

## 2005 Honda Pilot EX

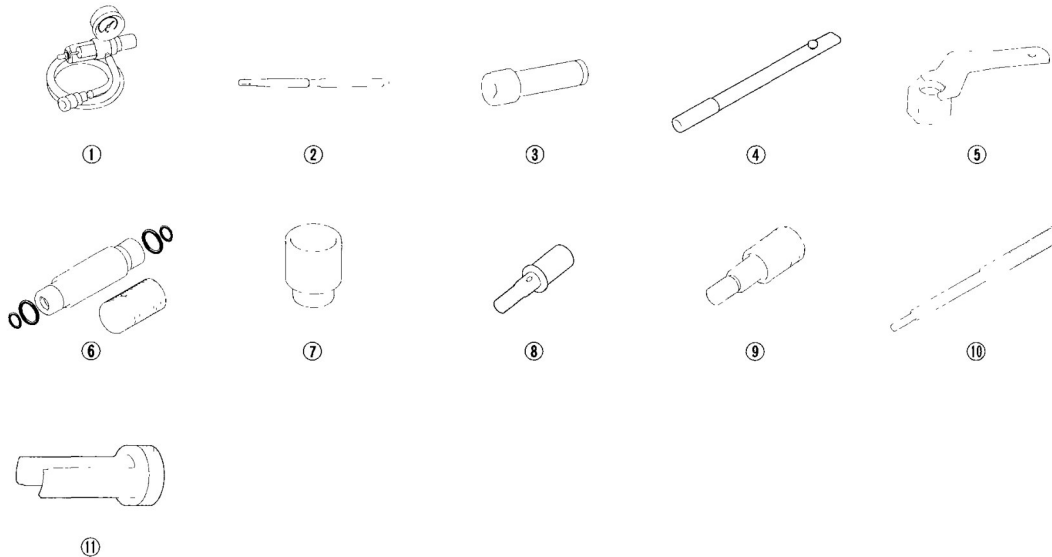
2005 ENGINE Cylinder Head - Pilot

### 2005 ENGINE

#### Cylinder Head - Pilot

## SPECIAL TOOLS

| Ref. No. | Tool Number   | Description                        | Qty |
|----------|---------------|------------------------------------|-----|
| ①        | 07AAJ-PNAA100 | Air Pressure Regulator             | 1   |
| ②        | 07HAH-PJ7A100 | Valve Guide Reamer, 5.5 mm         | 1   |
| ③        | 07JAA-001020A | Socket, 19 mm                      | 1   |
| ④        | 07JAB-001020A | Holder Handle                      | 1   |
| ⑤        | 07MAB-PY3010A | Holder Attachment, 50 mm, Offset   | 1   |
| ⑥        | 07PAD-0010000 | Stem Seal Driver                   | 1   |
| ⑦        | 07PAF-0030100 | Camshaft Oil Seal Driver           | 1   |
| ⑧        | 07VAJ-P8A010A | VTEC Air Adapter                   | 1   |
| ⑨        | 070AJ-0030100 | VTEC Air Stopper                   | 1   |
| ⑩        | 07742-0010100 | Valve Guide Driver, 5.5 mm         | 1   |
| ⑪        | 07757-PJ1010A | Valve Spring Compressor Attachment | 1   |



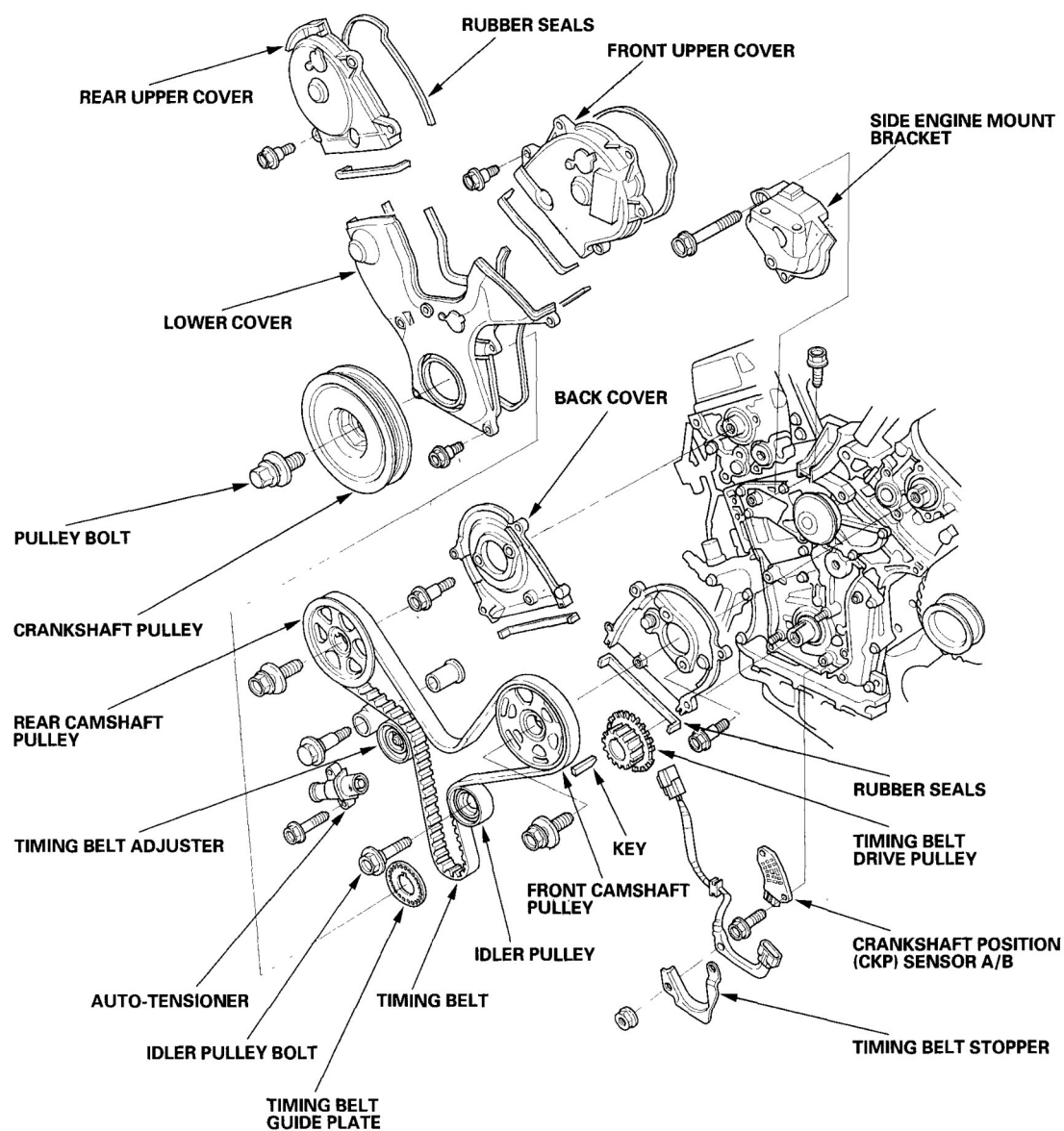
**Fig. 1: Identifying Special Tools**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

## COMPONENT LOCATION INDEX

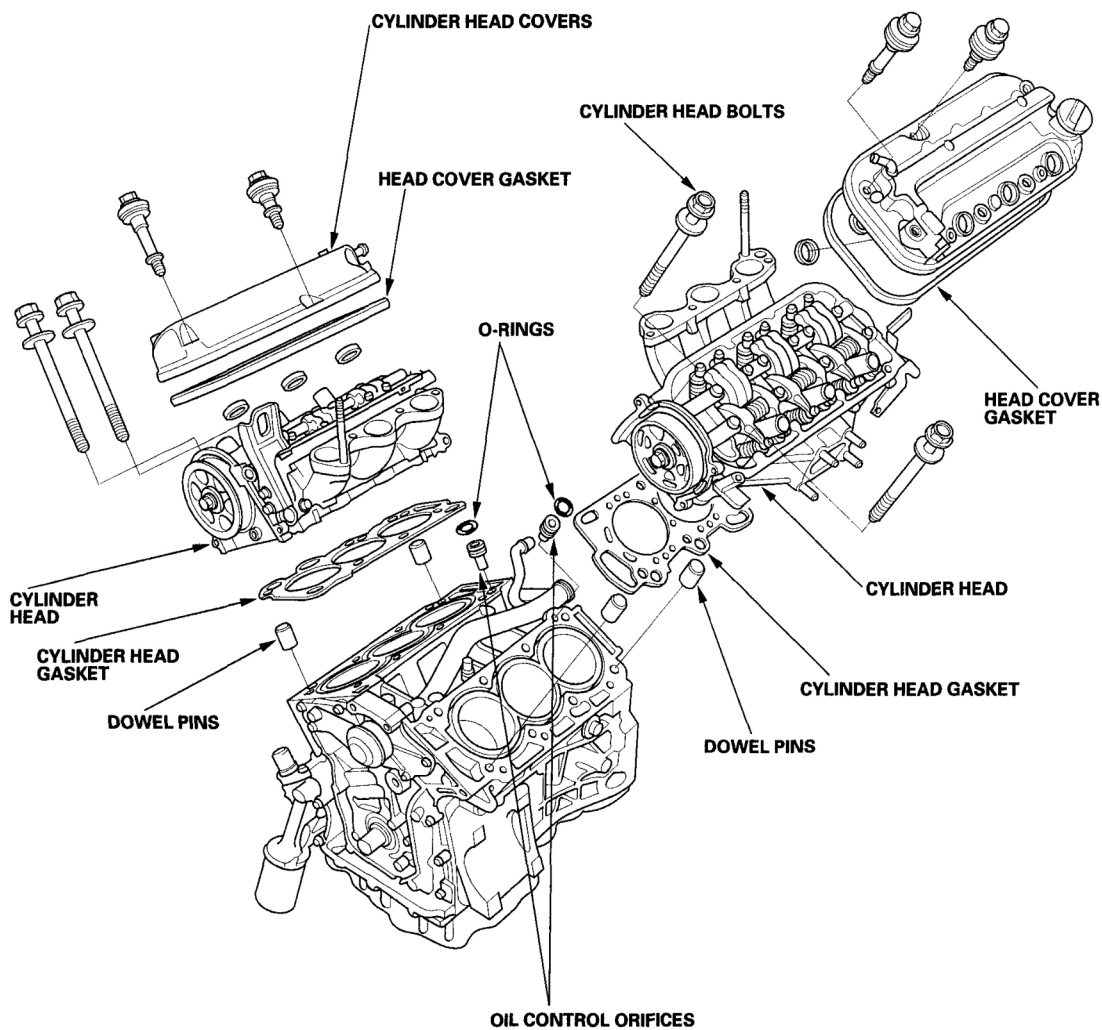
## 2005 Honda Pilot EX

### 2005 ENGINE Cylinder Head - Pilot

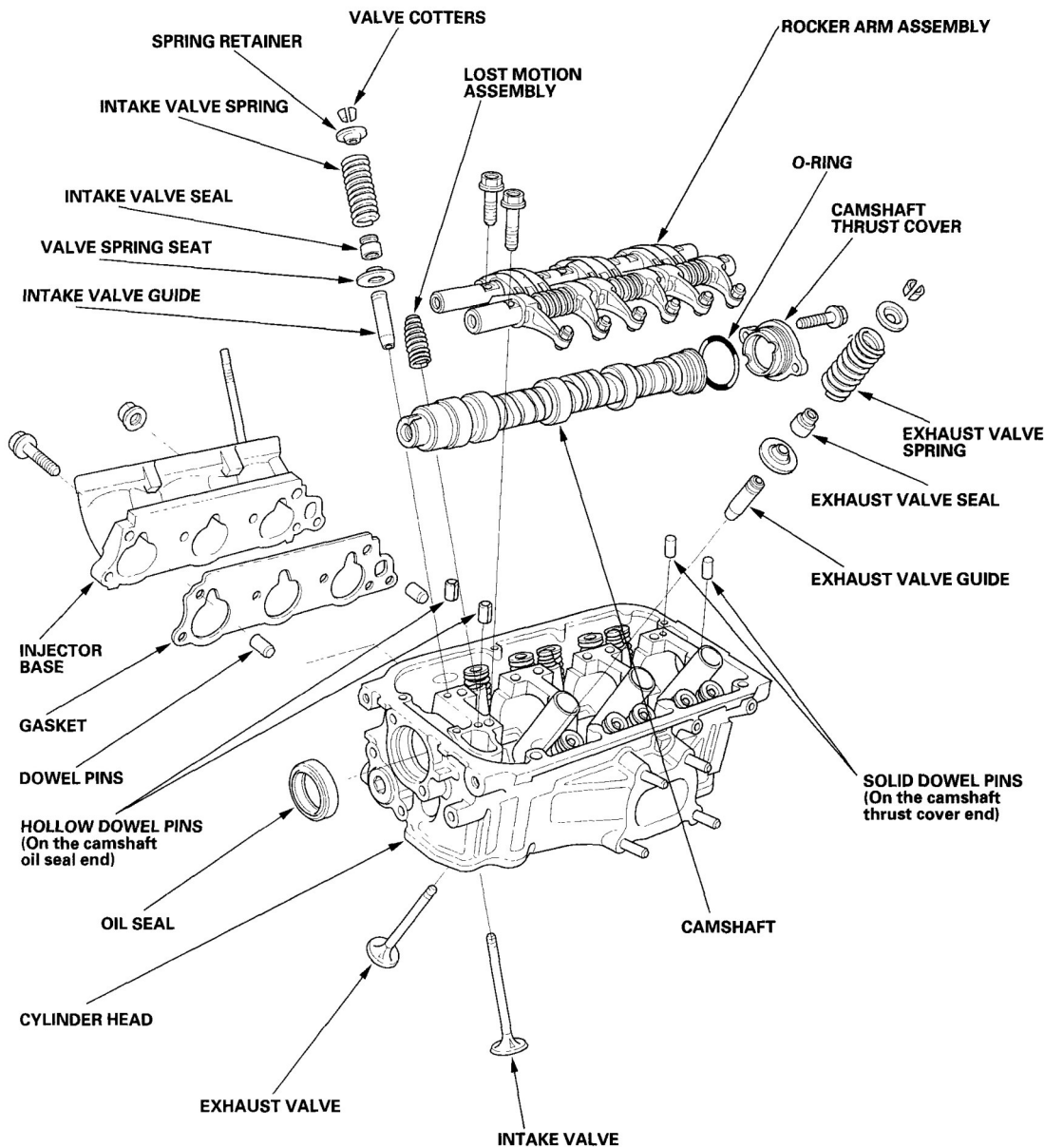


**Fig. 2: Identifying Engine Components Location (1 Of 3)**

Courtesy of AMERICAN HONDA MOTOR CO., INC.



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



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

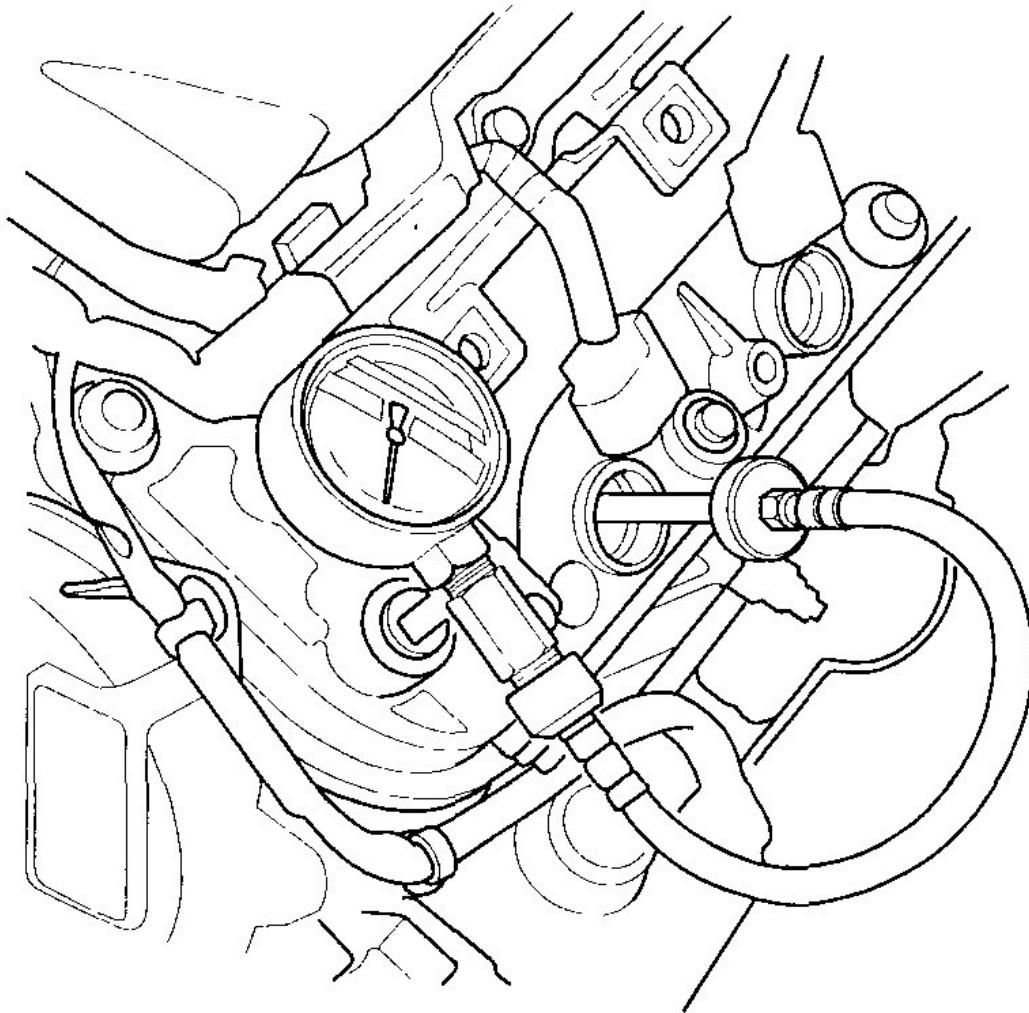
## ENGINE COMPRESSION INSPECTION

**NOTE:** After this inspection, you must reset the powertrain control module (PCM) (see HDS CLEAR COMMAND ), using the Honda Diagnostic System (HDS) otherwise the PCM continues to stop the fuel injectors.

1. Warm up the engine to normal operating temperature (cooling fan comes on).
2. Turn the ignition switch OFF.



3. Remove the six ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION** ).
4. Remove the six spark plugs.
5. Connect the HDS to the data link connector (DLC) (see step 2 **HOW TO USE THE HDS (HONDA DIAGNOSTIC SYSTEM)** ).
6. Select PGM-FI, INSPECTION, then ALL INJECTORS OFF function on the HDS.
7. Attach the compression gauge to a spark plug hole.



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

8. Open the throttle fully, crank the engine with the starter motor and measure the compression.

**Compression Pressure: Above 930 kPa (9.5 kgf/cm<sup>2</sup> , 135 psi)**

9. Measure the compression on the remaining cylinders.

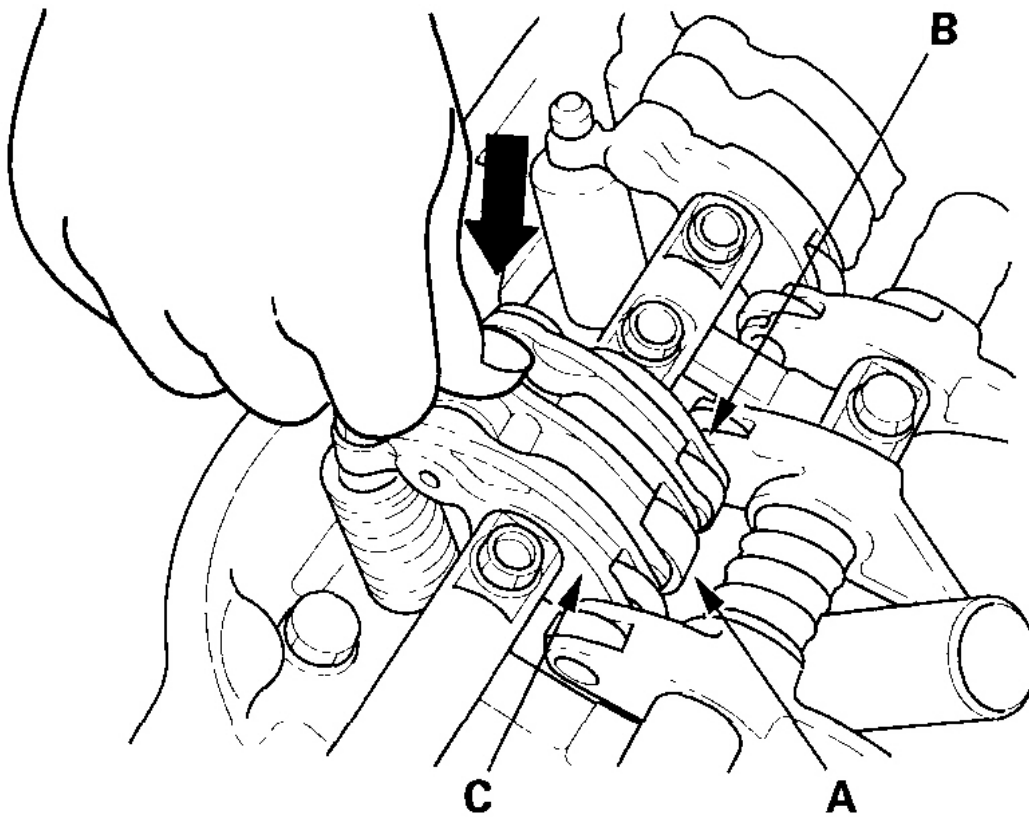
**Maximum Variation: Within 200 kPa (2.0 kgf/cm<sup>2</sup> , 28 psi)**

10. If the compression is not within specifications, check the following items, then remeasure the compression.
  - Damaged or worn valves and seats
  - Damaged cylinder head gasket
  - Damaged or worn piston rings
  - Damaged or worn piston and cylinder bore
11. Select PCM reset (see **PCM RESET** ) to cancel the ALL INJECTORS OFF function on the HDS.

## **VTEC ROCKER ARM TEST**

### **Special Tools Required**

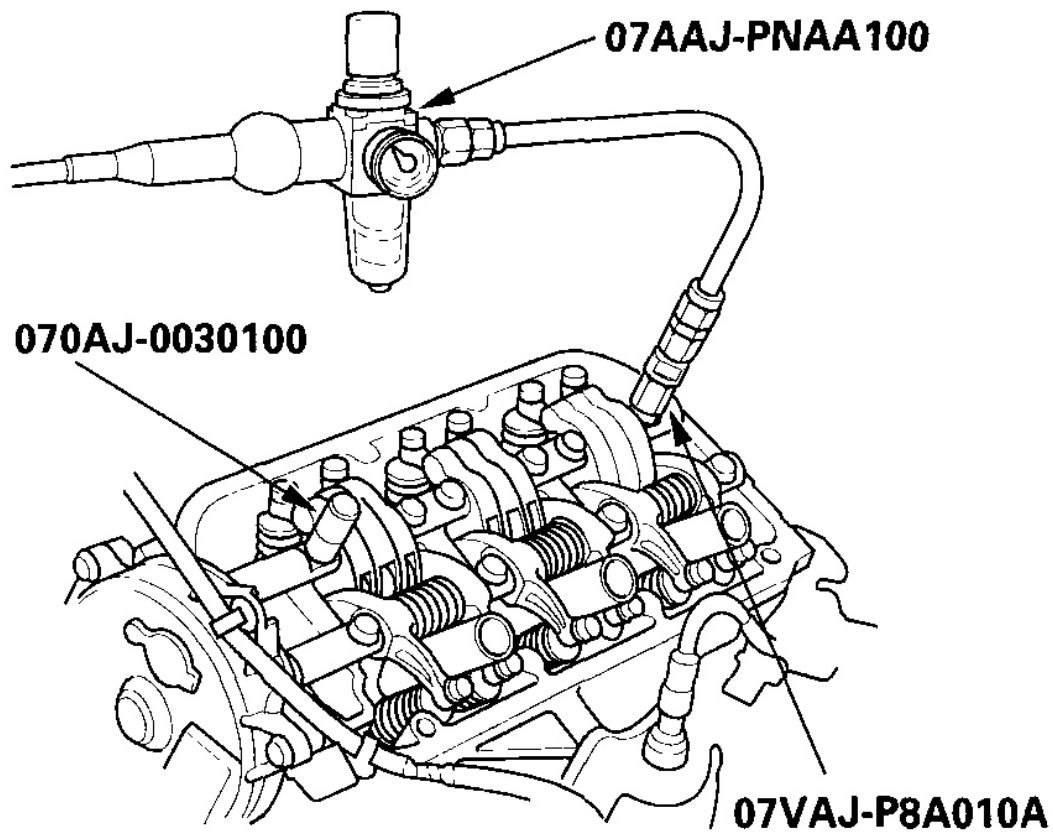
- VTEC air adapter 07VAJ-P8A010A
  - VTEC air stopper 070AJ-0030100
  - Air pressure regulator 07AAJ-PNAA100
1. Start the engine and let it run for 5 minutes, then turn OFF the ignition switch.
  2. Remove the intake manifold (see **REMOVAL** ).
  3. Remove the cylinder head covers (see **TIMING BELT DRIVE PULLEY REPLACEMENT** ).
  4. Set the No. 1 piston at top dead center (TDC) (see step 3 ).
  5. Push on the intake mid rocker arm (A) for the No. 1 cylinder. The mid rocker arm should move independently of the primary rocker arm (B) and secondary rocker arm (C).
    - If the mid rocker arm moves freely, go to step 6.
    - If the intake mid rocker arm does not move, remove the mid, primary, and secondary intake rocker arms as an assembly, then check that the pistons in the mid and primary rocker arms move smoothly. If any rocker arm needs replacing, replace the mid, primary, and secondary rocker arms as an assembly, and retest.



**Fig. 6: Pushing Intake Mid Rocker Arm**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Repeat step 5 on the remaining intake mid rocker arms with each piston at TDC. When all the mid rocker arms pass the test, go to step 7.
7. Check that the air pressure on the shop air compressor gauge indicates over 690 kPa (7.0 kgf/cm<sup>2</sup> , 100 psi).
8. Inspect the valve clearance (see **VALVE CLEARANCE ADJUSTMENT** ).
9. Remove the No. 1 and No. 6 intake rocker shaft mounting bolts, then install and connect the special tools as shown.

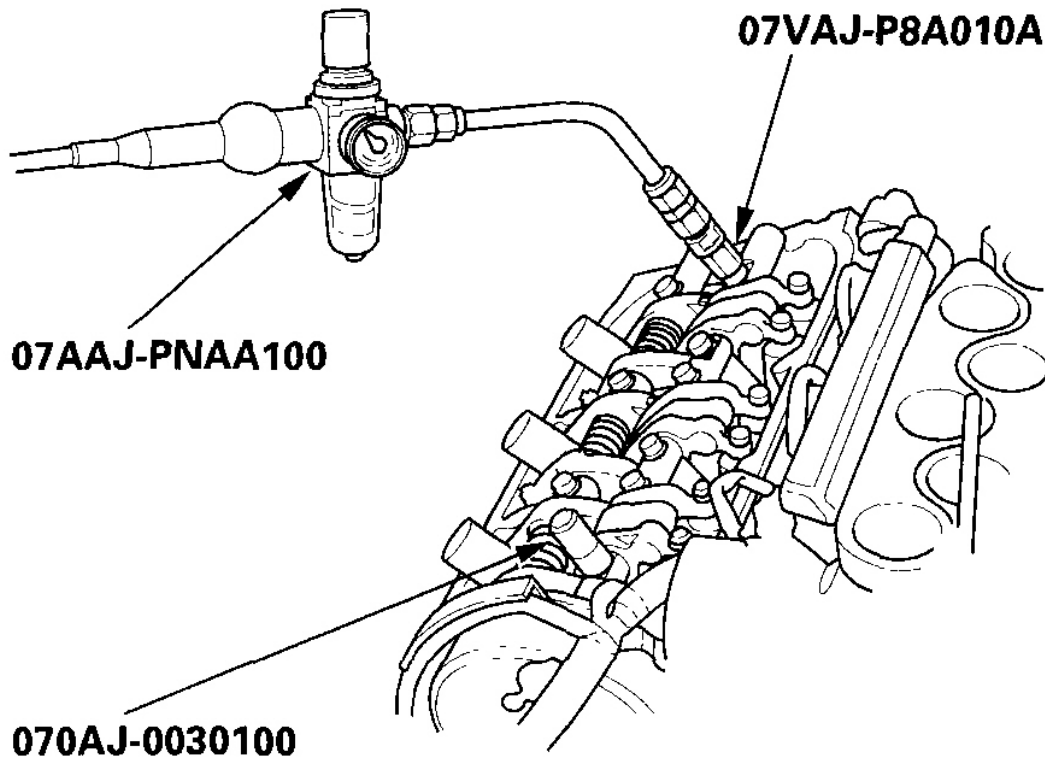
**FRONT:**



**Fig. 7: Connecting Special Tools (Front)**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

**REAR:**



**Fig. 8: Connecting Special Tools (Rear)**

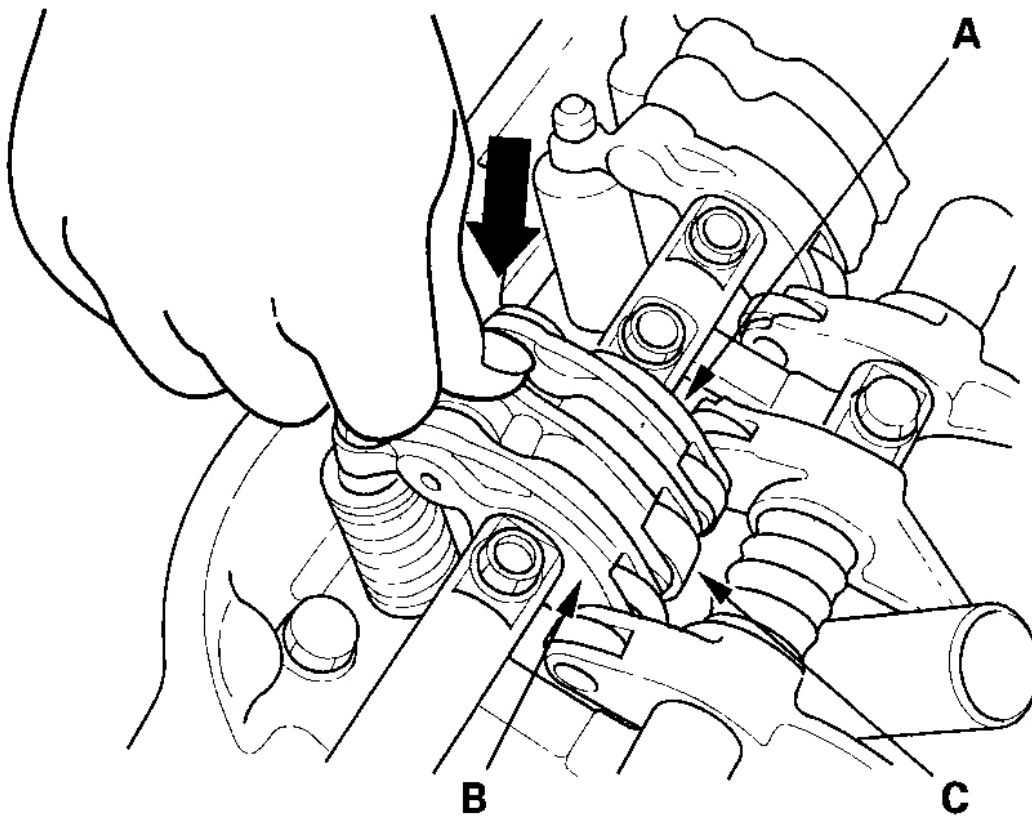
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

**Specified Air Pressure: 440-540 kPa (4.5-5.5 kgf/cm<sup>2</sup> , 64-78 psi)**

**NOTE:** If the synchronizing pistons do not move after applying air pressure, move the primary or secondary rocker arm up and down manually.

11. Make sure that the intake primary rocker arm (A) and intake secondary rocker arm (B) are mechanically connected by the piston and that the mid rocker arm (C) does not move when pushed manually. If any intake mid rocker arm moves independently of the primary and secondary rocker arms, replace the rocker arms as a set.



**Fig. 9: Pushing Intake Mid Rocker Arm**

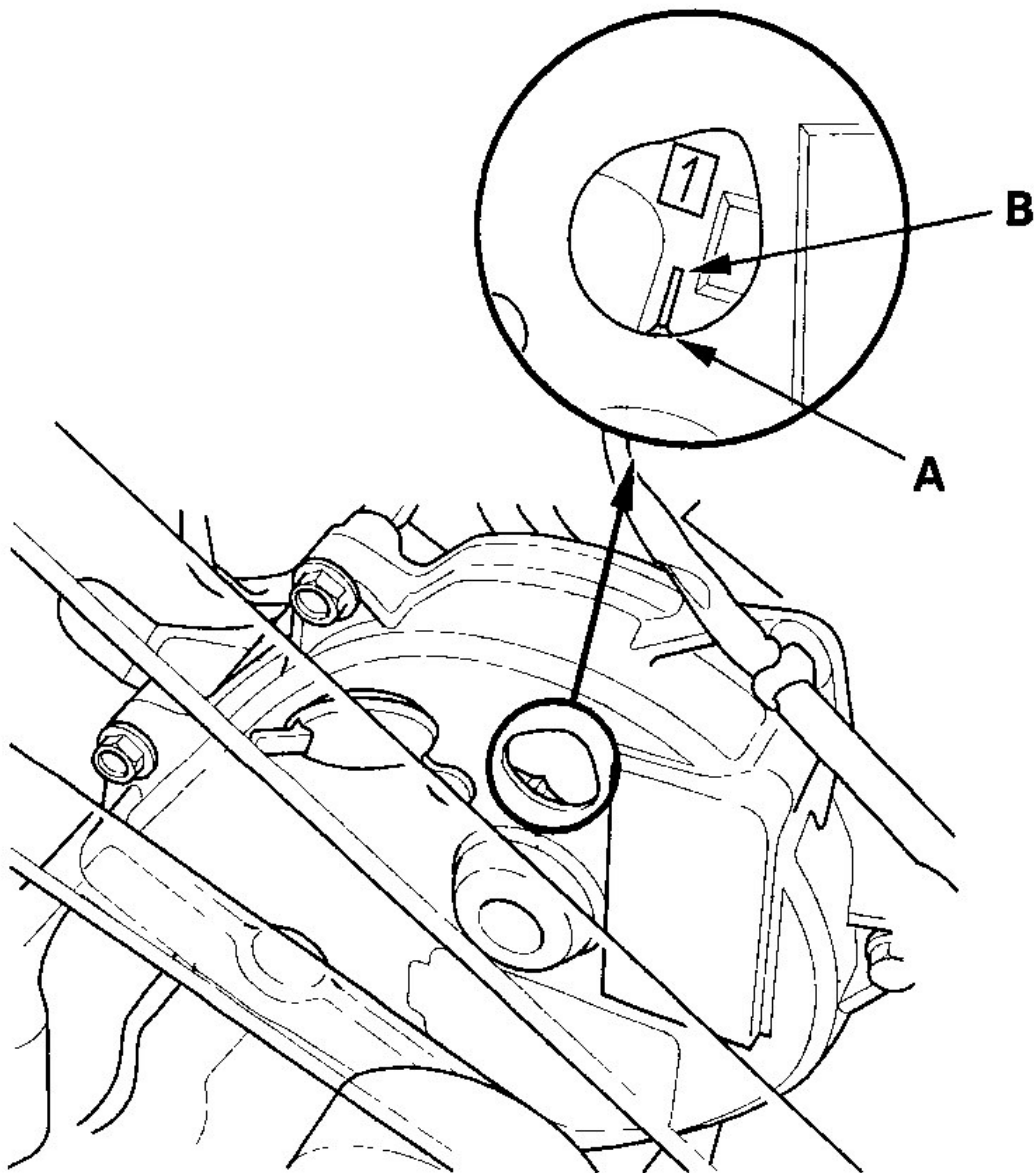
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Remove the special tools.
13. Tighten the rocker shaft bolts to 24 N.m (2.4 kgf.m, 17 lbf.ft)
14. Install the cylinder head covers (see CYLINDER HEAD COVER INSTALLATION ).
15. Install the intake manifold (see INSTALLATION ).

## VALVE CLEARANCE ADJUSTMENT

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

1. Remove the intake manifold (see REMOVAL ).
2. Remove the cylinder head covers (see TIMING BELT DRIVE PULLEY REPLACEMENT ).
3. Set the No. 1 piston at top dead center (TDC). Align the pointer (A) on the front upper cover with the No. 1 piston TDC mark (B) on the front camshaft pulley.



**Fig. 10: Aligning Pointer On Front Upper Cover With No. 1 Piston TDC Mark On Front Camshaft Pulley**

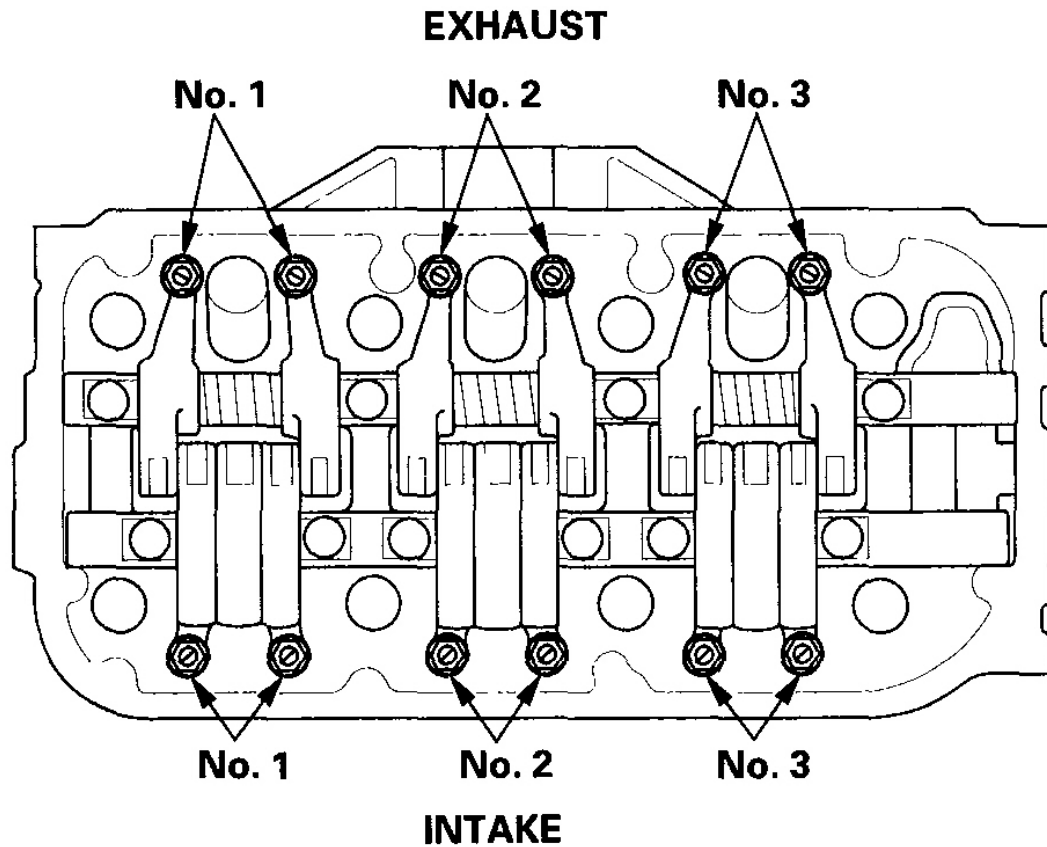
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

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

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

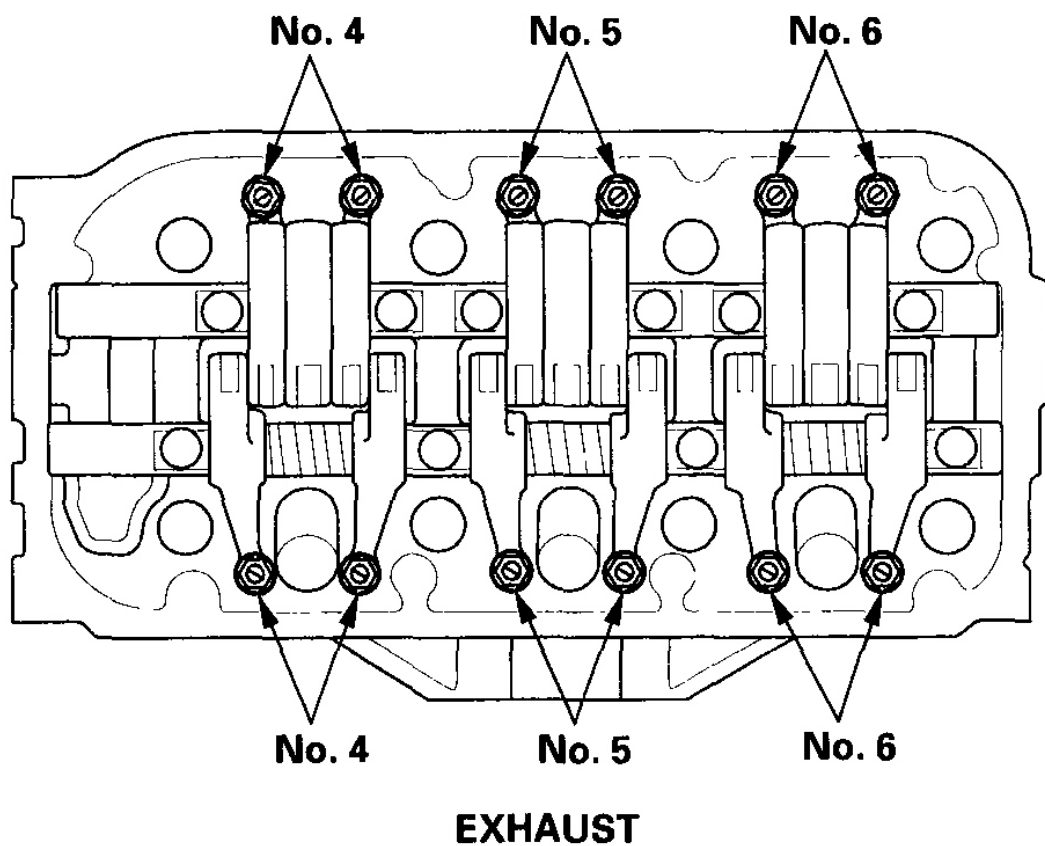
REAR:



**Fig. 11: Identifying Intake/Exhaust Valves (Rear)**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

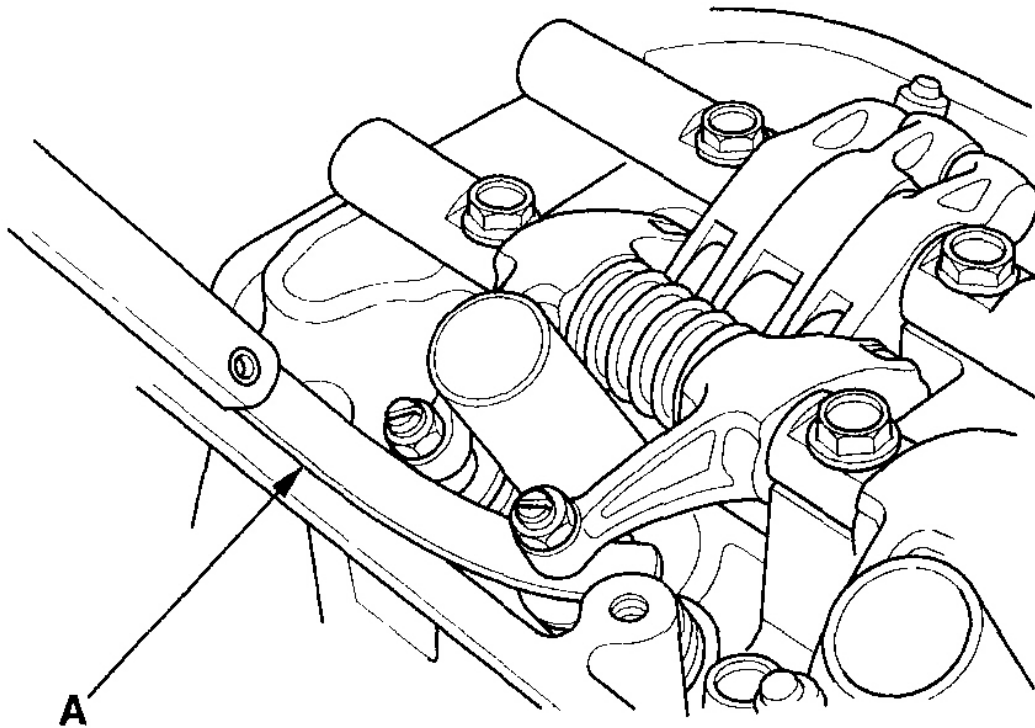
FRONT:





**Fig. 12: Identifying Intake/Exhaust Valves (Front)**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

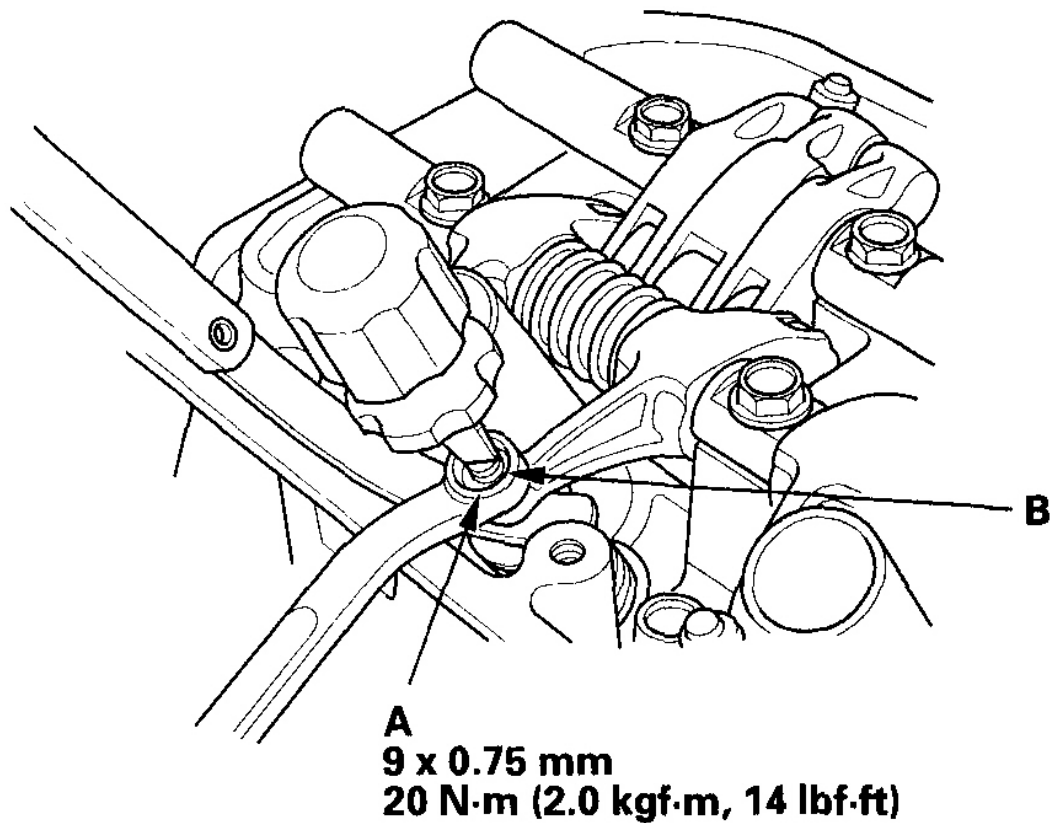
5. Insert the feeler gauge (A) between the adjusting screw and the end of the valve stem on No. 1 cylinder and slide it back and forth; you should feel a slight amount of drag.



**Fig. 13: Inserting Feeler Gauge Between Adjusting Screw And End Of Valve Stem On No. 1 Cylinder**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

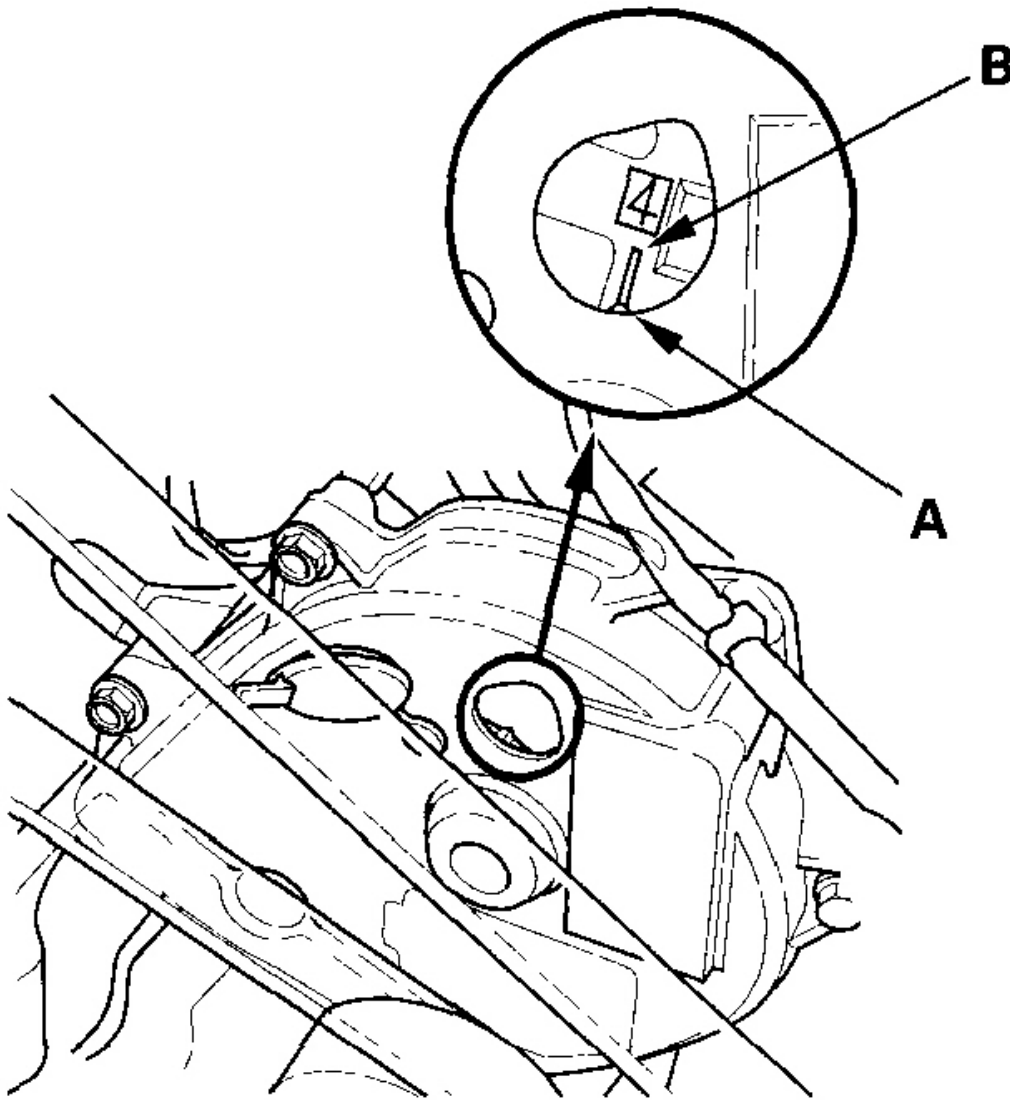
6. If you feel too much or too little drag, loosen the locknut (A), and turn the adjusting screw (B) until the drag on the feeler gauge is correct.



**Fig. 14: Loosening Locknut**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

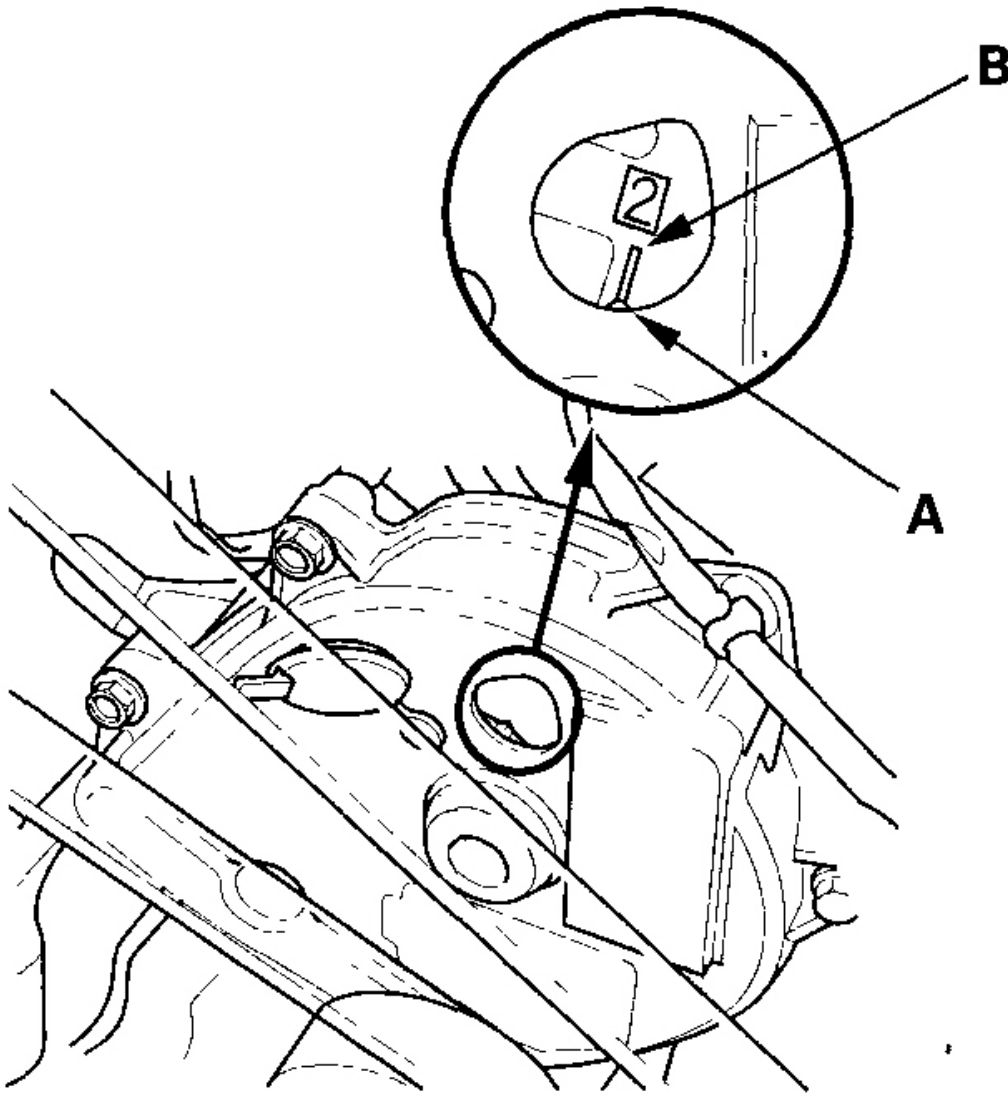
7. Tighten the locknut and recheck the clearance. Repeat the adjustment, if necessary.
8. Rotate the crankshaft clockwise. Align the pointer (A) on the front upper cover with the No. 4 piston TDC mark (B) on the front camshaft pulley.



**Fig. 15: Aligning Pointer On Front Upper Cover With No. 4 Piston TDC Mark On Front Camshaft Pulley**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

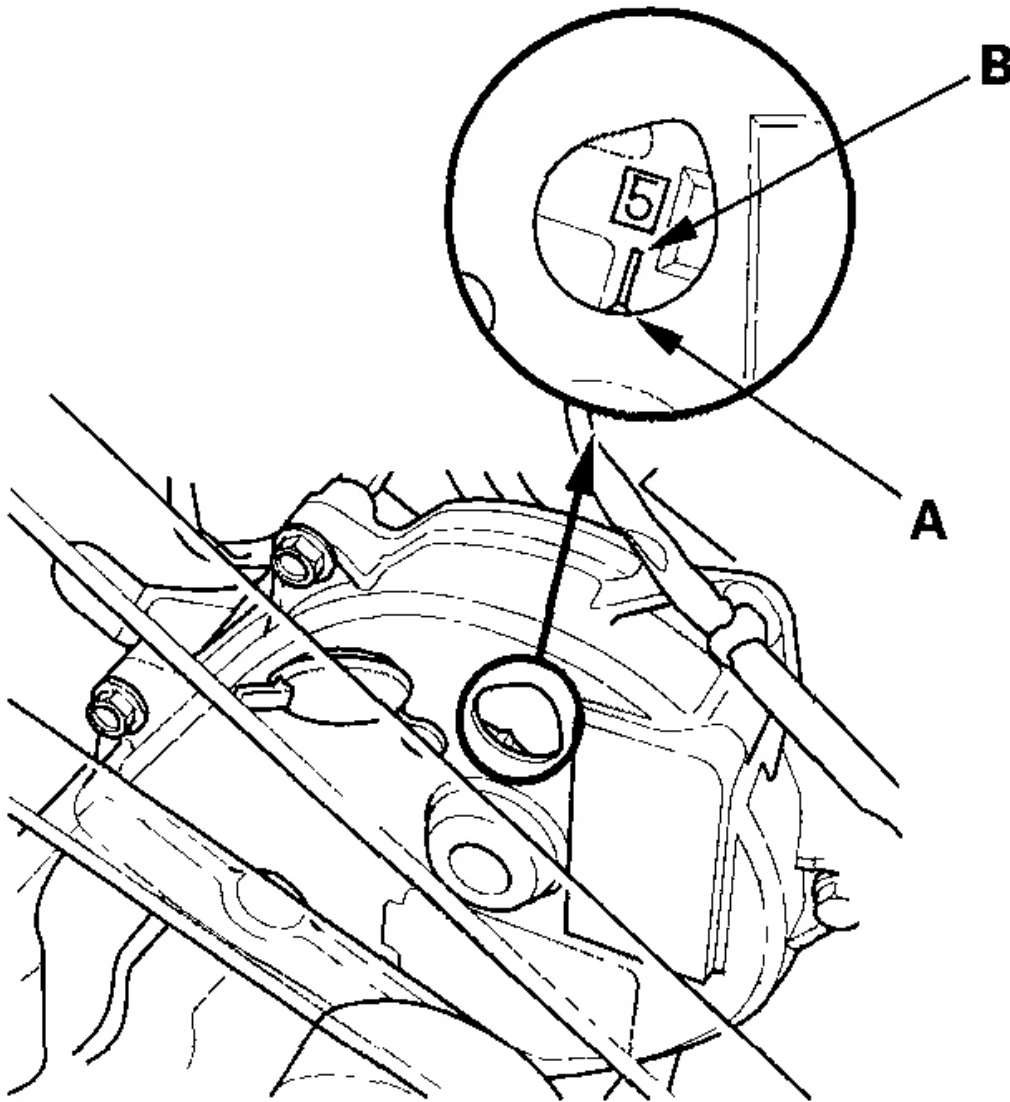
9. Check and, if necessary, adjust the valve clearance on No. 4 cylinder.
10. Rotate the crankshaft clockwise. Align the pointer (A) on the front upper cover with the No. 2 piston TDC mark (B) on the front camshaft pulley.



**Fig. 16: Aligning Pointer On Front Upper Cover With No. 2 Piston TDC Mark On Front Camshaft Pulley**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

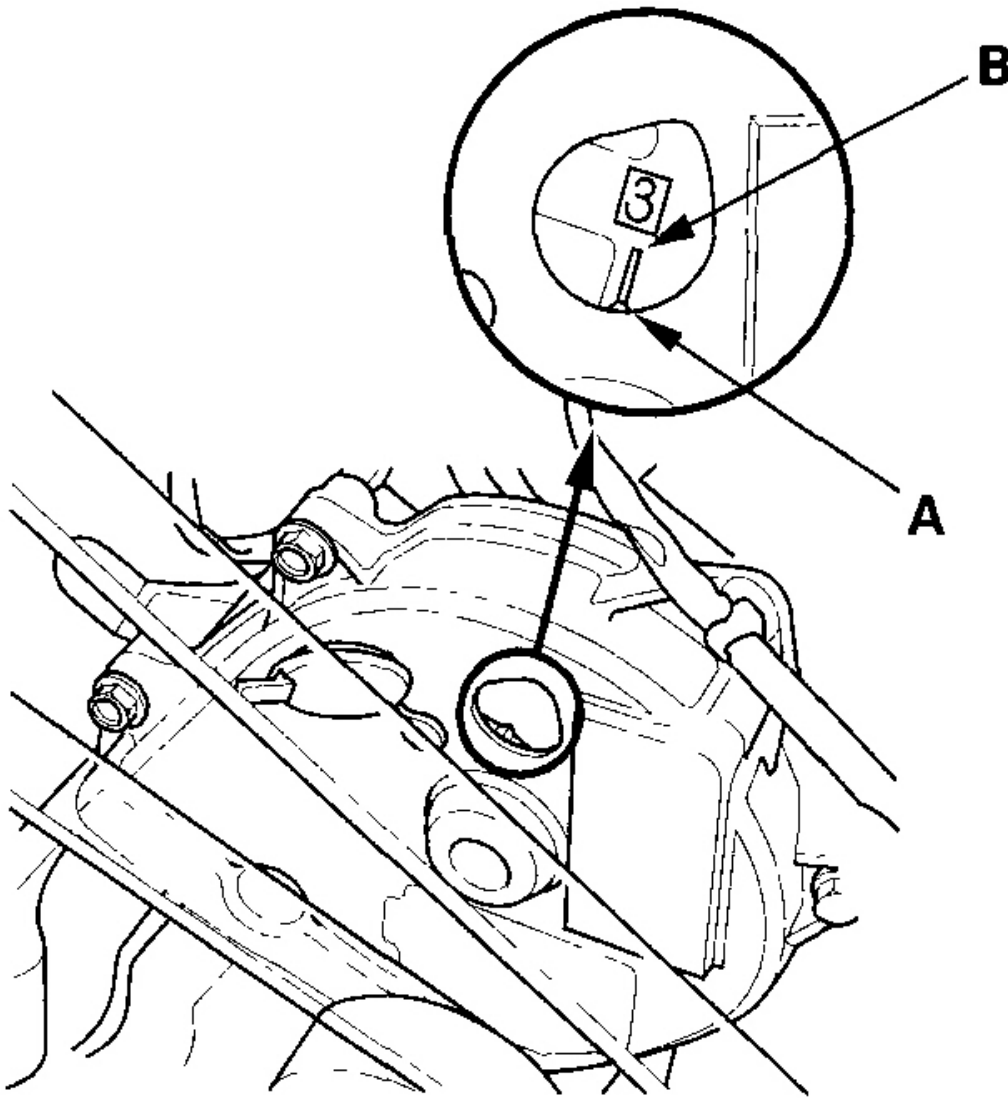
11. Check and, if necessary, adjust the valve clearance on No. 2 cylinder.
12. Rotate the crankshaft clockwise. Align the pointer (A) on the front upper cover with the No. 5 piston TDC mark (B) on the front camshaft pulley.



**Fig. 17: Aligning Pointer On Front Upper Cover With No. 5 Piston TDC Mark On Front Camshaft Pulley**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

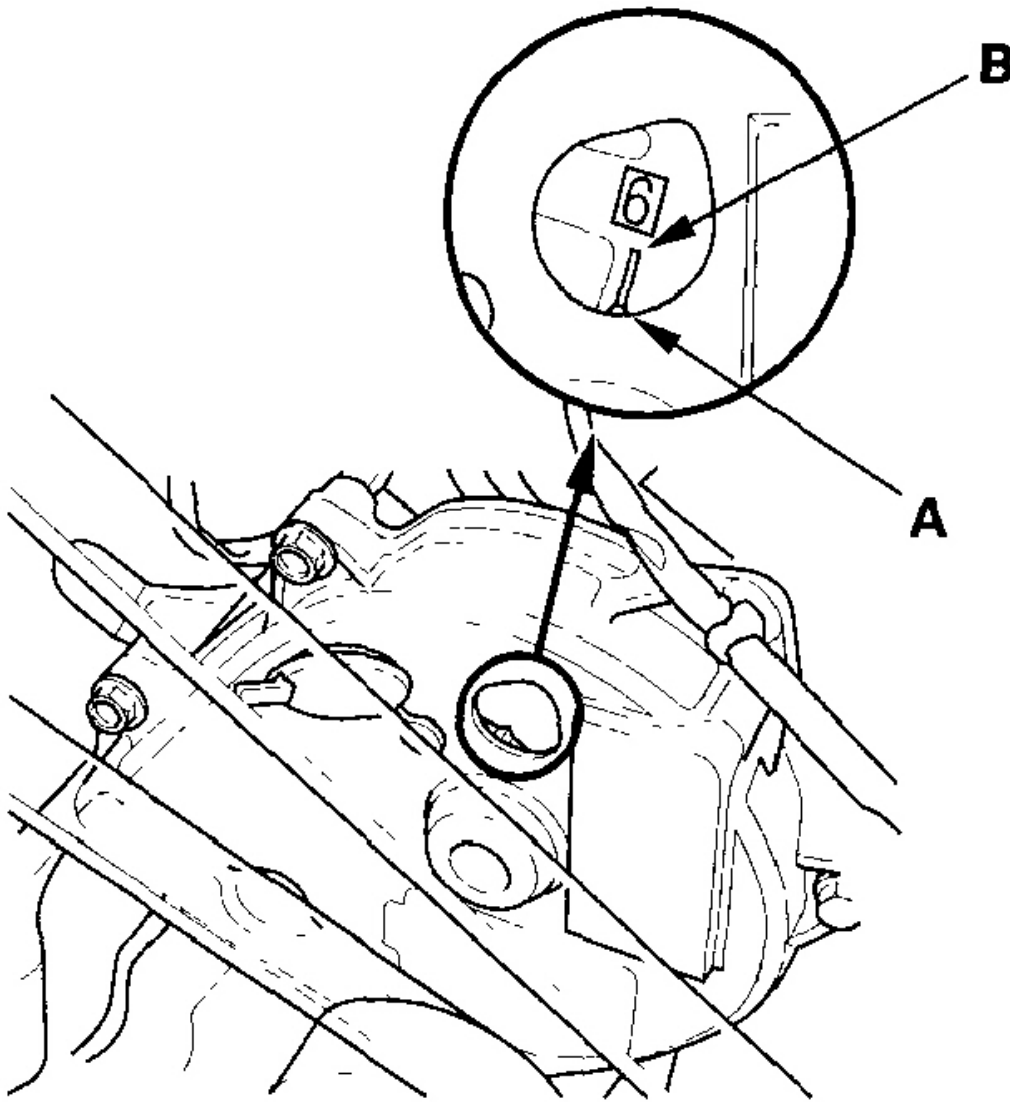
13. Check and, if necessary, adjust the valve clearance on No. 5 cylinder.
14. Rotate the crankshaft clockwise. Align the pointer (A) on the front upper cover with the No. 3 piston TDC mark (B) on the front camshaft pulley.



**Fig. 18: Aligning Pointer On Front Upper Cover With No. 3 Piston TDC Mark On Front Camshaft Pulley**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



**Fig. 19: Aligning Pointer On Front Upper Cover With No. 6 Piston TDC Mark On Front Camshaft Pulley**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

## CRANKSHAFT PULLEY REMOVAL AND INSTALLATION

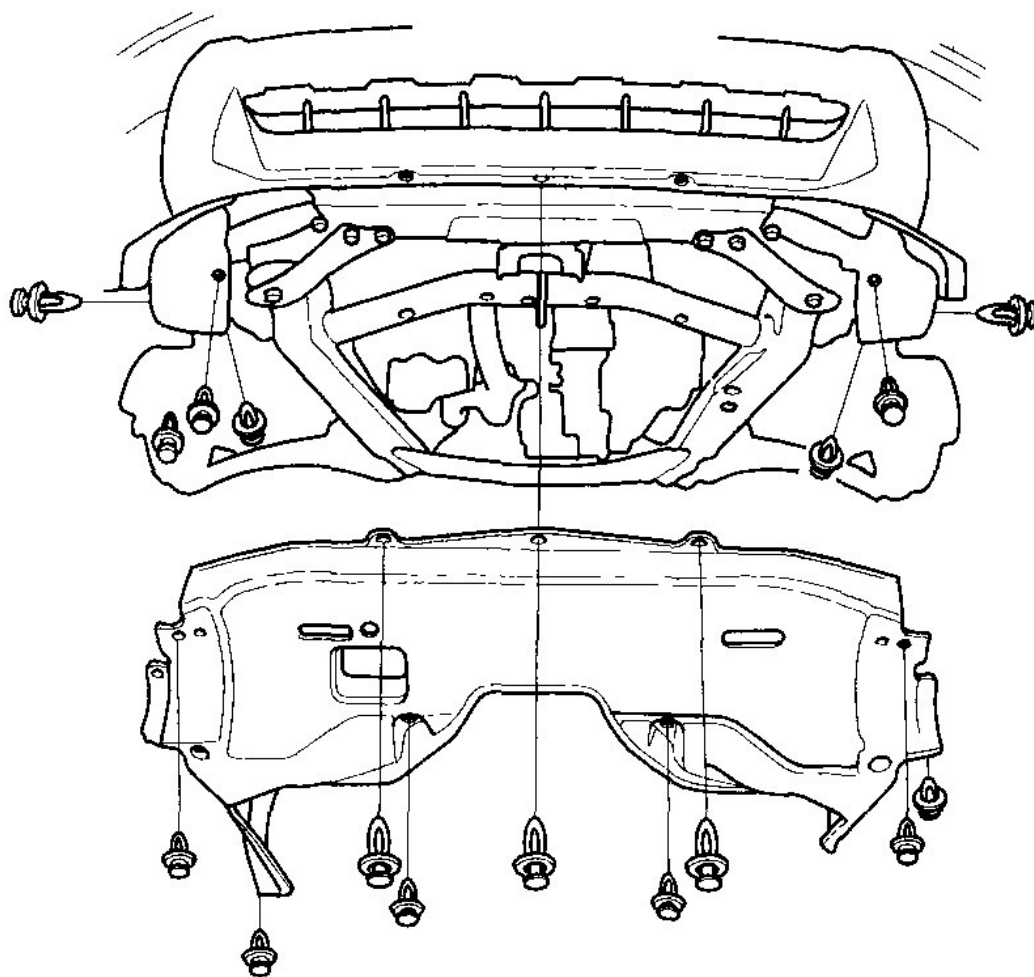


**Special Tools Required**

- Holder handle 07JAB-001020A
- Holder attachment, 50 mm, offset 07MAB-PY3010A
- Socket, 19 mm 07JAA-001020A, or a commercially available 19 mm socket

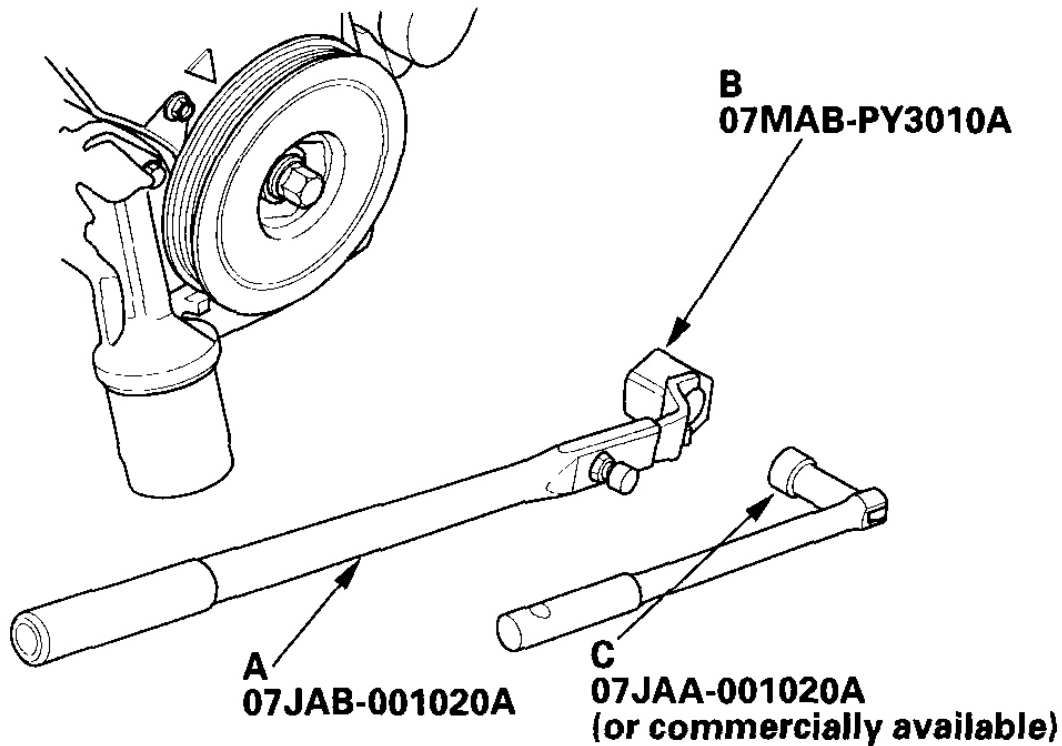
**REMOVAL**

1. Remove the right front tire/wheel.
2. Remove the splash shield.

**Fig. 20: Removing Splash Shield**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



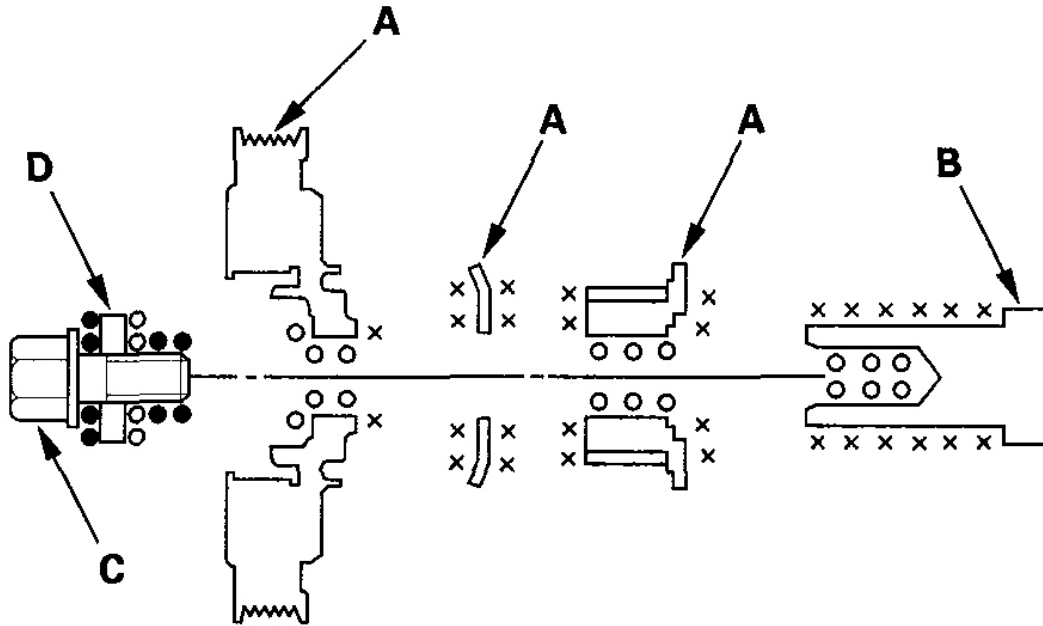
**Fig. 21: Identifying Hold Pulley With Holder Handle (A) And Holder Attachment (B)**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

## INSTALLATION

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

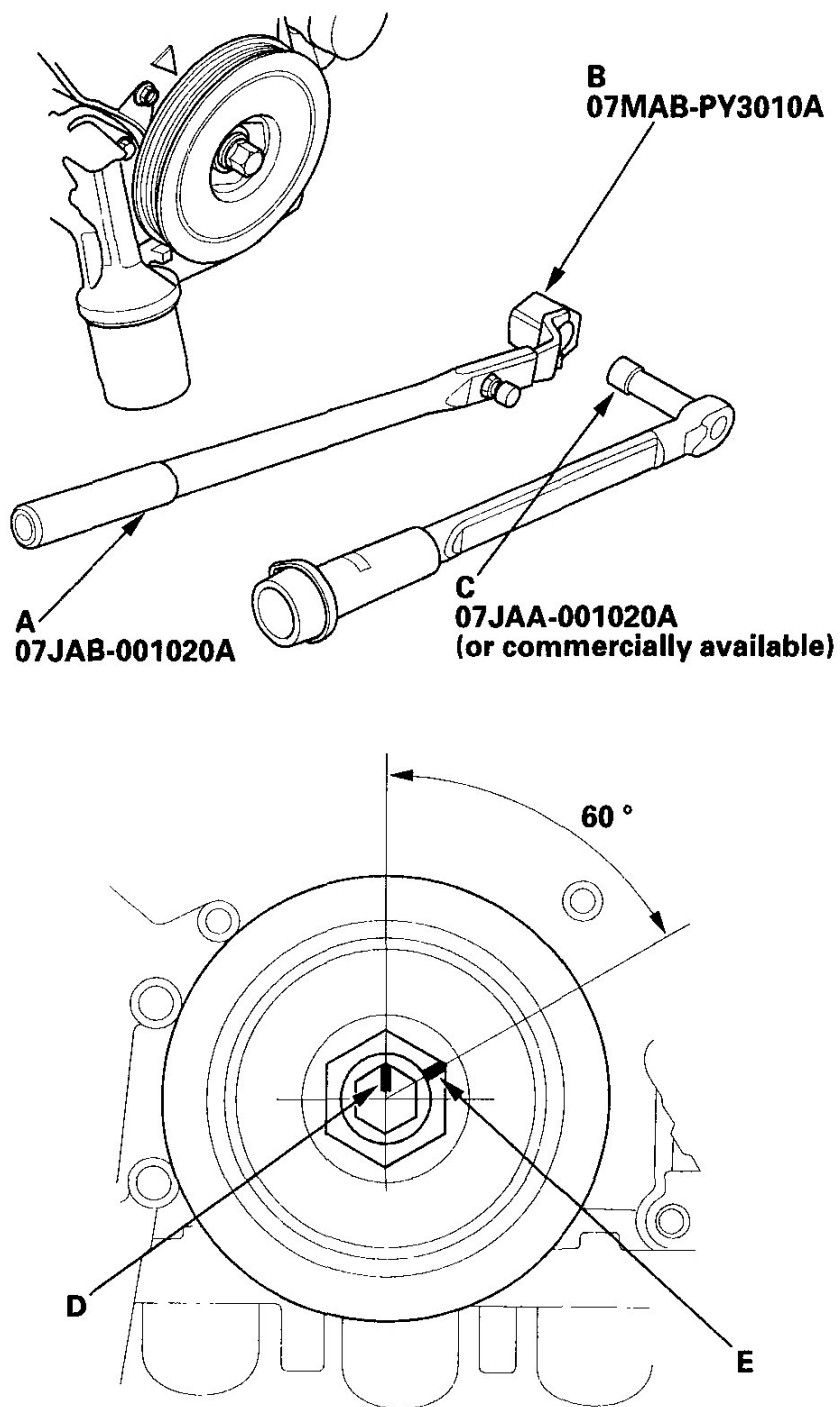
- ✕: Remove any oil  
 ○: Clean  
 ●: Lubricate with new engine oil



**Fig. 22: Identifying Lubricating Areas**

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 handle (A) and holder attachment (B), then tighten the bolt to 64 N.m (6.5 kgf.m, 47 lbf.ft) with a torque wrench and heavy duty 19 mm socket (C).
  - 2 Mark the bolt head (D) and crankshaft pulley (E) as shown, then tighten the bolt an additional 60° (The mark on the bolt head line up with the mark on the crankshaft pulley).



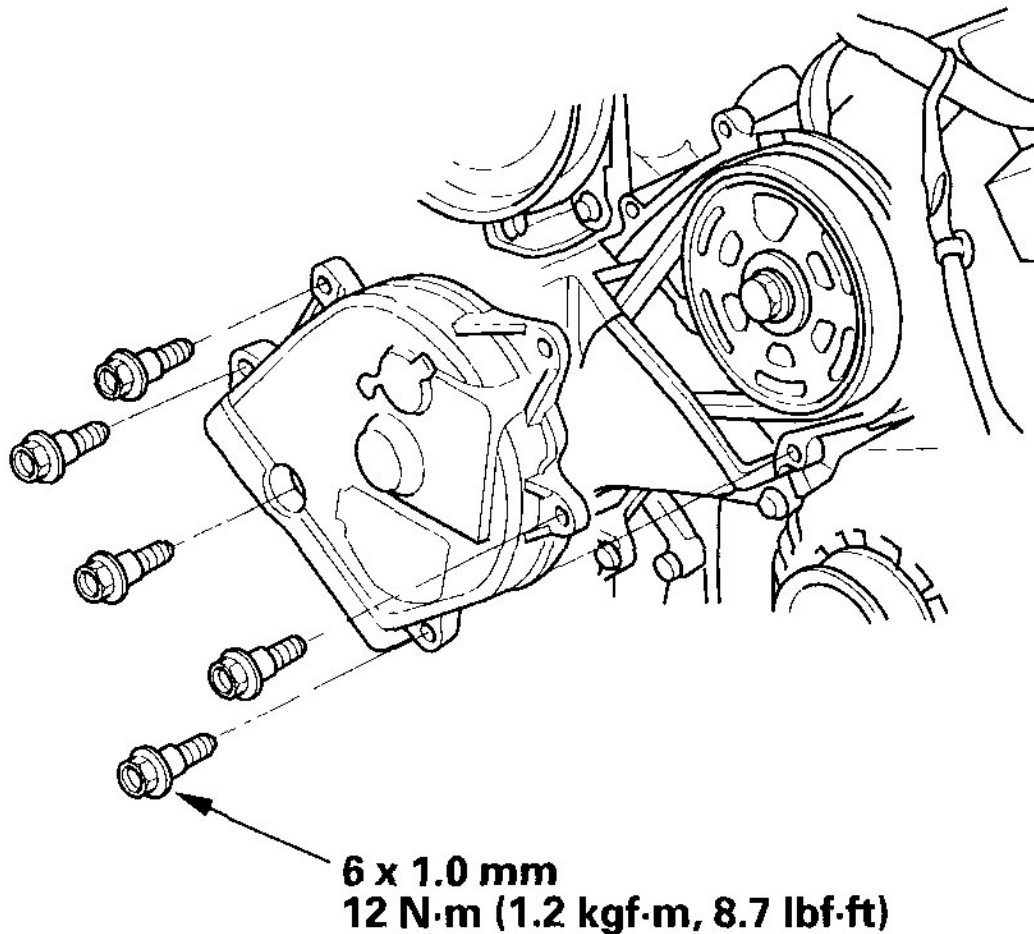
**Fig. 23: Identifying Additional Tightening Angle Of Crankshaft Pulley Bolt**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the drive belt. (see **DRIVE BELT INSPECTION** ).

4. Install the splash shield.
5. Install the right front tire/wheel.

## **TIMING BELT INSPECTION**

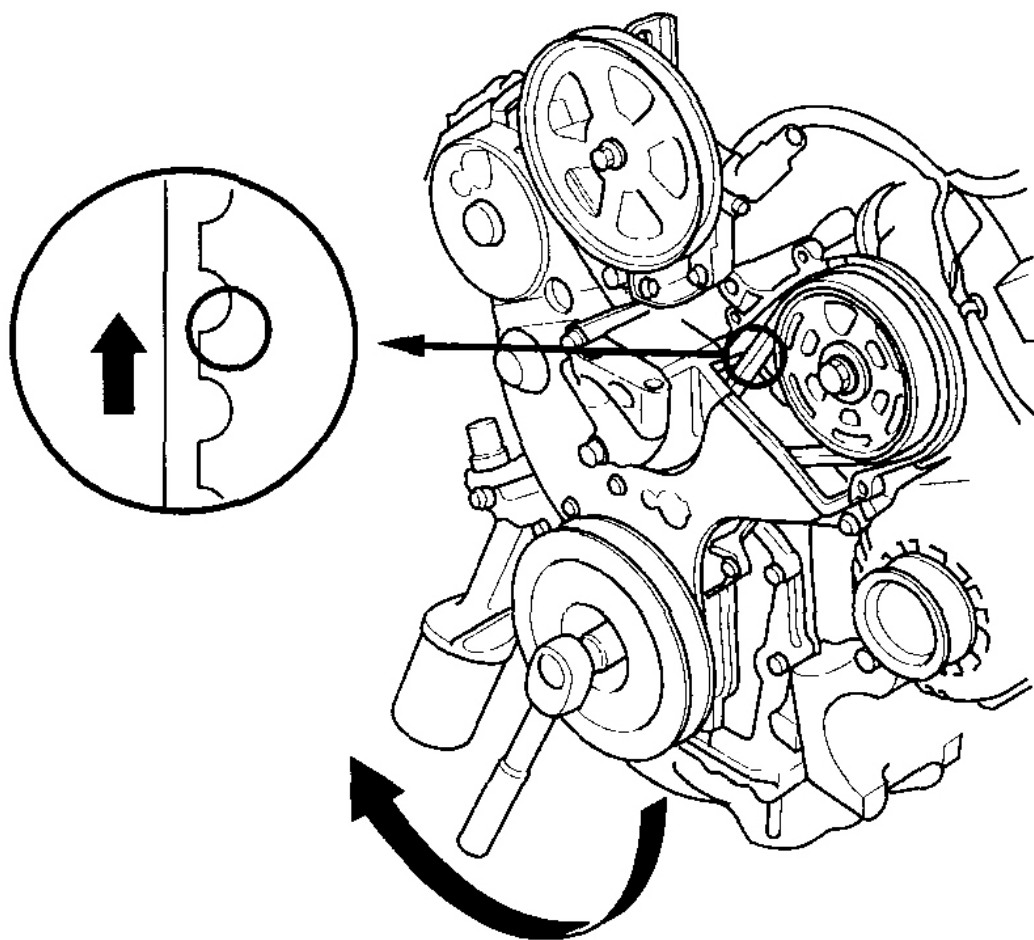
1. Remove the drive belt (see **DRIVE BELT REPLACEMENT** ).
2. Remove the front upper cover.



**Fig. 24: Removing Front Upper Cover**

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.

