2007-11 ENGINE

Cylinder Head - Element

SPECIAL TOOLS

Ref. No.	Tool Number	Description	Qty
①	07AAB-RWCA120	Camshaft Lock Pin Set	1
②	07AAJ-PNAA101	Air Pressure Regulator	1
③	07HAH-PJ7A100	Valve Guide Reamer, 5.5 mm	1
④	07JAA-001020A	Socket, 19 mm	1
⑤	07JAB-001020B	Holder Handle	1
⑥	07MAA-PR70100	Tappet Adjust Wrench Set	1
⑦	07NAB-001040A	Holder Attachment, 50 mm	1
⑧	07PAD-0010000	Stem Seal Driver	1
⑨	07ZAJ-PNAA101	VTEC Air Adapter	2
⑩	07ZAJ-PNAA200	VTEC Air Stopper	1
⑪	07ZAJ-PNAA300	Air Joint Adapter	1
⑫	07742-0010100	Valve Guide Driver, 5.5 mm	1
⑬	07746-0010400	Attachment, 52 x 55 mm	1
⑭	07749-0010000	Handle Driver	1
⑮	07757-PJ1010A	Valve Spring Compressor Attachment	1

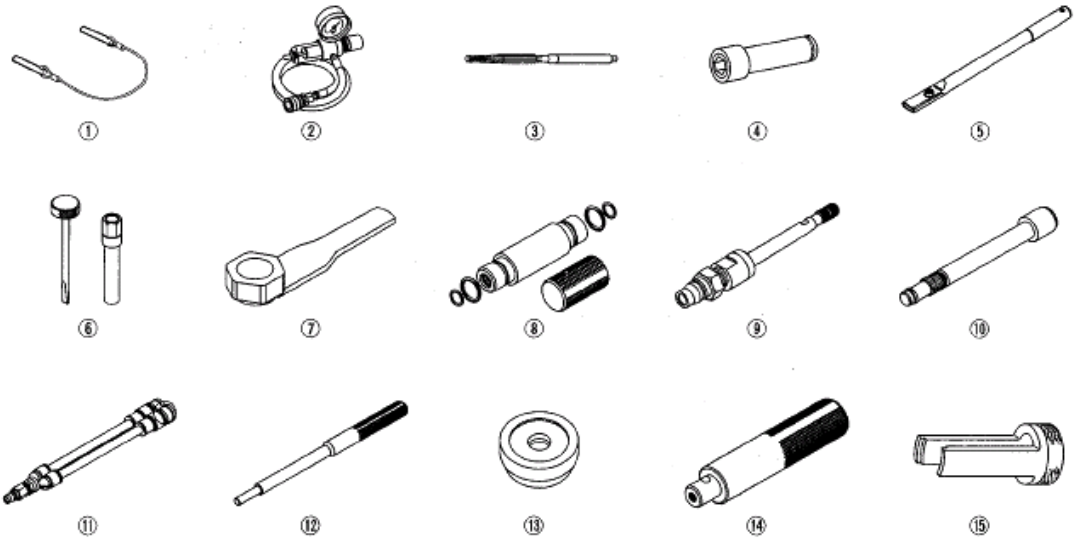

Fig. 1: Identifying Special Tools
Courtesy of AMERICAN HONDA MOTOR CO., INC.

COMPONENT LOCATION INDEX

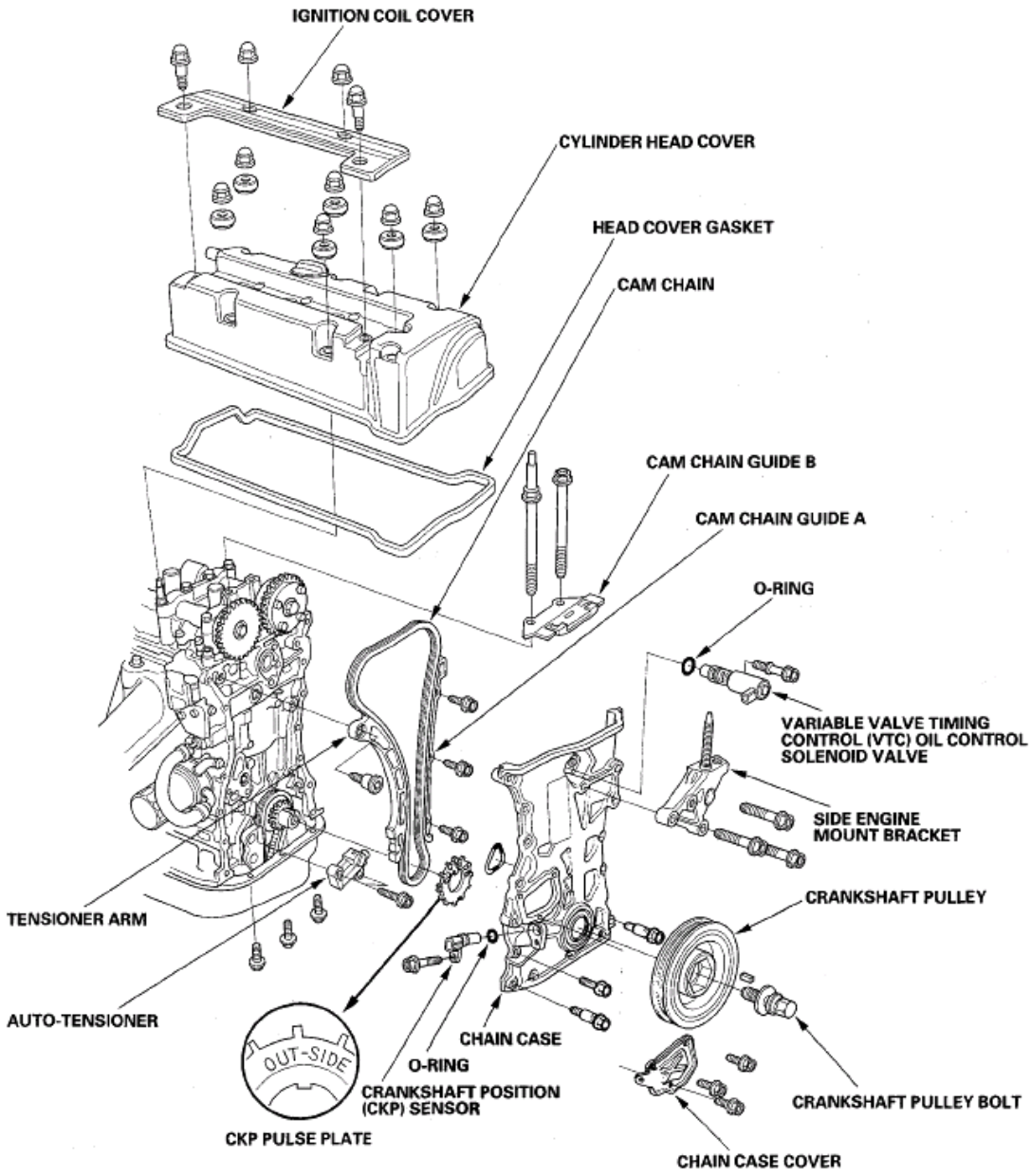

Fig. 2: Identifying Cylinder Head Replacement Components (1 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

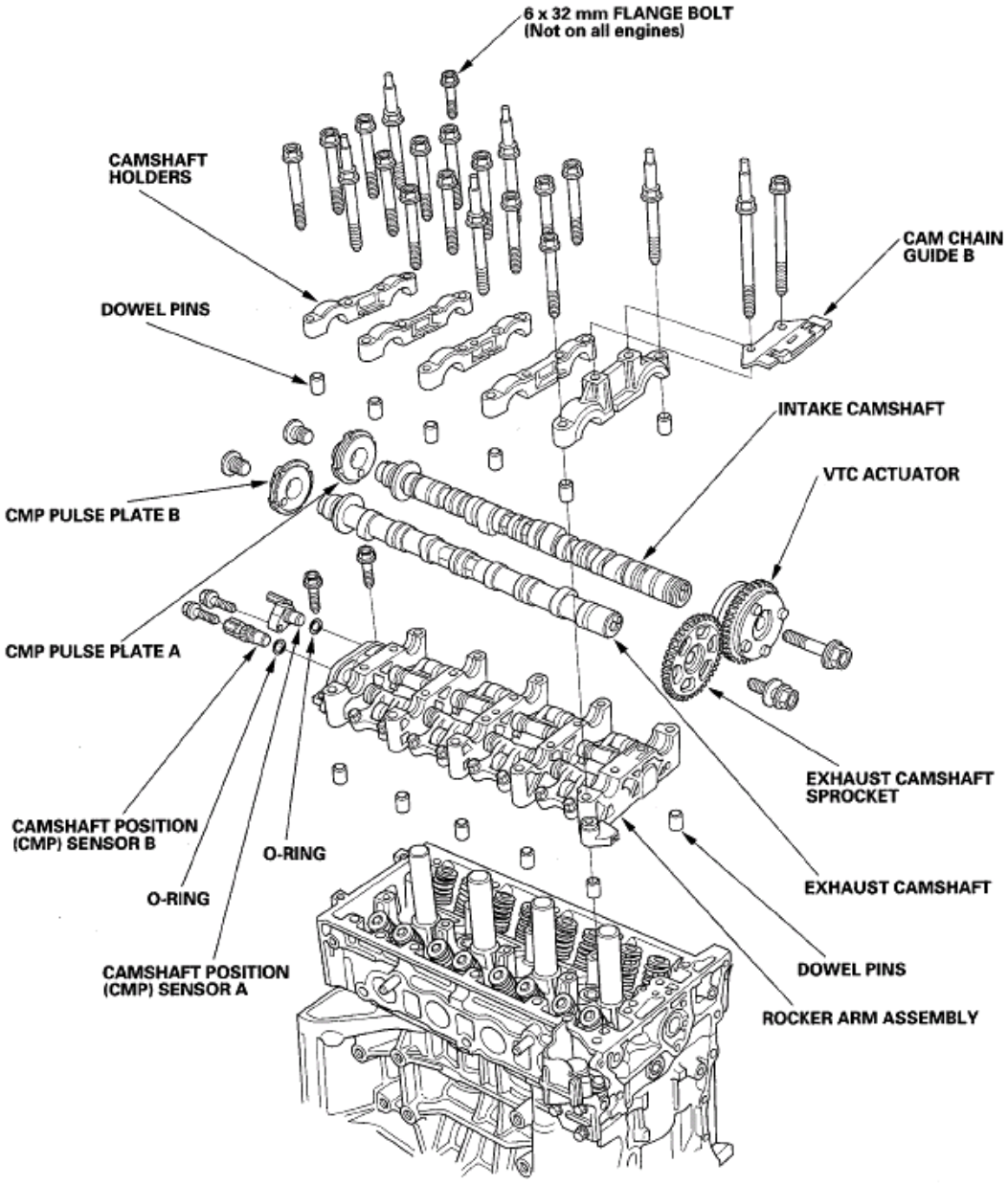

Fig. 3: Identifying Cylinder Head Replacement Components (2 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

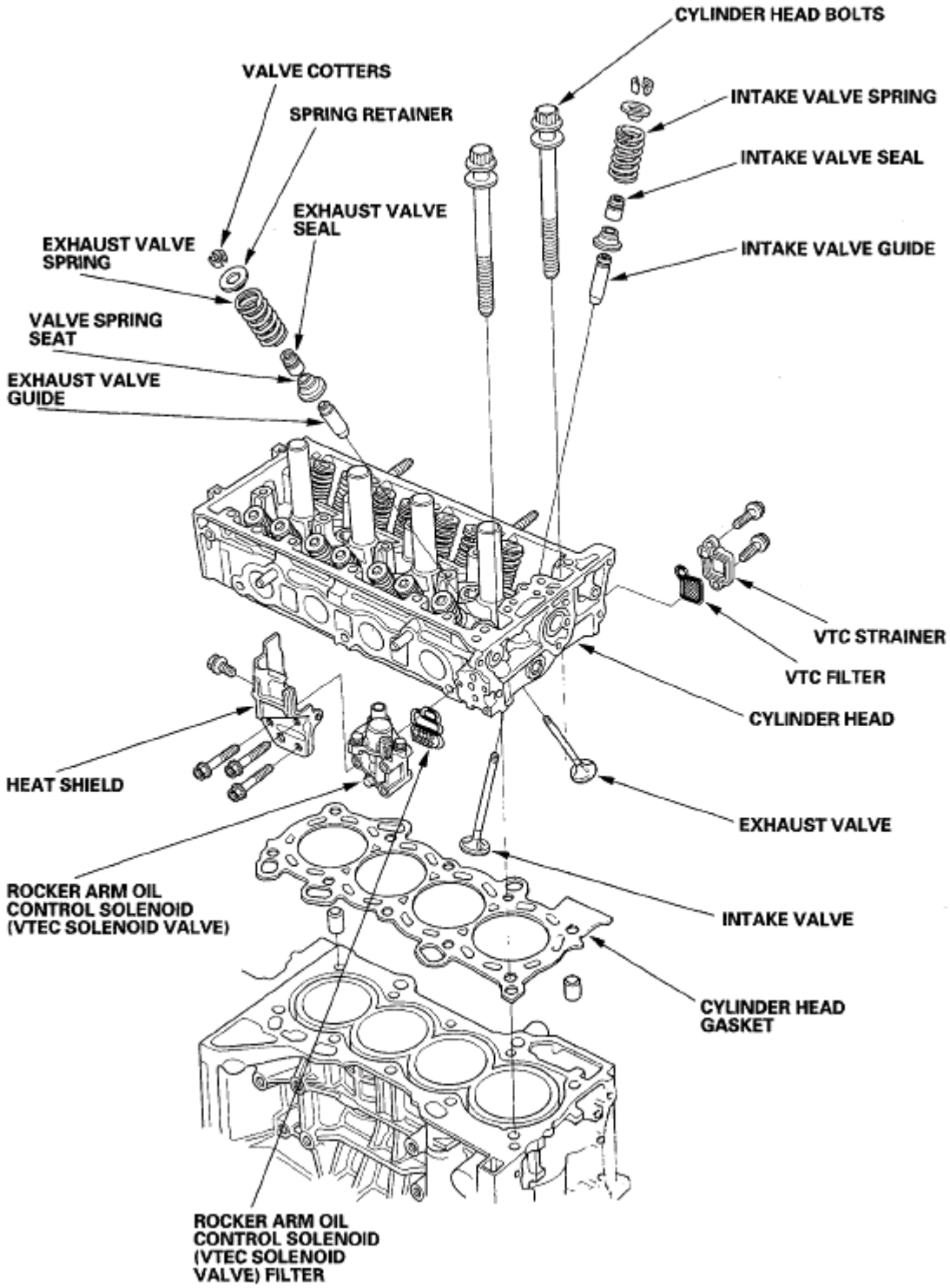

Fig. 4: Identifying Cylinder Head Replacement Components (3 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ENGINE COMPRESSION INSPECTION

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

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

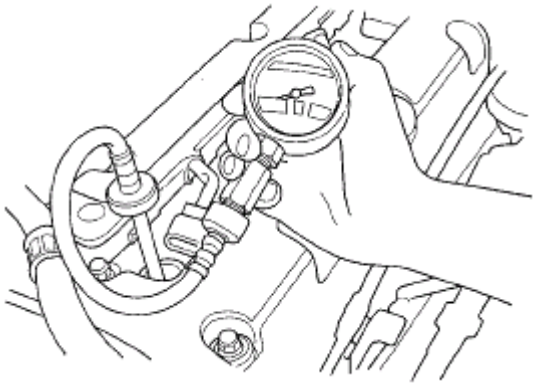

Fig. 5: Attaching Compression Gauge To Spark Plug Hole
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

    Compression Pressure:

    Above 930 kPa (9.5 kgf/cm^2 , 135 psi)

12. Measure the compression on the remaining cylinders.

    Maximum Variation:

    Within 200 kPa (2.0 kgf/cm^2 , 28 psi)

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

VTEC ROCKER ARM TEST

SPECIAL TOOLS REQUIRED

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

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

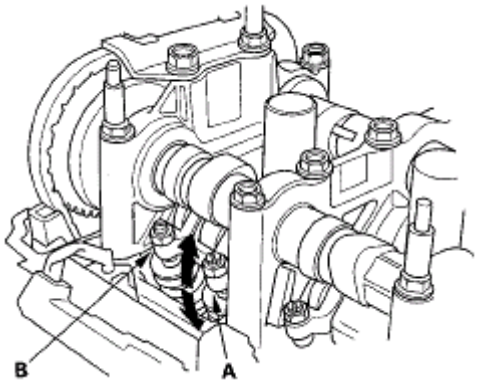

Fig. 6: Identifying Intake Primary Rocker Arm
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

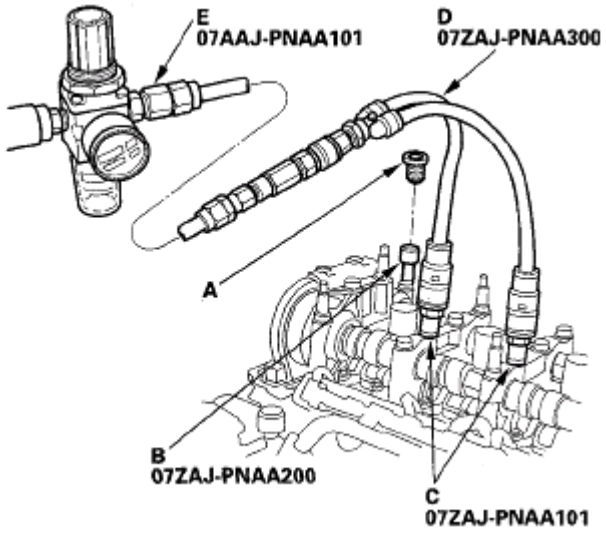

Fig. 7: Identifying Sealing Bolt From Relief Hole
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Specified Air Pressure:

290 kPa (3.0 kgf/cm^2 , 42 psi)

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

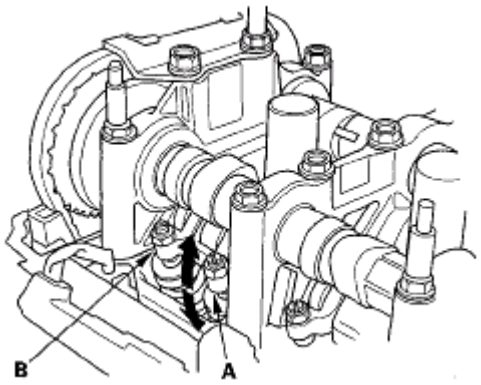

Fig. 8: Identifying Intake Primary Rocker Arm
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

VTC ACTUATOR INSPECTION

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

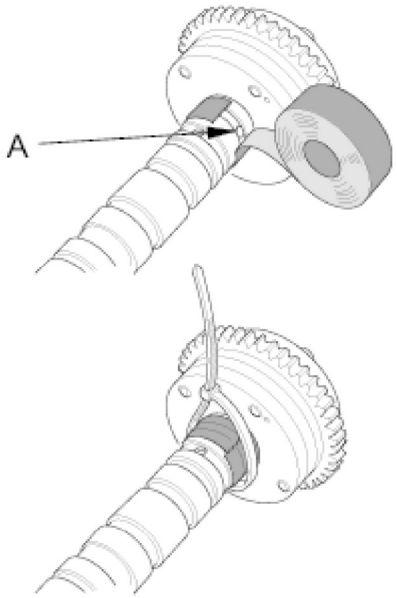

Fig. 9: Identifying Advance Holes & Retard Holes
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

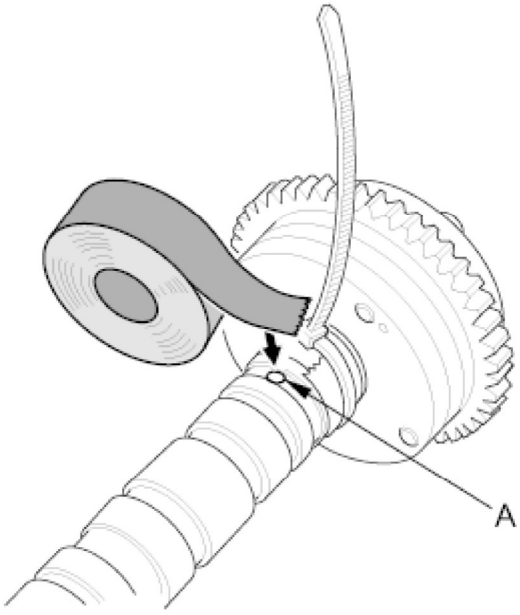

Fig. 10: Sealing Advanced Holes With Tape
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

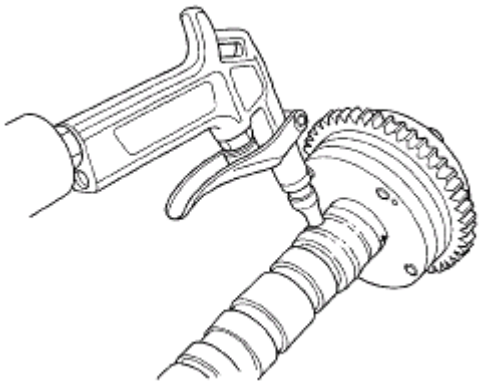

Fig. 11: Applying Air To Advance Hole To Release Lock
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

