**2009-12 ENGINE**

**Cylinder Head - Ridgeline**

# 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, Offset | 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 |

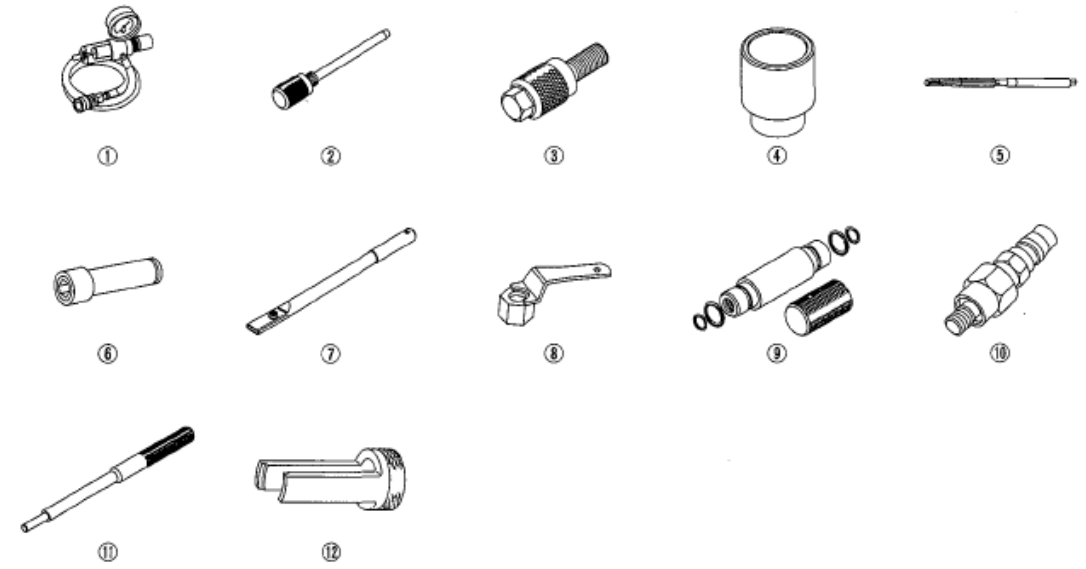


**Fig. 1: Identifying Special Tools**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

# COMPONENT LOCATION INDEX

 

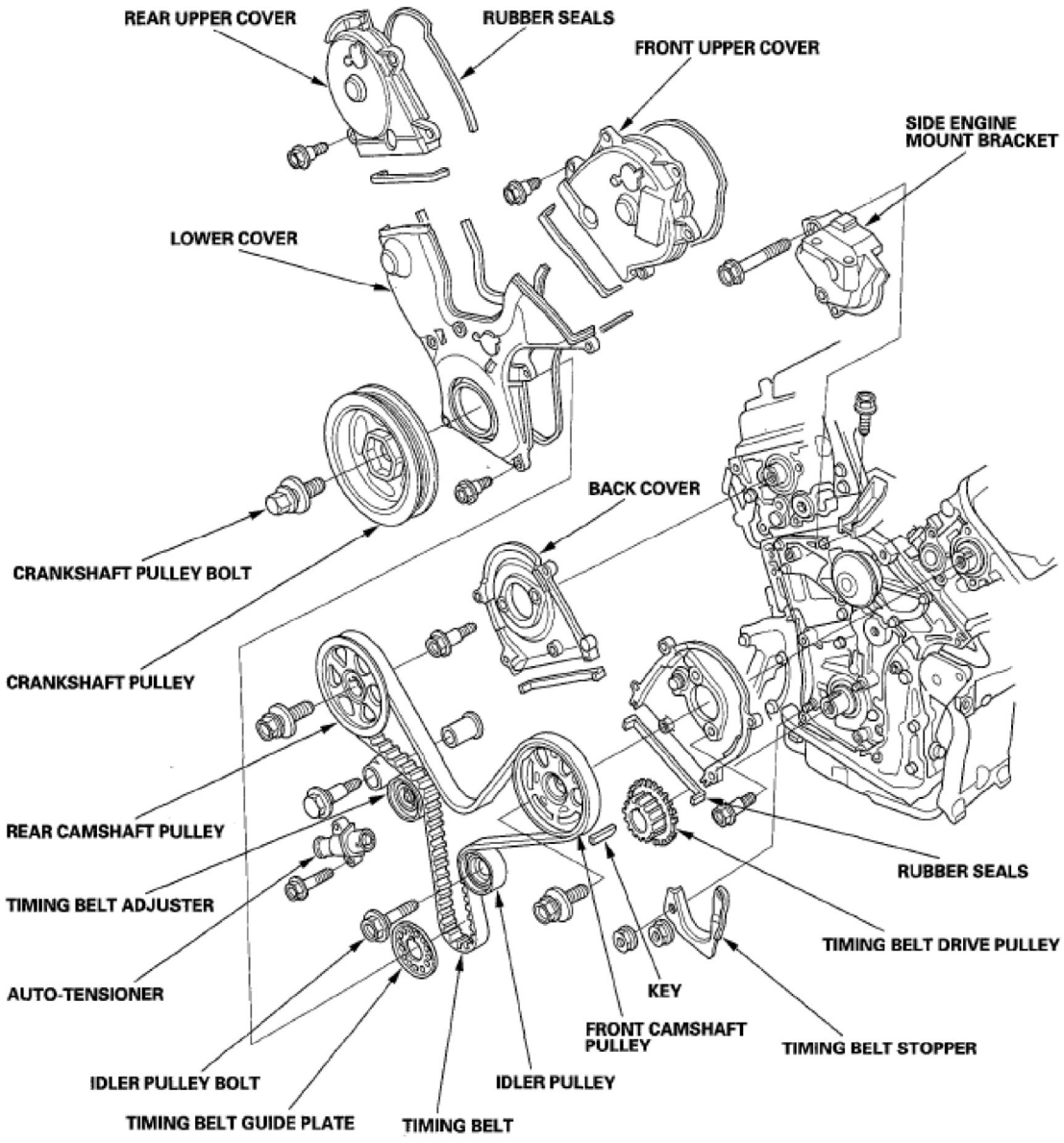


**Fig. 2: Identifying Cylinder Head Component Location (1 Of 2)**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

 

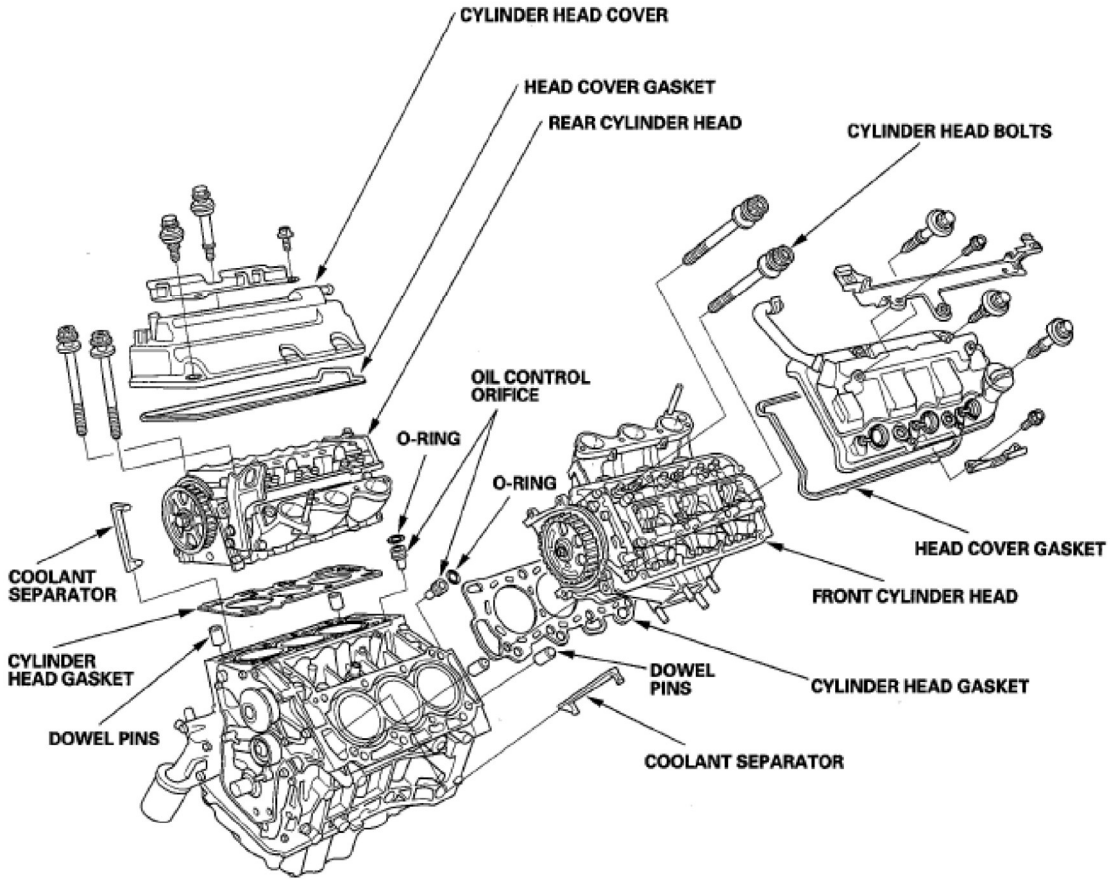


**Fig. 3: Identifying Cylinder Head Component Location (2 Of 2)**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**FRONT**

 

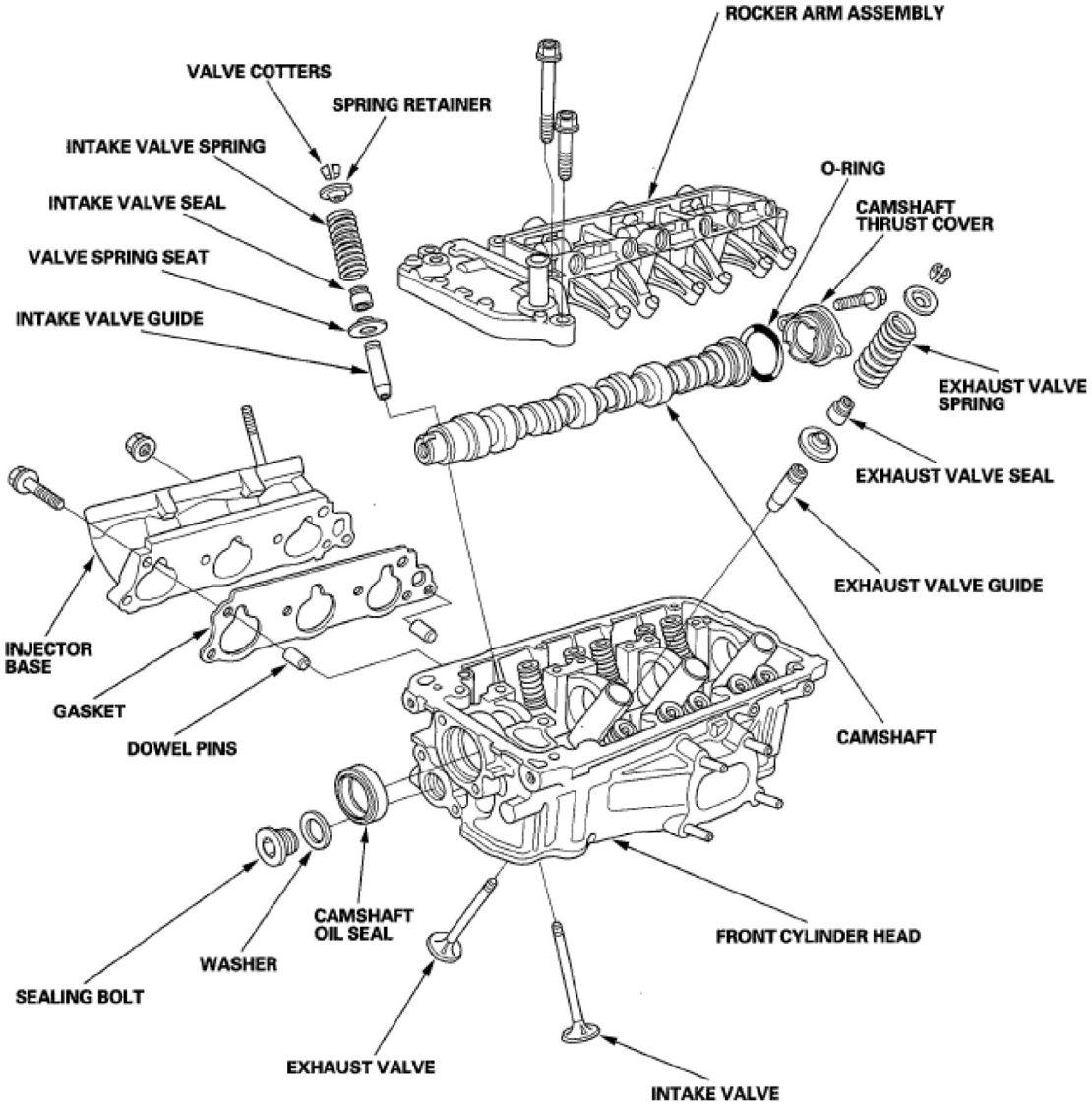


**Fig. 4: Identifying Cylinder Head Component Location - Front**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**REAR**

 

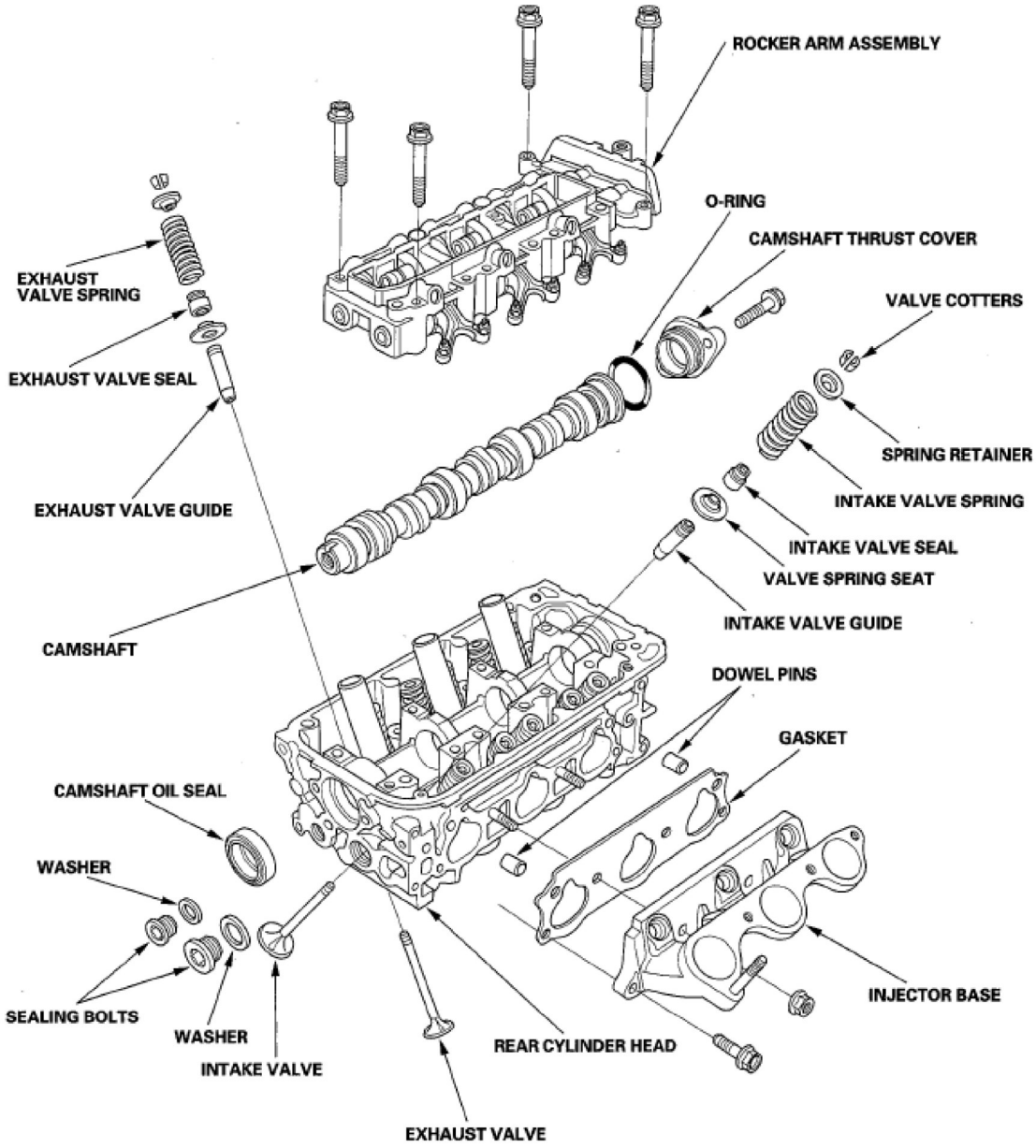


**Fig. 5: Identifying Cylinder Head Component Location - Rear**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

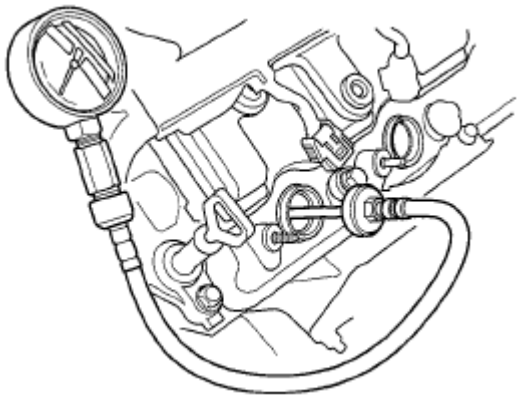

**Fig. 6: Attaching Compression Gauge To Spark Plug Hole**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

    **Compression Pressure:**

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

11. Measure the compression on the remaining cylinders.

    **Maximum Variation:**

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

12. If the compression is not within specifications, check the following items, then re-measure 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

13. Remove the compression gauge from the spark plug hole.
14. Install the six spark plugs and the six ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION** ).
15. Select PCM reset (see **HDS CLEAR COMMAND** ) in the PGM-FI INSPECTION menu to cancel the ALL INJECTORS STOP on the HDS.

## VTEC ROCKER ARM TEST

**Special Tools Required**

- VCM Air Adapter 070AJ-001A101
- VTEC Air Stop Tool A 07AAJ-R70A100
- VTEC Air Stop Tool B 07AAJ-R70A200
- Air Pressure Regulator 07AAJ-PNAA101

1. Start the engine and let it run for 5 minutes, then turn the ignition switch to LOCK (0).
2. Remove the six ignition coils and the six spark plugs (see **IGNITION COIL REMOVAL/INSTALLATION** ).
3. Remove the cylinder head covers (see **CYLINDER HEAD COVER REMOVAL**).
4. Rotate the crankshaft pulley clockwise, and visually check all the intake primary rocker arms (A) and the 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.

 

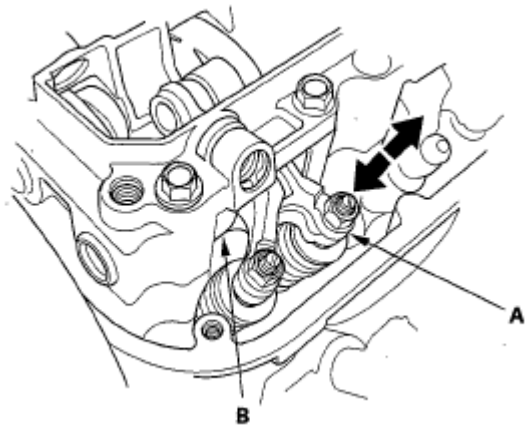


**Fig. 7: Identifying Mid, Primary, And Secondary Intake Rocker Arms**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

5. Check that the air pressure on the shop air compressor gauge indicates over 981 kPa (10.0 kgf/cm$^2$ ,142.3 psi).
6. Inspect the valve clearance (see **VALVE CLEARANCE ADJUSTMENT**).
7. Remove the sealing bolts, then install the VCM air adapter (A) and VTEC air stop tool B to the inspection hole, then connect the air pressure regulator (C) as shown.

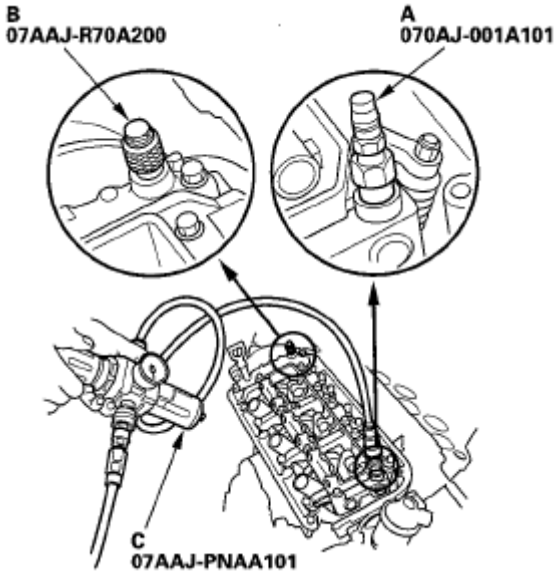


**Fig. 8: Identifying Intake Rocker Shaft Mounting Bolts - Front**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

8. Remove the sealing bolts, then install VTEC air stop tool A and the VCM air adapter (B) to the inspection hole, then connect the air pressure regulator (C) as shown.

 

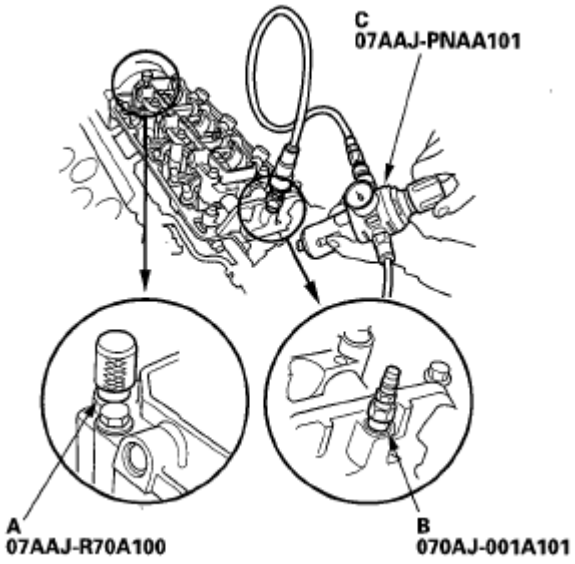


**Fig. 9: Identifying Intake Rocker Shaft Mounting Bolts - Rear**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

9. 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)**

10. With the specified air pressure applied, rotate the crankshaft pulley clockwise, and visually check all the intake primary rocker arms (A) and the 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 11.

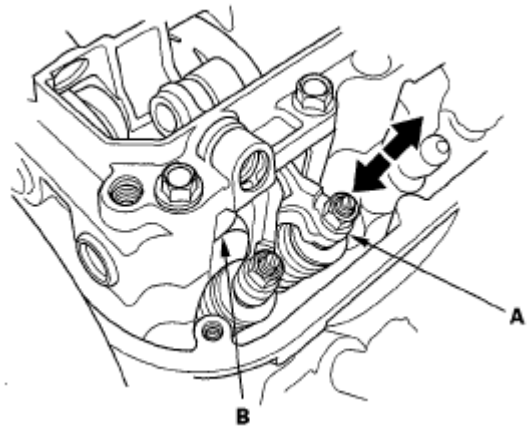


 

**Fig. 10: Identifying Intake Primary Rocker Arm And Intake Secondary Rocker Arm**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

## VALVE CLEARANCE ADJUSTMENT

**NOTE: Connect the Honda Diagnostic System (HDS) to the data link connector (DLC), and monitor the engine coolant temperature (ECT). Adjust the valves only when the cylinder head temperature is less than 100°F (38 °C).**

1. Remove the cylinder head covers (see **CYLINDER HEAD COVER REMOVAL**).
2. 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.

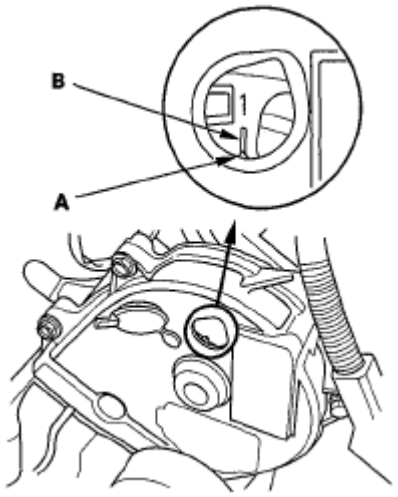


**Fig. 11: Aligning Pointer On Front Upper Cover**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

3. Select the correct 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**

 

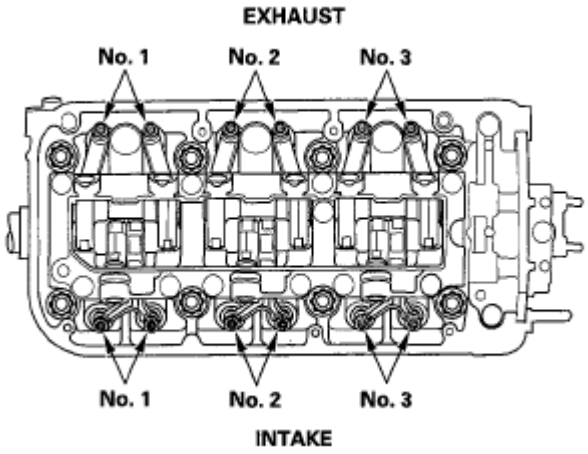


**Fig. 12: Identifying Valve Clearance - Rear**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**FRONT**

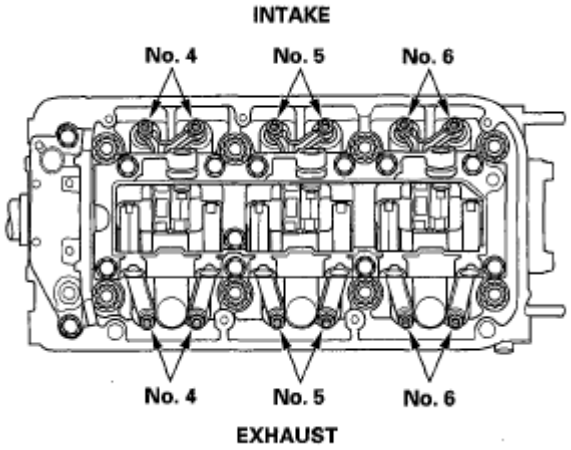


**Fig. 13: Identifying Valve Clearance - Front**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

4. 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**

 

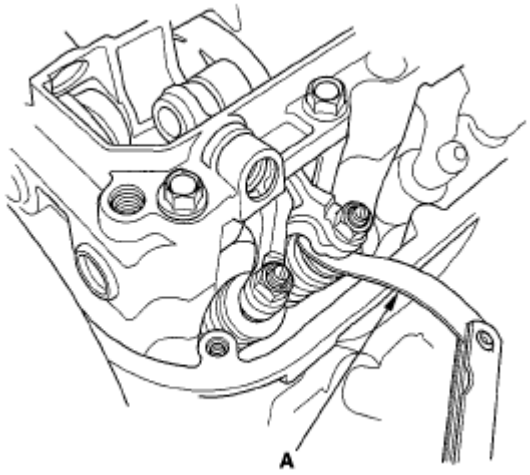


**Fig. 14: Inserting Feeler Gauge Between Adjusting Screw And End Of Valve Stem - Intake**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**EXHAUST**

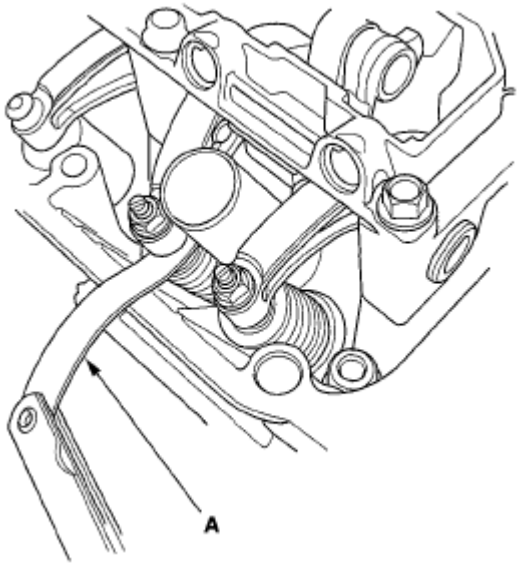


**Fig. 15: Inserting Feeler Gauge Between Adjusting Screw And End Of Valve Stem - Exhaust**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

5. 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**

 

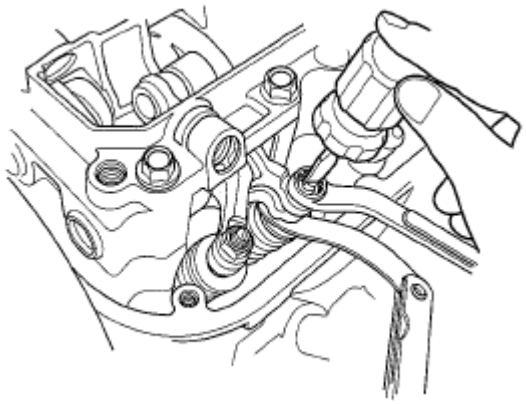

**Fig. 16: Turning Adjusting Screw - Intake**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**EXHAUST**

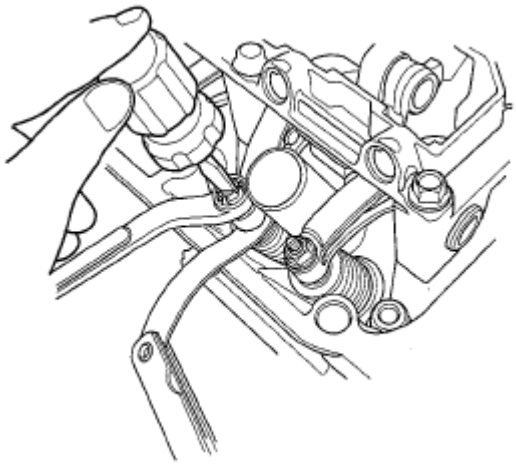

**Fig. 17: Turning Adjusting Screw - Exhaust**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

   **Specified Torque**

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

   **Apply new engine oil to the nut threads.**

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

   **Apply new engine oil to the nut threads.**

 

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

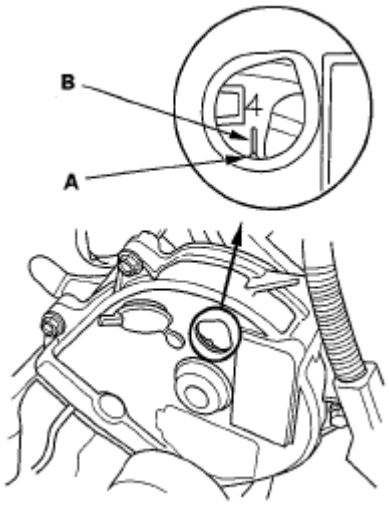


**Fig. 18: Aligning Pointer On Front Upper Cover**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

8. Check and, if necessary, adjust the valve clearance on the No. 4 cylinder.
9. 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.

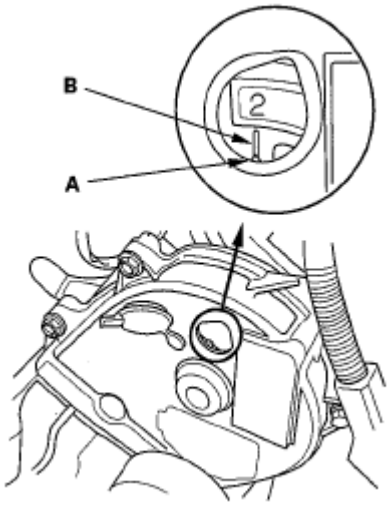


**Fig. 19: Aligning Pointer On Front Upper Cover**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

10. Check and, if necessary, adjust the valve clearance on the No. 2 cylinder.
11. 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.

 

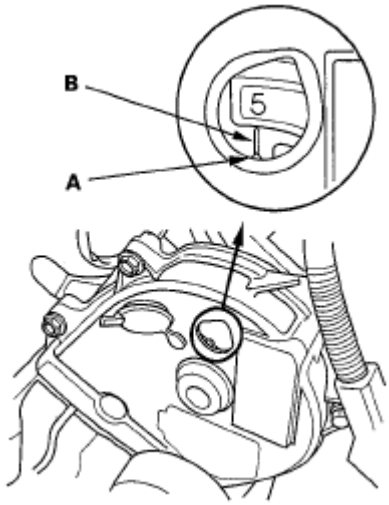


**Fig. 20: Aligning Pointer On Front Upper Cover**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

12. Check and, if necessary, adjust the valve clearance on the No. 5 cylinder.
13. 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.

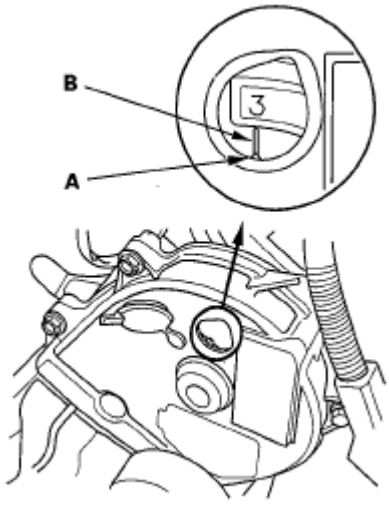


**Fig. 21: Aligning Pointer On Front Upper Cover**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

14. Check and, if necessary, adjust the valve clearance on the No. 3 cylinder.
15. 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.

 

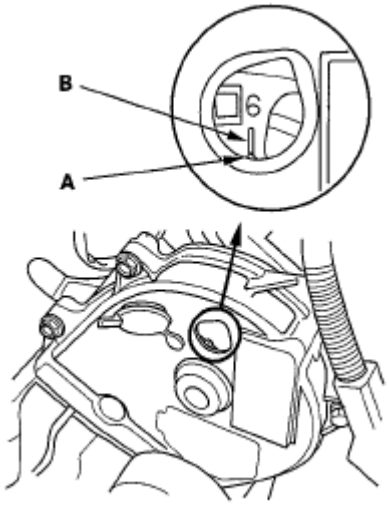


**Fig. 22: Aligning Pointer On Front Upper Cover With No. 6 Piston TDC Mark**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

16. Check and, if necessary, adjust the valve clearance on the No. 6 cylinder.
17. 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

**REMOVAL**

1. Raise the vehicle on the lift.
2. Remove the right front wheel.
3. Remove the front splash shield (see **FRONT SPLASH SHIELD REPLACEMENT** ).
4. Remove the drive belt (see **DRIVE BELT INSPECTION** ).
5. Hold the pulley with the holder handle (A) and the holder attachment, 50 mm, offset (B).

 

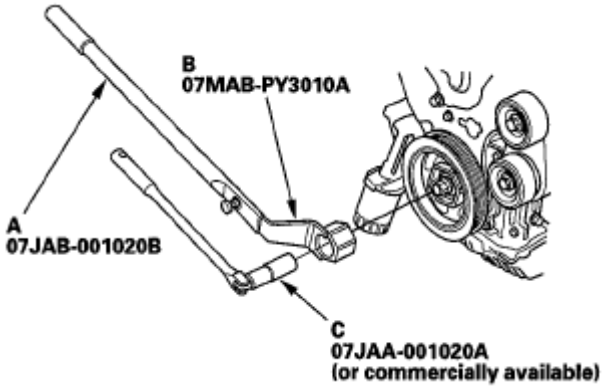


**Fig. 23: Holding Pulley With Holder Handle And Holder**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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 crankshaft pulley (A), the timing belt guide plate (B), the timing belt drive pulley (C), the crankshaft (D), the crankshaft pulley bolt (E), and the washer (F). Lubricate with new engine oil as shown.

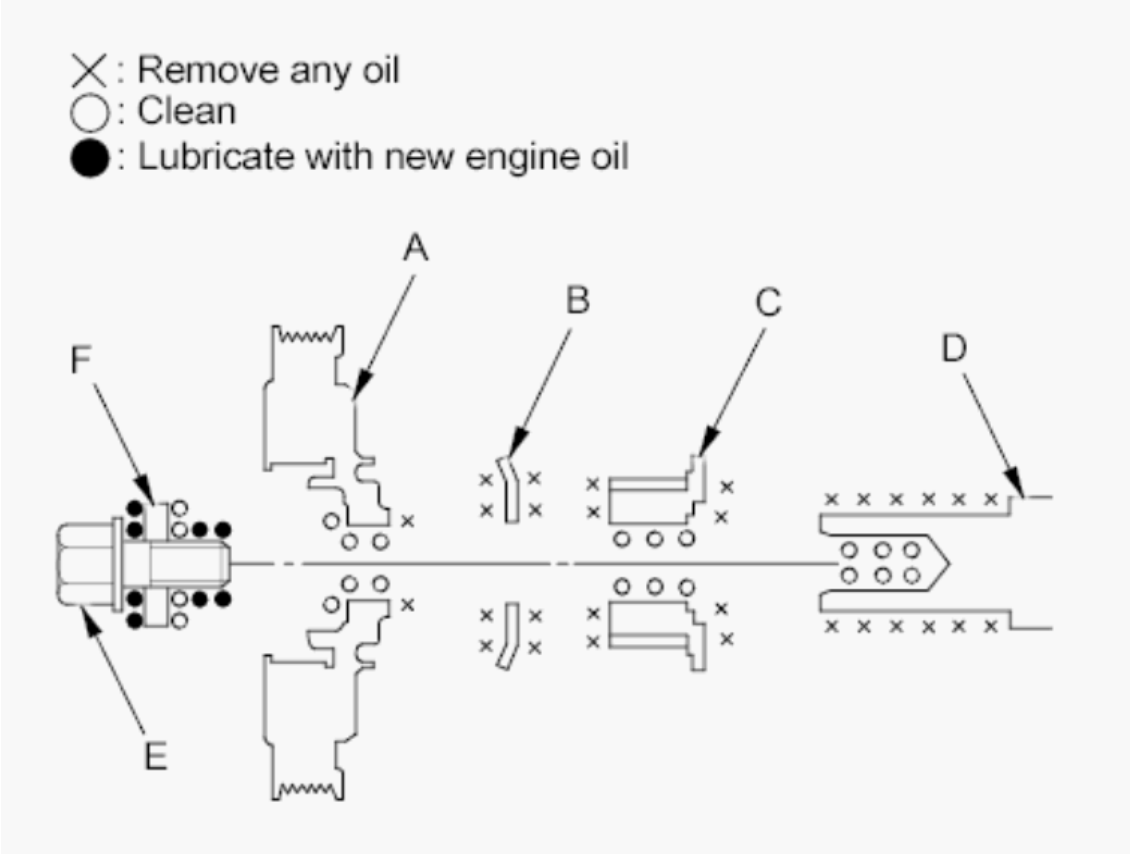


 

**Fig. 24: Identifying Pulleys, Crankshaft, Bolt And Washer**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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 65 N.m (6.6 kgf.m, 48 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).