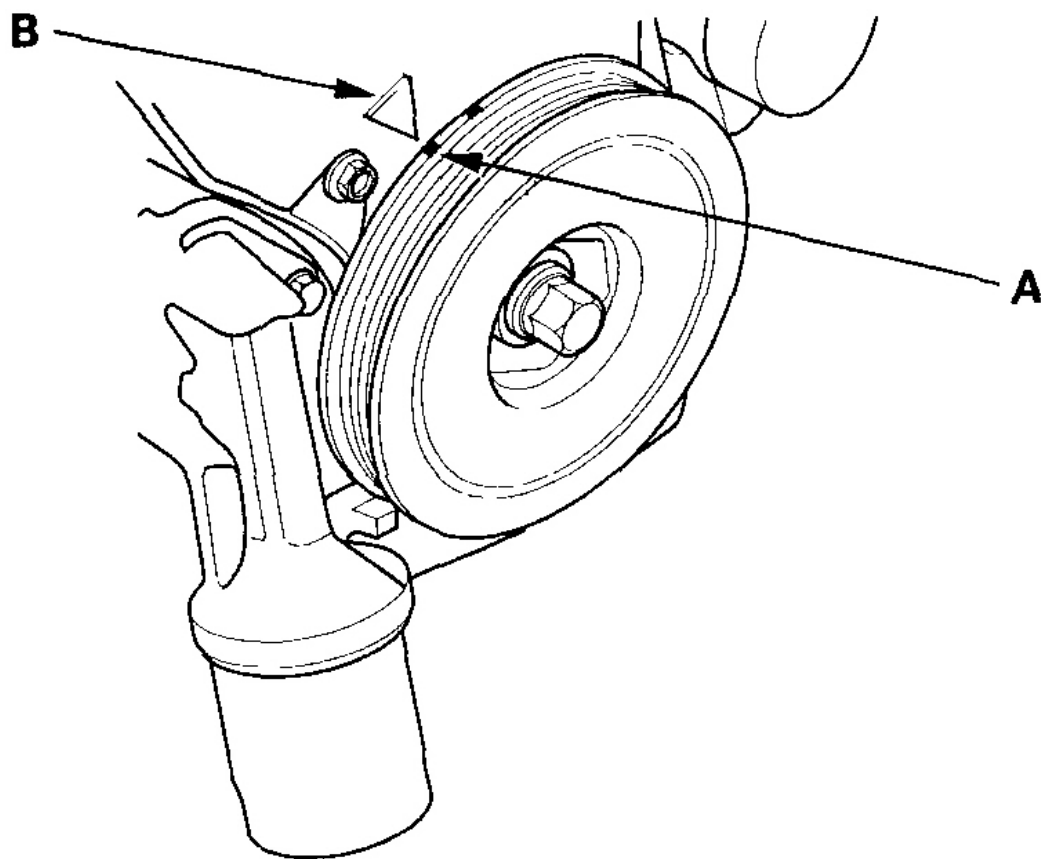


**Fig. 25: Inspecting Timing Belt For Cracks**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

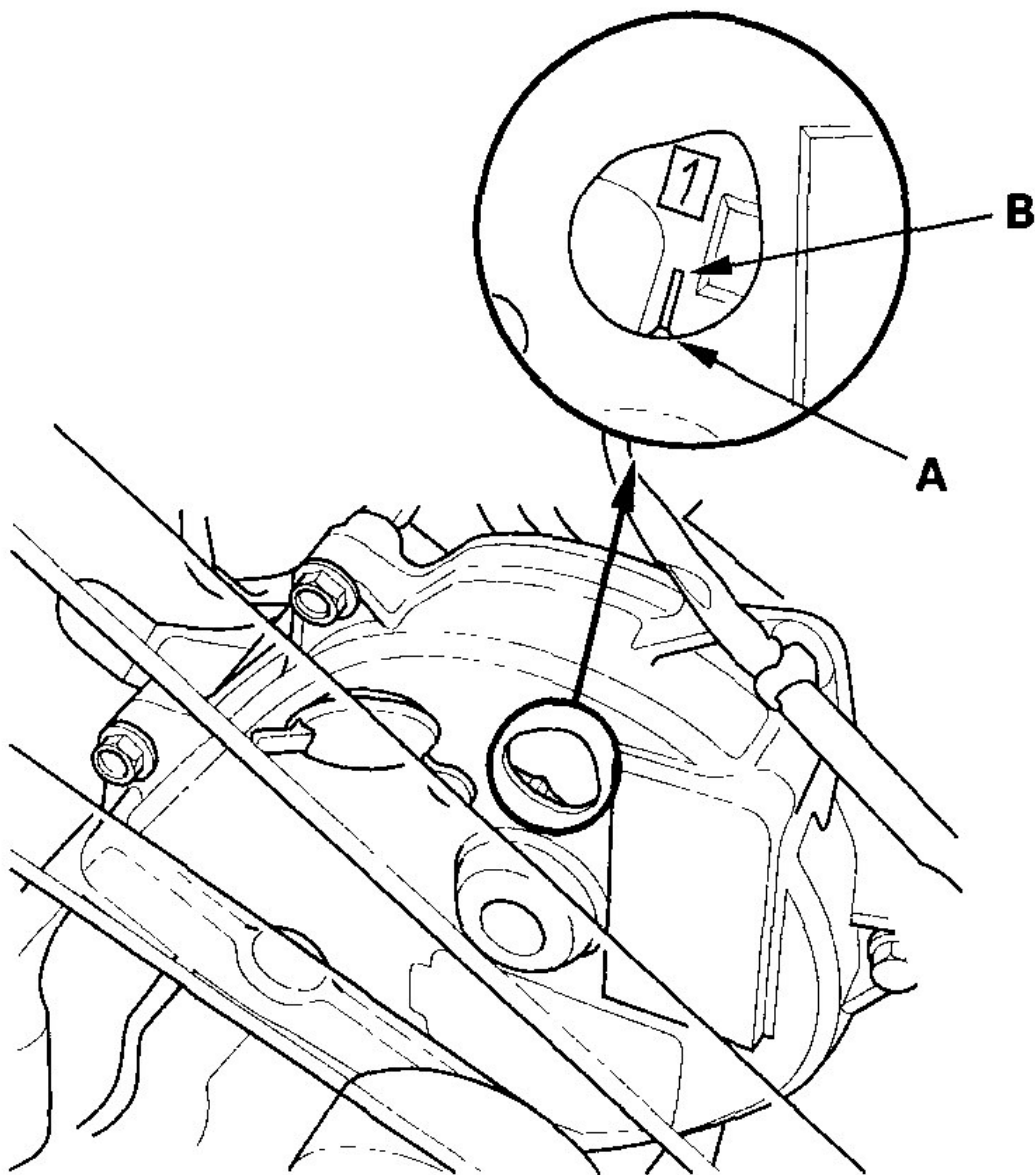
## **TIMING BELT REMOVAL**

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



**Fig. 26: Aligning Crankshaft White Mark With Pointer**  
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.

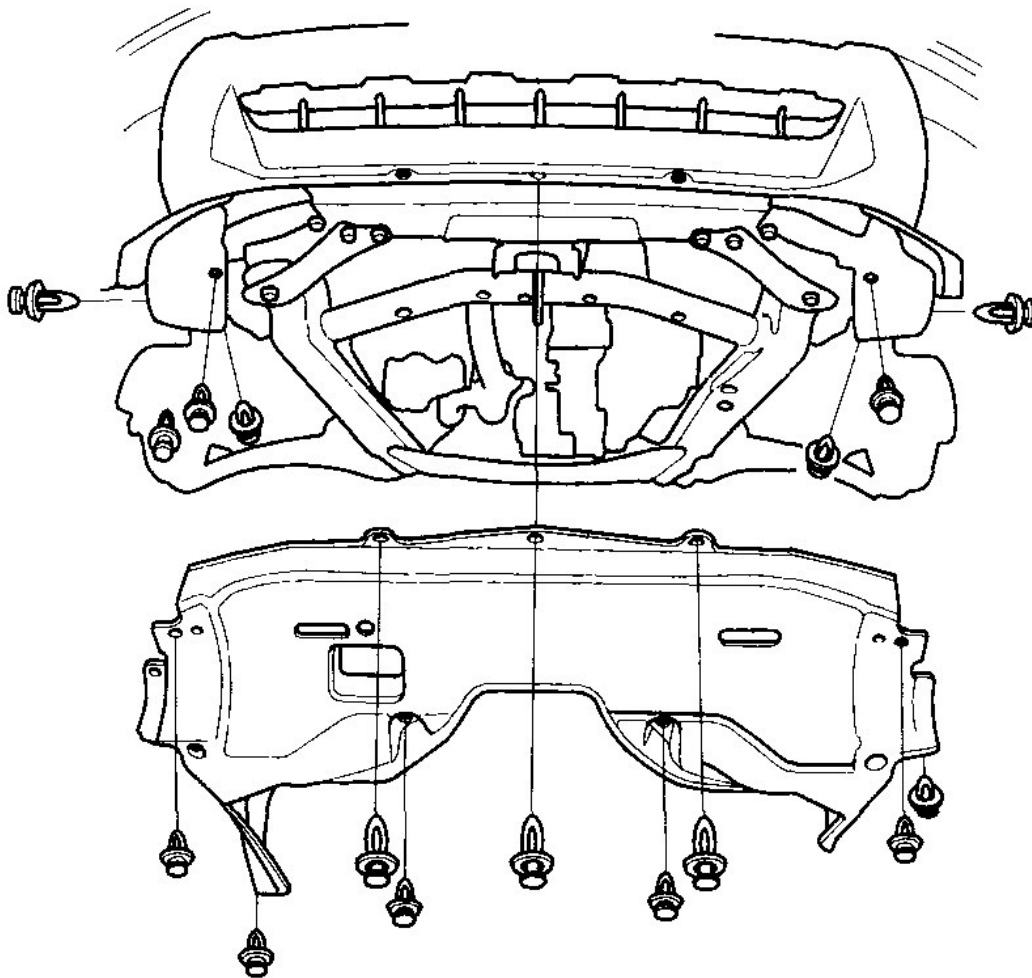


**Fig. 27: Aligning No. 1 Piston TDC Mark On Front Camshaft Pulley And Pointer On Front Upper Cover**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove the right front tire/wheel.
4. Remove the splash shield.

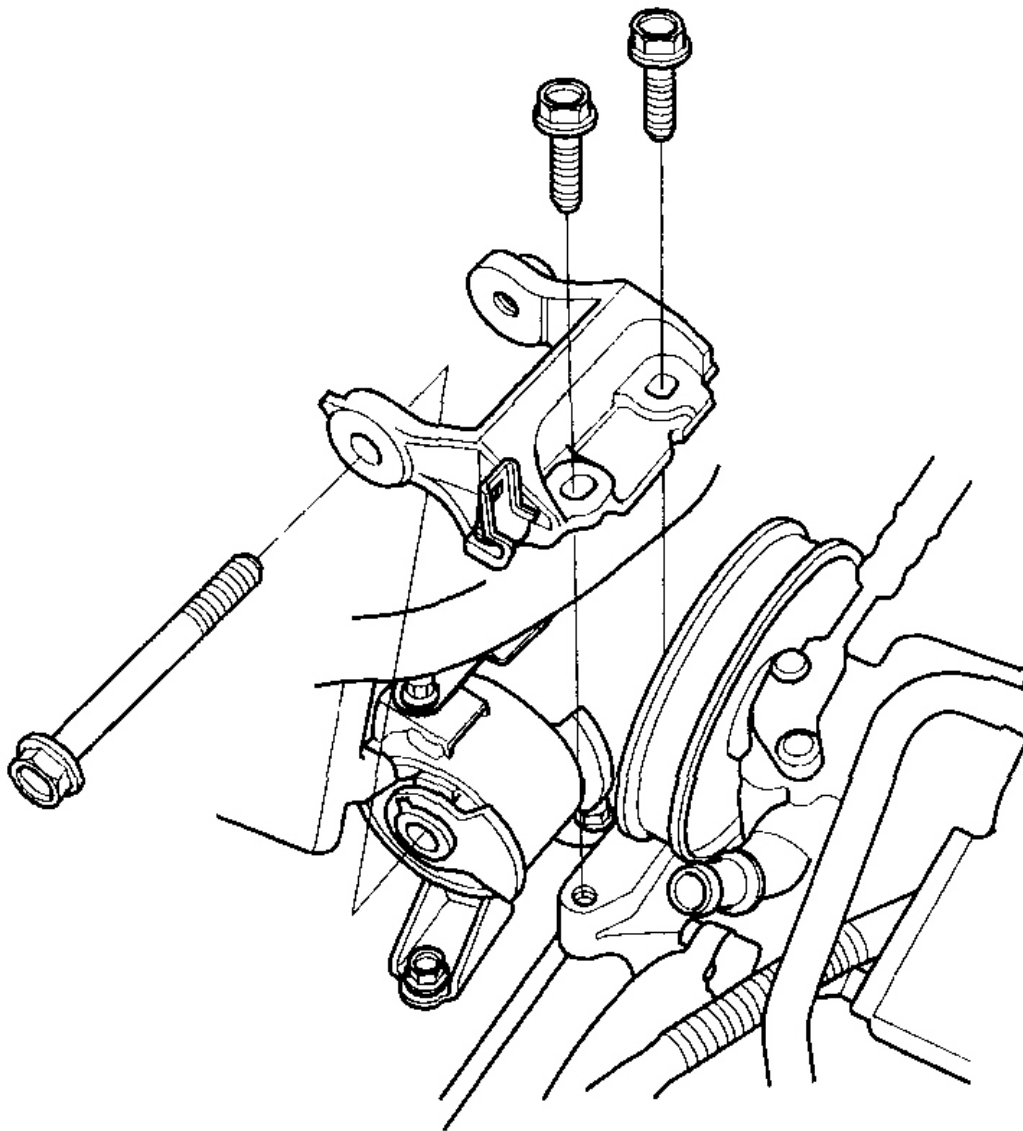




**Fig. 28: Removing Splash Shield**

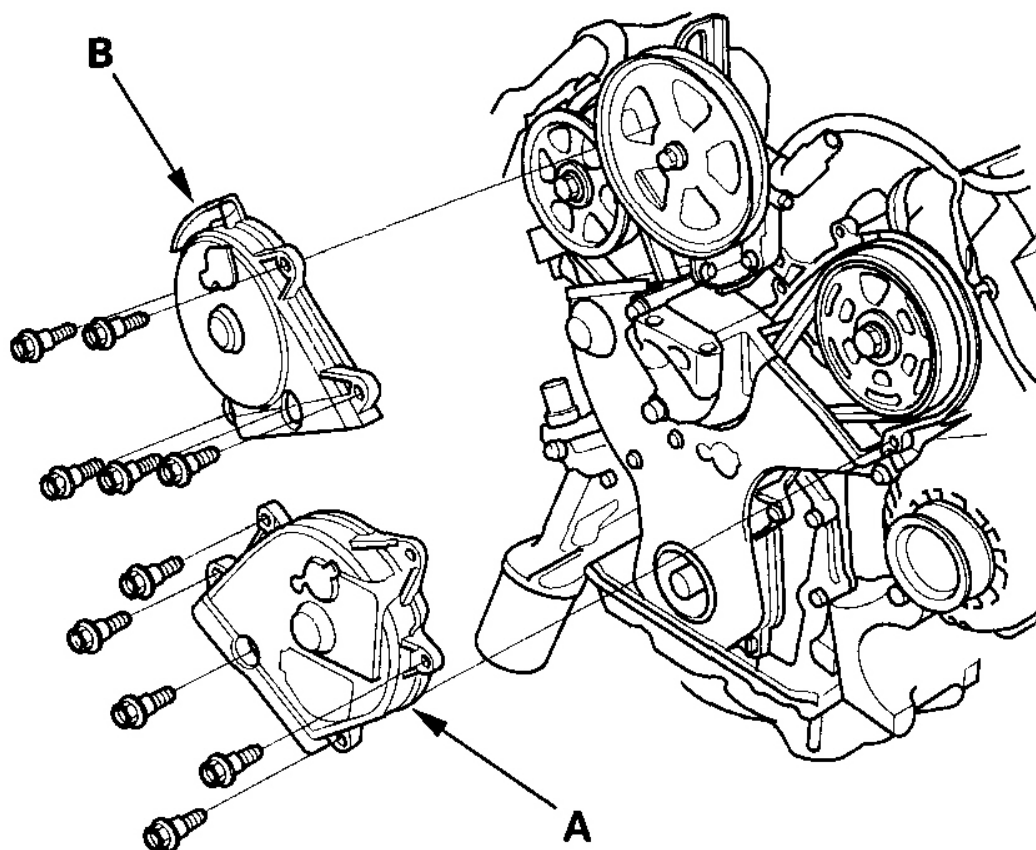
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Remove the drive belt (see **DRIVE BELT REPLACEMENT** ).
6. Support the engine with a jack and wood block under the oil pan.
7. Remove the upper half of the side engine mount bracket.



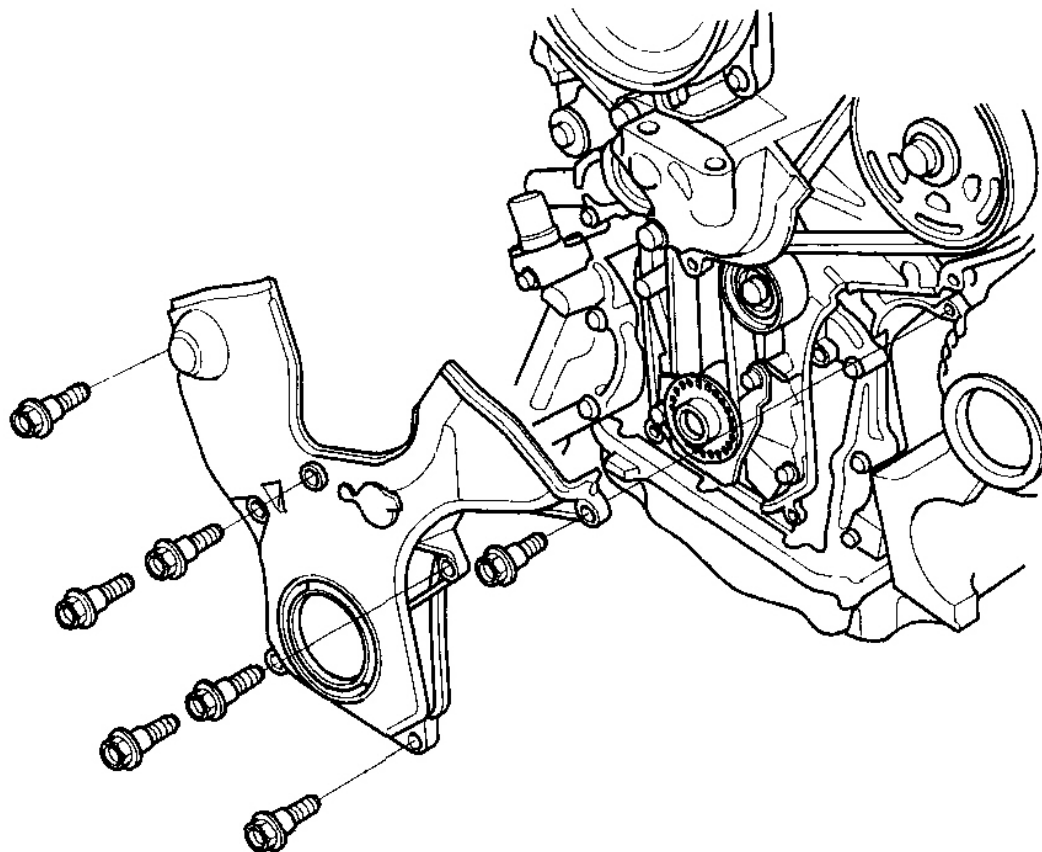
**Fig. 29: Removing Upper Half Of Side Engine Mount Bracket**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



**Fig. 30: Removing Front Upper Cover (A) And Rear Upper Cover (B)**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

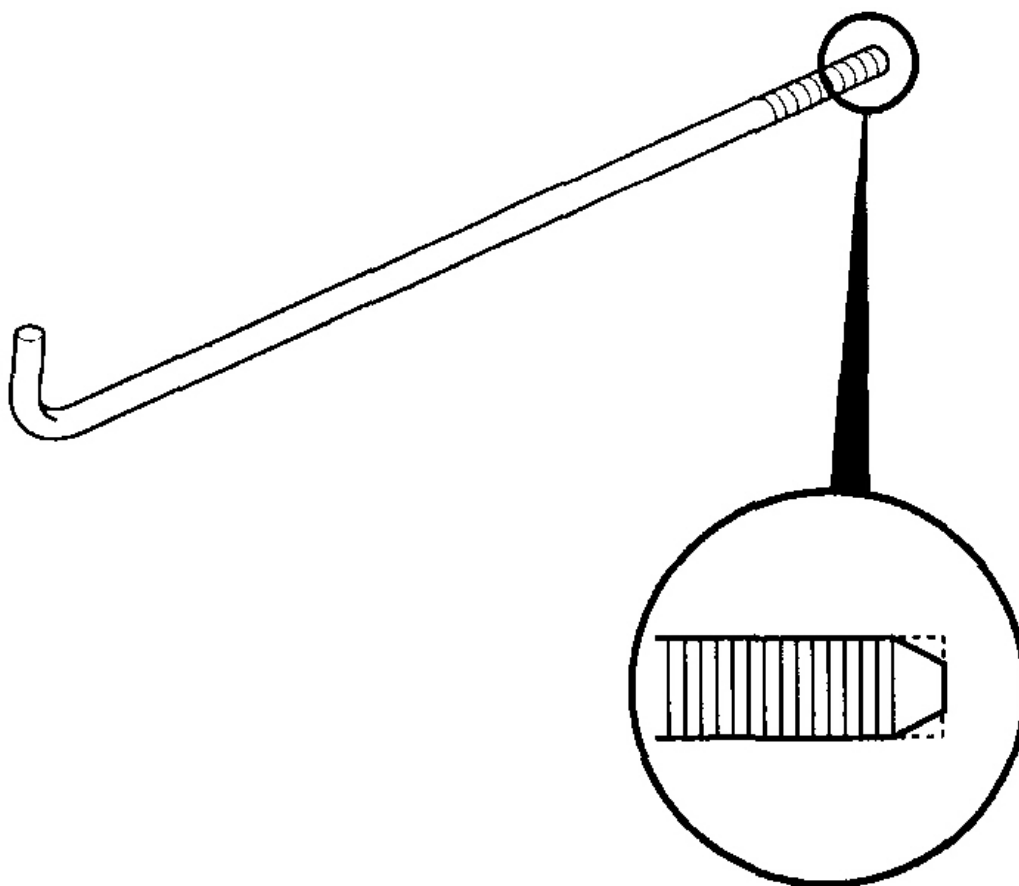
10. Remove the lower cover.



**Fig. 31: Removing Lower Cover**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

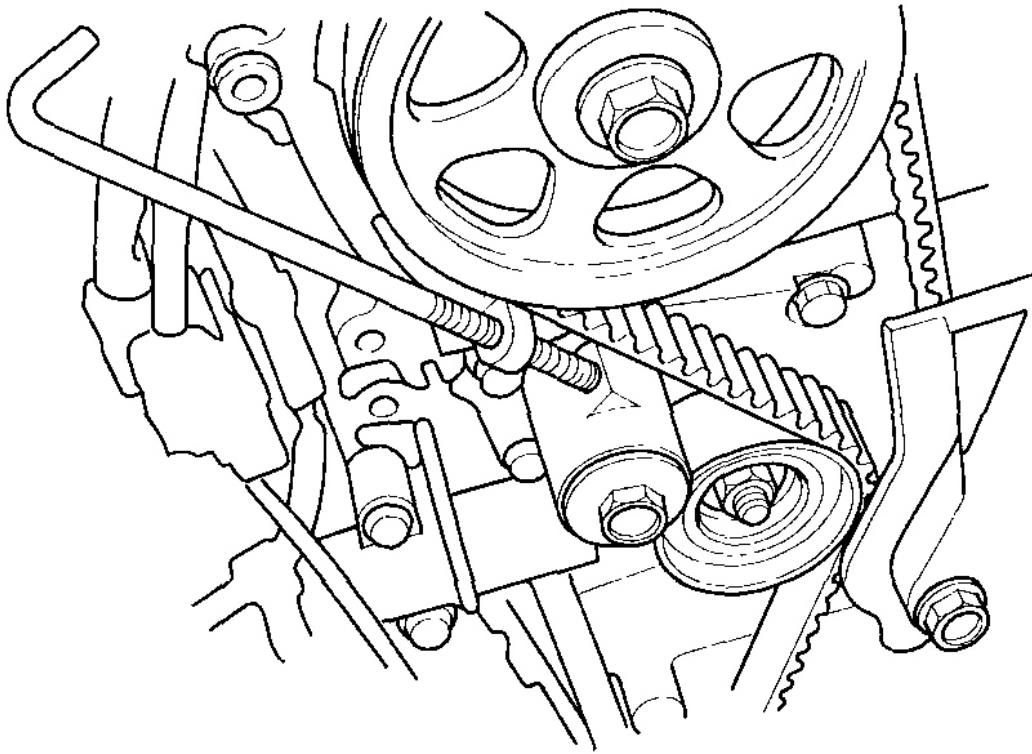
11. Remove one of the battery clamp bolts from the battery tray, and grind the end of it as shown.



**Fig. 32: Identifying Battery Clamp Bolt End**

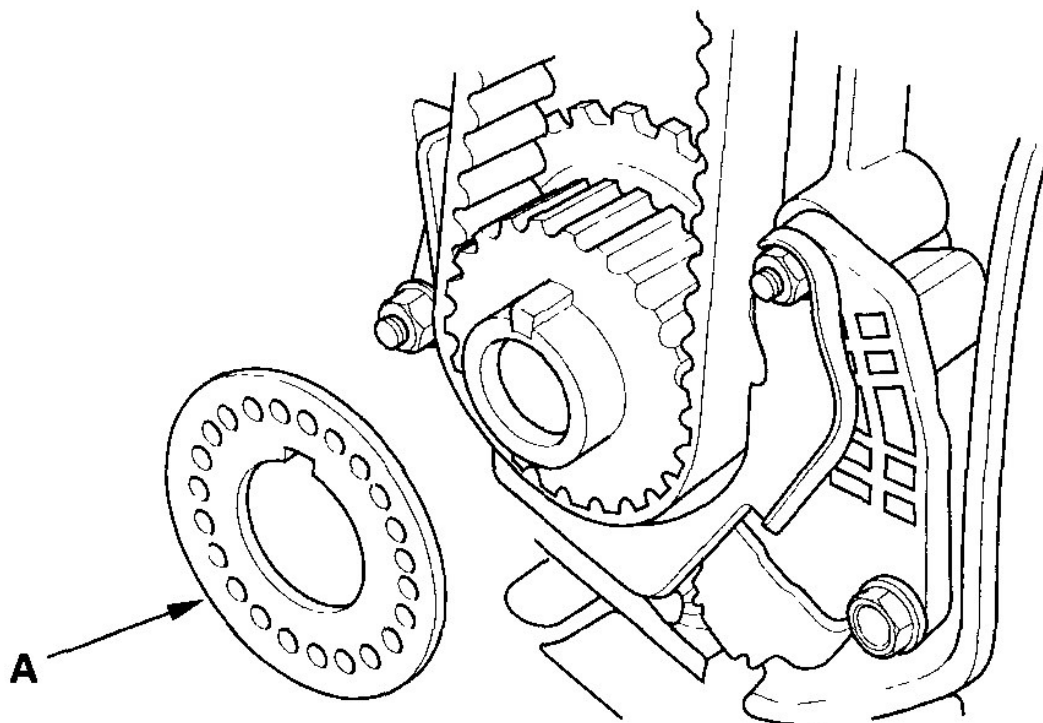
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



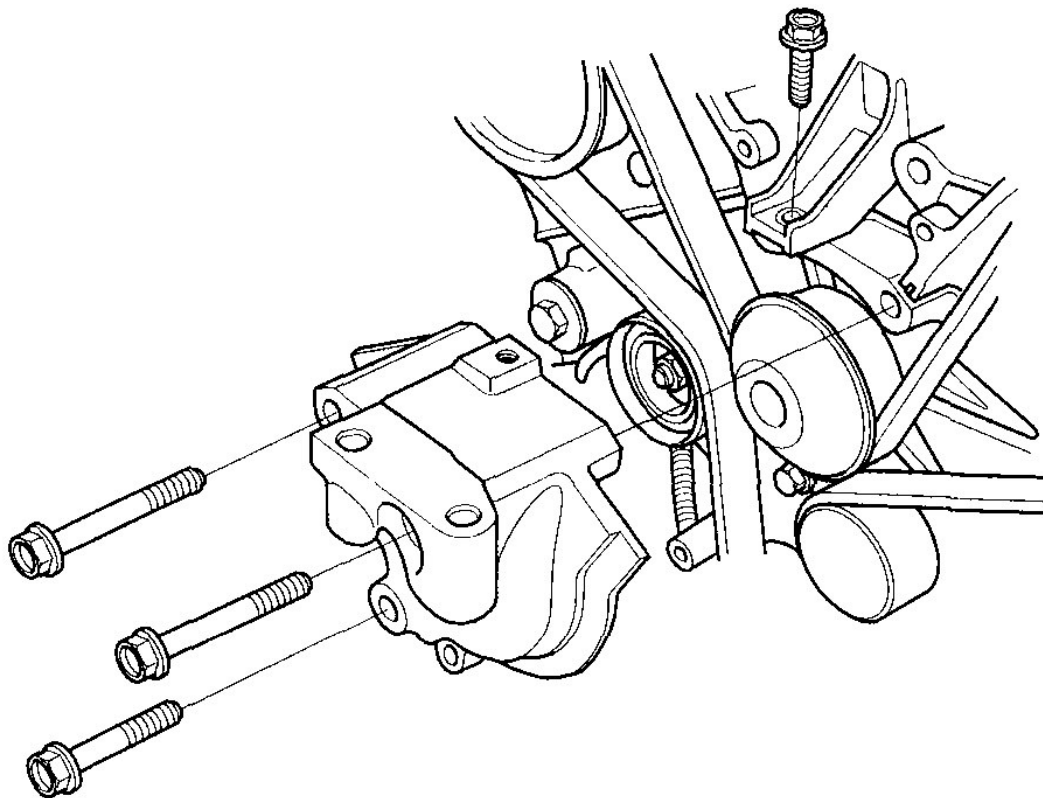
**Fig. 33: Screwing Battery Clamp Bolt**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



**Fig. 34: Removing Timing Belt Guide Plate**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

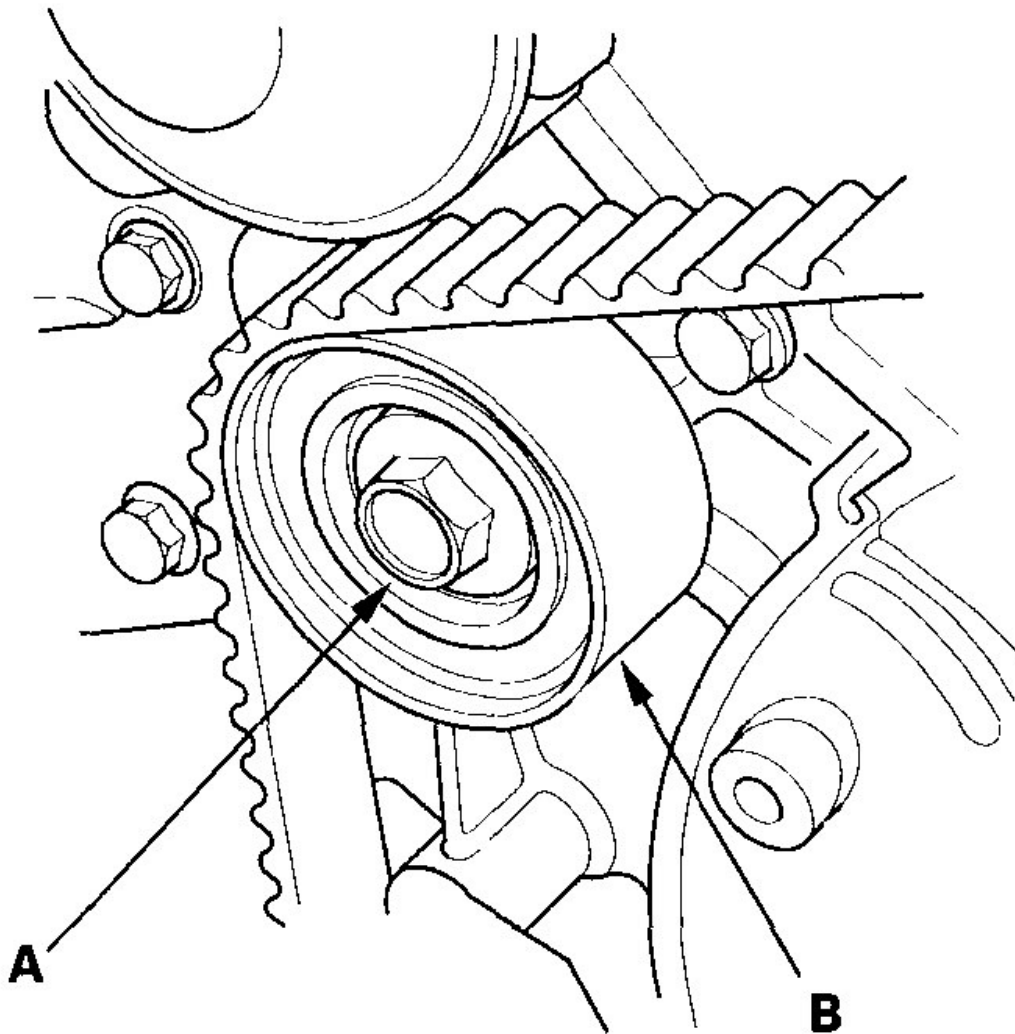
14. Remove the lower side engine mount bracket.



**Fig. 35: Removing Lower Side Engine Mount Bracket**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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





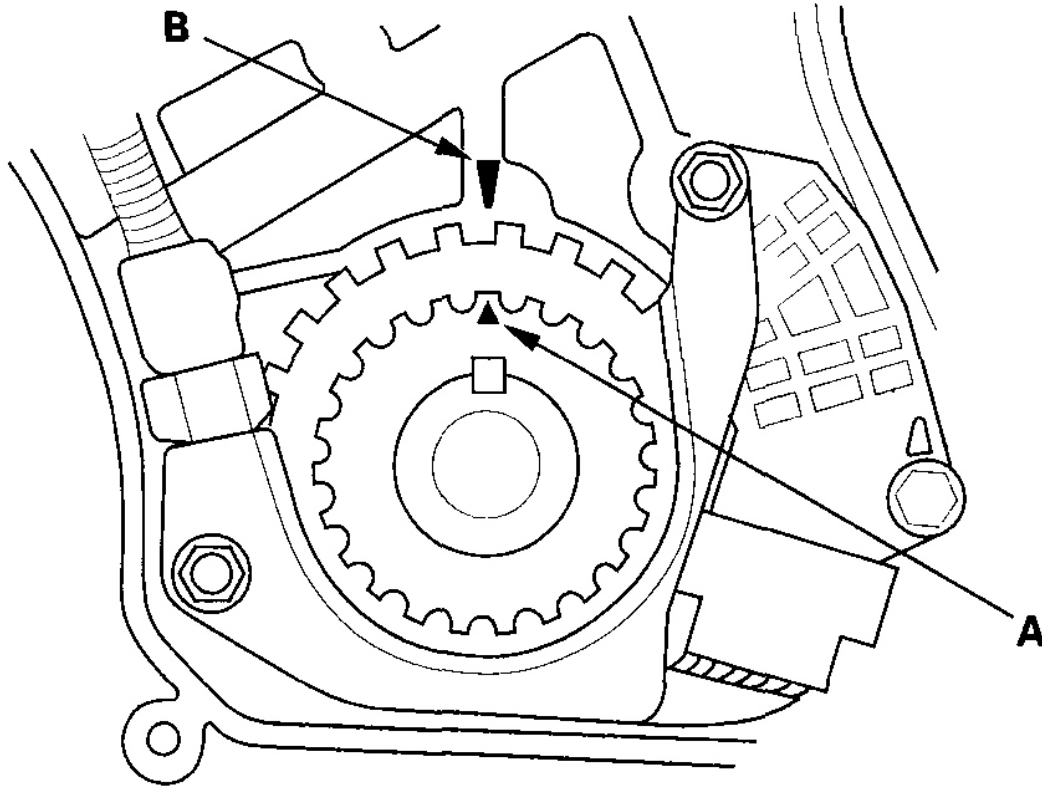
**Fig. 36: Removing Idler Pulley And Timing Belt**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

## TIMING BELT INSTALLATION

**NOTE:** The following procedure is for installing a used 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, 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.

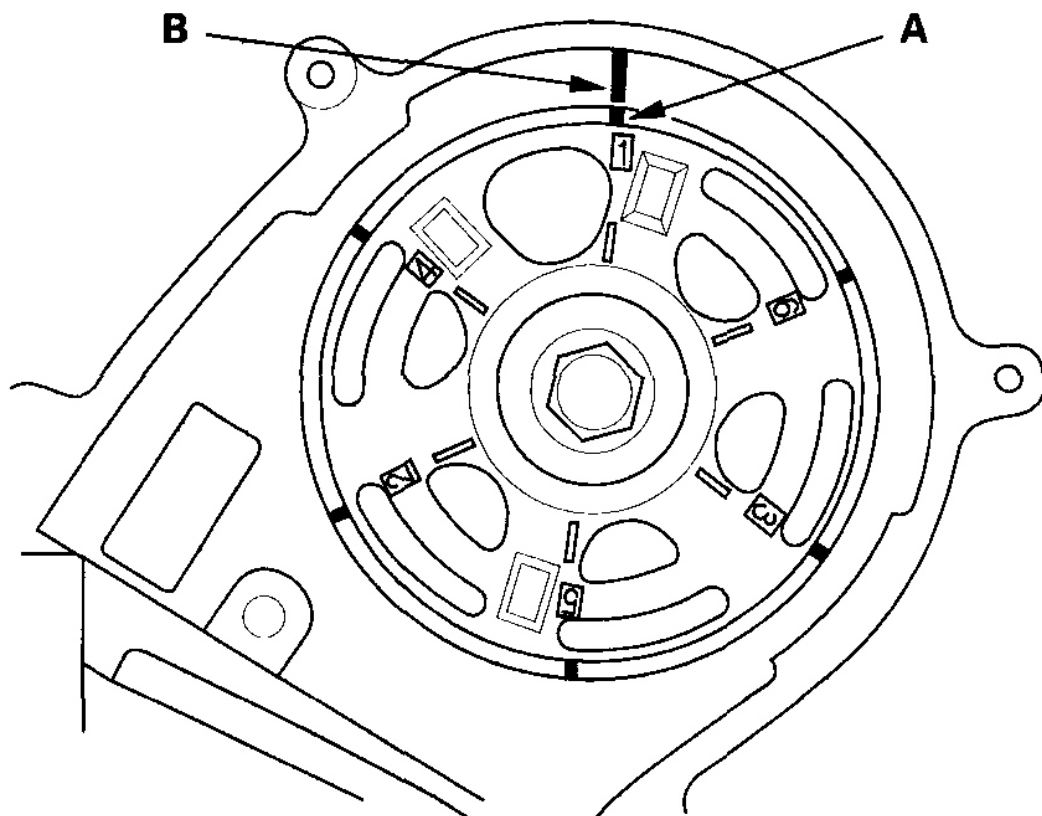


**Fig. 37: Aligning TDC Mark (A) On Tooth Of Timing Belt Drive Pulley With Pointer (B) On Oil Pump**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

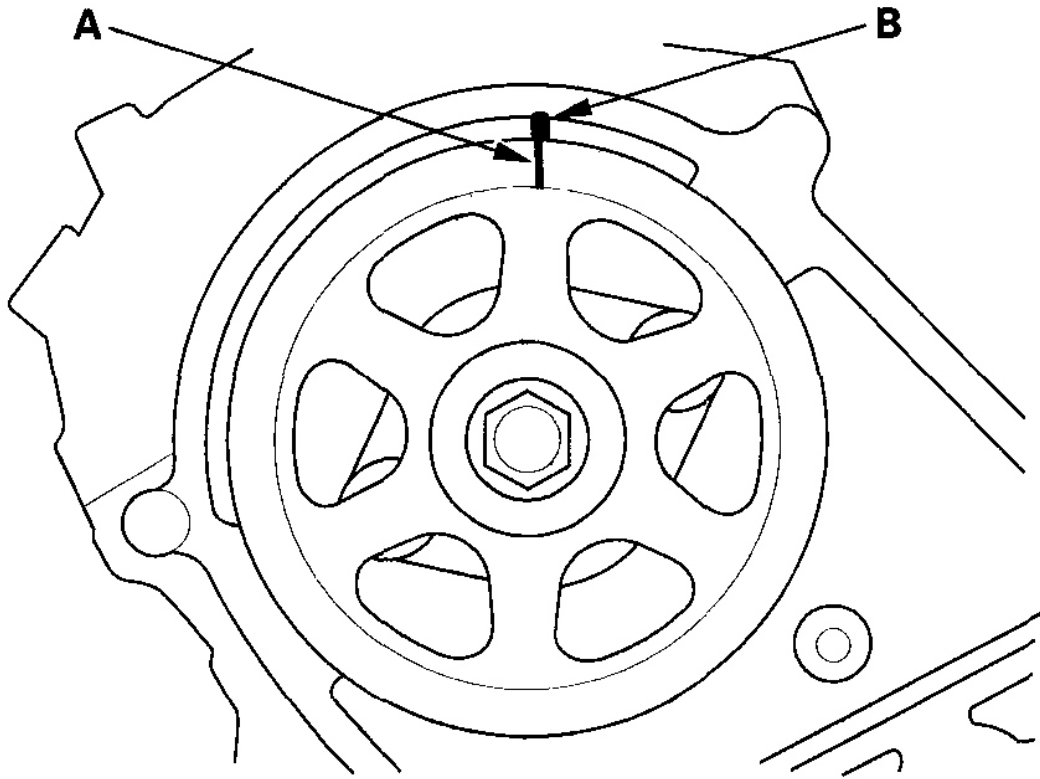
3. Set the camshaft pulleys to TDC by aligning the TDC marks (A) on the camshaft pulleys with the pointers (B) on the back covers.

**FRONT CAMSHAFT PULLEY:**



**Fig. 38: Aligning TDC Marks (A) On Camshaft Pulleys With Pointers (B) On Back Covers**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

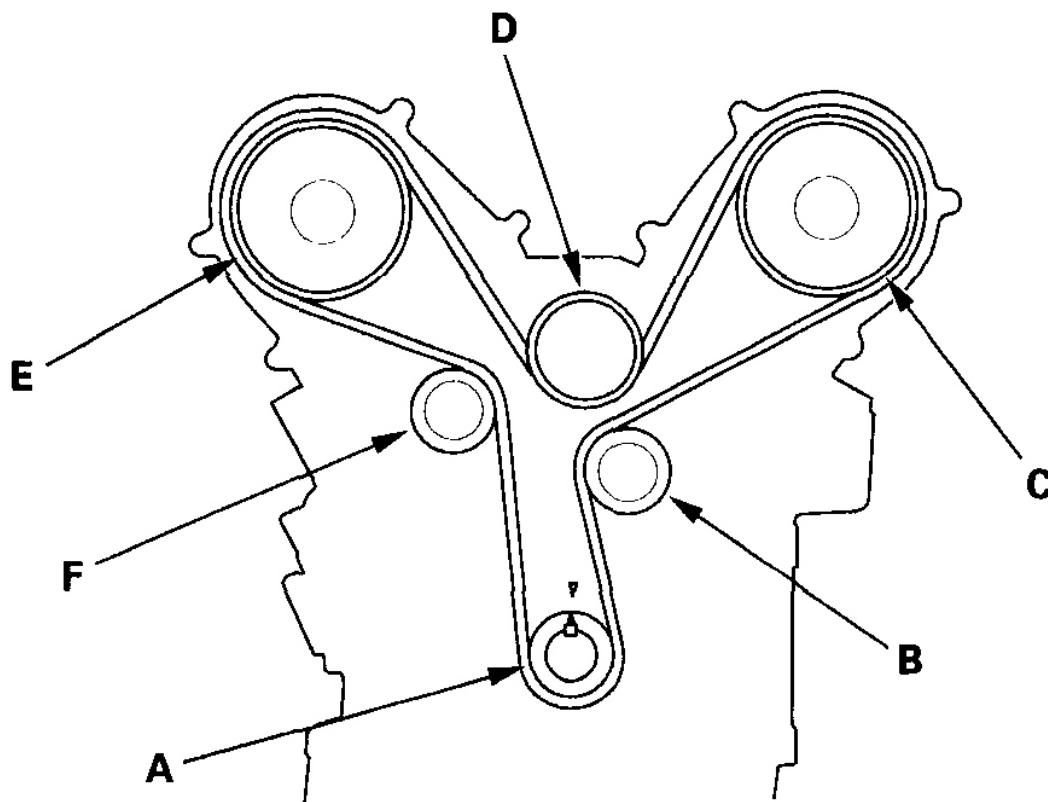
**REAR CAMSHAFT PULLEY:**



**Fig. 39: Aligning TDC Marks On Camshaft Pulleys With Pointers On Back Covers (Rear Camshaft Pulley)**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

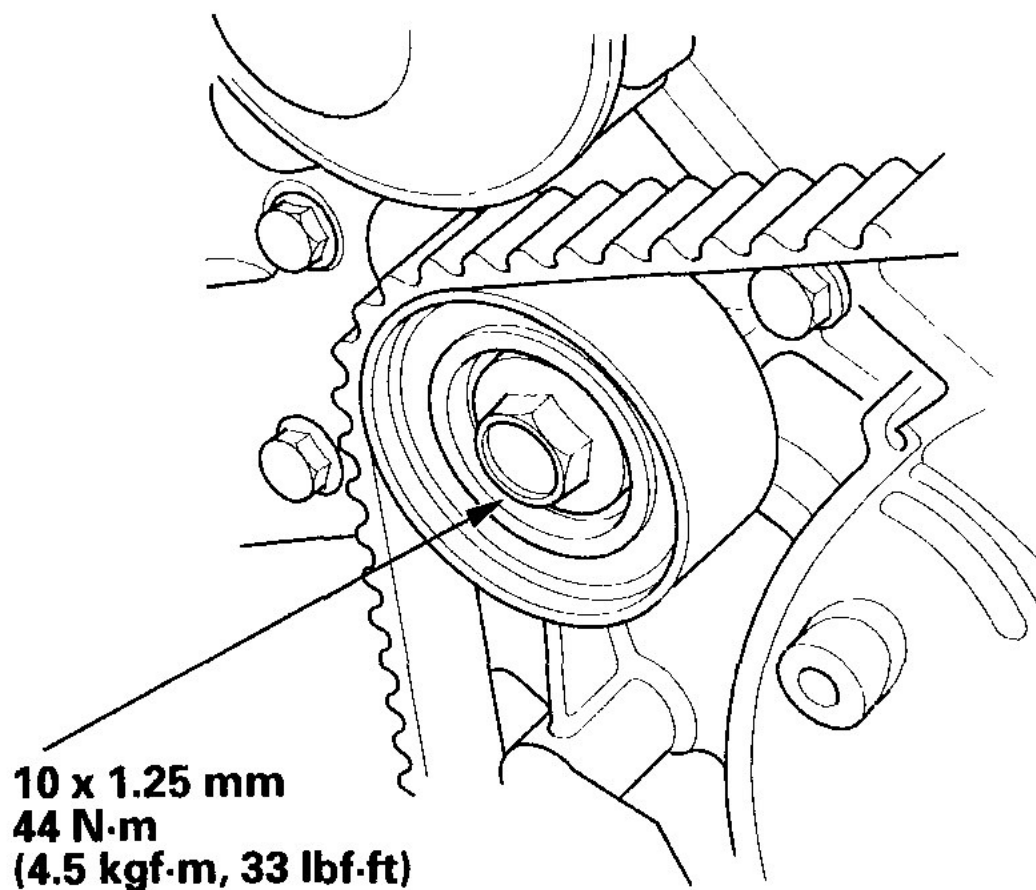
4. Apply liquid thread lock to the idler pulley bolt, then loosely install the idler pulley bolt as the pulley can move and does not come off.
5. If the auto-tensioner has extended and the timing belt cannot be installed, do the timing belt replacement procedure (see **TIMING BELT REPLACEMENT** ).
6.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



**Fig. 40: Installing Timing Belt**

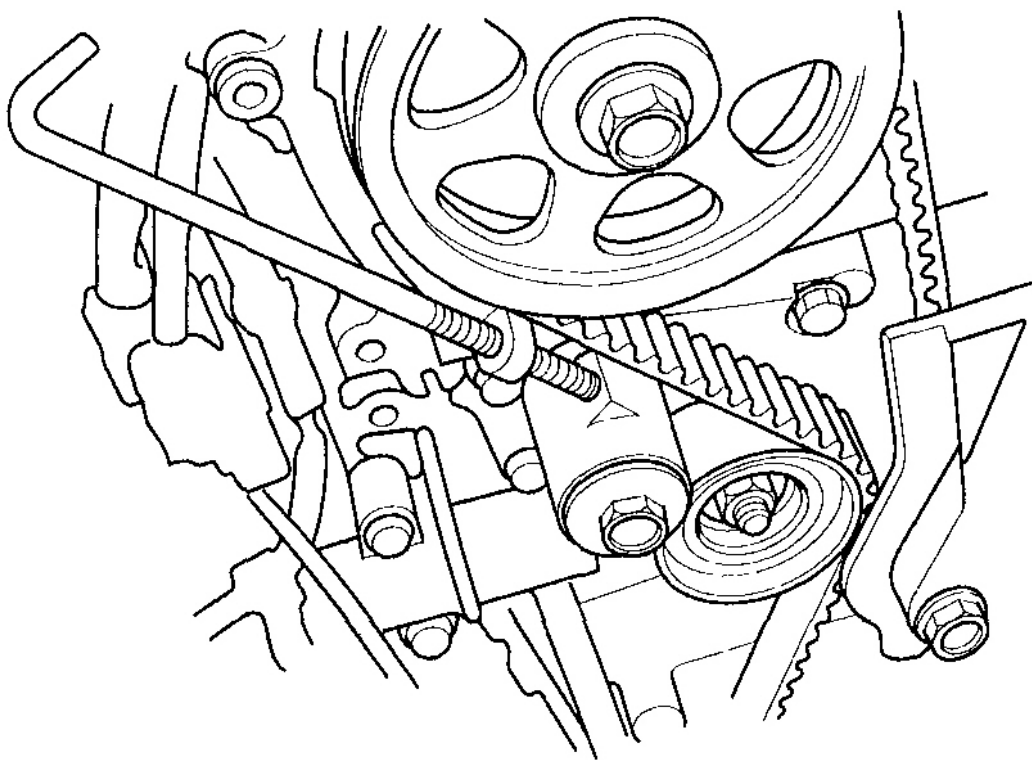
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Tighten the idler pulley bolt.



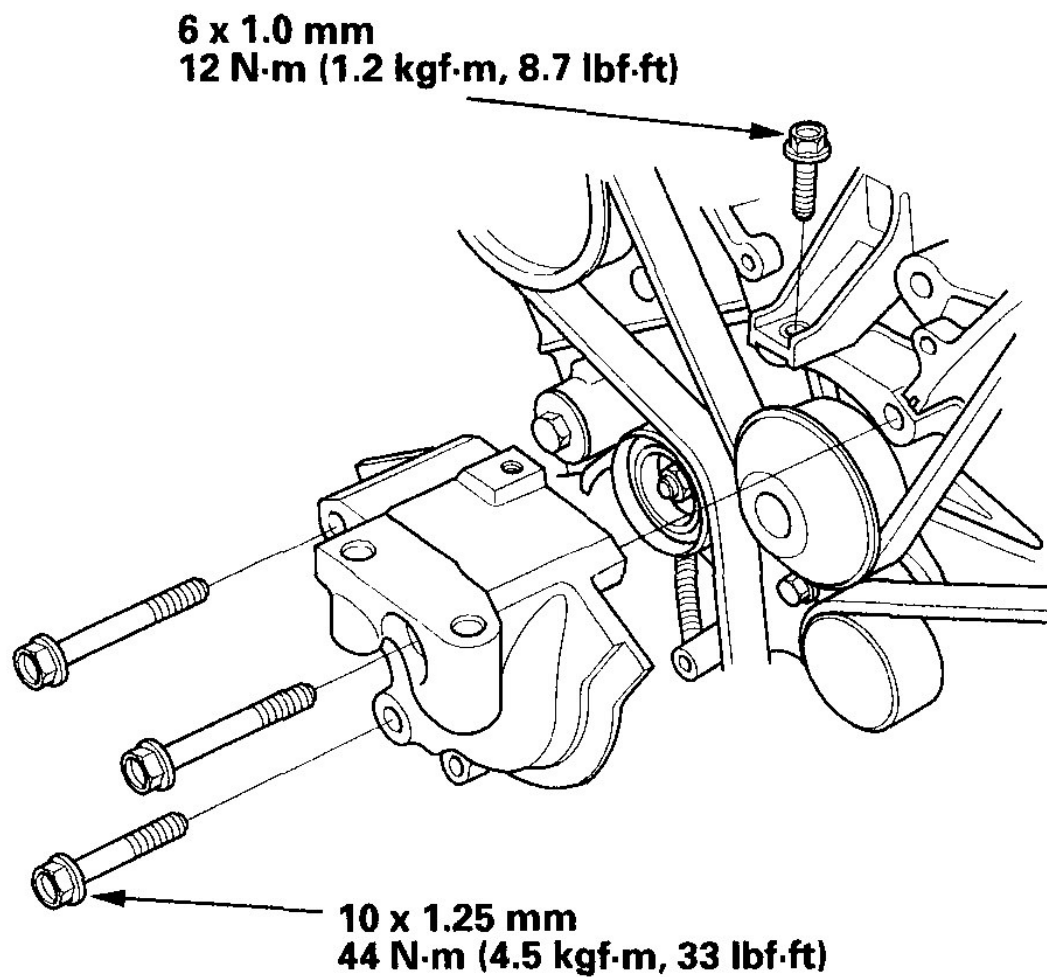
**Fig. 41: Tightening Idler Pulley Bolt**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



**Fig. 42: Removing Battery Clamp Bolt From Back Cover**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

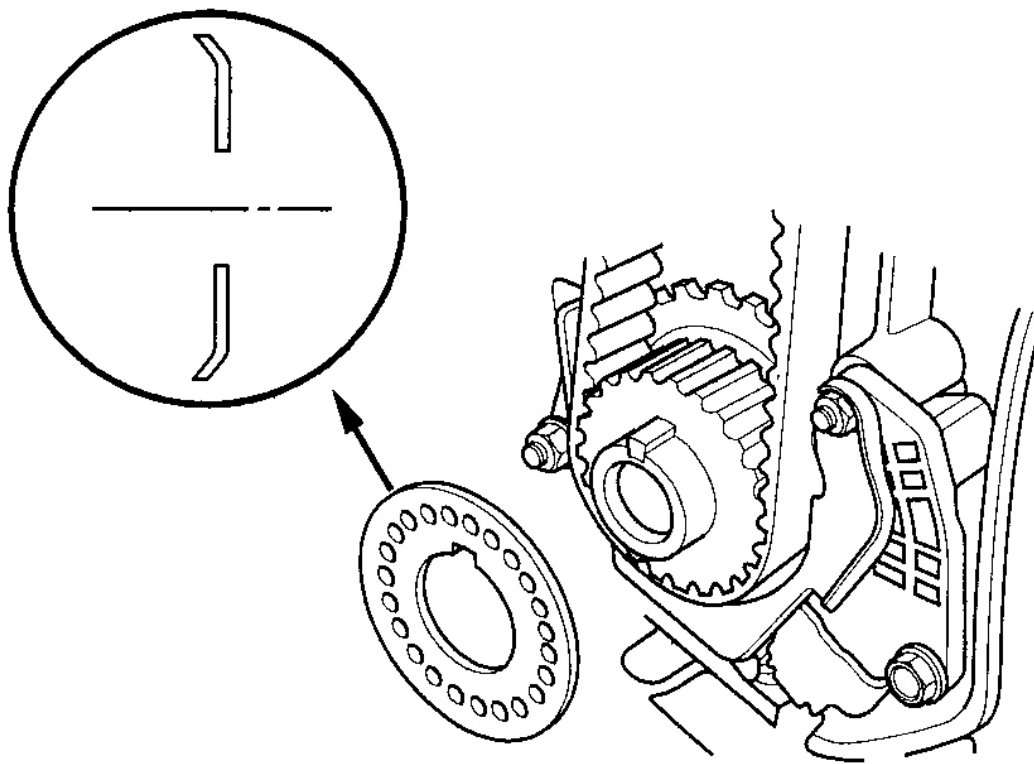
9. Install the lower half of the side engine mount bracket.



**Fig. 43: Installing Lower Half Of Side Engine Mount Bracket**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

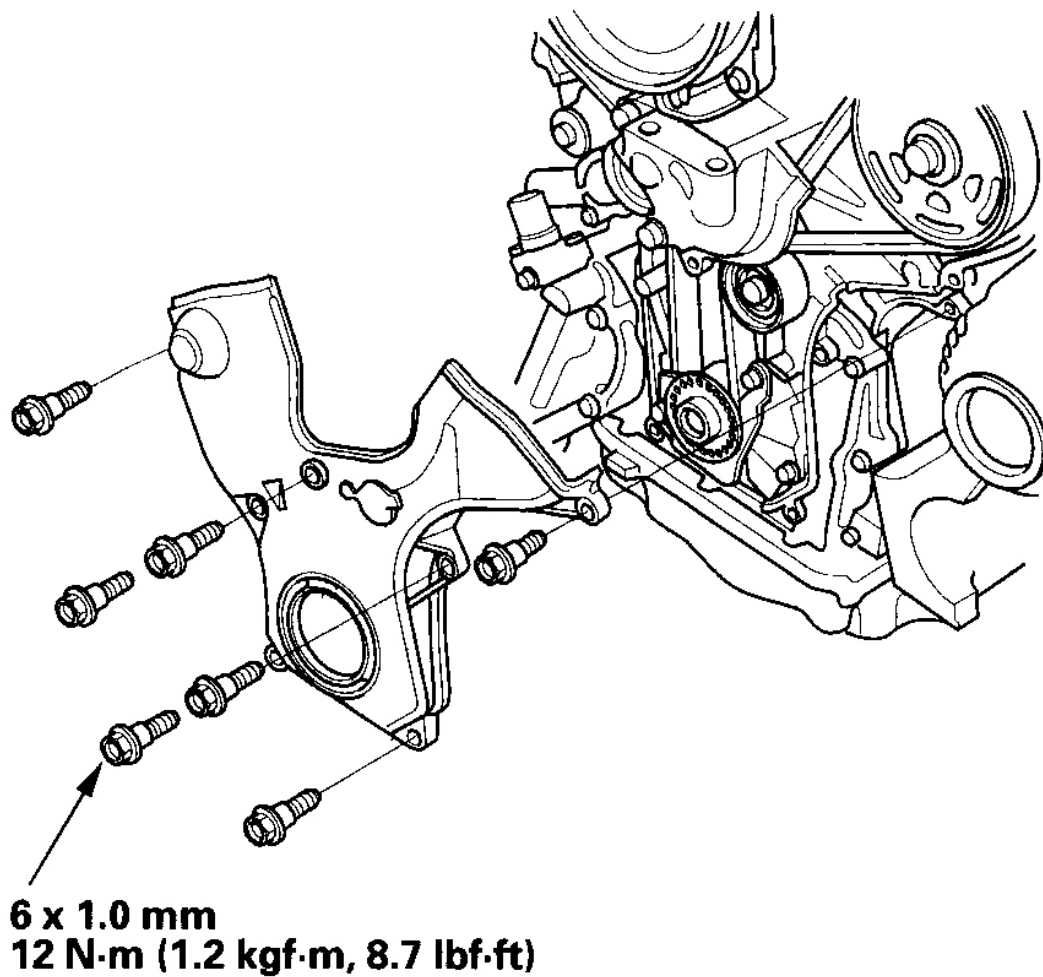
10. Install the timing belt guide plate as shown.





**Fig. 44: Installing Timing Belt Guide Plate**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

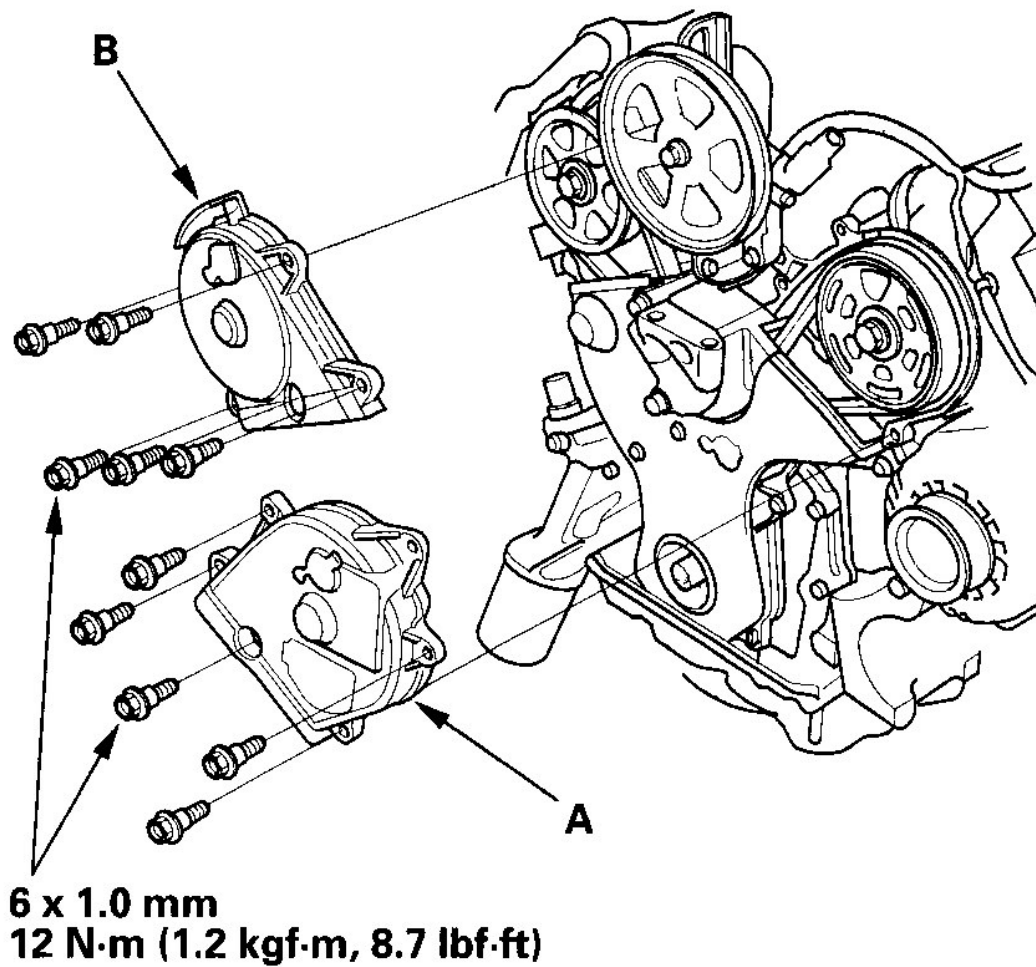
11. Install the lower cover.



**Fig. 45: Installing Lower Cover**

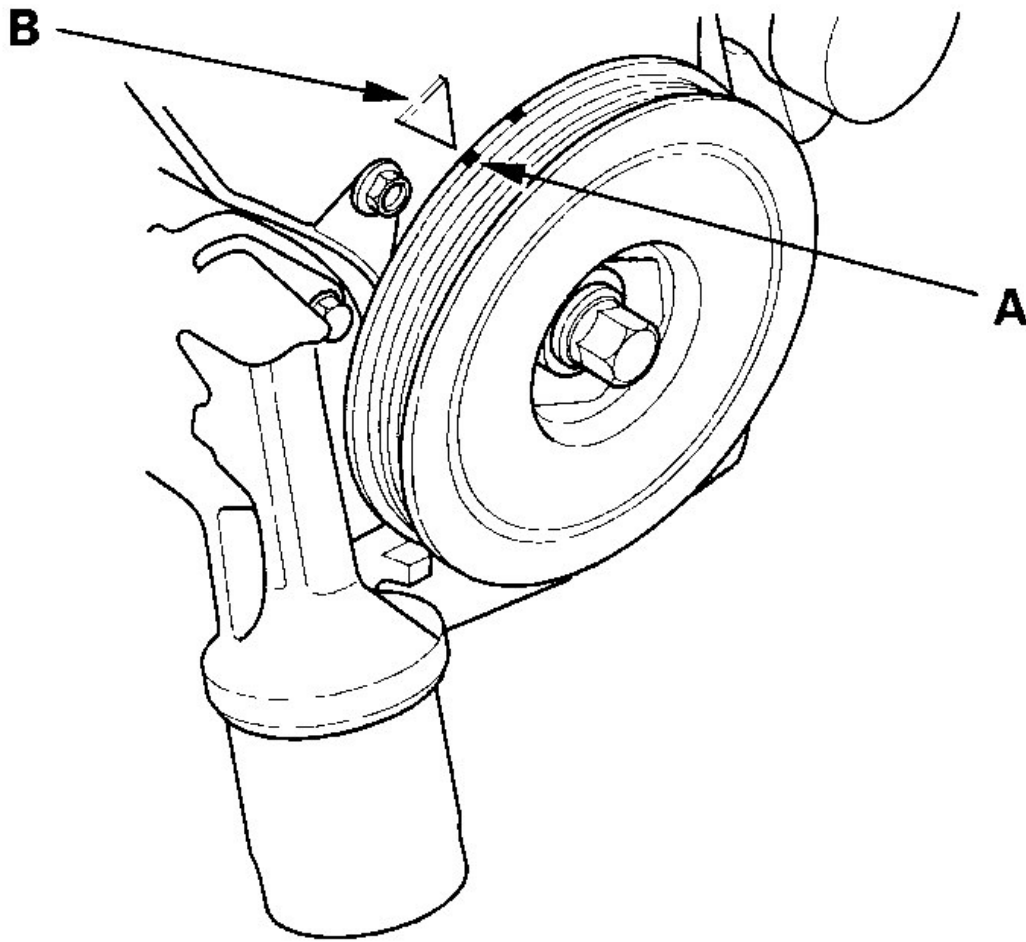
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



**Fig. 46: Installing Front Upper Cover (A) And Rear Upper Cover (B)**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

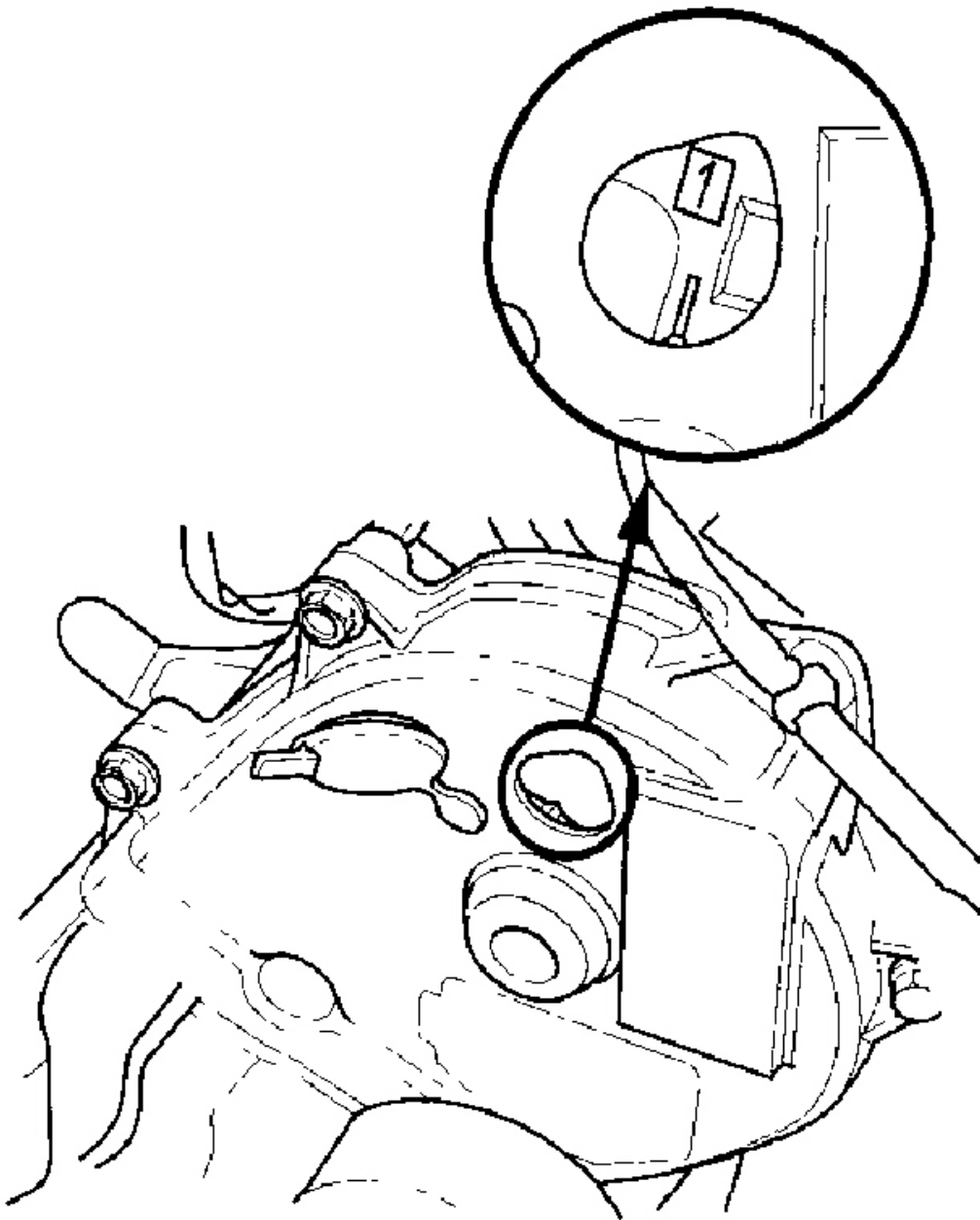
13. Install the crankshaft pulley (see **INSTALLATION** ).
14. Rotate the crankshaft pulley six turns clockwise so the timing belt positions itself on the pulleys.
15. Turn the crankshaft pulley so its white mark (A) lines up with the pointer (B).



**Fig. 47: Aligning Crankshaft Pulley So Its White Mark (A) Lines Up With Pointer (B)**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

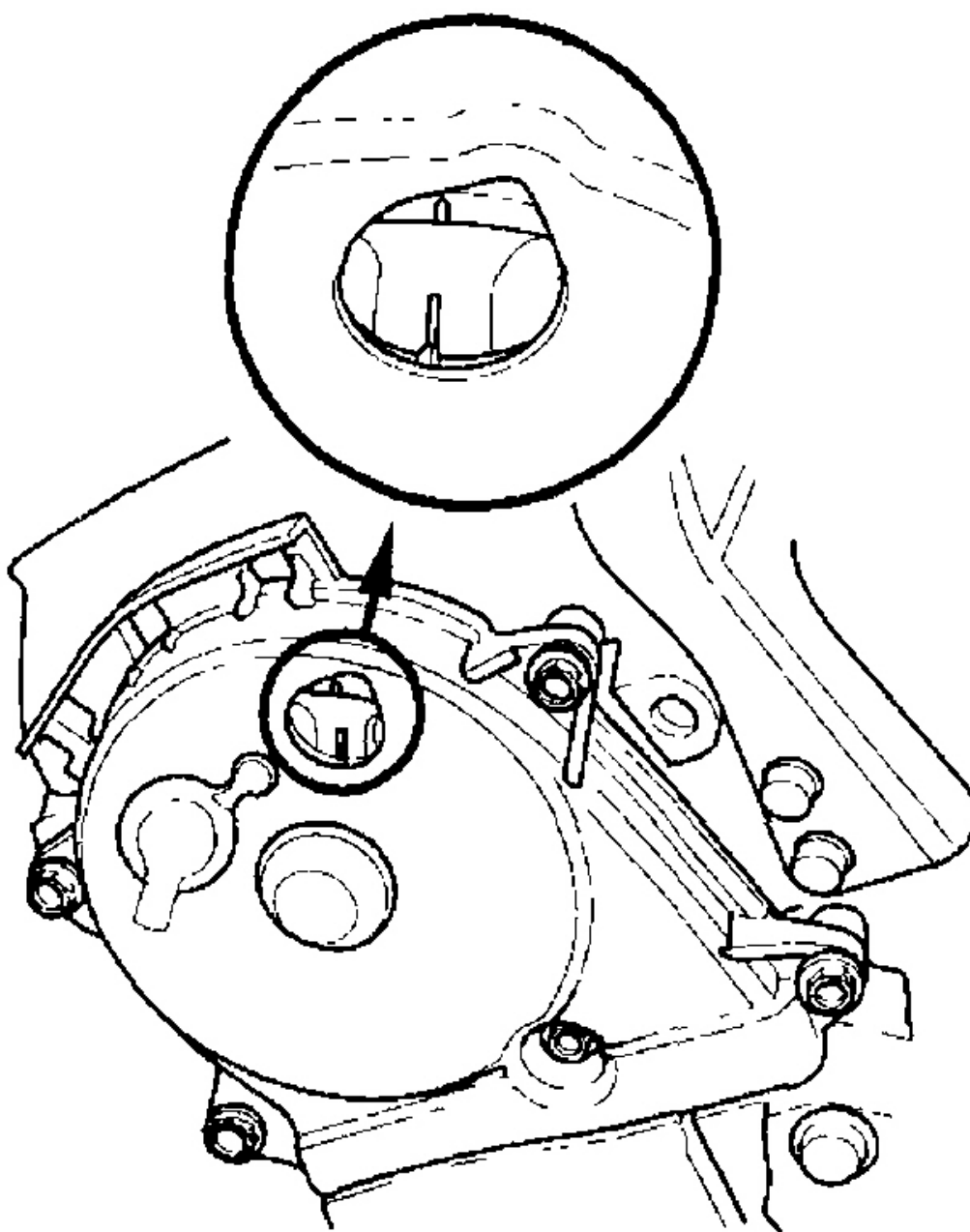
16. Check the camshaft pulley marks.
- If the camshaft pulley marks are at TDC, go to step 17.
  - If the camshaft pulley marks are not at TDC, remove the timing belt and repeat steps 2 through 16.

**FRONT CAMSHAFT PULLEY:**



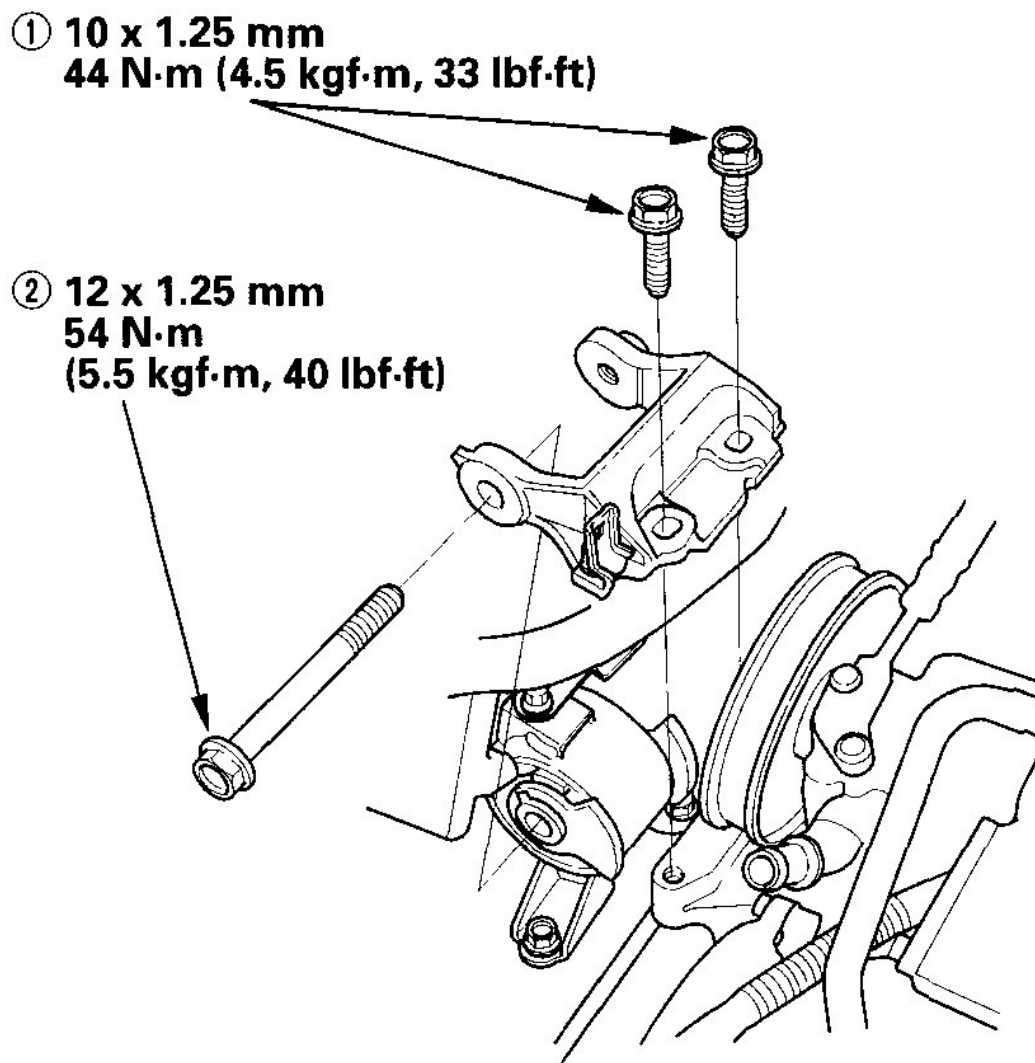
**Fig. 48: Identifying Front Camshaft Pulley Marks**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

**REAR CAMSHAFT PULLEY:**



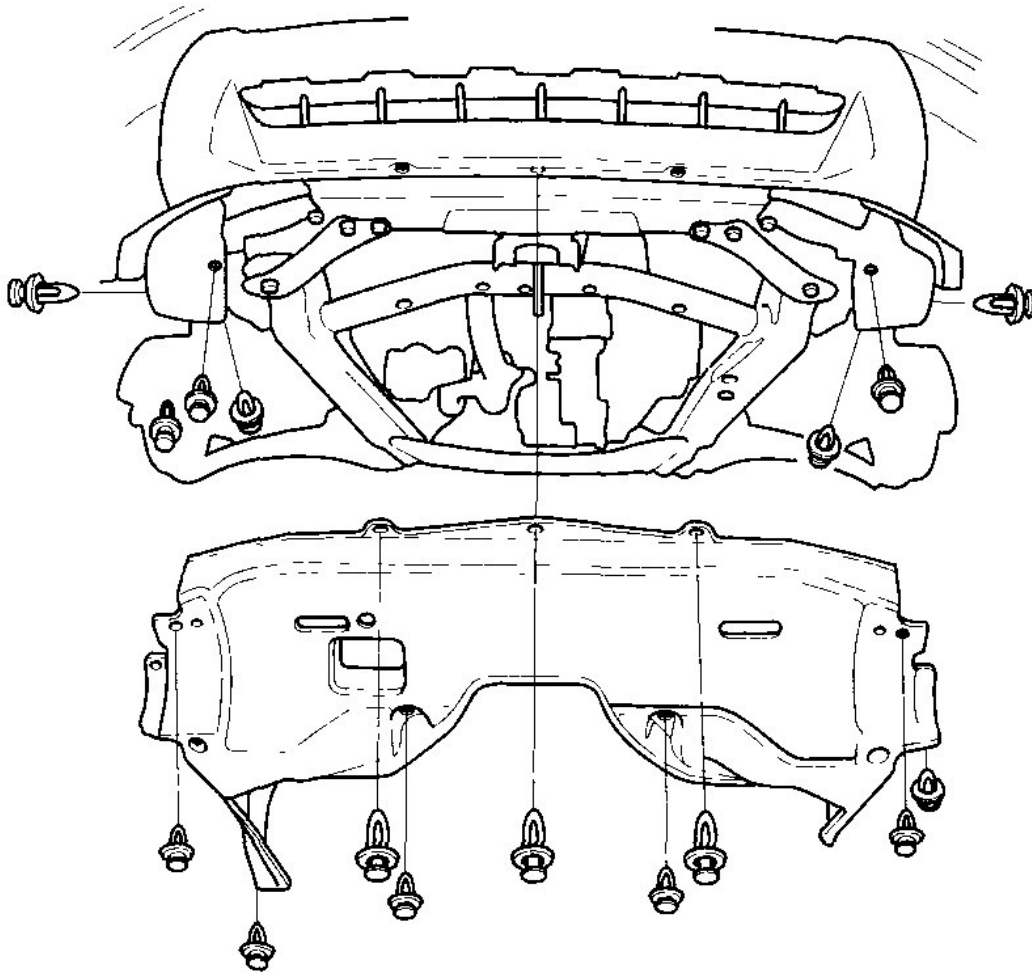
**Fig. 49: Identifying Rear Camshaft Pulley Marks**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Install the upper half of the side engine mount bracket, then tighten the mounting bolts in the numbered sequence shown.



**Fig. 50: Installing Upper Half Of Side Engine Mount Bracket**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Install the drive belt (see **DRIVE BELT INSPECTION** ).
19. Install the splash shield.



**Fig. 51: Installing Splash Shield**

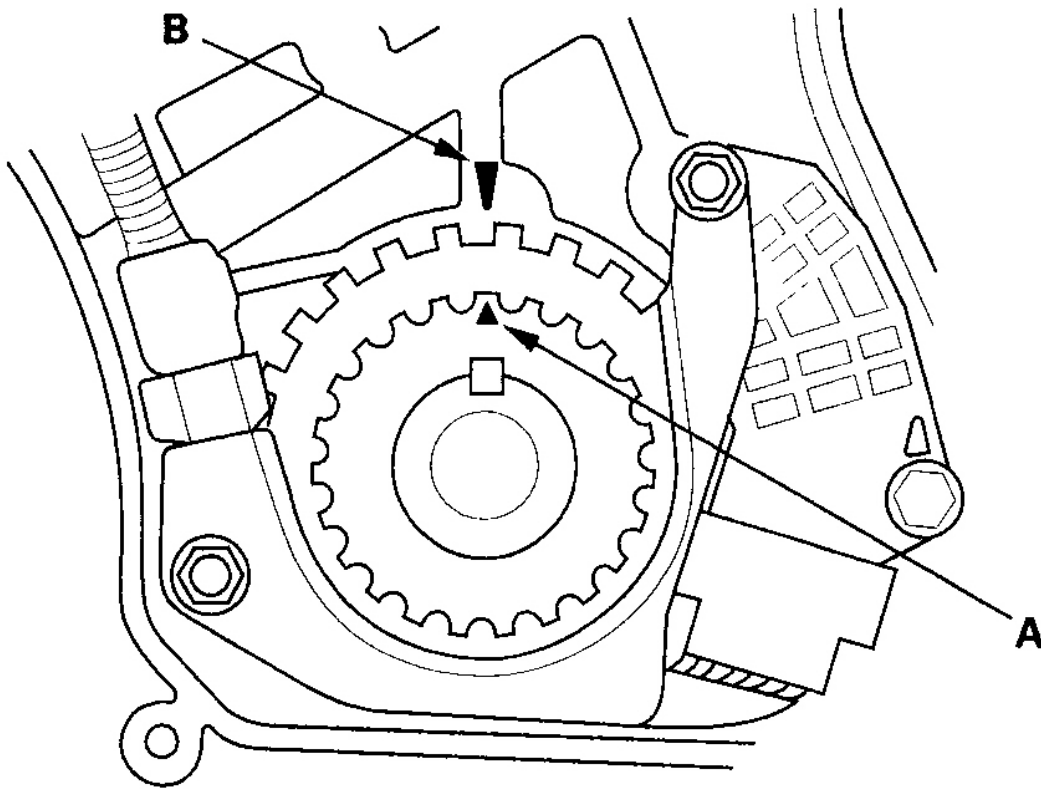
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

## **TIMING BELT REPLACEMENT**

1. Remove the timing belt (see **TIMING BELT INSPECTION** ).
2. Clean the timing belt pulleys, 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.



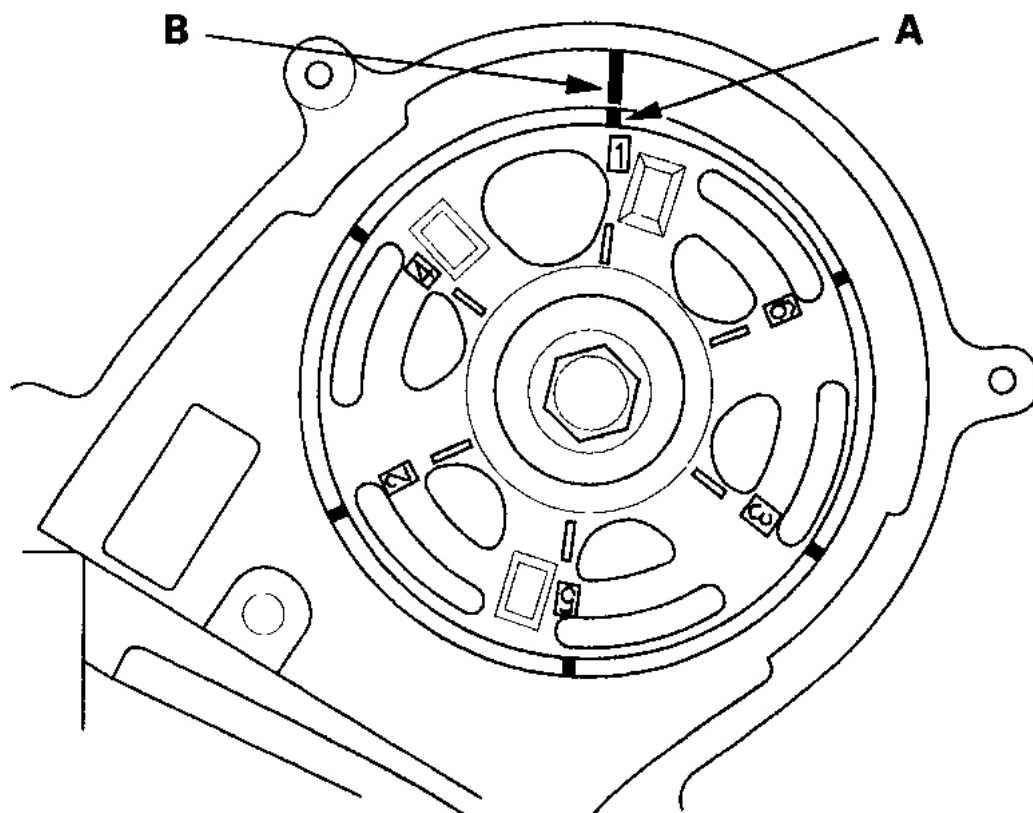


**Fig. 52: Aligning TDC Mark (A) On Tooth Of Timing Belt Drive Pulley With Pointer (B) On Oil Pump**

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.