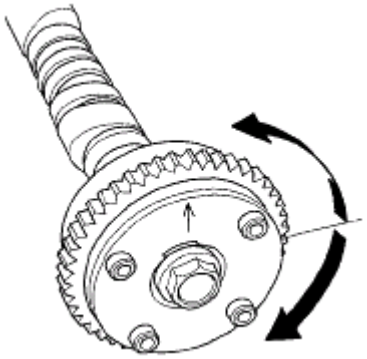

Fig. 12: Checking VTC Actuator Movement
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

VALVE CLEARANCE ADJUSTMENT

SPECIAL TOOLS REQUIRED

Tappet adjust wrench set 07MAA-PR70100

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

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

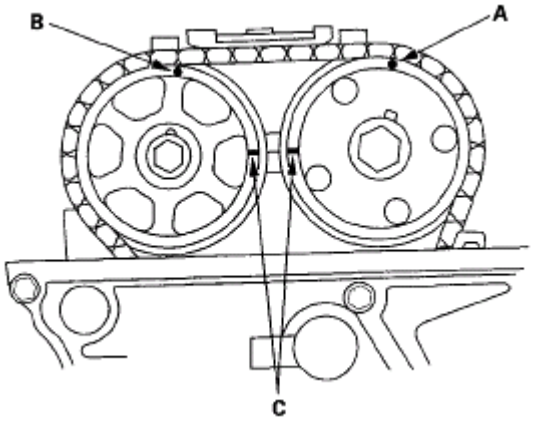

Fig. 13: Identifying Punch Mark On Variable Valve Timing Control (VTC) Actuator
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Valve Clearance

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

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

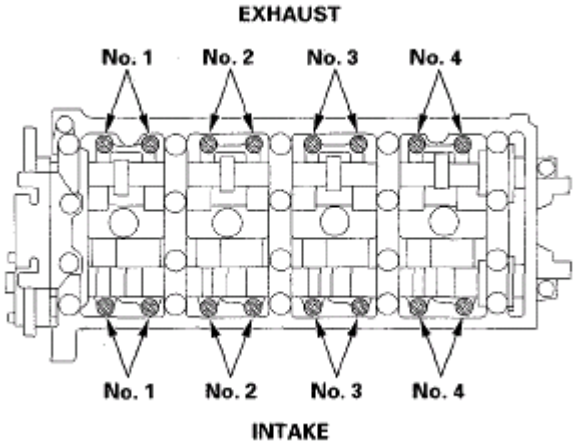

Fig. 14: Identifying Valve Position
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

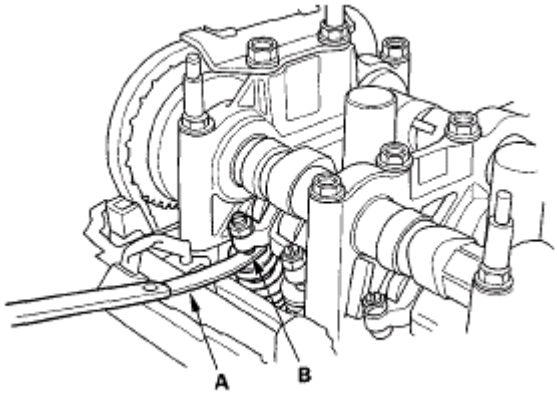

Fig. 15: Inserting Feeler Gauge Between Adjusting Screw
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

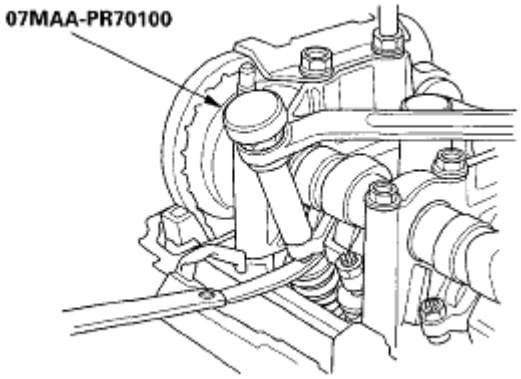

Fig. 16: Loosening Locknut
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Specified Torque

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

   Apply new engine oil to the nut threads.

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

   Apply new engine oil to the nut threads.

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

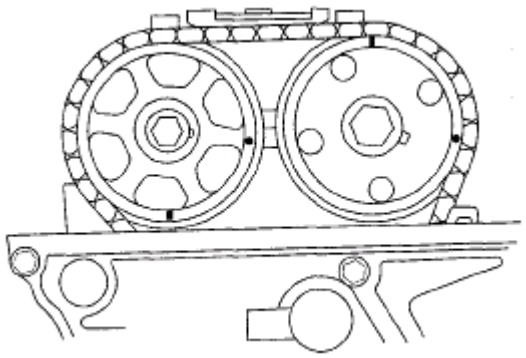

Fig. 17: Rotating Crankshaft Clockwise (1 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

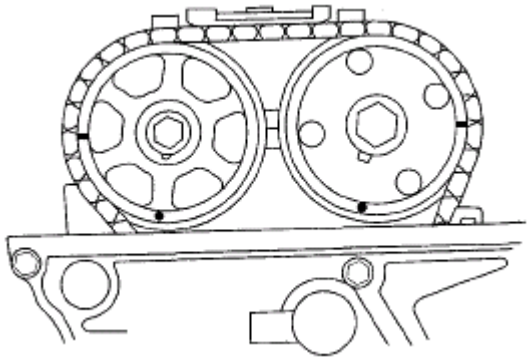

Fig. 18: Rotating Crankshaft Clockwise (2 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

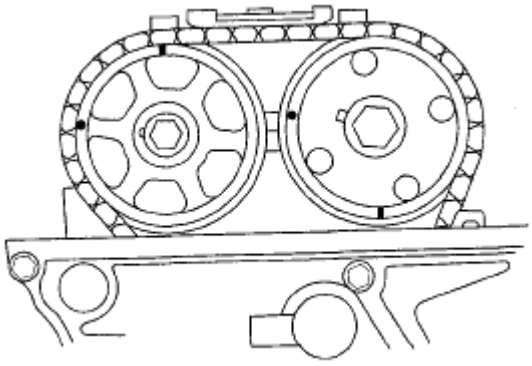

Fig. 19: Rotating Crankshaft Clockwise (3 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

CRANKSHAFT PULLEY REMOVAL AND INSTALLATION

SPECIAL TOOLS REQUIRED

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

REMOVAL

1. Remove the right front wheel.
2. Remove the splash shield (see step 26 in **ENGINE REMOVAL**).

3. Remove the drive belt (see **DRIVE BELT REPLACEMENT**).
4. Hold the crankshaft pulley with holder handle (A) and holder attachment (B).

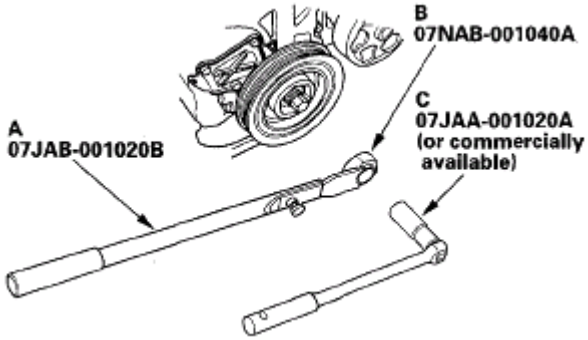

Fig. 20: Identifying Crankshaft Pulley With Holder Handle & Attachment
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

INSTALLATION

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

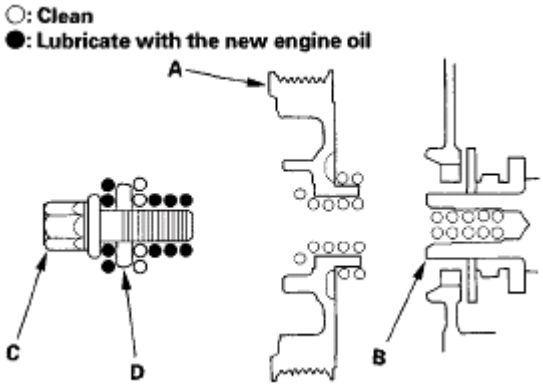

Fig. 21: Identifying Crankshaft Pulley Lubricating Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

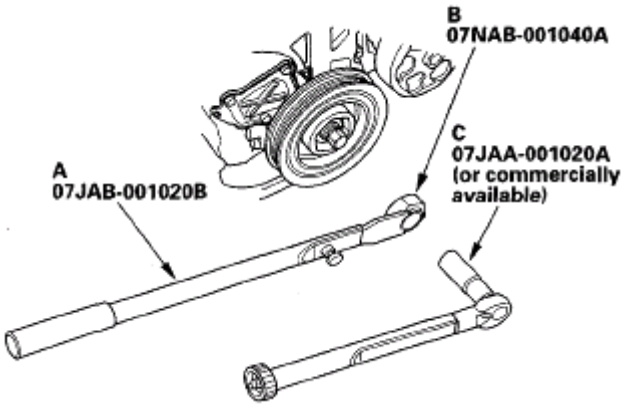

Fig. 22: Identifying Pulley With Holder Handle & Attachment
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

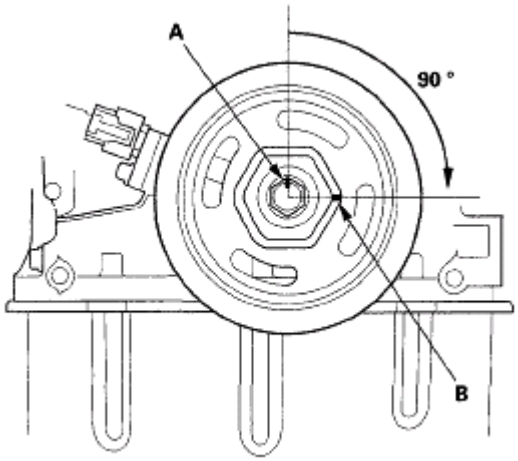

Fig. 23: Identifying Mark On Bolt Head & Crankshaft Pulley
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

CAM CHAIN REMOVAL

SPECIAL TOOLS REQUIRED

Camshaft lock pin set 07AAB-RWCA120

NOTE: Keep the cam chain away from magnetic fields.

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

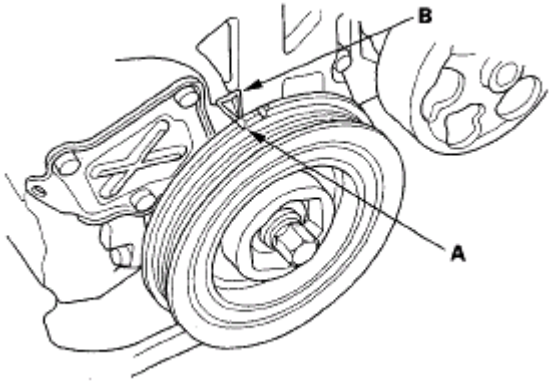

Fig. 24: Identifying TDC Mark Lines With Pointer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

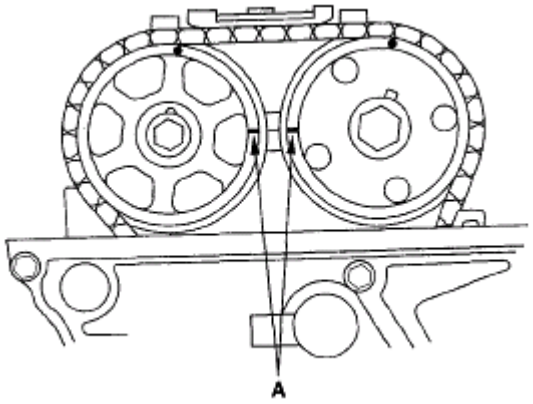

Fig. 25: Identifying TDC Marks On Variable Valve Timing Control (VTC) Actuator
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

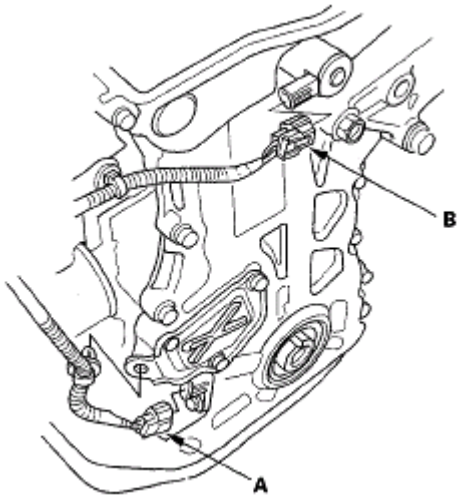

Fig. 26: Identifying Crankshaft Position (CKP) Sensor Connector & VTC Oil Control Solenoid Valve Connector
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

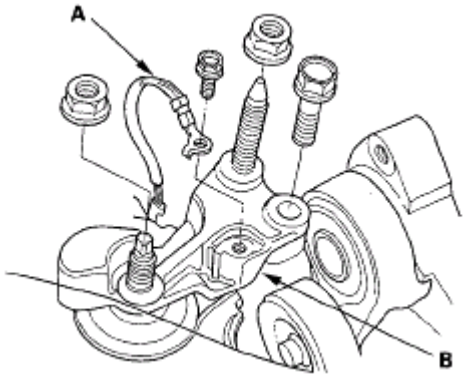

Fig. 27: Identifying Upper Engine Mount Bracket & Ground Cable
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Remove the side engine mount bracket.

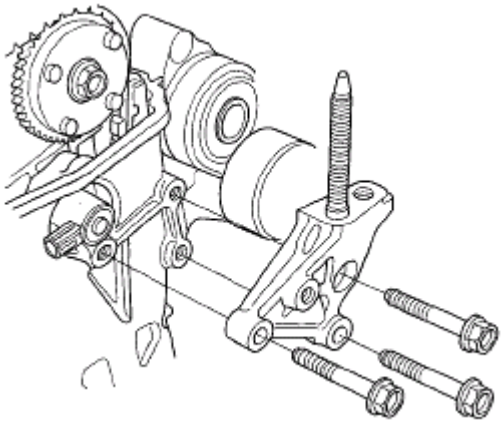

Fig. 28: Identifying Side Engine Mount Bracket Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Remove the chain case (A).

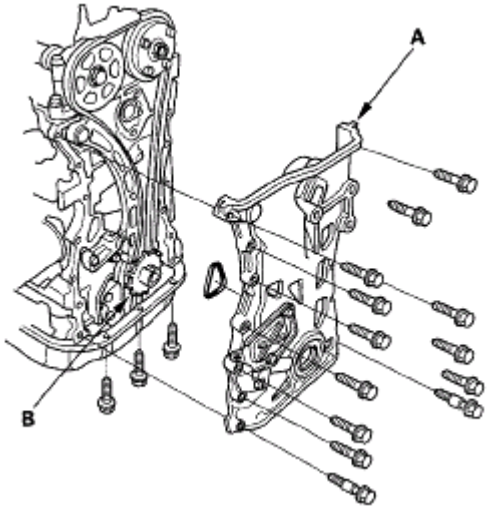

Fig. 29: Identifying Chain Case
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

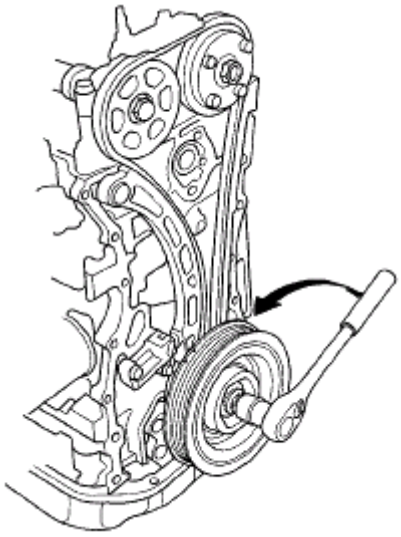

Fig. 30: Turning Crankshaft Counterclockwise
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

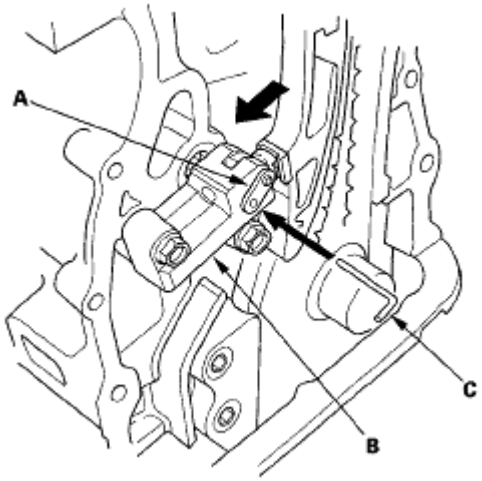

Fig. 31: Aligning Holes On Lock
Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Remove the auto-tensioner.

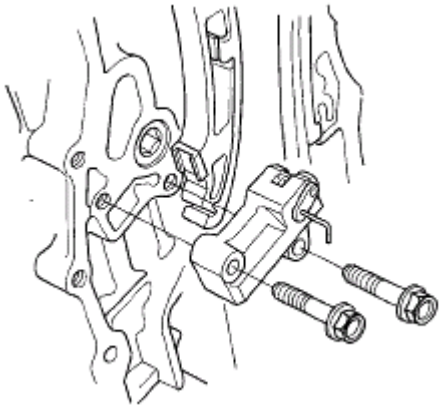

Fig. 32: Identifying Auto-Tensioner Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

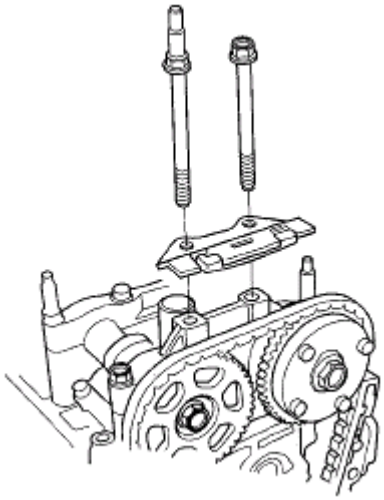

Fig. 33: Identifying Crankshaft Pulley
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

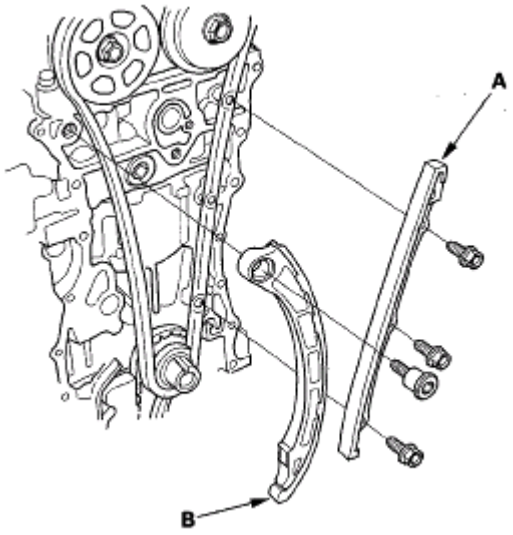

Fig. 34: Identifying Cam Chain Guide & Tensioner Arm
Courtesy of AMERICAN HONDA MOTOR CO., INC.

