

1992 Hyundai Elantra

1.6L 4-CYL - VIN [R] 1992 Engines - 1.6L 4-Cylinder

1.6L 4-CYL - VIN [R]

1992 Engines - 1.6L 4-Cylinder

ENGINE IDENTIFICATION

NOTE: For engine repair procedures not covered in this article, see [ENGINE OVERHAUL PROCEDURES - GENERAL INFORMATION](#) article in the **GENERAL INFORMATION** section.

The sixth character in Vehicle Identification Number (VIN) identifies engine type. Engine identification code is stamped at top right front side of cylinder block.

ENGINE IDENTIFICATION CODES

| Application | Engine Code | VIN Code |
|--------------------------------------------------------------------------------------------|-------------|----------|
| 1.6L 4-Cyl. | (1)G4DR | R |
| (1) Third character is a development order number and may not be the same for all engines. | | |

ADJUSTMENTS

VALVE CLEARANCE ADJUSTMENTS

Intake & Exhaust Valves

Hydraulic valve lash adjusters are used, eliminating the need for valve adjustment.

REMOVAL & INSTALLATION

NOTE: For reassembly reference, label all electrical connectors, vacuum hoses and fuel lines before removal. Also place mating marks on engine hood and other major assemblies before removal.

FUEL PRESSURE RELEASE

WARNING: ALWAYS relieve fuel pressure before disconnecting any fuel injection-related component. DO NOT allow fuel to contact engine or electrical components.

Disconnect fuel pump harness connector under rear seat. Start engine. After engine stalls, turn ignition switch to OFF position. Disconnect battery negative cable.

ENGINE

Removal

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1. Release fuel pressure. See **FUEL PRESSURE RELEASE**. Remove battery and air cleaner. Label and disconnect fuel lines and vapor hoses from engine. Drain cooling system, engine oil and transaxle oil.
2. Disconnect engine wiring harness and back-up light connector. On manual transaxle models, disconnect select control valve connector. On automatic transaxle models, disconnect oil cooler lines. On all models, disconnect alternator and oil pressure gauge wiring.
3. Disconnect radiator hoses and remove radiator. Disconnect ignition coil, engine ground and brake booster hose. Disconnect throttle cable, heater hoses and clutch cable on manual transaxles or shift control cable on automatic transaxles.
4. Disconnect speedometer cable from transaxle. Disconnect A/C compressor (with hoses attached), and secure with wire away from work area. Raise and support vehicle. Disconnect front exhaust pipe from manifold.
5. On manual transaxles, disconnect shift control and extension rods. On all models, disconnect lower ball joints and stabilizer bar from lower control arm. Remove drive axle shafts from transaxle. Plug shaft holes to prevent contamination.
6. Secure lower control arm out of the way and attach chain hoist to engine assembly. Raise engine slightly. Remove front roll stopper and disconnect rear roll stopper. Remove engine mounting bracket at front of timing cover.
7. Slowly raise engine and ensure all cables, wiring, hoses, etc. are disconnected. Remove right side fender shield and disconnect transaxle mount. Disconnect side left mount. While directing transaxle downward, lift and remove engine and transaxle from engine compartment.

CAUTION: Whenever drive axle shafts are removed from transaxle, replace drive axle shaft retainer rings.

Installation

To install, reverse removal procedure. Ensure throttle, transaxle cables and drive belts are properly adjusted. Tighten mounting bolts and nuts to specification with weight of engine on insulators. Replace all fluids, and check gauges for correct operation.

INTAKE MANIFOLD

CAUTION: Release fuel pressure before disconnecting fuel lines. See **FUEL PRESSURE RELEASE**.

Removal

1. Release fuel pressure. Disconnect fuel supply hose. Carefully remove delivery pipe with fuel injectors and pressure regulator attached. **DO NOT** allow fuel injectors to fall from delivery pipe.
2. Label and disconnect all wiring, hoses, cables and brackets interfering with intake manifold removal. Remove intake manifold-to-cylinder head attaching bolts, and remove intake manifold assembly. Disassemble as necessary.

Installation

To install, reverse removal procedure using NEW gaskets. Tighten intake manifold bolts to specification. See **TORQUE SPECIFICATIONS** table.

EXHAUST MANIFOLD

Removal

1. Disconnect battery negative cable. Label and disconnect all wiring, hoses, cables and brackets interfering with exhaust manifold removal.
2. Remove exhaust manifold heat shield. Disconnect exhaust pipe from exhaust manifold. Remove exhaust manifold-to-cylinder head attaching bolts, and remove exhaust manifold.

Installation

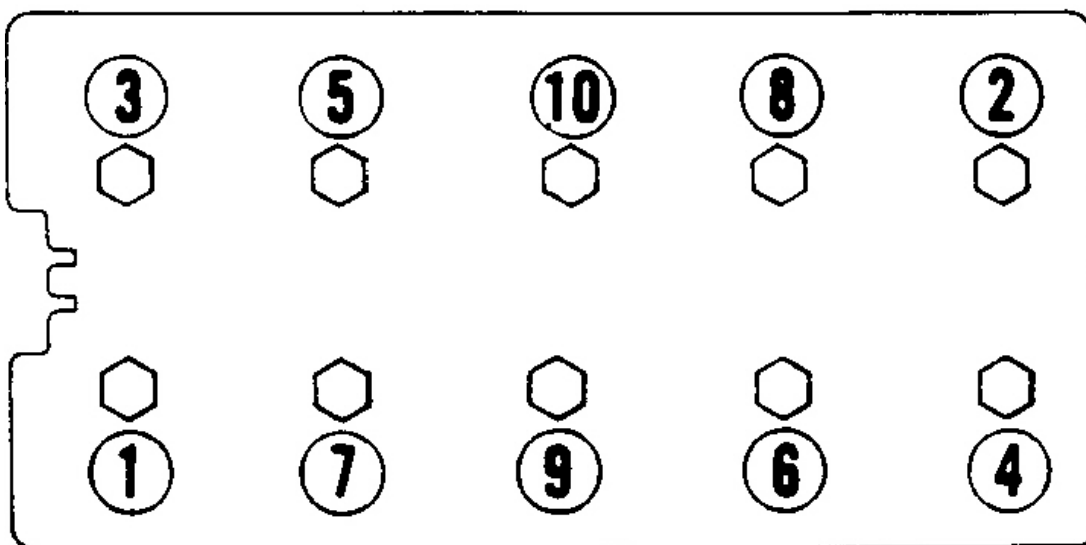
To install, reverse removal procedure using **NEW** gaskets. Tighten exhaust manifold bolts to specification. See **TORQUE SPECIFICATIONS** table.

CYLINDER HEAD

Removal

1. Release residual fuel pressure. See **FUEL PRESSURE RELEASE**. Drain cooling system. Remove radiator, accelerator cable and air intake hose, breather hose, PCV hose and air cleaner assembly.
2. Disconnect necessary coolant hoses, electrical connections, vacuum hoses and fuel lines. Remove center cover and spark plug wires. Remove crank angle sensor. Remove wiring harness.
3. Remove timing belt. See **TIMING BELT** under REMOVAL & INSTALLATION. Remove rocker cover and semi-circular packing at rear of cover.
4. Disconnect exhaust pipe at manifold. Disconnect tension rod at rear of intake manifold. Using Wrench (09221-32001), loosen head bolts in proper sequence. See **Fig. 1**. Remove cylinder head with exhaust and intake manifolds attached. Remove exhaust and intake manifolds from cylinder head (if necessary).

◀ FRONT OF ENGINE



REMOVAL

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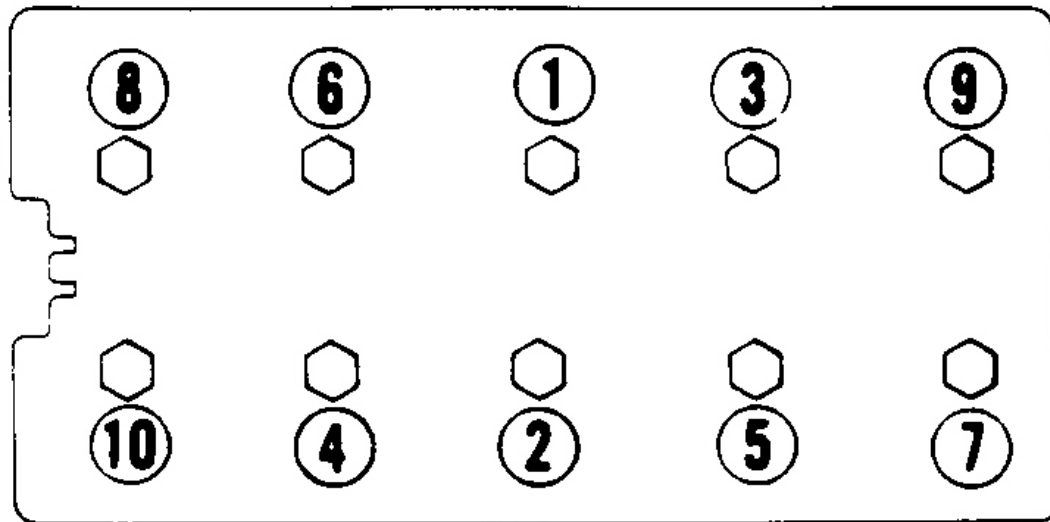
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Fig. 1: Cylinder Head Bolt Removal & Installation Sequence

Courtesy of HYUNDAI MOTOR CO.

 FRONT OF ENGINE

**INSTALLATION**

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Fig. 2: Cylinder Head Bolt Removal & Installation Sequence

Courtesy of HYUNDAI MOTOR CO.