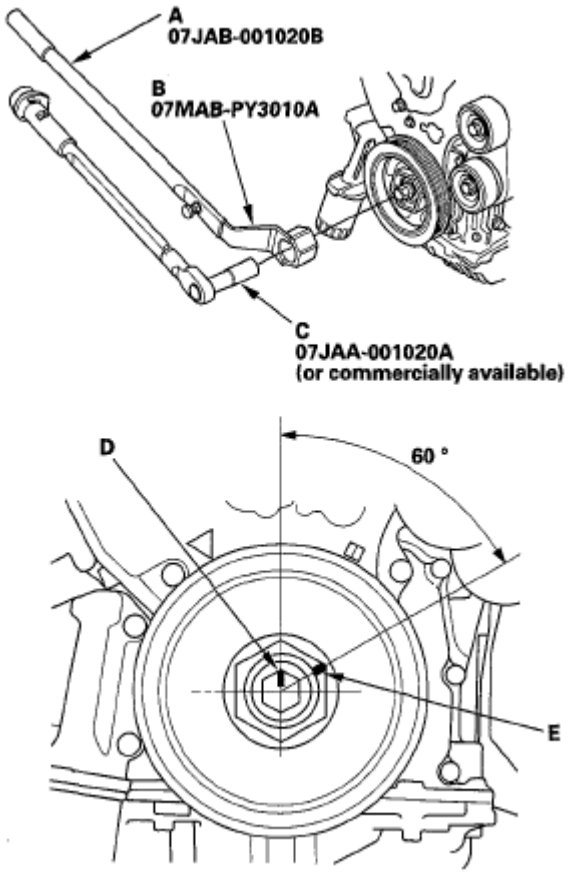


**Fig. 25: Holding Pulley With Holder Handle And Holder Attachment**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

## TIMING BELT INSPECTION

1. Remove the drive belt (see **DRIVE BELT INSPECTION** ).
2. Remove the front upper cover.

 

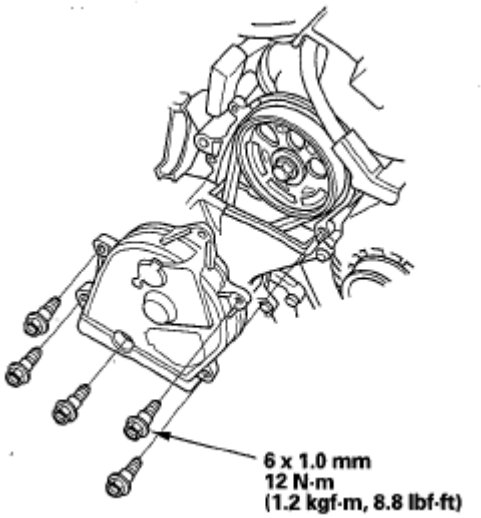


**Fig. 26: Identifying Front Upper Cover And Bolt With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

3. 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.

**NOTE: If there is any leakage, repair them before replacing the timing belt.**

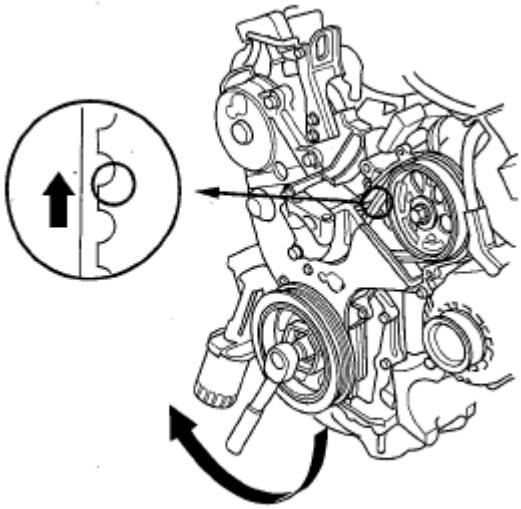

**Fig. 27: Inspecting Timing Belt For Cracks**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

## TIMING BELT REMOVAL

1. Turn the crankshaft so its white mark (A) lines up with the pointer (B).

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

 

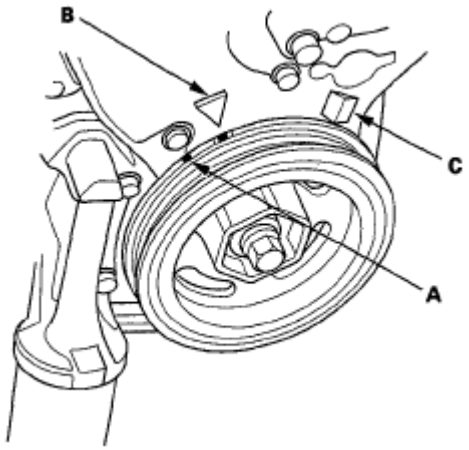


**Fig. 28: Identifying Mark On Pulley**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

2. 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.**

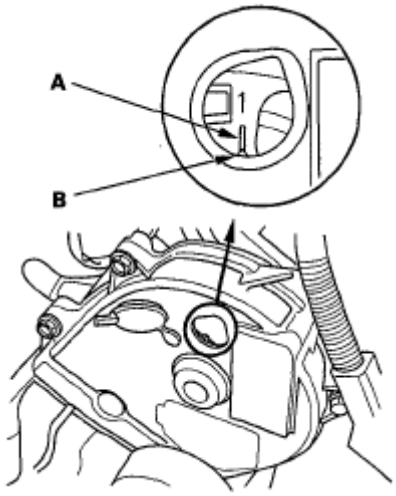


**Fig. 29: Checking No. 1 Piston Top Dead Center Mark On Front Camshaft Pulley**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

3. Raise the vehicle on the lift, then remove the right front wheel.
4. Remove the front splash shield (see **FRONT SPLASH SHIELD REPLACEMENT** ).
5. Remove the drive belt auto-tensioner (see **DRIVE BELT AUTO-TENSIONER REPLACEMENT** ).
6. Lift and support the engine with a jack and a wood block under the oil pan.
7. Remove the ground cable (A), then remove the upper half of the side engine mount bracket (B).

 

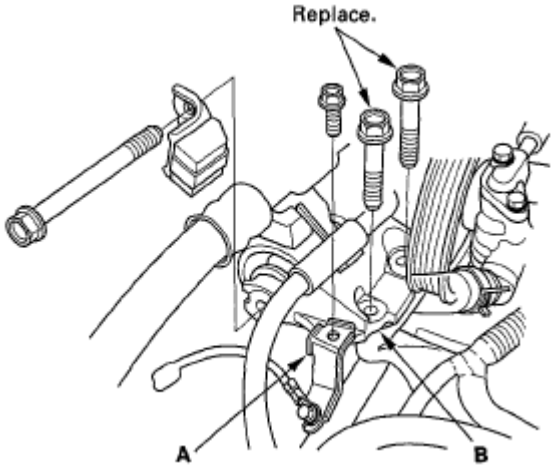


**Fig. 30: Identifying Side Engine Mount Bracket And Ground Cable**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

8. Remove the crankshaft pulley (see **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
9. Remove the front upper cover (A) and the rear upper cover (B).

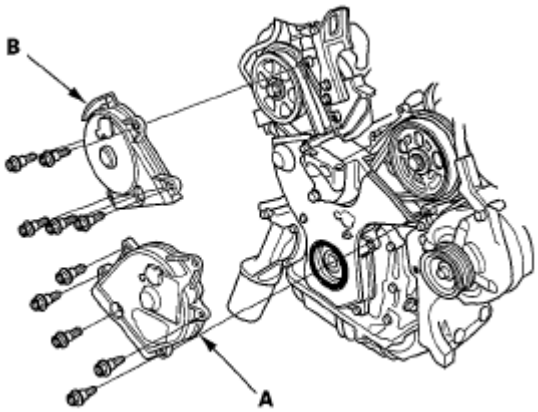


**Fig. 31: Identifying Front Upper Cover And Rear Upper Cover**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

10. Remove the lower cover.

 

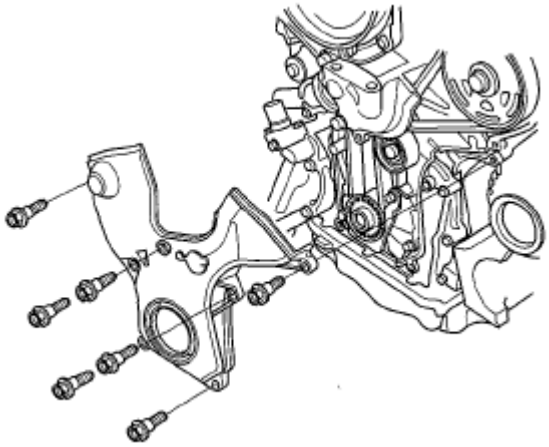

**Fig. 32: Identifying Lower Cover And Bolts**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

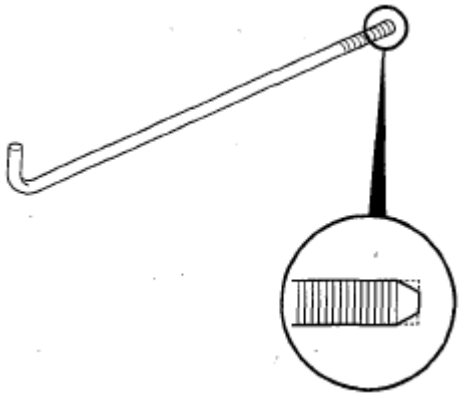

**Fig. 33: Identifying Battery Clamp Bolts**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

12. 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.

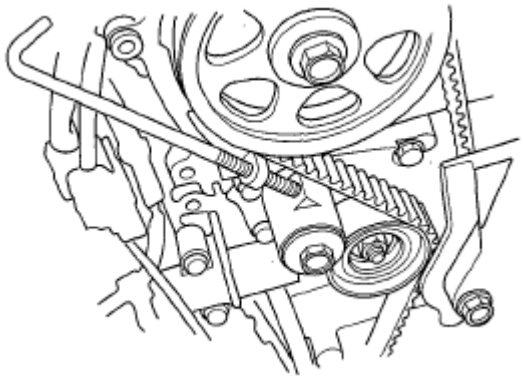

 

**Fig. 34: Identifying Battery Clamp Bolt**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

13. Remove the timing belt guide plate (A).

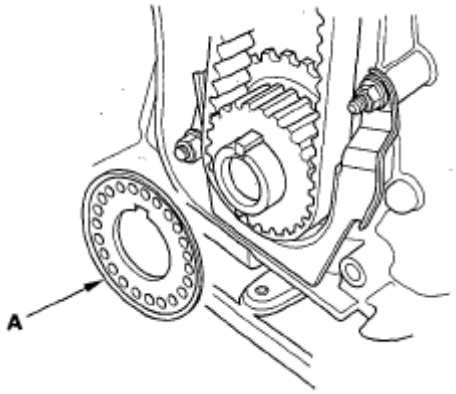


**Fig. 35: Identifying Timing Belt Guide Plate**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

14. Remove the lower half of the side engine mount bracket.

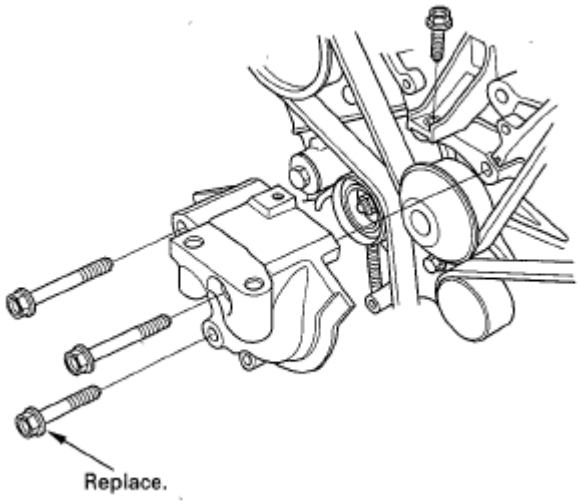


**Fig. 36: Identifying Lower Half Of Side Engine Mount Bracket**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

 

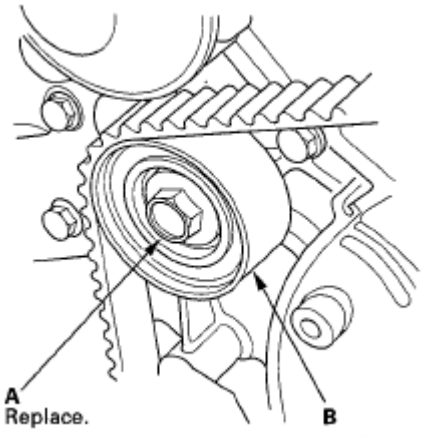


**Fig. 37: Identifying Idler Pulley Bolt And Idler Pulley**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

## TIMING BELT INSTALLATION

**NOTE: The following procedure is for installing a used timing belt. If you are installing a new belt, refer to the timing belt replacement procedure (see 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.

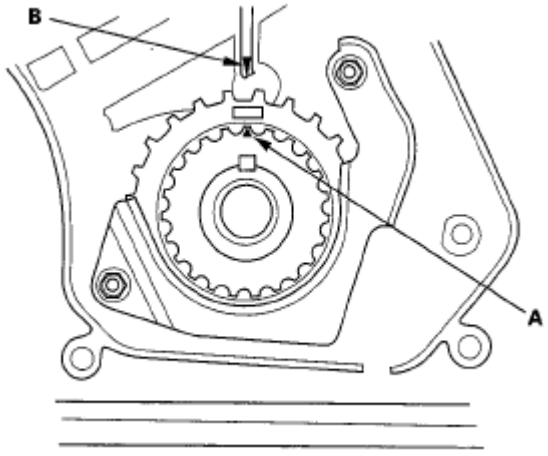


**Fig. 38: Aligning TDC Mark On Tooth Of Timing Belt Drive Pulley**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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**

 

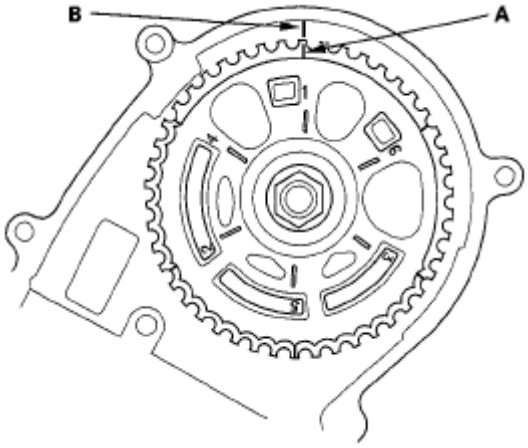


**Fig. 39: Aligning TDC Marks On Camshaft Pulleys With Pointers On Back Covers - Front**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**REAR**

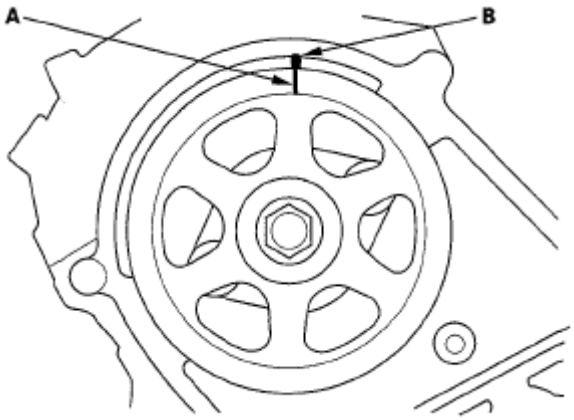


**Fig. 40: Aligning TDC Marks On Camshaft Pulleys With Pointers On Back Covers - Rear**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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, do 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 during installation.
    -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)

 

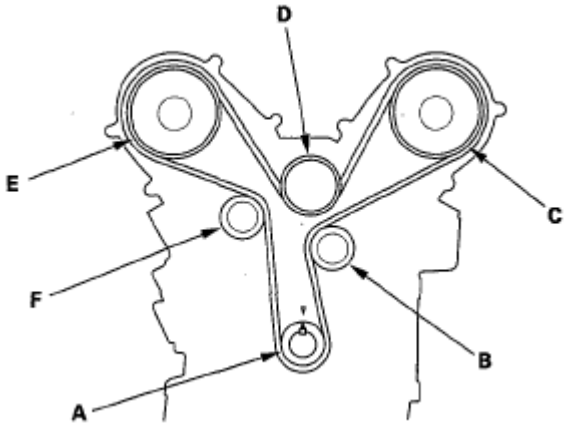


**Fig. 41: Timing Belt Routing Diagram**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

7. Tighten the idler pulley bolt.

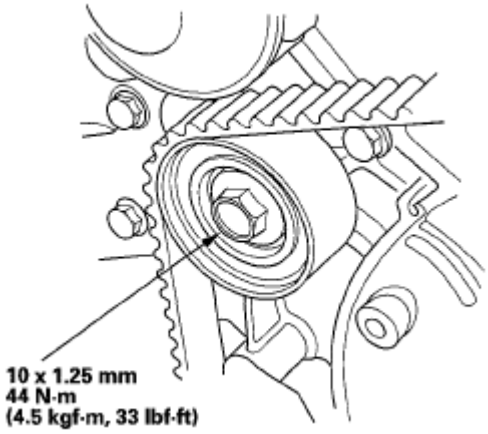


**Fig. 42: Identifying Idler Pulley Bolt With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

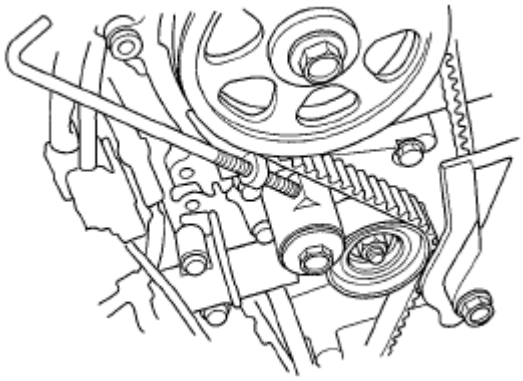

 

**Fig. 43: Identifying Battery Clamp Bolt**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

9. Install the lower half of the side engine mount bracket.

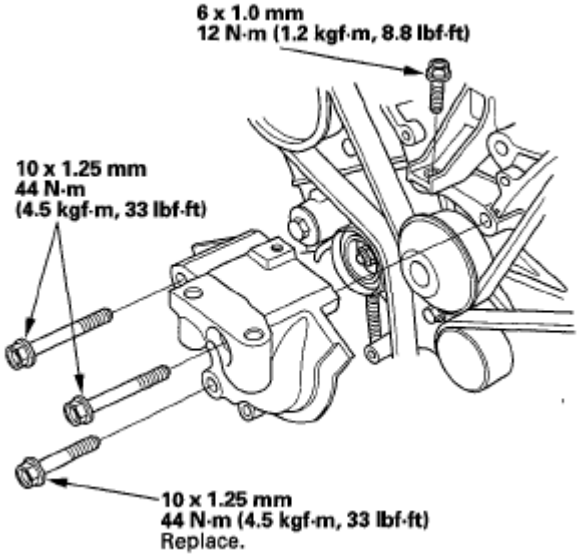


**Fig. 44: Identifying Lower Half Of Side Engine Mount Bracket With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

10. Install the timing belt guide plate as shown.

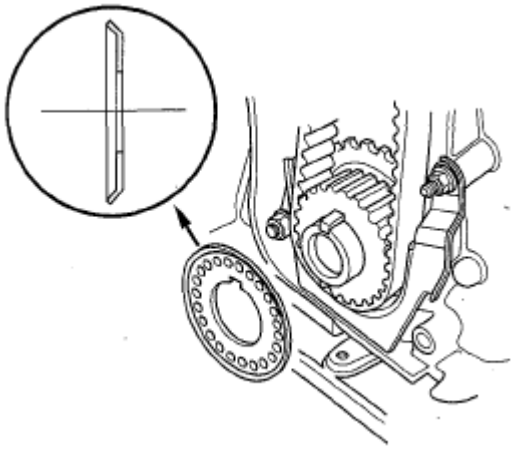

**Fig. 45: Identifying Timing Belt Guide Plate**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

11. Install the lower cover.

 

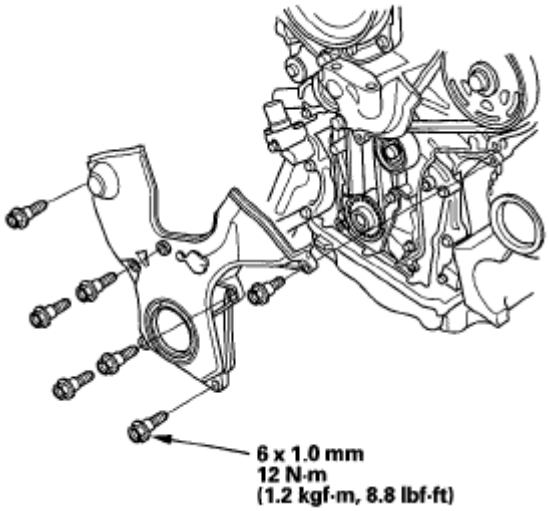


**Fig. 46: Identifying Lower Cover With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

12. Install the front upper cover (A) and the rear upper cover (B).

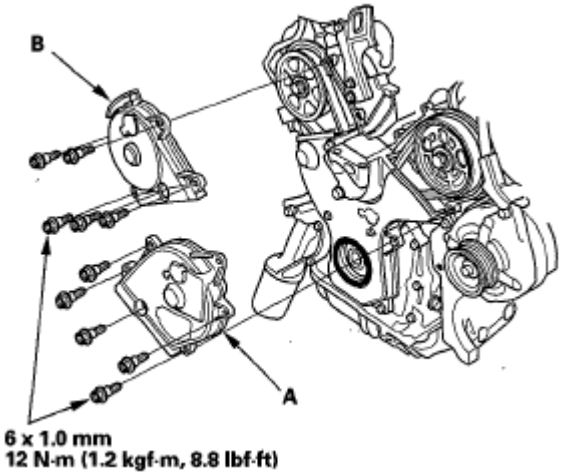


**Fig. 47: Identifying Front Upper Cover And Rear Upper Cover With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

13. Install the crankshaft pulley (see **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
14. Rotate the crankshaft pulley about six turns clockwise so the timing belt positions itself on the pulleys.
15. Turn the crankshaft pulley so its white mark (A) lines up with the pointer (B).

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

 

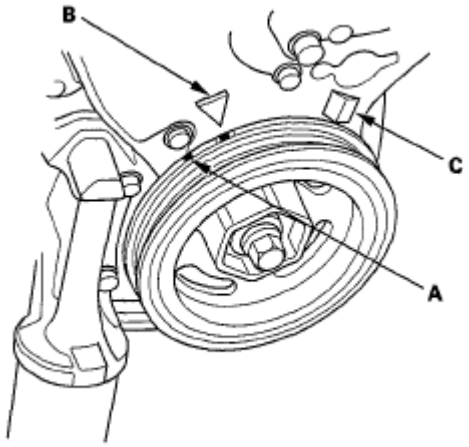


**Fig. 48: Aligning Timing Mark**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

16. Check the camshaft pulley marks.

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

- 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**

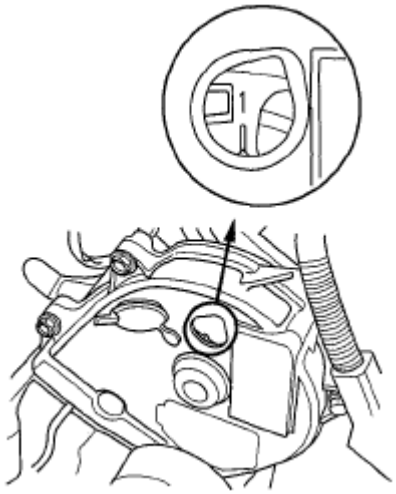

**Fig. 49: Identifying Camshaft Pulley Marks - Front**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**REAR**

 

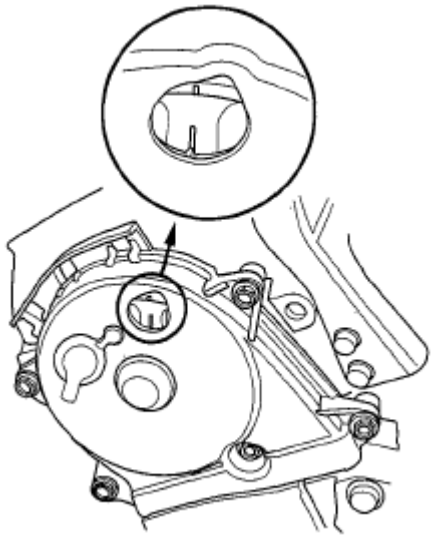

**Fig. 50: Identifying Camshaft Pulley Marks - Rear**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

17. Loosely install the upper half of the side engine mount bracket (A), then install the ground cable bracket (B).

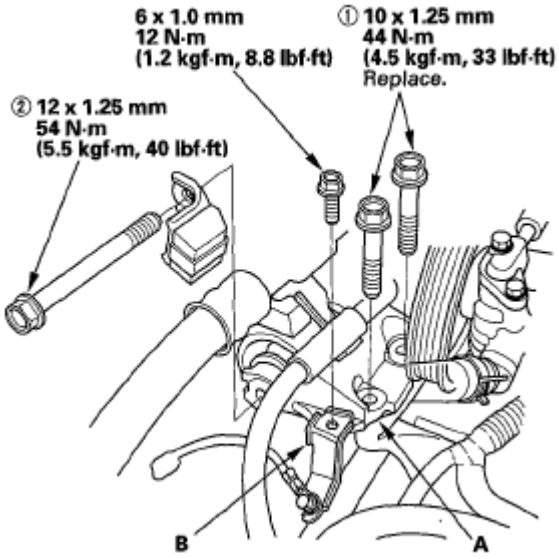


**Fig. 51: Identifying Upper Half Of Side Engine Mount Bracket With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

18. Remove the jack and the wood block.
19. Tighten the mounting bolts in the numbered sequence shown.
20. Install the drive belt auto-tensioner (see **DRIVE BELT AUTO-TENSIONER REPLACEMENT** ).
21. Install the front splash shield (see **FRONT SPLASH SHIELD REPLACEMENT** ).
22. Install the right front wheel.

 

23. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **CKP PATTERN CLEAR/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 the timing belt installation procedure (see 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.

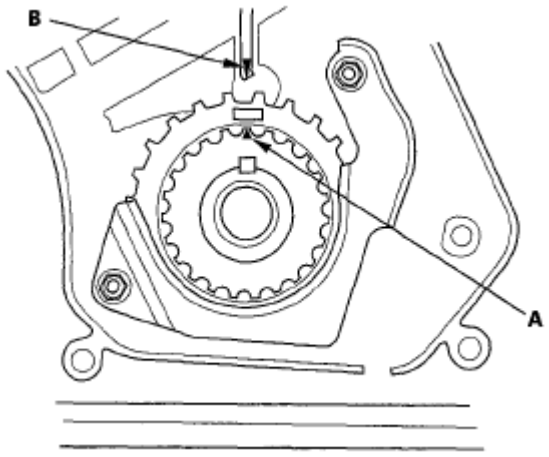


**Fig. 52: Aligning TDC Mark On Tooth Of Timing Belt Drive Pulley**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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**

 

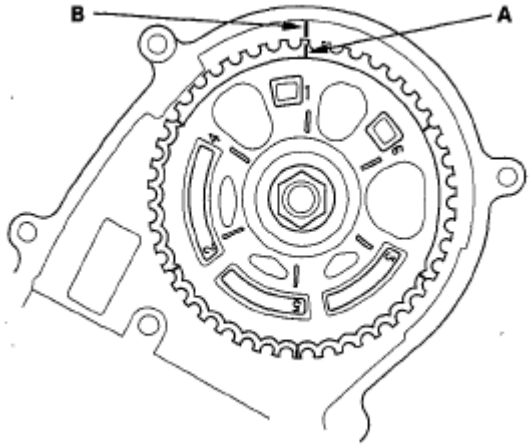


**Fig. 53: Aligning TDC Marks On Camshaft Pulleys - Front**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**REAR**

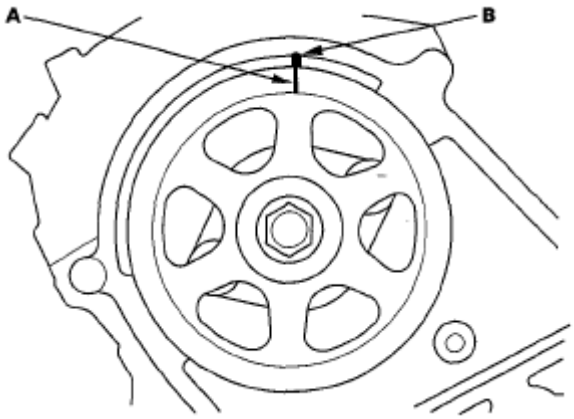


**Fig. 54: Aligning TDC Marks On Camshaft Pulleys - Rear**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

 

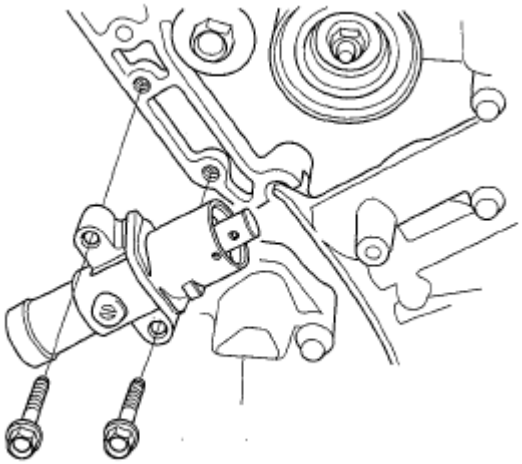

**Fig. 55: Identifying Battery Clamp Bolt And Auto-Tensioner**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

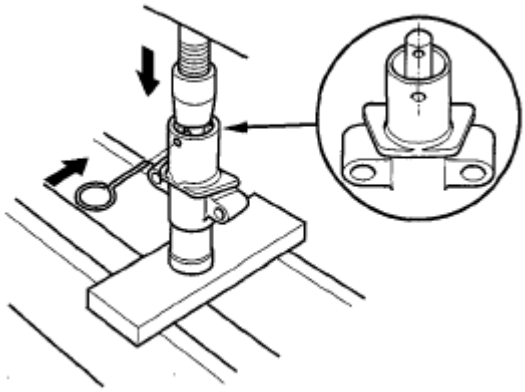

**Fig. 56: Aligning Holes On Rod And Housing Of Auto-Tensioner**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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.**

 

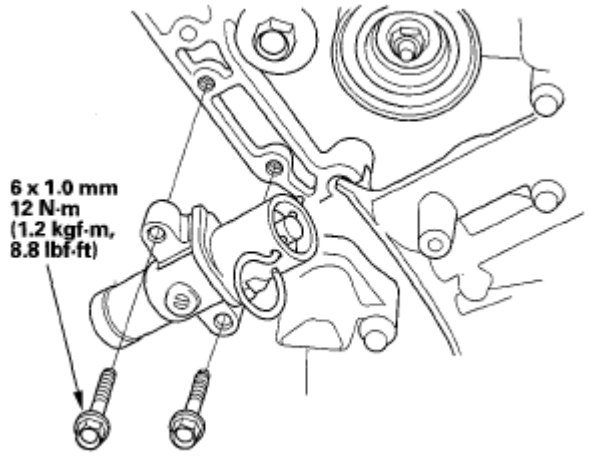


**Fig. 57: Identifying Auto-Tensioner With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

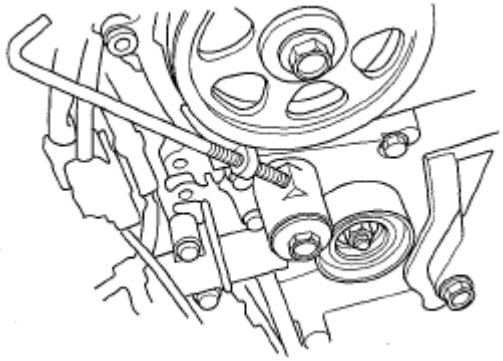

**Fig. 58: Identifying Battery Clamp Bolt**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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)

 

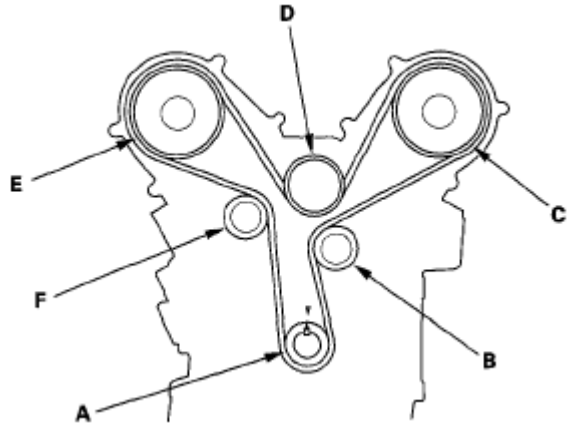


**Fig. 59: Timing Belt Routing Diagram**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

13. Tighten the idler pulley bolt.

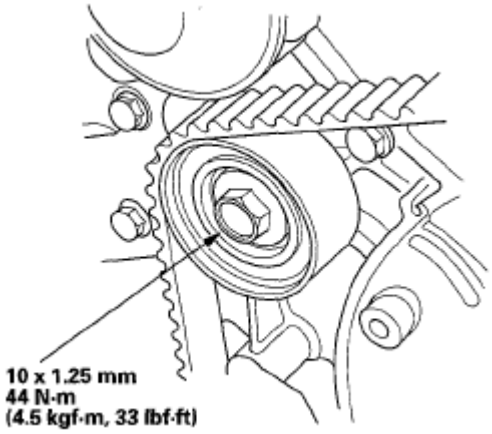


**Fig. 60: Identifying Idler Pulley Bolt With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

14. Remove the pin from the auto-tensioner.

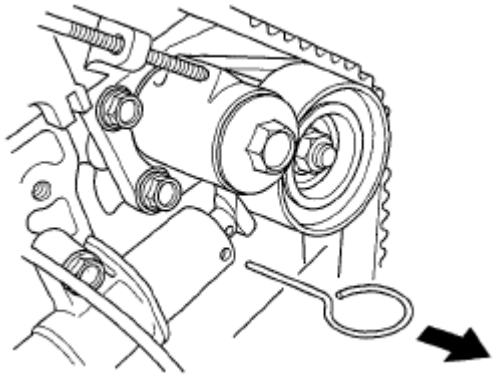

 

**Fig. 61: Identifying Auto-Tensioner Pin**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

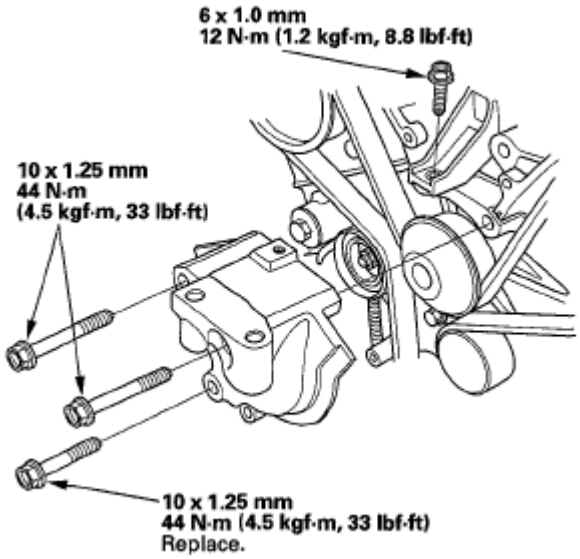


**Fig. 62: Identifying Lower Half Of Side Engine Mount Bracket With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

17. Install the timing belt guide plate as shown.

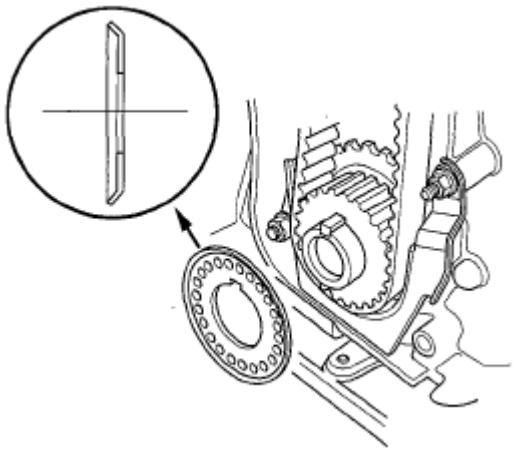

**Fig. 63: Identifying Timing Belt Guide Plate**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

18. Install the lower cover.

 

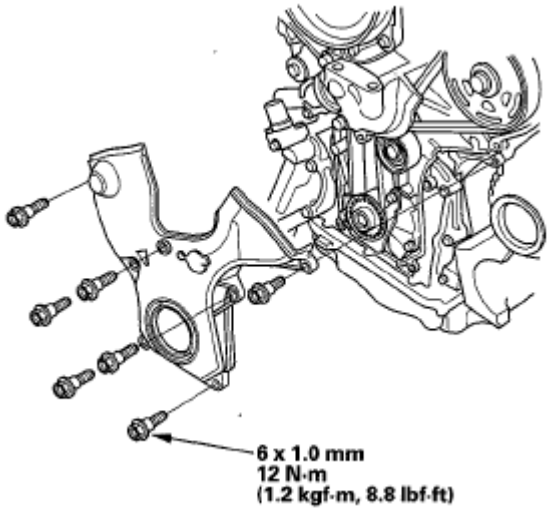


**Fig. 64: Identifying Lower Cover With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

19. Install the front upper cover (A) and the rear upper cover (B).

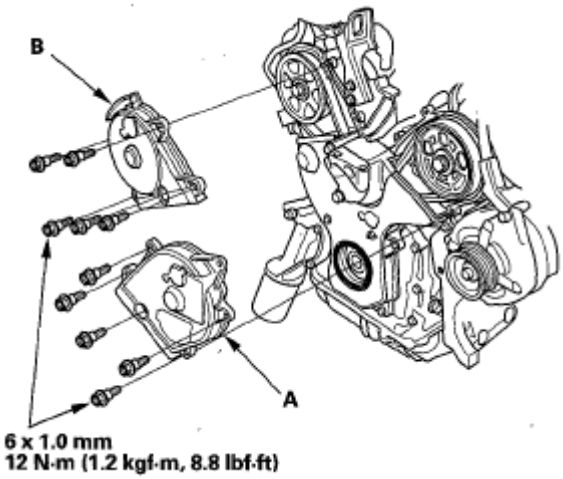


**Fig. 65: Identifying Front Upper Cover And Rear Upper Cover With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

20. Install the crankshaft pulley (see **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
21. Rotate the crankshaft pulley about six turns clockwise so the timing belt positions itself on the pulleys.
22. Turn the crankshaft pulley so its white mark (A) lines up with the pointer (B).

