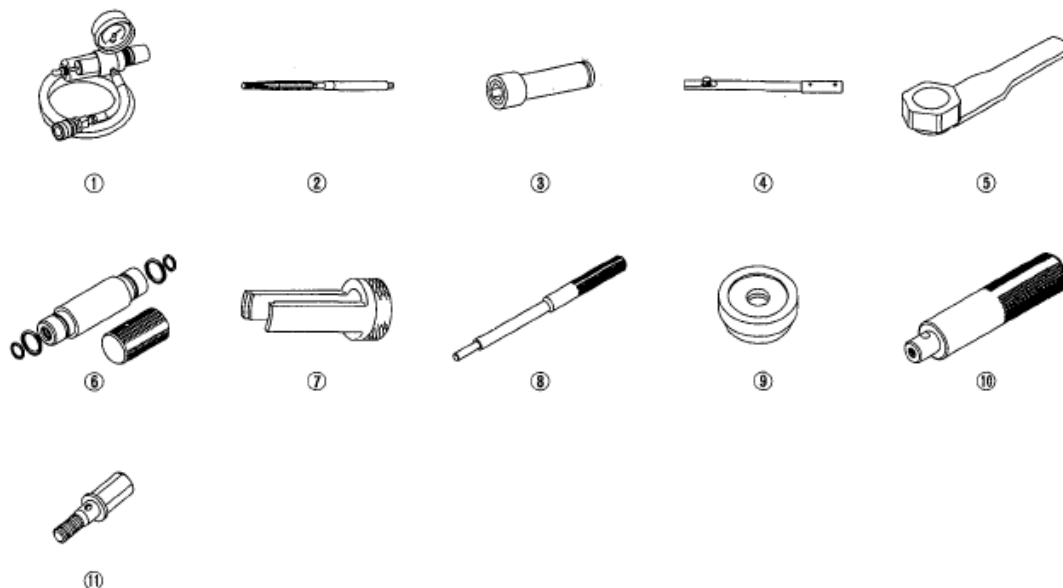


2006-11 ENGINE

Cylinder Head - Civic Hybrid

SPECIAL TOOLS

Ref. No.	Tool Number	Description	Qty
①	07AAJ-PNAA101	Air Pressure Regulator	1
②	07HAH-PJ7A100	Valve Guide Reamer, 5.5 mm	1
③	07JAA-001020A	Socket, 19 mm	1
④	07JAB-001020A	Holder Handle	1
⑤	07NAB-001040A	Holder Attachment, 50 mm	1
⑥	07PAD-0010000	Stem Seal Driver	1
⑦	07757-PJ1010A	Valve Spring Compressor Attachment	1
⑧	07742-0010100	Valve Guide Driver, 5.5 mm	1
⑨	07746-0010400	Attachment, 52 x 55 mm	1
⑩	07749-0010000	Handle Driver	1
⑪	07VAJ-P8A010A	VTEC Air Adapter	1

**Fig. 1: Identifying Special Tools**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

COMPONENT LOCATION INDEX

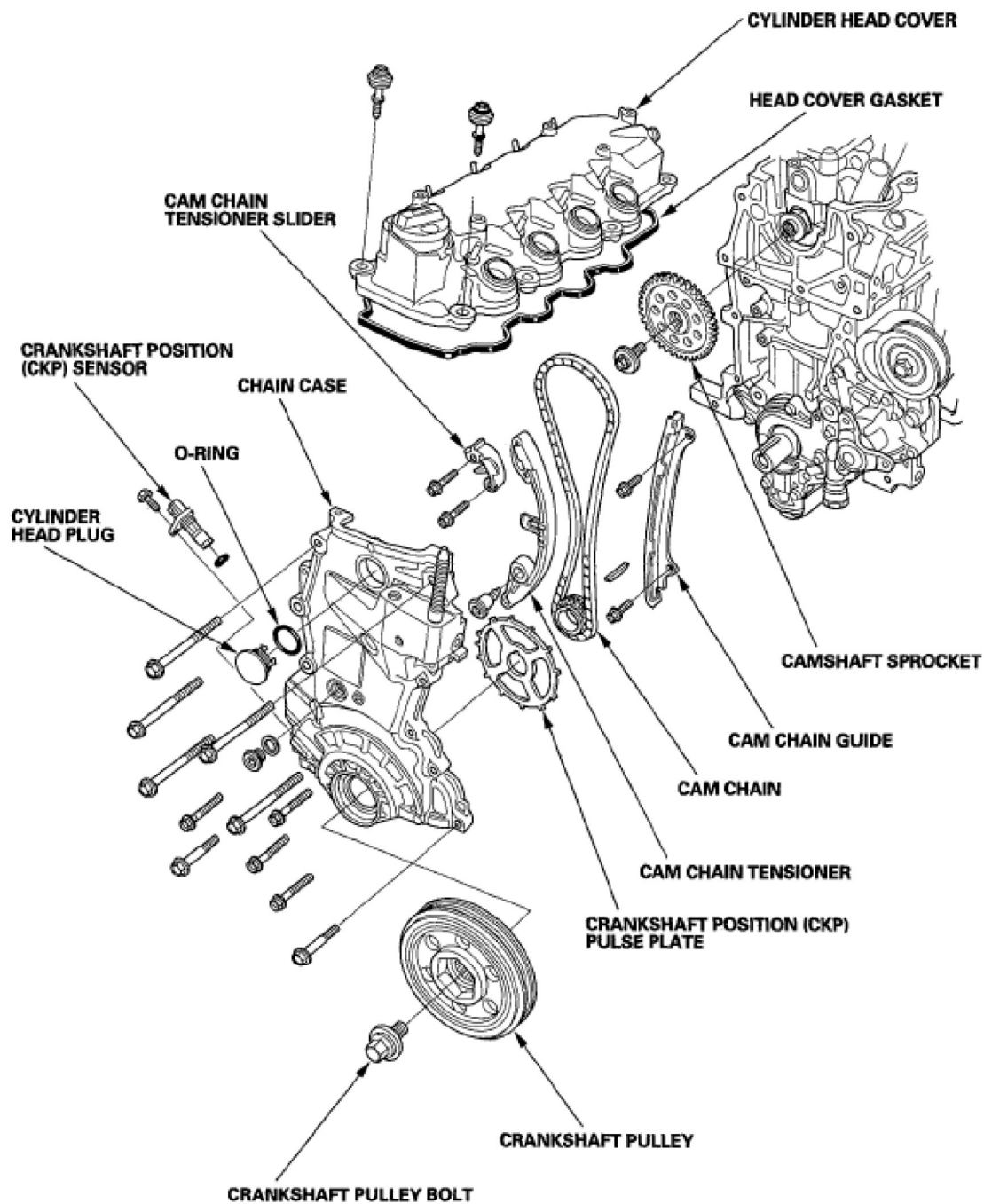


Fig. 2: Identifying Cylinder Head Replacement Components (1 Of 3)
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

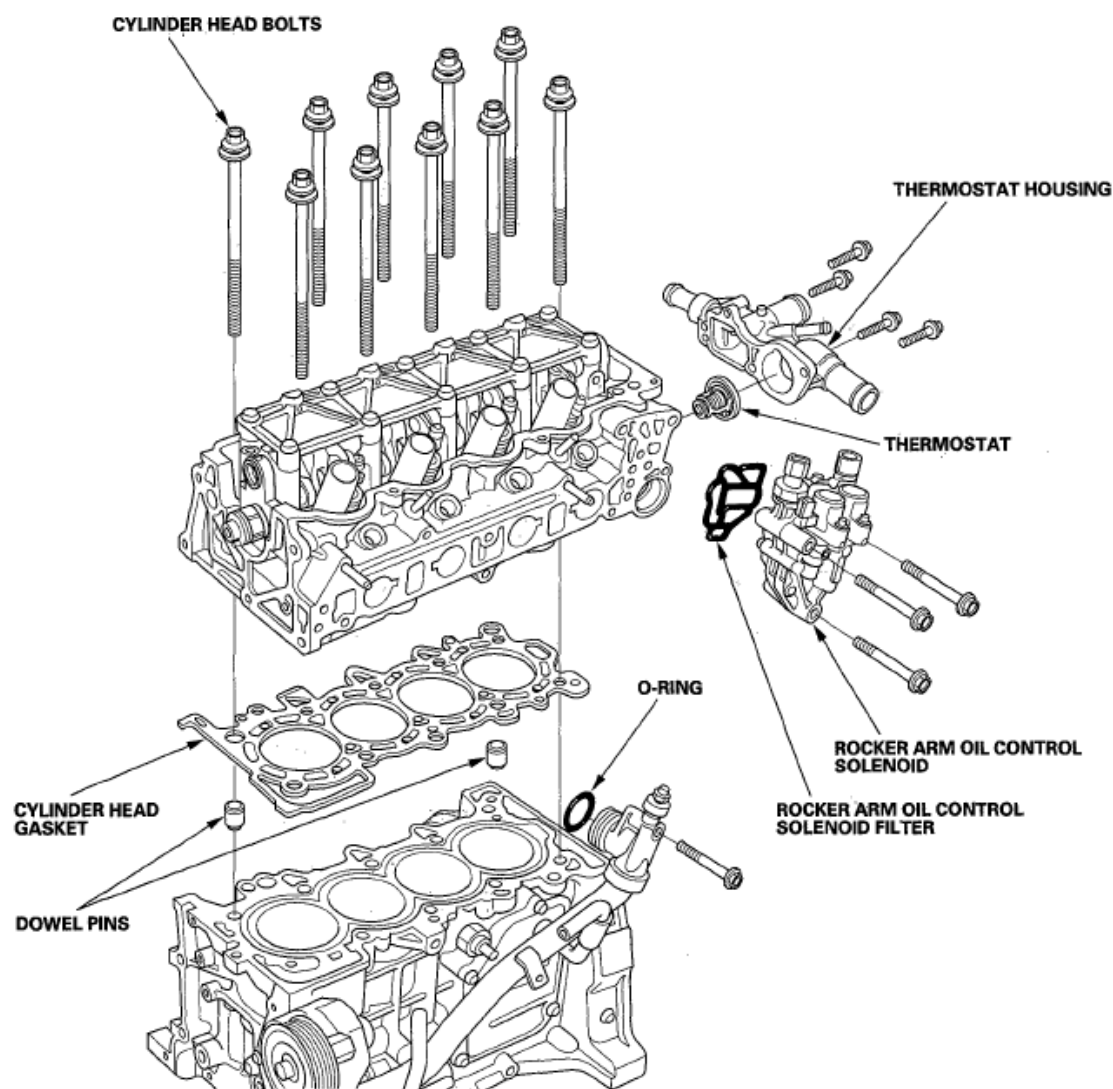


Fig. 3: Identifying Cylinder Head Replacement Components (2 Of 3)
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

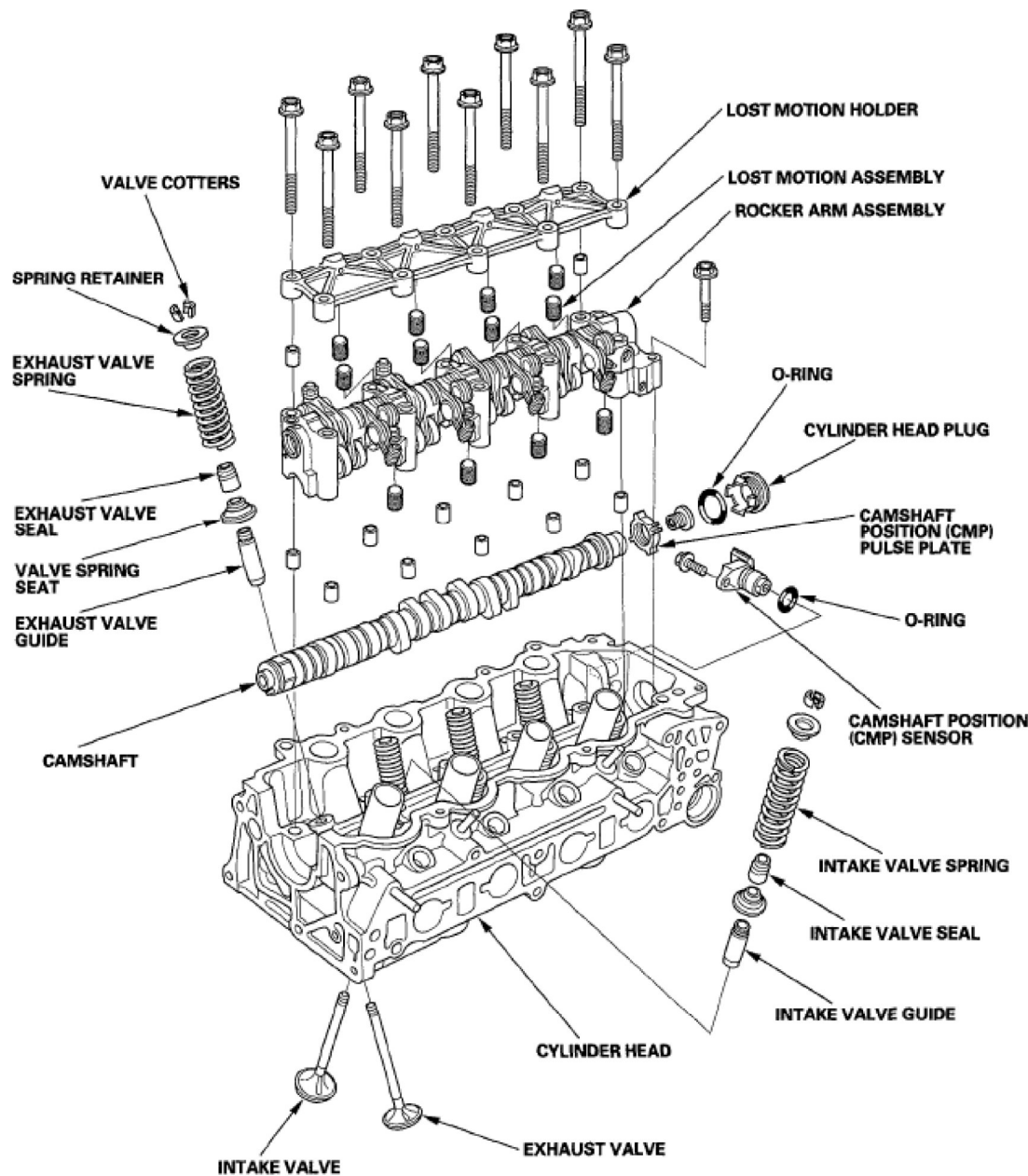


Fig. 4: Identifying Cylinder Head Replacement Components (3 Of 3)

Courtesy of AMERICAN HONDA MOTOR CO., INC.

ENGINE COMPRESSION INSPECTION

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

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 on **GENERAL TROUBLESHOOTING INFORMATION**).
4. Turn the ignition switch to ON (II).
5. Make sure the HDS communicates with the vehicle and the PCM. If it doesn't communicate, troubleshoot the DLC circuit (see **DLC CIRCUIT TROUBLESHOOTING**).
6. Select PGM-FI, INSPECTION, then All INJECTORS OFF on the HDS.
7. Turn the ignition switch to LOCK (0).
8. Remove the four intake side ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION**).
9. Remove the four intake side spark plugs.
10. Attach the compression gauge to a spark plug hole.

NOTE: Use a compression gauge with a connecting length (between the edge and the flange) of less than 23 mm (0.9 in.).

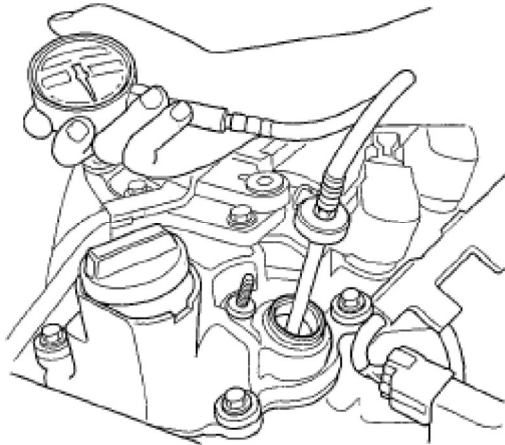


Fig. 5: Inspecting Engine Compression

Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Turn the IMA battery module switch OFF (see **TURNING OFF AND ON POWER TO THE HIGH VOLTAGE CIRCUIT**).
12. 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 981 kPa (10.0 kgf/cm² , 142 psi)

13. Measure the compression on the remaining cylinders.

Maximum Variation:

Within 196 kPa (2.0 kgf/cm² , 28 psi)

14. If the compression is not within specifications, check the following items, then remeasure the compression.
 - Looseness exhaust side spark plug
 - Damaged or worn valves and seats
 - Damaged cylinder head gasket
 - Damaged or worn piston rings
 - Damaged or worn piston and cylinder bore
15. Remove the compression gauge from the spark plug hole.
16. Install the four intake side spark plugs.
17. Install the four intake side ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION**).
18. Select PCM reset (see **PCM RESET**) to cancel the ALL INJECTORS OFF on the HDS.
19. Do **PCM IDLE LEARN PROCEDURE** .
20. Do **START CLUTCH PRESSURE CONTROL CALIBRATION PROCEDURES** .
21. Turn the IMA battery module switch ON (see **TURNING OFF AND ON POWER TO THE HIGH VOLTAGE CIRCUIT**).
22. Clear any IMA DTCs that may have been set while doing this inspection procedure.
23. If the IMA battery level gauge (BAT) displays no segment, start the engine, and hold it between 3, 500 rpm and 4, 000 rpm without load (in N or P) until the BAT displays at least three segments.

VTEC ROCKER ARM TEST

SPECIAL TOOLS REQUIRED

- Air pressure regulator 07AAJ-PNAA101
- VTEC air adapter 07VAJ-P8A010A

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. Set the No. 1 piston at top dead center (TDC) (see 2).
4. Push on the intake 1st rocker arm (A) for the No. 1 cylinder. Make sure that the intake 1st rocker arm and the intake 2nd rocker arm (B) are mechanically connected by the rocker arm pistons and that the intake 2nd rocker arm does not move when pushed manually. Then move the intake 3rd rocker arm (C) for the No. 1 cylinder. The intake 3rd rocker arm should move independently of the intake 1st rocker arm.
 - If the intake 2nd rocker arm does not move independently and the intake 3rd rocker arm moves independently, go to step 5.
 - If the intake 2nd rocker arm moves independently, remove and disassemble the rocker arm assembly, and check that the rocker arm pistons between the intake 1st and 2nd rocker arms move smoothly. If any rocker arm or rocker arm piston needs replacing, replace the rocker arms for the cylinder as an assembly.
 - If the intake 3rd rocker arm does not moves independently, remove and disassemble the rocker arm assembly, and check that the rocker arm pistons between the intake 2nd and 3rd rocker arms move smoothly. If any rocker arm or rocker arm piston needs replacing, replace the rocker arms for the

cylinder as an assembly.

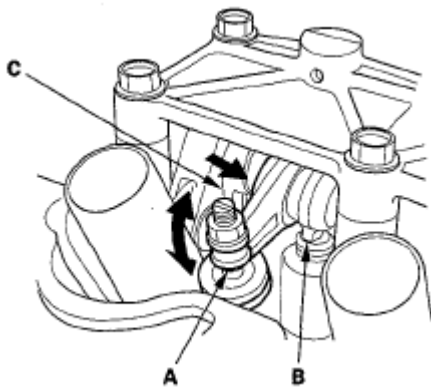


Fig. 6: Locating Intake 3rd Rocker Arm

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Push on the exhaust 1st rocker arm (A) for the No. 1 cylinder. Make sure that the exhaust 1st rocker arm and the exhaust 2nd rocker arm (B) are mechanically connected by the rocker arm pistons and that the exhaust 2nd rocker arm does not move when pushed manually.
 - If the exhaust 2nd rocker arm does not move independently, go to step 6.
 - If the exhaust 2nd rocker arm moves independently, remove and disassemble the rocker arm assembly, and check that the rocker arm pistons between the exhaust 1st and 2nd rocker arms move smoothly. If any rocker arm or rocker arm piston needs replacing, replace the rocker arms for the cylinder as an assembly.

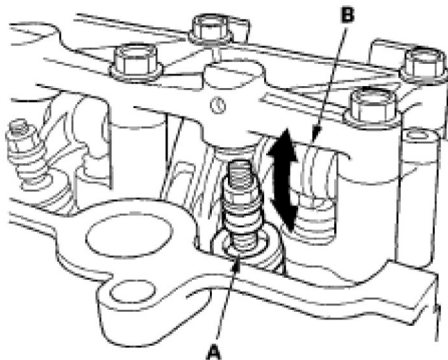


Fig. 7: Locating Exhaust 1st Rocker Arm & 2nd Rocker Arm

Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Check that the air pressure on the shop air compressor gauge indicates over 400 kPa (4.0 kgf/cm² , 47 psi).
7. Inspect the valve clearance (see **VALVE CLEARANCE ADJUSTMENT**).
8. Install the VTEC air adapter (A) to the cam chain side inspection hole, then connect the air pressure regulator (B).

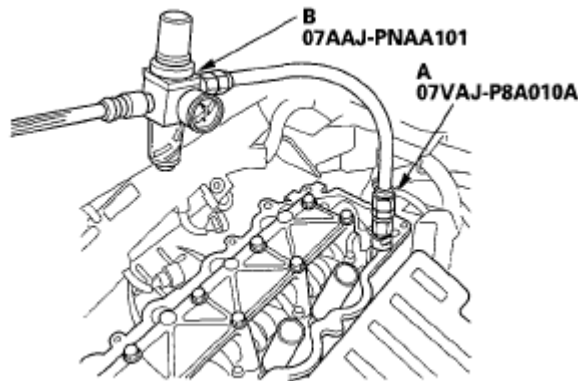


Fig. 8: Locating VTEC Air Adapter & Air Pressure Regulator
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Loosen the valve on the regulator, and apply the specified air pressure.

Specified Air Pressure:

200 kPa (2.0 kgf/cm² , 28 psi)

10. Push on the intake 1st rocker arm (A) for the No. 1 cylinder. Make sure that the intake 1st rocker arm and the intake 3rd rocker arm (B) are mechanically connected by the rocker arm pistons and that the intake 3rd rocker arm does not move when pushed manually.
 - If the intake 3rd rocker arm does not move independently, go to step 11.
 - If the intake 3rd rocker arm moves independently, remove and disassemble the rocker arm assembly, and check that the rocker arm pistons between the intake 1st and 3rd rocker arms move smoothly. If any rocker arm or rocker arm piston needs replacing, replace the rocker arms for the cylinder as an assembly.

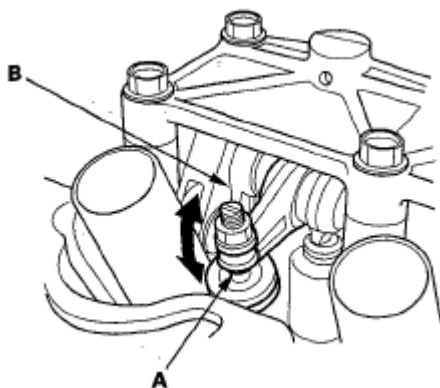


Fig. 9: Locating Intake 3rd Rocker Arm
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Tighten the valve on the air pressure regulator, then remove the VTEC air adapter.
12. Install the VTEC air adapter (A) to the transmission side inspection hole, then connect the air pressure

regulator (B).

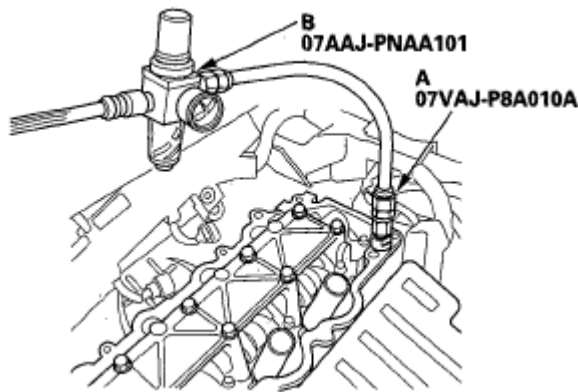


Fig. 10: Locating VTEC Air Adapter And Air Pressure Regulator
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Move the intake 2nd rocker arm (A) and intake 3rd rocker arm (B) for the No. 1 cylinder. The intake 2nd and intake 3rd rocker arm should move independently of the intake 1st rocker arm (C).
 - If the intake 2nd and 3rd rocker arms move independently, go to step 14.
 - If the intake 2nd or intake 3rd rocker arm does not move independently, remove and disassemble the rocker arm assembly, and check that the rocker arm pistons between the intake 1st and 2nd rocker arms move or intake 1st and 3rd smoothly. If any rocker arm or rocker arm piston needs replacing, replace the rocker arms for the cylinder as an assembly.

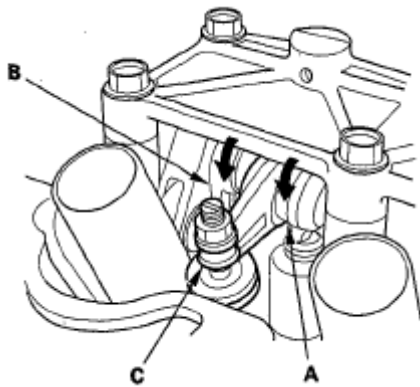


Fig. 11: Locating Intake 2nd Rocker Arm And Intake 3rd Rocker Arm
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Move the exhaust 2nd rocker arm (A) for the No. 1 cylinder. The exhaust 2nd rocker arm should move independently of the exhaust 1st rocker arm (B).
 - If the exhaust 2nd rocker arm moves independently, go to step 15.
 - If the exhaust 2nd rocker arm does not move independently, remove and disassemble the rocker arm assembly, and check that the rocker arm pistons between the exhaust 1st and 2nd rocker arms move smoothly. If any rocker arm or rocker arm piston needs replacing, replace the rocker arms for the cylinder as an assembly.

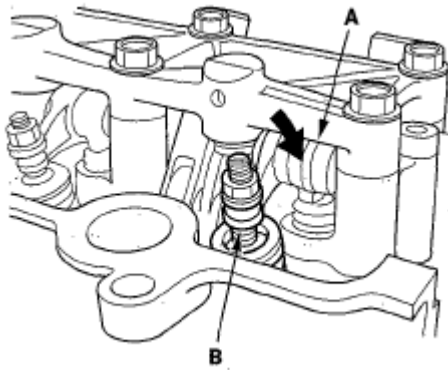


Fig. 12: Locating Exhaust 2nd Rocker Arm

Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Tighten the valve on the air pressure regulator, then remove the VTEC air adapter.
16. Repeat step 4 to 15 on the remaining cylinder's rocker arms with each piston at TDC. When all the rocker arms pass the test, go to step 17.
17. Install the cylinder head cover (see CYLINDER HEAD COVER INSTALLATION).

VALVE CLEARANCE ADJUSTMENT

NOTE: Adjust the valves only when the cylinder head 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 "UP" mark (A) on the camshaft sprocket should be at the top, and the TDC grooves (B) on the camshaft sprocket should line up with the top edge of the chain case.

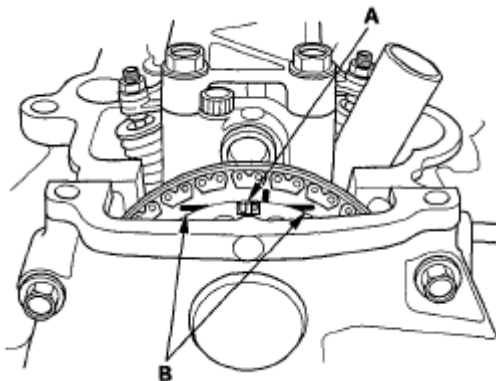


Fig. 13: Locating UP Mark On Camshaft Sprocket Should Be At Top

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Select the correct thickness feeler gauge for the valves you're going to check.

Valve Clearance

Intake: 0.15-0.19 mm (0.006-0.007 in.)

Exhaust: 0.24-0.28 mm (0.009-0.011 in.)

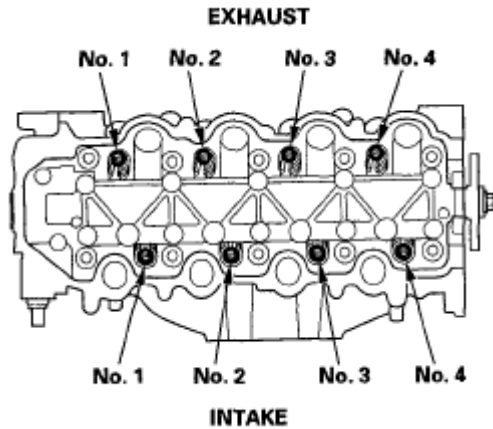


Fig. 14: Identifying Valve

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 on No. 1 cylinder and slide it back and forth; you should feel a slight amount of drag.

