

1997-2000 ENGINE

Cylinder Head/Valve Train - 1.6 EL

SPECIAL TOOLS

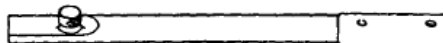
Ref. No.	Tool Number	Description	Qty	Page Reference
①	07HAH - PJ7010B	Valve Guide Reamer, 5.5 mm	1	6-37
②	07JAA - 001010A	Socket, 17 mm	1	6-14
③	07JAB - 001020A	Holder Handle	1	6-14
④	07LAJ - PR3020B	Air Stopper	1	6-7, 8
⑤	07NAB - 001040A	Holder Attachment, 50 mm	1	6-14
⑥	07NAJ - P07010A	Pressure Gauge Adapter	1	6-4
⑦	07406 - 0020201	A/T Pressure Hose	1	6-4
or ⑦-1	07MAJ - PY4011A	A/T Pressure Hose, 2,210 mm	1	6-4
and ⑦-2	07MAJ - PY40120	A/T Pressure Adapter	1	6-4
⑧	07406 - 0070300	A/T Low Pressure Gauge W/Panel	1	6-4
⑨	07742 - 0010100	Valve Guide Driver, 5.5 mm	1	6-35, 36



①



②



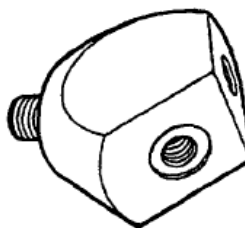
③



④



⑤



⑥

⑦
⑦-1

⑦-2



⑧



⑨

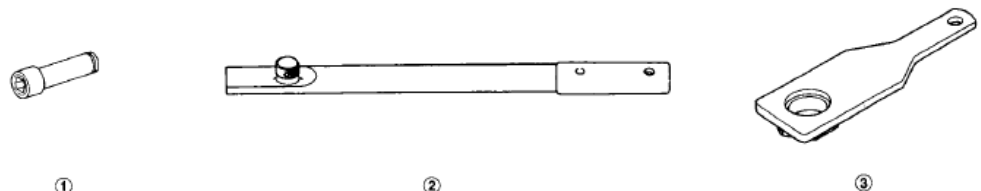
Fig. 1: Identifying Special Tools (1 Of 3)

1997 Acura 1.6EL RS

1997-2000 ENGINE Cylinder Head/Valve Train - 1.6 EL

Courtesy of AMERICAN HONDA MOTOR CO., INC.

Ref. No.	Tool Number	Description	Qty	Page Reference
①	07JAA - 001010A	Socket, 17 mm	1	6-3
②	07JAB - 001020A	Holder Handle	1	6-3
③	07NAB - 001040A	Holder Attachment, 50 mm	1	6-3



The diagram shows three tools labeled ①, ②, and ③. Tool ① is a small cylindrical socket. Tool ② is a long, thin handle with a small pin or bolt at one end. Tool ③ is a larger, L-shaped attachment with a circular hole in the longer arm.

Fig. 2: Identifying Special Tools (2 Of 3)

Courtesy of AMERICAN HONDA MOTOR CO., INC.

Ref. No.	Tool Number	Description	Qty
①	07NAJ - P07010A	Pressure Gauge Adapter	1
②	07406 - 0020201	A/T Pressure Hose	1
or ②-1	07MAJ - PY4011A	A/T Pressure Hose, 2,210 mm	1
and ②-2	07MAJ - PY40120	A/T Pressure Adapter	1
③	07406 - 0070300	A/T Low Pressure Gauge W/Panel	1

Fig. 3: Identifying Special Tools (2 Of 3)

VTEC CONTROL SYSTEM

TROUBLESHOOTING FLOWCHART

DTC P1259 (1997-99 Models)

The scan tool indicates Diagnostic Trouble Code (DTC) P1259: A problem in the VTEC Pressure Switch circuit or VTEC Solenoid Valve circuit.

NOTE: Refer to TROUBLESHOOTING before proceeding with troubleshooting flowcharts below.

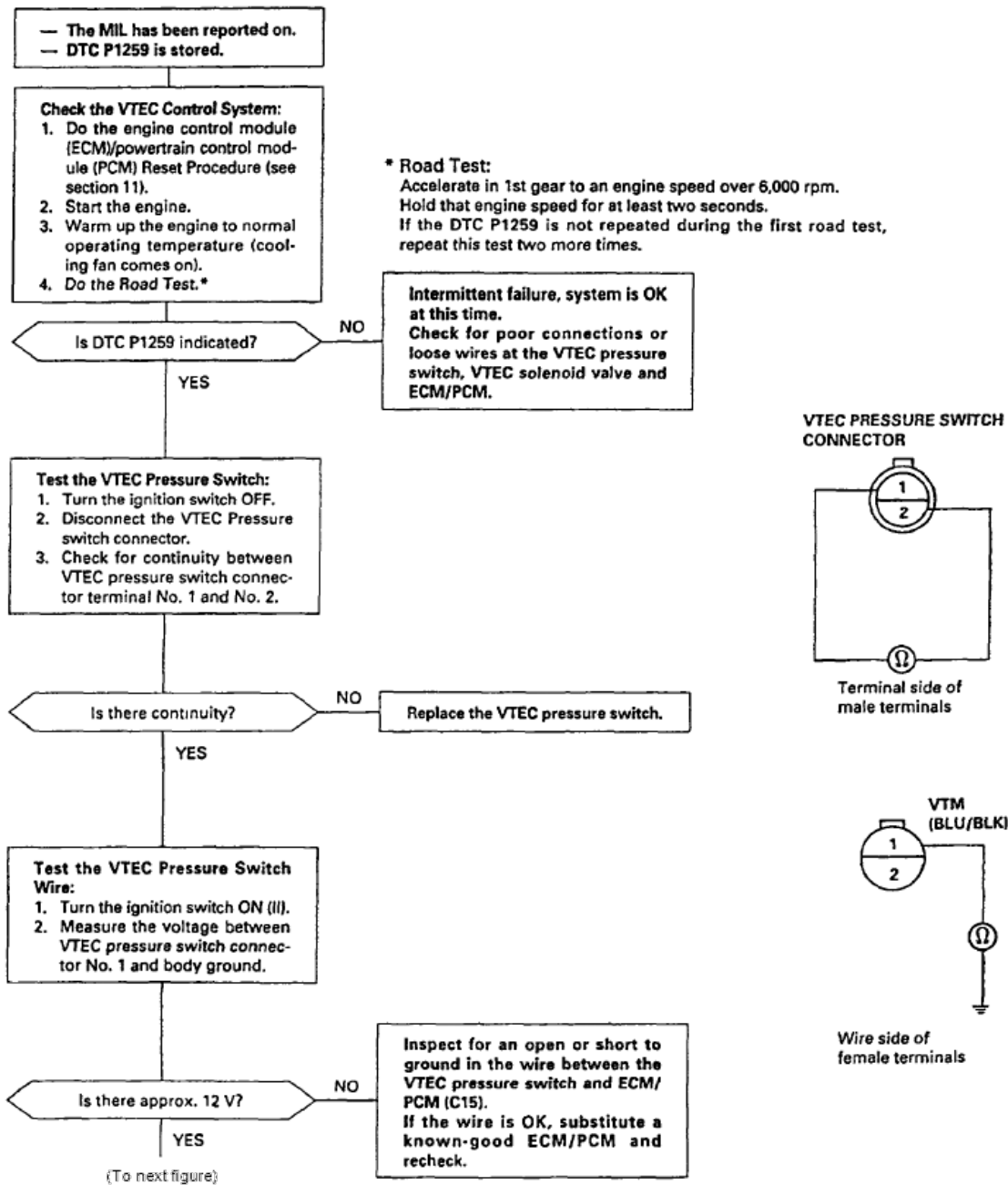


Fig. 4: Troubleshooting Flowchart (1 Of 3)

Courtesy of AMERICAN HONDA MOTOR CO., INC.

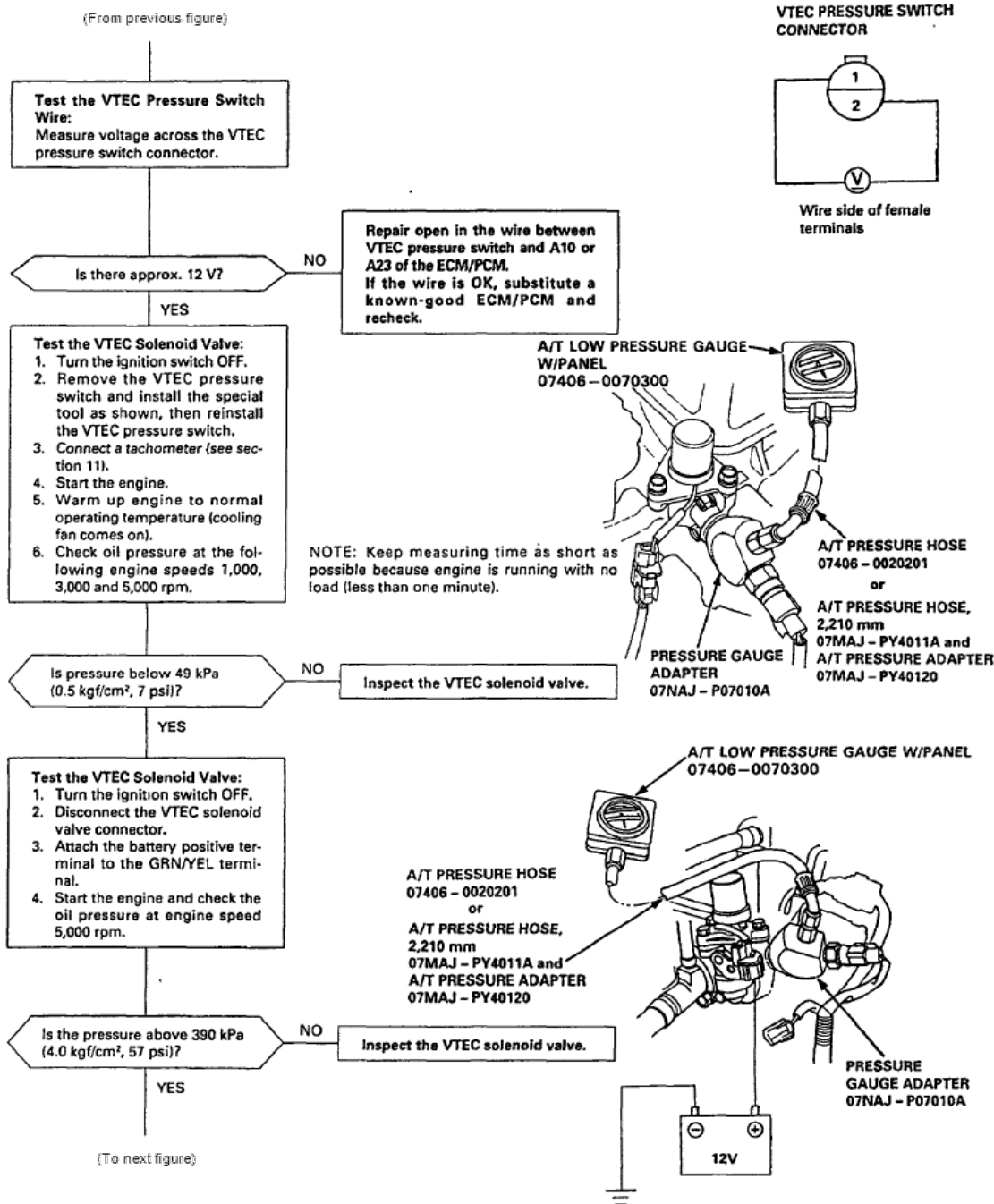


Fig. 5: Troubleshooting Flowchart (2 Of 3)

Courtesy of AMERICAN HONDA MOTOR CO., INC.

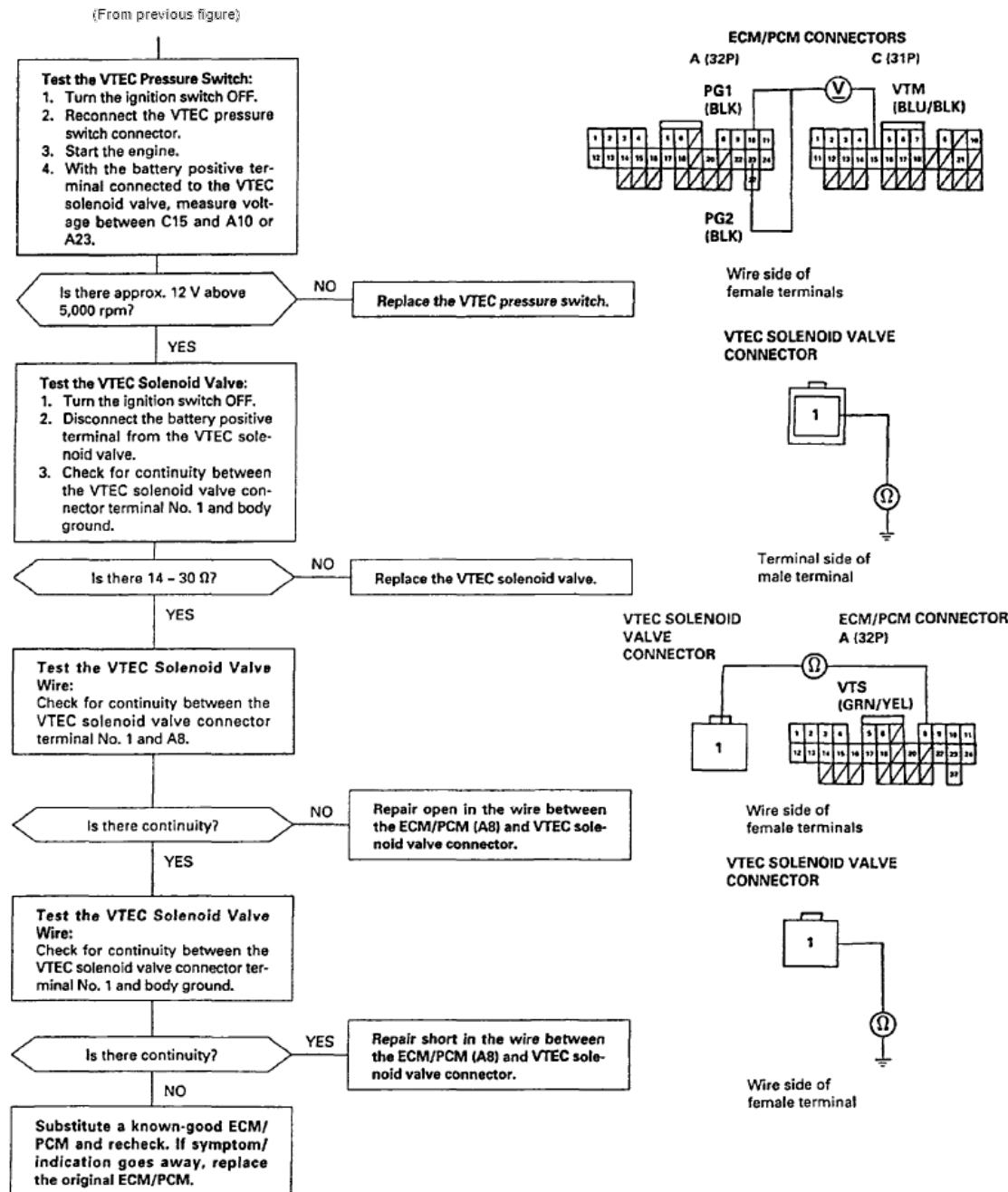


Fig. 6: Troubleshooting Flowchart (3 Of 3)

Courtesy of AMERICAN HONDA MOTOR CO., INC.

DTC P1259 (1999-2000 Models)

The scan tool indicates Diagnostic Trouble Code (DTC) P1259: A problem in the VTEC Pressure Switch circuit or VTEC Solenoid Valve circuit.

Refer to **TROUBLESHOOTING** before troubleshooting.

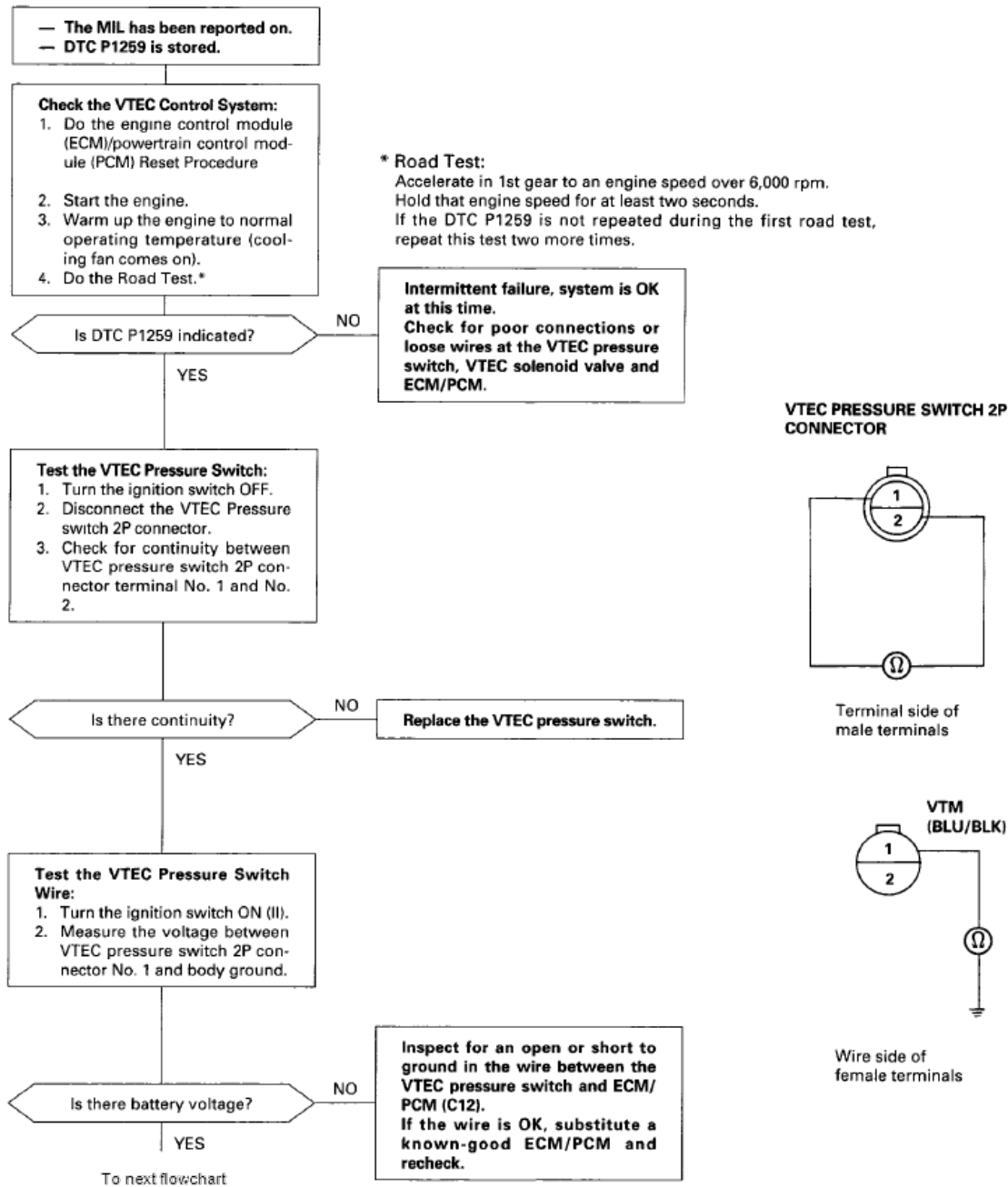


Fig. 7: Troubleshooting Flowchart (1 Of 3)

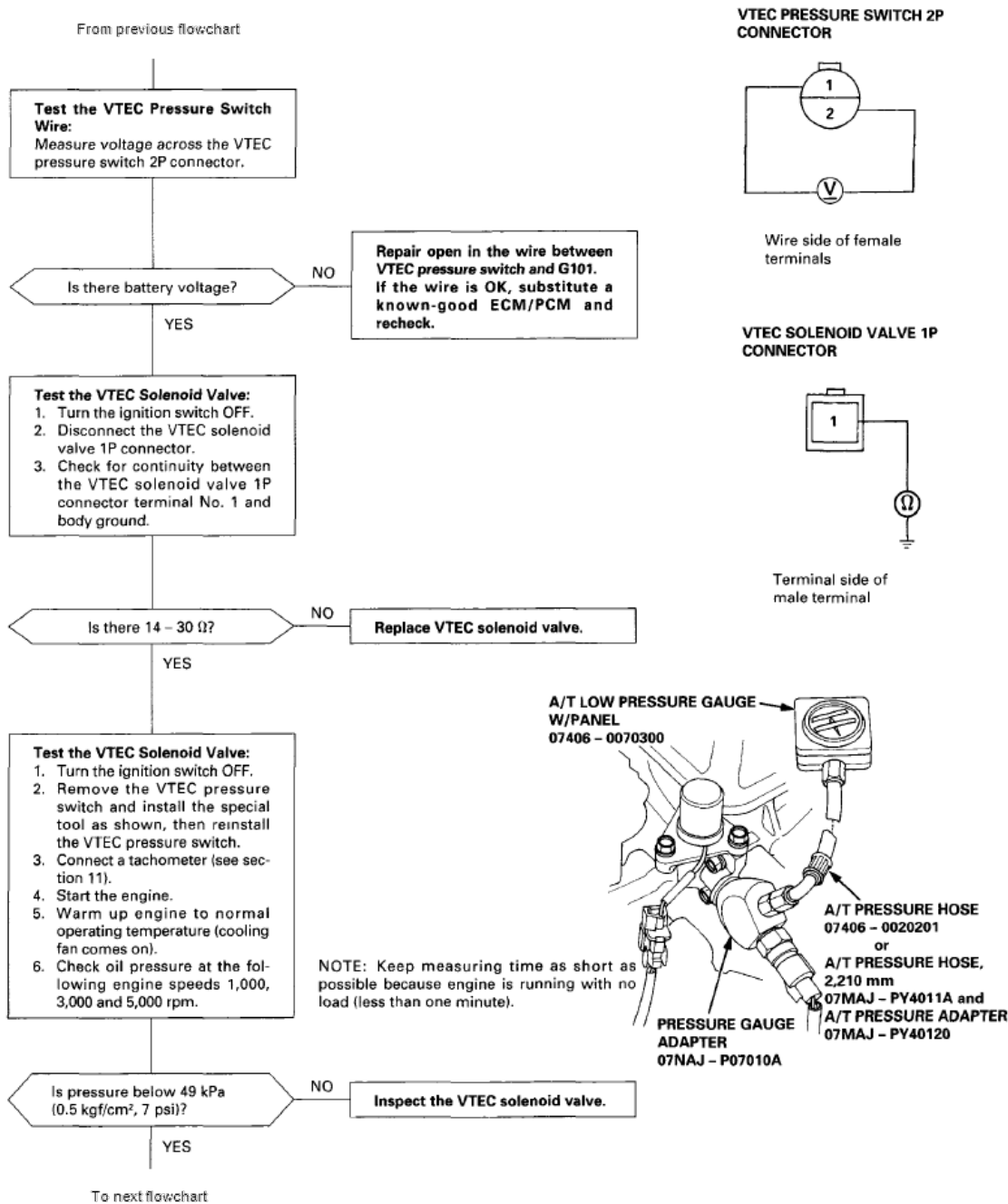


Fig. 8: Troubleshooting Flowchart (2 Of 3)

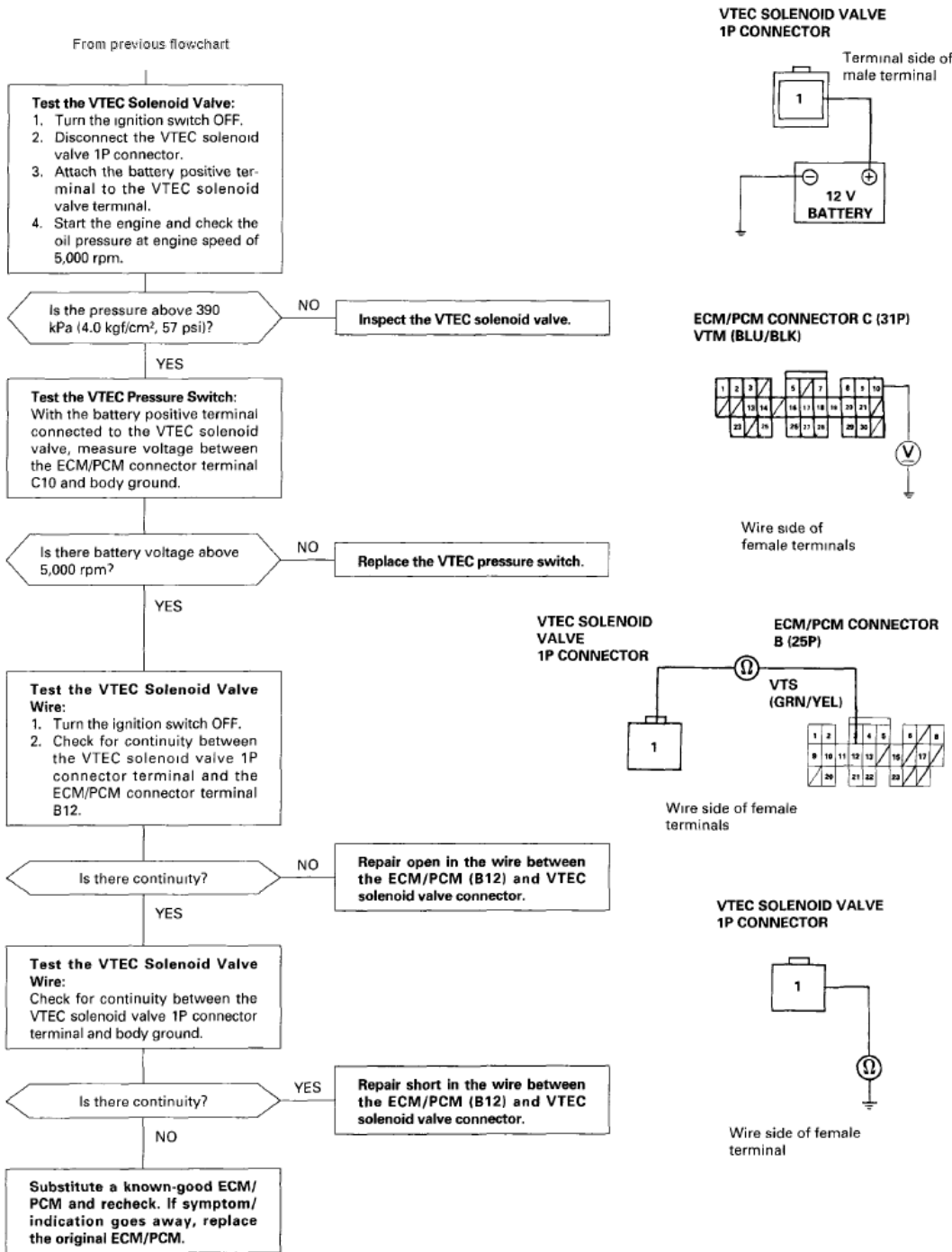


Fig. 9: Troubleshooting Flowchart (3 Of 3)

VTEC SOLENOID VALVE

INSPECTION

1. Disconnect the IP connector from the VTEC solenoid valve.
2. Measure resistance between the terminal and body ground.

Resistance: 14 - 30 ohms

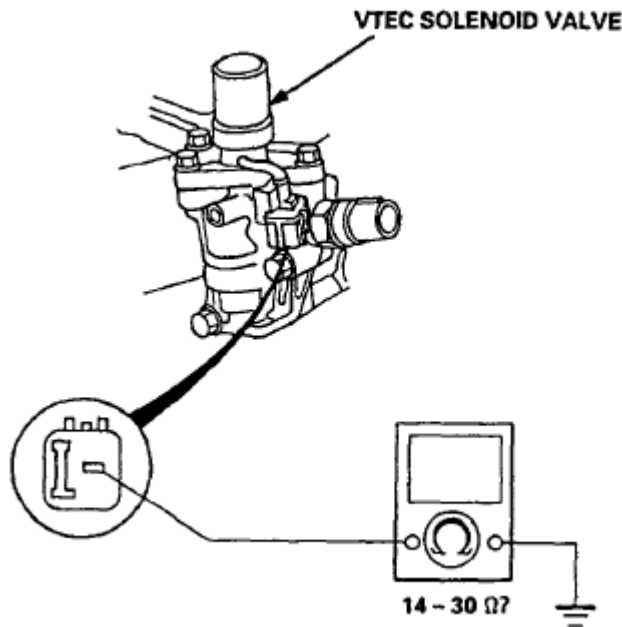


Fig. 10: Measuring Resistance Between Terminal And Body Ground
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. If the resistance is within specifications, remove the VTEC solenoid valve assembly from the cylinder head, and check the VTEC solenoid valve filter for clogging.
 - If there is clogging, replace the engine oil filter and the engine oil.

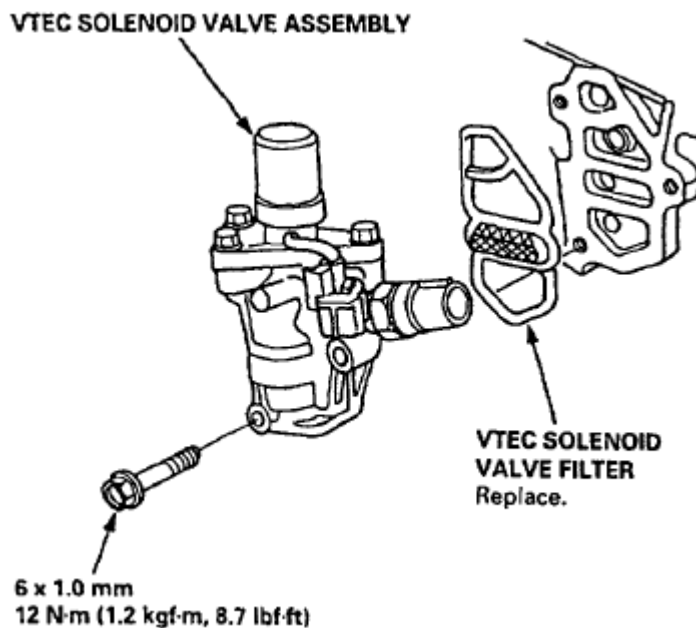


Fig. 11: Identifying VTEC Solenoid Valve Assembly And VTEC Solenoid Valve With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. If the filter is not clogged, push the VTEC solenoid valve with your finger and check its movement
 - If the VTEC solenoid valve is normal, check the engine oil pressure.

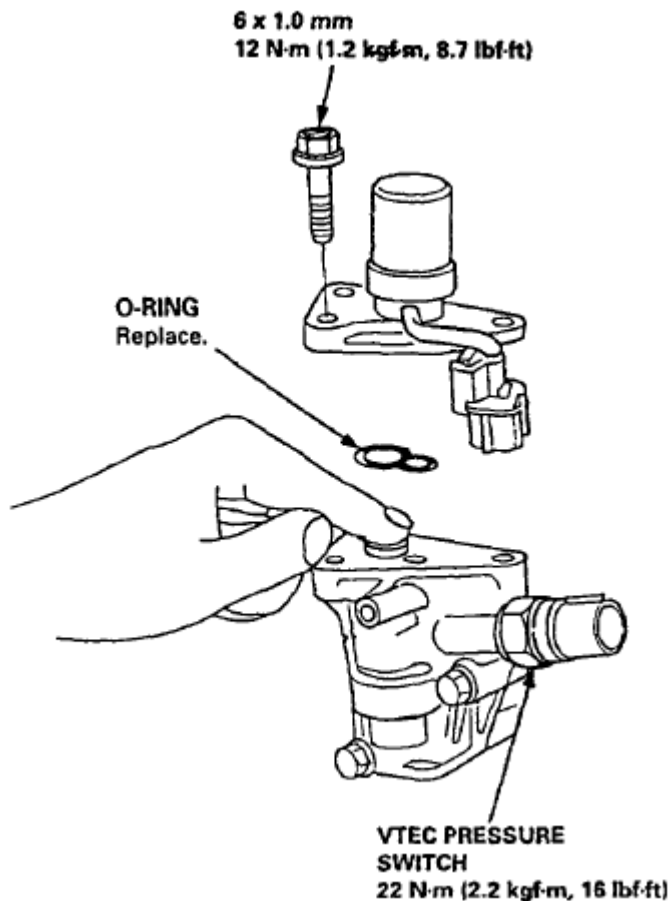


Fig. 12: Pushing VTEC Solenoid Valve With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

VTEC ROCKER ARMS

MANUAL INSPECTION

1. Set the No. 1 piston at TDC.
2. Remove the cylinder head cover.

NOTE: Refer to CYLINDER HEAD when installing the cylinder head cover.

3. Push the intake mid rocker arm on the No. 1 cylinder manually.
4. Check that the intake mid rocker arm moves independently of the primary and secondary intake rocker arms.

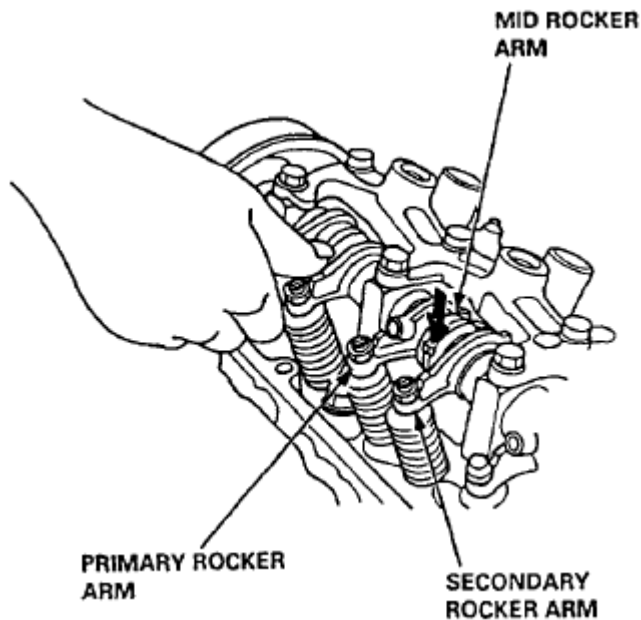


Fig. 13: Checking Intake Mid Rocker Arm Of Primary And Secondary Intake Rocker Arms
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Check the intake mid rocker arm of each cylinder at TDC.
 - If the intake mid rocker arm does not move, remove the mid, primary and secondary intake rocker arms as an assembly and check that the pistons in the mid and primary rocker arms move smoothly.
 - If any rocker arm needs replacing, replace the primary, mid, and secondary rocker arms as an assembly.

INSPECTION USING SPECIAL TOOLS

- CAUTION:**
- Before using the Valve Inspection Tool, make sure that the air pressure gauge on the air compressor indicates over 400 kPa (4 kgf/cm² , 57 psi).
 - Inspect the valve clearance before rocker arm inspection.
 - Cover the timing belt with a shop towel to protect the belt.
 - Check the intake primary rocker arm of each cylinder at TDC.

1. Remove the cylinder head cover.

NOTE: Refer to CYLINDER HEAD when installing the cylinder head cover.