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

 

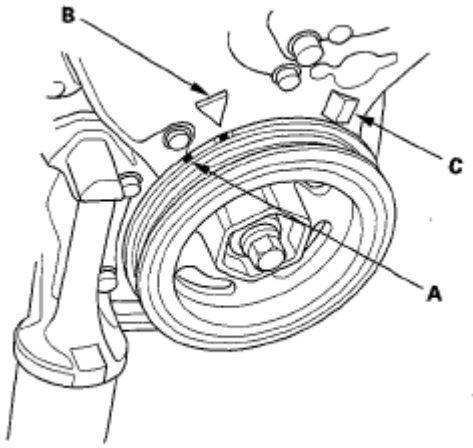


**Fig. 66: Aligning Timing Marks**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

23. Check the camshaft pulley marks.

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

- 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**

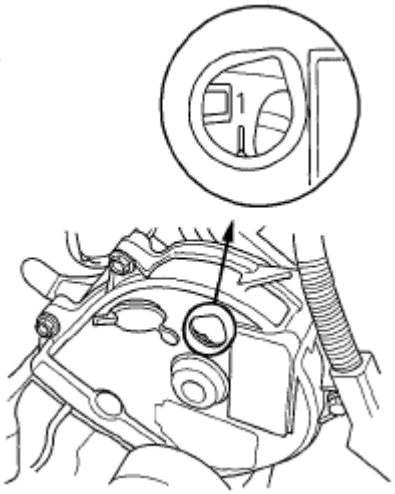

**Fig. 67: Identifying Camshaft Pulley Marks - Front**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**REAR**

 

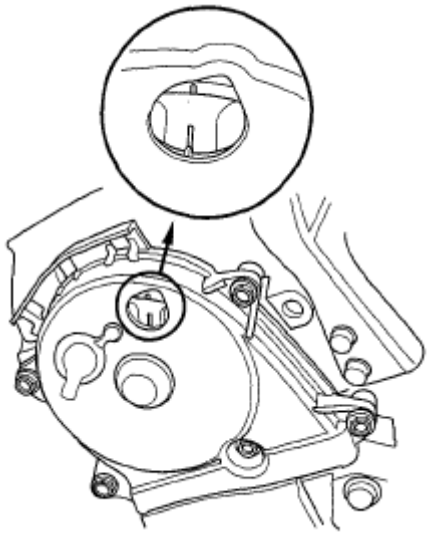

**Fig. 68: Identifying Camshaft Pulley Marks - Rear**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

24. Loosely install the upper half of the side engine mount bracket (A), then install the ground cable bracket (B).

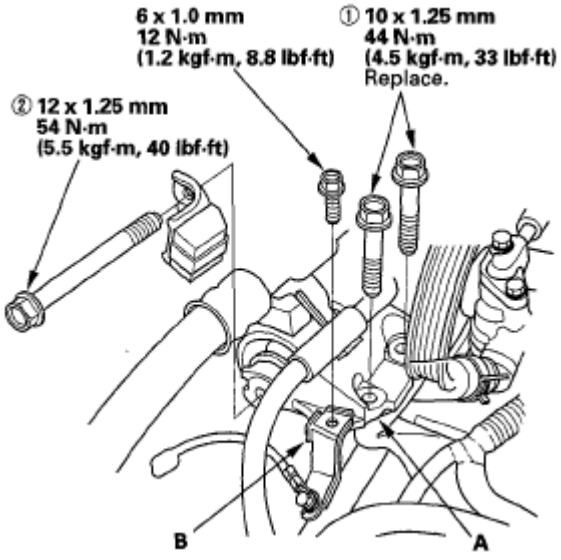


**Fig. 69: Identifying Upper Half Of Side Engine Mount Bracket And Mounting Bolts With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

25. Remove the jack and the wood block.
26. Tighten the mounting bolts in the numbered sequence shown.
27. Install the drive belt auto-tensioner (see **DRIVE BELT AUTO-TENSIONER REPLACEMENT** ).
28. Install the front splash shield (see **FRONT SPLASH SHIELD REPLACEMENT** ).

 

29. Install the right front wheel.
30. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **CKP PATTERN CLEAR/CKP PATTERN LEARN** ).

## 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 on **TIMING BELT REPLACEMENT**).
4. Remove the bolt (A), then remove the timing belt adjuster (B) and the collar (C).

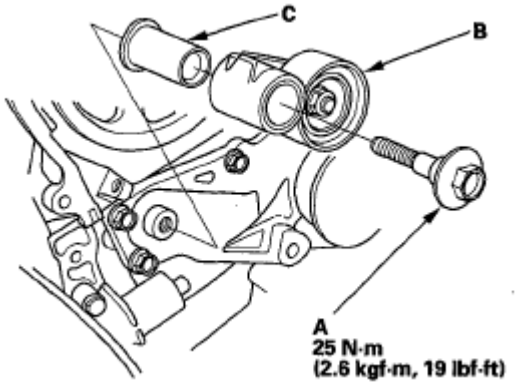


**Fig. 70: Identifying Timing Belt Adjuster, Collar And Bolts With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

5. Install the timing belt adjuster in the reverse order of removal.
6. Install the timing belt (see **TIMING BELT REPLACEMENT**).

## TIMING BELT DRIVE PULLEY REPLACEMENT

1. Remove the timing belt (see **TIMING BELT REMOVAL**).
2. Remove the timing belt stopper (A), then remove the timing belt drive pulley (B) and the key (C).

 

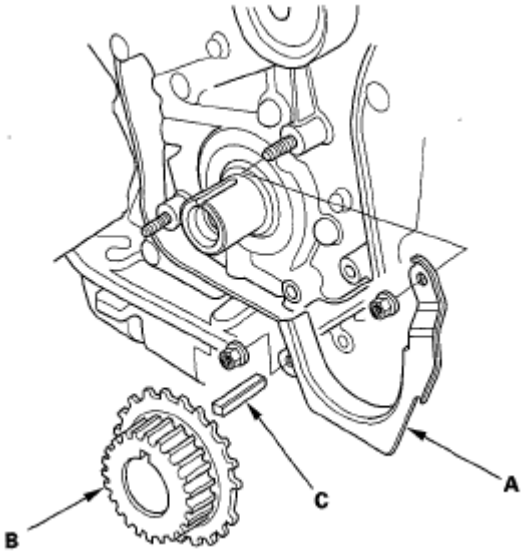


**Fig. 71: Identifying Timing Belt Stopper And Timing Belt Drive Pulley**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

3. Inspect the timing belt drive pulley and the key for damage. If it is cracked or damaged, replace the timing belt drive pulley and the key.
4. Install the new timing belt drive pulley and the key, then install the timing belt stopper.
5. Install the timing belt (see **TIMING BELT INSTALLATION**).
6. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **CKP PATTERN CLEAR/CKP PATTERN LEARN** ).

## CYLINDER HEAD COVER REMOVAL

**FRONT**

1. Remove the intake manifold (see **INTAKE MANIFOLD REMOVAL AND INSTALLATION** ).
2. Remove the three ignition coils from the front cylinder head (see **IGNITION COIL REMOVAL/INSTALLATION** ).
3. Disconnect the EGR valve connector (A), the ECT sensor 1 connector (B), the front secondary HO2S connector (C) and the front A/F sensor connector (D). Then remove the harness clamp (E) securing the harness holder.

 

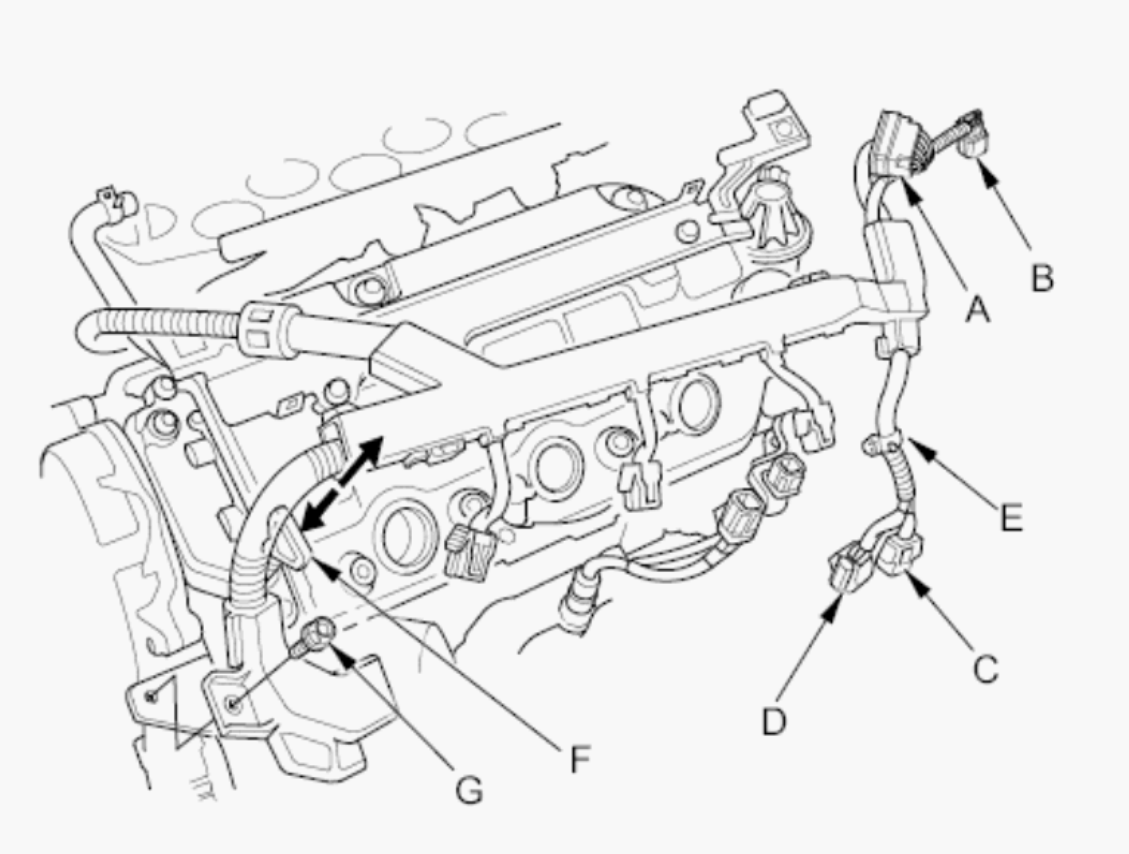


**Fig. 72: Identifying Ignition Coils Connectors, Harness Clamp And Harness Holders**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

4. Remove the dipstick (F), and the harness holder mounting bolt (G) securing the harness holder.
5. Remove the front cylinder head cover.

 

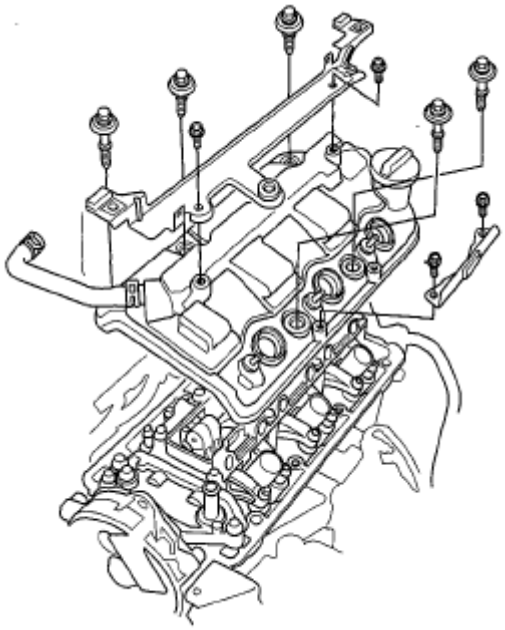

**Fig. 73: Identifying Front Cylinder Head Cover And Clips**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**REAR**

1. Remove the intake manifold (see **INTAKE MANIFOLD REMOVAL AND INSTALLATION** ).
2. Remove the three ignition coils from the rear cylinder head (see **IGNITION COIL REMOVAL/INSTALLATION** ).
3. Remove the drive belt (see **DRIVE BELT INSPECTION** ).
4. Remove the bolt securing the power steering (P/S) hose bracket and the P/S pump without disconnecting the P/S hoses (see step 5 on **CYLINDER HEAD REMOVAL**).
5. Remove the harness holder mounting bolts (A), the ground cable (B), and the breather hose (C).

 

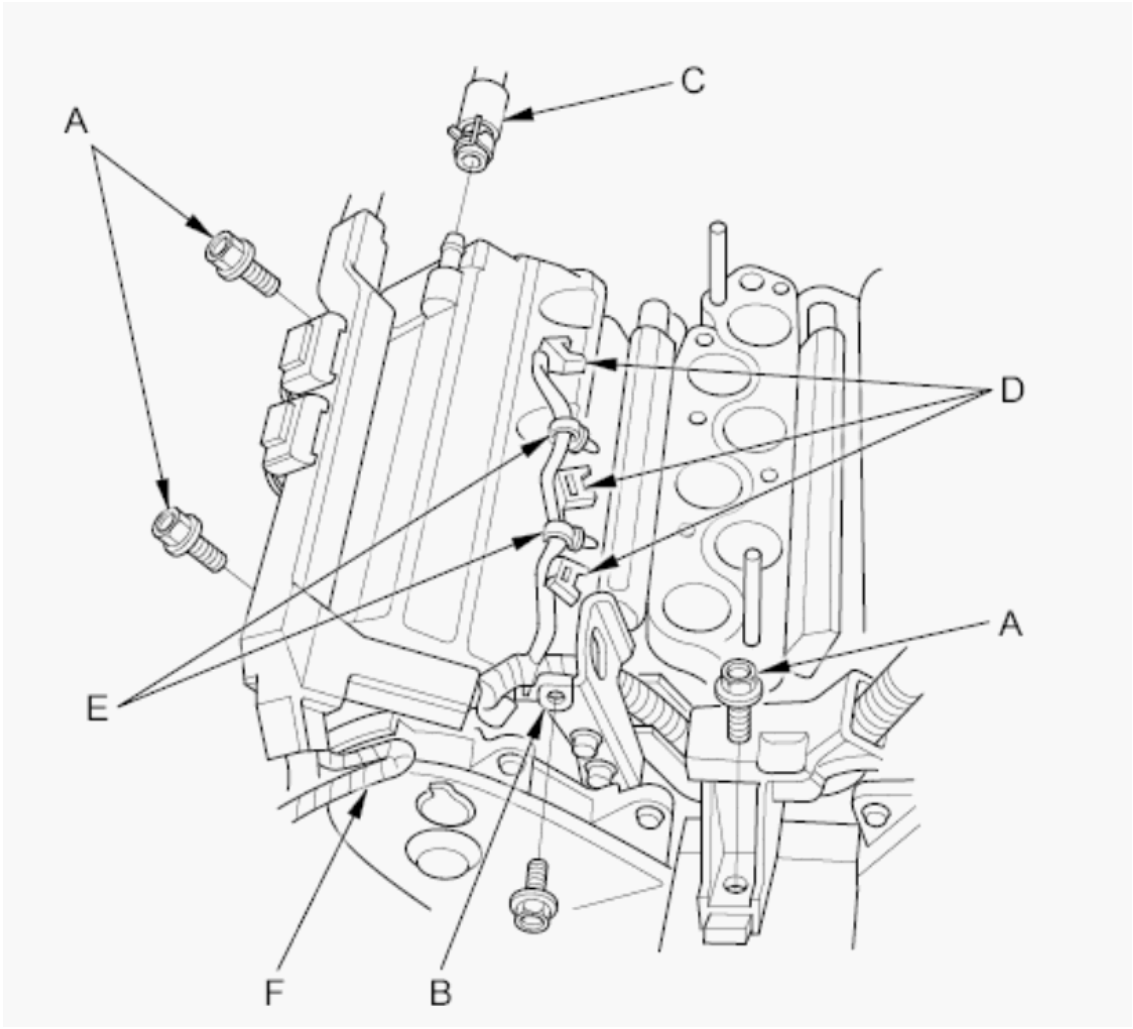


**Fig. 74: Identifying Harness Holder Mounting Bolts And Breather Hose**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

6. Disconnect the three injector connectors (D) and remove the harness clamps (E).
7. Remove the engine wire harness (F) from the rear upper cover.
8. Remove the rear cylinder head cover.

 

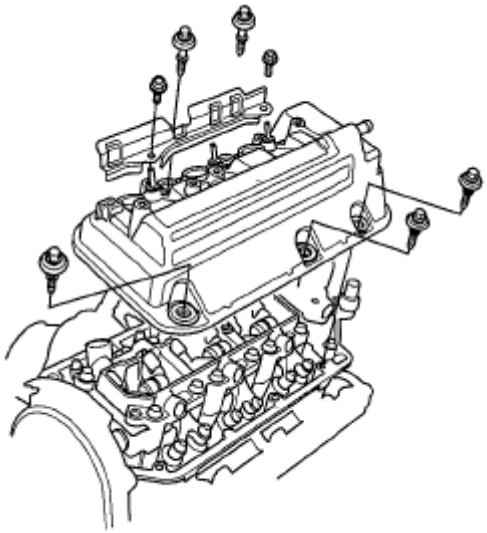

**Fig. 75: Identifying Rear Cylinder Head Cover And Clips**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

## 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 of the cylinder head cover.

**NOTE: Check and if necessary, replace the head cover gasket.**

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.

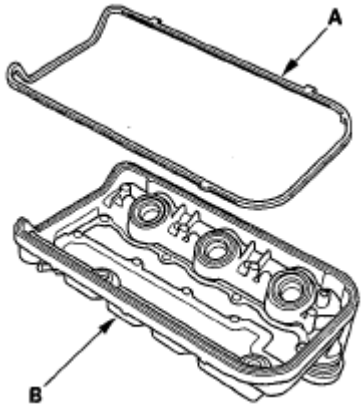


**Fig. 76: Identifying Cylinder Head Cover And Head Cover Gasket**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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.**

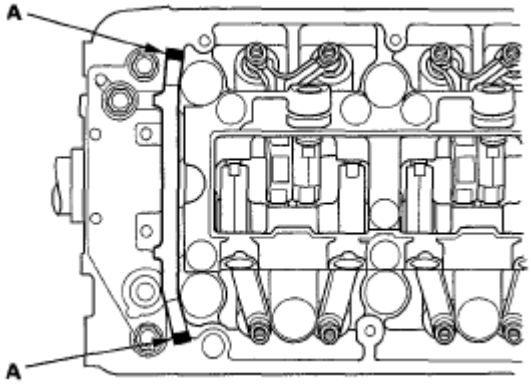


**Fig. 77: Identifying Rocker Shaft Holder Mating Areas**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

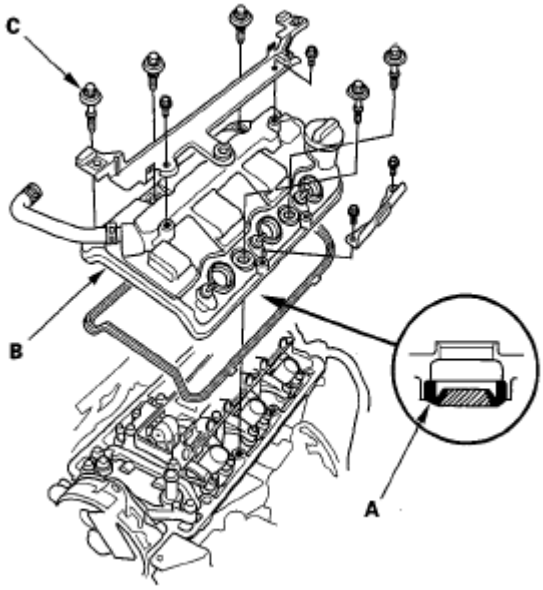


**Fig. 78: Identifying Spark Plug Seals On Spark Plug Tubes**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

8. Inspect the spark plug seals for damage.
9. Inspect the cover washers (C). Replace any washer that is damaged or deteriorated.
10. 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).

**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.**

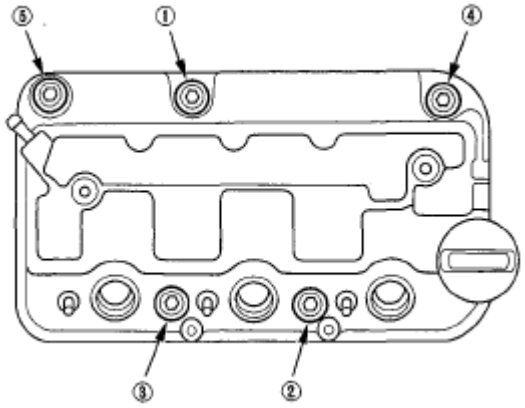


**Fig. 79: Identifying Bolts Tightening Sequence**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

 

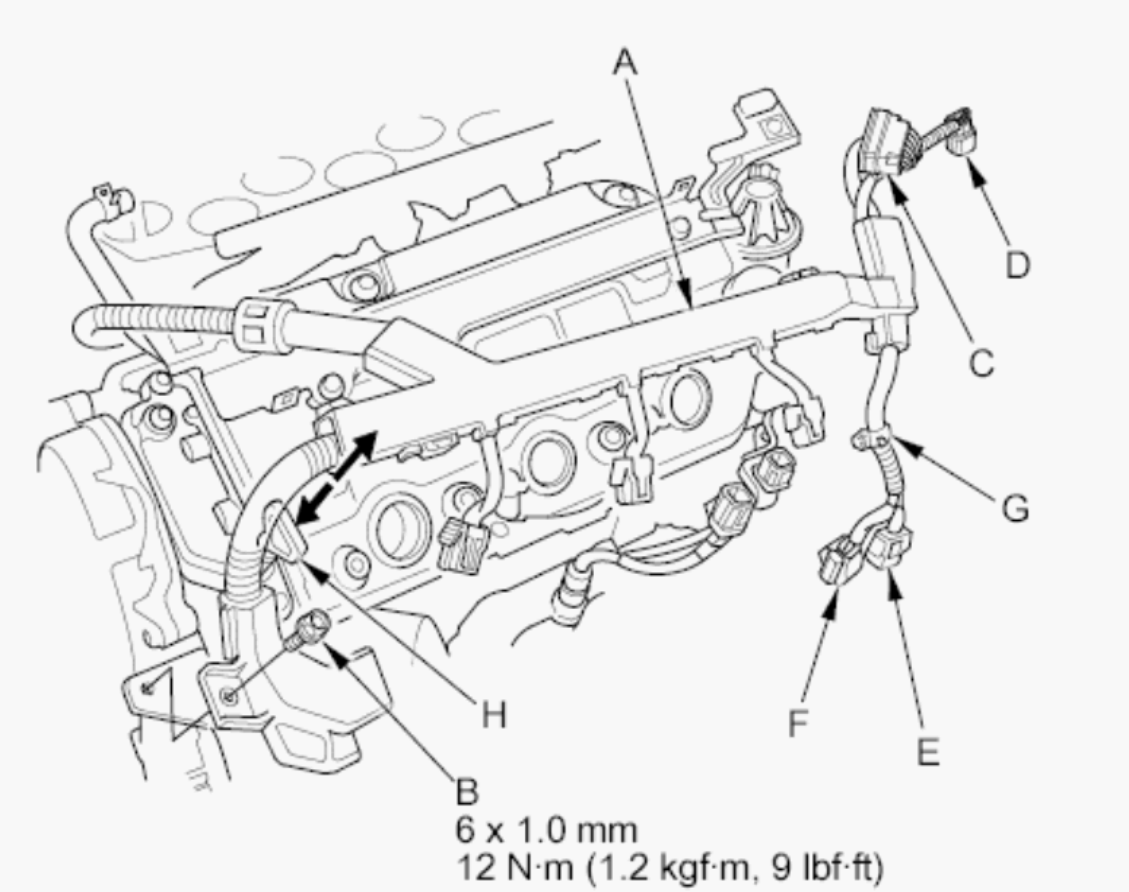


**Fig. 80: Identifying Harness Clamp And Harness Holders With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

12. Connect the EGR valve connector (C), the ECT sensor 1 connector (D), the front secondary HO2S connector (E) and the front A/F sensor connector (F). Then install the harness clamp (G) securing the harness holder.
13. Install the dipstick (H).
14. Install the three ignition coils to the front cylinder head (see **IGNITION COIL REMOVAL/INSTALLATION** ).
15. 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 of the cylinder head cover.

**NOTE: Check and if necessary, replace the head cover gasket.**

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.

 

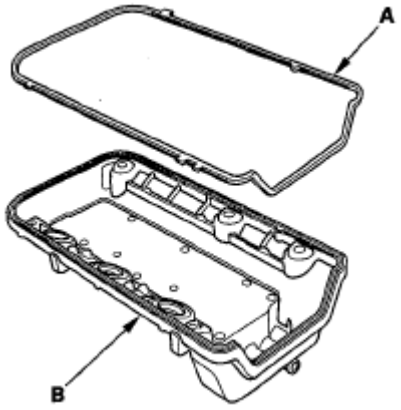


**Fig. 81: Identifying Head Cover Gasket And Cylinder Head Cover**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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.**

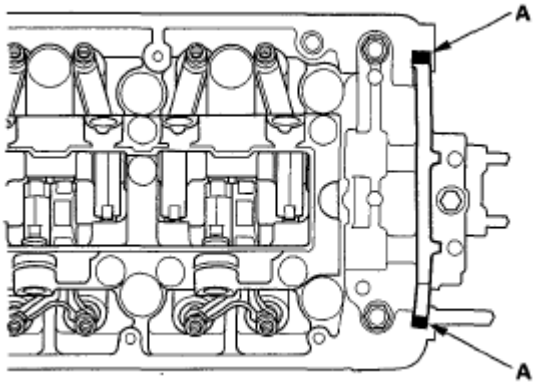


**Fig. 82: Identifying Rocker Shaft Holder Mating Areas**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

 

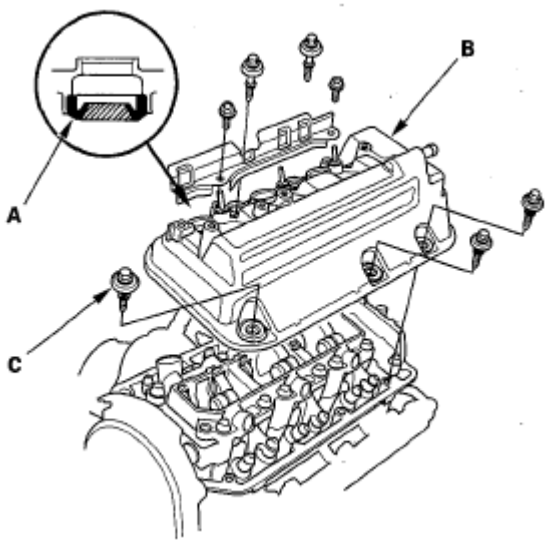


**Fig. 83: Identifying Spark Plug Seals And Spark Plug Tubes**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

8. Inspect the spark plug seals for damage.
9. Inspect the cover washers (C). Replace any washer that is damaged or deteriorated.
10. 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).

**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.**

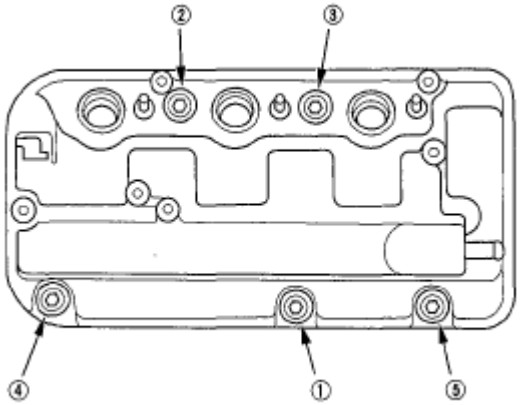


**Fig. 84: Identifying Bolts Tightening Sequence**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

11. Tighten the harness holder mounting bolts (A).

 

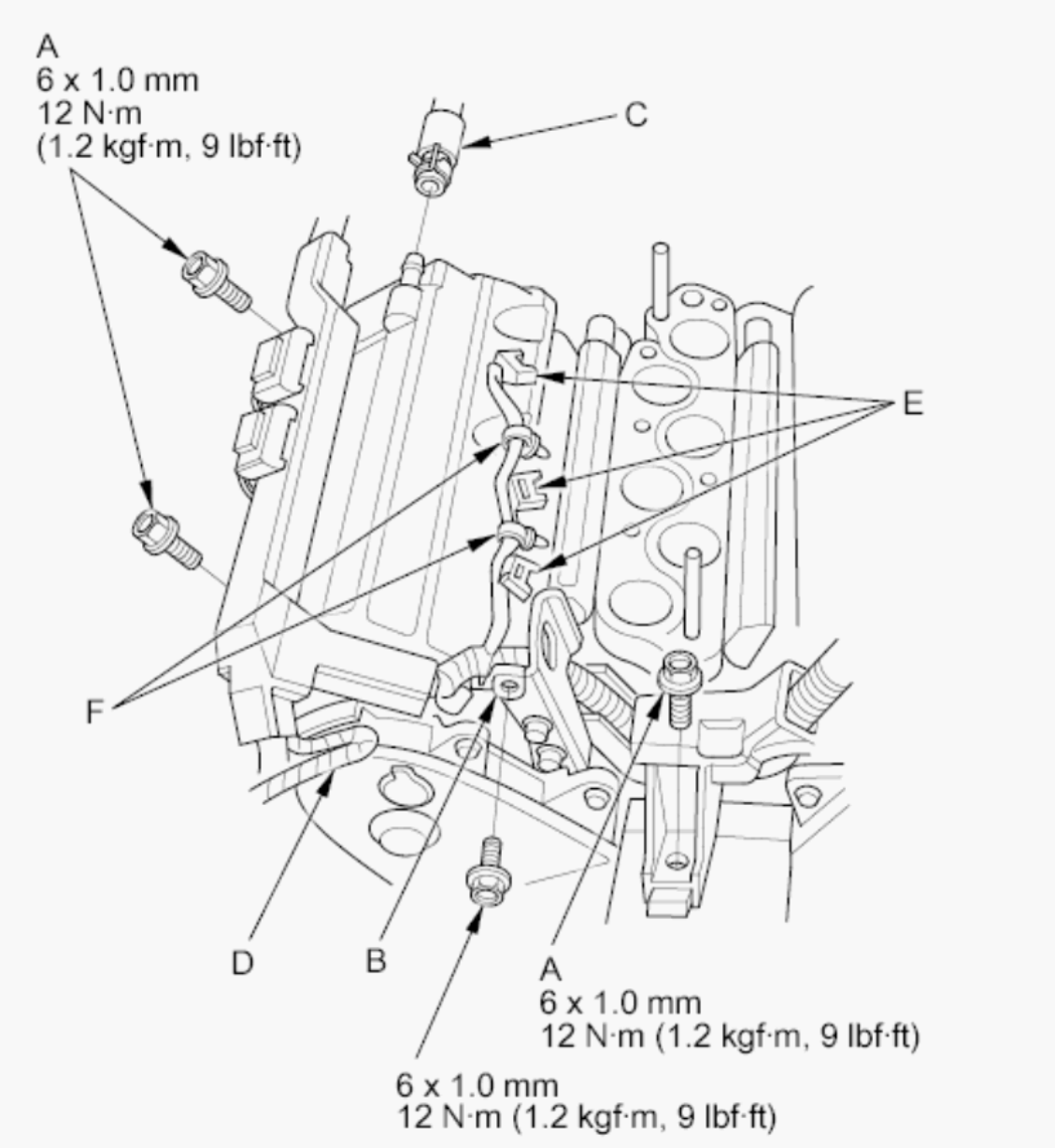


**Fig. 85: Identifying Harness Holder Mounting Bolts With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

12. Install the ground cable (B) and the breather hose (C), then install the engine wire harness (D) to the rear upper cover.
13. Connect the three injector connectors (E), then install the harness clamps (F).
14. Install the bolt securing the power steering (P/S) pump and the P/S hose bracket (see step 26 on **CYLINDER HEAD INSTALLATION**).
15. Install the drive belt (see **DRIVE BELT INSPECTION** ).
16. Install the three ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION** ).
17. 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.**
- **Connect the HDS to the DLC, and monitor the ECT sensor 1. To avoid damaging the cylinder head, wait until the ECT drops below 100 °F (38 °C) before loosening the cylinder head bolts.**
- **Mark all wiring and hoses to avoid mis-connection. 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 **BATTERY TERMINAL DISCONNECTION AND RECONNECTION** ).
3. Drain the engine coolant (see **COOLANT CHECK** ).
4. Remove the drive belt (see **DRIVE BELT INSPECTION** ).
5. Remove the alternator (see **ALTERNATOR REMOVAL AND INSTALLATION** ).
6. Remove the power steering pump (A) and the power steering hose bracket (B) with its hoses connected.

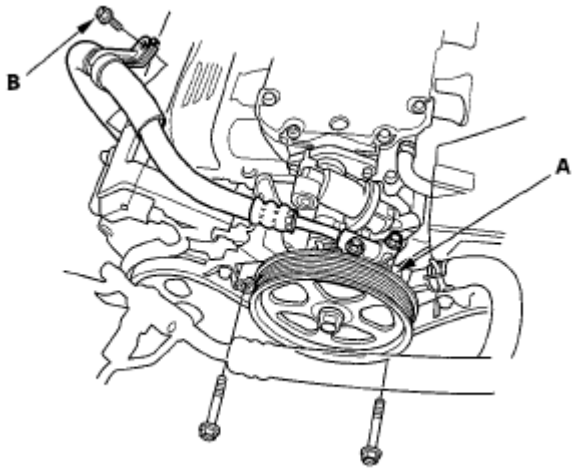


**Fig. 86: Identifying Power Steering (P/S) Pump And Bolt**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

7. Remove the intake manifold (see **INTAKE MANIFOLD REMOVAL AND INSTALLATION** ).
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
- Rear air fuel ratio (A/F) sensor connector
- Rear secondary heated oxygen sensor (secondary HO2S) connector

12. Remove the front warm up three way catalytic converter (front WU-TWC) (see **WARM UP TWC REMOVAL/INSTALLATION** ) 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** ).