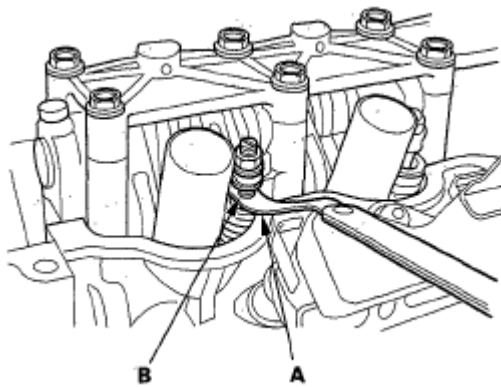


Fig. 15: Inserting Feeler Gauge Between Adjusting Screw & End Of Valve Stem On No. 1 Cylinder

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. If you feel too much or too little drag, loosen the locknut (A), and turn the adjusting screw (B) until the drag on the feeler gauge is correct.

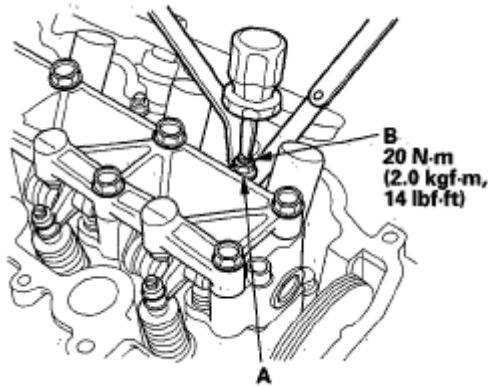


Fig. 16: Identifying Locknut & Adjusting Screw With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Tighten the locknut and recheck the clearance. Repeat the adjustment if necessary.

Specified Torque

20 N·m (2.0 kgf·m, 14 lbf·ft)

Apply new engine oil to the nut threads.

7. Rotate the crankshaft clockwise. Align the No. 3 piston TDC groove (A) on the camshaft sprocket with the top edge of the chain case.

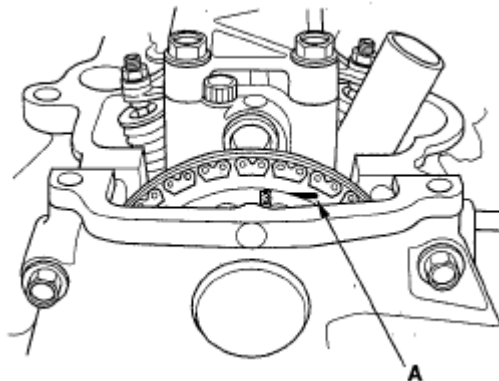


Fig. 17: Locating No. 3 Piston TDC Groove
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Check the valve clearance on the No. 3 cylinder; adjust it if necessary
9. Rotate the crankshaft clockwise. Align the No. 4 piston TDC groove (A) on the camshaft sprocket with the top edge of the chain.

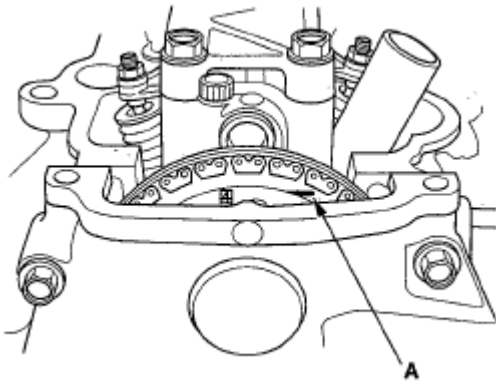


Fig. 18: Locating No. 4 Piston TDC Groove

Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Check the valve clearance on the No. 4 cylinder; adjust it if necessary.
11. Rotate the crankshaft clockwise. Align the No. 2 piston TDC groove (A) on the camshaft sprocket with the top edge of the head.

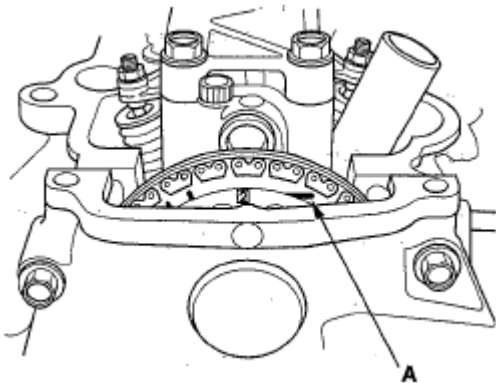


Fig. 19: Locating No. 2 Piston TDC Groove

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

CRANKSHAFT PULLEY REMOVAL AND INSTALLATION

SPECIAL TOOLS REQUIRED

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

REMOVAL

1. Remove the front wheels.
2. Remove the engine undercover and the splash shield (see step 23 on **ENGINE REMOVAL**).
3. Remove the drive belt (see **DRIVE BELT REPLACEMENT**).
4. Hold the crankshaft pulley with the holder handle (A) and the holder attachment (B).

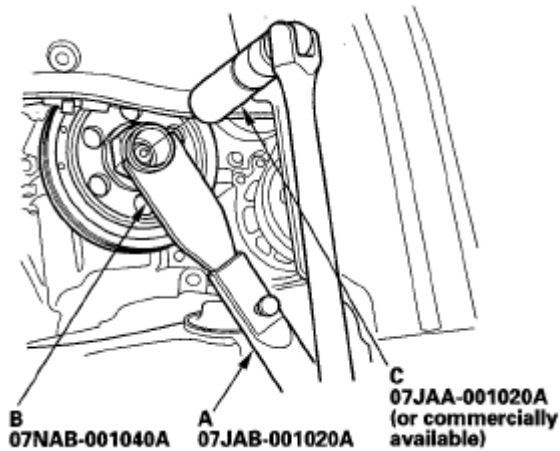


Fig. 20: Holding Crankshaft Pulley With Holder Handle & Holder Attachment
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Remove the crankshaft pulley bolt with a 19 mm socket (C) and a breaker bar.
6. Remove the under-floor three way catalytic converter (TWC) (see step 41 on **ENGINE REMOVAL**).
7. Support the engine with a jack and a wood block under the oil pan.
8. Remove the lower torque rod mounting bolts (see step 50 on **ENGINE REMOVAL**).
9. Remove the crankshaft pulley while moving the engine forward.

INSTALLATION

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

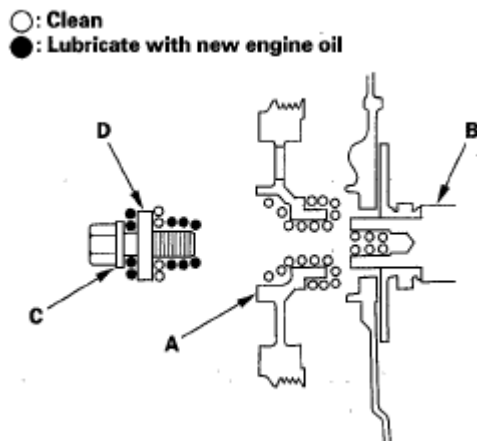


Fig. 21: Identifying Crankshaft Pulley, Crankshaft, Bolt & Washer Lubricating Points
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Install the crankshaft pulley while moving the engine forward and loosely install the crankshaft pulley.
3. Install the lower torque rod mounting bolts (see step 15 on **ENGINE INSTALLATION**).
4. Remove the jack and the wood block.
5. Install the under-floor TWC (see step 26 on **ENGINE INSTALLATION**).
6. Tighten the crankshaft pulley bolt. Do not use an impact wrench.
 1. Hold the pulley with the holder handle (A) and pulley holder attachment (B), then tighten the bolt to 37 N.m (3.8 kgf.m, 27 lbf.ft) with a torque wrench and a heavy duty 19 mm socket (C). If the pulley bolt or crankshaft are new, tighten the bolt to 177 N.m (18.0 kgf.m, 130 lbf.ft), then remove the bolt and tighten it to 37 N.m (3.8 kgf.m, 27 lbf.ft).
 2. Mark the bolt head (D) and the crankshaft pulley (E) as shown below, then tighten the bolt an additional 90° (The mark on the bolt head lines up with the mark on the crankshaft pulley).

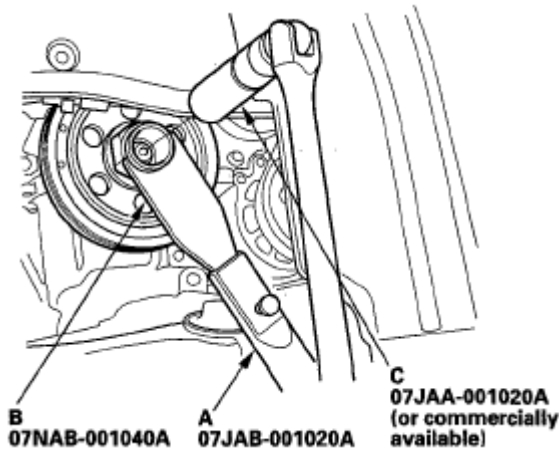


Fig. 22: Holding Pulley With Holder Handle & Pulley Holder Attachment
Courtesy of AMERICAN HONDA MOTOR CO., INC.

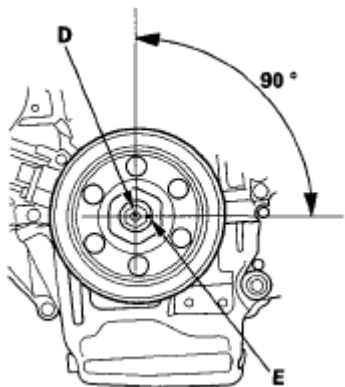


Fig. 23: Tightening Bolt Additional 90°
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Install the drive belt (see **DRIVE BELT INSPECTION**).
8. Install the engine undercover and the splash shield (see step 42 on **ENGINE INSTALLATION**).
9. Install the front wheels.

CAM CHAIN REMOVAL

NOTE: Keep the cam chain away from magnetic fields.

1. Remove the front wheels.
2. Remove the engine undercover and the splash shield (see step 23 on **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).

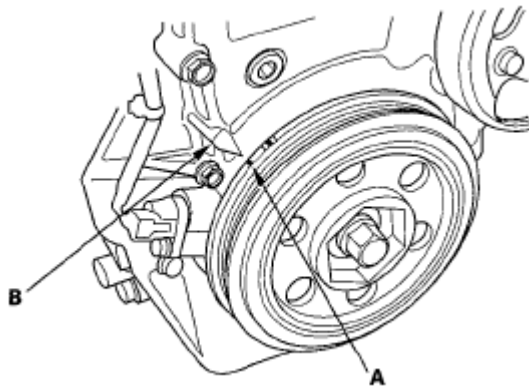


Fig. 24: Locating Crankshaft Pulley Top Dead Center Mark & Pointer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Remove the water pump pulley (see step 4 on **WATER PUMP REPLACEMENT**).
6. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
7. Remove the crankshaft pulley (see **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
8. Remove the oil pan (see **OIL PAN REMOVAL**).
9. Support the engine with a jack and a wood block under the engine block.
10. Remove the ground cable (A), then remove the side engine mount bracket (B).

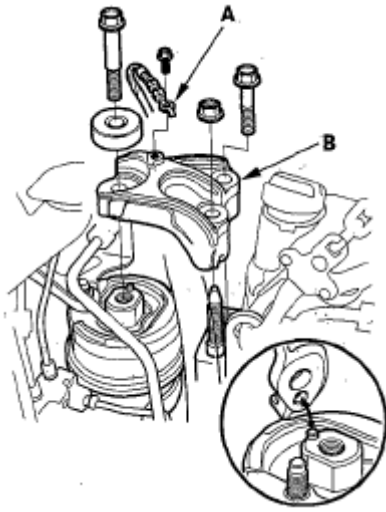


Fig. 25: Locating Ground Cable & Side Engine Mount Bracket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Disconnect the crankshaft position (CKP) sensor connector (A), then remove the dipstick tube mounting bolt (B) and the harness clamps (C).

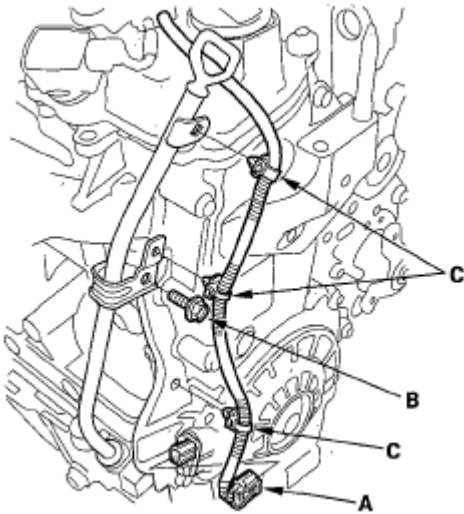


Fig. 26: Locating Crankshaft Position Sensor Connector, Dipstick Tube Mounting Bolt & Harness Clamps
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Remove the chain case (A), then remove the crankshaft position (CKP) pulse plate (B).

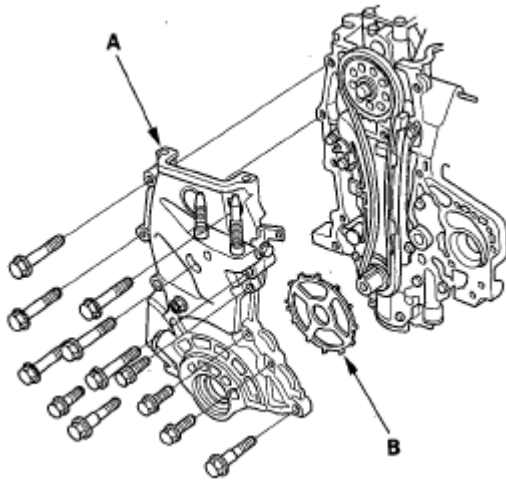


Fig. 27: Locating Chain Case & Crankshaft Position Pulse Plate
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Measure the cam chain separation. If the distance is less than the service limit, replace the cam chain and the cam chain tensioner.

Standard Distance: 19 mm (0.75 in.)
Service Limit: 15 mm (0.59 in.)

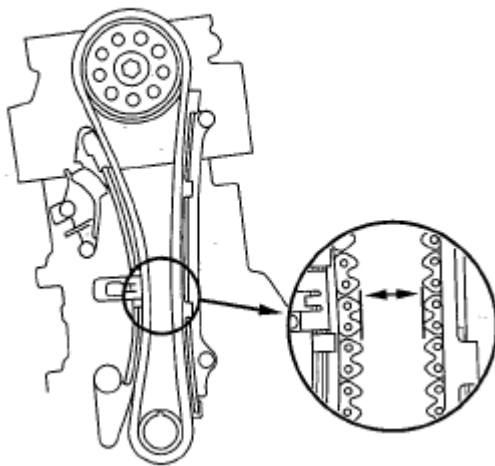


Fig. 28: Measuring Cam Chain Separation
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Apply new engine oil to the sliding surface of the cam chain tensioner slider (A).

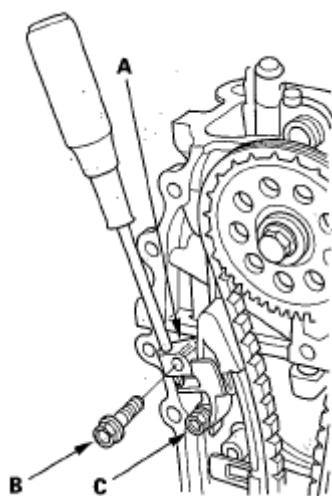


Fig. 29: Locating Cam Chain Tensioner Slider
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Hold the cam chain tensioner slider with a screwdriver, then remove the bolt (B), and loosen the bolt (C).
16. Remove the cam chain tensioner slider.

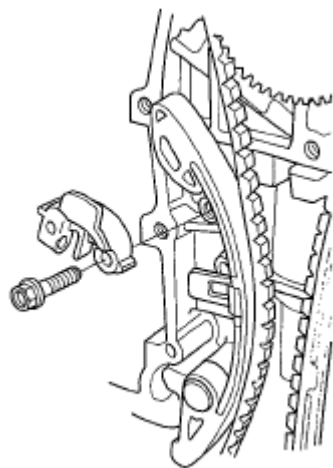


Fig. 30: Identifying Cam Chain Tensioner Slider & Bolt
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

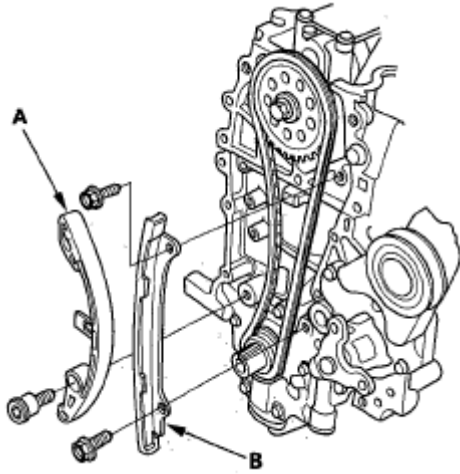


Fig. 31: Locating Cam Chain Tensioner & Cam Chain Guide
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Remove the cam chain.

CAM CHAIN INSTALLATION

NOTE: Keep the cam chain away from magnetic fields.

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

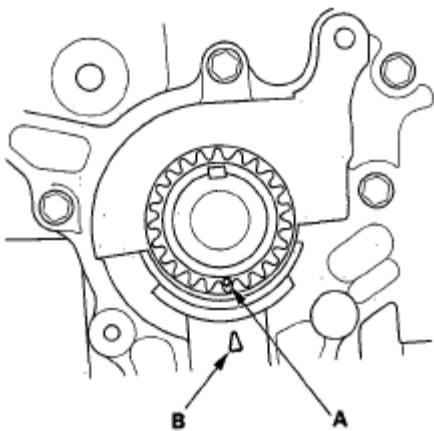


Fig. 32: Locating TDC Mark On Crankshaft Sprocket & Pointer On Oil Pump
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Set the No. 1 piston at TDC. The "UP" mark (A) on the camshaft sprocket should be at the top, and the TDC grooves (B) on the camshaft sprocket should line up with the top edge of the cylinder head.

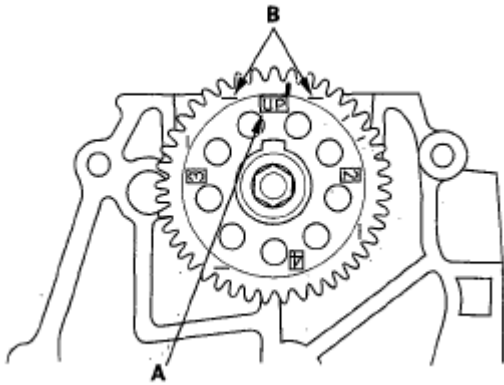


Fig. 33: Locating UP Mark On Camshaft Sprocket Should Be At Top
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the cam chain on the crankshaft sprocket with the colored piece (A) aligned with the TDC mark (B) on the crankshaft sprocket.

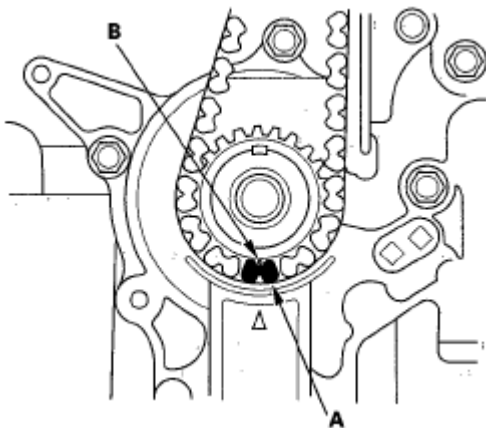


Fig. 34: Locating Colored Piece & TDC Mark On Crankshaft Sprocket
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Install the cam chain on the camshaft sprocket with the pointer (A) aligned with the center of the two colored pieces (8).

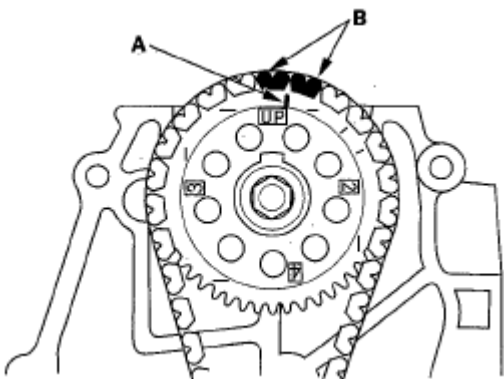
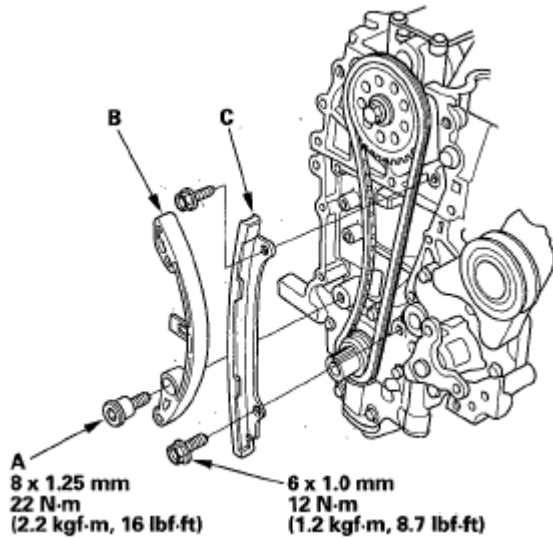


Fig. 35: Locating Pointer & Colored Pieces

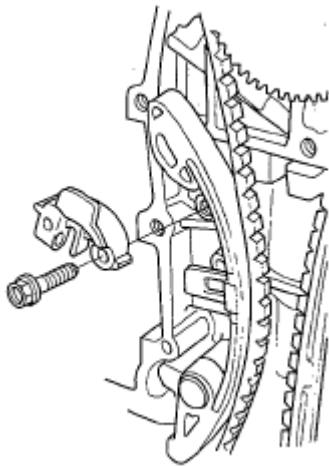
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Apply new engine oil to the threads of the cam chain tensioner mounting bolt (A).

**Fig. 36: Locating Cam Chain Tensioner Mounting Bolt With Torque Specifications**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Install the cam chain tensioner (B) and the cam chain guide (C).
7. Install the cam chain tensioner slider, and tighten the lower side bolt loosely.

**Fig. 37: Identifying Cam Chain Tensioner Slider & Bolt**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Apply new engine oil to the sliding surface of the cam chain tensioner slider (A).

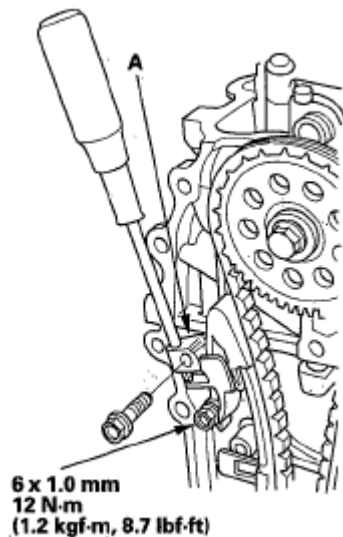


Fig. 38: Locating Cam Chain Tensioner Slider With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Turn the cam chain tensioner clockwise to compress the cam chain tensioner slider. Install the remaining bolt, then tighten the two bolts.
10. 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**).
11. Remove any old liquid gasket from the chain case mating surfaces, bolts, and bolt holes.
12. Clean and dry the chain case mating surfaces.
13. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the cylinder head and engine block mating surface of the chain case. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

- Apply a 1.5 mm wide bead of liquid gasket along the broken lines (A).
- Apply a 3.0 mm wide bead of liquid gasket to the engine block upper surface contact areas (B) on the chain case.
- 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.

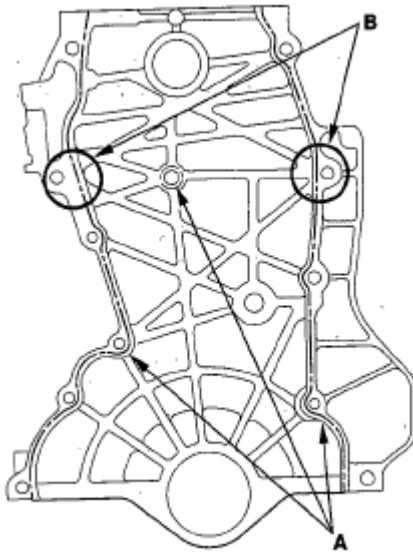


Fig. 39: Locating Engine Block Upper Surface Contact Areas On Chain Case
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

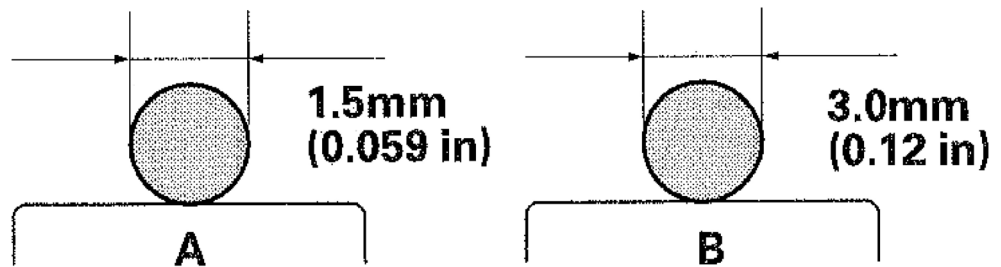


Fig. 40: Identifying Specifications For Liquid Gasket
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Install the crankshaft position (CKP) pulse plate (A) and the chain case (B).

NOTE:

- 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.

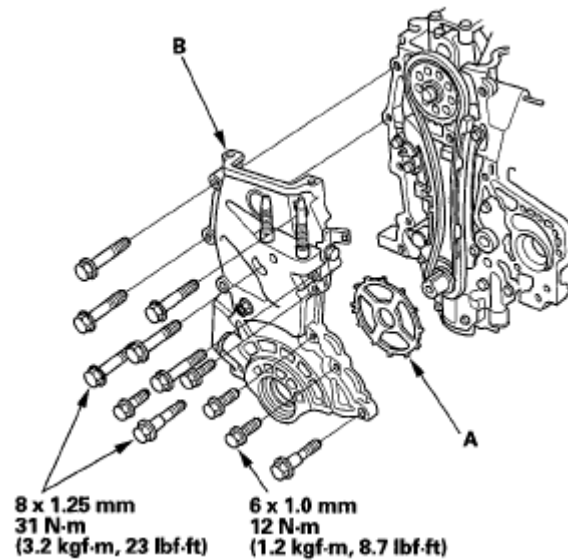


Fig. 41: Locating Crankshaft Position Pulse Plate & Chain Case With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Install the harness clamps (A) and the dipstick tube mounting bolt (B), then connect the CKP sensor connector (C).

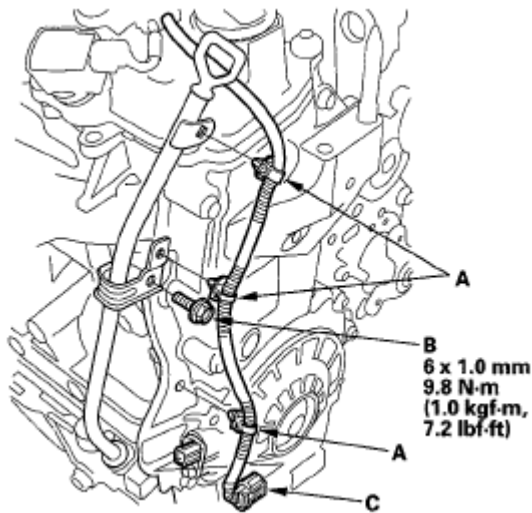


Fig. 42: Locating Harness Clamps, Dipstick Tube Mounting Bolt & CKP Sensor Connector With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

16. Install the side engine mount bracket (A), then tighten the mounting bolts and nut in the numbered sequence shown below.

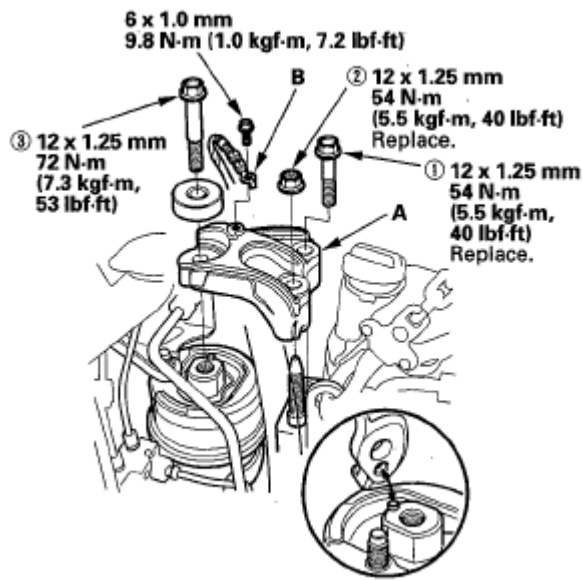


Fig. 43: Identifying Side Engine Mount Bracket Mounting Bolts & Nut Tightening Sequence With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Install the ground cable (B).
18. Remove the jack and the wood block.
19. Install the oil pan (see **OIL PAN INSTALLATION**).
20. Install the crankshaft pulley (see **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
21. Install the cylinder head cover (see **CYLINDER HEAD COVER INSTALLATION**).
22. Install the water pump pulley (see step 4 on **WATER PUMP REPLACEMENT**).
23. Install the drive belt (see **DRIVE BELT REPLACEMENT**).
24. Install the engine undercover and the splash shield (see step 42 on **ENGINE MOUNT REPLACEMENT**).
25. Install the front wheels.
26. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **CRANK (CKP) PATTERN CLEAR/CRANK (CKP) PATTERN LEARN**).