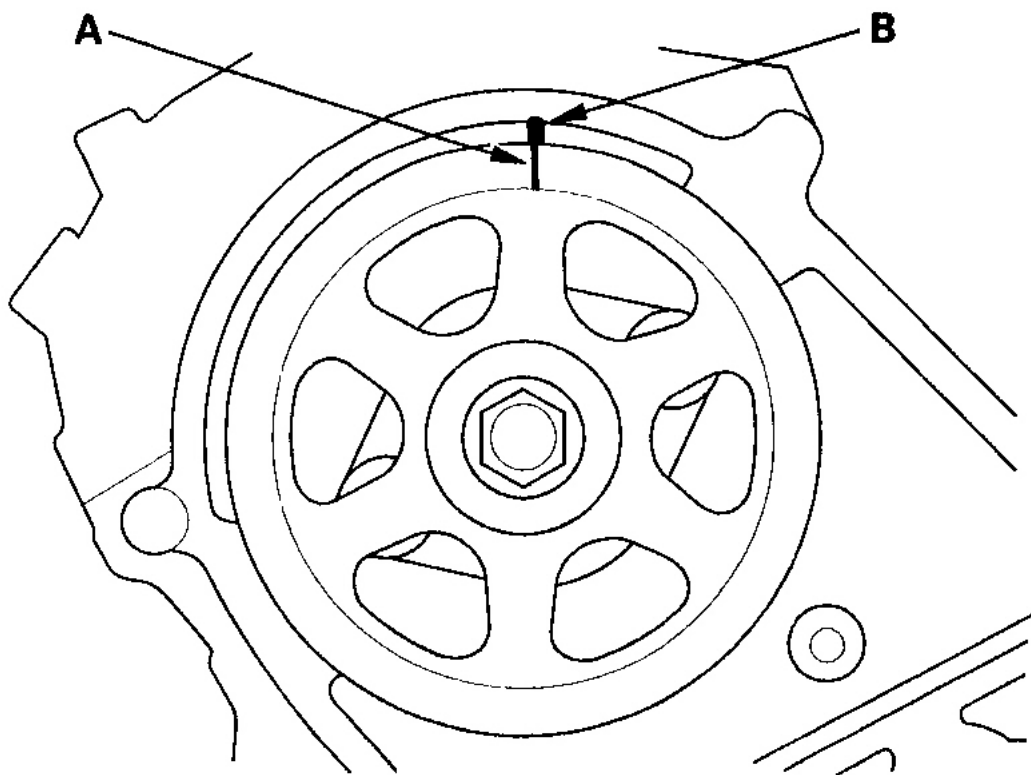
**FRONT CAMSHAFT PULLEY:**



**Fig. 53: Aligning TDC Marks On Camshaft Pulleys With Pointers On Back Covers (Front Camshaft Pulley)**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

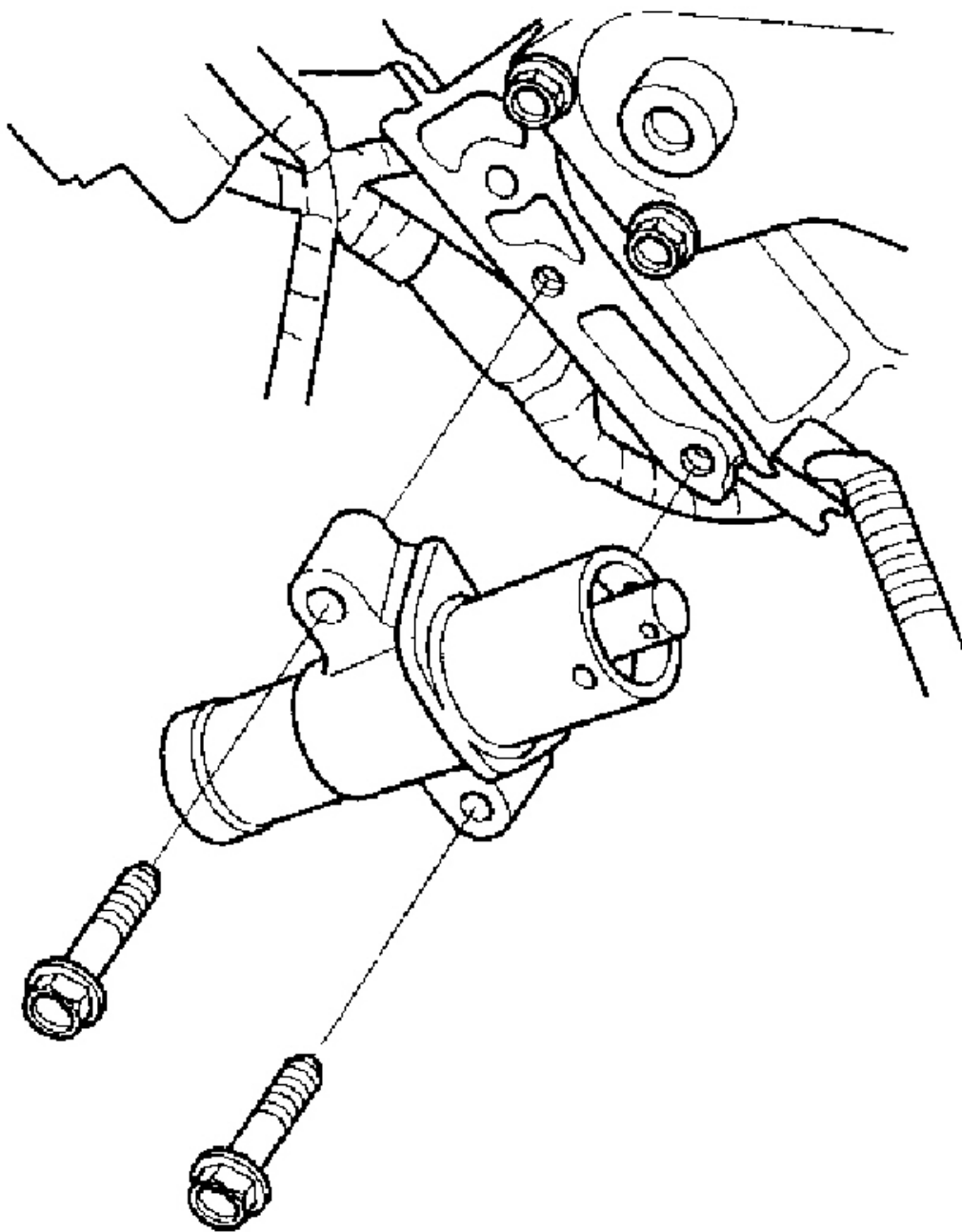
**REAR CAMSHAFT PULLEY:**



**Fig. 54: Aligning TDC Marks On Camshaft Pulleys With Pointers On Back Covers (Rear Camshaft Pulley)**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

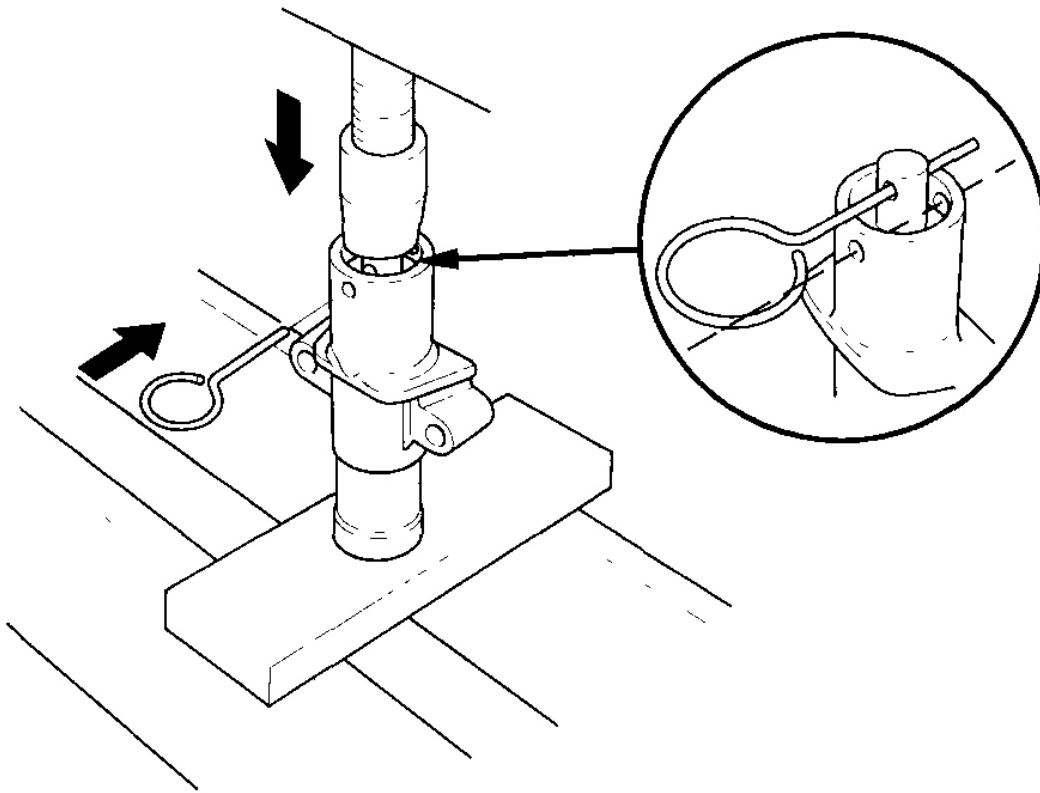
5. Remove the battery clamp bolt from the back cover.
6. Remove the auto-tensioner.



**Fig. 55: Removing Auto-Tensioner**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



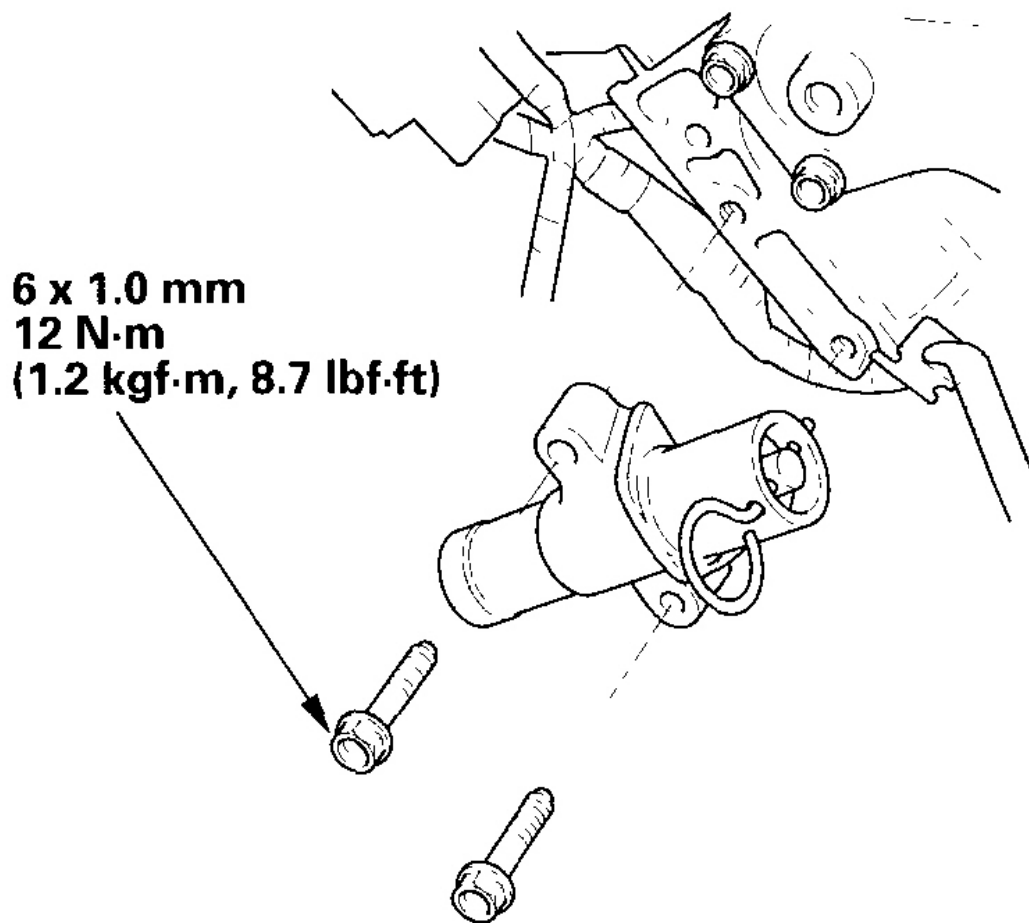
**Fig. 56: Aligning Holes On Rod And Housing Of Auto-Tensioner**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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. Make sure the pin can be removed once the auto-tensioner is installed.

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

9. Install the auto-tensioner.

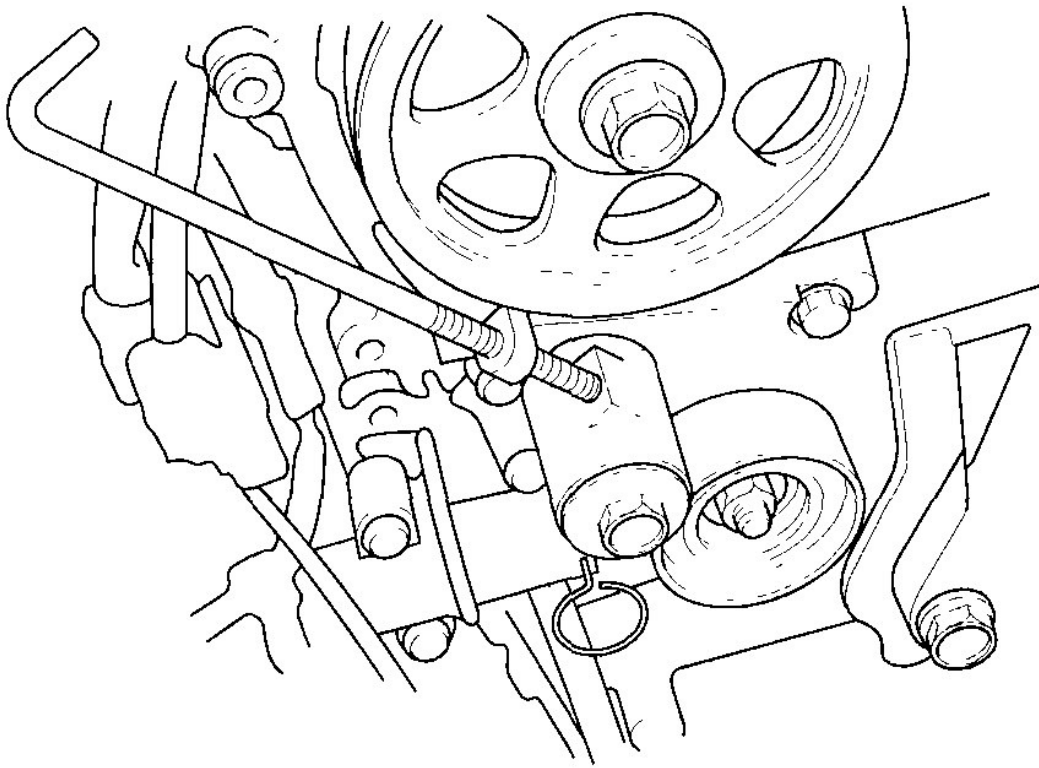
**NOTE:** Make sure the pin stays in place.



**Fig. 57: Installing Auto-Tensioner**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

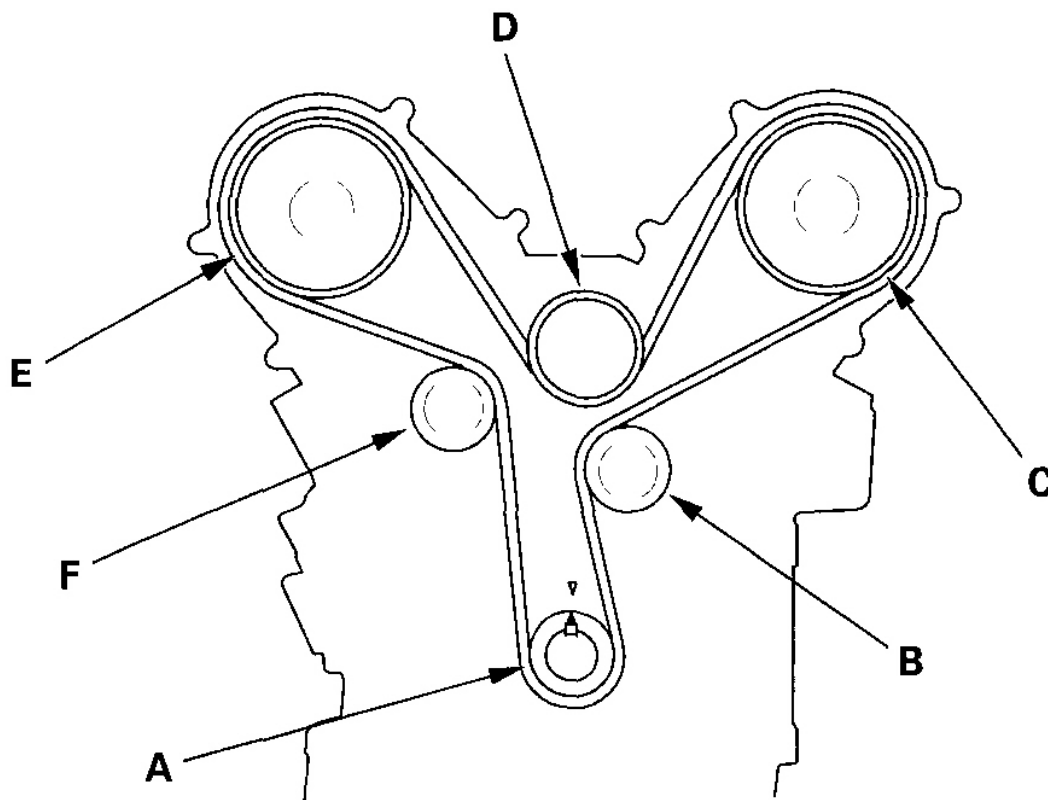
10. Screw the battery clamp bolt in as shown to hold the timing belt adjuster. Tighten it by hand; do not use a wrench.



**Fig. 58: Screwing Battery Clamp Bolt**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Apply liquid thread lock to the idler pulley bolt, then loosely install the idler pulley.
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)

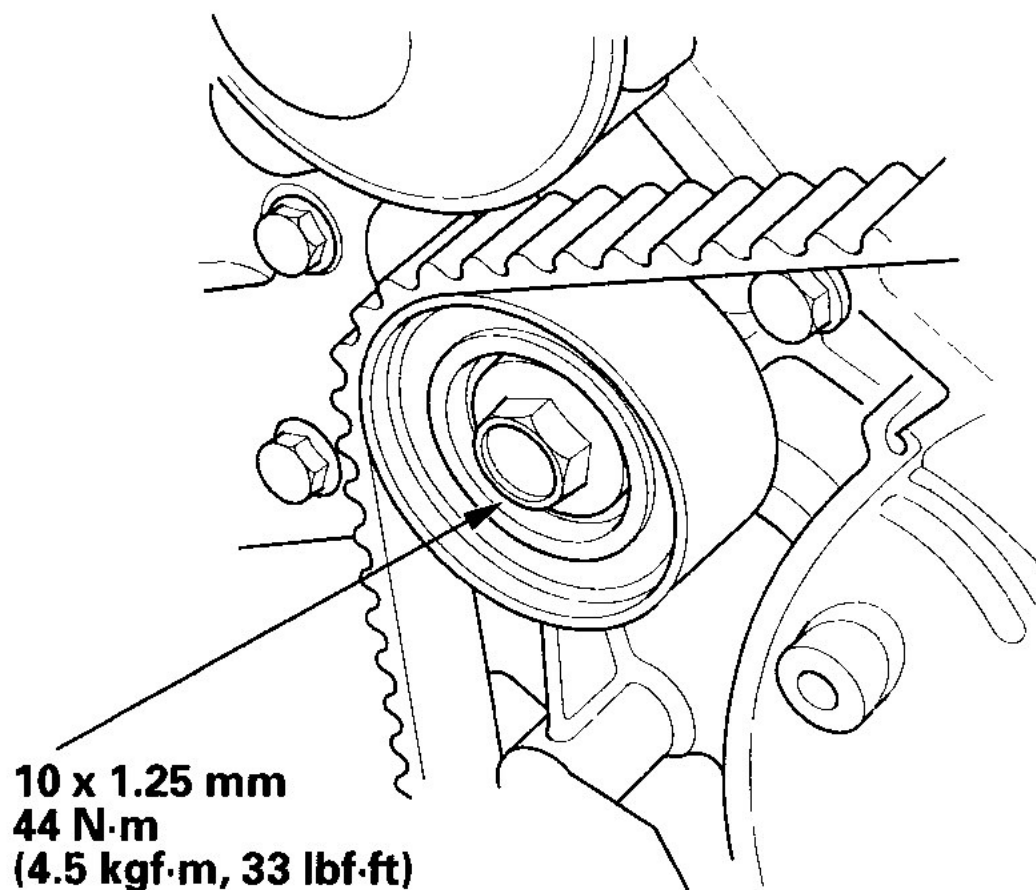


**Fig. 59: Installing Timing Belt**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

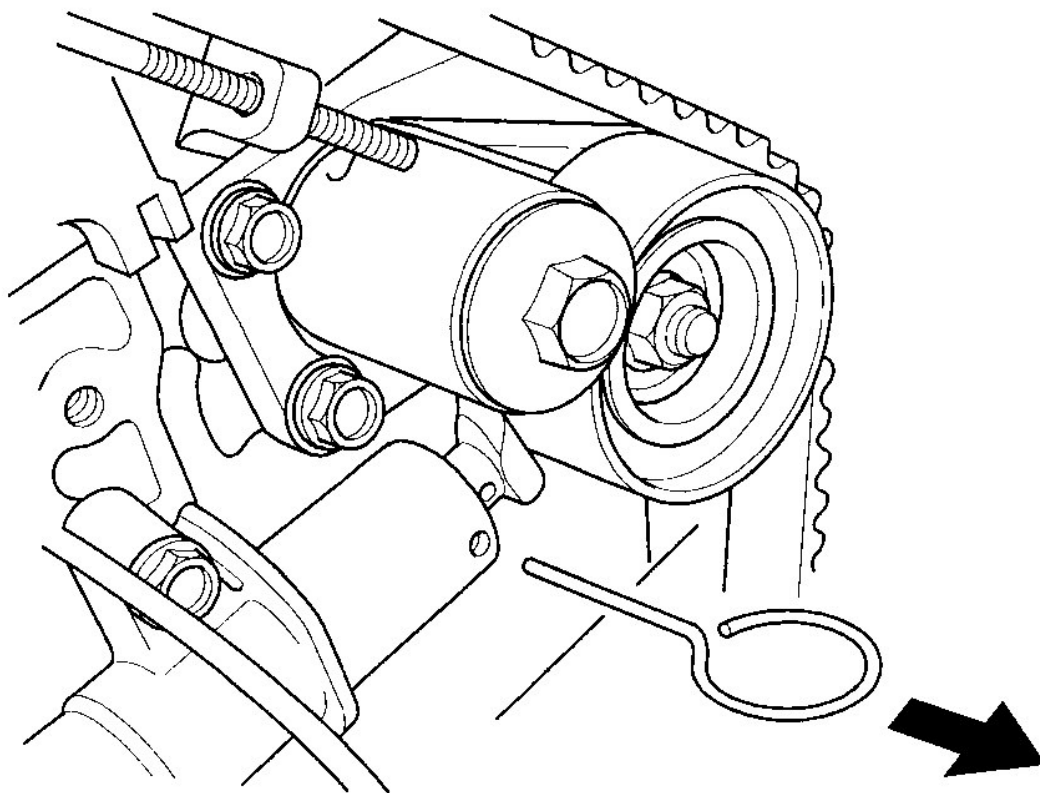
13. Tighten the idler pulley bolt.





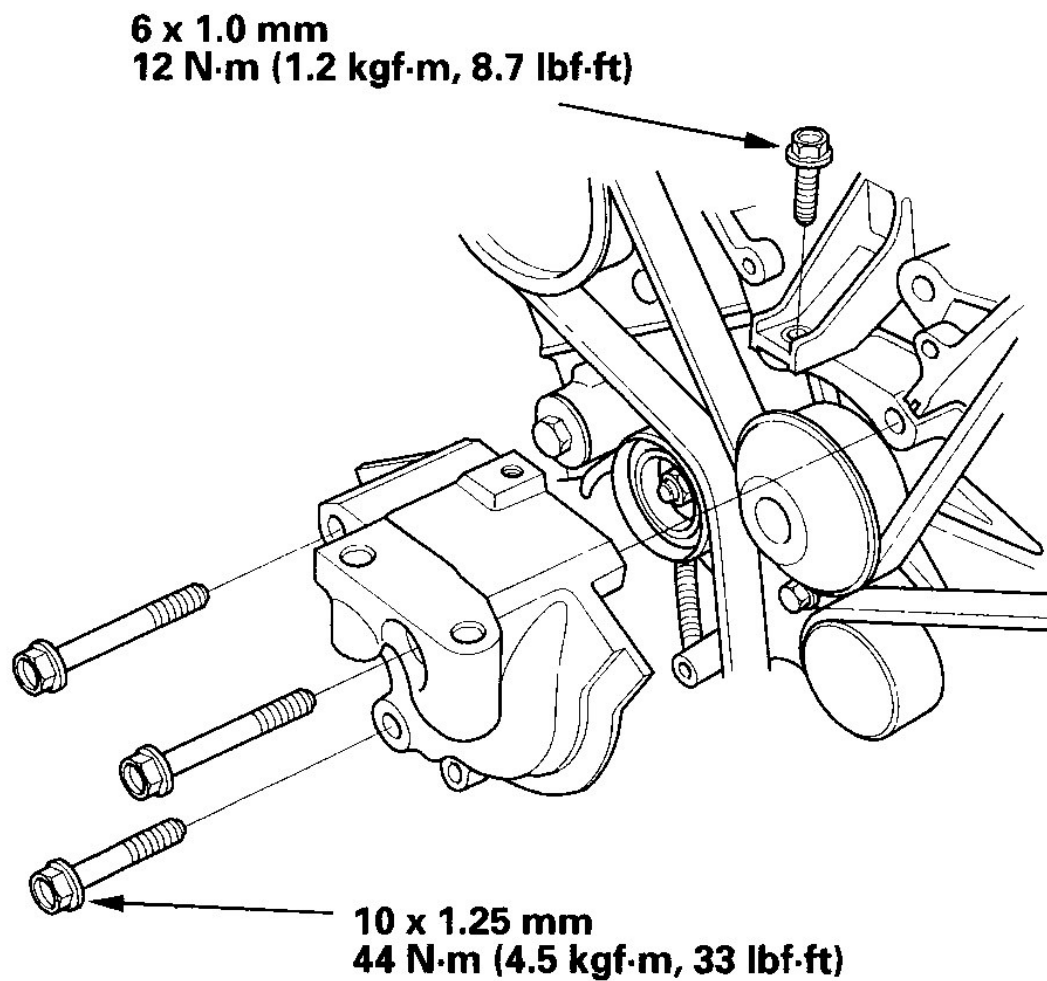
**Fig. 60: Tightening Idler Pulley Bolt**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Remove the pin from the auto-tensioner.



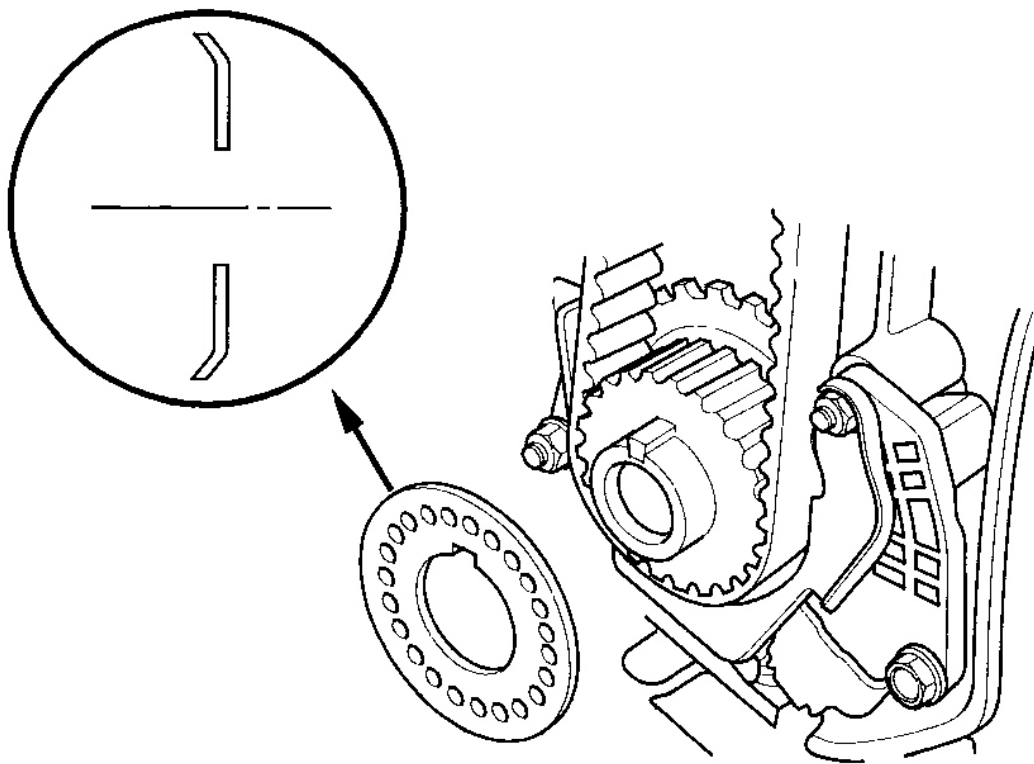
**Fig. 61: Removing Pin From Auto-Tensioner**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



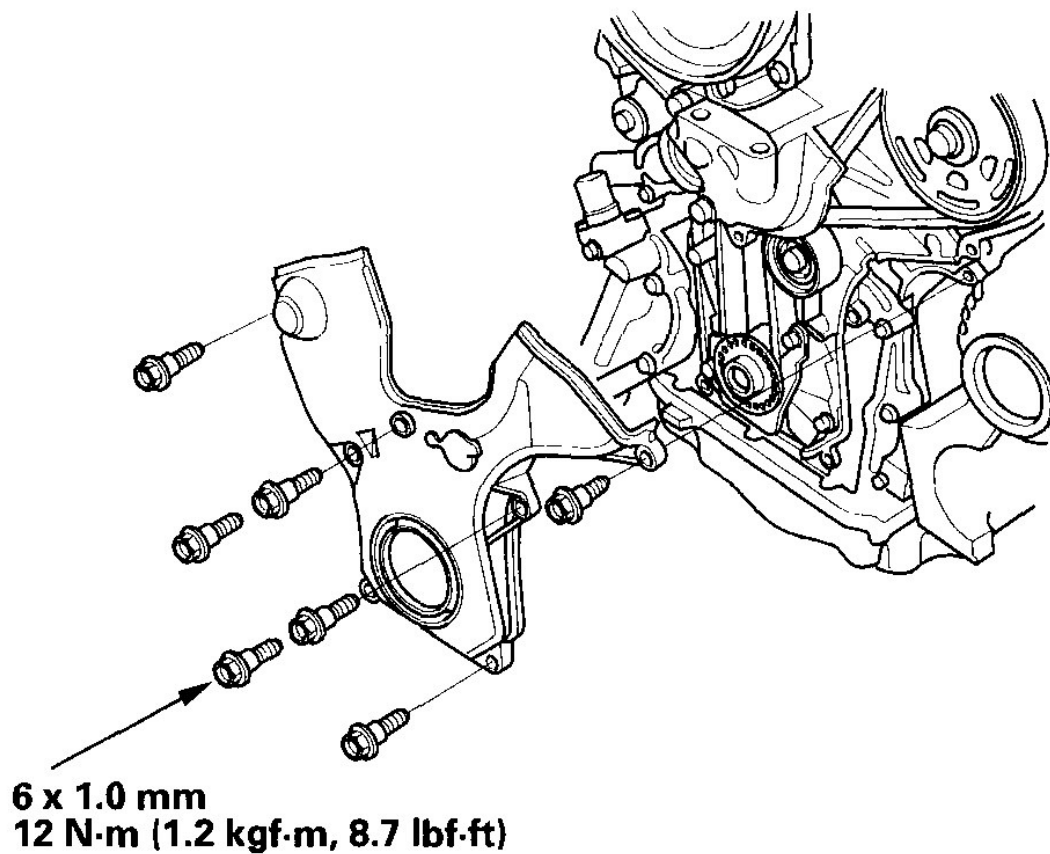
**Fig. 62: Installing Lower Half Of Side Engine Mount Bracket**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Install the timing belt guide plate as shown.



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

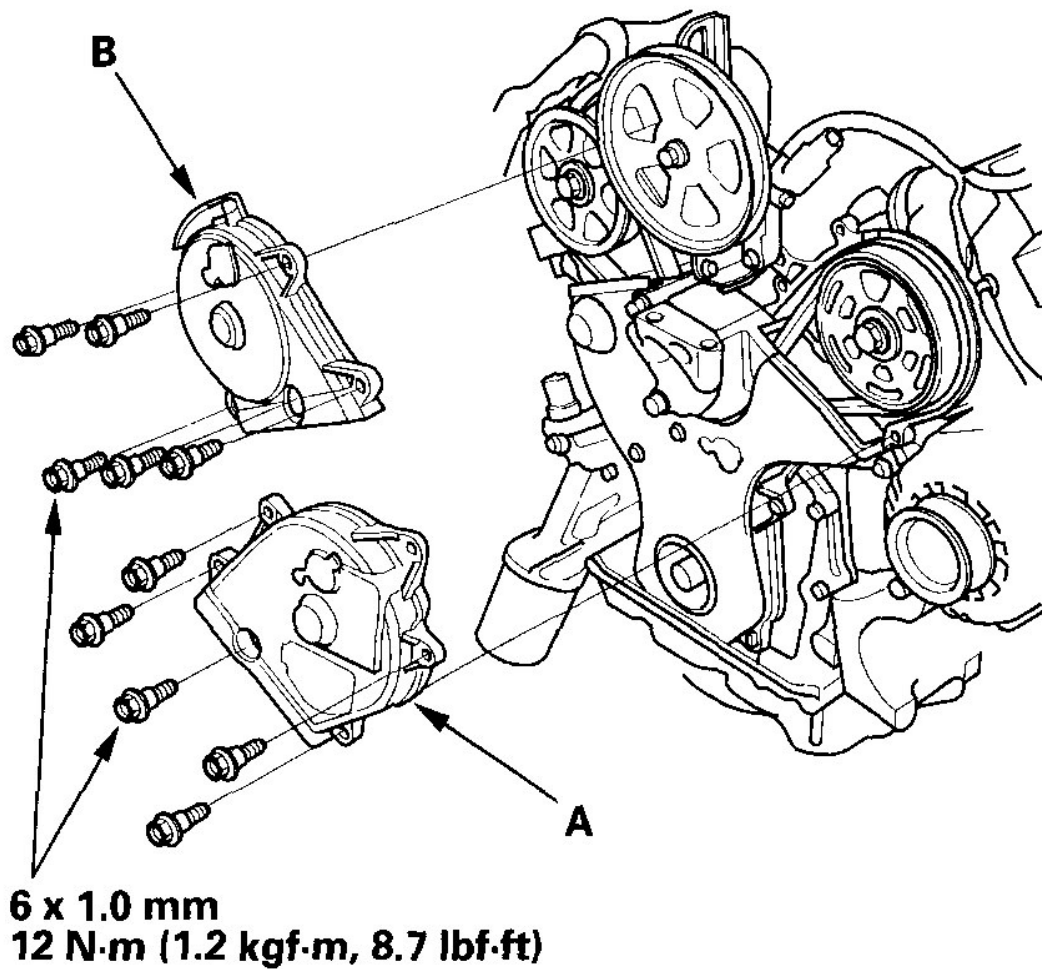
18. Install the lower cover.



**Fig. 64: Installing Lower Cover**

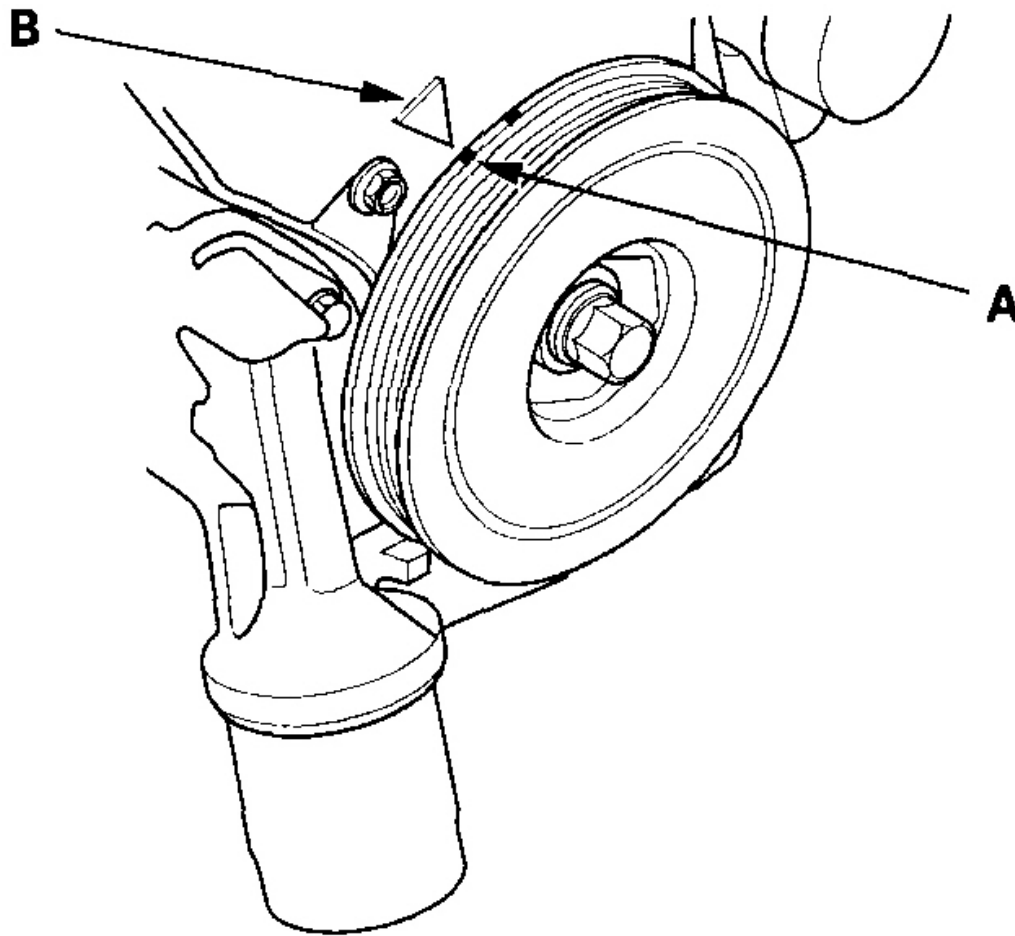
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



**Fig. 65: Installing Front Upper Cover (A) And Rear Upper Cover (B)**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

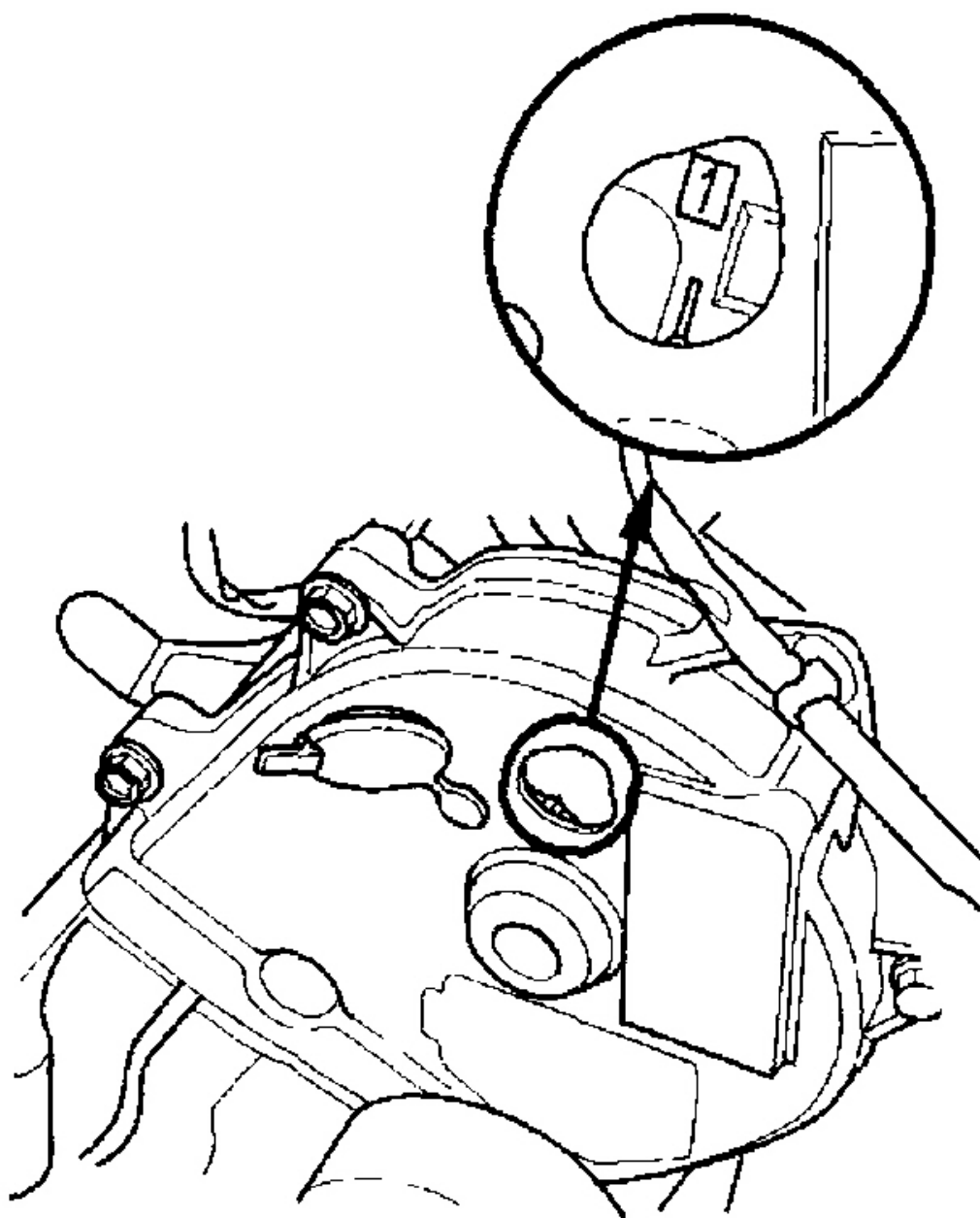
20. Install the crankshaft pulley (see **INSTALLATION** ).
21. Rotate the crankshaft pulley six turns clockwise so the timing belt positions itself on the pulleys.
22. Turn the crankshaft pulley so its white mark (A) lines up with the pointer (B).



**Fig. 66: Aligning Crankshaft Pulley White Mark With Pointer**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

23. Check the camshaft pulley marks.
- If the camshaft pulley marks are at TDC, go to step 24.
  - If the camshaft pulley marks are not at TDC, remove the timing belt and repeat steps 3 through 22.

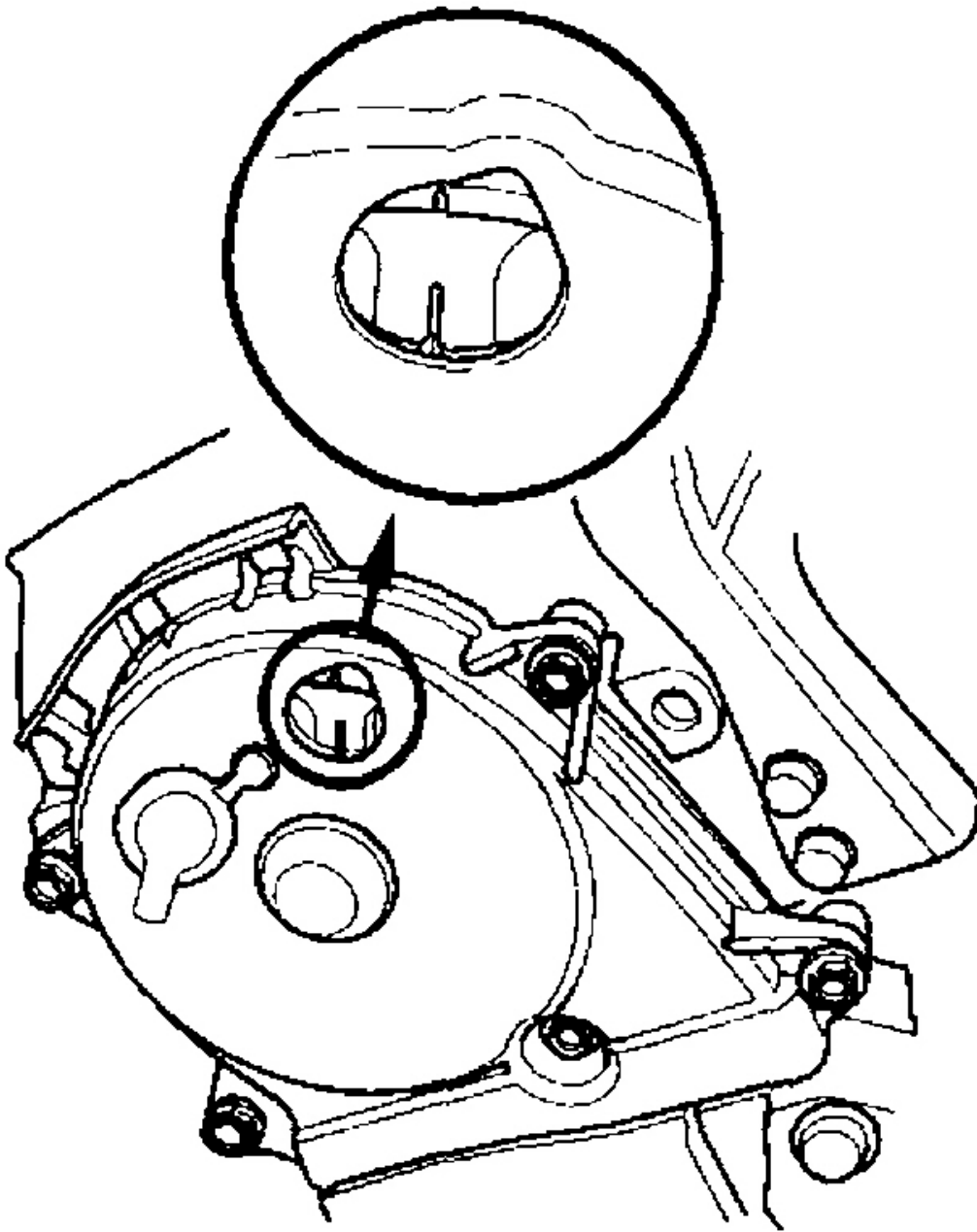
**FRONT CAMSHAFT PULLEY:**



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

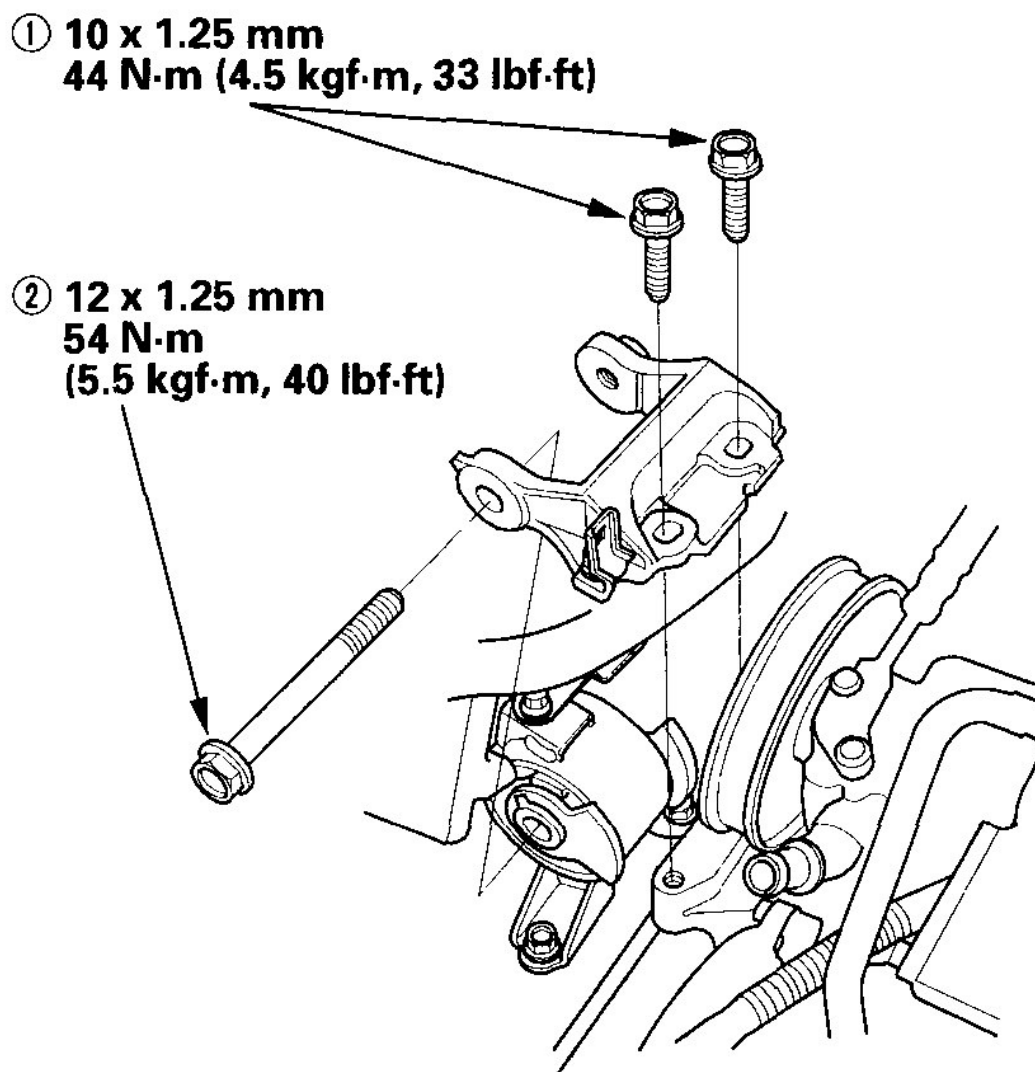
**REAR CAMSHAFT PULLEY:**





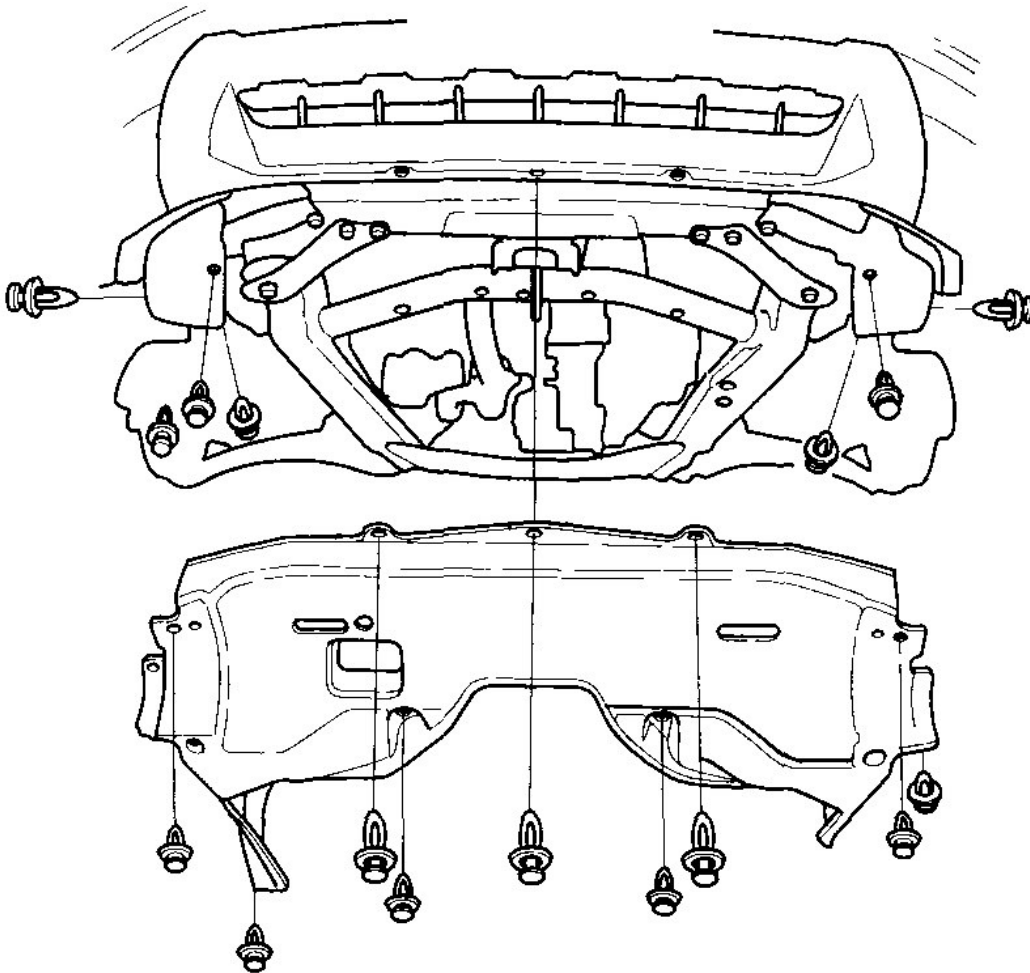
**Fig. 68: Identifying Rear Camshaft Pulley Marks**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

24. Install the upper half of the side engine mount bracket, then tighten the mounting bolts in the numbered sequence shown.



**Fig. 69: Installing Upper Half Of Side Engine Mount Bracket**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

25. Install the drive belt (see **DRIVE BELT INSPECTION** ).
26. Install the splash shield.



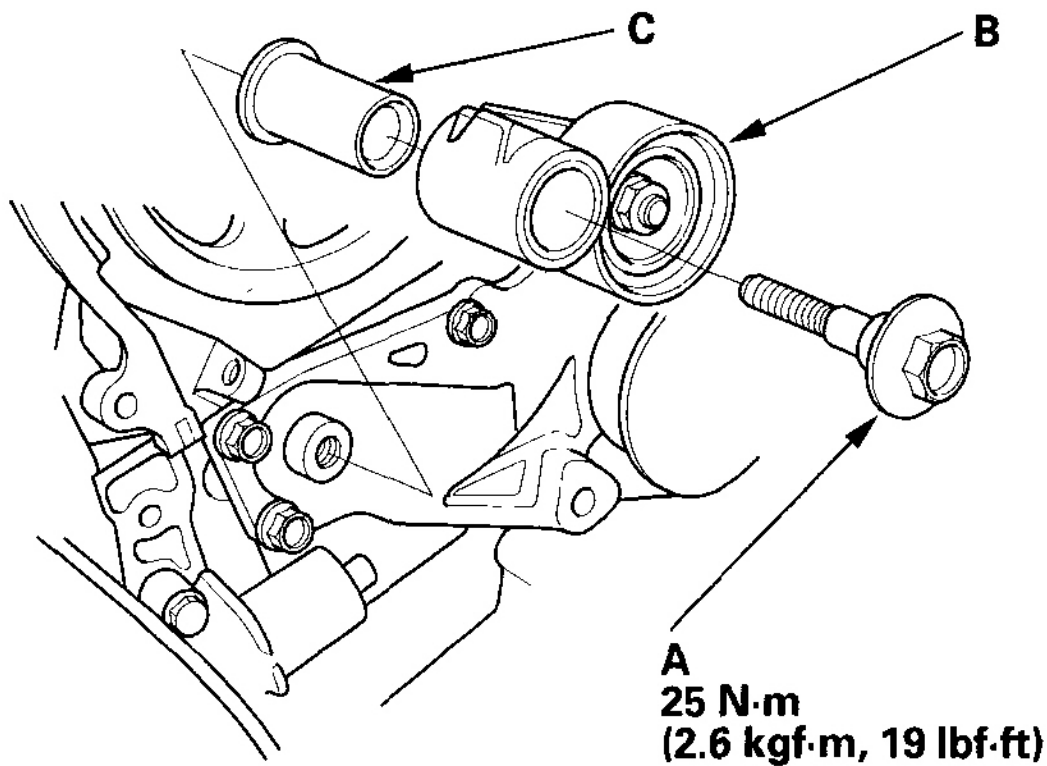
**Fig. 70: Installing Splash Shield**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

27. Install the right front tire/wheel.
28. 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 INSPECTION** ).
2. Remove the auto-tensioner.
3. Remove the bolt (A), then remove the timing belt adjuster (B) and collar (C).

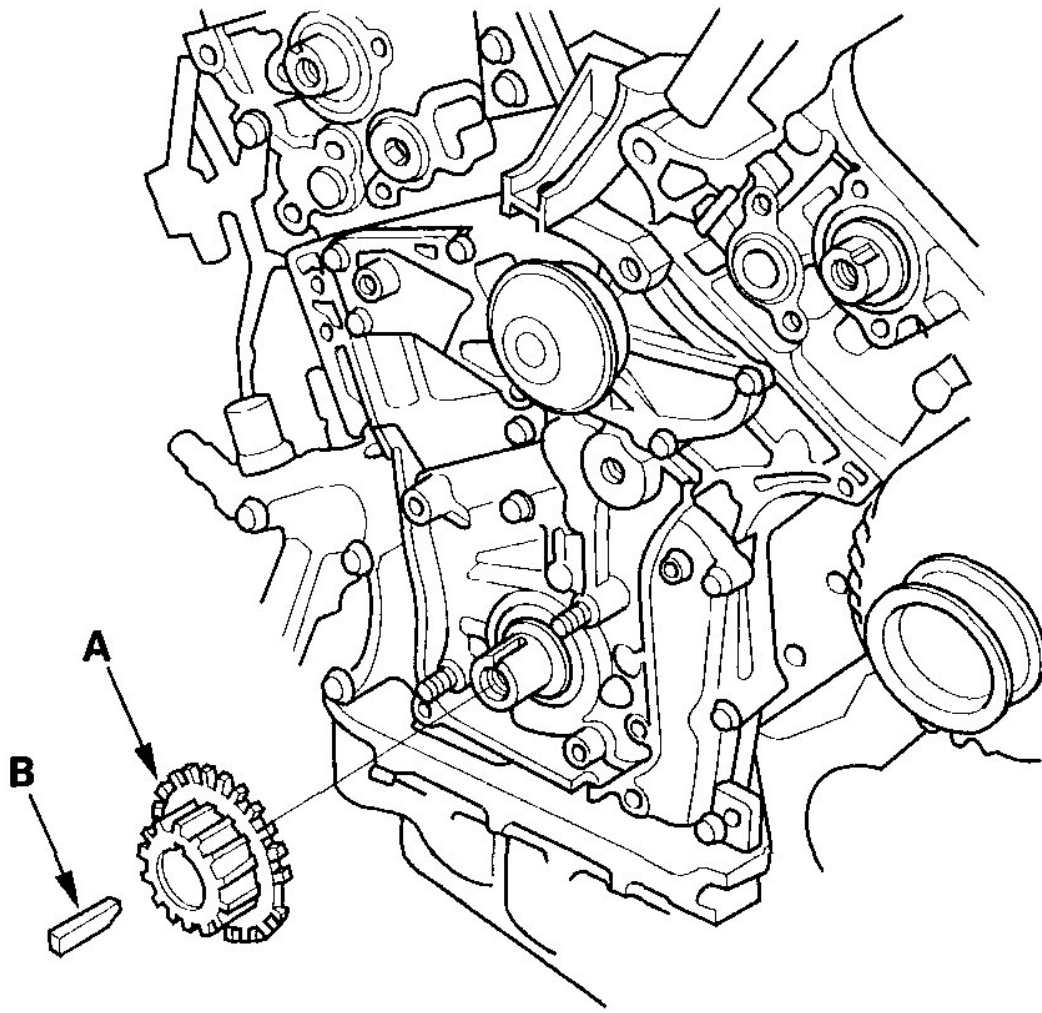


**Fig. 71: Removing Bolt (A), Timing Belt Adjuster (B) And Collar (C)**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

## **TIMING BELT DRIVE PULLEY REPLACEMENT**

1. Remove the timing belt (see **TIMING BELT INSPECTION** ).
2. Remove the crankshaft position (CKP) sensor A/B (see **CKP SENSOR REPLACEMENT** ).
3. Remove the timing belt drive pulley (A) and key (B).

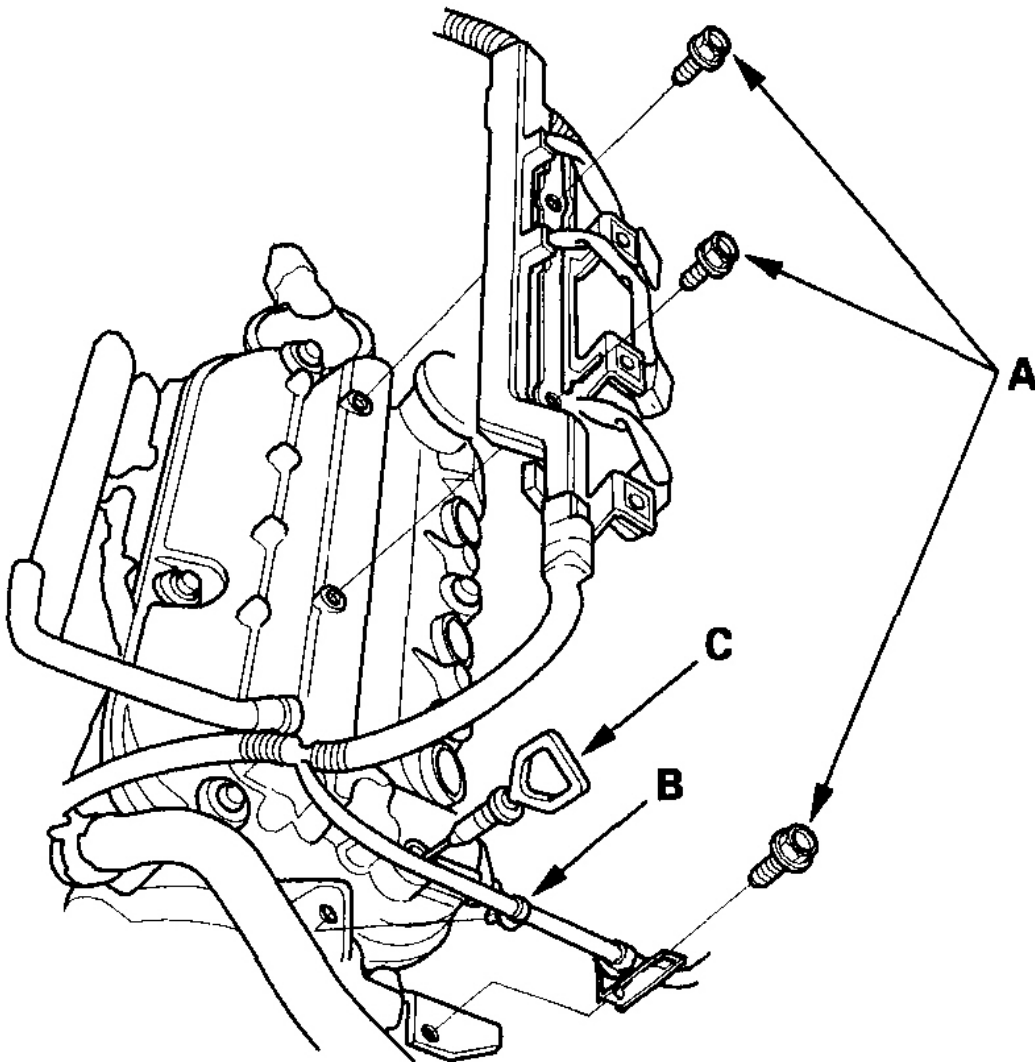


**Fig. 72: Removing Timing Belt Drive Pulley (A) And Key (B)**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Inspect the timing belt pulley and key for damage. If it is cracked or damaged, replace the timing belt drive pulley.
5. Install the new timing belt drive pulley.
6. Install the CKP sensor A/B (see **CKP SENSOR REPLACEMENT** ).
7. Install the timing belt (see **TIMING BELT REPLACEMENT** ).
8. Do the CKP pattern clear/CKP pattern learn procedure (see **CKP PATTERN CLEAR/CKP PATTERN LEARN** ).

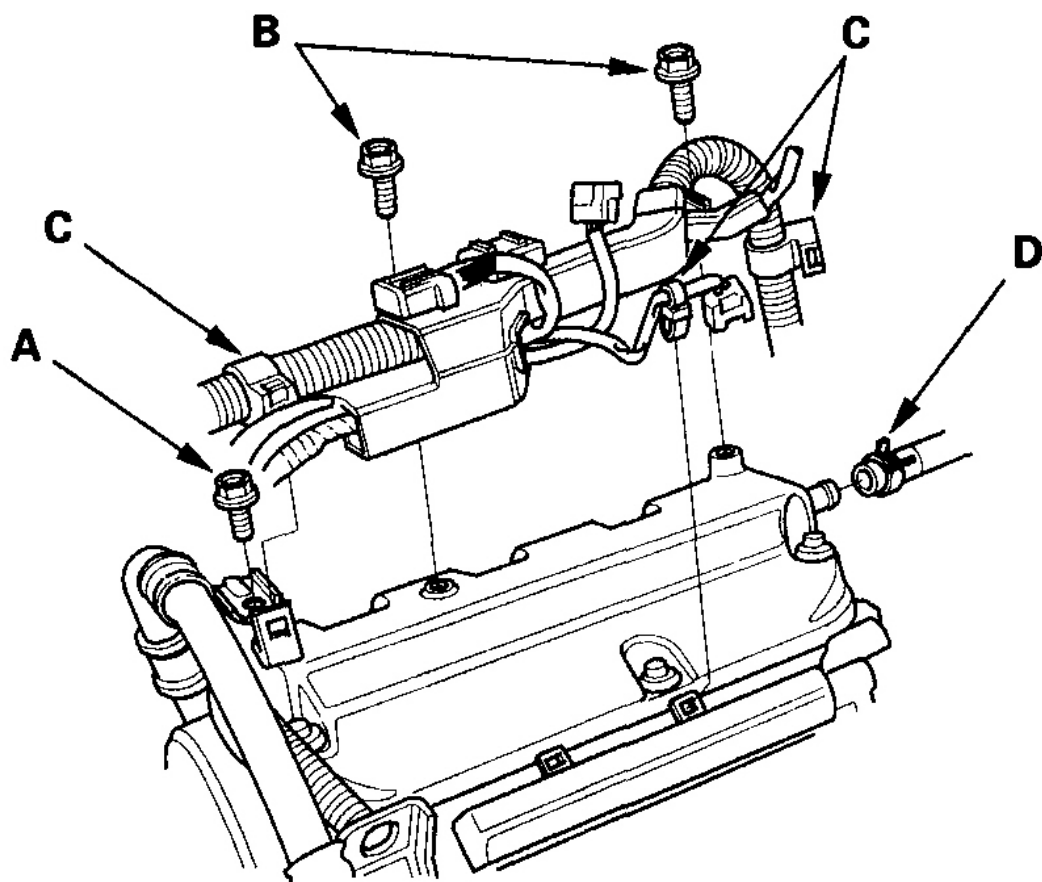
## CYLINDER HEAD COVER REMOVAL

1. Remove the intake manifold (see **REMOVAL** ).
2. Remove the six ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION** ).
3. Remove the three bolts (A) securing the harness holder and bracket, and remove the harness clamp (B) and dipstick (C).



**Fig. 73: Removing Harness Clamp And Dipstick**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

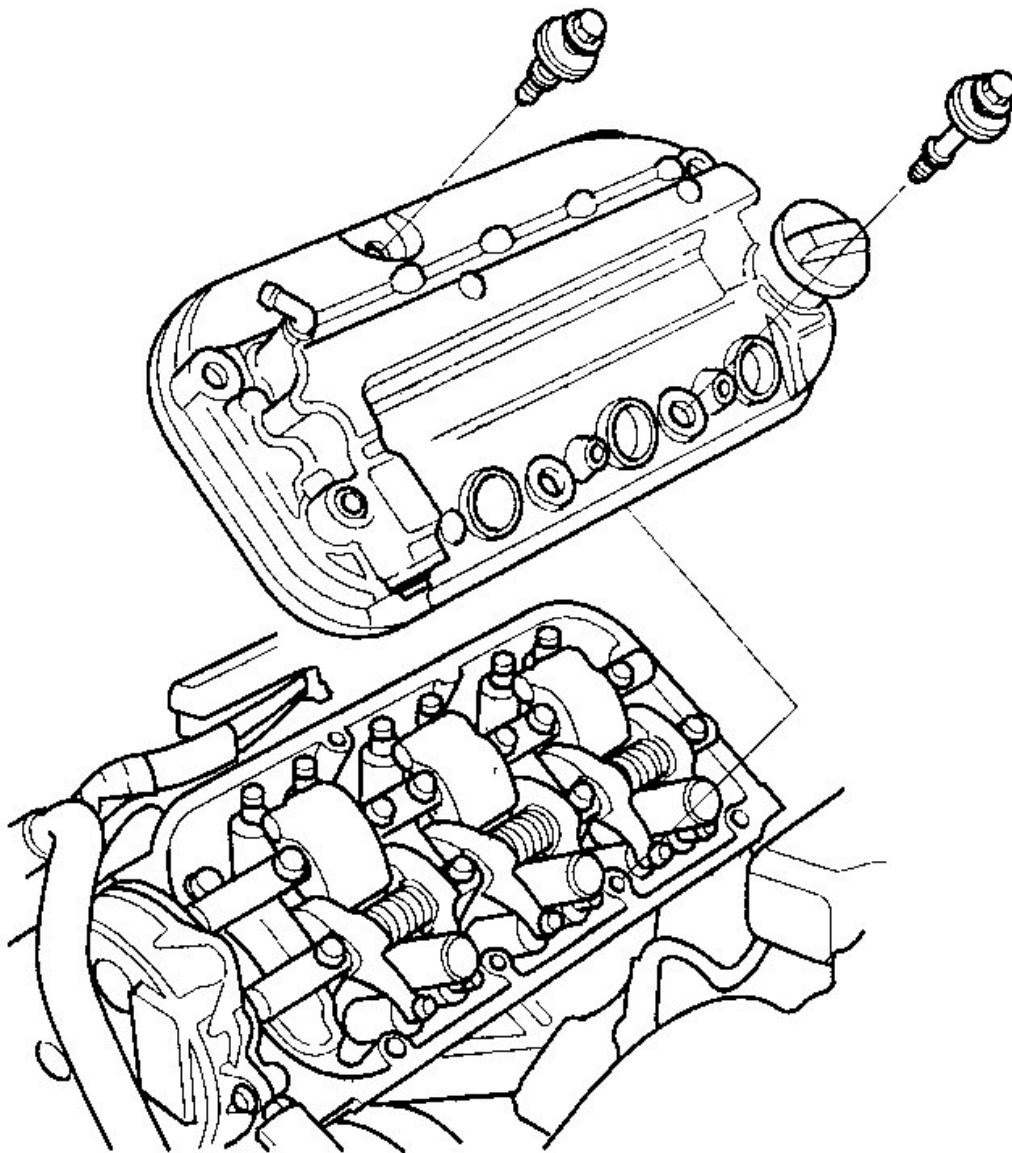
4. Disconnect the three injector connectors from the injectors on the cylinder head (see **INJECTOR REPLACEMENT** ).
5. Remove the power steering hose bracket mounting bolt (A) and the harness holder mounting bolts (B).



**Fig. 74: Removing Power Steering Hose Bracket Mounting Bolt**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the harness clamps (C) and breather hose (D).
7. Remove the cylinder head cover.

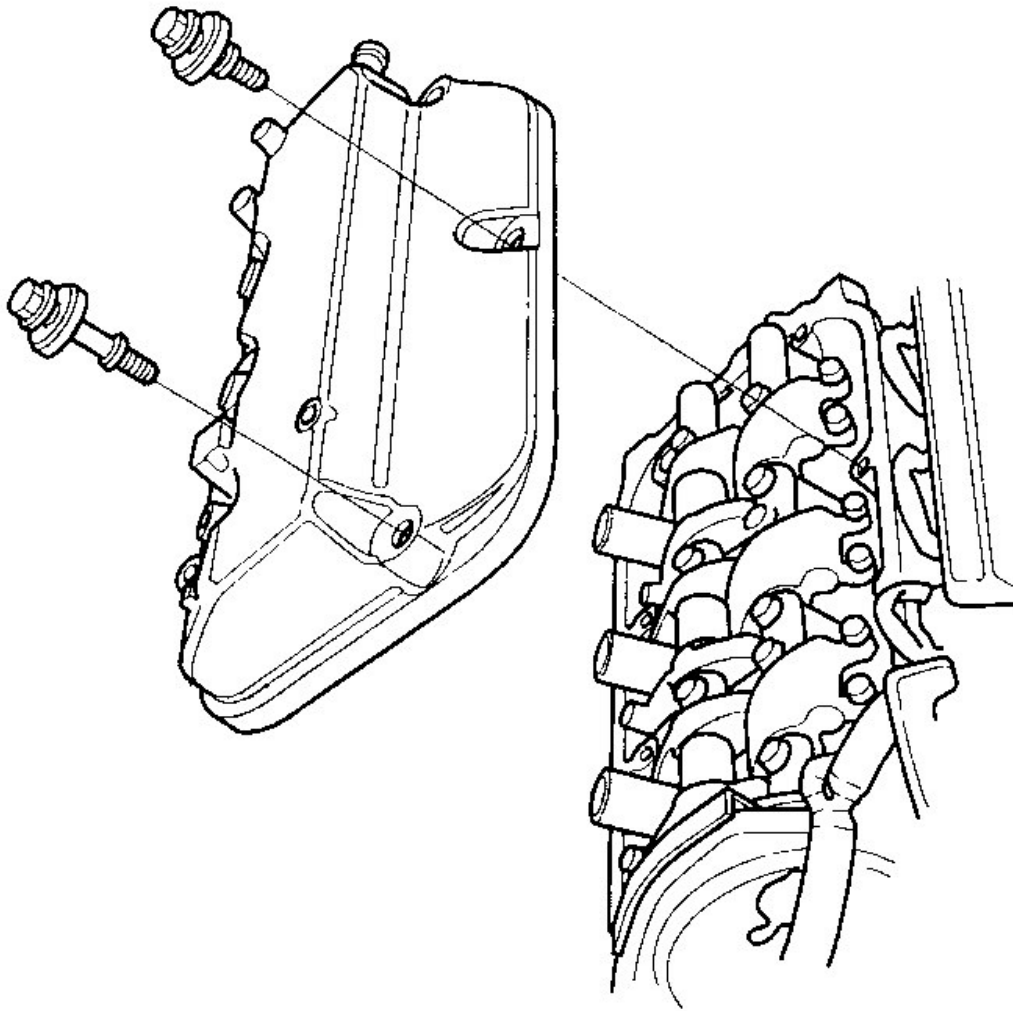
**FRONT:**



**Fig. 75: Removing Front Cylinder Head Cover**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

**REAR:**



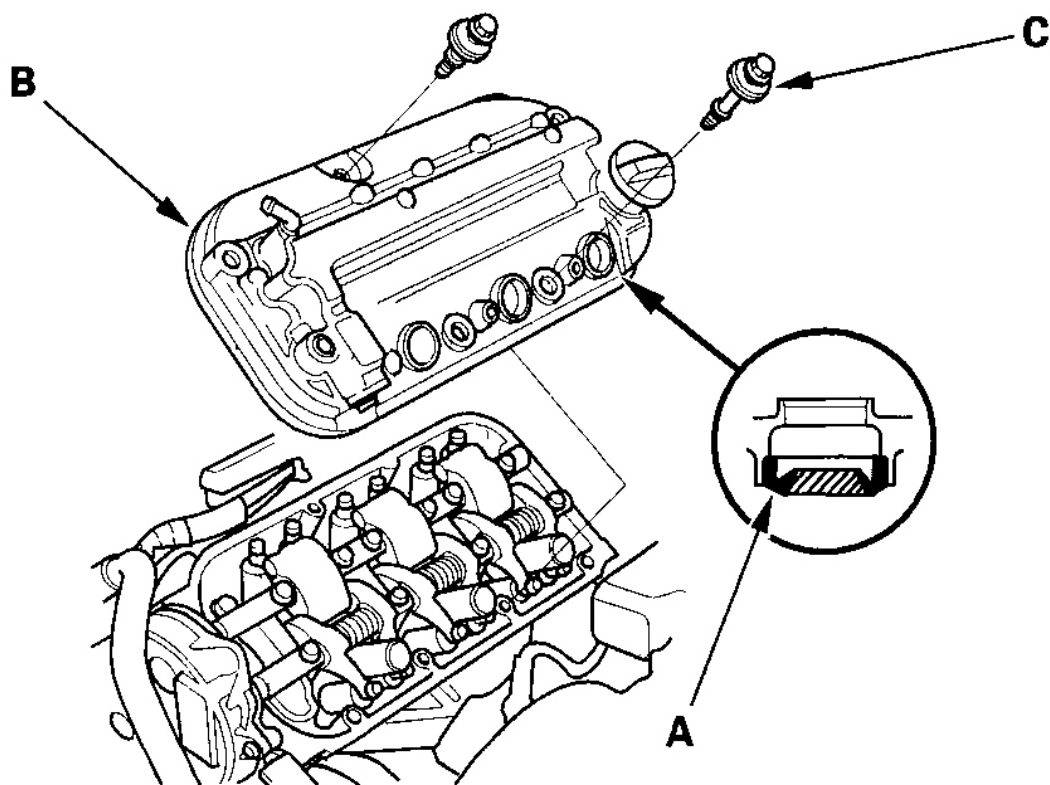


**Fig. 76: Removing Rear Cylinder Head Cover**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

## **CYLINDER HEAD COVER INSTALLATION**

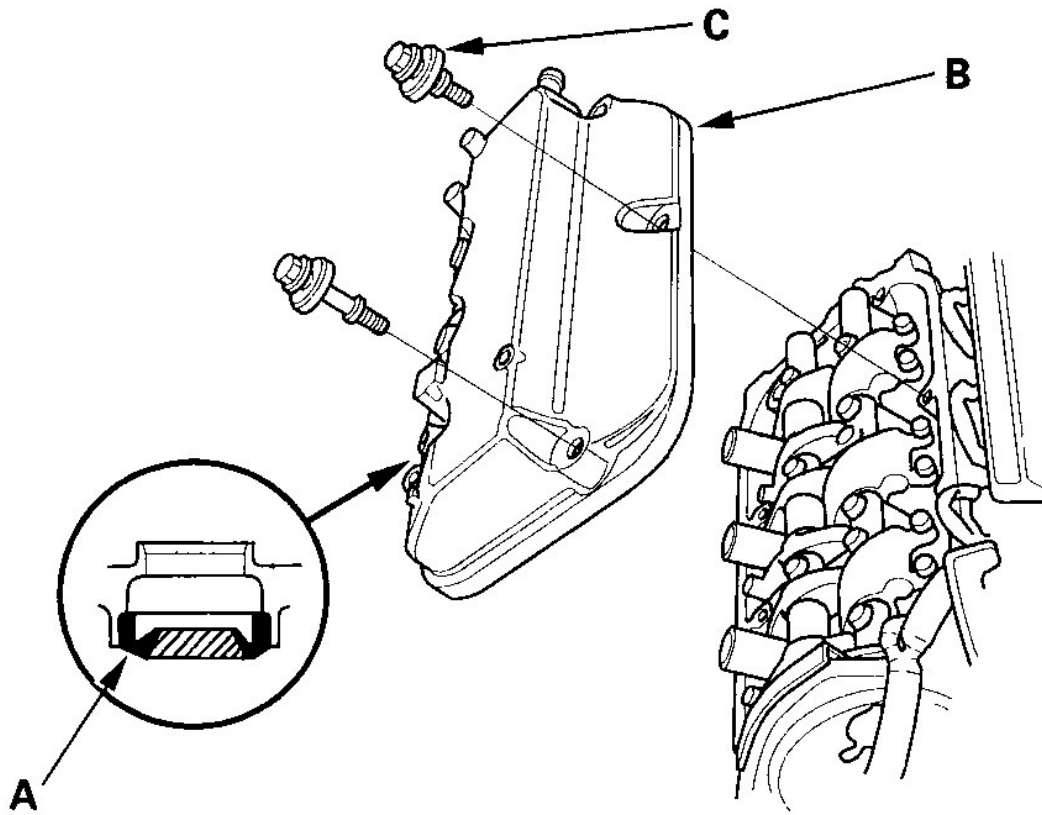
1. Clean the head cover contacting surfaces with a shop towel.
2. Visually check the spark plug seals for damage. Replace if necessary.
3. Set the spark plug seals (A) on the spark plug tubes, and install the cylinder head cover (B).

**FRONT:**



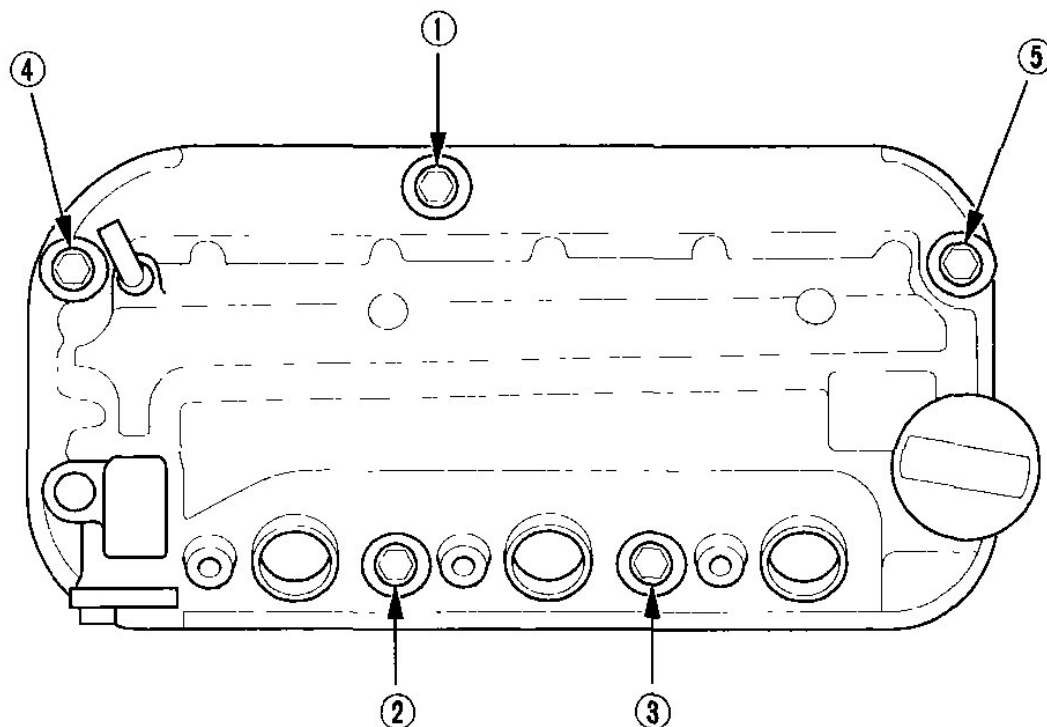
**Fig. 77: Installing Front Cylinder Head Cover**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

**REAR:**



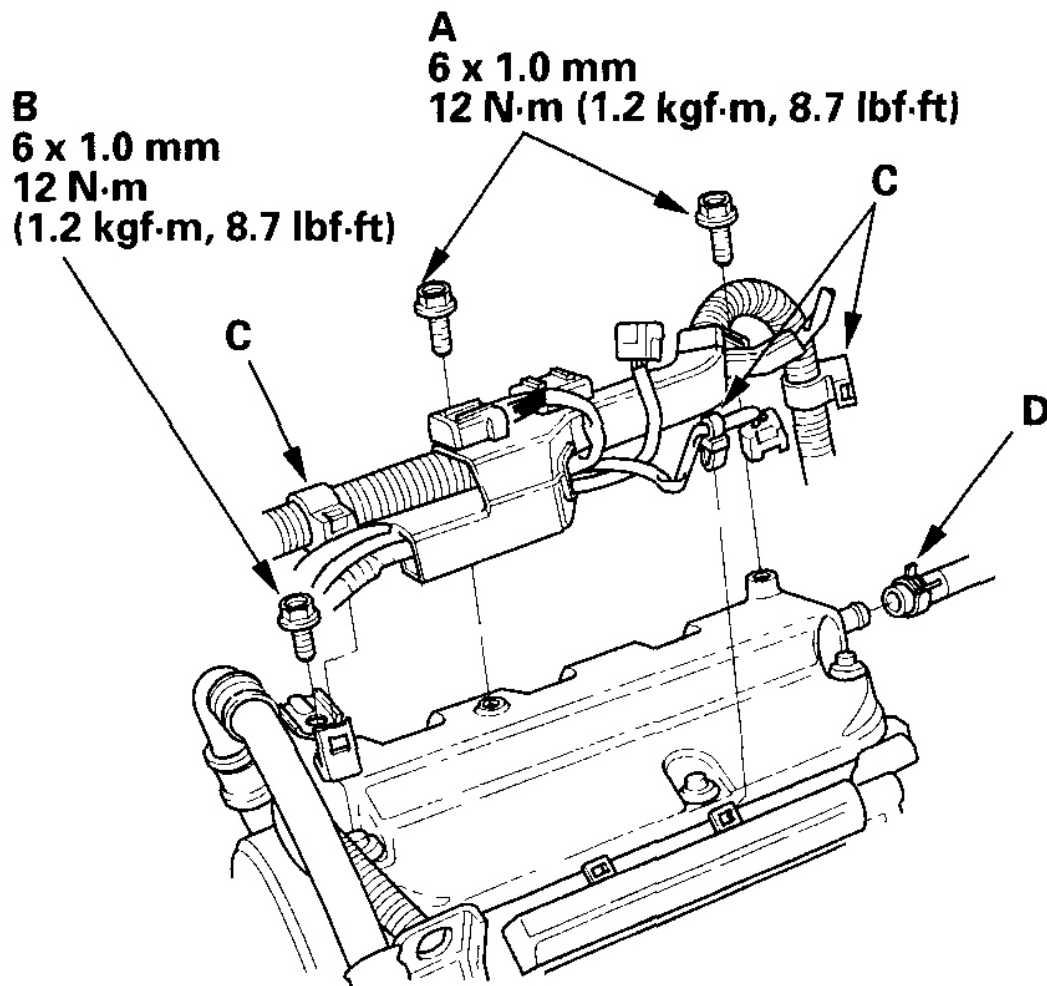
**Fig. 78: Installing Rear Cylinder Head Cover**  
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Inspect the cover washer (C). Replace any washer that is damaged or deteriorated.
5. Tighten the bolts in two or three steps. In the final step tighten all bolts, in sequence, 12 N.m (1.2 kgf.m, 8.7 lbf.ft).



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

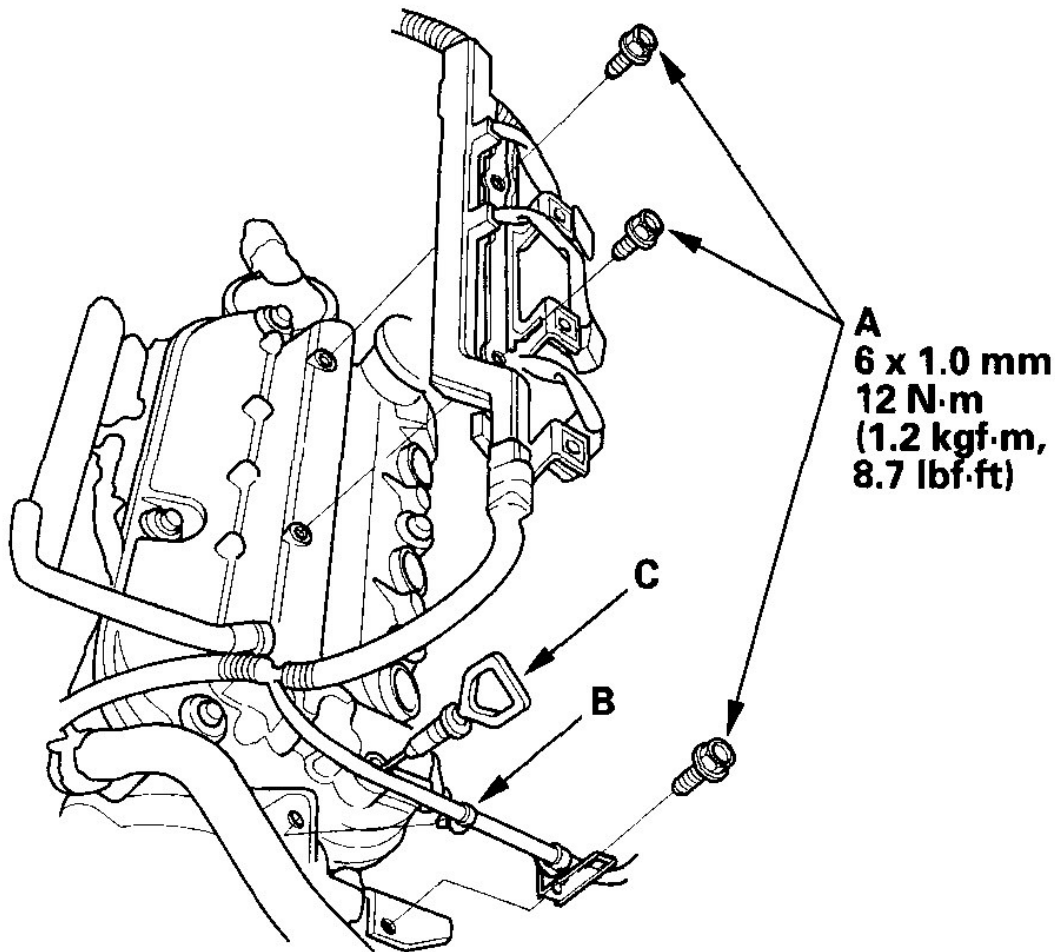
6. Tighten the harness holder mounting bolts (A) and the power steering hose bracket mounting bolt (B).



**Fig. 80: Tightening Harness Holder Mounting Bolts And Power Steering Hose Bracket Mounting Bolt**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Install the harness clamps (C) and breather hose (D).
8. Connect the three injector connectors to the injectors on the cylinder head.
9. Tighten the three bolts (A) securing the harness holder and bracket, then install the harness clamp (B) and dipstick (C).



**Fig. 81: Installing Bolts (A) Securing Harness Holder, Bracket, Harness Clamp (B) And Dipstick (C)**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Install the six ignition coils (see IGNITION COIL REMOVAL/INSTALLATION ).
11. Install the intake manifold (see INSTALLATION ).

