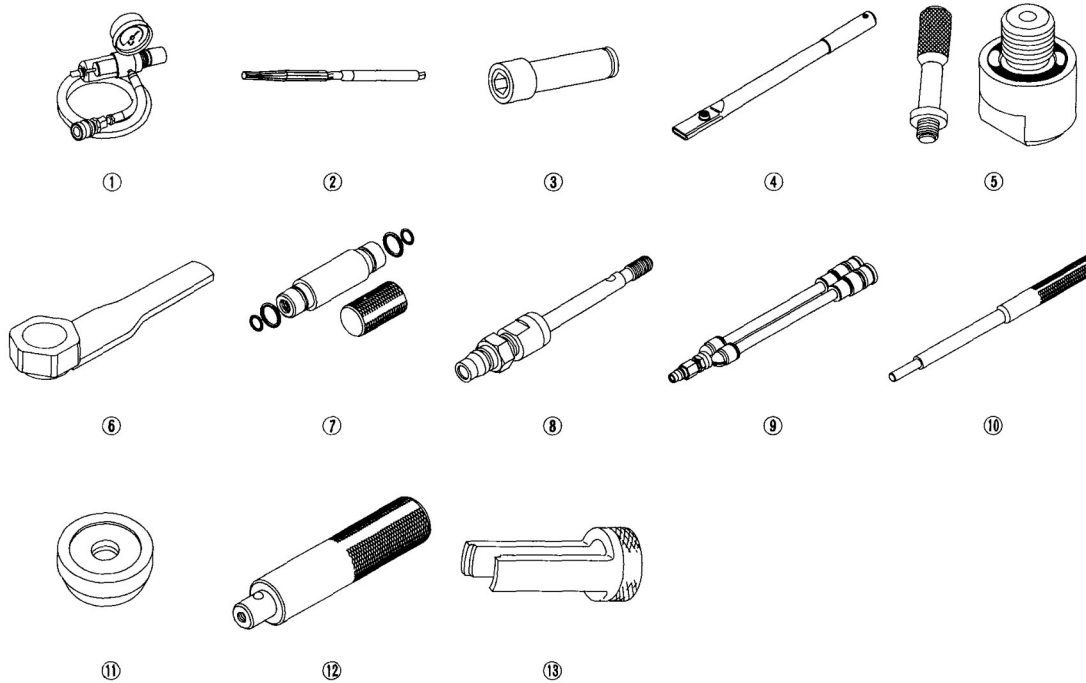


2000-09 ENGINE

Cylinder Head - S2000

SPECIAL TOOLS

Ref. No.	Tool Number	Description	Qty
①	07AAJ-PNAA100	Air Pressure Regulator	1
②	07HAH-PJ7010B	Valve Guide Reamer, 5.5 mm	1
③	07JAA-001020A	Socket, 19 mm	1
④	07JAB-001020B	Holder Handle	1
⑤	07LAK-PR3A101	Gauge Joint Adapter	1
⑥	07NAB-001040A	Holder Attachment, 50 mm	1
⑦	07PAD-0010000	Stem Seal Driver	1
⑧	07ZAJ-PNAA100	VTEC Air Adapter	2
⑨	07ZAJ-PNAA300	Air Joint Adapter	1
⑩	07742-0010100	Valve Guide Driver, 5.5 mm	1
⑪	07746-0010400	Attachment, 52 x 55 mm	1
⑫	07749-0010000	Driver	1
⑬	07757-PJ1010A	Valve Spring Compressor Attachment	1



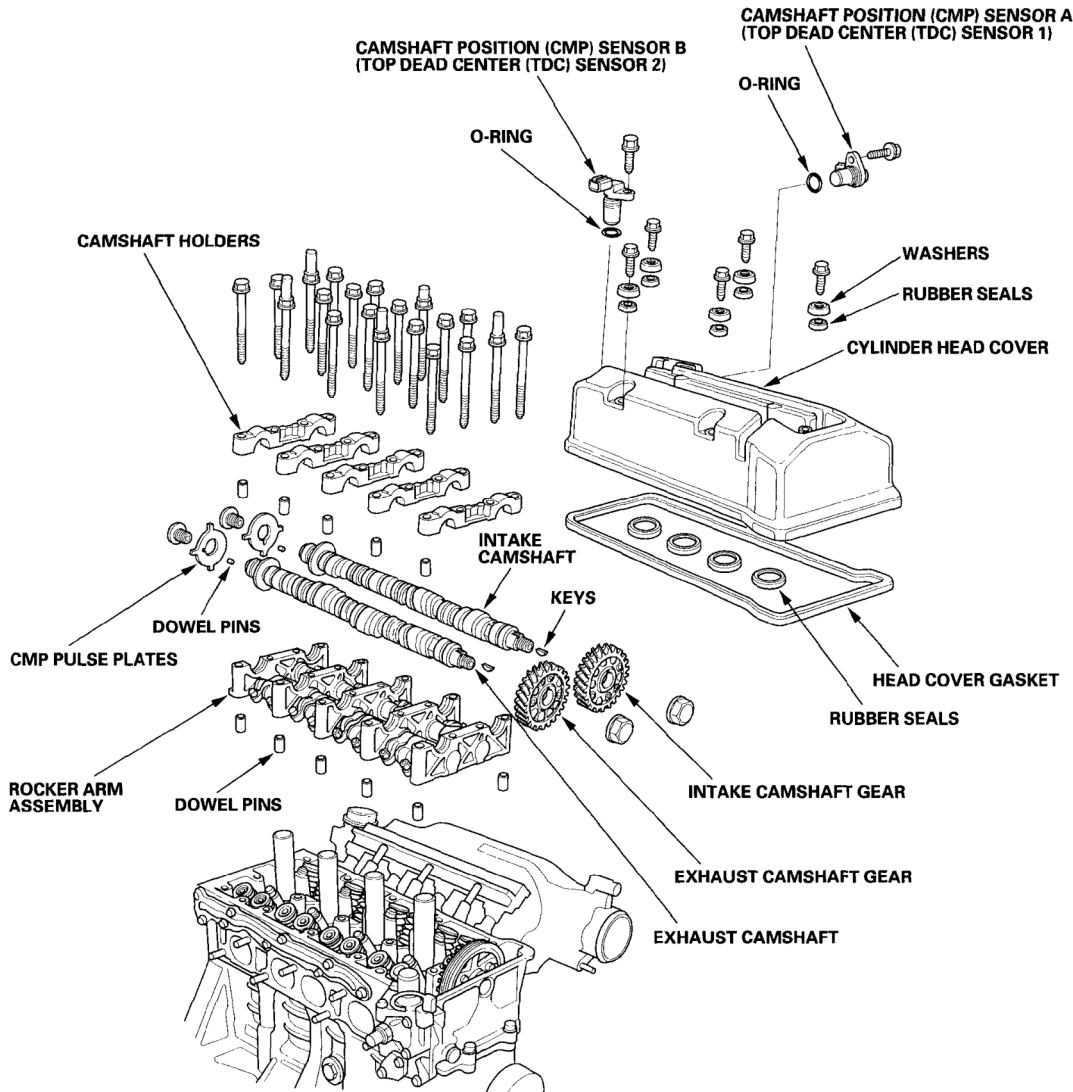
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Fig. 1: Identifying Special Tools

Courtesy of AMERICAN HONDA MOTOR CO., INC.

