

2007-11 ENGINE

Cylinder Head - Element

SPECIAL TOOLS

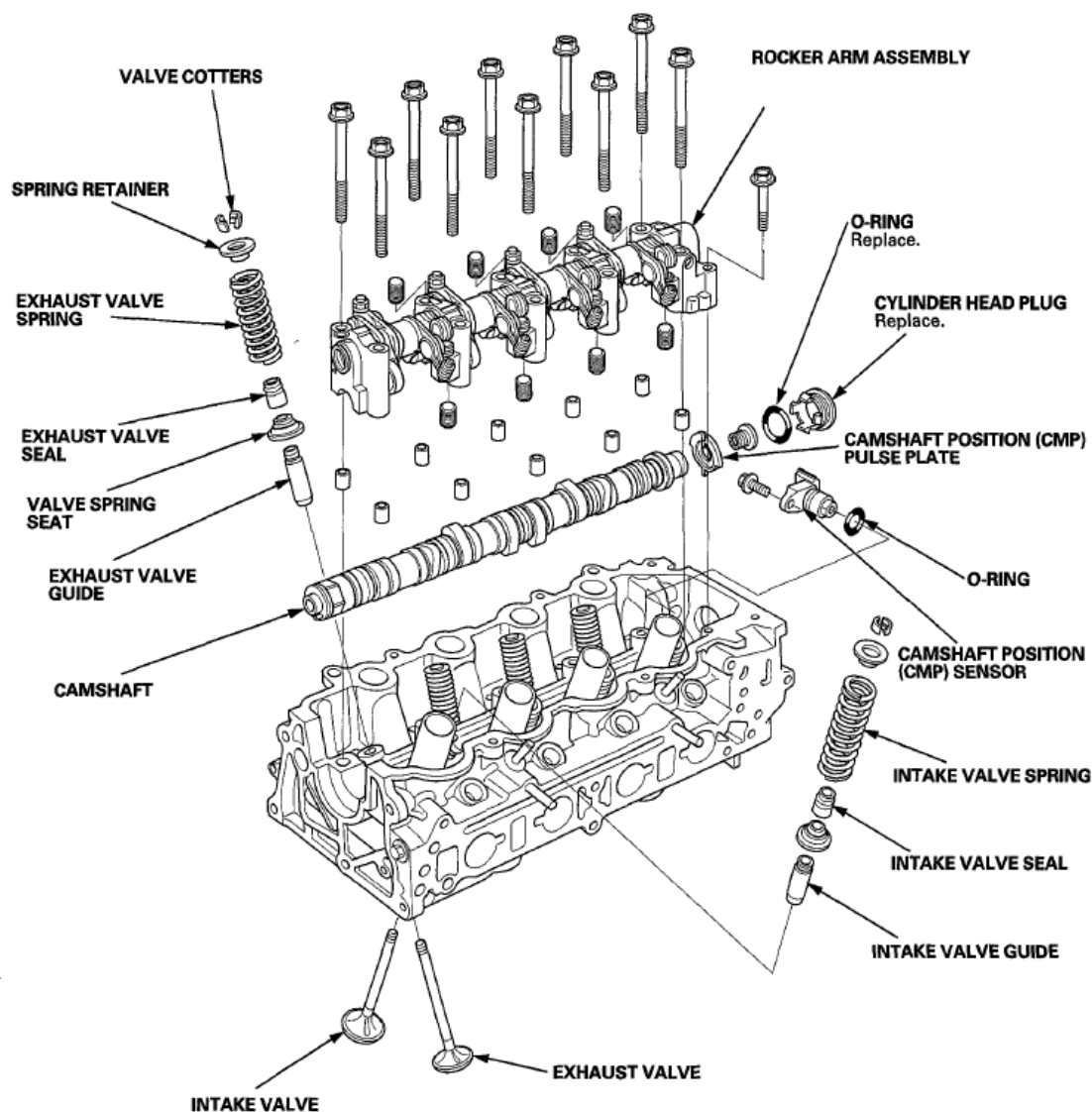


Fig. 1: Identifying Special Tools

Courtesy of AMERICAN HONDA MOTOR CO., INC.

COMPONENT LOCATION INDEX

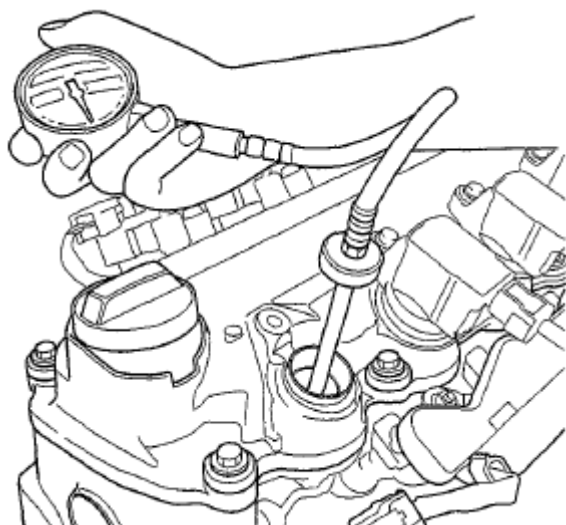


Fig. 2: Identifying Cylinder Head Replacement Components (1 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

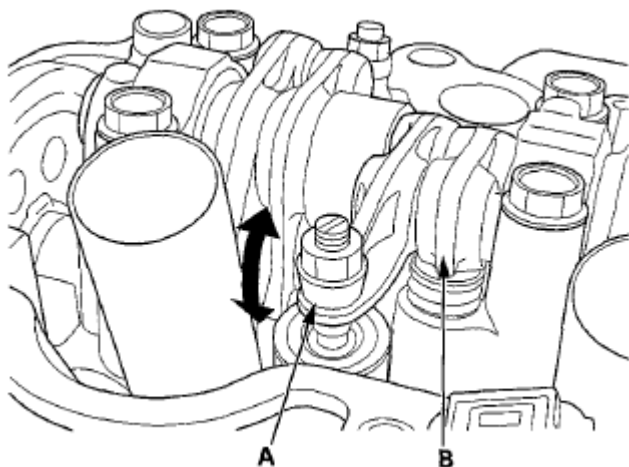


Fig. 3: Identifying Cylinder Head Replacement Components (2 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

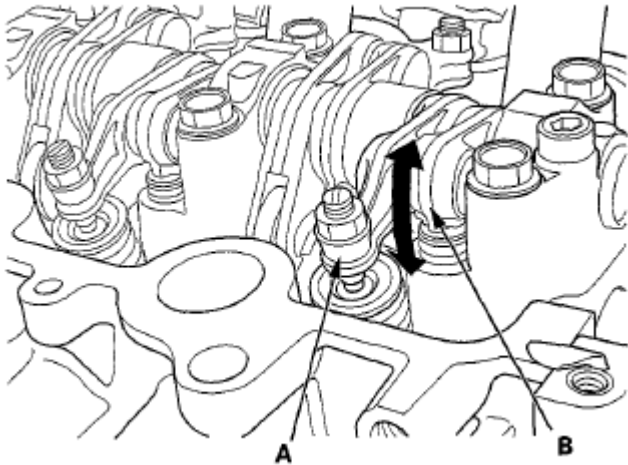


Fig. 4: Identifying Cylinder Head Replacement Components (3 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ENGINE COMPRESSION INSPECTION

NOTE: After the inspection, you must reset the engine control module (ECM)/powertrain control module (PCM). Otherwise, the ECM/PCM will continue to stop the fuel injectors from functioning.

1. Warm up the engine to normal operating temperature (cooling fan comes on).
2. Turn the ignition switch to LOCK (0).
3. Connect the Honda Diagnostic System (HDS) to the data link connector (DLC) (see step 2 in **HOW TO USE THE HDS (HONDA DIAGNOSTIC SYSTEM)**).
4. Turn the ignition switch to ON (II).
5. Make sure the HDS communicates with the vehicle and the ECM/PCM. If it doesn't communicate, troubleshoot the DLC circuit (see **DLC CIRCUIT TROUBLESHOOTING**).
6. Select ALL INJECTORS OFF in the PGM-FI INSPECTION menu with the HDS.
7. Turn the ignition switch to LOCK (0).
8. Remove the four ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION**).
9. Remove the four spark plugs (see **SPARK PLUG INSPECTION**).
10. Attach the compression gauge to the spark plug hole.

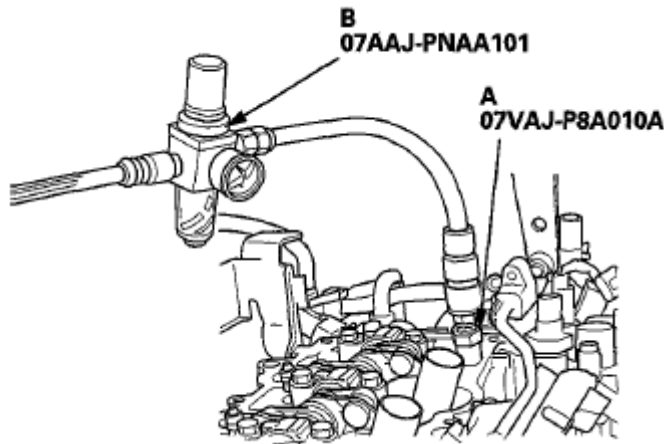


Fig. 5: Attaching Compression Gauge To Spark Plug Hole
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Step on the accelerator pedal to open the throttle fully, then crank the engine with the starter motor, and measure the compression.

Compression Pressure:

Above 930 kPa (9.5 kgf/cm² , 135 psi)

12. Measure the compression on the remaining cylinders.

Maximum Variation:

Within 200 kPa (2.0 kgf/cm² , 28 psi)

13. If the compression is not within specifications, check the following items, then remeasure the compression.
 - Incorrect valve clearance
 - Confirmation of cam timing
 - Damaged or worn cam lobes
 - Damaged or worn valves and seats
 - Damaged cylinder head gasket
 - Damaged or worn piston rings
 - Damaged or worn piston and cylinder bore
14. Remove the compression gauge from the spark plug hole.
15. Install the four spark plugs (see **SPARK PLUG INSPECTION**).
16. Install the four ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION**).
17. Select **ECM/PCM RESET** to cancel ALL INJECTORS OFF FUNCTION on the HDS.

VTEC ROCKER ARM TEST

SPECIAL TOOLS REQUIRED

- Air pressure regulator 07AAJ-PNAA101
- VTEC air adapter 07ZAJ-PNAA101
- VTEC air stopper 07ZAJ-PNAA200
- Air joint adapter 07ZAJ-PNAA300

1. Start the engine and let it run for 5 minutes, then turn the ignition switch to LOCK (0).
2. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
3. Rotate the crankshaft pulley clockwise. Make sure that the intake secondary rocker arm (A) and the intake primary rocker arm (B) are separated and that the intake secondary rocker arm and the intake primary rocker arm should move independently:
 - If the intake primary and secondary rocker arms move together, remove the primary and secondary rocker arms as an assembly, and check that the pistons in the primary and secondary rocker arms move smoothly. If any rocker arm needs replacing, replace the primary and secondary rocker arms as an assembly, then retest.
 - If the intake primary and secondary rocker arms move independently, go to step 4.

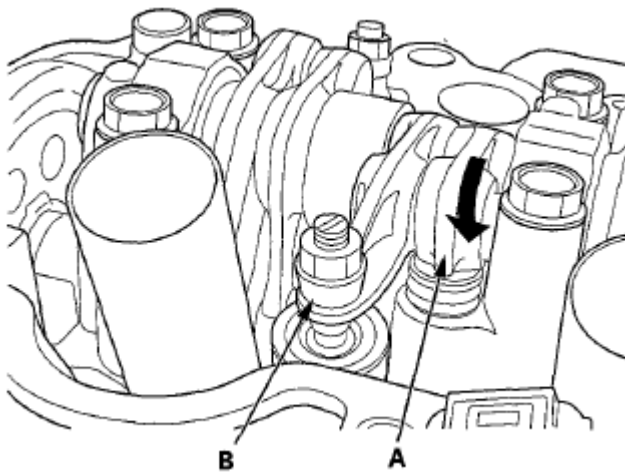


Fig. 6: Identifying Intake Primary Rocker Arm
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Check that the air pressure on the shop air compressor gauge indicates over 400 kPa (4.0 kgf/cm², 57 psi).
5. Inspect the valve clearance (see **VALVE CLEARANCE ADJUSTMENT**).
6. Remove the sealing bolt (A) from the relief hole, and install the VTEC air stopper (B).
7. Remove the No. 2 and No. 3 camshaft holder bolts, and install the VTEC air adapters (C) finger-tight.

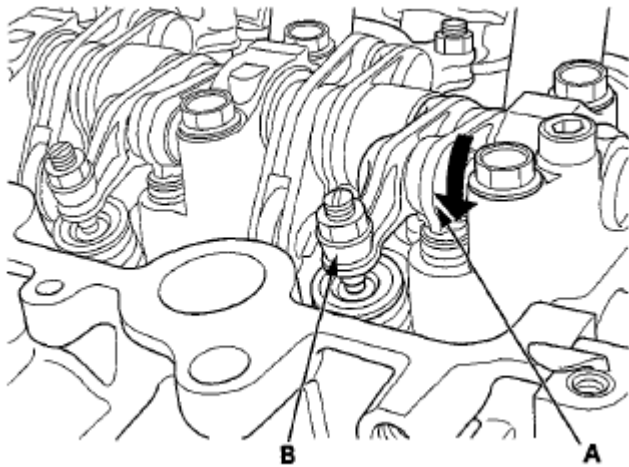


Fig. 7: Identifying Sealing Bolt From Relief Hole
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Connect the air joint adapter (D) and air pressure regulator (E).
9. Loosen the valve on the regulator, and apply the specified air pressure.

Specified Air Pressure:

290 kPa (3.0 kgf/cm² , 42 psi)

10. With the specified air pressure applied, move the intake primary rocker arm (A) for the No. 1 cylinder. The primary rocker arm and secondary rocker arm (B) should move together.
 - If the intake primary and secondary rocker arms move independently, remove the primary and secondary rocker arms as an assembly, and check that the pistons in the rocker arms move smoothly. Refer to **Rocker Arm and Shaft Inspection**. If any rocker arm needs replacing, replace the primary and secondary rocker arms as an assembly, then retest.
 - If the primary and secondary rocker arms move together, go to step 11.

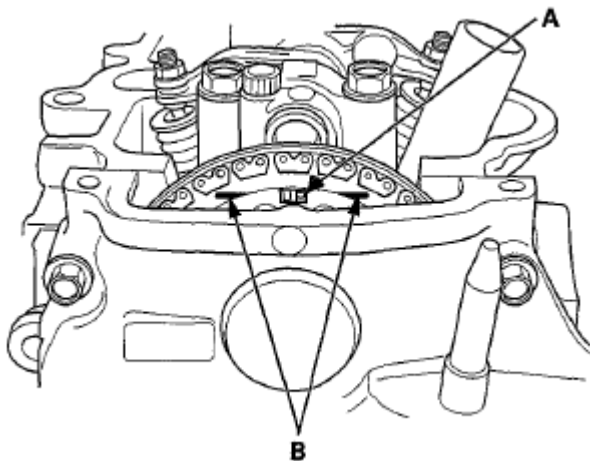


Fig. 8: Identifying Intake Primary Rocker Arm

Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Remove the air pressure regulator, the air joint adapter, the VTEC air adapters, and the VTEC air stopper.
12. Torque the camshaft holder mounting bolts to 22 N.m (2.2 kgf.m, 16 lbf.ft).
13. Torque the sealing bolt to 10 N.m (1.0 kgf.m, 7.4 lbf.ft).
14. Install the cylinder head cover (see **CYLINDER HEAD COVER INSTALLATION**).
15. Install the four spark plugs and the four ignition coils. Refer to **IGNITION COIL & SPARK PLUG REMOVAL/INSTALLATION**

VTC ACTUATOR INSPECTION

1. Remove the cam chain (see **CAM CHAIN REMOVAL**).
2. Loosen the rocker arm adjusting screws (see step 2).
3. Remove the camshaft holders (see step 3).
4. Remove the intake camshaft.
5. Check that the variable valve timing control (VTC) actuator is locked by turning the VTC actuator counterclockwise. If it is not locked, turn the VTC actuator clockwise until it stops, then recheck it. If it is still not locked, replace the VTC actuator.
6. Seal the retard holes (A) in the No. 1 camshaft journal with tape.

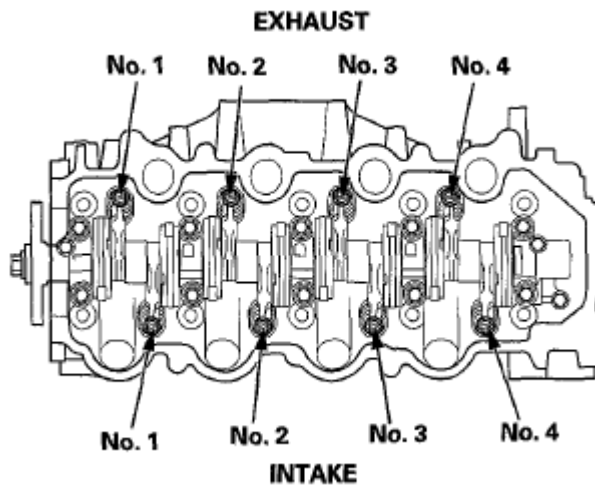


Fig. 9: Identifying Advance Holes & Retard Holes

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Seal one of the advanced holes (A) with tape.

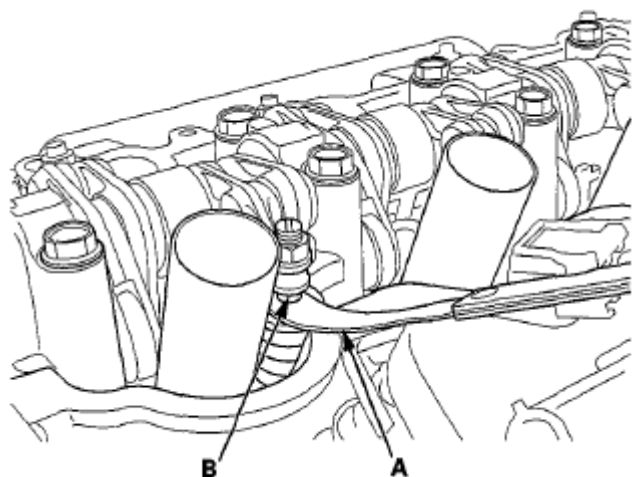


Fig. 10: Sealing Advance Holes With Tape
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Apply air to the unsealed advance hole to release the lock.

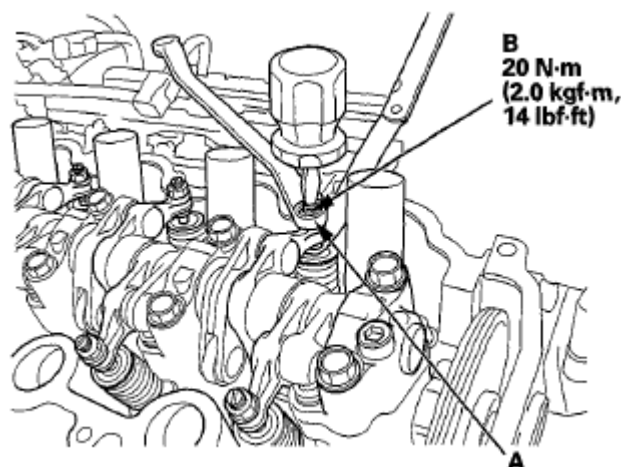


Fig. 11: Applying Air To Advance Hole To Release Lock
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Check that the VTC actuator moves smoothly. If the VTC actuator does not move smoothly, replace the VTC actuator.

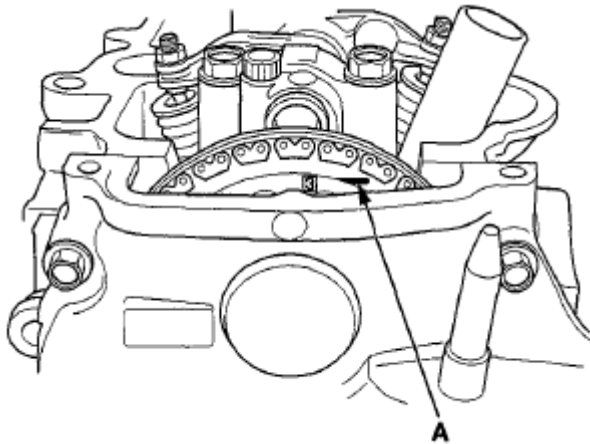


Fig. 12: Checking VTC Actuator Movement
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Remove the tape adhesive residue from the No. 1 camshaft journal.
11. Make sure the punch marks on the VTC actuator and exhaust camshaft sprocket are facing up, then set the camshafts in the rocker shaft holder (see step 6).
12. Set the camshaft holders and chain guide B in place (see step 7).
13. Torque the camshaft holder bolts to the specified torque (see step 8).
14. Hold the camshaft, and turn the VTC actuator clockwise until you hear it click. Make sure to lock the VTC actuator by turning it.
15. Install the cam chain (see CAM CHAIN INSTALLATION).
16. Adjust the valve clearance (see VALVE CLEARANCE ADJUSTMENT).

VALVE CLEARANCE ADJUSTMENT

SPECIAL TOOLS REQUIRED

Tappet adjust wrench set 07MAA-PR70100

NOTE: Connect the Honda Diagnostic System (HDS) to the data link connector (DLC) and monitor the engine coolant temperature (ECT) sensor 1 with the HDS. Adjust the valve clearance only when the engine coolant temperature is less than 100°F (38°C).

1. Remove the cylinder head cover (see CYLINDER HEAD COVER REMOVAL).
2. Set the No. 1 piston at top dead center (TDC). The punch mark (A) on the variable valve timing control (VTC) actuator and the punch mark (B) on the exhaust camshaft sprocket should be at the top. Align the TDC marks (C) on the VTC actuator and exhaust camshaft sprocket.

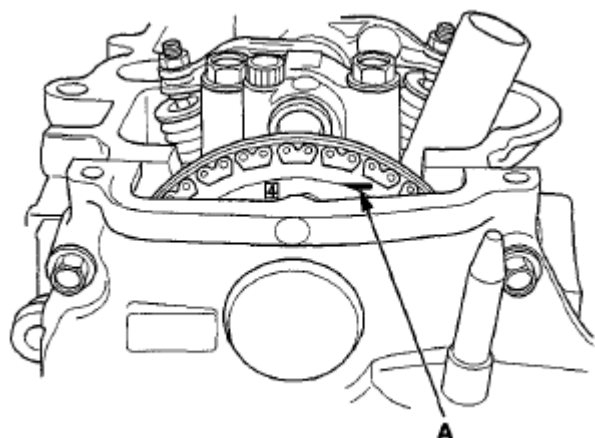


Fig. 13: Identifying Punch Mark On Variable Valve Timing Control (VTC) Actuator
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Select the correct thickness feeler gauge for the valve clearance you are going to check.

Valve Clearance

Intake: 0.21-0.25 mm (0.008-0.010 in.)

Exhaust: 0.28-0.32 mm (0.011-0.013 in.)

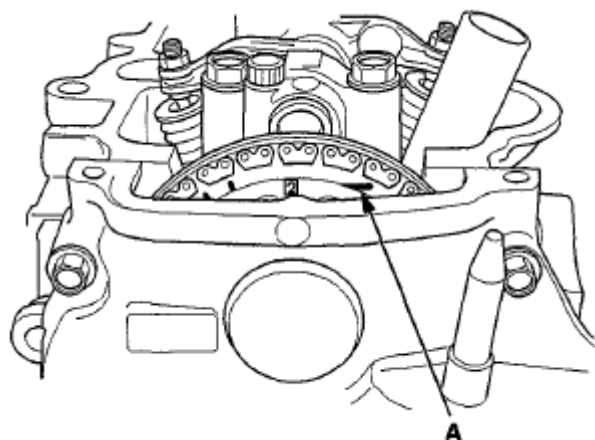


Fig. 14: Identifying Valve Position
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Insert the feeler gauge (A) between the adjusting screw (B) and the end of the valve stem, then slide it back and forth; you should feel a slight amount of drag.

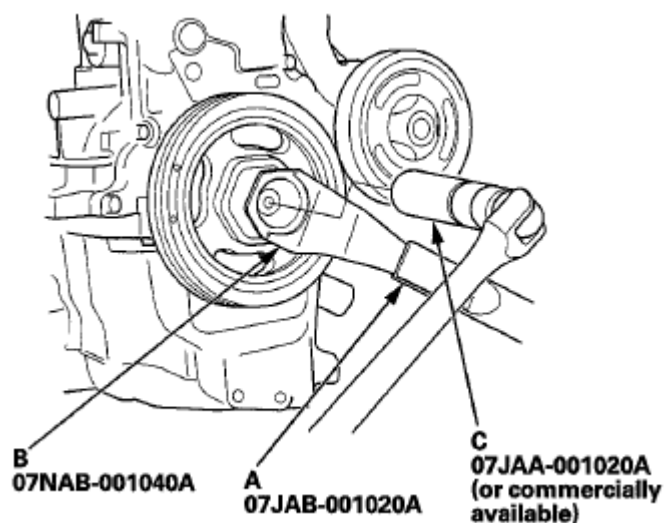


Fig. 15: Inserting Feeler Gauge Between Adjusting Screw

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. If you feel too much or too little drag, loosen the locknut with the tappet adjust wrench set, and turn the adjusting screw until the drag on the feeler gauge is correct.

- : Clean
- : Lubricate with new engine oil

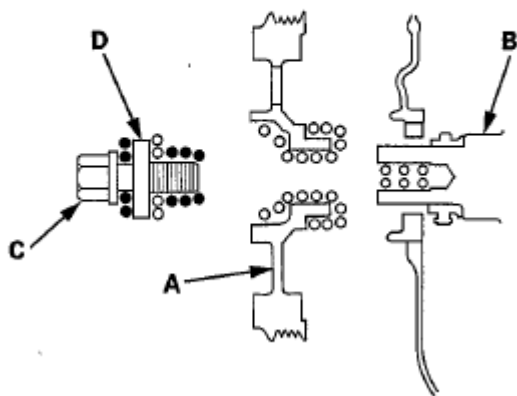


Fig. 16: Loosening Locknut

Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Tighten the locknut to the specified torque, and recheck the valve clearance. Repeat the adjustment, if necessary.

Specified Torque

Intake: 20 N.m (2.0 kgf.m, 15 lbf.ft)

Apply new engine oil to the nut threads.

Exhaust: 14 N.m (1.4 kgf.m, 10 lbf.ft)

Apply new engine oil to the nut threads.

7. Rotate the crankshaft 180° clockwise (camshaft pulley turns 90°).

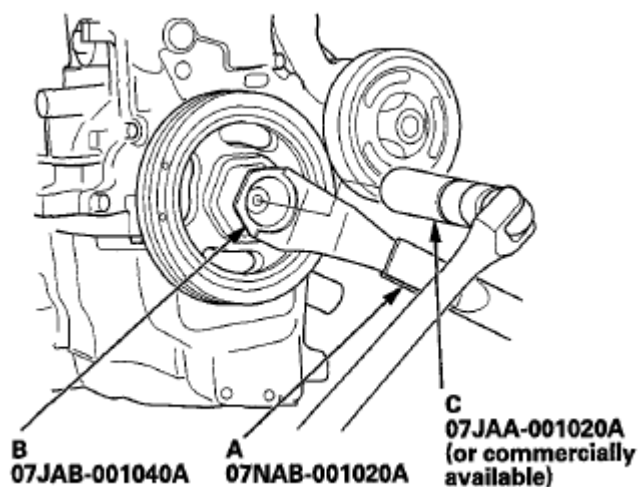


Fig. 17: Rotating Crankshaft Clockwise (1 Of 3)

Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Check and, if necessary, adjust the valve clearance on No. 3 cylinder.
9. Rotate the crankshaft 180° clockwise (camshaft pulley turns 90°).

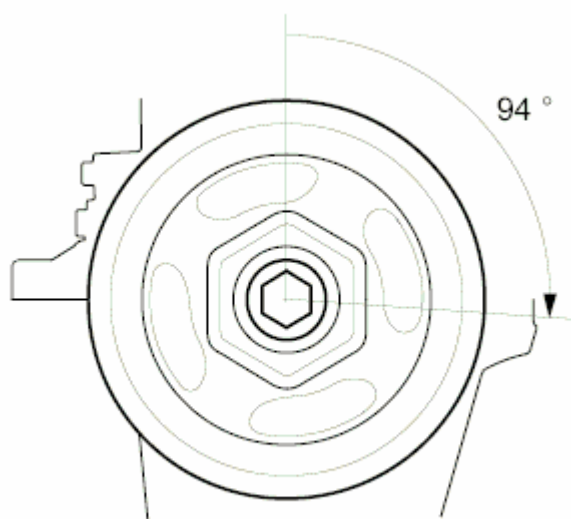


Fig. 18: Rotating Crankshaft Clockwise (2 Of 3)

Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Check and, if necessary, adjust the valve clearance on No. 4 cylinder.
11. Rotate the crankshaft 180° clockwise (camshaft pulley turns 90°).

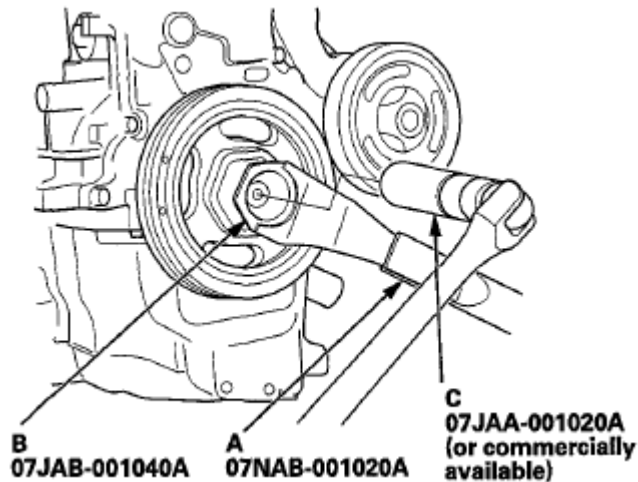


Fig. 19: Rotating Crankshaft Clockwise (3 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Check and, if necessary, adjust the valve clearance on No. 2 cylinder.
13. Install the cylinder head cover (see **CYLINDER HEAD COVER INSTALLATION**).

CRANKSHAFT PULLEY REMOVAL AND INSTALLATION

SPECIAL TOOLS REQUIRED

- Socket, 19 mm 07JAA-001020A or a commercially available 19 mm socket
- Holder handle 07JAB-001020B
- Holder attachment, 50 mm 07NAB-001040A

REMOVAL

1. Remove the right front wheel.
2. Remove the splash shield (see step 26 in **ENGINE REMOVAL**).
3. Remove the drive belt (see **DRIVE BELT REPLACEMENT**).
4. Hold the crankshaft pulley with holder handle (A) and holder attachment (B).

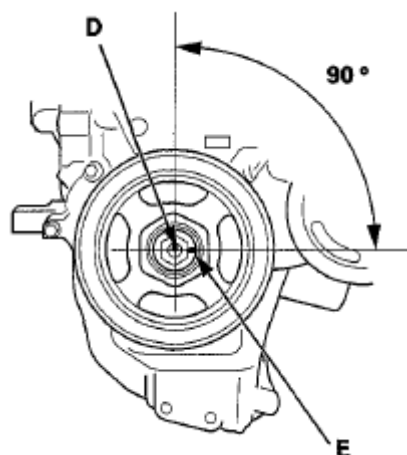


Fig. 20: Identifying Crankshaft Pulley With Holder Handle & Attachment
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Remove the bolt with a 19 mm socket (C) and breaker bar, then remove the crankshaft pulley.

INSTALLATION

1. Clean the crankshaft pulley (A), crankshaft (B), bolt (C), and washer (D). Lubricate with the new engine oil as shown below.

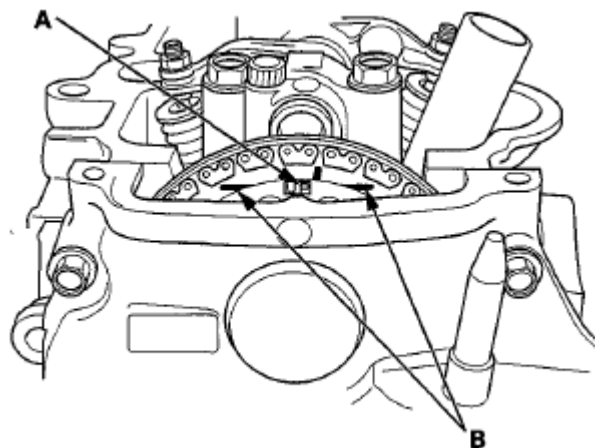


Fig. 21: Identifying Crankshaft Pulley Lubricating Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Install the crankshaft pulley, and hold the pulley with holder handle (A) and holder attachment (B).

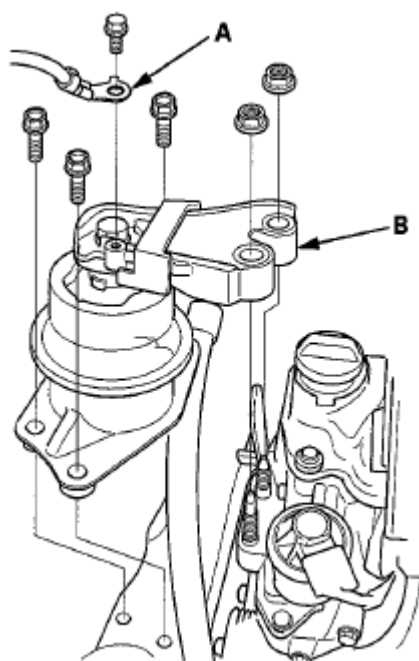


Fig. 22: Identifying Pulley With Holder Handle & Attachment
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Torque the bolt to 50 N.m (5.0 kgf.m, 37 lbf.ft) with a torque wrench and 19 mm socket (C). Do not use an impact wrench.
4. Mark the bolt head (A) and the crankshaft pulley (B) as shown below, then torque the bolt an additional 90° (The mark on the bolt head lines up with the mark on the crankshaft pulley).

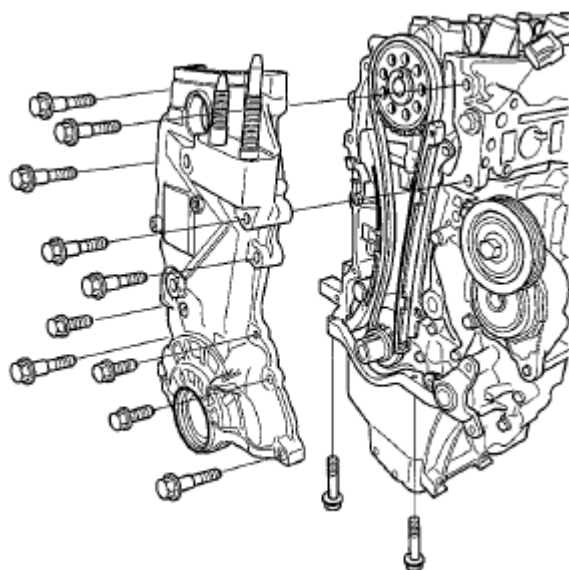


Fig. 23: Identifying Mark On Bolt Head & Crankshaft Pulley
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Install the drive belt (see **DRIVE BELT REPLACEMENT**).
6. Install the splash shield (see step 24 in **ENGINE INSTALLATION**).
7. Install the right front wheel.

CAM CHAIN REMOVAL

SPECIAL TOOLS REQUIRED

Camshaft lock pin set 07AAB-RWCA120

NOTE: **Keep the cam chain away from magnetic fields.**

1. Remove the right front wheel.
2. Remove the splash shield (see step 26 in **ENGINE REMOVAL**).
3. Remove the drive belt (see **DRIVE BELT REPLACEMENT**).
4. Turn the crankshaft pulley so its top dead center (TDC) mark (A) lines up with the pointer (B).

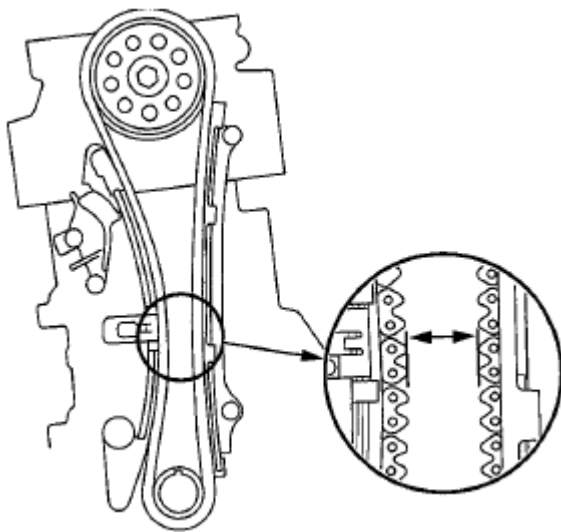


Fig. 24: Identifying TDC Mark Lines With Pointer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
6. Check that the No. 1 piston TDC marks (A) on the variable valve timing control (VTC) actuator and exhaust camshaft sprocket are aligned.