2. Plug the relief hole with the special tool.

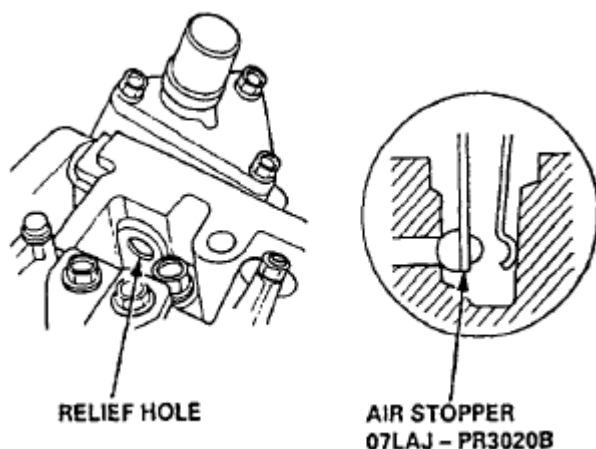


Fig. 14: Identifying Relief Hole And Air Stopper
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove the sealing bolt from the inspection hole and connect the Valve Inspection Tool.

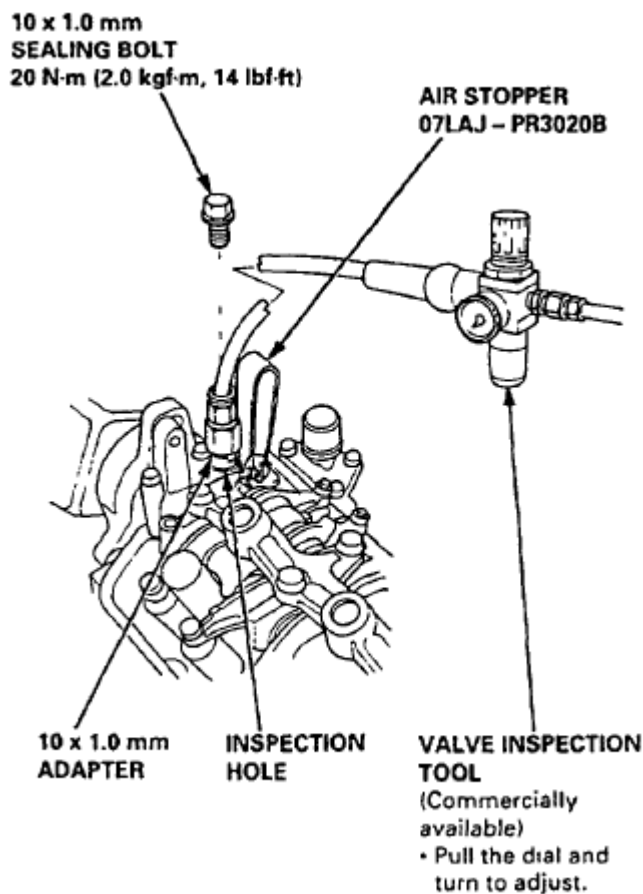


Fig. 15: Identifying Sealing Bolt, Inspection Hole, Valve Inspection Tool And Adapter With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Loosen the regulator valve on the valve inspection tool and apply the specified air pressure to the rocker arm synchronizing piston A/B.

Specified Air Pressure:**250 kPa (2.5 kgf/cm² , 36 psi)**

5. Make sure that the intake primary and secondary rocker arms are mechanically connected by the piston and that the mid rocker arm does not move when pushed manually.

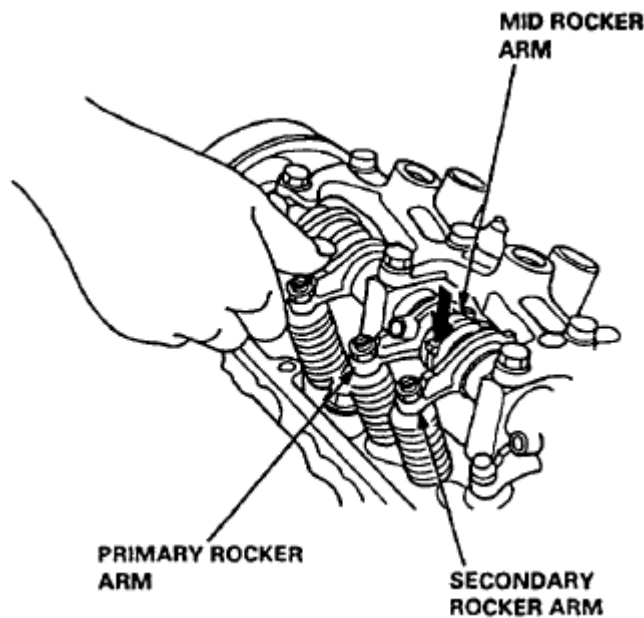


Fig. 16: Identifying Primary Rocker Arm, Mid Rocker Arm And Secondary Rocker Arms
Courtesy of AMERICAN HONDA MOTOR CO., INC.

If any intake mid rocker arm moves independently of the primary and secondary rocker arms, replace the rocker arms as a set.

6. Remove the special tools.
7. Use a 10 mm diameter rod to depress each lost motion assembly through its full movement. Replace any lost motion assembly that does not move smoothly.

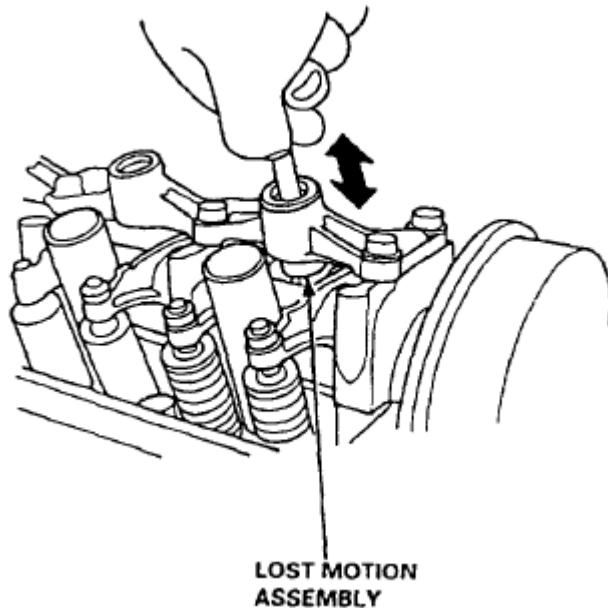


Fig. 17: Replacing Lost Motion Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. After inspection, check that the malfunction indicator lamp (MIL) does not come on.

VALVE CLEARANCE

ADJUSTMENT

NOTE:

- Valves should be adjusted only when the cylinder head temperature is less than 100°F (38°C).
- After adjusting, retorque the crankshaft pulley bolt to 181 N.m (18.5 kgf.m, 134 lbf.ft).

1. Remove the cylinder head cover.

NOTE: Refer to CYLINDER HEAD when installing the cylinder head.

2. Remove the upper cover (see REMOVAL).
3. Set the No. 1 piston at TDC. The "UP" mark on the cam-shaft pulley should be at the top, and the TDC marks should align with the cylinder head upper surface.

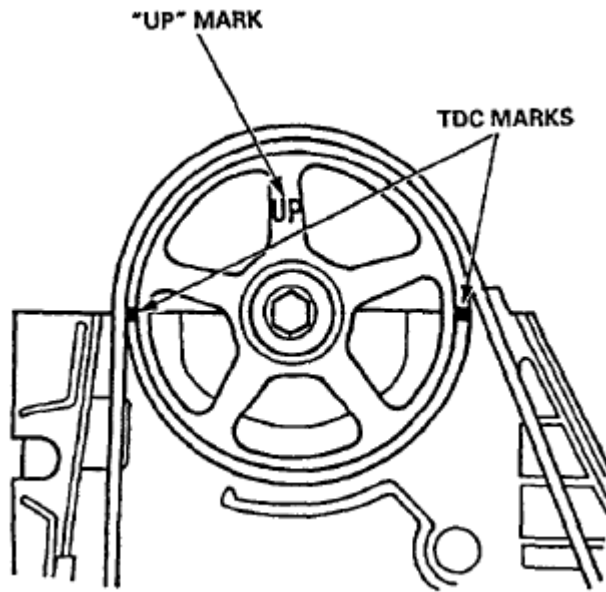


Fig. 18: Identifying TDC Marks And Up Mark
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Adjust the valves on No. 1 cylinder.

Intake: 0.18 - 0.22 mm (0.007 - 0.009 in)

Exhaust: 0.23 - 0.27 mm (0.009 - 0.011 in)

5. Loosen the locknut, and turn the adjustment screw until the feeler gauge slides back and forth with a slight amount of drag.

**INTAKE and EXHAUST VALVE
LOCKNUTS
20 N·m (2.0 kgf·m, 14 lbf·ft)**

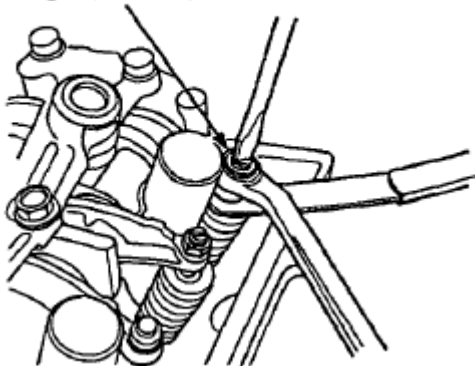


Fig. 19: Identifying Adjustment Screw Locknut With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Adjusting screw locations:

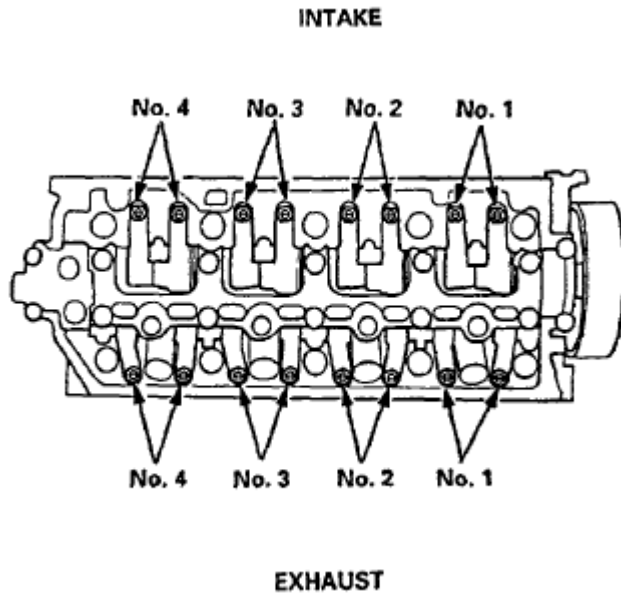


Fig. 20: Identifying Intake And Exhaust Valve
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Tighten the locknut, and check the clearance again. Repeat the adjustment if necessary.

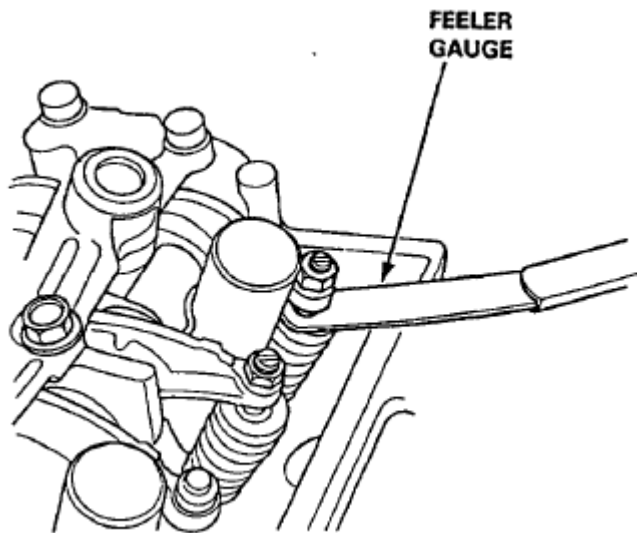


Fig. 21: Tightening Locknut
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Rotate the crankshaft 180° counterclockwise (camshaft pulley turns 90°). The "UP" mark should be on the exhaust side. Adjust the valves on No. 3 cylinder.

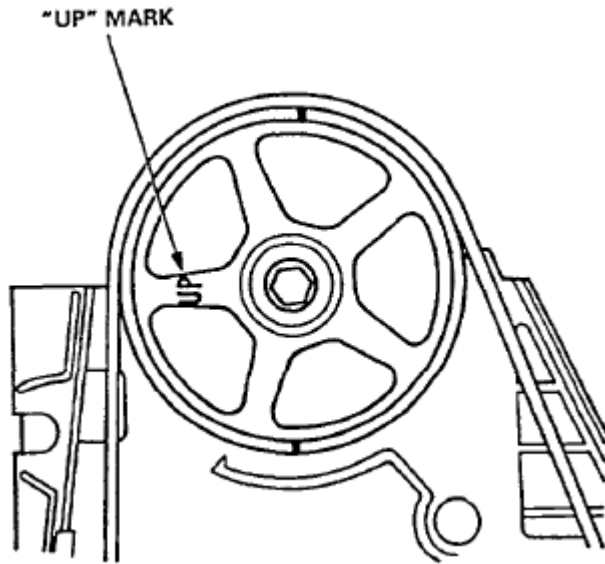


Fig. 22: Rotating Crankshaft Counterclockwise Mark Position
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Rotate the crankshaft 180° counterclockwise to bring No. 4 piston to TDC. Both TDC grooves are once again visible. Adjust the valves on No. 4 cylinder.

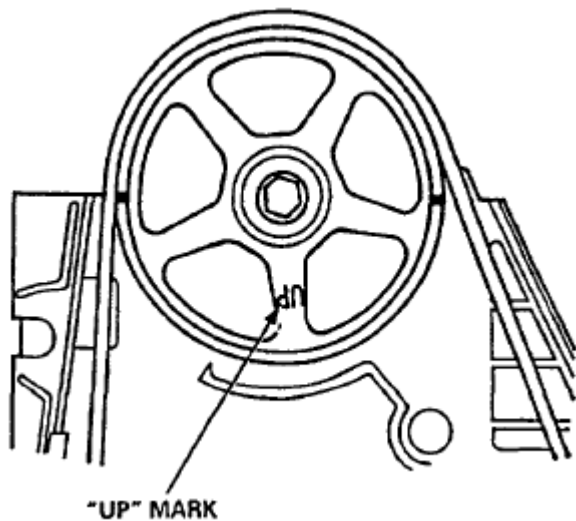


Fig. 23: Rotating Crankshaft Counterclockwise Mark Position
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Rotate the crankshaft 180° counterclockwise to bring No. 2 piston to TDC. The "UP" mark should be on the intake side. Adjust the valves on No. 2 cylinder.

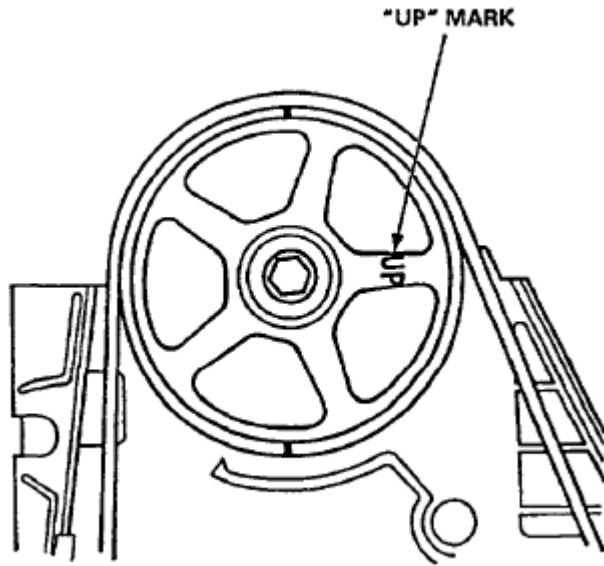


Fig. 24: Rotating Crankshaft Counterclockwise Mark Position
Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVE SEALS

REPLACEMENT (CYLINDER HEAD REMOVAL NOT REQUIRED)

NOTE: **Cylinder head removal is not required in this procedure.**

The procedure shown below applies when using the in-car valve spring compressor (Snap-on YA8845 with YA8845 - 2 A 7/8" attachment).

WARNING: Always wear approved eye protection when using the in-car valve spring compressor.

1. Turn the crankshaft so that the No. 1 and the No. 4 pistons are at top dead center (TDC).
2. Remove the cylinder head cover and the rocker arm assembly.

NOTE:

- Refer to **ROCKER ARMS** for rocker arm assembly removal.
- When removing or installing the rocker arm assembly, do not remove the camshaft holder bolts. The bolts will keep the holders, springs and rocker arms on the shaft.
- Refer to **CYLINDER HEAD** when installing the cylinder head cover.

3. Remove the fuel injectors and the wire harness.
4. Using the 8 mm bolts supplied with the tool, mount the two uprights to the cylinder head at the end camshaft holders. The uprights fit over the camshaft as shown.

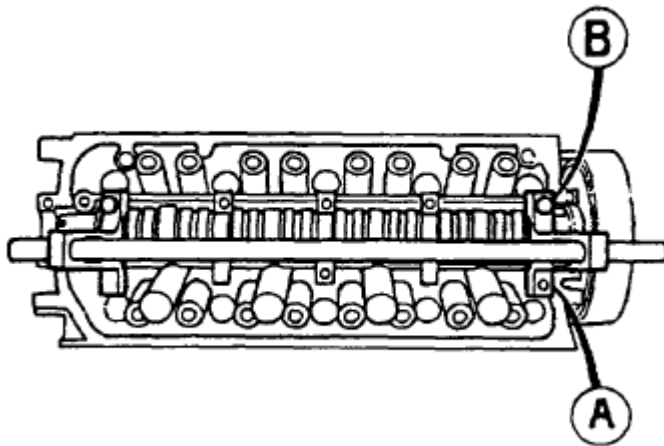


Fig. 25: Identifying Camshaft Bolts

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Insert the cross shaft through the top hole of the two uprights.

Intake Valve Seals:

6. Select the 7/8 in diameter short compressor attachment, and fasten the attachment to the No. 4 hole of the lever arm with the speed pin supplied.
7. Insert an air adaptor into the spark plug hole. Pump air into the cylinder to keep the valve closed while compressing the springs and removing the valve keepers.
8. Position the lever arm under the cross shaft so the lever is perpendicular to the shaft and the compressor attachment rests on top of the retainer for the spring being compressed. Use the front position slot on the lever as shown.

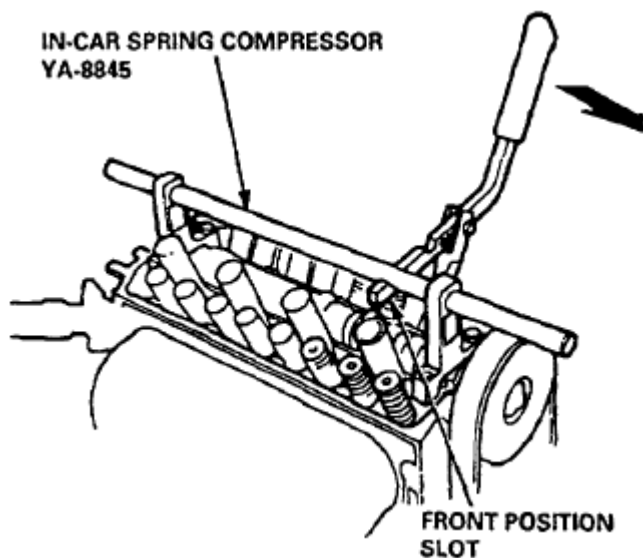


Fig. 26: Identifying Compressor Attachment Rests On Top Of Retainer

Courtesy of AMERICAN HONDA MOTOR CO., INC.

NOTE: Put shop towels over the oil passages to prevent the valve keepers from falling into the cylinder head.

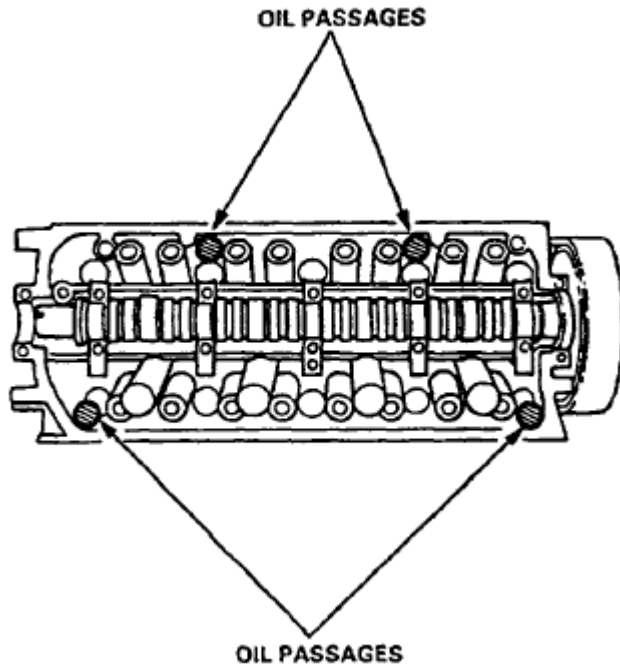


Fig. 27: Identifying Cylinder Head Oil Passages
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Using a downward motion on the lever arm, compress the valve spring and remove the keepers from the valve stem. Slowly release pressure on the spring.
10. Remove the valve seals (see **VALVES, VALVE SPRINGS AND VALVE SEALS**).
11. Install the valve seals (see **VALVES**).
12. Install the springs, the retainers and the keepers in reverse order of removal.

Exhaust Valve Seals:

13. Select the 7/8 in. diameter short compressor attachment, and fasten the attachment to the No. 2 hole of the lever arm with the speed pin supplied.
14. Position the lever arm under the cross shaft so the lever is perpendicular to the shaft and the compressor attachment rests on top of the retainer for the spring being compressed. Use the front position slot on the lever as shown.

NOTE: Put shop towels over the oil passages to prevent the valve keepers from falling into the cylinder head.

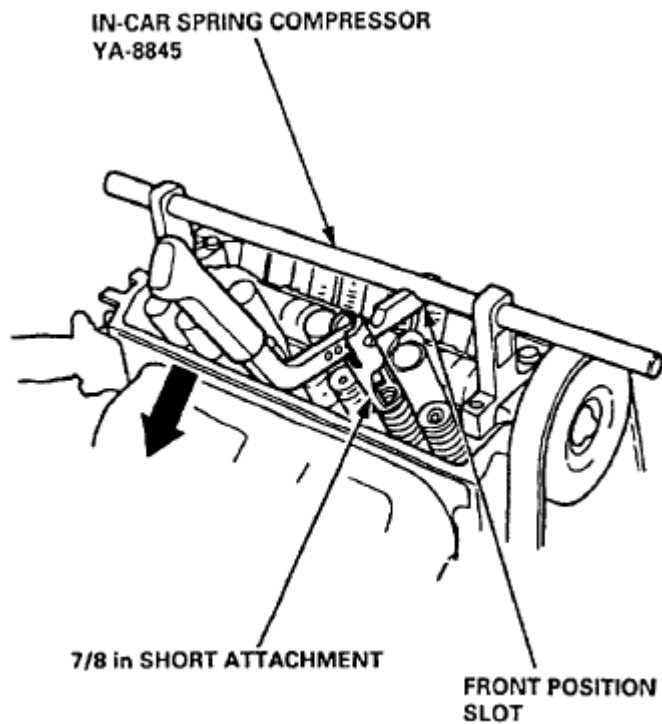


Fig. 28: Identifying Front Position Slot And In-Car Spring Compressor
Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Using a downward motion on the lever arm, compress the valve spring and remove the keepers from the valve stem. Slowly release pressure on the spring.
16. Remove the valve seals (see **VALVES, VALVE SPRINGS AND VALVE SEALS**).
17. Install the valve seals (see **VALVES**).
18. Install the springs, the retainers and the keepers in reverse order of removal.
19. Repeat steps 6 to 18 on the other cylinders.

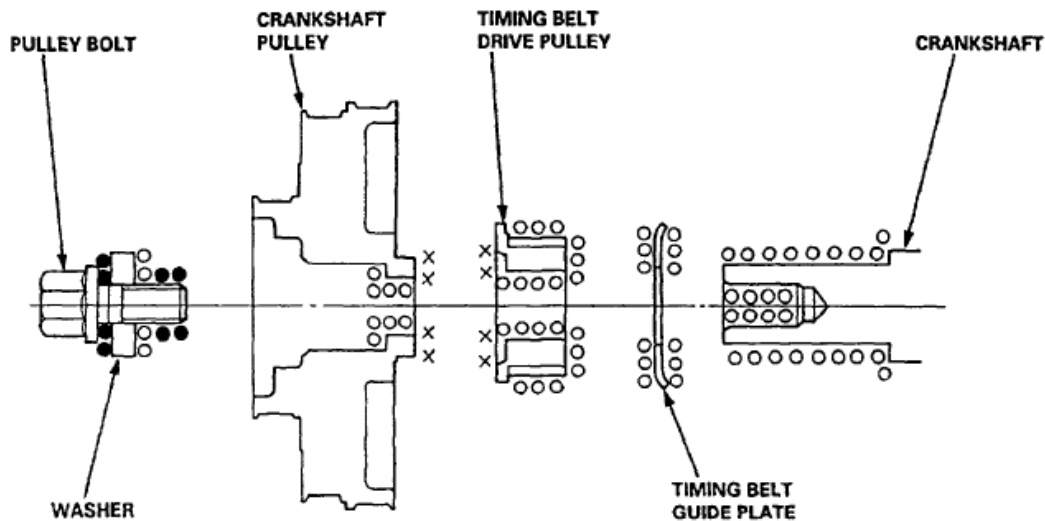
CRANKSHAFT PULLEY AND PULLEY BOLT

REPLACEMENT (1997 MODELS)

When installing and tightening the pulley, follow the procedure below.

Clean, remove any oil, and lubricate the points shown below.

- : Clean
- × : Remove any oil
- : Lubricate



Crankshaft pulley bolt size and torque value:

14 x 1.25 mm

181 N·m (18.5 kgf·m, 134 lbf·ft)

Fig. 29: Identifying Crankshaft Pulley, Timing Belt Drive Pulley, Crankshaft And Washer With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

Crankshaft pulley bolt size and torque value:

14 x 1.25 mm

181 N.m (18.5 kgf.m, 134 lbf.ft)

NOTE: Do not use an impact wrench when installing.

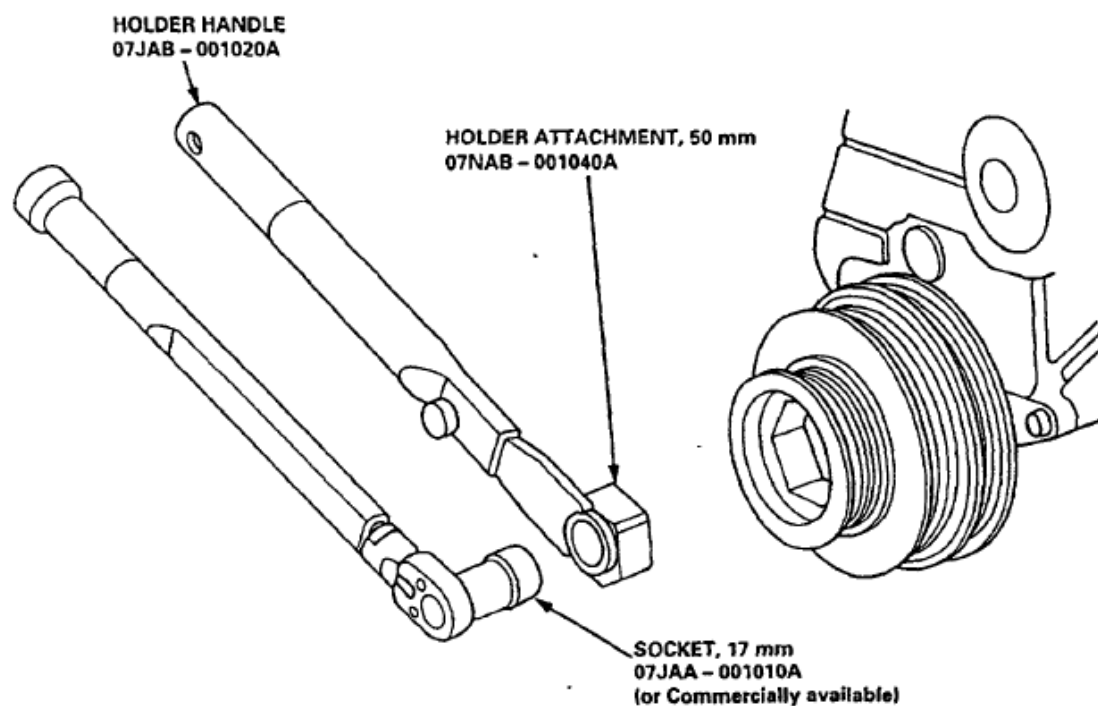


Fig. 30: Identifying Holder Attachment And Socket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REPLACEMENT (1998-2000 MODELS)

When installing and tightening the pulley, follow the procedure below.

Clean, remove any oil, and lubricate the points shown.

o: Clean

x: Remove any oil

•: Lubricate

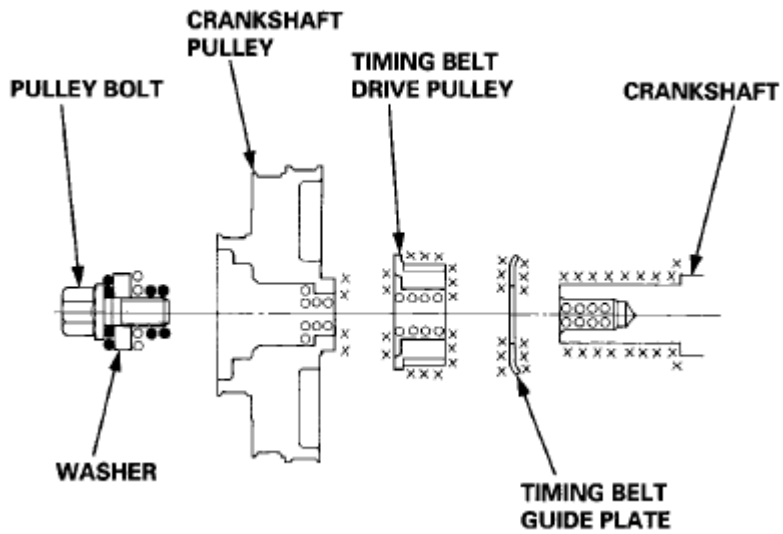


Fig. 31: Identifying Crankshaft Pulley And Pulley Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Crankshaft pulley bolt size and torque value:

14 x 1.25 mm

20 N.m (2.0 kgf.m, 14 lbf.ft) + 90°

NOTE: Do not use an impact wrench when installing.

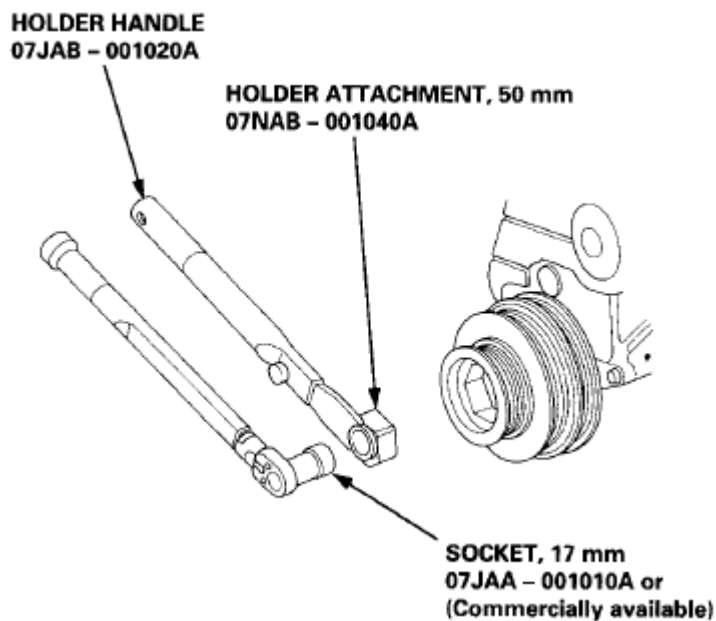


Fig. 32: Identifying Holder Attachment
Courtesy of AMERICAN HONDA MOTOR CO., INC.

1. Tighten the pulley bolt to the specified torque.

Torque: 20 N.m (2.0 kgf.m, 14 lbf.ft)

2. Use a felt tip pen to mark the pulley bolt head and washer.

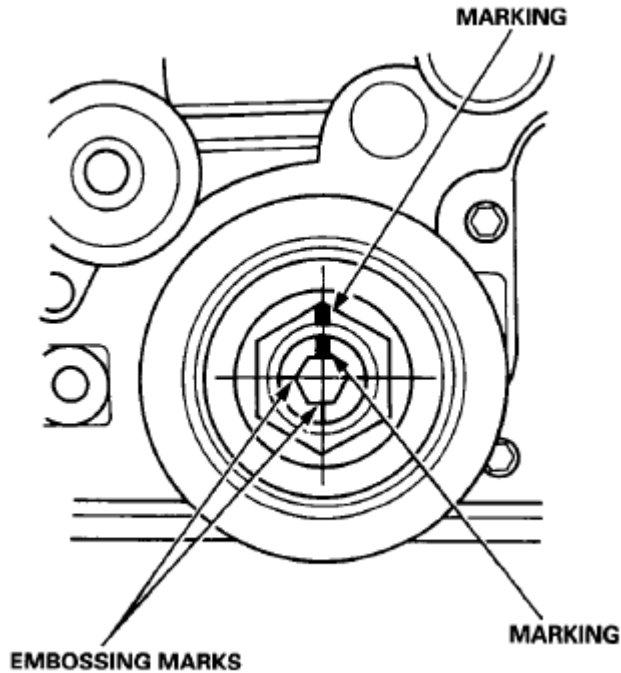


Fig. 33: Locating Embossing Marks And Marking
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Tighten the pulley bolt an additional 90°.

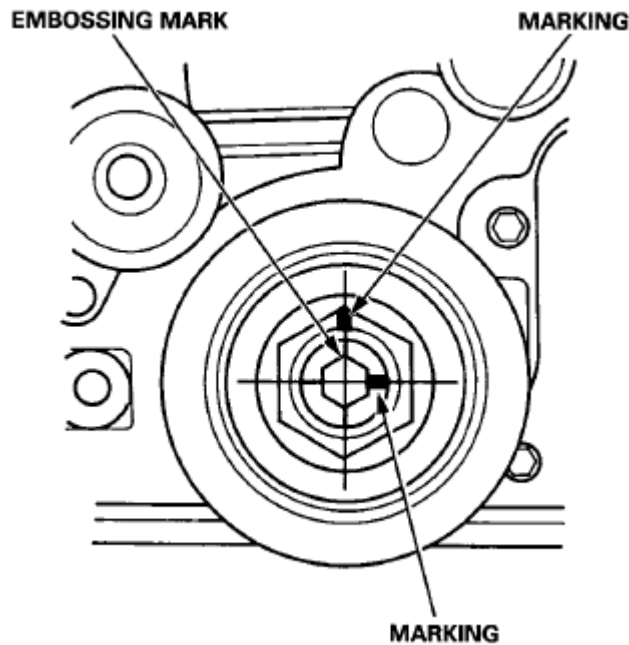


Fig. 34: Tightening Pulley Bolt An Additional 90°
Courtesy of AMERICAN HONDA MOTOR CO., INC.