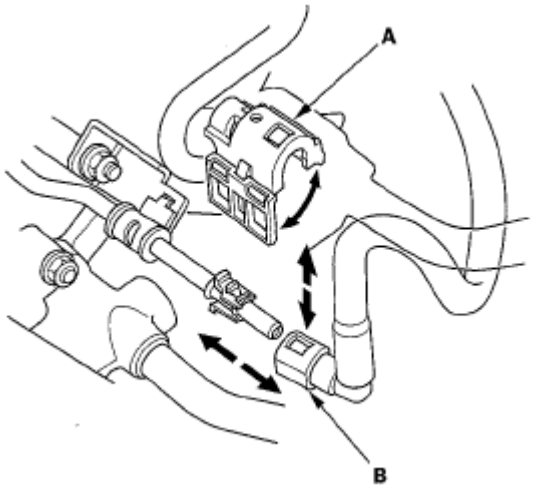


**Fig. 87: Identifying Quick-Connect Fitting Cover And Fuel Feed Hose**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

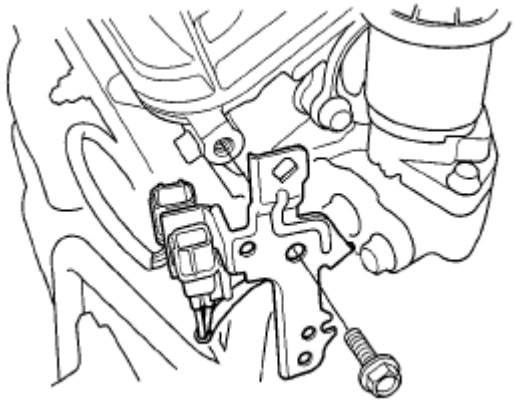

**Fig. 88: Identifying Connector Bracket**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

 

15. Remove the harness clamp bracket from the rear cylinder head.

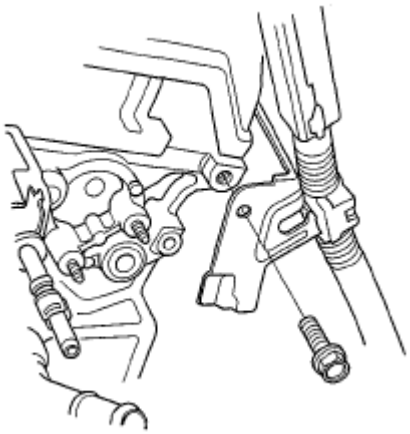

**Fig. 89: Identifying Harness Clamp Bracket**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

**FRONT**

 

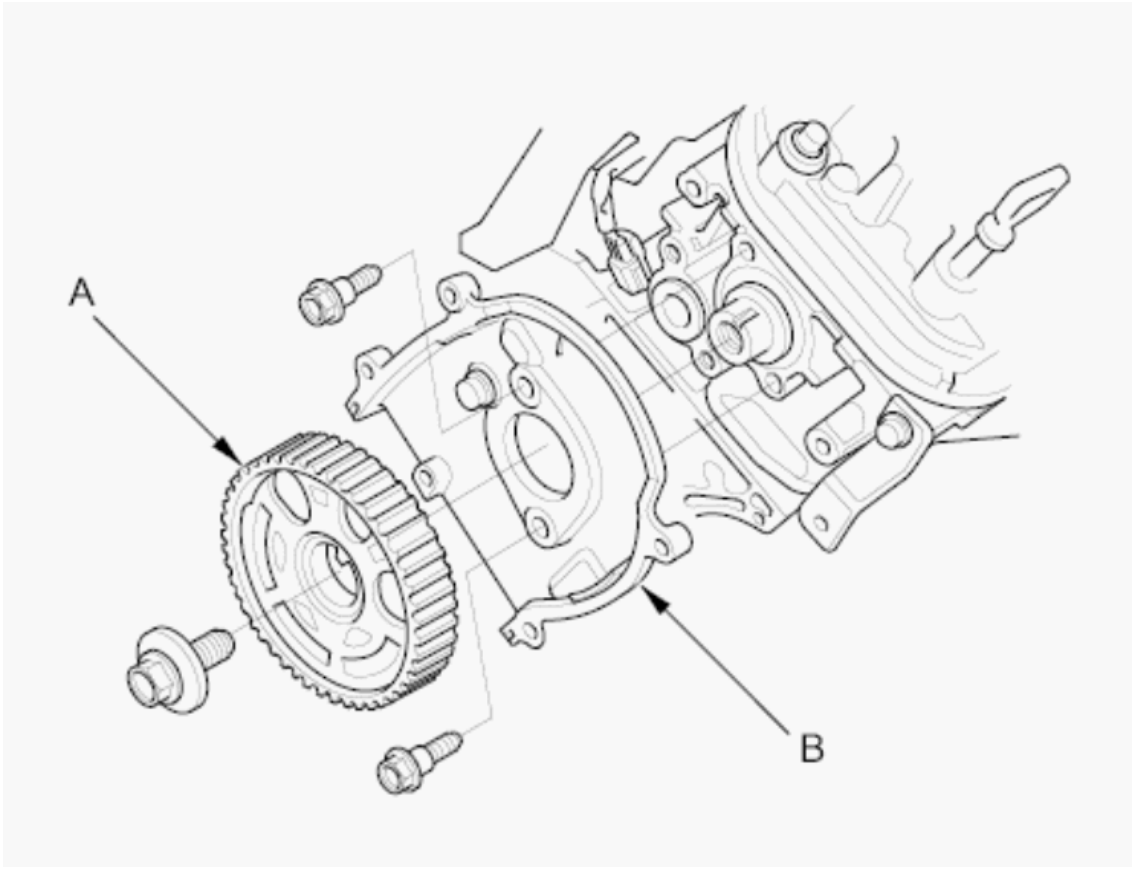


**Fig. 90: Identifying Camshaft Pulley (A) & Back Cover (B)**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**REAR**

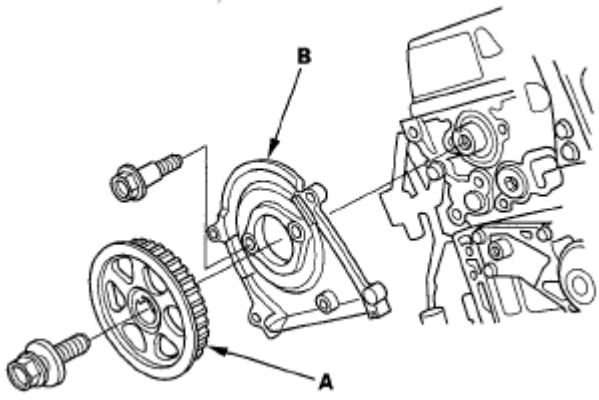


**Fig. 91: Identifying Front And Rear Camshaft Pulleys And Front And Rear Back Covers**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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**

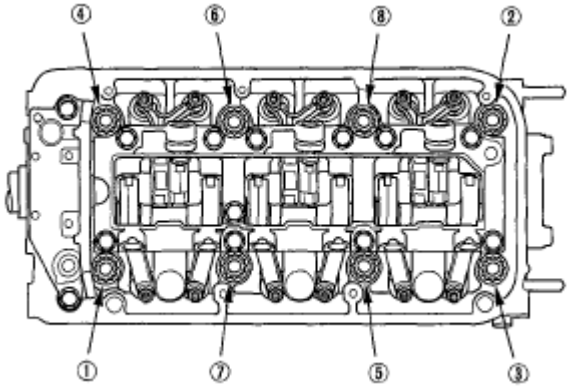


**Fig. 92: Identifying Cylinder Head Bolts Removing Sequence - Front**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**REAR**

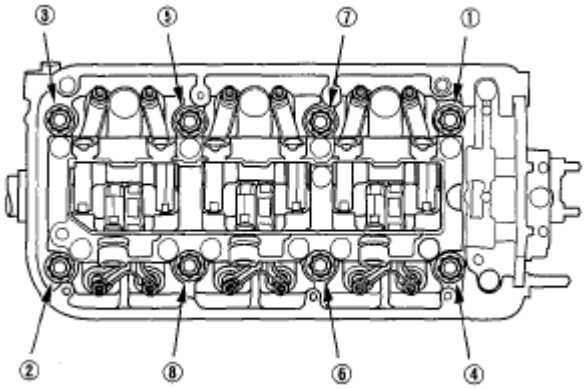


**Fig. 93: Identifying Cylinder Head Bolts Removing Sequence - Rear**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

20. Remove the cylinder heads.

## CAMSHAFT REPLACEMENT

**FRONT**

1. Do the battery removal procedure (see **BATTERY REMOVAL AND INSTALLATION** ).
2. Drain the engine coolant (see **COOLANT CHECK** ).
3. Disconnect the radiator hoses (A).

 

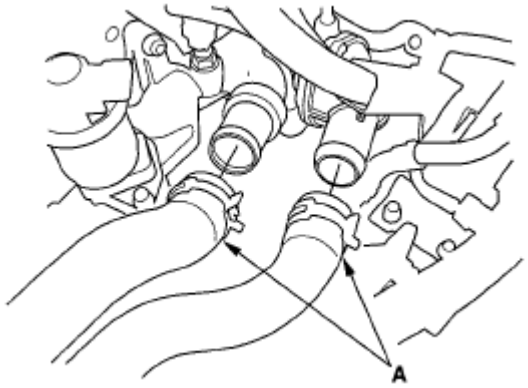


**Fig. 94: Identifying Radiator Hoses**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

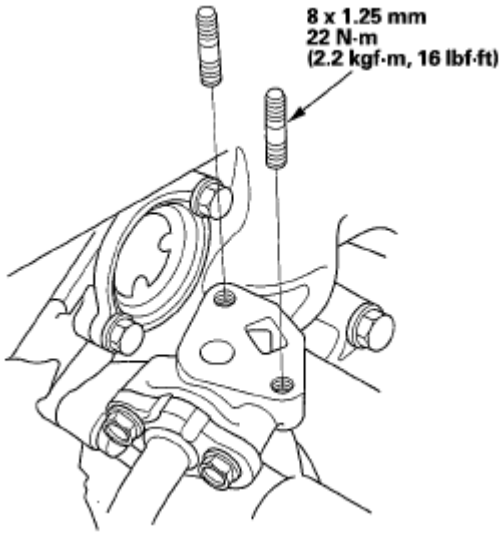


**Fig. 95: Identifying Stud Bolts With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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 (see **CYLINDER HEAD REMOVAL**).
9. Remove the thrust cover (A), then remove the front camshaft (B).

 

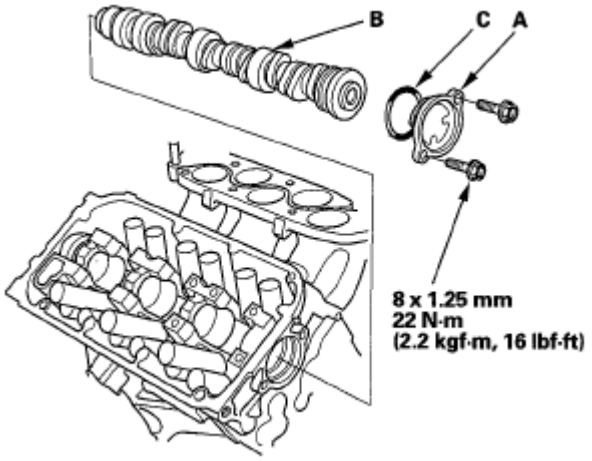


**Fig. 96: Identifying Thrust Cover, Front Camshaft And O-Ring With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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. Apply new engine oil to the threads of the camshaft pulley mounting bolt, then install the front camshaft pulley (see **CAMSHAFT, ROCKER ARM ASSEMBLY, CAMSHAFT SEAL, AND PULLEY INSTALLATION**).
12. Install the rocker arm assembly (see **CAMSHAFT, ROCKER ARM ASSEMBLY, CAMSHAFT SEAL, AND PULLEY INSTALLATION**).
13. Install the timing belt (see **TIMING BELT INSTALLATION**).
14. Adjust the valve clearance (see **VALVE CLEARANCE ADJUSTMENT**).
15. Install the stud bolts, then install the EGR valve (see **EGR VALVE REPLACEMENT** ), then connect the radiator hoses.

 

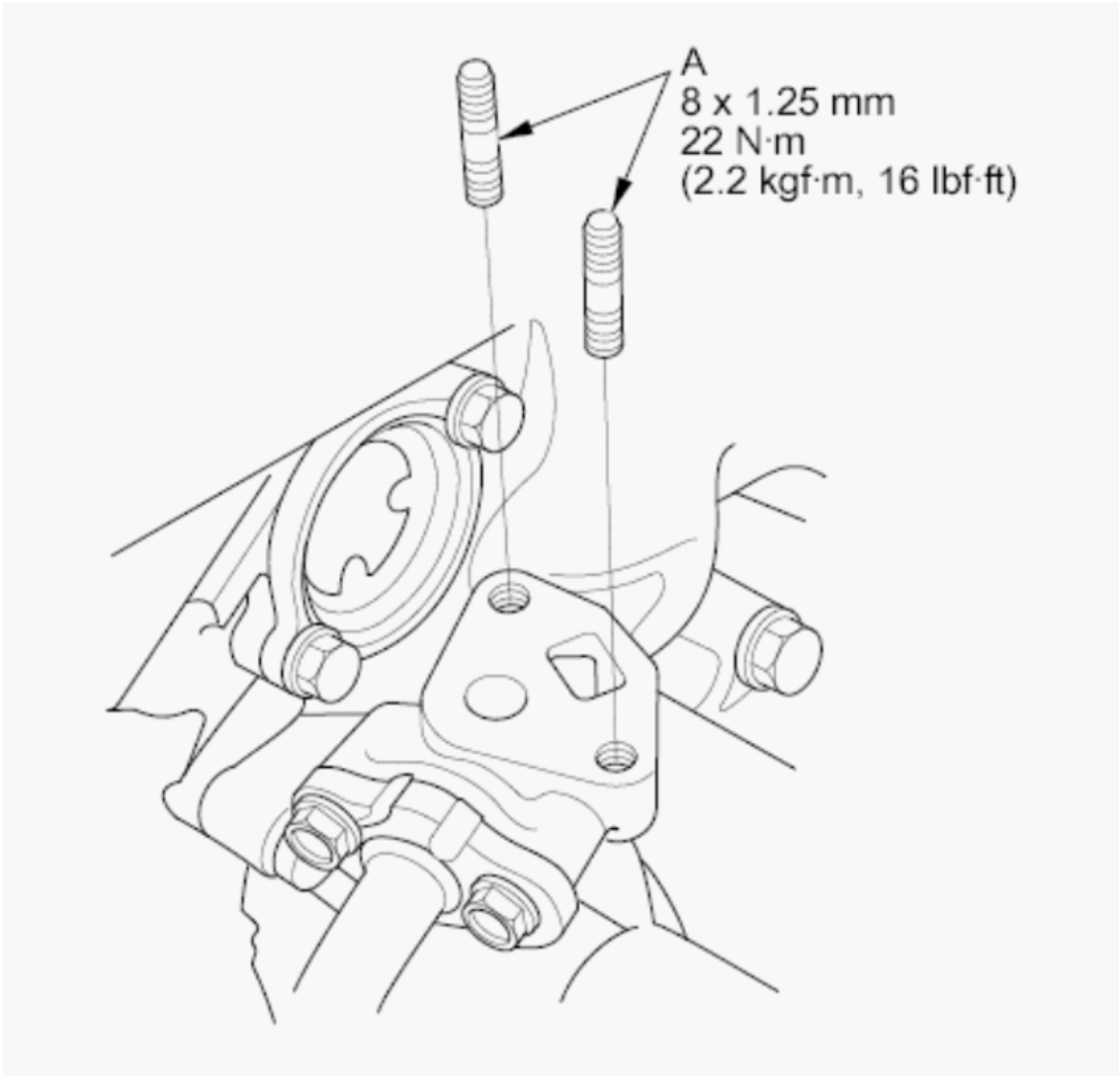


**Fig. 97: Identifying EGR Valve Stud Bolts**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

16. Connect the radiator hoses (A).

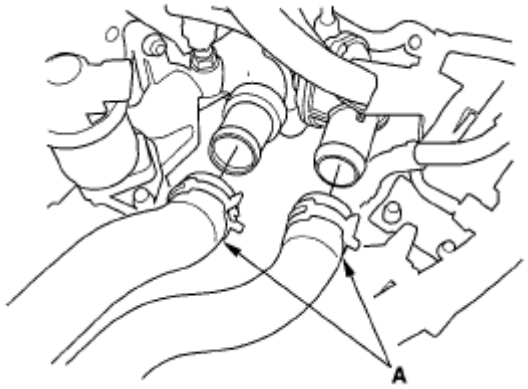


 

**Fig. 98: Identifying Radiator Hoses (A)**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

17. Do the battery installation procedure (see **BATTERY REMOVAL AND INSTALLATION** ).
18. Fill the radiator with engine coolant and bleed the air from the cooling system with the heater valve open (see step 9 on **COOLANT REPLACEMENT** ).
19. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **CKP PATTERN CLEAR/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. Disconnect the EVAP canister hose, then remove the EVAP canister purge joint.

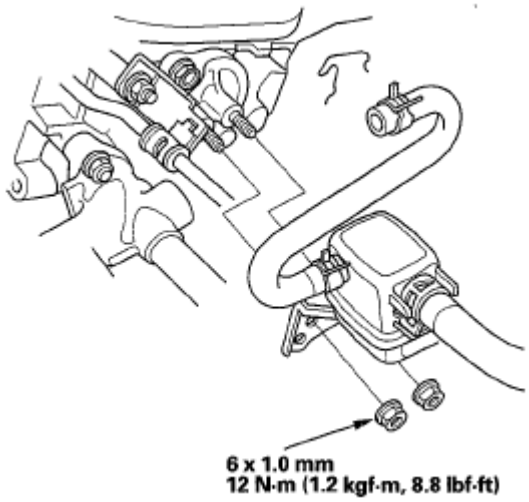


**Fig. 99: Identifying Purge Joint With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

5. Remove the water passage (see **WATER PASSAGE REPLACEMENT** ).
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 (see 18).
9. Remove the thrust cover (A), then remove the rear camshaft (B).

 

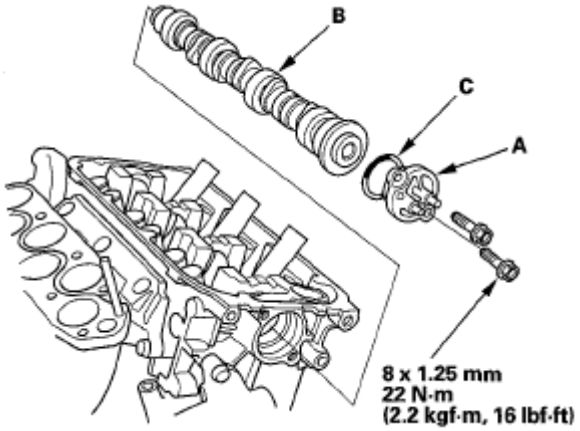


**Fig. 100: Identifying Thrust Cover, Rear Camshaft And O-Ring With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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. Apply new engine oil to the threads of the camshaft pulley mounting bolt, then install the rear camshaft pulley.
12. Install the rocker arm assembly (see **REAR**).
13. Install the timing belt (see **TIMING BELT INSTALLATION**).
14. Adjust the valve clearance (see **VALVE CLEARANCE ADJUSTMENT**).
15. Install the EVAP canister purge joint (A), then connect the EVAP canister hose (B).

 

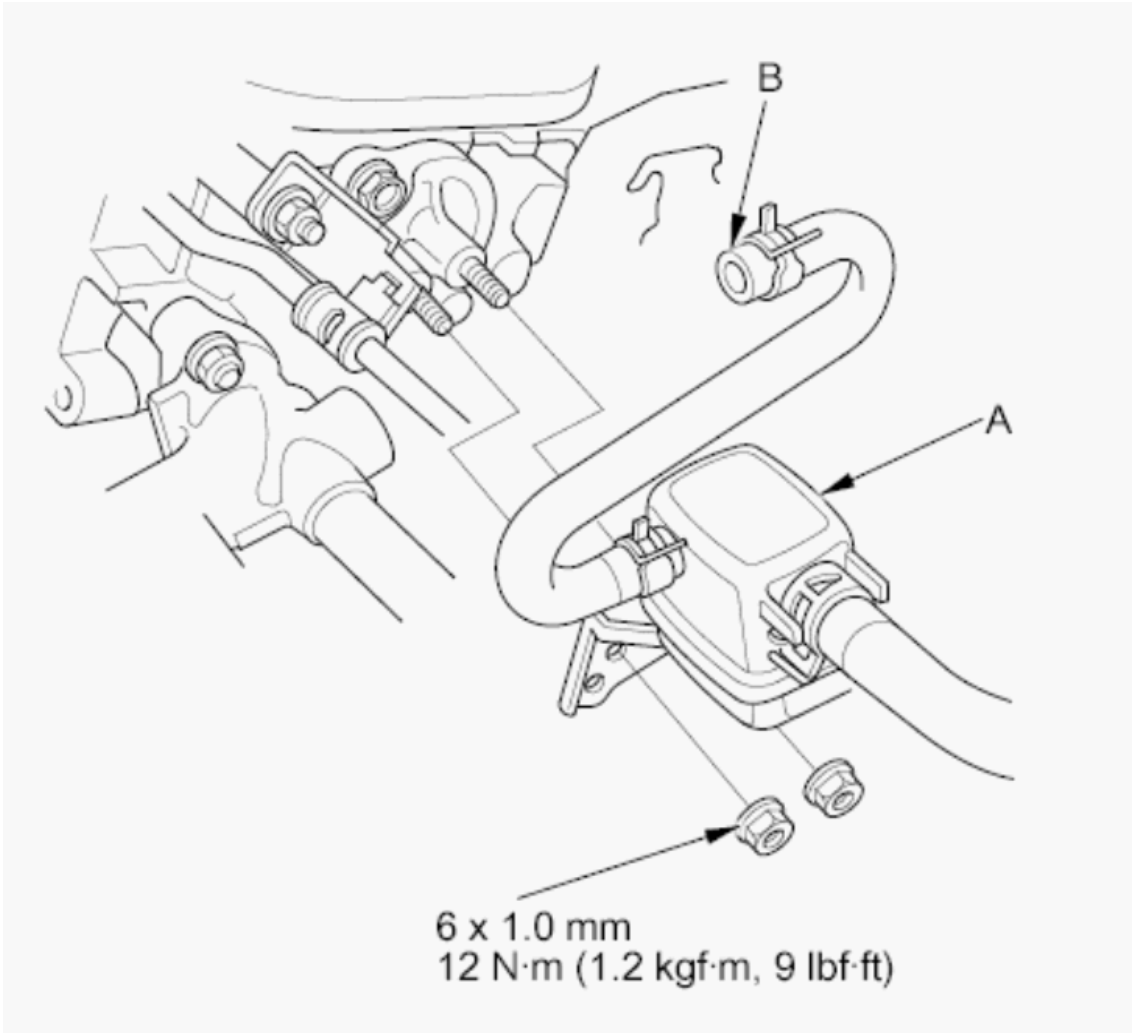


**Fig. 101: Identifying EVAP Canister Purge Joint (A) & Canister Hose (B)**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

16. Connect the fuel feed hose (see **FUEL LINE/QUICK-CONNECT FITTING INSTALLATION** ), then install the quick-connect fitting cover.
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. Fill the radiator with engine coolant, and bleed the air from the cooling system with the heater valve open (see step 9 on **COOLANT REPLACEMENT** ).
19. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **CKP PATTERN CLEAR/CKP PATTERN LEARN** ).

## CYLINDER HEAD INSPECTION FOR WARPAGE

1. Remove the cylinder head (see **CYLINDER HEAD REMOVAL**).
2. Inspect the camshaft (see **CAMSHAFT REPLACEMENT**).

 

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 (4.7618-4.7657 in)**

   **Service Limit: 120.8 mm (4.756 in)**

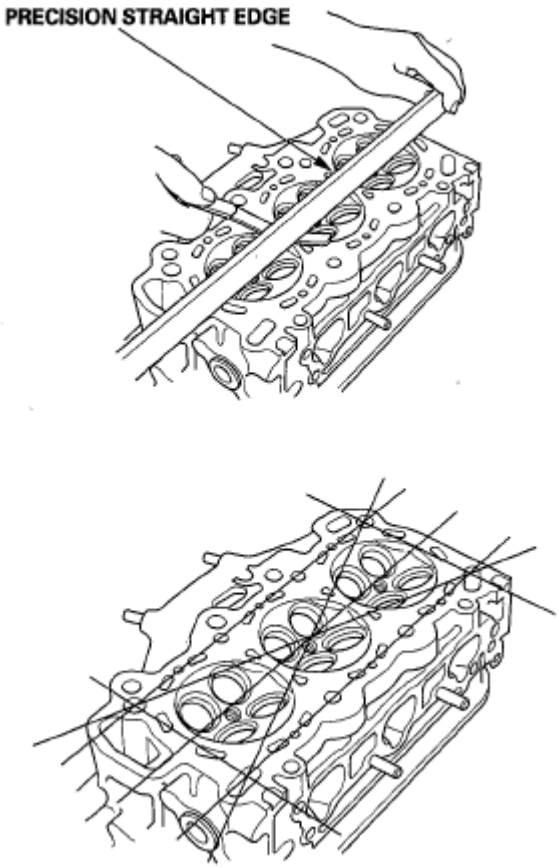


**Fig. 102: Measuring Cylinder Head For Warpage**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

## ROCKER ARM ASSEMBLY REMOVAL

**Front**

1. Remove the cylinder head cover (see **TIMING BELT DRIVE PULLEY REPLACEMENT**).
2. Loosen the locknuts and the adjusting screws (A).

 

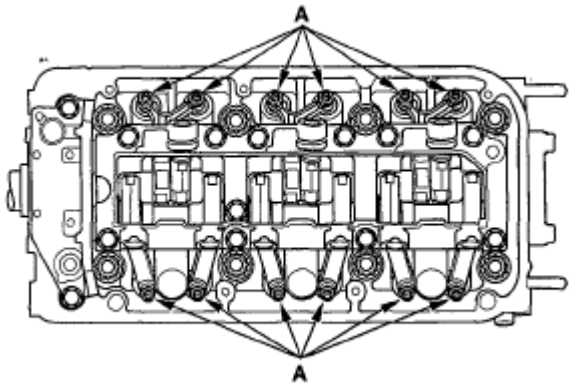


**Fig. 103: Identifying Locknuts And Adjusting Screws**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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.

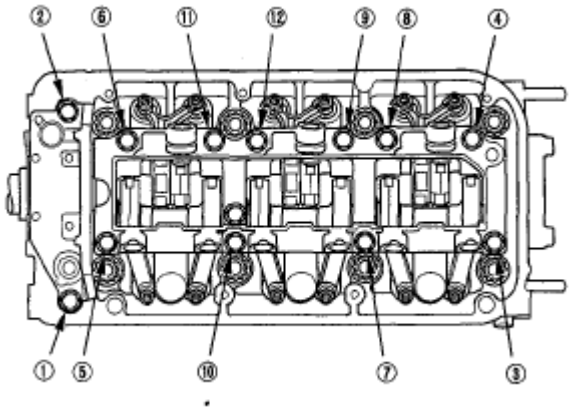


**Fig. 104: Identifying Rocker Shaft Bridge Mounting Bolts Loosening Sequence**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**Rear**

4. Remove the cylinder head cover (see **TIMING BELT DRIVE PULLEY REPLACEMENT**).
5. Loosen the locknuts and the adjusting screws (A).

 

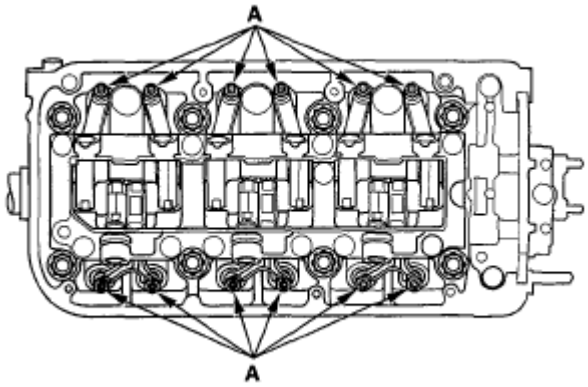


**Fig. 105: Identifying Locknuts And Adjusting Screws**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

6. 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.

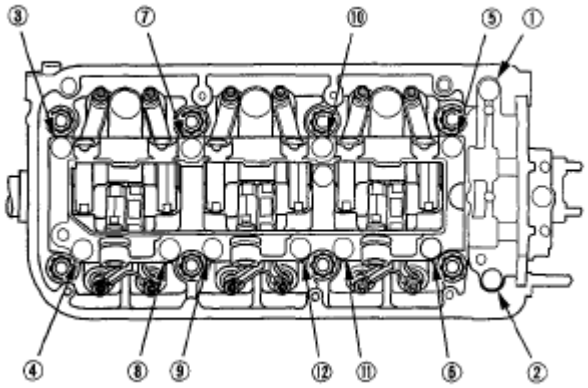


**Fig. 106: Identifying Rocker Shaft Bridge Mounting Bolts Loosening Sequence**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

## 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.**
- **Bundle the rocker arms with rubber bands to keep them together as a set, and remove the bands after the rocker arms have been installed.**
- **Prior to reassembling, clean all the parts in solvent, dry them, and apply new engine oil to all the contact points, and bearing surfaces, and the lost motion assembly.**
- **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.**

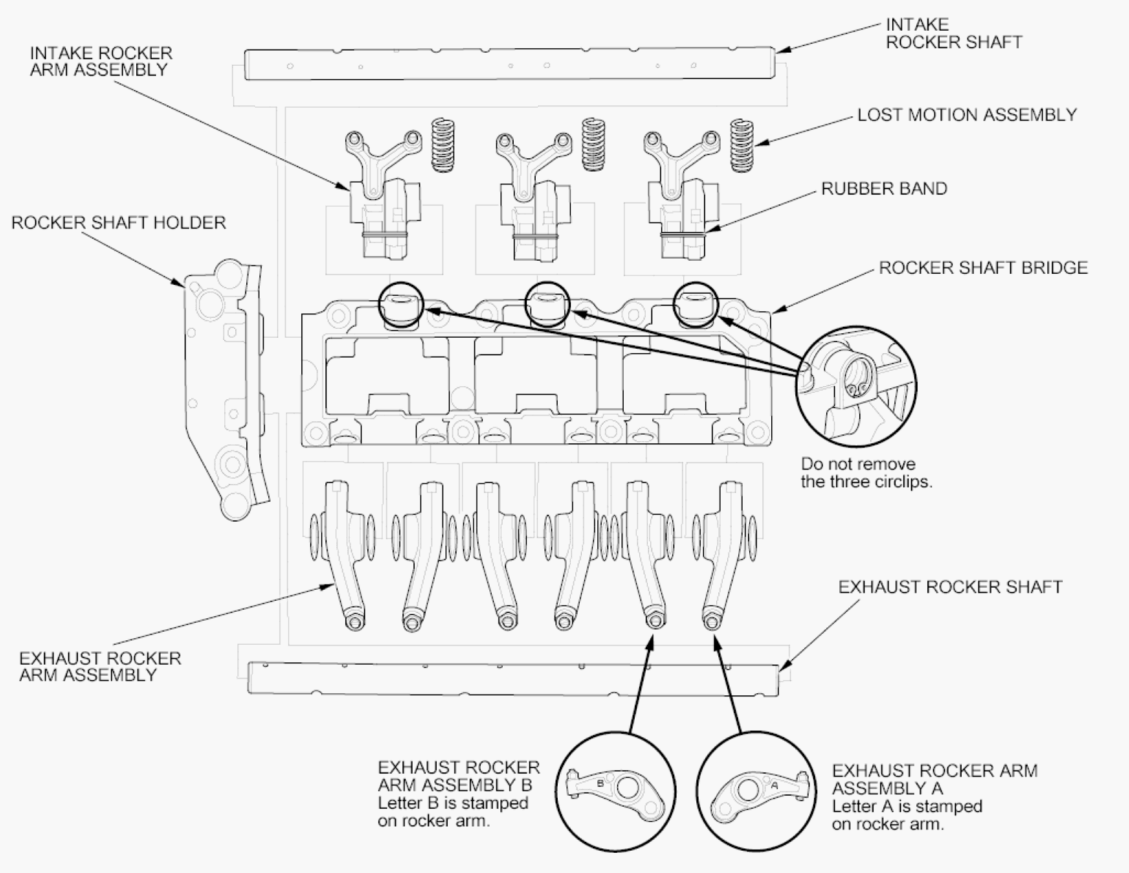


**Fig. 107: Identifying Rocker Arm And Shaft Assembly Components - Front**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**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.**
- **Bundle the rocker arms with rubber bands to keep them together as a set, and remove the bands after the rocker arms have been installed.**
- **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.**

 

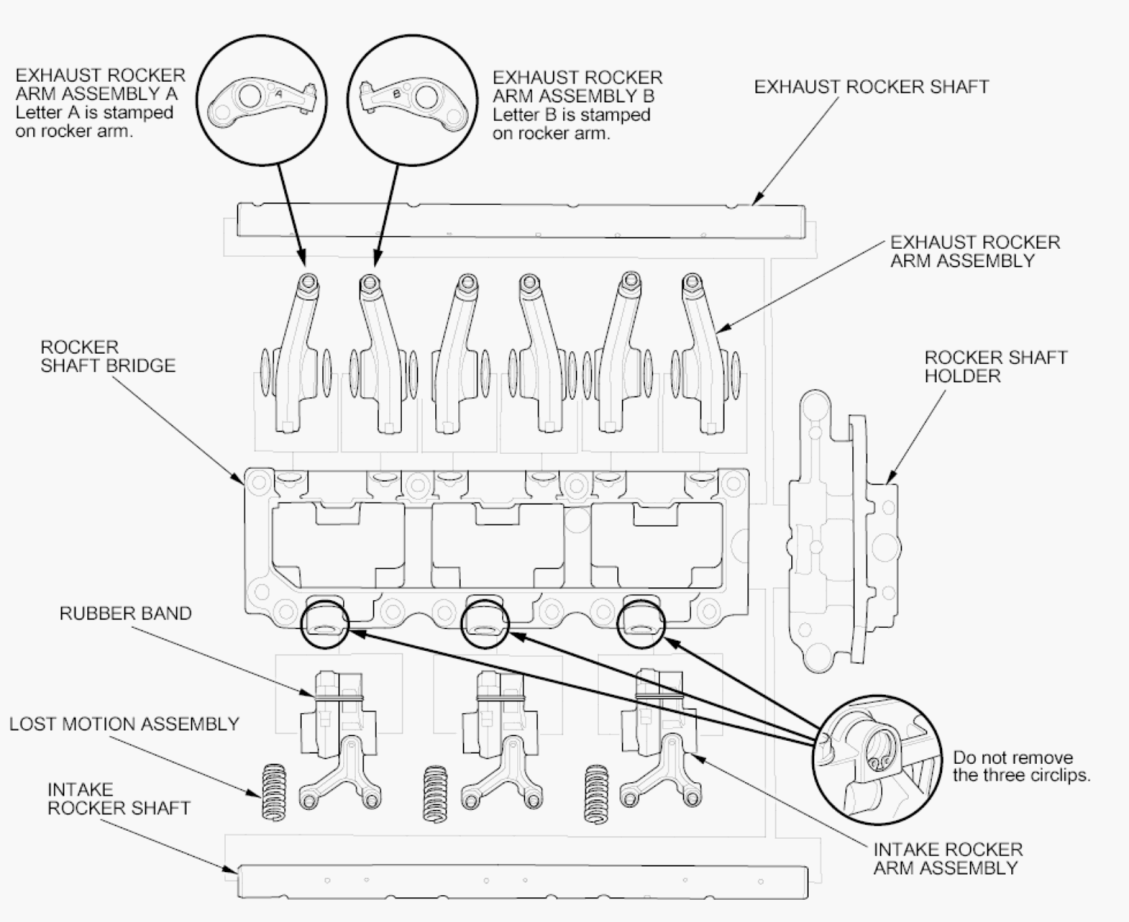


**Fig. 108: Identifying Rocker Arm And Shaft Assembly Components - Rear**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

## 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.

 

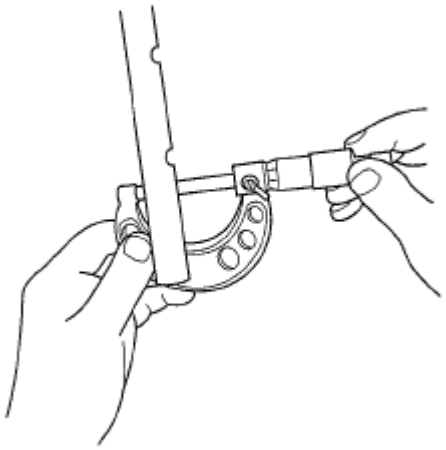

**Fig. 109: Measuring Diameter Of Shaft**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

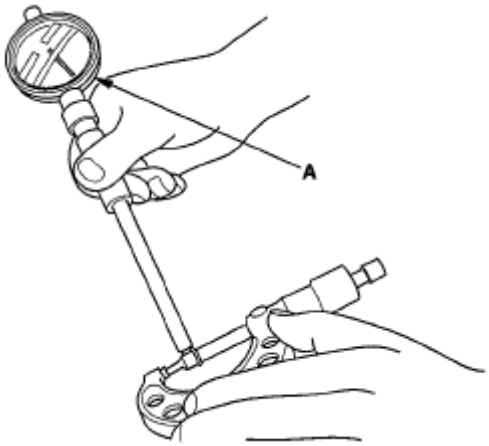


**Fig. 110: Identifying Zero Gauge To Shaft Diameter**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

   **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): 0.018-0.047 mm (0.00071-0.00185 in.)**

   **Service Limit: 0.047 mm (0.0185 in.)**

 

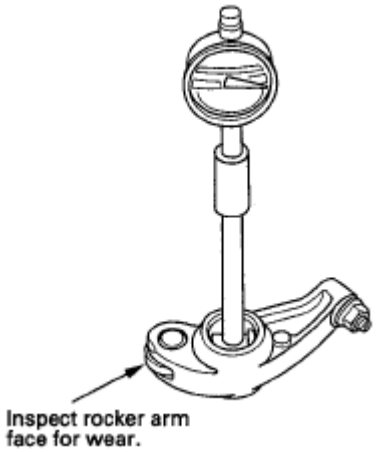


**Fig. 111: Measuring Inside Diameter Of Rocker Arm**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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 from the intake primary rocker arm (B), carefully apply air pressure to the oil passage of the rocker arm.**

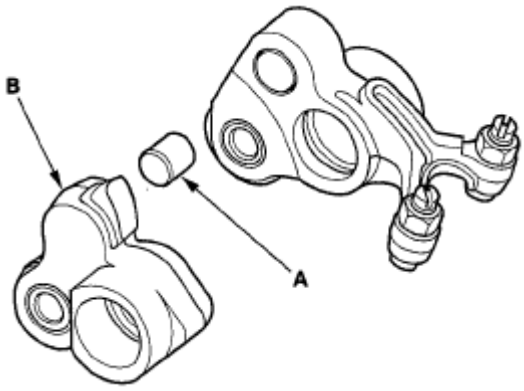


**Fig. 112: Identifying Rocker Arm Piston And Intake Primary Rocker Arm**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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. Disassemble the rocker arm assembly (see **ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY**).
4. 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: 24.5 N.m (2.5 kgf.m, 18 lbf.ft)**

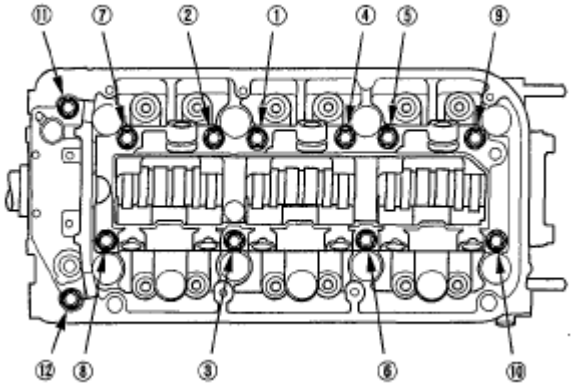


**Fig. 113: Identifying Cylinder Head Bolts Removing Sequence - Front**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

5. 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: 24.5 N.m (2.5 kgf.m, 18 lbf.ft)**

 

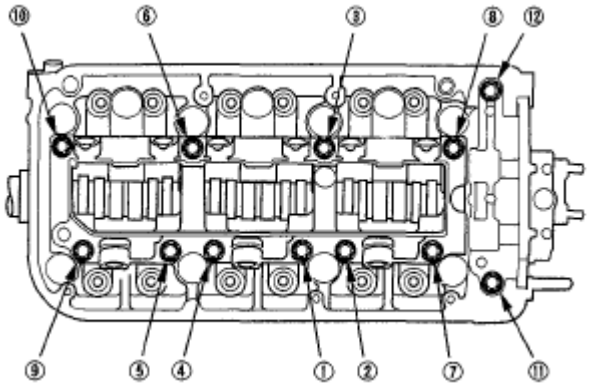


**Fig. 114: Identifying Cylinder Head Bolts Removing Sequence - Rear**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

6. Seat the camshaft by pushing it toward the rear of the cylinder head.
7. 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.)**

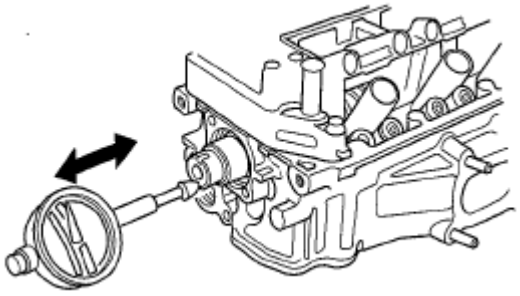

**Fig. 115: Measuring Camshaft End Play**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

 

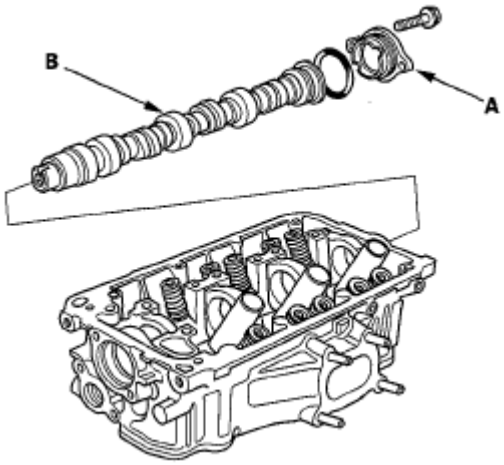


**Fig. 116: Identifying Camshaft Thrust Cover And Camshaft**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

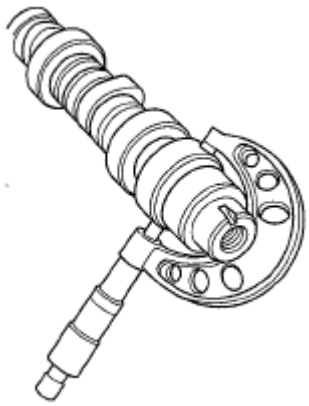

**Fig. 117: Measuring Diameter Of Camshaft Journal**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

11. Zero the gauge to the journal diameter.

 

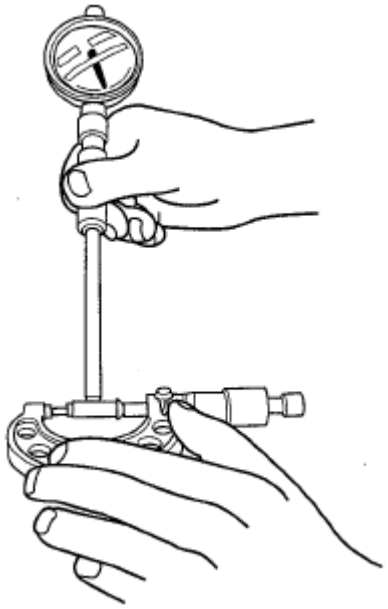

**Fig. 118: Identifying Zero Gauge To Journal Diameter**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

12. 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 14.
    - 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 13.

