1.8L 4-CYL - GS/LS/RS

1997-98 ENGINES Acura - 1.8L 4-Cylinder

ENGINE IDENTIFICATION

NOTE: For repair procedures not covered in this article, see ENGINE OVERHAUL PROCEDURES article in GENERAL INFORMATION.

Engine identification code is stamped on right rear of cylinder block as viewed from flywheel, below cylinder head mating surface. The first 5 characters of the code indicate engine type. The last 7 numbers of the code indicate engine serial number.

ENGINE IDENTIFICATION CODE

Application	Code
1.8L	B18B1

ADJUSTMENTS

VALVE CLEARANCE ADJUSTMENT

CAUTION: Always rotate engine in direction of normal rotation(counterclockwise as viewed from front of engine). Backward rotation may cause timing belt to jump camshaft pulley teeth.

1. Adjust valves when engine temperature is 100°F (38°C) or less. Remove valve cover. Rotate crankshaft counterclockwise until No. 1 piston is at TDC of compression stroke.
2. Ensure UP marks on camshaft sprockets are at top, and TDC grooves on pulleys are aligned with TDC groove on back cover. See **Fig. 1**. Adjust clearance on both valves for No. 1 cylinder. Loosen lock nuts, and turn adjustment screw until clearance is as specified. Tighten lock nut to 18 ft. lbs. (24 N.m). Recheck adjustment. See **VALVE CLEARANCE SPECIFICATIONS**.
3. Rotate crankshaft 180 degrees counterclockwise (camshaft sprockets turn 90 degrees) so No. 3 piston is at TDC of compression stroke. UP marks should point to exhaust side. Adjust clearance on both valves for No. 3 cylinder.
4. Rotate crankshaft 180 degrees counterclockwise so No. 4 piston is at TDC of compression stroke. Ensure UP marks are pointing down. Adjust clearance on both valves for No. 4 cylinder.
5. Rotate crankshaft 180 degrees counterclockwise so No. 2 piston is at TDC of compression stroke. Ensure UP marks are pointing to intake side. Adjust clearances on both valves for No. 2 cylinder. Install NEW valve cover gasket. Install valve cover.

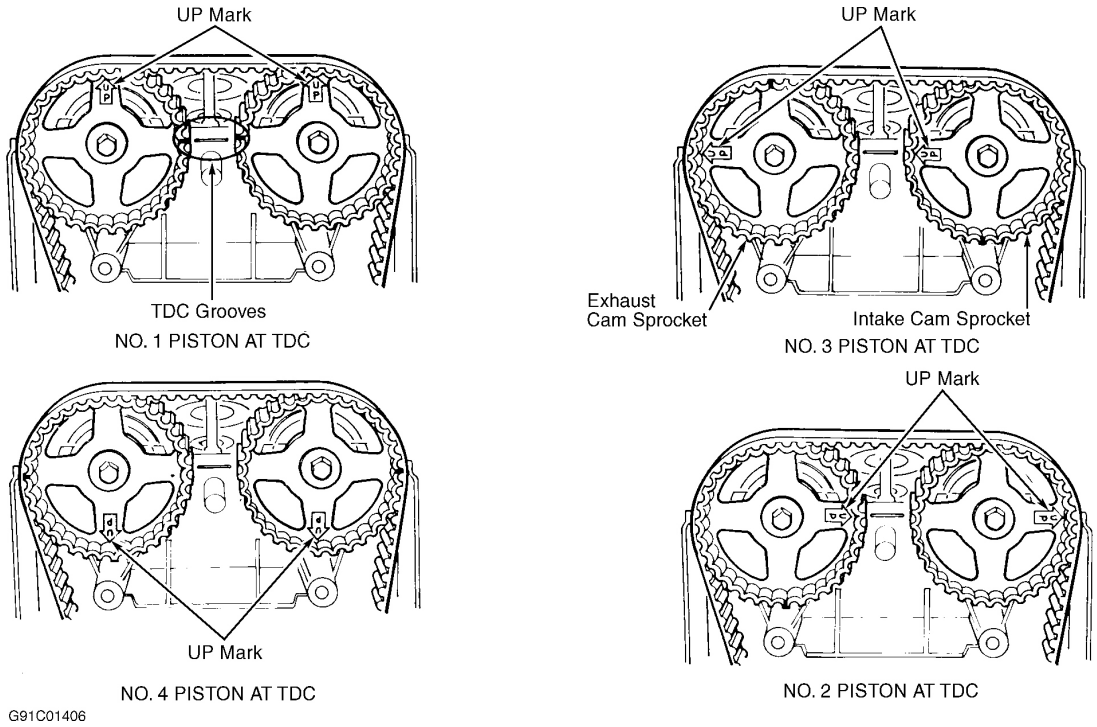


Fig. 1: Positioning Camshafts For Valve Adjustment
Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVE CLEARANCE SPECIFICATIONS

Application	In. (mm)
Exhaust	0.006-0.008 (0.16-0.20)
Intake	0.003-0.005 (0.08-0.12)

TIMING BELT TENSION ADJUSTMENT

CAUTION: Adjust timing belt with engine cold. DO NOT rotate crankshaft with timing belt tensioner adjusting bolt loose.

Remove valve cover. Rotate crankshaft counterclockwise until No. 1 piston is at TDC. Rotate crankshaft 5-6 revolutions counterclockwise to create tension on timing belt. Rotate crankshaft counterclockwise until No. 1 piston is at TDC. Loosen tension adjuster bolt one half turn (180 degrees). See **Fig. 2**. Rotate crankshaft counterclockwise enough to create tension on timing belt. Tighten tension adjuster bolt to specification. See **TORQUE SPECIFICATIONS**. Install valve cover with NEW gaskets.

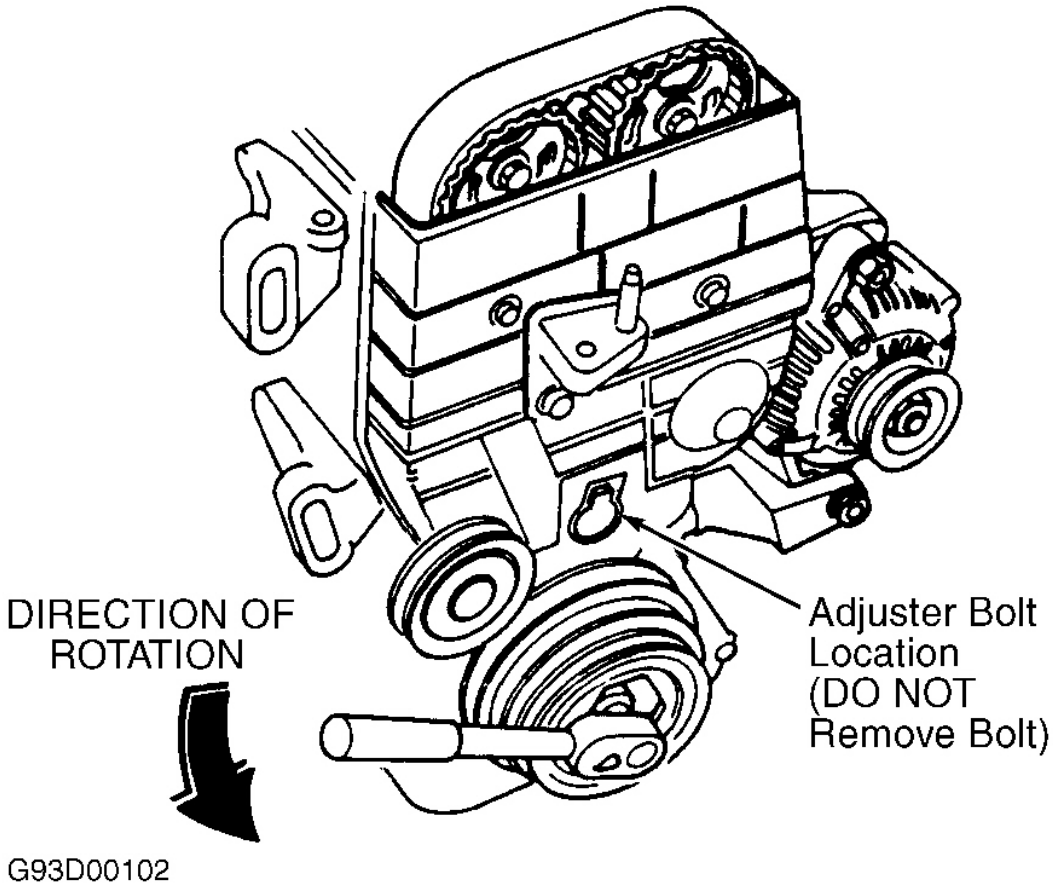


Fig. 2: Locating Timing Belt Adjuster Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REMOVAL & INSTALLATION

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

FUEL PRESSURE RELEASE

CAUTION: Fuel system is under pressure. Release pressure before servicing fuel system components.

Disconnect negative battery cable. Remove fuel tank filler cap. Place a shop towel on top of fuel filter. Release fuel injection system pressure by slowly loosening fuel filter banjo bolt. See **Fig. 3**.

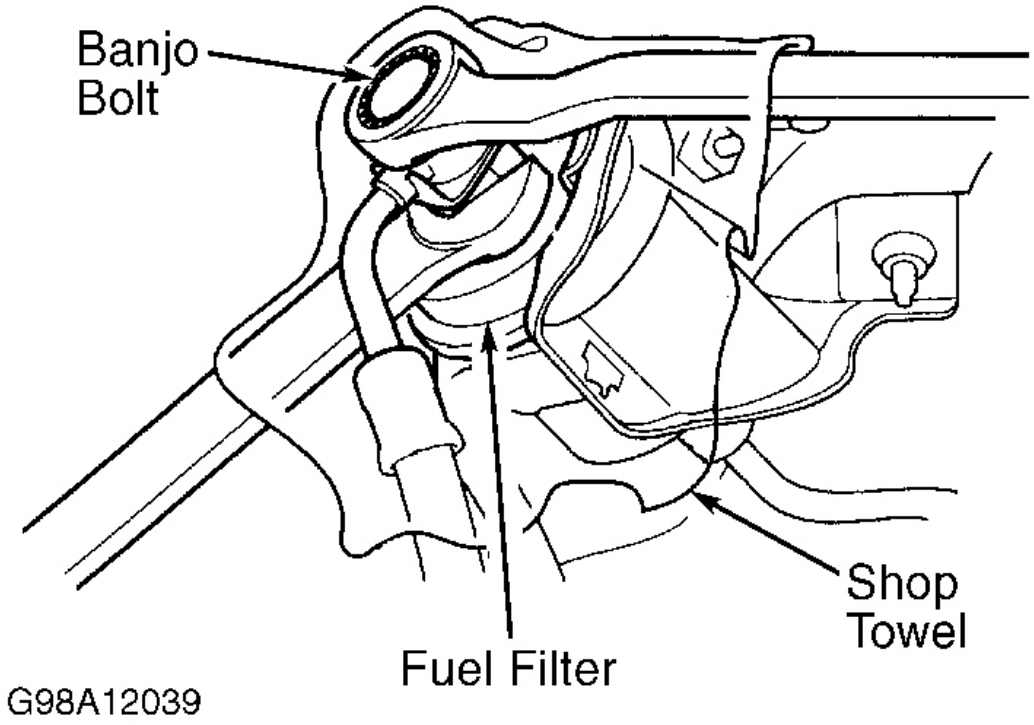


Fig. 3: Releasing Fuel System Pressure
Courtesy of AMERICAN HONDA MOTOR CO., INC.

BLEEDING COOLING SYSTEM

See BLEEDING COOLING SYSTEM in SPECIFICATIONS & ELECTRIC COOLING FANS article in ENGINE COOLING.

ENGINE

Removal

1. Remove hood. Remove strut brace. Disconnect battery cables. Disconnect battery cables from underhood fuse/relay box and ABS fuse/relay box. Remove intake air duct, air cleaner housing assembly and bracket. Remove evaporative canister hose.
2. Disconnect engine wiring harness connectors on right side of engine compartment. Release fuel pressure. See **FUEL PRESSURE RELEASE**. Remove fuel feed hose and return hose. Remove brake booster vacuum hose. Remove throttle cable by loosening lock nut and removing cable end from accelerator linkage.
3. Disconnect engine wiring harness connectors on left side of engine compartment. Remove harness clamps. Remove cruise control actuator. Remove engine ground cable.