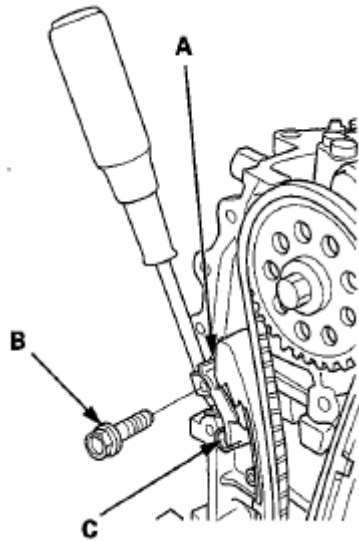


Fig. 25: Identifying TDC Marks On Variable Valve Timing Control (VTC) Actuator
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the crankshaft pulley (see **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
8. Disconnect the crankshaft position (CKP) sensor connector (A) and VTC oil control solenoid valve connector (B).

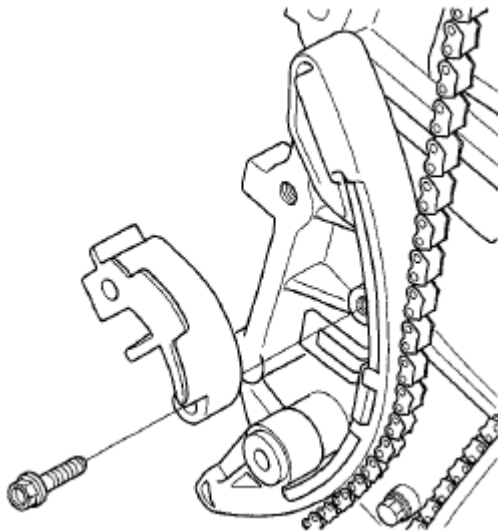


Fig. 26: Identifying Crankshaft Position (CKP) Sensor Connector & VTC Oil Control Solenoid Valve Connector
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Remove the VTC oil control solenoid valve (see **VTC OIL CONTROL SOLENOID VALVE REMOVAL/TEST/INSTALLATION**).
10. Support the engine with a jack and wood block under the oil pan.
11. Remove the ground cable (A), and remove the upper engine mount bracket (B).

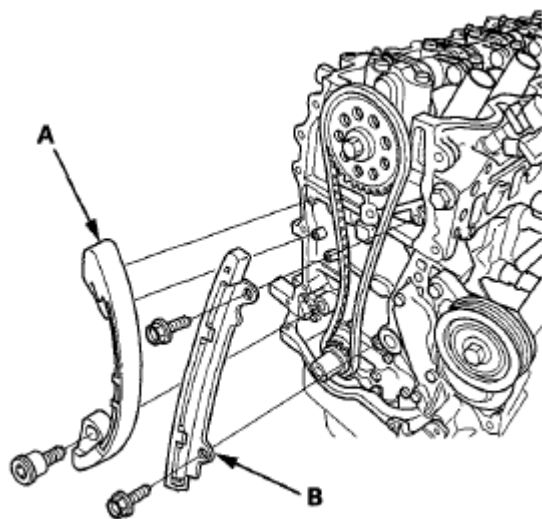


Fig. 27: Identifying Upper Engine Mount Bracket & Ground Cable
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Remove the side engine mount bracket.

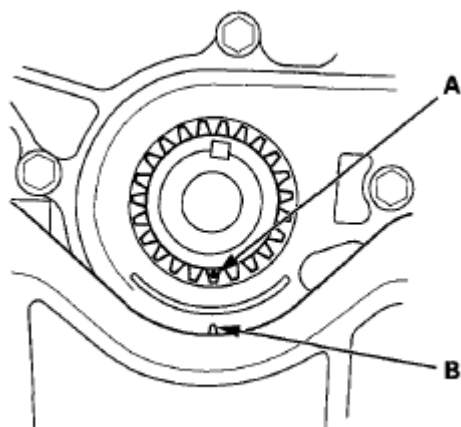


Fig. 28: Identifying Side Engine Mount Bracket Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Remove the chain case (A).

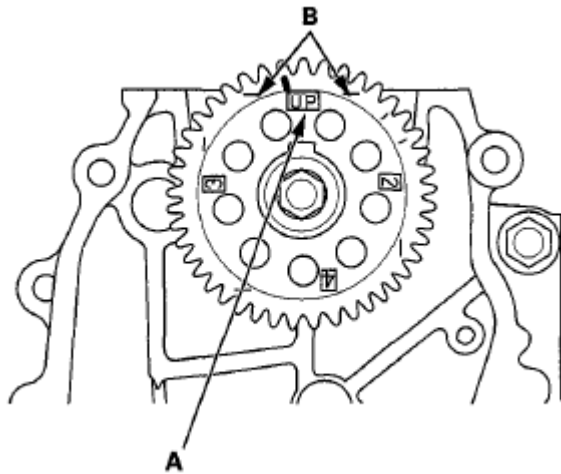


Fig. 29: Identifying Chain Case

Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Remove the CKP pulse plate (B).
15. Loosely install the crankshaft pulley.
16. Turn the crankshaft counterclockwise to compress the auto-tensioner.

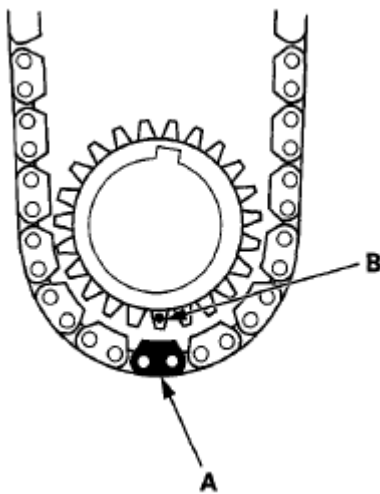


Fig. 30: Turning Crankshaft Counterclockwise

Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Align the holes on the lock (A) and the auto-tensioner (B), then insert a 1.2 mm (0.05 in) diameter pin or lock pin (C) into the holes. Turn the crankshaft clockwise to secure the pin.

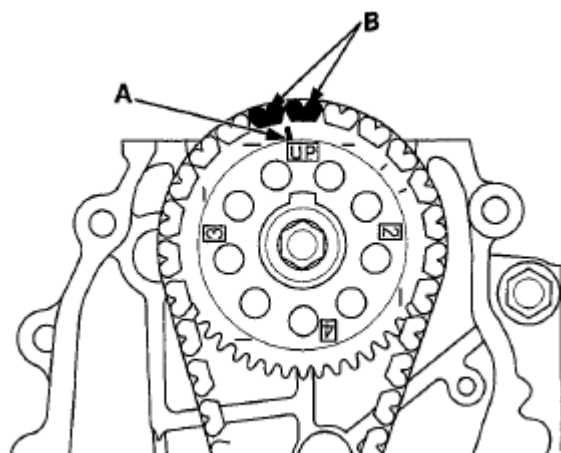


Fig. 31: Aligning Holes On Lock

Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Remove the auto-tensioner.

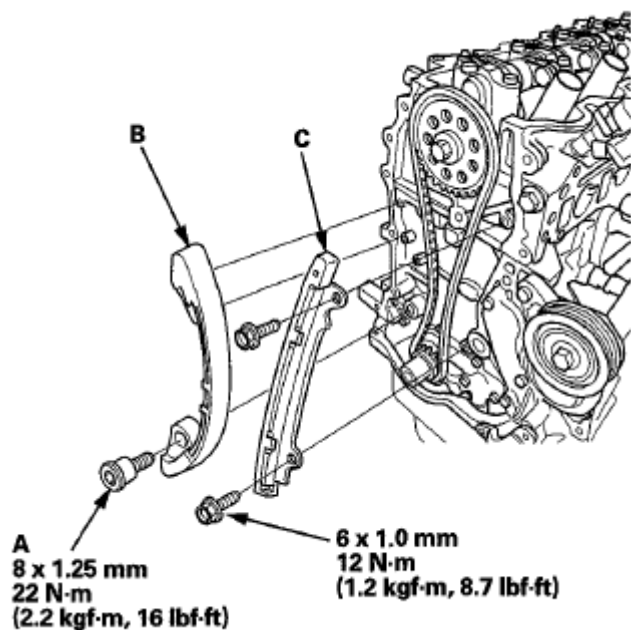


Fig. 32: Identifying Auto-Tensioner Bolts

Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Remove the crankshaft pulley.
20. Remove the cam chain guide B.

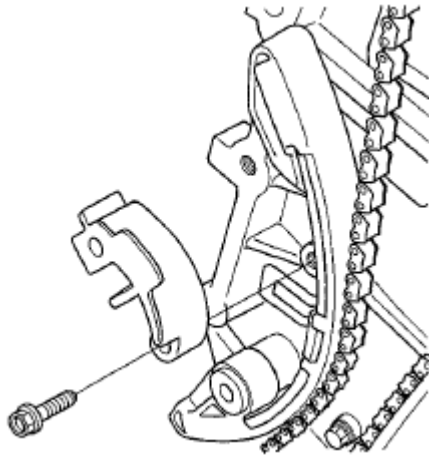


Fig. 33: Identifying Crankshaft Pulley

Courtesy of AMERICAN HONDA MOTOR CO., INC.

21. Remove the cam chain guide A and tensioner arm (B).

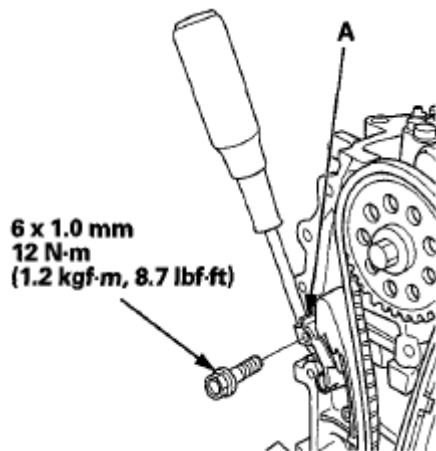


Fig. 34: Identifying Cam Chain Guide & Tensioner Arm

Courtesy of AMERICAN HONDA MOTOR CO., INC.

22. Remove the cam chain.

CAM CHAIN INSTALLATION

SPECIAL TOOLS REQUIRED

Camshaft lock pin set 07AAB-RWCA120

NOTE:

- Keep the cam chain away from magnetic fields.
- Before this procedure, check that the variable valve timing control (VTC) actuator is locked by turning the VTC actuator counterclockwise. If not

locked, turn the VTC actuator clockwise until it stops, then recheck it. If it is still not locked, replace the VTC actuator.

1. Set the crankshaft to top dead center (TDC). Align the TDC mark (A) on the crankshaft sprocket with the pointer (B) on the engine block.

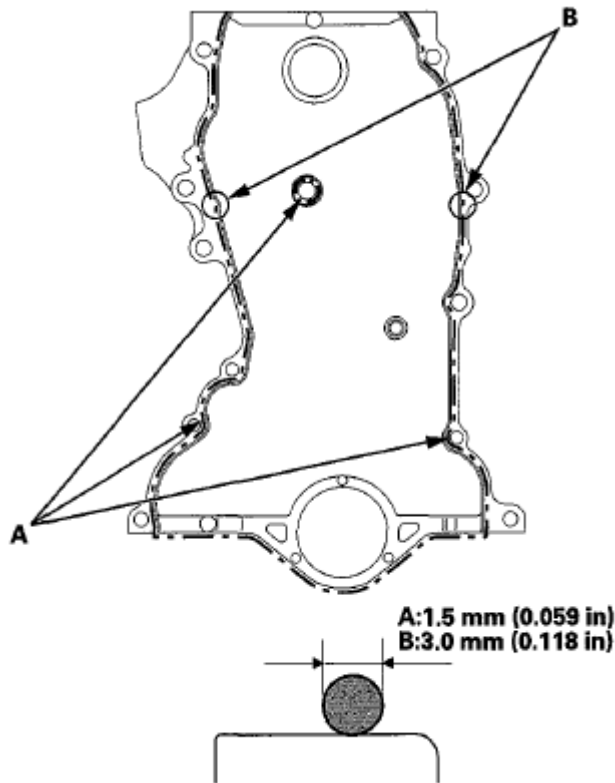


Fig. 35: Aligning TDC Mark On Crankshaft Sprocket With Pointer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Set the camshafts to TDC. The punch mark (A) on the VTC actuator and the punch mark (B) on the exhaust camshaft sprocket should be at the top. Align the TDC marks (C) on the VTC actuator and exhaust camshaft sprocket.

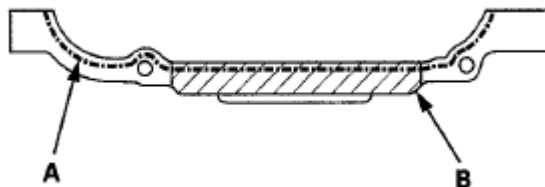


Fig. 36: Aligning TDC Marks On VTC Actuator & Exhaust Camshaft Sprocket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. To hold the intake camshaft, insert one of the pins (C) from the camshaft lock pin set into the maintenance hole in the camshaft position (CMP) pulse plate A and through the hole in the No. 5 rocker

shaft holder (D).

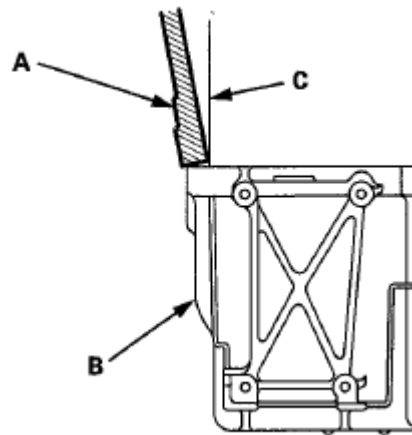


Fig. 37: Identifying Camshaft Lock Pin Set & Camshaft Position (CMP) Pulse Plate
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. To hold the exhaust camshaft, insert the other pin from the camshaft lock pin set into the maintenance hole in the camshaft position (CMP) pulse plate B and through the hole in the No. 5 rocker shaft holder.
5. Install the cam chain on the crankshaft sprocket with the colored link plate (A) aligned with the mark (B) on the crankshaft sprocket.

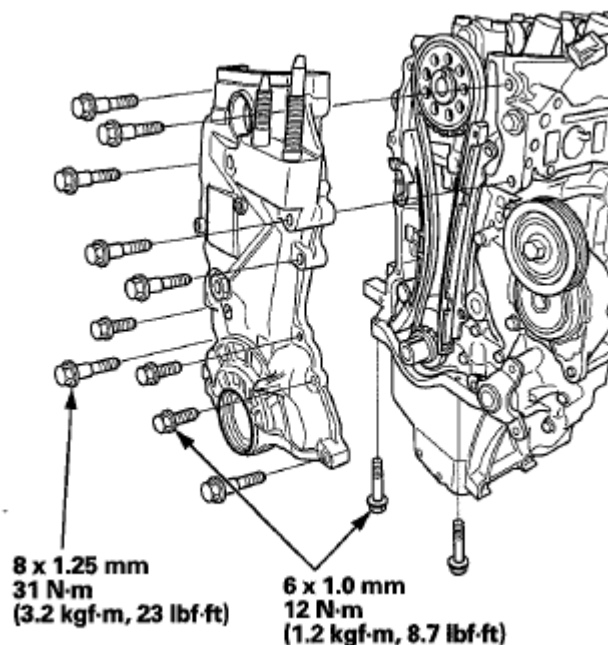


Fig. 38: Aligning Mark On Crankshaft Sprocket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Install the cam chain on the VTC actuator and the exhaust camshaft sprocket with the punch marks (A) aligned with the center of the two colored link plates (B).

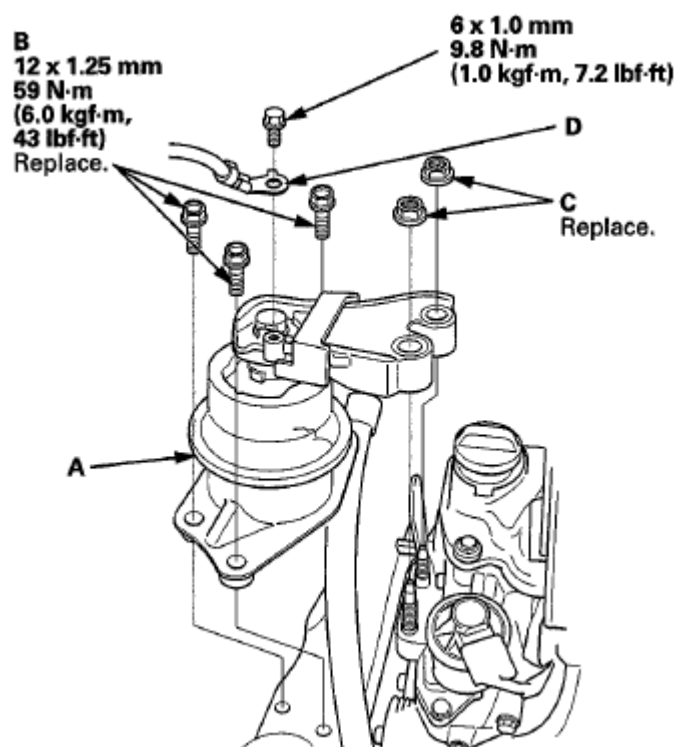


Fig. 39: Aligning Center Of Colored Link Plates
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Install the cam chain guide A and the tensioner arm (B).

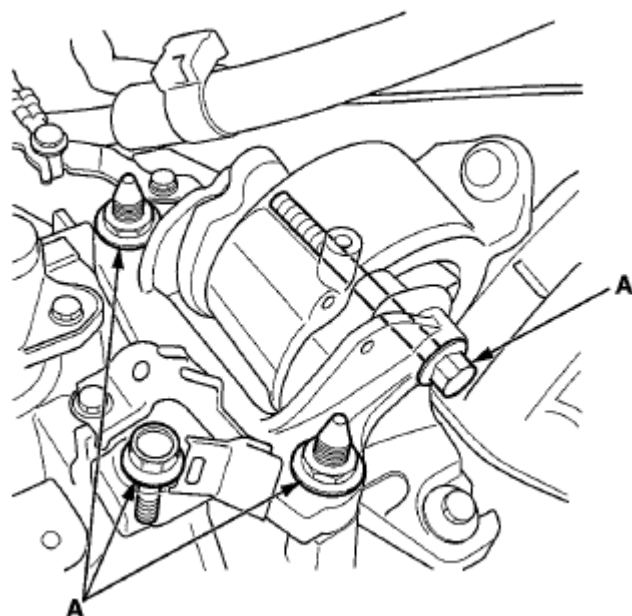


Fig. 40: Identifying Cam Chain Guide A & Tensioner Arm With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Install cam chain guide B.

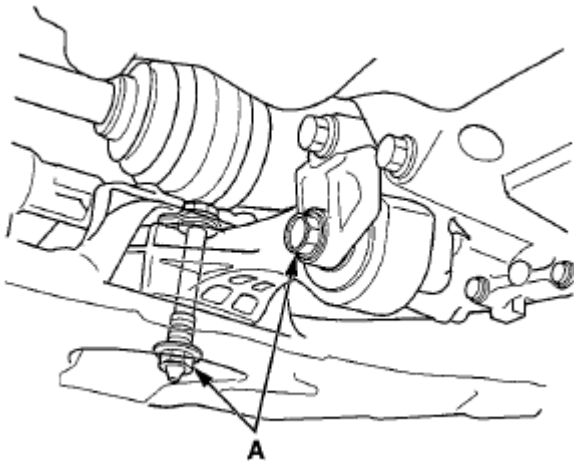


Fig. 41: Identifying Cam Chain Guide With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Compress the auto-tensioner when replacing the cam chain. Remove the pin from the auto-tensioner. Turn the plate (A) counterclockwise, to release the lock, then press the rod (B), and set the first cam (C) to the first edge of the rack (D). Insert the 1.2 mm (0.05 in.) diameter pin or lock pin (P/N 14511-PNA-003) (E) into the holes (F).

NOTE: If the chain tensioner is not set up as described, the tensioner will become damaged.

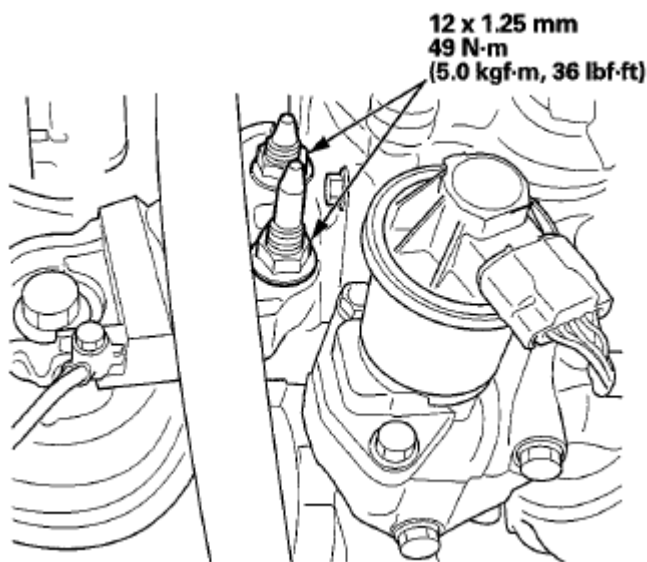


Fig. 42: View Of Plate, Rod, First Cam, Edge Of Rack & (P/N 14511-PNA-003)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Install the auto-tensioner.

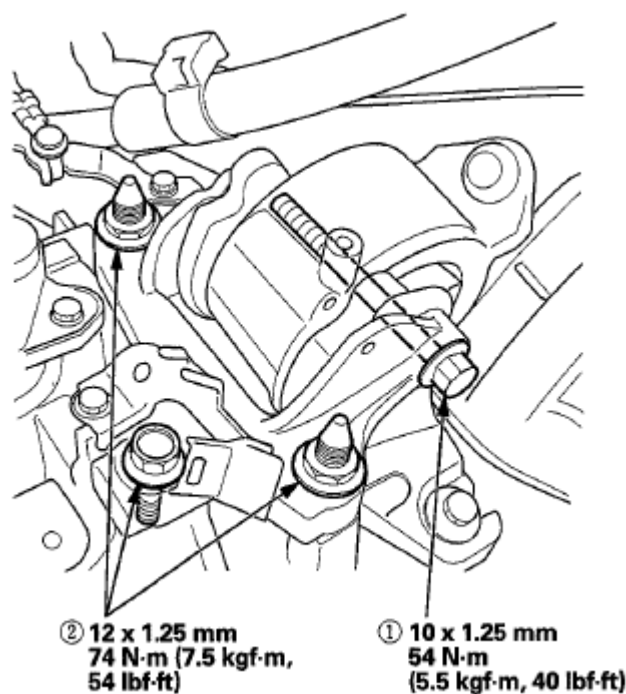


Fig. 43: Identifying Auto-Tensioner With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Remove the pin or lock pin from the auto-tensioner.

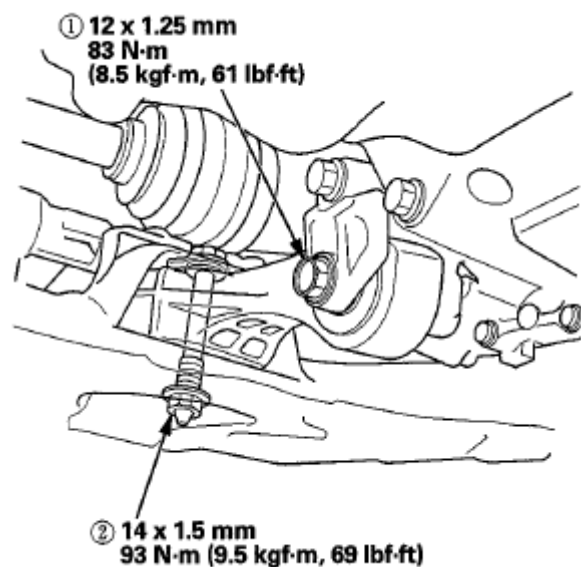


Fig. 44: Identifying Pin From Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Remove the camshaft lock pin set (07AAB-RWCA120).

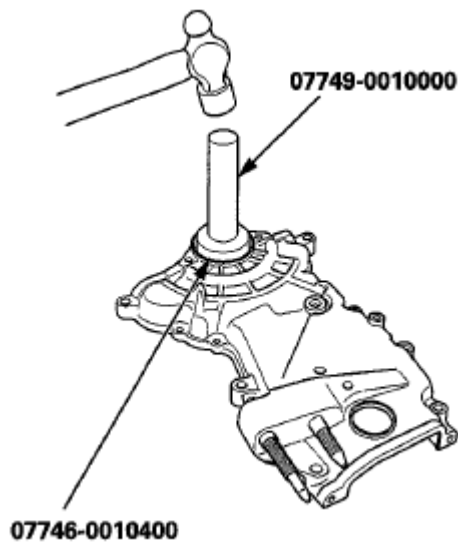


Fig. 45: Identifying Camshaft Lock Pin Set
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Install the crankshaft position (CKP) pulse plate.

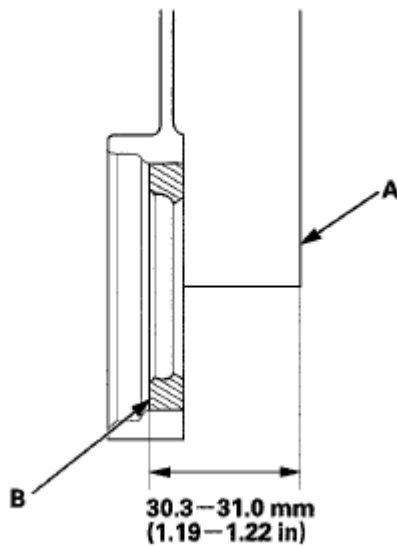


Fig. 46: Identifying Crankshaft Position (CKP) Pulse Plate
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Check the chain case oil seal for damage. If the oil seal is damaged, replace the chain case oil seal (see **CHAIN CASE OIL SEAL INSTALLATION**).
15. Remove old liquid gasket from the chain case mating surfaces, bolts, and bolt holes.
16. Clean and dry the chain case mating surfaces.
17. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the engine block mating surface of the chain case. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

- Apply a 2.5 mm (0.098 in) diameter bead of liquid gasket along the broken line.
- Apply a 5.0 mm (0.197 in) diameter bead of liquid gasket along the broken line.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply new liquid gasket.

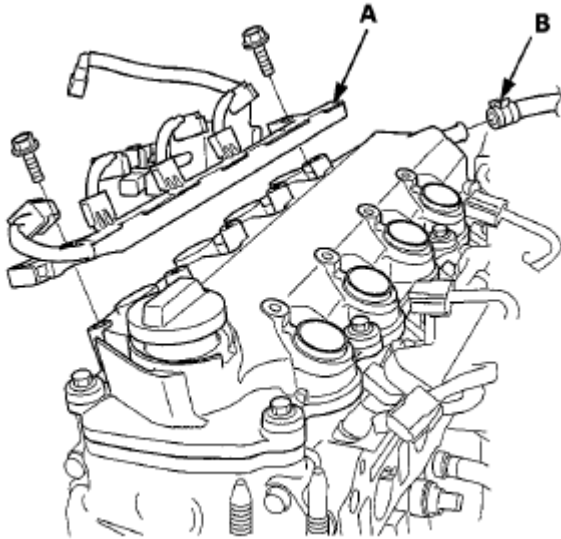


Fig. 47: Identifying Liquid Gasket Applying Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the oil pan mating surface of the chain case. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

- If you apply liquid gasket P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply new liquid gasket.

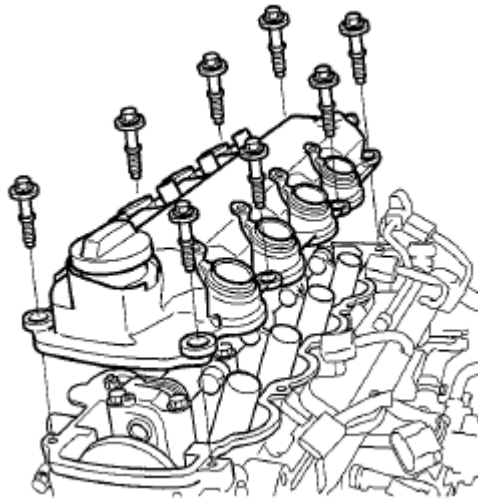


Fig. 48: Applying Liquid Gasket On Broken Line
Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Install the new O-ring (A) on the chain case. Set the edge of the chain case (B) to the edge of the oil pan (C), then install the chain case on the engine block (D). Wipe off excess liquid gasket on the oil pan and chain case mating surface.

NOTE:

- When installing the chain case, do not slide the bottom surface on the oil pan mounting surface.
- Wait at least 30 minutes before filling the engine with oil.
- Do not run the engine for at least 3 hours after installing the chain case.

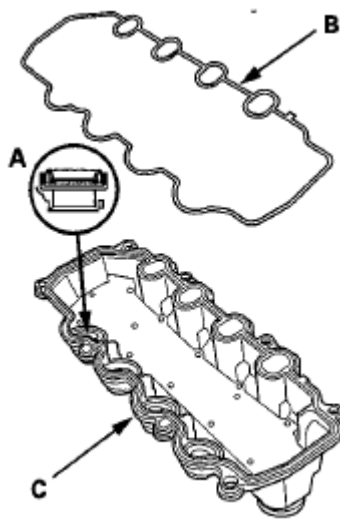


Fig. 49: Identifying O-Ring On Chain Case And Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

20. Install the side engine mount bracket, then tighten the side engine mount bracket mounting bolts.

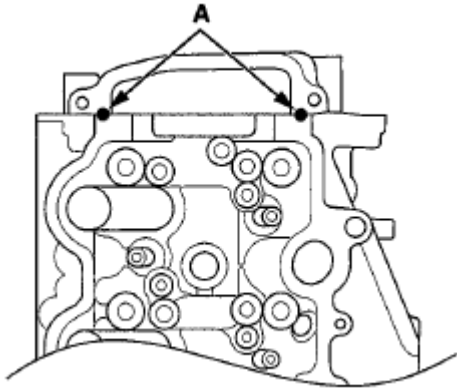


Fig. 50: Identifying Side Engine Mount Bracket With Bolts With Torque Specification
Courtesy of AMERICAN HONDA MOTOR CO., INC.

21. Install the upper engine mount bracket (A), then torque the bolt/nuts in the numbered sequence shown below.

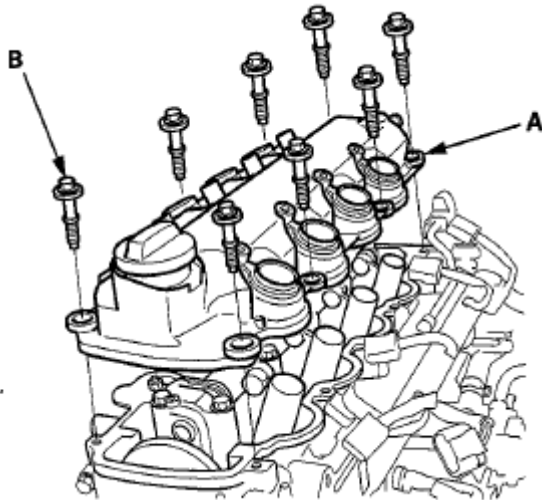


Fig. 51: Identifying Upper Engine Mount Bracket Bolt With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

22. Install the ground cable (B).
23. Remove the jack and the wood block.
24. Tighten the side engine mount bracket mounting bolt/nuts in the numbered sequence shown.
25. Install the VTC oil control solenoid valve (see **VTC OIL CONTROL SOLENOID VALVE REMOVAL/TEST/INSTALLATION**).
26. Connect the CKP sensor connector (A) and the VTC oil control solenoid valve connector (B).

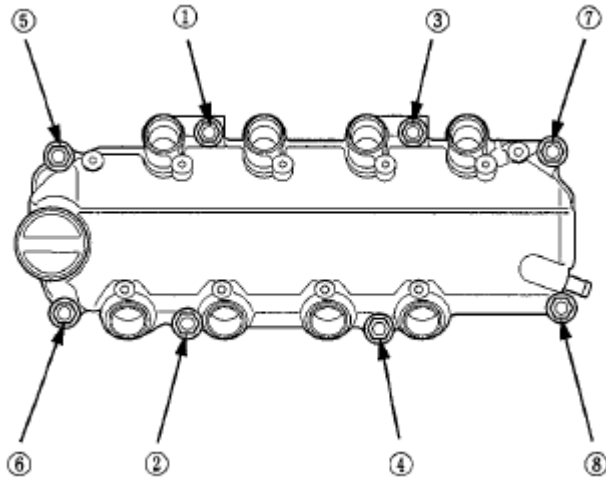


Fig. 52: Identifying CKP Sensor Connector & VTC Oil Control Solenoid Valve Connector
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

27. Install the crankshaft pulley (see INSTALLATION).
28. Install the cylinder head cover (see CYLINDER HEAD COVER INSTALLATION).
29. Install the drive belt (see DRIVE BELT REPLACEMENT).
30. Install the splash shield (see step 24 in ENGINE INSTALLATION).
31. Install the right front wheel.
32. Do the CKP pattern clear/CKP pattern learn procedure (see CRANK (CKP) PATTERN CLEAR/CRANK (CKP) PATTERN LEARN).

AUTO-TENSIONER REMOVAL AND INSTALLATION

REMOVAL

1. Remove the chain case cover.

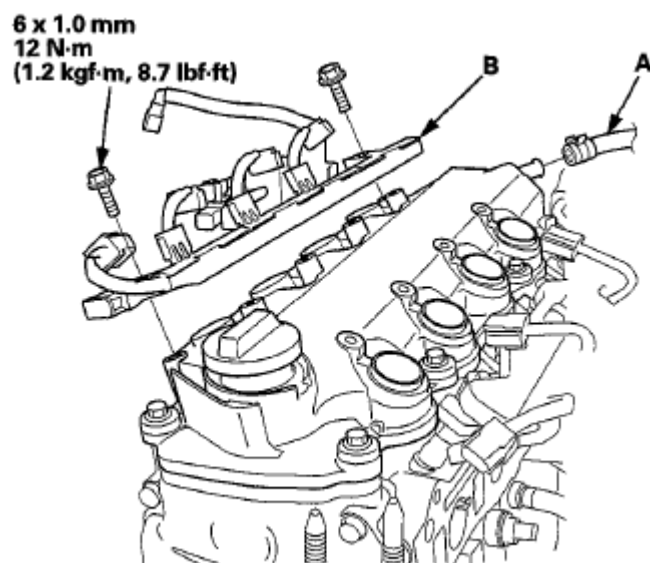


Fig. 53: Identifying Chain Case Cover

Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Turn the crankshaft counterclockwise to compress the auto-tensioner.

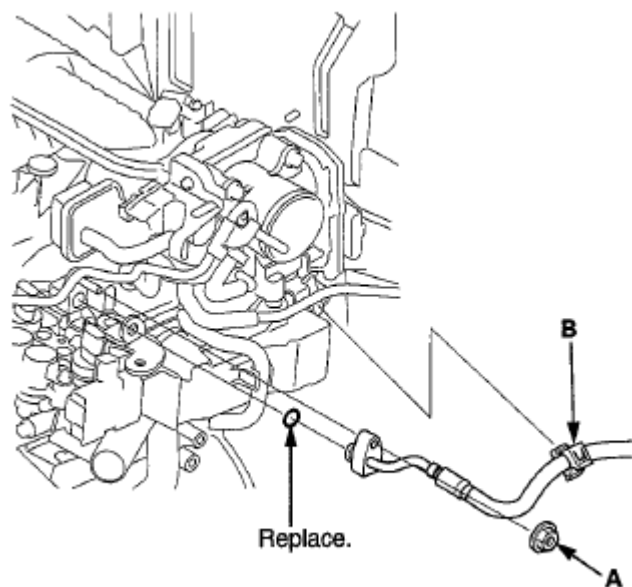


Fig. 54: Turning Crankshaft Counterclockwise

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Align the holes on the lock (A) and the auto-tensioner (B), then insert a 1.5 mm (0.06 in.) diameter pin (C) into the holes. Turn the crankshaft clockwise to secure the pin.