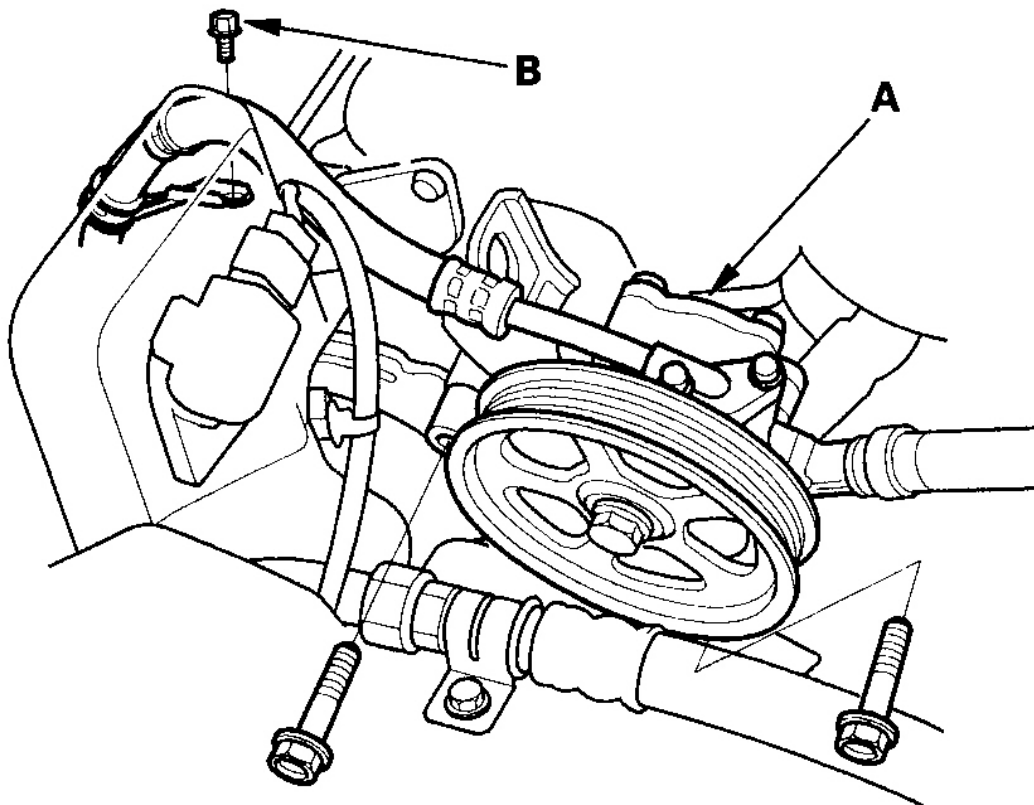
## CYLINDER HEAD REMOVAL

### NOTE:

- Use fender covers to avoid damaging painted surfaces.
- To avoid damaging the wires and terminals, unplug the wiring connectors carefully while holding the connector portion.
- To avoid damaging the cylinder head, wait until the engine coolant temperature drops below 100°F (38°C) before loosening the cylinder head bolts.

- **Mark all wiring and hoses to avoid misconnection. Also, be sure that they do not contact any other wiring or hoses, or interfere with any other parts.**

1. Make sure you have the anti-theft codes for the radio and the navigation system, then write down the customer's radio station presets.
2. Relieve fuel pressure (see **FUEL PRESSURE RELIEVING** ).
3. Disconnect the negative cable from the battery.
4. Drain the engine coolant (see **COOLANT CHECK** ).
5. Remove the drive belt (see **DRIVE BELT REPLACEMENT** ).
6. Remove the power steering (P/S) pump (A) and the bolt (B) securing the P/S hose bracket.

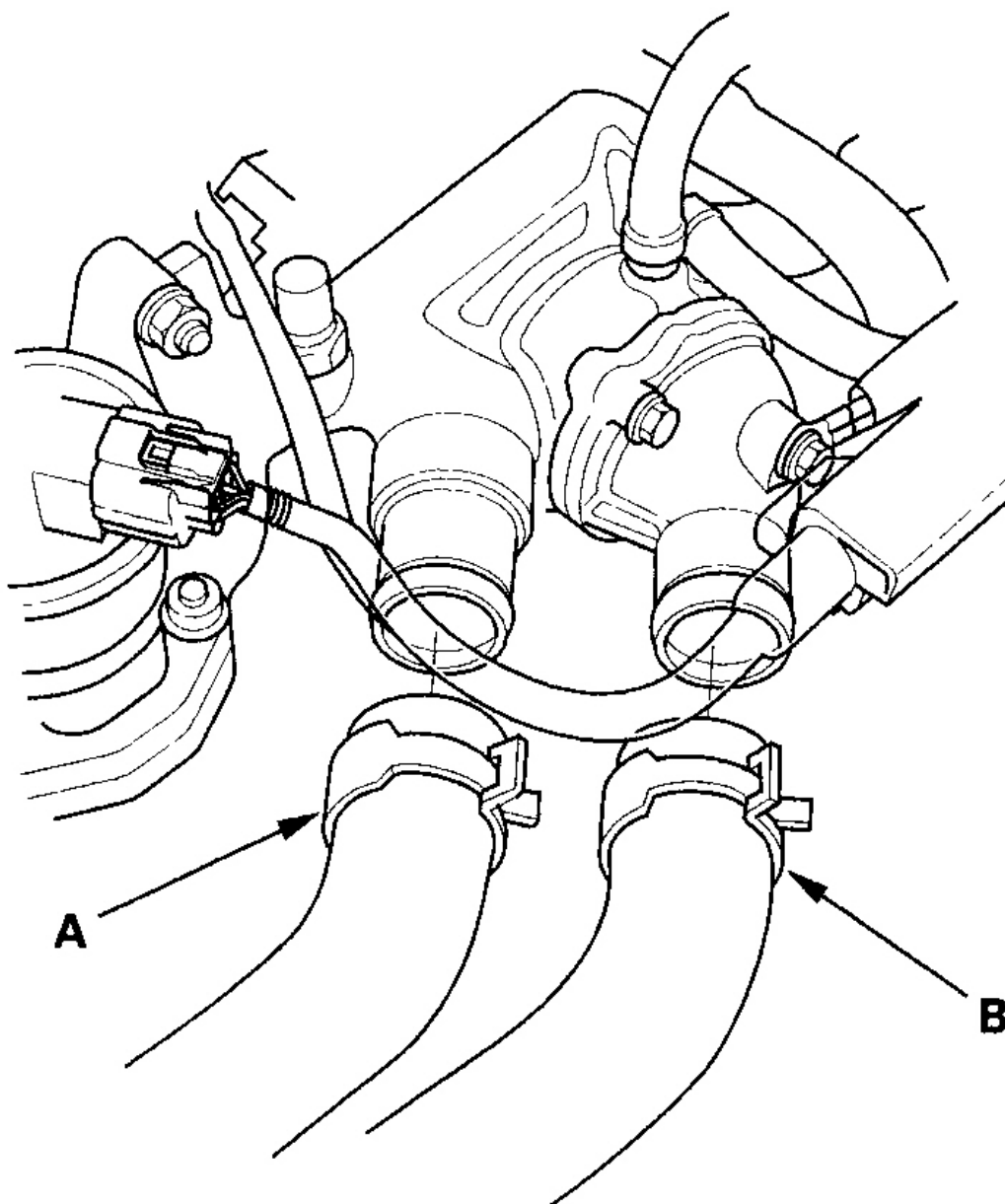


**Fig. 82: Removing Power Steering (P/S) Pump (A) And Bolt (B) Securing P/S Hose Bracket**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the alternator (see **ALTERNATOR REPLACEMENT** ).
8. Remove the intake manifold (see **REMOVAL** ).
9. Remove the six ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION** ).

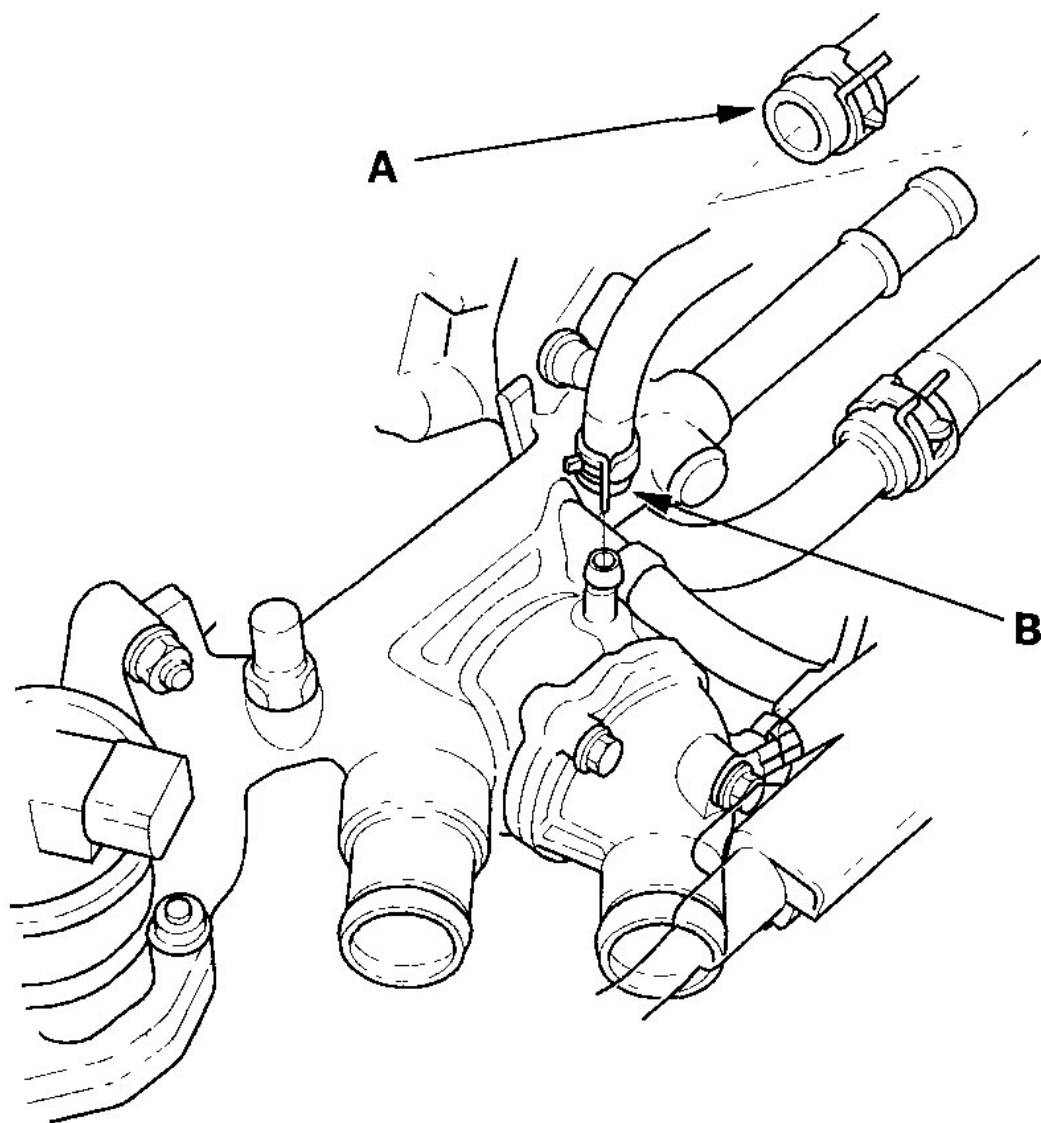
10. Remove the timing belt (see **TIMING BELT INSPECTION** ).
11. Remove these engine wire harness connectors and wire harness clamps from the cylinder head:
  - Six injector connectors
  - Engine coolant temperature (ECT) sensor 1 connector
  - Engine coolant temperature (ECT) sensor 2 connector
  - Camshaft position (CMP) sensor connector
  - Crankshaft position (CKP) sensor A/B connector
  - Exhaust gas recirculation (EGR) valve connector
  - VTEC solenoid valve connector
  - VTEC oil pressure switch connector
  - Oil pressure switch connector
  - Two air fuel ratio (A/F) sensor connectors
  - Two secondary heated oxygen sensor (secondary HO2S) connectors
12. Remove the upper radiator hose (A) and lower radiator hose (B).





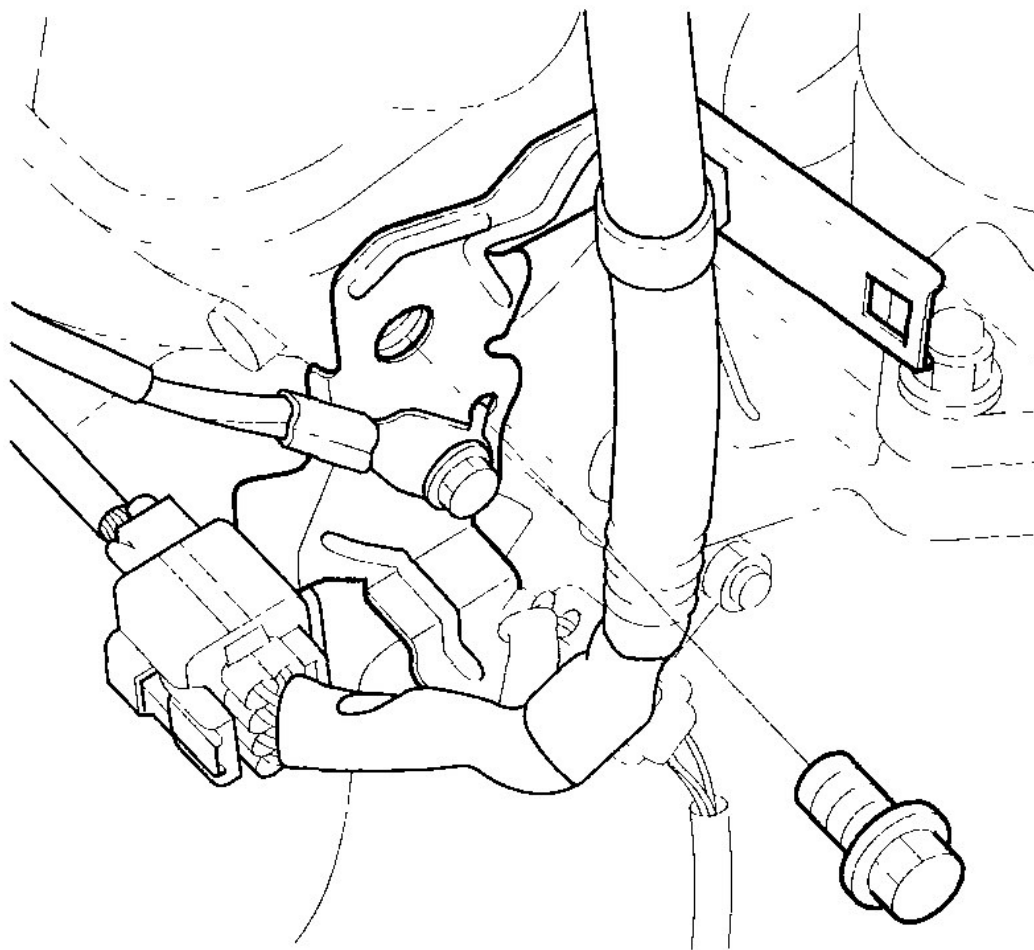
**Fig. 83: Removing Upper Radiator Hose (A) And Lower Radiator Hose (B)**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Remove the heater hose (A) and water bypass hose (B).



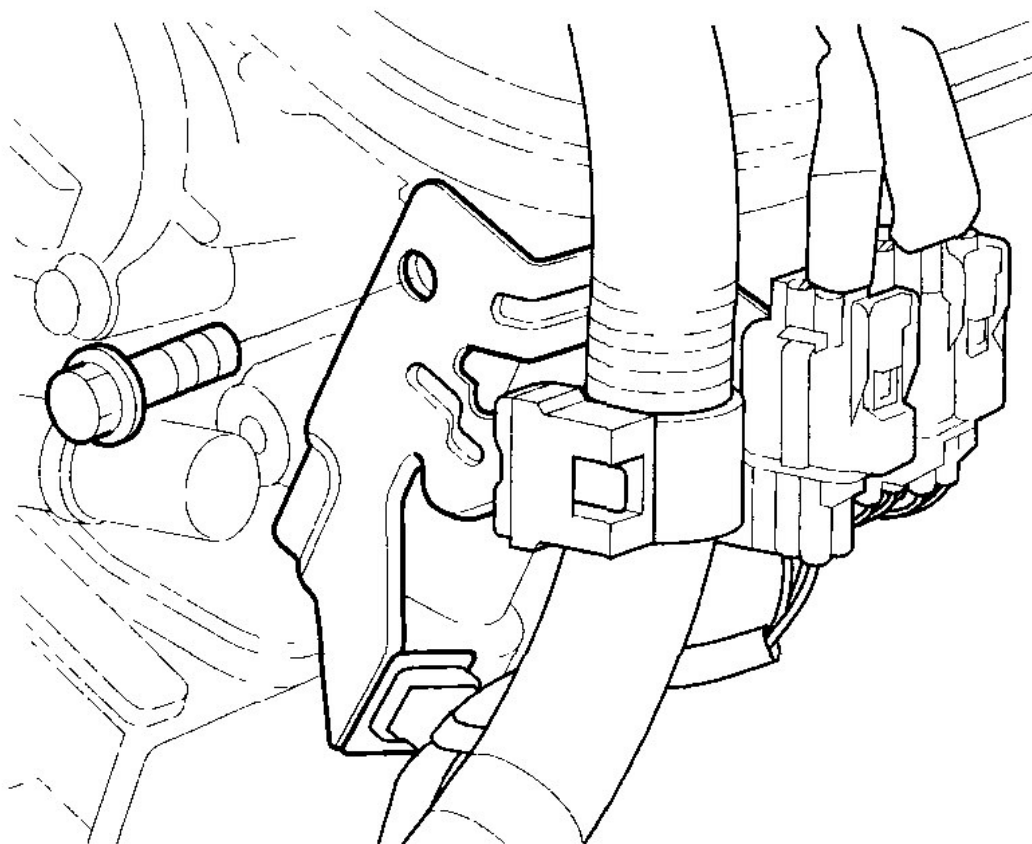
**Fig. 84: Removing Heater Hose And Water Bypass Hose**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Remove the bolt securing the harness bracket.



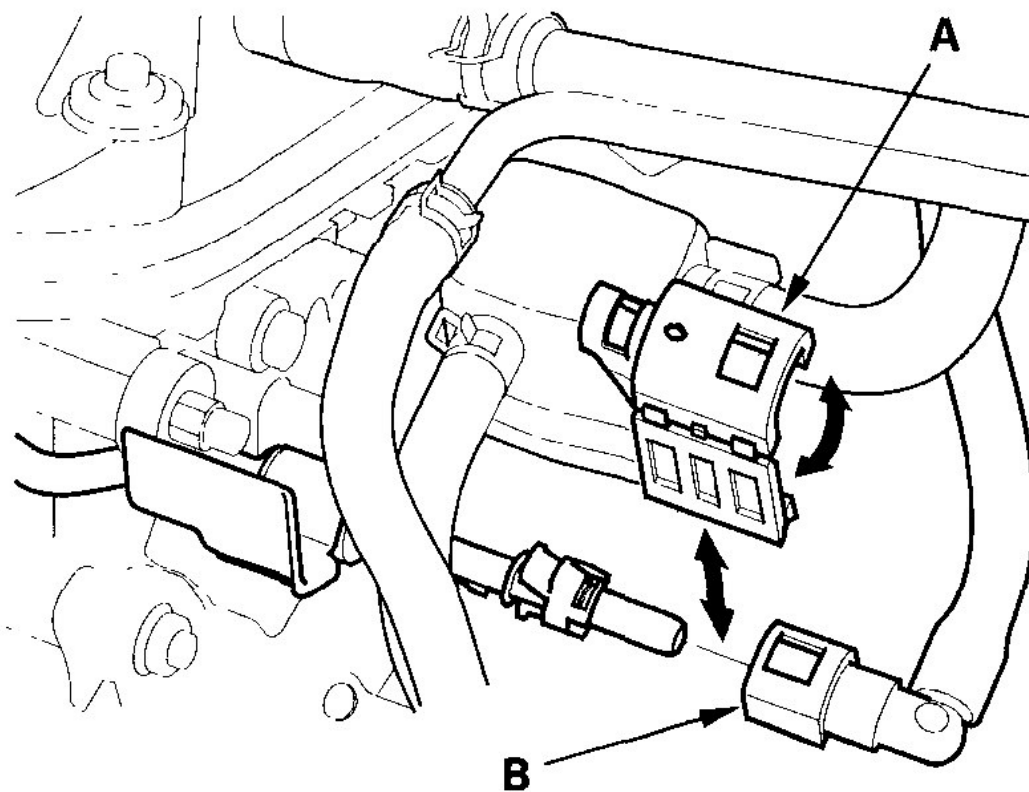
**Fig. 85: Removing Bolt Securing Harness Bracket**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Remove the bolt securing the harness bracket.



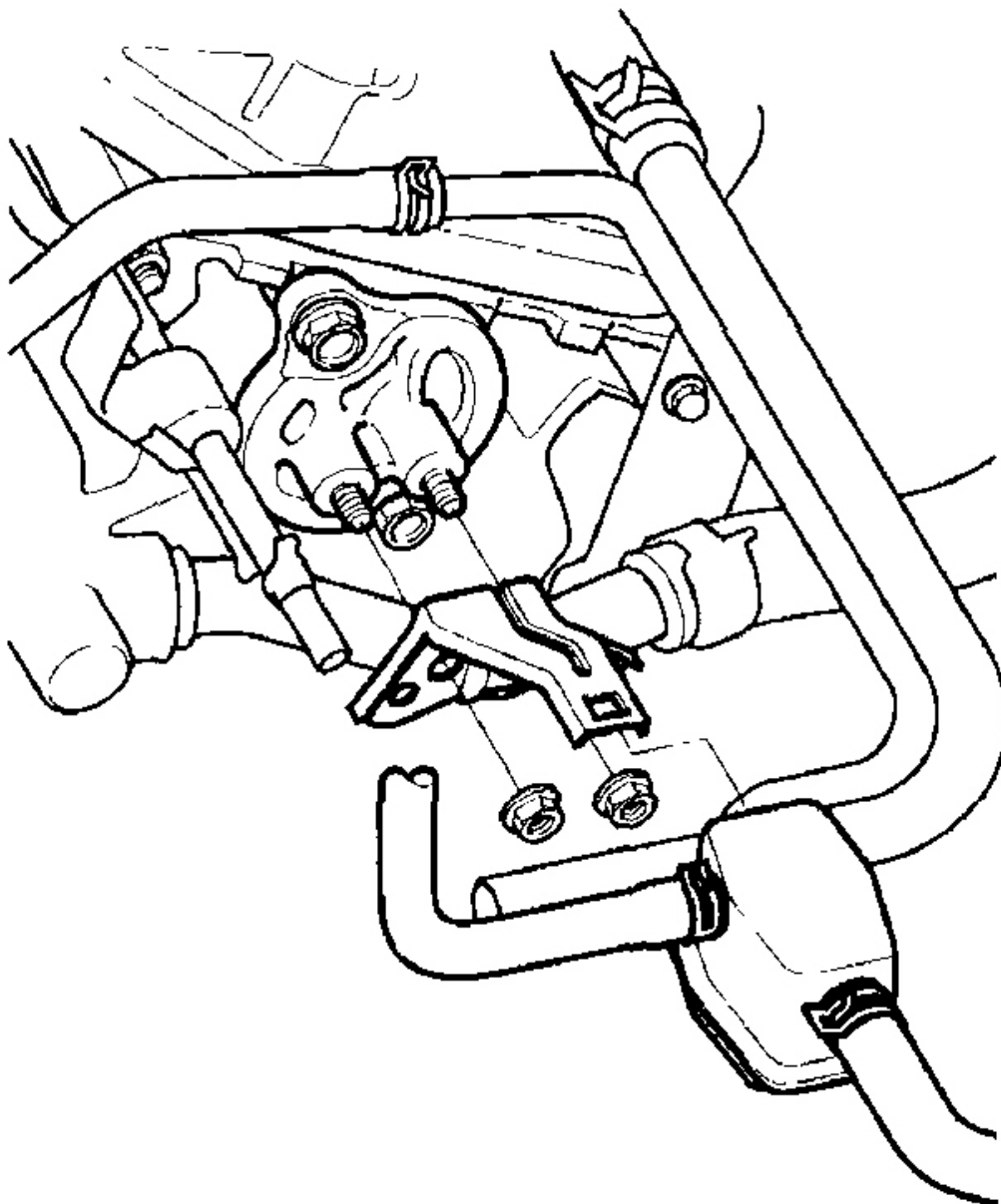
**Fig. 86: Removing Bolt Securing Harness Bracket**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

16. Remove the fuel quick-connect fitting cover (A), then disconnect the fuel quick-connect fitting (B).



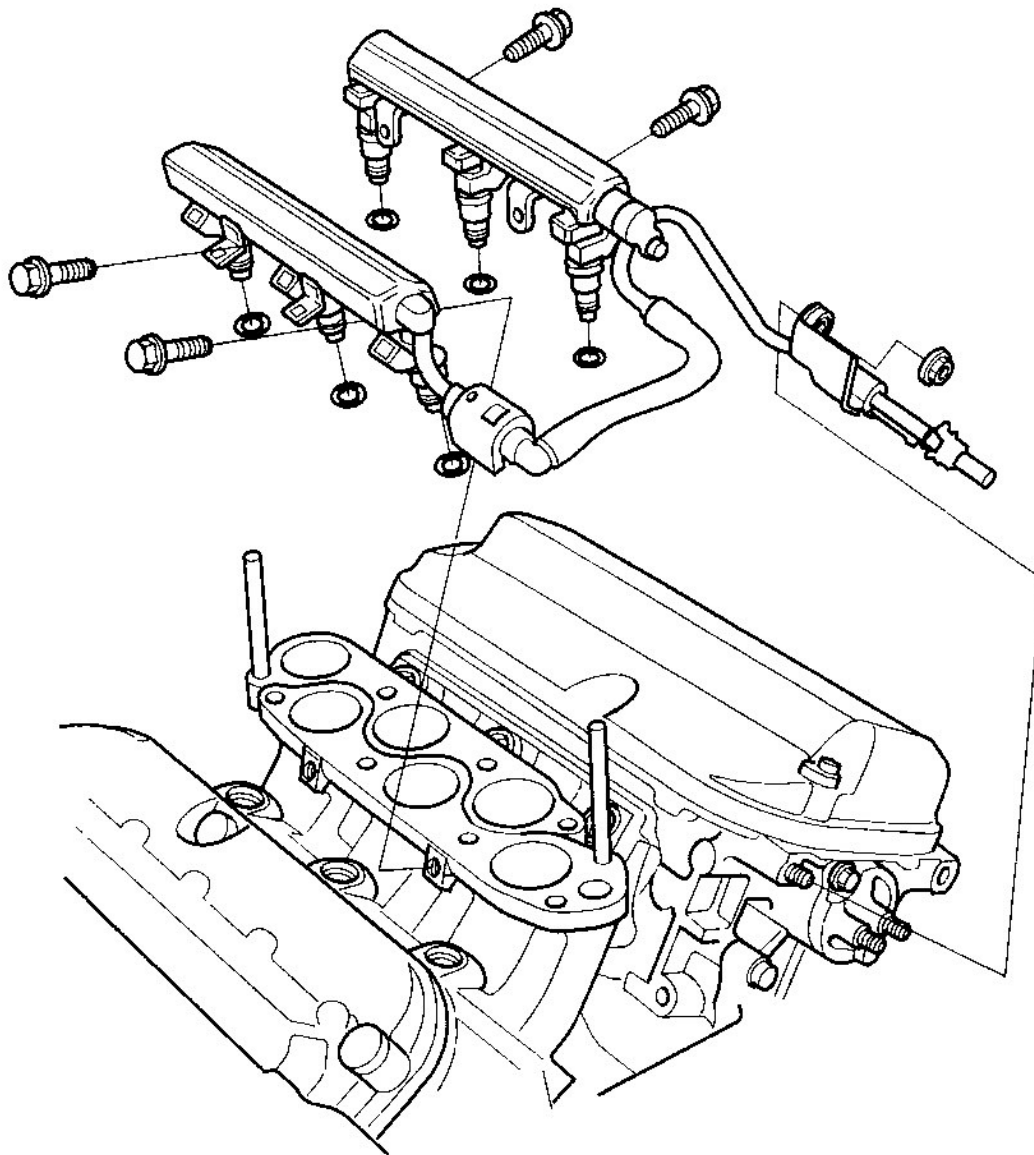
**Fig. 87: Removing Fuel Quick-Connect Fitting Cover And Fuel Quick-Connect Fitting**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Remove the evaporative emission (EVAP) canister hose joint with bracket.



**Fig. 88: Removing Evaporative Emission Canister Hose Joint With Bracket**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

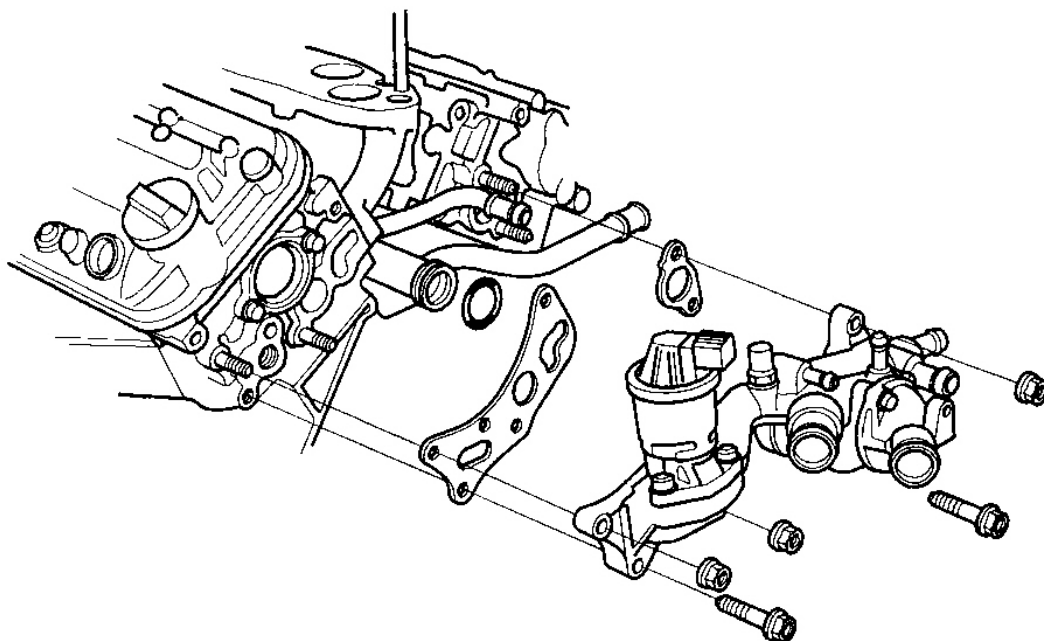
18. Remove the fuel rails.



**Fig. 89: Removing Fuel Rails**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Remove the front and rear warm up three way catalytic converter (WU-TWC) (see **WARM UP TWC REMOVAL/INSTALLATION** ).
20. Remove the water passage.

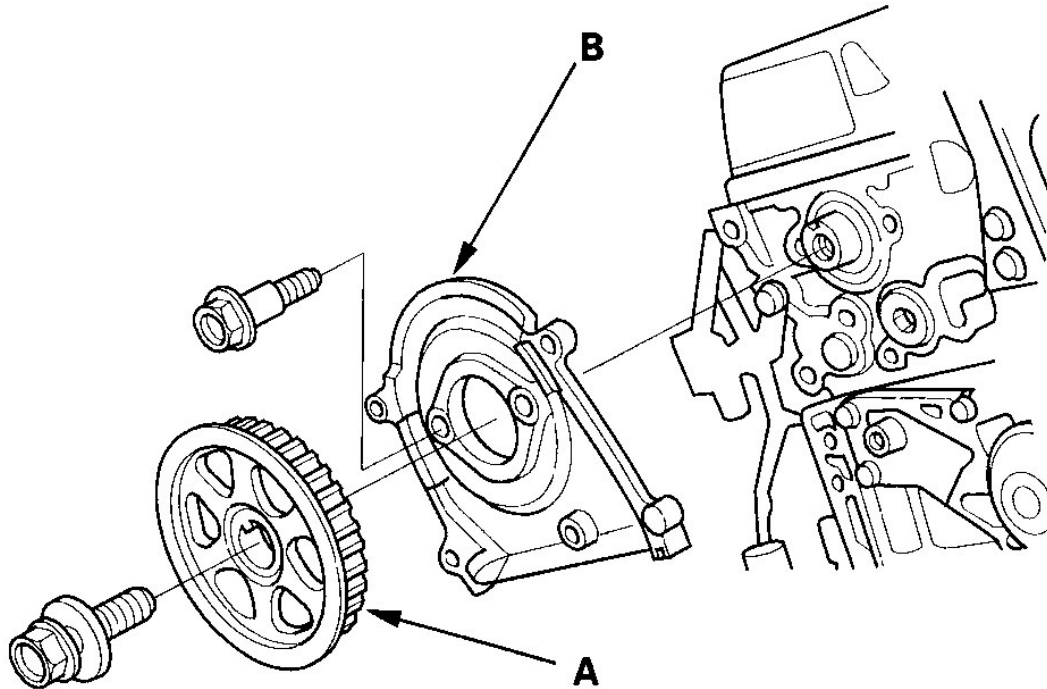


**Fig. 90: Removing Water Passage**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

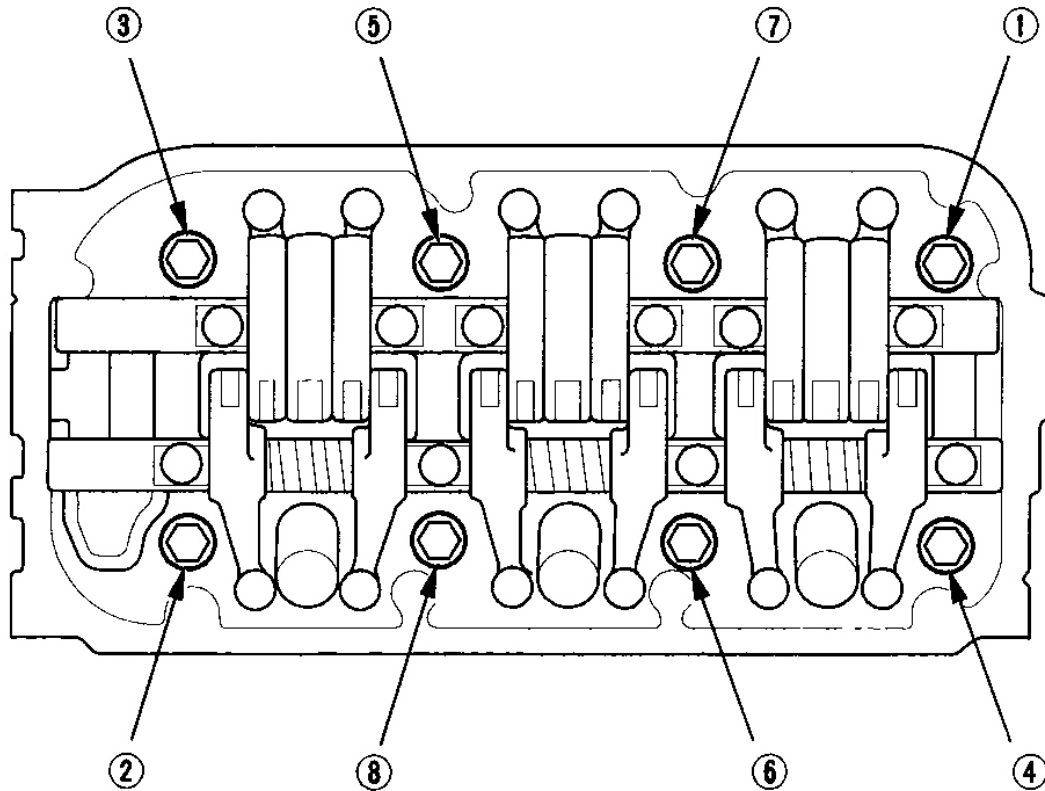
21. Remove the front and rear camshaft pulleys (A) and back covers (B).





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

22. Remove the cylinder head cover (see **TIMING BELT DRIVE PULLEY REPLACEMENT** ).
23. Remove the cylinder head bolts. To prevent warpage, unscrew the bolts in sequence 1/3 turn at a time; repeat the sequence until all bolts are loosened.



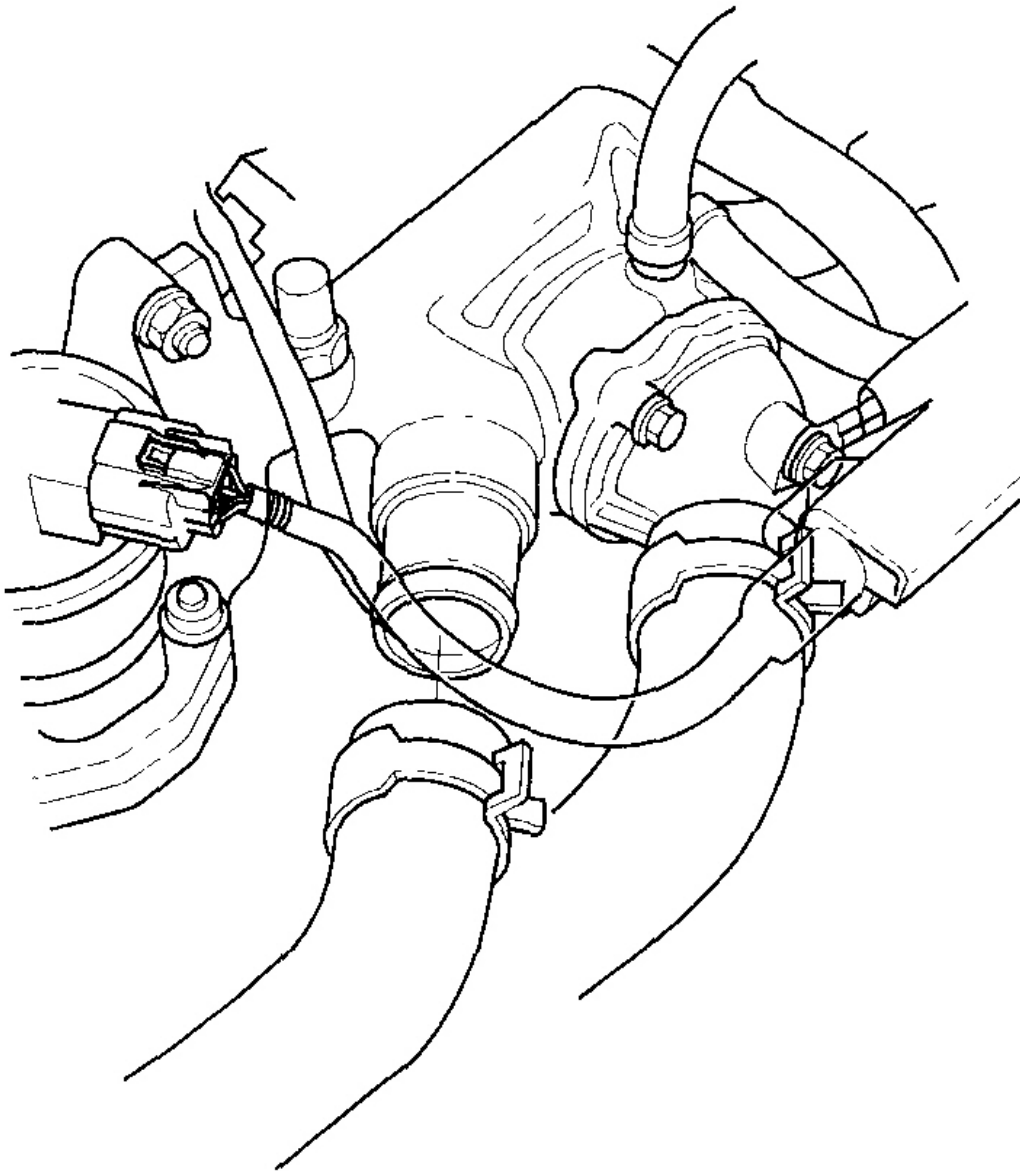
**Fig. 92: Identifying Cylinder Head Bolts Removal Sequence**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

24. Remove the cylinder head.

## CAMSHAFT REPLACEMENT

### FRONT

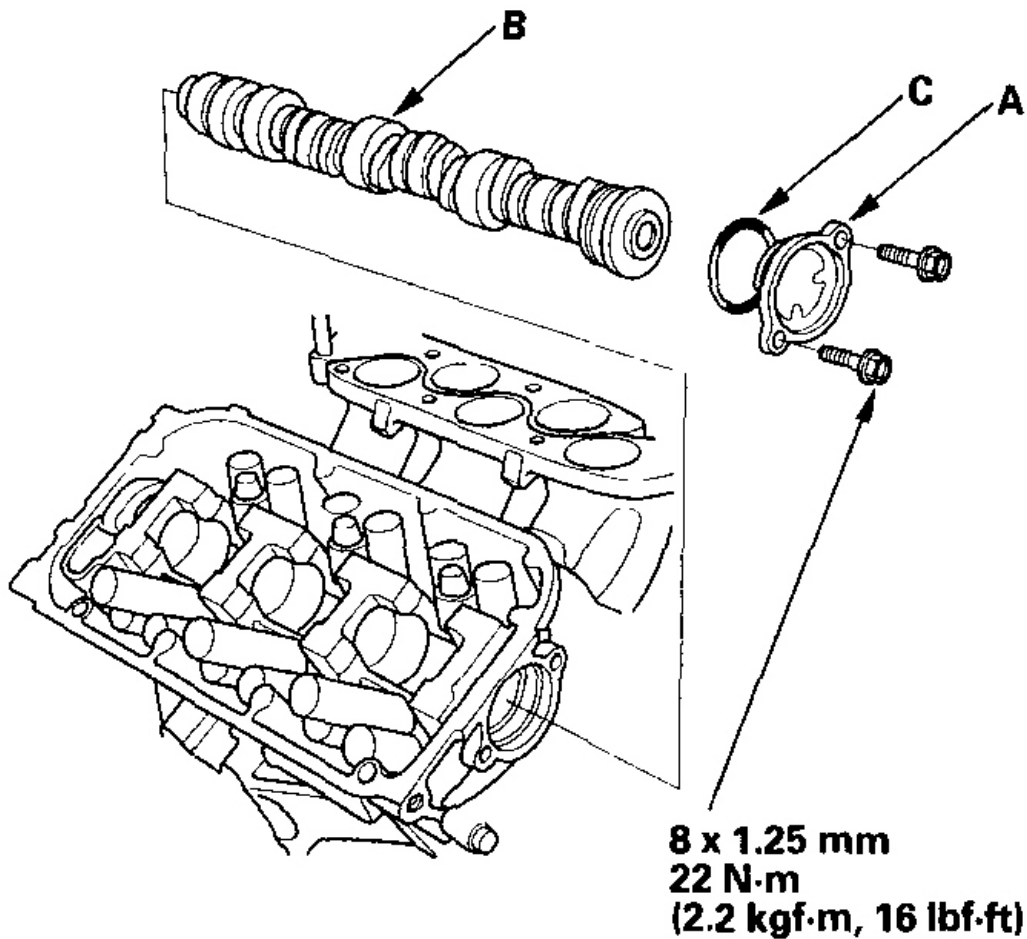
1. Make sure you have the anti-theft codes for the radio and the navigation system, then write down the customer's radio station presets.
2. Disconnect the negative cable from the battery first, then the positive cable.
3. Remove the battery and battery box.
4. Drain the engine coolant (see **COOLANT CHECK** ).
5. Remove the upper radiator hose.



**Fig. 93: Removing Upper Radiator Hose**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the exhaust gas recirculation (EGR) valve (see **EGR VALVE REPLACEMENT** ).
7. Remove the timing belt (see **TIMING BELT INSPECTION** ).
8. Remove the rocker arm assembly (see **CYLINDER HEAD INSPECTION FOR WARPAGE** ).
9. Remove the front camshaft pulley.
10. Remove the thrust cover (A), then remove the camshaft (B).



**Fig. 94: Removing Camshaft**

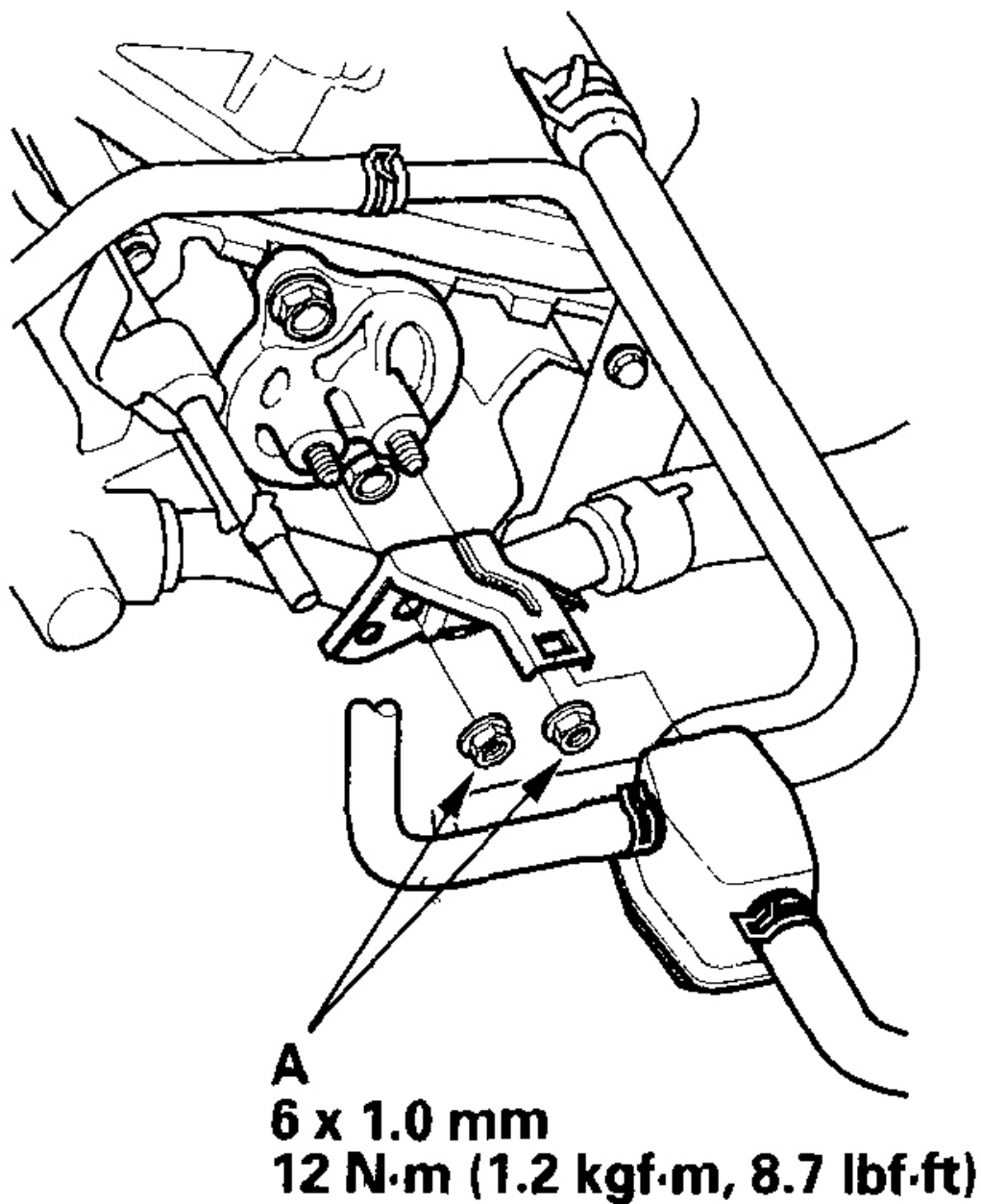
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Install the camshaft in the reverse order of removal. Always use a new O-ring (C). Apply new engine oil to the journals and cam lobes.
12. Apply new engine oil to the threads of the camshaft pulley mounting bolt, then install the front camshaft pulley (see step 11 ).
13. Install the rocker arm assembly, then tighten the mounting bolts (see step 6 ).
14. Install the timing belt (see **TIMING BELT INSTALLATION** ).
15. Adjust the valve clearance (see **VALVE CLEARANCE ADJUSTMENT** ).
16. Install the upper radiator hose.
17. Install the battery and battery box. Clean the battery posts and cable terminals with sandpaper, then assemble them and apply grease to prevent corrosion.

18. Fill the radiator with engine coolant and bleed the air out from the system (see step 8 **COOLANT REPLACEMENT** ).
19. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **CKP PATTERN CLEAR/CKP PATTERN LEARN** ).
20. Do the PCM idle learn procedure (see **PCM IDLE LEARN PROCEDURE** ) and the power window control unit reset procedure (see **RESETTING THE POWER WINDOW CONTROL UNIT** ).
21. Enter the anti-theft codes for the radio and the navigation system, then enter the customer's radio station presets.
22. Set the clock.

**REAR**

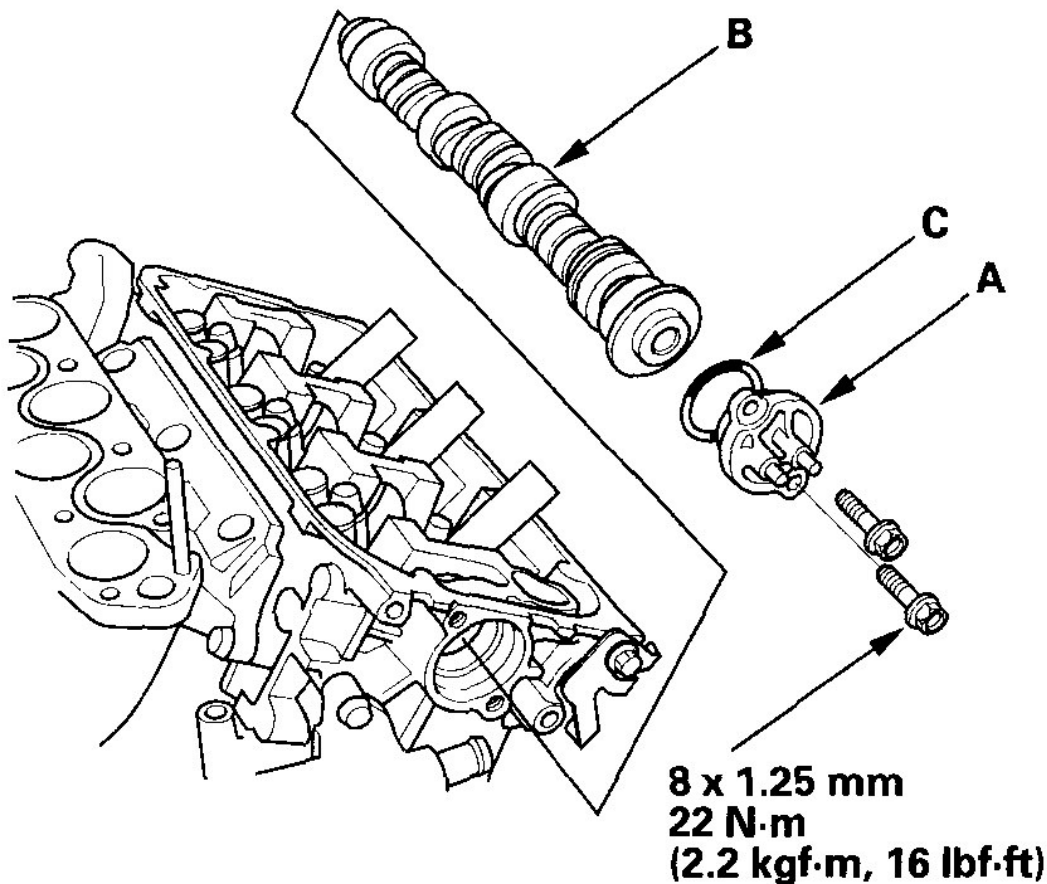
1. Make sure you have the anti-theft codes for the radio and the navigation system, then write down the customer's radio station presets.
2. Relieve fuel pressure (see **FUEL PRESSURE RELIEVING** ).
3. Disconnect the negative cable from the battery.
4. Remove the fuel quick-connect fitting cover, then disconnect the fuel quick-connect fitting (see step 13 **ENGINE REMOVAL** ).
5. Remove the nuts (A) securing the evaporative emission (EVAP) canister hose joint bracket.



**Fig. 95: Removing Nuts Securing Evaporative Emission Canister Hose Joint Bracket**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the brake lines from the master cylinder (see **MASTER CYLINDER REPLACEMENT** ).
7. Remove the timing belt (see **TIMING BELT INSPECTION** ).

8. Remove the rocker arm assembly (see **CYLINDER HEAD INSPECTION FOR WARPAGE** ).
9. Remove the rear camshaft pulley.
10. Remove the thrust cover (A), then remove the camshaft (B).



**Fig. 96: Removing Camshaft**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Install the camshaft in the reverse order of removal. Always use a new O-ring (C). Apply new engine oil to the journals and cam lobes.
12. Apply new engine oil to the threads of the camshaft pulley mounting bolt, then install the rear camshaft pulley (see step 11 ).
13. Install the rocker arm assembly, then tighten the mounting bolts (see step 6 ).
14. Install the timing belt (see **TIMING BELT INSTALLATION** ).
15. Adjust the valve clearance (see **VALVE CLEARANCE ADJUSTMENT** ).
16. Install the brake lines (see **MASTER CYLINDER REPLACEMENT** ) and do the brake system bleeding procedure (see **BRAKE SYSTEM BLEEDING** ).

17. Connect the fuel line and the battery cable, then inspect for fuel leaks (see step 54 in **ENGINE INSTALLATION** ).
18. Do the CKP pattern clear/CKP pattern learn procedure (see **CKP PATTERN CLEAR/CKP PATTERN LEARN** ).
19. Do the PCM idle learn procedure (see **PCM IDLE LEARN PROCEDURE** ) and the power window control unit reset procedure (see **RESETTING THE POWER WINDOW CONTROL UNIT** ).
20. Enter the anti-theft codes for the radio and navigation system, then enter the customer's radio station presets.
21. Set the clock.

## **CYLINDER HEAD INSPECTION FOR WARPAGE**

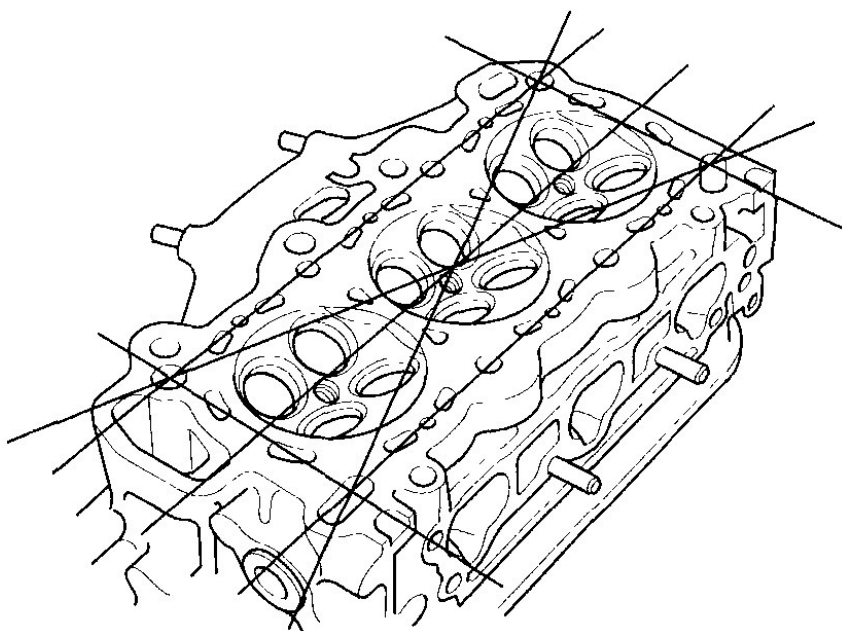
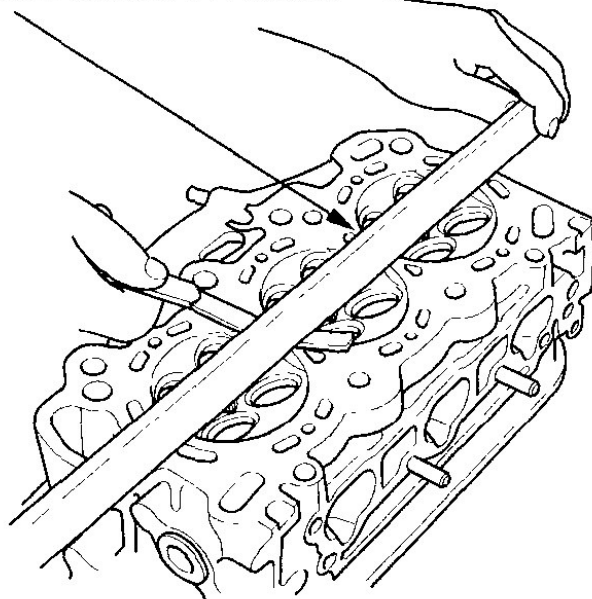
1. Remove the cylinder head (see **CYLINDER HEAD REMOVAL** ).
2. Inspect the camshaft (see **CAMSHAFT INSPECTION** ).
3. Check the cylinder head for warpage. Measure along the edges, and three ways across the center.
  - If warpage is less than 0.05 mm (0.002 in.), cylinder head resurfacing is not required.
  - If warpage is between 0.05 mm (0.002 in.) and 0.2 mm (0.008 in.), resurface the cylinder head.
  - Maximum resurface limit is 0.2 mm (0.008 in.) based on a height of 121 mm (4.76 in.).

### **Cylinder Head Height**

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



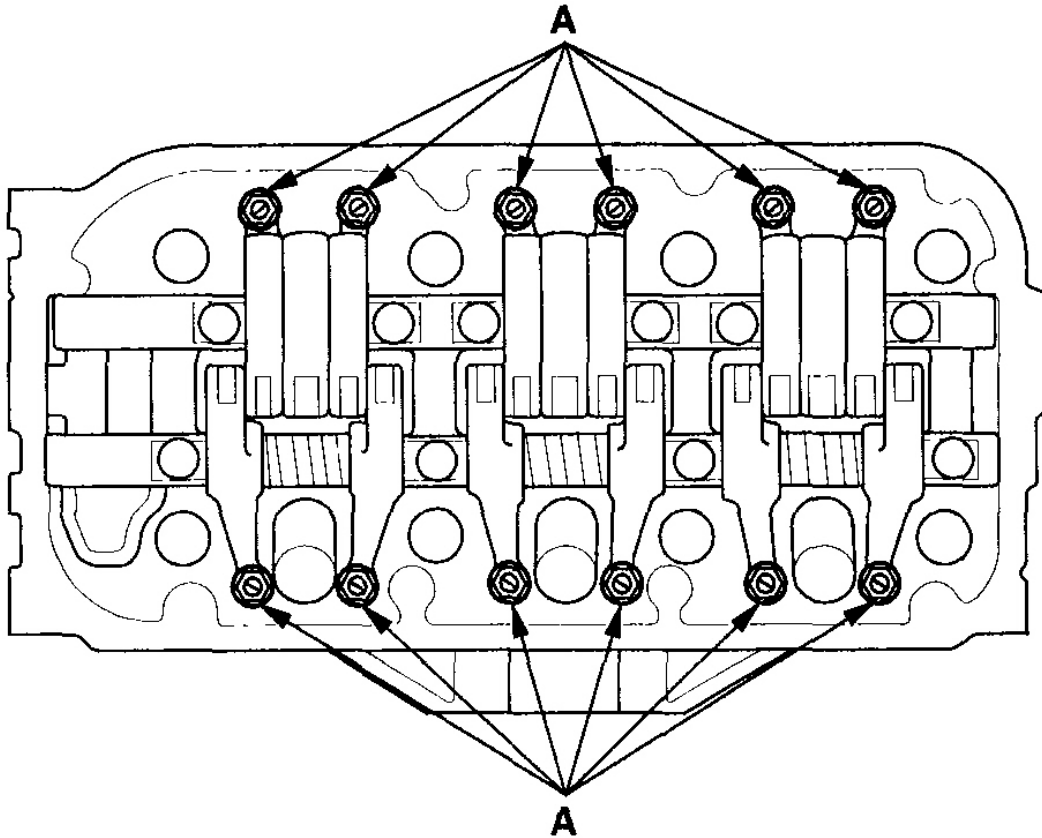
**PRECISION STRAIGHT EDGE**



**Fig. 97: Checking Cylinder Head For Warpage**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

## ROCKER ARM ASSEMBLY REMOVAL

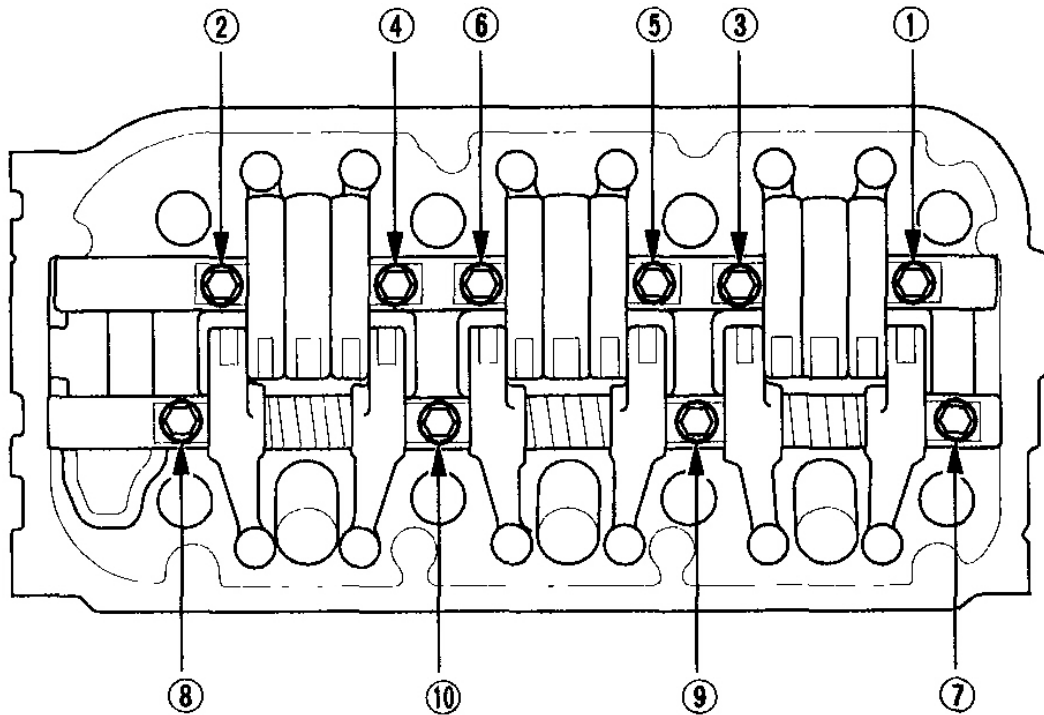
1. Remove the cylinder head cover (see **TIMING BELT DRIVE PULLEY REPLACEMENT** ).
2. Loosen the adjusting screws (A).



**Fig. 98: Loosening Adjusting Screws**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



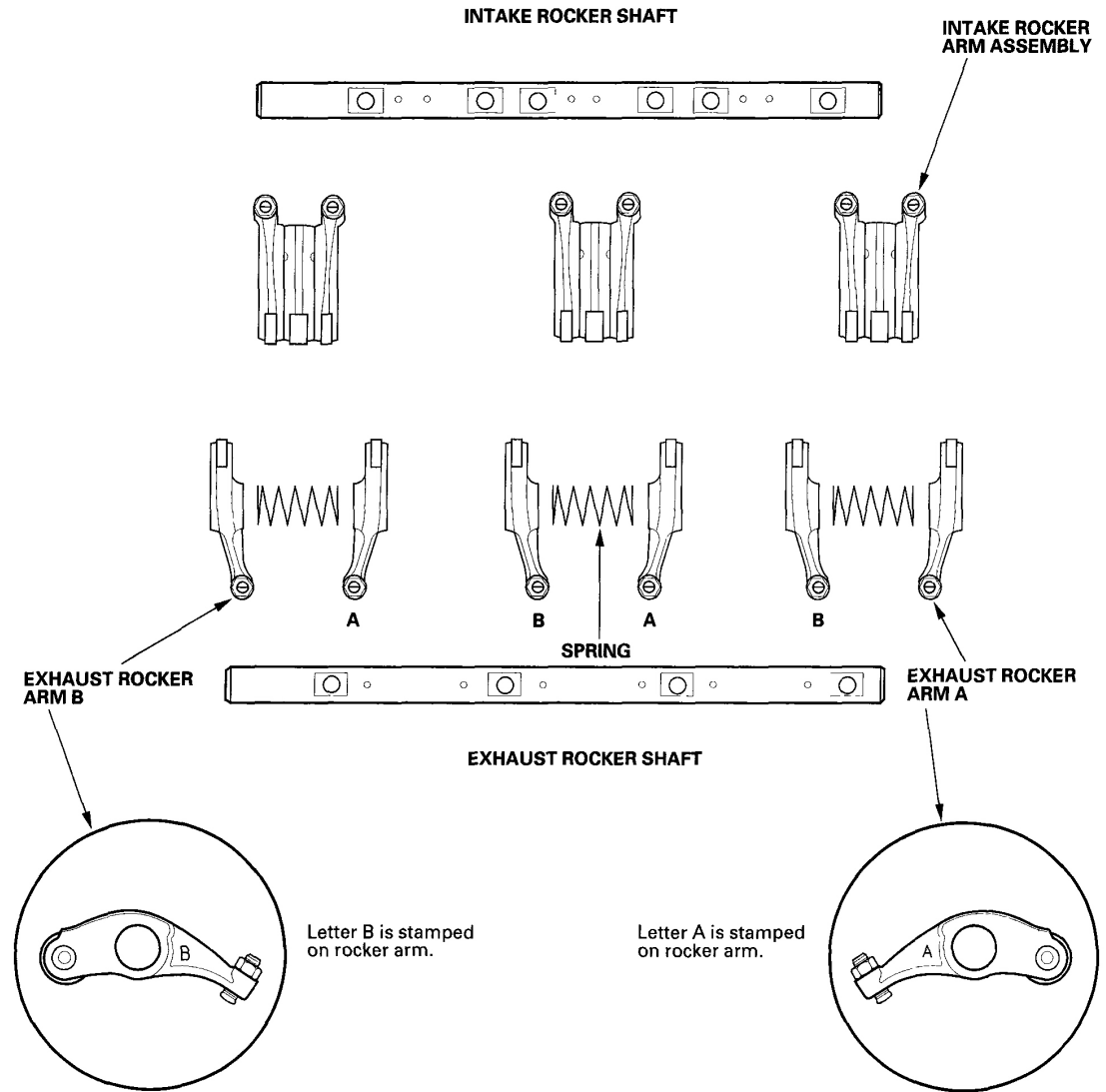
**Fig. 99: Identifying Rocker Arm Assembly Bolts**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

## ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY

### NOTE:

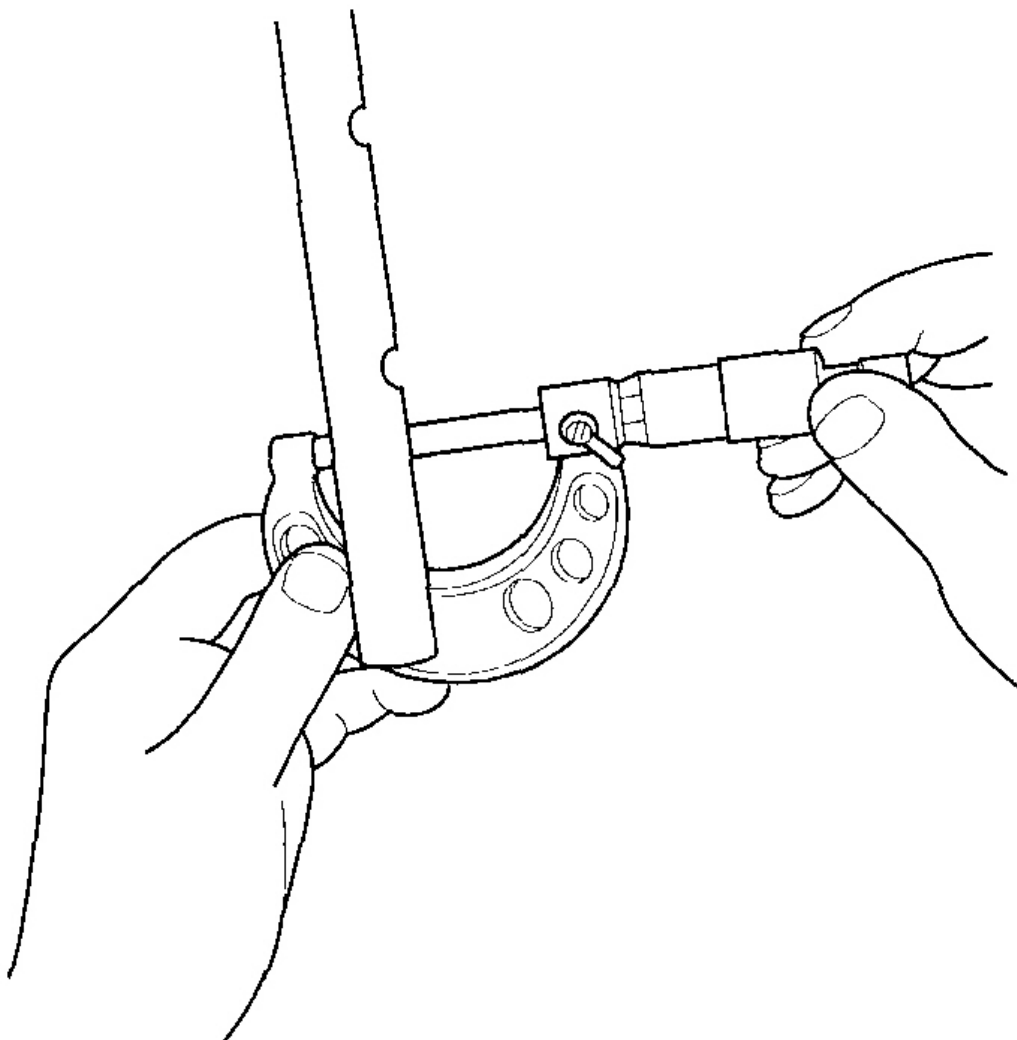
- Identify parts as they are removed so they can be reinstalled in their original locations.
- Inspect the rocker shafts and rocker arms (see ROCKER ARM AND SHAFT INSPECTION ).
- Rocker arms must be installed in the same positions if reused.
- When removing or installing the rocker arm assembly, do not remove the rocker shaft mounting bolts. The bolts will keep the springs and rocker arms on the shaft.
- Bundle the intake rocker arms with rubber bands to keep them together as a set.
- Prior to reassembling, clean all the parts in solvent, dry them and apply new engine oil to any contact points.
- When replacing the intake rocker arm assembly, remove the fastening hardwares from the new intake rocker arm assembly.



**Fig. 100: Disassembling Rocker Arm And Shaft**  
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

## ROCKER ARM AND SHAFT INSPECTION

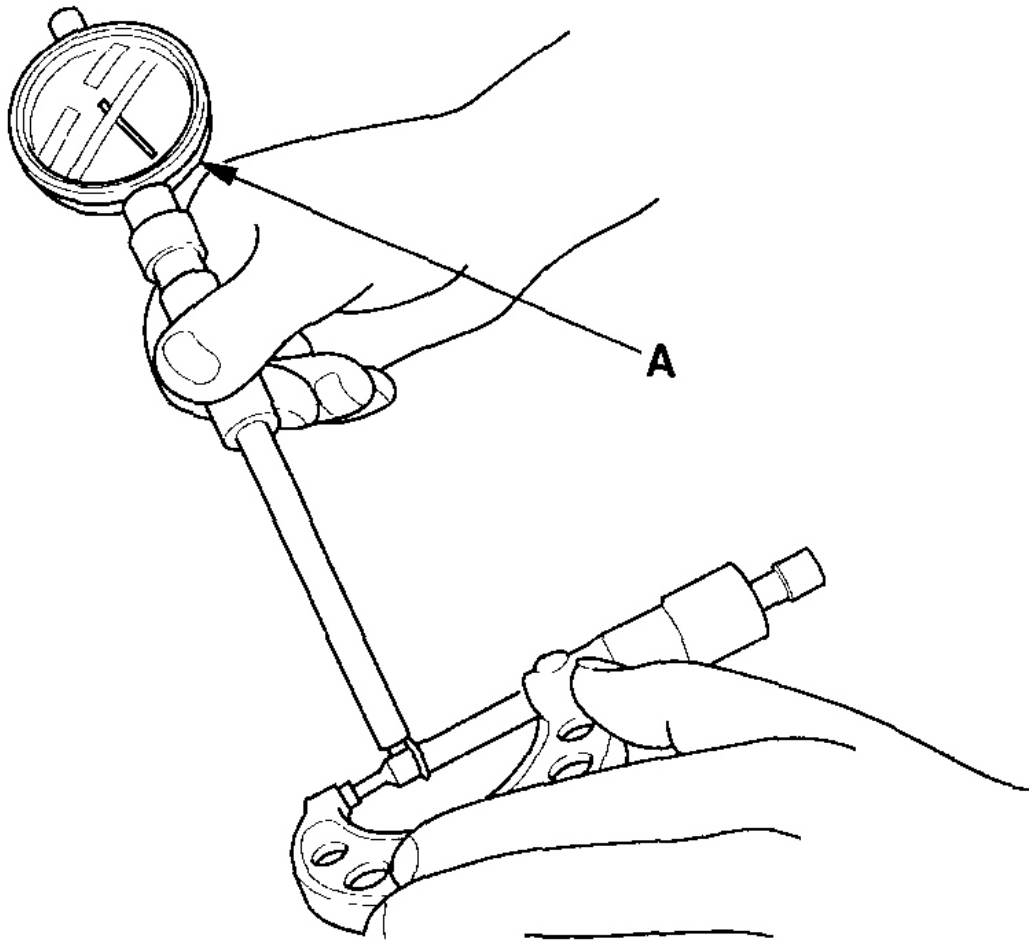
1. Remove the rocker arm assembly (see CYLINDER HEAD INSPECTION FOR WARPAGE ).
2. Disassembly the rocker arm assembly (see ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY ).
3. Measure the diameter of the shaft at the first rocker location.



**Fig. 101: Measuring Diameter Of Shaft**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



**Fig. 102: Zeroing Gauge (A) 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**

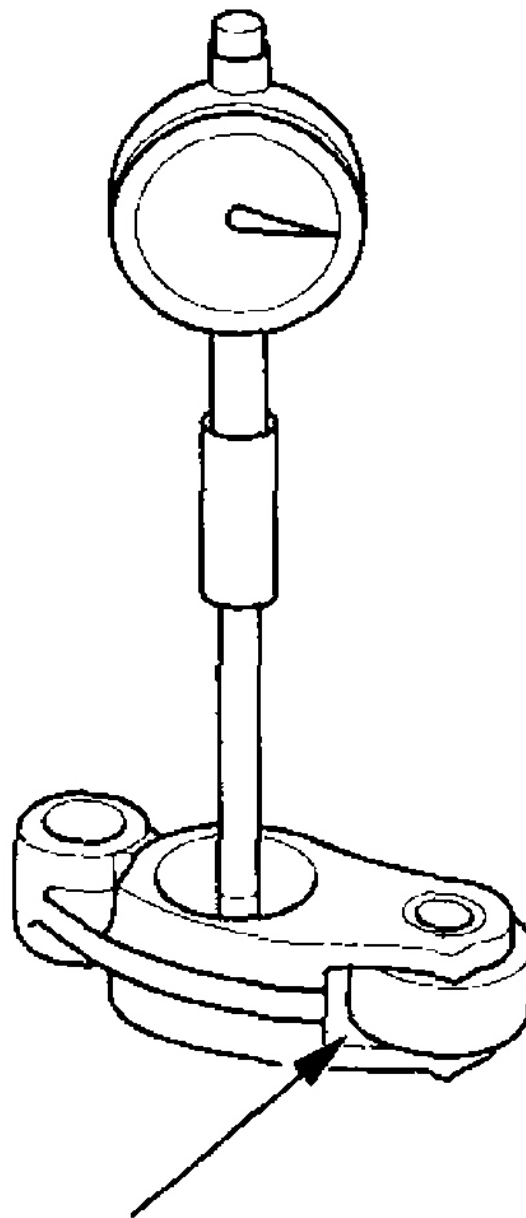
**Standard (New): 0.026-0.067 mm (0.0010-0.0026 in.)**

**Service Limit: 0.067 mm (0.0026 in.)**

**Exhaust Rocker Arm-to-Shaft Clearance**

**Standard (New): 0.026-0.077 mm (0.0010-0.0030 in.)**

**Service Limit: 0.077 mm (0.0030 in.)**



**Inspect rocker arm  
face for wear.**

**Fig. 103: 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 three rocker arms in

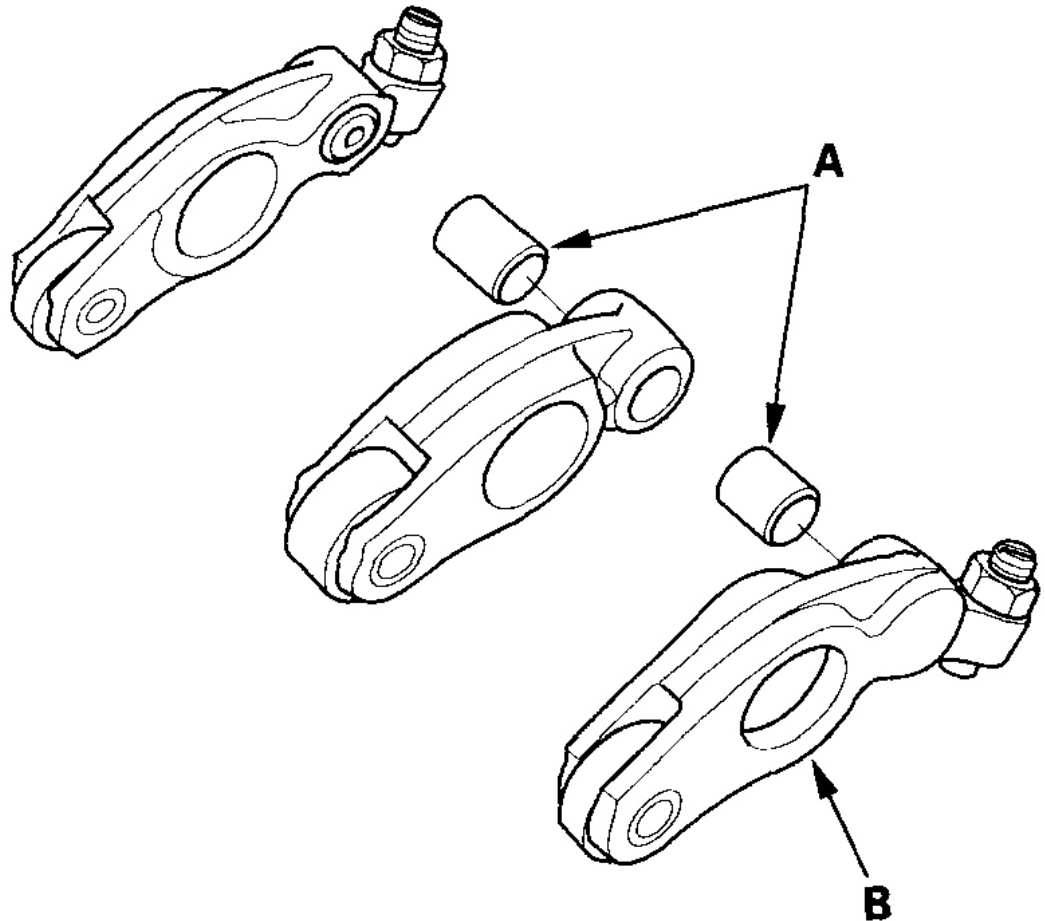
that set (primary, mid, and secondary).

### VTEC Rocker Arms

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

**NOTE:**

- Apply new engine oil to the pistons when reassembling.
- When reassembling the primary rocker arm (B), carefully apply air pressure to the oil passage of the rocker arm.



**Fig. 104: Inspecting Rocker Arm Synchronizing Pistons**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Reassemble the rocker arm assembly (see **ROCKER ARM AND SHAFT**)



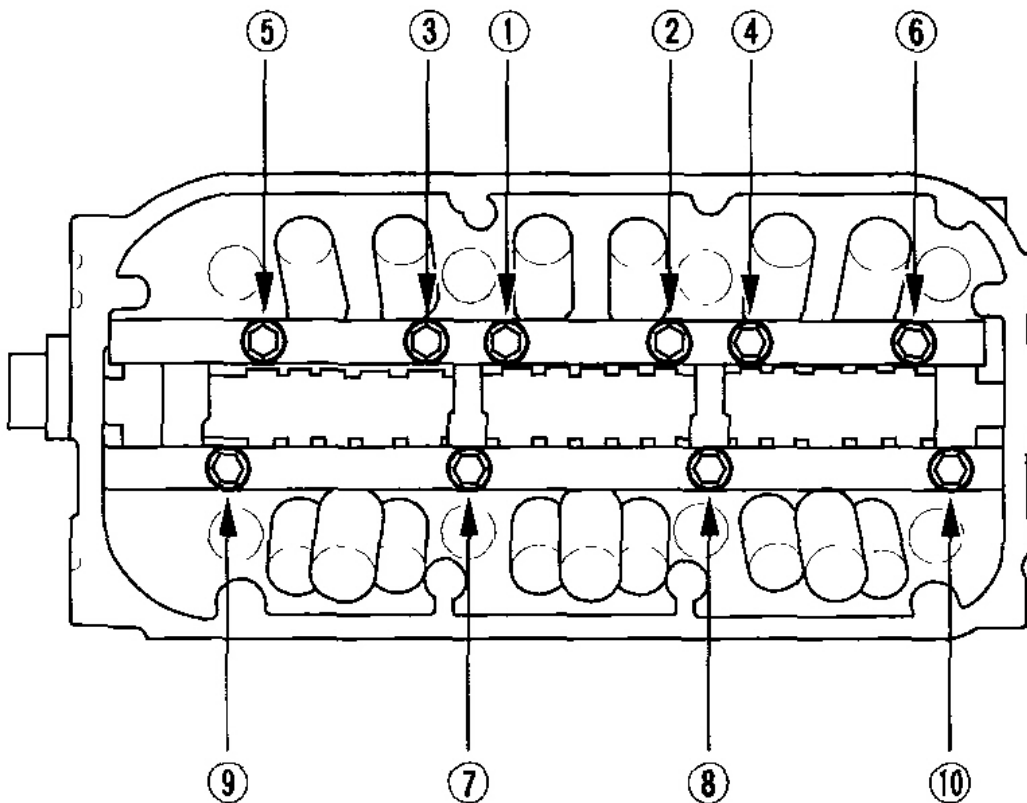
**DISASSEMBLY/REASSEMBLY** ).**CAMSHAFT INSPECTION**

1. Remove the cylinder head (see **CYLINDER HEAD REMOVAL** ).
2. Remove the rocker arms (see **CYLINDER HEAD INSPECTION FOR WARPAGE** ).
3. Put the rocker shafts on the cylinder head, then tighten the bolts to the specified torque.

**NOTE:** Apply new engine oil to the threads and flange of the exhaust rocker shaft mounting bolts.

**Specified Torque**

8 x 1.25 mm: 24 N.m (2.4 kgf.m, 17 lbf.ft)



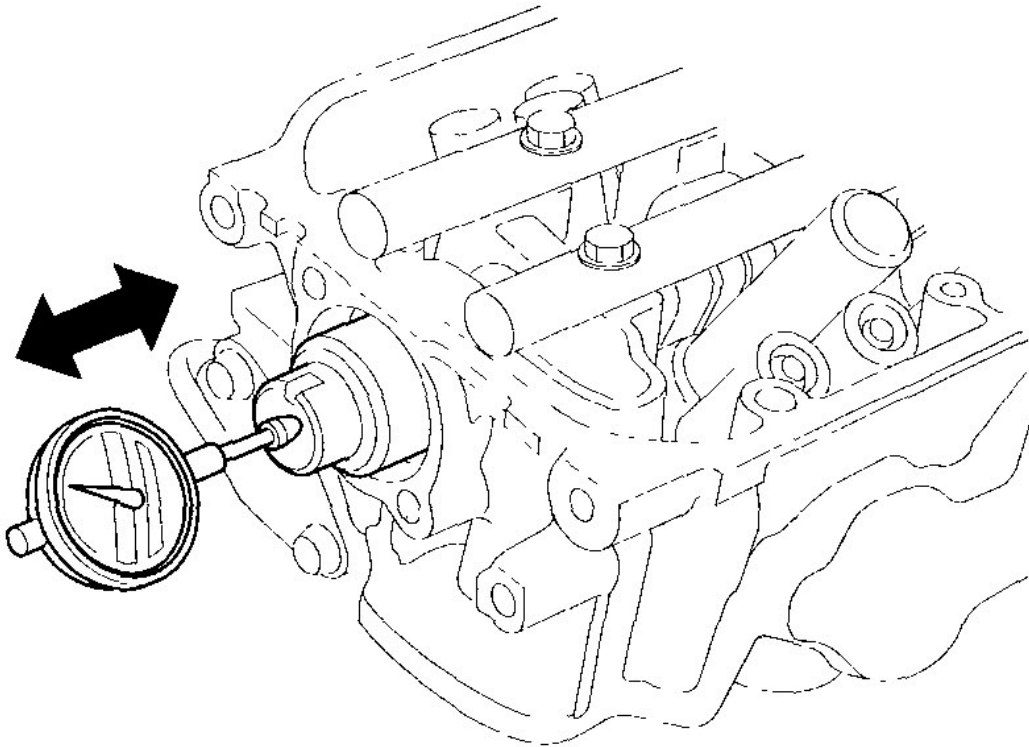
**Fig. 105: Identifying Rocker Shaft Bolts Tightening Sequence**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Seat the camshaft by pushing it toward the rear of the cylinder head.
5. 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**

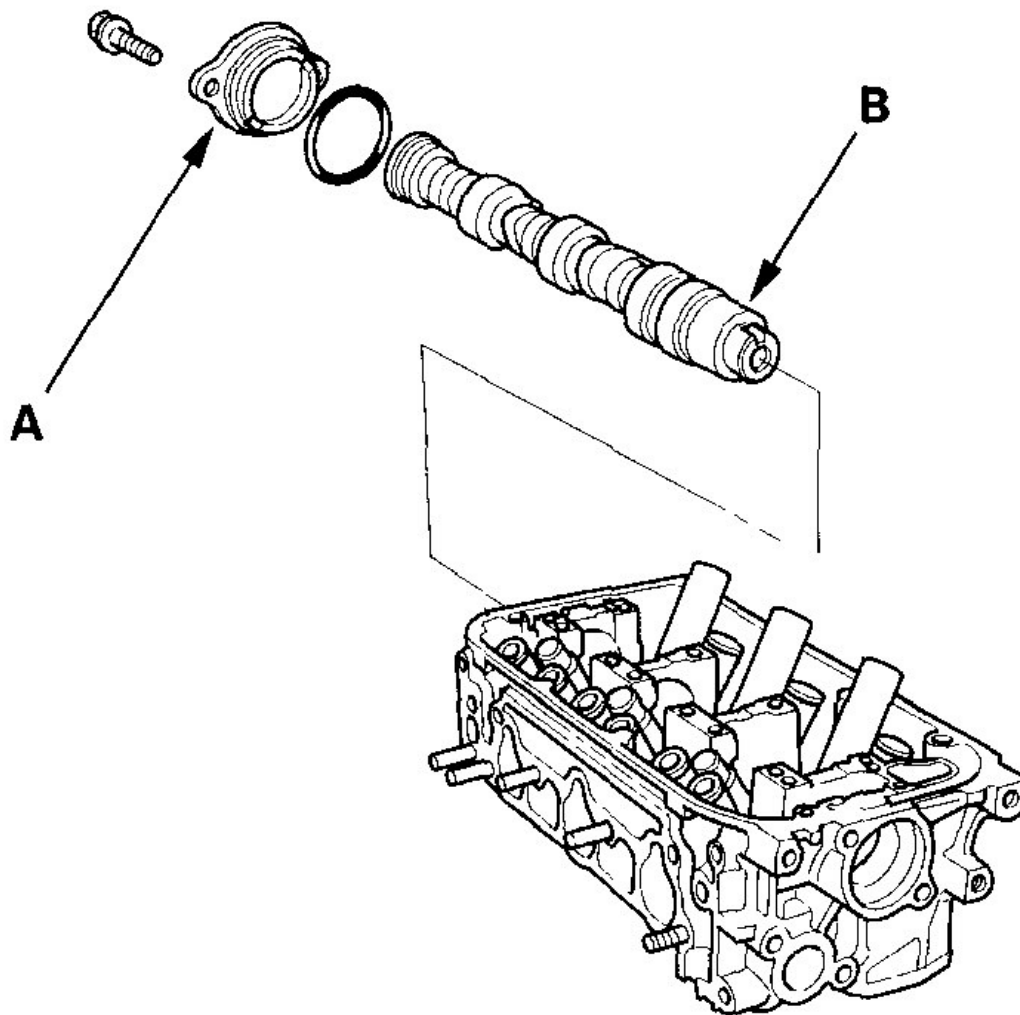
**Standard (New): 0.05-0.20 mm (0.002-0.008 in.)**

**Service Limit: 0.20 mm (0.008 in.)**



**Fig. 106: Checking Camshaft End Play**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

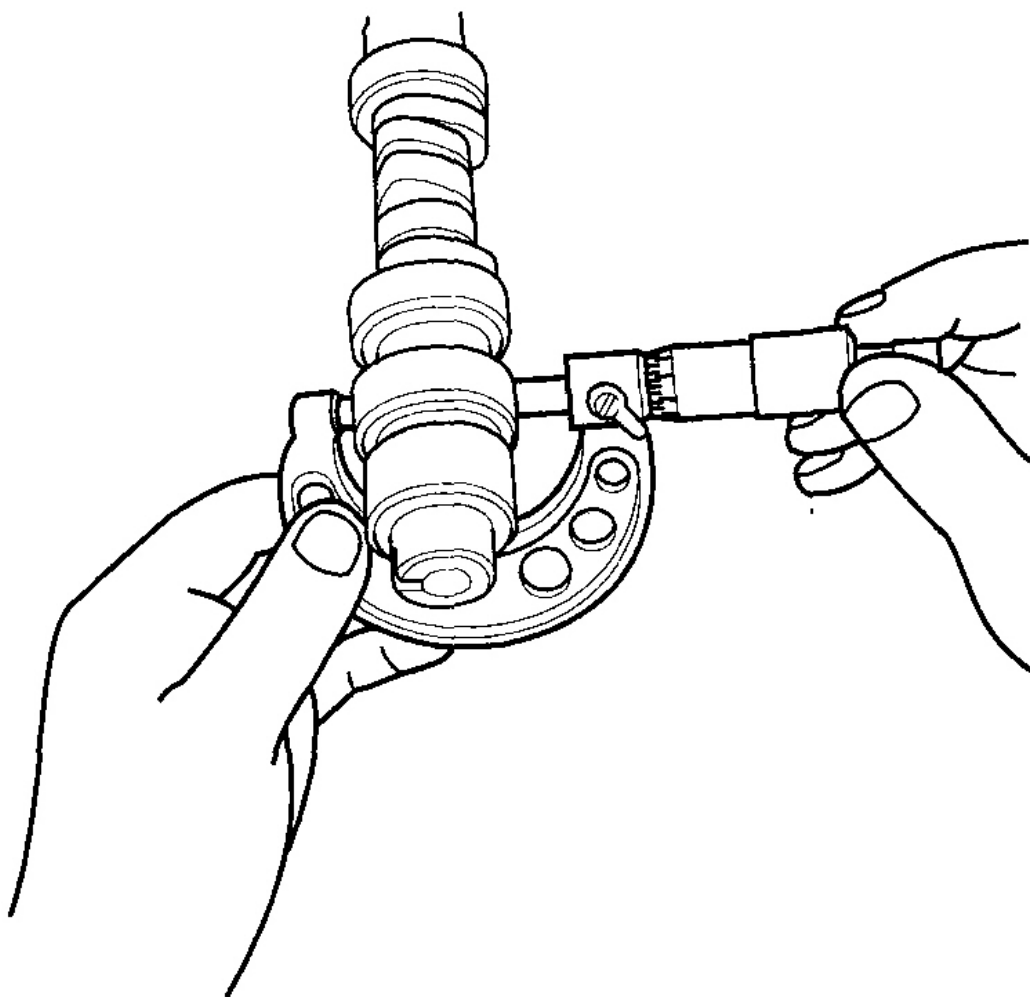
6. Remove the camshaft thrust cover (A), then pull out the camshaft (B).