    **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.)**

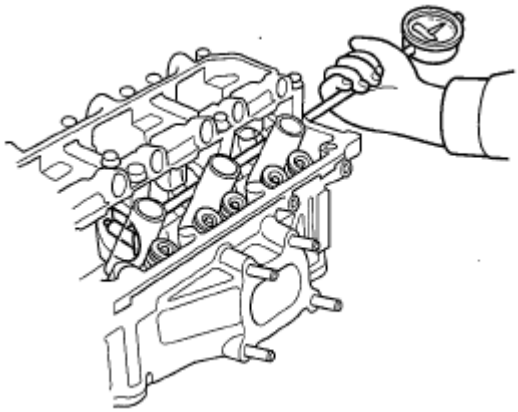

 

**Fig. 119: Measuring Camshaft-To-Holder Oil Clearance**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

13. 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 (0.0012 in.) max.**

**Service Limit: 0.04 mm (0.0016 in.)**

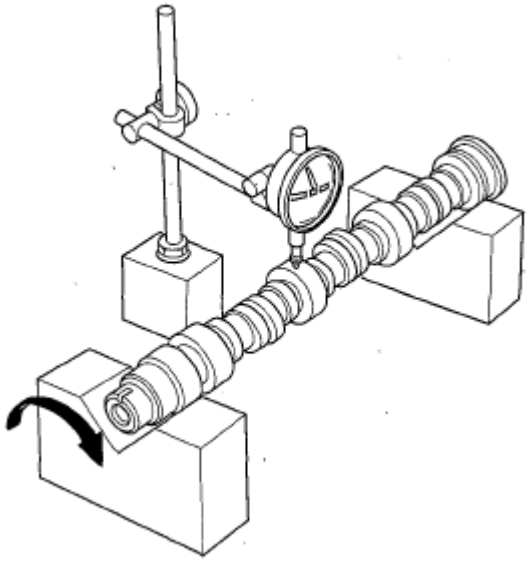

**Fig. 120: Measuring Camshaft Total Runout**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

14. Measure the cam lobe height.

**Cam Lobe Height Standard (New):**

**CAM LOBE HEIGHT SPECIFICATION**

| | INTAKE | EXHAUST |
|---|---|---|
| PRI | 34.299 mm (1.35035 in.) | 36.512 mm (1.43748 in.) |
| SEC | 35.621 mm (1.40240 in.) | |

**FRONT**

 

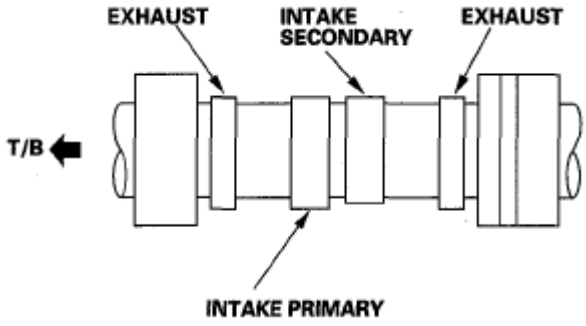


**Fig. 121: Measuring Cam Lobe Height - Front**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**REAR**

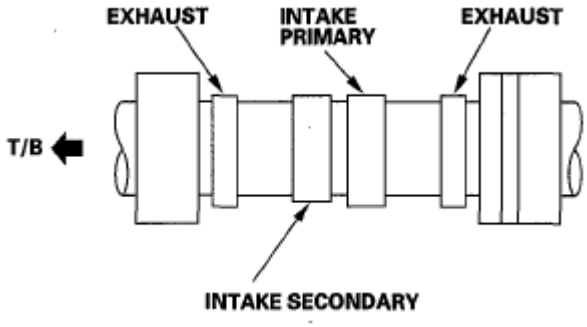


**Fig. 122: Measuring Cam Lobe Height - Rear**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

15. Install the camshaft, rocker arm assembly, camshaft seal, and pulley (see **CAMSHAFT, ROCKER ARM ASSEMBLY, CAMSHAFT SEAL, AND PULLEY INSTALLATION**).

## 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.

 

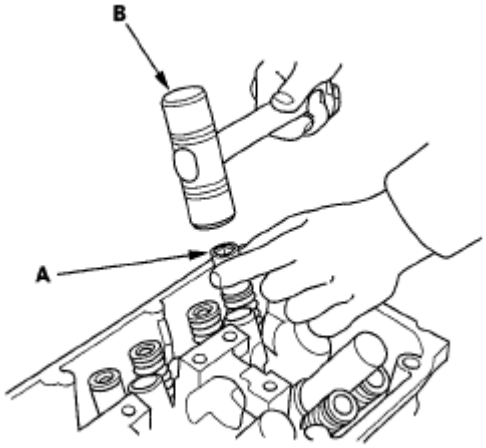


**Fig. 123: Tapping Spring Retainer**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

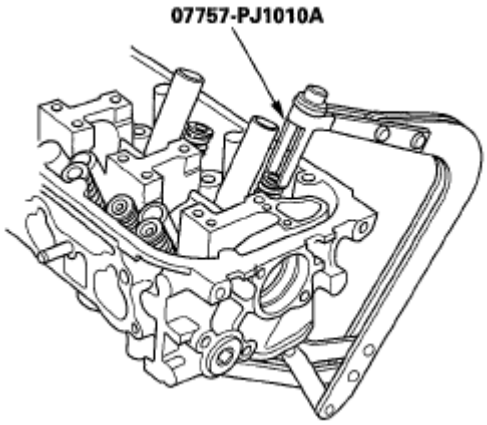


**Fig. 124: Compressing Spring**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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).

 

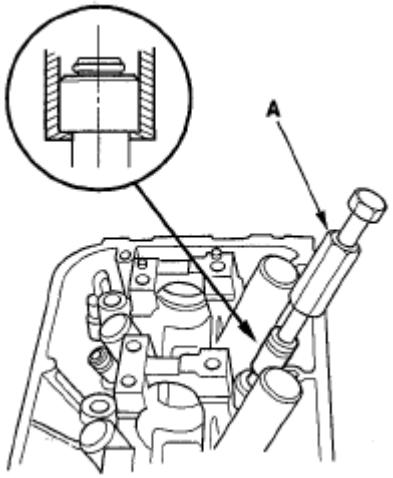


**Fig. 125: Identifying Valve Guide Seal Remover**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

6. Remove the valve seal.

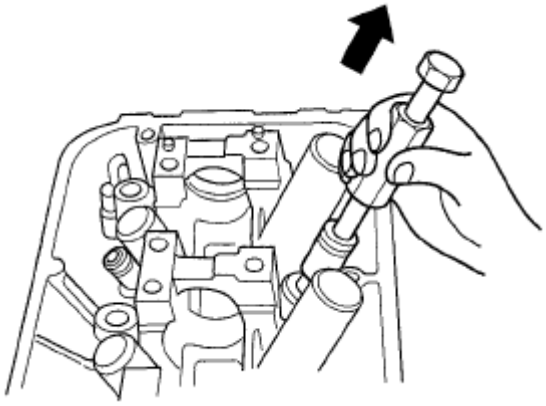

**Fig. 126: Identifying Valve Seal**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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): 29.90-30.10 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.)**

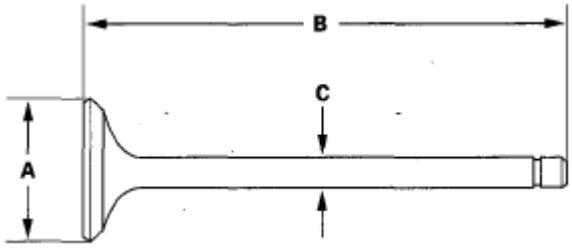


**Fig. 127: Measuring Exhaust Valve Dimensions**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

## VALVE STEM-TO-GUIDE CLEARANCE INSPECTION

1. Remove the valves (see **VALVE, SPRING, AND VALVE SEAL REMOVAL**).
2. Subtract the O.D. of the valve stem, measured with a micrometer, from the I.D. of the valve guide, measured with an inside micrometer or 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.)**

 

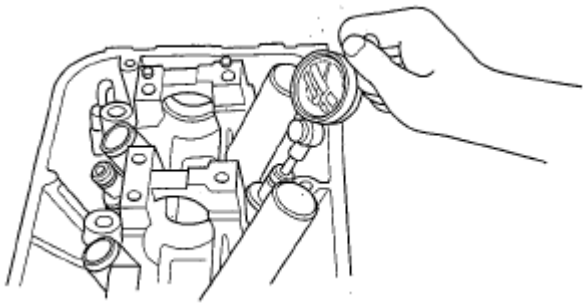

**Fig. 128: Measuring Valve Stem-To-Guide Clearance**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

## VALVE GUIDE REPLACEMENT

**Special Tools Required**

- Valve Guide Driver, 5.35 x 9.7 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.

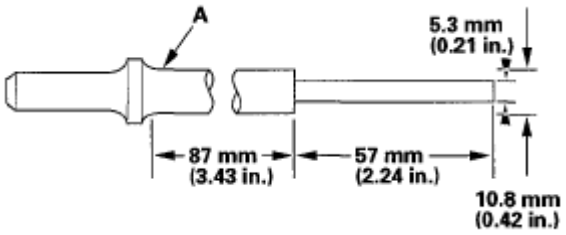


**Fig. 129: Identifying Valve Guide Dimension**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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.

 

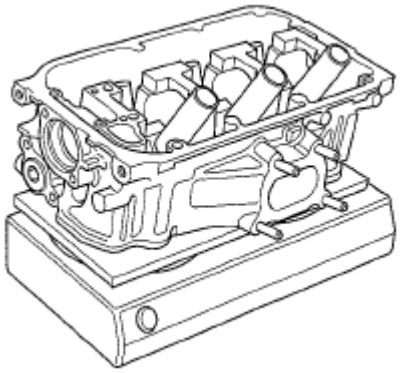

**Fig. 130: Heating Cylinder Head**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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.

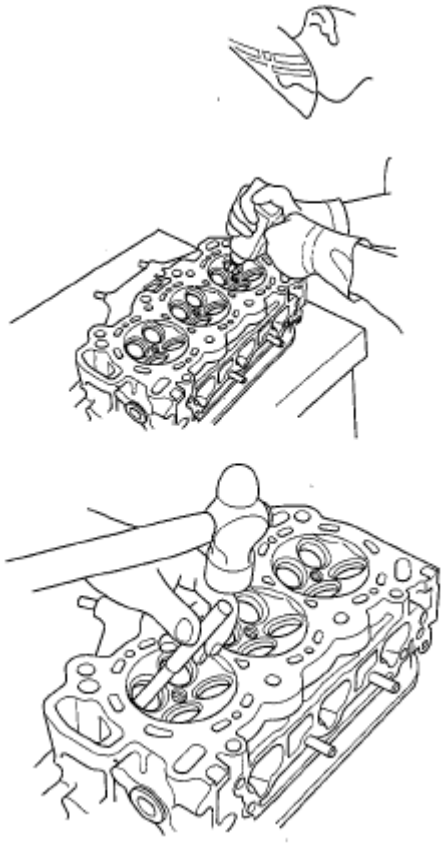

**Fig. 131: Removing Valve Guide**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

 

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.)**

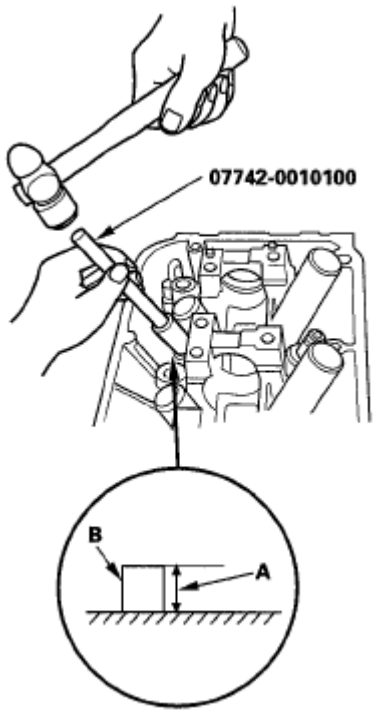


**Fig. 132: Identifying Valve Guide Installed Height**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

10. Coat both the reamer and the valve guide with cutting oil.
11. Rotate the valve guide reamer, 5.5 mm clockwise the full length of the valve guide bore.

 

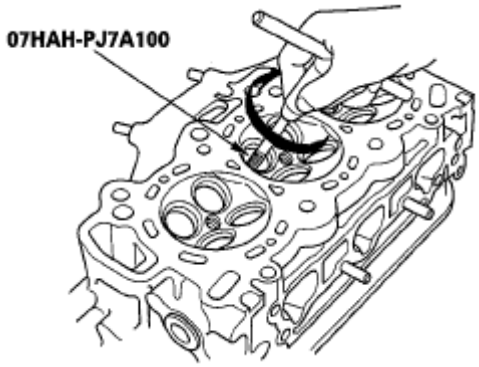


**Fig. 133: Reaming And Valve Guide**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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.

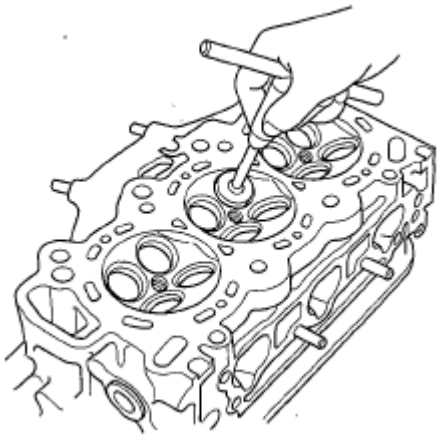

**Fig. 134: Reaming Valve Seats**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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.

 

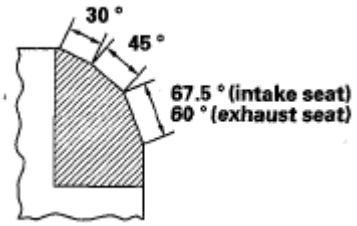


**Fig. 135: Identifying Valve Seats Angle**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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.

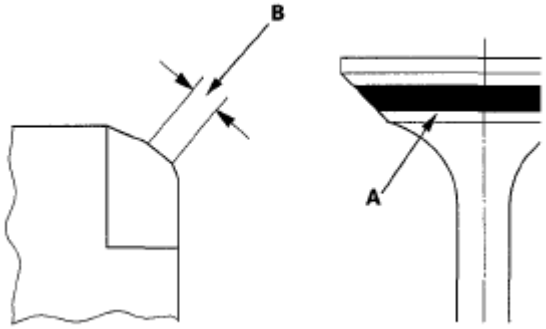


**Fig. 136: Identifying Valve Seat Width**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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.)**

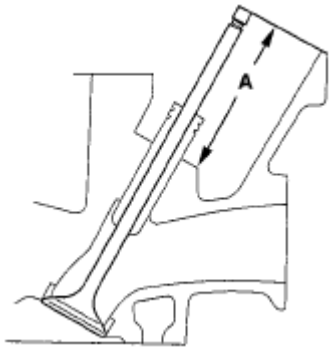


**Fig. 137: Measuring Valve Stem Installed Height**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

## VALVE, SPRING, AND VALVE SEAL INSTALLATION

**Special Tools Required**

- Stem Seal Driver 07PAD-0010000
- Valve Spring Compressor Attachment 07757-PJ1010A

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

 

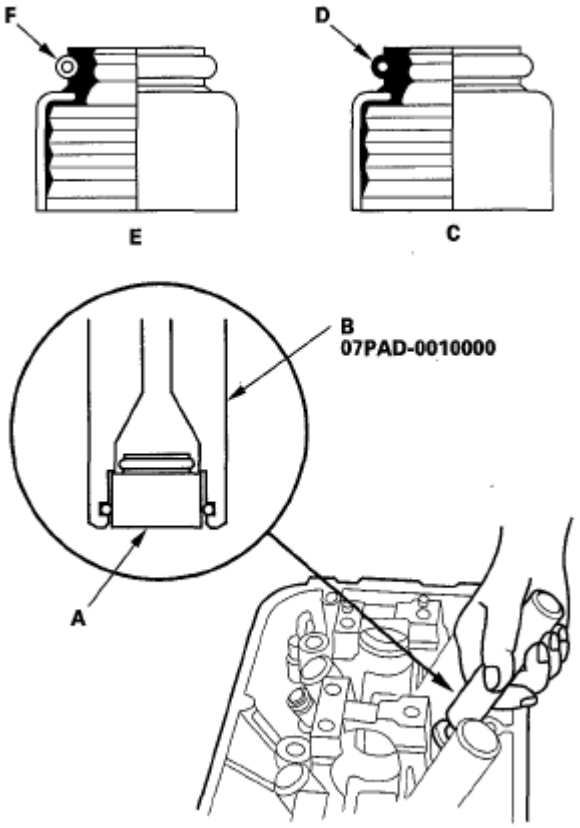


**Fig. 138: Identifying Valve Seals, Black Spring And Silver Spring**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

5. Install the valve spring and the spring retainer. Place the end of the valve spring with the 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.

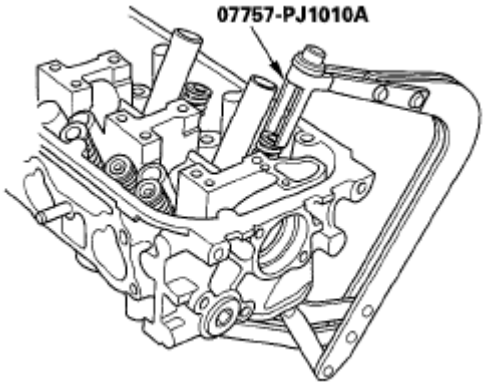


**Fig. 139: Installing Valve Spring Compressor Attachment**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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.

**NOTE: Be sure to raise the head off the work bench so the valve is not possibly damaged.**


**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 locknuts and the adjusting screws.
2. Clean and dry the camshaft oil seal housing.
3. Apply a light coat of new engine oil around the camshaft oil seal.
4. 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.

 

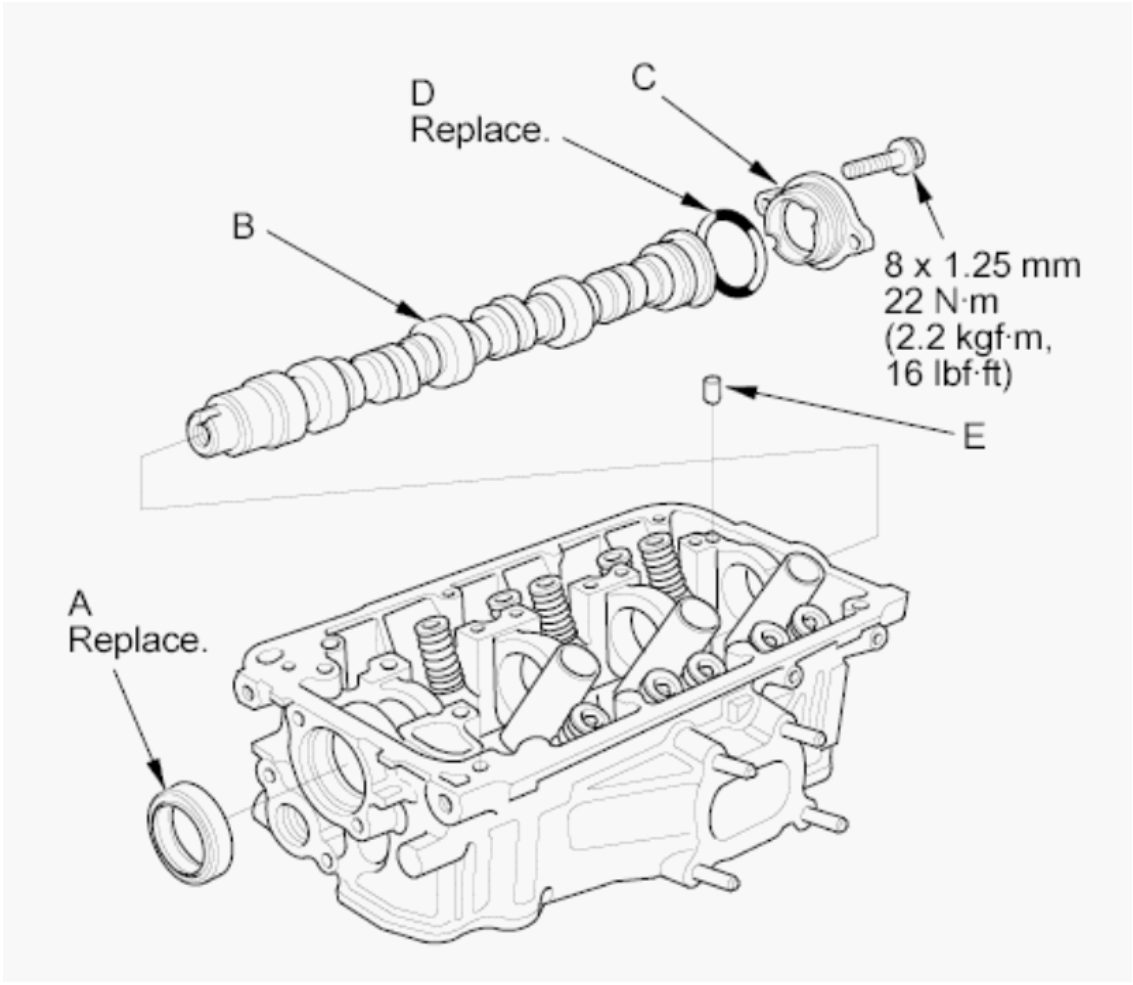


**Fig. 141: Identifying Camshaft Oil Seal With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

5. 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 journals and the cam lobes.
6. Clean the excess grease off the camshaft, and check that the oil seal lip is not distorted.
7. Install the dowel pin (E).
8. If the rocker arm assembly is disassembled, reassemble the rocker arm assembly (see **ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY**).
9. Remove all of the old liquid gasket from the rocker shaft holder and the cylinder head.
10. 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.**

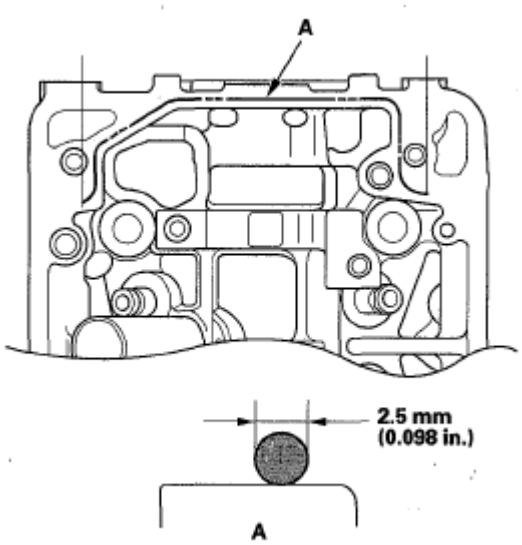


**Fig. 142: Identifying Liquid Gasket Application Area**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

11. 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.**

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

**When the rocker shaft bridge is reused:**

**Specified Torque 8 x 1.25 mm:**

**24.5 N.m (2.5 kgf.m, 18 lbf.ft)**

**When a new rocker shaft bridge is installed:**

**Specified Torque 8 x 1.25 mm:**

**1st: 28 N.m (2.9 kgf.m, 21 lbf.ft), then loosen the bolts.**

**2nd: 24.5 N.m (2.5 kgf.m, 18 lbf.ft)**

 

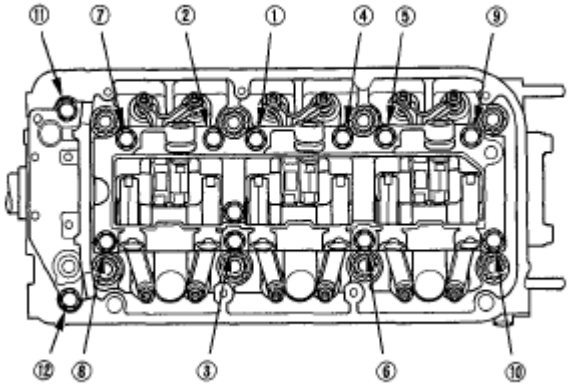


**Fig. 143: Identifying Bolt Tightening Sequence**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

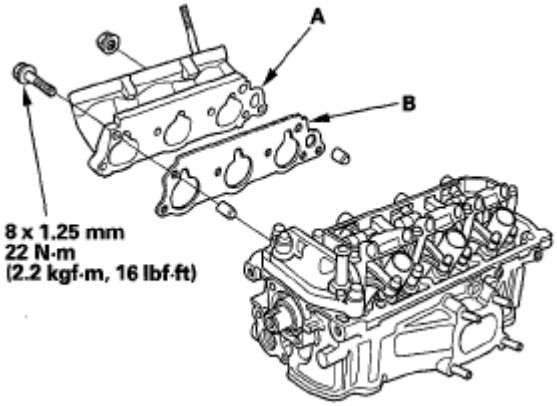


**Fig. 144: Identifying Injector Base And Gasket With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

14. 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).

 

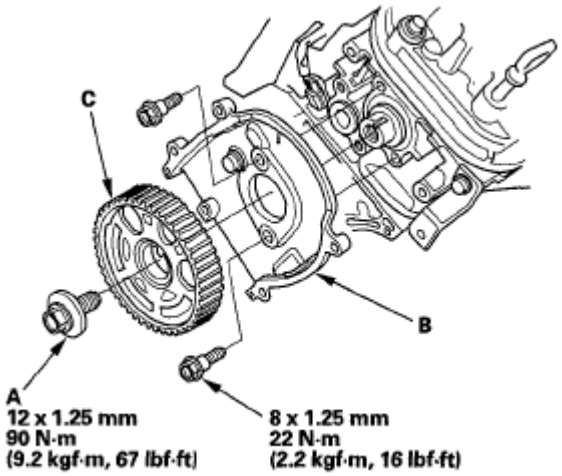


**Fig. 145: Identifying Camshaft Pulley Mounting Bolt And Back Cover With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

**REAR**

1. Loosen the locknuts and the adjusting screws.
2. Clean and dry the camshaft oil seal housing.
3. Apply a light coat of new engine oil around the camshaft oil seal.
4. 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.

 

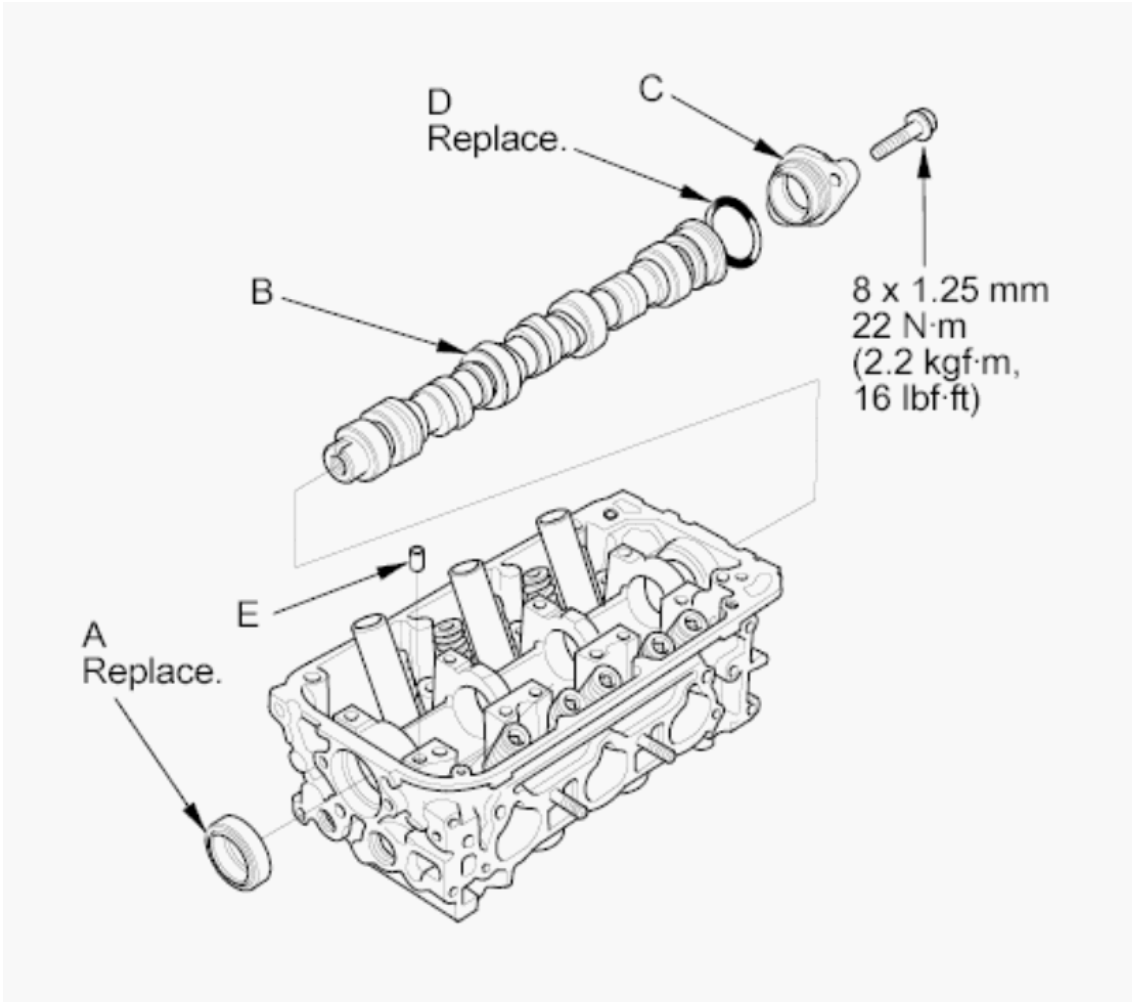


**Fig. 146: Identifying Camshaft Oil Seal And Camshaft With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

5. 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.
6. Clean the excess grease off the camshaft, and check that the oil seal lip is not distorted.
7. Install the dowel pin (E).
8. If the rocker arm assembly is disassembled, reassemble the rocker arm assembly (see **ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY**).
9. Remove all of the old liquid gasket from the rocker shaft holder and the cylinder head.
10. 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.**

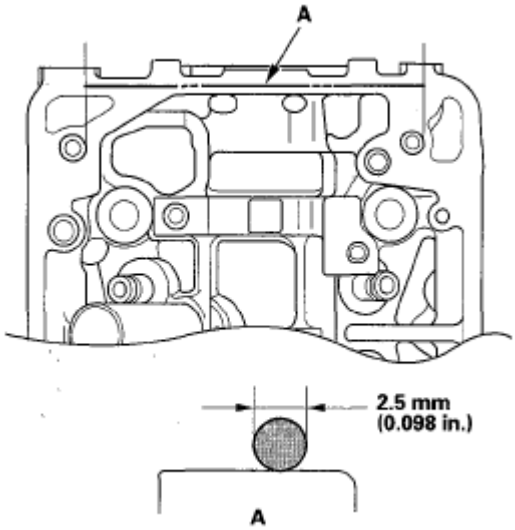


**Fig. 147: Identifying Liquid Gasket Application Area**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

11. 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.**

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

**When the rocker shaft bridge is reused:**

**Specified Torque 8 x 1.25 mm:**

**24.5 N.m (2.5 kgf.m, 18 lbf.ft)**

**When a new rocker shaft bridge is installed:**

**Specified Torque 8 x 1.25 mm:**

**1st: 28 N.m (2.9 kgf.m, 21 lbf.ft), then loosen the bolts.**

 

**2nd: 24.5 N.m (2.5 kgf.m, 18 lbf.ft)**

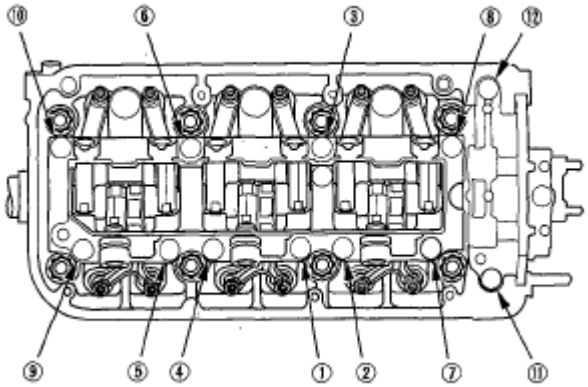


**Fig. 148: Identifying Bolt Tightening Sequence**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

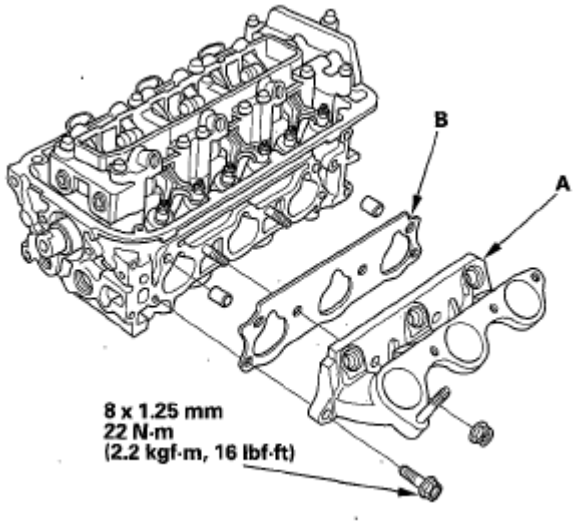


**Fig. 149: Identifying Injector Base And Gasket With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

14. 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).