CHAIN CASE OIL SEAL INSTALLATION

SPECIAL TOOLS REQUIRED

- Handle driver 07749-0010000
- Attachment, 52 x 55 mm 07746-0010400

1. Use the handle driver and attachment to drive a new oil seal squarely into the chain case to the specified installed height.

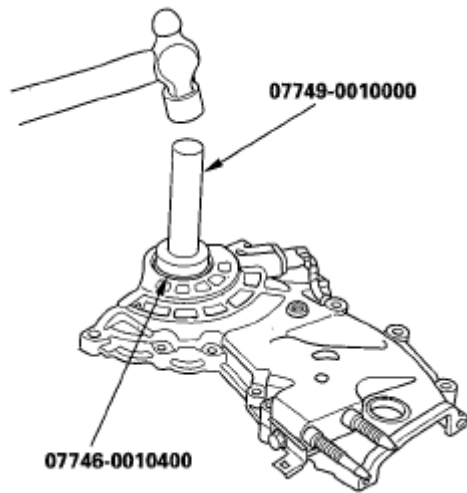


Fig. 44: Identifying Chain Case Oil Seal

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Oil Seal Installed Height:
34.5—35.2 mm (1.36—1.39 in.)

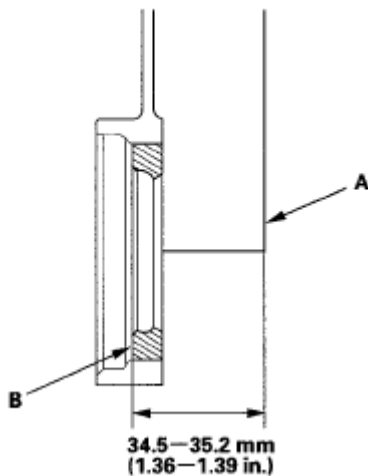


Fig. 45: Identifying Distance Between Chain Case Surface & Oil Seal

Courtesy of AMERICAN HONDA MOTOR CO., INC.

CKP PULSE PLATE REPLACEMENT

1. Remove the front wheels.
2. Remove the engine undercover and the splash shield (see step 23 on **ENGINE REMOVAL**).
3. Remove the drive belt (see **DRIVE BELT REPLACEMENT**).
4. Turn the crankshaft pulley so its top dead center (TDC) mark lines up with the pointer (see step 2).
5. Remove the water pump pulley (see step 4 on **WATER PUMP REPLACEMENT**).

6. Remove the cylinder head cover (see CYLINDER HEAD COVER REMOVAL).
7. Remove the crankshaft pulley (see CRANKSHAFT PULLEY REMOVAL AND INSTALLATION).
8. Remove the oil pan (see OIL PAN REMOVAL).
9. Support the engine with a jack and a wood block under the engine block.
10. Remove the ground cable, then remove the side engine mount bracket (see step 10).
11. Disconnect the crankshaft position (CKP) sensor connector, then remove the harness clamp and the dipstick tube mounting bolt (see step 11).
12. Remove the chain case (see step 12).
13. Remove the CKP pulse plate (A).

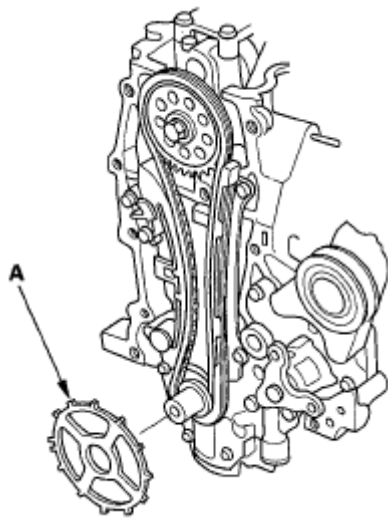


Fig. 46: Locating CKP Pulse Plate

Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Install the CKP pulse plate.
15. 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).
16. Remove all of the old liquid gasket from the chain case mating surfaces, bolt, and bolt holes.
17. Clean and dry the chain case mating surfaces.
18. 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 13).

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 chain case (see step 14).

20. Install the harness clamps and the dipstick tube mounting bolt, then connect the CKP sensor connector (see step 15).
21. Install the side engine mount bracket, then install the ground cable (see step 16).
22. Remove the jack and the wood block.
23. Install the oil pan (see **OIL PAN INSTALLATION**).
24. Install the crankshaft pulley (see **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
25. Install the cylinder head cover (see **CYLINDER HEAD COVER INSTALLATION**).
26. Install the water pump pulley (see step 4 on **WATER PUMP REPLACEMENT**).
27. Install the drive belt (see **DRIVE BELT REPLACEMENT**).
28. Install the engine undercover and the splash shield (see step 42 on **ENGINE MOUNT REPLACEMENT**).
29. Install the front wheels.
30. Do the crankshaft (CKP) pattern clear/CKP pattern learn procedure (see **CRANK (CKP) PATTERN CLEAR/CRANK (CKP) PATTERN LEARN**).

CYLINDER HEAD COVER REMOVAL

1. Remove the engine cover (see step 8 on **ENGINE REMOVAL**).
2. Remove the eight ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION**).
3. Remove the harness holder (A) and the breather hose (B).

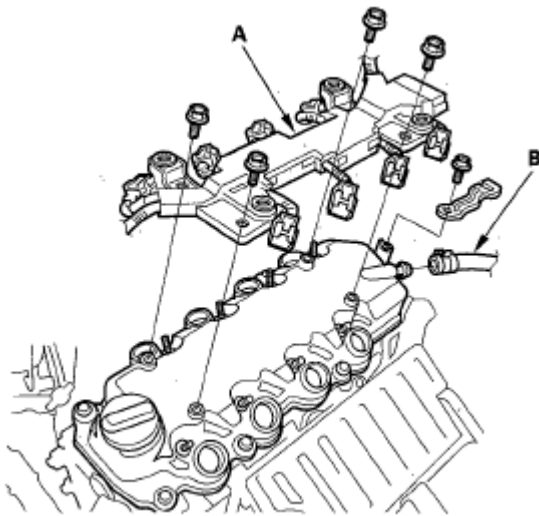


Fig. 47: Locating Harness Holder & Breather Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the cylinder head cover.

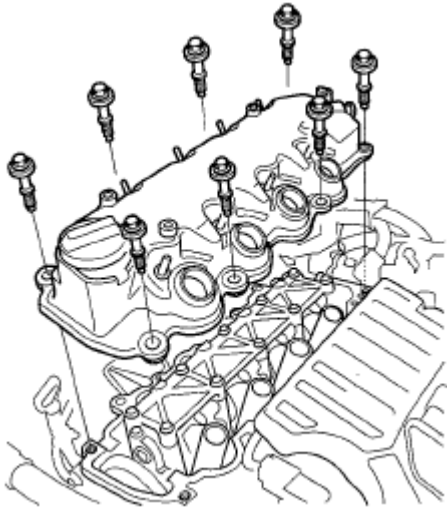


Fig. 48: Identifying Cylinder Head Cover & Bolts
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER HEAD COVER INSTALLATION

1. Check the spark plug seals (A) for damage. If the seal is damaged, replace the spark plug seals.

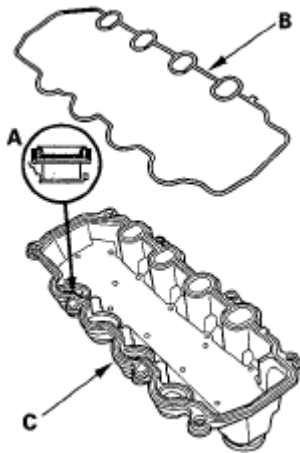


Fig. 49: Checking Spark Plug Seals
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Thoroughly clean the head cover gasket (B) and the groove.
3. Install the head cover gasket in the groove of the cylinder head cover (C).
4. Check that the mating surfaces are clean and dry.
5. Apply a 3.0 mm wide bead of the liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, on the chain case mating areas (A). 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.

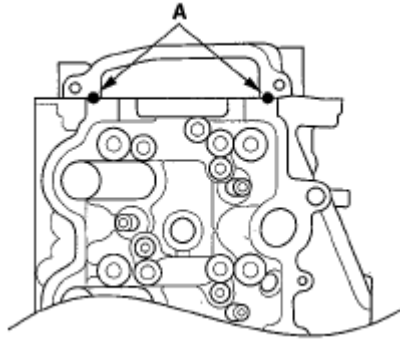


Fig. 50: Locating Chain Case Mating Areas
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Once the cylinder head cover (A) is on the cylinder head, slide the cover slightly back and forth to seat the head cover gasket.

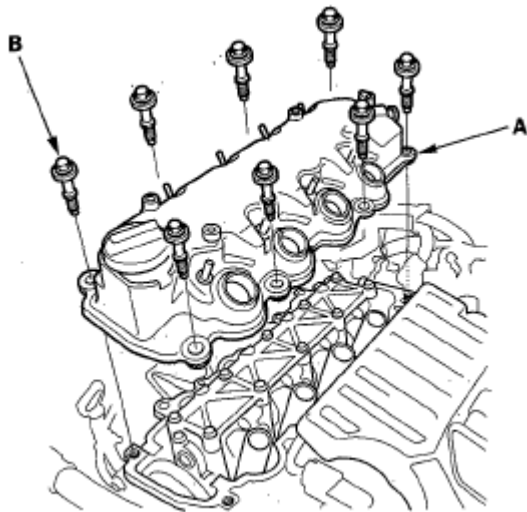


Fig. 51: Locating Cylinder Head Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Inspect the cover washer (B). Replace any washer that is damaged or deteriorated.
8. Tighten the bolts in three steps. In the final step, tighten all bolts in sequence shown to 12 N.m (1.2 kgf.m, 8.7 lbf.ft).

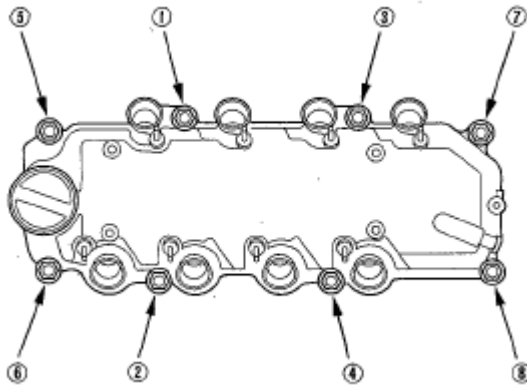


Fig. 52: Identifying Cylinder Head Cover Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Install the breather hose (A) and the harness holder (B).

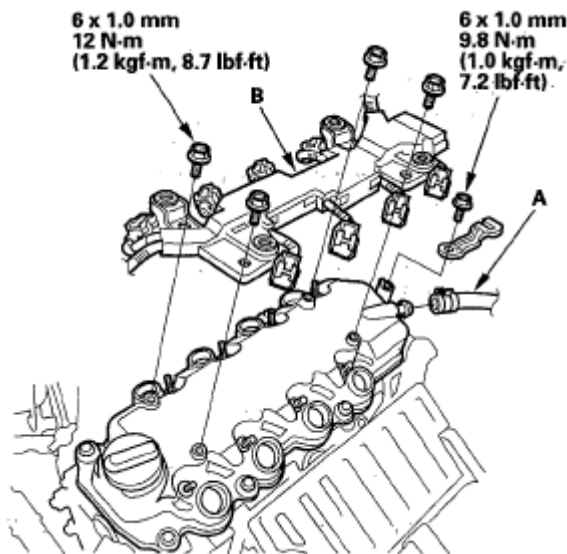


Fig. 53: Locating Breather Hose & Harness Holder With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Install the eight ignition coils (see [IGNITION COIL REMOVAL/INSTALLATION](#)).
11. Install the engine cover (see step 55 on [ENGINE MOUNT REPLACEMENT](#)).

CYLINDER HEAD REMOVAL

NOTE:

- Use fender covers to avoid damaging the painted surfaces.
- To avoid damaging the wire 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 disconnection. Also, be sure that they do not contact other wiring or hoses, or interfere with other parts.
- Keep the cam chain away from magnetic fields.

1. Relieve the fuel pressure (see **FUEL PRESSURE RELIEVING**).
2. Remove the engine cover (see step 8 on **ENGINE REMOVAL**).
3. Drain the engine coolant (see step 4 on **COOLANT REPLACEMENT**).
4. Remove the air cleaner assembly (see **AIR CLEANER REMOVAL/INSTALLATION**).
5. Remove the intake manifold (see **REMOVAL**).
6. Disconnect the knock sensor connector (A), then remove the harness clamp (B) and the connecting pipe (C).

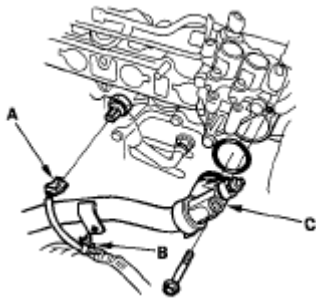


Fig. 54: Locating Knock Sensor Connector, Harness Clamp & Connecting Pipe
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Disconnect the camshaft position (CMP) sensor (A) and the engine coolant temperature (ECT) sensor 1 connector (B), then remove the harness clamp (C).

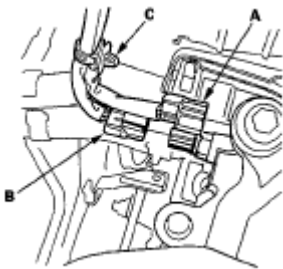


Fig. 55: Locating Camshaft Position Sensor, Engine Coolant Temperature Sensor 1 Connector & Harness Clamp
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Remove the eight ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION**).
9. Remove the harness holder and the breather hose (see step 3).
10. Disconnect the purge control solenoid valve connector (A), then remove the harness clamp (B).

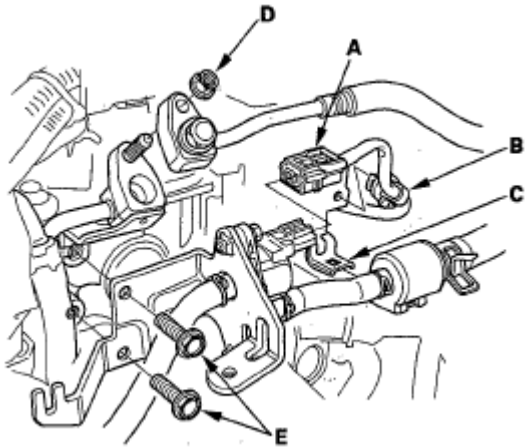


Fig. 56: Locating Purge Control Solenoid Valve Connector & Harness Clamp
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Disconnect the purge joint from the clamp bracket (C), then remove the fuel pipe nut (D) and remove the purge control solenoid bracket bolts (E).
12. Disconnect the upper radiator hose (A), lower radiator hose (B), water bypass hose (C), and heater hoses (D).

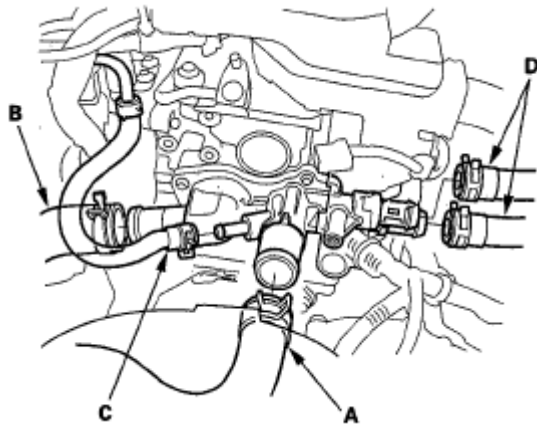


Fig. 57: Locating Upper Radiator Hose, Lower Radiator Hose, Water Bypass Hose & Heater Hoses
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Remove the drive belt (see **DRIVE BELT REPLACEMENT**).
14. Turn the crankshaft pulley so its top dead center (TDC) mark lines up with the pointer (see step 4).
15. Remove the water pump (see **WATER PUMP REPLACEMENT**).
16. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
17. Remove the under floor three way catalytic converter (TWO and the warm-up three way catalytic converter (WU-TWC) (see step 41 on **ENGINE REMOVAL**).
18. Remove the crankshaft pulley (see **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
19. Support the engine with a jack and a wood block under the oil pan.

20. Remove the ground cable, then remove the side engine mount bracket (see step 10).
21. Disconnect the crankshaft position (CKP) sensor (A) and the harness clamp (B), then remove the dipstick tube (C).

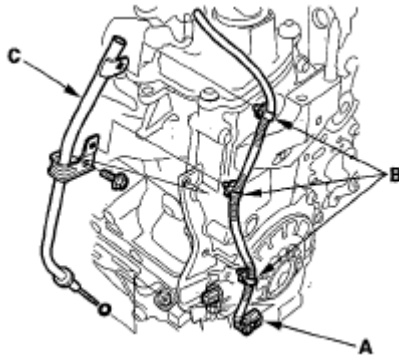


Fig. 58: Locating Crankshaft Position Sensor, Harness Clamp & Dipstick Tube
Courtesy of AMERICAN HONDA MOTOR CO., INC.

22. Remove the chain case.

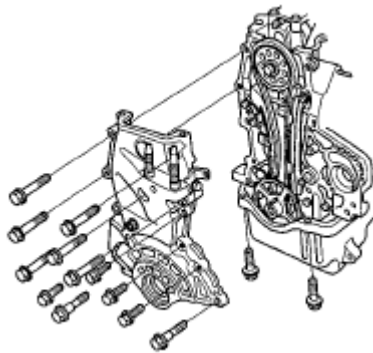


Fig. 59: Identifying Chain Case
Courtesy of AMERICAN HONDA MOTOR CO., INC.

23. Make a reference mark (A) across the camshaft sprocket and the cam chain.

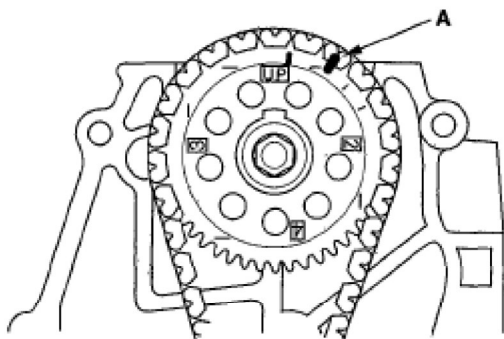


Fig. 60: Locating Reference Mark Across Camshaft Sprocket & Cam Chain

Courtesy of AMERICAN HONDA MOTOR CO., INC.

24. Loosely install the crankshaft pulley.
25. Apply new engine oil to the sliding surface of the cam chain tensioner through the oil return hole in the cylinder head.

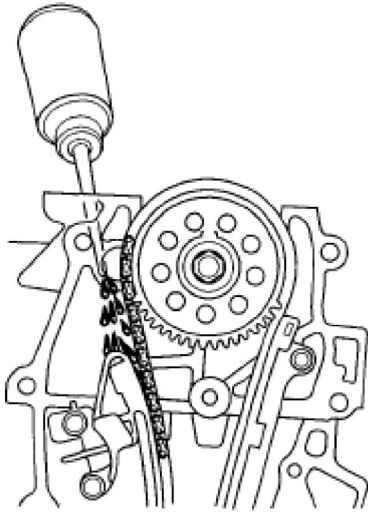


Fig. 61: Applying Engine Oil To Sliding Surface Of Cam Chain Tensioner Through Oil Return Hole In Cylinder Head

Courtesy of AMERICAN HONDA MOTOR CO., INC.

26. Hold the crankshaft pulley and set the socket wrench (A) on the camshaft sprocket bolt.

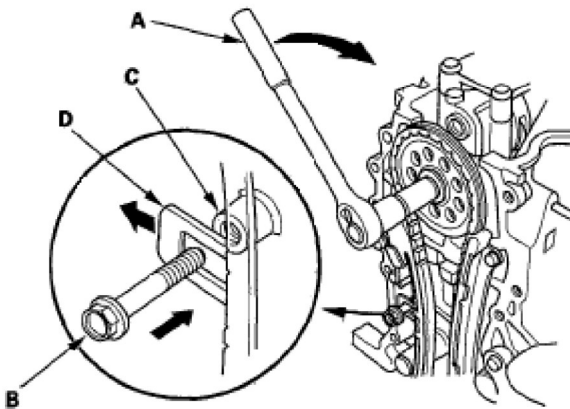


Fig. 62: Setting Socket Wrench On Camshaft Sprocket Bolt

Courtesy of AMERICAN HONDA MOTOR CO., INC.

27. Turn the camshaft clockwise to compress the cam chain tensioner, then install the 6 x 1.0 mm bolt (B) in the bolt hole (C) in the engine block through the cam chain tensioner (D).

NOTE:

- Turning torque should not exceed 44 N.m (4.5 kgf.m, 33 lbf.ft) when

turning the camshaft.

- **Do not turn the camshaft counterclockwise.**

28. Hold the camshaft with a 27 mm open-end wrench, then remove the camshaft sprocket.

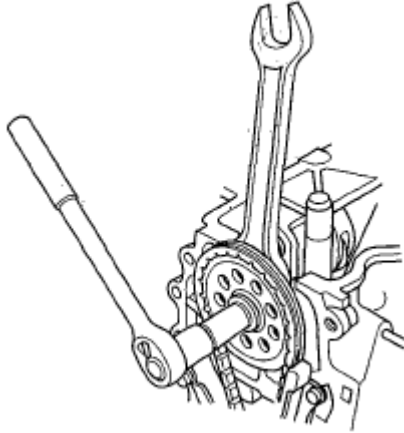


Fig. 63: Holding Camshaft With 27 mm Open-End Wrench
Courtesy of AMERICAN HONDA MOTOR CO., INC.

29. Remove the top bolt that secures the cam chain guide.

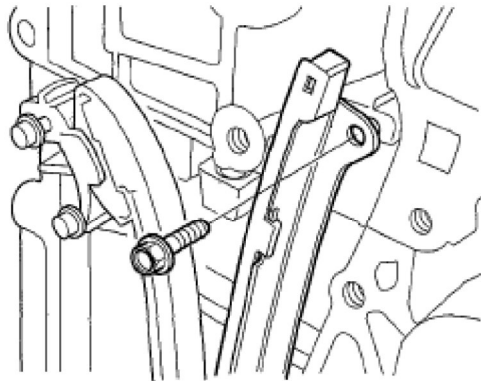


Fig. 64: Identifying Top Bolt That Secures Cam Chain Guide
Courtesy of AMERICAN HONDA MOTOR CO., INC.

30. 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.

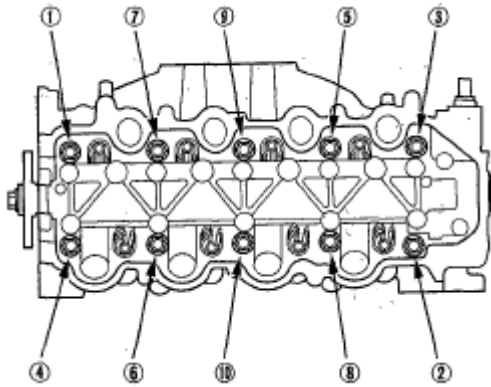


Fig. 65: Identifying Cylinder Head Bolts Loosening Bolts Sequence
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

31. Remove the cylinder head.

CAMSHAFT SPROCKET REMOVAL

NOTE: Keep the cam chain away from magnetic fields.

1. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
2. Make a reference mark (A) across the camshaft sprocket and the cam chain.

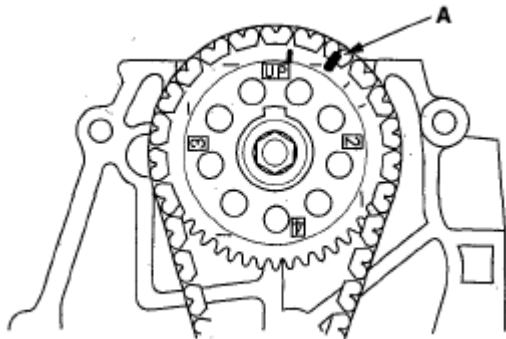


Fig. 66: Identifying Reference Mark Across Camshaft Sprocket And Cam Chain
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Apply new engine oil to the sliding surface of the cam chain tensioner through the oil return hole in the cylinder head.

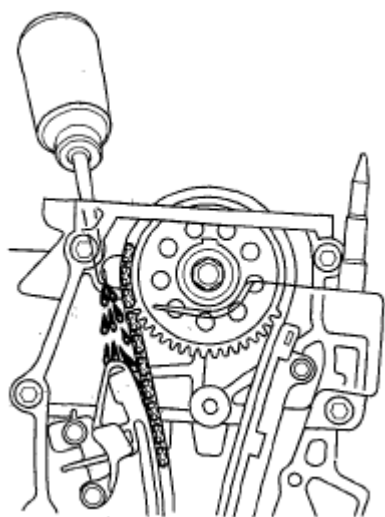


Fig. 67: Applying Engine Oil To Sliding Surface Of Cam Chain Tensioner Through Oil Return Hole In Cylinder Head

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the cylinder head plug.

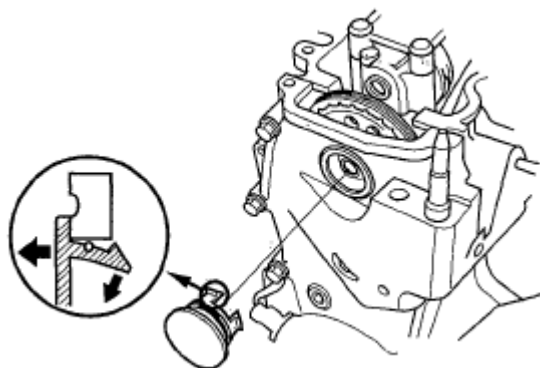


Fig. 68: Identifying Cylinder Head Plug

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Hold the crankshaft pulley and set the socket wrench (A) on the camshaft sprocket bolt.

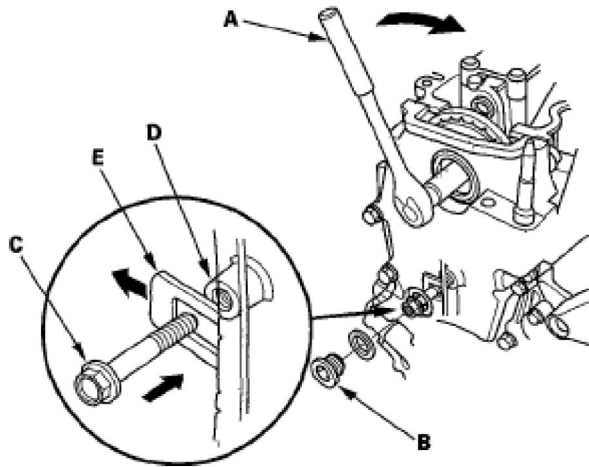


Fig. 69: Setting Socket Wrench On Camshaft Sprocket Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the maintenance bolt (B), and turn the camshaft clockwise to compress the cam chain tensioner, then install the 6 x 1.0 mm bolt (C) in the bolt hole (D) in the engine block through the maintenance hole and the cam chain tensioner (E).

NOTE:

- Turning torque should not exceed 44 N.m (4.5 kgf.m, 33 lbf.ft) when turning the camshaft.
- Do not turn the camshaft counterclockwise.

7. Hold the camshaft with a 27 mm open-end wrench, then loosen the camshaft sprocket bolt.

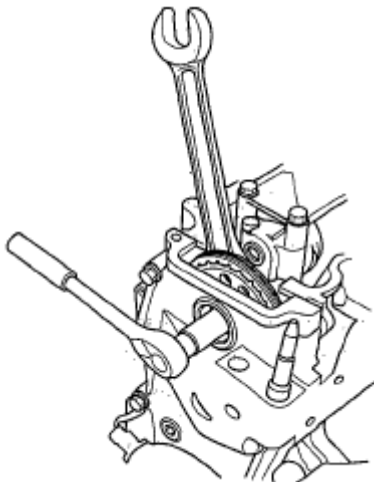


Fig. 70: Holding Camshaft With 27 mm Open-End Wrench
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Remove the camshaft sprocket bolt, then remove the camshaft sprocket.

NOTE: Hang the cam chain with a wire.

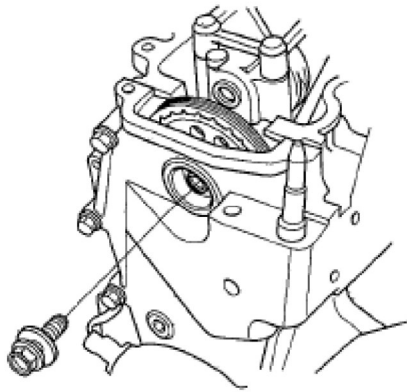


Fig. 71: Identifying Camshaft Sprocket Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CAMSHAFT SPROCKET INSTALLATION

NOTE: Keep the cam chain away from magnetic fields.

