

## **2003-04 ENGINE**

### **3.5L V6 - Pilot**

## **ENGINE ASSEMBLY**

### **ENGINE REMOVAL**

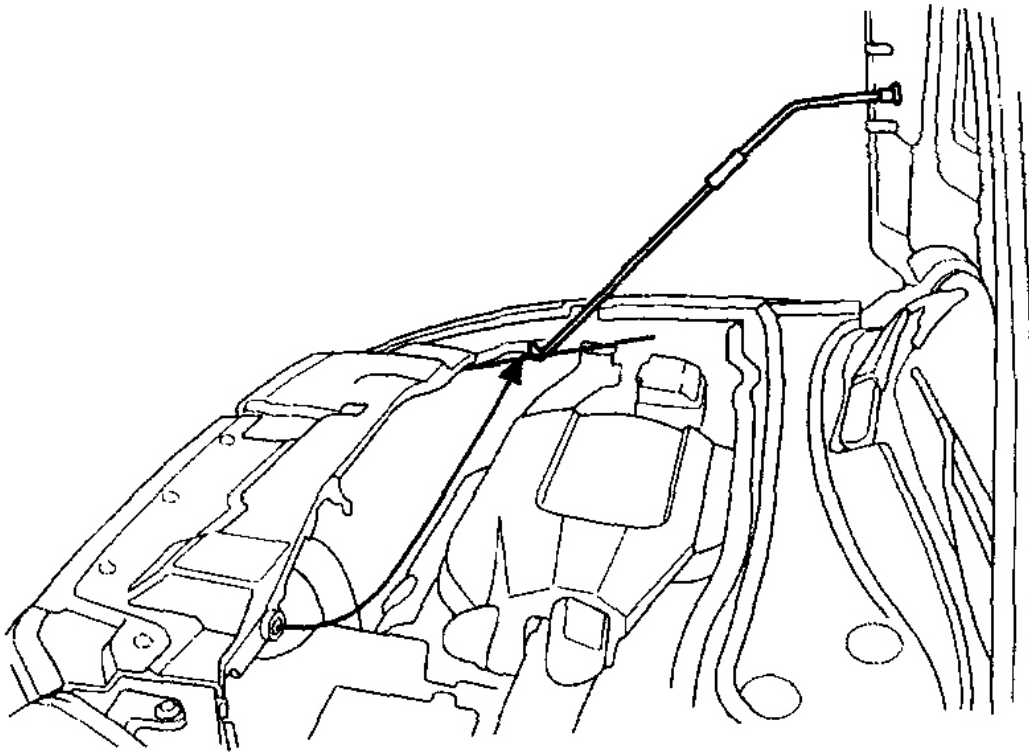
#### **Special Tools Required**

Front subframe adapter EQS02BMDXSBO

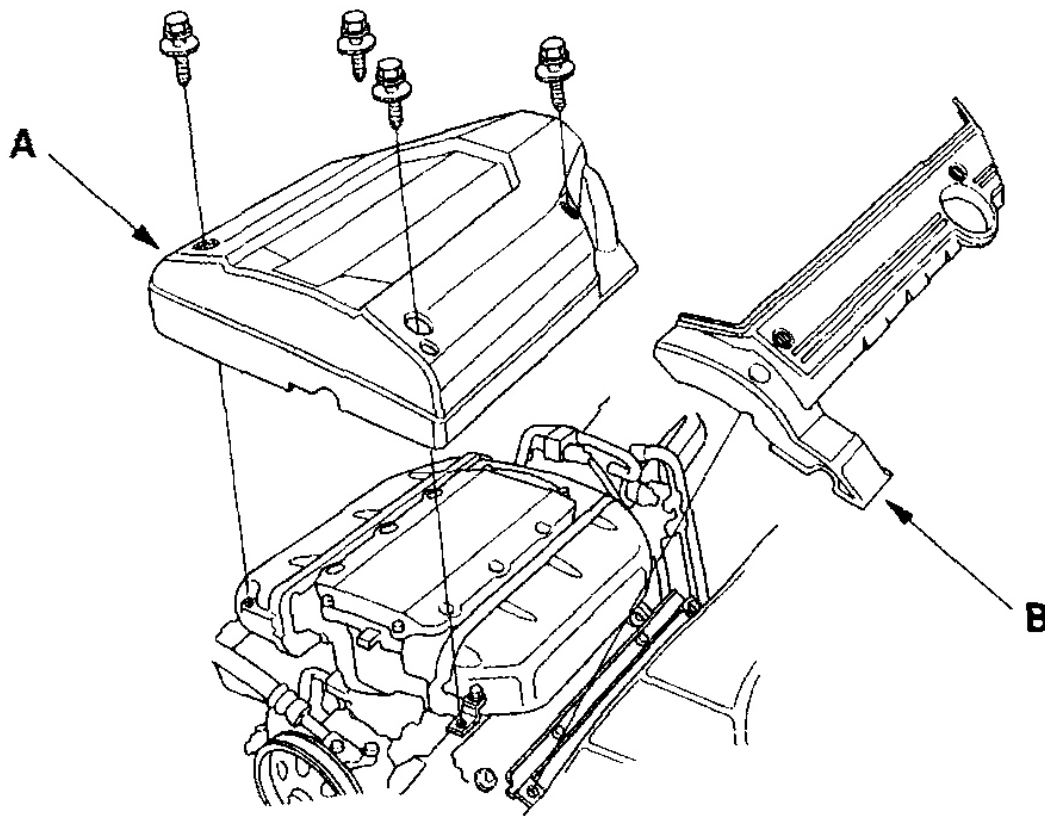
#### **NOTE:**

- **Use fender covers to avoid damaging painted surfaces.**
- **To avoid damage, unplug the wiring connectors carefully while holding the connector portion.**
- **Mark all wiring and hoses to avoid misconnection. Also, be sure that they do not contact other wiring or hoses, or interfere with other parts.**

1. Secure the hood in the wide open position by using the support rod as shown.

**G01463588****Fig. 1: Securing The Hood****Courtesy of AMERICAN HONDA MOTOR CO., INC.**

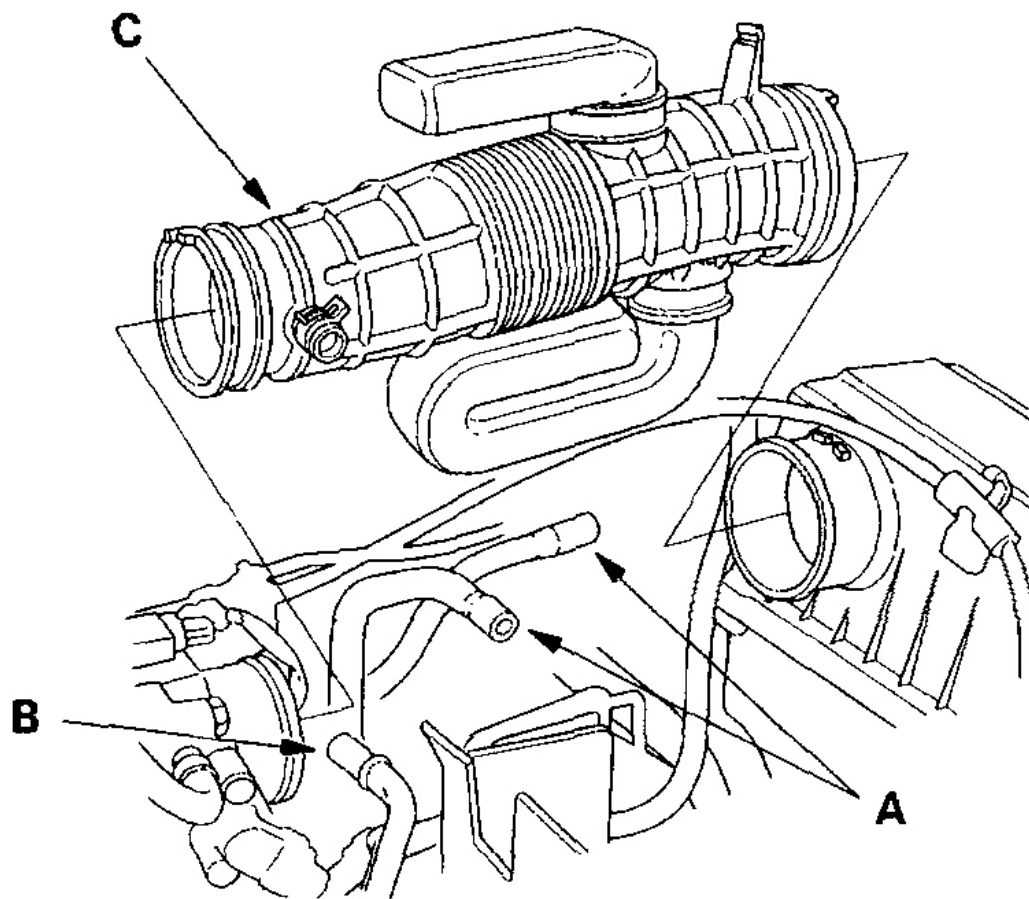
2. Drain the power steering system fluid (see **FLUID REPLACEMENT** ).
3. Make sure you have the anti-theft codes for the radio and navigation system, then write down the frequencies for the radio's preset buttons.
4. Disconnect the negative cable from the battery first, then disconnect the positive cable.
5. Remove the battery.
6. Remove the intake manifold cover (A) and ignition coil cover (B).



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**Fig. 2: Removing The Intake Manifold Cover & Ignition Coil Cover**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the vacuum hoses (A) and breather pipe (B), then remove the intake air duct (C).

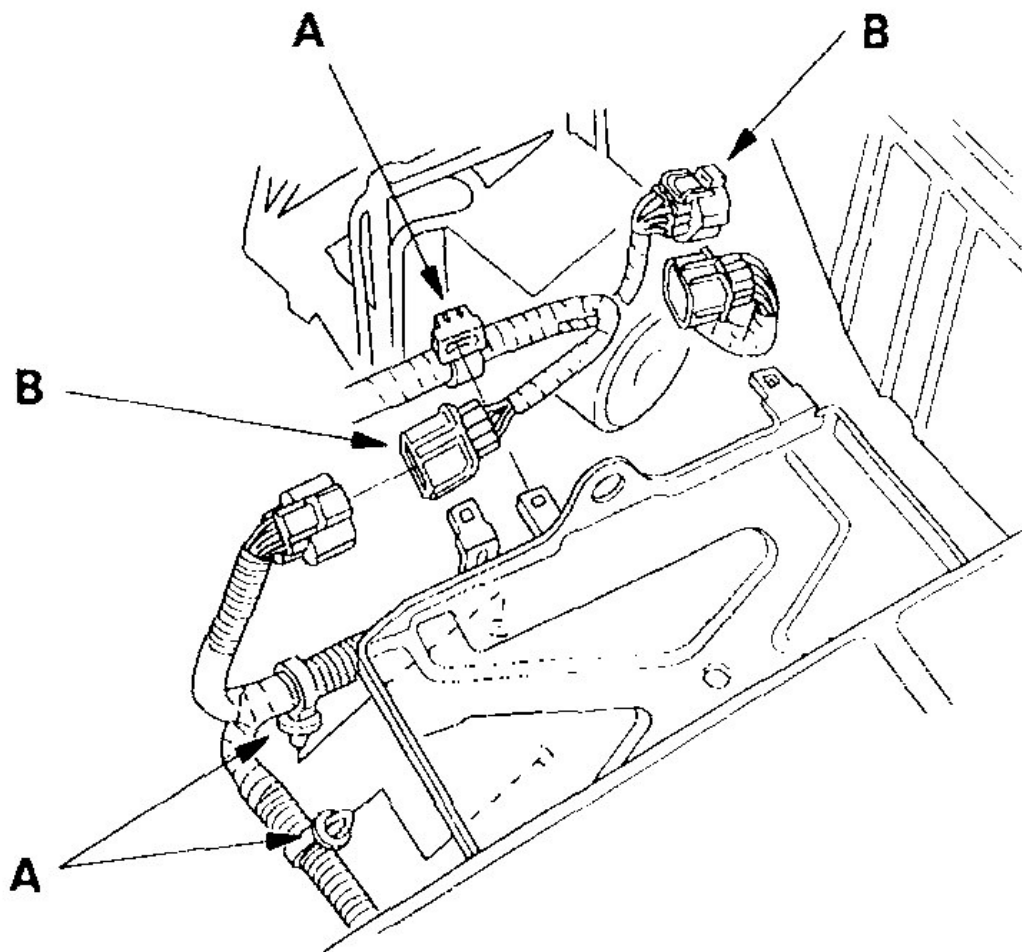


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**Fig. 3: Removing The Vacuum Hoses, Breather Pipe & The Intake Air Duct**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Remove the harness clamps (A), and disconnect the engine wire harness connectors (B) on the left side of the engine compartment.

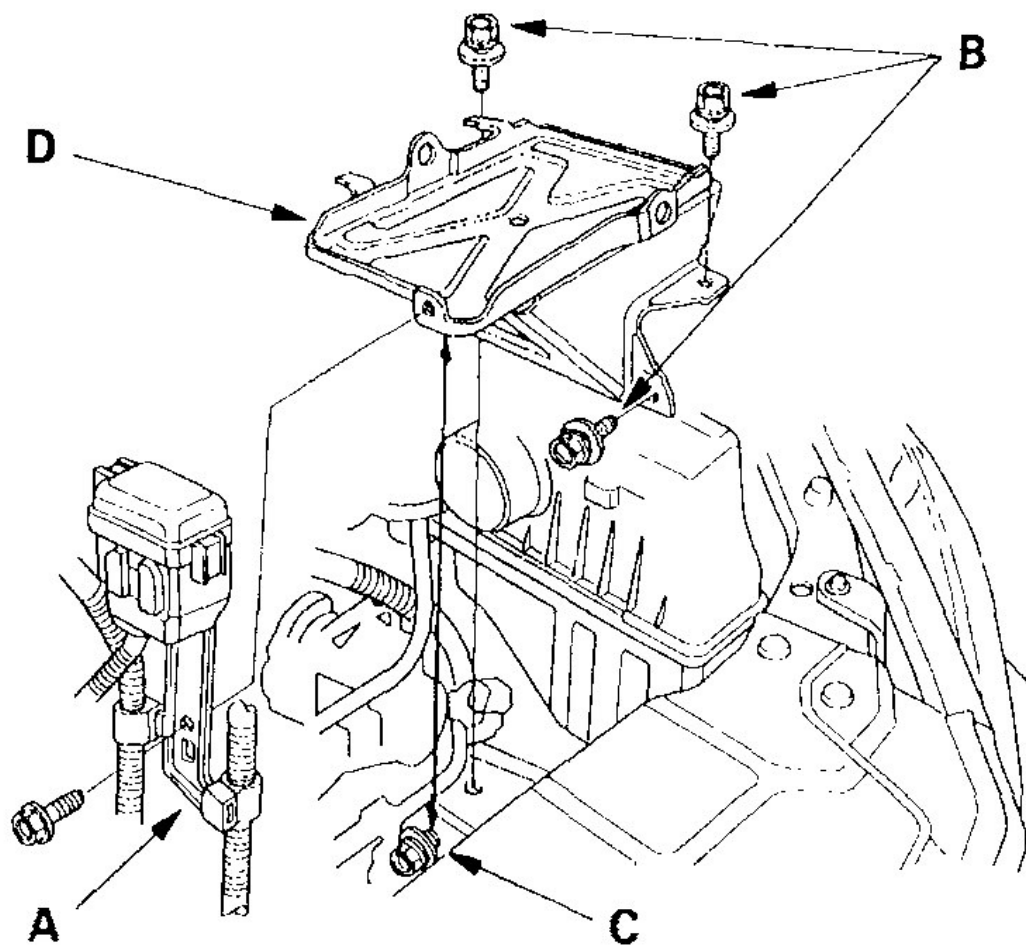




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**Fig. 4: Removing The Harness Clamps & Disconnecting The Engine Wire Harness Connectors**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Remove the relay bracket (A).

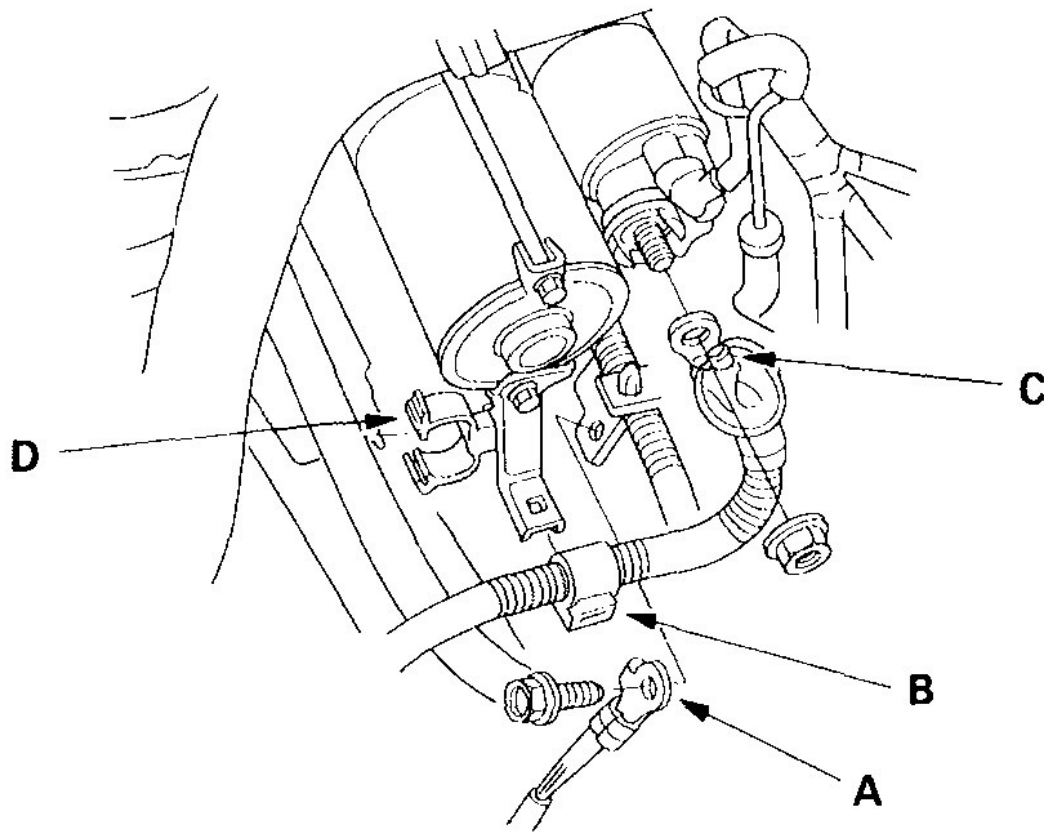


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**Fig. 5: Removing The Relay Bracket**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

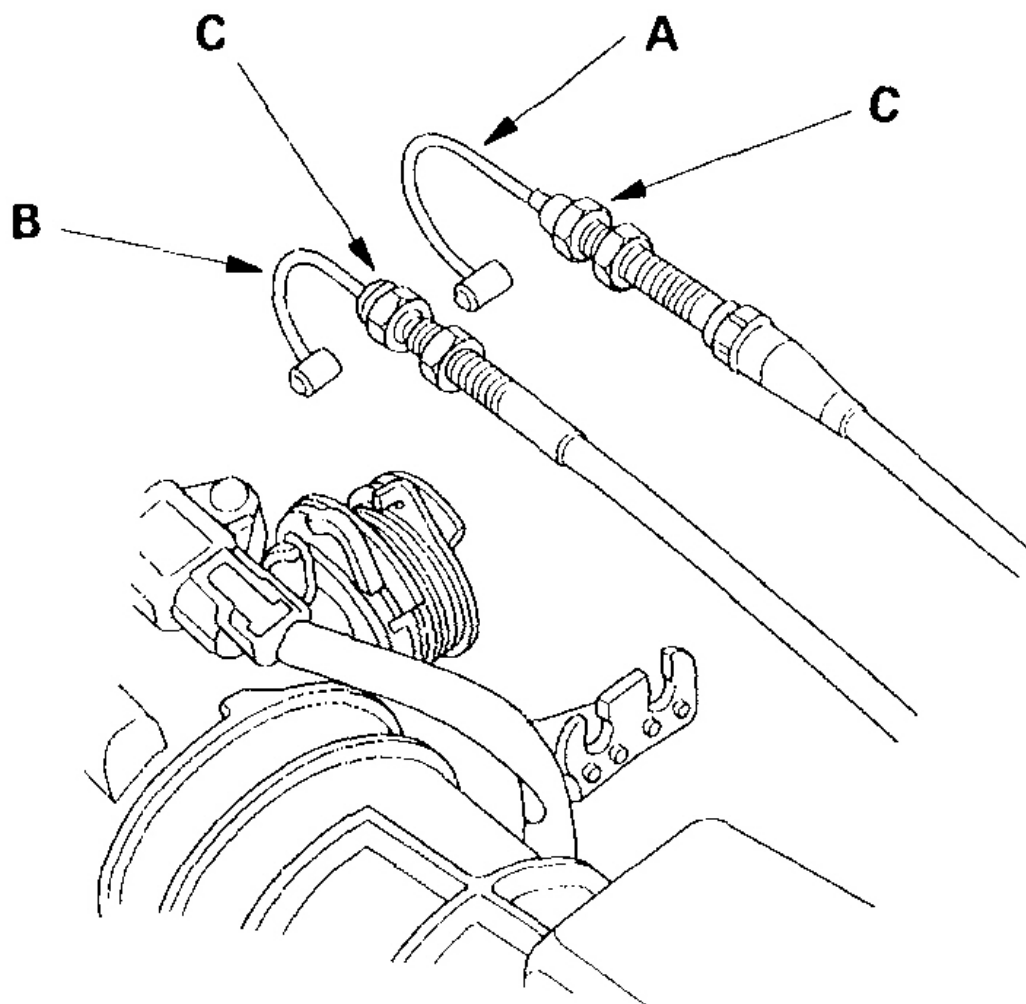
10. Remove the three mounting bolts (B), and loosen the mounting bolt (C), then remove the battery base (D).
11. Remove the ground cable (A), harness clamp (B) and starter cable (C), and unlatch the automatic transmission fluid (ATF) cooler hose clamp (D).



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**Fig. 6: Removing The Ground Cable, Harness Clamp & Starter Cable, & Unlatching The Automatic Transmission Fluid Cooler Hose Clamp**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

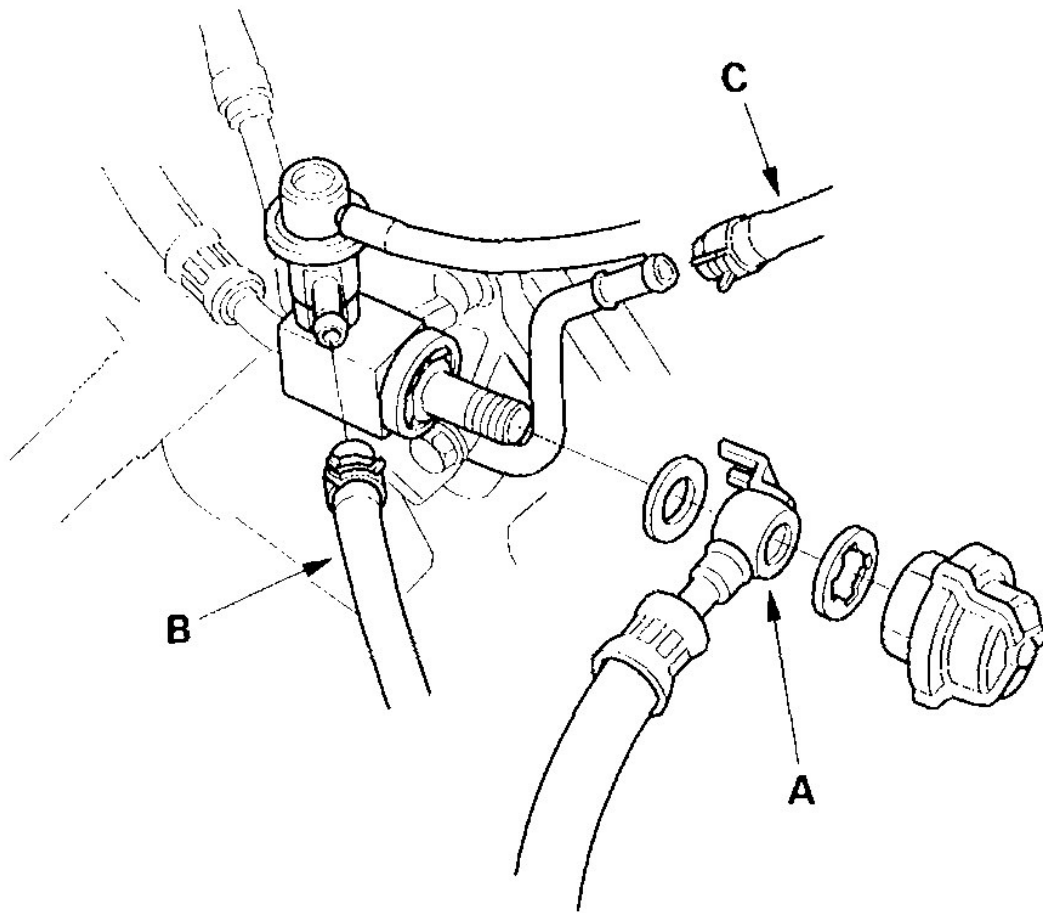
12. Remove the throttle cable (A), and cruise control actuator cable (B) by loosening the locknuts (C), then slipping the cable ends out of the accelerator linkage. Take care not to bend the cables when removing them. Always replace any kinked cable with a new one.



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**Fig. 7: Removing The Throttle Cable & Cruise Control Actuator Cable**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

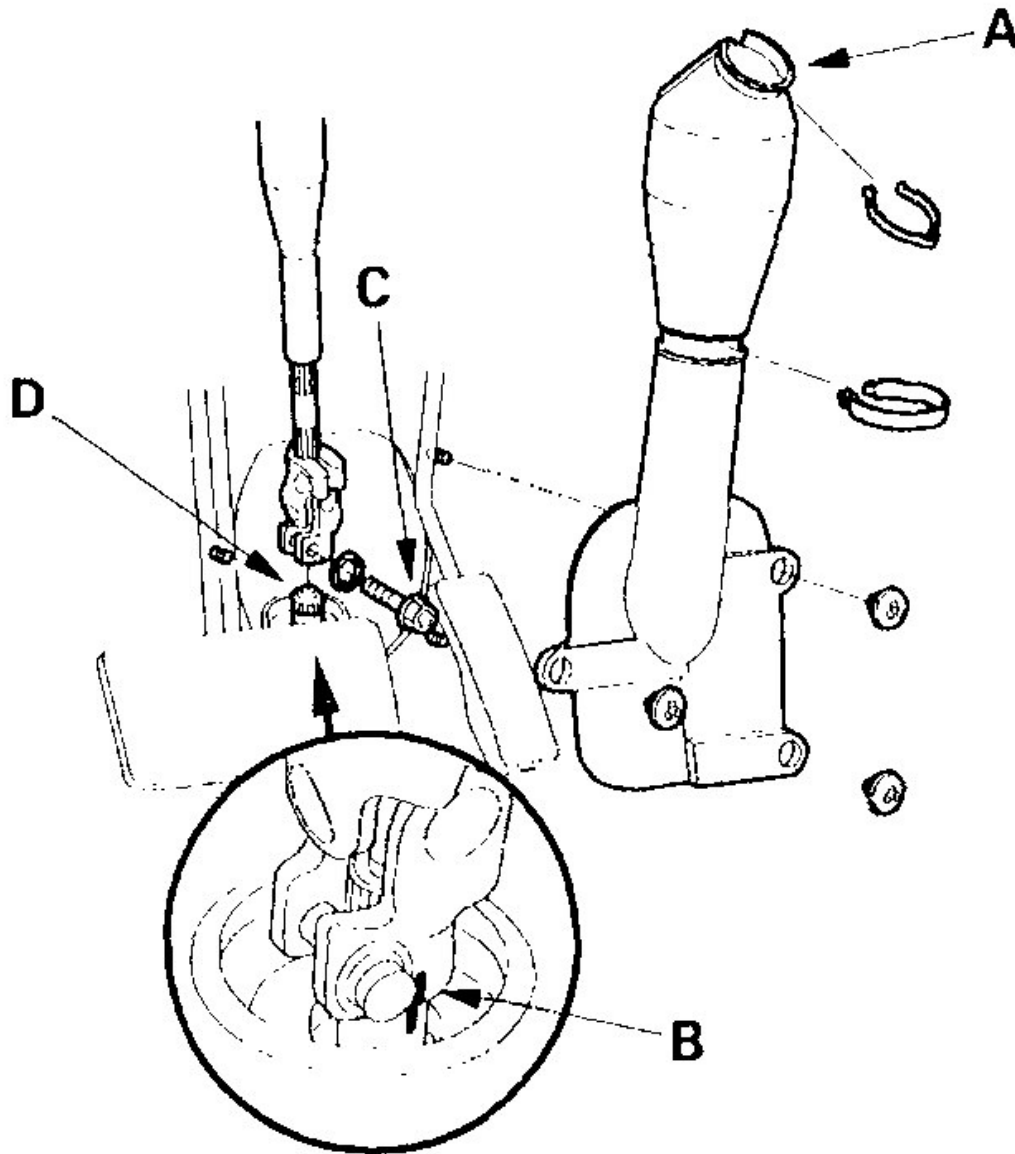
13. Relieve fuel pressure (see **FUEL PRESSURE RELIEVING** ).
14. Remove the fuel feed hose (A), fuel return hose (B), and evaporative emission (EVAP) canister hose (C).



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**Fig. 8: Removing The Fuel Feed Hose, Fuel Return Hose & Evaporative Emission Canister Hose**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Remove the center console lower panel (driver's side), and pull back the carpet to expose the steering joint cover.
16. Remove the steering joint cover (A).

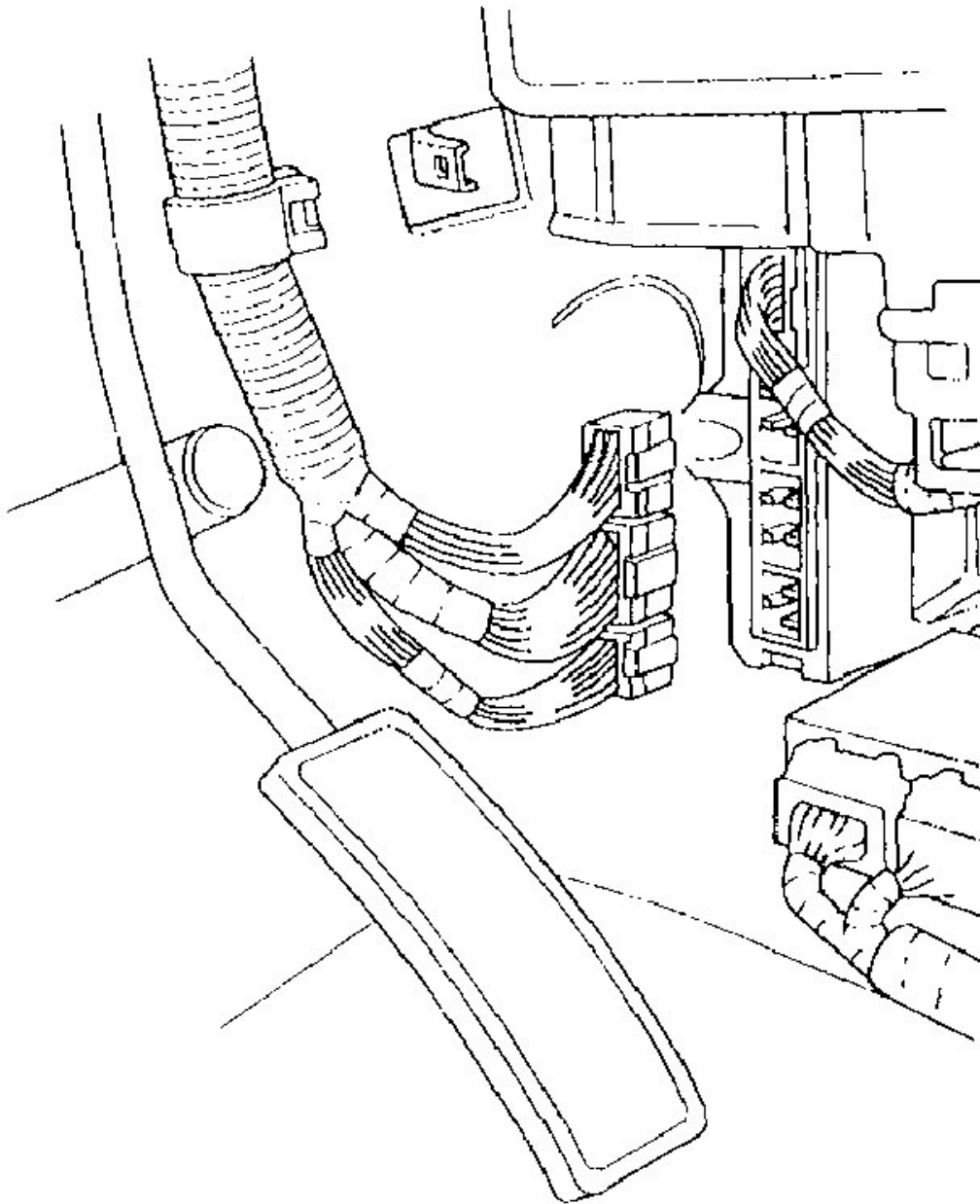


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**Fig. 9: Removing The Steering Joint Cover**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

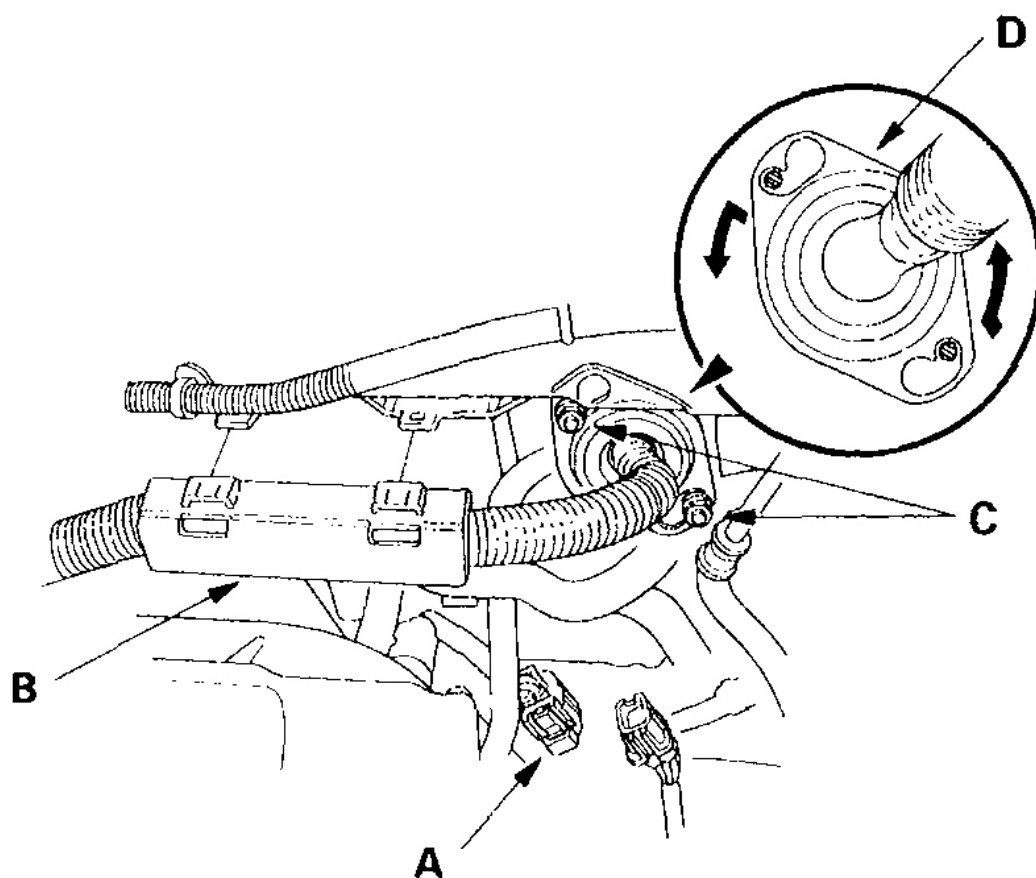
17. Make a reference mark (B) across the steering joint and steering gearbox pinion shaft. Remove the steering joint bolt (C), and disconnect the steering joint from the steering gearbox pinion shaft (D).
18. Disconnect the powertrain control module (PCM) connectors.



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**Fig. 10: Disconnecting The Powertrain Control Module Connectors**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Disconnect the primary heated oxygen sensor (primary HO2S) connector (A).

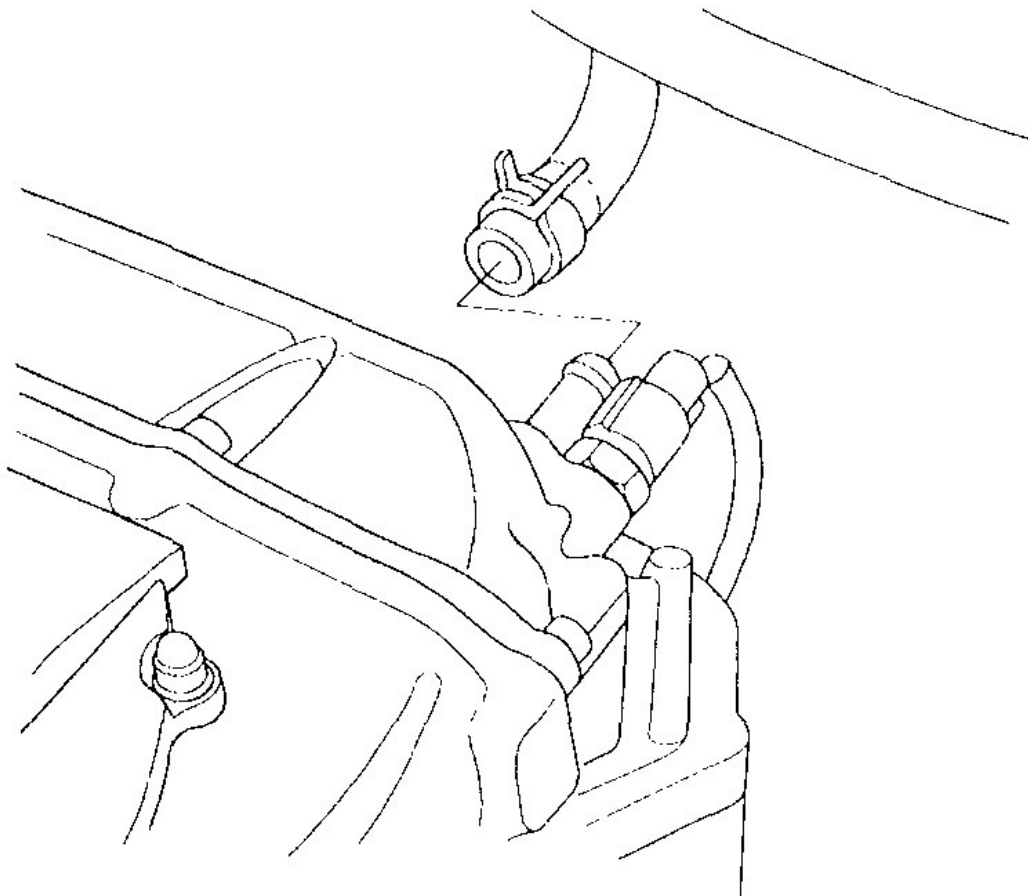


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**Fig. 11: Disconnecting The Primary Heated Oxygen Sensor Connector**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

20. Remove the harness holder (B).
21. Loosen the grommet mounting nuts (C). Turn the grommet (D) counterclockwise, then pull the engine wire harness through the bulkhead.
22. Remove the brake booster vacuum hose.

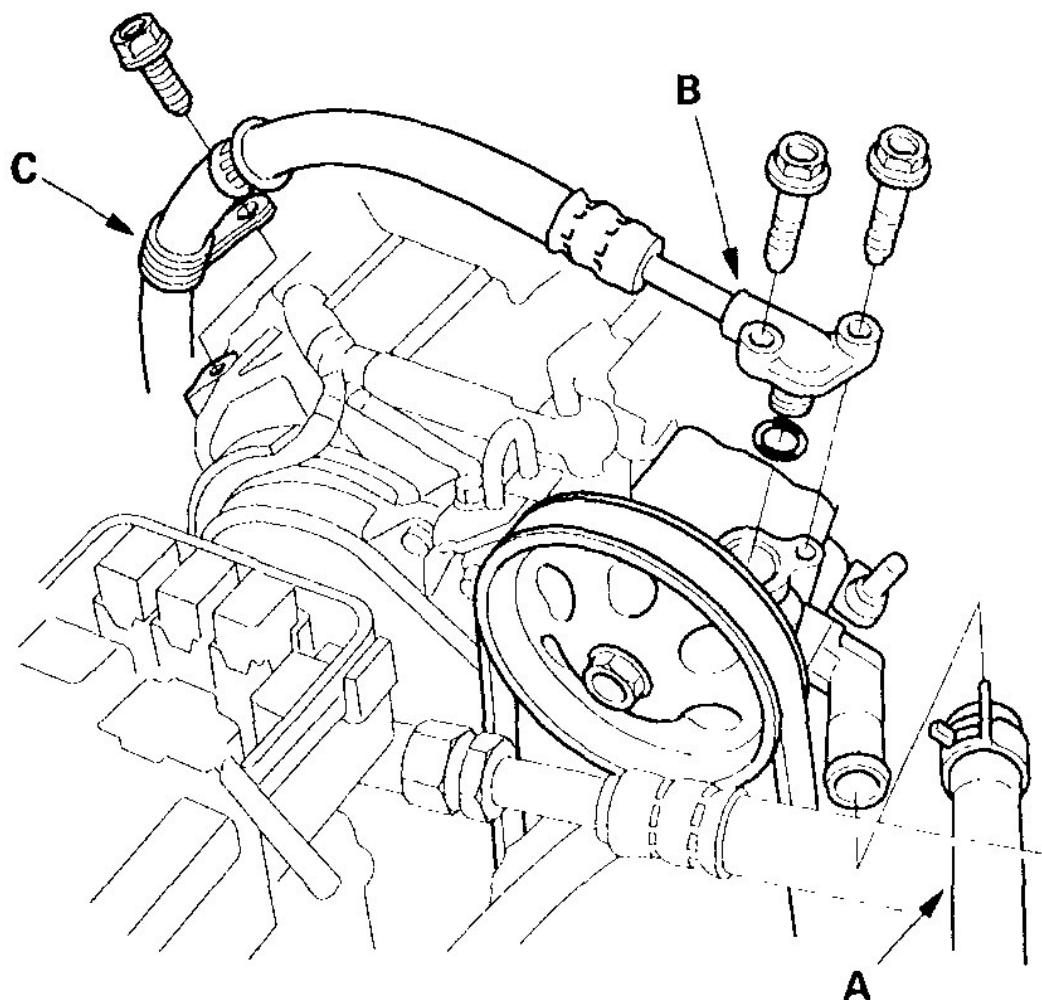




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**Fig. 12: Removing The Brake Booster Vacuum Hose**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

23. Remove the power steering (P/S) pump inlet hose (A) and P/S pump outlet hose (B) from the P/S pump.

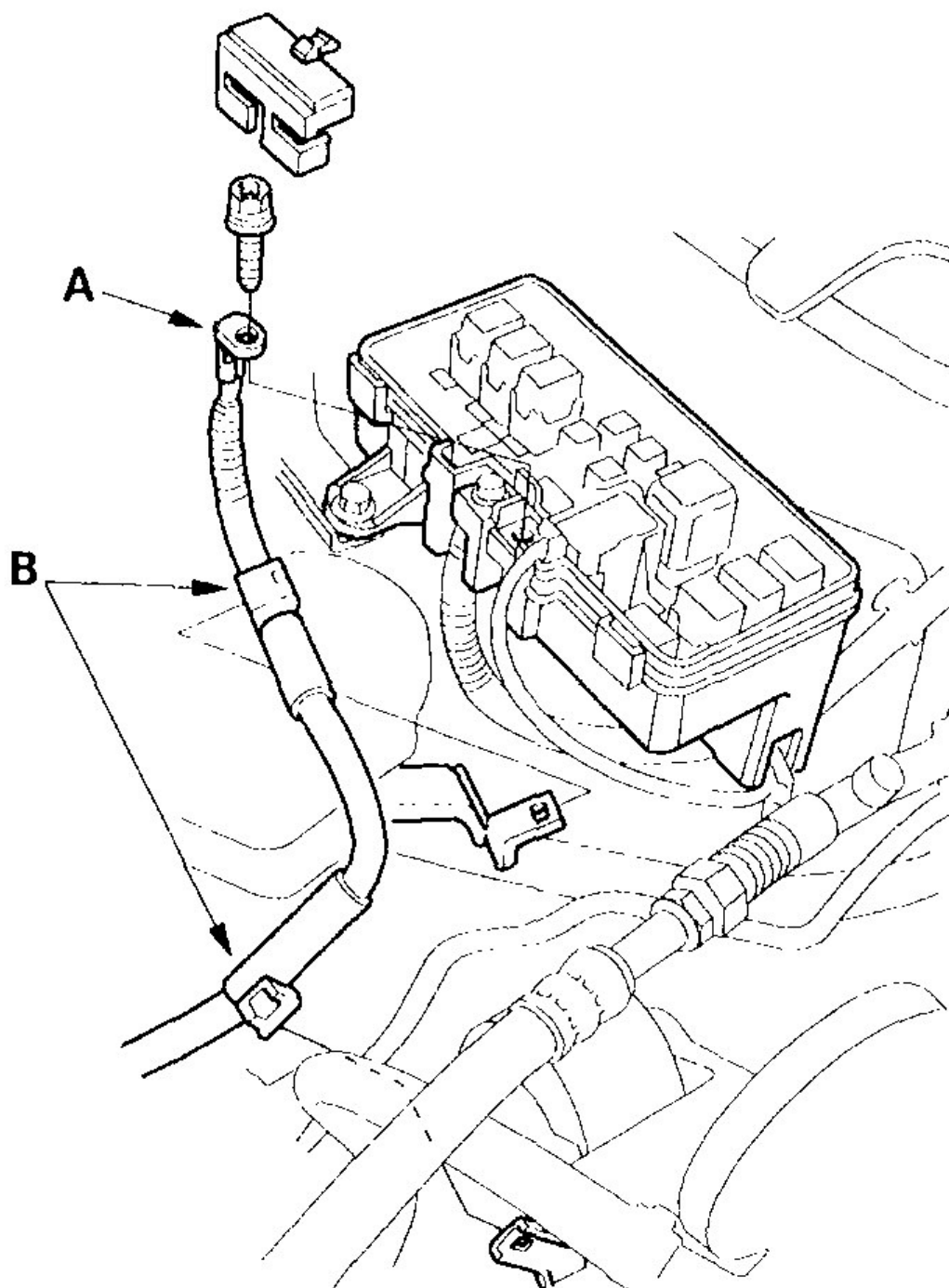


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**Fig. 13: Removing The Power Steering Pump Inlet Hose & Outlet Hose From The Power Steering Pump**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

24. Remove the P/S hose clamp (C).
25. Remove the battery cable (A) from the under-hood fuse/relay box, and remove the harness clamps (B).

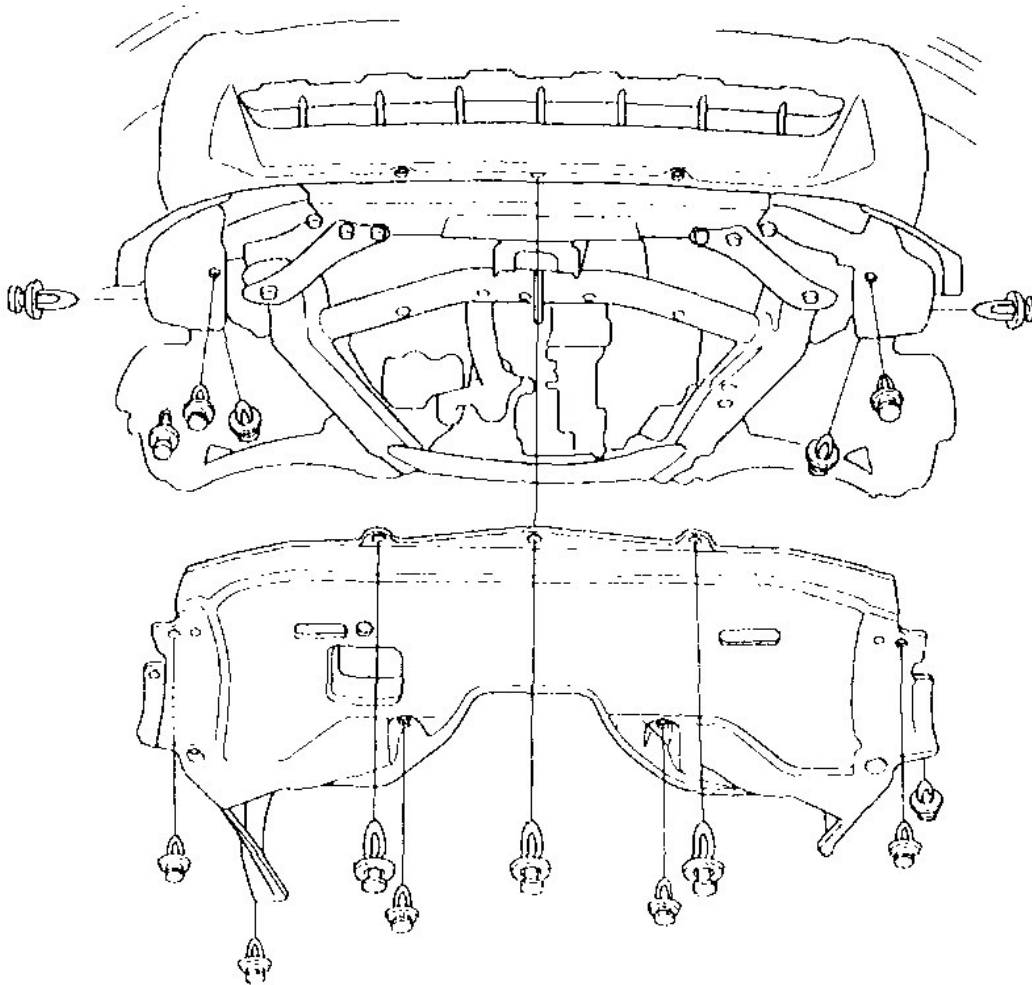


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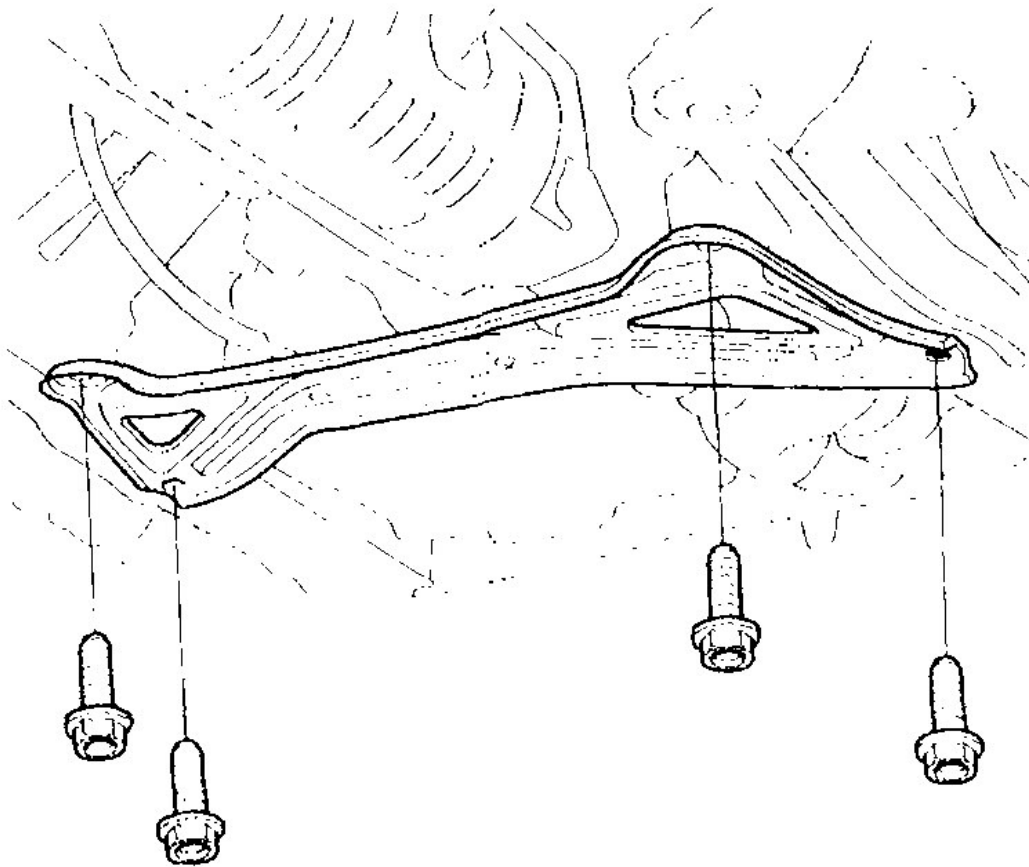
**Fig. 14: Removing The Battery Cable From The Under-Hood Fuse/Relay Box & Removing The**

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

26. Remove the alternator-compressor belt (see **ALTERNATOR BELT** ).
27. Remove the radiator cap.
28. Raise the vehicle on the hoist to full height.
29. Remove the front tires/wheels.
30. Remove the splash shield.

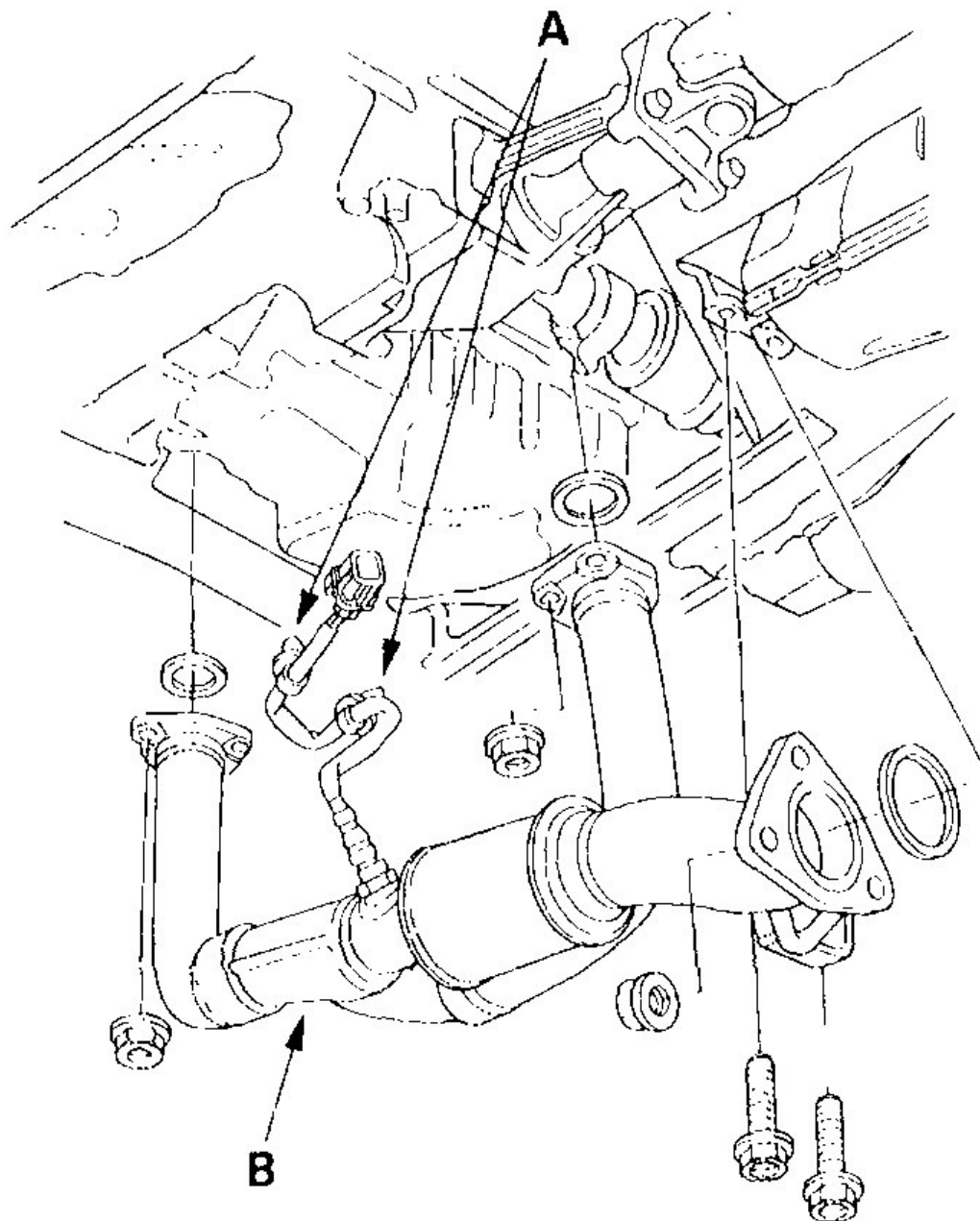
**G01463602****Fig. 15: Removing The Splash Shield****Courtesy of AMERICAN HONDA MOTOR CO., INC.**

31. Loosen the drain plug in the radiator, and drain the engine coolant (see **COOLANT REPLACEMENT** ).
32. Drain the ATF. Reinstall the drain plug using a new washer (see **ATF REPLACEMENT** ).
33. Drain the engine oil. Reinstall the drain bolt using a new washer (see **ENGINE OIL REPLACEMENT** ).
34. Remove the front subframe stiffener.

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**Fig. 16: Removing The Front Subframe Stiffener**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

35. Remove the harness clamps (A), then remove exhaust pipe A (B).

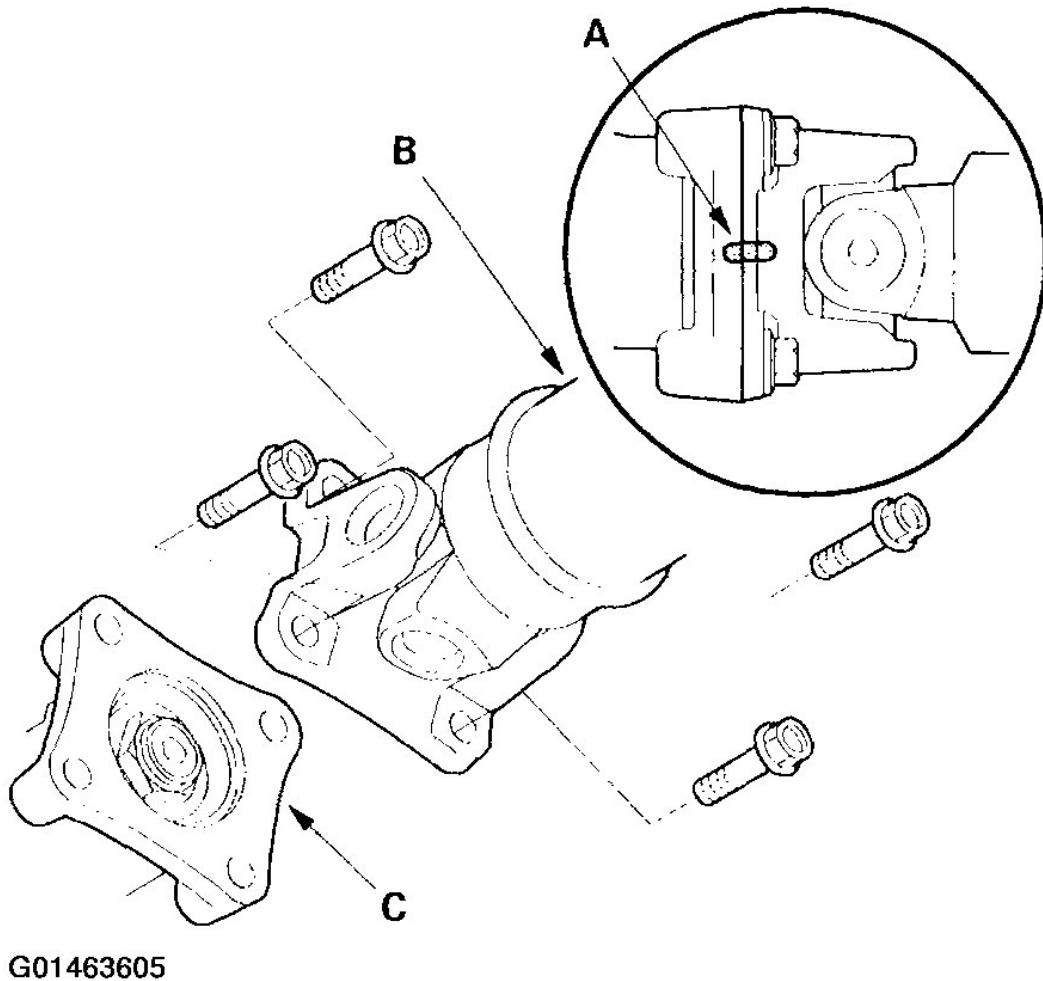


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**Fig. 17: Removing The Harness Clamps & Exhaust Pipe A**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

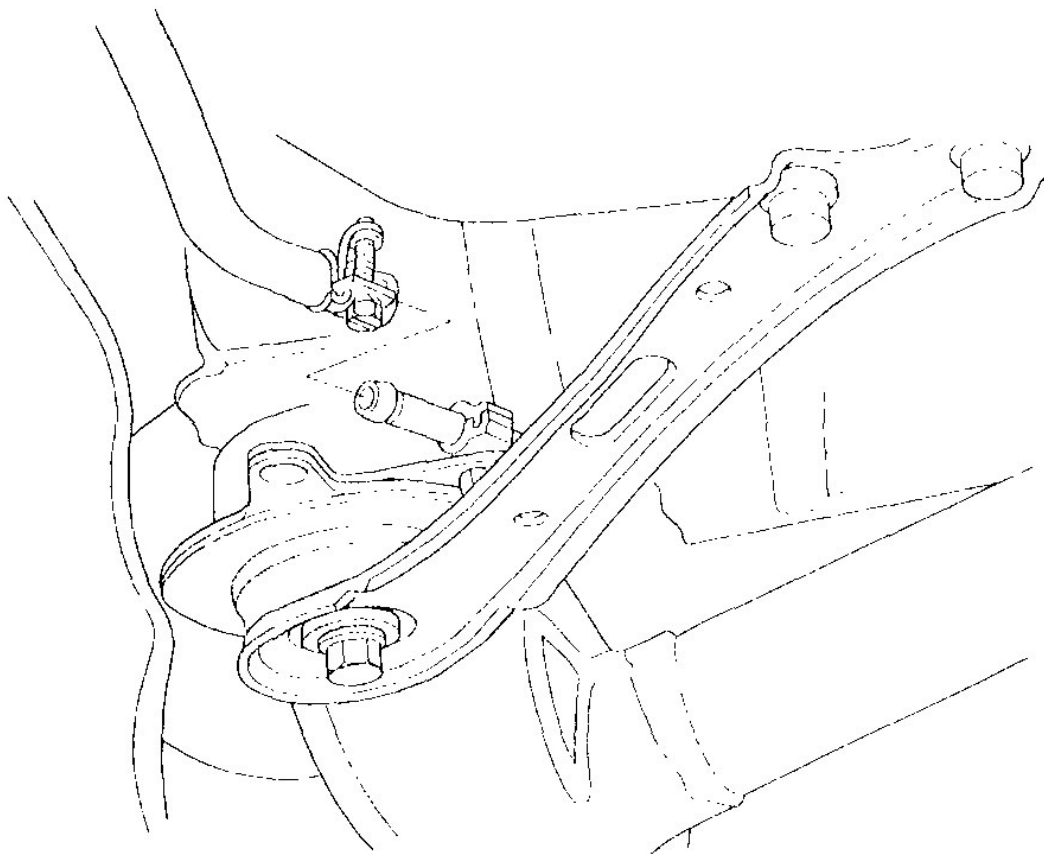
36. Make reference marks (A) on the propeller shaft (B) and transfer shaft flange (C), then separate the

propeller shaft from the transfer shaft flange.



**Fig. 18: Making Reference Marks On The Propeller Shaft & Transfer Shaft Flange, & Separating The Propeller Shaft From The Transfer Shaft Flange**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

37. Remove the shift cable (see step 1 on **SHIFT CABLE REPLACEMENT** ).
38. Remove the transfer assembly (see **TRANSFER ASSEMBLY REMOVAL** ).
39. Disconnect the tie-rod end ball joints (see step 12 on **STEERING GEARBOX REMOVAL** ).
40. Disconnect the suspension lower arm ball joints (see **LOWER ARM** ) and stabilizer links (see **STABILIZER LINK** ).
41. Remove the driveshaft (see **AXLE SHAFTS** ). Coat all precision finished surfaces with clean engine oil. Tie plastic bags over the driveshaft ends.
42. Remove the P/S hose.



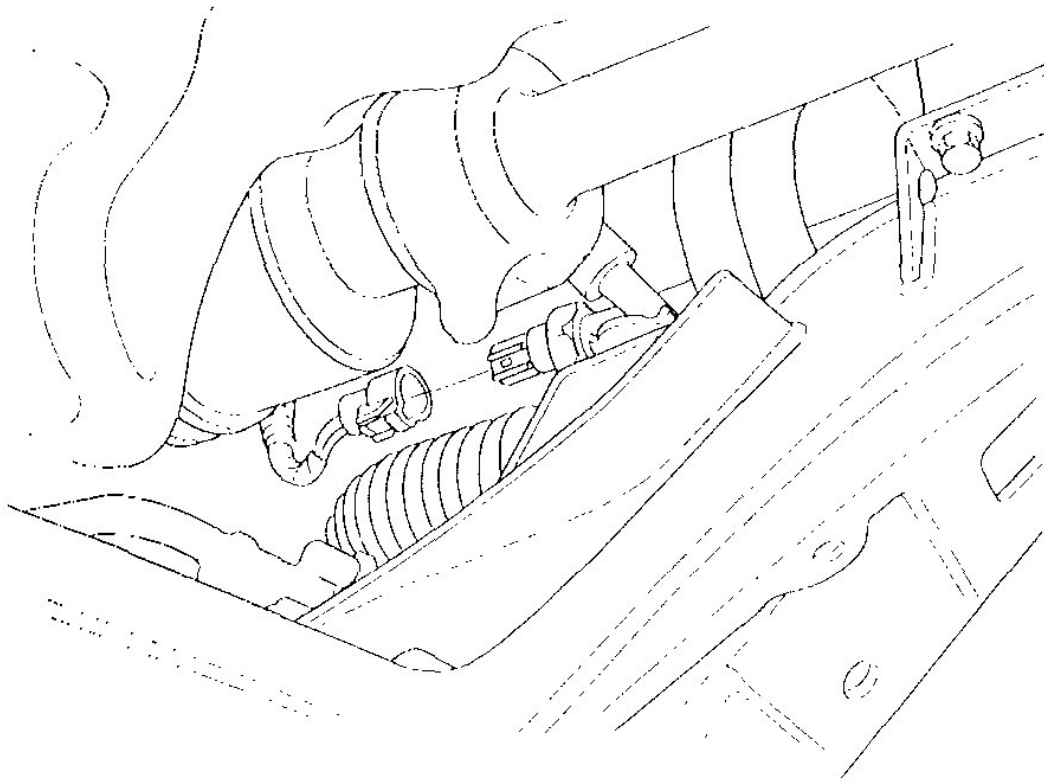
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**Fig. 19: Removing The P/S Hose**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

43. Disconnect the power steering pressure switch connector.

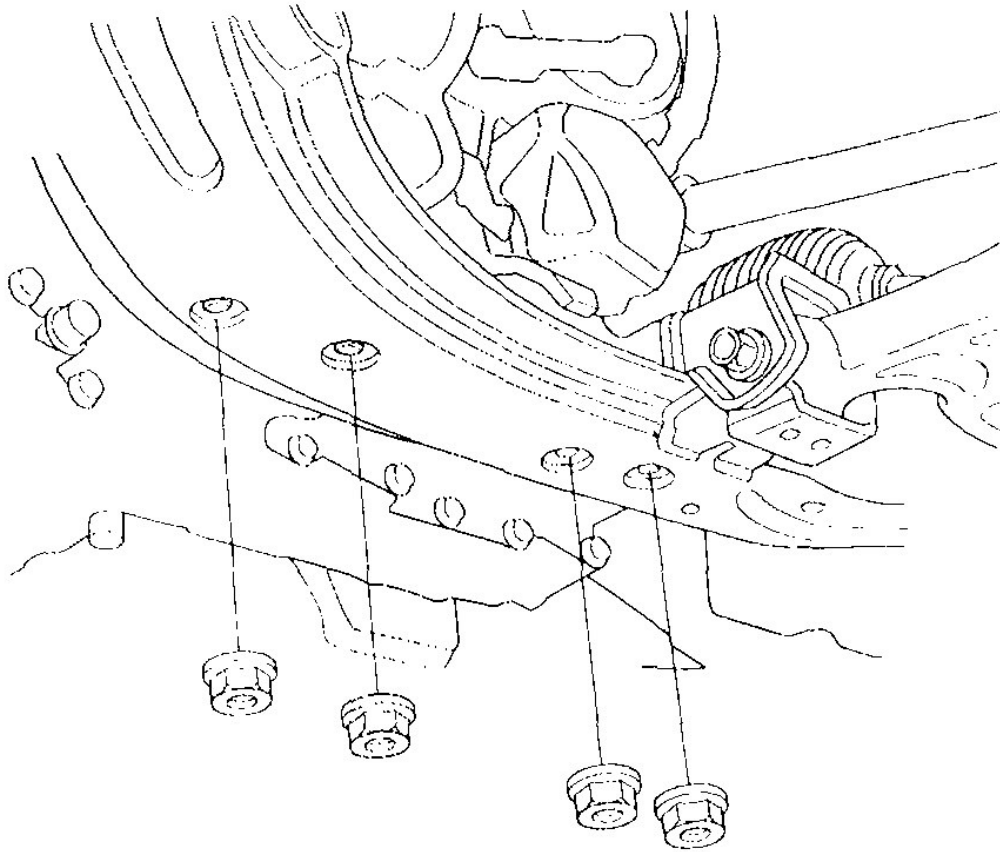




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**Fig. 20: Disconnecting The Power Steering Pressure Switch Connector**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

44. Remove the nuts securing the transmission lower front mount and transmission lower rear mount.

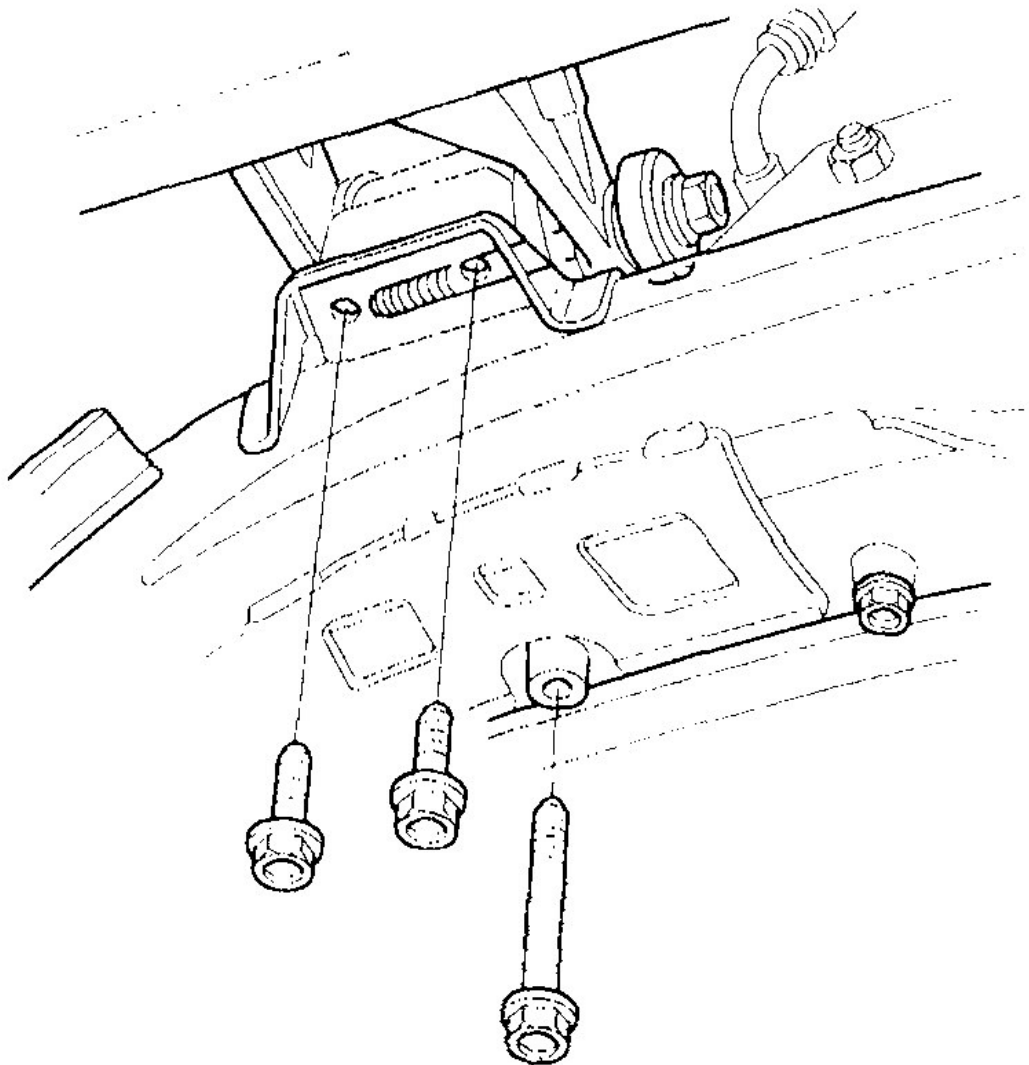


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**Fig. 21: Removing The Nuts Securing The Transmission Lower Front Mount & Transmission Lower Rear Mount**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

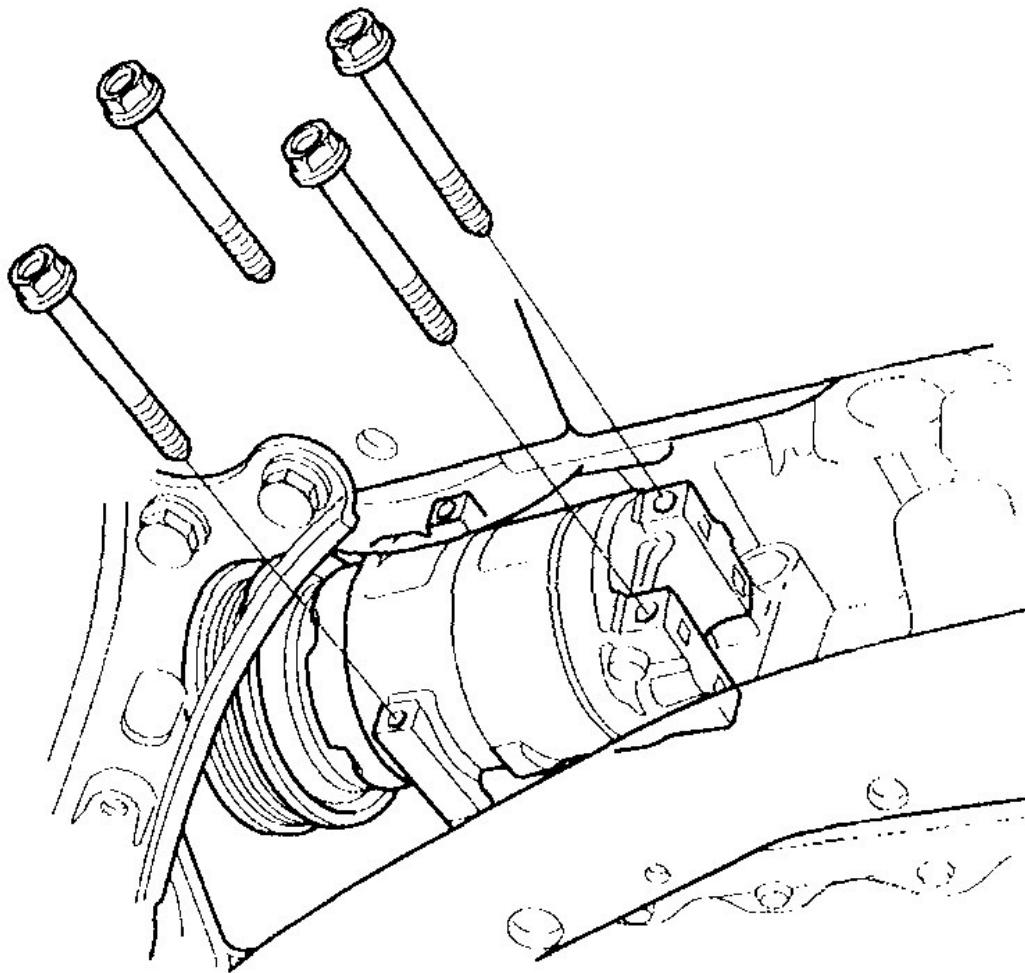
45. Remove the bolts securing the rear mount.



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**Fig. 22: Removing The Bolts Securing The Rear Mount**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

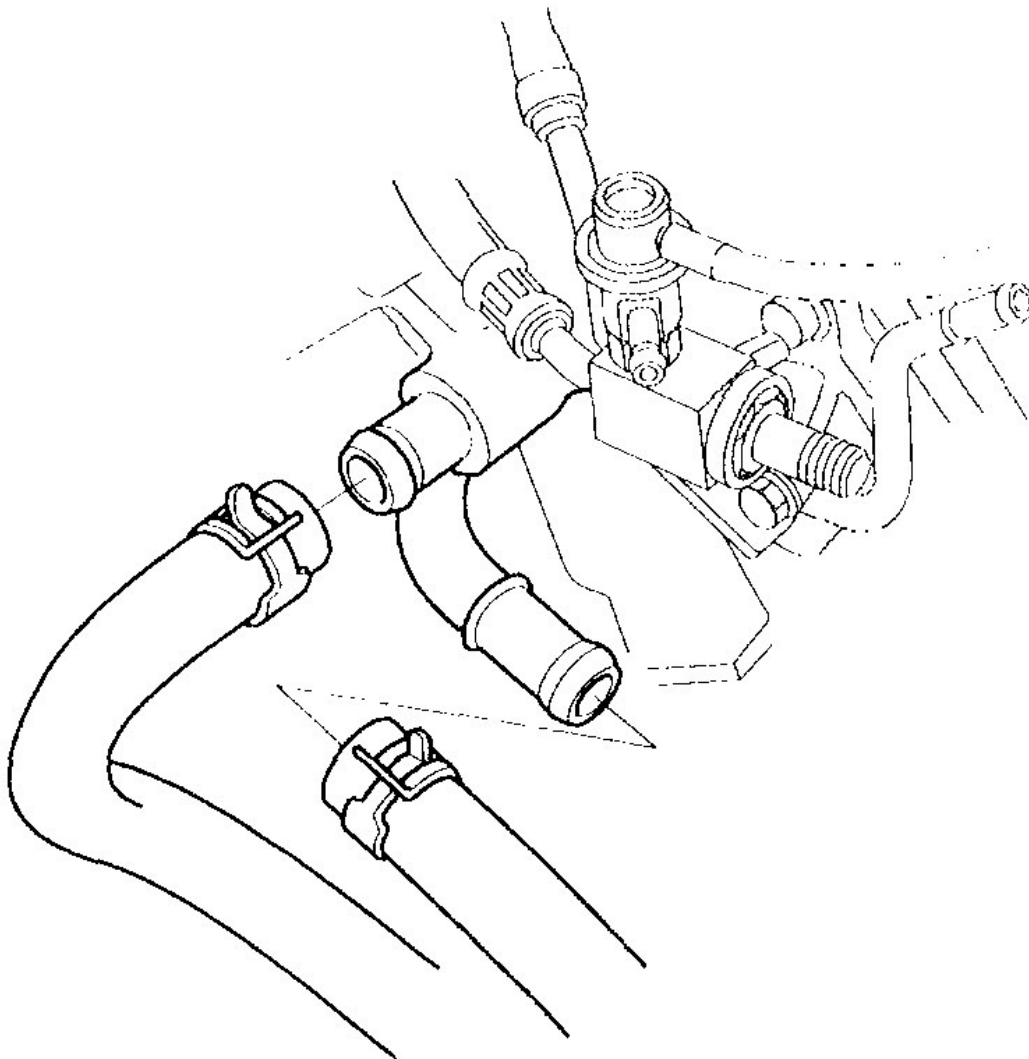
46. Remove the A/C compressor without disconnecting the A/C hoses.



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**Fig. 23: Removing The A/C Compressor**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

47. Lower the hoist.
48. Remove the heater hoses.

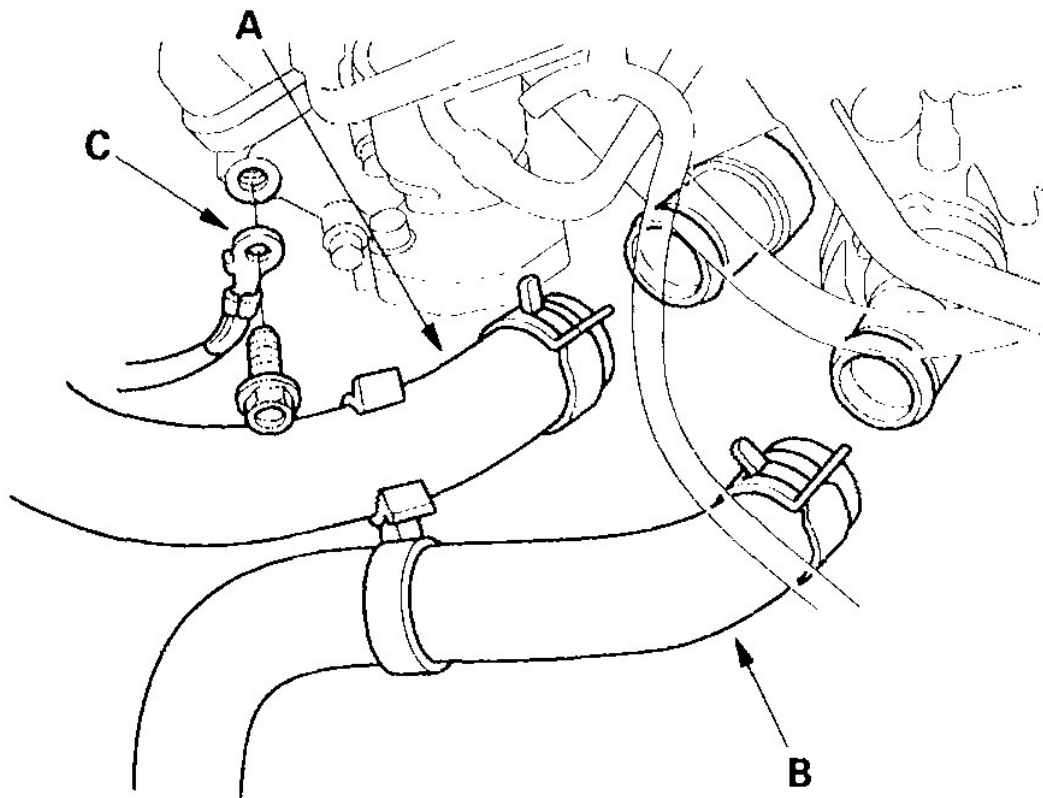


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**Fig. 24: Removing The Heater Hoses**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

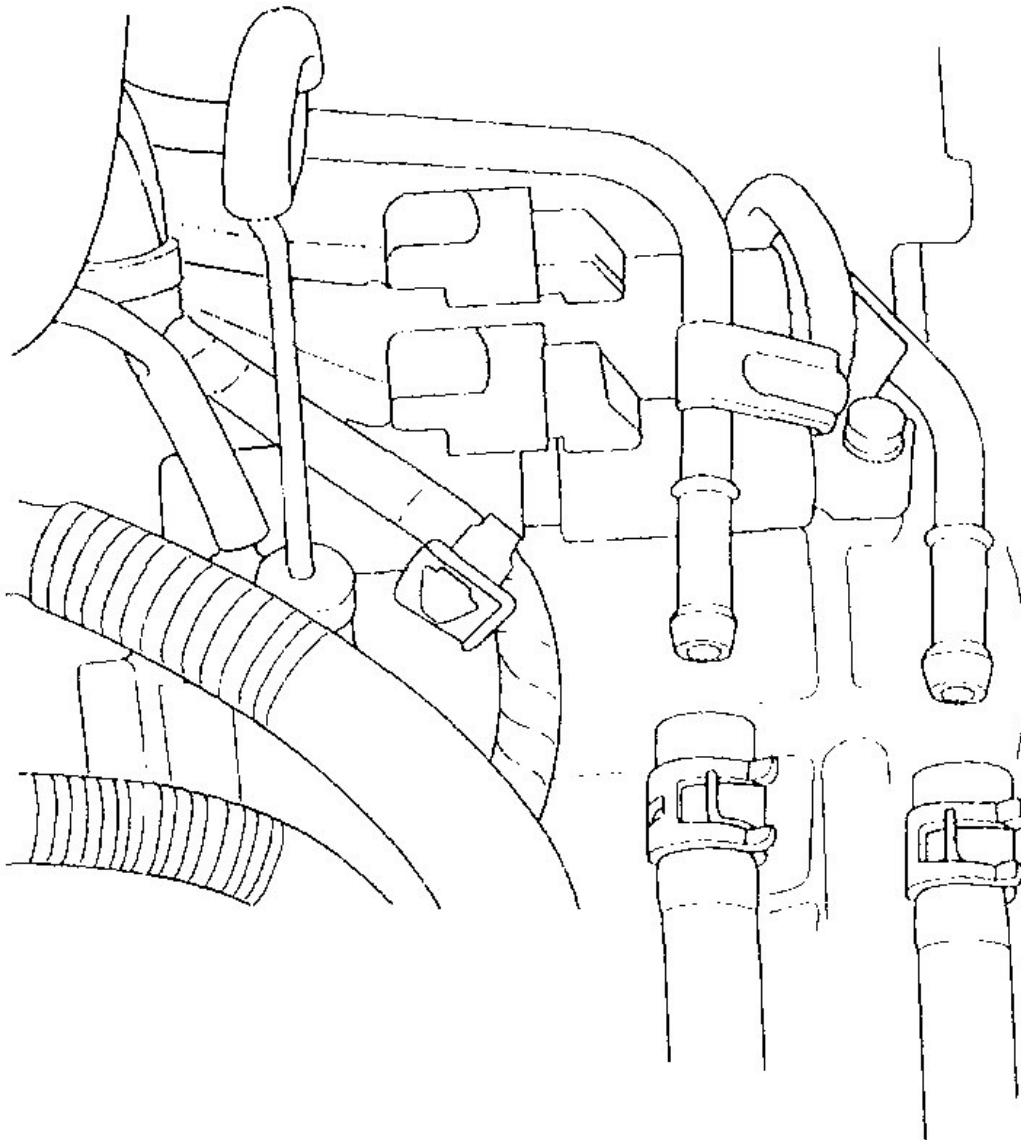
49. Remove the upper radiator hose (A), lower radiator hose (B), and ground cable (C).



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**Fig. 25: Removing The Upper Radiator Hose, Lower Radiator Hose & Ground Cable**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

50. Remove the ATF cooler hoses, then plug the ATF cooler hoses and lines.

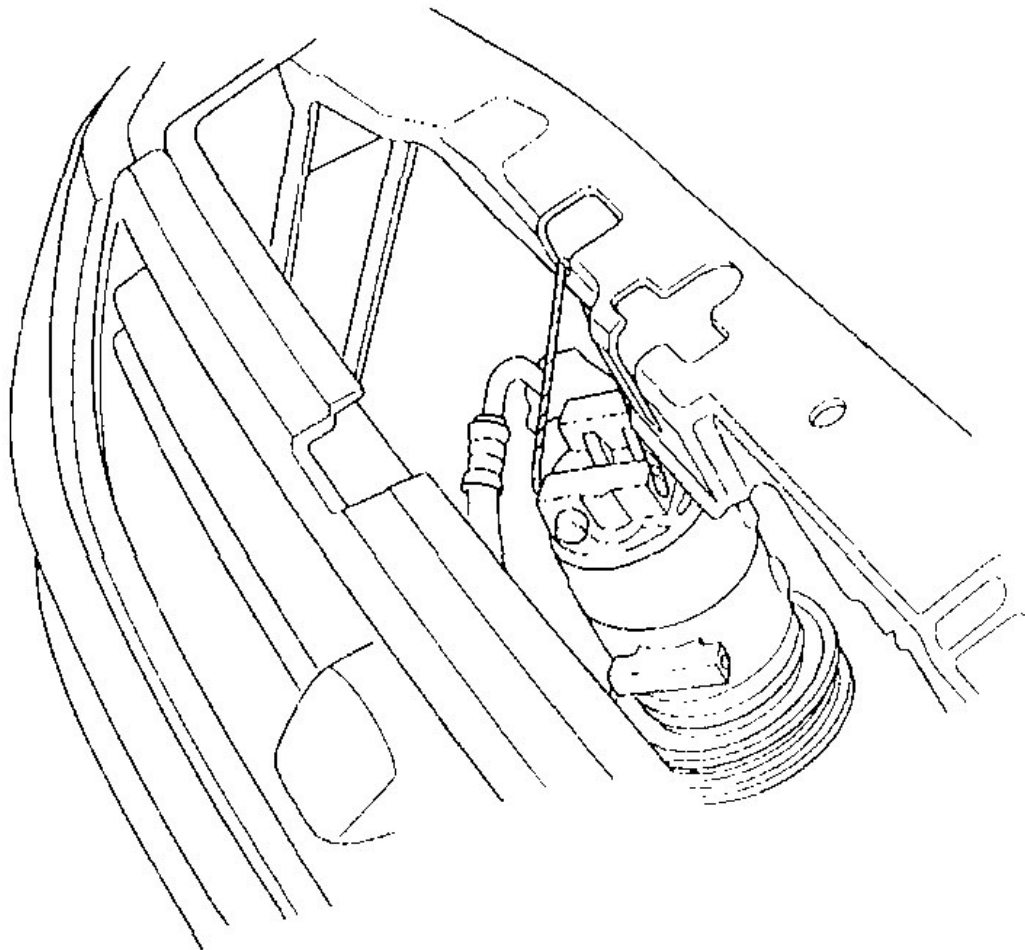


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**Fig. 26: Removing The ATF Cooler Hoses**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

51. Remove the radiator (see **RADIATOR AND FAN REPLACEMENT** ).
52. Hang the A/C compressor with a rope as shown.

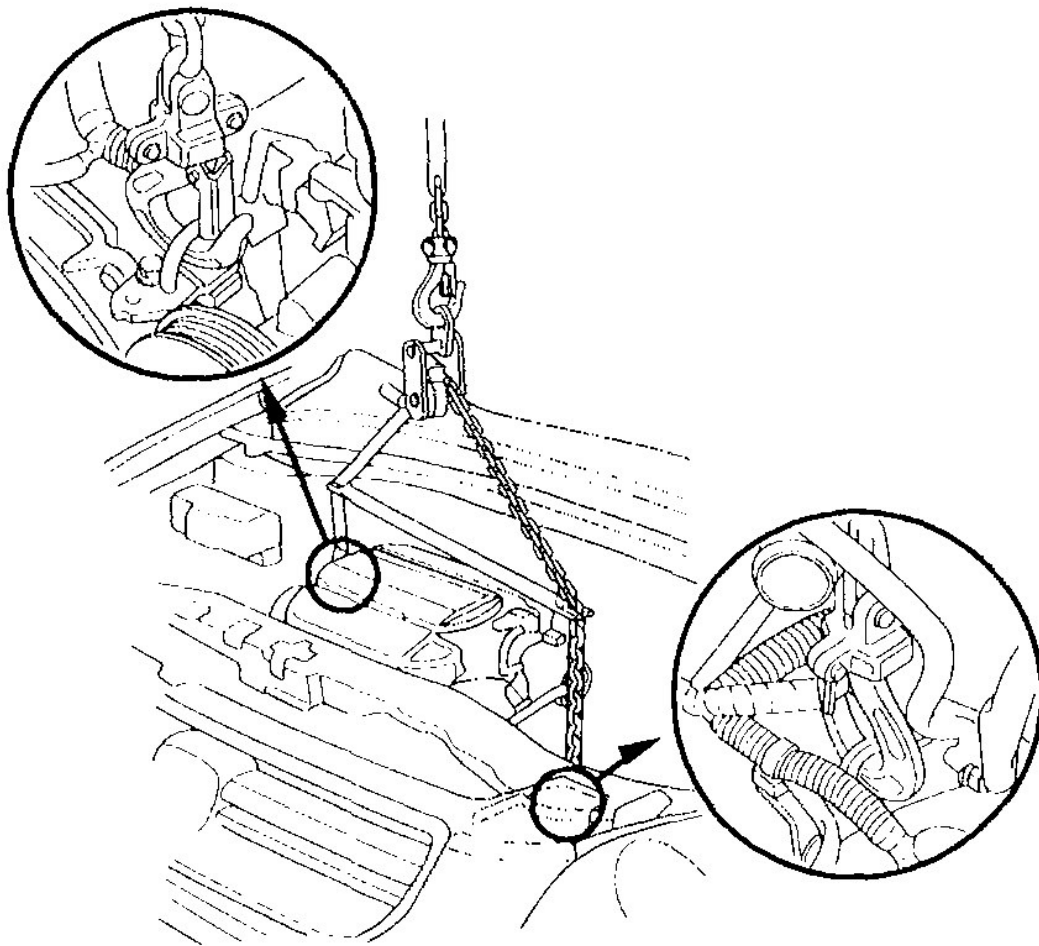


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**Fig. 27: Hanging The A/C Compressor With A Rope**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

53. Attach the chain hoist to the engine as shown.

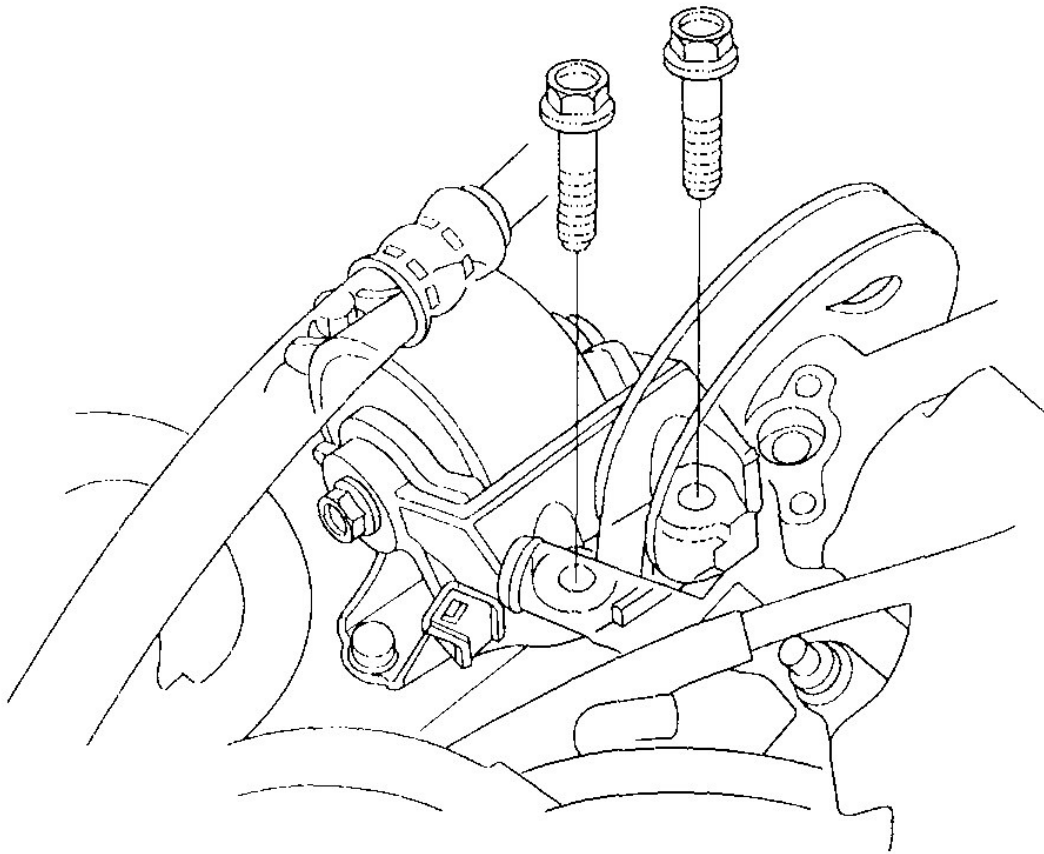




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**Fig. 28: Attaching The Chain Hoist To The Engine**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

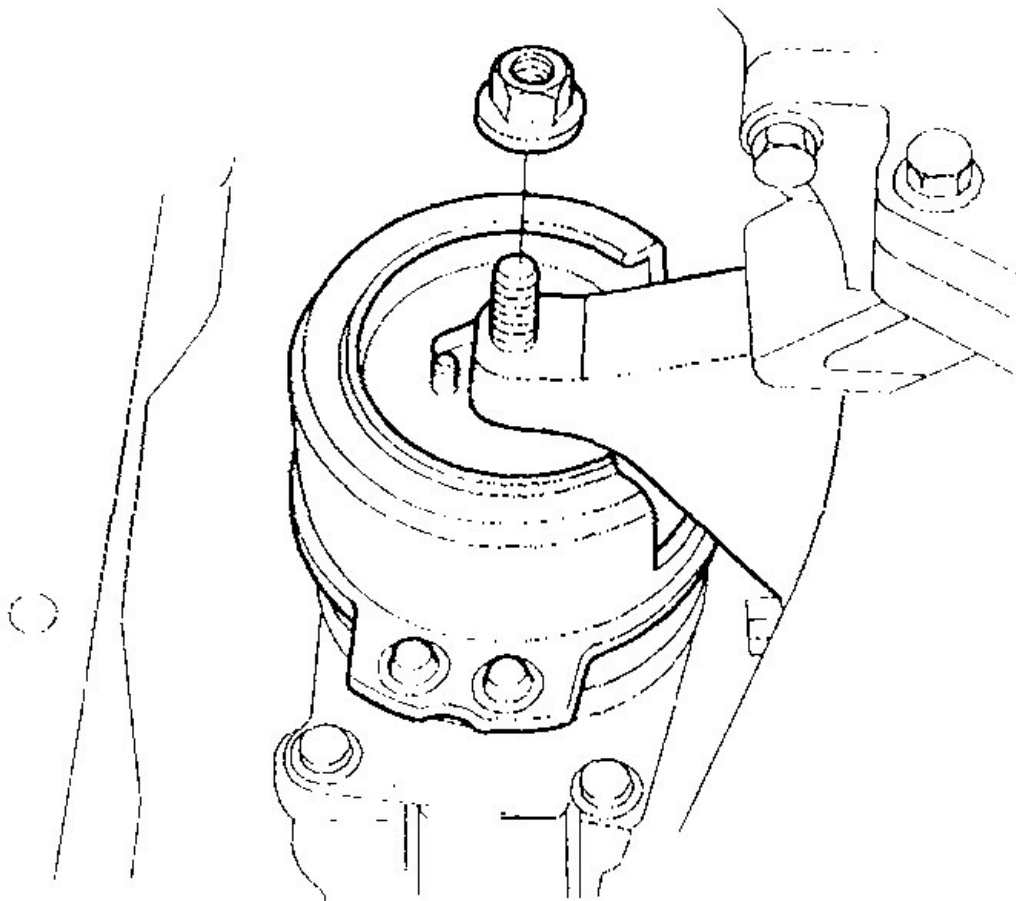
54. Remove the bolts securing the side engine mount bracket.



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**Fig. 29: Removing The Bolts Securing The Side Engine Mount Bracket**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

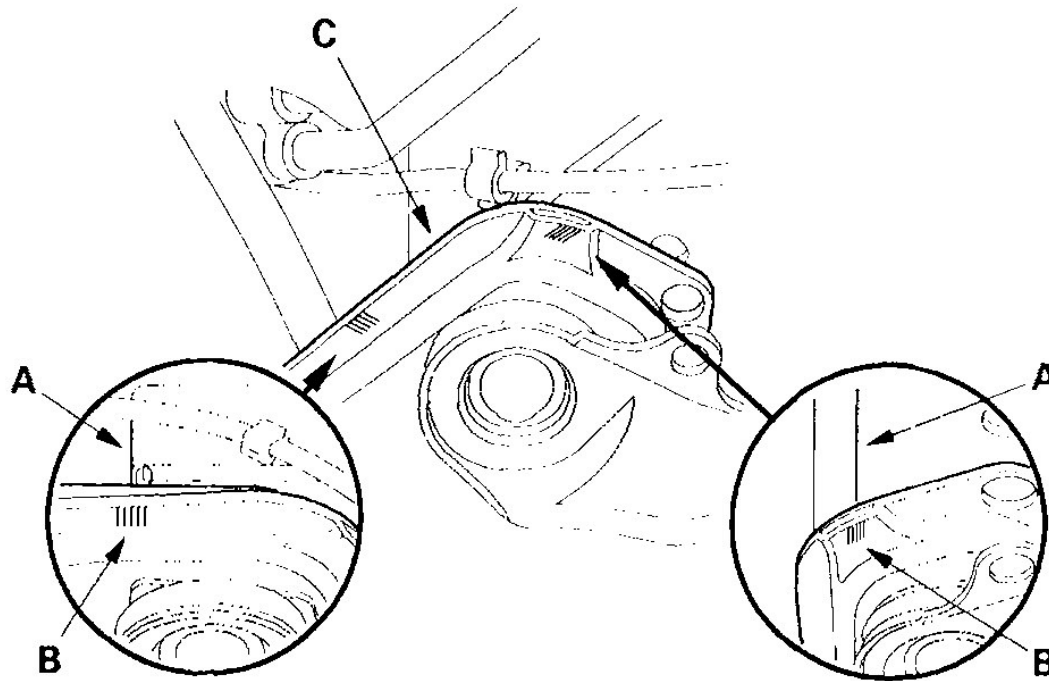
55. Remove the nut securing the front mount bracket.

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**Fig. 30: Removing The Nut Securing The Front Mount Bracket**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

56. Make sure the hoist brackets are positioned properly. Raise the hoist to full height.
57. Make reference marks (A) on the body across from the marks (B) on the edge of the front subframe (C).

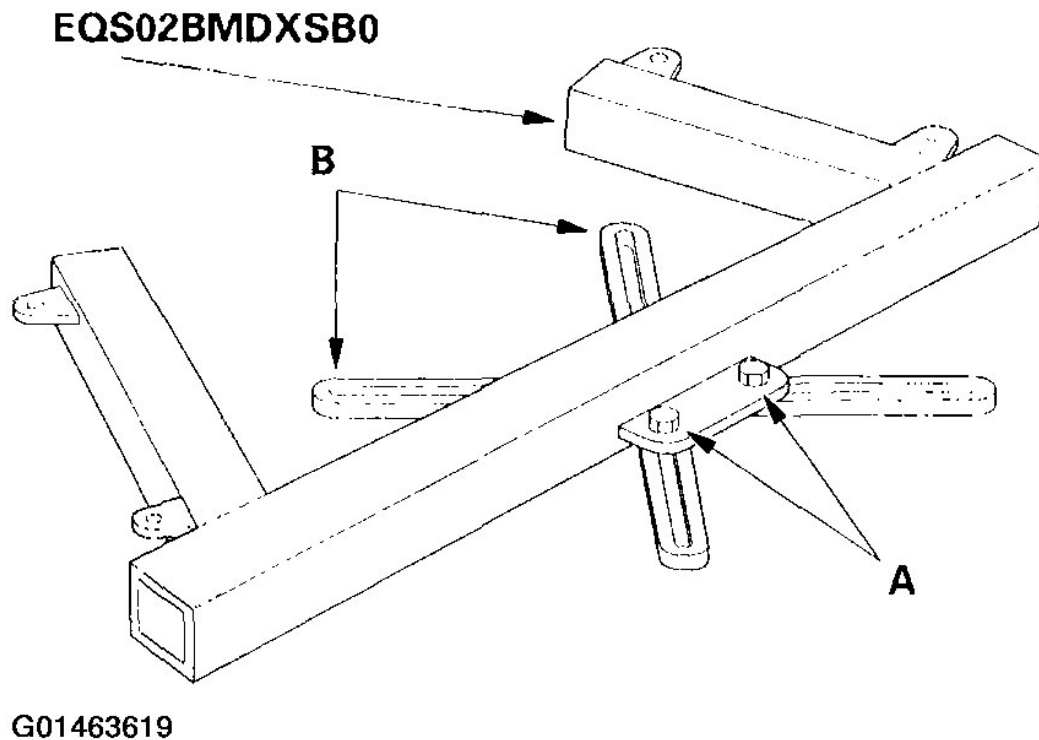


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**Fig. 31: Making Reference Marks On The Body Across From The Marks On The Edge Of The Front Subframe**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

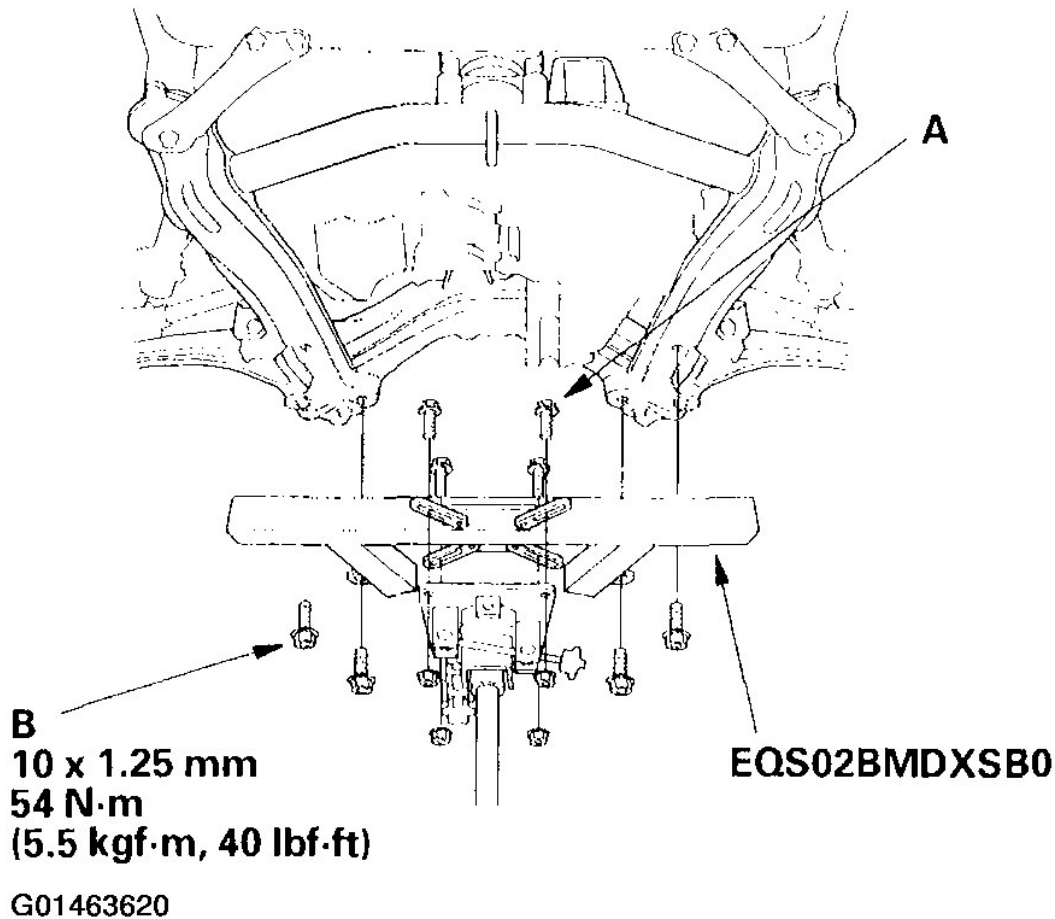
58. Loosen the four bolts (A) holding the adjustable arms (B) of the front subframe adapter to its center plate.



**Fig. 32: Loosening The Four Bolts Holding The Adjustable Arms Of The Front Subframe Adapter To Its Center Plate**

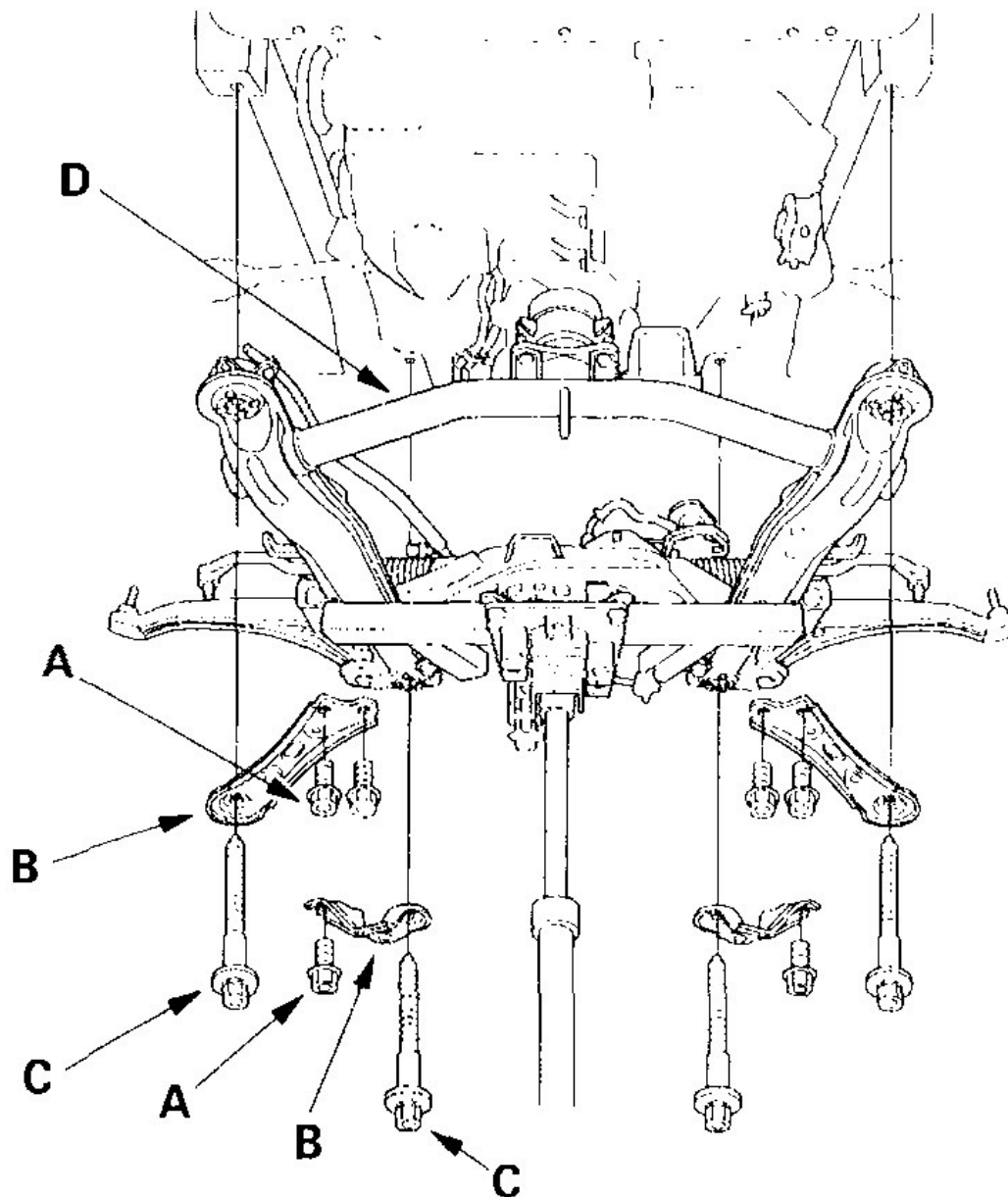
Courtesy of AMERICAN HONDA MOTOR CO., INC.

59. Line up the slots in the arms with the bolt holes on the corner of the jack base, then attach the front subframe adapter to the jack base with the bolts (A) that came with the jack. Tighten all of the bolts securely.



**Fig. 33: Lining Up The Slots In The Arms With The Bolt Holes On The Corner Of The Jack Base, & Attaching The Front Subframe Adapter To The Jack Base**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

60. Raise the jack to vehicle height, then attach the front subframe adapter to the front subframe using the subframe stiffener mounting bolts (B).
61. Remove the six 12x1.25 mm bolts (A) securing the subframe stiffeners (B), the four front subframe mounting bolts (C), and the subframe stiffeners, then lower the front subframe (D).



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**Fig. 34: Removing The Six 12X1.25 Mm Bolts Securing The Subframe Stiffeners, The Four Front Subframe Mounting Bolts & The Subframe Stiffeners**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

62. Check that the engine/transmission is completely free of vacuum hoses, fuel and coolant hoses, and electrical wiring.

63. Slowly lower the engine about 150 mm (6 in.). Check once again that all hoses and wires are disconnected from the engine/transmission.
64. Lower the engine/transmission assembly all the way. Remove the chain hoist from the engine.
65. Remove the engine/transmission assembly from under the vehicle.