**Fig. 107: Removing Camshaft**

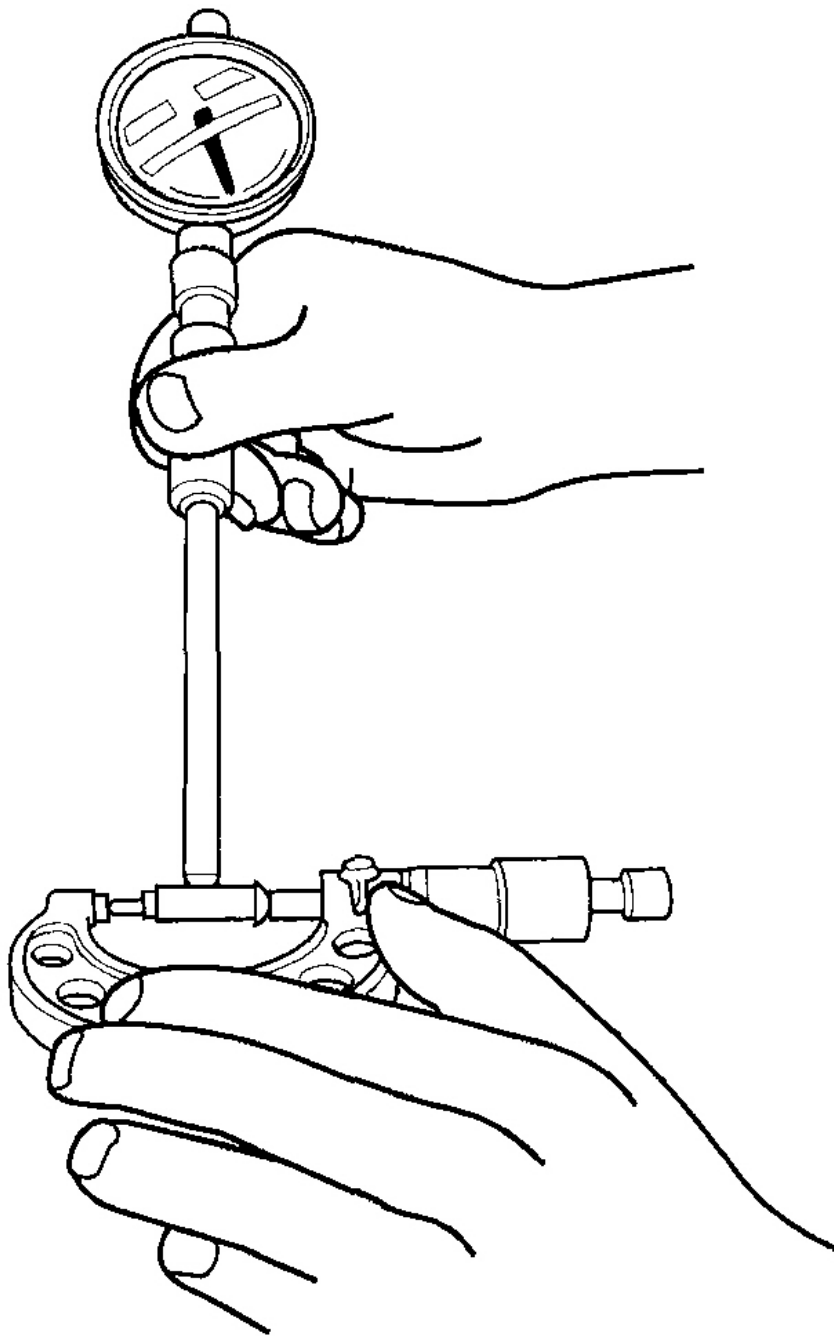
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



**Fig. 108: Measuring Diameter Of Camshaft Journal**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Zero the gauge to the journal diameter.



**Fig. 109: Zeroing Gauge To Journal Diameter**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

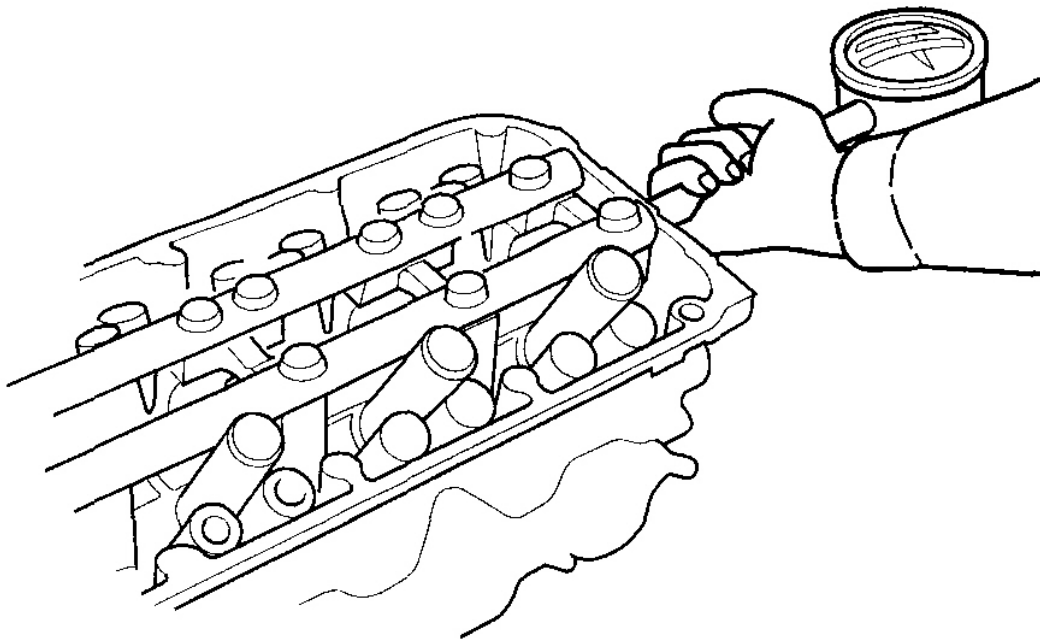
10. Clean the camshaft bearing surfaces in the cylinder head. Measure the inside diameter of each camshaft bearing surface, and check for an out-of-round condition.

- If the camshaft-to-holder clearance is within limits, go to step 12.
- If the camshaft-to-holder clearance is beyond the service limit and the camshaft has been replaced, replace the cylinder head.
- If the camshaft-to-holder clearance is beyond the service limit and the camshaft has not been replaced, go to step 11.

**Camshaft-to-Holder Oil Clearance**

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

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



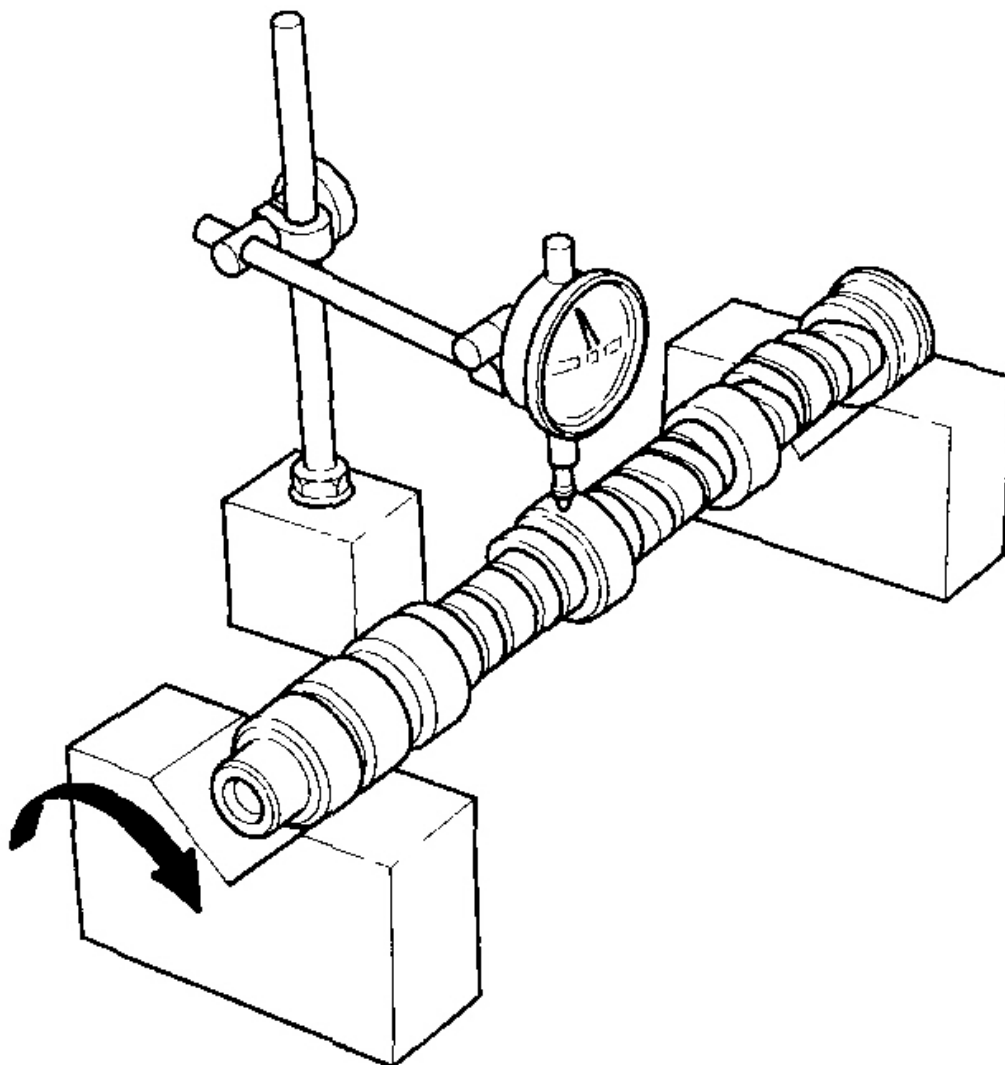
**Fig. 110: Measuring Inside Diameter Of Camshaft Bearing Surface**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

**Camshaft Total Runout**

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

**Service Limit: 0.04 mm (0.002 in.)**



**Fig. 111: Checking Camshaft Total Runout**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Measure cam lobe height.

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

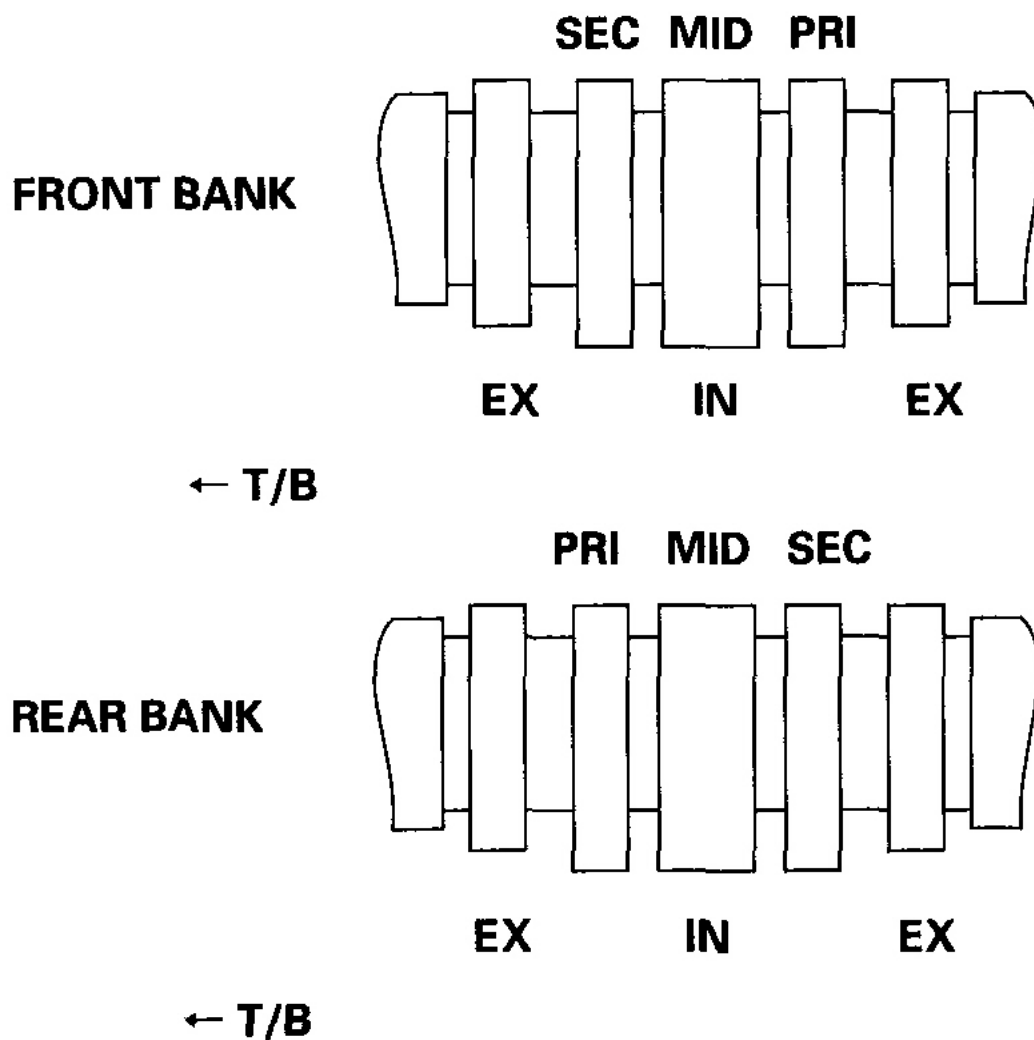
**CAM LOBE HEIGHT SPECIFICATION**

|  | INTAKE | EXHAUST |
|--|--------|---------|
|--|--------|---------|

|     |                        |                        |
|-----|------------------------|------------------------|
| PRI | 35.041 mm (1.3796 in.) |                        |
| MID | 36.445 mm (1.4348 in.) | 36.326 mm (1.4302 in.) |
| SEC | 35.284 mm (1.3891 in.) |                        |

PRI: Primary MID: Mid SEC: Secondary

IN: Intake EX: Exhaust T/B: Timing Belt



**Fig. 112: Identifying Cam Lobes**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

## VALVE, SPRING, AND VALVE SEAL REMOVAL

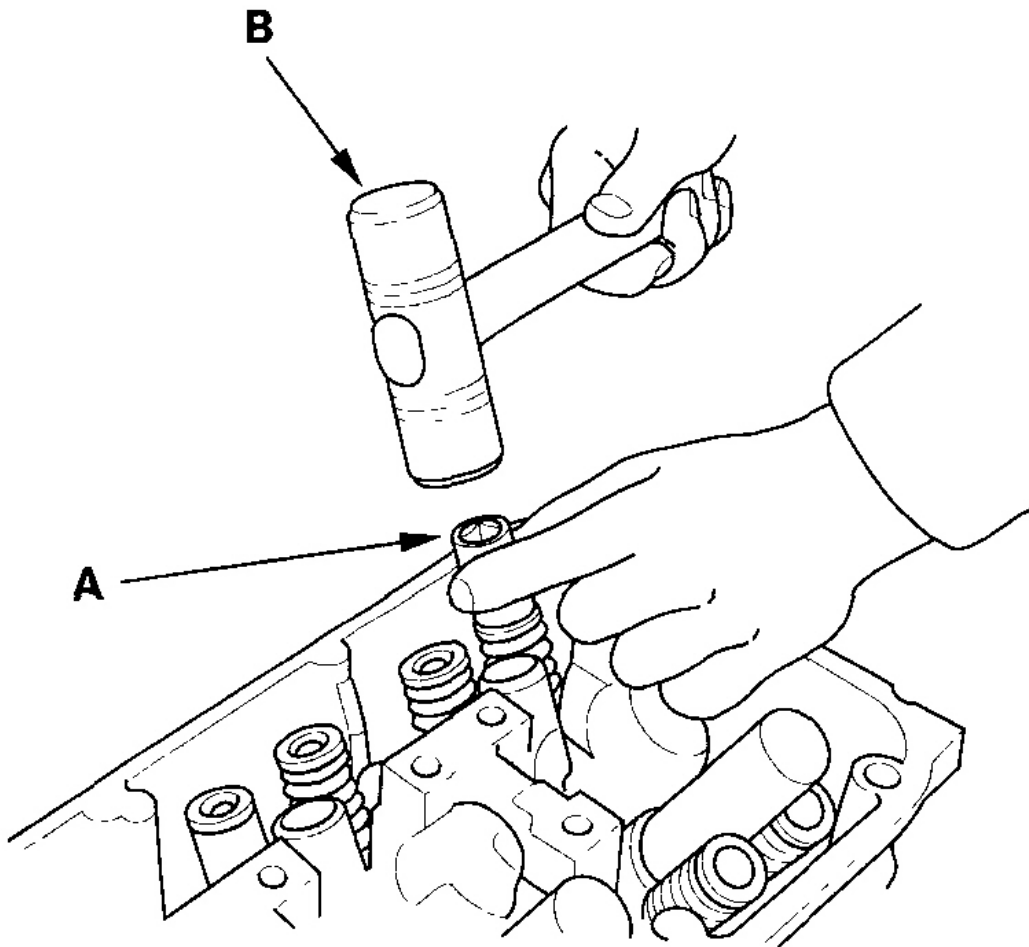


**Special Tools Required**

Valve spring compressor attachment 07757-PJ1010A

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

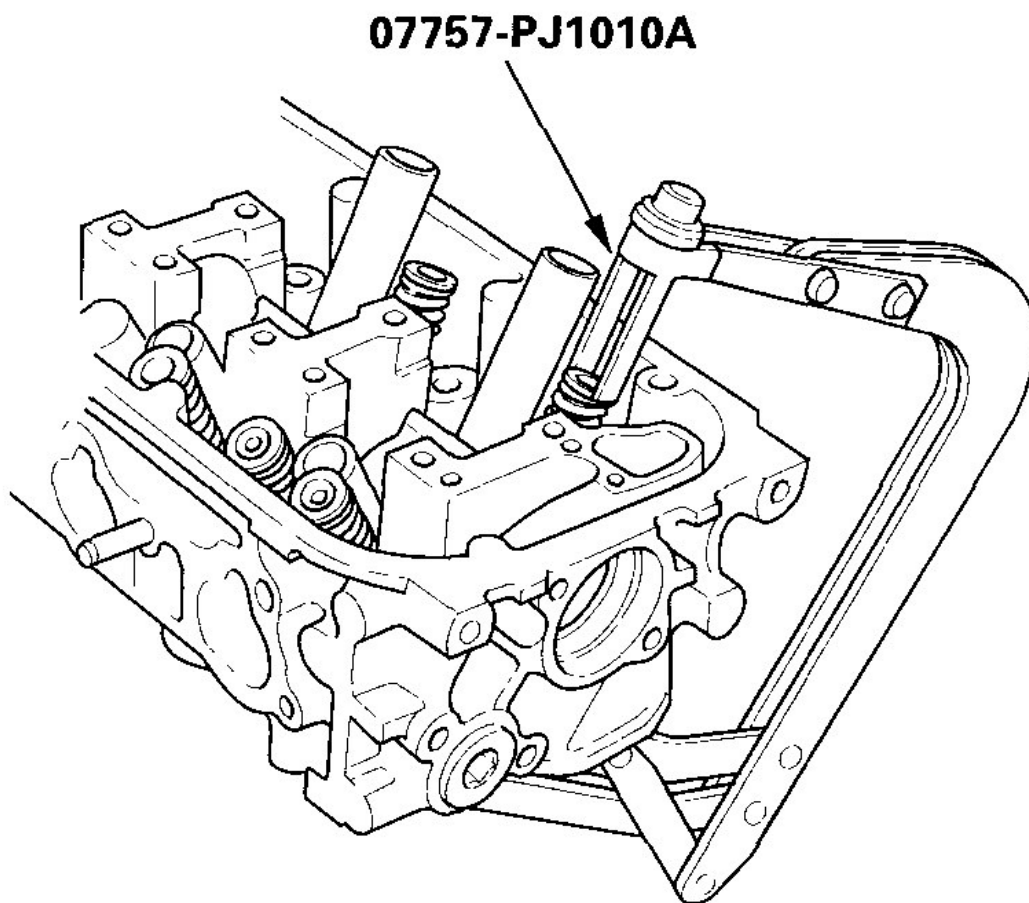
1. Remove the cylinder head (see **CYLINDER HEAD REMOVAL** ).
2. Using an appropriate-sized socket (A) and plastic mallet (B), lightly tap the valve retainer to loosen the valve cotters.



**Fig. 113: Loosening Valve Cotters**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

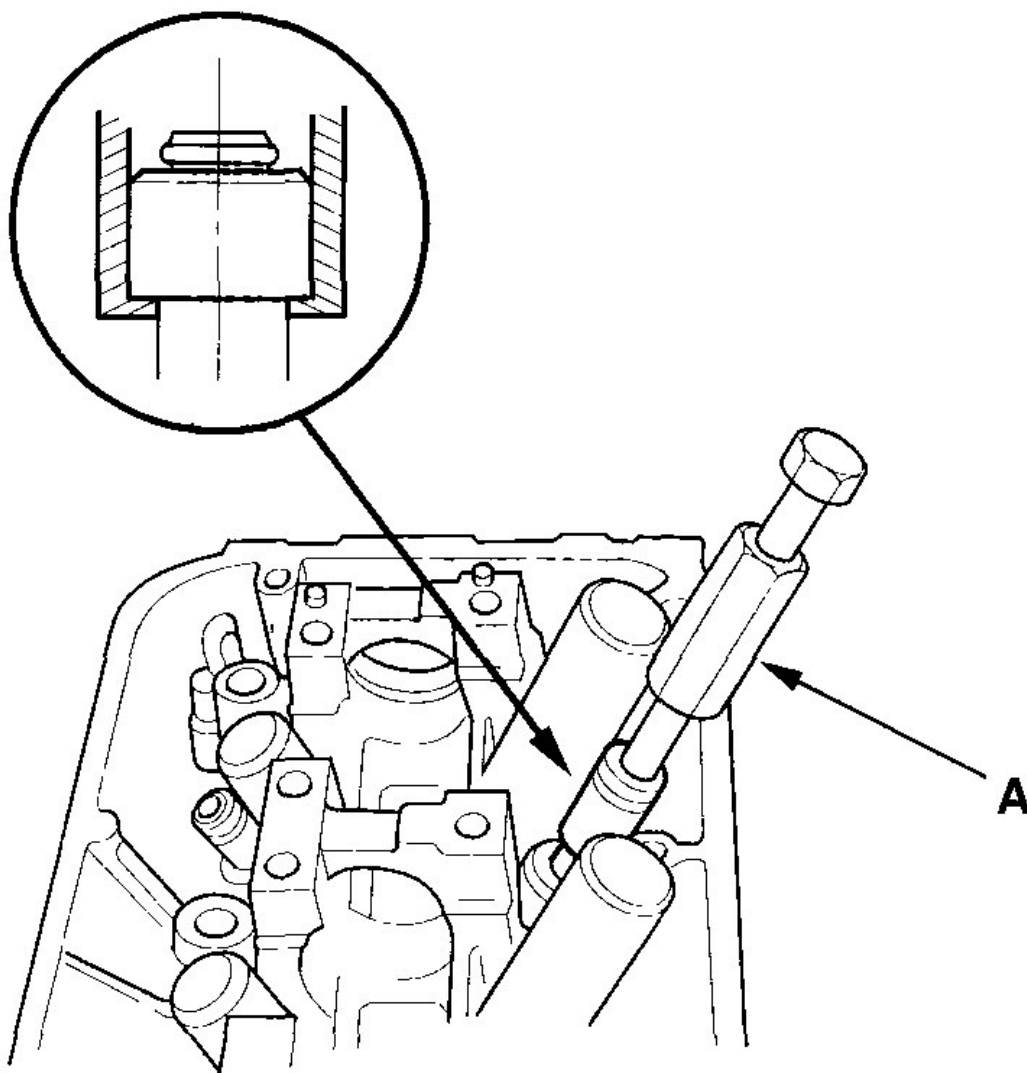
3. Install the valve spring compressor. Compress the spring and remove the valve cotters.



**Fig. 114: Removing Valve Cotters**

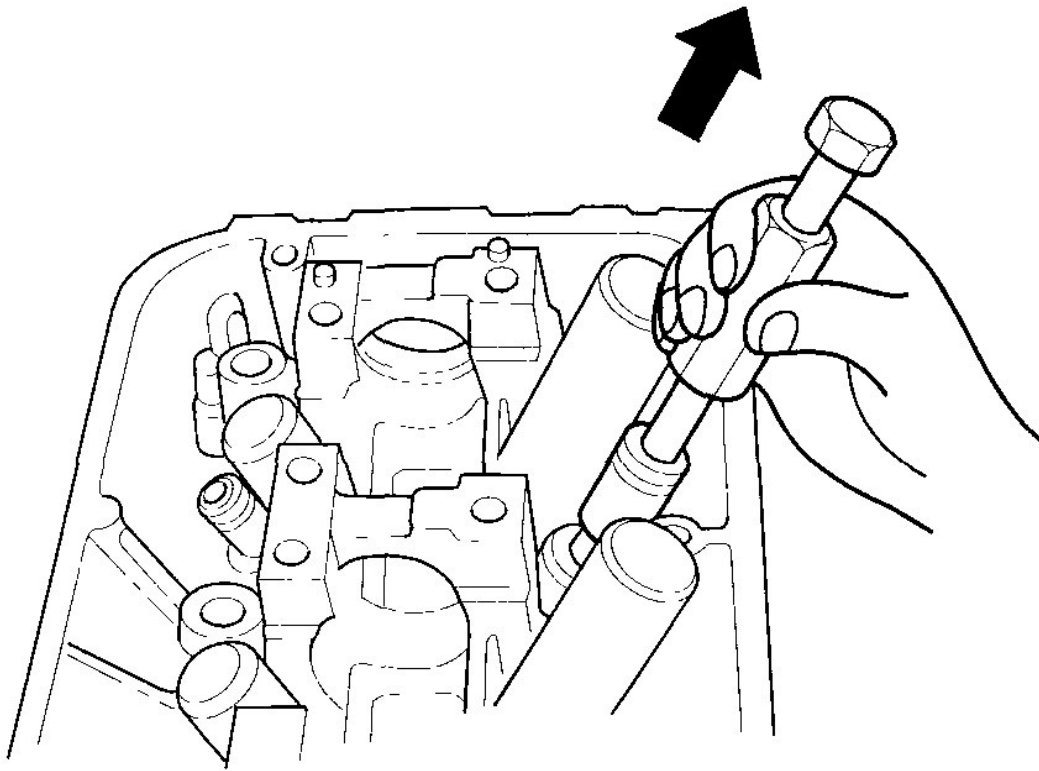
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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



**Fig. 115: Installing Valve Guide Seal Remover**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the valve seal.



**Fig. 116: Removing Valve Seal**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the valve spring seat and valve.

## **VALVE INSPECTION**

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

### **Intake Valve Dimensions**

**A Standard (New): 34.90-35.10 mm (1.374-1.382 in.)**

**B Standard (New): 115.70-116.30 mm (4.555-4.579 in.)**

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

**C Service Limit: 5.455 mm (0.2148 in.)**

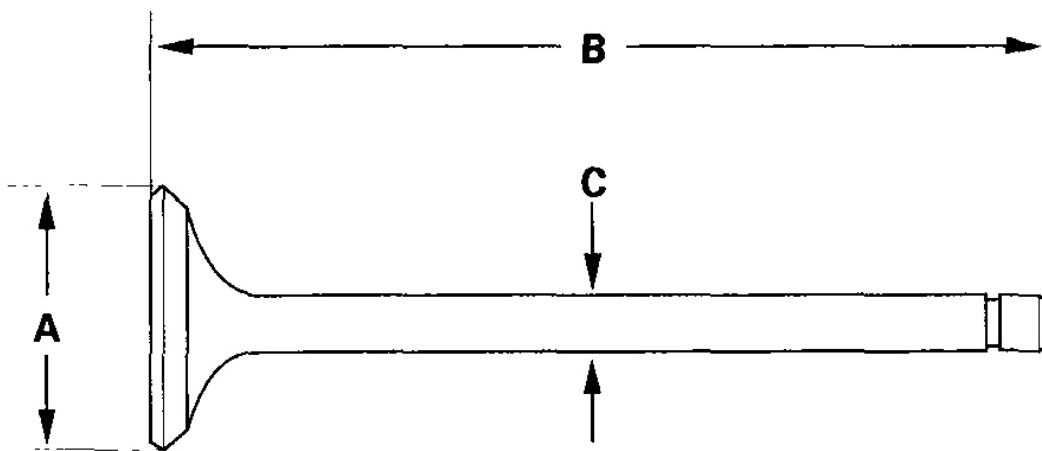
**Exhaust Valve Dimensions**

**A Standard (New): 29.90-30.10 mm (1.177-1.185 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. 117: Identifying Valve Measuring Areas**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

**VALVE STEM-TO-GUIDE CLEARANCE INSPECTION**

1. Remove the valves (see **VALVE, SPRING, AND VALVE SEAL REMOVAL** ).
2. Slide the valve out of its guide about 10 mm (0.39 in.), then measure the guide-to-stem clearance with a dial indicator while rocking the stem in the direction of normal thrust (wobble method).
  - If the measurement exceeds the service limit, recheck it using a new valve.
  - If the measurement is now within the service limit, reassemble using a new valve.
  - If the measurement with a new valve still exceeds the service limit, go to step 3.

**Intake Valve Stem-to-Guide Clearance**

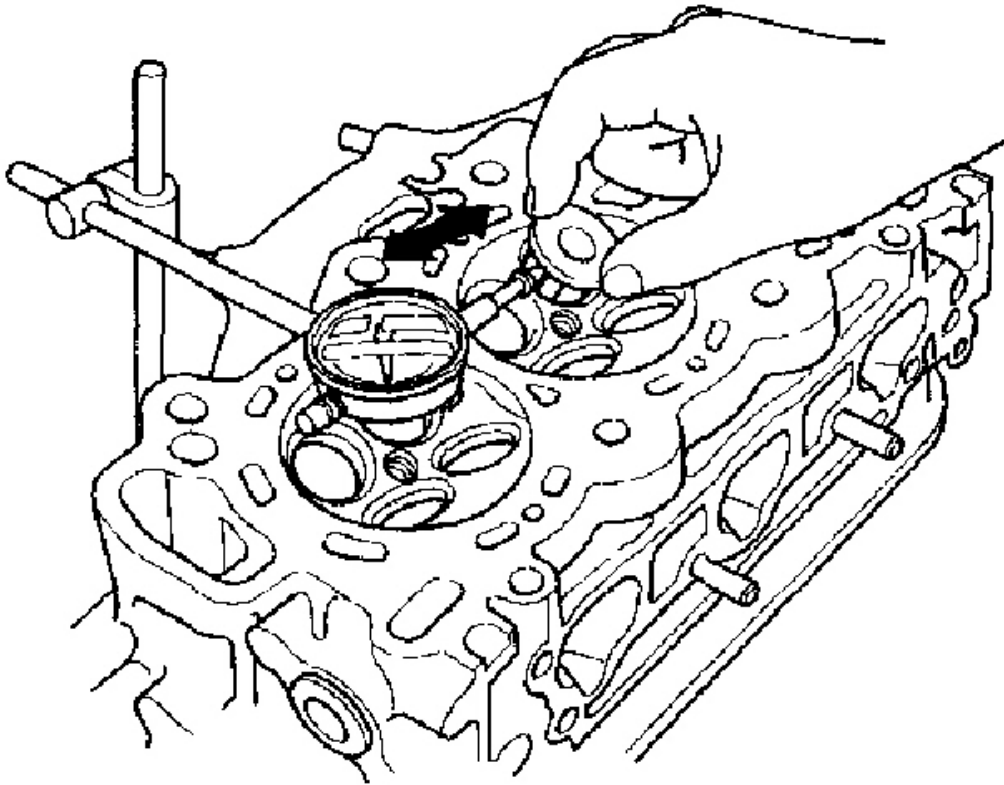
**Standard (New): 0.04-0.09 mm (0.002-0.004 in.)**

**Service Limit: 0.16 mm (0.006 in.)**

**Exhaust Valve Stem-to-Guide Clearance**

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

**Service Limit: 0.22 mm (0.009 in.)**



**Fig. 118: Checking Valve Stem-To-Guide Clearance**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

3. Subtract the O.D. of the valve stem, measured with a micrometer, from the I.D. of the valve guide, measured with an inside micrometer or ball gauge. Take the measurements in three places along the valve stem and three places inside the valve guide. The difference between the largest guide measurement and the smallest stem measurement should not exceed the service limit.

#### **Intake Valve Stem-to-Guide Clearance**

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

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

#### **Exhaust Valve Stem-to-Guide Clearance**

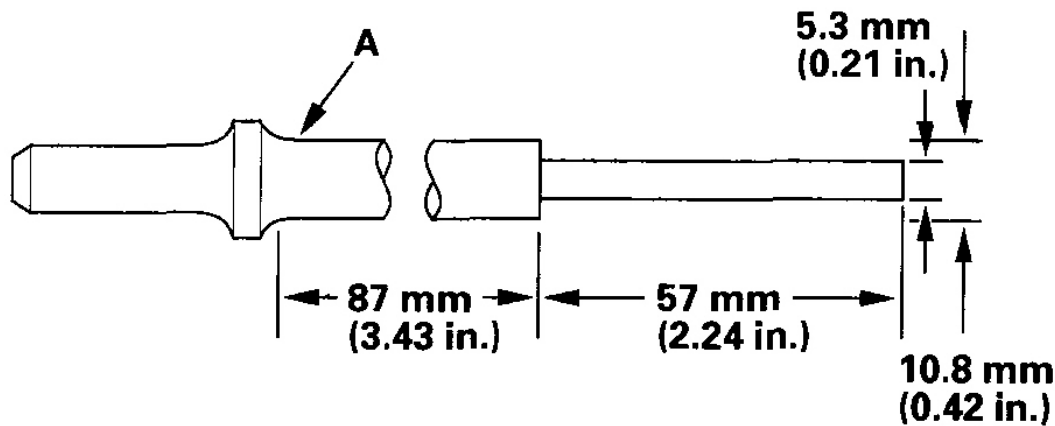
**Standard (New): 0.055-0.080 mm (0.0022-0.0031 in.)**

**Service Limit: 0.11 mm (0.004 in.)**

## VALVE GUIDE REPLACEMENT

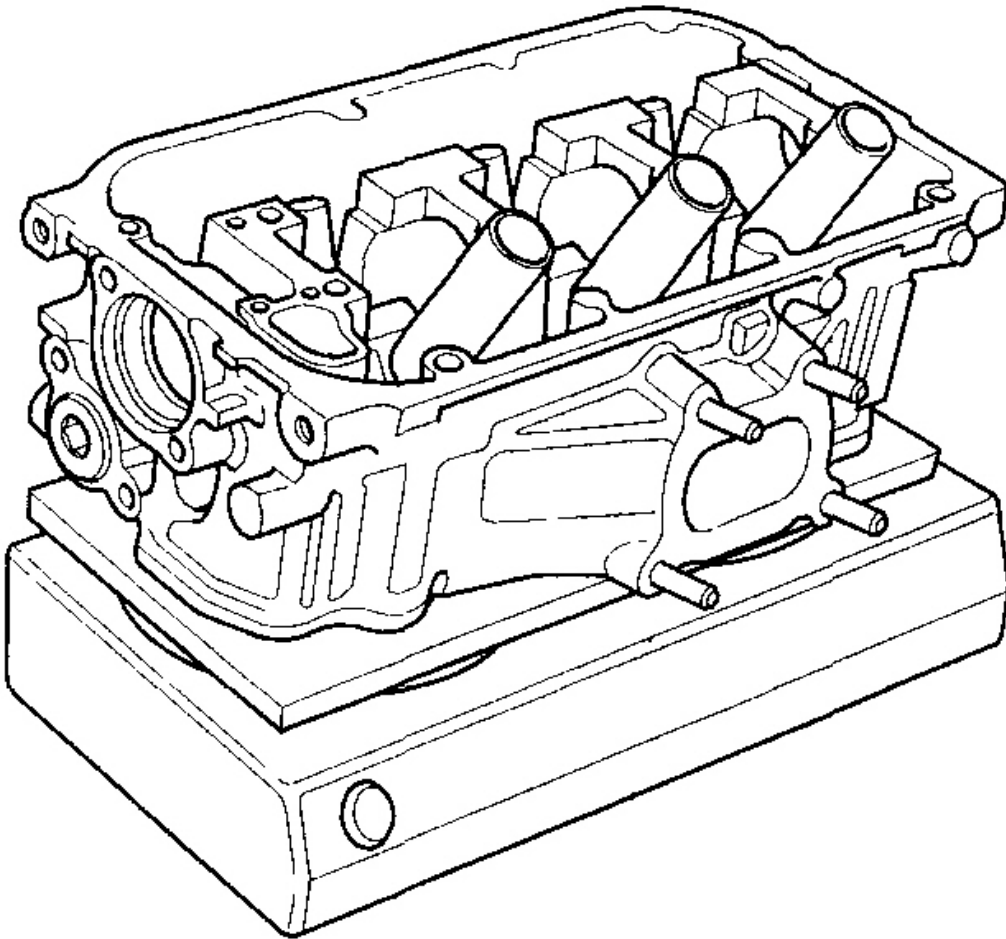
### Special Tools Required

- Valve guide driver, 5.5 mm 07742-0010100
  - Valve guide reamer, 5.5 mm 07HAH-PJ7A100
1. Inspect valve stem-to-guide clearance (see **VALVE INSPECTION** ).
  2. As 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 special tool and a conventional hammer.



**Fig. 119: Identifying Air-Impact Valve Guide Driver**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

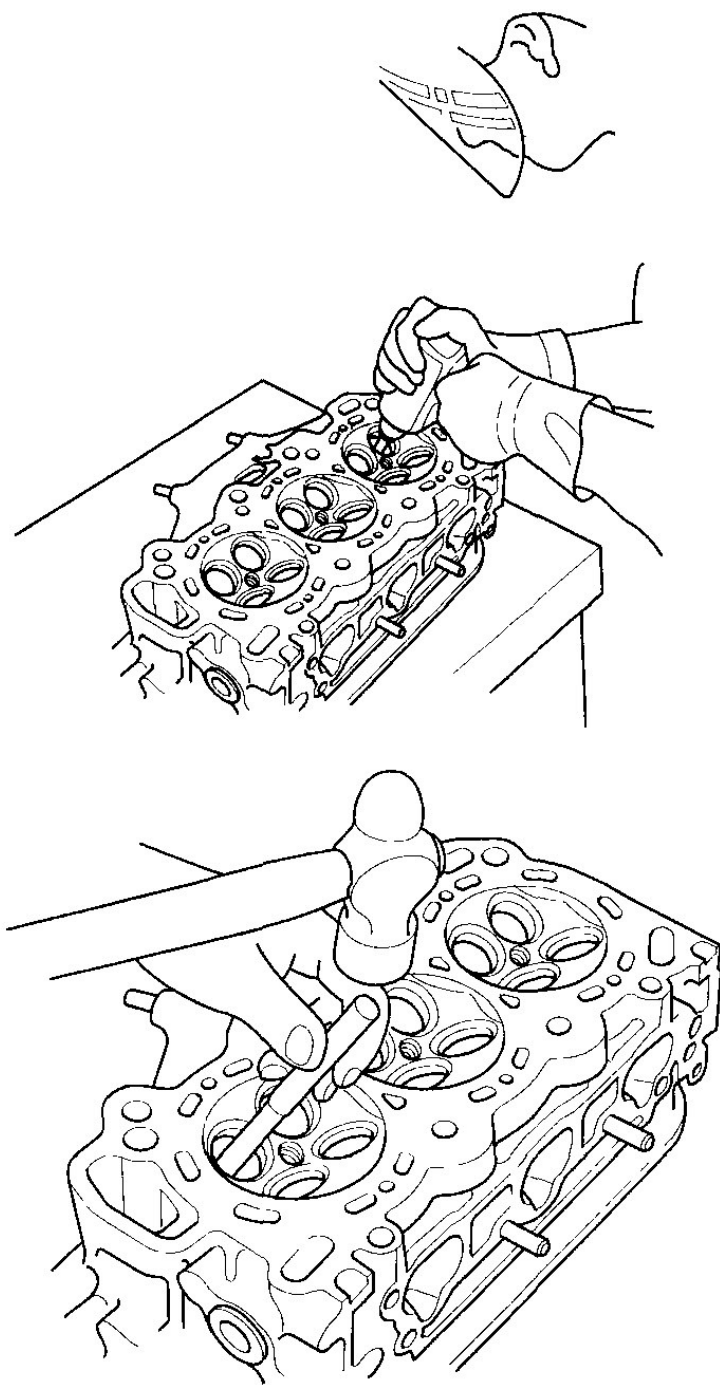


**Fig. 120: Heating Cylinder Head**

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. 121: Removing 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.

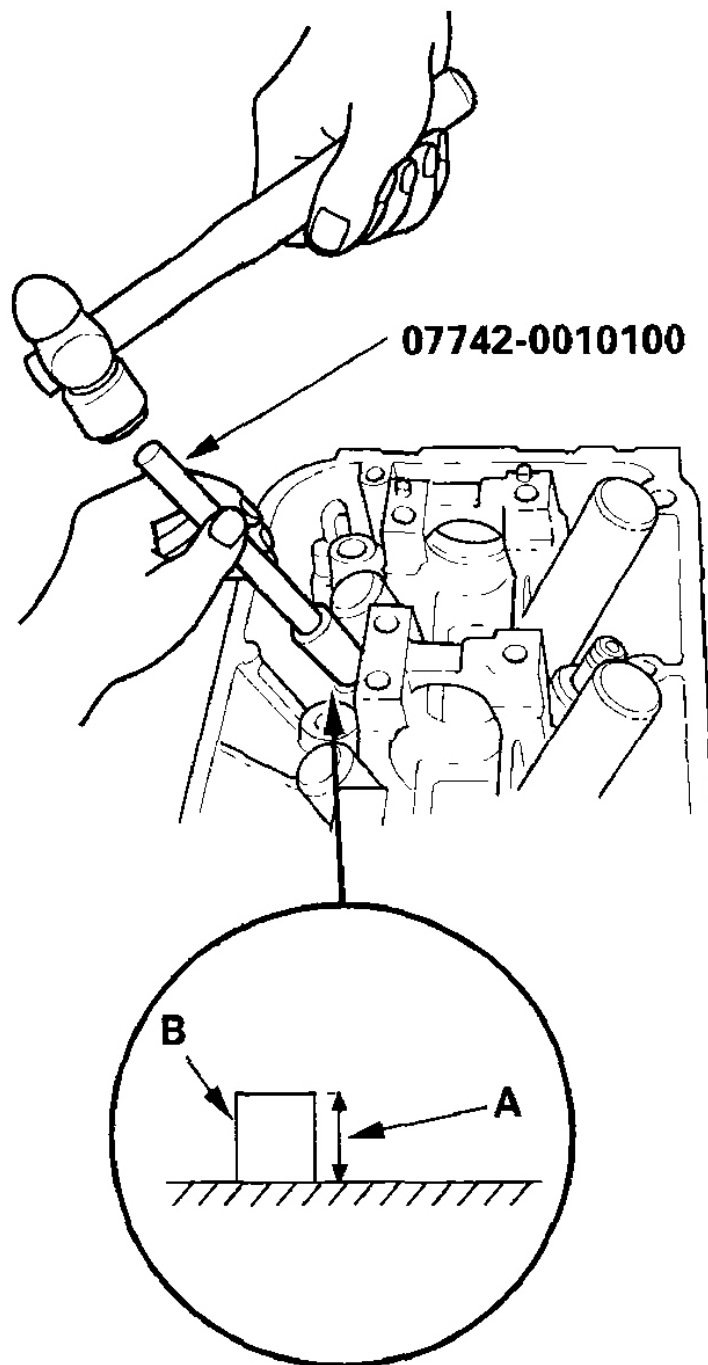
**NOTE:**        **Drill guides only in extreme cases; you could damage the cylinder head if the guide breaks.**

8. Take out the new guide(s) from the freezer, one at a time, as you need them.
9. Apply a thin coat of new engine oil to the outside of the new valve guide. Install the guide from the camshaft side of the head; use the special tool 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.)**

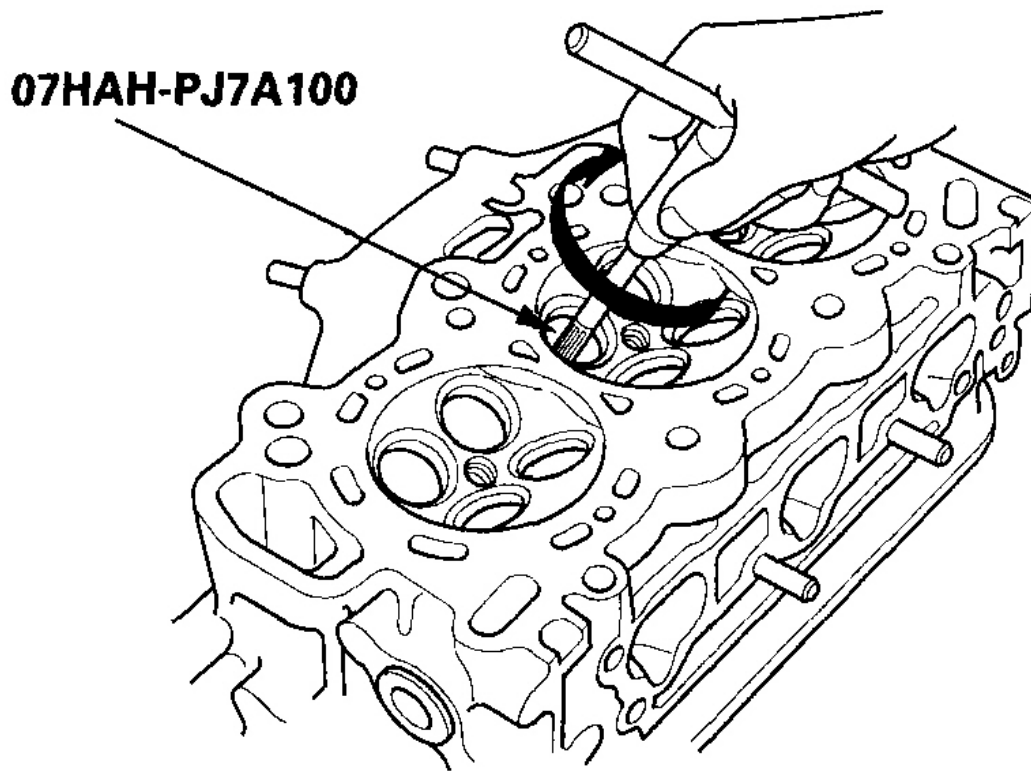
**Exhaust: 20.60-21.60 mm (0.811-0.850 in.)**



**Fig. 122: Installing Guide**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

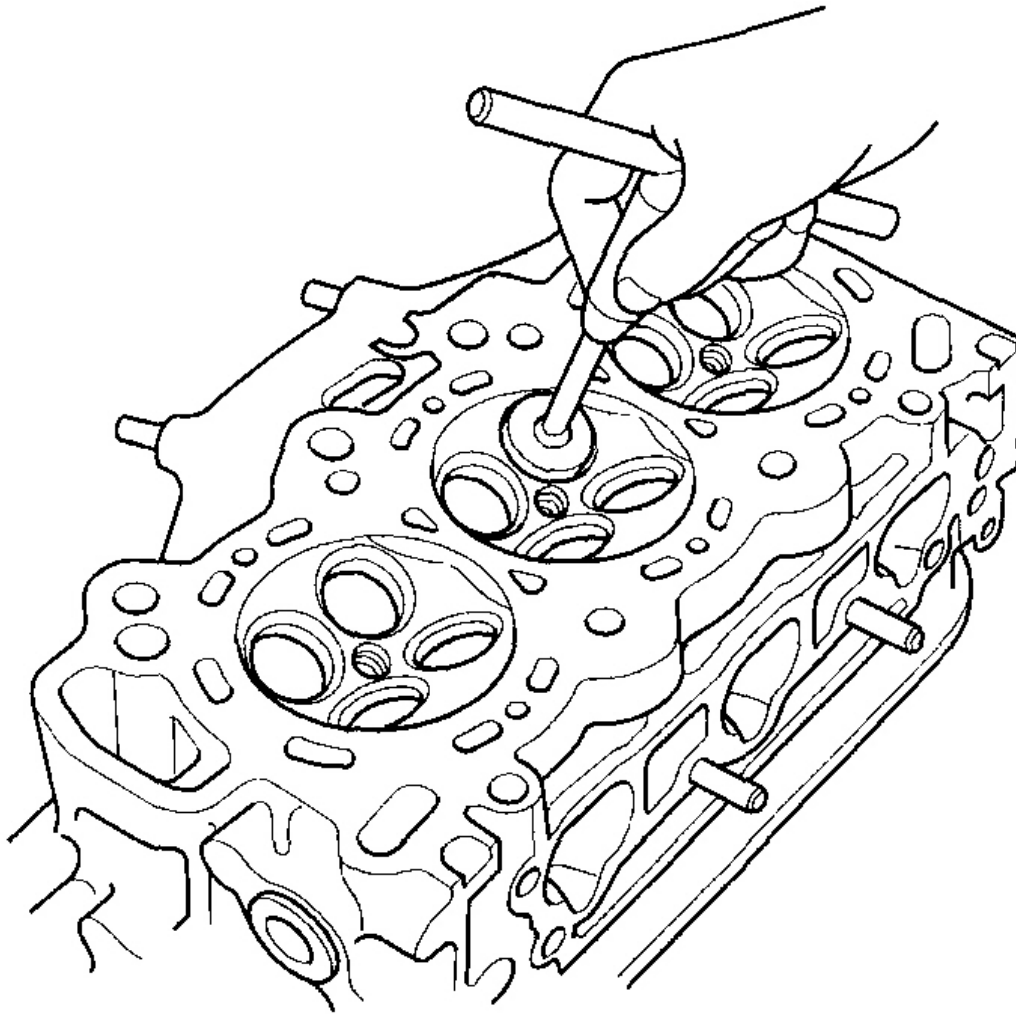


**Fig. 123: Rotating Reamer Clockwise**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

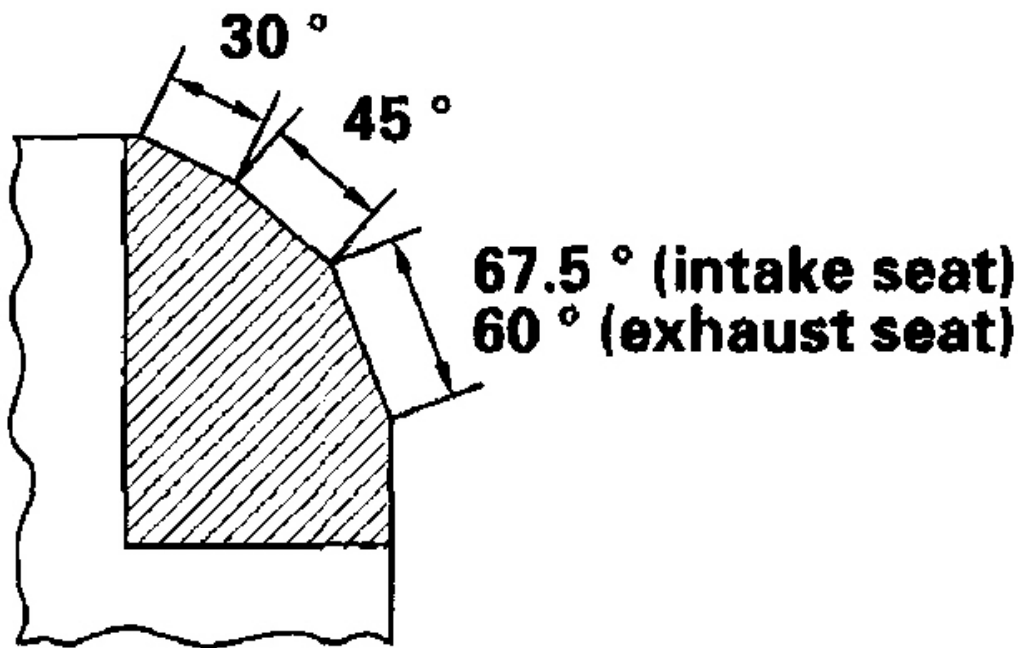
## VALVE SEAT RECONDITIONING

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

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



**Fig. 125: Identifying Valve Seat Cutter Angle**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

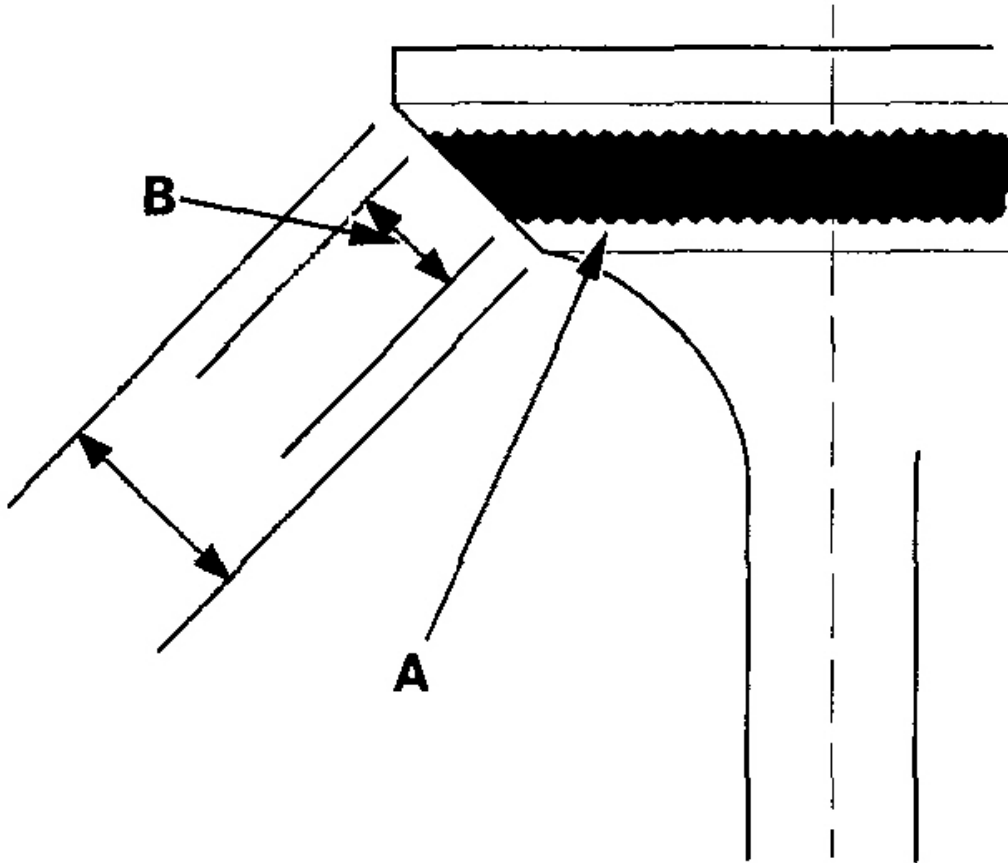
5. Make one more very light pass with the 45° cutter to remove any possible burrs caused by the other cutters.

#### **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. 126: Identifying Valve Seating Surface**

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

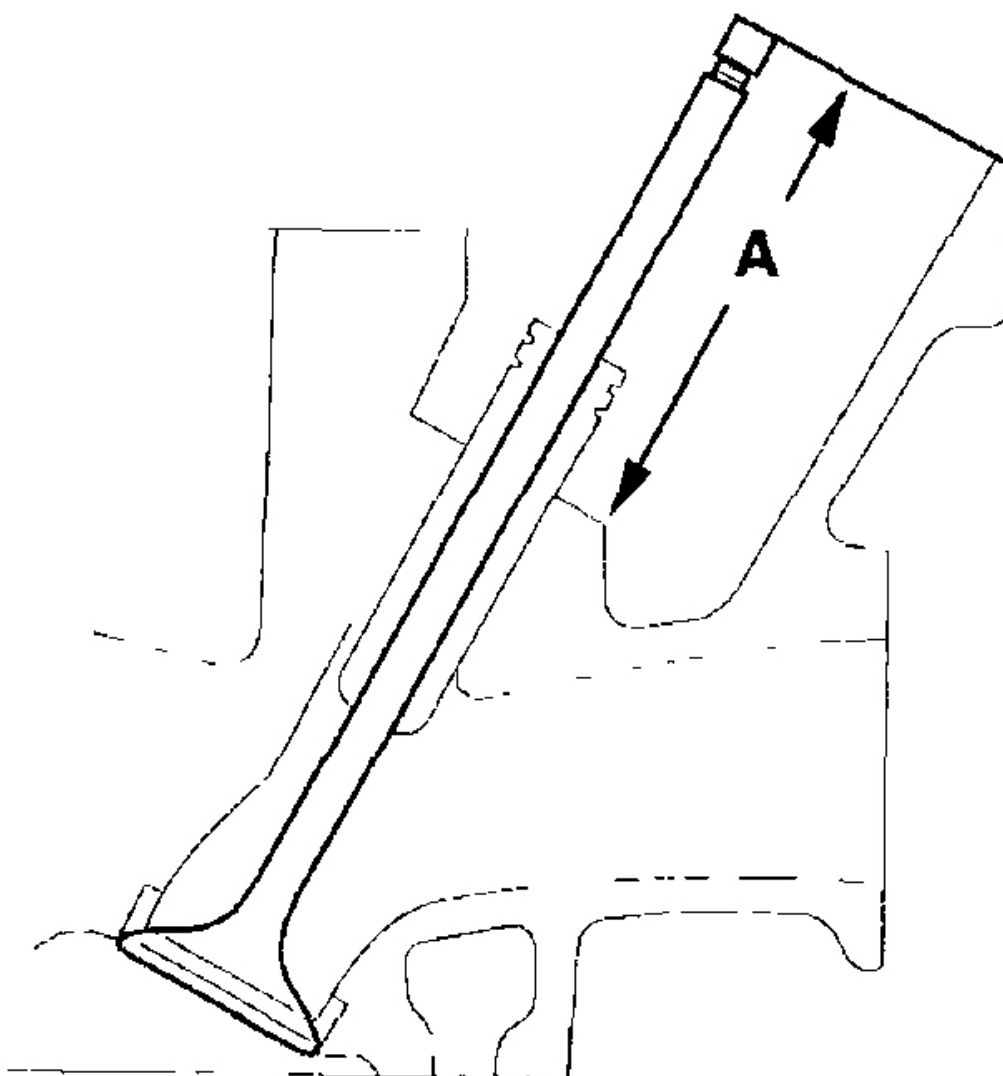
**Standard (New): 46.75-47.55 mm (1.841-1.872 in.)**

**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. 127: Identifying Valve Stem Installed Height**



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

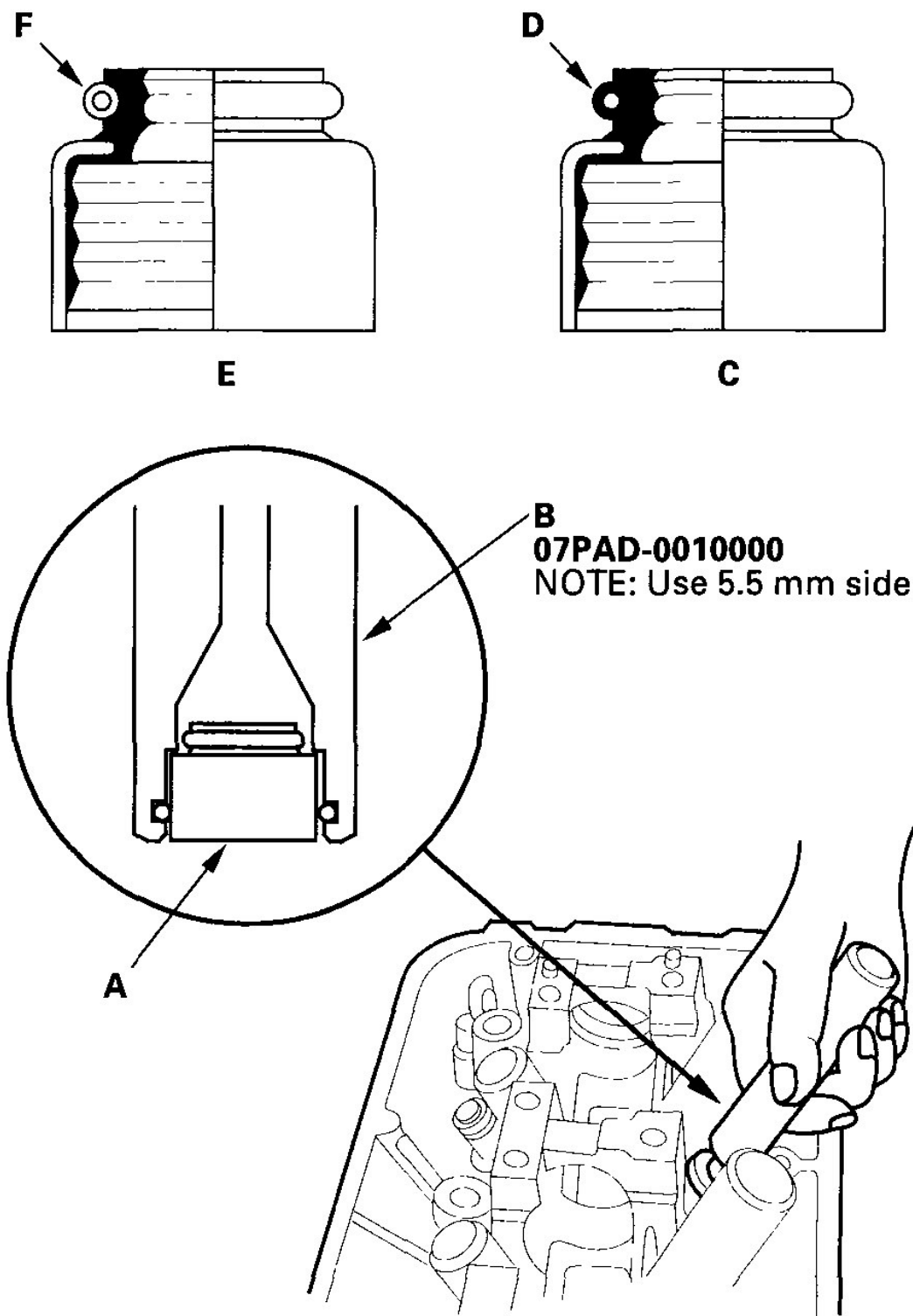
9. If the valve stem installed height is over the service limit, replace the valve and recheck. If it is still over the service limit, replace the cylinder head; the valve seat in the head is too deep.

## **VALVE, SPRING, AND VALVE SEAL INSTALLATION**

### **Special Tools Required**

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

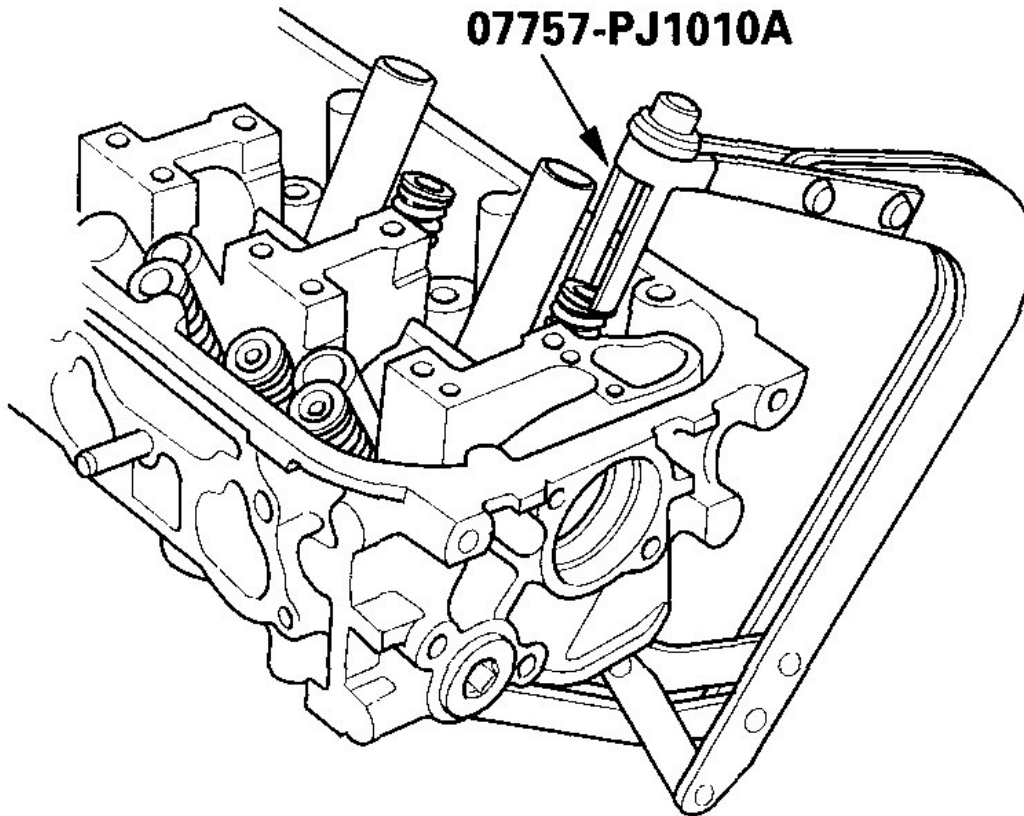
**NOTE:** Exhaust valve seals (C) have a black spring (D) and intake valve seals (E) have a white spring (F); they are not interchangeable.



**Fig. 128: Installing Valve Seals**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

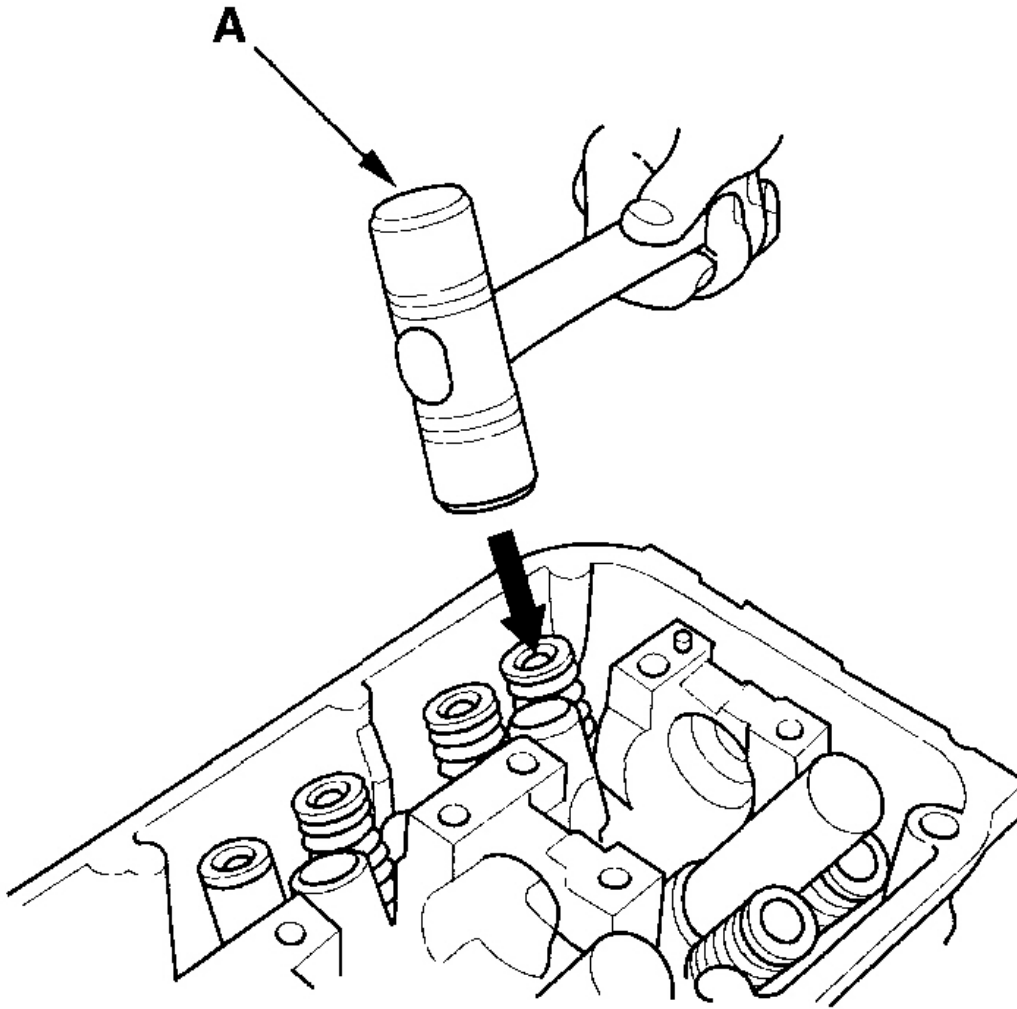
5. Install the valve spring and valve retainer. Place the end of the valve spring with closely wound coils toward the cylinder head.
6. Install the valve spring compressor. Compress the spring and install the valve cotters.



**Fig. 129: Installing Valve Cotters**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



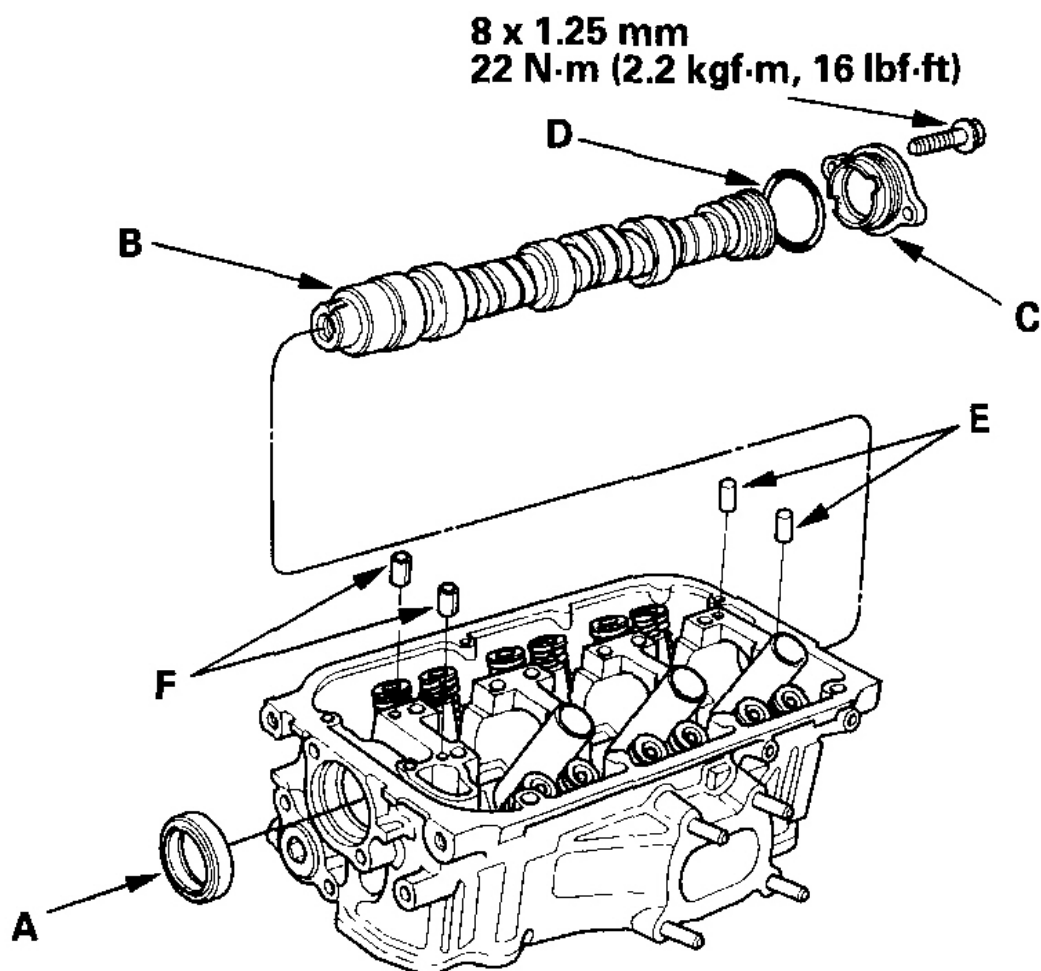
**Fig. 130: Taping End Of Valve Stem**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

## **CAMSHAFT, ROCKER ARM, CAMSHAFT SEAL, AND PULLEY INSTALLATION**

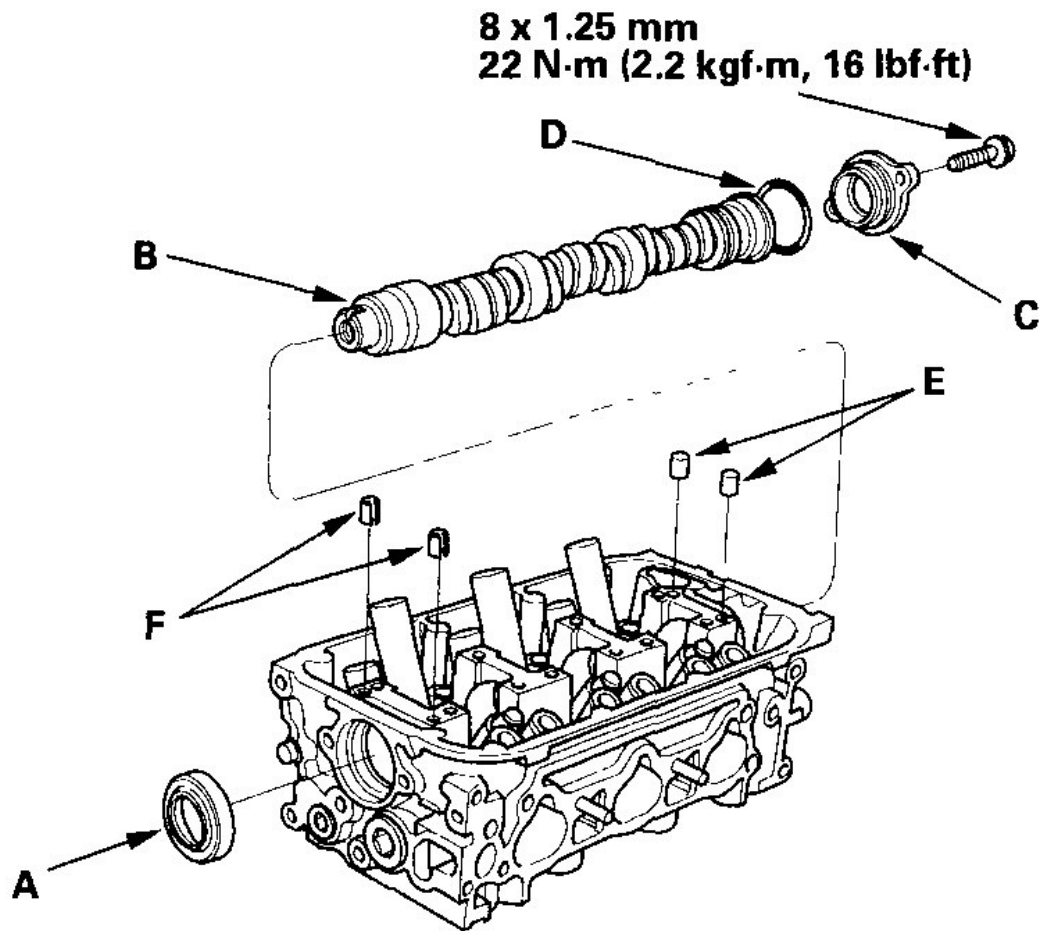
1. Apply a light coat of new engine oil around the camshaft oil seal.
2. Gently tap the new camshaft oil seal (A) into the cylinder head.
  - 1 Tap the camshaft oil seal in squarely.
  - 2 Install the oil seal about 0.5-1.5 mm (0.02-0.06 in.) below the surface of the cylinder head.

**FRONT:**



**Fig. 131: Installing Front Camshaft Oil Seal**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

**REAR:**



**Fig. 132: Installing Rear Camshaft Oil Seal**

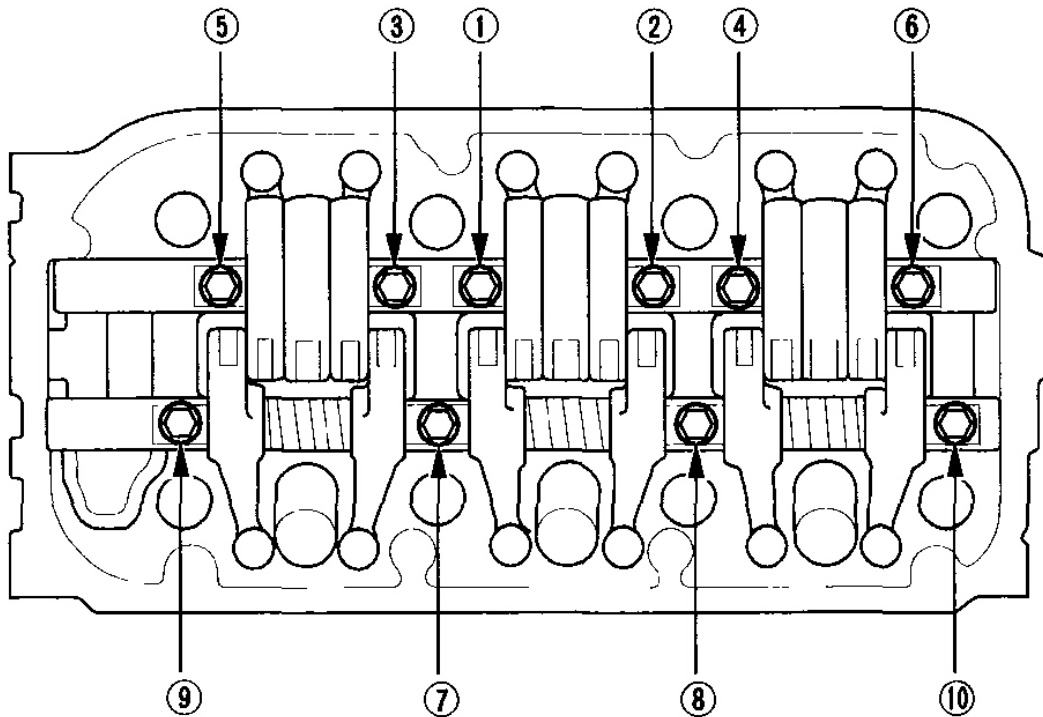
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Insert the camshaft (B) into the cylinder head, then install the camshaft thrust cover (C). Always use a new O-ring (D).
4. Check that the oil seal lips are not distorted.
5. Install the solid dowel pins (E) and the hollow dowel pins (F).
6. Loosen the valve adjusting screws.
7. If the rocker arm assembly is disassembled, reassemble the rocker arm assembly (see **ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY** ).
8. 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.
9. Tighten each bolt two turns at a time in the sequence as shown to ensure that the rockers do not bind on the valves.

**NOTE:** Apply new engine oil to the threads and flange of the exhaust rocker shaft mounting bolts.

**Specified Torque**

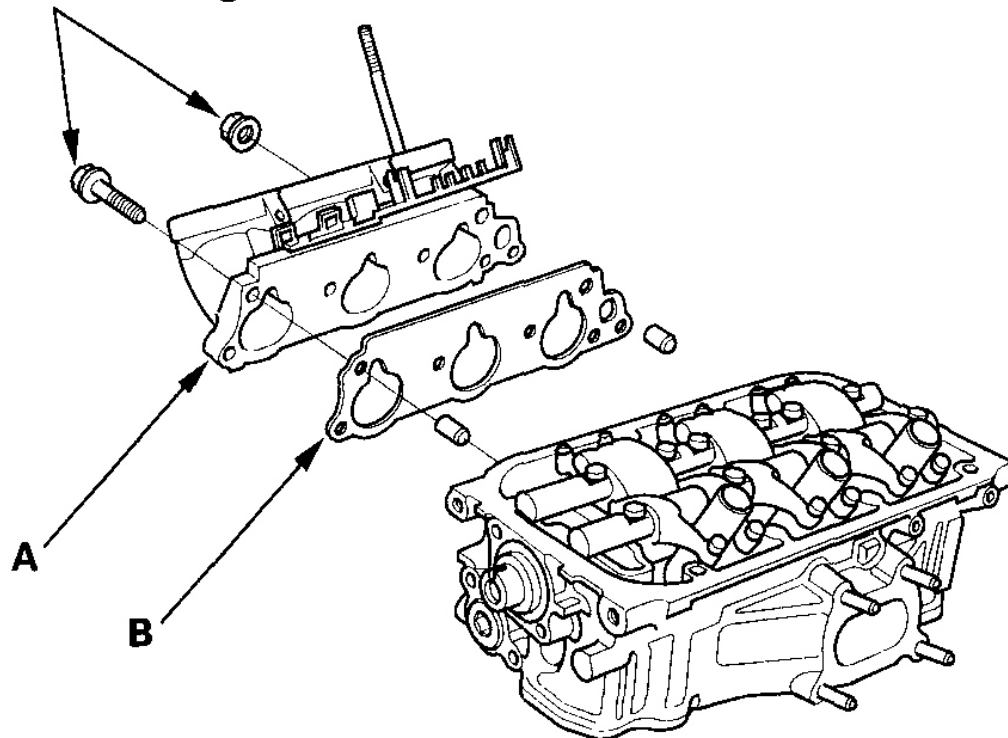
8 x 1.25 mm: 24 N.m (2.4 kgf.m, 17 lbf.ft)



**Fig. 133: Identifying Rocker Shaft Mounting Bolts Tightening Sequence**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

**8 x 1.25 mm  
22 N·m (2.2 kgf·m, 16 lbf·ft)**

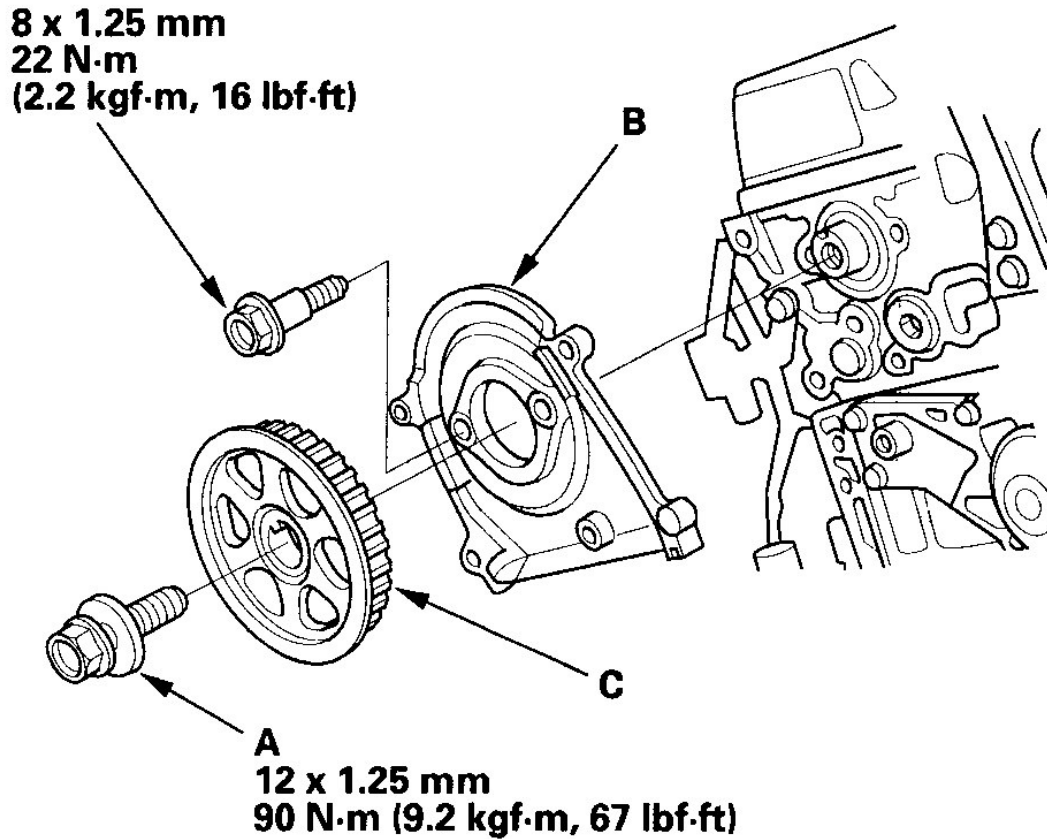


**Fig. 134: Installing Injector Base**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. 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).