22. Remove the cam chain.

CAM CHAIN INSTALLATION

SPECIAL TOOLS REQUIRED

Camshaft lock pin set 07AAB-RWCA120

NOTE:

- **Keep the cam chain away from magnetic fields.**
- **Before this procedure, check that the variable valve timing control (VTC) actuator is locked by turning the VTC actuator counterclockwise. If not locked, turn the VTC actuator clockwise until it stops, then recheck it. If it is still not locked, replace the VTC actuator.**

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

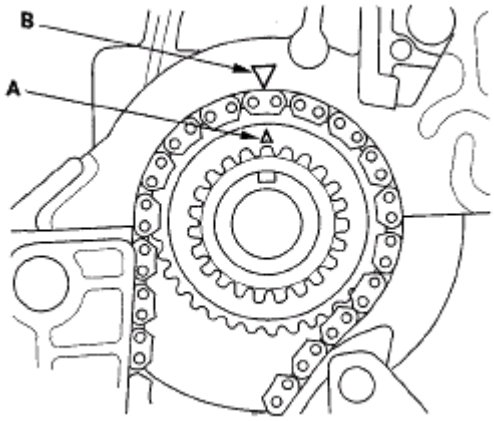

Fig. 35: Aligning TDC Mark On Crankshaft Sprocket With Pointer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

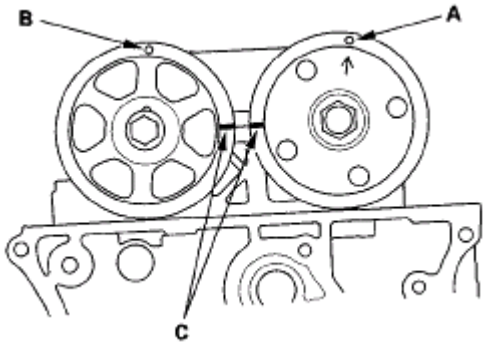

Fig. 36: Aligning TDC Marks On VTC Actuator & Exhaust Camshaft Sprocket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

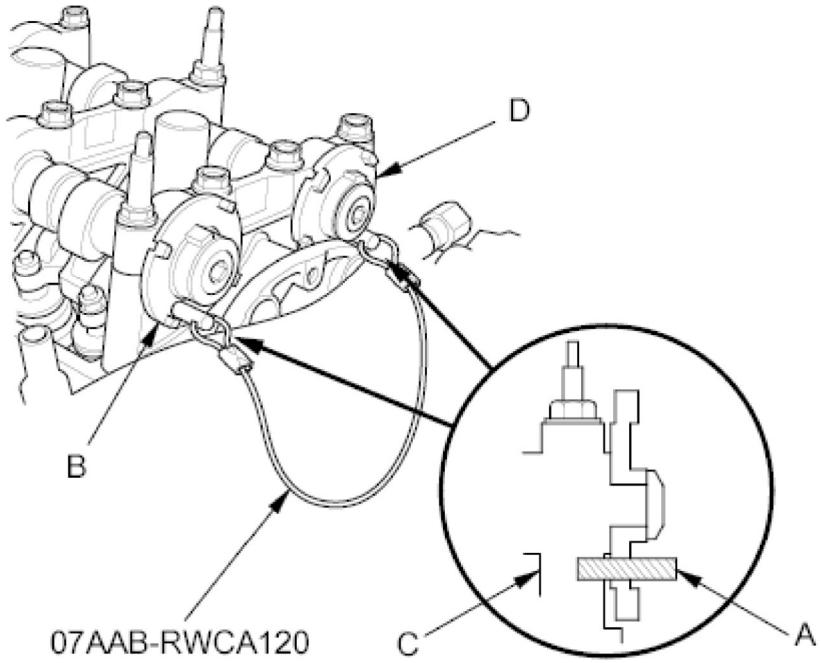

Fig. 37: Identifying Camshaft Lock Pin Set & Camshaft Position (CMP) Pulse Plate
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

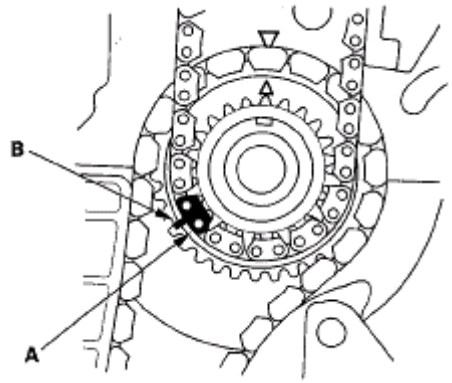

Fig. 38: Aligning Mark On Crankshaft Sprocket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

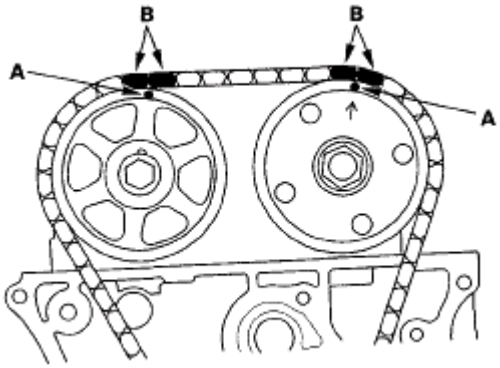

Fig. 39: Aligning Center Of Colored Link Plates
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

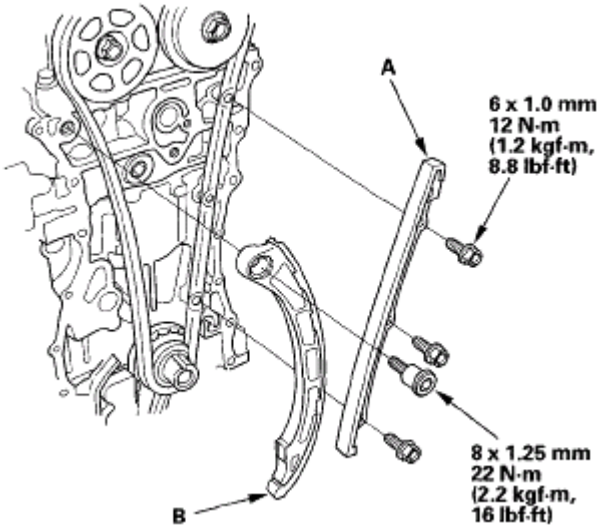

Fig. 40: Identifying Cam Chain Guide A & Tensioner Arm With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Install cam chain guide B.

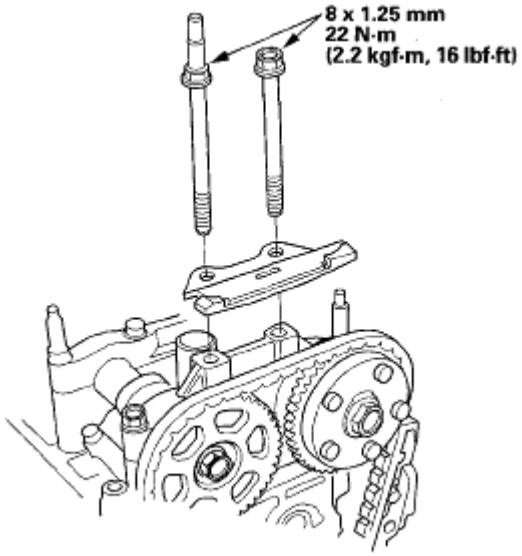

Fig. 41: Identifying Cam Chain Guide With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

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

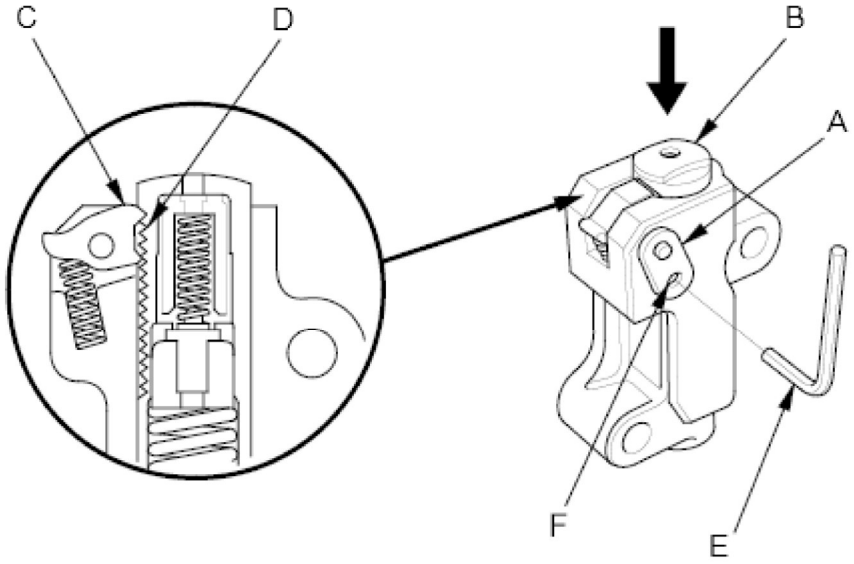

Fig. 42: View Of Plate, Rod, First Cam, Edge Of Rack & (P/N 14511-PNA-003)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Install the auto-tensioner.

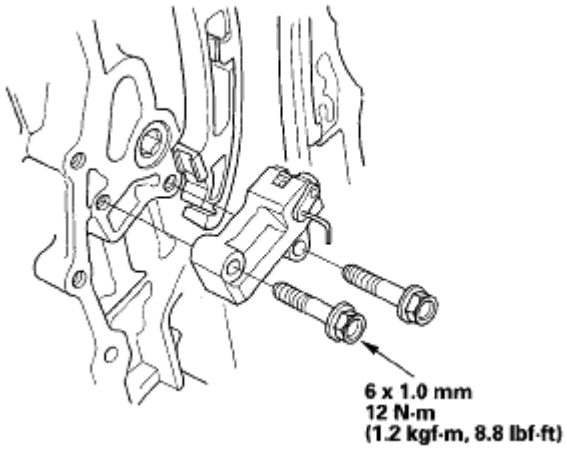

Fig. 43: Identifying Auto-Tensioner With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

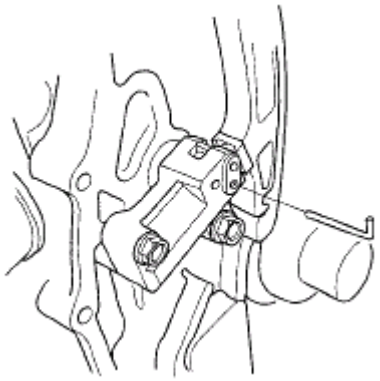

Fig. 44: Identifying Pin From Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

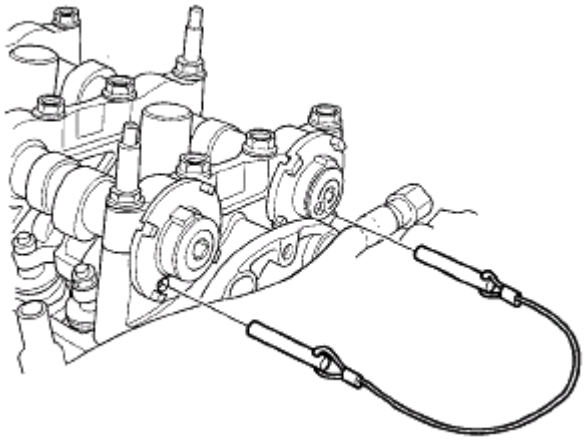

Fig. 45: Identifying Camshaft Lock Pin Set
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

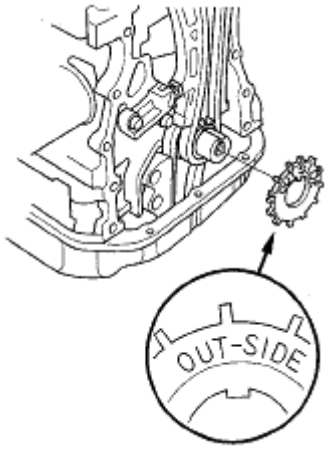

Fig. 46: Identifying Crankshaft Position (CKP) Pulse Plate
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

NOTE:

- **Apply a 2.5 mm (0.098 in) diameter bead of liquid gasket along the broken line.**
- **Apply a 5.0 mm (0.197 in) diameter bead of liquid gasket along the**

broken line.

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

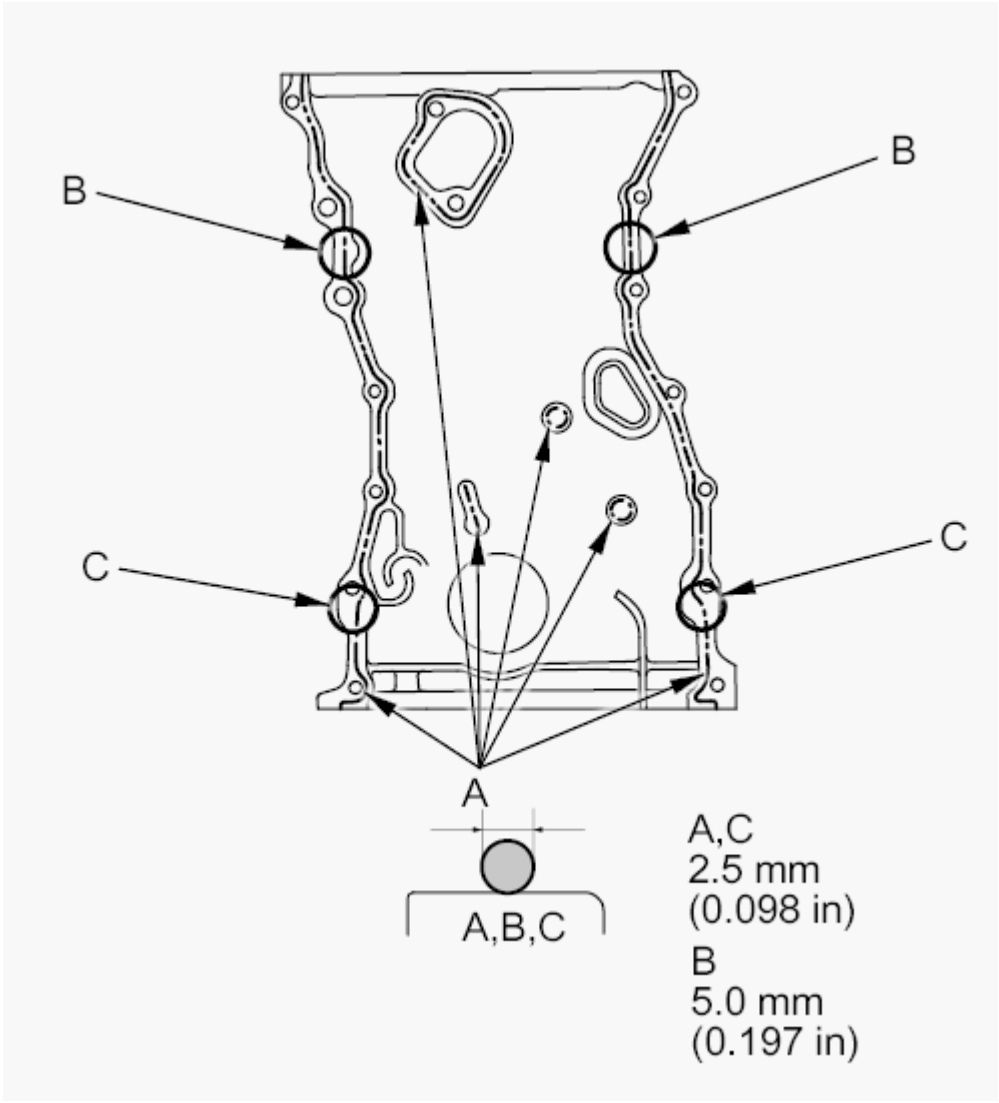

Fig. 47: Identifying Liquid Gasket Applying Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

NOTE:

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

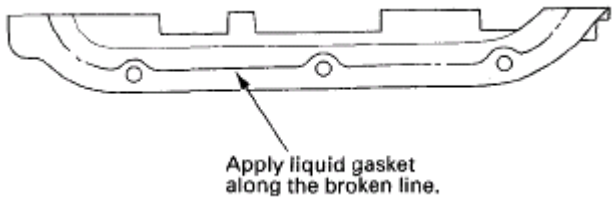

Fig. 48: Applying Liquid Gasket On Broken Line
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

NOTE:

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

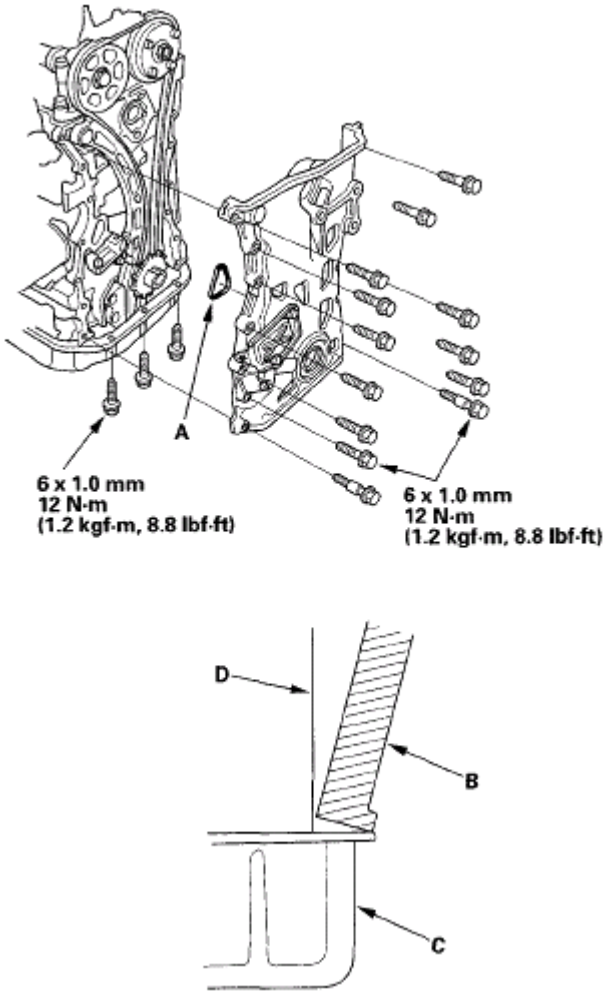

Fig. 49: Identifying O-Ring On Chain Case And Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

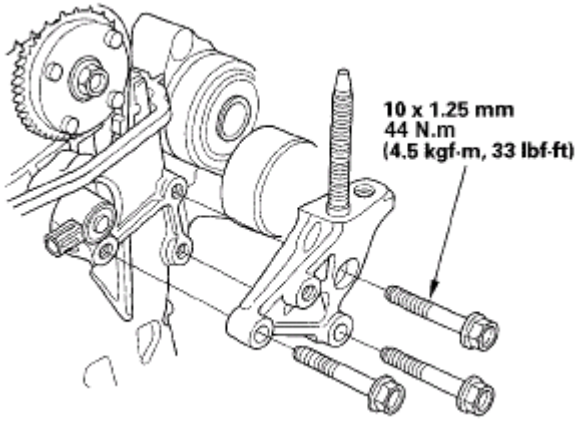

Fig. 50: Identifying Side Engine Mount Bracket With Bolts With Torque Specification
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

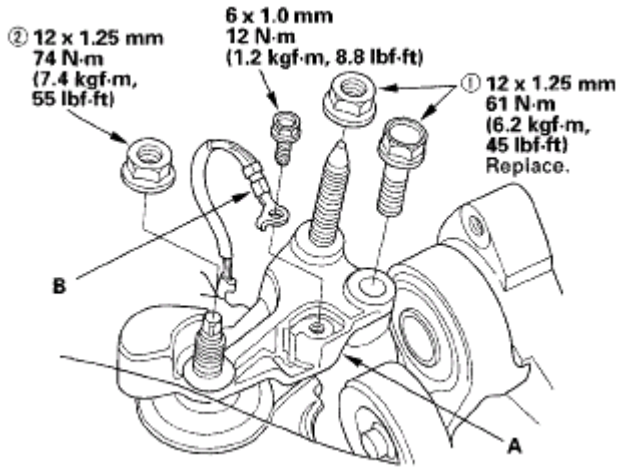

Fig. 51: Identifying Upper Engine Mount Bracket Bolt With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

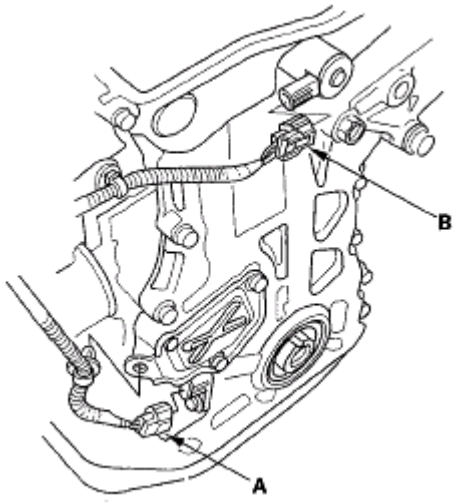

Fig. 52: Identifying CKP Sensor Connector & VTC Oil Control Solenoid Valve Connector
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

AUTO-TENSIONER REMOVAL AND INSTALLATION

REMOVAL

1. Remove the chain case cover.

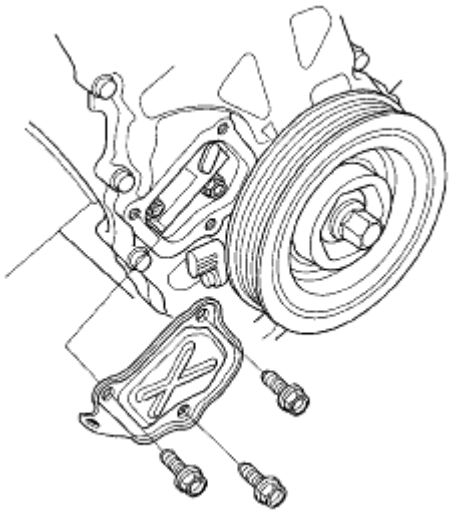

Fig. 53: Identifying Chain Case Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

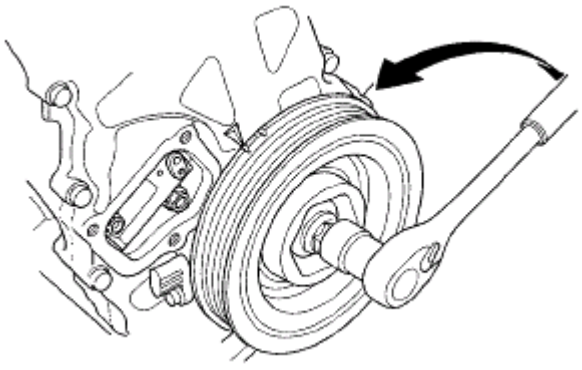

Fig. 54: Turning Crankshaft Counterclockwise
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

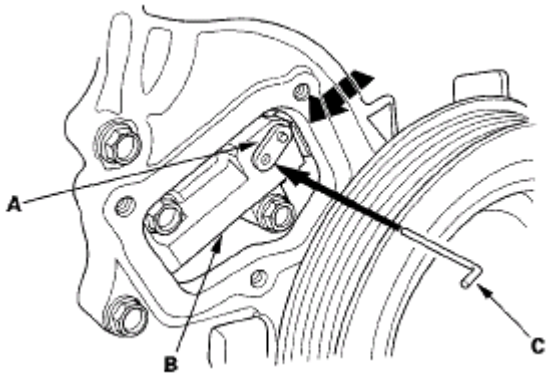

Fig. 55: Aligning Holes On Lock & Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the auto-tensioner.