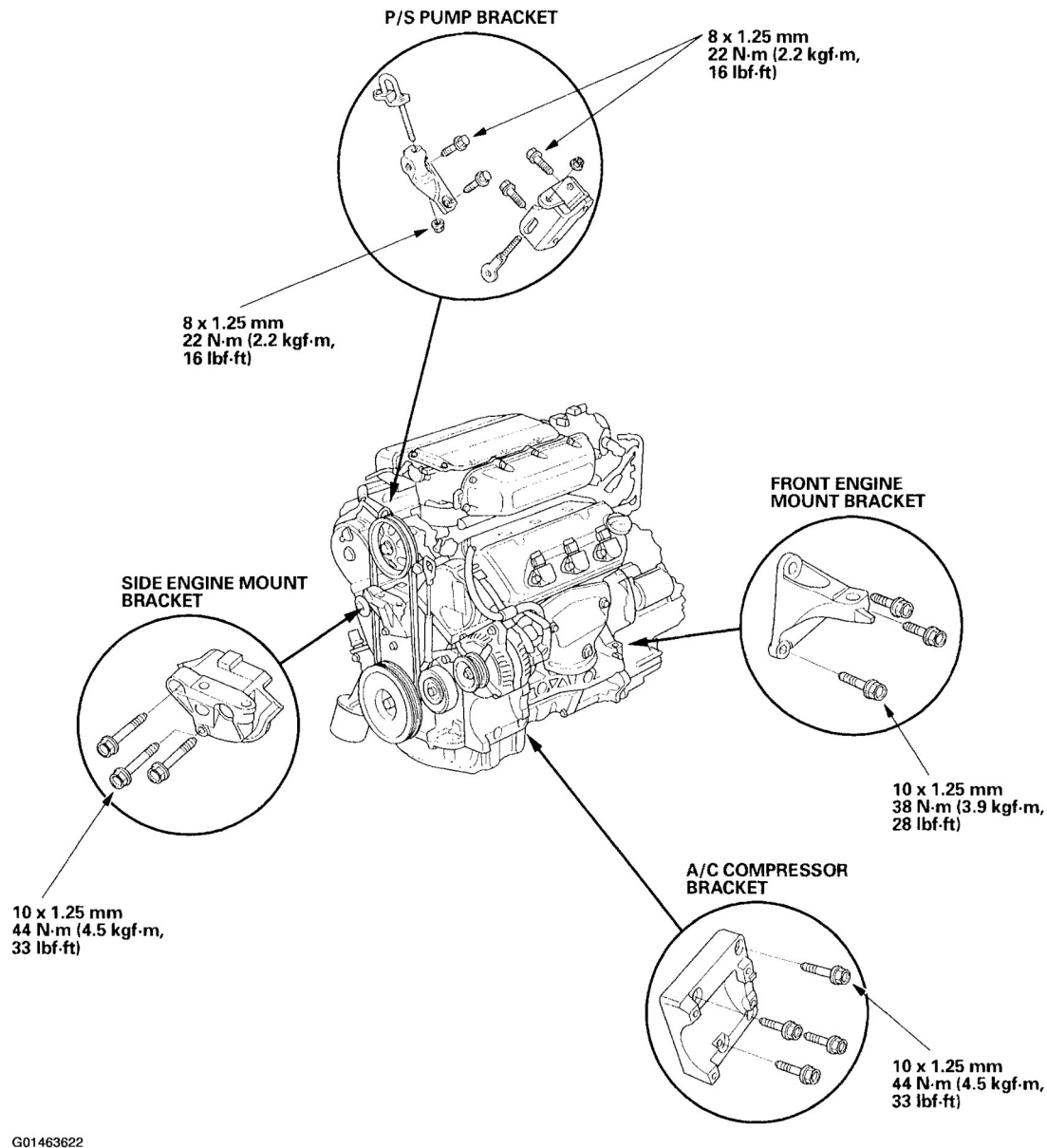
## **ENGINE INSTALLATION**

### **Special Tools Required**

Front subframe adapter EQS02BMDXSBO

1. Install the accessory brackets and tighten their bolts and nuts to the specified torques.



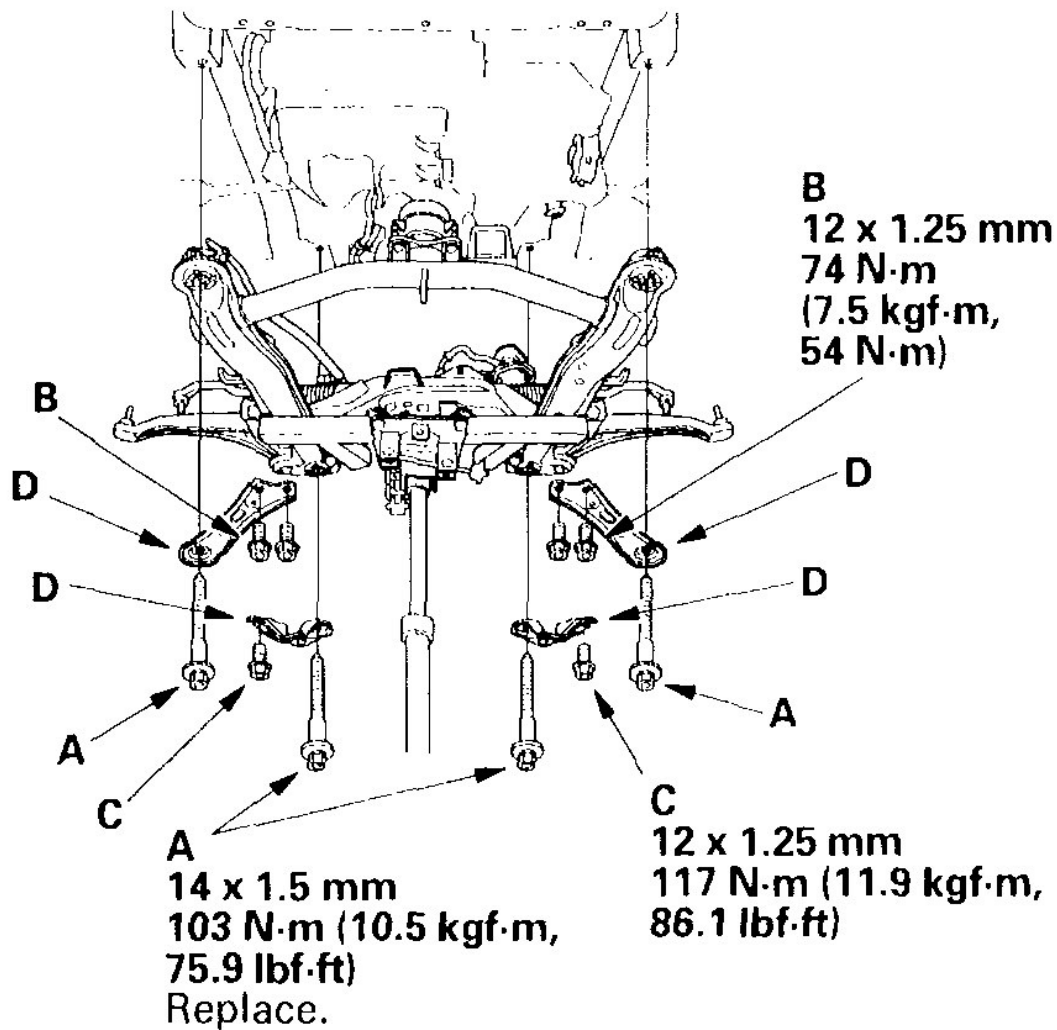


**Fig. 35: Installing The Accessory Brackets**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Position the engine/transmission assembly under the vehicle. Attach the chain hoist to the engine, then lift the engine into position in the vehicle.
3. Support the front subframe with the front subframe adapter and a jack, and lift it up to the body.

**NOTE:** Reinstall the mounting bolts/support nuts in the sequence given. Failure to follow this sequence may cause excessive noise and vibration, and reduce the bushing life.

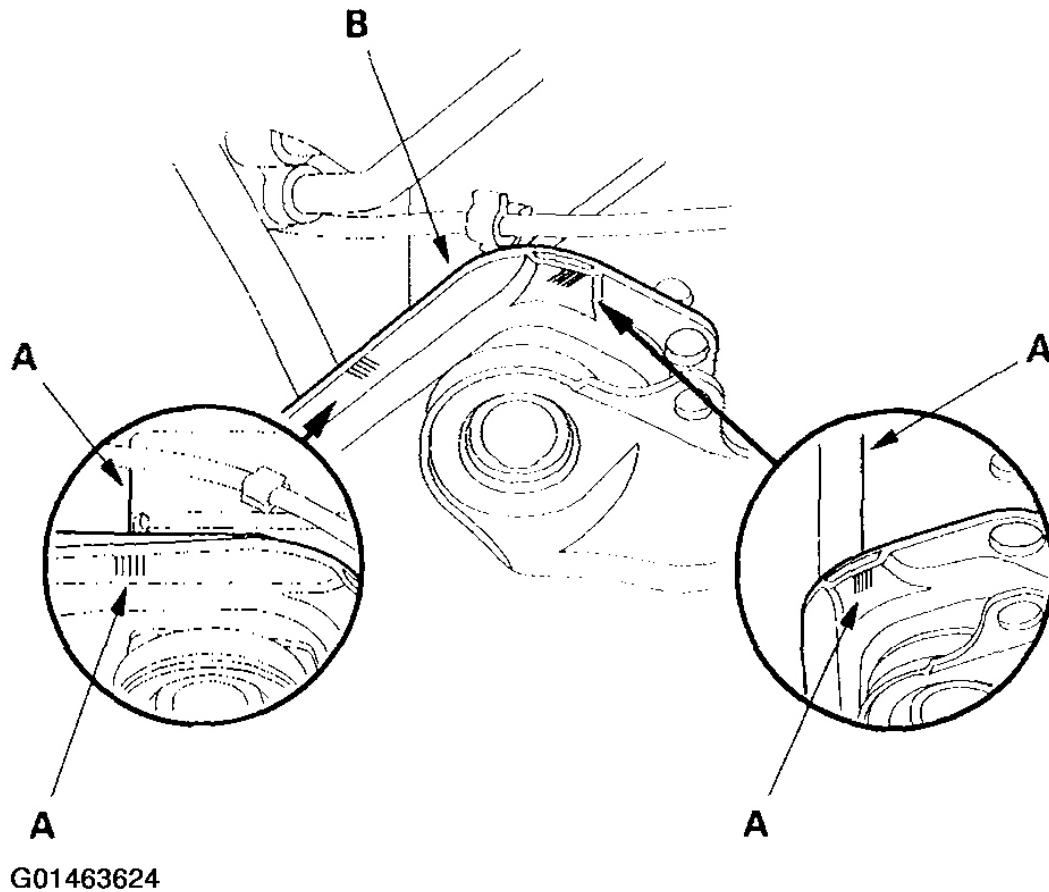


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**Fig. 36: Installing The Four Front Subframe Mounting Bolts & The Six 12 X 1.25 Mm Bolts With The Subframe Stiffeners**

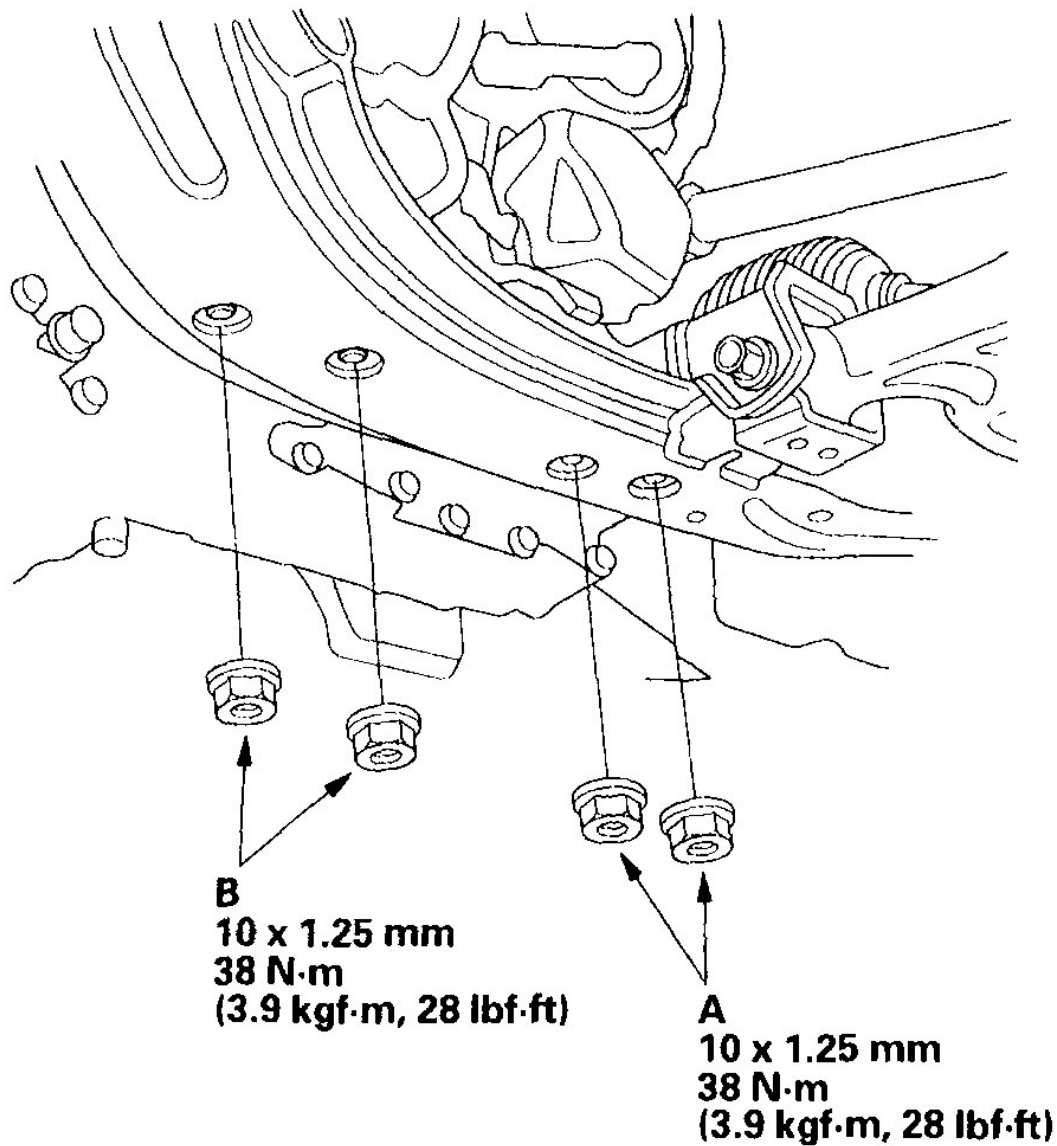
Courtesy of AMERICAN HONDA MOTOR CO., INC.

- Loosely install the four front subframe mounting bolts (A) and the six 12 X 1.25 mm bolts (B), (C) with the subframe stiffeners (D).
- Align all reference marks (A) on the front subframe (B) with the body, then tighten the bolts on the front subframe to the specified torque.



**Fig. 37: Aligning All Reference Marks On The Front Subframe With The Body, & Tightening The Bolts On The Front Subframe**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Tighten the transmission lower rear mount mounting nuts (A) and transmission lower front mount mounting nuts (B).

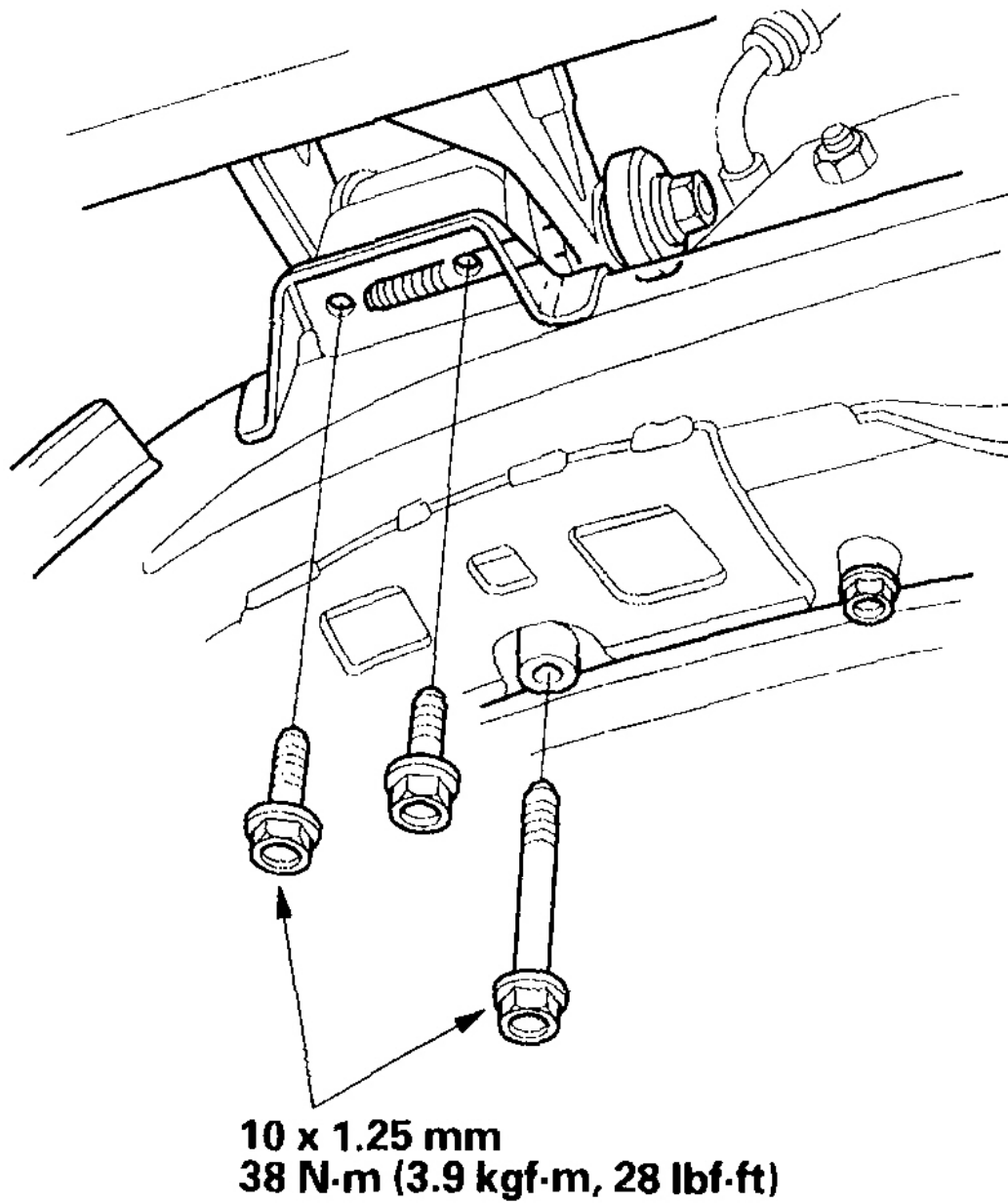


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**Fig. 38: Tightening The Transmission Lower Rear Mount Mounting Nuts & Transmission Lower Front Mount Mounting Nuts**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

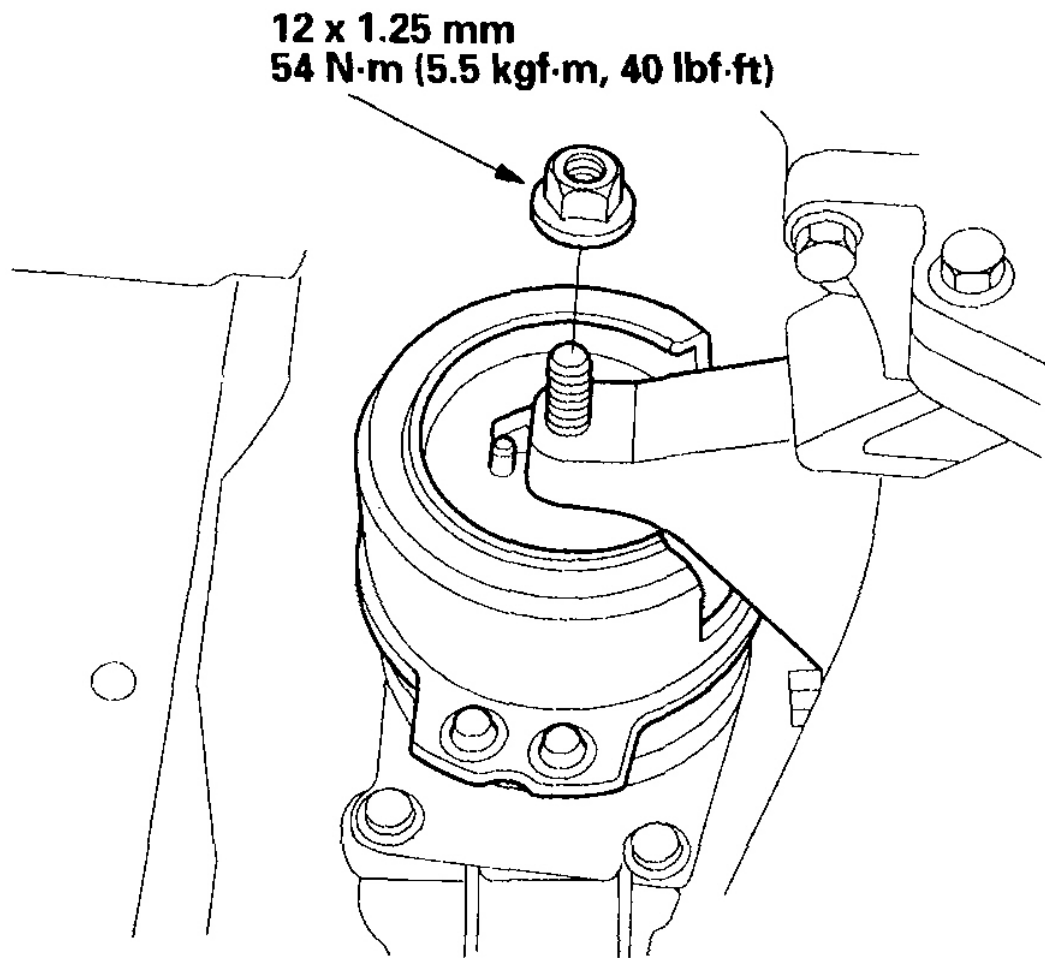
7. Tighten the rear mount mounting bolts.



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**Fig. 39: Tightening The Rear Mount Mounting Bolts**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

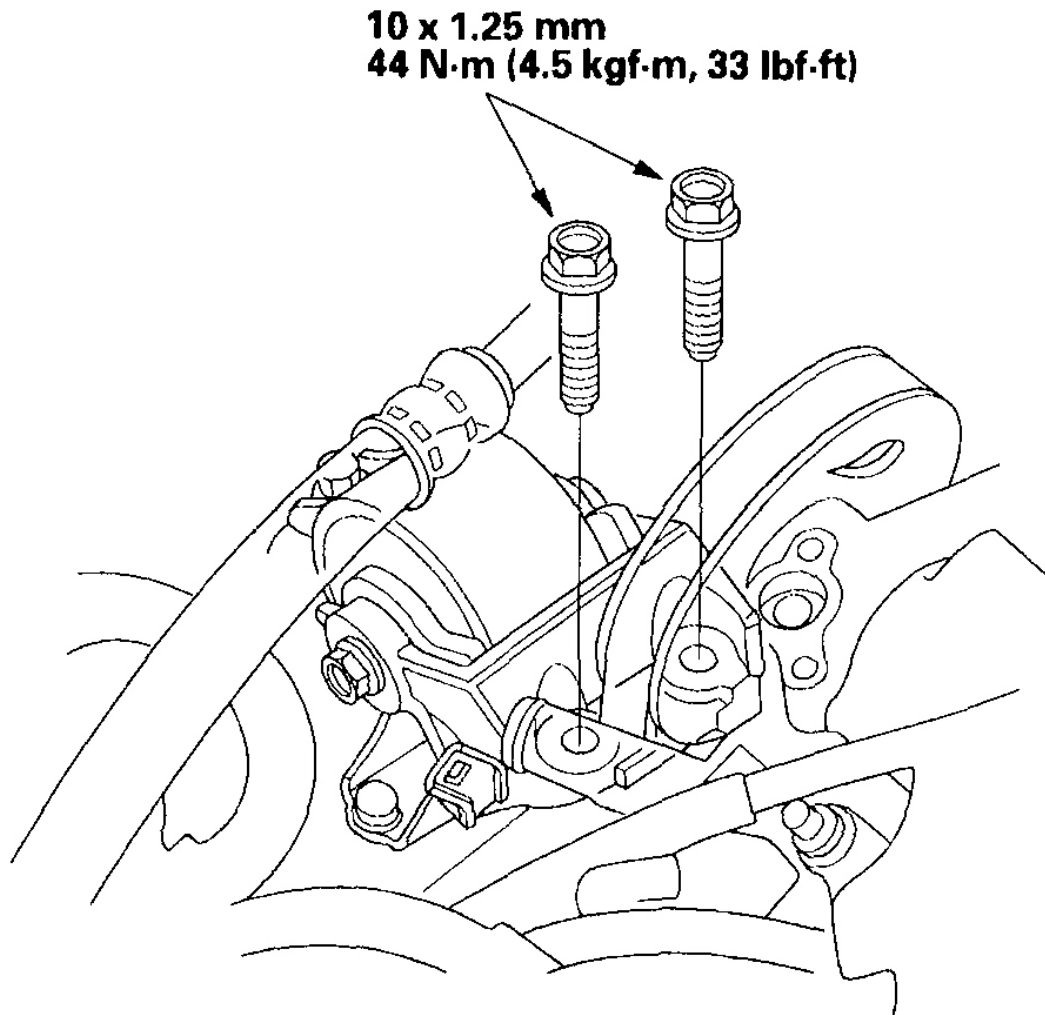
8. Lower the hoist.
9. Tighten the front mount support nut.



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**Fig. 40: Tightening The Front Mount Support Nut**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

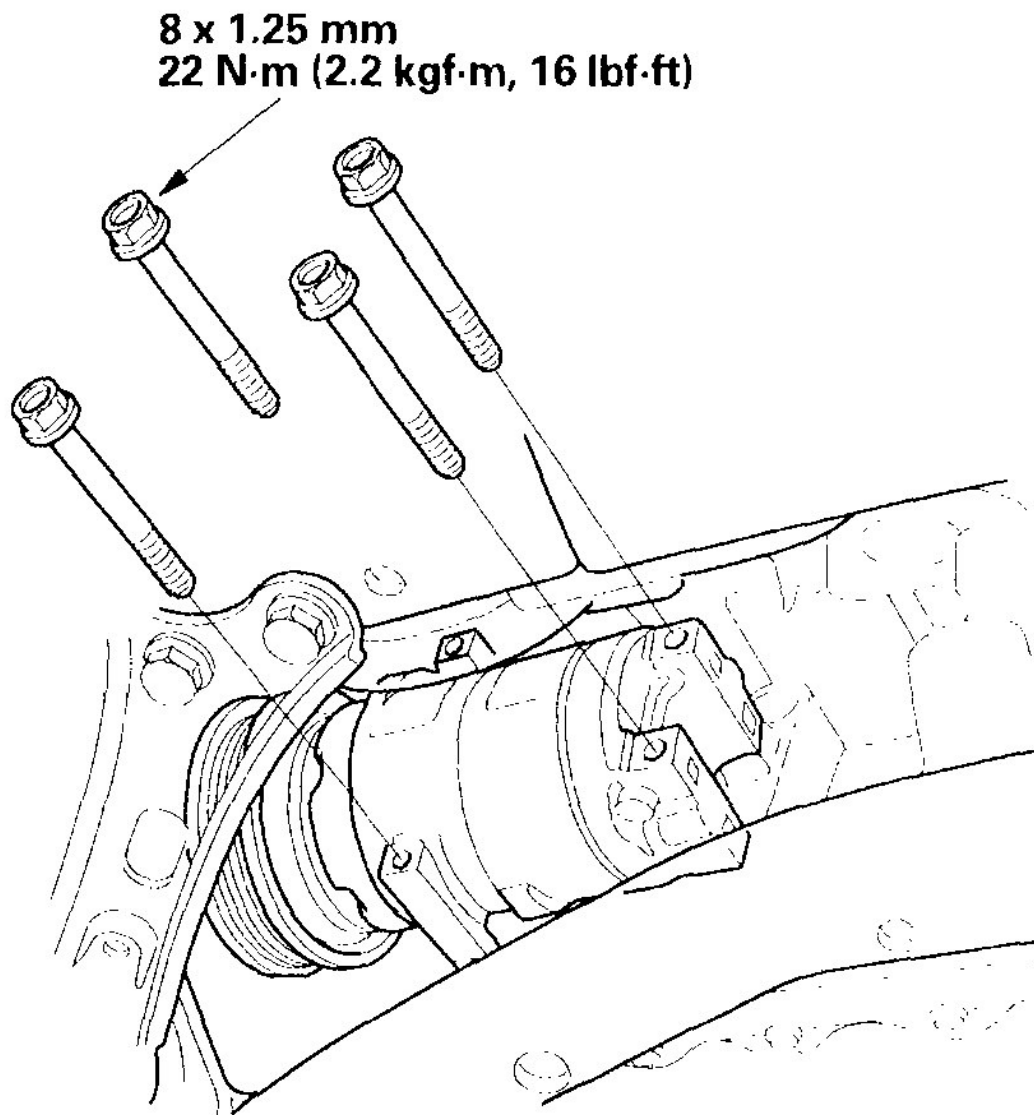
10. Tighten the side engine mount mounting bolts.



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**Fig. 41: Tightening The Side Engine Mount Mounting Bolts**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

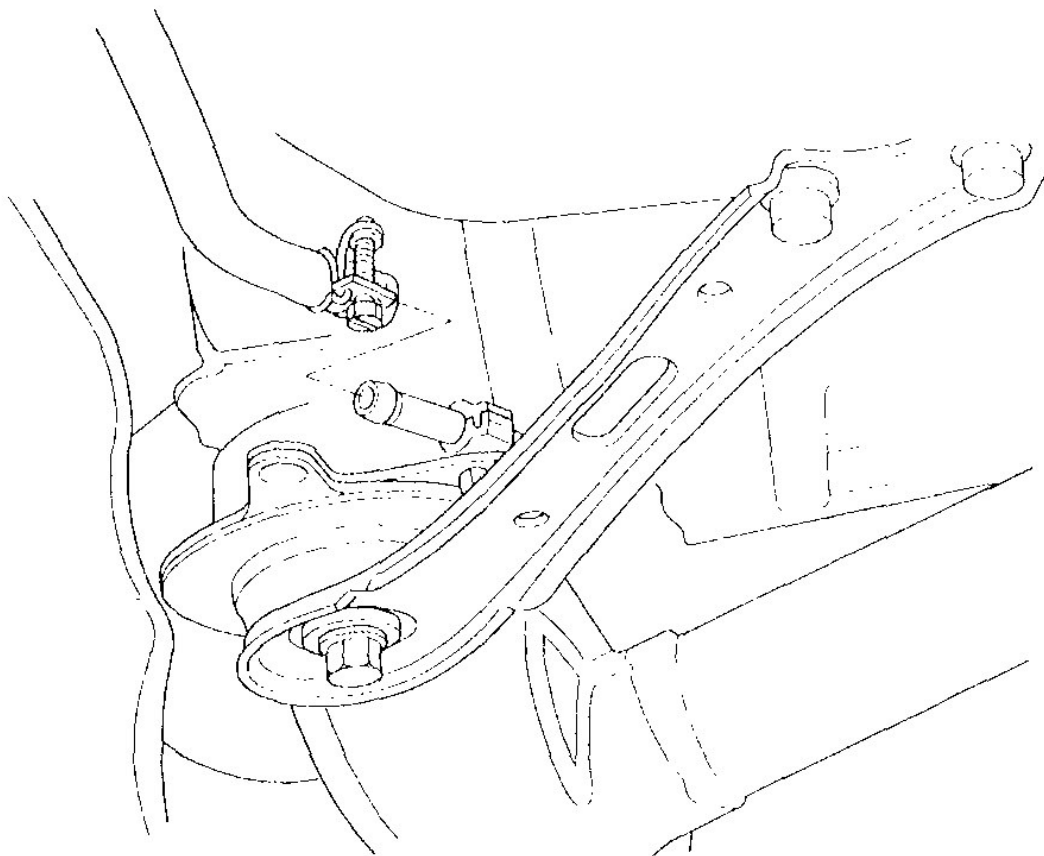
11. Remove the chain hoist from the engine.
12. Raise the hoist to full height.
13. Install the A/C compressor.



**Fig. 42: Installing The A/C Compressor**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Install the power steering (P/S) hose.



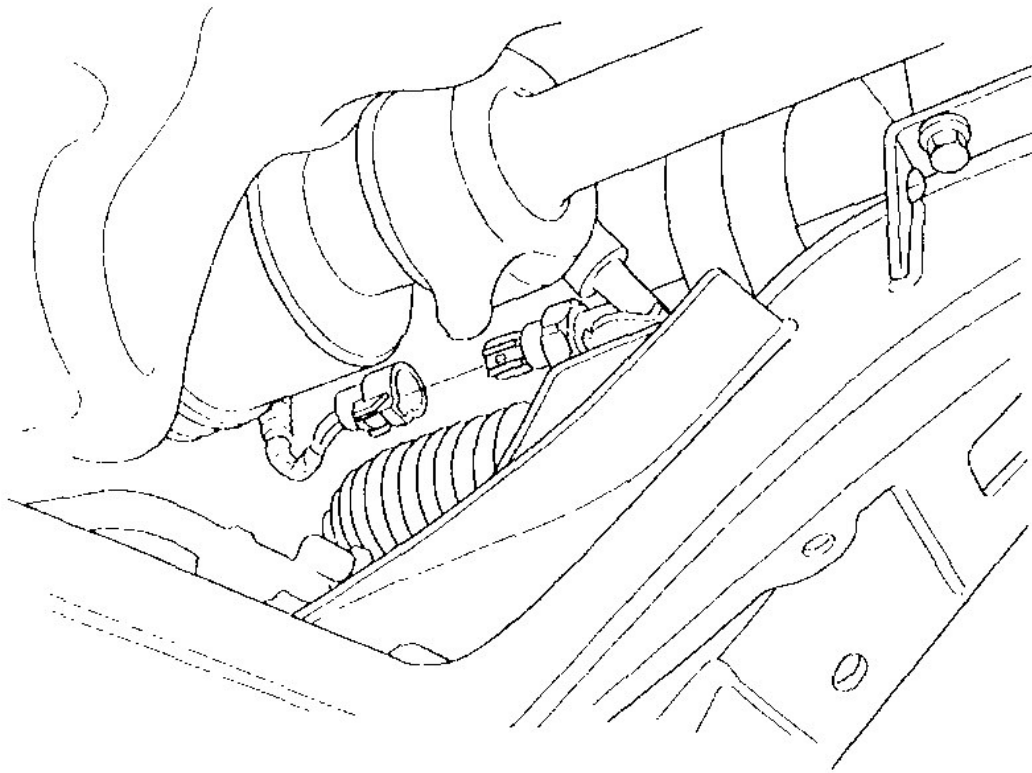


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**Fig. 43: Installing The Power Steering Hose**

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

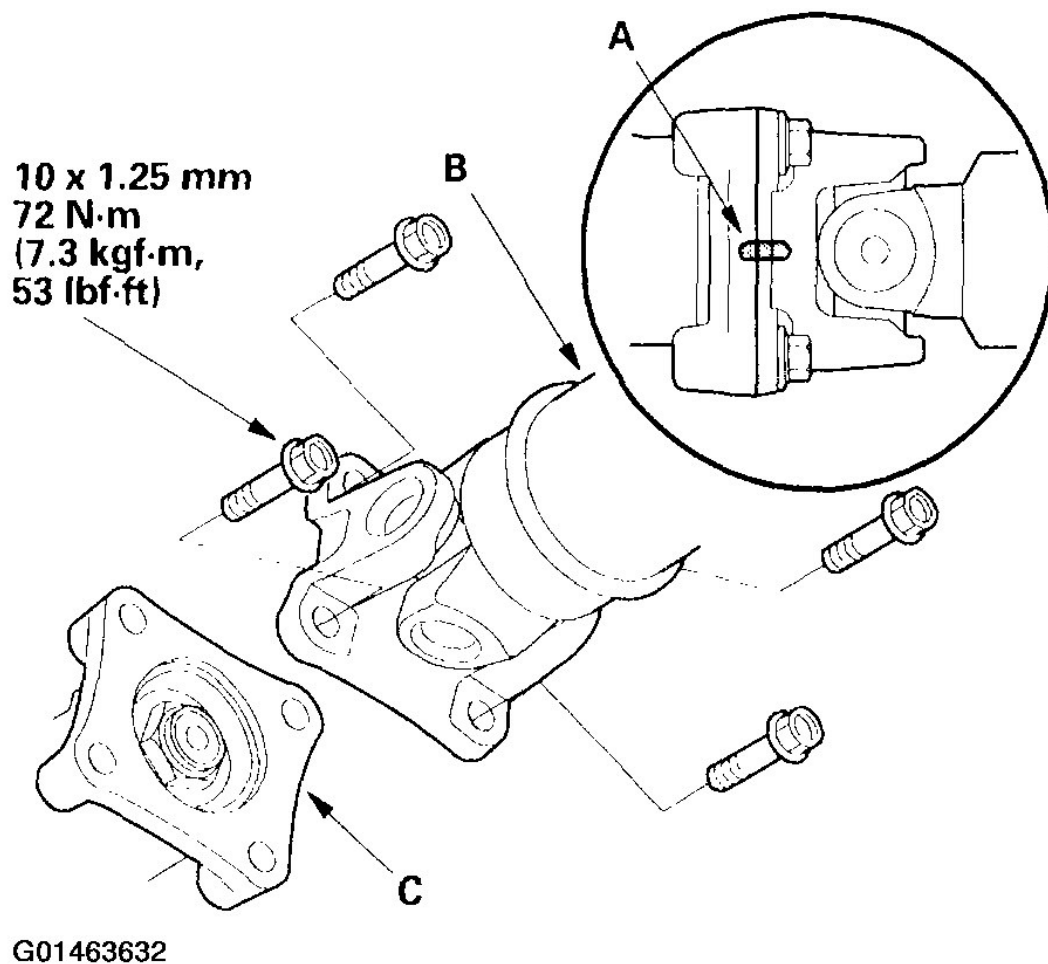
15. Connect the power steering pressure switch connector.



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**Fig. 44: Connecting The Power Steering Pressure Switch Connector**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

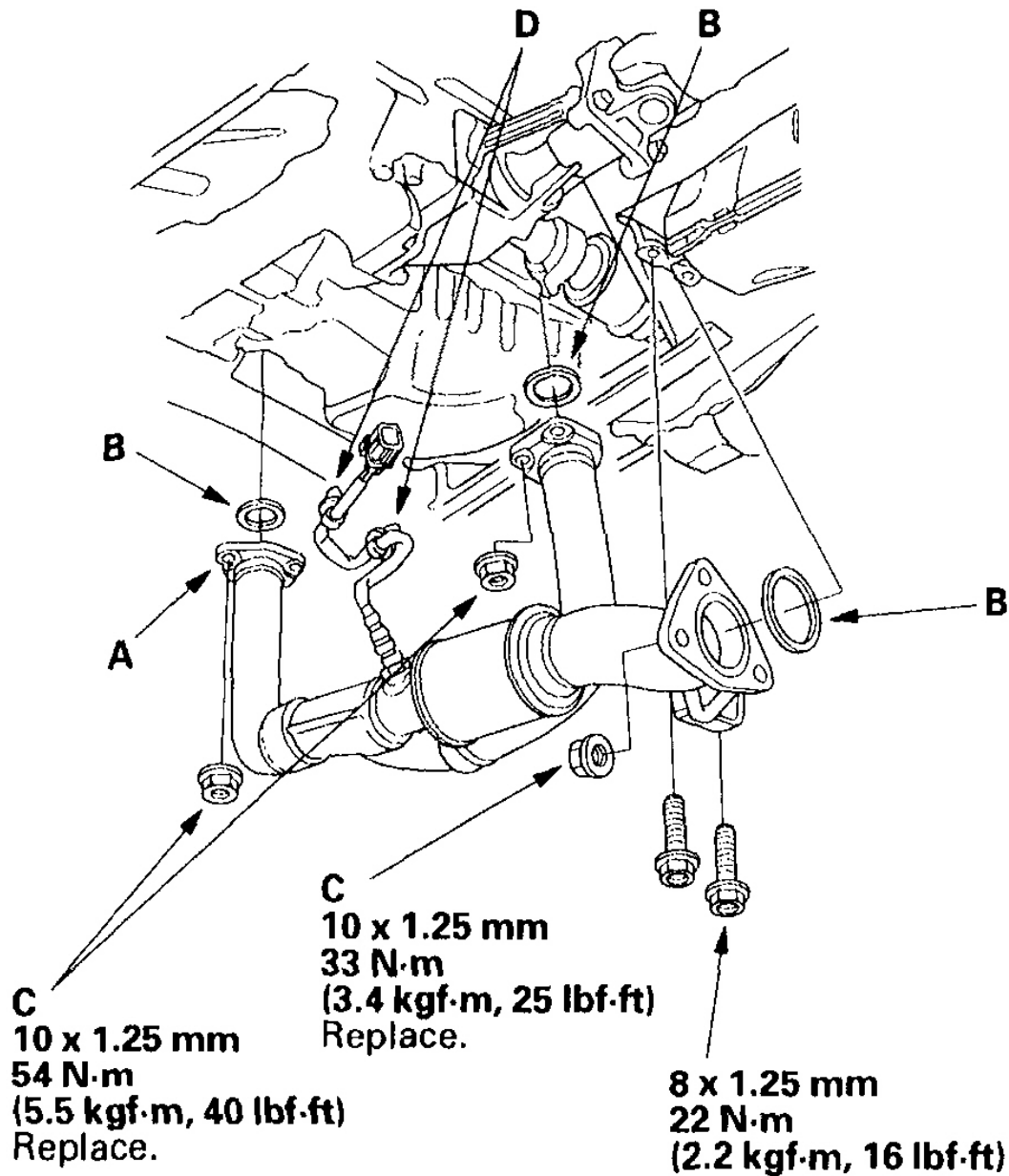
16. Install a new set ring on the end of each driveshaft, then install the driveshafts. Make sure each ring "clicks" into place in the differential and intermediate shaft.
17. Connect the suspension lower arm ball joints (see **LOWER ARM** ) and stabilizer links (see **STABILIZER LINK** ).
18. Connect the tie-rod end ball joints (see step 23 on **STEERING GEARBOX OVERHAUL** ).
19. Install the transfer assembly (see **TRANSFER ASSEMBLY INSTALLATION** ).
20. Install the shift cable (see step 10 on **SHIFT CABLE REPLACEMENT** ).
21. Align the reference marks (A) on the propeller shaft (B) and transfer shaft flange (C), then install the propeller shaft.



**Fig. 45: Aligning The Reference Marks On The Propeller Shaft & Transfer Shaft Flange, & Installing The Propeller Shaft**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

22. Install exhaust pipe A (A); use new gaskets (B) and new self locking nuts (C).

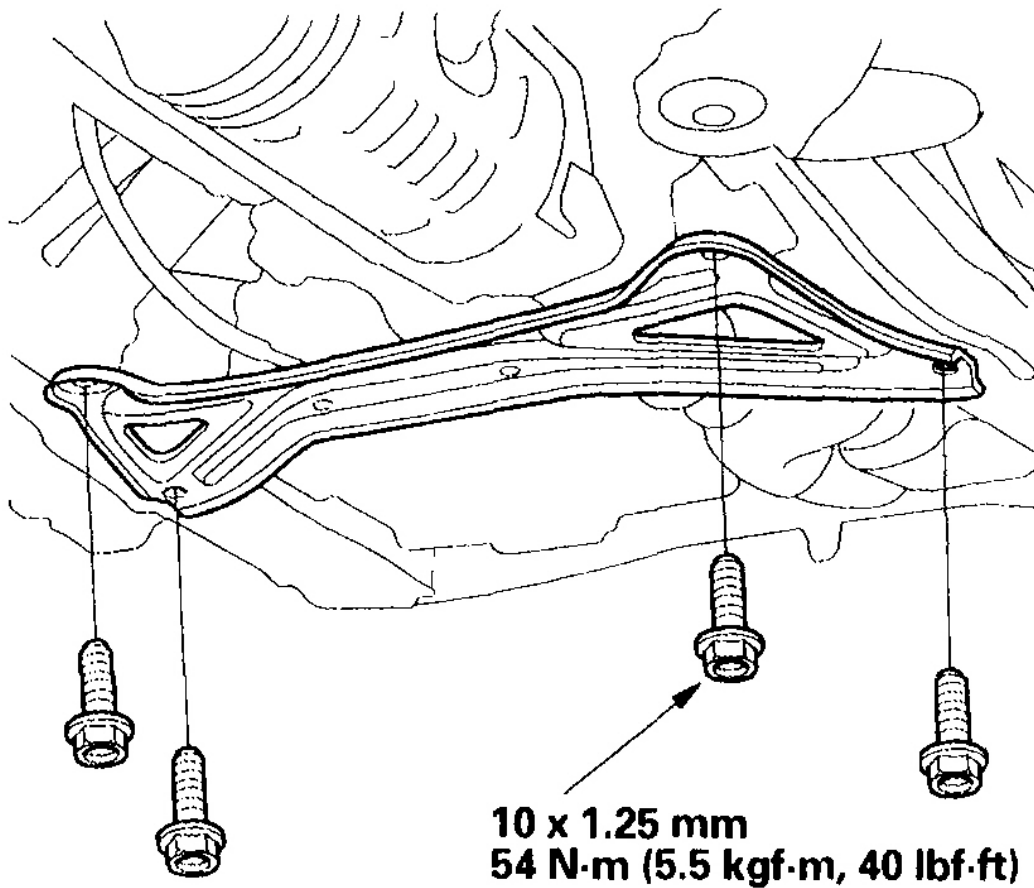


G01463633

**Fig. 46: Installing Exhaust Pipe A**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

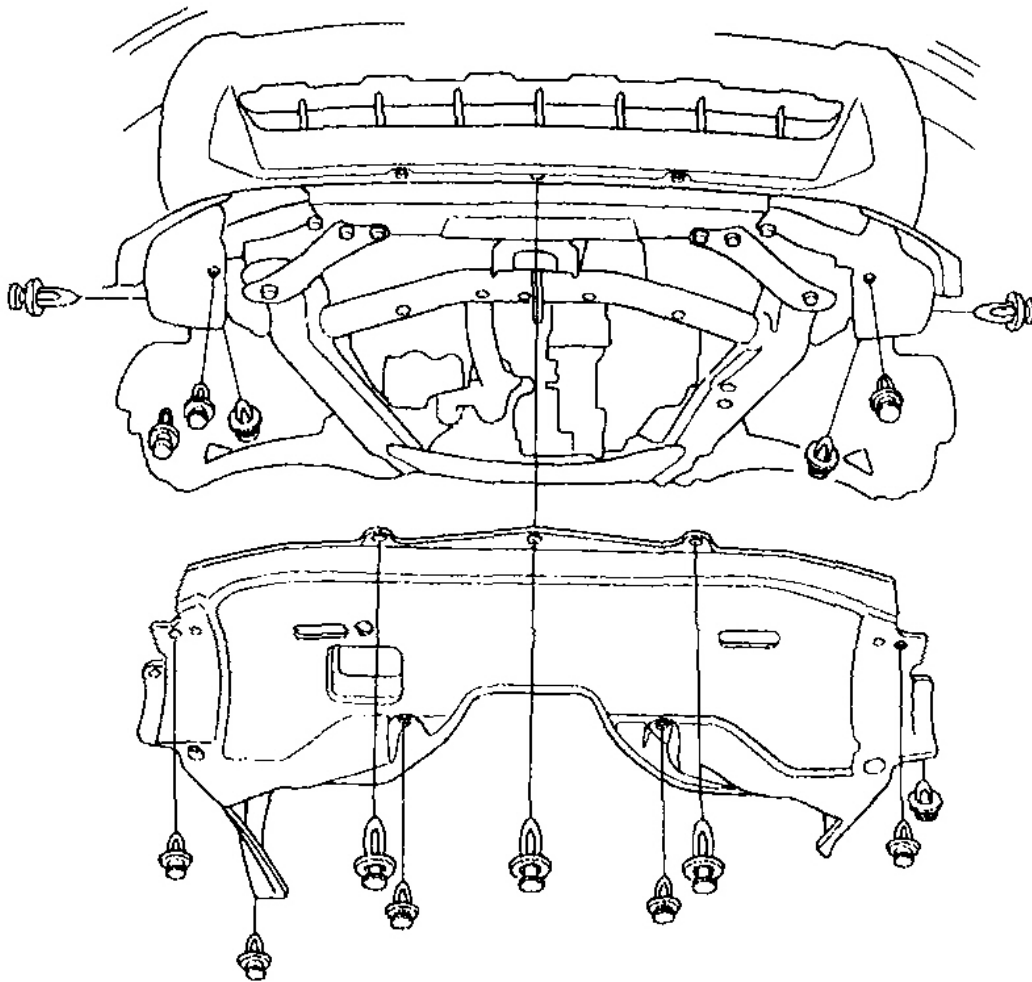
23. Install the harness clamps (D).
24. Install the front subframe stiffener.



G01463634

**Fig. 47: Installing The Front Subframe Stiffener**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

25. Install the splash shield.

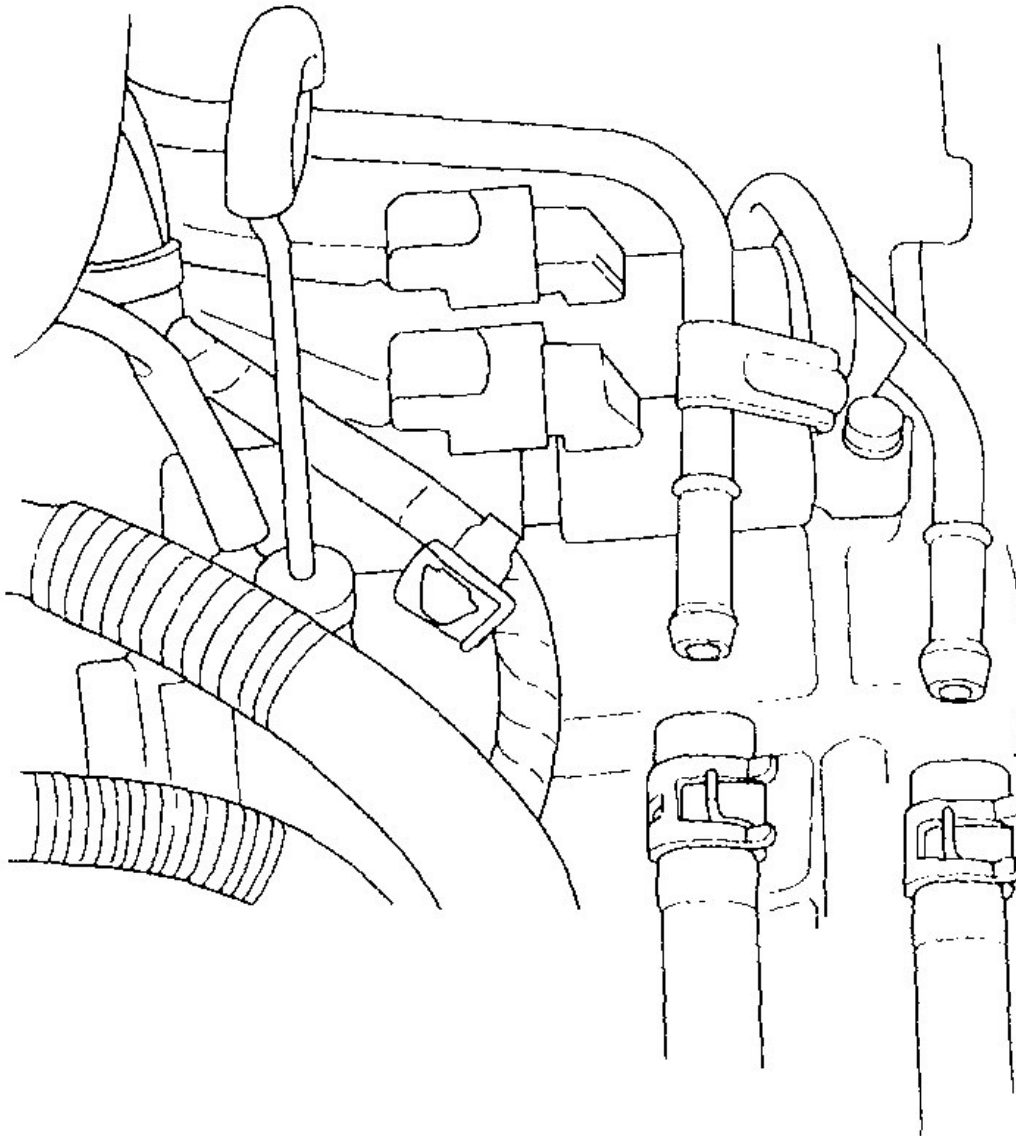


G01463635

**Fig. 48: Installing The Splash Shield**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

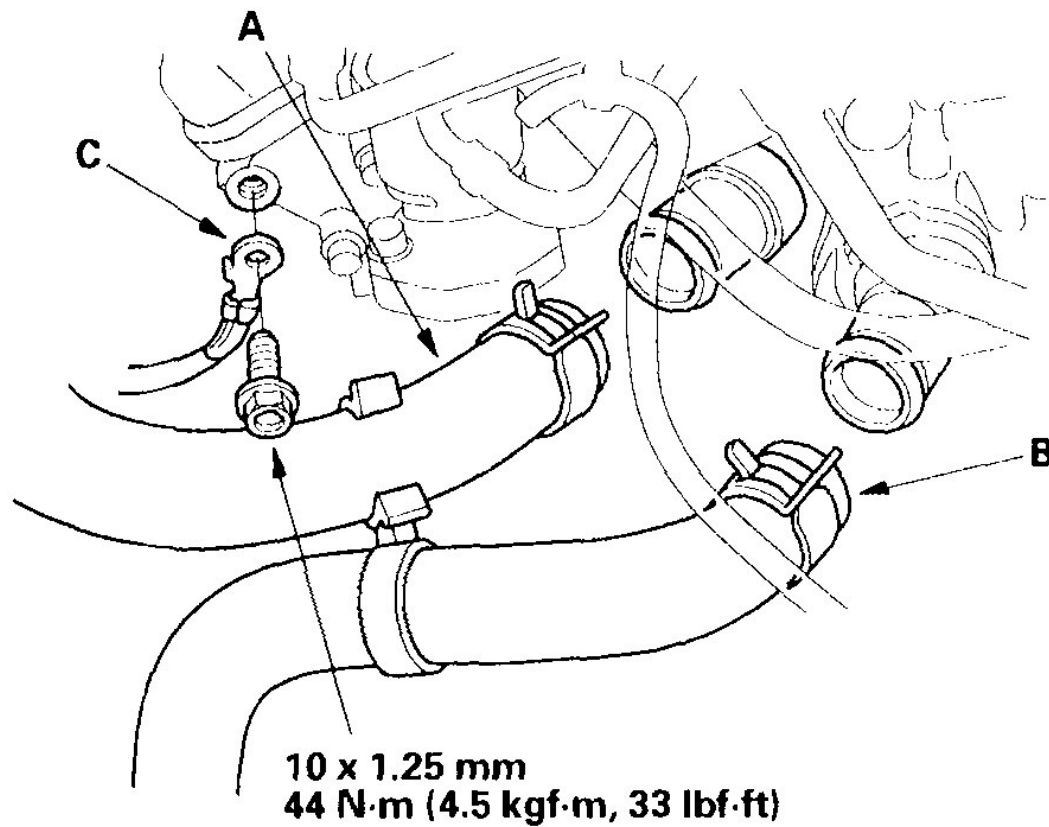
26. Install the front tires/wheels.
27. Lower the vehicle on the hoist.
28. Install the radiator (see **RADIATOR AND FAN REPLACEMENT** ).
29. Install the automatic transmission fluid (ATF) cooler hoses.



**G01463636**

**Fig. 49: Installing The Automatic Transmission Fluid Cooler Hoses**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

30. Install the upper radiator hose (A), lower radiator hose (B), and ground cable (C).

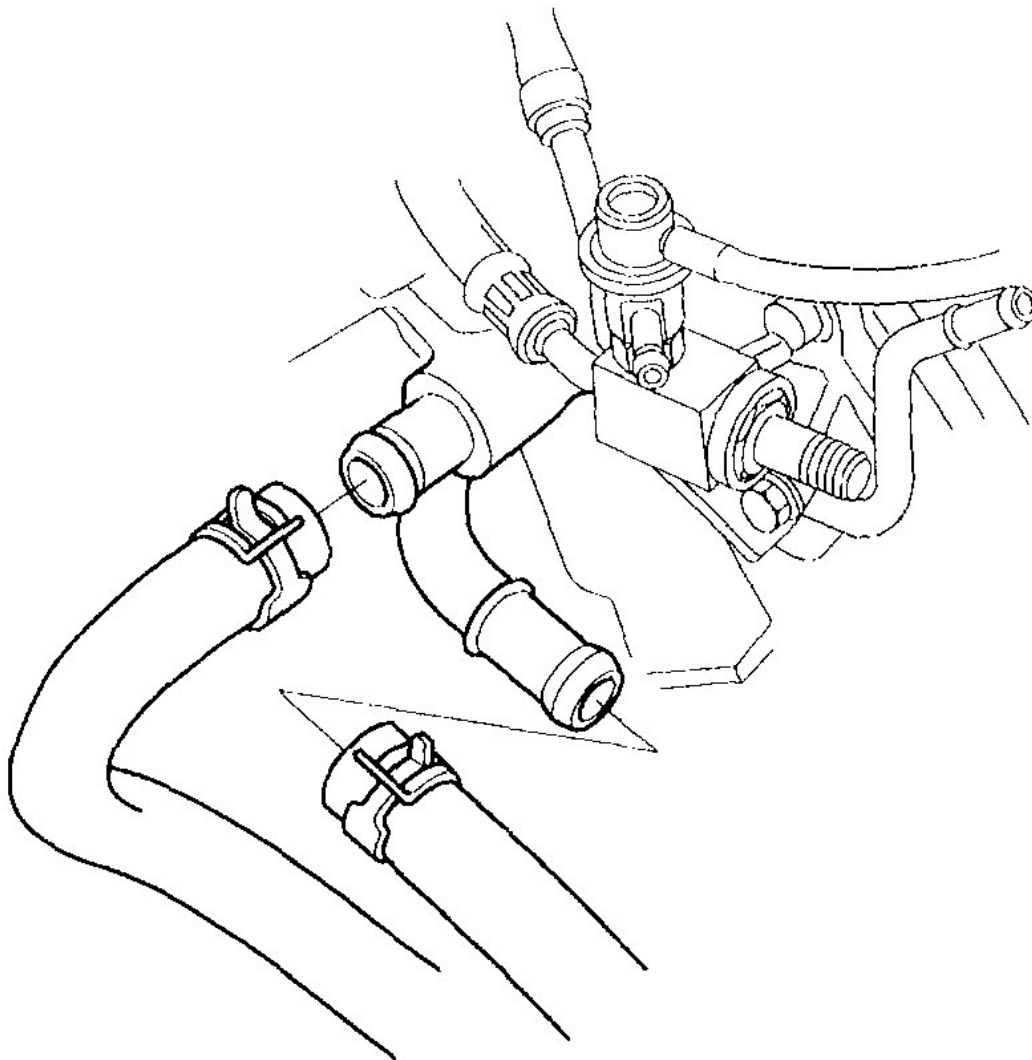


G01463637

**Fig. 50: Installing The Upper Radiator Hose, Lower Radiator Hose & Ground Cable**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

31. Install the heater hoses.



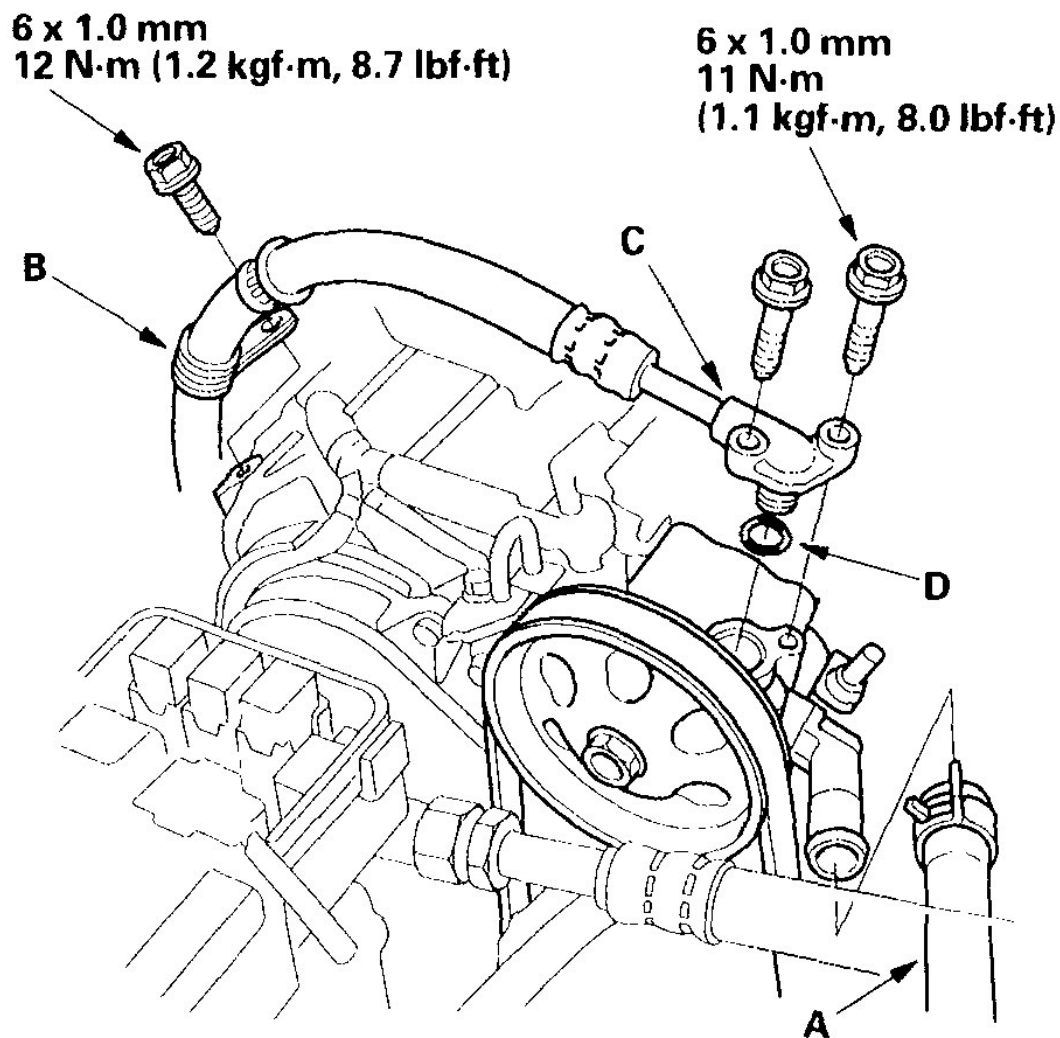


**G01463638**

**Fig. 51: Installing The Heater Hoses**

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

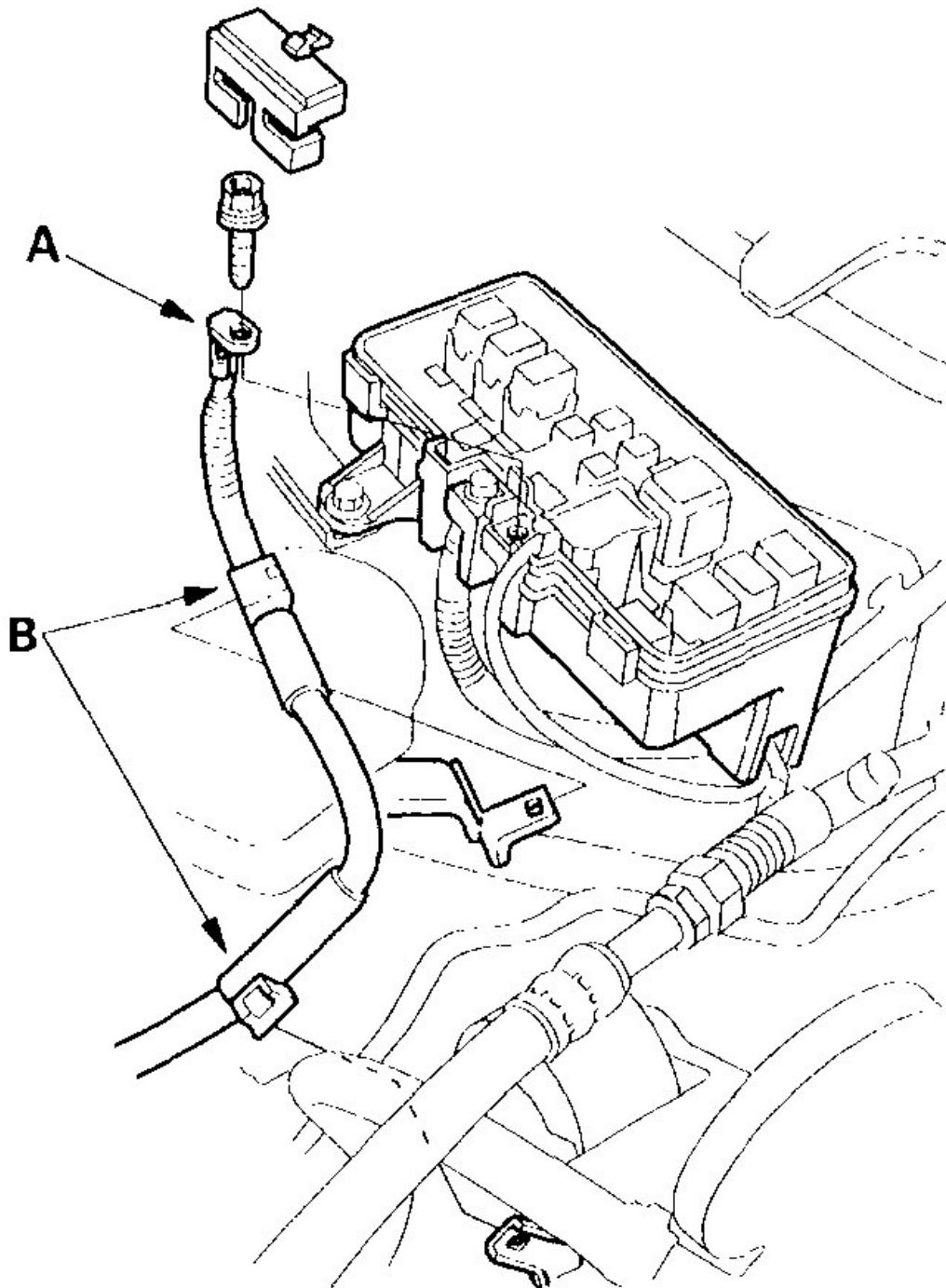
32. Install the alternator-compressor belt.
33. Install the P/S pump inlet hose (A) and P/S hose clamp (B).



G01463639

**Fig. 52: Installing The P/S Pump Inlet Hose & P/S Hose Clamp**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

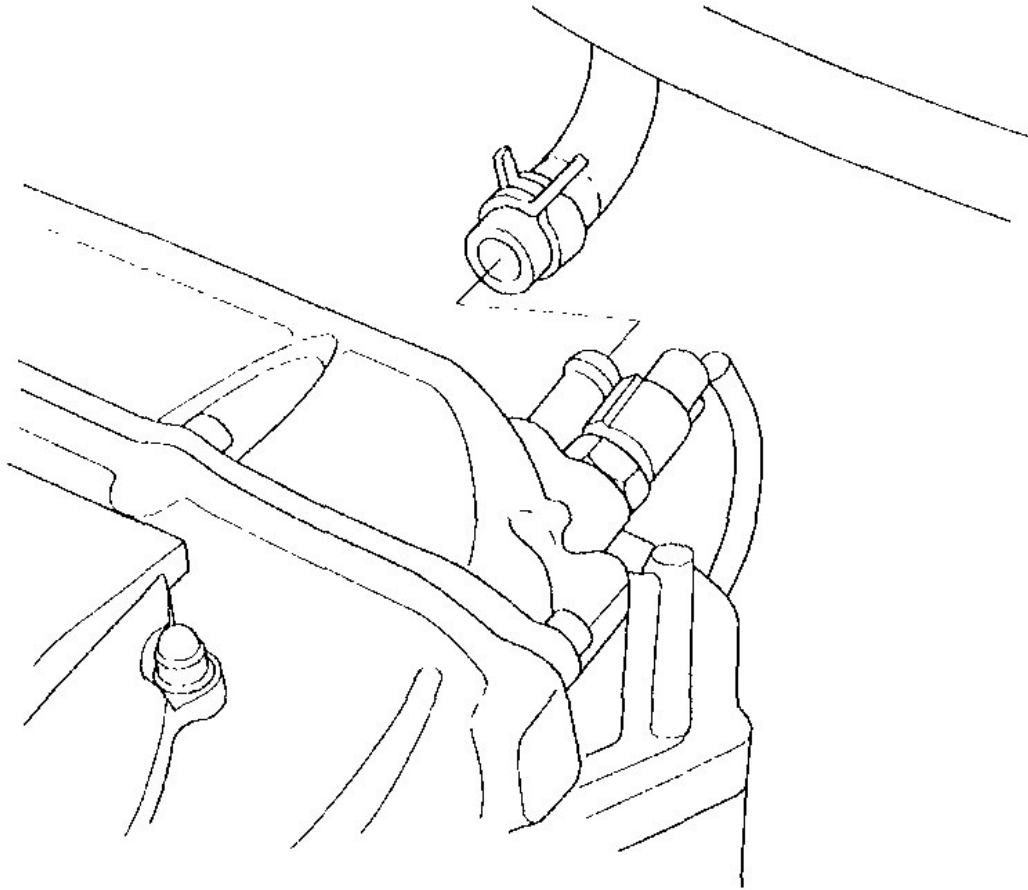
34. Install the P/S pump outlet hose (C) with a new O-ring (D).
35. Install the battery cable (A) on the under-hood fuse/relay box, then install the harness clamps (B).



G01463640

**Fig. 53: Installing The Battery Cable On The Under-Hood Fuse/Relay Box, & Installing The Harness Clamps**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

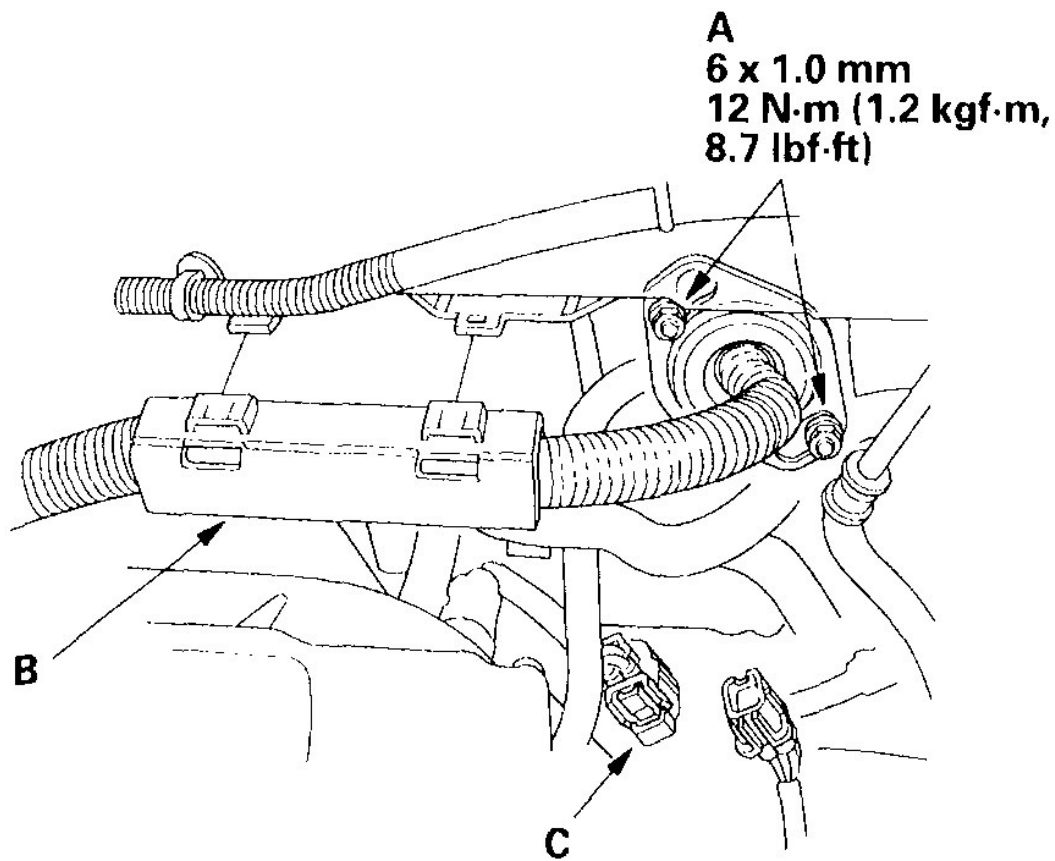
36. Install the brake booster vacuum hose.



**G01463641**

**Fig. 54: Installing The Brake Booster Vacuum Hose**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

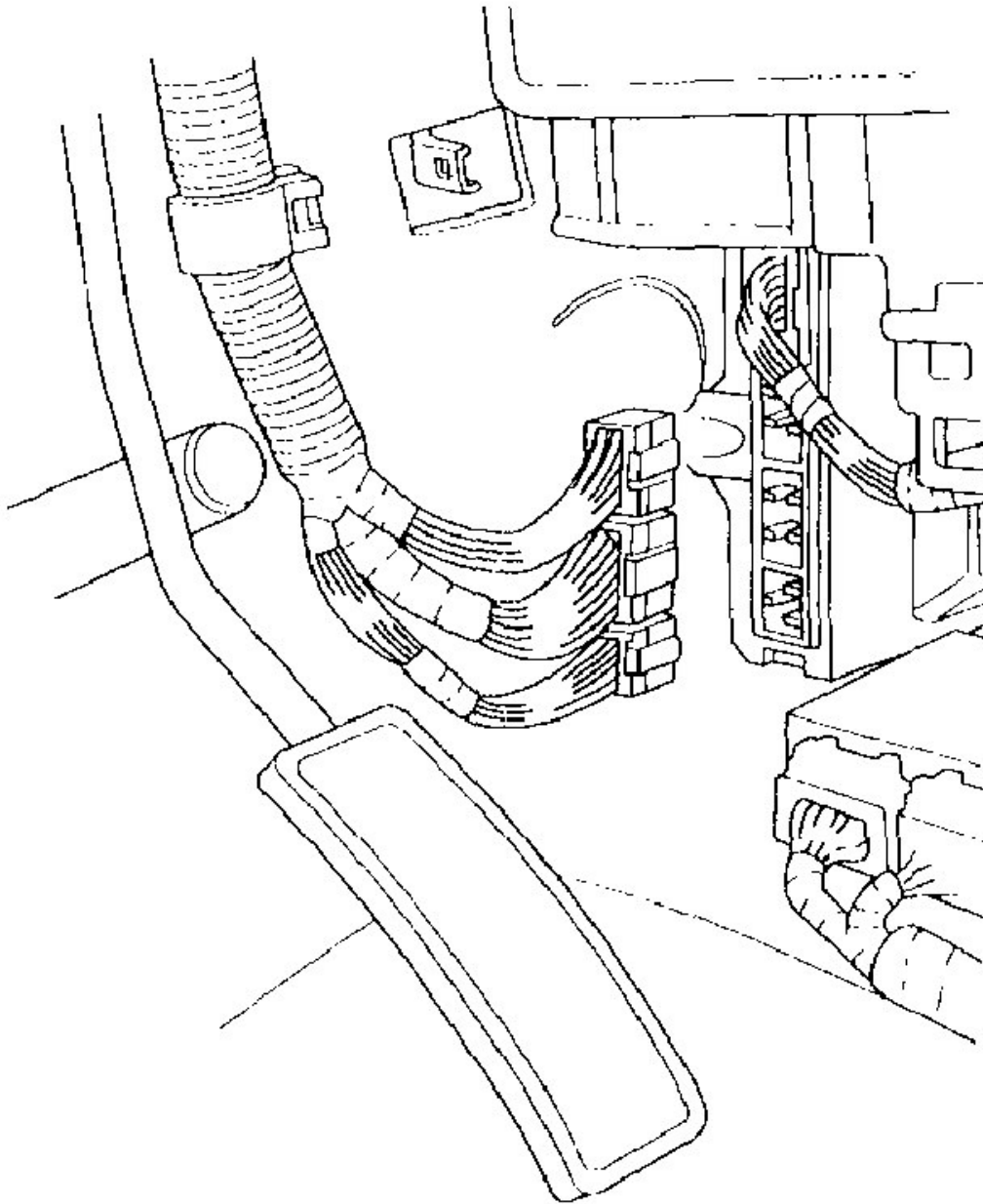
37. Push the powertrain control module (PCM) connectors through the bulkhead. Install the grommet, then tighten the grommet mounting nuts (A).



G01463642

**Fig. 55: Tightening The Grommet Mounting Nuts**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

38. Install the harness holder (B).
39. Connect the primary heated oxygen sensor (primary HO2S) connector (C).
40. Connect the PCM connectors.

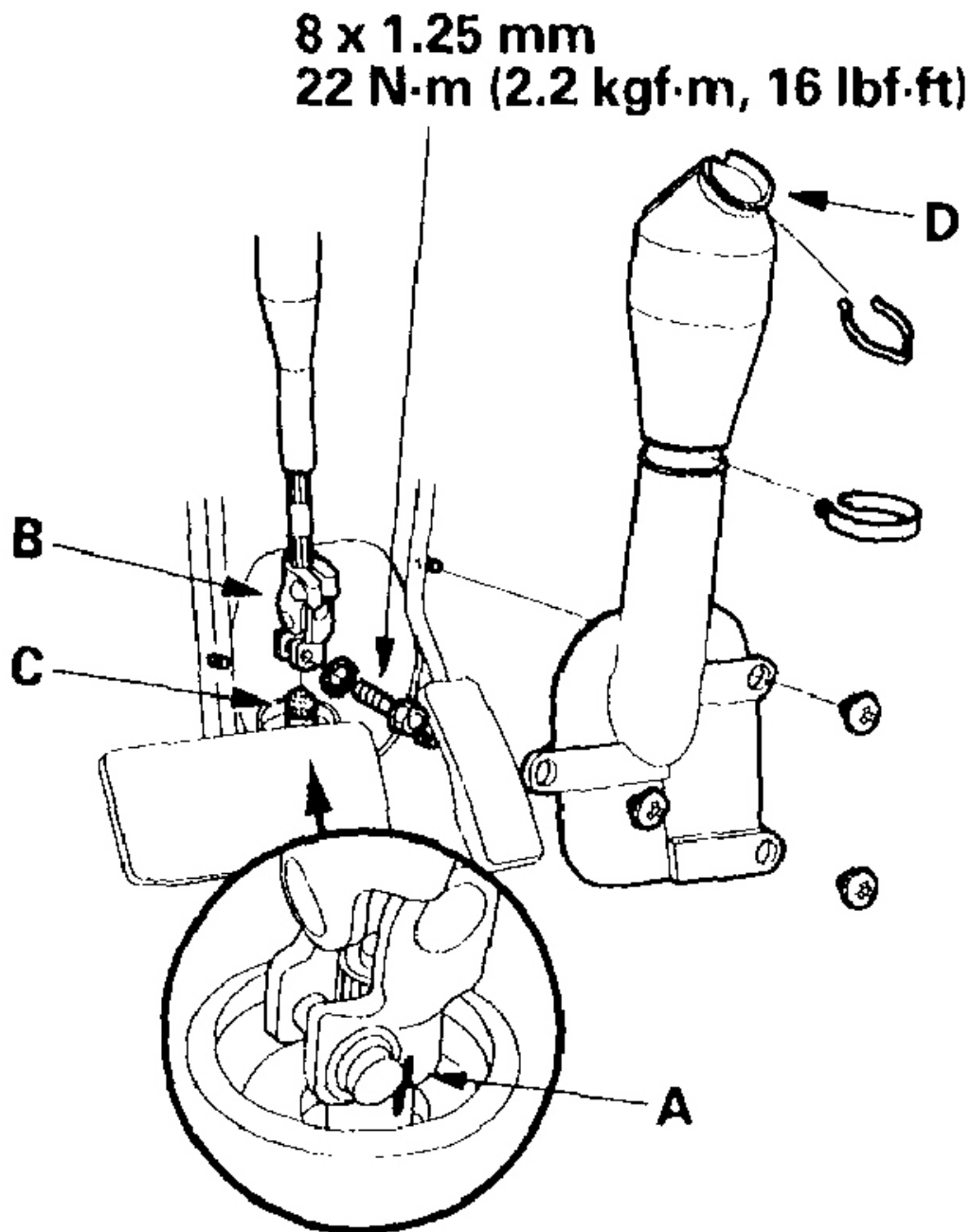


**G01463643**

**Fig. 56: Connecting The PCM Connectors**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

41. Align the reference mark (A) on the steering joint and steering gearbox pinion shaft. Connect the steering

joint (B) to the steering gearbox pinion shaft (C). Tighten the steering joint bolt.

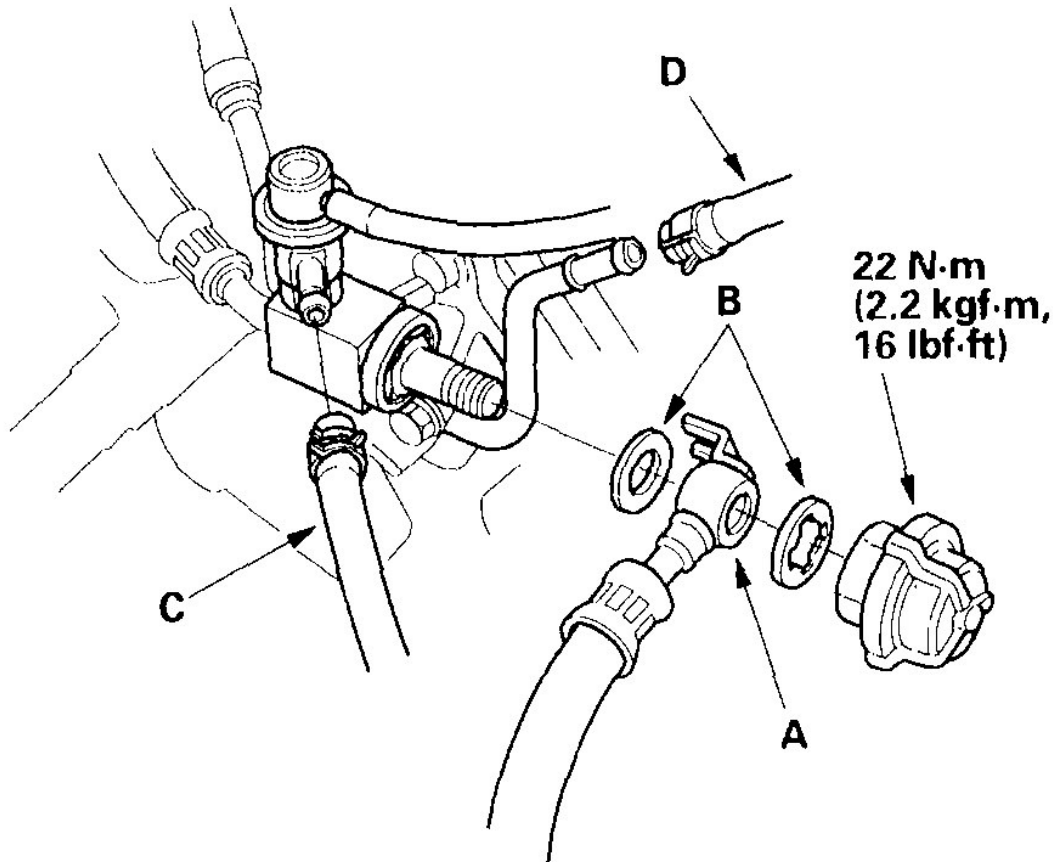


G01463644

**Fig. 57: Aligning The Reference Mark On The Steering Joint & Steering Gearbox Pinion Shaft, &**

**Connecting The Steering Joint To The Steering Gearbox Pinion Shaft**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

42. Install the steering joint cover (D).
43. Install the fuel feed hose (A) with new washers (B).

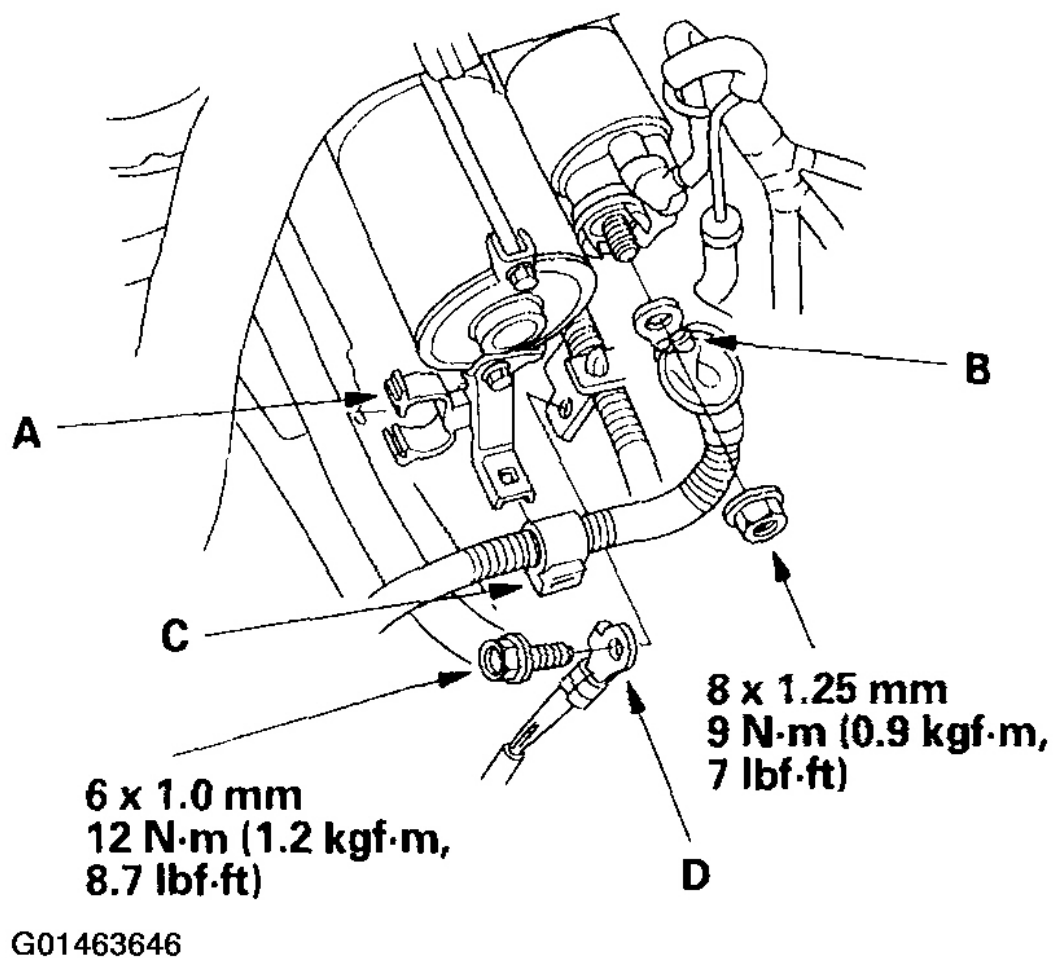


G01463645

**Fig. 58: Installing The Fuel Feed Hose**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

44. Install the fuel return hose (C) and evaporative emission (EVAP) canister hose (D).
45. Install the cruise control actuator cable, then adjust it (see **CRUISE CONTROL ACTUATOR/CABLE REPLACEMENT** ).
46. Install the throttle cable (see **THROTTLE CABLE REMOVAL/INSTALLATION** ), then adjust it (see **THROTTLE CABLE ADJUSTMENT** ).
47. Install the ATF cooler hose in the clamp (A), and install the starter motor cable (B), harness clamp (C), and ground cable (D).

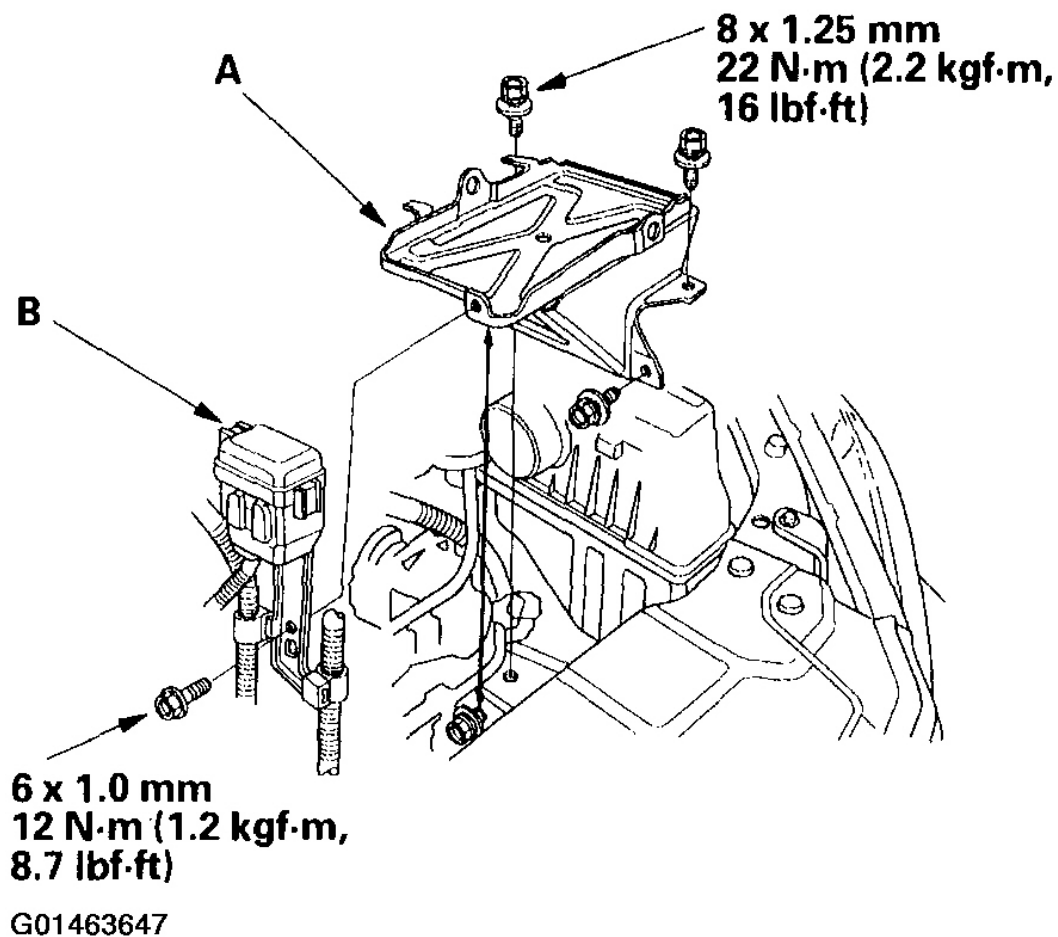




**Fig. 59: Installing The ATF Cooler Hose In The Clamp, The Starter Motor Cable, Harness Clamp & Ground Cable**

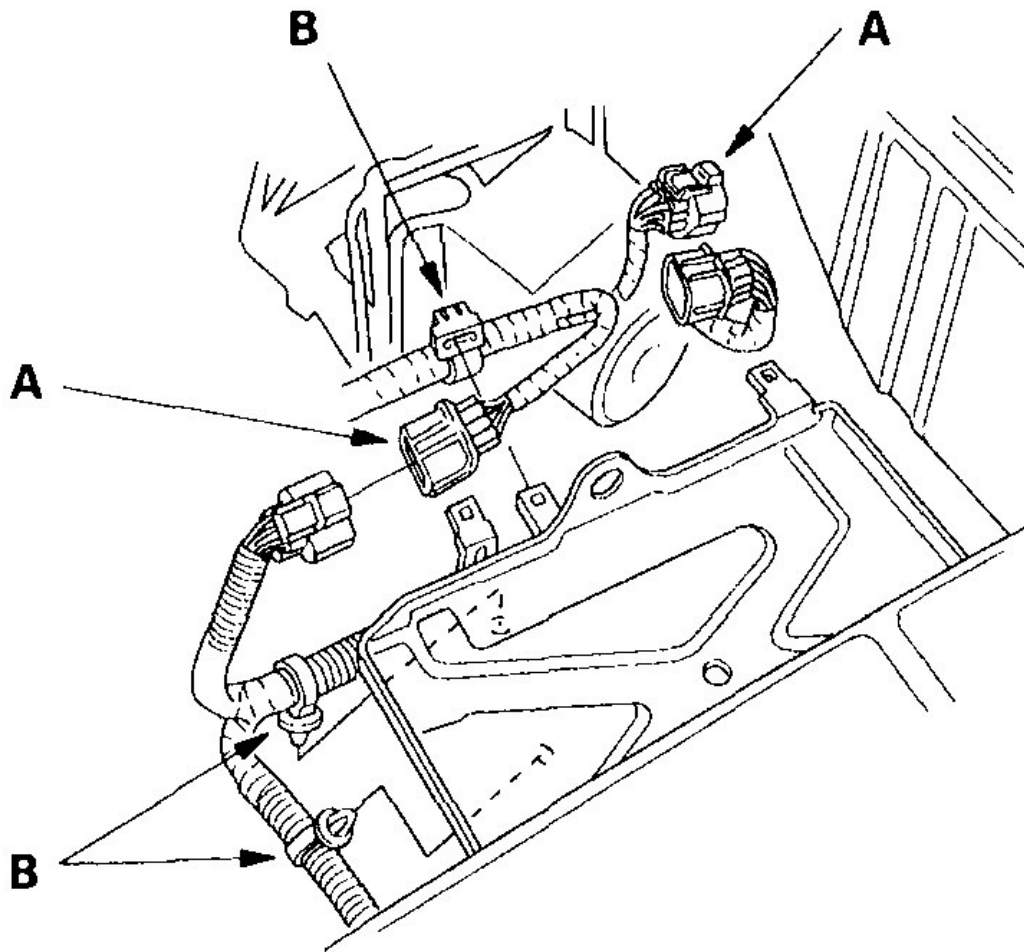
Courtesy of AMERICAN HONDA MOTOR CO., INC.

48. Install the battery base (A), then install the relay bracket (B).



**Fig. 60: Installing The Battery Base & The Relay Bracket**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

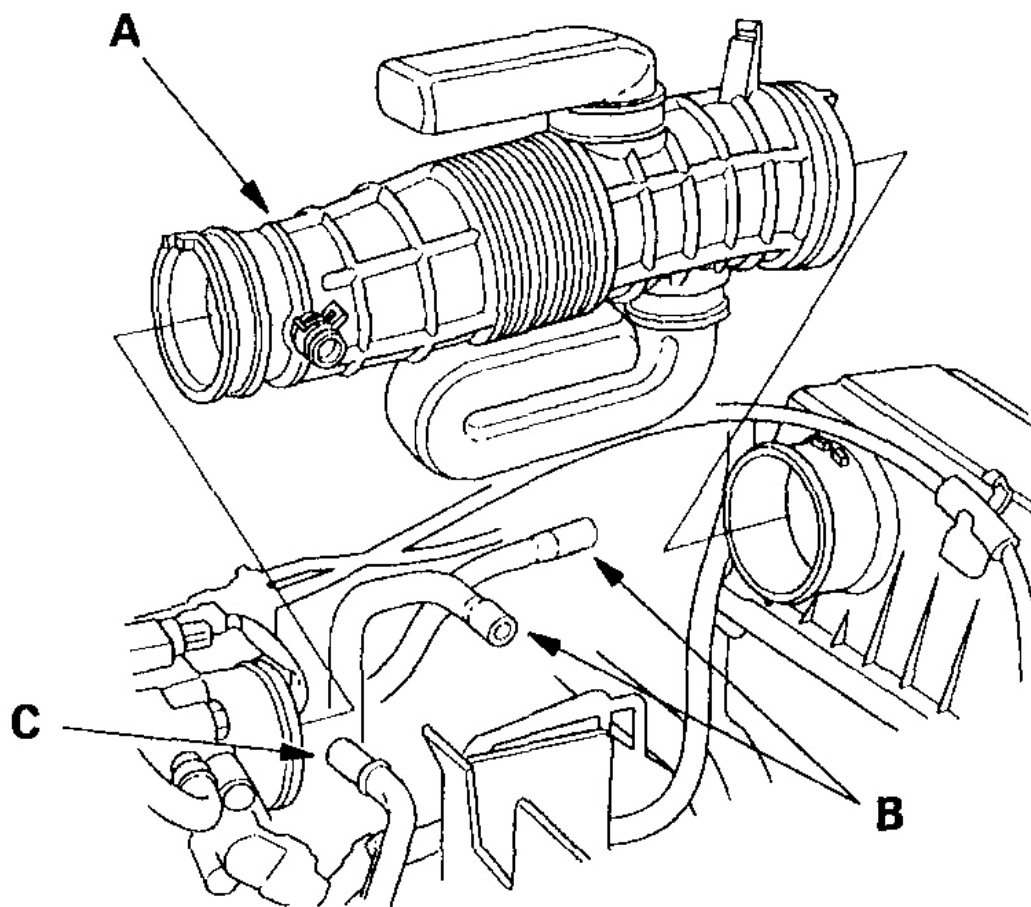
49. Connect the engine wire harness connectors (A) on the left side of the engine compartment, and install the harness clamps (B).



G01463648

**Fig. 61: Connecting The Engine Wire Harness Connectors On The Left Side Of The Engine Compartment & Installing The Harness Clamps**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

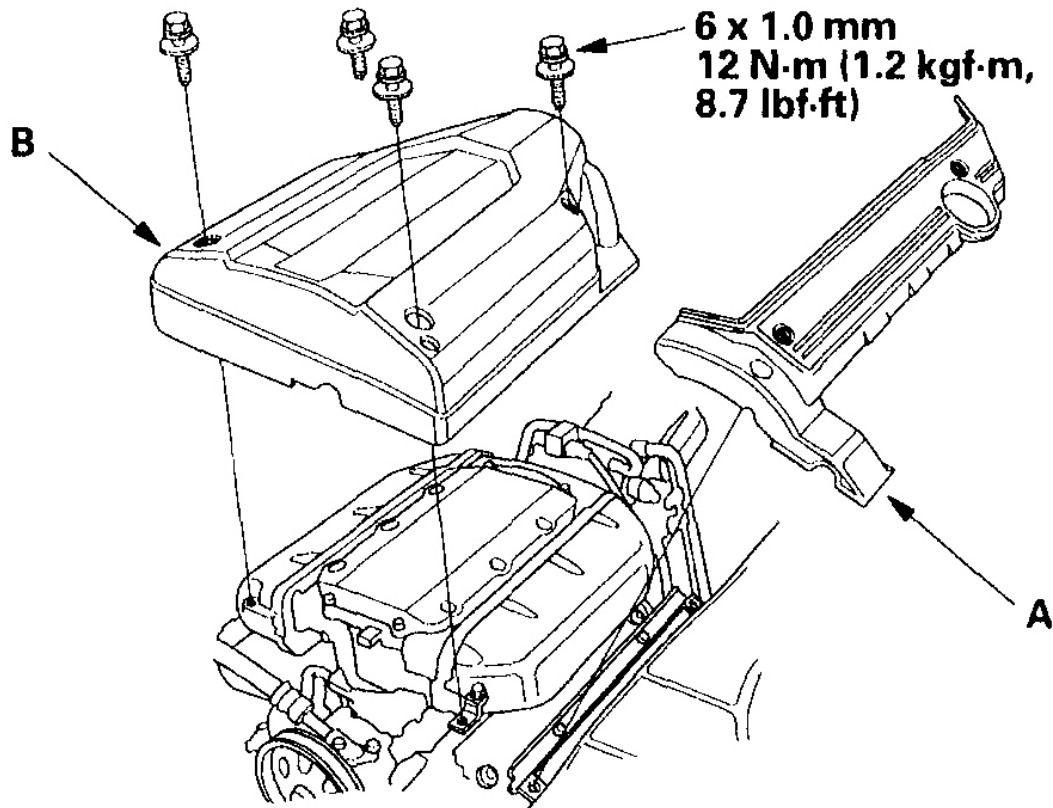
50. Install the intake air duct (A), then install the vacuum hoses (B) and breather pipe (C).



G01463649

**Fig. 62: Installing The Intake Air Duct, The Vacuum Hoses & Breather Pipe**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

51. Install the ignition coil cover (A) and intake manifold cover (B).



G01463650

**Fig. 63: Installing The Ignition Coil Cover & Intake Manifold Cover**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

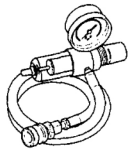
52. Install the battery. Clean the battery posts and cable terminals with sandpaper, then assemble them and apply grease to prevent corrosion.
53. Move the shift lever to each gear, and verify that the A/T gear position indicator follows the transmission range switch.
54. Inspect for fuel leaks. Turn 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.
55. Refill the engine with engine oil (see step 3 on **ENGINE OIL REPLACEMENT** ).
56. Refill the transmission with ATF (see **ATF REPLACEMENT** ).
57. Refill the radiator with engine coolant, and bleed air from the cooling system with the heater valve open (see **COOLANT REPLACEMENT** ).
58. Refill the power steering system fluid (see **FLUID REPLACEMENT** ).
59. Perform the PCM idle learn procedure (see **PCM IDLE LEARN PROCEDURE** ), and power window control unit reset procedure (see **RESETTING THE POWER WINDOW CONTROL UNIT** ).

60. Inspect the idle speed (see **IDLE SPEED ADJUSTMENT** ).
61. Inspect the ignition timing (see **IGNITION TIMING INSPECTION** ).
62. Check the wheel alignment (see **WHEEL ALIGNMENT PROCEDURES** ).
63. Enter the anti-theft codes for the radio and the navigation system, then enter the customer's radio station presets.

## CYLINDER HEAD

### SPECIAL TOOLS

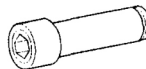
| Ref. No. | Tool Number   | Description                        | Qty |
|----------|---------------|------------------------------------|-----|
| ①        | 07AAJ-PNAA100 | Air Regulator                      | 1   |
| ②        | 07HAH-PJ70100 | Valve Guide Reamer, 5.5 mm         | 1   |
| ③        | 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        | 07VAJ-P8A010A | VTEC Air Adapter                   | 1   |
| ⑧        | 070AJ-0030100 | VTEC Air Stopper                   | 1   |
| ⑨        | 07742-0010100 | Valve Guide Driver, 5.5 mm         | 1   |
| ⑩        | 07757-PJ1010A | Valve Spring Compressor Attachment | 1   |



①



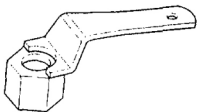
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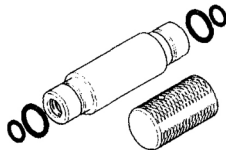
③



④



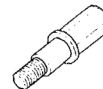
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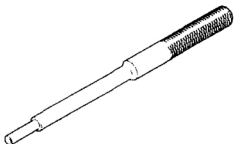
⑥



⑦



⑧



⑨



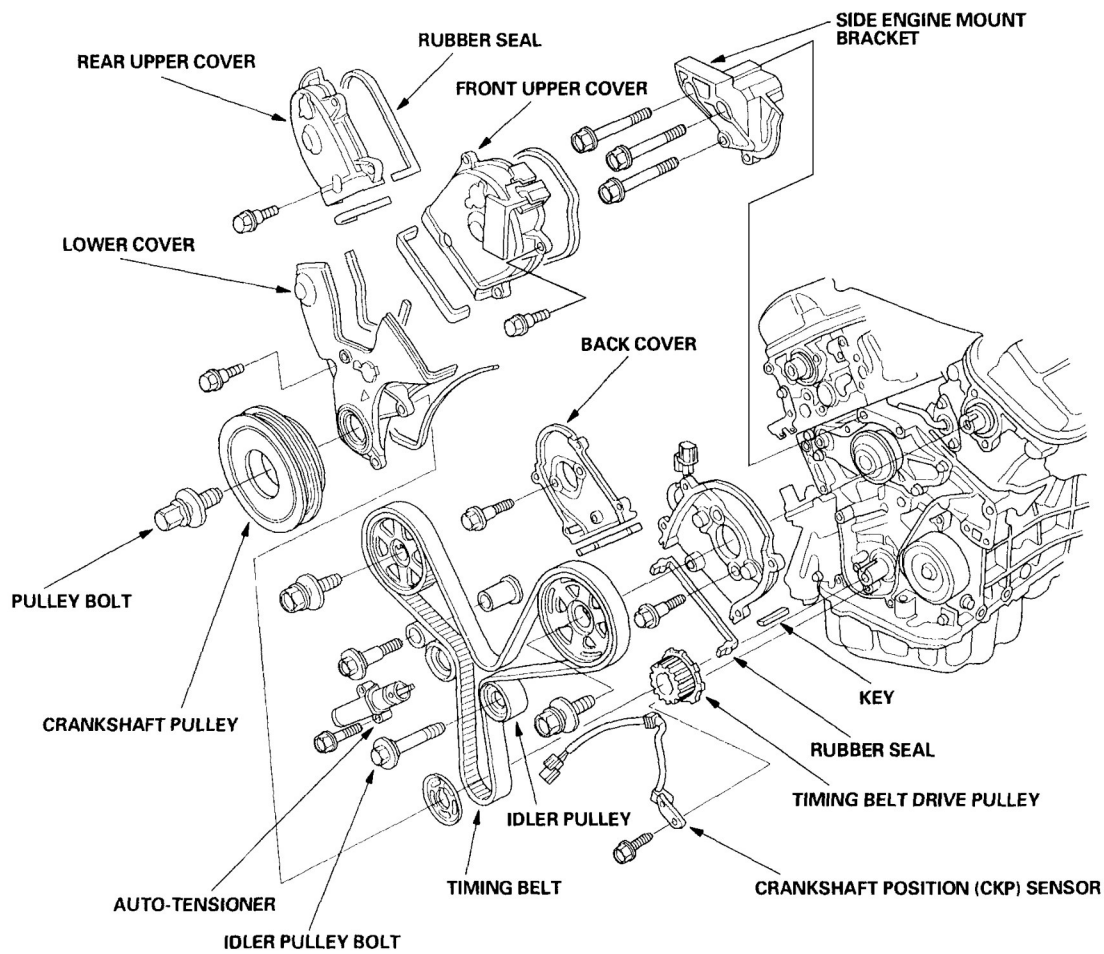
⑩

G01463651

**Fig. 64: Identifying Special Tools**

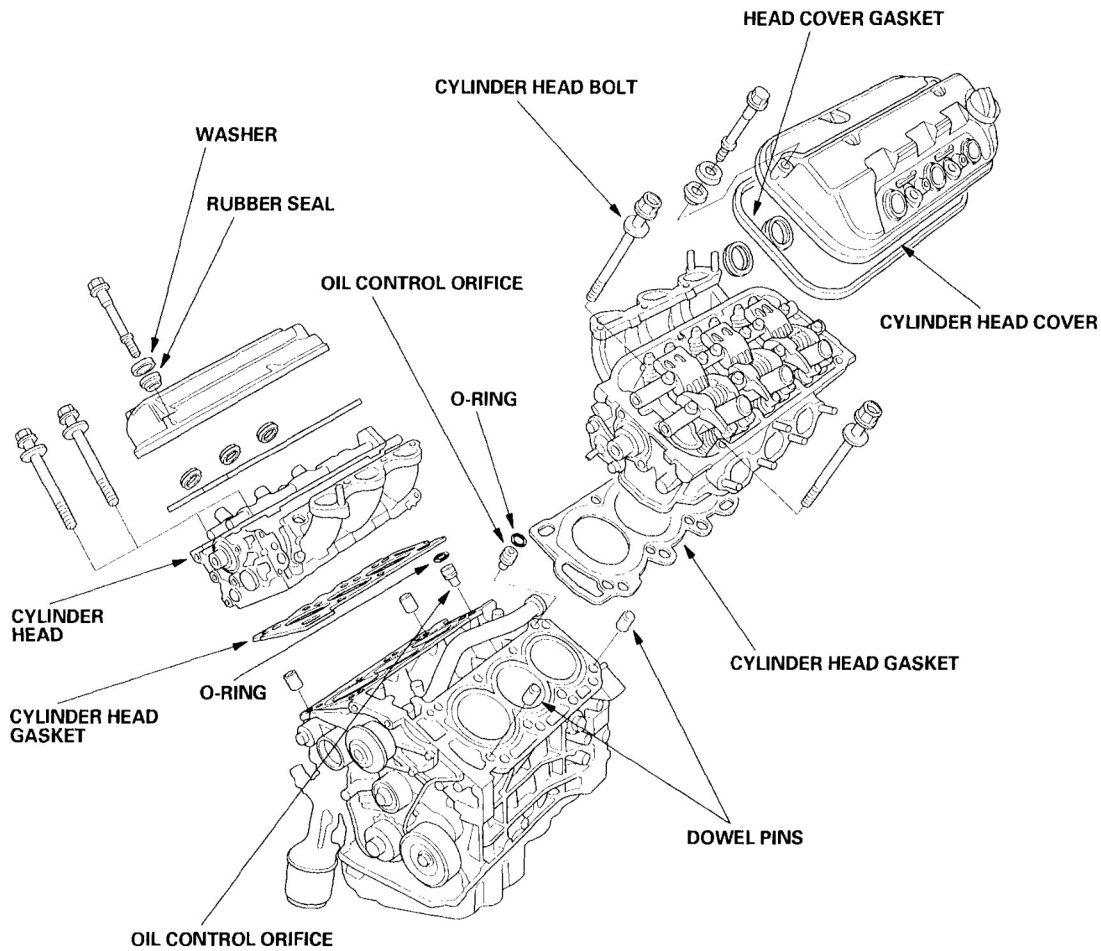
Courtesy of AMERICAN HONDA MOTOR CO., INC.

### COMPONENT LOCATION INDEX



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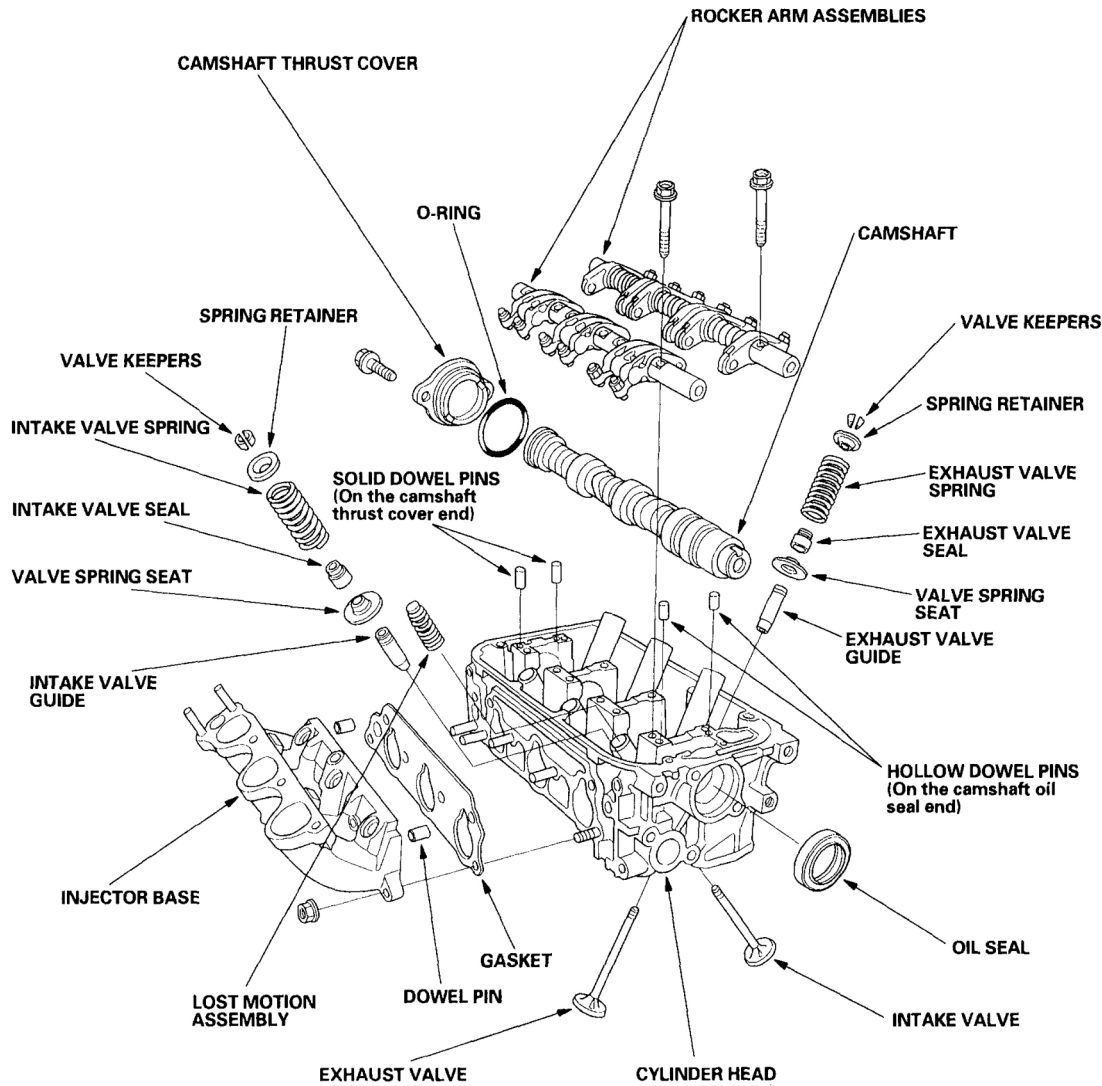
**Fig. 65: Locating Cylinder Head Components (1 Of 3)**  
 Courtesy of AMERICAN HONDA MOTOR CO., INC.



G01463653

**Fig. 66: Locating Cylinder Head Components (2 Of 3)**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.



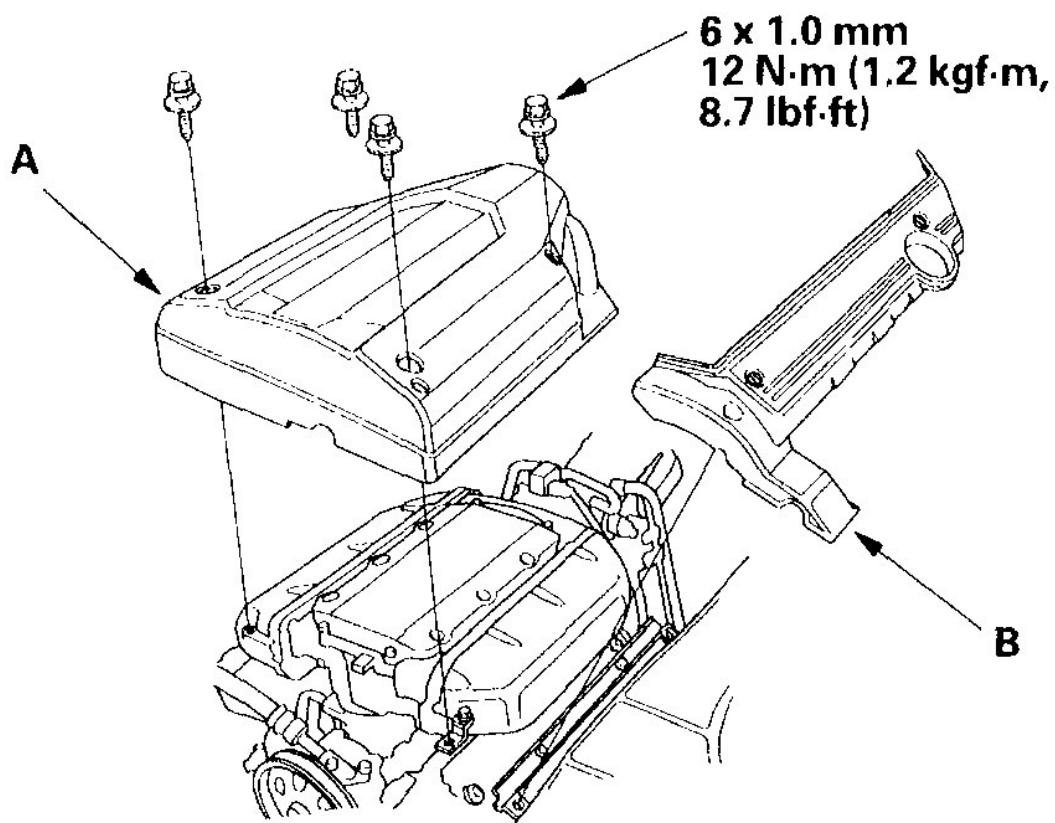


G01463654

**Fig. 67: Locating Cylinder Head Components (3 Of 3)**  
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

## ENGINE COMPRESSION INSPECTION

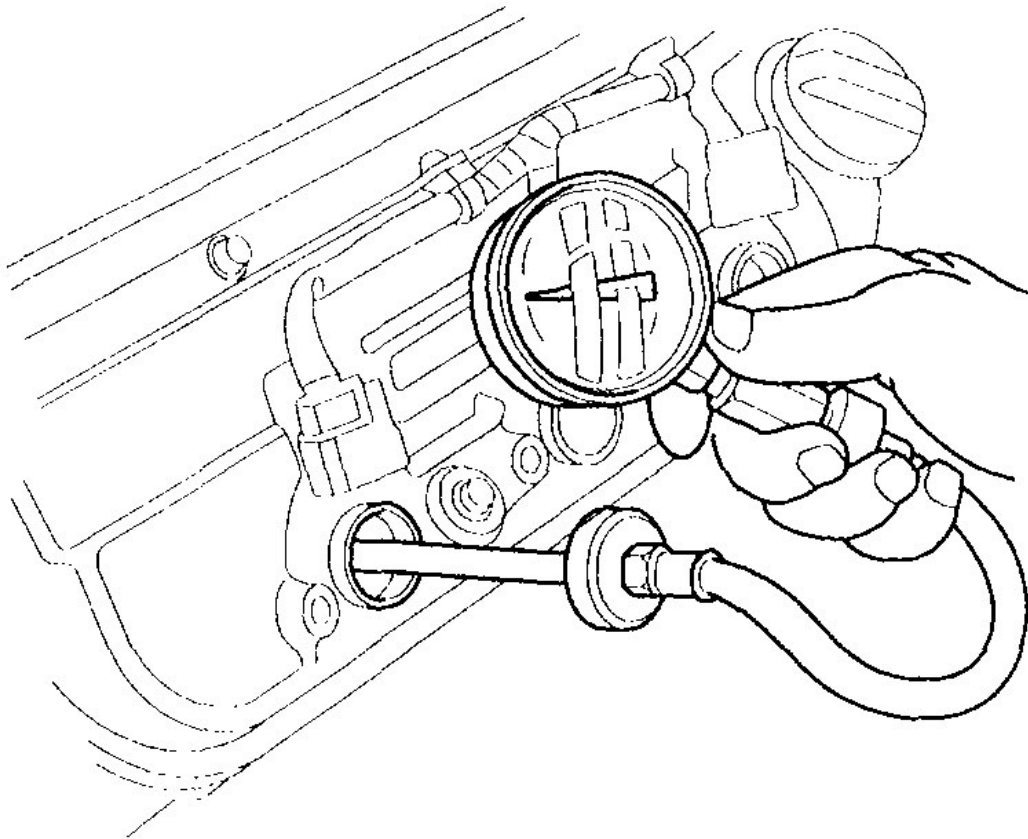
1. Warm up the engine to normal operating temperature (cooling fan comes on).
2. Turn the ignition switch OFF.
3. Remove the intake manifold cover (A) and ignition coil cover (B).



G01463655

**Fig. 68: Removing The Intake Manifold Cover & Ignition Coil Cover**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Disconnect the six injector connectors.
5. Remove the six ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION** ).
6. Remove the six spark plugs.
7. Attach the compression gauge to a spark plug hole.



G01463656

**Fig. 69: Attaching The Compression Gauge To A Spark Plug Hole**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Connect a tachometer.
9. Open the throttle fully, then crank the engine with the starter motor and measure the compression.