COMPONENT LOCATION INDEX

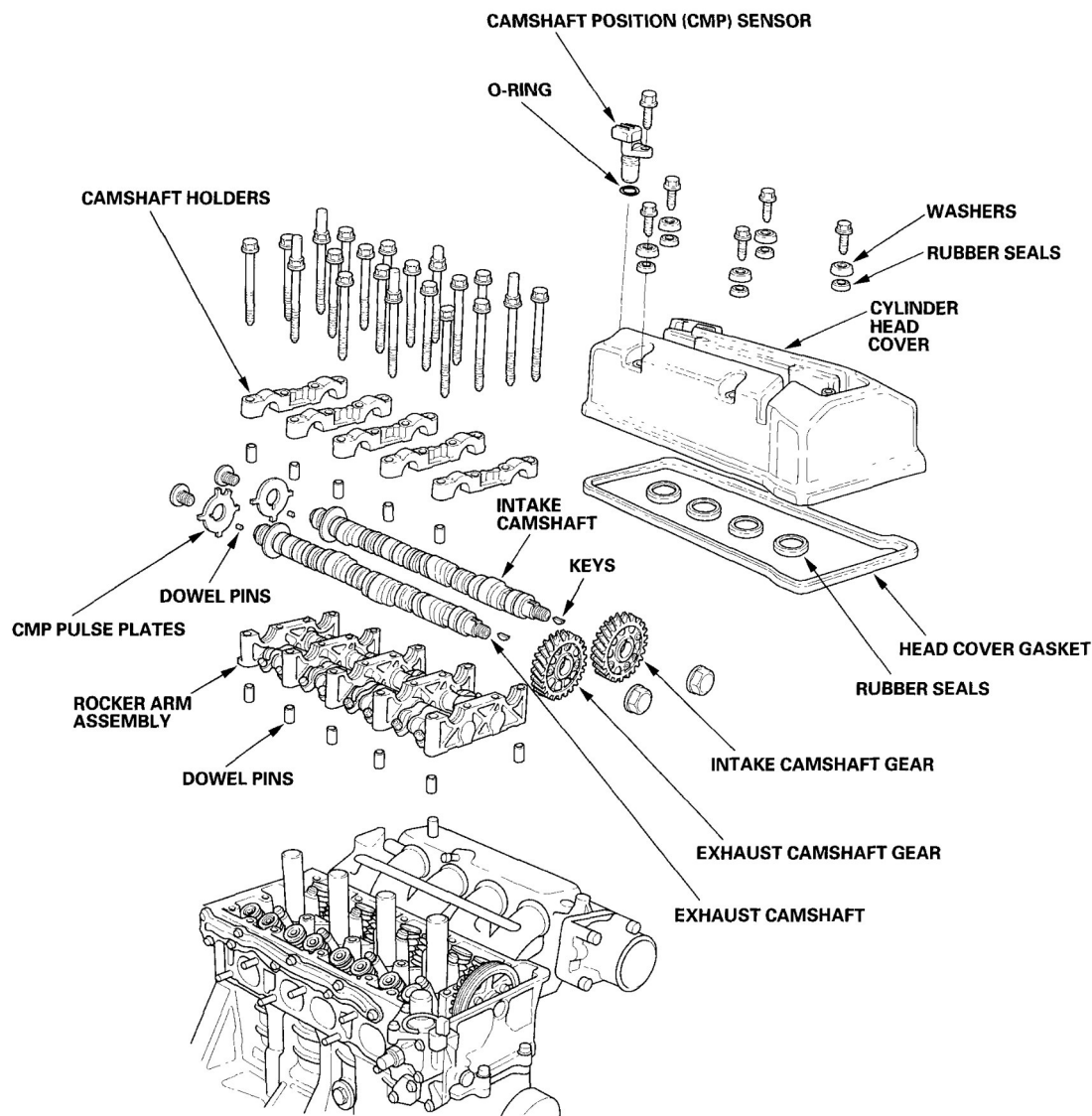
2000-2005 models



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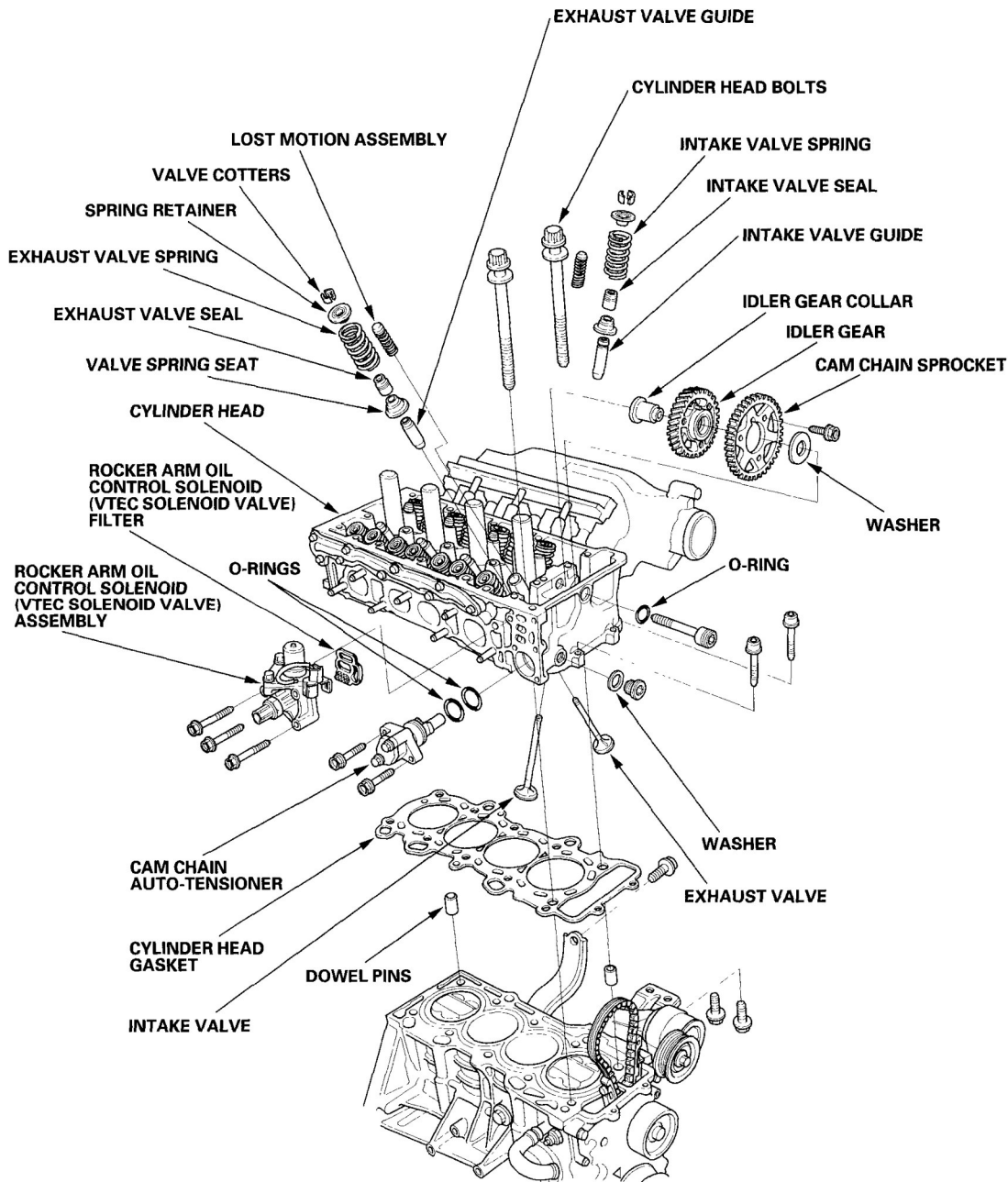
Fig. 2: Identifying Engine Assembly Components Location (2000-2005 Models)
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

2006-2008 models



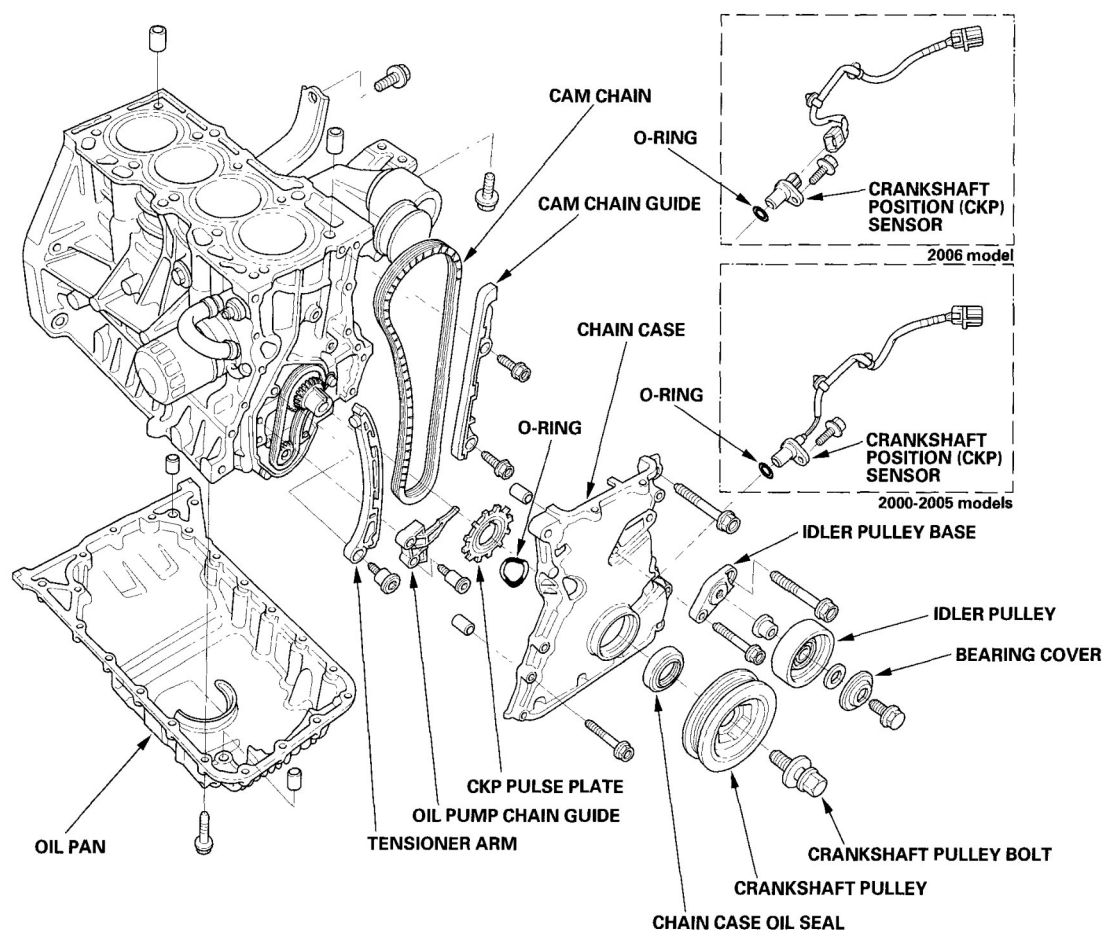
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Fig. 3: Identifying Engine Assembly Components Location (2006-09 Model) (1 Of 3)
 Courtesy of AMERICAN HONDA MOTOR CO., INC.



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Fig. 4: Identifying Engine Assembly Components Location (2006-09 Model) (2 Of 3)
 Courtesy of AMERICAN HONDA MOTOR CO., INC.