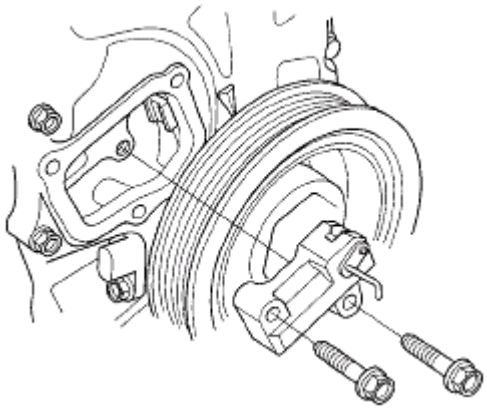

Fig. 56: Identifying Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

INSTALLATION

1. Install the auto-tensioner.

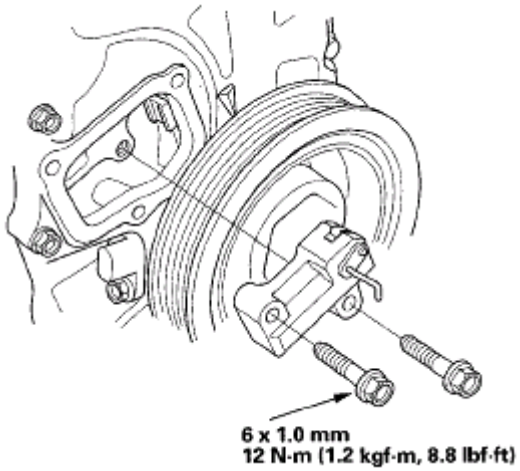

Fig. 57: Identifying Auto-Tensioner With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Remove the pin from the auto-tensioner.

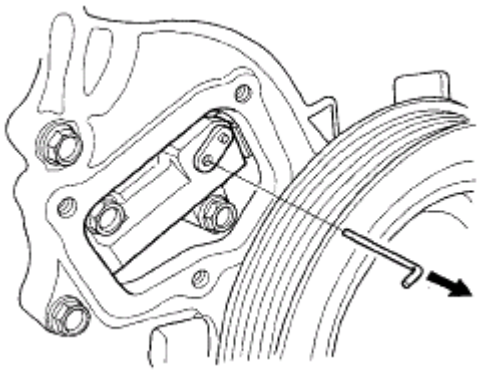

Fig. 58: Identifying Pin From Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

NOTE:

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

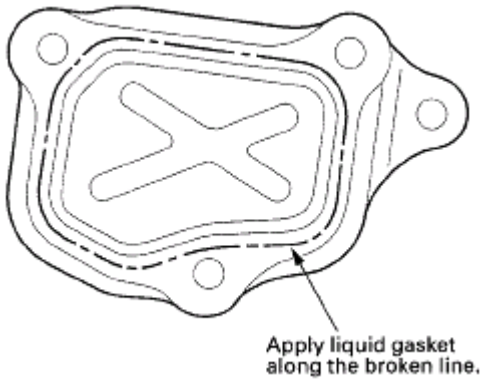

Fig. 59: Identifying Liquid Gasket Applying Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Install the chain case cover.

NOTE:

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

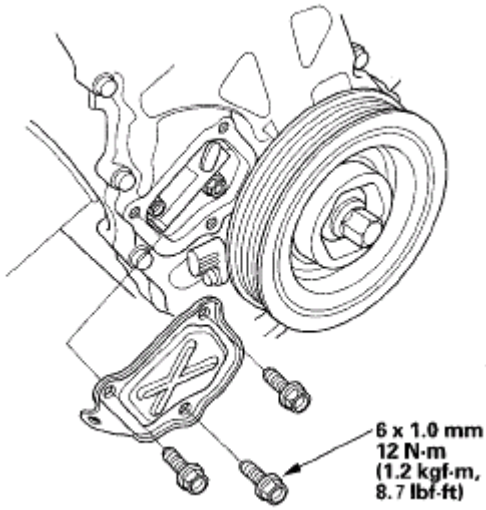

Fig. 60: Identifying Chain Case Cover Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CAM CHAIN CASE OIL SEAL INSTALLATION

SPECIAL TOOLS REQUIRED

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

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

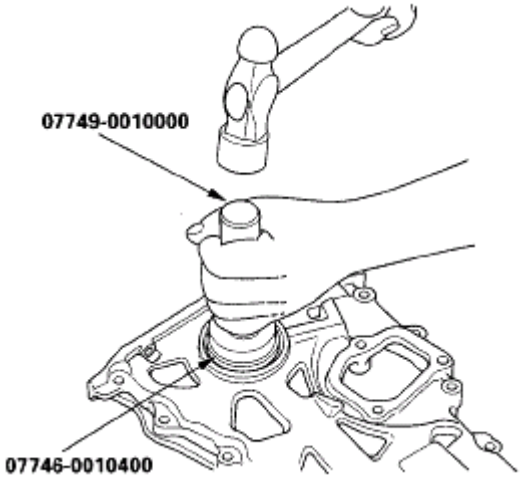

Fig. 61: Driving Oil Seal Using Handle Driver & Attachment
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

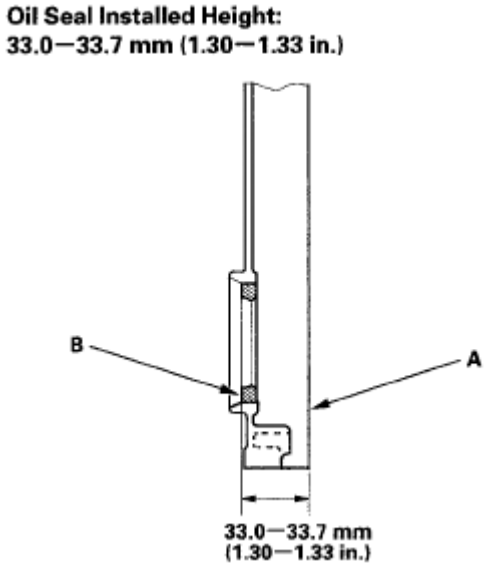

Fig. 62: Measuring Distance Between Chain Case Surface & Oil Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CAM CHAIN INSPECTION

1. Remove the right front wheel.

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

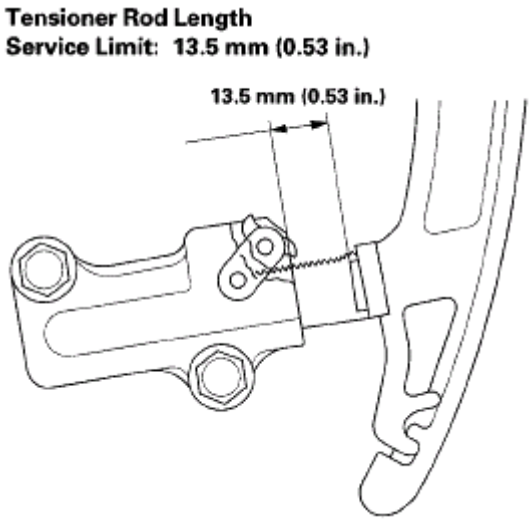

Fig. 63: Identifying Tensioner Rod Length Dimension
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

NOTE:

- **If you apply liquid gasket P/N 08718-0012, the component must be installed within 4 minutes.**

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

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

NOTE:

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

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

NOTE:

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

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

CKP PULSE PLATE REPLACEMENT

1. Remove the right front wheel.

2. Remove the splash shield (see step 24 in **ENGINE REMOVAL**).
3. Remove the drive belt (see **DRIVE BELT REPLACEMENT**).
4. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
5. Remove the crankshaft pulley (see **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
6. Disconnect the crankshaft position (CKP) sensor connector and variable valve timing control (VTC) oil control solenoid valve connector (see step 8).
7. Remove the VTC oil control solenoid valve (see **VTC OIL CONTROL SOLENOID VALVE REMOVAL/TEST/INSTALLATION**).
8. Support the engine with a jack and wood block under the oil pan.
9. Remove the ground cable, then remove the upper engine mount bracket (see step 11).
10. Remove the side engine mount bracket (see step 12).
11. Remove the chain case (see step 13).
12. Remove the CKP pulse plate.

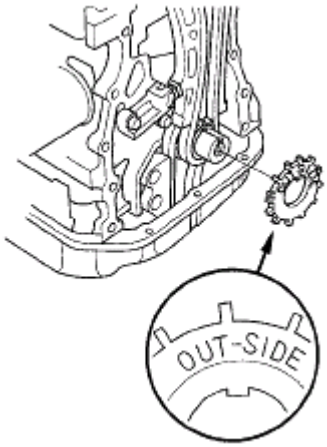

Fig. 64: Identifying CKP Pulse Plate
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

NOTE:

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

the old liquid gasket and residue, then reapply new liquid gasket.

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

NOTE:

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

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

NOTE:

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

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

CYLINDER HEAD COVER REMOVAL

1. Remove the engine cover.

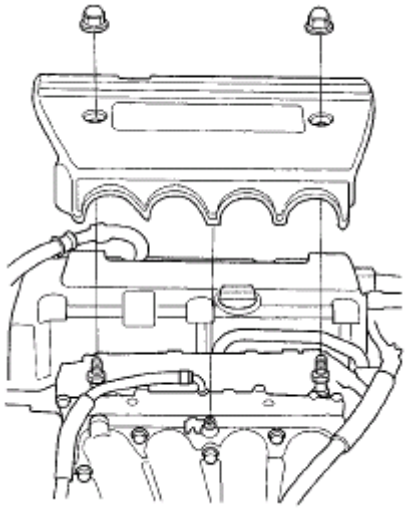

Fig. 65: Identifying Engine Cover With Nuts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

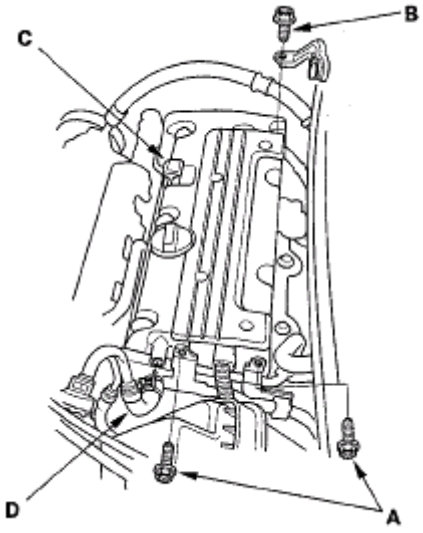

Fig. 66: Identifying Vacuum Line & Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

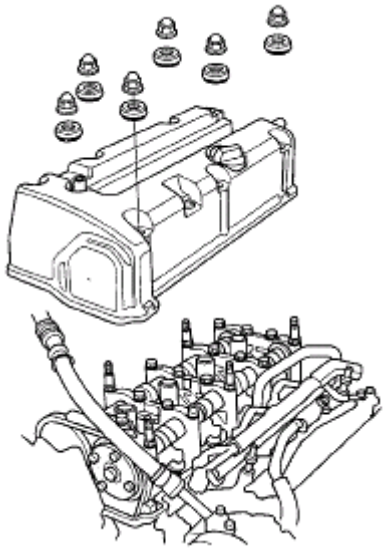

Fig. 67: Identifying Dipstick & Breather Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER HEAD COVER INSTALLATION

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

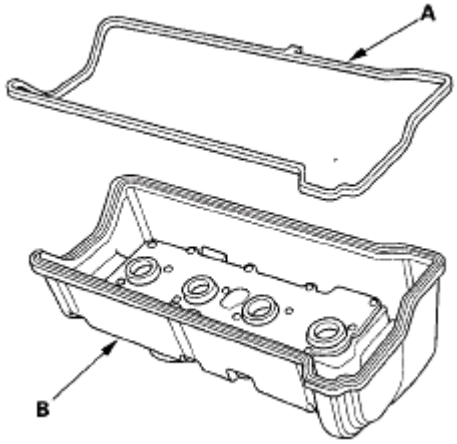

Fig. 68: Identifying Head Cover Gasket & Cylinder Head Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

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

NOTE:

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

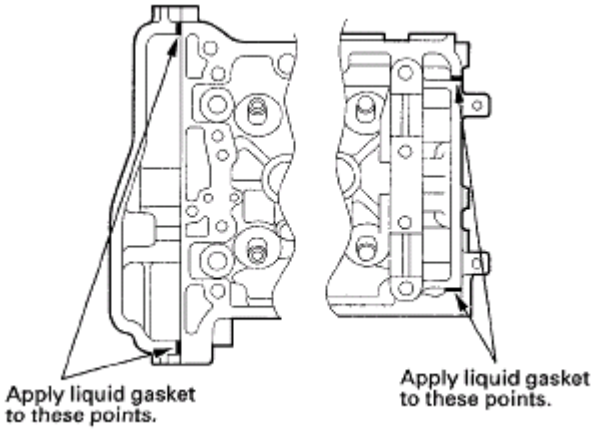

Fig. 69: Identifying Liquid Gasket Applying Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

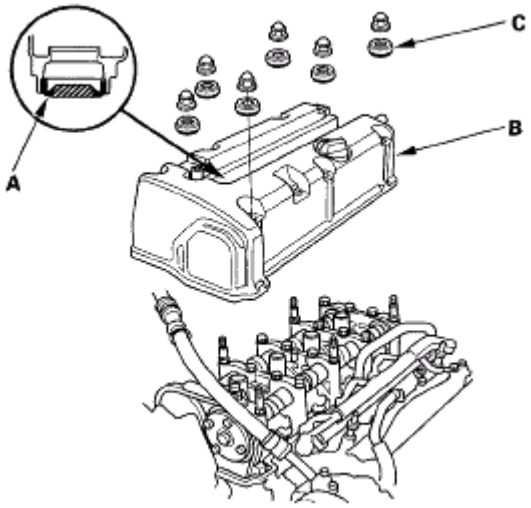

Fig. 70: Identifying Spark Plug Seals On Spark Plug Tubes
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Inspect the spark plug seals for damage.

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

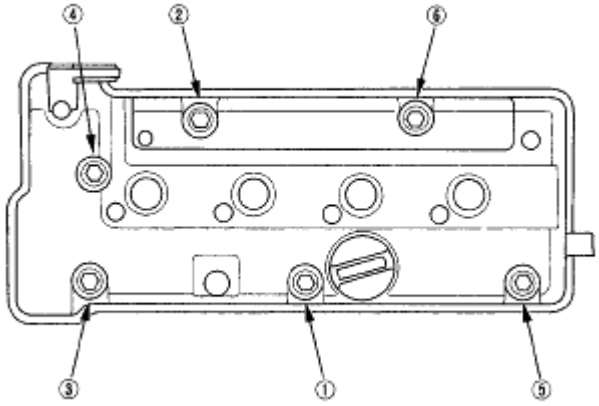

Fig. 71: Identifying Tightening Sequence Of Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

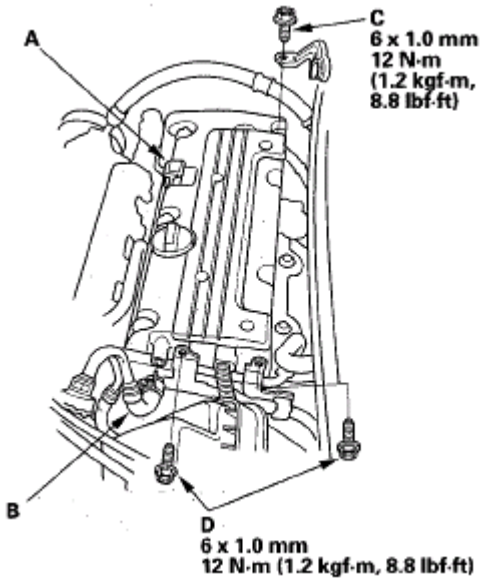

Fig. 72: Identifying Dipstick & Breather Hose Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Torque the bolt (C) securing the power steering (P/S) hose bracket.
13. Torque the two bolts (D) securing the vacuum line.
14. Install the four ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION**).
15. Check that all tubes, hoses, and connectors are installed correctly.
16. Install the engine cover.

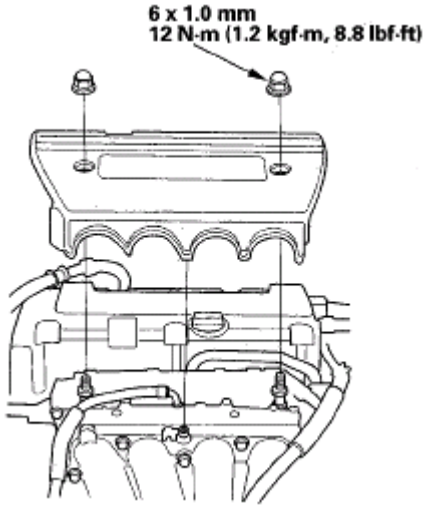

Fig. 73: Identifying Engine Cover Nuts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER HEAD REMOVAL

NOTE:

- **Use fender covers to avoid damaging the painted surfaces.**
- **To avoid damaging the wires and terminals, unplug the wiring connectors carefully while holding the connector portion.**
- **To avoid damaging the cylinder head, wait until the engine coolant temperature drops below 100°F (38°C) before loosening the cylinder head bolts.**
- **Mark all wiring and hoses to avoid misconnection. Also, be sure that they do not contact other wiring or hoses, or interfere with other parts.**

1. Relieve the fuel pressure (see **FUEL PRESSURE RELIEVING**).
2. Drain the engine coolant (see **COOLANT CHECK**).
3. Remove the drive belt (see **DRIVE BELT REPLACEMENT**).
4. Disconnect the mass air flow (MAF) sensor/intake air temperature (IAT) sensor connector (A).

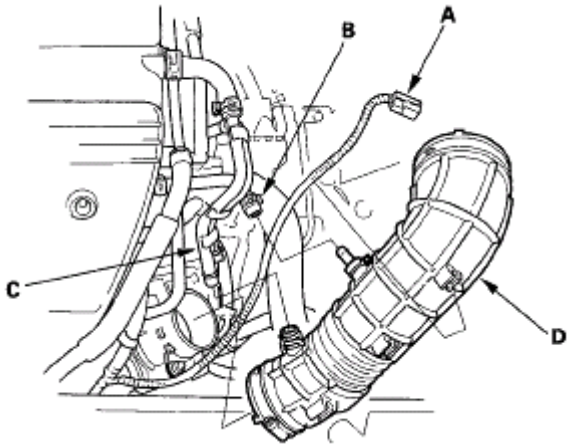

Fig. 74: Identifying Mass Air Flow (MAF) Sensor/Intake Air Temperature (IAT) Sensor Connector
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

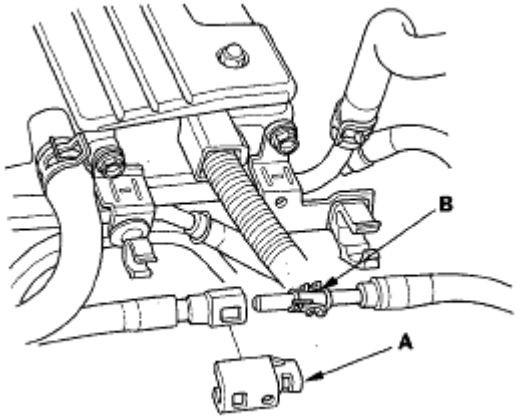

Fig. 75: Identifying Vacuum Hose & Breather Pipe
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

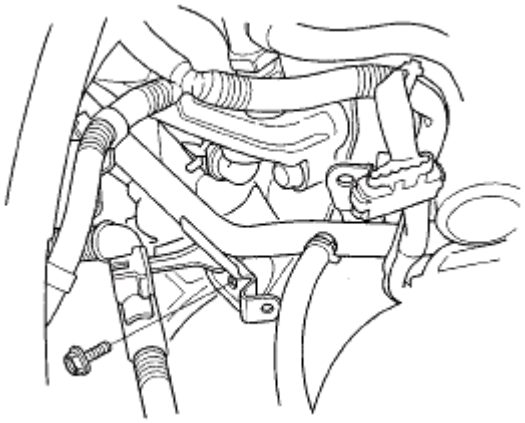

Fig. 76: Identifying Connecting Pipe Support Bracket Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

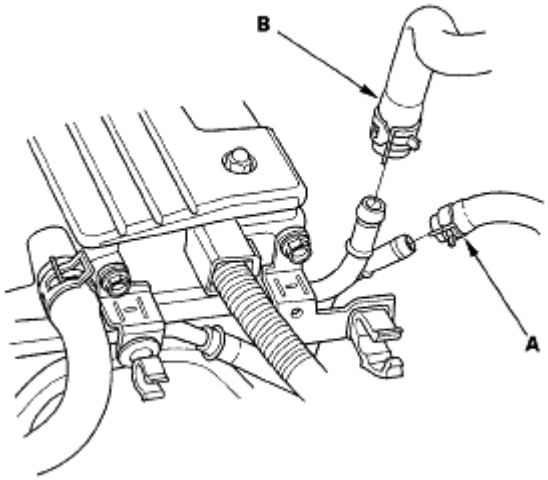

Fig. 77: Identifying Evaporative Emission (EVAP) Canister Hose & Brake Booster Vacuum Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