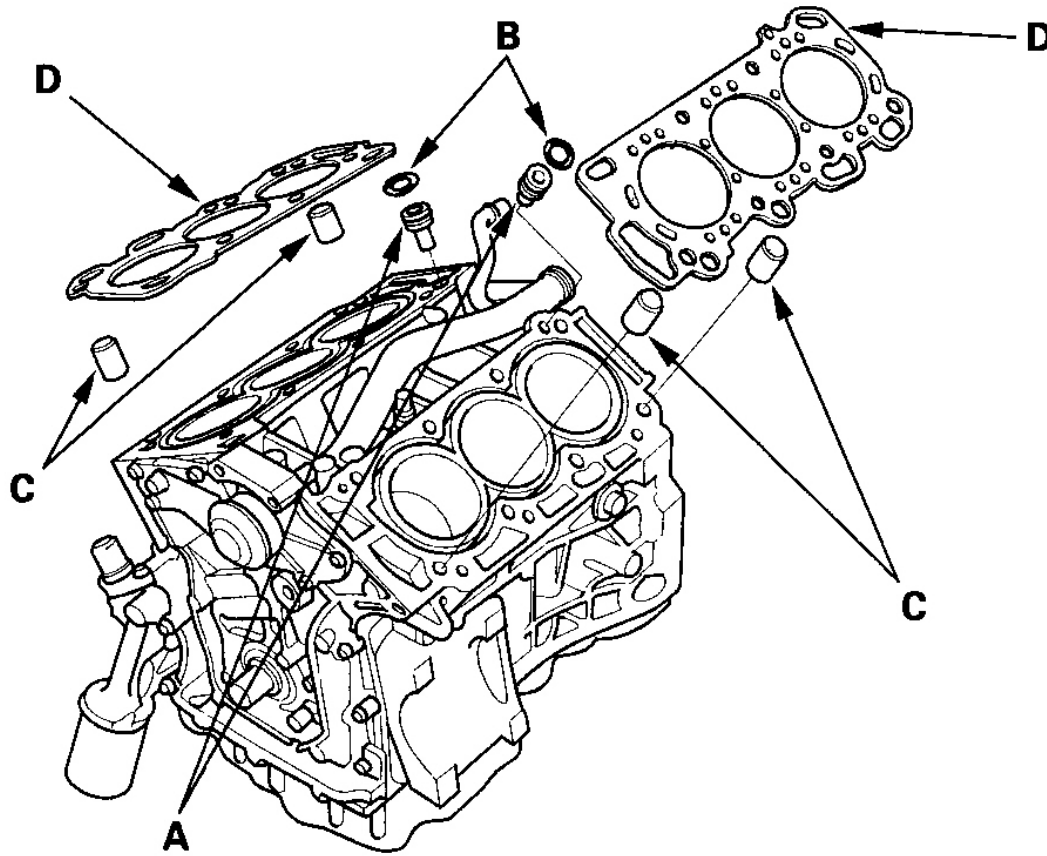




**Fig. 135: Installing Back Cover And Camshaft Pulley**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

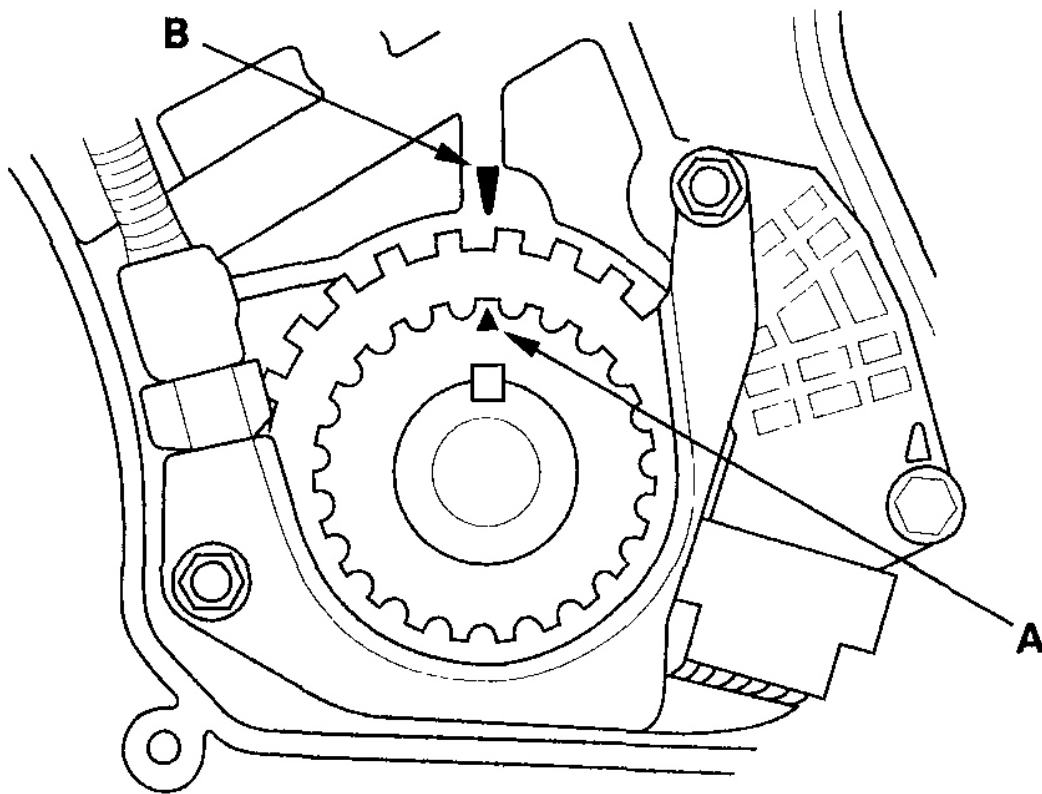
## CYLINDER HEAD INSTALLATION

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



**Fig. 136: Installing Oil Control Orifices**  
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

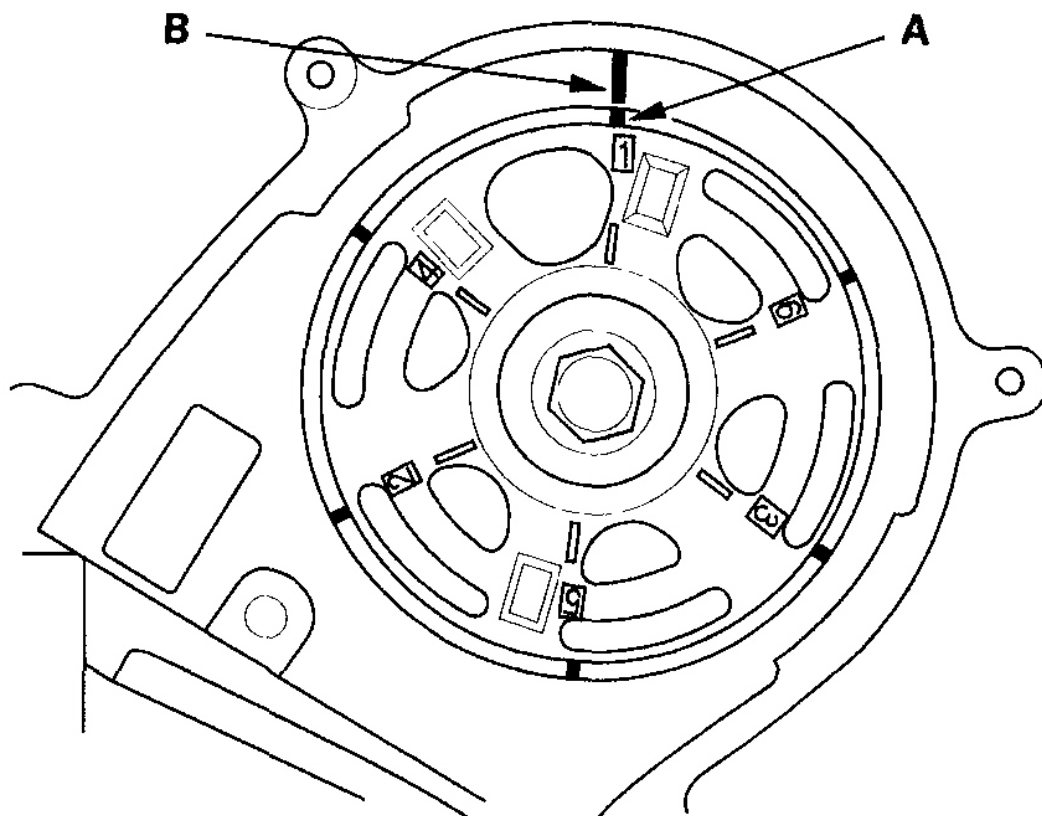
3. Install the dowel pins (C) and new cylinder head gaskets (D).
4. Put the cylinder head onto the engine block.
5. Clean the timing belt pulleys, timing belt guide plate, and the upper and lower covers.
6. Set the timing belt drive pulley to top dead center (TDC) by aligning the TDC mark (A) on the tooth of the timing belt drive pulley with the pointer (B) on the oil pump.



**Fig. 137: Aligning TDC Mark On Tooth Of Timing Belt Drive Pulley With Pointer On Oil Pump**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

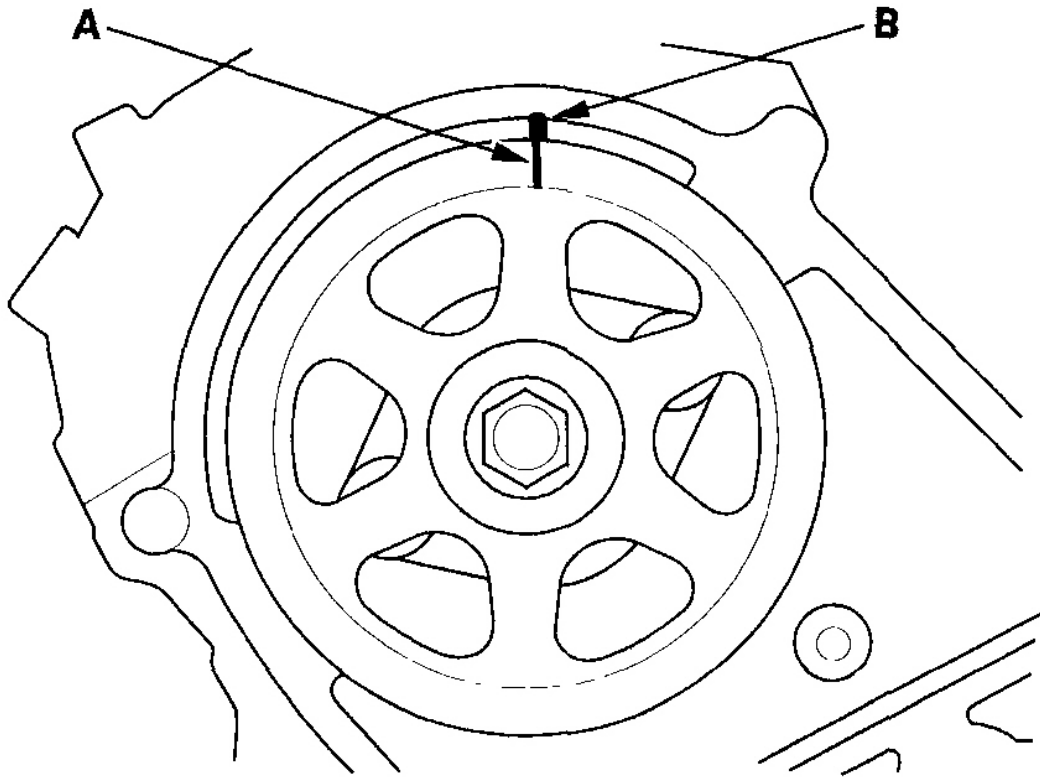
7. Set the camshaft pulleys to TDC by aligning the TDC marks (A) on the camshaft pulleys with the pointers (B) on the back covers.

**FRONT:**



**Fig. 138: Aligning TDC Marks On Camshaft Pulleys With Pointers On Back Covers (Front)**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

**REAR:**



**Fig. 139: Aligning TDC Marks On Camshaft Pulleys With Pointers On Back Covers (Rear)**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Apply new engine oil to the threads and flanges of the cylinder head bolts.
9. Tighten the cylinder head bolts sequentially in three steps.

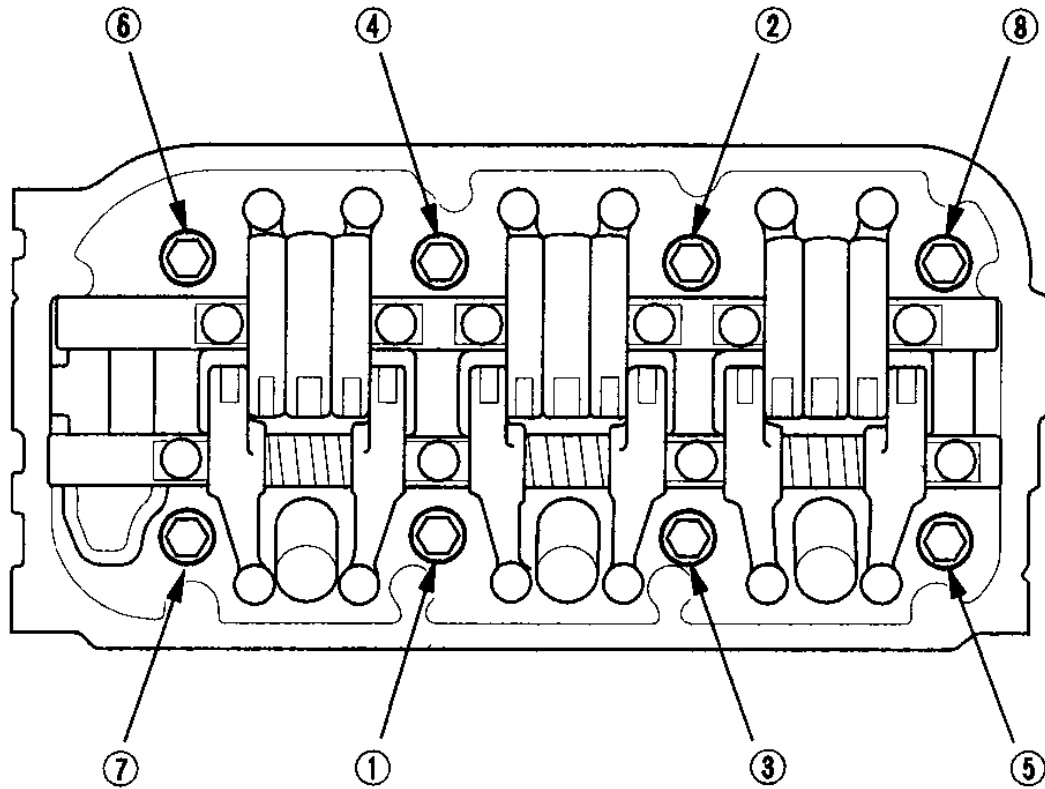
**NOTE: Perform each step twice.**

**1st Step Torque: 39 N.m (4.0 kgf.m, 29 lbf.ft)**

**2nd Step Torque: 69 N.m (7.0 kgf.m, 51 lbf.ft)**

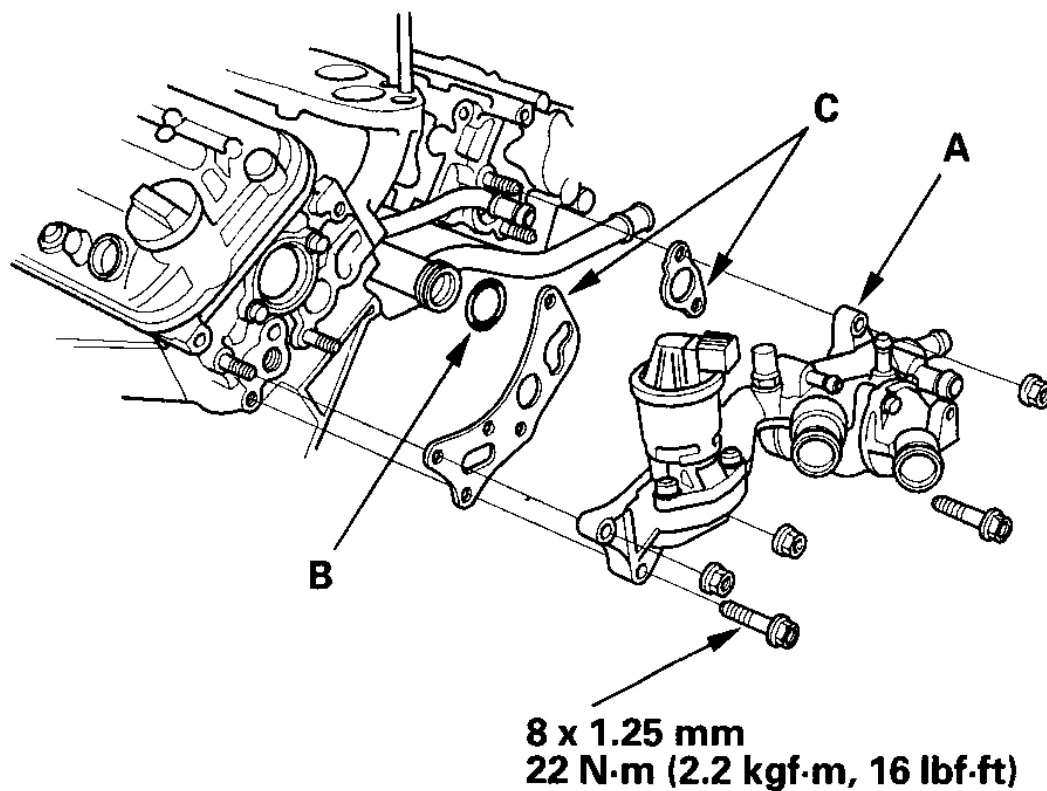
**3rd Step Torque: 98.1 N.m (10.0 kgf.m, 72.3 lbf.ft)**

Use a beam-type torque wrench. When using a preset-type torque wrench, be sure to tighten slowly and not to overtighten. If a bolt makes any noise while you are torquing it, loosen the bolt, and retighten it from the 1st step.



**Fig. 140: Identifying Cylinder Head Bolts Tightening Sequence**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

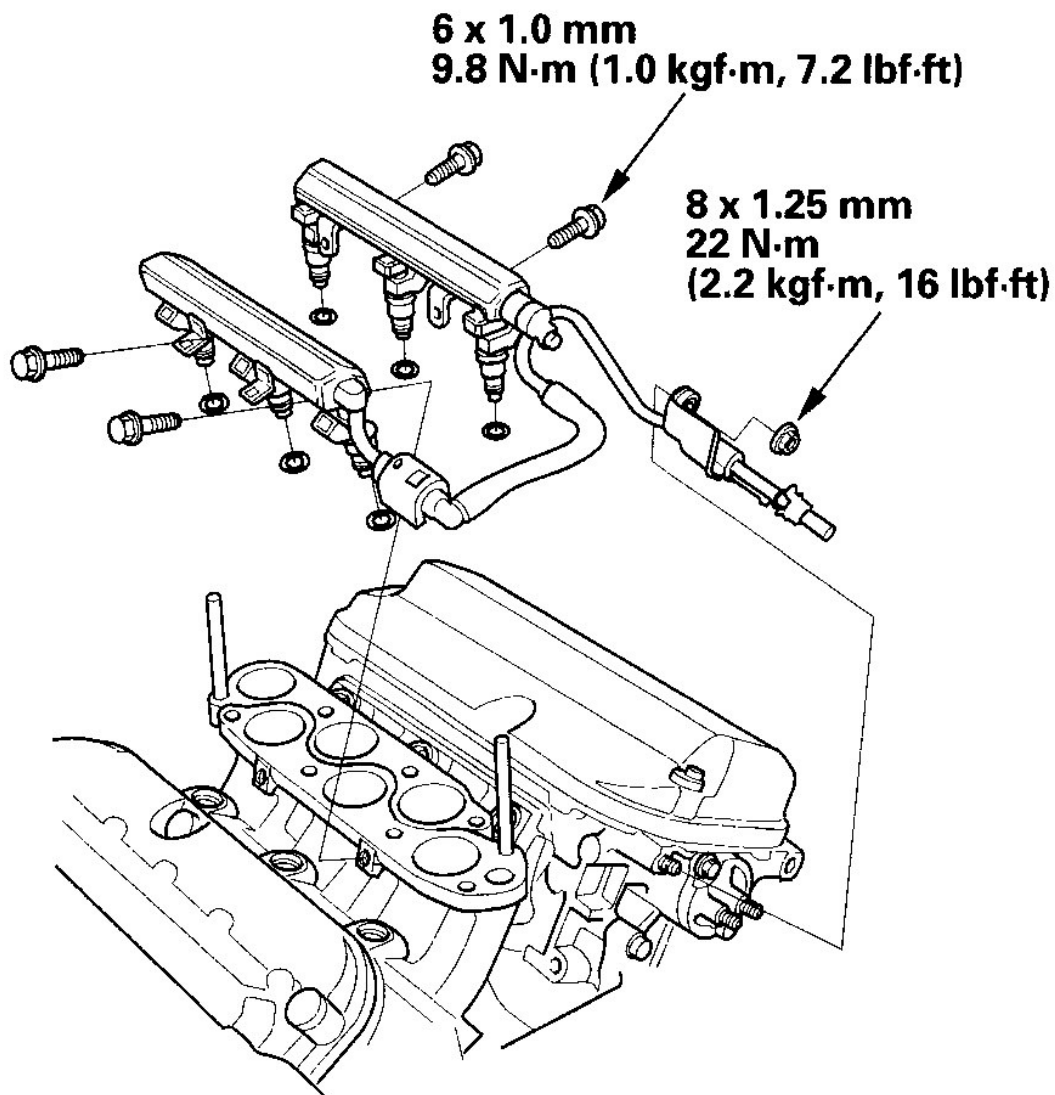
10. Install the timing belt (see **TIMING BELT INSTALLATION** ).
11. Adjust the valve clearance (see **VALVE CLEARANCE ADJUSTMENT** ).
12. Install the cylinder head cover (see **CYLINDER HEAD COVER INSTALLATION** ).
13. Install the front and rear warm up three way catalytic converter (WU-TWC) (see **WARM UP TWC REMOVAL/INSTALLATION** ).
14. Install the water passage (A). Always use a new O-ring (B) and new gaskets (C).



**Fig. 141: Installing Water Passage**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Set the new O-rings to the injectors, then install the fuel rails.

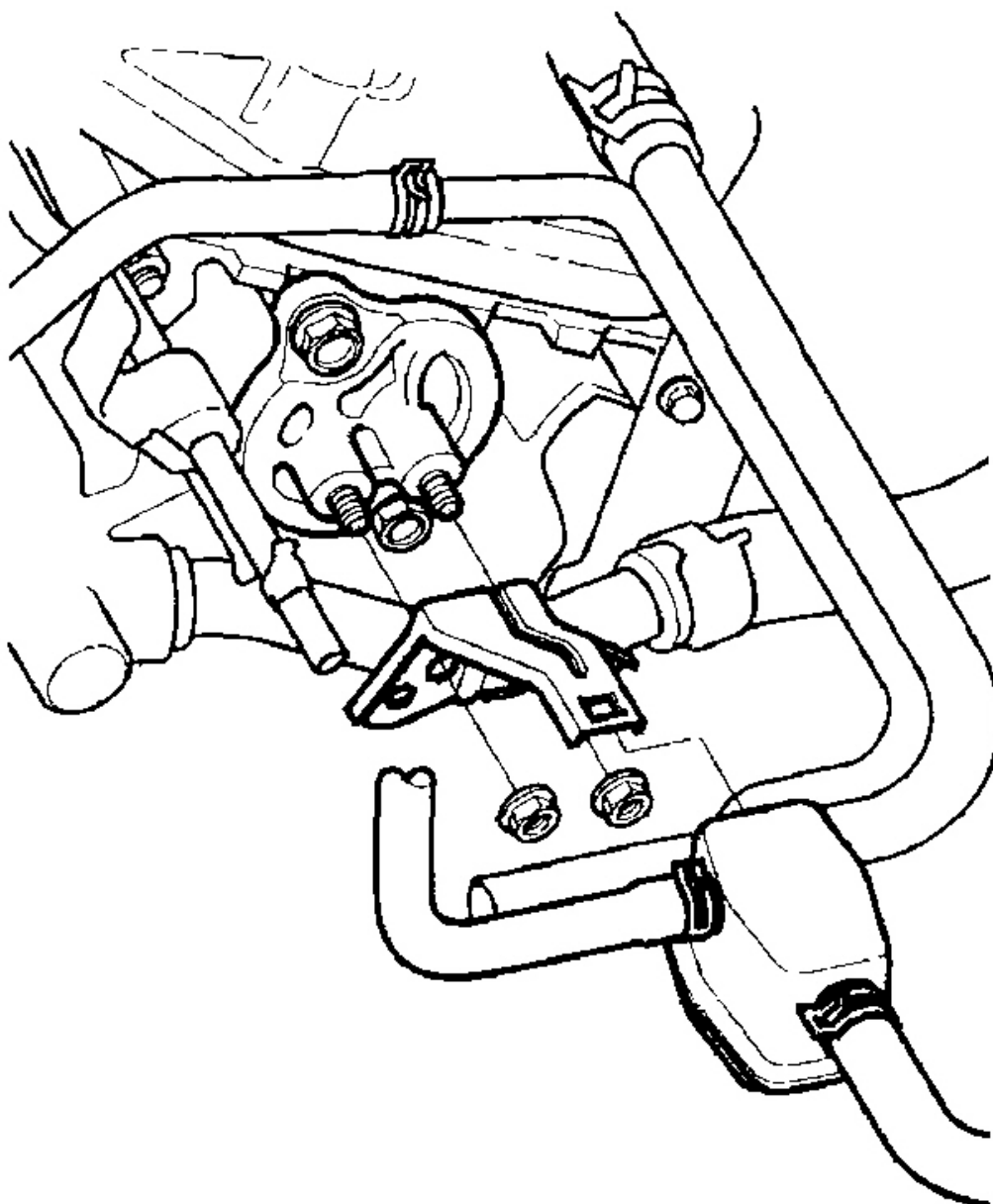


**Fig. 142: Installing Fuel Rails**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

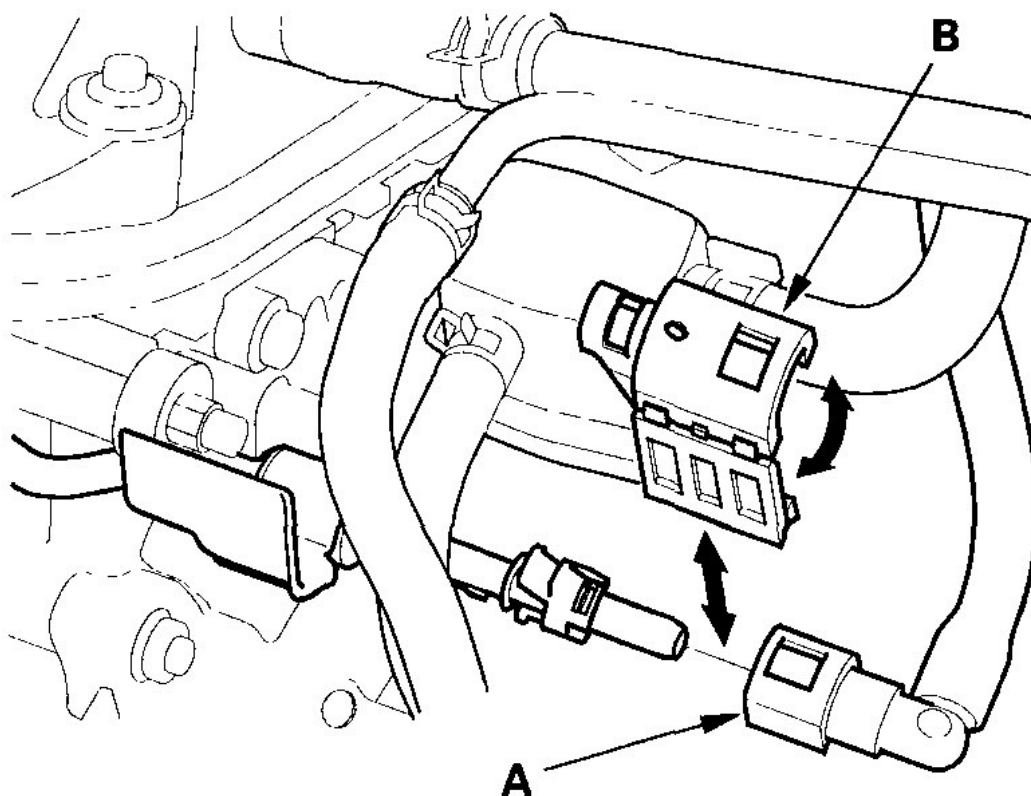
16. Install the evaporative emission (EVAP) canister hose joint with bracket.





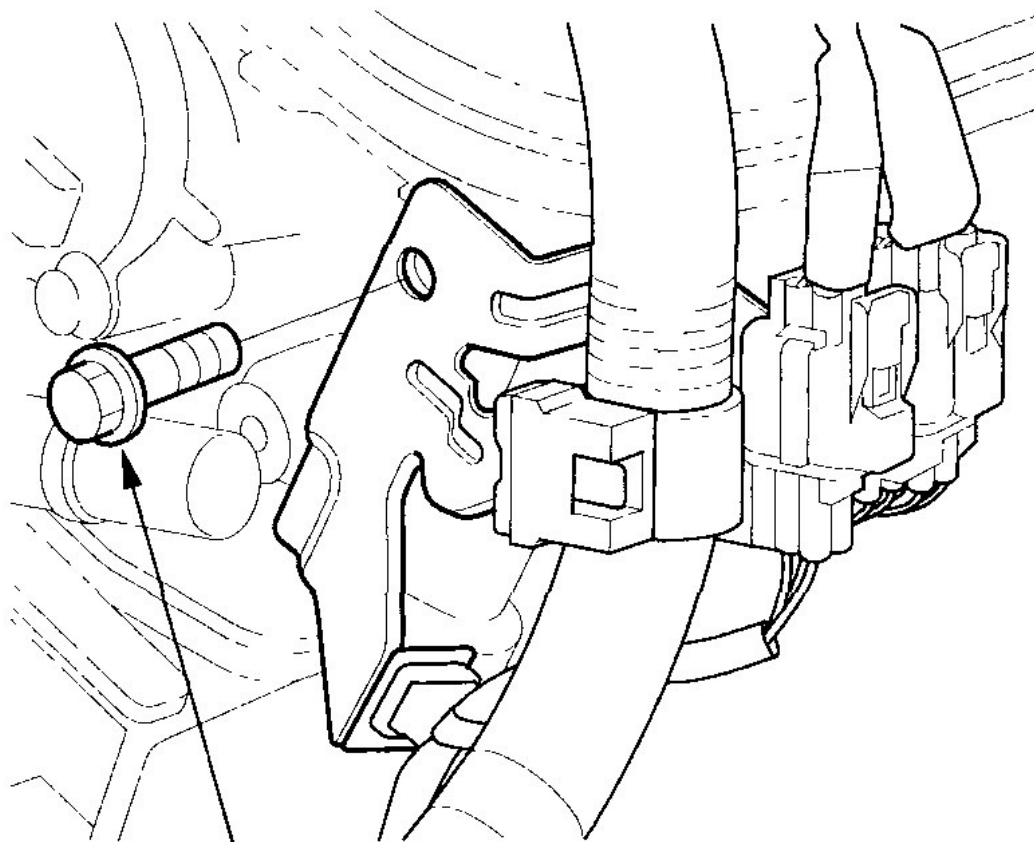
**Fig. 143: Installing Evaporative Emission Canister Hose Joint With Bracket**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Connect the fuel quick-connect fitting (A), then install the fuel quick-connect fitting cover (B).



**Fig. 144: Installing Fuel Quick-Connect Fitting And Fuel Quick-Connect Fitting Cover**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

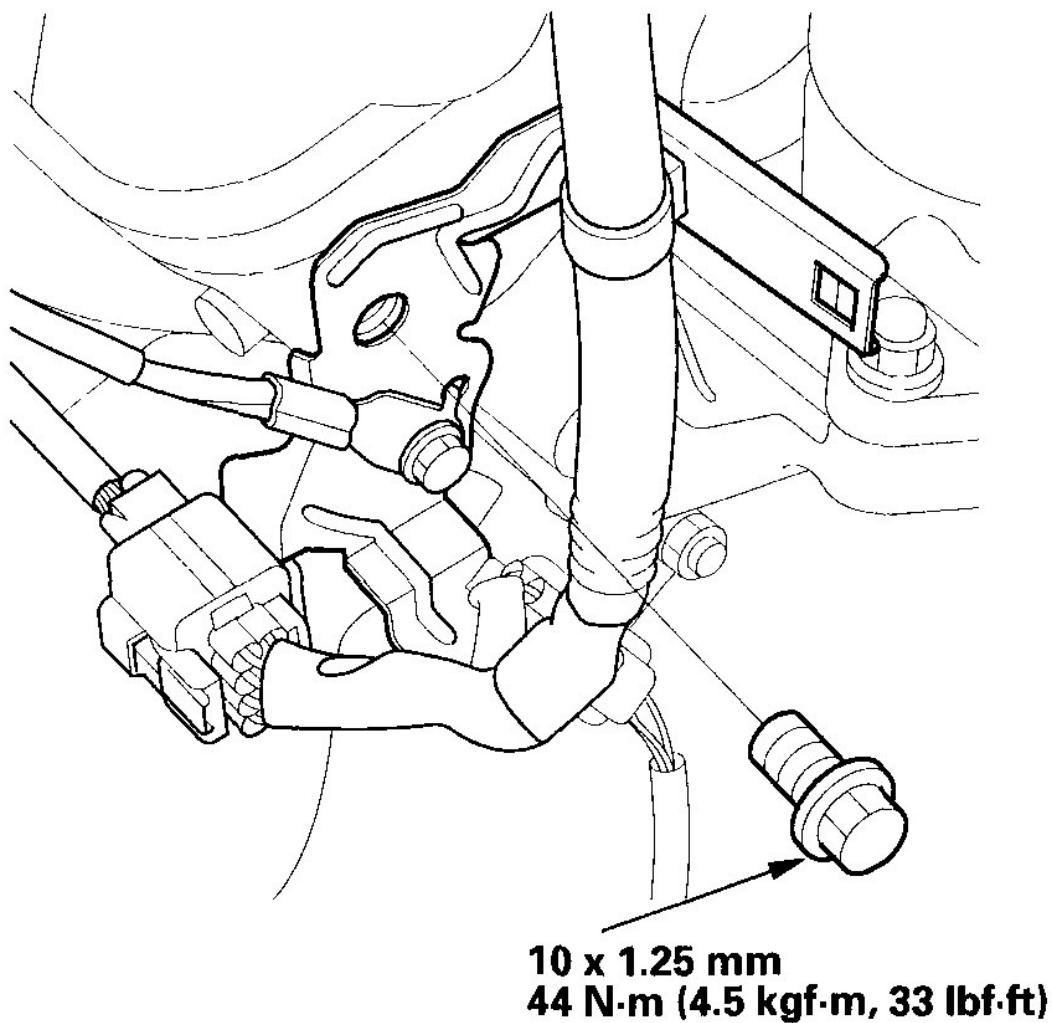
18. Tighten the bolt securing the harness bracket.



**8 x 1.25 mm**  
**22 N·m (2.2 kgf·m, 16 lbf·ft)**

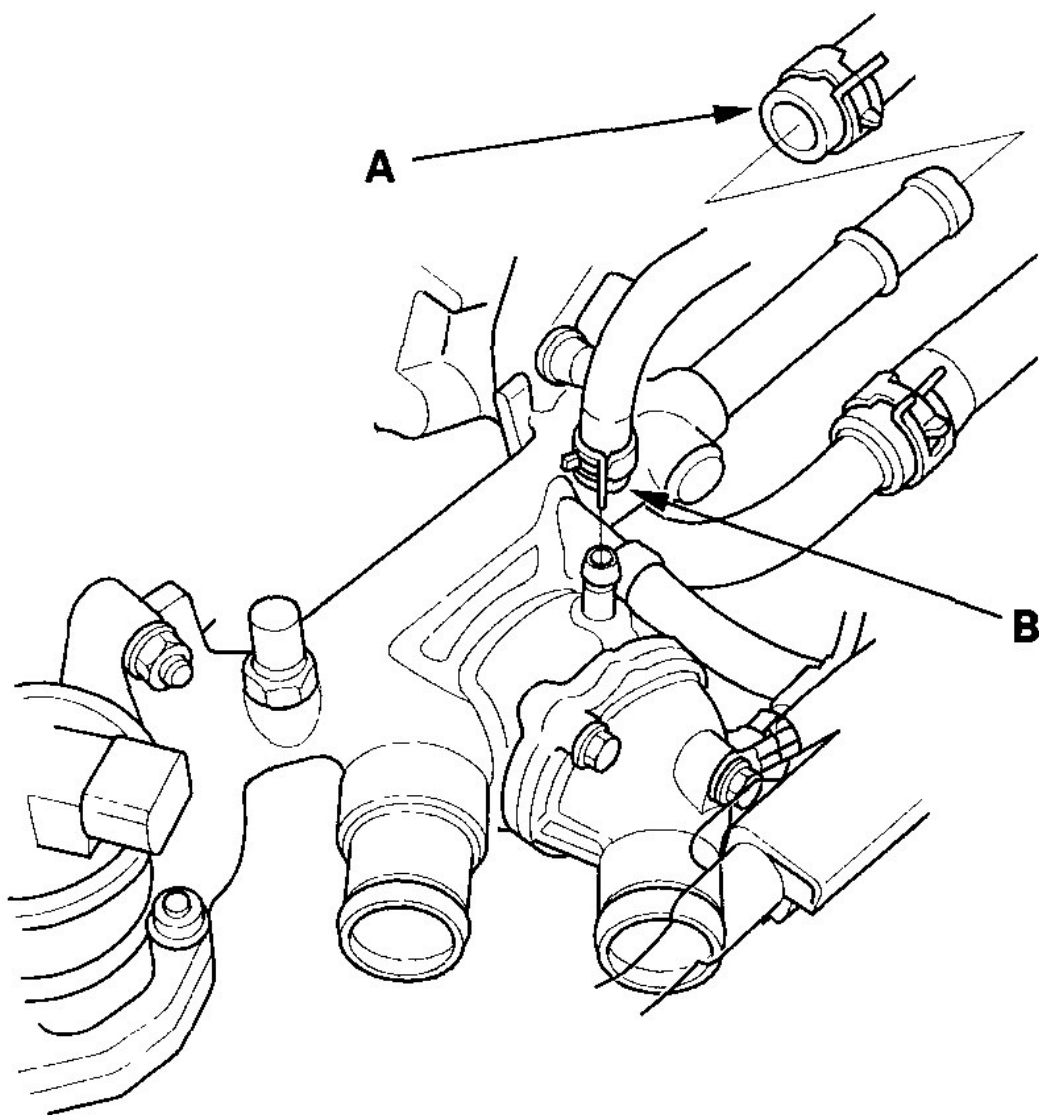
**Fig. 145: Tightening Bolt Securing Harness Bracket**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Tighten the bolt securing the harness bracket.



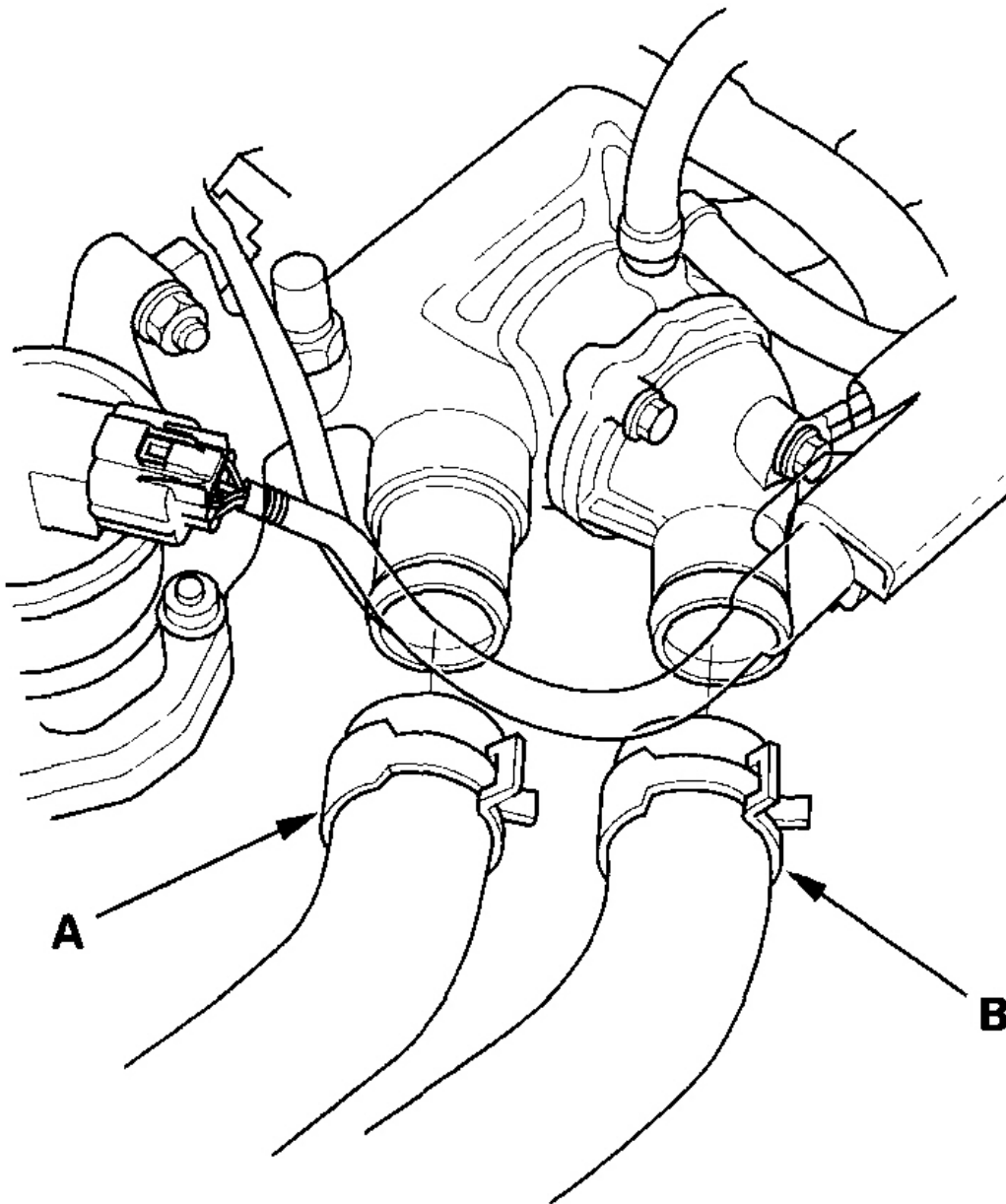
**Fig. 146: Tightening Bolt Securing Harness Bracket**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

20. Install the heater hose (A) and water bypass hose (B).



**Fig. 147: Installing Heater Hose And Water Bypass Hose**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

21. Install the upper radiator hose (A) and lower radiator hose (B).

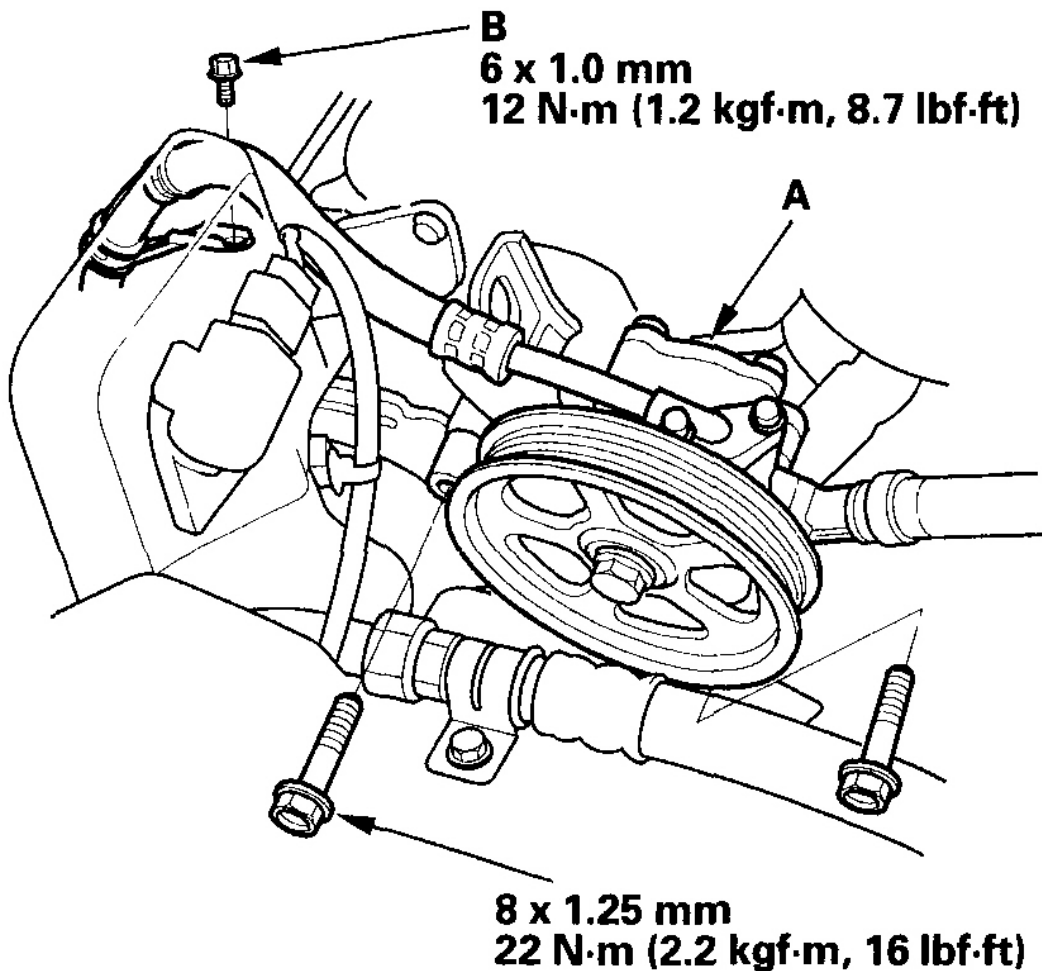


**Fig. 148: Installing Upper Radiator Hose And Lower Radiator Hose**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

22. Install the intake manifold (see INSTALLATION ).
23. Install these engine wire harness connectors and wire harness clamps to the cylinder head:
  - Six injector connectors
  - Engine coolant temperature (ECT) sensor 1 connector

- Engine coolant temperature (ECT) sensor 2 connector
- Camshaft position (CMP) sensor connector
- Crankshaft position (CKP) sensor A/B connector
- Exhaust gas recirculation (EGR) valve connector
- VTEC solenoid valve connector
- VTEC oil pressure switch connector
- Oil pressure switch connector
- Two air fuel ratio (A/F) sensor connectors
- Two secondary heated oxygen sensor (secondary HO2S) connectors

24. Install the power steering (P/S) pump (A), and tighten the bolt (B) securing the P/S hose bracket.



**Fig. 149: Installing Power Steering Pump**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

25. Install the alternator (see **ALTERNATOR REPLACEMENT** ).
26. Install the six ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION** ).
27. Install the drive belt (see **DRIVE BELT INSPECTION** ).
28. Clean the battery posts and cable terminals with sandpaper, then assemble them and apply grease to prevent corrosion.
29. After installation, check that all tubes, hoses, and connectors are installed correctly.
30. Inspect for fuel leaks. Turn the ignition switch ON (II) (do not operate the starter) so the fuel pump runs for about 2 seconds and pressurizes the fuel line. Repeat this operation two or three times, then check for fuel leakage at any point in the fuel line.
31. Refill the radiator with engine coolant, and bleed air from the cooling system with the heater valve open (see step 8 in **COOLANT REPLACEMENT** ).
32. Do the crankshaft (CKP) pattern clear/CKP pattern learn procedure (see **CKP PATTERN CLEAR/CKP PATTERN LEARN** ).
33. Do the powertrain control module (PCM) idle learn procedure (see **PCM IDLE LEARN PROCEDURE** ) and power window control unit reset procedure (see **RESETTING THE POWER WINDOW CONTROL UNIT** ).
34. Inspect the idle speed (see **IDLE SPEED INSPECTION** ).
35. Inspect the ignition timing (see **IGNITION TIMING INSPECTION** ).
36. Enter the anti-theft codes for the radio and the navigation system, then enter the customer's radio station presets.
37. Set the clock.

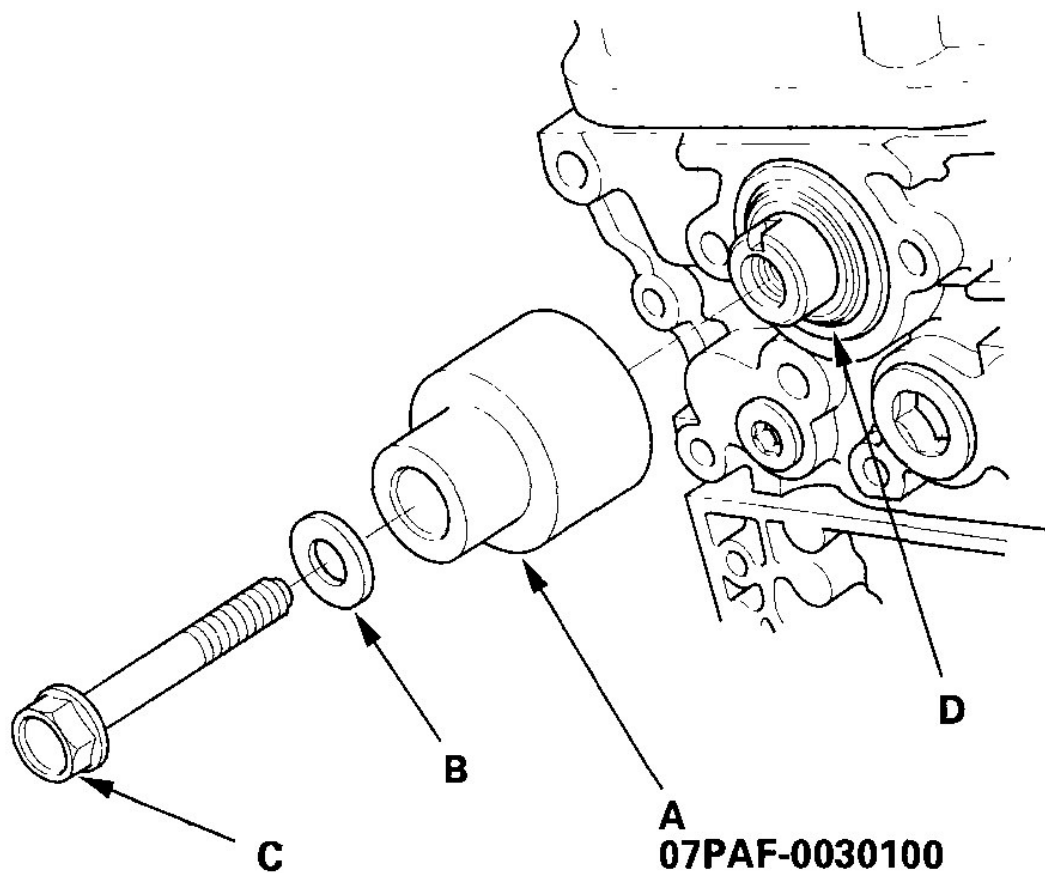
## **CAMSHAFT OIL SEAL INSTALLATION - IN CAR**

### **Special Tools Required**

Camshaft oil seal driver 07PAF-0030100

1. Dry the camshaft oil seal housing.
2. Apply a light coat of multipurpose grease to the lip of the camshaft oil seal.
3. Using the special tool (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.





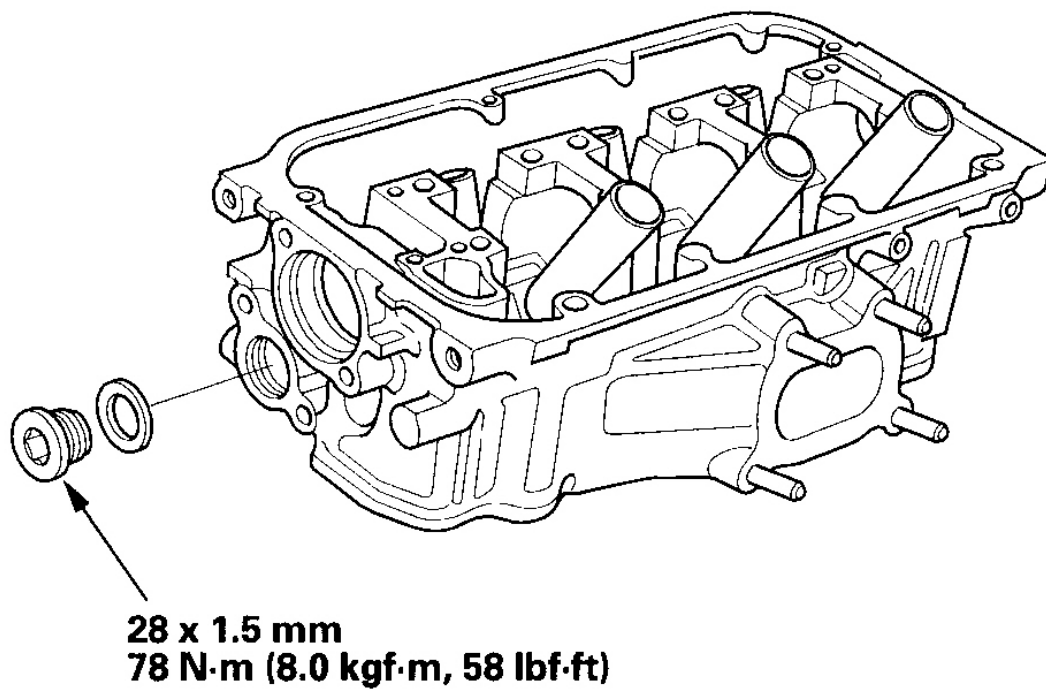
**Fig. 150: Installing Camshaft Oil Seal**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

## SEALING BOLT INSTALLATION

**NOTE:** When Installing the sealing bolt, always use new washer.

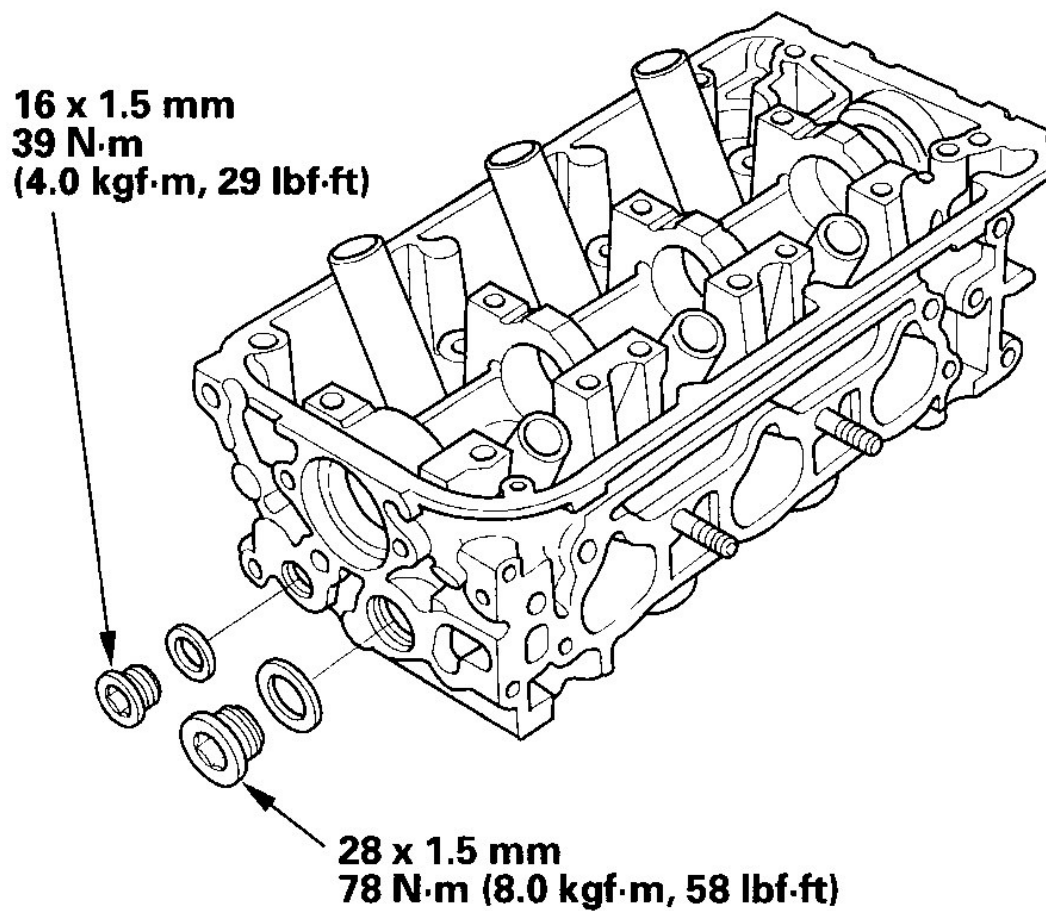
**FRONT:**



**Fig. 151: Installing Sealing Bolt (Front)**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

**REAR:**



**Fig. 152: Installing Sealing Bolt (Rear)**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

## 2005 Honda Pilot EX

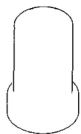
2005 ENGINE Engine Block - Pilot

### 2005 ENGINE

#### Engine Block - Pilot

## SPECIAL TOOLS

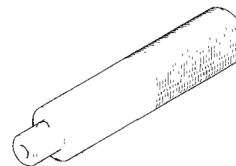
| Ref. No. | Tool Number   | Description               | Qty |
|----------|---------------|---------------------------|-----|
| ①        | 070AD-RCAA100 | Oil Seal Driver, 64 mm    | 1   |
| ②        | 070AD-RCAA200 | Driver Attachment, 106 mm | 1   |
| ③        | 07749-0010000 | Driver             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



①



②



③

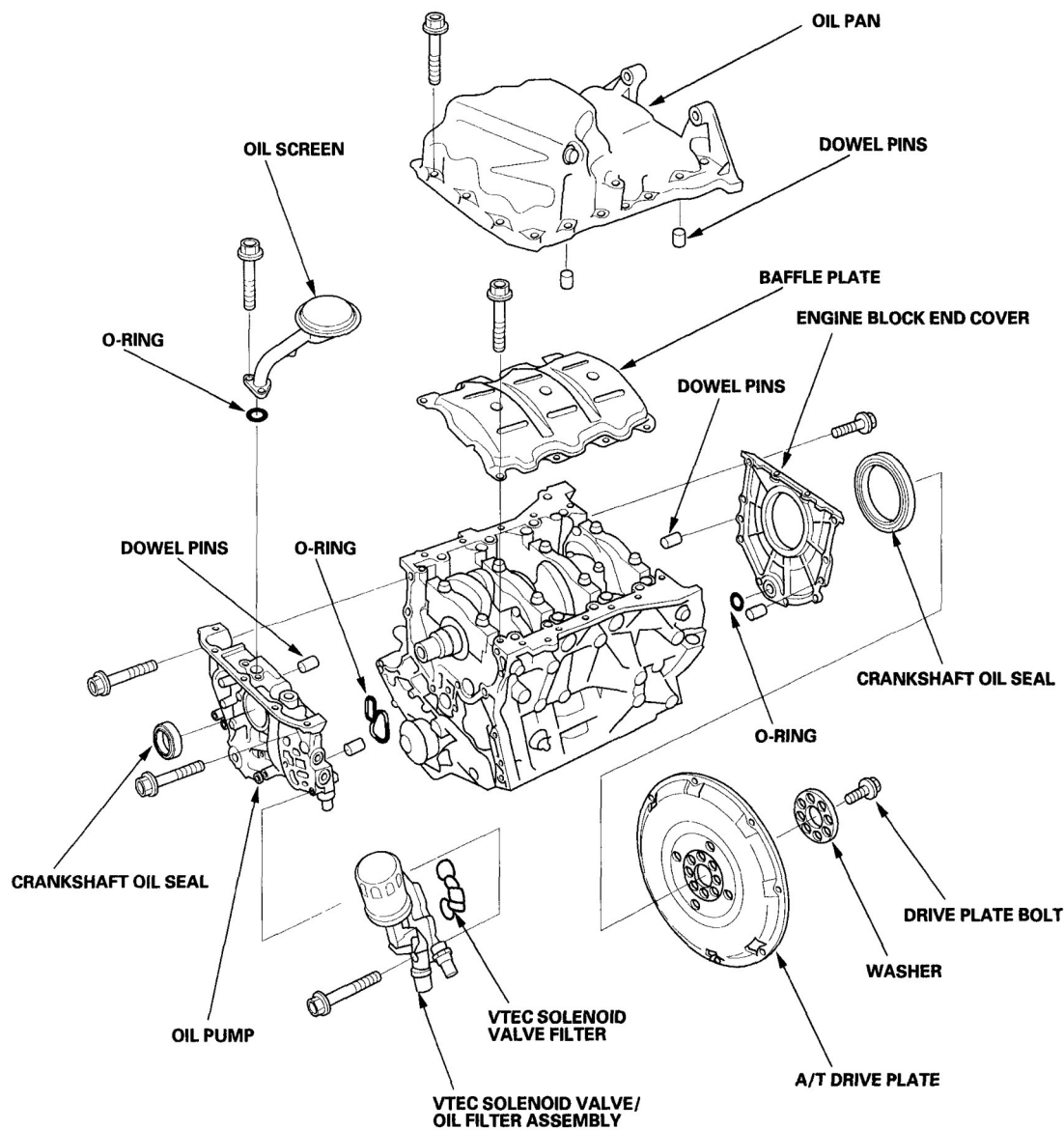
**Fig. 1: Identifying Special Tools**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

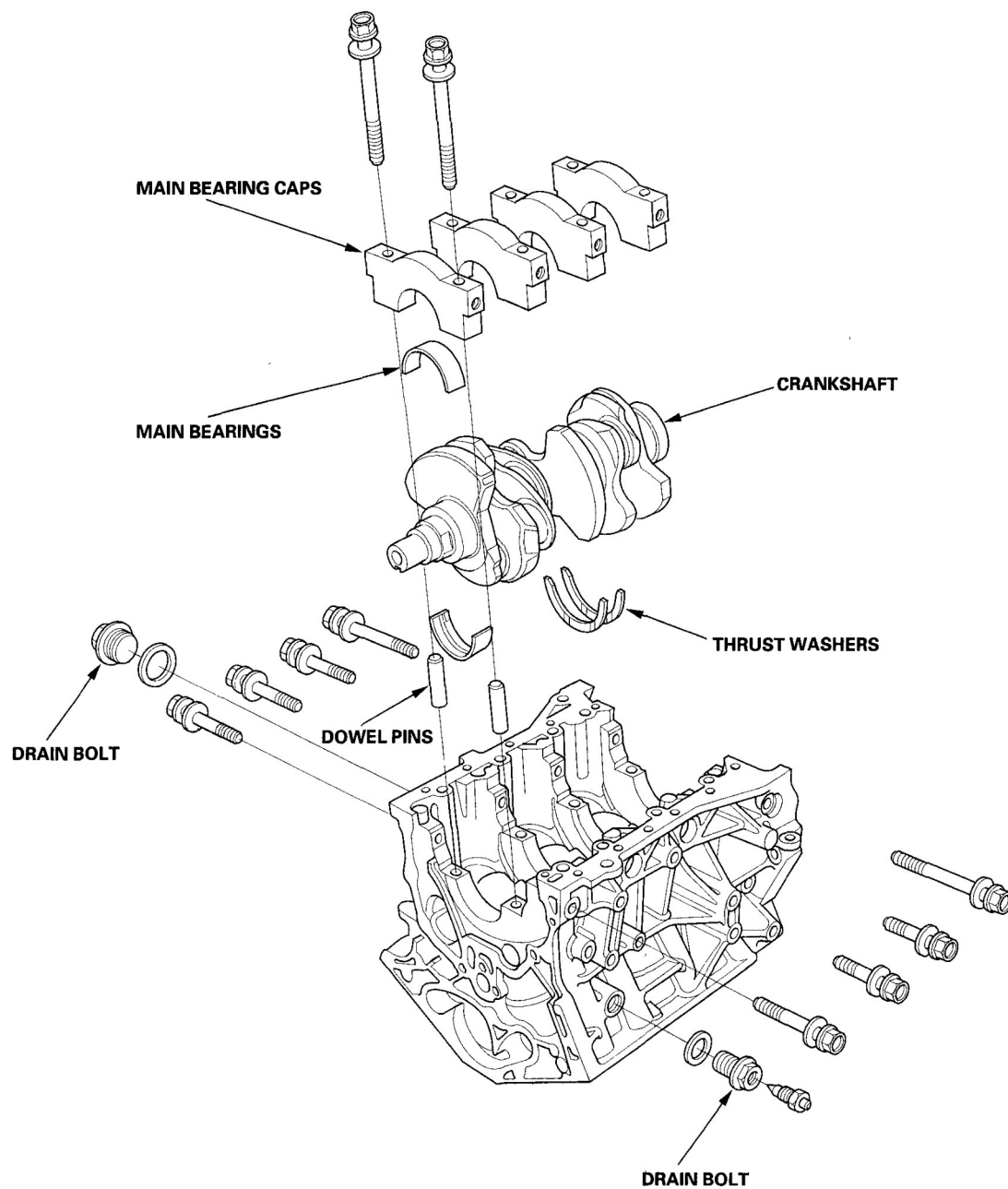
## COMPONENT LOCATION INDEX

## 2005 Honda Pilot EX

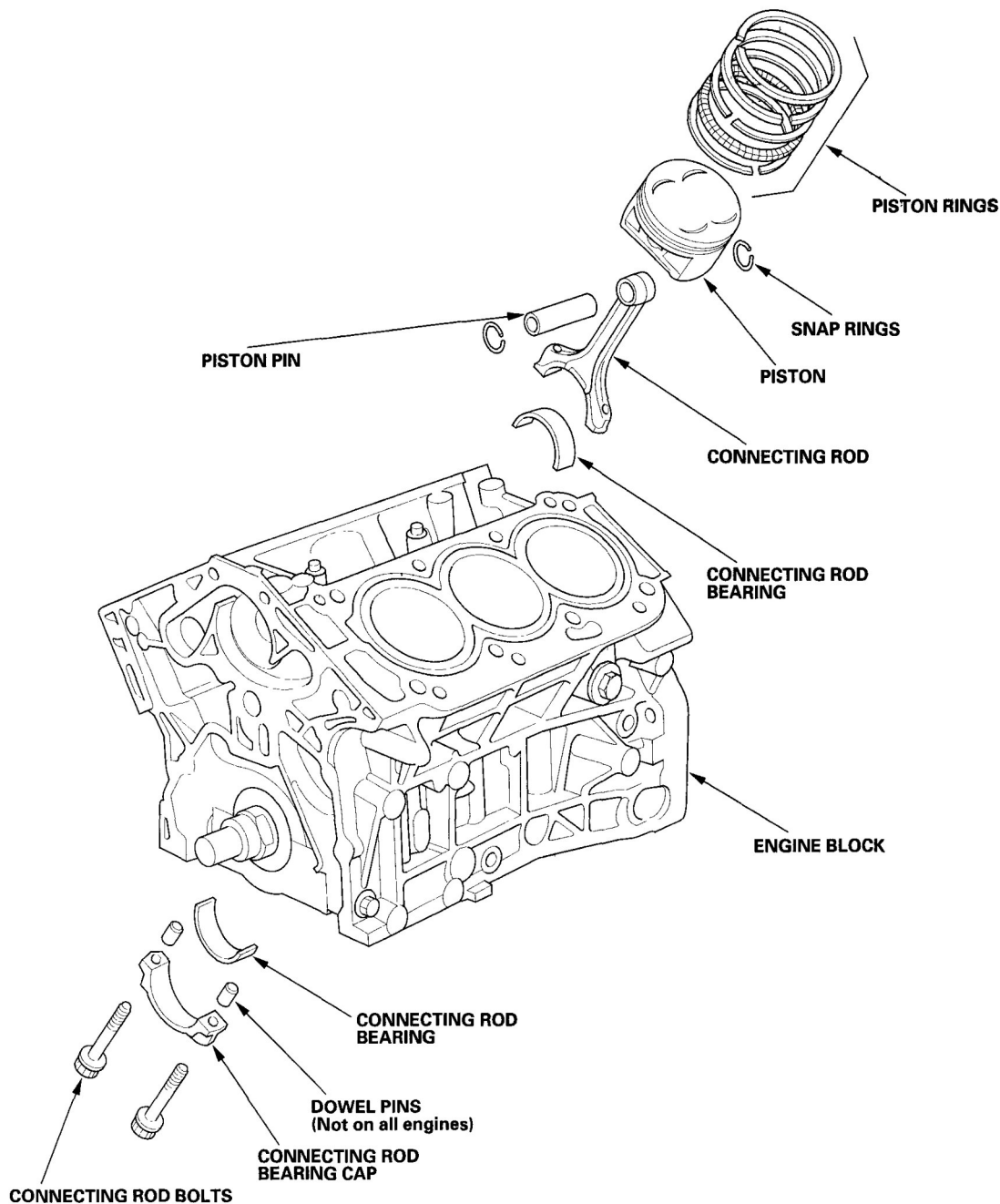
2005 ENGINE Engine Block - Pilot



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



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



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

## CONNECTING ROD AND CRANKSHAFT END PLAY INSPECTION

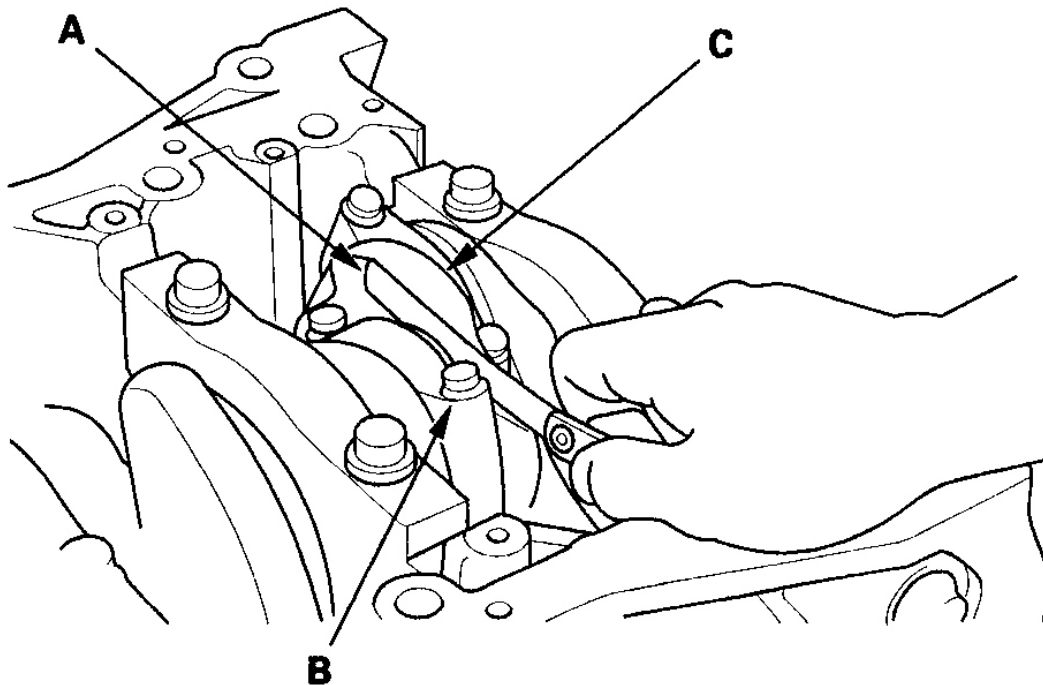
1. Remove the oil pump (see **REMOVAL** ).
2. Remove the baffle plate (see step 10 ).
3. Measure the connecting rod end play with a feeler gauge (A) between the connecting rod (B) and

crankshaft (C).

### **Connecting Rod End Play**

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

**Service Limit: 0.45 mm (0.018 in.)**



**Fig. 5: Measuring Connecting Rod End Play**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

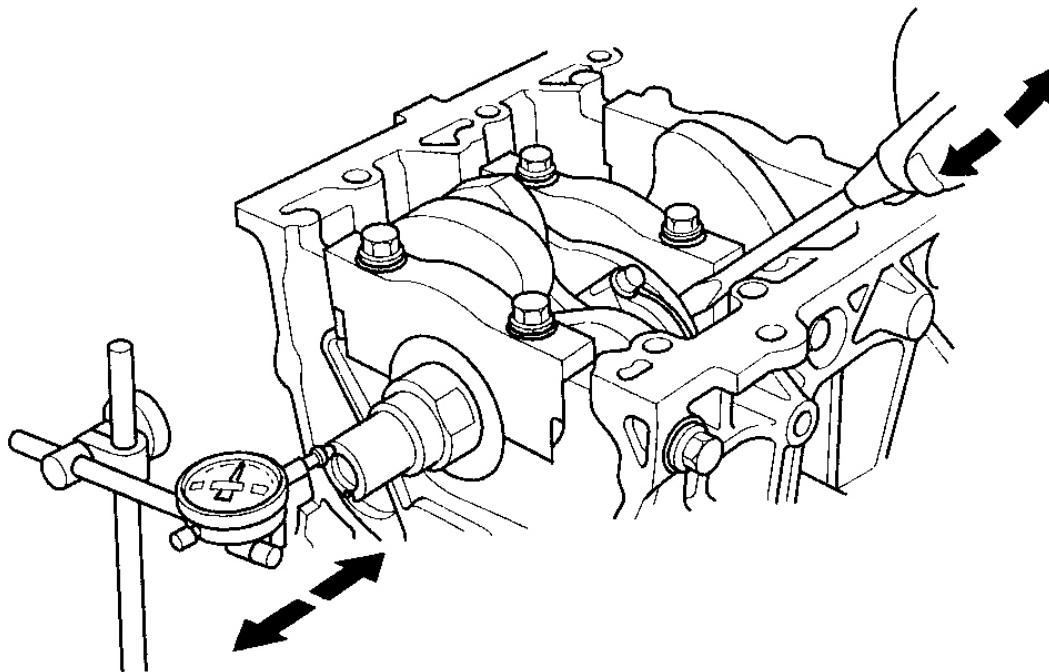
4. If the connecting rod end play is out-of-tolerance, install a new connecting rod and recheck. If it is still out-of-tolerance, replace the crankshaft (see **CRANKSHAFT AND PISTON REMOVAL** ).
5. Push the crankshaft firmly away from the dial indicator, and zero the dial against the end of the crankshaft.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

### **crankshaft End Play**

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

**Service Limit: 0.45 mm (0.018 in.)**





**Fig. 6: 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 out-of-tolerance, replace the crankshaft (see CRANKSHAFT AND PISTON REMOVAL )

## CRANKSHAFT MAIN BEARING REPLACEMENT

### MAIN BEARING CLEARANCE INSPECTION

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

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

4. Reinstall the bearings and caps, then torque the bearing cap bolts to 74 N.m (7.5 kgf.m, 54 bf.lft), and the bearing cap side bolts to 49 N.m (5.0 kgf.m, 36 lbf.ft).

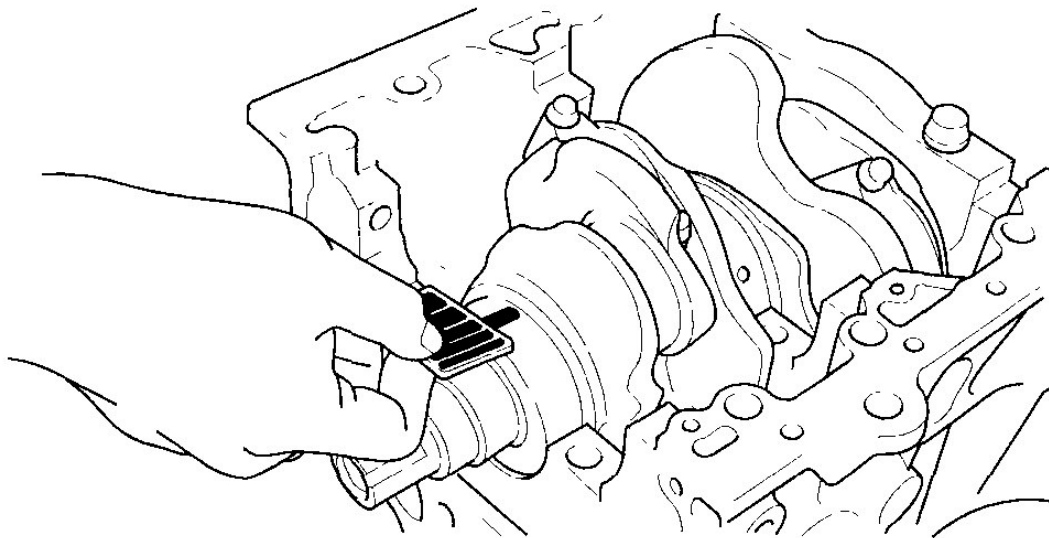
**NOTE:** Do not rotate the crankshaft during inspection.

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

#### **Main Bearing-to-Journal Oil Clearance**

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

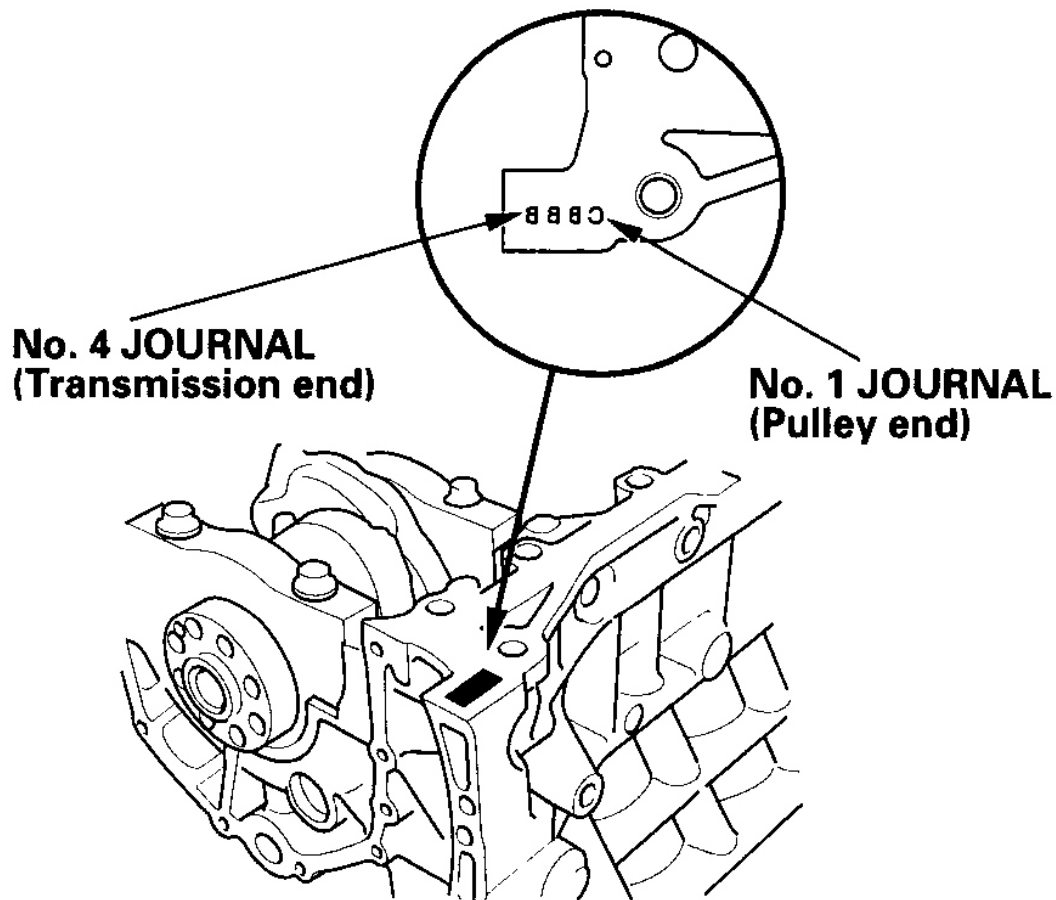
6. If the plastigage measures too wide or too narrow, remove the crankshaft, and remove the upper half of the bearing. Install a new, complete bearing with the same color code, and recheck the clearance. Do not file, shim, or scrape the bearings or the caps to adjust clearance.
7. If the plastigage shows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

## **MAIN BEARING SELECTION**

### **Crankshaft Bore Code Location**

Letters or bars have been stamped on the end of the 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.

**Bearing Identification**

Color code is on the edge of the bearing

➔ Larger crank bore

| A or I | B or II | C or III | D or IIII |
|--------|---------|----------|-----------|
|--------|---------|----------|-----------|

➔ Smaller bearing (Thicker)

|            |
|------------|
| 1 or I     |
| 2 or II    |
| 3 or III   |
| 4 or IIII  |
| 5 or IIIII |
| 6 or IIIII |

|                  |                  |                  |                  |
|------------------|------------------|------------------|------------------|
| Red/<br>Pink     | Pink             | Pink/<br>Yellow  | Yellow           |
| Pink             | Pink/<br>Yellow  | Yellow           | Yellow/<br>Green |
| Pink/<br>Yellow  | Yellow           | Yellow/<br>Green | Green            |
| Yellow           | Yellow/<br>Green | Green            | Green/<br>Brown  |
| Yellow/<br>Green | Green            | Green/<br>Brown  | Brown            |
| Green            | Green/<br>Brown  | Brown            | Brown/<br>Black  |

Smaller  
main  
journal

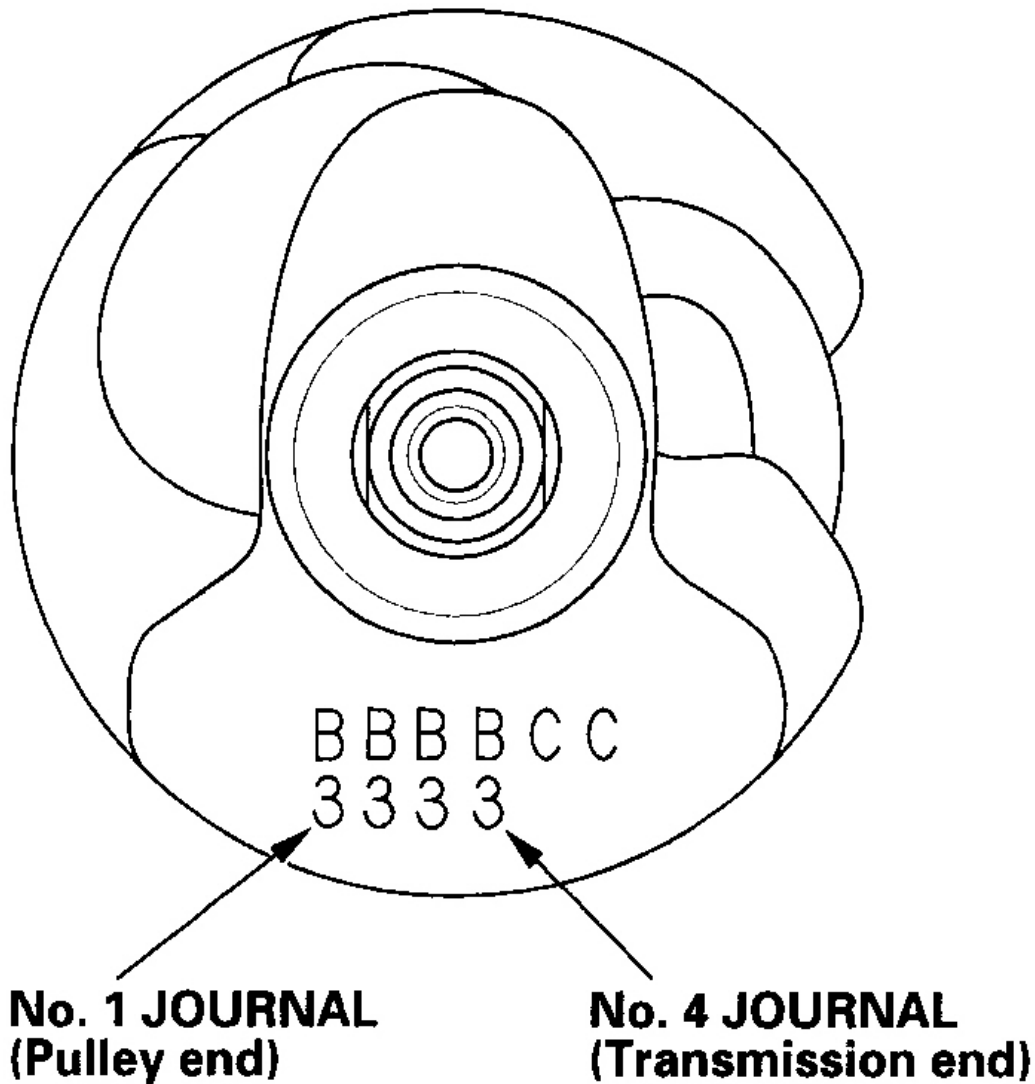
Smaller  
bearing  
(Thicker)

**NOTE:** When using bearing halves of different colors, it does not matter which color is used in the top or bottom.

**Fig. 9: Main Bearing Selection 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

### ROD BEARING CLEARANCE INSPECTION

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

4. Reinstall the bearing half and cap, and torque the bolts.

**NOTE:**

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

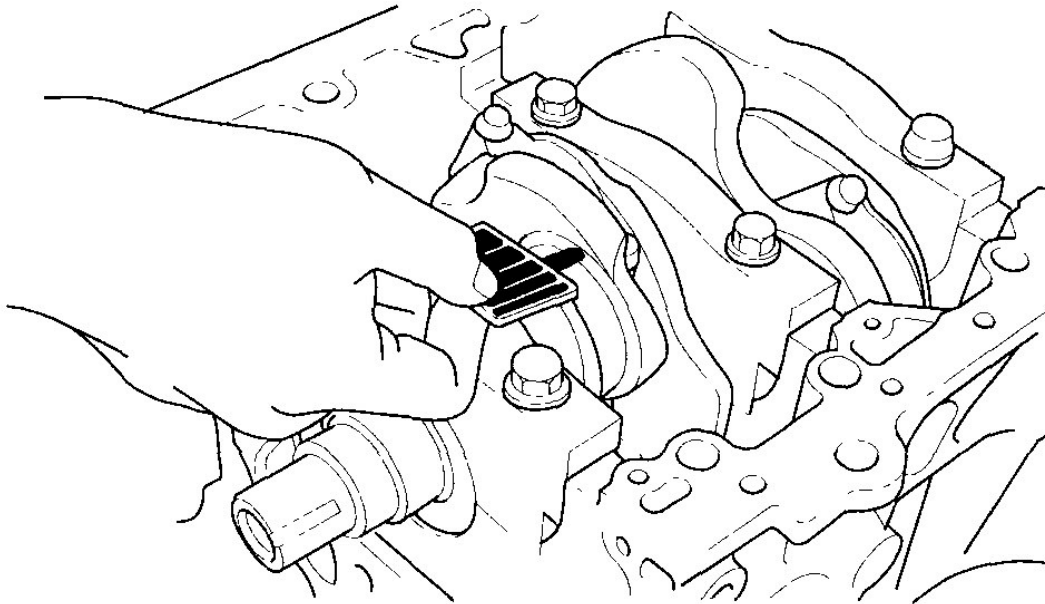
**Tightening Torque: 20 N.m (2.0 kgf.m, 14 lbf.ft) + 90°**

5. Remove the rod cap and 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 that one), and check clearance again. If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over (see **CRANKSHAFT AND PISTON REMOVAL** ).