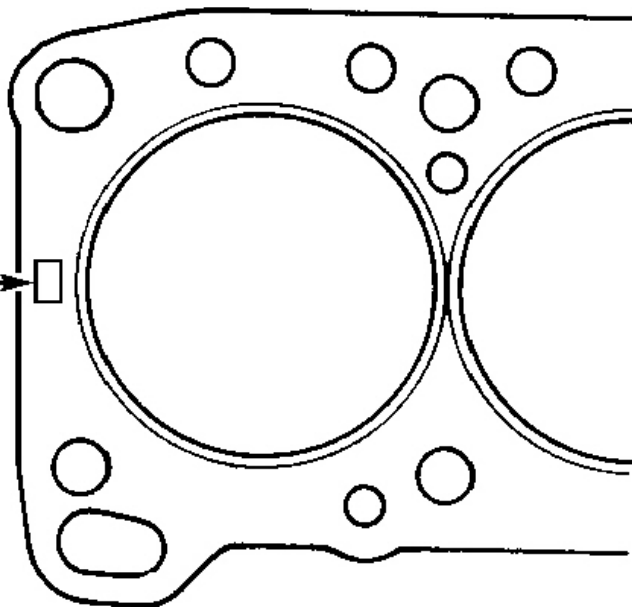
Inspection

Inspect cylinder head for warpage at deck surface. Resurface cylinder head if warpage exceeds specification. See **CYLINDER HEAD** table under ENGINE SPECIFICATIONS.

Installation

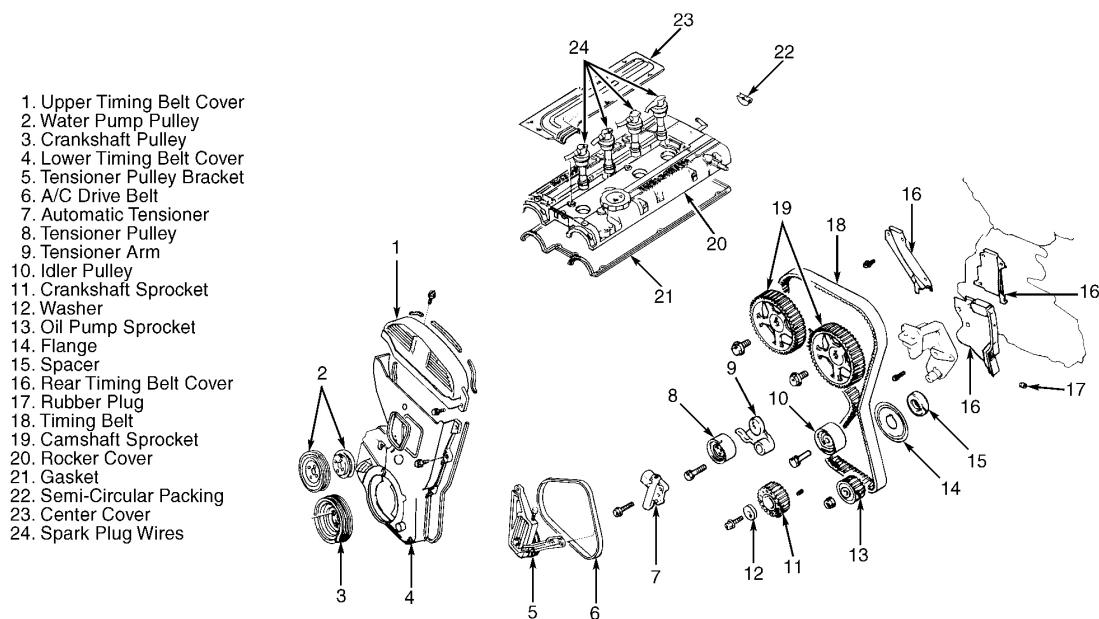
1. Install cylinder head. Use NEW gasket. Ensure identification mark on head gasket is toward timing belt side and faces up. See **Fig. 2**. **DO NOT** apply sealant to head gasket.
2. Install head bolts and tighten to specification in proper sequence. See **TORQUE SPECIFICATIONS**. To complete installation, reverse removal procedure. See **Fig. 1**.
3. Apply sealant to rocker cover sealing areas and proper areas of semi-circular packing. See **Fig. 4**. Apply gasoline to "O" ring on fuel line before installing fuel line in delivery pipe. Adjust all control cables.

Identification
Mark



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Fig. 3: Locating Cylinder Head Gasket Identification Mark
Courtesy of HYUNDAI MOTOR CO.



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Fig. 4: Exploded View Of Timing Belt & Components
Courtesy of HYUNDAI MOTOR CO.

FRONT COVER OIL SEAL

NOTE: "FRONT COVER" refers to cover at front of cylinder block. Cover contains oil pump, front cover oil seal (crankshaft front seal) and oil filter mount. Manufacturer lists oil seal removal procedure with front cover removed from engine. See OIL PUMP & FRONT COVER.

TIMING BELT

Removal

1. Remove cover from under engine. Support engine, and remove engine mount located near timing belt cover. Remove all drive belts, tensioner pulley bracket and drive pulleys from crankshaft and water pump.
2. Remove timing belt covers and gaskets, noting bolt lengths and locations. Remove center cover, breather hose, PCV hose and spark plug wires from spark plugs. See **Fig. 3**.

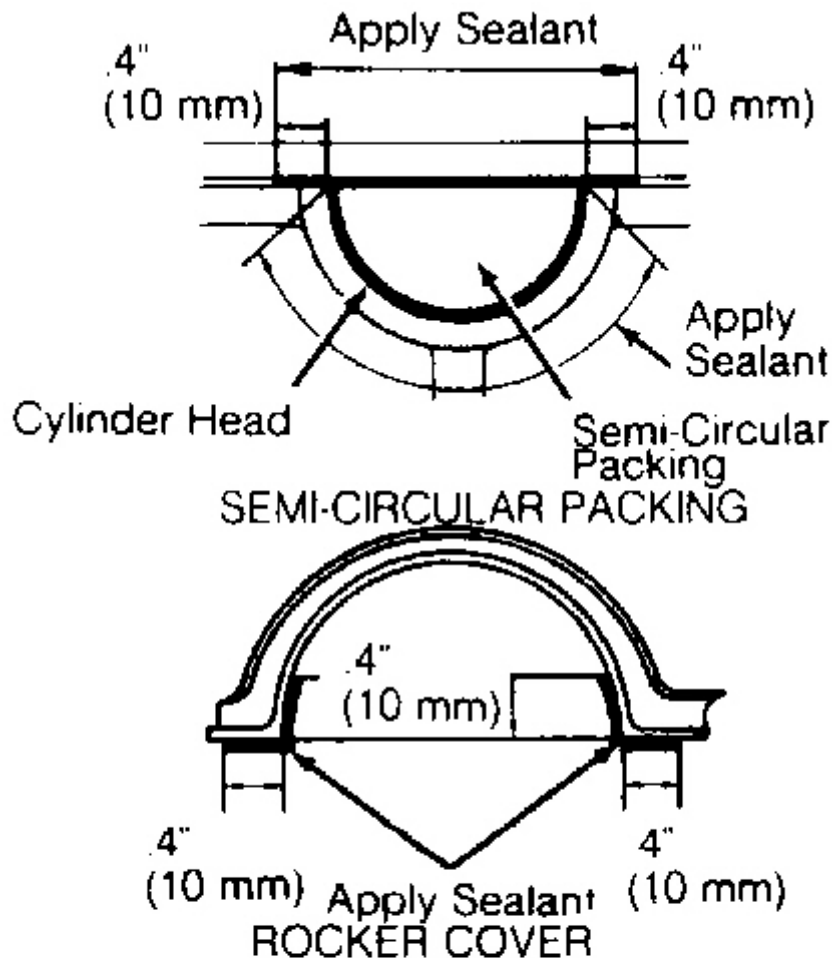


Fig. 5: Applying Sealant To Circlr. Packing/Rocker Cvr. Sealing Areas
 Courtesy of HYUNDAI MOTOR CO.

CAUTION: DO NOT rotate engine counterclockwise (as viewed from timing belt end of engine). If reusing timing belt, place reference mark on timing

belt to indicate direction of rotation before removing.

3. Remove rocker cover and semi-circular packing (located at rear of rocker cover). Remove rubber plug from rear timing belt cover. Rotate engine clockwise to align all timing marks so No. 1 cylinder is at TDC of compression stroke. See **Fig. 5**.

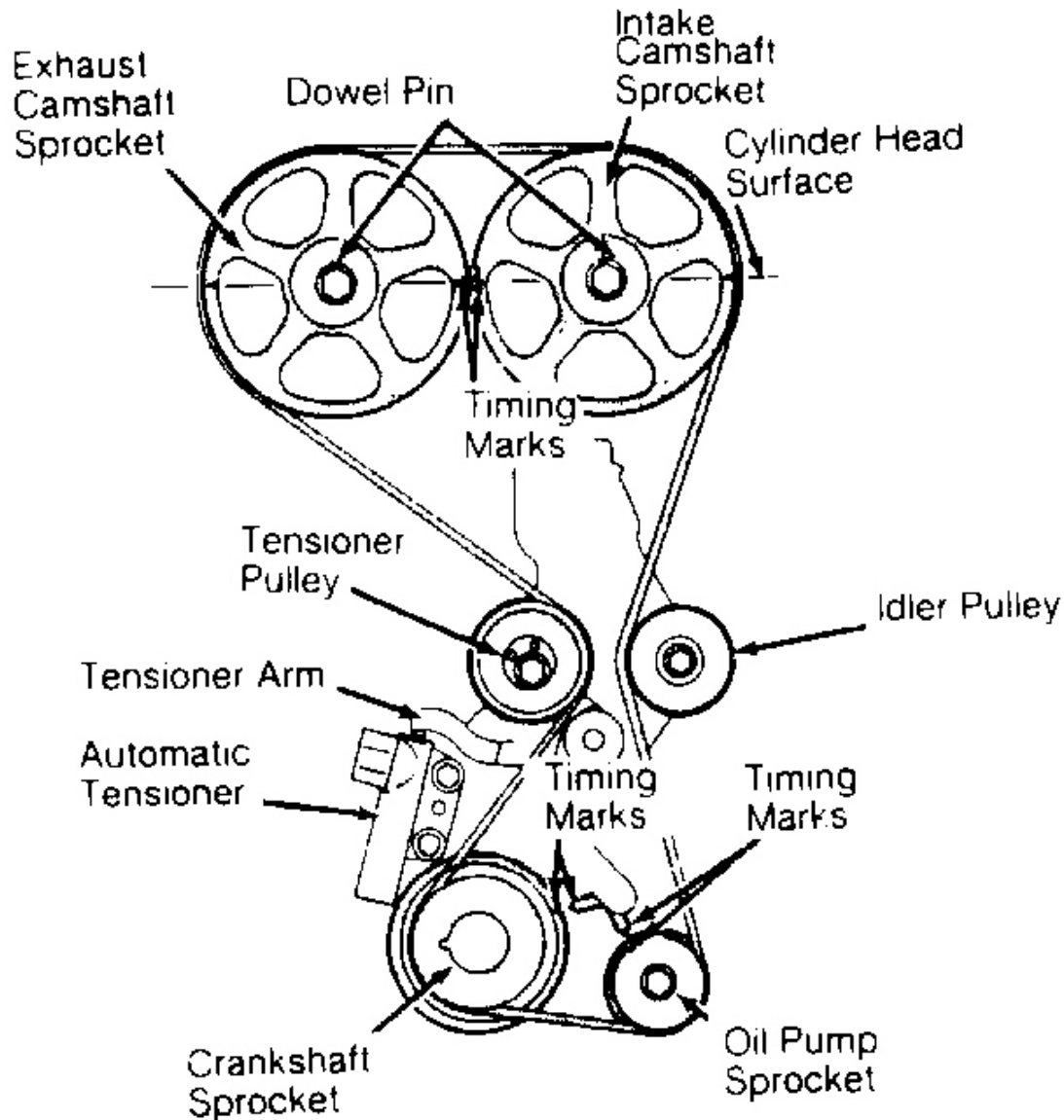


Fig. 6: Aligning Timing Marks
Courtesy of HYUNDAI MOTOR CO.