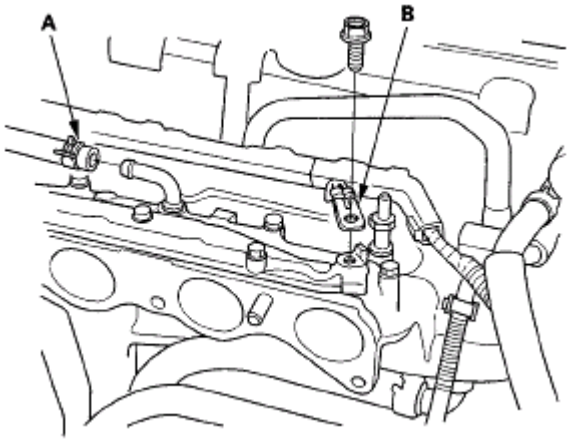

Fig. 78: Identifying Positive Crankcase Ventilation (PCV) Hose & Ground Cable
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

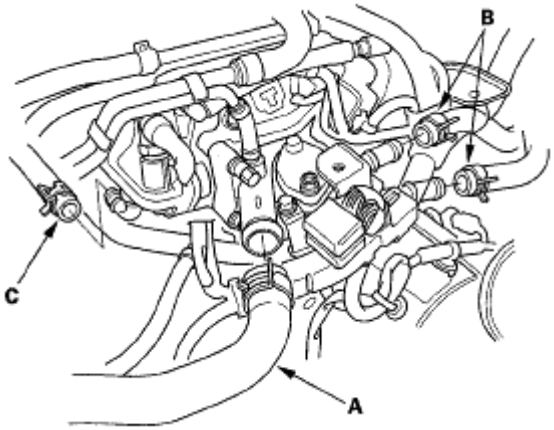

Fig. 79: Identifying Upper Radiator Hose, Heater Hoses & Water Bypass Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

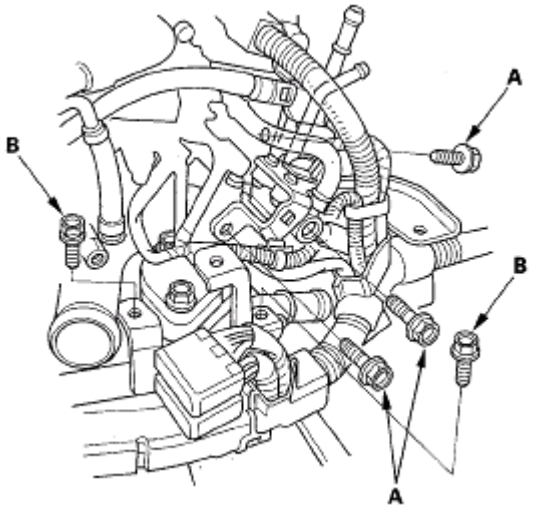

Fig. 80: Identifying EVAP Canister Purge Valve Bracket & Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

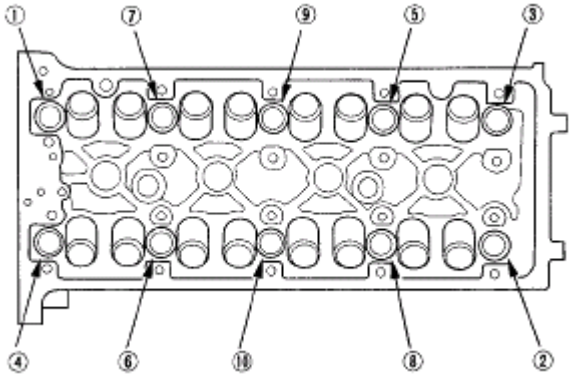

Fig. 81: Identifying Cylinder Head Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Remove the cylinder head.

CMP PULSE PLATE A REPLACEMENT

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

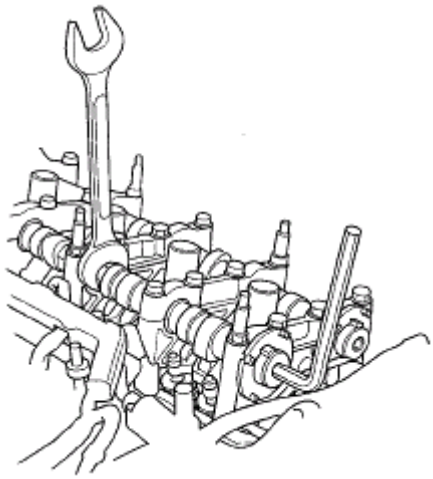

Fig. 82: Holding Intake Camshaft With Open-End Wrench
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

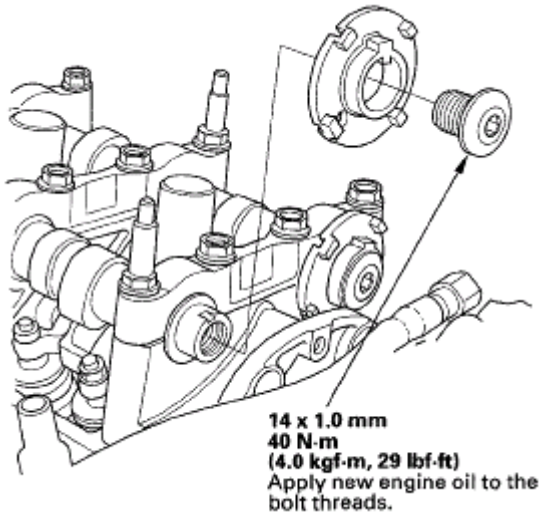

Fig. 83: Identifying Camshaft Position (CMP) Pulse Plate A With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

CMP PULSE PLATE B REPLACEMENT

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

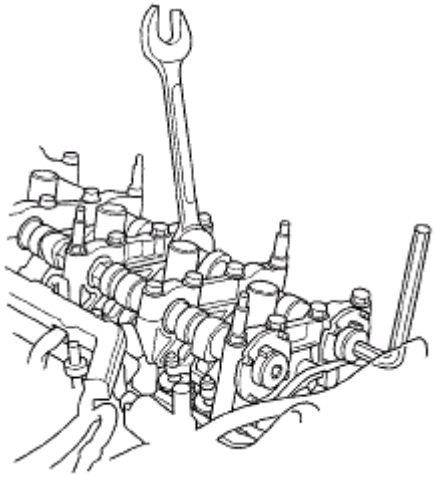

Fig. 84: Holding Exhaust Camshaft With Open-End Wrench
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

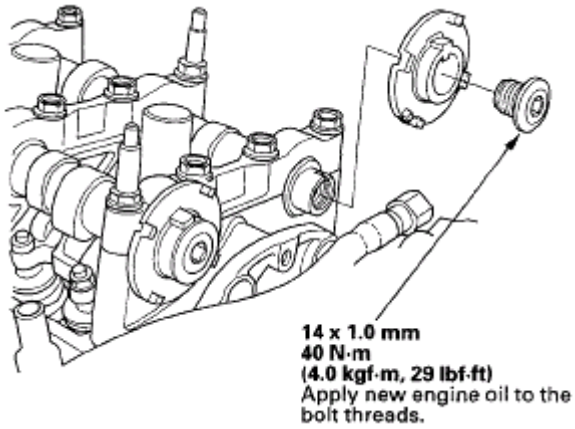

Fig. 85: Identifying Camshaft Position (CMP) Pulse Plate B With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

VTC ACTUATOR, EXHAUST CAMSHAFT SPROCKET REMOVAL AND INSTALLATION

REMOVAL

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

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

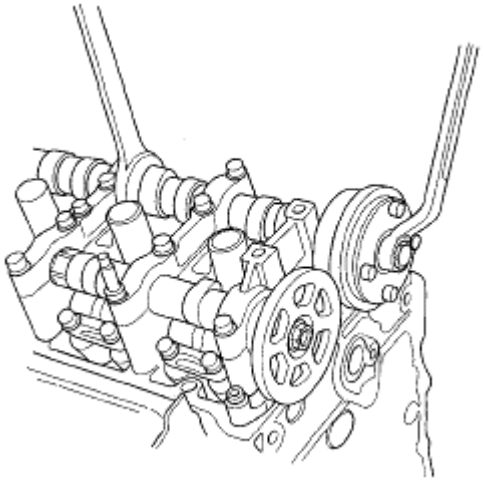

Fig. 86: Loosening Variable Valve Timing Control (VTC) Actuator Mounting Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

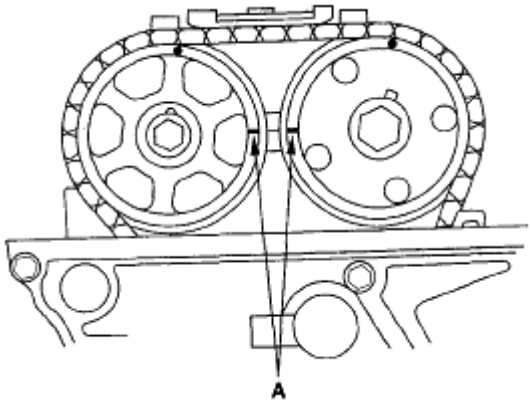

Fig. 87: Identifying TDC Marks On Variable Valve Timing Control (VTC) Actuator
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

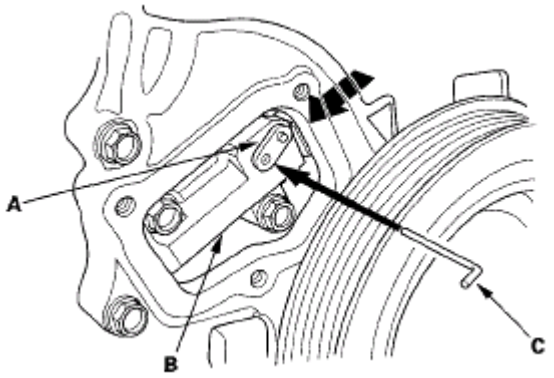

Fig. 88: Aligning Holes On Lock & Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Turn the crankshaft clockwise to secure the pin and the TDC on the No. 1 cylinder.
7. Loosen the locknuts and the adjusting screws. Refer to2
8. Remove the camshaft holder bolts. Refer to 8
9. Remove the five camshaft holders and cam chain guide B.
10. Carefully tip up the intake camshaft on the transmission side of the engine until there is enough slack in the chain to lift the chain off of the VTC actuator's teeth.
11. Remove the intake and exhaust camshafts while keeping some tension on the cam chain.
12. Secure the cam chain to the A/C compressor suction hose or the power steering hose with a wire tie to prevent the chain from falling down into the chain case.
13. Remove the VTC actuator and the exhaust camshaft sprocket.

INSTALLATION

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

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

2. Apply new engine oil to the threads of the VTC actuator and the exhaust camshaft sprocket mounting bolts, then loosely install them.
3. Turn the VTC actuator clockwise until you hear it click. Make sure to lock the VTC actuator by turning it.
4. Remove the wire tie while keeping light tension on the cam chain.
5. Slide the intake and exhaust camshafts in at an angle to allow the cam chain to slip over the VTC actuator's teeth and the exhaust sprocket's teeth.
6. Line up the marks made in step 3 for each cam.
7. Apply new engine oil to the camshaft journals and lobes on both cams, and reinstall the five camshaft holders and cam chain guide B in place.
8. Tighten the camshaft holder bolts to the specified torque. Refer to 8
9. Hold the camshaft with an open-end wrench, then tighten the mounting bolts.

Specified Torque

VTC Actuator Mounting Bolt:

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

Exhaust Camshaft Sprocket Mounting Bolt:

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

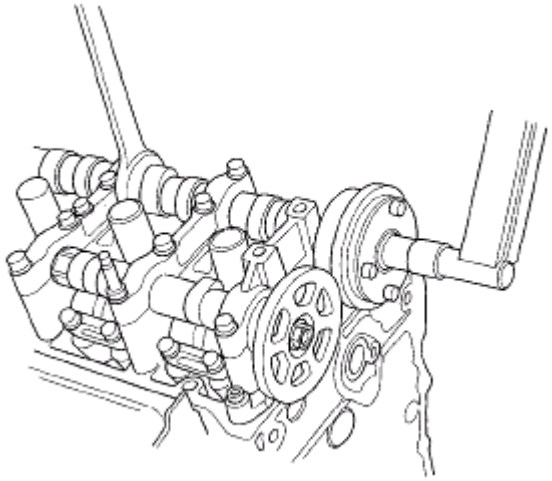

Fig. 89: Holding Camshaft With Open-End Wrench
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

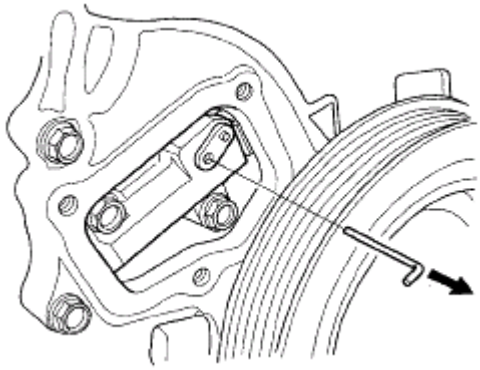

Fig. 90: Identifying Pin From Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Remove all of the old liquid gasket from the chain case cover mating surfaces, the bolts, and the bolt holes.
12. Clean and dry the chain case cover mating surfaces.

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

CYLINDER HEAD INSPECTION FOR WARPAGE

1. Remove the cylinder head (see **CYLINDER HEAD REMOVAL**).
2. Inspect the camshaft (see **CAMSHAFT INSPECTION**).
3. Check the cylinder head for warpage. Measure along the edges, and three ways across the center.
    - If warpage is less than 0.05 mm (0.002 in.), cylinder head resurfacing is not required.
    - If warpage is between 0.05 mm (0.002 in.) to 0.2 mm (0.008 in.), resurface the cylinder head.
    - Maximum resurface limit is 0.2 mm (0.008 in.) based on a height of 104 mm (4.09 in.).

    Cylinder Head Height

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

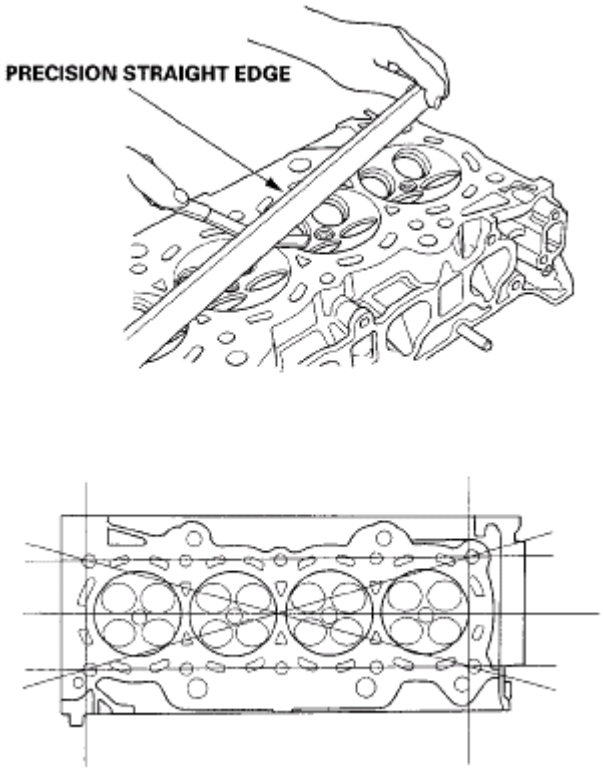

Fig. 91: Checking Cylinder Head Warpage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM ASSEMBLY REMOVAL

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

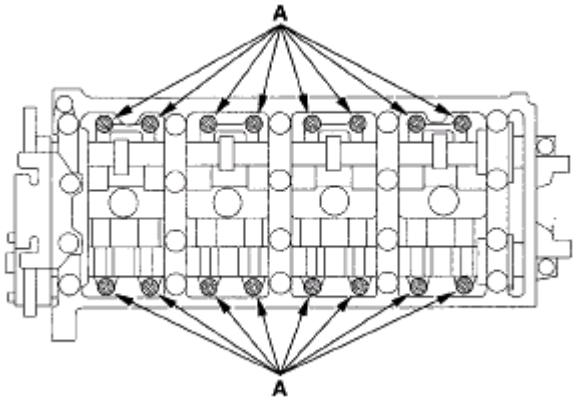

Fig. 92: Loosening Rocker Arm Adjusting Screws
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

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

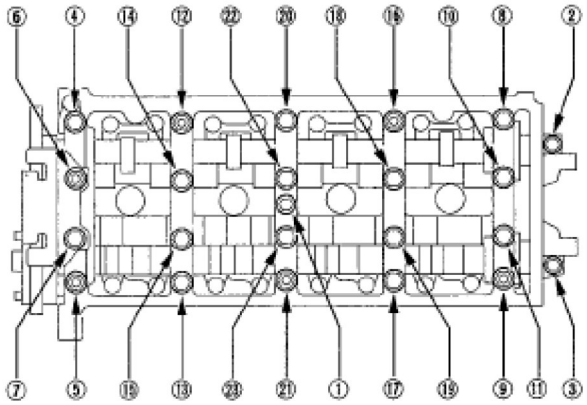

Fig. 93: Identifying Camshaft Holder Bolts Loosening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

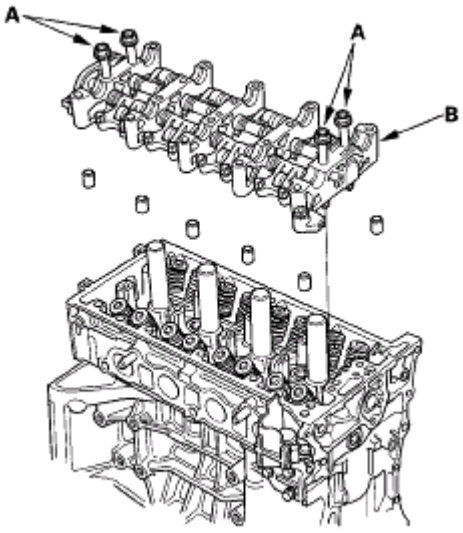

Fig. 94: Identifying Rocker Shaft Holder Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY

NOTE:

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

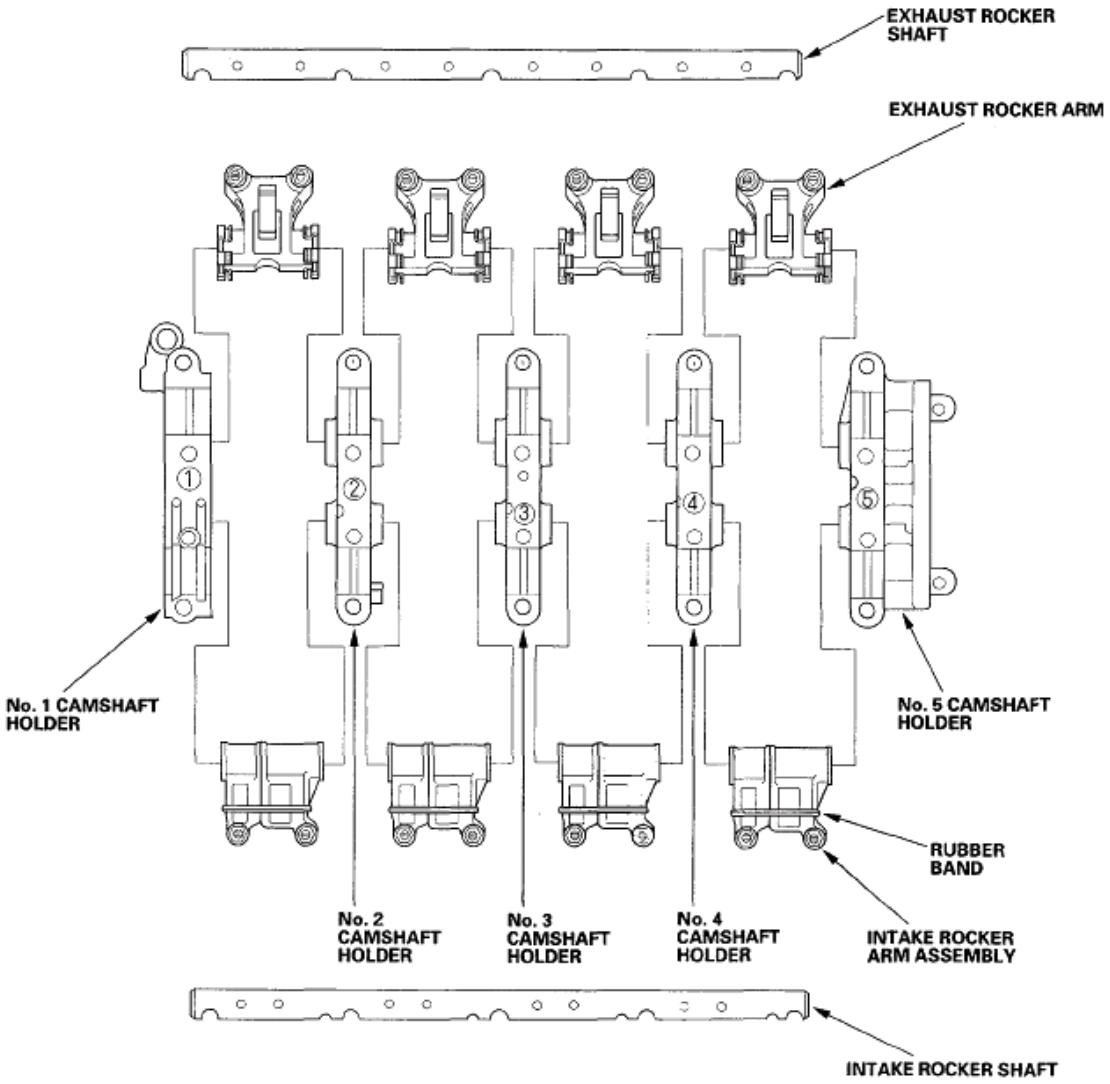

Fig. 95: Exploded View Of Rocker Arm & Shaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM AND SHAFT INSPECTION

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

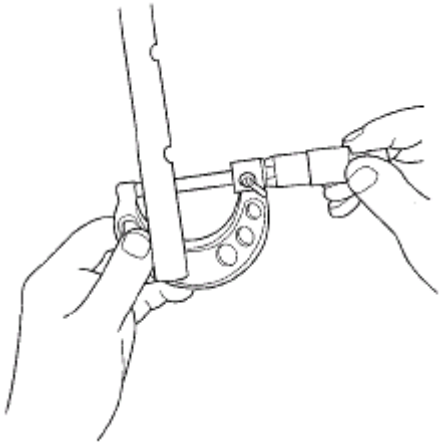

Fig. 96: Measuring Diameter Of Shaft At Rocker
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

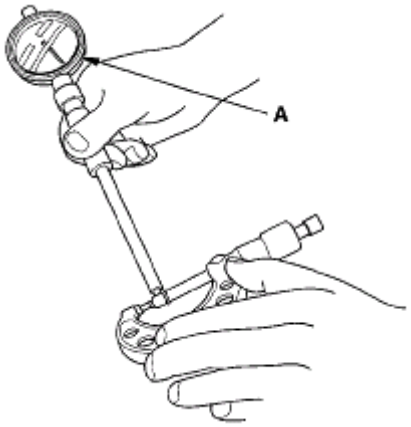

Fig. 97: Measuring Shaft Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Rocker Arm-to-Shaft Clearance

   Standard (New):

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

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

   Service Limit: 0.08 mm (0.003 in.)

