2009-10 ENGINE

Cylinder Head - RL

SPECIAL TOOLS

Ref. No.	Tool Number	Description	Qty
①	07AAJ-PNAA101	Air Pressure Regulator	1
②	07AAJ-R70A100	VTEC Air Stop Tool A	1
③	07AAJ-R70A200	VTEC Air Stop Tool B	1
④	07GAF-SD40330	Ball Joint Remover/Installer	1
⑤	07HAH-PJ7A100	Valve Guide Reamer, 5.5 mm	1
⑥	07JAA-001020A	Socket, 19 mm	1
⑦	07JAB-001020B	Holder Handle	1
⑧	07MAB-PY3010A	Holder Attachment, 50 mm	1
⑨	07PAD-0010000	Stem Seal Driver	1
⑩	070AJ-001A101	VTEC/VCM Air Adapter	1
⑪	07742-0010100	Valve Guide Driver, 5.5 mm	1
⑫	07757-PJ1010A	Valve Spring Compressor Attachment	1

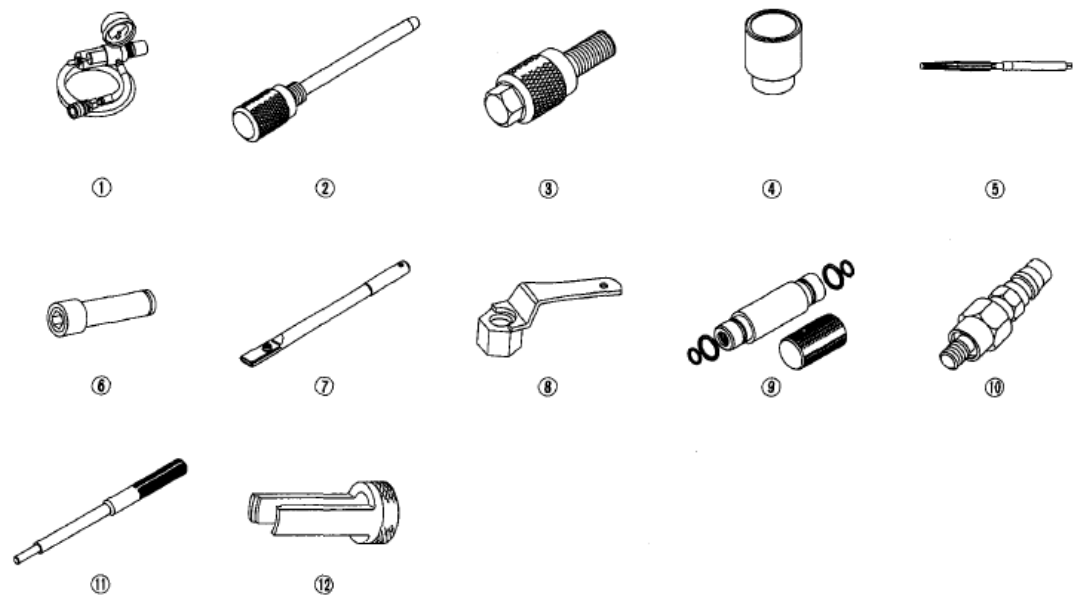

Fig. 1: Identifying Special Tools
Courtesy of AMERICAN HONDA MOTOR CO., INC.

COMPONENT LOCATION INDEX

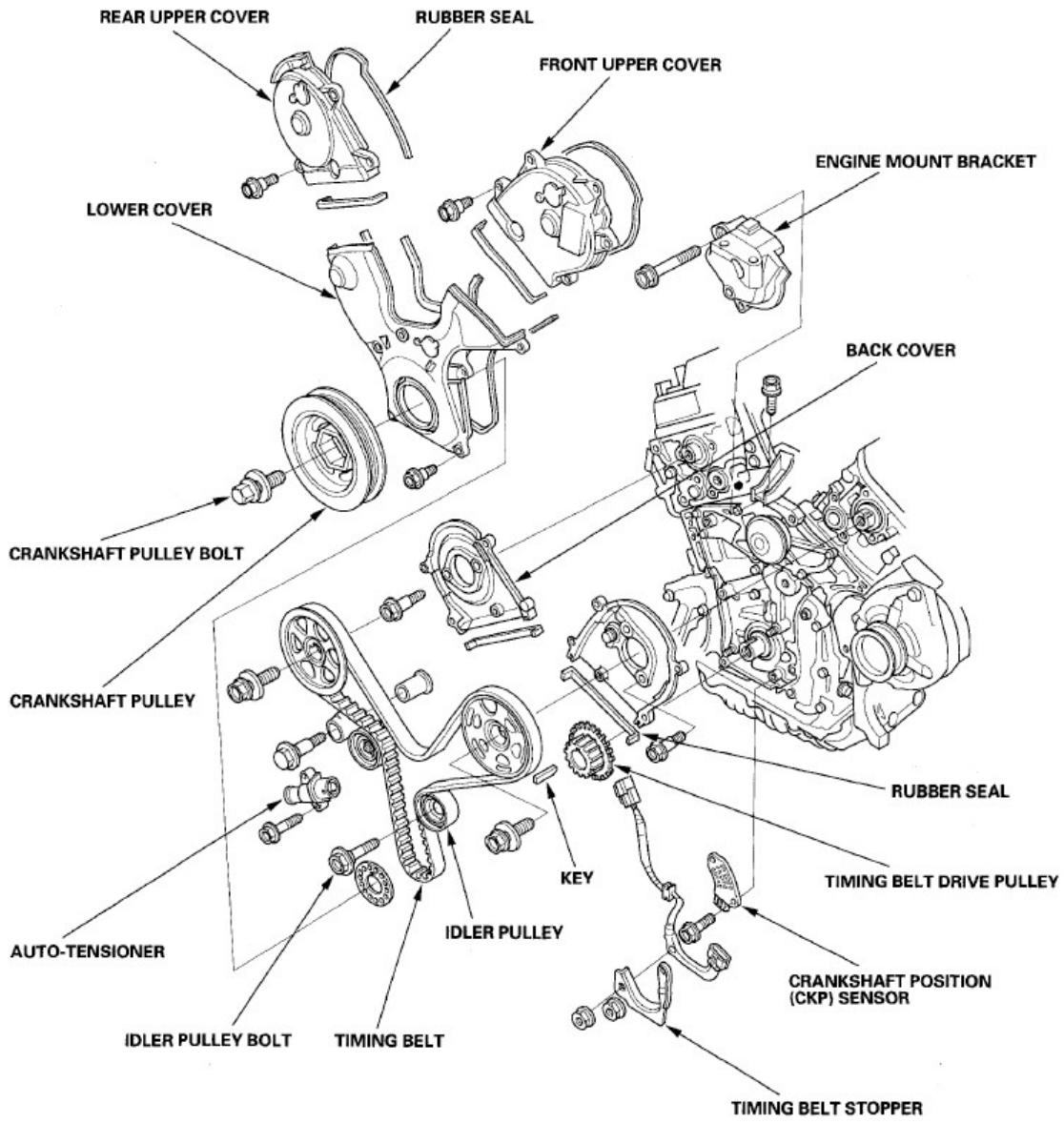

Fig. 2: Identifying Cylinder Head Replacement Components (1 Of 2)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

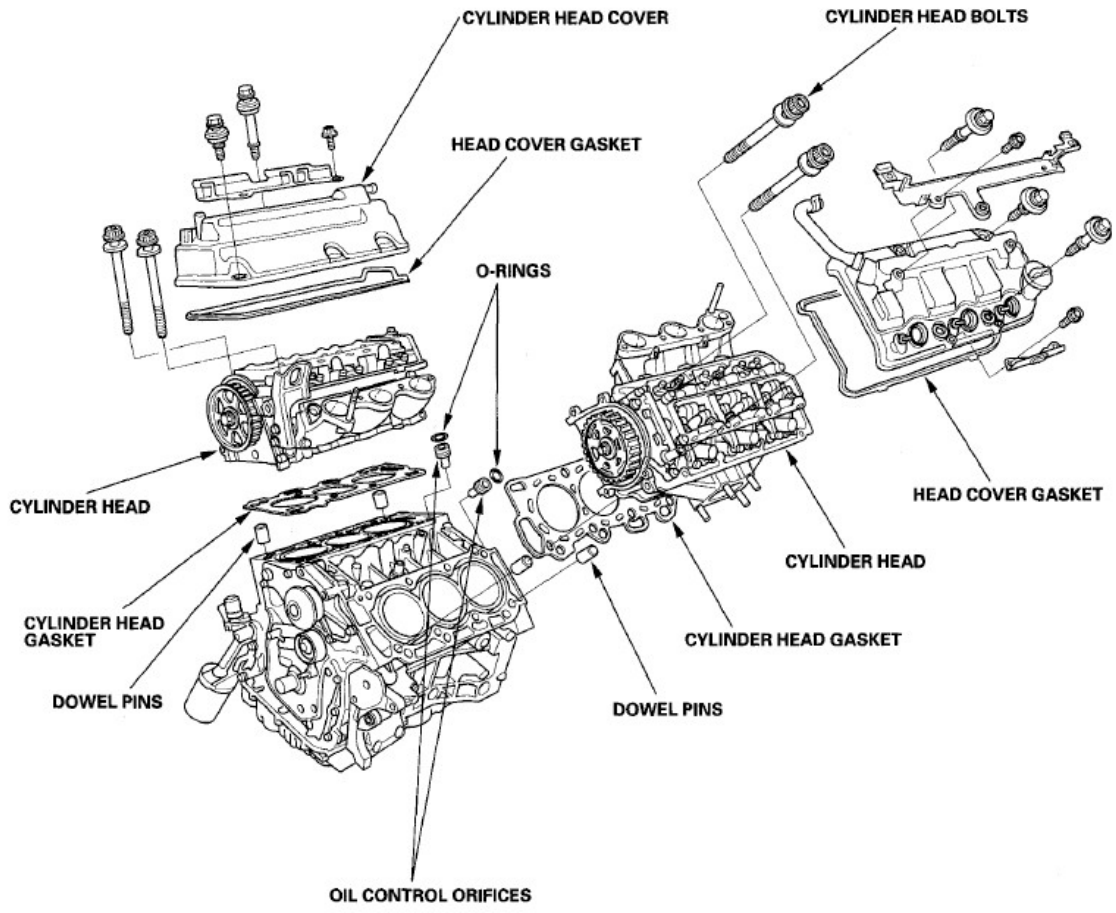

Fig. 3: Identifying Cylinder Head Replacement Components (2 Of 2)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

FRONT

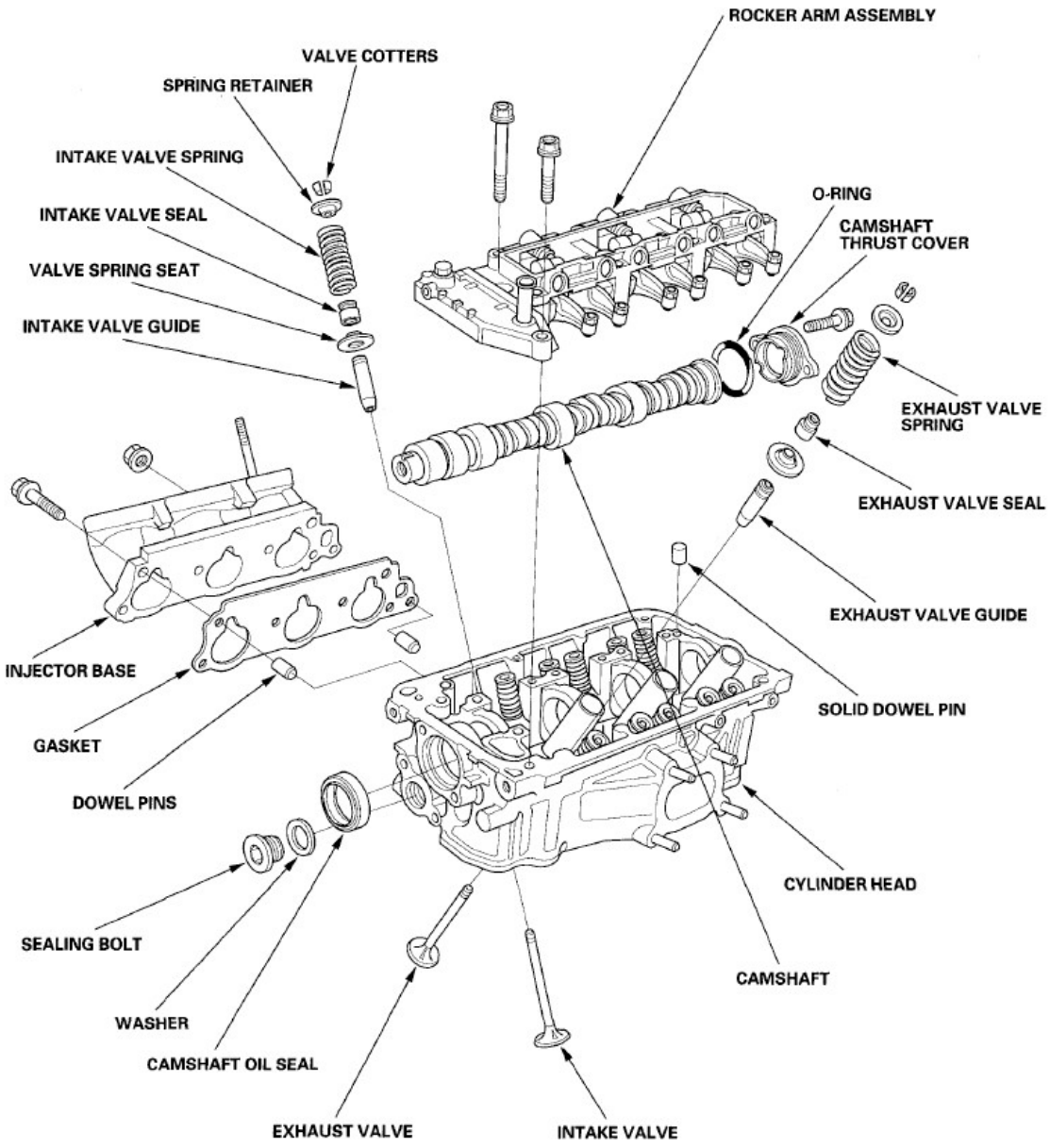

Fig. 4: Identifying Cylinder Head Replacement Components (Front)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

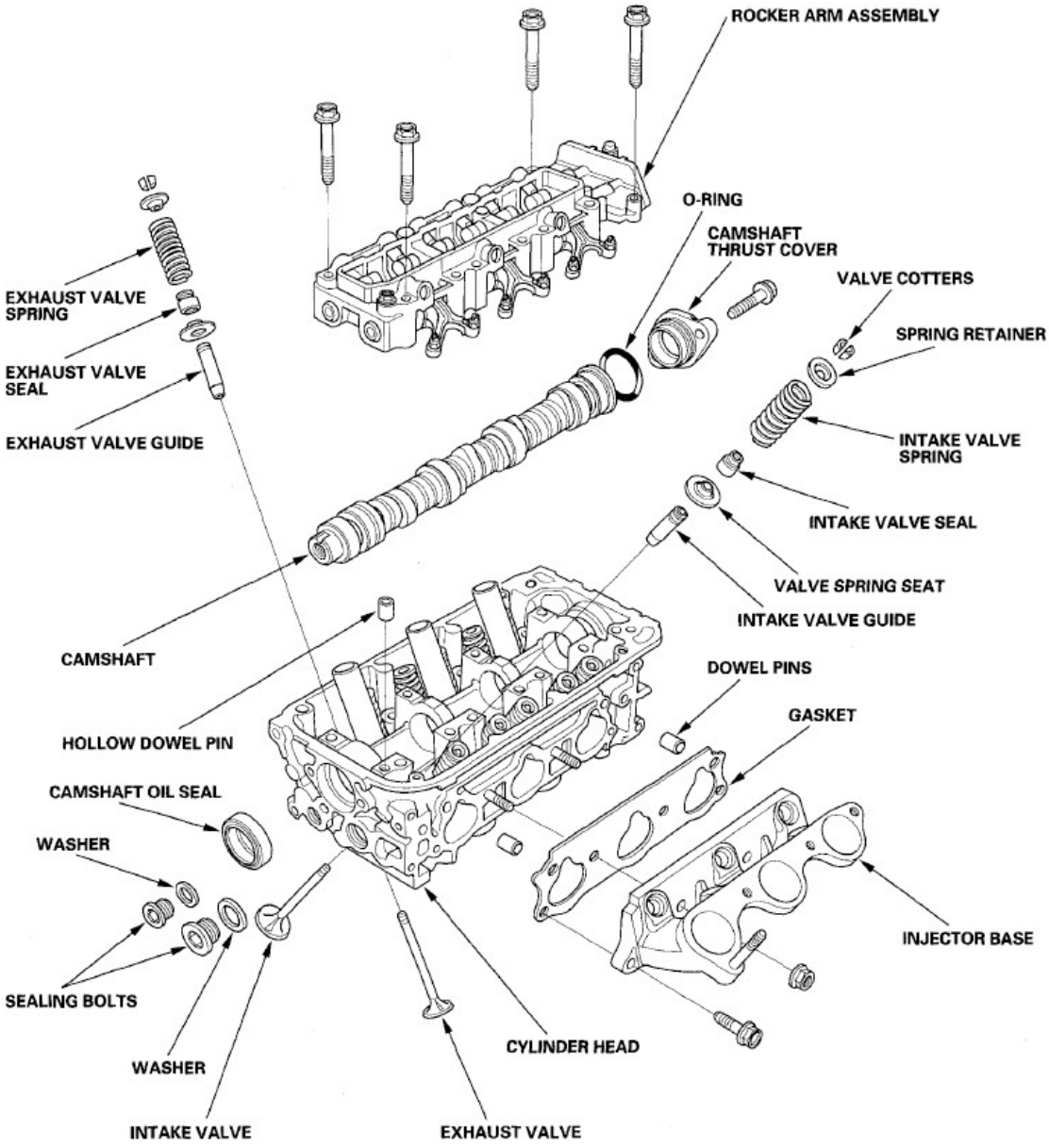

Fig. 5: Identifying Cylinder Head Replacement Components (Rear)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ENGINE COMPRESSION INSPECTION

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

1. Warm up the engine to normal operating temperature (cooling fan comes on).
2. Turn the ignition switch to LOCK (0).
3. Connect the Honda Diagnostic System (HDS) to the data link connector (DLC) (see step 2 in **GENERAL**

TROUBLESHOOTING INFORMATION).

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

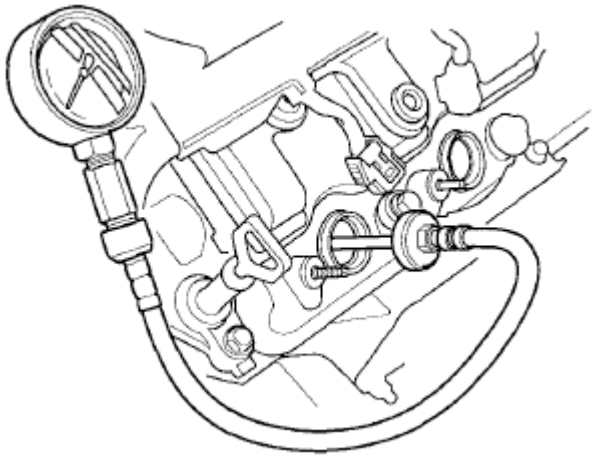

Fig. 6: Attaching Compression Gauge To Spark Plug Hole
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Step on the accelerator pedal to open the throttle plate, 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 six spark plugs.
16. Install the six ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION**).
17. Select **PCM RESET** to cancel the ALL INJECTORS STOP on the HDS.

VTEC ROCKER ARM TEST

SPECIAL TOOLS REQUIRED

- Air pressure regulator 07AAJ-PNAA101
- VTEC air stop tool A07AAJ-R70A100
- VTEC air stop tool B 07AAJ-R70A200
- VTEC/VCM air adapter 070AJ-001A101

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

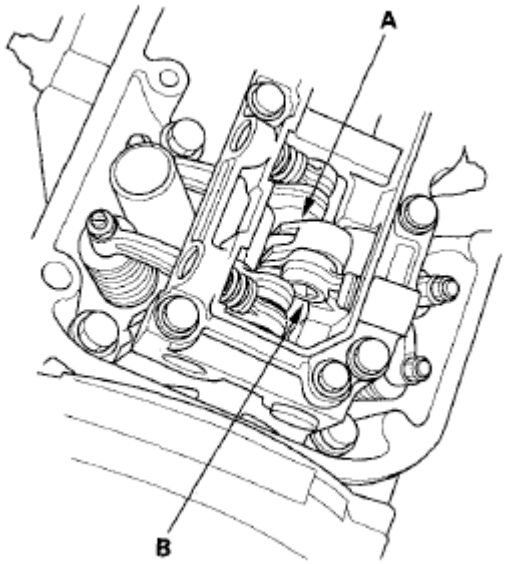

Fig. 7: Identifying Intake Primary & Secondary Rocker Arms
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Rotate the crankshaft pulley clockwise, and visually check all exhaust primary rocker arms (A) and exhaust secondary rocker arms (B) move independently.
   - If the exhaust primary rocker arm and the exhaust primary rocker arm move together, remove the exhaust primary rocker arm and the exhaust secondary rocker arm as an assembly, and check that the pistons in the rocker arms move smoothly. If any exhaust rocker arm needs replacing, replace the primary and secondary rocker arms as an assembly, then retest.
   - If the exhaust primary rocker arm and the exhaust secondary rocker arm move independently, go to step 6.

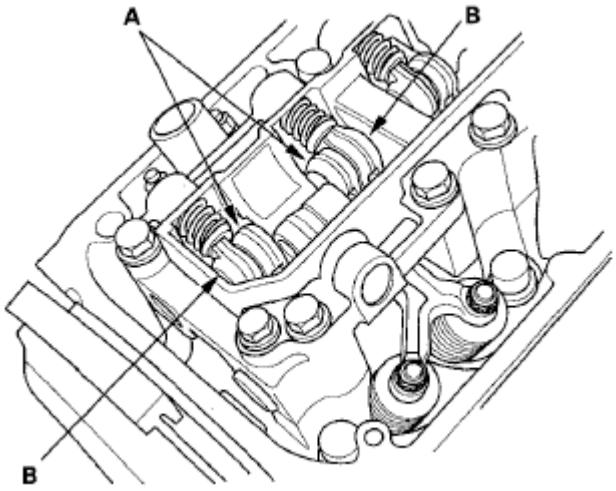

Fig. 8: Identifying Exhaust Primary & Secondary Rocker Arm
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Inspect the valve clearance (see **VALVE CLEARANCE ADJUSTMENT**).

7. Check that the air pressure on the shop air compressor gauge indicates over 981 kPa (10.0 kgf/cm^2 , 142 psi).
8. Remove the sealing bolts from the front cylinder head, then install the VTEC/VCM air adapter (A) to the inspection hole and install the VTEC air stop tool B, then connect the air pressure regulator (C).

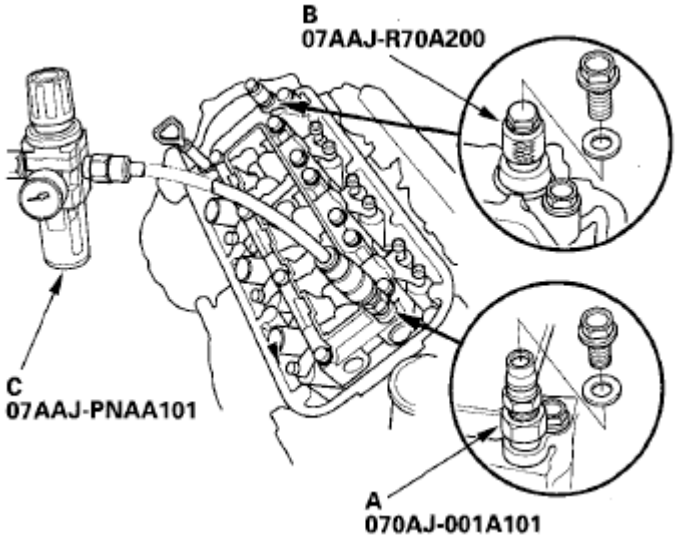

Fig. 9: Identifying VTEC/VCM Air Adapter & Inspection Hole
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Remove the sealing bolts from the rear cylinder head, then install the VTEC air stop tool A to the inspection hole and install the VTEC/VCM air adapter (B), then connect the air pressure regulator (C).

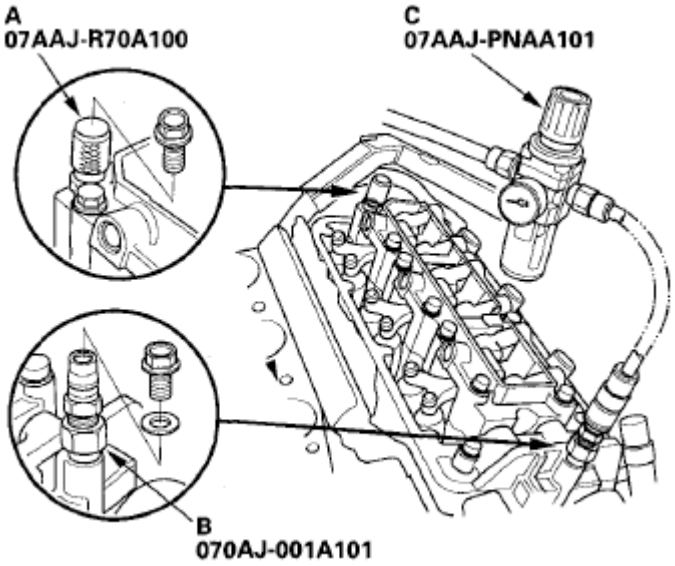

Fig. 10: Identifying VTEC/VCM Air Adapter & Air Pressure Regulator
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

    Specified Air Pressure:

    550-690 kPa (5.6-7.0 kgf/cm^2 , 80-100 psi)

11. With the specified air pressure applied, rotate the crankshaft pulley clockwise, and visually check all intake primary rocker arms (A) and intake secondary rocker arms (B) move together.
    - If the intake primary rocker arm and the intake secondary rocker arm move independently, remove the intake primary rocker arm and the intake secondary rocker arm as an assembly, and check that the pistons in the rocker arms move smoothly. If any intake rocker arm needs replacing, replace the primary and secondary rocker arms as an assembly, then retest.
    - If the intake primary rocker arm and the intake secondary rocker arm move together, go to step 12.

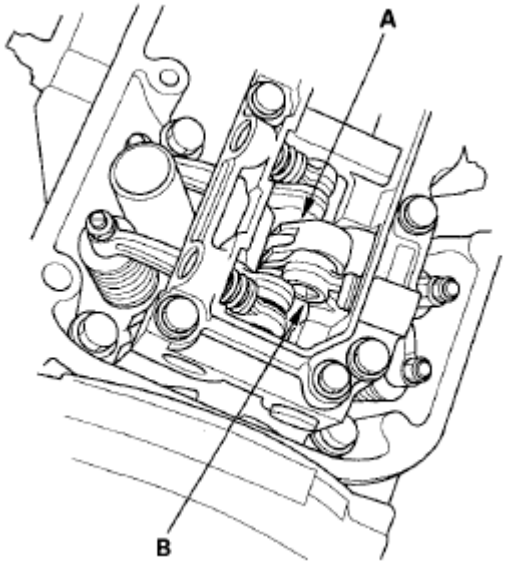

Fig. 11: Identifying Intake Primary & Secondary Rocker Arm
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. With the specified air pressure applied, rotate the crankshaft pulley clockwise, and visually check all exhaust rocker primary arms (A) and exhaust secondary rocker arms (B) move together.
    - If the exhaust primary rocker arm and the exhaust secondary rocker arm move independently, remove the exhaust primary rocker arm and the exhaust secondary rocker arm as an assembly, and check that the pistons in the rocker arms move smoothly. If any exhaust rocker arm needs replacing, replace the primary and secondary rocker arms as an assembly, then retest.
    - If the exhaust primary rocker arm and the exhaust secondary rocker arm move together, go to step 13.

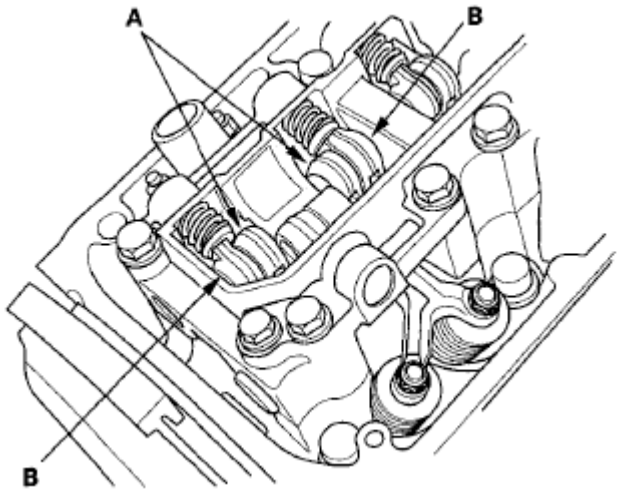

Fig. 12: Identifying Exhaust Rocker Primary Arms & Exhaust Secondary Rocker Arms
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Remove the air pressure regulator, the VTEC/VCM air adapter, the VTEC air stop tool A, and the VTEC air stop tool B.
14. Tighten the sealing bolts to 22 N.m (2.2 kgf.m, 16 lbf.ft).
15. Install the cylinder head covers (see **CYLINDER HEAD COVER INSTALLATION**).
16. Install the six spark plugs.

VALVE CLEARANCE ADJUSTMENT

NOTE: Adjust the valves only when the cylinder head temperature is less than 100°F (38°C).

1. Remove the right upper fender trim (see **UPPER GRILLE REPLACEMENT**).
2. Remove the cylinder head covers (see **CYLINDER HEAD COVER REMOVAL**).
3. Set the No. 1 piston at top dead center (TDC). Align the pointer (A) on the front upper cover with the No. 1 piston TDC mark (B) on the front camshaft pulley.

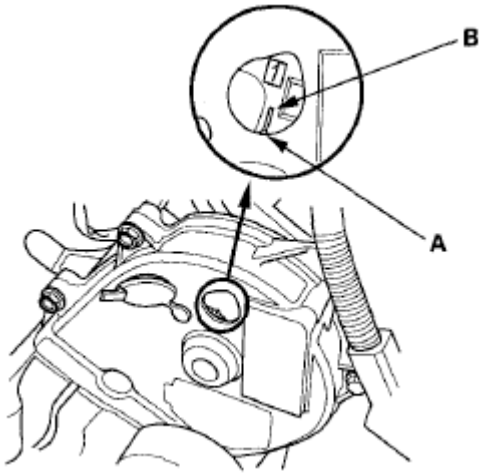

Fig. 13: Identifying No. 1 Piston TDC Mark On Front Camshaft Pulley
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Select the correct thickness feeler gauge for the valves you are going to check.

   Valve Clearance

   Intake: 0.20-0.24 mm (0.008-0.009 in.)

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

   REAR

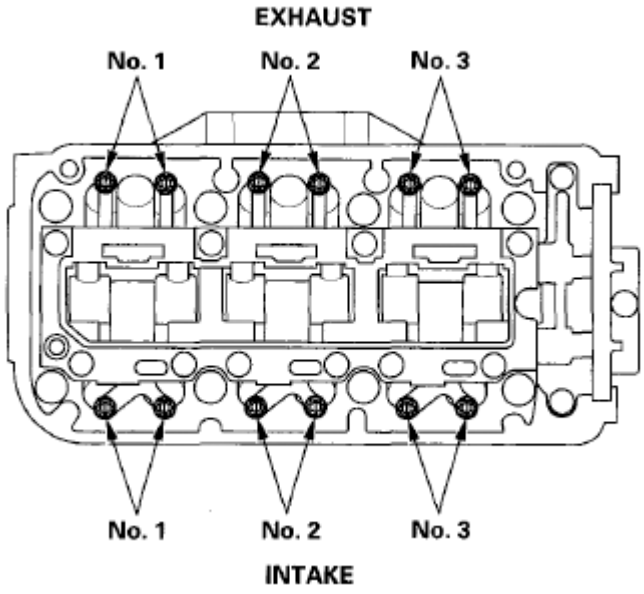

Fig. 14: Identifying Cylinder Head Bolts (Rear)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

FRONT

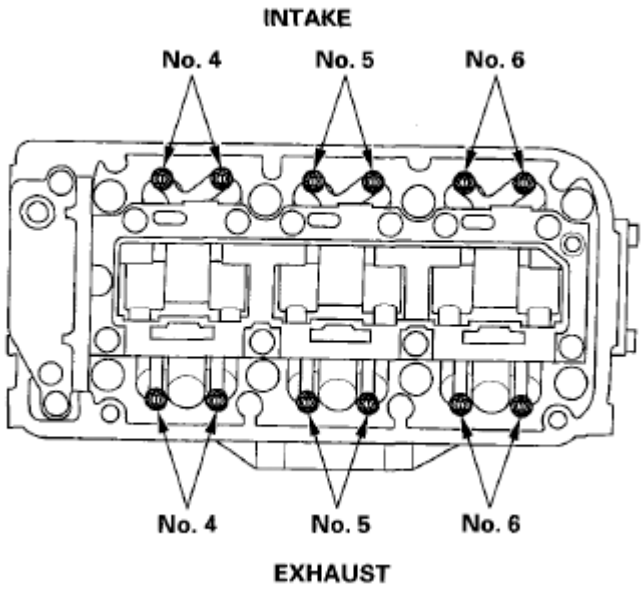

Fig. 15: Identifying Cylinder Head Bolts (Front)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Insert the feeler gauge (A) between the adjusting screw and the end of the valve stem on the No. 1 cylinder, and slide it back and forth; you should feel a slight amount of drag.

INTAKE

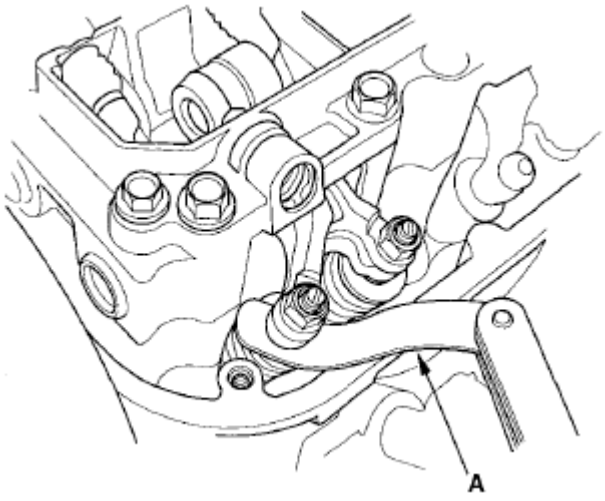

Fig. 16: Inserting Feeler Gauge Between Adjusting Screw & End Of Valve Stem (Intake)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

EXHAUST

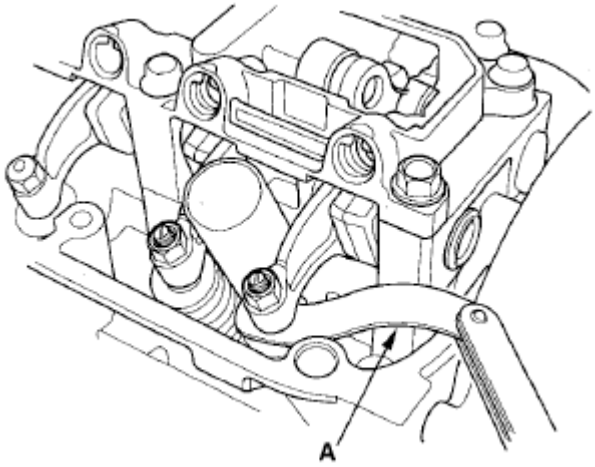

Fig. 17: Inserting Feeler Gauge Between Adjusting Screw & End Of Valve Stem (Exhaust)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. If you feel too much or too little drag, loosen the locknut, and turn the adjusting screw until the drag on the feeler gauge is correct.

INTAKE

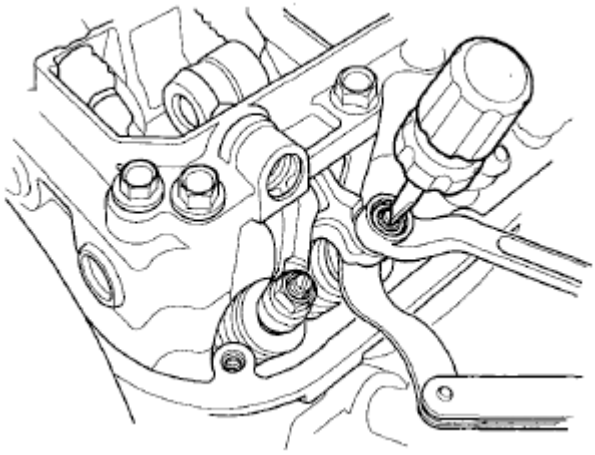

Fig. 18: Identifying Locknut (Intake)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

EXHAUST

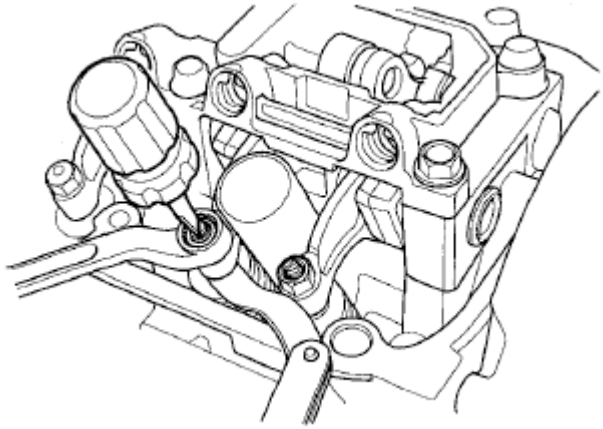

Fig. 19: Identifying Locknut (Exhaust)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. While holding the adjusting screw with the screw driver, tighten the locknut, then recheck the clearance. Repeat the adjustment, if necessary.

   Specified Torque

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

   Apply new engine oil to the nut threads.

8. Rotate the crankshaft clockwise. Align the pointer (A) on the front upper cover with the No. 4 piston TDC mark (B) on the front camshaft pulley.

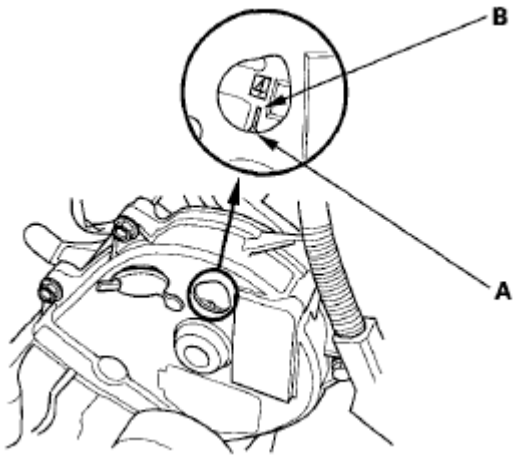

Fig. 20: Aligning Pointer On Front Upper Cover With No. 4 Piston TDC Mark
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Check and, if necessary, adjust the valve clearance on the No. 4 cylinder.
10. Rotate the crankshaft clockwise. Align the pointer (A) on the front upper cover with the No. 2 piston TDC mark (B) on the front camshaft pulley.

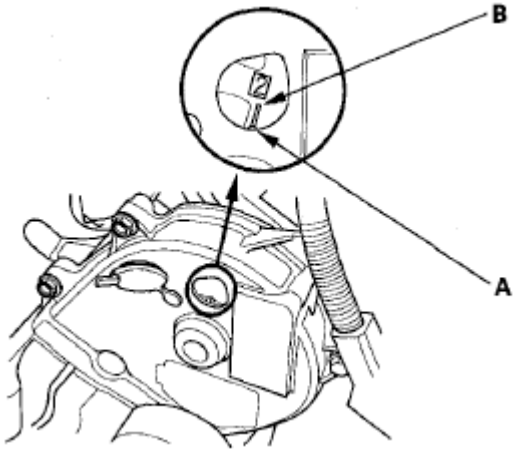

Fig. 21: Aligning Pointer On Front Upper Cover With No. 2 Piston TDC Mark
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Check and, if necessary, adjust the valve clearance on the No. 2 cylinder.
12. Rotate the crankshaft clockwise. Align the pointer (A) on the front upper cover with the No. 5 piston TDC mark (B) on the front camshaft pulley.

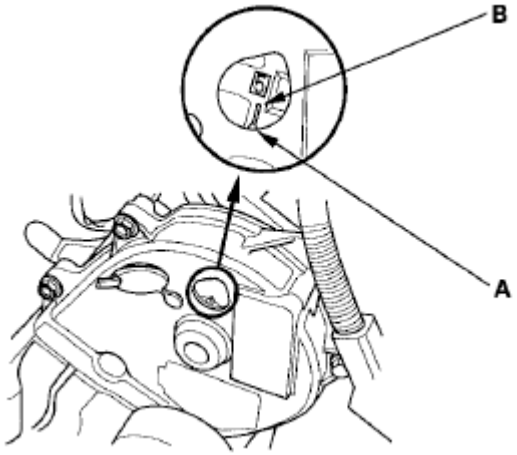

Fig. 22: Aligning Pointer On Front Upper Cover With No. 5 Piston TDC Mark
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Check and, if necessary, adjust the valve clearance on the No. 5 cylinder.
14. Rotate the crankshaft clockwise. Align the pointer (A) on the front upper cover with the No. 3 piston TDC mark (B) on the front camshaft pulley.

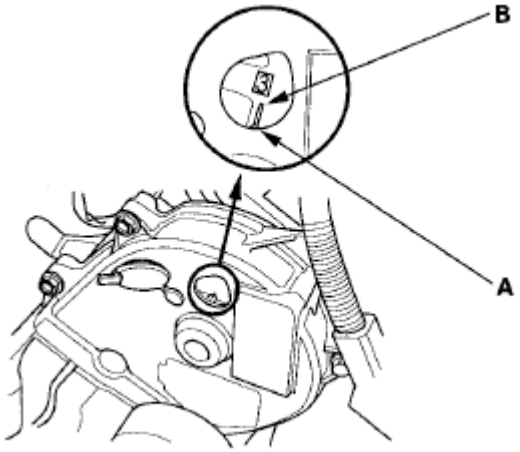

Fig. 23: Aligning Pointer On Front Upper Cover With No. 3 Piston TDC Mark
Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Check and, if necessary, adjust the valve clearance on the No. 3 cylinder.
16. Rotate the crankshaft clockwise. Align the pointer (A) on the front upper cover with the No. 6 piston TDC mark (B) on the front camshaft pulley.