4. Remove automatic tensioner. Place mark on timing belt to indicate direction of belt rotation. Remove timing belt. Remove tensioner pulley, tensioner arm and idler pulley (if necessary).
5. Inspect sprockets for damage. To remove camshaft sprocket, hold hexagon area of camshaft between camshaft journals No. 2 and 3 while removing camshaft sprocket bolt. Remove sprockets from camshafts.
6. If necessary, remove bolt, washer, crankshaft and oil pump sprockets, flange and spacer. Note direction of installed flange. Remove rear timing belt covers.

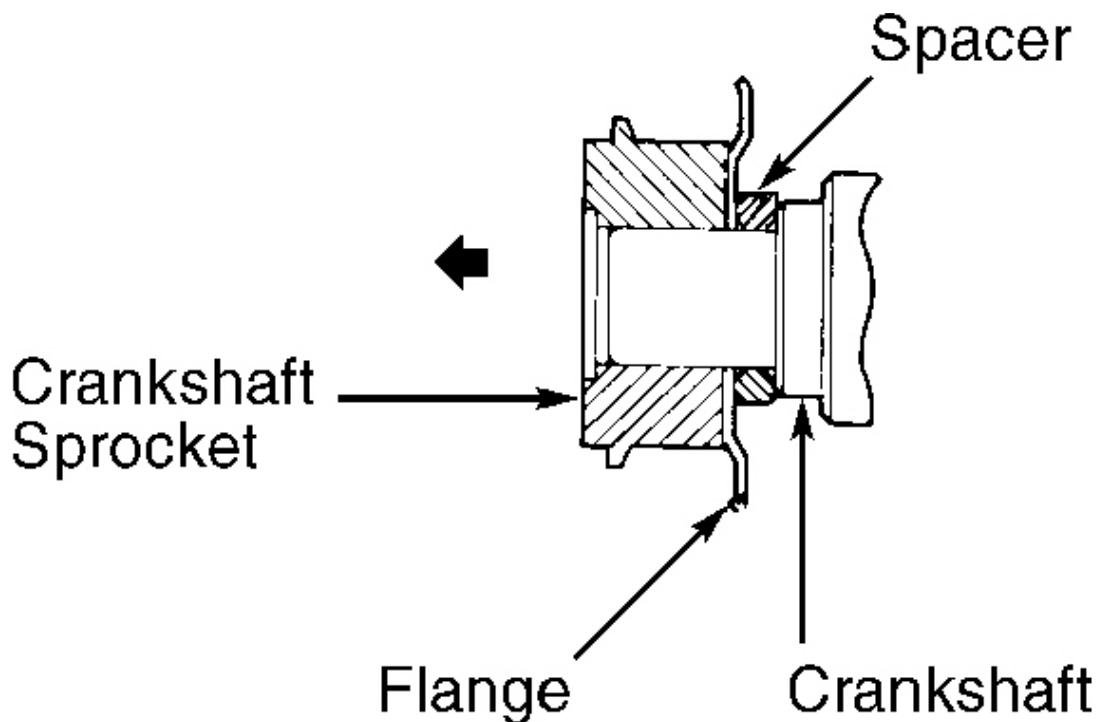
Inspection

1. Check belt teeth for cracks, damage and oil contamination. Inspect all sprockets for damage. Check tensioner pulley and idler pulley for grease leakage and roughness in rotation. Replace components if damaged.
2. Inspect automatic tensioner for leaks. Check end of automatic tensioner rod for wear. Measure distance from end of automatic tensioner rod to automatic tensioner housing. Distance should be .47"(12 mm).
3. Check if plug at bottom of tensioner protrudes past tensioner housing. If plug protrudes past housing, place a washer over plug to prevent plug from contacting vise when pushing rod into tensioner housing.
4. Place tensioner assembly in a soft-faced vise. Squeeze rod back into automatic tensioner. Replace tensioner if rod can be retracted easily into automatic tensioner.

CAUTION: Install flange and crankshaft sprocket in correct direction to prevent damage to timing belt.

Installation

1. If removed, install rear timing belt covers, spacer, flange, crankshaft sprocket, washer and retaining bolts. Ensure flange and crankshaft sprocket are installed in proper direction. See **Fig. 7**.

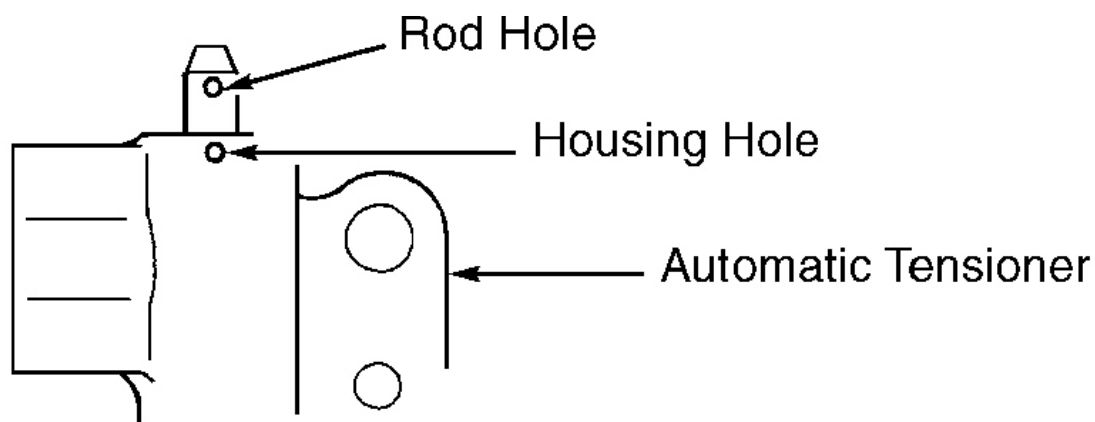


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Fig. 7: Installing Flange & Crankshaft Sprocket
Courtesy of HYUNDAI MOTOR CO.

2. Install camshaft sprockets. Tighten retaining bolts to specification while holding hexagon area of camshaft. See **TORQUE SPECIFICATIONS** table. Install idler pulley.
3. Push automatic tensioner rod into tensioner housing. Check if plug at bottom of tensioner protrudes past tensioner housing. If plug protrudes past housing, place a washer over plug to prevent plug from contacting vise when pushing rod into tensioner housing.

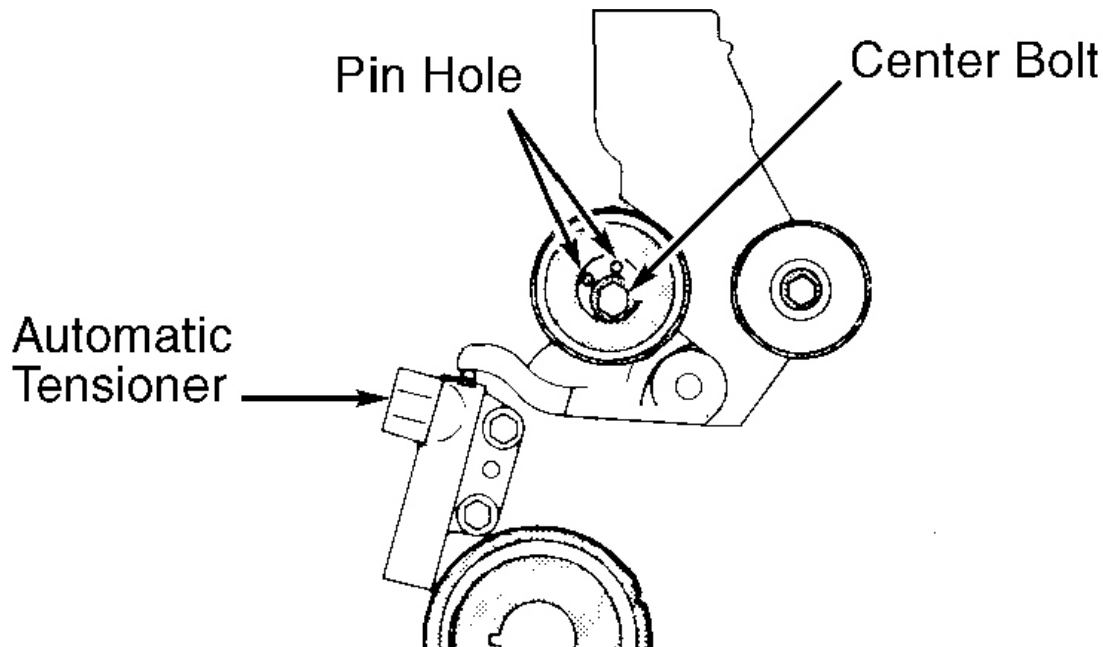
4. Place tensioner assembly in a soft-faced vise. Squeeze rod back into automatic tensioner in small increments until both rod and housing holes are aligned. See **Fig. 8**. Install a .055" (1.40 mm) diameter wire into holes.