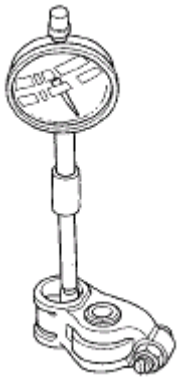

Fig. 98: Measuring Inside Diameter Of Rocker Arm
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

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

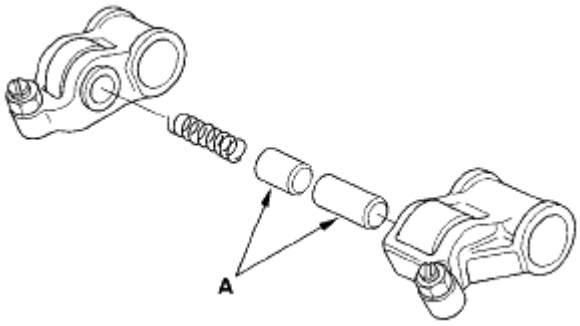

Fig. 99: Identifying Rocker Arm Pistons
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

CAMSHAFT INSPECTION

NOTE: Do not rotate the camshaft during inspection.

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

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

Specified Torque

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

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

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

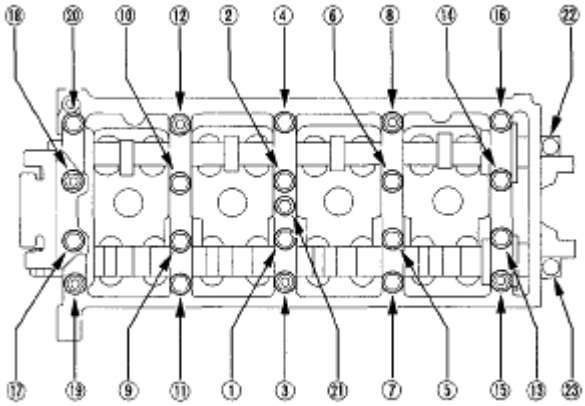

Fig. 100: Identifying Camshaft Bolts Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Camshaft End Play

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

Service Limit: 0.4 mm (0.02 in.)

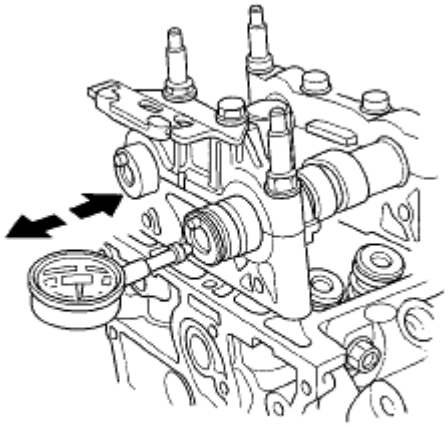

Fig. 101: Checking Camshaft End Play
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

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

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

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

Service Limit: 0.15 mm (0.006 in.)

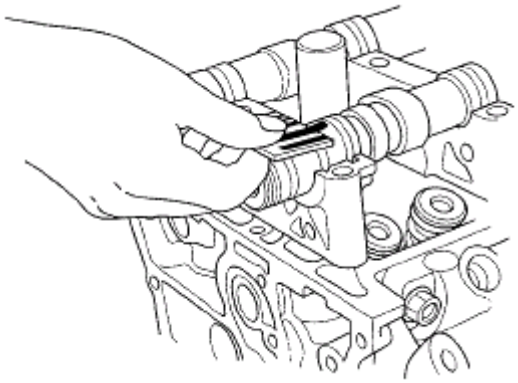

Fig. 102: Measuring Widest Portion Of Plastigage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

    Camshaft Total Runout

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

    Service Limit: 0.04 mm (0.002 in.)

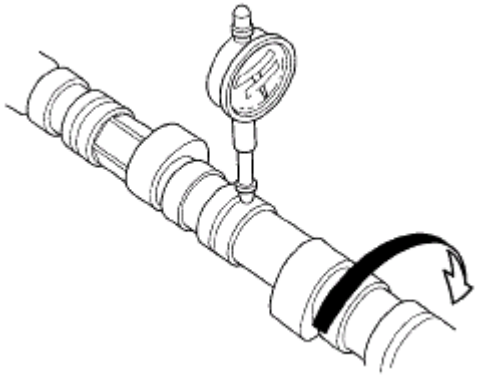

Fig. 103: Checking Runout Of Camshaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Measure cam lobe height.

Cam Lobe Height Standard (New):

	INTAKE	EXHAUST
PRI	34.263 mm (1.3489 in.)	34.092 mm (1.3422 in.)
SEC	29.638 mm (1.1668 in.)	

PRI: Primary SEC: Secondary C/C: Cam Chain

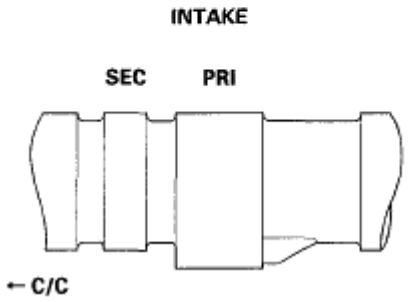

Fig. 104: Measuring Cam Lobe Height
Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVE, SPRING, AND VALVE SEAL REMOVAL

SPECIAL TOOLS REQUIRED

Valve spring compressor attachment 07757-PJ1010A

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

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

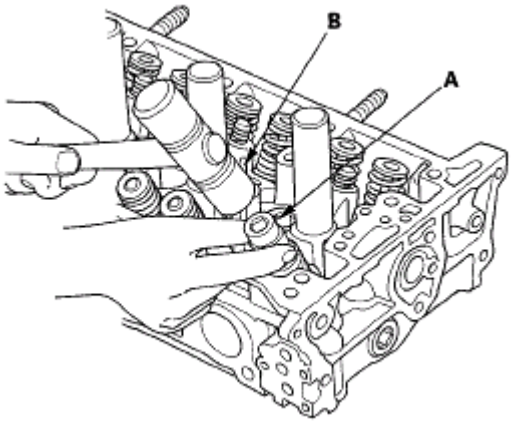

Fig. 105: Tapping Valve Spring Retainer

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

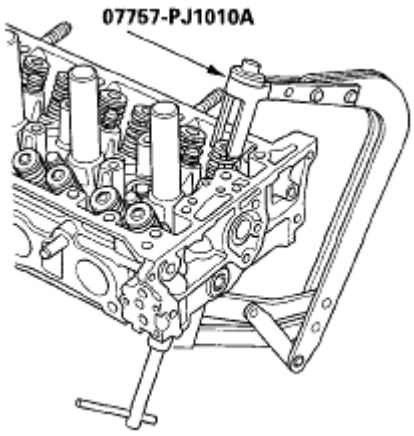

Fig. 106: Compressing Valve Spring
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

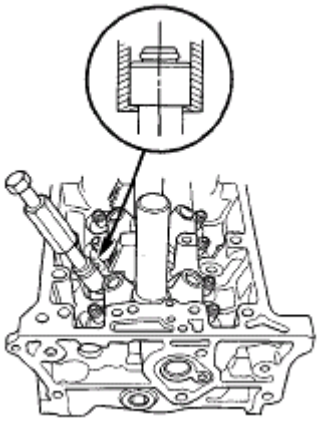

Fig. 107: Identifying Valve Guide Seal Remover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the valve seal.

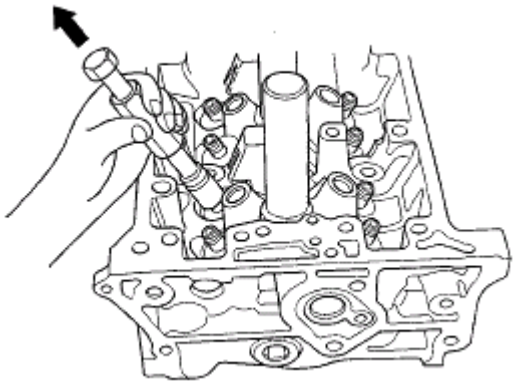

Fig. 108: Identifying Valve Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the valve spring seat.

VALVE INSPECTION

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

Intake Valve Dimensions

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

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

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

C Service Limit: 5.445 mm (0.214 in.)

Exhaust Valve Dimensions

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

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

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

C Service Limit: 5.42 mm (0.213 in.)

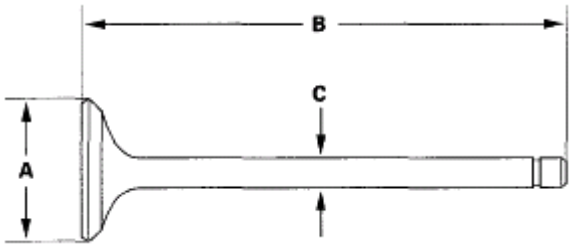

Fig. 109: Measuring Valve Dimension
Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVE STEM-TO-GUIDE CLEARANCE INSPECTION

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

Intake Valve Stem-to-Guide Clearance

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

Service Limit: 0.16 mm (0.006 in.)

Exhaust Valve Stem-to-Guide Clearance

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

Service Limit: 0.22 mm (0.009 in.)

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

3. Subtract the O.D. of the valve stem, measured with a micrometer, from the I.D. of the valve guide, measured with an inside micrometer or ball gauge. Take the measurements in three places along the valve stem and three places inside the valve guide. The difference between the largest guide measurement and

the smallest stem measurement should not exceed the service limit.

Intake Valve Stem-to-Guide Clearance

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

Service Limit: 0.08 mm (0.003 in.)

Exhaust Valve Stem-to-Guide Clearance

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

Service Limit: 0.11 mm (0.004 in.)

VALVE GUIDE REPLACEMENT

SPECIAL TOOLS REQUIRED

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

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

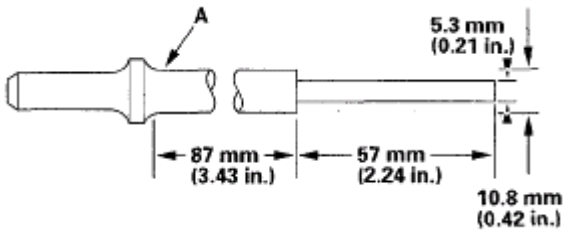

Fig. 111: Identifying Valve Guide Dimension
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

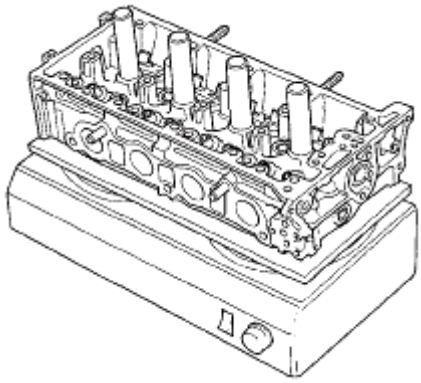

Fig. 112: Heating Cylinder Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Working from the camshaft side, use the driver and an air hammer to drive the guide about 2 mm (0.1 in.) towards the combustion chamber. This will knock off some of the carbon and make removal easier. Hold the air hammer directly inline with the valve guide to prevent damaging the driver. Wear safety goggles or a face shield.
6. Turn the head over, and drive the guide out toward the camshaft side of the head.

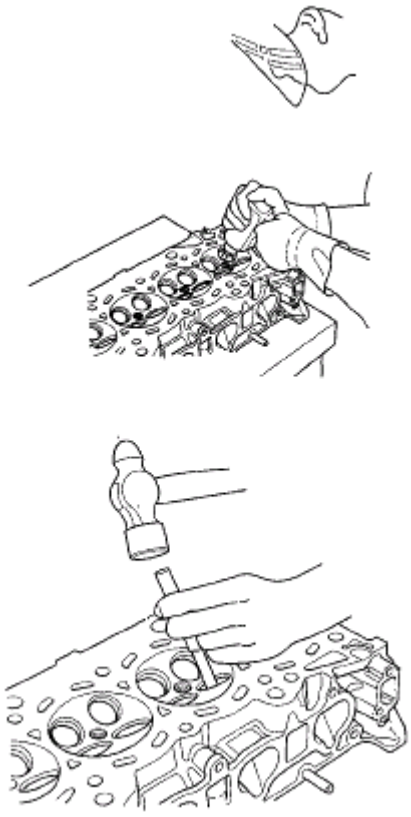

Fig. 113: Driving Guide Out Toward Camshaft Side Of Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

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

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

Valve Guide Installed Height

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

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

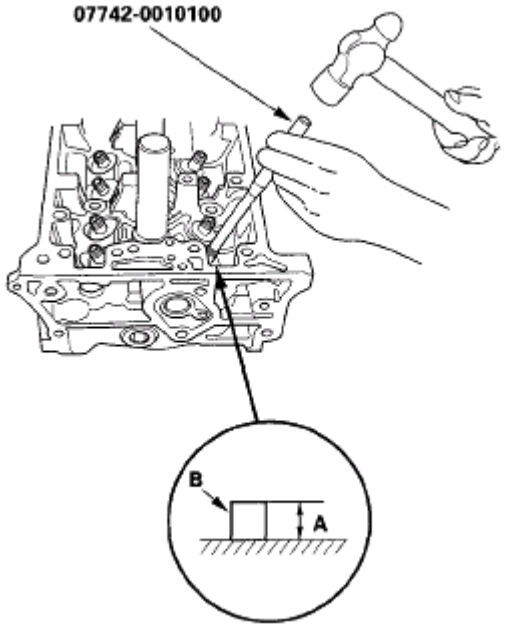

Fig. 114: View Of Guide From Camshaft Side Of Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

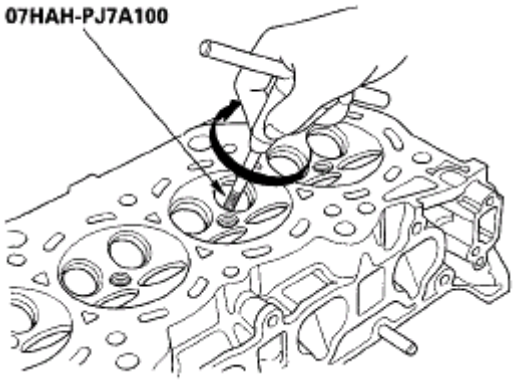

Fig. 115: Rotating Reamer Clockwise
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

VALVE SEAT RECONDITIONING

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

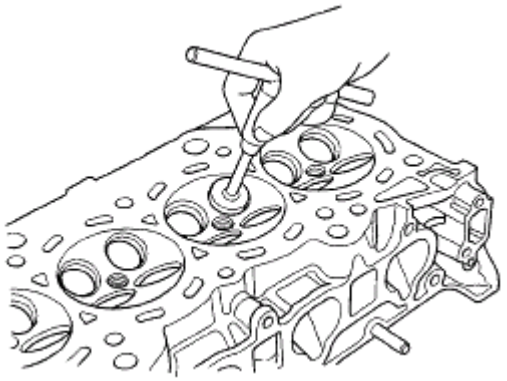

Fig. 116: Reaming Valve Seats In Cylinder Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

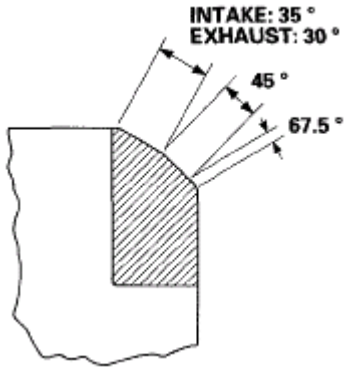

Fig. 117: Identifying Upper & Lower Edges At Angles
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Valve Seat Width

   Standard (New): 1.25-1.55 mm (0.049-0.061 in.)

   Service Limit: 2.00 mm (0.079 in.)

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

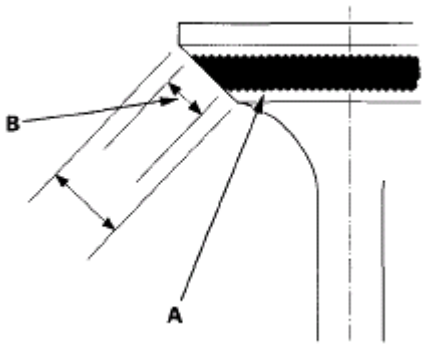

Fig. 118: Identifying Prussian Blue Compound Applying Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

restore seat width.

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

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

   Intake Valve Stem Installed Height

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

   Service Limit: 44.7 mm (1.76 in.)

   Exhaust Valve Stem Installed Height

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

   Service Limit: 44.8 mm (1.76 in.)

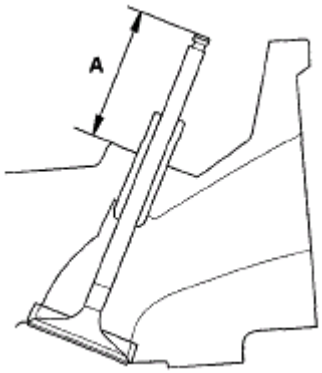

Fig. 119: Identifying Valve Stem Height
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

VALVE, SPRING, AND VALVE SEAL INSTALLATION

SPECIAL TOOLS REQUIRED

- Stem seal driver 07PAD-0010000
- Valve spring compressor attachment 07757-PJ1010A

1. Coat the valve stems with new engine oil. Install the valves in the valve guides.
2. Check that the valves move up and down smoothly.
3. Install the spring seats on the cylinder head.