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Fig. 5: Identifying Engine Assembly Components Location (2006-09 Model) (3 Of 3)
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

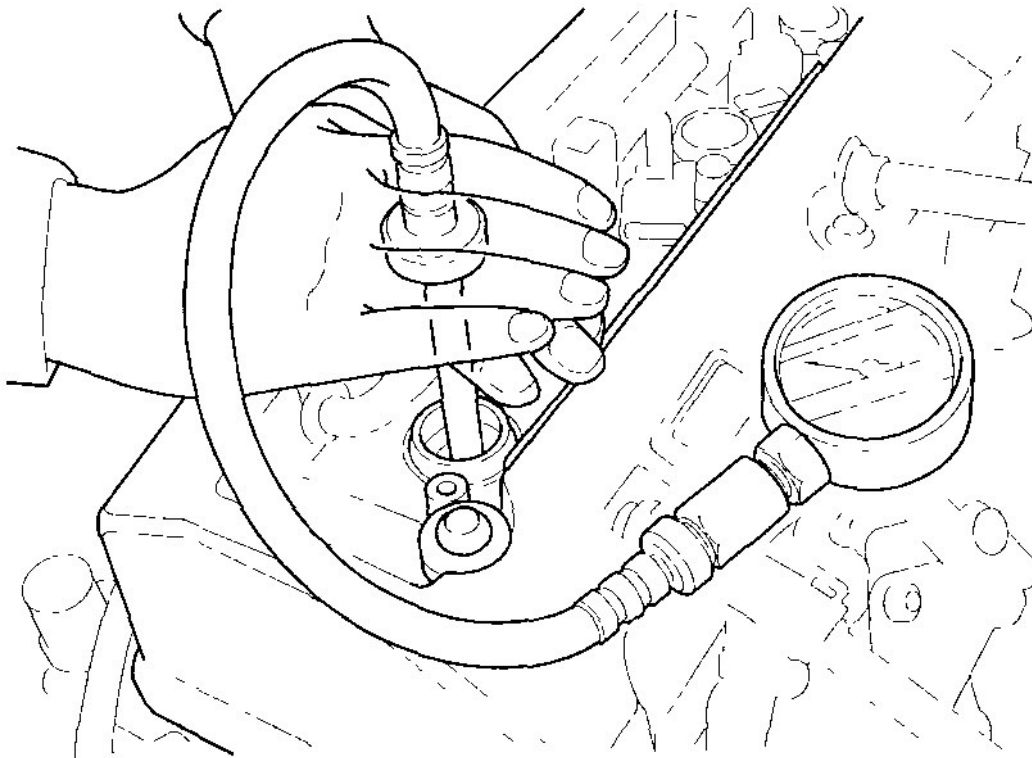
ENGINE COMPRESSION INSPECTION

NOTE:

- **2000-2005 models:** After this inspection, you must reset the engine control module (ECM) using the Honda Diagnostic System (HDS) (see HOW TO RESET THE ECM), to clear any diagnostic trouble codes (DTCs).
- **2006-09 model:** After this inspection, you must reset the ECM using the HDS (see HDS CLEAR COMMAND), otherwise the ECM continues to stop the fuel injectors.

1. Warm up the engine to normal operating temperature (cooling fan comes on).
2. Turn the ignition switch to LOCK (0).
3. 2000-2005 models: Remove the No. 2 (15 A) fuse from the under-dash fuse/relay box.
4. 2006-09 models: Connect the HDS to the data link connector (DLC) (see GENERAL TROUBLESHOOTING INFORMATION).

5. 2006-09 models :Turn the ignition switch ON (II).
6. 2006-09 models : Make sure the HDS communicates with the vehicle and the ECM. If it doesn't, troubleshoot the DLC circuit (see **DLC CIRCUIT TROUBLESHOOTING**).
7. 2006-09 models: Select PGM-FI, INSPECTION, then ALL INJECTORS OFF on the HDS.
8. 2006-09 models. Turn the ignition switch to LOCK (0).
9. Remove the four ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION**).
10. Remove the four spark plugs.
11. Attach the compression gauge to the spark plug hole.



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

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

Compression Pressure:

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

13. Measure the compression on the remaining cylinders.

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

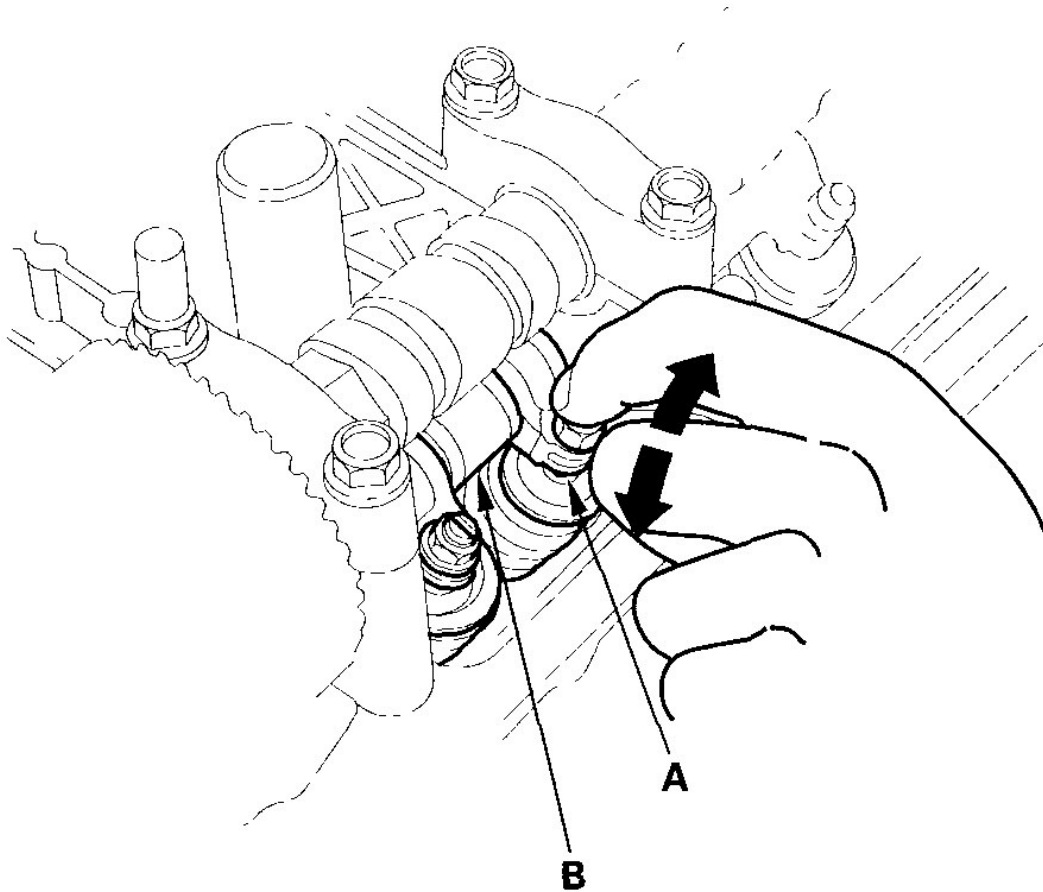
14. If the compression is not within specifications, check the following items, then remeasure the compression.
 - Incorrect valve clearance
 - Confirmation of cam timing
 - Damaged or worn cam lobes
 - Damaged or worn valves and seats
 - Damaged cylinder head gasket
 - Damaged or worn piston rings
 - Damaged or worn piston and cylinder bore
15. Remove the compression gauge from the spark plug hole.
16. Install the four spark plugs.
17. Install the four ignition coils
18. 2000-2005 models: Reinstall the No. 2 (15 A) fuse in the under-dash fuse/relay box.
19. Select ECM reset using the HDS:
 - 2000-2005 models (see **HOW TO RESET THE ECM**)
 - 2006-08 model (see **HDS CLEAR COMMAND**)
20. Do the ECM idle learn procedure:
 - 2000-2005 models (see **IDLE SPEED INSPECTION**)
 - 2006-08 model (see **ECM IDLE LEARN PROCEDURE**)

VTEC ROCKER ARM TEST

Special Tools Required

- Air pressure regulator 07AAJ-PNAA100
 - Gauge joint adapter 07LAK-PR3A101
 - VTEC air adapter (2) 07ZAJ-PNAA 100
 - Air joint adapter 07ZAJ-PNAA300
1. Start the engine and let it run for 5 minutes, then turn the ignition switch OFF.
 2. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
 3. Set the No. 1 piston at top dead center (TDC) (see step 2).
 4. Move the secondary rocker arm (A) for No. 1 cylinder. The secondary rocker arm should move independently of the mid rocker arm (B).
 - If the secondary rocker arm moves independently of the mid rocker arm, go to step 5.

- If the secondary rocker arm does not move, remove the mid, primary, and secondary 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 mid, primary, and secondary rocker arms as an assembly.

