oil Pump and Housing

Clean

- All parts in a suitable solvent. Remove all varnish, sludge and dirt.
- Remove all traces of old gasket from front cover and engine block.

Inspect

- Pump cover and front cover for:
 - cracks
 - scoring
 - porous or damaged casting
 - damaged threads
 - excessive wear
- Pressure regulator valve for:
 - scoring
 - sticking in bore
 - burrs

- Pressure regulator spring for:
 - loss of tension
 - bent condition
 - if in doubt, replace the spring
- Oil pump gears for:
 - chipping
 - galling
 - excessive wear



Measure

- Oil pump gears for:
 - inner gear tip clearance .152 mm (.006) - see Figure 32
 - outer gear diameter clearance .203 - .381 mm (.008-.015) - see Figure 33
 - Gear end clearance (gear drop in housing) .025 - .089 mm (.001 - .0035). See Figure 34.

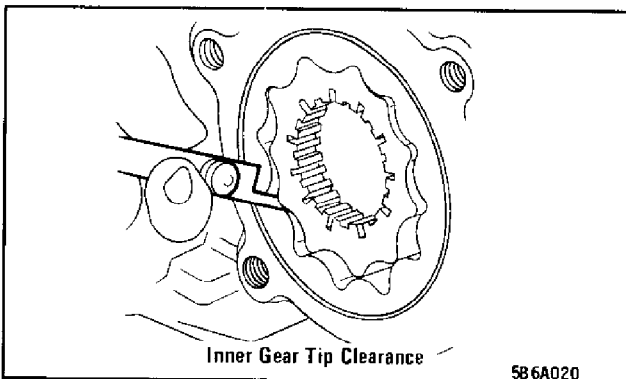


Figure 32 Measuring Gear Tip Clearance

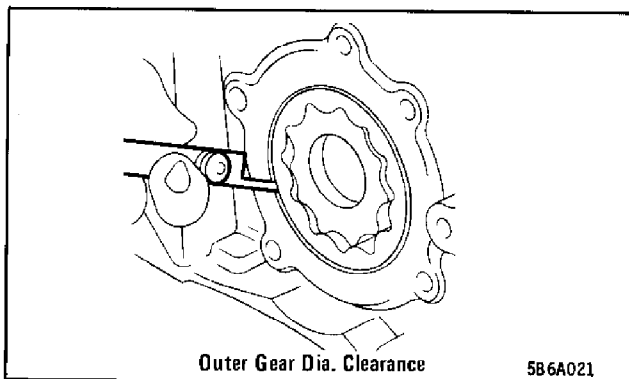


Figure 33 Measuring Outer Gear Diameter Clearance



Important

- During front cover installation, the inner pump gear must be properly engaged on the crankshaft sprocket.



Assemble

1. Lubricate gears with petroleum jelly.
2. Assemble gears in housing.
3. Pack gear cavity with petroleum jelly.
4. Install oil pump cover and screws.
5. Tighten oil pump cover screws to specifications.
6. Install pressure regulator valve & spring.

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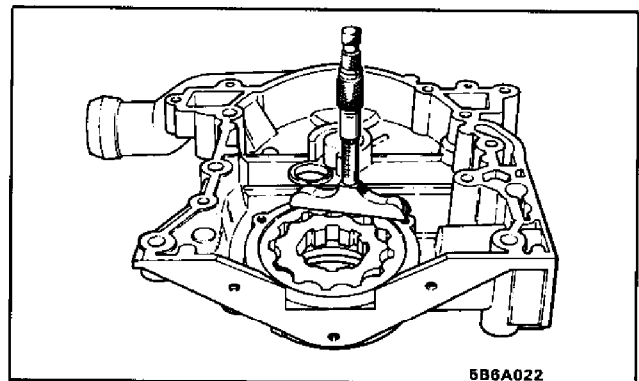


Figure 34 Measuring Gear End Clearance (Gear Drop In Housing)

7. Install oil filter adapter with a new gasket.
8. Tighten oil filter adapter bolts to specifications.
9. Install front cover on engine.