1. Install the cam chain around the camshaft sprocket aligned with the reference mark (A), then install the camshaft sprocket on the camshaft.

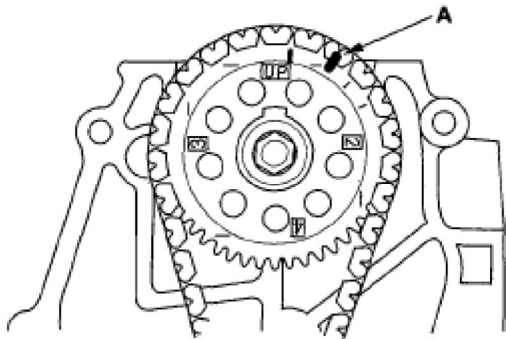


Fig. 72: Locating Reference Mark On Camshaft Sprocket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Hold the camshaft with a 27 mm open-end wrench, then tighten the bolt.

NOTE: Apply new engine oil to the bolt threads and flange.

Specified Torque: 56 N.m (5.7 kgf.m, 41 lbf.ft)

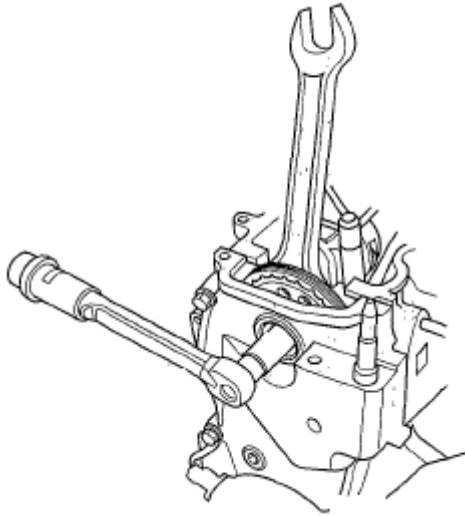


Fig. 73: Holding Camshaft With 27 mm Open-End Wrench
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Apply new engine oil to the sliding surface of the cam chain tensioner through the oil return hole in the cylinder head.

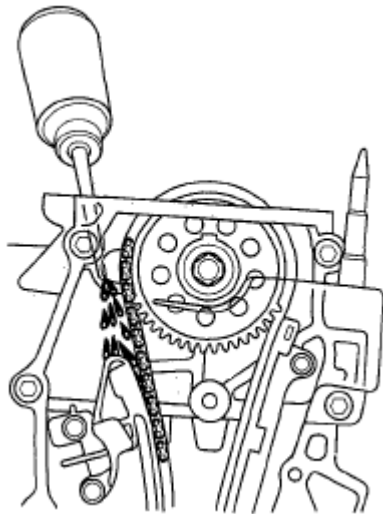


Fig. 74: Applying Engine Oil To Sliding Surface Of Cam Chain Tensioner Through Oil Return Hole In Cylinder Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Hold the crankshaft pulley and set the socket wrench (A) on the camshaft sprocket bolt.

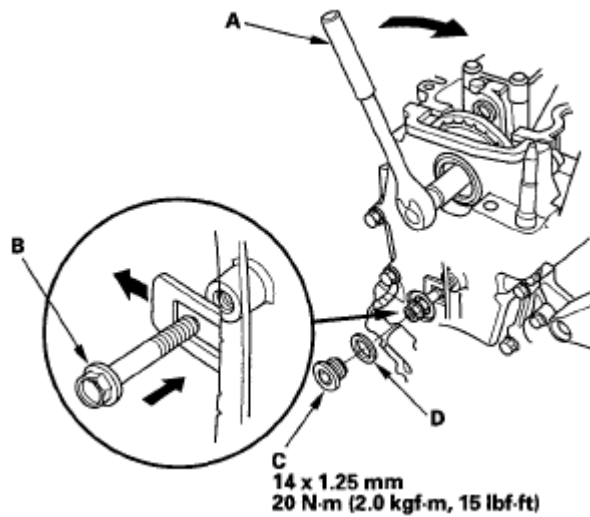


Fig. 75: Setting Socket Wrench On Camshaft Sprocket Bolt With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Turn the camshaft clockwise to compress the cam chain tensioner, then remove the 6 x 1.0 mm bolt (B).

NOTE:

- Turning torque should not exceed 44 N·m (4.5 kgf·m, 33 lbf·ft) when turning the camshaft.
- Do not turn the camshaft counterclockwise.

6. Install the maintenance bolt (C) with a new washer (D).
7. Install the new cylinder head plug.

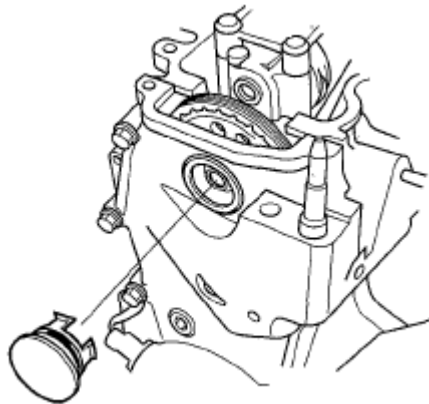


Fig. 76: Identifying Cylinder Head Plug
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Install the cylinder head cover (see CYLINDER HEAD COVER INSTALLATION).

CMP PULSE PLATE REMOVAL AND INSTALLATION

REMOVAL

1. Remove the air cleaner assembly (see **AIR CLEANER REMOVAL/INSTALLATION**).
2. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
3. Remove the purge control solenoid valve bracket (see step 17 on **ENGINE REMOVAL**).
4. Remove the cylinder head plug.

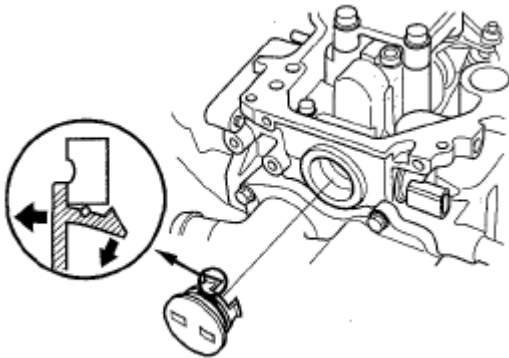


Fig. 77: Identifying Cylinder Head Plug
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Hold the camshaft with a 27 mm open-end wrench, then loosen the bolt.

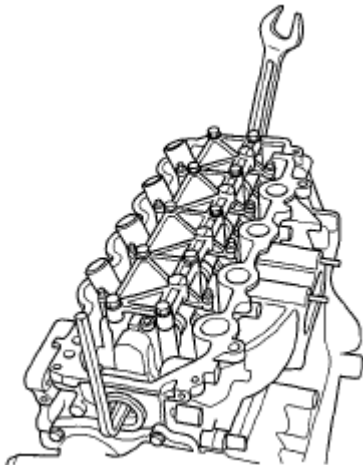


Fig. 78: Holding Camshaft With 27 mm Open-End Wrench
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the camshaft position (CMP) pulse plate.

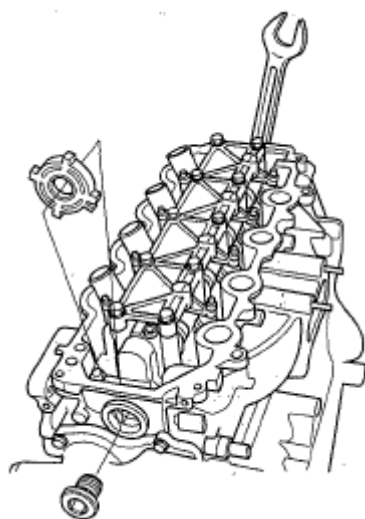


Fig. 79: Identifying Camshaft Position Pulse Plate
Courtesy of AMERICAN HONDA MOTOR CO., INC.

INSTALLATION

1. Install the CMP pulse plate (A). Hold the camshaft with an open-end wrench (B), then tighten the bolt (C).

NOTE: Apply new engine oil to the bolt threads.

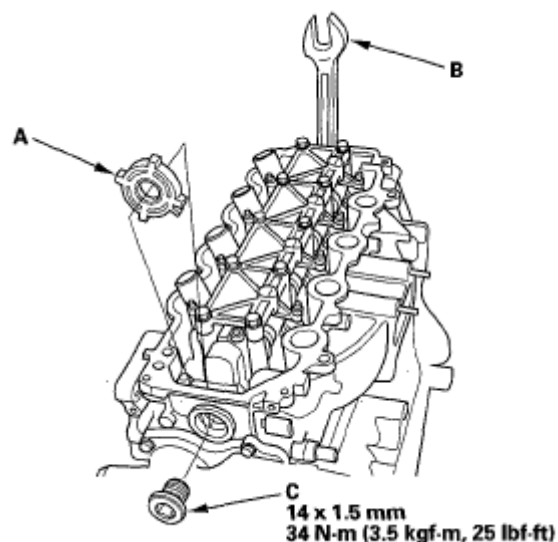


Fig. 80: Identifying Camshaft Position Pulse Plate With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Install the new cylinder head plug.

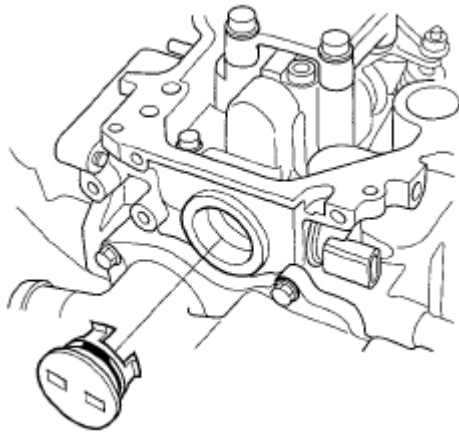


Fig. 81: Identifying Cylinder Head Plug

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the purge control solenoid valve bracket (see step 45 on ENGINE INSTALLATION).
4. Install the cylinder head cover (see CYLINDER HEAD COVER INSTALLATION).
5. Install the air cleaner assembly (see AIR CLEANER REMOVAL/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.

Warpage

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

Service Limit: 0.08 mm (0.003 in.)

- If warpage is less than 0.08 mm (0.0031 in.) cylinder head resurfacing is not required.
- If warpage is between 0.08 mm (0.0031 in.) and 0.2 mm (0.008 in.), resurface the cylinder head.
- Maximum resurface limit is 0.2 mm (0.008 in.) based on a height of 120 mm (4.72 in.).

Cylinder Head Height

Standard (New): 119.9-120.1 mm (4.72-4.73 in.)

Service Limit: 119.8 mm (4.72 in.)

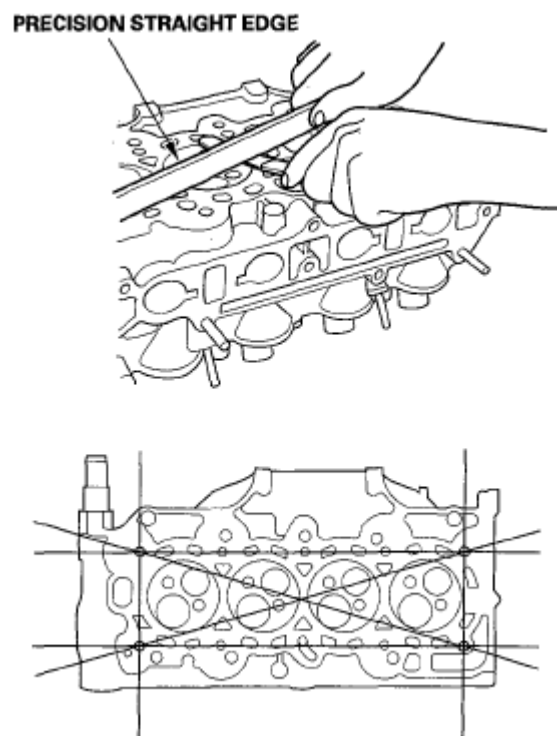


Fig. 82: Checking Cylinder Head For Warpage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM ASSEMBLY AND CAMSHAFT REMOVAL

1. Remove the camshaft sprocket (see **CAMSHAFT SPROCKET REMOVAL**).
2. Loosen the rocker arm adjusting screws (A).

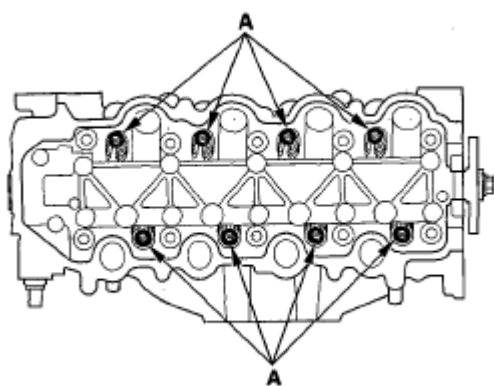


Fig. 83: Identifying Rocker Arm Adjusting Screws
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

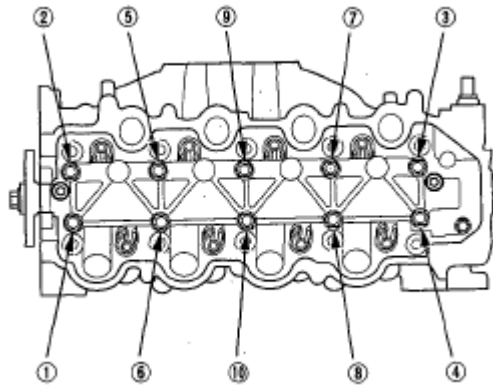


Fig. 84: Identifying Lost Motion Holder Bolts & Camshaft Holder Bolt Loosening Sequence
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the lost motion holder (A), the lost motion assembly (B), and the rocker arm assembly (C), then remove the camshaft (D).

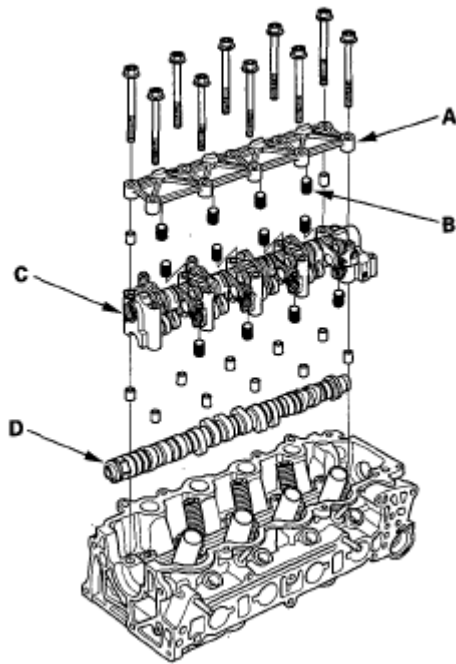


Fig. 85: Identifying Lost Motion Holder, Lost Motion Assembly & Rocker Arm Assembly & Camshaft
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY

NOTE:

- Identify parts as they are removed so they can be reinstalled in their original location.
- Remove the rocker shaft bolts before disassembling the rocker arms.

- Inspect the rocker shaft and rocker arms (see ROCKER ARM AND SHAFT INSPECTION).
- If reused, the rocker arms must be installed in their original location.
- Prior to reassembling, clean all the parts in solvent, dry them, and apply new engine oil to any contact points.
- Apply new engine oil to the threads of the rocker shaft bolts when installing them.
- When replacing the rocker arm assembly, remove the fastening hardware from the new rocker arm assembly.

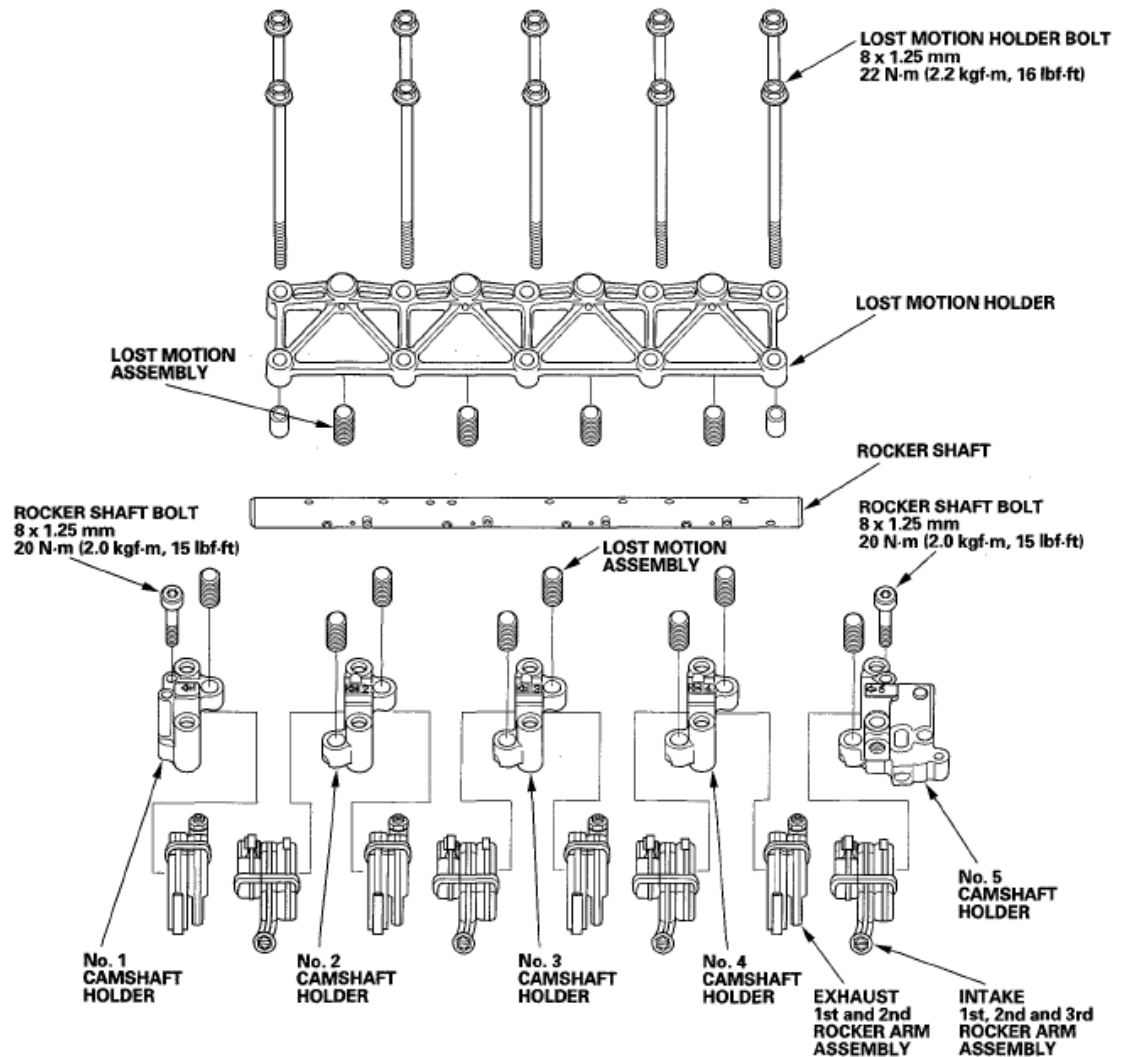


Fig. 86: Identifying Rocker Arm & Shaft Disassembly/Reassembly With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM AND SHAFT INSPECTION

1. Remove the rocker arm assembly (see **ROCKER ARM ASSEMBLY AND CAMSHAFT REMOVAL**).
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.

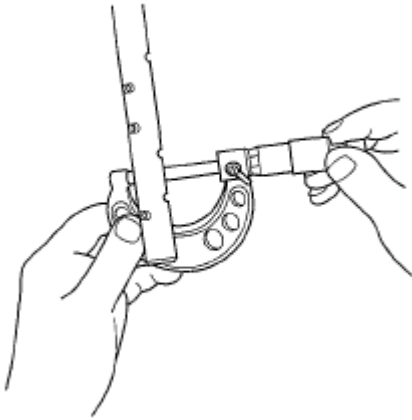


Fig. 87: Measuring Diameter Of Shaft At First Rocker Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

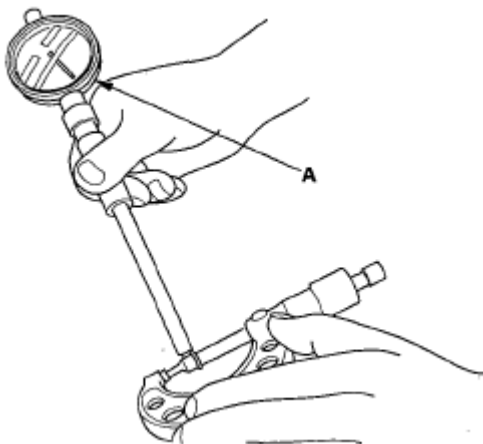


Fig. 88: Zeroing Gauge To Shaft Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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): 0.017-0.045 mm (0.0003-0.0018 in.)

Service Limit: 0.067 mm (0.0026 in.)



Fig. 89: Measuring Inside Diameter Of Rocker Arm & Checking For Out-Of-Round Condition
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Repeat for all the rockers and both shafts. If the clearance is over the limit, replace the rocker shaft and all over-tolerance rocker arms. If any intake rocker arm needs replacement, replace all five rocker arms in that set (intake 1st, 2nd, 3rd, exhaust 1st and 2nd).

Rocker Arms

7. Inspect the rocker arm pistons (A). Push them manually. If they do not move smoothly, replace the rocker arm set.

NOTE:

- Apply new engine oil to the rocker arm pistons when reassembling.
- When reassembling the intake 1st and exhaust 1st rocker arms (B), carefully apply air pressure to the oil passage of the rocker arm.

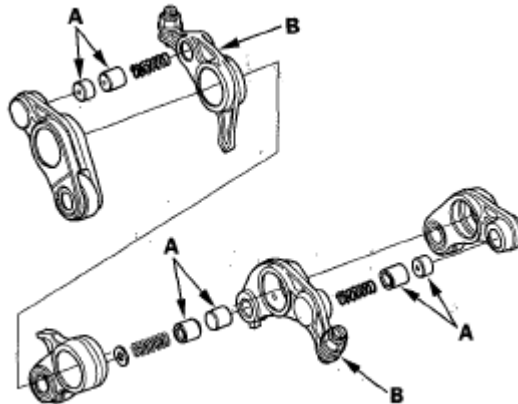


Fig. 90: Locating Rocker Arm Pistons
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Reassemble the rocker arm assembly (see **ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY**).
9. Install the rocker arm assembly (see **ROCKER ARM ASSEMBLY AND CAMSHAFT**).

INSTALLATION).**CAMSHAFT INSPECTION**

NOTE: Do not rotate the camshaft during inspection.

1. Remove the rocker arm assembly (see **ROCKER ARM ASSEMBLY AND CAMSHAFT REMOVAL**).
2. Disassemble the rocker arm assembly (see **Rocker Arm and Shaft Disassembly/Reassembly**).
3. Put the camshaft, the camshaft holders, and the lost motion holder on the cylinder head, then tighten the bolts to the specified torque.

Specified Torque**8 mm Bolts:**

22 N.m (2.2 kgf.m, 16 lbf.ft)

Apply new engine oil to the bolt threads and flange.

6 mm Bolt: (12)

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

Apply new engine oil to the bolt threads and flange.

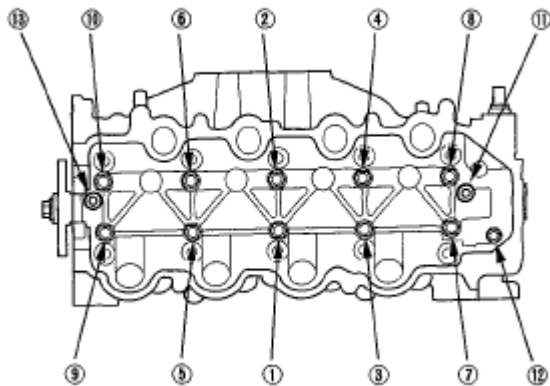
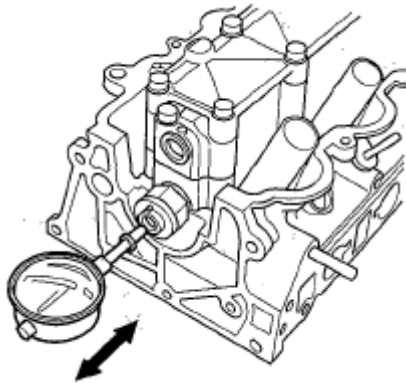


Fig. 91: Identifying Lost Motion Holder Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Seat the camshaft by pushing it away from the camshaft pulley end of the cylinder head.
5. 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): 0.05-0.15 mm (0.002-0.006 in.)****Service Limit: 0.3 mm (0.01 in.)****Fig. 92: Checking Camshaft End Play****Courtesy of AMERICAN HONDA MOTOR CO., INC.**

6. Loosen the lost motion holder bolts and the camshaft holder bolts two turns at a time, in a crisscross pattern. Then remove the lost motion holder and the camshaft holders from the cylinder head.
7. Lift the camshaft out of the cylinder head, wipe it clean, then inspect the lift ramps. Replace the camshaft if any lobes are pitted, scored, or excessively worn.
8. Clean the camshaft journal surfaces in the cylinder head, then set the camshaft back in place. Place a plastigage strip across each journal.
9. Install the camshaft holders, then tighten the bolts to the specified torque as shown in step 3.
10. Remove the camshaft holders. Measure the widest part of plastigage on each journal.
 - If the camshaft-to-holder clearance is within limits, go to step 12.
 - 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 11.

Camshaft-to-Holder Oil Clearance**Standard (New): 0.050-0.089 mm (0.0020-0.0035 in.)****Service Limit: 0.15 mm (0.006 in.)**

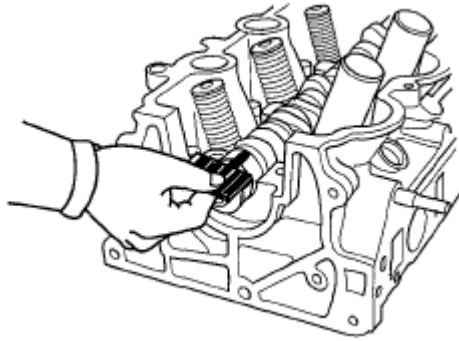


Fig. 93: Measuring Widest Part Of Plastigage On Each Journal
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. 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.)

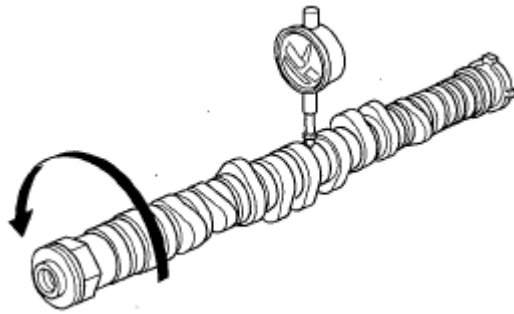


Fig. 94: Checking Camshaft Total Runout
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Measure the cam lobe height.

Cam Lobe Height Standard (New):

CAM LOBE HEIGHT STANDARD

-	INTAKE	EXHAUST
2nd	35.568 mm (1.4003 in.)	35.699 mm (1.4055 in.)
3rd	36.060 mm (1.4196 in.)	-
1st	29.700 mm (1.1693 in.)	29.900 mm (1.1772 in.)

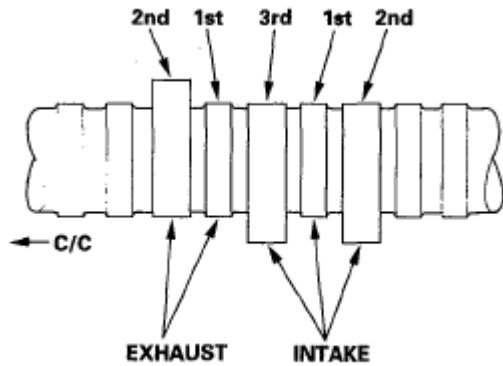


Fig. 95: Identifying Cam Lobe Height

Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVE, SPRING, AND VALVE SEAL REMOVAL

SPECIAL TOOLS REQUIRED

Valve spring compressor attachment 07757-PJ1010A

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. Remove the rocker arm assembly and the camshaft (see **ROCKER ARM ASSEMBLY AND CAMSHAFT REMOVAL**).
3. Using an appropriate-sized socket (A) and a plastic mallet (B), lightly tap the spring retainer to loosen the valve cotters.