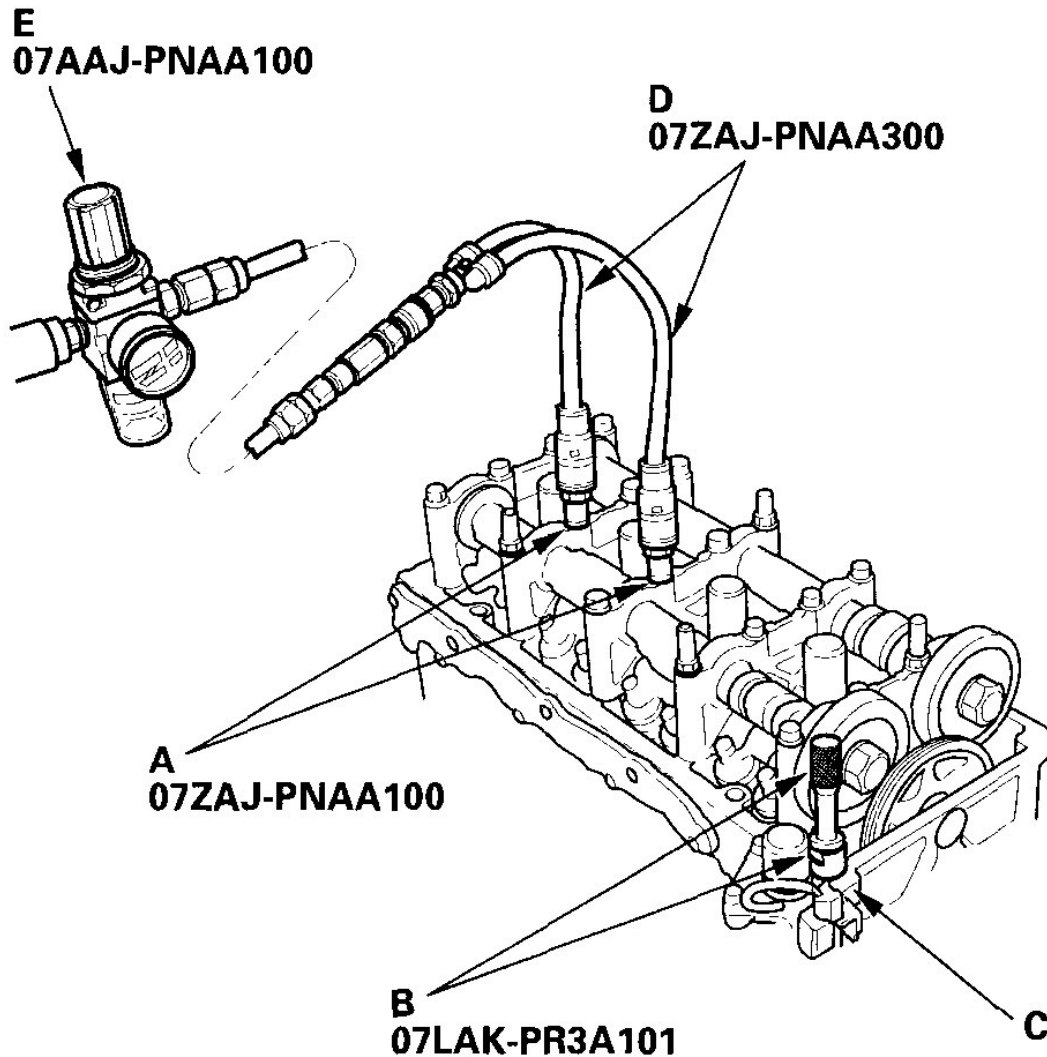


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Fig. 7: Moving Secondary Rocker Arm

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Repeat step 4 on the remaining rocker arms with each piston at TDC. When all the secondary rocker arms pass the test, go to step 6
6. Check that the air pressure on the shop air compressor gauge indicator is over 400 kPa (4 kgf/cm² , 57 psi).
7. Inspect the valve clearance (see **VALVE CLEARANCE ADJUSTMENT**).
8. Remove the No. 3 and No. 4 camshaft holder bolts, and install the VTEC air adapters (A) finger-tight.



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Fig. 8: Installing VTEC Air Adapters

Courtesy of AMERICAN HONDA MOTOR CO., INC.

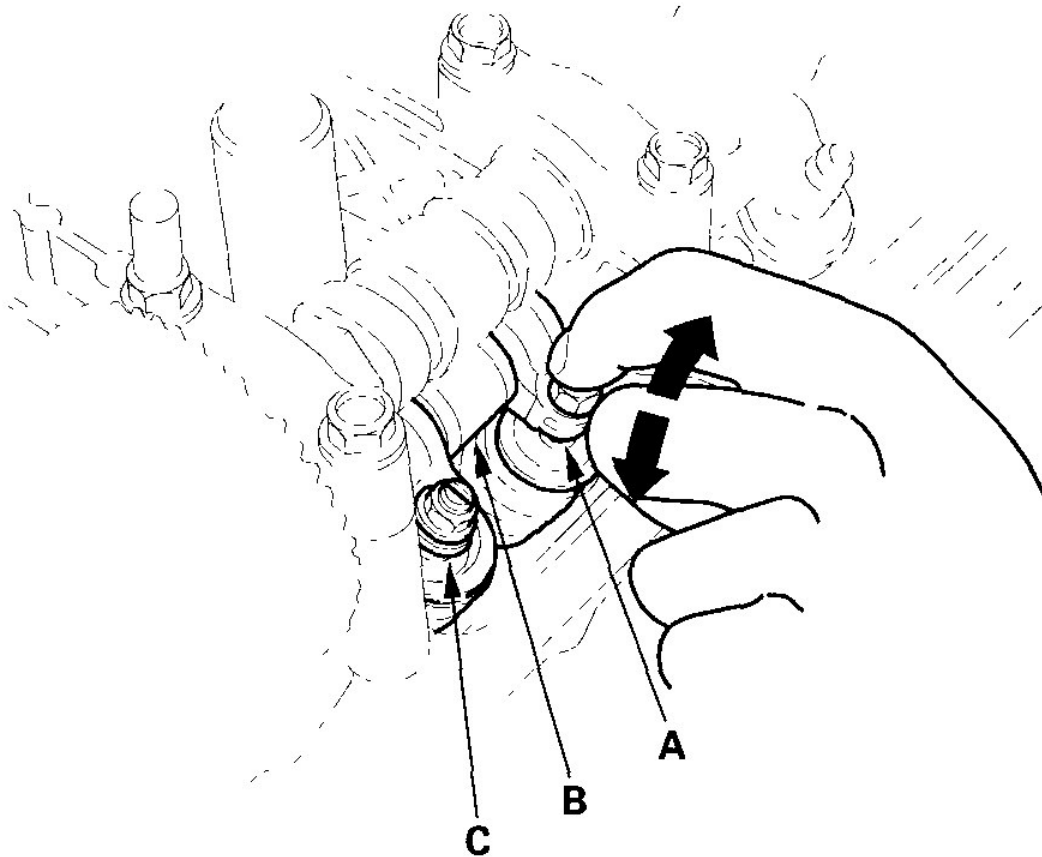
9. Install the gauge joint adapter (B) to the inspection hole (C).
10. Connect the air joint adapter (D) to the VTEC air adapters.
11. Connect the air pressure regulator (E) to the air joint adapter.
12. Loosen the valve on the regulator, then apply the specified air pressure.

Specified Air Pressure:

290 kPa (3.0 kgf/cm², 42 psi)

NOTE: If the synchronizing piston does not move after applying air pressure, move the primary and secondary rocker arms up and down manually by rotating the crankshaft clockwise.

13. With the specified air pressure applied and the piston at TDC, move the secondary rocker arm (A). The mid rocker arm (B), primary rocker arm (C), and secondary rocker arm should move together.
- If the three rocker arms move together, go to step 14.
 - If the three rocker arms does not move together, remove the mid, primary, and secondary rocker arms an assembly, and check that the pistons in the mid and primary rocker arms move smoothly. If rocker arm needs replacing, replace the mid, primary, and secondary rocker arms as an assembly.



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Fig. 9: Moving Mid Rocker Arm, Primary Rocker Arm And Secondary Rocker Arm
Courtesy of AMERICAN HONDA MOTOR CO., INC.

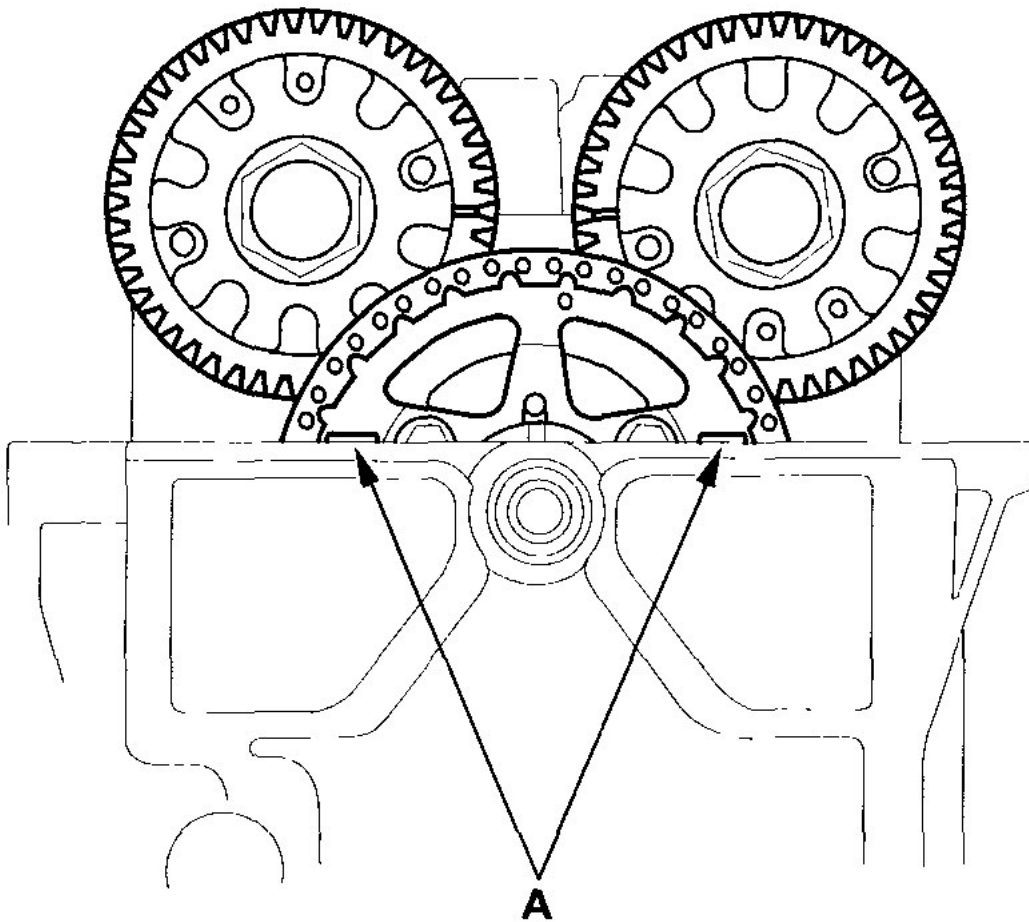
14. Repeat step 13 the remaining intake rocker arms with each piston at TDC. When all the rocker arms pass the test, go to step 15.