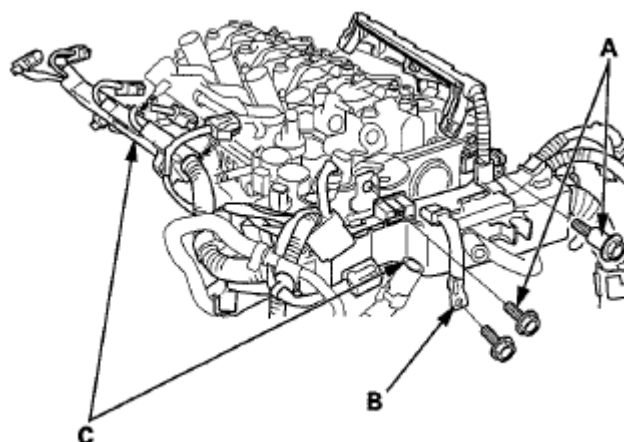


Fig. 55: Aligning Holes On Lock & Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the auto-tensioner.

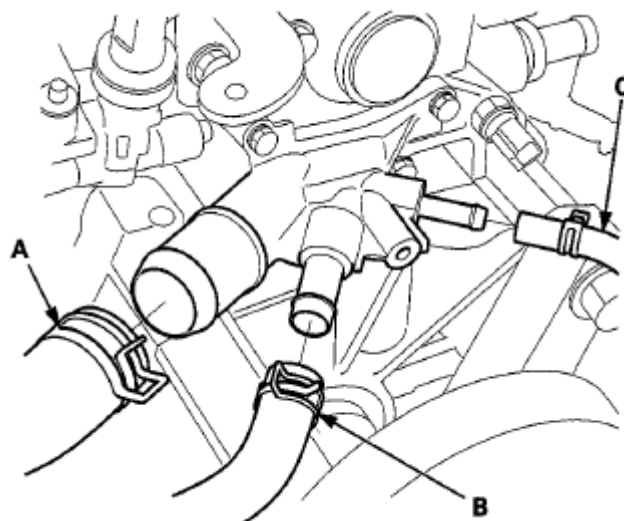


Fig. 56: Identifying Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

INSTALLATION

1. Install the auto-tensioner.

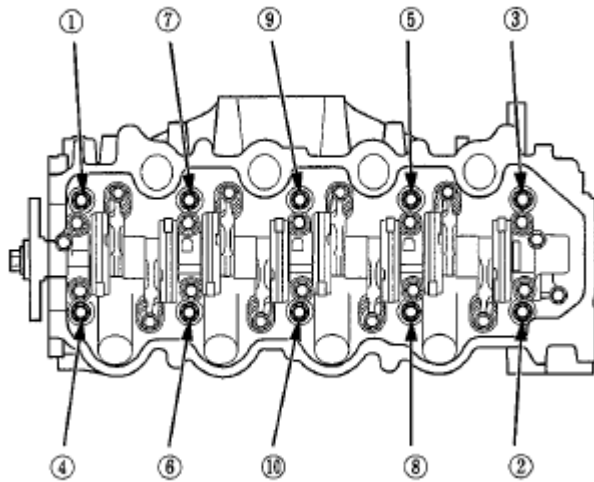


Fig. 57: Identifying Auto-Tensioner With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Remove the pin from the auto-tensioner.

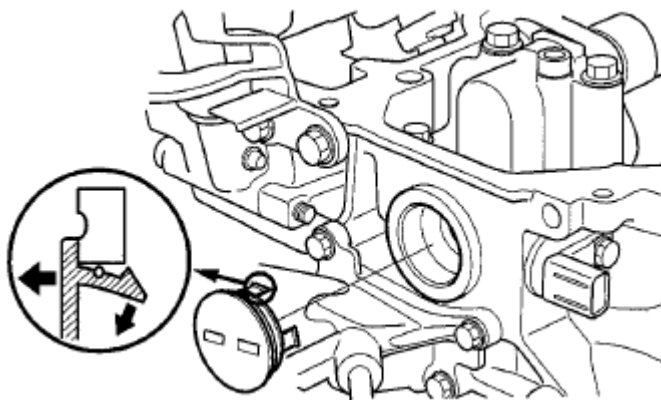


Fig. 58: Identifying Pin From Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove any old liquid gasket from the chain case cover mating surfaces, bolts, and bolt holes.
4. Clean and dry the chain case cover mating surfaces.
5. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the chain case mating surface of the chain case cover. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

- If you apply liquid gasket P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply new liquid gasket.

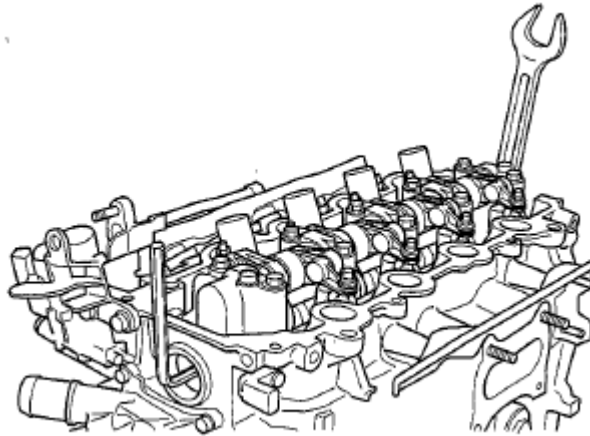


Fig. 59: Identifying Liquid Gasket Applying Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Install the chain case cover.

NOTE:

- Wait for at least 30 minutes before filling the engine with oil.
- Do not run the engine for at least 3 hours after installing the chain case cover.

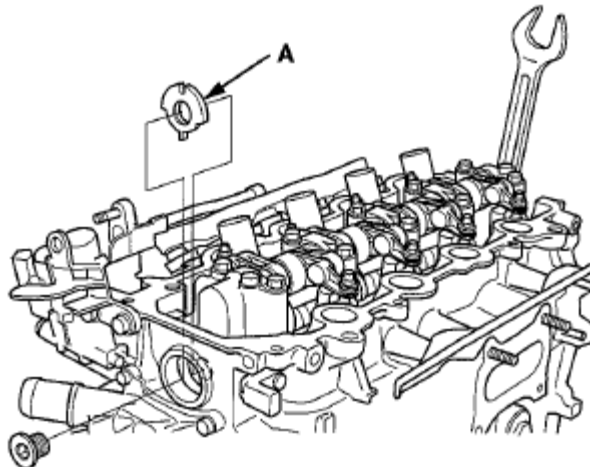


Fig. 60: Identifying Chain Case Cover Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CAM CHAIN CASE OIL SEAL INSTALLATION

SPECIAL TOOLS REQUIRED

- Handle driver 07749-0010000

- Attachment, 52 x 55 mm 07746-0010400

1. Clean and dry the crankshaft oil seal.
2. Apply a light coat of new engine oil to the lip of the chain oil seal.
3. Use the handle driver, 15 x 135L and attachment, 52 x 55 mm to drive a new oil seal squarely into the chain case to the specified installed height.

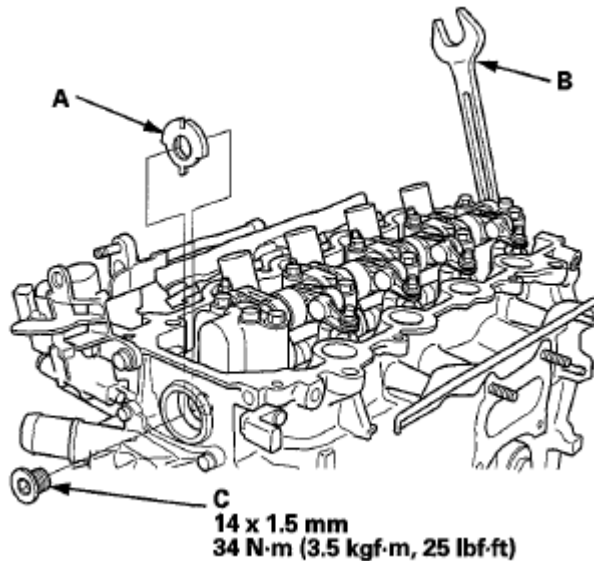


Fig. 61: Driving Oil Seal Using Handle Driver & Attachment
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Measure the distance between the chain case surface (A) and oil seal (B).

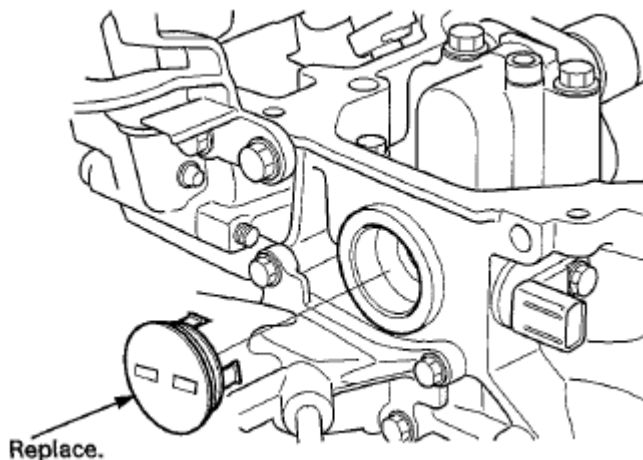


Fig. 62: Measuring Distance Between Chain Case Surface & Oil Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CAM CHAIN INSPECTION

1. Remove the right front wheel.
2. Remove the splash shield (see step 26 in **ENGINE REMOVAL**).
3. Remove the drive belt (see **DRIVE BELT REPLACEMENT**).
4. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
5. Remove the crankshaft pulley (see **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
6. Disconnect the crankshaft position (CKP) sensor connector and variable valve timing control (VTC) oil control solenoid valve connector (see step 8).
7. Remove the VTC oil control solenoid valve (see **VTC OIL CONTROL SOLENOID VALVE REMOVAL/TEST/INSTALLATION**).
8. Support the engine with a jack and wood block under the oil pan.
9. Remove the ground cable, and remove the upper bracket (see step 11).
10. Remove the side engine mount bracket (see step 12).
11. Remove the chain case (see step 13).
12. Measure the tensioner rod length between the tensioner body and bottom of the flat surface section on the tensioner rod. If the length is more than the service limit, replace the cam chain and oil pump chain.

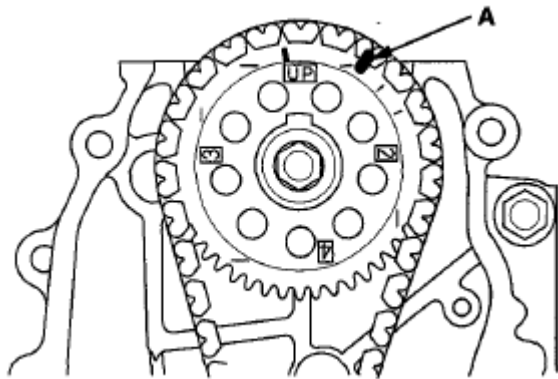


Fig. 63: Identifying Tensioner Rod Length Dimension
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Check the chain case oil seal for damage. If the oil seal is damaged, replace the chain case oil seal (see **CHAIN CASE OIL SEAL INSTALLATION**).
14. Remove all of the old liquid gasket from the chain case mating surfaces, bolt and bolt holes.
15. Clean and dry the chain case mating surfaces.
16. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the engine block mating surface of the chain case. Install the component within 5 minutes of applying the liquid gasket (see step 17).

NOTE:

- If you apply liquid gasket P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply new liquid gasket.

17. Apply liquid gasket to the engine block upper surface contact areas on the chain case and lower block upper surface contact areas on the chain case (see step 18).
18. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the oil pan mating surface of the chain case. Install the component within 5 minutes of applying the liquid gasket (see step 18).

NOTE:

- If you apply liquid gasket P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply new liquid gasket.

19. Install the new O-ring on the chain case. Set the edge of the chain case to the edge of the oil pan, then install the chain case on the engine block (see step 19). Wipe off the excess liquid gasket on the oil pan and chain case mating surface.

NOTE:

- When installing the chain case, do not slide the bottom surface onto the oil pan mounting surface.
- Wait at least 30 minutes before filling the engine with oil.
- Do not run the engine for at least 3 hours after installing the chain case.

20. Install the side engine mount bracket (see step 20).
21. Install the upper bracket and the ground cable (see step 21).
22. Remove the jack and the wood block.
23. Install the VTC oil control solenoid valve (see VTC OIL CONTROL SOLENOID VALVE REMOVAL/TEST/INSTALLATION).
24. Connect the CKP sensor connector and VTC oil control solenoid valve connector (see step 26).
25. Install the crankshaft pulley (see INSTALLATION).
26. Install the cylinder head cover (see CYLINDER HEAD COVER INSTALLATION).
27. Install the drive belt (see DRIVE BELT REPLACEMENT).
28. Install the splash shield (see step 24 in ENGINE INSTALLATION).
29. Install the right front wheel.
30. Do the CKP pattern clear/CKP learn procedure (see CRANK (CKP) PATTERN CLEAR/CRANK (CKP) PATTERN LEARN).

CKP PULSE PLATE REPLACEMENT

1. Remove the right front wheel.
2. Remove the splash shield (see step 24 in ENGINE REMOVAL).
3. Remove the drive belt (see DRIVE BELT REPLACEMENT).
4. Remove the cylinder head cover (see CYLINDER HEAD COVER REMOVAL).

5. Remove the crankshaft pulley (see **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
6. Disconnect the crankshaft position (CKP) sensor connector and variable valve timing control (VTC) oil control solenoid valve connector (see step 8).
7. Remove the VTC oil control solenoid valve (see **VTC OIL CONTROL SOLENOID VALVE REMOVAL/TEST/INSTALLATION**).
8. Support the engine with a jack and wood block under the oil pan.
9. Remove the ground cable, then remove the upper engine mount bracket (see step 11).
10. Remove the side engine mount bracket (see step 12).
11. Remove the chain case (see step 13).
12. Remove the CKP pulse plate.

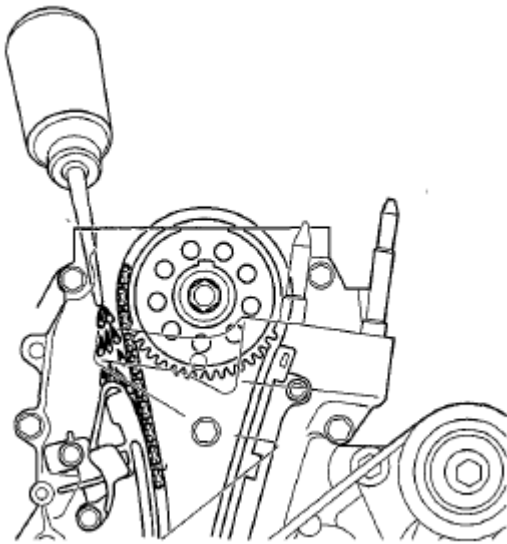


Fig. 64: Identifying CKP Pulse Plate

Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Install the CKP pulse plate.
14. Check the chain case oil seal for damage. If the oil seal is damaged, replace the chain case oil seal (see **CHAIN CASE OIL SEAL INSTALLATION**).
15. Remove any old liquid gasket from the chain case mating surfaces, bolt, and bolt holes.
16. Clean and dry the chain case mating surfaces.
17. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the engine block mating surface of the chain case. Install the component within 5 minutes of applying the liquid gasket (see step 17).

NOTE:

- If you apply liquid gasket P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply new liquid gasket.

18. Apply liquid gasket evenly to the engine block upper surface contact areas on the chain case and lower block upper surface contact areas on the chain case (see step 18).
19. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the oil pan mating surface of the chain case. Install the component within 5 minutes of applying the liquid gasket (see step 18).

NOTE:

- If you apply liquid gasket P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply new liquid gasket.

20. Install the new O-ring on the chain case. Set the edge of the chain case to the edge of the oil pan, then install the chain case on the engine block (see step 19). Wipe off the excess liquid gasket on the oil pan and chain case mating surface.

NOTE:

- When installing the chain case, do not slide the bottom surface on the oil pan mounting surface.
- Wait at least 30 minutes before filling the engine with oil.
- Do not run the engine for at least 3 hours after installing the chain case.

21. Install the side engine mount bracket (see step 20).
22. Install the upper engine mount bracket and the ground cable (see step 21).
23. Remove the jack and the wood block.
24. Install the VTC oil control solenoid valve (see VTC OIL CONTROL SOLENOID VALVE REMOVAL/TEST/INSTALLATION).
25. Connect the CKP sensor connector and VTC oil control solenoid valve connector (see step 26).
26. Install the crankshaft pulley (see INSTALLATION).
27. Install the cylinder head cover (see CYLINDER HEAD COVER INSTALLATION).
28. Install the drive belt (see DRIVE BELT REPLACEMENT).
29. Install the splash shield (see step 24 in ENGINE INSTALLATION).
30. Install the right front wheel.
31. Do the CKP pattern clear/CKP learn procedure (see CRANK (CKP) PATTERN CLEAR/CRANK (CKP) PATTERN LEARN).

CYLINDER HEAD COVER REMOVAL

1. Remove the engine cover.

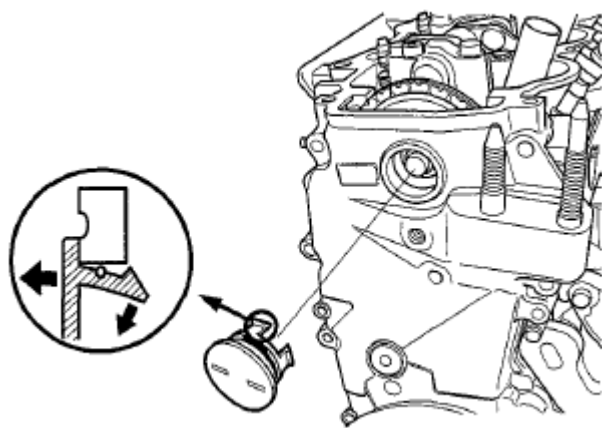


Fig. 65: Identifying Engine Cover With Nuts
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Remove the two bolts (A) securing the vacuum line.

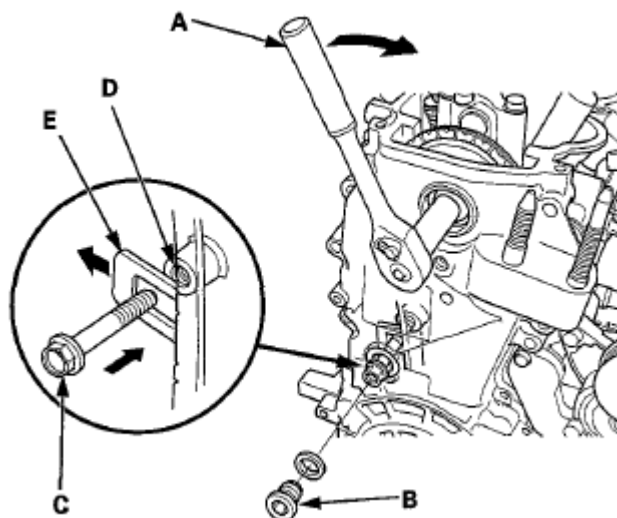


Fig. 66: Identifying Vacuum Line & Bolts
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove the bolt (B) securing the power steering (P/S) hose bracket.
4. Remove the dipstick (C) and breather hose (D).
5. Remove the four ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION**).
6. Remove the cylinder head cover.

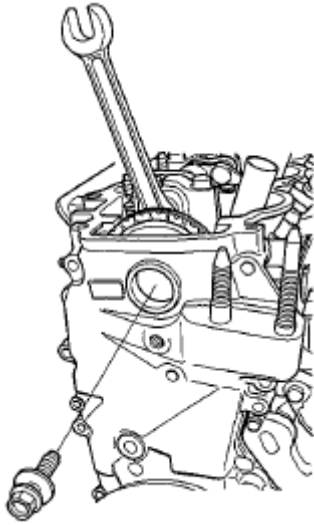


Fig. 67: Identifying Dipstick & Breather Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER HEAD COVER INSTALLATION

1. Check the spark plug seals for damage. If any seals are damaged, replace it.
2. Thoroughly clean the head cover gasket and the groove. Check the head cover gasket for damage. If the gasket is damaged, replace it.

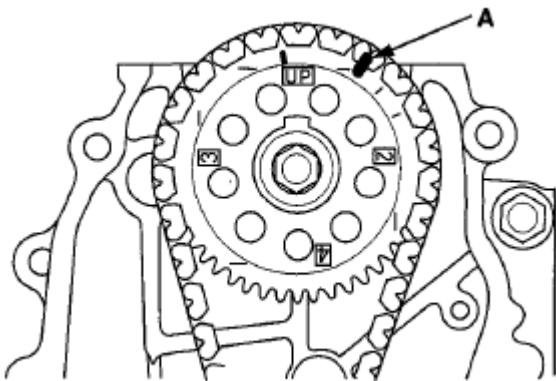


Fig. 68: Identifying Head Cover Gasket & Cylinder Head Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the head cover gasket (A) in the groove of the cylinder head cover (B). Make sure the gasket is evenly seated.
4. Remove all of the old liquid gasket from the chain case and No. 5 rocker shaft holder.
5. Clean the head cover contacting surfaces with a shop towel.
6. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the chain case and the No. 5 rocker shaft holder mating surface. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

- If you apply liquid gasket P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply new liquid gasket.

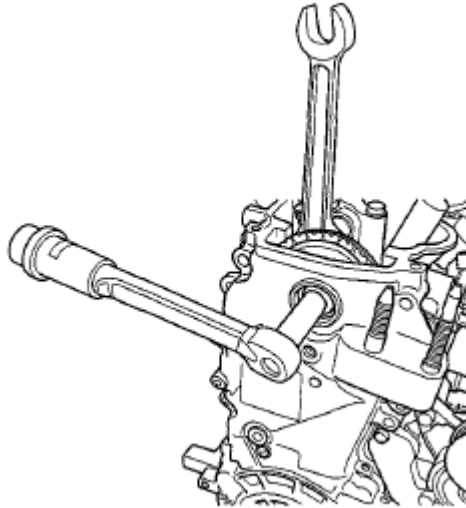


Fig. 69: Identifying Liquid Gasket Applying Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Set the spark plug seals (A) on the spark plug tubes. Place the cylinder head cover (B) on the cylinder head, then slide the cover slightly back and forth to seat the head cover gasket.

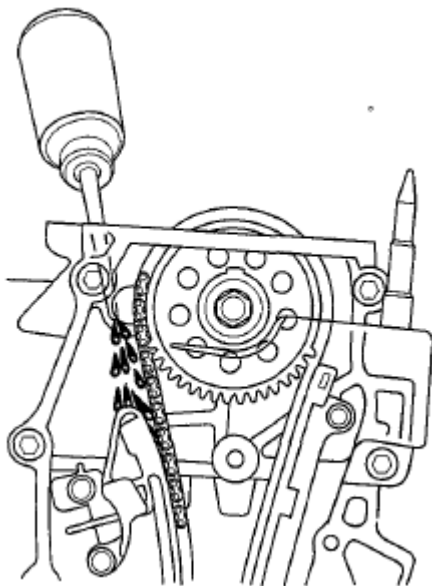


Fig. 70: Identifying Spark Plug Seals On Spark Plug Tubes
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Inspect the spark plug seals for damage.
9. Inspect the cover washers (C). Replace any washer that is damaged or deteriorated.
10. Torque the bolts in three steps. In the final step torque all bolts, in sequence, to 12 N.m (1.2 kgf.m, 8.8 lbf.ft).

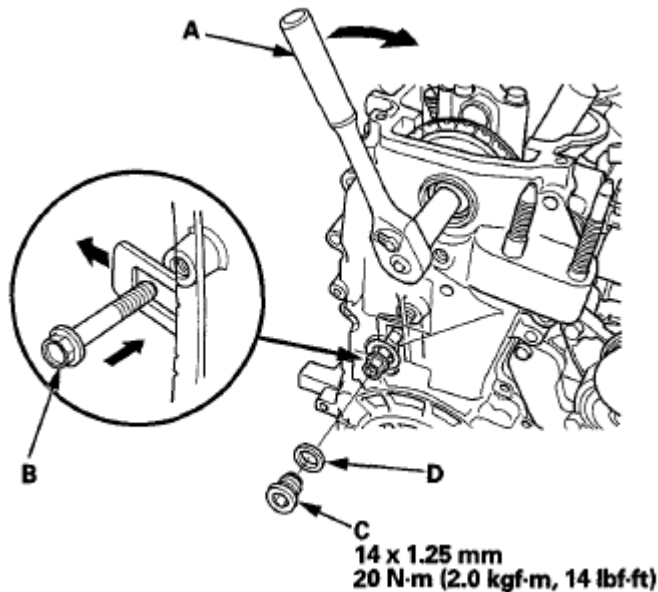


Fig. 71: Identifying Tightening Sequence Of Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Install the dipstick (A) and breather hose (B).

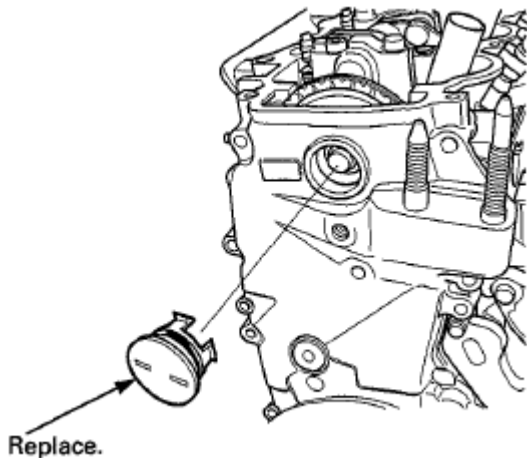


Fig. 72: Identifying Dipstick & Breather Hose Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Torque the bolt (C) securing the power steering (P/S) hose bracket.
13. Torque the two bolts (D) securing the vacuum line.

14. Install the four ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION**).
15. Check that all tubes, hoses, and connectors are installed correctly.
16. Install the engine cover.

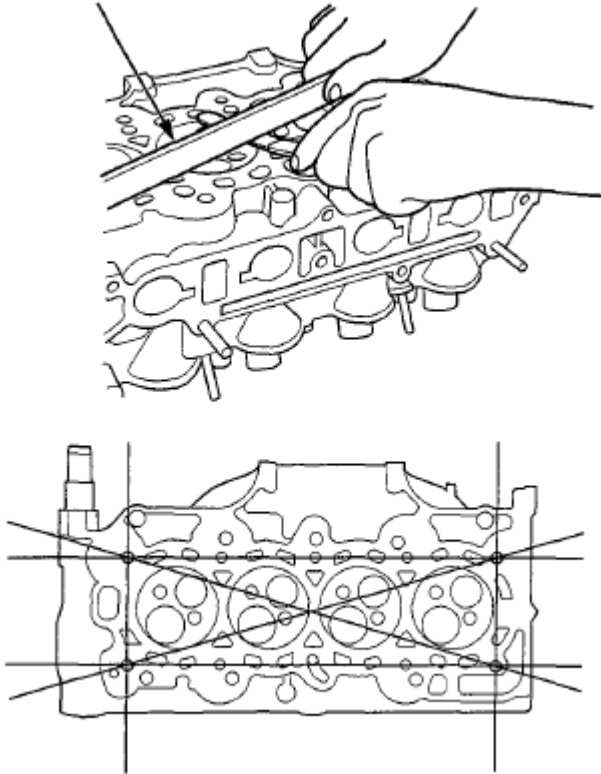
PRECISION STRAIGHT EDGE

Fig. 73: Identifying Engine Cover Nuts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER HEAD REMOVAL

NOTE:

- Use fender covers to avoid damaging the painted surfaces.
- To avoid damaging the wires and terminals, 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 cylinder head bolts.
- Mark all wiring and hoses to avoid misconnection. Also, be sure that they do not contact other wiring or hoses, or interfere with other parts.

1. Relieve the fuel pressure (see **FUEL PRESSURE RELIEVING**).
2. Drain the engine coolant (see **COOLANT CHECK**).
3. Remove the drive belt (see **DRIVE BELT REPLACEMENT**).

4. Disconnect the mass air flow (MAF) sensor/intake air temperature (IAT) sensor connector (A).

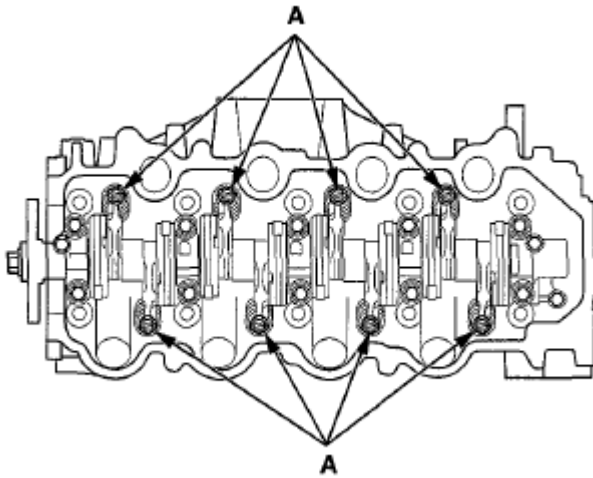


Fig. 74: Identifying Mass Air Flow (MAF) Sensor/Intake Air Temperature (IAT) Sensor Connector
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Disconnect the vacuum hose (B) and breather pipe (C), then remove the intake air duct (D).
6. Remove the quick-connect fitting cover (A), then disconnect the fuel feed hose (B) (see **FUEL LINE/QUICK-CONNECT FITTING REMOVAL**).

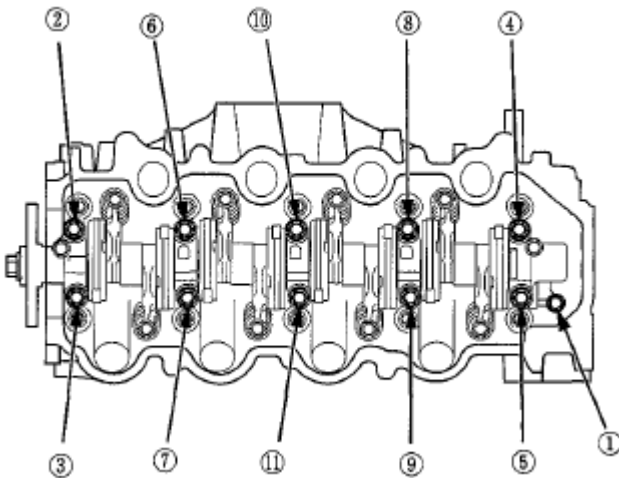


Fig. 75: Identifying Vacuum Hose & Breather Pipe
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the bolt securing the connecting pipe support bracket from the engine block.

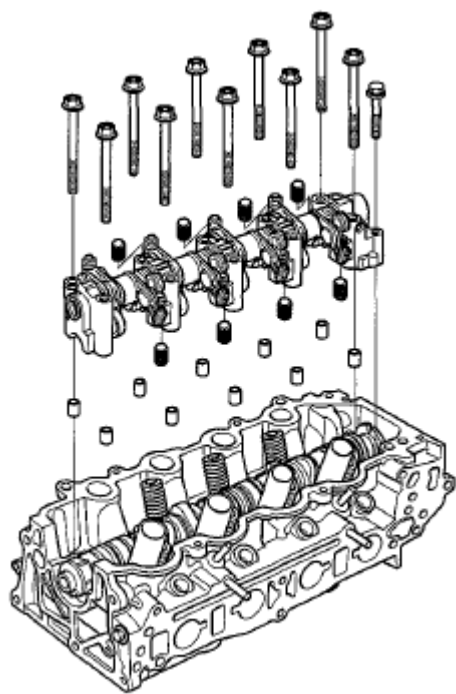


Fig. 76: Identifying Connecting Pipe Support Bracket Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Remove the evaporative emission (EVAP) canister hose (A) and brake booster vacuum hose (B).

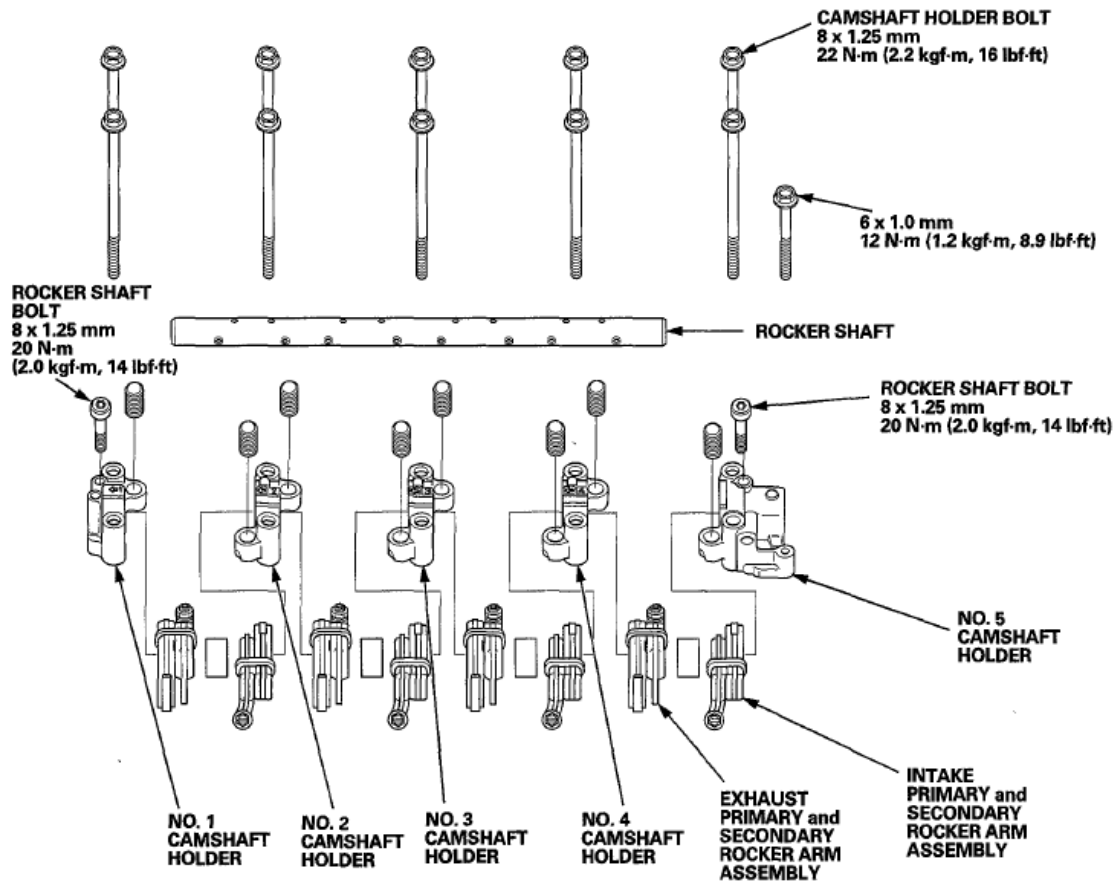


Fig. 77: Identifying Evaporative Emission (EVAP) Canister Hose & Brake Booster Vacuum Hose
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Remove the intake manifold (see **REMOVAL**).
10. Remove the exhaust manifold (see **EXHAUST MANIFOLD REMOVAL AND INSTALLATION**).
11. Remove the positive crankcase ventilation (PCV) hose (A) and ground cable (B).

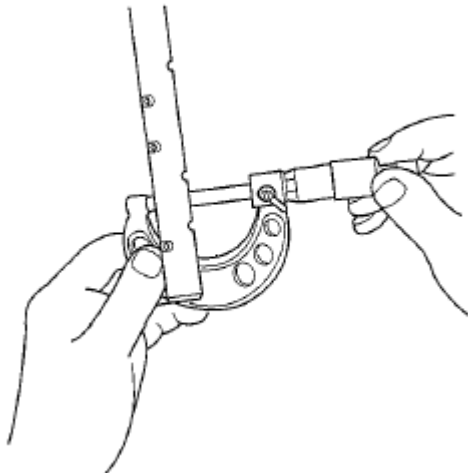


Fig. 78: Identifying Positive Crankcase Ventilation (PCV) Hose & Ground Cable
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Remove the upper radiator hose (A), heater hoses (B), and water bypass hose (C).

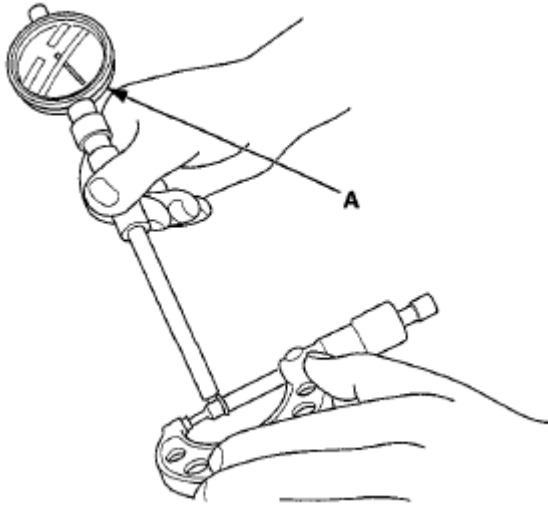


Fig. 79: Identifying Upper Radiator Hose, Heater Hoses & Water Bypass Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Remove the engine wire harness connectors and wire harness clamps from the cylinder head.
- Four injector connectors
 - Engine coolant temperature (ECT) sensor 1 connector
 - Camshaft position (CMP) sensor A connector (Intake side)
 - Camshaft position (CMP) sensor B connector (Exhaust side)
 - Rocker arm oil control solenoid (VTEC solenoid valve) connector
 - Rocker arm oil pressure switch (VTEC oil pressure switch) connector
14. Remove the three bolts (A) securing the EVAP canister purge valve bracket and remove the two bolts (B) securing the harness bracket.