**Compression Pressure:** Above 990 kPa (10.1 kgf/cm<sup>2</sup> , 145 psi) - 200 RPM

10. Perform the same measurement on the remaining cylinders.

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

11. 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

## **VTEC ROCKER ARM TEST**

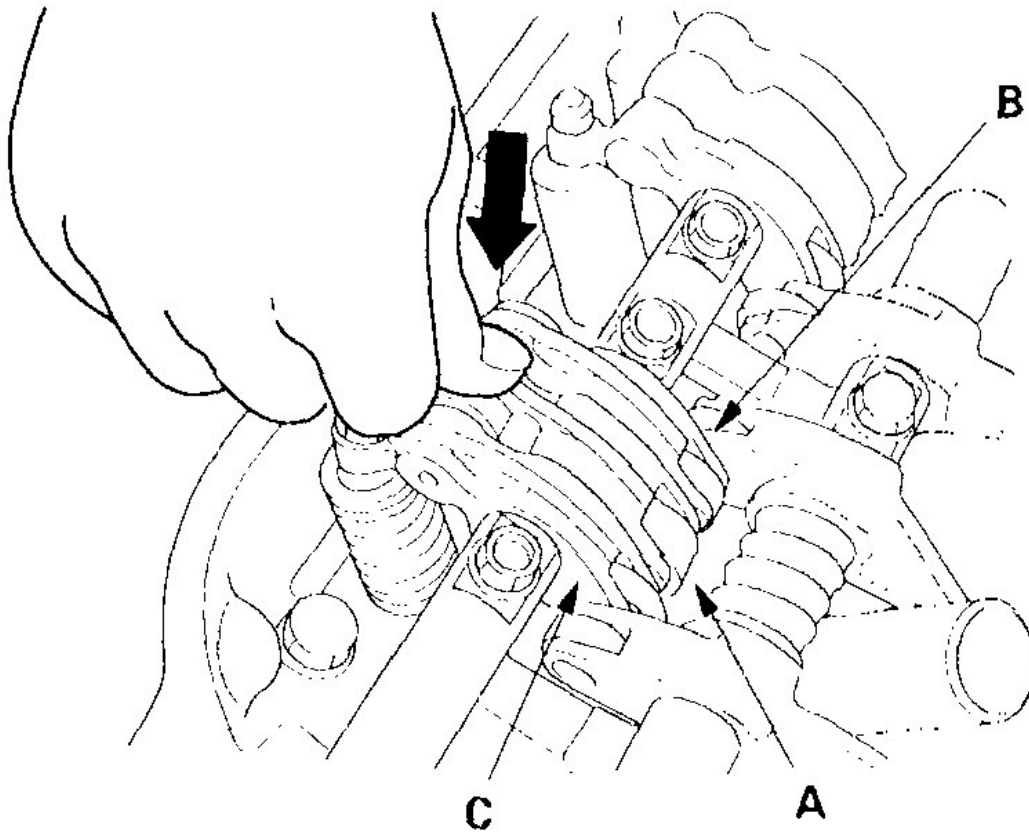
### **Special Tools Required**

- VTEC air adapter 07VAJ-P8A010A
- VTEC air stopper 070AJ-0030100
- Air regulator 07AAJ-PNAA100

1. Start the engine and let it run for 5 minutes, then turn the ignition switch OFF.
2. Remove the cylinder head covers (see **Cylinder Head Cover Removal** ).
3. Set the No. 1 piston at top dead center (TDC) (see step 2 on **Valve Clearance Adjustment** ).
4. 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 intake mid rocker arm does not move, remove the mid, primary, and secondary intake rocker arms as an assembly, and check that the pistons in the mid and primary rocker arms move smoothly.

If any rocker arm needs replacing, replace the primary, mid and secondary rocker arms as an assembly, and retest.

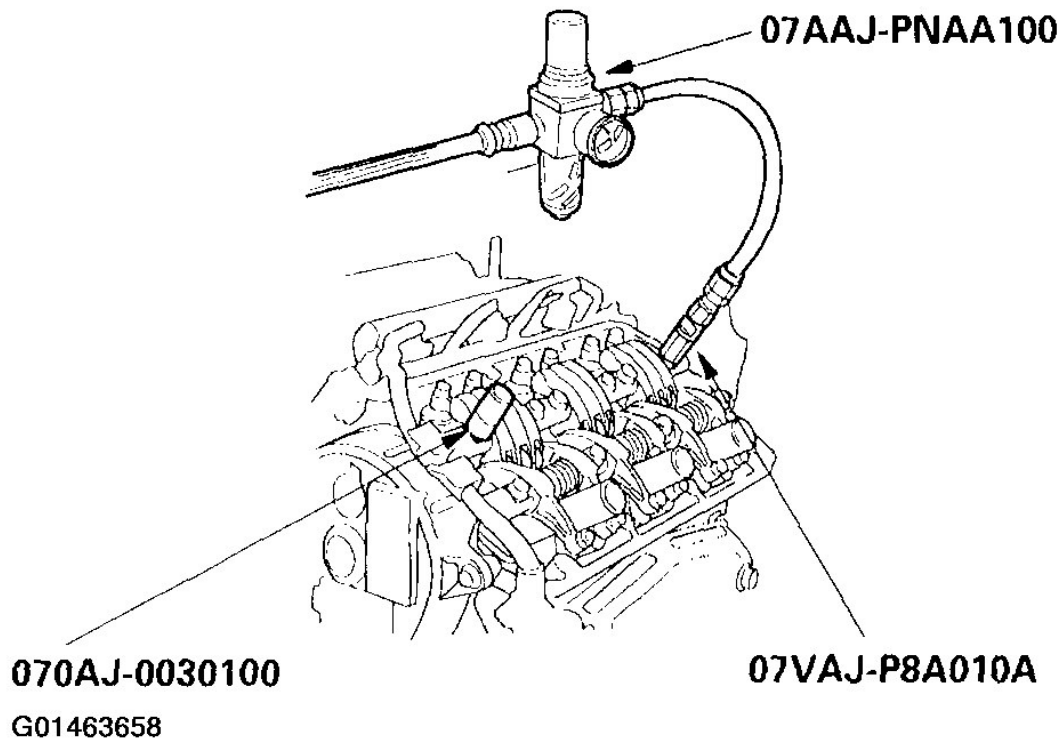
- If the mid rocker arm moves freely, go to step 6.



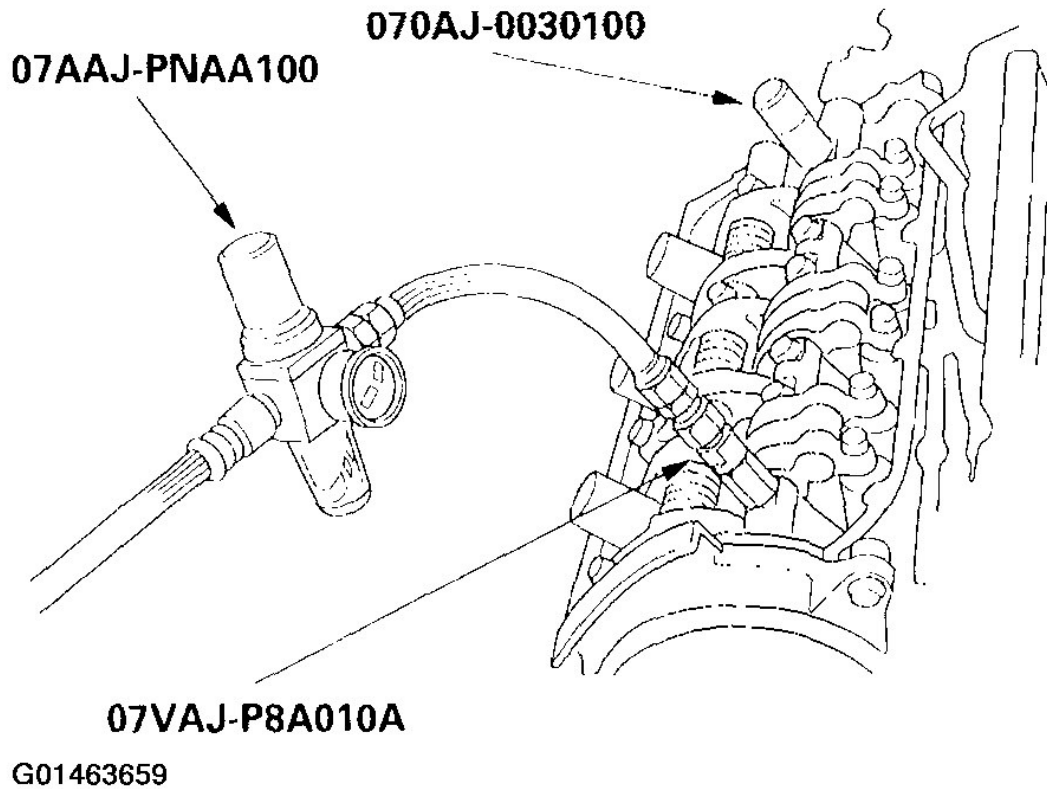
G01463657

**Fig. 70: Pushing On The Intake Mid Rocker Arm**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Repeat step 4 on the remaining intake mid rocker arms with each piston at TDC. When all the mid rocker arms pass the test, go to step 6.
6. Check that the air pressure on the shop air compressor gauge indicates over 690 kPa (7.0 kgf/cm<sup>2</sup> , 100 psi).
7. Inspect the valve clearance (see **Valve Clearance Adjustment** ).
8. Remove the two end intake rocker shaft mounting bolts, then install and connect the special tools as shown.



**Fig. 71: Connecting The Special Tools (Front)**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

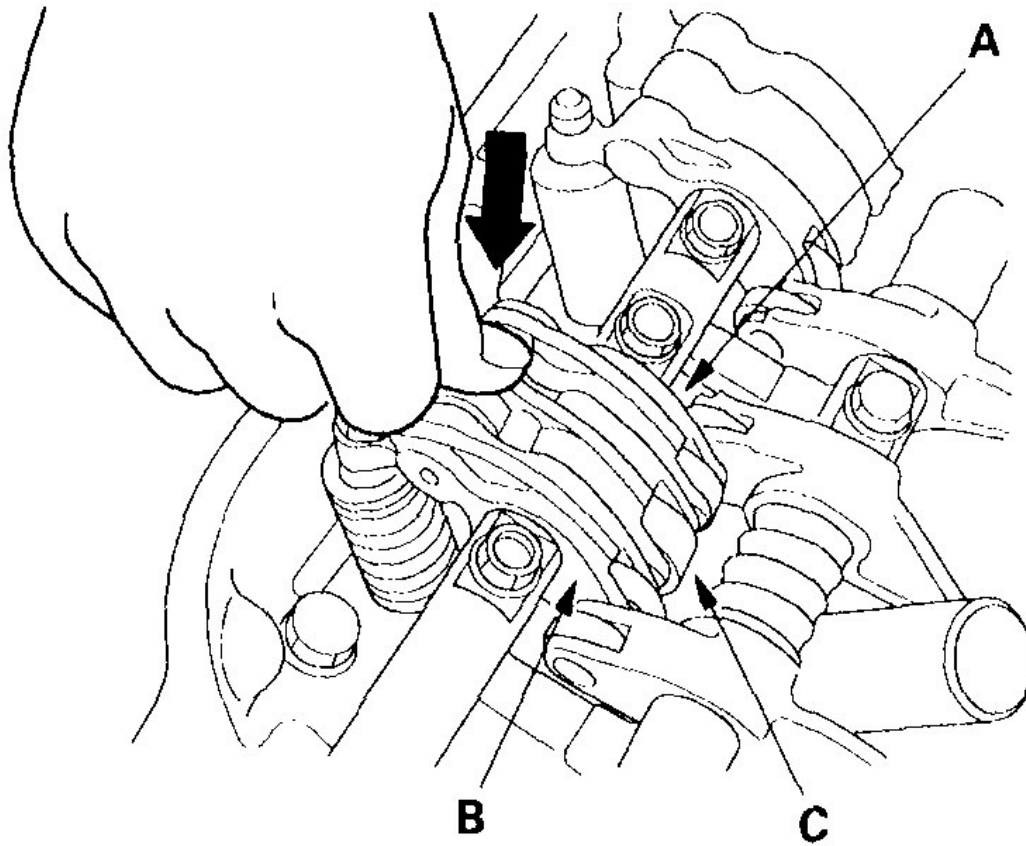


**Fig. 72: Connecting The Special Tools (Rear)**  
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. 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 A and B do not move after applying air pressure, move the primary or secondary rocker arm up and down manually.



G01463660

**Fig. 73: Ensuring The Mid Rocker Arm Does Not Move When Pushed Manually**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

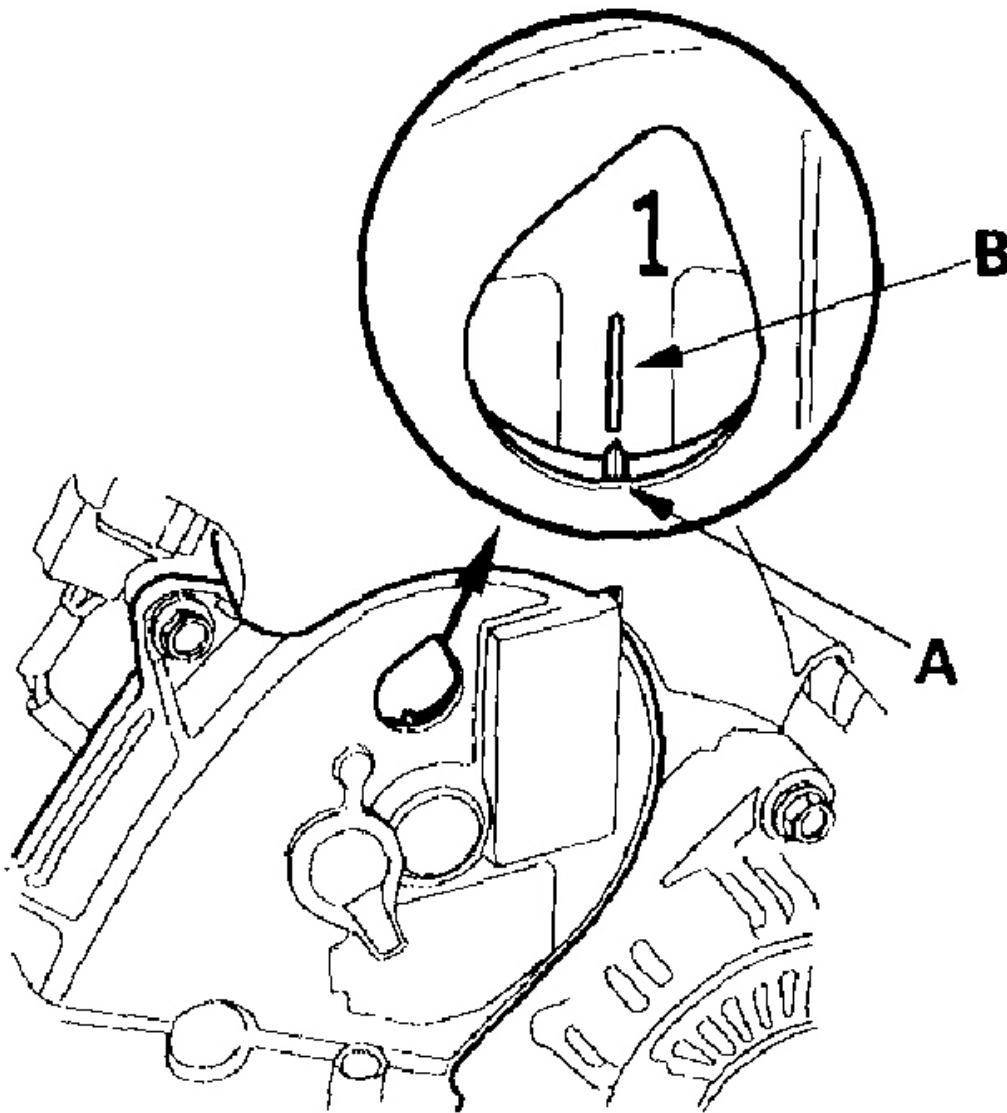
10. Make sure that the intake primary rocker arm (A) and intake secondary rocker arm (B) are mechanically connected by the piston and that the mid rocker arm (C) does not move when pushed manually. If any intake mid rocker arm moves independently of the primary and secondary rocker arms, replace the rocker arms as a set.
11. Remove the tools.
12. Tighten the rocker shaft bolts to 24 N.m (2.4 kgf.m, 17 lbf.ft)
13. Install the cylinder head covers (see Cylinder Head Cover Installation ).

## VALVE CLEARANCE ADJUSTMENT

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



1. Remove the cylinder head covers (see Cylinder Head Cover Removal ).
2. Set the No. 1 piston at top dead center (TDC). Align the pointer (A) on the front upper cover with the No. 1 piston TDC mark (B) on the front camshaft pulley.



G01463661

**Fig. 74: Aligning The Pointer On The Front Upper Cover With The No. 1 Piston TDC Mark On The Front Camshaft Pulley**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

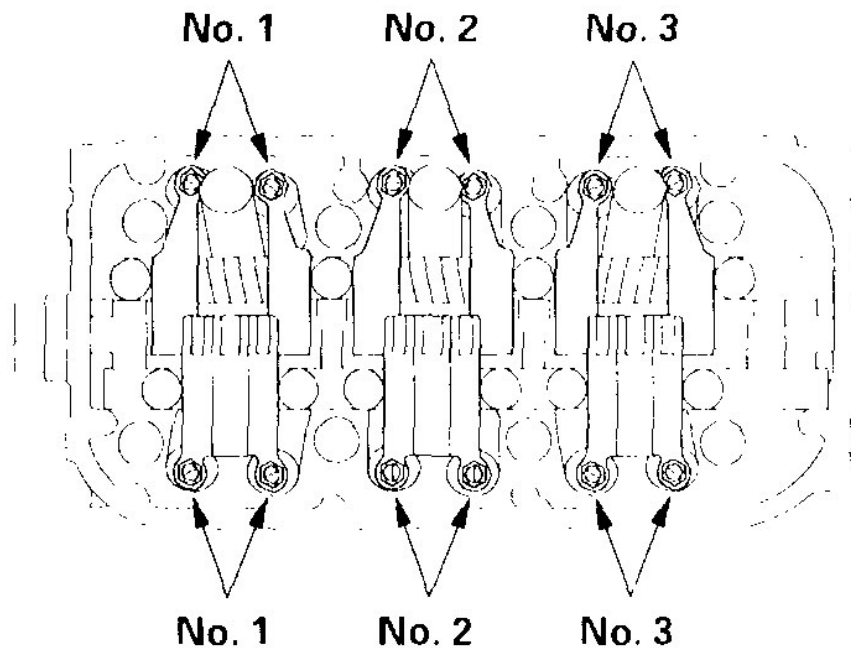
3. Select the correct thickness feeler gauge for the valves you're going to check.

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

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

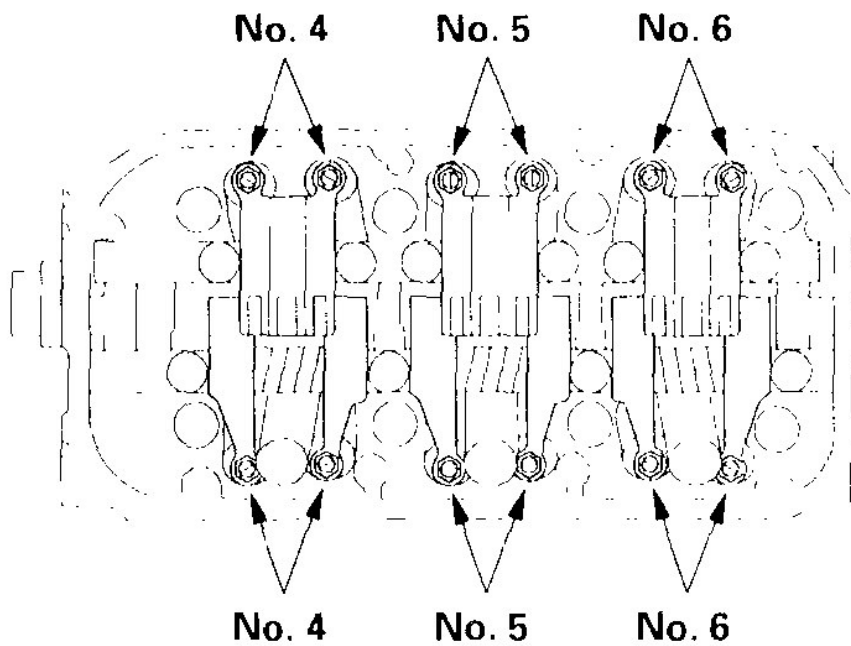
REAR:

EXHAUST



FRONT:

INTAKE

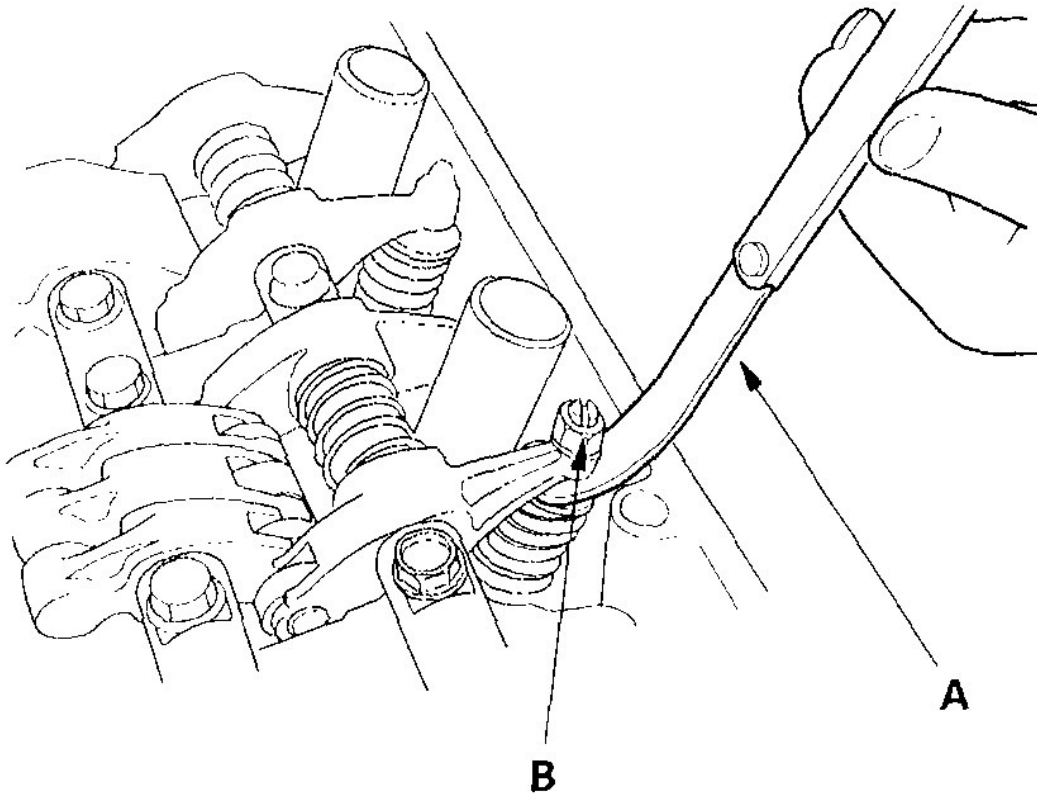


EXHAUST

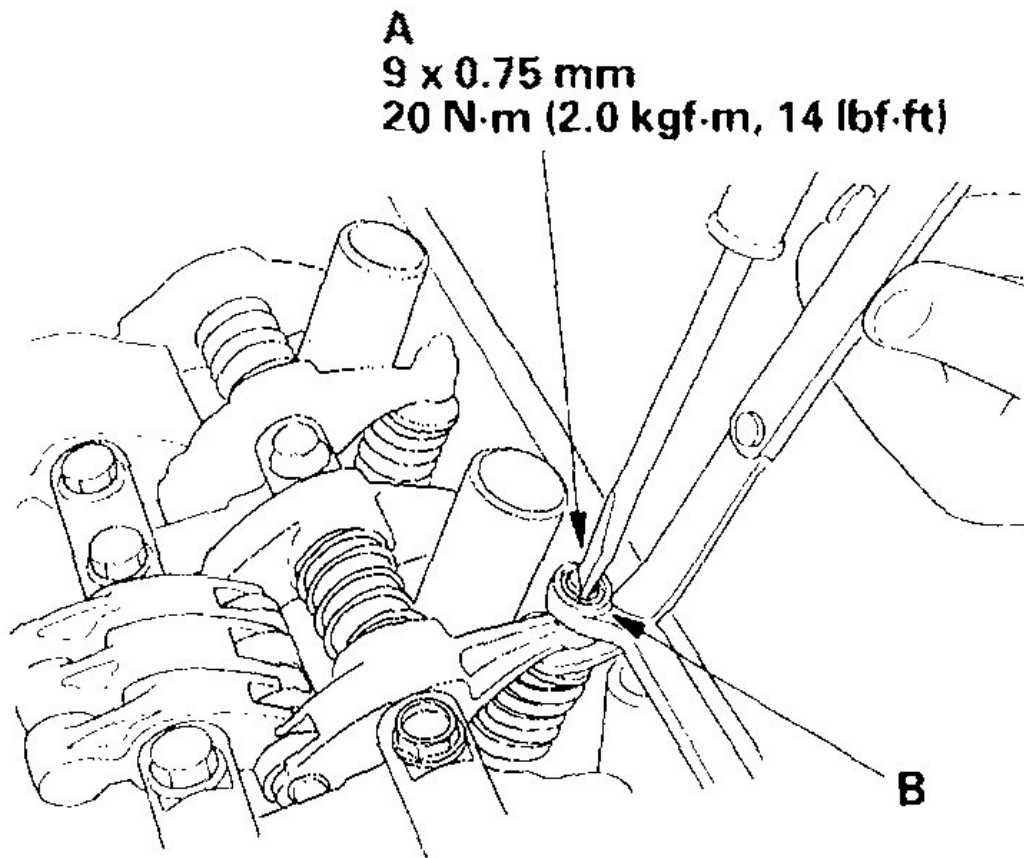
G01463662

**Fig. 75: Locating Adjusting Screws****Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

**G01463663****Fig. 76: Inserting The Feeler Gauge Between The Adjusting Screw & The End Of The Valve Stem****Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

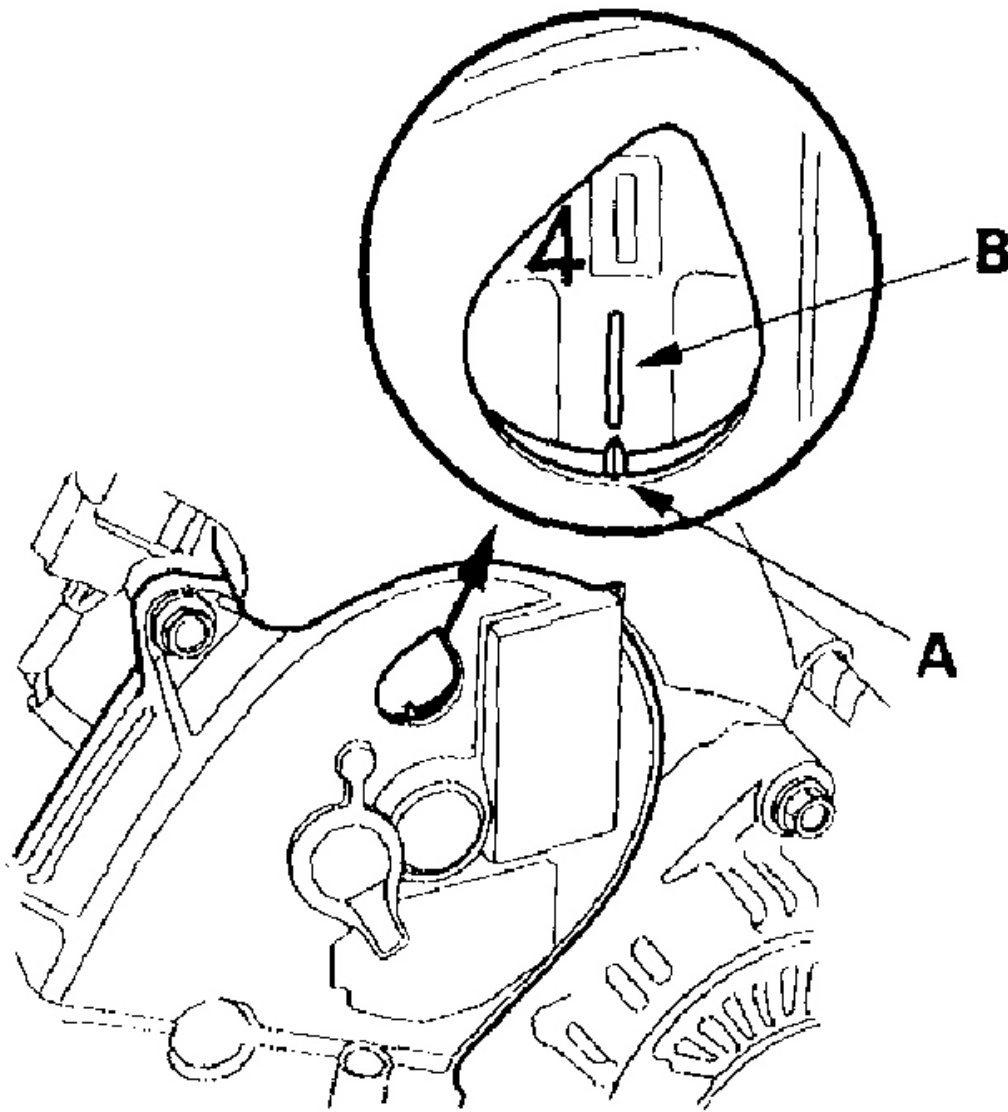


G01463664

**Fig. 77: Turning The Adjusting Screw**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

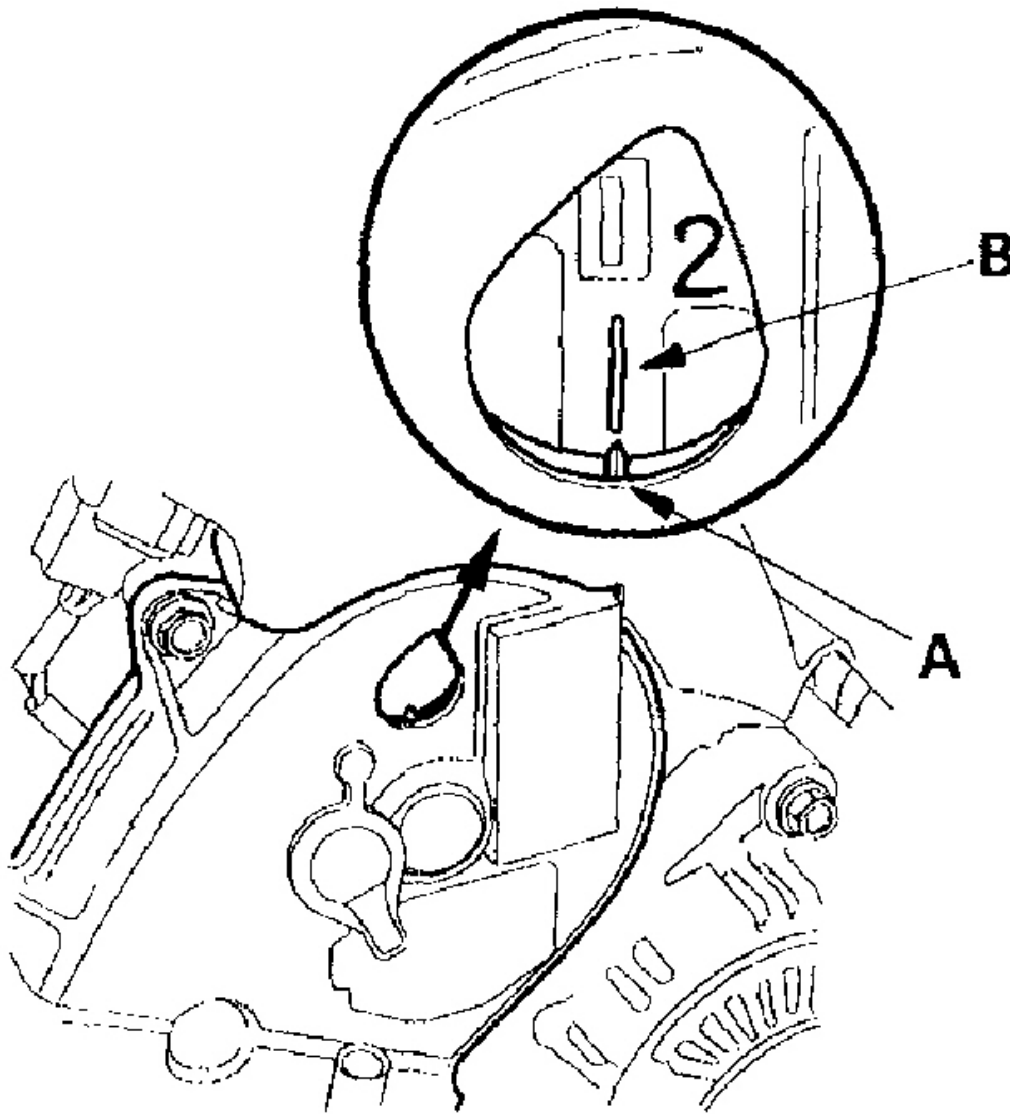


G01463665

**Fig. 78: Aligning The Pointer On The Front Upper Cover With The No. 4 Piston TDC Mark On The Front Camshaft Pulley**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

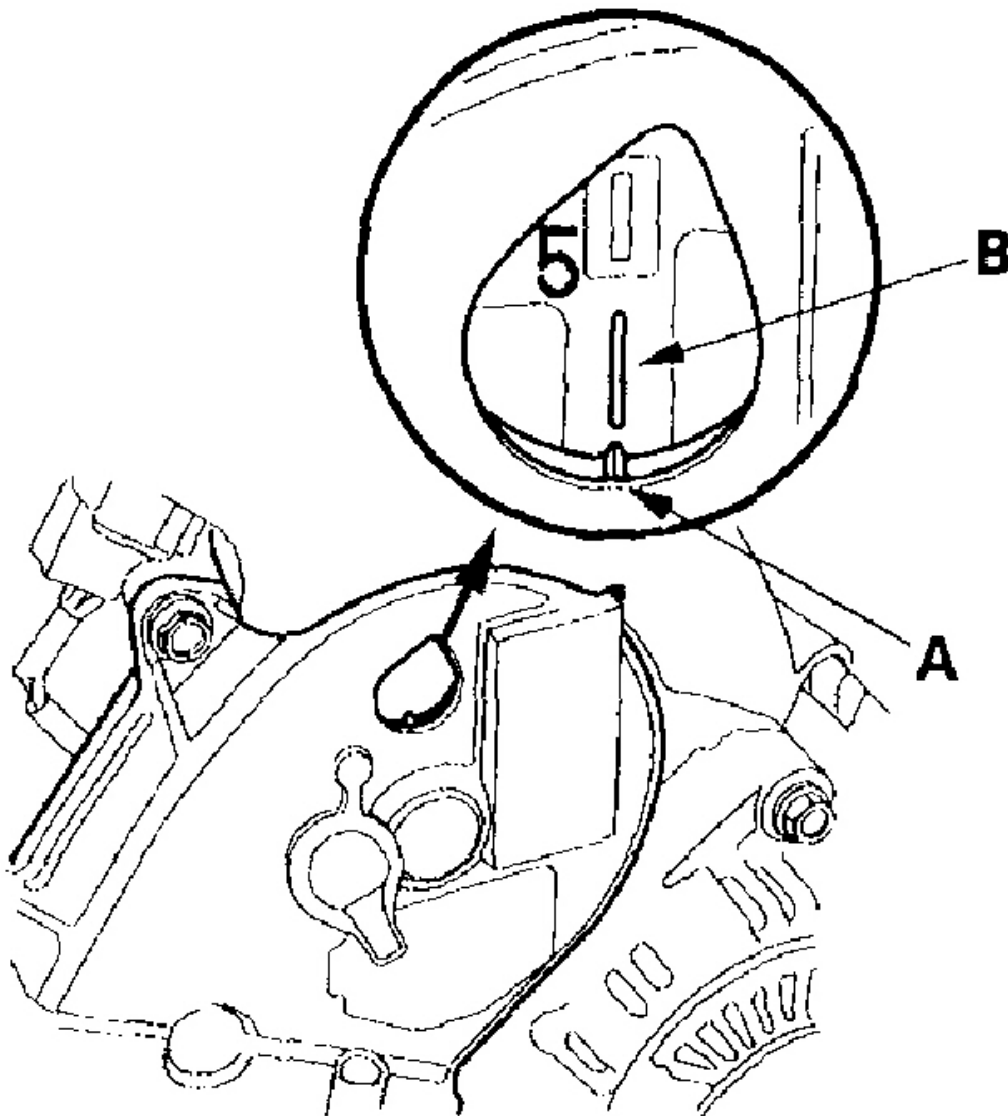
8. Check and, if necessary, adjust the valve clearance on No. 4 cylinder.
9. Rotate the crankshaft clockwise. Align the pointer (A) on the front upper cover with the No. 2 piston TDC mark (B) on the front camshaft pulley.



G01463666

**Fig. 79: Aligning The Pointer On The Front Upper Cover With The No. 2 Piston TDC Mark On The Front Camshaft Pulley**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



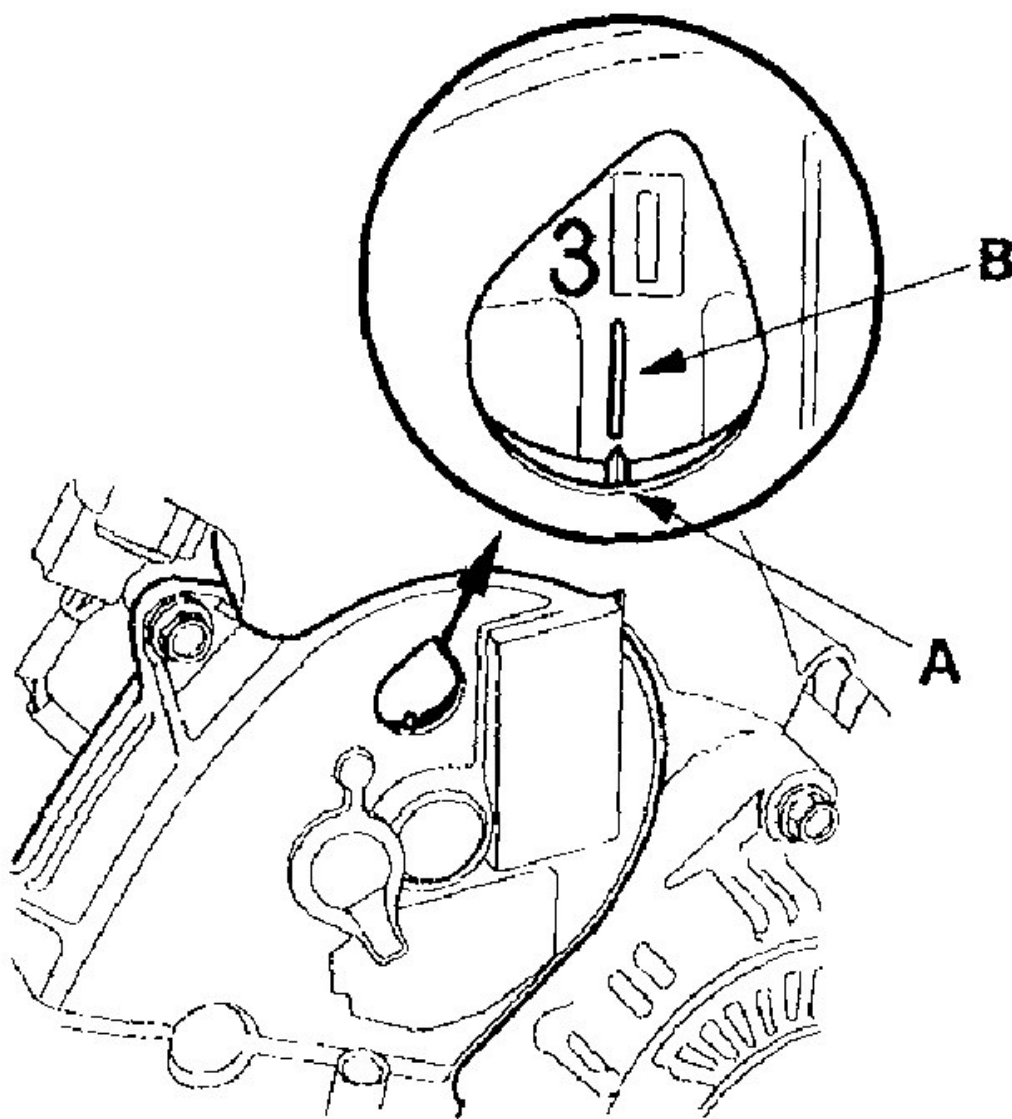
G01463667

**Fig. 80: Aligning The Pointer On The Front Upper Cover With The No. 5 Piston TDC Mark On The Front Camshaft Pulley**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

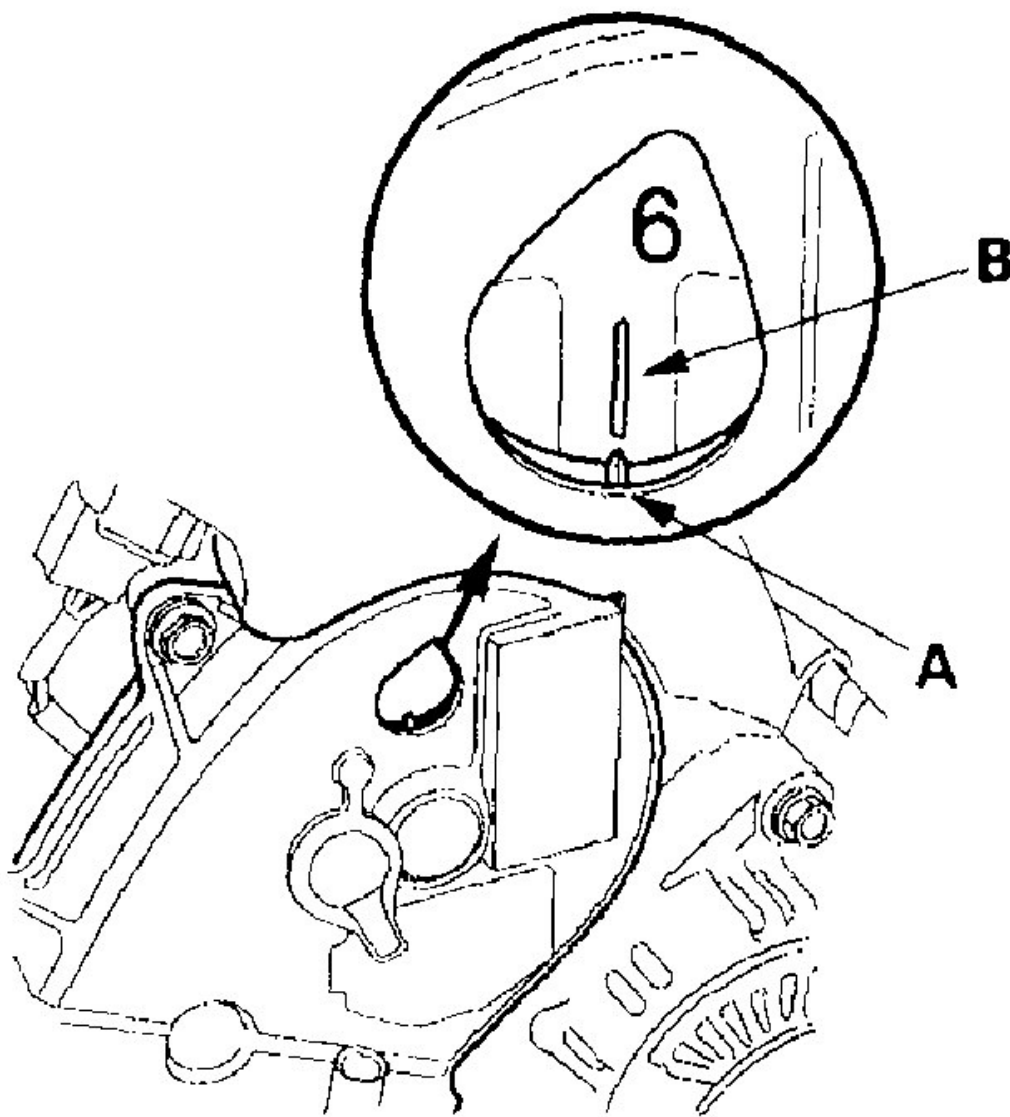




G01463668

**Fig. 81: Aligning The Pointer On The Front Upper Cover With The No. 3 Piston TDC Mark On The Front Camshaft Pulley**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



G01463669

**Fig. 82: Aligning The Pointer On The Front Upper Cover With The No. 6 Piston TDC Mark On The Front Camshaft Pulley**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

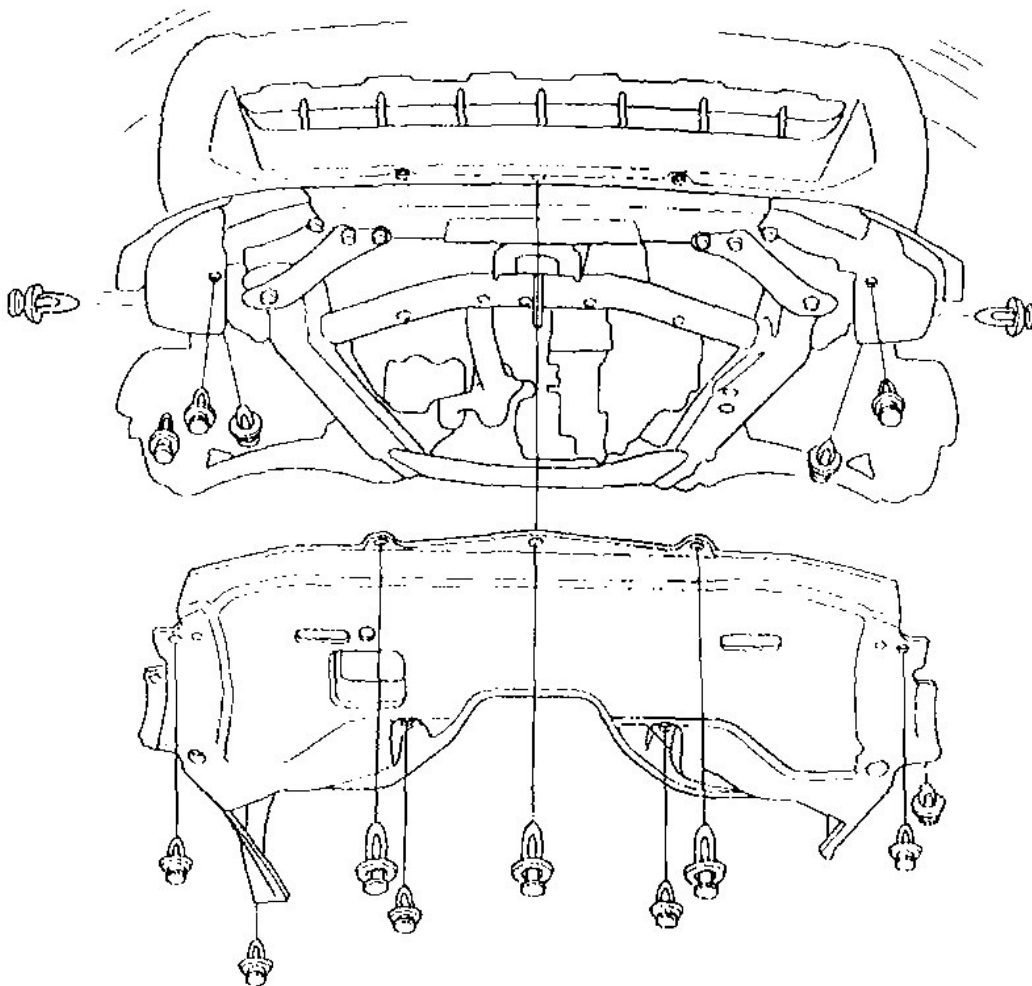
16. Check and, if necessary, adjust the valve clearance on No. 6 cylinder.
17. Install the cylinder head covers (see Cylinder Head Cover Installation ).

**CRANKSHAFT PULLEY REMOVAL & 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**

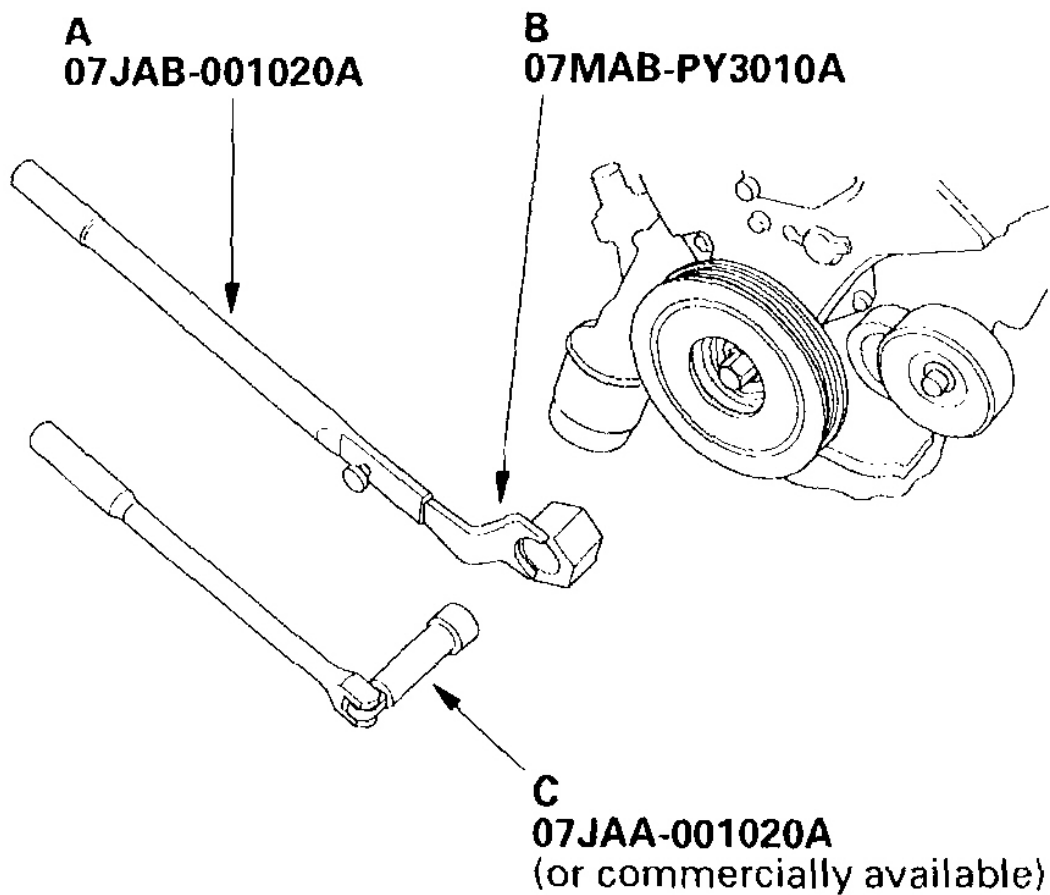
1. Remove the right front tire/wheel.
2. Remove the splash shield.

**G01463670**

**Fig. 83: Removing The Splash Shield**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Hold the pulley with the holder handle (A) and holder attachment (B).



G01463671

**Fig. 84: Holding The Pulley With The Holder Handle & Holder Attachment**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

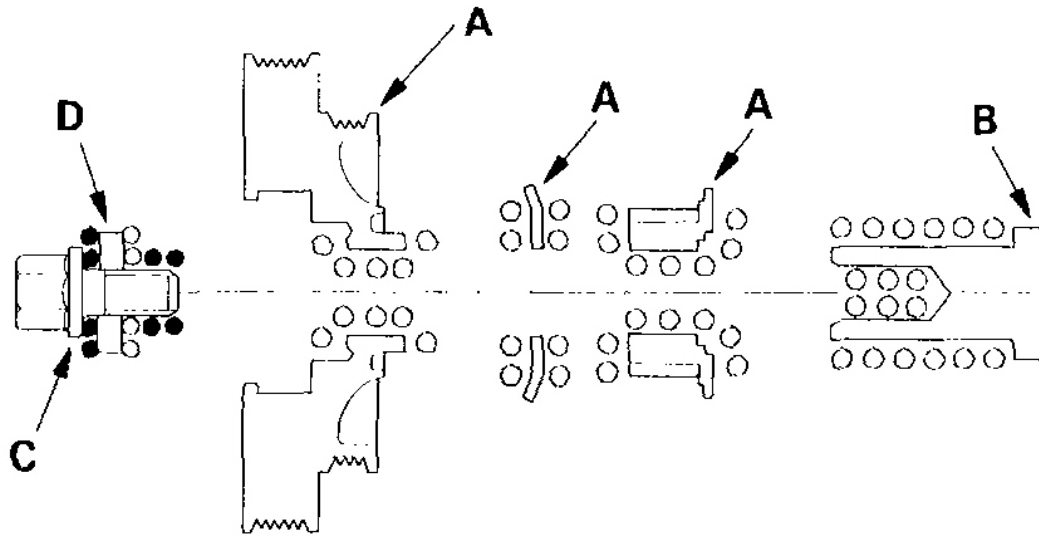
4. Remove the bolt with a heavy duty 19 mm socket (C) and breaker bar.

**Installation**

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

● : Lubricate with new engine oil

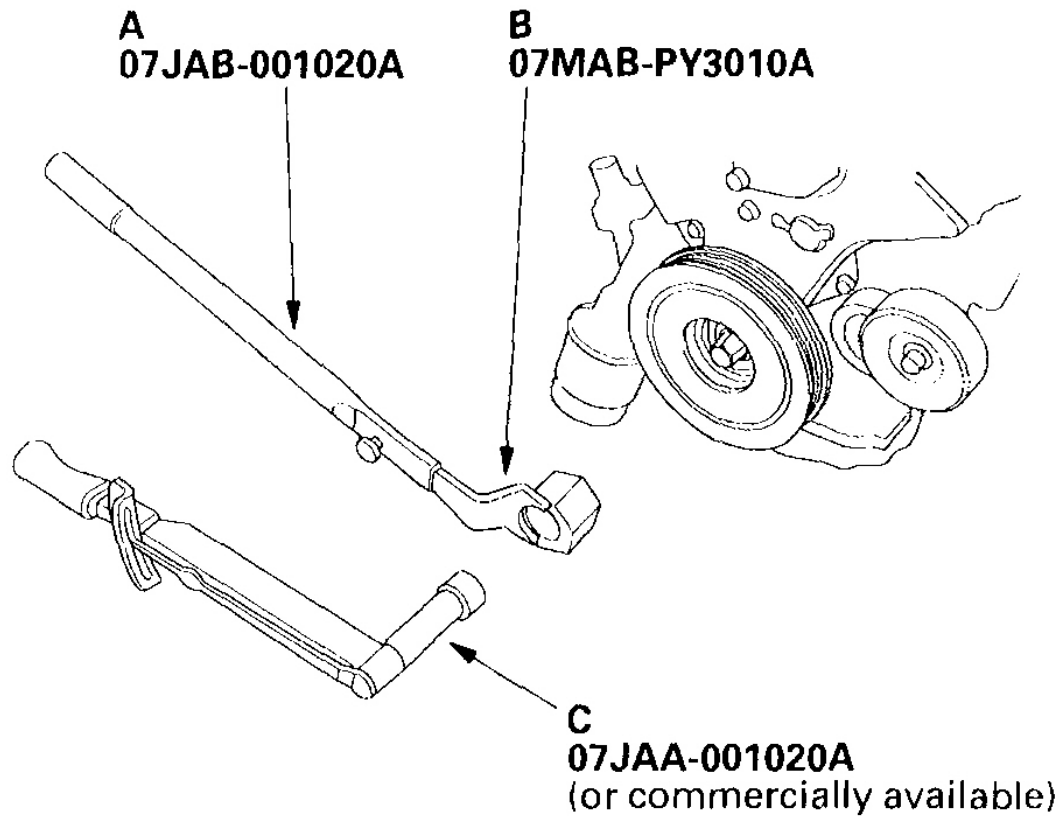
○ : Clean



G01463672

**Fig. 85: Cleaning The Pulleys, Crankshaft, Bolt & Washer**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Install the crankshaft pulley, and tighten the bolt to 245 N.m (25.0 kgf.m, 181 lbf.ft). Do not use an impact wrench.
  - a. Hold the pulley with the holder handle (A) and holder attachment (B).
  - b. Tighten the bolt with a torque wrench and 19 mm socket (C).



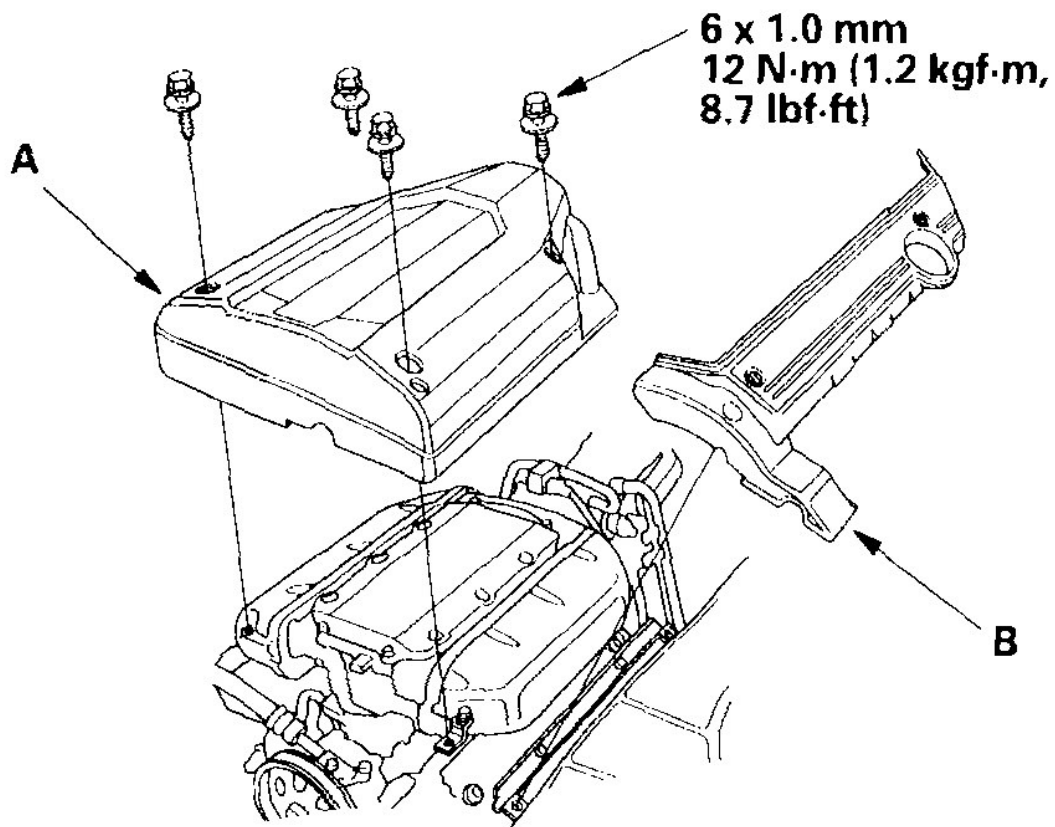
G01463673

**Fig. 86: Installing The Crankshaft Pulley**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

### TIMING BELT INSPECTION

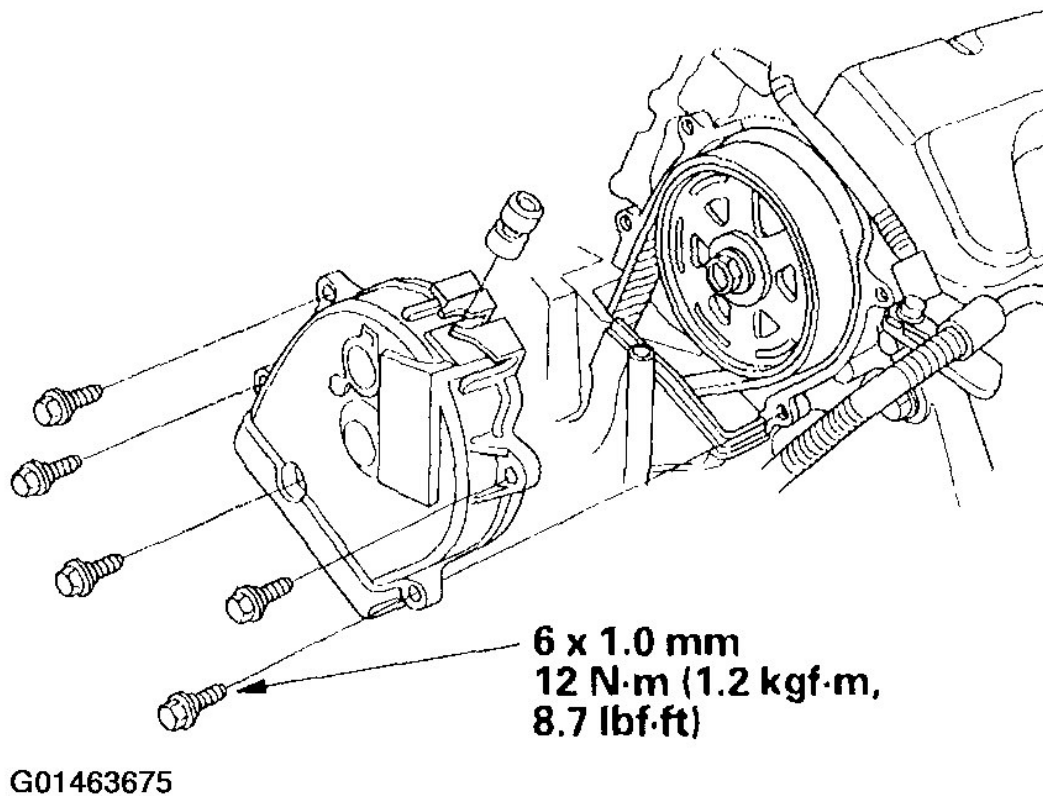
1. Remove the intake manifold cover (A) and ignition coil cover (B).



G01463674

**Fig. 87: Removing The Intake Manifold Cover & Ignition Coil Cover**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Remove the front upper cover.

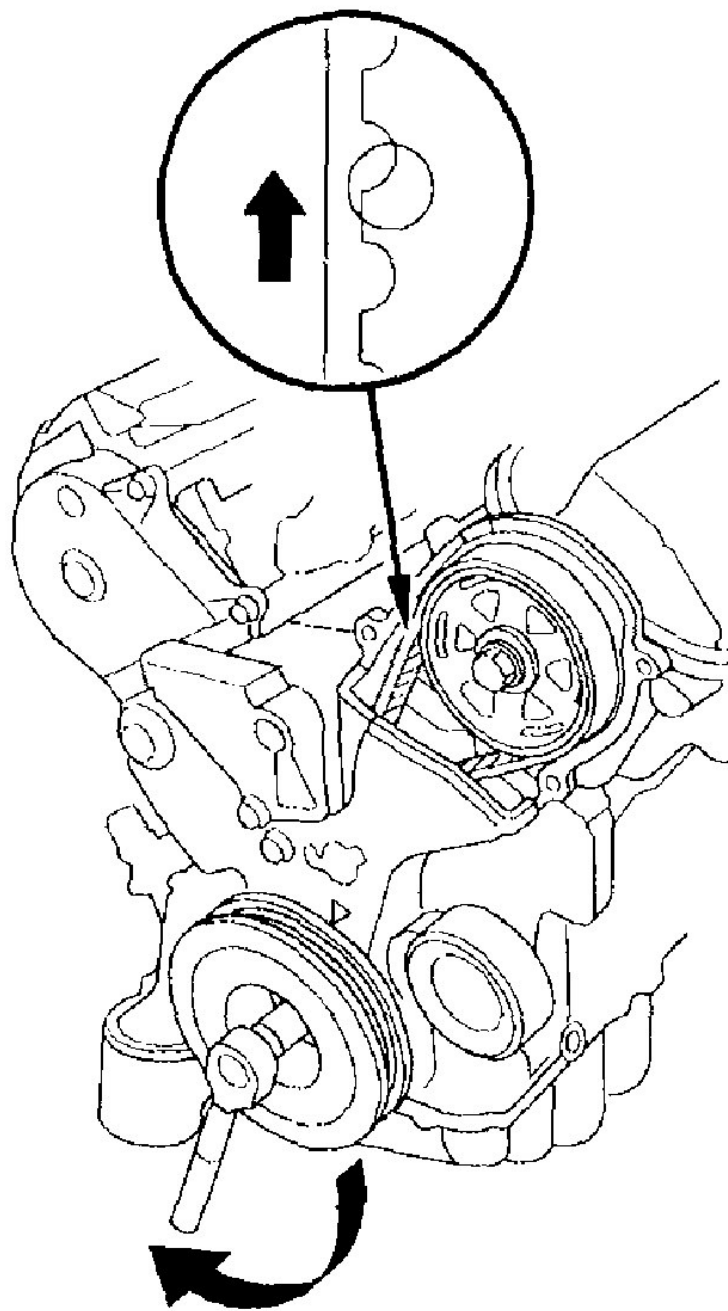


**Fig. 88: Removing The Front Upper Cover**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Inspect the timing belt for cracks and oil or coolant soaking. Replace the belt if it is oil or coolant soaked. Remove any oil or solvent that gets on the belt.



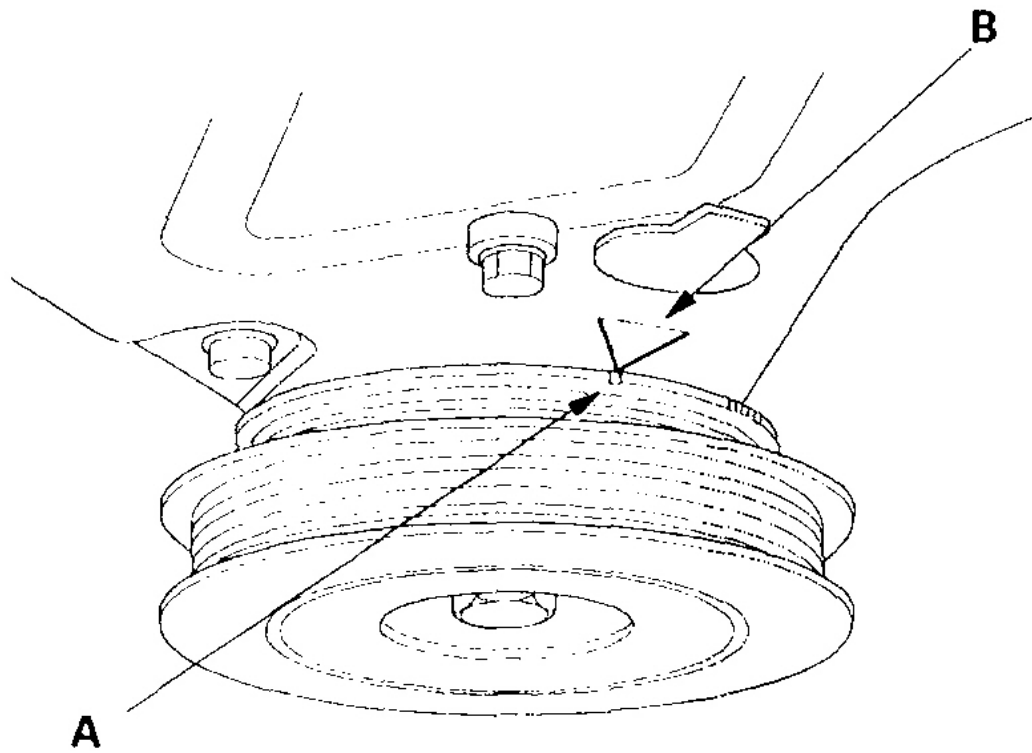


G01463676

**Fig. 89: Inspecting The Timing Belt For Cracks & Oil Or Coolant Soaking**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

## TIMING BELT REMOVAL

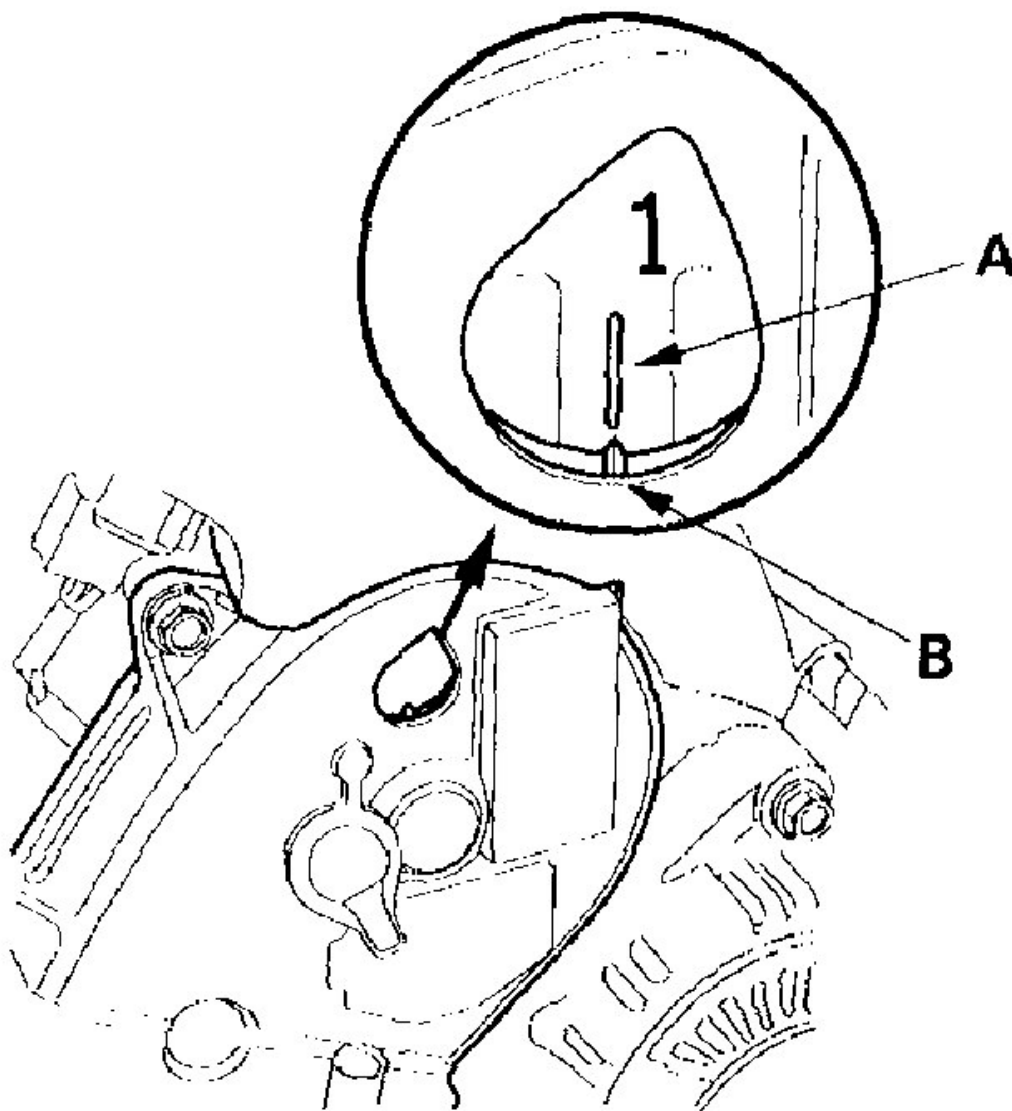
1. Turn the crankshaft so its white mark (A) lines up with the pointer (B).



G01463677

**Fig. 90: Turning The Crankshaft So Its White Mark Lines Up With The Pointer**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

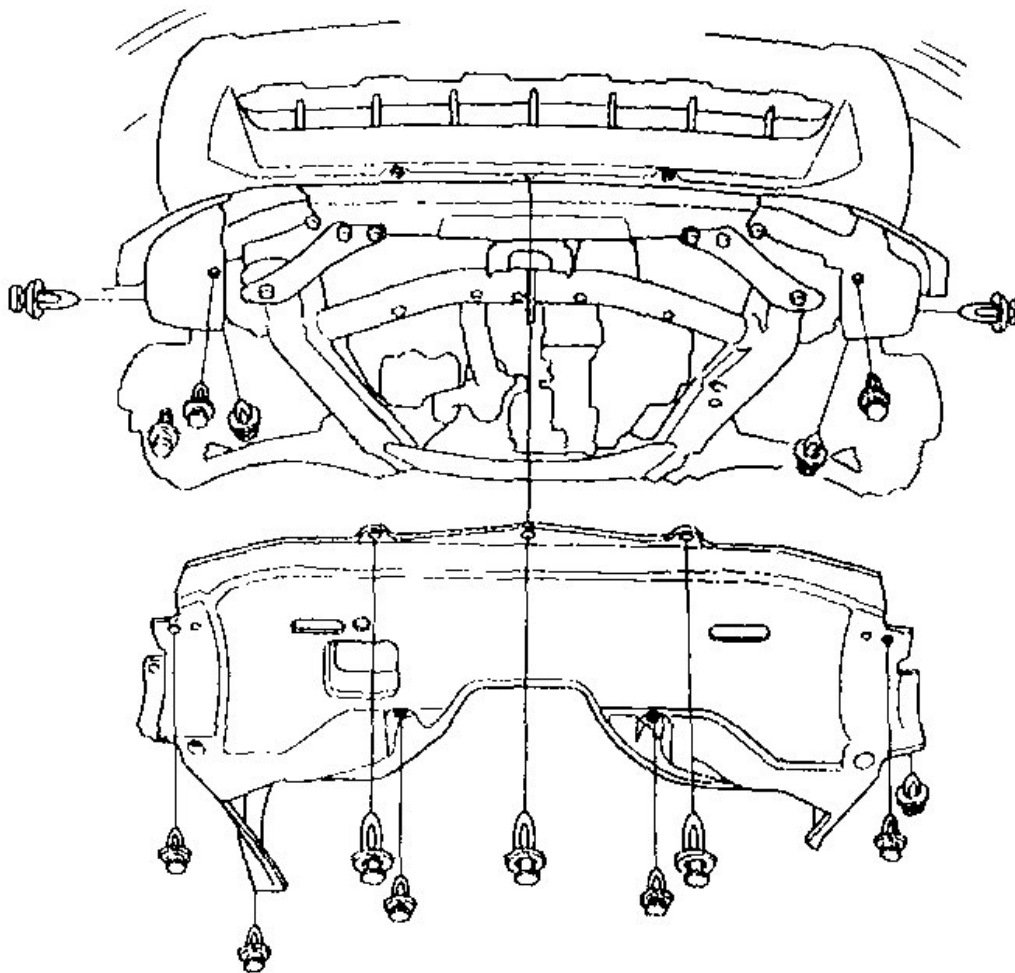
2. Check that the No. 1 piston top dead center (TDC) mark (A) on the front camshaft pulley and the pointer (B) on the front upper cover are aligned.



G01463678

**Fig. 91: Checking That The No. 1 Piston Top Dead Center Mark On The Front Camshaft Pulley & The Pointer On The Front Upper Cover Are Aligned**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove the front tires/wheels.
4. Remove the splash shield.

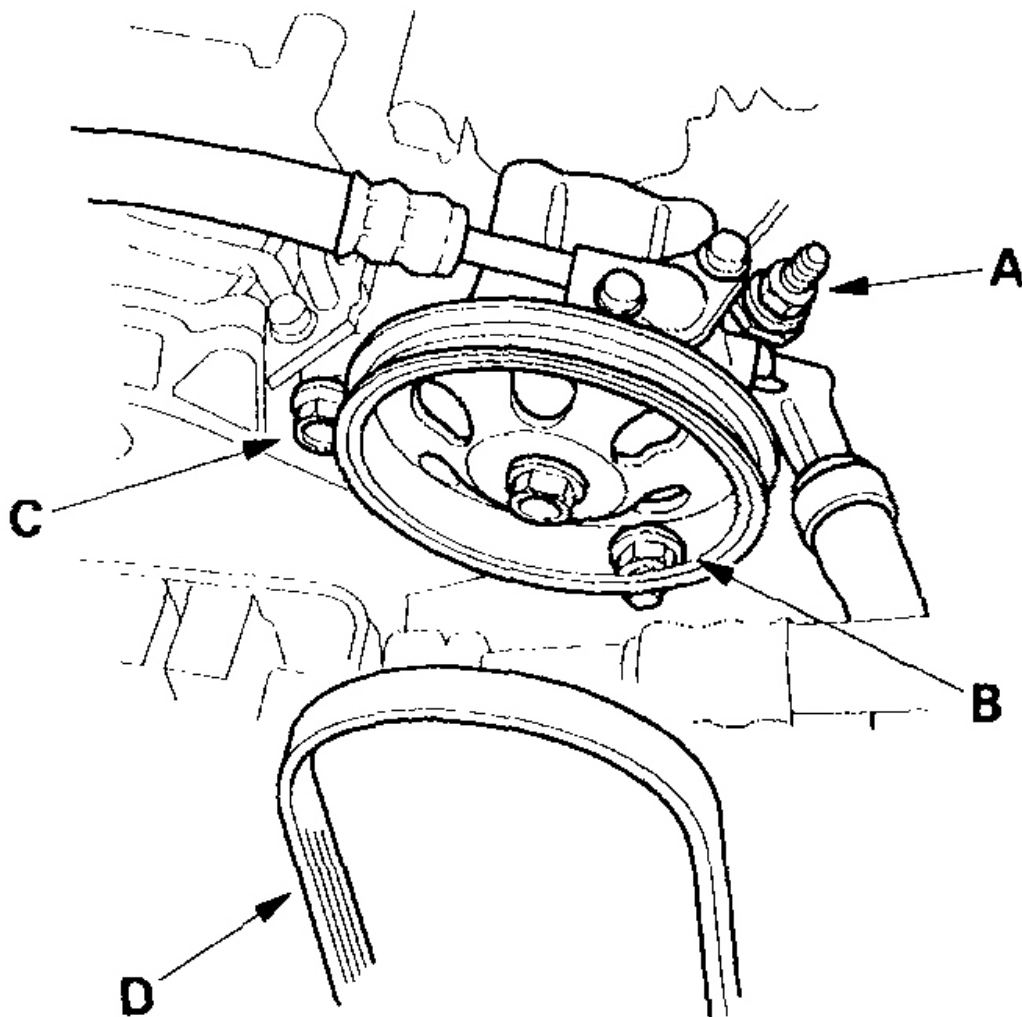


G01463679

**Fig. 92: Removing The Splash Shield**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Remove the alternator-compressor belt (see **ALTERNATOR BELT** ).
6. Loosen the adjusting nut (A), locknut (B) and mounting bolt (C), then remove the power steering (P/S) pump belt (D).

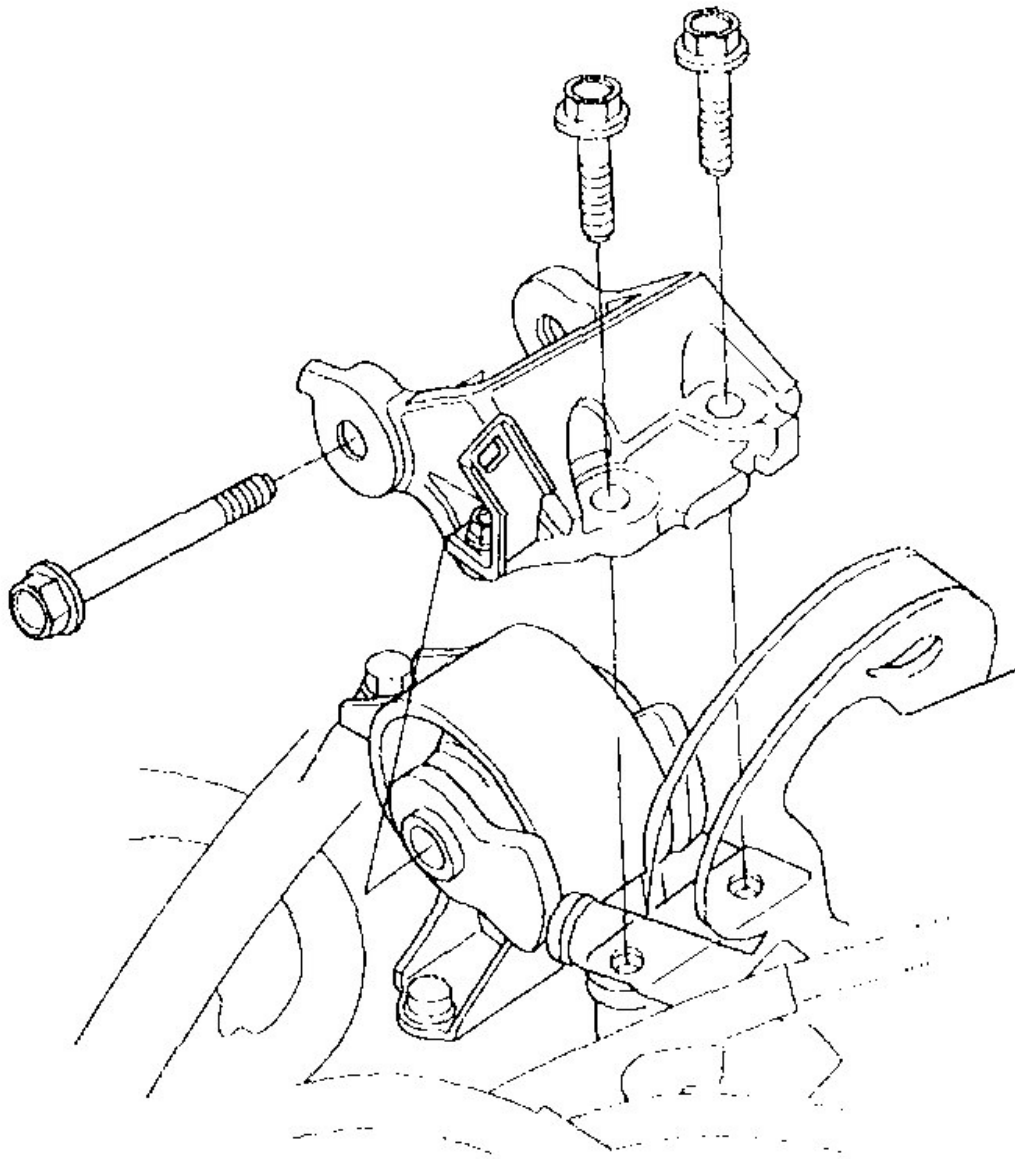


G01463680

**Fig. 93: Loosening The Adjusting Nut, Locknut & Mounting Bolt), & Removing The Power Steering Pump Belt**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

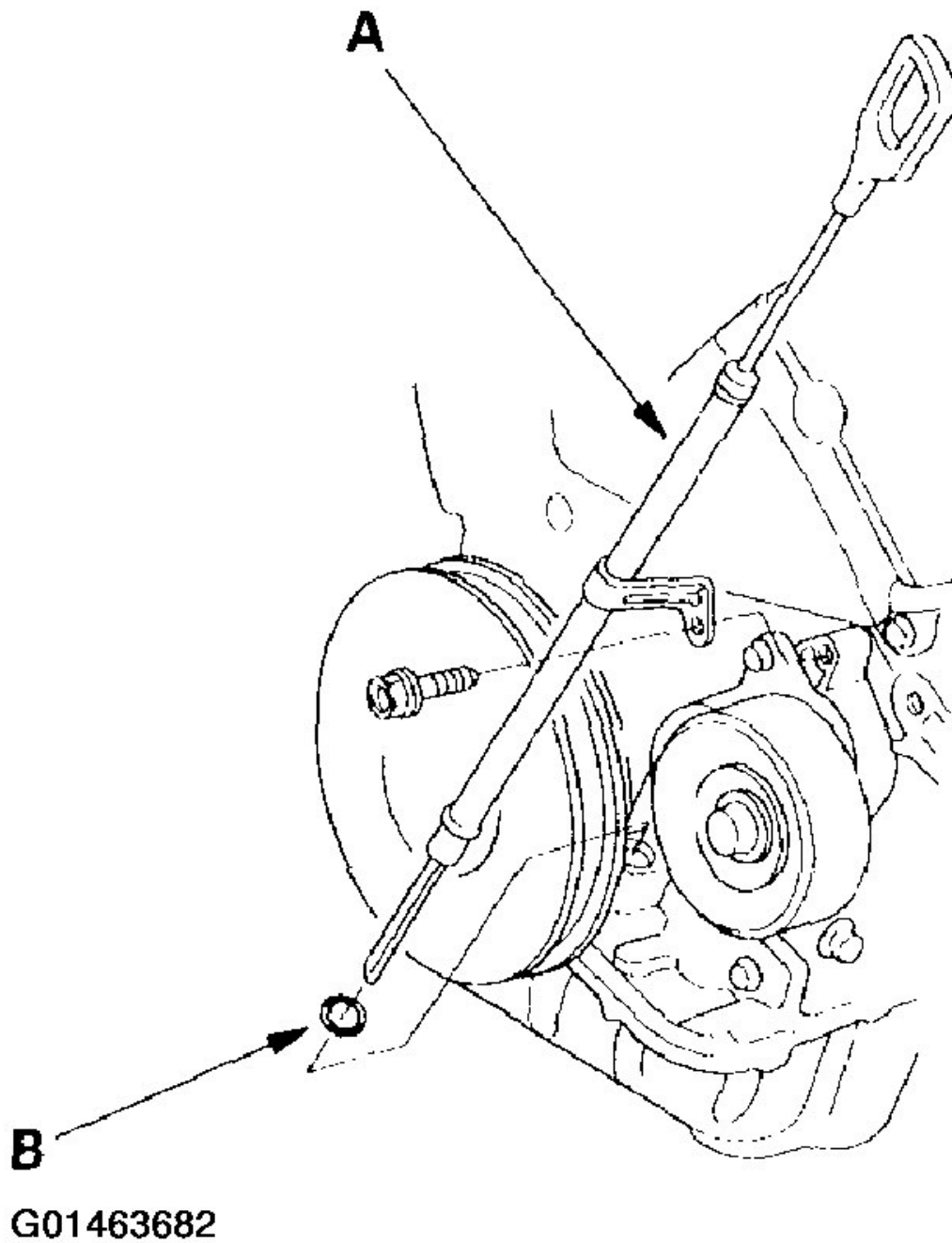
7. Support the engine with a jack and wood block under the oil pan.
8. Remove the side engine mount bracket.



**G01463681**

**Fig. 94: Removing The Side Engine Mount Bracket**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

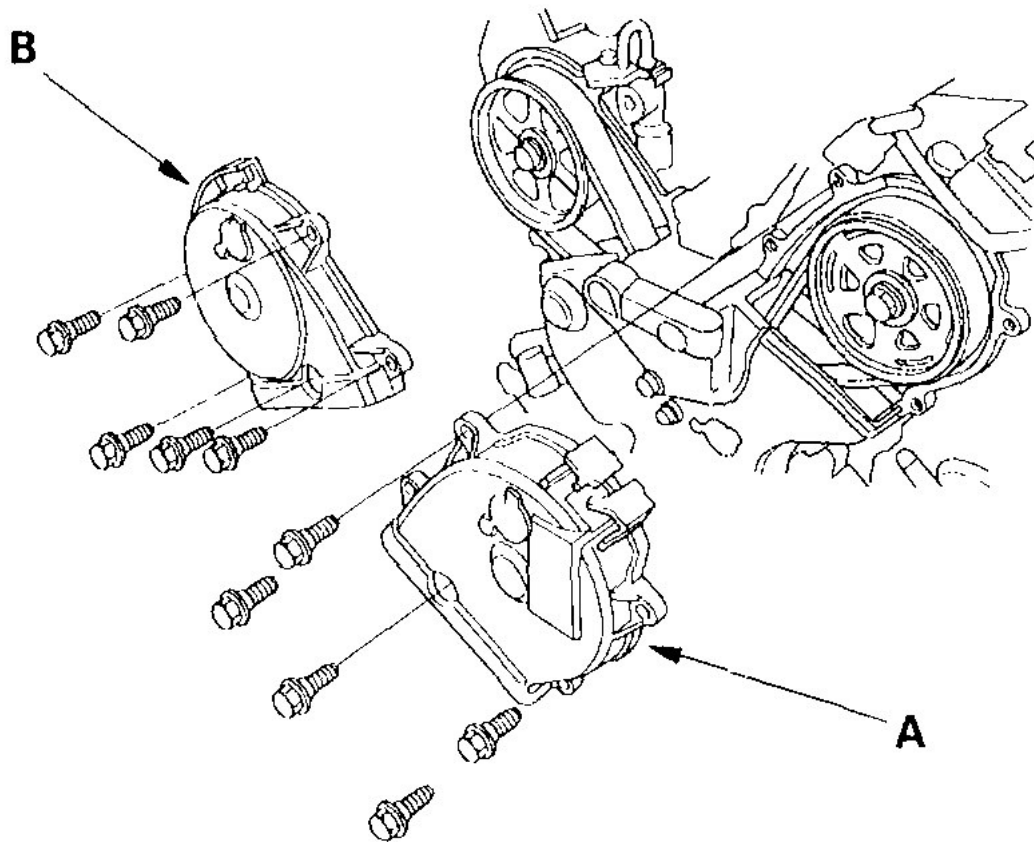
9. Remove the dipstick and tube (A); discard the O-ring (B).



**Fig. 95: Removing The Dipstick & Tube**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Remove the crankshaft pulley (see [Crankshaft Pulley Removal & Installation](#) ).

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

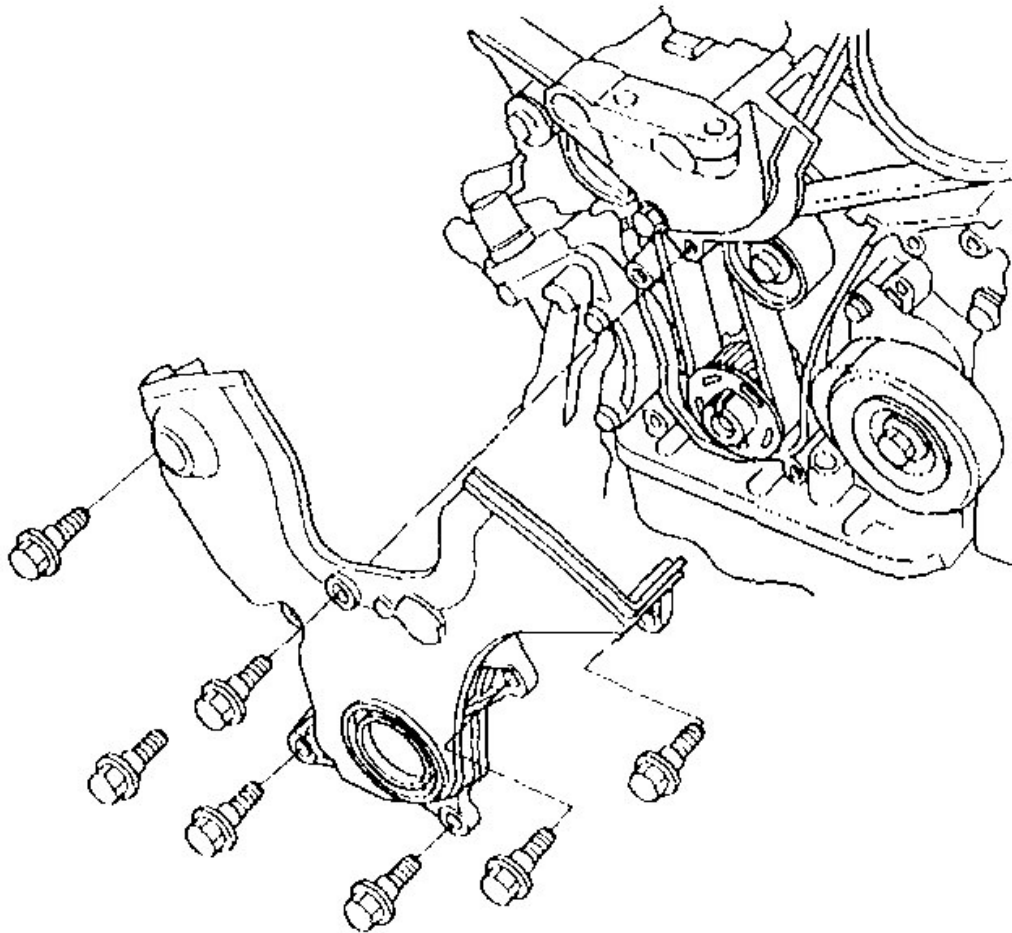


G01463683

**Fig. 96: Removing The Front Upper Cover & Rear Upper Cover**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Remove the lower cover.

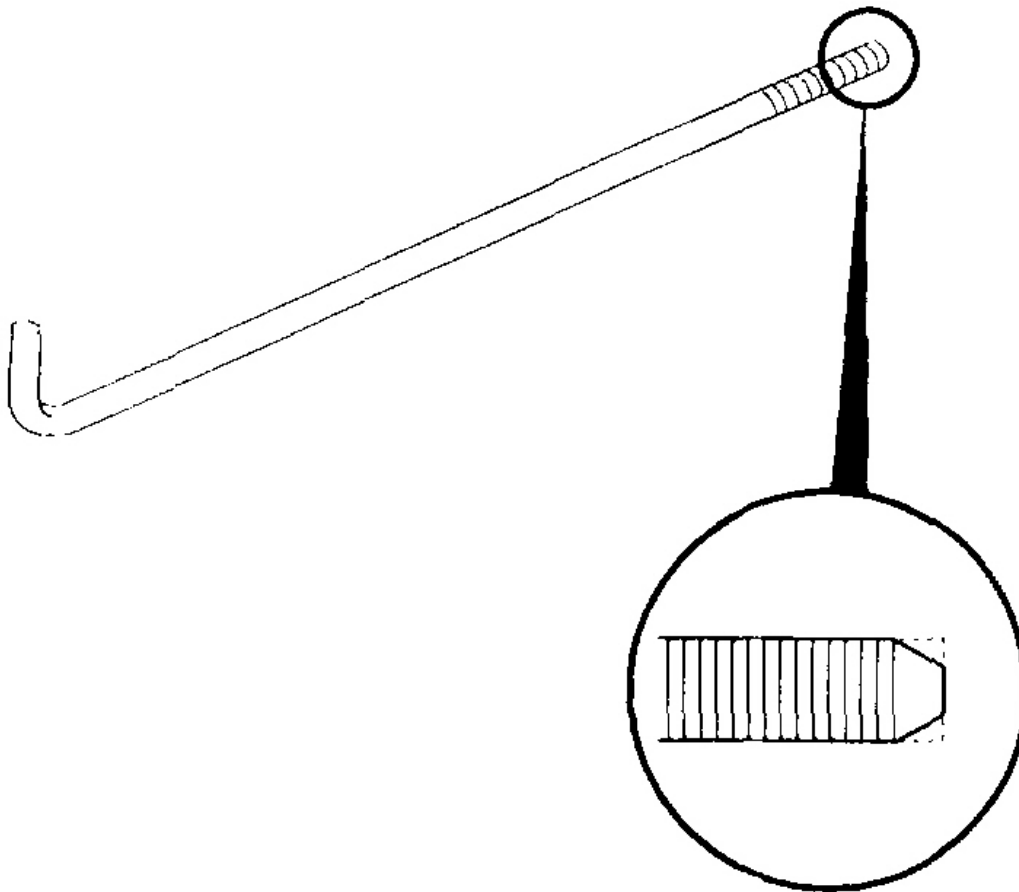




**G01463684**

**Fig. 97: Removing The Lower Cover**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

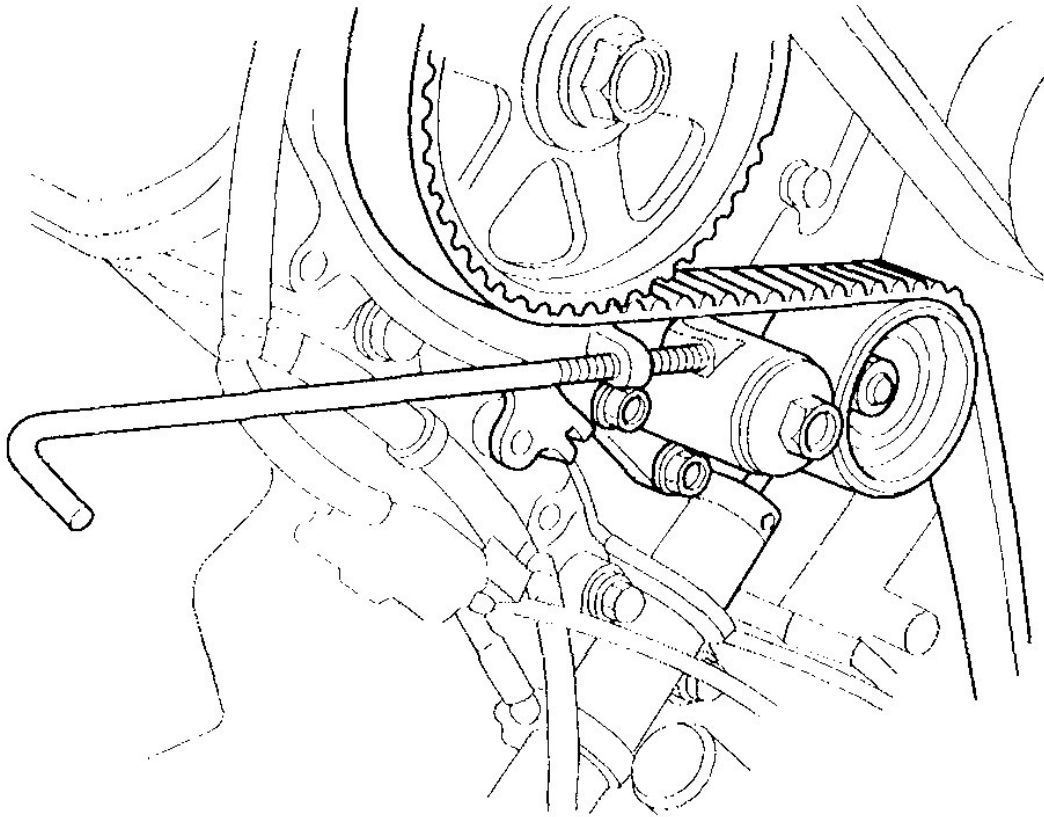
13. Remove one of the battery clamp bolts from the battery tray, and grind the end of it as shown.



G01463685

**Fig. 98: Removing Battery Clamp Bolt From The Battery Tray & Grinding The End**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

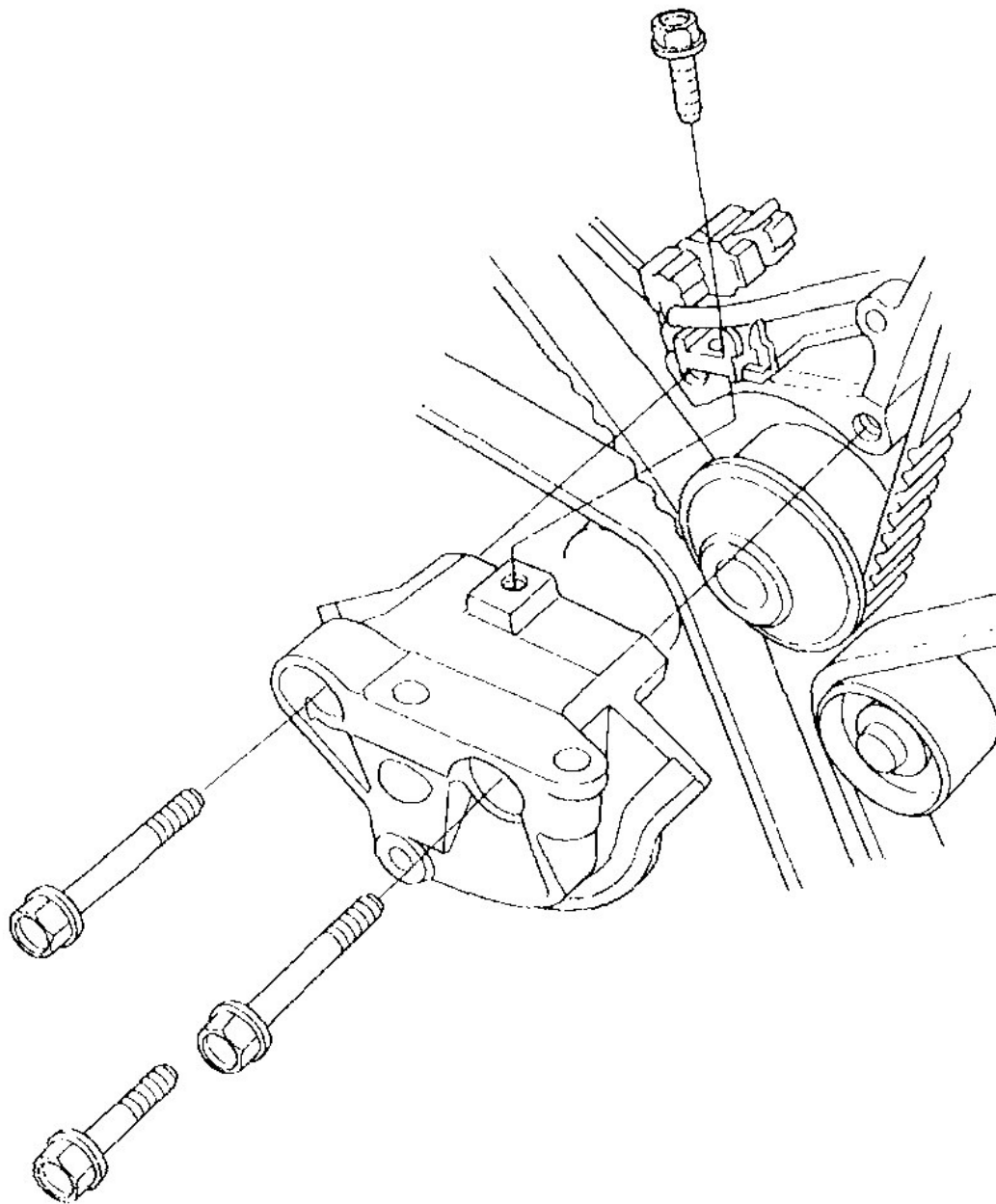
14. Screw the battery clamp bolt in as shown to hold the timing belt adjuster in its current position. Tighten it by hand; do not use a wrench.



G01463686

**Fig. 99: Screwing The Battery Clamp Bolt**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

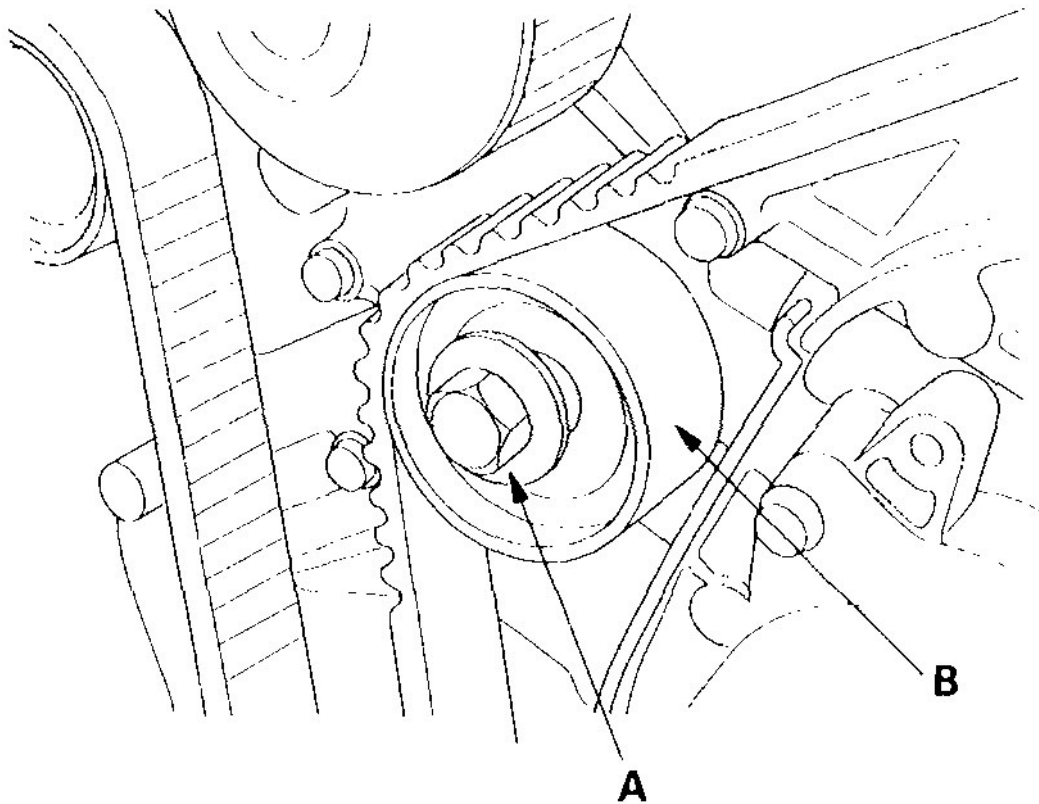
15. Remove the side engine mount bracket.



G01463687

**Fig. 100: Removing The Side Engine Mount Bracket**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



G01463688

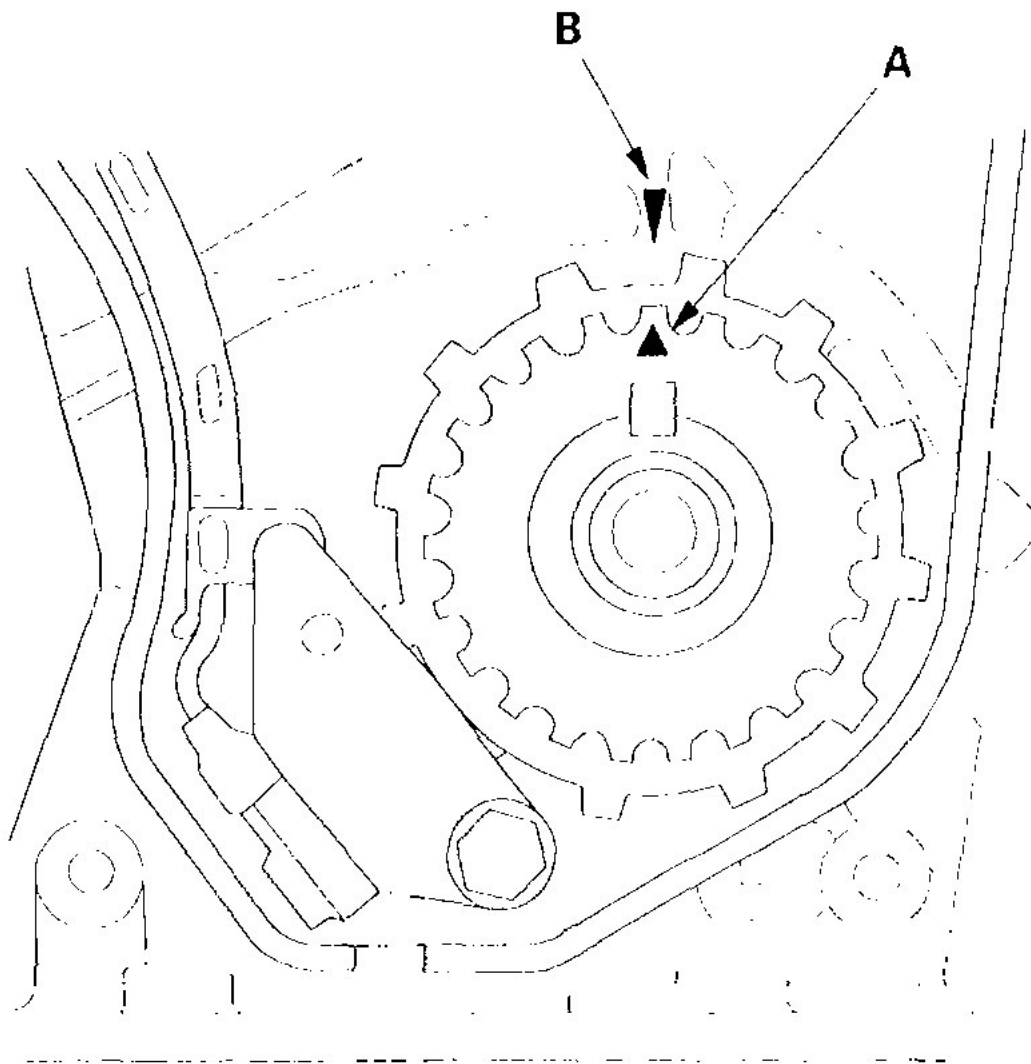
**Fig. 101: Removing The Idler Pulley Bolt & Idler Pulley**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

## TIMING BELT INSTALLATION

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

### New Belt

1. Clean the timing belt drive pulleys, crankshaft, camshaft 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.

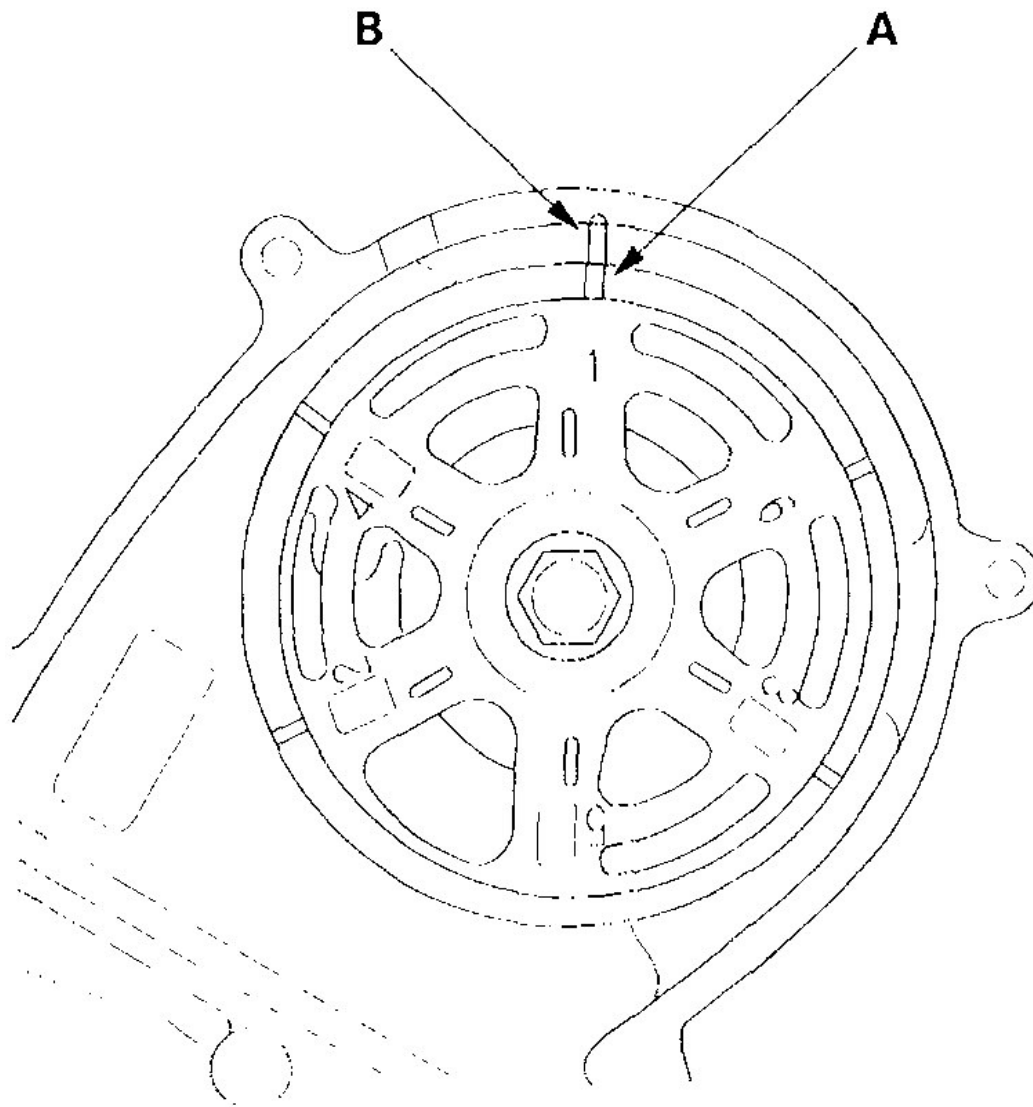


G01463689

**Fig. 102: Aligning The TDC Mark On The Tooth Of The Timing Belt Drive Pulley With The Pointer On The Oil Pump**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

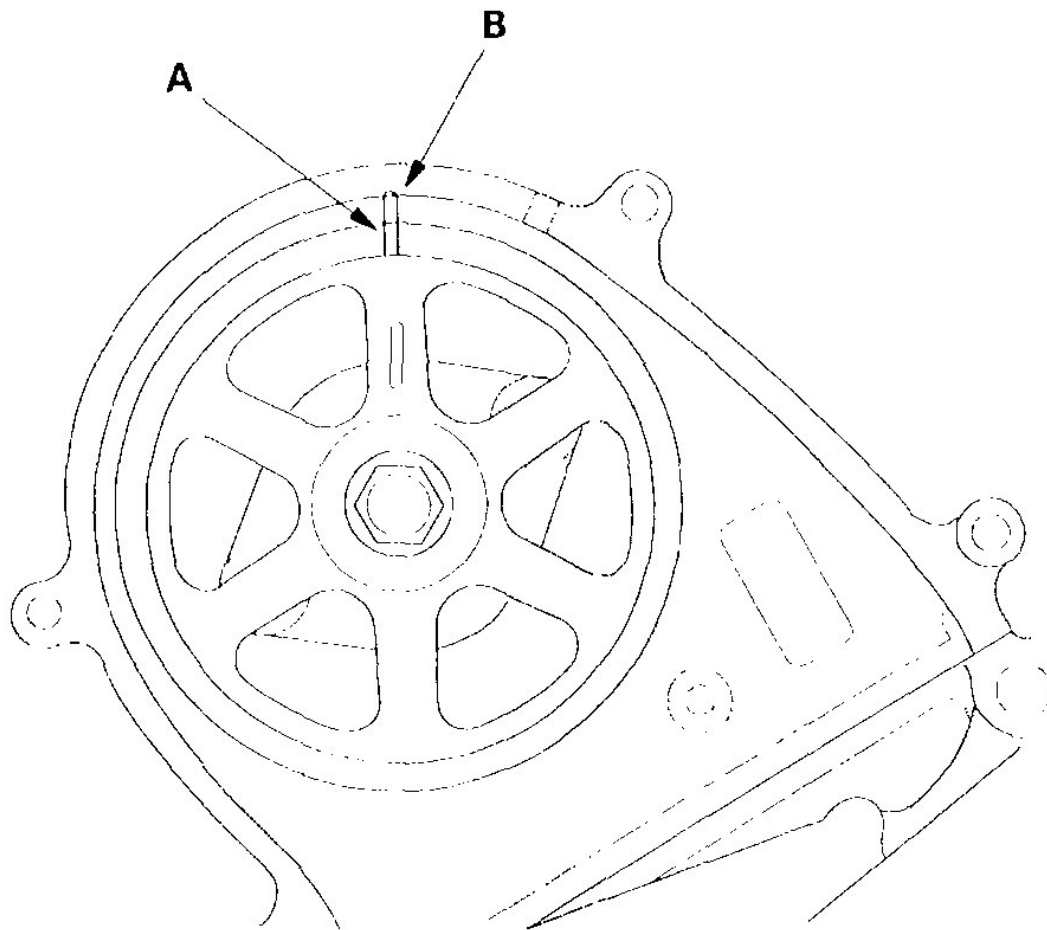
3. Set the camshaft pulleys to TDC by aligning the TDC marks (A) on the camshaft pulleys with the pointers (B) on the back covers.



G01463690

**Fig. 103: Aligning The TDC Marks On The Camshaft Pulleys With The Pointers On The Back Covers (Front)**

Courtesy of AMERICAN HONDA MOTOR CO., INC.