Inspect

- Proper completion of repairs
- Proper oil level
- Oil leaks
- Coolant leaks

PISTON AND CONNECTING ROD ASSEMBLY



Remove or Disconnect

See Figure 35

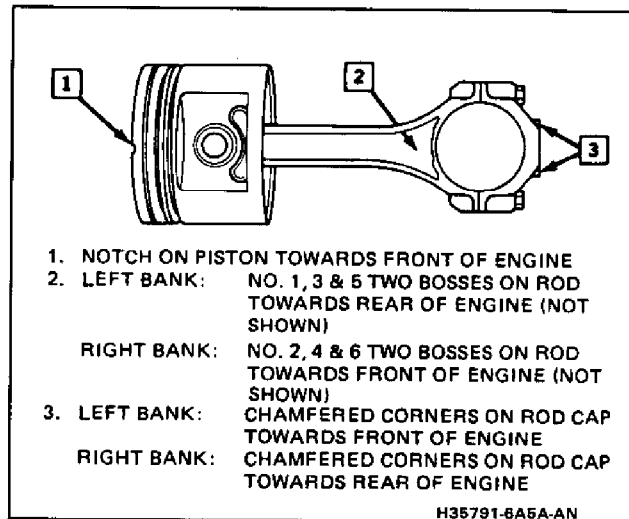


Figure 35 Piston and Connecting Rod Assembly

1. Cylinder head
2. Oil pan



Important

- To avoid damage to piston ring lands be sure to remove any carbon or ridge at the top of the cylinder bore. Refer to Section 6A.
3. Connecting rod bolts

4. Connecting rod cap
5. Piston and connecting rod assembly

**Clean**

- Cylinder bore
- Crankshaft rod journal

**Inspect**

- For inspection, fitting of piston rings and connecting rod bearings refer to Group 6A, General Engine Mechanical.

**Install or Connect**

1. Piston rings to piston
2. Piston and connecting rod bearing assembly
3. Rod bearing inserts
4. Connecting rod cap
5. Connecting rod bolts

**Tighten**

- Connecting rod bolts alternately to specifications
6. Oil pan
 7. Cylinder head

**Inspect**

- For correct completion of repair
- For proper oil pressure
- For exhaust smoke indicating poor ring seal

CRANKSHAFT

See Figure 36

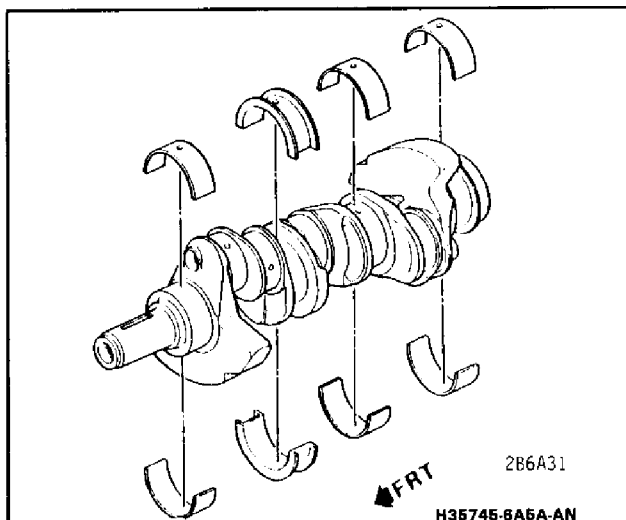
**Remove or Disconnect**

Figure 36 Crankshaft-Disassembled View

1. Engine
2. Timing chain cover
3. Timing chain
4. Oil pan

5. Oil pump pipe and screen assembly
6. Connecting rod caps and push piston and connecting rod assemblies to top of cylinder bores.
7. Secure connecting rods to outside of cylinder block using rubber bands attached to oil pan rail bolts.
8. Main bearing cap attaching bolts
9. Main bearing caps
10. Crankshaft

NOTICE: To avoid damaging crankshaft journals, rod or main bearing inserts, or connecting rods, use extreme care when removing or installing crankshaft.

**Clean**

- Crankshaft journals
- Connecting rods
- Main bearing bores

**Inspect**

- For inspection and fitting procedures, refer to Group 6A General Engine Mechanical.

**Install or Connect**

1. Crankshaft
2. Main bearing caps
3. Main bearing cap attaching bolts

**Tighten**

- Main bearing cap bolts alternately to specifications
4. Connecting rod bearing inserts
 5. Connecting rod cap bolts

**Tighten**

- Rod bearing cap bolts alternately to specifications
6. Oil pump pipe and screen
 7. Oil pan
 8. Timing chain
 9. Timing chain cover
 10. Engine

**Inspect**

- For proper completion of repair
- For proper oil pressure

AUTOMATIC TRANSAXLE FLYWHEEL**Remove or Disconnect**


1. Transaxle (refer to Section 7A1)
2. Six bolts attaching flywheel to crankshaft flange

**Inspect**

- Flywheel, if cracked, badly worn or broken teeth, replace flywheel

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- Crankshaft and flywheel mating surfaces for burrs. Remove as required.