4. Remove power steering pump adjusting and mounting bolts. Remove power steering pump belt and pump. Do not disconnect power steering pump hoses. Loosen idler pulley bolt and adjusting bolt. Remove air conditioning compressor belt.
5. For manual transmission models, remove clutch slave cylinder and pipe/hose assembly. Do not disconnect pipe/hose assembly. Remove transmission ground cable and hose clamp. Remove radiator cap. Raise and support vehicle. Remove front wheels and splash shield. Drain engine and transmission oil. Reinstall engine and transmission drain plugs with NEW washers. Drain cooling system. Remove upper and lower radiator and heater hoses.
6. For automatic transmission models, remove ATF cooler hoses. Remove radiator assembly. Remove A/C compressor with hoses attached. Disconnect heated oxygen sensor and remove exhaust pipe "A". See **Fig. 4**. For manual transmission vehicles, remove shift rod and extension rod. For automatic transmission vehicles, remove shift cable. On all models, remove damper fork and disconnect suspension lower arm ball joints. Remove axle shaft.
7. On all models, attach chain hoist to engine. Raise hoist to take all slack from chain. Remove left and right front engine mounts and brackets. Remove rear and side engine mount bracket. Remove transmission mount. Check that engine is free of all hoses and electrical wiring. Slowly raise engine, once again checking that all hoses and electrical wiring has been disconnected. Raise engine and remove from vehicle.

Installation

1. To install, reverse removal procedure. To prevent excessive engine vibration and premature engine mount wear, tighten engine/transaxle mounts in sequence specified. See **Fig. 5**.
2. Install transmission mount and tighten bolts/nuts on transmission side. Leave mount bolt loose. Install engine side mount and tighten bolts/nuts on engine side. Leave mount bolt loose. Tighten mount bolt on transmission mount and side engine mount. Tighten mount bolt on side engine mount and install rear mount bracket. Tighten rear mount bracket bolts. Install and tighten right and left front mounting brackets and bolts.
3. When installing drive axles, use NEW spring clips. Insert drive axles until spring clips click into groove of differential side gear. Ensure harness connectors and hoses are connected properly. Ensure control cables are not bent or pinched and are adjusted properly. On M/T models, adjust clutch pedal free play. Verify transaxle shifts smoothly.
4. On all models, adjust drive belt tension. Fill or top off all fluids. Fill and bleed air from cooling system. See **BLEEDING COOLING SYSTEM**. Start engine and check for leaks.

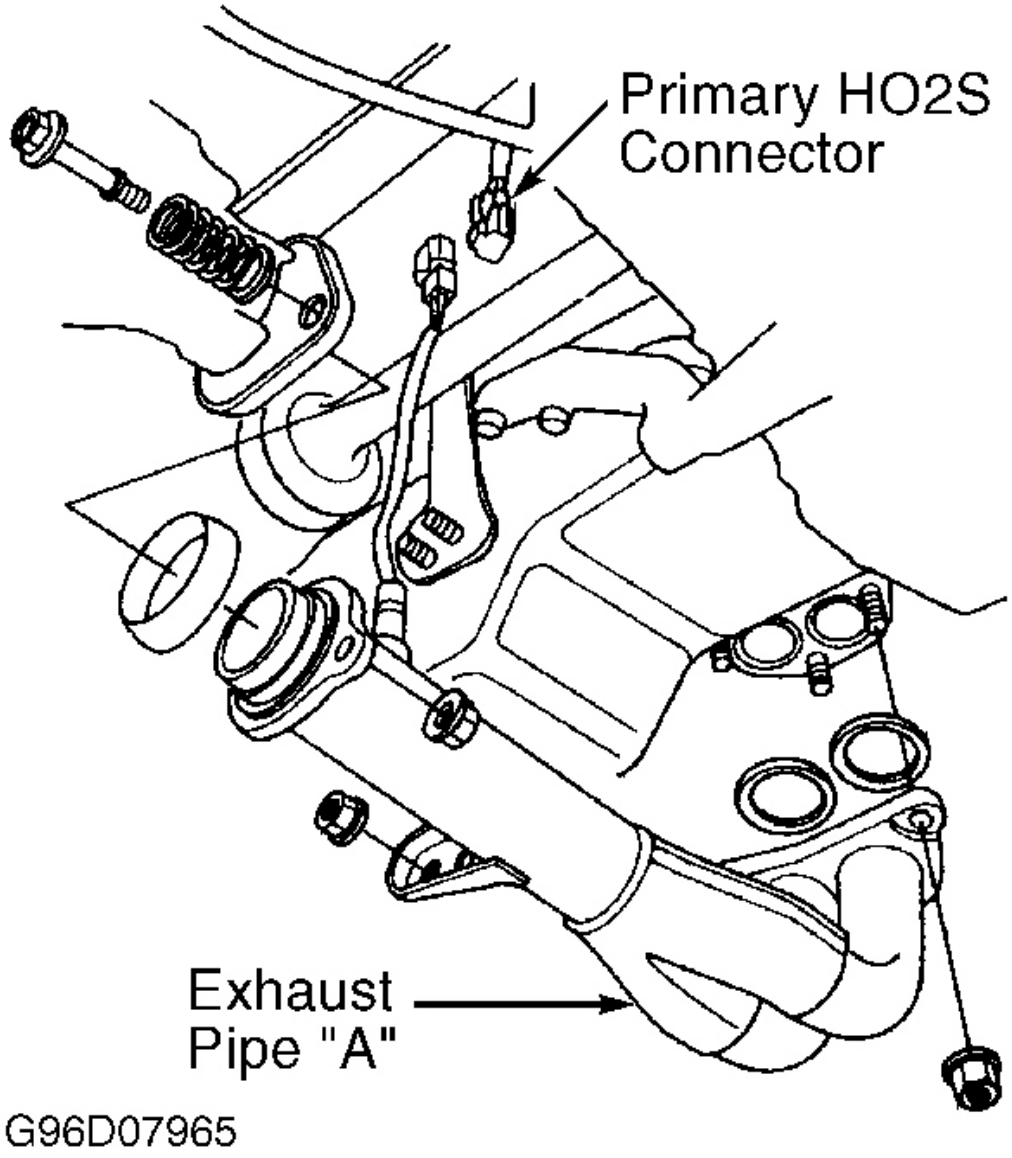


Fig. 4: Locating Exhaust System Components
Courtesy of AMERICAN HONDA MOTOR CO., INC.

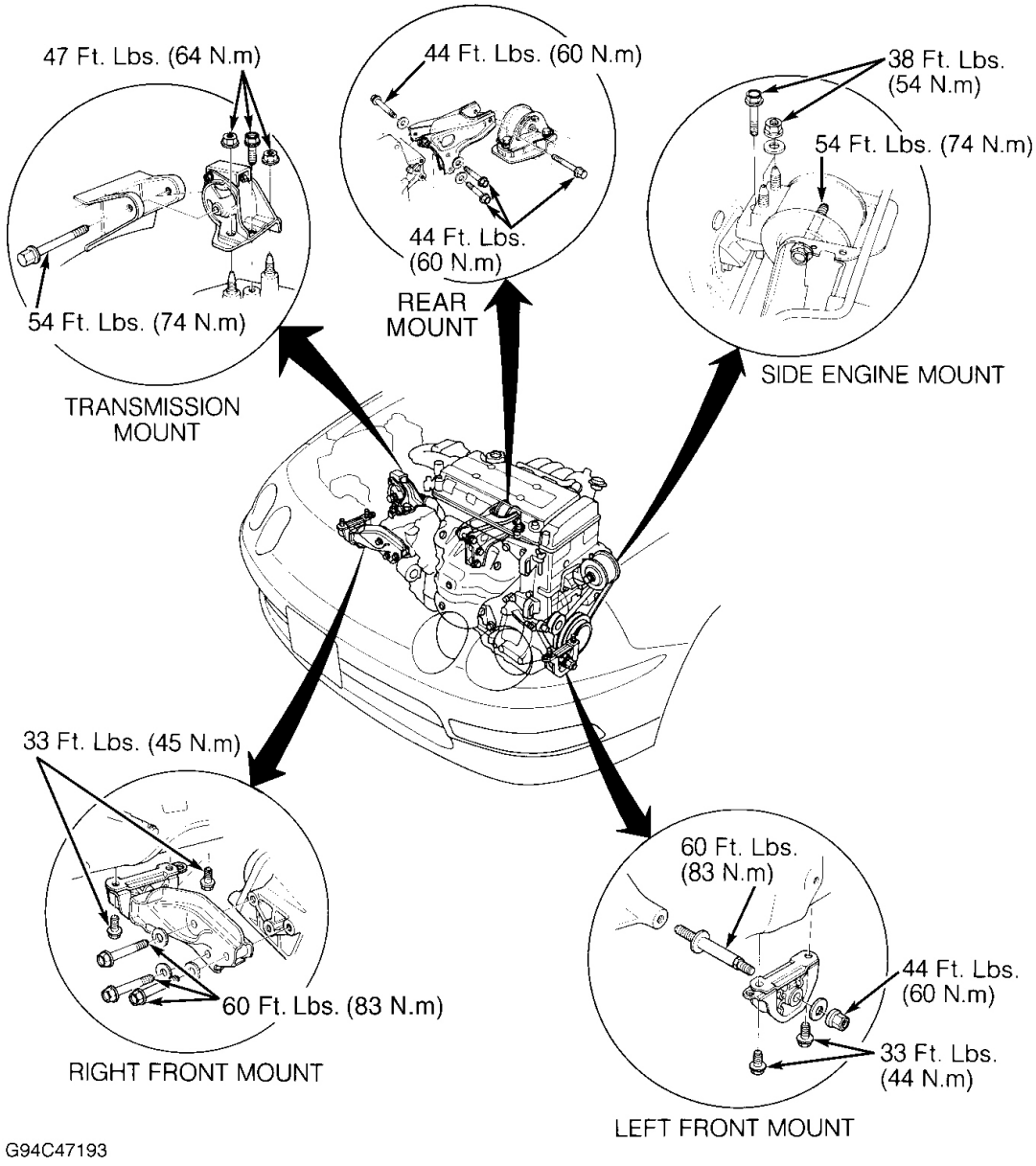


Fig. 5: Engine/Transaxle Mount Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

INTAKE MANIFOLD

Removal

1. Allow cylinder head to cool to at least 100°F (38°C). Disconnect negative battery cable. Release fuel pressure. See **FUEL PRESSURE RELEASE**. Disconnect fuel feed hose. Carefully remove radiator cap to release system pressure. Drain cooling system. Remove intake air duct.

2. Remove breather hose, water by-pass hose and EVAP control canister hose. Disconnect fuel return and PCV hoses. Remove brake booster vacuum hose, coolant by-pass hose and vacuum hose. Remove throttle cable (throttle control cable for A/T). Remove engine wire harness connectors and wire harness clamps from cylinder head and intake manifold.
3. Remove spark plug wires and distributor from cylinder head. Remove upper radiator hose and heater hose. Remove engine ground cable. Remove power steering belt and pump. Remove A/C and alternator belts. Remove cruise control actuator. Remove side engine mount. Remove intake manifold.

Installation

Clean gasket surfaces. Install intake manifold, using NEW intake manifold gasket. Tighten nuts, using a crisscross pattern in 2 or 3 stages, beginning with inner nuts. See **TORQUE SPECIFICATIONS**. To complete installation, reverse removal procedure. Fill and bleed air from cooling system. See **BLEEDING COOLING SYSTEM**.

EXHAUST MANIFOLD

Removal

Disconnect negative battery cable. Remove oil dipstick. Remove exhaust manifold heat shield. Disconnect exhaust pipe from exhaust manifold. See **Fig. 4**. Remove exhaust manifold bracket. Disconnect oxygen sensor harness connector. Remove exhaust manifold bolts. Remove exhaust manifold and gasket.