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Fig. 8: Retracting Automatic Tensioner Rod
 Courtesy of HYUNDAI MOTOR CO.

5. Remove automatic tensioner from vise, and install assembly with wire installed. Install tensioner arm. Install tensioner pulley on tensioner arm, ensuring pin holes of tensioner pulley shaft is left of center bolt. See **Fig. 9**. Tighten center bolt.



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Fig. 9: Installing Tensioner Pulley
 Courtesy of HYUNDAI MOTOR CO.

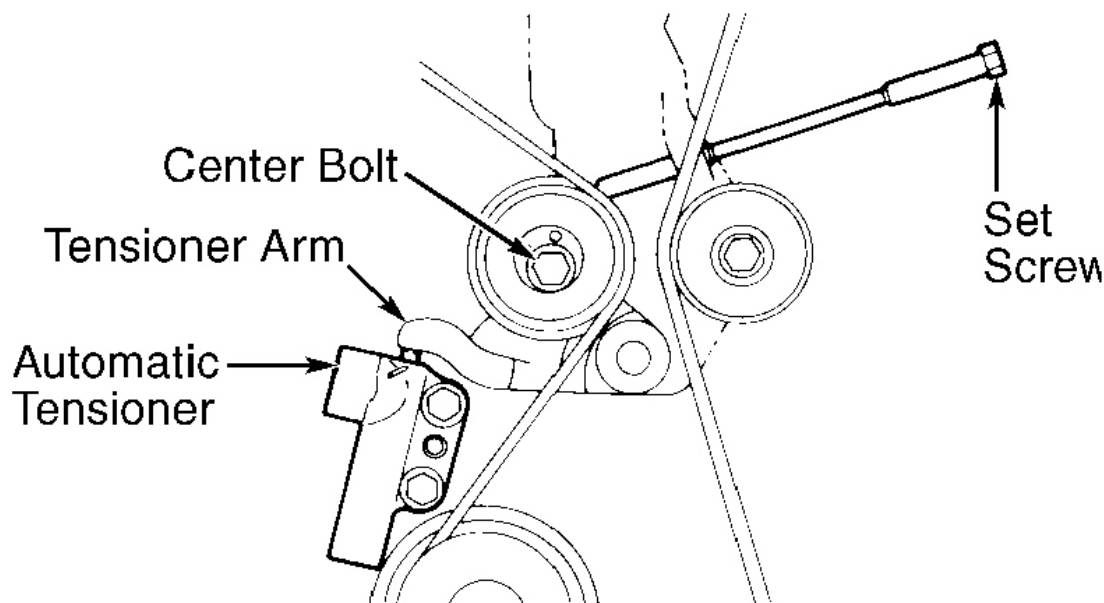
6. Rotate camshaft sprockets so dowel pins face up and timing marks on sprockets align. See **Fig. 5**. Outer marks on sprockets should be aligned with cylinder head surface.
7. When exhaust camshaft sprocket is released, camshaft will rotate one tooth in counterclockwise

direction. When installing timing belt, compensate for rotation.

8. Rotate crankshaft and align timing marks on crankshaft and oil pump sprockets. If installing old timing belt, ensure it is installed in original direction of rotation.
9. Install timing belt on tensioner pulley and crankshaft sprocket. Hold belt in place using left hand. Pull belt around oil pump sprocket using right hand. Pull belt around idler pulley.
10. Install timing belt around intake camshaft sprocket. Ensure exhaust timing mark on camshaft sprocket aligns with cylinder head surface. See **Fig. 5**. Using both hands, install timing belt around exhaust camshaft sprocket.
11. Rotate tensioner pulley in toward timing belt until belt does not sag. Temporarily tighten center bolt on tensioner pulley. Ensure all timing marks are aligned.
12. To adjust belt tension, rotate crankshaft 1/4 turn counterclockwise, and then rotate clockwise until No. 1 cylinder is at TDC. Loosen center bolt on tensioner pulley.
13. To rotate tensioner pulley, install Socket Wrench (09244-28100) into pin holes offset from center of pulley. Using INCH lb. torque wrench and socket wrench, apply a torque of 23-24 INCH lbs. (2.6-2.7 N.m) on tensioner pulley. With torque applied to tensioner pulley, tighten tensioner pulley center bolt to 31-40 ft. lbs. (42-54 N.m).

NOTE: If engine is in vehicle, it may be necessary during tensioner pulley adjustment to jack up engine slightly for clearance.

14. Install Set Screw (09244-28000) in left engine support bracket until screw end contacts tensioner arm. See **Fig. 10**. Turn set screw further until wire can be removed from automatic tensioner. Remove set screw.

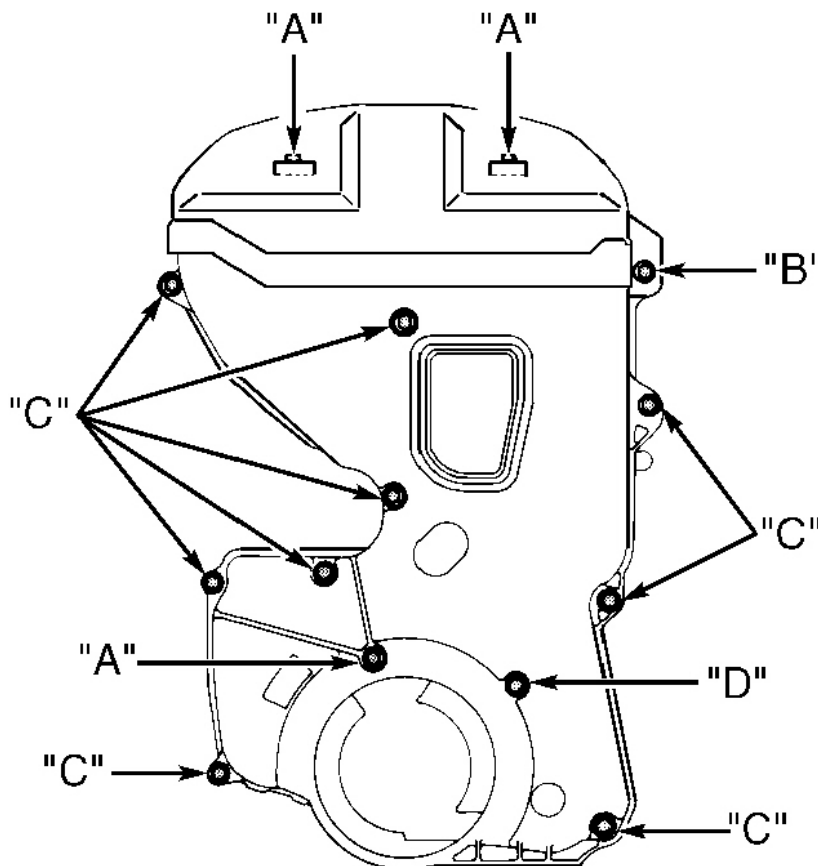


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Fig. 10: Removing Timing Belt Automatic Tensioner Lock Wire
Courtesy of HYUNDAI MOTOR CO.

15. Rotate crankshaft clockwise 2 complete revolutions, and leave it in this position for approximately 15 minutes. After 15 minutes, measure distance between tensioner arm and automatic tensioner body (automatic tensioner rod extension). Distance should be .15-.18" (3.8-4.5 mm). Repeat steps 12) through 15) until correct distance is obtained.

16. An alternate method can be used if engine is in vehicle or distance cannot be measured due to lack of clearance. Install Set Screw (09244-28000) until it contacts tensioner arm.
17. Turn set screw inward, counting number of turns until tensioner arm contacts automatic tensioner housing. Set screw should rotate 2 1/2 - 3 turns inward if belt tension is correct. Repeat steps 12) through 17) until correct number of turns is obtained.
18. Remove set screw. Install rubber plug in rear timing belt cover. To complete installation, reverse removal procedure. Apply sealant to appropriate areas on semi-circular packing and rocker cover before installing. See **Fig. 4**. Ensure timing belt cover bolts are installed in proper location. See **Fig. 11**.



NOTE: Thread diameter x length indicated in millimeters.

"A" - 6 x 16

"C" - 6 x 20

"B" - 6 x 22

"D" - 6 x 28

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Fig. 11: Installing Timing Belt Cover Bolts

Courtesy of HYUNDAI MOTOR CO.

ROCKER ARM & VALVE LASH ADJUSTER

Removal & Installation

Remove camshafts. See **CAMSHAFTS** under REMOVAL & INSTALLATION. Remove rocker arm and lash adjuster. See **Fig. 12**. To install, reverse removal procedure.

CAMSHAFTS

Removal

1. Remove timing belt. See **TIMING BELT** under REMOVAL & INSTALLATION. Remove camshaft sprockets. Remove crank angle sensor from rear of intake camshaft.

CAUTION: Note location and direction of installed bearing cap before removing. Bearing caps are marked with "L" to indicate intake camshaft or "R" to indicate exhaust camshaft.

2. Remove front and rear bearing caps. Remove camshaft oil seals. See **Fig. 12**. Remove remaining bearing caps in sequence: No. 5, 2, 4 and 3. Remove camshafts.