TIMING BELT

ILLUSTRATED INDEX

NOTE:

- Refer to INSTALLATION for how to position the crankshaft and pulley before installing the belt.
- Mark the direction of rotation on the belt before removing it.
- Do not use the upper cover and lower cover to store removed items.
- Clean the upper cover and lower cover before installing them.
- Replace the camshaft seals and crankshaft seals if there is oil leakage.
- Refer to CRANKSHAFT PULLEY AND PULLEY BOLT before installing the timing belt.

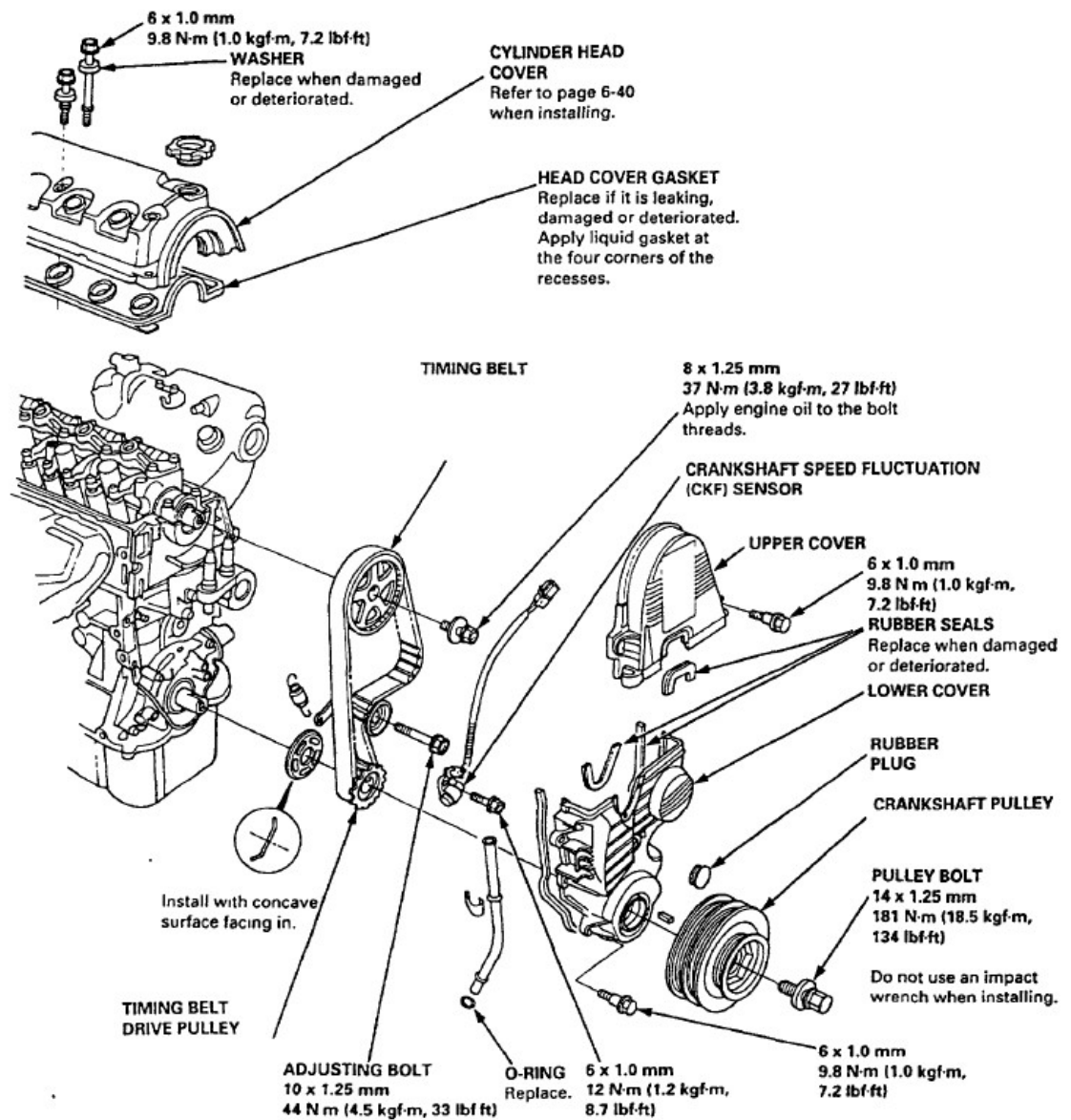


Fig. 35: Identifying Timing Belt Components With Torque Specification
Courtesy of AMERICAN HONDA MOTOR CO., INC.

INSPECTION

1. Remove the cylinder head cover.
 - Refer to **CYLINDER HEAD** when installing.
2. Remove the upper cover (see **REMOVAL**).
3. Inspect the timing belt for cracks and oil or coolant soaking.

NOTE:

- Replace the belt if it is oil or coolant soaked.
- Remove any oil or solvent that gets on the belt.

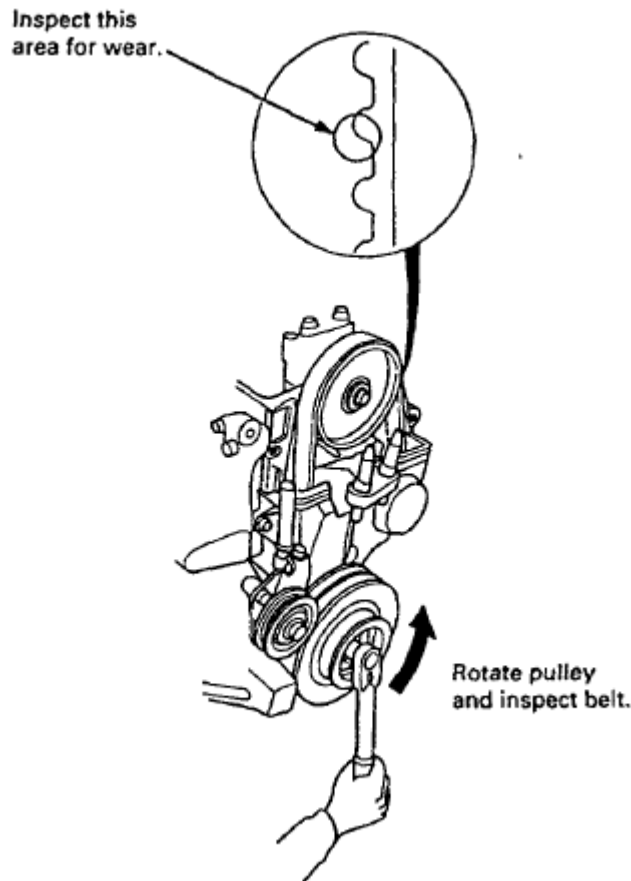


Fig. 36: Inspecting Timing Belt For Cracks And Oil Or Coolant Soaking
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. After inspecting, retorque the crankshaft pulley bolt to 181 N.m (18.5 kgf.m, 134 lbf.ft).

TENSION ADJUSTMENT

CAUTION: Always adjust the timing belt tension with the engine cold.

NOTE:

- The tensioner is spring-loaded to apply tension to the belt automatically after making the following adjustment.
- Always rotate the crankshaft counterclockwise when viewed from the pulley side. Rotating it clockwise may result in improper adjustment of the belt tension.
- Inspect the timing belt before adjusting the belt tension.

1. Remove the cylinder head cover.

- Refer to **CYLINDER HEAD** when installing.
- 2. Remove the upper cover (see **REMOVAL**).
- 3. Rotate the crankshaft five or six revolutions to set the belt.
- 4. Set the No. 1 piston at TDC (see **CRANKSHAFT SPEED FLUCTUATION (CKF) SENSOR**).
- 5. Loosen the adjusting bolt 180°.

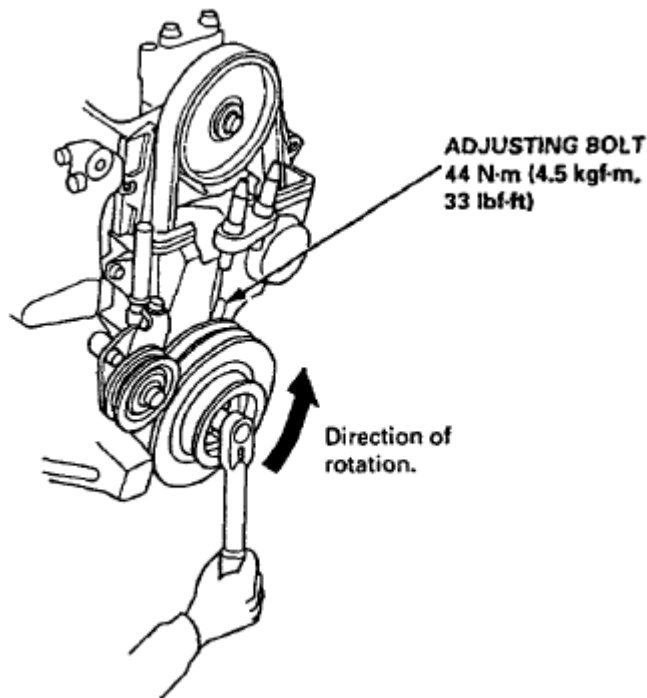


Fig. 37: Loosening Adjusting Bolt
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

- 6. Rotate the crankshaft counterclockwise three teeth on the camshaft pulley.
- 7. Tighten the adjusting bolt.
- 8. After inspecting, retorque the crankshaft pulley bolt to 181 N.m (18.5 kgf.m, 134 lbf.ft).

REMOVAL

CAUTION:

- Turn the crankshaft pulley so the No. 1 piston is at top dead center (TDC) before removing the belt (see **CRANKSHAFT SPEED FLUCTUATION (CKF) SENSOR**).
- Inspect the water pump before installing the timing belt (see **INSPECTION**).
- Replace the timing belt at 168,000 km according to the maintenance schedule (normal conditions/severe conditions).

If the vehicle is regularly driven in one or more of the following

conditions, replace the timing belt at 100,000 km.

In very high temperatures (over 110°F, 43°C)

In very low temperatures (under -20°F, -29°C)

NOTE: If the timing belt is going to be reused, mark the direction of rotation on the belt before removing it.

1. Remove the splash shield (see **REMOVAL**).
2. Loosen the mounting bolt and lock bolt, then remove the power steering (P/S) pump belt and pump.

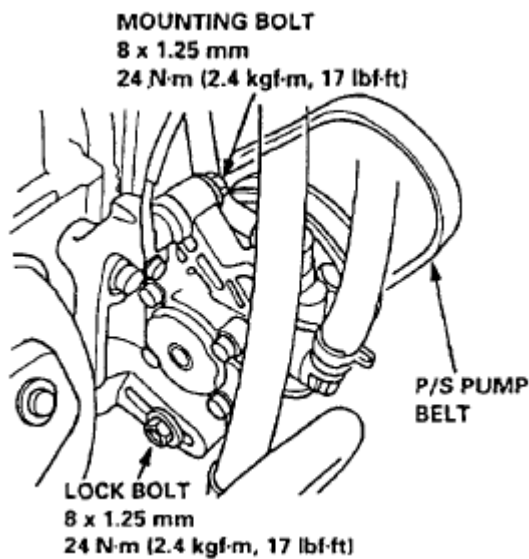


Fig. 38: Identifying Mounting Bolt, P/S Pump Belt And Lock Bolt With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Loosen the idler pulley center nut and adjusting bolt, then remove the air conditioning (A/C) compressor belt (see **REMOVAL**).
4. Loosen the mounting nut and lock bolt, then remove the alternator belt (see **REMOVAL**).
5. Remove the dipstick, then remove the upper cover and idler pulley bracket.

NOTE: Do not use the upper cover to store removed items.

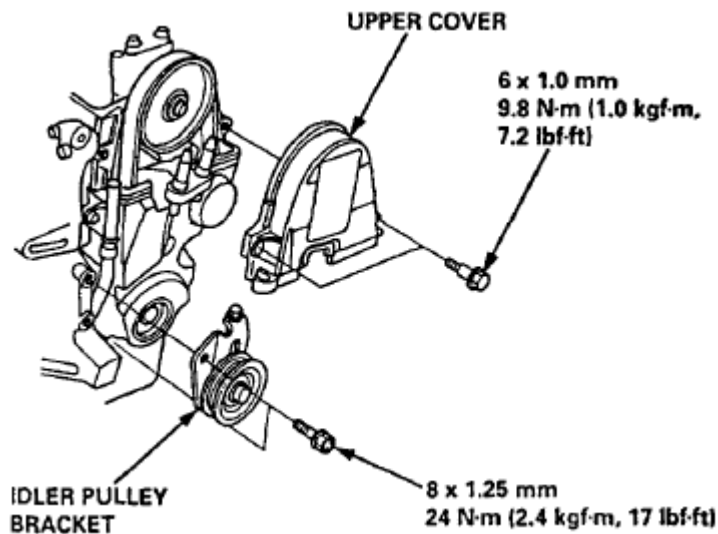


Fig. 39: Identifying Upper Cover And Idler Pulley Bracket With Torque Specifications
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the upper bracket (see ROCKER ARMS).

NOTE:

- Use a jack to support the engine before removing the upper bracket.
- Make sure to place a cushion between the oil pan and the jack.

7. Remove the crankshaft pulley (see CRANKSHAFT PULLEY AND PULLEY BOLT).
8. Remove the lower cover and dipstick tube.

NOTE:

Do not use the lower cover to store removed items.

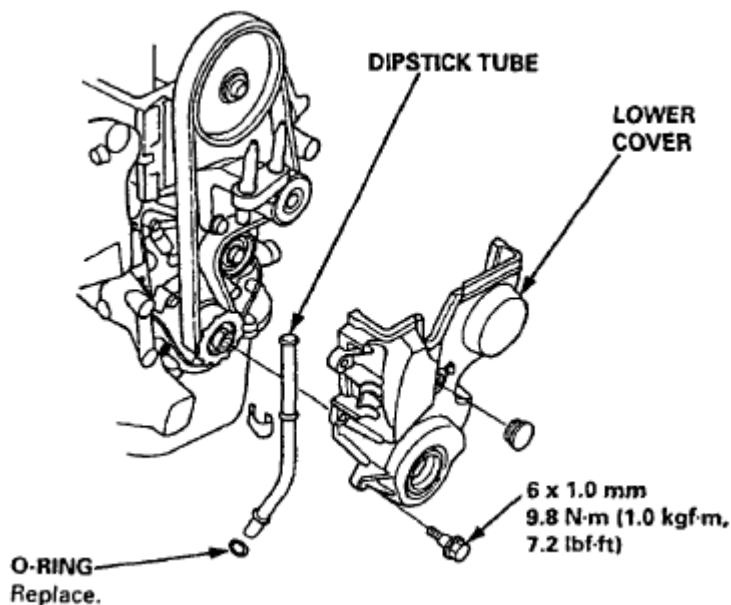


Fig. 40: Identifying Lower Cover, O-ring And Dipstick Tube With Torque Specifications
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Remove the CKF sensor from the oil pump.

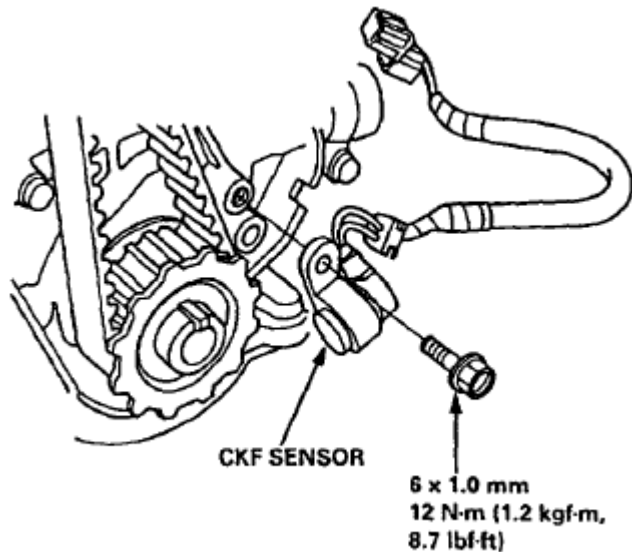


Fig. 41: Identifying CKF Sensor And Oil Pump With Torque Specifications
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Loosen the adjusting bolt 180°. Push the tensioner to remove tension from the timing belt, then retighten the adjusting bolt.

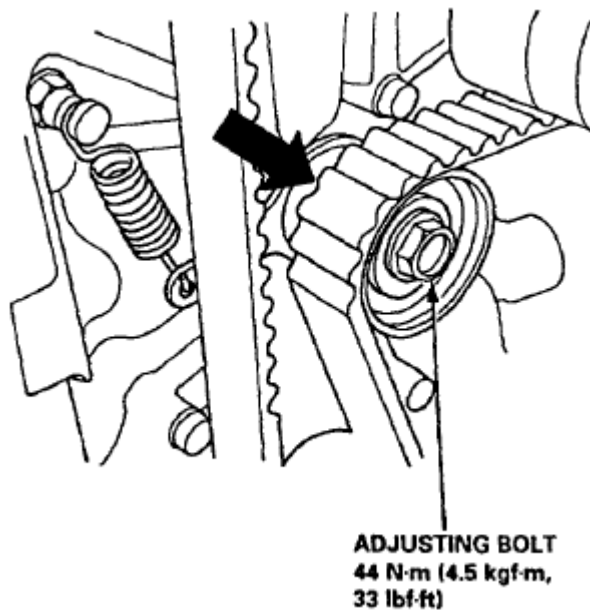


Fig. 42: Loosening Adjusting Bolt With Torque Specifications
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Remove the timing belt.

INSTALLATION

Install the timing belt in the reverse order of removal; Only key points are described here.

1. Set the timing belt drive pulley so that the No. 1 piston is at top dead center (TDC). Align the groove on the timing belt drive pulley to the pointer on the oil pump.

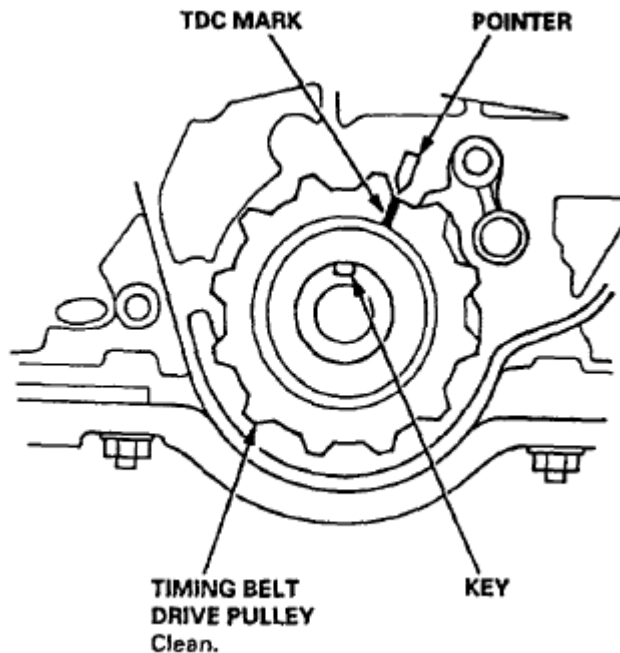


Fig. 43: Identifying TDC Mark, Pointer, Key And Timing Belt Drive Pulley
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Set the camshaft pulley to TDC. Align the TDC marks on the camshaft pulley to the cylinder head upper surface.

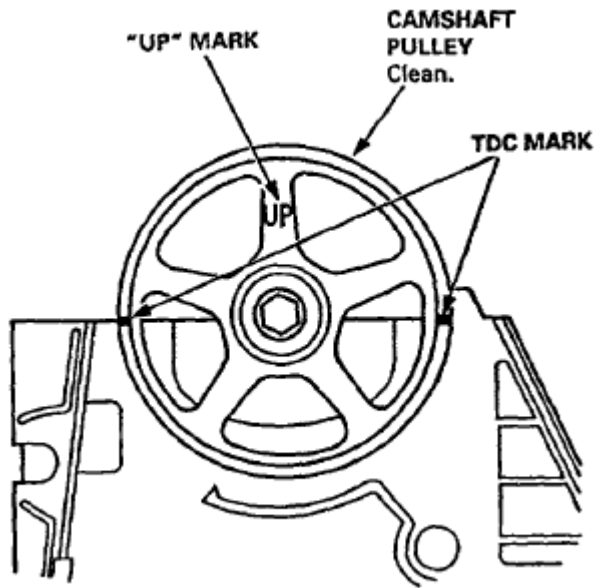


Fig. 44: Identifying Camshaft Pulley TDC Mark

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the timing belt tightly in the sequence shown. (1) Timing belt drive pulley (crankshaft) -->(2) Adjusting pulley -->(3) Water pump pulley -->(4) Camshaft pulley.

NOTE: Make sure the timing belt drive pulley and camshaft pulley are at TDC.

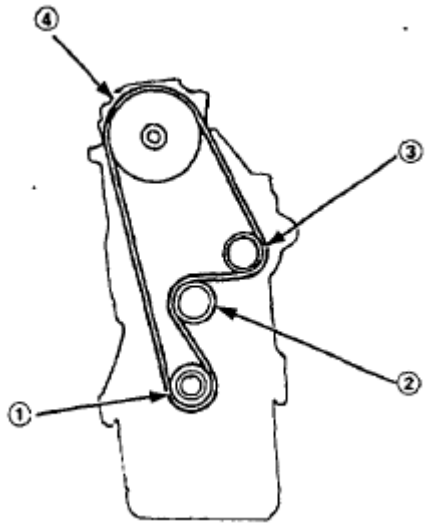


Fig. 45: Identifying Timing Belt Drive Pulley And Camshaft Pulley

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Loosen and retighten the adjusting bolt to tension the timing belt.
5. Install the lower cover and upper cover.

NOTE: Clean the upper and lower covers before installation.

6. Install the crankshaft pulley, then tighten the pulley bolt (see **CRANKSHAFT PULLEY AND PULLEY BOLT**).
7. Rotate the crankshaft pulley about five or six turns counterclockwise so that the timing belt positions on the pulleys.
8. Adjust the timing belt tension (see **TENSION ADJUSTMENT**).
9. Check that the crankshaft pulley and camshaft pulley are both at TDC.

CRANKSHAFT PULLEY:

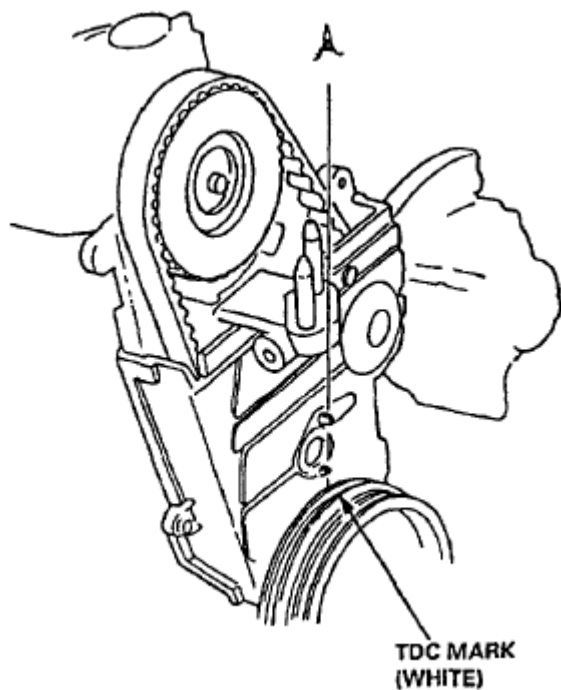


Fig. 46: Identifying Crankshaft Pulley And TDC Mark
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CAMSHAFT PULLEY:

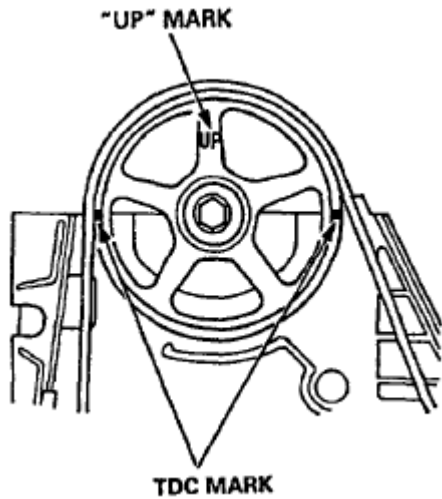


Fig. 47: Identifying Camshaft Pulley And TDC Mark
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. If the camshaft pulley is not positioned at TDC, remove the timing belt and adjust the position following the procedure **REMOVAL** on . Then reinstall the timing belt.
11. After installation, adjust the tension of each belt.
 - See **SECTION 4** for alternator belt tension adjustment.
 - See **SECTION 22** for A/C compressor belt tension adjustment.
 - See **SECTION 17** for P/S pump belt tension adjustment.

CRANKSHAFT SPEED FLUCTUATION (CKF) SENSOR

REPLACEMENT

1. Remove the cylinder head cover.

NOTE: Refer to **CYLINDER HEAD** when installing.

2. Remove the crankshaft pulley (see **CRANKSHAFT PULLEY AND PULLEY BOLT**).
3. Remove the upper cover and dipstick/tube (see **REMOVAL**).
4. Remove the lower cover and idler pulley bracket (see **REMOVAL**).
5. Disconnect the CKF sensor connector, then remove the CKF sensor.

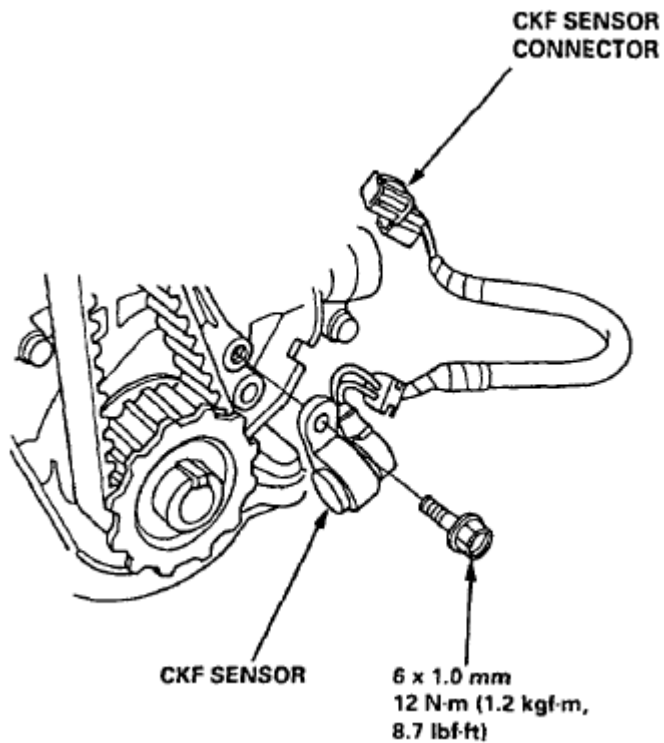


Fig. 48: Identifying CKF Sensor Connector And CKF Sensor
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Install the CKF sensor in reverse order of removal.

CYLINDER HEAD

ILLUSTRATED INDEX

CAUTION:

- To avoid damage, wait until the engine coolant temperature drops below 100°F (38°C) before removing the cylinder head.
- When handling a metal gasket, take care not to fold it or damage the contact surface.

NOTE:

Use new O-rings and gaskets when reassembling.

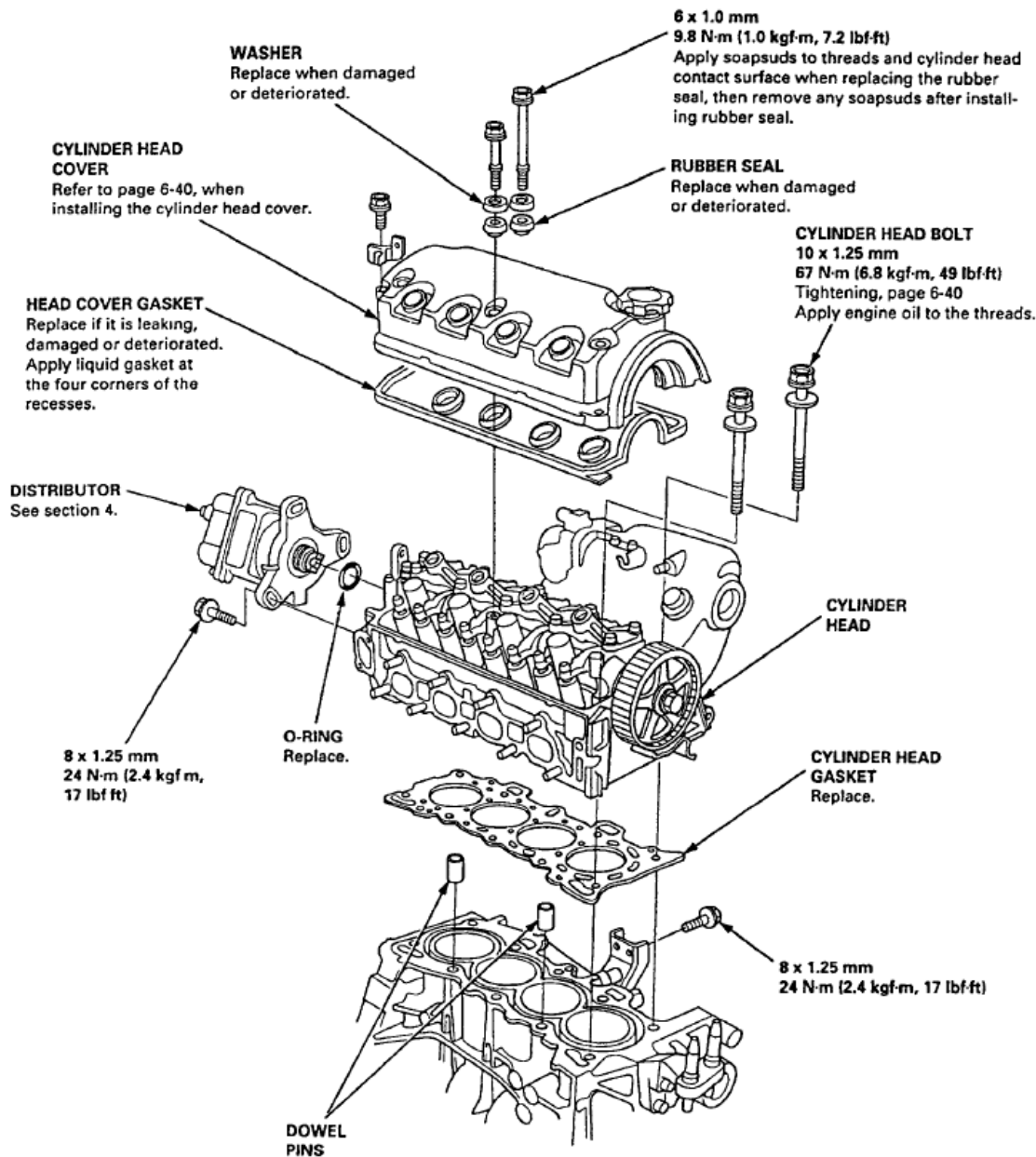


Fig. 49: Identifying Cylinder Head Components With Torque Specification (1 Of 2)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Prior to reassembling, clean all the parts in solvent, dry them and apply lubricant to any contact parts.

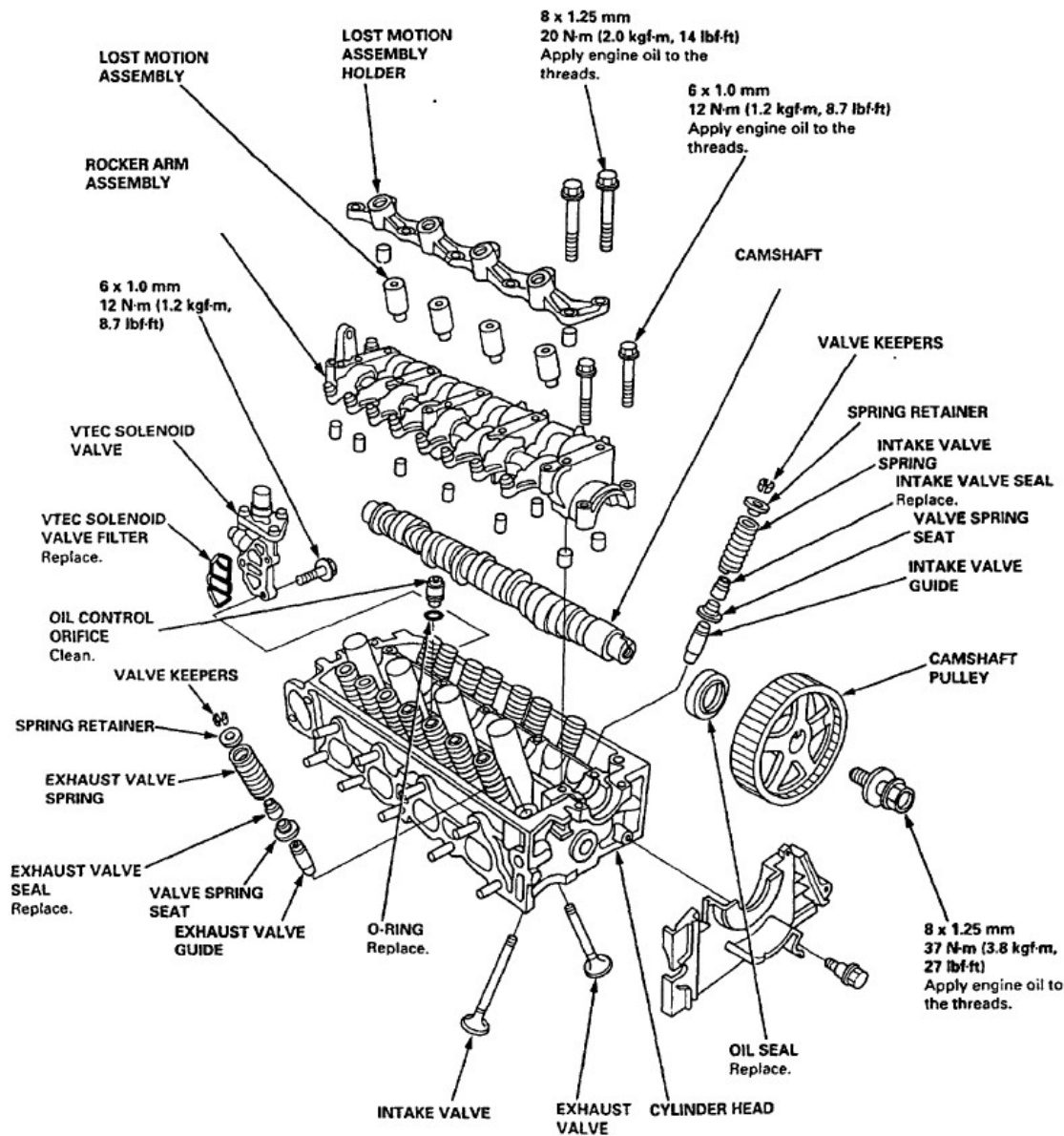


Fig. 50: Identifying Cylinder Head Components With Torque Specification (2 Of 2)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REMOVAL

Engine removal is not required for this procedure.

WARNING: Make sure jacks and safety stands are placed properly and hoist brackets are attached to the correct positions on the engine.

CAUTION:

- Use fender covers to avoid damaging painted surfaces.
- To avoid damage, unplug the wiring connectors carefully while holding the connector portion.
- To avoid damaging the cylinder head, wait until the engine coolant temperature drops below 100°F (38°C) before loosening the retaining bolts.