Installation

To install, reverse removal procedure. Tighten bolts to specification. See **TORQUE SPECIFICATIONS**.

CYLINDER HEAD

Removal

1. Allow cylinder head to cool to at least 100°F (38°C). Disconnect negative battery cable. Rotate crankshaft counterclockwise until No. 1 piston is at TDC of compression stroke. See **Fig. 6**. Release fuel pressure. See **FUEL PRESSURE RELEASE**. Disconnect fuel feed hose. Carefully remove radiator cap to release system pressure. Drain cooling system. Remove intake air duct.
2. Remove breather hose, water by-pass hose and EVAP control canister hose. Disconnect fuel return and PCV hoses. Remove brake booster vacuum hose, coolant by-pass hose and vacuum hose. Remove throttle cable (throttle control cable for A/T). Remove engine wire harness connectors and wire harness clamps from cylinder head and intake manifold.
3. Remove spark plug wires and distributor from cylinder head. Remove upper radiator and heater hose. Remove engine ground cable. Remove power steering belt and pump. Remove A/C compressor and generator belts. Remove cruise control actuator. Remove side engine mount. Remove valve cover and timing belt. See **TIMING BELT**. Remove camshaft pulleys and back cover. Remove exhaust and intake manifolds. See **EXHAUST MANIFOLD** and INTAKE MANIFOLD.
4. Loosen lock nuts and adjusting screws. Remove camshaft holder bolts, camshaft holders, camshafts and rocker arms. Remove cylinder head bolts and remove cylinder head.

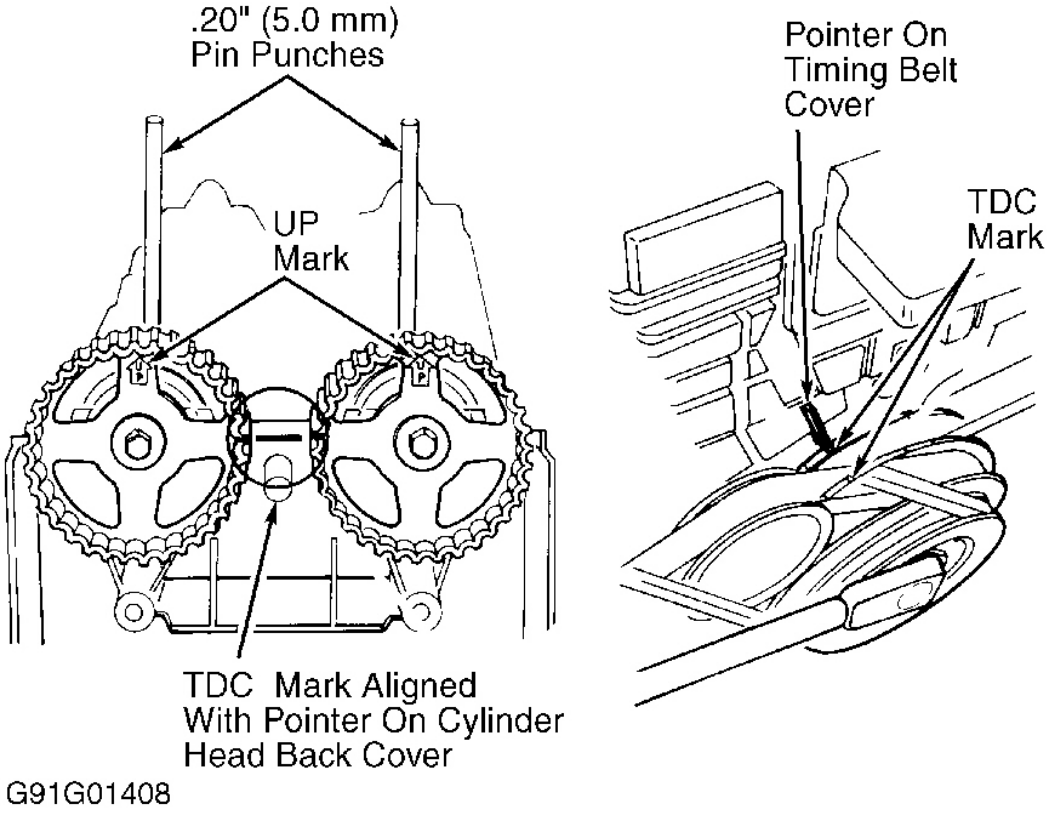


Fig. 6: Aligning Timing Marks
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Inspection

Ensure all mating surfaces are clean. Check cylinder block surface for warpage. Measure cylinder head for warpage. Resurfacing is not required if warpage is less than 0.002" (0.05 mm). Resurface cylinder head if warpage is greater than 0.002" (0.05 mm). Ensure cylinder head dowel pins, oil control jet, and "O" ring are installed. See **Fig. 9**.

Installation

1. Install NEW intake manifold gasket. Install intake manifold onto cylinder head. Tighten nuts in crisscross pattern in 2 or 3 stages, beginning with inner nuts. See **TORQUE SPECIFICATIONS**.
2. Ensure No. 1 piston is at TDC. Apply a light coat of engine oil to cylinder head bolts and washers. Install longer cylinder head bolts into positions No. 1 and 2. Install remaining bolts. Tighten cylinder head bolts to specification, in sequence, in 2 stages. See **Fig. 7**.
3. Reverse removal procedure to complete installation. If reusing timing belt, install belt with arrow mark (made during removal procedure) in direction of original rotation. Adjust timing belt tension. See **TIMING BELT TENSION ADJUSTMENT** under ADJUSTMENTS. Fill and bleed cooling system.

See BLEEDING COOLING SYSTEM in SPECIFICATIONS & ELECTRIC COOLING FANS article in ENGINE COOLING.

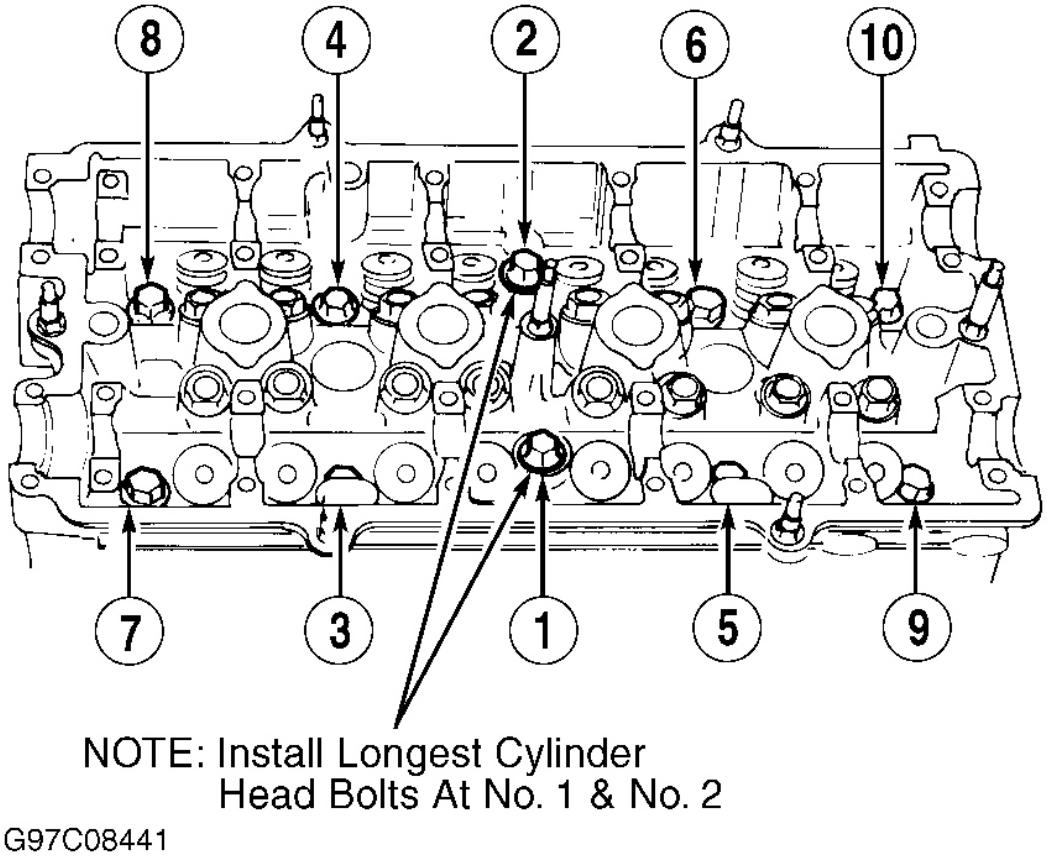
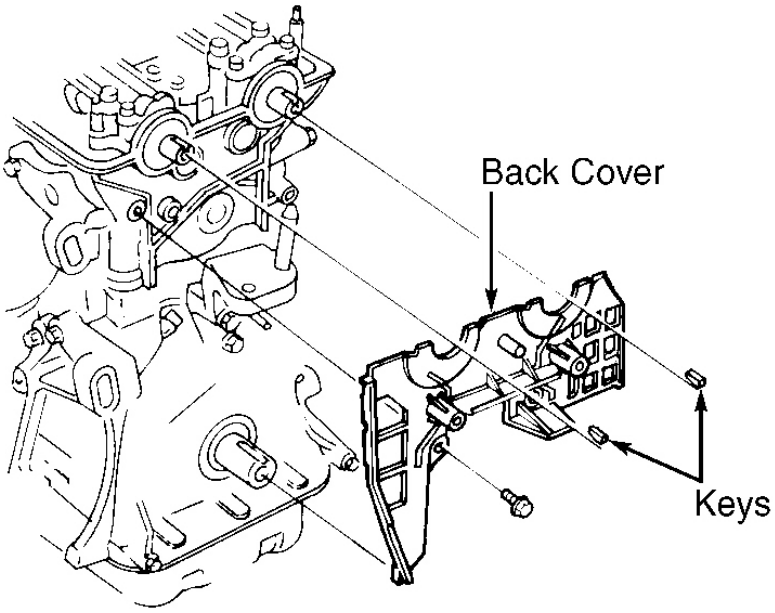


Fig. 7: Cylinder Head Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.



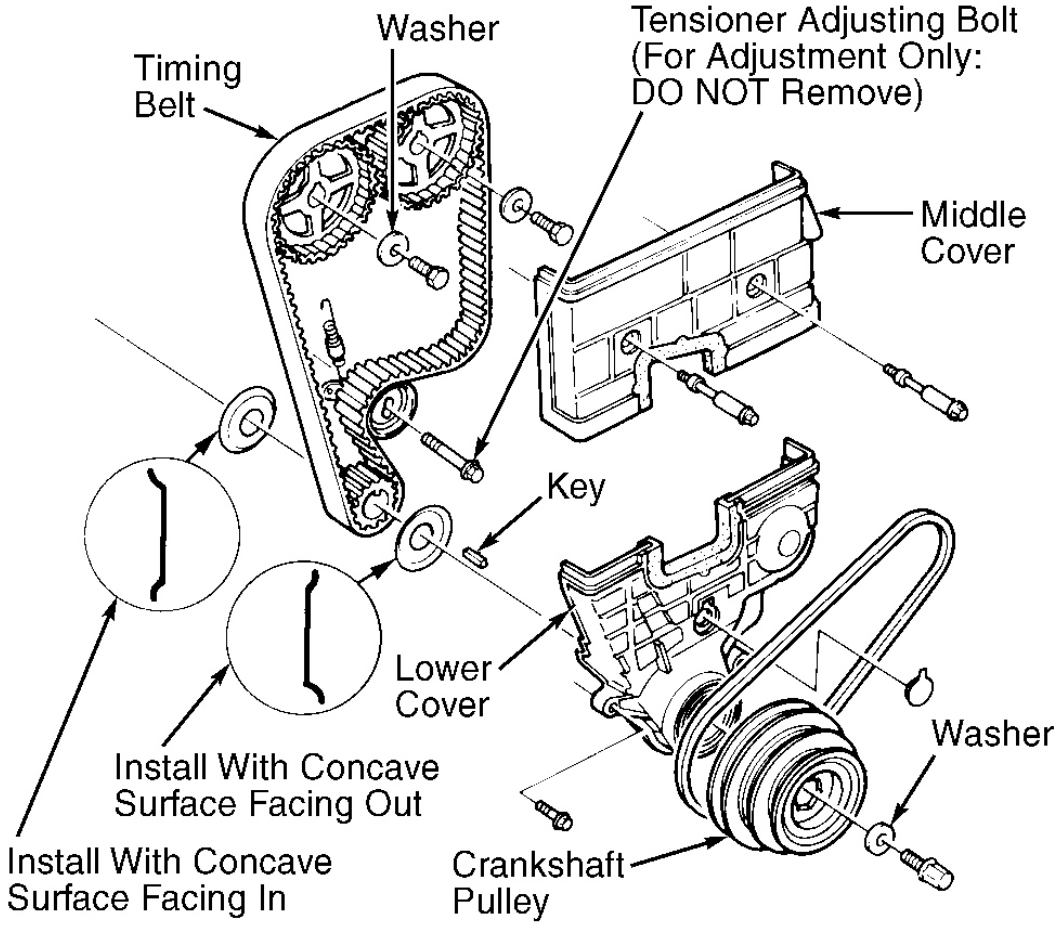


Fig. 8: Exploded View Of Timing Belt Components
Courtesy of AMERICAN HONDA MOTOR CO., INC.