15. Remove the special tools.
16. Tighten the camshaft holder bolts to 22 N.m (2.2 kgf.m, 16 lbf.ft).
17. Install the cylinder head cover (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 cover (see **CYLINDER HEAD COVER REMOVAL**).
2. Set the No. 1 piston at top dead center (TDC). The TDC marks (A) on the cam chain sprocket should align with the cylinder head surface.



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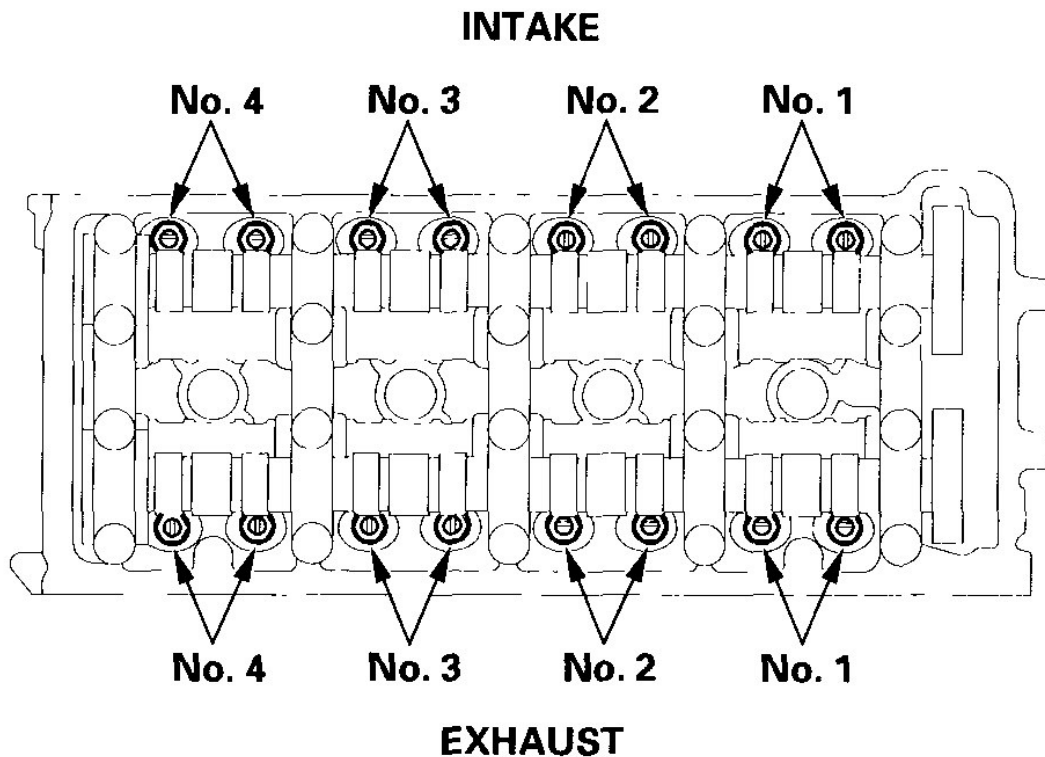
Fig. 10: Aligning TDC Marks On Cam Chain Sprocket With Cylinder Head Surface
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

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

Exhaust: 0.25-0.29 mm (0.010-0.011 in.)

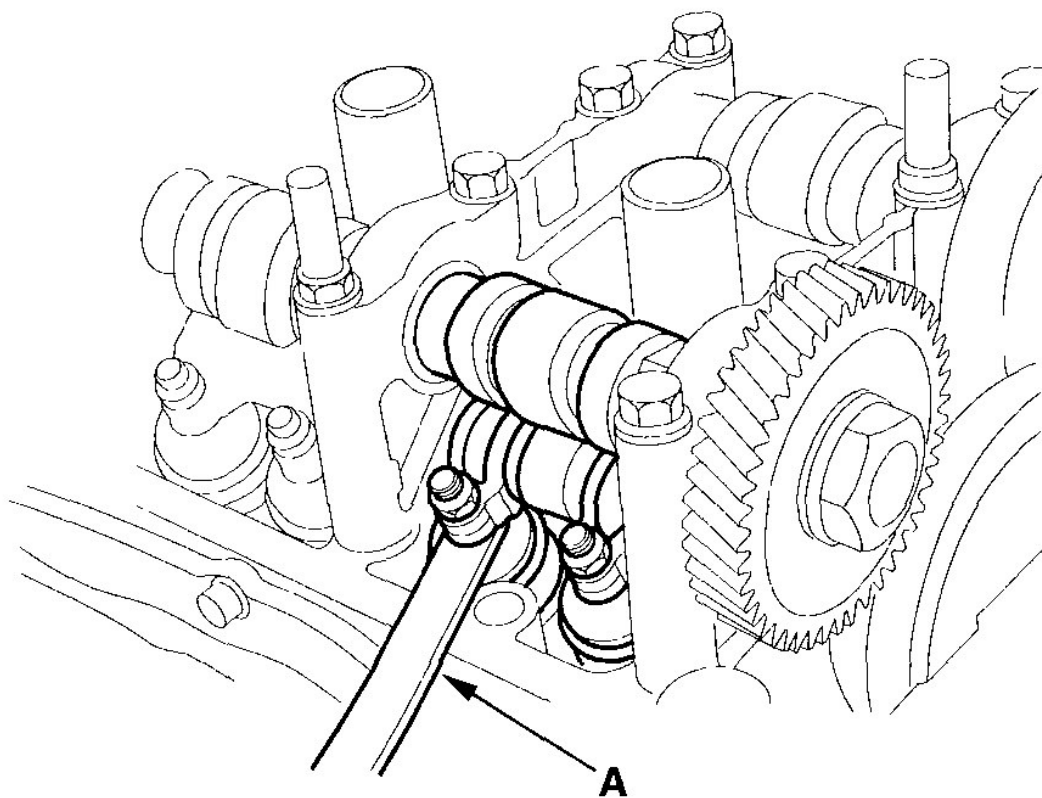
Adjusting screw location:



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Fig. 11: Identifying Intake And Exhaust Valves
Courtesy of AMERICAN HONDA MOTOR CO., INC.

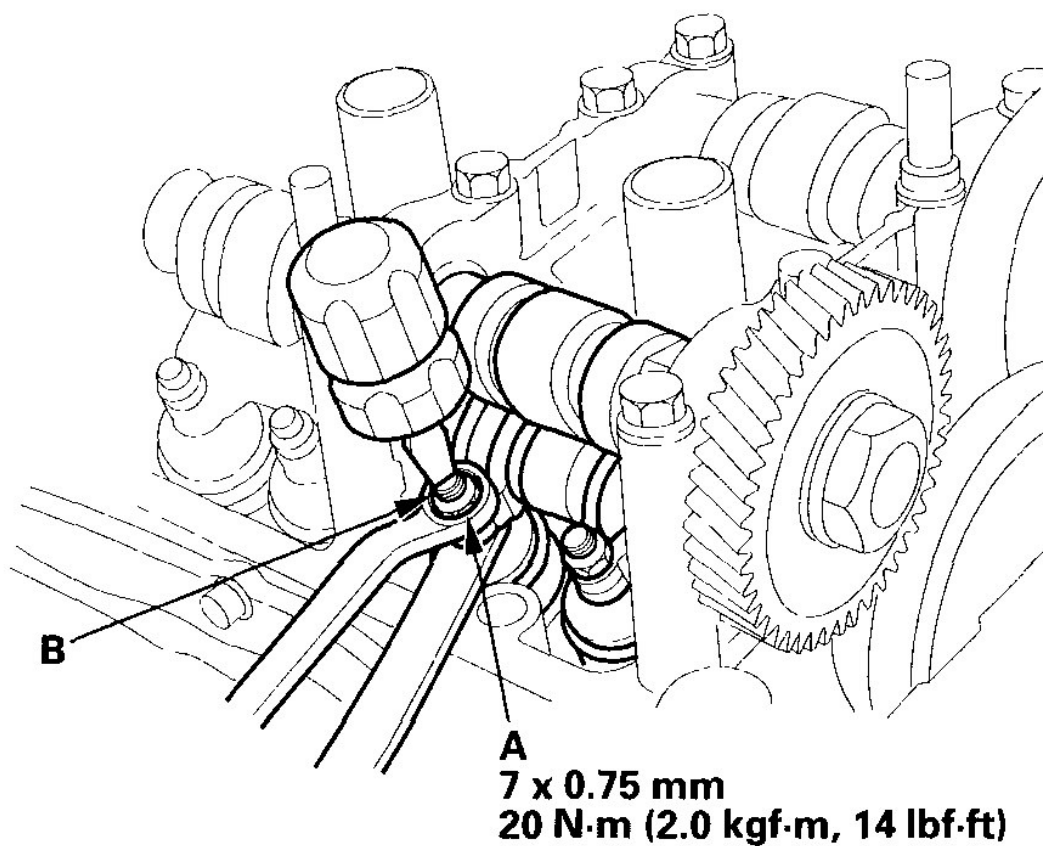
4. Insert the feeler gauge (A) between the adjusting screw and the end of the valve stem and slide it back and forth; you should feel a slight amount of drag.