 

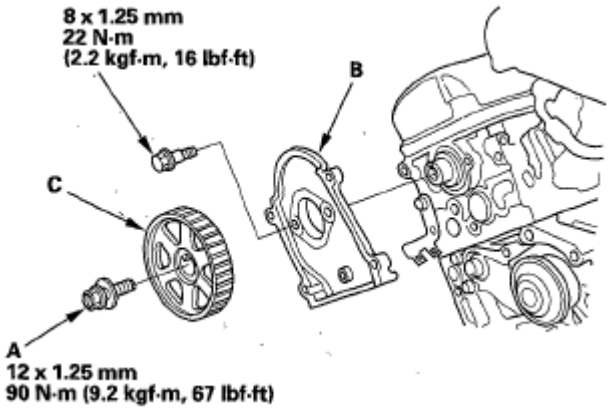


**Fig. 150: Identifying Camshaft Pulley Mounting Bolt And Back Cover With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

15. Set the camshaft pulley to TDC before bolting them onto the engine block (see step 6 on **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).

 

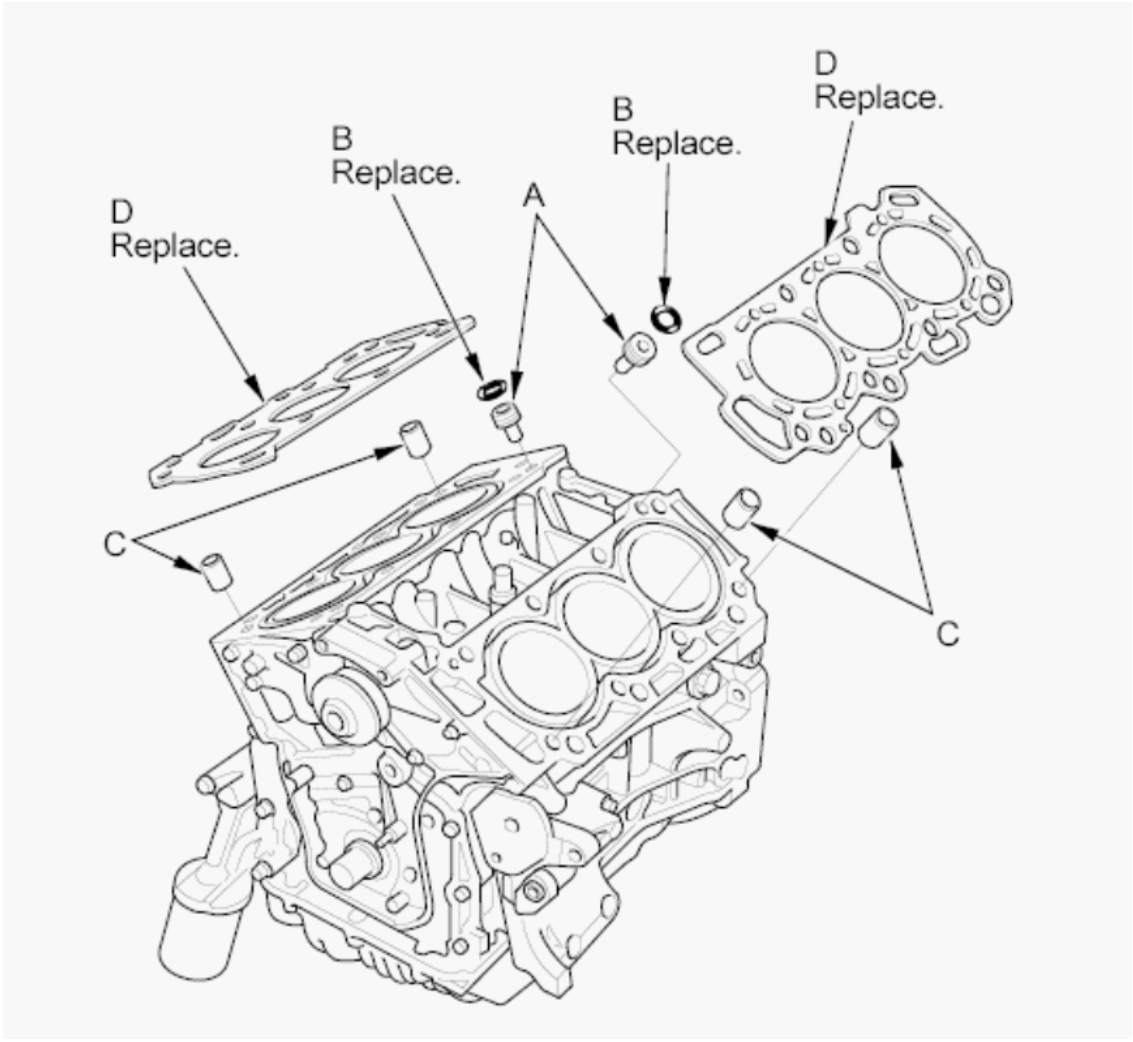


**Fig. 151: Identifying Cylinder Head Related Components**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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.

 

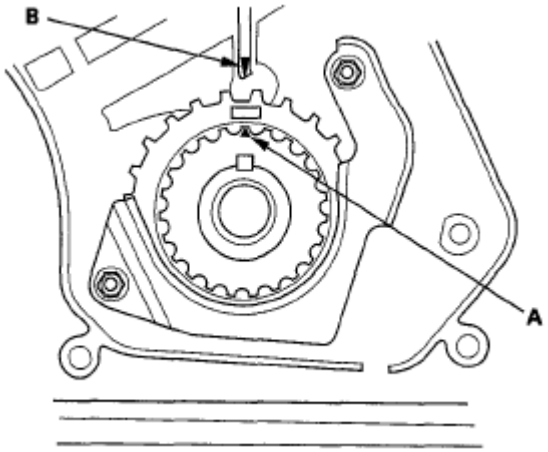


**Fig. 152: Aligning TDC Mark On Tooth Of Timing Belt Drive Pulley**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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**

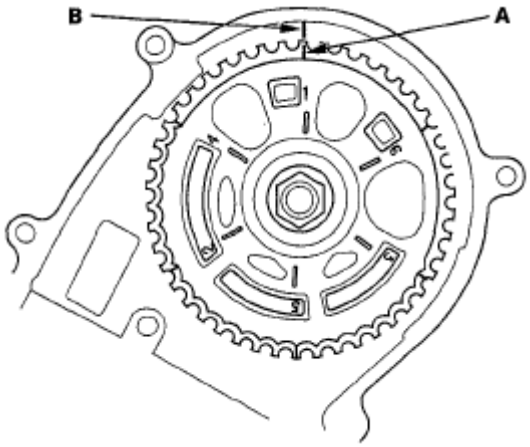


**Fig. 153: Aligning TDC Marks On Camshaft Pulleys - Front**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**REAR**

 

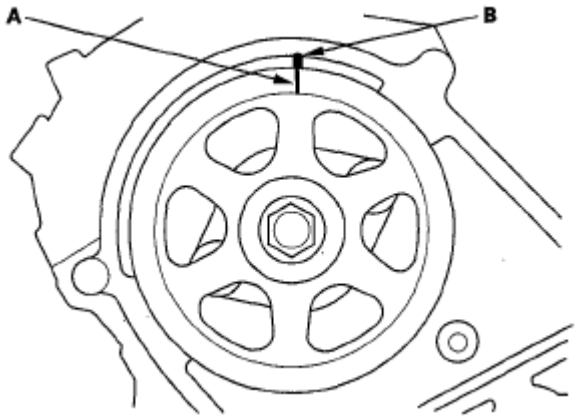


**Fig. 154: Aligning TDC Marks On Camshaft Pulleys - Rear**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

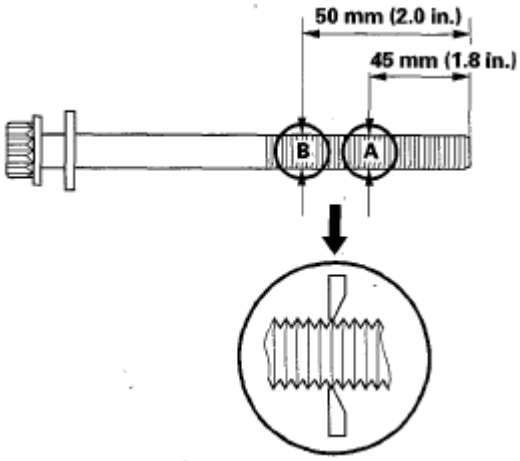


**Fig. 155: Measuring Diameter Of Cylinder Head Bolt**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

9. If either diameter is less than 10.6 mm (0.417 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. Torque the cylinder head bolts in sequence to 30 N.m (3.1 kgf.m, 22 lbf.ft) using a beam-type torque wrench. When using a preset click-type torque wrench, be sure to torque slowly and do not over tighten. If a bolt makes any noise while you are torquing it, loosen the bolt and retighten it from the first step.

**FRONT**

 

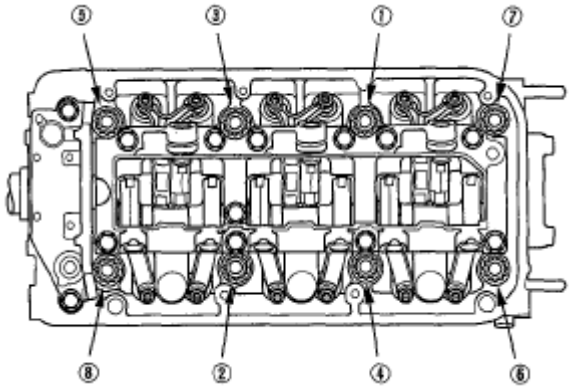


**Fig. 156: Identifying Cylinder Head Bolts Tightening Sequence - Front**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**REAR**

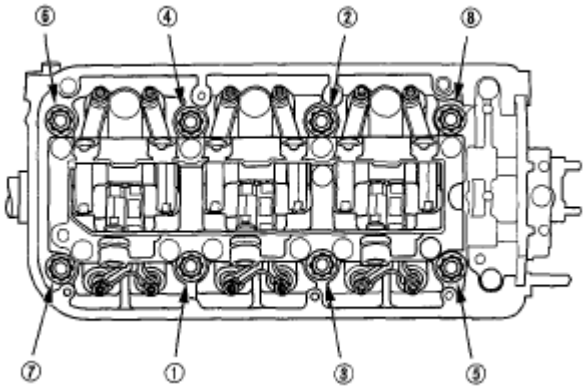


**Fig. 157: Identifying Cylinder Head Bolts Tightening Sequence - Rear**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

12. After torquing, tighten all cylinder head bolts in two steps (90° per step) using the sequence shown in step 12. 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.**

 

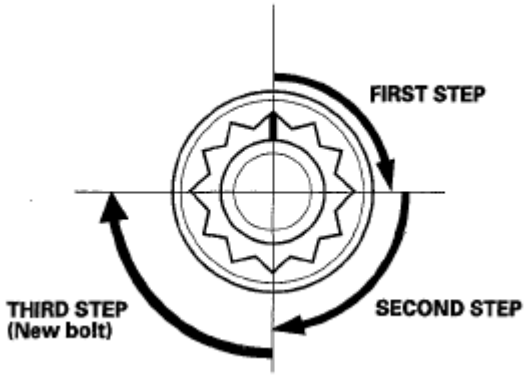


**Fig. 158: Identifying Cylinder Head Bolts Tightening Angle**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

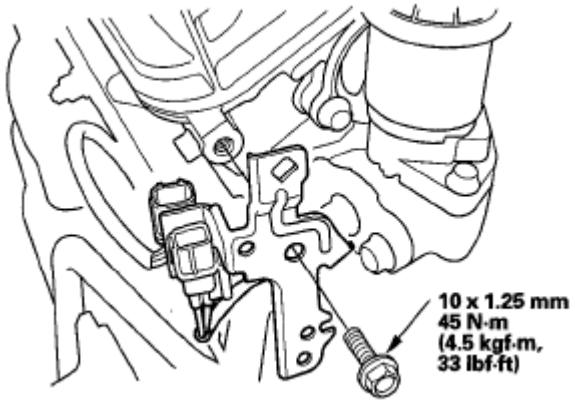


**Fig. 159: Identifying Connector Bracket With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

19. Install the harness clamp bracket to the rear cylinder head.

 

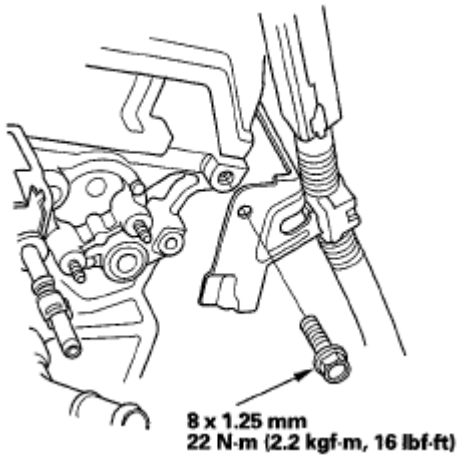


**Fig. 160: Identifying Harness Clamp Bracket With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

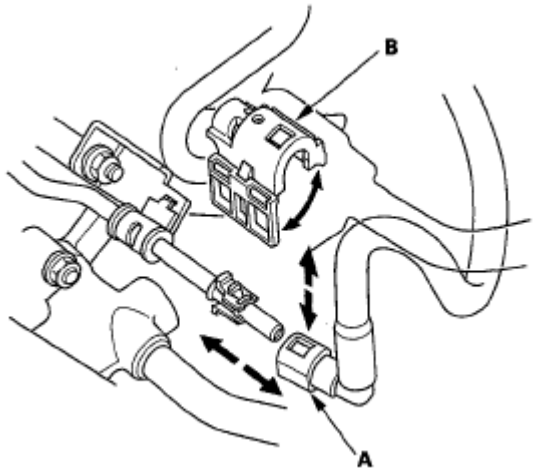


**Fig. 161: Identifying Fuel Feed Hose And Quick-Connect Fitting Cover**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

21. Install the front warm up three way catalytic converter (front WU-TWC) (see **WARM UP TWC REMOVAL/INSTALLATION** ) and the rear warm up three way catalytic converter (rear WU-TWC) (see **REAR** ).
22. 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

 

- Rocker arm oil control solenoid connector
- Rocker arm oil pressure switch connector
- Rear air fuel ratio (A/F) sensor connector
- Rear secondary heated oxygen sensor (secondary HO2S) connector

23. Install the six ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION** ).
24. Install the intake manifold (see **INSTALLATION** ).
25. Install the alternator (see **ALTERNATOR REMOVAL AND INSTALLATION** ).
26. Install the power steering (P/S) pump (A) and tighten the bolt (B) securing the P/S hose bracket.

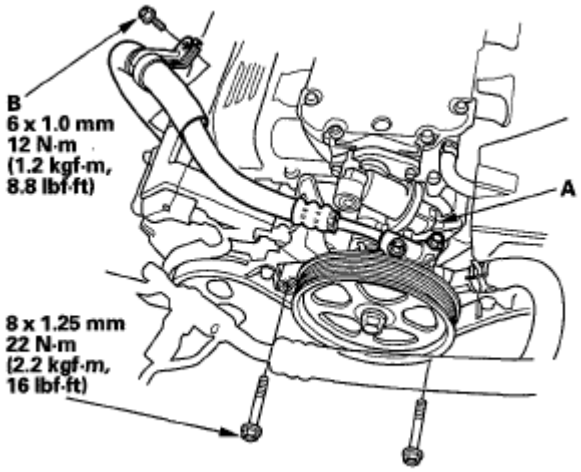


**Fig. 162: Identifying Power Steering (P/S) Pump And Bolts With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

27. Install the drive belt (see **DRIVE BELT INSPECTION** ).
28. Do the battery terminal reconnection procedure (see **BATTERY REMOVAL AND INSTALLATION** ).
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 **COOLANT REPLACEMENT** ).
32. Check for fluid leaks.
33. Do the PCM idle learn procedure (see **PCM IDLE LEARN PROCEDURE** ).
34. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **CKP PATTERN CLEAR/CKP PATTERN LEARN** ).
35. Inspect the idle speed (see **IDLE SPEED INSPECTION** ).
36. Inspect the ignition timing (see **IGNITION TIMING INSPECTION** ).

## CAMSHAFT OIL SEAL INSTALLATION - IN CAR

 

**Special Tools Required**

Ball Joint Remover/Installer 07GAF-SD40330

1. Remove the timing belt (see **TIMING BELT REMOVAL**).
2. Remove the camshaft pulley and the back cover (see step 18 **CYLINDER HEAD REMOVAL**).
3. Remove the camshaft oil seal.
4. Clean and dry the camshaft oil seal housing.
5. Apply a light coat of multipurpose grease to the lip of the camshaft oil seal.
6. 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.

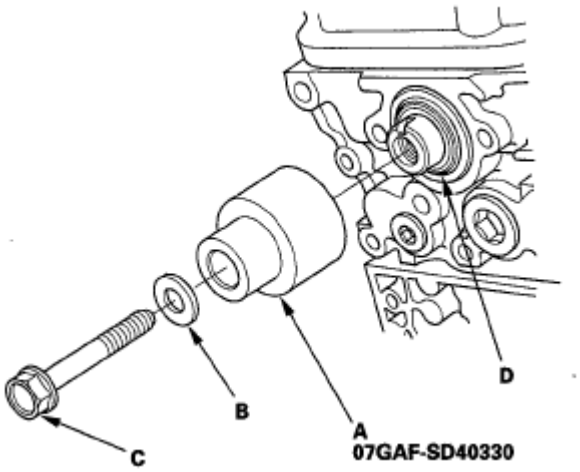


**Fig. 163: Installing Camshaft Oil Seal**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

7. Clean the excess grease off the camshaft, and check that the oil seal lip is not distorted.
8. Apply new engine oil to the threads of the camshaft pulley mounting bolt. Install the back cover, then install the camshaft pulley (see step 14 **CAMSHAFT, ROCKER ARM ASSEMBLY, CAMSHAFT SEAL, AND PULLEY INSTALLATION**).
9. Install the timing belt (see **TIMING BELT INSTALLATION**).

## SEALING BOLT INSTALLATION

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

**FRONT**

 

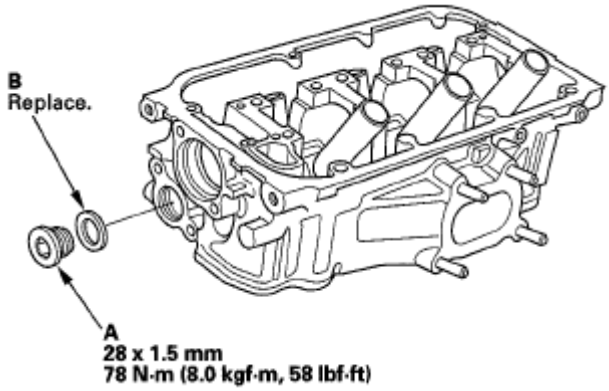


**Fig. 164: Identifying Sealing Bolt And Washer With Torque Specifications - Front**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**REAR**

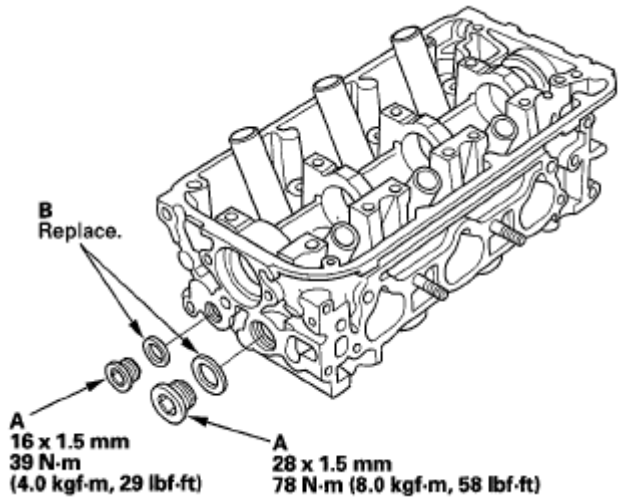


**Fig. 165: Identifying Sealing Bolt And Washer With Torque Specifications - Rear**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

 

**2009-12 ENGINE**

**Engine Block - Ridgeline**

# SPECIAL TOOLS

| Ref. No. | Tool Number | Description | Qty |
|---|---|---|---|
| ① | 070AD-RCAA100 | Oil Seal Driver, 64 mm | 1 |
| ② | 070AD-RCA0200 | Driver Attachment, 106 mm | 1 |
| ③ | 07749-0010000 | Driver Handle | 1 |

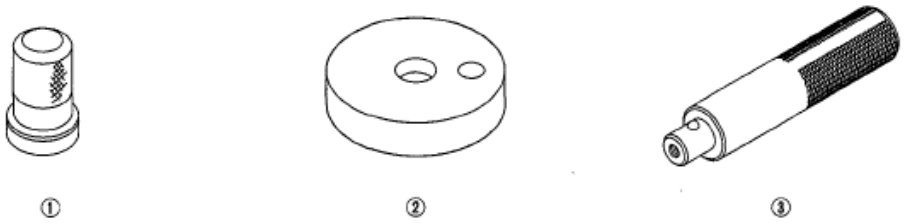


**Fig. 1: Identifying Special Tools**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

# COMPONENT LOCATION INDEX

 

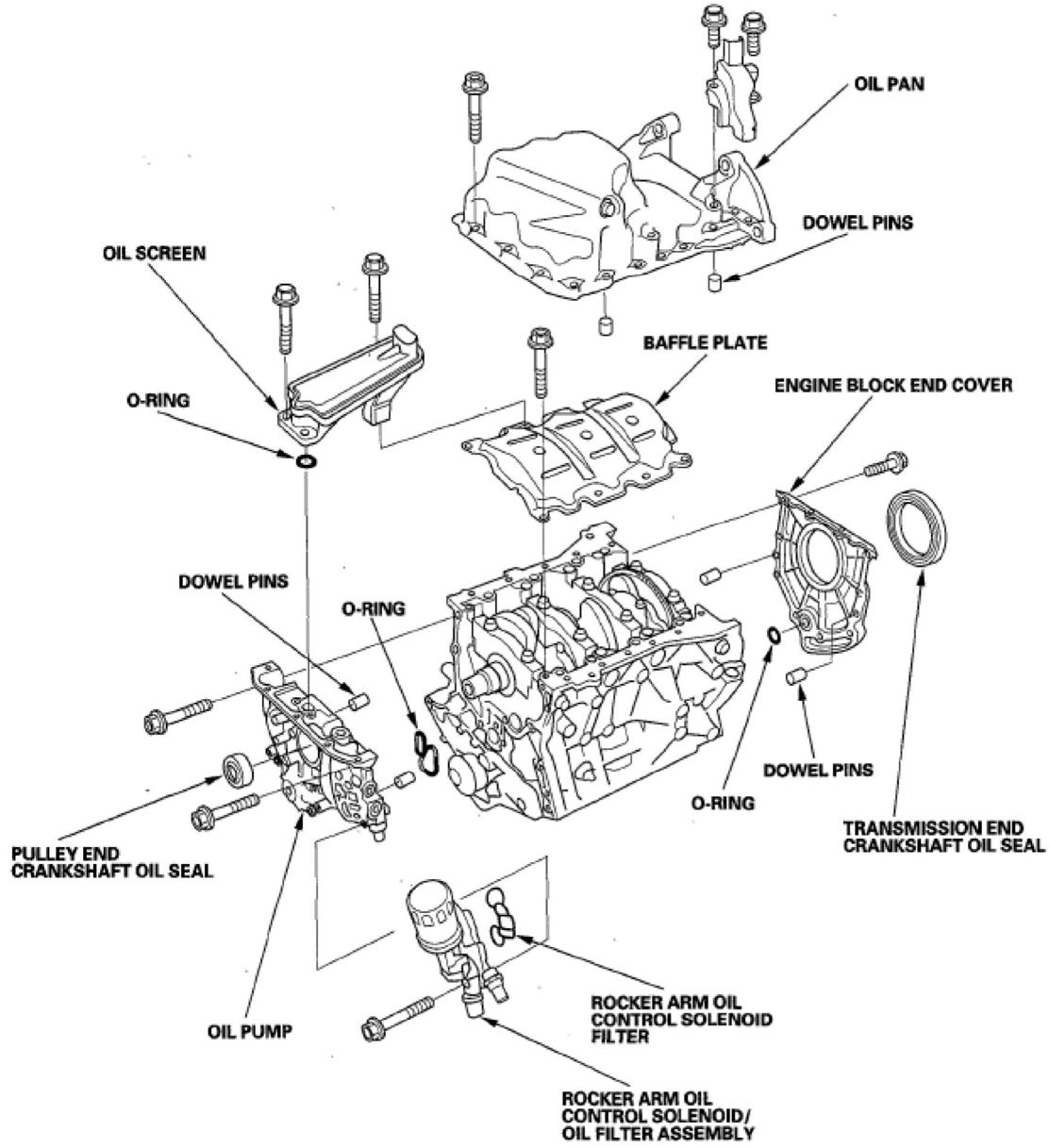


**Fig. 2: Identifying Engine Block Component Location (1 Of 3)**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

 

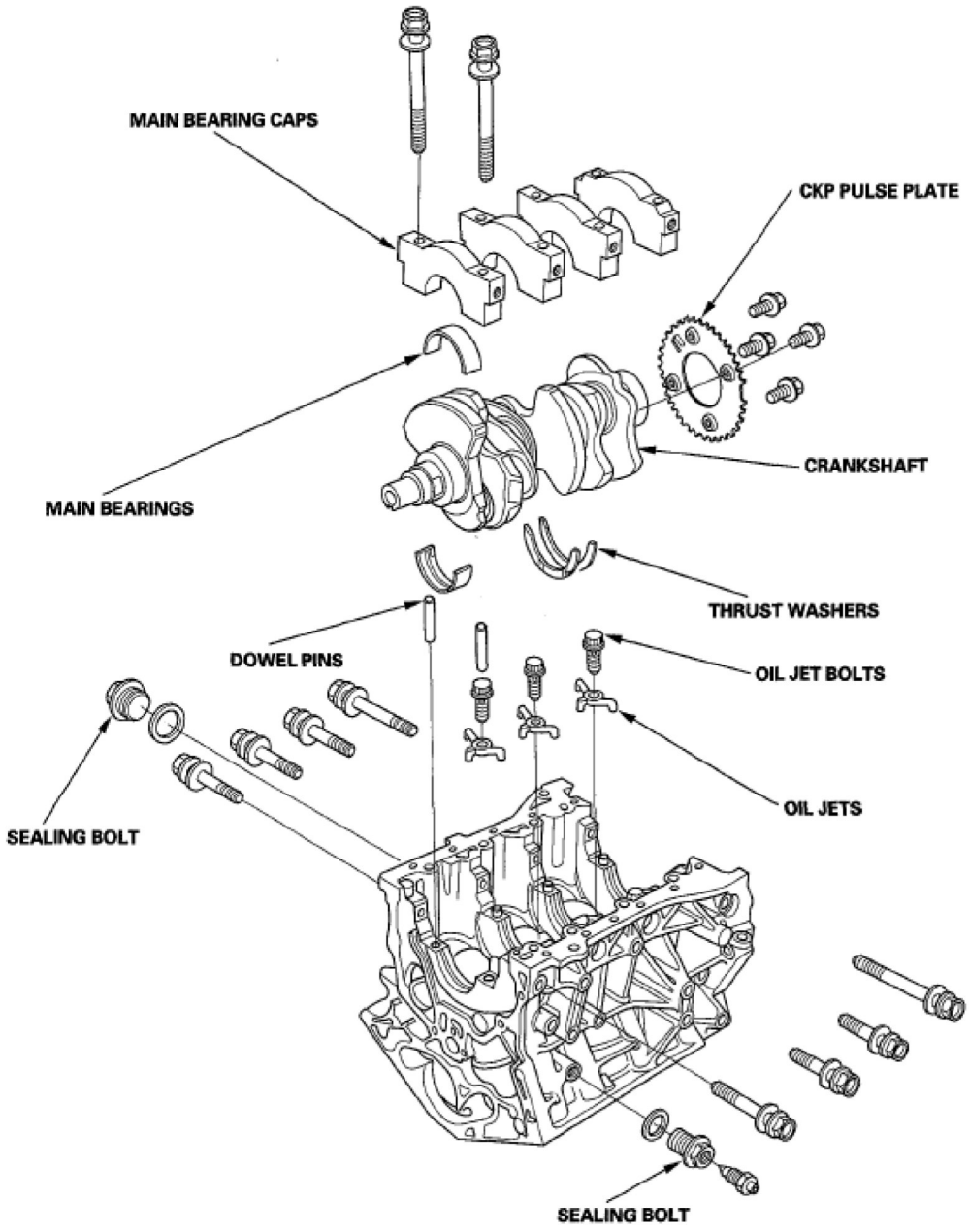


**Fig. 3: Identifying Engine Block Component Location (2 Of 3)**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

 

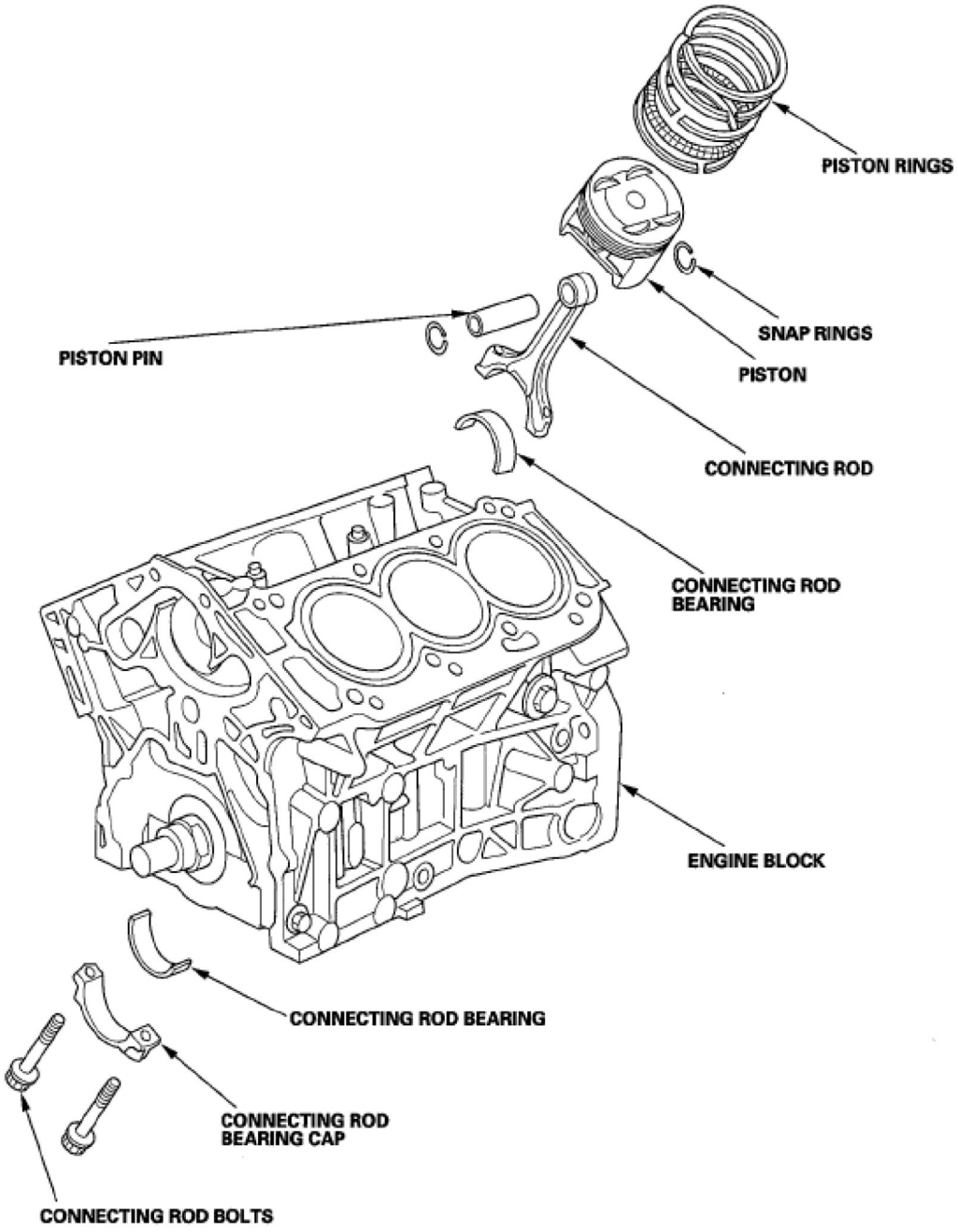


**Fig. 4: Identifying Engine Block Component Location (3 Of 3)**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

## CONNECTING ROD AND CRANKSHAFT END PLAY INSPECTION

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

 

**Connecting Rod End Play**

**Standard (New): 0.15-0.35 mm (0.006-0.013 in.)**

**Service Limit: 0.45 mm (0.017 in.)**

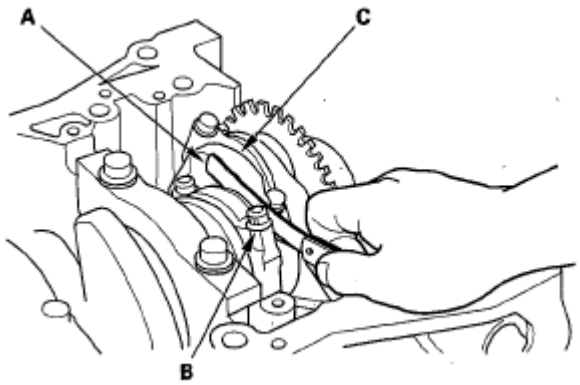


**Fig. 5: Measuring Connecting Rod End Play**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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 (0.0039-0.0138 in.)**

**Service Limit: 0.45 mm (0.0177 in.)**

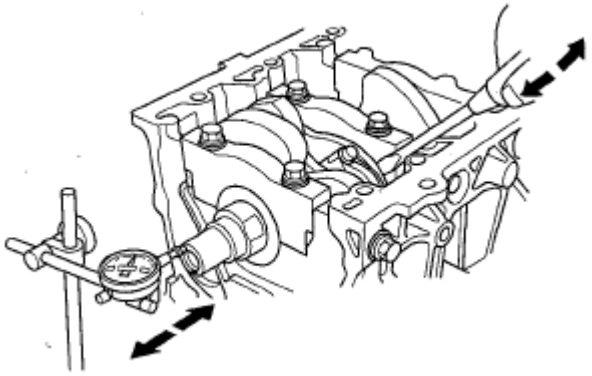

**Fig. 6: Measuring Crankshaft End Play**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

 

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 the bearing halves (see **CRANKSHAFT AND PISTON REMOVAL**).
2. Clean each main journal and bearing half with a clean shop towel.
3. Place one strip of plastigage across each main journal.

**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 the 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 tighten 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 23 on **CRANKSHAFT AND PISTON INSTALLATION**).