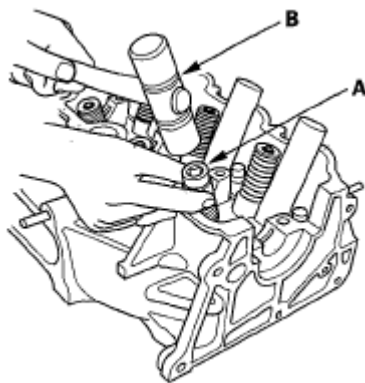


Fig. 96: Tapping Spring Retainer To Loosen Valve Cotters

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

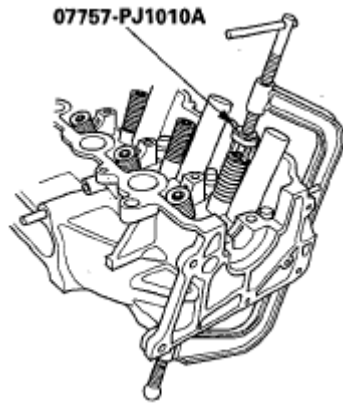


Fig. 97: Identifying Valve Spring Compressor & Attachment
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

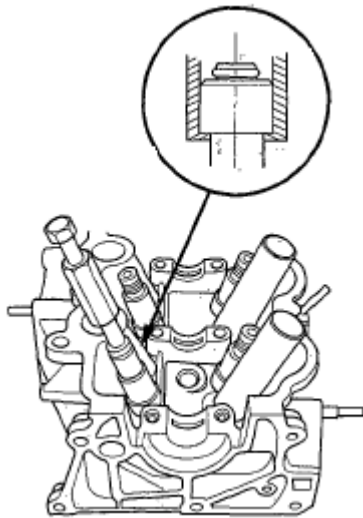


Fig. 98: Identifying Valve Guide Seal Remover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the valve seal.

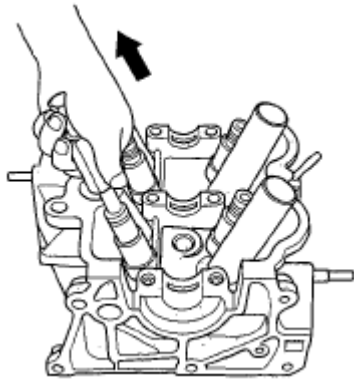


Fig. 99: Identifying Valve Seal

Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Remove the valve spring seat and the valve.

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 (1.372-1.383 in.)

B Standard (New): 117.65-118.15 mm (4.632-4.652 in.)

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

C Service Limit: 5.45 mm (0.215 in.)

Exhaust Valve Dimensions

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

B Standard (New): 117.75-118.25 mm (4.635-4.659 in.)

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

C Service Limit: 5.42 mm (0.213 in.)

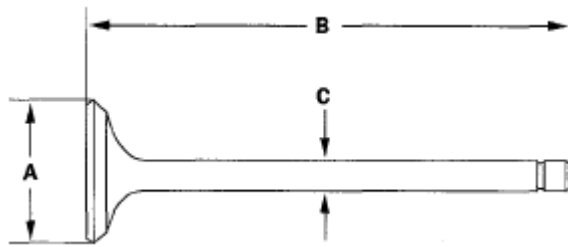


Fig. 100: Identifying Valve Dimensions

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

Service Limit: 0.08 mm (0.003 in.)

Exhaust Valve Stem-to-Guide Clearance

Standard (New): 0.050-0.080 mm (0.0020-0.0031 in.)

Service Limit: 0.11 mm (0.004 in.)

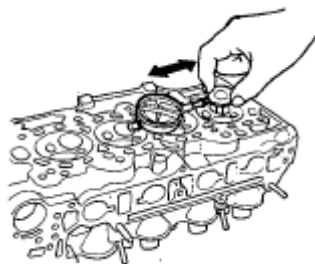


Fig. 101: Inspecting Valve Stem-To-Guide Clearance

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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 STEM-TO-GUIDE CLEARANCE INSPECTION**).
 2. As illustrated, 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.

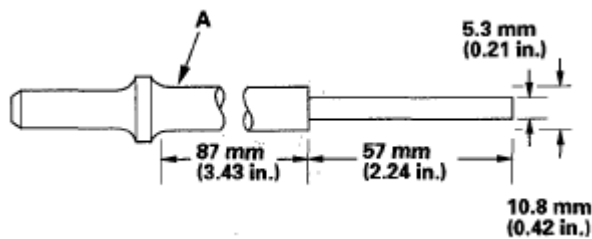


Fig. 102: Identifying Commercially Available Air-Impact Valve Guide Driver
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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.

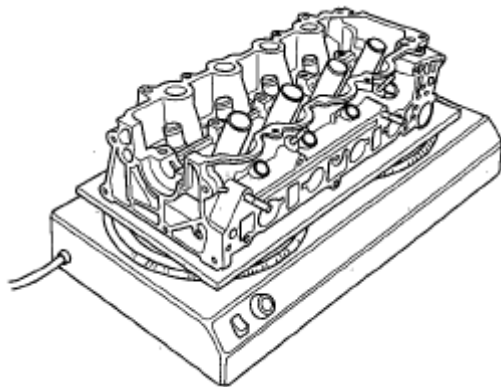


Fig. 103: Heating Cylinder Head To 300°F (150°C)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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 in line 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.

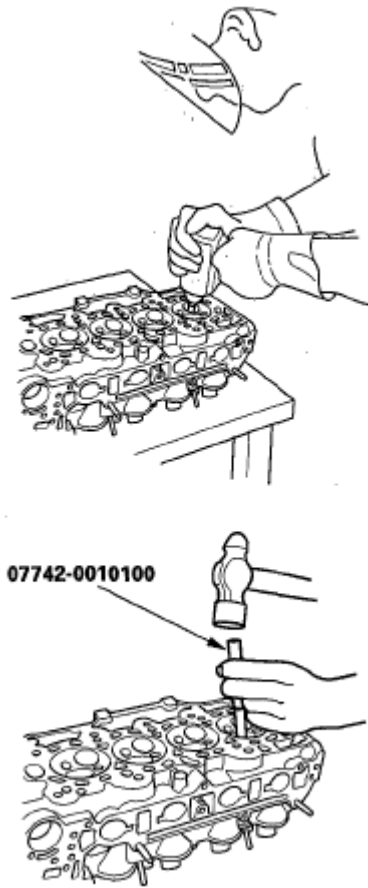


Fig. 104: Removing Guide Out Toward Camshaft Side Of Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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 eight guides to do, you may have to reheat the head.

Valve Guide Installed Height:

16.25-16.75 mm (0.640-0.659 in.)

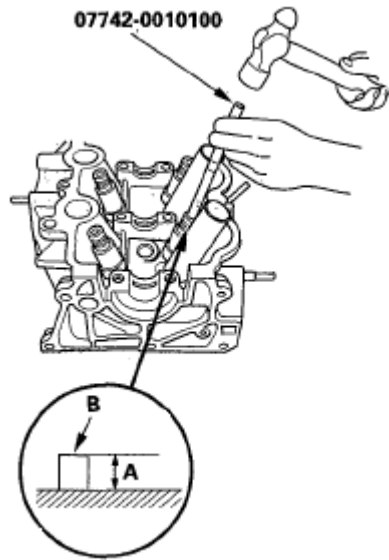


Fig. 105: Installing Guide From Camshaft Side Of Head
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

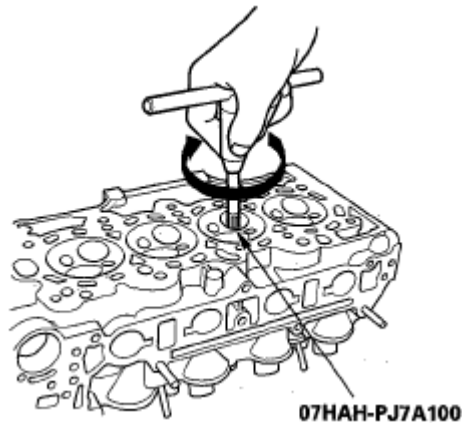


Fig. 106: Rotating Reamer Clockwise Full Length Of Valve Guide Bore
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Continue to rotate the reamer clockwise while drawing 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 STEM-TO-GUIDE CLEARANCE 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.

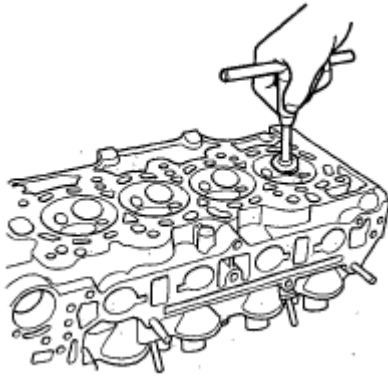


Fig. 107: Renewing Valve Seats In Cylinder Head Using Valve Seat Cutter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

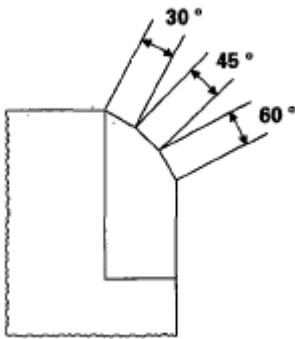


Fig. 108: Identifying Bevel Upper Edge Of Seat With 30° Cutter & Lower Edge Of Seat With 60° Cutter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Valve Seat Width

Intake:

Standard (New): 0.850-1.150 mm (0.0335-0.0453 in.)

Service Limit: 1.60 mm (0.063 in.)

Exhaust:

Standard (New): 1.250-1.550 mm (0.0492-0.0610 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.

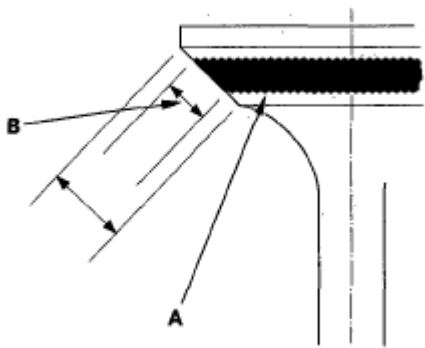


Fig. 109: Identifying Prussian Blue Compound On Valve Face
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Intake Valve Stem Installed Height

Standard (New): 47.7-48.1 mm (1.88-1.89 in.)

Service Limit: 48.4 mm (1.91 in.)

Exhaust Valve Stem Installed Height

Standard (New): 47.6-48.0 mm (1.87-1.89 in.)

Service Limit: 48.3 mm (1.90 in.)

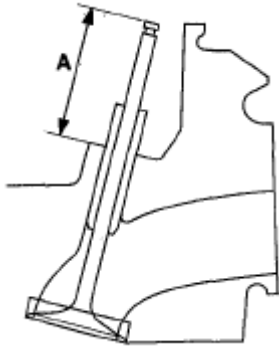


Fig. 110: Identifying Valve Stem Installed Height
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

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.

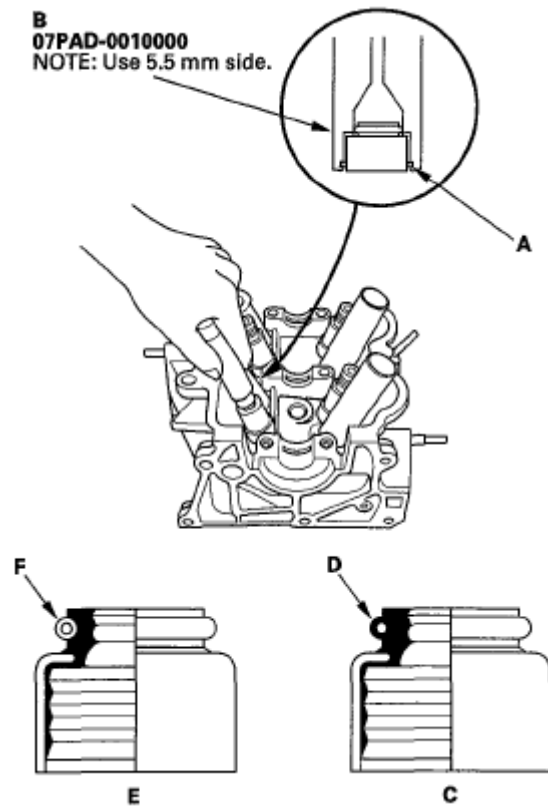


Fig. 111: Installing Valve Seals Using Stem Seal Driver
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Install the valve spring and the 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 the valve spring compressor. Compress the spring and install the valve cotters.

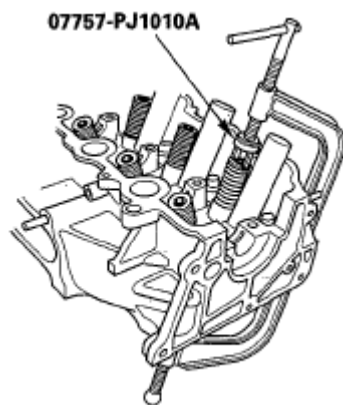


Fig. 112: Identifying Valve Spring Compressor & Attachment
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the valve-spring compressor and the 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 the valve cotters. Tap the valve stem only along its axis so you do not bend the stem.

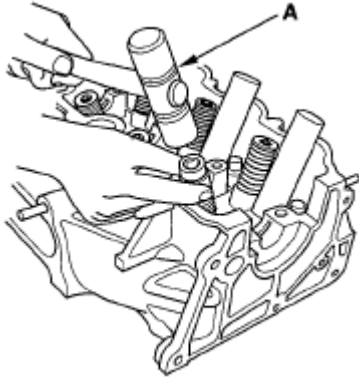


Fig. 113: Tapping Valve Stem

Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM ASSEMBLY AND CAMSHAFT INSTALLATION

1. Reassemble the rocker arm assembly (see **ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY**).
2. Apply new engine oil to the camshaft lobes and journals.
3. Install the camshaft (A) rocker arm assembly (B), then install the lost motion assembly (C) and the lost motion holder (D).

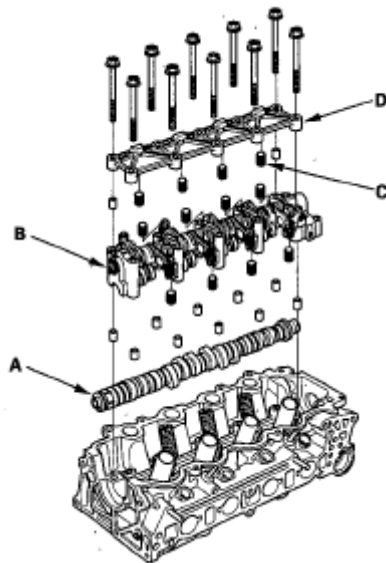


Fig. 114: Locating Camshaft, Rocker Arm Assembly, Lost Motion Assembly & Lost Motion Holder
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Apply new engine oil to the bolt threads and flange. Tighten each bolt two turns at a time in sequence.

Specified Torque

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

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

6 mm Bolt: (12)

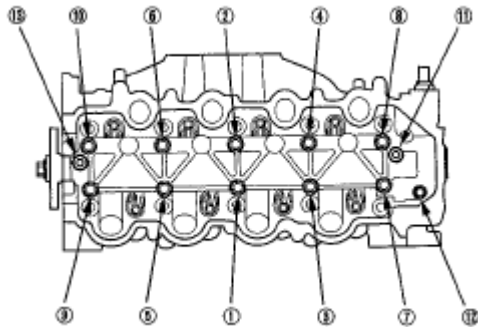


Fig. 115: Identifying Lost Motion Holder Bolts Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Install the camshaft sprocket (see CAMSHAFT SPROCKET INSTALLATION).
6. Adjust the valve clearance (see VALVE CLEARANCE ADJUSTMENT).

CYLINDER HEAD INSTALLATION

NOTE: Keep the cam chain away from magnetic fields.

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

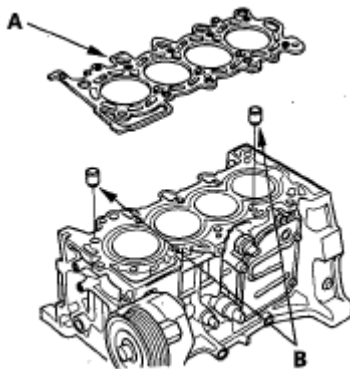


Fig. 116: Identifying Cylinder Head Gasket & Dowel Pins On Engine Block

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Set the crankshaft to top dead center (TDC). Align the TDC mark on the crankshaft sprocket with the pointer on the oil pump (see 1).
4. Set the No. 1 piston at TDC. The "UP" mark on the camshaft sprocket should be at the top, and the TDC grooves on the camshaft sprocket should line up with the top edge of the head (see 2).
5. Install the cylinder head on the engine block.
6. Apply new engine oil to the threads and flange of all cylinder head bolts. Be sure to install the 165 mm long head bolt (A) in the location shown.

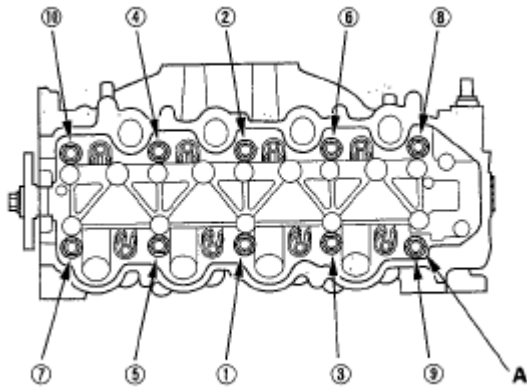


Fig. 117: Identifying Cylinder Head Bolt Tightening Sequence

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Torque the cylinder head bolts in sequence to 29 N.m (3.0 kgf.m, 22 lbf.ft), use a beam-type torque wrench. When using a preset-type torque wrench, be sure to tighten slowly and do not overtighten. If a bolt makes any noise while you are torquing it, loosen the bolt and retighten it from the first step.
8. Tighten all cylinder head bolts an additional 130°.

NOTE: Remove the cylinder head bolt if you tightened it beyond the specified angle.

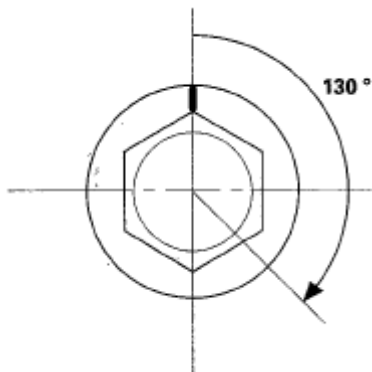


Fig. 118: Tightening All Cylinder Head Bolts An Additional 130°

Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Install the cam chain guide mounting top bolt.

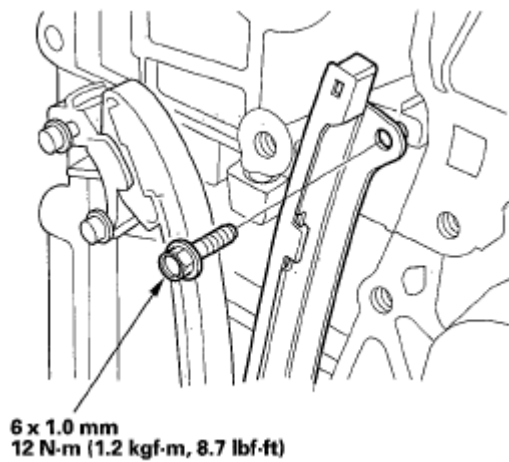


Fig. 119: Identifying Cam Chain Guide Mounting Top Bolt With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Install the cam chain around the camshaft sprocket aligned with the reference mark (A), then install the camshaft sprocket on the camshaft.

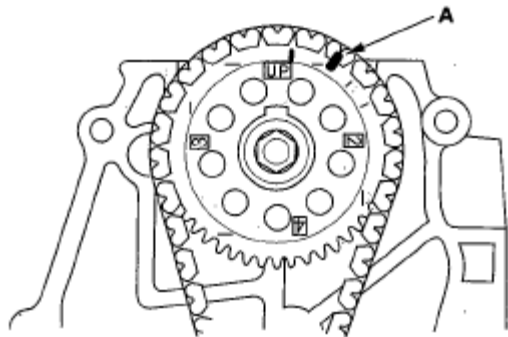


Fig. 120: Locating Camshaft Sprocket Reference Mark
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Apply new engine oil to the bolt threads and flange. Hold the camshaft with a 27 mm open-end wrench, then tighten the bolt.

Specified Torque: 56 N.m (5.7 kgf.m, 41 lbf.ft)

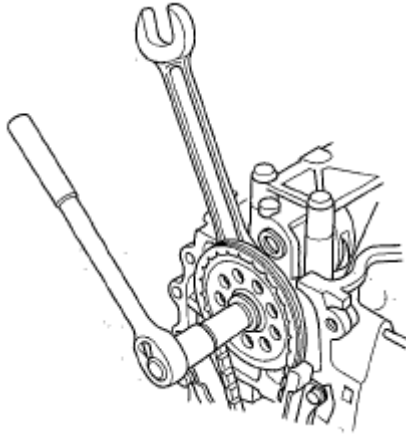


Fig. 121: Holding Camshaft With An Open-End Wrench
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Loosely install the crankshaft pulley.
13. Apply new engine oil to the sliding surface of the cam chain tensioner through the oil return hole in the cylinder head.

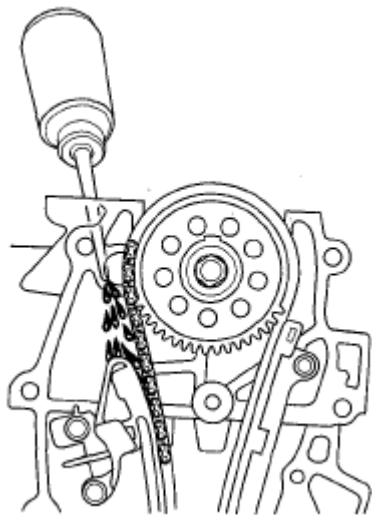


Fig. 122: Applying Engine Oil To Sliding Surface Of Cam Chain Tensioner Through Oil Return Hole In Cylinder Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Hold the crankshaft pulley and set the socket wrench (A) on the camshaft sprocket bolt.

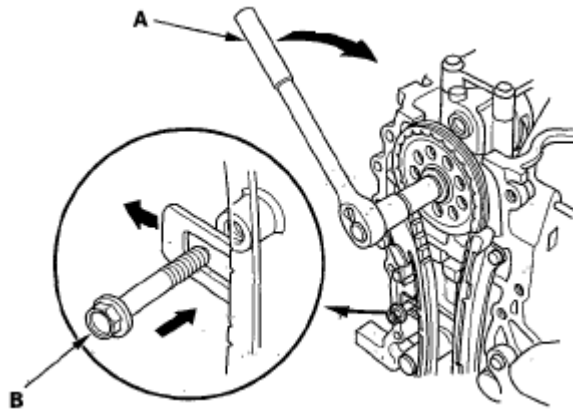


Fig. 123: Holding Crankshaft Pulley & Set Socket Wrench On Camshaft Sprocket Bolt
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Turn the camshaft clockwise to compress the cam chain tensioner, then remove the 6 x 1.0 mm bolt (B).

NOTE:

- Turning torque should not exceed 44 N.m (4.5 kgf.m, 33 lbf.ft), when turning the camshaft.
- Do not turn the camshaft counterclockwise.

16. 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**).
17. Remove any old liquid gasket from the chain case mating surfaces, bolts, and bolt holes.
18. Clean and dry the chain case mating surfaces.
19. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the cylinder head and engine block mating surface of the chain case. Install the component within 5 minutes of applying the liquid gasket (see step 13).

NOTE:

- Apply a 1.5 mm wide bead of liquid gasket along the broken lines (A).
- Apply a 3.0 mm wide bead of liquid gasket to the engine block upper surface contact areas (B) on the chain case.
- 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. Apply liquid gasket, P/N 08718-0001, 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:

- Apply a 1.5 mm wide bead of liquid gasket along the broken lines (A).
- Apply a 5.0 mm wide bead of liquid gasket to the shaded area (B).
- 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.

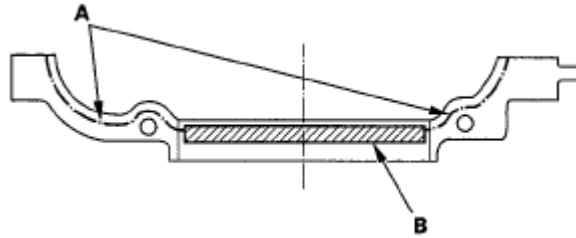


Fig. 124: Identifying 5.0 mm Wide Bead Of Liquid Gasket To Shaded Area

Courtesy of AMERICAN HONDA MOTOR CO., INC.

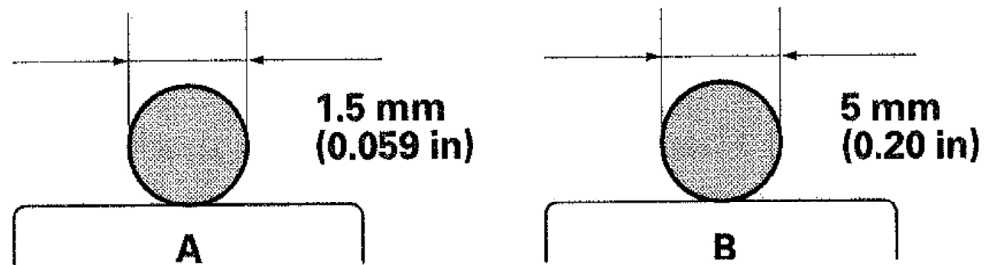


Fig. 125: Identifying Specifications For Liquid Gasket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

21. Set the edge of the chain case (A) to the edge of the oil pan (B), then install the chain case on the engine block (C). Wipe off the excess liquid gasket on the oil pan and chain case mating area.

NOTE: When installing the chain case, do not slide the bottom surface on the oil pan mounting surface.

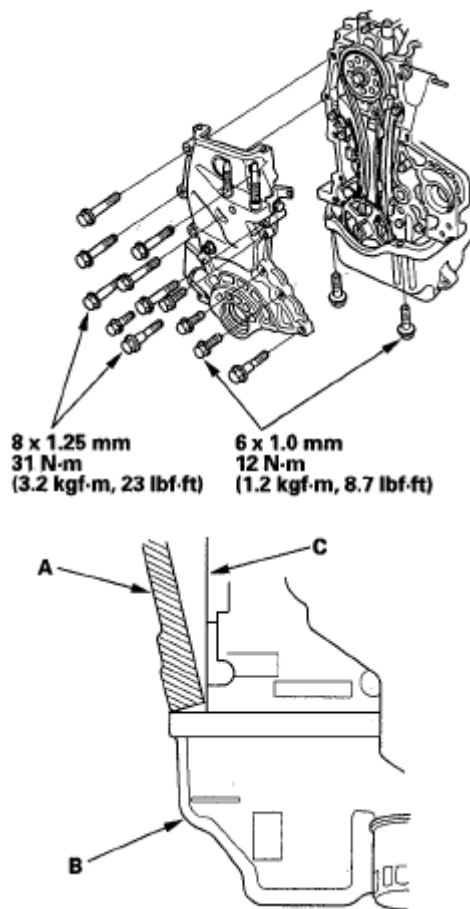


Fig. 126: Locating Chain Case, Oil Pan & Engine Block With Torque Specifications
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

22. Install the dipstick tube (A) with a new O-ring (B). Connect the crankshaft position (CKP) sensor connector (C) and the harness clamps (D).

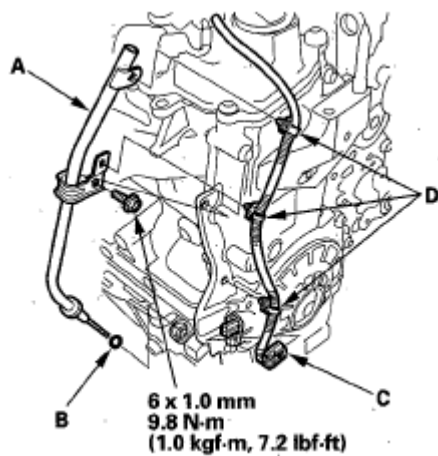


Fig. 127: Locating Dipstick Tube, O-Ring, Crankshaft Position Sensor Connector & Harness Clamps With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

23. Install the side engine mount bracket, then tighten the mounting nuts in the numbered sequence shown (see step 16).
24. Install the ground cable (see step 17).
25. Remove the engine with the jack and the wood block under the oil pan.
26. Install the crankshaft pulley (see **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
27. Install the warm-up three way catalytic converter (WU-TWC) and the under-floor three way catalytic converter (TWC) (see step 26 on **ENGINE INSTALLATION**).
28. Install the cylinder head cover (see **CYLINDER HEAD COVER INSTALLATION**).
29. Install the water pump (see **WATER PUMP REPLACEMENT**).
30. Install the drive belt (see **COOLANT REPLACEMENT**).
31. Connect the upper radiator hose (A), the lower radiator hose (B), the water bypass hose (C), and the heater hoses (D).

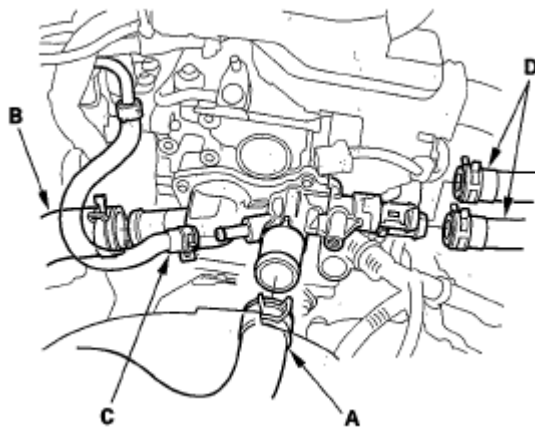


Fig. 128: Locating Upper Radiator Hose, Lower Radiator Hose, Water Bypass Hose & Heater Hoses

Courtesy of AMERICAN HONDA MOTOR CO., INC.