4. Install the new valve seals (A) using the stem seal driver (B).

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

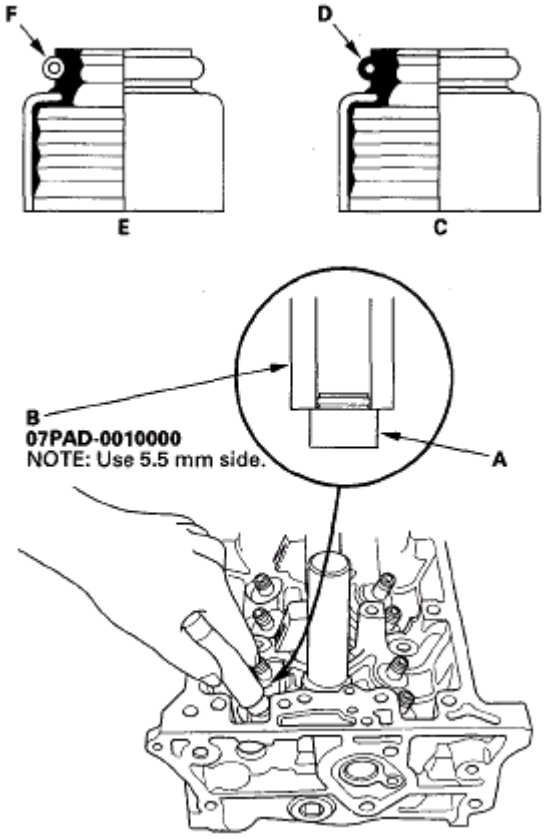

Fig. 120: Identifying Valve Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

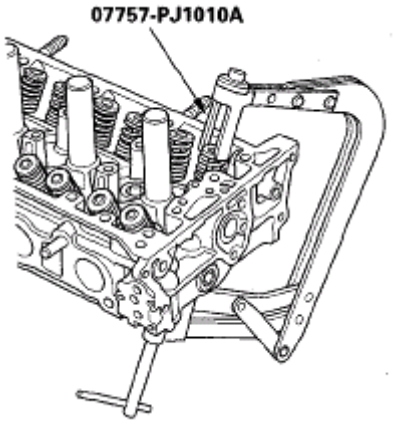

Fig. 121: Identifying Valve Spring Compressor Attachment & Valve Spring Compressor
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

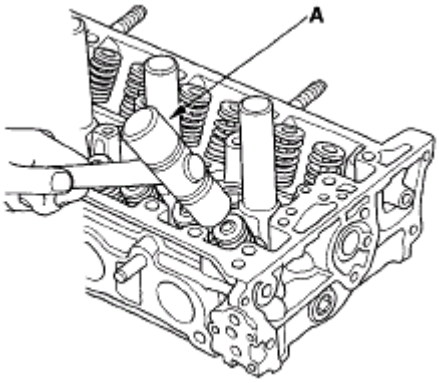

Fig. 122: Tapping End Of Valve Stem
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM ASSEMBLY INSTALLATION

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

NOTE:

- **If you apply liquid gasket P/N 08718-0012, the component must be installed within 4 minutes.**

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

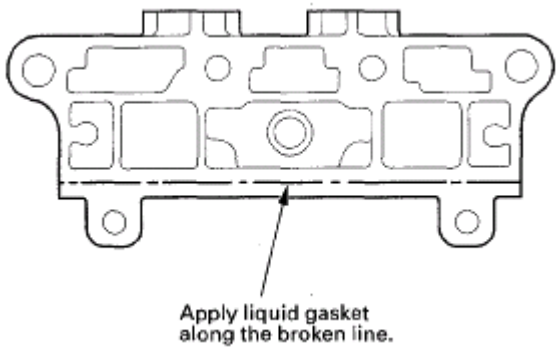

Fig. 123: Identifying Liquid Gasket Applying Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

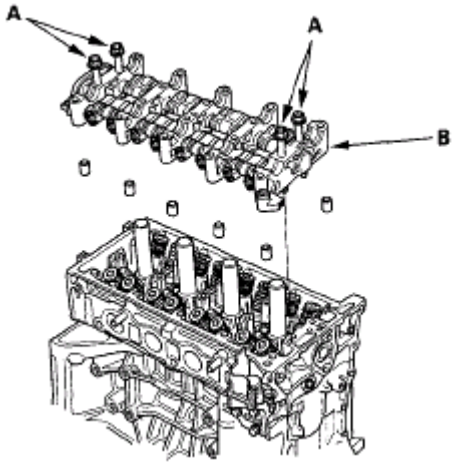

Fig. 124: Identifying Rocker Arm Assembly Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

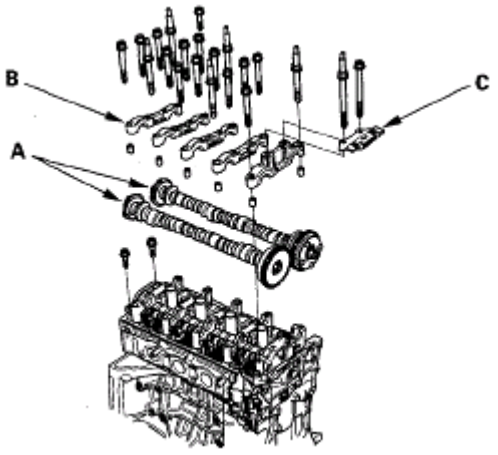

Fig. 125: Identifying Camshafts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

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

Specified Torque

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

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

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

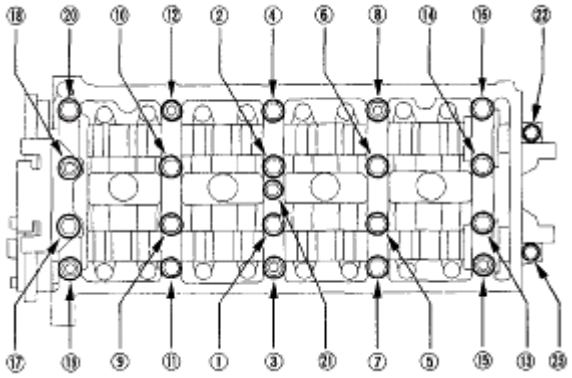

Fig. 126: Identifying Camshaft Bolts Torque Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

CYLINDER HEAD INSTALLATION

Install the cylinder head in the reverse order of removal:

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

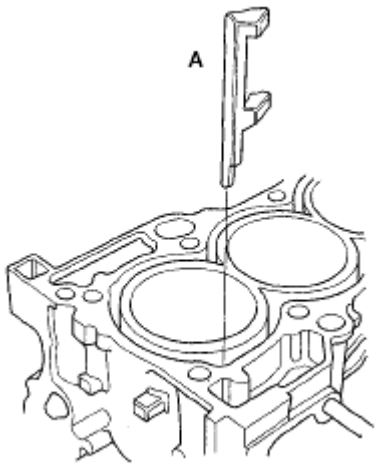

Fig. 127: Identifying Coolant Separator In Engine Block
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

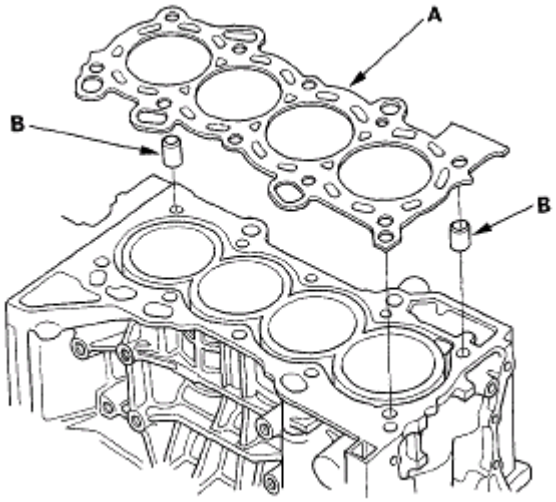

Fig. 128: Identifying Cylinder Head Gasket & Dowel Pins On Engine Block
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

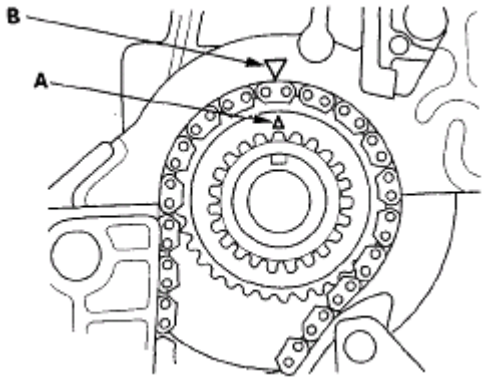

Fig. 129: Aligning TDC Mark On Crankshaft Sprocket With Pointer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

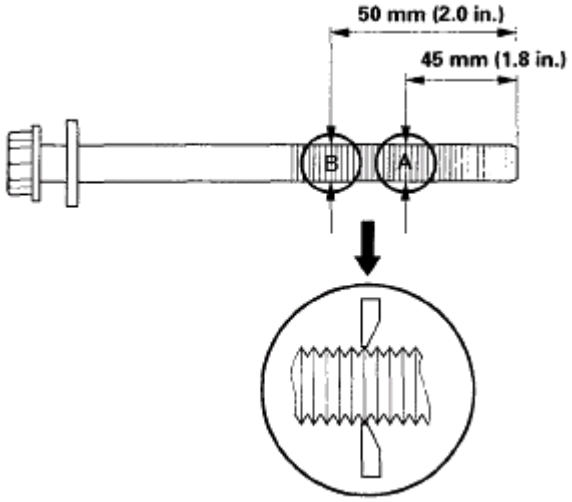

Fig. 130: Measuring Diameter Of Cylinder Head Bolt At Point A & B
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

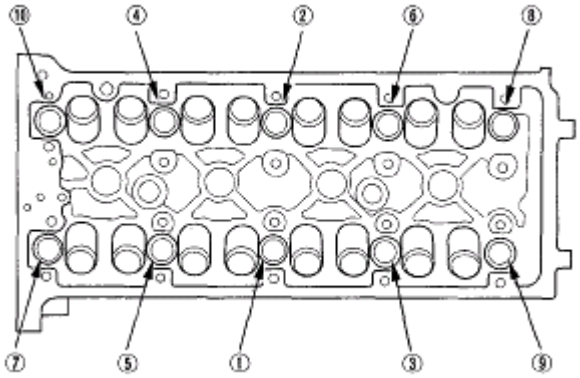

Fig. 131: Identifying Cylinder Head Bolt Torque Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

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

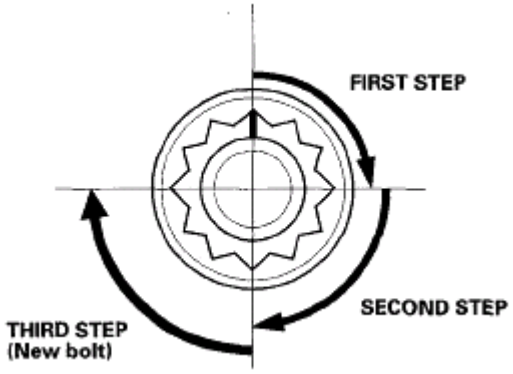

Fig. 132: Identifying Cylinder Head Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

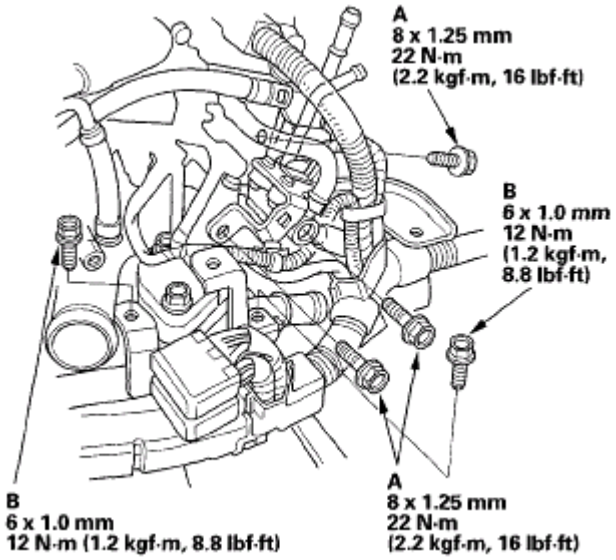

Fig. 133: Identifying Evaporative Emission (EVAP) Canister Purge Valve Bracket Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Connect the following engine wire harness connectors, and install the wire harness clamps from the cylinder head:
    - Four injector connectors
    - Engine coolant temperature (ECT) sensor 1 connector
    - Camshaft position (CMP) sensor A connector (Intake side)
    - Camshaft position (CMP) sensor B connector (Exhaust side)
    - Rocker arm oil control solenoid (VTEC solenoid valve) connector
    - Rocker arm oil pressure switch (VTEC oil pressure switch) connector
16. Connect the upper radiator hose (A), the heater hoses (B), and the water bypass hose (C).

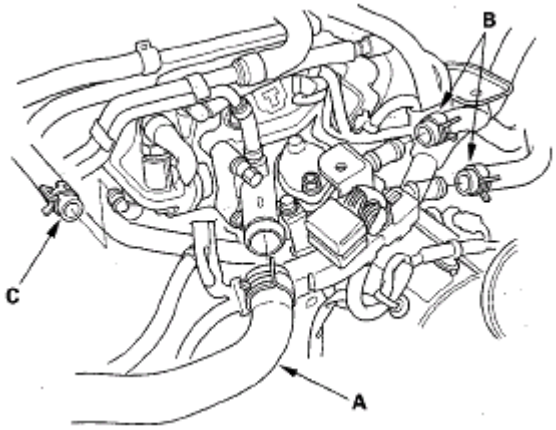

Fig. 134: Identifying Upper Radiator Hose, Heater Hoses & Water Bypass Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

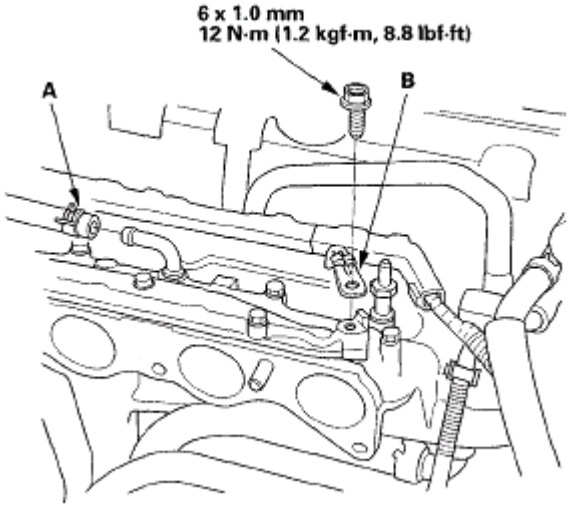

Fig. 135: Identifying Positive Crankcase Ventilation (PCV) Hose & Ground Cable With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

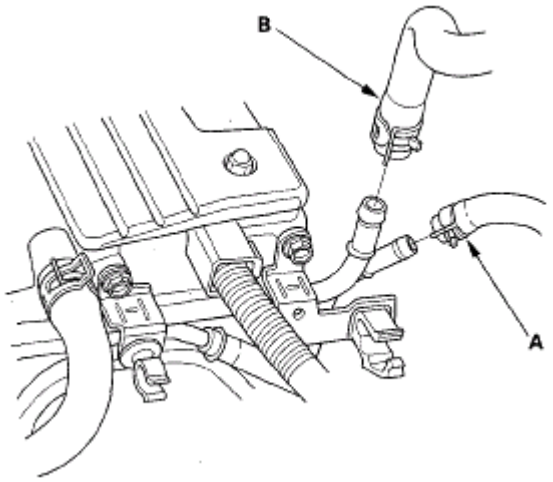

Fig. 136: Identifying EVAP Canister Hose & Brake Booster Vacuum Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

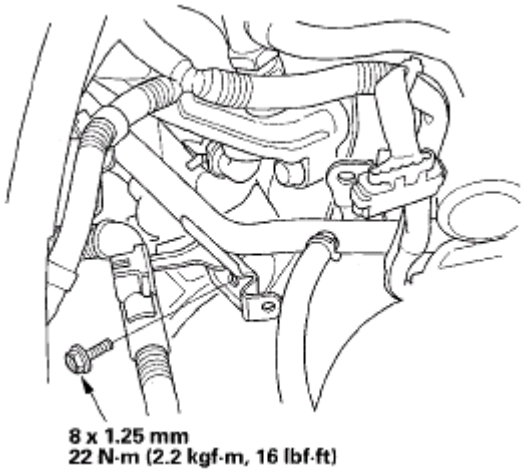

Fig. 137: Identifying Connecting Pipe Support Bracket Bolt With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

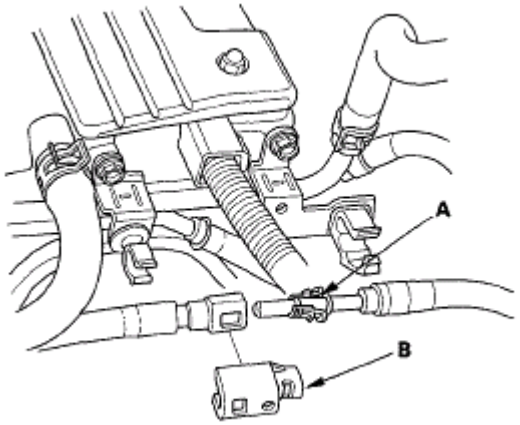

Fig. 138: Identifying Fuel Feed Hose & Quick-Connect Fitting Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

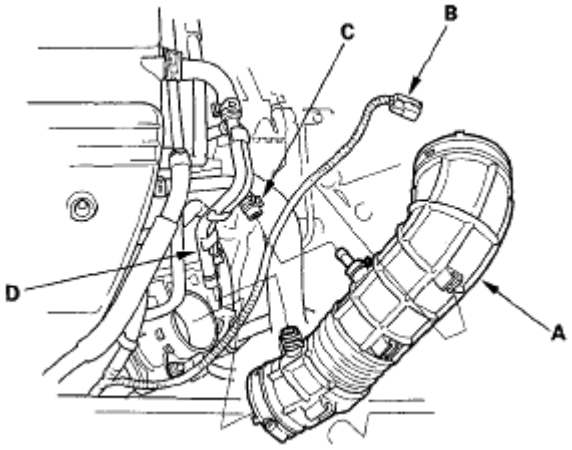

Fig. 139: Identifying Intake Air Duct, Vacuum Hose & Breather Pipe
Courtesy of AMERICAN HONDA MOTOR CO., INC.

24. Install the drive belt (see **DRIVE BELT REPLACEMENT**).
25. After installation, check that all tubes, hoses, and connectors are installed correctly.
26. Inspect for fuel leaks. Turn the ignition switch to ON (II) (do not operate the starter) so the fuel pump runs for about 2 seconds and pressurizes the fuel line. Repeat this operation three times, then check for fuel leakage at any point in the fuel line.
27. Refill the radiator with engine coolant, and bleed air from the cooling system with the heater valve open (see **COOLANT CHECK**).
28. Do the engine control module (ECM)/powertrain control module (PCM) idle learn procedure (see **ECM/PCM IDLE LEARN PROCEDURE**).
29. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **CRANK (CKP) PATTERN CLEAR/CRANK (CKP) PATTERN LEARN**).
30. Inspect the idle speed (see **IDLE SPEED INSPECTION**).
31. Inspect the ignition timing (see **IGNITION TIMING INSPECTION**).

2007-011 ENGINE

Engine Block - Element

SPECIAL TOOLS

Ref.No.	Tool Number	Description	Qty
①	07746-0010700	Attachment, 24 x 26 mm	1
②	07749-0010000	Driver Handle, 15 x 135L	1
③	07AAK-SNAA120	Universal Lifting Eyelet	1
④	07ZAD-PNAA100	Oil Seal Driver Attachment, 96 mm	1

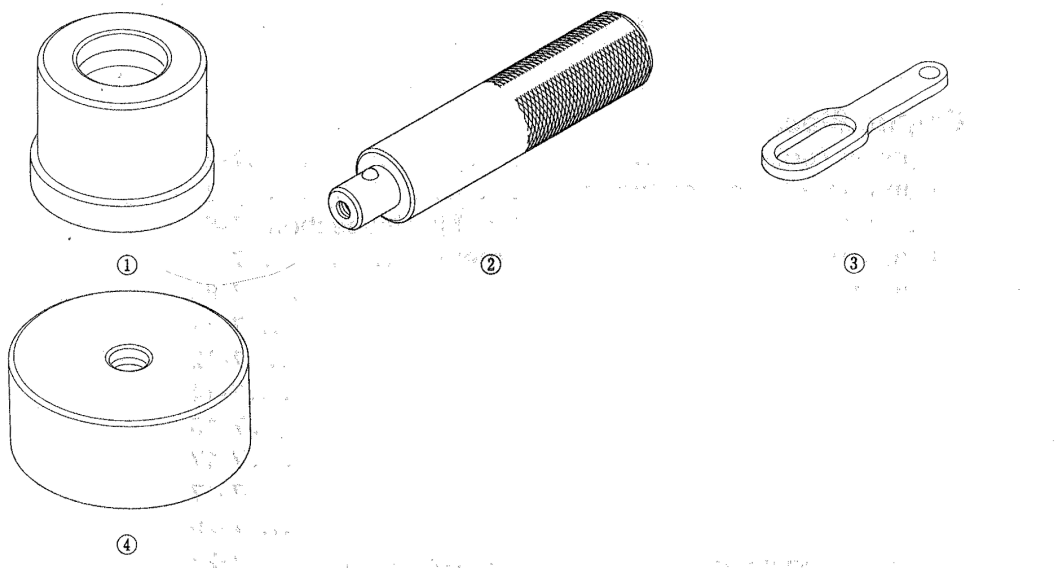

Fig. 1: Identifying Special Tools
Courtesy of AMERICAN HONDA MOTOR CO., INC.