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

5. Remove the cap and the 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.)**

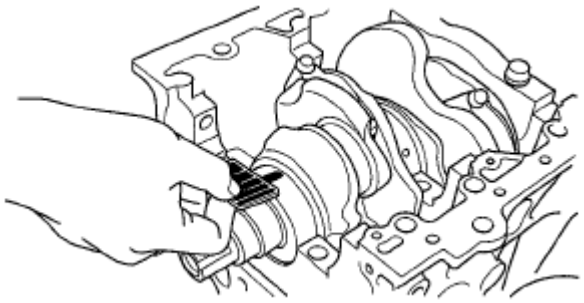

**Fig. 7: Measuring Main Bearing-To-Journal Oil Clearance**

 

**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

### Block 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.

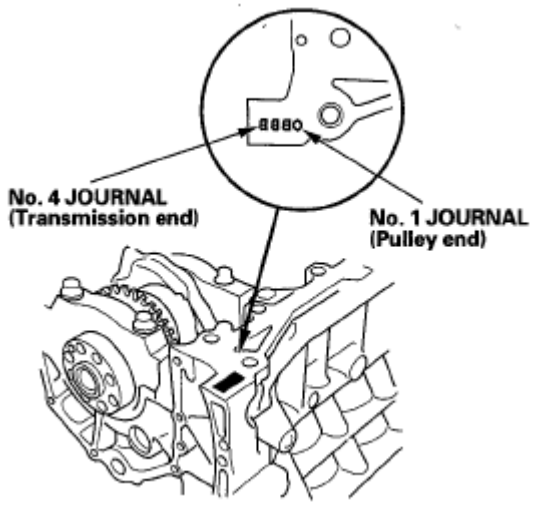


**Fig. 8: Identifying Crankshaft Bore Code Location**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

 

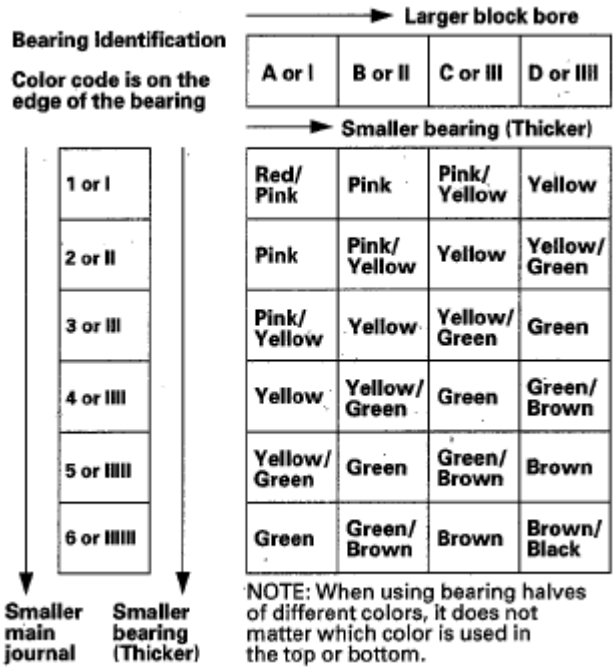


**Fig. 9: Crankshaft Bore Code Specification Chart**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**Main Journal Code Locations (Numbers or Bars)**

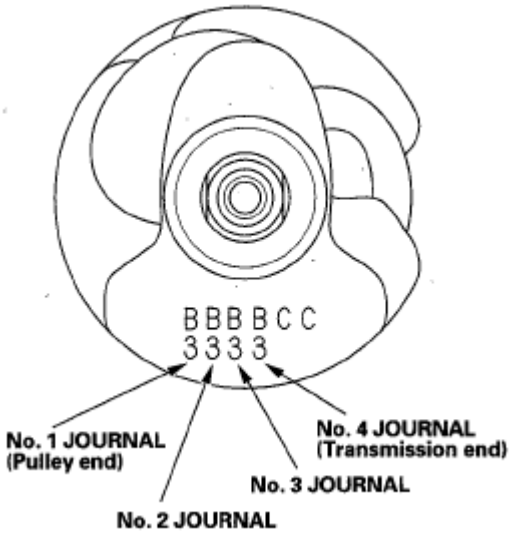


**Fig. 10: Identifying Main Journal Code Locations**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

# CONNECTING ROD BEARING REPLACEMENT

## CONNECTING 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 tighten 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, 15 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.)**

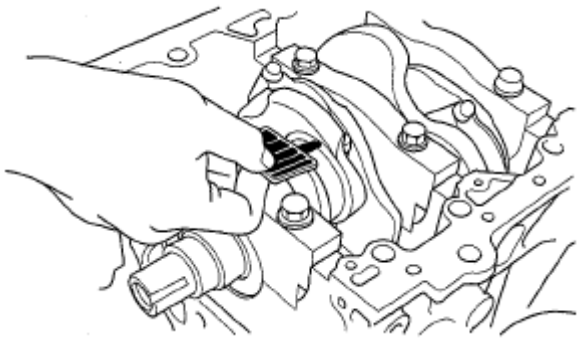

**Fig. 11: Measuring Connecting Rod Bearing-To-Journal Oil Clearance**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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**).

 

**CONNECTING ROD BEARING SELECTION**

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

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

**Normal Bore Size: 58.0 mm (2.28 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.

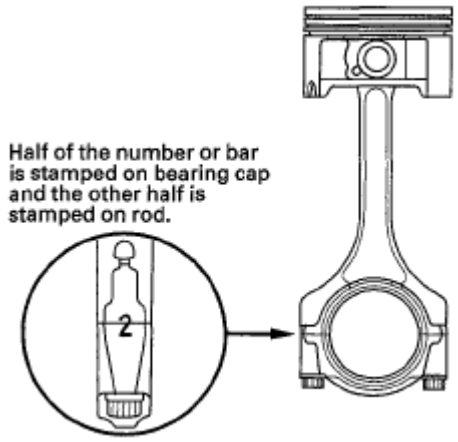


**Fig. 12: Identifying Connecting Rod Journal Code Locations**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

 

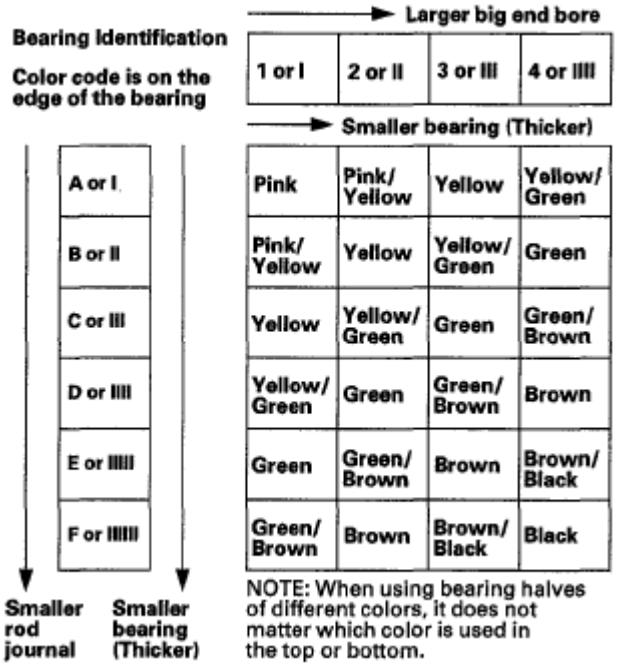


**Fig. 13: Connecting Rod Journal Code Color Specification Chart**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**Connecting Rod Journal Code Locations (Letters or Bars)**

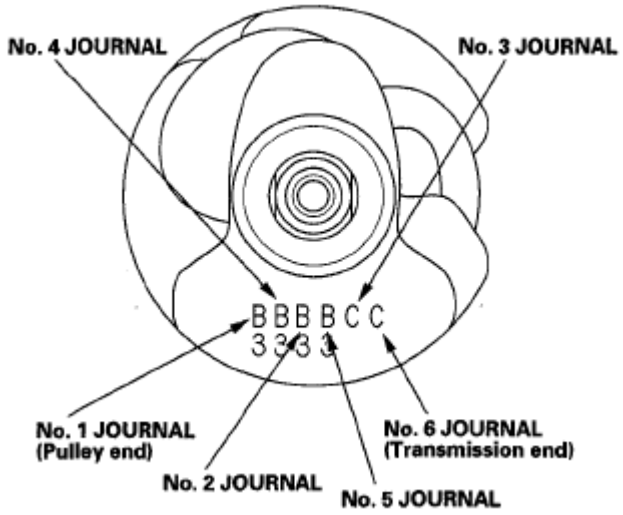


**Fig. 14: Identifying Connecting Rod Journal Code Locations**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

## OIL PAN REMOVAL

1. If the engine is already out of the vehicle, Go to step 6.
2. Raise the vehicle on the lift.

 

3. Drain the engine oil (see **ENGINE OIL LEVEL CHECK** ).
4. Remove the splash shield (see **FRONT SPLASH SHIELD REPLACEMENT** ).
5. Remove exhaust pipe A (see **EXHAUST PIPE AND MUFFLER REPLACEMENT** ).
6. Remove the rear WU-TWC bracket.

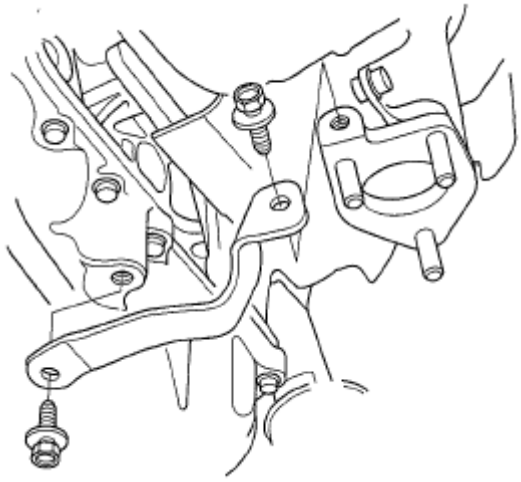

**Fig. 15: Identifying Bracket And Bolts**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

7. Remove the crankshaft position (CKP) sensor cover (A) and the bolt (B), then disconnect the CKP sensor connector (C).

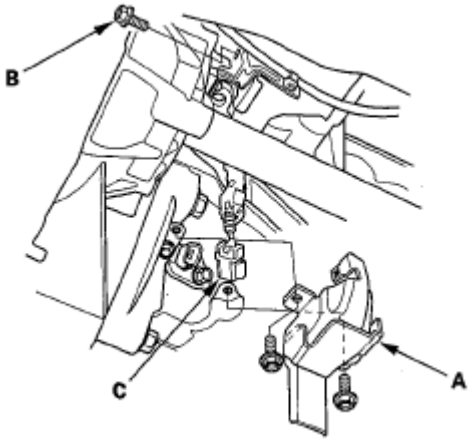


**Fig. 16: Identifying Crankshaft Position Sensor Cover And Bolt**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

8. Remove the clutch/torque converter cover (A) and the four bolts (B) securing the transmission.

 

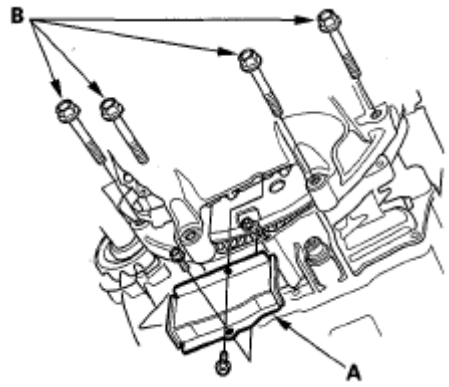


**Fig. 17: Identifying Clutch/Torque Converter Cover And Bolts**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

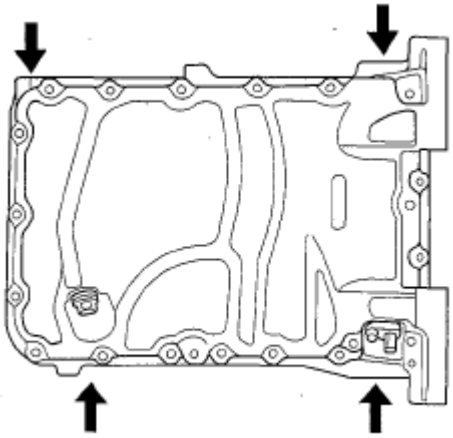

**Fig. 18: Identifying Oil Pan Bolts**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

11. Remove the oil pan.

## CRANKSHAFT AND PISTON REMOVAL

1. Remove the engine/transmission (see **ENGINE REMOVAL** ).
2. Remove the transmission (see **TRANSMISSION REMOVAL** ).
3. Remove the drive plate (see **DRIVE PLATE REMOVAL AND INSTALLATION** ).
4. Remove the cylinder heads (see **CYLINDER HEAD REMOVAL** ).
5. Remove the CKP sensor (see **CKP SENSOR REPLACEMENT** ).
6. Remove the timing belt drive pulley from the crankshaft (see **TIMING BELT DRIVE PULLEY REPLACEMENT** ).
7. Remove the oil pan (see **OIL PAN REMOVAL**).

 

8. Remove the engine block end cover.

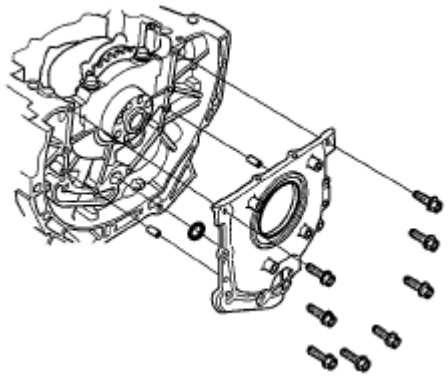

**Fig. 19: Identifying Engine Block End Cover And Bolts**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

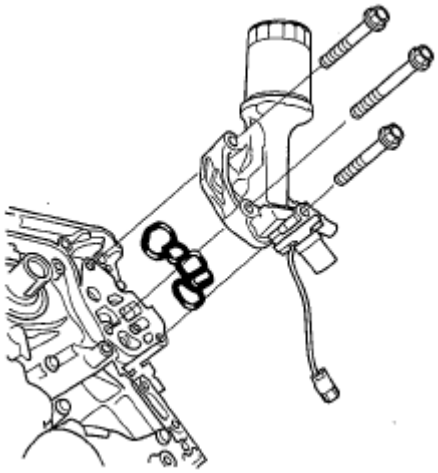

**Fig. 20: Identifying Rocker Arm Oil Control Solenoid/Oil Filter Assembly**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

 

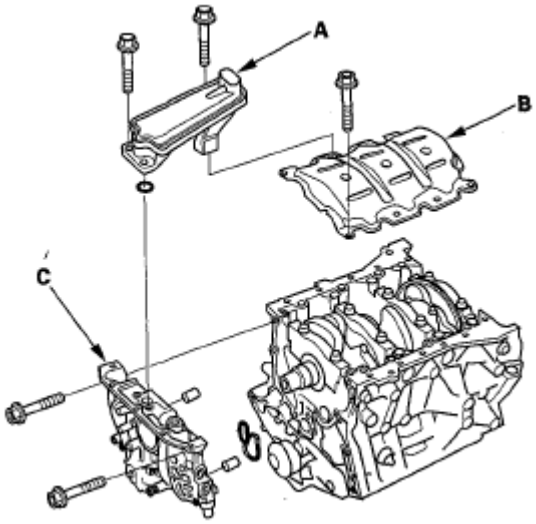


**Fig. 21: Identifying Baffle Plate, Oil Pump And Oil Screen**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

11. If you can feel a ridge of metal or hard carbon around the top of any cylinder, remove it with a ridge reamer (A). Follow the reamer manufacturer's instructions. If the ridge is not removed, it may damage the piston as it's pushed out.

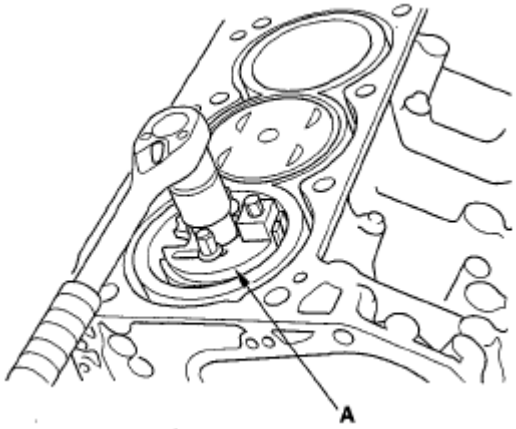


**Fig. 22: Identifying Hard Carbon Around Top Of Cylinder**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

12. 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, the crank pin, or the cylinder with the connecting rod.

 

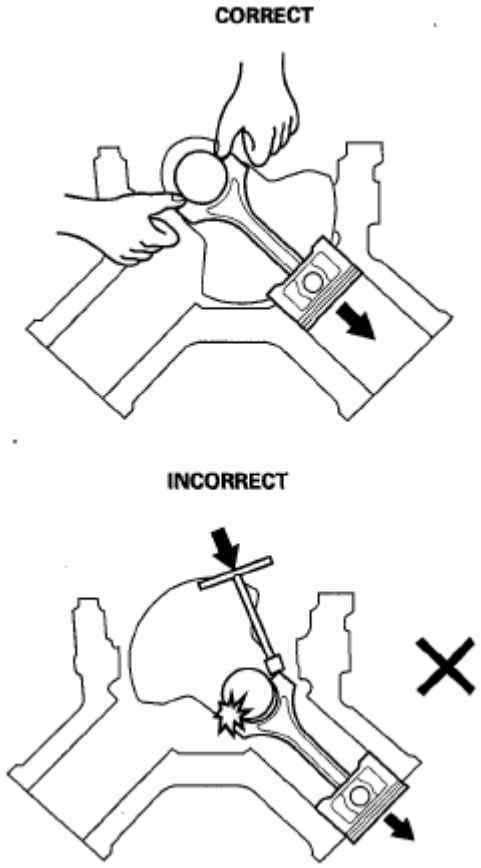


**Fig. 23: Removing Piston/Connecting Rod Assembly By Pushing On Connecting Rod**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

13. Remove the bearing from the cap. Keep all caps/bearings in order.
14. Remove the upper bearing halves from the connecting rods, and set them aside with their respective caps.
15. After-removing a piston/connecting rod assembly, reinstall the cap on the rod.
16. To avoid confusion during reassembly, mark each piston/connecting rod assembly with its cylinder number.
17. 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.

 

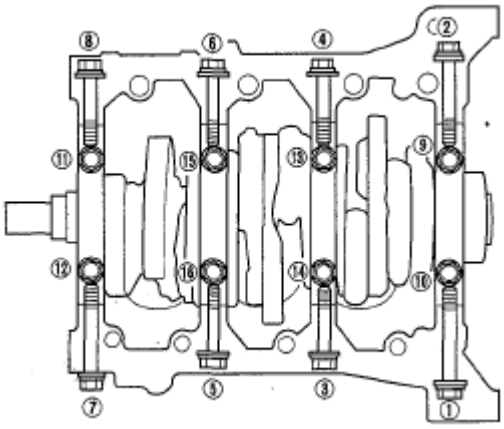


**Fig. 24: Identifying Bearing Cap Bolts Loosening Sequence**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

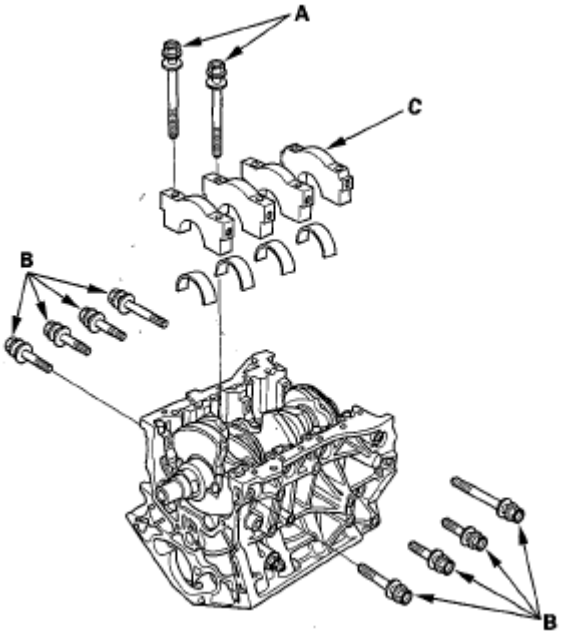


**Fig. 25: Identifying Bearing Cap Bolts And Bearing Cap Side Bolts**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

19. Lift the crankshaft (A) out of the engine block, being careful not to damage the journals and the CKP pulse plate.

 

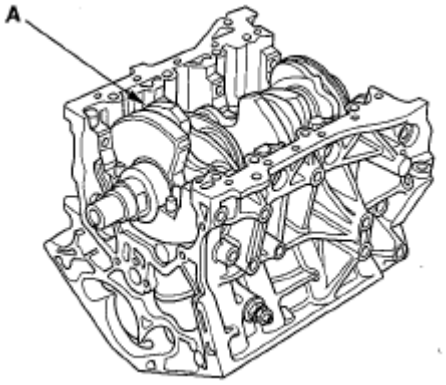


**Fig. 26: Identifying Crankshaft**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

20. Remove the CKP pulse plate from the crankshaft (see **CKP PULSE PLATE REPLACEMENT**).
21. 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. Remove the CKP pulse plate from the crankshaft (see **CKP PULSE PLATE REPLACEMENT**).
3. Clean the crankshaft oil passages with pipe cleaners or a suitable brush.
4. Check the keyway slot and the threaded holes for damage.
5. Measure the out-of-round at the middle of each rod and the main journal in two places. The difference between measurements on each journal must not be more than the service limit.

   **Journal Out-of-Round**

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

   **Service Limit: 0.010 mm (0.0004 in.)**

 

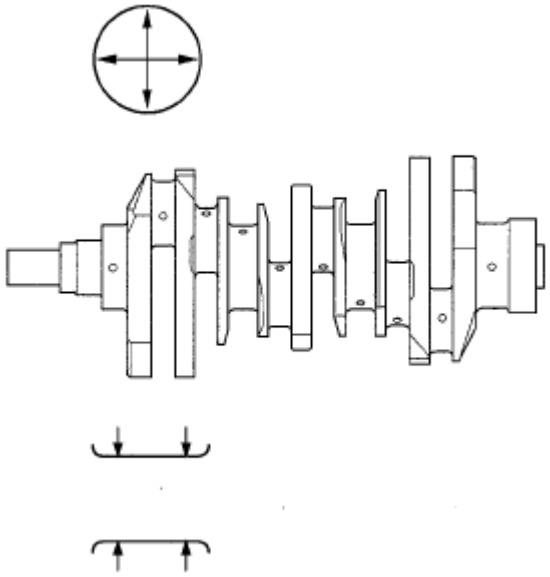

**Fig. 27: Measuring Out-Of-Round At Middle Of Each Rod And Main Journal**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

6. 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**

7. Place the V-block on a flat surface.
8. Check the total runout with the crankshaft supported on V-blocks.
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.)**

 

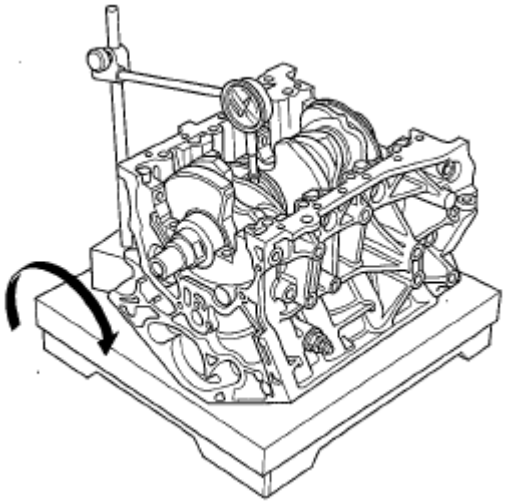

**Fig. 28: Measuring Crankshaft Total Runout**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

## BLOCK AND PISTON INSPECTION

1. Remove the pistons from the engine block (see **CRANKSHAFT AND PISTON REMOVAL**).
2. Check the pistons for distortion or cracks.
3. Measure the piston skirt diameter (A) at a point 16 mm(0.63 in) from the bottom of the skirt.

**Piston Skirt Diameter**

**Standard (New): 88.975-88.985 mm**

**(3.5029-3.5033 in.)**

**Service Limit: 88.965 mm (3.5026 in.)**

**Oversize Piston Skirt Diameter**

**0.25: 89.235 mm (3.51279-3.51318 in)**

 

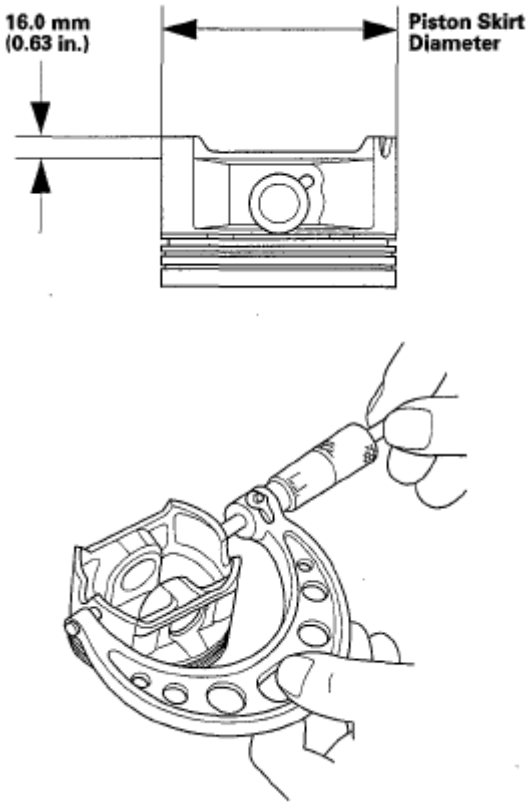


**Fig. 29: Measuring Piston Skirt Diameter**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

   If the measurements in any cylinder are beyond the oversize bore service limit, replace the engine block. If the engine block has to be rebored, refer to step 7 after reboring.

   **Cylinder Bore Size**

   **Standard (New): 89.000-89.015 mm**

   **(3.5039-3.5045 in.)**

   **Service Limit: 89.065 mm (3.5065 in.)**

   **Oversize**

   **0.25: 89.250-89.265 mm (3.5138-3.5144 in.)**

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

   **Bore Taper**

 

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

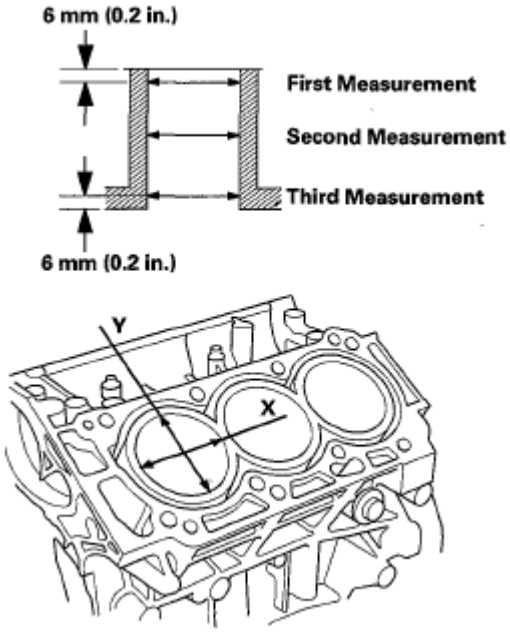


**Fig. 30: Measuring Cylinder Bore Size**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

5. Hone any scored or scratched cylinder bores (see **CYLINDER BORE HONING**).
6. Check the top of the engine block for warpage. Measure along the edges and across the center as shown.

**Engine Block Warpage**

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

**Service Limit: 0.10 mm (0.004 in.)**

 

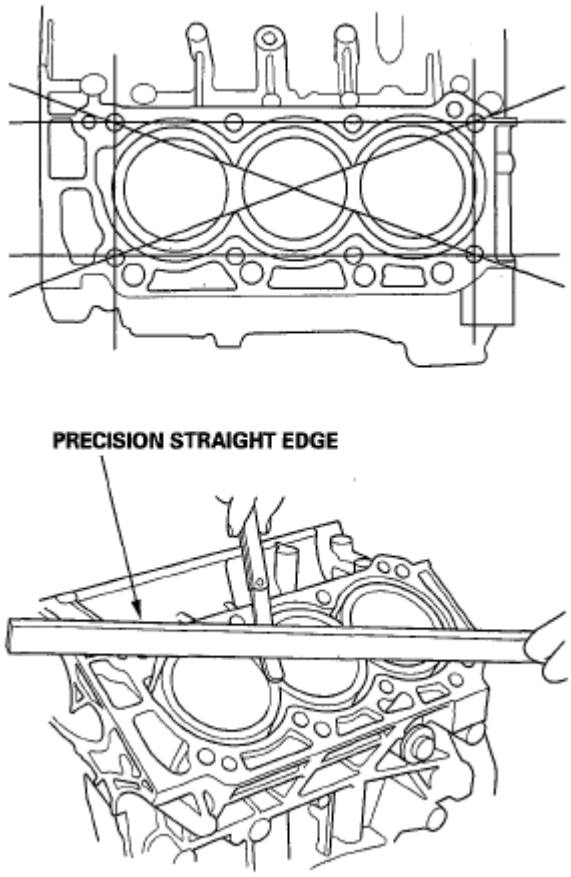


**Fig. 31: Measuring Engine Block Warpage**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

   **Piston-to-Cylinder Bore Clearance**

   **Standard (New): 0.015-0.040 mm**

   **(0.0006-0.0016 in.)**

   **Service Limit: 0.08 mm (0.003 in.)**

 

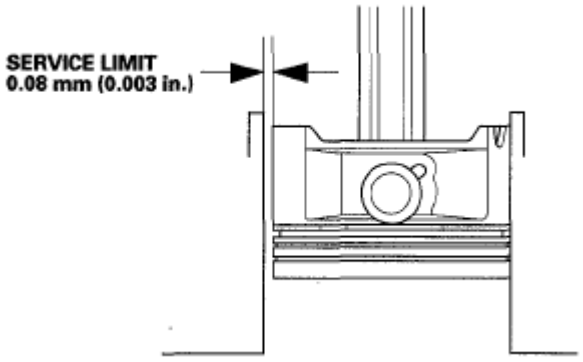


**Fig. 32: Measuring Piston-To-Cylinder Bore Clearance**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

## CYLINDER BORE HONING

1. Measure the cylinder bores (see step 4 on **BLOCK AND PISTON INSPECTION**). If the engine block is to be reused, hone the cylinders and re-measure the bores. Only scored or scratched cylinder bores must be honed.
2. Remove the oil jets (see **OIL JET REPLACEMENT** ).
3. Hone the cylinder bores with honing oil and a fine (400 grit) stone in a 60 degree Crosshatch pattern.

**NOTE:**

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

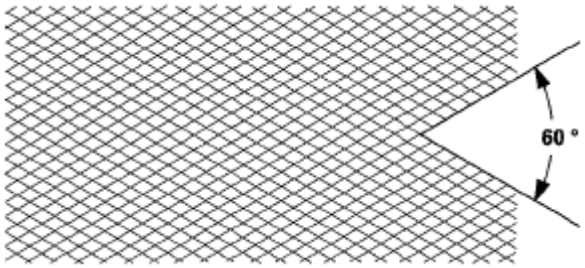


**Fig. 33: Measuring Cylinder Bore Honing**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

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

5. If scoring or scratches are still present in the cylinder bores after honing to the service limit, rebore the engine block. Some light vertical scoring and scratching is acceptable if it is not deep enough to catch your fingernail and does not run the full length of the bore.

 

6. Install the oil jets (see **OIL JET REPLACEMENT** ).

# PISTON, PIN, AND CONNECTING ROD REPLACEMENT

**DISASSEMBLY**

1. Remove the pistons 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.**

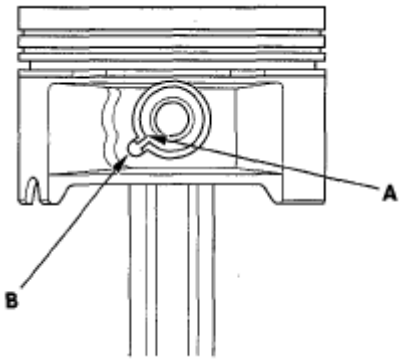


**Fig. 34: Identifying Piston Pin Snap Rings And Piston Pin Bores**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

3. Remove the snap rings (A) from both sides of each 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.

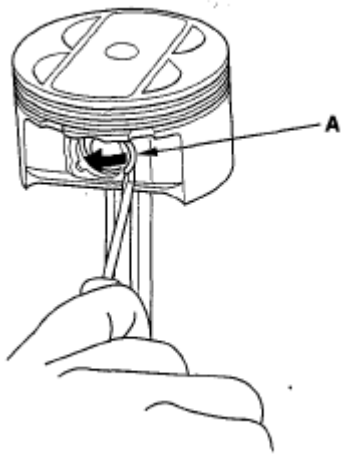


**Fig. 35: Identifying Snap Rings**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

 

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

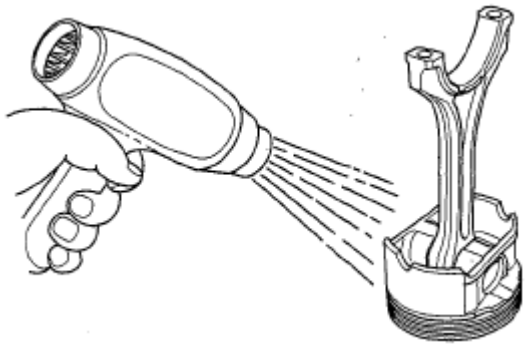

**Fig. 36: Heating Piston And Connecting Rod Assembly**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**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): 21.962-21.965 mm**

   **(0.8646-0.8648 in.)**

   **Service Limit: 21.954 mm (0.8643 in.)**

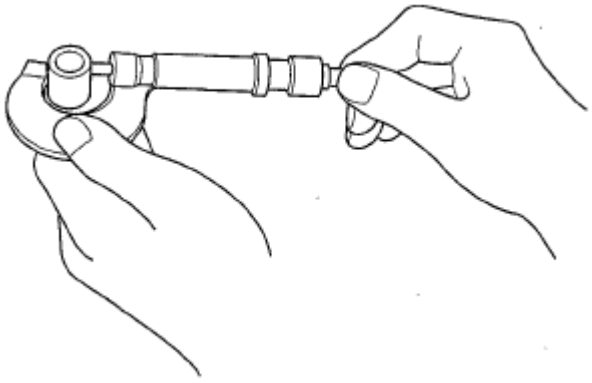

**Fig. 37: Measuring Diameter Of Piston Pin**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

 

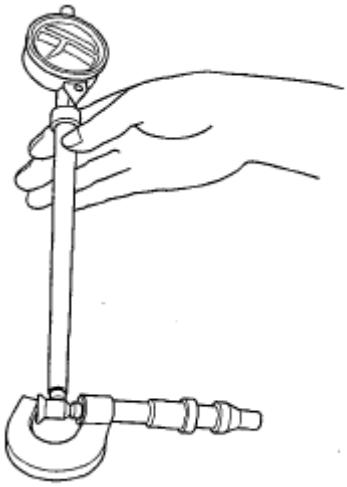

**Fig. 38: Identifying Zero Dial Indicator To Piston Pin Diameter**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

   **Piston Pin-to-Piston Clearance**

   **Standard (New): -0.0050 to +0.0010 mm**

   **(-0.00020 to +0.00004 in.)**

   **Service Limit: 0.004 mm (0.0002 in.)**

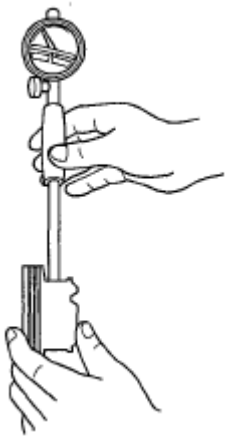

**Fig. 39: Measuring Piston Pin-To-Piston Clearance**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

   **Piston Pin-to-Connecting Rod Clearance**

 

**Standard (New): 0.005-0.014 mm**

**(0.0002-0.0006 in.)**

**Service Limit: 0.019 mm (0.0007 in.)**

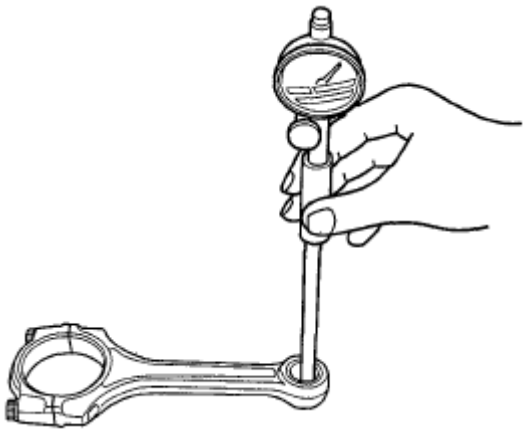

**Fig. 40: Measuring Piston Pin-To-Connecting Rod Clearance**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

**REASSEMBLY**

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

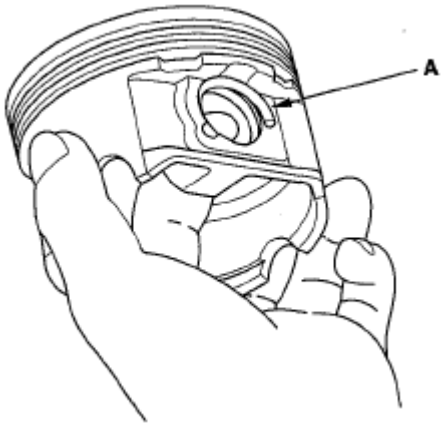


**Fig. 41: Identifying Piston Pin Snap Ring**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

 

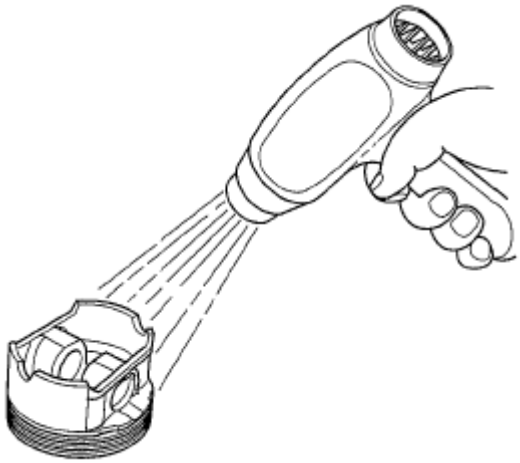

**Fig. 42: Heating Piston**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

4. Assemble the piston (A) and the 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.**

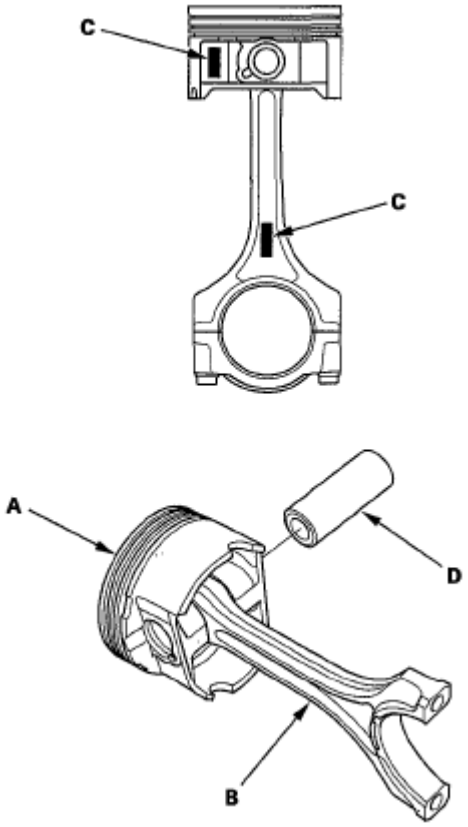


**Fig. 43: Assembling Piston And Connecting Rod**

 

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

5. Install the remaining snap ring.
6. Reassemble the other pistons the same way.

## PISTON RING REPLACEMENT

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

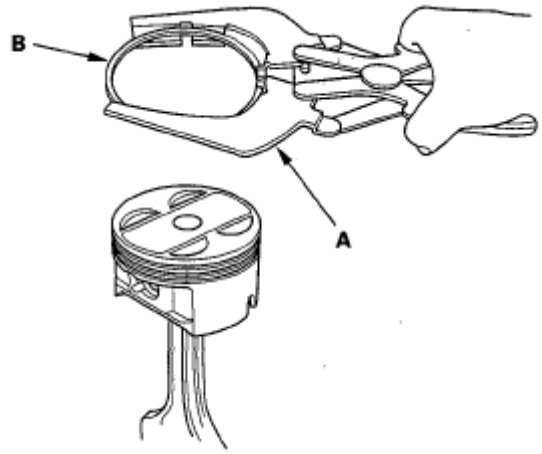


**Fig. 44: Removing Old Piston Rings**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

3. Clean all the ring grooves thoroughly with a squared-off broken ring, or a ring groove cleaner with a blade to fit 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.