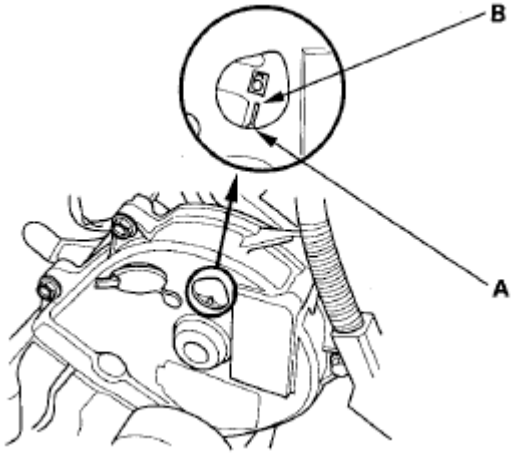

Fig. 24: Aligning Pointer On Front Upper Cover With No. 6 Piston TDC Mark
Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Check and, if necessary, adjust the valve clearance on the No. 6 cylinder.
18. Install the cylinder head covers (see **CYLINDER HEAD COVER INSTALLATION**).

CRANKSHAFT PULLEY REMOVAL AND INSTALLATION

SPECIAL TOOLS REQUIRED

- Holder handle 07JAB-001020B
- Holder attachment, 50 mm, offset 07MAB-PY3010A

- Socket, 19 mm 07JAA-001020A, or a commercially available 19 mm socket

REMOVAL

1. Raise the vehicle on the lift.
2. Remove the right front wheel.
3. Remove the splash shield.

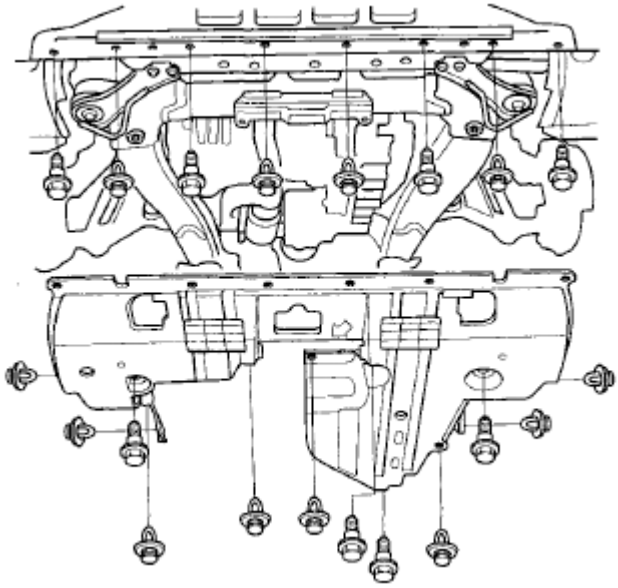

Fig. 25: Identifying Splash Shield
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

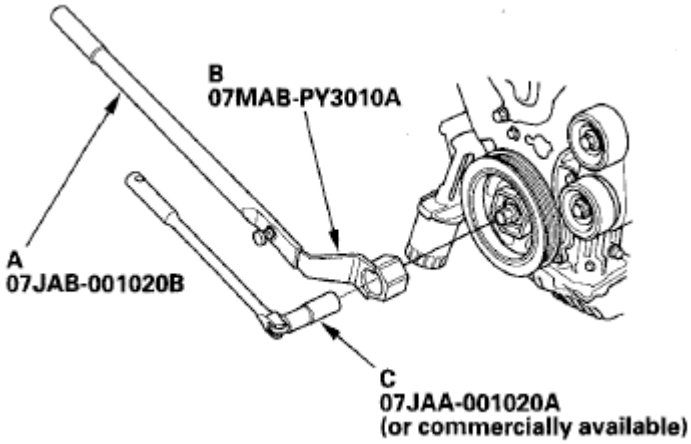

Fig. 26: Identifying Holder Handle & Holder Attachment
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

INSTALLATION

1. Remove any oil and clean the pulleys (A), the crankshaft (B), the bolt (C), and the washer (D). Lubricate with new engine oil as shown below.

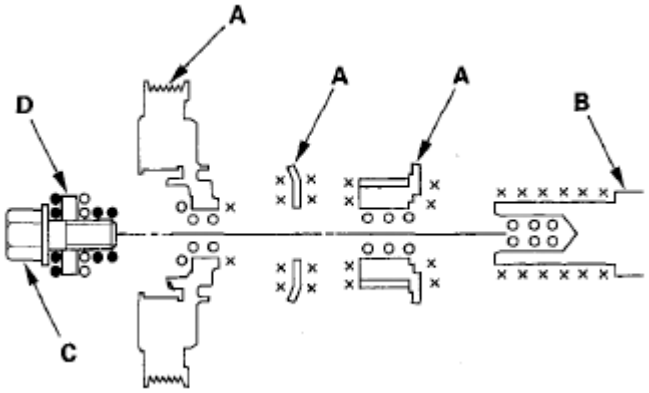

Fig. 27: Identifying Pulleys, Crankshaft & Washer Lubrication Points
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Install the crankshaft pulley, and tighten the bolt. Do not use an impact wrench.
    1. Hold the pulley with the holder handle (A) and the holder attachment (B). Tighten the bolt to 64 N.m (6.5 kgf.m, 47 lbf.ft) with a torque wrench and a 19 mm socket (C).
    2. Mark the bolt head (D) and the crankshaft pulley (E) as shown, then tighten the bolt an additional 60° (The mark on the bolt head lines up with the mark on the crankshaft pulley).

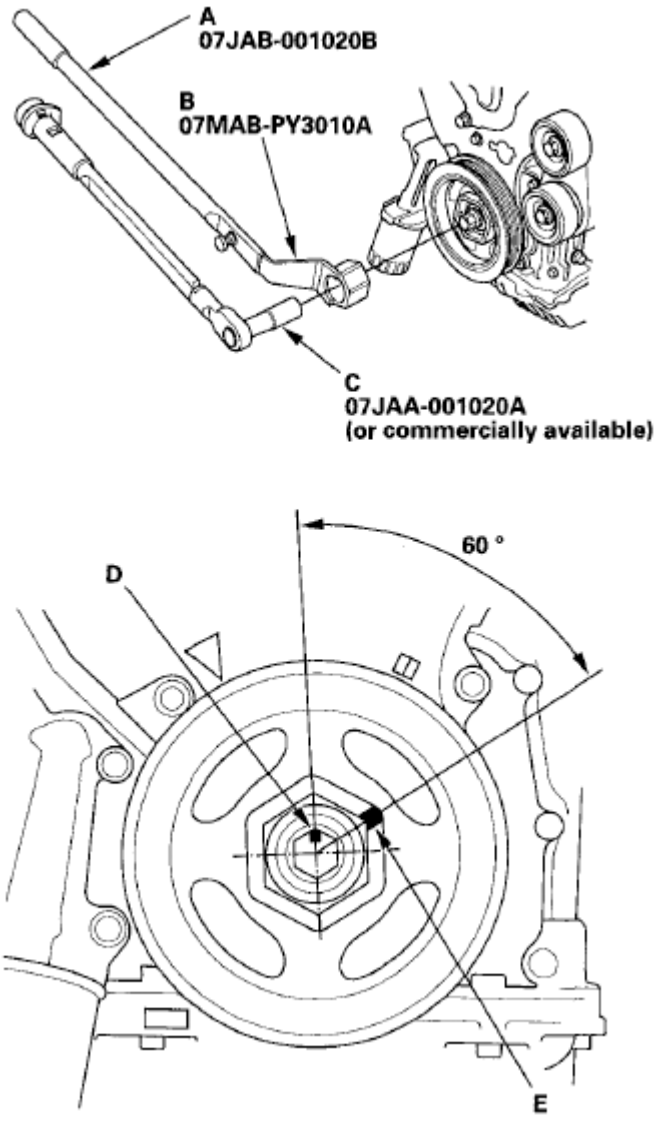

Fig. 28: Identifying Mark On Bolt Head Lines Up With Mark On Crankshaft Pulley
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the drive belt (see **DRIVE BELT REPLACEMENT**).
4. Install the splash shield.
5. Install the right front wheel.

TIMING BELT INSPECTION

1. Remove the right upper fender trim (see **UPPER GRILLE REPLACEMENT**).
2. Remove the drive belt (see **DRIVE BELT REPLACEMENT**).
3. Remove the front upper cover.

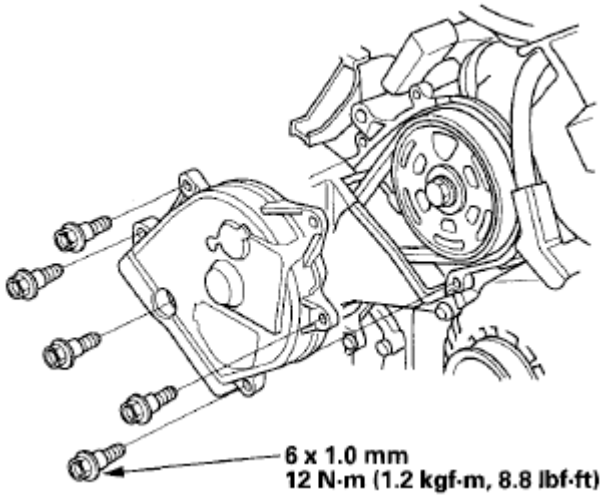

Fig. 29: Identifying Drive Belt Front Upper Cover Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Inspect the timing belt for cracks and oil or coolant contamination. Replace the belt if it is cracked, or is contaminated with oil or coolant. Wipe off any oil or solvent that gets on the belt pulleys.

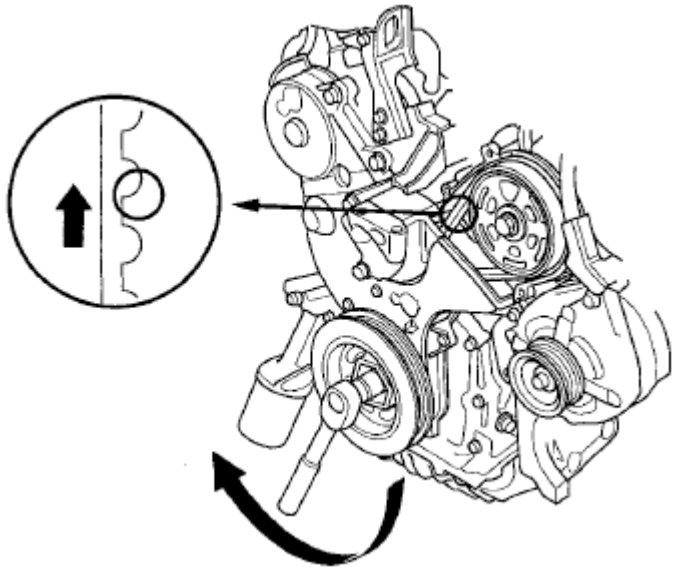

Fig. 30: Inspecting Timing Belt For Cracks & Oil Or Coolant Contamination
Courtesy of AMERICAN HONDA MOTOR CO., INC.

TIMING BELT REMOVAL

1. Remove the right upper fender trim (see **UPPER GRILLE REPLACEMENT**).
2. Turn the crankshaft so its white mark (A) lines up with the pointer (B).

NOTE: The other pointer (C) is not used.

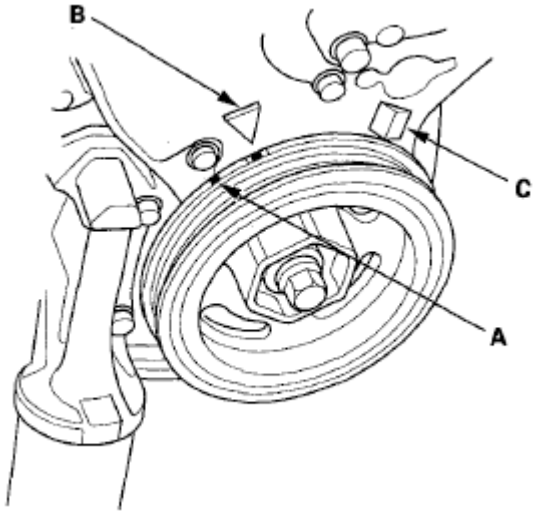

Fig. 31: Identifying Timing Belt Mark
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Check that the No. 1 piston top dead center (TDC) mark (A) on the front camshaft pulley and the pointer (B) on the front upper cover are aligned.

NOTE: If the marks are not aligned, rotate the crankshaft 360 degrees, and recheck the camshaft pulley mark.

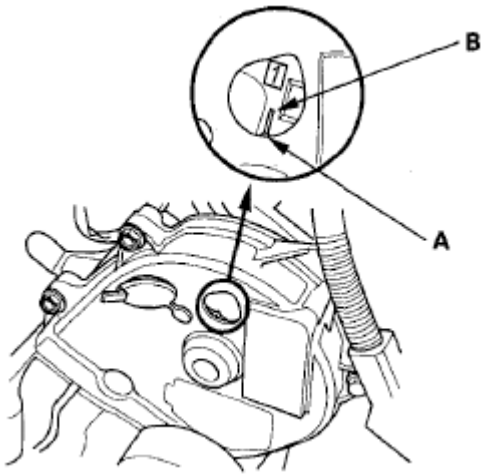

Fig. 32: Identifying Mark On Front Camshaft Pulley And Pointer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the right front wheel.
5. Remove the splash shield.

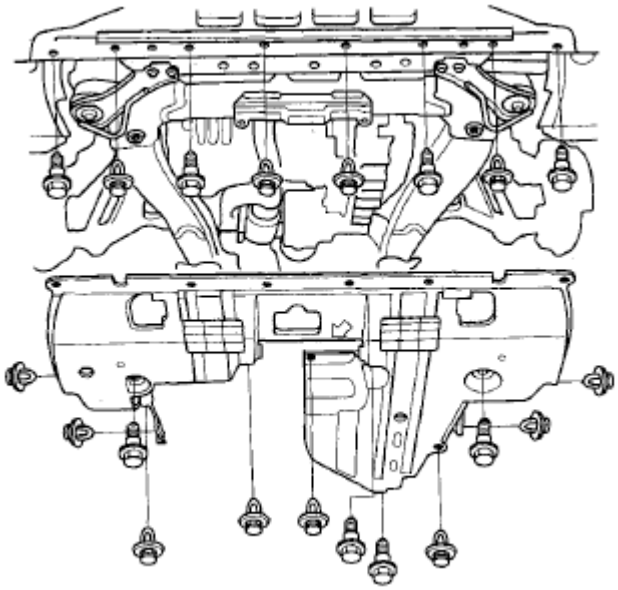

Fig. 33: Identifying Splash Shield Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the drive belt (see **DRIVE BELT REPLACEMENT**).
7. Remove the drive belt auto-tensioner (see **DRIVE BELT AUTO-TENSIONER REPLACEMENT**).
8. Support the engine with a jack and wood block under the oil pan.
9. Remove the ground cable (A), then remove the upper engine mount bracket (B).

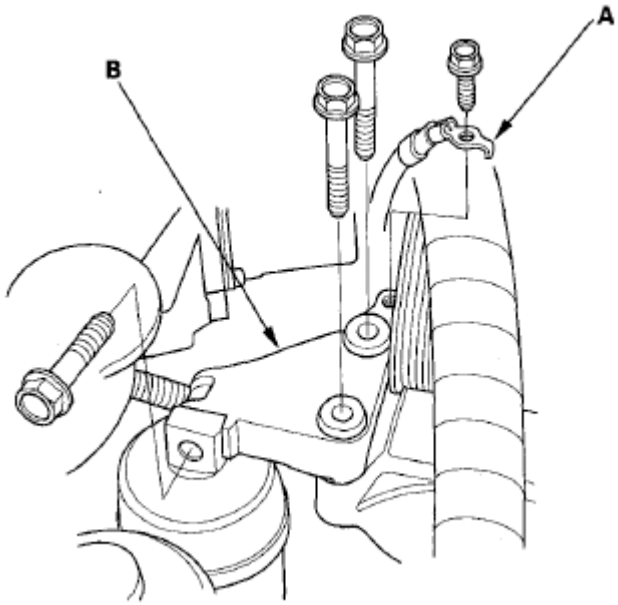

Fig. 34: Identifying Ground Cable & Upper Engine Mount Bracket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Remove the front upper cover (A) and rear upper cover (B).

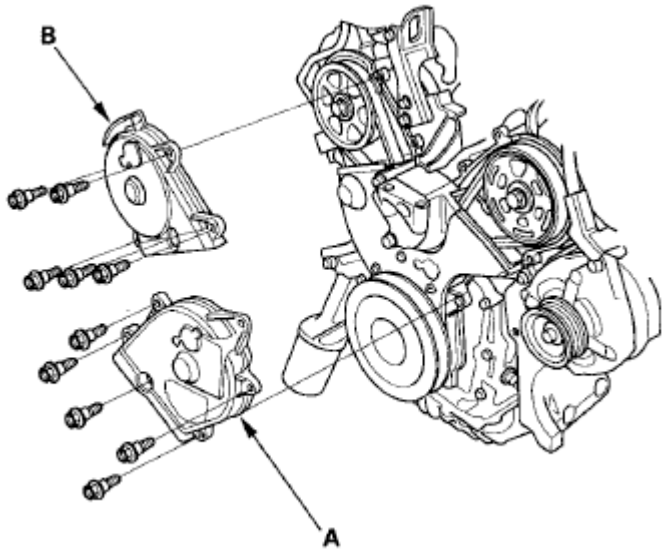

Fig. 35: Identifying Front & Rear Upper Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Remove the crankshaft pulley (see step 5 in **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
12. Remove the lower cover.

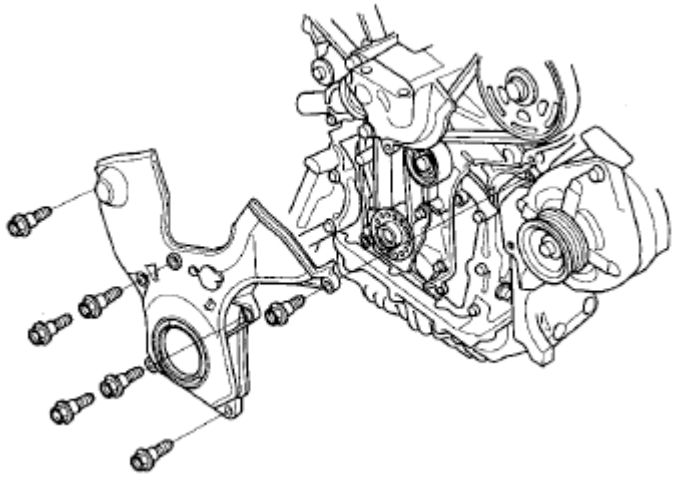

Fig. 36: Identifying Lower Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Remove one of the battery clamp bolts from the battery tray, and grind the end of it as shown below.

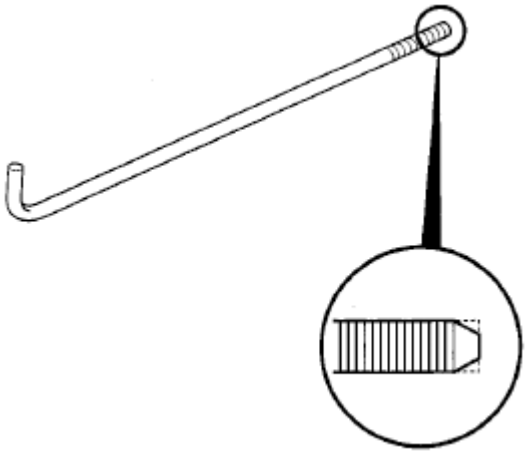

Fig. 37: Identifying Battery Clamp Bolt End
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Thread in the battery clamp bolt as shown to hold the timing belt adjuster in its current position. Tighten it by hand; do not use a wrench.

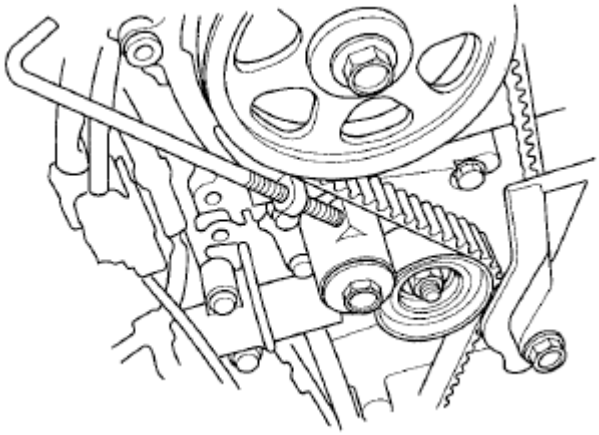

Fig. 38: Identifying Timing Belt Adjuster Position
Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Remove the side engine mount bracket.

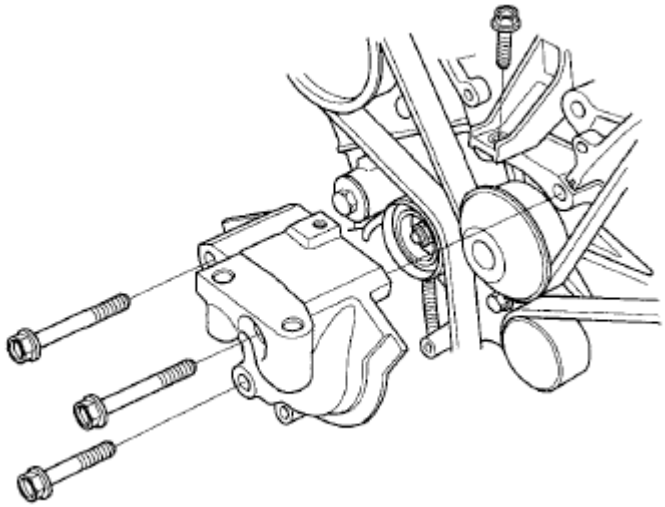

Fig. 39: Identifying Side Engine Mount Bracket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

16. Remove the idler pulley bolt (A) and the idler pulley (B), then remove the timing belt. Discard the idler pulley bolt.

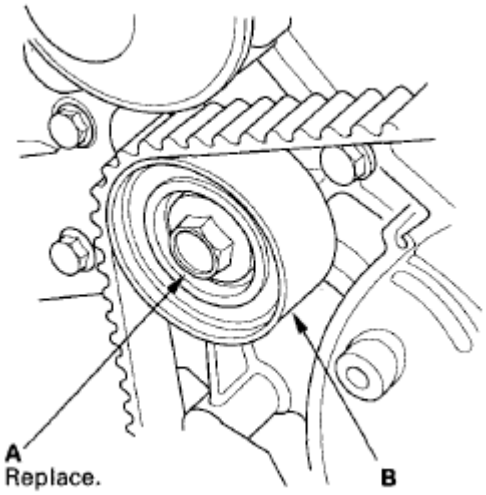

Fig. 40: Identifying Idler Pulley & Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

TIMING BELT INSTALLATION

NOTE: The following procedure is for installing a used timing belt. If you are installing a new belt, refer to TIMING BELT REPLACEMENT .

1. Clean the timing belt pulleys, the timing belt guide plate, and the upper and lower covers.
2. Set the timing belt drive pulley to top dead center (TDC) by aligning the TDC mark (A) on the tooth of the timing belt drive pulley with the pointer (B) on the oil pump.

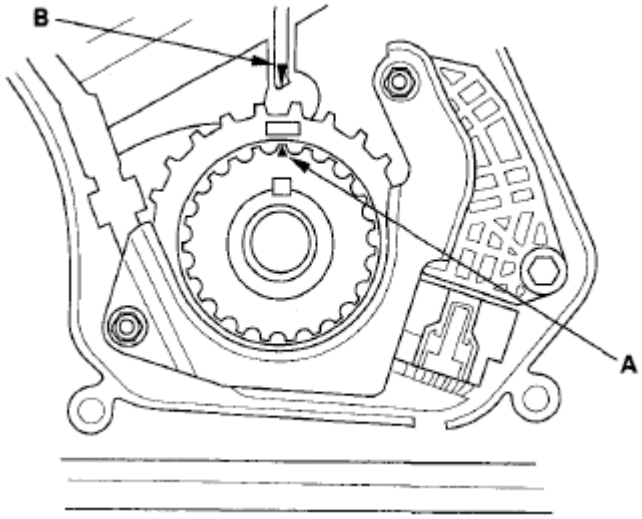

Fig. 41: Identifying TDC Mark On Tooth Of Timing Belt Drive Pulley
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Set the camshaft pulleys to TDC by aligning the TDC marks (A) on the camshaft pulleys with the pointers (B) on the back covers.

FRONT

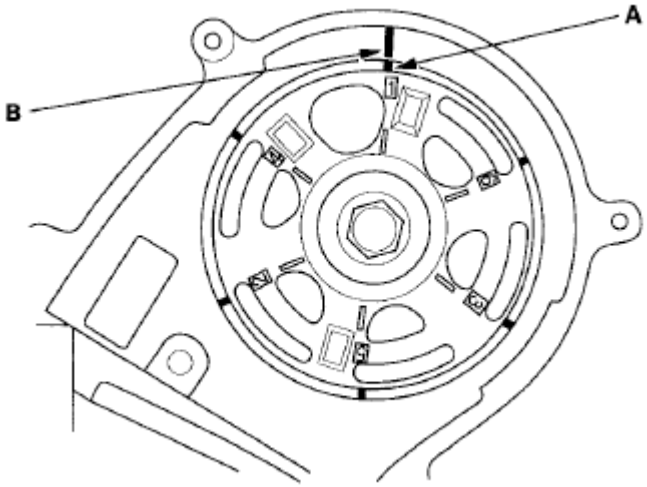

Fig. 42: Identifying TDC Mark On Tooth Of Timing Belt Drive Pulley (Front)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

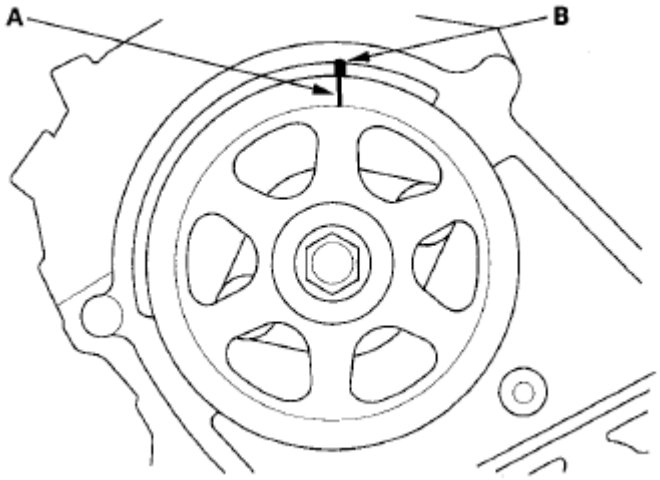

Fig. 43: Identifying TDC Mark On Tooth Of Timing Belt Drive Pulley (Rear)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Loosely install the idler pulley with a new idler pulley bolt so the pulley can move, but does not come off.
5. If the auto-tensioner has extended and the timing belt cannot be installed, perform the timing belt replacement procedure (see **TIMING BELT REPLACEMENT**).
6. Install the timing belt in a counterclockwise sequence starting with the drive pulley. Take care not to damage the timing belt when installing it.
    1. Drive pulley (A)
    2. Idler pulley (B)
    3. Front camshaft pulley (C)
    4. Water pump pulley (D)
    5. Rear camshaft pulley (E)
    6. Adjusting pulley (F)

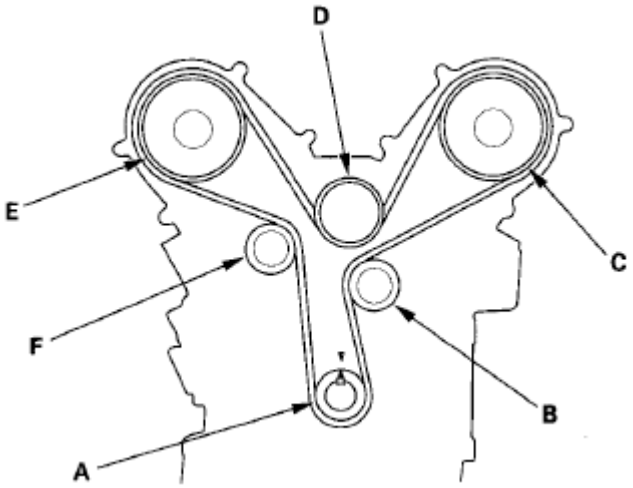

Fig. 44: Identifying Adjusting Pulley, Rear Camshaft Pulley & Idler Pulley
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Tighten the idler pulley bolt.

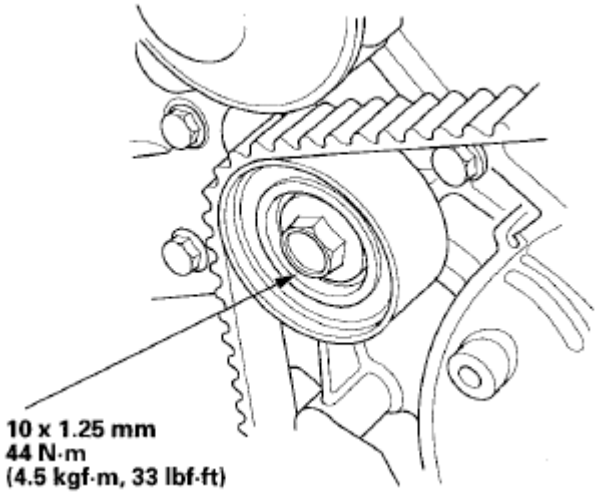

Fig. 45: Identifying Idler Pulley Bolt With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Remove the battery clamp bolt from the back cover.

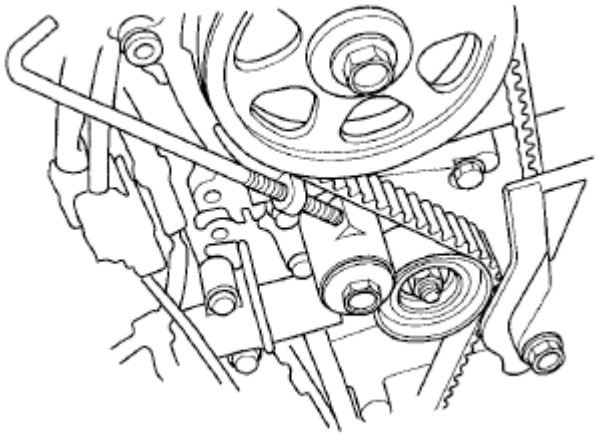

Fig. 46: Identifying Battery Clamp Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Install the side engine mount bracket.

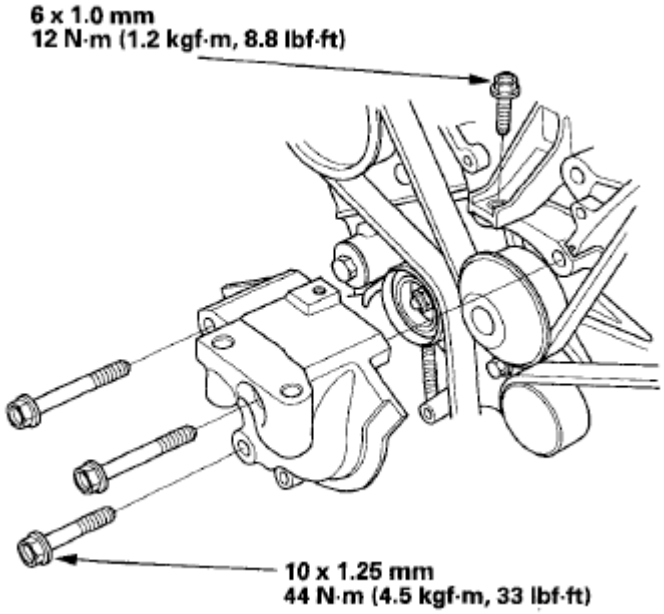

Fig. 47: Identifying Side Engine Mount Bracket With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Install the timing belt guide plate as shown below.

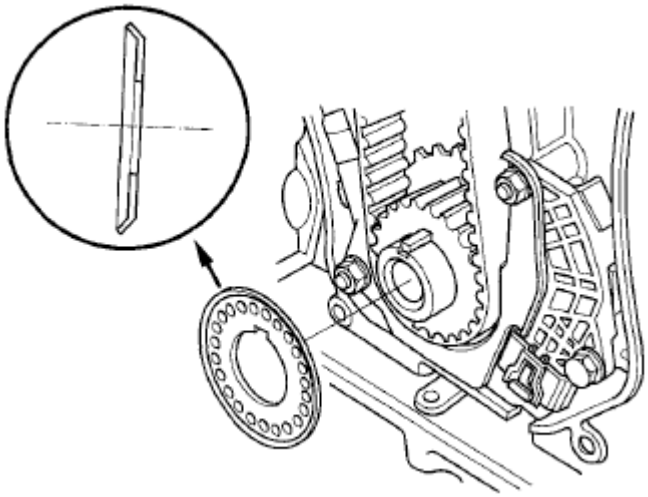

Fig. 48: Identifying Timing Belt Guide Plate
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Install the lower cover.

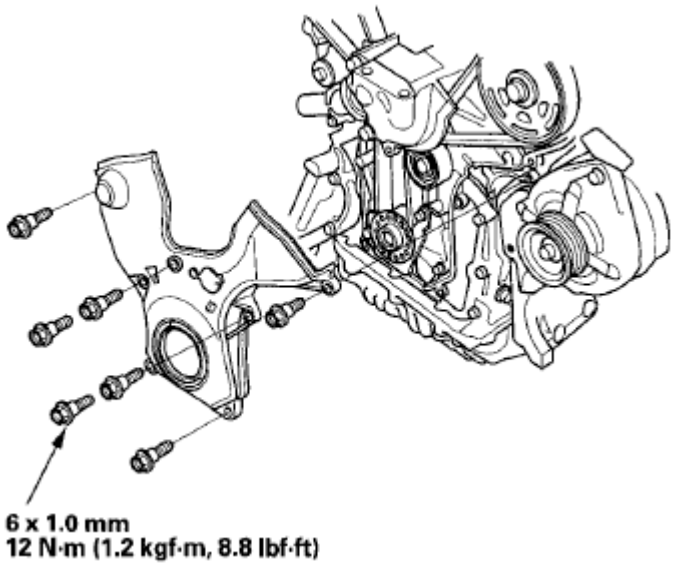

Fig. 49: Identifying Lower Cover With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Install the crankshaft pulley (see **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
13. Install the front upper cover (A) and the rear upper cover (B).

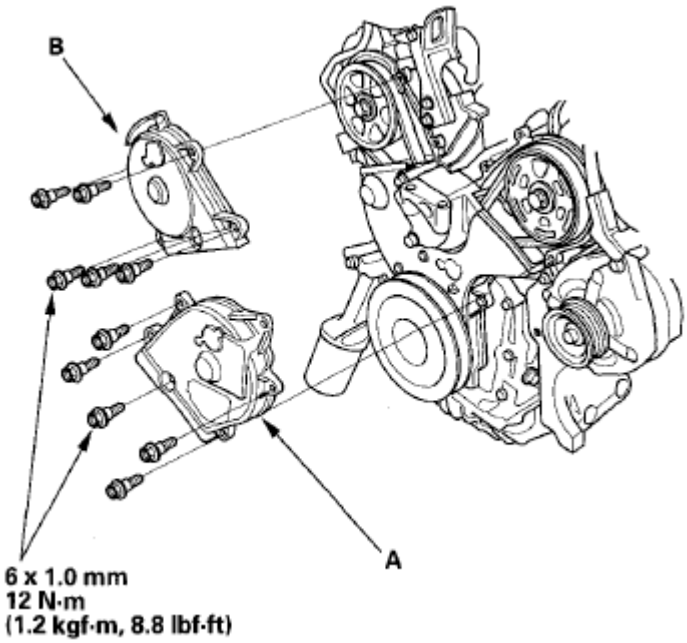

Fig. 50: Identifying Front Upper Cover & Rear Upper Cover With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Rotate the crankshaft pulley about six turns clockwise so the timing belt positions itself on the pulleys.
15. Turn the crankshaft pulley so the white mark (A) lines up with the pointer (B).

NOTE: The other pointer (C) is not used.

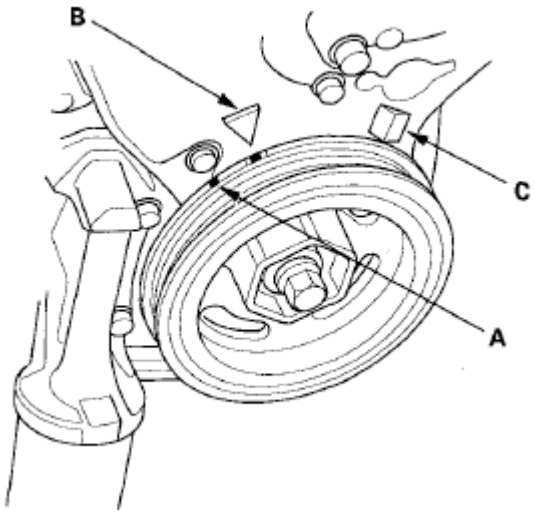

Fig. 51: Identifying Mark On Crankshaft Pulley
Courtesy of AMERICAN HONDA MOTOR CO., INC.

16. Check the camshaft pulley marks.
    - If the camshaft pulley marks are at TDC, go to step 17.
    - If the camshaft pulley marks are not at TDC, remove the timing belt and repeat steps 2 through 16.

FRONT

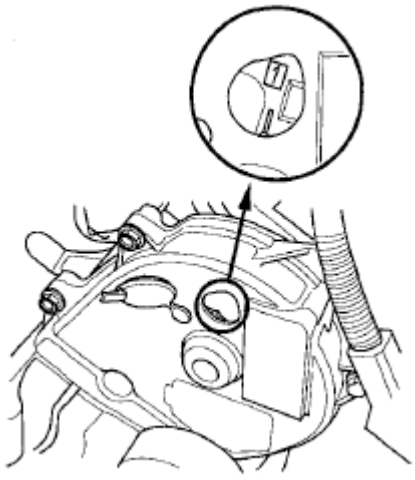

Fig. 52: Identifying Camshaft Pulley Mark (Front)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

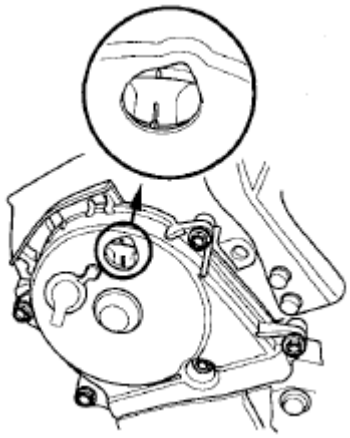

Fig. 53: Identifying Camshaft Pulley Mark (Rear)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Install the upper engine mount bracket (A), then tighten the bolts in the numbered sequence shown below.

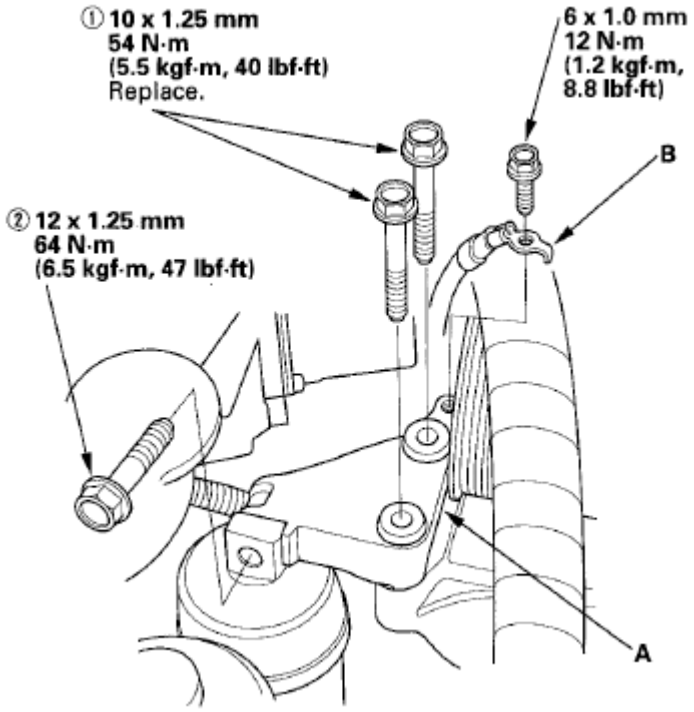

Fig. 54: Identifying Upper Engine Mount Bracket Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Install the ground cable (B).
19. Install the drive belt auto-tensioner (see **DRIVE BELT AUTO-TENSIONER REPLACEMENT**).
20. Install the drive belt (see **DRIVE BELT REPLACEMENT**).
21. Install the splash shield.
22. Install the right front wheel.

23. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **CRANK (CKP) PATTERN CLEAR/CRANK (CKP) PATTERN LEARN**).

TIMING BELT REPLACEMENT

NOTE: The following procedure is for the installation of a new timing belt. If you are installing a used belt, refer to TIMING BELT INSTALLATION .

1. Remove the timing belt (see **TIMING BELT REMOVAL**).
2. Clean the timing belt pulleys, the timing belt guide plate, and the upper and lower covers.
3. Set the timing belt drive pulley to top dead center (TDC) by aligning the TDC mark (A) on the tooth of the timing belt drive pulley with the pointer (B) on the oil pump.

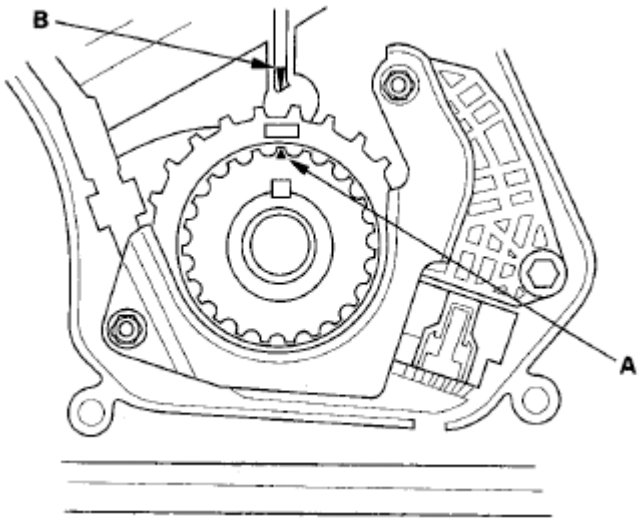

Fig. 55: Identifying TDC Mark On Timing Belt Drive Pulley
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Set the camshaft pulleys to TDC by aligning the TDC marks (A) on the camshaft pulleys with the pointers (B) on the back covers.