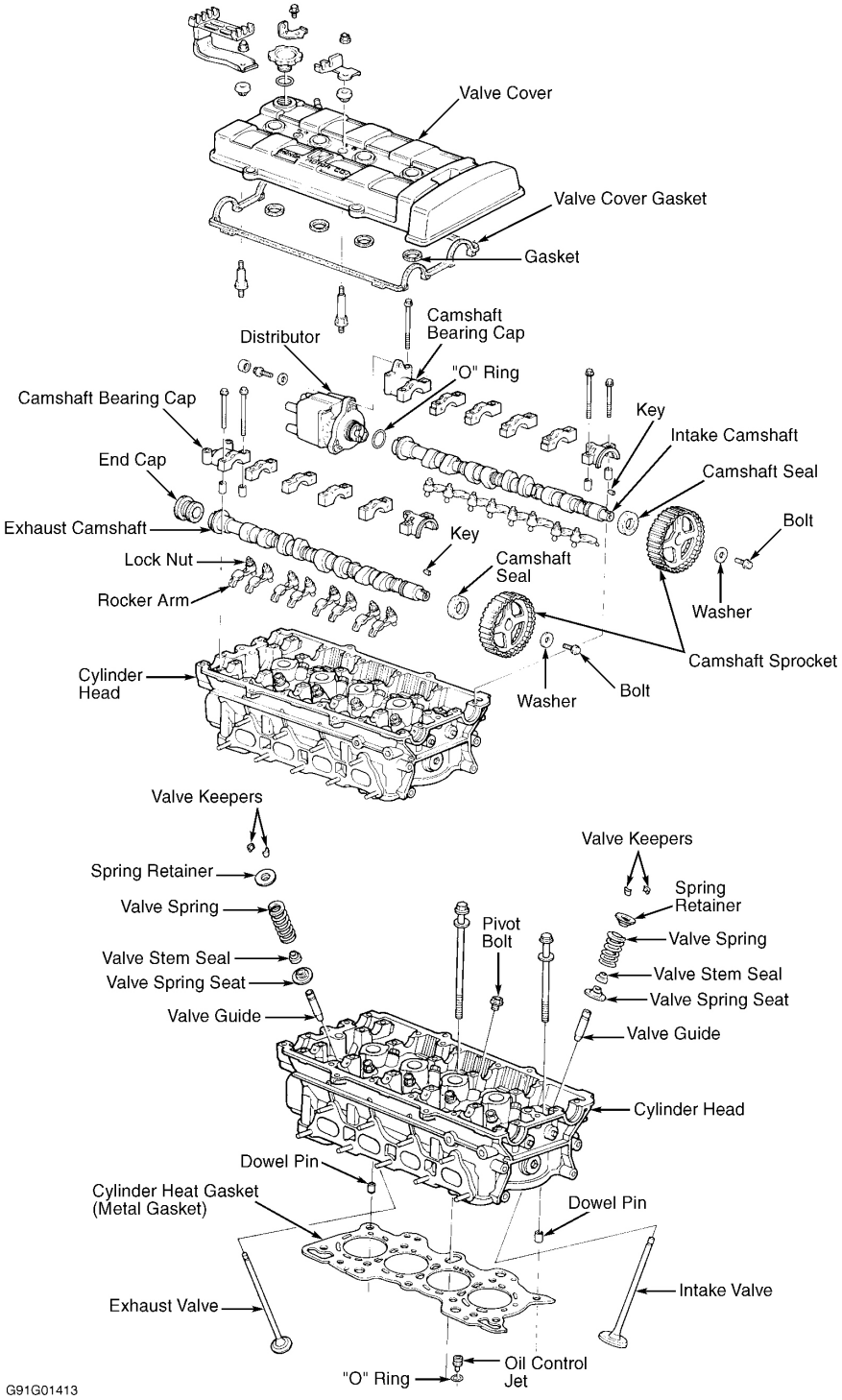


Fig. 9: Exploded View Of Cylinder Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CRANKSHAFT FRONT OIL SEAL

Removal

Remove timing belt. See **TIMING BELT**. Remove crankshaft timing belt pulley. Remove front crankshaft oil seal.

Installation

Lubricate crankshaft and seal lip with grease. Install seal using Seal Driver (07LAD-PR4010A) until seal driver bottoms against oil pump. To complete installation, reverse removal procedure.

TIMING BELT

Removal

1. Raise and support vehicle. Rotate crankshaft counterclockwise until No. 1 cylinder is at TDC of compression stroke. Remove front wheels and remove wheelwell splash shield. Remove power steering pump belt, A/C compressor belt and generator belt. Remove cruise control actuator and side engine mount.
2. Remove valve cover. Remove crankshaft pulley bolt and crankshaft pulley. Remove middle and lower timing belt covers. See **Fig. 8**. Loosen adjusting bolt 180 degrees. If reusing timining belt, mark direction of rotation for installation reference. Push tensioner to remove tension from timing belt and retighten adjusting bolt. Remove timing belt.

Installation

1. Position crankshaft and camshaft pulleys as shown in illustration. See **Fig. 6**. Align holes in camshafts with holes in No. 1 camshaft holders and insert 5-mm pin punches into holes. Install timing belt tightly in sequence indicated. See **Fig. 10**. Loosen and retighten adjusting bolt to tension belt. Remove pin punches.
2. Rotate crankshaft counterclockwise 4 to 6 turns to position belt on pulley. Adjust timing belt tension. See **TIMING BELT TENSION ADJUSTMENT** under ADJUSTMENTS. Verify crankshaft and camshaft pulleys line up at TDC. If pulleys are not aligned, repeat installation procedure.
3. Reverse remaining removal procedures to complete installation, adjusting tension of each belt installed. Tighten crankshaft pulley bolt to 147 ft. lbs. (200 N.m), loosen, and retighten to 133 ft. lbs. (180 N.m).

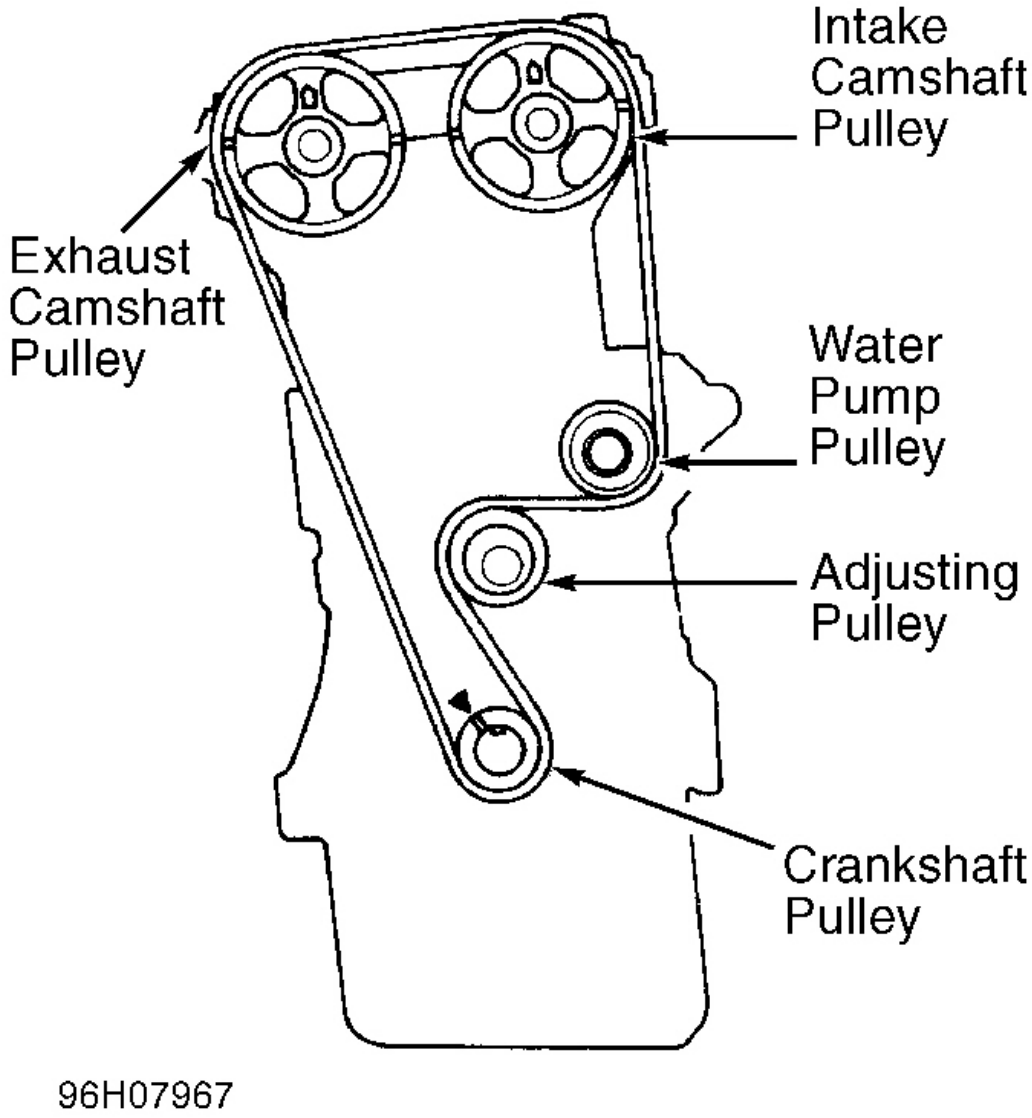


Fig. 10: Timing Belt Installation Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CAMSHAFTS

Removal

1. Ensure No. 1 piston is at TDC. Position UP mark on camshaft sprockets at top. See **Fig. 6**. Align grooves on sprockets. Remove timing belt. See **TIMING BELT**.
2. Remove camshaft sprockets. Camshafts may be held in place by installing 5-mm pin punches into No. 1

cam bearing caps. Mark position of distributor. Remove distributor. Loosen rocker arm adjuster screws.

3. Measure camshaft end play by prying camshaft toward front of cylinder head. Attach dial indicator, and zero it against sprocket end of camshaft. Pry camshaft away from dial indicator. Read dial indicator. Desired end play is 0.002-0.006" (0.05-0.15 mm). Maximum allowable end play is 0.020" (0.50 mm). If end play exceeds limit, replace camshaft.
4. Remove camshaft bearing cap bolts by turning bolts 2 turns at a time in a crisscross pattern. Tag all parts for installation reference. Remove camshafts. Remove rocker arms if necessary.

Installation

1. Lubricate camshaft journals and bearing surfaces in caps and cylinder head. Install rocker arms (if removed) in their original positions. Install camshafts with keyways pointing upward (No. 1 piston at TDC). Install camshaft bearing caps in original positions.
2. Starting with center caps and working outward, tighten camshaft bearing cap bolts to 88 INCH lbs. (10 N.m) in 2 stages.
3. Install new camshaft seals (if removed). To complete installation, reverse removal procedure. Adjust timing belt tension. See **TIMING BELT TENSION ADJUSTMENT** under ADJUSTMENTS. Adjust valve clearance. See **VALVE CLEARANCE ADJUSTMENT** under ADJUSTMENTS.