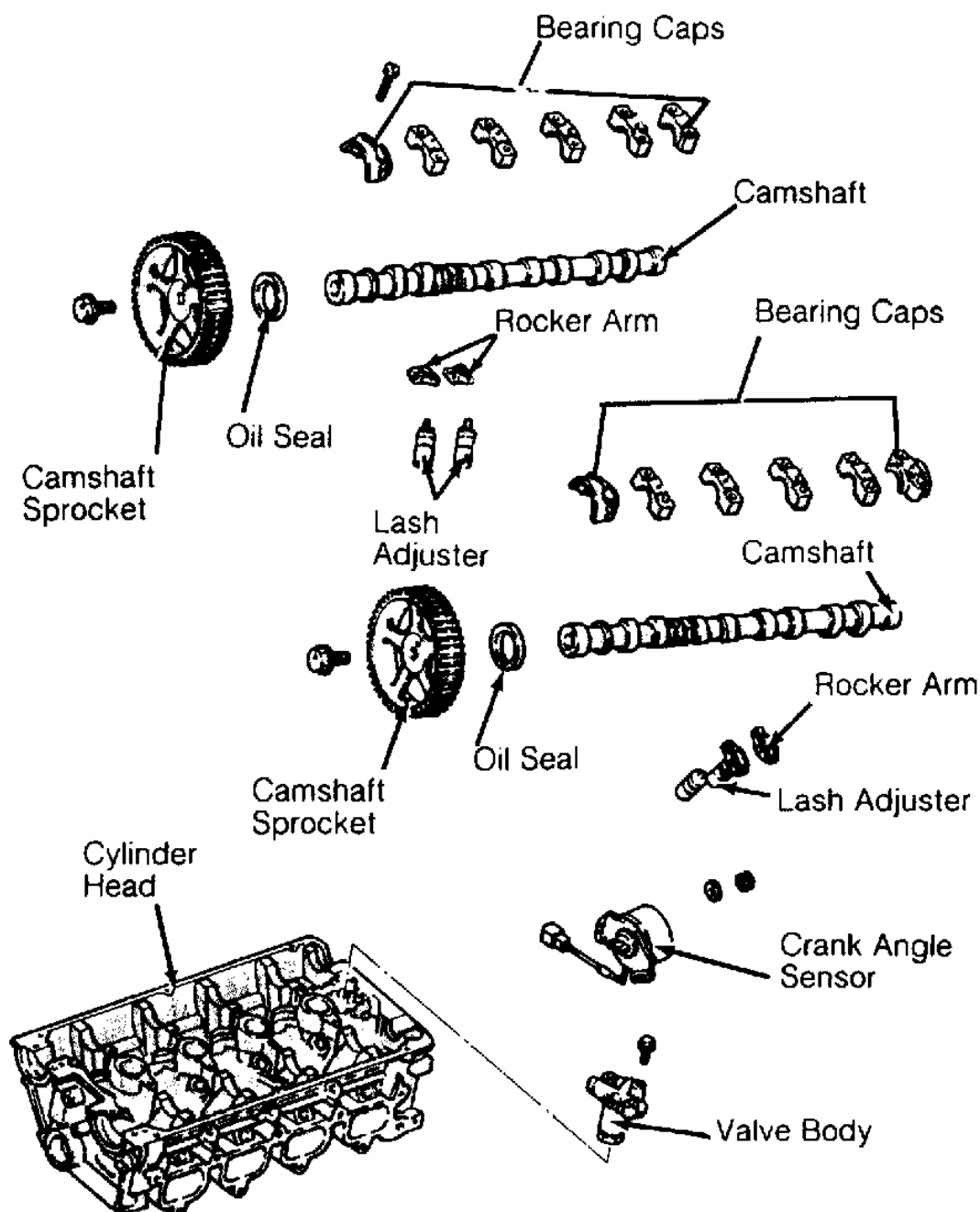


Fig. 12: Exploded View Of Camshaft Assembly

Courtesy of HYUNDAI MOTOR CO.

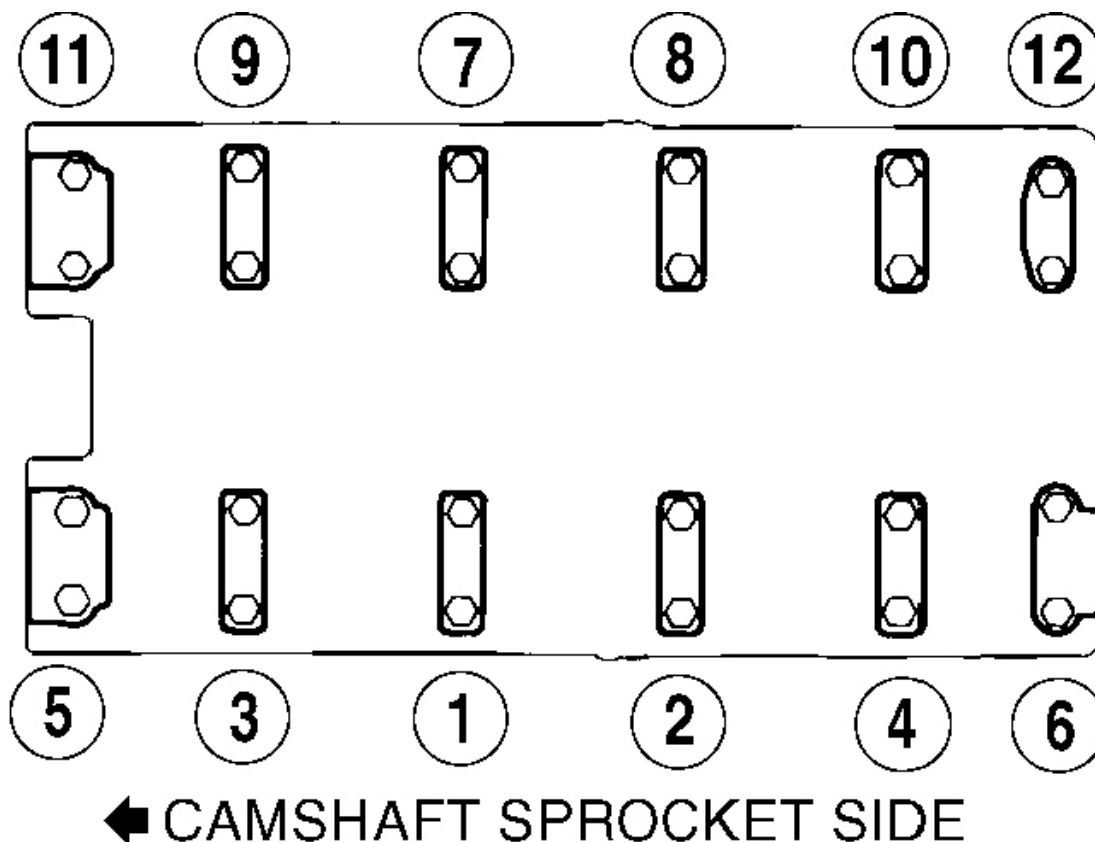
Inspection

Inspect all components for damage. Inspect camshaft journal diameter and lobe height for wear. Replace camshaft if journal diameter and lobe height are not within specifications. See **CAMSHAFT** table under ENGINE SPECIFICATIONS. Ensure rocker arms do not show wear.

Installation

1. Lubricate camshafts with engine oil. Note intake camshaft has a slit in rear to drive crank angle sensor. Install camshafts with dowel pin for camshaft sprockets at a 12 o'clock position.
2. Install bearing caps. Ensure rocker arm is mounted on lash adjuster and valve stem. Tighten bearing cap bolts in sequence to specification (in 2 steps). See **Fig. 13**.
3. Install Seal Guide (09221-21100) on camshaft. Coat oil seal with engine oil, and install on seal guide. Using Seal Installer (09221-21000), install seal into cylinder head.
4. Ensure dowel pin for intake camshaft sprocket is at 12 o'clock position. Align punch mark on crank angle sensor housing with notch in plate. See **Fig. 14**. Install crank angle sensor on cylinder head. To complete installation, reverse removal procedure.

CAUTION: Ensure crank angle sensor is installed with punch mark aligned with notch in plate. Otherwise, incorrect fuel injection and ignition timing will result.



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Fig. 13: Camshaft Bearing Cap Bolt Tightening Sequence
Courtesy of HYUNDAI MOTOR CO.

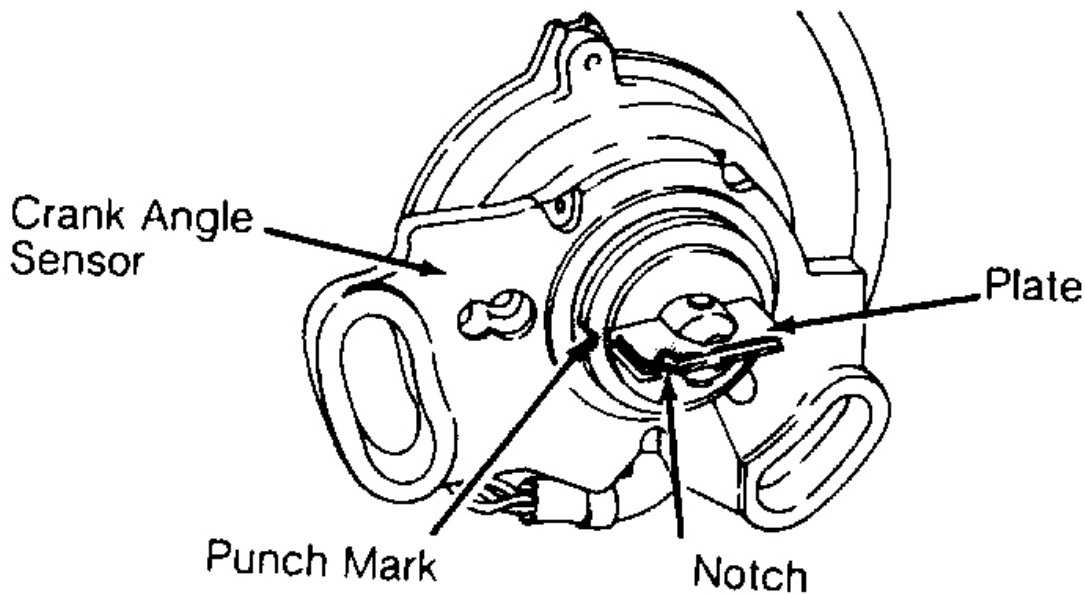


Fig. 14: Installing Crank Angle Sensor
Courtesy of HYUNDAI MOTOR CO.

REAR CRANKSHAFT OIL SEAL

Removal

Remove transaxle. See FWD article in CLUTCHES or TRANSMISSION SERVICING article. Remove drive plate (A/T) or flywheel (M/T). Remove oil seal case from rear of cylinder block. If necessary, remove oil pan. Remove oil seal from seal case. An oil separator plate is located behind oil seal in oil seal case.

NOTE: Ensure oil separator plate is installed in oil seal case, with oil hole located toward oil pan sealing area, at bottom of oil seal case.

Installation

1. Install oil separator plate in oil seal case. Ensure oil hole of oil separator plate is located at bottom of oil seal case (toward oil pan sealing surface).
2. Install seal in oil seal case until it bottoms using Seal Installer (09231-21000). Install oil seal case with NEW gasket. To complete installation, reverse removal procedure.