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Fig. 12: Inserting Feeler Gauge Between Adjusting Screw And End Of Valve Stem
Courtesy of AMERICAN HONDA MOTOR CO., INC.

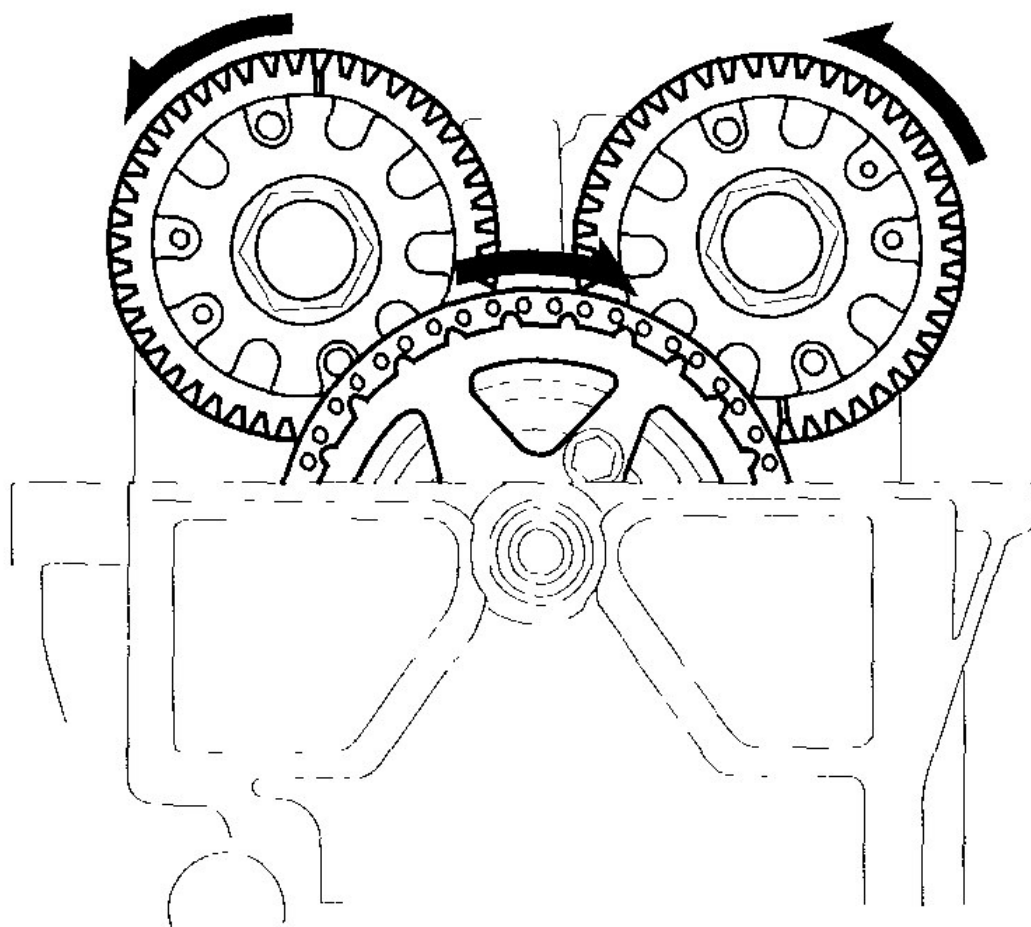
5. If you feel too much or too little drag, loosen the locknut (A), and turn the adjusting screw (B) until the drag on the feeler gauge is correct.



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Fig. 13: Loosening Locknut With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

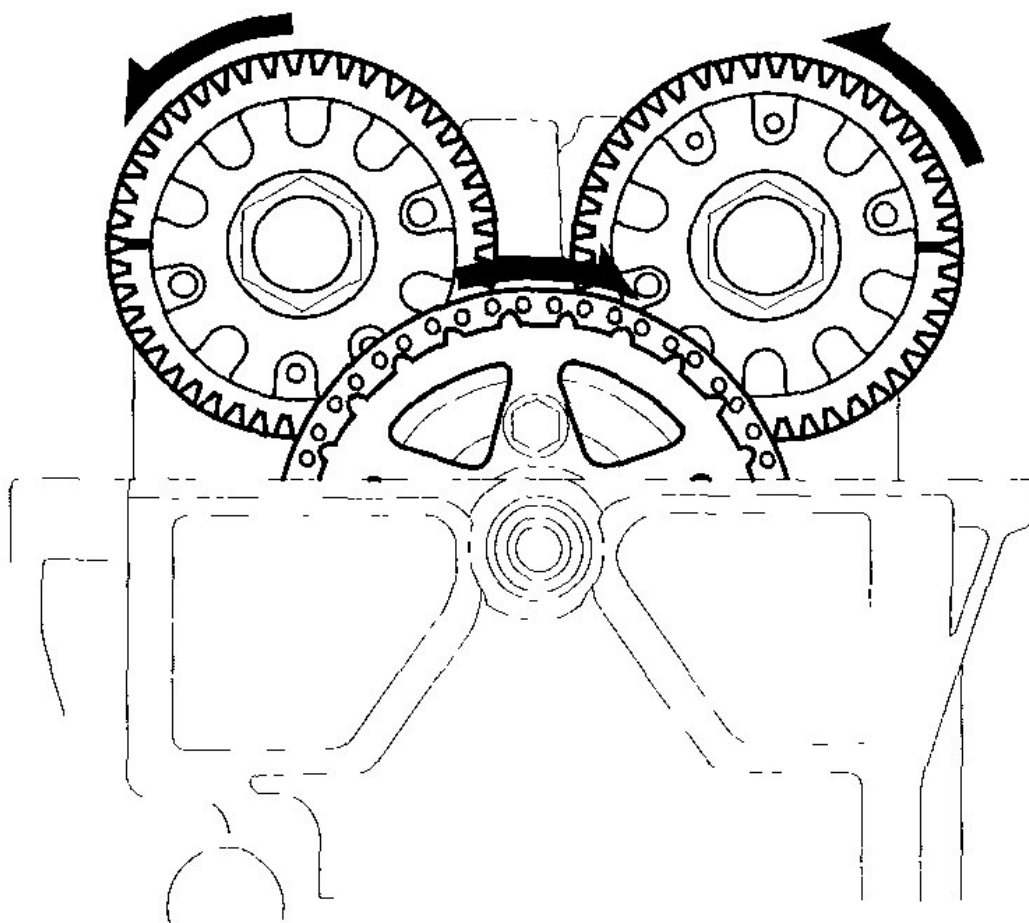
6. Tighten the locknut and recheck the clearance. Repeat the adjustment, if necessary.
7. Rotate the crankshaft 180 ° clockwise (camshaft gears turn 90 °)



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Fig. 14: Rotating Crankshaft 180 ° Clockwise (Camshaft Gears Turn 90 °) (1 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