**ROD BEARING SELECTION**

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

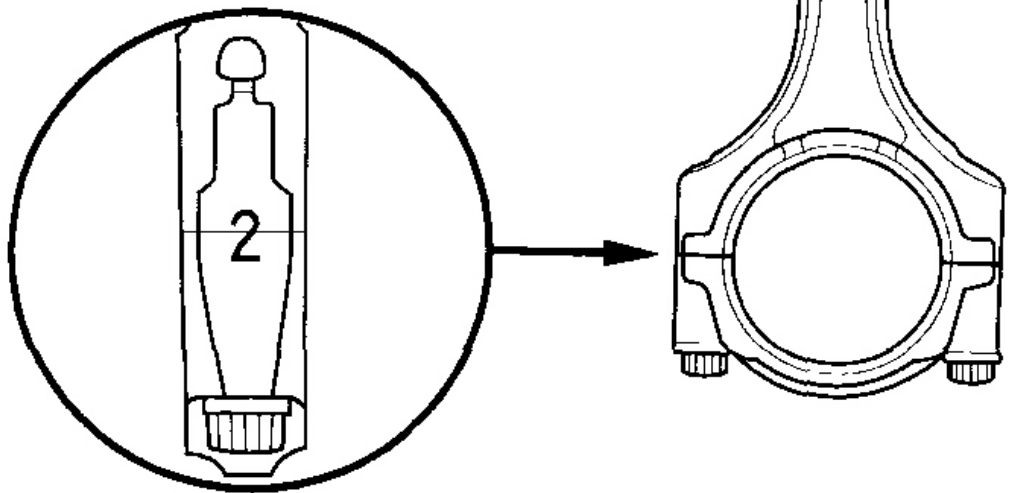
**Normal Bore Size: 58.0 mm (2.28 in.)**

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.

Half of number or bar  
is stamped on bearing cap  
and the other half is  
stamped on rod.



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



**Bearing Identification**

Color code is on the edge of the bearing

→ Larger big end bore

|        |         |          |           |
|--------|---------|----------|-----------|
| 1 or I | 2 or II | 3 or III | 4 or IIII |
|--------|---------|----------|-----------|

→ Smaller bearing (Thicker)

|             |
|-------------|
| A or I      |
| B or II     |
| C or III    |
| D or IIII   |
| E or IIIII  |
| F or IIIIII |

|                  |                  |                  |                  |
|------------------|------------------|------------------|------------------|
| Pink             | Pink/<br>Yellow  | Yellow           | Yellow/<br>Green |
| Pink/<br>Yellow  | Yellow           | Yellow/<br>Green | Green            |
| Yellow           | Yellow/<br>Green | Green            | Green/<br>Brown  |
| Yellow/<br>Green | Green            | Green/<br>Brown  | Brown            |
| Green            | Green/<br>Brown  | Brown            | Brown/<br>Black  |
| Green/<br>Brown  | Brown            | Brown/<br>Black  | Black            |

Smaller  
rod  
journal

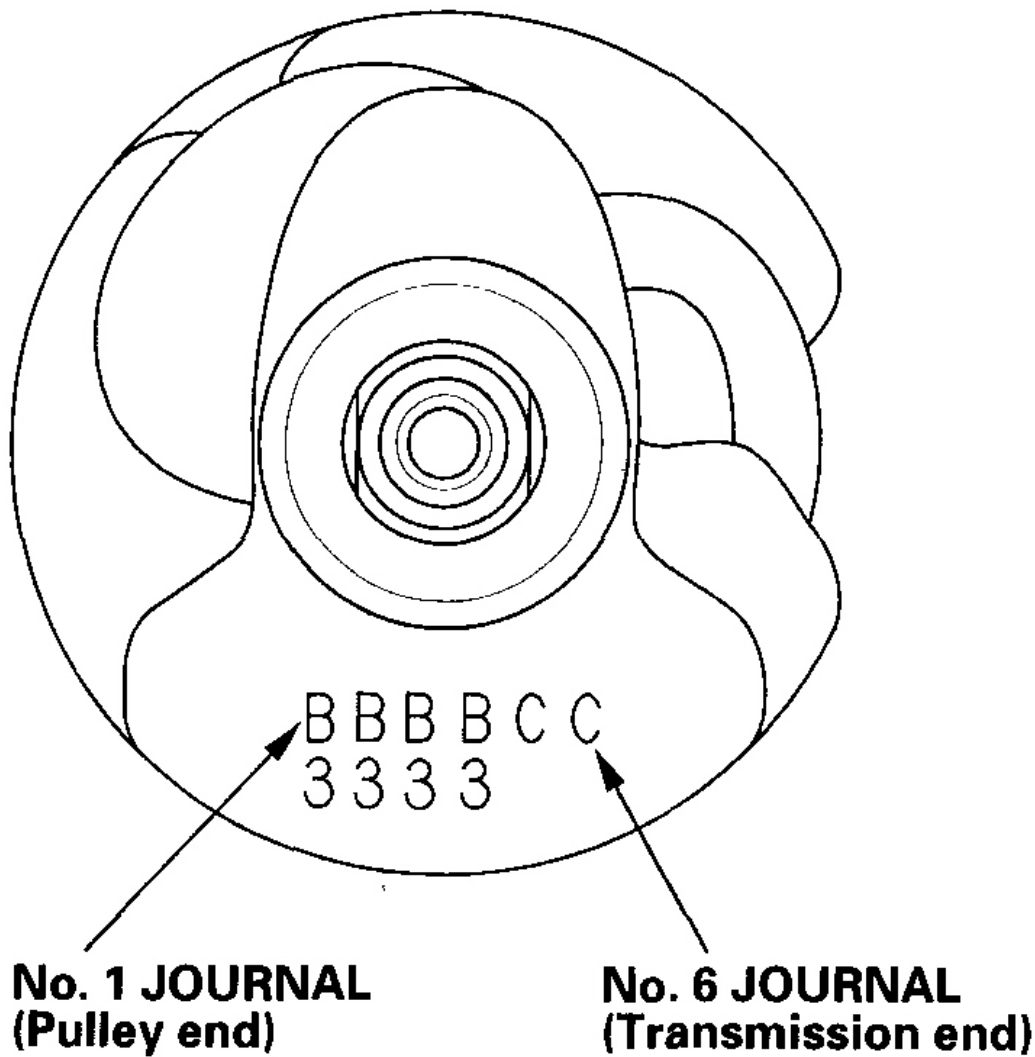
Smaller  
bearing  
(Thicker)

**NOTE:** When using bearing halves of different colors, it does not matter which color is used in the top or bottom.

**Fig. 13: Connecting Rod Bearing Selection Chart**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

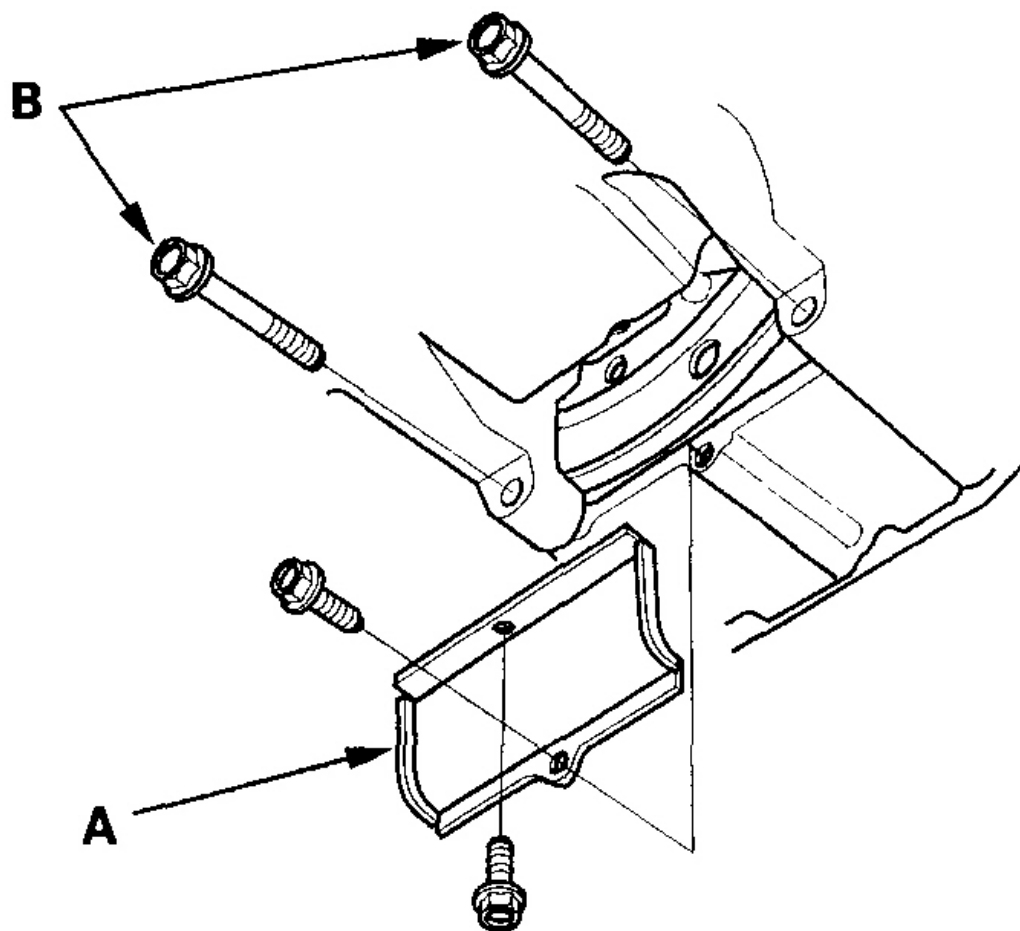
Connecting Rod Journal Code Locations (Letters or Bars)



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

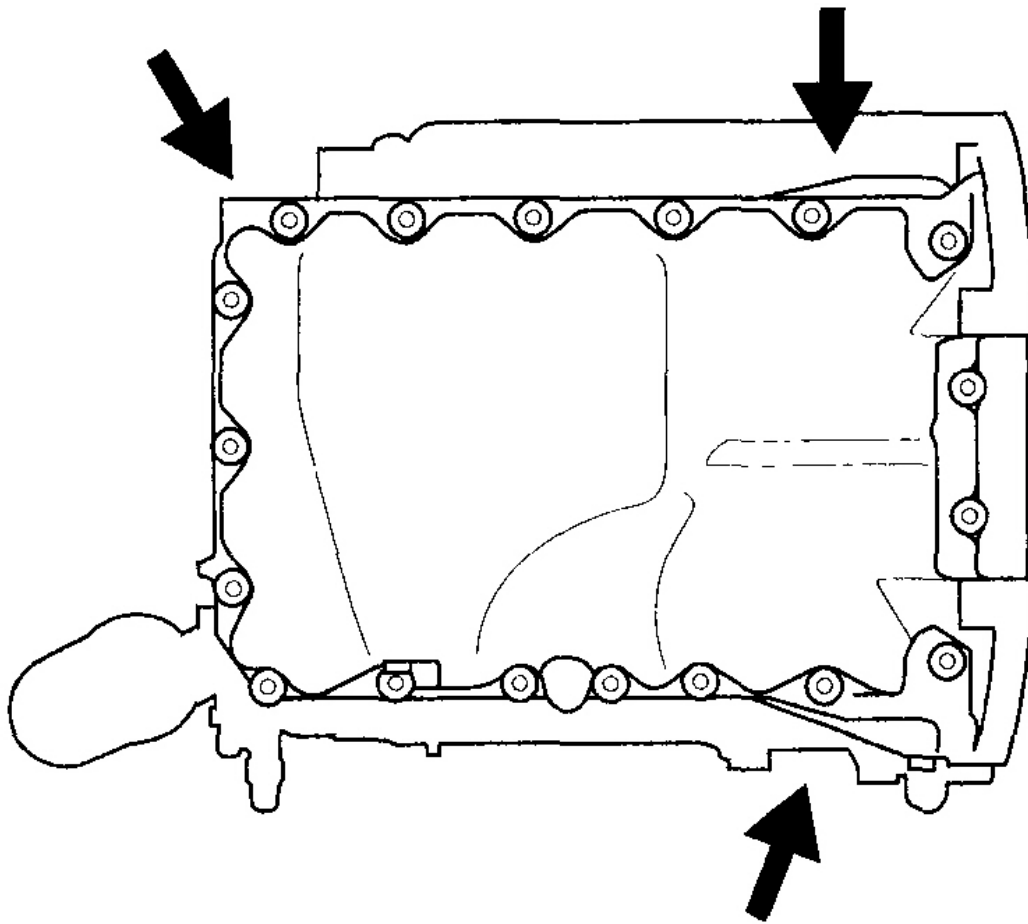
## OIL PAN REMOVAL

1. If the engine is already out of the vehicle, go to step 6.
2. Raise the vehicle on the hoist to full height.
3. Drain the engine oil (see **ENGINE OIL REPLACEMENT** ).
4. Remove exhaust pipe A (see step 33 in **ENGINE REMOVAL** ).
5. Remove the torque converter cover (A) and the two bolts (B) securing the transmission.



**Fig. 15: Removing Torque Converter Cover**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



**Fig. 16: Removing Oil Pan**

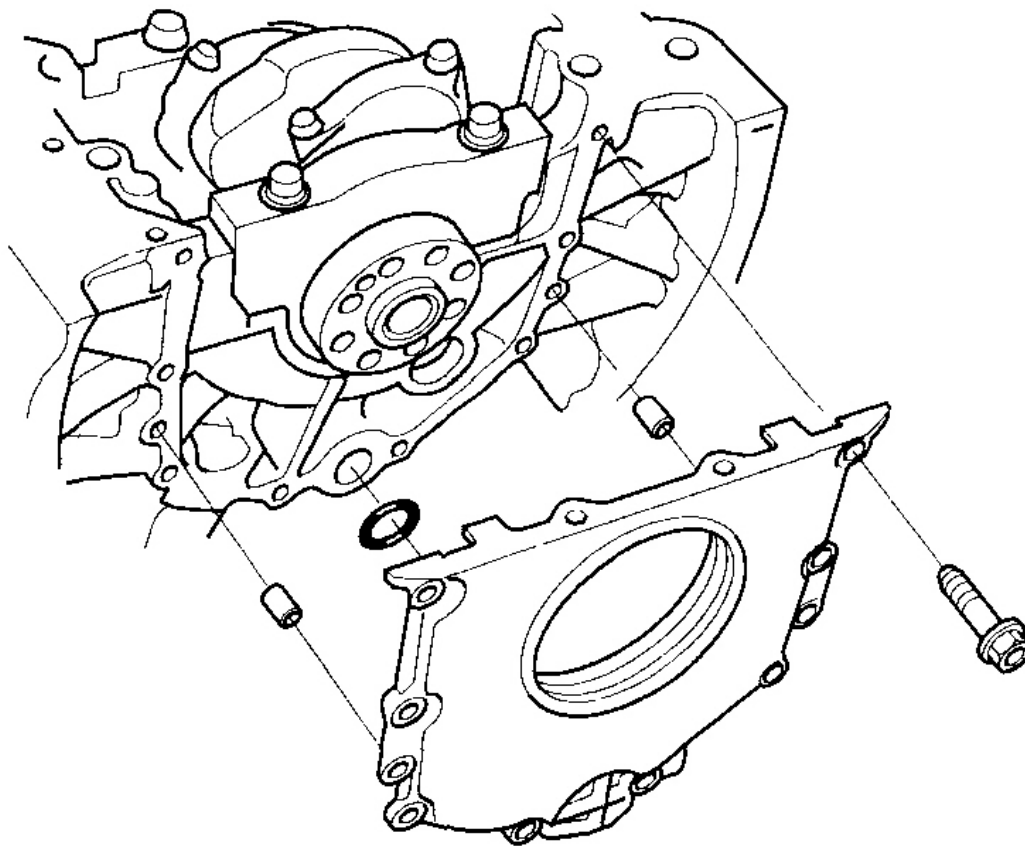
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Remove the oil pan.

## CRANKSHAFT AND PISTON REMOVAL

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

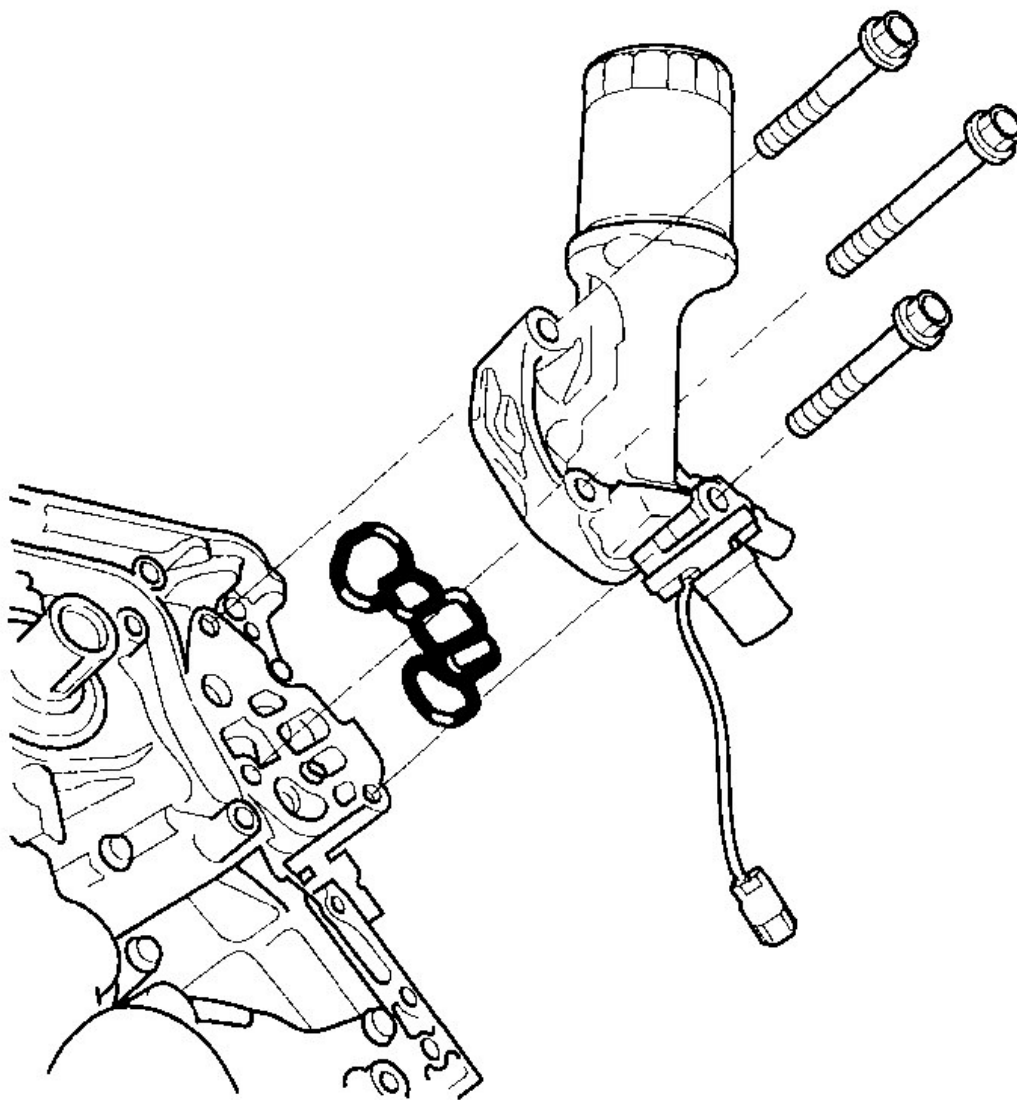
8. Remove the engine block end cover.



**Fig. 17: Removing Engine Block End Cover**

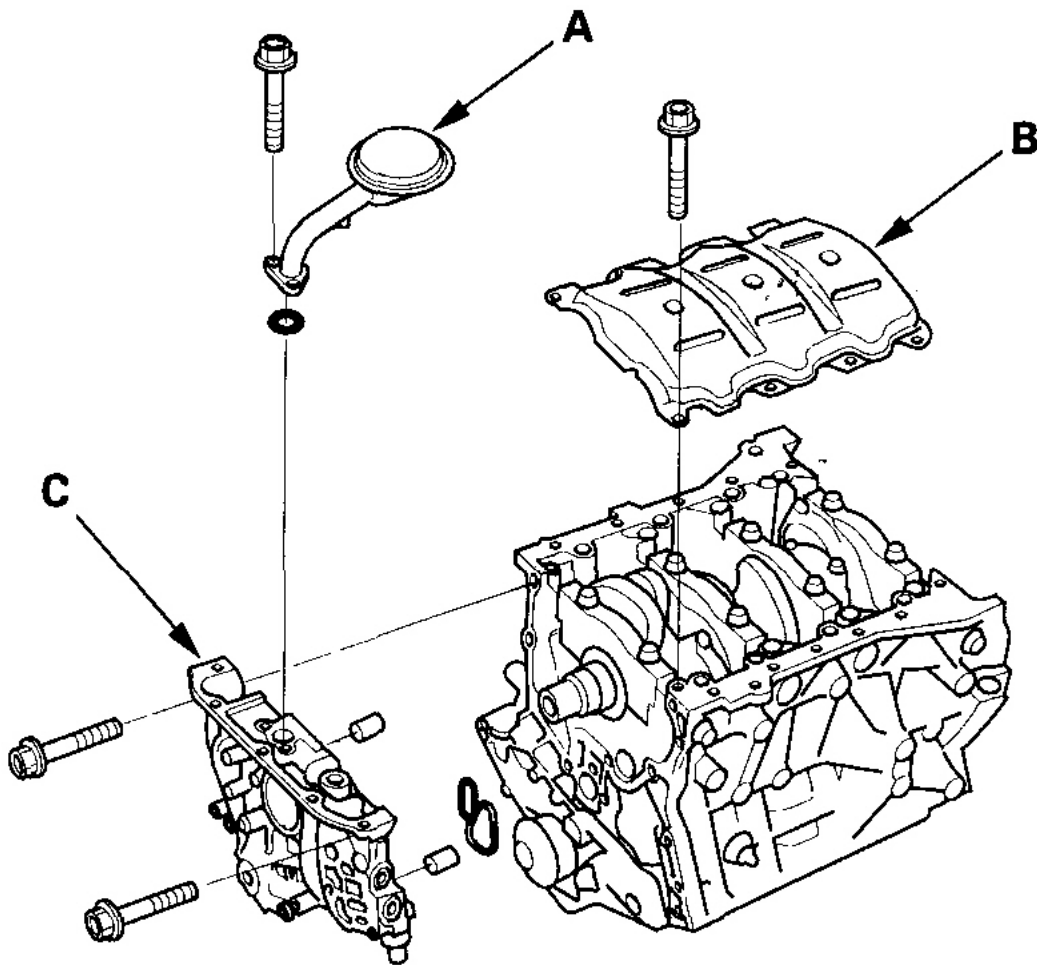
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Remove the VTEC solenoid valve/oil filter assembly.



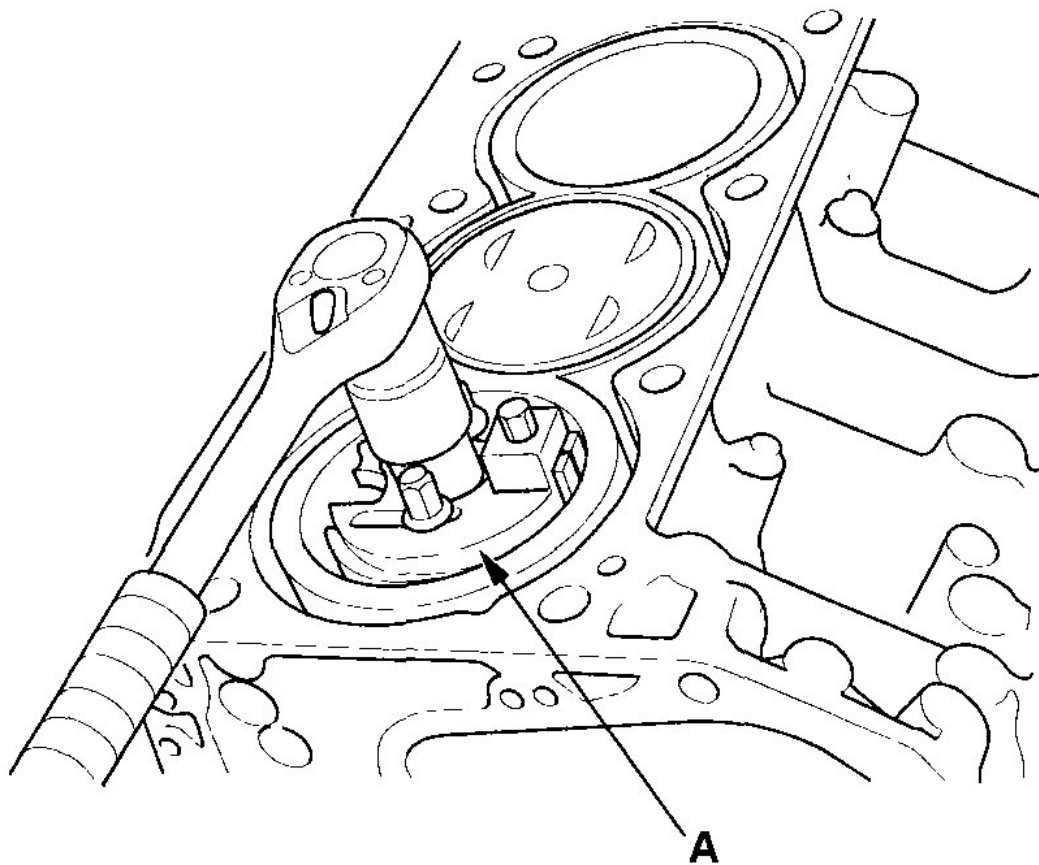
**Fig. 18: Removing VTEC Solenoid Valve/Oil Filter Assembly**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



**Fig. 19: Removing Oil Screen, Baffle Plate And Oil Pump**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

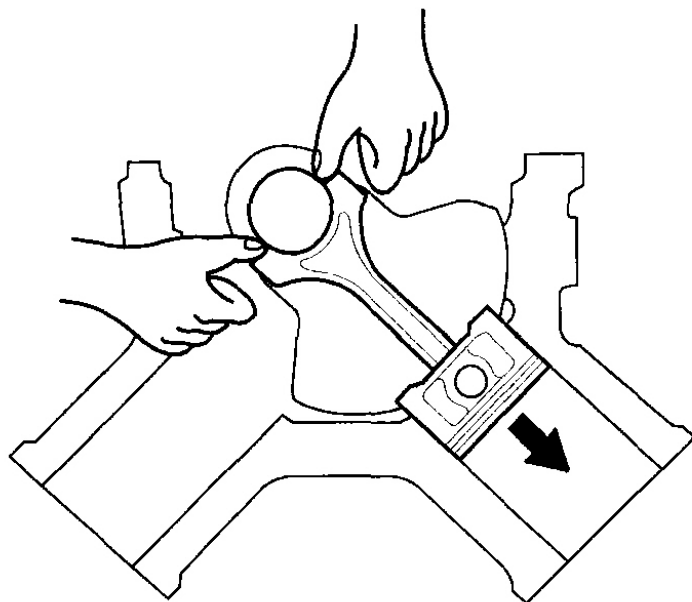
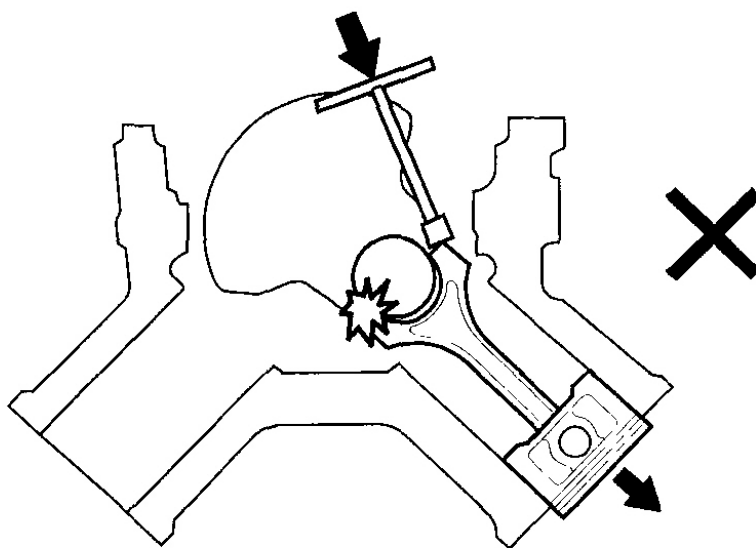
11. If you can feel a ridge of metal or hard carbon around the top of any cylinder, remove it with a ridge reamer (A). Follow the reamer manufacturer's instructions. If the ridge is not removed, it may damage the piston as it's pushed out.

**Fig. 20: Removing Carbon**

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 crank pin or cylinder with the connecting rod.

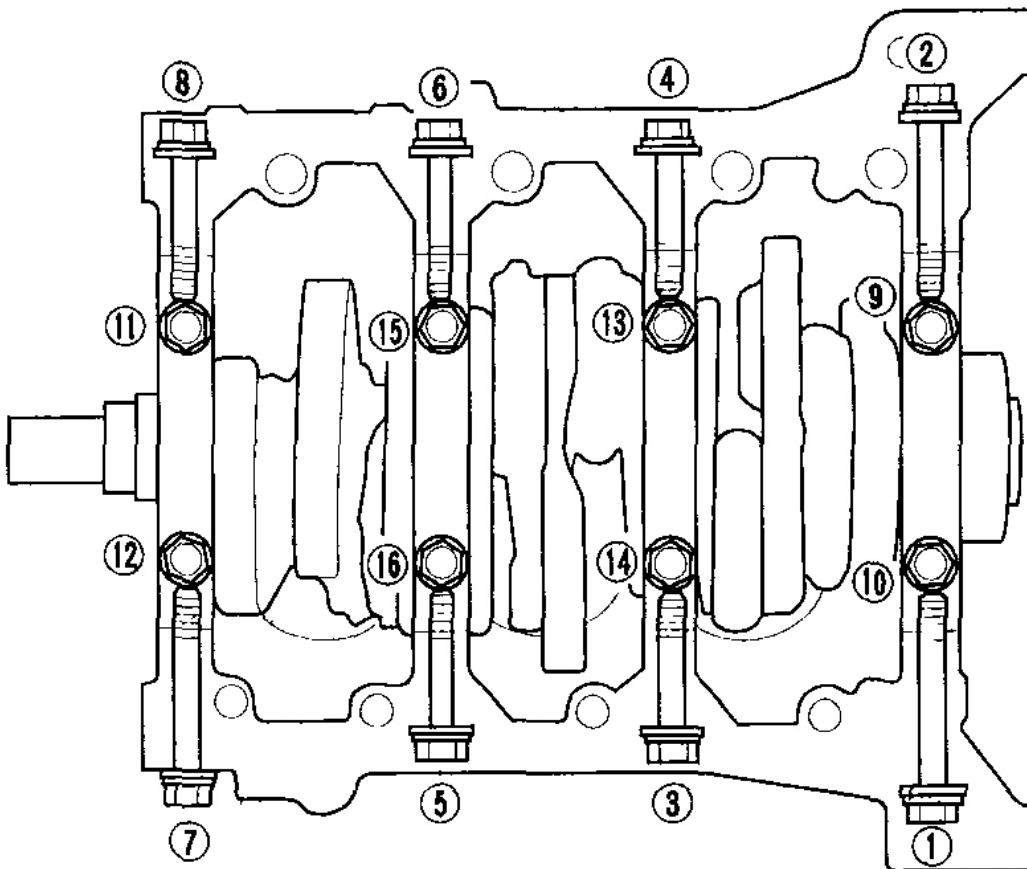


**CORRECT****INCORRECT**

**Fig. 21: Removing Piston/Connecting Rod Assembly**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

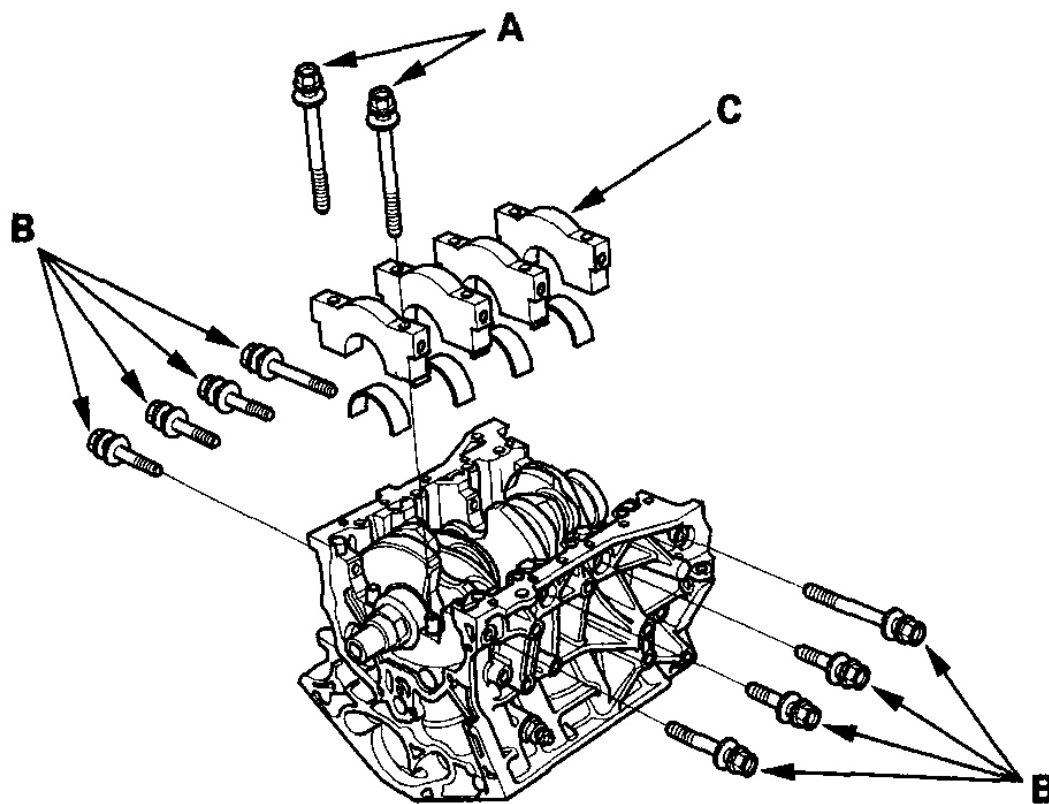
13. Remove the bearing from the cap. Keep all caps/bearings in order.
14. Remove the upper bearing halves from the connecting rods, and set them aside with their respective caps.

15. After removing a piston/connecting rod assembly, reinstall the cap on the rod.
16. To avoid mix-up during reassembly, mark each piston/connecting rod assembly with its cylinder number.
17. Unscrew the bearing cap bolts and bearing cap side bolts in sequence 1/3 turn at a time; repeat the sequence until all bolts are loosened.



**Fig. 22: Identifying Bearing Cap Bolt Tightening Sequence**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

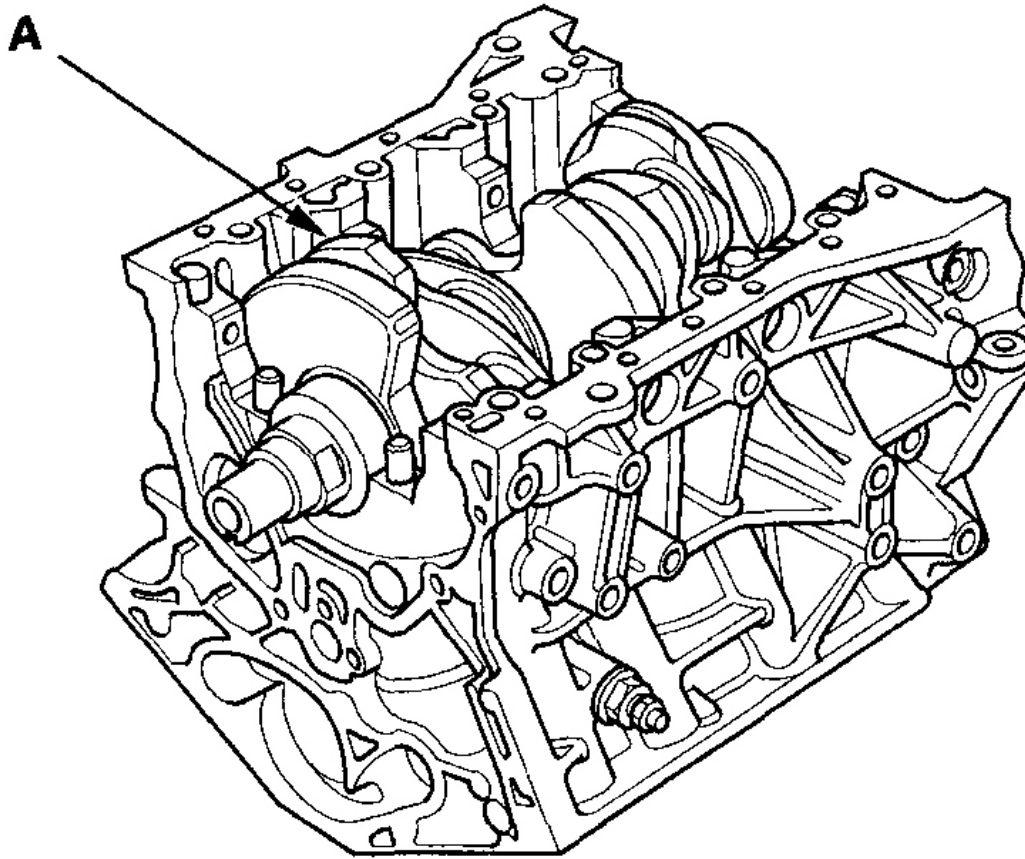
18. Remove the bearing cap bolts (A) and bearing cap side bolts (B), then remove the bearing cap (C).



**Fig. 23: Removing Bearing Cap 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.



**Fig. 24: Removing Crankshaft**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

## CRANKSHAFT INSPECTION

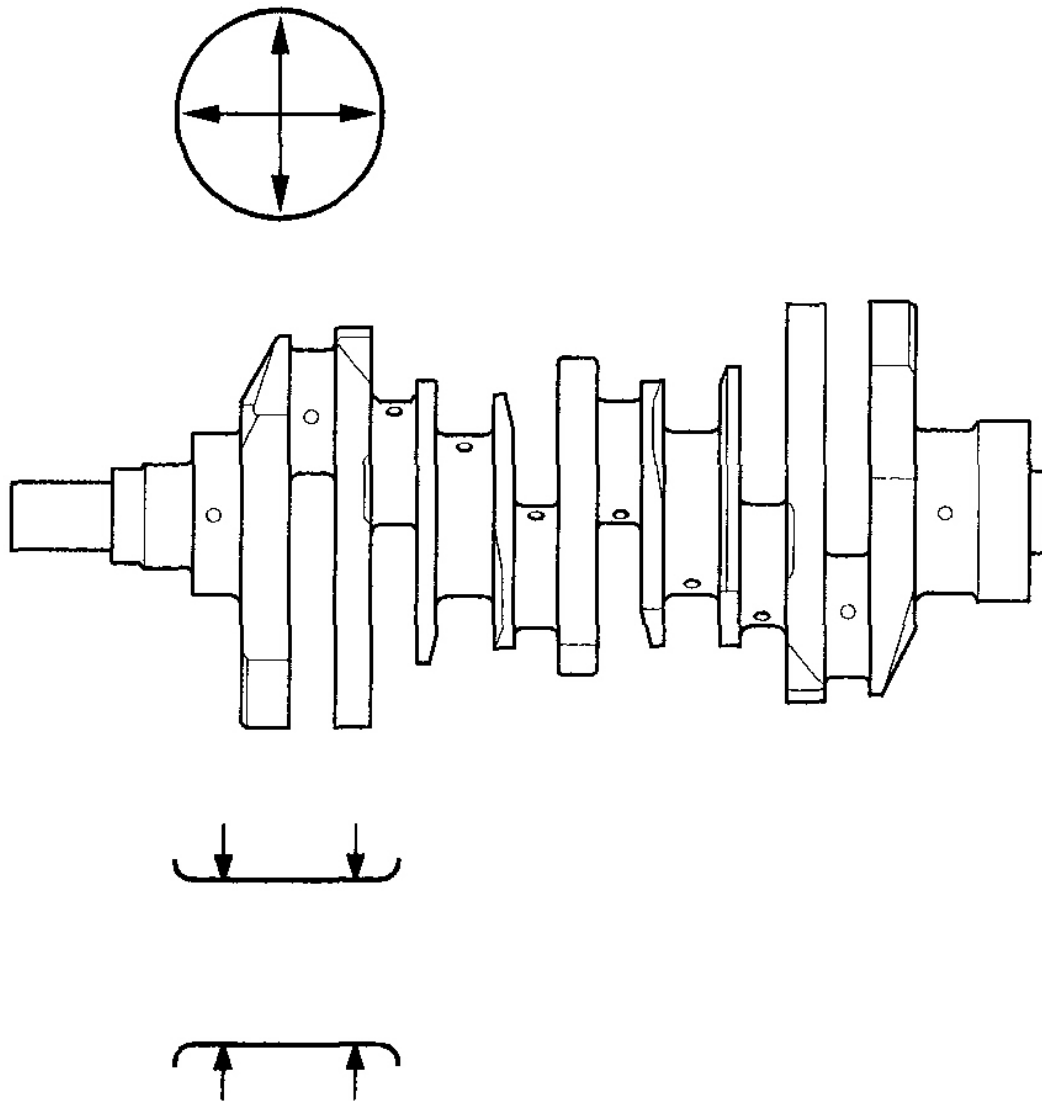
### Out-of-Round and Taper

1. Remove the crankshaft from the engine block (see **CRANKSHAFT AND PISTON REMOVAL** ).
2. Clean the crankshaft oil passages with pipe cleaners or a suitable brush.
3. Check the keyway and threads.
4. Measure for an out-of-round condition at the middle of each rod and main journal at two locations in a cross-pattern. 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. 25: Identifying Journal Out-Of-Round**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

### **Journal Taper**

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

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

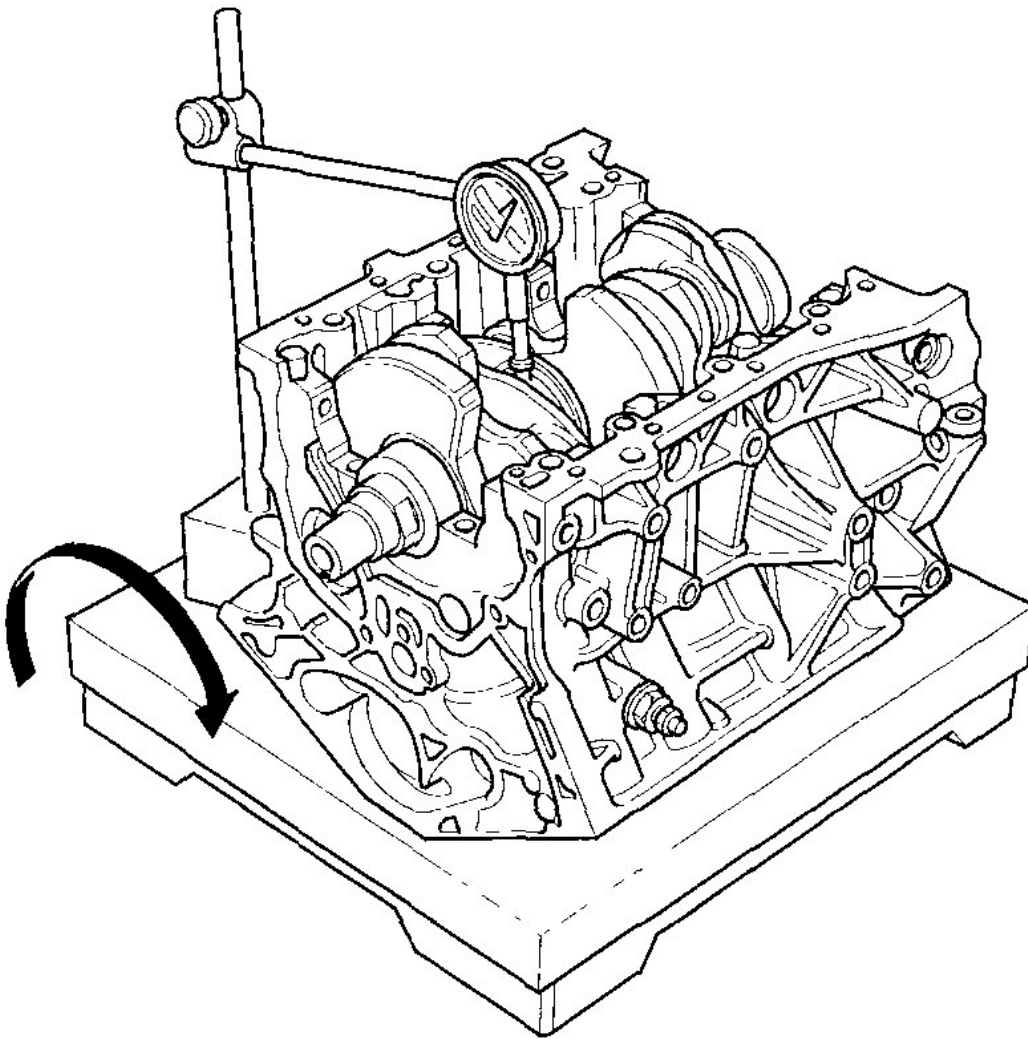
### **Straightness**

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

### **Crankshaft Total Runout**

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

**Service Limit: 0.030 mm (0.0012 in.)**



**Fig. 26: Checking Crankshaft Total Runout**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

## BLOCK AND PISTON INSPECTION

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

### Piston Diameter

**Standard (New): 88.975-88.985 mm (3.5029-3.5033 in.)**

## 2005 Honda Pilot EX

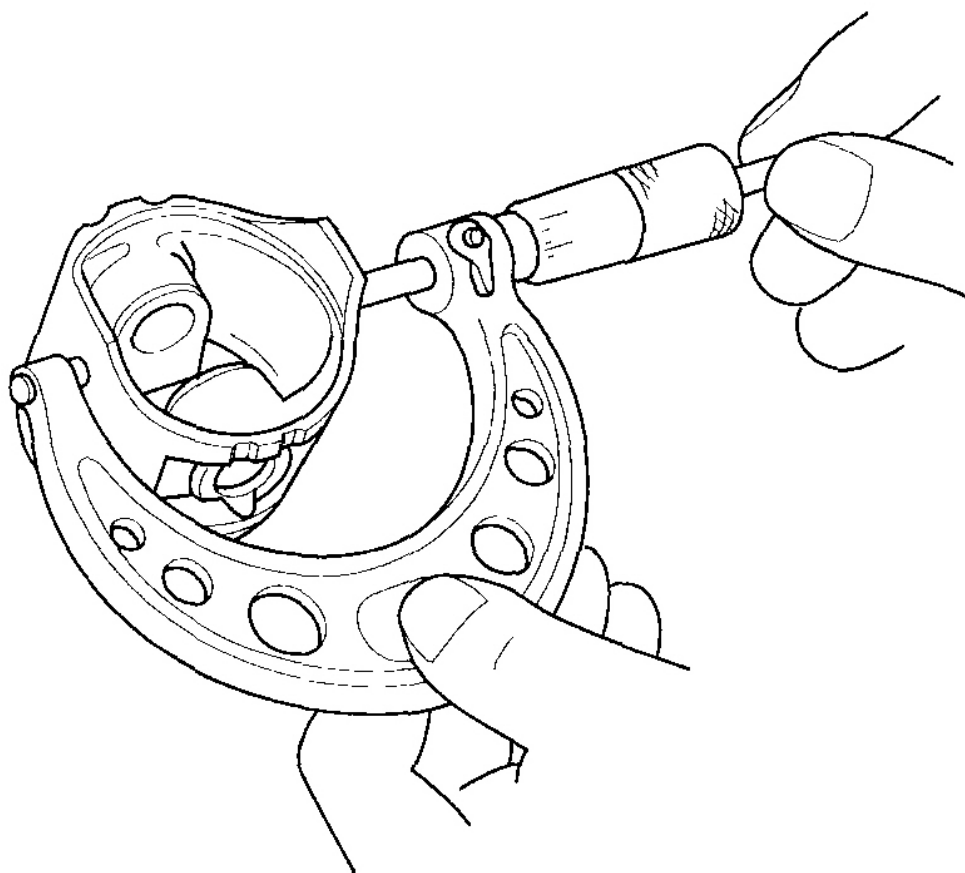
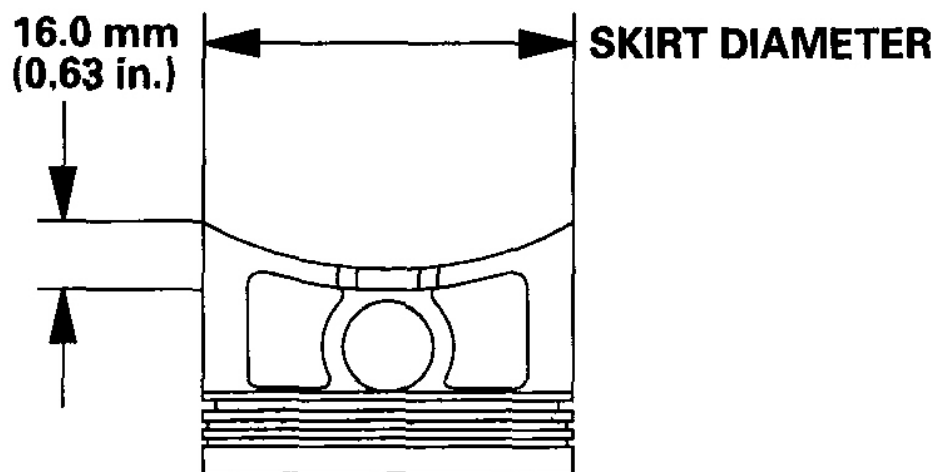
2005 ENGINE Engine Block - Pilot

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

**Oversize Piston Diameter**

**0.25: 89.225-89.235 mm (3.5128-3.5132 in.)**





**Fig. 27: Measuring Piston Diameter**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

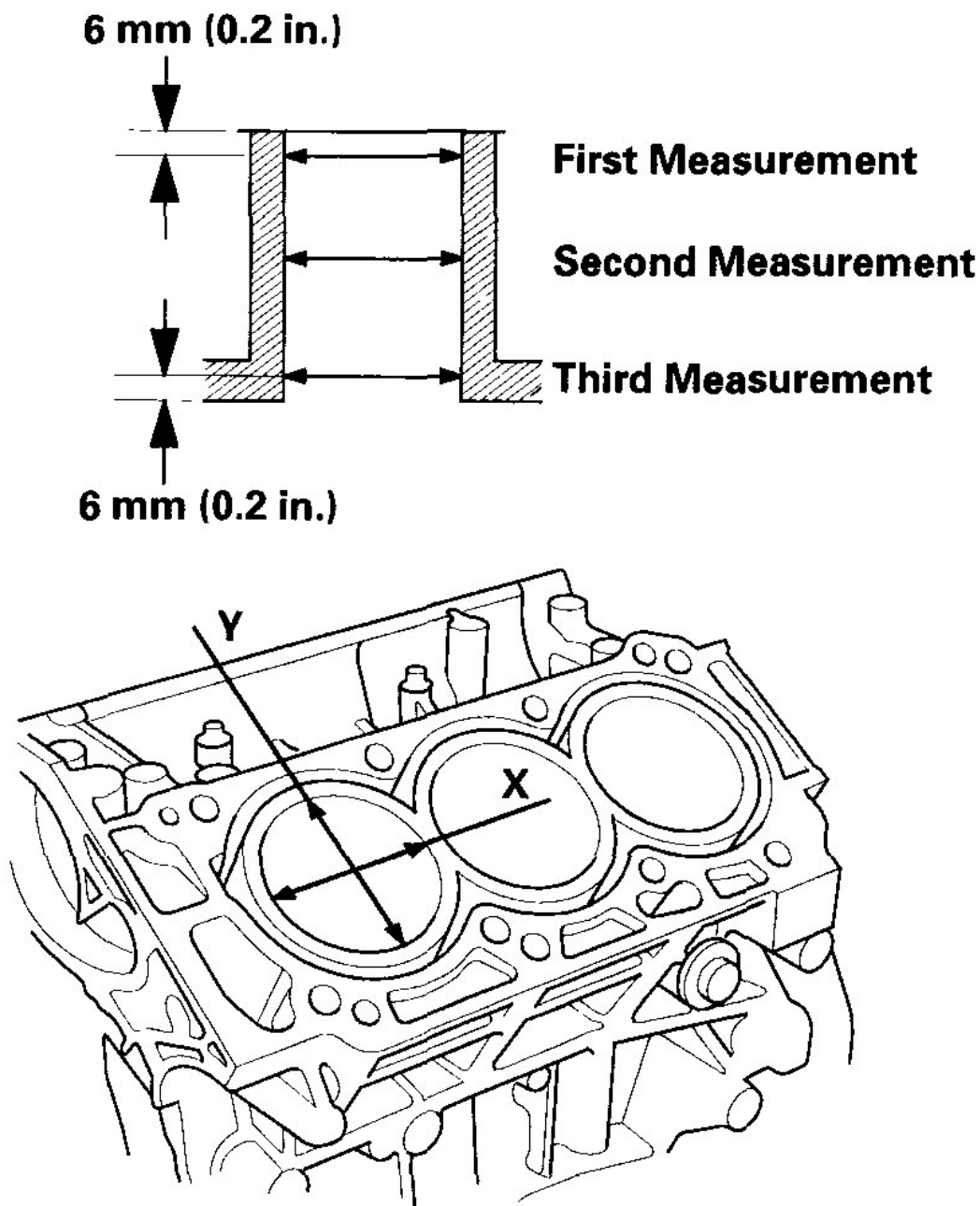
**Oversize**

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

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

**Bore Taper**

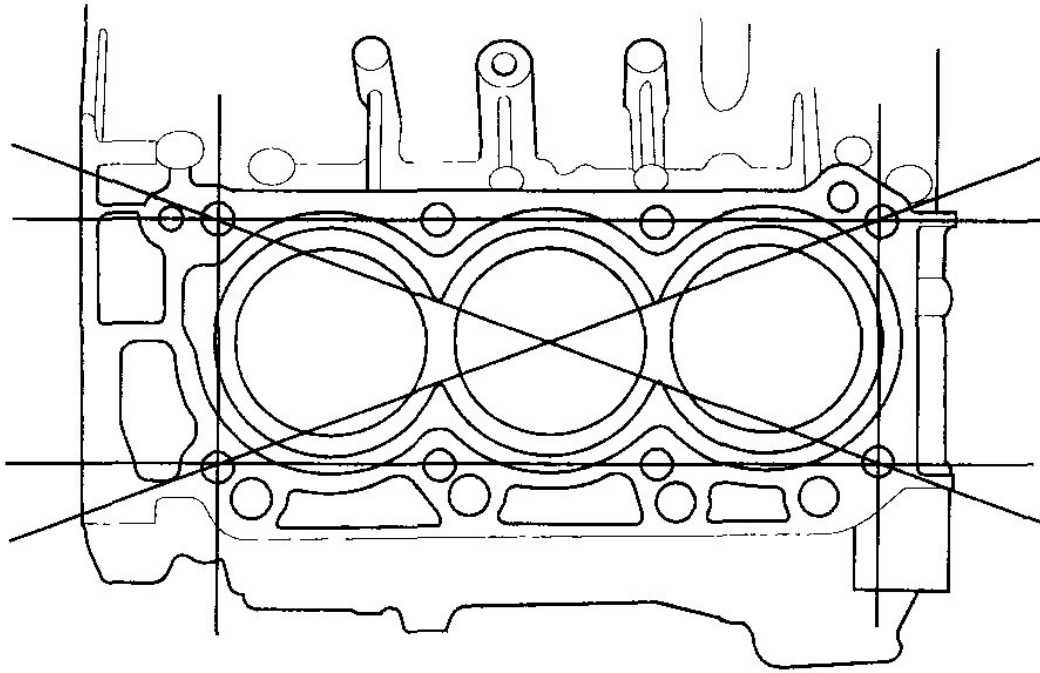
**Limit: (Difference between first and third measurement) 0.05 mm (0.002 in.)**



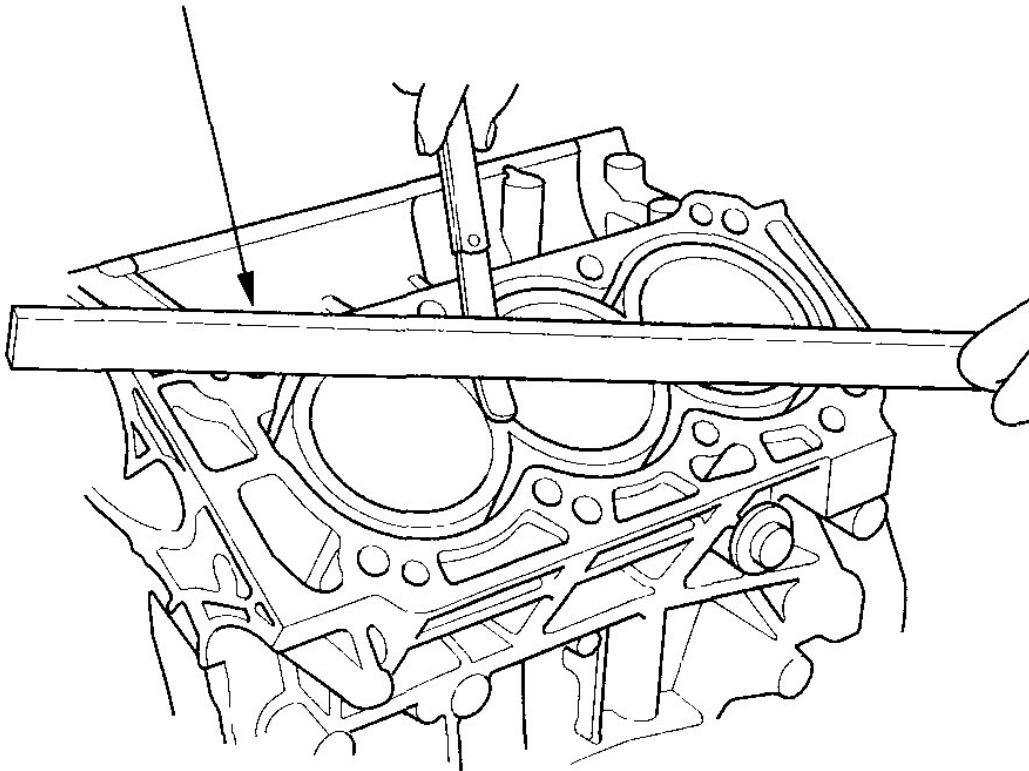
**Fig. 28: Identifying Cylinder Bore Measurement Location**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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.)**



**PRECISION STRAIGHT EDGE**



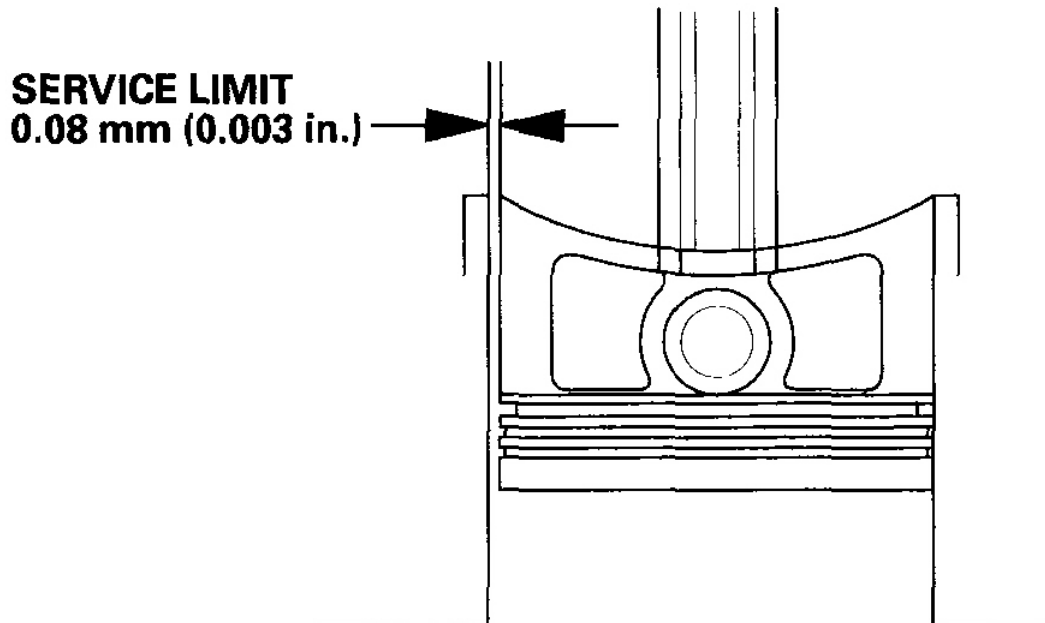
**Fig. 29: Checking Top Of Engine Block For Warpage**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

#### **Piston-to-Cylinder Bore Clearance**

**Standard (New): 0.015-0.040 mm (0.0006-0.0016 in.)**

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



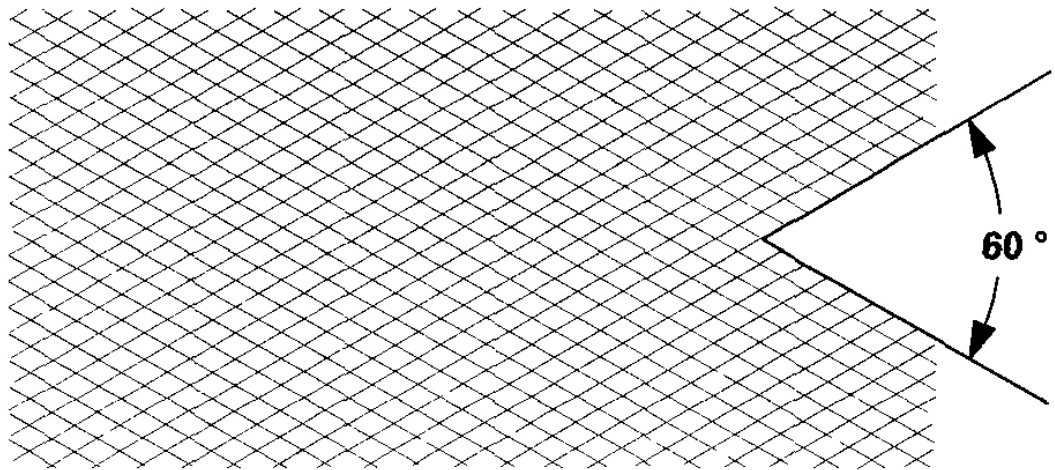
**Fig. 30: Identifying Piston-To-Cylinder Bore Clearance**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

## **CYLINDER BORE HONING**

1. Measure the cylinder bores (see step 4 ). If the engine block is to be reused, hone the cylinders and remeasure the bores. Only scored or scratched cylinder bores must be honed.
2. Hone the cylinder bores with honing oil and a fine (400 grit) stone in a 60° 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. 31: Identifying Cylinder Bore Honing Angle**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

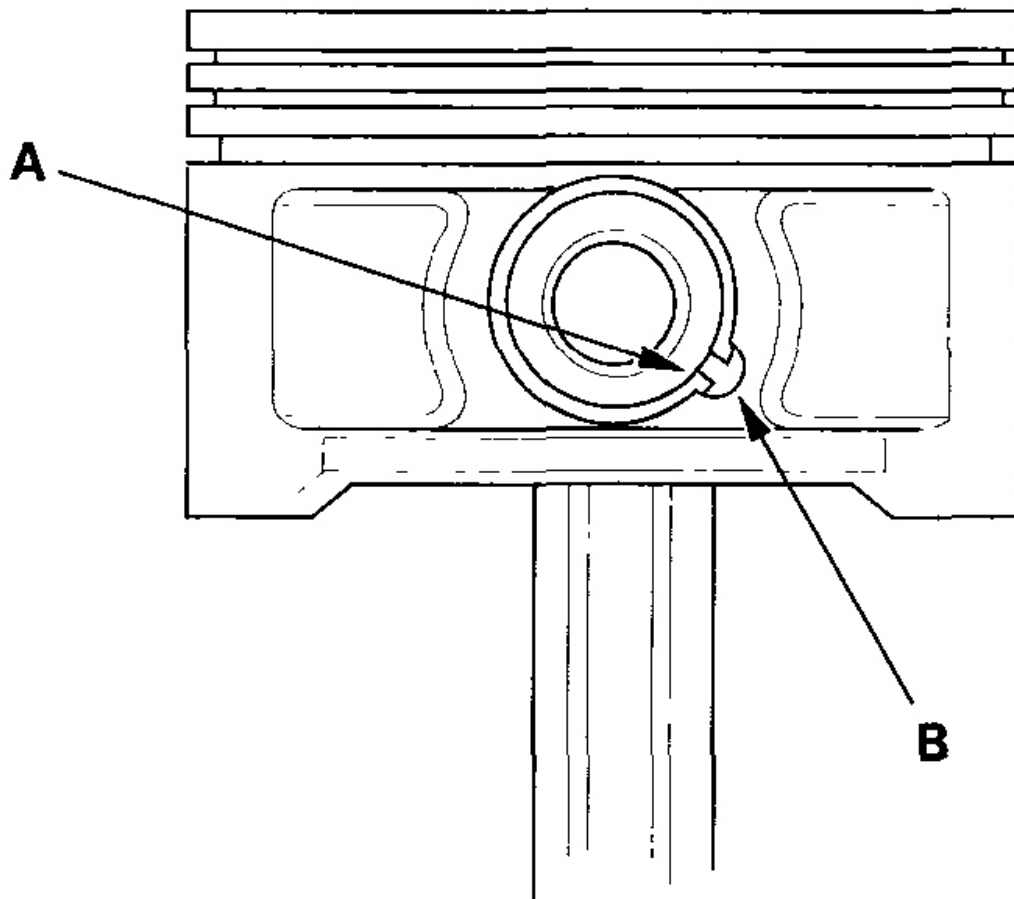
3. When honing is complete, thoroughly clean the engine block of all metal particles. Wash the cylinder bores with hot soapy water, then dry and oil them immediately to prevent rusting. Never use solvent, it will only redistribute the grit on the cylinder walls.
4. If scoring or scratches are still present in the cylinder bores after honing to the service limit, rebore the engine block. Some light vertical scoring and scratching is acceptable if it is not deep enough to catch your fingernail and does not run the full length of the bore.

## PISTON, PIN, AND CONNECTING ROD REPLACEMENT

### DISASSEMBLY

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

**NOTE:** Take care not to damage the ring grooves.

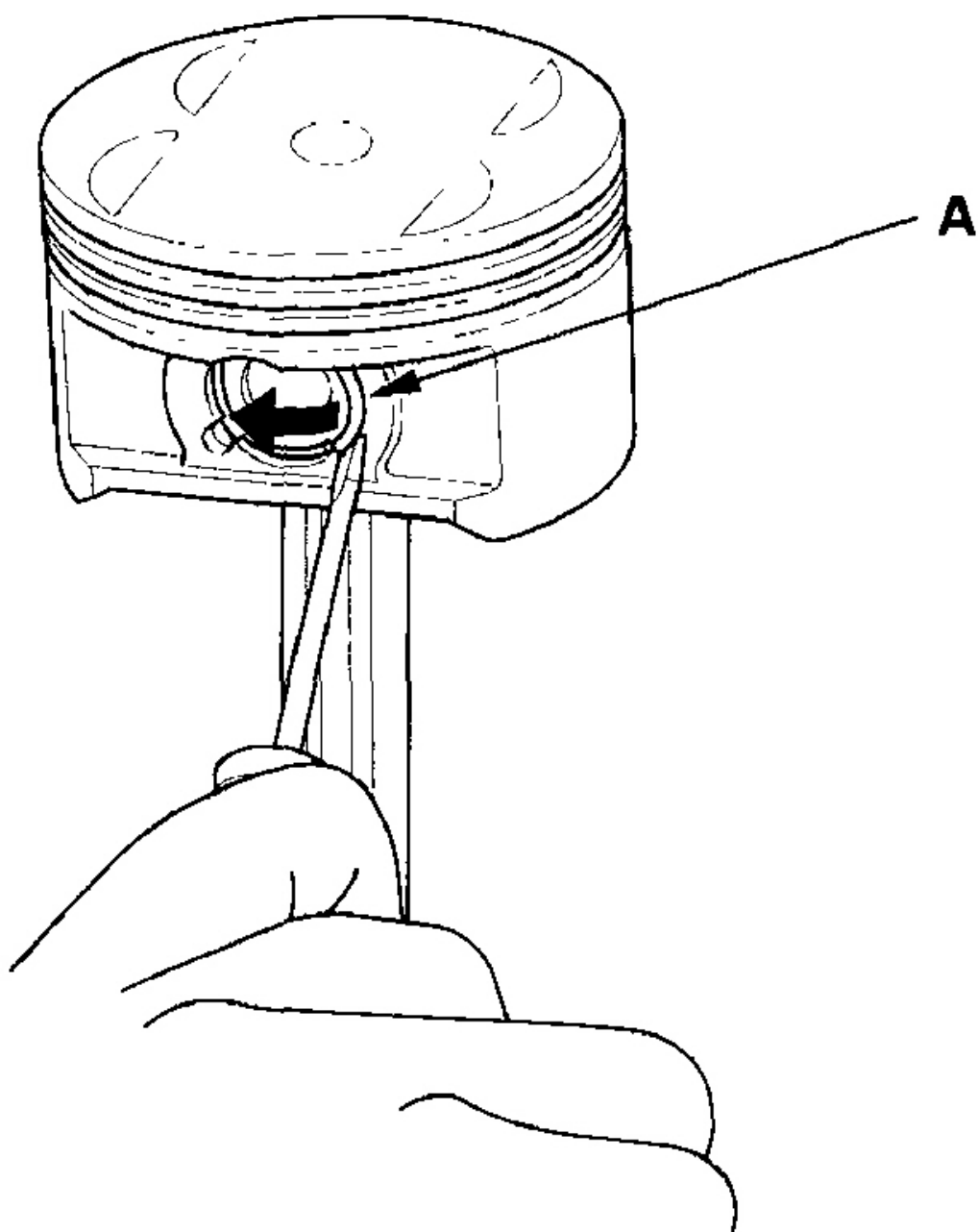


**Fig. 32: Identifying Piston Pin Snap Ring**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

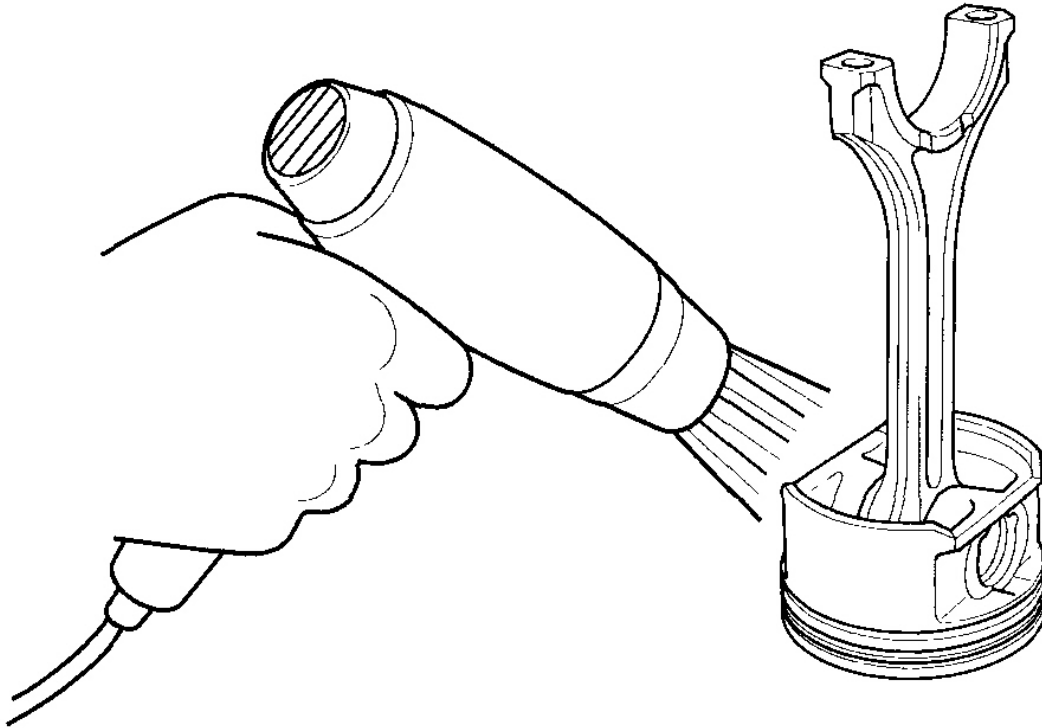




**Fig. 33: Removing Piston Pin Snap Ring**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



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

## INSPECTION

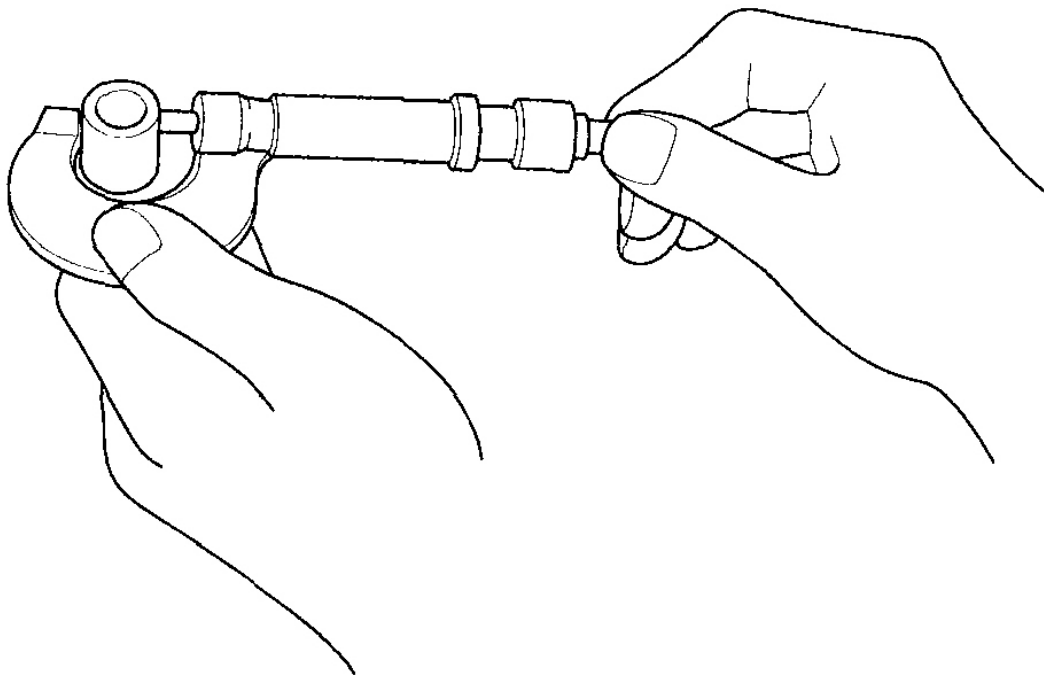
**NOTE:** Inspect the piston, piston pin, and connecting rod when they are at room temperature.

1. Measure the diameter of the piston pin.

### **Piston Pin Diameter**

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

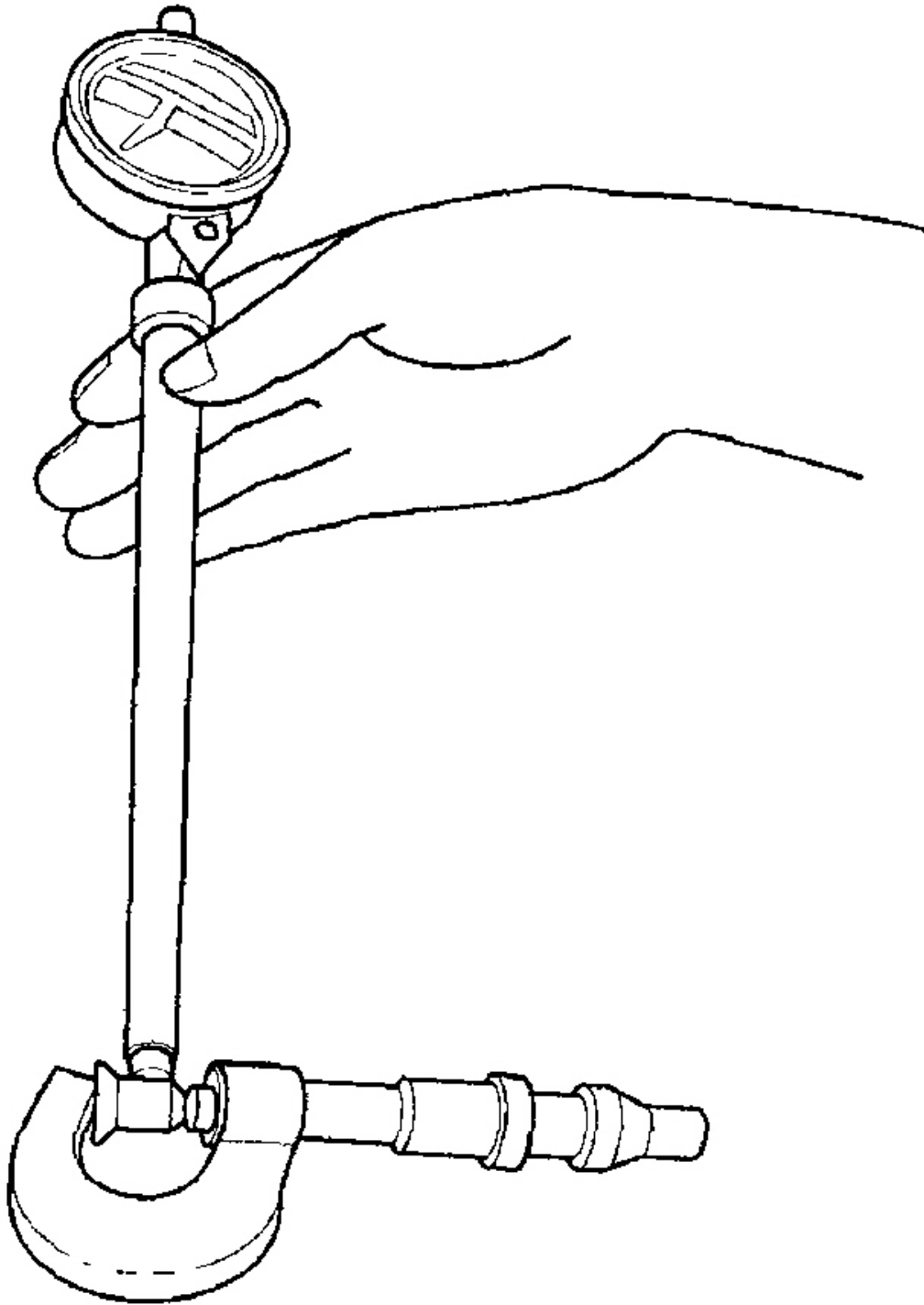
**Service Limit: 21.954 mm (0.8643 in.)**



**Fig. 35: Measuring Diameter Of Piston Pin**

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

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



**Fig. 36: Zeroing Dial Indicator To Piston Pin Diameter**

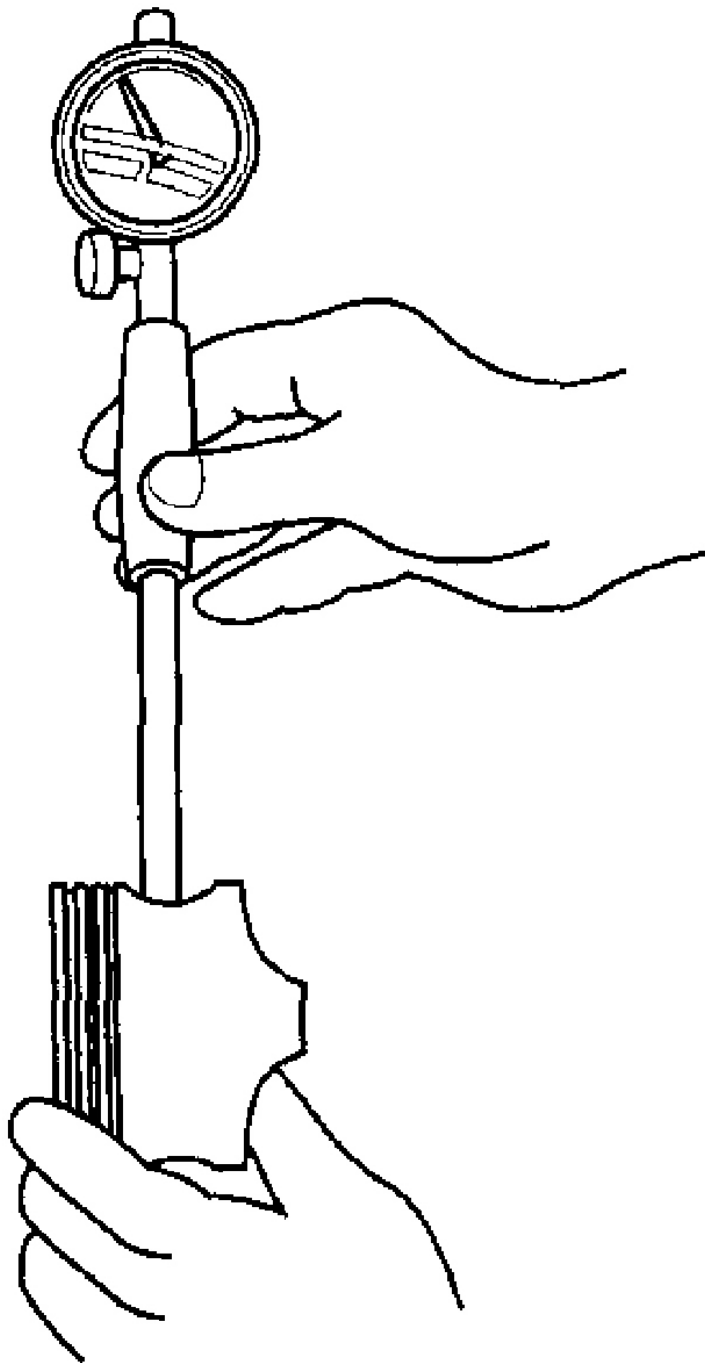
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

**Piston Pin-to-Piston Clearance**

**Standard (New): -0.0050 to +0.0010 mm (-0.00020 to +0.00004 in.)**

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



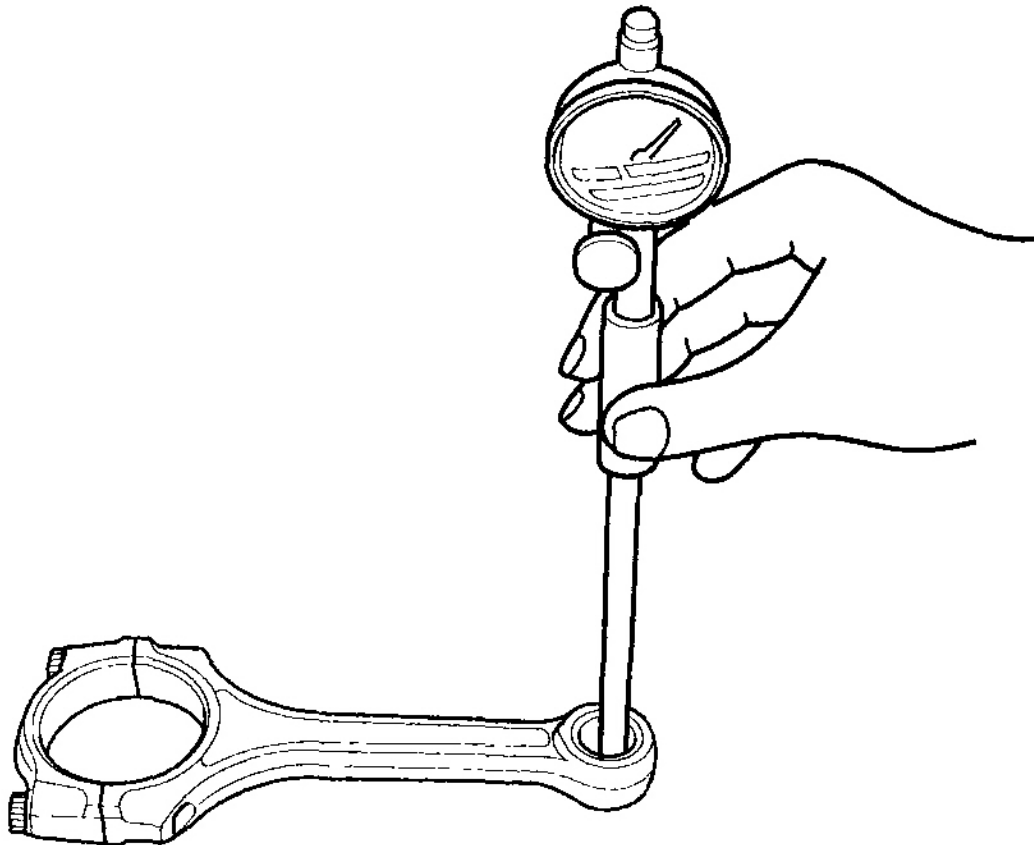
**Fig. 37: Checking Piston Pin-To-Piston Clearance**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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.)**

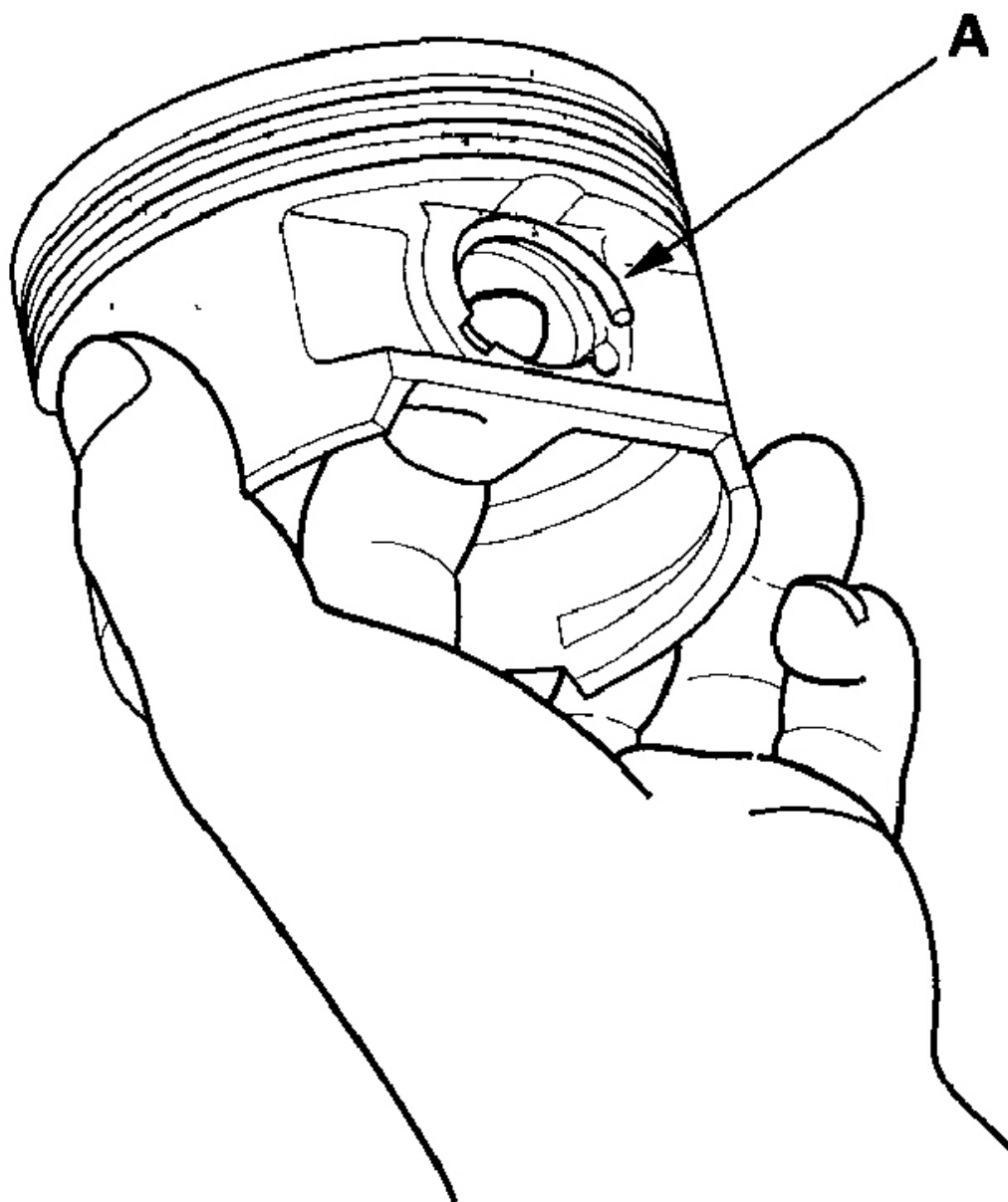
**Service Limit: 0.019 mm (0.0007 in.)**



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

**REASSEMBLY**

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

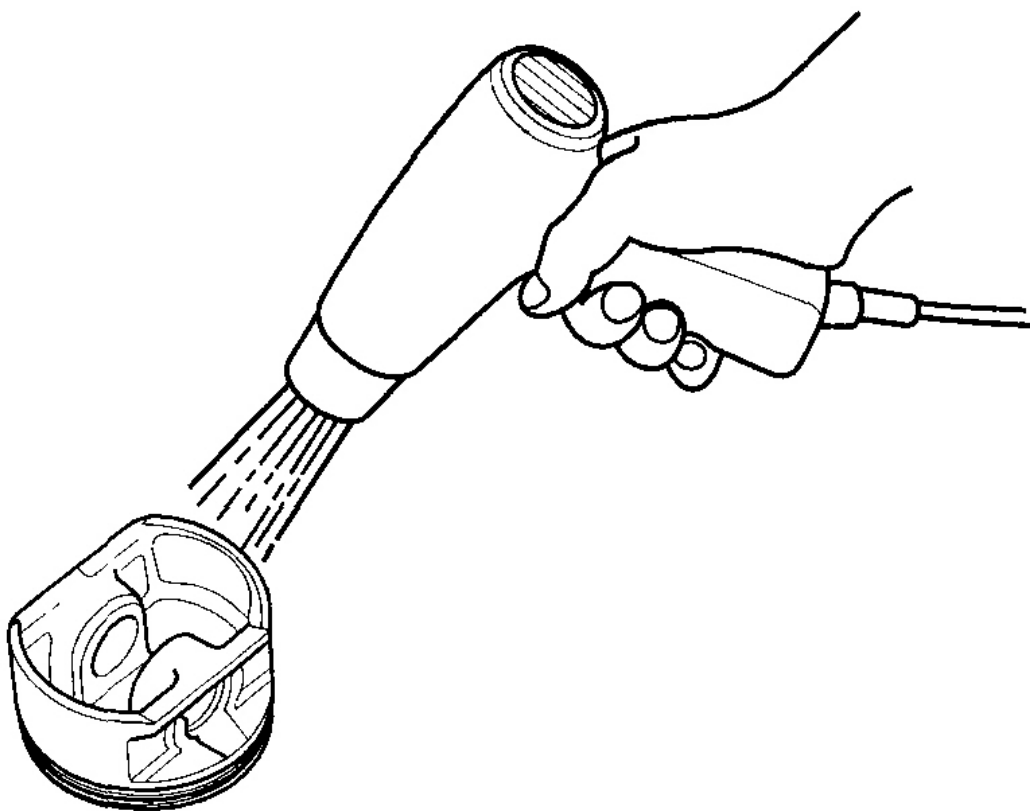


**Fig. 39: Installing Piston Pin Snap Ring**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

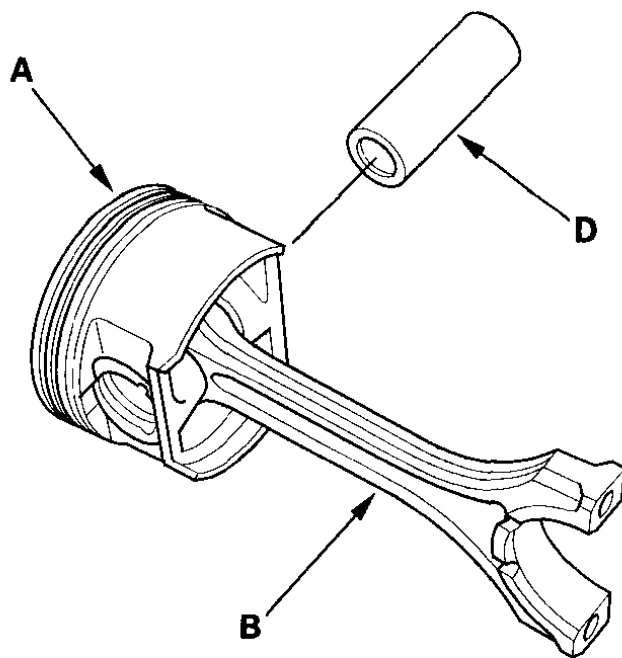
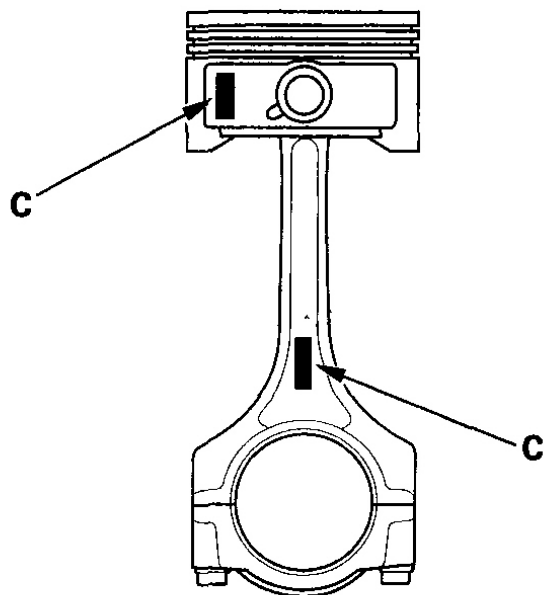




**Fig. 40: Heating Piston**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



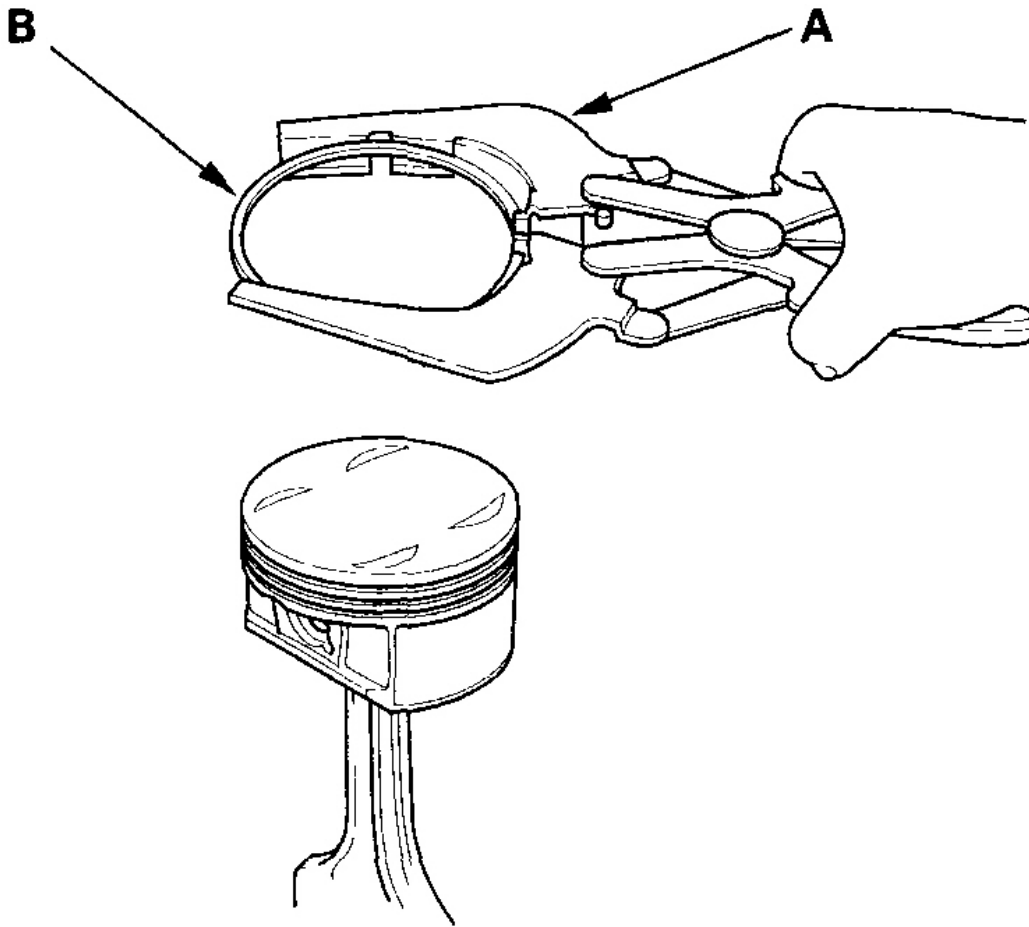
**Fig. 41: Installing Piston Pin**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Install the remaining snap ring.