32. Install the evaporative emission (EVAP) canister purge valve bracket bolts and the fuel pipe nut, then connect the purge joint to the bracket (see step 43 in **ENGINE INSTALLATION**).

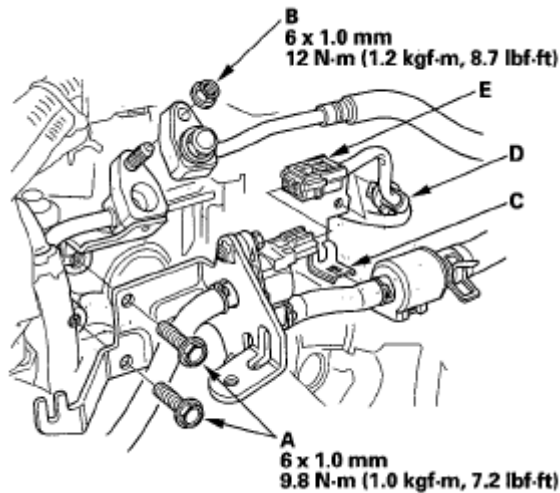


Fig. 129: Locating Purge Control Solenoid Bracket Bolts, Fuel Pipe Nut & Clamp Bracket With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

33. Install the harness clamp, then connect the EVAP canister purge valve connector (see step 44 in **ENGINE INSTALLATION**).
34. Connect the breather hose and install the harness holder. (See step 9
35. Install the eight ignition coils (see **IGNITION COIL AND SPARK PLUG REMOVAL/INSTALLATION**).
36. Install the harness clamp (A), then connect the camshaft position (CMP) sensor (B) and the engine coolant temperature (ECT) sensor 1 connector (C).

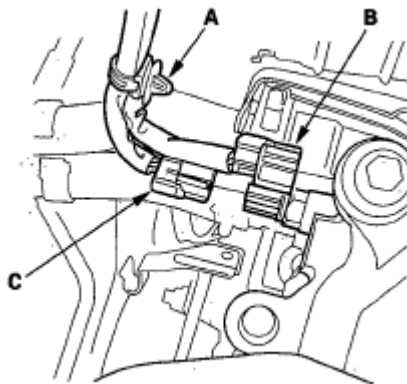


Fig. 130: Locating Harness Clamp, Camshaft Position Sensor & Engine Coolant Temperature Sensor 1 Connector

Courtesy of AMERICAN HONDA MOTOR CO., INC.

37. Install the connecting pipe (A) with a new O-ring (B). Install the harness clamp (C), then connect the knock sensor connector (D).

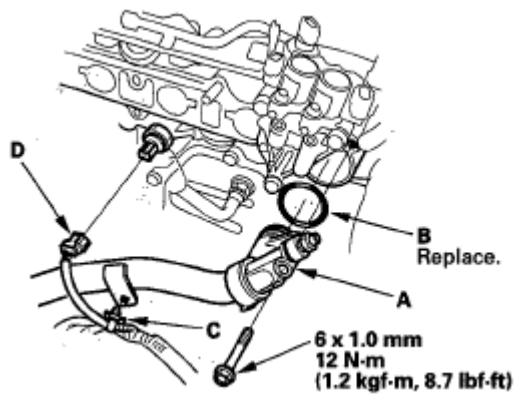


Fig. 131: Locating Connecting Pipe, O-Ring, Harness Clamp & Knock Sensor Connector With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

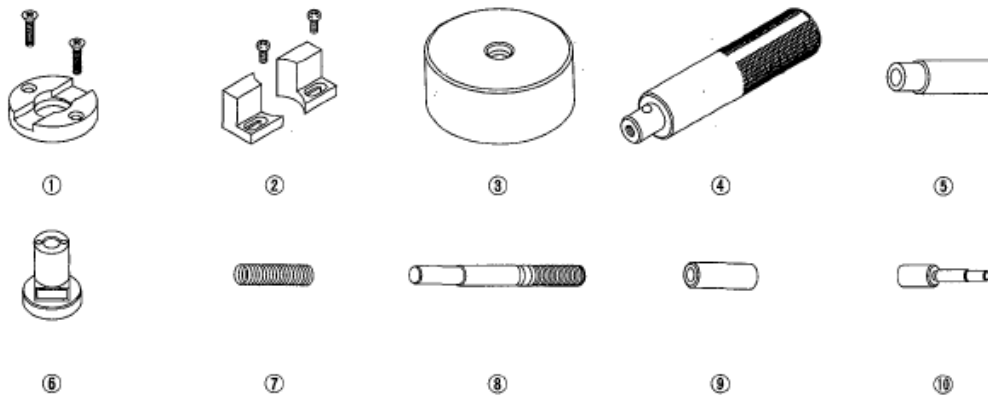
38. Install the intake manifold (see **INSTALLATION**).
39. Install the air cleaner assembly (see **AIR CLEANER REMOVAL/INSTALLATION**).
40. Install the engine cover (see step 53 in **ENGINE INSTALLATION**).
41. After installation, check that all tubes, hoses, and connectors are installed correctly.
42. 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.
43. Refill the radiator with engine coolant, and bleed air from the cooling system with the heater valve open (see step 9 on **COOLANT REPLACEMENT**).
44. Check for fluid leaks.
45. Do the CKP pattern clear/CKP pattern learn procedure (see **CRANK (CKP) PATTERN CLEAR/CRANK (CKP) PATTERN LEARN**).
46. Inspect the idle speed (see **IDLE SPEED INSPECTION**).
47. Inspect the ignition timing (see **IGNITION TIMING INSPECTION**).

2006-11 ENGINE

Engine Block - Civic Hybrid

SPECIAL TOOLS

Ref. No.	Tool Number	Description	Qty
①	07PAF-0010400	Piston Base Head	1
②	07PAF-0010500	Piston Base Head Insert (2)	1
③	07ZAD-PNA0100	Oil Seal Driver Attachment	1
④	07749-0010000	Handle Driver	1
⑤	07973-6570201	Adjustable Piston Pin Driver Head	1
⑥	07973-6570500	Piston Base	1
⑦	07973-6570600	Piston Base Spring	1
⑧	07973-6890200	Adjustable Piston Pin Driver Shaft	1
⑨	07973-6890300	Pilot Collar	1
⑩	07973-6890400	Piston Pin Base Insert	1

**Fig. 1: Identifying Special Tools**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

COMPONENT LOCATION INDEX

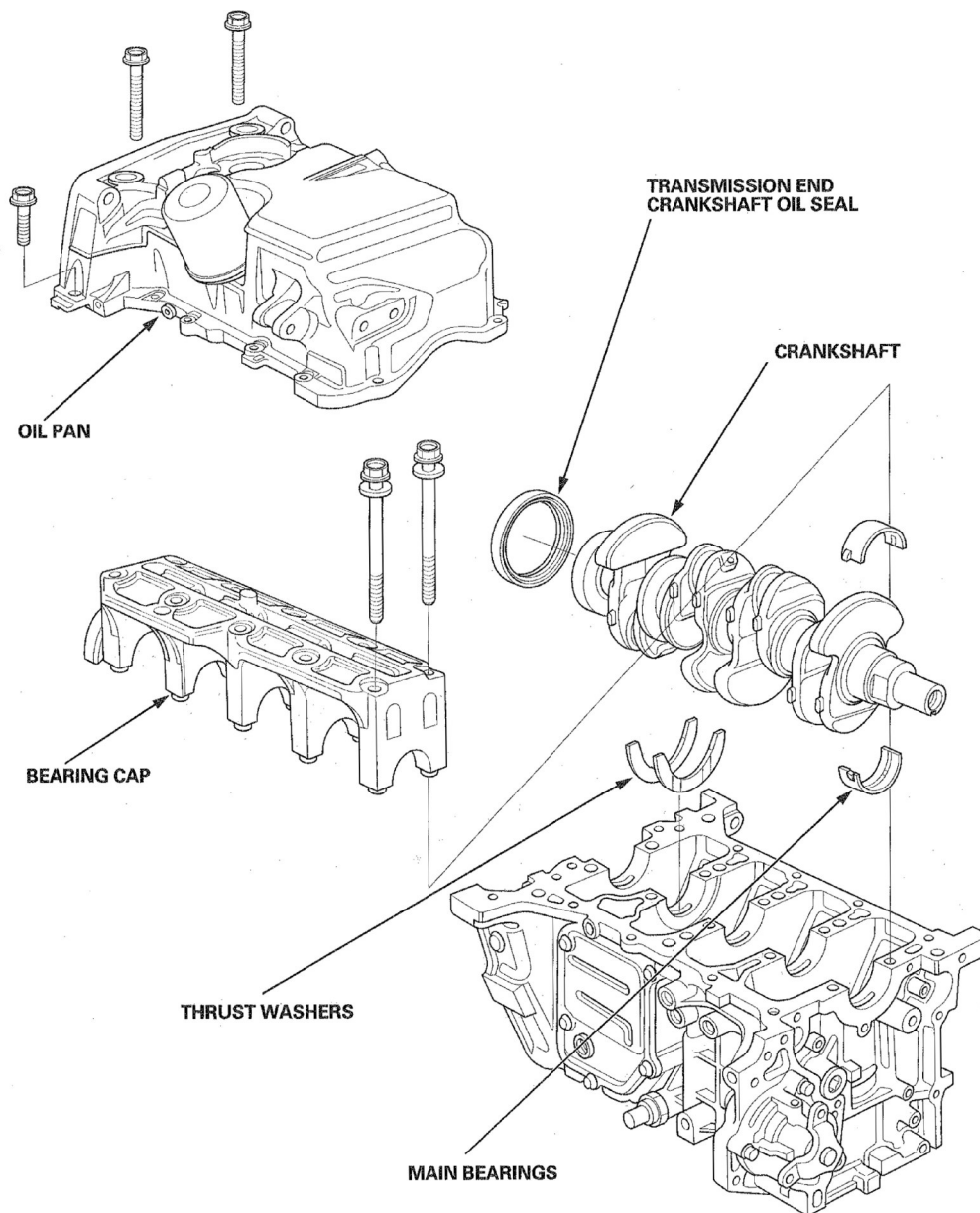


Fig. 2: Identifying Engine Block Components (1 Of 2)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Connecting Rod End Play
Standard (New): 0.15—0.30 mm
(0.006—0.012 in.)
Service Limit: 0.40 mm (0.016 in.)

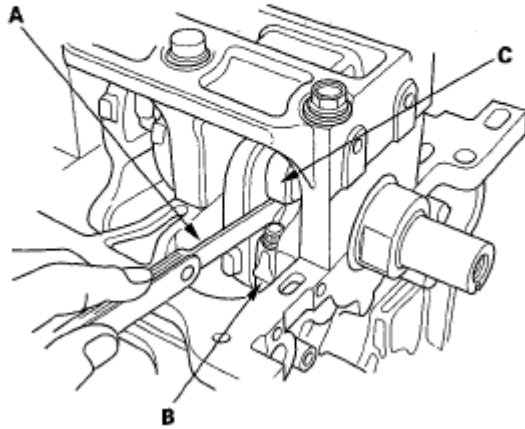


Fig. 4: Measuring Connecting Rod End Play With Feeler Gauge Between Connecting Rod & Crankshaft

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. 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**).
4. 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.)

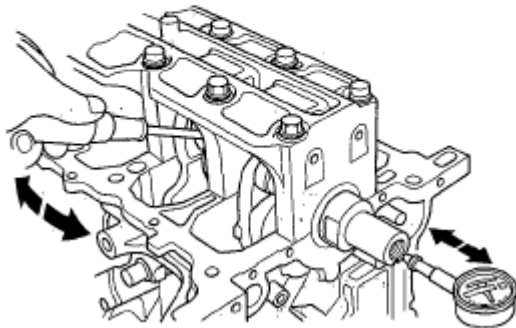


Fig. 5: Measuring Crankshaft End Play

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. If the 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. Remove the bearing cap and the 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 bearing half and the bearing cap, then torque the bolts to 25 N.m (2.5 kgf.m, 18 lbf.ft) +40° (see step 18).

NOTE: Do not rotate the crankshaft during inspection.

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

Main Bearing-to-Journal Oil Clearance
Standard (New): 0.018 — 0.036 mm
(0.0007 — 0.0014 in.)
Service Limit: 0.050 mm (0.0020 in.)

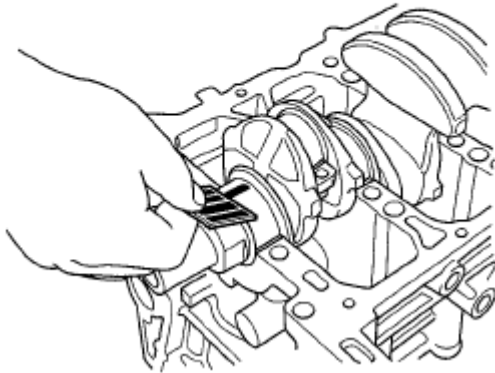


Fig. 6: Measuring Widest Part Of Plastigage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. 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 same color code, and recheck the clearance. Do not file, shim, or scrape the bearings or the caps to adjust clearance.
7. If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below that one), and check again. If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft (see CRANKSHAFT AND PISTON REMOVAL) and start over.

MAIN BEARING SELECTION

Crankshaft Bore Code Location

1. Letters 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.

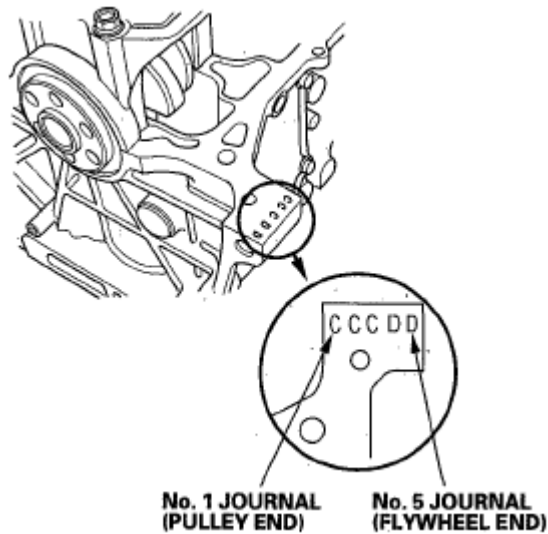


Fig. 7: Identifying Crankshaft Bore Code Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Main Journal Code Location

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

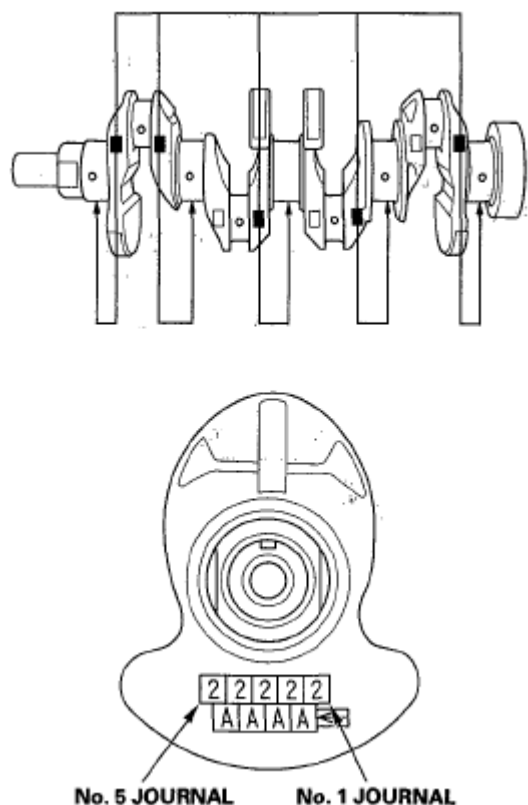


Fig. 8: Identifying Main Journal Code Location
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

NOTE: Color code is on the edge of the bearing.

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

Fig. 9: Identifying Crank Bore Codes & Crank Journal Codes Table
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

CONNECTING ROD BEARING REPLACEMENT

CONNECTING ROD BEARING CLEARANCE INSPECTION

1. To check rod bearing-to-journal oil clearance, remove the bearing cap (see CRANKSHAFT AND PISTON REMOVAL).
2. Remove the connecting rod cap and the bearing half.
3. Clean the crankshaft rod journal and the bearing half with a clean shop towel.
4. Place plastigage across the rod journal.
5. Reinstall the bearing half and connecting rod cap, and torque the bolts.

NOTE:

- Apply new engine oil to the bolt threads and flanges.
- Do not rotate the crankshaft during inspection.

Tightening Torque:

9.8 N.m (1.0 kgf.m, 7.2 lbf.ft) +90°

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

Connecting Rod Bearing-to-Journal Oil Clearance

Standard (New): 0.020-0.038 mm (0.0008-0.0015 in.)

Service Limit: 0.050 mm (0.0020 in.)

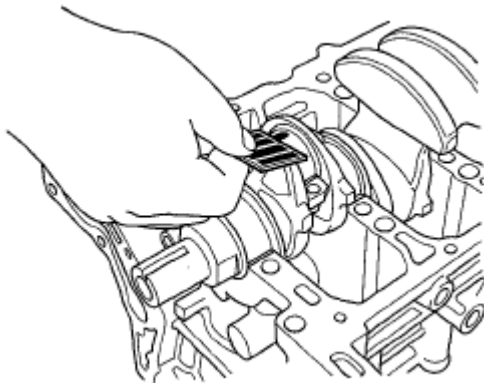


Fig. 10: Measuring Widest Part Of Plastigage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. If the plastigage measures too wide or too narrow, remove the upper half of the bearing, install a new, complete bearing with the same color code, 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 that one), and check clearance again. If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft (see **CRANKSHAFT AND PISTON REMOVAL**) and start over.

CONNECTING ROD BEARING SELECTION

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

Connecting Rod Big End Bore Code Locations

2. Each connecting rod falls into one of four tolerance ranges (from 0 to 0.024 mm (0.0009 in.), in 0.006 mm (0.0002 in.) increments) depending on the size of its big end bore.

It's then stamped with a number or bar (1, 2, 3, or 4) indicating the range. You may find any combination of 1, 2, 3, or 4 in any engine.

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

Normal Bore Size: 43.0 mm (1.69 in.)

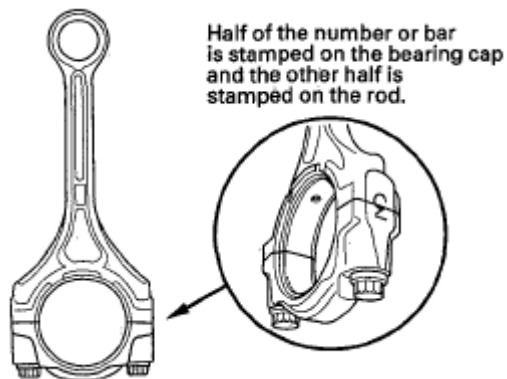


Fig. 11: Identifying Connecting Rod Big End Bore Code Locations
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Connecting Rod Journal Code Location

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

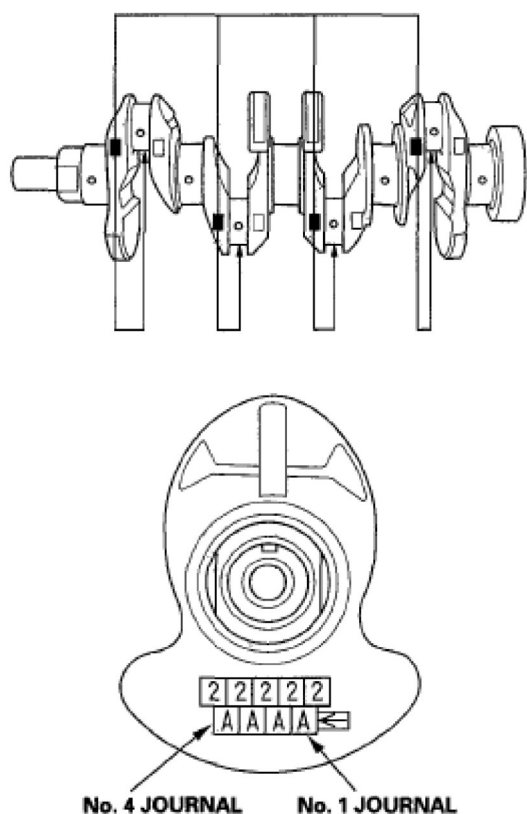


Fig. 12: Identifying Connecting Rod Journal Code Location
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

NOTE: Color code is on the edge of the bearing.

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

Fig. 13: Identifying Big End Bore Codes & Rod Journal Codes Table
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

OIL PAN REMOVAL

1. If the engine is already out of the vehicle, go to step 26.
2. Raise the vehicle on the lift.
3. Remove the front wheels.
4. Remove the engine undercover and the splash shield (see step 21 on ENGINE REMOVAL).
5. Drain the engine oil (see ENGINE OIL REPLACEMENT).
6. Lower vehicle on the lift.
7. Remove the A/C condenser fan shroud assembly (see RADIATOR AND FAN REPLACEMENT).
8. Disconnect the A/C compressor clutch connector, then remove the A/C compressor (see step 27 on ENGINE REMOVAL).
9. Remove the steering wheel (see STEERING WHEEL REMOVAL), then remove the steering joint bolt (see step 32 on ENGINE REMOVAL).
10. Raise the vehicle on the lift.
11. Remove the intake manifold bracket and the harness bracket and the harness clamp (see step 10 on REMOVAL).
12. Disconnect the steering gearbox harness connectors (see step 43 on ENGINE REMOVAL).
13. Remove the under-floor three way catalytic converter (TWC) (see step 39 on ENGINE REMOVAL).
14. Disconnect the front stabilizer links (see STABILIZER LINK REMOVAL/INSTALLATION).
15. Disconnect the suspension lower arm ball joints (see LOWER BALL JOINT REPLACEMENT).
16. Lower the vehicle on the lift.
17. Attach the universal lifting eyelet (07AAK-SNAA120) to the threaded hole on the cylinder head with a 10 x 1.25 mm bolt. (See step 45 on ENGINE REMOVAL).
18. Install the front leg assembly, the hook, and the wing nut to an A and Reds engine support hanger (AAR-T1256) onto the 2006 civic engine hanger (VSB02C000025). Carefully position the engine hanger on the vehicle, and attach the hook to the universal lifting eyelet. Tighten the wing nut by hand to lift and support the engine/IMA motor/transmission (see step 46 on ENGINE REMOVAL).
19. Raise the vehicle on the lift.
20. Remove the lower torque rod mounting bolts (see step 48 on ENGINE REMOVAL).
21. make the appropriate reference line at the both side front subframe that line up with the edge on the body (see step 49 on ENGINE REMOVAL).
22. Loosen the mid stiffener mounting bolts (see step 50 on ENGINE REMOVAL).
23. Attach the subframe adapter (VSB02C000016) to the front subframe by looping the belt over the front of the front subframe, then secure the belt with its stop, then tighten the wing nut (see step 51 on ENGINE REMOVAL).
24. Raise the jack and line up the slots in the subframe adapter arms with the bolt holes on the jack base, then carefully attach them with four bolts (see step 52 on ENGINE REMOVAL).
25. Remove the four bolts securing the front subframe, and lower the front subframe (see step 53 on ENGINE REMOVAL).
26. Remove the harness clamps (A) and the mounting bolt (B), then remove the dipstick tube (C).

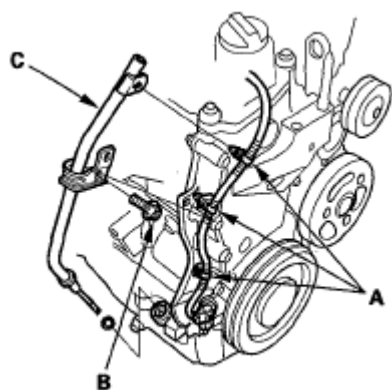


Fig. 14: Locating Harness Clamps, Mounting Bolt & Dipstick Tube
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

27. Remove the lower torque rod bracket mounting bolts.

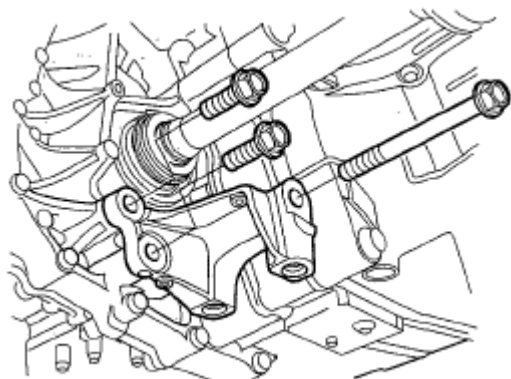


Fig. 15: Identifying Lower Torque Rod Bracket Mounting Bolts
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

28. Remove the two bolts securing the transmission.

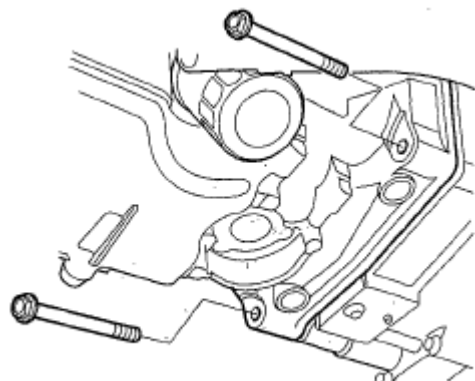


Fig. 16: Identifying Bolts Securing Transmission
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

29. Remove the bolts securing the oil pan.
30. Insert a flat blade screwdriver where shown, and separate the oil pan from the engine block.

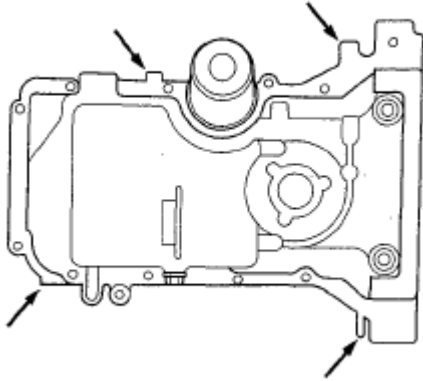


Fig. 17: Locating Engine Block Insert Flat Blade Screwdriver Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

31. Remove the oil pan.

NOTE: Lower the oil pan carefully not to damage the IMA motor (resolver stator).

CRANKSHAFT AND PISTON REMOVAL

1. Remove the engine/IMA motor/transmission assembly (see ENGINE REMOVAL).
2. Remove the IMA motor housing (see MOTOR HOUSING REMOVAL/INSTALLATION).
3. Remove the cam chain (see CAM CHAIN REMOVAL).
4. Remove the cylinder head (see CYLINDER HEAD REMOVAL).
5. Remove the oil strainer (A), then remove the oil pump (B).

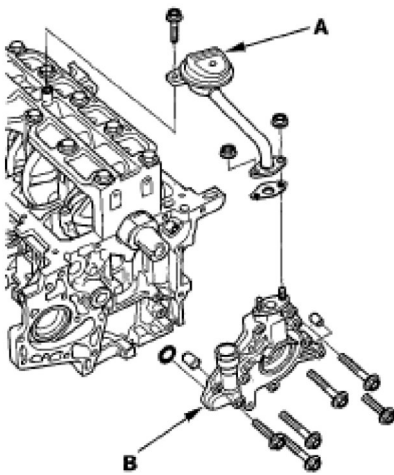


Fig. 18: Locating Oil Strainer & Oil Pump

Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. 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.

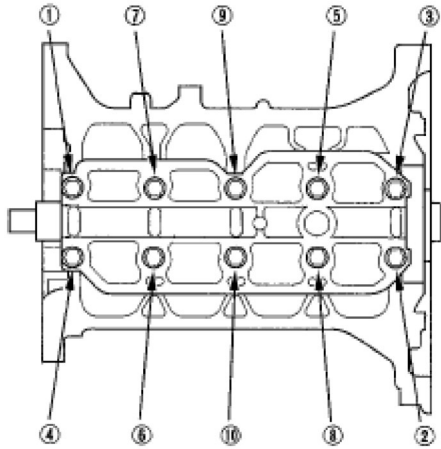


Fig. 19: Identifying Bearing Cap Bolts Loosening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the bearing cap.
8. Remove the connecting rod caps/bearings. Keep all caps/bearings in order.
9. Lift the crankshaft out of the engine block, being careful not to damage the journals.