FRONT

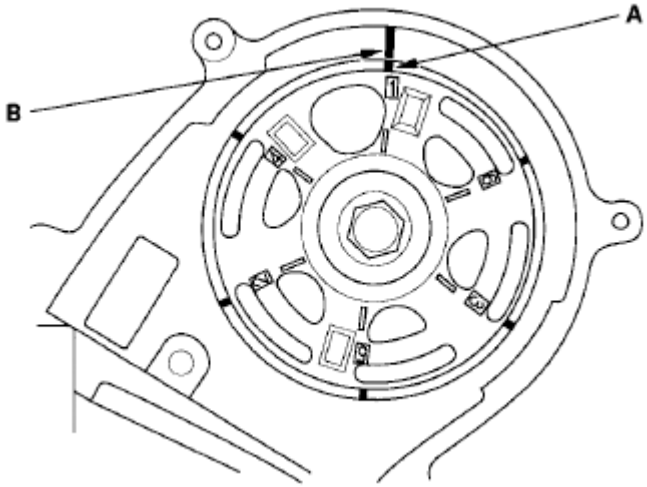

Fig. 56: Identifying TDC Marks On Camshaft Pulleys With Pointers (Front)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

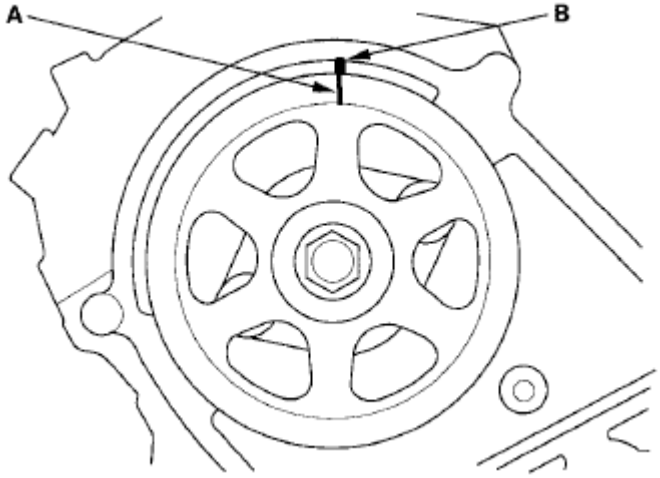

Fig. 57: Identifying TDC Marks On Camshaft Pulleys With Pointers (Rear)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Remove the battery clamp bolt from the back cover.
6. Remove the auto-tensioner.

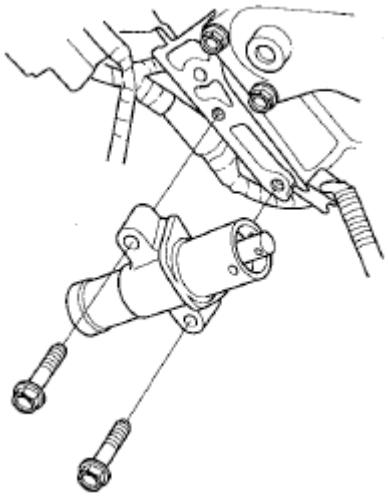

Fig. 58: Identifying Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Align the holes on the rod and housing of the auto-tensioner.

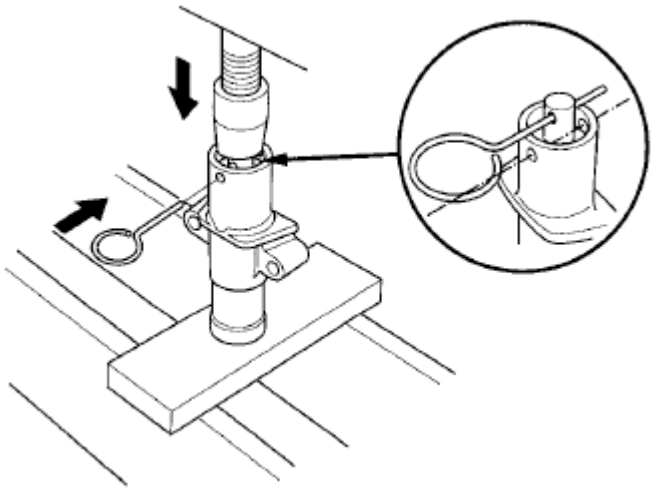

Fig. 59: Aligning Holes On Rod & Housing Of Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Use a hydraulic press to slowly compress the auto-tensioner. Insert a 2.0 mm (0.08 in.) pin through the housing and the rod.

NOTE: The compression pressure should not exceed 9,800 N (1,000 kgf, 2,200 lbf).

9. Install the auto-tensioner.

NOTE: Make sure the pin stays in place.

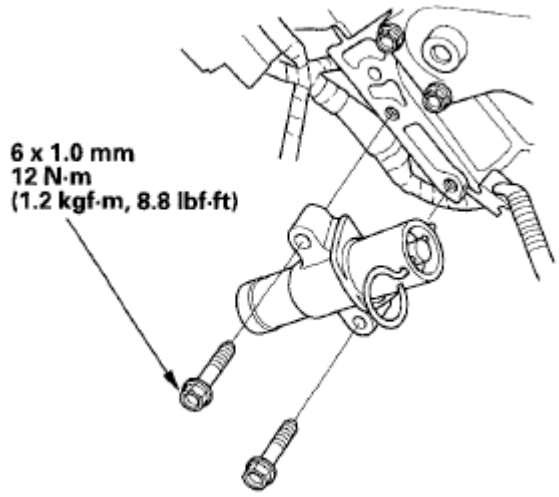

Fig. 60: Identifying Auto-Tensioner With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Thread in the battery clamp bolt as shown below to hold the timing belt adjuster. Tighten it by hand, do not use a wrench.

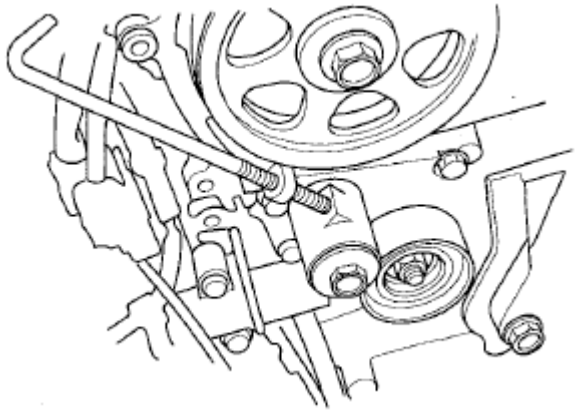

Fig. 61: Identifying Timing Belt Adjuster Position
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Loosely install the idler pulley with a new idler pulley bolt so the pulley can move but does not come off.
12. Install the timing belt in a counterclockwise sequence starting with the drive pulley.
    1. Drive pulley (A)
    2. Idler pulley (B)
    3. Front camshaft pulley (C)
    4. Water pump pulley (D)
    5. Rear camshaft pulley (E)
    6. Adjusting pulley (F)

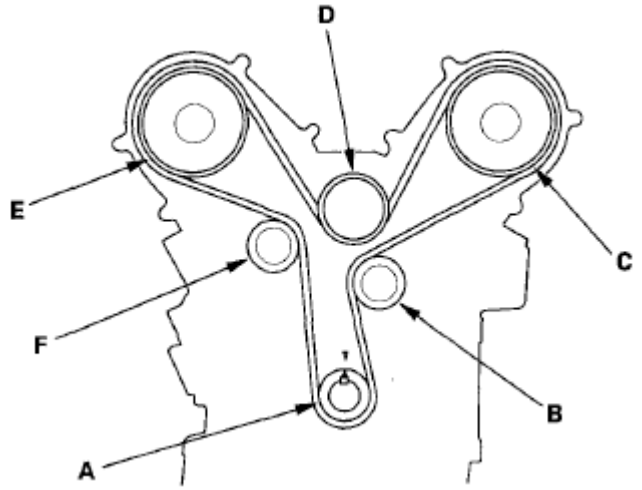

Fig. 62: Identifying Adjusting Pulley, Rear Camshaft Pulley & Idler Pulley
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Tighten the idler pulley bolt.

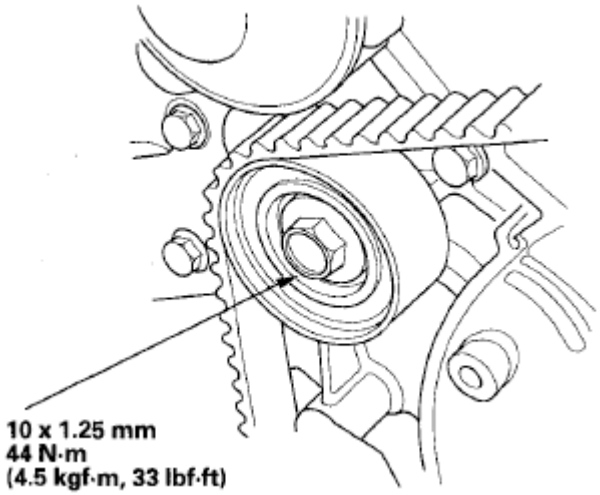

Fig. 63: Identifying Idler Pulley Bolt With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Remove the pin from the auto-tensioner.

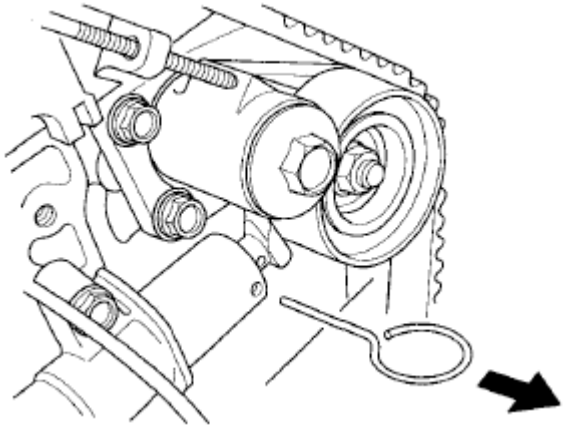

Fig. 64: Identifying Pin & Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Remove the battery clamp bolt from the back cover.
16. Install the side engine mount bracket.

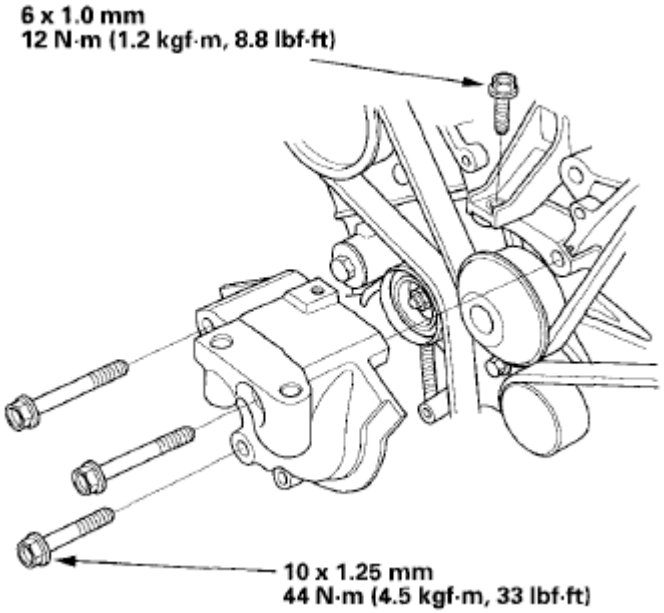

Fig. 65: Identifying Side Engine Mount Bracket With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Install the timing belt guide plate as shown below.

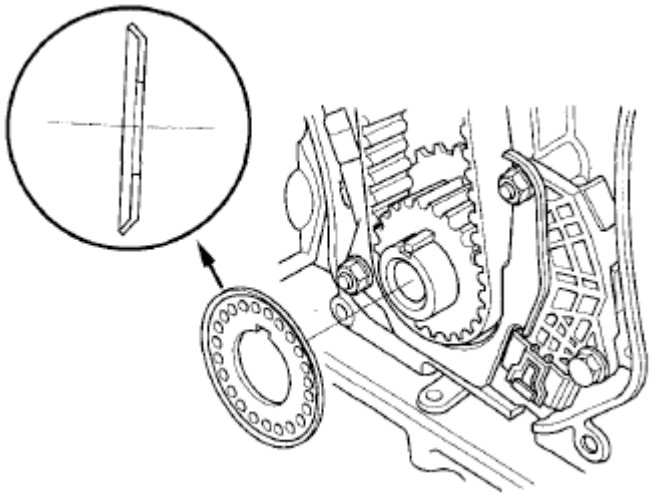

Fig. 66: Identifying Timing Belt Guide Plate
Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Install the lower cover.

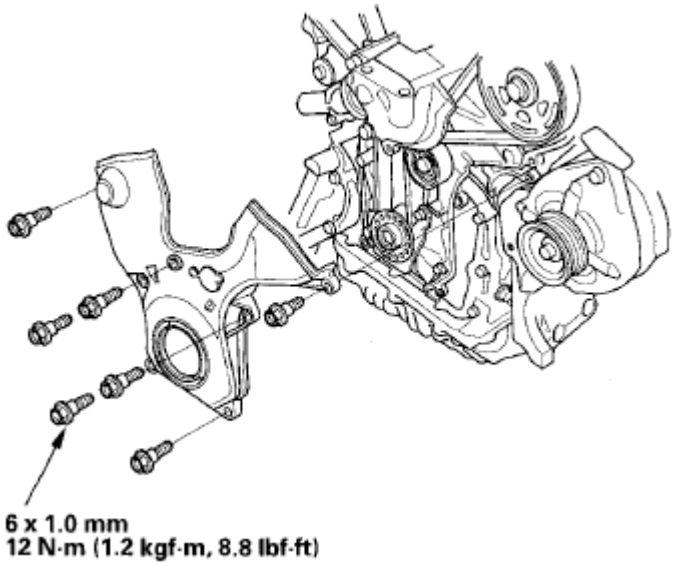

Fig. 67: Identifying Lower Cover With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Install the crankshaft pulley (see **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
20. Install the front upper cover (A) and the rear upper cover (B).

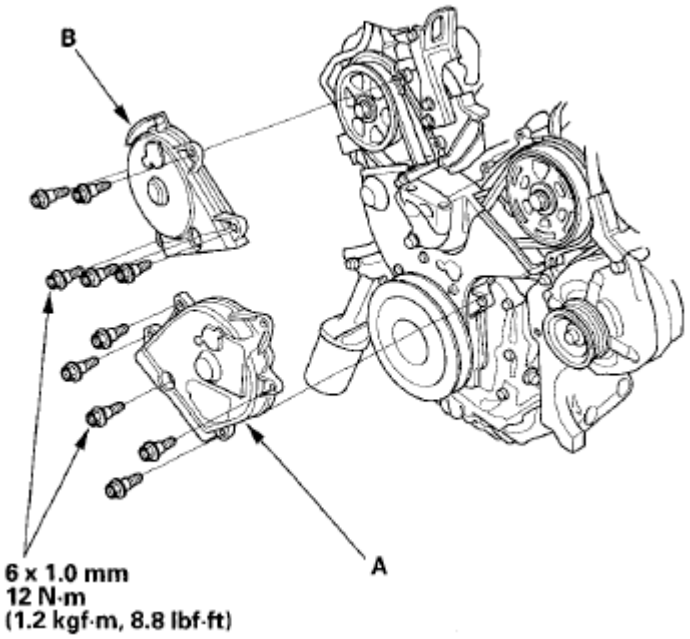

Fig. 68: Identifying Front Upper Cover & Rear Upper Cover With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

21. Rotate the crankshaft pulley about six turns clockwise so the timing belt positions itself on the pulleys.
22. Turn the crankshaft pulley so the white mark (A) lines up with the pointer (B).

NOTE: The other pointer (C) is not used.

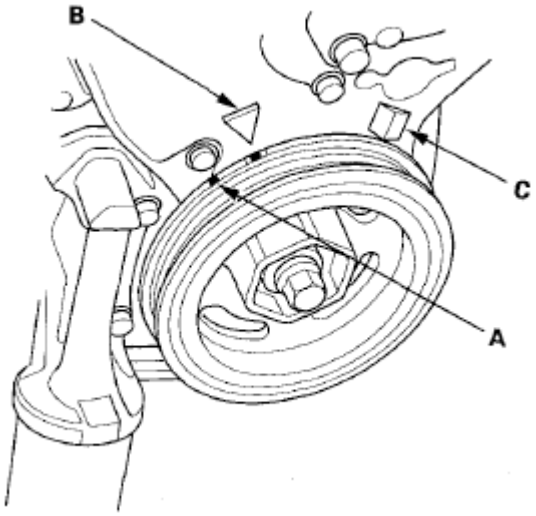

Fig. 69: Identifying Mark On Crankshaft Pulley
Courtesy of AMERICAN HONDA MOTOR CO., INC.

23. Check the camshaft pulley marks.
    - If the camshaft pulley marks are at TDC, go to step 24.

- If the camshaft pulley marks are not at TDC, remove the timing belt and repeat steps 3 through 23.

FRONT

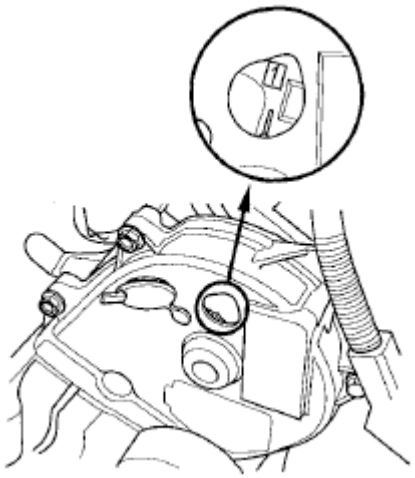

Fig. 70: Identifying Camshaft Pulley Mark (Front)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

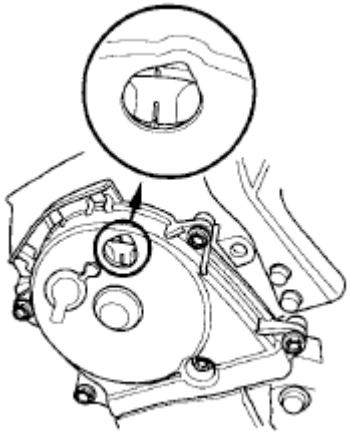

Fig. 71: Identifying Camshaft Pulley Mark (Rear)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

24. Install the upper engine mount bracket (A), then tighten the bolts in the numbered sequence shown.

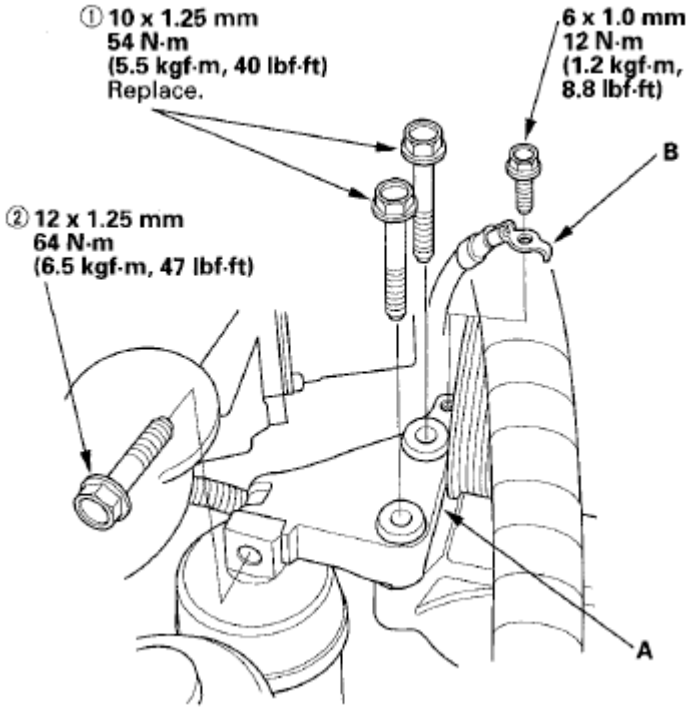

Fig. 72: Identifying Upper Engine Mount Bracket Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

25. Install the ground cable (B).
26. Install the drive belt auto-tensioner (see **DRIVE BELT AUTO-TENSIONER REPLACEMENT**).
27. Install the drive belt (see **DRIVE BELT REPLACEMENT**).
28. Install the splash shield.
29. Install the right front wheel.
30. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **CRANK (CKP) PATTERN CLEAR/CRANK (CKP) PATTERN LEARN**).

TIMING BELT DRIVE PULLEY REPLACEMENT

1. Remove the timing belt (see **TIMING BELT REMOVAL**).
2. Remove the crankshaft position (CKP) sensor (see **CKP SENSOR REPLACEMENT**).
3. Remove the timing belt drive pulley (A).

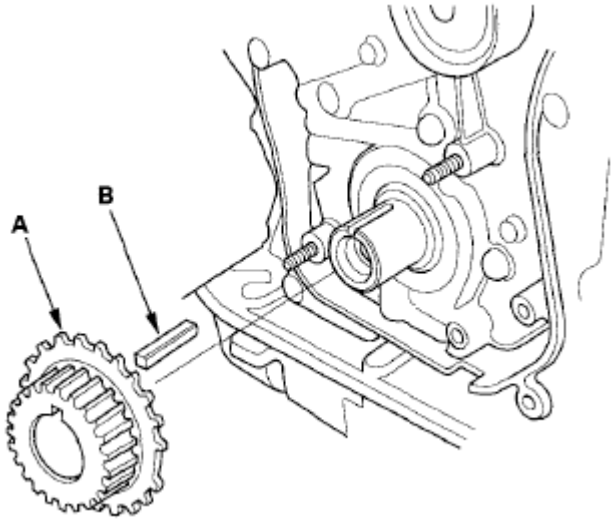

Fig. 73: Identifying Timing Belt Drive Pulley & Key
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Inspect the timing belt drive pulley and the key (B) for damage. If it is cracked or damaged, replace the timing belt drive pulley.
5. Install the timing belt drive pulley.
6. Install the CKP sensor (see **CKP SENSOR REPLACEMENT**).
7. Install the timing belt (see **TIMING BELT INSTALLATION**).

TIMING BELT ADJUSTER REPLACEMENT

1. Remove the timing belt (see **TIMING BELT REMOVAL**).
2. Remove the battery clamp bolt from the back cover.
3. Remove the auto-tensioner (see step 6 in **TIMING BELT REPLACEMENT**).
4. Remove the bolt (A), then remove the timing belt adjuster (B) and the collar (C).

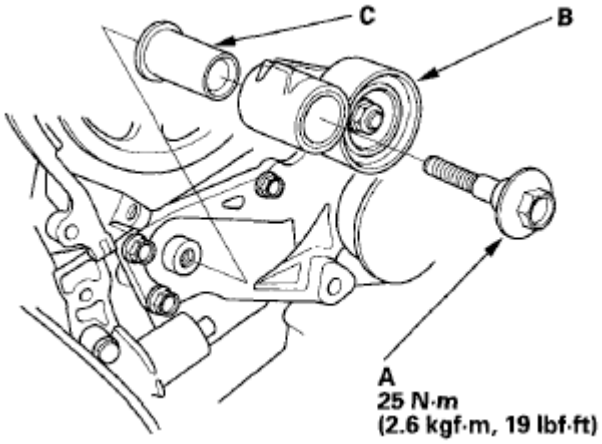

Fig. 74: Identifying Timing Belt Adjuster, Bolt & Collar With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Install the timing belt adjuster.
6. Install the timing belt (see **TIMING BELT INSTALLATION**).

CYLINDER HEAD COVER REMOVAL

FRONT

1. Remove the intake manifold (see **REMOVAL**).
2. Remove the three ignition coils from the front cylinder head (see **IGNITION COIL REMOVAL/INSTALLATION**).
3. Remove the harness holder mounting bolt (A) and the harness clamp (B), then remove the harness holder (C) from the bracket.

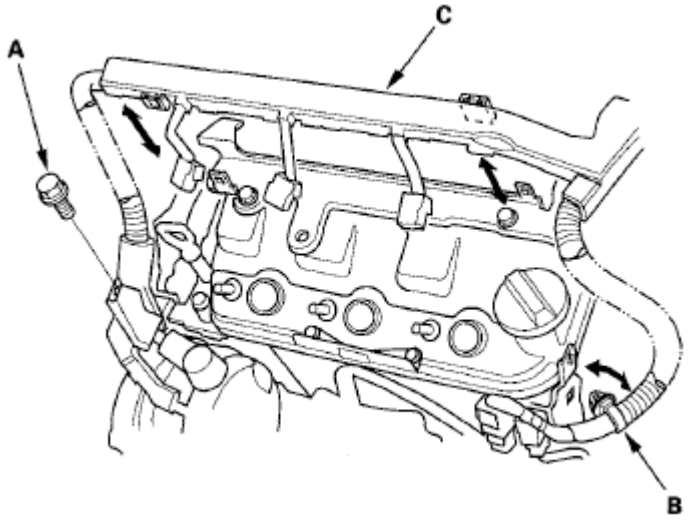

Fig. 75: Identifying Harness Holder Mounting Bolt, Harness Clamp & Harness Holder
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the front cylinder head cover.

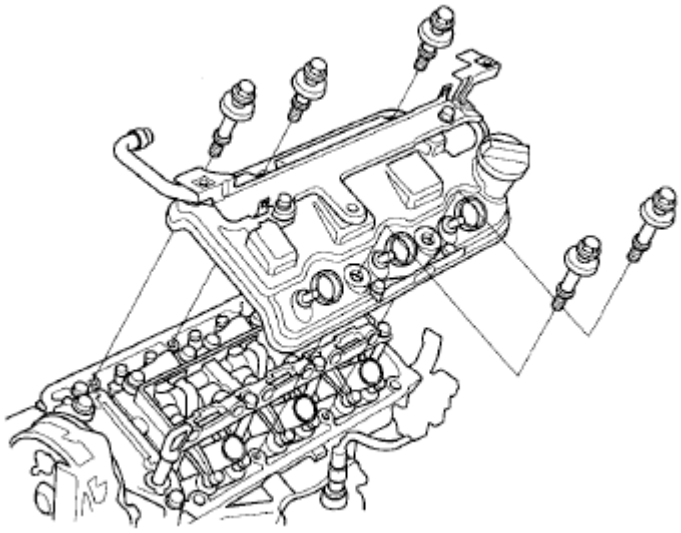

Fig. 76: Identifying Cylinder Head Cover & Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

1. Remove the intake manifold (see **REMOVAL**).
2. Remove the three ignition coils from the rear cylinder head (see **IGNITION COIL REMOVAL/INSTALLATION**).
3. Remove the power steering hose clamp mounting bolt (A), the harness holder mounting bolts (B), the harness clamp (C), and the breather hose (D).

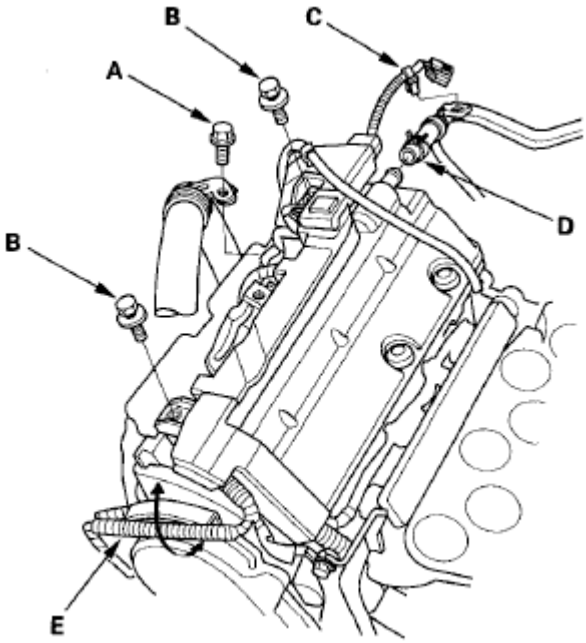

Fig. 77: Identifying Power Steering Hose Clamp Mounting Bolt, Harness Holder Mounting Bolts &

Harness Clamp
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the wire harness (E) from the rear upper cover.
5. Remove the rear cylinder head cover.

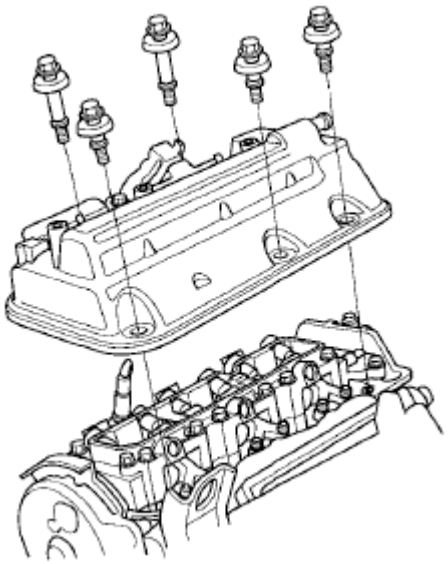

Fig. 78: Identifying Rear Cylinder Head Cover Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER HEAD COVER INSTALLATION

FRONT

1. Check the spark plug seals for damage. If any seal is damaged, replace it.
2. Thoroughly clean the head cover gasket and the groove.
3. Install the head cover gasket (A) in the groove of the cylinder head cover (B). Make sure the head cover gasket is seated securely.

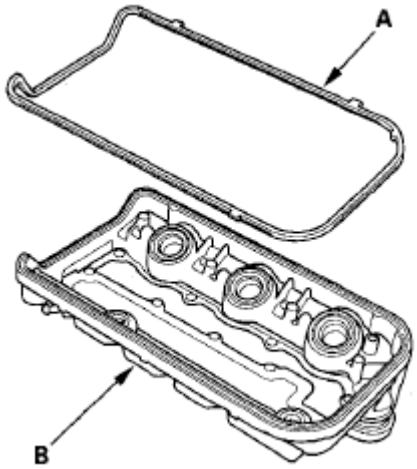

Fig. 79: Identifying Head Cover Gasket & Cylinder Head Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove all of the old liquid gasket from the rocker shaft holder and the cylinder head.
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 rocker shaft holder mating areas (A). Install the component within 5 minutes of applying the liquid gasket.

NOTE:

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

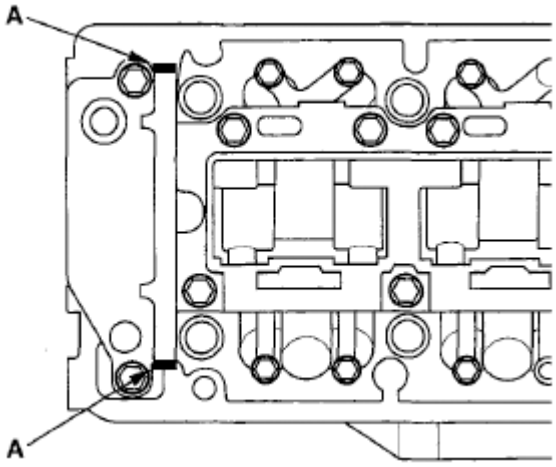

Fig. 80: Identifying Cylinder Head Cover Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Set the spark plug seals (A) on the spark plug tubes, and install the front cylinder head cover (B).

NOTE:

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

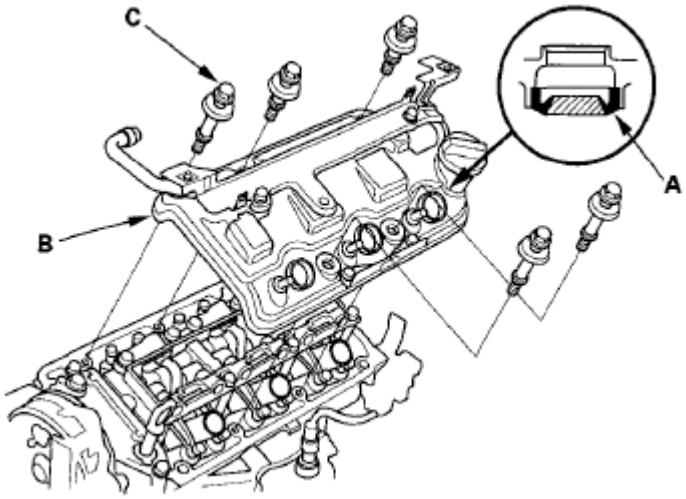

Fig. 81: Identifying Spark Plug Seals & Front Cylinder Head Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

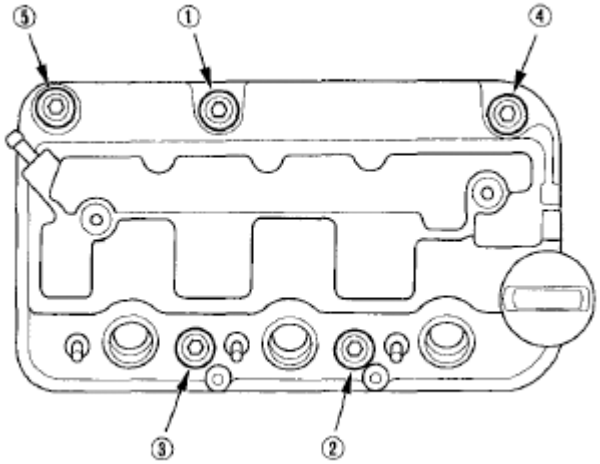

Fig. 82: Identifying Cylinder Head Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Install the harness holder (A) to the bracket, then install the harness holder mounting bolt (B) and the harness clamp (C).

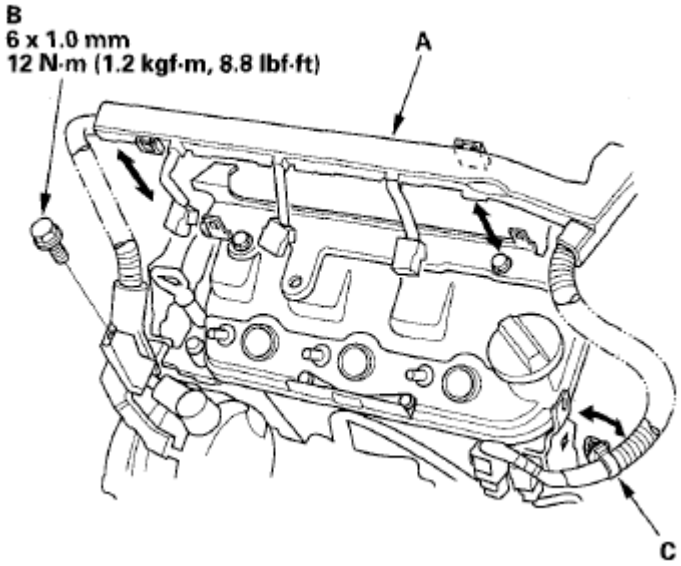

Fig. 83: Identifying Harness Holder, Harness Holder Mounting Bolt & Harness Clamp With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Install the three ignition coils to the front cylinder head (see **IGNITION COIL REMOVAL/INSTALLATION**).
13. Install the intake manifold (see **INSTALLATION**).

REAR

1. Check the spark plug seals for damage. If any seal is damaged, replace it.
2. Thoroughly clean the head cover gasket and the groove.
3. Install the head cover gasket (A) in the groove of the cylinder head cover (B). Make sure the head cover gasket is seated securely.

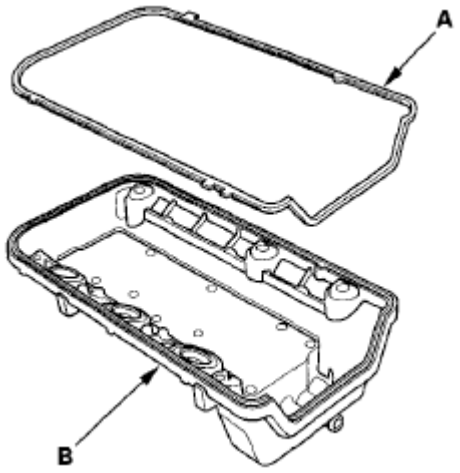

Fig. 84: Identifying Head Cover Gasket & Cylinder Head Cover

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove all of the old liquid gasket from the rocker shaft holder and the cylinder head.
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 rocker shaft holder mating areas (A). Install the component within 5 minutes of applying the liquid gasket.

NOTE:

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

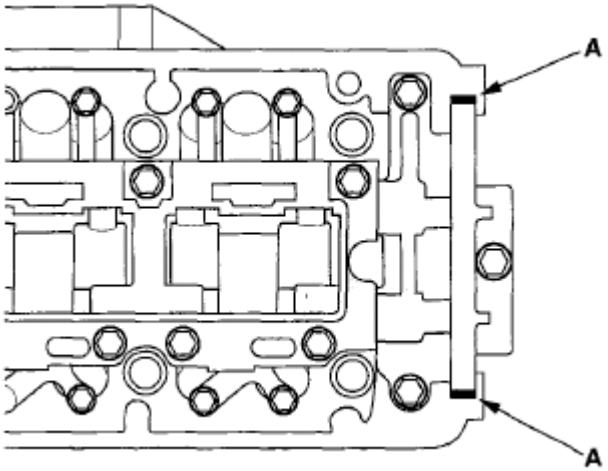

Fig. 85: Identifying Rocker Shaft Holder Mating Areas
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Set the spark plug seals (A) on the spark plug tubes, and install the rear cylinder head cover (B).

NOTE:

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

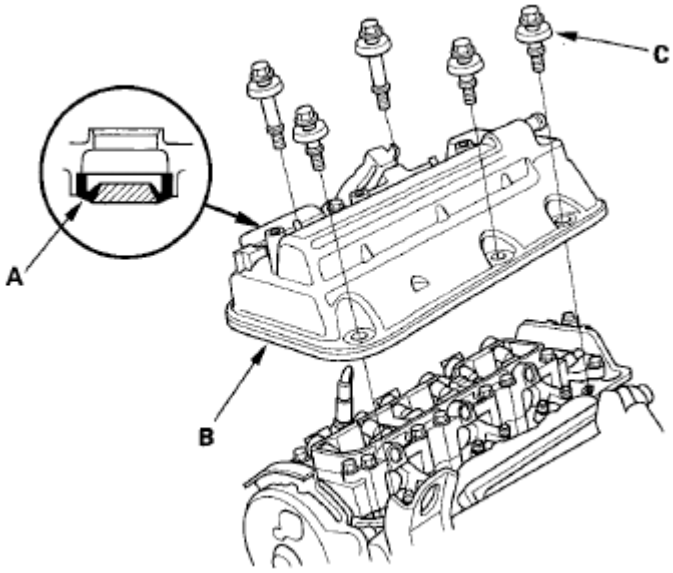

Fig. 86: Identifying Cylinder Head Cover & Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

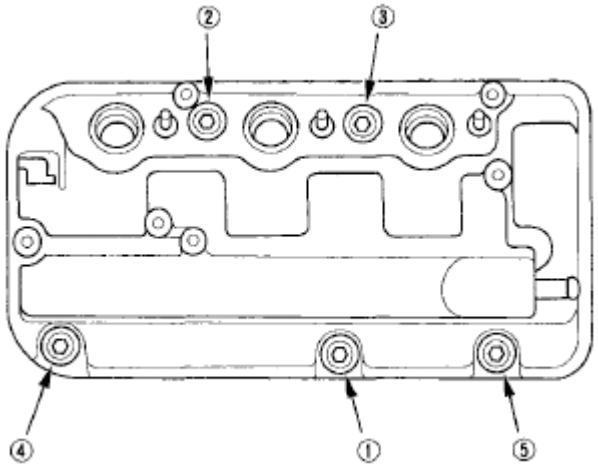

Fig. 87: Identifying Cylinder Head Cover Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Install the wire harness (A) to the rear upper cover.

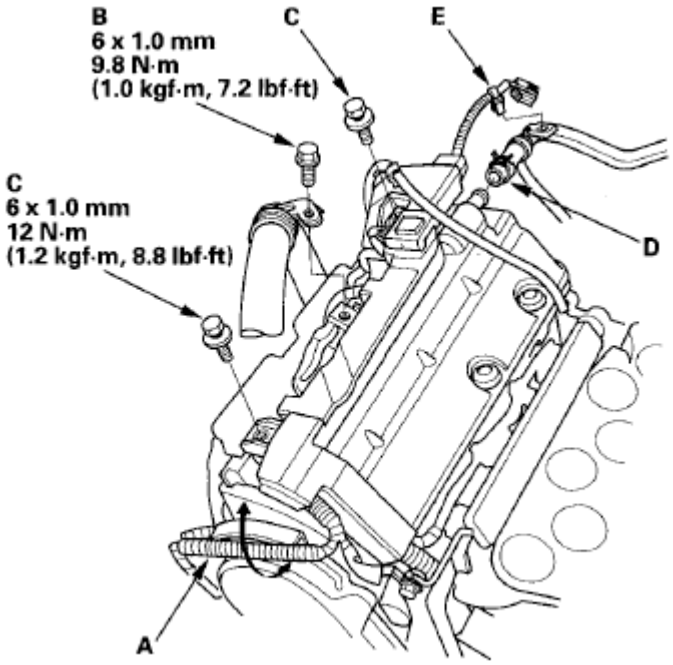

Fig. 88: Identifying Power Steering Hose Clamp Mounting Bolt, Harness Holder Mounting Bolts & Breather Hose With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Install the power steering hose clamp mounting bolt (B), the harness holder mounting bolts (C), the breather hose (D), and the harness clamp (E).
13. Install the three ignition coils to the rear cylinder head (see **IGNITION COIL REMOVAL/INSTALLATION**).
14. Install the intake manifold (see **INSTALLATION**).

CYLINDER HEAD REMOVAL

NOTE:

- **Use fender covers to avoid damaging painted surfaces.**
- **To avoid damaging the wiring 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 any other wiring or hoses, or interfere with any other parts.**

1. Relieve the fuel pressure (see **FUEL PRESSURE RELIEVING**).
2. Do the battery terminal disconnection procedure (see **DISCONNECTION**).
3. Drain the engine coolant (see **COOLANT REPLACEMENT**).
4. Remove the drive belt (see **DRIVE BELT REPLACEMENT**).

5. Remove the power steering (P/S) pump (A) and the bolt (B) securing the P/S hose clamp.

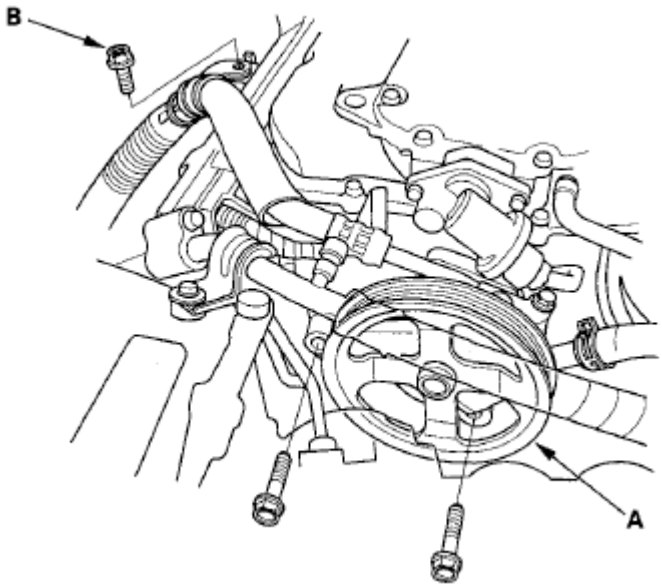

Fig. 89: Identifying Power Steering (P/S) Pump & Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the alternator (see **ALTERNATOR REMOVAL AND INSTALLATION**).
7. Remove the intake manifold (see **REMOVAL**).
8. Remove the six ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION**).
9. Remove the timing belt (see **TIMING BELT REMOVAL**).
10. Remove the cylinder head covers (see **CYLINDER HEAD COVER REMOVAL**).
11. Remove the following engine wire harness connectors and wire harness clamps from the cylinder head:
    - Six injector connectors
    - Engine coolant temperature (ECT) sensor 1 connector
    - Oil pressure switch connector
    - Camshaft position (CMP) sensor connector
    - Rocker arm oil control solenoid connector
    - Rocker arm oil pressure switch connector
    - Front and rear air fuel ratio (A/F) sensor connector
    - Front and rear secondary heated oxygen sensor (secondary HO2S) connector
12. Remove the front warm up three way catalytic converter (front WU-TWC) (see **FRONT**) and the rear warm up three way catalytic converter (rear WU-TWC) (see **REAR**).
13. Remove the quick-connect fitting cover (A), then disconnect the fuel feed hose (B) (see **FUEL LINE/QUICK-CONNECT FITTING REMOVAL**).