CRANKSHAFT REAR OIL SEAL

Removal

1. Disconnect negative battery cable. Remove transaxle assembly. See appropriate article in CLUTCHES (M/T) or TRANSMISSION SERVICING (A/T).
2. Place reference mark on clutch pressure plate (M/T) and flywheel for installation reference. Remove pressure plate and clutch disc (if equipped). Remove flywheel. Pry seal from cover.

NOTE: When installing new crankshaft oil seal, align hole in Driver Attachment (07948-SB00101) with pin on crankshaft.

Installation

Apply a light coat of engine oil to crankshaft and lip of new seal. Using Seal Driver (07749-0010000) and Driver Attachment (07948-SB00101), install new seal. To complete installation, reverse removal procedure.

THERMOSTAT

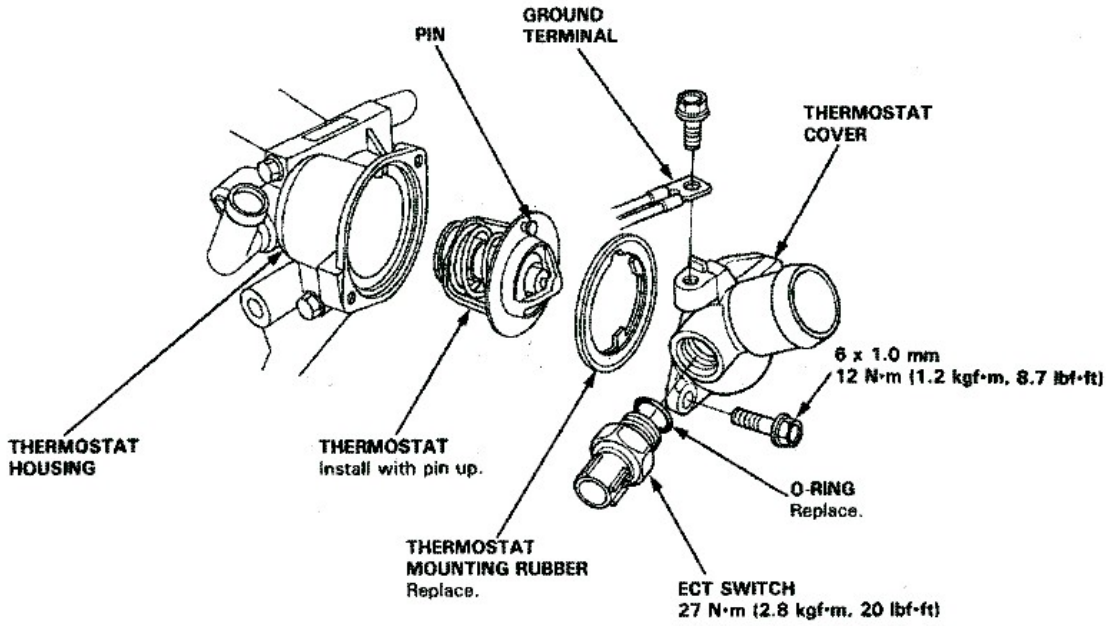


Fig. 11: Exploded View Of Thermostat
Courtesy of AMERICAN HONDA MOTOR CO., INC.

WATER PUMP

Removal

Remove timing belt. See **TIMING BELT**. Remove camshaft sprockets and timing belt back cover. See **Fig. 8**. See **CAMSHAFTS**. Remove retaining bolts, water pump, and "O" rings.

Installation

1. Clean gasket surfaces. Install water pump. Install new "O" rings. To complete installation, reverse removal procedure. Tighten bolts to specifications. See **TORQUE SPECIFICATIONS**.
2. Adjust timing belt tension. See **TIMING BELT TENSION** under ADJUSTMENTS. Fill and bleed air from cooling system. See BLEEDING COOLING SYSTEM in SPECIFICATIONS & ELECTRIC COOLING FANS article in ENGINE COOLING.

OIL PAN

Removal

1. Drain engine oil. Rotate crankshaft counterclockwise to align crankshaft pulley timing marks. See **Fig. 6**. Remove valve cover and middle timing belt cover. See **Fig. 9**. Remove accessory drive belts.
2. Remove crankshaft pulley and timing belt lower cover. Mark timing belt for installation reference. Loosen belt tensioner. Remove timing belt and crankshaft sprocket. See TIMING BELT. Remove oil pan and gasket.

Installation

Clean gasket mating surfaces. Install new gasket and oil pan. Tighten bolts to specification. See **TORQUE SPECIFICATIONS**. To complete installation, reverse removal procedure.

OVERHAUL

CYLINDER HEAD

Cylinder Head

Ensure all mating surfaces are clean. Measure cylinder head warpage. If warpage is 0.002" (0.05 mm) or less, resurfacing is not required. If warpage is 0.002-0.008" (0.05-0.20 mm), resurface cylinder head. Maximum resurface limit is 0.008" (0.20 mm).

Valve Springs

Measure free length of valve springs. If measurements are not within specification, replace valve springs. See **VALVES & VALVE SPRINGS** under ENGINE SPECIFICATIONS.

Valve Stem Oil Seals

Intake and exhaust valve stem seals are not interchangeable. Intake valve stem seals have a White spring around neck of seal. Oil seals for exhaust valves have a Black spring around neck of seal. Use Valve Stem Seal Installer (07GAD-PH70100) to install valve stem seals.

Valve Guide Inspection

Measure O.D. of valve stem using a micrometer. Measure I.D. of valve guide using an inside micrometer. Subtract O.D. of valve stem from I.D. of valve guide to get valve stem-to-guide clearance. Replace valve guides if stem-to-guide clearance is not within specification. See **CYLINDER HEAD** under ENGINE SPECIFICATIONS.

Valve Guide Removal

1. Use a hot plate or oven to heat cylinder head to 300°F (150°C). Use Valve Guide Driver (07942-6570100), or fabricate valve guide remover from an air impact chisel. See **Fig. 12**. Using an air hammer and valve guide remover, drive valve guide 5/64" (2 mm) toward combustion chamber to aid in carbon removal.

CAUTION: DO NOT heat cylinder head with a torch, or heat cylinder head hotter than 300°F (150°C). Excessive heat may loosen valve seats.

2. Turn head over. Working from combustion chamber side of head, drive valve guide out toward camshaft side of head. If valve guide does not move, drill valve guide using a 5/16" drill bit, then try to drive it out again.

CAUTION: Drill guides in extreme cases only. Cylinder head damage can occur if valve guide breaks.

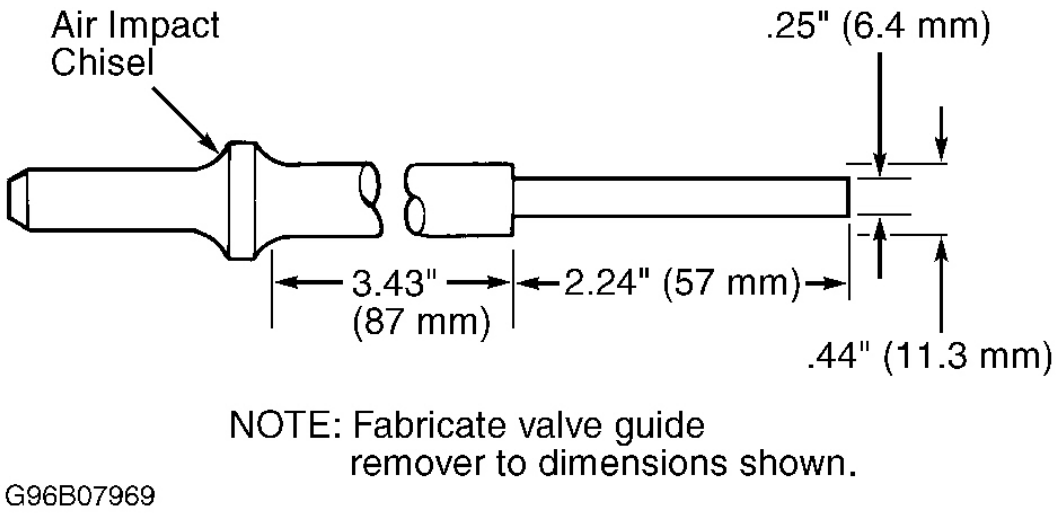


Fig. 12: Fabricating Valve Guide Remover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Valve Guide Installation

1. Cool new valve guides in freezer for about one hour. Remove valve guides from freezer as needed. Install valve guides from camshaft side of cylinder head.
2. Drive each guide into heated head until attachment bottoms against head. If replacing all valve guides, reheat cylinder head as necessary.
3. Intake valve guide installed height must be 0.541-0.561" (13.75-14.25 mm). Exhaust valve guide installed height must be 0.620-0.640" (15.75-16.25 mm). Using cutting oil, ream new valve guides by rotating Valve Guide Reamer (07984-657010C) clockwise the full length of valve guide bore. Measure valve stem-to-guide clearance. See **CYLINDER HEAD** under ENGINE SPECIFICATIONS.

NOTE: Always reface valve seat after replacing valve guide.

Valve Seat

Valve seat replacement procedure is not available from manufacturer.

Seat Correction Angles

If replacing valve guides, perform replacement before refacing valve seats. After refacing, if seat width is too wide, use 60-degree stone to raise seat, or 30-degree stone to lower seat. Ensure valve seat width is within specification. See **CYLINDER HEAD** under ENGINE SPECIFICATIONS.

Valve Stem Installed Height

After servicing valves, measure valve stem installed height. See **Fig. 13**. If valve stem installed height exceeds 1.633" (41.485 mm) for intake valve, or 1.712" (43.485 mm) for exhaust valve, replace valve. If valve stem installed height still exceeds limit, replace cylinder head.

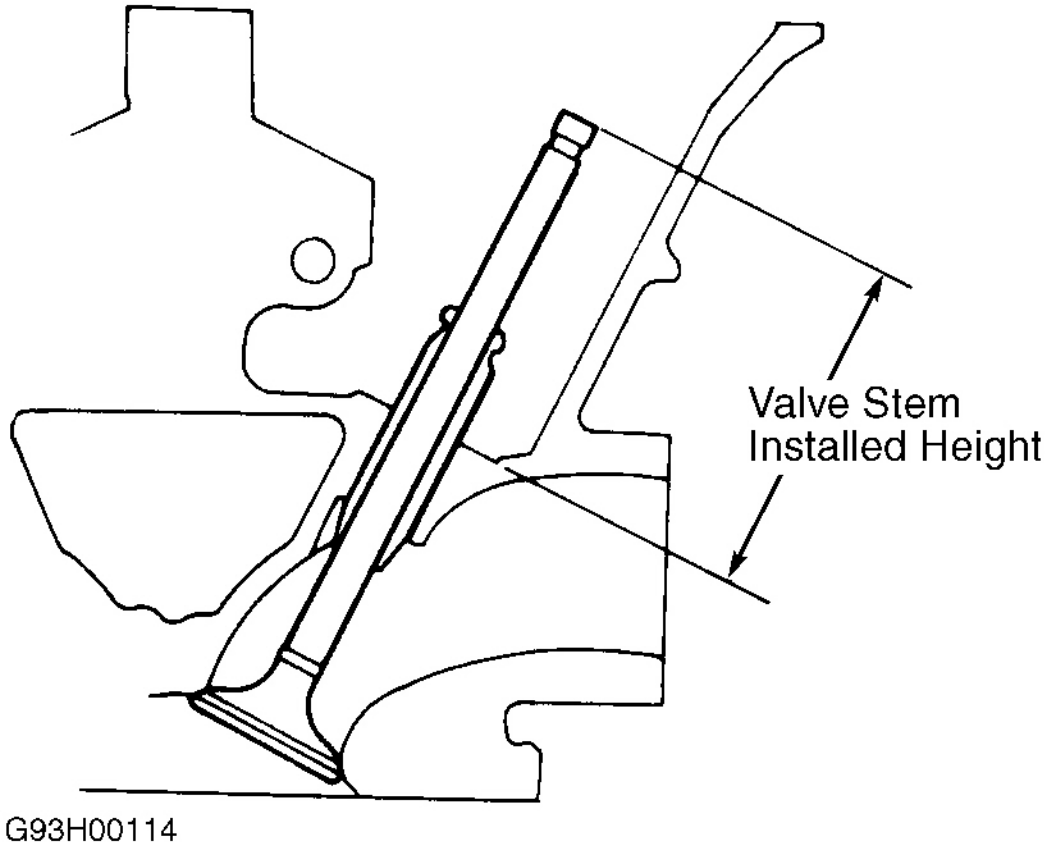


Fig. 13: Measuring Valve Stem Installed Height
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER BLOCK ASSEMBLY

Piston & Rod Assembly

1. Each rod is sorted into 1 of 4 tolerance ranges. Size depends on crank journal bore. A number between 1 and 4 is stamped on split line of rod big end. Any combination of numbers between 1 and 4 may be found on any engine. See **CONNECTING RODS** under ENGINE SPECIFICATIONS.