NOTE:

- Unspecified items are common.
 - Mark all wiring and hoses to avoid mis-connection. Also, be sure that they do not contact other wiring or hoses, or interfere with other parts.
 - Inspect the timing belt before removing the cylinder head.
 - Turn the crankshaft pulley so that the No. 1 piston is at top dead center (see CRANKSHAFT SPEED FLUCTUATION (CKF) SENSOR).
1. Make sure you have anti-theft code for the radio, then write down the frequencies for the radio's preset buttons.
 2. Disconnect the negative terminal from the battery.
 3. Drain the engine coolant (see ENGINE COOLANT REFILLING AND BLEEDING).
 - Remove the radiator cap to speed draining.
 4. Disconnect the intake air temperature (IAT) sensor connector, then remove the air cleaner housing.

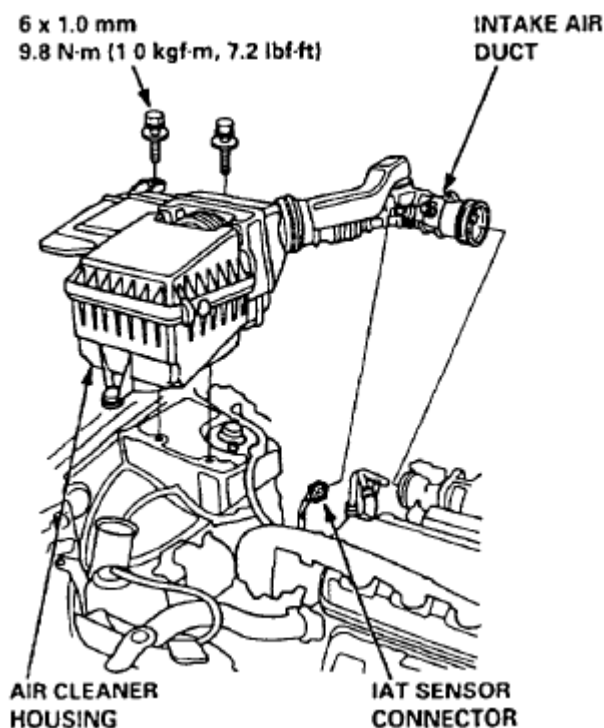


Fig. 51: Identifying Intake Air Temperature (IAT) Sensor Connector And Air Cleaner Housing With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Loosen the mounting bolt and lock bolt, then remove the power steering (P/S) pump belt and pump (see **REMOVAL**).
6. Loosen the idler pulley center nut and adjusting bolt, then remove the air conditioning (A/C) compressor belt (see **REMOVAL**).
7. Loosen the mounting nut and lock bolt, then remove the alternator belt.

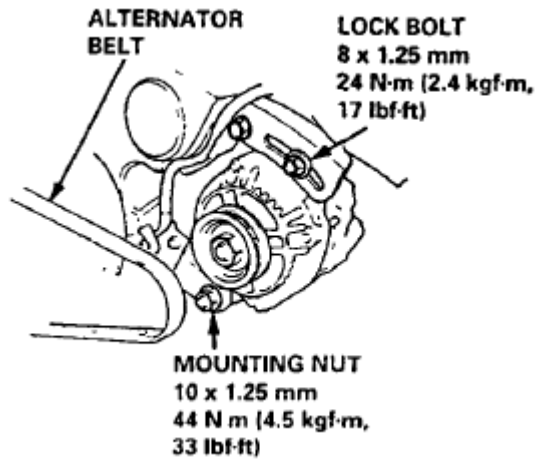


Fig. 52: Identifying Alternator Belt, Lock Nut And Mounting Nut With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Remove the P/S pump bracket (see **REMOVAL**).
9. Remove the throttle cable by loosening the locknut, then slip the cable end out of the throttle linkage.

NOTE:

- Take care not to bend the cable when removing it. Always replace any kinked cable with a new one.
- Adjust the throttle cable when installing (see **SECTION 11**).

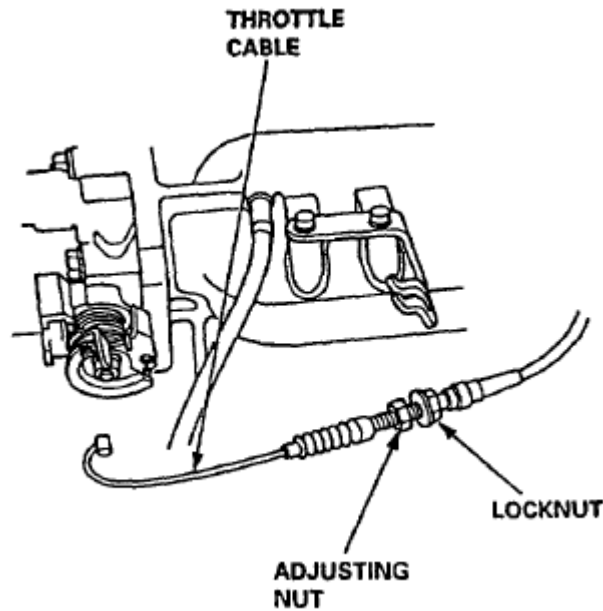


Fig. 53: Identifying Throttle Cable, Locknut And Adjusting Nut
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Relieve fuel pressure (see SECTION 11).

WARNING: Do not smoke while working on the fuel system. Keep open flame or spark away from the work area. Drain fuel only into an approved container.

11. Remove the evaporative emission (EVAP) control canister hose, fuel feed hose and breather hose.

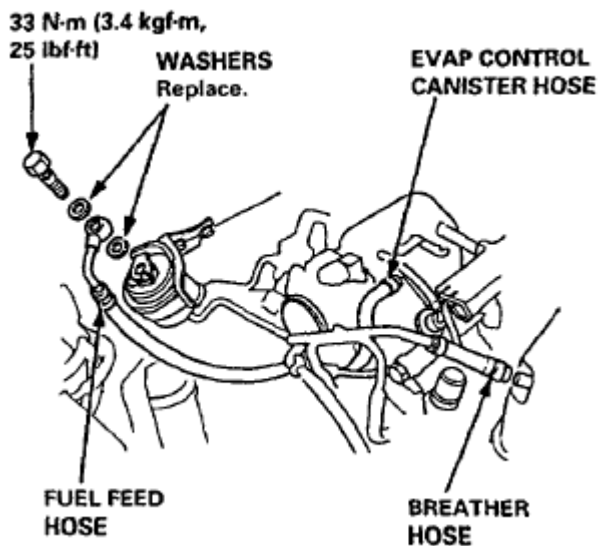


Fig. 54: Identifying EVAP Control Canister Hose, Fuel Feed Hose And Breather Hose With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Remove the brake booster vacuum hose, fuel return hose and vacuum hose (see **REMOVAL**).
13. Remove the water bypass hose and positive crank-case ventilation (PCV) hose.

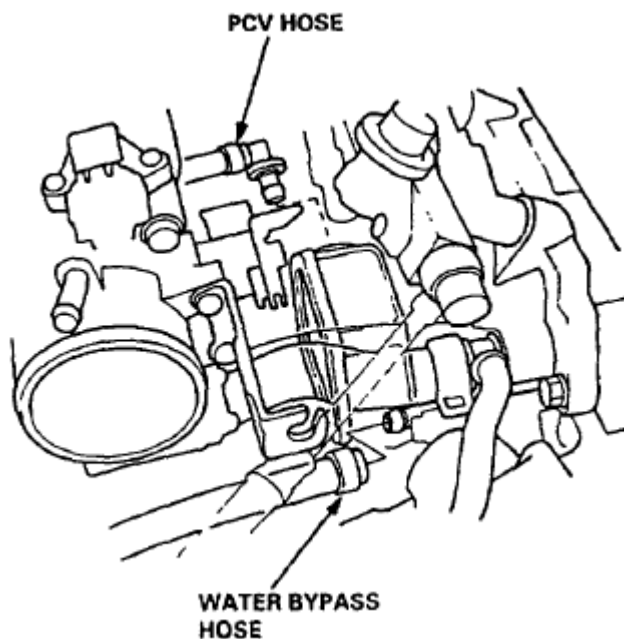


Fig. 55: Identifying Water Bypass Hose And Positive Crank-Case Ventilation (PCV) Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Remove the upper radiator hose, heater hose and water bypass hose.

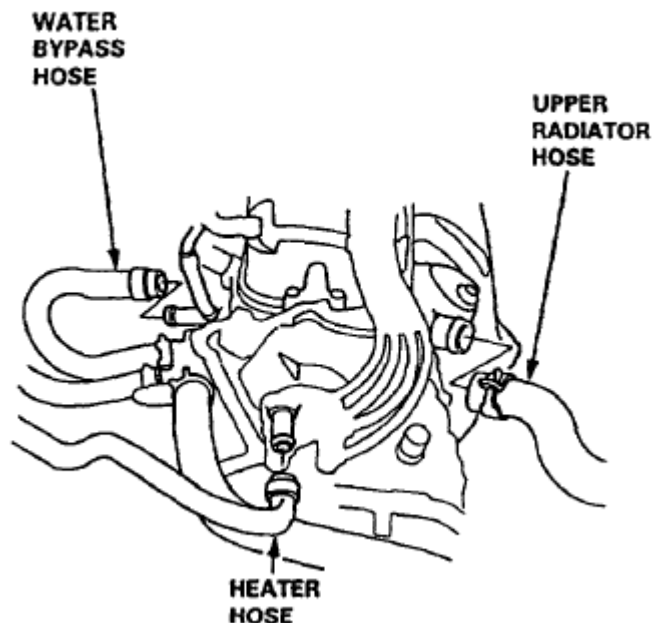


Fig. 56: Identifying Upper Radiator Hose, Heater Hose And Water Bypass Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Remove the engine wire harness connectors and wire harness clamps from the cylinder head and the intake manifold.
 - Four fuel injector connectors
 - Engine coolant temperature (ECT) sensor connector
 - ECT switch connector
 - ECT gauge sending unit connector
 - Throttle position sensor connector
 - Manifold absolute pressure (MAP) sensor connector
 - Primary heated oxygen sensor (primary HO2S) connector
 - Secondary heated oxygen sensor (secondary HO2S) connector
 - VTEC solenoid valve connector
 - VTEC pressure switch connector
 - Idle air control (IAC) valve connector
16. Remove the spark plug caps and distributor from the cylinder head.
17. Remove the upper bracket.

NOTE:

- Use a jack to support the engine before removing the upper bracket.
- Make sure to place a cushion between the oil pan and the jack.

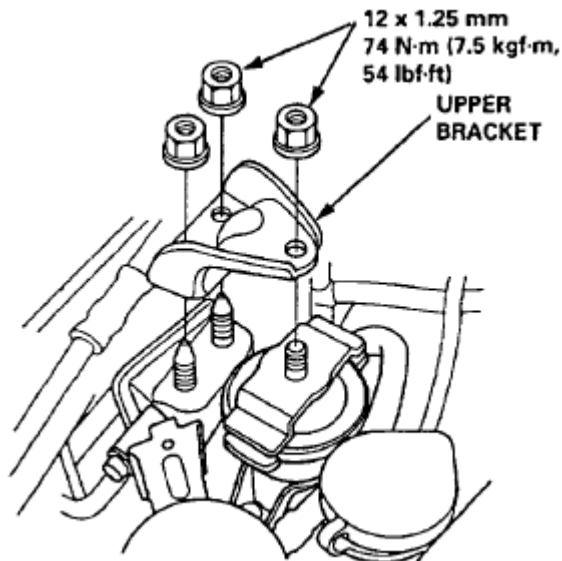


Fig. 57: Identifying Upper Bracket With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Remove the cylinder head cover.

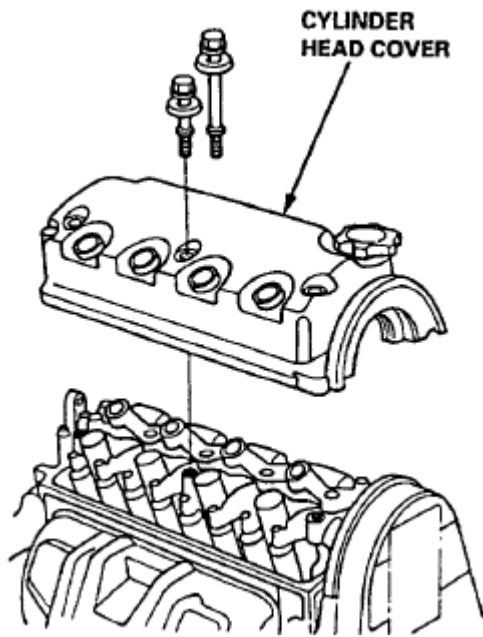


Fig. 58: Identifying Cylinder Head Cover

Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Remove the timing belt (see **REMOVAL**).
20. Remove the camshaft pulley.

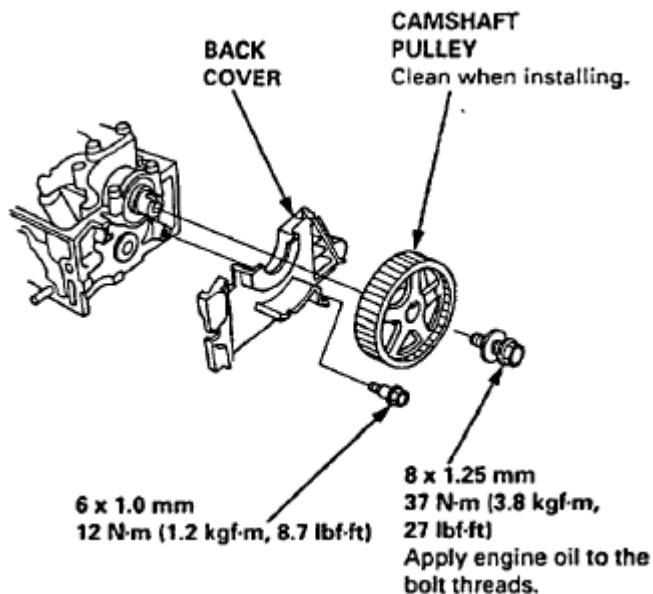


Fig. 59: Identifying Camshaft Pulley Components With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

21. Remove the exhaust manifold (see **REPLACEMENT**).
22. Remove the intake manifold (see **INTAKE MANIFOLD**).

23. Remove the cylinder head bolts, then remove the cylinder head.

CAUTION: To prevent warpage, unscrew the bolts in sequence 1/3 turn at a time; repeat the sequence until all the bolts are loosened.

CYLINDER HEAD BOLTS LOOSENING SEQUENCE:

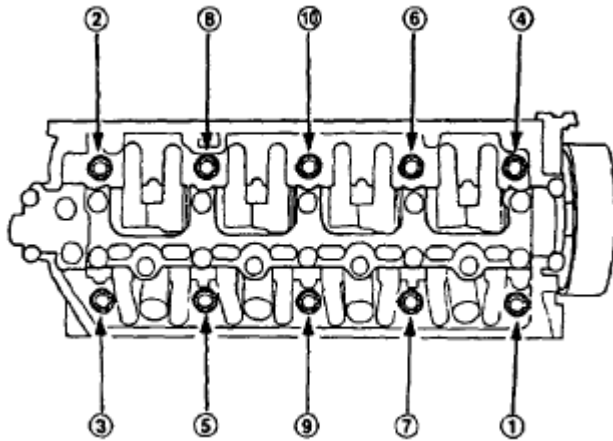


Fig. 60: Identifying Cylinder Head Bolts Loosening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARMS

REMOVAL

1. Loosen the adjusting screws.

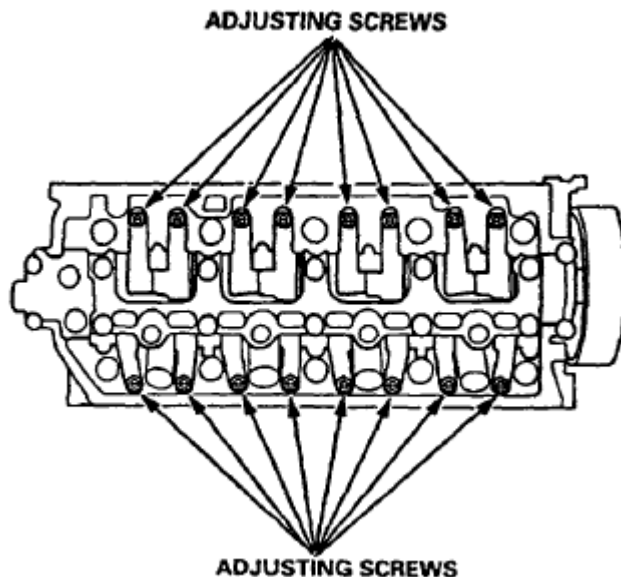


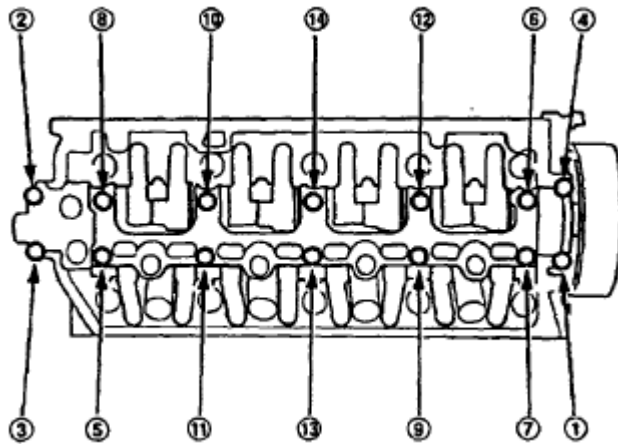
Fig. 61: Identifying Adjusting Screws

Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Unscrew the camshaft holder bolts, then remove the rocker arm assembly.

NOTE:

- Unscrew the camshaft holder bolts two turns at a time, in a crisscross pattern, to prevent damaging the valves or rocker arm assembly.
- When removing the rocker arm assembly, do not remove the camshaft holder bolts. The bolts will keep the camshaft holders, the springs and the rocker arms on the shaft.

CAMSHAFT HOLDER BOLTS LOOSENING SEQUENCE:**Fig. 62: Identifying Camshaft Holder Bolts Loosening Sequence**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

DISASSEMBLY/REASSEMBLY**NOTE:**

- Identify parts as they are removed to ensure reinstallation in original locations.
- Inspect rocker shafts and rocker arms (see ROCKER ARMS AND LOST MOTION ASSEMBLIES).
- Rocker arms must be installed in the same position if reused.
- When removing or installing the rocker arm assembly, do not remove the camshaft holder bolts. The bolts will keep the holders, springs and rocker arms on the shaft.

Prior to reassembling, clean all the parts in solvent, dry them and apply lubricant to any contact points.

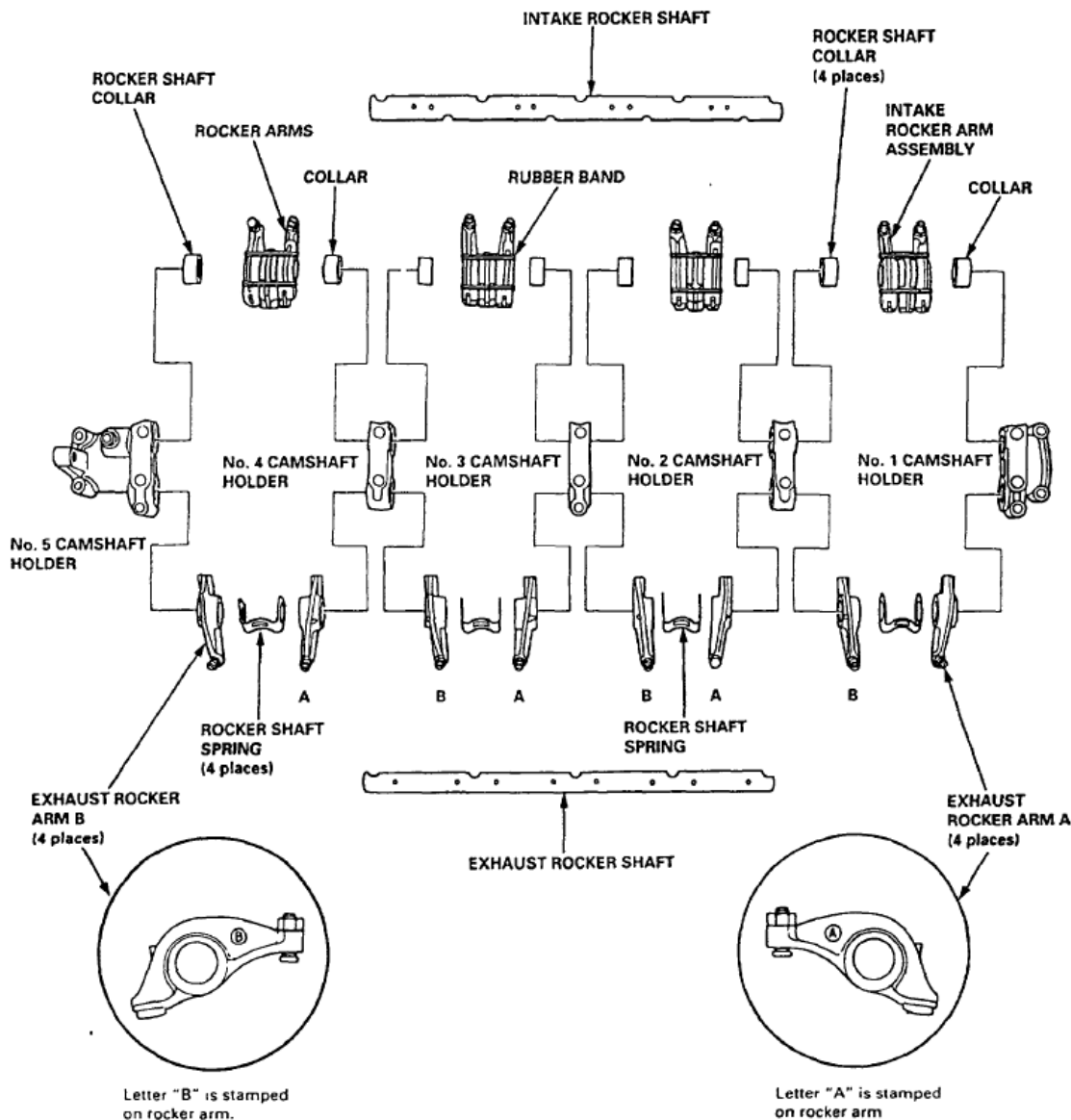


Fig. 63: Identifying Rocker Shaft Components
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARMS AND LOST MOTION ASSEMBLIES

INSPECTION

NOTE: When reassembling the primary rocker arm, carefully apply air pressure to the oil passage of the rocker arm.

1. Inspect the rocker arm piston. Push it manually.
 - If it does not move smoothly, replace the rocker arm assembly.

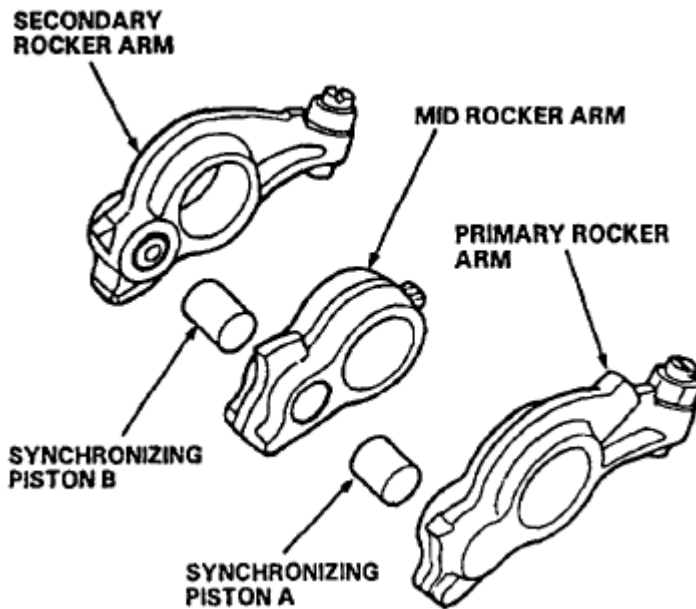


Fig. 64: Identifying Primary Rocker Arm, Secondary Rocker Arm And MID Rocker Arm
Courtesy of AMERICAN HONDA MOTOR CO., INC.

NOTE:

- Apply oil to the pistons when reassembling.
- Bundle the rocker arms with a band to prevent them from separating.

2. Remove the lost motion assembly from the holder and inspect it. Test it by pushing the plunger with your finger.
 - If the lost motion assembly plunger does not move smoothly, replace it.

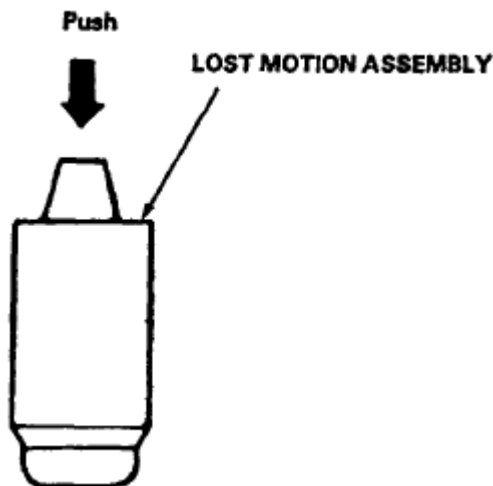


Fig. 65: Removing Lost Motion Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARMS AND SHAFTS

CLEARANCE INSPECTION

Measure both the intake rocker shaft and exhaust rocker shaft.

1. Measure the diameter of the shaft at the first rocker location.

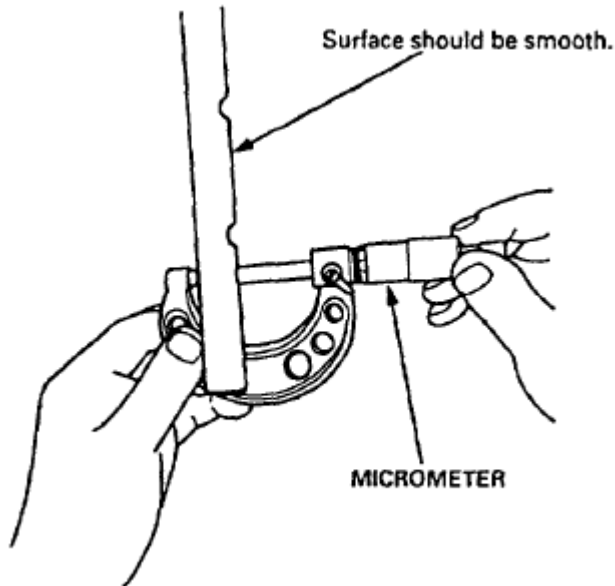


Fig. 66: Measuring Diameter Of Shaft First Rocker
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Zero the gauge to the shaft diameter.

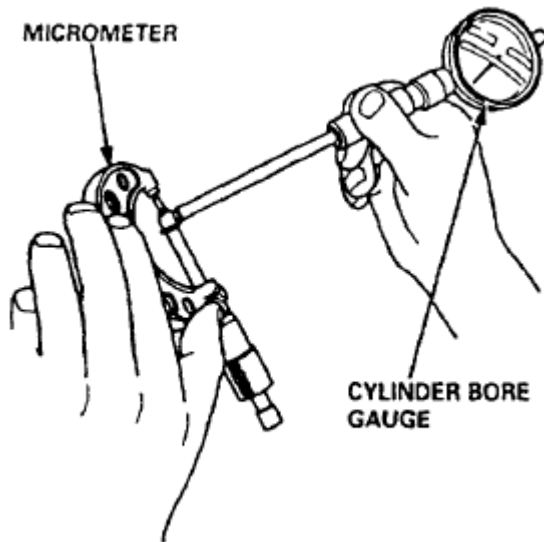


Fig. 67: Identifying Cylinder Gauge And Micrometer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Measure the inside diameter of the rocker arm and check for an out-of-round condition.

Rocker Arm-to-Shaft Clearance:**Standard (New):**

Intake: 0.017 - 0.050 mm (0.0007 - 0.0020 in)

Exhaust: 0.018 - 0.054 mm (0.0007 - 0.0021 in)

Service Limit: 0.08 mm (0.003 in)

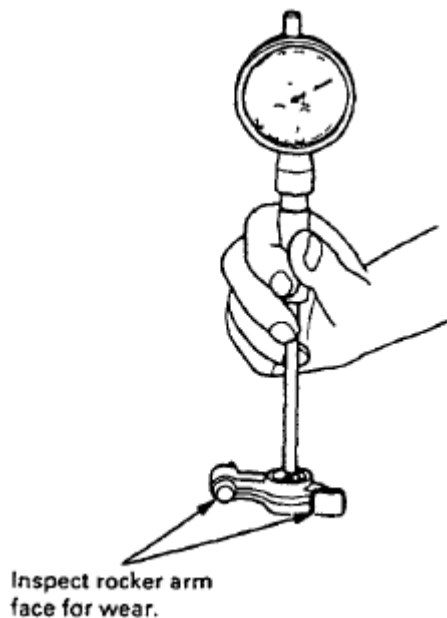


Fig. 68: Measuring Inside Diameter Of Rocker Arm
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Repeat these measurements on all the rockers.
 - If the clearance is over the service limit, replace the rocker shaft and all over-tolerance rocker arms.

CAMSHAFT

INSPECTION

NOTE:

- **Do not rotate the camshaft during inspection.**
- **Remove the rocker arms and rocker shafts.**

1. Put the camshaft and the camshaft holders on the cylinder head, then tighten the bolts to the specified torque.

Specified torque:

8 mm bolts: 20 N.m (2.0 kgf.m 14 lbf.ft)

Apply engine oil to the threads.

6 mm bolts: 12 N.m (1.2 kgf.m 8.7 lbf.ft)

Apply engine oil to the threads.

6 mm bolts: (11), (12), (13), (14)

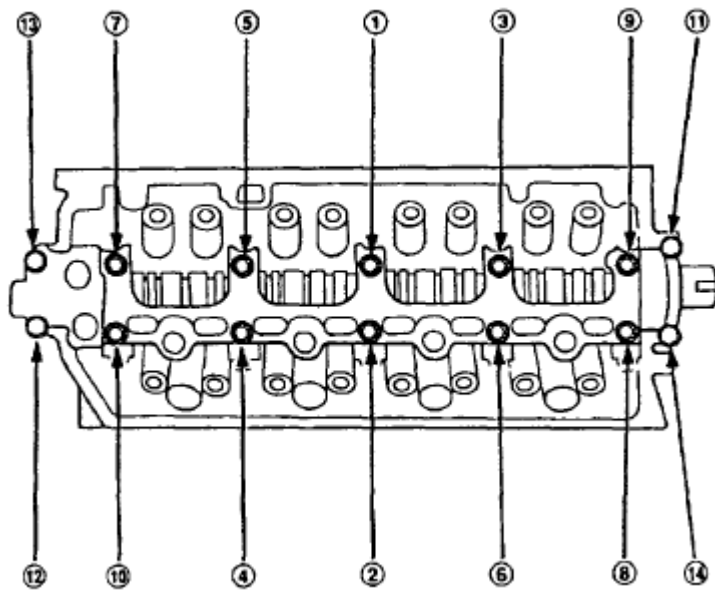


Fig. 69: Identifying Camshaft Bolt Tighten Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Seat the camshaft by pushing it toward the rear of the cylinder head.
3. Zero the dial indicator against the end of the camshaft. Push the camshaft back and forth, and read the end play.

Camshaft End Play:

Standard (New): 0.05 - 0.15 mm (0.002- 0.006 in)

Service Limit: 0.5 mm (0.02 in)

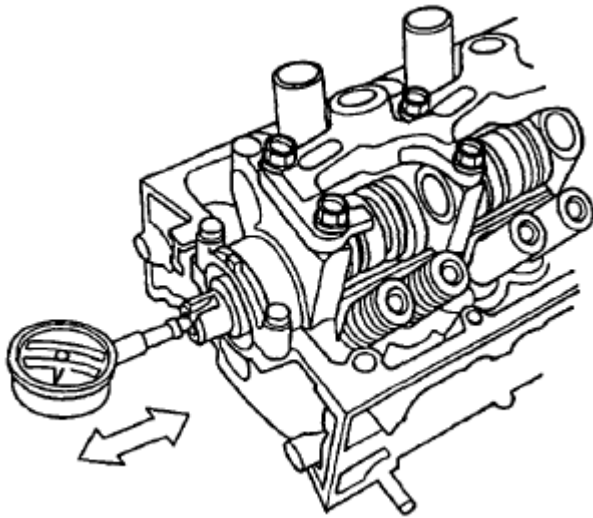


Fig. 70: Measuring Camshaft End Play

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the bolts, then remove the camshaft holders from the cylinder head.
5. Lift the camshaft out of the cylinder head, wipe it clean, then inspect the lift ramps. Replace the camshaft if any lobes are pitted, scored, or excessively worn.
6. Clean the camshaft bearing surfaces in the cylinder head, then set the camshaft back in place.
7. Place a plastigage strip across each journal.
8. Install the camshaft holders, and tighten the bolts to the specified torque.
9. Remove the camshaft holders, then measure the widest portion of the plastigage on each journal.

Camshaft-to-Holder Oil Clearance:

Standard (New): 0.050- 0.089 mm (0.002 - 0.004 in)

Service Limit: 0.15 mm (0.006 in)

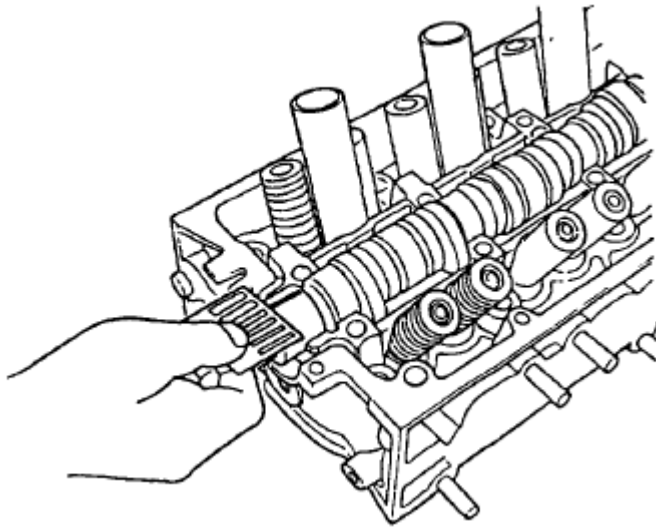


Fig. 71: Measuring Widest Portion Of Plastigage On Journal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. If the camshaft-to-holder oil clearance is out of tolerance:
- And the camshaft has already been replaced, you must replace the cylinder head.
 - If the camshaft has not been replaced, first check the total runout with the camshaft supported on V-blocks.

Camshaft Total Runout:

Standard (New): 0.03 mm (0.001 in) max.

Service Limit: 0.04 mm (0.002 in)

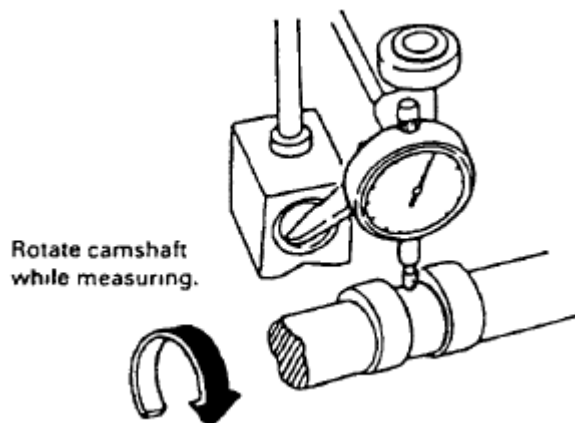


Fig. 72: Checking Camshaft Total Runout
Courtesy of AMERICAN HONDA MOTOR CO., INC.