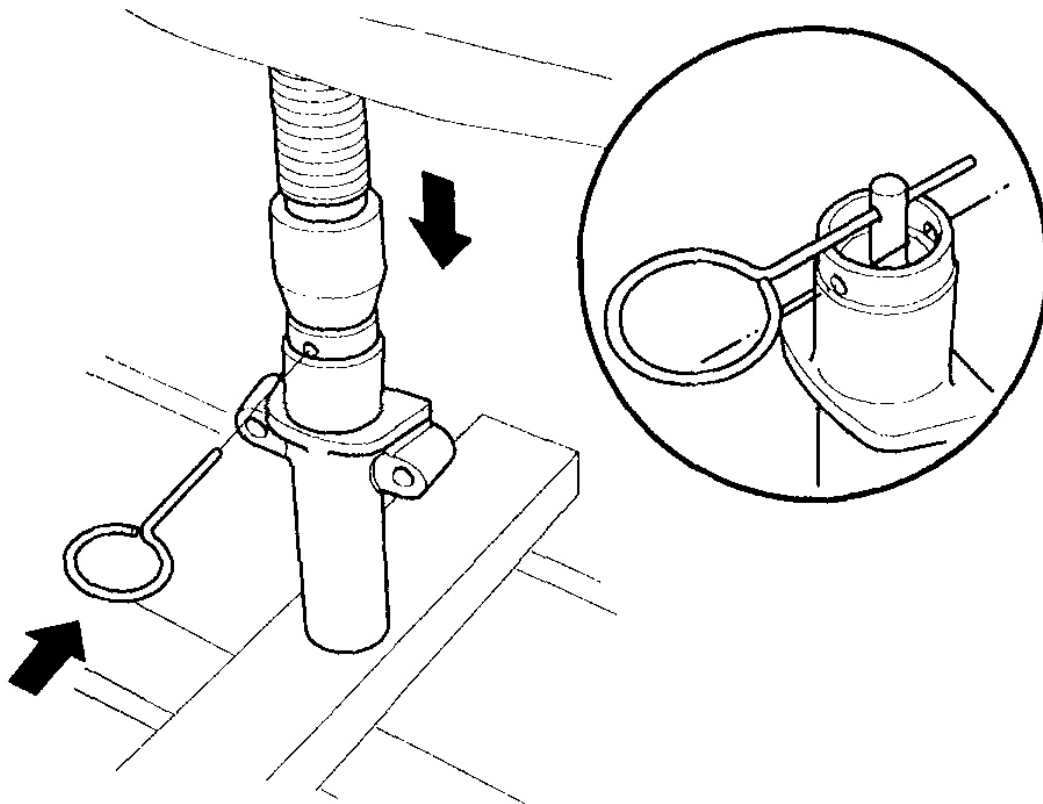
G01463691

**Fig. 104: Aligning The TDC Marks On The Camshaft Pulleys With The Pointers On The Back Covers (Rear)**

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

4. Remove the battery clamp bolt from the back cover.
5. Remove the auto-tensioner.
6. Align the holes on the rod and housing of the auto-tensioner.





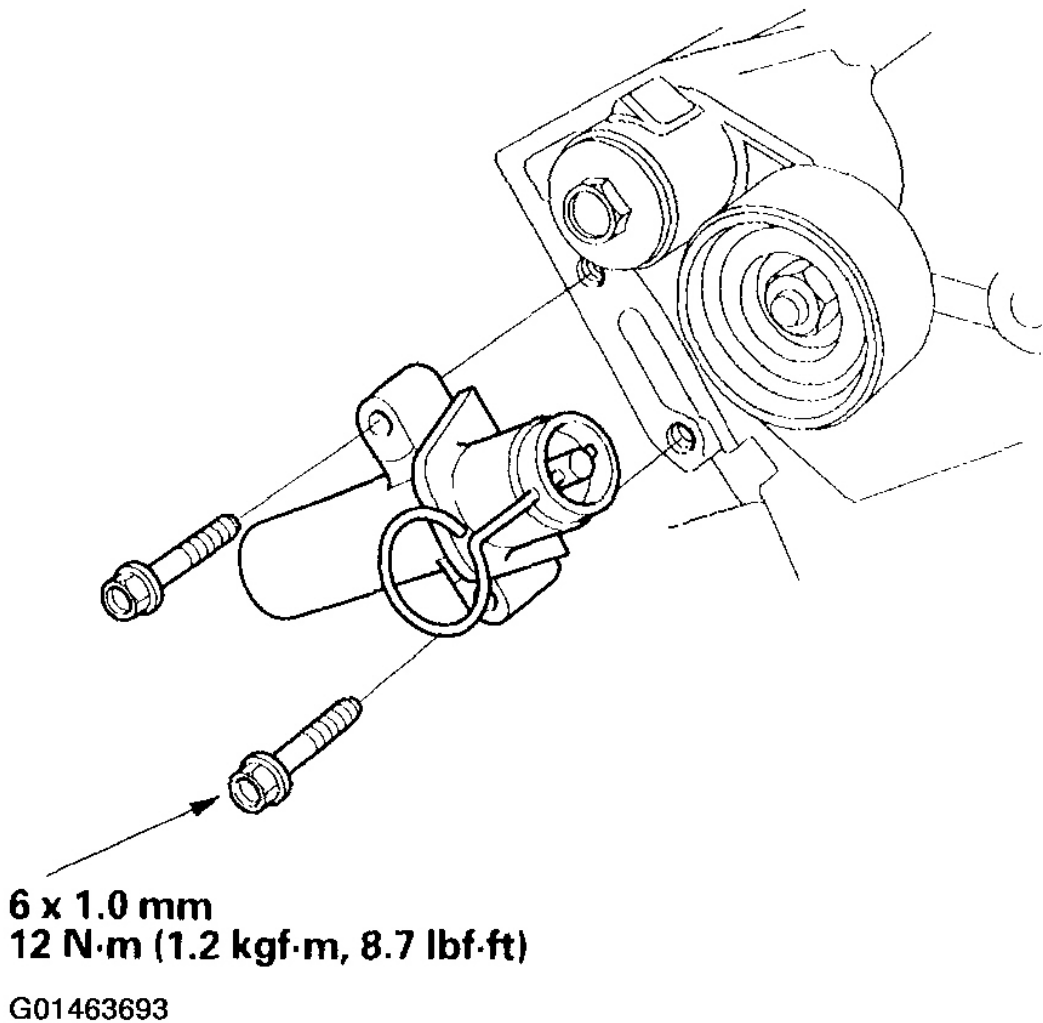
G01463692

**Fig. 105: Aligning The Holes On The Rod & Housing Of The Auto-Tensioner**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

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

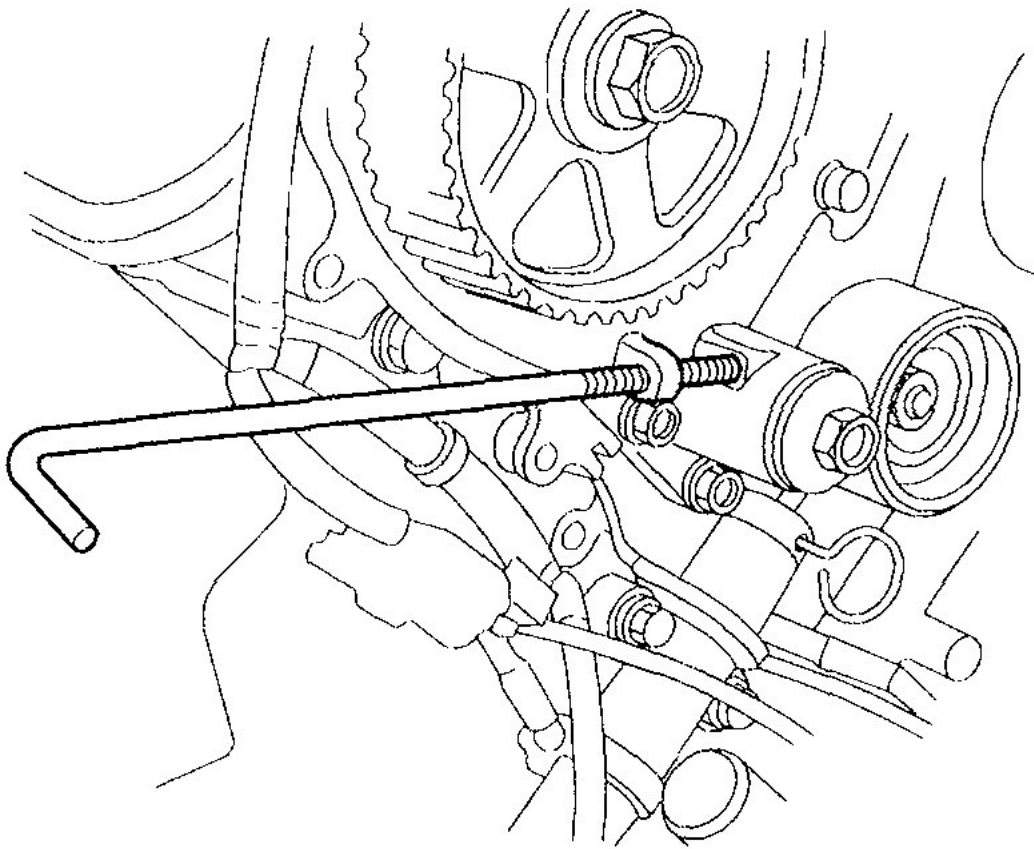
**NOTE:** Make sure the pin stays in place.



**Fig. 106: Installing The Auto-Tensioner**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

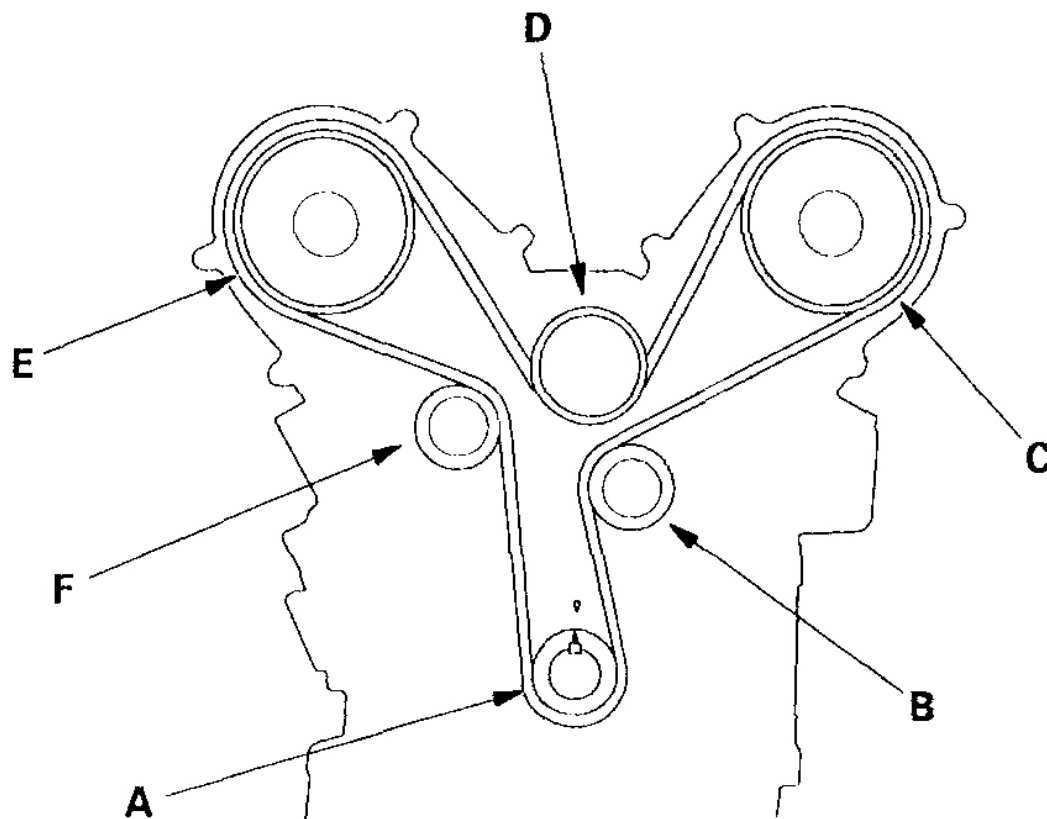
8. Install the auto-tensioner.
9. Screw the battery clamp in as shown to hold the timing belt adjuster in its current position. Tighten it by hand, do not use a wrench.

**G01463694**

**Fig. 107: Holding The Timing Belt Adjuster In Its Current Position**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Apply liquid thread lock to the idle pulley bolt, then loosely install the idler pulley.
11. Install the timing belt in a counterclockwise sequence starting with the drive pulley.
  - a. Drive pulley (A).
  - b. Idler pulley (B).
  - c. Front camshaft pulley (C).
  - d. Water pump pulley (D).
  - e. Rear camshaft pulley (E).
  - f. Adjusting pulley (F).

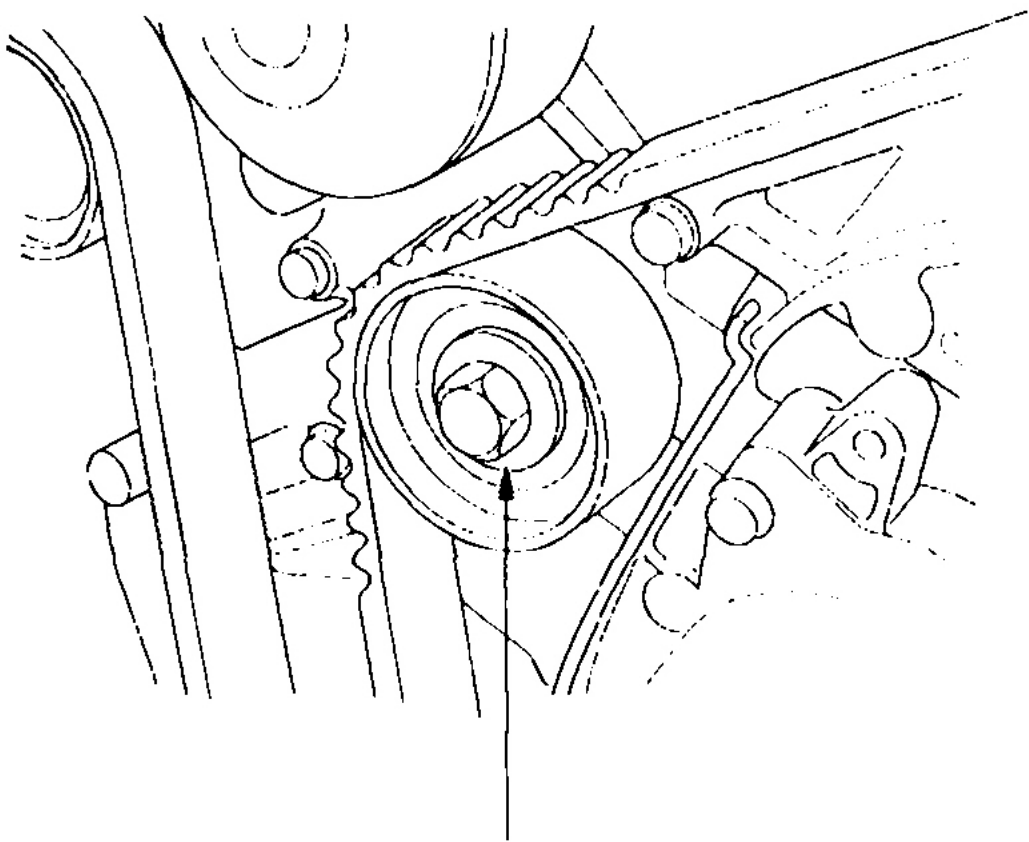


G01463695

**Fig. 108: Installing The Timing Belt**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Tighten the idler pulley bolt.

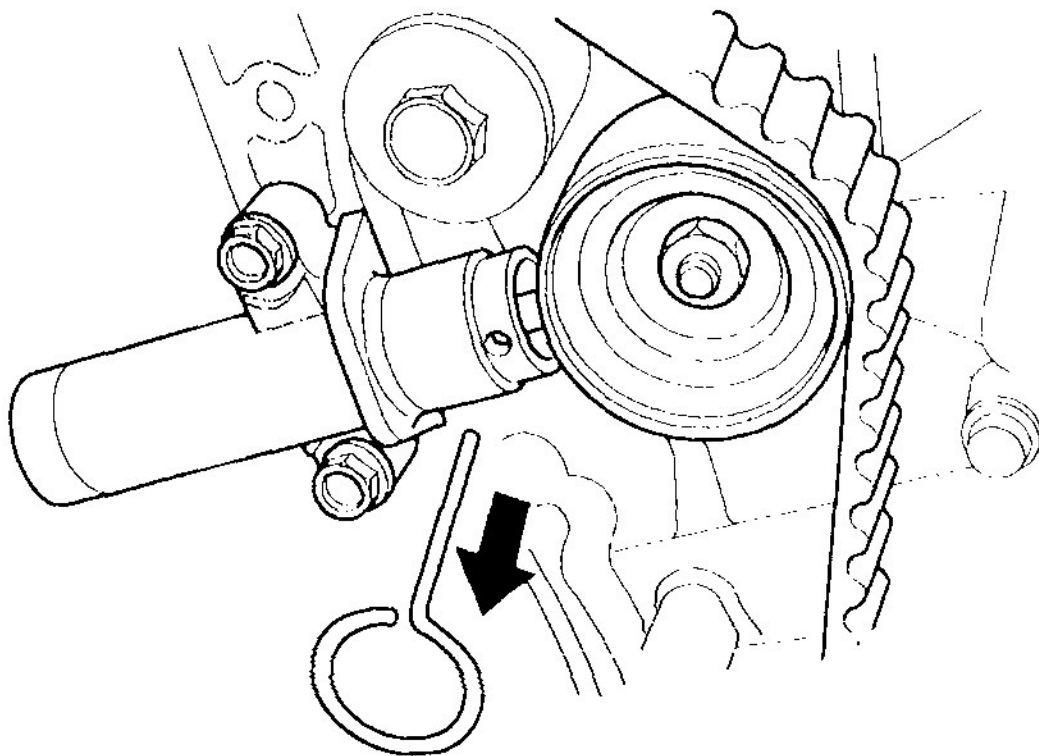


**10 x 1.25 mm  
44 N·m (4.5 kgf·m, 33 lbf·ft)**

G01463696

**Fig. 109: Tightening The Idler Pulley Bolt**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

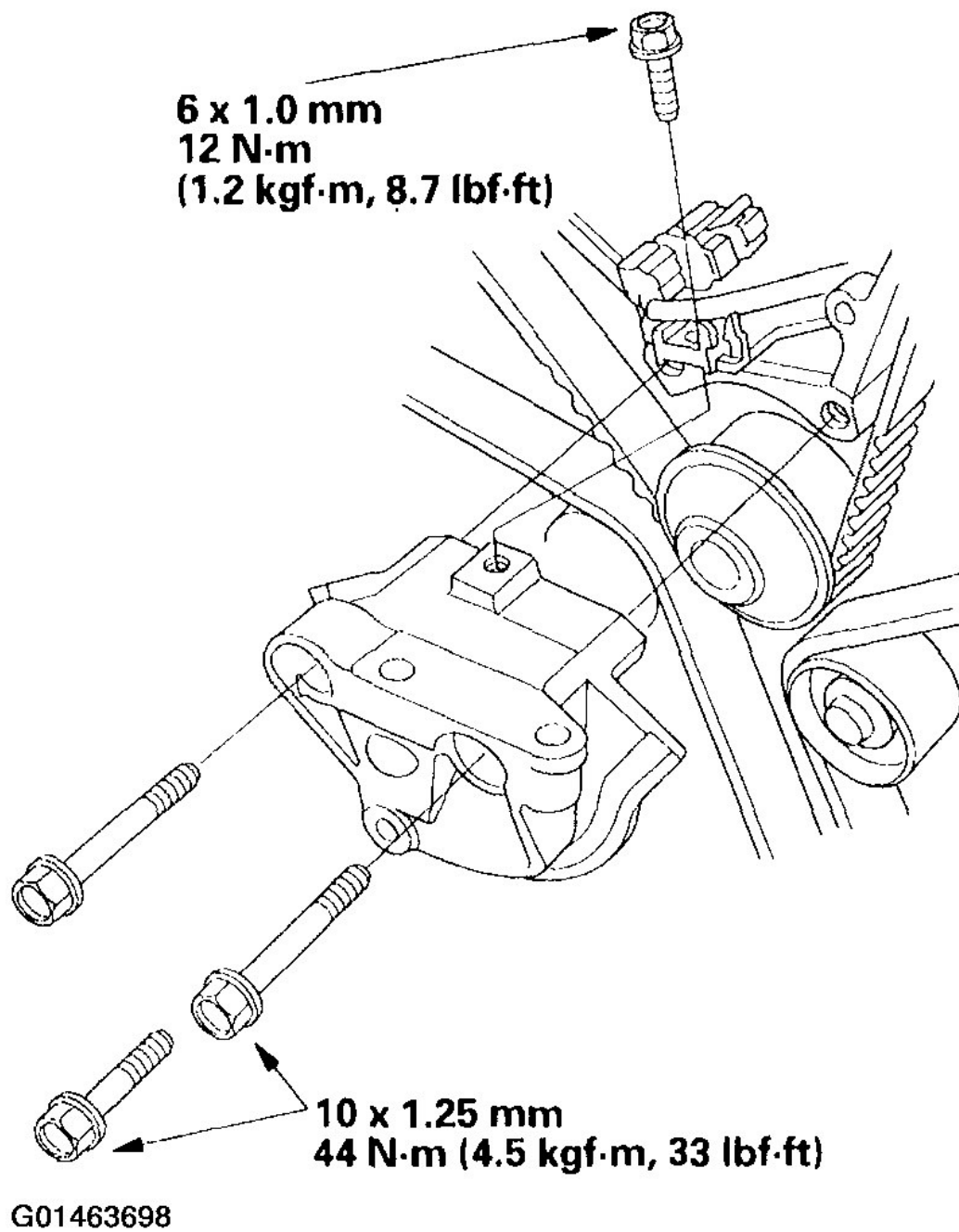
13. Remove the pin from the auto-tensioner.



**G01463697**

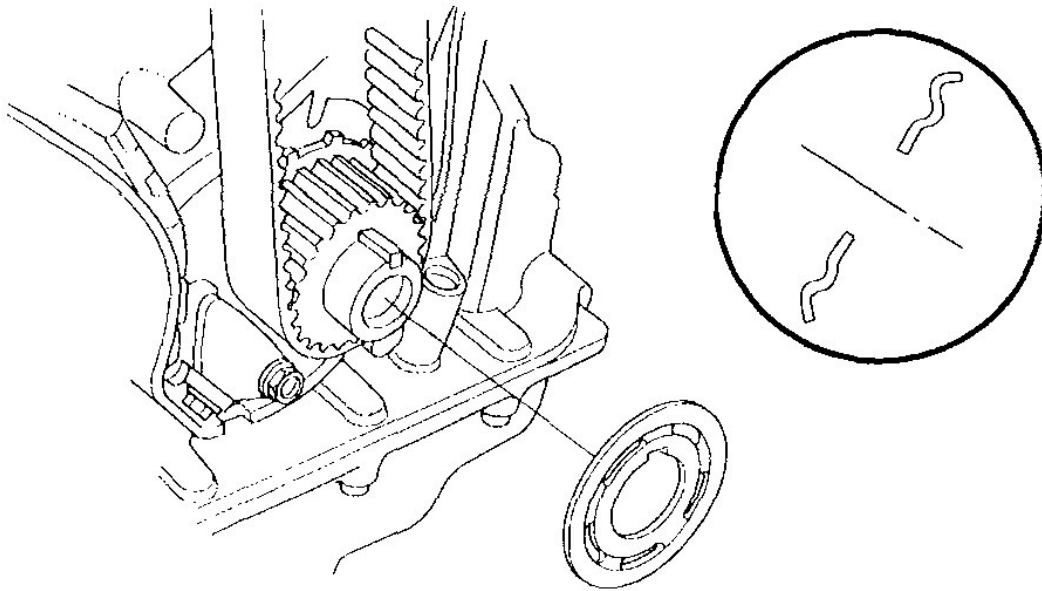
**Fig. 110: Removing The Pin From The Auto-Tensioner**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



**Fig. 111: Installing The Side Engine Mount Bracket**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

16. Install the timing belt guide plate as shown.

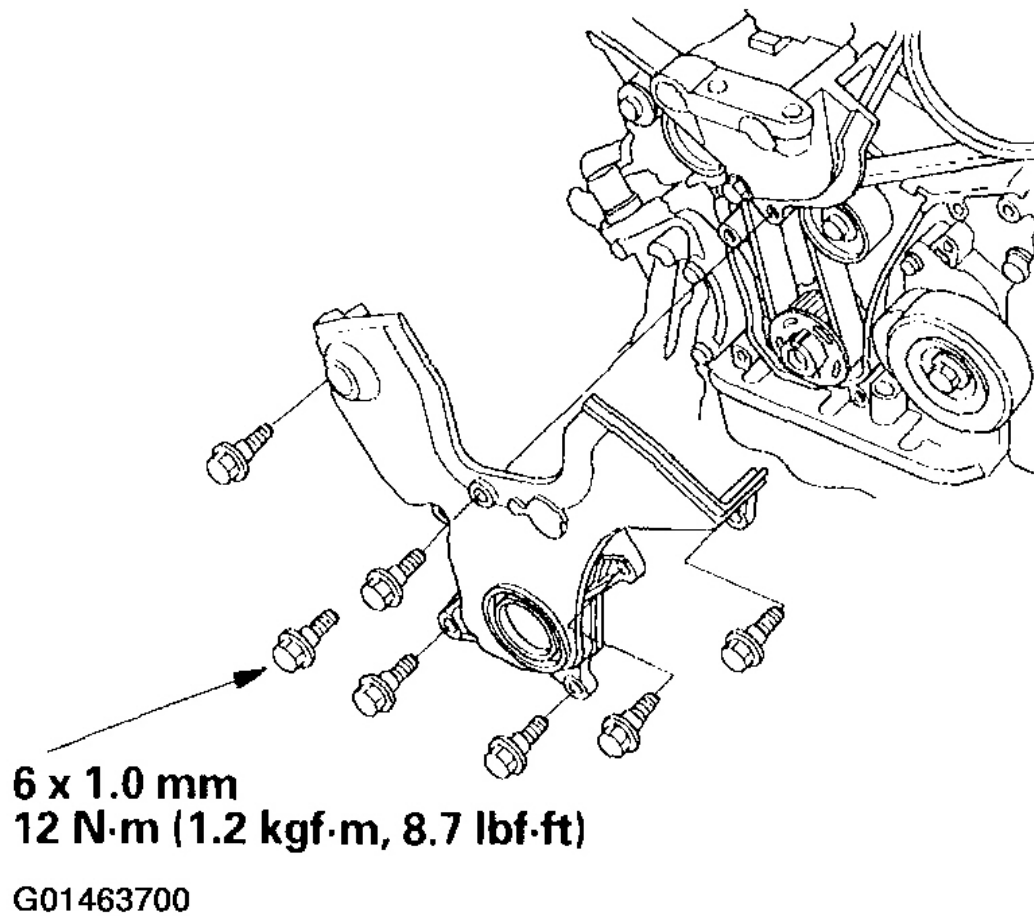


G01463699

**Fig. 112: Installing The Timing Belt Guide Plate**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

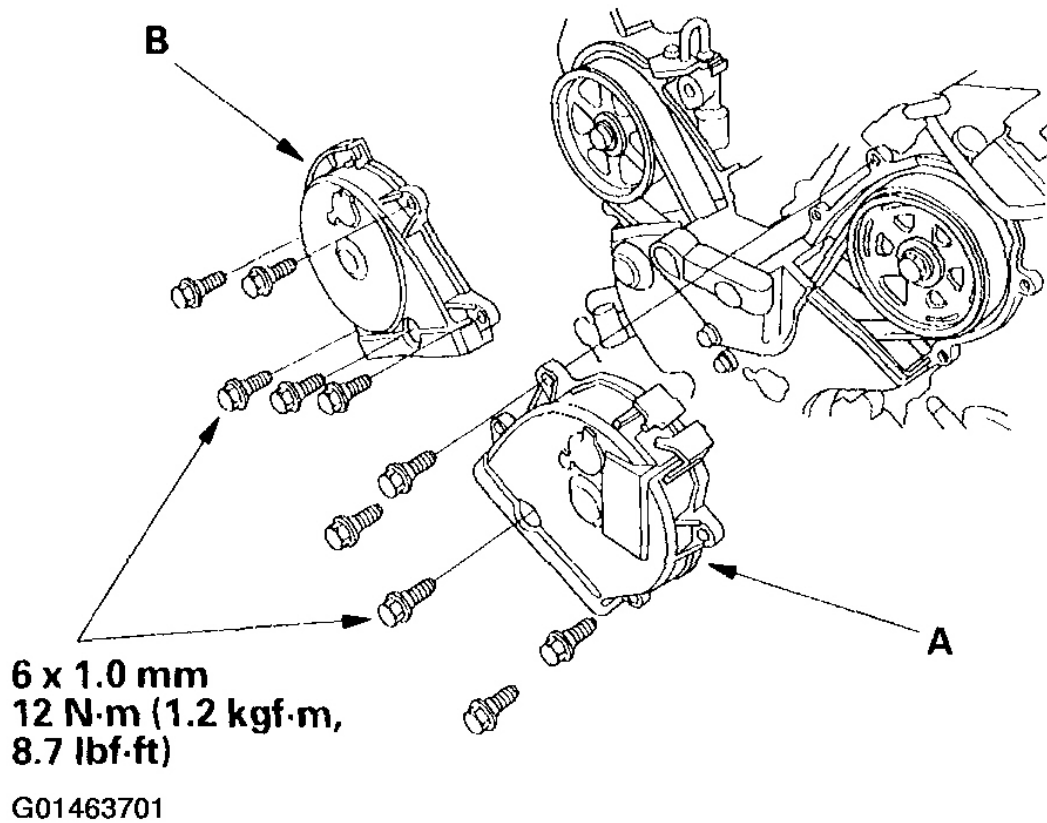
17. Install the lower cover.





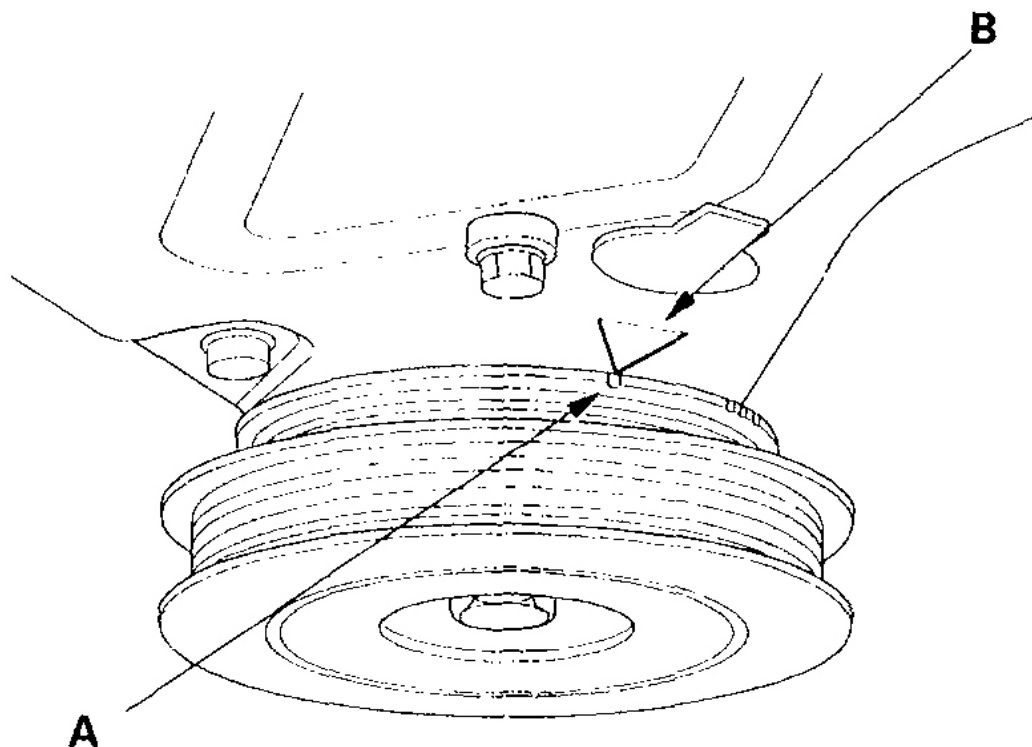
**Fig. 113: Installing The Lower Cover**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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



**Fig. 114: Installing The Front Upper Cover & Rear Upper Cover**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

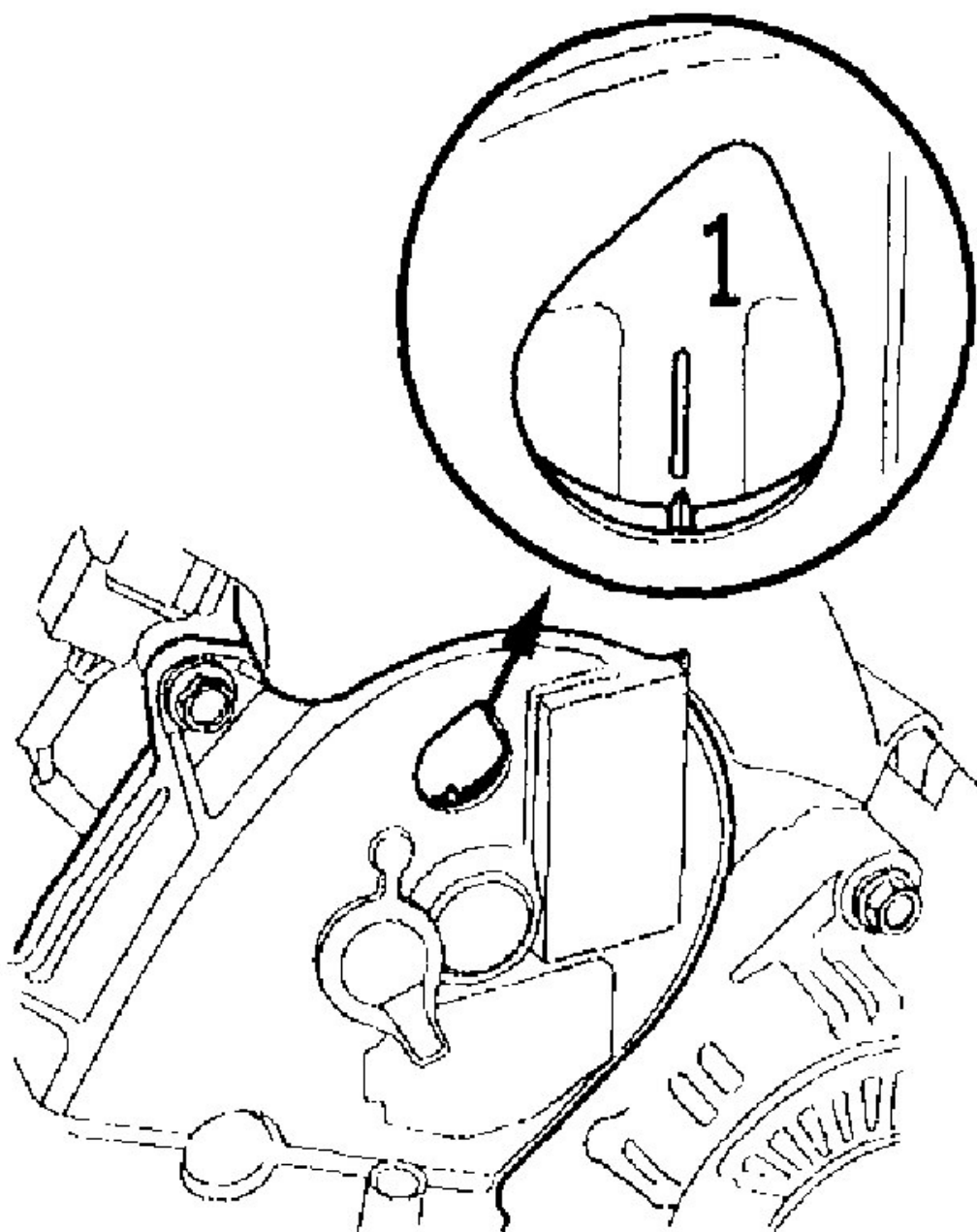
19. Install the crankshaft pulley (see [Crankshaft Pulley Removal & Installation](#) ).
20. Rotate the crankshaft pulley about five or six turns clockwise so the timing belt is positioned correctly on the pulleys.
21. Turn the crankshaft pulley so its white mark (A) lines up with the pointer (B).



G01463702

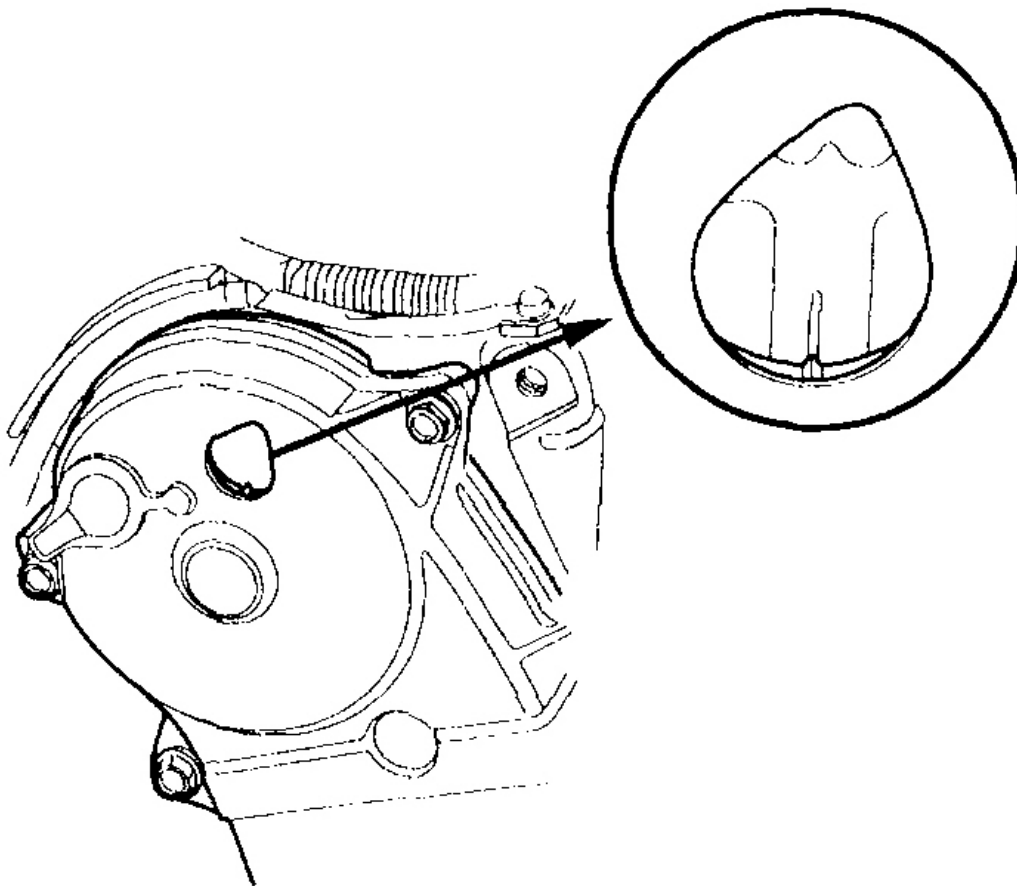
**Fig. 115: Turning The Crankshaft Pulley So Its White Mark Lines Up With The Pointer**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

22. Check the camshaft pulley marks.
- If the camshaft pulley marks are at TDC, go to step 23.
  - If the camshaft pulley marks are not at TDC, remove the timing belt and repeat step 2 through 19.



G01463703

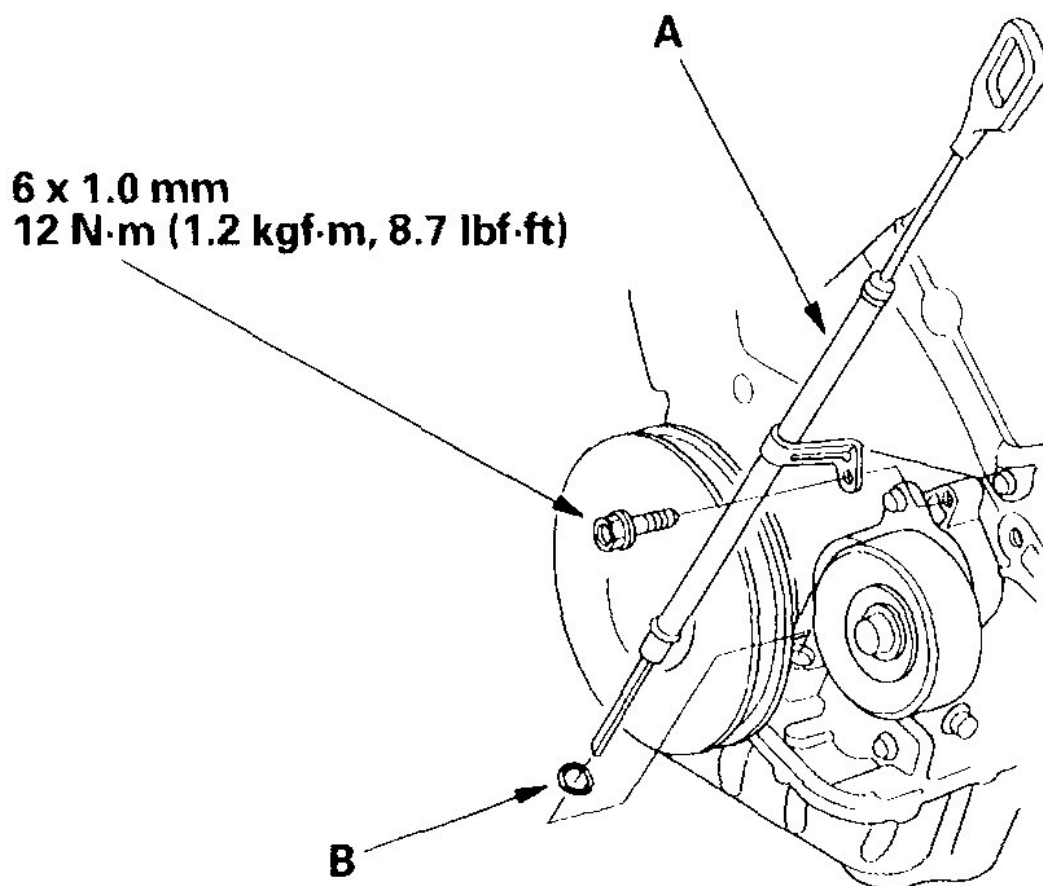
**Fig. 116: Checking The Camshaft Pulley Marks (Front Camshaft Pulley)**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.



G01463704

**Fig. 117: Checking The Camshaft Pulley Marks (Rear Camshaft Pulley)**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

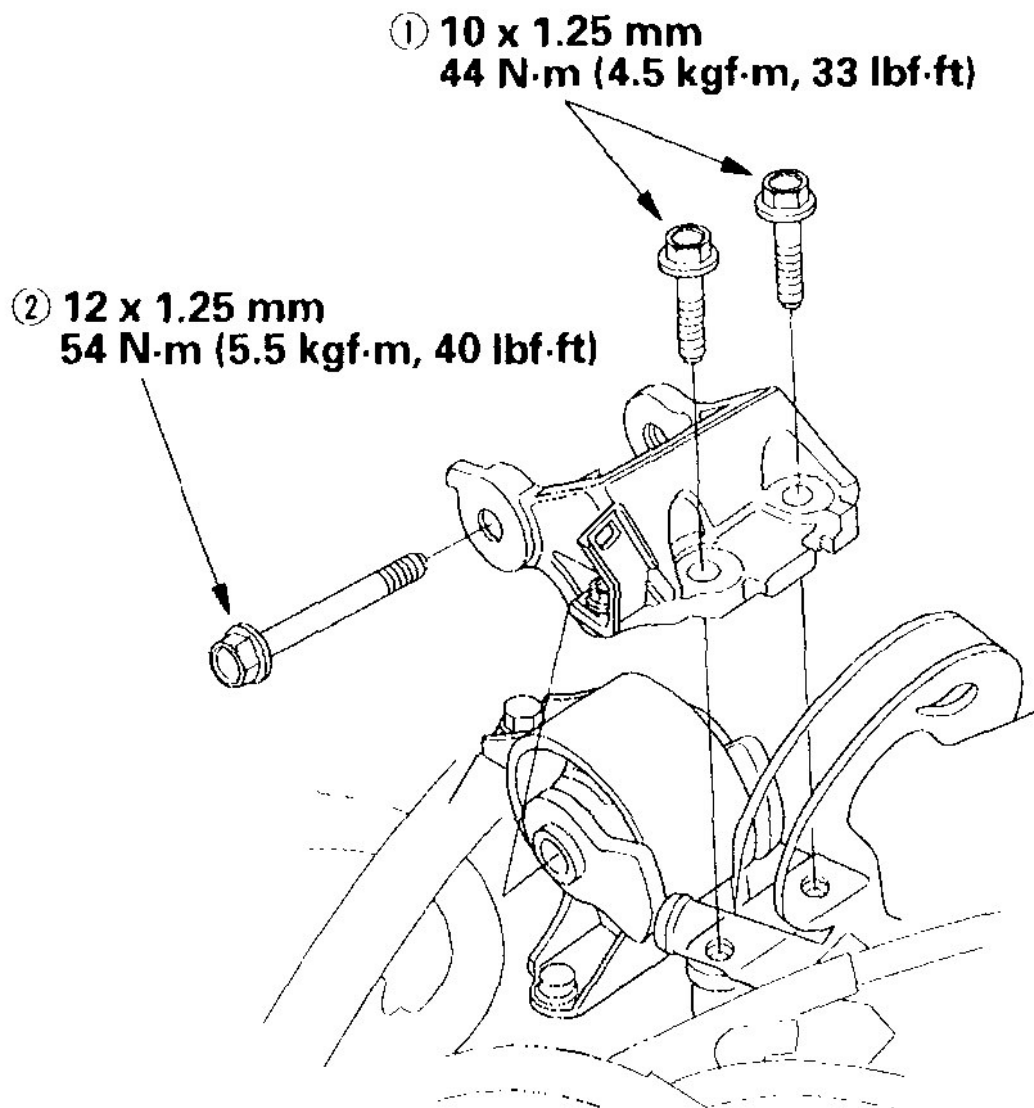
23. Install the dipstick and tube (A) with a new O-ring (B).



G01463705

**Fig. 118: Installing The Dipstick & And Tube**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

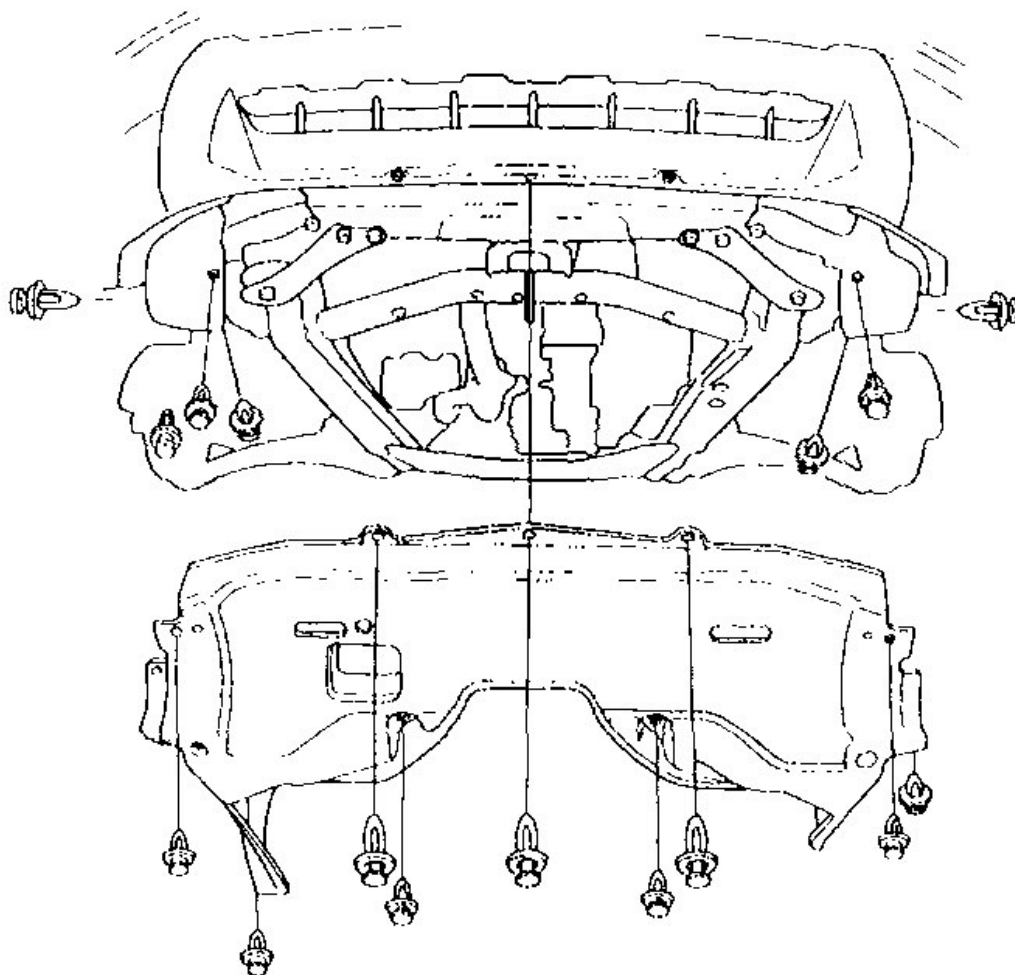
24. Install and adjust the power steering (P/S) pump belt (see **PUMP BELT INSPECTION & ADJUSTMENT** ).
25. Install the alternator-compressor belt.
26. Install the side engine mount bracket, then tighten the mounting bolts in the numbered sequence shown.



G01463706

**Fig. 119: Installing The Side Engine Mount Bracket**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

27. Install the splash shield.

**G01463707****Fig. 120: Installing The Splash Shield****Courtesy of AMERICAN HONDA MOTOR CO., INC.**

28. Install the front tires/wheels.

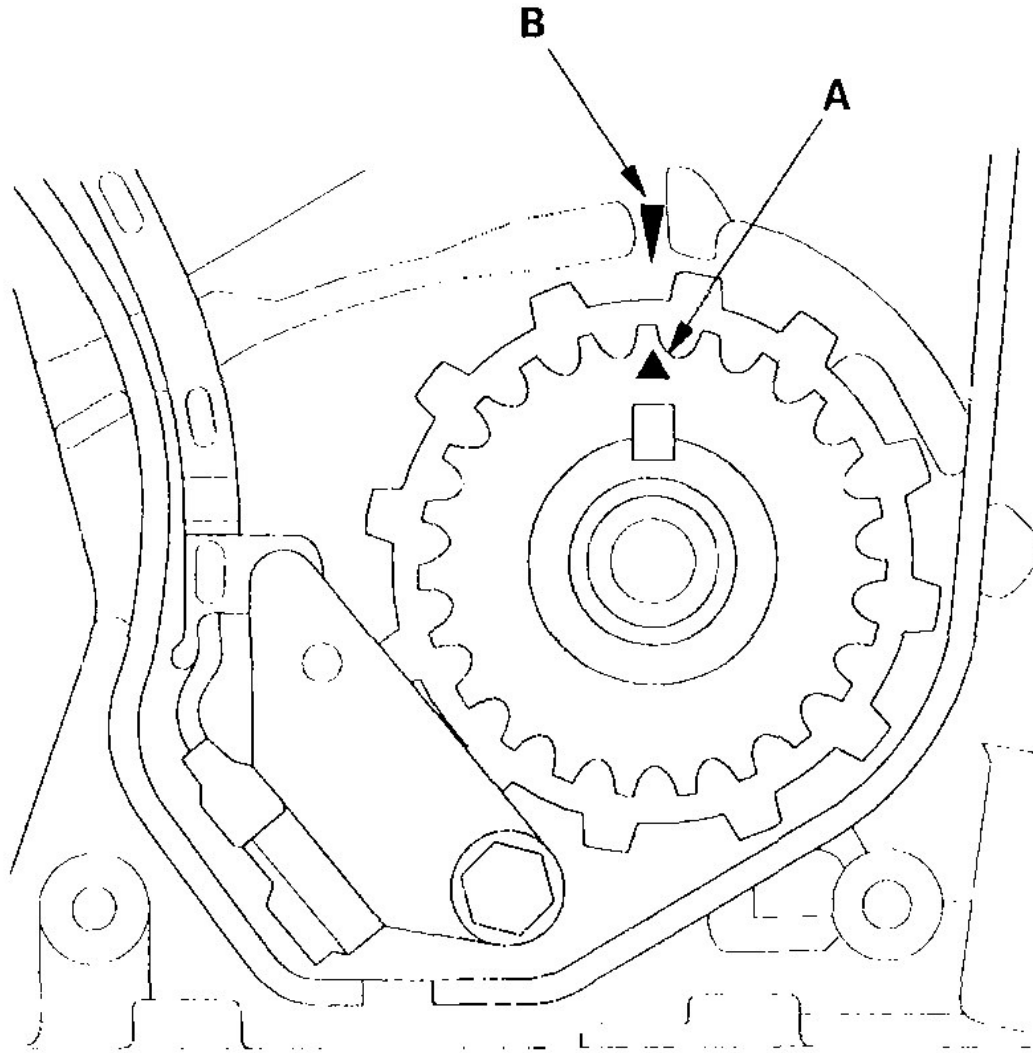
**Used Belt**

Follow this procedure when installing a used timing belt.

1. Clean the timing belt drive pulleys, crankshaft, camshaft pulleys timing belt guide plate, and the upper and lower covers.
2. Set the timing belt drive pulley to TDC by aligning the TDC mark (A) on the tooth of the timing belt



drive pulley with the pointer (B) on the oil pump.

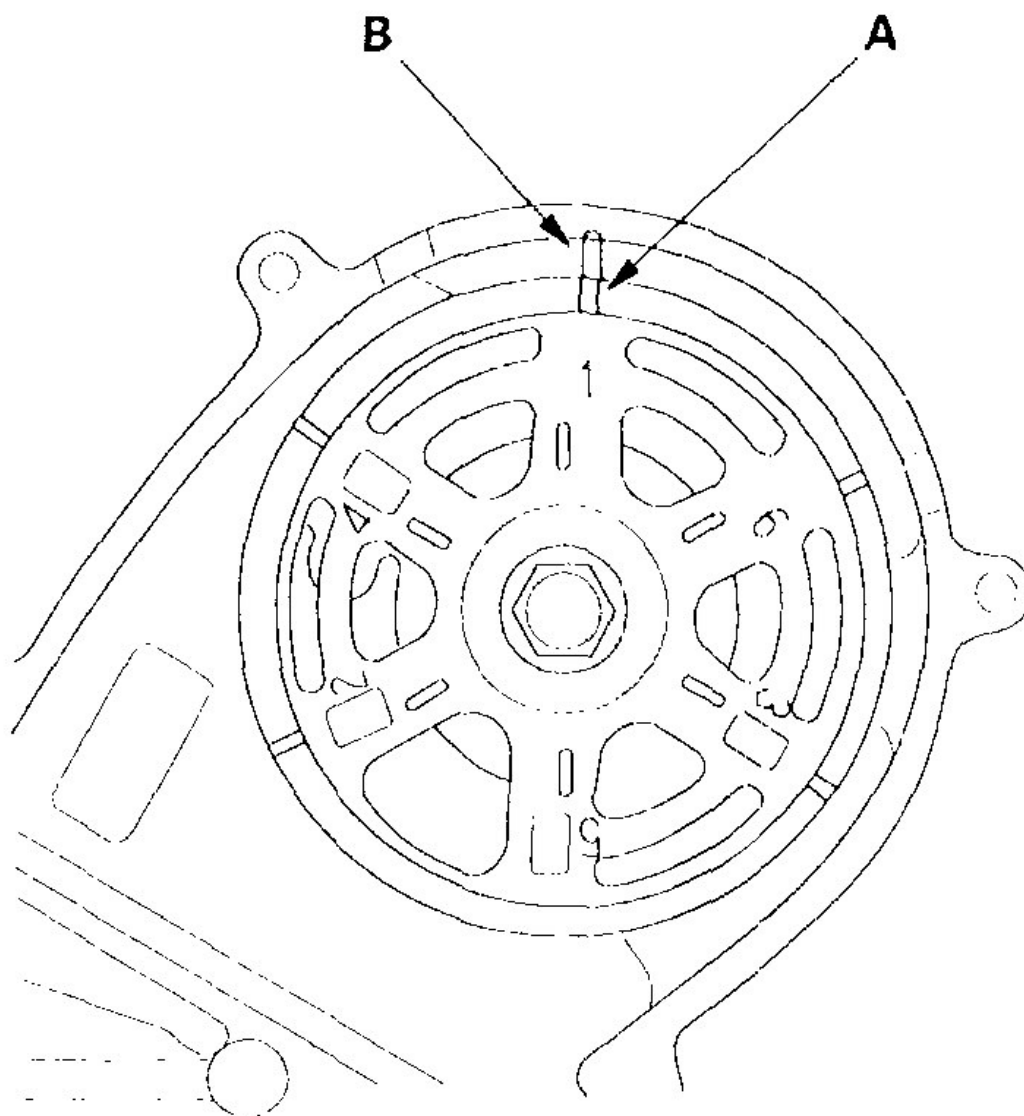


G01463708

**Fig. 121: Aligning The TDC Mark On The Tooth Of The Timing Belt Drive Pulley With The Pointer On The Oil Pump**

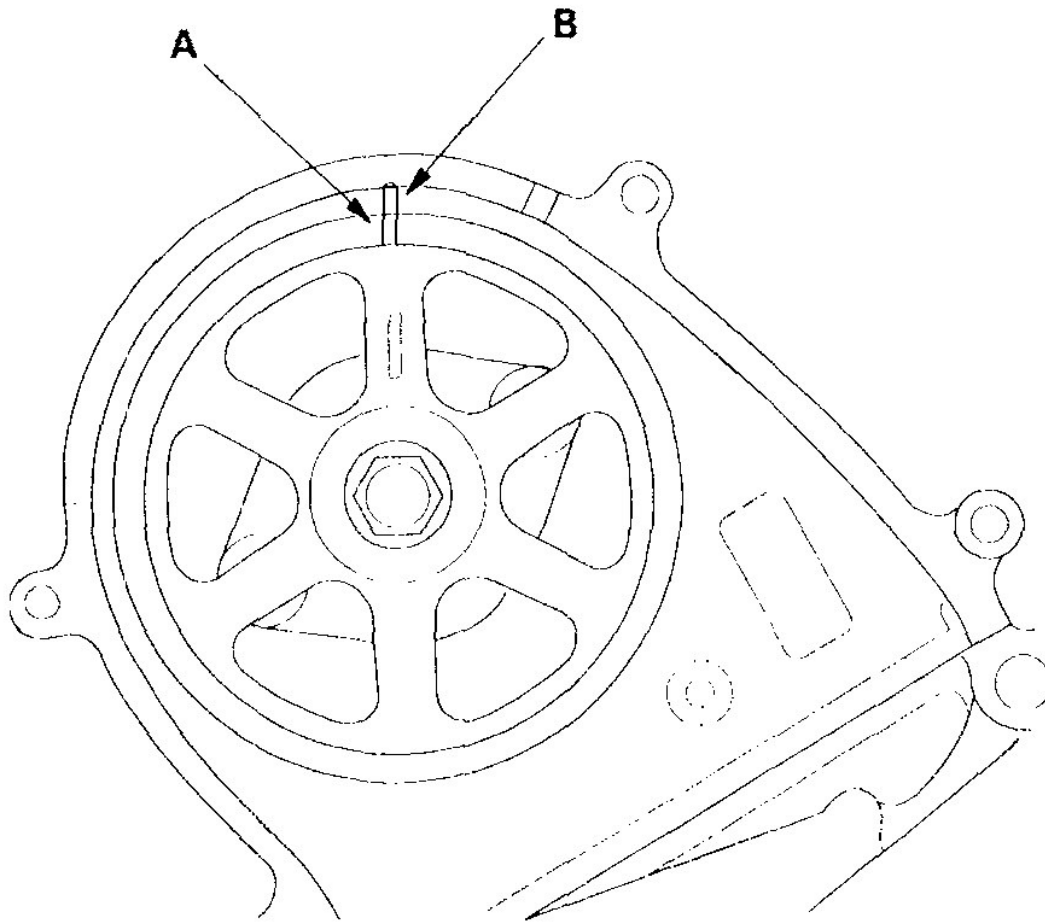
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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.



G01463709

**Fig. 122: Aligning The TDC Marks On The Camshaft Pulleys With The Pointers On The Back Covers (Front)**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.



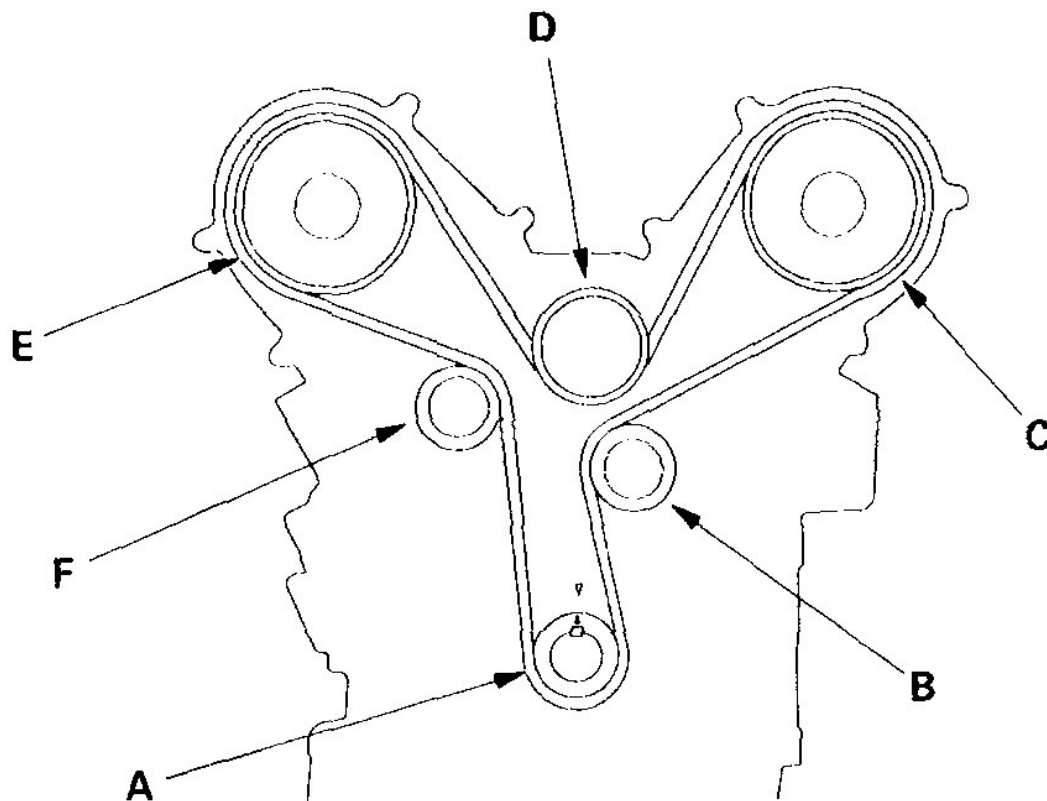
G01463710

**Fig. 123: Aligning The TDC Marks On The Camshaft Pulleys With The Pointers On The Back Covers (Rear)**

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

4. If the auto-tensioner has extended and the timing belt cannot be installed, perform the new belt installation procedure.
5. Apply liquid thread lock to the idler pulley bolt, then loosely install the idler pulley.
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.
  - a. Drive pulley (A).
  - b. Idler pulley (B).
  - c. Front camshaft pulley (C).
  - d. Water pump pulley (D).
  - e. Rear camshaft pulley (E).

f. Adjusting pulley (F).

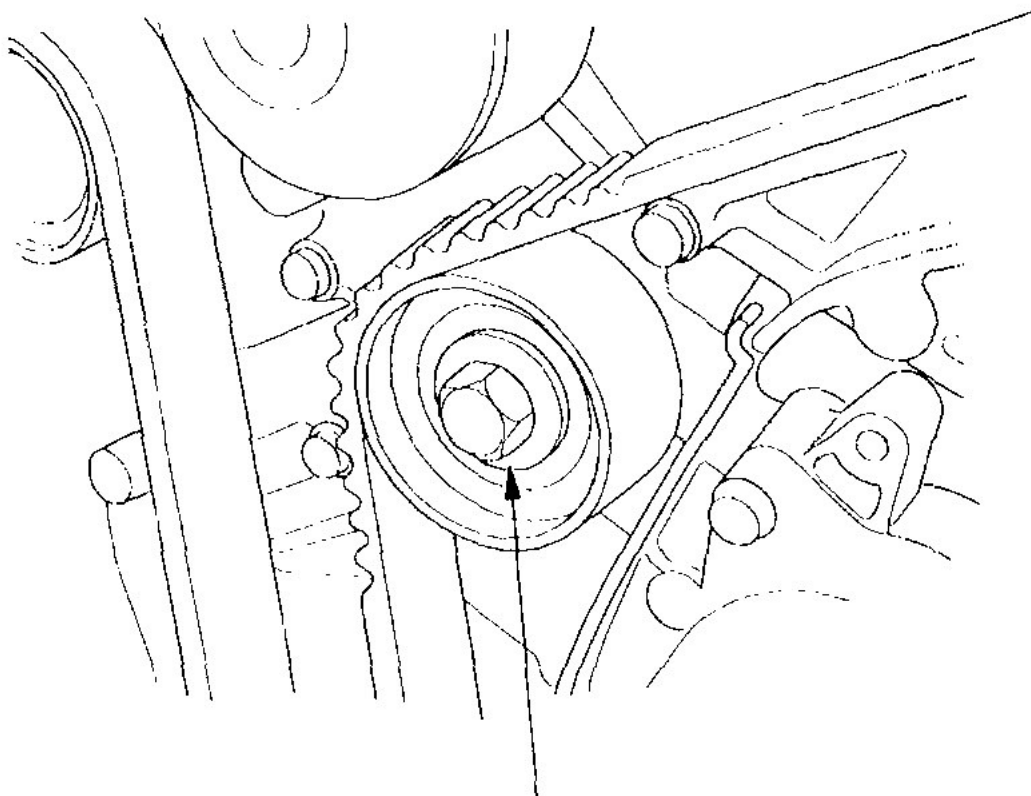


G01463711

**Fig. 124: Installing The Timing Belt**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Tighten the idler pulley bolt.

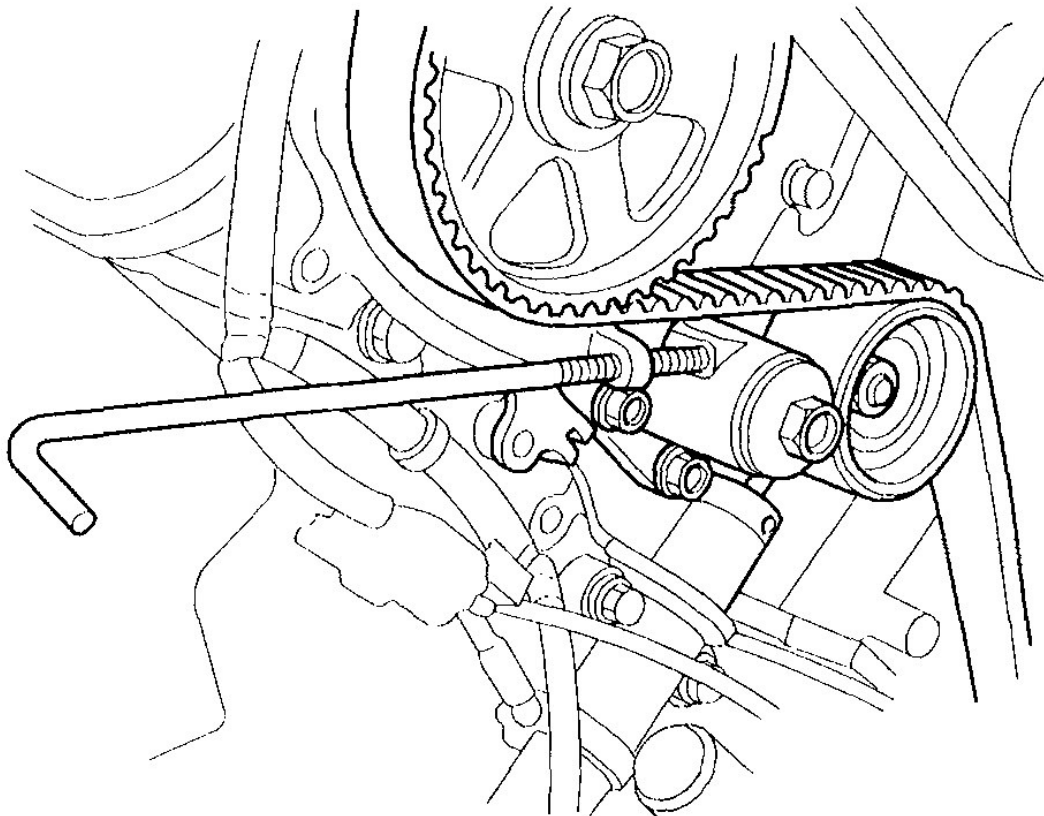


**10 x 1.25 mm  
44 N·m (4.5 kgf·m, 33 lbf·ft)**

**G01463712**

**Fig. 125: Tightening The Idler Pulley Bolt**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



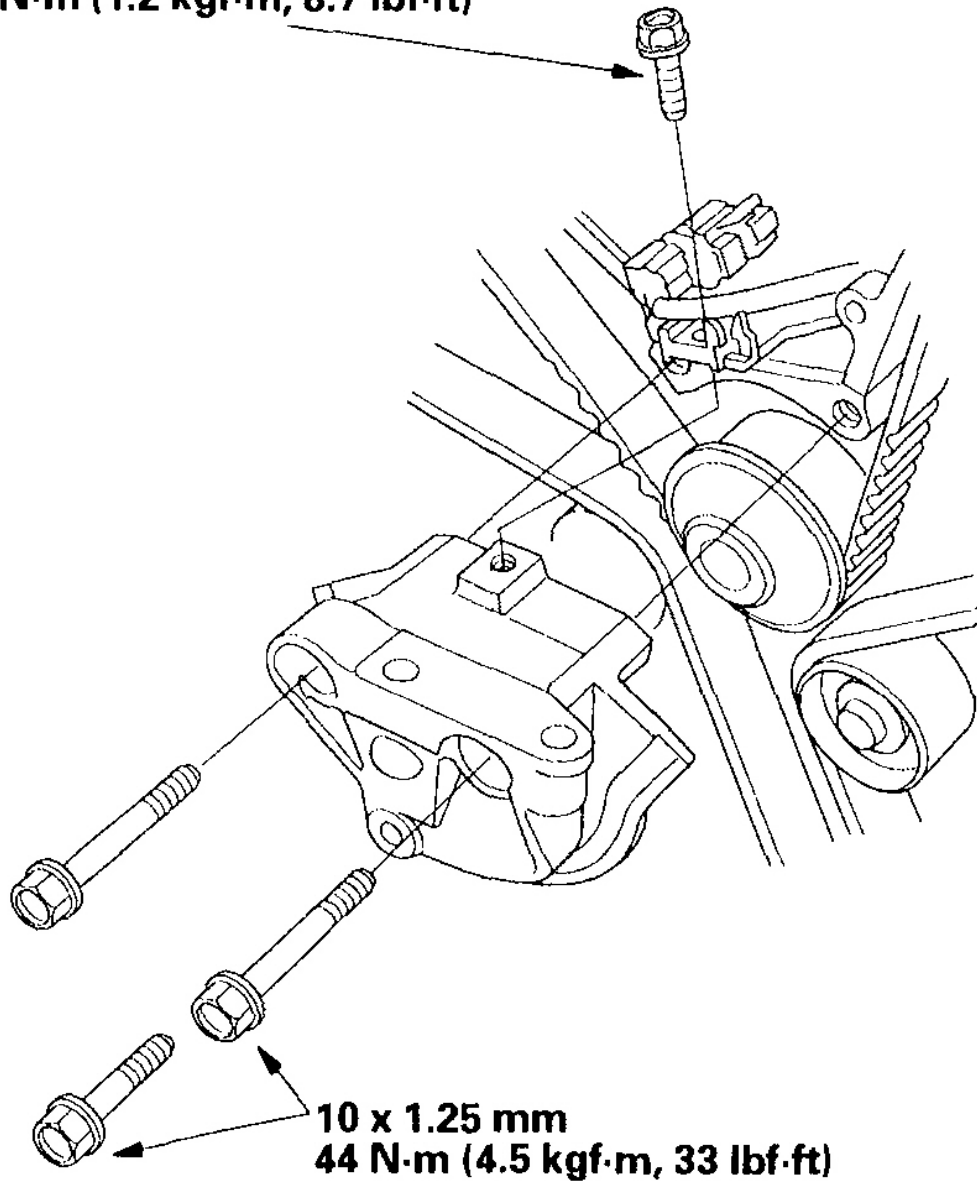
G01463713

**Fig. 126: Removing The Battery Clamp Bolt From The Back Cover**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Install the side engine mount bracket.

**6 x 1.0 mm**

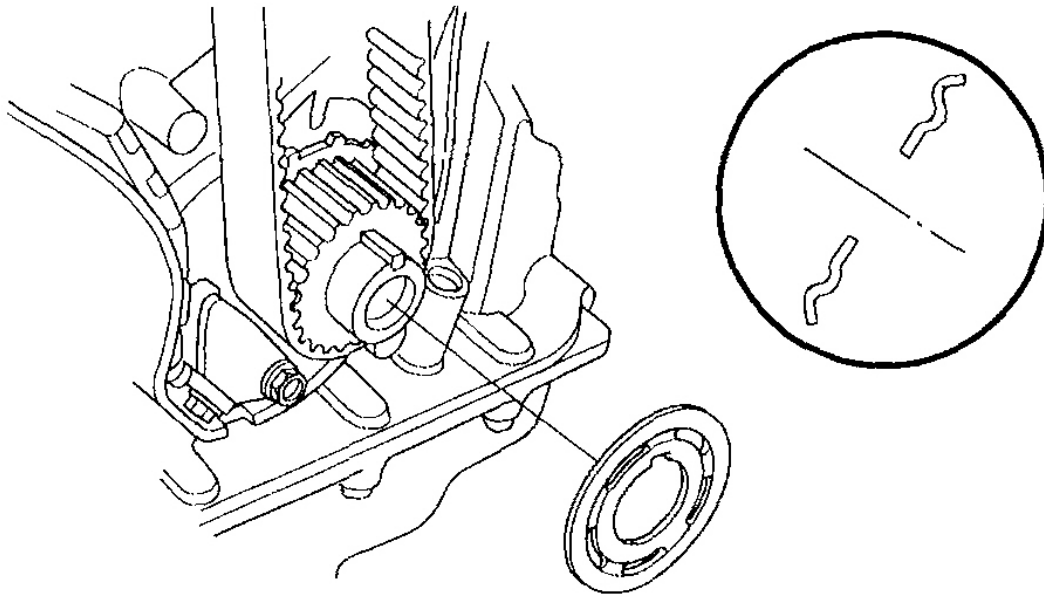
**12 N·m (1.2 kgf·m, 8.7 lbf·ft)**



G01463714

**Fig. 127: Installing The Side Engine Mount Bracket**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Install the timing belt guide plate as shown.

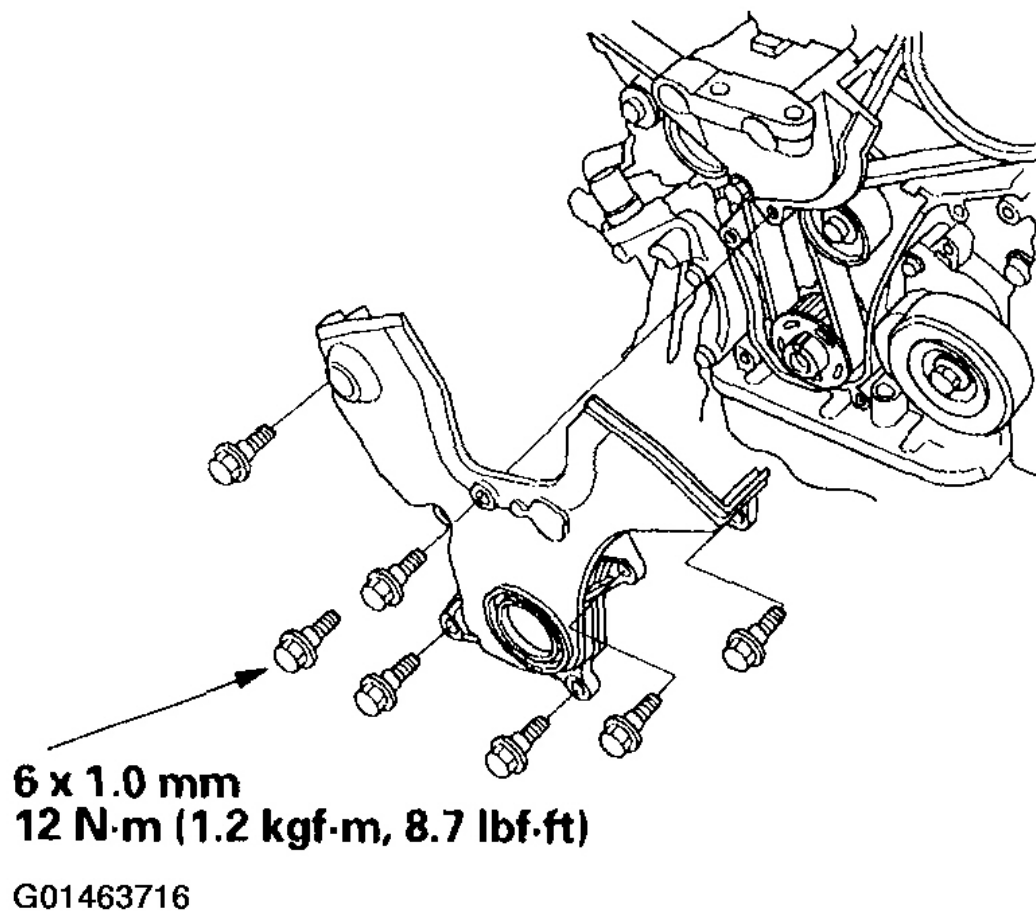


**G01463715**

**Fig. 128: Installing The Timing Belt Guide Plate**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

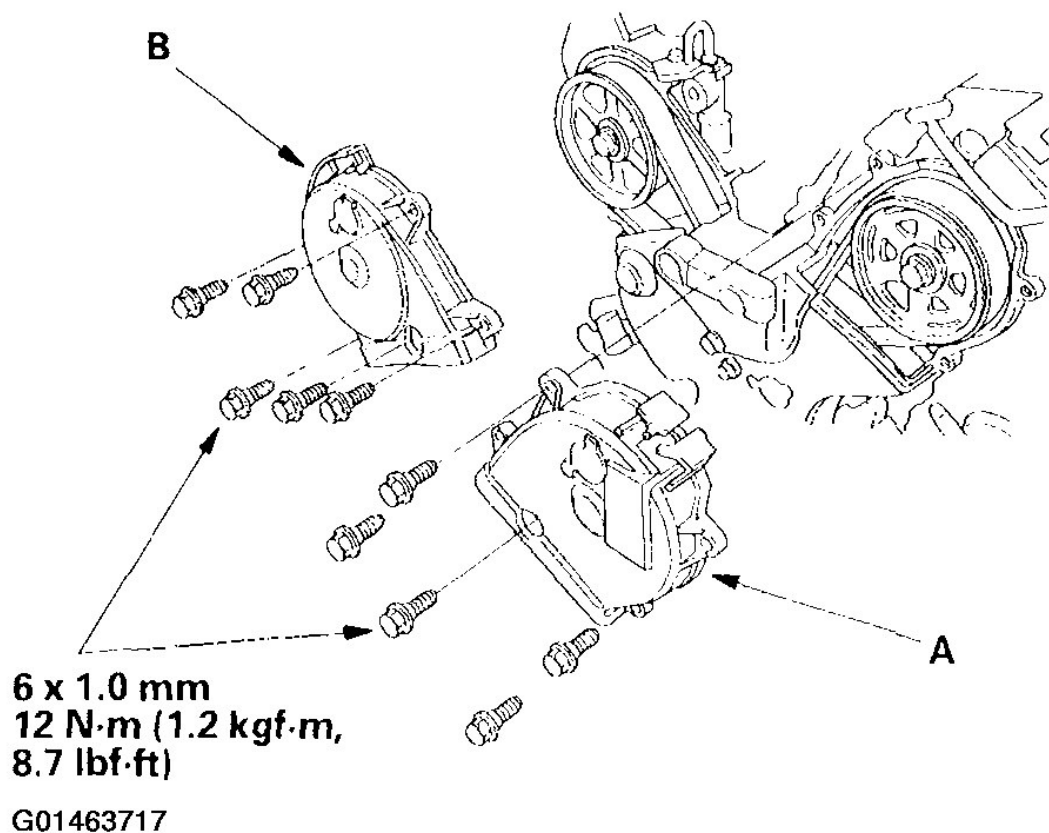
11. Install the lower cover.





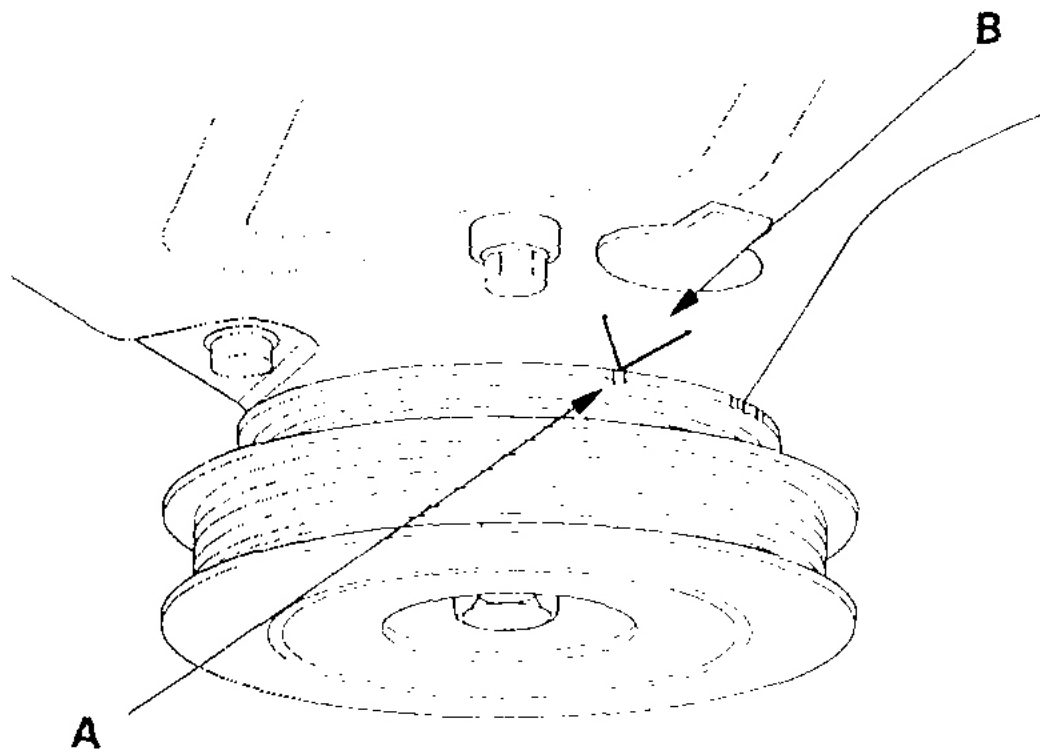
**Fig. 129: Installing The Lower Cover**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



**Fig. 130: Installing The Front Upper Cover & Rear Upper Cover**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

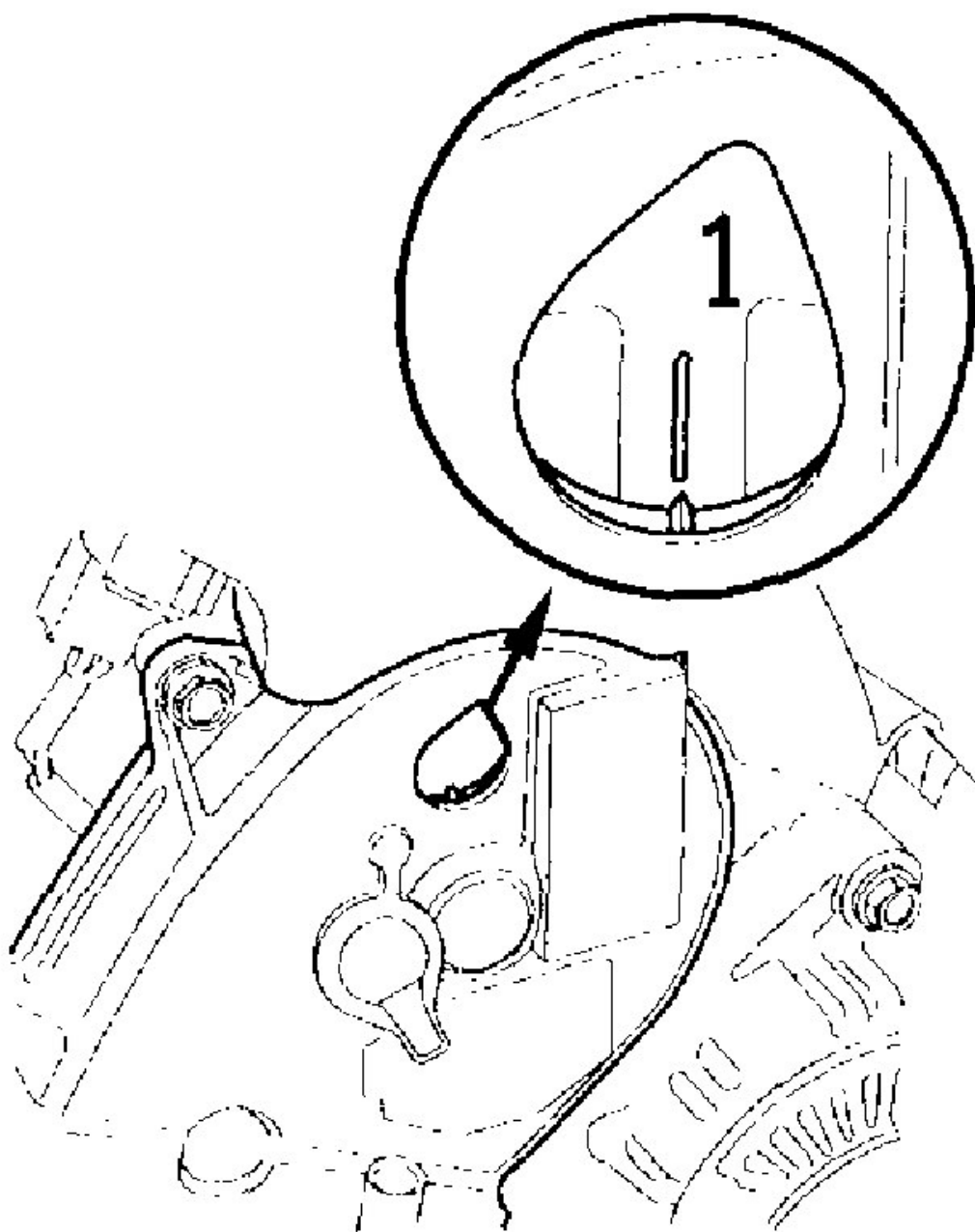
13. Install the crankshaft pulley (see [Crankshaft Pulley Removal & Installation](#) ).
14. Rotate the crankshaft pulley about five or six turns clockwise so the timing belt is positioned correctly on the pulleys.
15. Turn the crankshaft pulley so its white mark (A) lines up with the pointer (B).



G01463718

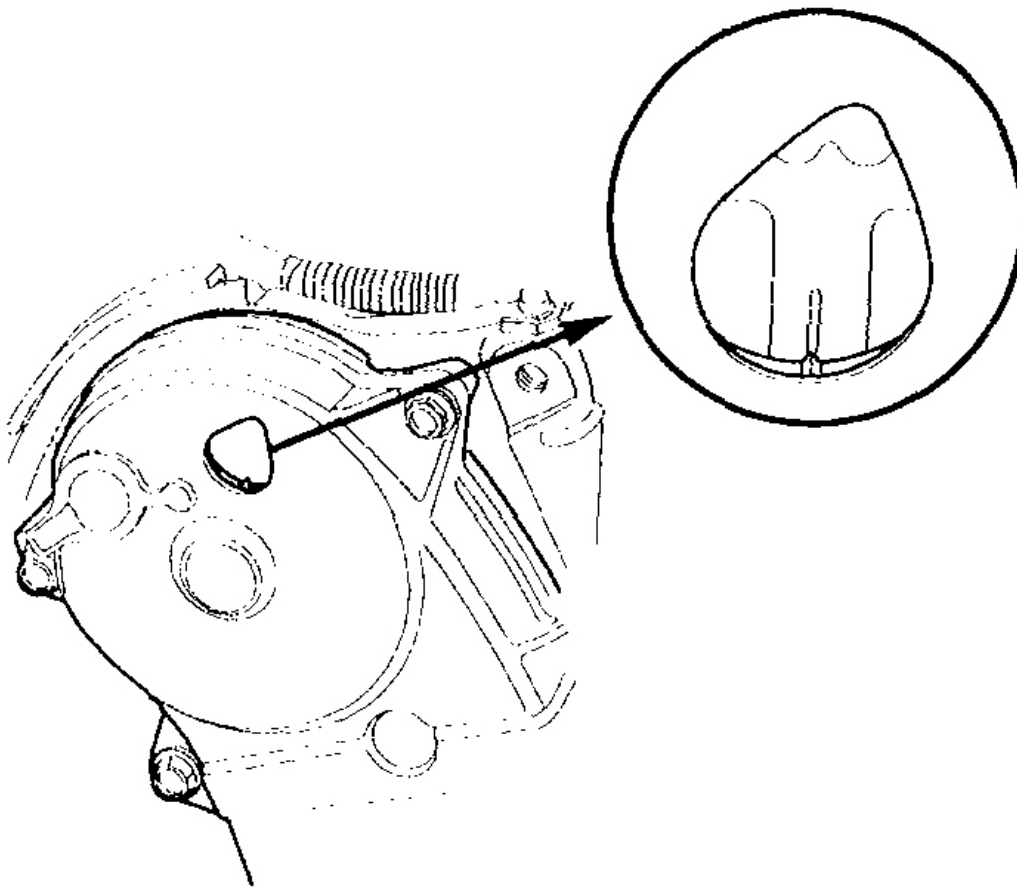
**Fig. 131: Turning The Crankshaft Pulley So Its White Mark Lines Up With The Pointer**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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 step 2 through 13 .



G01463719

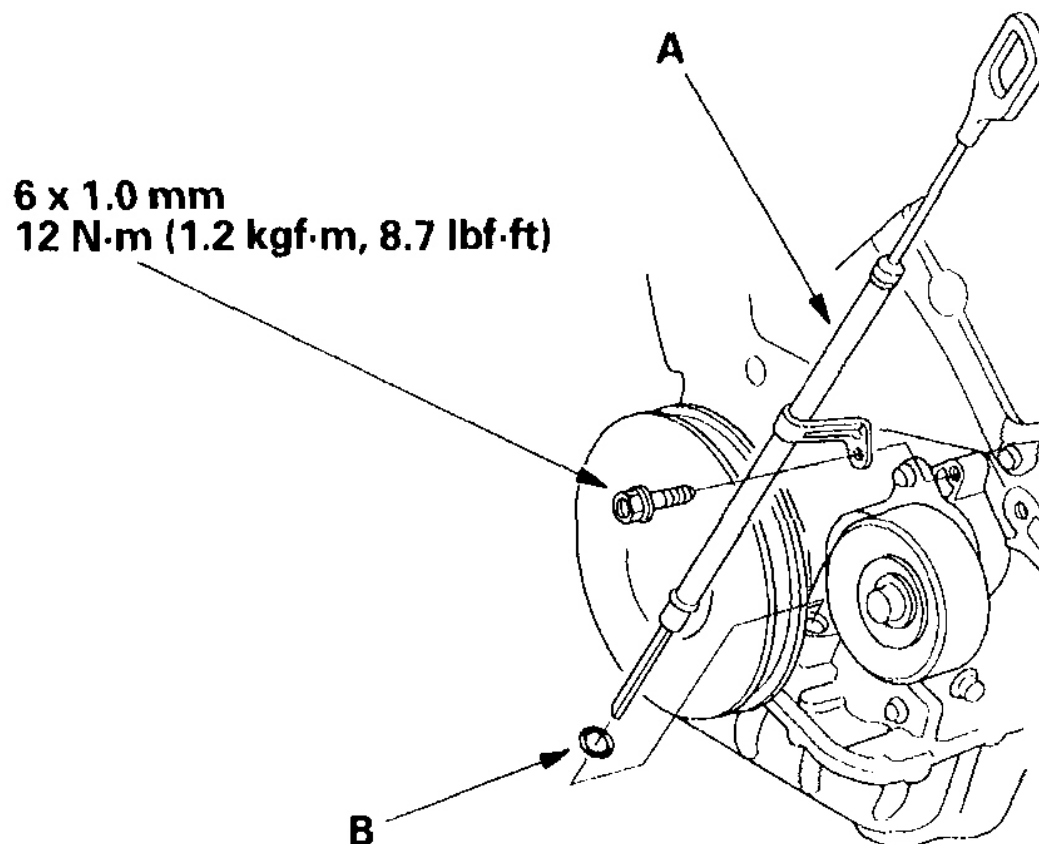
**Fig. 132: Checking The Camshaft Pulley Marks (Front Camshaft Pulley)**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.



G01463720

**Fig. 133: Checking The Camshaft Pulley Marks (Rear Camshaft Pulley)**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

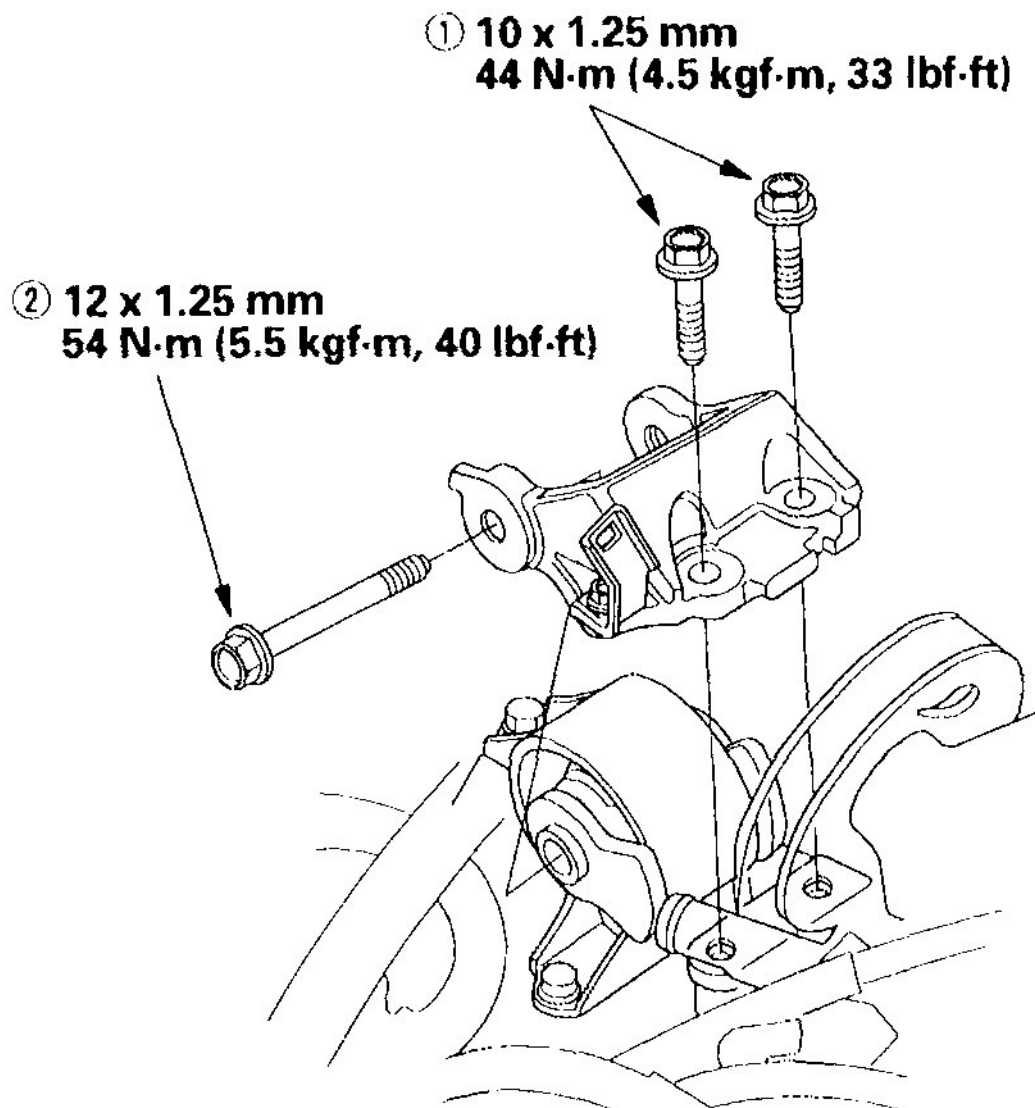
17. Install the dipstick and tube (A) with a new O-ring (B).



G01463721

**Fig. 134: Installing The Dipstick & Tube**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

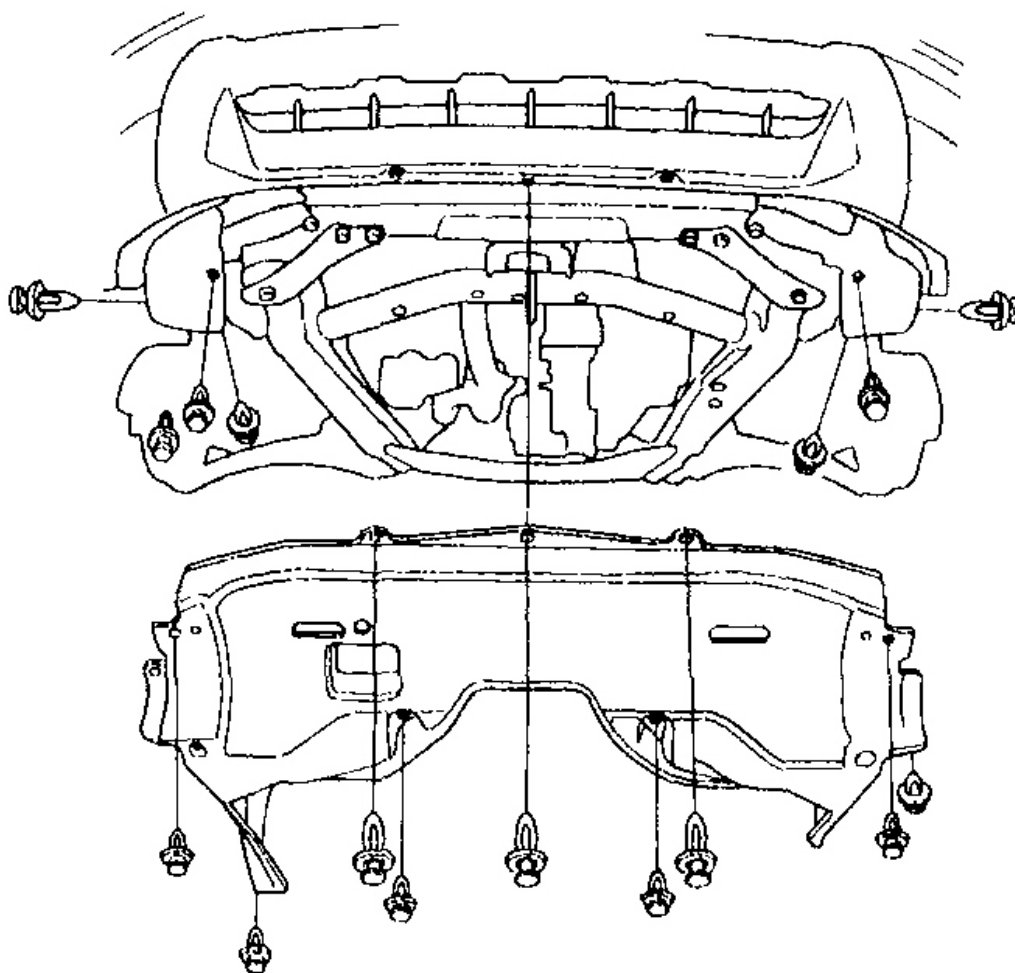
18. Install and adjust the P/S pump belt (see **PUMP BELT INSPECTION & ADJUSTMENT** ).
19. Install the alternator-compressor belt.
20. Install the side engine mount bracket, then tighten the mounting bolts in the numbered sequence shown.



G01463722

**Fig. 135: Installing The Side Engine Mount Bracket**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

21. Install the splash shield.



G01463723

**Fig. 136: Installing The Splash Shield**

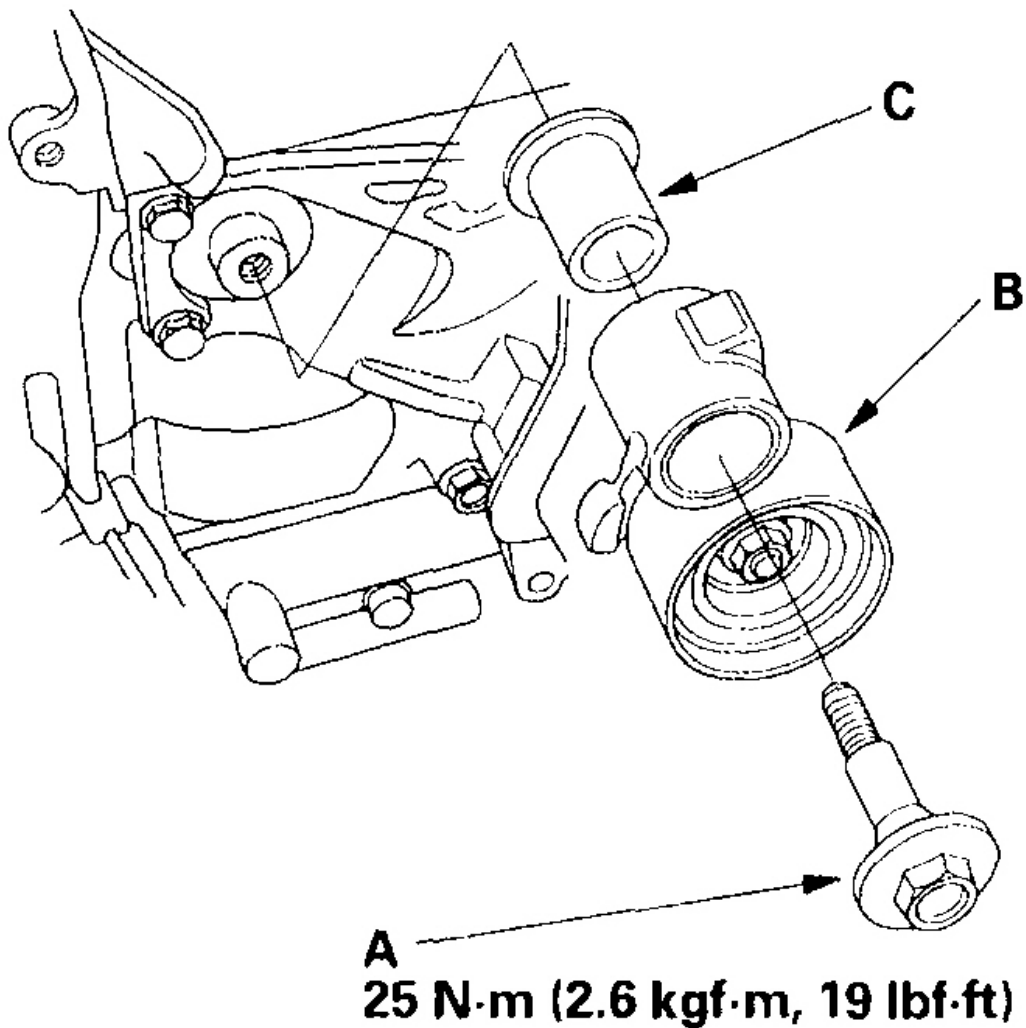
Courtesy of AMERICAN HONDA MOTOR CO., INC.

22. Install the front tires/wheels.

**TIMING BELT ADJUSTER REPLACEMENT**

1. Remove the timing belt (see **Timing Belt Removal** ).
2. Remove the auto-tensioner .
3. Remove the bolt (A), then remove the timing belt adjuster (B) and collar (C).





G01463724

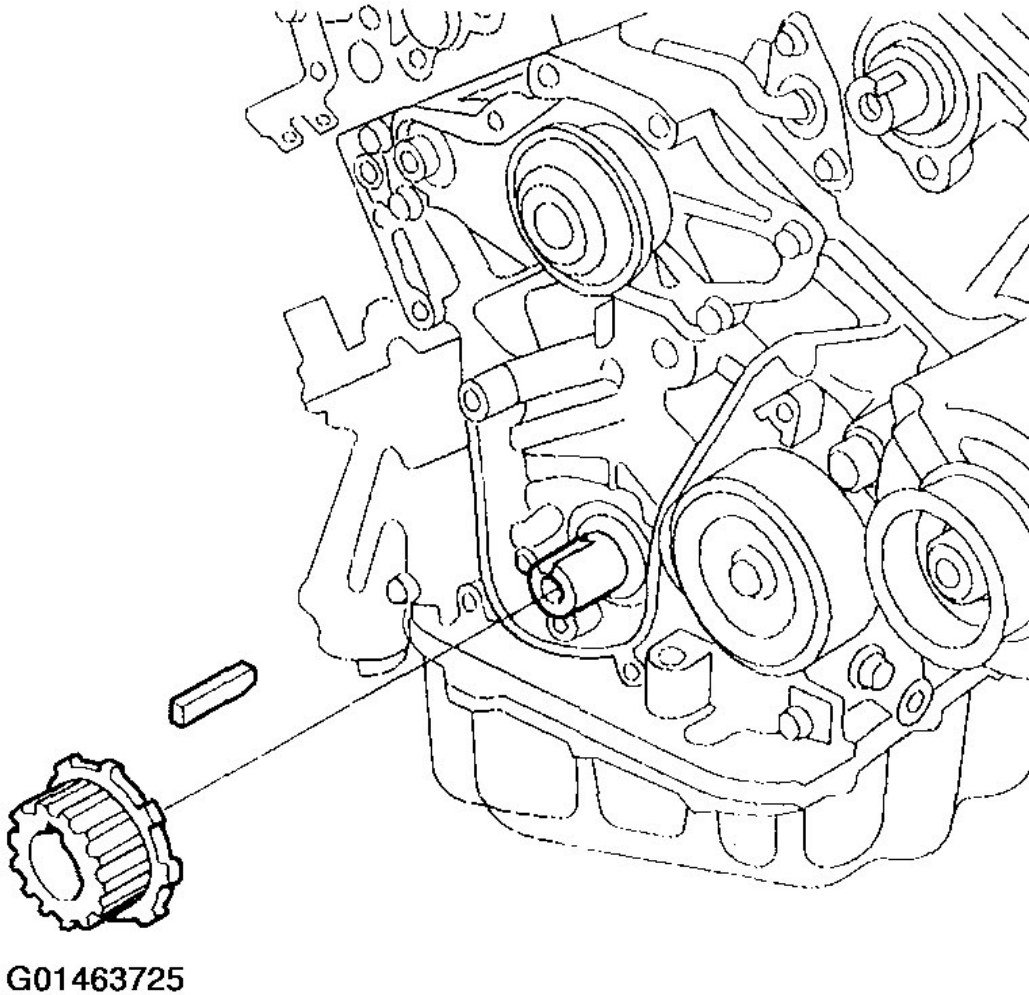
**Fig. 137: Removing The Bolt, The Timing Belt Adjuster & Collar**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Install the timing belt adjuster.
5. Install the timing belt (see **Timing Belt Installation** ).

#### **TIMING BELT DRIVE PULLEY REPLACEMENT**

1. Remove the timing belt (see **Timing Belt Removal** ).
2. Remove the crankshaft position (CKP) sensor (see **CKP SENSOR REPLACEMENT** ).

3. Remove the timing belt drive pulley.

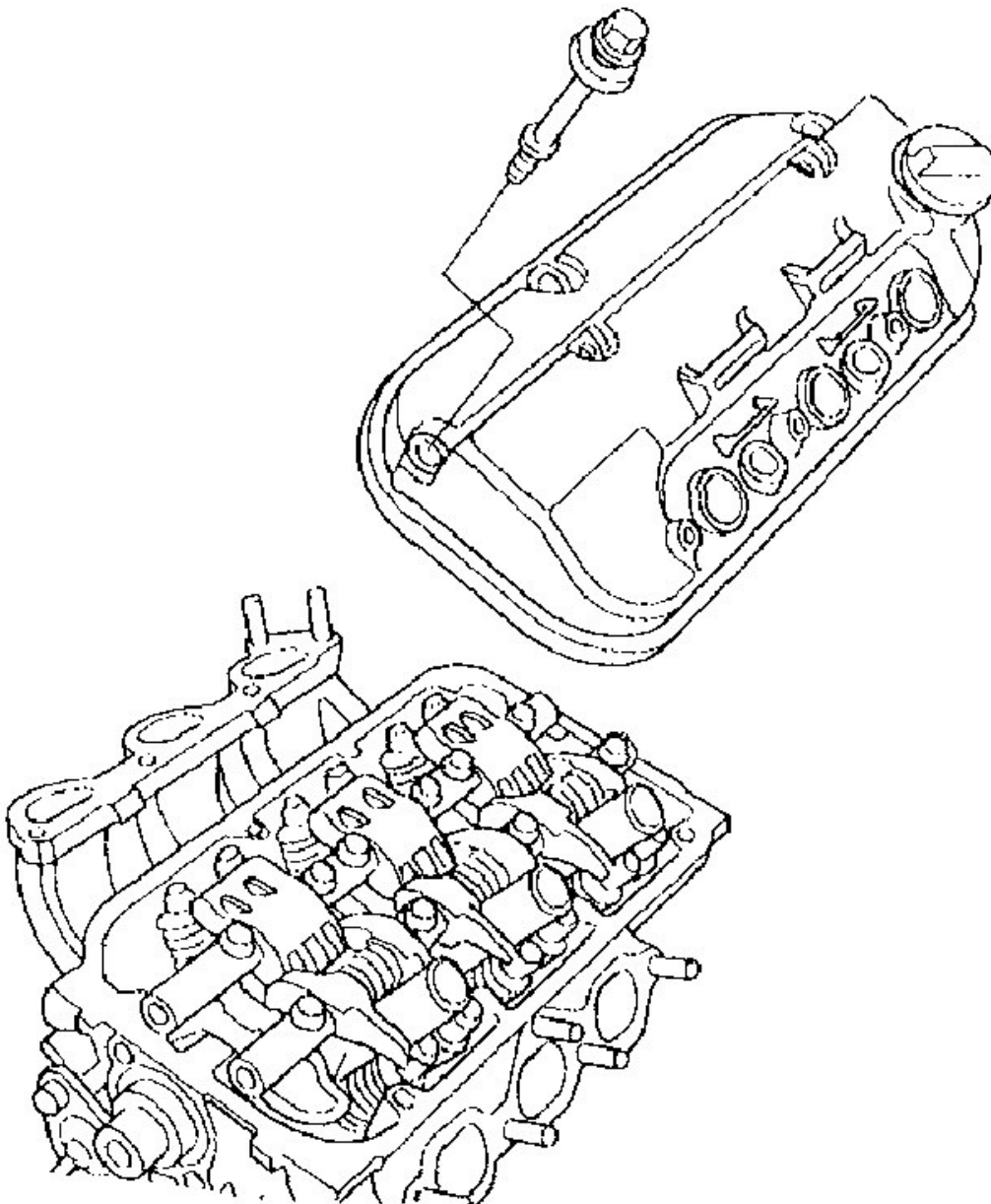


**Fig. 138: Removing The Timing Belt Drive Pulley**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Check the timing belt drive pulley for damage. If the timing belt drive pulley is damaged, replace the timing belt drive pulley.
5. Install the new timing belt drive pulley.
6. Install the CKP sensor (see **CKP SENSOR REPLACEMENT** ).
7. Install the timing belt (see **Timing Belt Installation** ).

#### **CYLINDER HEAD COVER REMOVAL**

1. Remove the intake manifold (see **Intake Manifold Removal & Installation** ).
2. Remove the six ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION** ).
3. Remove the cylinder head cover.

**G01463726**

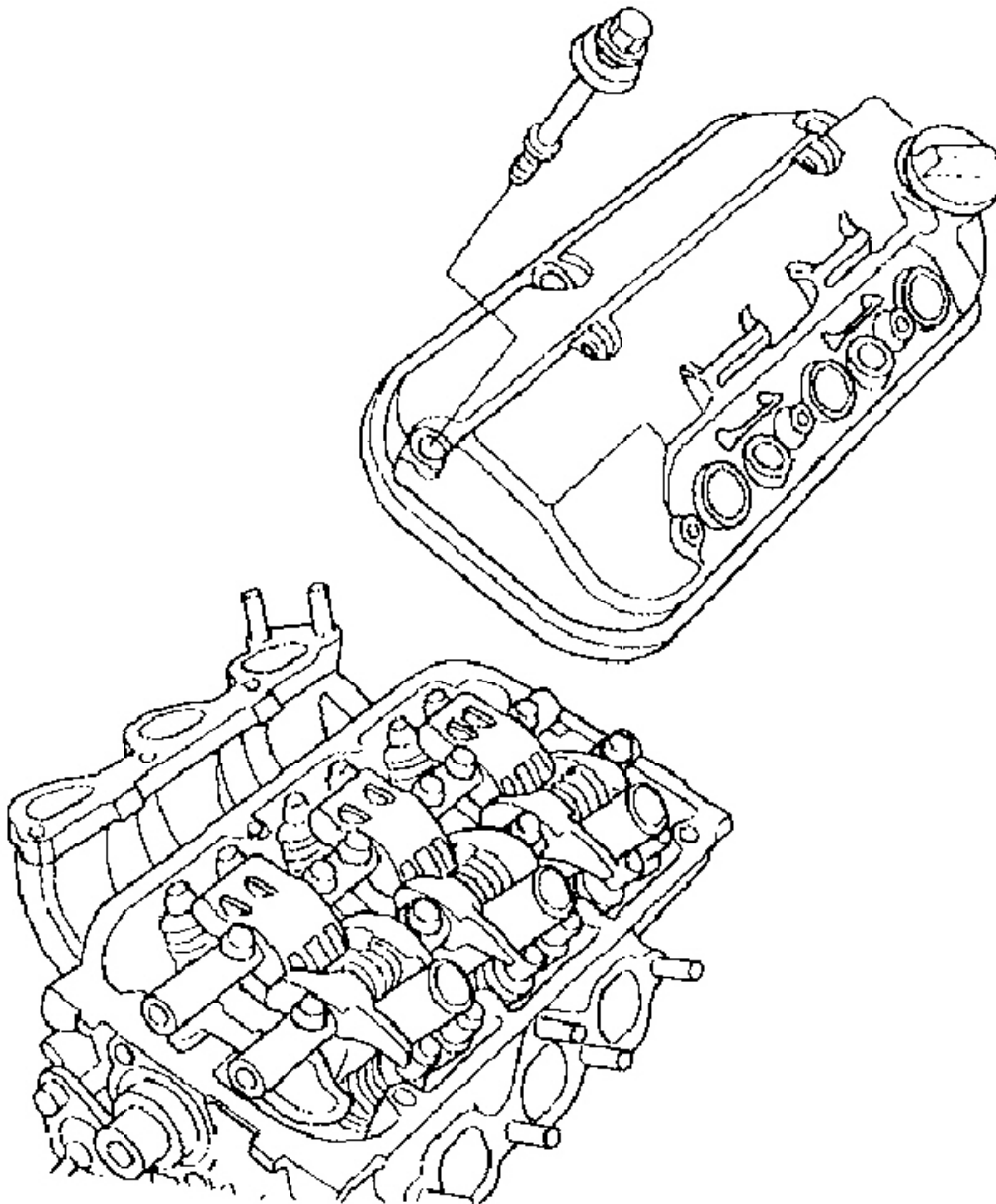
**Fig. 139: Removing The Cylinder Head Cover**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

## CYLINDER HEAD COVER INSTALLATION

**NOTE:**

- Before installing the cylinder head cover, clean the cylinder head contacting surfaces with a shop towel.
- Take care not damage the spark plug seal when installing the cylinder head cover.
- Visually check the spark plug seals for damage.
- Replace the washer if it is damaged or deteriorated.