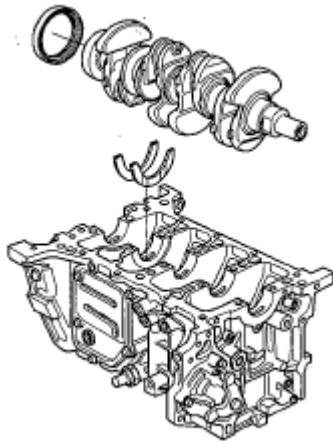


Fig. 20: Identifying Crankshaft Out, Engine Block & Journals
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Remove the upper bearing halves from the connecting rods, and set them aside with their respective caps.
11. 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.

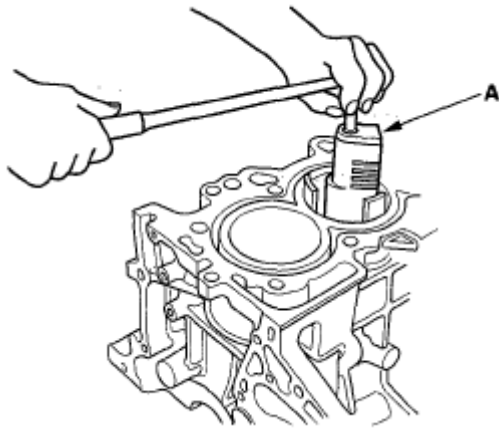


Fig. 21: Identifying Ridge Of Metal Or Hard Carbon With Ridge Reamer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

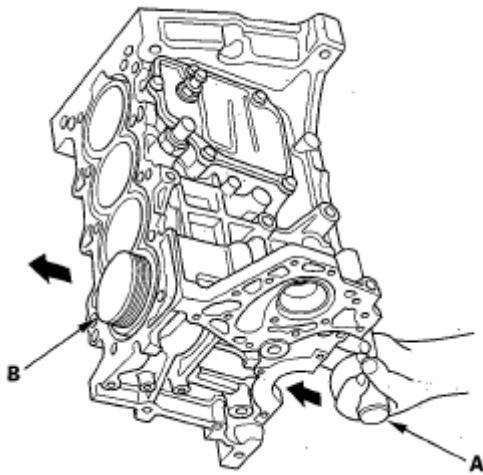


Fig. 22: Using Wooden Handle Of Hammer To Remove Piston/Connecting Rod Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Reinstall the bearing cap and bearings on the engine block.
14. Reinstall the connecting rod bearings and caps after removing each piston/connecting rod assembly.
15. Mark each piston/connecting rod assembly with its cylinder number to make sure that they are reinstalled 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 slot and the threaded holes for damage.
4. Measure the out-of round at the middle of each rod and the main journal in two places. The difference between measurements on each journal must not be more than the service limit.

Journal Out-of-Round

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

Service Limit: 0.010 mm (0.0004 in.)

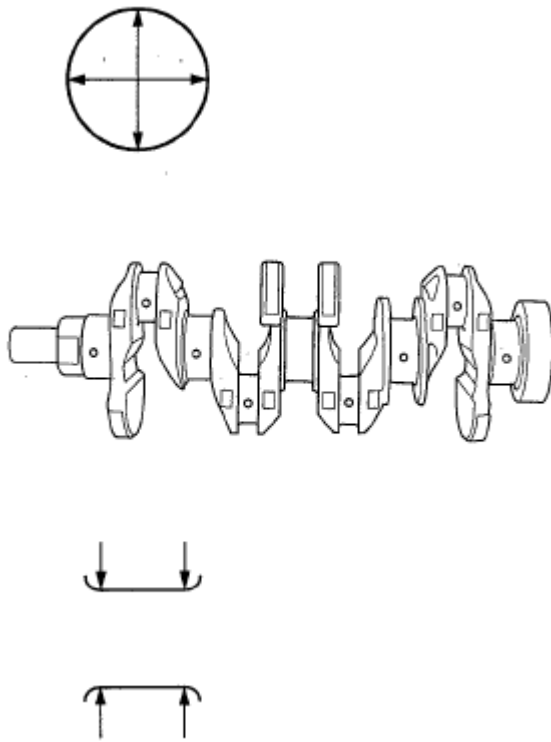


Fig. 23: Measuring Journal Out-Of-Round
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Measure the taper at the edges of each rod and the 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 block on the surface plate.
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 (0.001 in.) max.

Service Limit: 0.04 mm (0.002 in.)

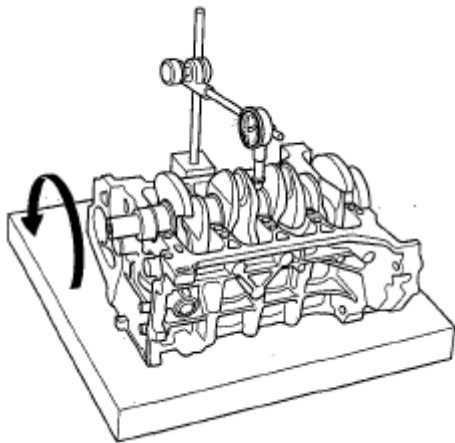


Fig. 24: Measuring Crankshaft Total Runout
Courtesy of AMERICAN HONDA MOTOR CO., INC.

BLOCK AND PISTON INSPECTION

1. Remove the crankshaft and the pistons (see **CRANKSHAFT AND PISTON REMOVAL**).
2. Check the piston for distortion or cracks.
3. Measure the piston skirt diameter (A) at a point 13 mm (0.5 in.) from the bottom of the skirt.

Piston Diameter

Standard (New): 72.98-72.99 mm (2.873-2.874 in.)

Service Limit: 72.97 mm (2.873 in.)

Oversize Piston Diameter

0.25: 73.23-73.24 mm (2.8831-2.8835 in.)

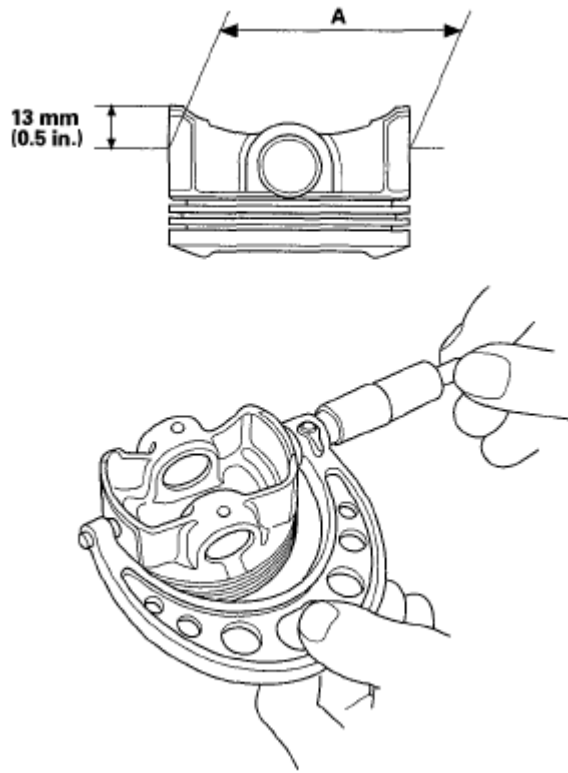


Fig. 25: Measuring Piston Diameter At Point 13 mm (0.5 in.) From Bottom Of Skirt
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Measure the wear and taper in direction X and Y at three levels in each cylinder as shown below. 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): 73.00-73.02 mm (2.874-2.875 in.)

Service Limit: 73.07 mm (2.877 in.)

Oversize

0.25: 73.25-73.27 mm (2.8839-2.8846 in.)

Reboring Limit: 0.25 mm (0.010 in.) max.

Bore Taper

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

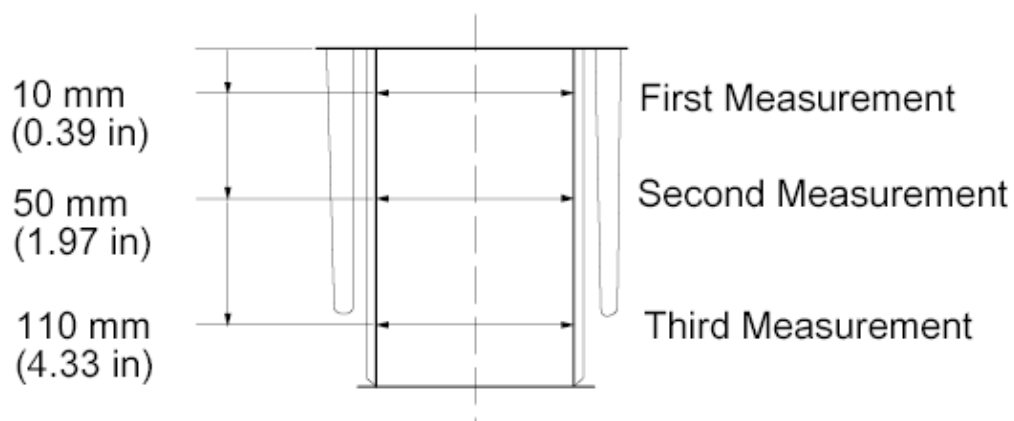


Fig. 26: 1st, 2nd and 3rd Measurements

Courtesy of AMERICAN HONDA MOTOR CO., INC.

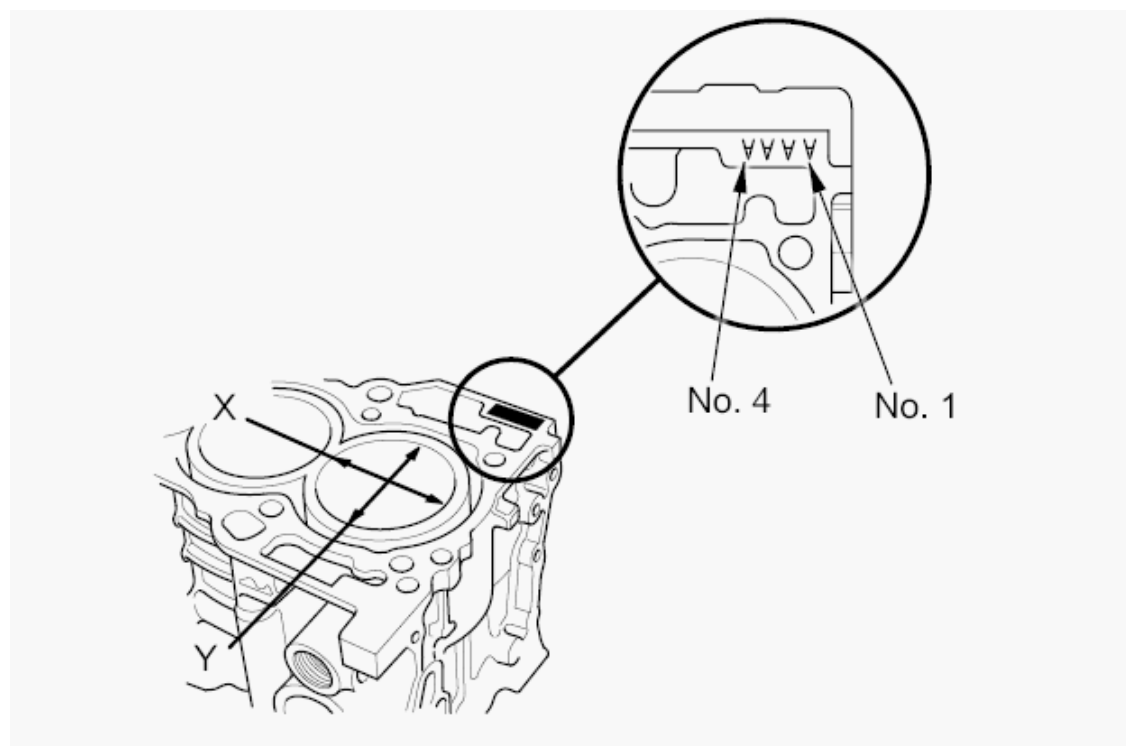


Fig. 27: Identifying Marks

Courtesy of AMERICAN HONDA MOTOR CO., INC.

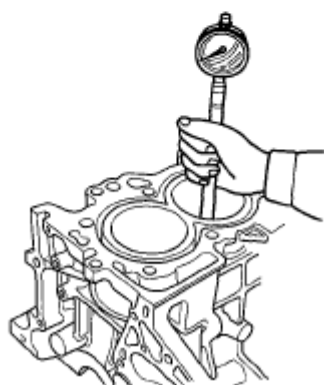
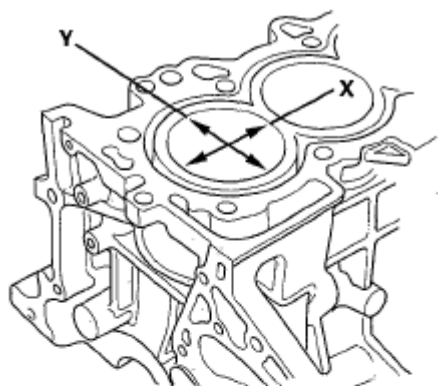


Fig. 28: Measuring Wear & Taper In Direction X & Y At Three Levels In Each Cylinder
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Hone any scored or scratched cylinder bores.
6. Check the top of the engine block for warpage.

Measure the along the edges and across the center as shown below.

Engine Block Warpage

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

Service Limit: 0.10 mm (0.004 in.)

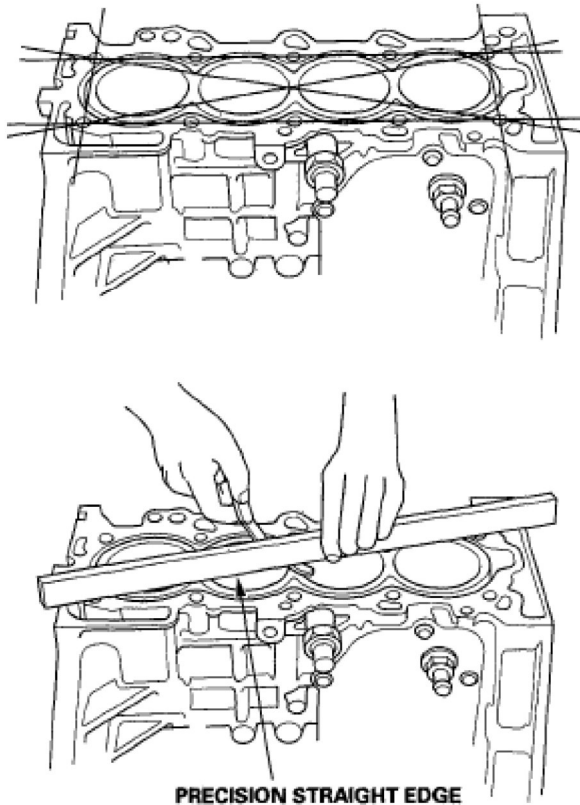


Fig. 29: Checking Top Of Engine Block For Warpage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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 the engine block for excessive wear.

Piston-to-Cylinder Bore Clearance

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

Service Limit: 0.05 mm (0.002 in.)

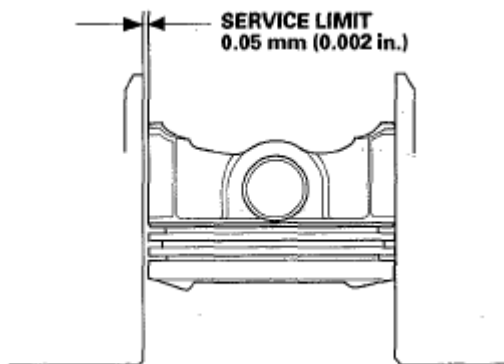


Fig. 30: Identifying Piston-To-Cylinder Bore Clearance

Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER BORE HONING

Only a scored or scratched cylinder core 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. Only a scored or scratched cylinder bore must be honed.

2. Hone the cylinder bores with honing oil and a fine (400 grit) stone in a 60 degree cross-hatch pattern.

NOTE:

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

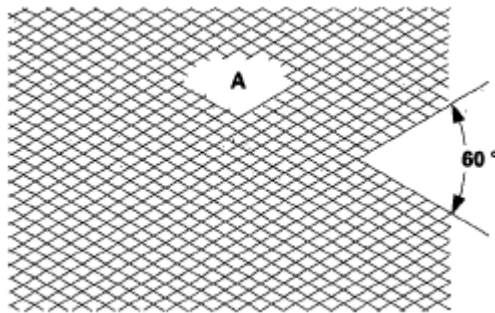


Fig. 31: Identifying Honing 60 Degree Cross-Hatch Pattern
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

SPECIAL TOOLS REQUIRED

- Piston base 07973-6570500
- Piston base spring 07973-6570600
- Piston pin base insert 07973-6890400
- Piston base head 07PAF-0010400

- Pilot collar 07973-6890300
- Adjustable piston pin driver shaft 07973-6890200
- Adjustable piston pin driver head 07973-6570201
- Piston base head insert (2) 07PAF-0010500

DISASSEMBLY

1. Assemble the piston base (A), piston base spring (B), piston pin base insert (C), and piston base head (D) as shown below.

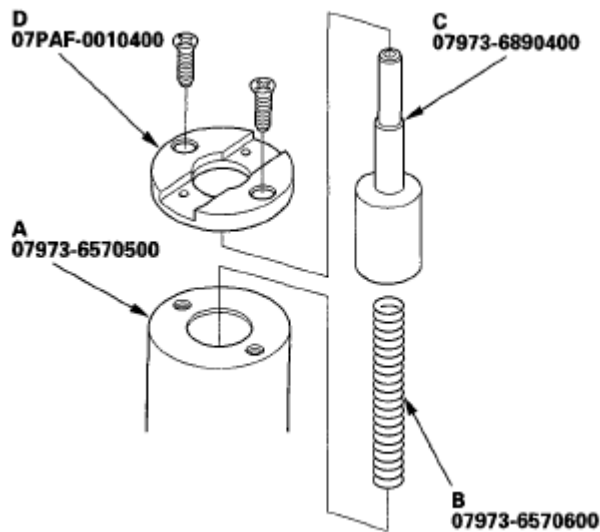


Fig. 32: Locating Piston Base, Piston Base Spring, Piston Pin Base Insert & Piston Base Head
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Temporarily install the pilot collar over the piston pin base insert (A), and adjust the piston base head inserts as shown below, then tighten the screws (B). Remove the pilot collar.

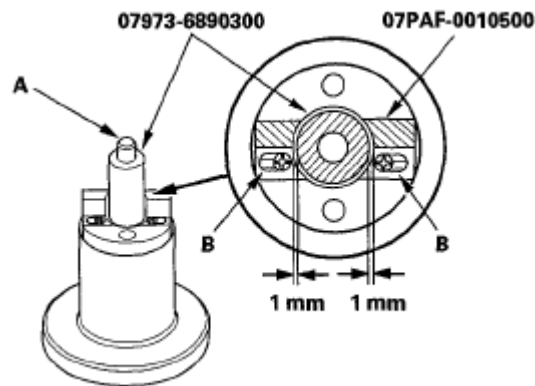


Fig. 33: Locating Piston Pin Base Insert
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Assemble and adjust the length of the piston pin driver head and shaft to 57 mm (2.2 in.).

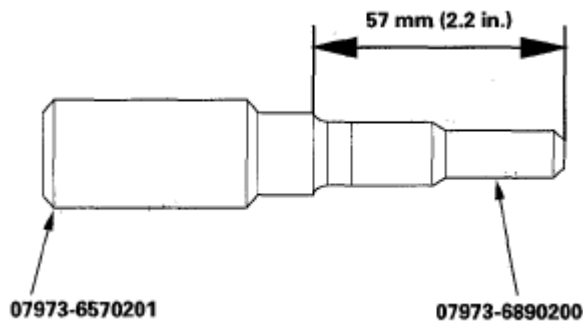


Fig. 34: Identifying Length Of Piston Pin Driver Head & Shaft To 57 mm (2.2 in.)
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. With the arrow on top of the piston pointing up, place the piston assembly (A) on the piston base (B). Be sure you position the recessed flat area of the piston against the piston base head inserts (C) as shown below.

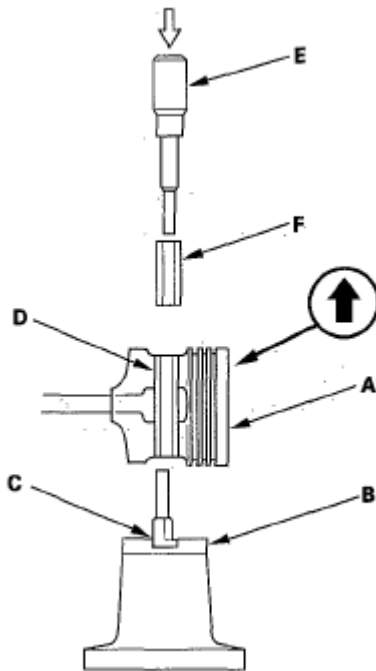


Fig. 35: Placing Piston Assembly On Piston Base
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Press the pin (D) out with the piston pin driver (E), the pilot collar (F), and a hydraulic press.

INSPECTION

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

temperature.

1. Measure the diameter of the piston pin.

Piston Pin Diameter

Standard (New): 17.996-18.000 mm (0.7085-0.7087 in.)

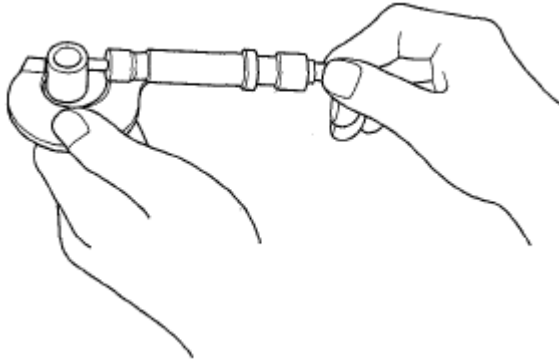


Fig. 36: Measuring Diameter Of Piston Pin
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

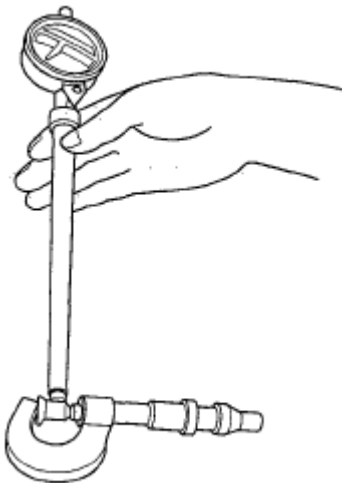


Fig. 37: Zeroing Dial Indicator To Piston Pin Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Piston Pin-to-Piston Clearance

Standard (New): 0.010-0.018 mm (0.0004-0.0007 in.)

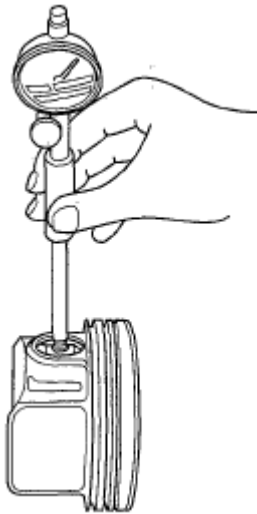


Fig. 38: Checking Difference Between Piston Pin Diameter & Piston Pin Hole Diameter In Piston
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Check the difference between the piston pin diameter and the connecting rod small end diameter.

Piston Pin-to-Connecting Rod Clearance

Standard (New): 0.019-0.036 mm (0.0007-0.0014 in.)

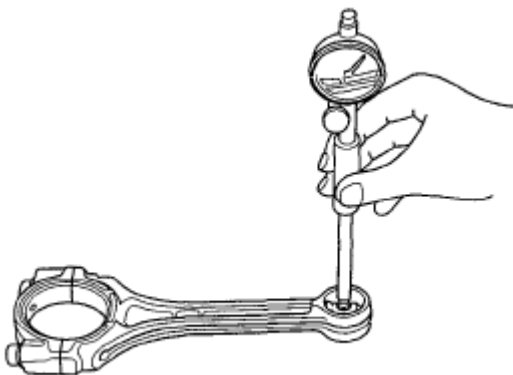


Fig. 39: Checking Difference Between Piston Pin Diameter & Connecting Rod Small End Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REASSEMBLY

1. Assemble the piston with the arrow (A) pointing up and the connecting rod with the embossed marks (B) on the same side.

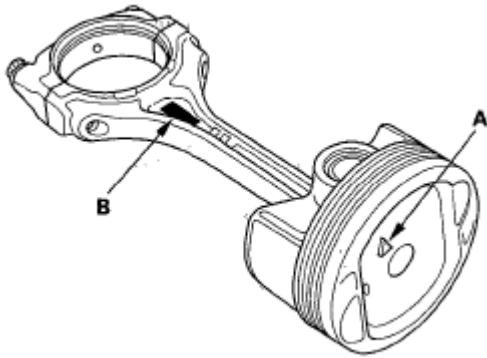


Fig. 40: Identifying Piston Arrow Pointing Up & Connecting Rod With Embossed Marks On Same Side

Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Insert the pilot collar (A) into the piston and the connecting rod.

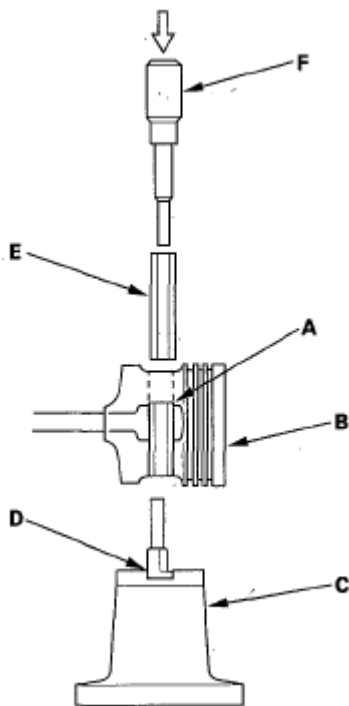


Fig. 41: Inserting Pilot Collar Into Piston & Connecting Rod

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. With the arrow on top of the piston and the embossed mark on the connecting rod facing up, place the piston assembly (B) on the piston base (C). Be sure you position the recessed flat area of the piston against the piston base head inserts (D) as shown below.
4. Press the pin (E) in with the piston pin driver (F) and a hydraulic press.

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).

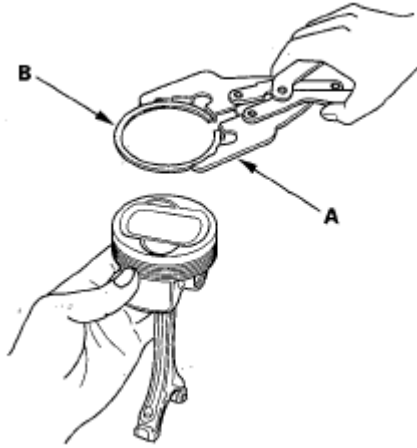


Fig. 42: Removing Piston Rings Using Ring Expander
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Clean all the ring grooves thoroughly with a squared-off broken ring, or a ring groove cleaner with a blade to fit the piston grooves. File down the blade, if necessary. The top ring grooves are 1.0 mm (0.04 in.) wide, the second ring groove is 1.2 mm (0.05 in.) wide, and the oil ring groove is 2.0 mm (0.08 in.) wide. Do not use a wire brush to clean the ring grooves, or cut the ring grooves deeper with the cleaning tool.

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

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

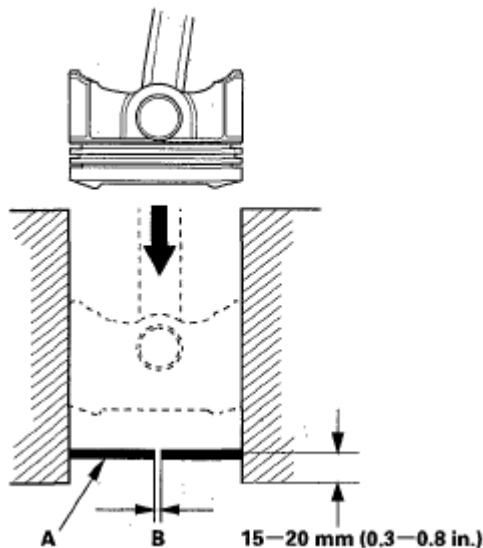


Fig. 43: Pushing Ring Into Cylinder Bore 15-20 mm (0.6-0.8 in.) From Bottom
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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 over the service limit, the engine block must be rebored.

Piston Ring End-Gap

Top Ring:

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

Service Limit: 0.60 mm (0.024 in.)

Second Ring:

Standard (New): 0.35-0.50 mm (0.014-0.020 in.)

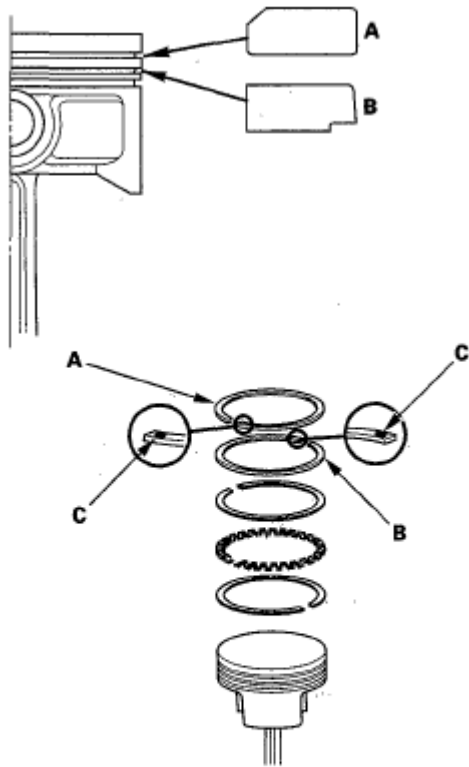
Service Limit: 0.65 mm (0.026 in.)