   NOTE: Reference numbers are for big end bore code, and do not indicate rod position in engine.

2. Install piston and connecting rod so arrow on top of piston is toward timing belt, and connecting rod oil

hole is toward intake manifold side of engine. See **Fig. 14**.

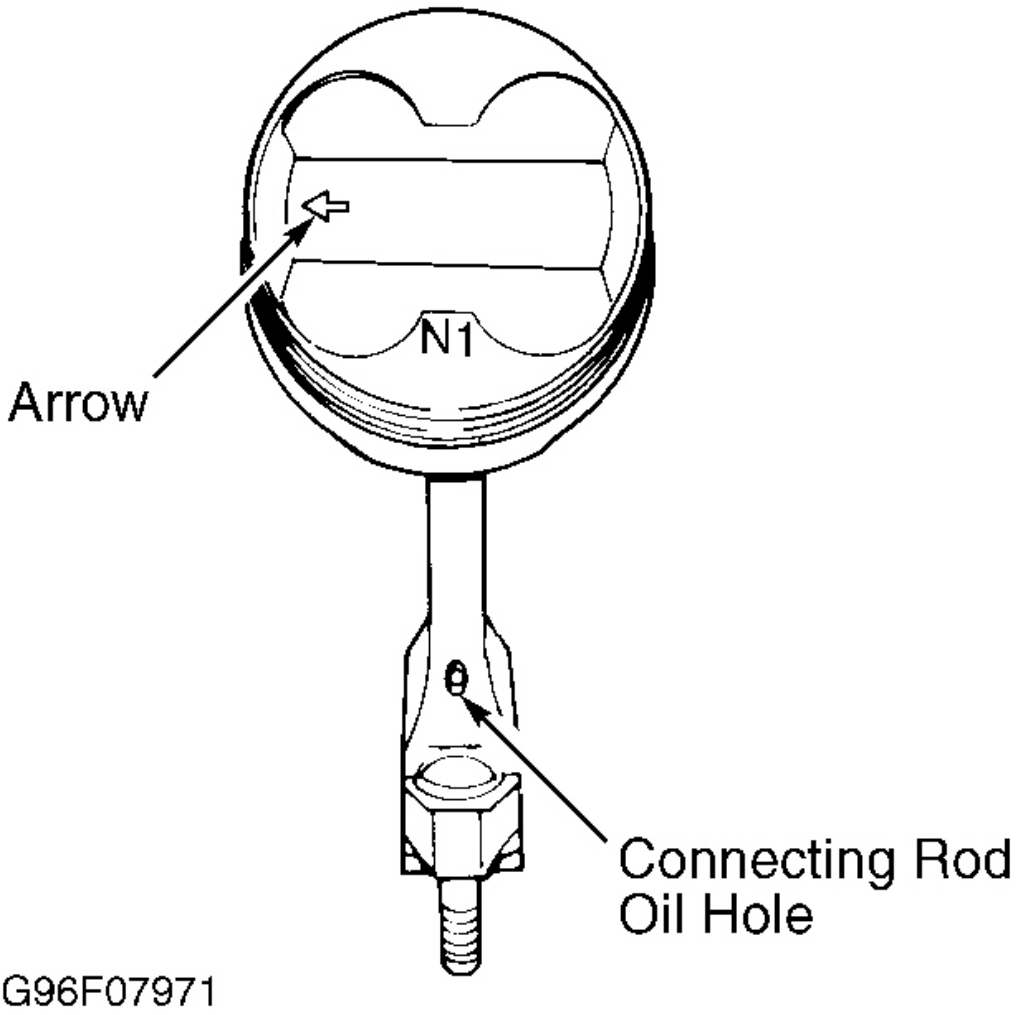


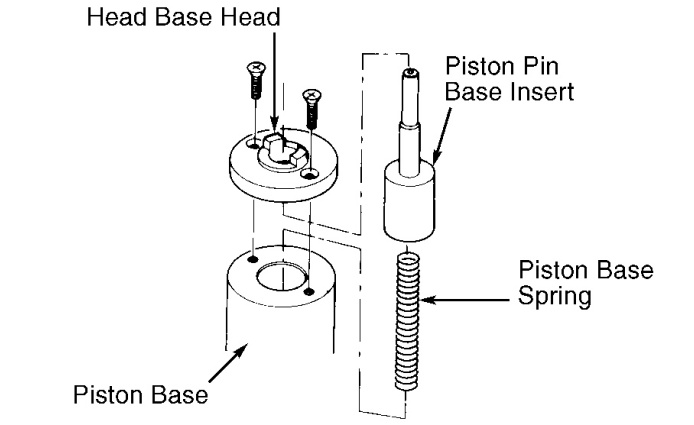
Fig. 14: Positioning Piston On Connecting Rod
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Piston Pin Removal

1. Install Piston Base Head (07HAF-PL20102) and Piston Pin Base Insert (07GAF-PH60300) into Base (07973-6570500). Turn handle on Piston Pin Driver Head (07973-PE00320) so piston driver length is 1.957" (49.70 mm). See **Fig. 15**.
2. Insert Piston Driver Shaft (07973-PE00310) into Pilot Collar (07LAF-PR30100). Place piston onto base. Press out piston pin. When removing or installing piston pin, place piston into press with embossed side facing up. Align recessed part of piston with lugs on base insert.

NOTE: Piston pins are available in oversize.

1. Assemble Piston Pin Tools As Shown



2. Adjust Length "A" Of Piston Pin Driver
   "A": 1.957" (49.7 mm)

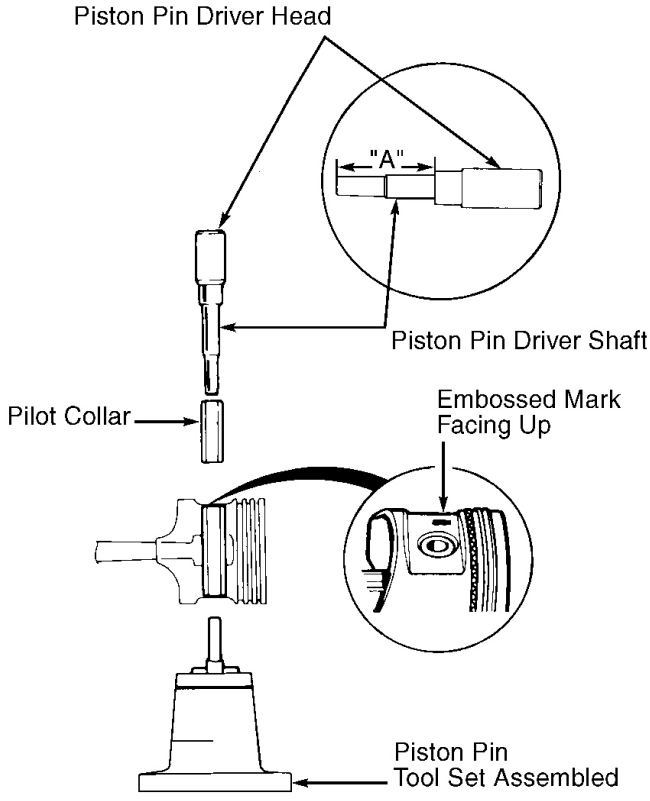


Fig. 15: Removing Piston Pin
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Piston Pin Inspection

1. Measure diameter of piston pin. Measure diameter of piston pin bore in piston. Piston pin clearance is difference between the 2 measurements. Ensure piston pin clearance is within specification. See **PISTONS, PINS & RINGS** under ENGINE SPECIFICATIONS.
2. If piston pin clearance is more than specification, install oversize piston pin and recheck clearance. Oversize pin diameter is .8267-.8269" (20.997-21.003 mm).
3. Determine difference between piston pin diameter and connecting rod small end bore to obtain interference fit. See **PISTONS, PINS & RINGS** under ENGINE SPECIFICATIONS.

Piston Pin Installation

1. Ensure piston and connecting rod are positioned as shown in illustration. See **Fig. 14**. Turn handle on Piston Pin Driver (07973-PE00320) so piston driver length is 1.957" (49.70 mm).
2. Install Pilot Collar (07LAF-PR30100) into piston and connecting rod. Lightly lubricate new piston pin. Place piston onto base. Press in piston pin.

Fitting Pistons

1. Using a feeler gauge, ensure piston-to-cylinder clearance is within specification. See **PISTONS, PINS & RINGS** under ENGINE SPECIFICATIONS. If clearance exceeds service limit, bore cylinder and install oversize piston.
2. Remove all rings from piston. Clean piston thoroughly. Inspect piston for damage. Measure piston diameter at a point 0.6" (15 mm) from bottom of piston skirt. If diameter is not within specification, replace piston. See **PISTONS, PINS & RINGS** under ENGINE SPECIFICATIONS.

Piston Rings

1. Using inverted piston, push NEW piston ring into cylinder bore 0.6-0.8" (15-20 mm) from bottom. Measure piston ring end gap using a feeler gauge. Repeat for each ring. See **PISTONS, PINS & RINGS** under ENGINE SPECIFICATIONS.
2. Clean piston ring grooves thoroughly. Install piston rings with identification mark toward top of piston. Using a feeler gauge, measure piston ring side clearance between ring and ring land.
3. If ring lands are excessively worn, replace piston. See **PISTONS, PINS & RINGS** under ENGINE SPECIFICATIONS. Align piston ring end gaps properly on piston. See Fig. 16.