 **Install or Connect**

1. Flywheel
2. Flywheel attaching bolts and torque to 80 N·m (60 lbs. ft.)
3. Dial indicator on engine block and check flywheel runout at three attaching bosses.

 **Important**

- The crankshaft end-play must be held in one direction during this check. Runout should not exceed .381 (.015 in.)
4. If runout exceeds .381 mm (.015 in.), attempt to correct by tapping high side with mallet.
 5. If condition cannot be corrected, replace flywheel.
 6. Transaxle (refer to Section 7A1).

 **Inspect**

- For correct completion of repair
- For vibration

SPECIFICATIONS

BOLT TORQUE SPECIFICATIONS

Use a reliable torque wrench to obtain the figures listed below. This will prevent straining or distorting the parts, as well as preventing thread damage. These specifications are for clean and lightly-lubricated threads only. Dry or dirty threads produce friction which prevents accurate measurements of the actual torque. It is important that these specifications be strictly observed. Overtightening can damage threads. This will prevent attainment of the proper torque and will require replacement of the damaged part.

Area	N·m (lbs. Ft.)
Accelerator Cable Bracket to Cylinder Head	50 (37)
Balancer Assembly to Crankshaft	297 (219)
Camshaft Sensor Pedestal to Front Cover	8.5 (75)*
Cylinder Block Drain Plug	44 (32)
Connecting Rods	61 (45)
Crankshaft Bearing Caps to Cylinder Block	135 (100)
Crankshaft Sensor to Front Cover	30 (22)
Crankshaft Sensor Clamp Bolt	3.4 (89)*
Cylinder Head to Block	See Given Procedure
EGR Valve to Intake Manifold	18 (13)
ESC Knock Sensor to Block	18 (13)
Exhaust Crossover Pipe to Manifold	20 (15)
Exhaust Manifold to Cylinder Head	50 (37)
Filter Assembly to Filter Adapter	25 (18)
Flywheel Cover to Transaxle	6 (48)*
Flywheel to Crankshaft	80 (60)
Front Cover to Block	30 (22)
Fuel Rail to Intake Manifold	15 (120)*
Generator Support to Cylinder Head	48 (35)
Generator Support through Generator	27 (20)
Intake Manifold to Cylinder Head	44 (32)
Mount (Engine) to Cylinder Block	95 (70)
Oil Filter Adapter to Timing Chain Cover	33 (24)
Oil Galley Plugs	34 (25)
Oil Pan Drain Plug	57 (42)
Oil Pan to Cylinder Block	10 (88)*
Oil Pressure Switch to Oil Filter Adapter	32 (24)
Oil Pump Cover to Timing Chain Cover	11 (97)*
Oil Screen Housing to Cylinder Block	11 (97)*
Oxygen Sensor to Exhaust Manifold	42 (31)
Rocker Arm Cover to Cylinder Head	10 (88)*
Rocker Arm to Cylinder Head	60 (45)
Spark Plug to Cylinder Head	27 (20)
Starting Motor to Cylinder Block	48 (35)
Thermostat Housing to Intake Manifold	27 (20)
Throttle Body to Intake Manifold	27 (20)
Timing Chain Dampener (Special Bolt)	19 (14)
Transaxle to Cylinder Block	75 (55)
Valve Lifter Guide Retainer Bolts	33 (25)
Water Pump Cover to Timing Chain Cover	10 (84)*
Water Pump Pulley to Hub	12 (106)*

ENGINE	3.8
ENGINE TYPE	90°V-6
BORE AND STROKE	3.800 x 3.400
DISPLACEMENT	231 CU. IN.
FUEL SYSTEM TYPE	SFI
COMPRESSION RATIO	8.0:1
FUEL REQUIREMENTS	UNLEADED
OCTANE REQUIREMENTS-MOTOR	82
OCTANE REQUIREMENTS-RESEARCH	91
CYLINDER NUMBERS-FRONT TO REAR-RIGHT BANK	2-4-6
CYLINDER NUMBERS-FRONT TO REAR-LEFT BANK	1-3-5
FIRING ORDER	1-6-5-4-3-2

H35930-6A5B-AH

Figure 37 Engine Specifications

LUBRICATION SYSTEM SPECIFICATIONS

Type of Lubrication

Main Bearings	Pressure
Connecting Rods	Pressure
Piston Pins	Splash
Camshaft Bearing	Pressure
Timing Chain	Splash and Nozzle
Cylinder Walls	Splash
Oil Pump Type	Gear Driven
Oil Pressure Sending Unit	Electrical
Oil Intake	Stationary
Oil Filter System	Full Flow
Filter Type	Throw-Away Element and Can
Crankcase Capacity - Less Filter	3.75 Liters (4 Quarts)*

When changing oil filter, additional engine oil may be required to bring oil level to the full mark.