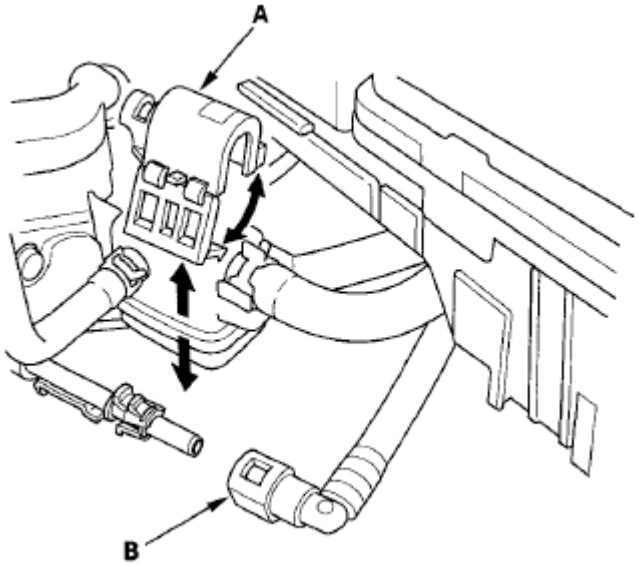

Fig. 90: Removing Quick-Connect Fitting Cover & Fuel Feed Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Remove the connector bracket from the front cylinder head.

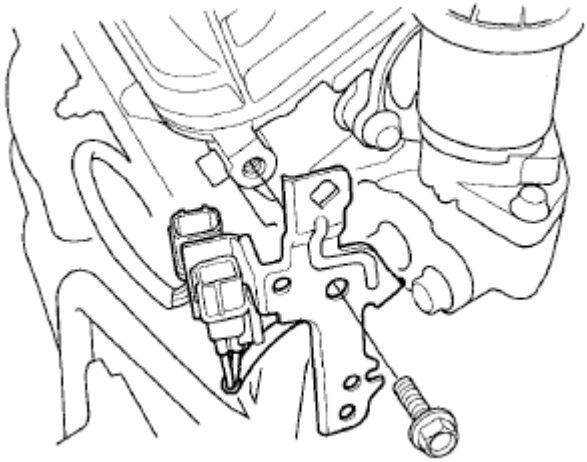

Fig. 91: Identifying Connector Bracket & Front Cylinder Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Remove the engine mount control solenoid valve bracket and the harness clamp bracket from the rear cylinder head.

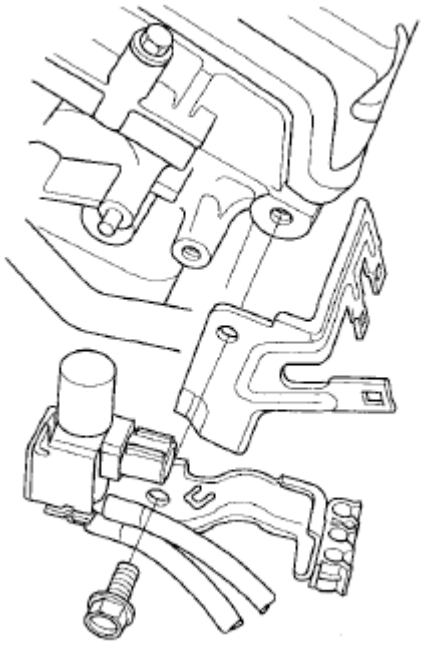

Fig. 92: Identifying Engine Mount Control Solenoid Valve Bracket & Harness Clamp Bracket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

16. Remove the fuel rails (see **INJECTOR REPLACEMENT**).
17. Remove the water passage (see **WATER PASSAGE REPLACEMENT**).
18. Remove the front and rear camshaft pulleys (A) and the front and rear back covers (B).

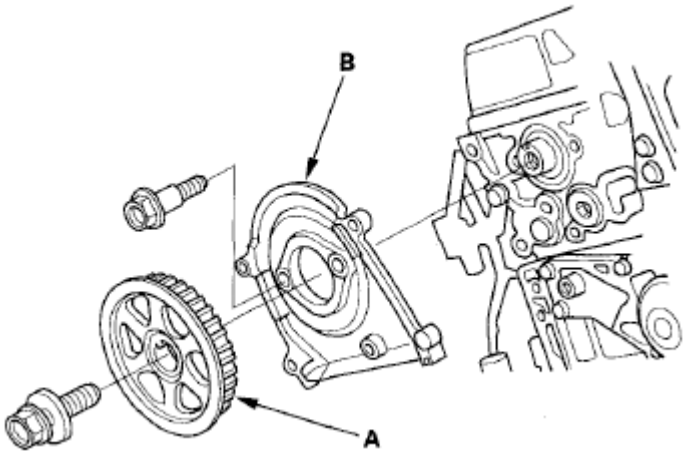

Fig. 93: Identifying Front & Rear Camshaft Pulleys And Front & Rear Back Covers
Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. 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.

FRONT

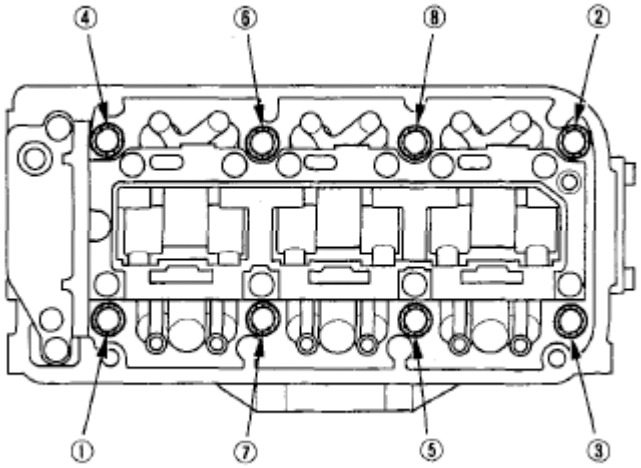

Fig. 94: Identifying Cylinder Head Bolt Tightening Sequence (Front)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

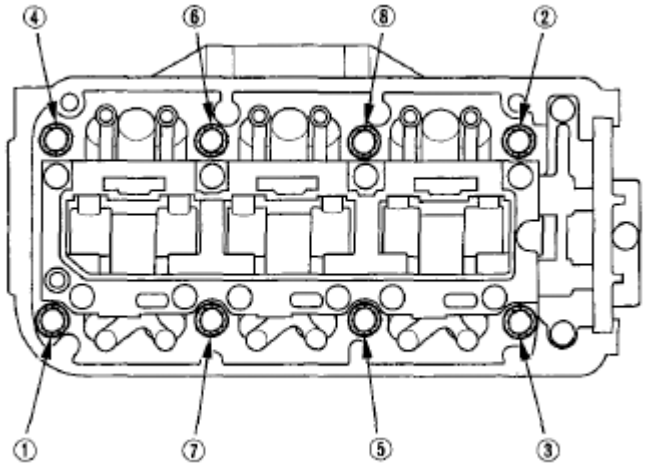

Fig. 95: Identifying Cylinder Head Bolt Tightening Sequence (Rear)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

20. Remove the cylinder heads.

CAMSHAFT REPLACEMENT

FRONT

1. Do the battery removal procedure (see **REMOVAL**).
2. Drain the engine coolant (see **COOLANT REPLACEMENT**).
3. Disconnect the upper radiator hose (A) and the lower radiator hose (B).

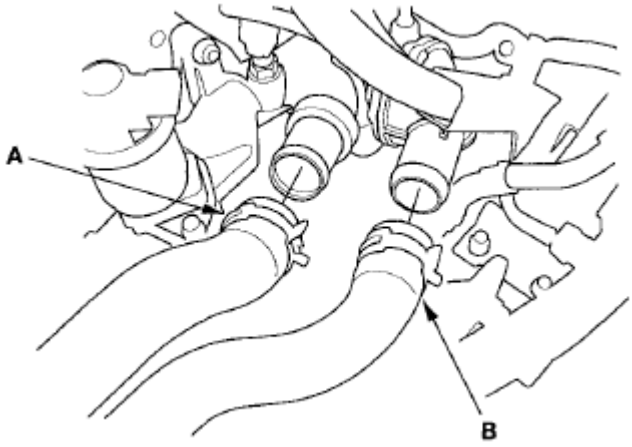

Fig. 96: Identifying Upper & Lower Radiator Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the exhaust gas recirculation (EGR) valve (see **EGR VALVE REPLACEMENT**).
5. Remove the stud bolts.

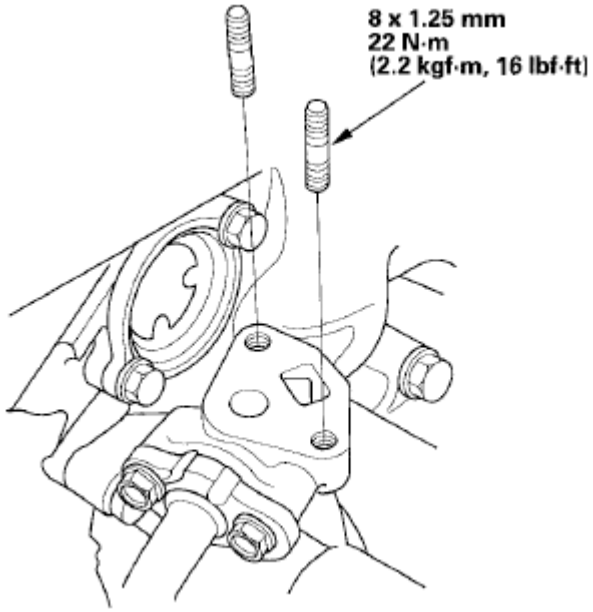

Fig. 97: Identifying Stud Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the timing belt (see **TIMING BELT REMOVAL**).
7. Remove the rocker arm assembly (see **ROCKER ARM ASSEMBLY REMOVAL**).
8. Remove the front camshaft pulley.
9. Remove the thrust cover (A), then remove the front camshaft (B).

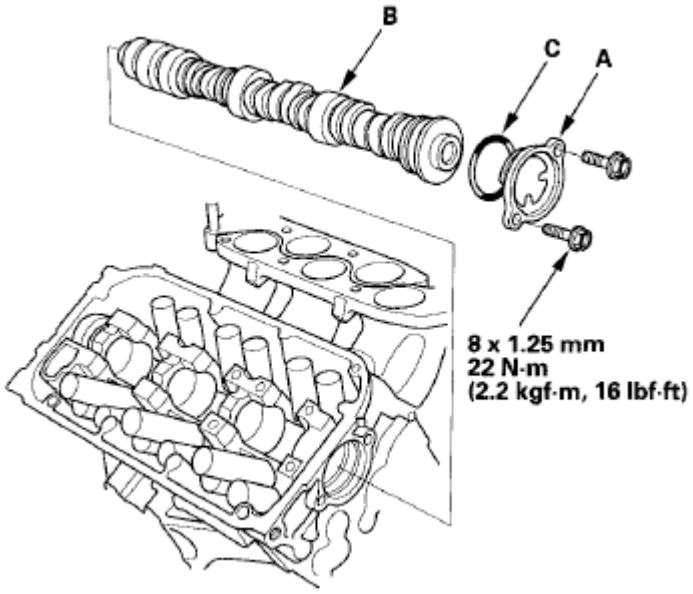

Fig. 98: Identifying Thrust Cover & Front Camshaft With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Install the front camshaft in the reverse order of removal. Always use a new O-ring (C). Apply new engine oil to the journals and the cam lobes.
11. Install the rocker arm assembly (see **CAMSHAFT, ROCKER ARM ASSEMBLY, CAMSHAFT SEAL, AND PULLEY INSTALLATION**).
12. Install the timing belt (see **TIMING BELT INSTALLATION**).
13. Install the stud bolts, then install the EGR valve (see **EGR VALVE REPLACEMENT**).
14. Install the upper radiator hose and the lower radiator hose.
15. Adjust the valve clearance (see **VALVE CLEARANCE ADJUSTMENT**).
16. Do the battery installation procedure (see **INSTALLATION**).
17. Fill the radiator with engine coolant and bleed the air out (see step 8 in **COOLANT REPLACEMENT**).
18. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **CRANK (CKP) PATTERN CLEAR/CRANK (CKP) PATTERN LEARN**).

REAR

1. Relieve the fuel pressure (see **FUEL PRESSURE RELIEVING**).
2. Remove the quick-connect fitting cover, then disconnect the fuel feed hose (see **FUEL LINE/QUICK-CONNECT FITTING REMOVAL**).
3. Remove the intake manifold (see **REMOVAL**).
4. Remove the purge joint (A).

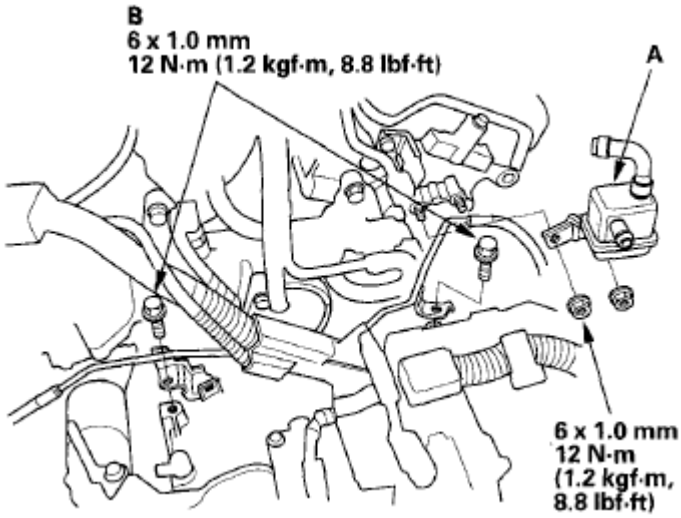

Fig. 99: Identifying Purge Joint & Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Remove the two bolts (B) securing the vacuum line.
6. Remove the timing belt (see **TIMING BELT REMOVAL**).
7. Remove the rocker arm assembly (see **ROCKER ARM ASSEMBLY REMOVAL**).
8. Remove the rear camshaft pulley.
9. Remove the thrust cover (A), then remove the rear camshaft (B).

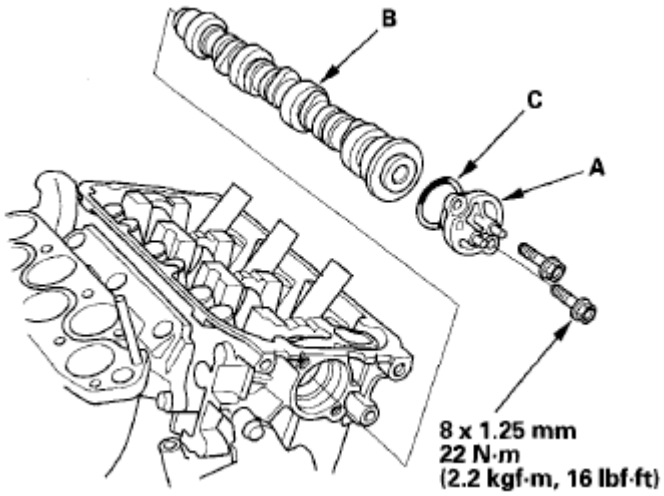

Fig. 100: Identifying Thrust Cover & Rear Camshaft With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Install the rear camshaft in the reverse order of removal. Always use a new O-ring (C). Apply new engine oil to the journals and cam lobes.
11. Install the rocker arm assembly (see **CAMSHAFT, ROCKER ARM ASSEMBLY, CAMSHAFT SEAL AND PULLEY INSTALLATION**).

12. Install the timing belt (see **TIMING BELT INSTALLATION**).
13. Install the vacuum line and the purge joint.
14. Install the intake manifold (see **INSTALLATION**).
15. Connect the fuel feed hose (see **FUEL LINE/QUICK-CONNECT FITTING INSTALLATION**), then install the quick-connect fitting cover.
16. Adjust the valve clearance (see **VALVE CLEARANCE ADJUSTMENT**).
17. 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.
18. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **CRANK (CKP) PATTERN CLEAR/CRANK (CKP) PATTERN LEARN**).

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.) and 0.2 mm (0.008 in.), resurface the cylinder head.
    - Maximum resurface limit is 0.2 mm (0.008 in.) based on a height of 121 mm (4.76 in.).

    Cylinder Head Height

    Standard (New): 120.95-121.05 mm (4.762-4.766 in.)

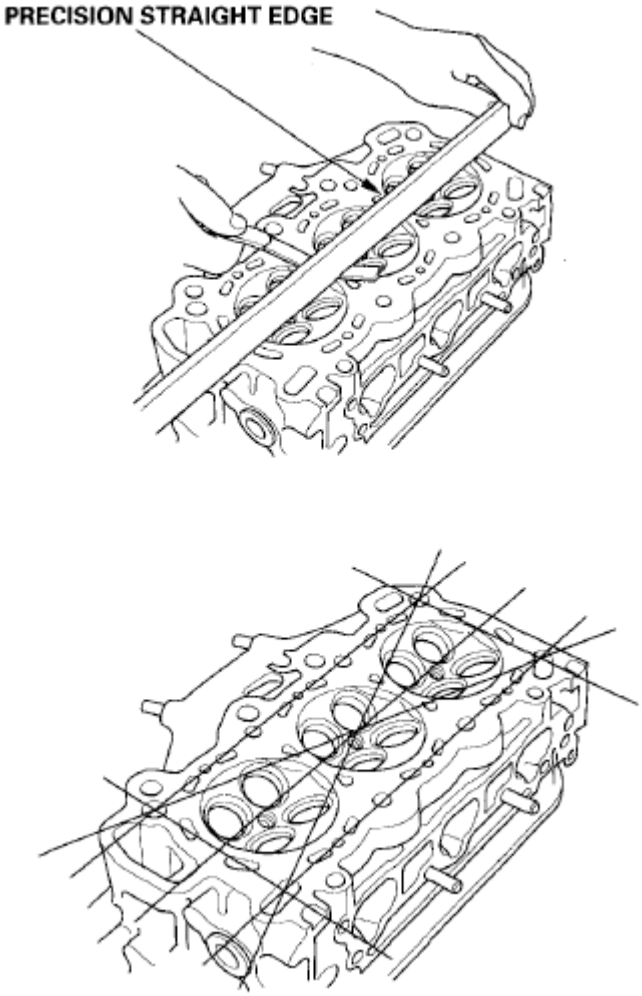

Fig. 101: Checking Cylinder Head For Warpage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM ASSEMBLY REMOVAL

FRONT

1. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
2. Loosen the locknuts and the adjusting screws (A).

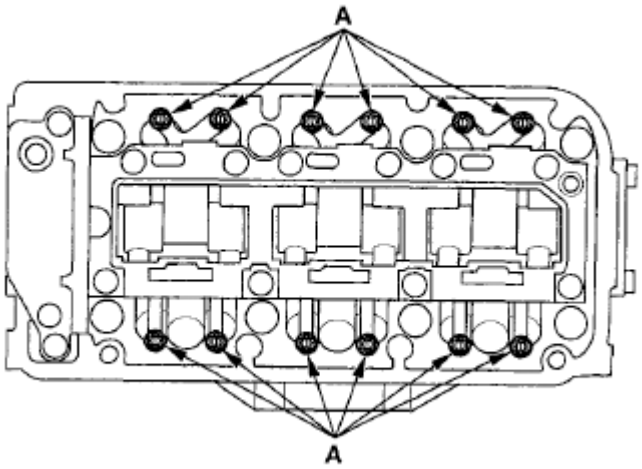

Fig. 102: Identifying Cylinder Head Cover Locknuts & Adjusting Screws
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove the rocker shaft bridge mounting bolts, the rocker shaft holder mounting bolts, and the rocker arm assembly.
    1. Loosen the rocker shaft bridge mounting bolts and the rocker shaft holder mounting bolts in sequence two turns at a time, to prevent damaging the valves or the rocker arm assembly.
    2. When removing the rocker arm assembly, do not remove the rocker shaft bridge mounting bolts and the rocker shaft holder mounting bolts. The bolts will keep the springs and the rocker arms on the shafts.

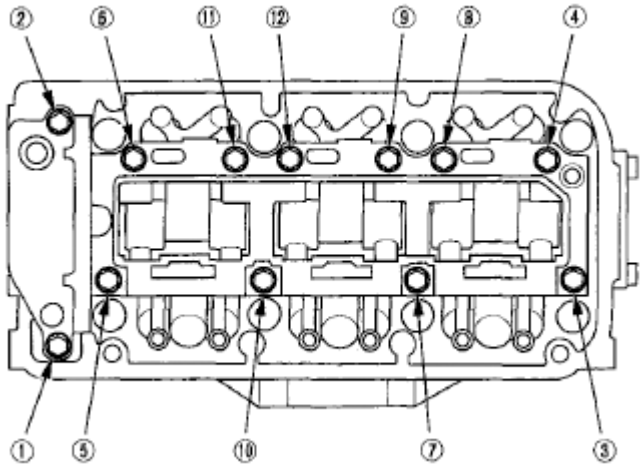

Fig. 103: Identifying Rocker Arm Assembly & Rocker Shaft Bridge Mounting Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

1. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
2. Loosen the locknuts and the adjusting screws (A).

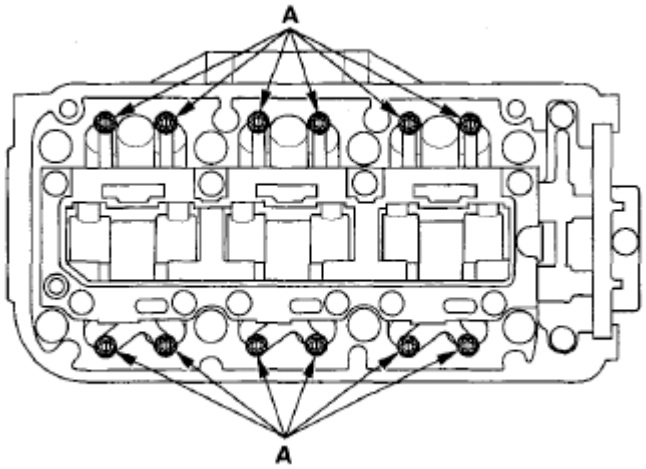

Fig. 104: Identifying Locknuts & Adjusting Screws
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove the rocker shaft bridge mounting bolts, the rocker shaft holder mounting bolts, and the rocker arm assembly.
    1. Loosen the rocker shaft bridge mounting bolts and the rocker shaft holder mounting bolts in sequence two turns at a time, to prevent damaging the valves or the rocker arm assembly.
    2. When removing the rocker arm assembly, do not remove the rocker shaft bridge mounting bolts and the rocker shaft holder mounting bolts. The bolts will keep the rocker arms on the shafts.

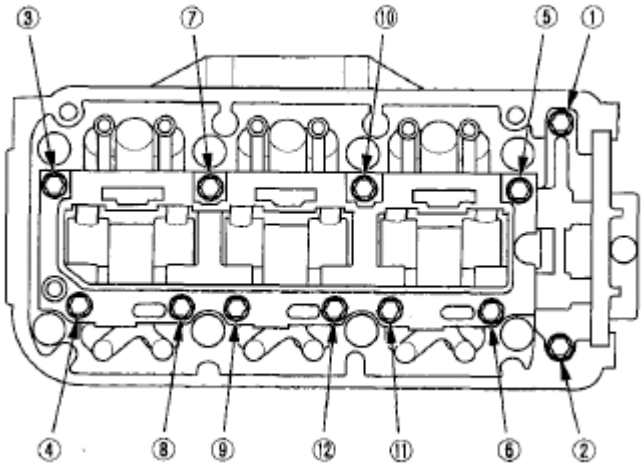

Fig. 105: Identifying Rocker Arm Assembly & Rocker Shaft Bridge Mounting Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY

FRONT

NOTE:

- **Identify parts as they are removed so they can be reinstalled in their original locations.**
- **Inspect the rocker shafts and the 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 mounting bolts. The bolts will keep the rocker arms, the rocker shaft bridge, and the rocker shaft holder on the shaft.**
- **If the rocker shaft cannot be removed or installed by hand, remove or install the rocker shaft by heating the rocker shaft bridge.**
- **Prior to reassembling, clean all the parts in solvent, dry them, and apply new engine oil to all contact points and bearing surfaces.**
- **When replacing the rocker arm assembly, remove the fastening hardware from the new rocker arm assembly.**
- **Never remove any of the circlips that retain the lost motion assemblies in the rocker shaft bridge. The circlips are not available separately, and are factory installed in the rocker shaft bridge. To remove the lost motion assemblies, first remove the rocker shafts and the rocker arms.**

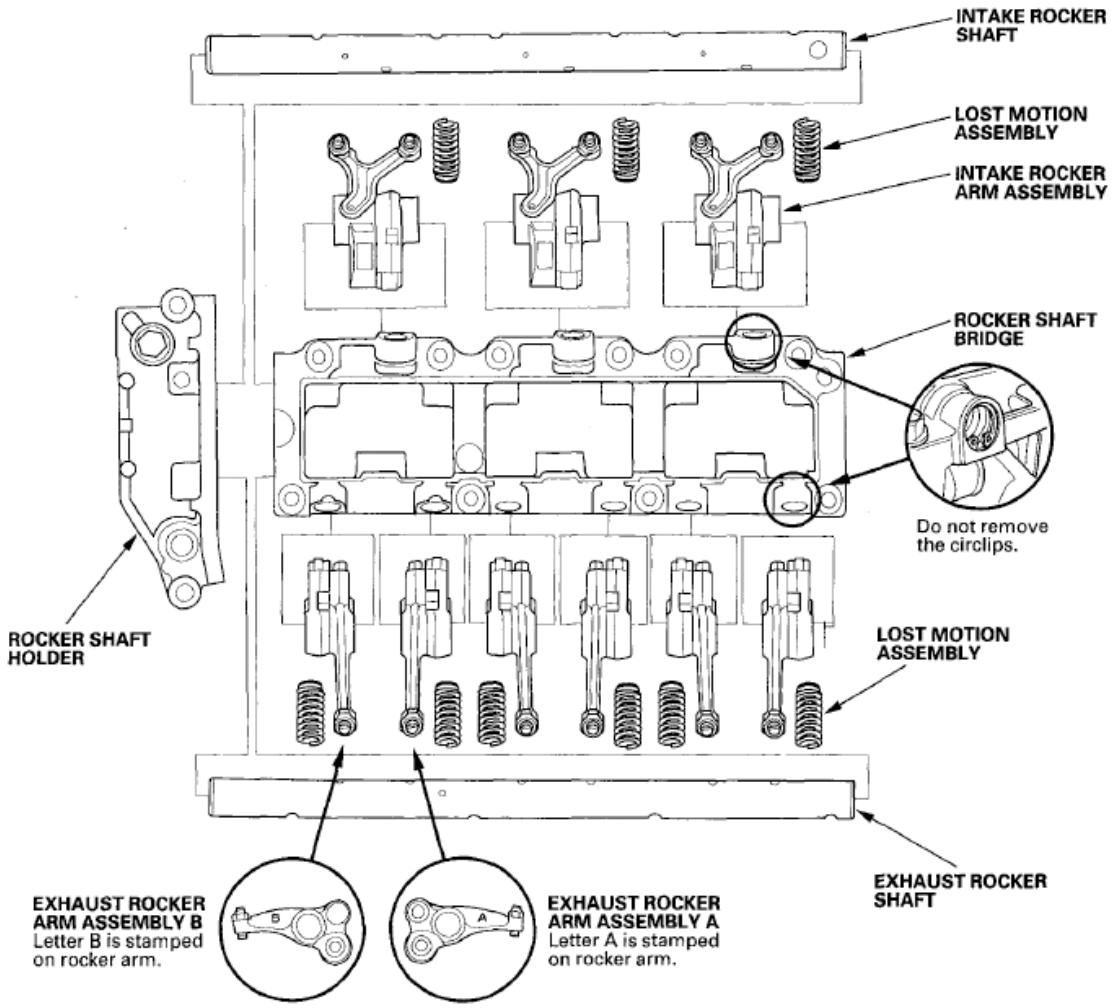

Fig. 106: Identifying Rocker Arms & Shaft Replacement Components (Front)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

NOTE:

- **Identify parts as they are removed so they can be reinstalled in their original locations.**
- **Inspect the rocker shafts and the 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 mounting bolts. The bolts will keep the rocker arms, the rocker shaft bridge, and the rocker shaft holder on the shaft.**
- **If the rocker shaft cannot be removed or installed by hand, remove or install the rocker shaft by heating the rocker shaft bridge.**
- **Prior to reassembling, clean all the parts in solvent, dry them, and apply**

new engine oil to all contact points and bearing surfaces.

- **When replacing the rocker arm assembly, remove the fastening hardware from the new rocker arm assembly.**
- **Never remove any of the circlips that retain the lost motion assemblies in the rocker shaft bridge. The circlips are not available separately, and are factory installed in the rocker shaft bridge. To remove the lost motion assemblies, first remove the rocker shafts and the rocker arms.**

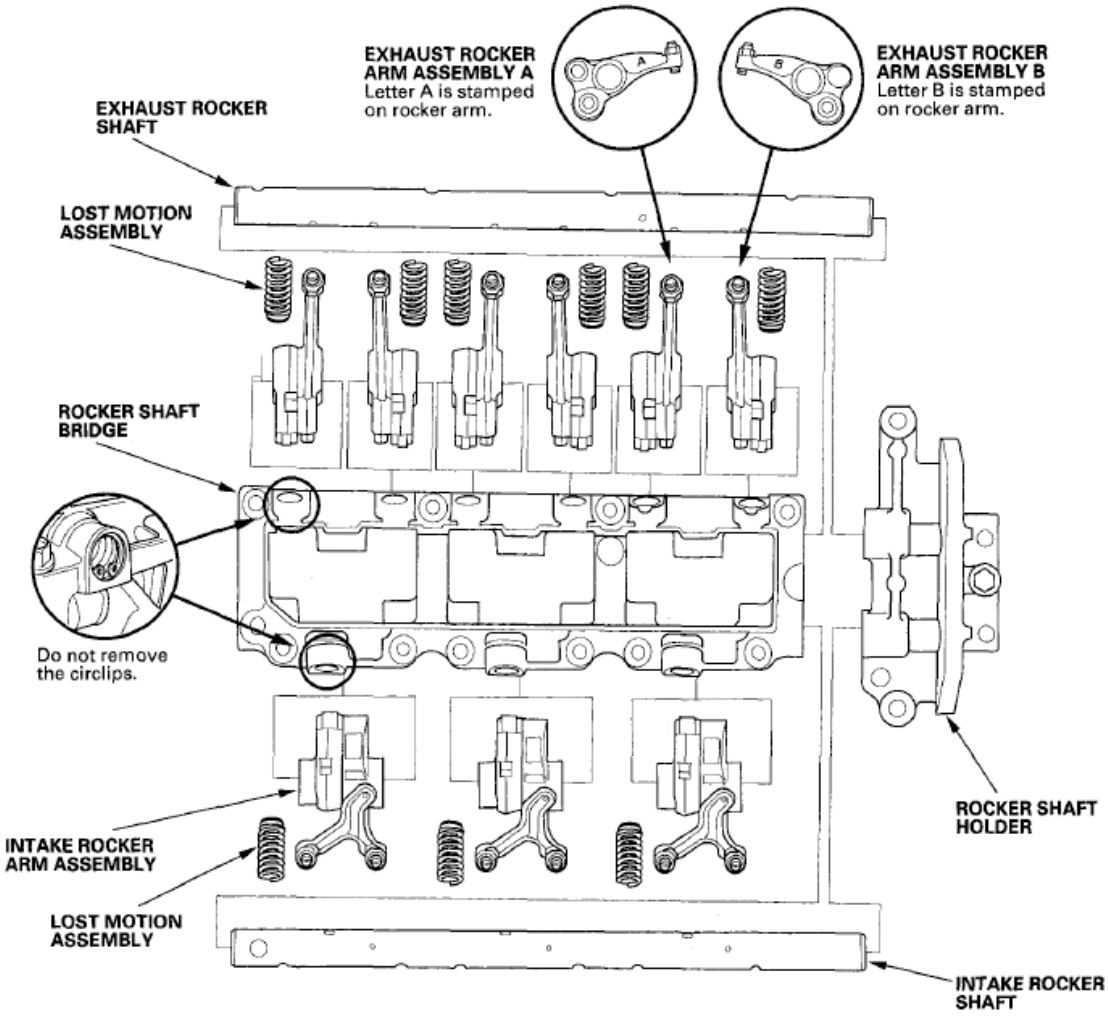

Fig. 107: Identifying Rocker Arms & Shaft Component Location (Rear)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM AND SHAFT INSPECTION

1. Remove the rocker arm assembly (see **ROCKER ARM ASSEMBLY REMOVAL**).
2. Disassemble the rocker arm assembly (see **ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY**).
3. Measure the diameter of the shaft at the first rocker location.

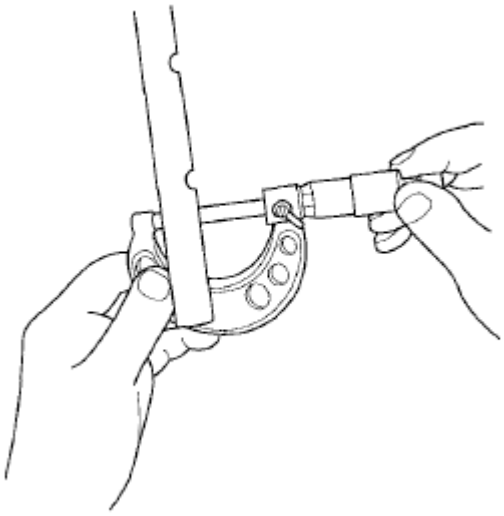

Fig. 108: Measuring Diameter Of Shaft & First Rocker
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

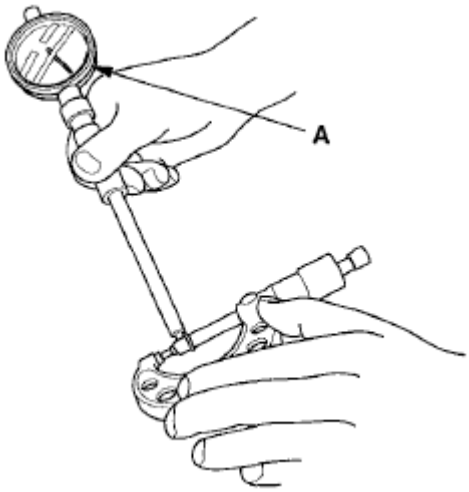

Fig. 109: Measuring Shaft Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Intake Rocker Arm-to-Shaft Clearance:

   Standard (New): 0.015-0.046 mm (0.0006-0.0018 in.)

   Service Limit: 0.046 mm (0.0018 in.)

   Exhaust Rocker Arm-to-Shaft Clearance:

Standard (New): 0.015-0.046 mm (0.0006-0.0018 in.)

Service Limit: 0.046 mm (0.0018 in.)

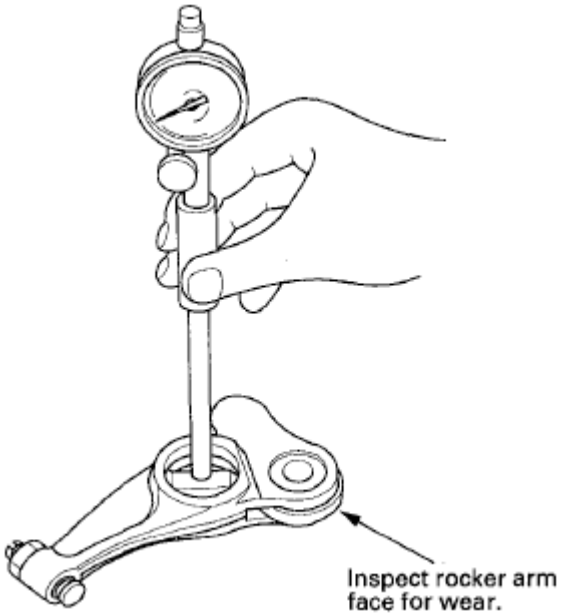

Fig. 110: Measuring Inside Diameter Of Rocker Arm
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Repeat for all rockers and both shafts. If the clearance is over the limit, replace the rocker shaft and all over-tolerance rocker arms. If any intake rocker arm needs replacement, replace all rocker arms in that set (primary and secondary).

VTEC Rocker Arms

7. Inspect the rocker arm piston (A). Slide them into the rocker arms. If they do not move smoothly, replace the rocker arm set.

NOTE:

- **Apply new engine oil to the rocker arm piston when reassembling.**
- **When removing the rocker arm piston, carefully apply air pressure to the oil passage of the rocker arm.**

INTAKE

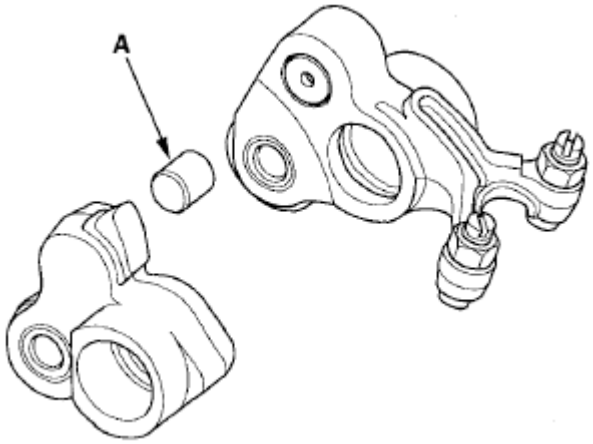

Fig. 111: Identifying VTEC Rocker Arm (Intake)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

EXHAUST

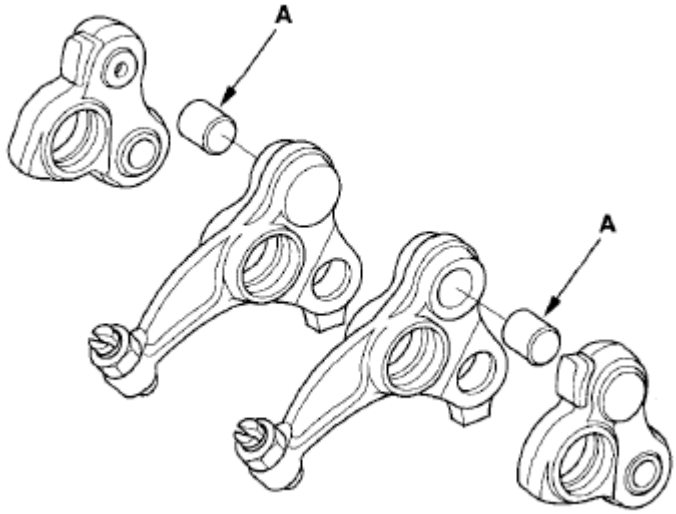

Fig. 112: Identifying VTEC Rocker Arm (Exhaust)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

CAMSHAFT INSPECTION

1. Remove the cylinder head (see **CYLINDER HEAD REMOVAL**).
2. Remove the rocker arm assembly (see **ROCKER ARM ASSEMBLY REMOVAL**).
3. Front: Put the rocker shafts bridge and the rocker shaft holder on the front cylinder head, then tighten the

bolts to the specified torque.

Specified Torque

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

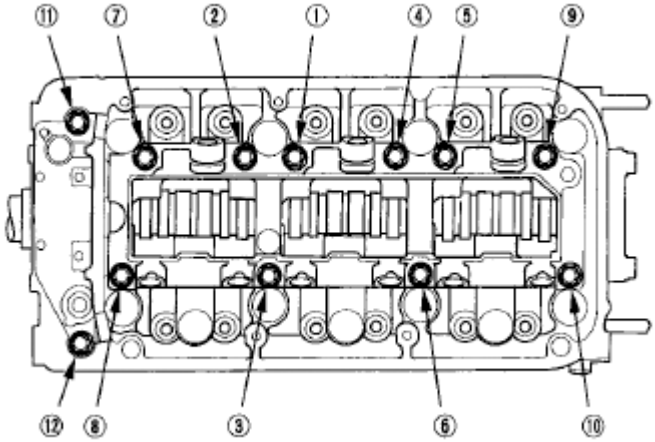

Fig. 113: Identifying Camshaft Bolt Tighten Sequence (Front)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Rear: Put the rocker shaft bridge and the rocker shaft holder on the rear cylinder head, then tighten the bolts to the specified torque.

Specified Torque

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

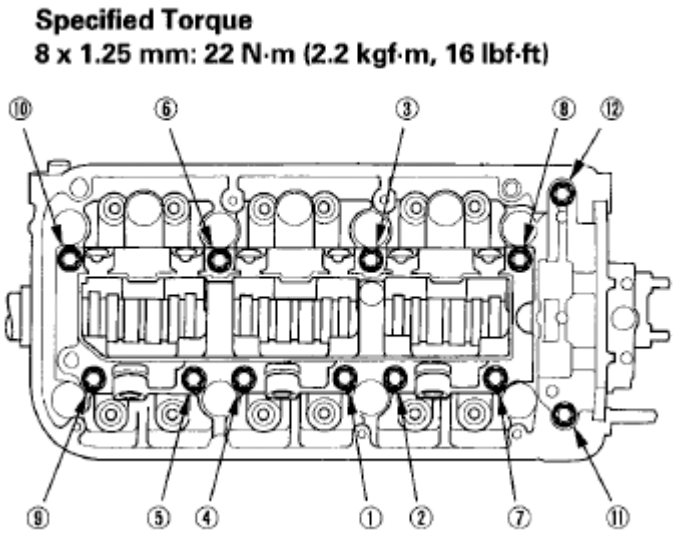

Fig. 114: Identifying Camshaft Bolt Tighten Sequence (Rear)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Seat the camshaft by pushing it toward the rear of the cylinder head.
6. Zero the dial indicator against the end of the camshaft. Push the camshaft back and forth and read the end play. If the end play is beyond the service limit, replace the thrust cover 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: 0.20 mm (0.008 in.)

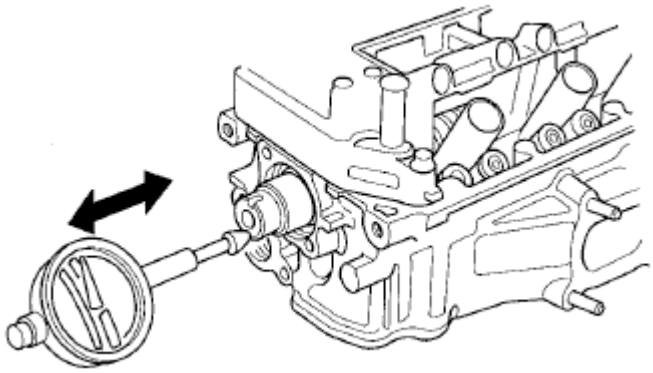

Fig. 115: Checking Camshaft End Play
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the camshaft thrust cover (A), then pull out the camshaft (B).