 

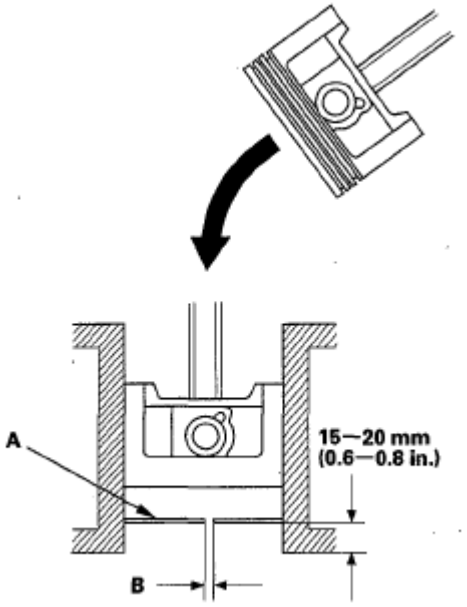


**Fig. 45: Pushing Ring Into Cylinder Bore**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

5. Measure the piston ring end-gap (B) with a feeler gauge:
   - If the gap is too small, check to see if you have the proper rings for your engine.
   - If the gap is too large, recheck the cylinder bore diameter against the wear limits (see step 4 on **BLOCK AND PISTON INSPECTION**). If the bore is over the service limit, the engine block must be rebored.

**Piston Ring End-Gap**

**Top Ring:**

**Standard (New): 0.20-0.35 mm**

**(0.008-0.014 in.)**

**Service Limit: 0.60 mm (0.024 in.)**

**Second Ring:**

**Standard (New): 0.40-0.55 mm**

**(0.016-0.022 in.)**

**Service Limit: 0.70 mm (0.028 in.)**

**Oil Ring:**

 

**Standard (New): 0.20-0.70 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 1D or 1R mark and the second ring (B) has a 2X or 2R mark. The manufacturing marks (C) must be facing upward.

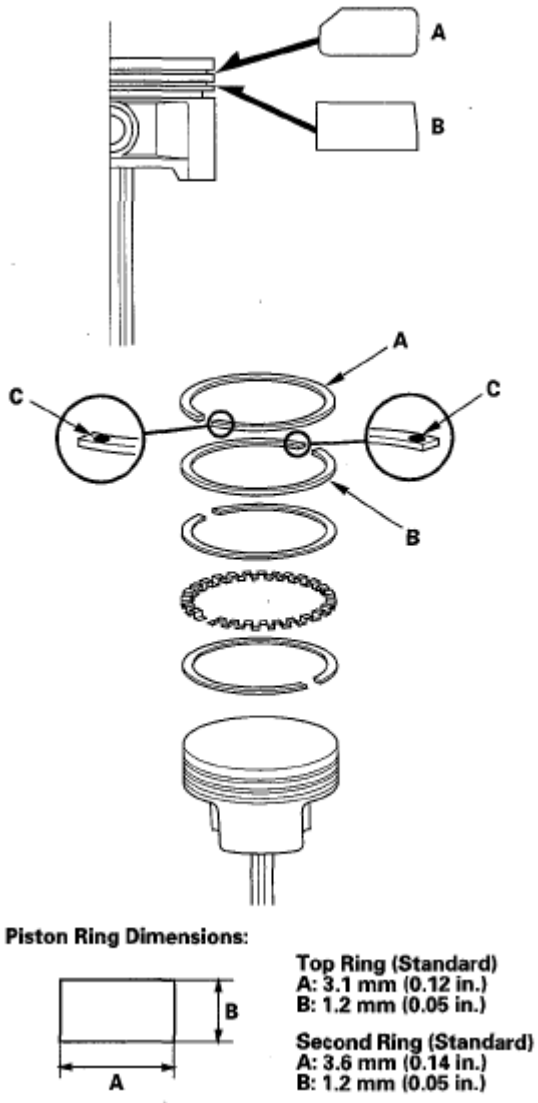


**Fig. 46: Identifying Top And Second Ring Mark**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

**Top Ring Clearance**

 

**Standard (New): 0.055-0.080 mm**

**(0.0022-0.0031 in.)**

**Service Limit: 0.15 mm (0.006 in.)**

**Second Ring Clearance**

**Standard (New): 0.030-0.055 mm**

**(0.0012-0.0022 in.)**

**Service Limit: 0.13 mm (0.005 in.)**

**Fig. 47: 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:

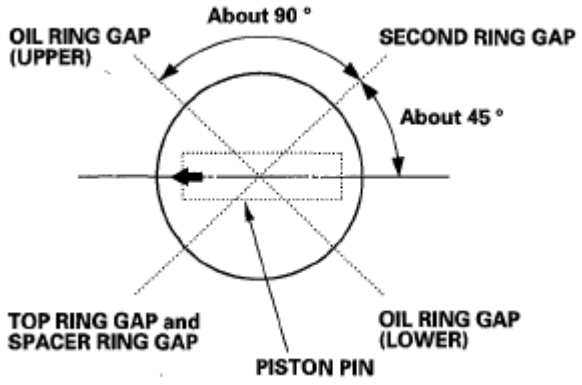


**Fig. 48: Positioning Ring End Gaps**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

## CRANKSHAFT AND PISTON INSTALLATION

 

**Special Tools Required**

- Driver Handle, 15 x 135L 07749-0010000
- Oil Seal Driver Attachment, 106 mm 070AD-RCA0200

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 the rod bearings.
5. Remove the CKP pulse plate from the crankshaft (see **CKP PULSE PLATE REPLACEMENT**).
6. Lower the crankshaft (A) into the engine block, being careful not to damage the journals and the CKP pulse plate.

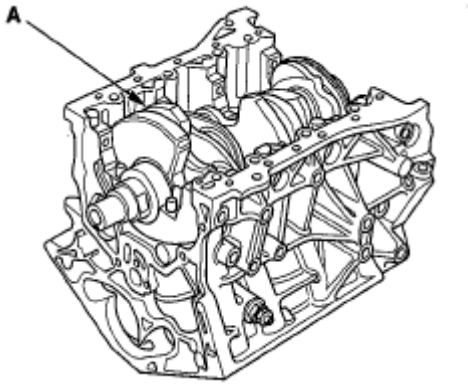


**Fig. 49: Identifying Crankshaft**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

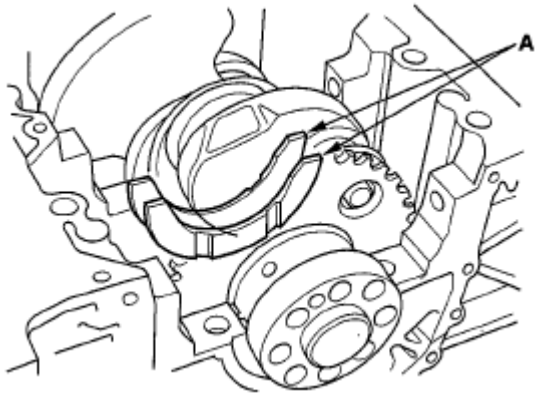


**Fig. 50: Identifying Thrust Washers**

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

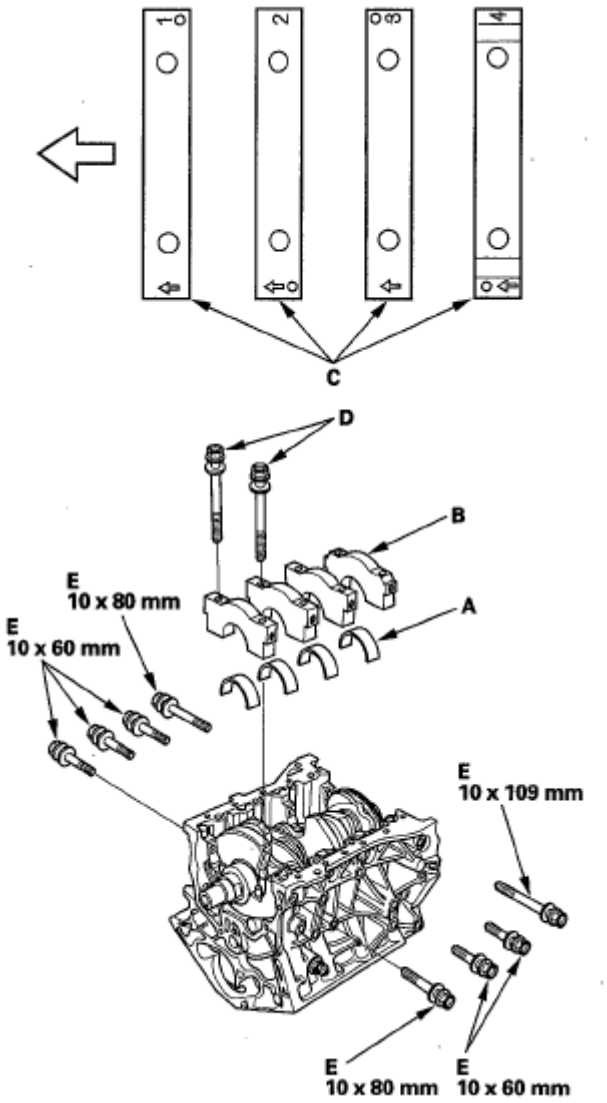


**Fig. 51: Identifying Bearings And Bearing Caps With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

 

block.

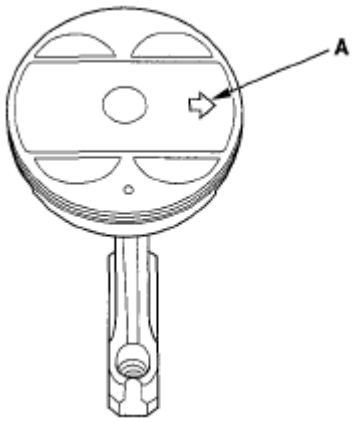


**Fig. 52: Positioning Piston/Connecting Rod Assembly**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

14. 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.

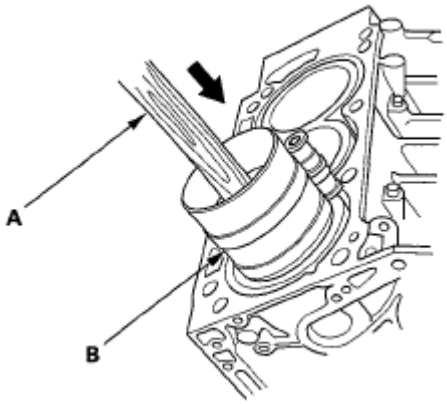


**Fig. 53: Positioning Piston/Connecting Rod Assembly In Cylinder**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

 

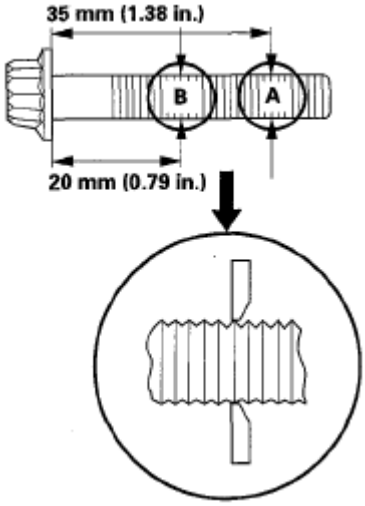


**Fig. 54: Measuring Diameter Of Connecting Rod Bolt With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

17. 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.)**

18. If the difference in diameter is out of tolerance, replace the connecting rod bolt.
19. Install the bearing (A), then line up the mark (B) on the connecting rod (C) and the rod cap (D).

 

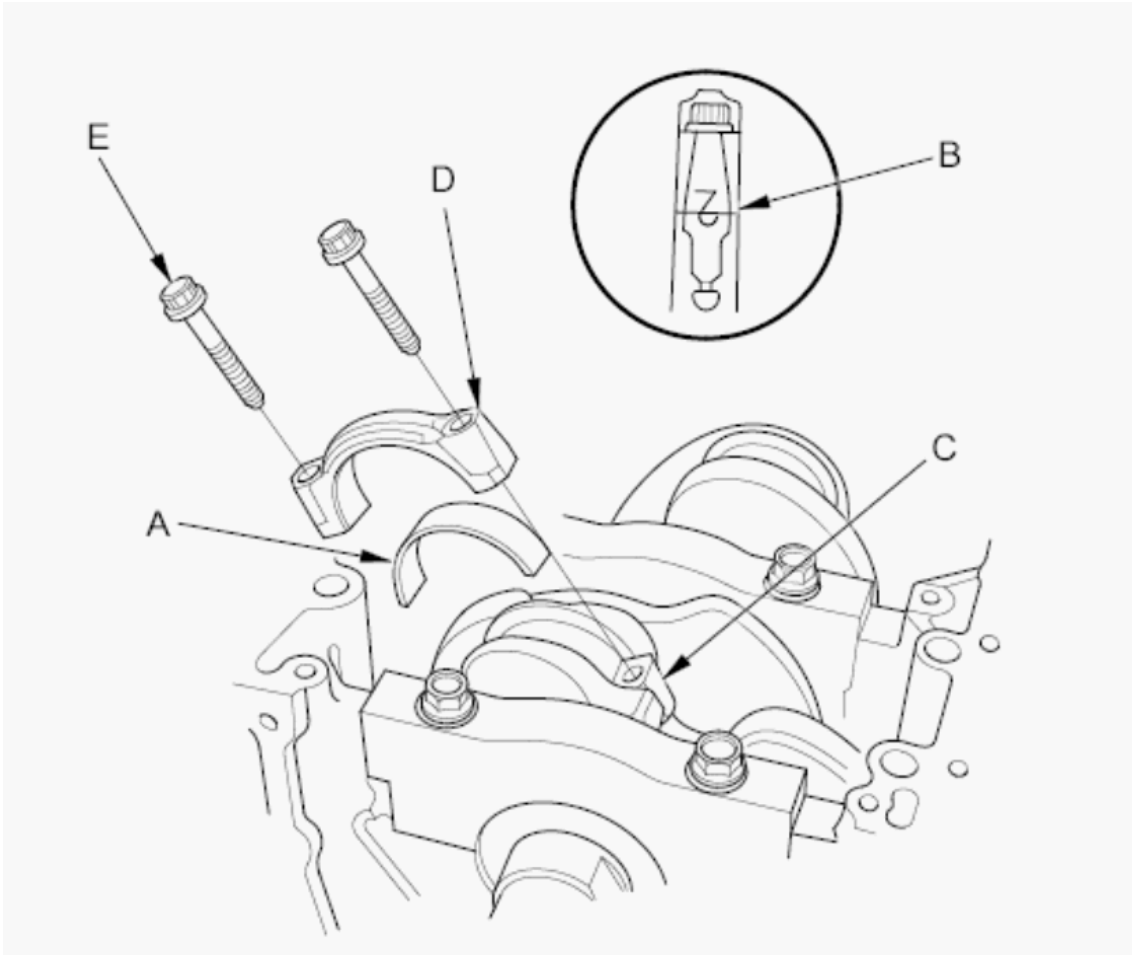


**Fig. 55: Identifying Mark On Connecting Rod And Cap**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

20. Apply new engine oil to the bolt threads and flanges, then install the bolts (E).
21. Tighten the connecting rod bolt to 20 N.m (2.0 kgf.m, 15 lbf.ft).

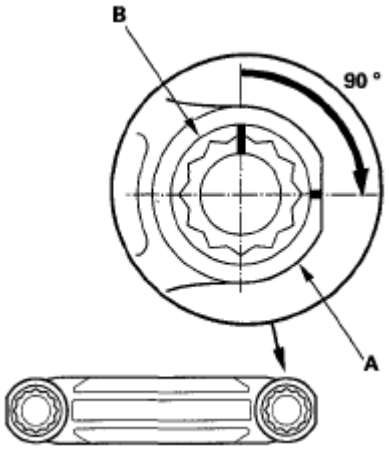


**Fig. 56: Identifying Tightening Angle Of Bolts**

 

**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

22. Tighten the connecting rod bolt an additional 90 °.

**NOTE: Remove the connecting rod bolt if you tightened it beyond the specified angle, and go back to step 16 of the procedure. Do not loosen it back to the specified angle. Repeat steps 10 to 21 for the remaining cylinders.**

23. 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 ensure the bolts are properly torqued.

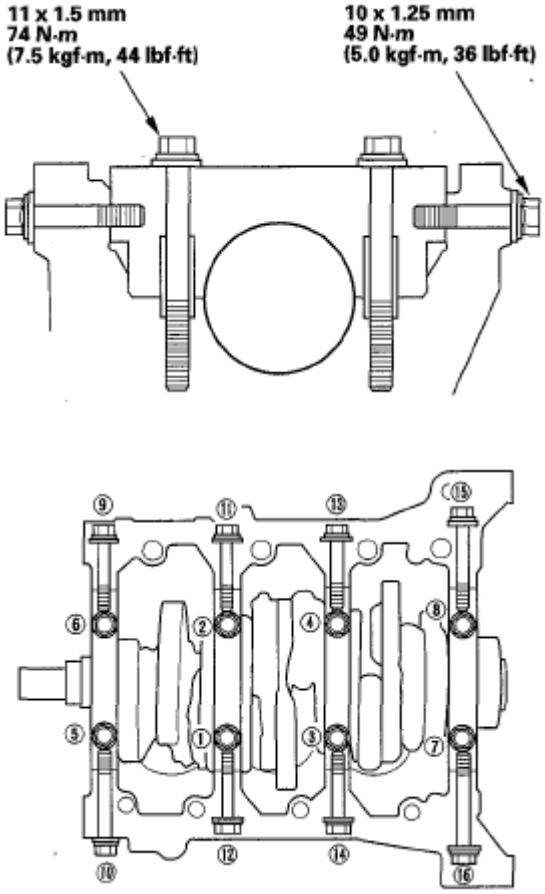


**Fig. 57: Identifying Bearing Cap Bolts With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

24. Remove all of the old liquid gasket from the engine block end cover mating surfaces, bolts, and the bolt holes.
25. Clean and dry the engine block end cover mating surfaces, and the crankshaft oil seal housing.
26. Apply a light coat of multipurpose grease to the crankshaft and to the lip of the seal.
27. Using the driver handle, 15 x 135L and the oil seal driver attachment, 106 mm, drive in the new transmission end crankshaft oil seal (A) until the oil seal driver attachment bottoms on the engine block end cover.

 

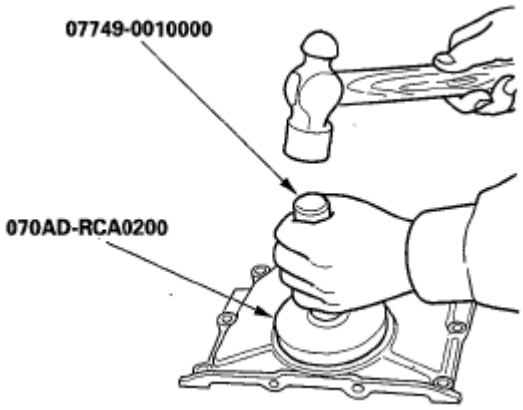


**Fig. 58: Installing Crankshaft Oil Seal**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

28. Apply liquid gasket (P/N 08717-0004, 08718-0003, 08718-0004, 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 a 2.5 mm (0.098 in) diameter bead of liquid gasket 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.**

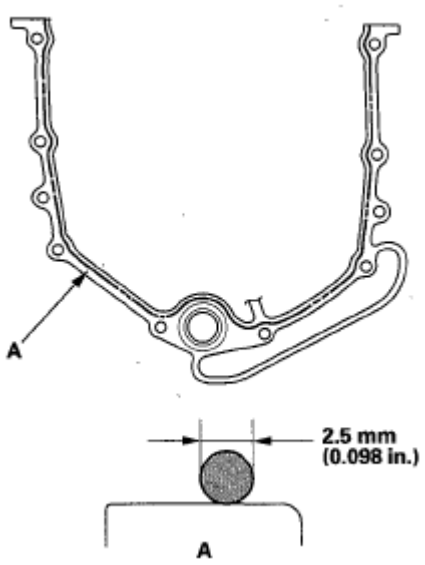


**Fig. 59: Identifying Liquid Gasket Application Area**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

 

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

**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 engine block end cover.**

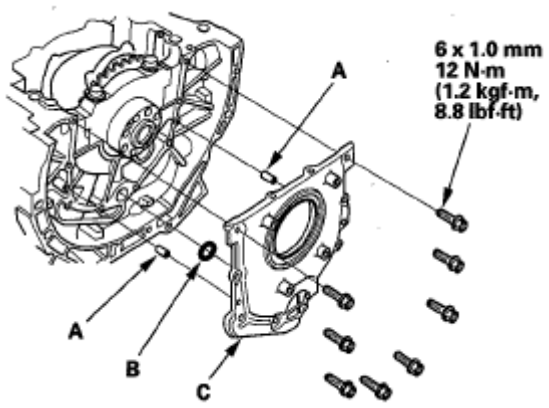


**Fig. 60: Identifying Engine Block End Cover, Dowel Pin And O-Ring With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

30. Clean the excess grease off the crankshaft, and check the seal for distortion.
31. Install a new crankshaft oil seal in the oil pump (see step 3 on **INSTALLATION** ).
32. Remove all of the old liquid gasket from the oil pump mating surfaces, the bolts, and the bolt holes.
33. Clean and dry the oil pump mating surfaces.
34. 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 a 2.5 mm (0.098 in) diameter bead of liquid gasket 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.**

 

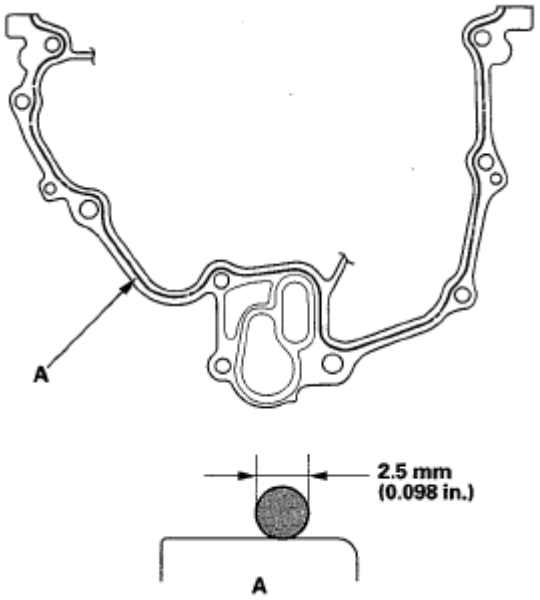


**Fig. 61: Identifying Liquid Gasket Application Area**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

35. Apply a light coat of new engine oil to the lip of the crankshaft oil seal, and apply new engine oil to the new O-ring (A).

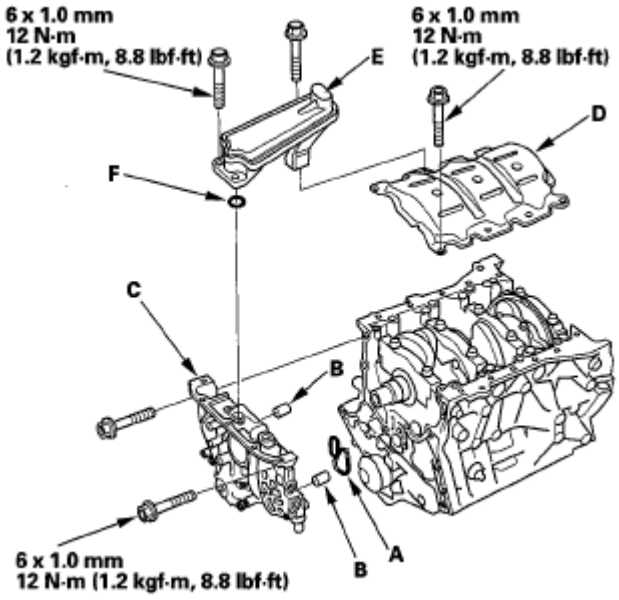


**Fig. 62: Identifying Oil Seal And O-Ring With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

 

39. Install the rocker arm oil control solenoid/oil filter assembly (A), with a new rocker arm oil control solenoid filter (B).

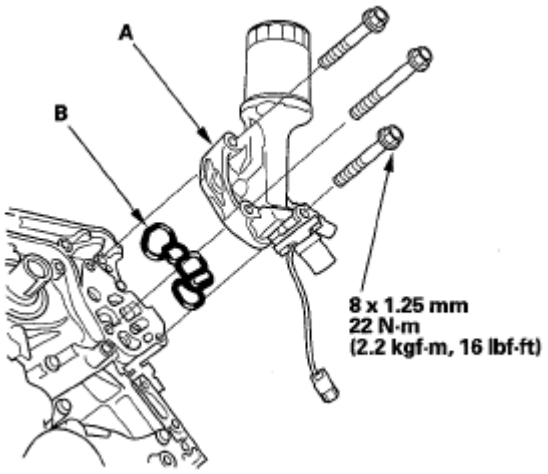


**Fig. 63: Identifying Rocker Arm Oil Control Solenoid/Oil Filter Assembly With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

40. Install the oil pan (see **OIL PAN INSTALLATION**).
41. Install the timing belt drive pulley to the crankshaft (see **TIMING BELT DRIVE PULLEY REPLACEMENT** ).
42. Install the cylinder heads (see **CYLINDER HEAD INSTALLATION** ).
43. Install drive plate (see **DRIVE PLATE REMOVAL AND INSTALLATION** ).
44. Install the transmission (see **TRANSMISSION INSTALLATION** ).
45. Install the engine/transmission (see **ENGINE INSTALLATION** ).

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

## CKP PULSE PLATE REPLACEMENT

1. Remove the crankshaft from the engine block (see **CRANKSHAFT AND PISTON REMOVAL**).
2. Remove the CKP pulse plate (A) from the crankshaft.

 

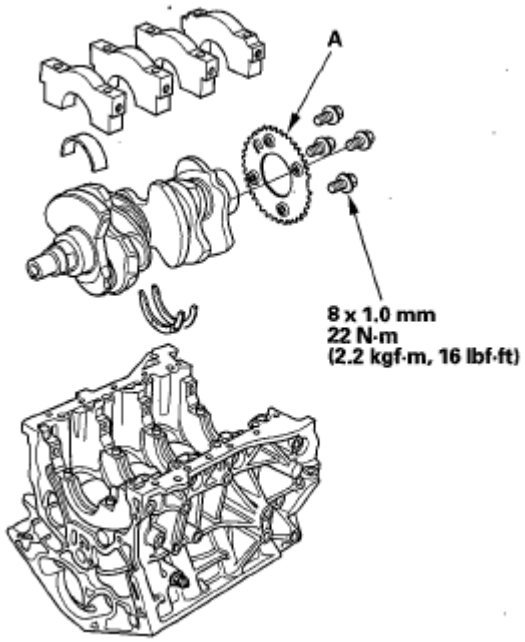


**Fig. 64: Identifying CKP Pulse Plate With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

3. Install the CKP pulse plate in the reverse order of removal.

## 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 a 2.5 mm (0.098 in) diameter bead of liquid gasket 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.**

 

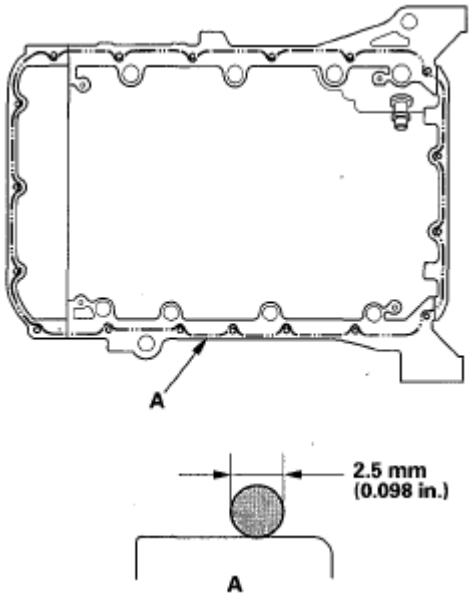


**Fig. 65: Identifying Liquid Gasket Application**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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 before filling the engine with oil.**
- **Do not run the engine for at least 3 hours after installing the oil pan.**

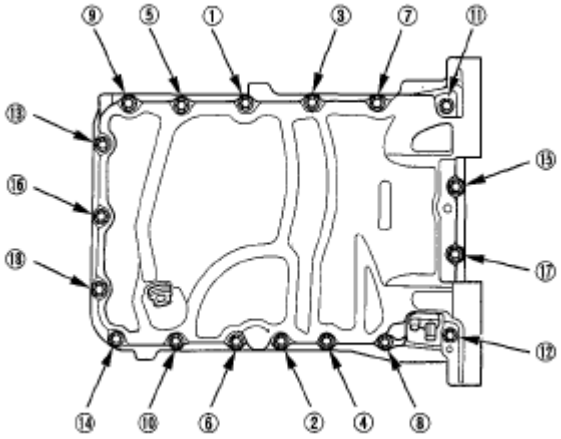


**Fig. 66: Identifying Oil Pan Bolts Tightening Sequence**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

 

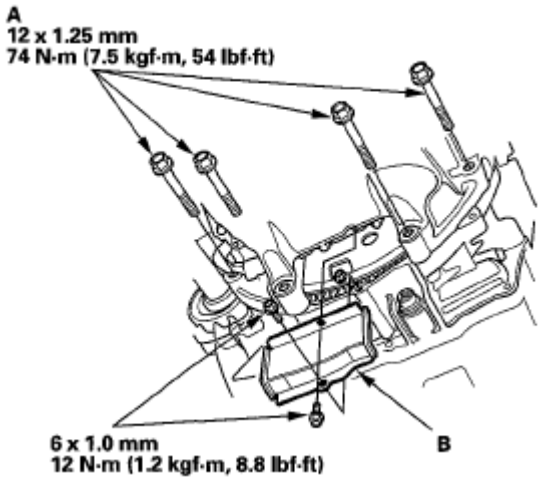


**Fig. 67: Identifying Clutch/Torque Converter Cover And Bolts With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

7. Connect the crankshaft position (CKP) sensor connector (A), then install the CKP sensor cover (B) and the bolt (C).

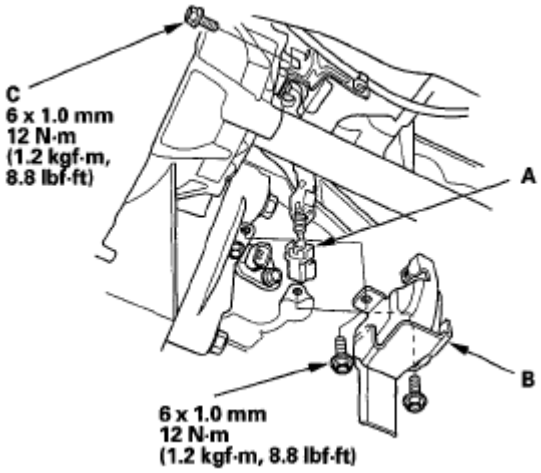


**Fig. 68: Identifying Crankshaft Position Sensor Connector With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

8. Install the rear WU-TWC bracket (A).

 

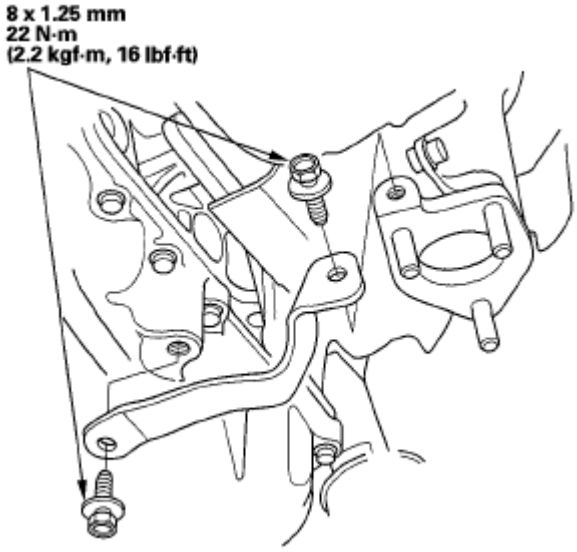


**Fig. 69: Identifying Rear Warm Up Three Way Catalytic Converter Bracket With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

9. If the engine is still in the vehicle, do the following steps.
10. Install exhaust pipe A using new gaskets and new self-locking nuts (see **EXHAUST PIPE AND MUFFLER REPLACEMENT** ).
11. Install the front splash shield (see **FRONT SPLASH SHIELD REPLACEMENT** ).
12. Lower the vehicle on the lift.
13. Refill the engine with engine oil (see step 4 on **ENGINE OIL LEVEL CHECK** ).

## PULLEY END CRANKSHAFT OIL SEAL INSTALLATION - IN CAR

**Special Tools Required**

Oil Seal Driver, 64 mm 070AD-RCAA100

1. Remove the timing belt, the timing belt stopper 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 oil seal driver, 64 mm, drive in the new crankshaft oil seal until the oil seal driver bottoms on the oil pump. When the seal is in place.

 

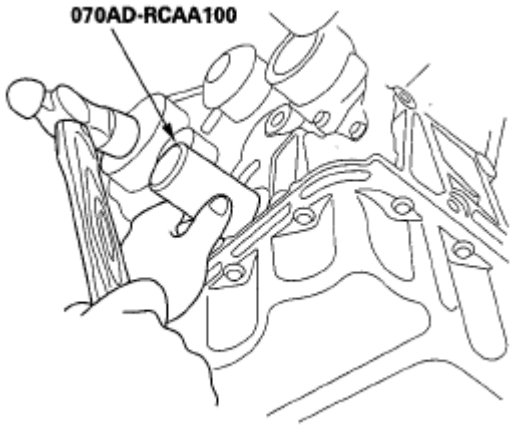


**Fig. 70: Identifying Special Tools**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

6. Clean the excess oil off the crankshaft, and check that the oil seal lip is not distorted.
7. Install the timing belt drive pulley and the timing belt stopper (see **TIMING BELT DRIVE PULLEY REPLACEMENT** ).

## TRANSMISSION END CRANKSHAFT OIL SEAL INSTALLATION - IN CAR

**Special Tools Required**

- Driver Handle, 15 x 135L 07749-0010000
- Oil Seal Driver Attachment, 106 mm 070AD-RCA0200

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 driver handle and the driver attachment, drive in the crankshaft oil seal until the driver attachment bottoms against the engine block end cover. Align the hole in the driver attachment with the pin on the crankshaft.

 

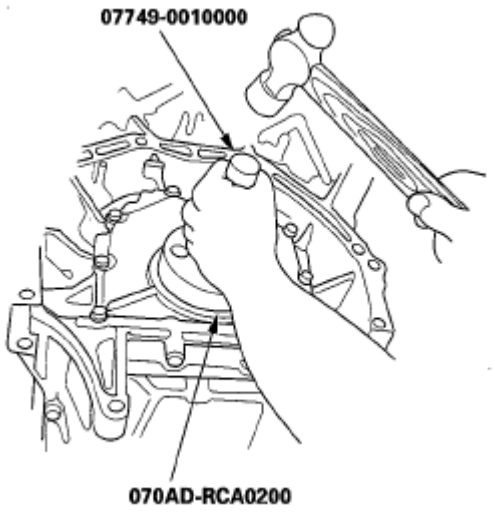


**Fig. 71: Installing Crankshaft Oil Seal**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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 (see **TRANSMISSION INSTALLATION** ).

## SEALING BOLT INSTALLATION

**NOTE: When installing the sealing bolts, always use new washers.**

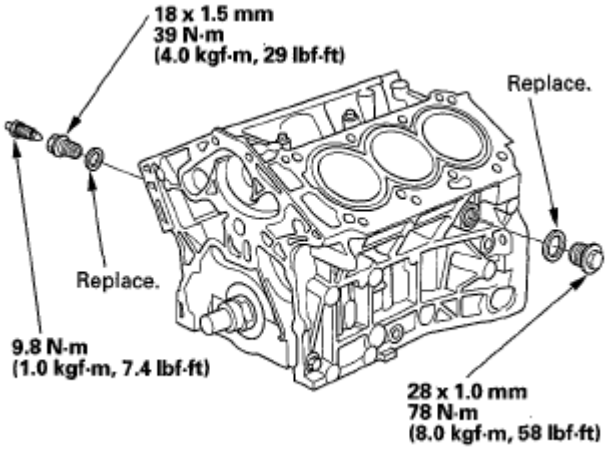


**Fig. 72: Identifying Sealing Bolt And O-Ring With Torque Specifications**
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

 