- If the total runout of the camshaft is within tolerance, replace the cylinder head.

- If the total runout is out of tolerance, replace the camshaft and recheck. If the bearing clearance is still out of tolerance, replace the cylinder head.

11. Check the cam lobe height wear.

Cam lobe height standard (New)

STANDARD SPECIFICATION

Unit mm (in)		
	INTAKE	EXHAUST
PRI	37.065 (1.4592)	38.008 (1.4964)
MID	38.274 (1.5068)	
SEC	36.778 (1.4479)	

PRI: Primary cam lobe, SEC: Secondary cam lobe
 MID: Mid cam lobe, T/B: Timing belt
 IN: Intake, EX: Exhaust

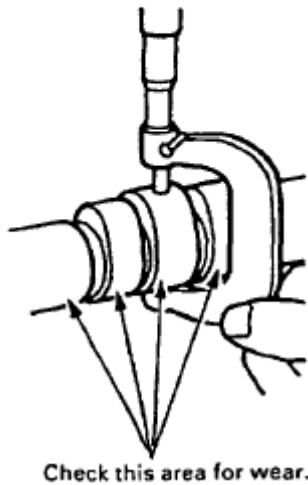
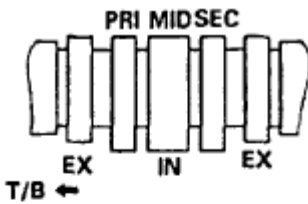


Fig. 73: Checking Cam Lobe Height Wear
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVES, VALVE SPRINGS AND VALVE SEALS

REMOVAL

NOTE: Index the valves and valve springs as they are removed so that each item can

be reinstalled in its original position.

1. Using an appropriate-sized socket and plastic mallet, lightly tap the valve retainer to loosen the valve keepers before installing the valve spring compressor.

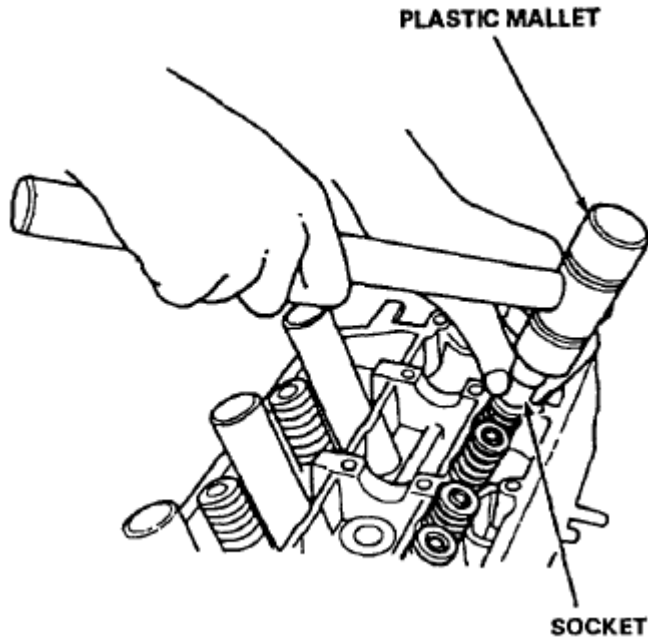
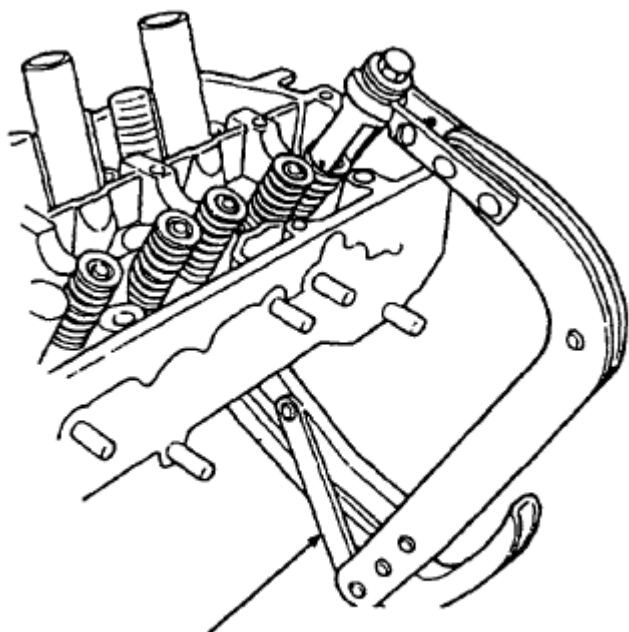


Fig. 74: Loosening Valve Using Valve Retainer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Install the spring compressor. Compress the spring and remove the valve keeper.



VALVE SPRING COMPRESSOR
Snap-on CF711 or KD-383
with #32 JAWS

Fig. 75: Compressing Spring And Remove Valve Keeper
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the valve guide seal remover.

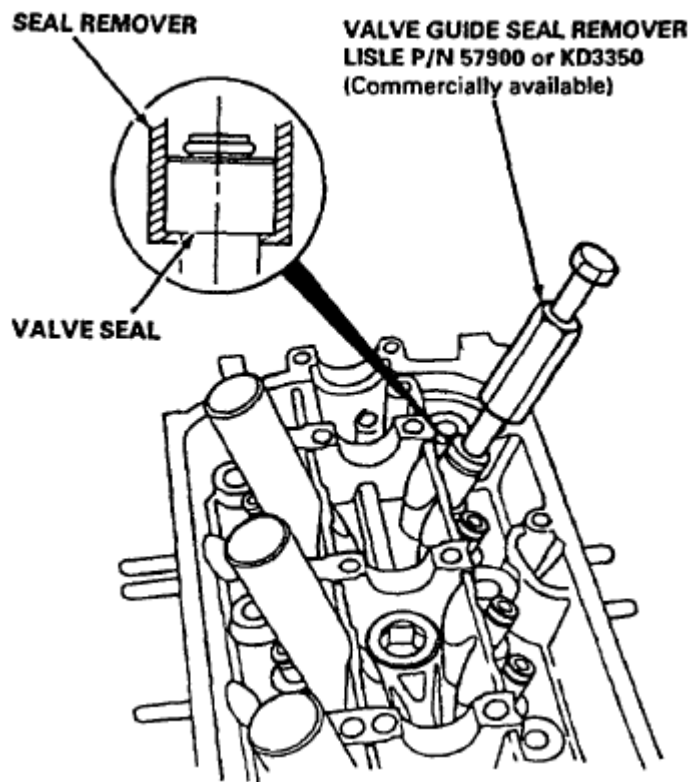


Fig. 76: Installing Valve Guide Seal Remover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the valve seal.

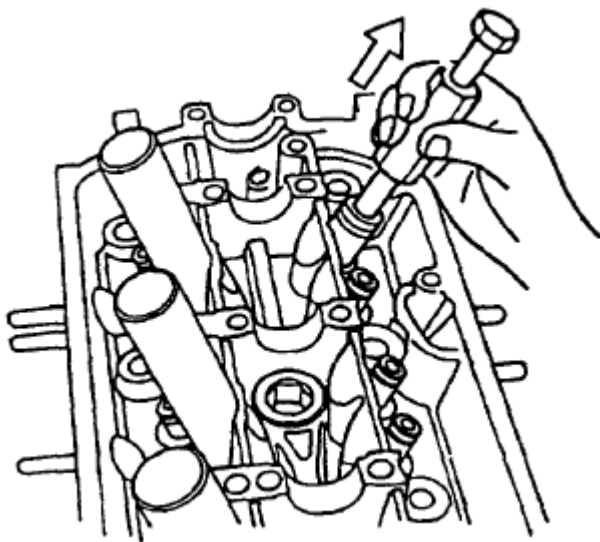


Fig. 77: Removing Valve Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

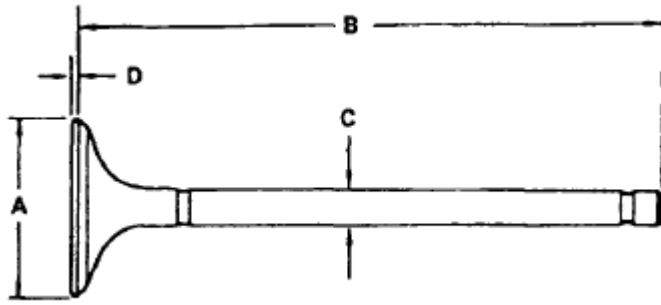


Fig. 78: Identifying Intake Valve Dimensions
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Intake Valve Dimensions

A Standard (New): 29.9 - 30.1 mm (1.18-1.19 in)

B Standard (New): 117.42-117.72 mm (4.623 - 4.635 in)

C Standard (New): 5.48 - 5.49 mm (0.2157-0.2161 in)

C Service Limit: 5.45 mm (0.2146 in)

D Standard (New): 0.85-1.15 mm (0.033-0.045 in)

D Service Limit: 0.65 mm (0.026 in)

Exhaust Valve Dimensions

A Standard (New): 25.9 - 26.1 mm (1.02 - 1.03 in)

B Standard (New): 114.60-114.90 mm (4.512 - 4.524 in)

C Standard (New): 5.45-5.46 mm (0.2146 - 0.2150 in)

C Service Limit: 5.42 mm (0.2134 in)

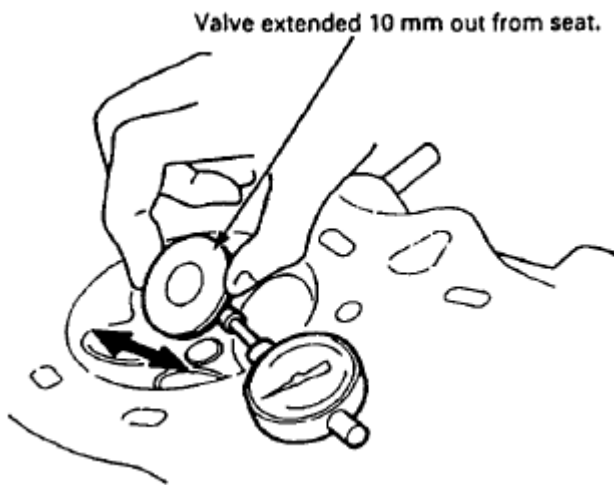
D Standard (New): 1.05-1.35 mm (0.041 - 0.053 in)

D Service Limit: 0.95 mm (0.037 in)

VALVE GUIDES

VALVE MOVEMENT

Measure the guide-to-stem clearance with a dial indicator while rocking the stem in the direction of normal thrust (wobble method).

Intake Valve Stem-to-Guide Clearance:**Standard (New): 0.04 - 0.10 mm (0.002-0.004 in)****Service Limit: 0.16 mm (0.006 in)****Exhaust Valve Stem-to-Guide Clearance:****Standard (New): 0.10-0.16 mm (0.004-0.006 in)****Service Limit: 0.22 mm (0.009 in)****Fig. 79: Measuring Guide-To-Stem Clearance Using Dial Indicator****Courtesy of AMERICAN HONDA MOTOR CO., INC.**

- If the measurement exceeds the service limit, recheck using a new valve.
- If the measurement is now within the service limit, reassemble using a new valve.
- If the measurement still exceeds the limit, recheck using the alternate method below, then replace the valve and guide, if necessary.

NOTE: An alternate method of checking guide to stem clearance is to subtract the O.D. of the valve stem, measured with a micrometer, from the I.D. of the valve guide, measured with an inside micrometer or ball gauge. Take the measurements in three places along the valve stem and three places inside the valve guide. The difference between the largest guide measurement and the smallest stem measurement should not exceed the service limit.

Intake Valve Stem-to-Guide Clearance:**Standard (New): 0.02 - 0.05 mm (0.001 - 0.002 in)****Service Limit: 0.08 mm (0.003 in)**

Exhaust Valve Stem-to-Guide Clearance:**Standard (New): 0.05 - 0.08 mm (0.002 - 0.003 in)****Service Limit: 0.11 mm (0.004 in)****CYLINDER HEAD****WARPAGE**

NOTE: If the camshaft-to-holder oil clearances (see CAMSHAFT) are not within specification, the cylinder head cannot be resurfaced.

If the camshaft-to-holder oil clearances are within specifications, check the cylinder head for warpage.

- If warpage is less than 0.05 mm (0.002 in), cylinder head resurfacing is not required.
- If warpage is between 0.05 mm (0.002 in) and 0.2 mm (0.008 in), resurface the cylinder head.
- Maximum resurface limit is 0.2 mm (0.008 in) based on a height of 93 mm (3.66 in).

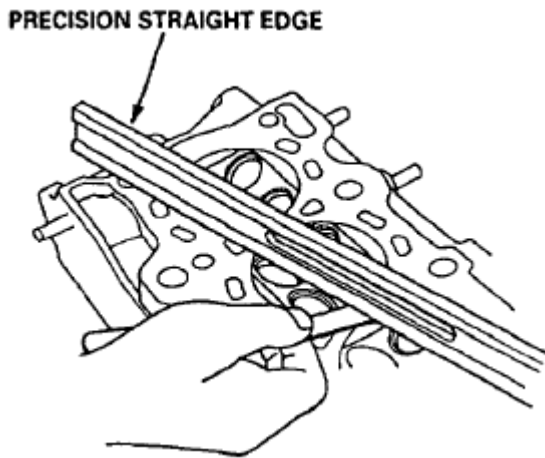
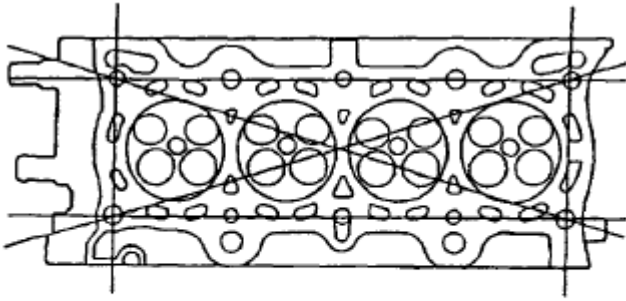


Fig. 80: Checking Cylinder Head For Warpage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Measure along edges, and three ways across center.

**Cylinder Head Height:**

Standard (New): 92.95 - 93.05 mm
(3.659 - 3.663 in)

Fig. 81: Caution For Cylinder Head Height

Courtesy of AMERICAN HONDA MOTOR CO., INC.

Cylinder Head Height:

Standard (New): 92.95 - 93.05 mm (3.659 - 3.663 in)

VALVE SEATS**RECONDITIONING**

1. Renew the valve seats in the cylinder head using a valve seat cutter.

NOTE: If the guides are worn (see **VALVE GUIDES**), replace them (see **VALVE GUIDES**) before cutting the valve seats.

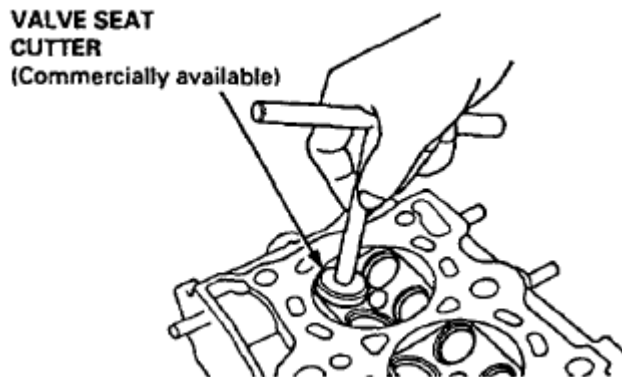


Fig. 82: Removing Valve Seats In Cylinder Head

Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Carefully cut a 45° seat, removing only enough material to ensure a smooth and concentric seat.
3. Bevel the upper edge of the seat with the 30° cutter and the lower edge of the seat with the 60° cutter. Check the width of the seat and adjust accordingly.

4. Make one more very light pass with the 45° cutter to remove any possible burrs caused by the other cutters.

Valve Seat Width:**Standard (New):**

Intake: 0.85-1.15 mm (0.033 - 0.045 in)

Exhaust: 1.25 - 1.55 mm (0.049 - 0.061 in)

Service Limit:

Intake: 1.6 mm (0.063 in)

Exhaust: 2.0 mm (0.079 in)

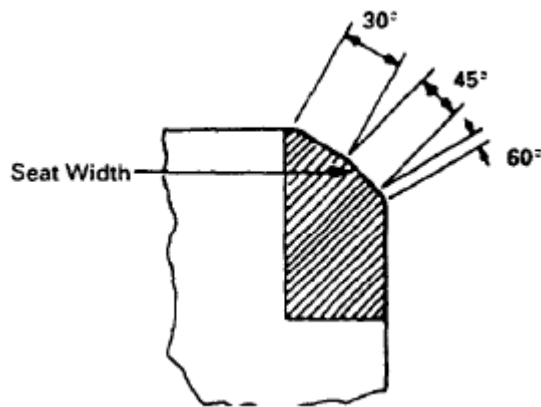


Fig. 83: Identifying Valve Seat Width

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. After resurfacing the seat, inspect for even valve seating: Apply Prussian Blue compound to the valve face, and insert the valve in its original location in the head, then lift and snap it closed again the seat several times.

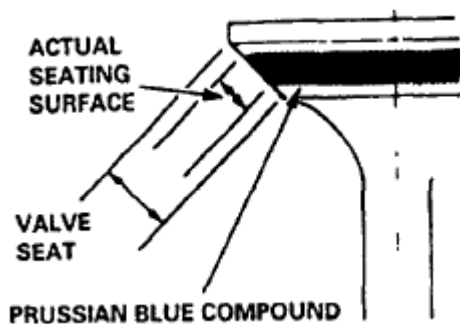


Fig. 84: Identifying Actual Seating Surface And Valve Seat

Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. The actual valve seating surface, as shown by the blue compound, should be centered on the seat.
 - If it is too high (closer to the valve stem), you must make a second cut with the 60° cutter to move it down, then one more cut with the 45° cutter to restore seat width.
 - If it is too low (closer to the valve edge), you must make a second cut with the 30° cutter to move it up, then one more cut with the 45° cutter to restore seat width.

NOTE: The final cut should always be made with the 45° cutter.

7. Insert the intake and exhaust valves in the head and measure the valve stem installed height.

Intake, Exhaust Stem Installed Height:

Standard (New): 53.17 - 53.64 mm (2.093-2.112 in)

Service Limit: 53.89 mm (2.122 in)

8. If the valve stem installed height is over the service limit, replace the valve and recheck. If it is still over the service limit, replace the cylinder head; the valve seat in the head is too deep.

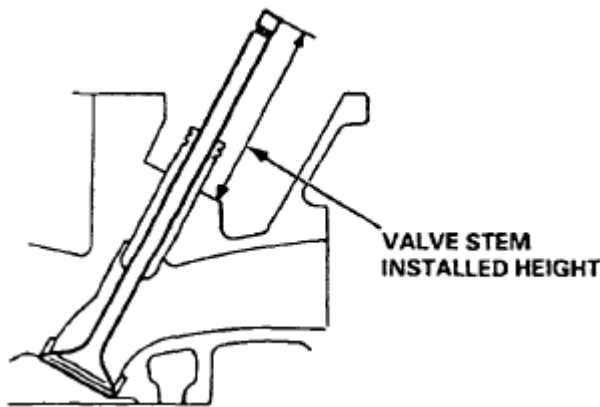


Fig. 85: Identifying Valve Stem Installed Height
Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVE GUIDES

REPLACEMENT

1. As illustrated below, use a commercially-available air-impact valve guide driver attachment modified to fit the diameter of the valve guides. In most cases, the same procedure can be done using the special tool and a conventional hammer.

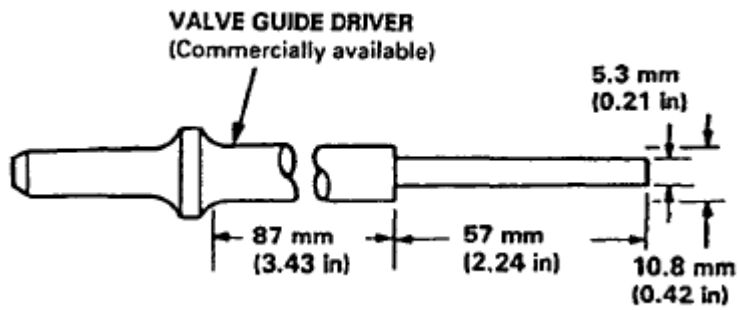


Fig. 86: Identifying Valve Guides Dimension

Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Select the proper replacement guides, and chill them in the freezer section of a refrigerator for about an hour.
3. Use a hot plate or oven to evenly heat the cylinder head to 300°F (150°C). Monitor the temperature with a cooking thermometer.

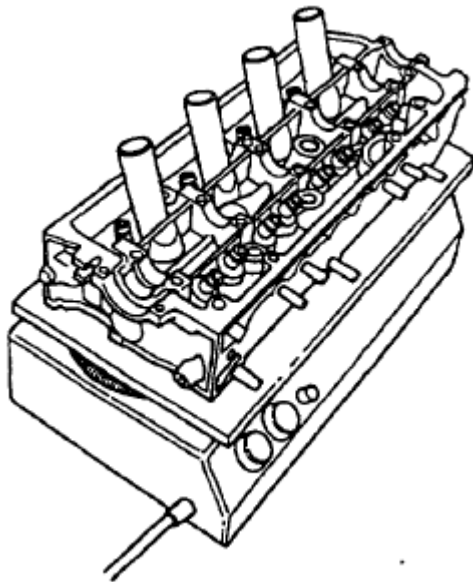


Fig. 87: Heating Cylinder Head

Courtesy of AMERICAN HONDA MOTOR CO., INC.

CAUTION:

- Do not use a torch; it may warp the head.
- Do not get the head hotter than 300°F (150°C): excessive heat may loosen the valve seats.
- To avoid burns, use heavy gloves when handling the heated cylinder head.

4. Working from the camshaft side, use the driver and an air hammer to drive the guide about 2 mm (0.1 in) towards the combustion chamber. This will knock off some of the carbon and make removal easier.

CAUTION:

- Always wear safety goggles or a face shield when driving valve guides.
- Hold the air hammer directly in line with the valve guide to prevent damaging the driver.

5. Turn the head over, and drive the guide out toward the camshaft side of the head.

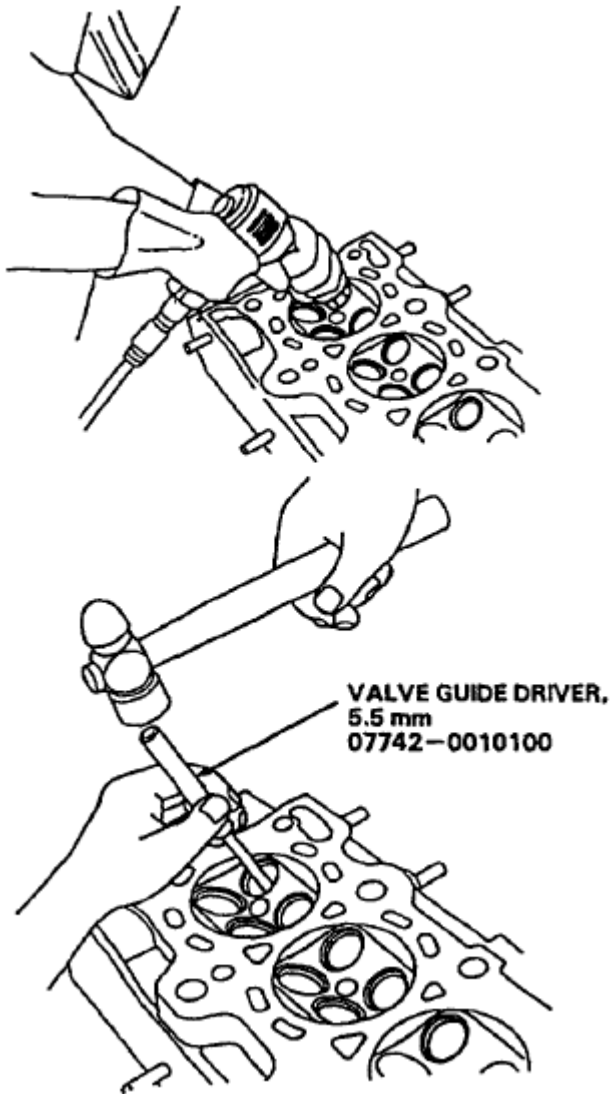


Fig. 88: Tapping Valve Guide Driver

Courtesy of AMERICAN HONDA MOTOR CO., INC.

If a valve guide still won't move, drill it out with a 8 mm (5/16 in) bit, then try again.

CAUTION: Drill guides only in extreme cases; you could damage the cylinder head if the guide breaks.

6. Remove the new guides from the freezer, one at a time, as you need them.
7. Apply a thin coat of clean engine oil to the outside of the new valve guide. Install the guide from the camshaft side of the head; use the special tool to drive the guide in to the specified installed height. If you have all 16 guides to do, you may have to reheat the head.

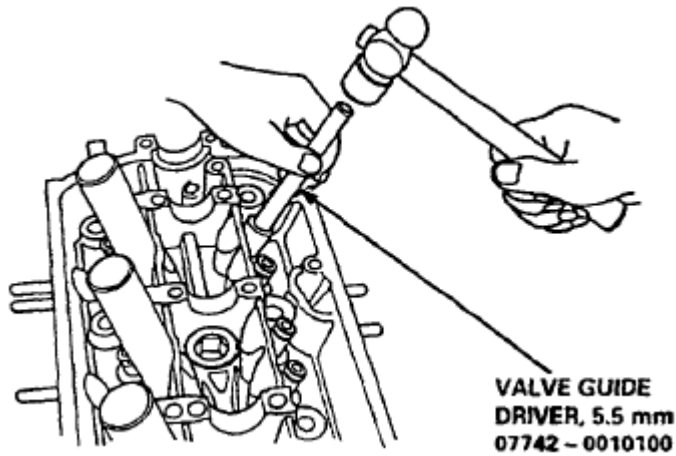


Fig. 89: Removing Guides From Freezer

Courtesy of AMERICAN HONDA MOTOR CO., INC.

Valve Guide Installed Height:

Intake: 17.85 - 18.35 mm (0.703 - 0.722 in)

Exhaust: 18.65 - 19.15 mm (0.734 - 0.754 in)

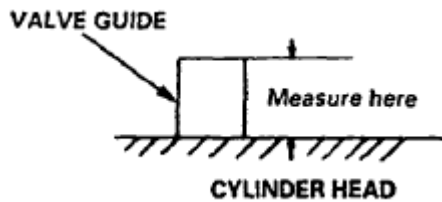


Fig. 90: Identifying Valve Guide Installed Height

Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAMING

NOTE: For new valve guides only.

1. Coat both the reamer and valve guide with cutting oil.
2. Rotate the reamer clockwise the full length of the valve guide bore.
3. Continue to rotate the reamer clockwise while removing it from the bore.
4. Thoroughly wash the guide in detergent and water to remove any cutting residue.

5. Check the clearance with a valve (see **VALVE GUIDES**). Verify that the valve slides in the valve guide without exerting pressure.

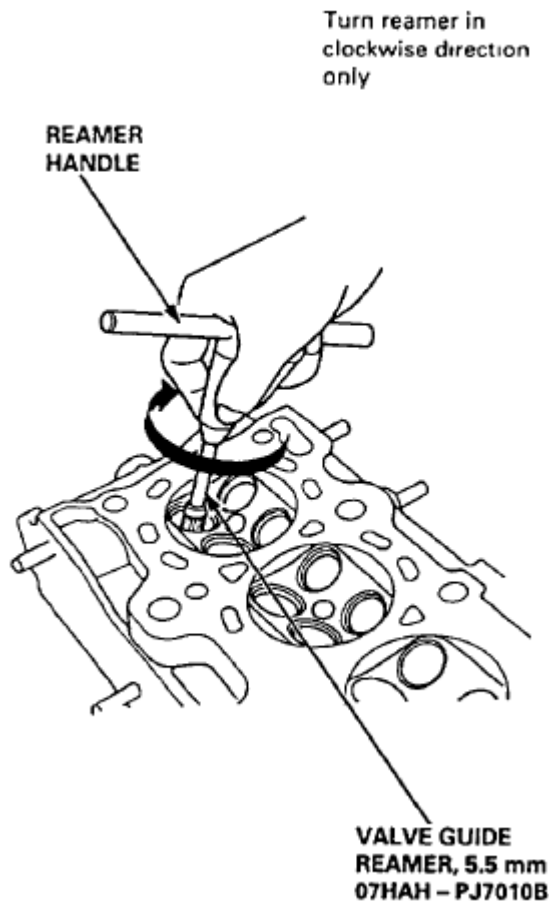


Fig. 91: Rotating Reamer Clockwise

Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVES

INSTALLATION

1. Coat the valve stems with engine oil. Insert the valves in the valve guides.

NOTE: Make sure the valves move up and down smoothly.

2. Install the spring seats on the cylinder head.
3. Install the valve seals using the valve guide seal installer.

NOTE: Exhaust and intake valve seals are not interchangeable.

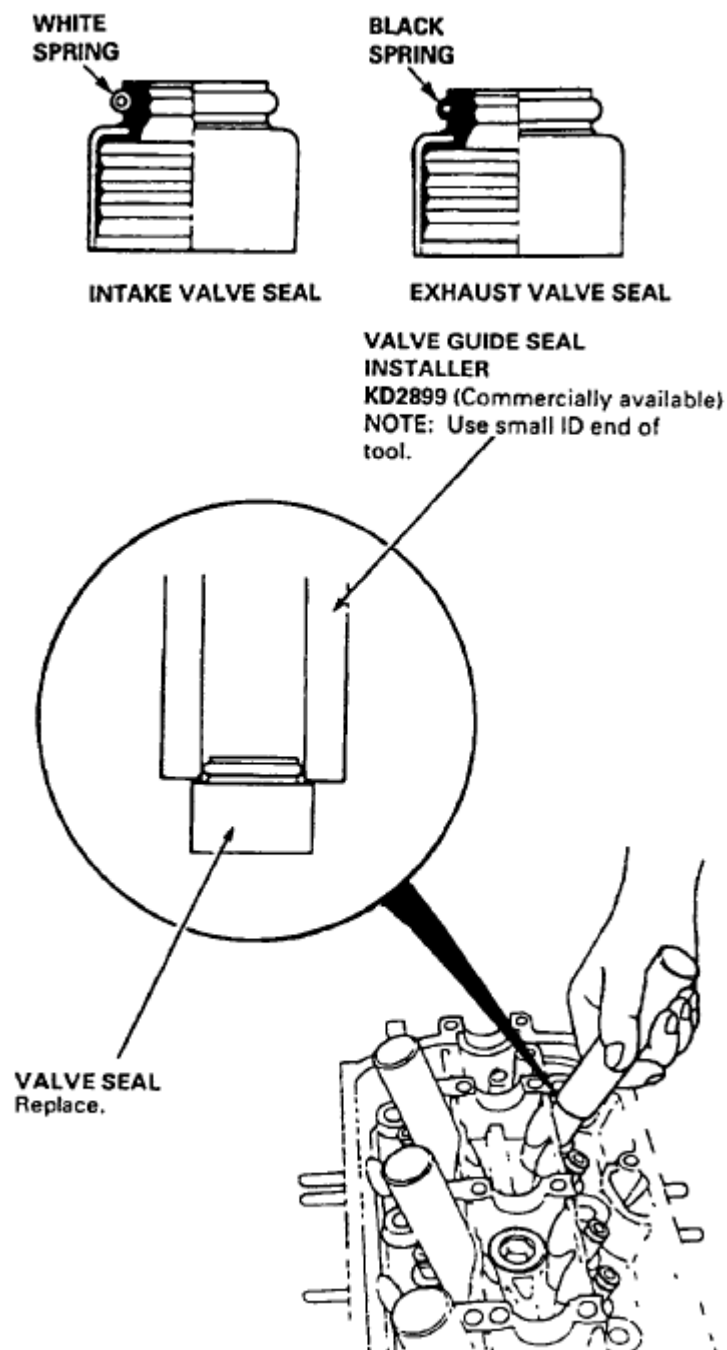
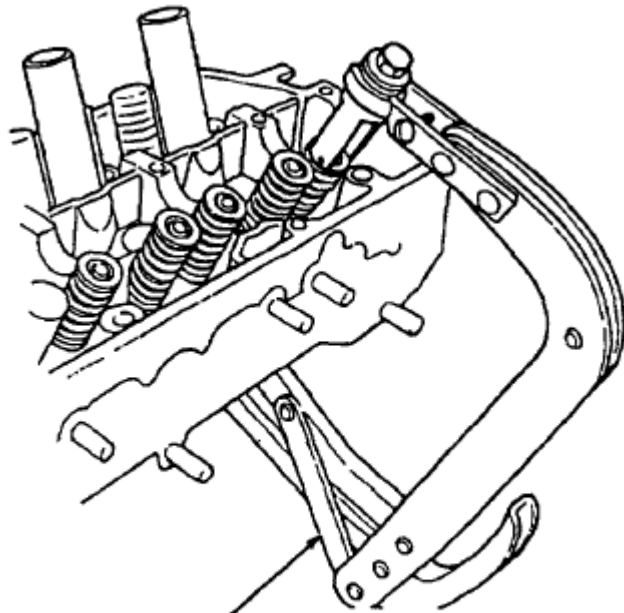


Fig. 92: Identifying Intake Valve Seal And Exhaust Valve Seal
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Install the valve spring and valve retainer, then install the valve spring compressor. Compress the spring and install the valve keepers.

NOTE: Place the end of the valve spring with closely wound coils toward the cylinder head.



VALVE SPRING COMPRESSOR
(Commercially available)
Snap-on CF711 or KD - 383
with #32 JAWS

Fig. 93: Compressing Spring And Install Valve Keepers

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Lightly tap the end of each valve stem two or three times with a plastic mallet to ensure proper seating of the valve and valve keepers.

NOTE: Tap the valve stem only along its axis so you do not bend the stem.

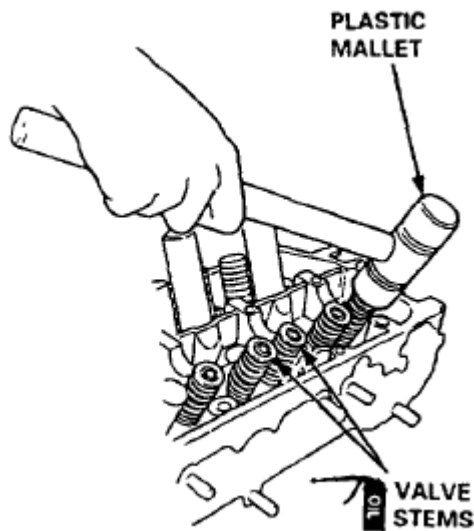


Fig. 94: Tapping Valve Stem

Courtesy of AMERICAN HONDA MOTOR CO., INC.

CAMSHAFT/ROCKER ARMS AND CAMSHAFT SEAL/PULLEY

INSTALLATION

CAUTION:

- Make sure that all rockers are in alignment with their valves when torquing the rocker assembly bolts.
- Valve locknuts should be loosened and adjusting screws backed off before installation.
- To prevent the rocker arm assembly from coming apart, leave the camshaft holder bolts in the holders.

1. After wiping down the camshaft, camshaft seal and journals in the cylinder head, lubricate both surfaces and install the camshaft.
2. Clean and install the oil control orifice with a new O-ring.