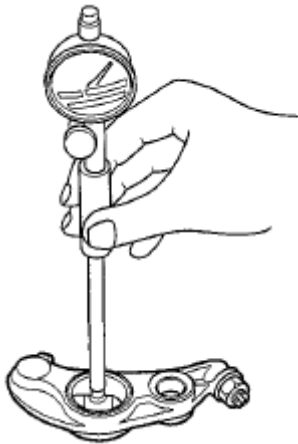


Fig. 80: Identifying EVAP Canister Purge Valve Bracket & Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Remove the cam chain (see CAM CHAIN REMOVAL).
16. Remove the rocker arm assembly (see ROCKER ARM ASSEMBLY REMOVAL).
17. Remove the cylinder head bolts. To prevent warpage, loosen the bolts in sequence 1/3 turn at a time, repeat the sequence until all bolts are loosened.

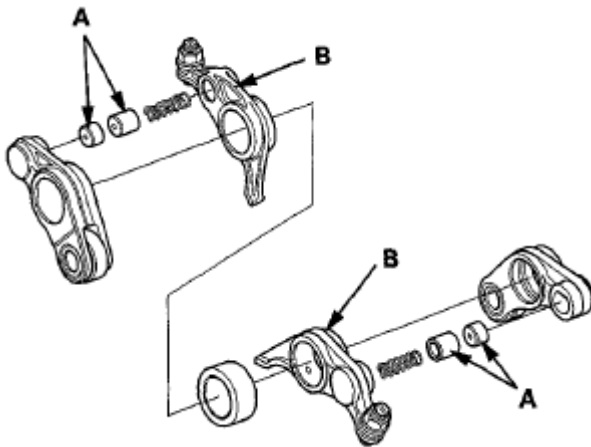


Fig. 81: Identifying Cylinder Head Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Remove the cylinder head.

CMP PULSE PLATE A REPLACEMENT

1. Remove the cylinder head cover (see CYLINDER HEAD COVER REMOVAL).
2. Hold the intake camshaft with an open-end wrench, then loosen the bolt.

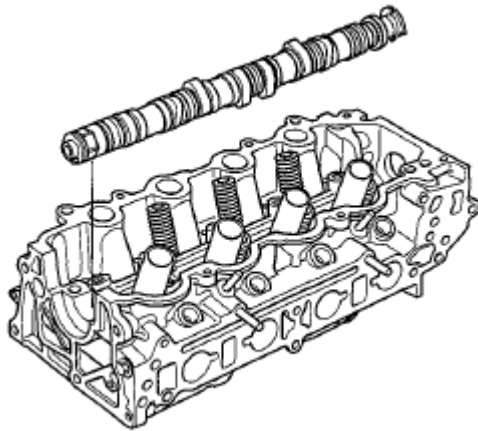


Fig. 82: Holding Intake Camshaft With Open-End Wrench
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove the camshaft position (CMP) pulse plate A.

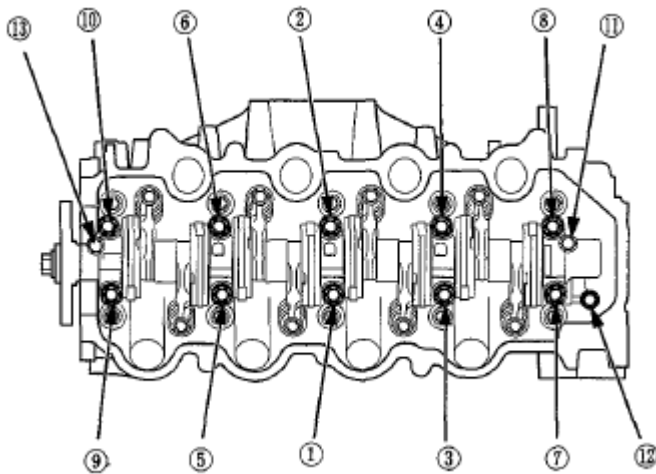


Fig. 83: Identifying Camshaft Position (CMP) Pulse Plate A With Torque Specifications
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Install the CMP pulse plate A in the reverse order of removal.

CMP PULSE PLATE B REPLACEMENT

1. Remove the cylinder head cover (see CYLINDER HEAD COVER REMOVAL).
2. Hold the exhaust camshaft with an open-end wrench, then loosen the bolt.

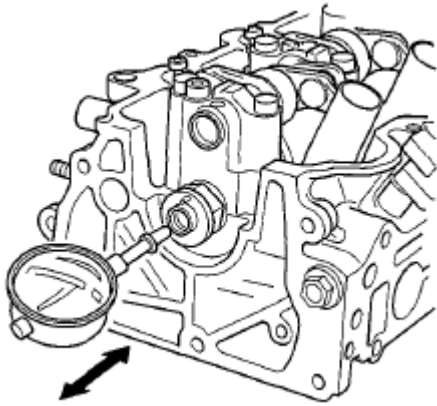


Fig. 84: Holding Exhaust Camshaft With Open-End Wrench
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove the camshaft position (CMP) pulse plate B.

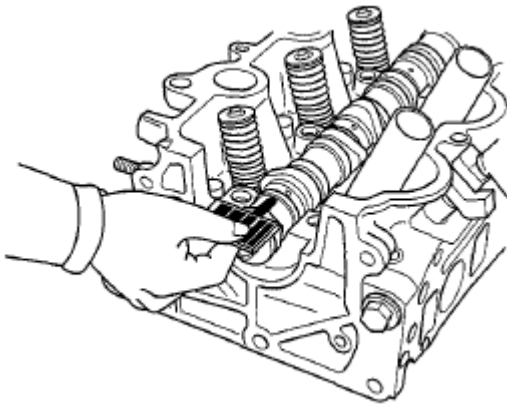


Fig. 85: Identifying Camshaft Position (CMP) Pulse Plate B With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Install the CMP pulse plate B in the reverse order of removal.

VTC ACTUATOR, EXHAUST CAMSHAFT SPROCKET REMOVAL AND INSTALLATION

REMOVAL

1. Remove the cam chain (see **CAM CHAIN REMOVAL**).
2. Hold the camshaft with an open-end wrench, then loosen the VTC actuator mounting bolt and the exhaust camshaft sprocket mounting bolt.

NOTE: Do not remove the VTC actuator and the exhaust camshaft sprocket mounting bolts.

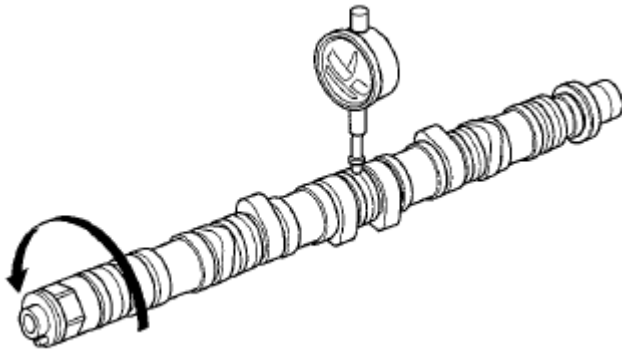


Fig. 86: Loosening Variable Valve Timing Control (VTC) Actuator Mounting Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Check that the No. 1 piston TDC marks (A) on the VTC actuator and the exhaust camshaft sprocket are aligned.

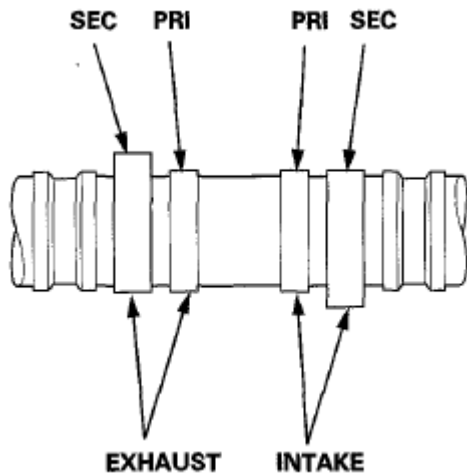


Fig. 87: Identifying TDC Marks On Variable Valve Timing Control (VTC) Actuator
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the chain case cover. Refer to **Auto-tensioner Removal and Installation**.
5. Rotate the crankshaft counterclockwise and align the holes on the lock (A) and the auto-tensioner (B), then insert a 1.2 mm (3/64 in) diameter pin (C) into the holes.

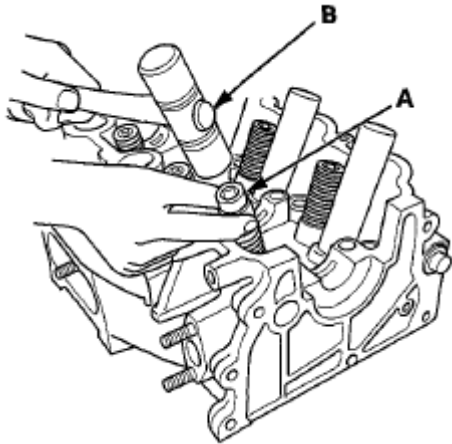


Fig. 88: Aligning Holes On Lock & Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Turn the crankshaft clockwise to secure the pin and the TDC on the No. 1 cylinder.
7. Loosen the locknuts and the adjusting screws. Refer to 2
8. Remove the camshaft holder bolts. Refer to 8
9. Remove the five camshaft holders and cam chain guide B.
10. Carefully tip up the intake camshaft on the transmission side of the engine until there is enough slack in the chain to lift the chain off of the VTC actuator's teeth.
11. Remove the intake and exhaust camshafts while keeping some tension on the cam chain.
12. Secure the cam chain to the A/C compressor suction hose or the power steering hose with a wire tie to prevent the chain from falling down into the chain case.
13. Remove the VTC actuator and the exhaust camshaft sprocket.

INSTALLATION

1. Install the VTC actuator and the exhaust camshaft sprocket.

NOTE: **Install the VTC actuator while in the unlocked position.**

2. Apply new engine oil to the threads of the VTC actuator and the exhaust camshaft sprocket mounting bolts, then loosely install them.
3. Turn the VTC actuator clockwise until you hear it click. Make sure to lock the VTC actuator by turning it.
4. Remove the wire tie while keeping light tension on the cam chain.
5. Slide the intake and exhaust camshafts in at an angle to allow the cam chain to slip over the VTC actuator's teeth and the exhaust sprocket's teeth.
6. Line up the marks made in step 3 for each cam.
7. Apply new engine oil to the camshaft journals and lobes on both cams, and reinstall the five camshaft holders and cam chain guide B in place.

8. Tighten the camshaft holder bolts to the specified torque. Refer to 8
9. Hold the camshaft with an open-end wrench, then tighten the mounting bolts.

Specified Torque**VTC Actuator Mounting Bolt:**

115 N.m (11.5 kgf.m, 85 lbf.ft)

Exhaust Camshaft Sprocket Mounting Bolt:

73 N.m (7.3 kgf.m, 54 lbf.ft)

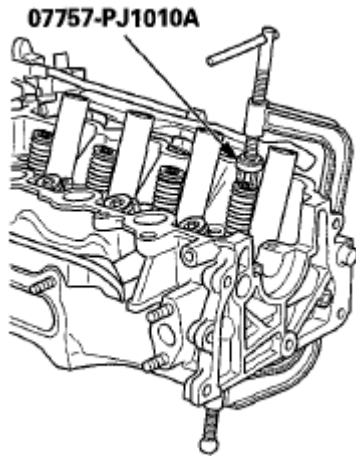


Fig. 89: Holding Camshaft With Open-End Wrench
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Remove the 1.2 mm (3/64 in) diameter pin from the auto-tensioner.

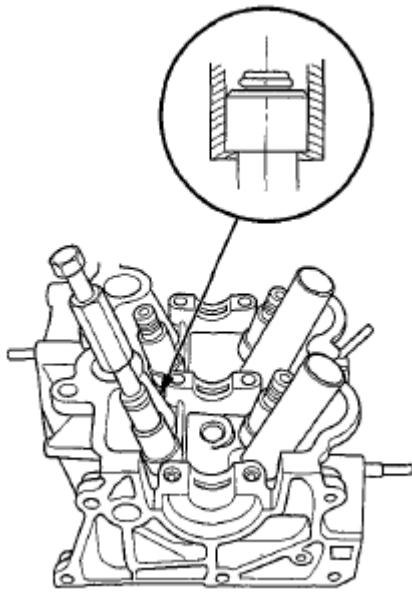


Fig. 90: Identifying Pin From Auto-Tensioner
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Remove all of the old liquid gasket from the chain case cover mating surfaces, the bolts, and the bolt holes.
12. Clean and dry the chain case cover mating surfaces.
13. Apply liquid gasket, P/N 08717-0004, 08718-0003, or 08718-0009 to the chain case mating surface of the chain case cover, and to the inside edge of the threaded bolt holes. Install the component within 5 minutes of applying the liquid gasket 5.
14. Install the chain case cover 6.
15. Adjust the valve clearance **Valve Clearance Adjustment**.
16. Install the cylinder head cover **Cylinder Head Cover Installation**.

CYLINDER HEAD INSPECTION FOR WARPAGE

1. Remove the cylinder head (see **CYLINDER HEAD REMOVAL**).
2. Inspect the camshaft (see **CAMSHAFT INSPECTION**).
3. Check the cylinder head for warpage. Measure along the edges, and three ways across the center.
 - 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.) to 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 104 mm (4.09 in.).

Cylinder Head Height

Standard (New): 103.95-104.05 mm (4.093-4.096 in.)

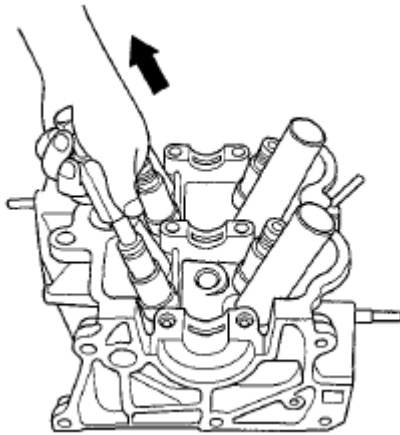


Fig. 91: Checking Cylinder Head Warpage

Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM ASSEMBLY REMOVAL

1. Remove the cam chain (see [CAM CHAIN REMOVAL](#)).
2. Loosen the rocker arm adjusting screws (A).

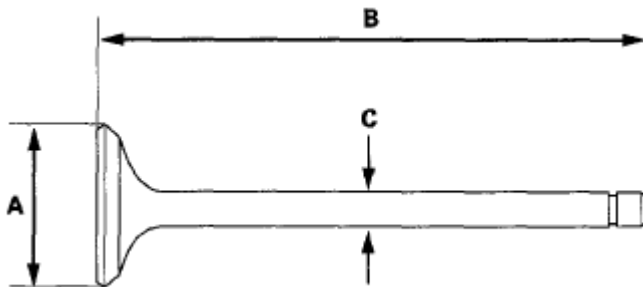


Fig. 92: Loosening Rocker Arm Adjusting Screws

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove the camshaft holder bolts. To prevent damaging the camshafts, loosen the bolts in sequence two turns at a time, in a crisscross pattern.

NOTE: Bolt (1) is not on all engines.

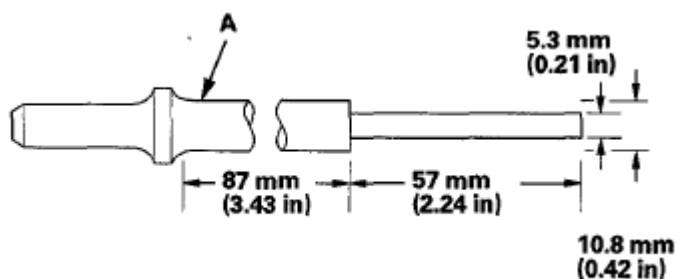


Fig. 93: Identifying Camshaft Holder Bolts Loosening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the cam chain guide B, camshaft holders, and camshafts.
5. Insert the bolts (A) into the rocker shaft holder, then remove the rocker arm assembly (B).

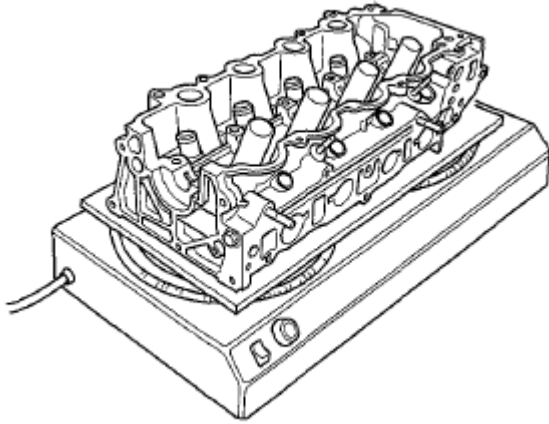


Fig. 94: Identifying Rocker Shaft Holder Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY

NOTE:

- Identify each part as it is removed so that each item can be reinstalled in their original locations.
- Inspect the rocker arm shaft and rocker arms (see ROCKER ARM AND SHAFT INSPECTION).
- If reused, the rocker arms must be installed in their original locations.
- When removing or installing the rocker arm assembly, do not remove the camshaft holder bolts. The bolts will keep the holders and rocker arms on the shaft.
- Prior to reassembling, clean all the parts in solvent, dry them, and apply new engine oil to any contact points.
- Bundle the intake rocker arms with rubber bands to keep them together as a set.
- When replacing the intake rocker arm assembly, remove the fastening hardware from the new intake rocker arm assembly.

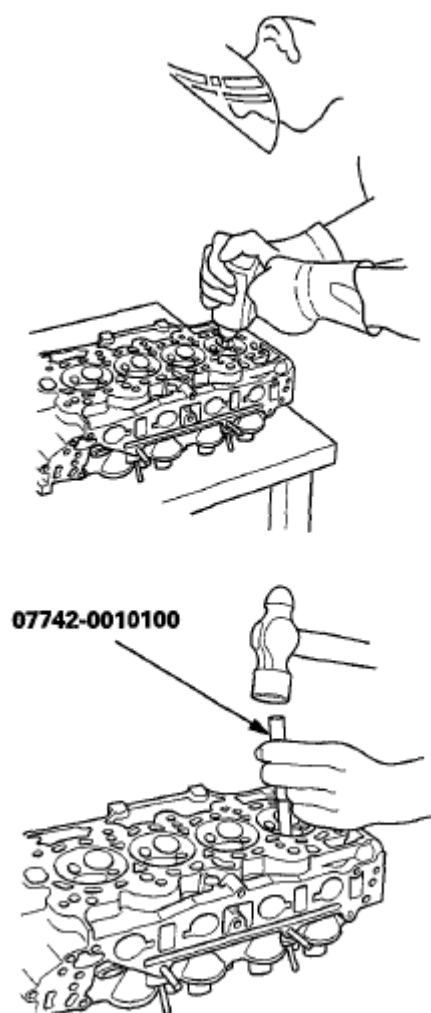


Fig. 95: Exploded View Of Rocker Arm & Shaft
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM AND SHAFT INSPECTION

1. Remove the rocker arm assembly (see ROCKER ARM ASSEMBLY REMOVAL), then disassemble the rocker arm assembly (see ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY).
2. Disassemble the rocker arm assembly. See Rocker Arm and Shaft Disassembly/Reassembly.
3. Measure the diameter of the shaft at the first rocker location.

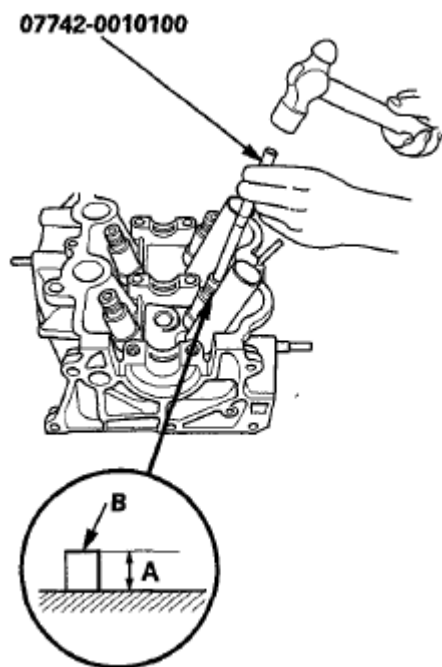


Fig. 96: Measuring Diameter Of Shaft At Rocker
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Zero the gauge (A) to the shaft diameter.



Fig. 97: Measuring Shaft Diameter
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Rocker Arm-to-Shaft Clearance

Standard (New):

Intake: 0.025-0.052 mm (0.0010-0.0020 in.)

Exhaust: 0.018-0.056 mm (0.0007-0.0022 in.)

Service Limit: 0.08 mm (0.003 in.)

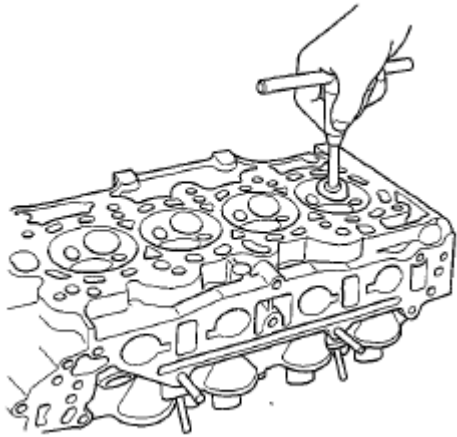


Fig. 98: Measuring Inside Diameter Of Rocker Arm
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Repeat for all rocker arms and both shafts. If the clearance is beyond the service limit, replace the rocker shaft and all out of service limit rocker arms. If any VTEC rocker arm needs replacement, replace the rocker arms (primary and secondary), as a set.
7. Inspect the rocker arm pistons (A). Push on each piston manually. If it does not move smoothly, replace the rocker arms as a set.

NOTE: Apply new engine oil to the rocker arm pistons when reassembling.

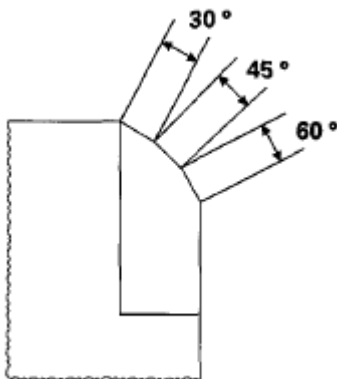


Fig. 99: Identifying Rocker Arm Pistons
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Reassemble the Rocker Arm assembly. See **Rocker Arm and Shaft Disassembly/Reassembly.**
9. Install the rocker arm assembly (see **ROCKER ARM ASSEMBLY INSTALLATION**).

CAMSHAFT INSPECTION

NOTE: Do not rotate the camshaft during inspection.

1. Remove the rocker arm assembly (see **ROCKER ARM ASSEMBLY REMOVAL**).
2. Put the rocker shaft holders, camshaft, and camshaft holders on the cylinder head, then torque the bolts in sequence to the specified torque.

NOTE: If the engine does not have bolt (21), skip it and continue the torque sequence.

Specified Torque

8 mm Bolts: 22 N.m (2.2 kgf.m, 16 lbf.ft)

6 mm Bolts: 12 N.m (1.2 kgf.m, 8.8 lbf.ft)

6 mm Bolts: (21), (22), (23)

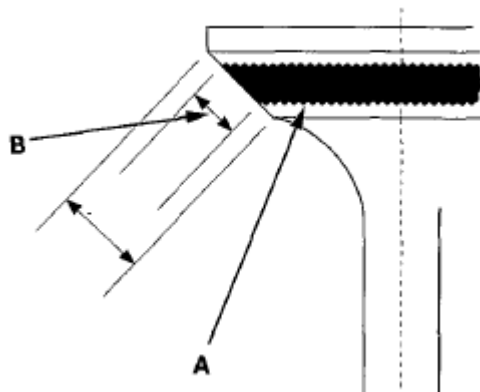


Fig. 100: Identifying Camshaft Bolts Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Seat the camshaft by pushing it away from the camshaft pulley end of the cylinder head.
4. Zero the dial indicator against the end of the camshaft, then push the camshaft back and forth and read the end play. If the end play is beyond the service limit, replace the cylinder head and recheck. If it is still beyond the service limit, replace the camshaft.

Camshaft End Play

Standard (New): 0.05-0.20 mm (0.002-0.008 in.)

Service Limit: 0.4 mm (0.02 in.)

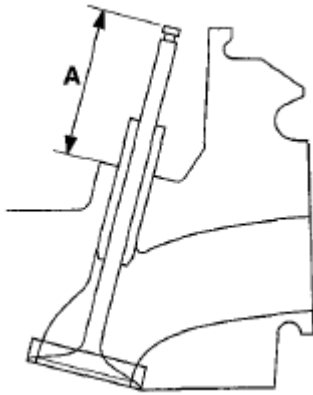


Fig. 101: Checking Camshaft End Play

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Loosen the camshaft holder bolts two turns at a time, in a crisscross pattern. Then remove the camshaft holders from the cylinder head.
6. Lift the camshafts out of the cylinder head, wipe them clean, then inspect the lift ramps. Replace the camshaft if any lobes are pitted, scored, or excessively worn.
7. Clean the camshaft journal surfaces in the cylinder head, then set the camshafts back in place. Place a plastigage strip across each journal.
8. Install the camshaft holders, then torque the bolts to the specified torque as shown in step 2.
9. Remove the camshaft holders. Measure the widest portion of plastigage on each journal.
 - If the camshaft-to-holder clearance is within limits, go to step 11.
 - If the camshaft-to-holder clearance is beyond the service limit and the camshaft has been replaced, replace the cylinder head.
 - If the camshaft-to-holder clearance is beyond the service limit and the camshaft has not been replaced, go to step 10.

Camshaft-to-Holder Oil Clearance Standard (New):

No. 1 Journal: 0.030-0.069 mm (0.001-0.003 in.)

No. 2, 3, 4, 5 Journals: 0.060-0.099 mm (0.002-0.004 in.)

Service Limit: 0.15 mm (0.006 in.)

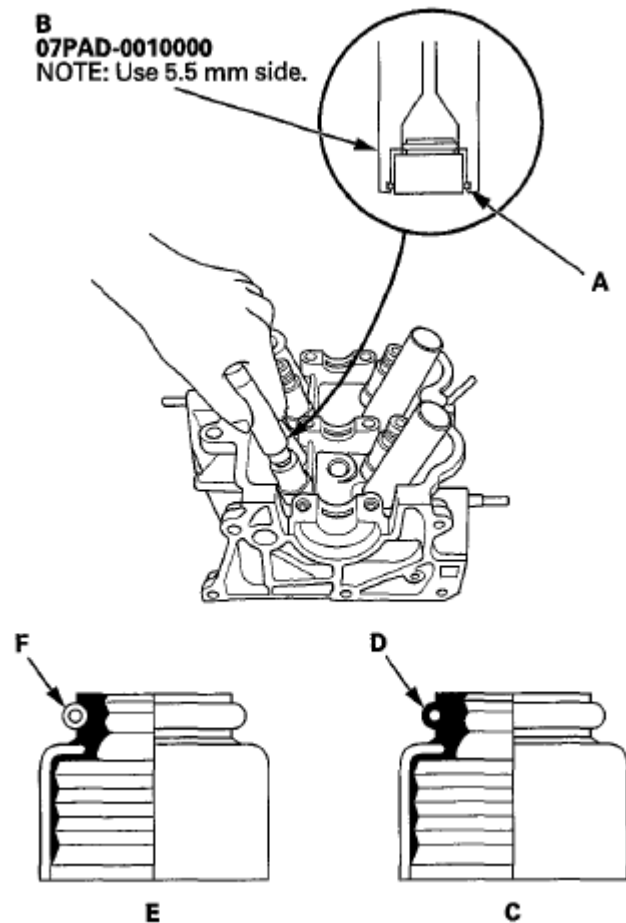


Fig. 102: Measuring Widest Portion Of Plastigage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Check the total runout with the camshaft supported on V-blocks.
 - If the total runout of the camshaft is within the service limit, replace the cylinder head.
 - If the total runout is beyond the service limit, replace the camshaft and recheck the camshaft-to-holder oil clearance. If the oil clearance is still beyond the service limit, replace the cylinder head.

Camshaft Total Runout

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

Service Limit: 0.04 mm (0.002 in.)

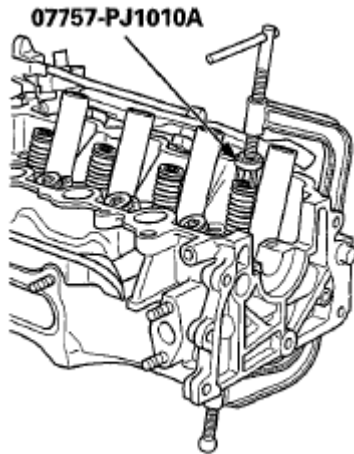


Fig. 103: Checking Runout Of Camshaft
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Measure cam lobe height.

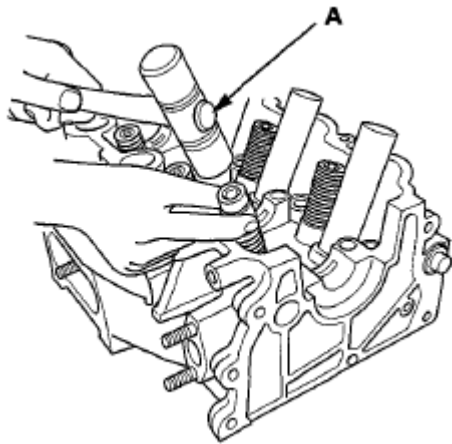


Fig. 104: Measuring Cam Lobe Height
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVE, SPRING, AND VALVE SEAL REMOVAL

SPECIAL TOOLS REQUIRED

Valve spring compressor attachment 07757-PJ1010A

NOTE: Identify the valves and valve springs as they are removed so that each item can be reinstalled in its original position.

1. Remove the cylinder head (see **CYLINDER HEAD REMOVAL**).
2. Using an appropriate-sized socket (A) and plastic mallet (B), lightly tap the valve spring retainer to loosen the valve cotter.

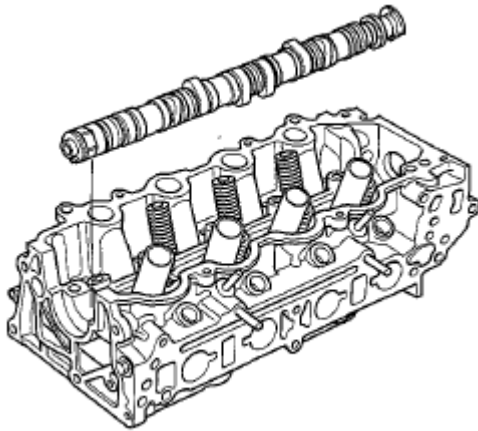


Fig. 105: Tapping Valve Spring Retainer

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the valve spring compressor attachment and valve spring compressor. Compress the valve spring and remove the valve cotters.

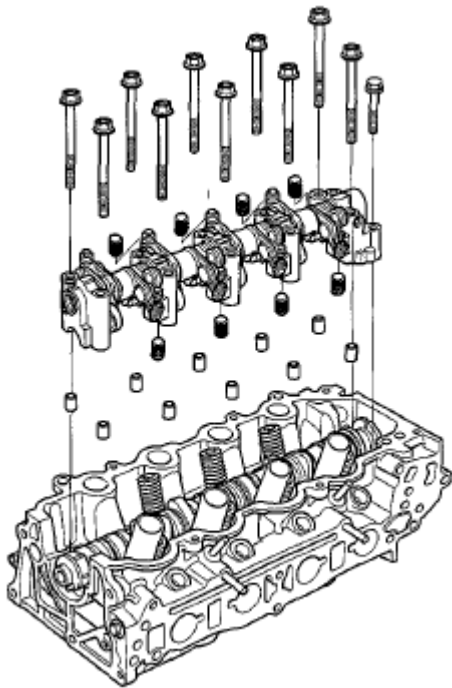


Fig. 106: Compressing Valve Spring

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the valve spring compressor, valve spring compressor attachment, valve spring retainer, and valve spring.
5. Install the valve guide seal remover.

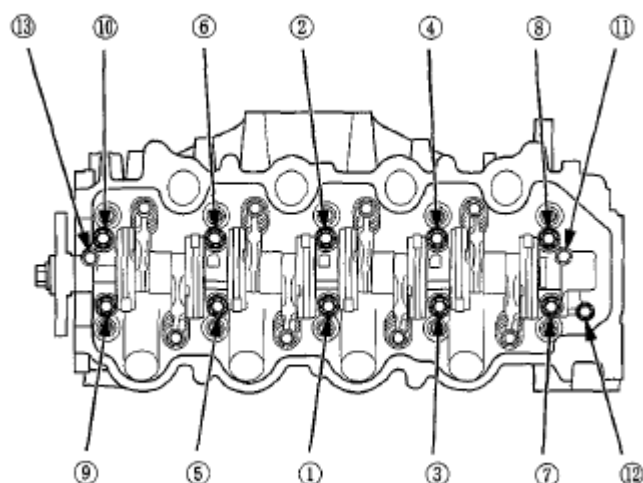


Fig. 107: Identifying Valve Guide Seal Remover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the valve seal.

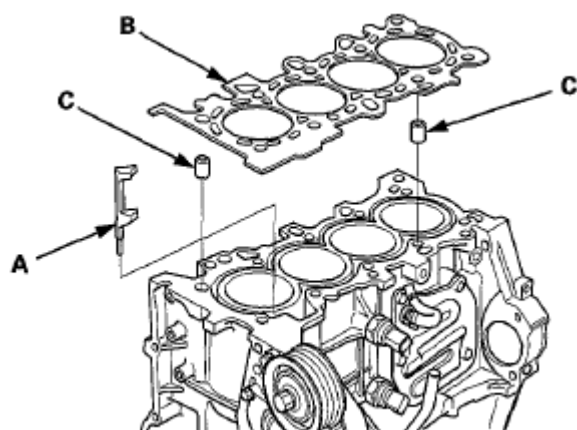


Fig. 108: Identifying Valve Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the valve spring seat.

VALVE INSPECTION

1. Remove the valves (see VALVE, SPRING, AND VALVE SEAL REMOVAL).
2. Measure the valve in these areas.

Intake Valve Dimensions

A Standard (New): 34.85-35.15 mm (1.372-1.384 in.)

B Standard (New): 108.7-109.5 mm (4.280-4.311 in.)

C Standard (New): 5.475-5.485 mm (0.2156-0.2159 in.)

C Service Limit: 5.445 mm (0.214 in.)

Exhaust Valve Dimensions

A Standard (New): 29.85-30.15 mm (1.175-1.187 in.)

B Standard (New): 108.3-109.1 mm (4.264-4.295 in.)

C Standard (New): 5.450-5.460 mm (0.2146-0.2150 in.)

C Service Limit: 5.42 mm (0.213 in.)

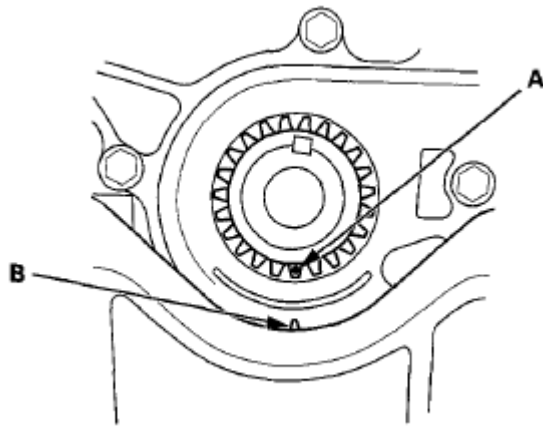


Fig. 109: Measuring Valve Dimension

Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVE STEM-TO-GUIDE CLEARANCE INSPECTION

1. Remove the valves (see **VALVE, SPRING, AND VALVE SEAL REMOVAL**).
2. Slide the valve out of its guide about 10 mm (3/8 in.), then measure the guide-to-stem clearance with a dial indicator while rocking the stem in the direction of normal thrust (wobble method).
 - If the measurement exceeds the service limit, recheck it using a new valve.
 - If the measurement is now within the service limit, reassemble using a new valve.
 - If the measurement with a new valve still exceeds the service limit, go to step 3.

Intake Valve Stem-to-Guide Clearance

Standard (New): 0.06-0.11 mm (0.002-0.004 in.)

Service Limit: 0.16 mm (0.006 in.)

Exhaust Valve Stem-to-Guide Clearance

Standard (New): 0.11-0.16 mm (0.004-0.006 in.)

Service Limit: 0.22 mm (0.009 in.)