WATER PUMP

Removal

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Drain cooling system, and disconnect battery. Remove necessary coolant hoses. Remove timing belt. See **TIMING BELT** under REMOVAL & INSTALLATION. Remove pump mounting bolts. Note bolt length and locations. Remove alternator brace and water pump.

Installation

To install, reverse removal procedure. Use NEW gasket and "O" ring. Install "O" ring on coolant pipe, and apply water to "O" ring. **DO NOT** apply grease or oil to "O" ring. Ensure bolts are installed in original location.

NOTE: For further information on cooling systems, see **ENGINE COOLING FANS** article in **ENGINE COOLING** section.

OIL PAN

Removal & Installation

Drain engine oil. Remove oil pan retaining bolts. Using a gasket cutter, cut gasket along sealing surface of cylinder block. Remove oil pan and gasket. To install, reverse removal procedure. Apply a .16" (4.0 mm) bead of sealant to groove areas in oil pan sealing surfaces before installing.

OVERHAUL

CYLINDER HEAD OVERHAUL

NOTE: Valve spring installed height specification is not available from manufacturer. For reassembly reference, measure installed height before disassembly.

CYLINDER HEAD

Inspect cylinder head for warpage at deck surface. Resurface cylinder head if warpage exceeds specification. See **CYLINDER HEAD** table under ENGINE SPECIFICATIONS.

VALVE SPRINGS

Inspect valve spring free length and out-of-square. Replace valve springs if not within specification. See **VALVES & VALVE SPRINGS** table under ENGINE SPECIFICATIONS. Install all valve springs with painted area toward rocker arm.

VALVE STEM OIL SEALS

Install seal using Valve Seal Installer (09222-28200) to properly position oil seal.

VALVE GUIDES

1. Ensure valve stem diameter is within specification. Check valve stem clearance. Ensure clearance is within specification. See **CYLINDER HEAD** and **VALVES & VALVE SPRINGS** tables under ENGINE SPECIFICATIONS.
2. If clearance exceeds service limits, valve guide can be replaced with an oversized valve guide. See

OVERSIZED VALVE GUIDE SPECIFICATIONS table.

- Remove valve guide from cylinder head using Valve Guide Remover/Installer (09222-21200). Drive valve guide out toward combustion chamber side of cylinder head.
- Machine cylinder head valve guide bore to specification for oversized valve guide. See **OVERSIZED VALVE GUIDE SPECIFICATIONS** table. Note intake valve guides are shorter than exhaust valve guides.
- Using valve guide installer, press NEW valve guide into cylinder head from top. Ensure valve guide is installed to proper height. See **CYLINDER HEAD** table.

CAUTION: DO NOT install valve guide with same diameter as one removed.

- Check guide clearance of new valve guides. Ream as necessary. Check valve seat contact.

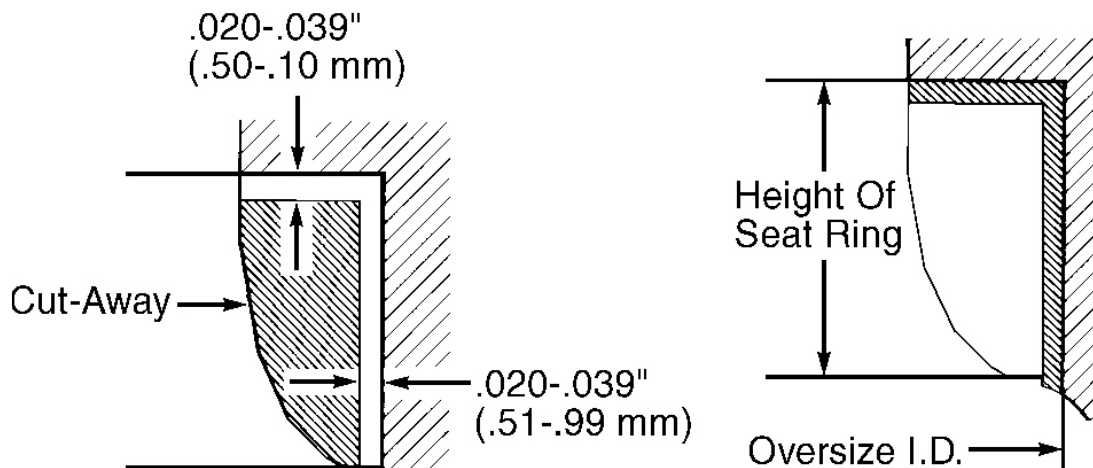
OVERSIZED VALVE GUIDE SPECIFICATIONS ⁽¹⁾

| Size Mark | Guide Size In. (mm) | Cylinder Head Bore In. (mm) |
|-----------|---------------------|-----------------------------|
| 5 | .002 (.05) | .4744-.4751 (12.050-12.068) |
| 25 | .010 (.25) | .4823-.4830 (12.250-12.268) |
| 50 | .020 (.50) | .4921-.4928 (12.500-12.518) |

(1) For installed valve guide height, see **CYLINDER HEAD** table under ENGINE SPECIFICATIONS.

VALVE SEATS

- To replace valve seats, cut valve seat to designated dimension. See **Fig. 15**. Machine cylinder head to proper dimension. See **OVERSIZED VALVE SEAT SPECIFICATIONS** table.
- Heat cylinder head to 480°F (250°C) and press replacement seat into cylinder head. Ensure valve seat height is within specification. Cut valve seat to proper angle to obtain correct seat width.



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Fig. 15: Cutting Valve Seat & Measuring Installed Height
Courtesy of HYUNDAI MOTOR CO.

OVERSIZED VALVE SEAT SPECIFICATIONS

| Size Mark | Seat Size In. (mm) | Cyl. Head Bore In. (mm) | Seat Height In. (mm) |
|-----------|--------------------|-------------------------|----------------------|
|-----------|--------------------|-------------------------|----------------------|

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1992 Hyundai Elantra

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| | | | |
|---------|------------|---------------------------|-----------------------|
| Intake | | | |
| 30 | .012 (.30) | 1.390-1.390 (35.30-35.33) | .311-.319(7.90-8.10) |
| 60 | .024 (.60) | 1.402-1.403 (35.60-35.63) | .323-.331 (8.20-8.40) |
| Exhaust | | | |
| 30 | .012 (.30) | 1.311-1.312 (32.30-33.33) | .311-.319 (7.90-8.10) |
| 60 | .024 (.60) | 1.323-1.324 (33.60-33.63) | .323-.331 (8.20-8.40) |

VALVES

Ensure valve stem diameter and valve margin are within specifications. See **VALVES & VALVE SPRINGS** table under ENGINE SPECIFICATIONS. Replace valve if diameter and margin are not to specifications.

VALVE TRAIN

Ensure rocker arm and valve lifter are undamaged and not excessively worn. When hydraulic valve lifter is pressed down, lifter should resist and require some effort to move. No overhaul is possible. Replace as necessary.

CYLINDER BLOCK ASSEMBLY

PISTON & ROD ASSEMBLY

Mark piston and rod assembly with corresponding cylinder number before removing. Install piston and rod assembly in cylinder block, with front mark on piston top toward timing belt side of engine.

FITTING PISTONS

1. Measure piston skirt diameter .08" (2 mm) above bottom of piston skirt and at 90-degree angle to piston pin. If piston diameter is not within specification, replace piston. See **PISTONS, PINS & RINGS SPECIFICATIONS** table under ENGINE SPECIFICATIONS.
2. Measure cylinder bore diameter in 3 places: .47" (12 mm) from top of bore, .47" (12 mm) from bottom of bore and near center of bore. If cylinder bore diameter or taper is not within specification, machine cylinder bore. See **CYLINDER BLOCK** table under ENGINE SPECIFICATIONS.
3. If piston-to-cylinder bore clearance is not within specification, replace piston and/or machine cylinder bore. See **PISTONS, PINS & RINGS SPECIFICATIONS** table.

PISTON RINGS

Ensure ring end gap and side clearance are within specification. See **PISTONS, PINS & RINGS SPECIFICATIONS** table under ENGINE SPECIFICATIONS. **DO NOT** use ring expander to install oil ring side rails. Position ring end gaps around circumference of piston properly before installing. See **Fig. 16**.

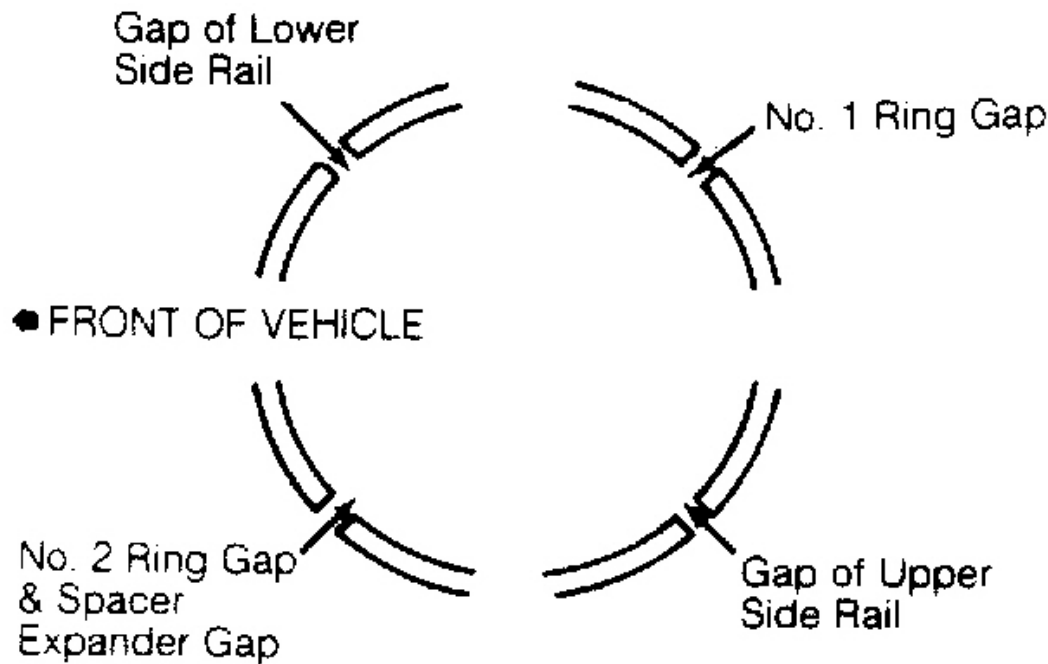


Fig. 16: Positioning Piston Ring Gap
 Courtesy of HYUNDAI MOTOR CO.