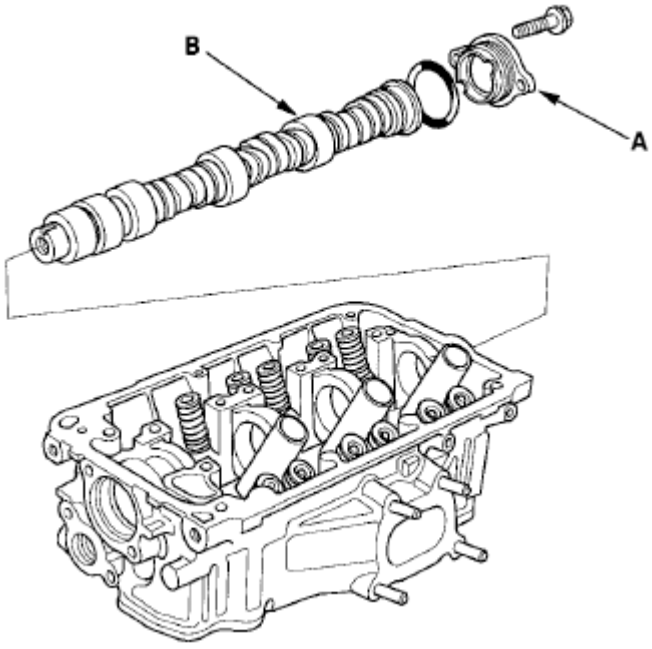

Fig. 116: Identifying Camshaft Thrust Cover & Camshaft

Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Wipe the camshaft clean, then inspect the lift ramps. Replace the camshaft if any lobes are pitted, scored, or excessively worn.
9. Measure the diameter of each camshaft journal.

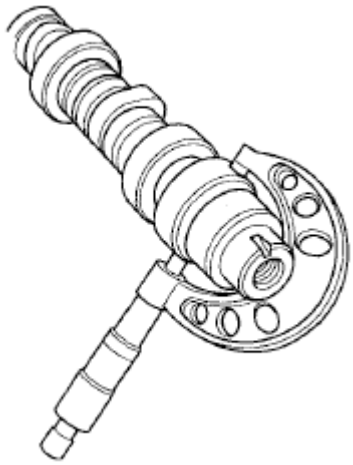

Fig. 117: Measuring Diameter Of Camshaft Journal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Zero the gauge to the journal diameter.

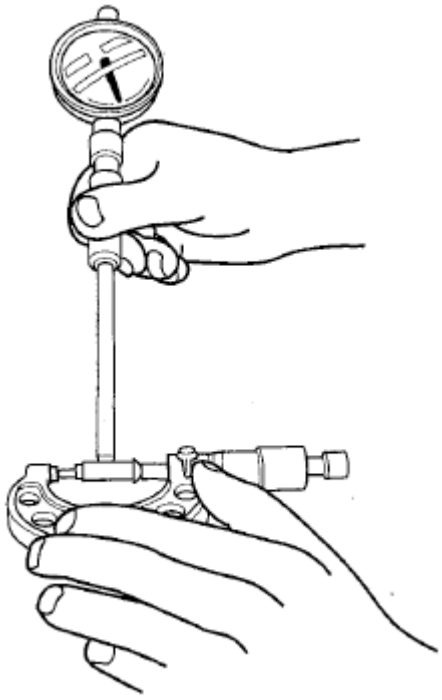

Fig. 118: Zeroing Gauge To Journal Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Clean the camshaft bearing surfaces in the cylinder head. Measure the inside diameter of each camshaft bearing surface, and check for an out-of-round condition.
    - If the camshaft-to-holder clearance is within limits, go to step 13.
    - 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 12.

    Camshaft-to-Holder Oil Clearance

    Standard (New): 0.050-0.089 mm (0.0020-0.0035 in.)

    Service Limit: 0.15 mm (0.006 in.)

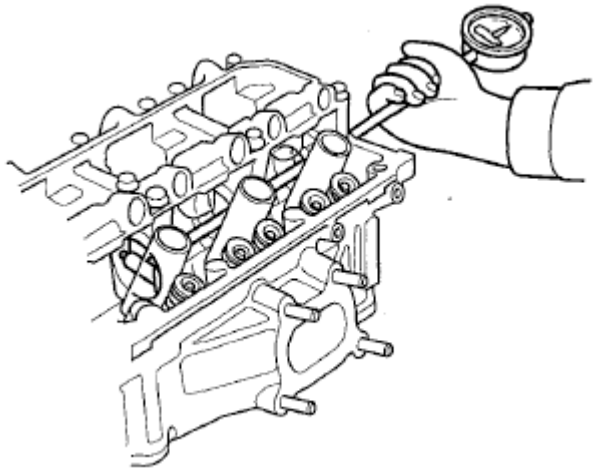

Fig. 119: Measuring Inside Diameter Of Camshaft Bearing Surface
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Check 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 oil clearance. If the oil clearance is still out of tolerance, replace the cylinder head.

    Camshaft Total Runout

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

    Service Limit: 0.04 mm (0.002 in.)

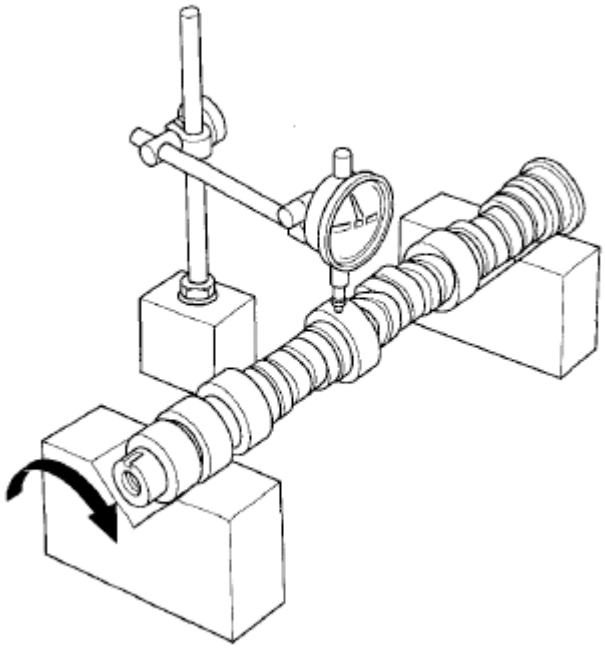

Fig. 120: Checking Total Runout With Camshaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Measure the cam lobe height.

Cam Lobe Height Standard (New):

CAM LOBE HEIGHT TABLE

-	INTAKE	EXHAUST
PRI	34.299 mm (1.3504 in.)	36.734 mm (1.4462 in.)
SEC	35.932 mm (1.4146 in.)	37.370 mm (1.4713 in.)

FRONT

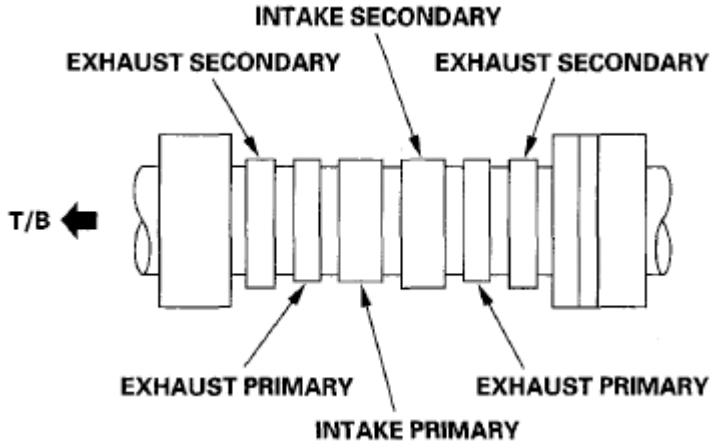

Fig. 121: Identifying Cam Lobe (Front)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

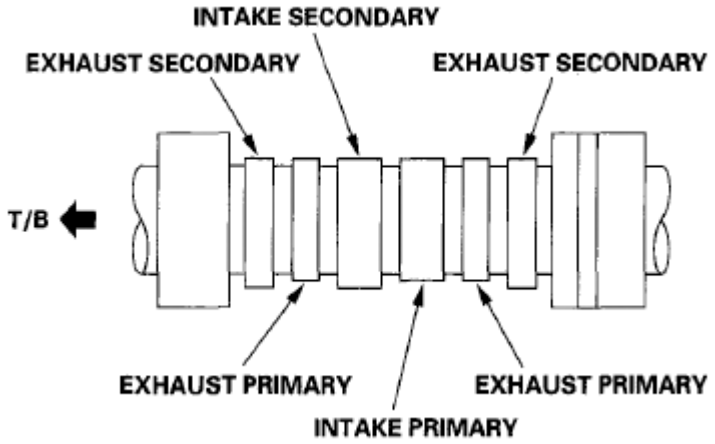

Fig. 122: Identifying Cam Lobe (Rear)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVE, SPRING, AND VALVE SEAL REMOVAL

SPECIAL TOOLS REQUIRED

Valve spring compressor attachment 07757-PJ1010A

Identify the valves and the 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 a plastic mallet (B), lightly tap the spring retainer to loosen the valve cotters.

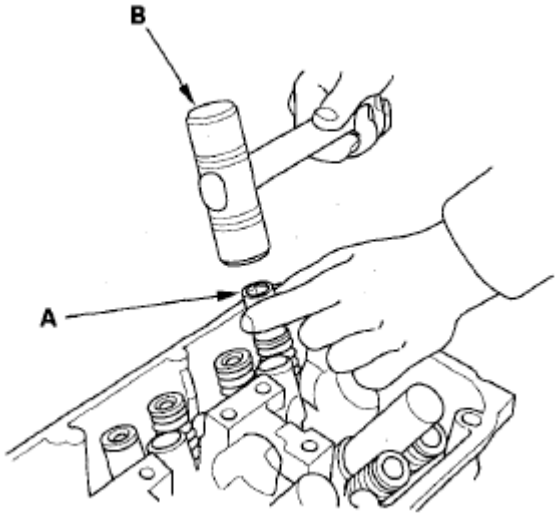

Fig. 123: Tapping Spring Retainer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

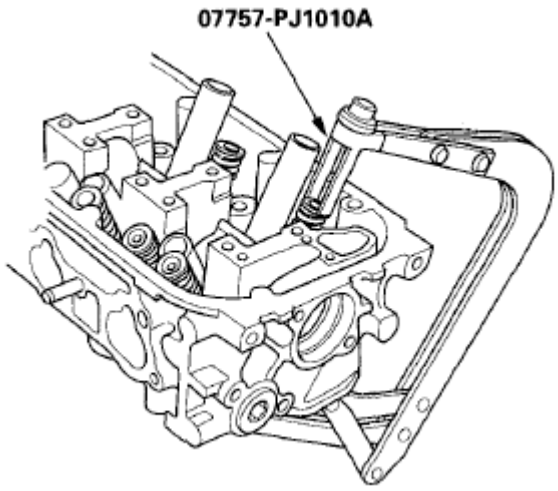

Fig. 124: Identifying Valve Spring Compressor & Attachment
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the valve spring compressor and the valve spring compressor attachment, then remove the spring retainer, the valve spring, and the valve.
5. Install the valve guide seal remover (A).

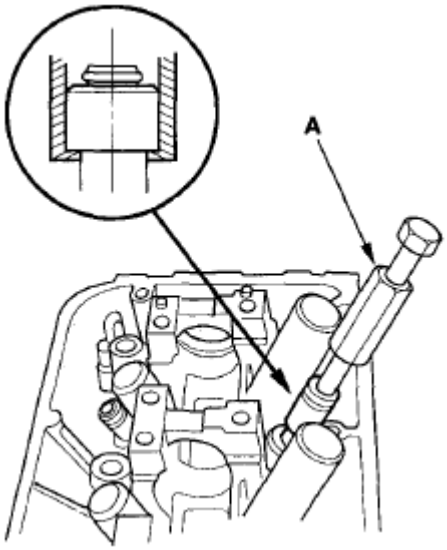

Fig. 125: Identifying Valve Guide Seal Remover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the valve seal.

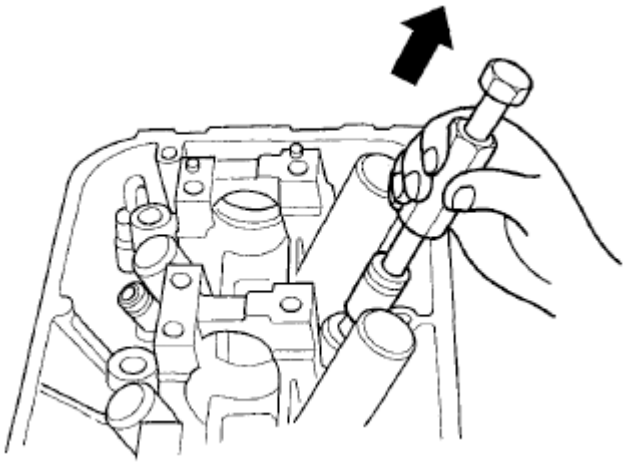

Fig. 126: Identifying Valve Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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): 35.90-36.01 mm (1.413-1.421 in.)

B Standard (New): 116.55-117.15 mm (4.589-4.612 in.)

C Standard (New): 5.485-5.495 mm (0.2159-0.2163 in.)

C Service Limit: 5.455 mm (0.2148 in.)

Exhaust Valve Dimensions

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

B Standard (New): 113.90-114.50 mm (4.484-4.508 in.)

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

C Service Limit: 5.420 mm (0.2134 in.)

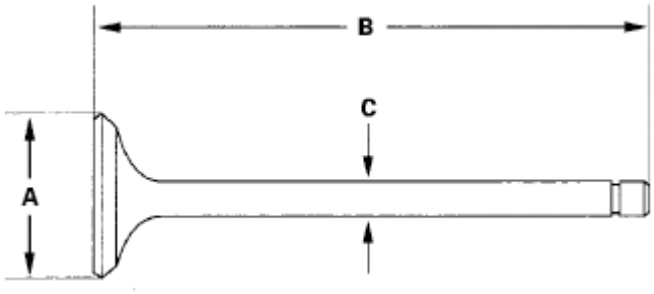

Fig. 127: Measuring Valve Dimension
Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVE STEM-TO-GUIDE CLEARANCE INSPECTION

1. Remove the valves (see **VALVE, SPRING, AND VALVE SEAL REMOVAL**).
2. 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 a ball gauge. Take the measurements in three places along the valve stem and three places inside the valve guide. The difference between the largest guide measurement and the smallest stem measurement should not exceed the service limit.

Intake Valve Stem-to-Guide Clearance

Standard (New): 0.020-0.045 mm (0.0008-0.0018 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.)

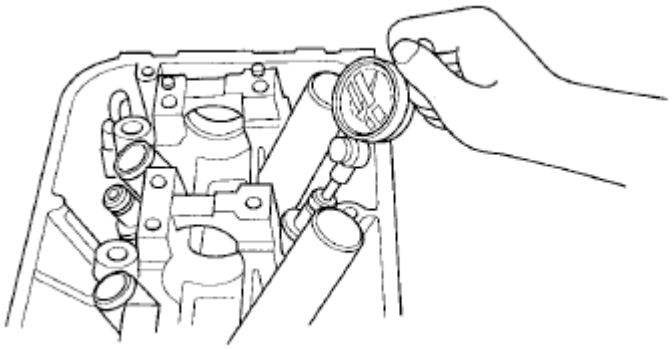

Fig. 128: Inspecting Valve Stem-To-Guide Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVE GUIDE REPLACEMENT

SPECIAL TOOLS REQUIRED

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

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

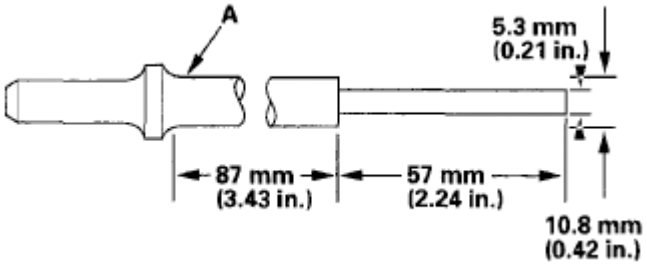

Fig. 129: Identifying Valve Guide Dimension
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Select the proper replacement guides, and chill them in the freezer section of a refrigerator for at least 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.

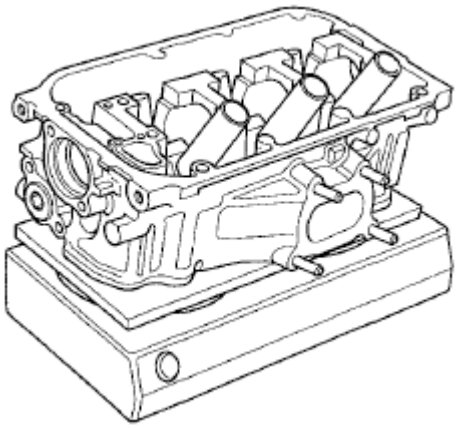

Fig. 130: Heating Cylinder Head Using Hot Plate Or Oven
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

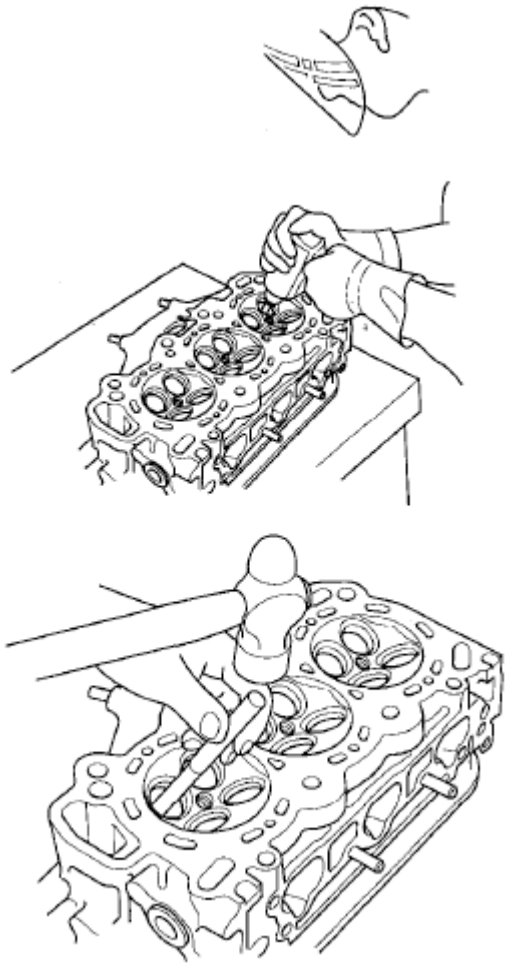

Fig. 131: Identifying Valve Guide
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. If a valve guide still 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. Remove 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 to the specified installed height (A) of the guide (B). If you have all 12 guides to do, you may have to reheat the head.

Valve Guide Installed Height

Intake: 21.20-22.20 mm (0.835-0.874 in.)

Exhaust: 20.60-21.60 mm (0.811 -0.850 in.)

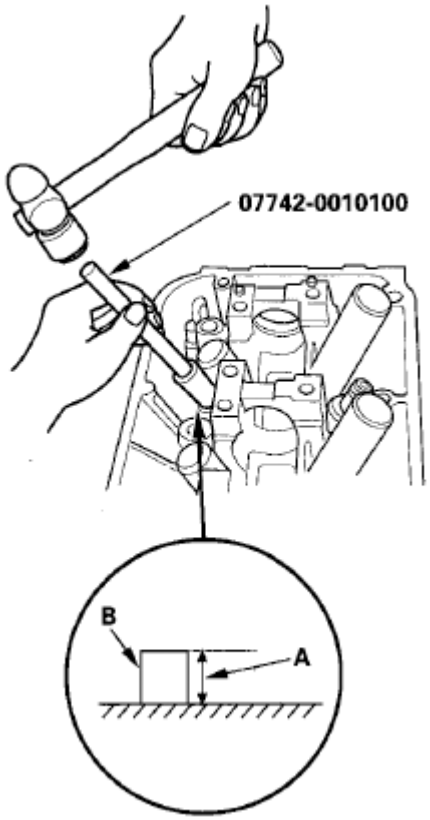

Fig. 132: Installing Guide From Camshaft Side
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

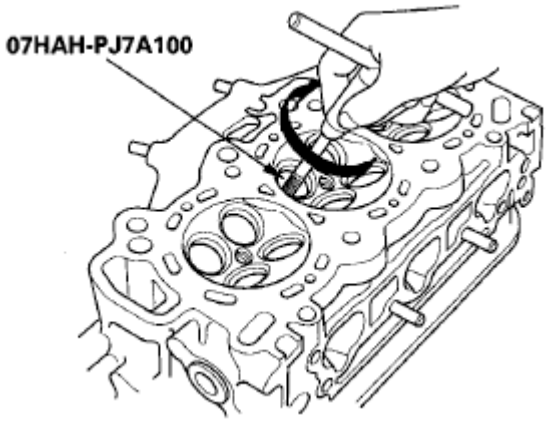

Fig. 133: Rotating Reamer Clockwise
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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 clearance 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.

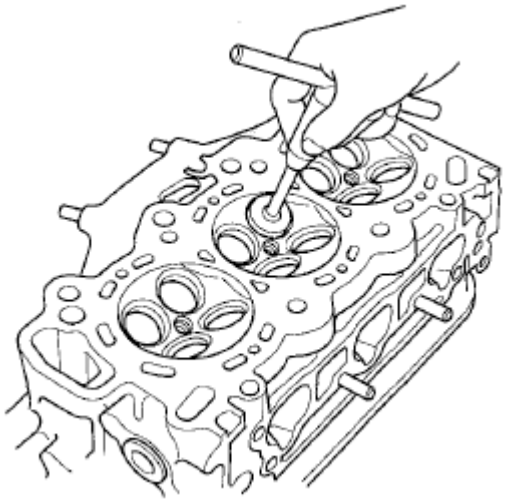

Fig. 134: Inspecting Valve Stem-To-Guide Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Carefully cut a 45° seat, removing only enough material to ensure a smooth and concentric seat.
4. Bevel the upper edge of the seat with the 30° cutter and the lower edge of the seat with the 67.5° cutter (intake seat) or the 60° cutter (exhaust seat). Check the width of the seat and adjust accordingly.

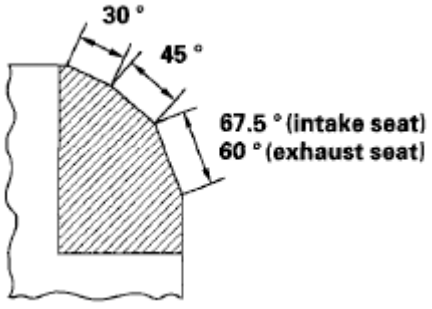

Fig. 135: Checking Width Of Seat
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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 it 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.

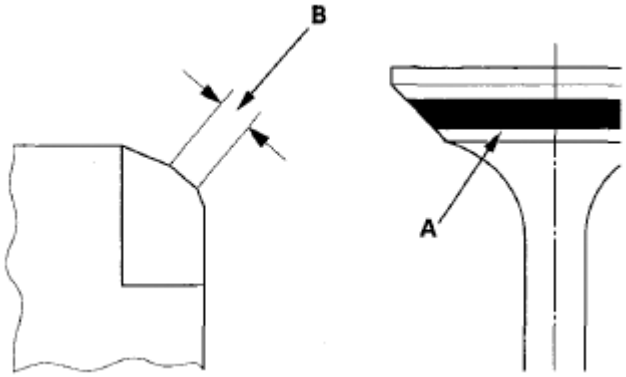

Fig. 136: Identifying Valve Seat Width
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. The actual valve seating surface (B), as shown by the blue compound, should be centered on the seat.
   - If it is too high (closer to the valve stem), you must make a second cut with the 67.5° cutter (intake seat) or the 60° cutter (exhaust seat) to move it down, then one more cut with the 45° cutter to restore seat width.
   - If it is too low (closer to the valve edge), you must make a second cut with the 30° cutter to move it up, then one more cut with the 45° cutter to restore seat width.

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

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

Intake Valve Stem Installed Height

Standard (New): 46.75-47.55 mm (1.841-1.872 in.)

Service Limit: 47.80 mm (1.882 in.)

Exhaust Valve Stem Installed Height

Standard (New): 46.68-47.48 mm (1.838-1.869 in.)

Service Limit: 47.73 mm (1.879 in.)

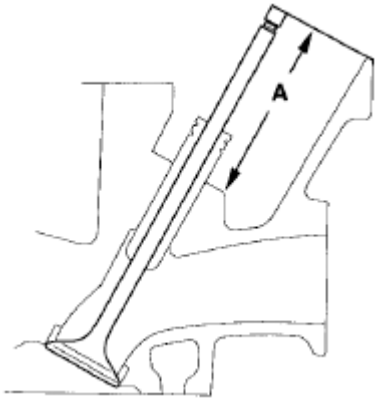

Fig. 137: Identifying Valve Stem Height
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

VALVE, SPRING, AND VALVE SEAL INSTALLATION

SPECIAL TOOLS REQUIRED

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

1. Coat the valve stems with new engine oil. Install the valves in the valve guides.
2. Check that the valves move up and down smoothly.
3. Install the spring seats on the cylinder head.
4. Install the new valve seals (A) using the 5.5 mm side of the stem seal driver (B).

NOTE: Exhaust valve seals (C) have a black spring (D) and intake valve seals (E) have a white or silver spring (F). They are not interchangeable.

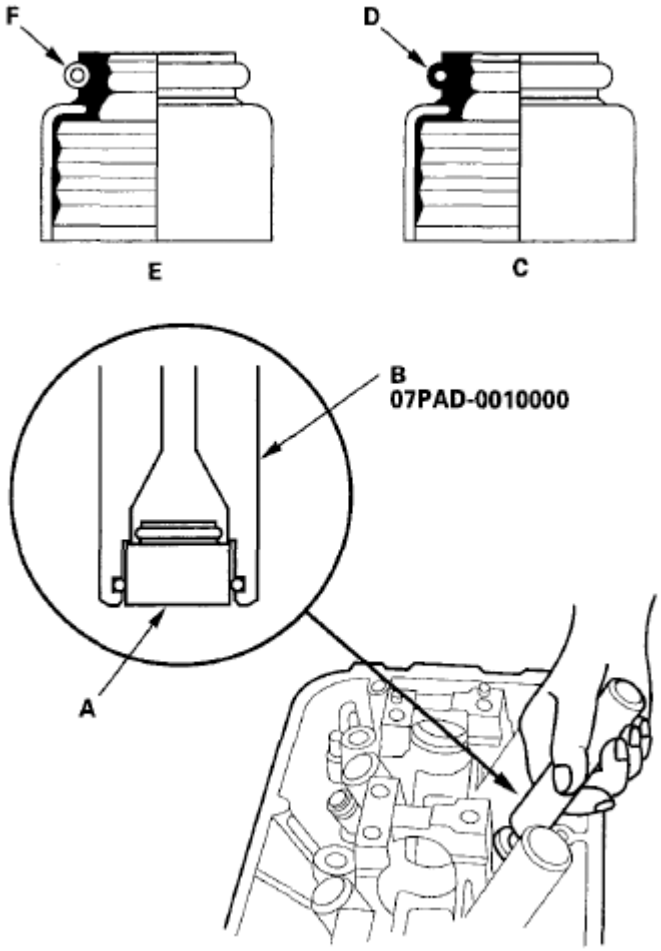

Fig. 138: Identifying Valve Seals & Stem Seal Driver
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

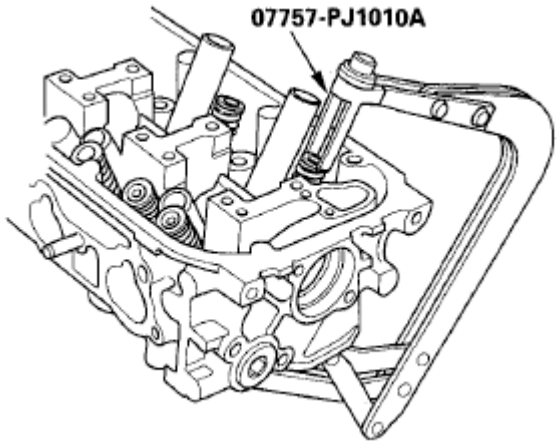

Fig. 139: Identifying Valve Spring Compressor & Attachment
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Fig. 140: Tapping Valve Stem
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CAMSHAFT, ROCKER ARM ASSEMBLY, CAMSHAFT SEAL AND PULLEY INSTALLATION

FRONT

1. Loosen the valve adjusting screws.
2. Apply a light coat of new engine oil around the camshaft oil seal.
3. Gently tap the new camshaft oil seal (A) into the cylinder head.

1. Tap the camshaft oil seal in squarely.
2. Install the oil seal about 0.5-1.5 mm (0.02-0.06 in.) below the surface of the cylinder head.

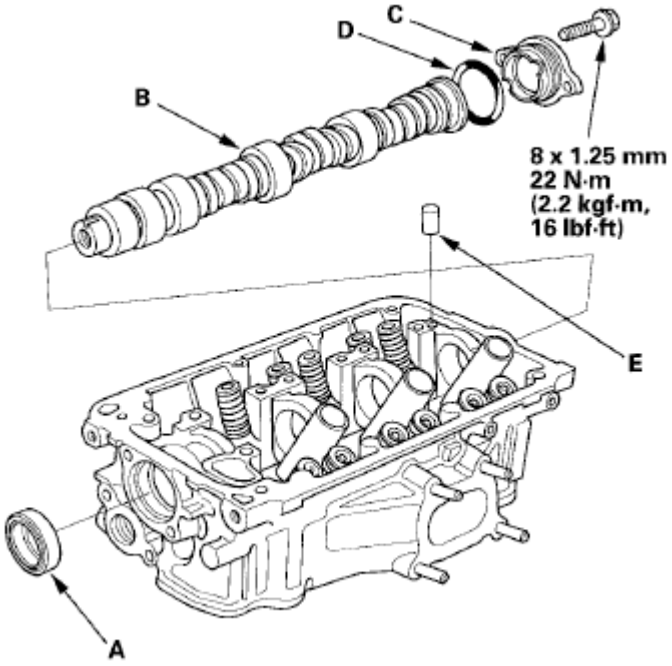

Fig. 141: Identifying Oil Seal & Cylinder Head With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Insert the camshaft (B) into the cylinder head, then install the camshaft thrust cover (C). Always use a new O-ring (D). Apply new engine oil to the camshaft journals and lobes.
5. Check that the oil seal lips are not distorted.
6. Install the solid dowel pin (E).
7. If the rocker arm assembly is disassembled, reassemble the rocker arm assembly (see **ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY**).
8. Remove all of the old liquid gasket from the rocker shaft holder and the cylinder head.
9. Apply liquid gasket (P/N 08717-0004,08718-0001, 08718-0003, or 08718-0009) to the rocker shaft holder mating surface of the cylinder head. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

- **Apply liquid gasket about 2.5 mm (0.098 in.) diameter bead along the broken line (A).**
- **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 the new liquid gasket.**

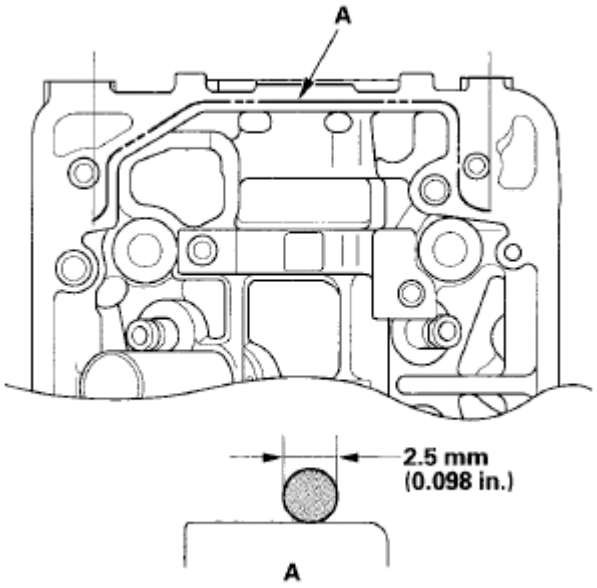

Fig. 142: Applying Liquid Gasket Area Of Broken Line
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Set the rocker arm assembly in place, and loosely install the bolts. Make sure that the rocker arms are properly positioned on the valve stems.

NOTE:

- **Wait at least 30 minutes before filling the engine with oil.**
- **Do not run the engine for at least 3 hours after installing the rocker arm assembly.**

11. Tighten each bolt two turns at a time in the sequence shown to ensure that the rockers do not bind on the valves.

Specified Torque

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

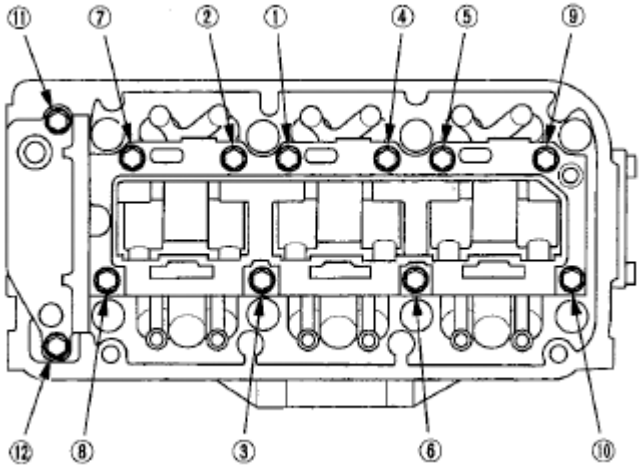

Fig. 143: Identifying Rocker Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Install the injector base (A). Always use a new gasket (B).

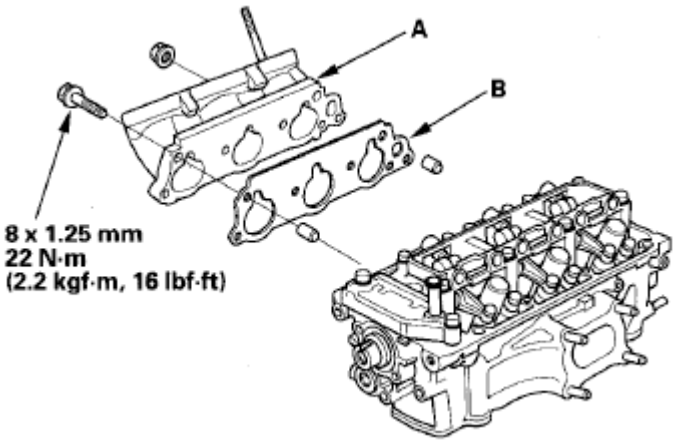

Fig. 144: Identifying Injector Base With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Apply new engine oil to the threads of the camshaft pulley mounting bolt (A). Install the back cover (B), then install the camshaft pulley (C).

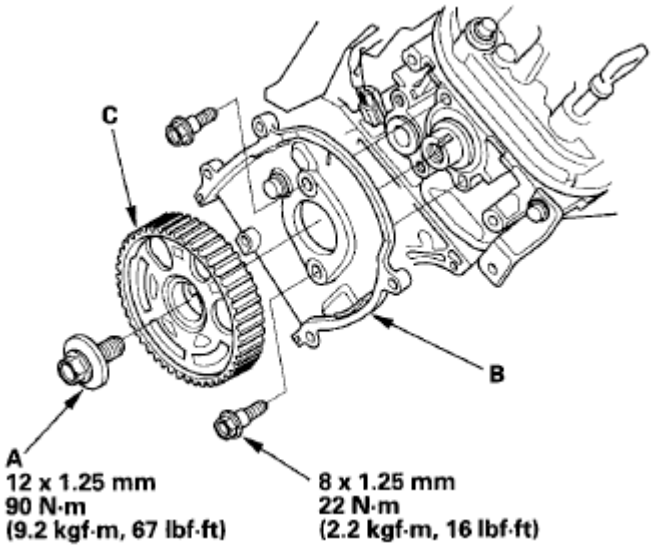

Fig. 145: Identifying Camshaft Pulley Mounting Bolt & Back Cover With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Set the camshaft pulleys to top dead center (TDC) before bolting them onto the engine block (see step 6 in **CYLINDER HEAD INSTALLATION**).

REAR

1. Loosen the valve adjusting screws.
2. Apply a light coat of new engine oil around the camshaft oil seal.
3. Gently tap the new camshaft oil seal (A) into the cylinder head.
    1. Tap the camshaft oil seal in squarely.
    2. Install the oil seal about 0.5-1.5 mm (0.02-0.06 in.) below the surface of the cylinder head.

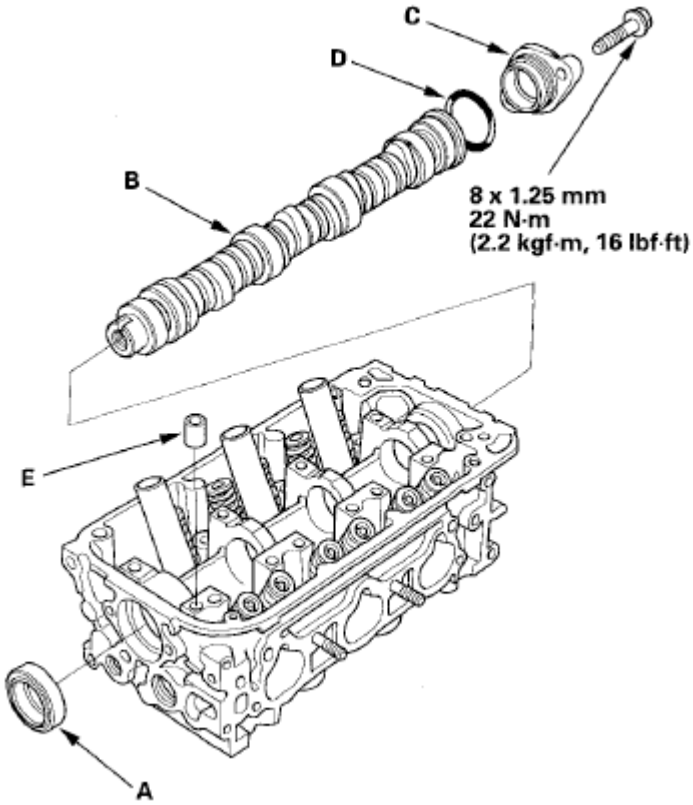

Fig. 146: Identifying Oil Seal & Cylinder Head With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Insert the camshaft (B) into the cylinder head, then install the camshaft thrust cover (C). Always use a new O-ring (D). Apply new engine oil to the camshaft journals and lobes.
5. Check that the oil seal lips are not distorted.
6. Install the hollow dowel pin (E).
7. If the rocker arm assembly is disassembled, reassemble the rocker arm assembly (see **REAR**).
8. Remove all of the old liquid gasket from the rocker shaft holder and the cylinder head.
9. Apply liquid gasket (P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009) to the rocker shaft holder mating surface of the cylinder head. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

- **Apply liquid gasket about 2.5 mm (0.098 in.) diameter bead along the broken line (A).**
- **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.**

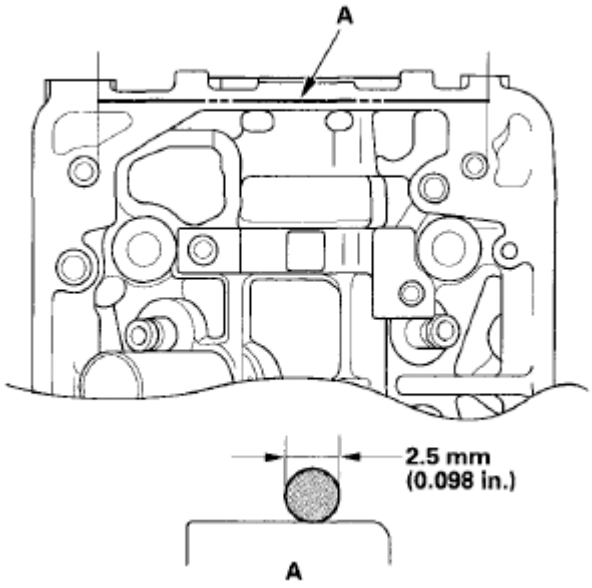

Fig. 147: Applying Liquid Gasket Area Of Broken Line
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Set the rocker arm assembly in place, and loosely install the bolts. Make sure that the rocker arms are properly positioned on the valve stems.

NOTE:

- **Wait at least 30 minutes before filling the engine with oil.**
- **Do not run the engine for at least 3 hours after installing the rocker arm assembly.**

11. Tighten each bolt two turns at a time in the sequence shown below to ensure that the rockers do not bind on the valves.

Specified Torque

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

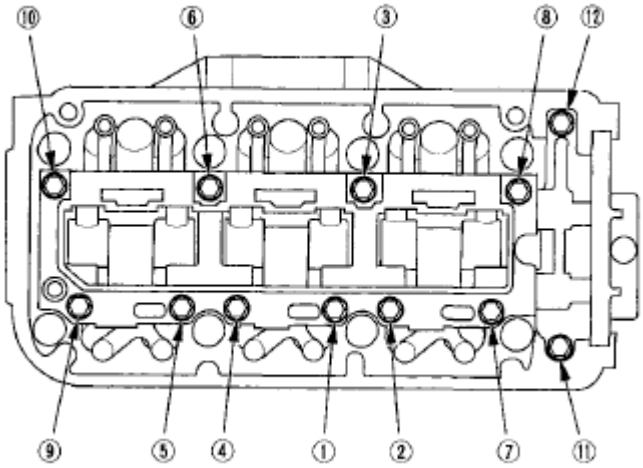

Fig. 148: Identifying Camshaft Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Install the injector base (A). Always use a new gasket (B).

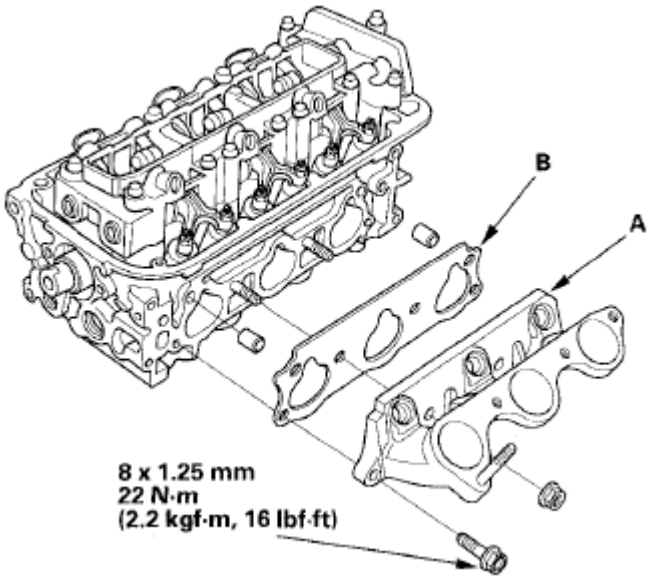

Fig. 149: Identifying Injector Base & Gasket With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Apply new engine oil to the threads of the camshaft pulley mounting bolt (A). Install the back cover (B), then install the camshaft pulley (C).