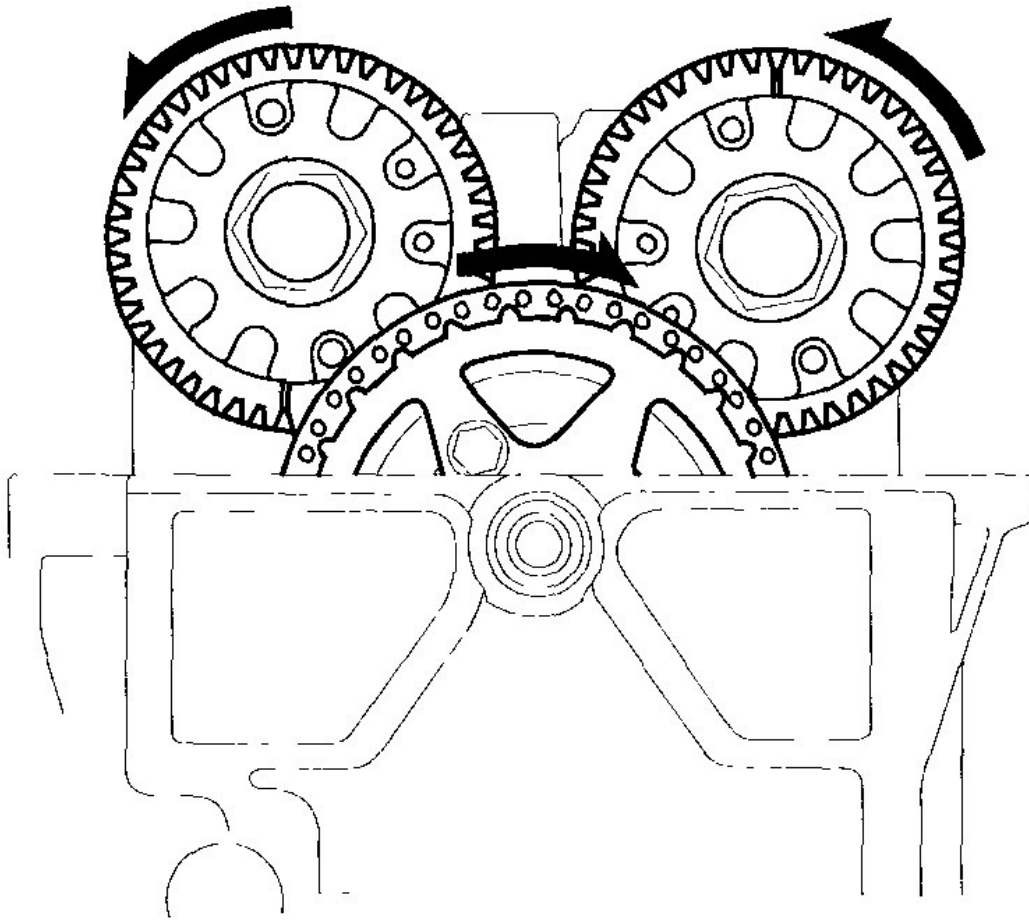
8. Check and, if necessary, adjust the valve clearance on No. 3 cylinder.
9. Rotate the crankshaft 180 ° clockwise (camshaft gears turn 90°)



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Fig. 15: Rotating Crankshaft 180 ° Clockwise (Camshaft Gears Turn 90 °) (2 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



G03692269

Fig. 16: Rotating Crankshaft 180 ° Clockwise (Camshaft Gears Turn 90 °) (3 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

CRANKSHAFT PULLEY REMOVAL AND INSTALLATION

Special Tools Required

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

REMOVAL

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

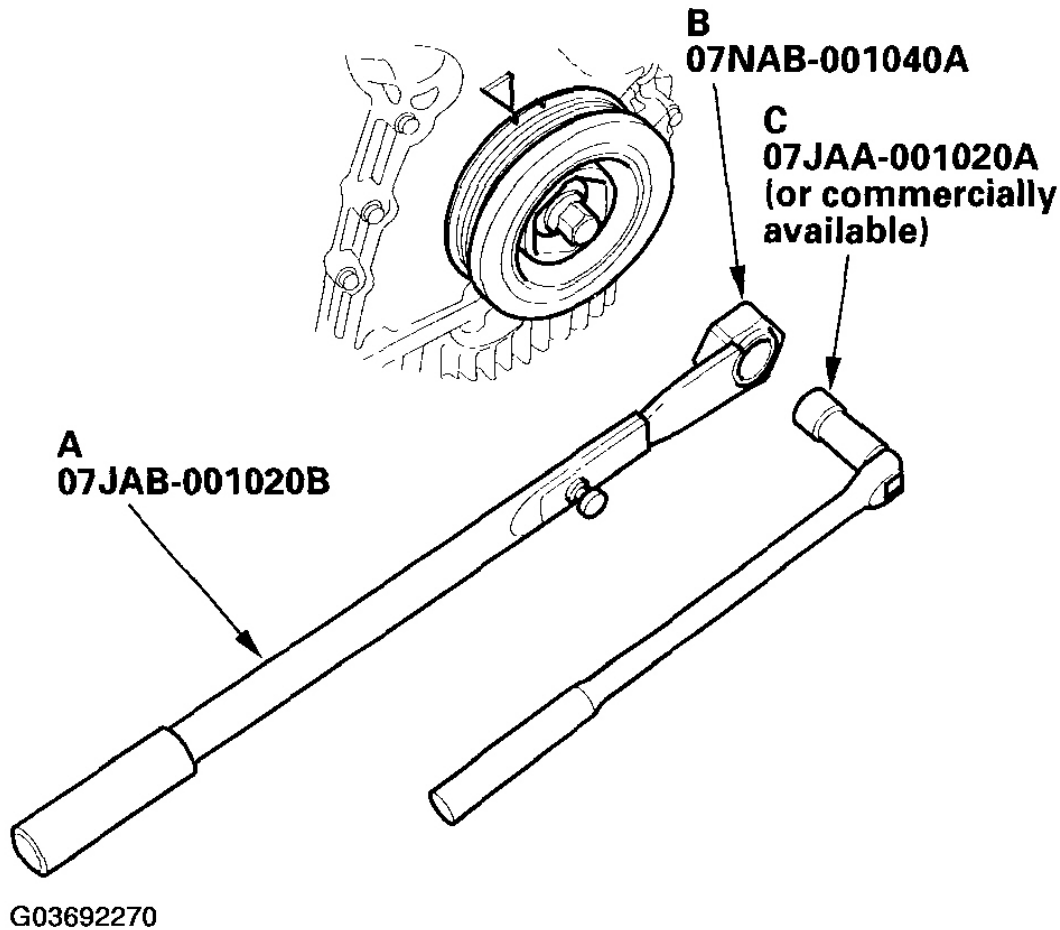


Fig. 17: Identifying Holder Handle And Holder Attachment
Courtesy of AMERICAN HONDA MOTOR CO., INC.

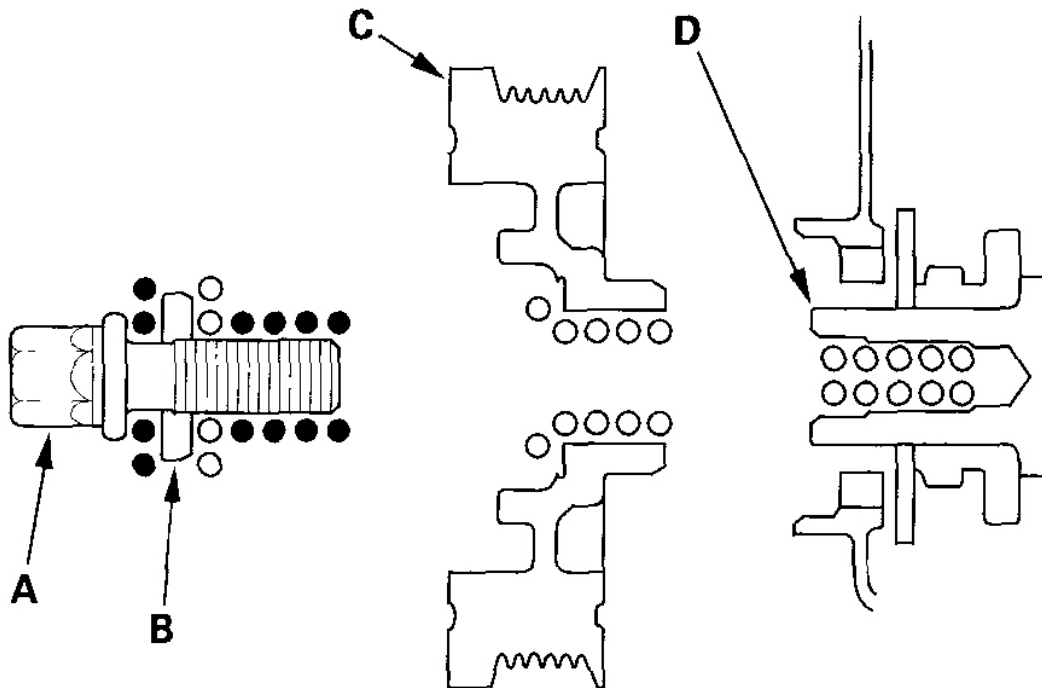
2. Remove the bolt with a heavy duty 19 mm socket (C) and breaker bar.