COMPONENT LOCATION INDEX

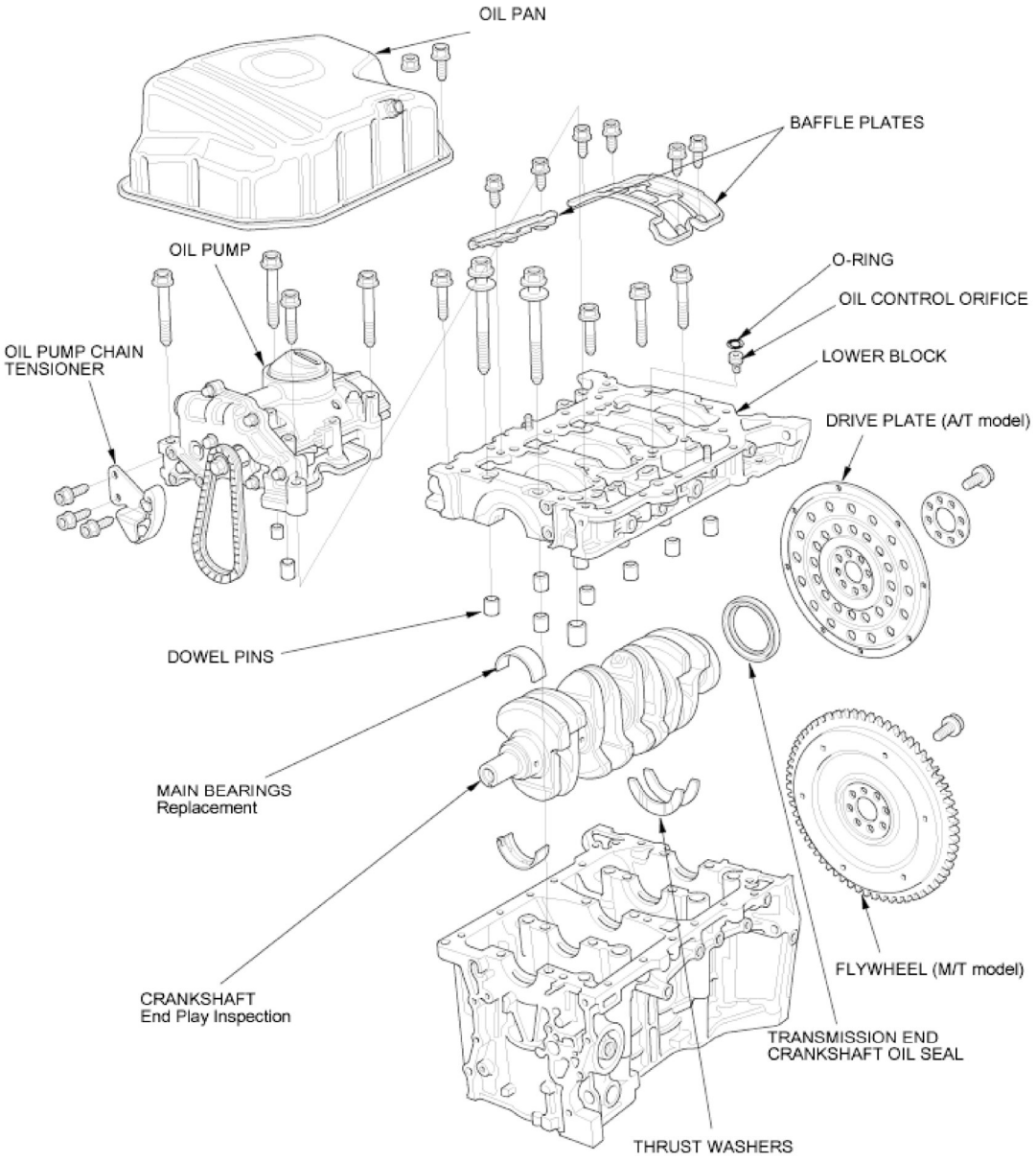

Fig. 2: Identifying Engine Block Replacement Components (1 Of 2)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

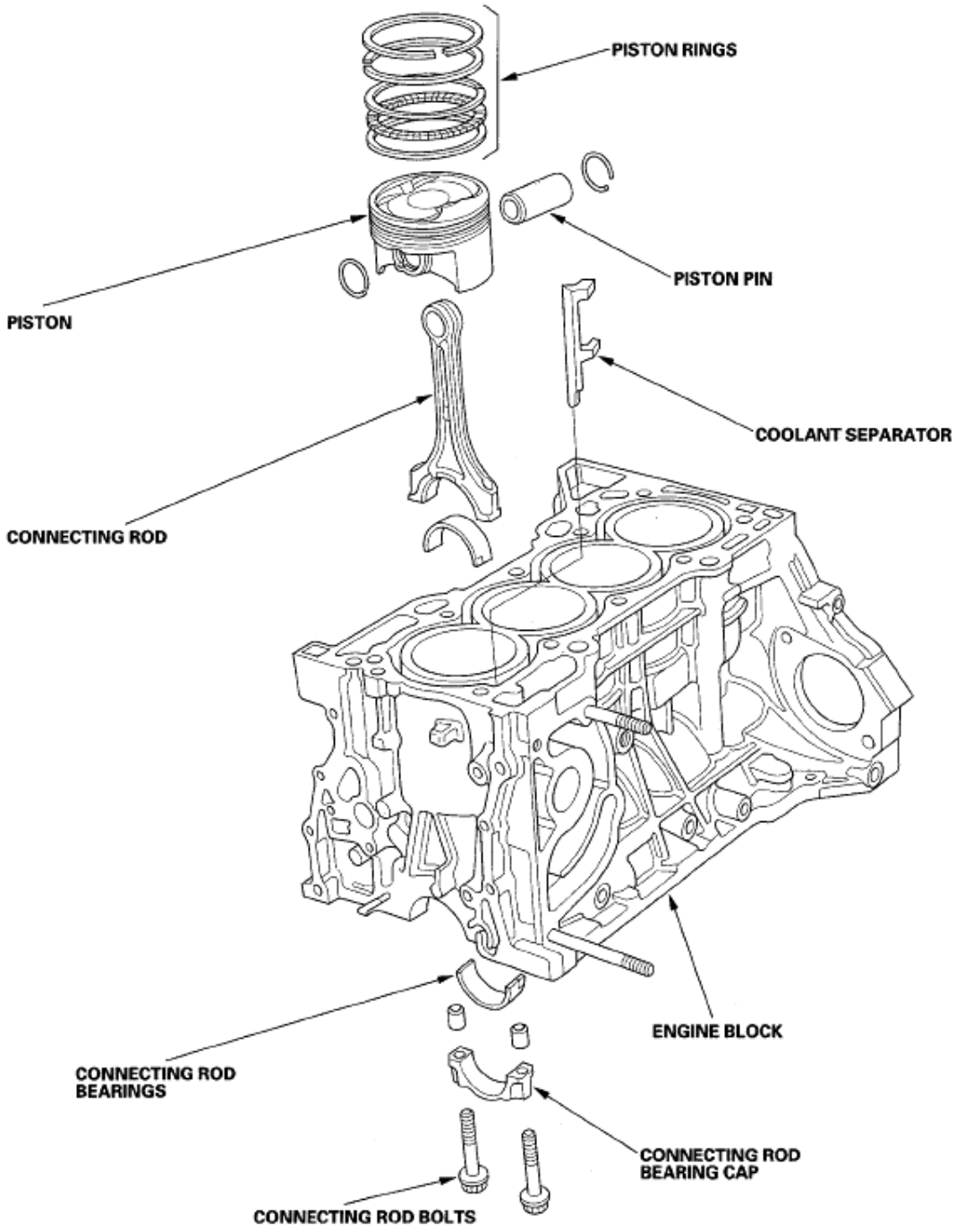

Fig. 3: Identifying Engine Block Replacement Components (2 Of 2)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CONNECTING ROD AND CRANKSHAFT END PLAY INSPECTION

1. Remove the oil pump (see **OIL PUMP REMOVAL**).
2. Remove the baffle plates (see step 8).

3. Measure the connecting rod end play with a feeler gauge between the connecting rod and crankshaft.

   Connecting Rod End Play

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

   Service Limit: 0.40 mm (0.016 in.)

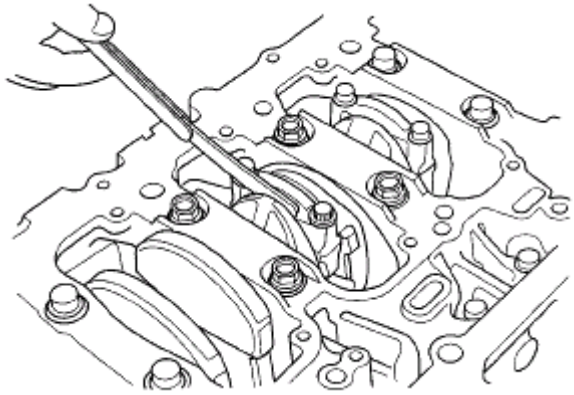

Fig. 4: Measuring Connecting Rod End Play With Feeler Gauge
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. If the connecting rod end play is beyond the service limit, install a new connecting rod, and recheck. If it is still beyond the service limit, replace the crankshaft (see **CRANKSHAFT AND PISTON REMOVAL**).
5. Push the crankshaft firmly away from the dial indicator, and zero the dial against the end of the crankshaft. Then pull the crankshaft firmly back toward the indicator, the dial reading should not exceed the service limit.

   Crankshaft End Play

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

   Service Limit: 0.45 mm (0.018 in.)

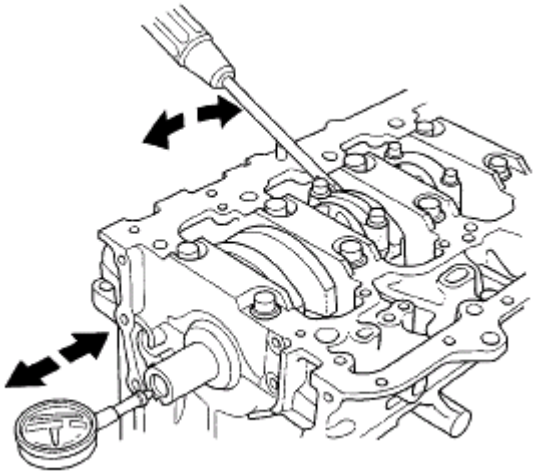

Fig. 5: Checking Crankshaft End Play
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

CRANKSHAFT MAIN BEARING REPLACEMENT

MAIN BEARING CLEARANCE INSPECTION

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

NOTE: Do not rotate the crankshaft during inspection.

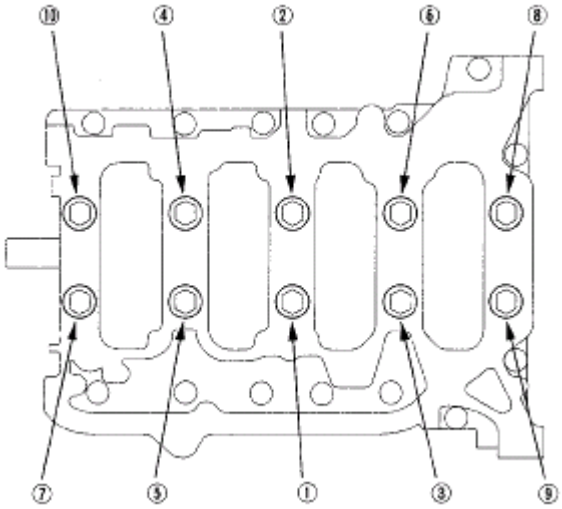

Fig. 6: Identifying Crankshaft Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Main Bearing-to-Journal Oil Clearance

No. 1, 2, 4, 5 Journals:

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

Service Limit: 0.050 mm (0.0020 in.)

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

Service Limit: 0.055 mm (0.0022 in.)

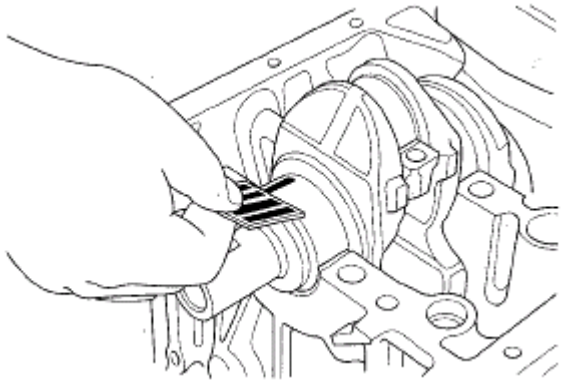

Fig. 7: Measuring Widest Part Of Plastigage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

MAIN BEARING SELECTION

Crankshaft Bore Code Location

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

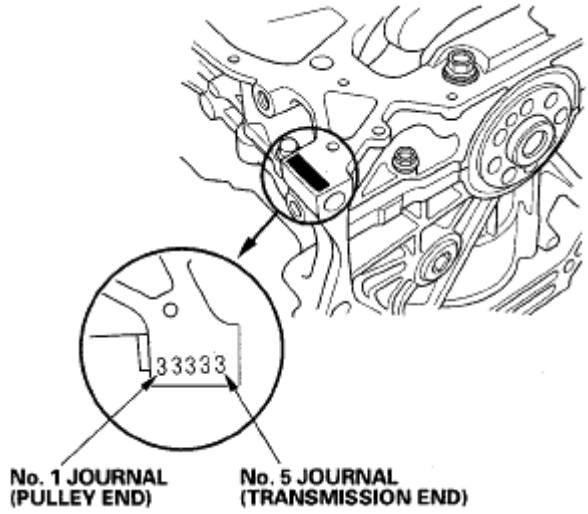

Fig. 8: Identifying Crankshaft Bore Code Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Main Journal Code Location

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

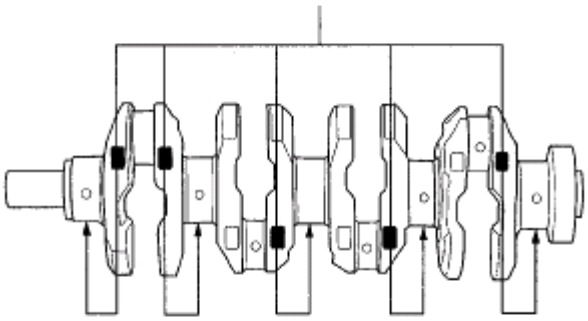

Fig. 9: Identifying Main Journal Code Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

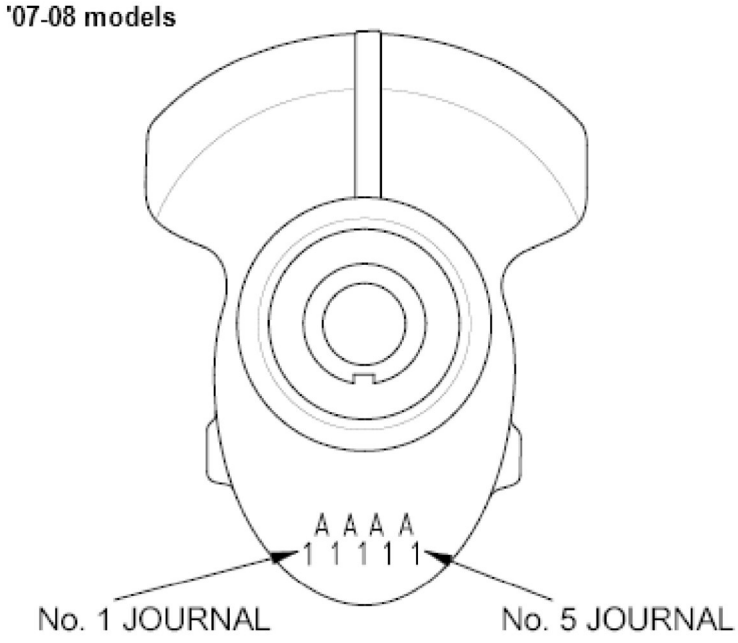

Fig. 10: Identifying Main Journal Code ('07-08 Models)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

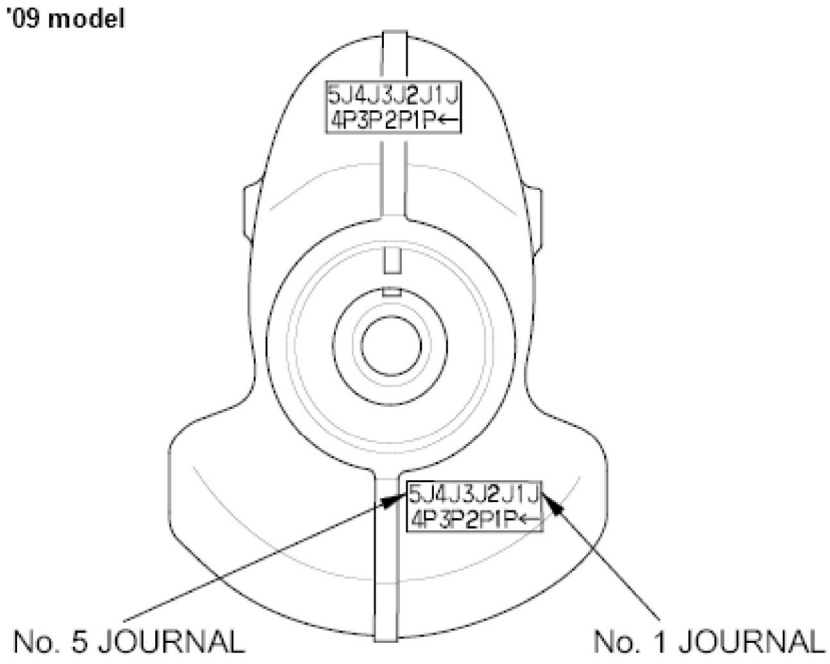

Fig. 11: Identifying Main Journal Code ('09-10 Models)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

NOTE:

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

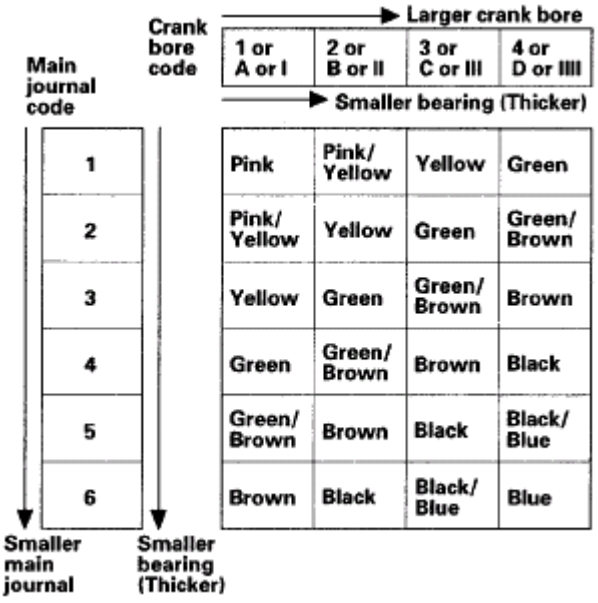

Fig. 12: Identifying Crank Bore Codes & Crank Journal Codes Table
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CONNECTING ROD BEARING REPLACEMENT

ROD BEARING CLEARANCE INSPECTION

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

NOTE: Do not rotate the crankshaft during inspection.

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

Connecting Rod Bearing-to-Journal Oil Clearance

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

Service Limit: 0.060 mm (0.0024 in.)

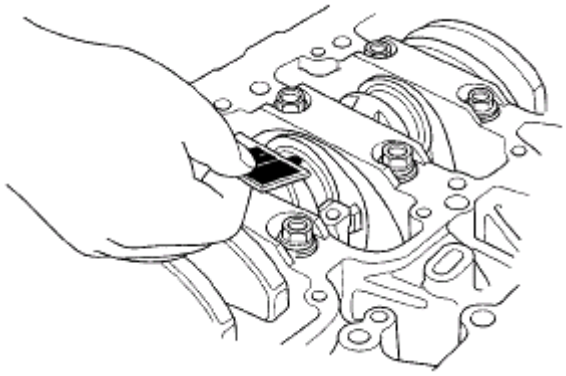

Fig. 13: Measuring Widest Part Of Plastigage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

CONNECTING ROD BEARING SELECTION

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

   Connecting Rod Big End Bore Code Locations

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

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

   Normal Bore Size: 51.0 mm (2.01 in.)

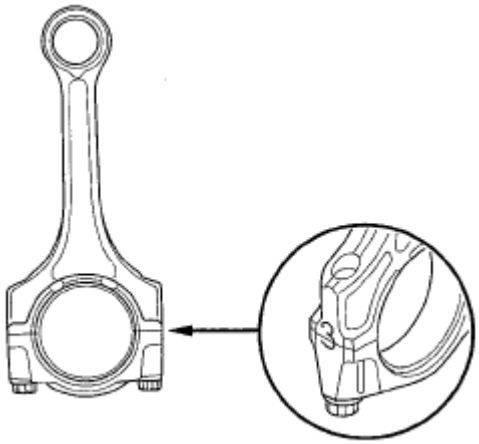

Fig. 14: Identifying Connecting Rod Big End Bore Size
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Connecting Rod Journal Code Location

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

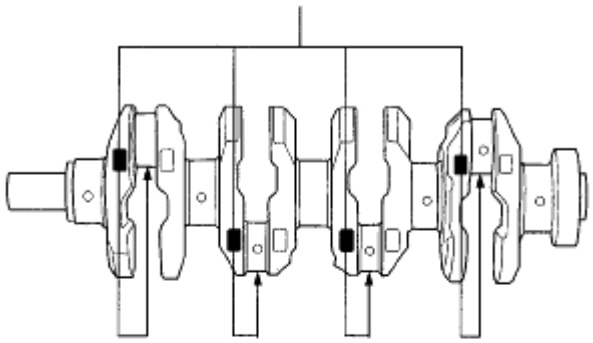

Fig. 15: Identifying Connecting Rod Journal Code Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