ENGINE DIMENSIONS AND FITS

GENERAL

Piston Clearance Limits

Top Land	1.168-1.422 (.046 in.-.056 in.)
Skirt Top .....	.020-.050 (.0008 in.-.0020 in.)
Skirt Bottom .....	.033-.089 (.0013 in.-.0035 in.)
Ring Groove Depth	
#1 - Compression Ring	4.674-4.928 (.184 in.-.194 in.)
#2 - Compression Ring	4.674-4.928 (.186 in.-.194 in.)
#3 - Oil Ring	4.775-4.978 (.188 in.-.196 in.)
Ring Width	
#1 - Compression Ring	1.956-1.981 (.077 in.-.078 in.)
#2 - Compression Ring .....	.178-1.981 (.077 in.-.078 in.)
#3 - Oil Ring	4.648-4.801 (.183 in.-.189 in.)
Ring Gap	
#1 - Compression Ring .....	.254-.508 (.010 in.-.020 in.)
#2 - Compression Ring .....	.254-.508 (.010 in.-.020 in.)
#3 - Oil Ring .....	.381-1.397 (.015 in.-.055 in.)
Piston Pin Length	73.66 (2.900 in.)
Diameter of Pin	23.853-23.861 (.9391 in.-.9394 in.)
Clearance	
In Piston .....	.010-.018 (.0004 in.-.0007 in.)
Press Fit in Rod .....	.018-.043 (.0007 in.-.0017 in.)
Direction and Amount Offset	
in Piston	1.016 (.040 in.) Major Thrust Side

CONNECTING ROD SPECIFICATIONS

Bearing Length	16.612 (.654 in.)
Bearing Clearance (Limits) .....	.013-.066 (.0005 in.-.0026 in.)
End Play .....	.076-.381 (.003 in.-.015 in.)

CRANKSHAFT SPECIFICATIONS

End Play at Thrust Bearing .....	.076	(.003 in.-.011 in.)
Main Bearing Journal Diameter	63.487	(2.4995 in.)
Crankpin Journal Diameter	57.177-57.137	(2.2487 in.-2.2495 in.)
Main Bearing Overall Length		
#1	21.946	(.864 in.)
#2	26.848	(1.057 in.)
#3	21.946	(.864 in.)
#4	21.946	(.864 in.)
Main Bearing to Journal Clearance .....	.008-.046	(.0003 in.-.0018 in.)

CAMSHAFT SPECIFICATIONS

Bearing Journal Diameter	All 45.339-45.364 (1.785 in.-1.786 in.)
Journal Clearance in Bearings .....	.013-.064 (.0005 in.-.0025 in.) (#1)

VALVE SYSTEM SPECIFICATIONS

Rocker Arm Ratio	1.55 to 1
Valve Lifter Diameter	21.387-21.405 (.8420 in. - .8427 in.)
Valve Lifter Clearance in Crankcase .....	.020-.064 (.0008 in. - .0025 in.)
Minimum Recommended Valve Margin .....	.635 (.025 in.)
Intake Valve	
Head Diameter	43.561-43.307 (1.715 in. - 1.705 in.)
Seat Angle	45°
Stem Diameter	8.666-8.639 (.3412 in. - .3401 in.)
Clearance in Guide .....	.038-.089 (.0015 in. - .0035 in.)
Exhaust Valve	
Head Diameter	38.227-37.973 (1.505 in. - 1.495 in.)
Seat Angle	45°
Stem Diameter	8.666-8.649 (.3412 in. - .3405 in.)
Clearance in Guide .....	.038-.081 (.0015 in. - .0032 in.)
Valve Spring Valve Closed - Lbs. @ Length Not Including Dampener	90 ± 5 @ 1.727 in.
Valve Open - Lbs. @ Length Not Including Dampener	185 ± 10 @ 1.340 in.
Valve Lift, Intake & Exhaust	10.0 mm (.397 in.)