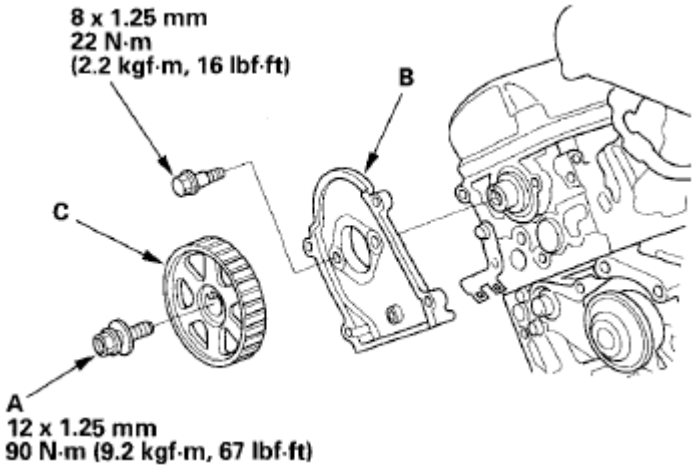

Fig. 150: Identifying Camshaft Pulley Mounting Bolt & Back Cover With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Set the camshaft pulleys to TDC before bolting them onto the engine block (see step 6 **CYLINDER HEAD INSTALLATION**).

CYLINDER HEAD INSTALLATION

1. Clean the cylinder head and the engine block surface.
2. Clean and install the oil control orifices (A) with new O-rings (B).

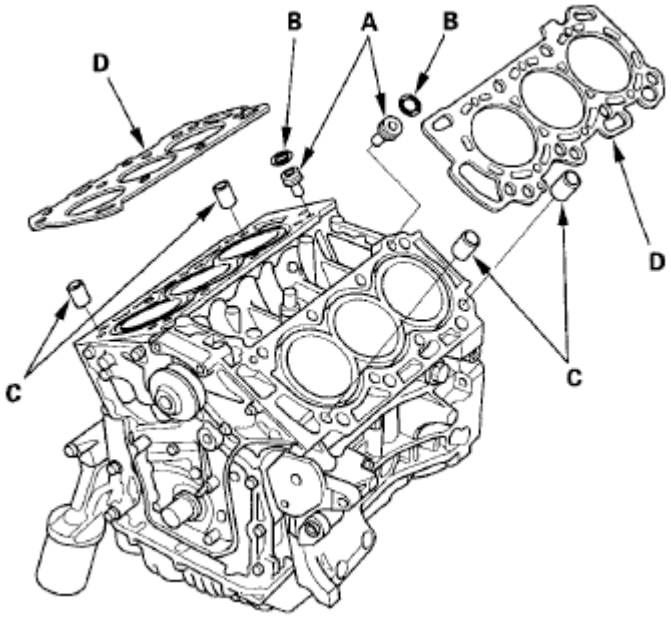

Fig. 151: Identifying Oil Control Orifices & O-Rings
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the dowel pins (C) and the new cylinder head gaskets (D).

4. Clean the timing belt pulleys, the timing belt guide plate, and the upper and lower covers.
5. Set the timing belt drive pulley to top dead center (TDC) by aligning the TDC mark (A) on the tooth of the timing belt drive pulley with the pointer (B) on the oil pump.

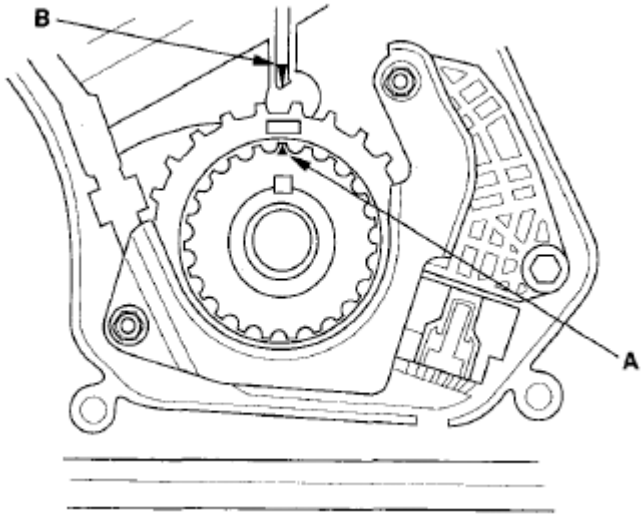

Fig. 152: Identifying Timing Belt Drive Pulley To Top Dead Center (TDC)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Set the camshaft pulleys to TDC by aligning the TDC marks (A) on the camshaft pulleys with the pointers (B) on the back covers.

FRONT

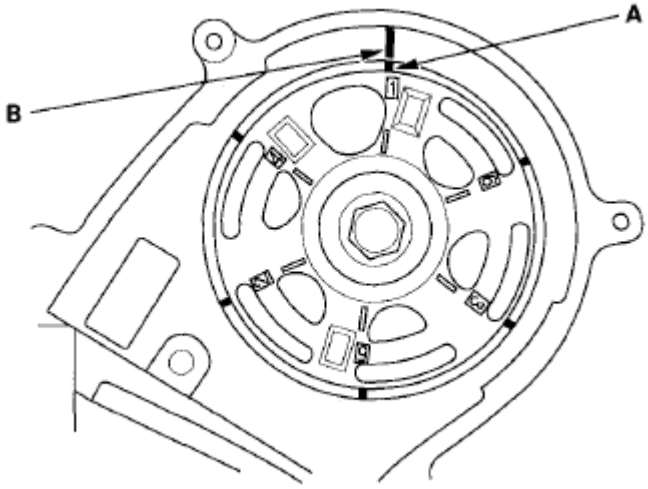

Fig. 153: Aligning TDC Marks On Camshaft Pulleys (FRONT)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

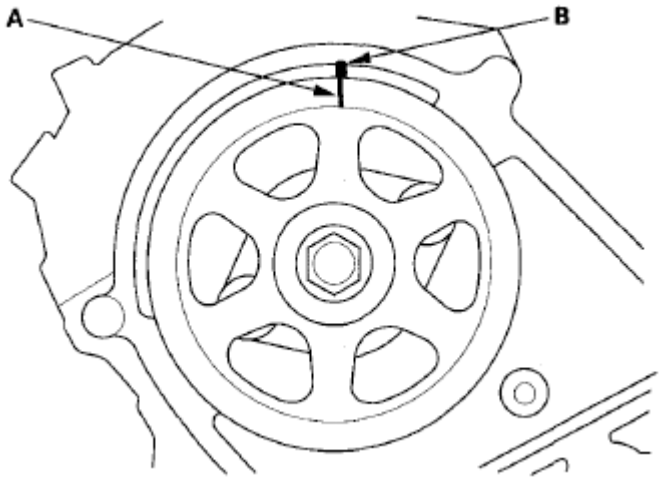

Fig. 154: Aligning TDC Marks On Camshaft Pulleys (REAR)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Install the cylinder heads on the engine block.
8. Measure the diameter of each cylinder head bolt at point A and point B.

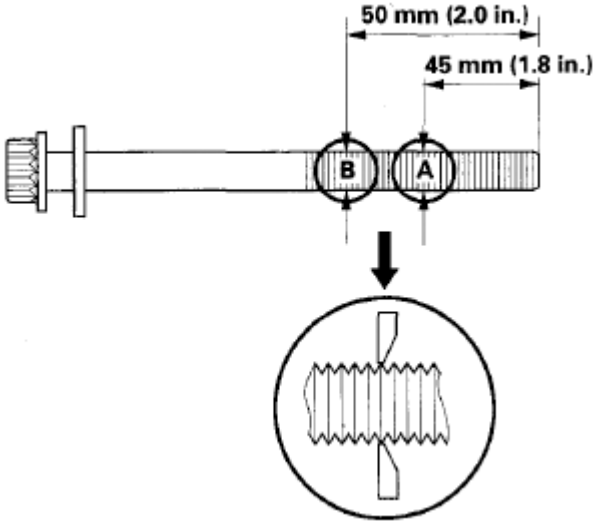

Fig. 155: Measuring Diameter Of Cylinder Head Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. If either diameter is less than 10.6 mm (0.42 in.), replace the cylinder head bolt.
10. Apply new engine oil to the threads and under the bolt heads of all cylinder head bolts.
11. Tighten the cylinder head bolts in sequence to 29 N.m (3.0 kgf.m, 22 lbf.ft) using a beam-type torque wrench. When using a preset-type torque wrench, be sure to torque slowly and do not overtighten. If a bolt makes any noise while you are torquing it, loosen the bolt and retighten it from the first step.

FRONT

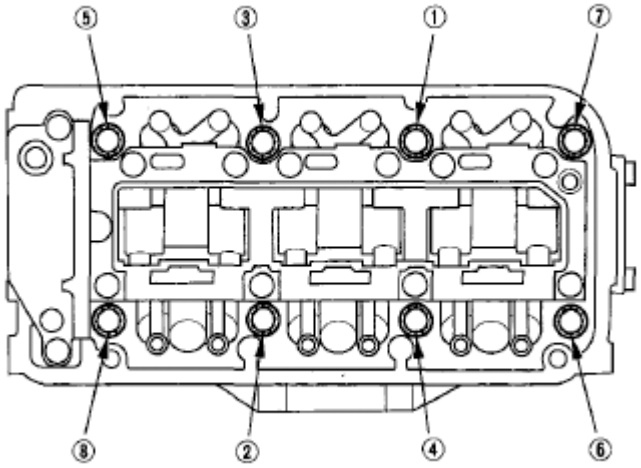

Fig. 156: Identifying Cylinder Head Bolt Tightening Sequence (Front)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

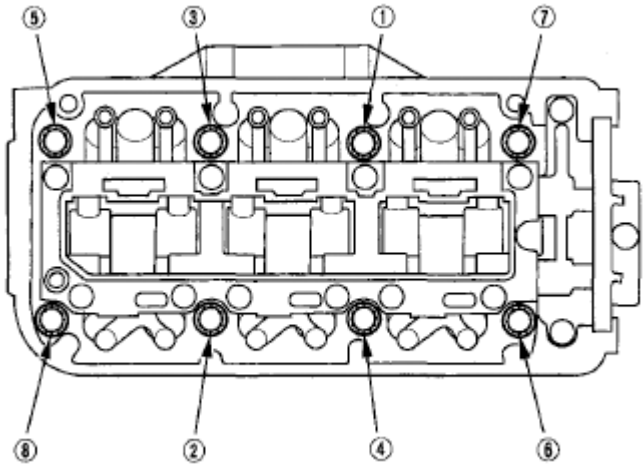

Fig. 157: Identifying Cylinder Head Bolt Tightening Sequence (Rear)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

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

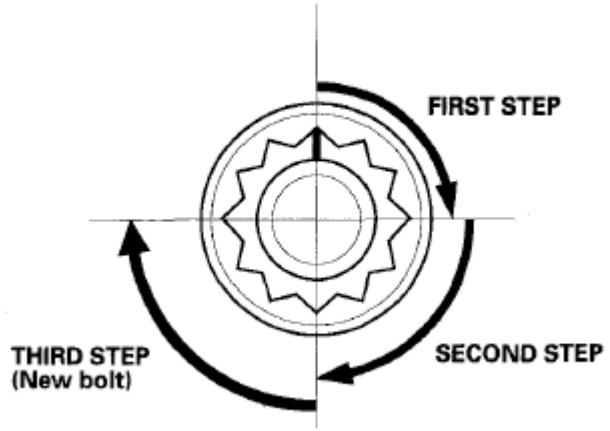

Fig. 158: Tightening Cylinder Head Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Install the timing belt (see **TIMING BELT INSTALLATION**).
14. Adjust the valve clearance (see **VALVE CLEARANCE ADJUSTMENT**).
15. Install the water passage (see **WATER PASSAGE REPLACEMENT**).
16. Install the fuel rails (see **INJECTOR REPLACEMENT**).
17. Install the connector bracket to the front cylinder head.

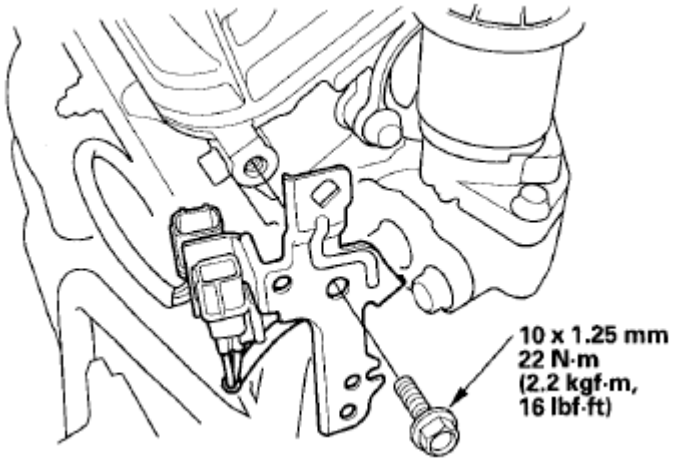

Fig. 159: Identifying Connector Bracket To Front Cylinder Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Install the engine mount control solenoid valve bracket and the harness clamp bracket from the rear cylinder head.

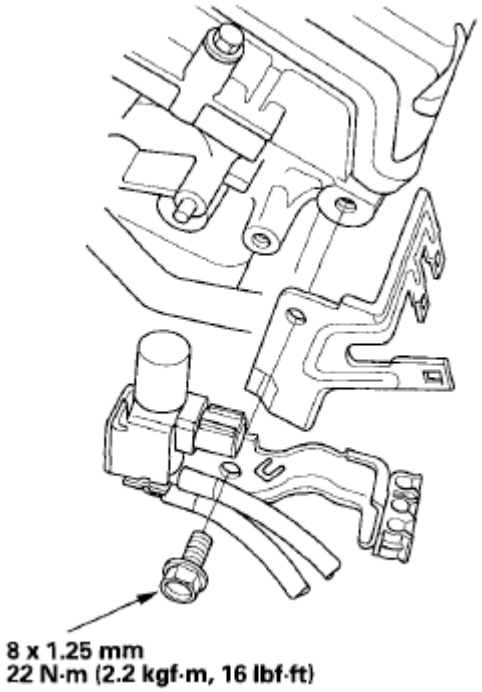

Fig. 160: Identifying Engine Mount Control Solenoid Valve Bracket & Harness Clamp Bracket With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

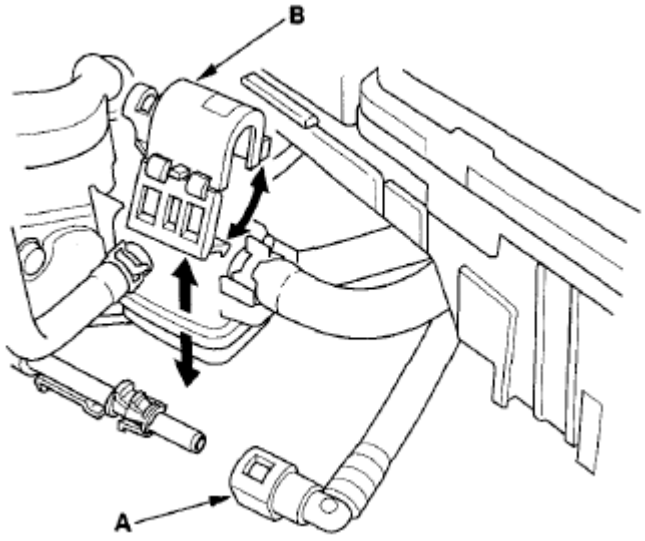

Fig. 161: Identifying Fuel Feed Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

20. Install the front warm up three way catalytic converter (front WU-TWC) (see **FRONT**) and the rear

warm up three way catalytic converter (rear WU-TWC) (see **REAR**).

21. Connect the following engine wire harness connectors, and install the wire harness clamps to the cylinder head:
    - Six injector connectors
    - Engine coolant temperature (ECT) sensor 1 connector
    - Oil pressure switch connector
    - Camshaft position (CMP) sensor connector
    - Front and rear air fuel ratio (A/F) sensor connectors
    - Front and rear secondary heated oxygen sensor (secondary HO2S) connectors
22. Install the cylinder head covers (see **CYLINDER HEAD COVER INSTALLATION**).
23. Install the six ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION**).
24. Install the intake manifold (see **INSTALLATION**).
25. Install the alternator (see **INSTALLATION**).
26. Install the power steering (P/S) pump (A) and tighten the bolt (B) securing the P/S hose bracket.

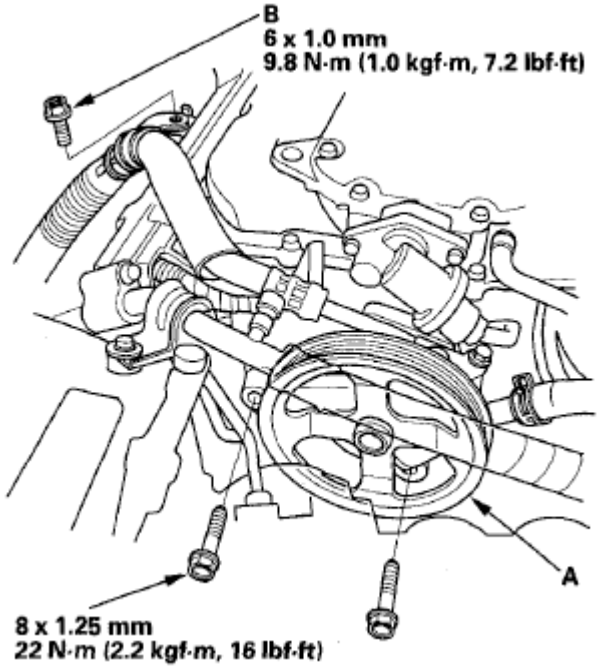

Fig. 162: Identifying Power Steering (P/S) Pump & Bolt With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

27. Install the drive belt (see **DRIVE BELT REPLACEMENT**).
28. Do the battery terminal reconnection procedure (see **RECONNECTION**).
29. After installation, check that all tubes, hoses, and connectors are installed correctly.
30. 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.

31. Refill the radiator with engine coolant, and bleed the air from the cooling system with the heater valve open (see step 8 in **COOLANT REPLACEMENT**).
32. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **CRANK (CKP) PATTERN CLEAR/CRANK (CKP) PATTERN LEARN**).
33. Inspect the idle speed (see **IDLE SPEED INSPECTION**).
34. Inspect the ignition timing (see **IGNITION TIMING INSPECTION**).
35. Check for fluid leaks.

CAMSHAFT OIL SEAL INSTALLATION - IN CAR

SPECIAL TOOLS REQUIRED

Ball joint remover/installer 07GAF-SD40330

1. Dry the camshaft oil seal housing.
2. Apply a light coat of multipurpose grease to the lip of the camshaft oil seal.
3. Using the ball joint remover/installer (A), a washer (B), and a 12 x 75 x 1.25 mm bolt (C), press in the camshaft oil seal (D) about 0.5-1.5 mm (0.02-0.06 in.) below the surface of the cylinder head.

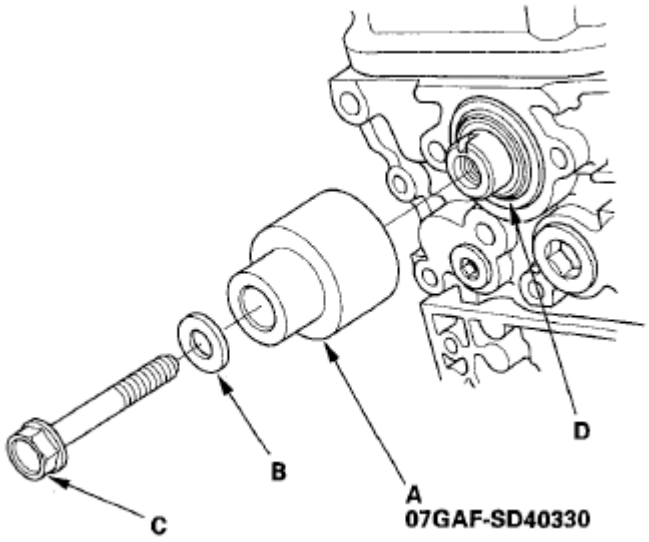

Fig. 163: Identifying Ball Joint Remover/Installer With Washer & Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

SEALING BOLT INSTALLATION

NOTE: When installing the sealing bolts (A), always use a new washer (B).

FRONT

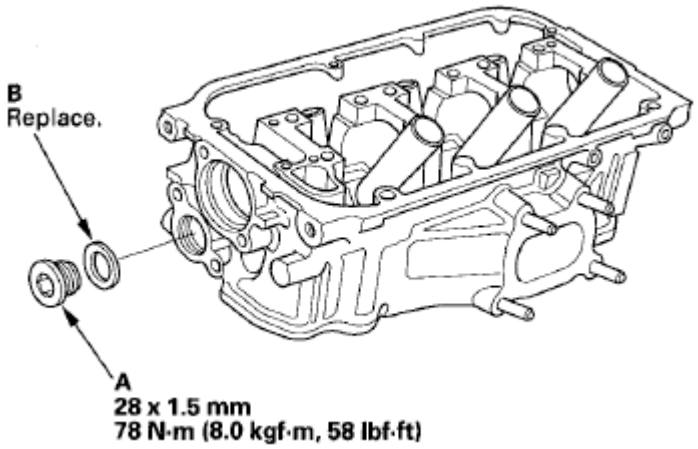

Fig. 164: Identifying Cylinder Head Bolt (Front) With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

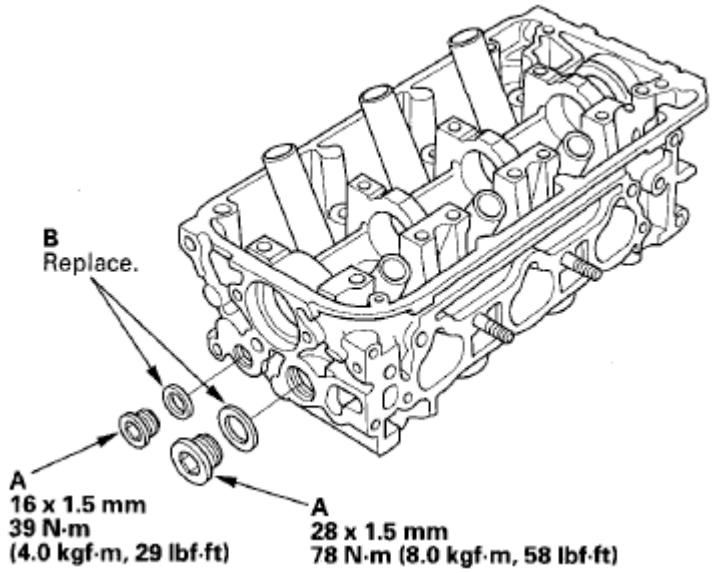

Fig. 165: Identifying Cylinder Head Bolt (Rear) With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2009-10 ENGINE

Engine Block - RL

ENGINE BLOCK

SPECIAL TOOLS

Ref. No.	Tool Number	Description	Qty
①	070AD-RCAA100	Oil Seal Driver, 64 mm	1
②	070AD-RCAA200	Driver Attachment, 106 mm	1
③	07749-0010000	Driver Handle, 15 x 135L	1

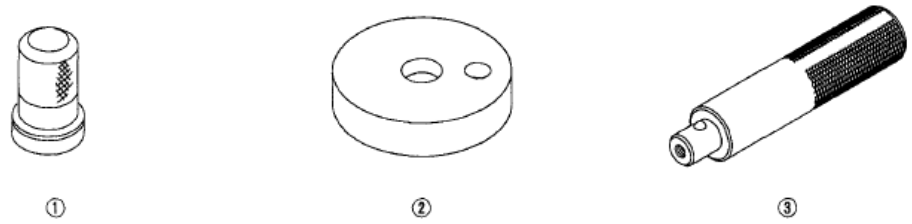

Fig. 1: Identifying Special Tools
Courtesy of AMERICAN HONDA MOTOR CO., INC.

COMPONENT LOCATION INDEX

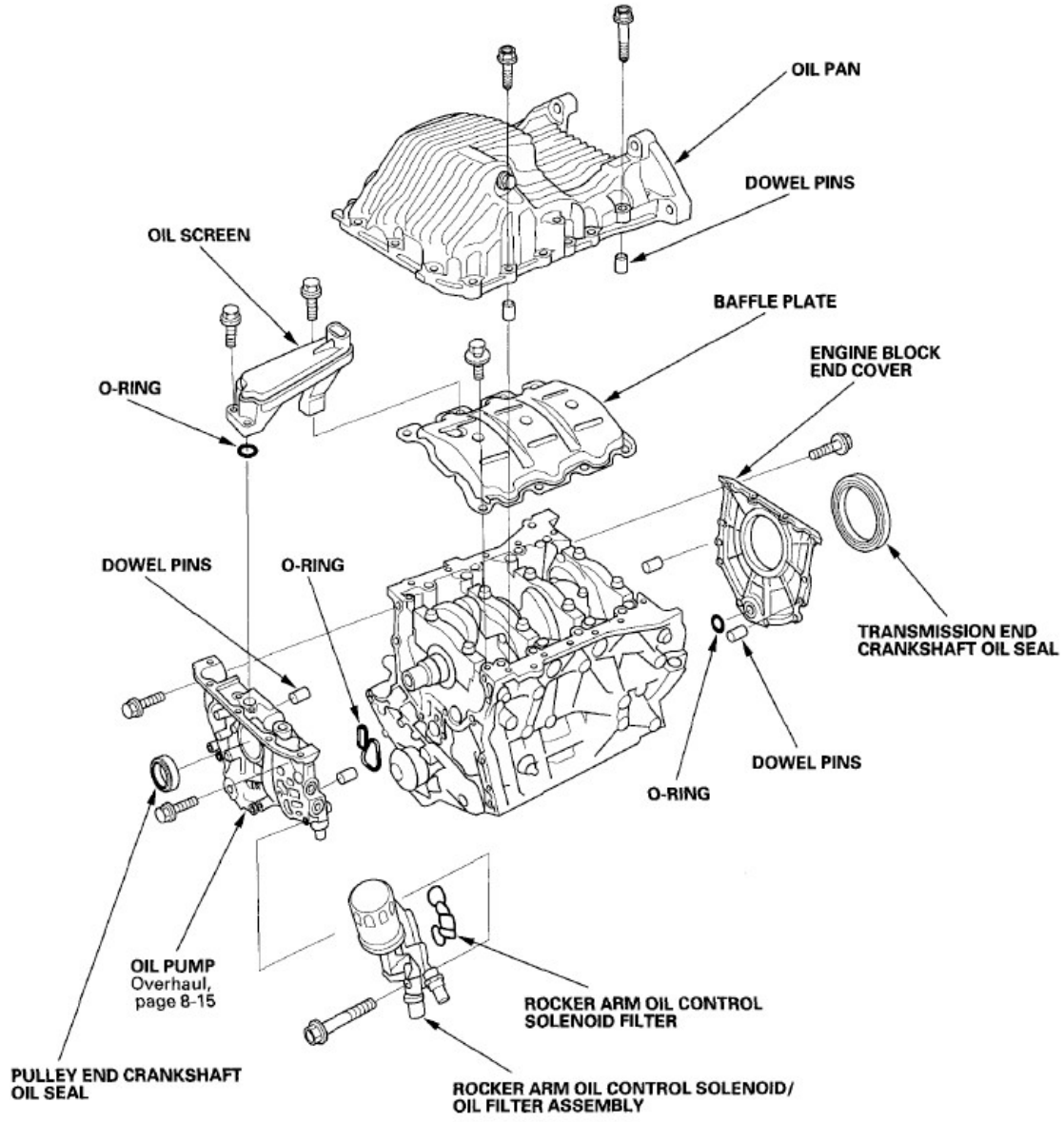

Fig. 2: Identifying Engine Block Component Location (1 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

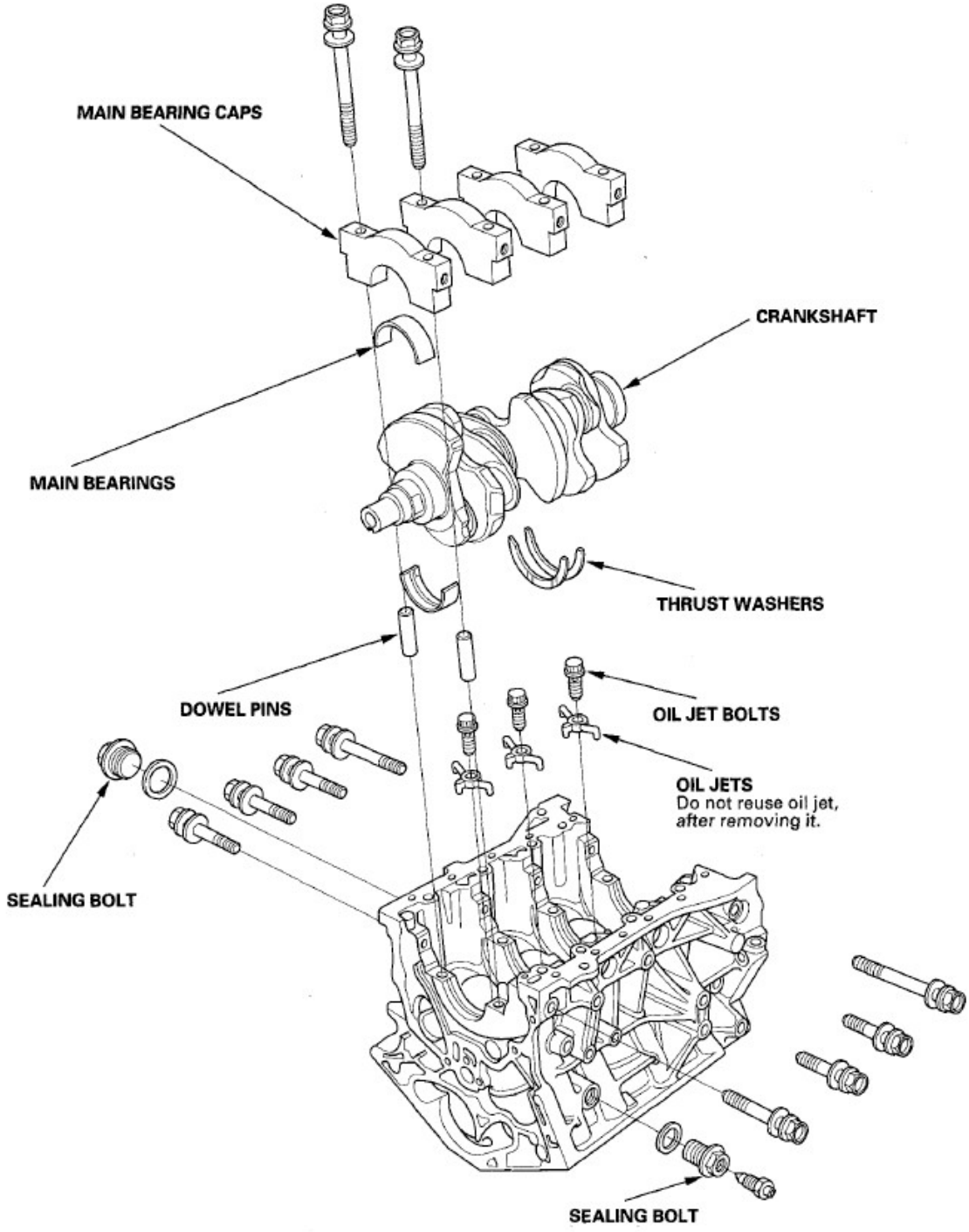

Fig. 3: Identifying Engine Block Component Location (2 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

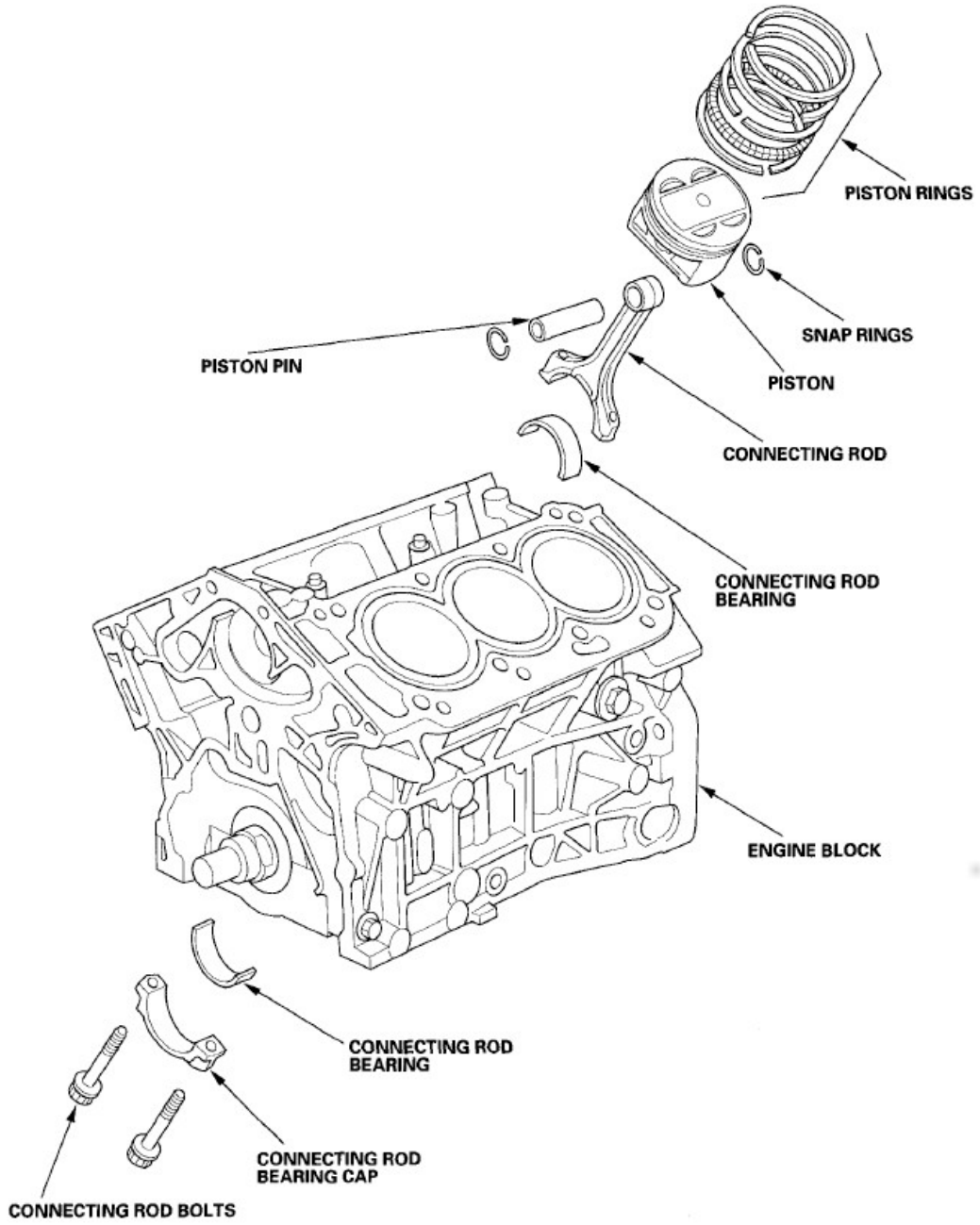

Fig. 4: Identifying Engine Block Component Location (3 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CONNECTING ROD AND CRANKSHAFT END PLAY INSPECTION

1. Remove the oil pump (see **REMOVAL**).
2. Remove the baffle plate (see step 10).
3. Measure the connecting rod end play with a feeler gauge (A) between the connecting rod (B) and crankshaft (C).

Connecting Rod End Play

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

Service Limit: 0.45 mm (0.018 in.)

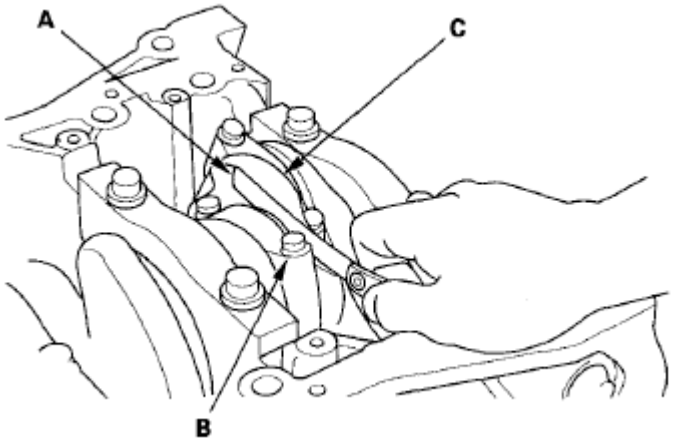

Fig. 5: Measuring Connecting Rod End Play Between Connecting Rod And Crankshaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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.)

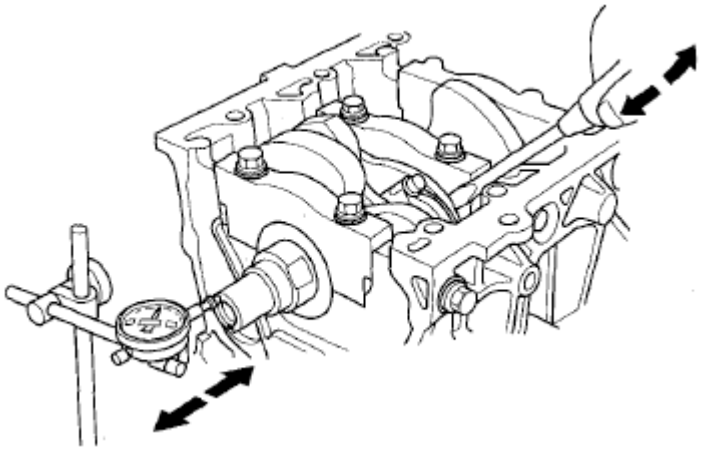

Fig. 6: Pushing Crankshaft Firmly Of Dial Indicator
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

CRANKSHAFT MAIN BEARING REPLACEMENT

Main Bearing Clearance Inspection

1. Remove the main bearing caps 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.

NOTE: If the engine is still in the vehicle when you bolt the main cap down to check the clearance, the weight of the crankshaft and drive plate will flatten the plastigage further than just the torque on the cap bolt and give you an incorrect reading. For an accurate reading, support the crank with a jack under the counterweights, and check only one bearing at a time.

4. Reinstall the bearings and the caps, then torque the bearing cap bolts to 74 N.m (7.5 kgf.m, 54 lbf.ft), and the bearing cap side bolts to 49 N.m (5.0 kgf.m, 36 lbf.ft) in the proper sequence (see step 22).

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

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

Main Bearing-to-Journal Oil Clearance

Standard (New): 0.019-0.045 mm (0.0007-0.0018 in.)

Service Limit: 0.050 mm (0.0020 in.)

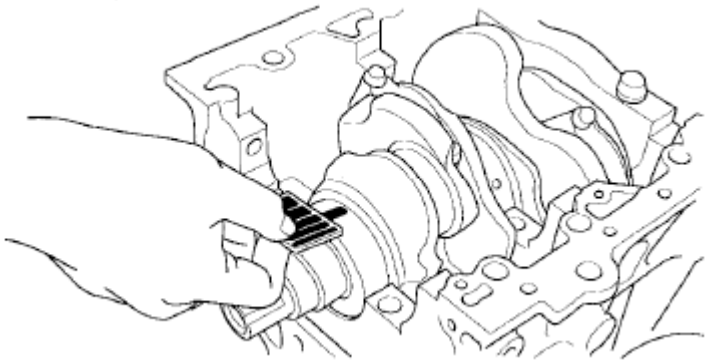

Fig. 7: Measuring Widest Part Of Plastigage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. If the plastigage measures too wide or too narrow, remove the crankshaft, and remove the upper half of the bearing. Install a new, complete bearing with the same color code, and recheck the clearance. Do not file, shim, or scrape the bearings or the caps to adjust clearance.
7. If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below 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 (see **CRANKSHAFT AND PISTON REMOVAL**).

Main Bearing Selection

Crankshaft Bore Code Location

Letters or bars have been stamped on the end of the engine block as a code for the size of each of the four main journal bores.

Use them, and the numbers stamped on the crankshaft (codes for main journal size), to choose the correct bearings. If the codes are indecipherable because of an accumulation of dirt and dust, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.

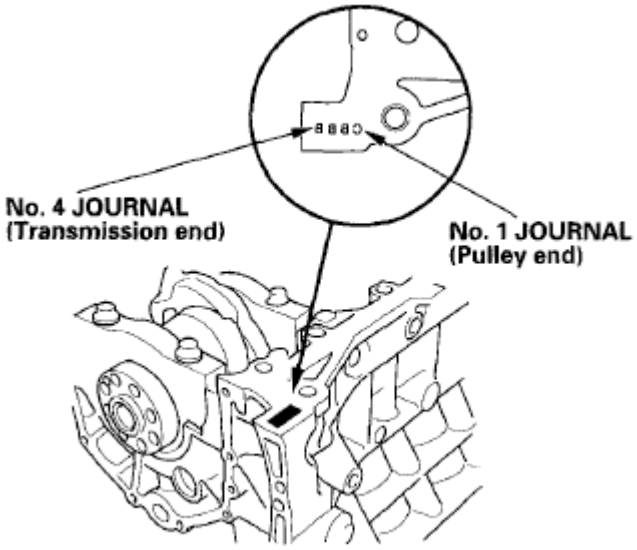

Fig. 8: Identifying Main Bearing Selection
Courtesy of AMERICAN HONDA MOTOR CO., INC.

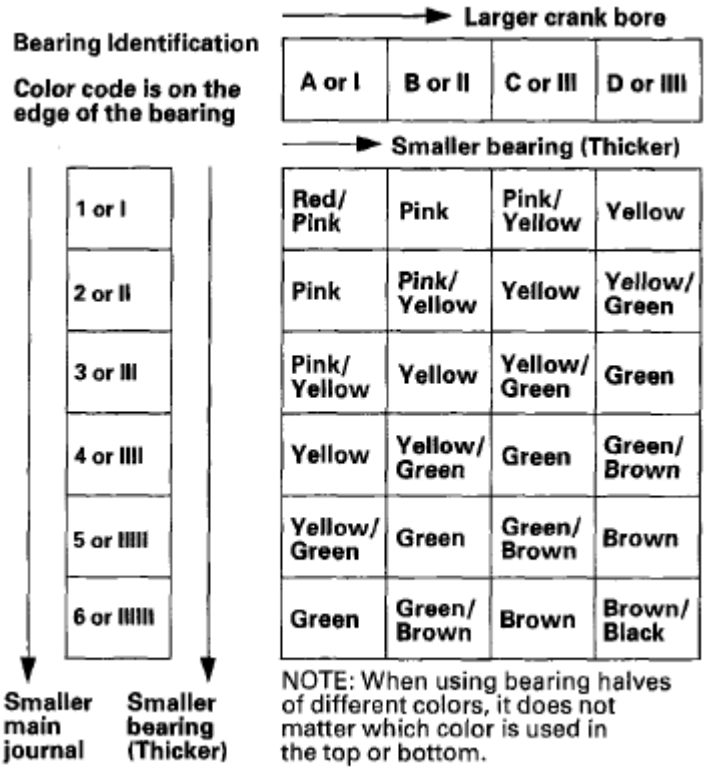

Fig. 9: Main Bearing Color Chart
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Main Journal Code Locations (Numbers or Bars)

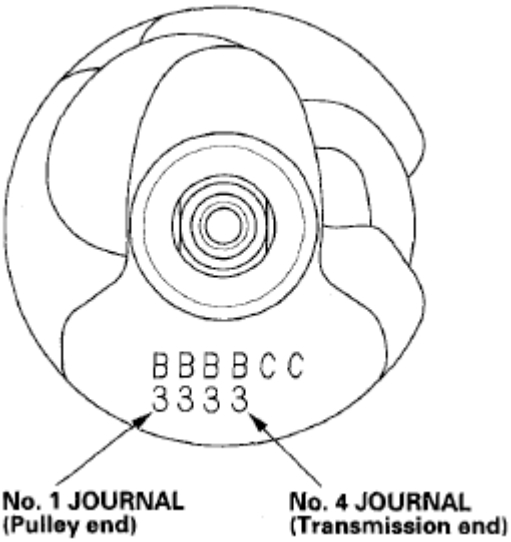

Fig. 10: Identifying Main Journal Code Locations (Numbers Or Bars)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CONNECTING ROD BEARING REPLACEMENT

Rod Bearing Clearance Inspection

1. Remove the connecting rod cap and the bearing half (see **CRANKSHAFT AND PISTON REMOVAL**).
2. Clean the crankshaft rod journal and the bearing half with a clean shop towel.
3. Place a strip of plastigage across the rod journal.
4. Reinstall the bearing half and the cap, and torque the bolts.