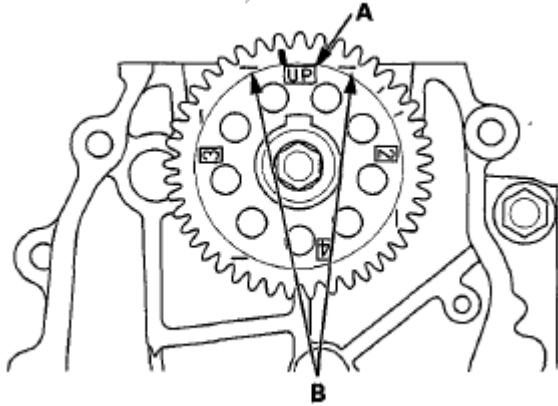


Fig. 110: Measuring Valve Stem-To-Guide Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. 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): 0.030-0.055 mm (0.0012-0.0022 in.)

Service Limit: 0.08 mm (0.003 in.)

Exhaust Valve Stem-to-Guide Clearance

Standard (New): 0.055-0.080 mm (0.0022-0.0031 in.)

Service Limit: 0.11 mm (0.004 in.)

VALVE GUIDE REPLACEMENT

SPECIAL TOOLS REQUIRED

- Valve guide driver, 5.5 mm 07742-0010100
- Valve guide reamer, 5.5 mm 07HAH-PJ7A100

1. Inspect valve stem-to-guide clearance (see **VALVE INSPECTION**).
2. As shown below, use a commercially available air-impact valve guide driver (A) modified to fit the diameter of the valve guides. In most cases, the same procedure can be done using the valve guide driver,

and a conventional hammer.

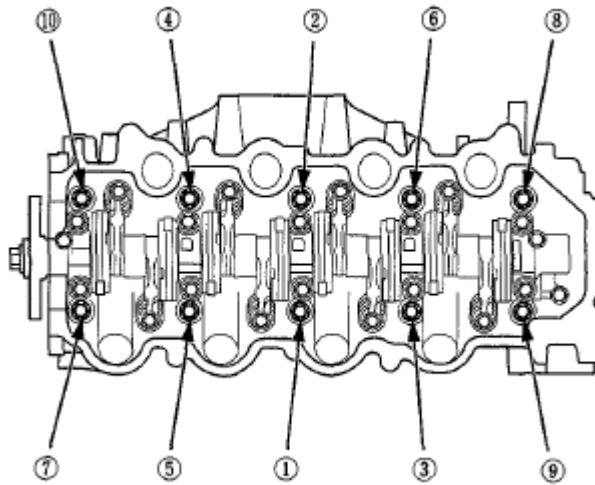


Fig. 111: Identifying Valve Guide Dimension
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Select the proper replacement guides, and chill them in the freezer section of a refrigerator for about an hour.
4. Use a hot plate or oven to evenly heat the cylinder head to 300°F (150°C). Monitor the temperature with a cooking thermometer. Do not get the head hotter than 300°F (150°C); excessive heat may loosen the valve seats.

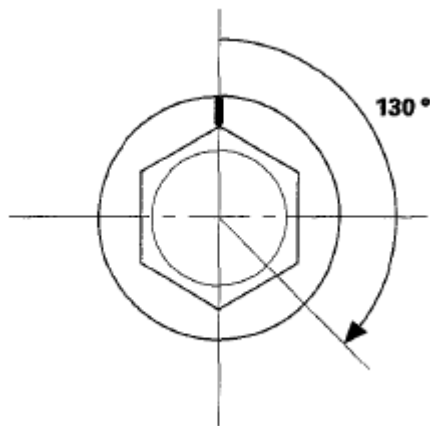


Fig. 112: Heating Cylinder Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. 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. Hold the air hammer directly inline with the valve guide to prevent damaging the driver. Wear safety goggles or a face shield.
6. Turn the head over, and drive the guide out toward the camshaft side of the head.

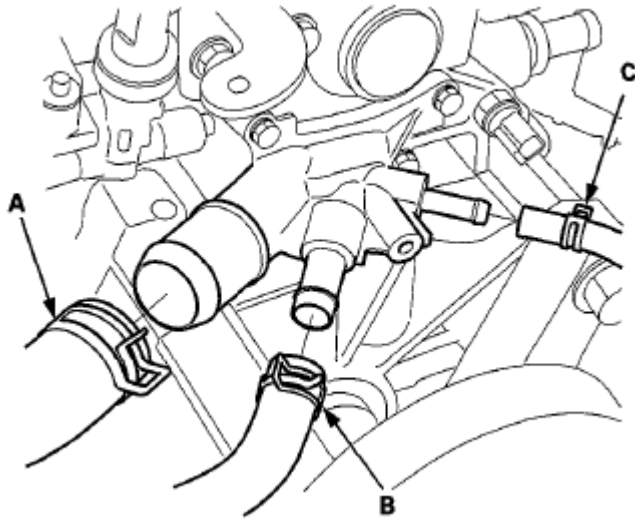


Fig. 113: Driving Guide Out Toward Camshaft Side Of Head

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

NOTE: **Drill guides only in extreme cases, you could damage the cylinder head if the guide breaks.**

8. Take out the new guide(s) from the freezer, one at a time, as you need them.
9. Apply a thin coat of new engine oil to the outside of the new valve guide. Install the guide from the camshaft side of the head, use the valve guide driver to drive the guide into the specified installed height (A) of the guide (B). If you have all 16 guides to do, you may have to reheat the head.

Valve Guide Installed Height

Intake: 15.2-16.2 mm (0.598-0.638 in.)

Exhaust: 15.5-16.5 mm (0.610-0.650 in.)

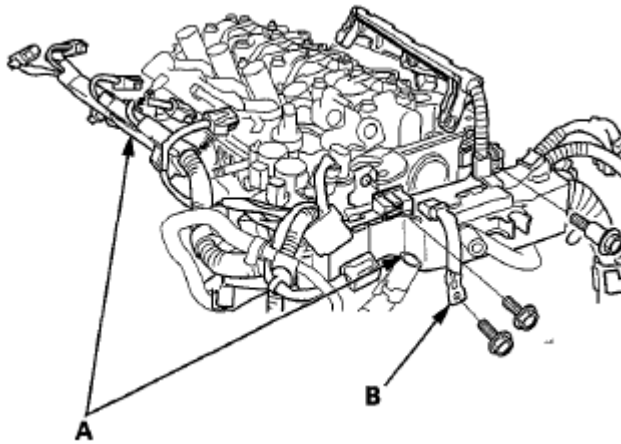


Fig. 114: View Of Guide From Camshaft Side Of Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Coat both reamer and valve guide with cutting oil.
11. Rotate the reamer clockwise the full length of the valve guide bore.

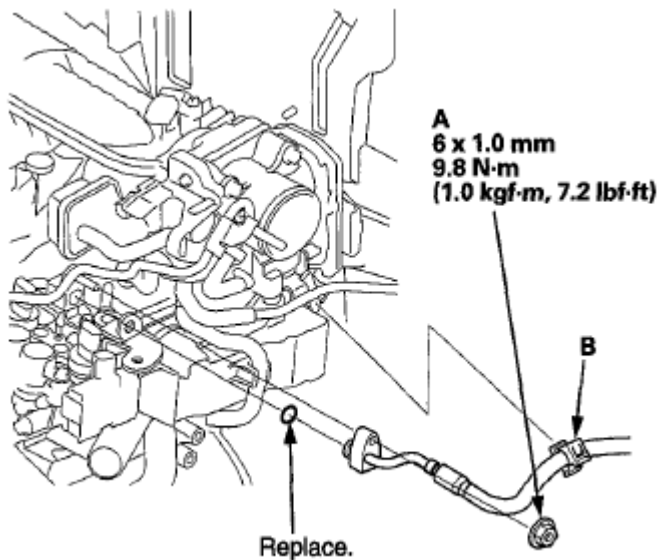


Fig. 115: Rotating Reamer Clockwise
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Continue to rotate the reamer clockwise while removing it from the bore.
13. Thoroughly wash the guide in detergent and water to remove any cutting residue.
14. Check the clearances with a valve (see VALVE INSPECTION). Verify that a valve slides in the intake and exhaust valve guides without sticking.
15. Inspect the valve seating. If necessary, renew the valve seat using a valve seat cutter (see VALVE SEAT RECONDITIONING).

VALVE SEAT RECONDITIONING

1. Inspect valve stem-to-guide clearance (see VALVE INSPECTION). If the valve guides are worn, replace them (see VALVE GUIDE REPLACEMENT) before cutting the valve seats.
2. Renew the valve seats in the cylinder head using a valve seat cutter.



Fig. 116: Reaming Valve Seats In Cylinder Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Carefully cut a 45° seat, removing only enough material to ensure a smooth and concentric seat.
4. Bevel the upper and lower edges at the angles shown in the illustration. Check the width of the seat and adjust accordingly.

2008 Honda Element EX

2007-11 ENGINE Cylinder Head - Element

Ref.No.	Tool Number	Description	Qty
①	070AF-PWC0110	Pilot Pin	1
②	070AF-PWC0120	Insert Adjust	1
③	070AF-PWC0130	Pilot Collar, O.D. 18 mm	1
④	07749-0010000	Driver Handle, 15 x 135L	1
⑤	07946-1870100	Bearing Driver Attachment, 28 x 30	1
⑥	07973-6570500	Piston Base	1
⑦	07973-6570600	Piston Base Spring	1
⑧	07PAF-0010400	Piston Base Head	1
⑨	07PAF-0010500	Piston Base Head Insert	2
⑩	07PAF-0010700	Insert Pin	1
⑪	07ZAD-PNAA100	Oil Seal Driver Attachment, 96 mm	1

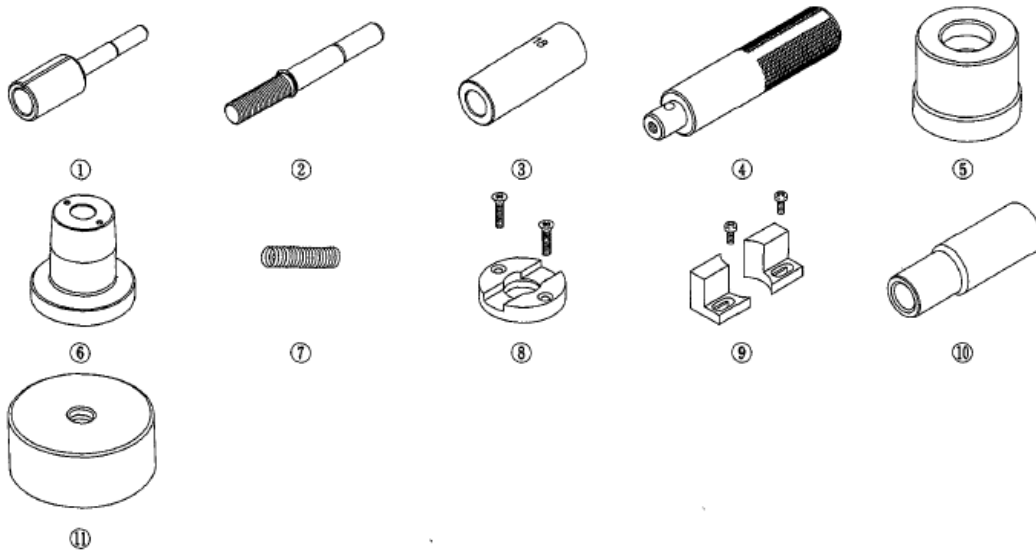


Fig. 117: Identifying Upper & Lower Edges At Angles
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. 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): 1.25-1.55 mm (0.049-0.061 in.)

Service Limit: 2.00 mm (0.079 in.)

6. After resurfacing the seat, inspect for even valve seating. Apply Prussian Blue compound (A) to the valve face. Insert the valve in its original location in the head, then lift it and snap it closed against the seat several times.

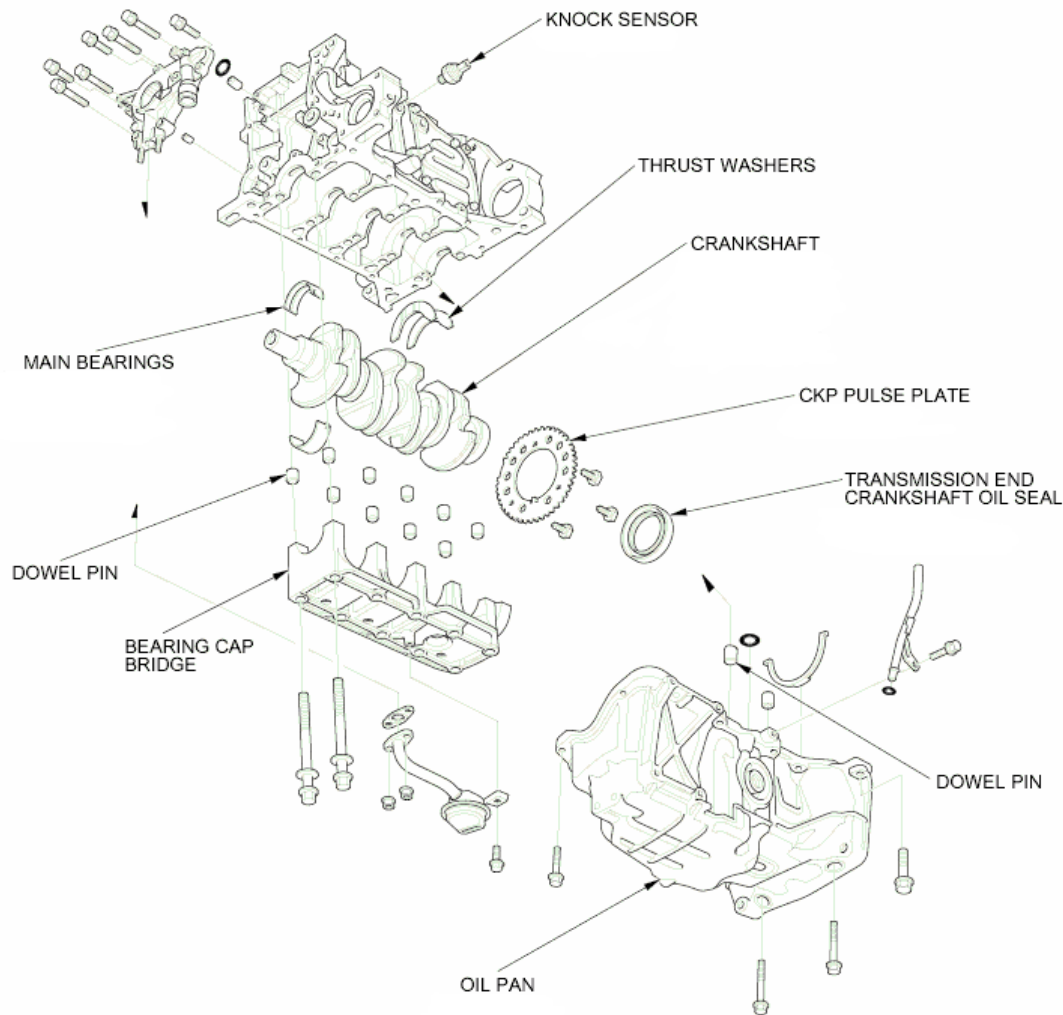


Fig. 118: Identifying Prussian Blue Compound Applying Area
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. The actual valve seating surface (B), as shown below 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 67.5° cutter to move it down, then one more cut with the 45° cutter to restore seat width.
 - If it is too low (close to the valve edge), you must make a second cut with the 35° cutter (intake side) or the 30° cutter (exhaust side) to move it up, then make one more cut with the 45° cutter to restore seat width.

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

8. Insert the intake and exhaust valves in the head, and measure valve stem installed height (A).

Intake Valve Stem Installed Height

Standard (New): 44.0-44.5 mm (1.73-1.75 in.)

Service Limit: 44.7 mm (1.76 in.)

Exhaust Valve Stem Installed Height

Standard (New): 44.1-44.6 mm (1.74-1.76 in.)

Service Limit: 44.8 mm (1.76 in.)

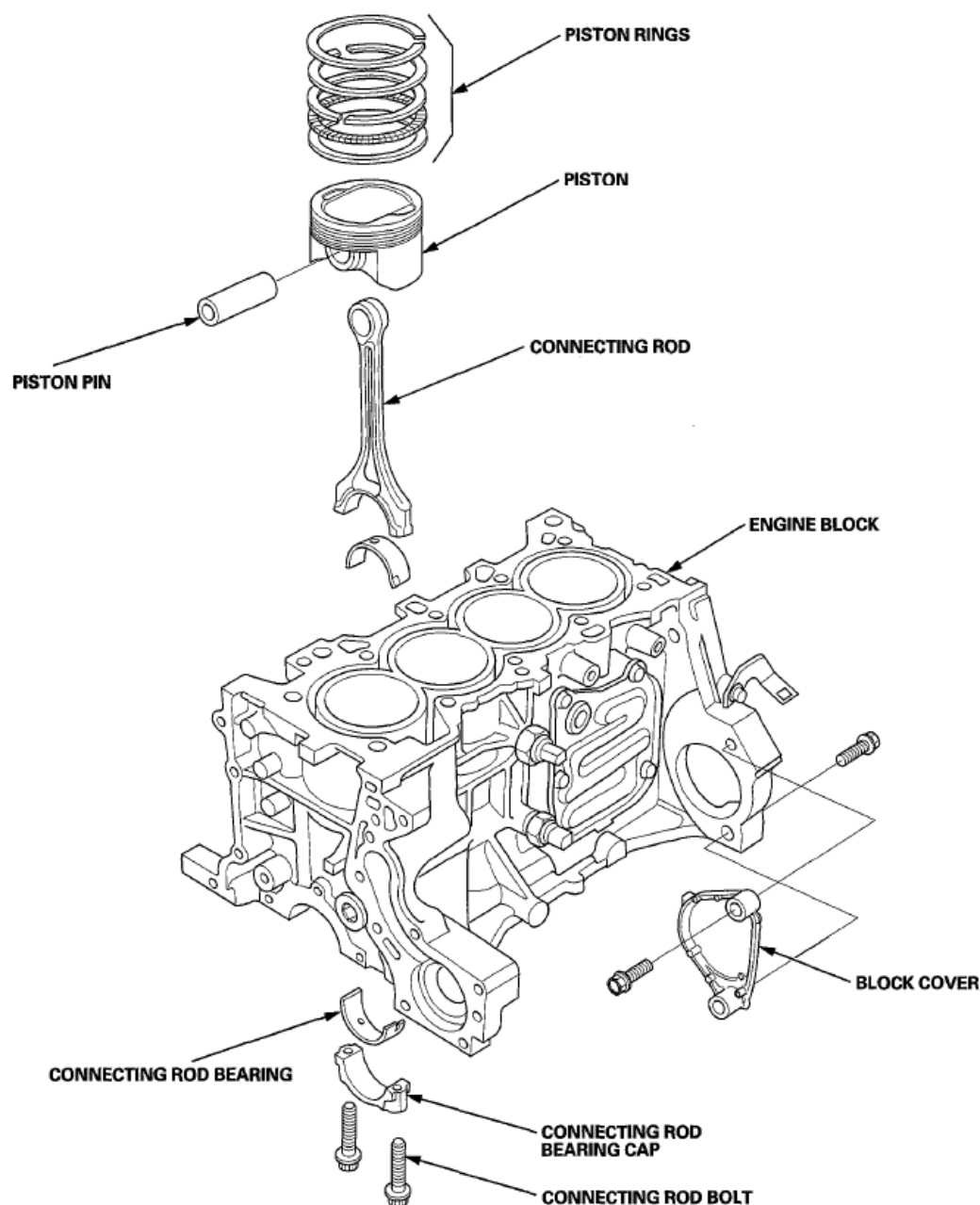


Fig. 119: Identifying Valve Stem Height

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

VALVE, SPRING, AND VALVE SEAL INSTALLATION

SPECIAL TOOLS REQUIRED

- Stem seal driver 07PAD-0010000
 - Valve spring compressor attachment 07757-PJ1010A
1. Coat the valve stems with new engine oil. Install the valves in the valve guides.
 2. Check that the valves move up and down smoothly.
 3. Install the spring seats on the cylinder head.
 4. Install the new valve seals (A) using the stem seal driver (B).

NOTE: The exhaust valve seal (C) has a black spring (D), and the intake valve seal (E) has a white spring (F). They are not interchangeable.

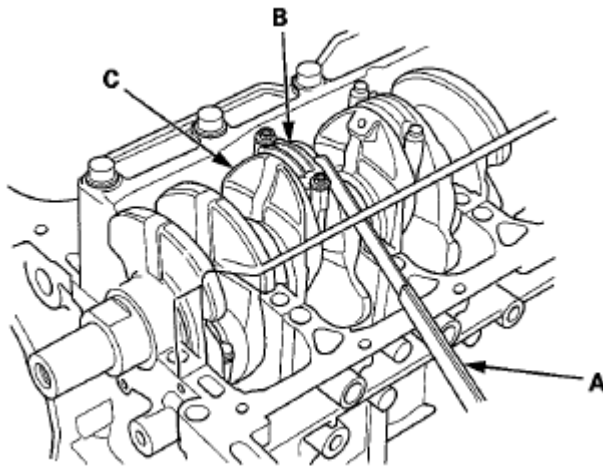


Fig. 120: Identifying Valve Seal

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Install the valve spring and valve spring retainer. Place the end of the valve spring with closely wound coils toward the cylinder head.
6. Install the valve spring compressor attachment and valve spring compressor. Compress the spring, and install the valve cotters.

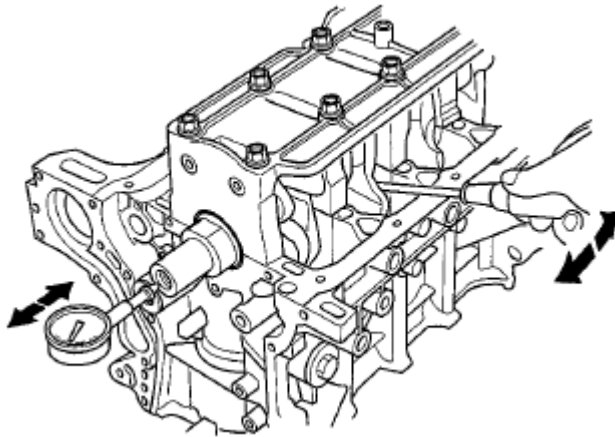


Fig. 121: Identifying Valve Spring Compressor Attachment & Valve Spring Compressor
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the valve spring compressor and valve spring compressor attachment.
8. Lightly tap the end of each valve stem two or three times with a plastic mallet (A) to ensure proper seating of the valve and valve cotters. Tap the valve stem only along its axis so you do not bend the stem.

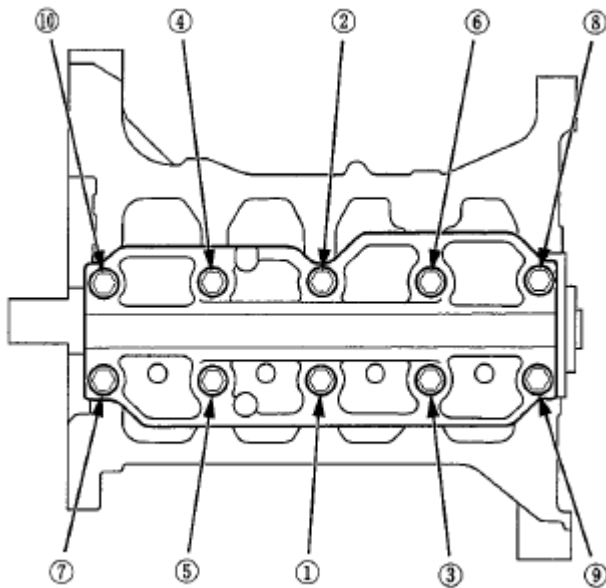


Fig. 122: Tapping End Of Valve Stem
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM ASSEMBLY INSTALLATION

1. Reassemble the rocker arm assembly (see **ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY**).
2. Clean and dry the No. 5 rocker shaft holder mating surface.
3. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the cylinder

head mating surface of the No. 5 rocker shaft holder. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

- If you apply liquid gasket P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply new liquid gasket.

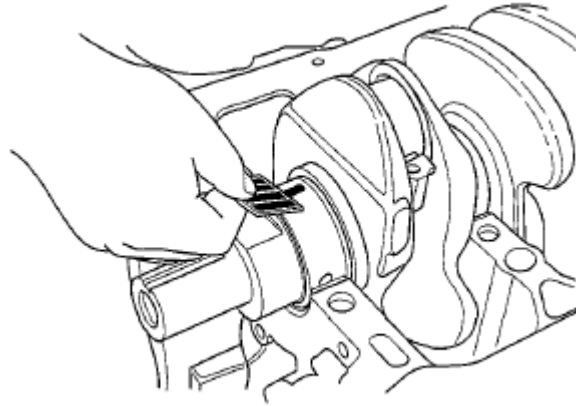


Fig. 123: Identifying Liquid Gasket Applying Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Insert the bolts (A) into the rocker shaft holder, then install the rocker arm assembly (B) on the cylinder head.

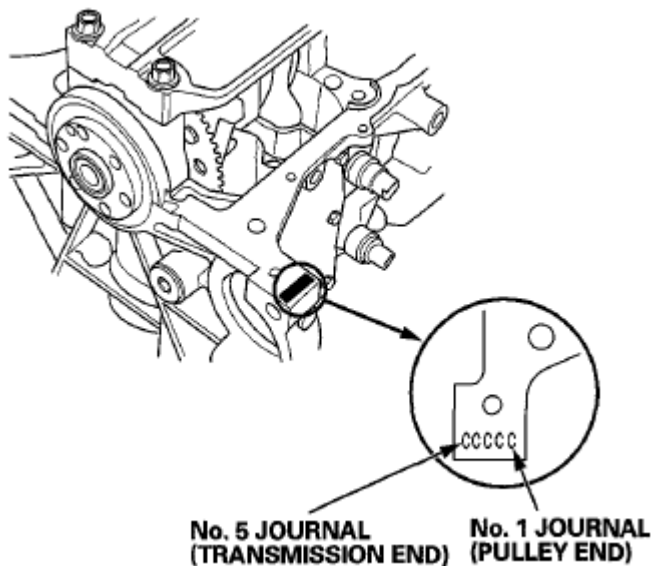


Fig. 124: Identifying Rocker Arm Assembly Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Remove the bolts from the rocker shaft holder.

6. Make sure the punch marks on the variable valve timing control (VTC) actuator and exhaust camshaft sprocket are facing up, then set the camshafts (A) in the holder. Apply new engine oil to the camshaft journals and lobes.

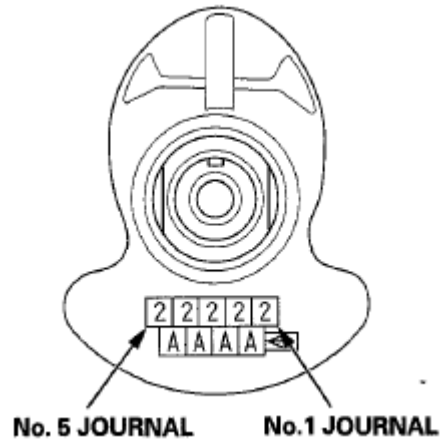


Fig. 125: Identifying Camshafts

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Set the camshaft holders (B) and cam chain guide B (C) in place.
8. Torque the bolts in the specified sequence.

NOTE: If the engine does not have bolt (21), skip it and continue the torque sequence.

Specified Torque

8 x 1.25 mm Bolts: 22 N.m (2.2 kgf.m, 16 lbf.ft)

6 x 1.0 mm Bolts: 12 N.m (1.2 kgf.m, 8.7 lbf.ft)

6 x 1.0 mm Bolts: (21), (22), (23)

		Crank bore code → Larger crank bore			
		A	B	C	D
Main Journal code ↓	1	→ Smaller bearing (Thicker)			
	2	Red	Pink	Yellow	Green
	3	Pink	Yellow	Green	Brown
	4	Yellow	Green	Brown	Black
		Green	Brown	Black	Blue
		Smaller main journal ↓ Smaller bearing (Thicker)			

Fig. 126: Identifying Camshaft Bolts Torque Sequence
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Install the cam chain (see CAM CHAIN INSTALLATION), and adjust the valve clearance (see VALVE CLEARANCE ADJUSTMENT).

CYLINDER HEAD INSTALLATION

Install the cylinder head in the reverse order of removal:

1. Install a new coolant separator (A) in the engine block whenever the engine block is replaced.

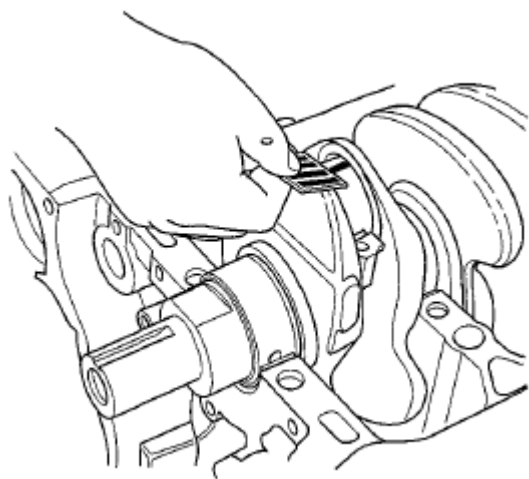


Fig. 127: Identifying Coolant Separator In Engine Block
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Clean the cylinder head and engine block surface.
3. Install the new cylinder head gasket (A) and dowel pins (B) on the engine block. Always use a new cylinder head gasket.

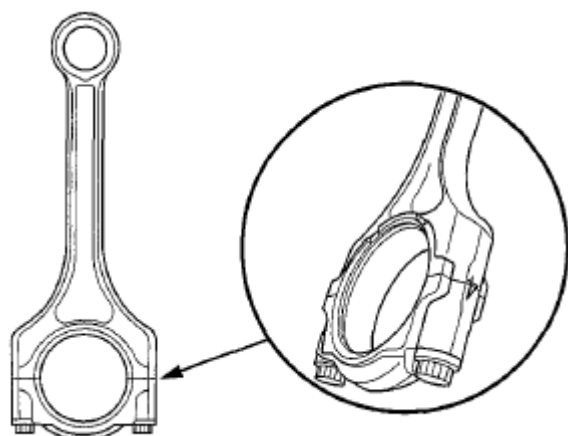


Fig. 128: Identifying Cylinder Head Gasket & Dowel Pins On Engine Block
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Set the crankshaft to top dead center (TDC). Align the TDC mark (A) on the crankshaft sprocket with the pointer (B) on the engine block.

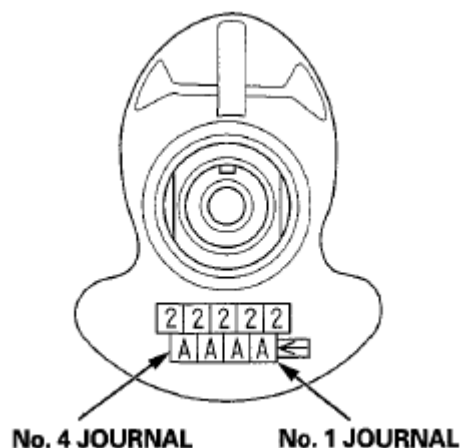


Fig. 129: Aligning TDC Mark On Crankshaft Sprocket With Pointer
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Set the camshaft pulley to TDC (see step 2).
6. Install the cylinder head on the engine block.
7. Measure the diameter of each cylinder head bolt at point A and point B.

		Big end bore code → Larger big rod bore			
		1	2	3	4
Rod Journal code ↓	A	Smaller bearing (Thicker) →			
	B	White	Red	Pink	Yellow
	C	Red	Pink	Yellow	Green
	D	Pink	Yellow	Green	Brown
Smaller rod journal	Smaller bearing (Thicker)	Yellow	Green	Brown	Black

Fig. 130: Measuring Diameter Of Cylinder Head Bolt At Point A & B
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. If either diameter is less than 10.6 mm (0.42 in.), replace the cylinder head bolt.
9. Apply new engine oil to the threads and flange of all the cylinder head bolts.
10. Tighten the cylinder head bolts in sequence to 40 N.m (4.0 kgf.m, 29 lbf.ft). Use a beam-type torque wrench. When using a preset-type torque wrench, be sure to torque slowly and do not over torque. If a bolt makes any noise while you are torquing it, loosen the bolt and torque it from the first step.

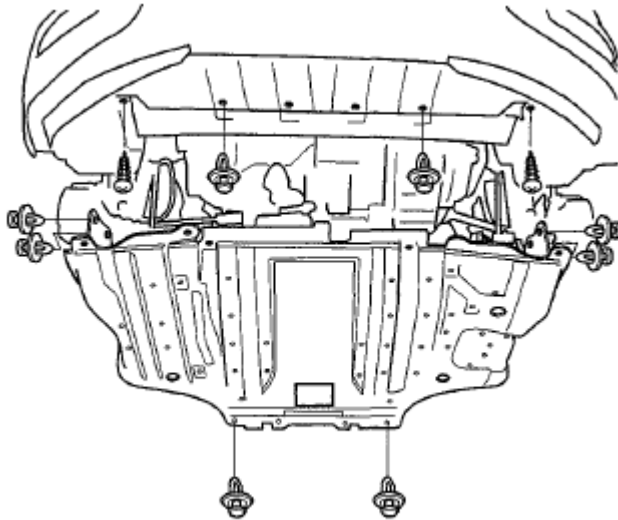


Fig. 131: Identifying Cylinder Head Bolt Torque Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. After torquing, torque all cylinder head bolts in two steps (90° per step) using the sequence shown in step 10 above. If you are using a new cylinder head bolt, torque the bolt an extra 90°.

NOTE: Remove the cylinder head bolt if you torqued it beyond the specified angle, and go back to step 6 of the procedure. Do not loosen it back to the

specified angle.

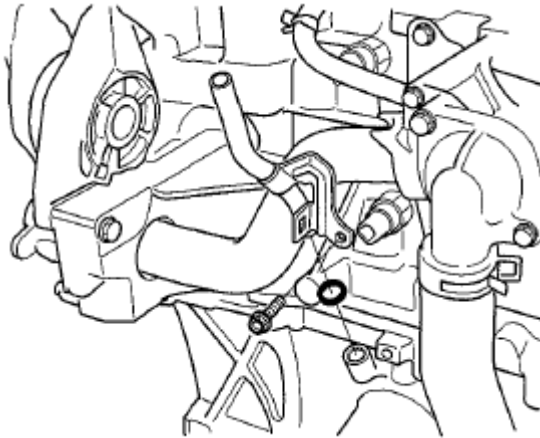


Fig. 132: Identifying Cylinder Head Bolt Tightening Sequence
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Install the rocker arm assembly (see **ROCKER ARM ASSEMBLY INSTALLATION**).
13. Install the cam chain (see **CAM CHAIN INSTALLATION**).
14. Tighten the three bolts (A) securing the evaporative emission (EVAP) canister purge valve bracket, and torque the two bolts (B) securing the harness brackets.

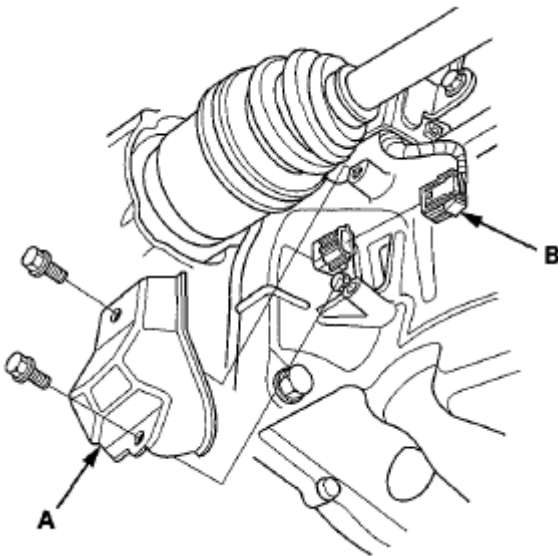


Fig. 133: Identifying Evaporative Emission (EVAP) Canister Purge Valve Bracket Bolts With Torque Specifications
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Connect the following engine wire harness connectors, and install the wire harness clamps from the cylinder head:
 - Four injector connectors

- Engine coolant temperature (ECT) sensor 1 connector
- Camshaft position (CMP) sensor A connector (Intake side)
- Camshaft position (CMP) sensor B connector (Exhaust side)
- Rocker arm oil control solenoid (VTEC solenoid valve) connector
- Rocker arm oil pressure switch (VTEC oil pressure switch) connector

16. Connect the upper radiator hose (A), the heater hoses (B), and the water bypass hose (C).



Fig. 134: Identifying Upper Radiator Hose, Heater Hoses & Water Bypass Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Connect the positive crankcase ventilation (PCV) hose (A) and ground cable (B).