Oil Ring:

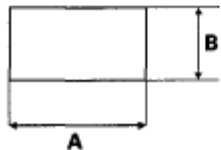
Standard (New): 0.20-0.70 mm (0.008-0.028 in.)

Service Limit: 0.80 mm (0.031 in.)

6. Install the rings as shown. The top ring (A) has a Z1R mark and the second ring (B) has a R mark. The manufacturing marks (C) must be facing upward.



Piston Ring Dimensions:



Top Ring (Standard)

A: 2.3 mm (0.09 in.)

B: 1.0 mm (0.04 in.)

Second Ring (Standard)

A: 3.0 mm (1.2 in.)

B: 1.2 mm (0.05 in.)

Fig. 44: Locating Top Ring Z1R Mark & Second Ring R Mark
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

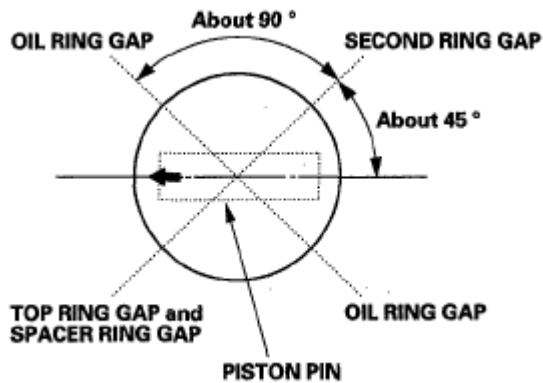


Fig. 45: Identifying Ring End Gaps Position

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Top Ring Clearance

Standard (New): 0.065-0.090 mm (0.0025-0.0035 in.)

Service Limit: 0.15 mm (0.006 in.)

Second Ring Clearance

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

Service Limit: 0.13 mm (0.005 in.)

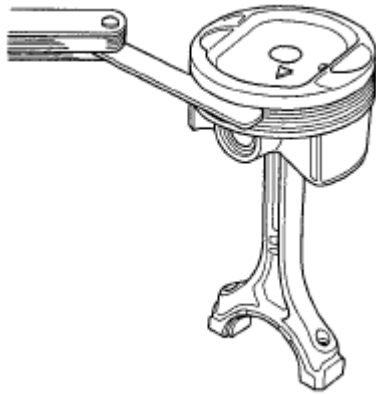


Fig. 46: Measuring Ring-To-Groove Clearances
Courtesy of AMERICAN HONDA MOTOR CO., INC.

PISTON INSTALLATION

IF THE CRANKSHAFT IS ALREADY INSTALLED

1. Set the crankshaft to bottom dead center (BDC) for each cylinder.
2. Apply new engine oil to the piston, inside of the ring compressor, and the cylinder bore.
3. Attach the ring compressor to the piston/connecting rod assembly, and check that the bearing is securely in place.
4. Position the piston/connecting rod assembly with the arrow (A) facing the cam chain side of the engine.

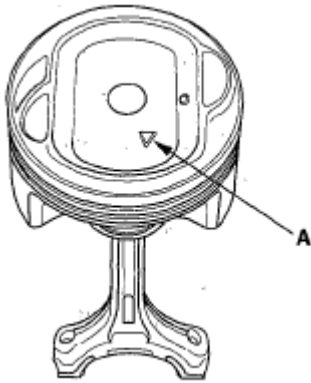


Fig. 47: Locating Piston/Connecting Rod Assembly Arrow
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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.

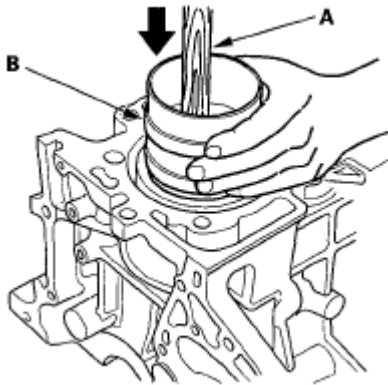


Fig. 48: Positioning Piston/Connecting Rod Assembly In Cylinder
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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 **CONNECTING ROD BEARING REPLACEMENT**).
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. Tighten the bolts to 9.8 N.m (1.0 kgf.m, 7.2 lbf.ft).
10. Tighten the connecting rod bolts an additional 90°.

NOTE: Remove the connecting rod bolt if you tightened it beyond the specified angle, and go back to step 7 of the procedure. Do not loosen it back to the

specified angle.

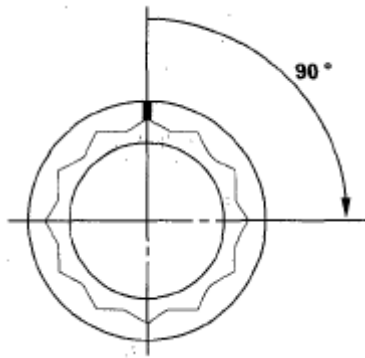


Fig. 49: Tightening Connecting Rod Bolts Additional 90°
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

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 arrow (A) facing the timing chain side of the engine.

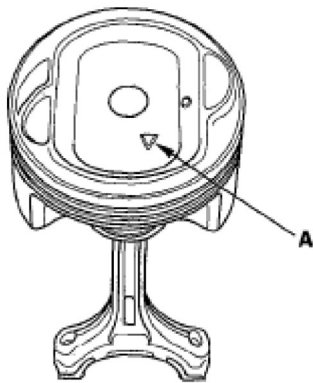


Fig. 50: Positioning Arrow Facing Timing Chain Side Of Engine
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Position the piston/connecting rod assembly in the cylinder, and tap it in using the wooden handle of a hammer (A).

Maintain downward force on the ring compressor (B) to prevent the rings from expanding before entering the cylinder bore.

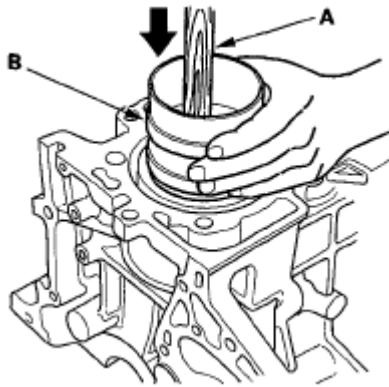


Fig. 51: Positioning Piston/Connecting Rod Assembly In Cylinder
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

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 with a micrometer.

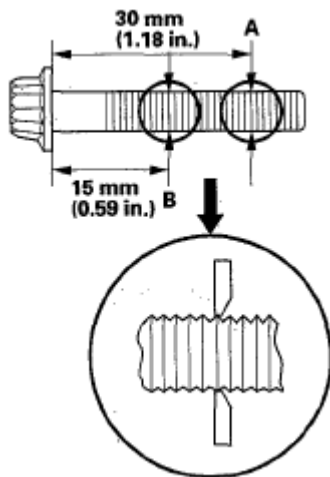


Fig. 52: Measuring Diameter Of Each Connecting Rod Bolt At Point A & B With Micrometer
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Point A-Point B = Difference in Diameter

Difference in Diameter

Specification: 0-0.05 mm (0-0.002 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
 - Oil seal driver attachment 07ZAD-PNA0100
1. Check the connecting rod bearing clearance with plastigage (see CONNECTING ROD BEARING REPLACEMENT).
 2. Check the main bearing clearance with plastigage (see CRANKSHAFT MAIN BEARING REPLACEMENT).
 3. Install the bearing halves in the engine block and connecting rods.
 4. Apply a coat of new engine oil to the main bearings and rod bearings.
 5. Hold the crankshaft so rod journal No. 2 and rod journal No. 3 are straight up, then lower the crankshaft into the engine block.
 6. Apply new engine oil to the thrust washer surfaces. Install the thrust washers (A) in the No. 4 journal of the engine block.

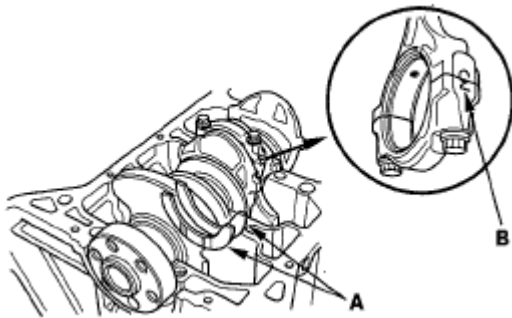


Fig. 53: Locating Thrust Washers

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Inspect the connecting rod bolts (see CONNECTING ROD BOLT INSPECTION).
8. Apply new engine oil to the threads of the connecting rod bolts.
9. 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.
10. 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.
11. Tighten the connecting rod bolts to 9.8 N.m (1.0 kgf.m, 7.2 lbf.ft).
12. Tighten the connecting rod bolts an additional 90°.

NOTE: Remove the connecting rod bolt if you tightened it beyond the specified angle, and go back to step 7 of the procedure. Do not loosen it back to the specified angle.

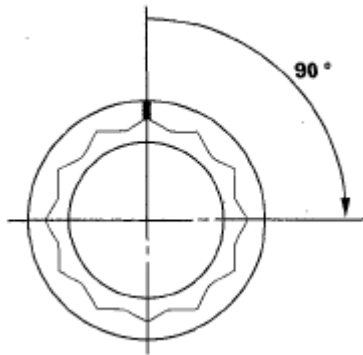


Fig. 54: Tightening Connecting Rod Bolts Additional 90°
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Remove any old liquid gasket from the bearing cap mating surfaces.
14. Clean and dry the bearing cap mating surfaces.
15. Apply a 1.5 mm wide bead of the liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, along the broken lines (A). 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.

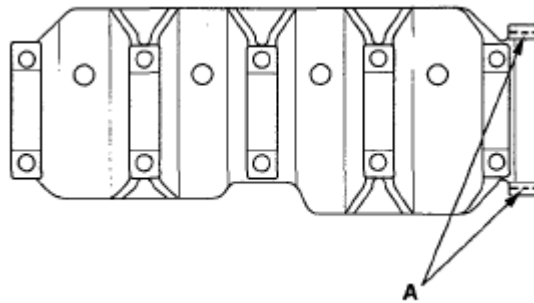


Fig. 55: Locating Bead Of Liquid Gasket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

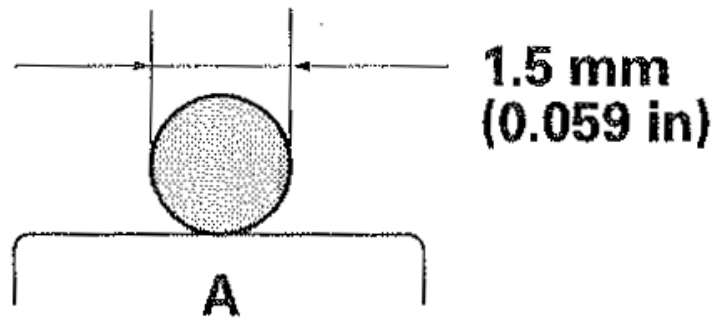


Fig. 56: Identifying Liquid Gasket Specification
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

16. Put the bearing cap on the engine block.
17. Apply new engine oil to the threads of the bearing cap bolts.
18. Tighten the bearing cap bolts in sequence to 25 N.m (2.5 kgf.m, 18 lbf.ft).

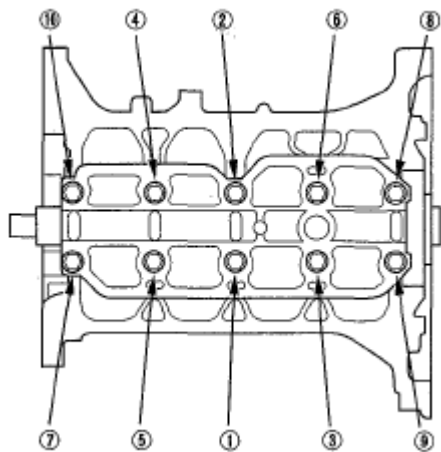


Fig. 57: Identifying Bearing Cap Bolt Tightening Sequence
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Tighten the bearing cap bolts an additional 40°.

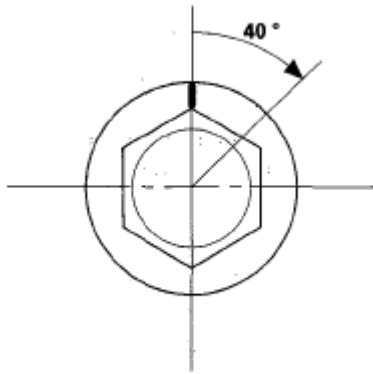


Fig. 58: Tightening Bearing Cap Bolts Additional 40°
Courtesy of AMERICAN HONDA MOTOR CO., INC.

20. Clean the excess liquid gasket off the engine block.
21. Apply a light coat of new engine oil to the lip of the crankshaft oil seal.
22. Use the handle driver and oil seal driver attachment to drive a new crankshaft oil seal squarely into the block to the specified installed height.

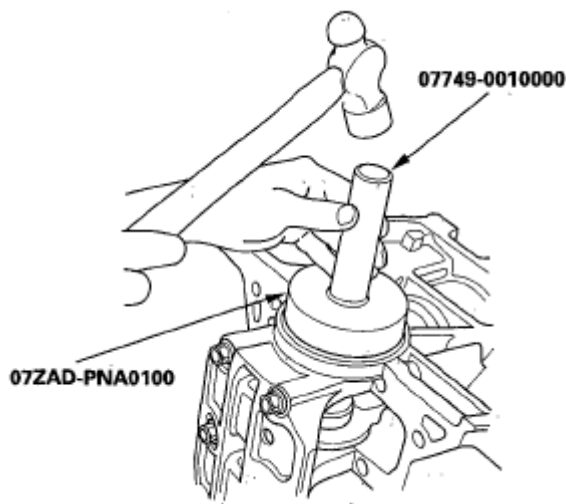


Fig. 59: Identifying Oil Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

23. Measure the distance between the crankshaft (A) and the oil seal (B).

Oil Seal Installed Height: 7-8 mm (0.28-0.31 in.)

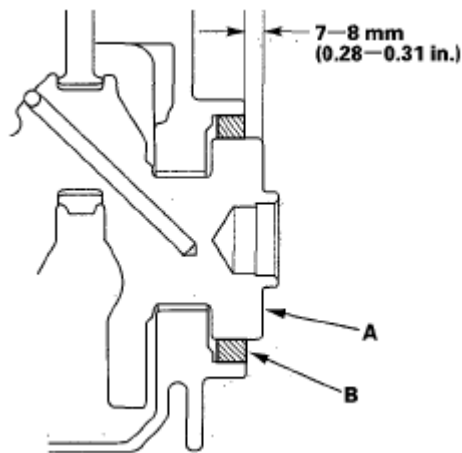


Fig. 60: Locating Crankshaft & Oil Seal

Courtesy of AMERICAN HONDA MOTOR CO., INC.

24. Install the dowel pins (A) and a new O-ring (B) on the oil pump (C), then align the inner rotor with the crankshaft, and install the oil pump.

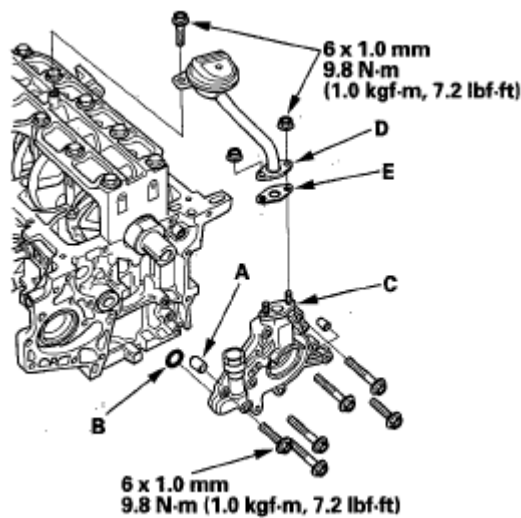


Fig. 61: Locating Dowel Pins, O-Ring & Oil Pump With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

25. Install the oil screen (D) with a new gasket (E).
26. Install the cylinder head (see **ROCKER ARM ASSEMBLY AND CAMSHAFT INSTALLATION**).
27. Install the cam chain (see **CAM CHAIN INSTALLATION**).
28. Install the IMA motor housing (see **MOTOR HOUSING REMOVAL/INSTALLATION**).
29. Install the engine/IMA motor/transmission assembly (see **ENGINE INSTALLATION**).

NOTE: When any crankshaft or connecting rod bearing is replaced, after assembly it is necessary 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 any old liquid gasket from the oil pan mating surfaces, bolts, and bolt holes.
2. Clean and dry the oil pan mating surfaces and the O-ring groove.
3. Install the dowel pins (A), and install the new O-ring (B) and oil pan gasket (C) on the oil pan.

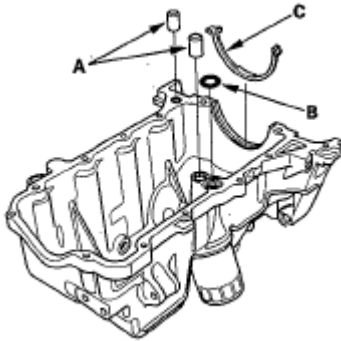


Fig. 62: Locating Dowel Pins, O-Ring & Oil Pan Gasket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Apply liquid gasket, P/N 08718-0001, or 08718-0009, evenly to the engine block mating surface of the oil pan and to the inside edge of the bolt holes. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

- Apply a 1.5 mm wide bead of the liquid gasket along the broken line (A).
- Apply a 5.0 mm wide bead of the liquid gasket to the shaded area (B).
- 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.

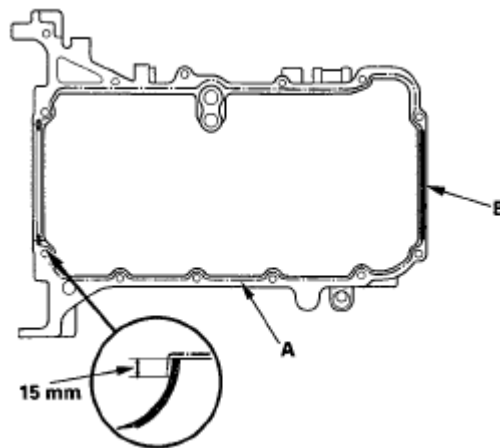


Fig. 63: Locating Bead Of Liquid Gasket To Shaded Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

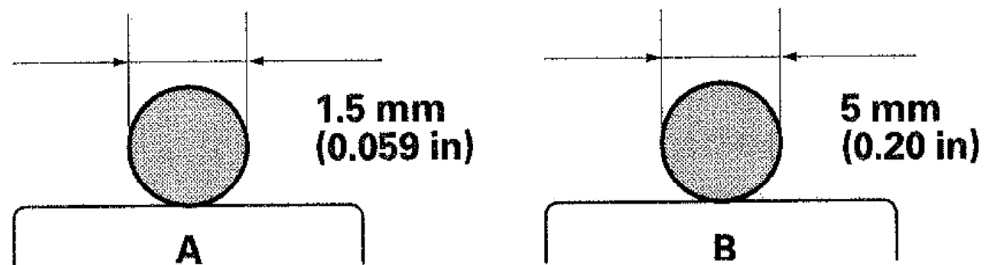


Fig. 64: Identifying Liquid Gasket Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Install the oil pan.

NOTE: **Raise the oil pan carefully not to damage IMA motor (resolver stator).**

6. Tighten the bolts in three steps. Wipe off the excess liquid gasket on the each side of the crankshaft pulley and the drive plate.

Specified Torque

①: 24 N·m (2.4 kgf·m, 17 lbf·ft)

②—⑬: 12 N·m (1.2 kgf·m, 8.7 lbf·ft)

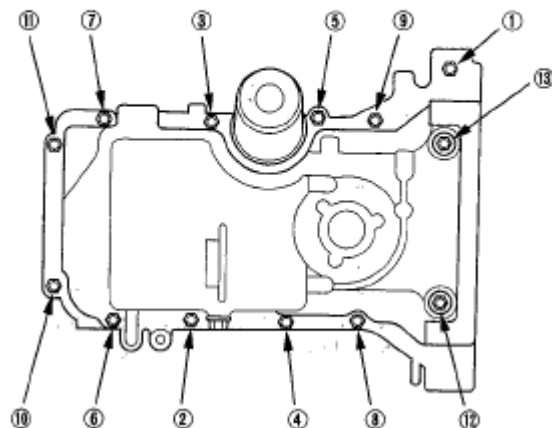


Fig. 65: Identifying Oil Pan Bolt Tightening Sequence With Torque Specifications
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Tighten the two bolts securing the transmission.

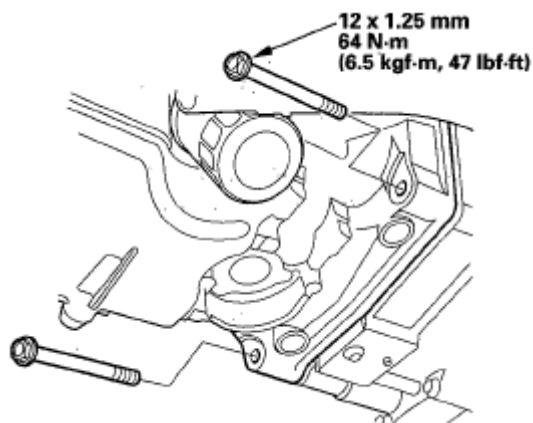


Fig. 66: Identifying Bolts Securing Transmission With Torque Specifications
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Install the lower torque rod bracket mounting bolts.

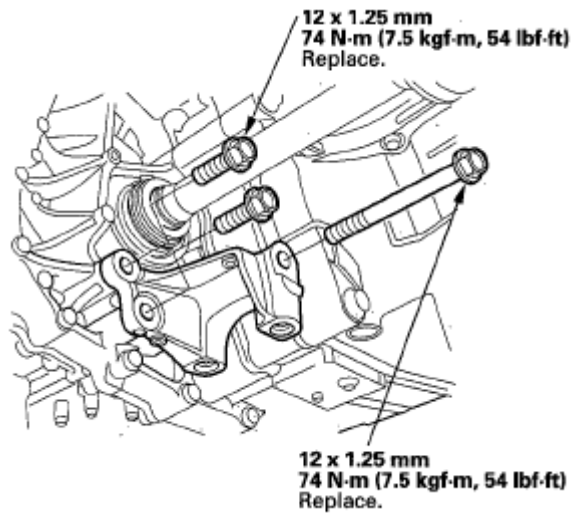


Fig. 67: Identifying Lower Torque Rod Bracket Mounting Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Install the dipstick tube (A) with a new O-ring (B), then install the mounting bolt (C) and the harness clamps (D).

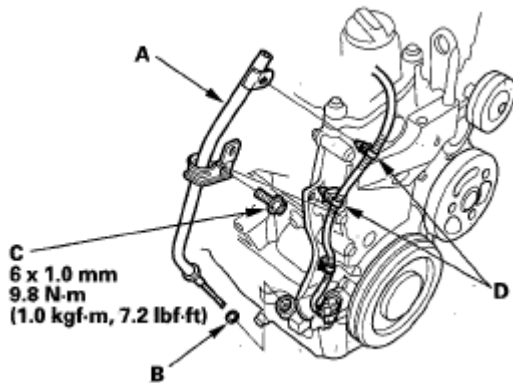


Fig. 68: Locating Dipstick Tube, O-Ring, Mounting Bolt & Harness Clamps With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. If the engine is still in the vehicle, do the following steps.
11. Attach the subframe adapter (VSB02C000016) to the front subframe by looping the belt over the front of the front subframe, then secure the belt with its stop, then tighten the wing nut (see step 9 on **ENGINE INSTALLATION**).
12. Line up the slots in the front subframe arms with the bolt holes on the jack base, then carefully attach them with four bolts, raise the front subframe up to the body (see step 10 on **ENGINE INSTALLATION**).
13. Loosely install the new front subframe mounting bolts (see step 11 on **ENGINE INSTALLATION**).
14. Align the reference marks with the edge of the body, then tighten the mounting bolts (see step 12 on **ENGINE INSTALLATION**).

15. Remove the jack and subframe adapter.
16. Tighten the mid stiffener mounting bolts (see step 14 on **ENGINE INSTALLATION**).
17. Install the lower torque rod mounting bolts (see step 15 on **ENGINE INSTALLATION**).
18. Remove the engine support hanger and universal eyelet.
19. Connect the steering gearbox harness connectors (see step 22 on **ENGINE INSTALLATION**).
20. Connect the suspension lower arm ball joints (see **LOWER BALL JOINT REPLACEMENT**).
21. Connect the front stabilizer links (see **STABILIZER LINK REMOVAL/INSTALLATION**).
22. Install the under-floor three way catalytic converter (TWC) (see step 26 on **ENGINE INSTALLATION**).
23. Install the intake manifold bracket and the harness clamp (see step 8 on **INSTALLATION**).
24. Install the splash shield and the front undercover (see step 27 on **ENGINE INSTALLATION**).
25. Lower the vehicle on the lift.
26. Install the steering joint bolt (see step 35 on **ENGINE INSTALLATION**), then install the steering wheel (see **STEERING WHEEL INSTALLATION**).
27. Install the A/C compressor, then connect the A/C compressor clutch connector (see step 38 on **ENGINE MOUNT REPLACEMENT**).
28. Install the A/C condenser fan shroud assembly (see **RADIATOR AND FAN REPLACEMENT**).
29. Install the front wheels.
30. After assembly, wait at least 30 minutes before filling the engine oil.
31. Check the wheel alignment (see **WHEEL ALIGNMENT**).

TRANSMISSION END CRANKSHAFT OIL SEAL INSTALLATION - IN CAR

SPECIAL TOOLS REQUIRED

- Handle driver 07749-0010000
- Oil seal driver attachment 07ZAD-PNA0100

1. Remove the IMA motor housing (see **MOTOR HOUSING REMOVAL/INSTALLATION**).
2. Remove the transmission end crankshaft oil seal.
3. Clean and dry the crankshaft oil seal housing.
4. Apply a light coat of multipurpose grease to the crankshaft and to the lip of the seal.
5. Using the handle driver and oil seal driver attachment, drive in the crankshaft oil seal until the driver attachment bottoms against the engine block end cover. Align the hole in the driver attachment with the pin on the crankshaft.

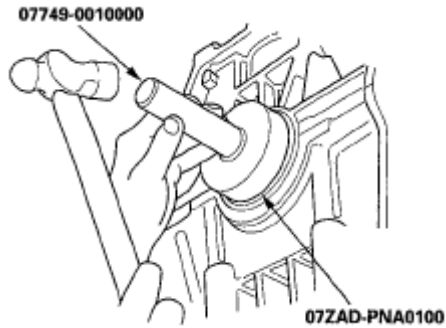


Fig. 69: Identifying Oil Seal

Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Measure the distance between the crankshaft (A) and the oil seal (B).

Oil Seal Installed Height: 7-8 mm (0.28-0.31 in.)

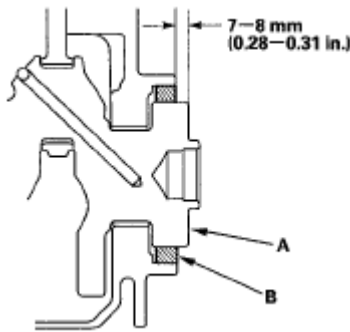


Fig. 70: Locating Crankshaft & Oil Seal

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Clean any excess grease off the crankshaft, and check that the oil seal lip is not distorted.
8. Install the IMA motor housing (see **MOTOR HOUSING REMOVAL/INSTALLATION**).

DRAIN BOLT INSTALLATION

NOTE: When installing the drain bolt, always use a new washer.

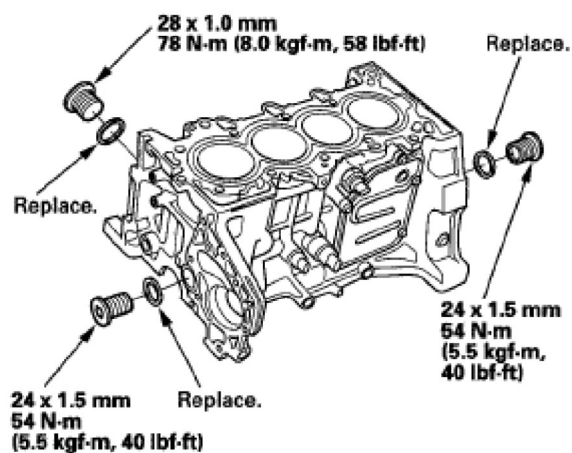


Fig. 71: Locating Drain Bolt With Torque Specifications
 Courtesy of AMERICAN HONDA MOTOR CO., INC.