ROD BEARINGS

Note position of connecting rod in relation to bearing cap before removing. Ensure bearing oil clearance and side play are within specification. See **CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS** and **CONNECTING RODS** tables under ENGINE SPECIFICATIONS.

CRANKSHAFT & MAIN BEARINGS

1. Check diameters of main bearing journals and connecting rod bearing journals. Check journals for taper and out-of-round. Check crankshaft end play. See **CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS** table under ENGINE SPECIFICATIONS.
2. Install main bearing caps with arrow on top of cap pointing toward timing belt end of engine. "F" stamped on top of cap (next to arrow) indicates front main bearing cap and "R" indicates rear main bearing cap.

THRUST BEARING

Replace thrust bearing if crankshaft end play is not within specification. See **CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS** table under ENGINE SPECIFICATIONS.

CYLINDER BLOCK

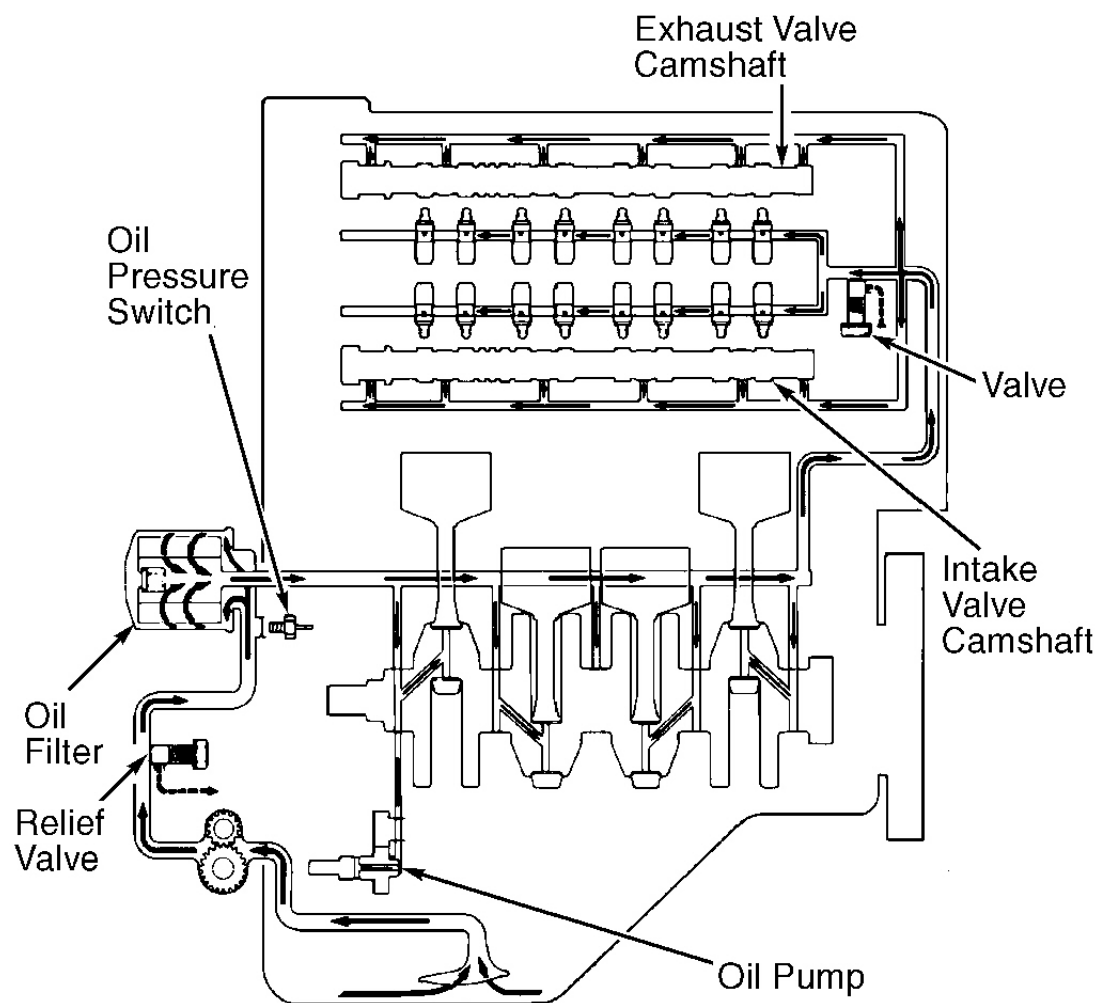
1. Check cylinder block deck warpage. Ensure warpage does not exceed specification. See **CYLINDER BLOCK** table under ENGINE SPECIFICATIONS. If warpage exceeds specification, machine surface. **DO NOT** remove more than a combined total of .008" (0.20 mm) material from cylinder head or cylinder block gasket surfaces.
2. Check cylinder bore wear and taper. Measure cylinder bore diameter in 3 places: .47" (12 mm) from top of bore, .47" (12 mm) from bottom of bore and near center of bore. If cylinder bore diameter or

taper is not within specification, machine cylinder bore. See **CYLINDER BLOCK** table.

ENGINE LUBRICATION

The 1.6L engine uses a timing belt-driven oil pump mounted in front cover. See **Fig. 17**. Oil is delivered to hydraulic lifters from oil passage at rear of engine.

Pressure relief valve is non-adjustable and located in oil filter bracket. See **OIL PUMP & FRONT COVER**.



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Fig. 17: Engine Oiling System
Courtesy of HYUNDAI MOTOR CO.

CRANKCASE CAPACITY

Dry fill capacity including oil filter is 4.6 qts. (4.4L). Fill capacity at oil change including oil filter is 3.5 qts. (3.3L).

OIL PRESSURE

At curb idle and with oil temperature 167-194°F (75-90°C), normal oil pressure should be at least 11 psi (.77 kg/cm²).

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1.6L 4-CYL - VIN [R] 1992 Engines - 1.6L 4-Cylinder

OIL PUMP & FRONT COVER

Removal

Remove timing belt and crankshaft sprocket. See **TIMING BELT** under REMOVAL & INSTALLATION. Remove oil filter and oil pressure switch. Remove oil pan, oil screen and oil filter bracket. Remove front cover and oil pump assembly. Remove plug cap located on front of front cover.

Disassembly & Inspection

1. Check clearance between tip of gear teeth and front cover. Place straightedge across front cover housing. Measure gear end play clearance between each gear and straightedge.
2. Check pressure relief valve for freedom of movement in bore. Check spring tension and free length of relief valve spring. Replace components if not within specifications. See **OIL PUMP SPECIFICATIONS** table. Check oil pan for cracks and damage and oil screen for clogging.

Reassembly & Installation

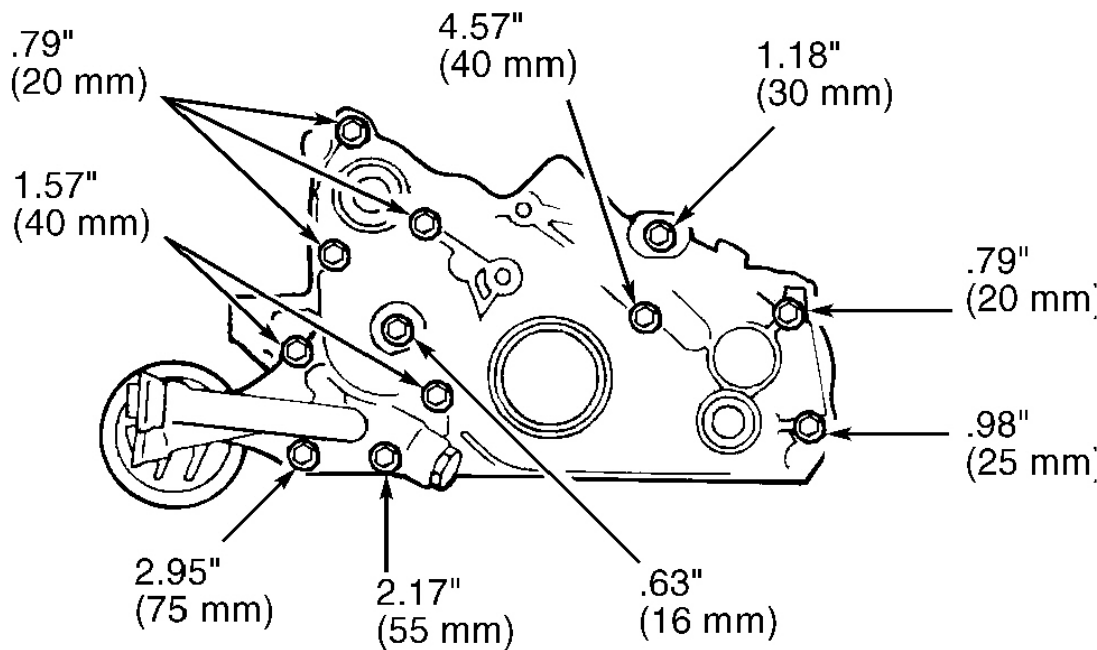
1. Ensure timing marks are aligned on gears. Install gear cover. Use Seal Installer (09214-32000) to install seal in front cover. Coat outer surface of Seal Guide (09214-32100) with oil, and install over end of crankshaft.
2. Install front cover with NEW gasket. Install oil filter bracket. See **Fig. 18**. Install proper length front cover bolts in appropriate locations. Tighten to proper specification. See **TORQUE SPECIFICATIONS** table.
3. Using plug cap wrench, install plug cap, and tighten to specification. To complete installation, reverse removal procedure.