NOTE:

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

Tightening Torque:

20 N.m (2.0 kgf.m, 14 lbf.ft) + 90 °

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

Connecting Rod Bearing-to-Journal Oil Clearance

Standard (New): 0.020-0.044 mm (0.0008-0.0017 in.)

Service Limit: 0.050 mm (0.0020 in.)

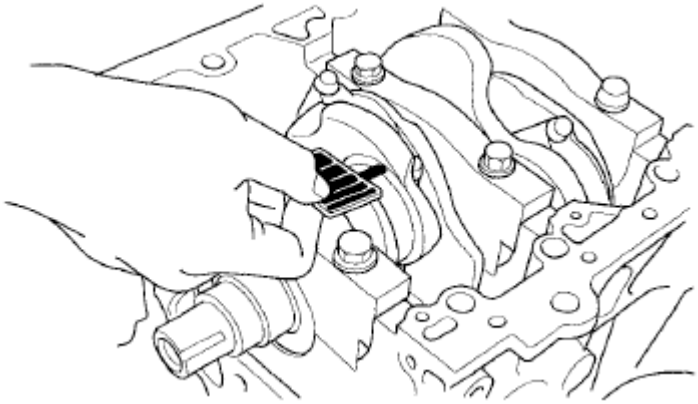

Fig. 11: Measuring Widest Part Of Plastigage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Rod Bearing Selection

Each rod falls into one of four tolerance ranges, from 0 to 0.024 mm (0.0009 in.), in 0.006 mm (0.0002 in.) increments, depending on the size of its big end bore. It's then stamped with a number or bar (1,2,3, or 4/I, II, III, or Mil) indicating the range. You may find any combination of 1, 2,3, or 4/I, II, III, or IIII in any engine.

Normal Bore Size: 60.0 mm (2.36 in.)

Inspect the connecting rod for cracks and heat damage.

Connecting Rod Journal Code Locations

Numbers or bars have been stamped on the side of each connecting rod as a code for the size of the big end. Use them, and the letters or bars stamped on the crank (codes for rod journal size) to choose the correct bearings. If the codes are indecipherable because of an accumulation of dirt and dust, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.

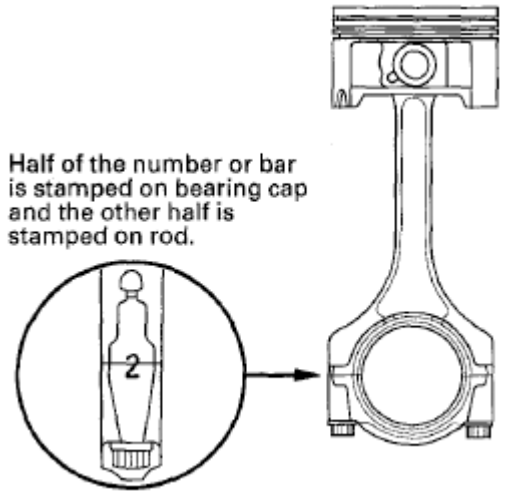

Fig. 12: Identifying Connecting Rod Journal Code Locations
Courtesy of AMERICAN HONDA MOTOR CO., INC.

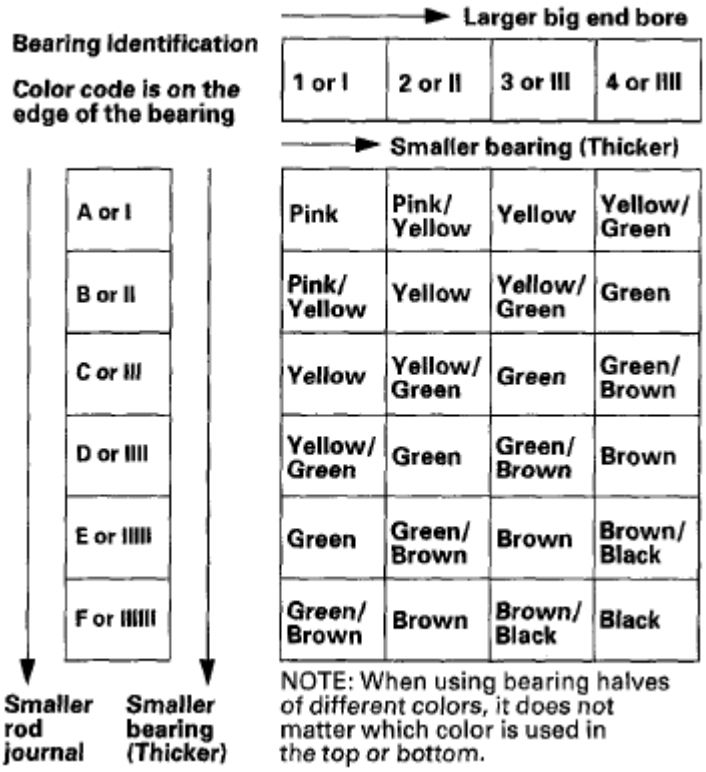

Fig. 13: Bearing Color Code Chart
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Connecting Rod Journal Code Locations (Letters or Bars)

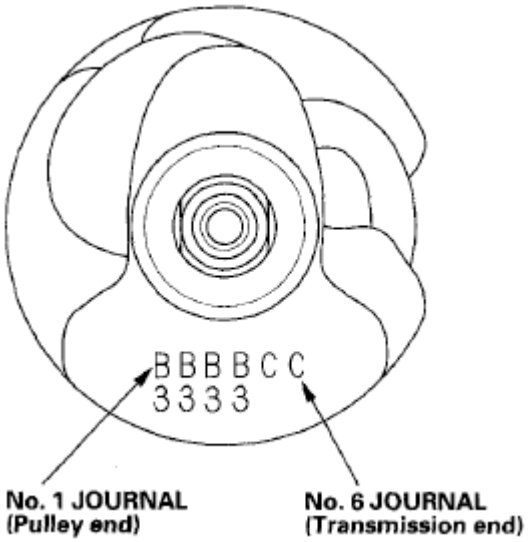

Fig. 14: Identifying Connecting Rod Journal Code Locations (Letters Or Bars)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

OIL PAN REMOVAL

1. If the engine is out of the vehicle, go to step 6.
2. Raise the vehicle on the lift to full height.
3. Drain the engine oil (see **ENGINE OIL LEVEL CHECK**).
4. Remove the splash shield (see step 31 under **ENGINE REMOVAL**).
5. Remove exhaust pipe A.

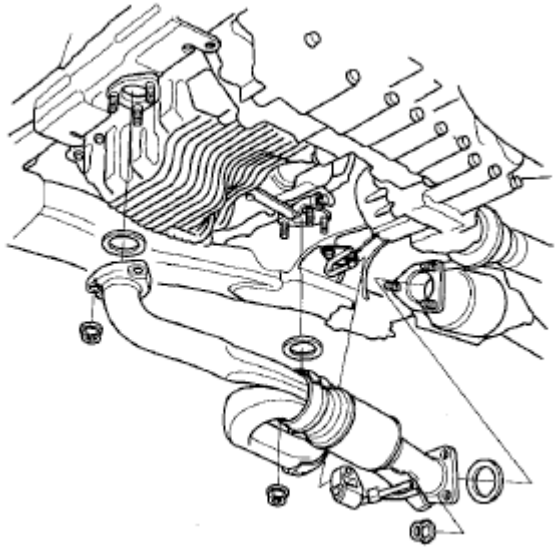

Fig. 15: Identifying Exhaust Pipe
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the rear warm up three way catalytic converter (rear WU-TWC) bracket.

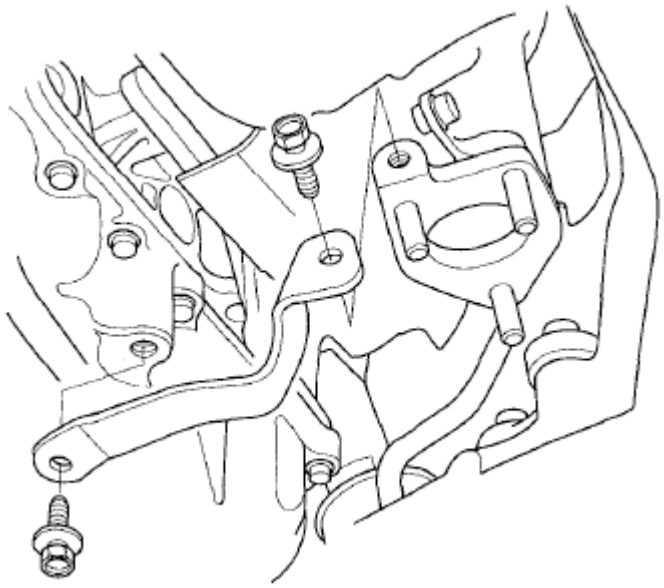

Fig. 16: Identifying Three Way Catalytic Converter (Rear WU-TWC) Bracket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the torque converter cover (A) and the four bolts (B) securing the transmission.

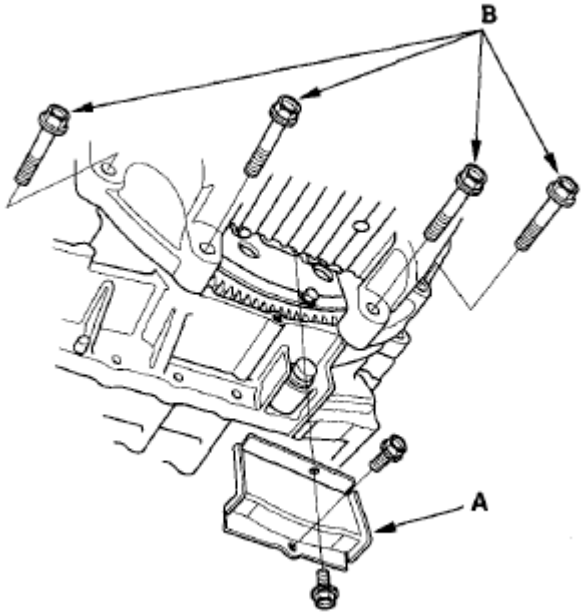

Fig. 17: Identifying Torque Converter Cover And Four Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Remove the bolts securing the oil pan.
9. Using a flat blade screwdriver, separate the oil pan from the block in the places shown.

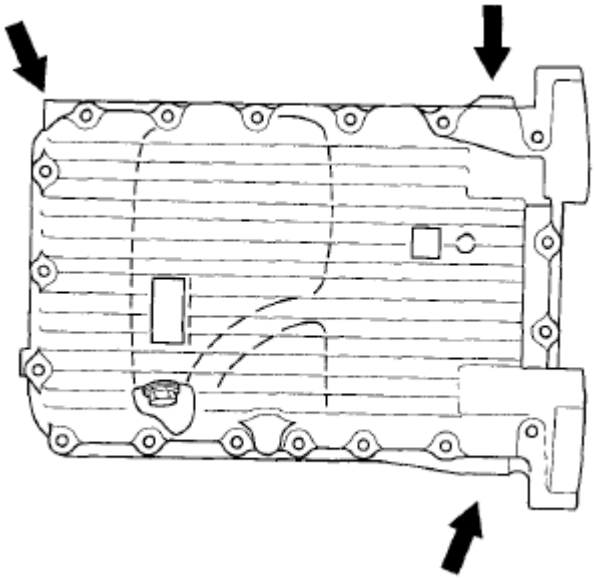

Fig. 18: Identifying Oil Pan
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Remove the oil pan.

CRANKSHAFT AND PISTON REMOVAL

1. Remove the engine assembly (see **ENGINE REMOVAL**).
2. Remove the transmission (see **TRANSMISSION REMOVAL**).
3. Remove the drive plate.
4. Remove the cylinder heads (see **CYLINDER HEAD REMOVAL**).
5. Remove the crankshaft position (CKP) sensor (see **CMP SENSOR REPLACEMENT**).
6. Remove the timing belt drive pulley from the crankshaft.
7. Remove the oil pan (see **OIL PAN REMOVAL**).
8. Remove the engine block end cover.

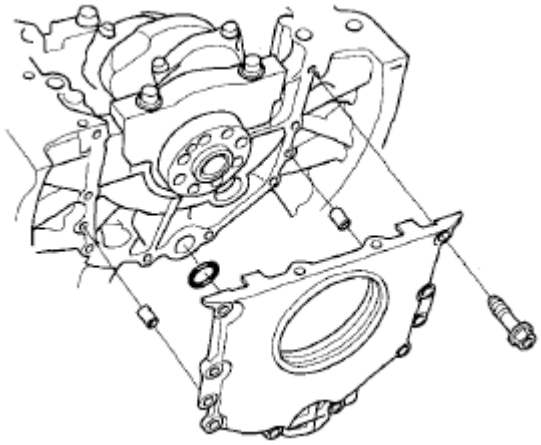

Fig. 19: Identifying Engine Block End Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Remove the rocker arm oil control solenoid/oil filter assembly.

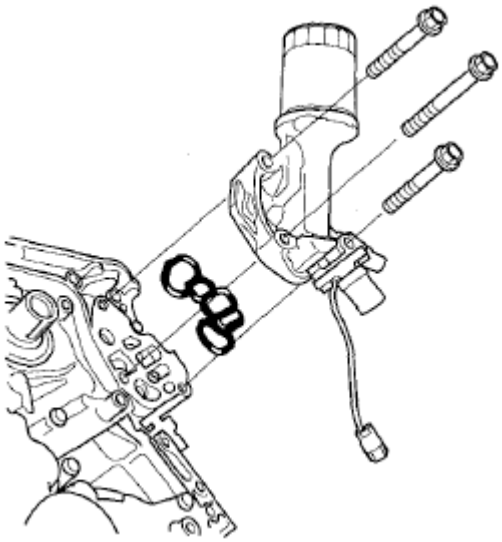

Fig. 20: Identifying Rocker Arm Oil Control Solenoid And Oil Filter Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Remove the oil screen (A), baffle plate (B), and oil pump (C).

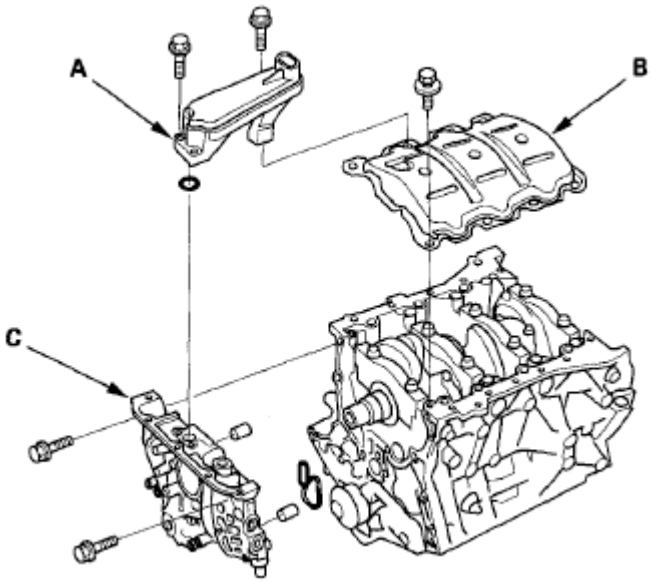

Fig. 21: Identifying Oil Screen, Baffle Plate And Oil Pump
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Remove the connecting rod caps after setting the crank pin at bottom dead center (BDC) for each cylinder. Remove the piston/connecting rod assembly by pushing on the connecting rod. Take care not to damage the oil jets, crank pin, or cylinder with the connecting rod.

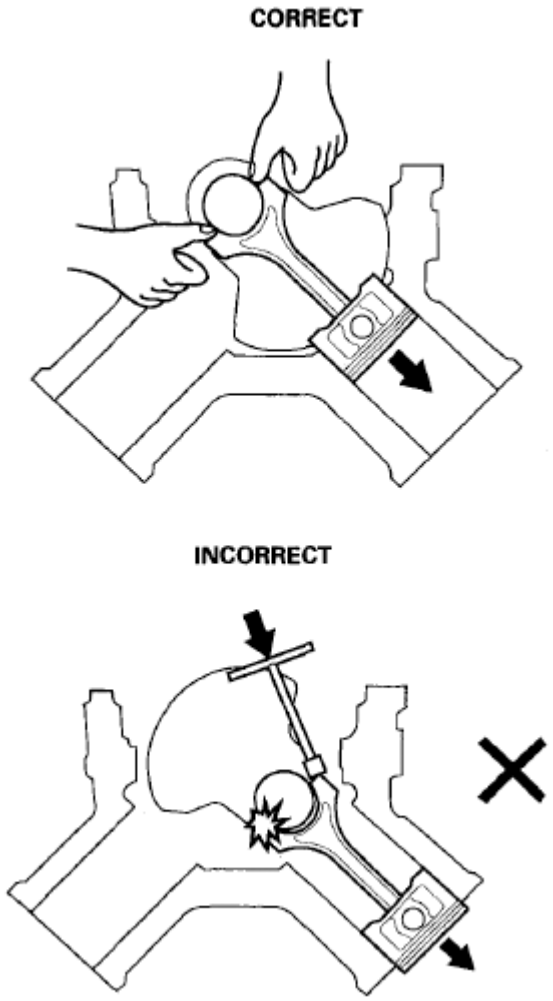

Fig. 22: Removing Connecting Rod Caps
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Remove the bearing from the cap. Keep all caps/ bearings in order.
13. Remove the upper bearing halves from the connecting rods, and set them aside with their respective caps.
14. After removing a piston/connecting rod assembly, reinstall the cap on the rod.
15. To avoid mix-up during reassembly, mark each piston/connecting rod assembly with its cylinder number.
16. Loosen the bearing cap bolts and the bearing cap side bolts in sequence 1/3 turn at a time; repeat the sequence until all bolts are loosened.

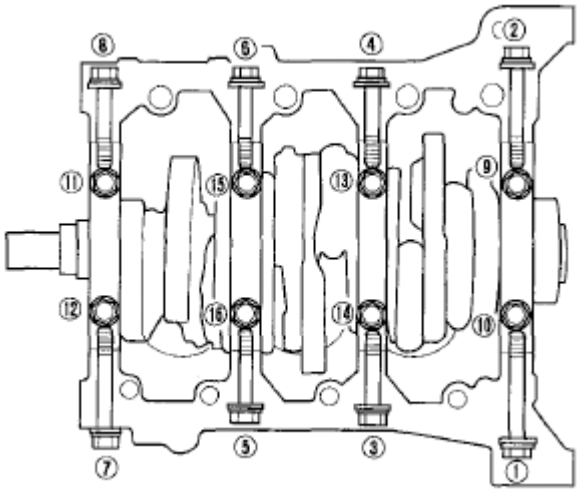

Fig. 23: Identifying Bearing Cap Bolts Loosen Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Remove the bearing cap bolts (A) and the bearing cap side bolts (B), then remove the bearing cap (C).

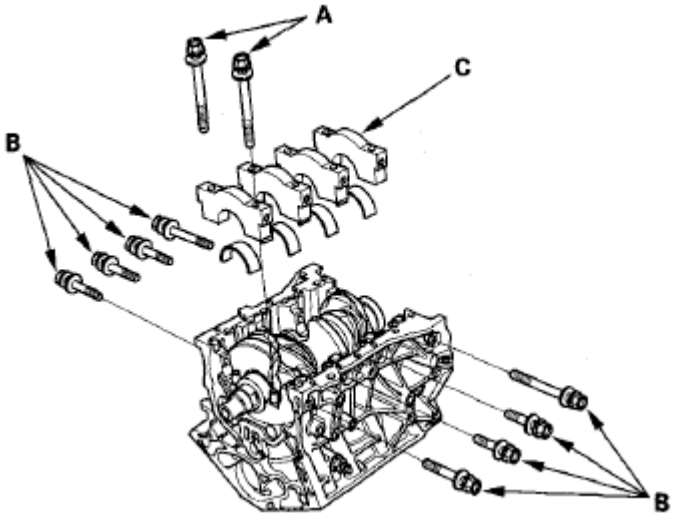

Fig. 24: Identifying Bearing Cap Bolts And Bearing Cap Side Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Lift the crankshaft (A) out of the engine block, being careful not to damage the journals.

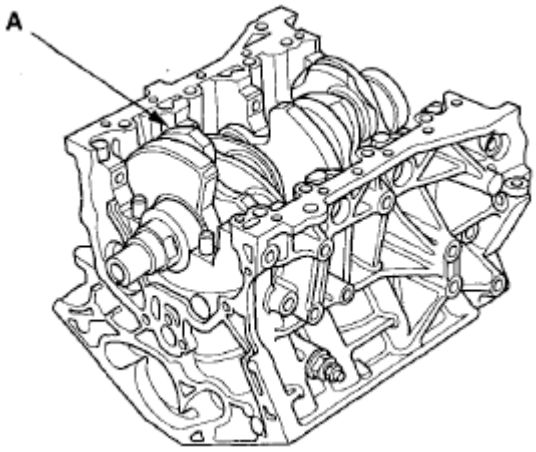

Fig. 25: Lifting Crankshaft Of Engine Block
Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Reinstall the main caps and the bearings on the engine block in the proper order.

CRANKSHAFT INSPECTION

Out-of-Round and Taper

1. Remove the crankshaft from the engine block (see **CRANKSHAFT AND PISTON REMOVAL**).
2. Clean the crankshaft oil passages with pipe cleaners or a suitable brush.
3. Check the keyway slot and the threaded holes for damage.
4. Measure out-of-round at the middle of each rod and main journal in two places. The difference between measurements on each journal must not be more than the service limit.

   Journal Out-of-Round

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

   Service Limit: 0.010 mm (0.0004 in.)

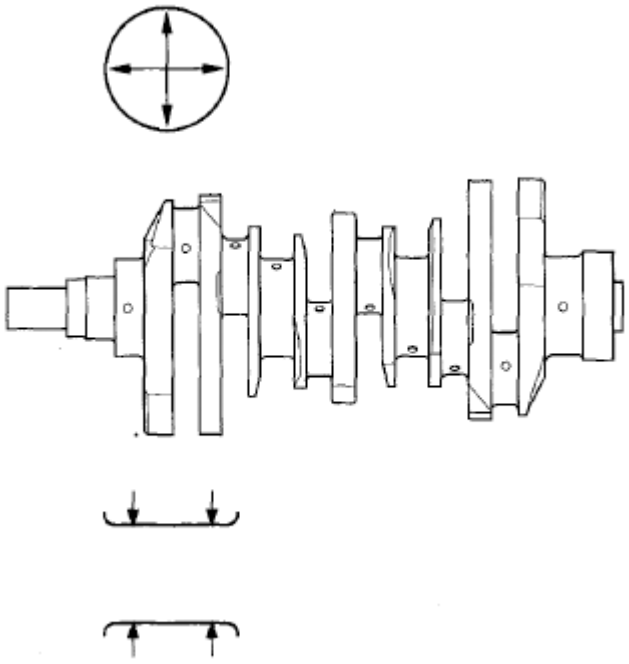

Fig. 26: Identifying Crankshaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Journal Taper

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

   Service Limit: 0.010 mm (0.0004 in.)

   Straightness

6. Place the engine block on the surface plate.
7. Clean and install the bearings on the No. 1 and No. 4 journal of the engine block.
8. Lower the crankshaft into the engine block.
9. Measure the runout on all of the main journals. Rotate the crankshaft two complete revolutions. The difference between measurements on each journal must not be more than the service limit.

   Crankshaft Total Runout

   Standard (New): 0.025 mm (0.0010 in.) max.

   Service Limit: 0.030 mm (0.0012 in.)

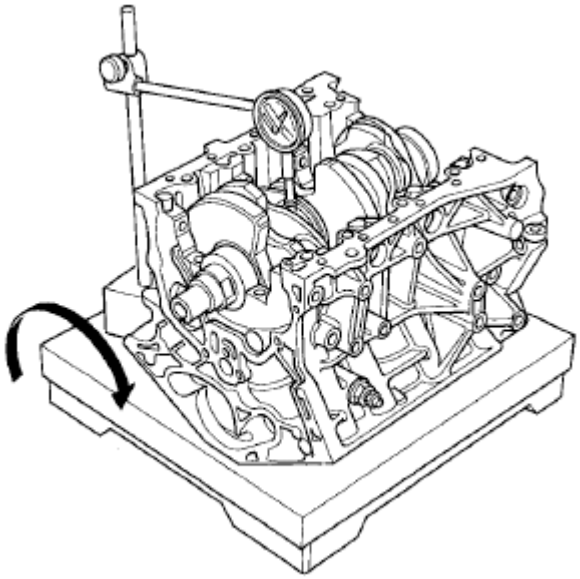

Fig. 27: Measuring Runout On Main Journals
Courtesy of AMERICAN HONDA MOTOR CO., INC.

BLOCK AND PISTON INSPECTION

1. Remove the piston from the engine block (see **CRANKSHAFT AND PISTON REMOVAL**).
2. Check the piston for distortion or cracks.
3. Measure the piston diameter at a point 16.0 mm (0.63 in.) from the bottom of the skirt.

Piston Diameter

Standard (New): 89.983-89.996 mm (3.5426-3.5431 in.)

Service Limit: 89.975 mm (3.5423 in.)

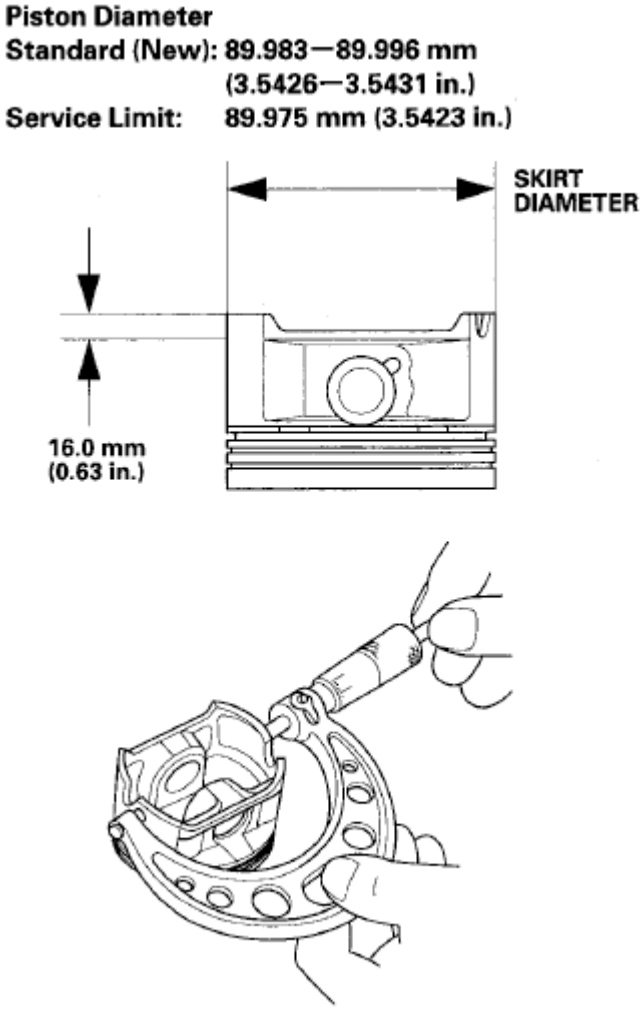

Fig. 28: Identifying Piston Dimension
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Measure wear and taper in direction X and Y at three levels in each cylinder as shown.

   Cylinder Bore Size

   Standard (New): 90.000-90.015 mm (3.5433-3.5439 in.)

   Service Limit: 90.065 mm (3.5459 in.)

   Bore Taper

   Limit: (Difference between first and third measurement) 0.015 mm (0.00059 in.)

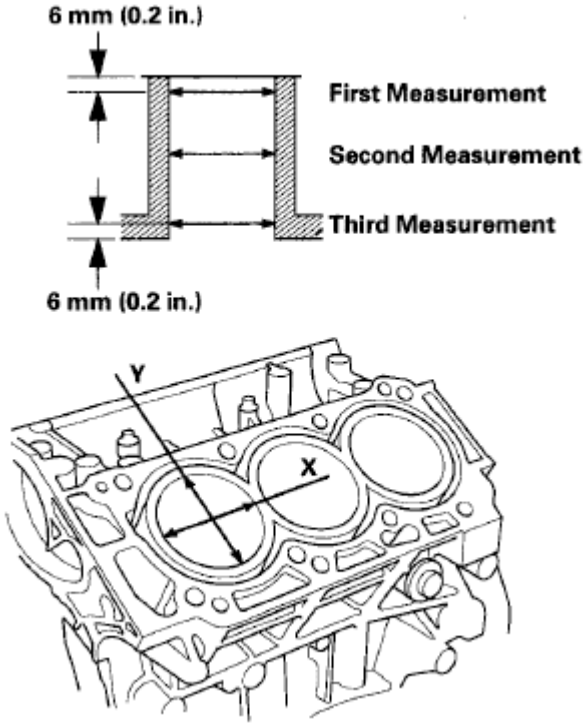

Fig. 29: Measuring Wear And Taper
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Check the top of the engine block for warpage. Measure along the edges and across the center as shown.

   Engine Block Warpage

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

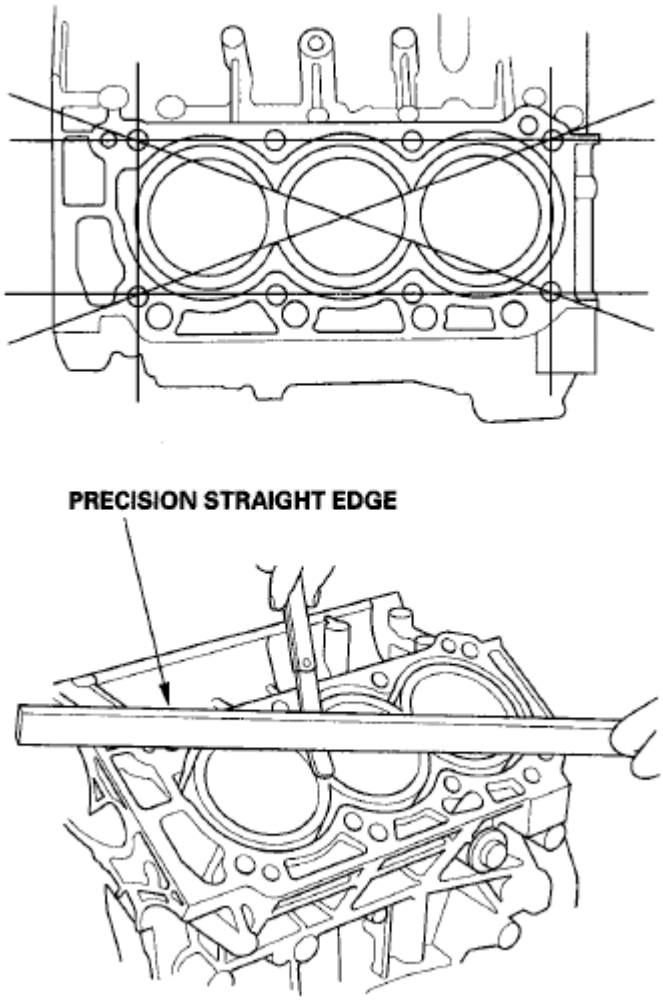

Fig. 30: Checking Engine Block Warpage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Piston-to-Cylinder Bore Clearance

   Standard (New): 0.004-0.032 mm (0.0002-0.0013 in.)

   Service Limit: 0.070 mm (0.0027 in.)

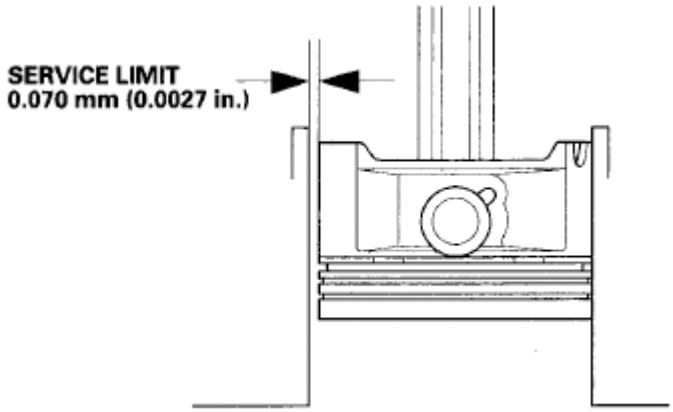

Fig. 31: Identifying Difference Between Cylinder Bore Diameter And Piston Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

PISTON, PIN, AND CONNECTING ROD REPLACEMENT

Disassembly

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

NOTE: Take care not to damage the ring grooves.

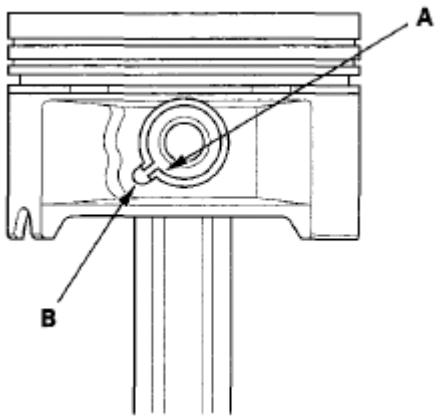

Fig. 32: Identifying Piston Pin Snap Rings And Piston Pin Bores
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

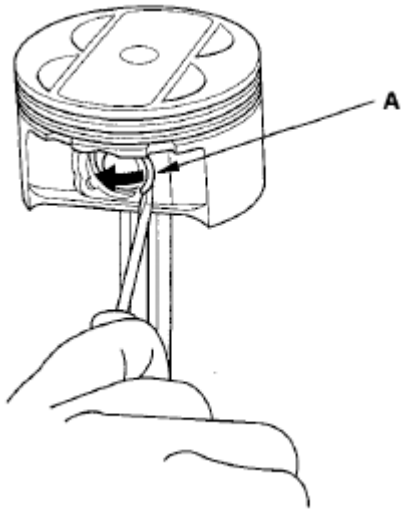

Fig. 33: Removing Snap Rings
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

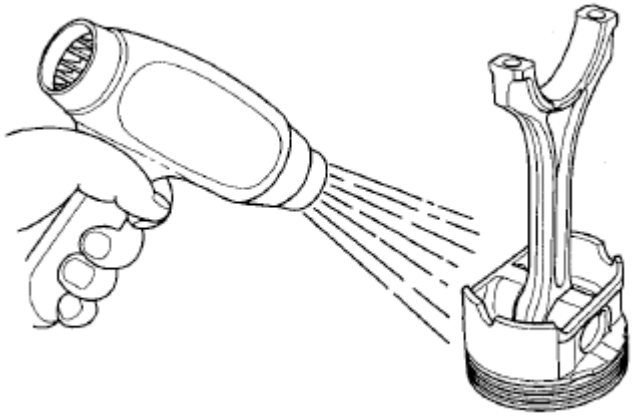

Fig. 34: Heating Piston And Connecting Rod Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Inspection

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

1. Measure the diameter of the piston pin.

   Piston Pin Diameter

   Standard (New): 21.961-21.965 mm (0.8646-0.8648 in.)

Service Limit: 21.954 mm (0.8643 in.)

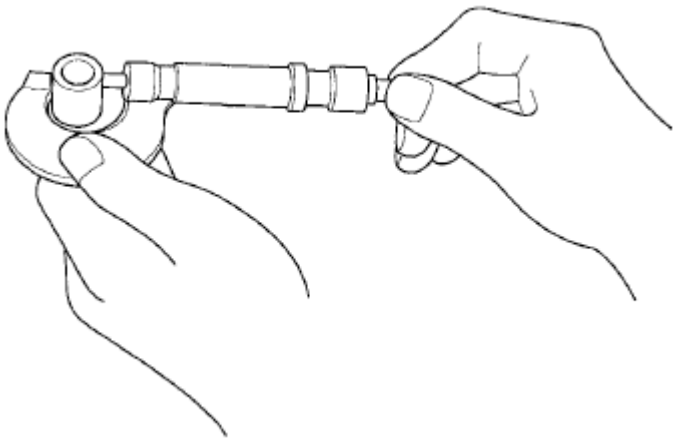

Fig. 35: Measuring Diameter Of Piston Pin
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

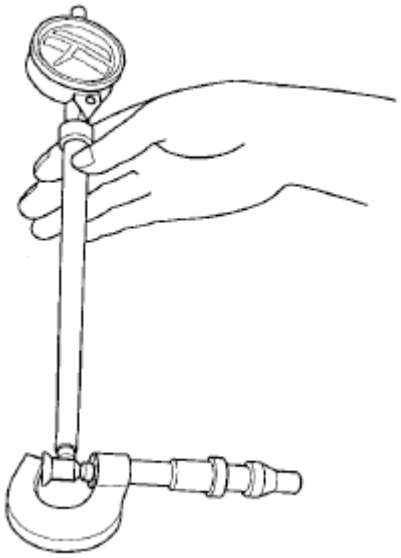

Fig. 36: Identifying Zero Dial Indicator To Piston Pin Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Piston Pin-to-Piston Clearance

   Standard (New): -0.005 to +0.002 mm (-0.0002 to +0.00008 in.)

   Service Limit: 0.004 mm (0.0002 in.)

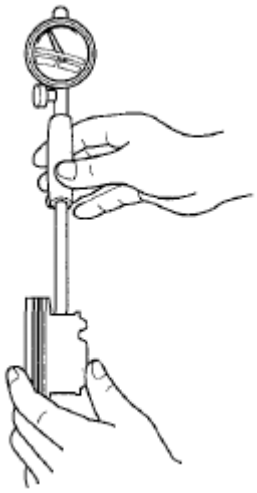

Fig. 37: Checking Difference Between Piston Pin Diameter And Piston Pin Hole Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Piston Pin-to-Connecting Rod Clearance

   Standard (New): 0.005-0.015 mm (0.0002-0.0006 in.)

   Service Limit: 0.019 mm (0.0007 in.)

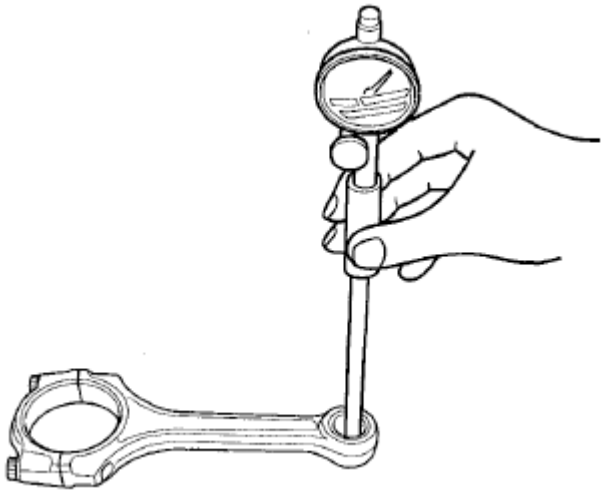

Fig. 38: Measuring Piston Pin-To-Connecting Rod Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Reassembly

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

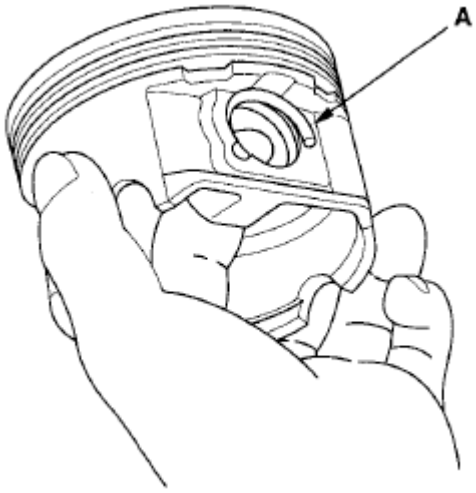

Fig. 39: Installing Piston Pin Snap Ring
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Fig. 40: Heating Piston
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

NOTE: Apply new engine oil to the piston pin.

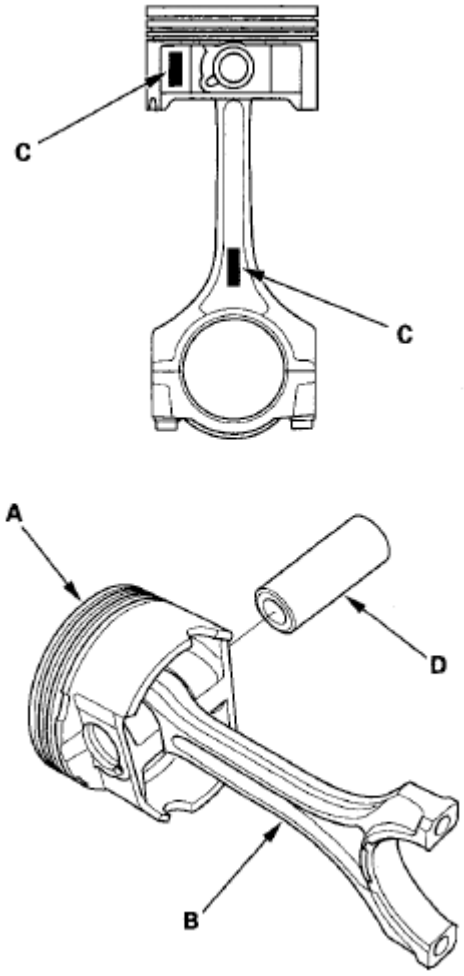

Fig. 41: Identifying Piston, Connecting Rod And Embossed Marks
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Install the remaining snap ring.