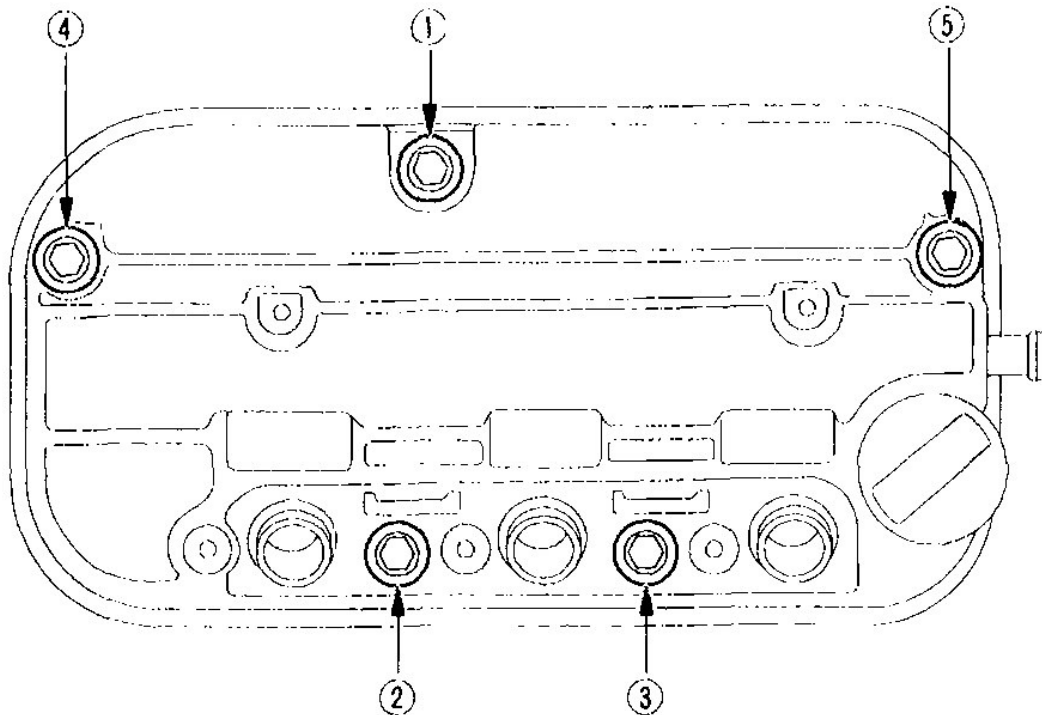
1. Install the cylinder head covers.



**G01463727**

**Fig. 140: Installing The Cylinder Head Covers**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Tighten the nuts in two or three steps. In the final step, tighten all nuts, in sequence, to 12 N.m (1.2 kgf.m, 8.7 lbf.ft).



G01463728

**Fig. 141: Identifying Nut Tightening Sequence**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the six ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION** ).
4. Install the intake manifold (see **Intake Manifold Removal & Installation** ).

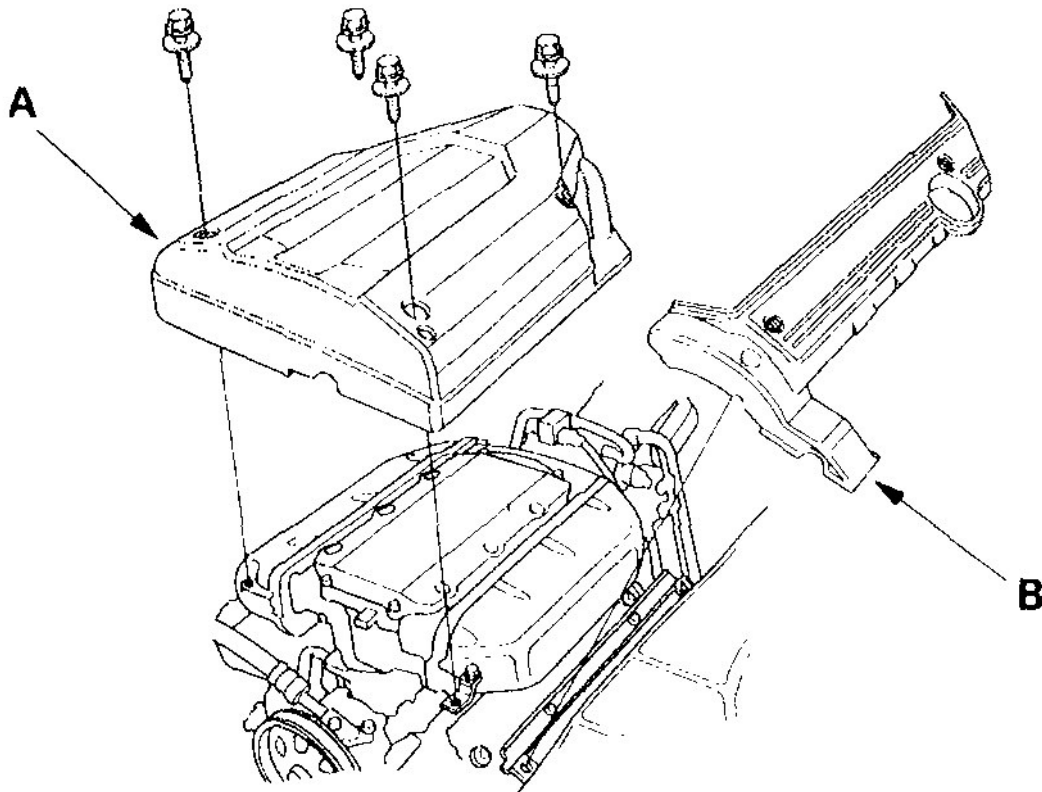
## CYLINDER HEAD REMOVAL

### NOTE:

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

1. Make sure you have the anti-theft codes for the radio and the navigation system, then write down the frequencies for the radio's preset buttons.

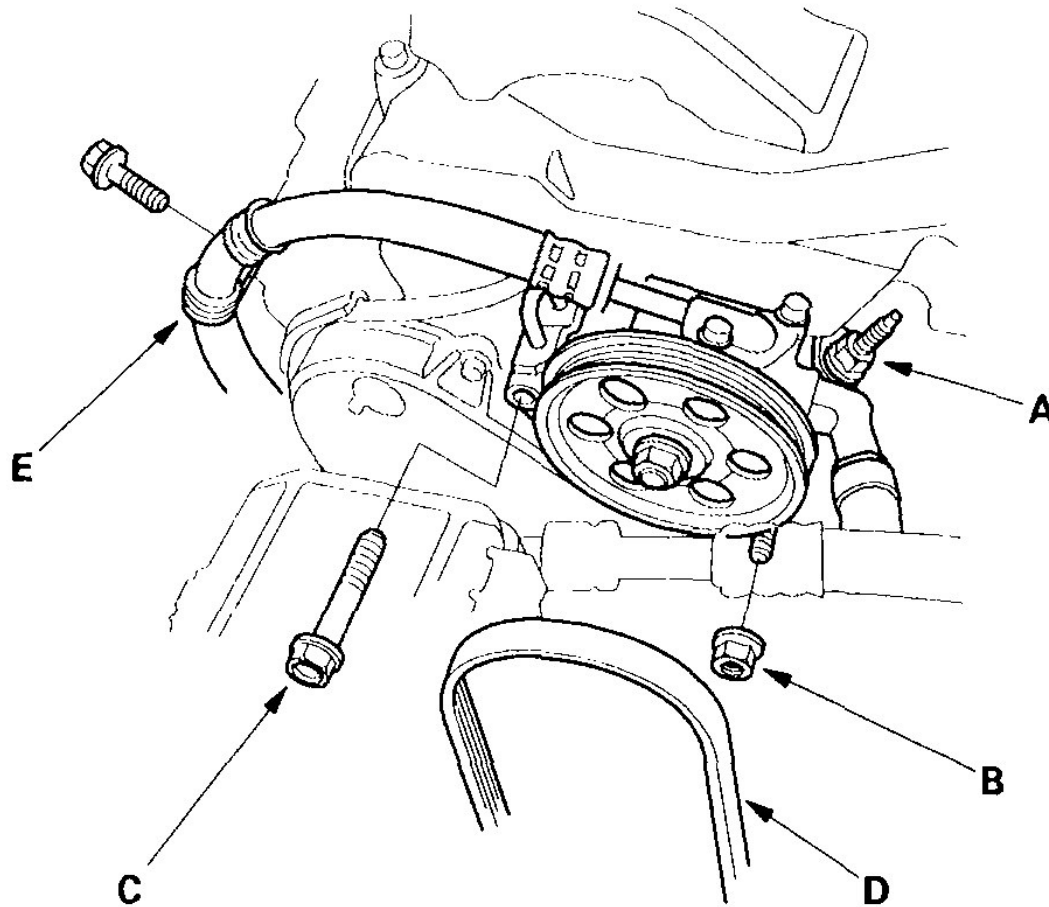
2. Disconnect the battery negative cable from the battery.
3. Drain the engine coolant (see **COOLANT REPLACEMENT** ).
4. Remove the alternator-compressor belt (see **ALTERNATOR BELT** ).
5. Remove the intake manifold cover (A) and ignition coil cover (B).



G01463729

**Fig. 142: Removing The Intake Manifold Cover & Ignition Coil Cover**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Loosen the adjusting nut (A), and remove the locknut (B) and mounting bolt (C), then remove the power steering (P/S) pump belt (D) and pump without disconnecting the P/S hoses.



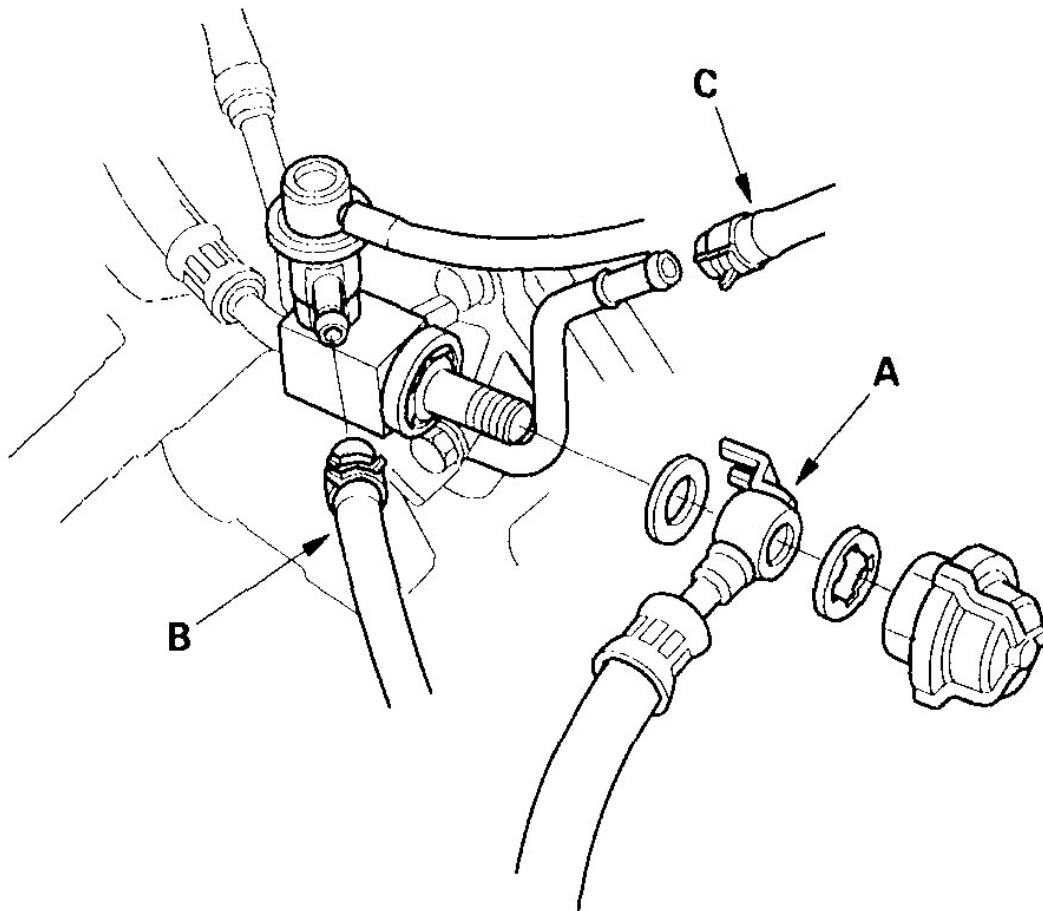
G01463730

**Fig. 143: Loosening The Adjusting Nut, & Removing The Locknut, Mounting Bolt, Power Steering Pump Belt & Pump**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the P/S hose clamp (E).
8. Remove the alternator (see **ALTERNATOR** ).
9. Relieve fuel pressure (see **FUEL PRESSURE RELIEVING** ).
10. Remove the fuel feed hose (A), fuel return hose (B) and evaporative emission (EVAP) canister hose (C).





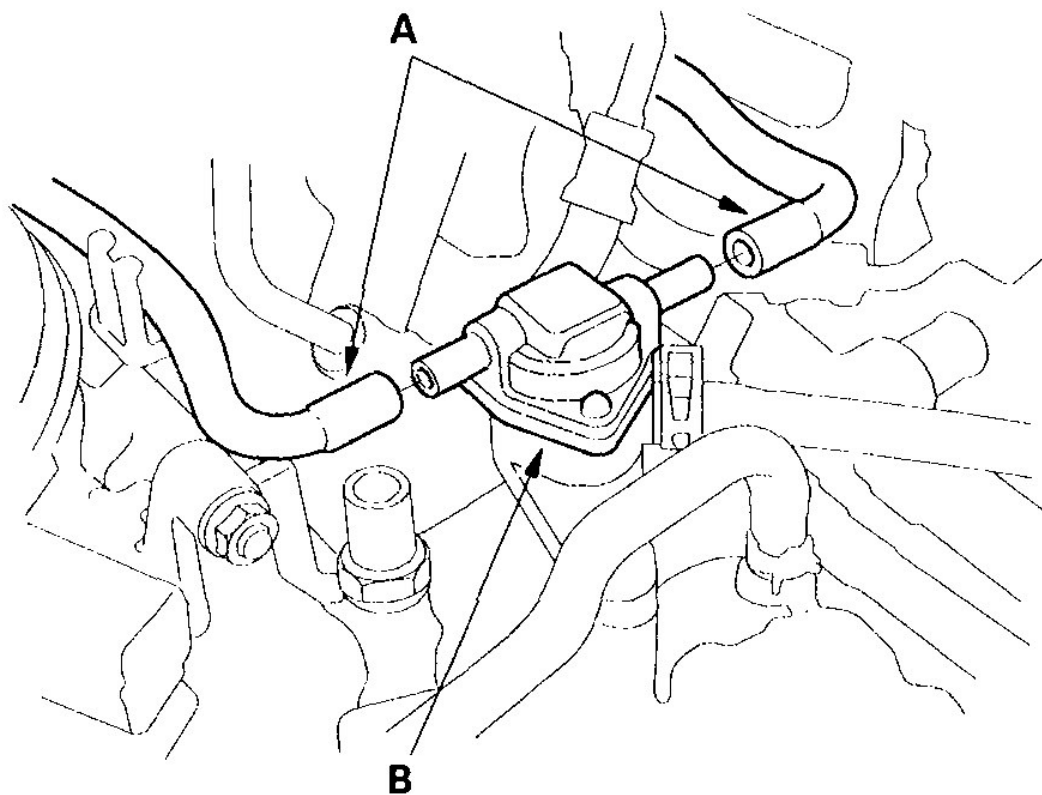
G01463731

**Fig. 144: Removing The Fuel Feed Hose, Fuel Return Hose & Evaporative Emission Canister Hose**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Remove the intake manifold (see **Intake Manifold Removal & Installation** ).
12. Remove the six ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION** ).
13. Remove the timing belt (see **Timing Belt Removal** ).
14. Remove the engine wire harness connectors and wire harness clamps from the cylinder head.
  - Six injector connectors
  - Engine coolant temperature (ECT) sensor connector
  - Radiator fan switch A connector
  - Radiator fan switch B connector
  - Crankshaft position (CKP) sensor connector
  - Camshaft position (CMP) sensor connector

- Exhaust gas recirculation (EGR) valve connector
- VTEC solenoid valve connector
- VTEC oil pressure switch connector
- Oil pressure switch connector

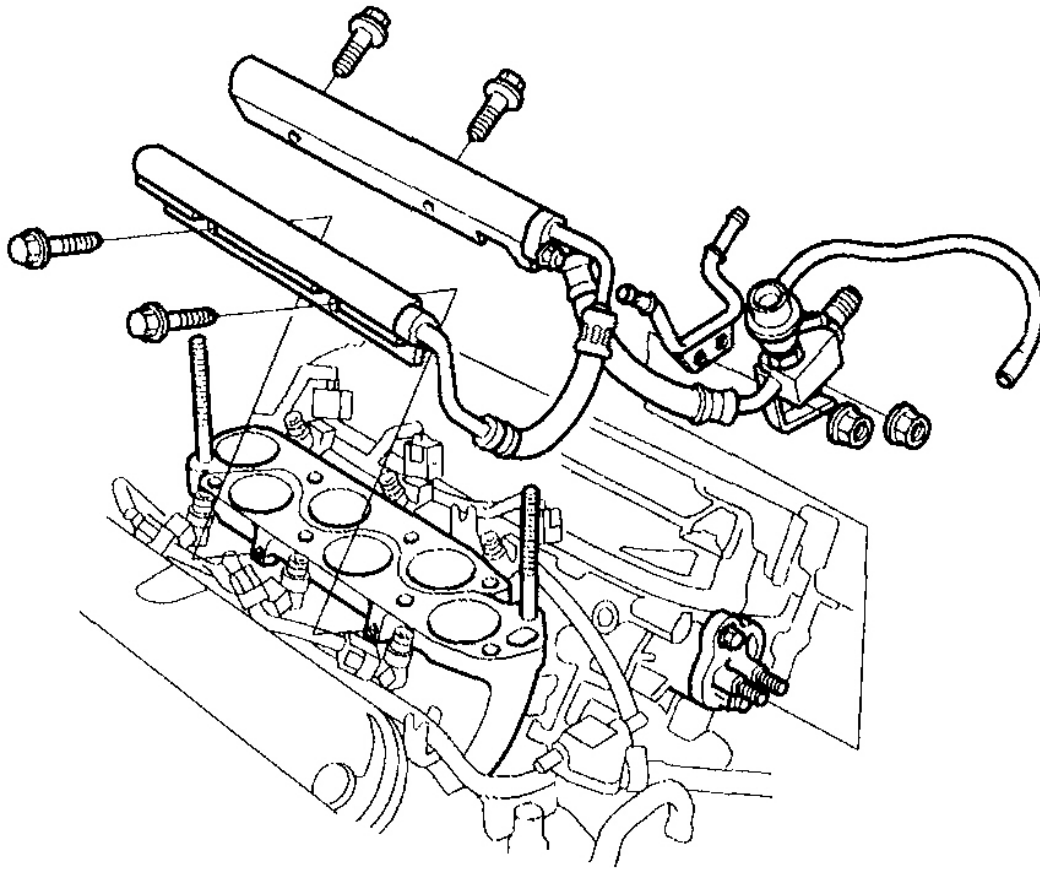
15. Remove the vacuum hoses (A) from the intake air bypass control thermal valve (B).



G01463732

**Fig. 145: Removing The Vacuum Hoses From The Intake Air Bypass Control Thermal Valve**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

16. Remove the fuel rails.

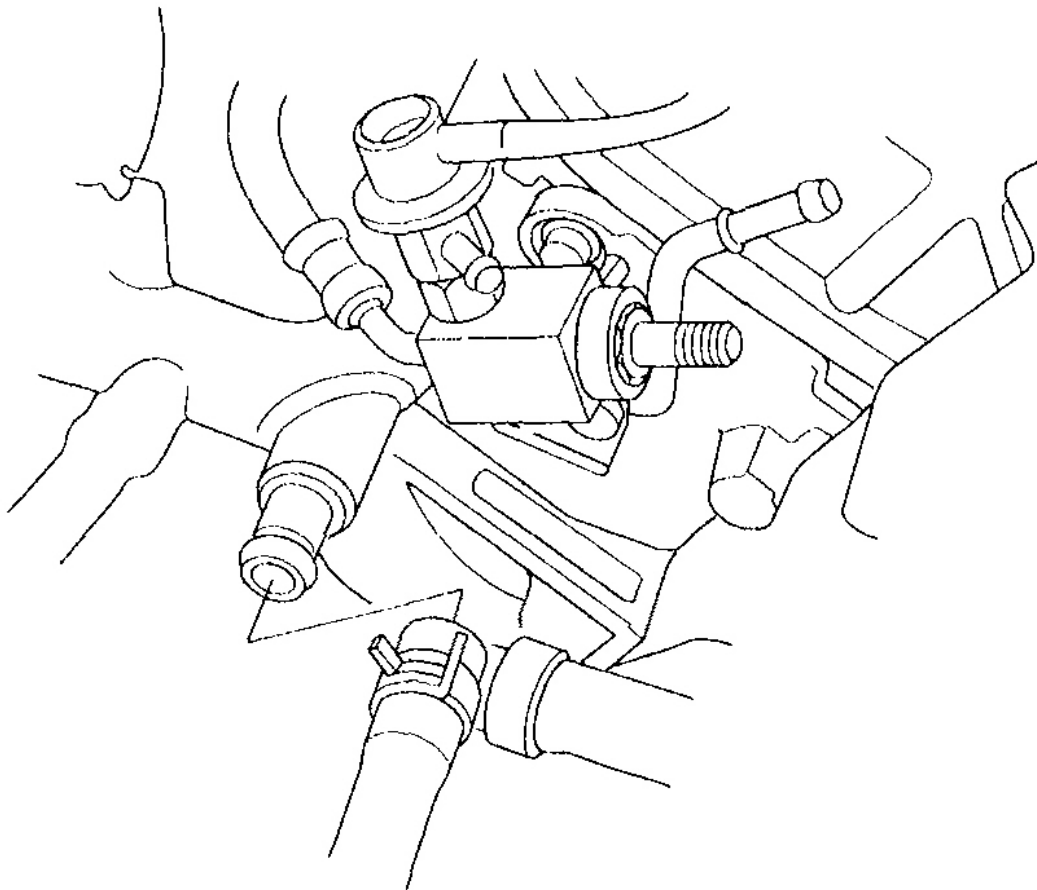


G01463733

**Fig. 146: Removing The Fuel Rails**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Remove the heater hose.

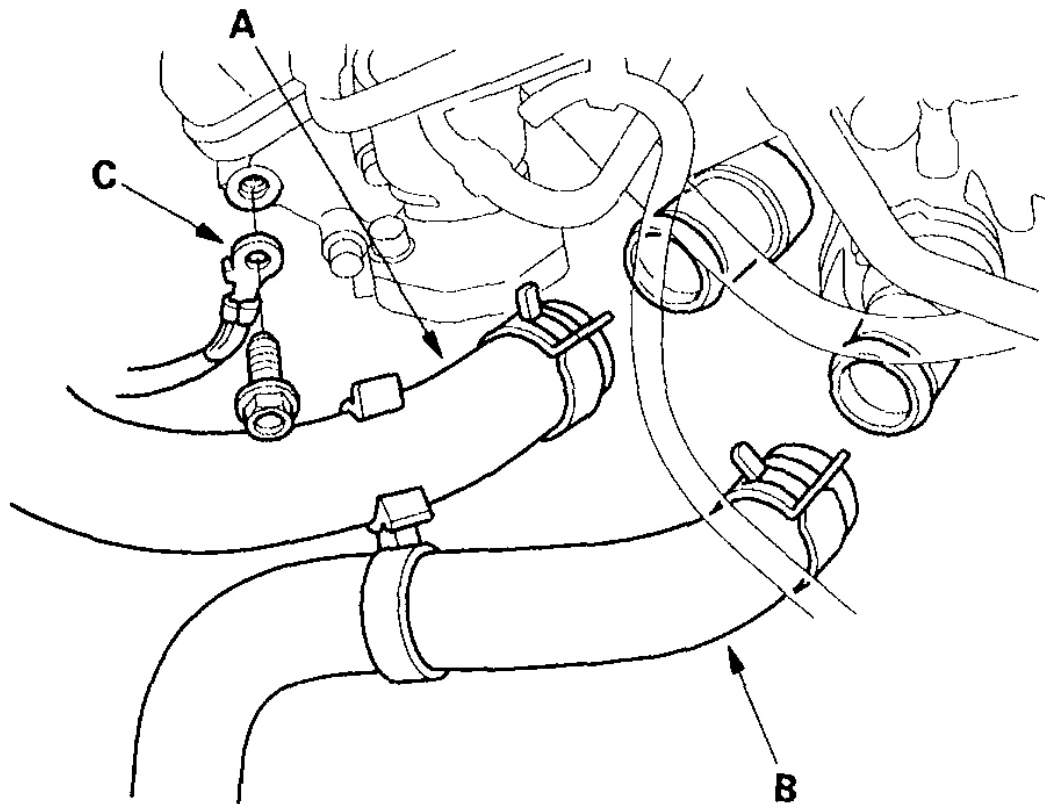


**G01463734**

**Fig. 147: Removing The Heater Hose**

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

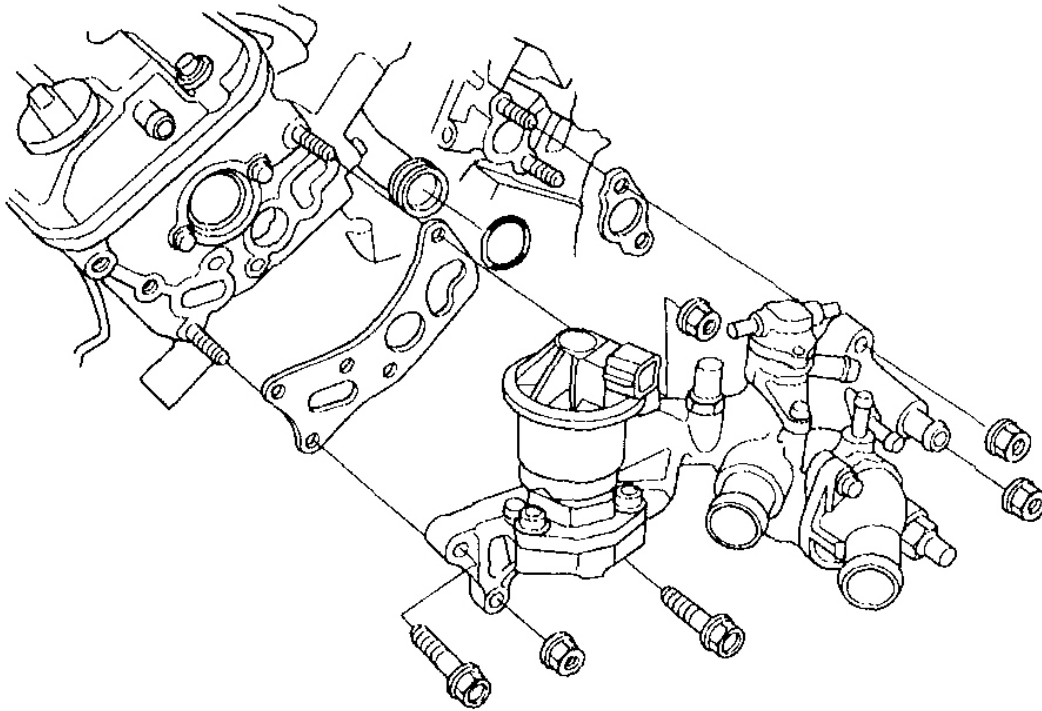
18. Remove the upper radiator hose (A), lower radiator hose (B), and ground cable (C).



G01463735

**Fig. 148: Removing The Upper Radiator Hose, Lower Radiator Hose & Ground Cable**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

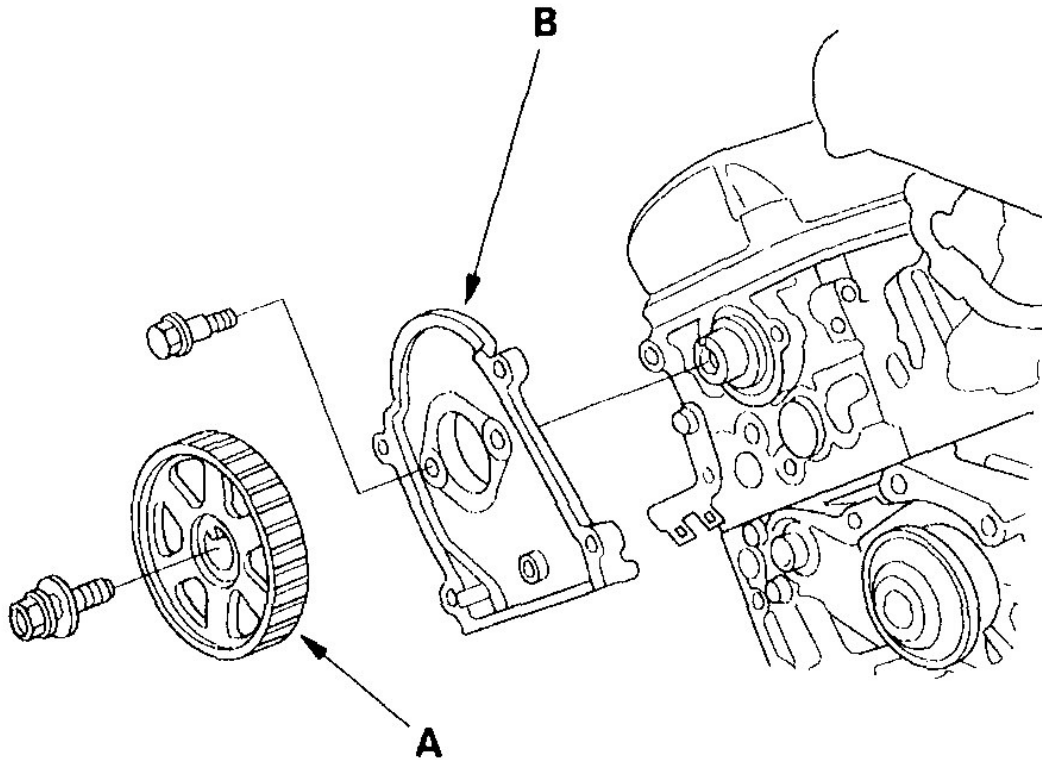
19. Remove the front and rear exhaust manifolds (see [Exhaust Manifold Removal & Installation](#) ).
20. Remove the water passage.



**G01463736**

**Fig. 149: Removing The Water Passage**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

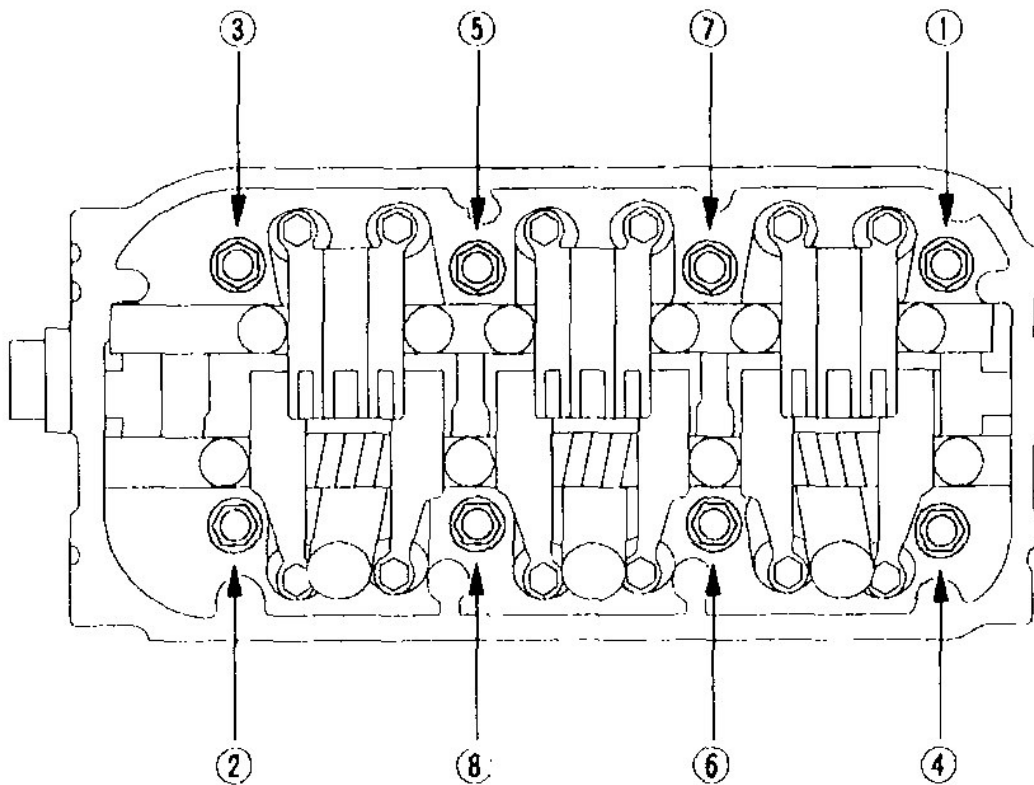
21. Remove the camshaft pulleys (A) and back covers (B).



G01463737

**Fig. 150: Removing The Camshaft Pulleys & Back Covers**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

22. Remove the cylinder head covers (see Cylinder Head Cover Removal ).
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.



G01463738

**Fig. 151: Identifying Cylinder Head Bolt Loosening Sequence**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

24. Remove the cylinder heads.

#### CYLINDER HEAD INSPECTION FOR WARPAGE

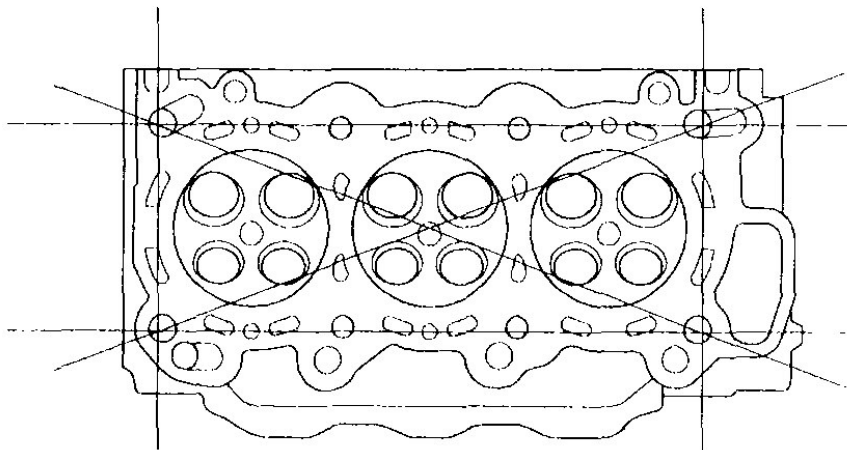
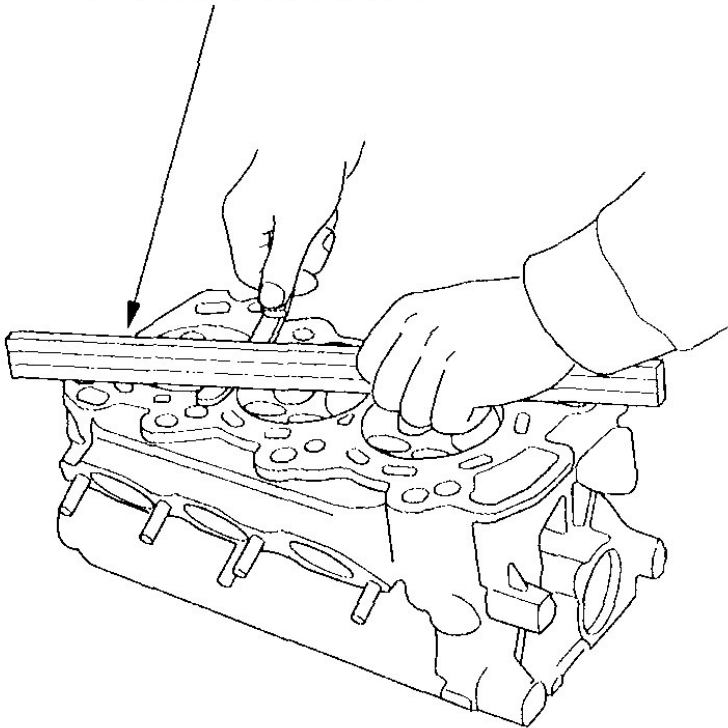
1. Remove the cylinder head (see **Cylinder Head Removal** ).
2. Inspect the camshaft (see **Camshaft Inspection** ).
3. Check the cylinder head for warpage. Measure along the edges, and three ways across the center.
  - If warpage is less than 0.05 mm (0.002 in.), cylinder head resurfacing is not required.
  - 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**

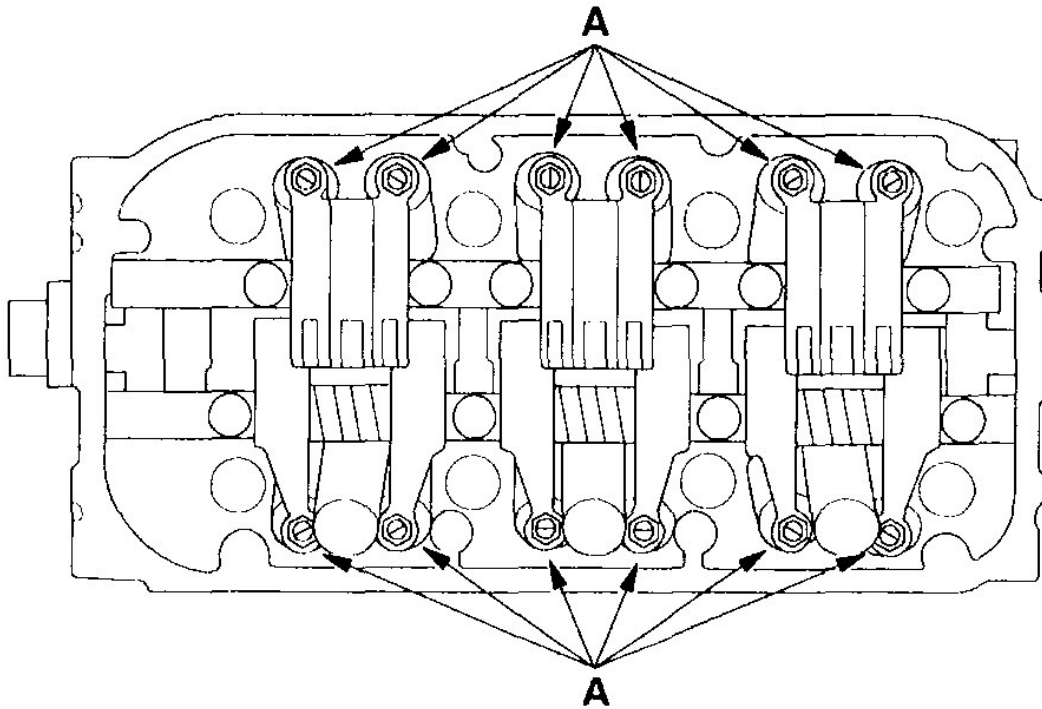


G01463739

**Fig. 152: Checking The Cylinder Head For Warpage**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

**ROCKER ARM ASSEMBLY REMOVAL**

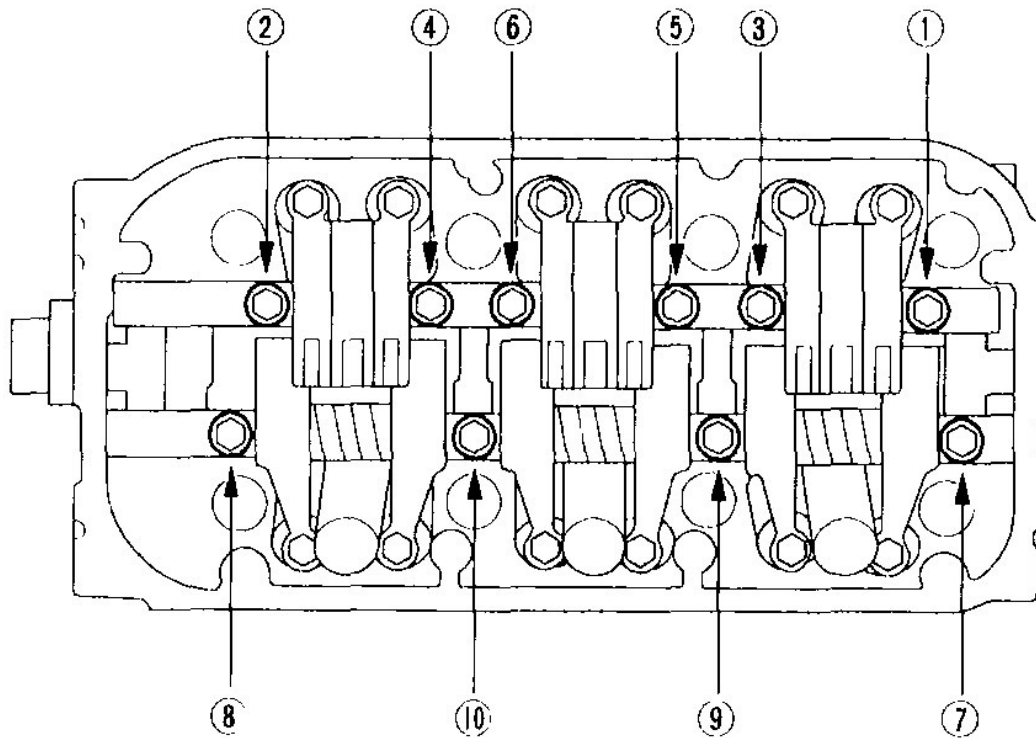
1. Remove the cylinder head cover (see **Cylinder Head Cover Removal** ).
2. Loosen the adjusting screws (A).



G01463740

**Fig. 153: Loosening The Adjusting Screws**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove the bolts and the rocker arm assembly.
  - a. Unscrew the rocker shaft mounting bolts two turns at a time, in a crisscross pattern, to prevent damaging the valves or rocker arm assembly.
  - b. 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.



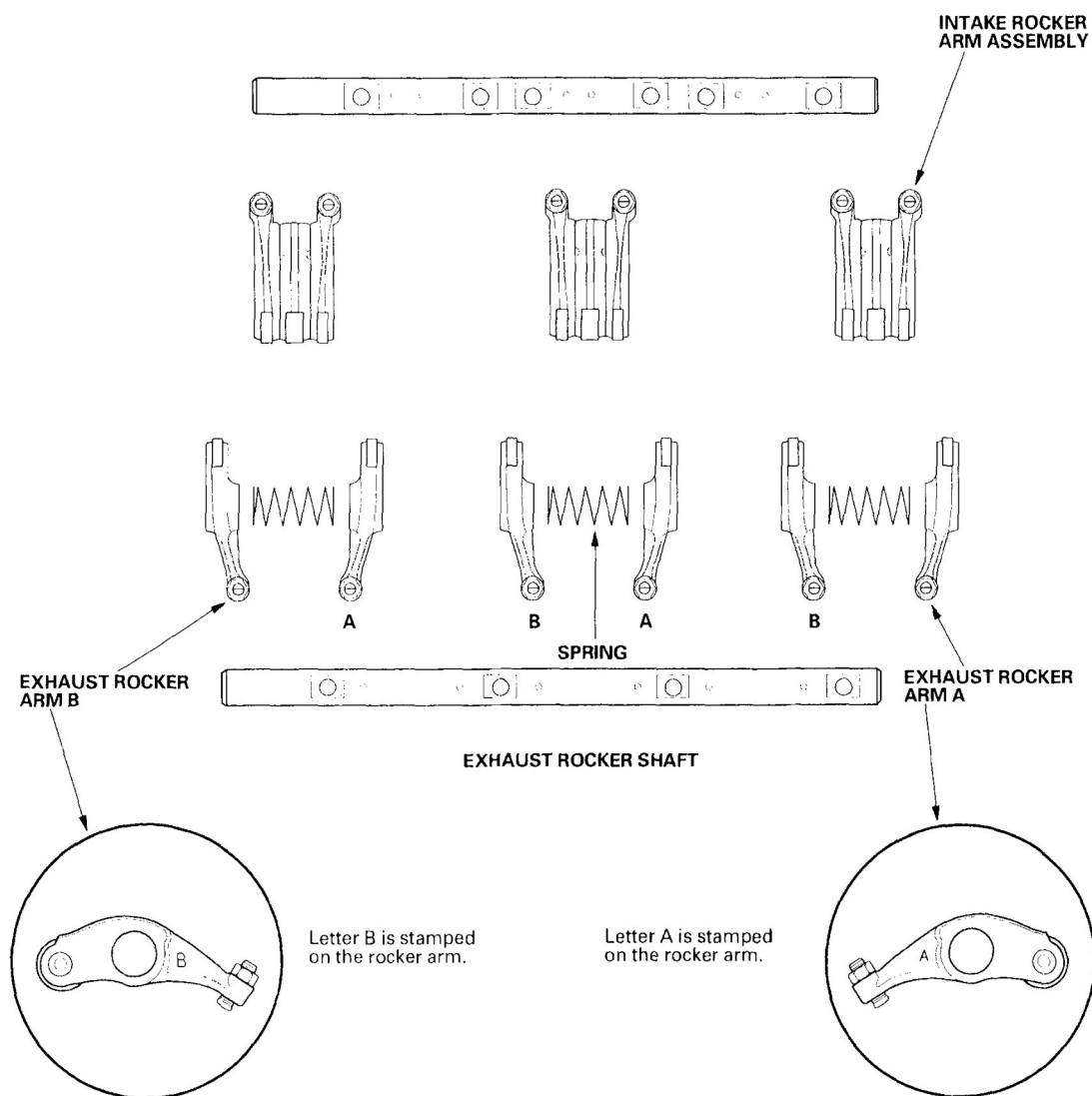
G01463741

**Fig. 154: Identifying Camshaft Holder Bolt Loosening Sequence**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

**ROCKER ARM & 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 & 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.

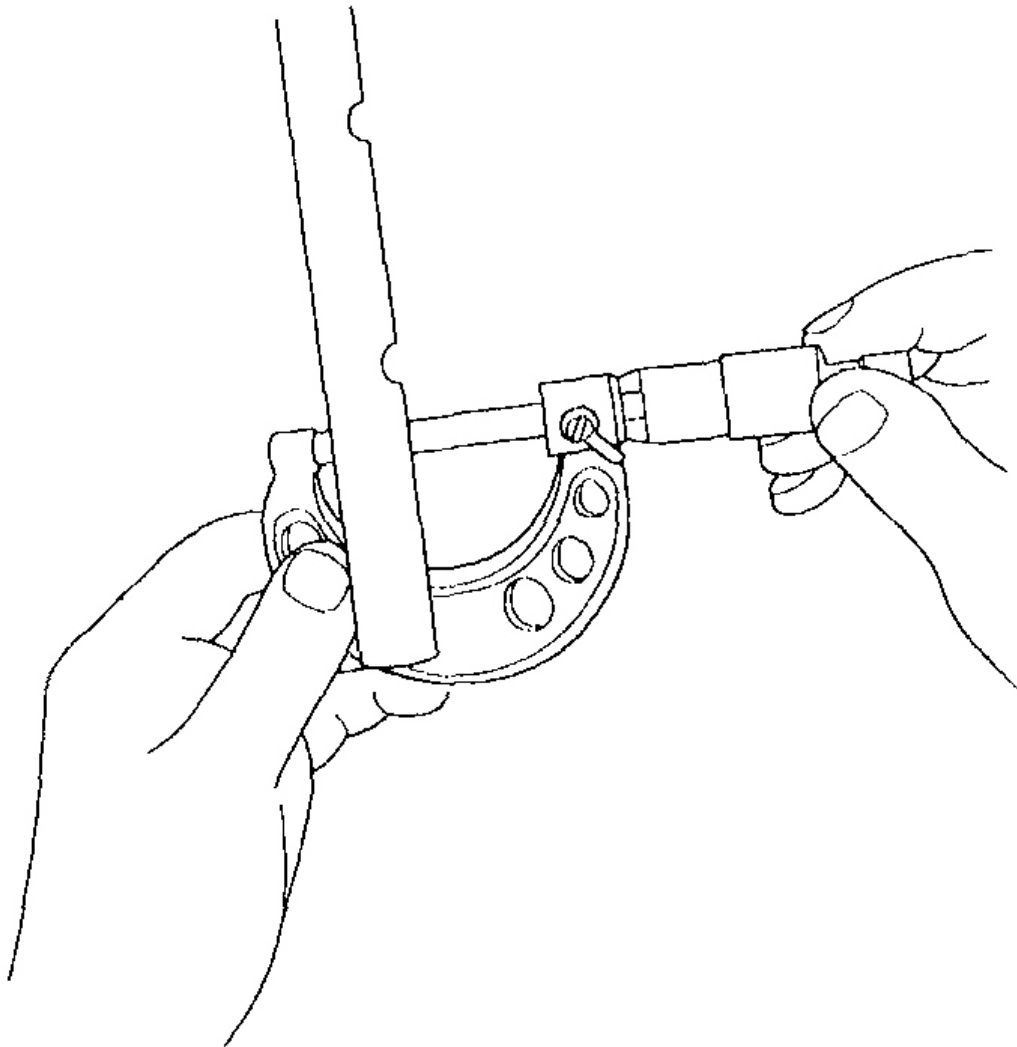


G01463742

**Fig. 155: Identifying Rocker Arm & Shaft Assembly Parts**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

## ROCKER ARM & SHAFT INSPECTION

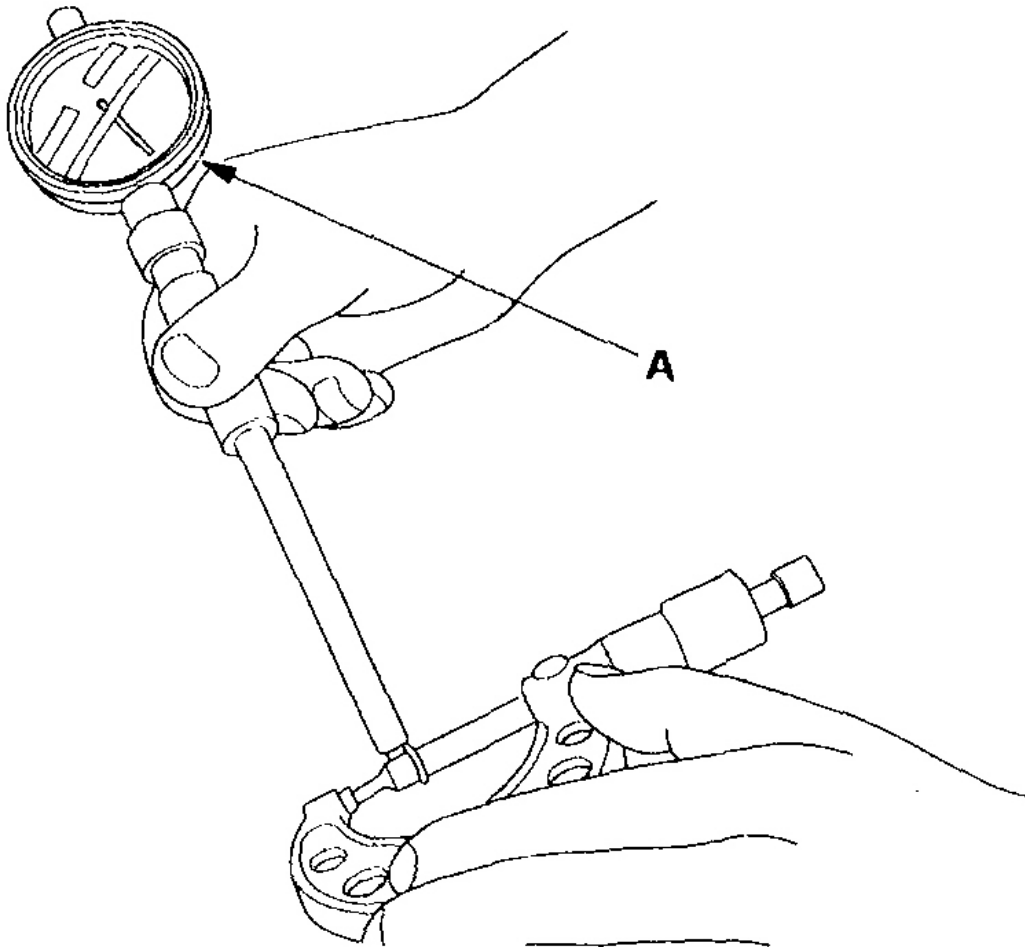
1. Remove the rocker arm assembly (see **Rocker Arm Assembly Removal** ).
2. Measure the diameter of the shaft at the first rocker location.



**G01463743**

**Fig. 156: Measuring The Diameter Of The Shaft At The First Rocker Location**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



G01463744

**Fig. 157: Zeroing The Gauge To The Shaft Diameter**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

**Rocker Arm-to-Shaft Clearance**

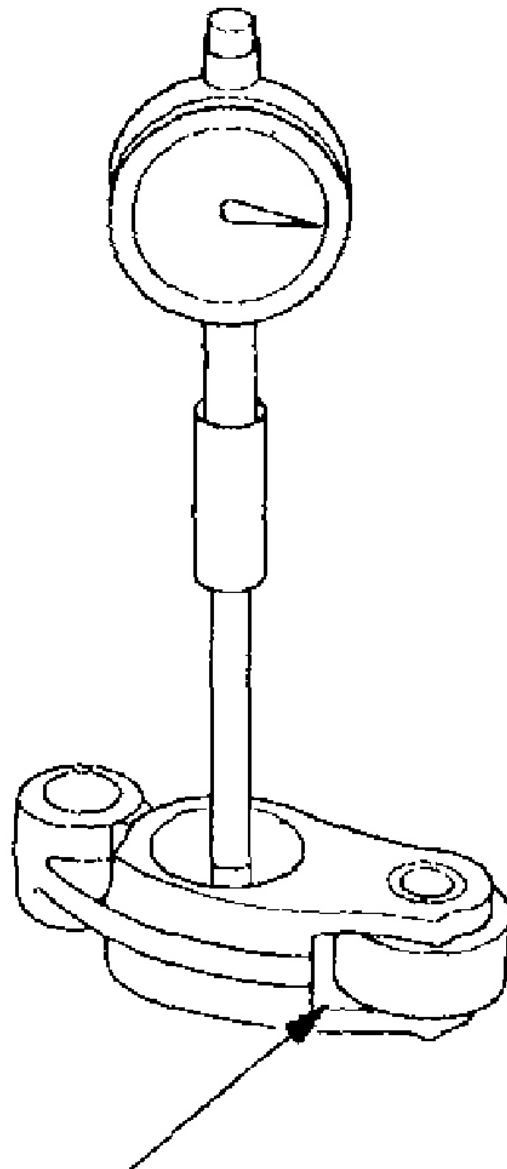
**Standard (New):**

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

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

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

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



**Inspect rocker arm  
face for wear.**

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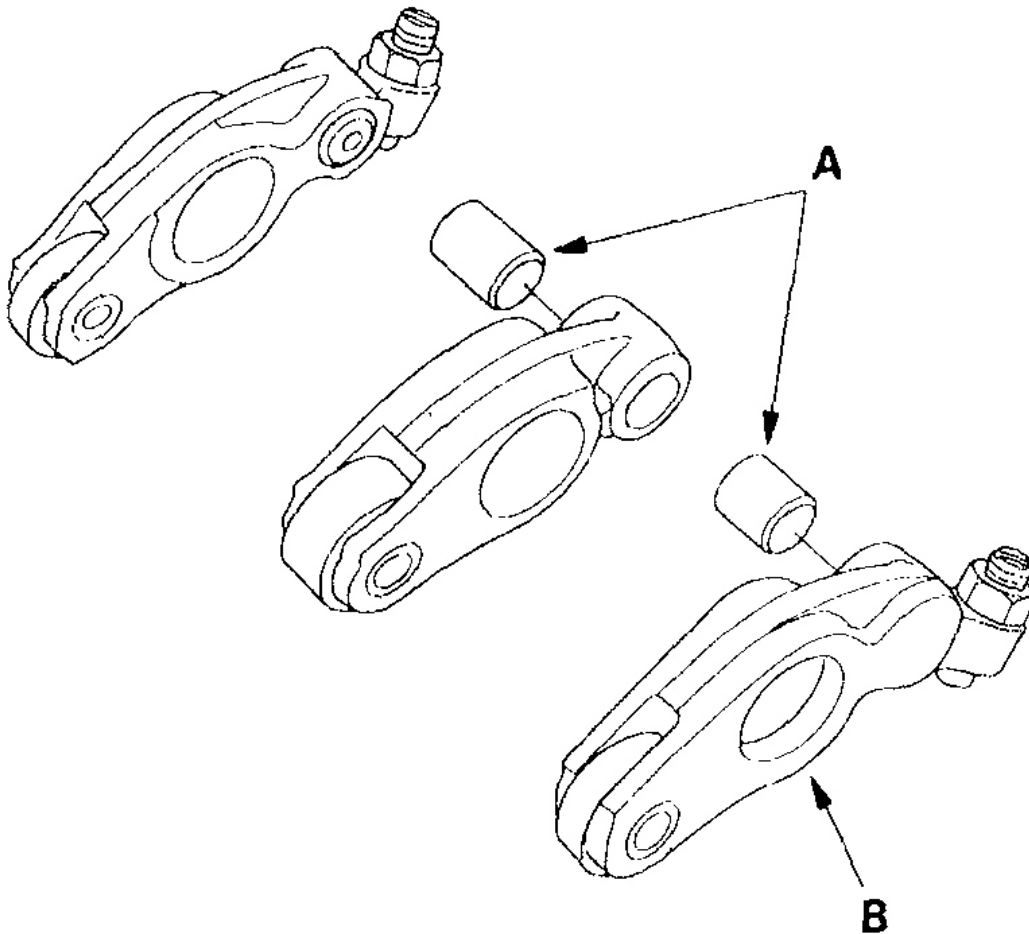
**Fig. 158: Measuring The Inside Diameter Of The Rocker Arm**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Repeat step 1-4 for all rockers and both shafts. If the clearance is over the limit, replace the rocker shaft and all overtolerance rocker arms, that are overtolerance. If any intake rocker arm needs replacement, replace all three rocker arms in that set (primary, mid, and secondary).

### VTEC Rocker Arms

**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.



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**Fig. 159: Inspecting The Rocker Arm Pistons**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.



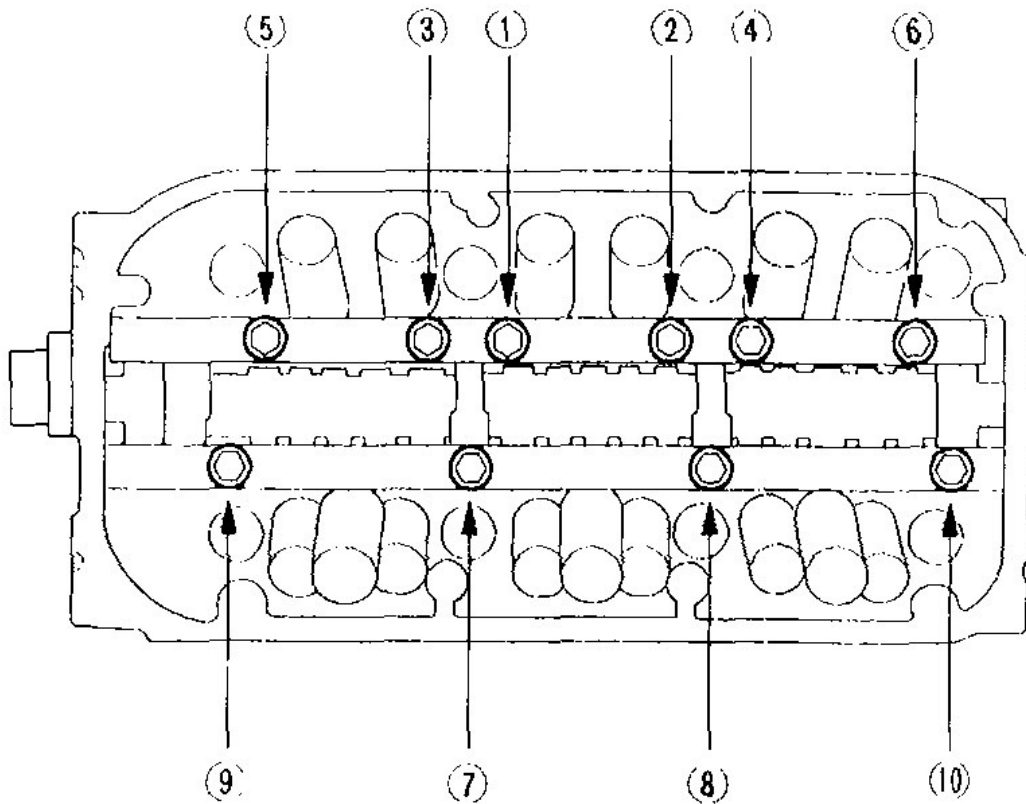
6. Inspect the rocker arm pistons (A). Push them manually. If they do not move smoothly, replace the rocker arm set.

## CAMSHAFT INSPECTION

1. Remove the cylinder head (see Cylinder Head Removal ).
2. Remove the rocker arms (see Rocker Arm Assembly Removal ).
3. Put the rocker shafts on the cylinder head, then tighten the bolts to the specified torque.

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

**Apply new engine oil to the bolt threads and flange**



G01463747

**Fig. 160: Identifying Bolt Tightening Sequence**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

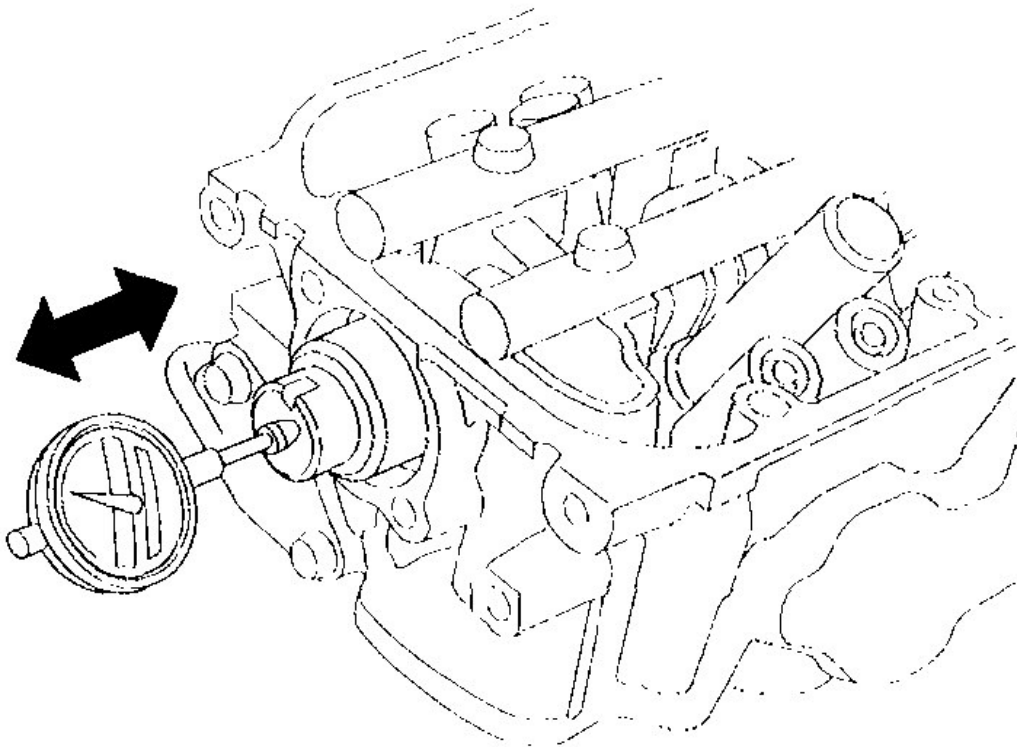
4. Seat the camshaft by pushing it toward the rear of the cylinder head.
5. Zero the dial indicator against the end of the camshaft. Push the camshaft back and forth and read the end

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.)

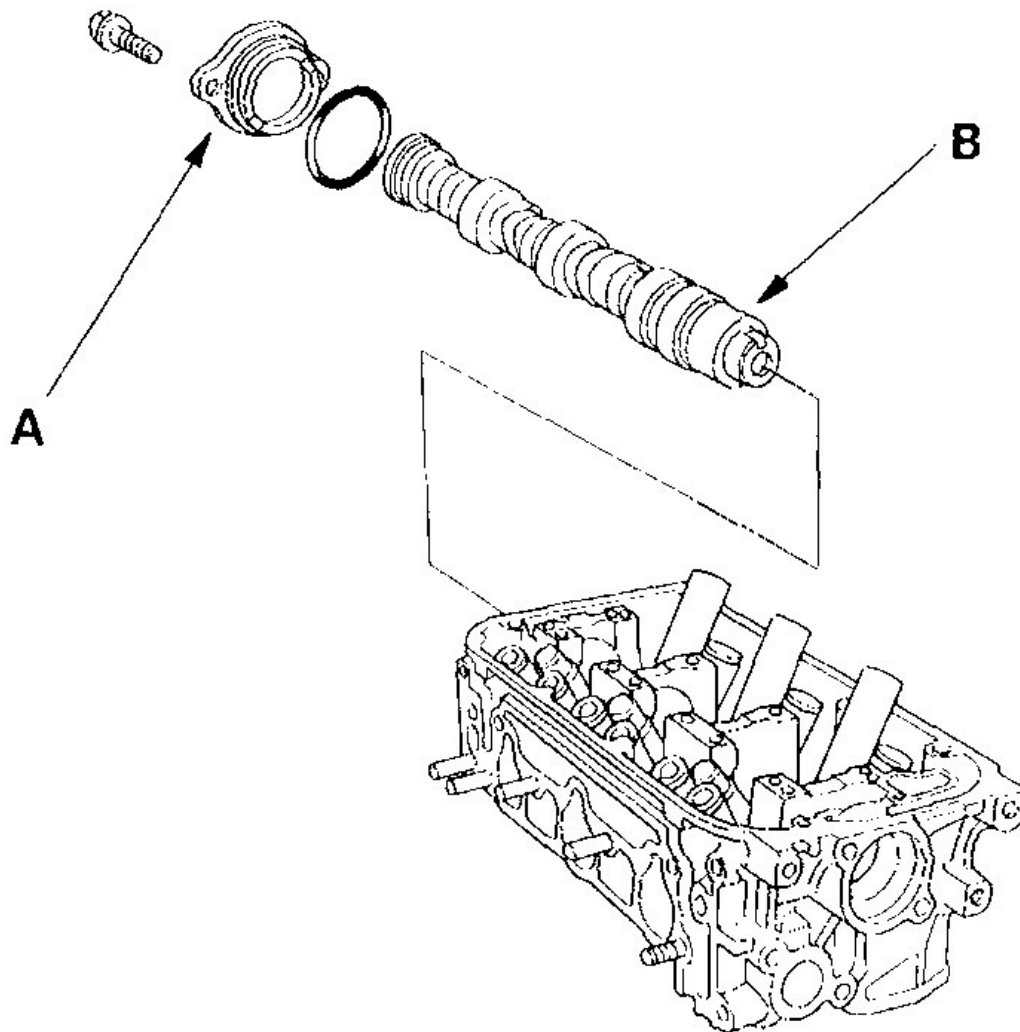
**Service Limit:** 0.20 mm (0.008 in.)



**G01463748**

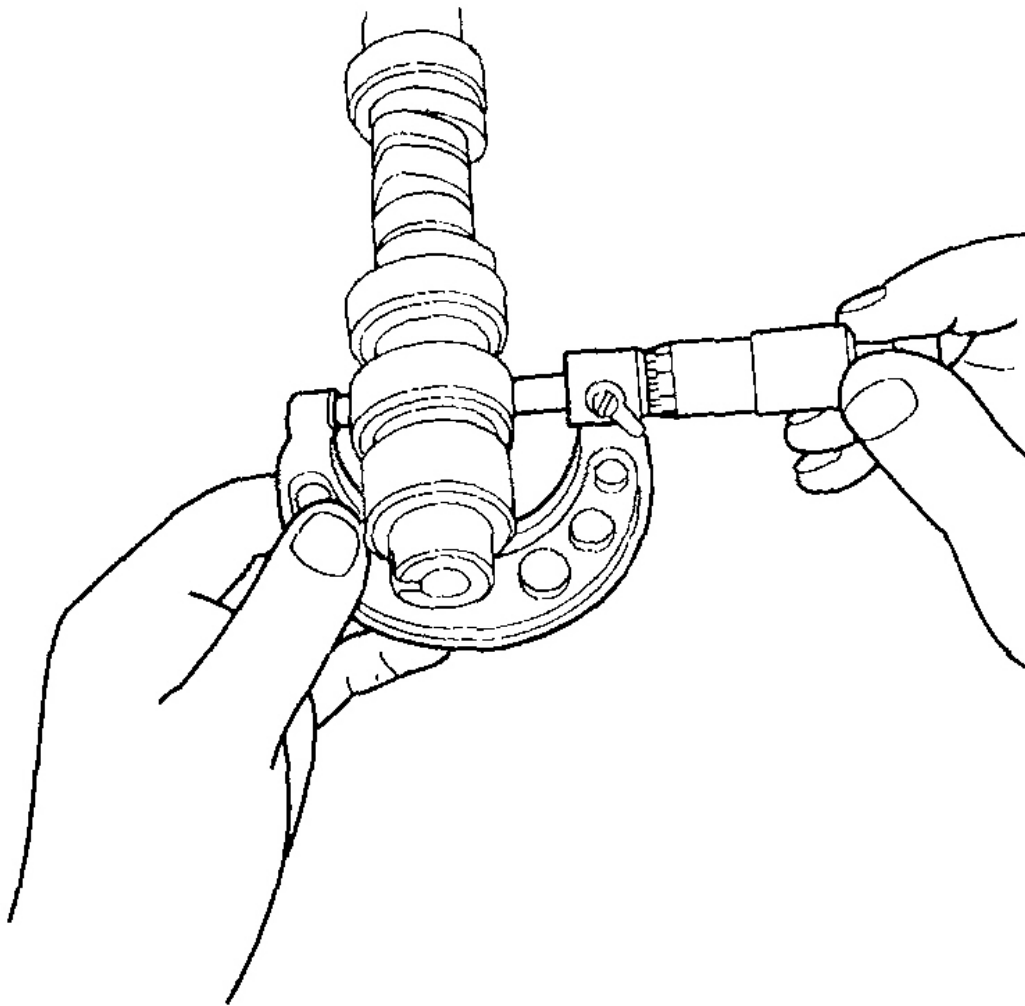
**Fig. 161: Zeroing The Dial Indicator Against The End Of The Camshaft**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

**G01463749**

**Fig. 162: Removing The Camshaft Thrust Cover & Pulling Out The Camshaft**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

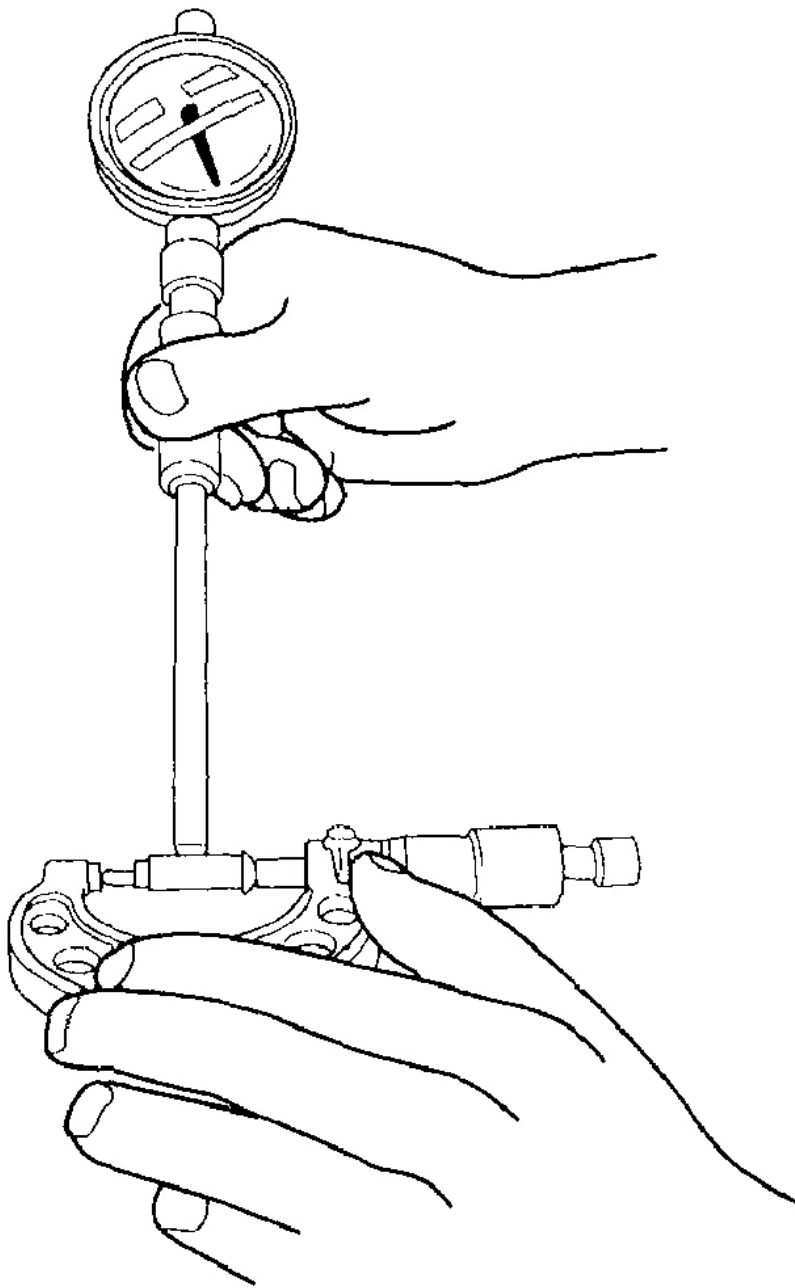
7. Wipe the camshaft clean, then inspect the lift ramps. Replace the camshaft if any lobes are pitted, scored or excessively worn.
8. Measure the diameter of each camshaft journal.



G01463750

**Fig. 163: Measuring The Diameter Of Each Camshaft Journal**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Zero the gauge to the journal diameter.



G01463751

**Fig. 164: Zeroing The Gauge To The Journal Diameter**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

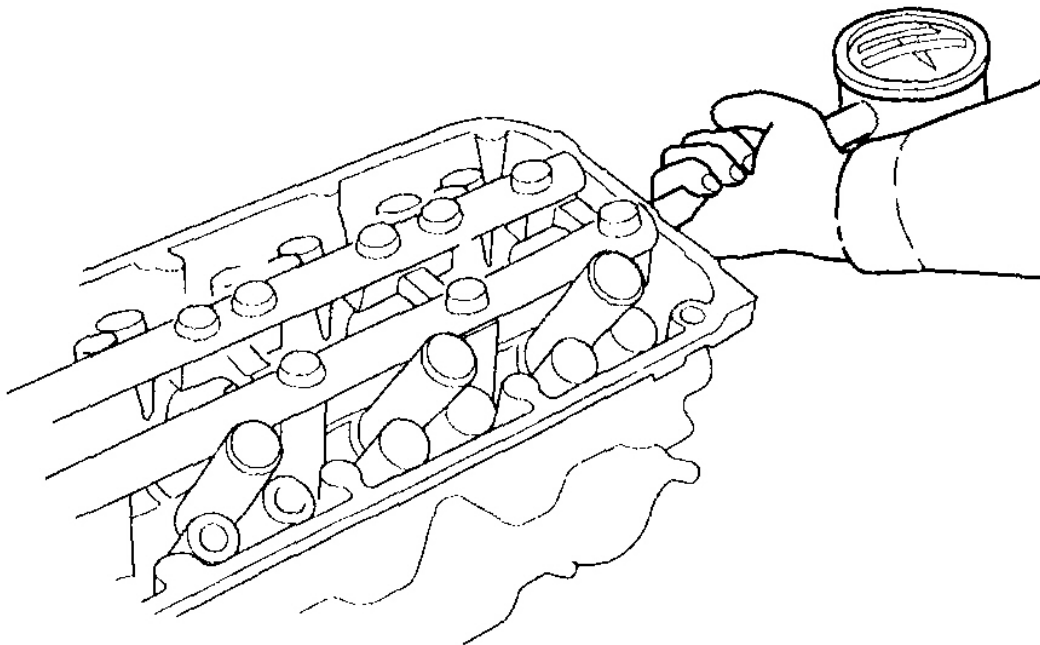
10. Clean the camshaft bearing surfaces in the cylinder head. Measure the inside diameter of each camshaft bearing surface, and check for an out-of-round condition.

- 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.)



G01463752

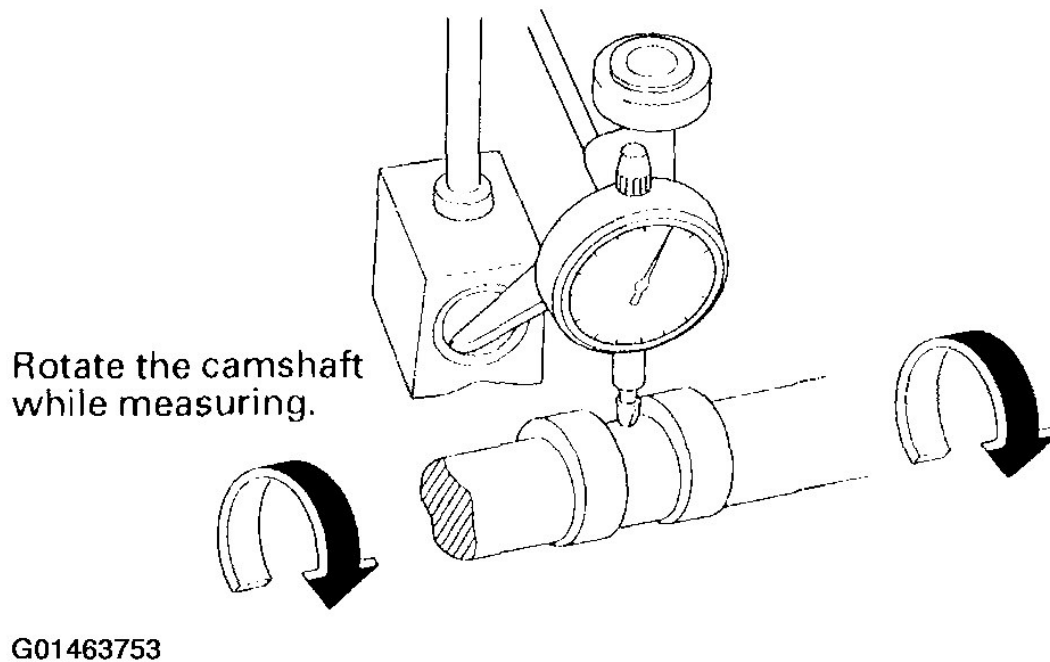
**Fig. 165: Measuring Camshaft-To-Holder Oil Clearance**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

12. Measure cam lobe height.

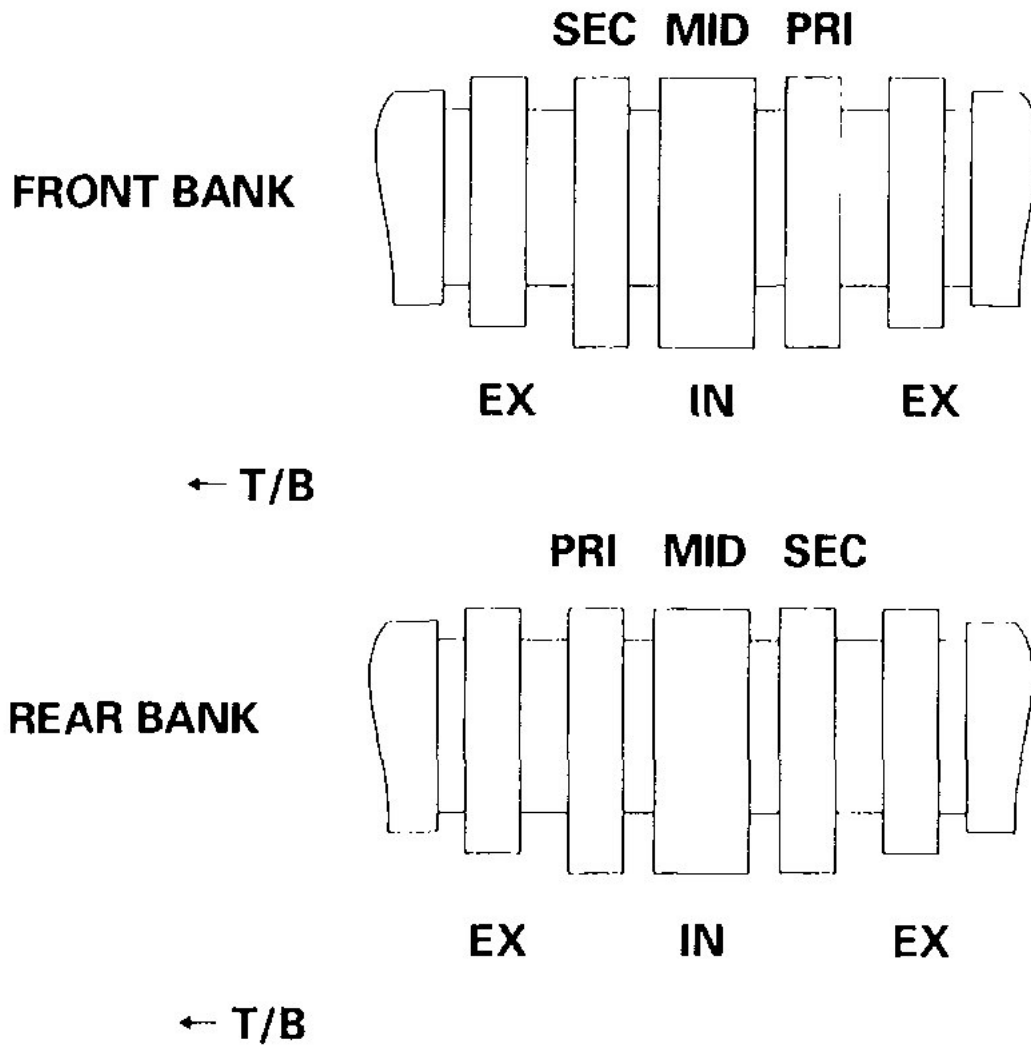
|     | INTAKE                    | EXHAUST                   |
|-----|---------------------------|---------------------------|
| PRI | 34.737 mm<br>(1.3676 in.) | 36.326 mm<br>(1.4302 in.) |
| MID | 36.445 mm<br>(1.4348 in.) |                           |
| SEC | 34.919 mm<br>(1.3748 in.) |                           |

G01463754

**Fig. 167: Cam Lobe Height Standard Chart**

Courtesy of AMERICAN HONDA MOTOR CO., INC.





G01463755

**Fig. 168: Measuring Cam Lobe Height**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

**VALVE, SPRING & VALVE SEAL REMOVAL****Special Tools Required**

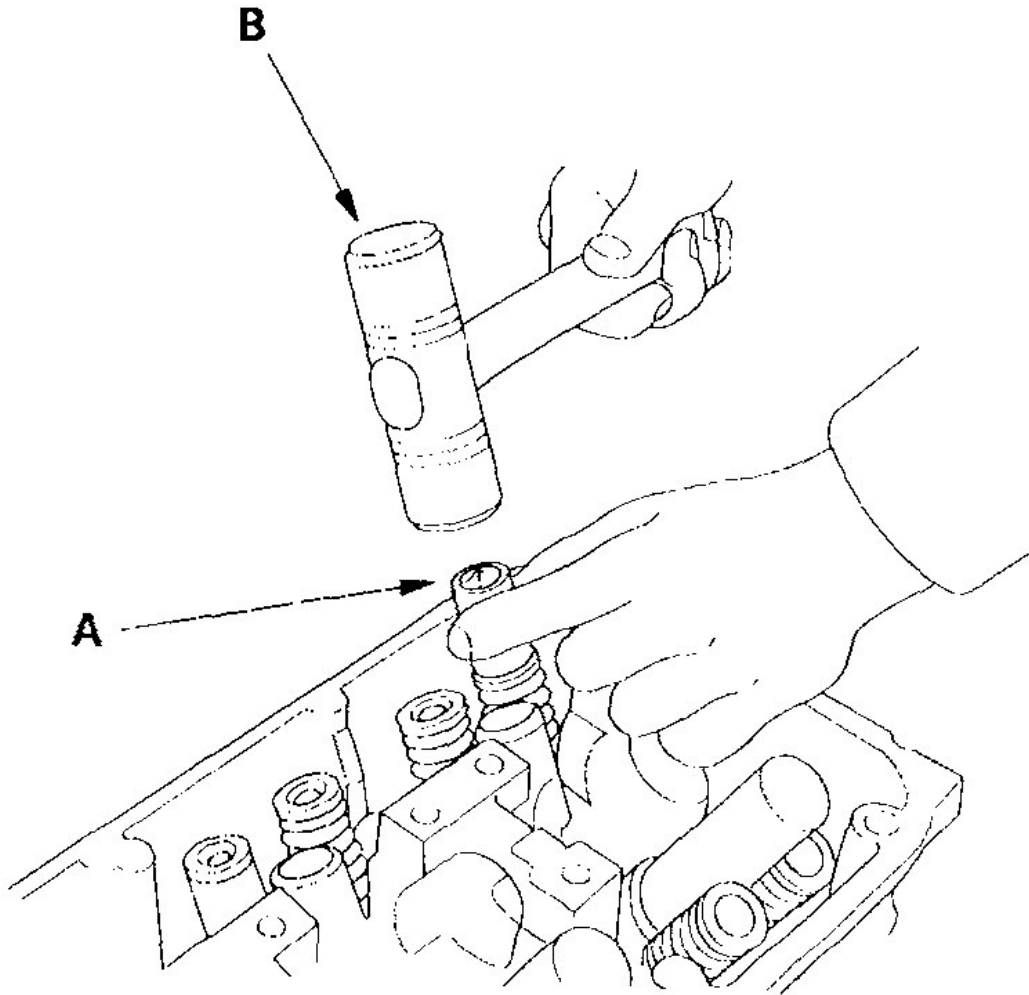
Valve spring compressor attachment

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 keepers.



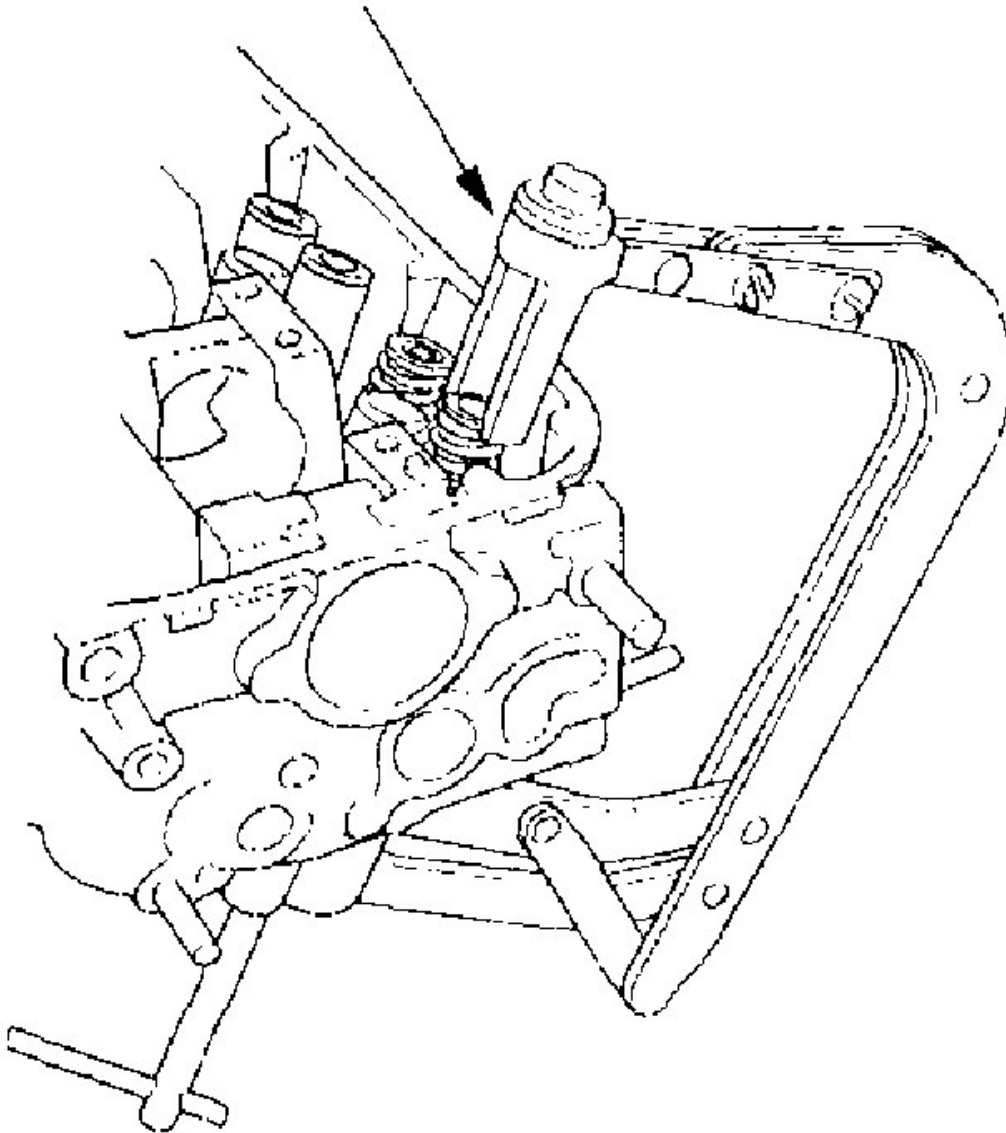
G01463756

**Fig. 169: Loosening The Valve Keepers**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the special tool. Compress the spring and remove the valve keepers.

**07757-PJ1010A**

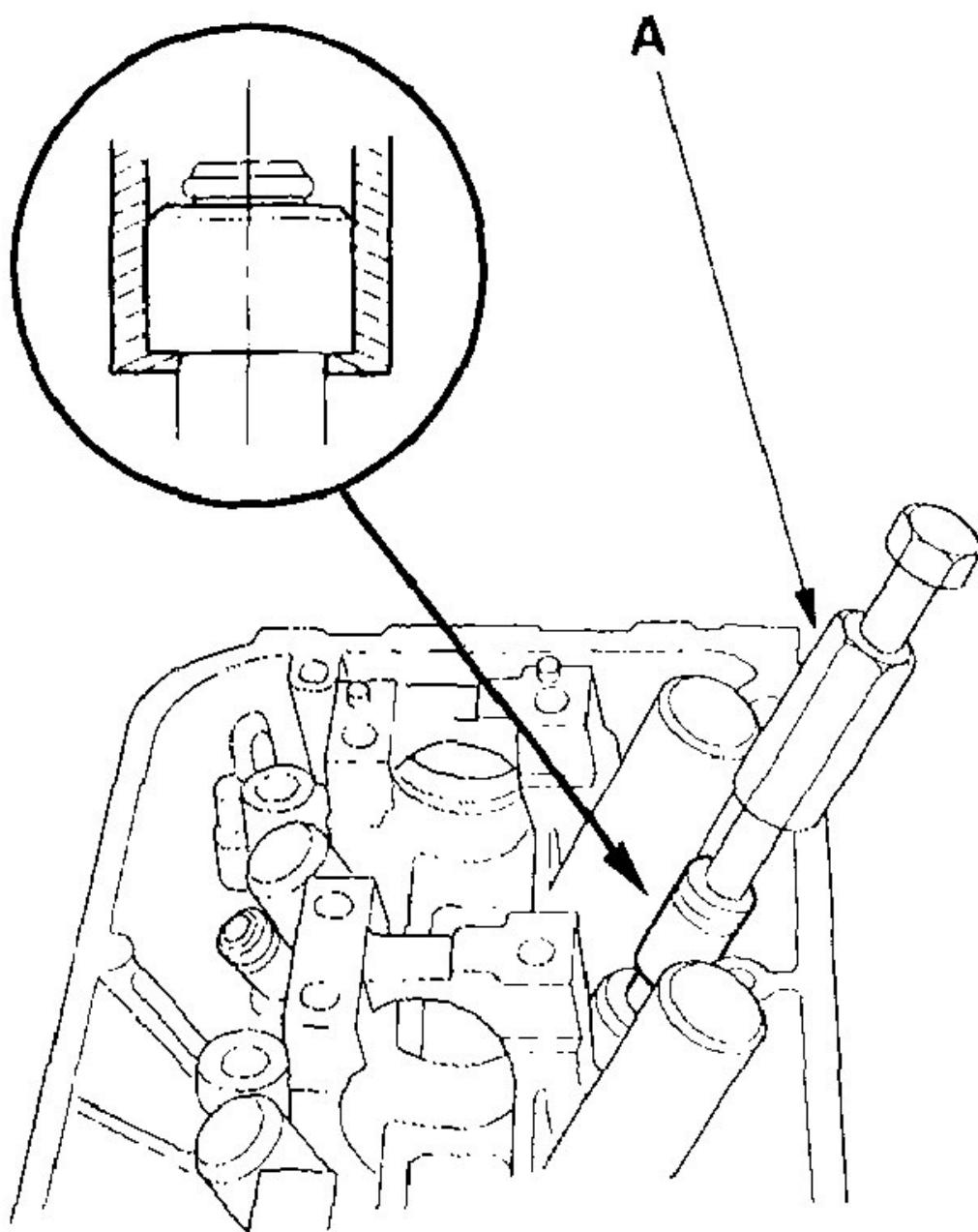


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**Fig. 170: Removing The Valve Keepers**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

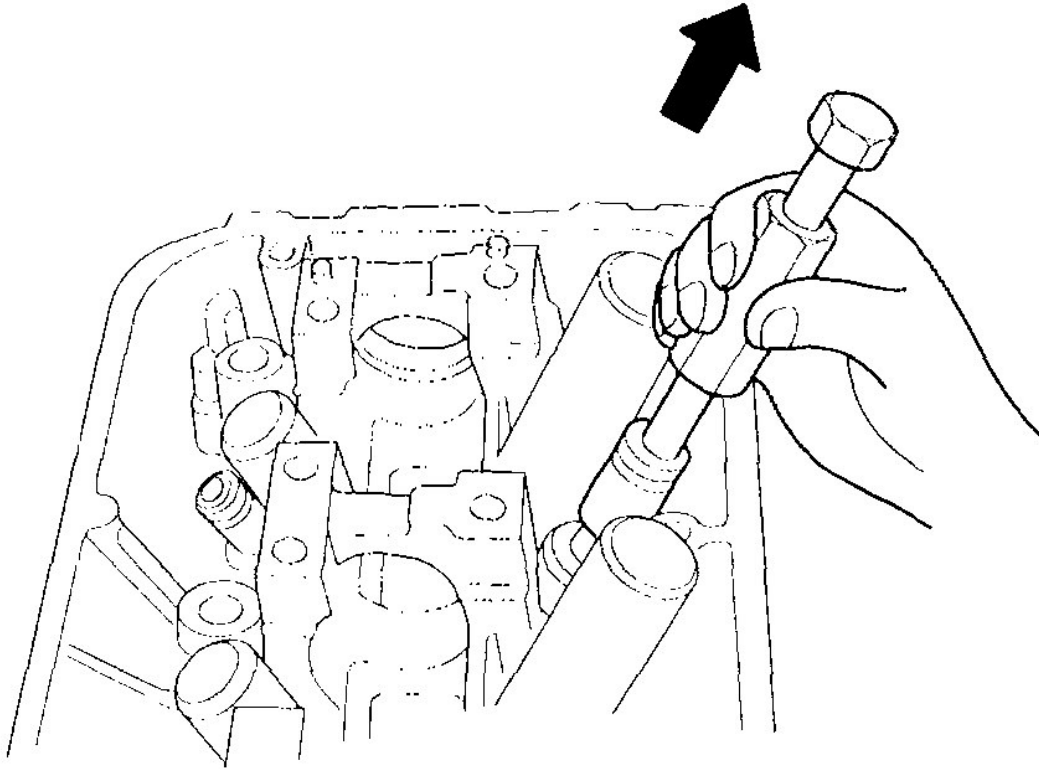
4. Remove the special tool, then remove the valve retainer and valve spring.
5. Install the valve guide seal remover (A).



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**Fig. 171: Installing The Valve Guide Seal Remover**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the valve seal.



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**Fig. 172: Removing The Valve Seal**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

## VALVE INSPECTION

1. Remove the valves (see Valve, Spring & 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.)

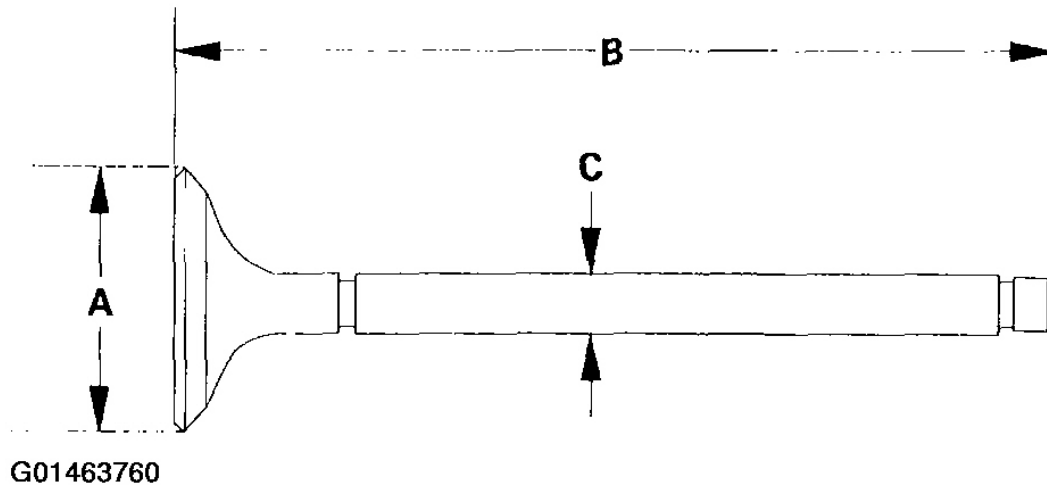
### Exhaust Valve Dimensions

**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. 173: Measuring The Valve**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

## VALVE STEM-TO-GUIDE CLEARANCE INSPECTION

1. Remove the valves (see **Valve, Spring & 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**

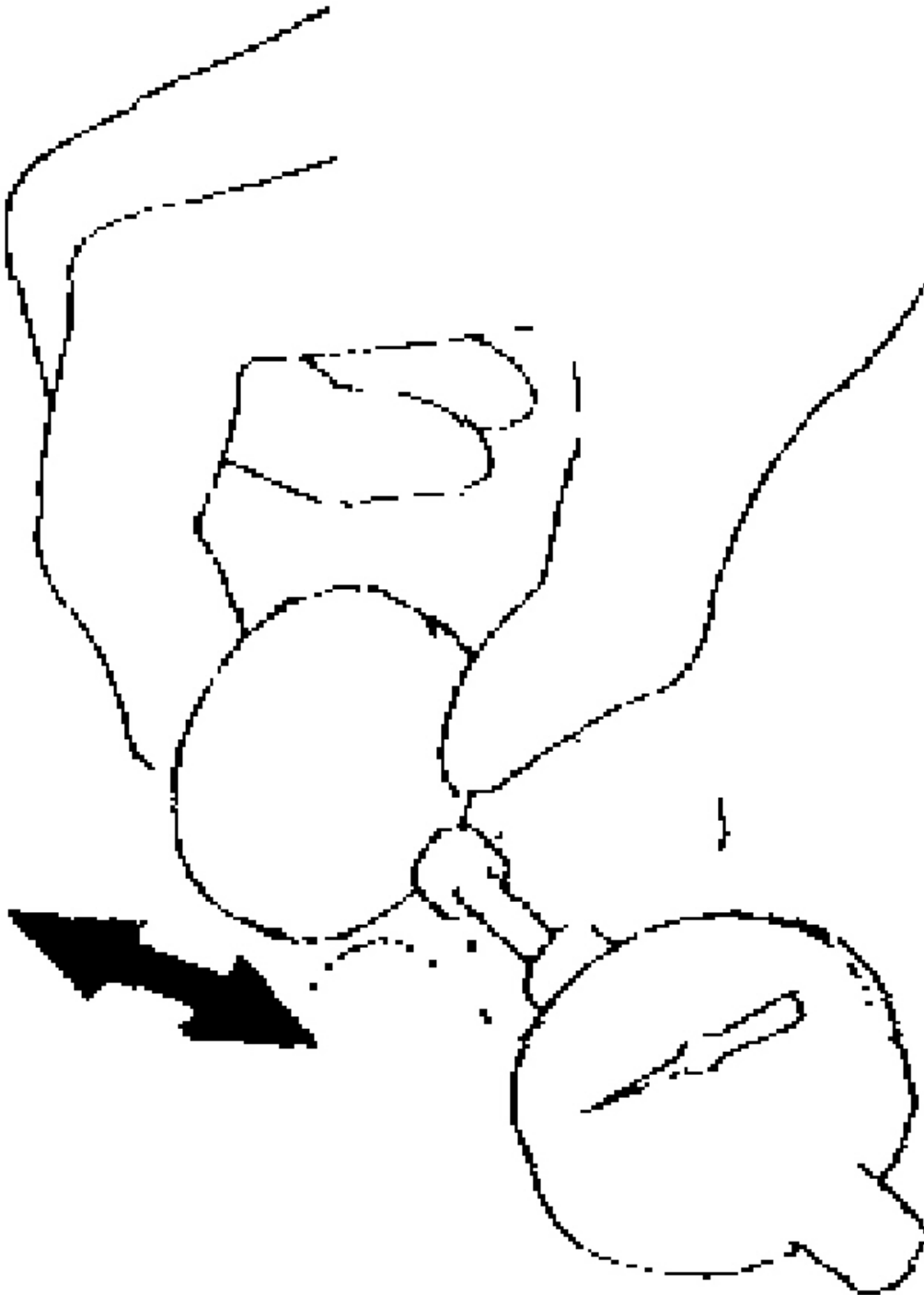
**Standard (New):** 0.04-0.09 mm (0.002-0.004 in.)

**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:** 0.24 mm (0.009 in.)



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**Fig. 174: Measuring The Guide-To-Stem 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.)

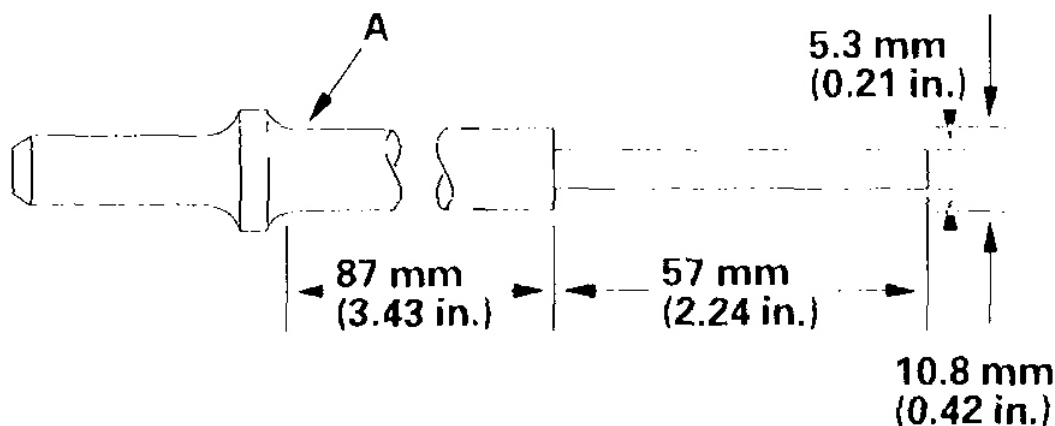
**Service Limit:** 0.12 mm (0.005 in.)

## VALVE GUIDE REPLACEMENT

### Special Tools Required

- Valve guide driver, 5.5 mm 07742-0010100
- Valve guide reamer, 5.5 mm 07HAH-PJ70100

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.



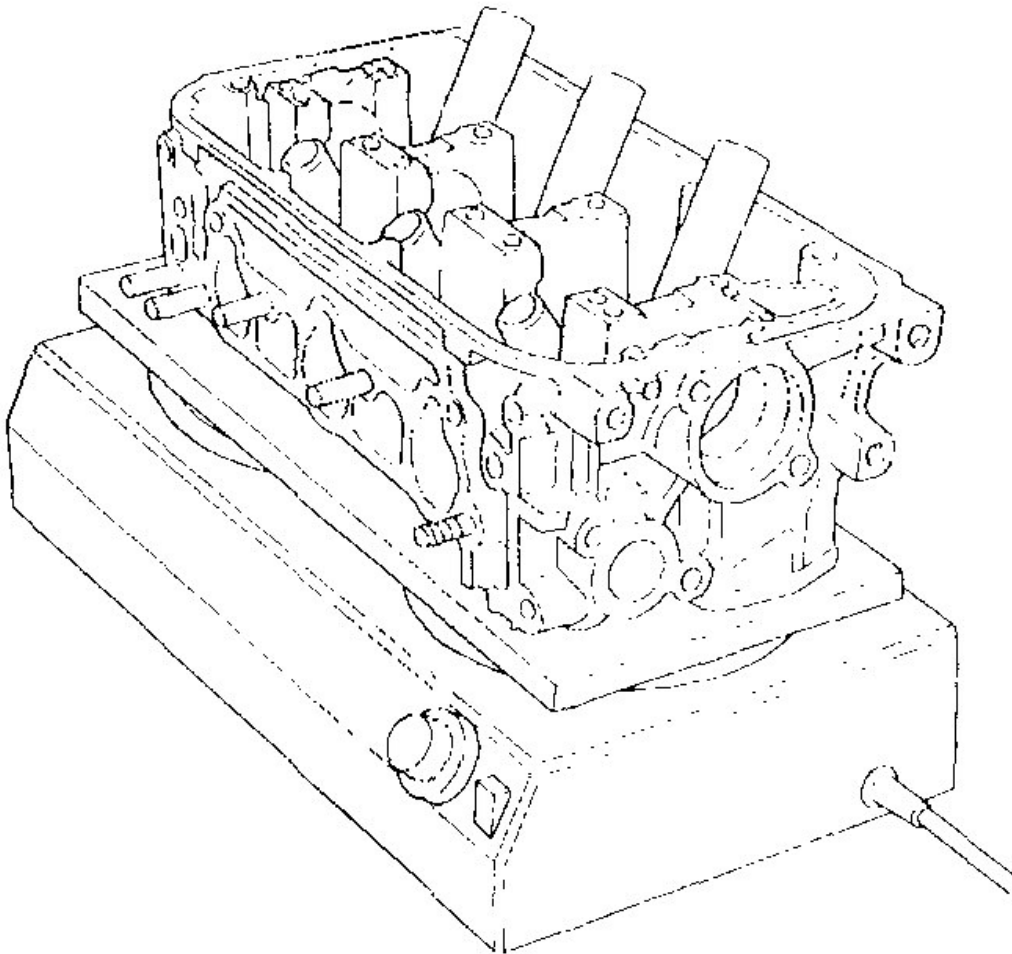
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**Fig. 175: Using Air-Impact Valve Guide Driver Modified To Fit Diameter Of Valve Guides**



**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.



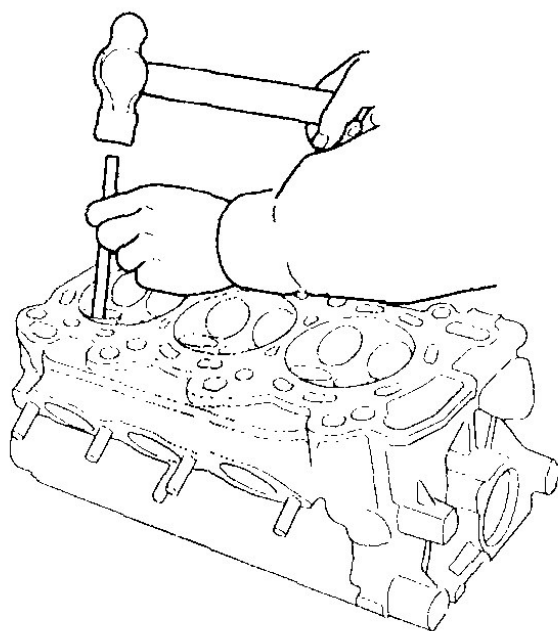
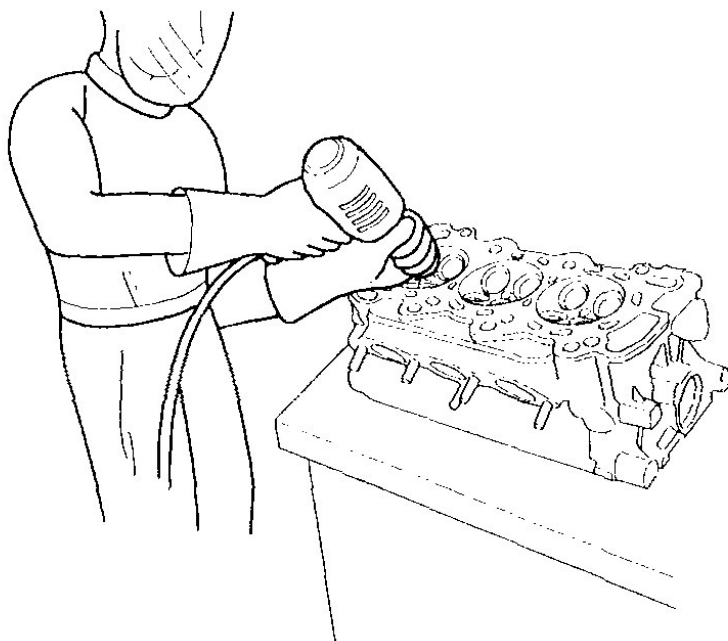
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**Fig. 176: Using Hot Plate To Heat Cylinder Head**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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.

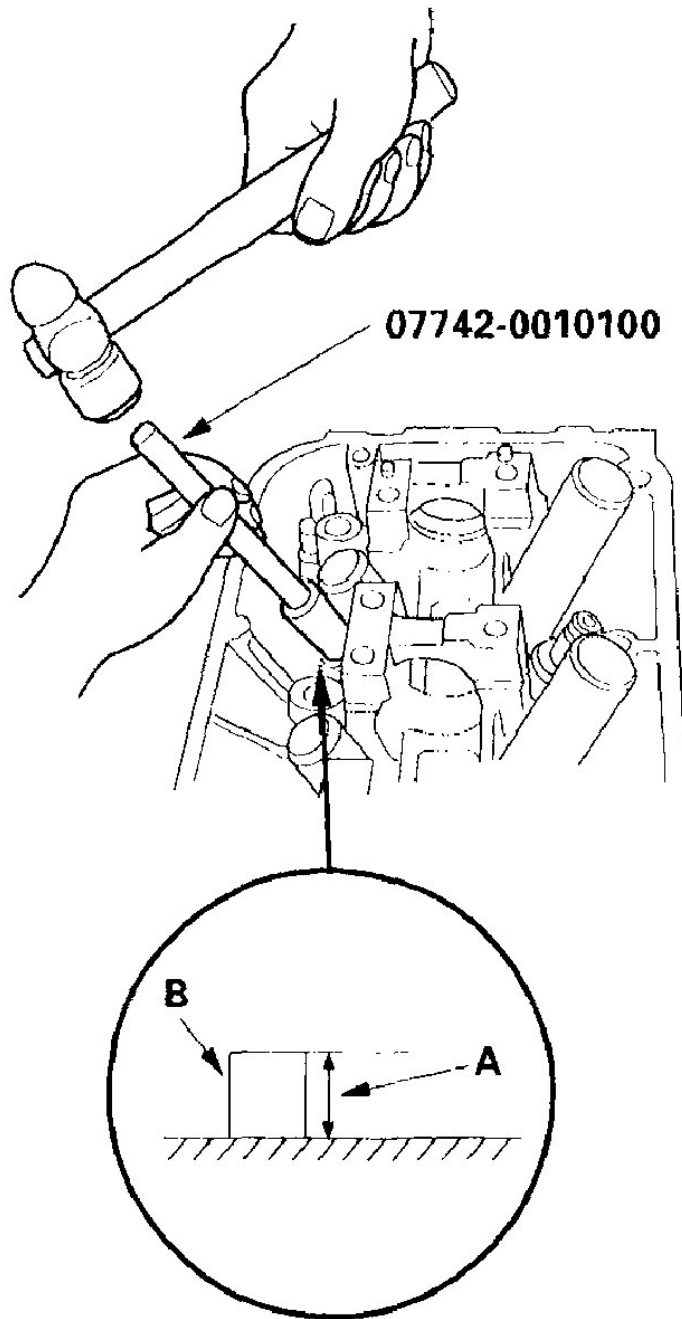


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**Fig. 177: Driving The Guide****Courtesy of AMERICAN HONDA MOTOR CO., INC.**

7. If a valve guide still won't move, drill it out with a 8 mm (5/16 inch) bit, then try again. Drill guides only in extreme cases; you could damage the cylinder head if the guide breaks.
8. Remove the new guide(s) from the freezer, one at a time, as you need them.
9. Apply a thin coat of clean 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 into 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:** 20.63-21.63 mm (0.812-0.852 in.)