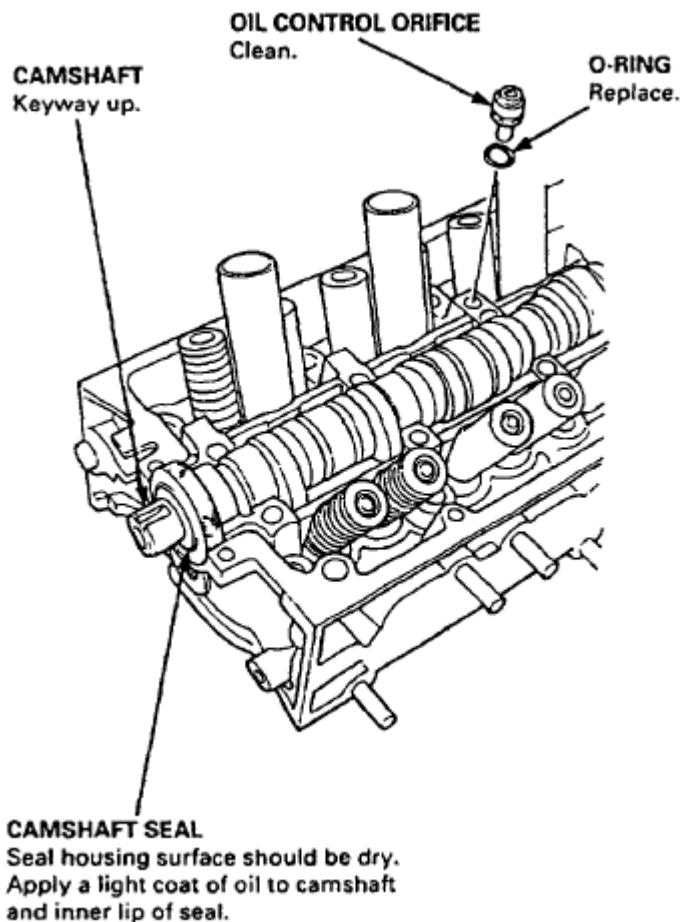


Fig. 95: Identifying Camshaft, Oil Control Orifice And O-ring
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Turn the camshaft until its keyway is facing up (No. 1 piston at TDC).

4. Apply liquid gasket (Part No. 08718 - 0001 or 08718 - 0003) to the head mating surfaces of the No. 1 and No. 5 camshaft holders.
 - Apply liquid gasket to the shaded areas.

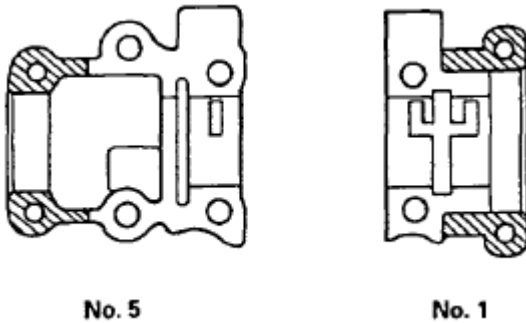


Fig. 96: Applying Liquid Gasket To Head Mating Surfaces Of No. 1 And No. 5 Camshaft Holders

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Set the rocker arm assembly in place and loosely install the bolts.
 - Make sure that the rocker arms are properly positioned on the valve stems.
6. Tighten each bolt two turns at a time in the sequence shown below to ensure that the rockers do not bind on the valves.

Specified torque:

8 mm bolts: 20 N.m (2.0 kgf.m, 14 lbf.ft)

Apply engine oil to the threads.

6 mm bolts: 12 N.m (1.2 kgf.m, 8.7 lbf.ft)

Apply engine oil to the threads.

6 mm bolts: (11), (12), (13), (14)

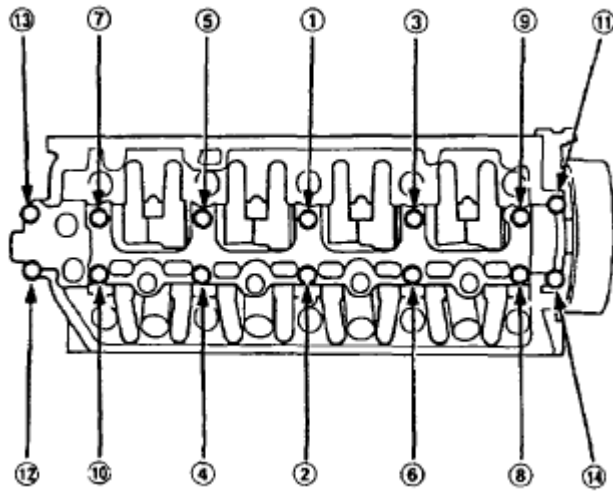


Fig. 97: Identifying Camshaft Bolt Tighten Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Install the back cover, then install the camshaft pulley.

CYLINDER HEAD

INSTALLATION

Install the cylinder head in the reverse order of removal:

NOTE:

- Always use a new head gasket.
- Cylinder head and cylinder block surface must be clean.
- "UP" mark on the camshaft pulley should be at the top.
- Turn the crankshaft so the No. 1 piston is at TDC (see INSTALLATION).
- Clean the oil control orifice before installing.
- Do not use the upper cover and lower cover to store removed items.
- Clean the upper cover and lower cover before installation.

1. Cylinder head dowel pins must be aligned.

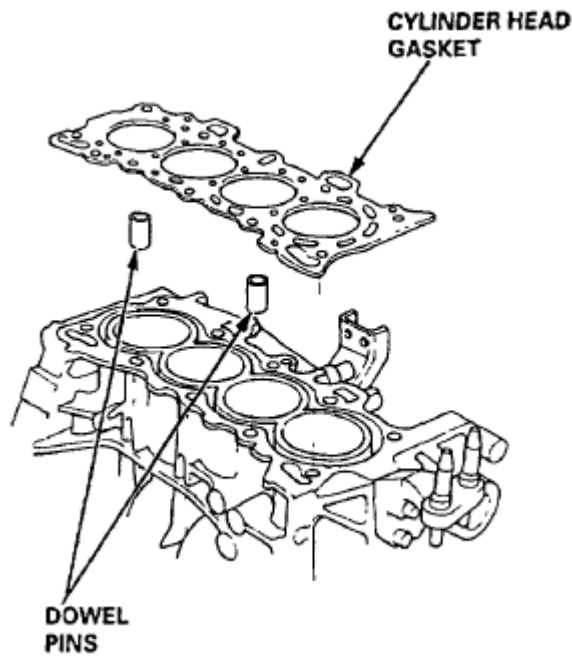


Fig. 98: Identifying Cylinder Head Gasket And Dowel Pins
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Position the camshaft correctly (see **INSTALLATION**).
3. Tighten the cylinder head bolts sequentially in four steps.

1st step: (1) - (10) 20 N.m (2.0 kgf.m, 14 lbf.ft)

2nd step: (1) - (10) 49 N.m (5.0 kgf.m, 36 lbf.ft)

3rd step: (1) - (10) 67 N.m (6.8 kgf.m, 49 lbf.ft)

4th step: (1), (2) 67 N.m (6.8 kgf.m, 49 lbf.ft)

NOTE:

- We recommend using a beam-type torque wrench. When using a preset-type torque wrench, be sure to tighten slowly and not to overtighten.
- If a bolt makes any noise while you are torquing it, loosen the bolt, and retighten it from the 1st step.

CYLINDER HEAD BOLTS TORQUE SEQUENCE:

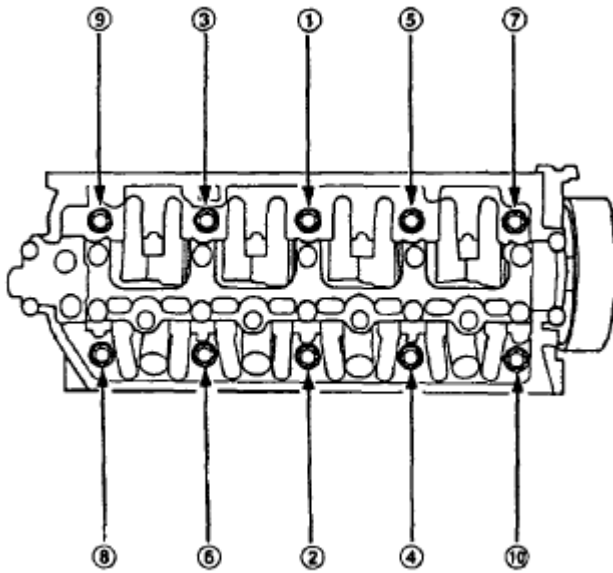


Fig. 99: Identifying Cylinder Head Bolts Torque Sequence
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Install the intake manifold and tighten the nuts in a crisscross pattern in two or three steps, beginning with the inner nuts (see **INTAKE MANIFOLD**).
 - Always use a new intake manifold gasket.
5. Install the exhaust manifold and tighten the nuts in a crisscross pattern in two or three steps, beginning with the inner nut (see **EXHAUST MANIFOLD**).
 - Always use a new exhaust manifold gasket.
6. Install the exhaust manifold bracket. Install exhaust pipe A and the bracket, then install the cover.
7. Install the timing belt (see **INSTALLATION**).
8. Adjust the valve clearance (see **VALVE CLEARANCE**).
9. Install the head cover gasket in the groove of the cylinder head cover. Seat the recesses for the camshaft first, then work it into the groove around the outside edges.

NOTE:

- Before installing the head cover gasket, thoroughly clean the seal and the groove.
- When installing, make sure the head cover gasket is seated securely in the corners of the recesses with no gap.

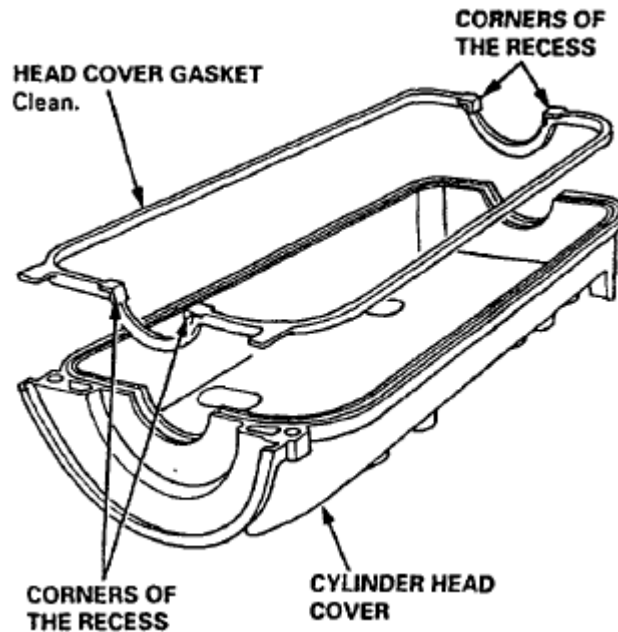


Fig. 100: Identifying Head Cover Gasket And Cylinder Head Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Apply liquid gasket to the head cover gasket at the four corners of the recesses.

NOTE:

- Use liquid gasket. Part No. 08718 - 0001 or 08718 - 0003.
- Check that the mating surfaces are clean and dry before applying liquid gasket.
- Do not install the parts if five minutes or more have elapsed since applying liquid gasket. Instead, reapply liquid gasket after removing old residue.
- After assembly, wait at least 20 minutes before filling the engine with oil.

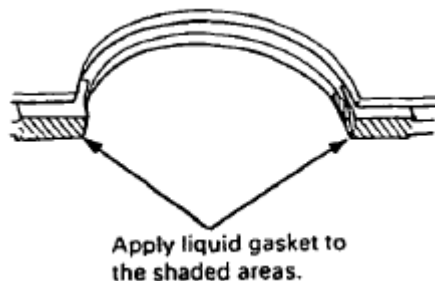


Fig. 101: Applying Liquid Gasket To Head Cover Gasket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. When installing the cylinder head cover, hold the head cover gasket in the groove by placing your fingers

on the camshaft holder contacting surfaces (top of the semicircles). Set the spark plug seal on the spark plug tube. Once the cylinder head cover is on the cylinder head, slide the cover slightly back and forth to seat the head cover gasket.

NOTE:

- Before installing the cylinder head cover, clean the cylinder head contacting surfaces with a shop towel.
- Do not touch the parts where liquid gasket was applied.
- Take care not to damage the spark plug seals when installing the cylinder head cover.
- Visually check the spark plug seals for damage.
- Replace the washer if it is damaged or deteriorated.

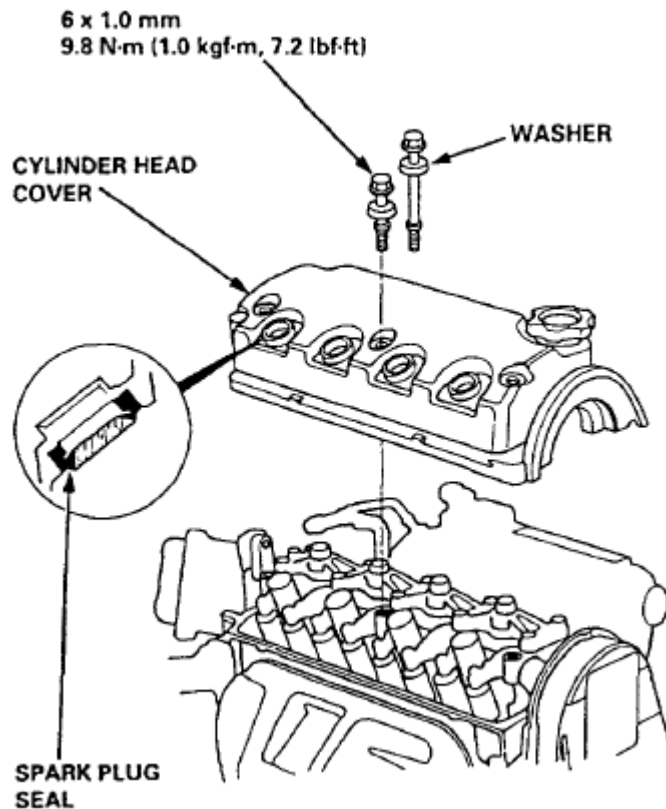


Fig. 102: Identifying Cylinder Head Cover, Washer And Spark Plug Seal

Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Tighten the bolts in two or three steps. In the final step, tighten all the bolts, in sequence, to 9.8 N.m (1.0 kgf.m, 7.2 lbf.ft).

NOTE:

After assembly, wait at least 20 minutes before filling the engine with oil.

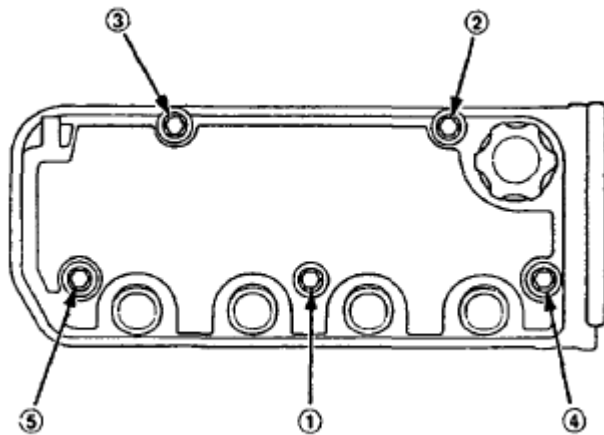


Fig. 103: Identifying Cylinder Head Cover Bolts Tighten Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. After installation, check that all tubes, hoses and connectors are installed correctly.
14. Enter the anti-theft code for the radio, then enter the customer's radio station presets.

1997 ENGINE

Engine Block - 1.6 EL

SPECIAL TOOLS

Ref. No.	Tool Number	Description	Qty
①	07LAB - PV00100	Ring Gear Holder	1
②	07749 - 0010000	Driver	1
③	07947 - SB00200	Seal Driver	1
④	07948 - SB00101	Driver Attachment	1
⑤	07973 - PE00200	Pilot Collar	1
⑥	07973 - PE00310	Piston Pin Driver Shaft	1
⑦	07973 - PE00320	Piston Pin Driver Head	1
⑧	07973 - PE00400	Piston Pin Base Insert	1
⑨	07973 - SB00100	Piston Base Head	1
⑩	07973 - 6570500	Piston Base	1
⑪	07973 - 6570600	Piston Base Spring	1

Fig. 1: Identifying Special Tools

Courtesy of AMERICAN HONDA MOTOR CO., INC.

ILLUSTRATED INDEX

Lubricate all internal parts with engine oil during reassembly.

NOTE:

- **Apply liquid gasket to the mating surfaces of the right side cover and oil pump case before installing them.**
- **Use liquid gasket, part No. 08718 - 0001 or 08718 - 0003.**
- **Clean the oil pan gasket mating surfaces before installing the oil pan.**

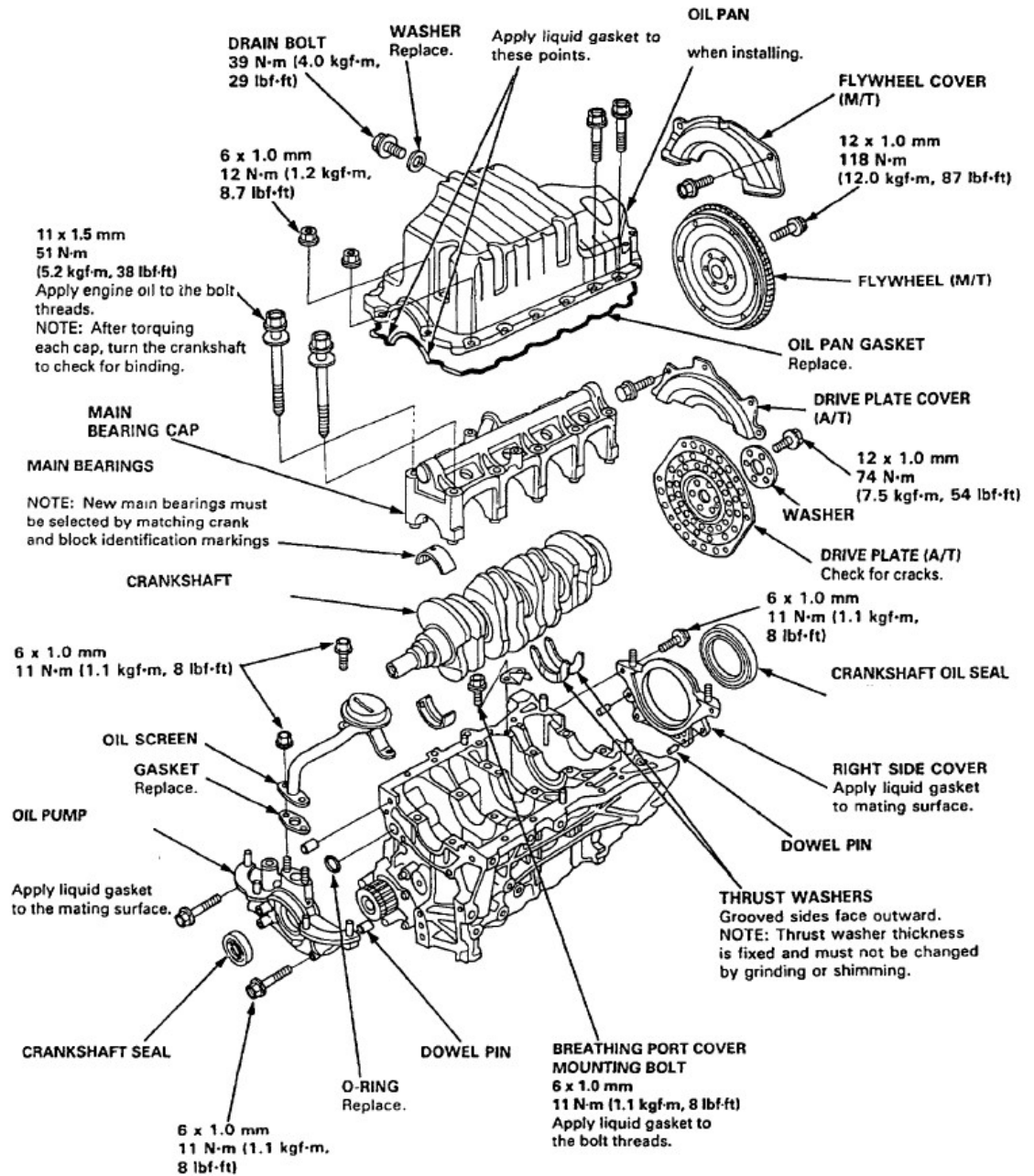


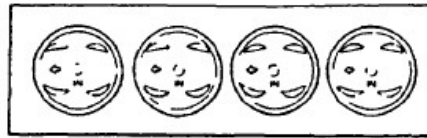
Fig. 2: Exploded View Of Engine Block With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

NOTE: New rod bearings must be selected by matching connecting rod assembly and crankshaft identification markings (see PISTONS AND CRANKSHAFT).

 Lubricate all internal parts with engine oil during reassembly.

PISTON INSTALLATION DIRECTION:

EXHAUST



INTAKE

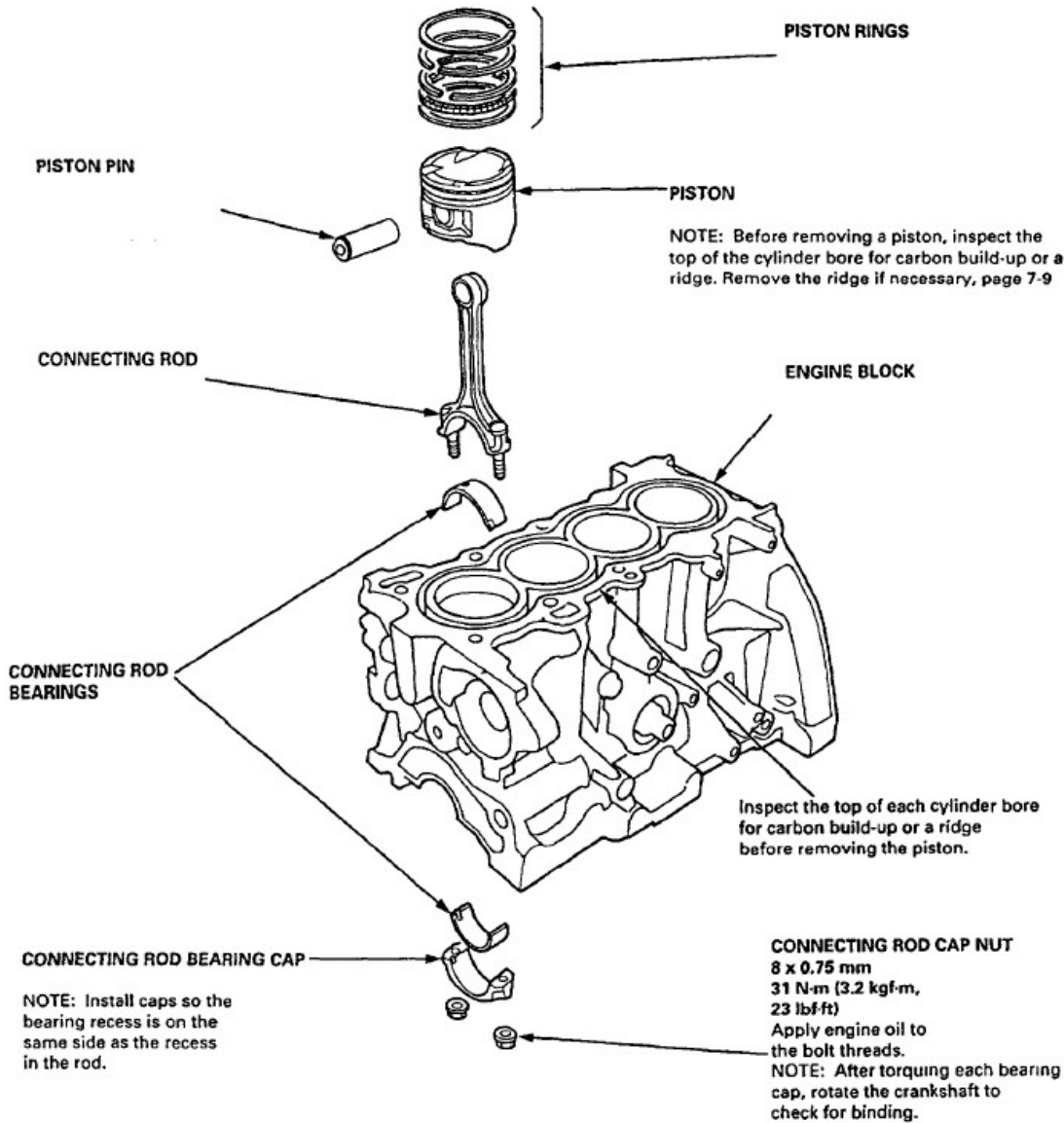


Fig. 3: Identifying Connecting Rod Components With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

FLYWHEEL AND DRIVE PLATE

REPLACEMENT

Manual Transmission:

Remove the six flywheel bolts, then separate the flywheel from the crankshaft flange. After installation, tighten the bolts in a crisscross pattern.

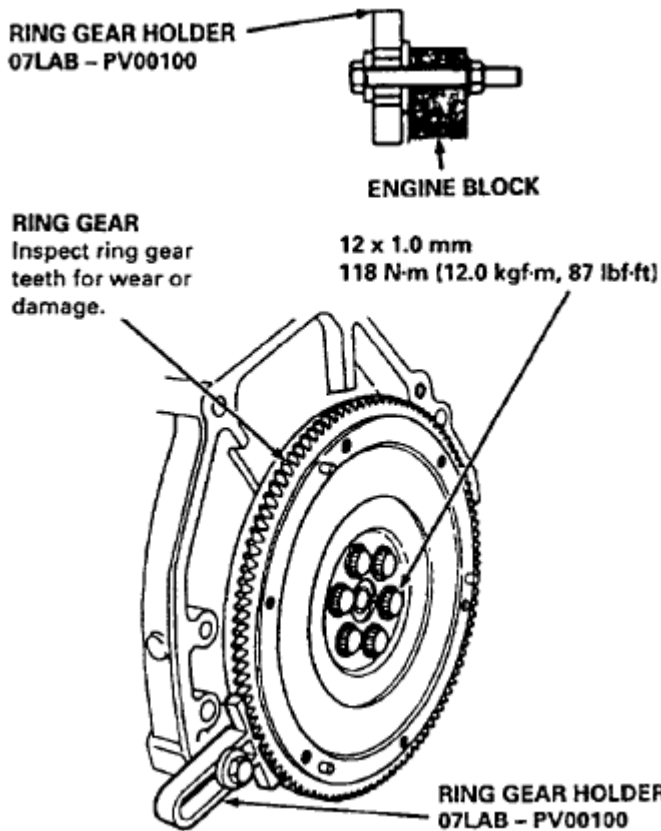


Fig. 4: Identifying Flywheel Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Automatic Transmission:

Remove the six drive plate bolts, then separate the drive plate from the crankshaft flange. After installation, tighten the bolts in a crisscross pattern.

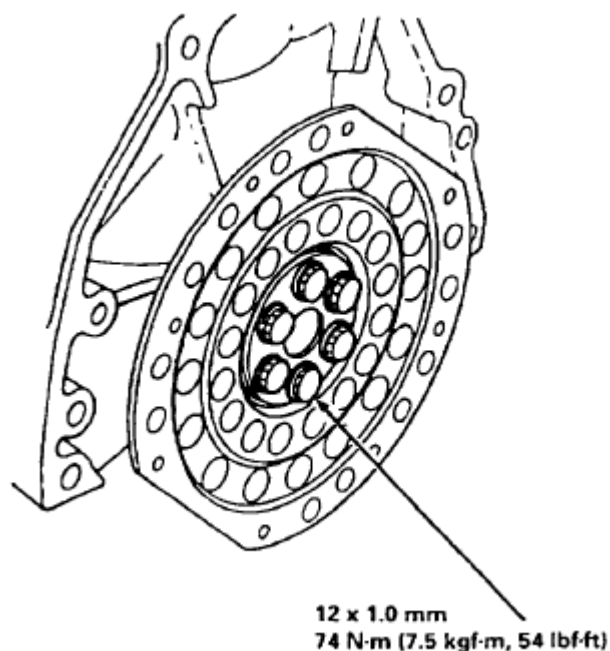


Fig. 5: Identifying Drive Plate Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CONNECTING ROD AND CRANKSHAFT

END PLAY

Connecting Rod End Play:

Standard (New): 0.15 - 0.30 mm (0.006 - 0.012 in)

Service Limit: 0.40 mm (0.016 in)

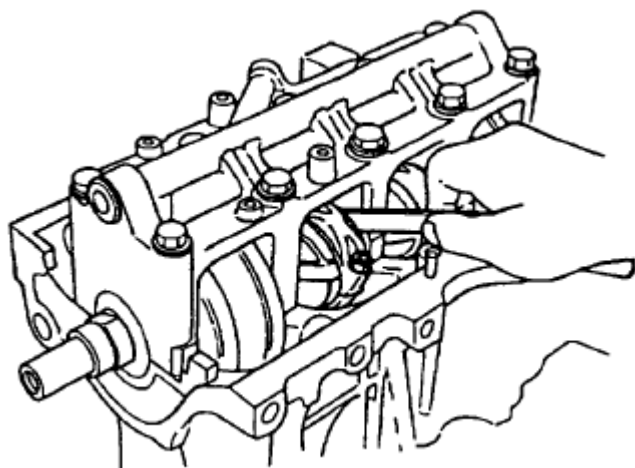


Fig. 6: Checking Connecting Rod End Play

Courtesy of AMERICAN HONDA MOTOR CO., INC.

- If out-of-tolerance, install a new connecting rod.
- If still out-of-tolerance, replace the crankshaft (see **REMOVAL** and see **CRANKSHAFT**).

Push the crankshaft firmly away from the dial indicator, and zero the dial against the end of the crankshaft. Then pull the crankshaft firmly back toward the indicator; dial reading should not exceed the service limit.

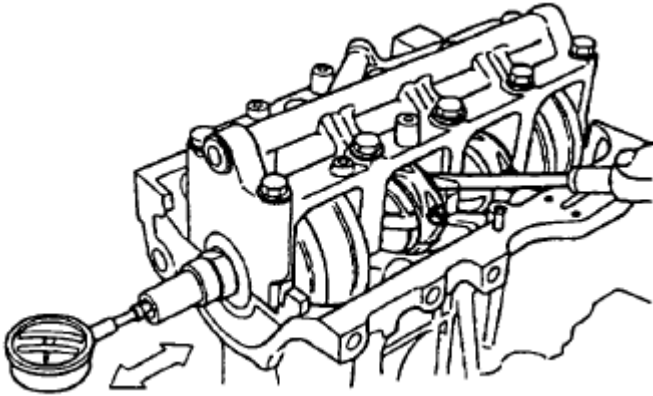


Fig. 7: Checking Crankshaft End Play

Courtesy of AMERICAN HONDA MOTOR CO., INC.

Crankshaft End Play:

Standard (New): 0.10 - 0.35 mm (0.004 - 0.014 in)

Service Limit: 0.45 mm (0.018 in)

- If end play is excessive, inspect the thrust washers and thrust surface on the crankshaft. Replace parts as necessary.

NOTE: Thrust washer thickness is fixed and must not be changed either by grinding or shimming. Thrust washers are installed with the grooved sides facing outward.

MAIN BEARINGS

CLEARANCE

1. To check main bearing-to-journal oil clearance, remove the main caps and bearing halves.
2. Clean each main journal and bearing half with a clean shop towel.
3. Place one strip of plastigage across each main journal.

NOTE: If the engine is still in the car when you bolt the main cap down to check clearance, the weight of the crankshaft and flywheel will flatten the plastigage further than just the torque on the cap bolt, and give you an

incorrect reading. For an accurate reading, support the crank with a jack under the counterweights and check only one bearing at a time.

4. Reinstall the bearings and caps, then torque the bolts.

1st step: 25 N.m (2.5 kgf.m, 18 lbf.ft)

Final step: 51 N.m (5.2 kgf.m, 38 lbf.ft)

NOTE: Do not rotate the crankshaft during inspection.

5. Remove the cap and bearing again, and measure the widest part of the plastigage.

Main Bearing-to-Journal Oil Clearance:

Standard (New):

No. 1,5 Journals:

0.018 - 0.036 mm (0.0007 - 0.0014 in)

No. 2, 3, 4 Journals:

0.024 - 0.042 mm (0.0009 - 0.0017 in)

Service Limit: 0.05 mm (0.002 in)

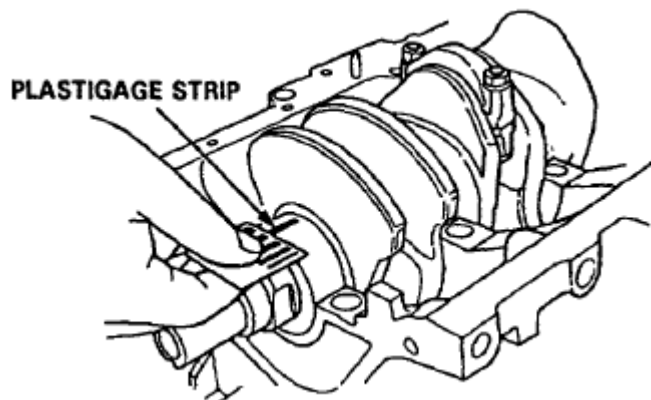


Fig. 8: Measuring Widest Part Of Plastigage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. If the plastigage measures too wide or too narrow, (remove the engine if it's still in the car), remove the crankshaft, and remove the upper half of the bearing. Install a new, complete bearing with the same color code (select the color as shown on the next page), and recheck the clearance.

CAUTION: Do not file, shim, or scrape the bearings or the caps to adjust clearance.

7. If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below that one), and check again.

NOTE: If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over.

SELECTION

CAUTION: If the codes are indecipherable because of an accumulation of dirt and dust, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.

Crankshaft Bore Code Location

Letters have been stamped on the end of the block as a code for the size of each of the 5 main journal bores. Use them, and the numbers stamped on the crankshaft (codes for main journal size), to choose the correct bearings.

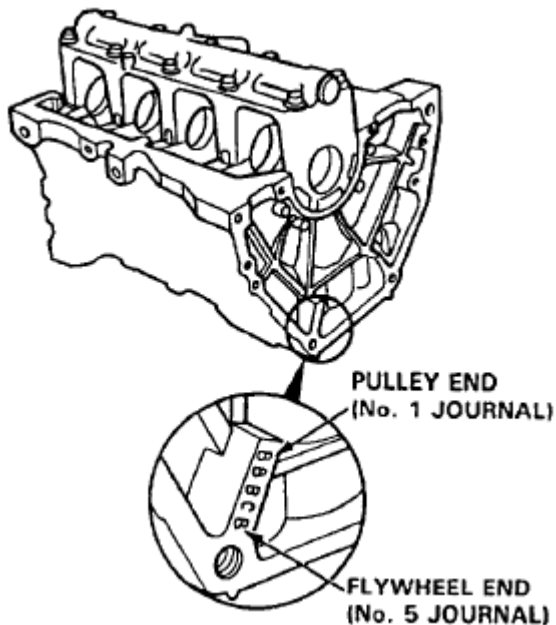
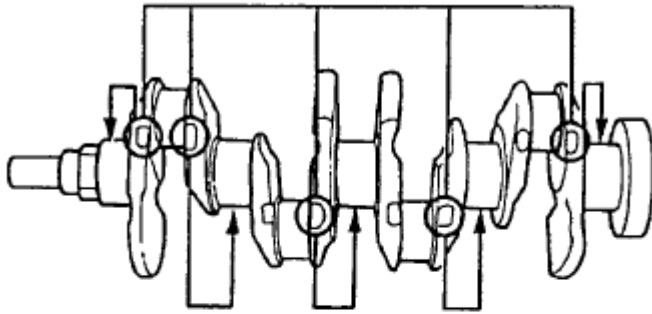


Fig. 9: Identifying Crankshaft Bore Code Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Main Journal Code Location (Numbers)**Bearing Identification**

Color code is on the edge of the bearing. → Larger crank bore

A	B	C	D
---	---	---	---

→ Smaller bearing (thicker)

1	Red	Pink	Yellow	Green
2	Pink	Yellow	Green	Brown
3	Yellow	Green	Brown	Black
4	Green	Brown	Black	Blue

↓
Smaller
main
journal

↓
Smaller
bearing
(thicker)

Fig. 10: Identifying Main Journal Code Location

Courtesy of AMERICAN HONDA MOTOR CO., INC.