PISTON RING REPLACEMENT

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

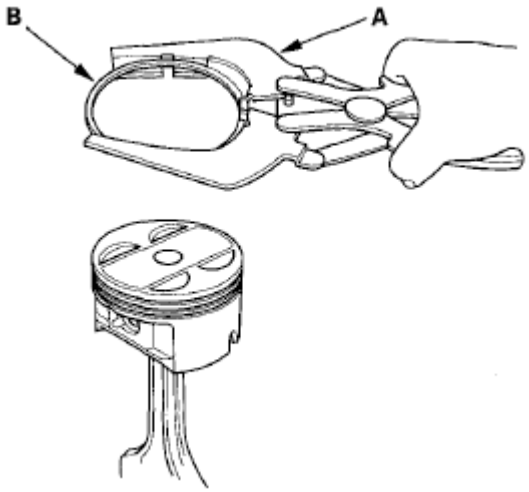

Fig. 42: Removing Piston Rings
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Clean all the ring grooves thoroughly with a squared-off broken ring, or a ring groove cleaner with a blade that fits the piston grooves. File down the blade, if necessary. The top ring and second ring grooves are 1.2 mm (0.05 in.) wide, and the oil ring groove is 2.8 mm (0.11 in.) wide. Do not use a wire brush to clean the ring grooves, or cut the ring grooves deeper with the cleaning tool.

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

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

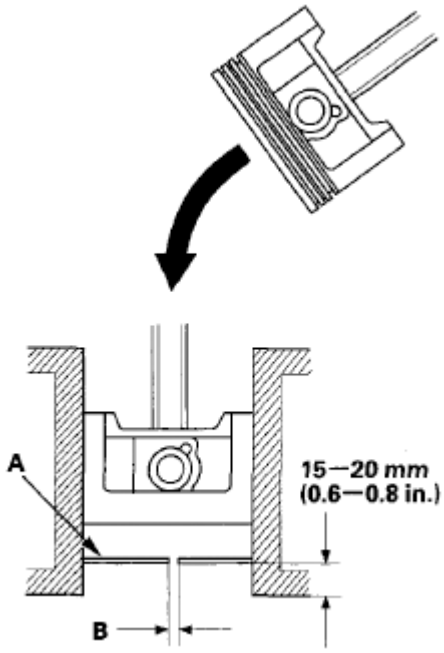

Fig. 43: Pushing Ring Into Cylinder

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Measure the piston ring end-gap (B) with a feeler gauge:
   - If the gap is too small, check to see if you have the proper rings for your engine.
   - If the gap is too large, recheck the cylinder bore diameter against the wear limits (see step 4).

   Piston Ring End-Gap

   Top Ring:

   Standard (New): 0.30-0.40 mm (0.012-0.016 in.)

   Service Limit: 0.60 mm (0.024 in.)

   Second Ring:

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

   Service Limit: 0.70 mm (0.028 in.)

   Oil Ring:

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

   Service Limit: 0.80 mm (0.031 in.)

6. Install the rings as shown. The top ring (A) has a 1E mark and the second ring (B) has a 2E mark. The manufacturing marks (C) must face upward.

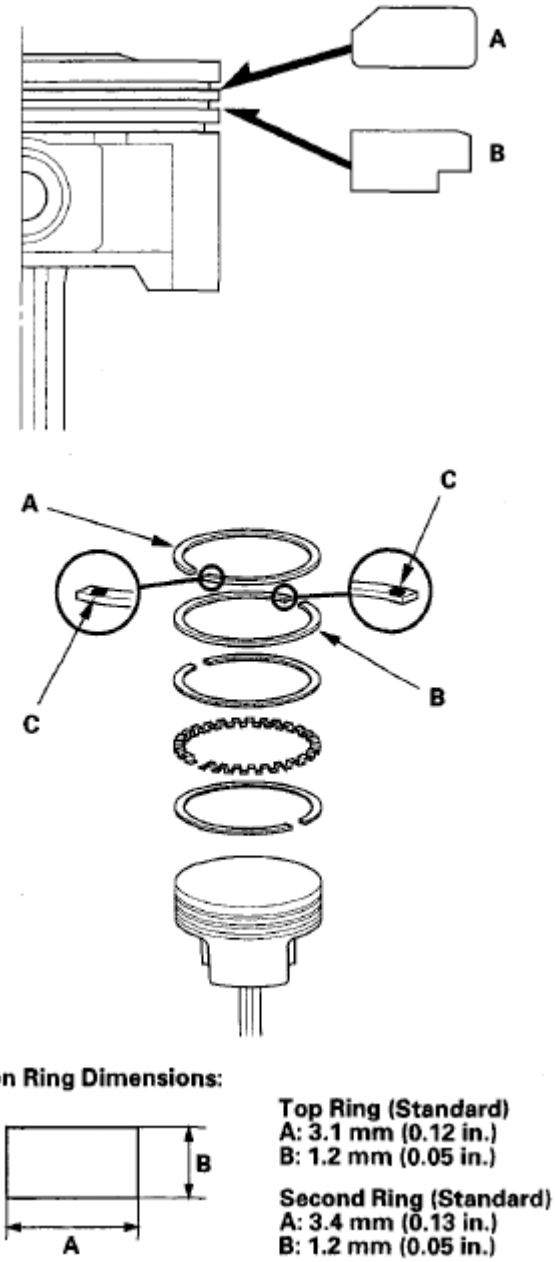

Fig. 44: Identifying Rings, Top Ring And Second Ring
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Top Ring Clearance

   Standard (New): 0.055-0.085 mm (0.0022-0.0033 in.)

   Service Limit: 0.15 mm (0.006 in.)

Second Ring Clearance Standard (New): 0.030-0.060 mm (0.0012-0.0024 in.)

Service Limit: 0.13 mm (0.005 in.)

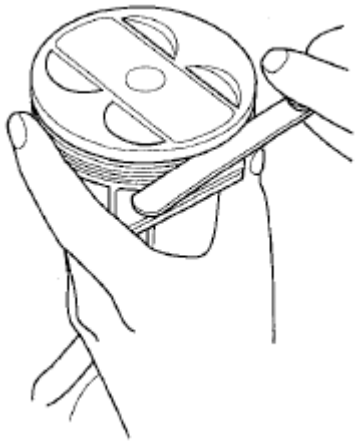

Fig. 45: Measuring Ring-To-Groove Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

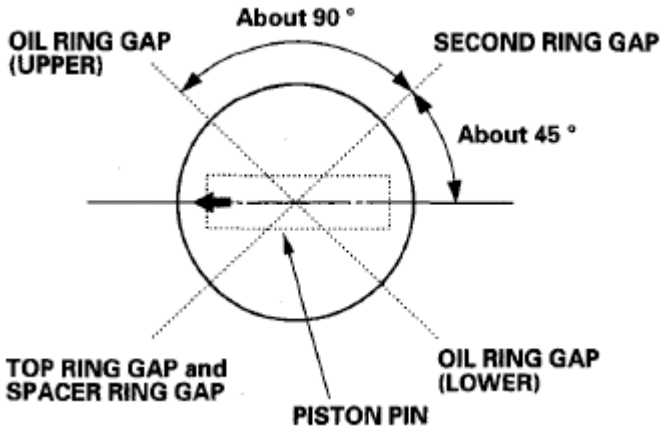

Fig. 46: Positioning Ring End Gaps
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CRANKSHAFT AND PISTON INSTALLATION

Special Tools Required

- Driver handle, 15 x 135L 07749-0010000
- Driver attachment, 106 mm 070AD-RCAA200

1. Check the connecting rod bearing clearance with plastigage (see **CONNECTING ROD BEARING**

REPLACEMENT).

2. Check the main bearing clearance with plastigage (see **CRANKSHAFT MAIN BEARING REPLACEMENT**).
3. Install the bearing halves in the engine block and the connecting rods.
4. Apply new engine oil to the inside of the main bearings and rod bearings.
5. Lower the crankshaft (A) into the engine block.

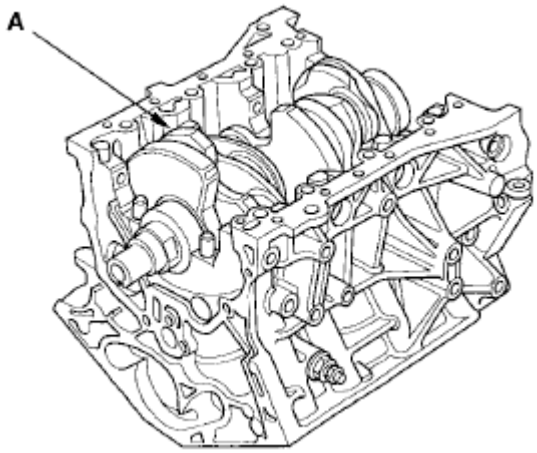

Fig. 47: Identifying Crankshaft Into Engine Block
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Apply new engine oil to the side with the thrust washer groove. Install the thrust washers (A) in the No. 3 journal.

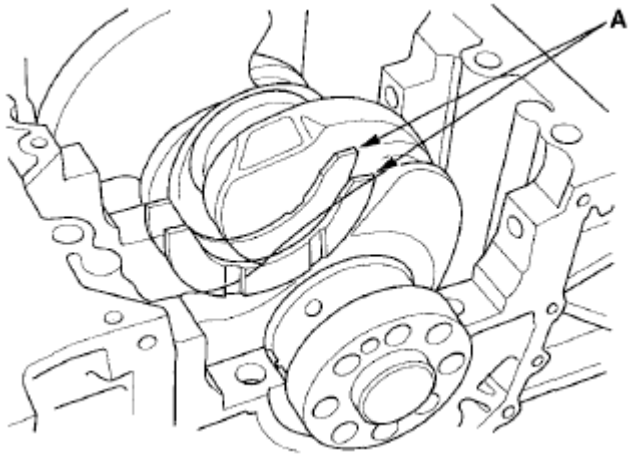

Fig. 48: Identifying Thrust Washer Groove And Thrust Washer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Install the bearings (A) and the bearing caps (B) with the arrow (C) facing the timing belt end of the engine.

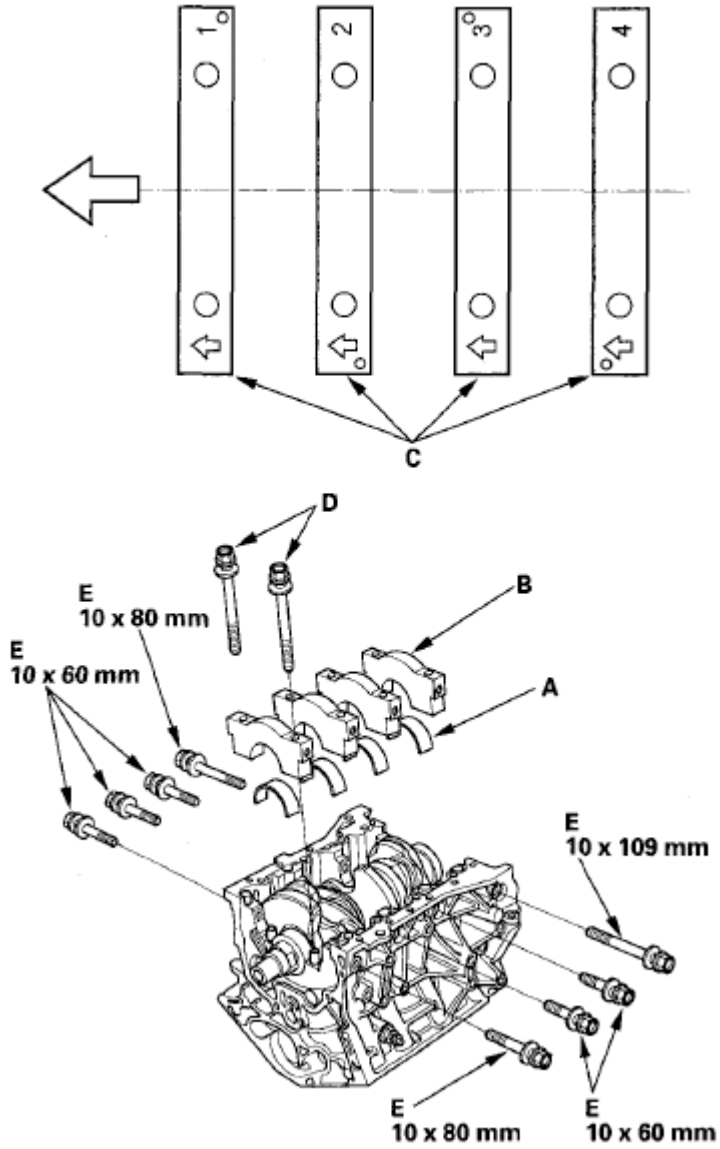

Fig. 49: Identifying Bearings And Bearing Caps
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Apply new engine oil to the bolt threads and flanges, then loosely install the bearing cap bolts (D) and bearing cap side bolts (E).
9. Set the crankshaft to bottom dead center (BDC) for the cylinder you are installing the piston in.
10. Apply new engine oil to the piston, inside of the ring compressor, and the cylinder bore.
11. Attach the ring compressor to the piston/ connecting rod assembly, and check that the bearing is securely in place.
12. Position the piston/connecting rod assembly with the arrow (A) facing the timing belt side of the engine.

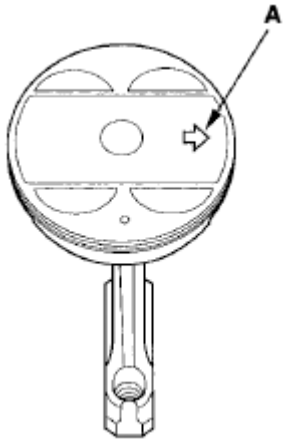

Fig. 50: Identifying Piston And Connecting Rod Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

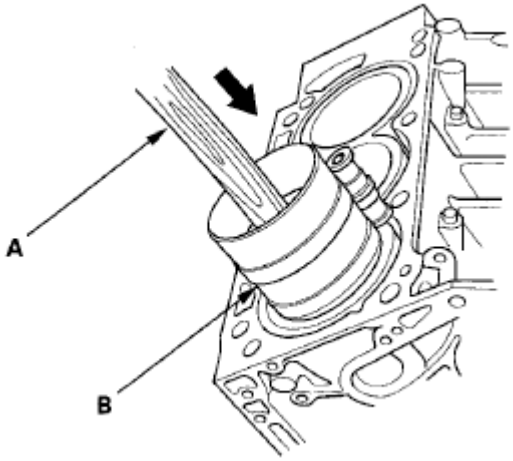

Fig. 51: Positioning Piston And Connecting Rod Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Stop after the ring compressor pops free, and check the connecting rod-to-crank journal alignment before pushing the piston into place.
15. Measure the diameter of each connecting rod bolt at point A and point B.

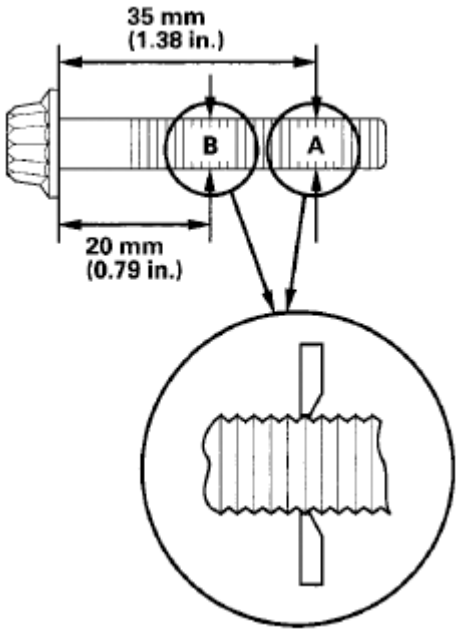

Fig. 52: Measuring Diameter Of Connecting Rod Bolt Point A And Point B
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

    Point A-Point B = Difference in Diameter

    Difference in Diameter

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

17. If the difference in diameter is out of tolerance, replace the connecting rod bolt.
18. Line up the mark (A) on the connecting rod and cap, then install the cap.

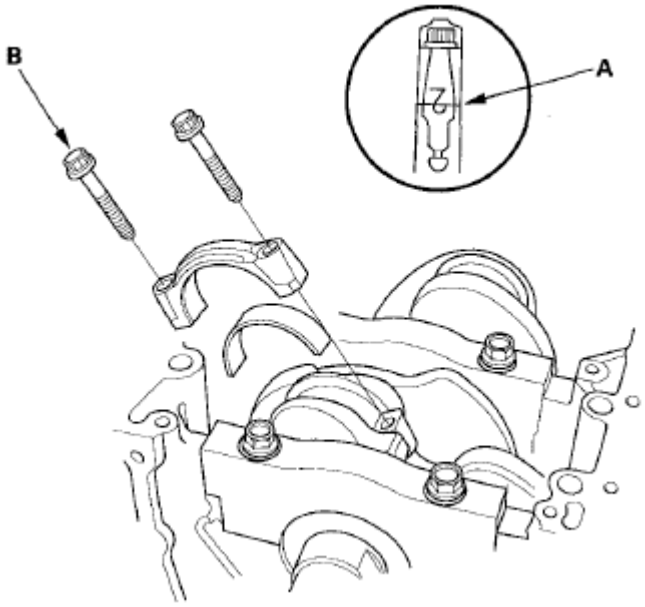

Fig. 53: Identifying Mark On Connecting Rod And Cap
Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Apply new engine oil to the bolt threads and flanges. Torque the bolts (B) to 20 N.m (2.0 kgf.m, 14 lbf.ft).
20. Mark the connecting rod (A) and bolt head (B) as shown.

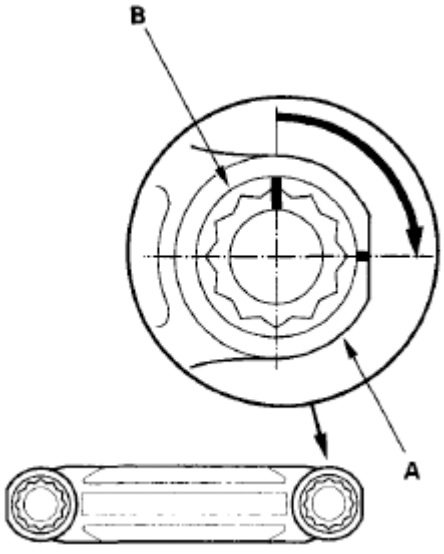

Fig. 54: Identifying Mark On Connecting Rod And Bolt Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

21. Tighten the bolt until the mark on the bolt head lines up with the mark on the connecting rod (turn the bolt 90 °).

NOTE: Remove the connecting rod bolt if you tightened it beyond the specified angle, and go back to step 15 of the procedure. Do not loosen it back to the specified angle.

22. Tighten the bearing cap bolts, and then the bearing cap side bolts to the specified torque in the sequence as shown. Repeat the torque sequence again to measure the bolts are properly torqued.

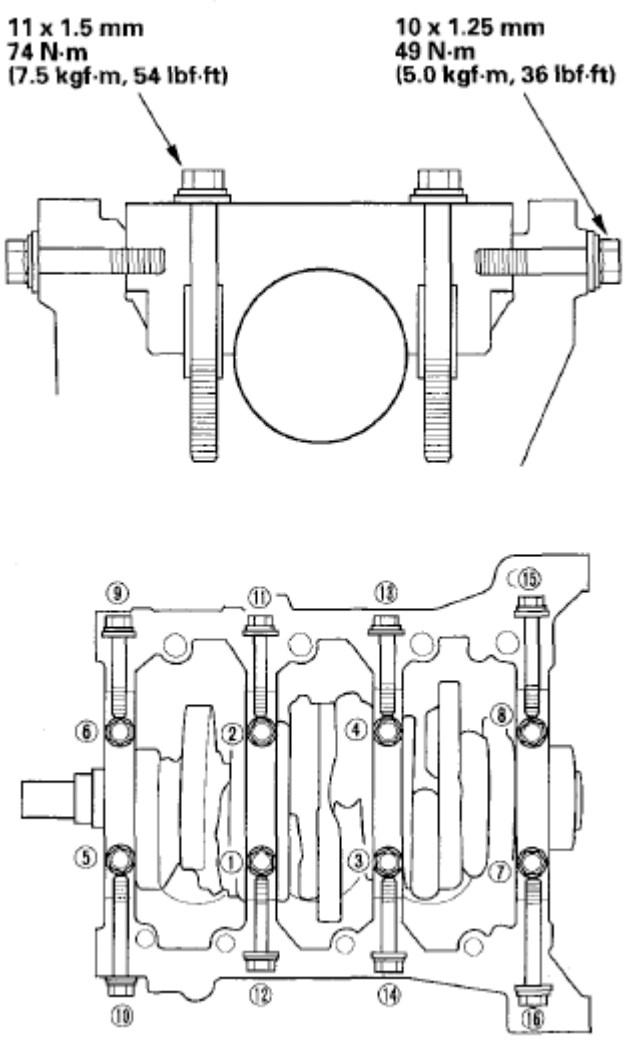

Fig. 55: Identifying Bearing Cap Bolts Tighten Sequence With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

23. Apply a light coat of multipurpose grease to the crankshaft and to the lip of the seal.
24. Drive the new crankshaft oil seal until the driver attachment bottoms on the engine block end cover.

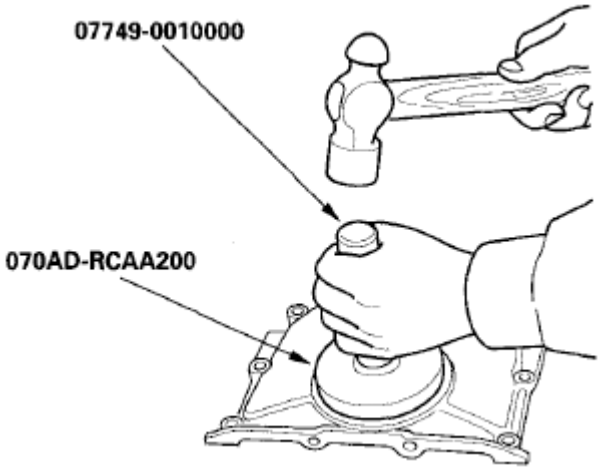

Fig. 56: Installing Crankshaft Oil Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

25. Remove all of the old liquid gasket from the engine block end cover mating surfaces, bolts, and bolt holes.
26. Clean and dry the engine block end cover mating surfaces.
27. Apply liquid gasket (P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009) to the engine block mating surface of the engine block end cover and to the inside edge of the threaded bolt holes. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

- **Apply liquid gasket about 2.5 mm (0.098 in.) diameter bead along the broken line (A).**
- **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.**

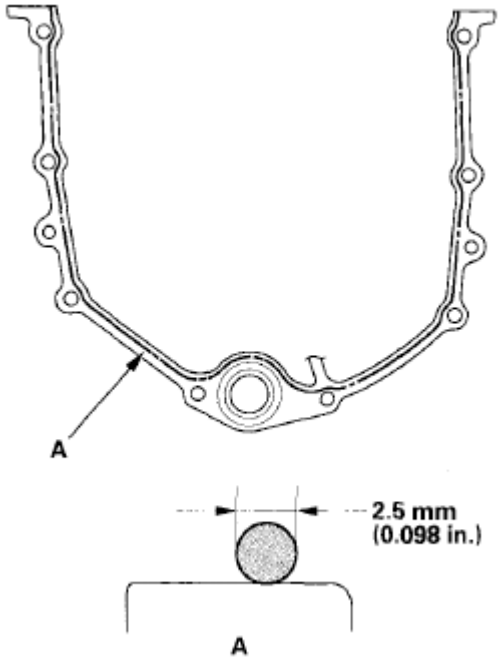

Fig. 57: [Identifying Diameter Bead Of Broken Line]
Courtesy of AMERICAN HONDA MOTOR CO., INC.

28. Install the dowel pins (A), new O-ring (B), and the engine block end cover (C) on the engine block.

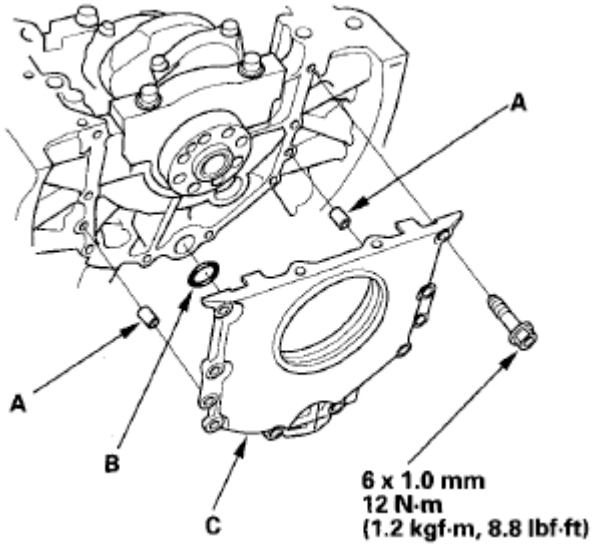

Fig. 58: Identifying Dowel Pins, O-Ring And Engine Block End Cover With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

29. Clean the excess grease off the crankshaft, and check the seal for distortion.
30. Install a new crankshaft oil seal in the oil pump (see step 2 under **INSTALLATION**).
31. Remove all of the old liquid gasket from the oil pump mating surfaces, bolts, and bolt holes.

32. Clean and dry the oil pump mating surfaces.
33. Apply liquid gasket (P/N 08717-0004,08718-0001, 08718-0003, or 08718-0009) to the engine block mating surface of the oil pump and to the inside edge of the threaded bolt holes. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

- **Apply liquid gasket about 2.5 mm (0.098 in.) diameter bead along the broken line (A).**
- **If you apply liquid gasket P/N 087178-0012, 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.**

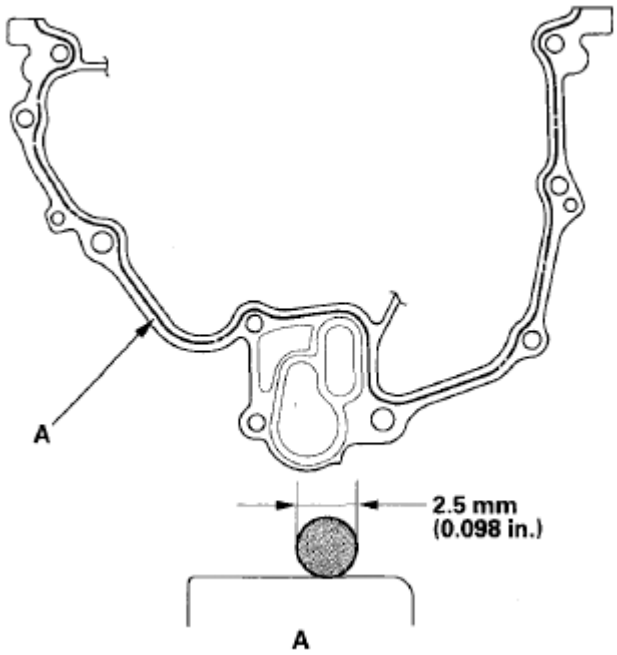

Fig. 59: [Identifying Diameter Bead Of Broken Line]
Courtesy of AMERICAN HONDA MOTOR CO., INC.

34. Grease the lip of the oil seal, and apply new engine oil to the new O-ring (A).

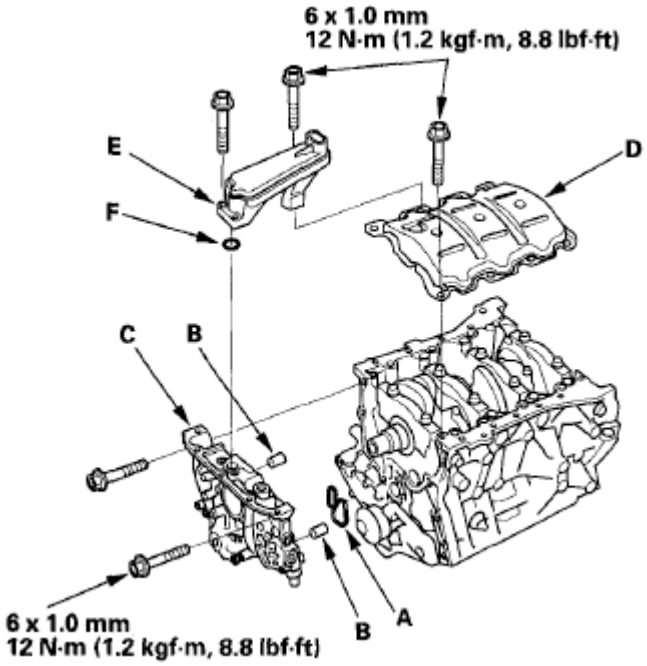

Fig. 60: Identifying Dowel Pins, Oil Pump And O-Ring With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

35. Install the dowel pins (B), then align the inner rotor with the crankshaft, and install the oil pump (C).
36. Clean the excess grease off the crankshaft, and check the seal for distortion.
37. Install the baffle plate (D), then install the oil screen (E) with the new O-ring (F).
38. Install the rocker arm oil control solenoid/oil filter assembly (A), with a new rocker arm oil control solenoid filter (B).

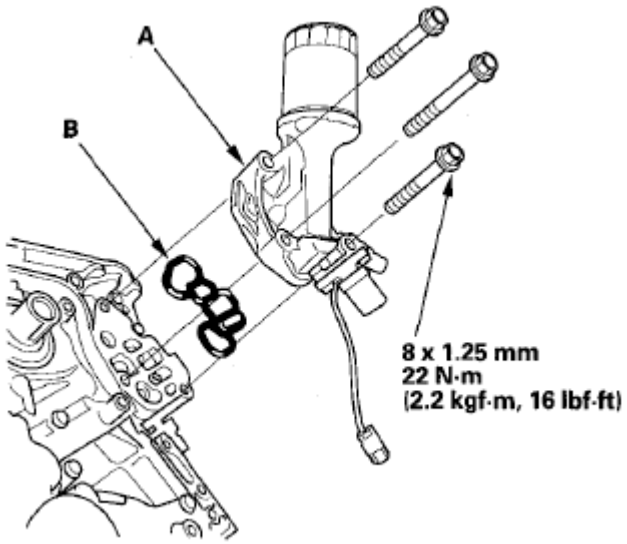

Fig. 61: Identifying Baffle Plate, Oil Screen And O-Ring With Torque Specification
Courtesy of AMERICAN HONDA MOTOR CO., INC.

39. Install the oil pan (see **OIL PAN INSTALLATION**).
40. Install the crankshaft position (CKP) sensor (see **CMP SENSOR REPLACEMENT**).
41. Install the cylinder heads (see **CYLINDER HEAD INSTALLATION**).
42. Install the drive plate.
43. Install the transmission (see **TRANSMISSION INSTALLATION**).
44. Install the engine assembly (see **ENGINE INSTALLATION**).

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

OIL PAN INSTALLATION

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

NOTE:

- **Apply liquid gasket about 2.5 mm (0.098 in.) diameter bead along the broken line (A).**
- **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.**

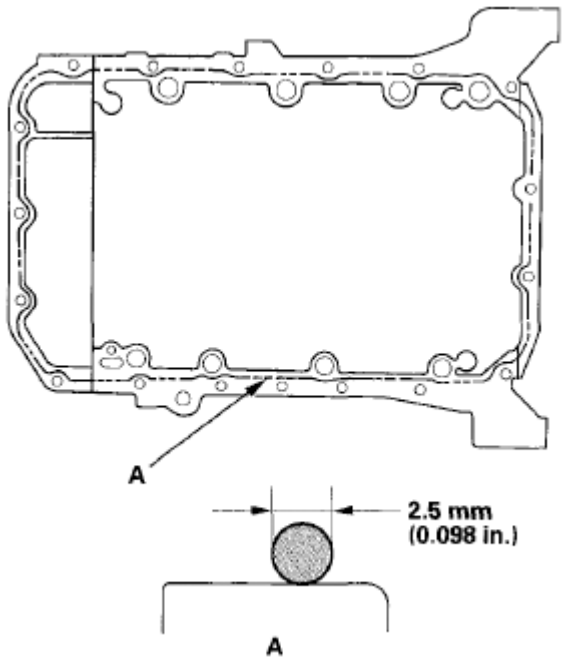

Fig. 62: [Applying Liquid To Diameter Bead Broken Line]
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Install the oil pan on the engine block.
5. Tighten the bolts in three steps. In the final step, tighten all bolts, in sequence, to 12 N.m (1.2 kgf.m, 8.8 lbf.ft).

NOTE:

- **Wait at least 30 minutes to allow liquid gasket to cure before filling the engine with oil.**
- **Do not run the engine for at least 3 hours after installing the oil pan.**

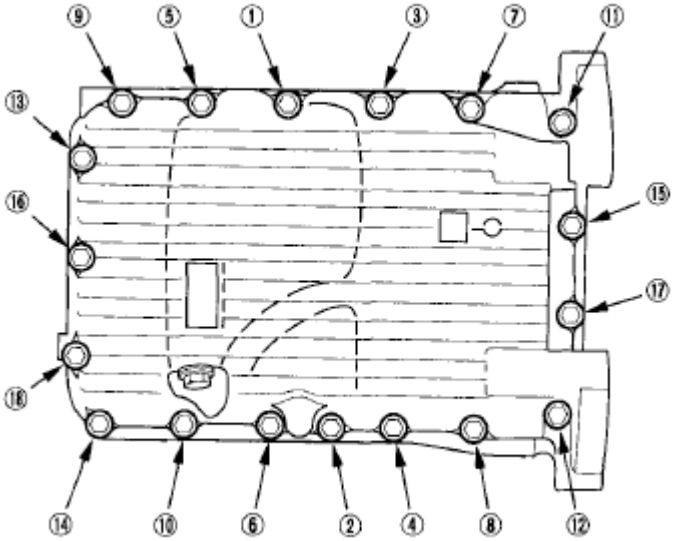

Fig. 63: Identifying Oil Pan Bolt Tighten Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Tighten the four bolts (A) securing the transmission, then install the torque converter cover (B).

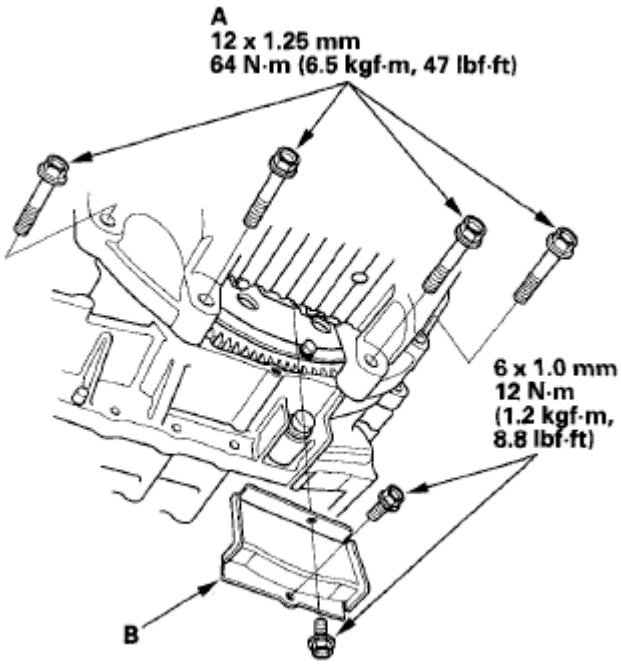

Fig. 64: Identifying Torque Converter Cover With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Install the rear warm up three way catalytic converter (rear WU-TWC) bracket.

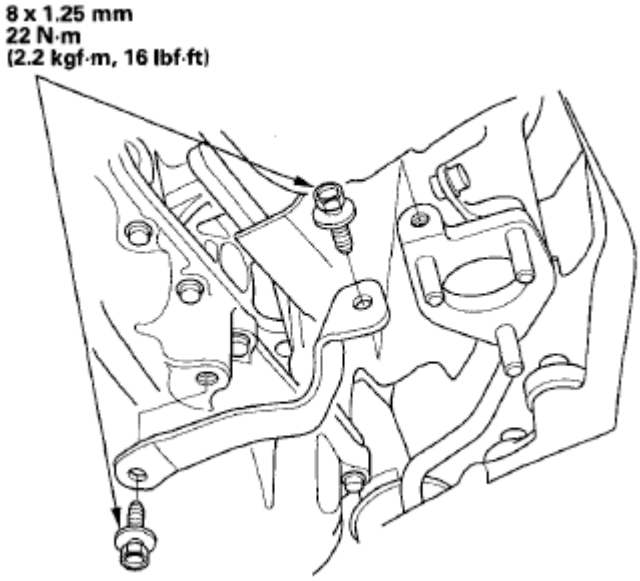

Fig. 65: Identifying Three Way Catalytic Converter Bracket With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. If the engine is still in the vehicle, do the following steps.
9. Install exhaust pipe A, using new gaskets (B) and new self-locking nuts (C).

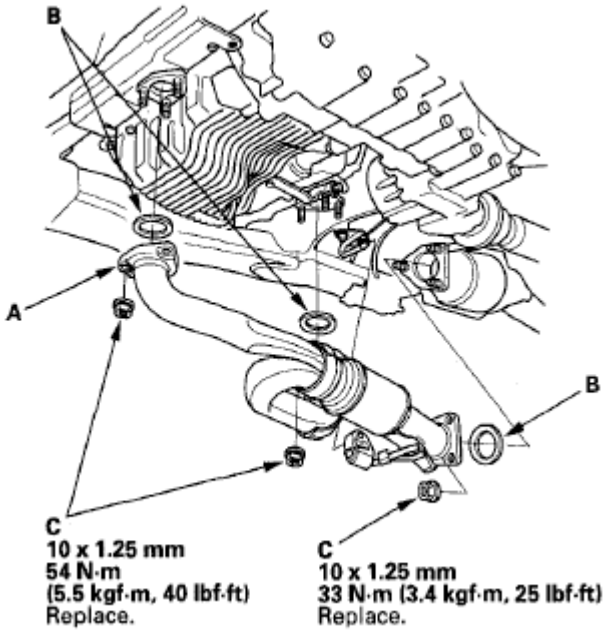

Fig. 66: Identifying Self-Locking Nuts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Install the splash shield (see step 39 under **ENGINE INSTALLATION**).
11. Refill the engine with oil (see step 4 under **ENGINE OIL LEVEL CHECK**).
12. Lower the vehicle on the lift.

PULLEY END CRANKSHAFT OIL SEAL INSTALLATION - IN CAR

Special Tools Required

Oil seal driver, 64 mm 070AD-RCAA100

1. Remove the crankshaft position (CKP) sensor, the timing belt, and the timing belt drive pulley (see **TIMING BELT DRIVE PULLEY REPLACEMENT**).
2. Remove the pulley end crankshaft oil seal.
3. Clean and dry the crankshaft oil seal housing.
4. Apply a light coat of multipurpose grease to the crankshaft and to the lip of the seal.
5. Using the seal driver, drive in the crankshaft oil seal until the driver bottoms against the oil pump. When the seal is in place, clean any excess grease off the crankshaft, and check that the oil seal lip is not distorted.

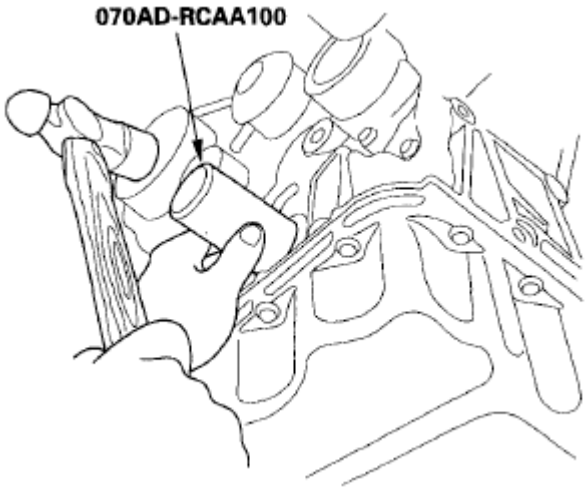

Fig. 67: Installing Crankshaft Oil Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Install the timing belt drive pulley, the timing belt, and the CKP sensor (see **TIMING BELT DRIVE PULLEY REPLACEMENT**).

TRANSMISSION END CRANKSHAFT OIL SEAL INSTALLATION - IN CAR

Special Tools Required

- Driver Handle, 15 x 135L 07749-0010000
- Driver attachment, 106 mm 070AD-RCAA200

1. Remove the transmission (see **TRANSMISSION REMOVAL**) and the drive plate (see **DRIVE PLATE REMOVAL AND INSTALLATION**).
2. Remove the transmission end crankshaft oil seal.
3. Clean and dry the crankshaft oil seal housing.
4. Apply a light coat of multipurpose grease to the crankshaft and to the lip of the seal.
5. Using the special tools, drive in the crankshaft oil seal until the driver attachment bottoms against the engine block end cover. Align the hole in the driver attachment with the pin on the crankshaft.

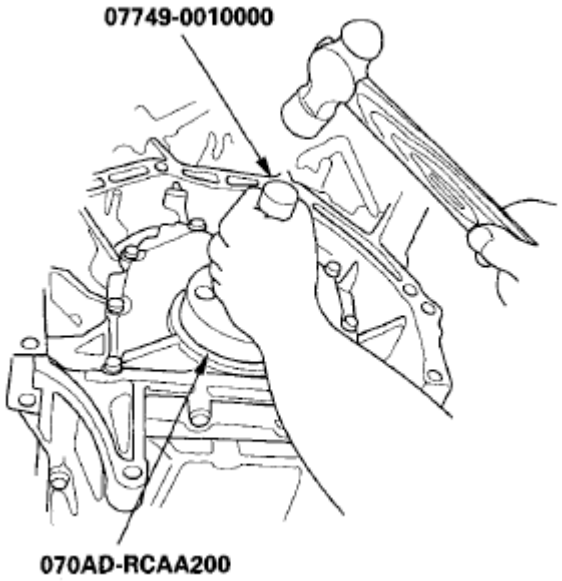

Fig. 68: Installing Pin On Crankshaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Clean any excess grease off the crankshaft, and check that the oil seal lip is not distorted.
7. Install the drive plate (see **DRIVE PLATE REMOVAL AND INSTALLATION**), and the transmission.

SEALING BOLT INSTALLATION

NOTE: When installing the sealing bolt (A), always use a new washer.

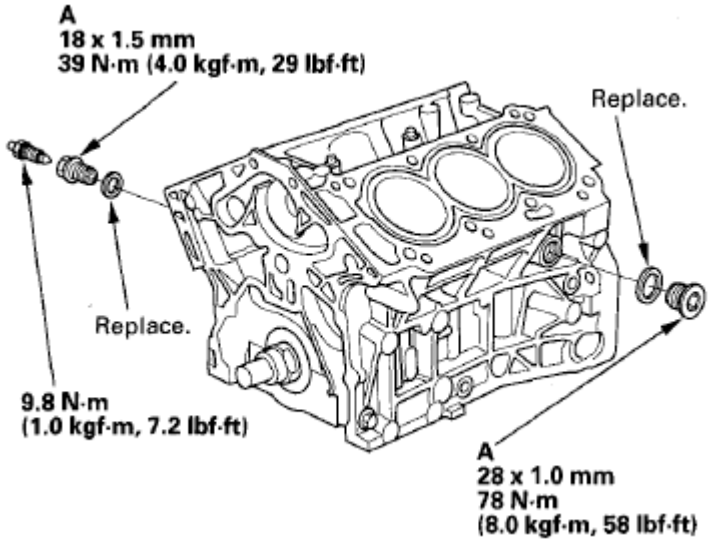

Fig. 69: Identifying Sealing Bolt With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