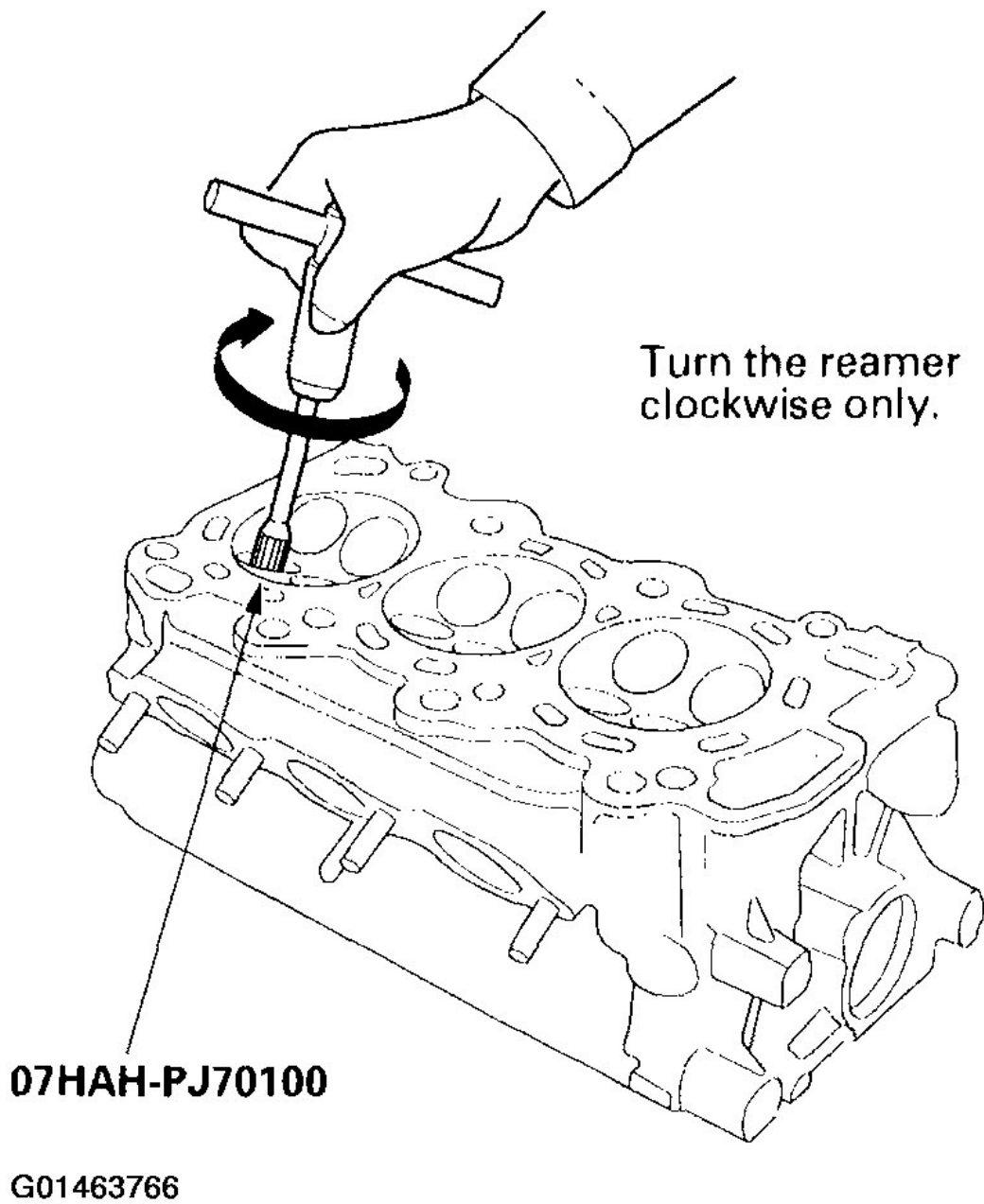


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**Fig. 178: Installing The Guide**

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. 179: Rotating The Reamer**

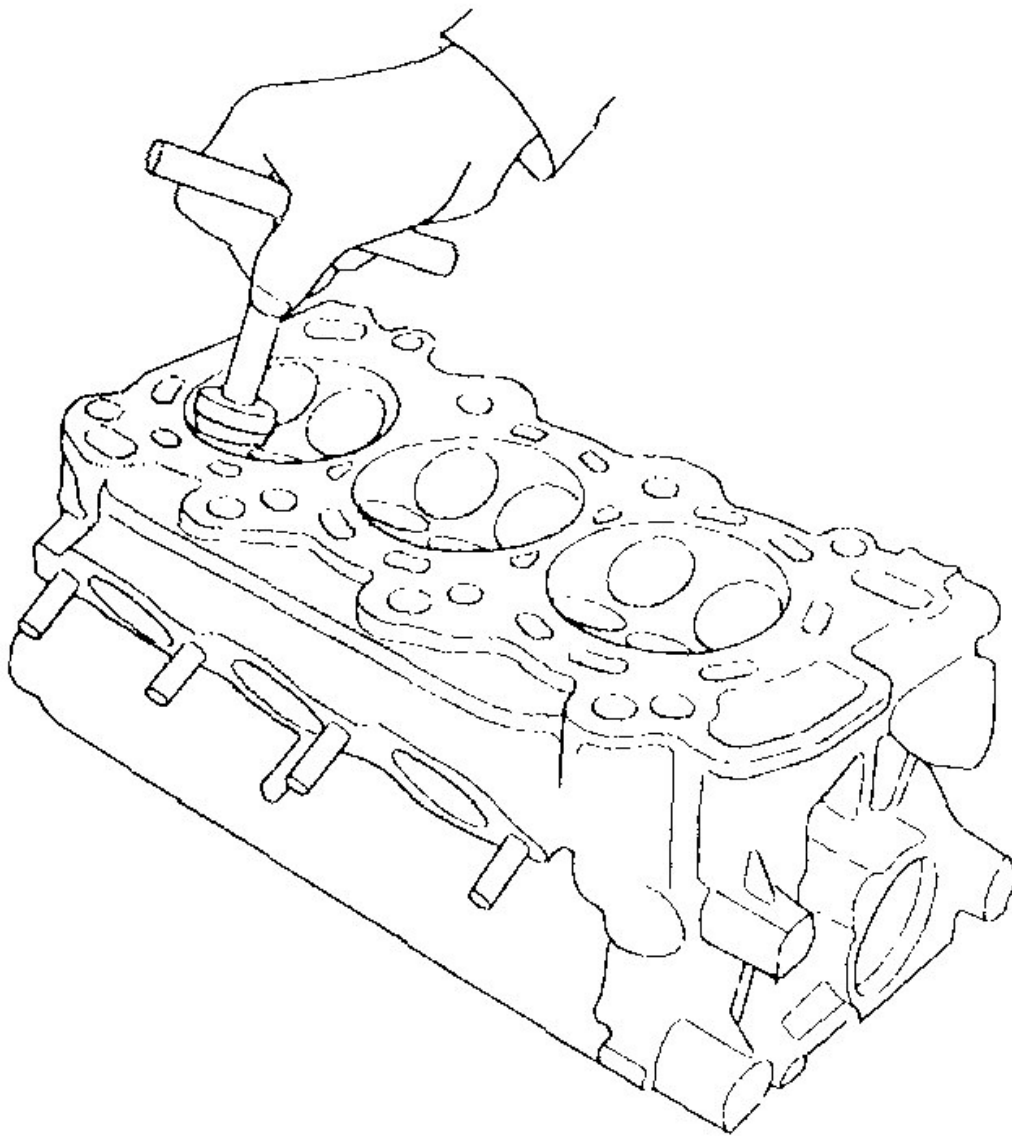
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Continue to rotate the reamer clockwise while removing it from the bore.
13. Thoroughly wash the guide in detergent and water to remove any cutting residue.
14. Check the clearance with a valve (see **Valve Inspection**). Verify that a valve slides in the intake and

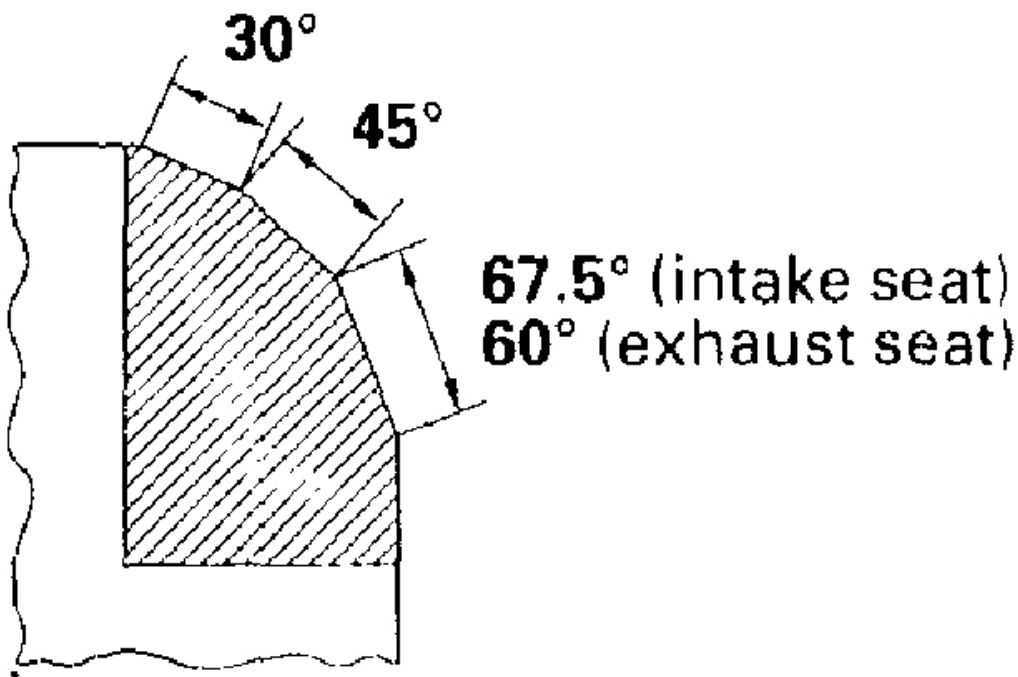
exhaust valve guides without exerting pressure.

## **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.

**G01463767****Fig. 180: 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.



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**Fig. 181: Beveling Edges**

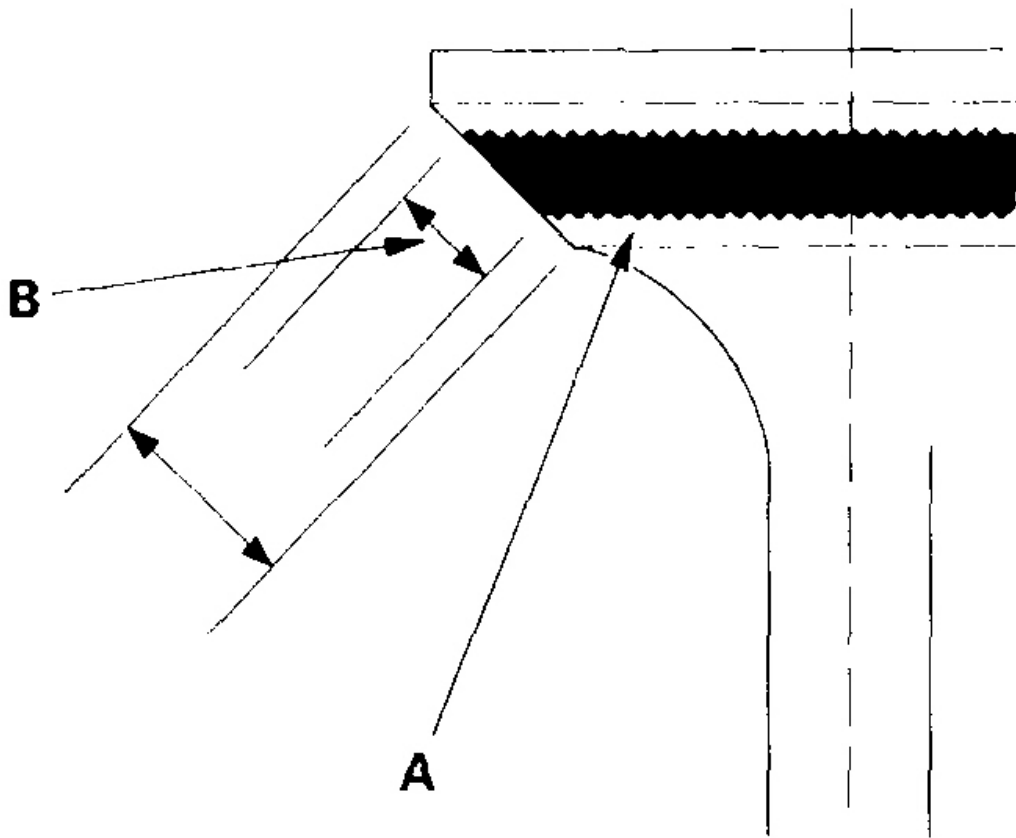
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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.





G01463769

**Fig. 182: Applying Prussian Blue Compound**

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**

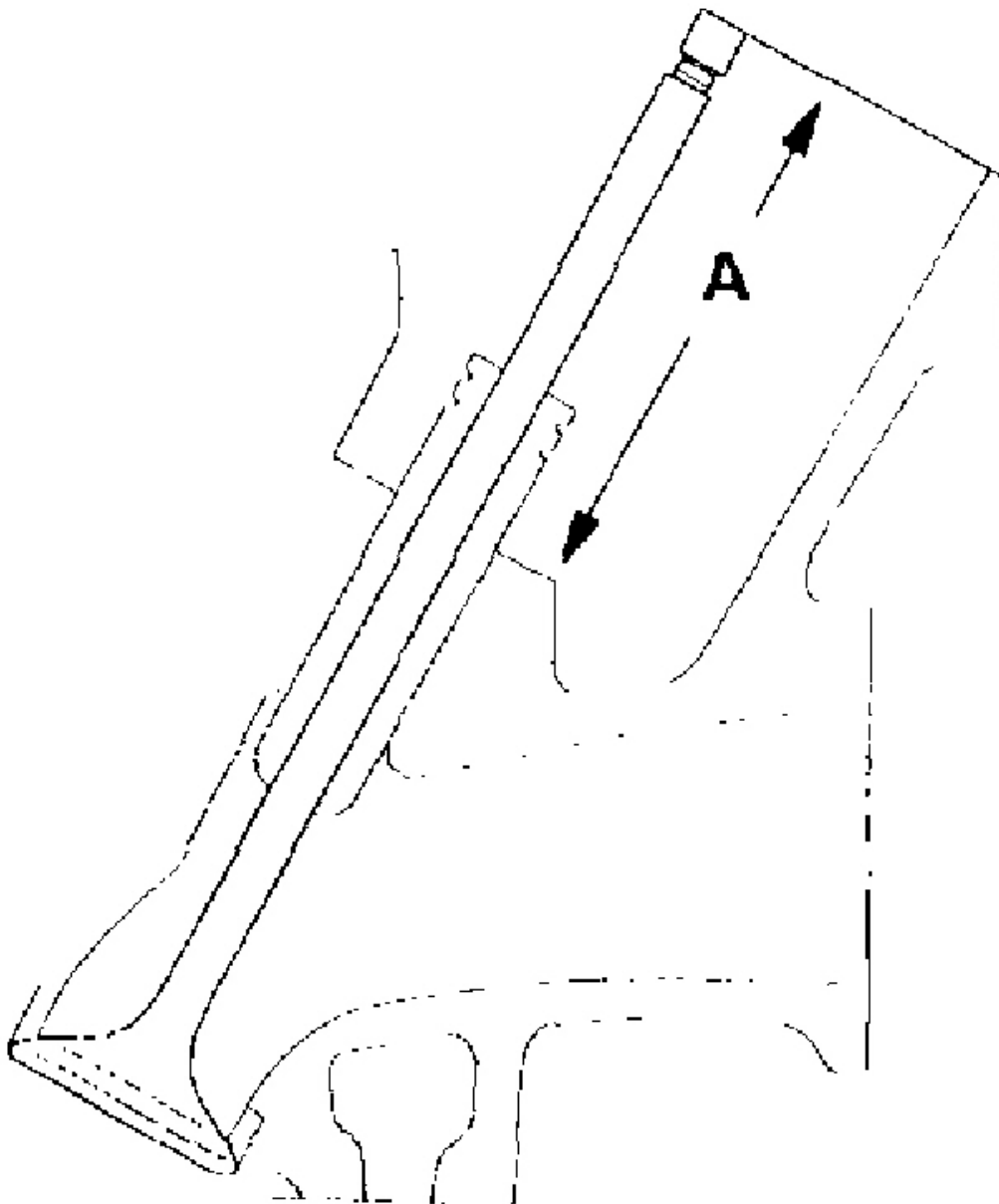
**Standard (New):** 46.75-47.55 mm (1.841-1.872 in.)

**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.)

**G01463770**

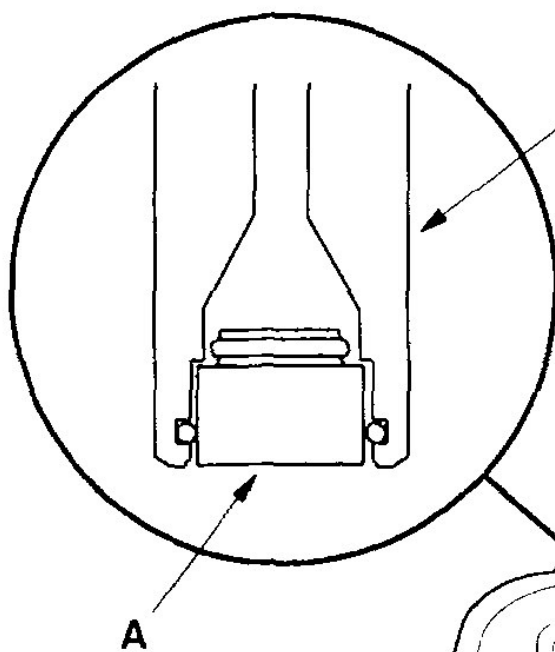
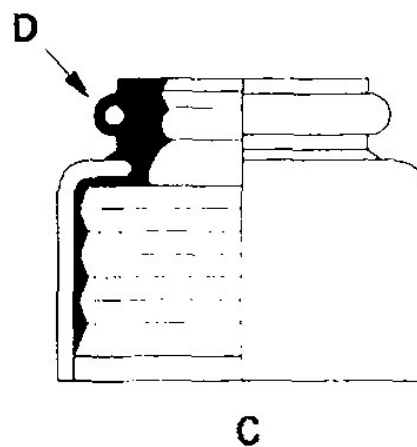
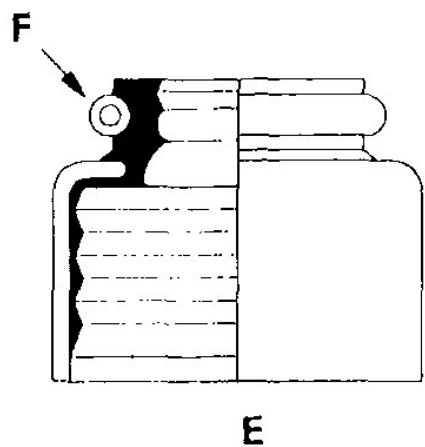
**Fig. 183: Measuring Valve Stem Installed Height**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

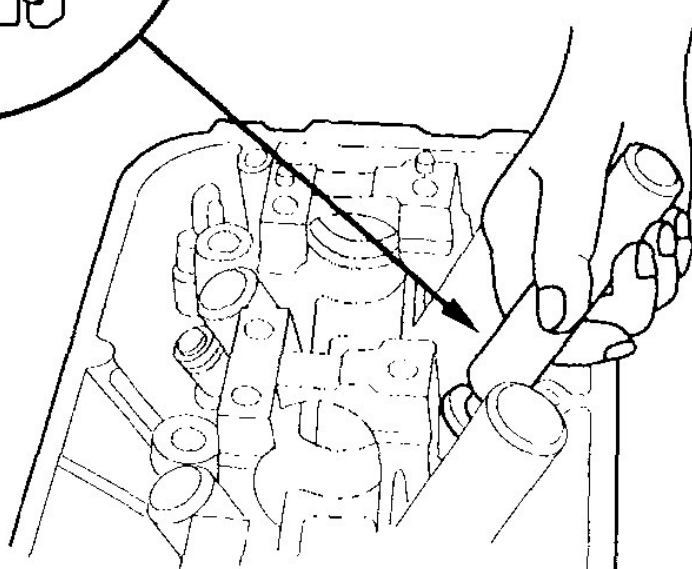
**VALVE, SPRING & VALVE SEAL INSTALLATION****Special Tools Required**

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

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



**B**  
**07PAD-0010000**  
**NOTE: Use 5.5 mm side.**

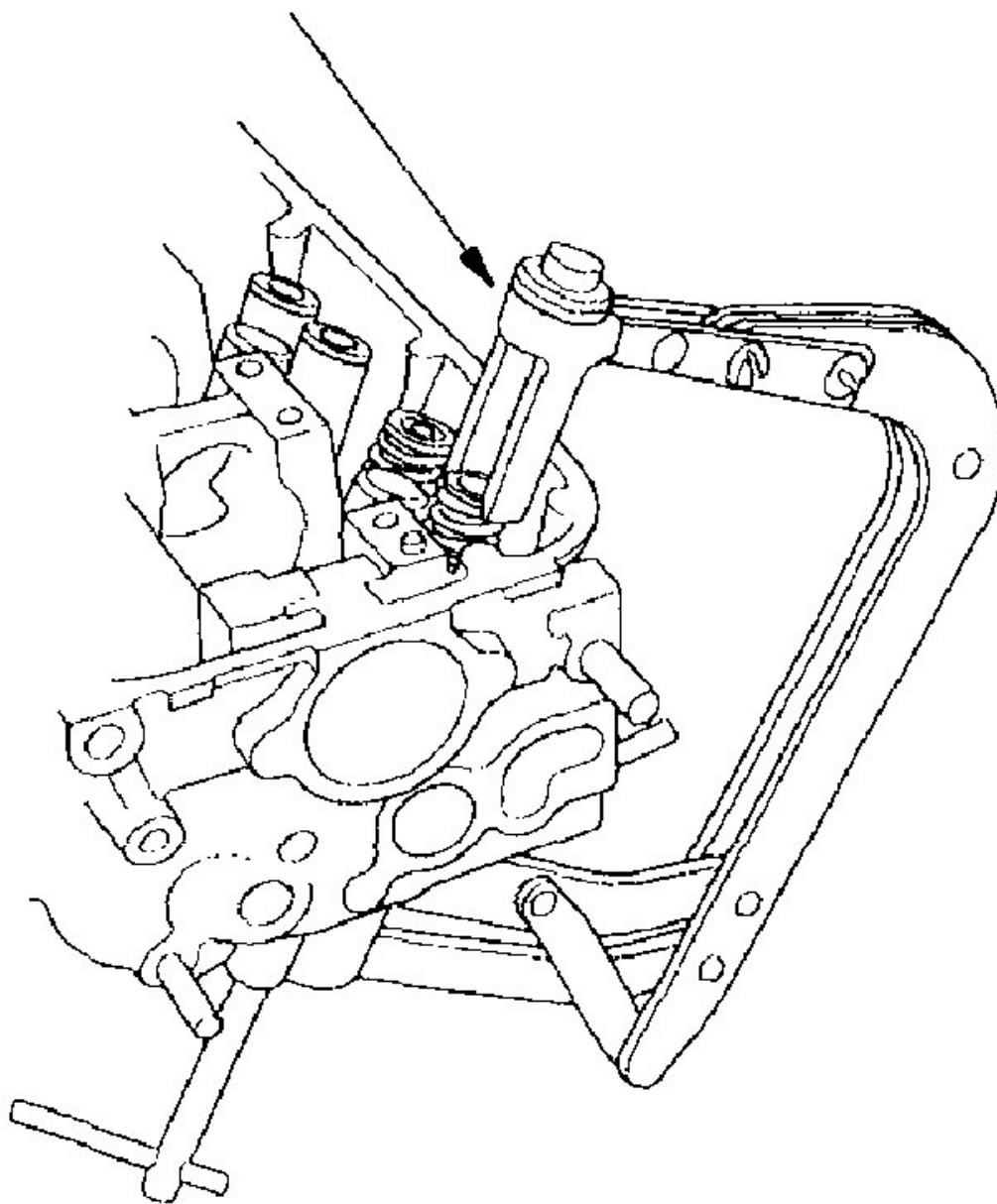


G01463771

**Fig. 184: Installing Valve Seals****Courtesy of AMERICAN HONDA MOTOR CO., INC.**

4. Install the new valve seals (A) using the valve guide seal installer (B).
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 keepers.

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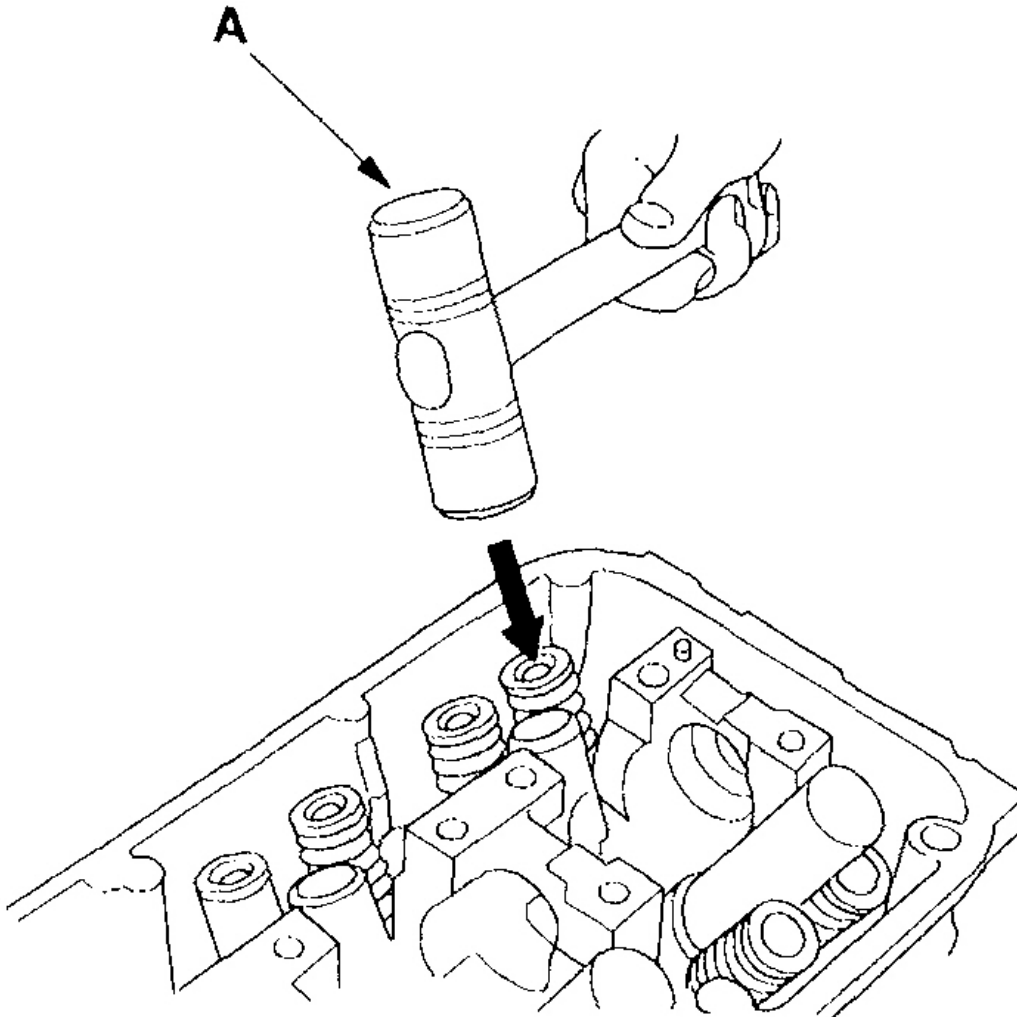


**G01463772**

**Fig. 185: Installing Valve Keepers**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. 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 keepers. Tap the valve stem only along its axis so you do not bend the stem.

**G01463773**

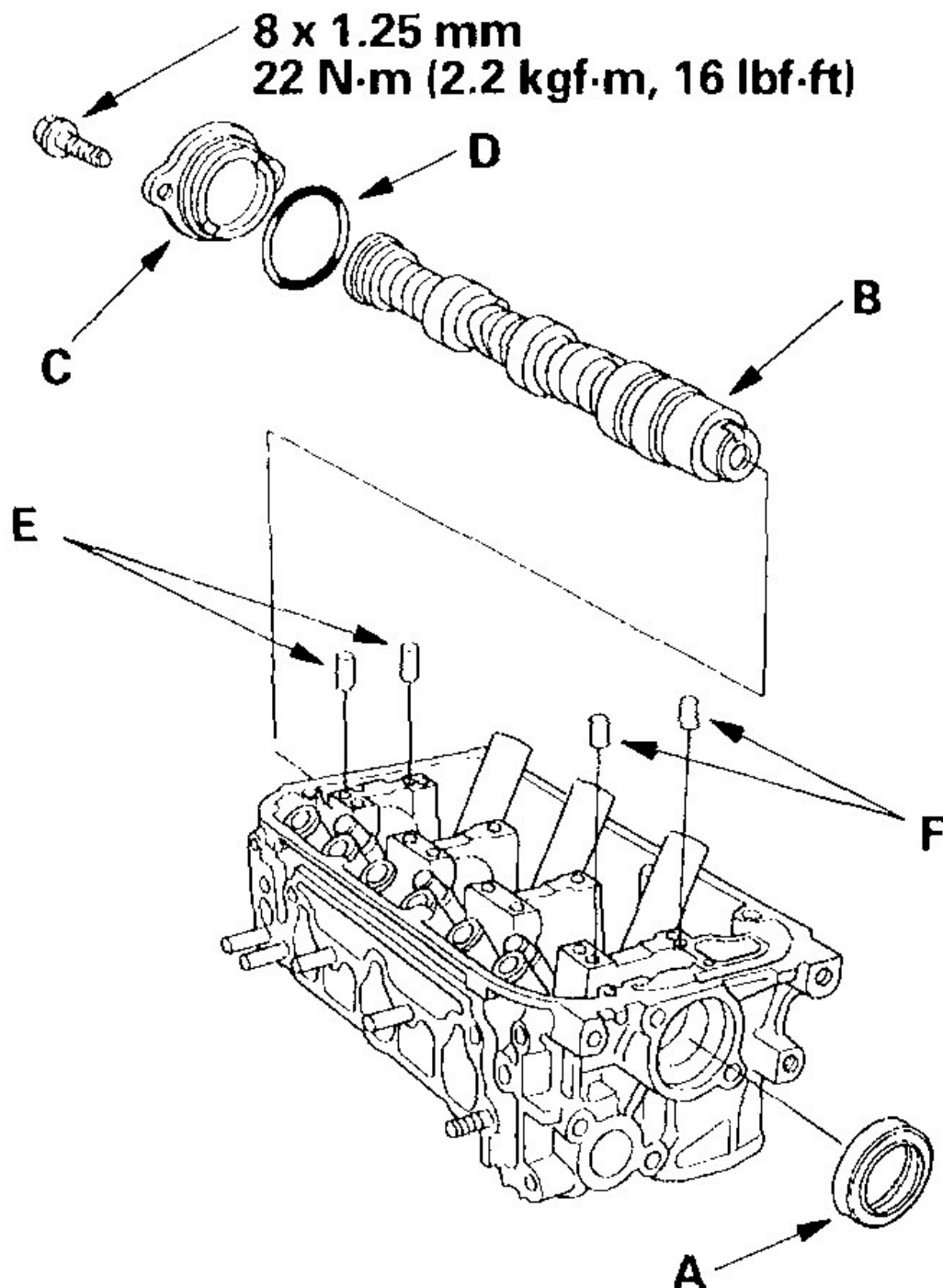
**Fig. 186: Ensuring Proper Seating Of Valve & Valve Keepers**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

#### **CAMSHAFT, ROCKER ARM, CAMSHAFT SEAL & 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.



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



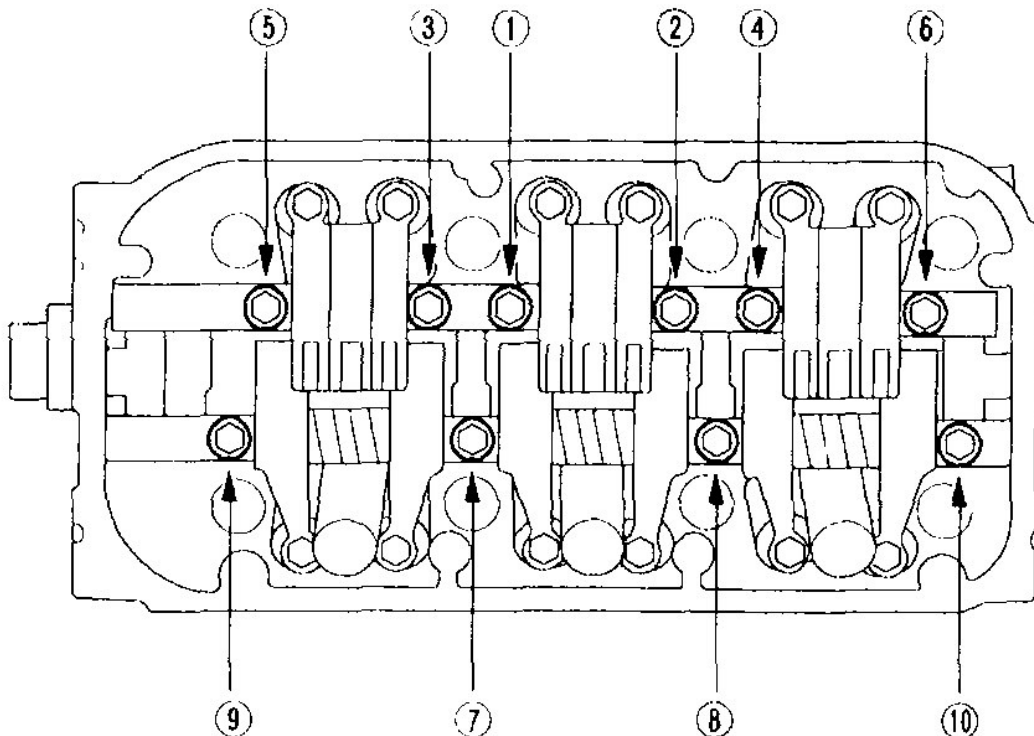
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**Fig. 187: Installing Camshaft Oil Seal Into The Cylinder Head**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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) in the camshaft thrust cover end, and the hollow dowel pins (F) in the camshaft oil seal end.
6. Loosen the valve adjusting screws.
7. 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.
8. Tighten each bolt two turns at a time in the sequence shown to ensure that the rockers do not bind on the valves.

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

**Apply new engine oil to the bolt threads and flange**

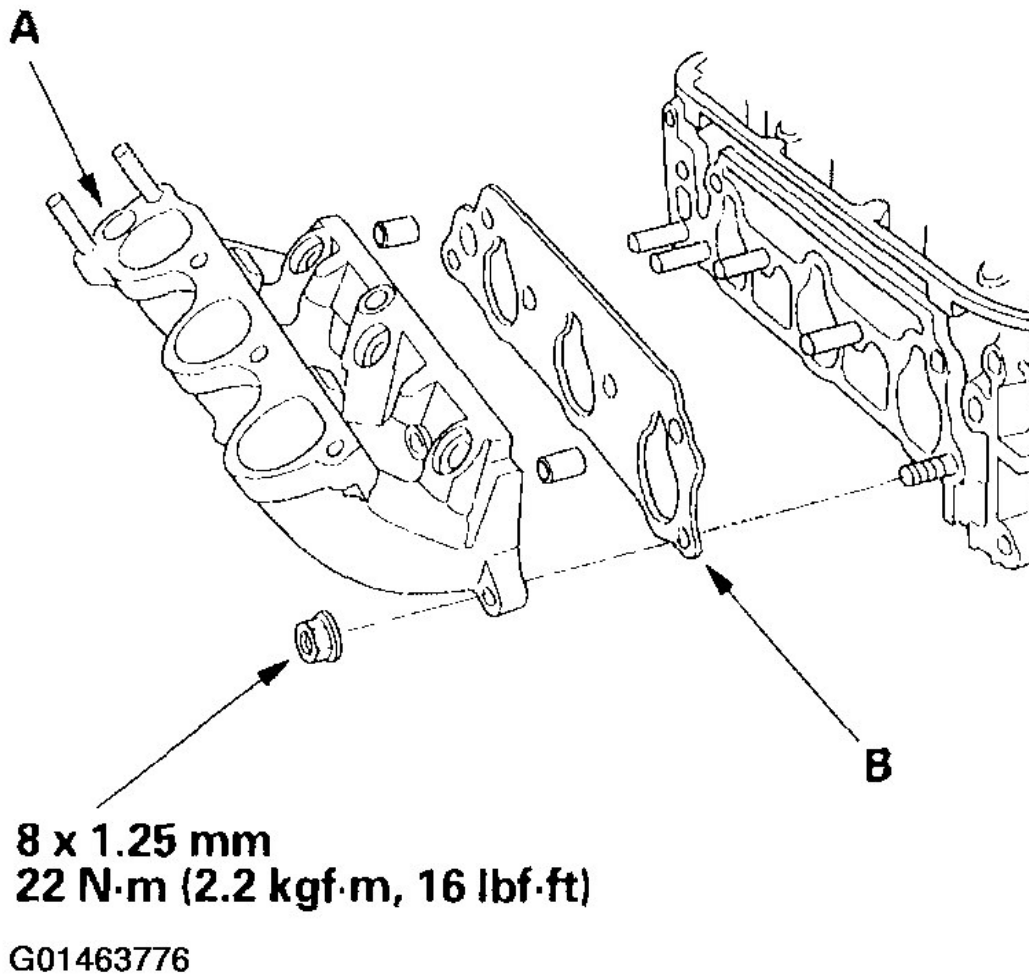


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**Fig. 188: Identifying Bolt Tightening Sequence**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

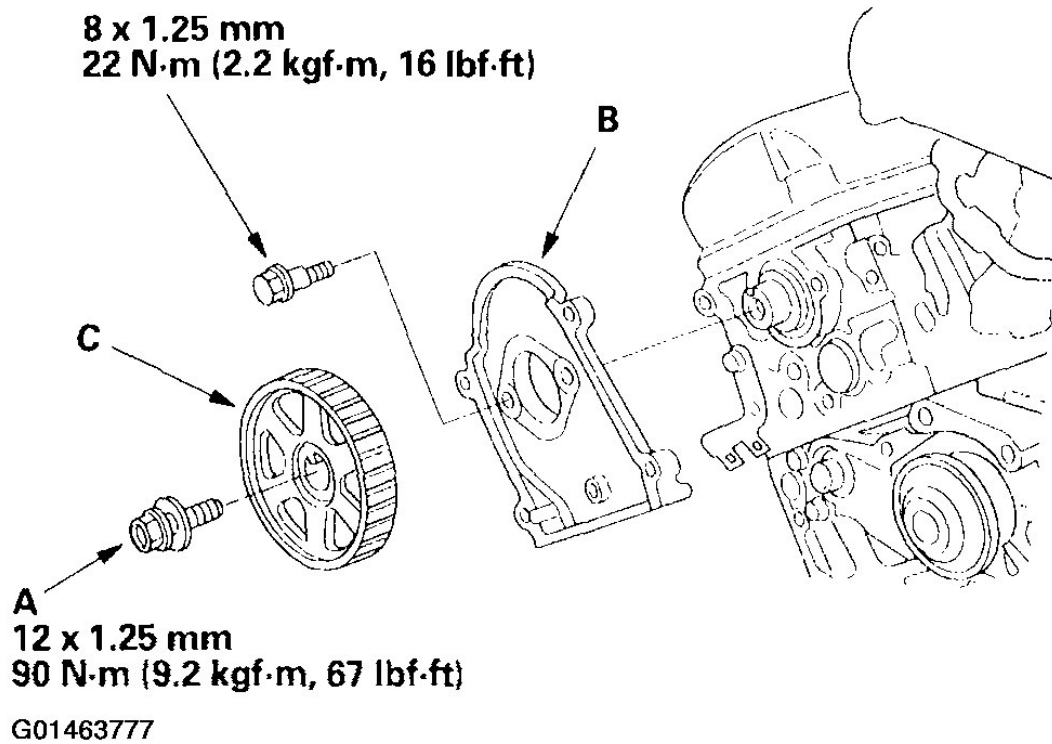
9. Install the injector base (A). Always use a new gasket (B).



**Fig. 189: Installing The Injector Base**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. 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).



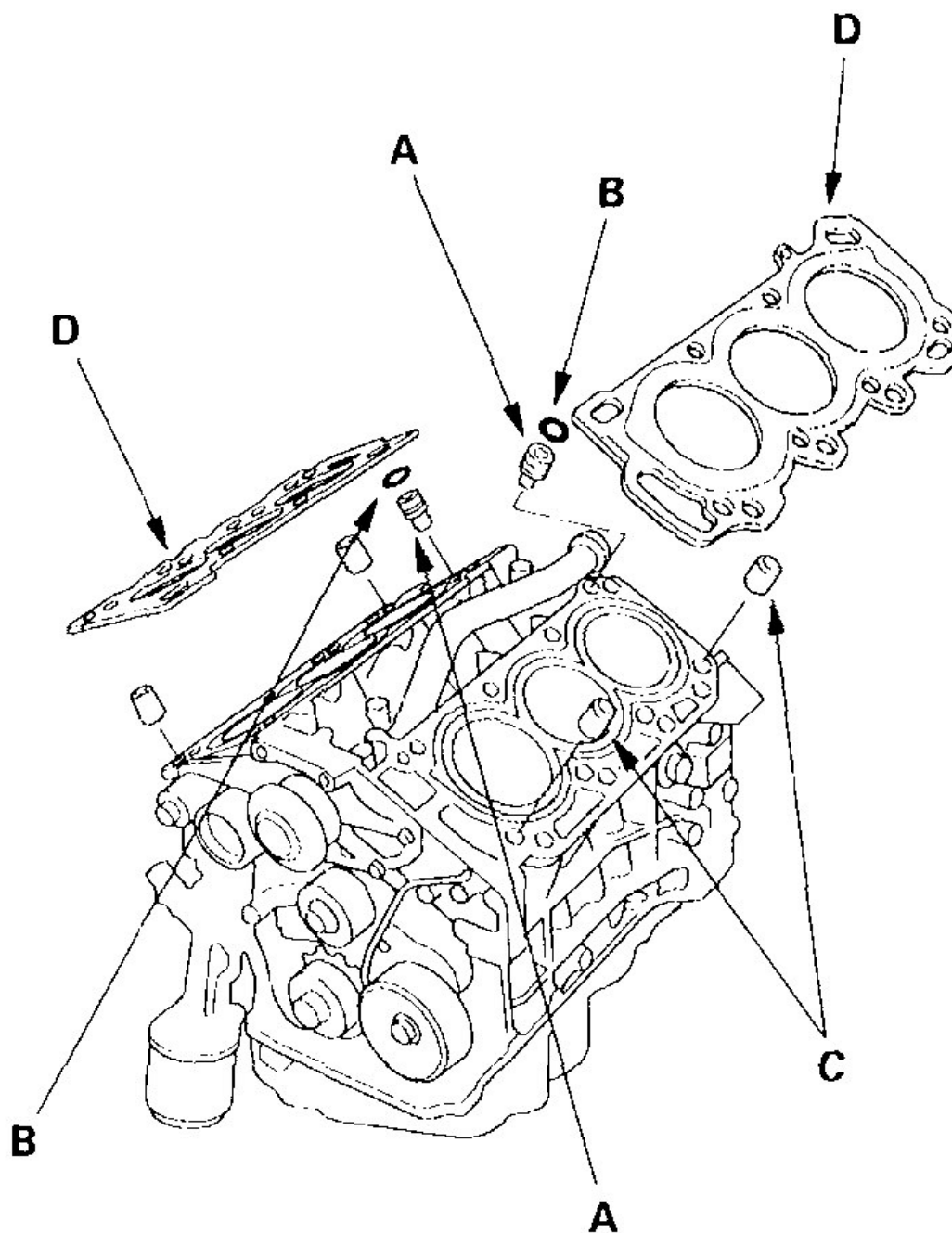
**Fig. 190: Installing Camshaft Pulley Mounting Bolt, Back Cover & Camshaft Pulley**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Install the timing belt (see [Timing Belt Installation](#) ).
12. Adjust the valve clearance (see [Valve Clearance Adjustment](#) ).

## CYLINDER HEAD INSTALLATION

Install the cylinder head in the reverse order of removal:

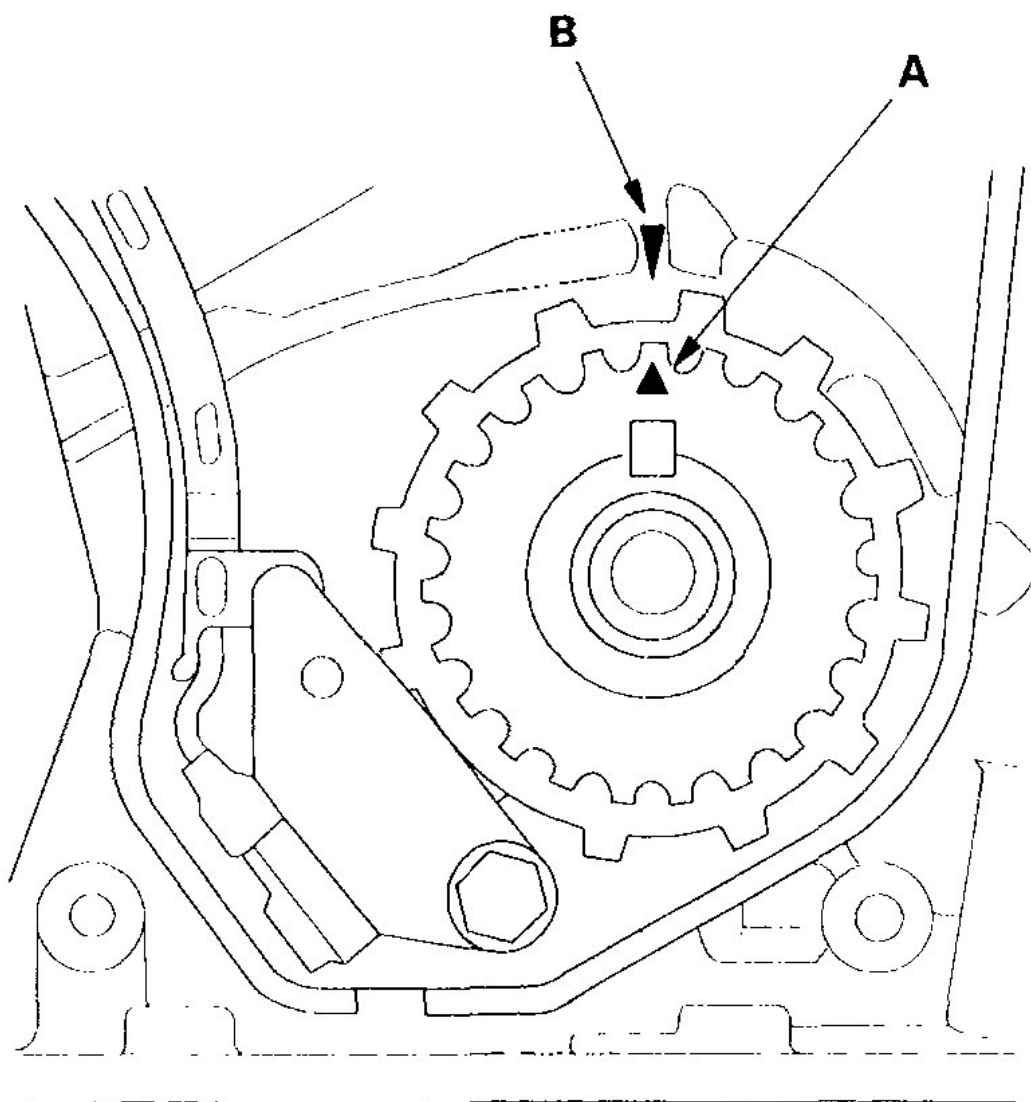
1. Clean the cylinder head and block surface.
2. Clean and install the oil control orifices (A) with new O-rings (B).



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**Fig. 191: Installing The Oil Control Orifices**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

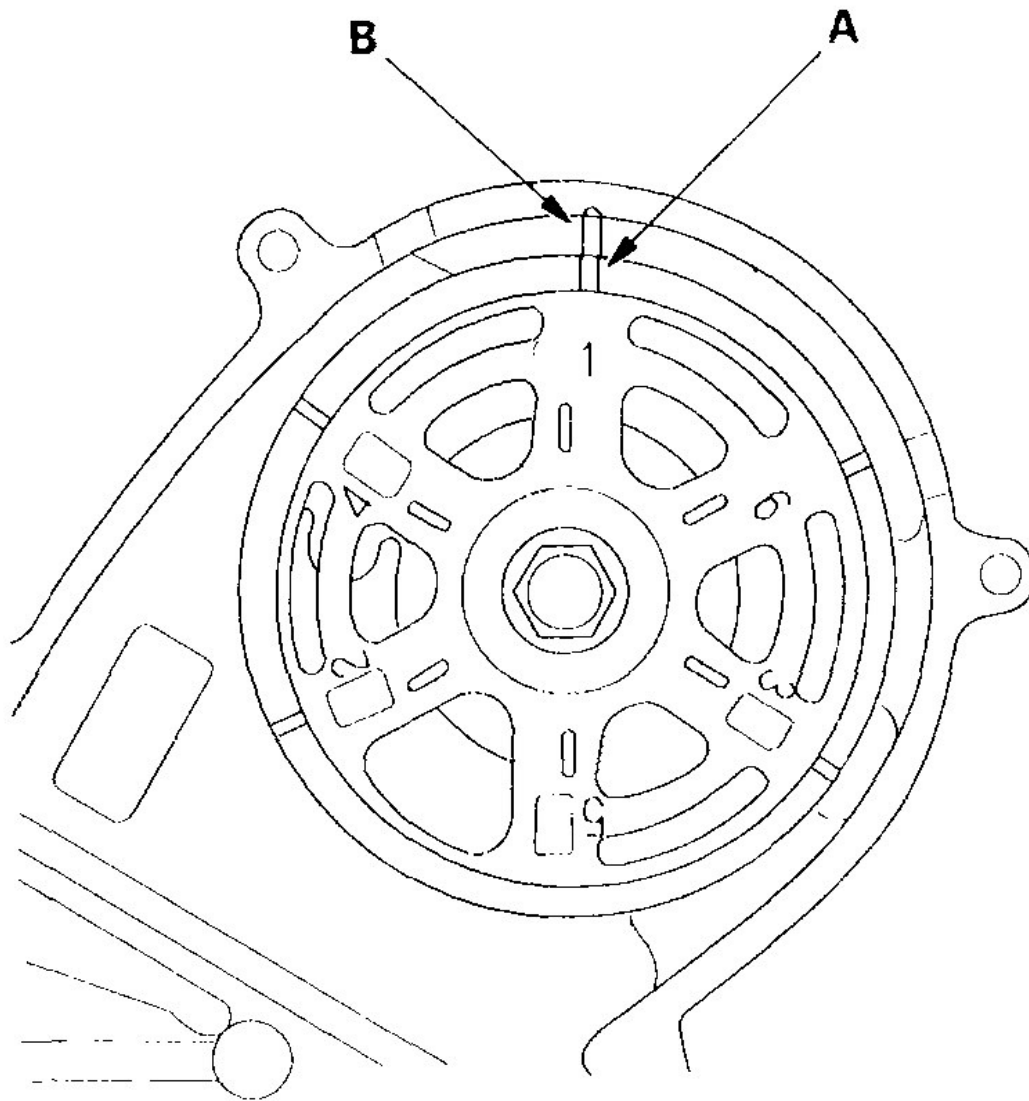
3. Install the dowel pins (C) and new cylinder head gaskets (D).
4. Clean the timing belt drive pulley.
5. Set the timing belt drive pulley to top dead center (TDC) by aligning the TDC mark (A) on the tooth of the timing belt drive pulley with the pointer (B) on the oil pump.



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**Fig. 192: Aligning The TDC Mark On The Tooth Of The Timing Belt Drive Pulley With The Pointer On The Oil Pump**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

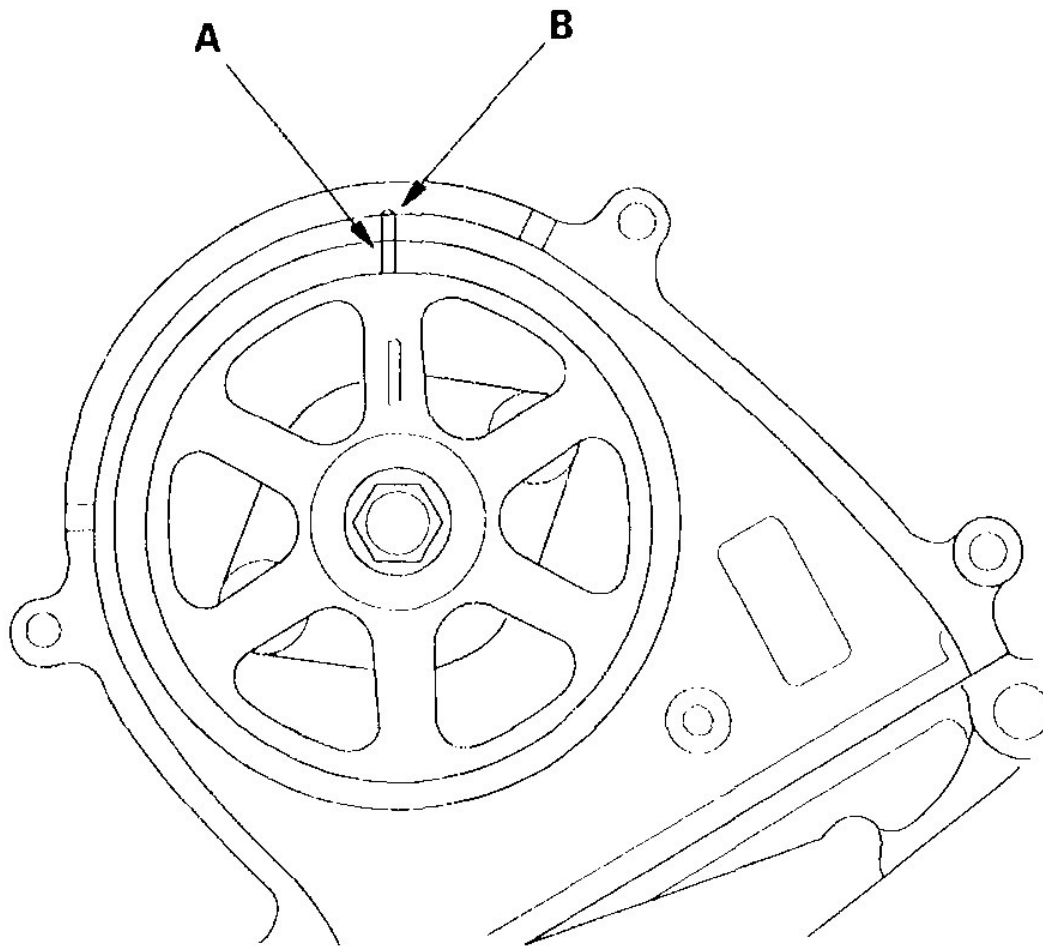


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**Fig. 193: Aligning The TDC Marks On The Camshaft Pulleys With The Pointers On The Back Covers (Front)**

Courtesy of AMERICAN HONDA MOTOR CO., INC.





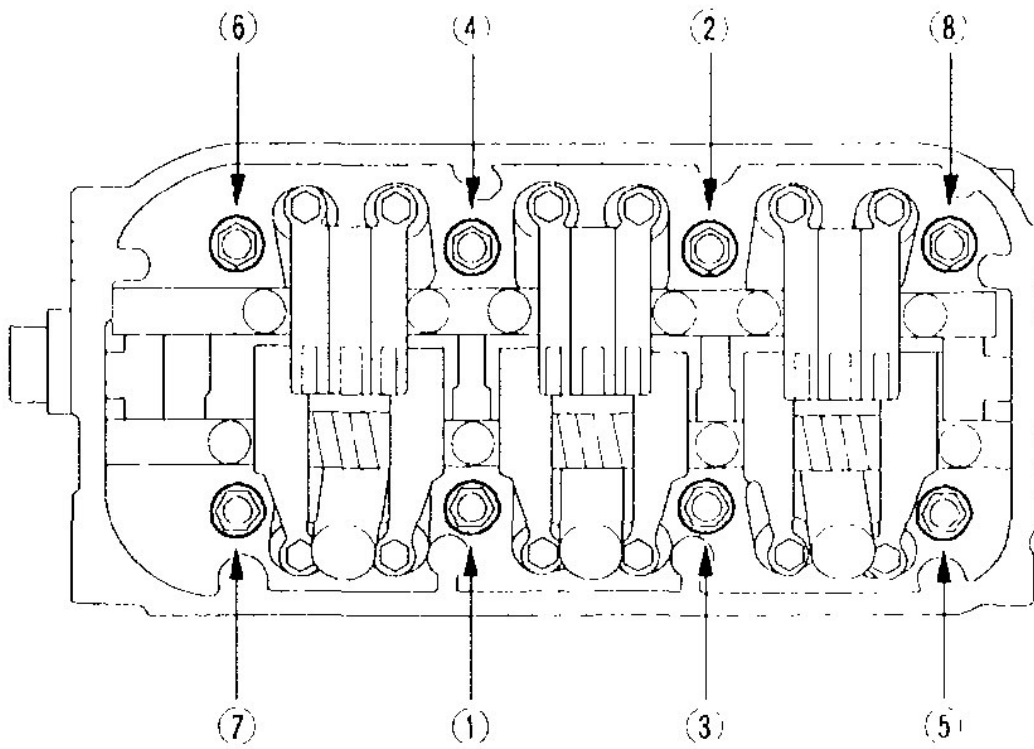
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**Fig. 194: Aligning The TDC Marks On The Camshaft Pulleys With The Pointers On The Back Covers (Rear)**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Apply new engine oil to the threads and flanges of the cylinder head bolts.

**NOTE:        Perform each step twice.**



G01463782

**Fig. 195: Identifying Cylinder Head Bolts Tightening Sequence**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Tighten the cylinder head bolts sequentially in three steps.

**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)

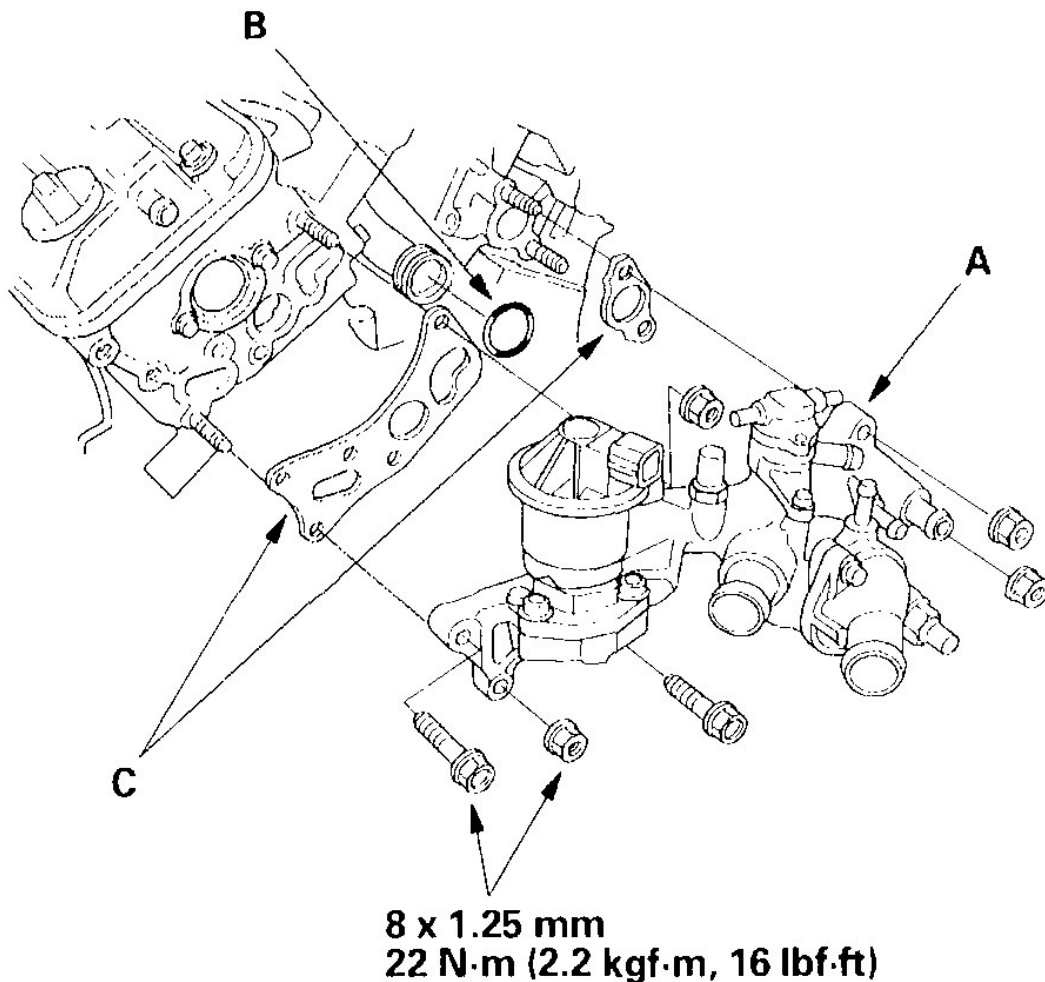
**3rd step torque:** 98.1 N.m (10.0 kgf.m, 72.3 lbf.ft)

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.

9. Install the timing belt (see **Timing Belt Installation** ).
10. Adjust the valve clearance (see **Valve Clearance Adjustment** ).
11. Install the cylinder head cover (see **Cylinder Head Cover Installation** 8).

12. Install the exhaust manifold and tighten the nuts in a crisscross pattern in two or three steps, beginning with the inner nut (see **Exhaust Manifold Removal & Installation** ). Always use a new exhaust manifold gasket.
13. Install the nuts securing exhaust pipe A and exhaust manifold, then install the cover on the exhaust manifold.
14. Install the water passage (A). Always use a new O-ring (B) and new gaskets (C).

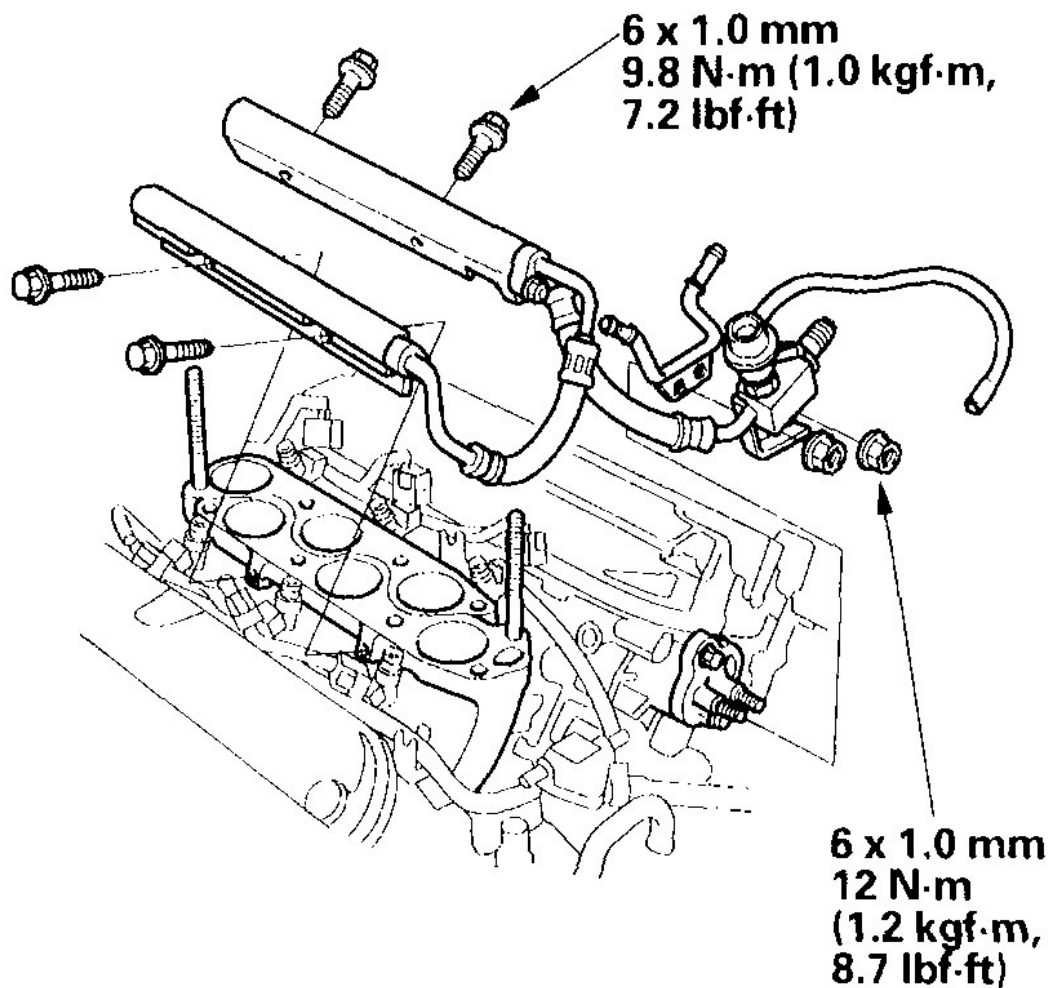


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**Fig. 196: Installing The Water Passage**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Install the fuel rails.

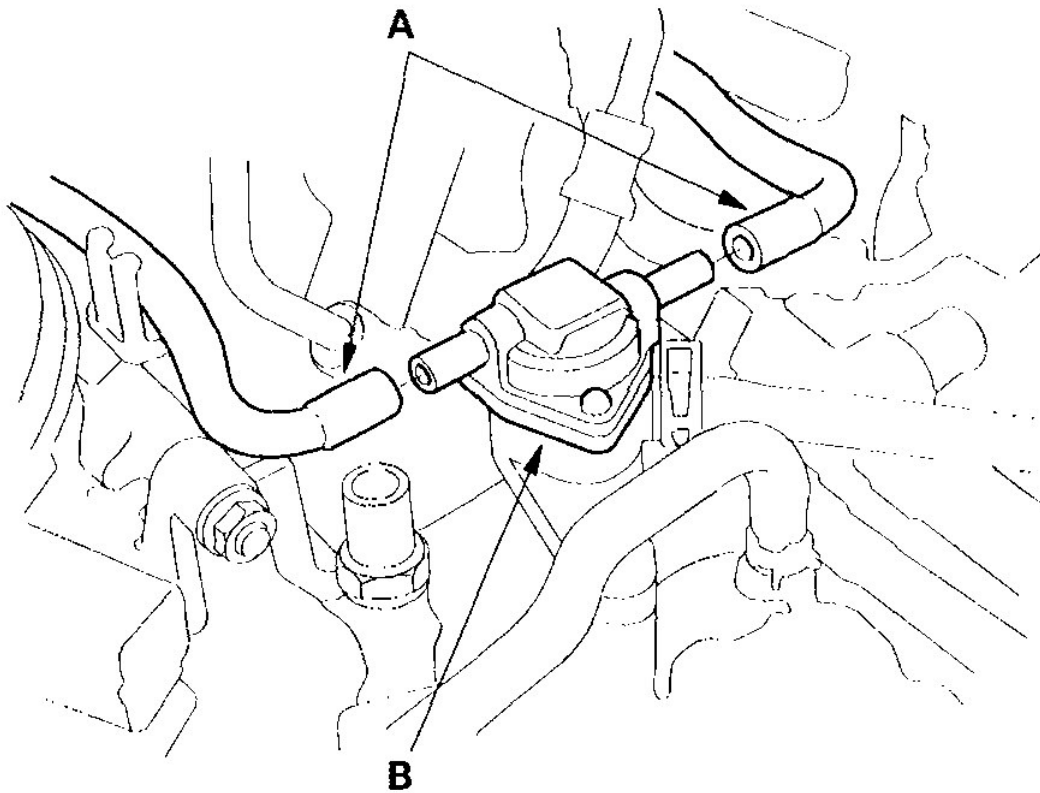


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**Fig. 197: Installing The Fuel Rails**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

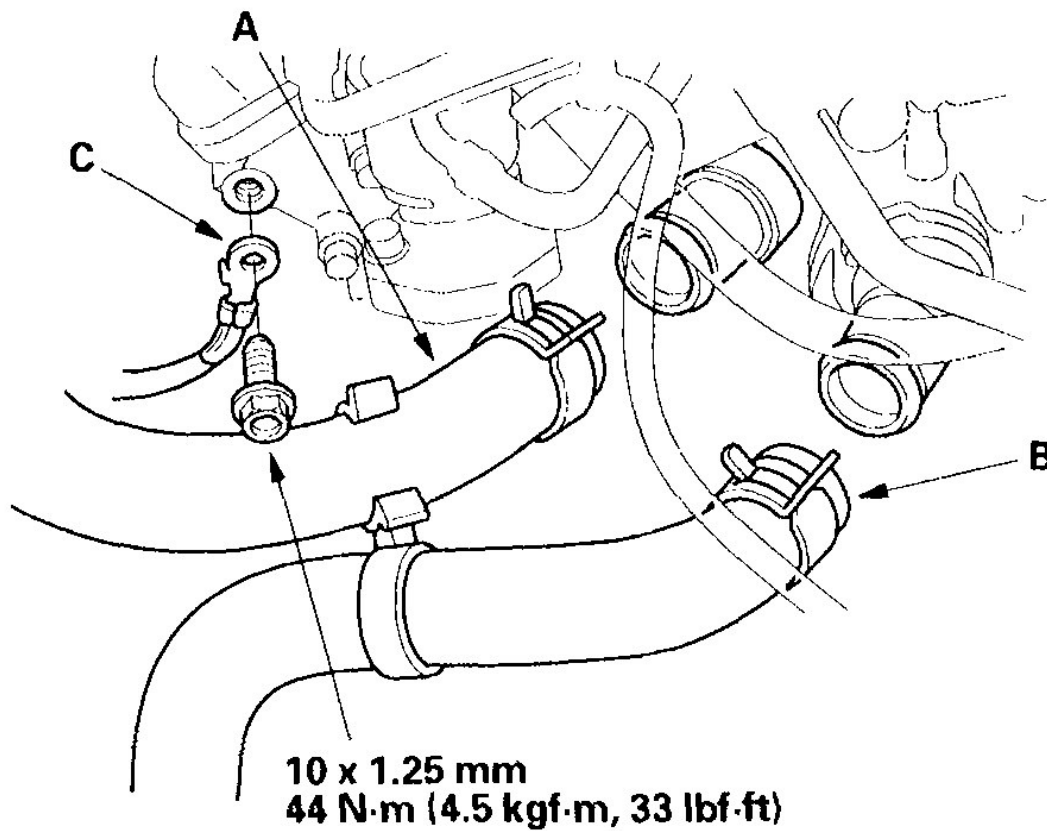
16. Install the vacuum hoses (A) on the intake air bypass control thermal valve (B).



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**Fig. 198: Installing The Vacuum Hoses On The Intake Air Bypass Control Thermal Valve**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

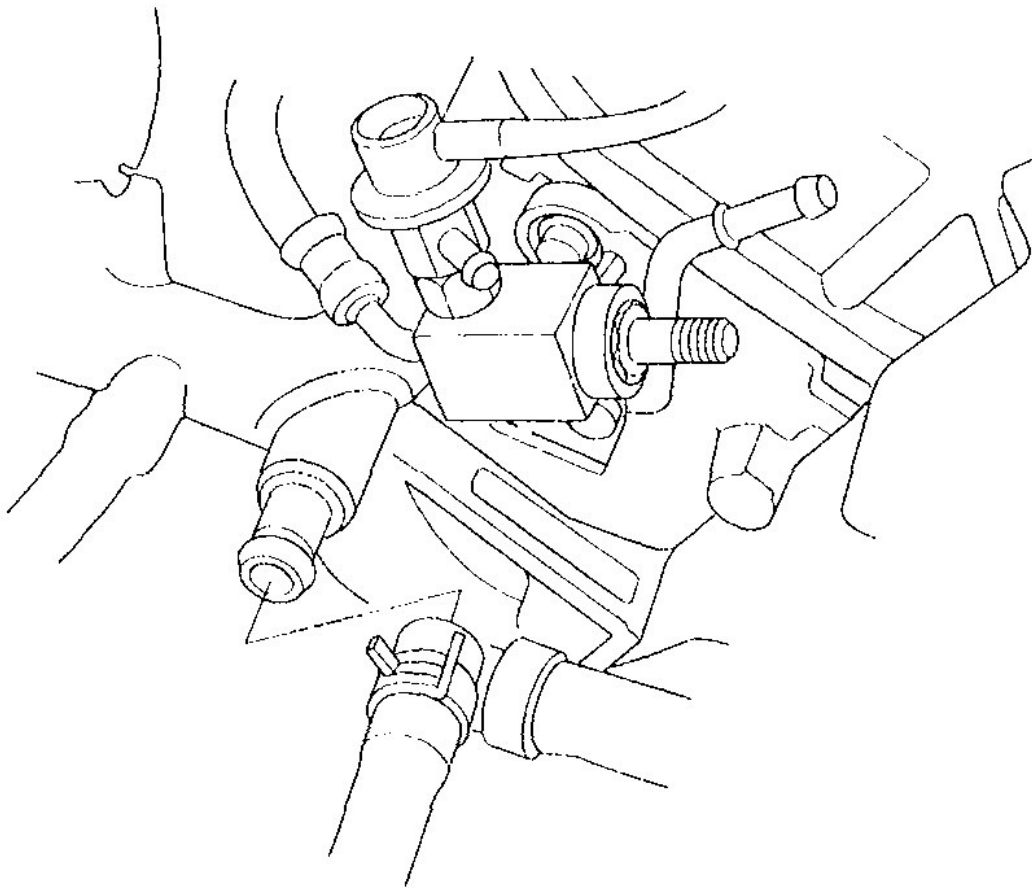
17. Install the upper radiator hose (A), lower radiator hose (B), and ground cable (C).



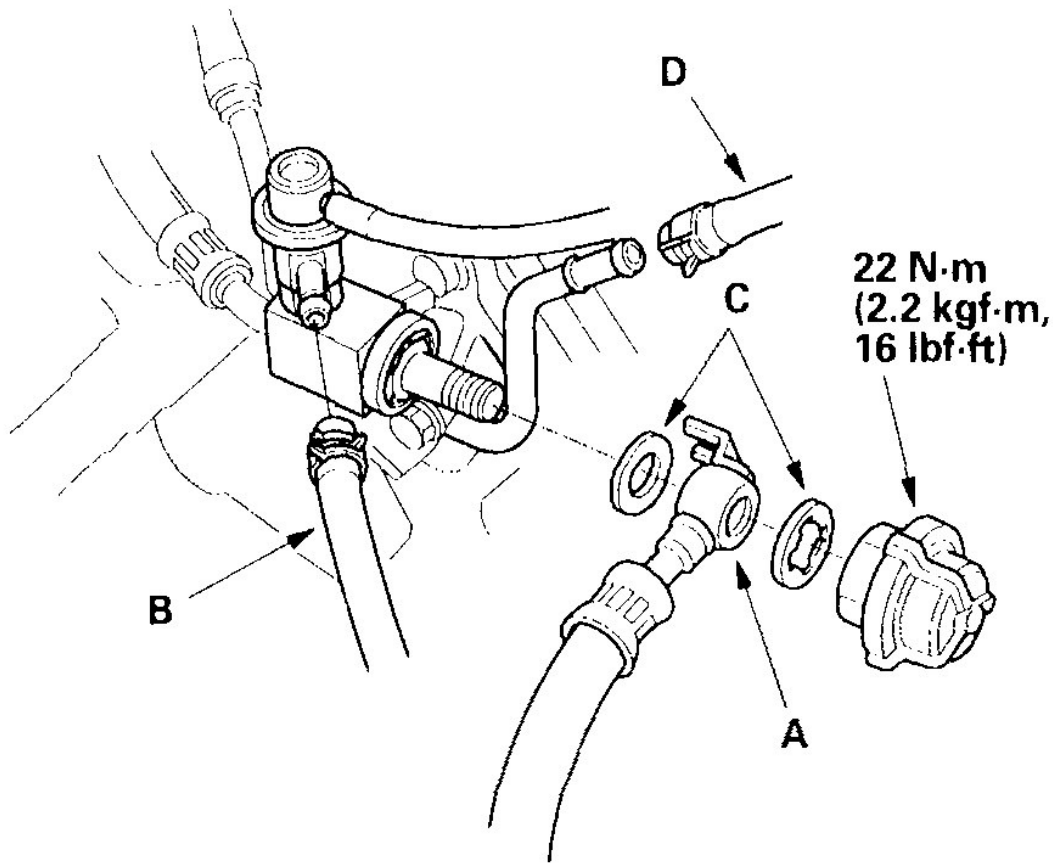
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**Fig. 199: Installing The Upper Radiator Hose, Lower Radiator Hose & Ground Cable**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Install the heater hose.

**G01463787****Fig. 200: Installing The Heater Hose****Courtesy of AMERICAN HONDA MOTOR CO., INC.**

19. Install the intake manifold (see **Intake Manifold Removal & Installation** ).
20. Loosely install the power steering (P/S) pump and P/S pump belt.
21. Adjust the P/S pump belt (see **PUMP BELT INSPECTION & ADJUSTMENT** ).
22. Install the alternator (see **ALTERNATOR** ).
23. Install the alternator-compressor belt (see **ALTERNATOR BELT** ).
24. Install the fuel feed hose (A) and fuel return hose (B), using new washers (C).



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**Fig. 201: Installing The Fuel Feed Hose & Fuel Return Hose**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

25. Install the evaporative emission (EVAP) canister hose (D).
26. Clean the battery posts and cable terminals with sandpaper, then assemble them and apply grease to prevent corrosion.
27. After installation, check that all tubes, hoses and connectors are installed correctly.
28. 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.
29. Refill the radiator with engine coolant, and bleed air from cooling system with the heater valve open (see step 8 on **COOLANT REPLACEMENT** ).
30. Perform 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** ).
31. Inspect the idle speed (see **IDLE SPEED ADJUSTMENT** ).



32. Inspect the ignition timing (see **IGNITION TIMING INSPECTION** ).
33. Enter the anti-theft codes for the radio and the navigation system, then enter the customer's radio station presets. Reset the clock.

## ENGINE BLOCK

### SPECIAL TOOLS

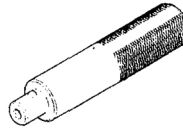
| Ref. No. | Tool Number   | Description               | Qty |
|----------|---------------|---------------------------|-----|
| ①        | 070AD-RCAA100 | Oil Seal Driver, 64 mm    | 1   |
| ②        | 070AD-RCAA200 | Driver Attachment, 106 mm | 1   |
| ③        | 07749-0010000 | Driver             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



①



②



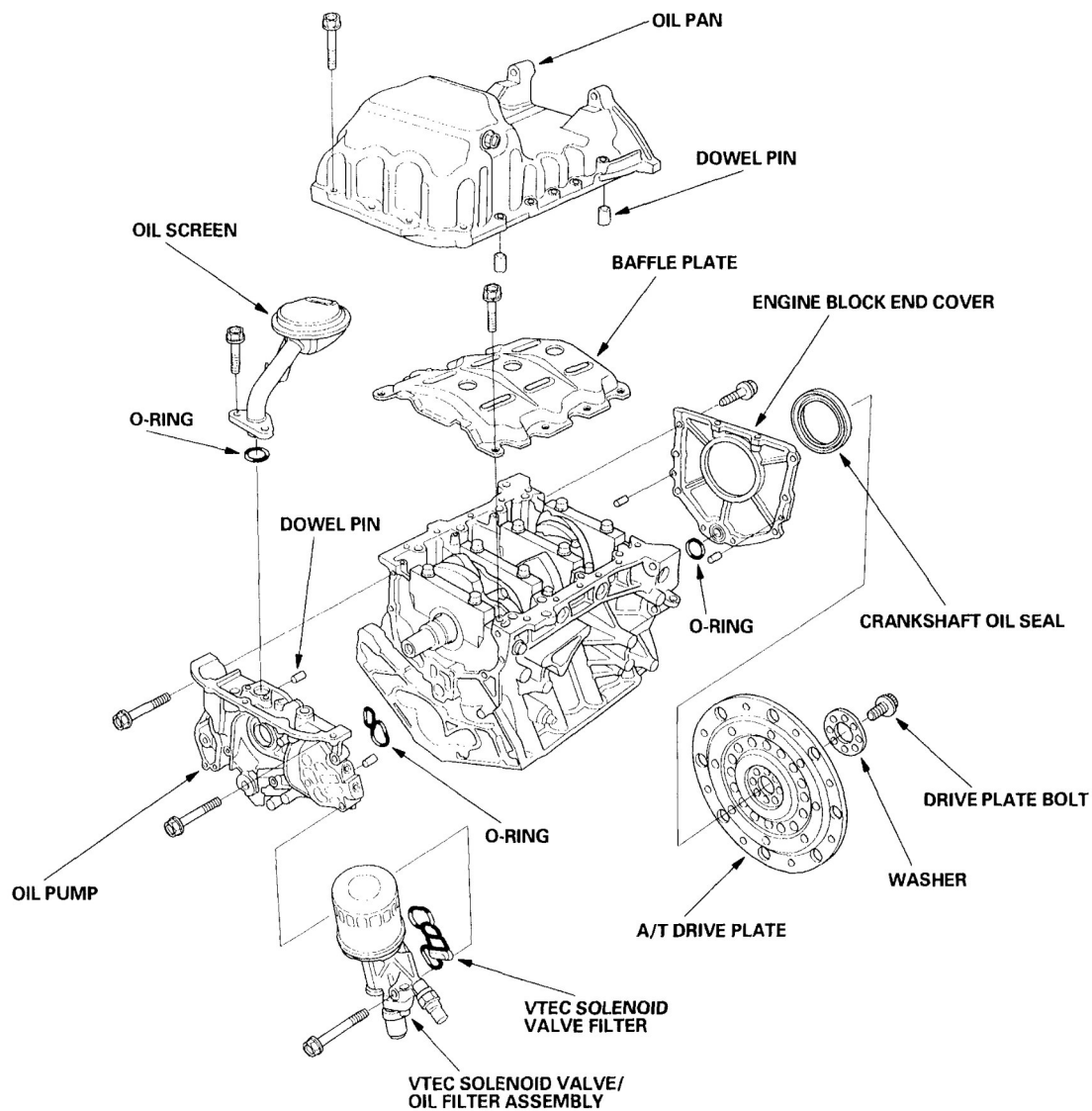
③

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### **Fig. 202: Identifying Special Tools**

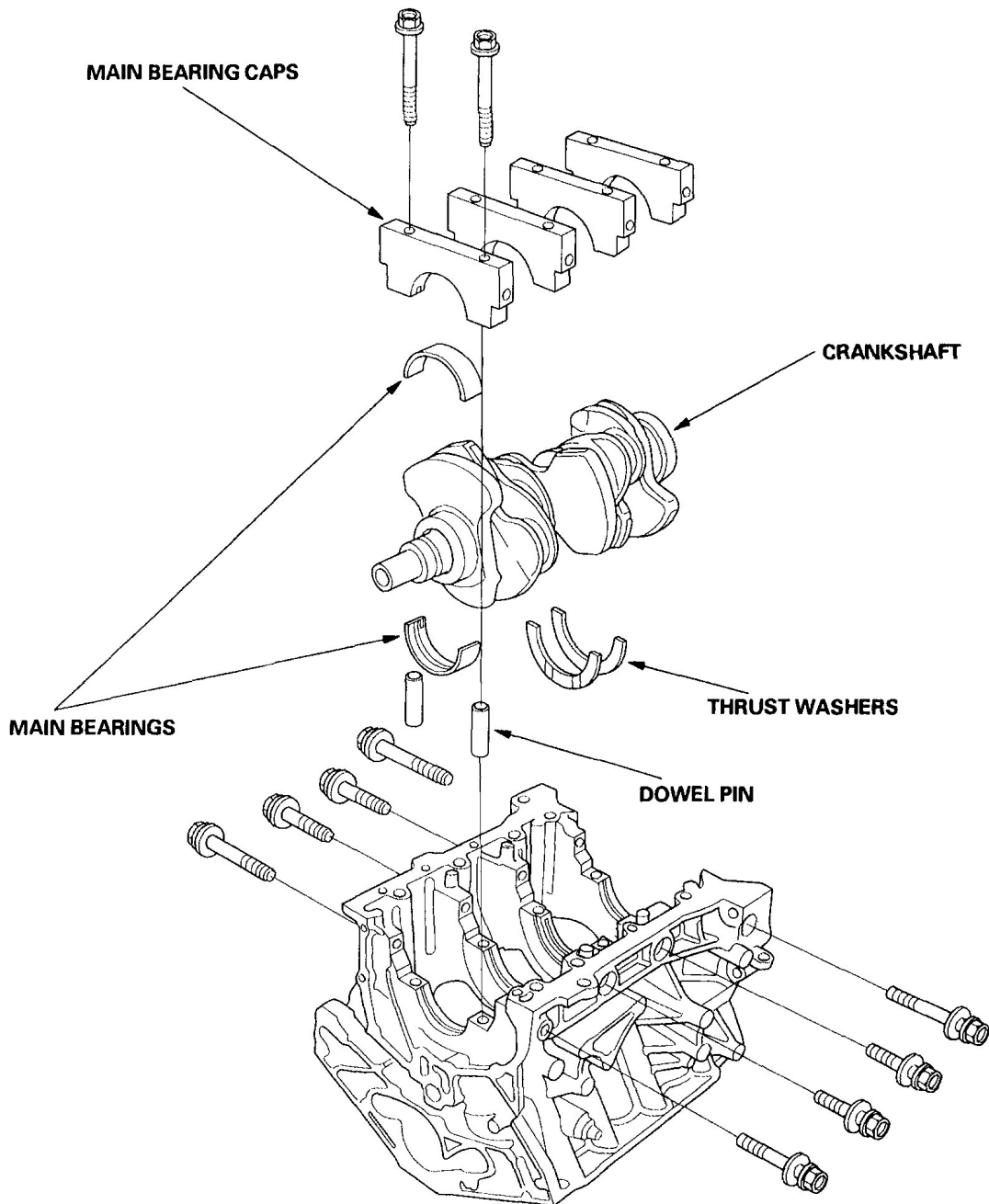
Courtesy of AMERICAN HONDA MOTOR CO., INC.

### COMPONENT LOCATION INDEX



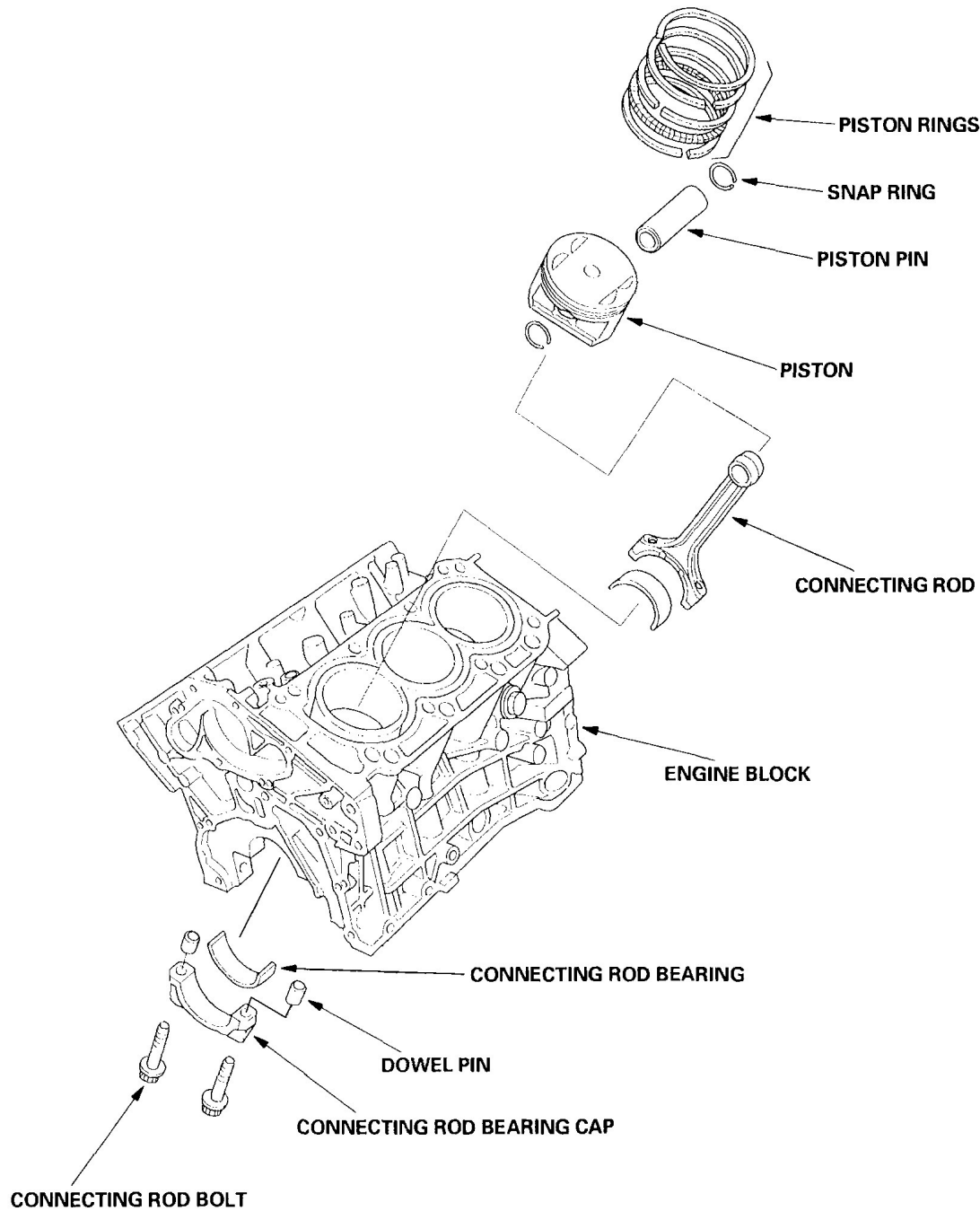
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**Fig. 203: Locating Engine Block Components (1 Of 3)**  
 Courtesy of AMERICAN HONDA MOTOR CO., INC.



G01463791

**Fig. 204: Locating Engine Block Components (2 Of 3)**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.



G01463792

**Fig. 205: Locating Engine Block Components (3 Of 3)**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

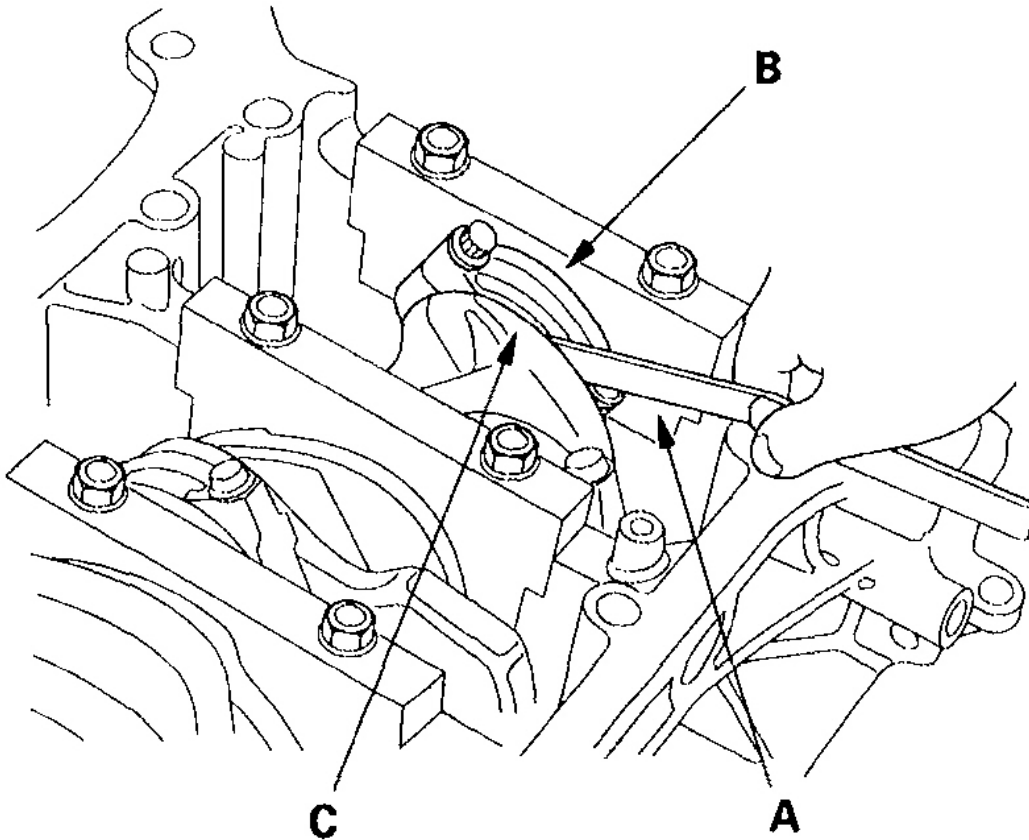
## CONNECTING ROD & CRANKSHAFT END PLAY INSPECTION

1. Remove the oil pump (see **OIL PUMP OVERHAUL** ).
2. Remove the baffle plate (see step 7 on **Crankshaft & Piston Removal** ).
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 mm (0.006-0.14 in.)

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



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**Fig. 206: Measuring The Connecting Rod End Play**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

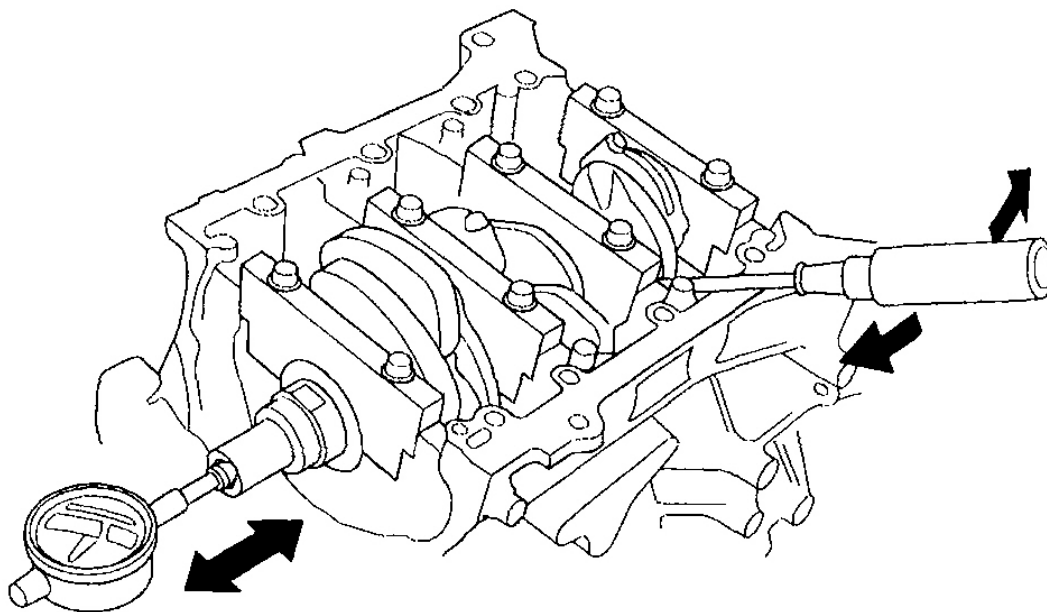
4. If the connecting rod end play is out-of-tolerance, install a new connecting rod and recheck. If it is still out-of-tolerance, replace the crankshaft (see **Crankshaft & Piston Removal** ).

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):** 0.1 mm (0.004-0.014 in.)

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



G01463794

**Fig. 207: Pushing The Crankshaft Away From The Dial Indicator & Zeroing The Dial Against The End Of The Crankshaft**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. If end play is excessive, replace the thrust washers and recheck. If it is still out-of-tolerance, replace the crankshaft (see Crankshaft & Piston Removal ).

## CRANKSHAFT MAIN BEARING REPLACEMENT

### Main Bearing Clearance Inspection

1. Remove the main caps and bearing halves (see Crankshaft & 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.

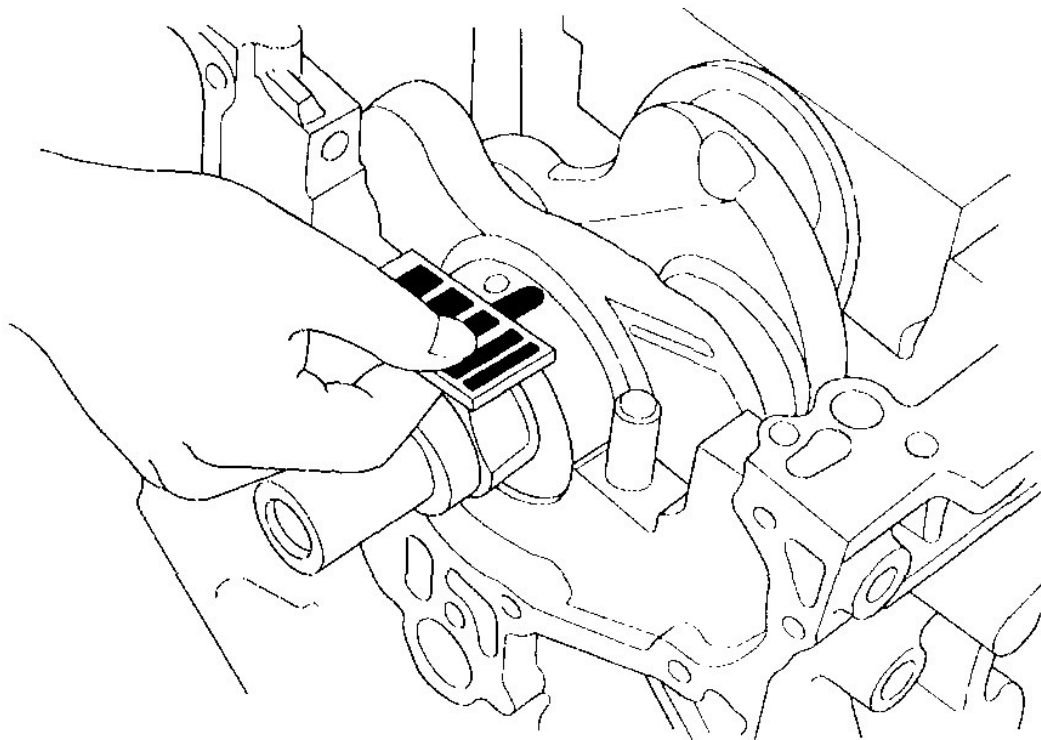
**NOTE:** Do not rotate the crankshaft during inspection.

4. Reinstall the bearings and caps, then torque the bearing cap bolts to 76 N.m (7.8 kgf.m, 56 lbf.ft), and the bearing cap side bolts to 49 N.m (5.0 kgf.m, 36 lbf.ft).
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.)



G01463795

**Fig. 208: Measuring Main Bearing-To-Journal Oil Clearance**

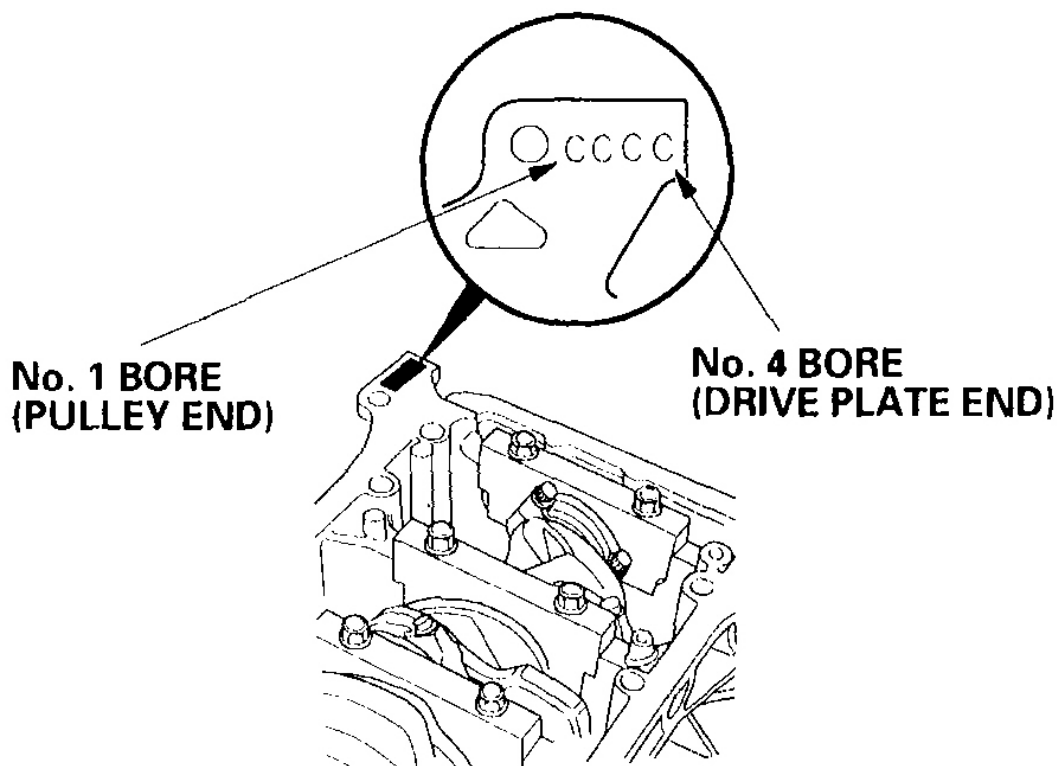
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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.

**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.

**G01463796**



**Fig. 209: Locating Crankshaft Bore Code**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

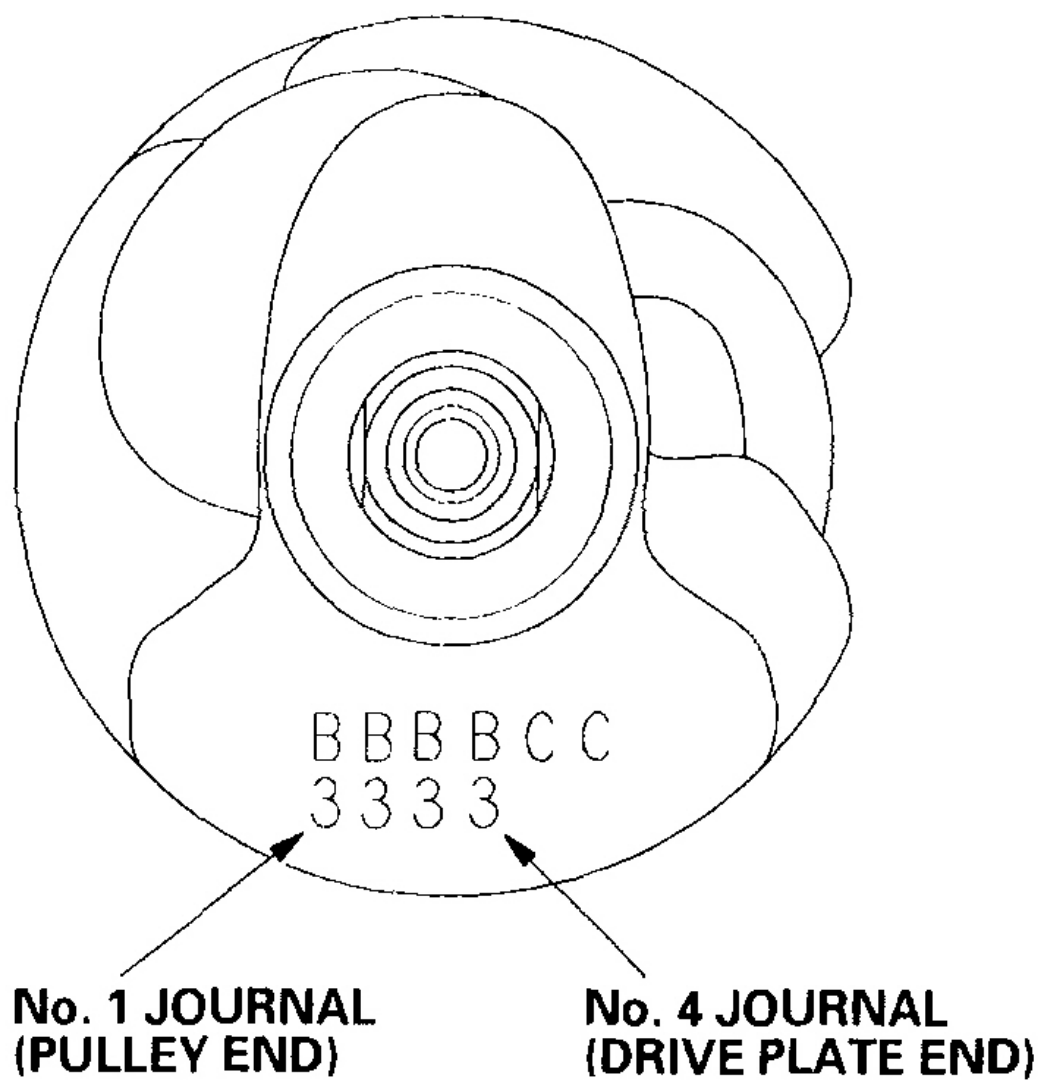
| Bearing Identification                                                                                                                 |  | Larger crank bore         |                  |                  |                  |
|----------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------|------------------|------------------|------------------|
| Color code is on the edge of the bearing                                                                                               |  | A or I                    | B or II          | C or III         | D or IIII        |
| <div> <div>1 or I</div> <div>2 or II</div> <div>3 or III</div> <div>4 or IIII</div> <div>5 or IIIII</div> <div>6 or IIIII</div> </div> |  | Smaller bearing (Thicker) |                  |                  |                  |
|                                                                                                                                        |  | 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  |

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

G01463797

**Fig. 210: Using Crankshaft Bore Codes & Main Journal Codes To Select Appropriate Main Bearings From Table**

Courtesy of AMERICAN HONDA MOTOR CO., INC.



G01463798

**Fig. 211: Locating Main Journal Codes**

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 & 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 connecting rod cap.

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

**Apply new engine oil to the bolt threads**

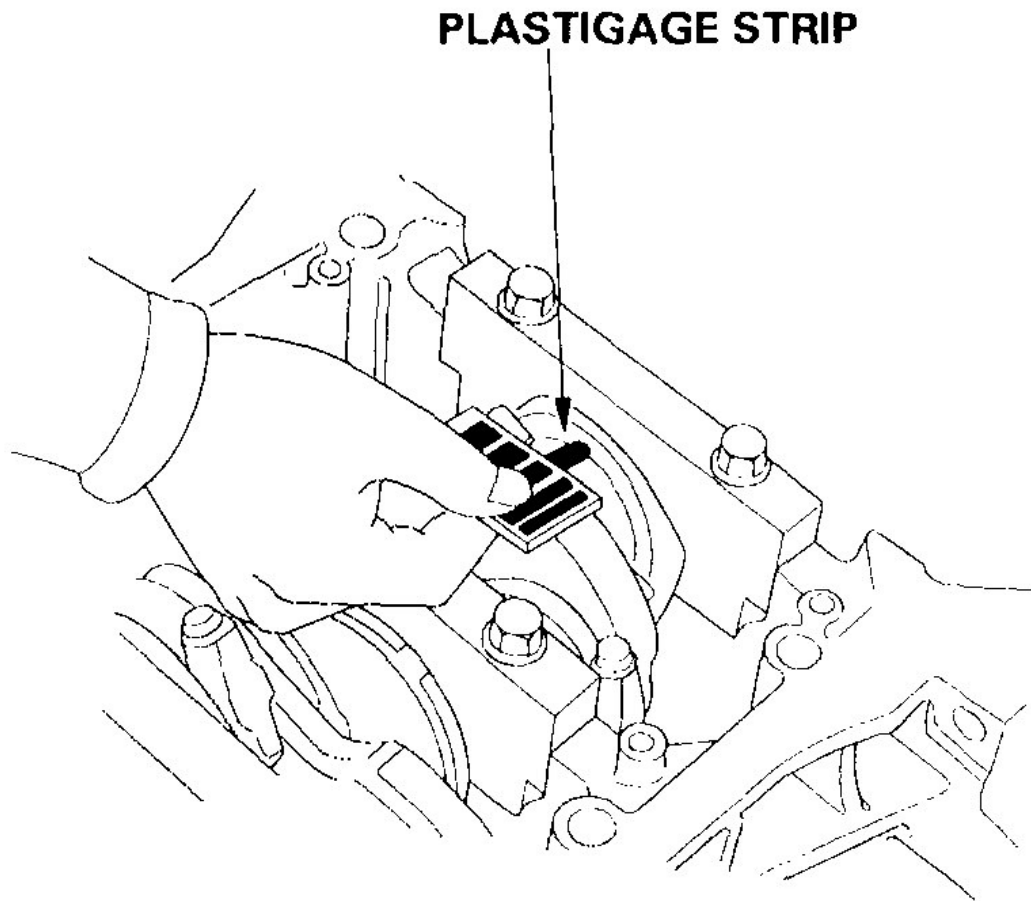
**NOTE: Do not rotate the crankshaft during inspection.**

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.)



G01463799

**Fig. 212: 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, 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.

#### 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, or 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.

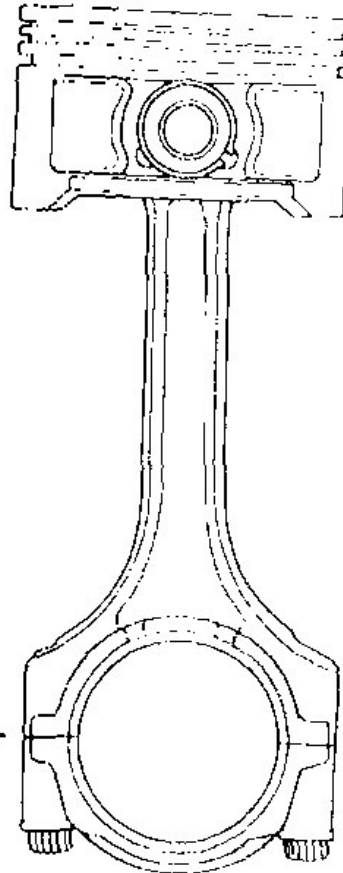
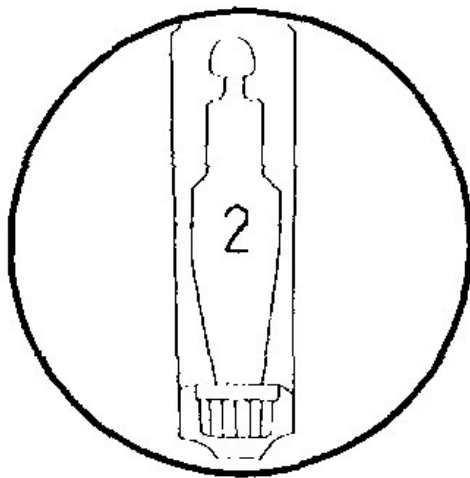
**Normal Bore Size:** 58.0 mm (2.28 in.)

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.**



G01463800

**Fig. 213: Locating Rod Bearing Code**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

**Bearing Identification**

Color code is on the edge of the bearing

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

→ Larger big end bore

→ Smaller bearing (Thicker)

|  |            |                  |                  |                  |                  |
|--|------------|------------------|------------------|------------------|------------------|
|  | A or I     | Pink             | Pink/<br>Yellow  | Yellow           | Yellow/<br>Green |
|  | B or II    | Pink/<br>Yellow  | Yellow           | Yellow/<br>Green | Green            |
|  | C or III   | Yellow           | Yellow/<br>Green | Green            | Green/<br>Brown  |
|  | D or IIII  | Yellow/<br>Green | Green            | Green/<br>Brown  | Brown            |
|  | E or IIIII | Green            | Green/<br>Brown  | Brown            | Brown/<br>Black  |
|  | F or IIIII | Green/<br>Brown  | Brown            | Brown/<br>Black  | Black            |

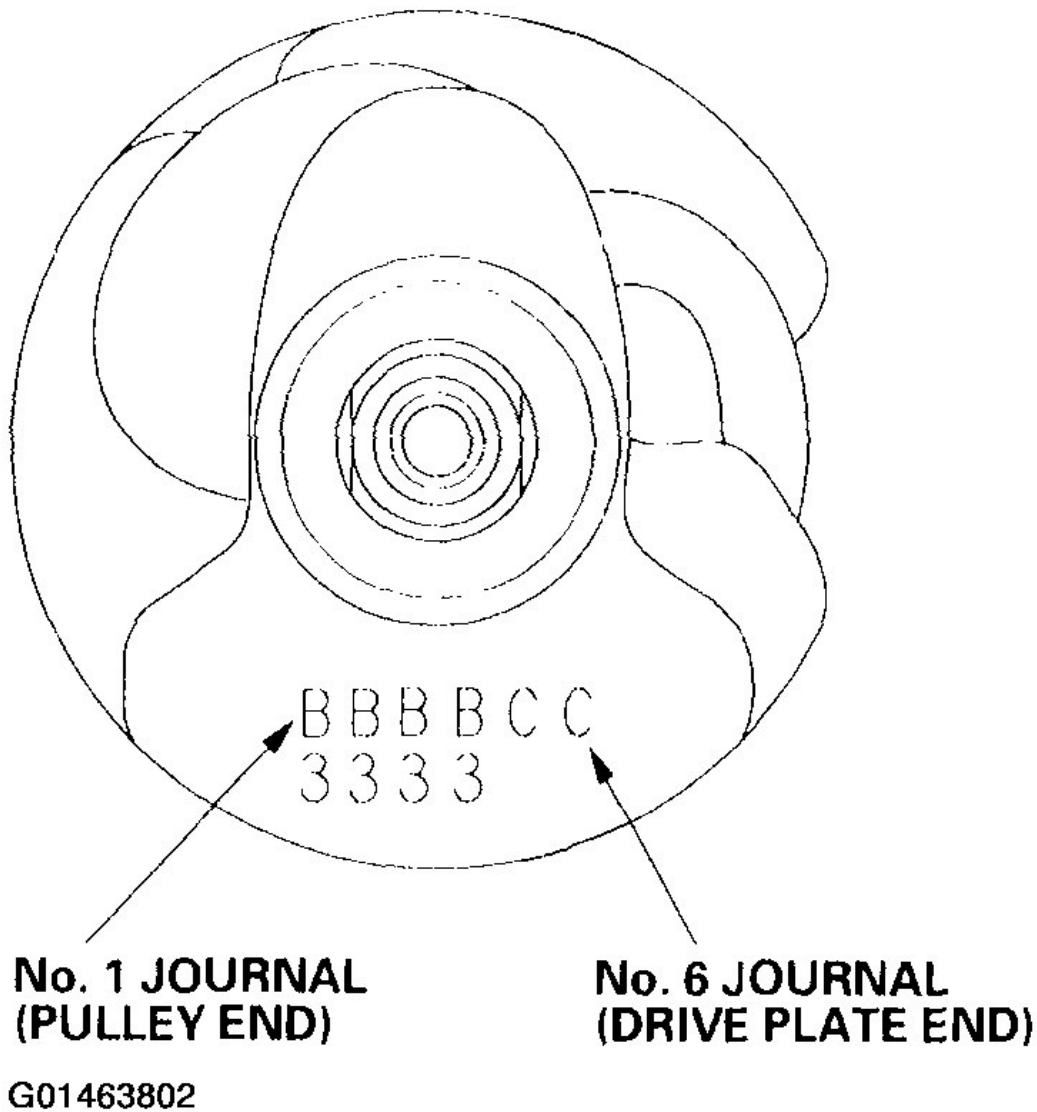
↓ Smaller rod Journal      ↓ Smaller bearing (Thicker)

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

G01463801

**Fig. 214: Using Connecting Rod Bore Codes & Journal Codes To Select Appropriate Rod Bearings From Table**

Courtesy of AMERICAN HONDA MOTOR CO., INC.



**Fig. 215: Locating Connecting Rod Journal Code**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

## OIL PAN REMOVAL

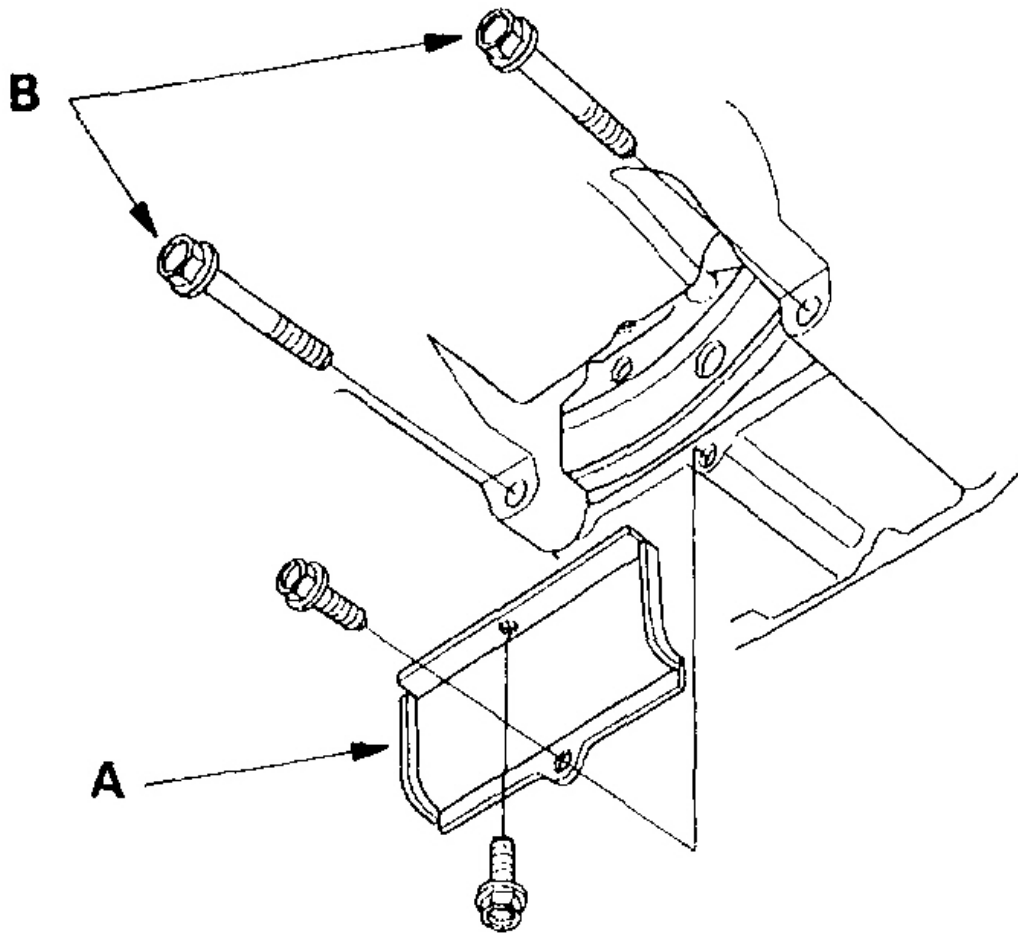
If the engine is out of the vehicle, go to step 17 .

1. Drain the engine oil (see **ENGINE OIL REPLACEMENT** ).
2. Drain the power steering system fluid (see **FLUID REPLACEMENT** ).
3. Remove the power steering (P/S) pump outlet hose from the P/S pump, and remove the P/S hose clamp

(see step 11 on **TRANSMISSION REMOVAL** ).

4. Remove the steering joint cover, and make a reference mark across the steering joint and steering gearbox pinion shaft. Remove the steering joint from the steering joint pinion shaft (see step 17 on **Engine Removal** ).
5. Remove the splash shield (see step 30 on **Engine Removal** ).
6. Remove the transfer assembly (see **TRANSFER ASSEMBLY REMOVAL** ).
7. Disconnect the tie-rod end ball joints (see step 12 on **STEERING GEARBOX REMOVAL** ).
8. Disconnect the suspension lower arm ball joints (see **LOWER ARM** ).
9. Remove the P/S hose (see step 42 on **Engine Removal** ).
10. Disconnect the power steering pressure switch connector (see step 43 on **Engine Removal** ).
11. Remove the nuts securing the transmission lower front mount and transmission lower rear mount (see step 44 on **Engine Removal** ).
12. Remove the bolt securing the rear mount (see step 45 on **Engine Removal** ).
13. Attach the chain hoist to the engine (see step 53 on **Engine Removal** ).
14. Remove the nut securing the front mount bracket (see step 55 on **Engine Removal** ).
15. Make reference marks on the body across the marks on the edge of the front subframe (see step 57 on **Engine Removal** ).
16. Remove the front subframe (see step 61 on **Engine Removal** ).
17. Remove the torque converter cover (A) and two bolts (B) securing the transmission.