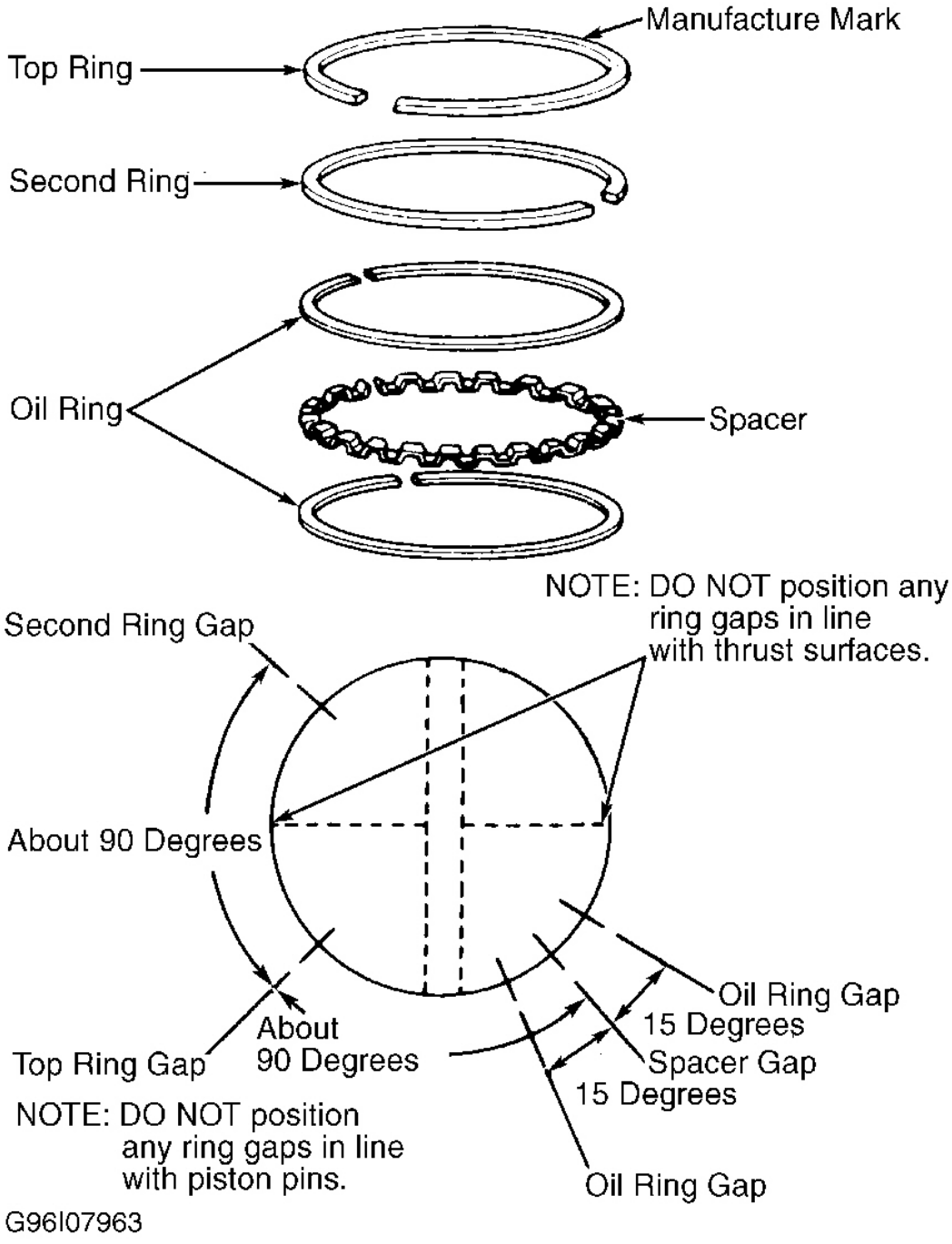


Fig. 16: Installing Piston Rings
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Rod Bearings

1. Using Plastigage, measure rod bearing oil clearance. Tighten bearing cap to 23 ft. lbs. (32 N.m). If oil clearance is incorrect, install a new bearing set (same color code) and recheck oil clearance. See **CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS** under ENGINE SPECIFICATIONS. DO NOT shim or file cap to adjust oil clearance.
2. If oil clearance is still incorrect, try the next larger or smaller bearing. Measure oil clearance again. If correct oil clearance cannot be obtained by using larger or smaller bearings, replace crankshaft and repeat procedure.

NOTE: A number code indicating connecting rod big end bore is stamped on side of each connecting rod and cap. Connecting rod journal diameter codes (letters) are stamped on crankshaft counterweight pads. See Fig. 17. Use both codes when ordering replacement bearings.

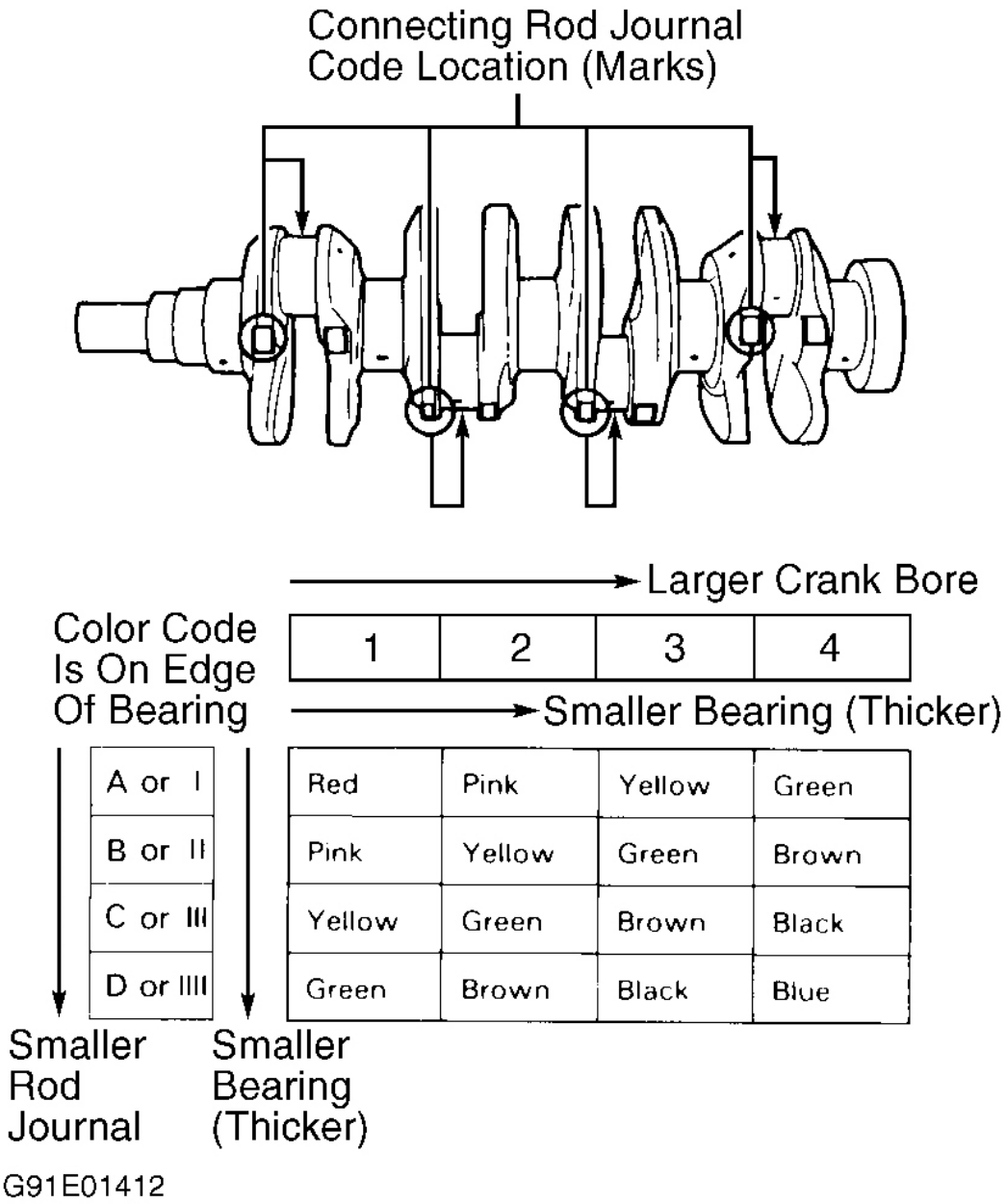


Fig. 17: Connecting Rod Journal & Bearing Identification Codes
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Crankshaft & Main Bearings

1. Remove rear crankshaft oil seal cover, oil screen, oil pump, and baffle plate. Rotate crankshaft so No. 2 and 3 crankpins are at bottom. Remove all connecting rod caps and bearings.
2. Mark all main bearing caps for assembly reference. Remove main bearing caps and bearing halves. Lift

crankshaft from block, being careful not to damage journals.

3. Using a lathe or "V" blocks to support crankshaft, measure crankshaft runout, out-of-round, and taper. If any measurement exceeds service limit, replace crankshaft. See **CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS** under ENGINE SPECIFICATIONS.
4. Install crankshaft into block. Measure main bearing oil clearance, using Plastigage. If engine is in vehicle, support counterweights, and measure only one bearing at a time. Tighten main bearing caps to 56 ft. lbs. (76 N.m).
5. If oil clearance is incorrect, install a new bearing set (same color code) and recheck oil clearance. See CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS table under ENGINE SPECIFICATIONS. If oil clearance is still incorrect, try next larger or smaller bearing and measure oil clearance once more.
6. If correct oil clearance cannot be obtained by using larger or smaller bearings, replace crankshaft and repeat procedure.

NOTE: A letter code indicating main journal bore diameters is stamped on cylinder block. See Fig. 18. Use these codes, together with crankshaft main journal diameter numbers, when ordering replacement bearings.

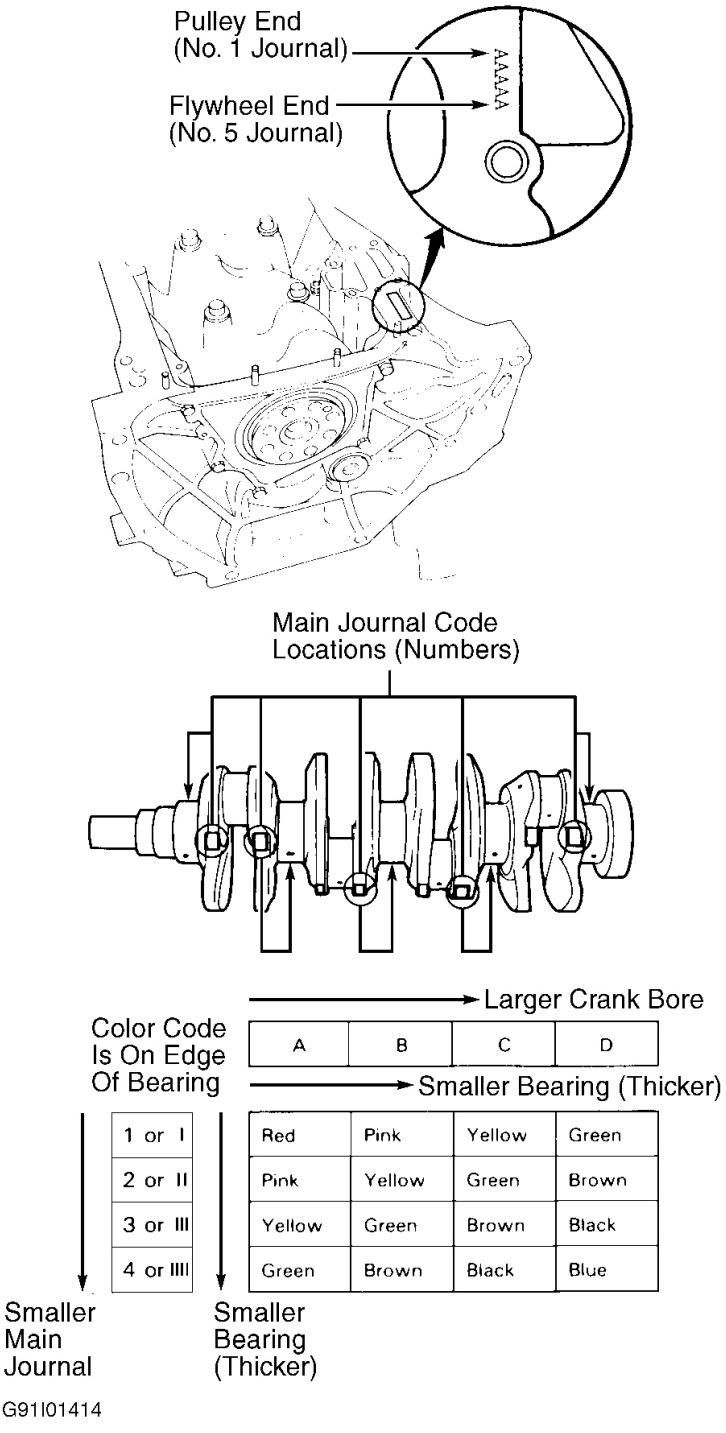


Fig. 18: Crankshaft Main Journal & Bearing Identification Codes
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Thrust Bearing

1. Measure crankshaft end play using a dial indicator. If end play exceeds specification, inspect thrust washers and thrust surface of crankshaft. See **CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS** under ENGINE SPECIFICATIONS.
2. Replace worn parts as necessary. Thrust washer thickness is fixed. DO NOT change thrust washer thickness by grinding or shimming. Install thrust washers with grooved side out.