CONNECTING ROD BEARINGS

CLEARANCE

1. Remove the connecting rod cap and bearing half.
2. Clean the crankshaft rod journal and bearing half with a clean shop towel.
3. Place a strip of plastigage across the rod journal.
4. Reinstall the bearing half and cap, and torque the nuts.

Torque: 31 N.m (3.2 kgf.m, 23 lbf.ft)

NOTE: Do not rotate the crankshaft during inspection.

5. Remove the rod cap and bearing half, and measure the widest part of the plastigage.

Connecting Rod Bearing-to-Journal Oil Clearance:

Standard (New): 0.020 - 0.038 mm

(0.0008 - 0.0015 in)

Service Limit: 0.05 mm (0.002 in)

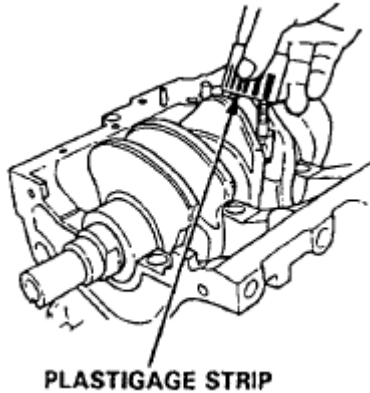


Fig. 11: Measuring Widest Part Of Plastigage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. If the plastigage measures too wide or too narrow, remove the upper half of the bearing, install a new, complete bearing with the same color code (select the color as shown on the next page), and recheck the clearance.

CAUTION: Do not file, shim, or scrape the bearings or the caps to adjust clearance.

7. If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below that one), and check clearance again.

NOTE: If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over.

SELECTION

CAUTION: If the codes are indecipherable because of an accumulation of dirt and dust, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.

Connecting Rod Code Location

Numbers have been stamped on the side of each connecting rod as a code for the size of the big end. Use them, and the letters stamped on the crankshaft (codes for rod journal size), to choose the correct bearings.

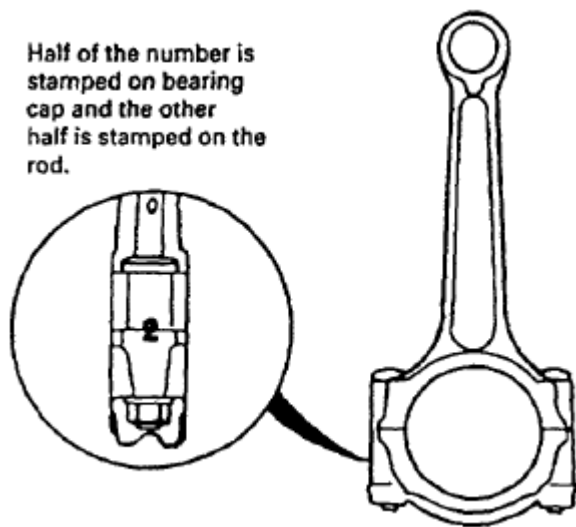


Fig. 12: Identifying Connecting Rod Code Location
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

Connecting Rod Journal Code Locations (Letters)

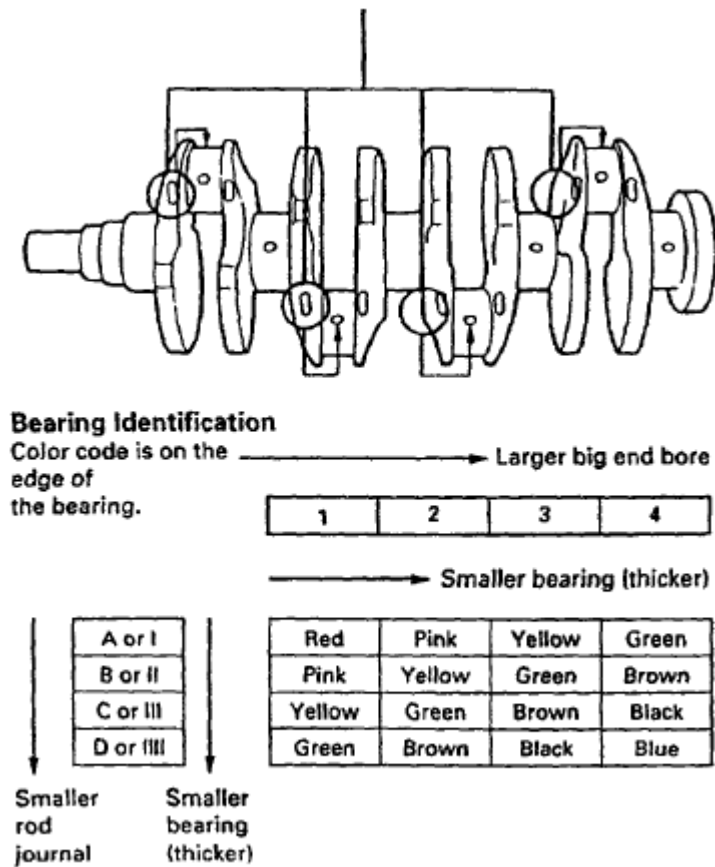


Fig. 13: Identifying Connecting Rod Journal Code Locations
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

PISTONS AND CRANKSHAFT

REMOVAL

1. Remove the oil pan assembly.
2. Remove the right side cover.

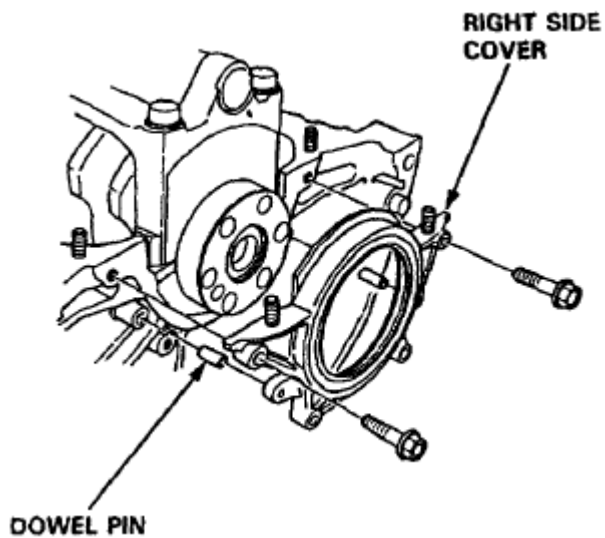


Fig. 14: Identifying Right Side Cover And Dowel Pin
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove the oil screen.

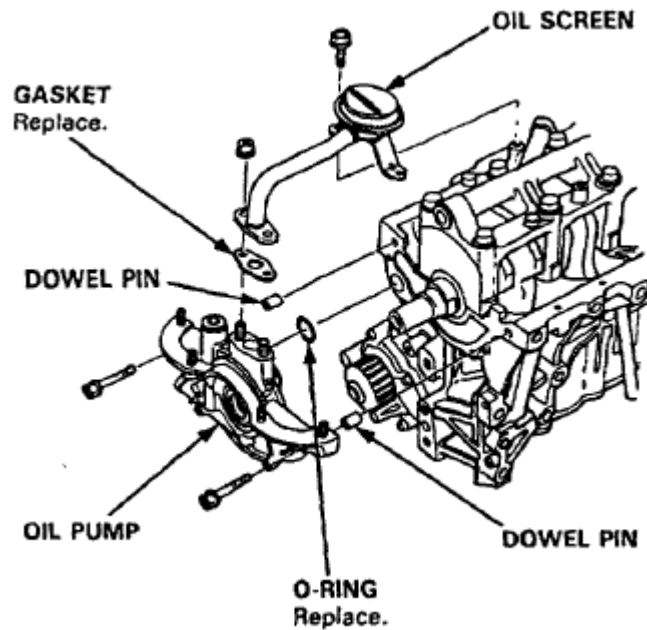


Fig. 15: Identifying Oil Screen With O-Ring

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the oil pump.
5. Remove the bolts and the bearing cap.

CAUTION: To prevent warpage, unscrew the bolts in sequence 1/3 turn at a time; repeat the sequence until all bolts are loosened.

MAIN BEARING CAP BOLTS LOOSENING SEQUENCE

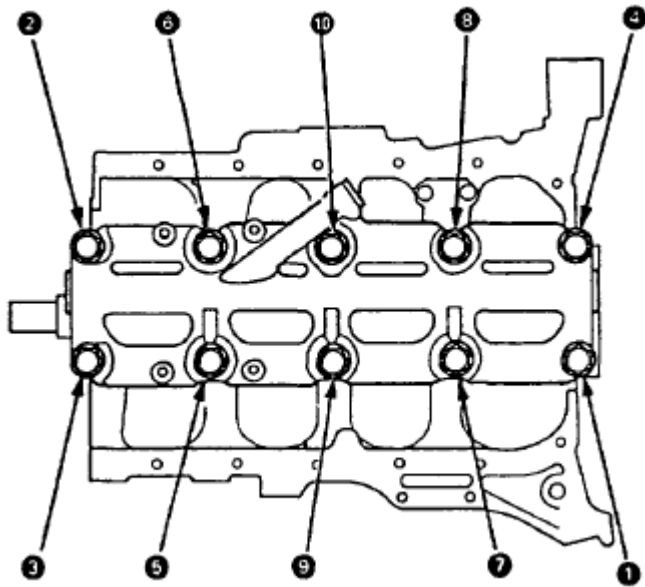


Fig. 16: Identifying Main Bearing Cap Bolts Loosening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the rod caps/bearings and main caps/bearings. Keep all caps/bearings in order.
7. Lift the crankshaft out of the engine, being careful not to damage the journals.

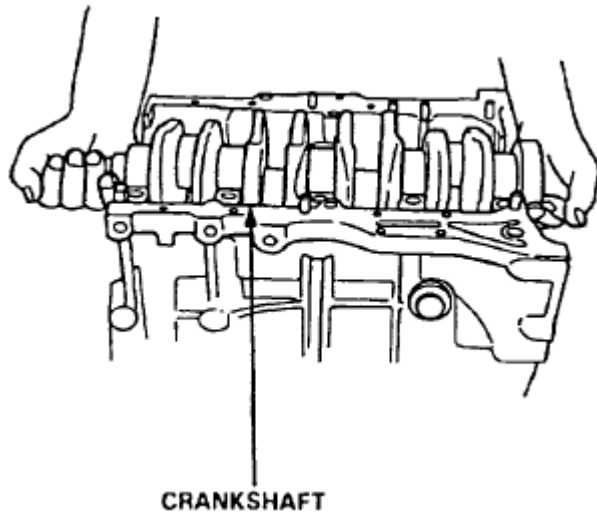


Fig. 17: Lifting Crankshaft Out Of Engine

Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Remove the upper bearing halves from the connecting rods and set them aside with their respective caps.
9. Reinstall the main caps and bearings on the engine in proper order.
10. If you can feel a ridge of metal or hard carbon around the top of each cylinder, remove it with a ridge reamer. Follow the reamer manufacturer's instructions.

CAUTION: If the ridge is not removed, it may damage the pistons as they are pushed out.

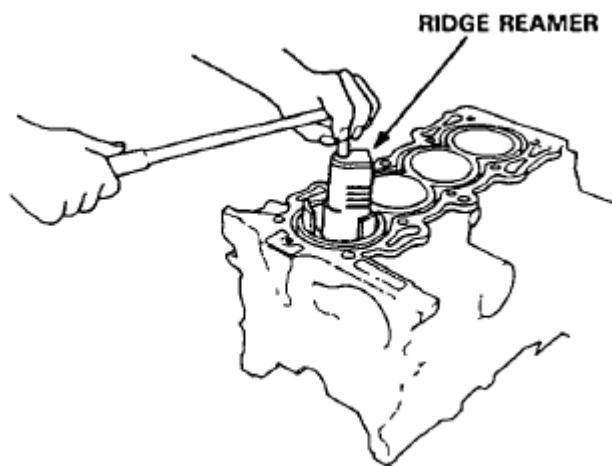
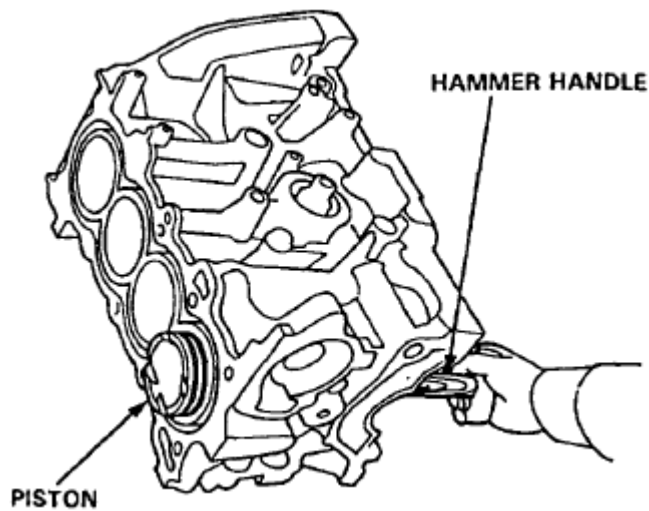


Fig. 18: Removing Hard Carbon Around Top Of Cylinder

Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Use the wooden handle of a hammer to drive the pistons out.

**Fig. 19: Tapping Piston**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Reinstall the connecting rod bearings and caps after removing each piston/connecting rod assembly.
13. Mark each piston/connecting rod assembly with its cylinder number to avoid mixup on reassembly.

NOTE: The existing number on the connecting rod does not indicate its position in the engine, it indicates the rod bore size.

CRANKSHAFT

INSPECTION

- Clean the crankshaft oil passages with pipe cleaners or a suitable brush.
- Check the keyway and threads.

Alignment

- Measure runout on all main journals to make sure the crank is not bent.
- The difference between measurements on each journal must not be more than the service limit.

Crankshaft Total Indicated Runout:

Standard (New): 0.03 mm (0.001 in) max.

Service Limit: 0.04 mm (0.002 in)

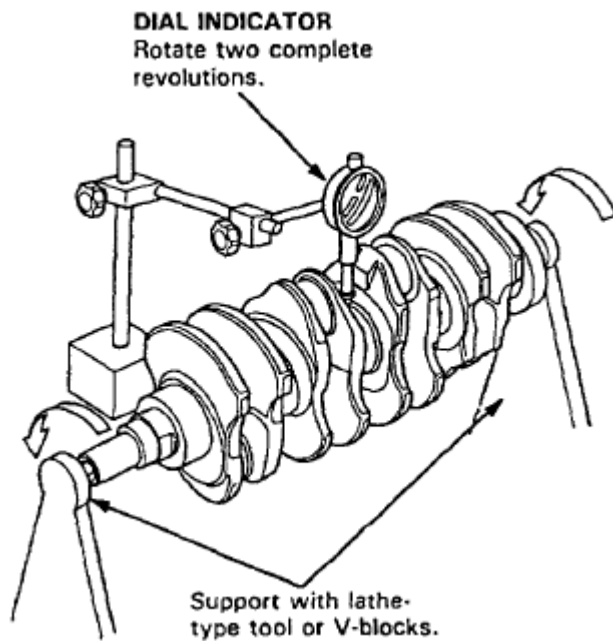


Fig. 20: Measuring Runout On All Main Journals
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Out-of-Round and Taper

- Measure out-of-round at the middle of each rod and main journal in two places.
- The difference between measurements on each journal must not be more than the service limit.

Journal Out-of-Round:

Standard (New): 0.0025 mm (0.0001 in) max.

Service Limit: 0.005 mm (0.0002 in)

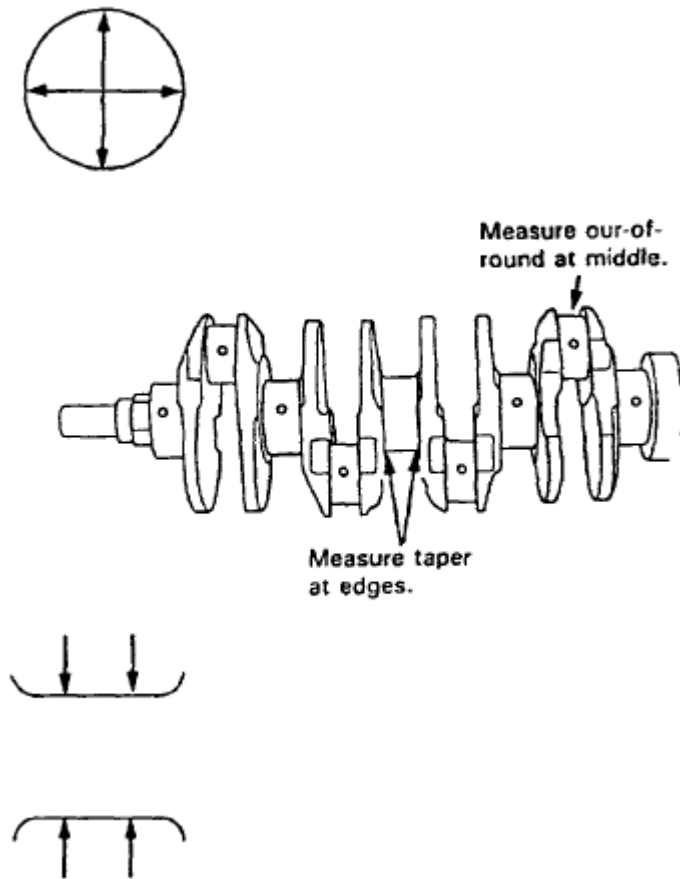


Fig. 21: Measuring Out-Of-Round Middle Of Each Rod And Main Journal
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

- Measure taper at the edges of each rod and main journal.
- The difference between measurements on each journal must not be more than the service limit.

Journal Taper:

Standard (New): 0.0025 mm (0.0001 in) max.

Service Limit: 0.005 mm (0.0002 in)

PISTONS

INSPECTION

1. Check the piston for distortion or cracks.

NOTE: **If a cylinder is bored, an oversized piston must be used.**

2. Measure the piston diameter at distance A from the bottom of the skirt.

A: 5 mm (0.2 in)

Piston Diameter:

Standard (New): 74.980 - 74.990 mm (2.9520 - 2.9524 in)

Service Limit: 74.970 mm (2.9516 in)

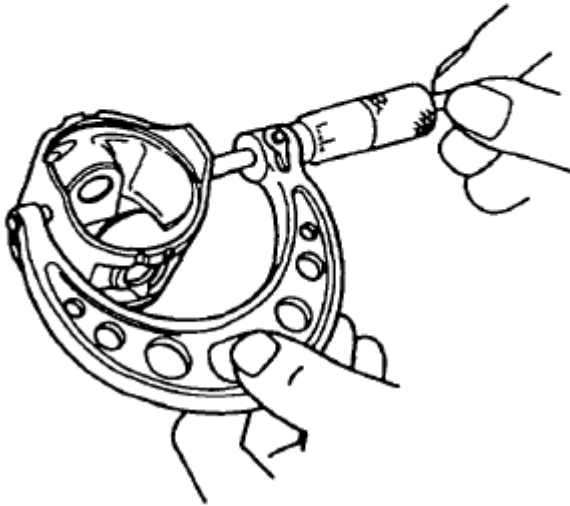
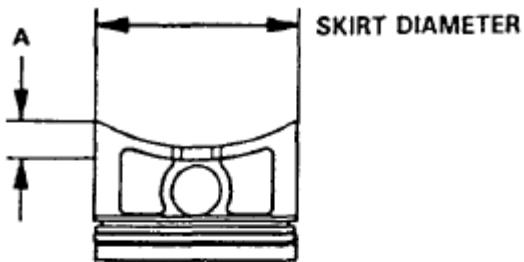


Fig. 22: Measuring Piston Diameter Distance From Bottom Of Skirt
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Calculate the difference between the cylinder bore diameter (see CYLINDER BLOCK) and piston diameter.

Piston-to-Cylinder Clearance

Standard (New): 0.010 - 0.040 mm (0.0004 - 0.0016 in)

Service Limit: 0.05 mm (0.002 in)

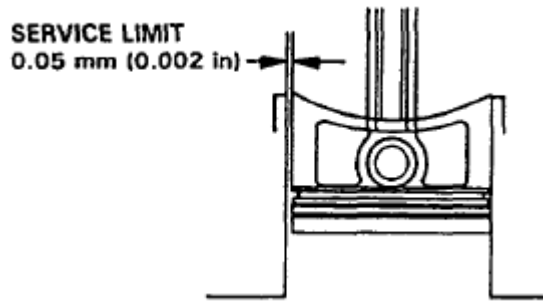


Fig. 23: Identifying Clearance Between Piston And Cylinder Bore
Courtesy of AMERICAN HONDA MOTOR CO., INC.

If the clearance is near or exceeds the service limit, inspect the piston and cylinder block for excessive wear.

Oversize Piston Diameter

0.25: 75.23 - 75.24 mm (2.9618 - 2.9622 in)

0.50: 75.48 - 75.49 mm (2.9716 - 2.9720 in)

CYLINDER BLOCK

INSPECTION

1. Measure wear and taper in directions X and Y at three levels in each cylinder as shown.

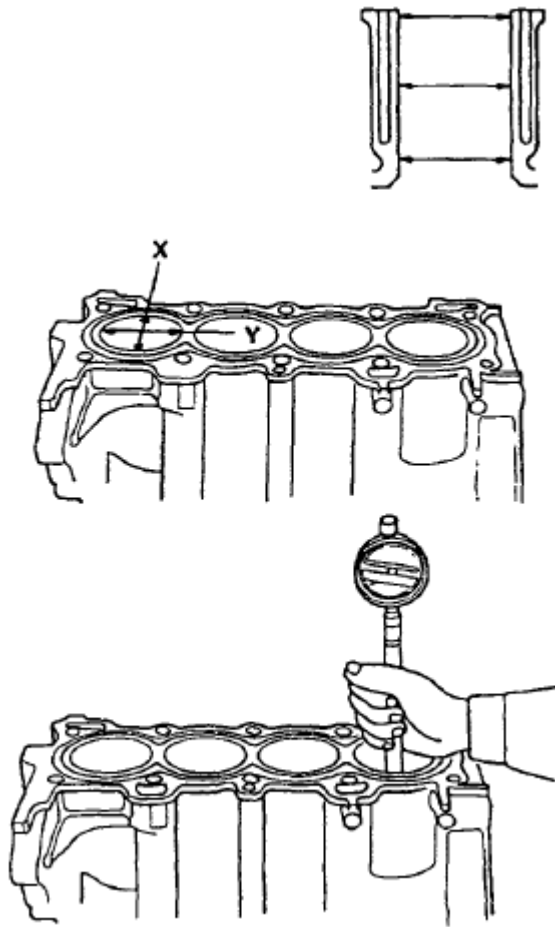


Fig. 24: Measuring Wear And Taper In Directions X And Y
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Cylinder Bore Size

Standard (New): 75.00 - 75.02 mm (2.953 - 2.954 in)

Service Limit: 75.07 mm (2.956 in)

Oversize

0.25: 75.25 - 75.27 mm (2.9626 - 2.9634 in)

0.50: 75.50 - 75.52 mm (2.9724 - 2.9732 in)

Bore Taper

Limit: (Difference between first and third measurement) 0.05 mm (0.002 in)

- If measurements in any cylinder are beyond the Oversize Bore Service Limit, replace the block.

- If the block is to be rebored, refer to **PISTON CLEARANCE INSPECTION** after reboring.

NOTE: **Scored or scratched cylinder bores must be honed.**

Reboring Limit: 0.50 mm (0.020 in)

2. Check the top of the block for warpage.

Measure along the edges and across the center as shown.

SURFACES TO BE MEASURED

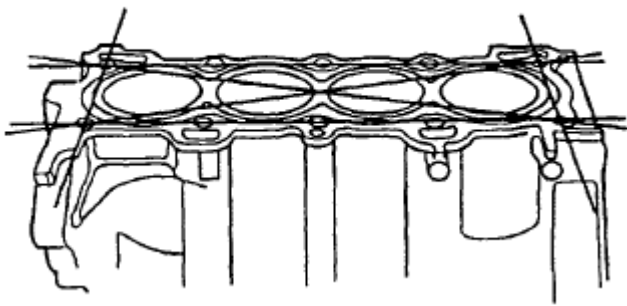


Fig. 25: Measuring Along Edges And Across Center
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Engine Block Warpage:

Standard (New): 0.07 mm (0.003 in) max.

Service Limit: 0.10 mm (0.004 in)

PRECISION STRAIGHT EDGE

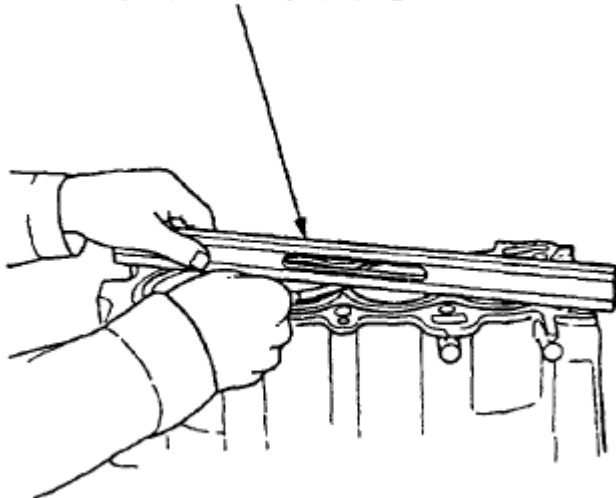


Fig. 26: Checking Engine Block Warpage

Courtesy of AMERICAN HONDA MOTOR CO., INC.

BORE HONING

1. Measure the cylinder bores as shown on **CYLINDER BLOCK** . If the block is to be reused, hone the cylinders and remeasure the bores.
2. Hone the cylinder bores with honing oil and a fine (400 grit) stone in a 60 degree cross-hatch pattern.

NOTE:

- Use only a rigid hone with 400 grit or finer stone such as Sunnen, Ammco, or equivalent.
- Do not use stones that are worn or broken.

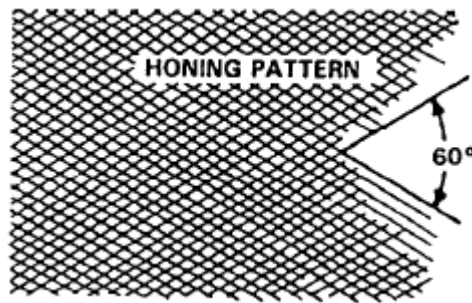


Fig. 27: Honing Pattern

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. When honing is complete, thoroughly clean the engine block of all metal particles. Wash the cylinder bores with hot soapy water, then dry and oil them immediately to prevent rusting.

NOTE:

Never use solvent, it will only redistribute the grit on the cylinder walls.

4. If scoring or scratches are still present in the cylinder bores after honing to the service limit, rebore the cylinder block.

NOTE:

Some light vertical scoring and scratching is acceptable if it is not deep enough to catch your fingernail and does not run the full length of the bore.

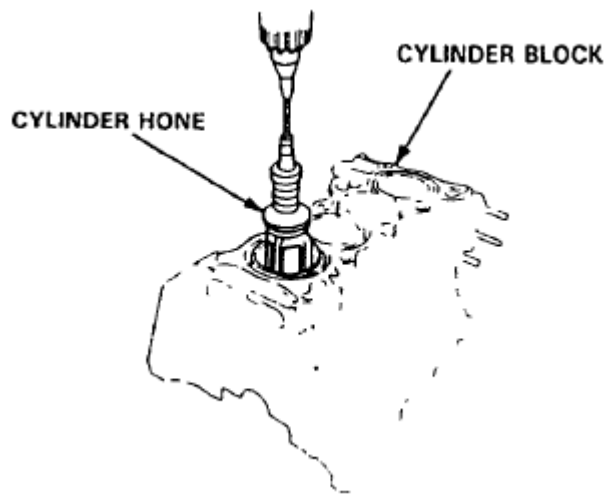


Fig. 28: Identifying Cylinder Hone And Block
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

NOTE:

- After honing, clean the cylinder thoroughly with soapy water.
- Only a scored or scratched cylinder bore must be honed

PISTON PINS

REMOVAL

1. Assemble the special tool as shown.

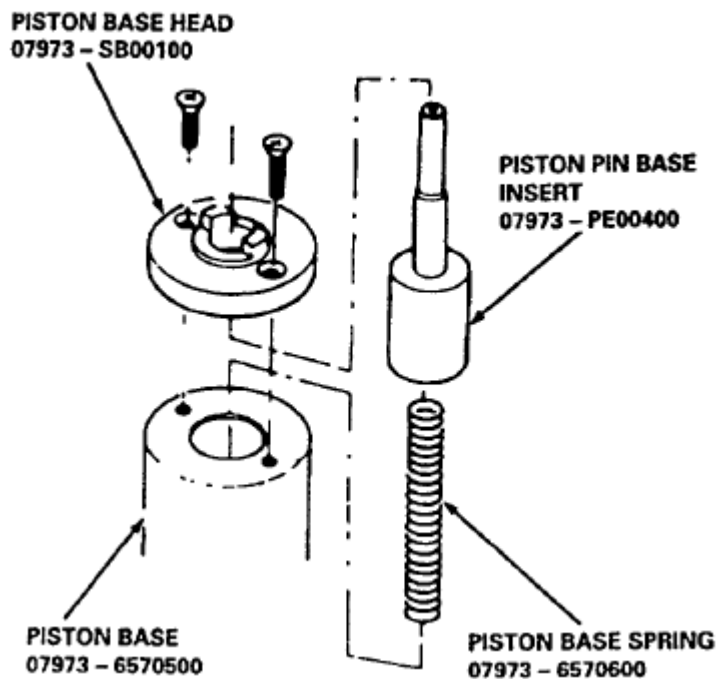
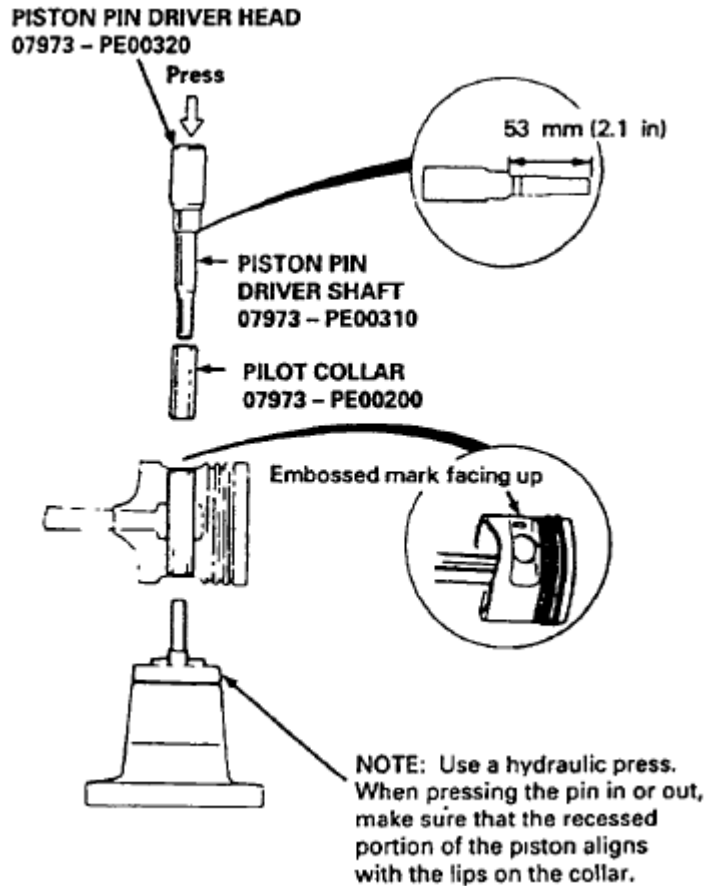


Fig. 29: Identifying Special Tool

Courtesy of AMERICAN HONDA MOTOR CO., INC.

- Assemble and adjust the length of the piston pin driver and shaft to 53 mm (2.1 in) as shown.

**Fig. 30: Adjusting Length Of Piston Pin Driver And Shaft**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

- Place the piston on the special tool and press the pin out with the special tools and a hydraulic press.

CONNECTING RODS

SELECTION

Each rod falls into one of four tolerance ranges (from 0 to + 0.024 mm (0 to + 0.0009 in), in 0.006 mm (0.0002 in) increments) depending on the size of its big end bore. It's then stamped with a number (1, 2, 3, or 4) indicating the range.

You may find any combination of 1, 2, 3, or 4 in any engine.

Normal Bore Size: 48.0 mm (1.89 in)

NOTE:

- Reference numbers are for the big end bore size and do NOT indicate the position of the rod in the engine.
- Inspect each connecting rod for cracks and heat damage.

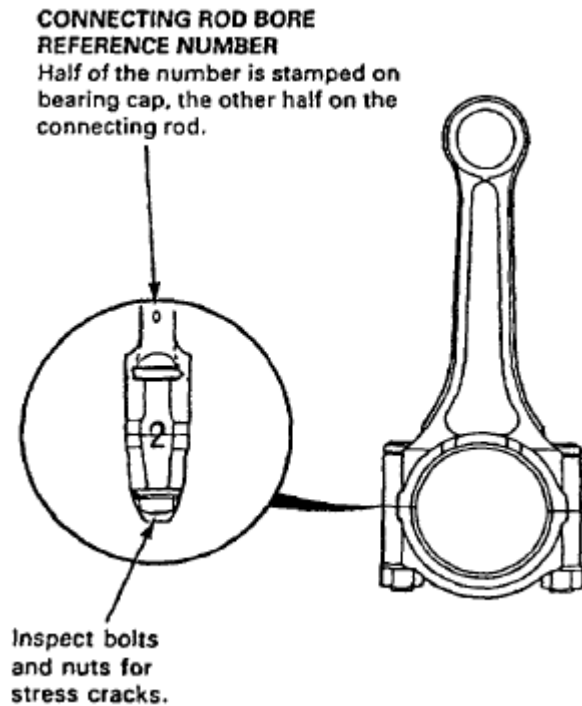


Fig. 31: Identifying Connecting Rod Position
Courtesy of AMERICAN HONDA MOTOR CO., INC.

PISTON PINS**INSTALLATION**

1. Use a hydraulic press for installation.
 - When pressing the pin in or out, be sure you position the recessed flat on the piston against the lugs on the base attachment.

The arrow must face the timing belt side of the engine and the connecting rod oil hole must face the rear of the engine.