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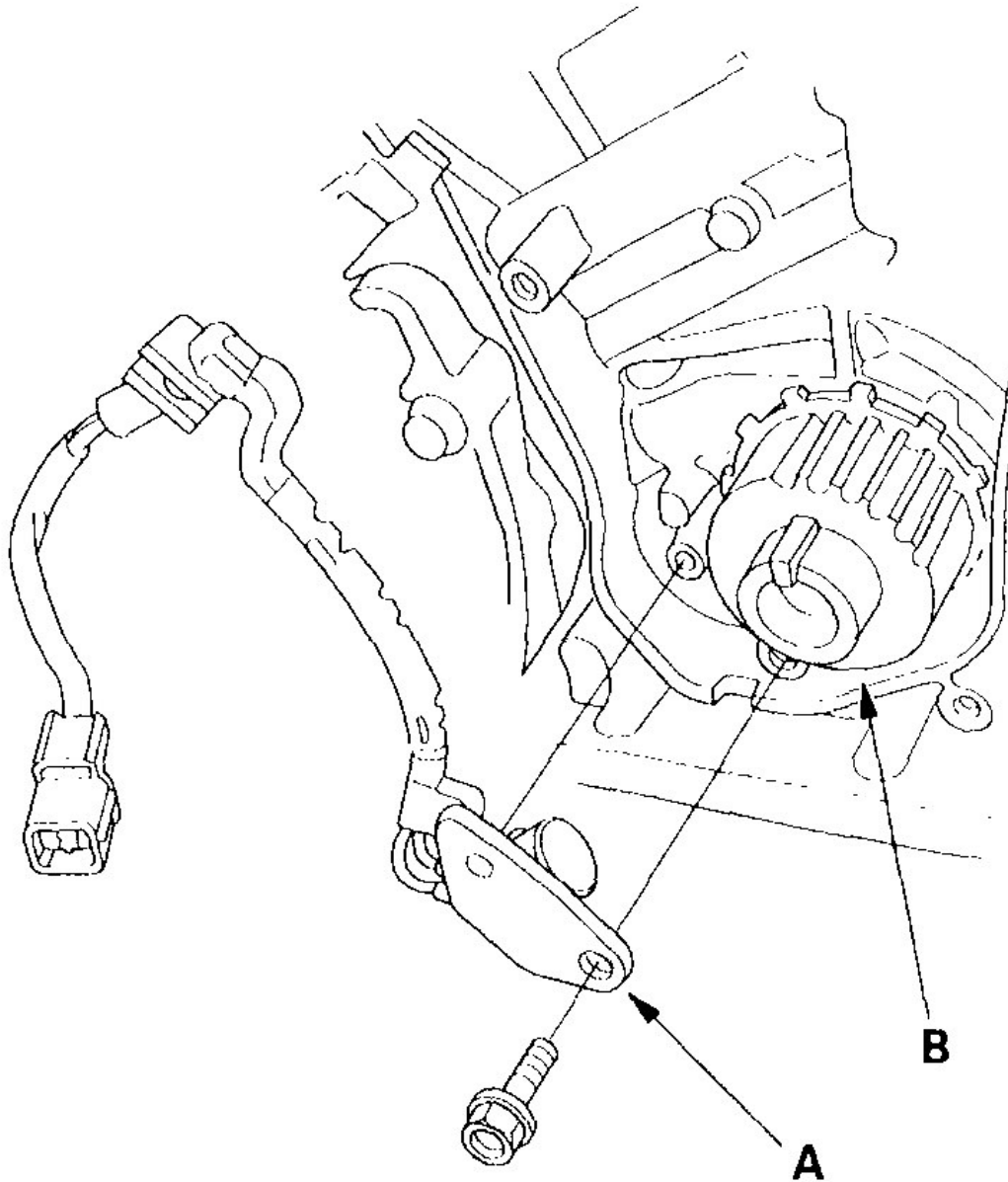
**Fig. 216: Removing The Torque Converter Cover & Two Bolts Securing The Transmission**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Remove the bolts securing the oil pan.
19. Remove the oil pan.

#### CRANKSHAFT & PISTON REMOVAL

1. Remove the engine assembly (see Engine Removal ).
2. Remove the transmission (see TRANSMISSION REMOVAL ).
3. Remove the cylinder heads (see Cylinder Head Removal ).
4. Remove the crankshaft position (CKP) sensor (A) from the oil pump, then remove the timing belt drive

pulley (B).



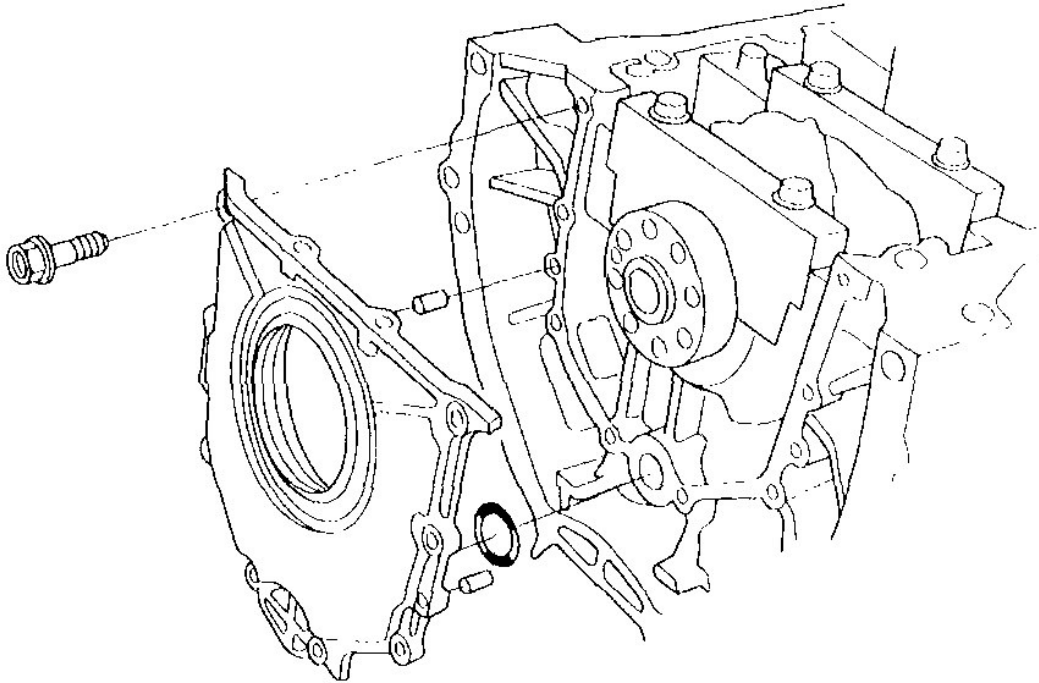
G01463804

**Fig. 217: Removing The Crankshaft Position Sensor From The Oil Pump & Removing The Timing Belt Drive Pulley**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Remove the oil pan (see [Oil Pan Removal](#) ).

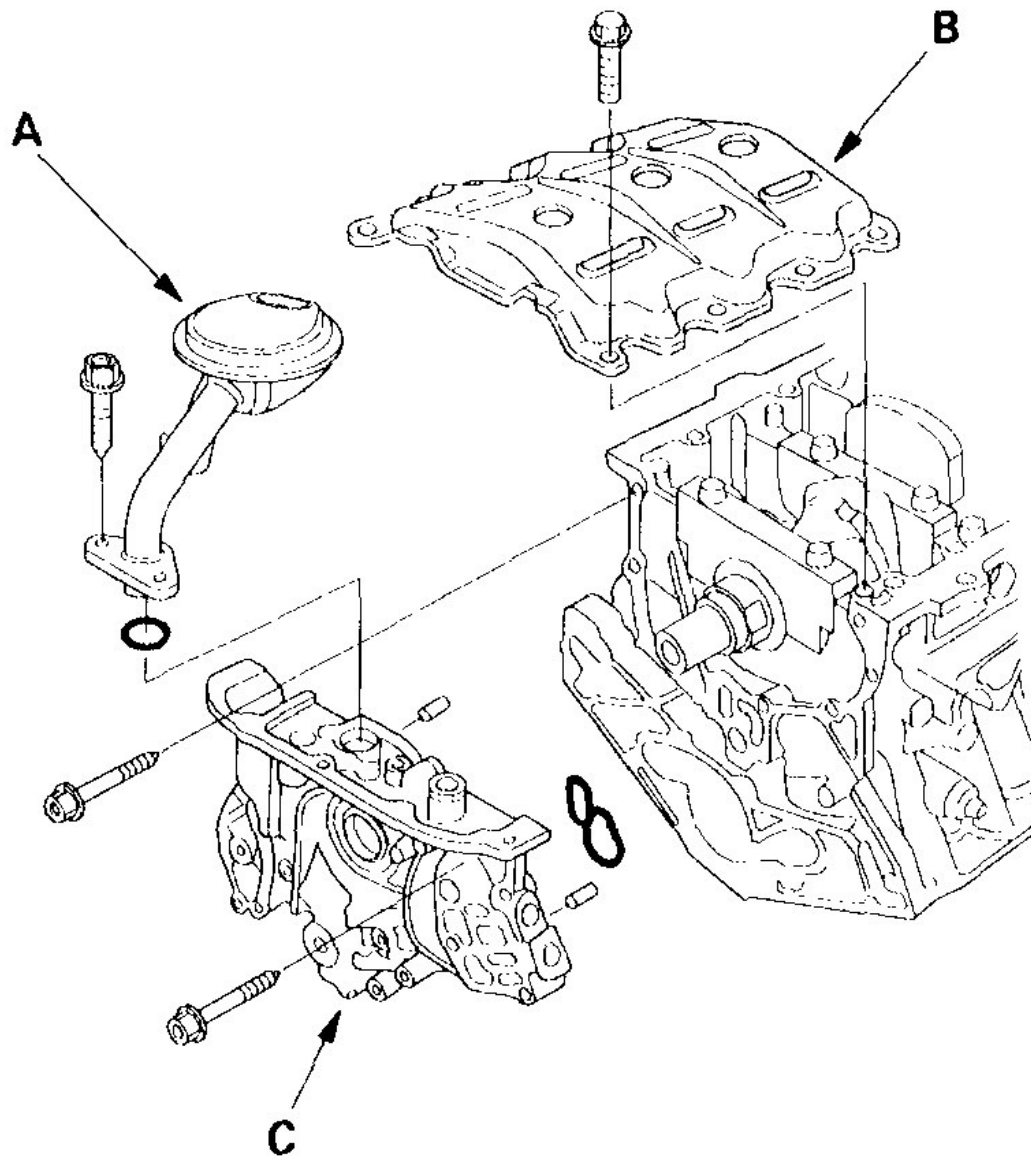
6. Remove the engine block end cover.



G01463805

**Fig. 218: Removing The Engine Block End Cover**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

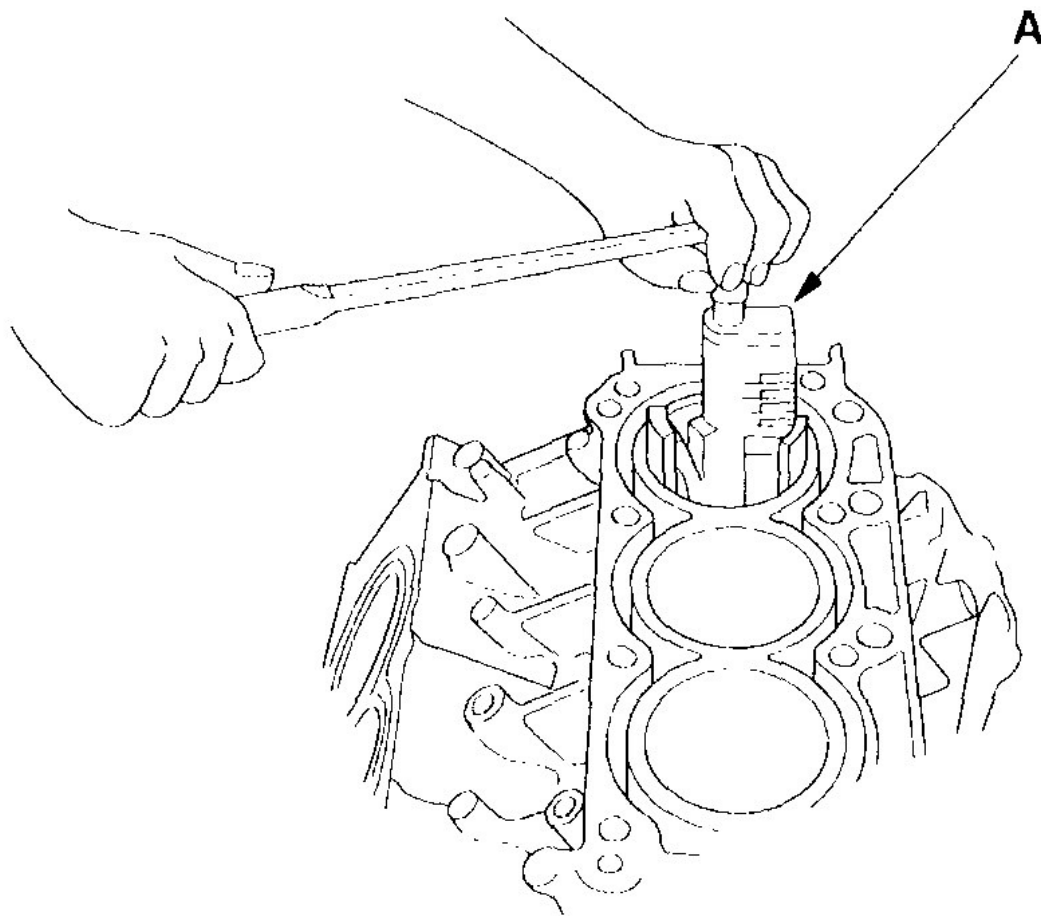
7. Remove the oil screen (A), baffle plate (B), and oil pump (C).



G01463806

**Fig. 219: Removing The Oil Screen, Baffle Plate & Oil Pump**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. 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.

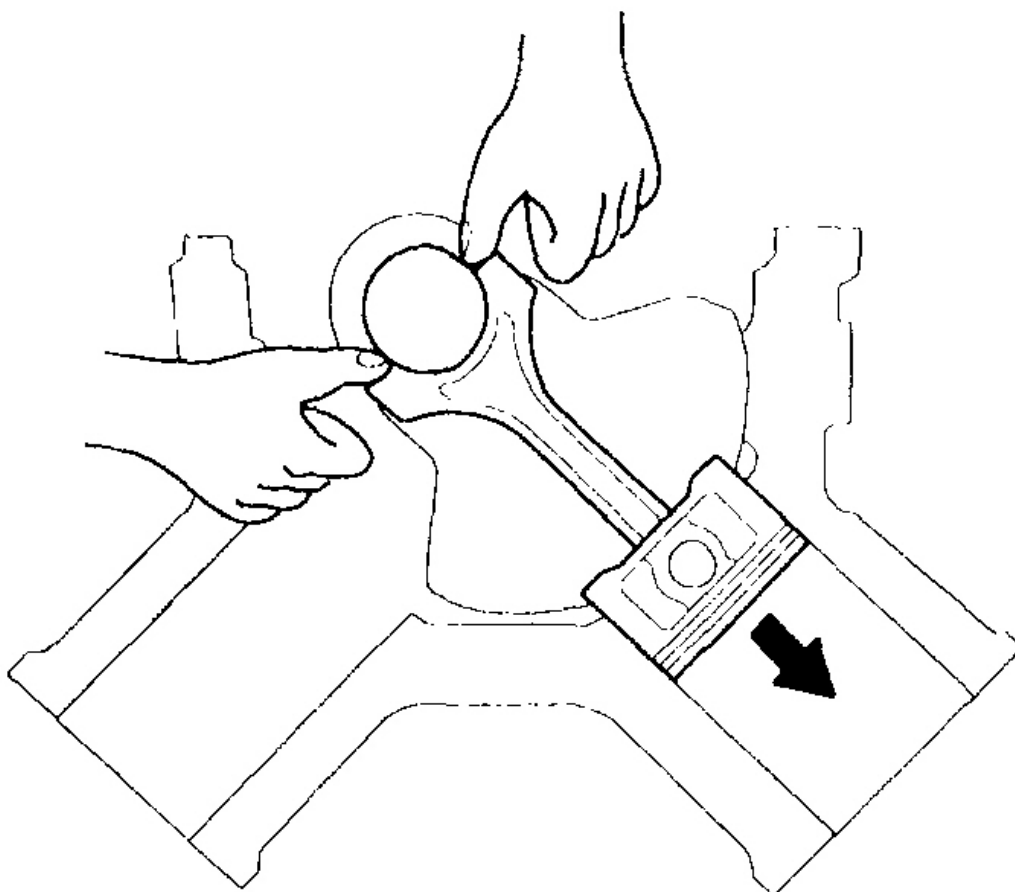


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**Fig. 220: Reaming Top Of Cylinder**

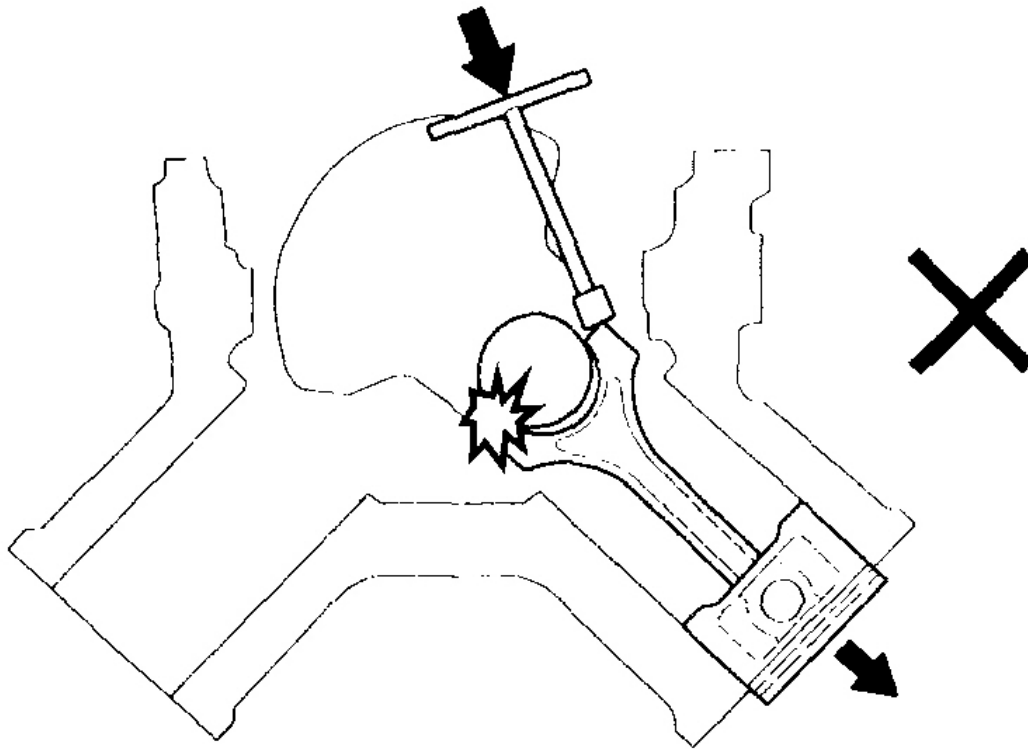
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



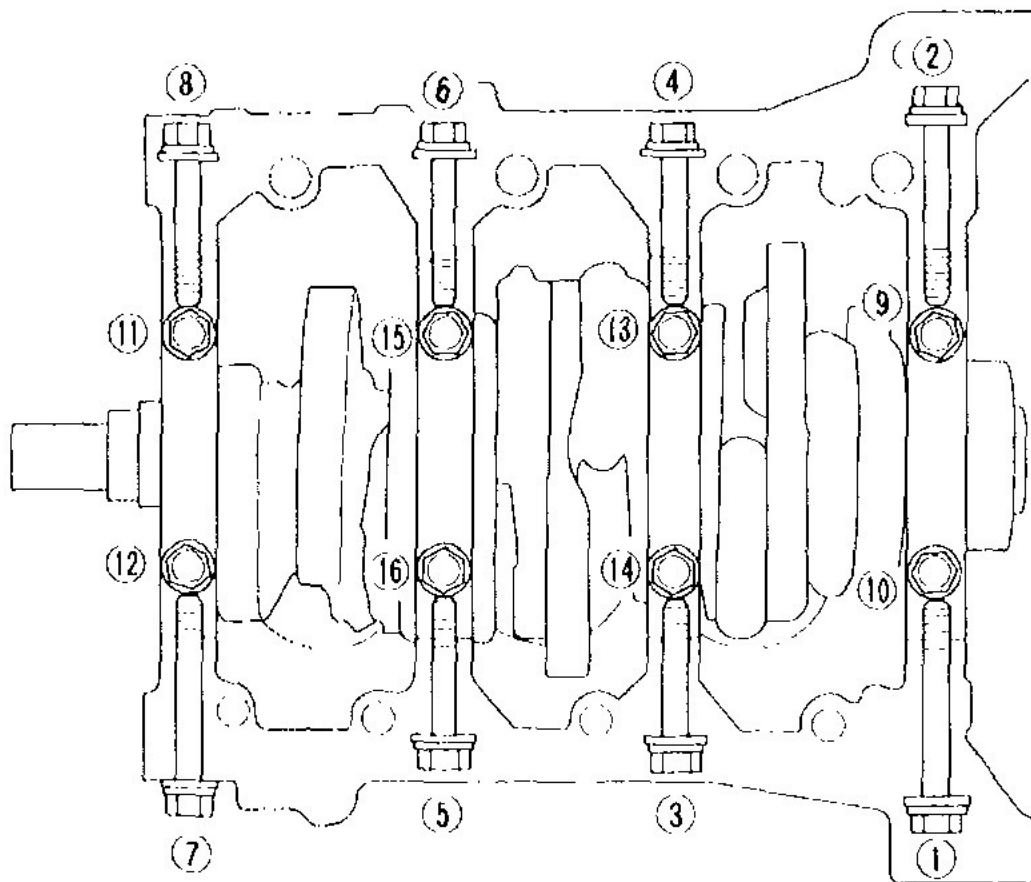
G01463808

**Fig. 221: Correctly Removing The Piston Assembly**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

**G01463809**

**Fig. 222: Incorrectly Removing The Piston Assembly**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



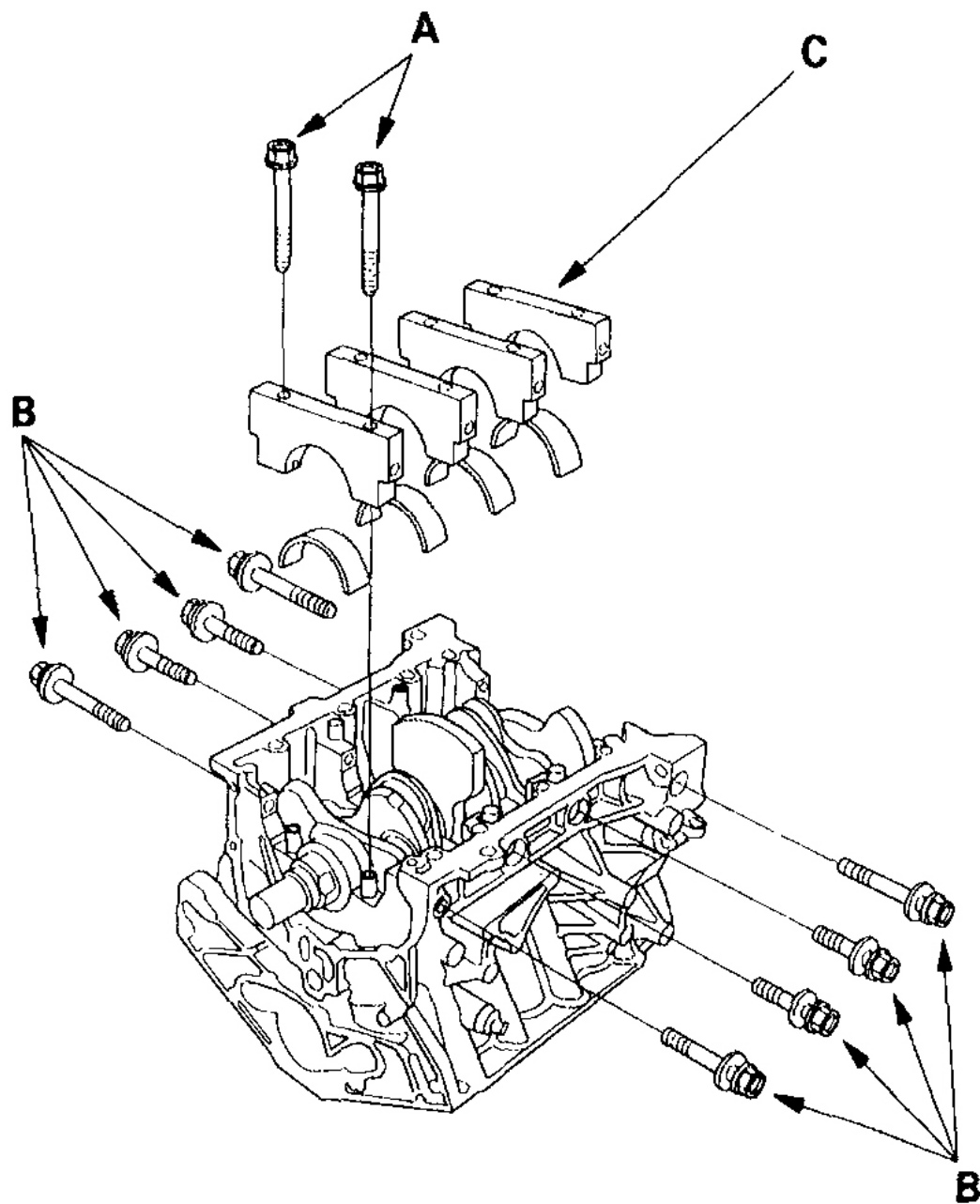
G01463810

**Fig. 223: Identifying Bearing Cap Bolt Loosening Sequence**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

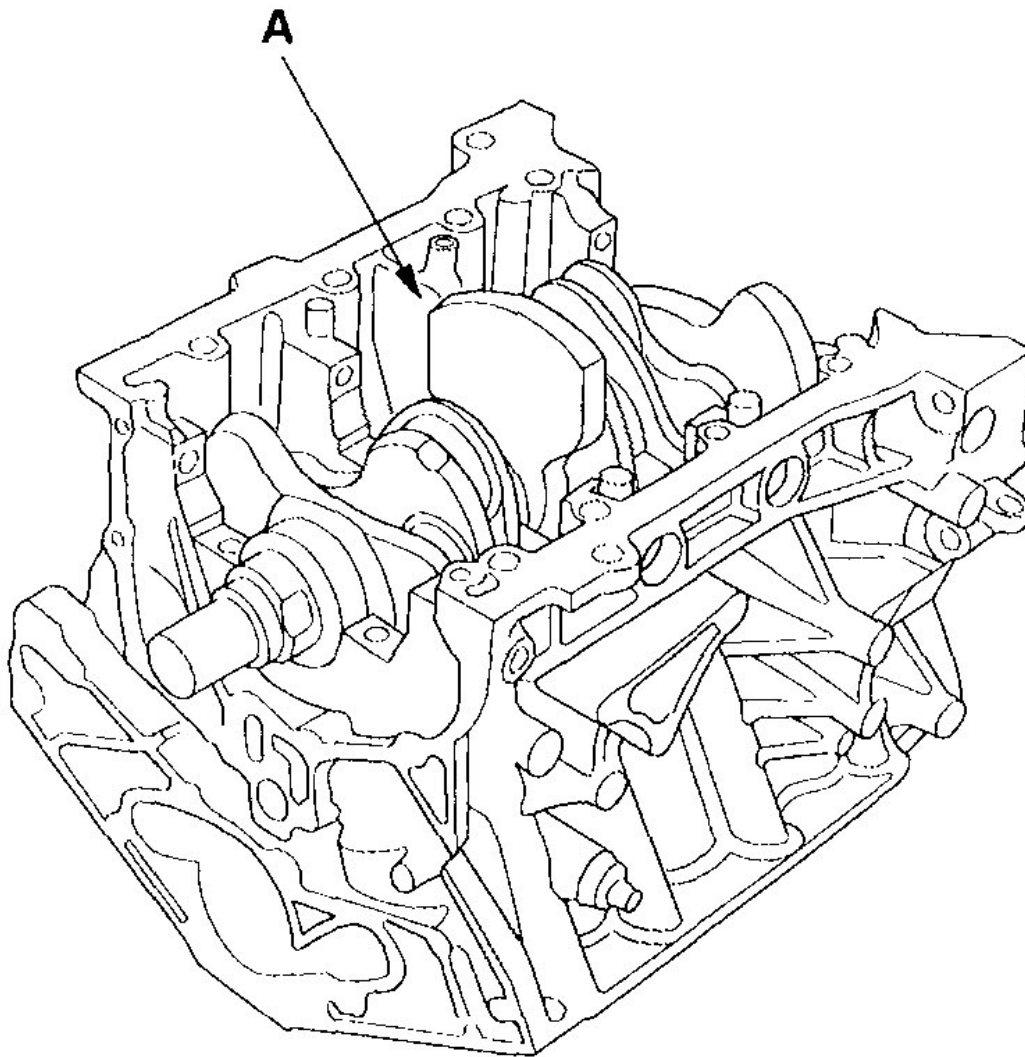




G01463811

**Fig. 224: Removing Bearing Cap Bolts, Bearing Cap Side Bolts & Bearing Caps**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

**G01463812**

**Fig. 225: Lifting The Crankshaft Out Of The Cylinder Block**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Reinstall the main caps and bearings on the cylinder block in the proper order.

## **CRANKSHAFT INSPECTION**

### **Out-of-Round & Taper**

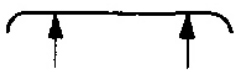
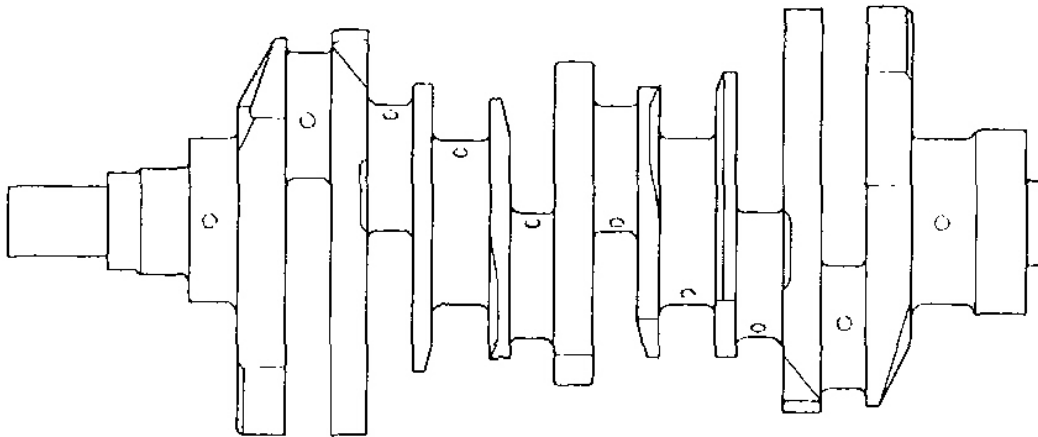
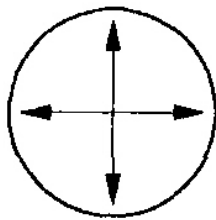
1. Remove the crankshaft from the cylinder block (see **Crankshaft & Piston Removal** ).
2. Clean the crankshaft oil passages with pipe cleaners or a suitable brush.

3. Check the keyway and threads.
4. Measure out-of-round at the middle of each rod and main journal in two places. The difference between measurements on each journal must not be more than the service limit.

**Journal Out-of-Round**

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

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



**G01463813**

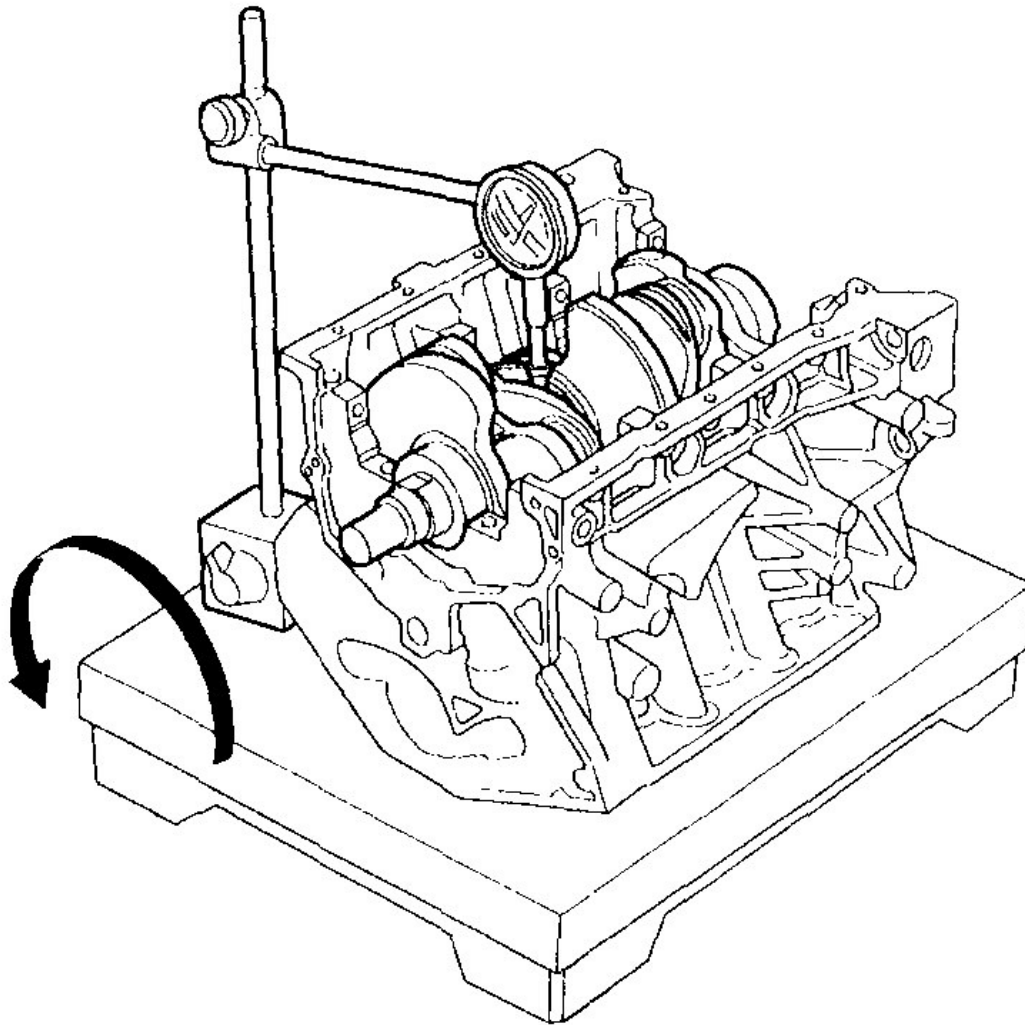
**Fig. 226: Measuring Journal Out-of-Round****Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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 cylinder block on the surface plate.
7. Clean and install the bearings on the No. 1 and No. 4 journal of the cylinder block.
8. Lower the crankshaft into the 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):** 0.020 mm (0.0008 in.) max.**Service Limit:** 0.030 mm (0.0012 in.)



G01463814

**Fig. 227: Measuring Crankshaft Total Runout**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

## BLOCK & PISTON INSPECTION

1. Remove the piston from the cylinder block (see **Crankshaft & 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

## 2003 Honda Pilot LX

2003-04 ENGINE 3.5L V6 - Pilot

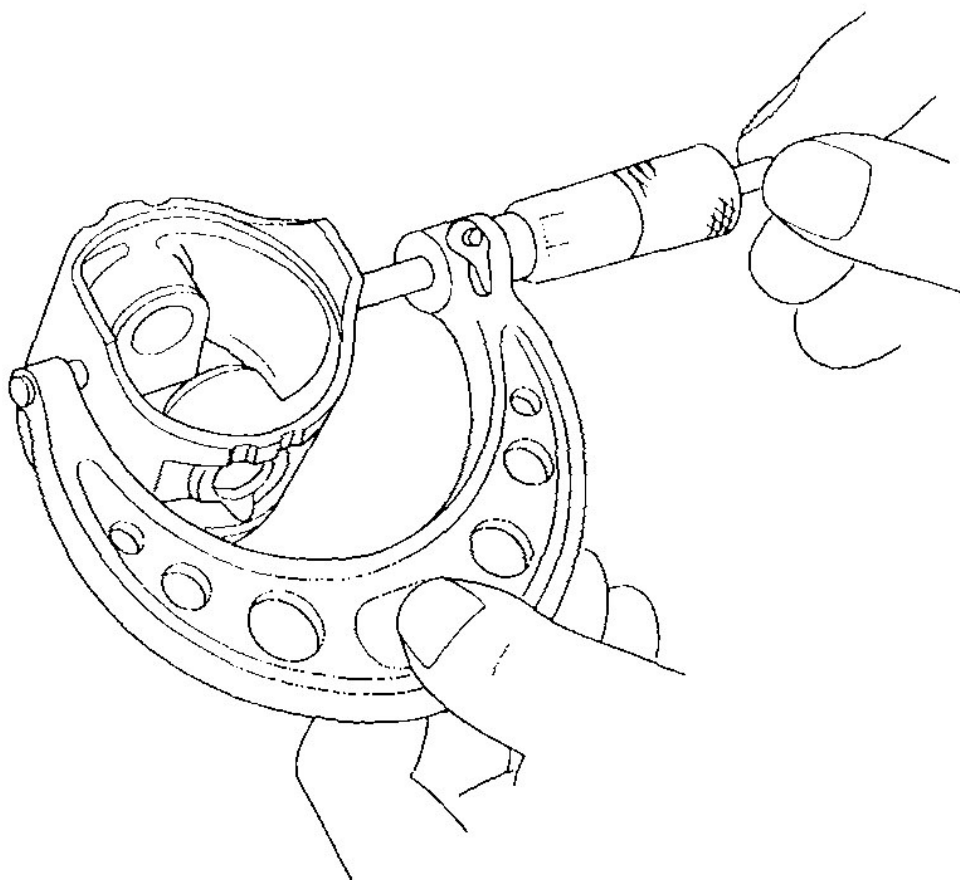
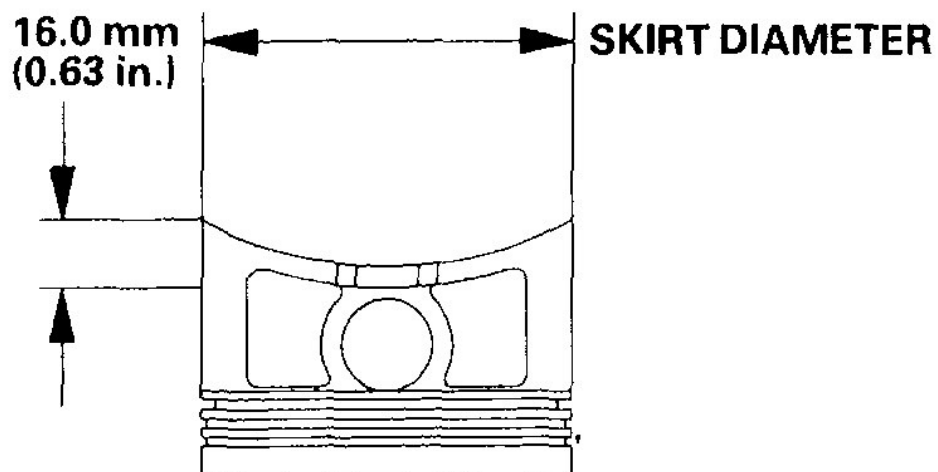
**Standard (New):** 88.975-88.985 mm (3.5029-3.5033 in.)

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

### Oversize Piston Diameter

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

**0.50:** 89.475-89.485 mm (3.5226-3.5230 in.)

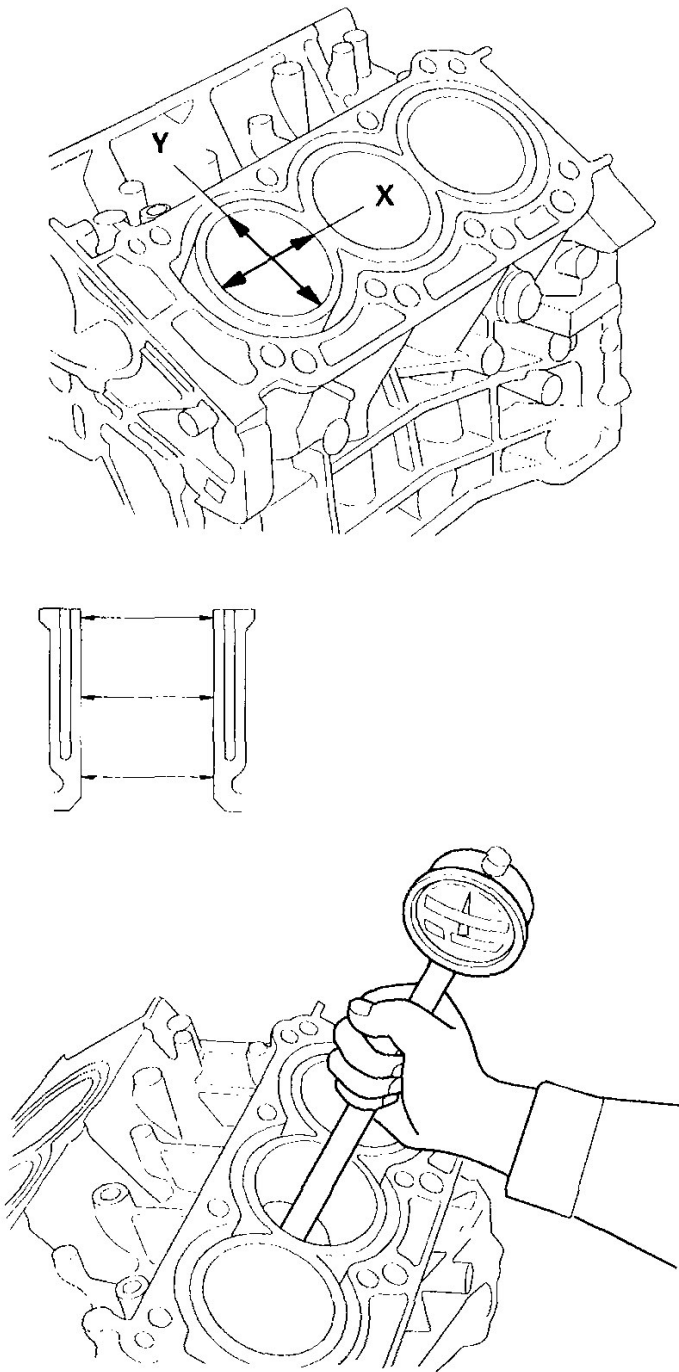


G01463815

**Fig. 228: Measuring Piston Diameter****Courtesy of AMERICAN HONDA MOTOR CO., INC.**

4. Measure wear and taper in directions X and Y at three levels in each cylinder as shown.
  - If the bore size or taper in any cylinder is over the service limit, the block must be rebored.
  - If the measurements in any cylinder are beyond the oversize bore service bore service limit, replace the cylinder block.





G01463816

**Fig. 229: Measuring Wear & Taper**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

**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.)

**0.50:** 89.500-89.515 mm (3.5236-3.5242 in.)

**Reboring Limit:** 0.5 mm (0.02 in.)

### **Bore Taper**

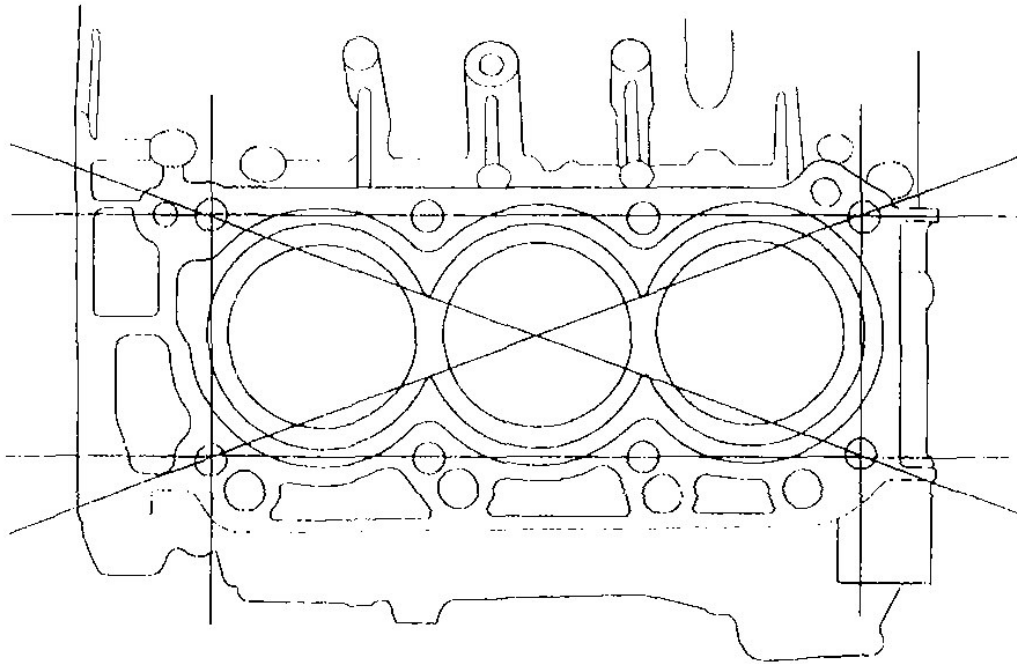
**Limit:** (Difference between first and third measurement) 0.05 mm (0.002 in.)

5. Scored or scratched cylinder bores must be honed.
6. Check the top of the cylinder block for warpage. Measure along the edges and across the center as shown.

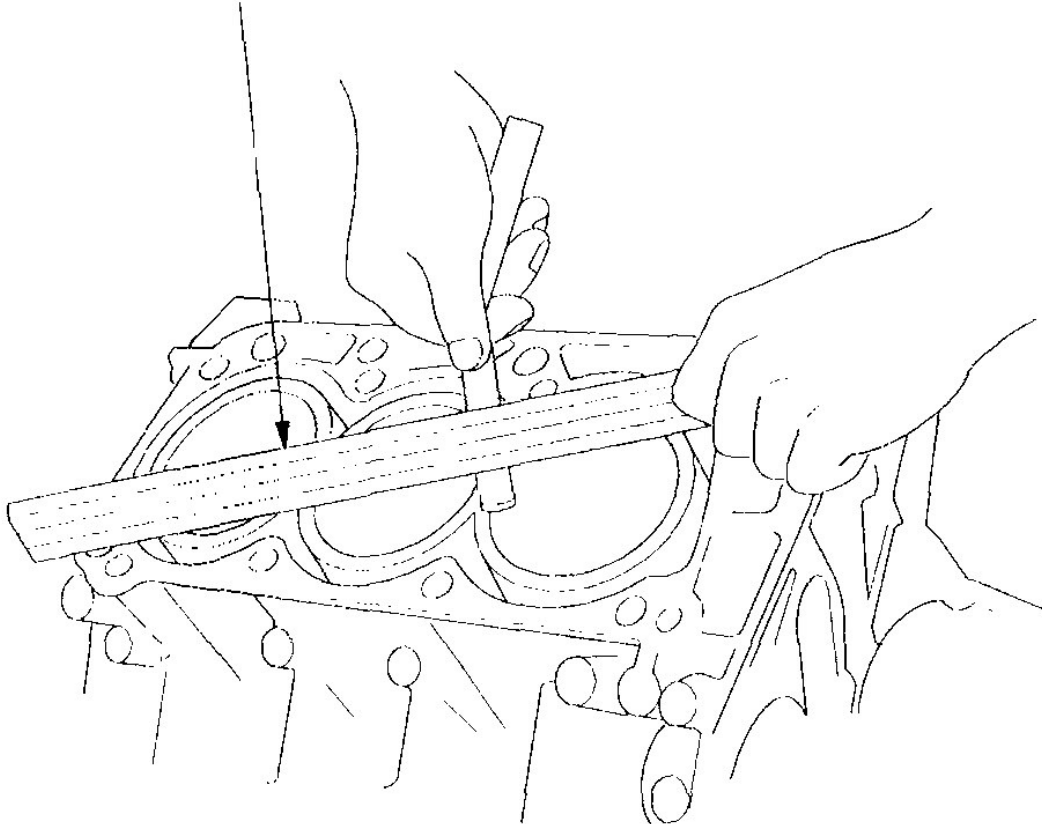
### **Cylinder Block Warpage**

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

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



**PRECISION STRAIGHT EDGE**



**G01463817**

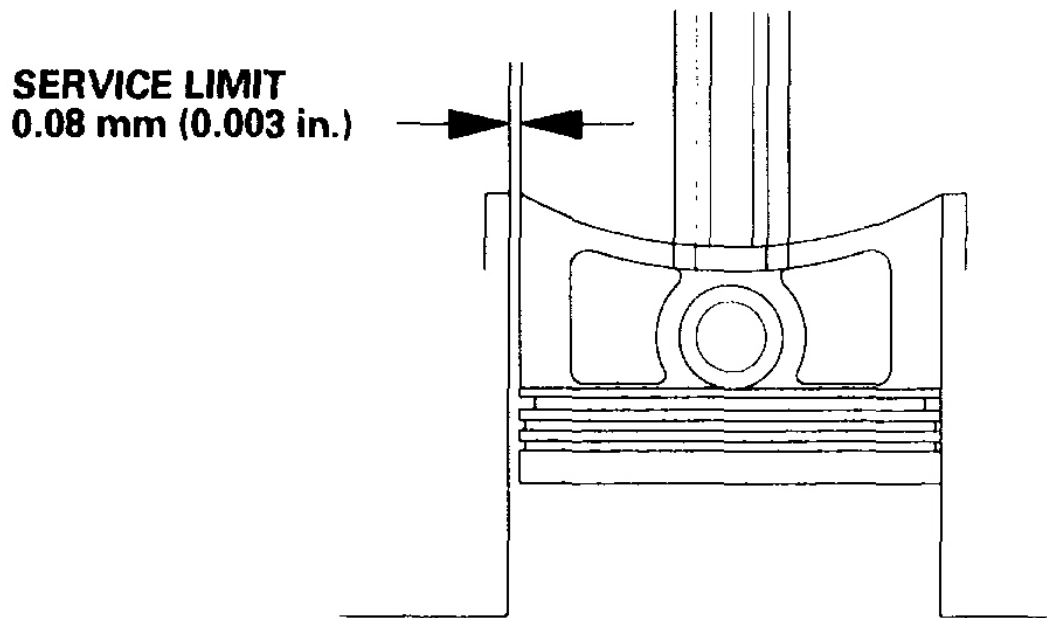
**Fig. 230: Checking The Top Of The Cylinder Block For Warp**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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 block for excessive wear.

#### **Piston-to-Block Clearance**

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

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



G01463818

**Fig. 231: Measuring Piston-To-Block Clearance**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

#### **CYLINDER BORE HONING**

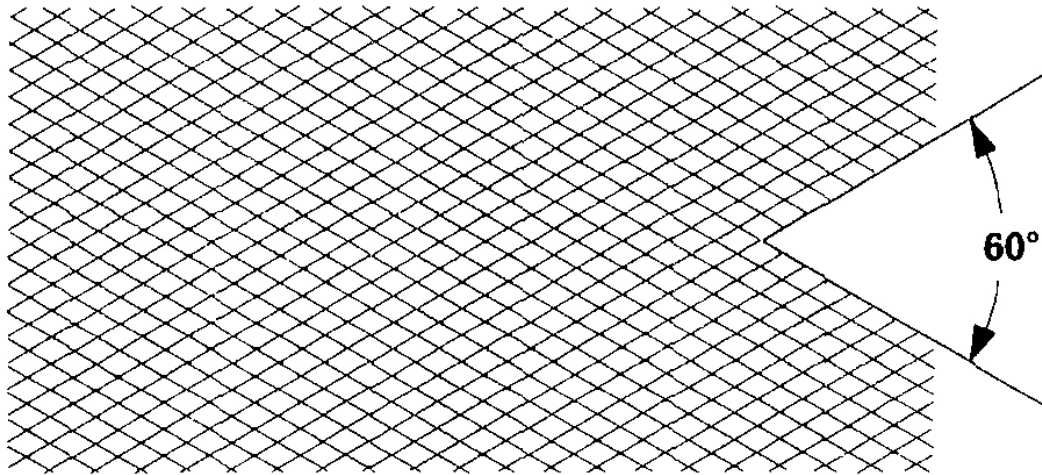
1. Measure the cylinder bores (see step 4 on **Block & Piston Inspection**). If the cylinder block is to be reused, hone the cylinders and remeasure the bores. Only scored or scratched cylinder bores must be honed.
2. Hone the cylinder bores with honing oil and a fine (400 grit) stone in a 60 degree crosshatch pattern.

#### **NOTE:**

- Use only a rigid hone with 400 grit or finer stone, such as Sunnen,

**Ammco, or equivalent.**

- **Do not use stones that are worn or broken.**



G01463819

**Fig. 232: Identifying 60 Degree Crosshatch Pattern**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

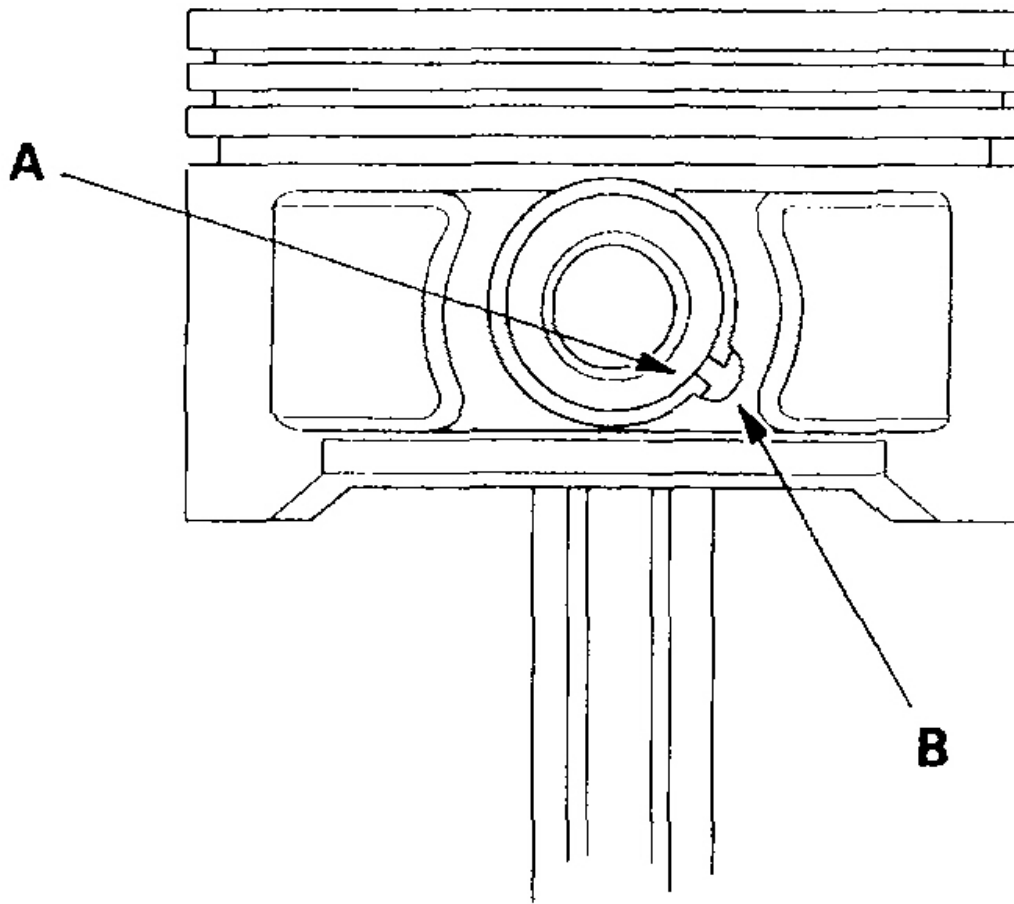
3. When honing is complete, thoroughly clean the cylinder block of all metal particles. Wash the cylinder bores with hot soapy water, then dry and oil them immediately to prevent rusting. Never use solvent, it will only redistribute the grit on the cylinder walls.
4. If scoring or scratches are still present in the cylinder bores after honing to the service limit, rebore the cylinder 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 & CONNECTING ROD REPLACEMENT**

### **Disassembly**

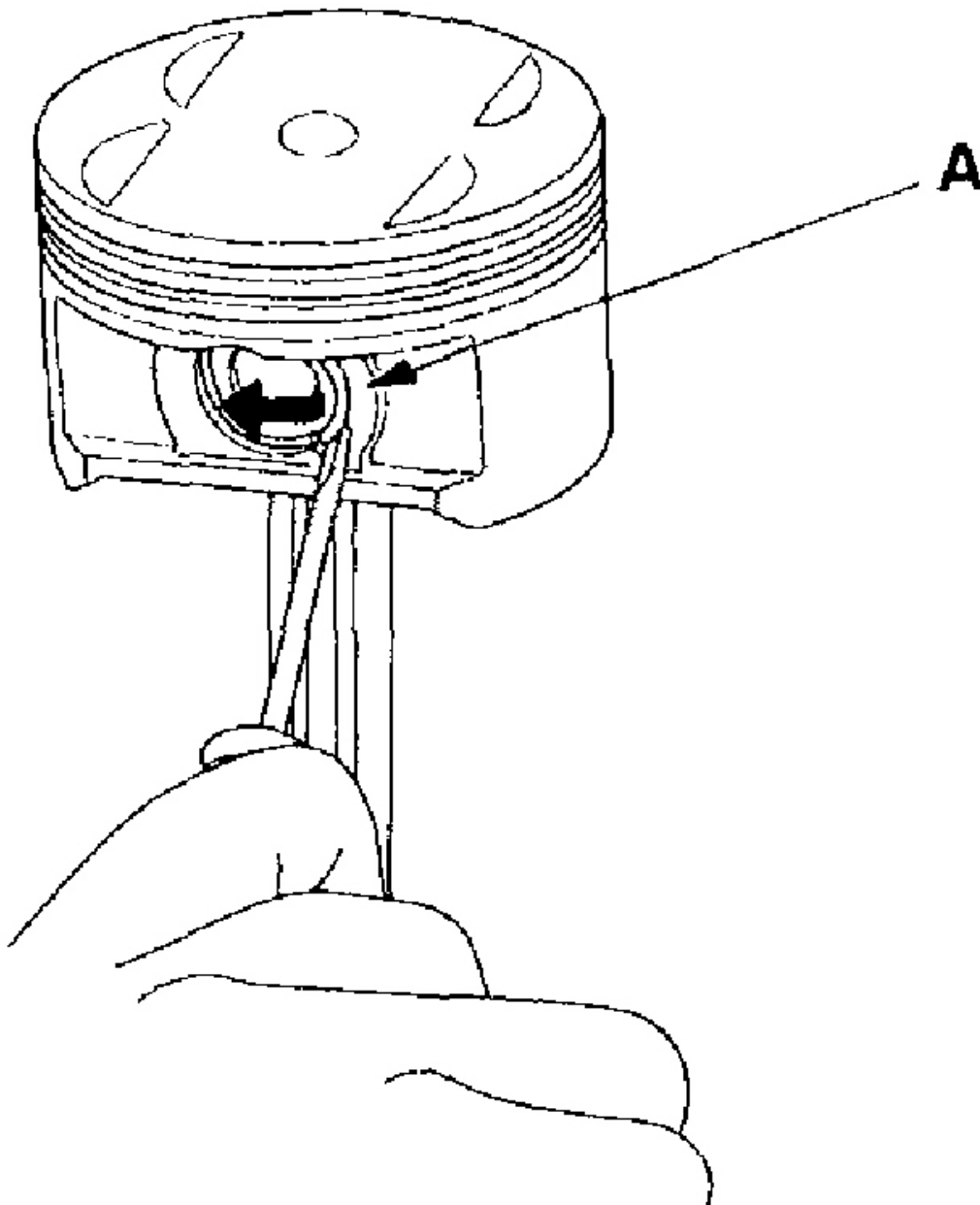
1. Remove the piston from the cylinder block (see **Crankshaft & Piston Removal** ).

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

**G01463820**

**Fig. 233: Lining Up Piston Pin Snap Ring Gaps With Cutouts In Piston Pin Bores**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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).
3. Remove both snap rings (A). 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.

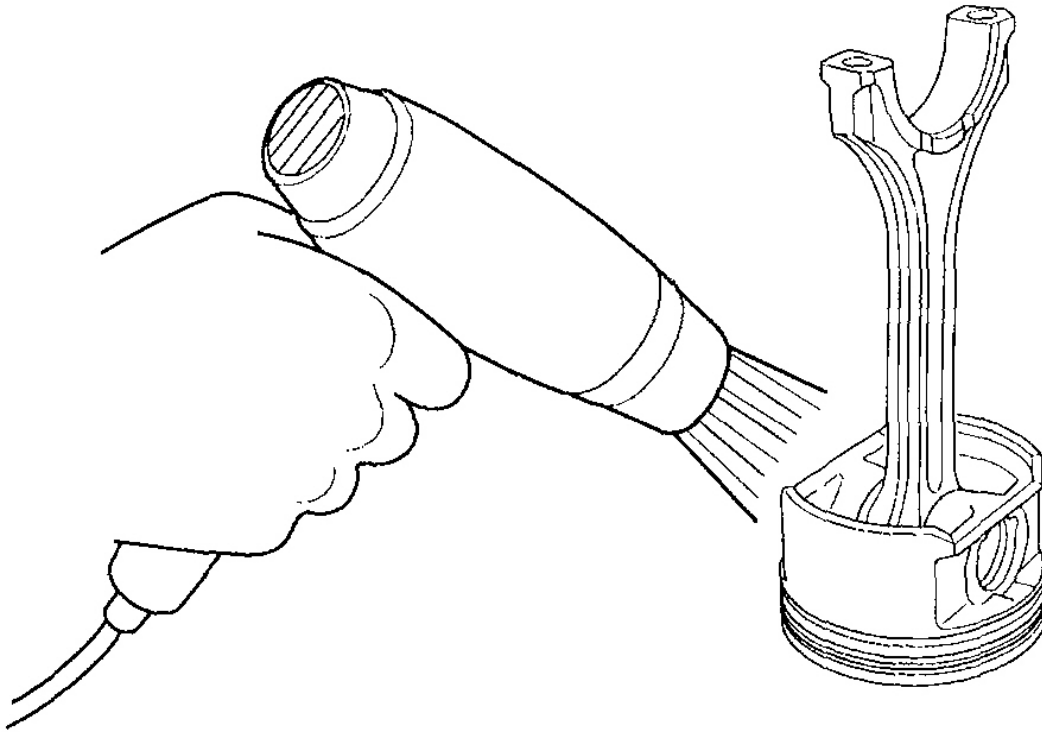


G01463821

**Fig. 234: Removing Snap Rings**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



G01463822

**Fig. 235: Heating The Piston & 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.**

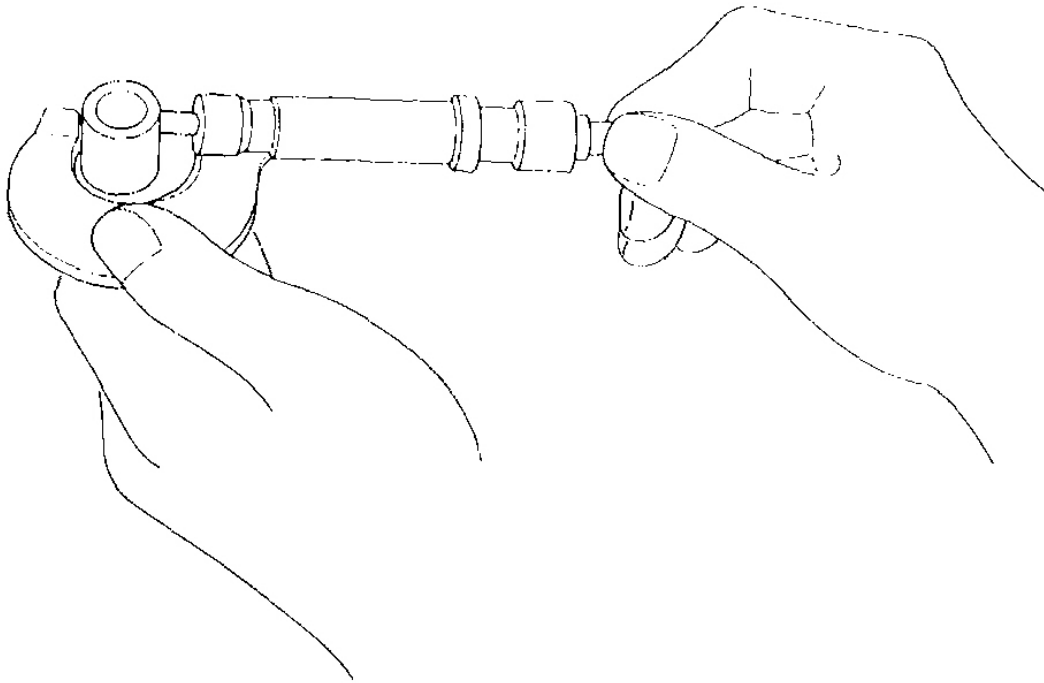
1. Measure the diameter of the piston pin.

#### **Piston Pin Diameter**

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

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

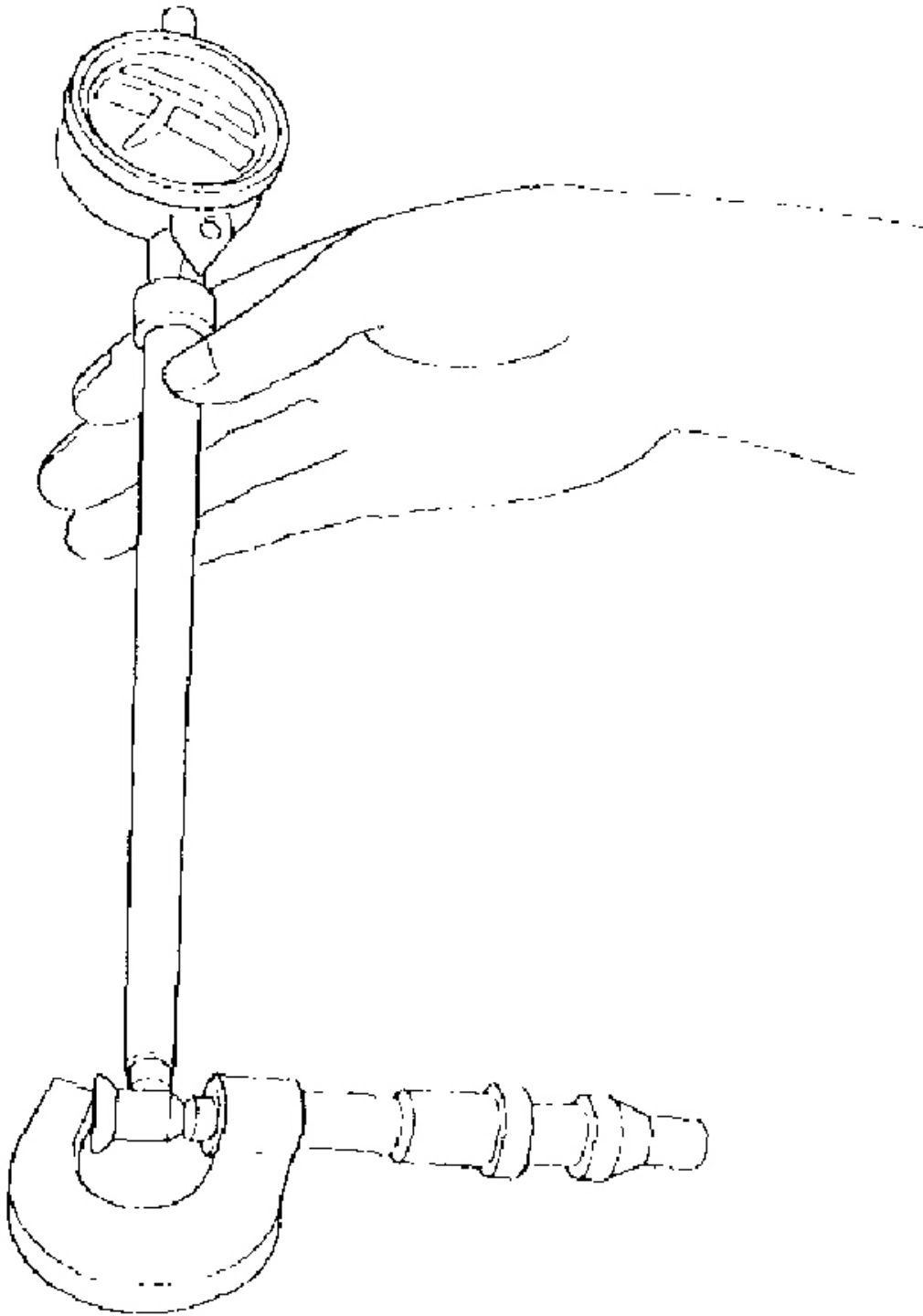




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**Fig. 236: Measuring The Diameter Of The Piston Pin**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



**G01463824**

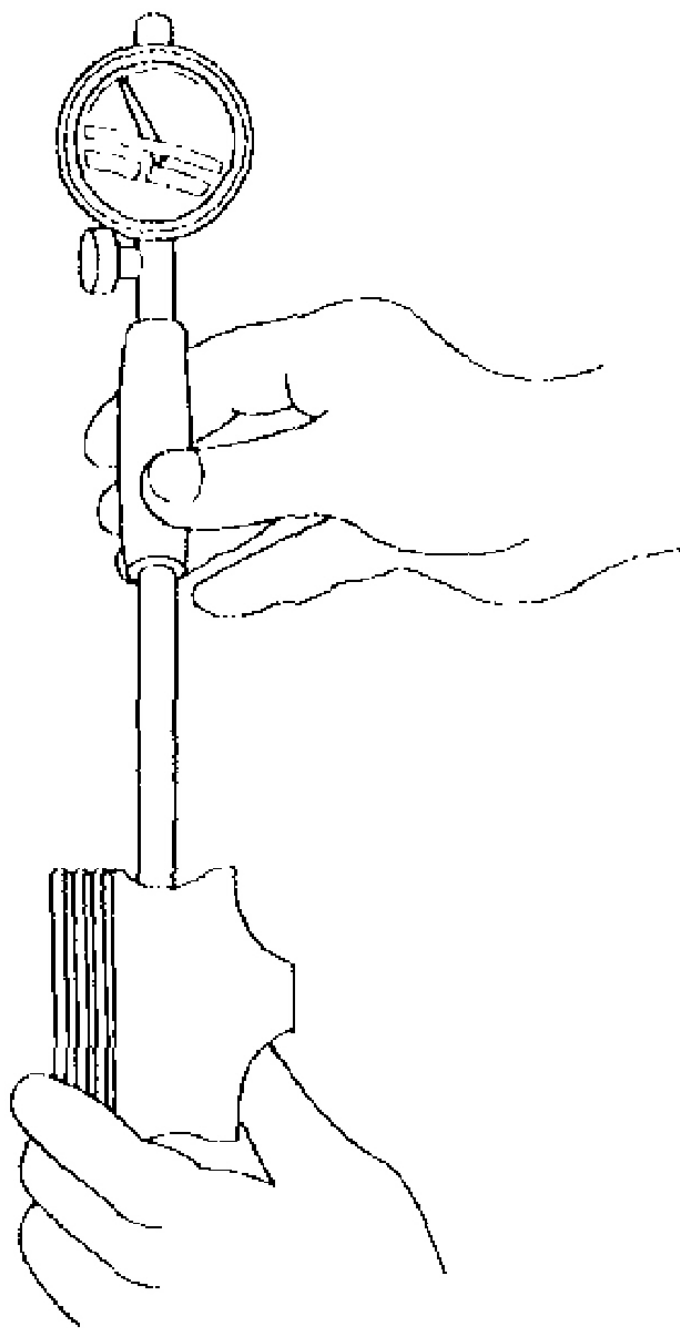
**Fig. 237: Zeroing The Dial Indicator To The Piston Pin Diameter**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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.)



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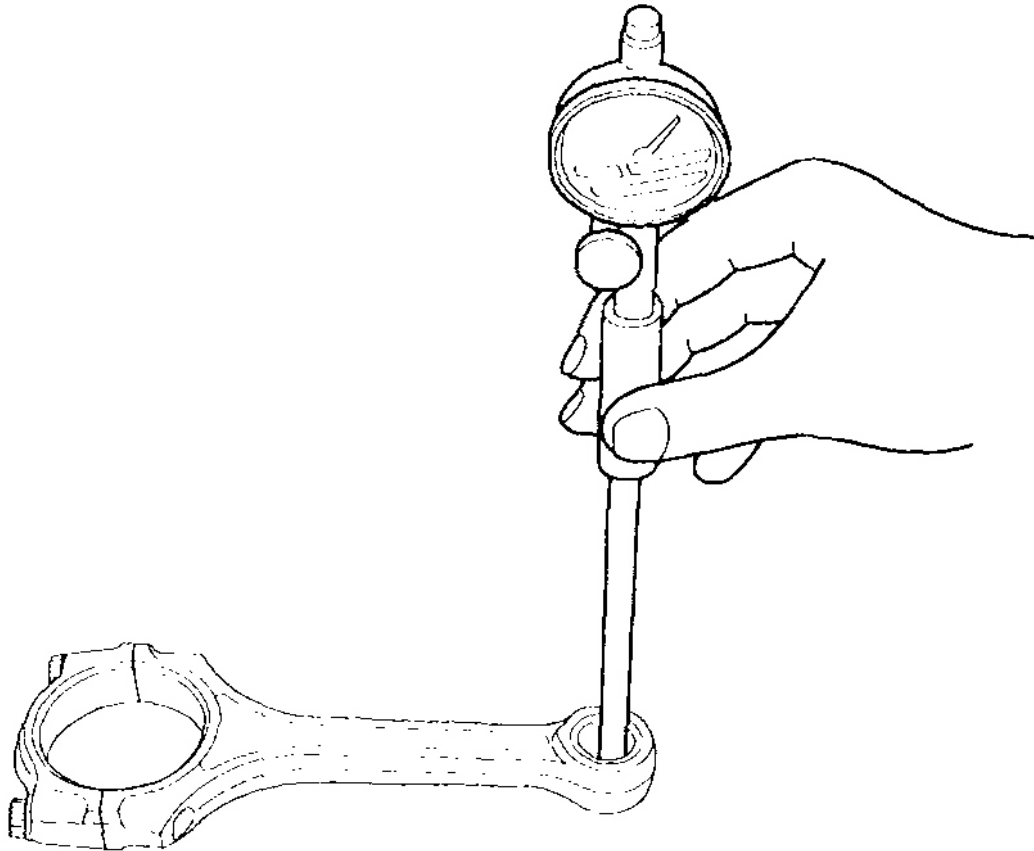
**Fig. 238: Measuring Piston Pin-To-Piston Clearance**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

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

**Standard (New):** 0.005-0.014 mm (0.002-0.0006 in.)

**Service Limit:** 0.019 mm (0.007 in.)

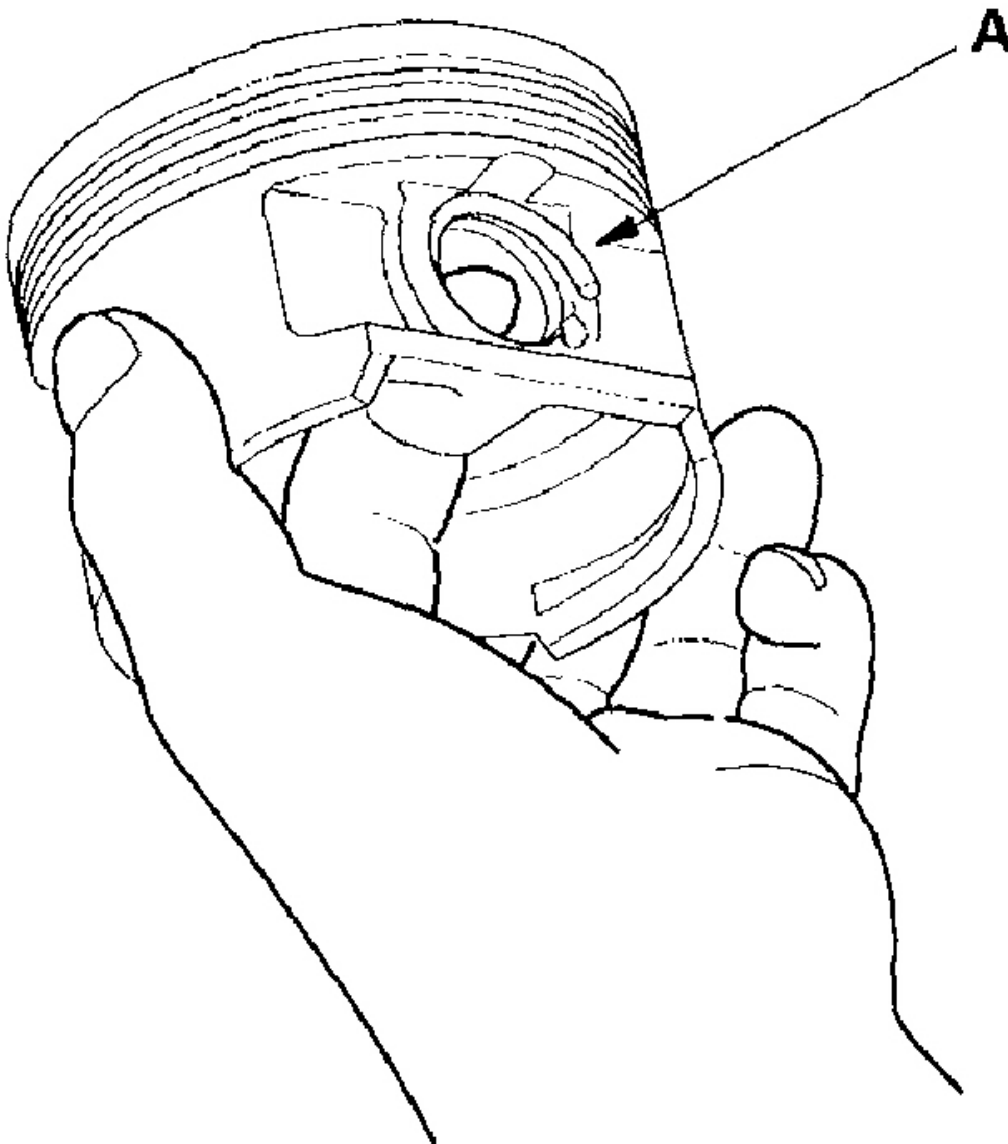


**G01463826**

**Fig. 239: Measuring Piston Pin-To-Connecting Rod Clearance**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

**Reassembly**

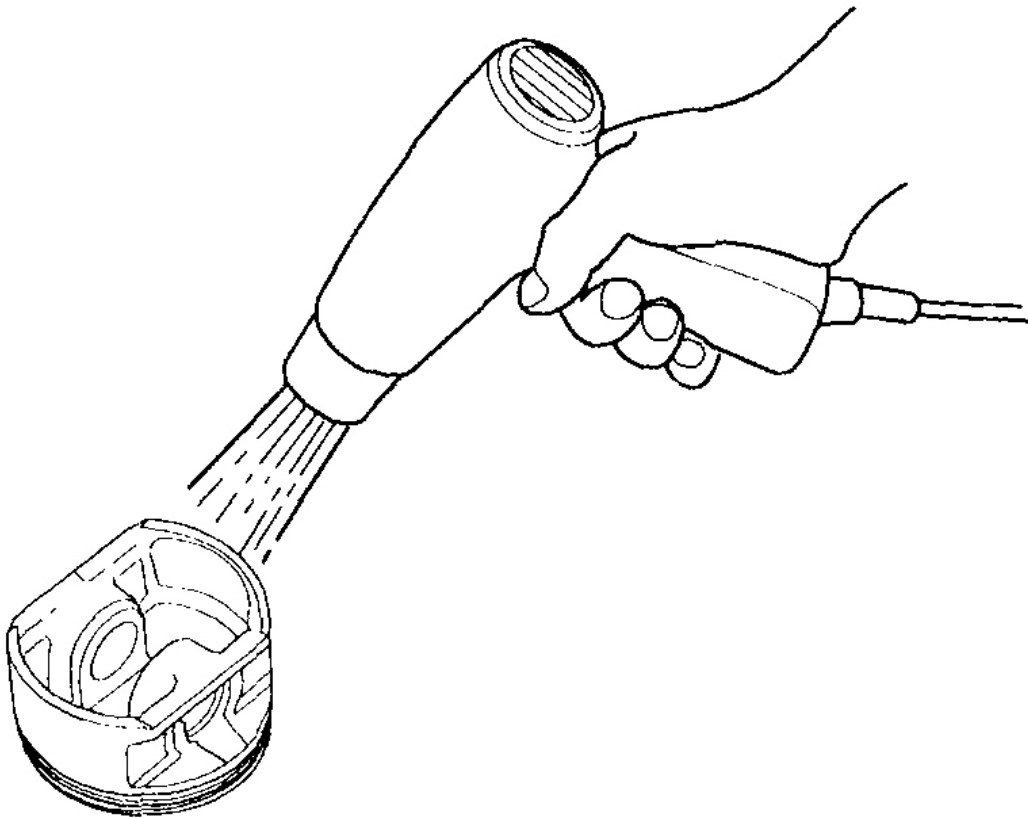
1. Install a piston pin snap ring (A).



G01463827

**Fig. 240: 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).

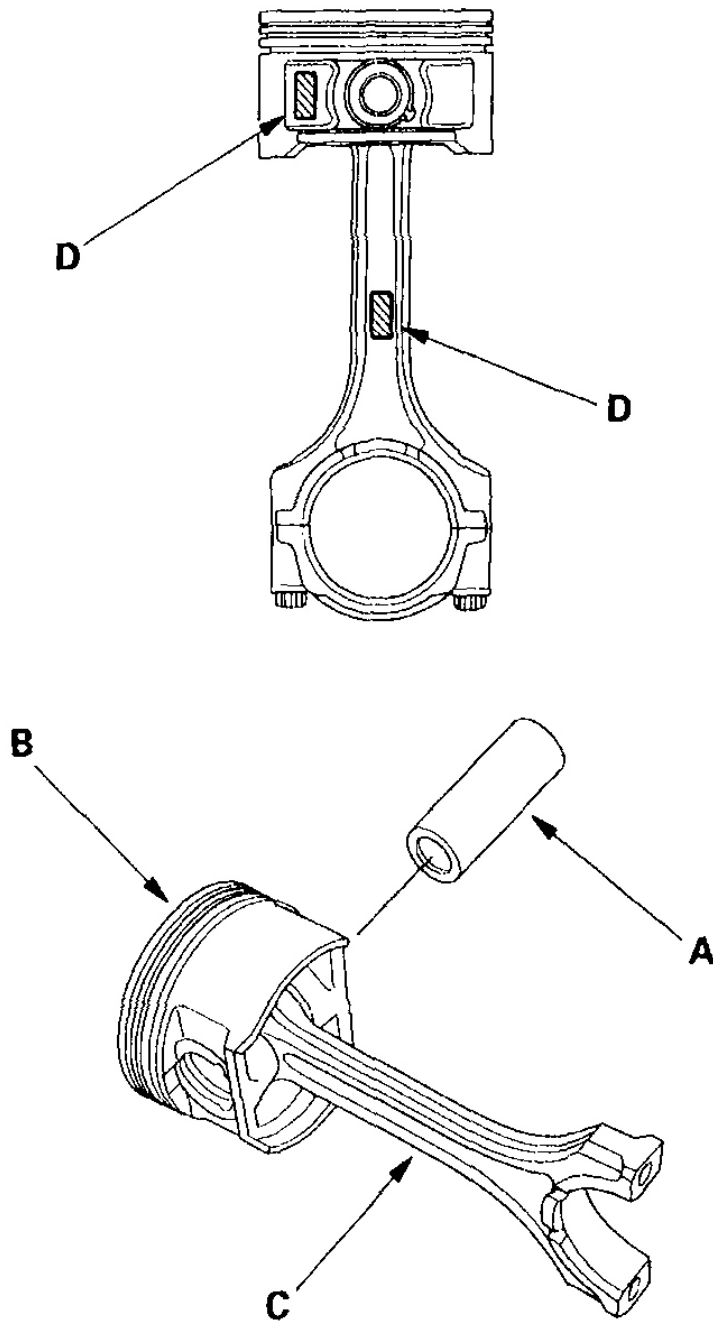


**G01463828**

**Fig. 241: Heating The Piston**

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

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



G01463829

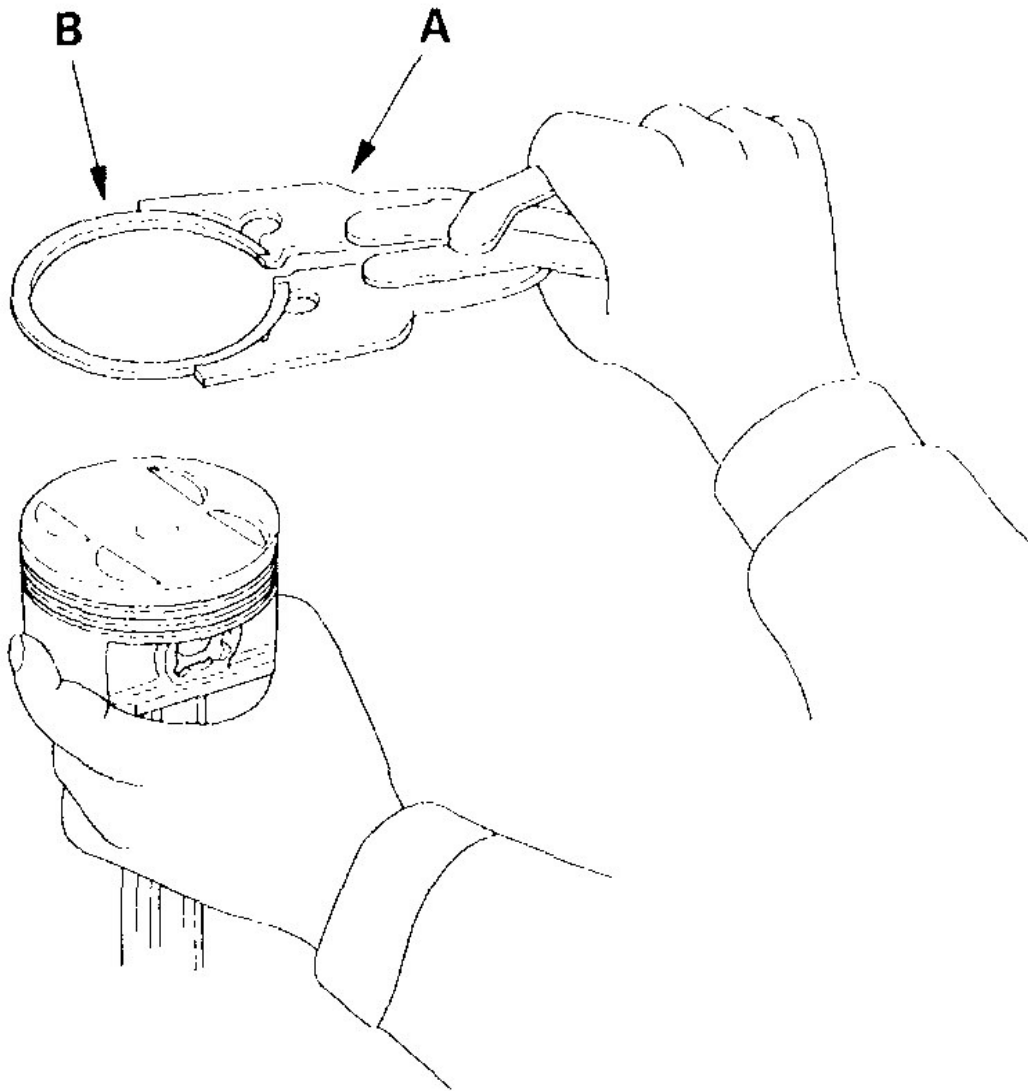
**Fig. 242: Installing The Piston Pin, & Assembling The Piston & Connecting Rod**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Install the remaining snap ring.



**PISTON RING REPLACEMENT**

1. Remove the piston from the cylinder block (see **Crankshaft & Piston Removal** ).
2. Using a ring expander (A), remove the old piston rings (B).

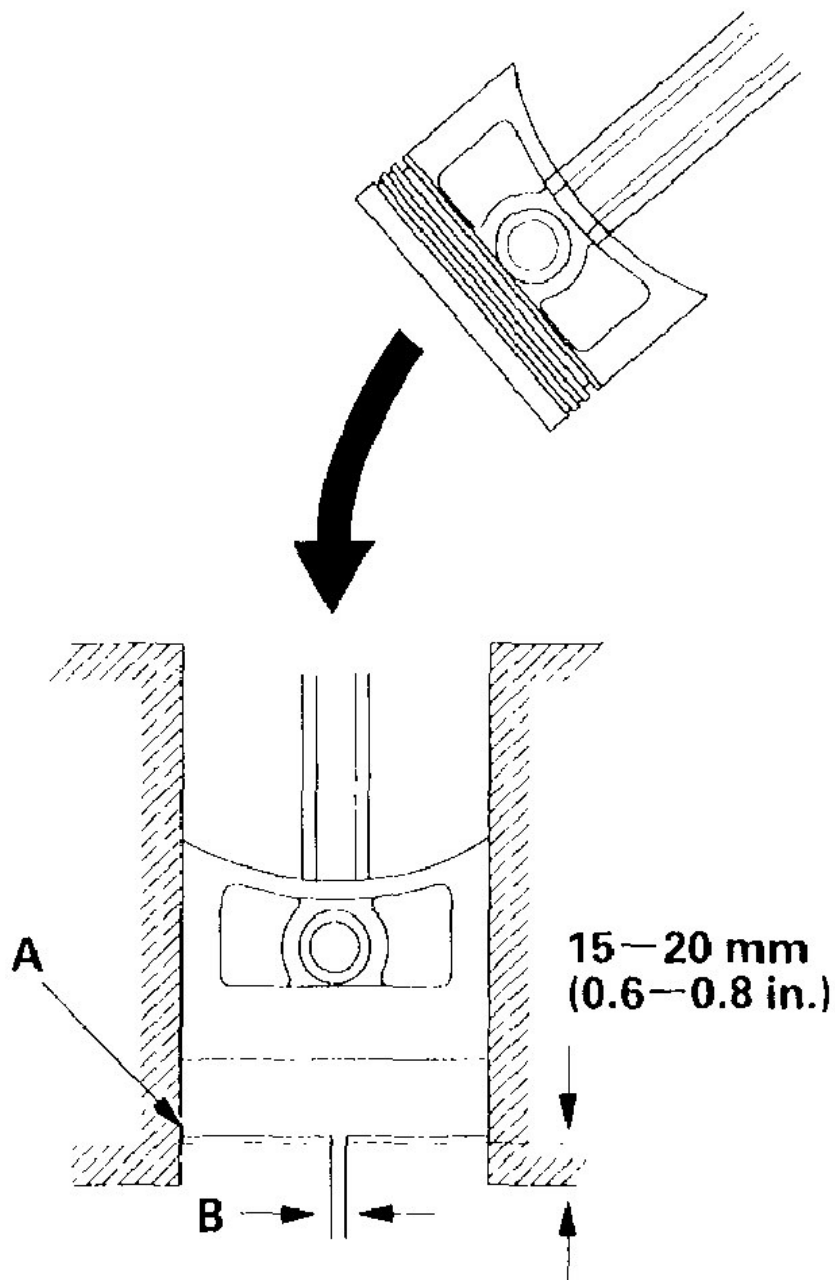
**G01463830****Fig. 243: Removing The Old Piston Rings****Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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. 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.



G01463831

**Fig. 244: Pushing A New Ring Into The Cylinder Bore**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Measure the piston ring end-gap (B) with a feeler gauge:

- If the gap is too small, check to see if you have the proper rings for your engine.
- If the gap is too large, recheck the cylinder bore diameter against the wear limits (see step 4 on **Block & Piston Inspection** ).

If the bore is over the service limit, the cylinder block must be rebored.

### **Piston Ring End-Gap**

#### **Top Ring**

**Standard (New):** 0.20-0.35 mm (0.008-0.014 in.)

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

#### **Second Ring**

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

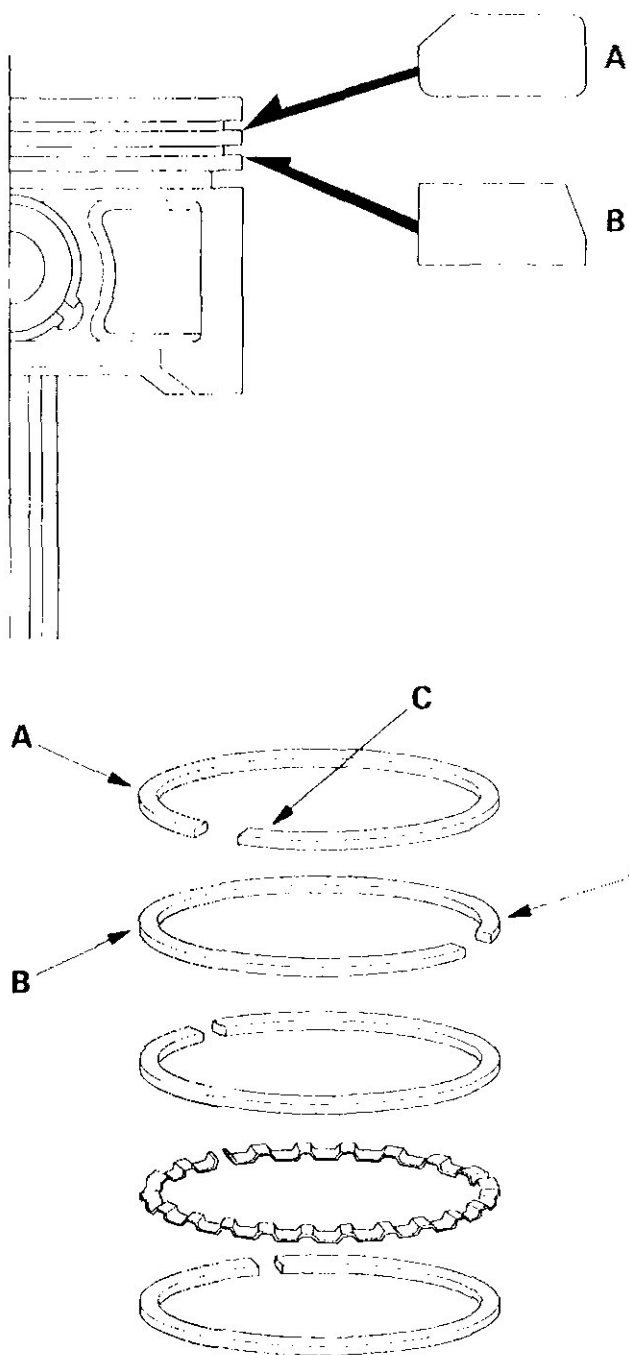
**Service Limit:** 0.70 mm (0.028 in.)

#### **Oil Ring**

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

**Service Limit:** 0.80 mm (0.031 in.)

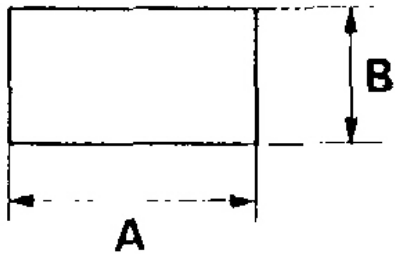
6. Install the rings as shown. The top ring (A) has a 1D mark and the second ring (B) has a 2C mark. The manufacturing marks (C) must be facing upward.



G01463832

**Fig. 245: Installing The Rings**

Courtesy of AMERICAN HONDA MOTOR CO., INC.



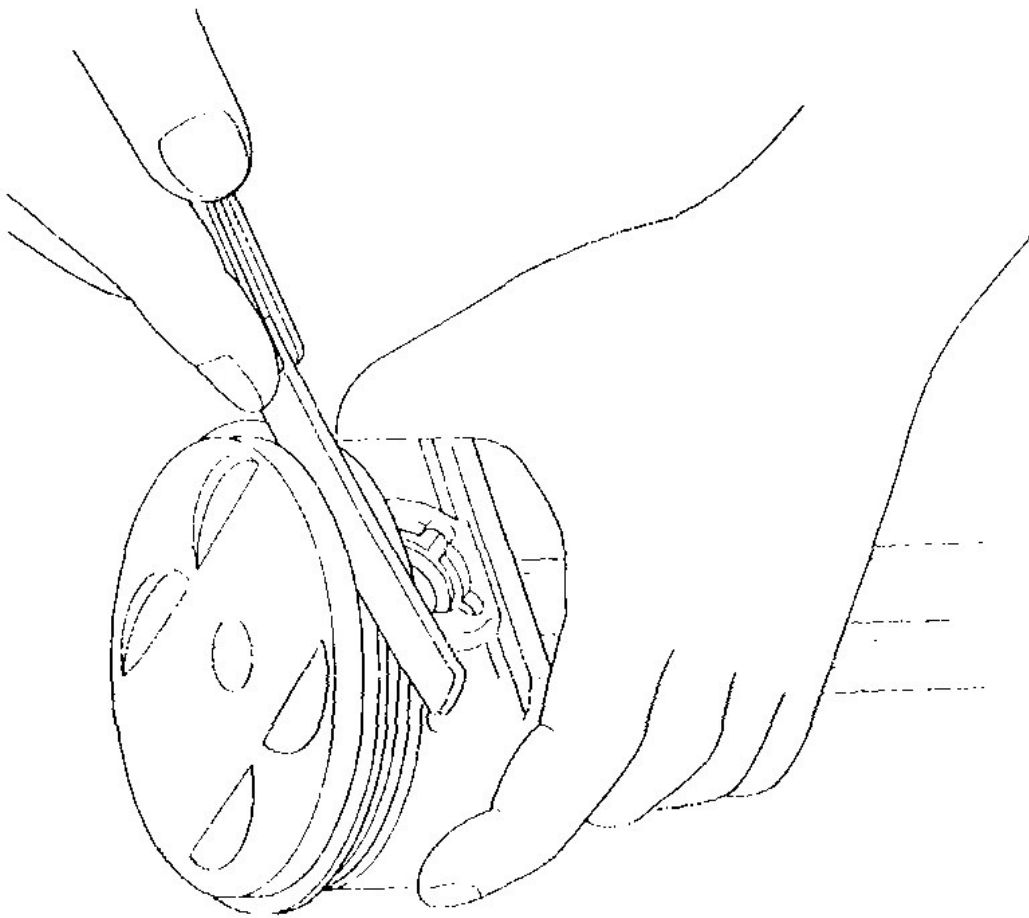
G01463833

**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. 246: Piston Ring Dimensions**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

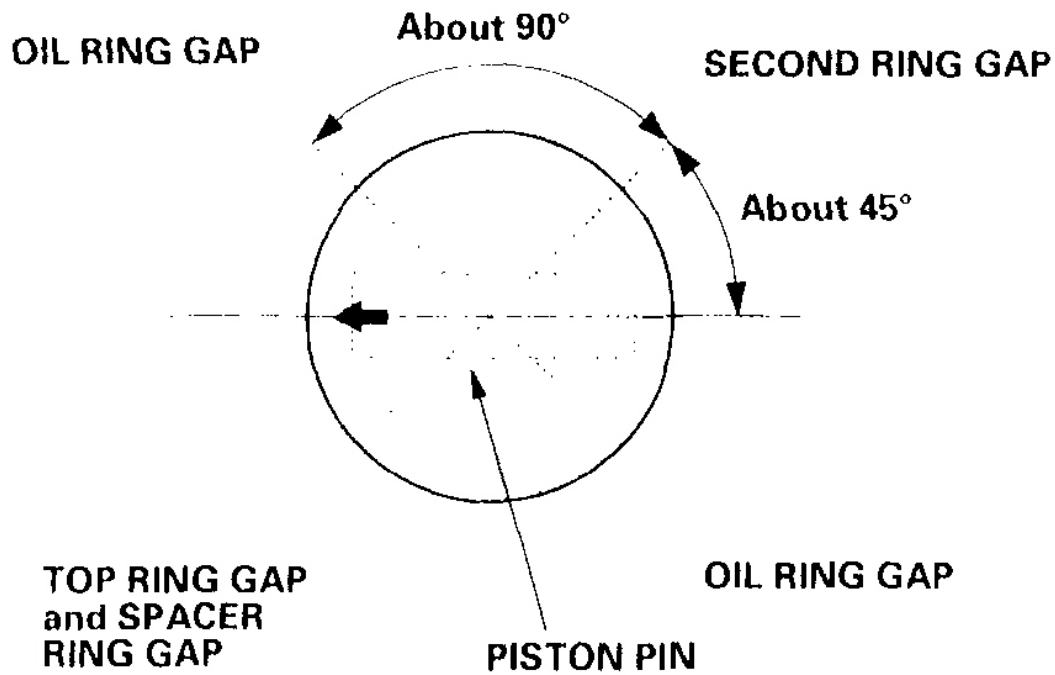
**Top Ring Clearance****Standard (New):** 0.055-0.080 mm (0.0022-0.0031 in.)**Service Limit:** 0.13 mm (0.005 in.)**Second Ring Clearance****Standard (New):** 0.030-0.055 mm (0.0012-0.0022 in.)**Service Limit:** 0.13 mm (0.005 in.)



**G01463834**

**Fig. 247: Measuring Ring-To-Groove Clearances**  
**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:



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**Fig. 248: Positioning The Ring End Gaps**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

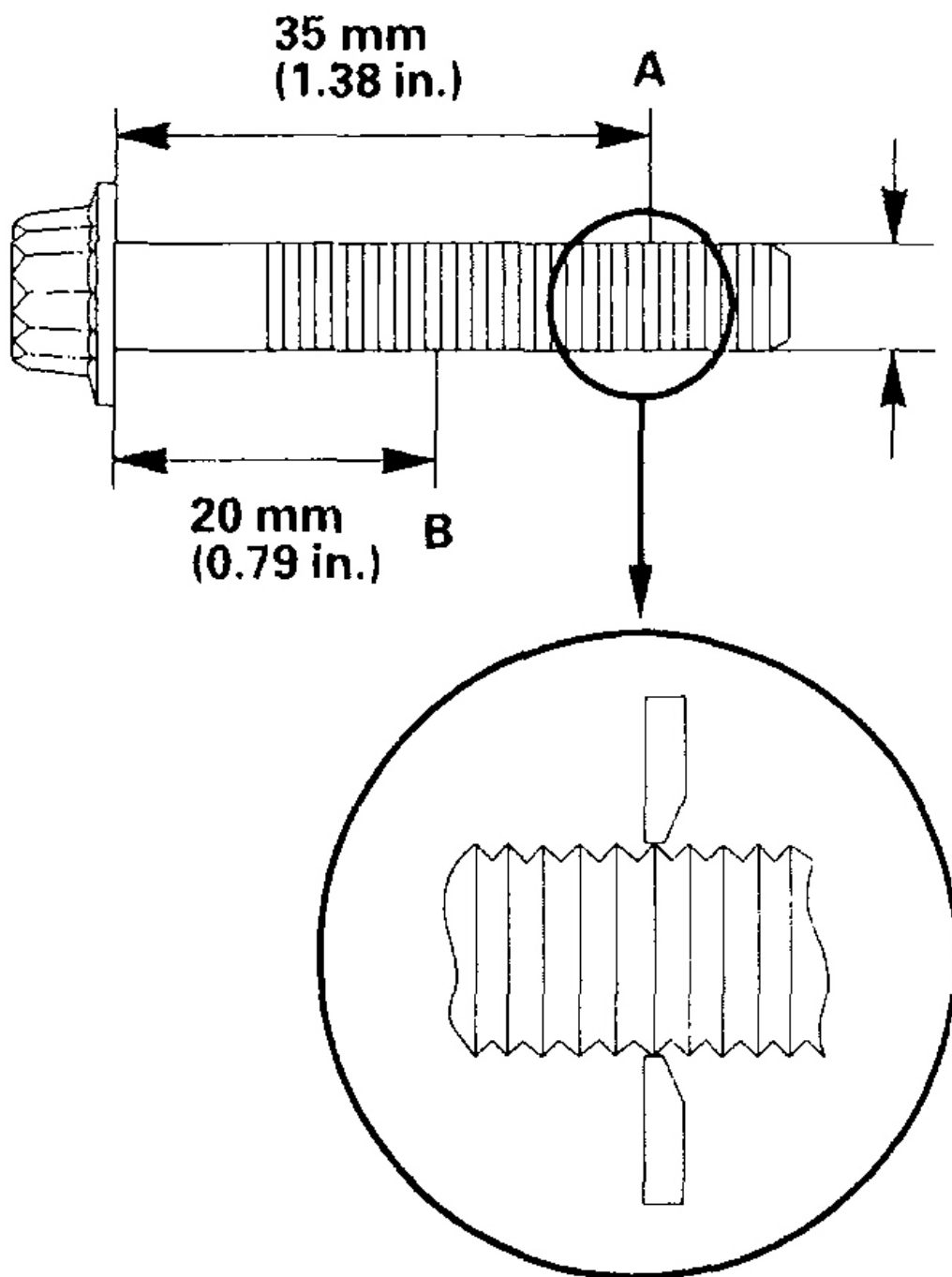
## CRANKSHAFT & PISTON INSTALLATION

### Special Tools Required

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

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





G01463836

**Fig. 249: Measuring The Diameter Of The Connecting Rod Bolts**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

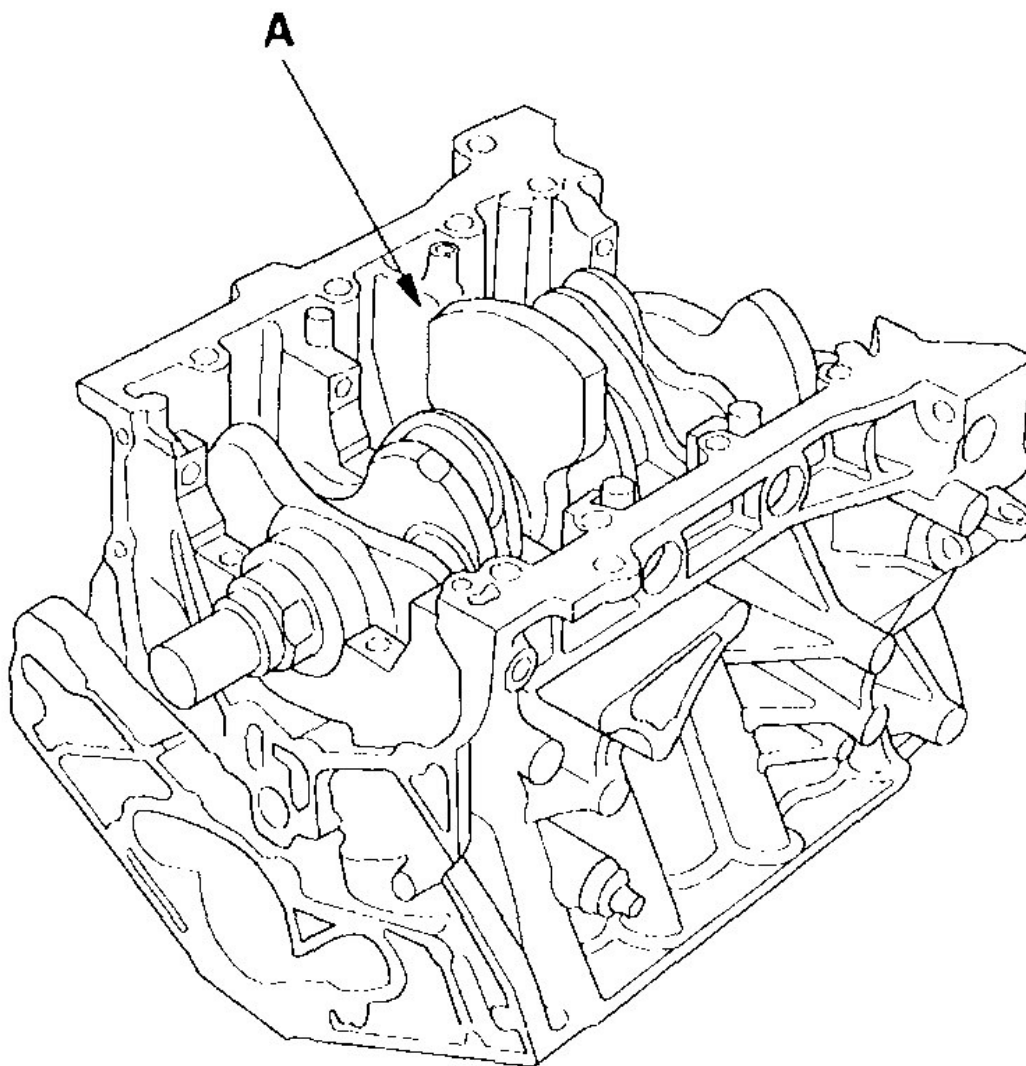
2. Calculate the difference in diameter between point A and point B.

**Point A - Point B = Difference in Diameter**

**Difference in Diameter**

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

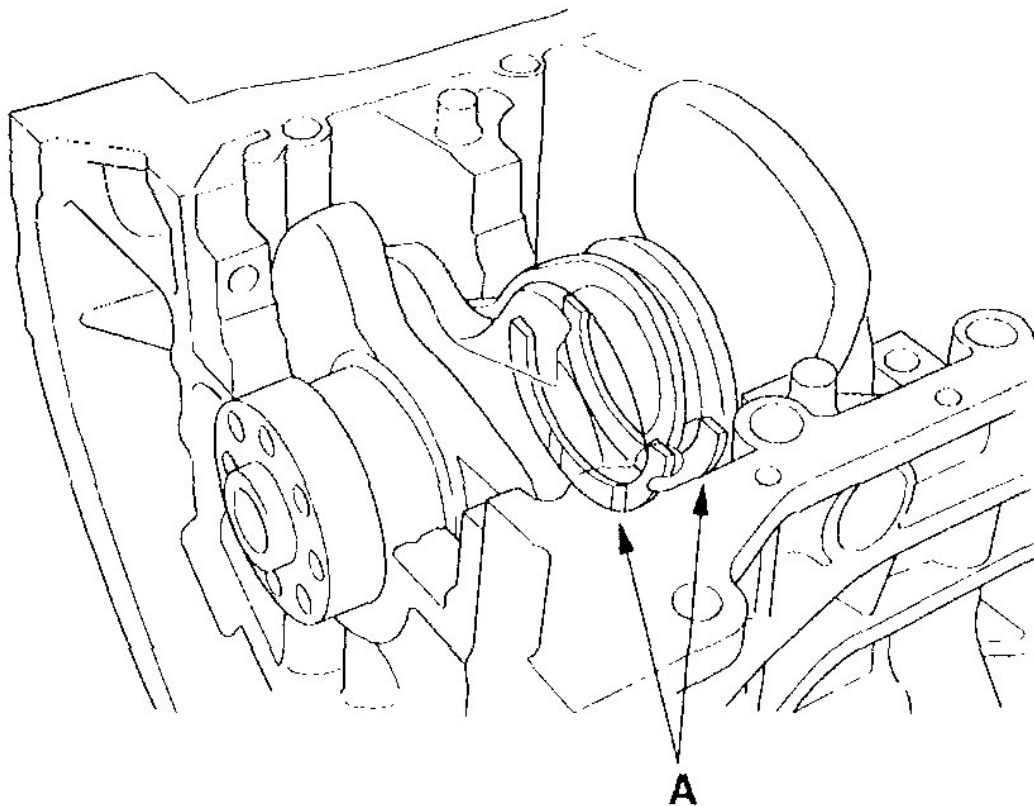
3. If the difference in diameter is out of tolerance, replace the connecting rod bolt.
4. Check the connecting rod bearing clearance with plastigage (see **Rod Bearing Clearance Inspection** ).
5. Check the main bearing clearance with plastigage (see **Main Bearing Clearance Inspection** ).
6. Install the bearing halves in the cylinder block and connecting rods.
7. Apply new engine oil to the main bearings and rod bearings.
8. Lower the crankshaft (A) into the block.



**G01463837**

**Fig. 250: Lowering The Crankshaft Into The Block**  
**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

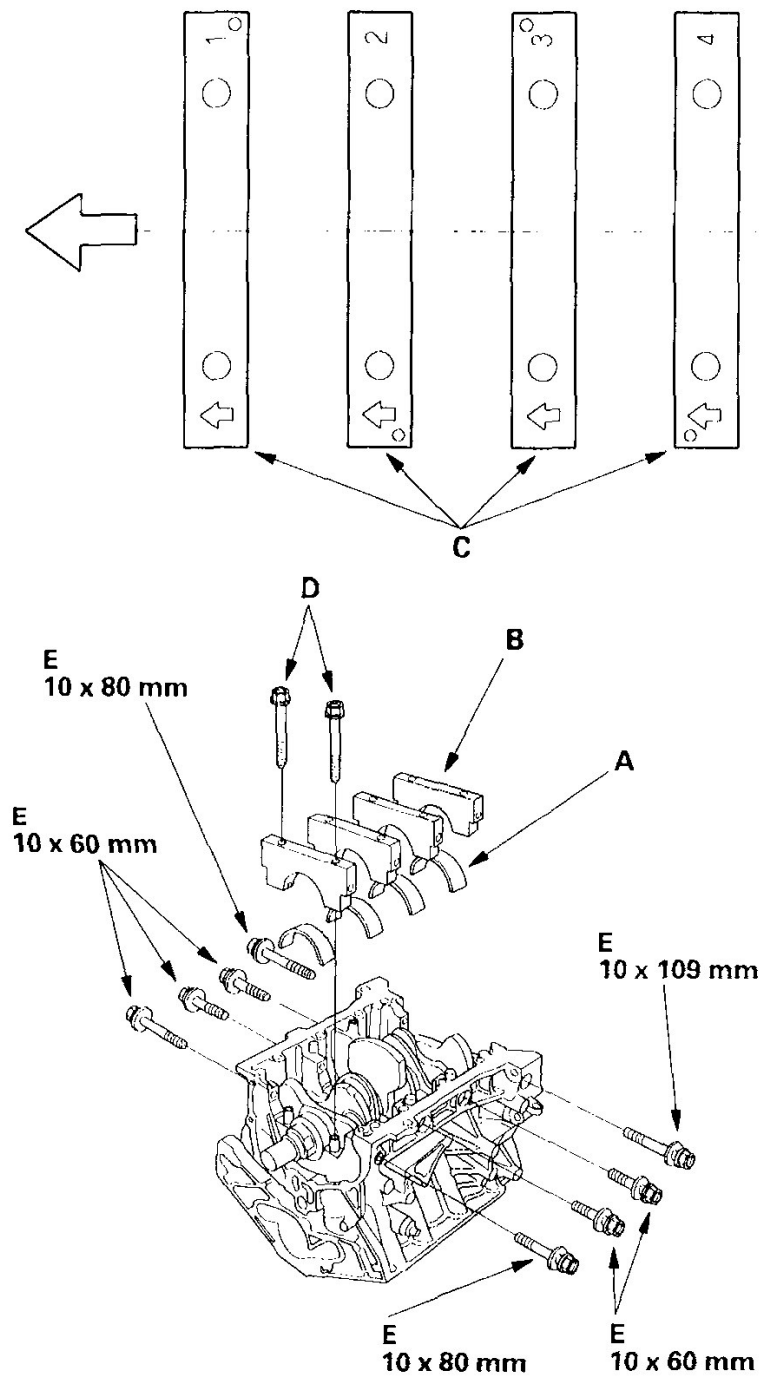
9. Apply new engine oil to the thrust washer surfaces. Install the thrust washers (A) in the No. 3 journal.



**G01463838**

**Fig. 251: Installing The Thrust Washers In The 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.

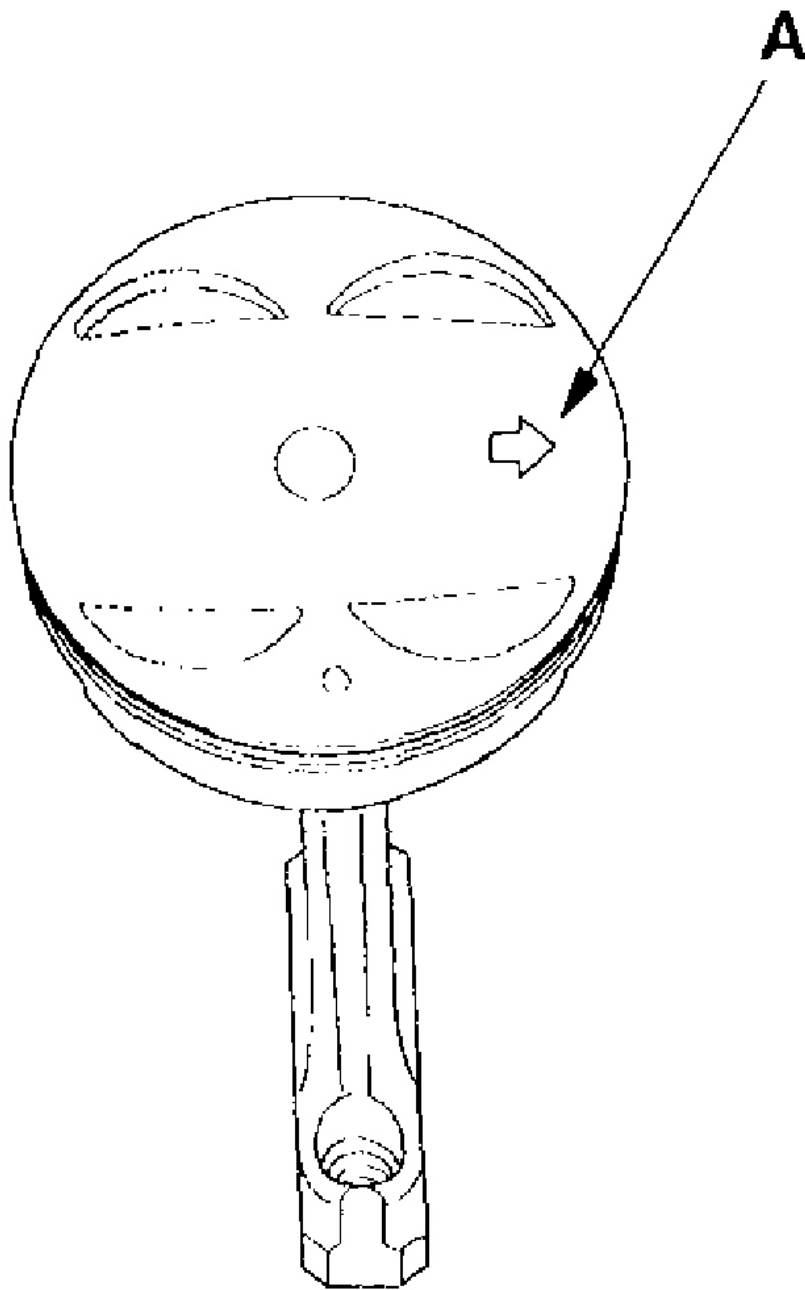


G01463839

**Fig. 252: Installing The Bearings & Bearing Caps**  
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Apply engine oil to the bolt threads and flanges, then 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. Remove the connecting rod cap. Install the ring compressor, and check that the bearing is securely in place.
14. Position the piston with the arrow (A) facing the timing belt side of the engine.