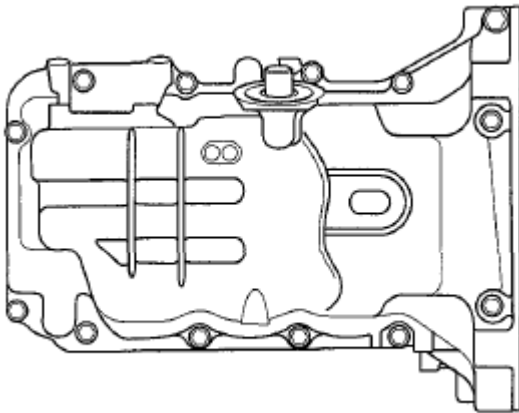


Fig. 135: Identifying Positive Crankcase Ventilation (PCV) Hose & Ground Cable With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Install the exhaust manifold (see **EXHAUST MANIFOLD REMOVAL AND INSTALLATION**).
19. Install the intake manifold (see **INSTALLATION**).
20. Connect the EVAP canister hose (A) and brake booster vacuum hose (B).

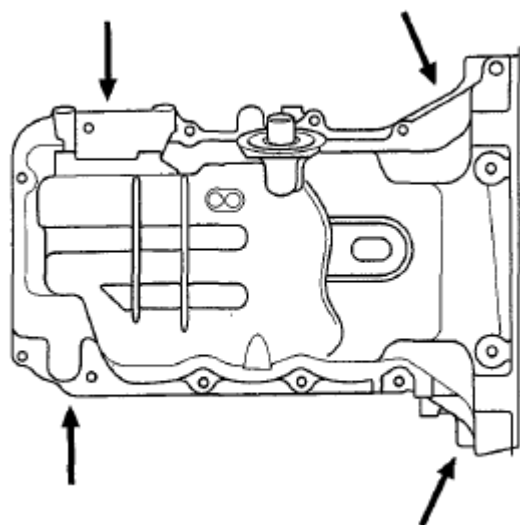


Fig. 136: Identifying EVAP Canister Hose & Brake Booster Vacuum Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

21. Tighten the bolt securing the connecting pipe support bracket to the engine block.

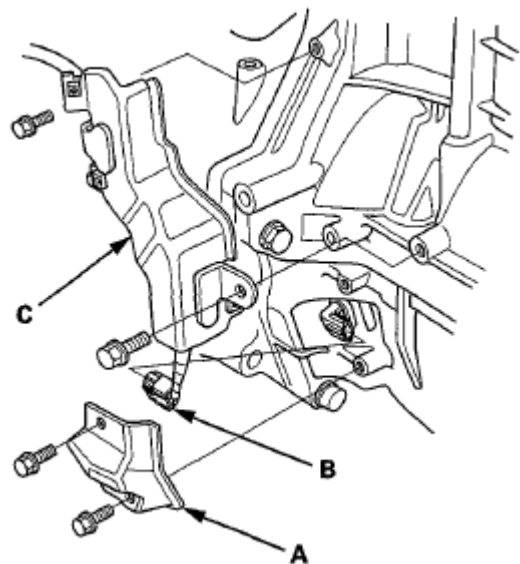


Fig. 137: Identifying Connecting Pipe Support Bracket Bolt With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

22. Connect the fuel feed hose (A) (see **FUEL LINE/QUICK-CONNECT FITTING INSTALLATION**), then install the quick-connect fitting cover (B).

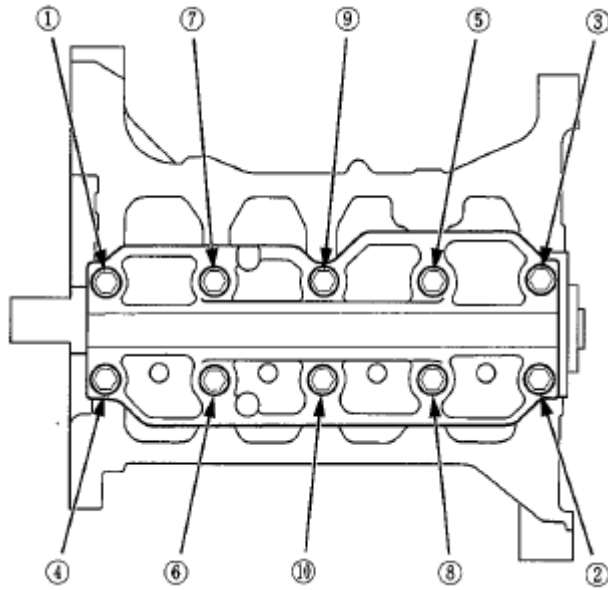


Fig. 138: Identifying Fuel Feed Hose & Quick-Connect Fitting Cover
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

23. Install the intake air duct (A), then connect the mass airflow (MAF) sensor/intake air temperature (IAT) sensor connector (B), and connect the vacuum hose (C) and breather pipe (D).

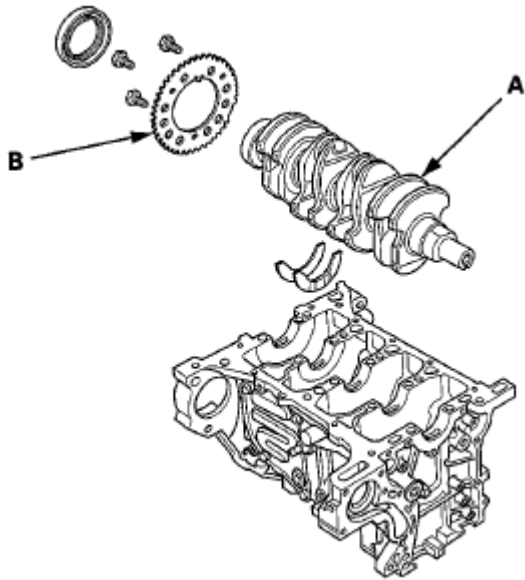


Fig. 139: Identifying Intake Air Duct, Vacuum Hose & Breather Pipe
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

24. Install the drive belt (see **DRIVE BELT REPLACEMENT**).
25. After installation, check that all tubes, hoses, and connectors are installed correctly.
26. Inspect for fuel leaks. Turn the ignition switch to ON (II) (do not operate the starter) so the fuel pump runs for about 2 seconds and pressurizes the fuel line. Repeat this operation three times, then check for

fuel leakage at any point in the fuel line.

27. Refill the radiator with engine coolant, and bleed air from the cooling system with the heater valve open (see **COOLANT CHECK**).
28. Do the engine control module (ECM)/powertrain control module (PCM) idle learn procedure (see **ECM/PCM IDLE LEARN PROCEDURE**).
29. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **CRANK (CKP) PATTERN CLEAR/CRANK (CKP) PATTERN LEARN**).
30. Inspect the idle speed (see **IDLE SPEED INSPECTION**).
31. Inspect the ignition timing (see **IGNITION TIMING INSPECTION**).

2007-011 ENGINE

Engine Block - Element

SPECIAL TOOLS

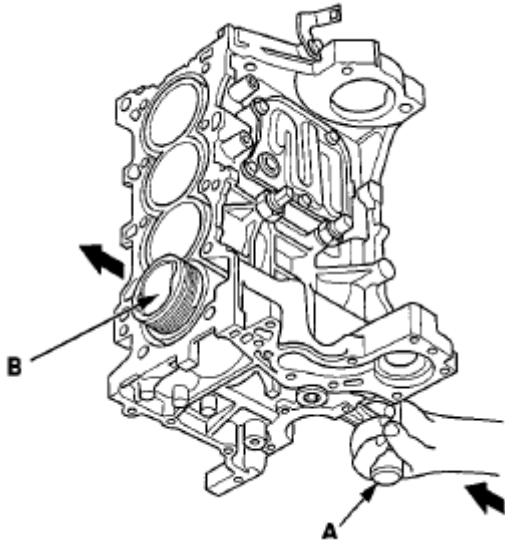


Fig. 1: Identifying Special Tools

Courtesy of AMERICAN HONDA MOTOR CO., INC.

COMPONENT LOCATION INDEX

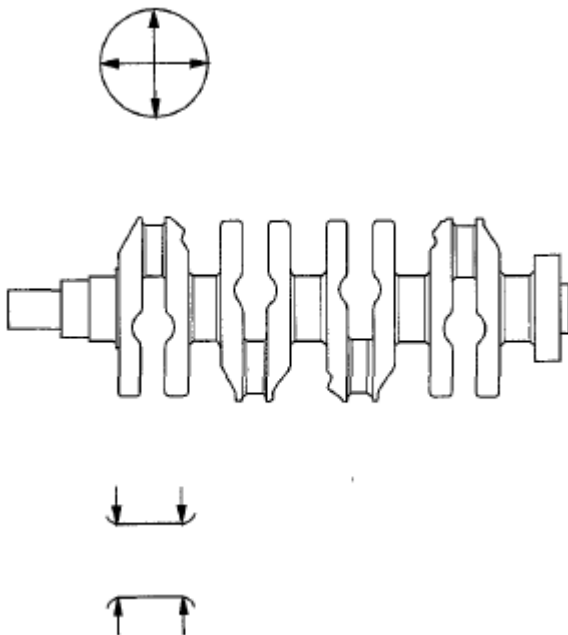


Fig. 2: Identifying Engine Block Replacement Components (1 Of 2)

Courtesy of AMERICAN HONDA MOTOR CO., INC.

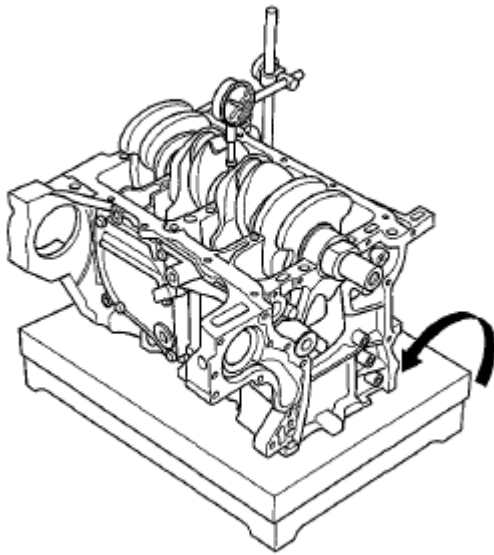


Fig. 3: Identifying Engine Block Replacement Components (2 Of 2)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CONNECTING ROD AND CRANKSHAFT END PLAY INSPECTION

1. Remove the oil pump (see **OIL PUMP REMOVAL**).
2. Remove the baffle plates (see step 8).
3. Measure the connecting rod end play with a feeler gauge between the connecting rod and crankshaft.

Connecting Rod End Play

Standard (New): 0.15-0.35 mm (0.006-0.014 in.)

Service Limit: 0.40 mm (0.016 in.)

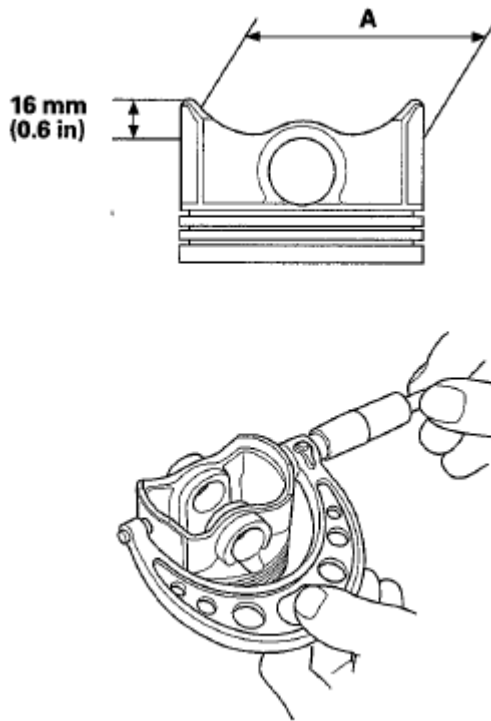


Fig. 4: Measuring Connecting Rod End Play With Feeler Gauge
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. If the connecting rod end play is beyond the service limit, install a new connecting rod, and recheck. If it is still beyond the service limit, replace the crankshaft (see **CRANKSHAFT AND PISTON REMOVAL**).
5. 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, the dial reading should not exceed the service limit.

Crankshaft End Play

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

Service Limit: 0.45 mm (0.018 in.)

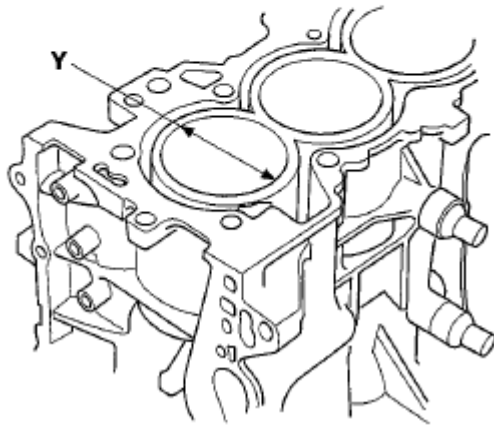
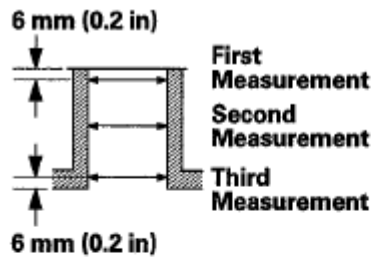


Fig. 5: Checking Crankshaft End Play

Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. If the crankshaft end play is beyond the service limit, replace the thrust washers and recheck. If it is still beyond the service limit, replace the crankshaft (see CRANKSHAFT AND PISTON REMOVAL).

CRANKSHAFT MAIN BEARING REPLACEMENT

MAIN BEARING CLEARANCE INSPECTION

1. To check main bearing-to-journal oil clearance, remove the lower block and bearing halves (see CRANKSHAFT AND PISTON REMOVAL).
2. Clean each main journal and bearing half with a clean shop towel.
3. Place one strip of plastigage across each main journal.
4. Reinstall the bearings and lower block, then torque the bolts to 30 N.m (3.0 kgf.m, 22 lbf.ft).

NOTE: Do not rotate the crankshaft during inspection.

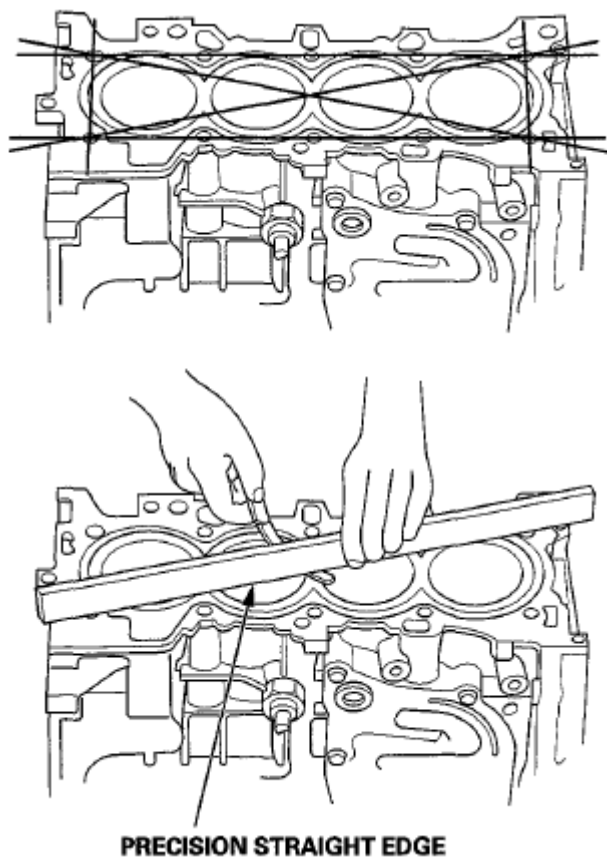


Fig. 6: Identifying Crankshaft Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Tighten the bearing cap bolts an additional 56°.
6. Remove the lower block and bearings again, and measure the widest part of the plastigage.

Main Bearing-to-Journal Oil Clearance

No. 1, 2, 4, 5 Journals:

Standard (New): 0.017 - 0.041 mm (0.0007 - 0.0016 in.)

Service Limit: 0.050 mm (0.0020 in.)

No. 3 Journal: Standard (New): 0.025 - 0.049 mm (0.0010 - 0.0019 in.)

Service Limit: 0.055 mm (0.0022 in.)

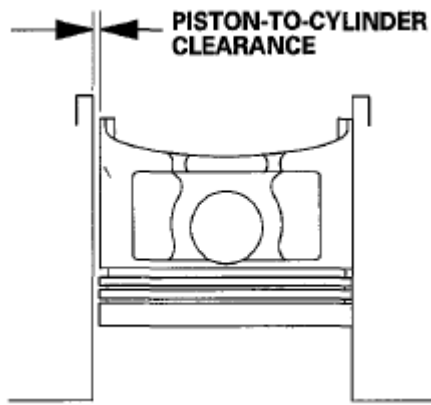


Fig. 7: Measuring Widest Part Of Plastigage

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. If the plastigage measures too wide or too narrow, remove the crankshaft, and remove the upper half of the bearing. Install a new, complete bearing with the appropriate color code(s), and recheck the clearance. Do not file, shim, or scrape the bearings or the caps to adjust clearance.
8. If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below the current one), and check again. If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over.

MAIN BEARING SELECTION

Crankshaft Bore Code Location

1. Numbers letters, or bars have been stamped on the end of the engine block as a code for the size of each of the five main journal bores. Write down the crank bore codes. If you can't read the codes because of accumulated dirt and dust, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.

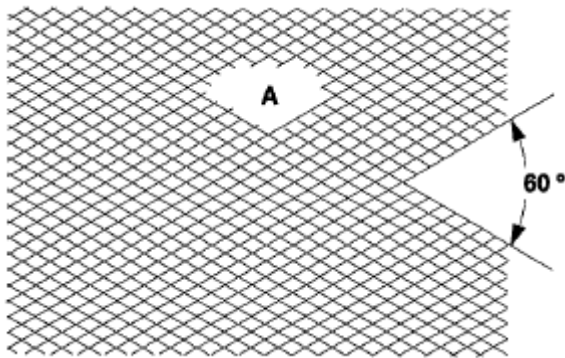


Fig. 8: Identifying Crankshaft Bore Code Location

Courtesy of AMERICAN HONDA MOTOR CO., INC.

Main Journal Code Location

2. The main journal codes are stamped on the crankshaft in either location.

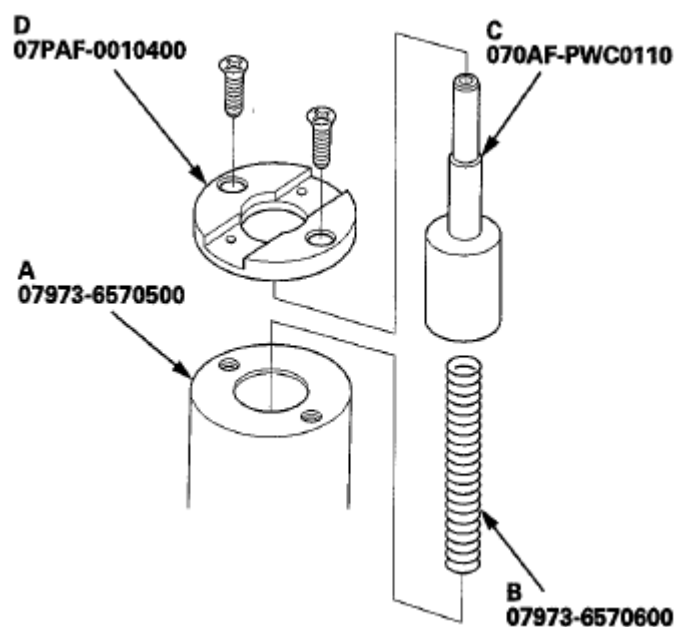


Fig. 9: Identifying Main Journal Code Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

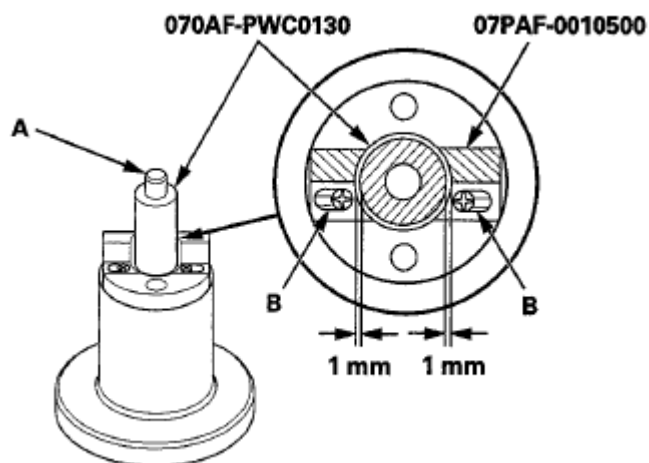


Fig. 10: Identifying Main Journal Code ('07-08 Models)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

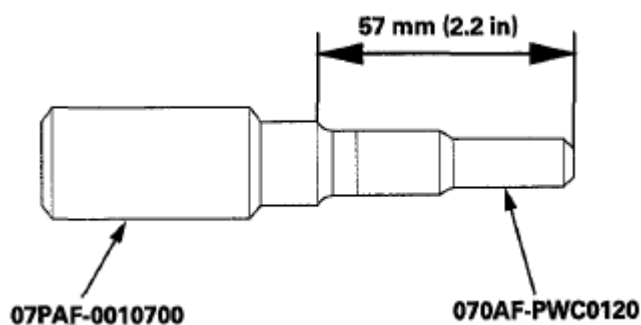


Fig. 11: Identifying Main Journal Code ('09-10 Models)
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

- Use the crank bore codes and crank journal codes to select the appropriate replacement bearings from the following table.

NOTE:

- The color code is on the edge of the bearing.
- When using bearing halves of different colors, it does not matter which color is used in the top or bottom.

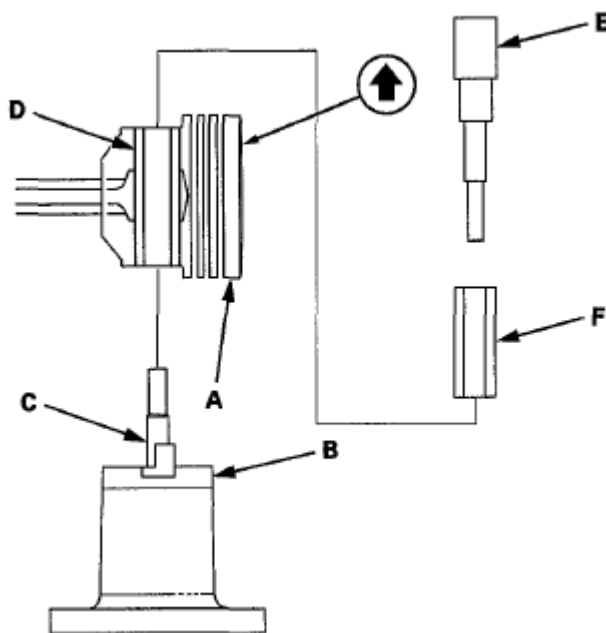


Fig. 12: Identifying Crank Bore Codes & Crank Journal Codes Table
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

CONNECTING ROD BEARING REPLACEMENT

ROD BEARING CLEARANCE INSPECTION

- Remove the oil pump (see [OIL PUMP REMOVAL](#)).

2. Remove the baffle plates (see step 8).
3. Remove the connecting rod cap and bearing half.
4. Clean the crankshaft rod journal and bearing half with a clean shop towel.
5. Place plastigage across the rod journal.
6. Reinstall the bearing half and connecting rod cap, and torque the bolts to 20 N.m (2.0 kgf.m, 15 lbf.ft) + 90° using a commercially available torque angle gauge.

NOTE: **Do not rotate the crankshaft during inspection.**

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

Connecting Rod Bearing-to-Journal Oil Clearance

Standard (New): 0.020-0.050 mm (0.0008-0.0020 in.)

Service Limit: 0.060 mm (0.0024 in.)

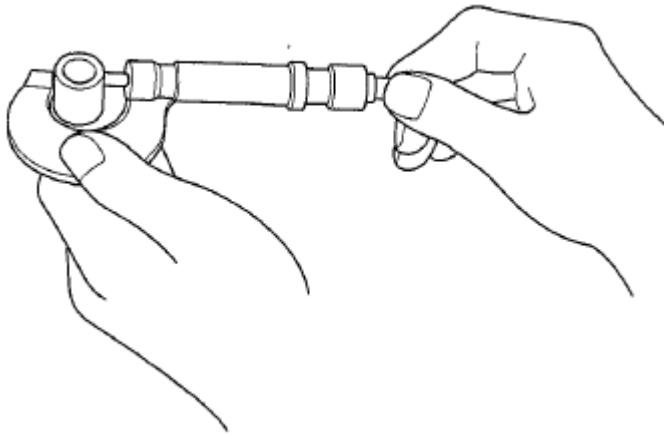


Fig. 13: Measuring Widest Part Of Plastigage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. If the plastigage measures too wide or too narrow, remove the upper half of the bearing, install a new, complete bearing with the appropriate color code(s), and recheck the clearance. Do not file, shim, or scrape the bearings or the caps to adjust clearance.
9. If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below the current one), and check clearance again. If the proper clearance cannot be obtained by using the appropriate larger or smaller bearing, replace the crankshaft and start over.

CONNECTING ROD BEARING SELECTION

1. Inspect each connecting rod for cracks and heat damage.

Connecting Rod Big End Bore Code Locations

2. Each rod has a tolerance range from 0 to 0.024 mm (0.0009 in.), and in 0.006 mm (0.0002 in.) increments, depending on the size of its big end bore. It's then stamped with a number or bar (1, 2, 3, or 4/I, II, III, or IIII) indicating the range. You may find any combination of numbers and bars in any engine. (Half the number or bar is stamped on the bearing cap, the other half is on the rod.)

If you can't read the code because of an accumulation of oil and varnish, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.

Normal Bore Size: 51.0 mm (2.01 in.)

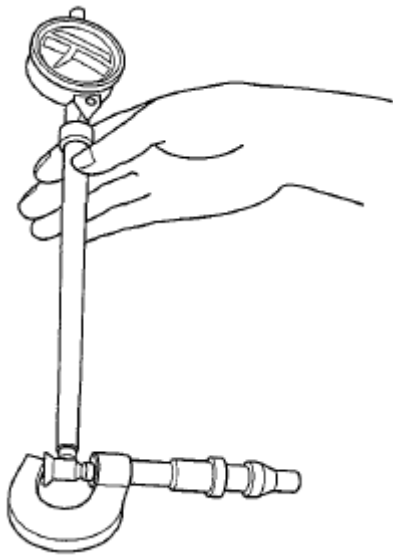


Fig. 14: Identifying Connecting Rod Big End Bore Size
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Connecting Rod Journal Code Location

3. The connecting rod journal codes are stamped on the crankshaft in either location.

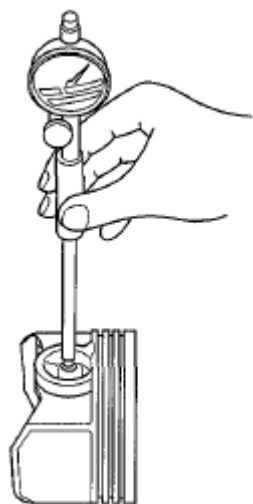


Fig. 15: Identifying Connecting Rod Journal Code Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

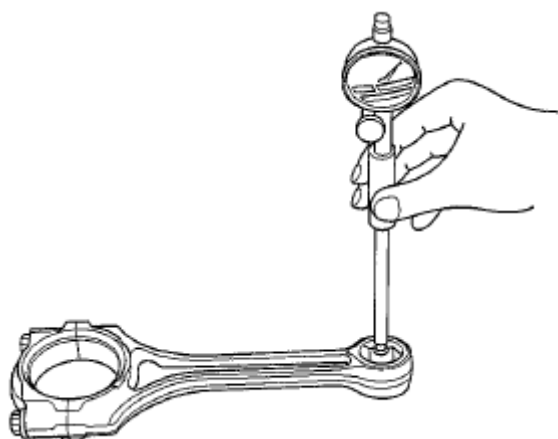


Fig. 16: Identifying Connecting Rod Journal Code ('07-08 Models)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

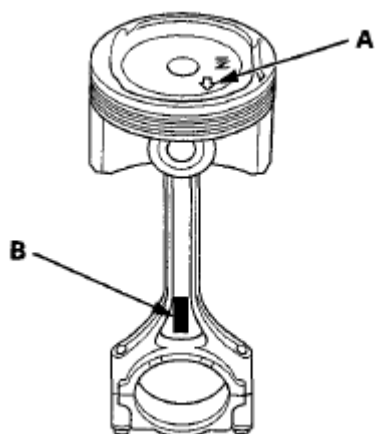


Fig. 17: Identifying Connecting Rod Journal Code ('09-10 Models)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Use the big end bore codes and rod journal codes to select appropriate replacement bearings from the following table.

NOTE:

- The color code is on the edge of the bearing.
- When using bearing halves of different colors, it does not matter which color is used in the top or bottom.

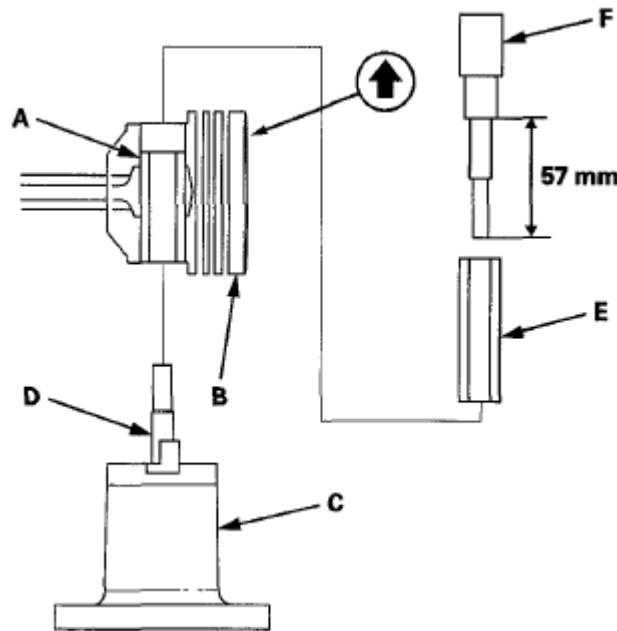


Fig. 18: Identifying Big End Bore Codes & Rod Journal Codes Table
Courtesy of AMERICAN HONDA MOTOR CO., INC.

OIL PAN REMOVAL

1. Drain the engine oil (see **ENGINE OIL REPLACEMENT**).
2. If the engine is still in the vehicle, remove the subframe.
 1. Attach the engine support hanger to the engine (see step 42 in **ENGINE REMOVAL**).
 2. Disconnect the suspension knuckle ball joints (see **LOWER ARM REPLACEMENT**).
 3. Remove the rear mount mounting bolts (see step 44 in **ENGINE REMOVAL**).
 4. Remove the front mount mounting bolt (see step 45 in **ENGINE REMOVAL**).
 5. A/T model: Remove the automatic transmission fluid (ATF) filter mounting bolt (see step 37 in **ENGINE REMOVAL**).
 6. Make the appropriate reference lines at positions A and B that line up with the center of the subframe mounting bolts (see step 46 in **ENGINE REMOVAL**).
 7. Attach the subframe adapter to the subframe, then attach the jack to the subframe adapter (see step

47 in **ENGINE REMOVAL**).

8. Remove the front subframe mounting bolts, then lower the subframe (see step 49 in **ENGINE REMOVAL**).
3. M/T model: Remove the clutch cover.

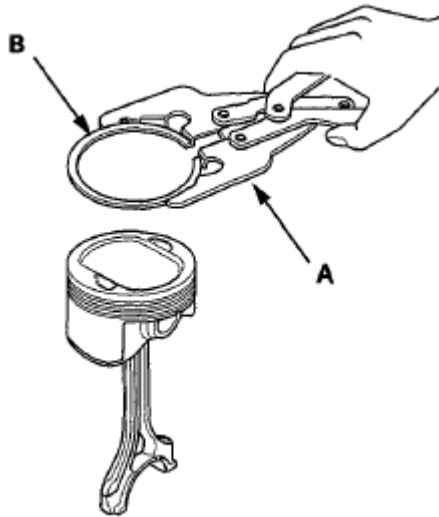


Fig. 19: Identifying Front Subframe Mounting Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the bolts/nuts securing the oil pan.
5. Drive an oil pan seal cutter between the oil pan and engine block.

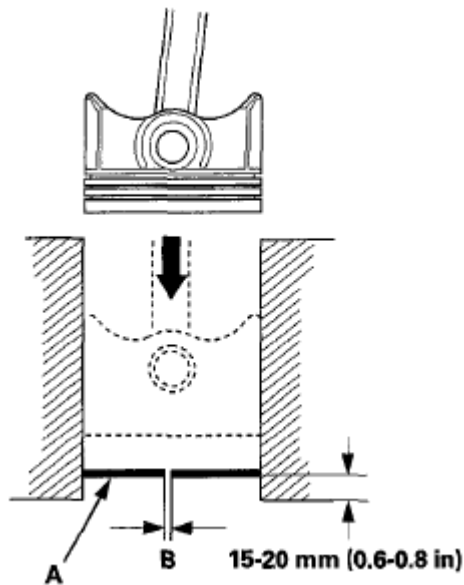


Fig. 20: Driving Oil Pan Seal Cutter Between Oil Pan & Engine Block
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Cut the oil pan seal by striking the side of the cutter to slide the cutter along the oil pan.

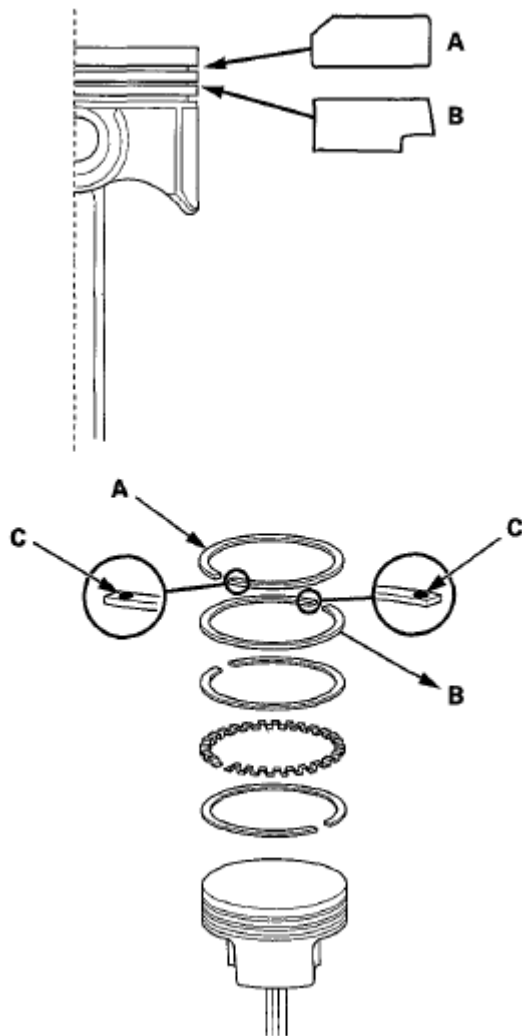


Fig. 21: Cutting Oil Pan Seal By Striking Side Of Cutter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the oil pan.

CRANKSHAFT AND PISTON REMOVAL

1. Remove the engine/transmission (see **ENGINE REMOVAL**).
2. Remove the transmission:
 - Manual transmission (see **TRANSMISSION REMOVAL**)
 - Automatic transmission (see **TRANSMISSION REMOVAL**)
3. M/T model: Remove the pressure plate (see **PRESSURE PLATE AND CLUTCH DISC REMOVAL**), clutch disc (see **PRESSURE PLATE AND CLUTCH DISC REMOVAL**), and flywheel (see **FLYWHEEL REPLACEMENT**).

4. A/T model: Remove the drive plate (see **DRIVE PLATE REMOVAL AND INSTALLATION**).
5. Remove the oil pan (see **OIL PAN REMOVAL**).
6. Remove the oil pump (see **OIL PUMP REMOVAL**).
7. Remove the cylinder head (see **CYLINDER HEAD REMOVAL**).
8. Remove the baffle plates.

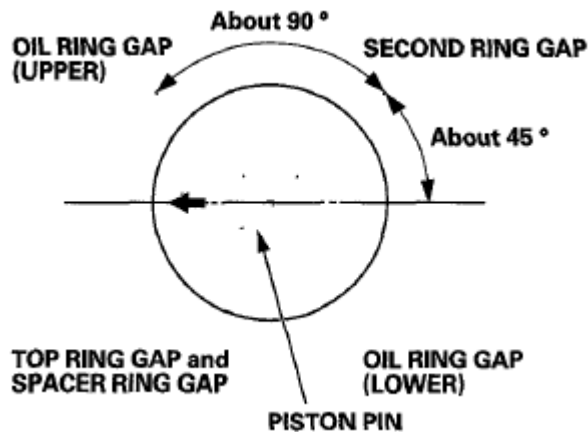


Fig. 22: Identifying Baffle Plates & Bolts
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Remove the 8 mm bolts from the lower block in the criss-cross pattern shown below.