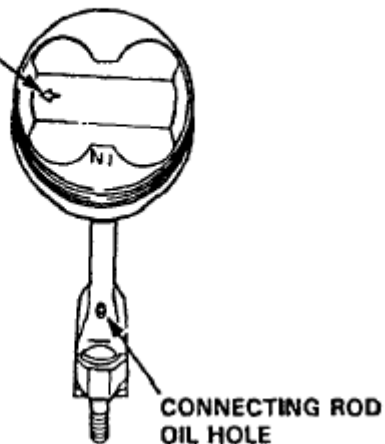


Fig. 32: Identifying Connecting Rod Oil Hole
Courtesy of AMERICAN HONDA MOTOR CO., INC.

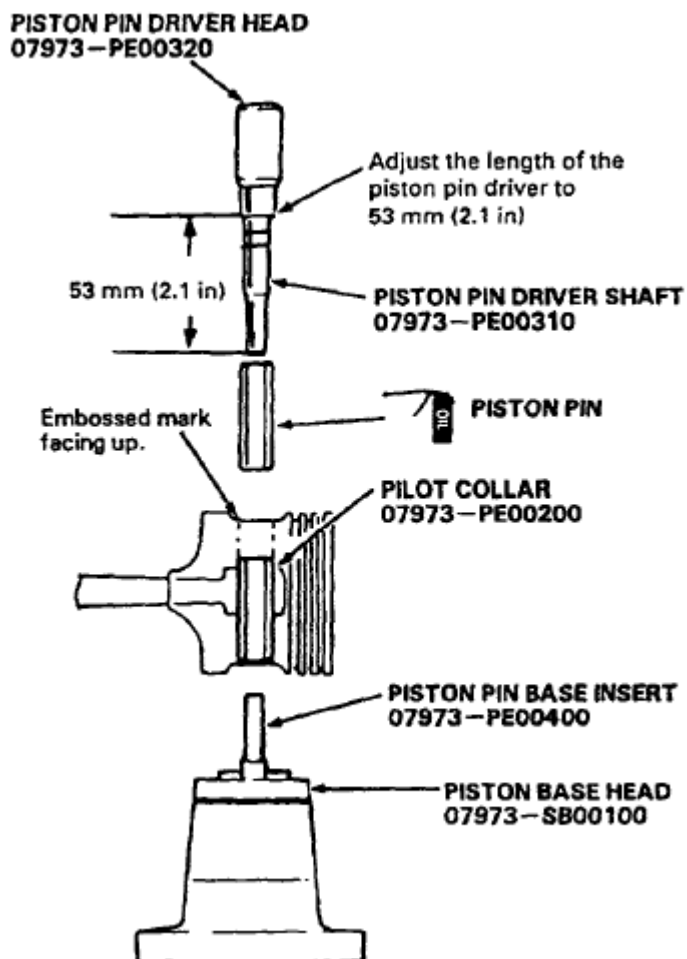


Fig. 33: Identifying Special Tool

Courtesy of AMERICAN HONDA MOTOR CO., INC.

PISTON RINGS

END GAP

1. Using a piston, push a new ring into the cylinder bore 15-20 mm (0.6 - 0.8 in) from the bottom.
2. Measure the piston ring end-gap with a feeler gauge:
 - If the gap is too small, check to see if you have the proper rings for your engine.
 - If the gap is too large, recheck the cylinder bore diameter against the wear limits on **CYLINDER BLOCK**.

If the bore is over the service limit, the cylinder block must be rebored.

Piston Ring End-Gap:

Top Ring

Standard (New): 0.15 - 0.30 mm (0.006 - 0.012 in)

Service Limit: 0.60 mm (0.024 in)

Second Ring

Standard (New): 0.30 - 0.45 mm (0.012 - 0.018 in)

Service Limit: 0.70 mm (0.028 in)

Oil Ring

Standard (New): 0.20 - 0.70 mm (0.008 - 0.028 in)

Service Limit: 0.80 mm (0.031 in)

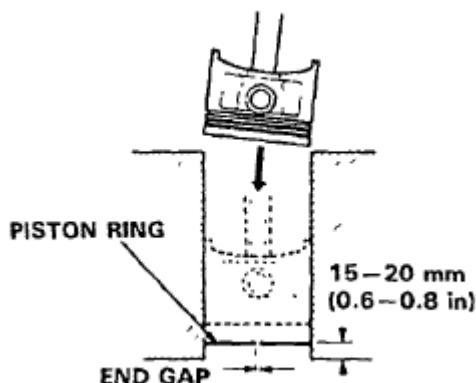


Fig. 34: Measuring Piston Ring End-Gap**Courtesy of AMERICAN HONDA MOTOR CO., INC.****REPLACEMENT**

1. Using a ring expander, remove the old piston rings.
2. Clean all ring grooves thoroughly.

NOTE:

- Use a squared-off broken ring or ring groove cleaner with a blade to fit the piston grooves.
- Top ring groove is 1.0 mm (0.039 in) wide.
- Second ring groove is 1.2 mm (0.047 in) wide.
- Oil ring groove is 2.8 mm (0.11 in) wide.
- File down the blade if necessary.

CAUTION: Do not use a wire brush to clean ring lands, or cut ring lands deeper with cleaning tool.

NOTE:

If the piston is to be separated from the connecting rod, do not install new rings yet.

3. Install new rings in the proper sequence and position (see **RING-TO-GROOVE CLEARANCE** , **CRANKSHAFT OIL SEAL**).

NOTE:

Do not reuse old piston rings.

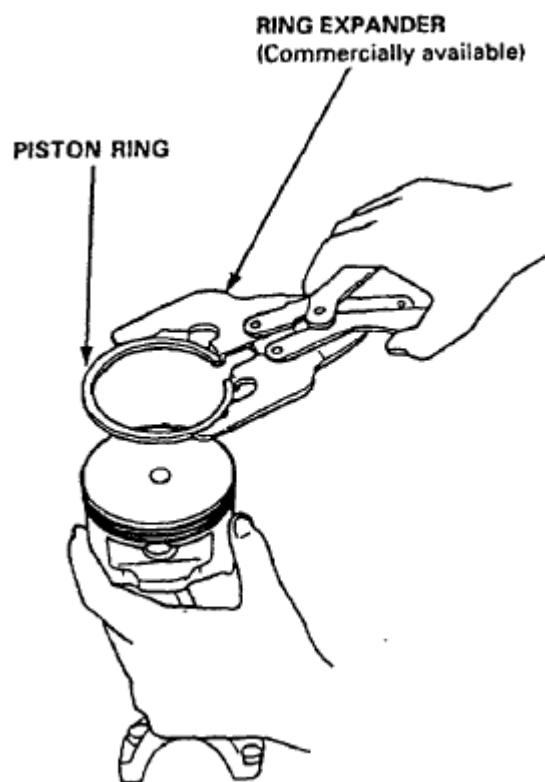


Fig. 35: Identifying Piston Ring Proper Installation Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

RING-TO-GROOVE CLEARANCE

After installing a new set of rings, measure the ring-to-groove clearances:

Top Ring Clearance

Standard (New): 0.035 - 0.060 mm (0.0014 - 0.0024 in)

Service Limit: 0.13 mm (0.005 in)

Second Ring Clearance

Standard (New): 0.030 - 0.055 mm (0.0012 - 0.0022 in)

Service Limit: 0.13 mm (0.005 in)

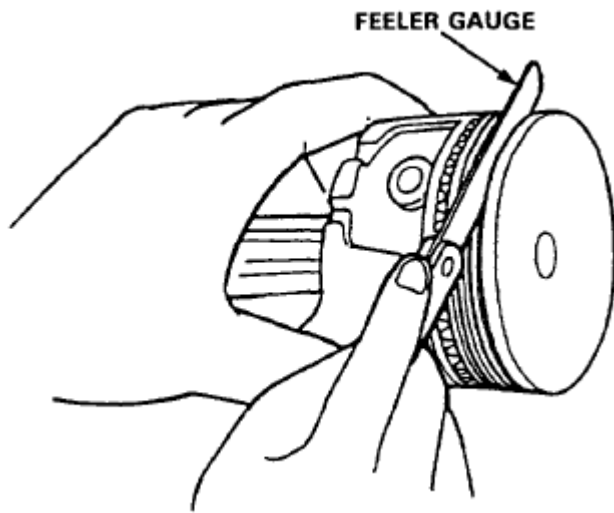


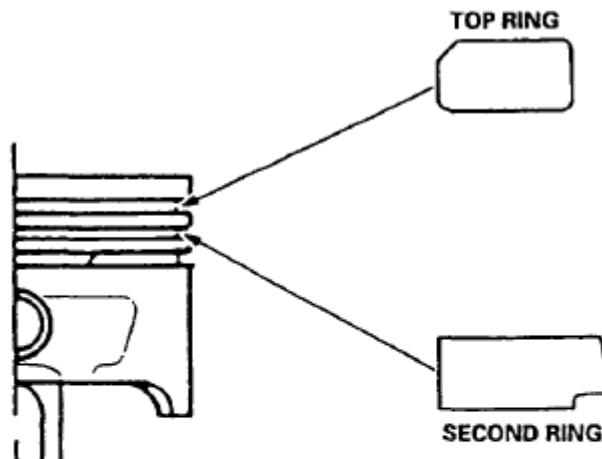
Fig. 36: Measuring Ring-To-Groove Clearances
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ALIGNMENT

1. Install the rings as shown.

NOTE:

- The top ring has an A mark.
- The second ring has an R mark.



Piston Ring Dimensions:



Fig. 37: Identifying Piston Ring Dimensions
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Top Ring (Standard):

A: 2.6 mm (0.10 in)

B: 1.0 mm (0.04 in)

Second Ring (Standard):

A: 3.0 mm (0.12 in)

B: 1.2 mm (0.05 in)

NOTE: The manufacturing marks must be facing upward.

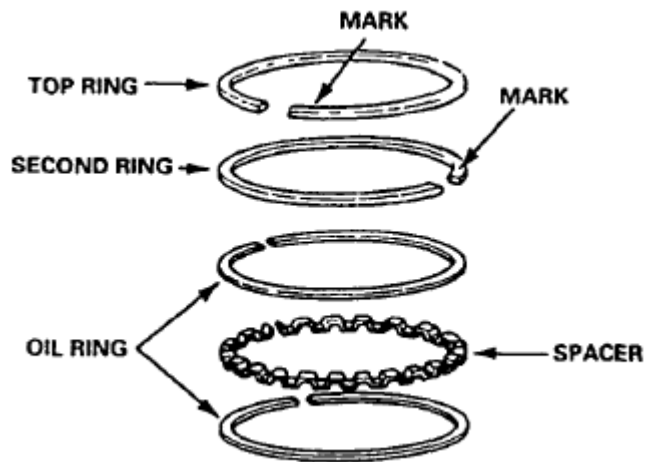


Fig. 38: Identifying Piston Ring Position
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Rotate the rings in their grooves to make sure they do not bind.
3. Position the ring end gaps as shown:

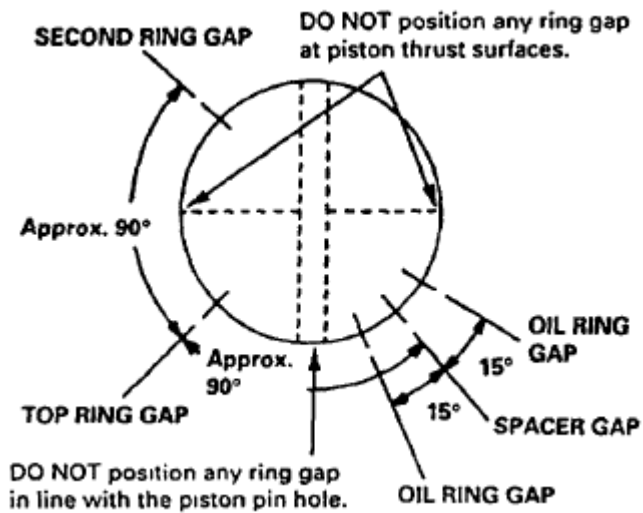


Fig. 39: Positioning Ring End Gaps

Courtesy of AMERICAN HONDA MOTOR CO., INC.

CRANKSHAFT OIL SEAL

INSTALLATION

The seal surface on the block should be dry. Apply a light coat of oil to the crankshaft and to the lip of the seal.

1. Drive the crankshaft oil seal into the right side cover using the special tools.

NOTE: Drive the crankshaft oil seal in squarely.

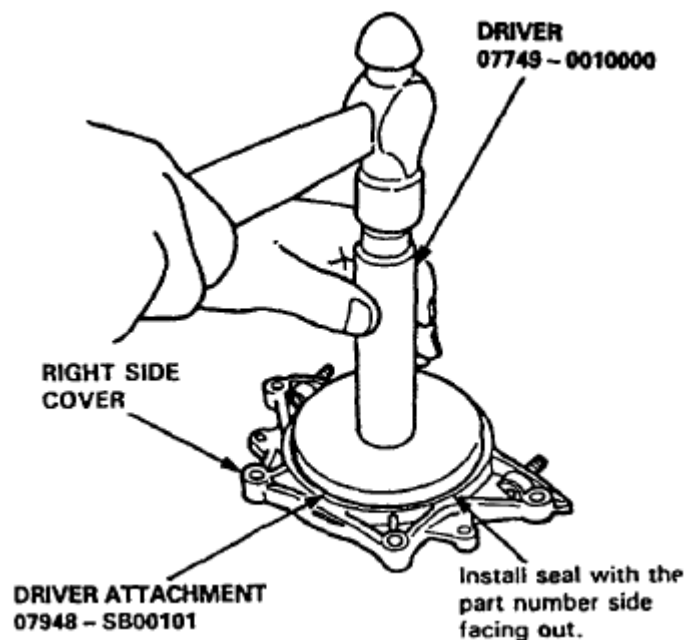
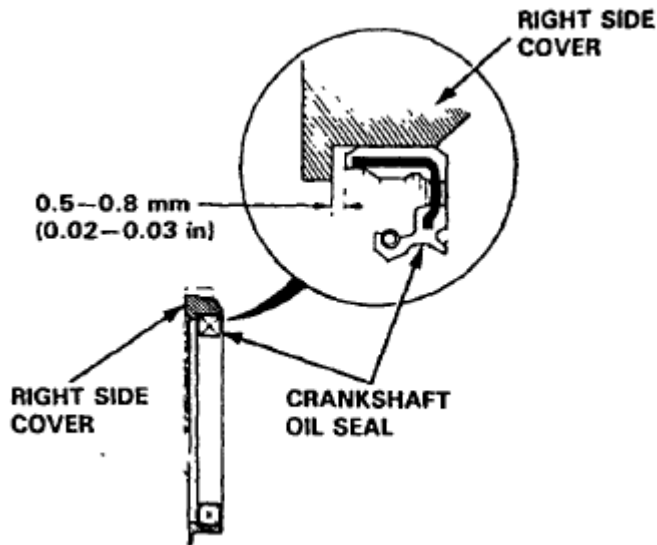


Fig. 40: Tapping Crankshaft Oil Seal

Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Confirm equal clearance all the way around with a feeler gauge.

Clearance: 0.5 - 0.8 mm (0.02 - 0.03 in)

**Fig. 41: Identifying Crankshaft Oil Seal Gap**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

NOTE: Refer to OIL SEALS and 8-10 for installation of the oil pump side crankshaft oil seal.

PISTONS

INSTALLATION

Before installing the pistons, apply a coat of engine oil to the ring grooves and cylinder bores.

1. If the crankshaft is already installed:
 - Set the crankshaft to BDC for each cylinder.
 - Remove the connecting rod caps, and slip short sections of rubber hose over the threaded ends of the connecting rod bolts.
 - Install the ring compressor, check that the bearing is securely in place, then position the piston in the cylinder, and tap it in using the wooden handle of a hammer.
 - Stop after the ring compressor pops free, and check the connecting rod-to-crank journal alignment before pushing the piston into place.
 - Install the rod caps with bearings, and torque the nuts to:

31 N.m (3.2 kgf.m, 23 lbf.ft)

Apply engine oil to the bolt threads.

2. If the crankshaft is not installed:

- Remove the rod caps and bearings, install the ring compressor, then position the piston in the cylinder and tap it in using the wooden handle of a hammer.
- Position all pistons at top dead center.

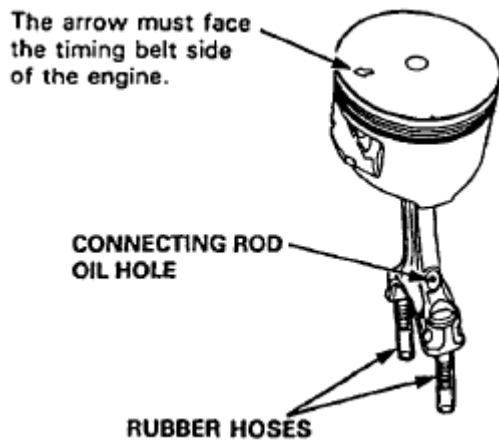


Fig. 42: Positioning Pistons Top Dead Center

Courtesy of AMERICAN HONDA MOTOR CO., INC.

NOTE: Maintain downward force on the ring compressor to prevent the rings from expanding before they enter the cylinder bore.

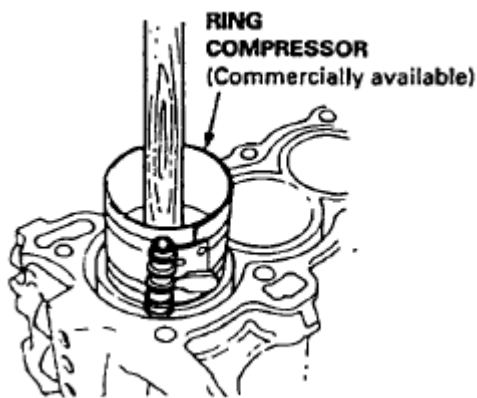


Fig. 43: Installing Piston

Courtesy of AMERICAN HONDA MOTOR CO., INC.

CRANKSHAFT

INSTALLATION

Before installing the crankshaft, apply a coat of engine oil to the main bearings and rod bearings.

1. Insert the bearing halves in the cylinder block and connecting rods.
2. Hold the crankshaft so the rod journals for cylinders No. 2 and No. 3 are straight down.
3. Lower the crankshaft into the block, seating the rod journals into connecting rods No. 2, No. 3. Install the rod caps and nuts finger-tight.

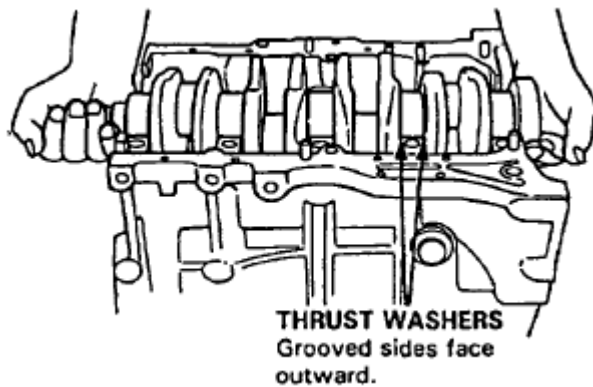


Fig. 44: Lowering Crankshaft Into Block

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Rotate the crankshaft clockwise, seat the journals into connecting rods No. 1 and No. 4. Install the rod caps and nuts finger-tight.

NOTE: Install the caps so the bearing recess is on the same side as the recess in the rod.

5. Check rod bearing clearance with plastigage (see CLEARANCE), then torque the capnuts.

Torque: 31 N.m (3.2 kgf.m, 23 lbf.ft)

Apply engine oil to the bolt threads.

NOTE: Reference numbers on the connecting rods are for big-end bore tolerance and do not indicate the position of the piston in the engine.

6. Install the thrust washers on the No. 4 journal. Oil the thrust washer surfaces.

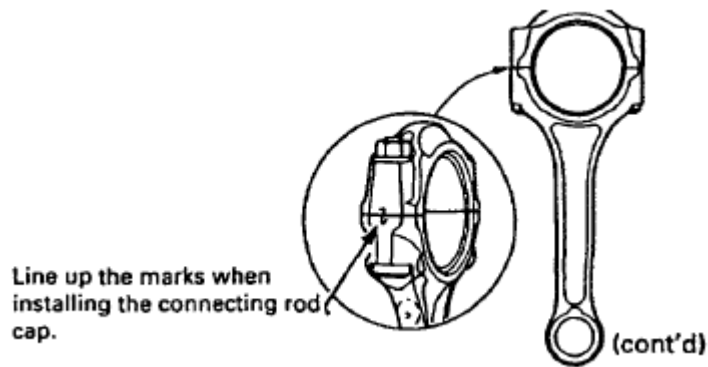


Fig. 45: Identifying Number Mark On Connecting Rods
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Install the main bearing caps.

Check clearances with plastigage (see **CLEARANCE**), then tighten the bearing cap bolts in 2 steps.

First step: 25 N.m (2.5 kgf.m, 18 lbf.ft)

Second step: 51 N.m (5.2 kgf.m, 38 lbf.ft)

NOTE: Coat the thrust washer surfaces and bolt threads with oil.

MAIN BEARING CAP BOLTS TIGHTENING SEQUENCE

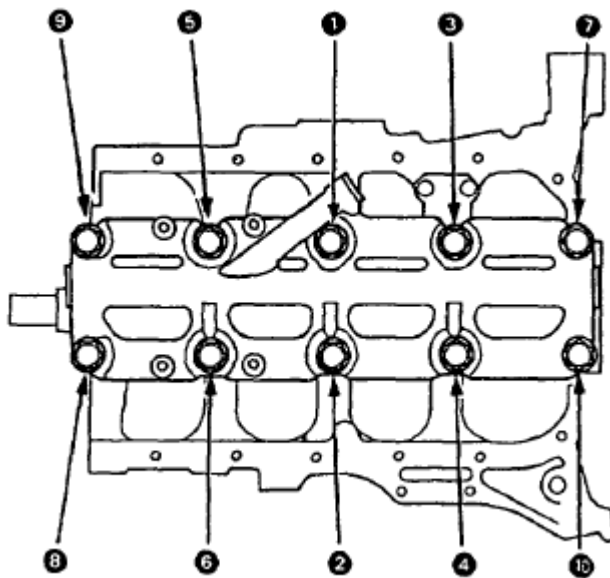


Fig. 46: Identifying Main Bearing Cap Bolts Tightening Sequence
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Apply liquid gasket to the block mating surface of the right side cover, then install it on the cylinder

block.

NOTE:

- Use liquid gasket, part No. 08718 - 0001 or 08718 - 0003.
- Check that the mating surfaces are clean and dry before applying liquid gasket.
- Apply liquid gasket evenly, being careful to cover all the mating surface.
- To prevent oil leakage, apply liquid gasket to the inner threads of the bolt holes.
- Do not install the parts if five minutes or more have elapsed since applying the liquid gasket. Instead reapply liquid gasket after removing the old residue.
- After assembly, wait at least 20 minutes before filling the engine with oil.

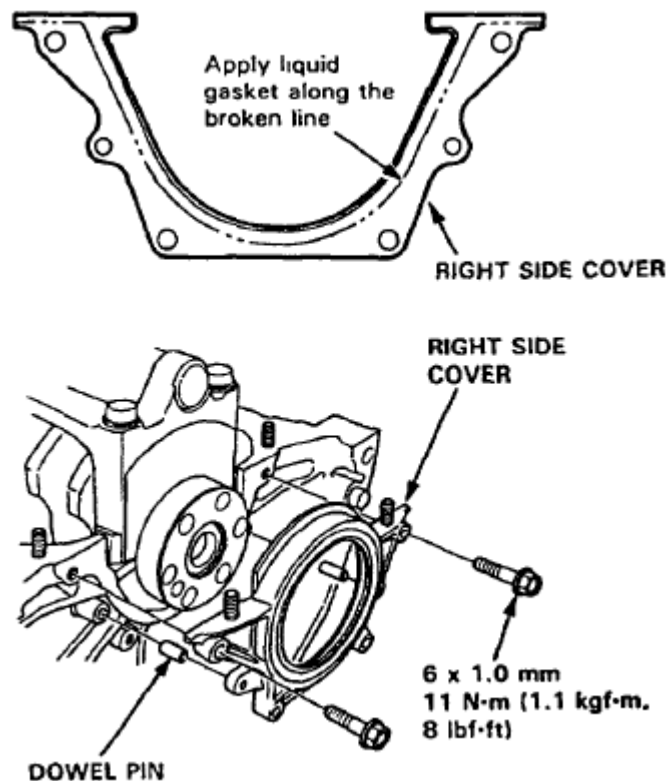


Fig. 47: Identifying Liquid Gasket Applying Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Apply liquid gasket to the oil pump mating surface of the block, then install the oil pump on the cylinder block.

Apply grease to the lips of the oil seals. Then, install the oil pump while aligning the inner rotor with the crankshaft. When the pump is in place, clean any excess grease off the crankshaft, then check that the oil

seal lips are not distorted.

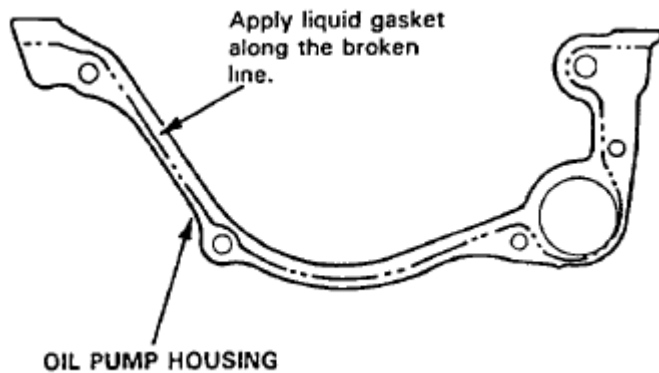


Fig. 48: Identifying Liquid Gasket Applying Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

NOTE:

- Apply a light coat of oil to the crankshaft and to the lip of the seal.
- Use new O-rings, and apply oil when installing them.

10. install the oil pump and oil screen.

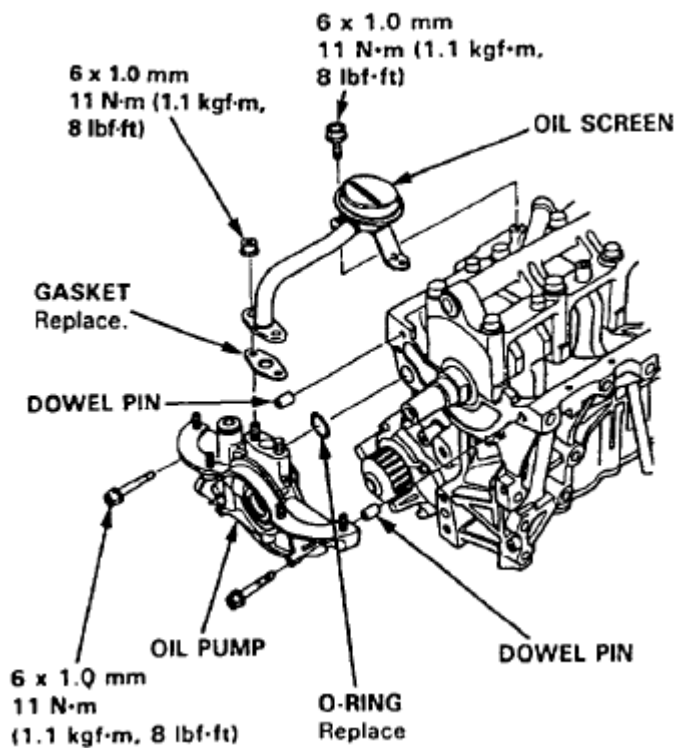


Fig. 49: Identifying Oil Pump And Oil Screen With O-Ring With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

OIL PAN

INSTALLATION

1. Install the oil pan gasket on the oil pan.

NOTE:

- Use liquid gasket, part No. 08718 - 0001 or 08718 - 0003.
- Check that the mating surfaces are clean and dry before applying liquid gasket.
- Apply liquid gasket as an even bead, centered between the edges of the mating surface.
- To prevent oil leakage, apply liquid gasket to the inner threads of the bolt holes.
- Do not install the parts if five minutes or more have elapsed since applying the liquid gasket. Instead, reapply liquid gasket after removing the old residue.
- After assembly, wait at least 20 minutes before filling the engine with oil.

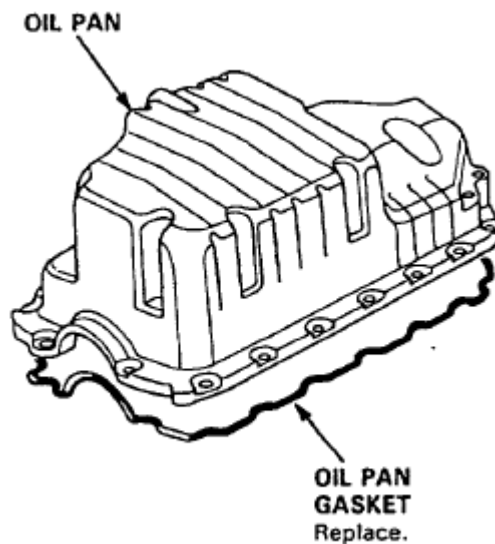


Fig. 50: Identifying Oil Pan Gasket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Apply liquid gasket to the block mating surfaces, then install the oil pan. Apply liquid gasket to the shaded areas.

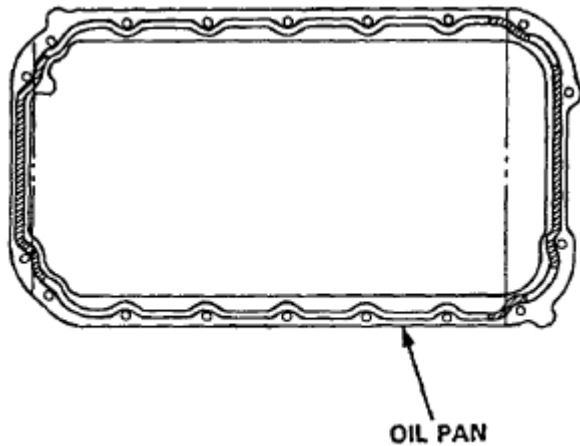


Fig. 51: Applying Liquid Gasket To Block Mating Surfaces
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Tighten the nuts finger-tight at six points as shown below.

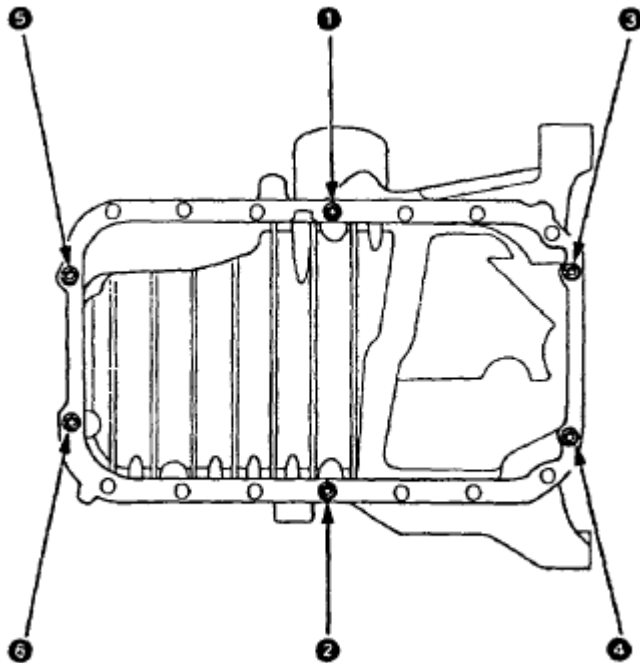


Fig. 52: Identifying Oil Pan Nuts Tightening Sequence
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Tighten all bolts and nuts, starting from nut(1), clockwise in three steps.

NOTE: Excessive tightening can cause distortion of the oil pan gasket and oil leakage.

Torque: 12 N.m(1.2 kgf.m, 8.7 lbf.ft)

OIL SEALS

INSTALLATION

NOTE:

- Engine removal is not required.
- The crankshaft oil seal housing should be dry-Apply a light coat of grease to the crankshaft and to the lips of the seals.

1. Using the special tool, drive in the timing pulley-end seal until the driver bottoms against the oil pump. When the seal is in place, clean any excess grease off the crankshaft and check that the oil seal lip is not distorted.

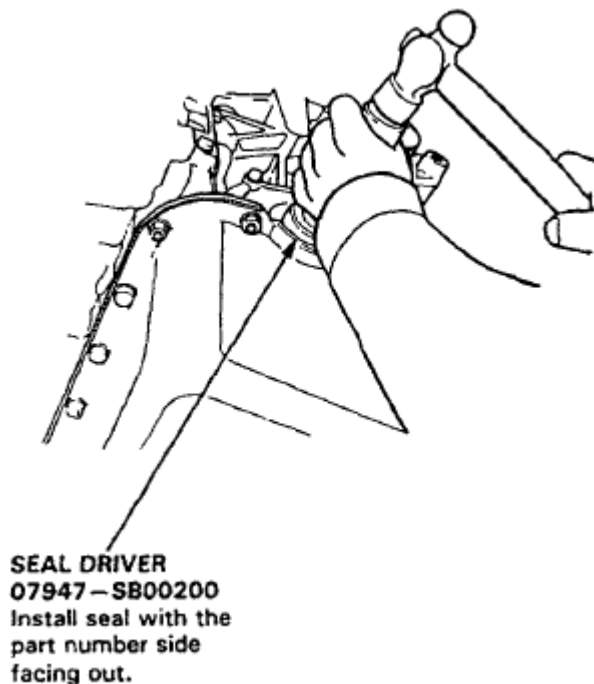


Fig. 53: Tapping Oil Seal

Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Measure the flywheel-end seal thickness and the oil seal housing depth. Using the special tool, drive the flywheel-end seal into the rear cover to the point where the clearance between the bottom of the oil seal and the right side cover is 0.5 - 0.8 mm (0.02 - 0.03 in) (see CRANKSHAFT OIL SEAL).

NOTE: Align the hole in the driver attachment with the pin on the crankshaft.

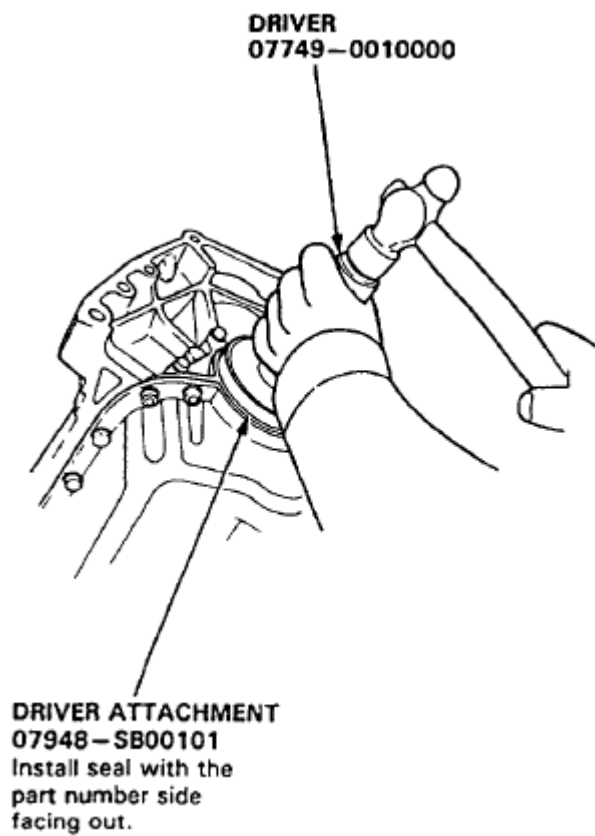


Fig. 54: Tapping Oil Seal

Courtesy of AMERICAN HONDA MOTOR CO., INC.