## PISTON RING REPLACEMENT

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



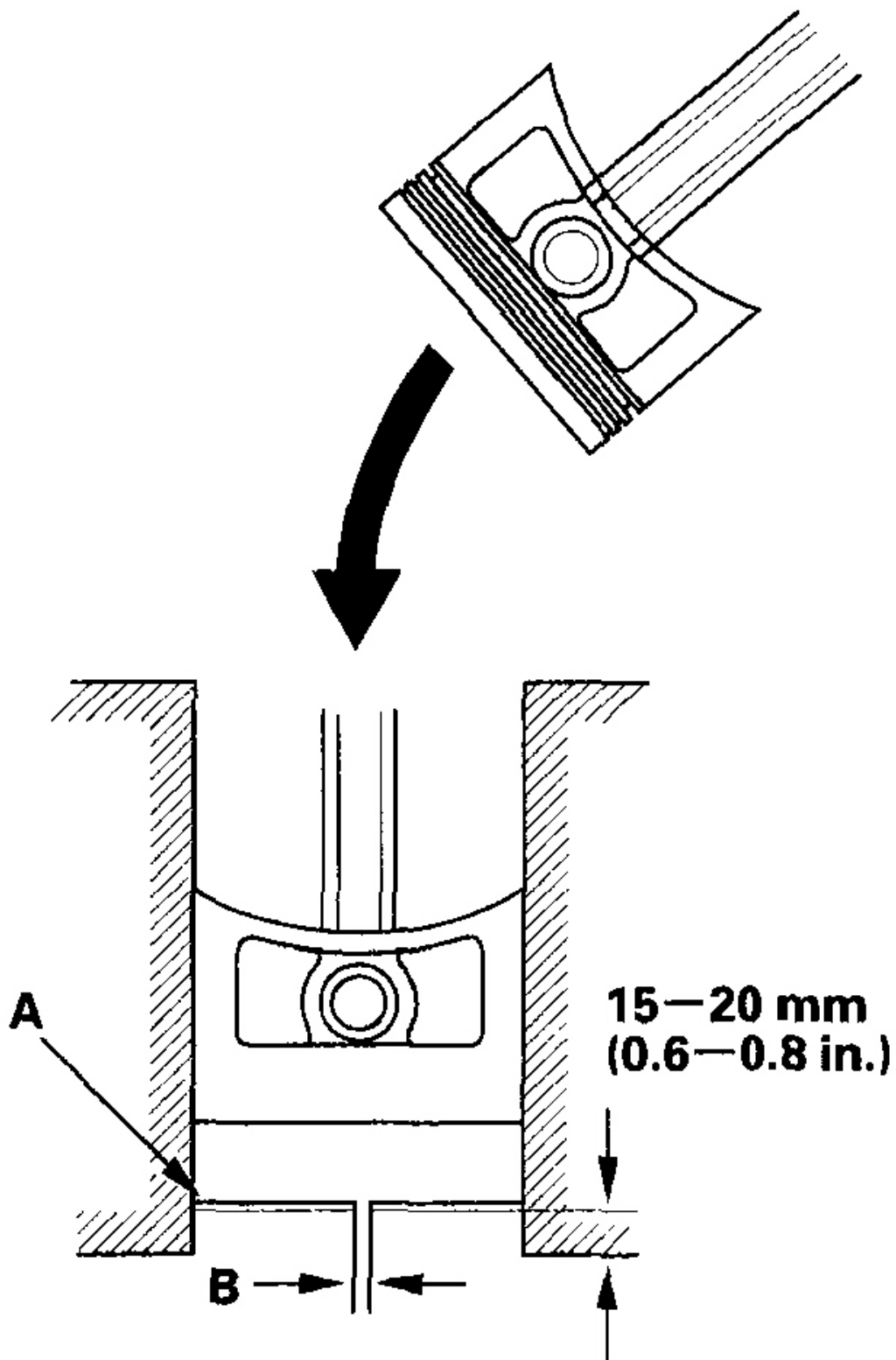
**Fig. 42: Removing Old Piston Rings**

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. 43: Pushing New 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 ). 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.)**

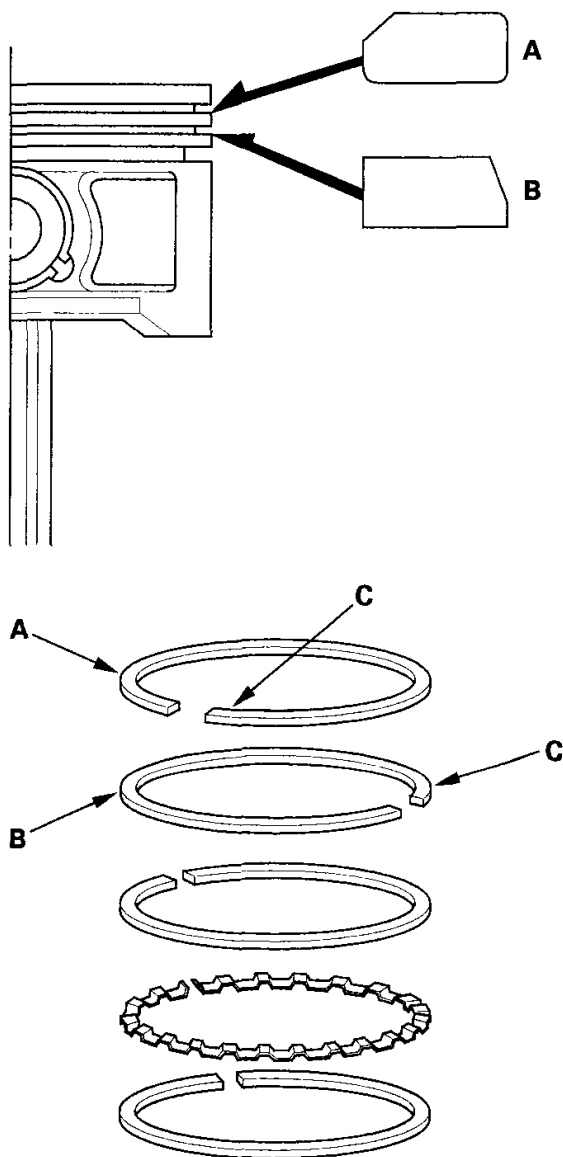
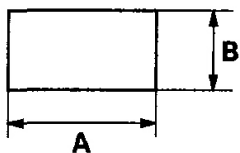
**Second Ring: Standard (New): 0.40-0.55 mm (0.016-0.022 in.)**

**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 in illustration. The top ring (A) has a 1D mark and the second ring (B) has a 2C mark. The manufacturing marks (C) must be facing upward.

**Piston Ring Dimensions:**

**Top Ring (Standard)**  
A: 3.1 mm (0.12 in.)  
B: 1.2 mm (0.05 in.)

**Second Ring (Standard)**  
A: 3.4 mm (0.13 in.)  
B: 1.2 mm (0.05 in.)

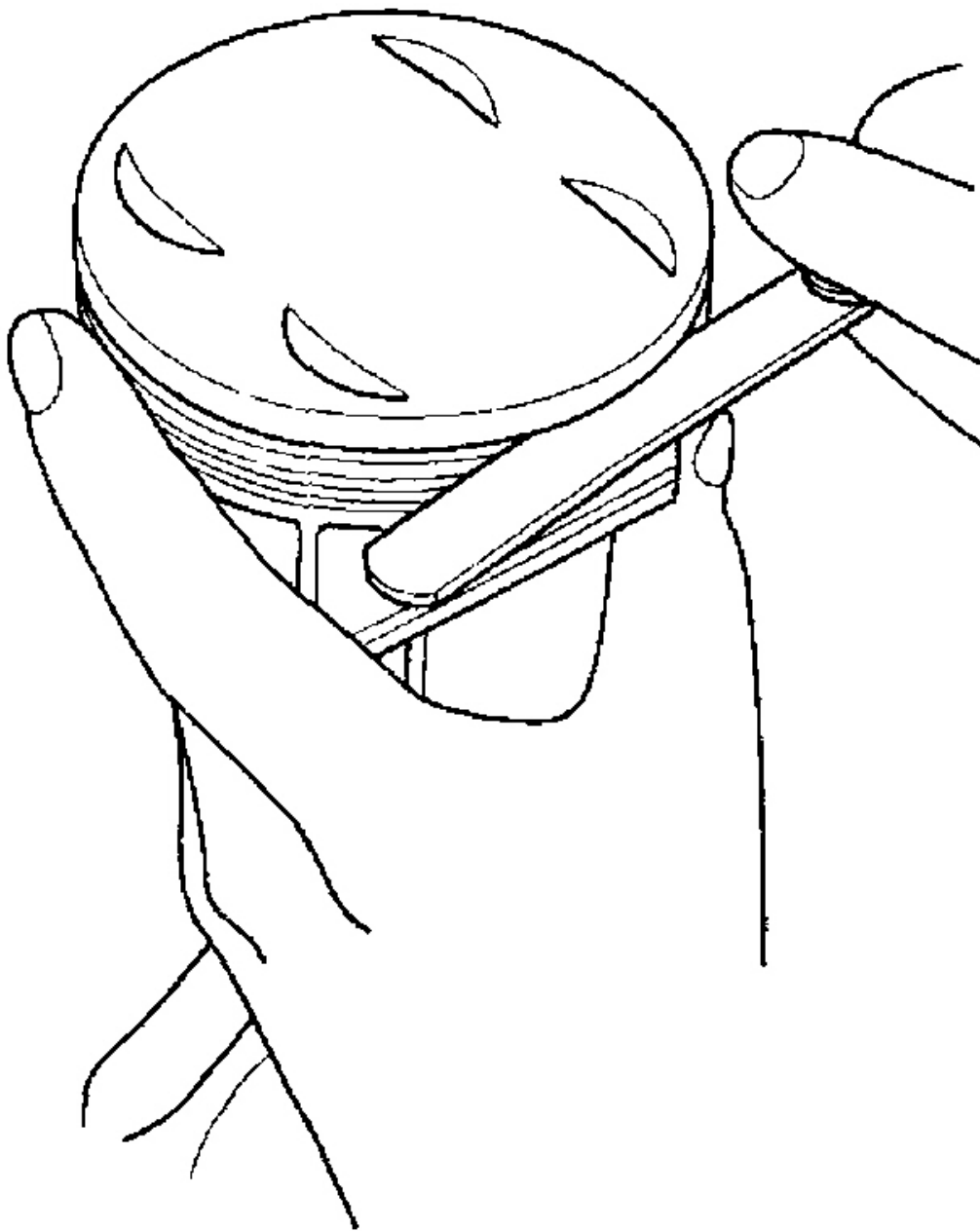
**Fig. 44: Identifying Piston Rings**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

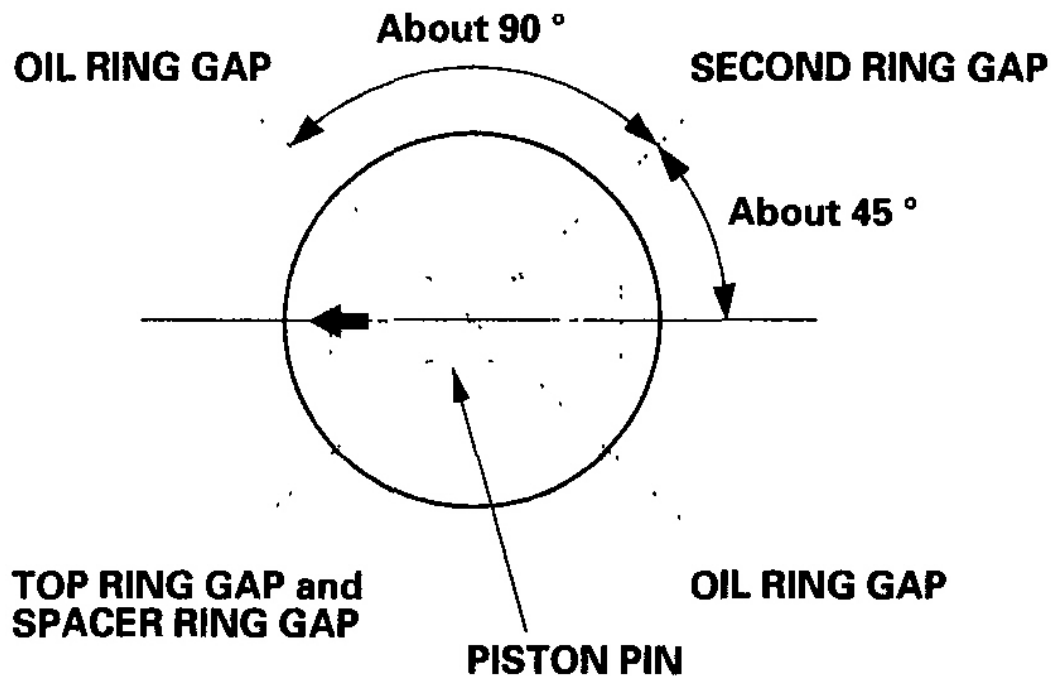
**Top Ring Clearance****Standard (New): 0.055-0.080 mm (0.0022-0.0031 in.)****Service Limit: 0.15 mm (0.006 in.)****Second Ring Clearance****Standard (New): 0.030-0.055 mm (0.0012-0.0022 in.)****Service Limit: 0.13 mm (0.005 in.)**





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

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



**Fig. 46: Identifying Ring End Gaps**

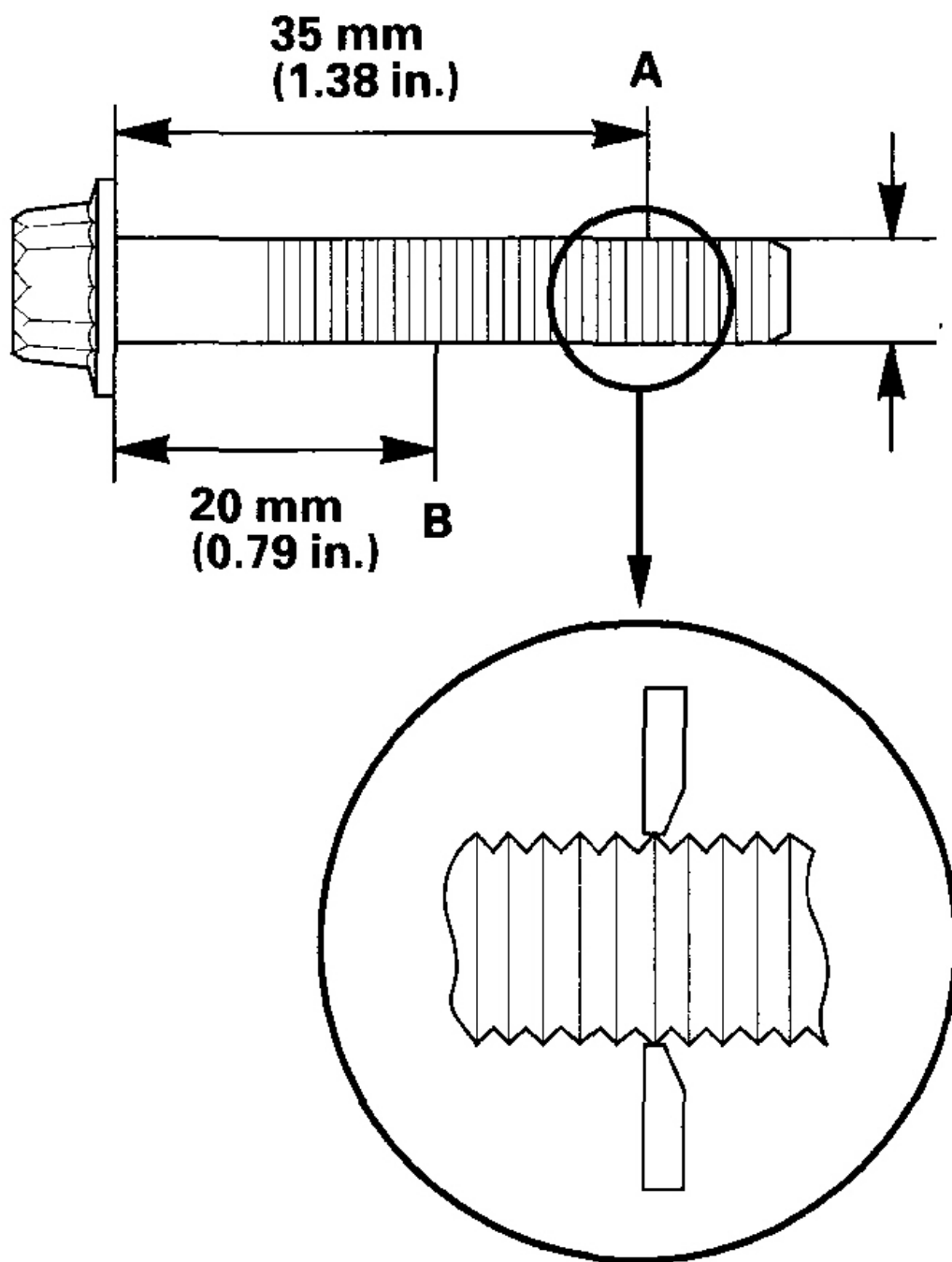
Courtesy of AMERICAN HONDA MOTOR CO., INC.

## CRANKSHAFT AND PISTON INSTALLATION

### Special Tools Required

- Driver 07749-0010000
- Driver attachment, 106 mm 070AD-RCAA200

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

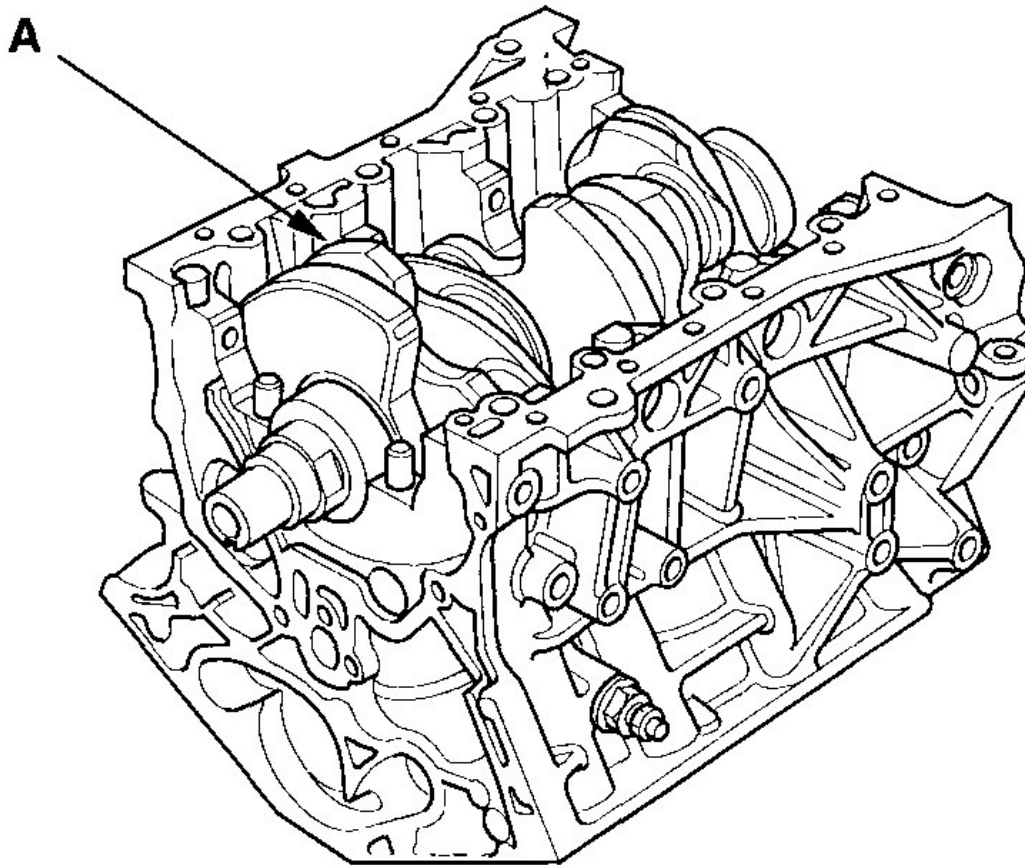


**Fig. 47: Identifying Connecting Rod Bolt Dimension**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

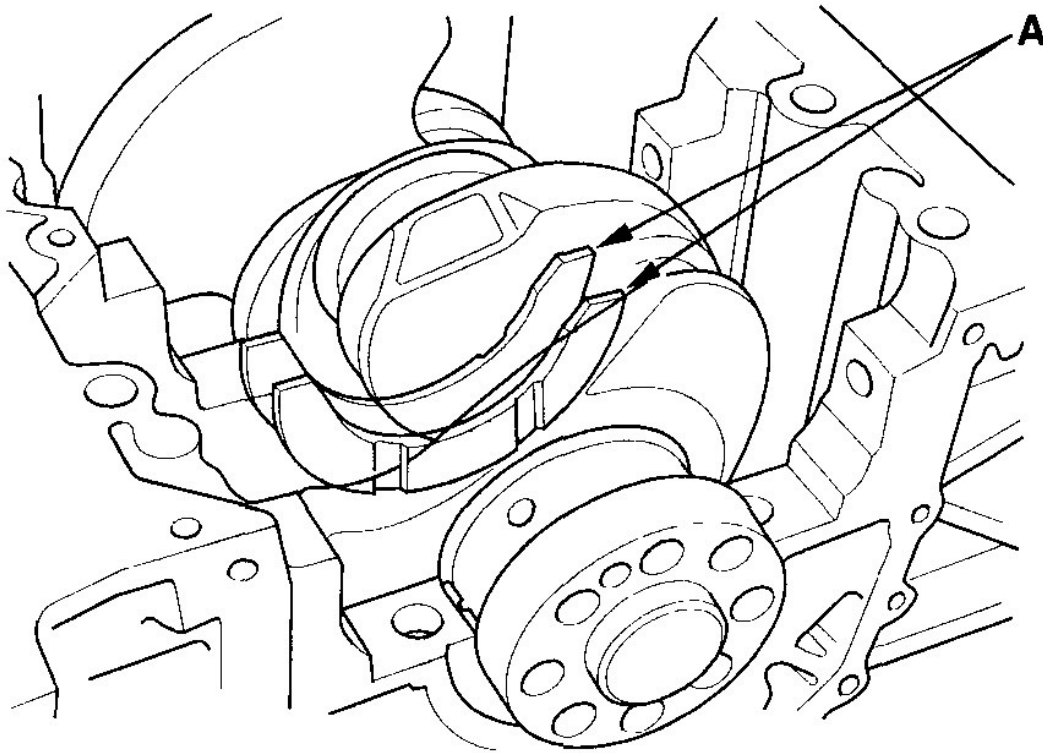
**Point A-Point B = Difference in Diameter****Difference in Diameter****Specification: 0-0.1 mm (0-0.004 in.)**

3. If the difference in diameter is out of tolerance, replace the connecting rod bolt.
4. Check the connecting rod bearing clearance with plastigage (see **CONNECTING ROD BEARING REPLACEMENT** ).
5. Check the main bearing clearance with plastigage (see **CRANKSHAFT MAIN BEARING REPLACEMENT** ).
6. Install the bearing halves in the engine block and connecting rods.
7. Apply new engine oil to inside of the main bearings and rod bearings.
8. Lower the crankshaft (A) into the engine block.

**Fig. 48: Installing Crankshaft Into Engine Block**

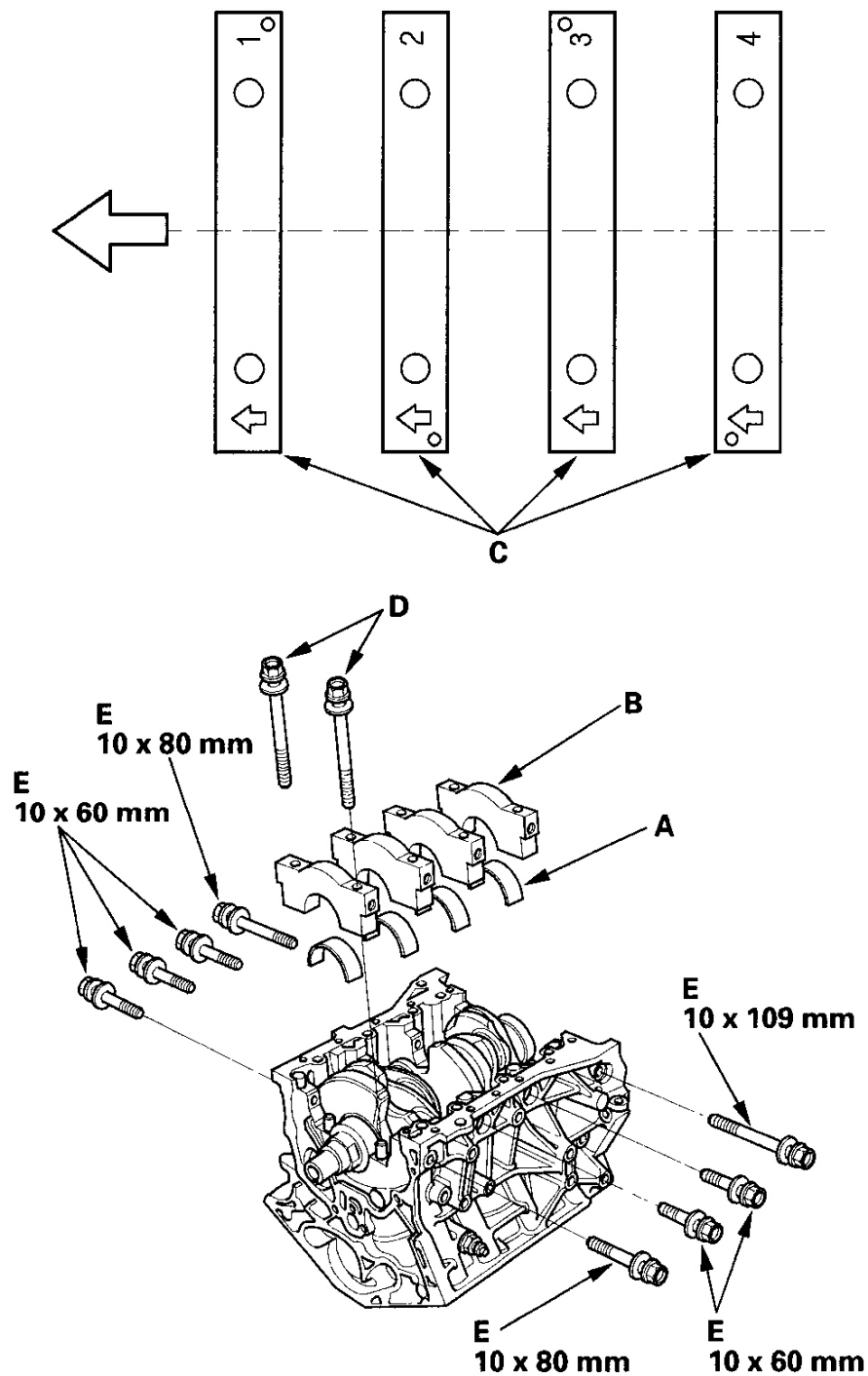
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



**Fig. 49: Installing Thrust Washers In No. 3 Journal**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

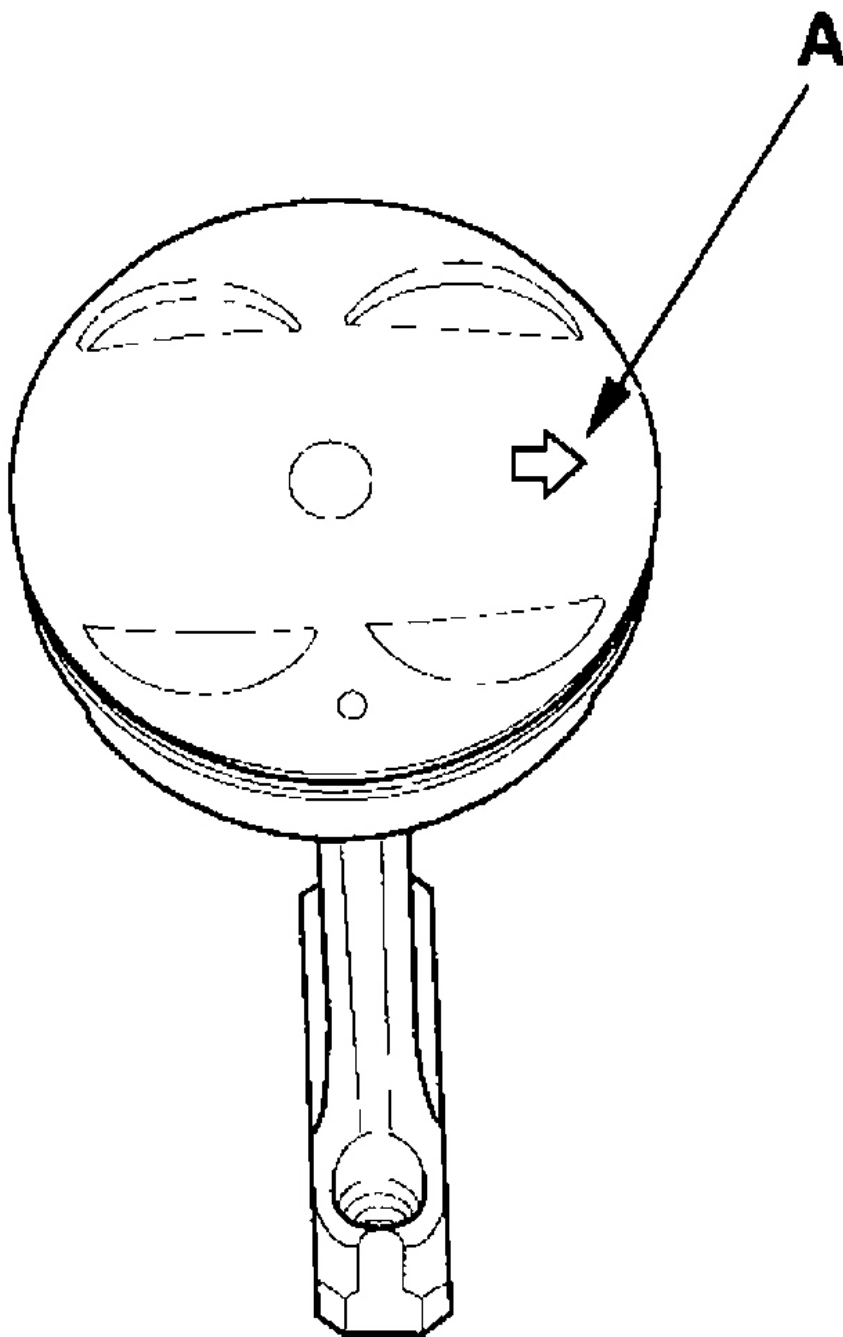
10. Install the bearings (A) and bearing caps (B) with the arrow (C) facing the timing belt end of the engine.



**Fig. 50: Installing Bearings And Bearing Caps**  
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Apply new engine oil to the bolt threads and flanges, then loosely install the bearing cap bolts (D) and bearing cap side bolts (E).

12. Set the crankshaft to bottom dead center (BDC) for the cylinder you are installing the piston in.
13. Apply new engine oil to the piston, inside of the ring compressor, and the cylinder bore.
14. Attach the ring compressor to the piston/connecting rod assembly, and check that the bearing is securely in place.
15. Position the piston/connecting rod assembly with the arrow (A) facing the timing belt side of the engine.

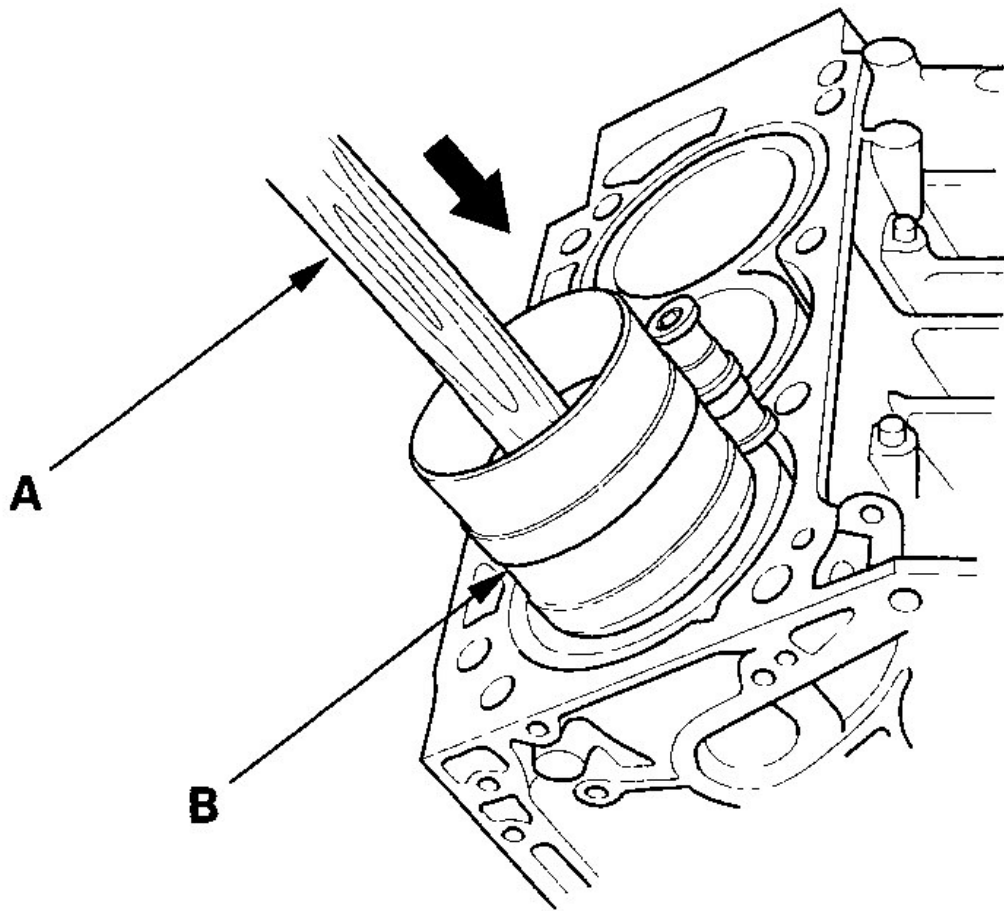


**Fig. 51: Identifying Piston/Connecting Rod Assembly Position**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

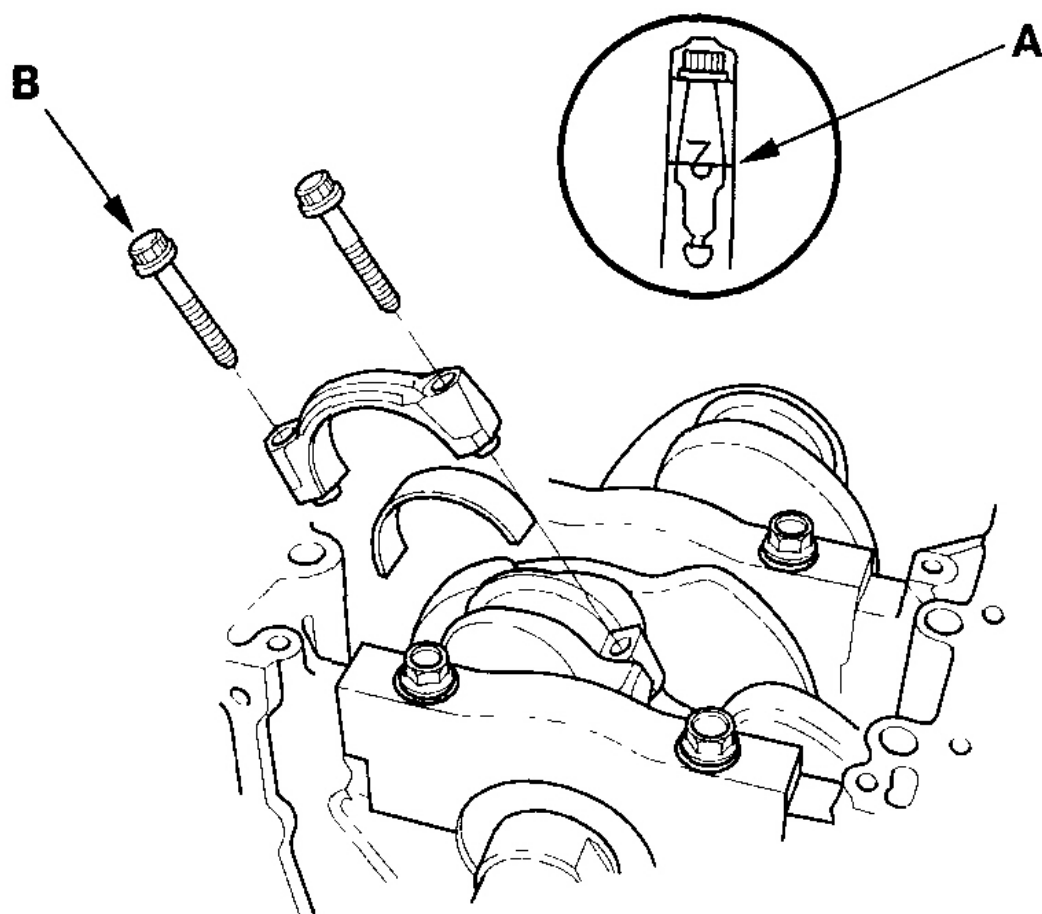


before entering the cylinder bore.



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

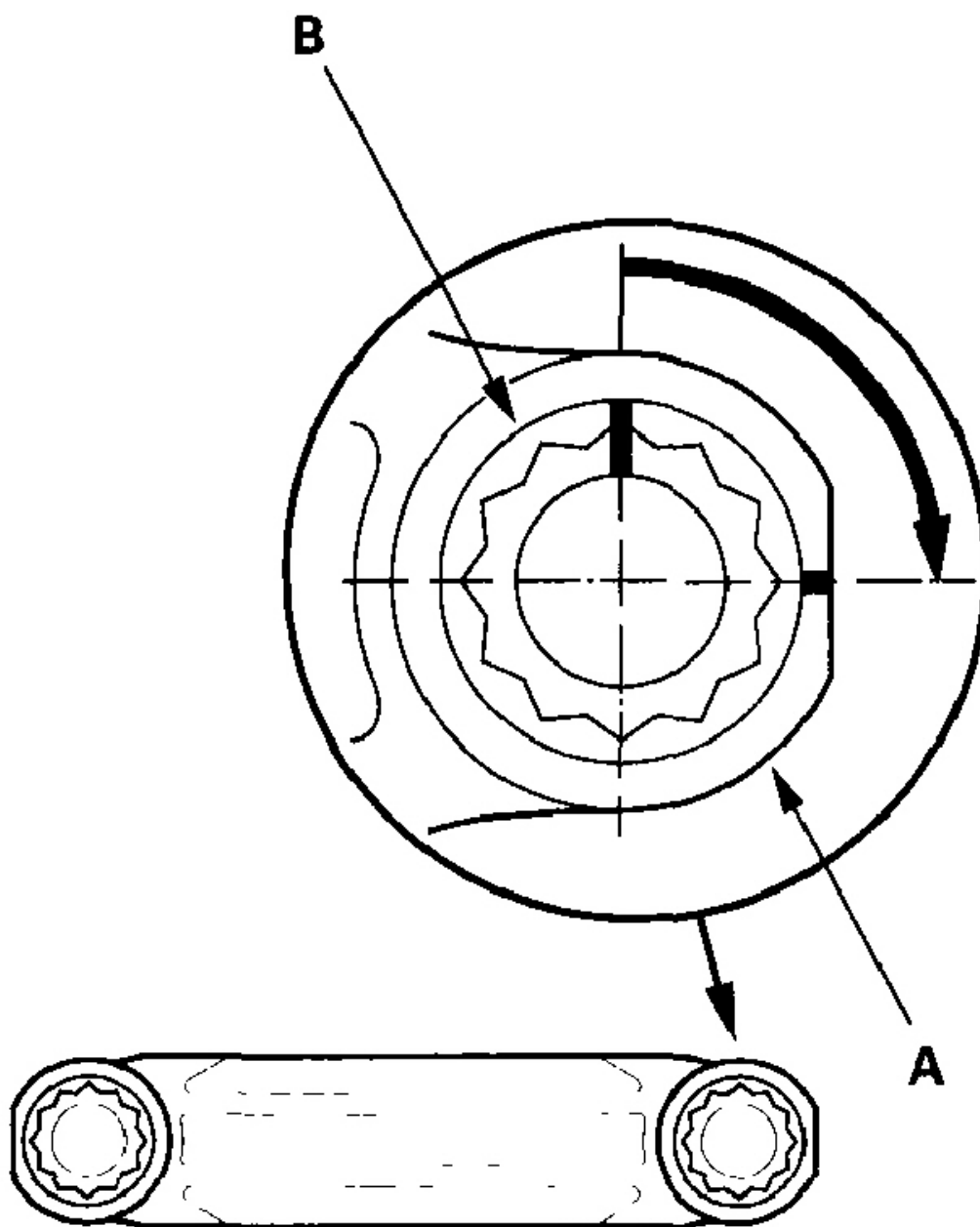
17. Stop after the ring compressor pops free, and check the connecting rod-to-crank journal alignment before pushing the piston into place.
18. Line up the mark (A) on the connecting rod and cap, then install the cap.



**Fig. 53: Installing Connecting Rod Cap**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

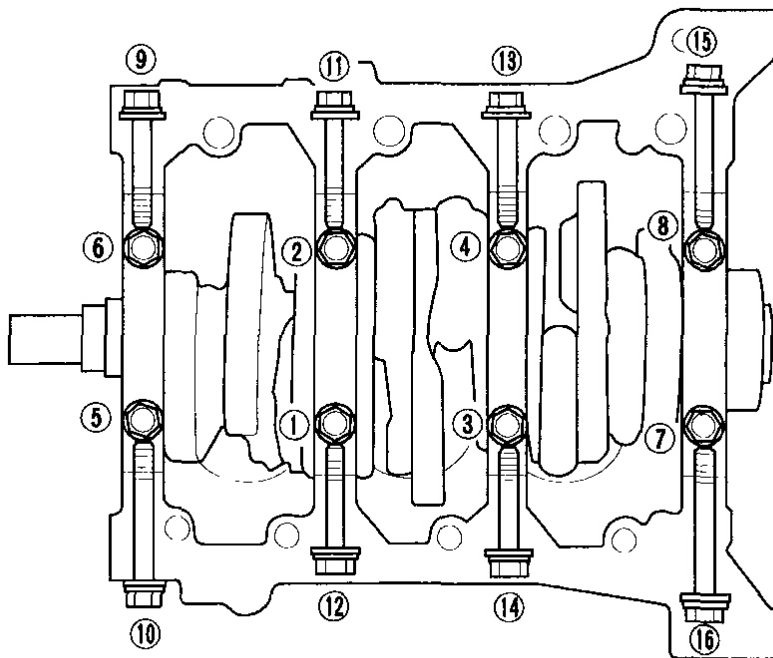
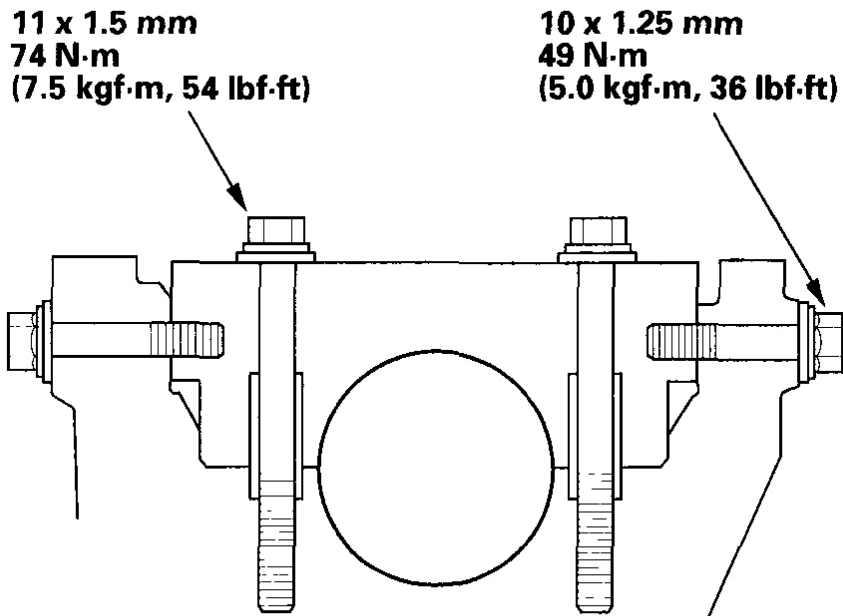
19. Apply new engine oil to the bolt threads and flanges. Torque the bolts (B) to 20 N.m (2.0 kgf.m, 14 lbf.ft).



**Fig. 54: Identifying Connecting Rod Bolt**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

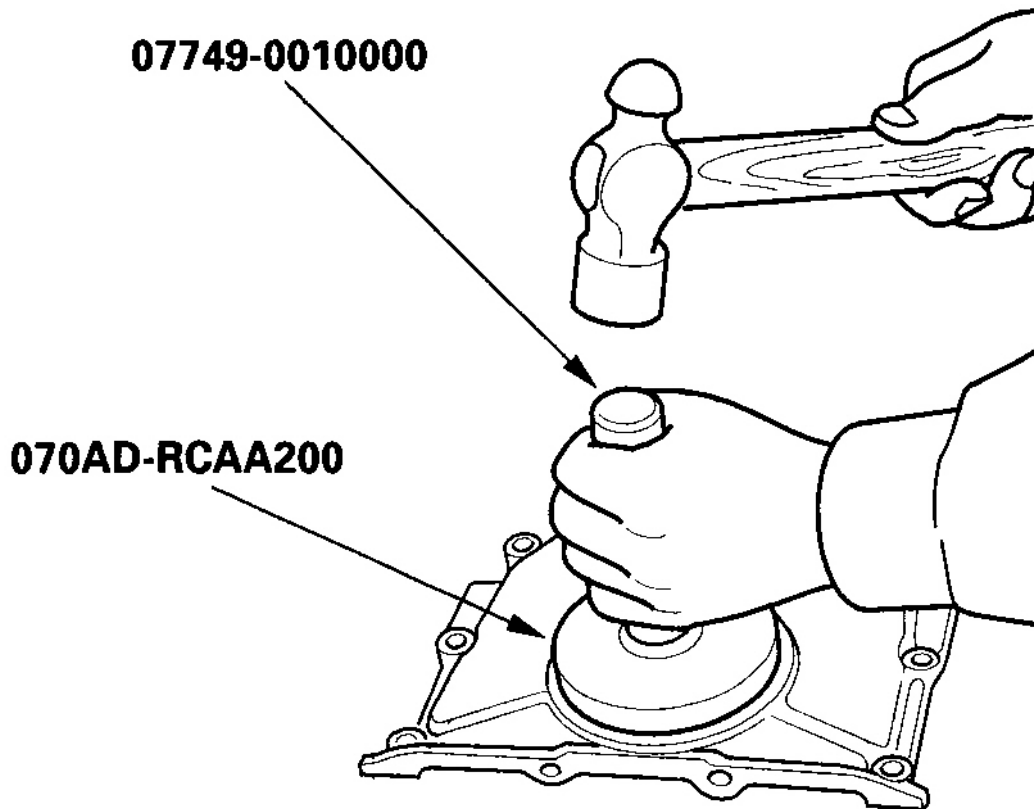
20. Mark the connecting rod (A) and bolt head (B) as shown.
21. Tighten the bolt until the mark on the bolt head lines up with the mark on the connecting rod (turn the bolt 90°).



**Fig. 55: Identifying Connecting Rod Bolts Tightening Sequence**  
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

23. Remove any old liquid gasket from the engine block end cover mating surfaces, bolts, and bolt holes.
24. Clean and dry the engine block end cover mating surfaces.
25. Apply a light coat of multipurpose grease to the crankshaft and to the lip of the seal.
26. Drive the new crankshaft oil seal until the special tool bottoms on the engine block end cover.

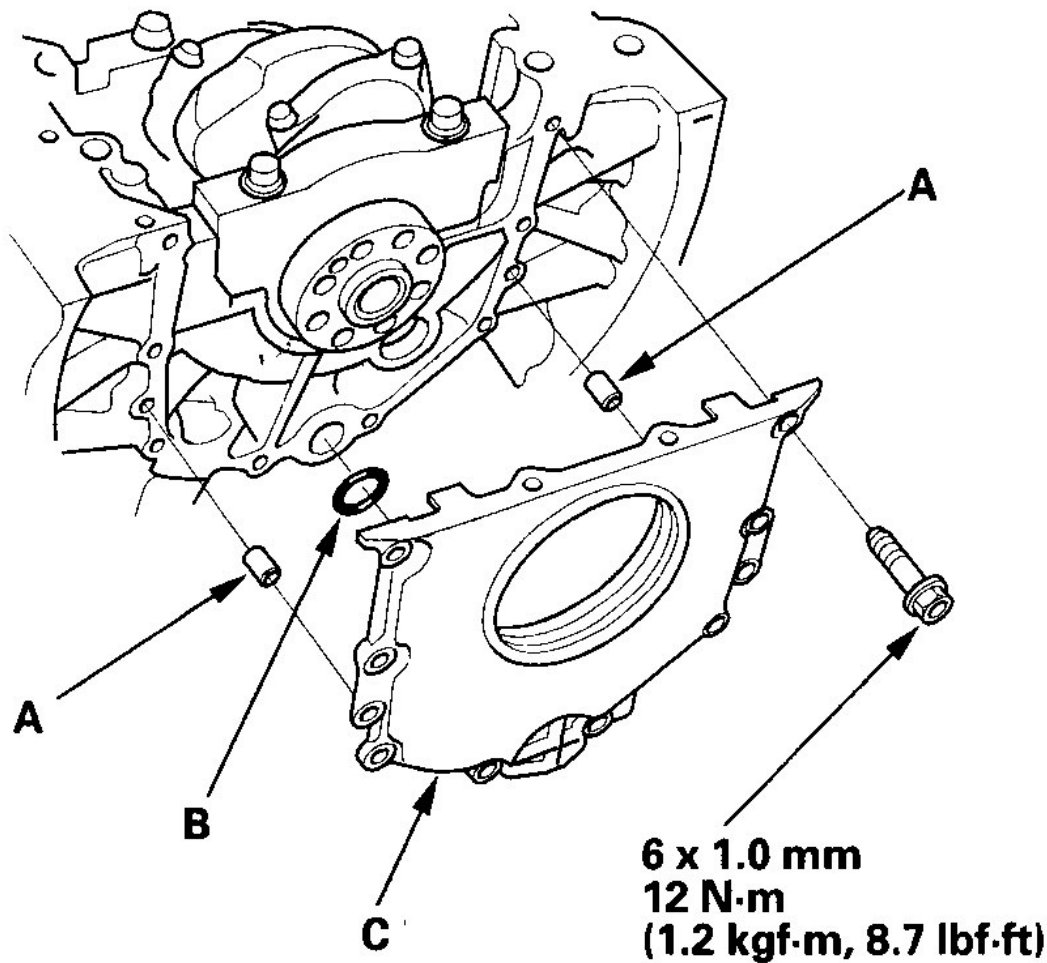


**Fig. 56: Installing Crankshaft Oil Seal**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

27. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the engine block mating surface of the engine block end cover. Install the dowel pins (A), new O-ring (B), and the engine block end cover (C) on the engine block. Clean the excess grease off the crankshaft, and check the seal for distortion.

**NOTE:** Do not install the parts if 4 minutes or more have elapsed since applying the liquid gasket. Instead, re-apply liquid gasket after removing the old residue.



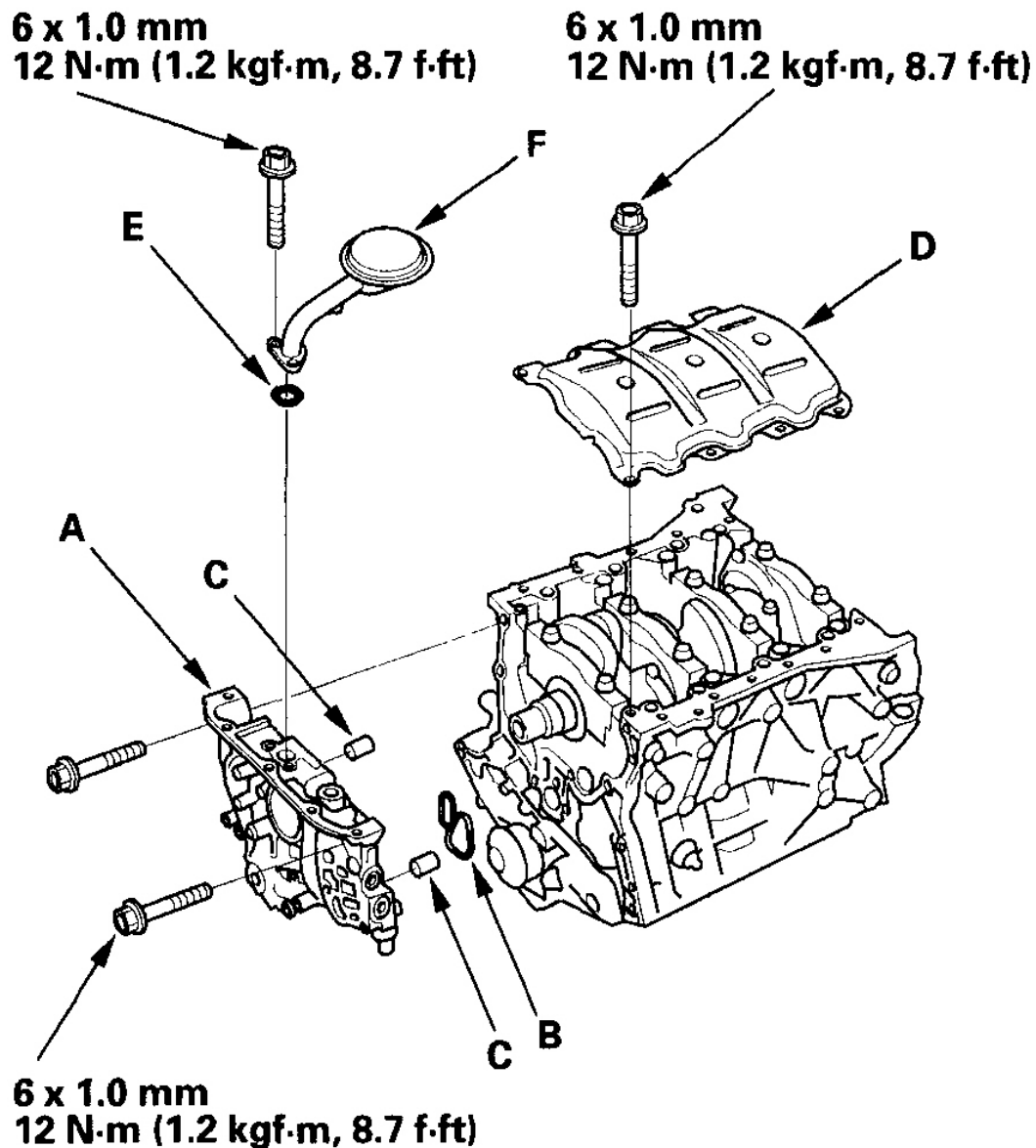
**Fig. 57: Installing Engine Block End Cover**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

28. After assembly, wait at least 30 minutes before filling the engine with new engine oil.
29. Remove any old liquid gasket from the oil pump mating surfaces, bolts, and bolt holes.
30. Clean and dry the oil pump mating surfaces.
31. Install the oil pump (A).
  - 1 Install a new crankshaft oil seal in the oil pump (see step 2 in **INSTALLATION** ).
  - 2 Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the block mating surface of the oil pump.

**NOTE:** Do not install the parts if 4 minutes or more have elapsed since applying the liquid gasket. Instead, re-apply liquid gasket after removing the old residue.

- 3 Grease the lip of the oil seal, and apply oil to the new O-ring (B).
- 4 Install the dowel pins (C), then align the oil pump inner rotor with the crankshaft, and install the oil pump.
- 5 Clean the excess grease off the crankshaft, and check the seal for distortion.

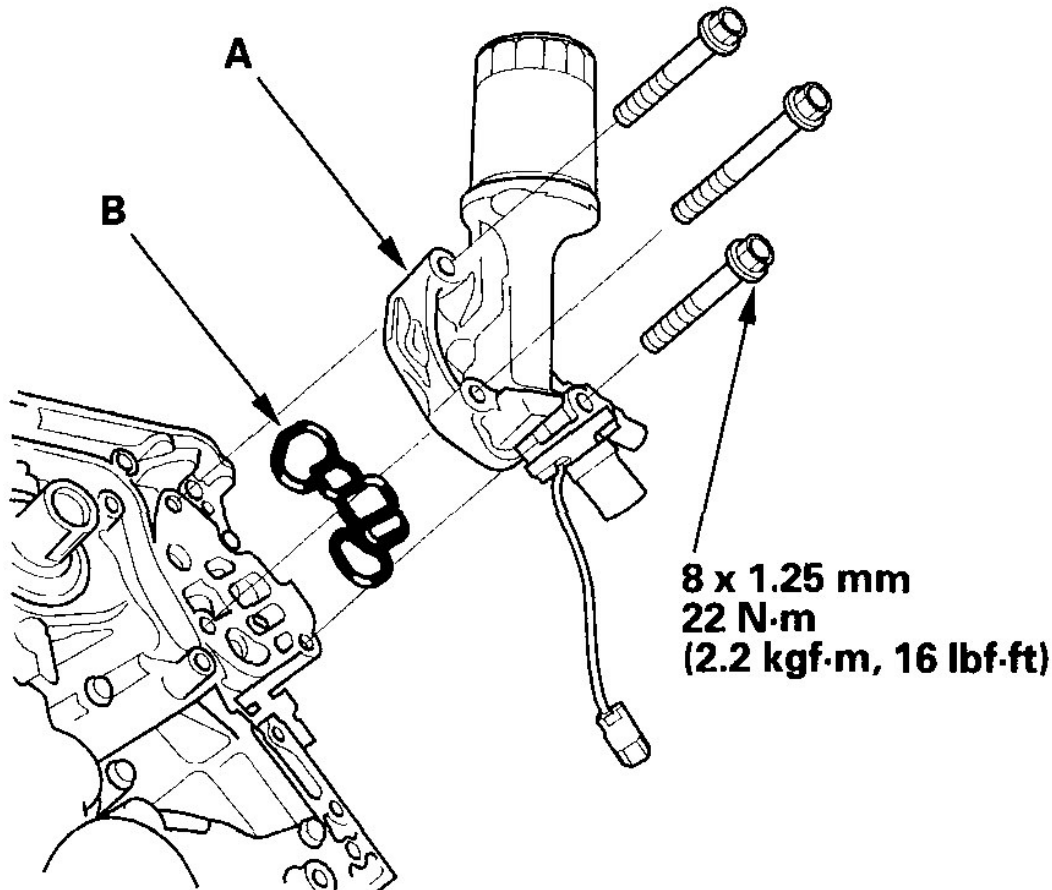


**Fig. 58: Installing Oil Pump**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

32. Install the baffle plate (D), then install the new O-ring (E) and the oil screen (F).

33. Install the VTEC solenoid valve/oil filter assembly (A), with a new VTEC solenoid valve filter (B).



**Fig. 59: Installing VTEC Solenoid Valve/Oil Filter Assembly**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

34. Install the oil pan (see **OIL PAN INSTALLATION** ).
35. Install the timing belt drive pulley (see **TIMING BELT DRIVE PULLEY REPLACEMENT** ).
36. Install the crankshaft position (CKP) sensor A/B (see **CKP SENSOR REPLACEMENT** ).
37. Install the cylinder heads (see **CYLINDER HEAD INSTALLATION** ).
38. Install the drive plate (see **DRIVE PLATE REMOVAL AND INSTALLATION** ).
39. Install the transmission (see **TRANSMISSION INSTALLATION** ).
40. Install the engine assembly (see **ENGINE INSTALLATION** ).

**NOTE:** When any crankshaft or connecting rod bearing is replaced, after assembly it is necessary to run the engine at idling speed until it reaches

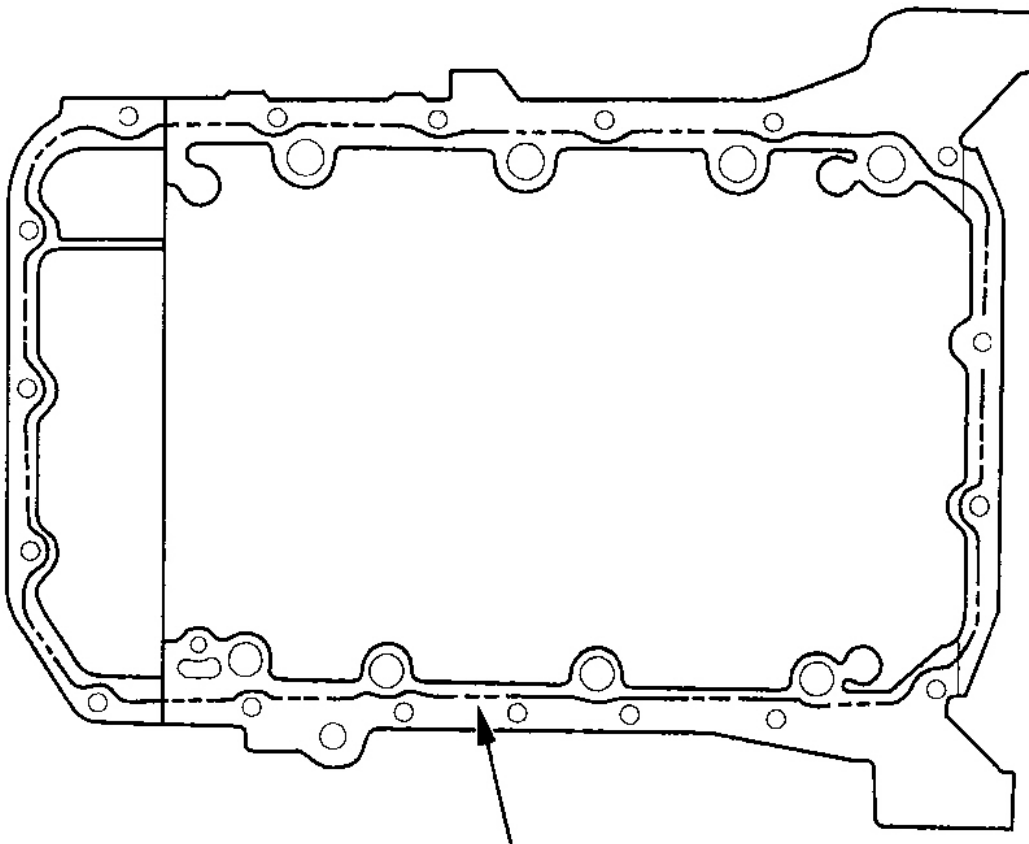


**normal operating temperature, then continue to run it for about 15 minutes.**

## **OIL PAN INSTALLATION**

1. Remove any old liquid gasket from the oil pan mating surfaces, bolts, and bolt holes.
2. Clean and dry the oil pan mating surfaces.
3. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-009, evenly to the oil pan mating surface of the engine block.

**NOTE:** Do not install the parts if 4 minutes or more have elapsed since applying liquid gasket. Instead, re-apply liquid gasket after removing the old residue.

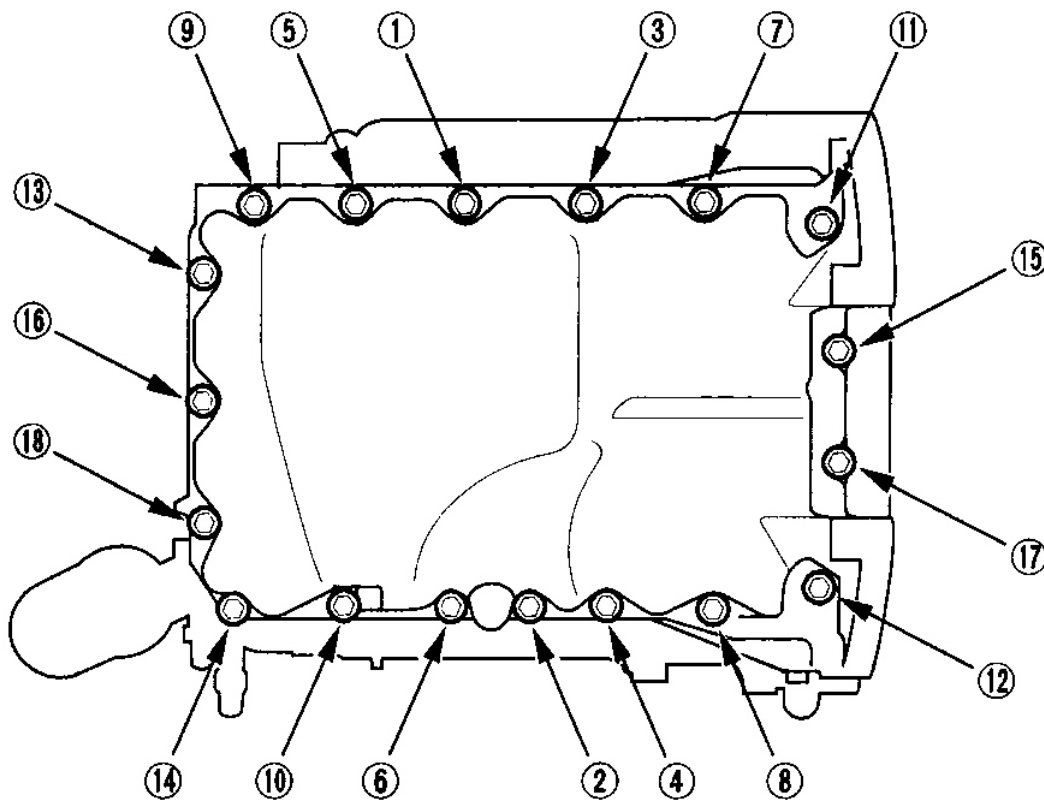


**Apply liquid gasket  
along the broken line.**

**Fig. 60: Applying Liquid Gasket To Oil Pan Mating Surface Of Engine Block**  
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

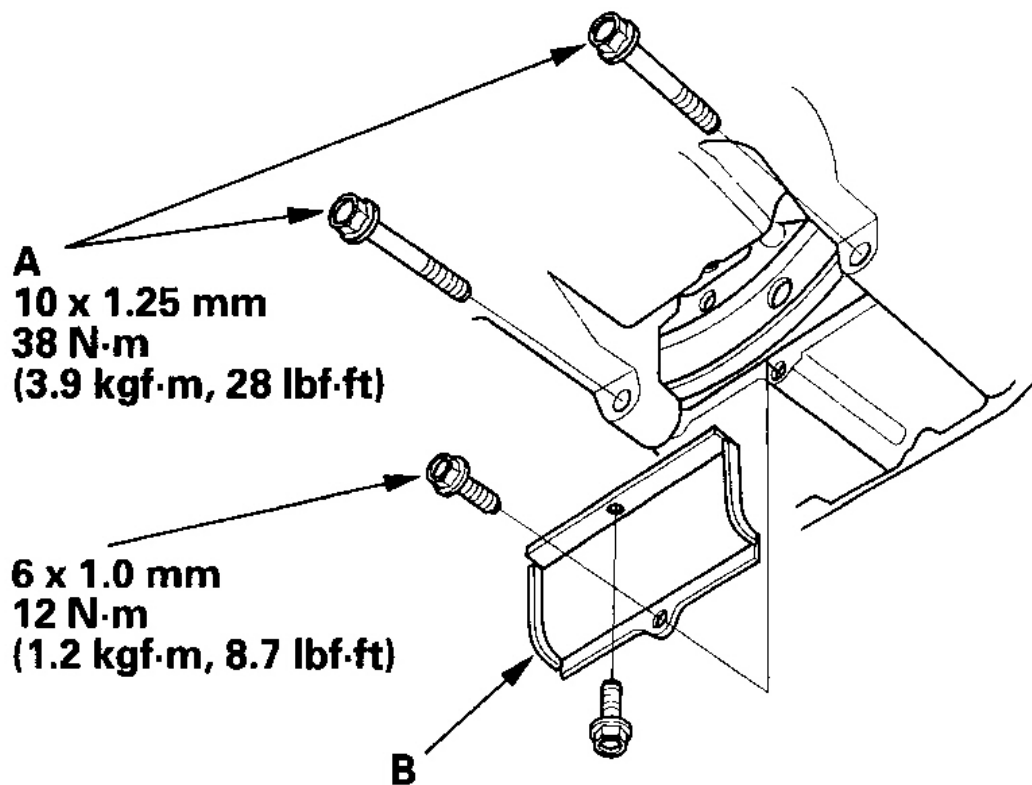
4. Install the oil pan on the engine block.
5. Tighten the bolts in two or three steps. In the final step, tighten all bolts, in sequence, to 12 N.m (1.2 kgf.m, 8.7 lbf.ft).

**NOTE:** After assembly, wait at least 30 minutes before filling the engine with oil.



**Fig. 61: Identifying Oil Pan Bolt Tightening Sequence**  
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



**Fig. 62: Installing Torque Converter Cover**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

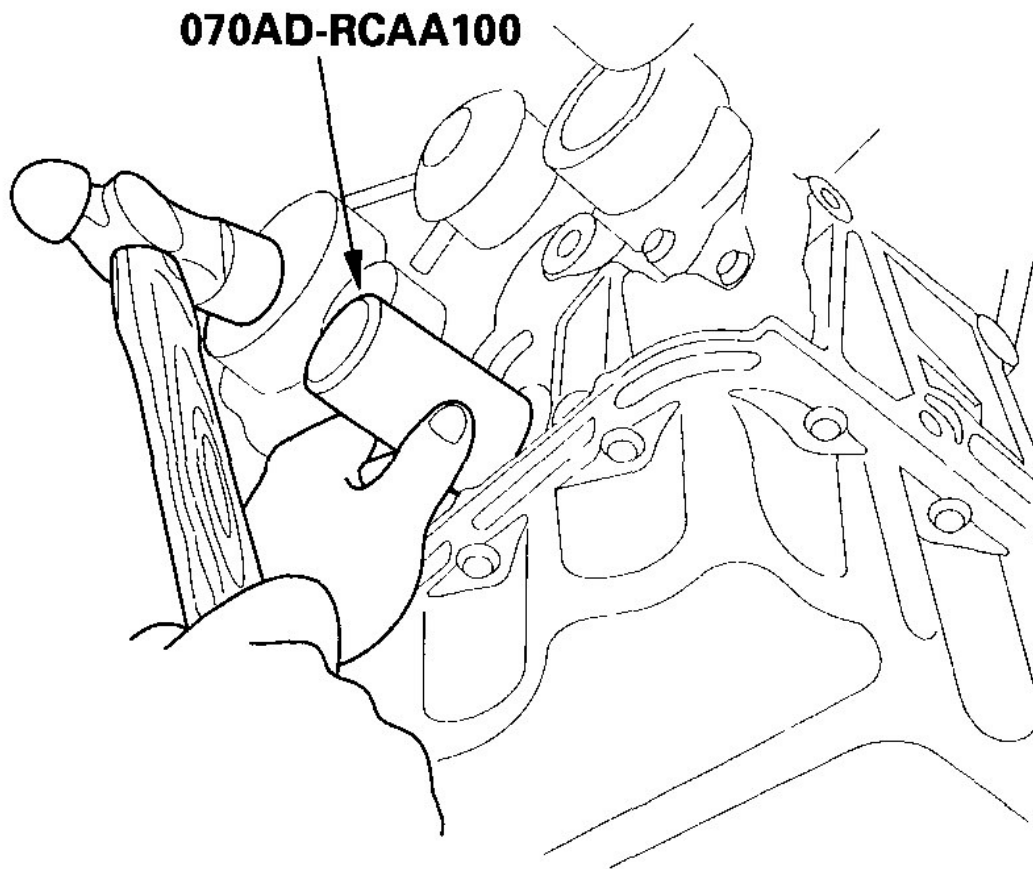
7. Install exhaust pipe A using new gaskets and new self locking nuts (see step 24 in **ENGINE INSTALLATION** ).
8. Refill the engine with oil (see step 3 in **ENGINE OIL REPLACEMENT** ).
9. Lower the vehicle on the hoist.

## PULLEY END CRANKSHAFT OIL SEAL INSTALLATION - IN CAR

### Special Tools Required

Oil seal driver, 64 mm 070AD-RCAA100

1. Clean and dry the crankshaft oil seal housing.
2. Apply a light coat of multipurpose grease to the crankshaft and to the lip of the seal.
3. Using the special tool, drive in the crankshaft oil seal until the driver bottoms against the oil pump. When the seal is in place, clean any excess grease off the crankshaft, and check that the oil seal lip is not distorted.



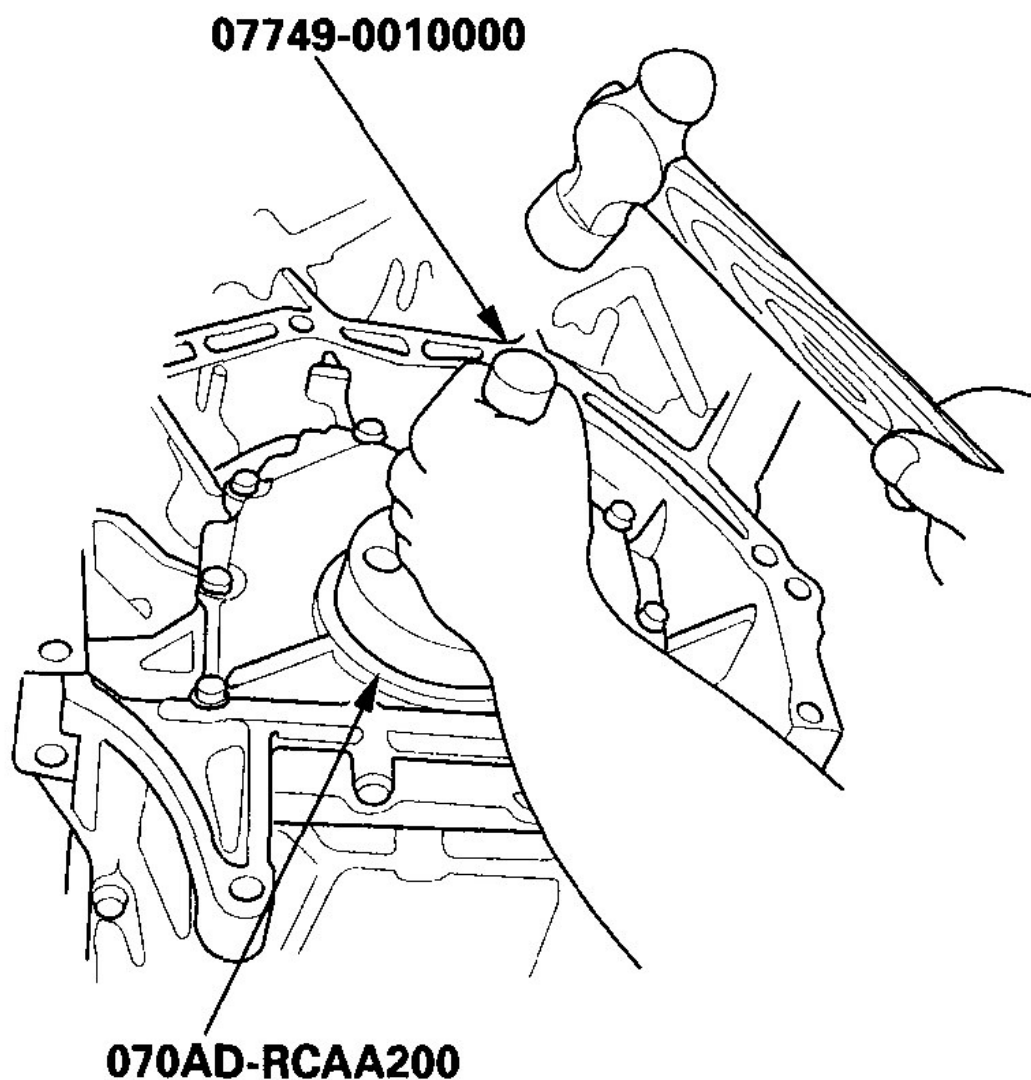
**Fig. 63: Installing Crankshaft Oil Seal**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

## TRANSMISSION END CRANKSHAFT OIL SEAL INSTALLATION - IN CAR

### Special Tools Required

- Driver 07749-0010000
  - Driver attachment, 106 mm 070AD-RCAA200
1. Clean and dry the crankshaft oil seal housing.
  2. Apply a light coat of multipurpose grease to the crankshaft and to the lip of the seal.
  3. Using the special tools, drive in the crankshaft oil seal until the driver attachment bottoms against the engine block end cover. Align the hole in the driver attachment with the pin on the crankshaft.



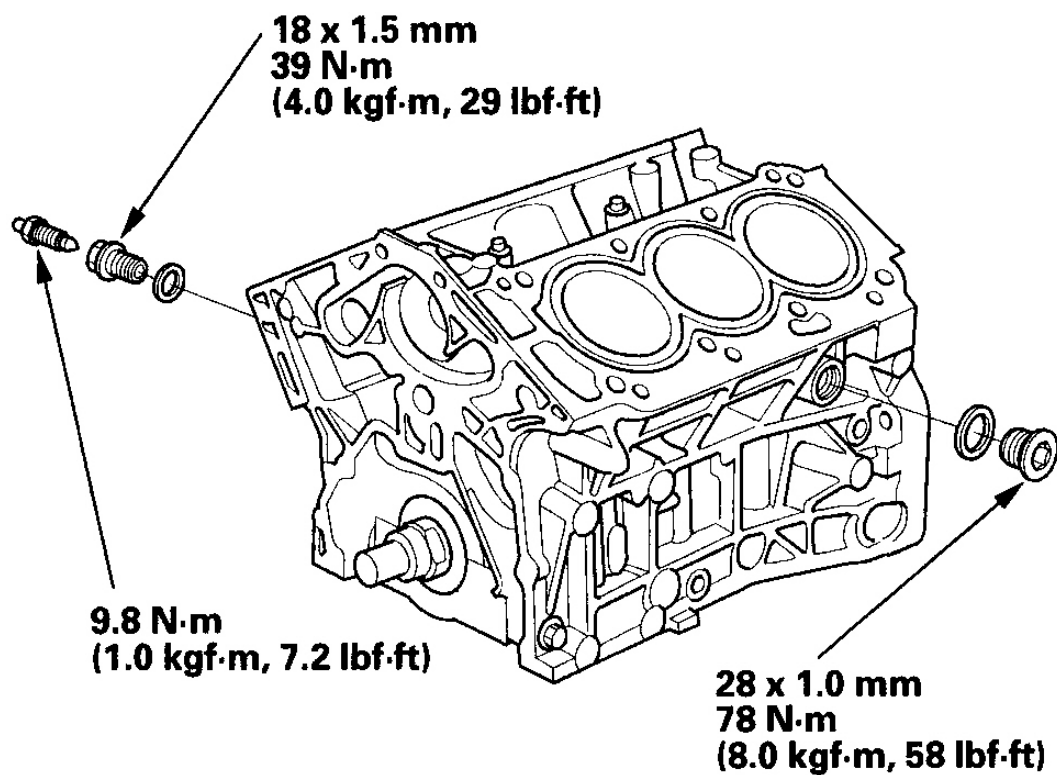
**Fig. 64: Installing Crankshaft Oil Seal**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Clean any excess grease off the crankshaft, and check that the oil seal lip is not distorted.

## DRAIN BOLT INSTALLATION

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



**Fig. 65: Installing Drain Bolt**

Courtesy of AMERICAN HONDA MOTOR CO., INC.