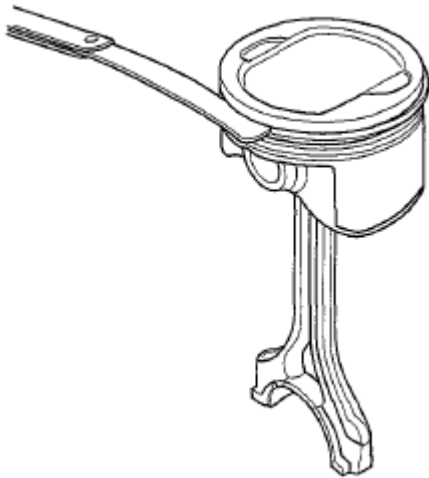


Fig. 23: Identifying Lower Block Bolts Criss-Cross Pattern
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Remove the bearing cap bolts. To prevent warpage, loosen the bolts in sequence 1/3 turn at a time. Repeat the sequence until all bolts are loosened.

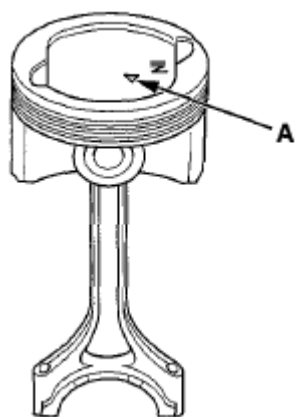


Fig. 24: Identifying Bearing Cap Bolt Loosening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Remove the lower block and bearings. Keep all bearings in order.

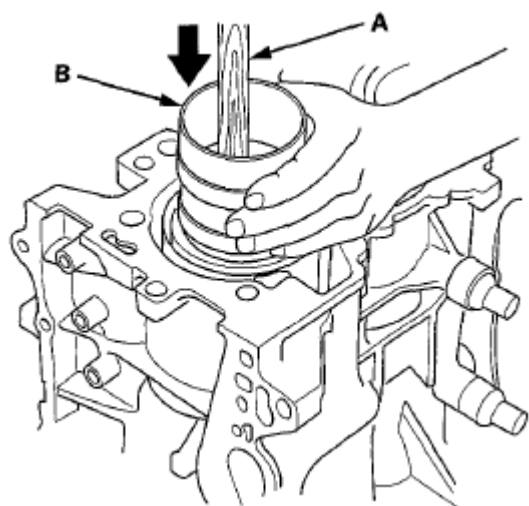


Fig. 25: Identifying Lower Block & Bearings
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Remove the connecting rod caps/bearing halves. Keep all connecting rod caps/bearing halves in order.
13. Lift the crankshaft out of the engine block, being careful not to damage the journals.

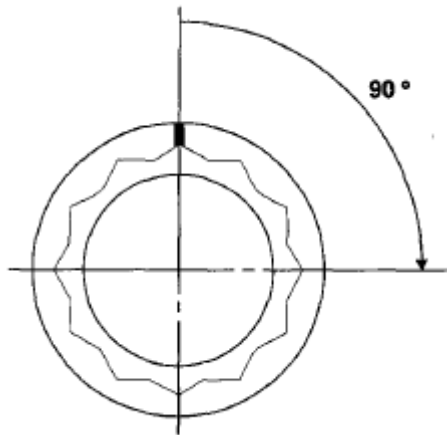


Fig. 26: Lifting Crankshaft Out Of Engine Block
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Remove the upper bearing halves from the connecting rods, and set them aside with their respective caps.
15. If you can feel a ridge of metal or hard carbon around the top of each cylinder, remove it with a ridge reamer (A). Follow the reamer manufacturer's instructions. If the ridge is not removed, it may damage the pistons as they are pushed out.

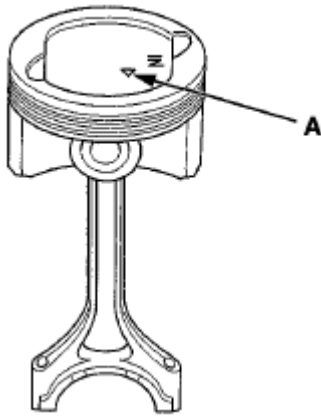


Fig. 27: Identifying Ridge Reamer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

16. Use the wooden handle of a hammer (A) to drive out the piston/connecting rod assembly (B).

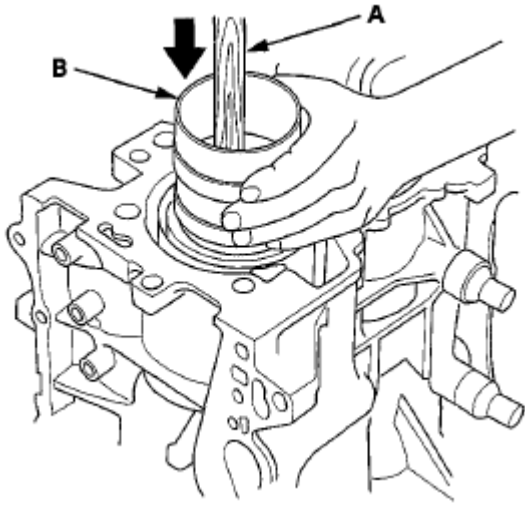


Fig. 28: Driving Out Piston/Connecting Rod Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Reinstall the lower block and bearings on the engine block in the proper order.
18. Reinstall the connecting rod bearings and caps after removing each piston/connecting rod assembly.
19. Mark each piston/connecting rod assembly with its cylinder number to make sure they are reused in the original order.

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

CRANKSHAFT INSPECTION

OUT-OF-ROUND AND TAPER

1. Remove the crankshaft from the engine block (see CRANKSHAFT AND PISTON REMOVAL).
2. Clean the crankshaft oil passages with pipe cleaners or a suitable brush.
3. Clean the keyway and threads.
4. Measure the 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.

'07-08 models

Journal Out-of-Round

Standard (New): 0.005 mm (0.0002 in.) max.

Service Limit: 0.010 mm (0.0004 in.)

'09-10 models

Journal Out-of-Round

Standard (New): 0.004 mm (0.0002 in.) max.

Service Limit: 0.010 mm (0.0004 in.)

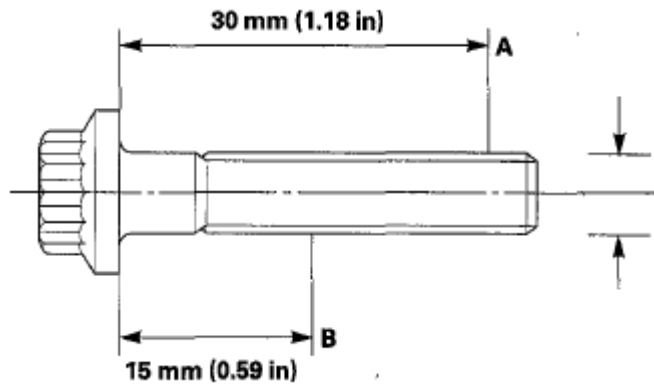


Fig. 29: Measuring Out-Of Round At Middle Of Rod & Main Journal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Measure the 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): 0.005 mm (0.0002 in.) max.

Service Limit: 0.010 mm (0.0004 in.)

Straightness

6. Place the V-blocks on a flat surface.
7. Check the total runout with the crankshaft supported on V-blocks.
8. Measure the runout on all of the main journals. Rotate the crankshaft two complete revolutions. The difference between measurements on each journal must not be more than the service limit.

Crankshaft Total Runout

Standard (New): 0.03 mm (0.0012 in.) max.

Service Limit: 0.04 mm (0.0016 in.)

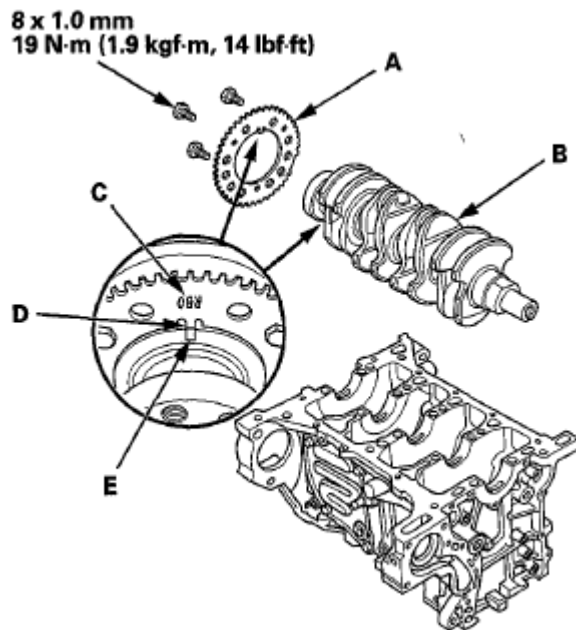


Fig. 30: Measuring Runout Of Main Journals
Courtesy of AMERICAN HONDA MOTOR CO., INC.

BLOCK AND PISTON INSPECTION

1. Remove the crankshaft and pistons (see **CRANKSHAFT AND PISTON REMOVAL**).
2. Check the piston for distortion or cracks.
3. Measure the piston diameter at a point 13 mm (0.5 in.) from the bottom of the skirt. There are two standard-size pistons (No Letter or A, and B). The letter is stamped on the top of the piston. Letters are also stamped on the engine block as cylinder bore sizes.

Piston Diameter

Standard (New):

No Letter (or A): 86.980-86.990 mm (3.4244-3.4248 in.)

B: 86.970-86.980 mm (3.4240-3.4244 in.)

Service Limit:

No Letter (or A): 86.930 mm (3.4224 in.)

B: 86.920 mm (3.4220 in.)

Oversize Piston Diameter

0.25: 87.230-87.240 mm (3.4342-3.4346 in.)

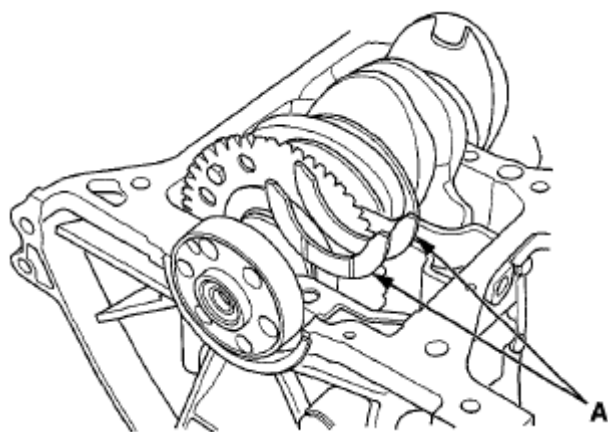


Fig. 31: Measuring Piston Diameter

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Measure the wear and taper in direction X and Y at three levels in each cylinder as shown. If measurements in any cylinder are beyond the Oversize Bore Service Limit, replace the engine block. If the engine block is to be rebored, refer to step 7 after reboring.

Cylinder Bore Size

Standard (New):

A or I: 87.010-87.020 mm (3.4256-3.4260 in.)

B or II: 87.000-87.010 mm (3.4252-3.4256 in.)

Service Limit: 87.070 mm (3.4279 in.)

Oversize

0.25: 87.250-87.260 mm (3.4350-3.4354 in.)

Reboring Limit: 0.25 mm (0.01 in.) max.

Bore Taper

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

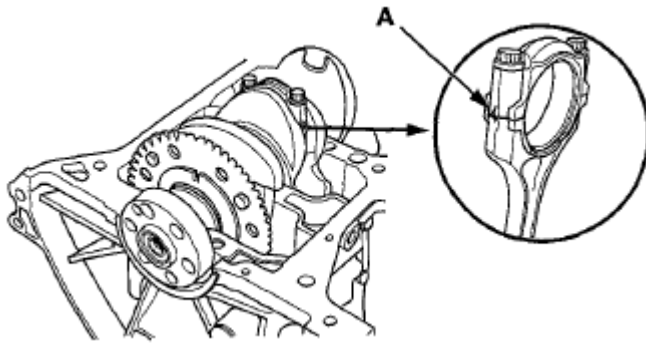


Fig. 32: Measuring Wear & Taper In Direction X & Y In Cylinder
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Scored or scratched cylinder bores must be honed.
6. Check the top of the engine block for warpage. Measure along the edges, and across the center as shown.

Engine Block Warpage

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

Service Limit: 0.10 mm (0.004 in.)

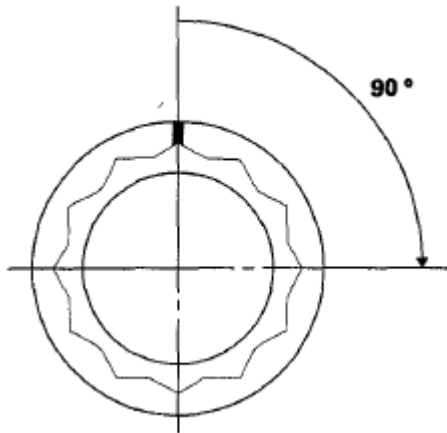


Fig. 33: Checking Top Of Engine Block For Warpage
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Calculate the difference between the cylinder bore diameter and the piston diameter. If the clearance is near or exceeds the service limit, inspect the piston and cylinder bore for excessive wear.

Piston-to-Cylinder Bore Clearance

Standard (New): 0.020-0.040 mm (0.0008-0.0016 in.)

Service Limit: 0.05 mm (0.002 in.)

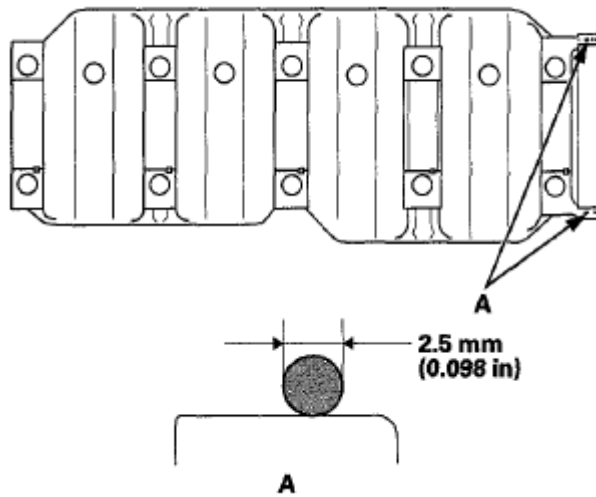


Fig. 34: Identifying Piston-To-Cylinder Bore Clearance
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER BORE HONING

Only a scored or scratched cylinder bore must be honed.

1. Measure the cylinder bores (see **BLOCK AND PISTON INSPECTION**). If the engine 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 (A).

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.

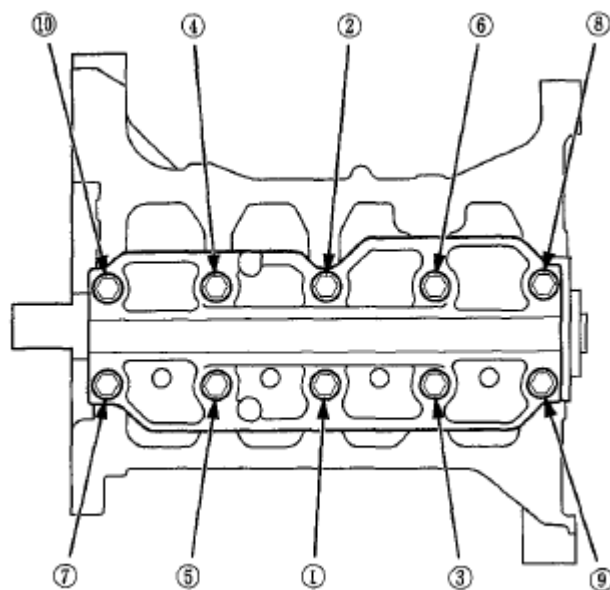


Fig. 35: Identifying Cylinder Bore Honing

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. 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 the engine block to the service limit, rebore the engine block. 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.

PISTON, PIN, AND CONNECTING ROD REPLACEMENT

DISASSEMBLY

1. Remove the piston from the engine block (see CRANKSHAFT AND PISTON REMOVAL).
2. Apply new engine oil to the piston pin snap rings (A), and turn them in the ring grooves until the end gaps are lined up with the cutouts in the piston pin bores (B).

NOTE: Take care not to damage the ring grooves.

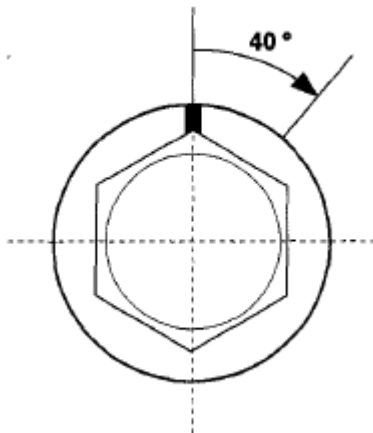


Fig. 36: Identifying Piston Pin Snap Rings

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove both snap rings (A). Start at the cutout in the piston pin bore. Remove the snap rings carefully so they do not go flying or get lost. Wear eye protection.

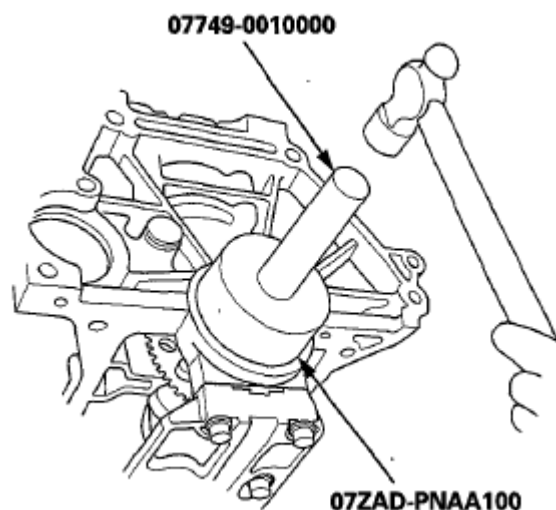


Fig. 37: Identifying Snap Rings

Courtesy of AMERICAN HONDA MOTOR CO., INC.

- Heat the piston and connecting rod assembly to about 158°F (70°C), then remove the piston pin.

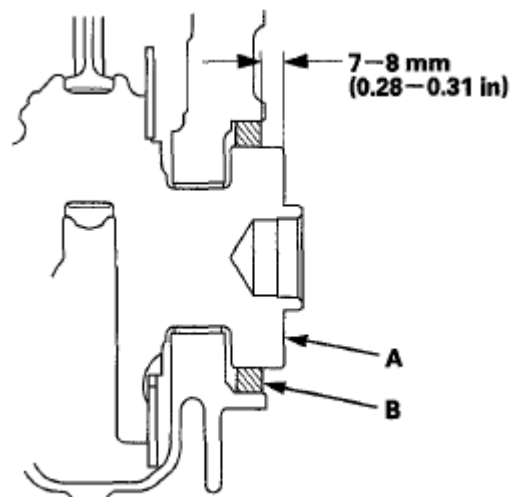


Fig. 38: Heating Piston & Connecting Rod Assembly

Courtesy of AMERICAN HONDA MOTOR CO., INC.

INSPECTION

NOTE: Inspect the piston, piston pin, and connecting rod when they are at room temperature.

- Measure the diameter of the piston pin.

Piston Pin Diameter

Standard (New): 21.962-21.965 mm (0.8646-0.8648 in.)

Service Limit: 21.953 mm (0.8643 in.)

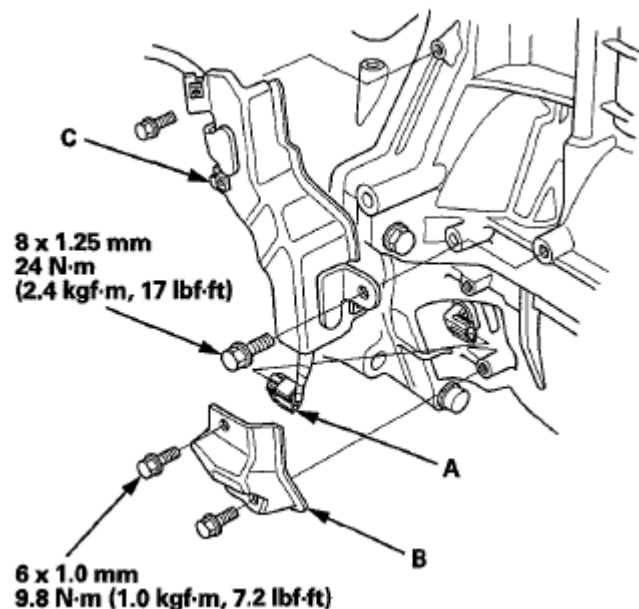


Fig. 39: Measuring Diameter Of Piston Pin

Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Zero the dial indicator to the piston pin diameter.

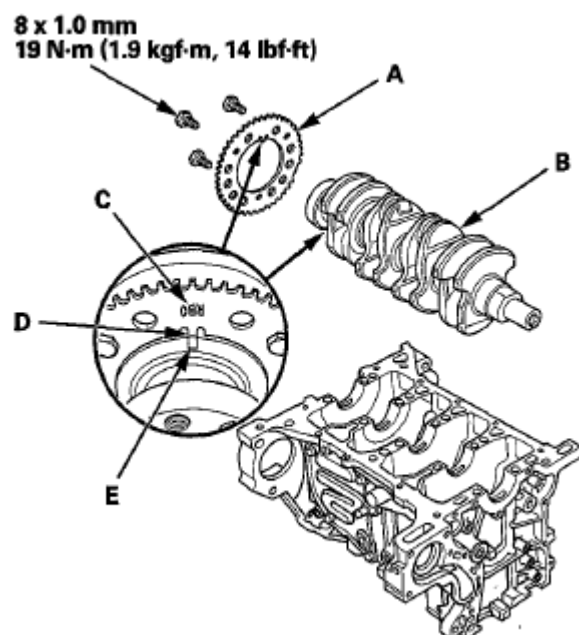


Fig. 40: Identifying Piston Pin Diameter

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Check the difference between the piston pin diameter and piston pin hole diameter in the piston.

Piston Pin-to-Piston Clearance

Standard (New): -0.005 to +0.001 mm (-0.00020 to +0.00008 in.)

Service Limit: 0.005 mm (0.0002 in.)

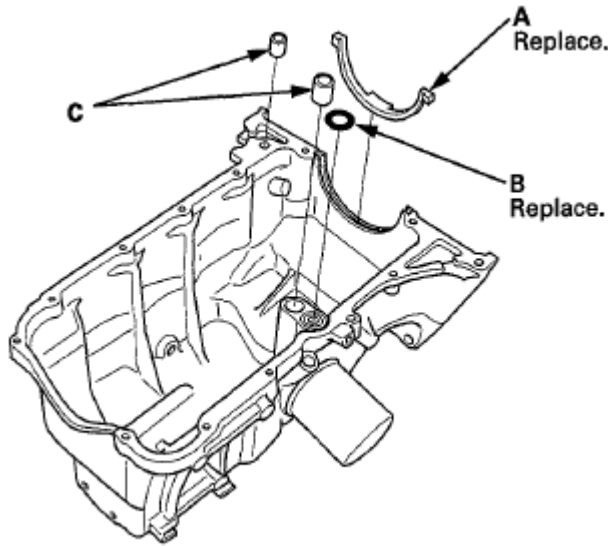


Fig. 41: Checking Difference Between Piston Pin Diameter & Piston Pin Hole Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Measure the piston pin-to-connecting rod clearance.

Piston Pin-to-Connecting Rod Clearance

Standard (New): 0.005-0.014 mm (0.0002-0.0006 in.)

Service Limit: 0.02 mm (0.0008 in.)

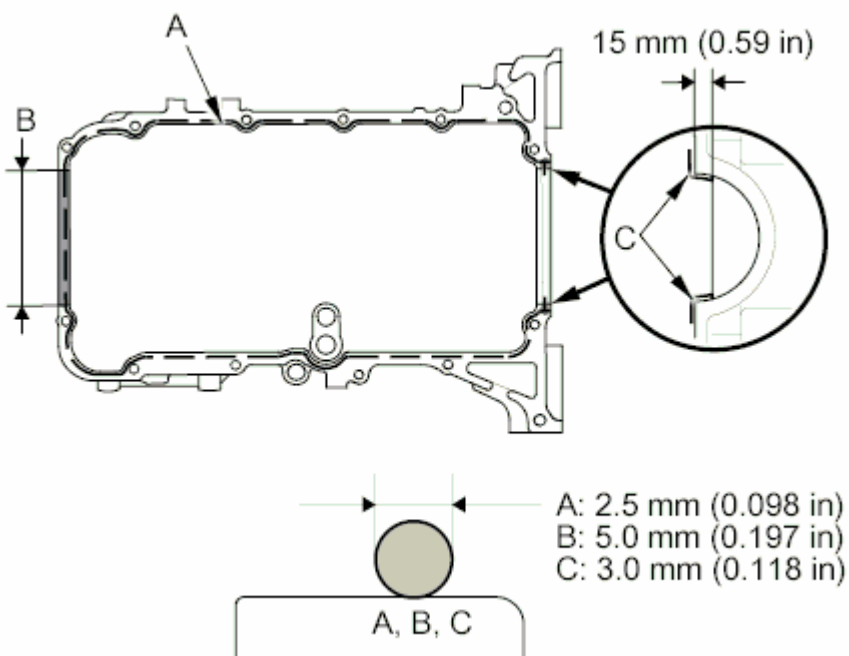


Fig. 42: Measuring Piston Pin-To-Connecting Rod Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REASSEMBLY

1. Install a piston pin snap ring (A) only one side.

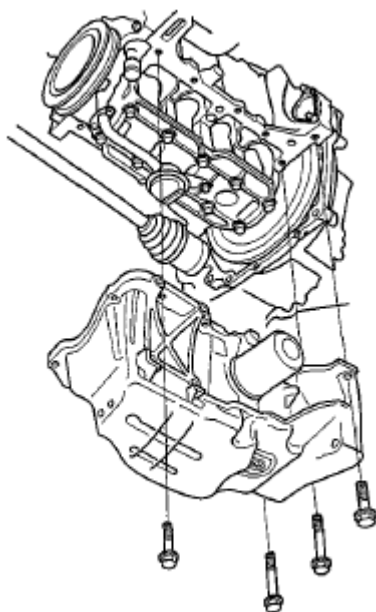


Fig. 43: Identifying Piston Pin Snap Ring
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Coat the piston pin bore in the piston, the bore in the connecting rod, and the piston pin with new engine oil.
3. Heat the piston to about 158°F (70°C).

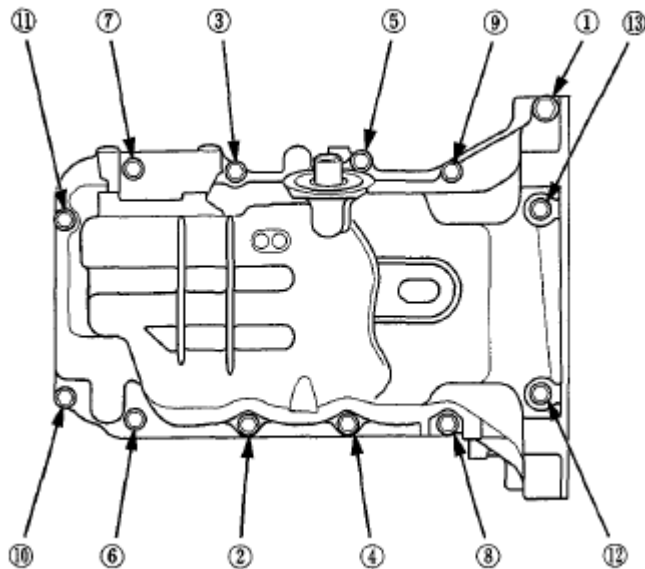


Fig. 44: Heating Piston

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Assemble the piston (A) and connecting rod (B) with the arrow (C) and the embossed mark (D) on the same side. Install the piston pin (E).

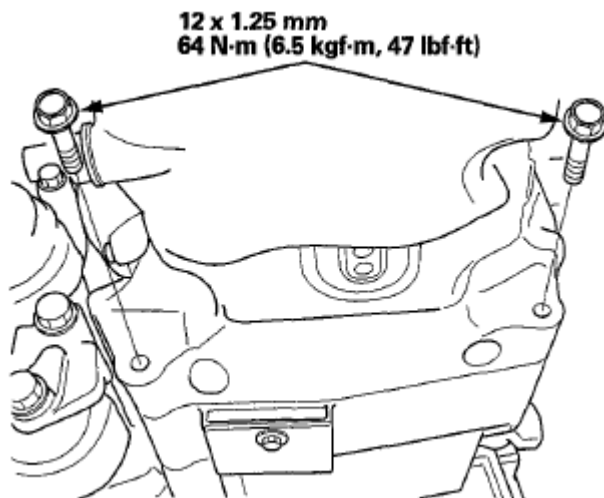


Fig. 45: Identifying Piston & Connecting Rod

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Install the remaining snap ring (F).
6. Turn the snap rings in the ring grooves until the end gaps are positioned at the bottom of the piston.

PISTON RING REPLACEMENT

1. Remove the piston from the engine block (see **CRANKSHAFT AND PISTON REMOVAL**).
2. Using a ring expander (A), remove the old piston rings (B).

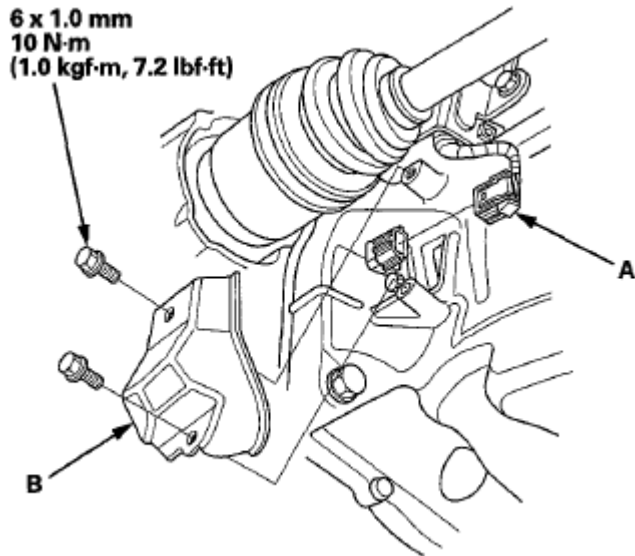


Fig. 46: Using Ring Expander To Remove Piston Rings
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Clean all ring grooves thoroughly with a squared-off broken ring or ring groove cleaner with a blade to fit the piston grooves. The top and 2nd ring grooves are 1.2 mm (0.05 in.) wide. The oil ring groove is 2.0 mm (0.08 in.) wide. File down a blade if necessary. Do not use a wire brush to clean the ring grooves, or cut the ring grooves deeper with the cleaning tools.

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

4. Using a piston that has its rings removed, push a new ring (A) into the cylinder bore 15-20 mm (0.6 -0.8 in.) from the bottom.

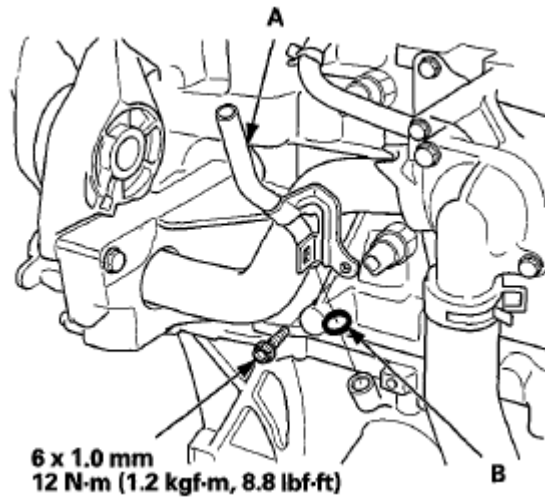


Fig. 47: Pushing Ring Into Cylinder Bore

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Measure the piston ring end-gap (B) 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 (see **BLOCK AND PISTON INSPECTION**). If the bore is beyond the service limit, the engine block must be rebored.

Piston Ring End-Gap

Top Ring:

Standard (New) 0.20-0.35 mm (0.008-0.014 in.)

Service Limit: 0.60 mm (0.024 in.)

Second Ring:

Standard (New): 0.40-0.55 mm (0.016-0.022 in.)

Service Limit: 0.70 mm (0.028 in.)

Oil Ring:

Standard (New): 0.20-0.50 mm (0.008-0.020 in.)

Service Limit: 0.80 mm (0.031 in.)

6. Install the top ring and second ring as shown. The top ring (A) has a 1Z mark and the second ring (B) has a 2R mark. The manufacturing marks (C) must be facing upward.

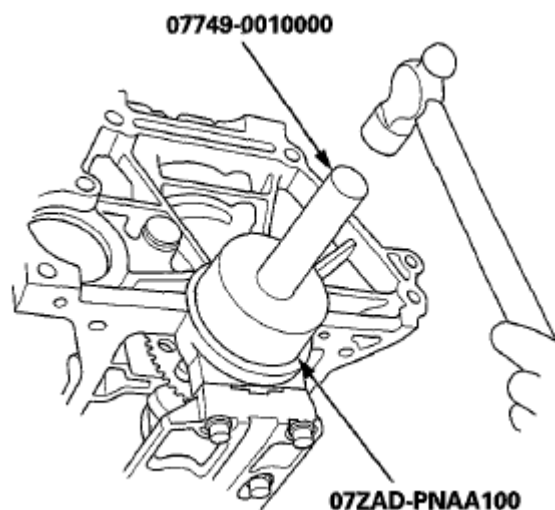


Fig. 48: Identifying Top Ring & Second Ring
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Top Ring Clearance

Standard (New): 0.050-0.075 mm (0.0020-0.0030 in.)

Service Limit: 0.13 mm (0.005 in.)

Second Ring Clearance

Standard (New): 0.050-0.075 mm (0.0020-0.0030 in.)

Service Limit: 0.13 mm (0.005 in.)

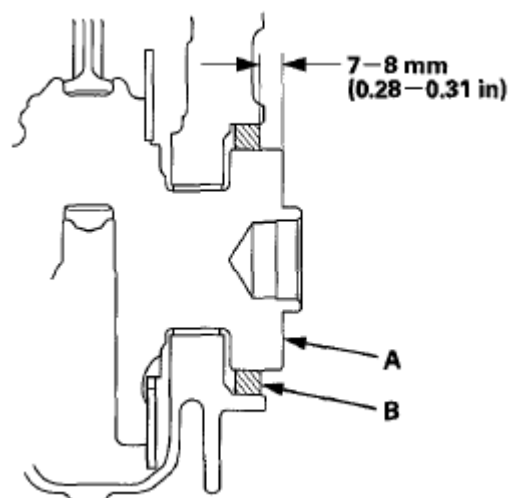


Fig. 49: Measuring Ring-To-Groove Clearances
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

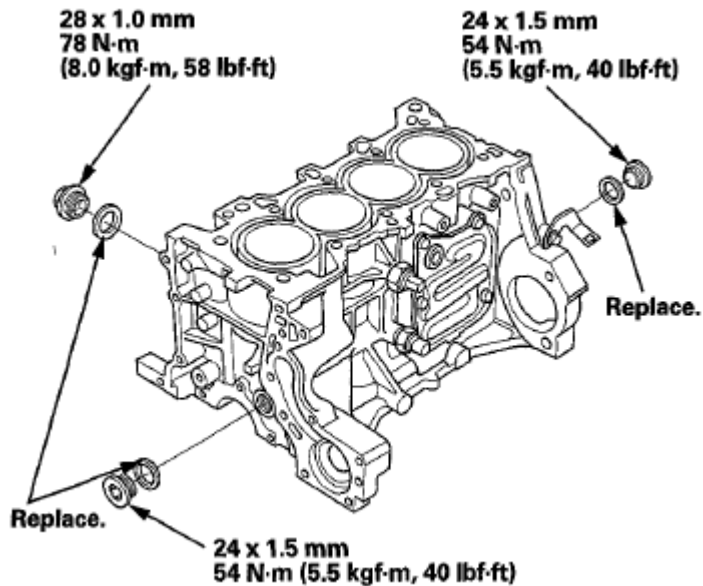


Fig. 50: Positioning Ring End Gaps
Courtesy of AMERICAN HONDA MOTOR CO., INC.

PISTON INSTALLATION

IF THE CRANKSHAFT IS ALREADY INSTALLED

1. Set the crankshaft to bottom dead center (BDC) for each cylinder as its piston is installed.
2. Remove the connecting rod caps. Check that the bearing is securely in place.
3. Apply new engine oil to the piston, inside of the ring compressor, and cylinder bore, then attach the ring compressor to the piston/connecting rod assembly.
4. Position the mark (A) to face the cam chain side of the engine.