Cylinder Block

1. Measure cylinder bore out-of-round and taper. If either out-of-round or taper exceeds 0.002" (0.05 mm), bore cylinder for oversize pistons. If any cylinder exceeds oversize bore service limit, replace cylinder block. See **CYLINDER BLOCK** under ENGINE SPECIFICATIONS.
2. If cylinder bore is okay, hone cylinder to obtain a 60-degree crosshatch pattern. After honing, wash cylinder bore with hot soapy water. Air-dry cylinder bore, and apply engine oil to prevent rusting. Using a feeler gauge and straightedge, measure cylinder block deck surface warpage. See **CYLINDER BLOCK** under ENGINE SPECIFICATIONS.

ENGINE OILING

ENGINE LUBRICATION SYSTEM

A rotor-type oil pump draws oil from oil pan and delivers it under pressure to main and connecting rod bearings. An oil hole in each connecting rod lubricates thrust side of piston and cylinder wall. An oil passage carries oil to camshaft and rocker arms. Oil spray lubricates valve stems.

Crankcase Capacity

Crankcase capacity is 4.0 qts. (3.8L) including oil filter.

Oil Pressure

Oil pressure at idle should be 10 psi (0.7 kg/cm^2) minimum. Oil pressure at 3000 RPM should be 50 psi (3.5 kg/cm^2) minimum.

OIL PUMP

Removal

Remove oil pan. See **OIL PAN** under REMOVAL & INSTALLATION. Remove oil screen and oil pump assembly. Remove screws from oil pump housing. Separate housing and cover.

Inspection

Measure radial clearance between inner and outer rotors. Measure axial clearance between housing and outer rotor. Inspect both rotors and pump housing for scoring or other damage. Replace components if clearance measurements are not within specification. See **OIL PUMP SPECIFICATIONS**.

OIL PUMP SPECIFICATIONS

Application	In. (mm)
Inner Rotor-To-Outer Rotor	
Radial Clearance	
Standard (New)	0.0016-0.0063 (0.04-0.16)
Service Limit	0.008 (0.20)
Housing-To-Outer Rotor	
Axial Clearance	
Standard (New)	0.0008-0.0027 (0.02-0.07)
Service Limit	0.006 (0.15)
Housing-To-Outer Rotor	
Radial Clearance	
Standard (New)	0.0039-0.0074 (0.10-0.19)
Service Limit	0.008 (0.20)

Installation

1. Reassemble oil pump using Loctite on pump housing screws. Ensure oil pump turns freely. Install dowel pins and NEW "O" ring into cylinder block. Clean oil pump mating surfaces. Apply Liquid Sealant (08718-0001) to cylinder block mating surface of oil pump.
2. Apply sealant to threads of inner bolt holes. Install oil pump before sealant dries. Install oil screen and oil pump. Wait at least 30 minutes before filling crankcase with oil. To complete installation, reverse removal procedure.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
A/C Compressor Bracket Bolts	17 (23)
Camshaft Sprocket Bolts	27 (37)
Connecting Rod Nuts	(1) 24 (32)
Crankshaft Pulley Bolt	133 (180)
Cylinder Head Bolts	(2) 63 (85)
Distributor Mount Bolts	17 (23)
Engine Block-To-Transaxle Housing Bolts	47 (64)
Engine Mount Bolts	(3)
Exhaust Manifold Nuts	23 (31)
Exhaust Pipe Flange Nuts	40 (54)
Flexplate (A/T)	55 (75)
Flywheel Bolts (M/T)	(4) 77 (105)
Fuel Filter Banjo Bolt	25 (33)
Generator Belt Adjustment Bolt	17 (23)
Generator Mount Bolt	33 (45)

Intake Manifold Nuts	17 (23)
Main Bearing Cap Bolts	(5) 58 (78)
Oil Pump Bolts	
6-mm Bolts	(6)
8-mm Bolts	17 (23)
Power Steering Mount Bolt	17 (23)
Rocker Arm Lock Nuts	18 (24)
Rocker Arm Pivot Bolt	46 (62)
Shift Lever Torque Rod Bolt	16 (22)
Timing Belt Tension Adjuster Bolt	40 (54)
	INCH Lbs. (N.m)
Camshaft Bearing Bolt	88 (10)
Crankshaft Baffle Plate	98 (11)
Crankshaft Rear Seal Cover Bolts	98 (11)
Oil Pan Bolts	106 (12)
Oil Pump Screen Nuts	98 (11)
Timing Belt Cover Bolts	106 (12)
Valve Cover Nuts	88 (10)
Water Pump Bolt	106 (12)

(1) Tighten connecting rod nuts in 2 stages. First tighten nuts to 15 ft. lbs. (20 N.m), then tighten them to 24 ft. lbs. (32 N.m).

(2) Tighten cylinder head bolts in 2 stages. First tighten bolts to 22 ft. lbs. (30 N.m) and then to 63 ft. lbs. (85 N.m). See **Fig. 7**.

(3) See **Fig. 4**.

(4) Tighten in a crisscross pattern.

(5) Tighten main bearing bolts in 2 stages. First tighten bolts to 22 ft. lbs. (30 N.m), then tighten them to 58 ft. lbs. (78 N.m).

(6) Tighten to 96 INCH lbs. (11 N.m).

ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

Application	Specification
Displacement	110 Cu. In. (1.8L)
Bore	3.19" (81 mm)
Stroke	3.50" (89 mm)
Compression Ratio	9.2:1
Fuel System	SFI
Horsepower @ RPM	140 @ 6300
Torque Ft. Lbs. @ RPM	127 @ 5200

CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS

CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS

Application	In. (mm)
Crankshaft	
End Play	
Standard	0.004-0.014 (0.10-0.35)
Service Limit	0.018 (0.45)
Runout	
Standard	0.0010 (0.025)
Service Limit	0.0020 (0.050)
Main Bearings	
Journal Diameter	
Except No. 3	2.1644-2.1654 (54.976-55.000)
No. 3	2.1642-2.1651 (54.970-54.994)
Journal Out-Of-Round	
Standard	0.0002 (0.005)
Service Limit	0.0004 (0.010)
Journal Taper	
Standard	0.0002 (0.005)
Service Limit	0.0004 (0.010)
Oil Clearance	
Except No. 3 Journal	
Standard	0.0009-0.0017 (0.024-0.042)
Service Limit	0.0020 (0.050)
No. 3 Journal	
Standard	0.0012-0.0019 (0.030-0.048)
Service Limit	0.0024 (0.060)
Connecting Rod Bearings	
Journal Diameter	1.7707-1.7717 (44.976-45.000)
Journal Out-Of-Round	
Standard	0.0002 (0.005)
Service Limit	0.0004 (0.010)
Journal Taper	
Service Limit	0.0004 (0.010)
Oil Clearance	
Standard	0.0008-0.0015 (0.020-0.038)
Service Limit	0.0020 (0.050)

CONNECTING RODS

CONNECTING RODS

Application	In. (mm)
Bore Diameter	
Crankpin Bore	1.89 (48.0)
Pin Bore	0.8255-0.8260 (20.968-20.981)
End Play	
Standard	0.006-0.012 (0.15-0.30)
Service Limit	0.016 (0.40)

PISTONS, PINS & RINGS

PISTONS, PINS & RINGS

Application	In. (mm)
Pistons	
Clearance	
Standard	0.0004-0.0016 (0.010-0.040)
Service Limit	0.0020 (0.050)
Diameter (1)	
Standard	3.188-3.189 (80.98-80.99)
Service Limit	3.1878 (80.97)
Oversize 0.010" (0.25 mm)	3.1980-3.1984 (81.230-81.240)
Pins	
Diameter	0.8265-0.8268 (20.994-21.000)
Piston Fit	0.0004-0.0009 (0.010-0.022)
Rod Fit	0.0005-0.0013 (0.013-0.032)
Oversize	.8267-.8269 (20.997-21.003)
Rings	
No. 1	
End Gap	
R (2)	0.008-0.014 (0.20-0.35)
T (3)	0.008-0.012 (0.20-0.30)
Service Limit	0.024 (0.60)
Side Clearance	0.0018-0.0028 (0.045-0.070)
Service Limit	0.005 (0.13)
No. 2	
End Gap	0.016-0.022 (0.40-0.55)
Service Limit	0.028 (0.70)
Side Clearance	
R (2)	0.0016-0.0026 (0.040-0.065)
T (3)	0.0018-0.0028 (0.045-0.070)
Service Limit	0.005 (0.13)

No. 3 (Oil)	
End Gap	
R (2)	0.008-0.020 (0.20-0.50)
T (3)	0.008-0.018 (0.20-0.45)
Service Limit	0.028 (0.70)
(1) Measure at 0.6" (15 mm) from bottom of skirt.	
(2) RIKEN manufactured piston ring.	
(3) TEIKOKU manufactured piston ring.	

CYLINDER BLOCK

CYLINDER BLOCK

Application	In. (mm)
Cylinder Bore	
Standard Diameter	3.189-3.190 (81.00-81.02)
Service Limit	3.192 (81.07)
Maximum Taper	0.002 (0.05)
Maximum Re-bore Limit	0.010 (0.25)
Maximum Deck Warpage	0.003 (0.08)
Service Limit	0.004 (0.10)

VALVES & VALVE SPRINGS

VALVES & VALVE SPRINGS

Application	Specification
Intake Valves	
Face Angle	45°
Head Diameter	1.217-1.224" (30.90-31.10 mm)
Stem Diameter	
Standard	0.2591-0.2594" (6.58-6.59 mm)
Service Limit	0.258" (6.55 mm)
Minimum Margin	0.045" (1.15 mm)
Exhaust Valves	
Face Angle	45°
Head Diameter	1.098-1.106" (27.90-28.10 mm)
Stem Diameter	
Standard	0.2579-0.2583" (6.55-6.56 mm)
Service Limit	0.257" (6.52 mm)
Minimum Margin	0.057" (1.45 mm)
Valve Springs Free Length	

1995	
Intake	1.668" (42.36 mm)
Exhaust	
NH (1)	1.854" (47.09 mm)
CH (2)	1.854" (47.08 mm)
1996-97	
Intake	
NH (1)	1.625" (41.27 mm)
CH (2)	1.625" (41.28 mm)
Exhaust	1.745" (44.32 mm)
(1) NIHON HATSUJO manufactured valve spring.	
(2) CHUO HATSUJO manufactured valve spring.	

CYLINDER HEAD

CYLINDER HEAD

Application	Specification
Cylinder Head	
Height	5.195-5.199" (131.95-132.05 mm)
Maximum Warpage	(1) 0.002-0.008" (0.05-0.20 mm)
Valve Seats	
Intake & Exhaust Valves	
Seat Angle	45°
Seat Width	
Standard	0.049-0.061" (1.25-1.55 mm)
Service Limit	0.079" (2.00 mm)
Valve Guides	
Intake & Exhaust Valves	
Valve Guide I.D.	
Standard	0.260-0.261" (6.61-6.63 mm)
Service Limit	0.262" (6.65 mm)
Intake Valves	
Valve Guide Installed Height	0.541-0.561" (13.75-14.25 mm)
Valve Stem-To-Guide Clearance	
Standard	0.001-0.002" (0.02-0.05 mm)
Service Limit	0.003" (0.08 mm)
Exhaust Valves	
Valve Guide Installed Height	0.620-0.640" (15.75-16.25 mm)
Valve Stem-To-Guide Clearance	
Standard	0.002-0.003" (0.05-0.08 mm)

Service Limit	0.004" (0.10 mm)
(1) Maximum resurface limit is 0.008" (0.20 mm).	

CAMSHAFT

CAMSHAFT

Application	In. (mm)
End Play	
Standard	0.002-0.006 (0.05-0.15)
Service Limit	0.020 (0.50)
Journal Runout	
Standard	0.001 (0.03)
Service Limit	0.002 (0.05)
Oil Clearance	
Standard	0.0012-0.0027 (0.030-0.069)
Service Limit	0.006 (0.15)

VALVE STEM INSTALLED HEIGHT

VALVE STEM INSTALLED HEIGHT (1)

Application	In. (mm)
Intake	
Standard	1.6049-1.6234 (40.765-41.235)
Service Limit	1.633 (41.485)
Exhaust	
Standard	1.6837-1.7022 (42.765-43.235)
Service Limit	1.712 (43.485)
(1) Measure from base of valve guide to tip of valve stem.	