OIL PUMP SPECIFICATIONS

| Application | Specification |
|-------------------------------------|-----------------------------------------|
| Gear End Play | |
| Drive Gear | (1).0031-.0055" (.080-.140 mm) |
| Driven Gear | (1).0024-.0047" (.060-.120 mm) |
| Gear Tip-To-Body Clearance | |
| Drive Gear | (1).0063-.0083" (.160-.210 mm) |
| Driven Gear | (1).0051-.0071" (.130-.180 mm) |
| Relief Valve Spring | |
| Free Length | 1.835" (46.60 mm) |
| Spring Pressure | . 13.4 lbs @ 1.579" (6.1 kg @ 40.10 mm) |
| (1) Wear limit is .0098" (.250 mm). | |

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1.6L 4-CYL - VIN [R] 1992 Engines - 1.6L 4-Cylinder



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Fig. 18: Installing Front Cover Bolts

Courtesy of HYUNDAI MOTORS CO.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

| Application | Ft. Lbs. (N.m) |
|------------------------------------------|------------------|
| Automatic Tensioner Bolt | 14-20 (19-27) |
| Camshaft Bearing Cap Bolt ⁽¹⁾ | 14-15 (19-20) |
| Camshaft Sprocket Bolt | 58-72 (79-98) |
| Connecting Rod Cap Bolt | 36-38 (49-52) |
| Crankshaft Pulley-To-Sprocket Bolt | 14-22 (19-30) |
| Crankshaft Sprocket Bolt | 80-94 (108-127) |
| Cylinder Head Bolt ⁽²⁾ | 65-72 (88-98) |
| Drive Plate-To-Crankshaft Bolt | 94-101 (127-137) |
| Exhaust Manifold-To-Engine Bolt | 18-22 (24-30) |
| Exhaust Pipe-To-Manifold Bolt | 29-36 (39-49) |
| Flywheel-To-Crankshaft Bolt | 94-101 (127-137) |
| Front Cover Bolt | |
| M8 x 30 Bolt | 20-26 (27-35) |
| Except M8 x 30 Bolt | 14-20 (19-27) |
| Idler Pulley Bolt | 25-30 (34-41) |
| Intake Manifold Bolt | |
| 8-mm Bolt | 11-14 (15-19) |
| 10-mm Bolt/Nut | 22-30 (30-41) |
| Main Bearing Cap Bolt | 47-51 (64-69) |
| Oil Filter Bracket Bolt | 11-16 (15-22) |

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1.6L 4-CYL - VIN [R] 1992 Engines - 1.6L 4-Cylinder

| | |
|---------------------------------------------------------------|---------------|
| Oil Pump Cover Bolt | 11-13 (15-18) |
| Oil Pump Driven Gear Bolt | 25-29 (34-39) |
| Oil Pump Relief Valve Plug | 29-36 (39-49) |
| Oil Pump Sprocket Bolt | 36-43 (49-58) |
| Oil Screen Bolt | 11-16 (15-22) |
| Plug Cap | 14-20 (19-27) |
| Tensioner Pulley Bracket Bolt | 17-20 (23-27) |
| Tensioner Pulley Center Bolt | 31-40 (42-54) |
| Throttle Body-To-Intake Manifold Bolt | 11-16 (15-22) |
| Torque Converter-To-Drive Plate Bolt | 34-38 (46-52) |
| INCH Lbs. (N.m) | |
| Oil Pan Bolt | 48-72 (5-8) |
| Rear Oil Seal Case Bolt | 84-108 (9-12) |
| Rocker Cover Bolt | 24-36 (3-4) |
| Timing Belt Cover Bolt | |
| Left Lower Rear Cover Bolt | (3) |
| Except Left Lower Rear Cover Bolt | 84-108 (9-12) |
| (1) Tighten in sequence. See Fig. 13 . | |
| (2) Tighten in sequence with engine cold. See Fig. 1 . | |
| (3) Tighten to 22-30 ft. lbs. (30-41 N.m). | |

ENGINE SPECIFICATIONS

GENERAL ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

| Application | Specification |
|-----------------------|-------------------|
| Displacement | 97 Cu. In. (1.6L) |
| Bore | 3.24" (82.3 mm) |
| Stroke | 2.95" (75.0 mm) |
| Compression Ratio | 9.2:1 |
| Fuel System | PFI |
| Horsepower @ RPM | |
| A/T | 105 @ 6500 |
| M/T | 113 @ 6000 |
| Torque Ft. Lbs. @ RPM | |
| A/T | 101 @ 4500 |
| M/T | 102 @ 5000 |

CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS SPECIFICATIONS

CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS

| | | |
|--------------------------------------|---------|--------------------------------------------------|
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1992 Hyundai Elantra

1.6L 4-CYL - VIN [R] 1992 Engines - 1.6L 4-Cylinder

| Application | In. (mm) |
|--------------------------------|-------------------------|
| Crankshaft | |
| End Play | |
| Standard | .002-.007 (.05-.18) |
| Service Limit | .010 (.25) |
| Main Bearings | |
| Journal Diameter | 2.2441 (57.000) |
| Journal Out-Of-Round | .0006 (.015) |
| Journal Taper | .0002 (.005) |
| Oil Clearance | |
| Standard | .0008-.0020 (.020-.050) |
| Service Limit | .004 (.10) |
| Connecting Rod Bearings | |
| Journal Diameter | 1.7717 (45.000) |
| Journal Out-Of-Round | .0006 (.015) |
| Journal Taper | .0002 (.005) |
| Oil Clearance | |
| Standard | .0008-.0020 (.020-.050) |
| Service Limit | .004 (.10) |

CONNECTING RODS SPECIFICATIONS**CONNECTING RODS**

| Application | In. (mm) |
|--------------------|---------------------|
| Maximum Bend | .002 (.05) |
| Maximum Twist | .004 (.10) |
| Side Play | |
| Standard | .004-.010 (.10-.25) |
| Service Limit | .016 (.40) |

PISTONS, PINS & RINGS SPECIFICATIONS ()**PISTONS, PINS & RINGS SPECIFICATIONS ⁽¹⁾**

| Application | In. (mm) |
|-------------------------|-------------------------------|
| Pistons | |
| Clearance | .0008-.0016 (.020-.040) |
| Diameter ⁽²⁾ | 3.2390-3.2402 (82.270-82.300) |
| Rings | |
| No. 1 | |
| End Gap | |
| Standard | .010-.016 (.25-.40) |
| Service Limit | .031 (.80) |
| Side Clearance | |

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| | |
|----------------------------------------------------------------------------------------------------------------------------|-------------------------|
| Standard | .0012-.0028 (.030-.070) |
| Service Limit | .004 (.10) |
| No. 2 | |
| End Gap | |
| Standard | .014-.020 (.35-.50) |
| Service Limit | .031 (.80) |
| Side Clearance | |
| Standard | .0012-.0028 (.030-.070) |
| Service Limit | .004 (.10) |
| No. 3 (Oil) | |
| End Gap | |
| Standard | .008-.028 (.20-.70) |
| Service Limit | .040 (1.00) |
| (1) Pin specifications are not available from manufacturer. | |
| (2) Diameter is measured at specified location and at 90° angle to piston pin. See <u>CYLINDER BLOCK ASSEMBLY</u> . | |

CYLINDER BLOCK SPECIFICATIONS

CYLINDER BLOCK

| Application | In. (mm) |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| Cylinder Bore | |
| Standard Diameter | 3.2402-3.2413 (82.300-82.330) |
| Maximum Taper | .0004 (.010) |
| Maximum Out-Of-Round | .0004 (.010) |
| Maximum Deck Warpage | ⁽¹⁾ .002 (.05) |
| (1) If deck warpage exceeds specification, machine deck surface. DO NOT remove more than a combined total of .008" (.20 mm) material from original surfaces of cylinder head and cylinder block. | |

VALVES & VALVE SPRINGS SPECIFICATIONS

VALVES & VALVE SPRINGS

| Application | Specification |
|----------------|-----------------|
| Intake Valves | |
| Face Angle | 45° |
| Minimum Margin | |
| Standard | .040" (1.00 mm) |
| Service Limit | .028" (.70 mm) |
| Stem Diameter | .259" (6.58 mm) |
| Exhaust Valves | |
| Face Angle | 45° |
| Minimum Margin | |

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1.6L 4-CYL - VIN [R] 1992 Engines - 1.6L 4-Cylinder

| | |
|---------------|---------------------------|
| Standard | .059" (1.50 mm) |
| Service Limit | .040" (1.00 mm) |
| Stem Diameter | .257-.258" (6.53-6.55 mm) |
| Valve Springs | |
| Free Length | |
| Standard | 1.90" (48.3 mm) |
| Service Limit | 1.86" (47.2 mm) |
| Out-Of-Square | |
| Standard | 1.5° |
| Service Limit | 4.0° |

CYLINDER HEAD SPECIFICATIONS

CYLINDER HEAD

| Application | Specification |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| Maximum Warp | ⁽¹⁾ .002" (.05 mm) |
| Valve Seats | |
| Intake Valve | |
| Seat Angle | 45° |
| Seat Width | .035-.051" (.90-1.30 mm) |
| Exhaust Valve | |
| Seat Angle | 45° |
| Seat Width | .035-.051" (.90-1.30 mm) |
| Valve Guides | |
| Valve Guide Installed Height | .768" (19.5 mm) |
| Intake Valve | |
| Valve Stem-To-Guide Oil Clearance | |
| Standard | .0008-.0019" (.020-.047 mm) |
| Service Limit | .004" (.10) |
| Exhaust Valve | |
| Valve Stem-To-Guide Oil Clearance | |
| Standard | .0020-.0033" (.050-.085 mm) |
| Service Limit | .0059" (.150 mm) |
| (1) If deck warpage exceeds specification, machine deck surface. DO NOT remove more than a combined total of .008" (.20 mm) material from original surfaces of cylinder head and cylinder block. | |

CAMSHAFT SPECIFICATIONS

CAMSHAFT

| Application | In. (mm) |
|------------------|---------------------|
| End Play | .004-.008 (.10-.20) |
| Journal Diameter | 1.0236 (26.000) |

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1.6L 4-CYL - VIN [R] 1992 Engines - 1.6L 4-Cylinder

Lobe Height

| | |
|---------------|-------------------------|
| Intake | |
| Standard | 1.3858 (35.200) |
| Service Limit | 1.3661 (34.700) |
| Exhaust | |
| Standard | 1.3743 (34.907) |
| Service Limit | 1.3546 (34.407) |
| Oil Clearance | .0020-.0035 (.050-.090) |