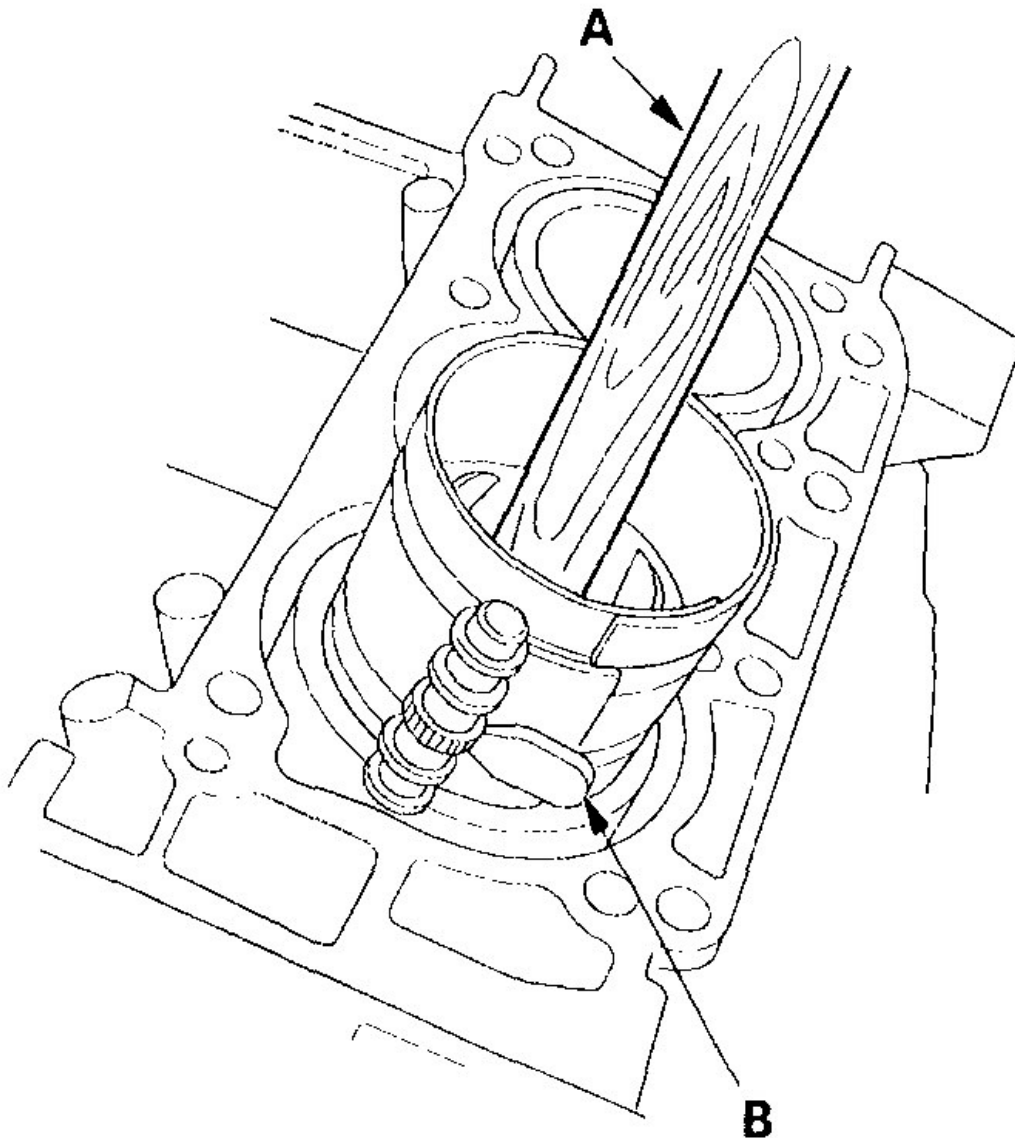


G01463840

**Fig. 253: Positioning The Arrow On The Piston**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Position the piston 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.



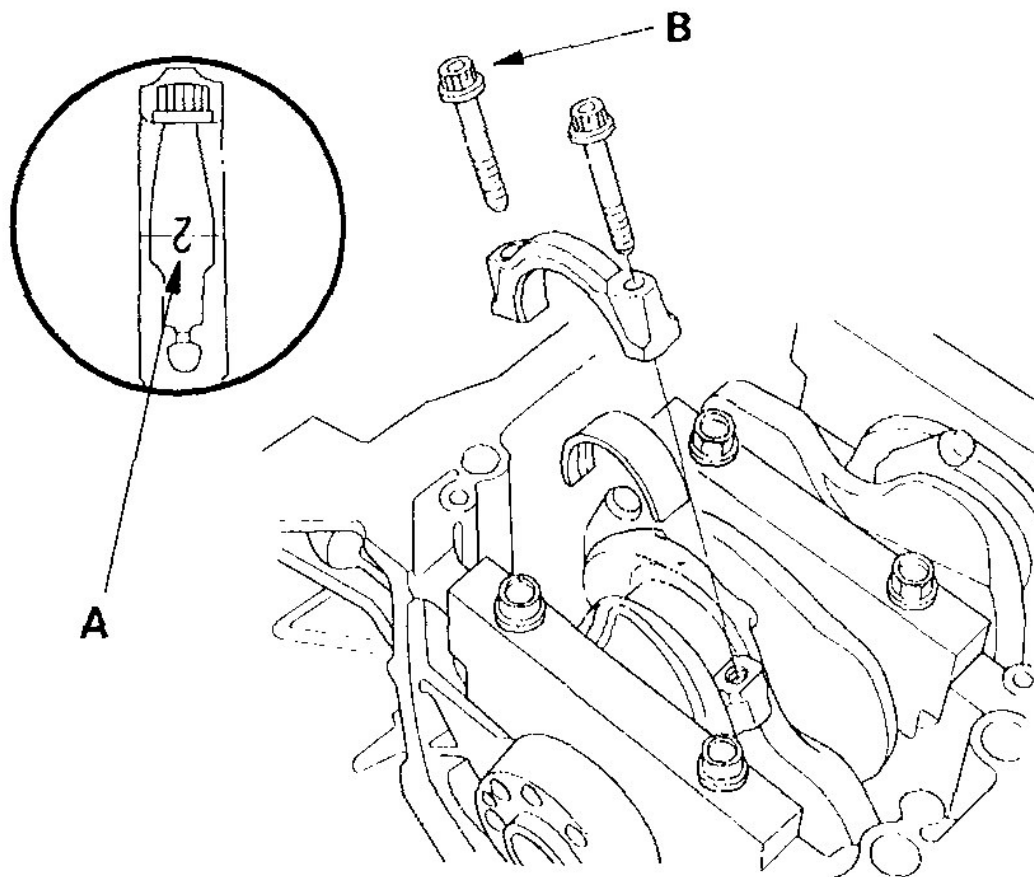
G01463841

**Fig. 254: Positioning The Piston In The Cylinder**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

16. Stop after the ring compressor pops free, and check the connecting rod-to-crank journal alignment before pushing the piston into place.



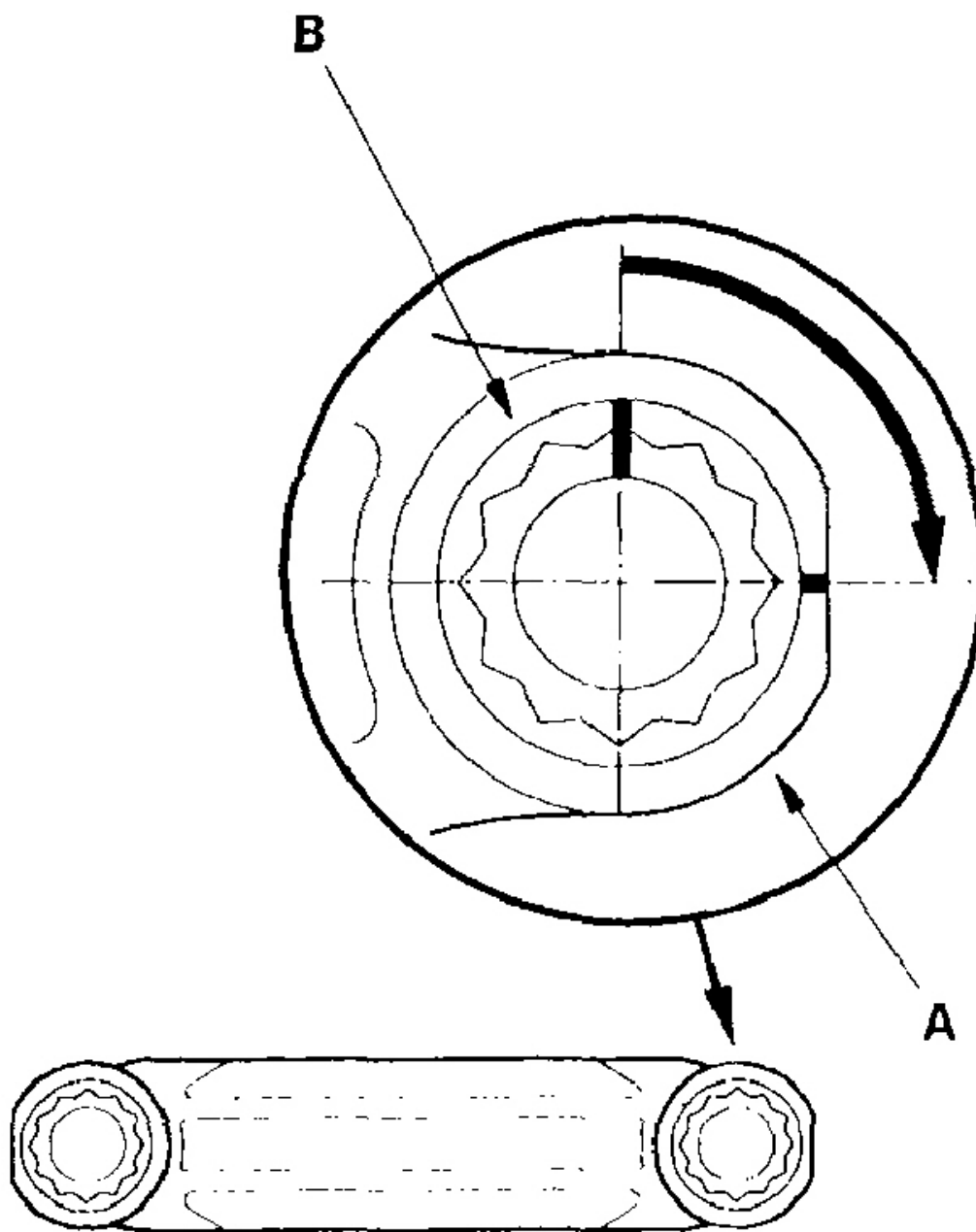
17. Line up the mark (A) on the connecting rod and cap, then install the cap.



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**Fig. 255: Lining Up The Mark On The Connecting Rod & Cap**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

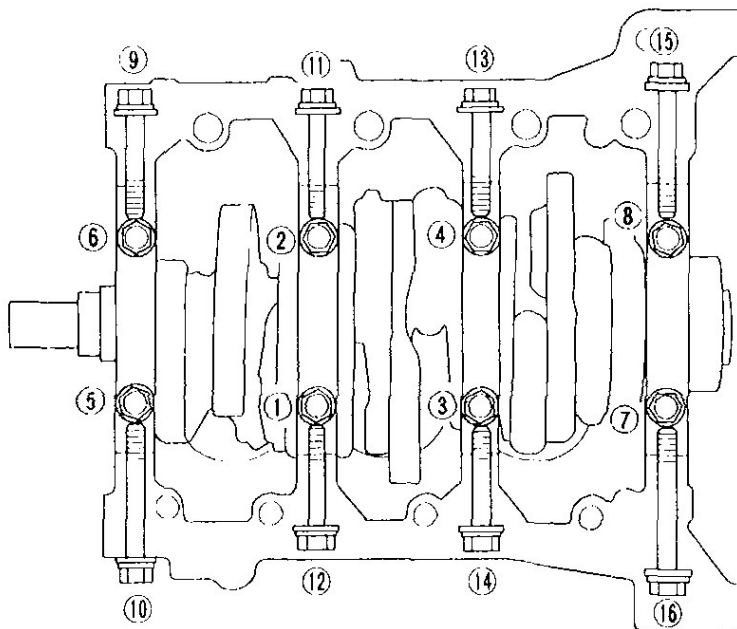
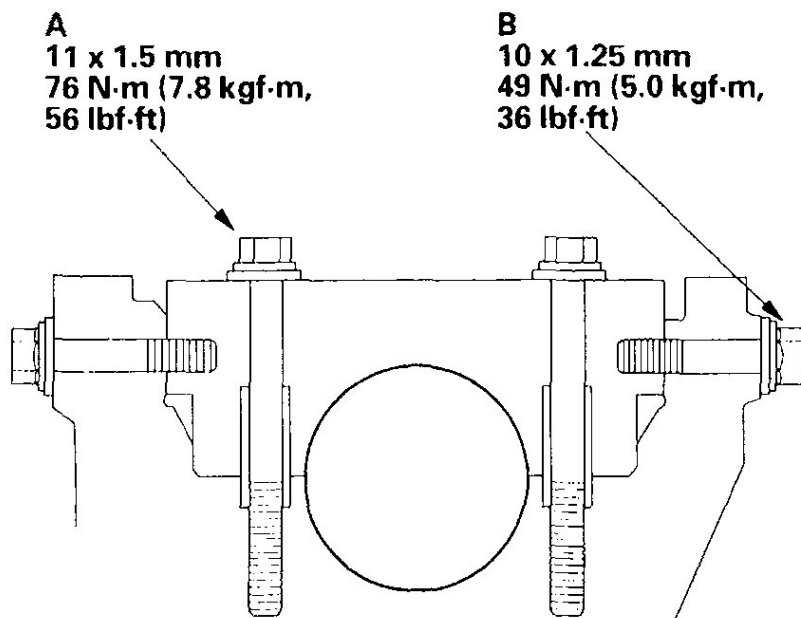
18. Apply new engine oil to the bolt threads. Torque the bolts (B) to 20 N.m (2.0 kgf.m, 14 lbf.ft).  
19. Mark the connecting rod (A) and bolt head (B) as shown.



G01463843

**Fig. 256: Marking The Connecting Rod & Bolt Head**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

20. Tighten the bolt until the mark on the bolt head lines up with the mark on the connecting rod (turn the bolt 90°).
21. Tighten the bearing cap bolts (A) and the bearing cap side bolts (B) two turns at a time in the sequence shown.

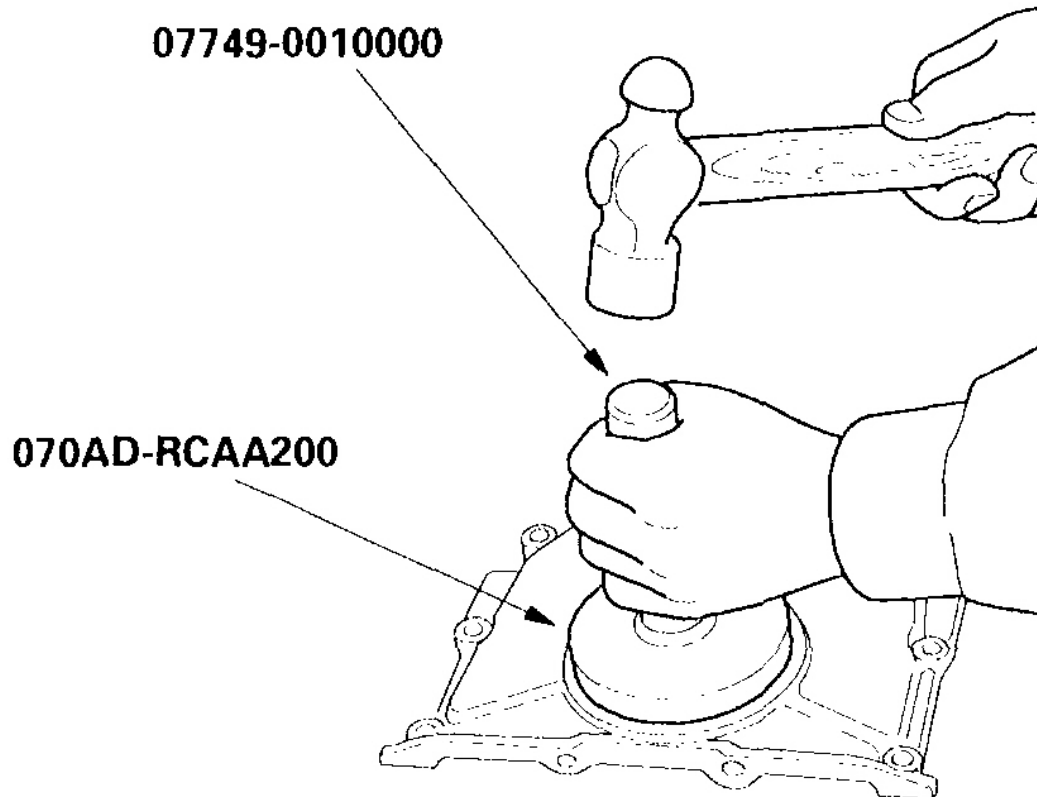


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**Fig. 257: Tightening The Bearing Cap Bolts & The Bearing Cap Side Bolts In Sequence**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

22. The seal mating surface on the engine block end cover should be dry. Apply a light coat of multipurpose grease to the crankshaft and to the lip of the seal.

23. Drive the crankshaft oil seal squarely into the engine block end cover.



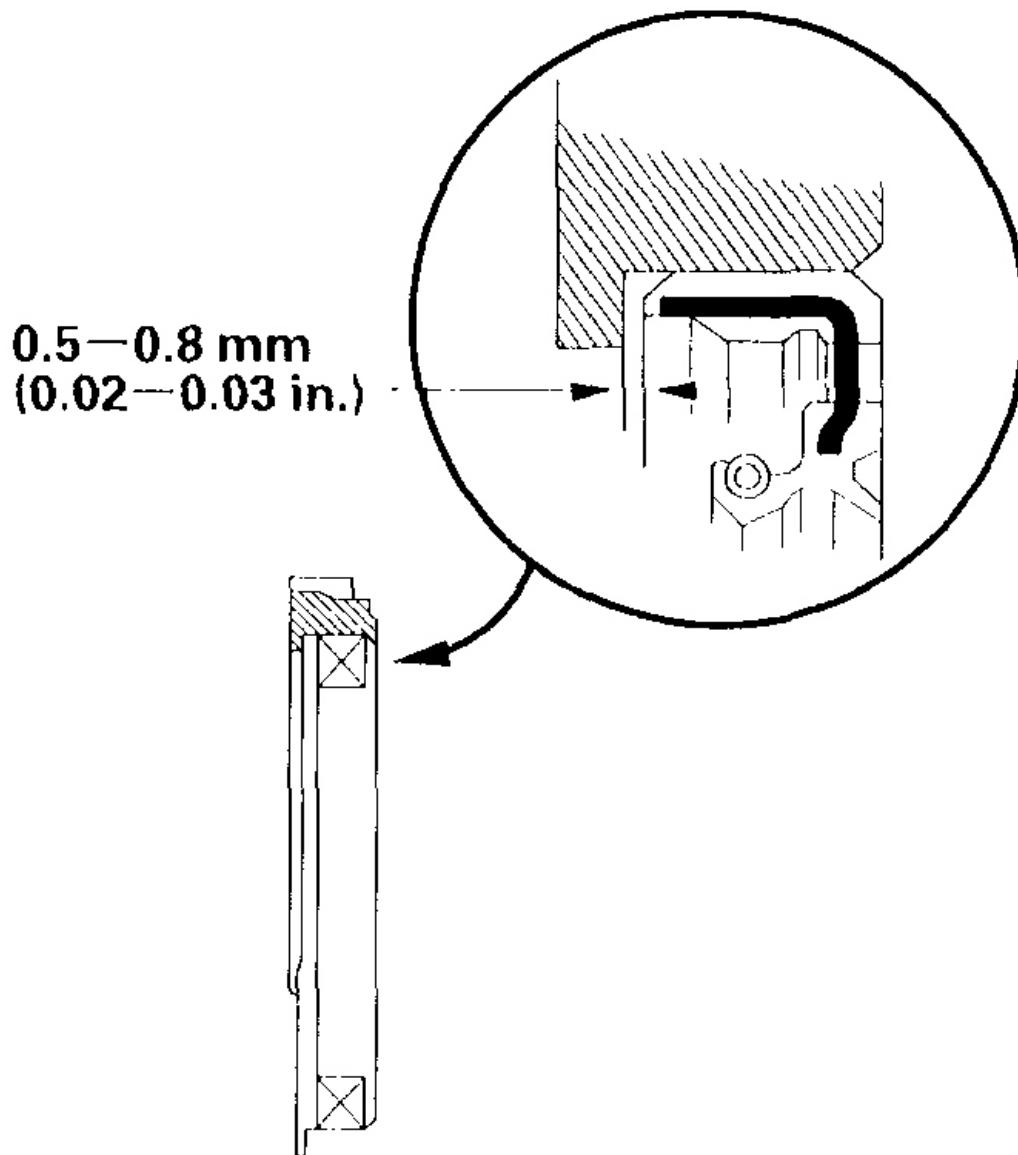
**G01463845**

**Fig. 258: Driving The Crankshaft Oil Seal**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

24. Confirm that the clearance is equal all the way around with a feeler gauge.

**Clearance:** 0.5-0.8 mm (0.02-0.03)



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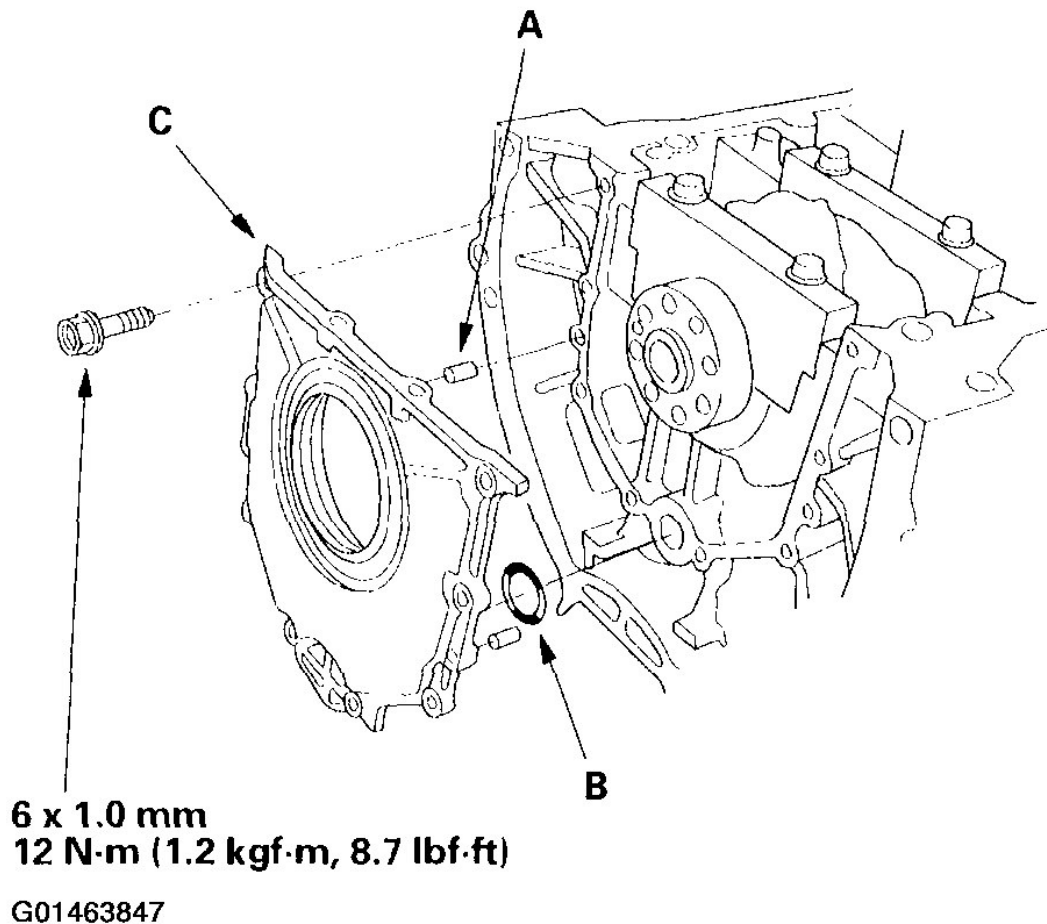
**Fig. 259: Confirming Clearance Is Equal**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

25. Remove any old liquid gasket from the engine block end cover mating surfaces, bolts and bolt holes.
26. Clean and dry the engine block end cover mating surfaces.

**NOTE:** Do not install the parts if 4 minutes or more have elapsed since applying

the liquid gasket. Instead, reapply liquid gasket after removing the old residue.



**Fig. 260: Installing The Dowel Pins, O-Ring & The Engine Block End Cover On The Cylinder Block**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

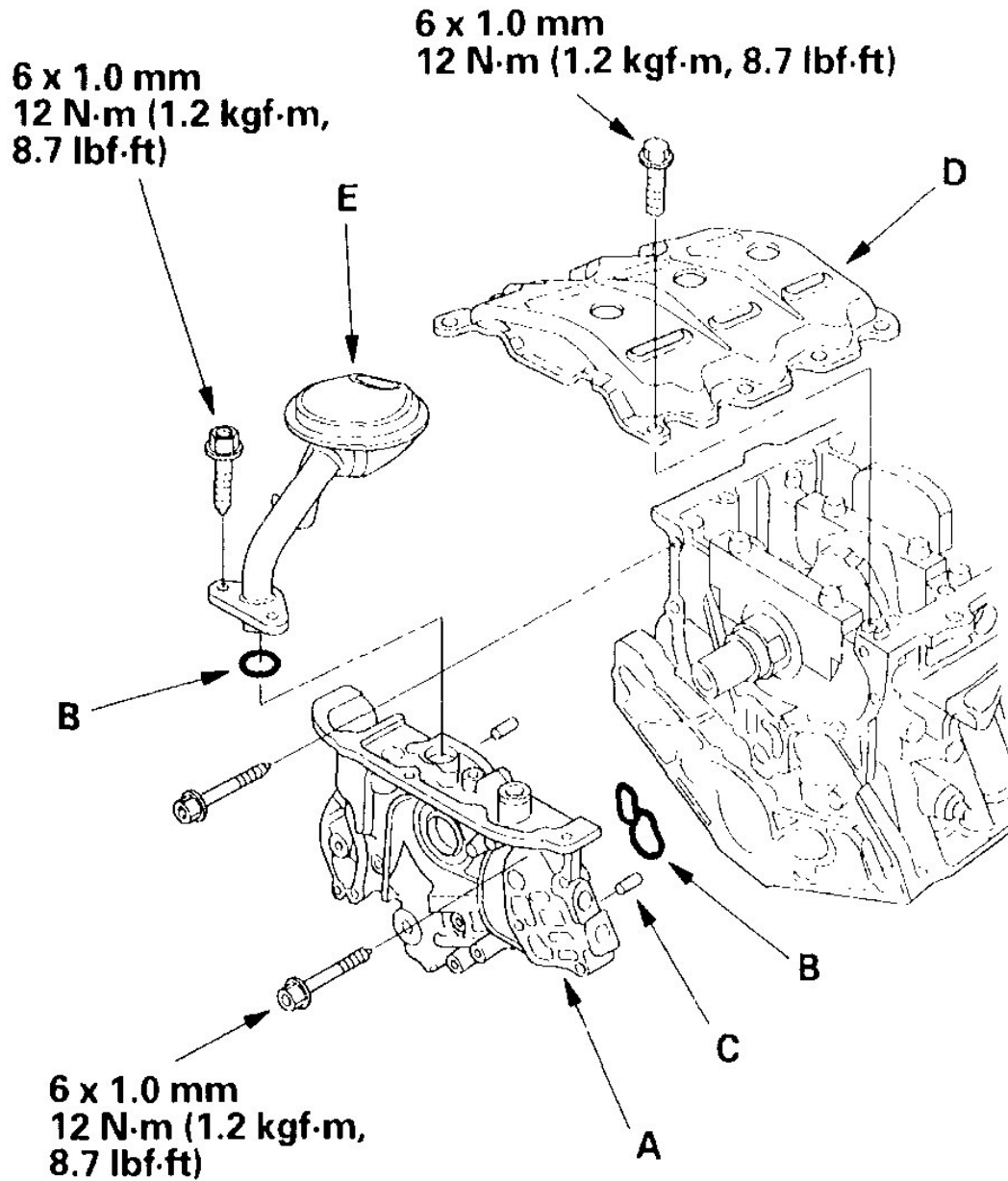
27. Apply liquid gasket, P/N 08718-0001 or 08718-0003, evenly to the block mating surface of the engine block end cover and to the inner threads of the bolt holes. Install the dowel pins (A), new O-ring (B), and the engine block end cover (C) on the cylinder block.
28. Remove any old liquid gasket from the oil pump mating surfaces, bolts and bolt holes.
29. Clean and dry the oil pump mating surfaces.
30. Install the oil pump (A).
  - Install a new crankshaft oil seal in the oil pump (see step 2 on **OIL PUMP OVERHAUL** ).
  - Apply liquid gasket, P/N 08718-0001 or 08718-0003, evenly to the block mating surface of the oil pump and to the inner threads of the bolt holes.

**NOTE:**        **Do not install the parts if 5 minutes or more have elapsed since applying the liquid gasket.**

Instead, reapply liquid gasket after removing the old residue.

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



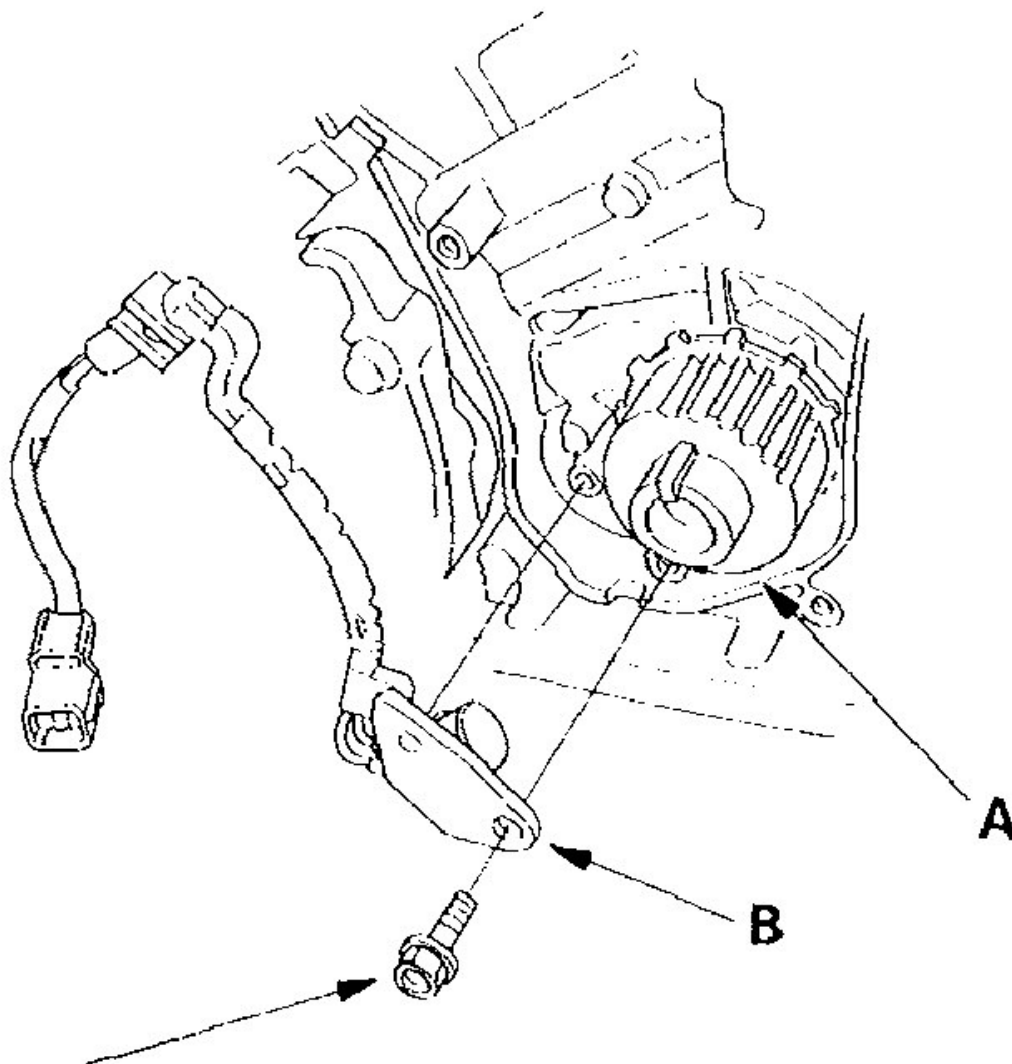


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**Fig. 261: Installing The Oil Pump**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

31. Install the baffle plate (D), then install the oil screen (E).
32. Install the oil pan (see **Oil Pan Installation**).
33. Install the timing belt drive pulley (A), then install the crankshaft position (CKP) sensor (B).



**6 x 1.0 mm**  
**12 N·m (1.2 kgf·m, 8.7 lbf·ft)**

**G01463849**

**Fig. 262: Installing The Timing Belt Drive Pulley & The Crankshaft Position Sensor**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

34. Install the cylinder heads (see **Camshaft, Rocker Arm, Camshaft Seal & Pulley Installation** ).
35. Install the transmission (see **TRANSMISSION INSTALLATION** ).

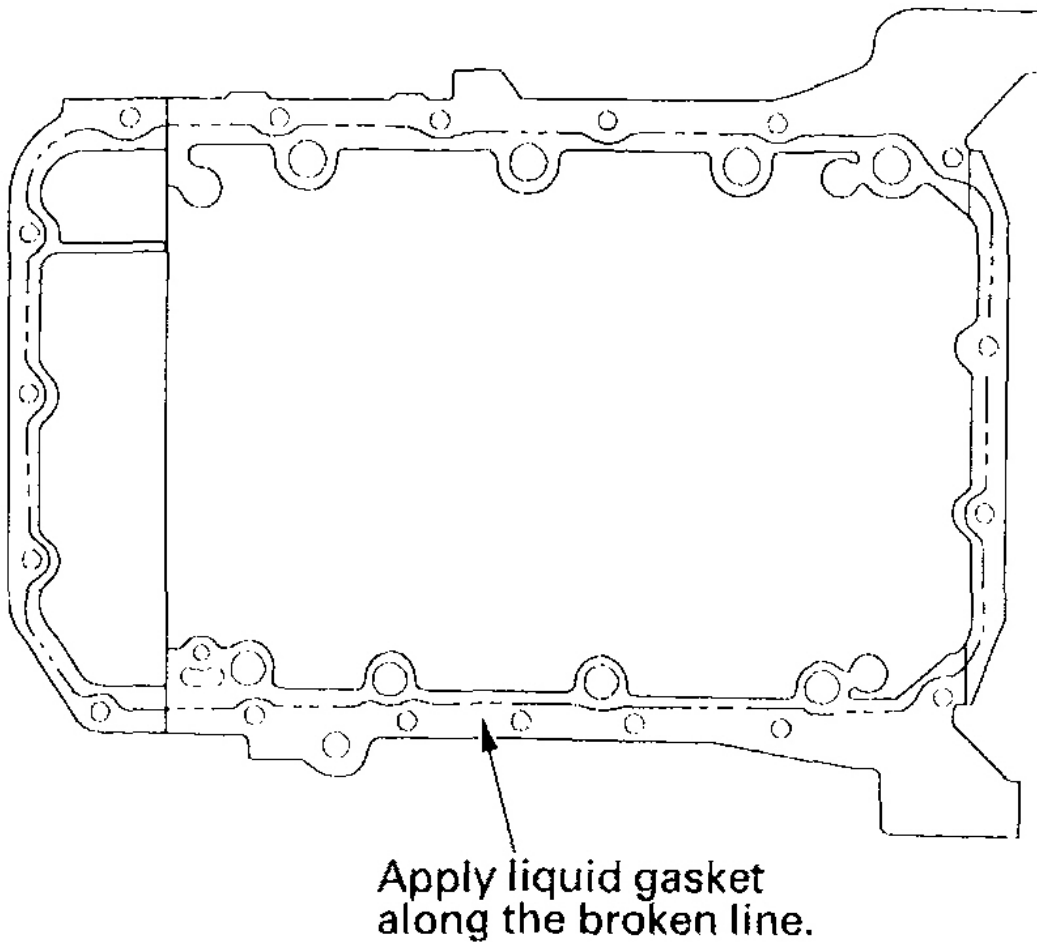
36. Install the engine assembly (see **Engine Installation** ).

**NOTE:** Whenever any crankshaft or connecting rod bearing is replaced, it is necessary after reassembly 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.

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



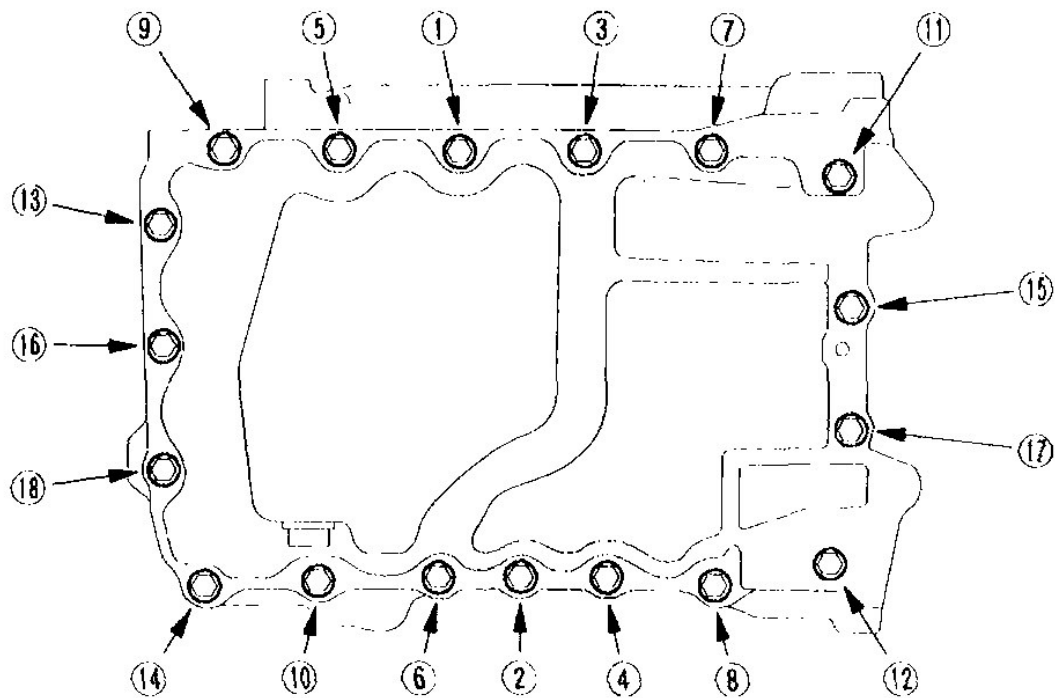
G01463850

**Fig. 263: Applying Liquid Gasket**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Apply liquid gasket, P/N 08718-0001 or 08718-003, evenly to the oil pan mating surface of the cylinder block and to the inner threads of the bolt holes.
4. Install the oil pan on the cylinder block.

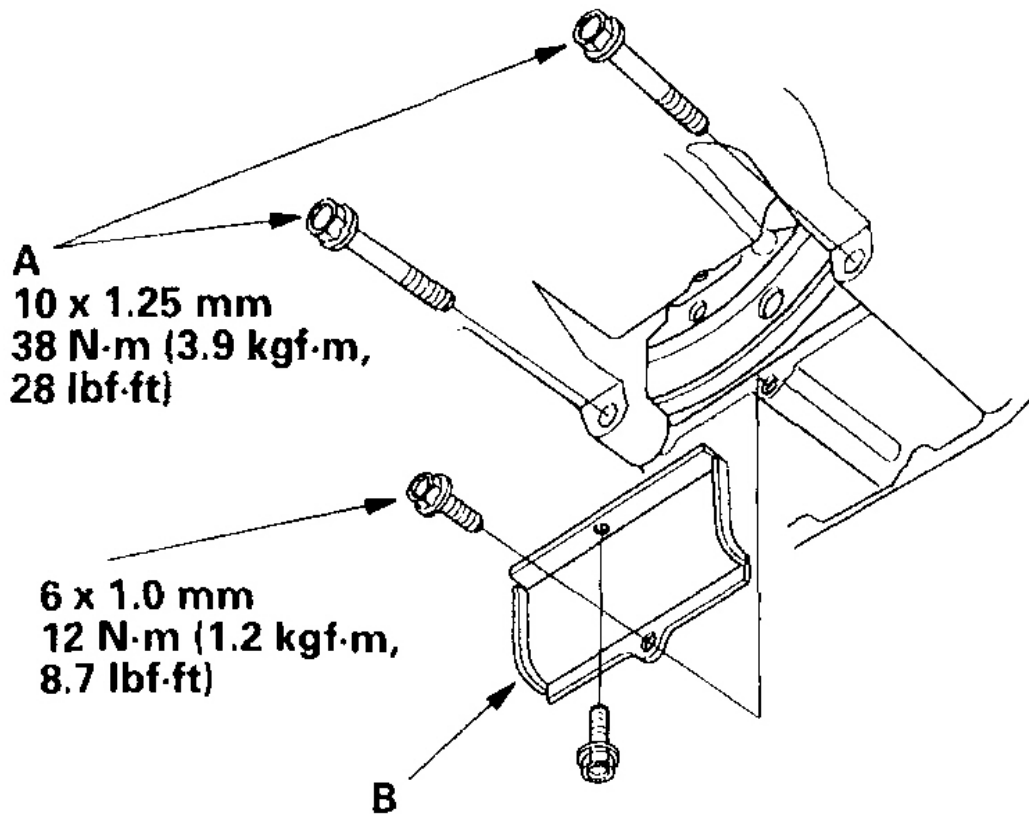
**NOTE:** After assembly, wait at least 30 minutes before filling the engine with oil.



G01463851

**Fig. 264: Installing The Oil Pan On The Cylinder Block**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



G01463852

**Fig. 265: Tightening The Two Bolts Securing The Transmission & Installing The Torque Converter Cover**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

When the engine is in the vehicle, perform the following procedure.

7. Install the front subframe and loosely install the subframe mounting bolts (see step 4 on **Engine Installation** ).
8. Align all reference marks on the front subframe with the body, then tighten the bolts on the subframe to the specified torque (see step 5 on **Engine Installation** ).
9. Tighten the transmission lower rear amount mounting nuts and transmission lower front mount mounting nuts (see step 6 on **Engine Installation** ).
10. Tighten the rear mount mounting bolts (see step 7 on **Engine Installation** ).
11. Tighten the front mount support nut (see step 14 on **Engine Installation** ).
12. Install the power steering (P/S) hose (see step 14 on **Engine Installation** ).
13. Connect the power steering pressure switch connector (see step 15 on **Engine Installation** ).

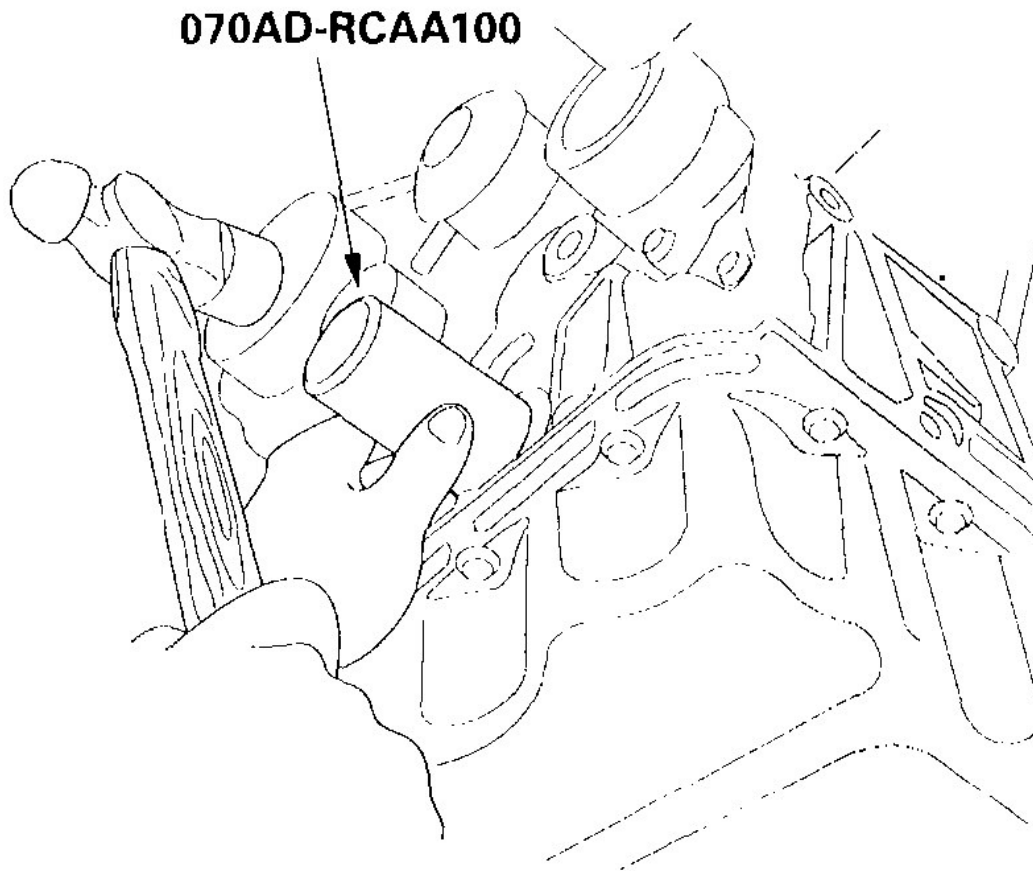
14. Connect the suspension lower arm ball joints (see **LOWER ARM** ).
15. Connect the tie-rod end ball joints (see step 23 on **STEERING GEARBOX OVERHAUL** ).
16. Install the transfer assembly (see **TRANSFER ASSEMBLY INSTALLATION** ).
17. Install the splash shield (see step 25 on **Engine Installation** ).
18. Install the P/S hose clamp, and install the P/S pump outlet hose with a new O-ring (see step 57 on **Engine Installation** ).
19. Align the reference mark on the steering joint and steering gearbox pinion shaft. Connect the steering joint to the steering gearbox pinion shaft, and tighten the steering joint bolt. Then install the steering joint cover (see step 41 on **Engine Installation** ).
20. Refill the power steering system fluid (see **FLUID REPLACEMENT** ).
21. Refill the engine with oil (see step 3 on **ENGINE OIL REPLACEMENT** ).

## **PULLEY END CRANKSHAFT SEAL INSTALLATION - IN CAR**

### **Special Tools Required**

Oil Seal driver 64 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 seal driver, drive in the crankshaft oil seal until the driver bottoms against the oil pump. When the seal is in place, clean any excess grease off the crankshaft, and check that the oil seal lip is not distorted.



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**Fig. 266: Driving In The Crankshaft Oil Seal**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

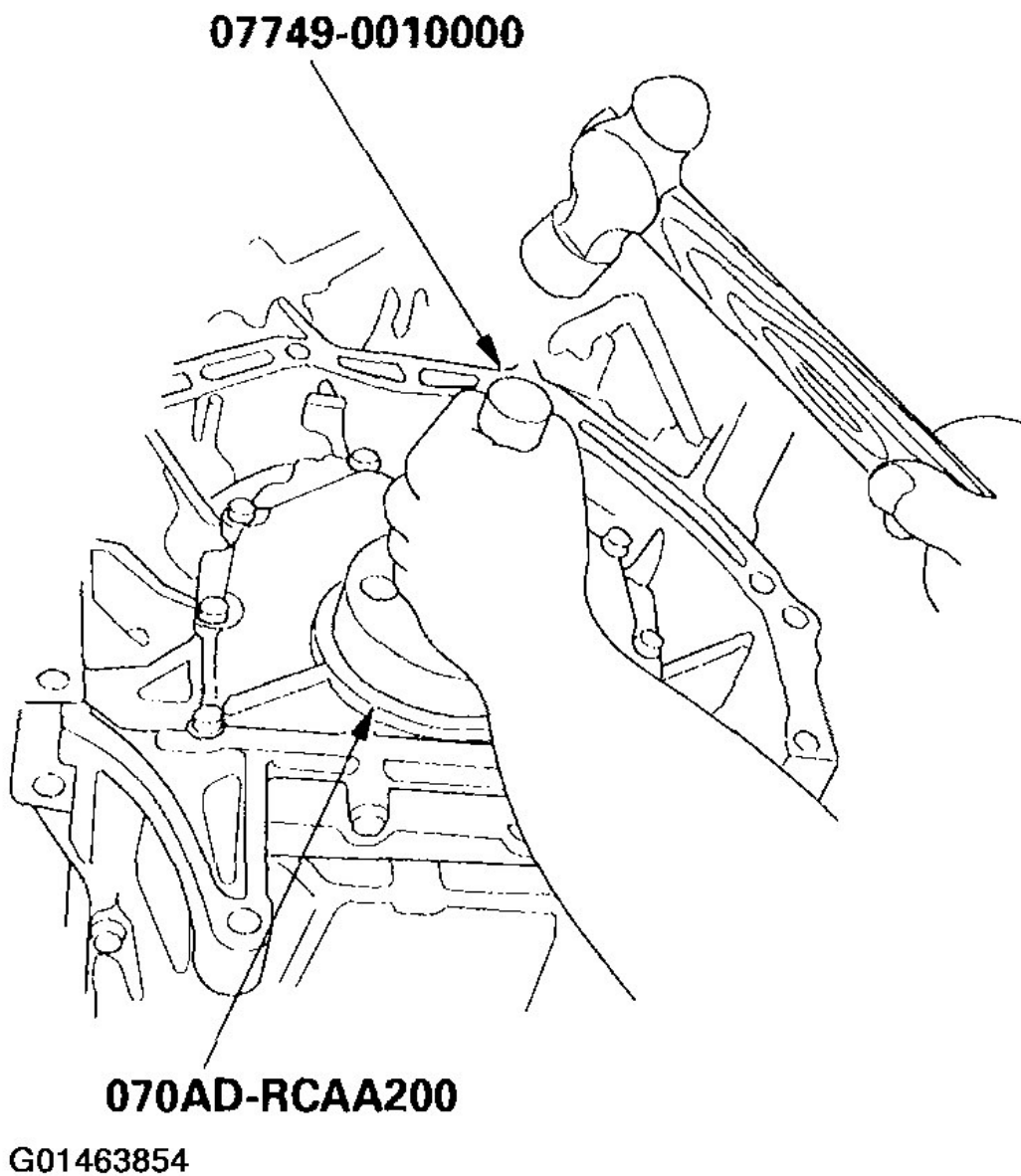
## TRANSMISSION END CRANKSHAFT SEAL INSTALLATION - IN CAR

### Special Tools Required

- Driver 07749-0010000
- Driver attachment 106 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 crankshaft. Align the hole in the driver attachment with the pin on the crankshaft.





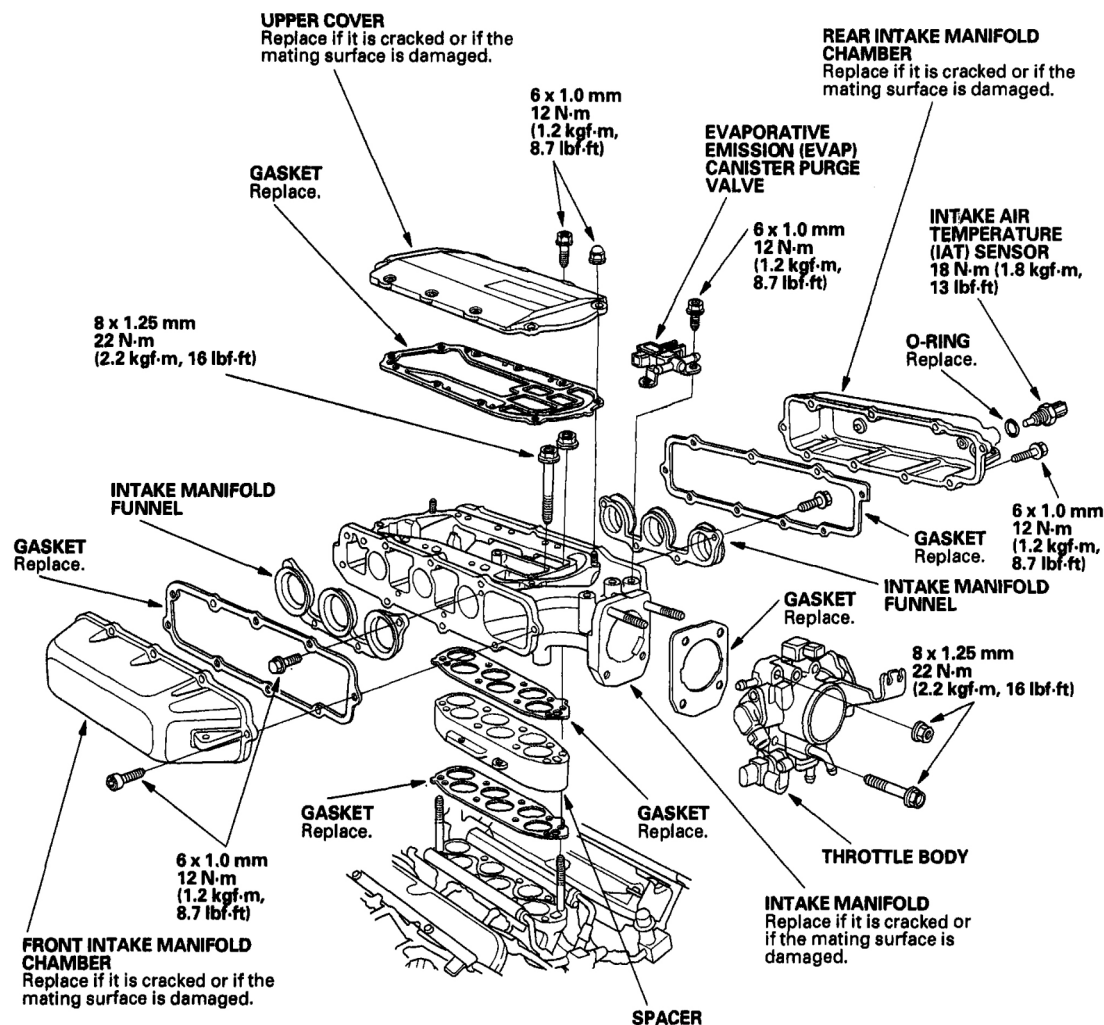
**Fig. 267: Driving In The Crankshaft Oil Seal**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

## INTAKE MANIFOLD & EXHAUST SYSTEM

### INTAKE MANIFOLD REMOVAL & INSTALLATION

## Exploded View

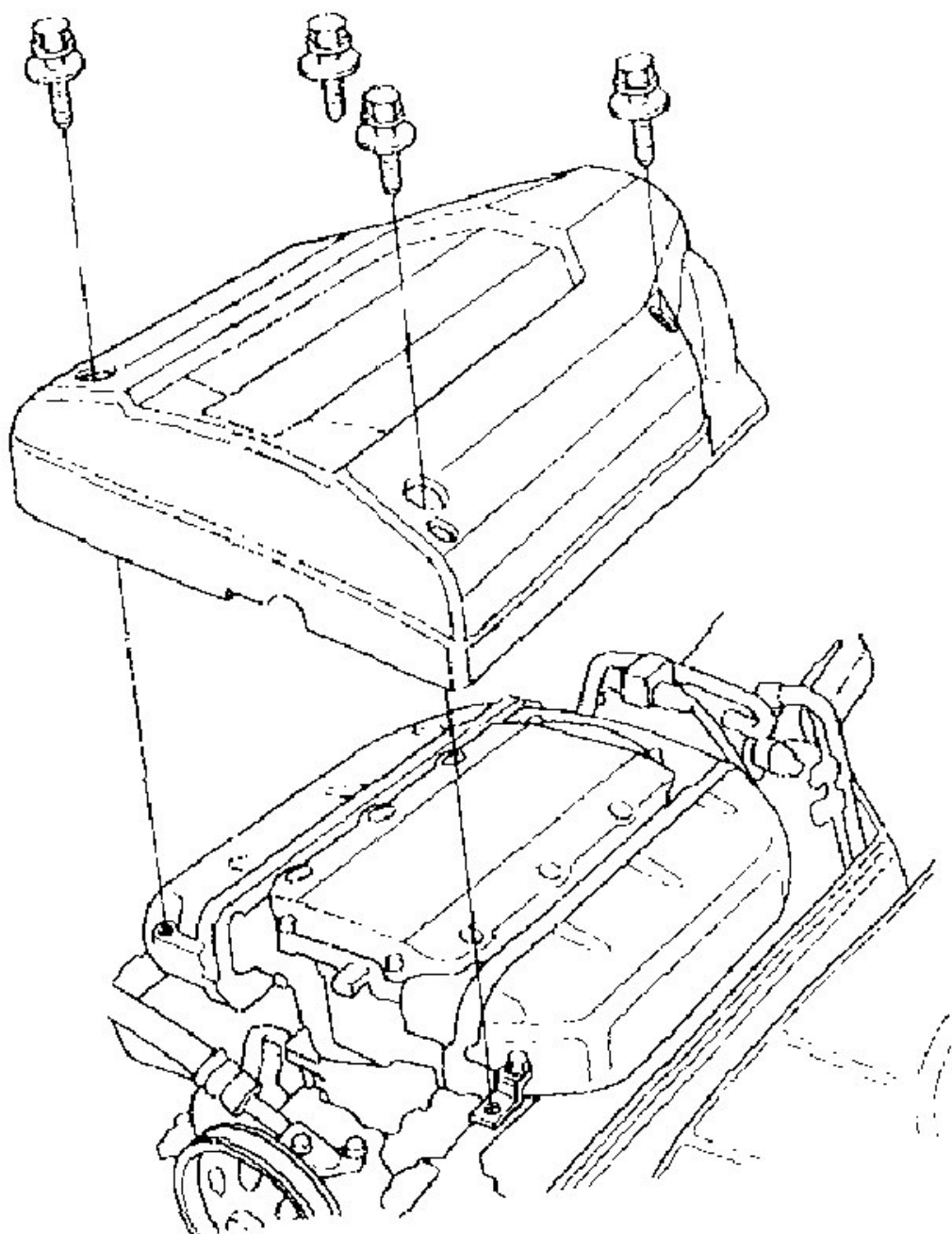


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**Fig. 268: Exploded View Of Intake Manifold**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

## Removal

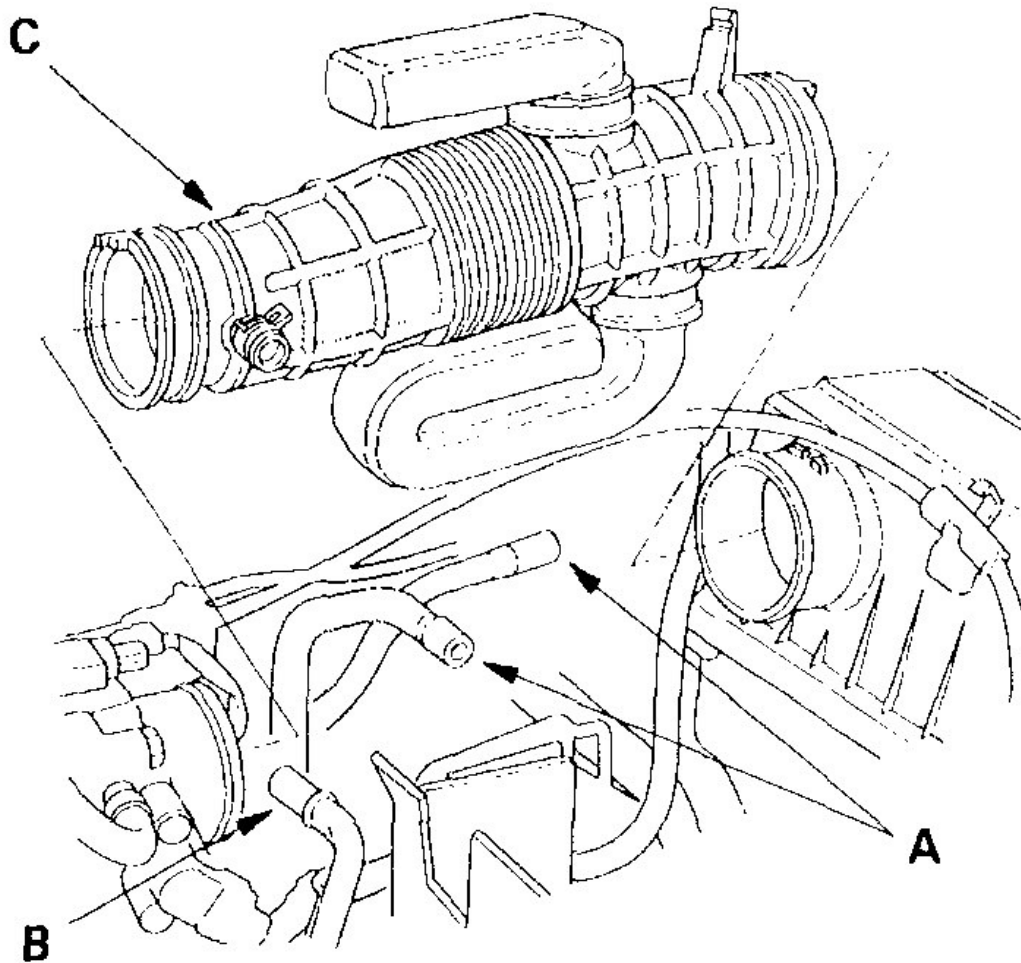
1. Remove the intake manifold cover.



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**Fig. 269: Removing The Intake Manifold Cover**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

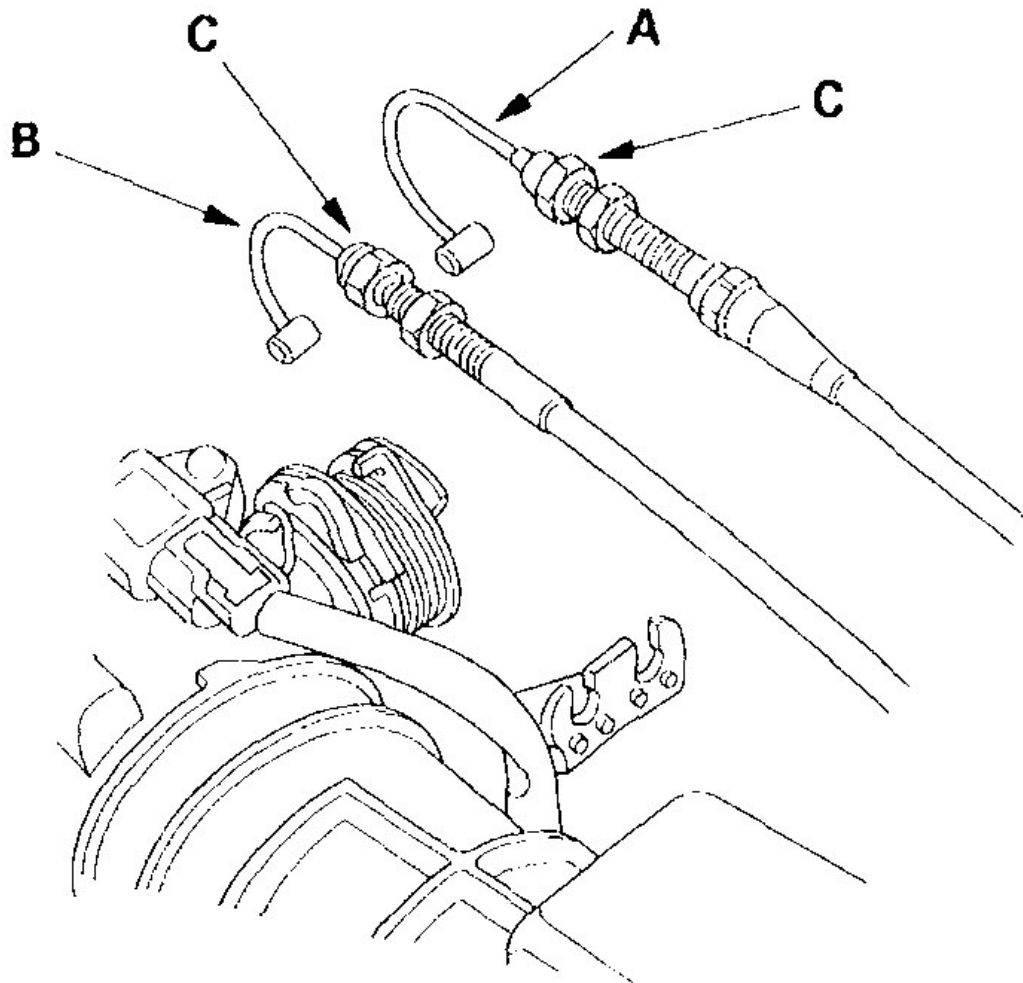
2. Remove the vacuum hoses (A) and breather pipe (B), then remove the intake air duct (C).



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**Fig. 270: Removing The Vacuum Hoses, Breather Pipe & Intake Air Duct**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

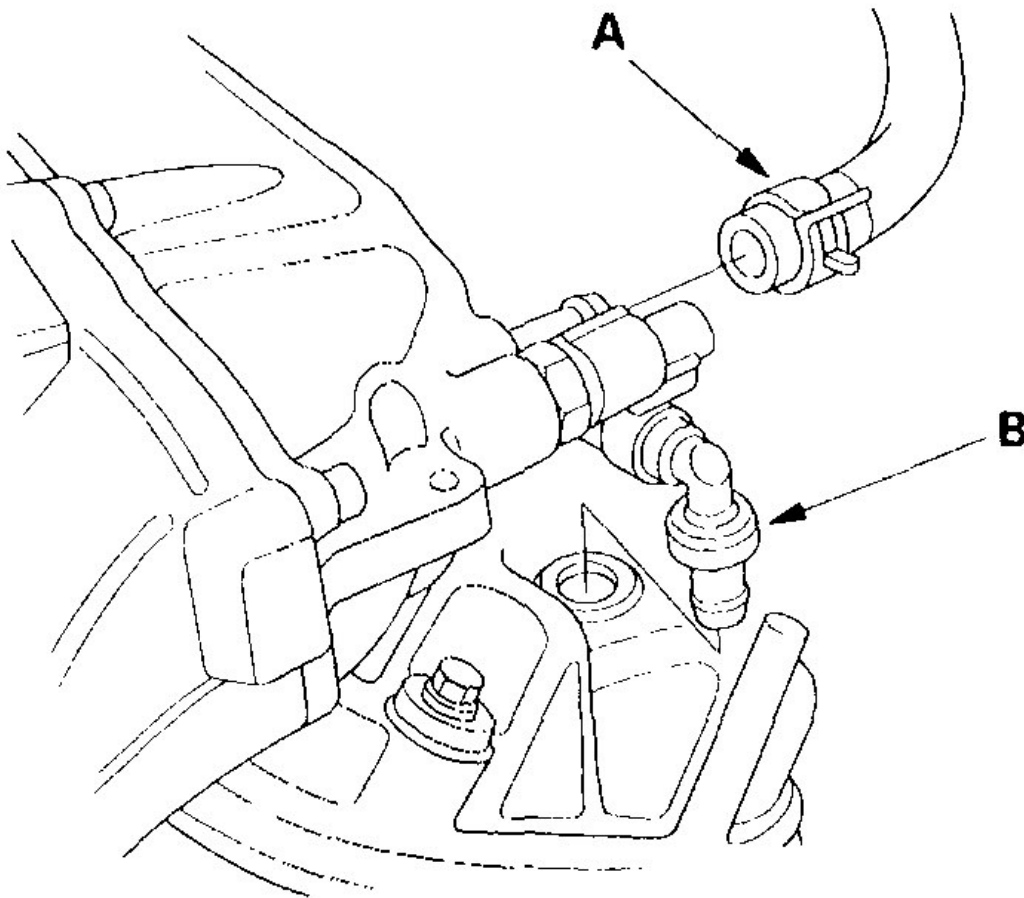
3. Remove the throttle cable (A) and cruise control actuator cable (B) by loosening the locknuts (C), then slipping the cable ends out of the accelerator linkage. Take care not to bend the cables when removing them. Always replace any kinked cable with a new one.



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**Fig. 271: Removing The Throttle Cable & Cruise Control Actuator Cable**  
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

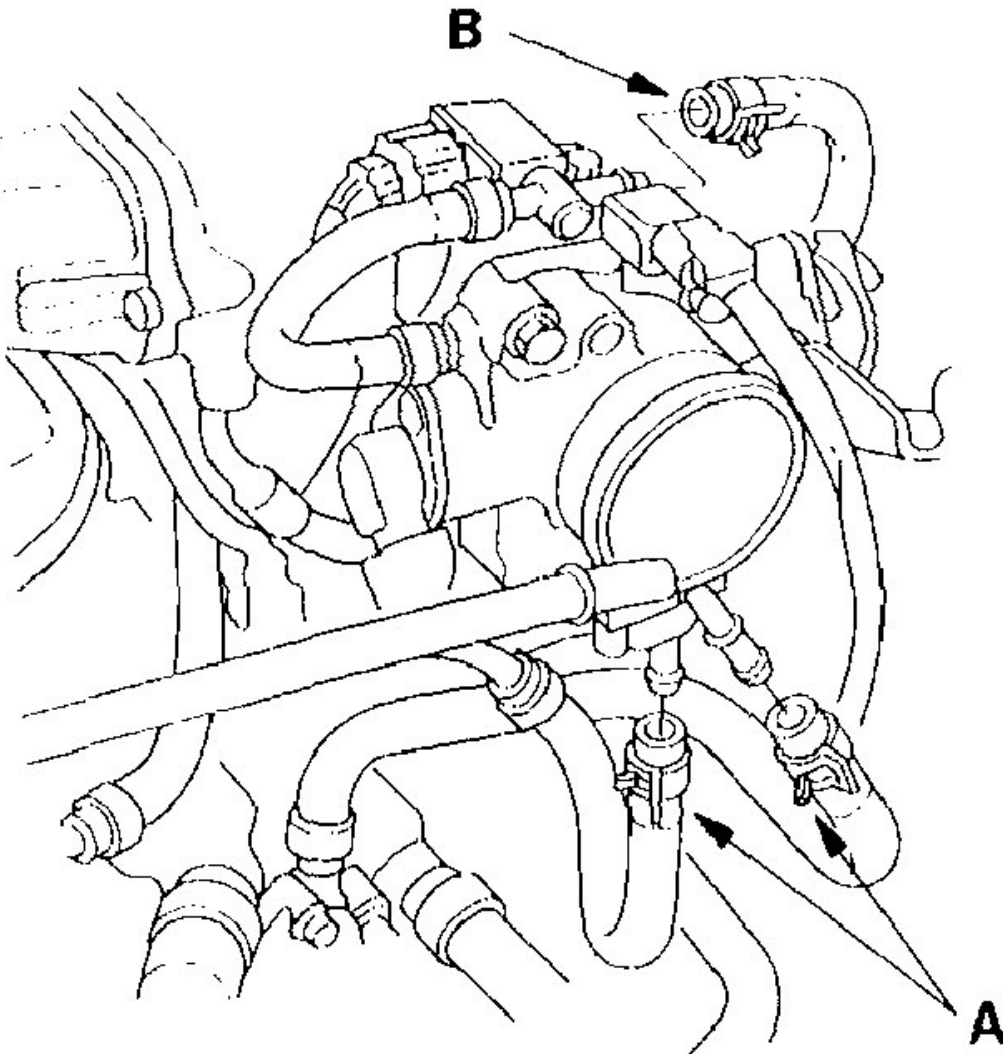
4. Remove the engine wire harness connectors and wire harness clamps from the intake manifold.
  - Intake air temperature (IAT) sensor connector
  - Idle air control (IAC) valve connector
  - Throttle position (TP) sensor connector
  - Manifold absolute pressure (MAP) sensor connector
  - Evaporative emission (EVAP) canister purge valve connector
5. Remove the brake booster vacuum hose (A) and positive crankcase ventilation (PCV) hose (B).



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**Fig. 272: Removing The Brake Booster Vacuum Hose & Positive Crankcase Ventilation Hose**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

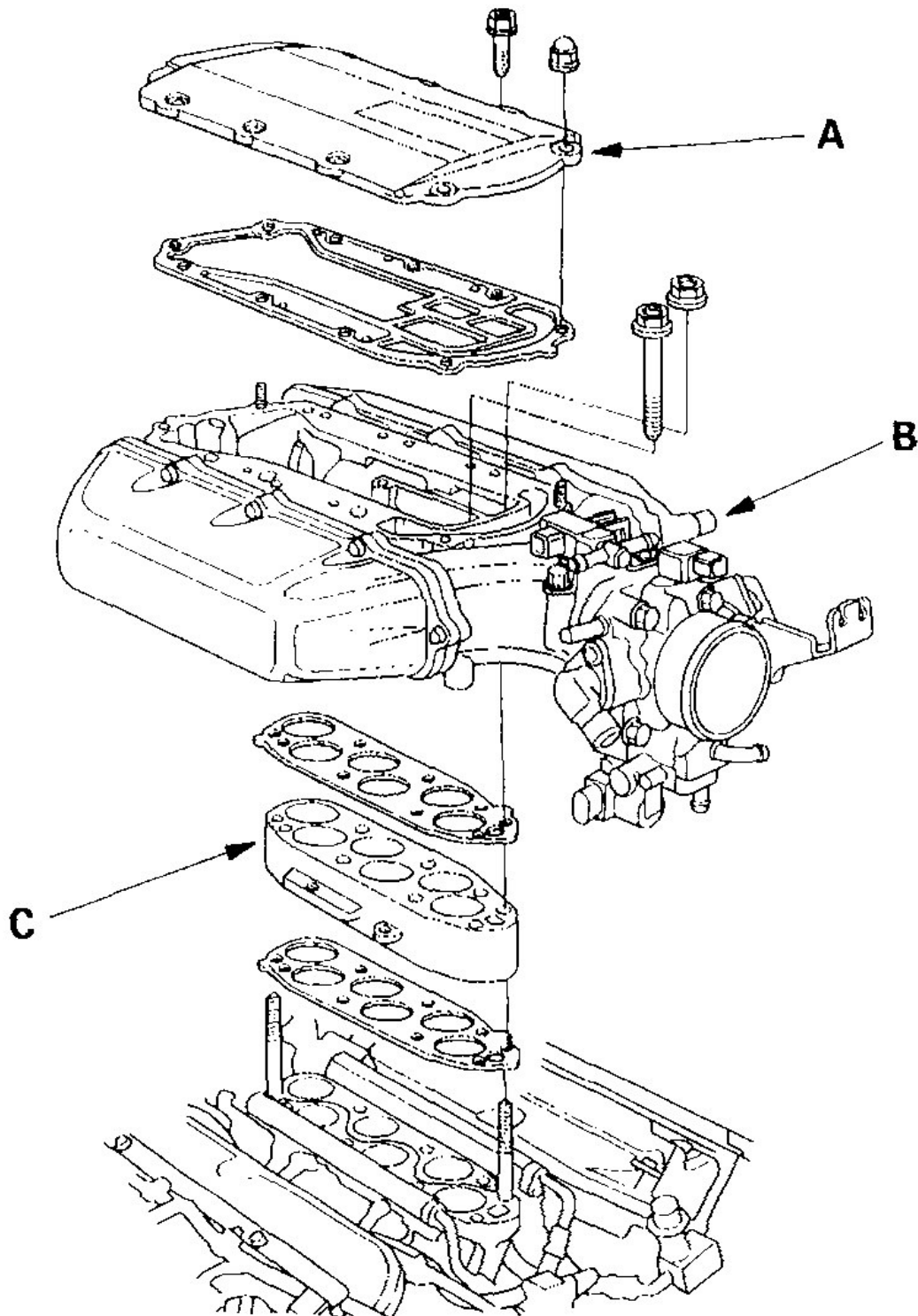
6. Remove the water bypass hoses (A), then plug the water bypass hoses.



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**Fig. 273: Removing & Plugging The Water Bypass Hoses**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the EVAP canister hose (B).
8. Remove the upper cover (A), then remove the intake manifold (B) and spacer (C).



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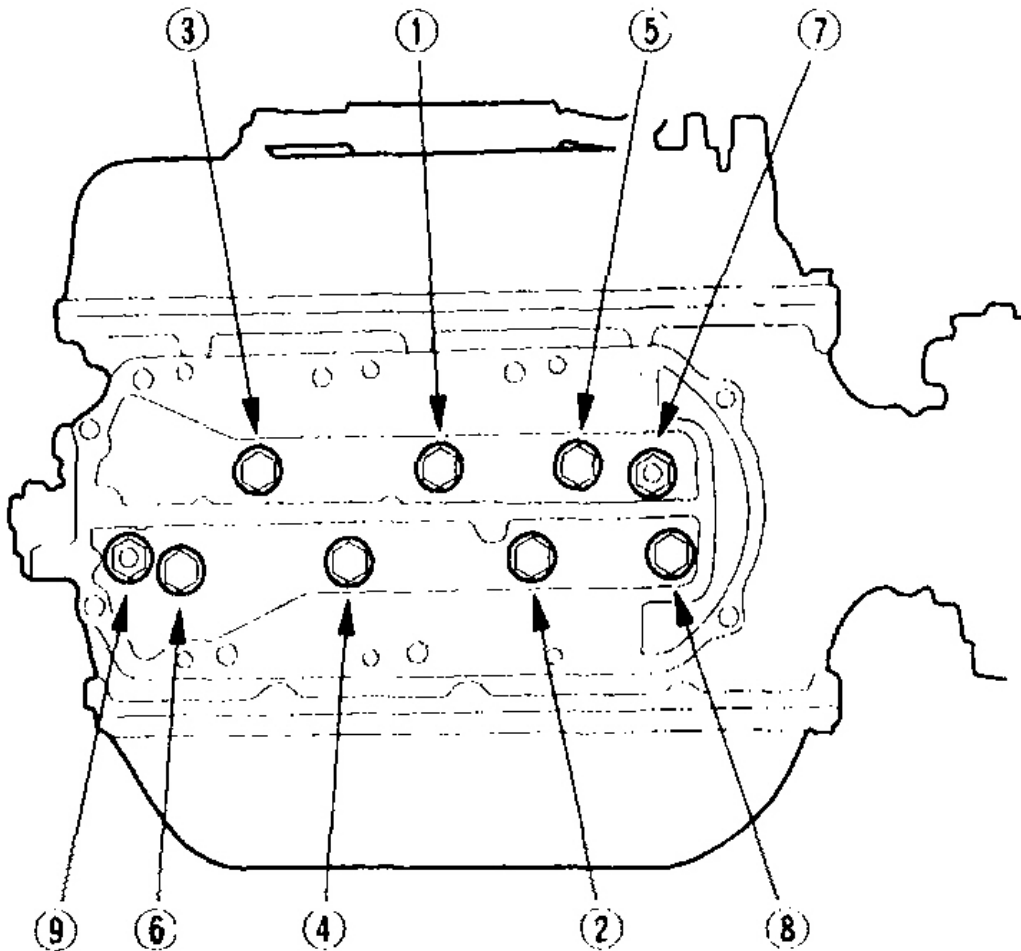


**Fig. 274: Removing The Upper Cover, The Intake Manifold & Spacer**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

#### Installation

1. Put the gasket and spacer on the injector base.
2. Install the intake manifold. Tighten the bolts and nuts sequentially in two or three steps. Always use a new intake manifold gasket.

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

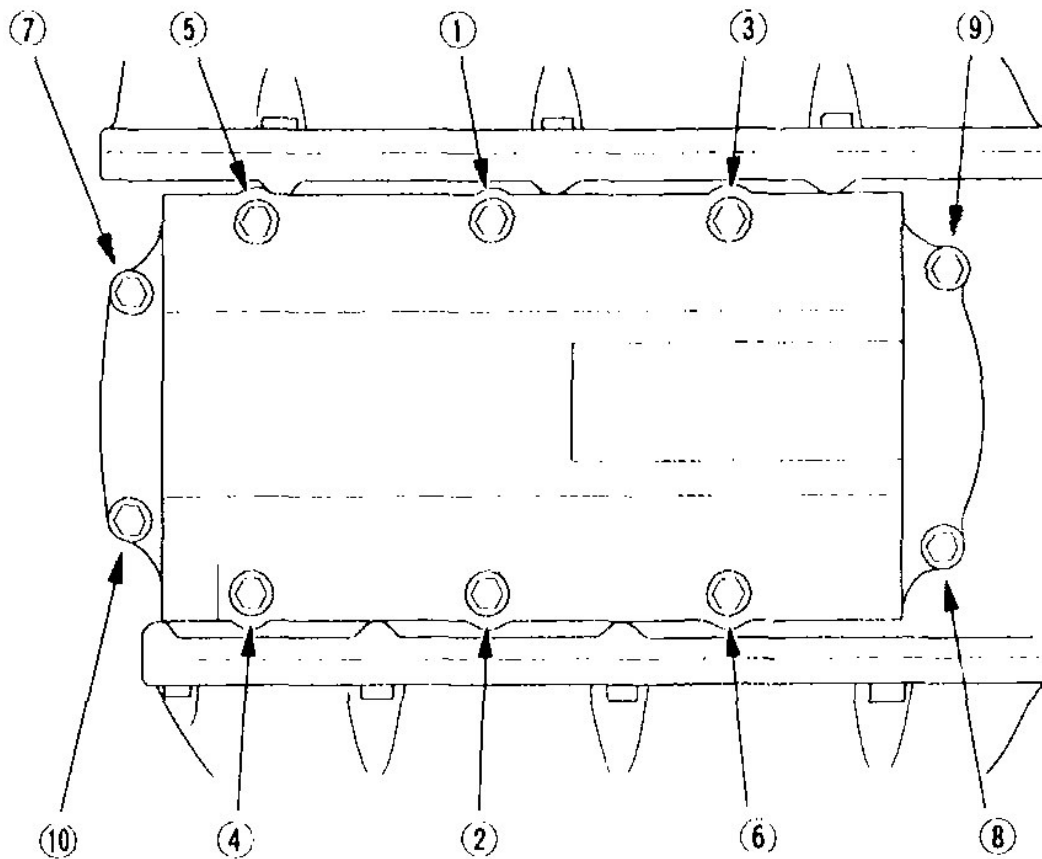


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**Fig. 275: Installing The Intake Manifold Mounting Bolts & Nuts In Sequence**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the upper cover. Tighten the bolts and nuts sequentially in two or three steps. Always use a new gasket.

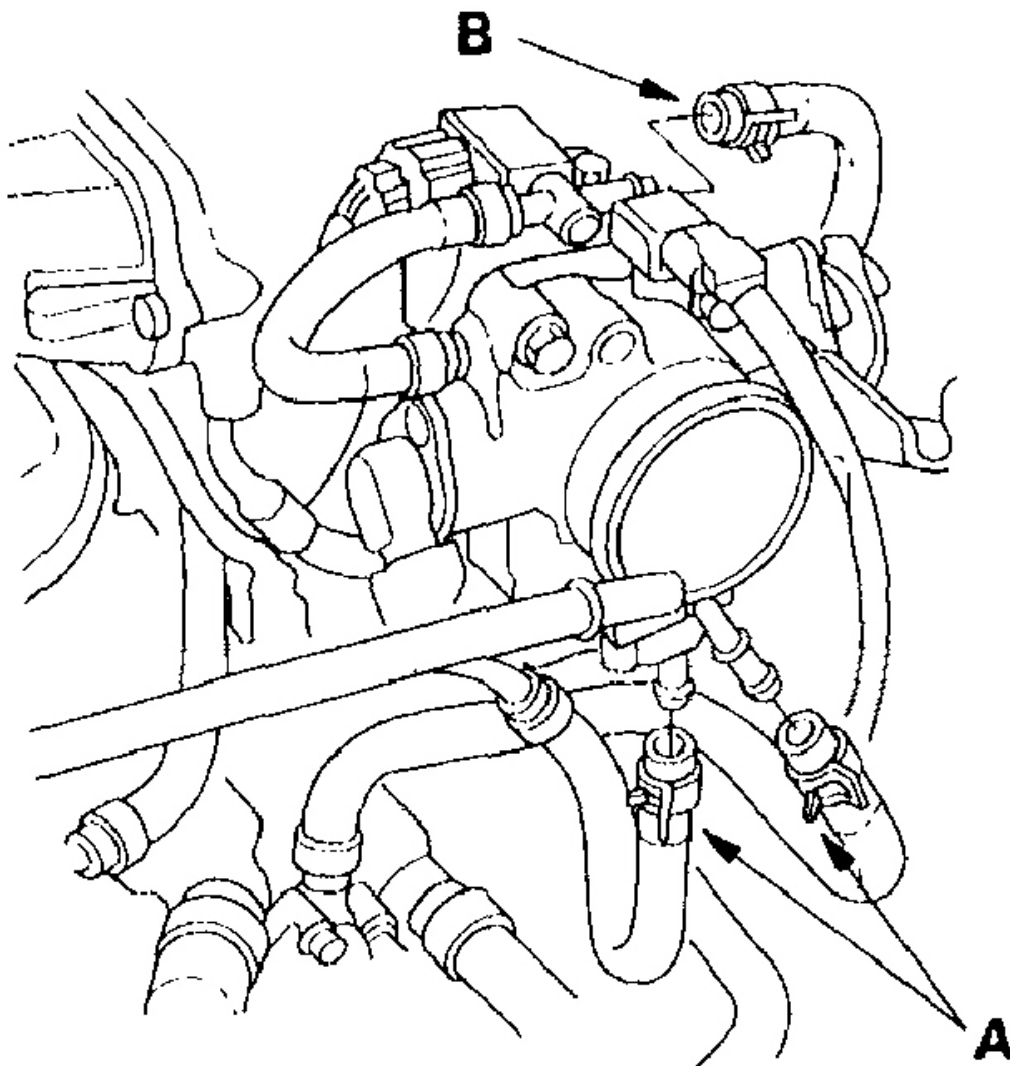
**Specified torque: (6 x 1.0 mm) 12 N.m (1.2 kgf.m, 8.7 lbf.ft)**



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**Fig. 276: Installing The Upper Cover Bolts & Nuts In Sequence**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

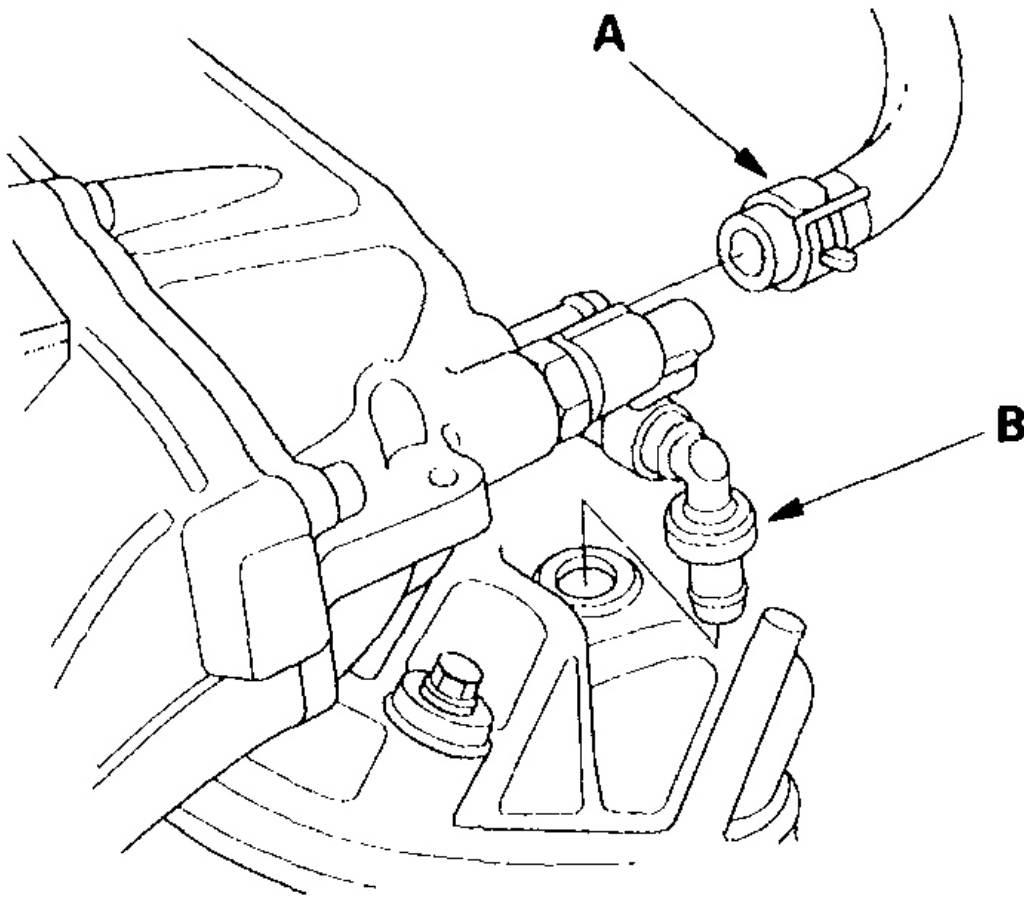
4. Install the water bypass hoses (A) and EVAP canister hose (B).



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**Fig. 277: Installing The Water Bypass Hoses & EVAP Canister Hose**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

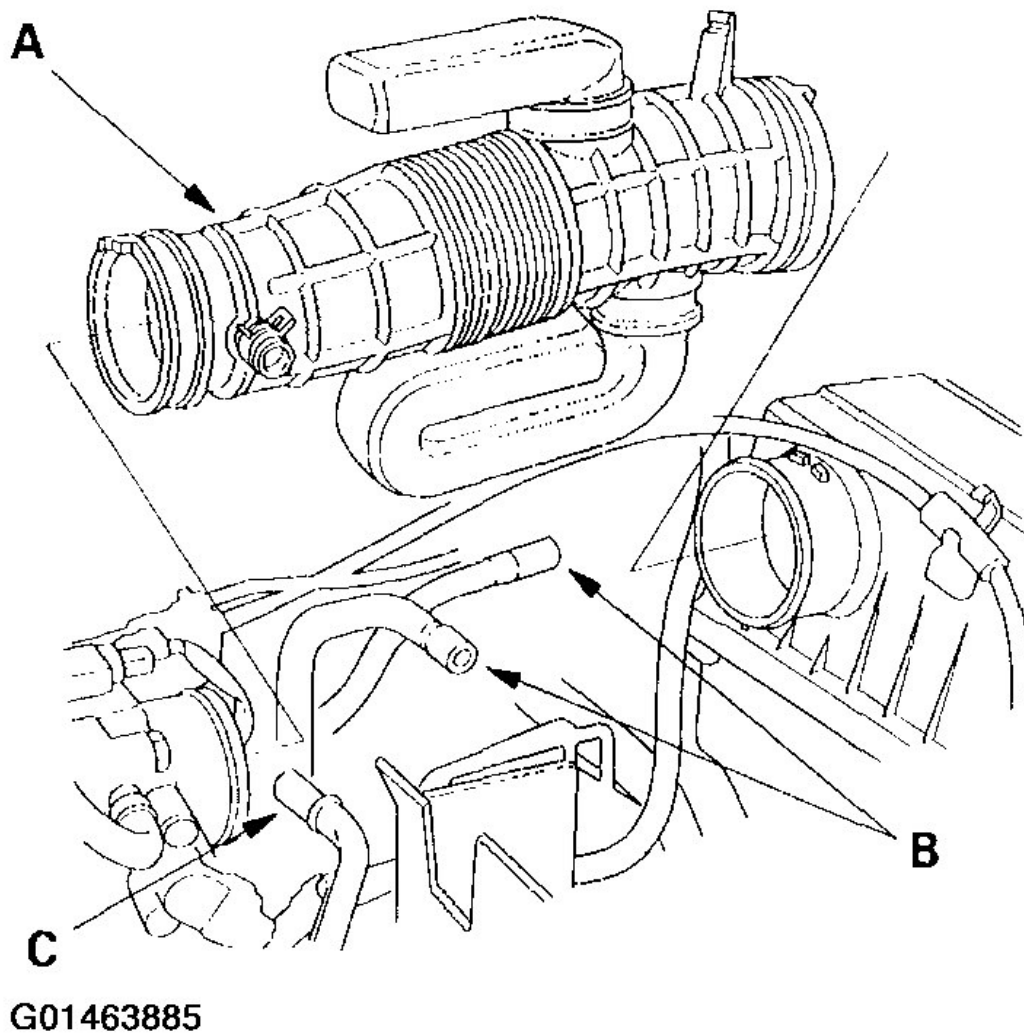
5. Install the brake booster vacuum hose (A) and PCV hose (B).



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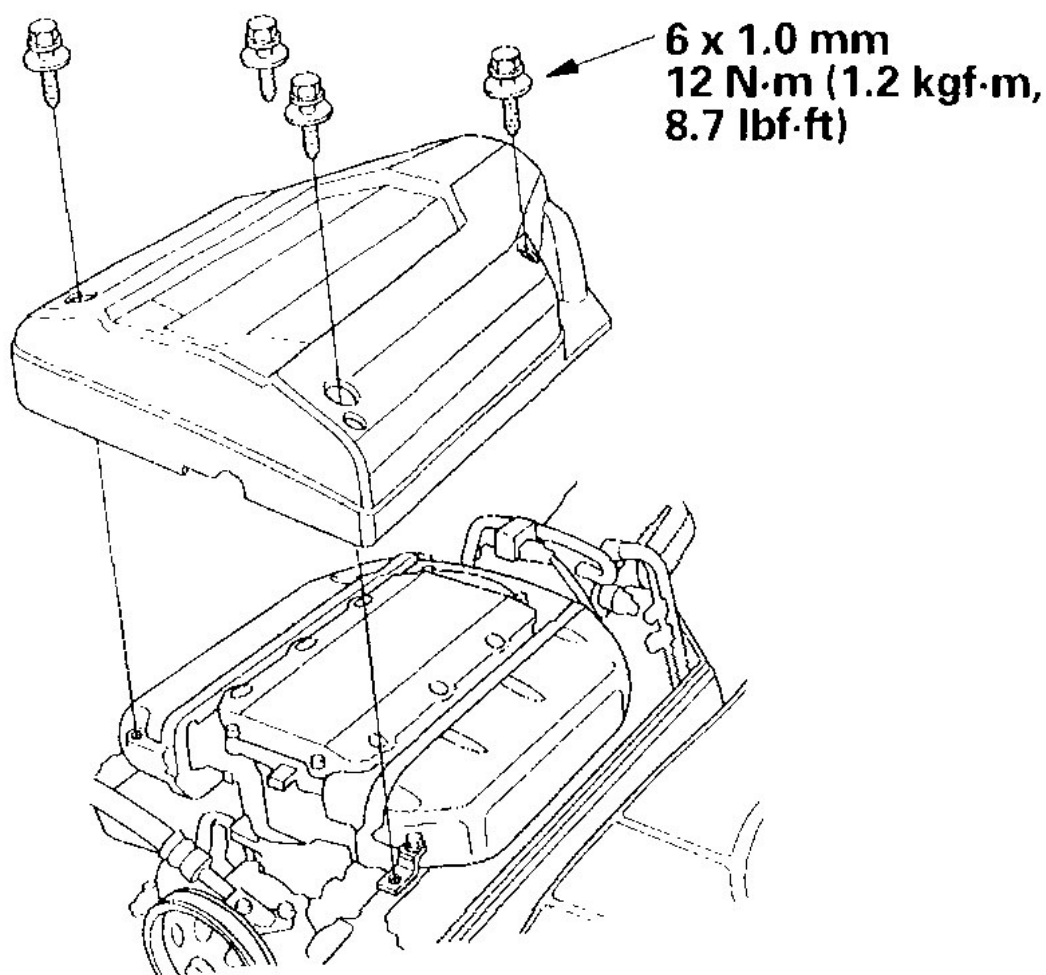
**Fig. 278: Installing The Brake Booster Vacuum Hose & PCV Hose**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Install the throttle cable (see **THROTTLE CABLE REMOVAL/INSTALLATION** ), then adjust it (see **THROTTLE CABLE ADJUSTMENT** ).
7. Install the cruise control actuator cable, then adjust it (see **CRUISE CONTROL ACTUATOR/CABLE REPLACEMENT** ).
8. Install the intake air duct (A), then install the vacuum hoses (B) and breather pipe (C).



**Fig. 279: Installing The Intake Air Duct, The Vacuum Hoses & Breather Pipe**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Install the intake manifold cover.



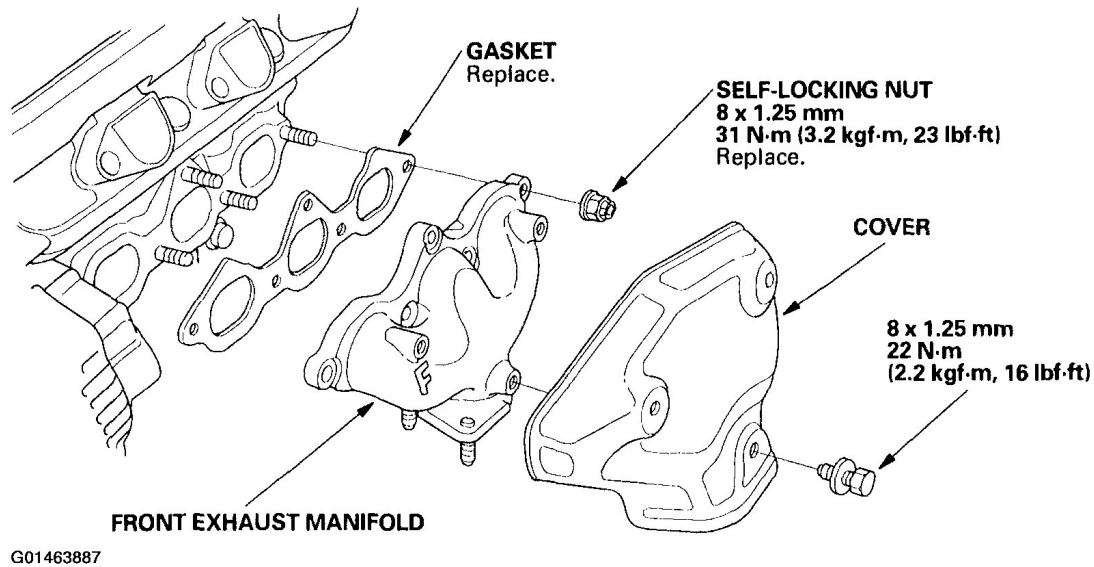
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**Fig. 280: Installing The Intake Manifold Cover**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Clean up any spilled engine coolant.
11. After installation, check that all tubes, hoses and connectors are installed correctly.
12. Refill the radiator with engine coolant, and bleed air from the cooling system with the heater valve open (see step 8 on **COOLANT REPLACEMENT** ).

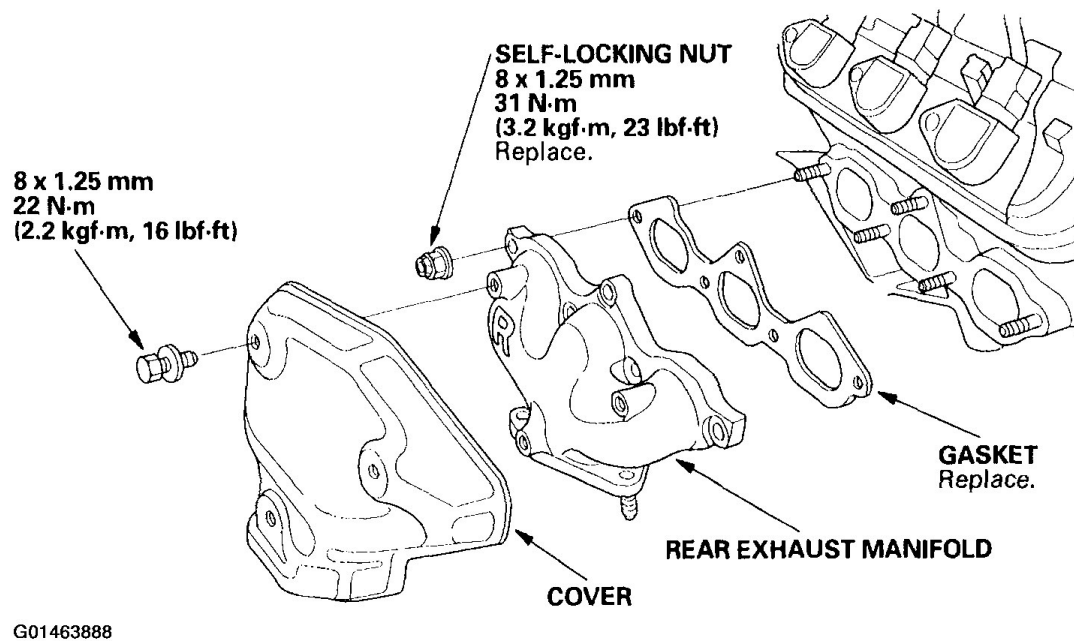
## EXHAUST MANIFOLD REMOVAL & INSTALLATION

1. Remove the cover, then remove the exhaust manifold.



**Fig. 281: Removing Front Exhaust Manifold**

Courtesy of AMERICAN HONDA MOTOR CO., INC.



**Fig. 282: Removing Rear Exhaust Manifold**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Install the exhaust manifold, and tighten the nuts in a crisscross pattern in two or three steps, beginning with the inner nut.

3. Install the other parts in the reverse order of removal.

## TORQUE SPECIFICATIONS

### TORQUE SPECIFICATIONS

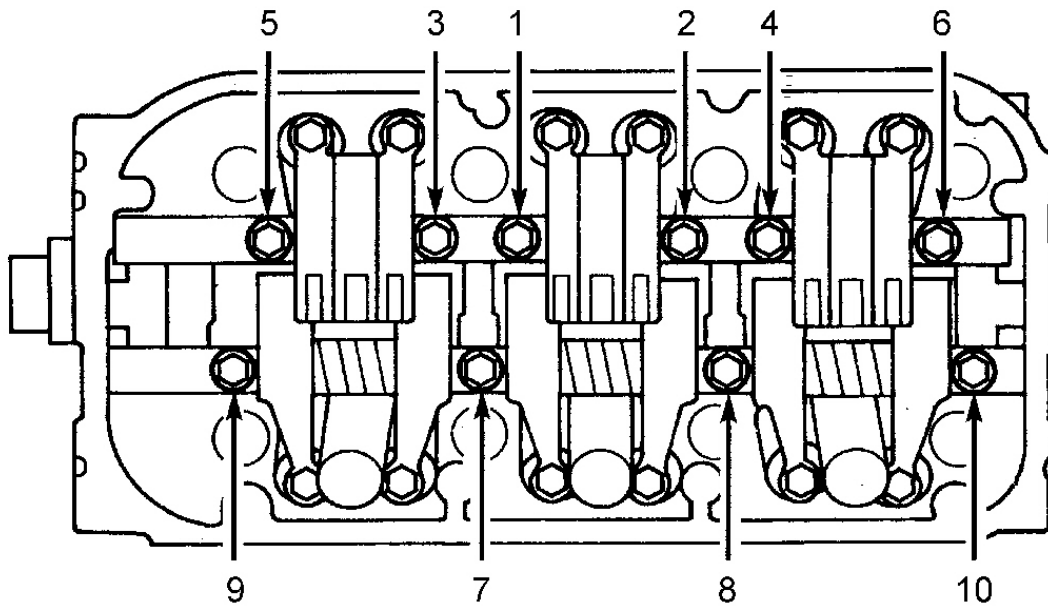
| Application                                  | Ft. Lbs. (N.m) |
|----------------------------------------------|----------------|
| A/C Compressor Bracket-To-Engine             | 33 (44)        |
| A/C Compressor Mounting Bolt                 | 33 (44)        |
| Camshaft Bearing Cap Bolt <sup>(1)</sup>     | 17 (23)        |
| Camshaft Pulley Bolt                         | 67 (91)        |
| Camshaft Thrust Cover Bolt                   | 16 (22)        |
| Connecting Rod Cap Bolt <sup>(2)</sup>       | 14 (19)        |
| Crankshaft Pulley Bolt                       | 181 (245)      |
| Cylinder Head Bolt <sup>(3)</sup>            |                |
| Step 1                                       | 29 (39)        |
| Step 2                                       | 51 (69)        |
| Step 3                                       | 72 (98)        |
| Engine Oil Drain Bolt                        | 29 (39)        |
| Exhaust Manifold                             |                |
| Self-Locking Nut                             | 23 (31)        |
| Shroud Bolt                                  | 16 (22)        |
| Exhaust Pipe Flange Nut                      | 40 (54)        |
| Flexplate Bolt <sup>(4)</sup>                | 54 (73)        |
| Front Engine Mount Bracket                   | 33 (44)        |
| Front Mount Nut                              | 40 (54)        |
| Heated Oxygen Sensor (Primary HO2S)          | 33 (44)        |
| Idler Pulley Bolt                            | 33 (44)        |
| Main Bearing Cap Bolt <sup>(5)</sup>         |                |
| 10-mm Side Bolt                              | 36 (49)        |
| 11-mm Vertical Bolt                          | 56 (76)        |
| Power Steering Pump                          |                |
| Lock Nut                                     | 16 (22)        |
| Mounting Bolt                                | 16 (22)        |
| Oil Filter Feed Pipe                         | 36 (49)        |
| Rear Mount Bracket                           | 28 (38)        |
| Side Mount Bracket                           |                |
| 6-mm                                         | (6)            |
| 10-mm                                        | 33 (44)        |
| Throttle Body Bolt/Nut                       | 16 (22)        |
| VTEC Solenoid Valve/Oil Filter Assembly Bolt | 16 (22)        |



**2003 Honda Pilot LX**

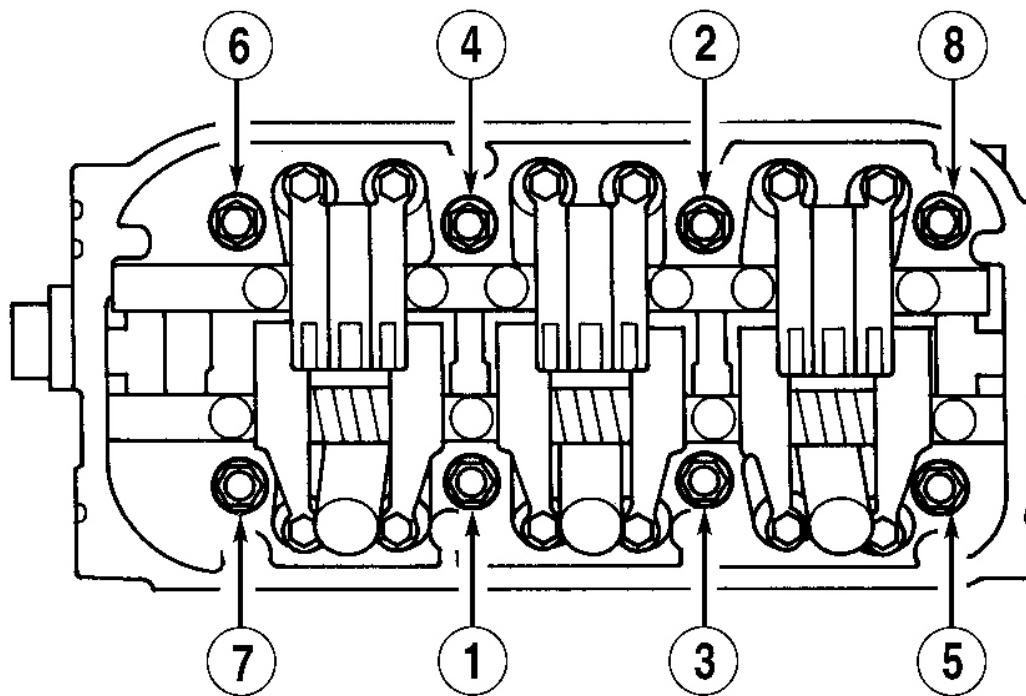
2003-04 ENGINE 3.5L V6 - Pilot

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | INCH Lbs. (N.m) |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Auto-Tensioner Mounting Bolt                                                                                                                                                                                                                                                                                                                                                                                                                                               | 106 (12)        |
| Coolant Passage Manifold Bolt                                                                                                                                                                                                                                                                                                                                                                                                                                              | 106 (12)        |
| Crankshaft Rear Seal Cover Bolt                                                                                                                                                                                                                                                                                                                                                                                                                                            | 106 (12)        |
| Cylinder Head Cover Bolt                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 106 (12)        |
| Intake Manifold Bolt/Nut                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 106 (12)        |
| Baffle Plate Bolt                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 106 (12)        |
| Oil Pan Bolt <sup>(7)</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                | 106 (12)        |
| Timing Belt Cover Bolt                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 106 (12)        |
| Valve Cover Bolt                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 106 (12)        |
| Water Pump Bolt                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 106 (12)        |
| <p>(1) Rocker arm shaft bolts. Tighten bolts 2 turns at a time in sequence until rocker is seated, then tighten to specification. <b>Fig. 283</b> .</p> <p>(2) Tighten an additional 90 degrees.</p> <p>(3) Tighten in sequence, in 2-3 steps. <b>Fig. 284</b> .</p> <p>(4) Tighten in a crisscross pattern.</p> <p>(5) Tighten in sequence. <b>Fig. 285</b> .</p> <p>(6) Tighten bolts to 106 INCH (12 N.m).</p> <p>(7) Tighten in sequence. <b>Fig. 286</b></p> <p>.</p> |                 |



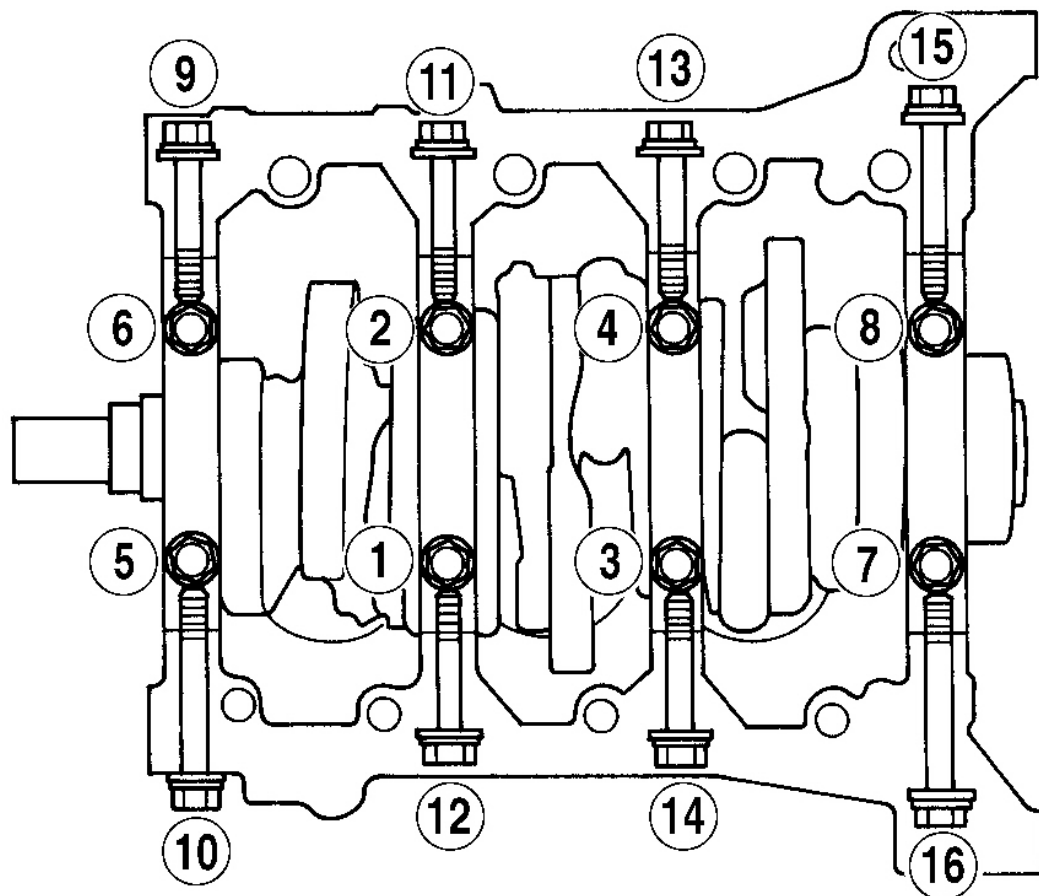
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**Fig. 283: Camshaft Bearing Cap Bolt Tightening Sequence**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.



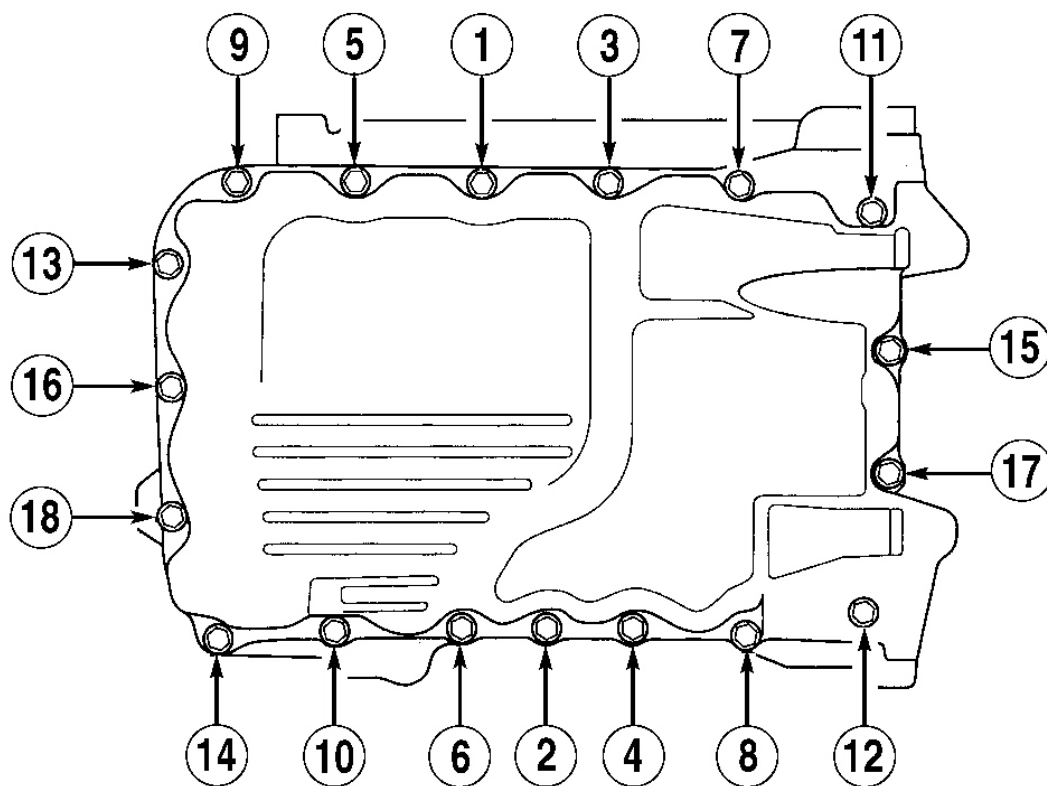
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**Fig. 284: Cylinder Head Bolt Tightening Sequence**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.



G97G08527

**Fig. 285: Main Bearing Cap bolt Tightening Sequence**  
 Courtesy of AMERICAN HONDA MOTOR CO., INC.



G97C08525

**Fig. 286: Oil Pan Bolt Tightening Sequence**  
Courtesy of AMERICAN HONDA MOTOR CO., INC.