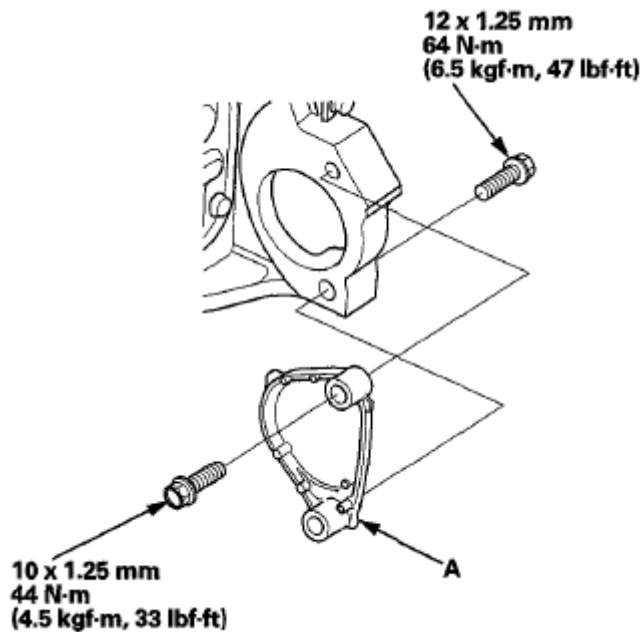


Fig. 51: Identifying Cam Chain Side Of Engine Mark
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Position the piston/connecting rod assembly in the cylinder, and tap it in using the wooden handle of a hammer (A). Maintain downward force on the ring compressor (B) to prevent the rings from expanding before entering the cylinder bore.

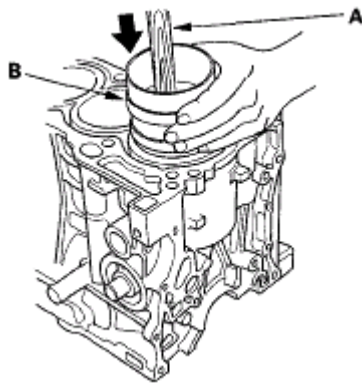


Fig. 52: Positioning Piston/Connecting Rod Assembly In Cylinder
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Stop after the ring compressor pops free, and check the connecting rod-to-crank journal alignment before pushing the piston into place.
7. Check the connecting rod bearing clearance with plastigage (see **ROD BEARING CLEARANCE INSPECTION**).
8. Inspect the connecting rod bolts (see **CONNECTING ROD BOLT INSPECTION**).
9. Apply new engine oil to the bolt threads, then install the rod caps with bearings. Torque the bolts to 20 N.m (2.0 kgf.m, 15 lbf.ft).

10. Torque the connecting rod bolts an additional 90°.

NOTE: Remove the connecting rod bolt if you torqued it beyond the specified angle, and go back to step 8 of the procedure. Do not loosen it back to the specified angle.

Ref. No.	Tool Number	Description	Qty
①	07AAJ-PNAA101	Air Pressure Regulator	1
②	07GAF-SD40330	Camshaft Oil Seal Driver	1
③	07HAH-PJ7A100	Valve Guide Reamer, 5.5 mm	1
④	07JAA-001020A	Socket, 19 mm	1
⑤	07JAB-001020B	Holder Handle	1
⑥	07MAB-PY3010A	Holder Attachment, 50 mm, Offset	1
⑦	07PAD-0010000	Stem Seal Driver	1
⑧	07PAF-0030100	Camshaft Oil Seal Driver	1
⑨	07VAJ-P8A020A	VTEC Air Stopper	1
⑩	070AJ-001A101	VTEC Air Adapter	1
⑪	07742-0010100	Valve Guide Driver, 5.5 mm	1
⑫	07757-PJ1010A	Valve Spring Compressor Attachment	1

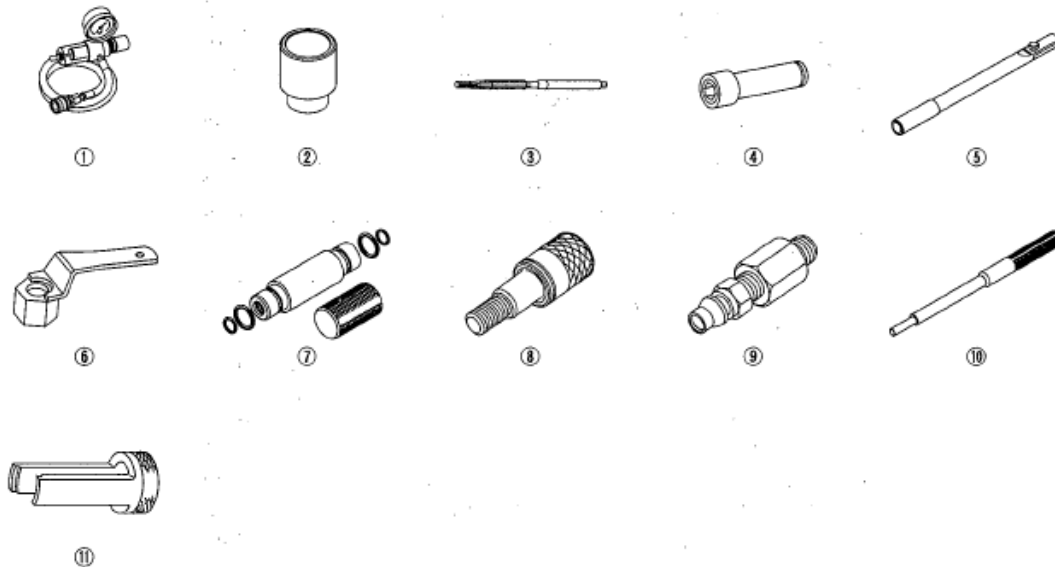


Fig. 53: Identifying Connecting Rod Bolts Angle
Courtesy of AMERICAN HONDA MOTOR CO., INC.

IF THE CRANKSHAFT IS NOT INSTALLED

1. Remove the connecting rod caps, then install the ring compressor, and check that the bearing is securely in place.
2. Apply new engine oil to the piston, inside of the ring compressor, and cylinder bore, then attach the ring compressor to the piston/connecting rod assembly.
3. Position the mark (A) to face the cam chain side of the engine.

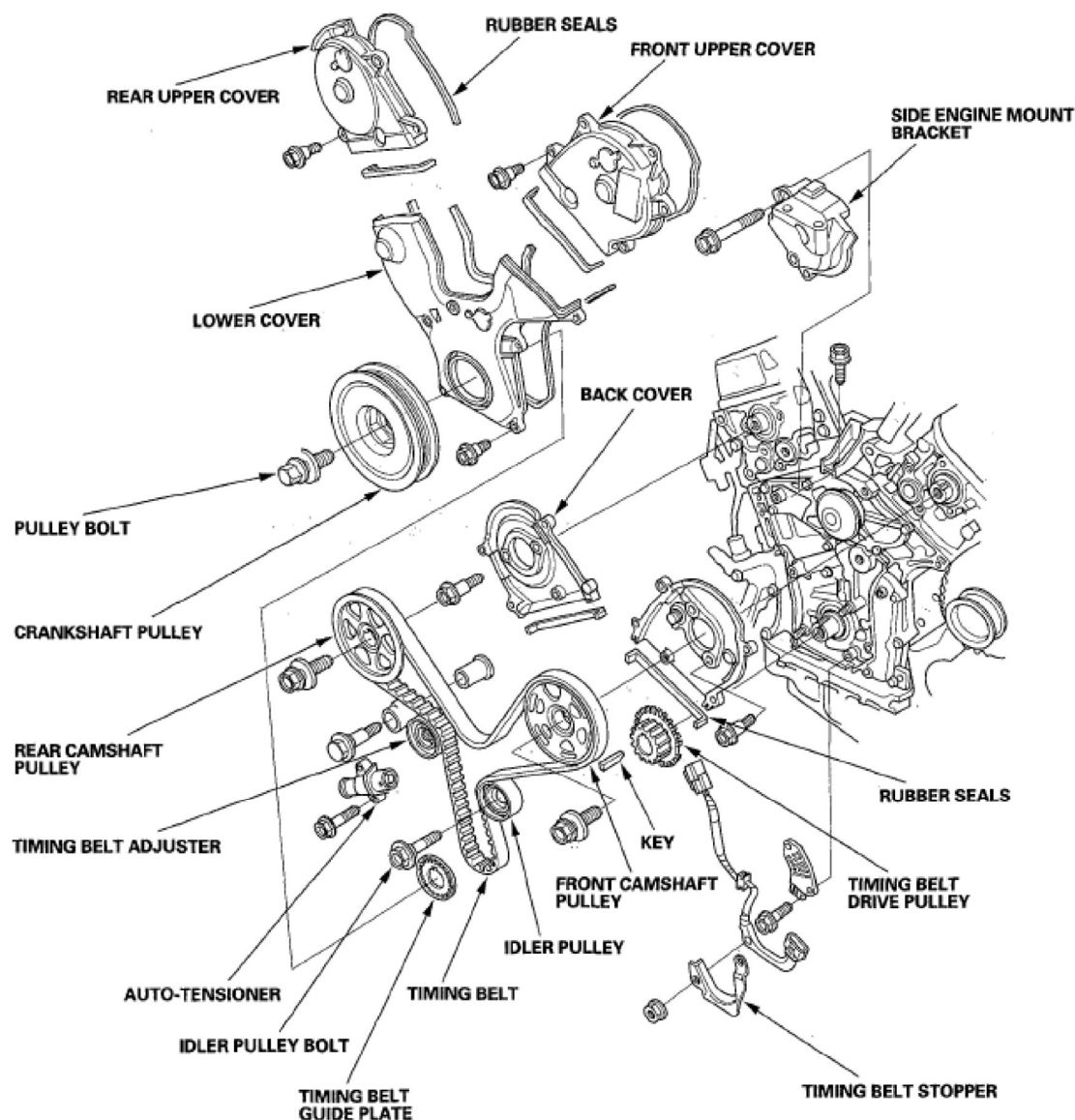


Fig. 54: Identifying Piston Position Mark To Face Cam Chain Side Of Engine
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Position the piston/connecting rod assembly in the cylinder, and tap it in using the wooden handle of a hammer (A). Push down on the ring compressor (B) to prevent the rings from expanding before entering the cylinder bore.

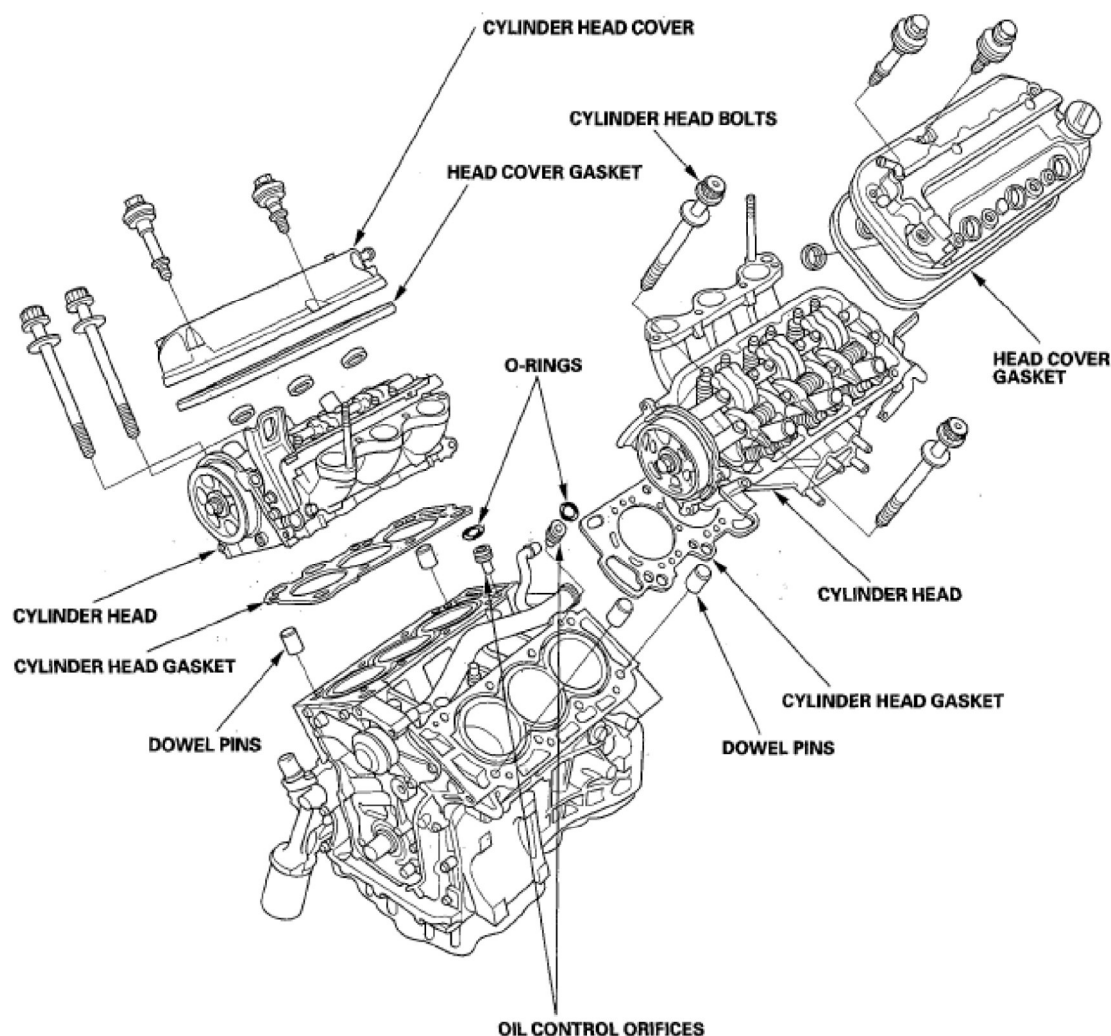


Fig. 55: Positioning Piston/Connecting Rod Assembly In Cylinder
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Position all pistons at top dead center (TDC).

CONNECTING ROD BOLT INSPECTION

1. Measure the diameter of each connecting rod bolt at point A and point B.

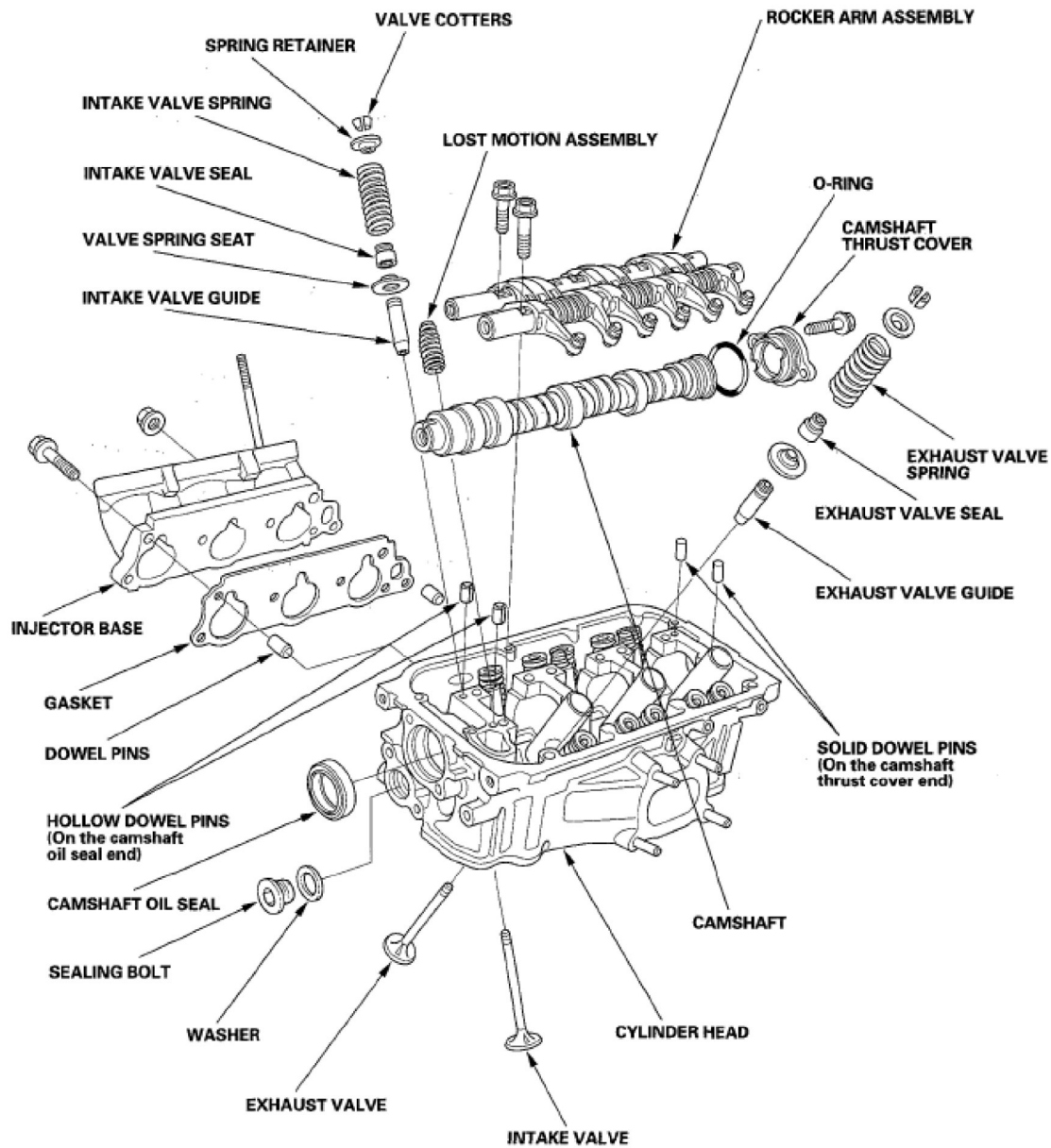


Fig. 56: Measuring Diameter Of Connecting Rod Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Calculate the difference in diameter between point A and point B.

Point A - Point B = Difference in Diameter

Difference in Diameter:

Specification: 0-0.1 mm (0-0.004 in.)

3. If the difference in diameter is out of tolerance, replace the connecting rod bolt.

CRANKSHAFT INSTALLATION

SPECIAL TOOLS REQUIRED

- Handle Driver 07749-0010000
 - Attachment, 24 x 26 mm 07746-0010700
 - Oil seal driver attachment 96 07ZAD-PNAA100
1. M/T model: Install the crankshaft end bushing when replacing the crankshaft. Using the handle driver and attachment, drive in the crankshaft end bushing until the driver and attachment bottom against the crankshaft.

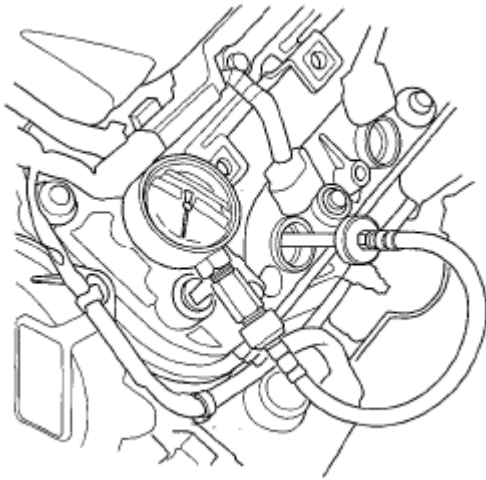


Fig. 57: Driving In Crankshaft End Bushing

Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Check the connecting rod bearing clearance with plastigage (see **ROD BEARING CLEARANCE INSPECTION**).
3. Check the main bearing clearance with plastigage (see **MAIN BEARING CLEARANCE INSPECTION**).
4. Install the bearing halves in the engine block and connecting rods.
5. Apply a coat of new engine oil to the main bearings and rod bearings.
6. Hold the crankshaft so rod journal No. 2 and rod journal No. 3 are straight up, then lower the crankshaft into the engine block.
7. Apply new engine oil to the thrust washer surfaces. Install the thrust washers (A) in the No. 4 journal of the engine block.

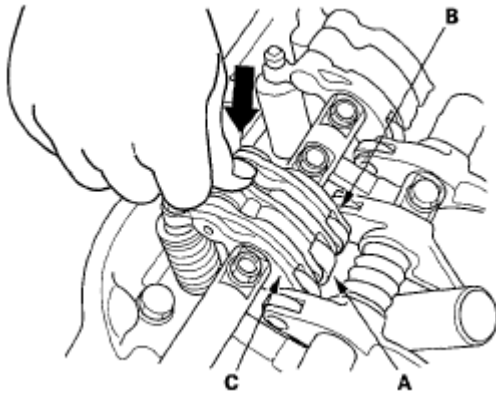


Fig. 58: Identifying Thrust Washer

Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Inspect the connecting rod bolts (see CONNECTING ROD BOLT INSPECTION).
9. Apply new engine oil to the threads of the connecting rod bolts.
10. Seat the rod journals into connecting rod No. 1 and connecting rod No. 4. Line up the mark (B) on the connecting rod and cap, then install the caps and bolts finger-tight.
11. Rotate the crankshaft clockwise, and seat the journals into connecting rod No. 2 and connecting rod No. 3. Line up the mark on the connecting rod and cap, then install the caps and bolts finger-tight.
12. Torque the connecting rod bolts to 20 N.m (2.0 kgf.m, 15 lbf.ft).
13. Torque the connecting rod bolts an additional 90°.

NOTE: Remove the connecting rod bolt if you torqued it beyond the specified angle, then go back to step 8 of the procedure. Do not loosen it back to the specified angle.

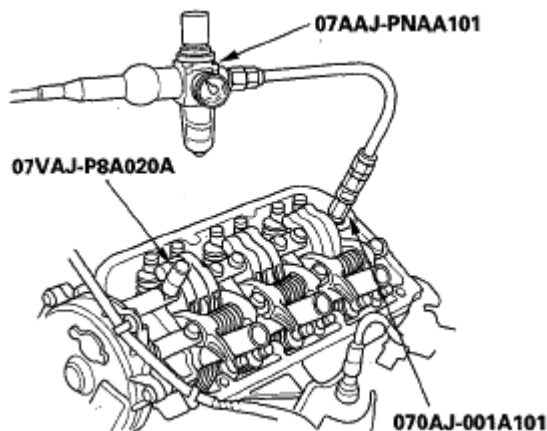


Fig. 59: Identifying Connecting Rod Bolt Position Angle

Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Remove all of the old liquid gasket from the lower block mating surfaces, bolts, and bolt holes.
15. Clean and dry the lower block mating surfaces.

16. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the engine block mating surface of the lower block and to the inner threads of the bolt holes. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

- If you apply liquid gasket P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply new liquid gasket.

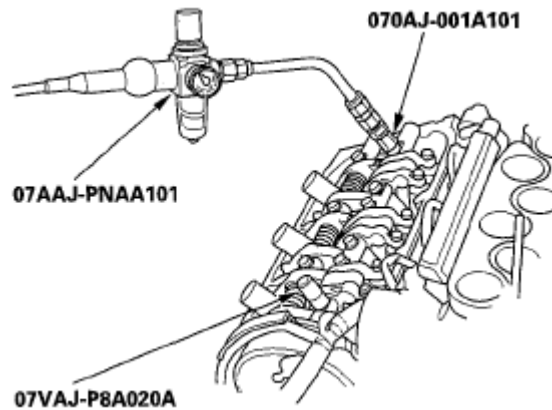


Fig. 60: Identifying Liquid Gasket Applying Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Put the lower block on the engine block.
18. Apply new engine oil to the bearing cap bolts. Torque the bearing cap bolts in sequence to 30 N.m (3.0 kgf.m, 22 lbf.ft).

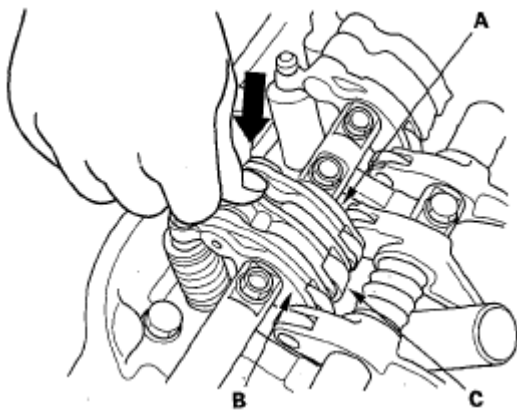


Fig. 61: Identifying Bearing Cap Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Tighten the bearing cap bolts an additional 56°.

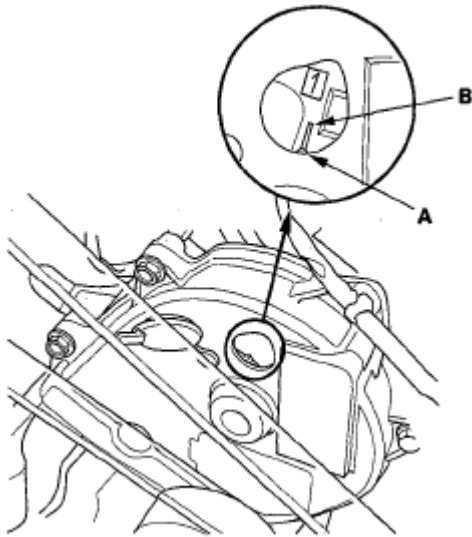


Fig. 62: Identifying Bearing Cap Bolts Angle
Courtesy of AMERICAN HONDA MOTOR CO., INC.

20. Tighten the 8 mm bolts in sequence to 22 N.m (2.2 kgf.m, 16 lbf.ft).

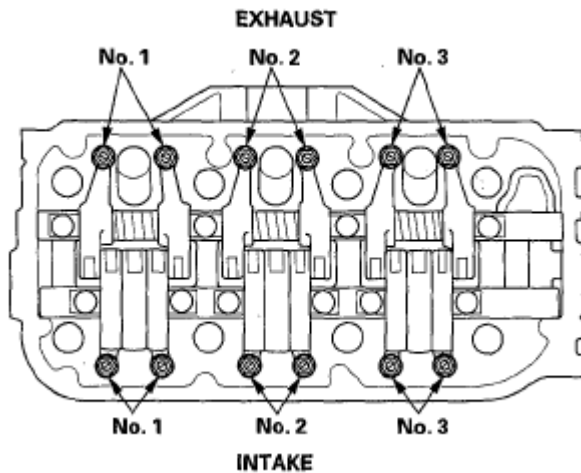


Fig. 63: Identifying Bearing Cap Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

21. Apply a light coat of new engine oil around the crankshaft oil seal.
22. Apply a light coat of new engine oil to the lip of the crankshaft oil seal.
23. Use the handle driver and oil seal driver attachment to drive a new crankshaft oil seal squarely into the engine block to the specified installed height.

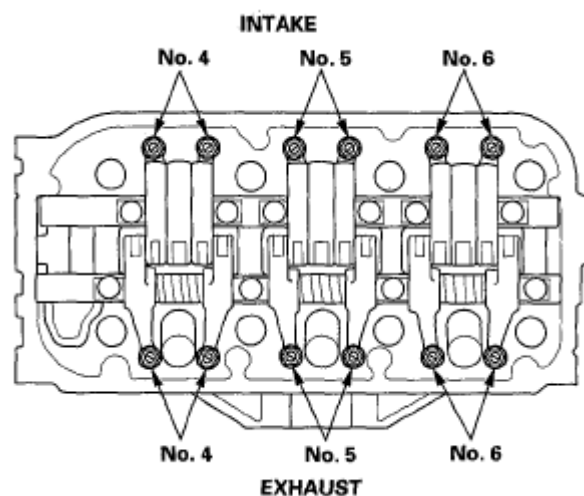


Fig. 64: Driving Crankshaft Oil Seal Using Handle Driver & Oil Seal Driver Attachment
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

24. Measure the distance between the engine block (A) and crankshaft oil seal (B).

Crankshaft Oil Seal Installed Height:

0.2-1.2 mm (0.001-0.047 in.)

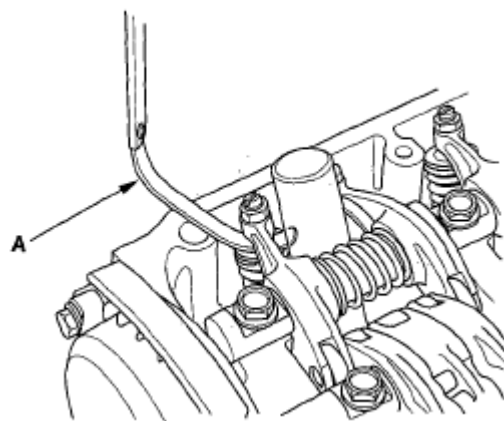


Fig. 65: Measuring Distance Between Engine Block & Crankshaft Oil Seal
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

25. Install the baffle plates.

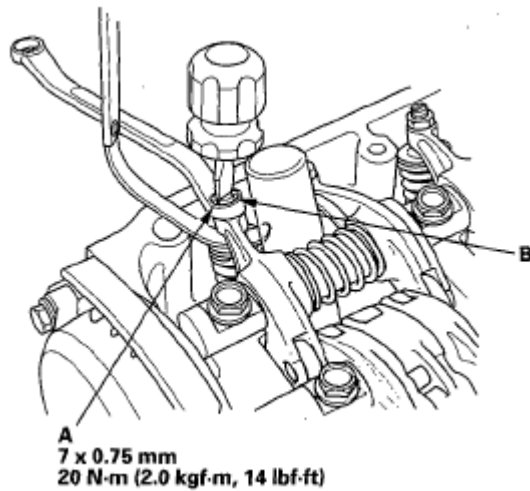


Fig. 66: Identifying Baffle Plates Bolts With Torque Specifications
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

26. Install the oil pump (see [OIL PUMP INSTALLATION](#)).
27. Install the oil pan (see [OIL PAN INSTALLATION](#)).
28. Install the cylinder head (see [CYLINDER HEAD INSTALLATION](#)).
29. M/T model: Install the flywheel (see [FLYWHEEL INSPECTION](#)), clutch disc (see [CLUTCH DISC AND PRESSURE PLATE INSTALLATION](#)), and pressure plate (see [CLUTCH DISC AND PRESSURE PLATE INSTALLATION](#)).
30. A/T model: Install the drive plate (see [DRIVE PLATE REMOVAL AND INSTALLATION](#)).
31. Install the transmission:
 - Manual transmission (see [TRANSMISSION INSTALLATION](#))
 - Automatic transmission (see [TRANSMISSION INSTALLATION](#))
32. Install the engine/transmission (see [ENGINE INSTALLATION](#)).

NOTE: Whenever any crankshaft or connecting rod bearing is replaced, it is necessary after reassembly to run the engine at idling speed until it reaches normal operating temperature, then continue to run it for about 15 minutes.

OIL PAN INSTALLATION

1. Remove all of the old liquid gasket from the oil pan mating surfaces, bolts, and bolt holes.
2. Clean and dry the oil pan mating surfaces.
3. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the engine block mating surface of the oil pan and to the inner threads of the bolt holes. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

- If you apply liquid gasket P/N 08718-0012, the component must be

installed within 4 minutes.

- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply new liquid gasket.

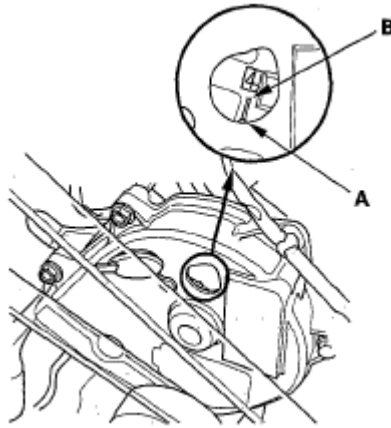


Fig. 67: Identifying Liquid Gasket Applying Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Install the oil pan.
5. Torque the bolts/nuts in three steps. In the final step, torque all bolts, in sequence, to 12 N.m (1.2 kgf.m, 8.8 lbf.ft).

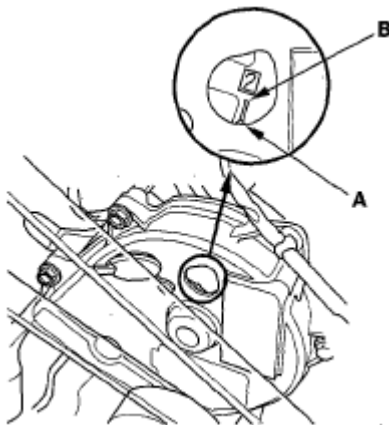


Fig. 68: Identifying Oil Pan Bolt/Nut Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. M/T model: Install the clutch cover.

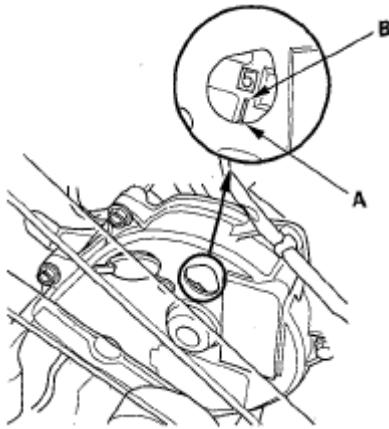


Fig. 69: Identifying Clutch Cover Bolts With Torque Specifications
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

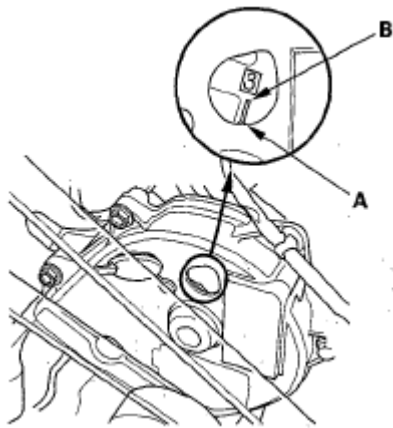
7. If the engine is still in the vehicle, install the subframe.
 1. Support the subframe with the subframe adapter and a jack, and lift it up to the body.
 2. Loosely install the new front subframe mounting bolts (see step 12 in **ENGINE INSTALLATION**).
 3. Align the reference marks with the center of the subframe mounting bolts, then torque the bolts to the specified torque (see step 14 in **ENGINE INSTALLATION**).
 4. A/T model: Install the automatic transmission fluid (ATF) filter mounting bolt (see step 36 in **ENGINE INSTALLATION**).
 5. Tighten the rear mount mounting bolts (see step 16 in **ENGINE INSTALLATION**).
 6. Tighten the front mount mounting bolt (see step 15 in **ENGINE INSTALLATION**).
 7. Connect the suspension knuckle ball joints (see **LOWER ARM REPLACEMENT**).
 8. Connect the stabilizer links (see **STABILIZER LINK REMOVAL/INSTALLATION**).
 9. Remove the engine support hanger from the vehicle.
8. After assembly, wait at least 30 minutes before filling the engine with oil.

TRANSMISSION END CRANKSHAFT OIL SEAL INSTALLATION - IN CAR

SPECIAL TOOLS REQUIRED

- Handle Driver 07749-0010000
 - Oil seal driver attachment 96 07ZAD-PNAA100
1. Remove the transmission:
 - Manual transmission (see **TRANSMISSION REMOVAL**).
 - Automatic transmission (see **TRANSMISSION INSTALLATION**).
 2. M/T model: Remove the flywheel (see **FLYWHEEL REPLACEMENT**), the clutch disc and the pressure plate (see **CLUTCH DISC AND PRESSURE PLATE INSTALLATION**).

3. A/T model: Remove the drive plate (see **DRIVE PLATE REMOVAL AND INSTALLATION**).
4. Clean and dry the crankshaft oil seal housing.
5. Apply a light coat of new engine oil to the lip of the crankshaft oil seal.
6. Use the handle driver and oil seal driver attachment to drive a new oil seal squarely into the engine block to the specified installed height.

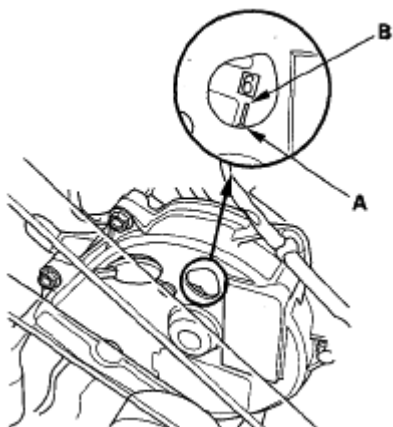
**Fig. 70: Driving Oil Seal**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Measure the distance between the engine block (A) and crankshaft oil seal (B).

Crankshaft Oil Seal Installed Height:

0.2-1.2 mm (0.001-0.047 in.)

**Fig. 71: Measuring Distance Between Engine Block & Crankshaft Oil Seal**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. M/T model: Install the flywheel (see **FLYWHEEL REPLACEMENT**), the clutch disc and the pressure plate (see **CLUTCH DISC AND PRESSURE PLATE INSTALLATION**).

9. A/T model: Install the drive plate (see **DRIVE PLATE REMOVAL AND INSTALLATION**).
10. Install the transmission:
 - Manual transmission (see **TRANSMISSION INSTALLATION**).
 - Automatic transmission (see **TRANSMISSION INSTALLATION**).