INSTALLATION

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

○: Clean

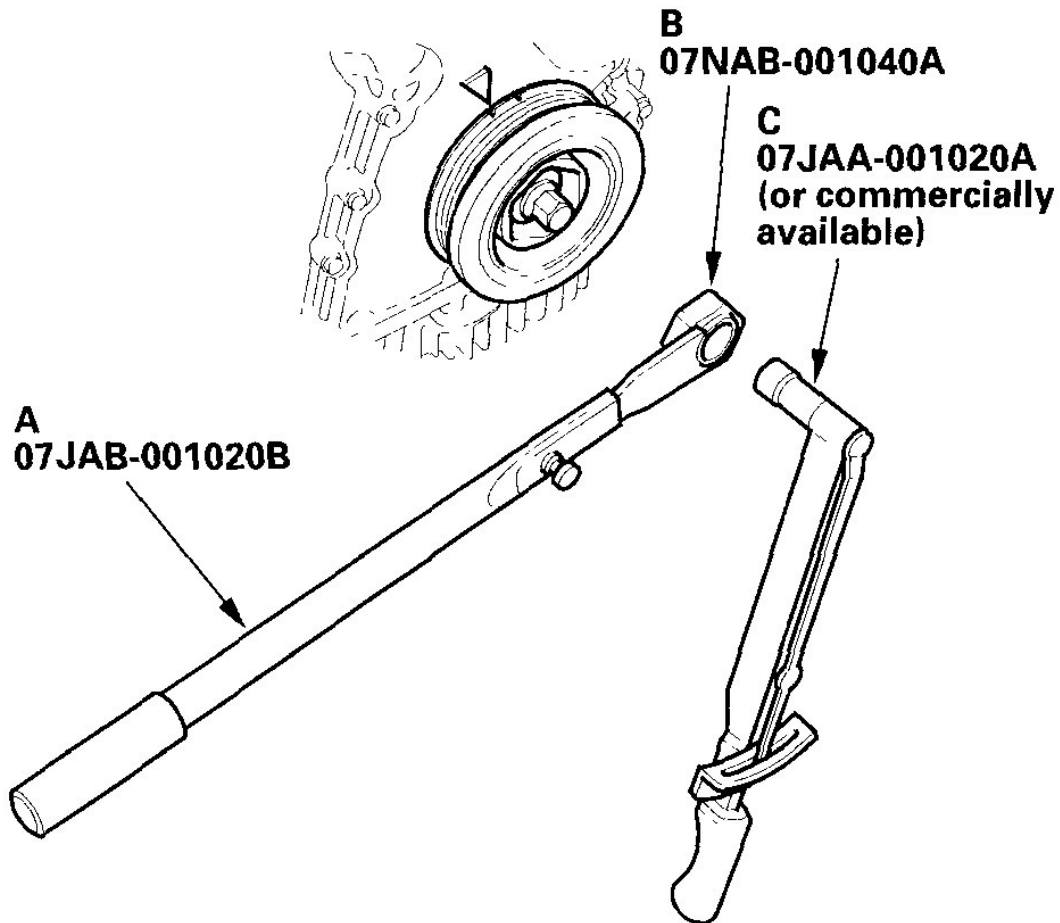
●: Lubricate with new engine oil



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Fig. 18: Lubricating Bolt And Washer With New Engine Oil
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Install the crankshaft pulley, and tighten the bolt to 260 N.m (26.5 kgf.m, 192 lbf.ft). Do not use an impact wrench.
 - Hold the pulley with the holder handle (A) and holder attachment (B).
 - Tighten the bolt with a torque wrench and heavy duty 19 mm socket (C).



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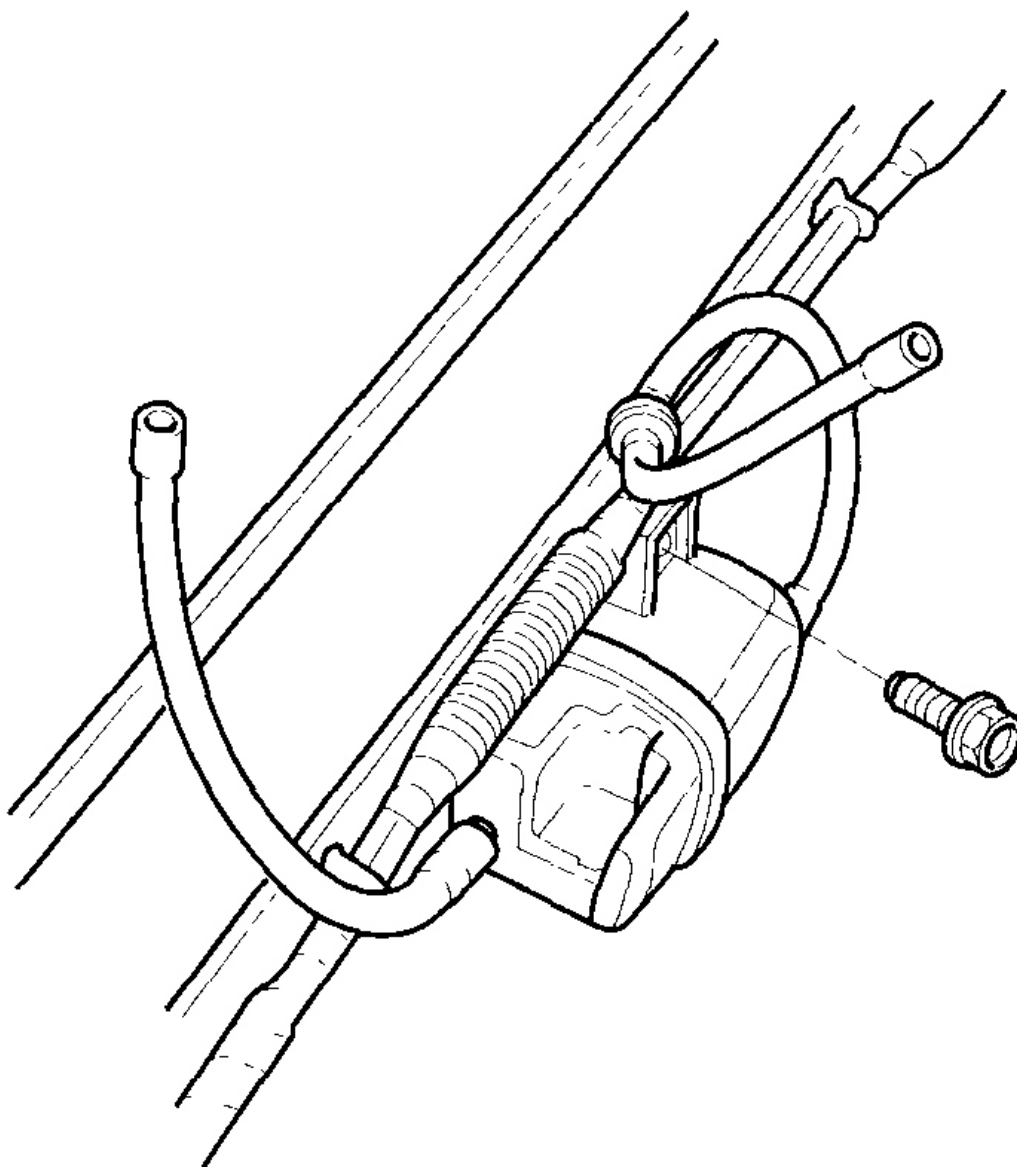
Fig. 19: Tightening Crankshaft Pulley Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CAM CHAIN REMOVAL

NOTE:

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

1. Relieve fuel pressure:
 - 2000-2005 models (see **FUEL PRESSURE RELIEVING**)
 - 2006-09 model (see **FUEL PRESSURE RELIEVING**)
2. Do the battery terminal disconnection procedure (see **DISCONNECTION**).
3. Drain the engine coolant (see **COOLANT REPLACEMENT**).
4. Drain the engine oil (see **OIL PRESSURE TEST**).
5. Loosen the water pump pulley bolts.
6. Remove the drive belt (see **DRIVE BELT REPLACEMENT**).
7. Remove the cylinder head (see **CYLINDER HEAD REMOVAL**).
8. 2000-2005 models: Remove the vacuum tank.



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Fig. 20: Removing Vacuum Tank - 2000-2005 Models
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Disconnect the water bypass hose (A), then remove the three bolts (B) securing the water bypass tube (C).

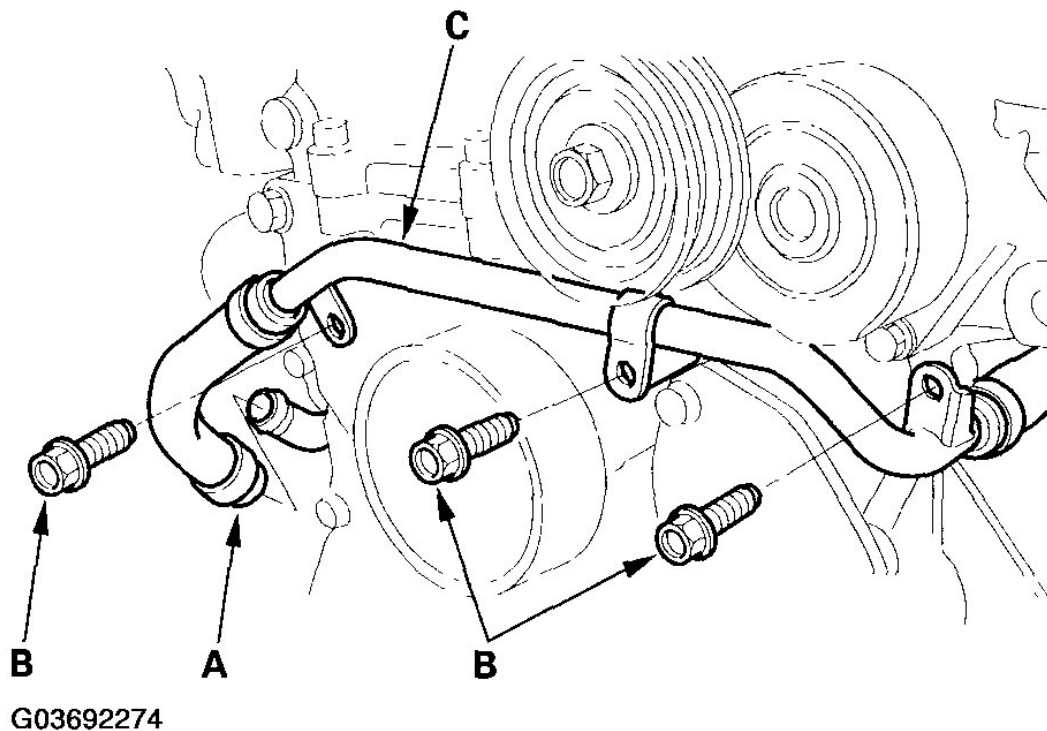
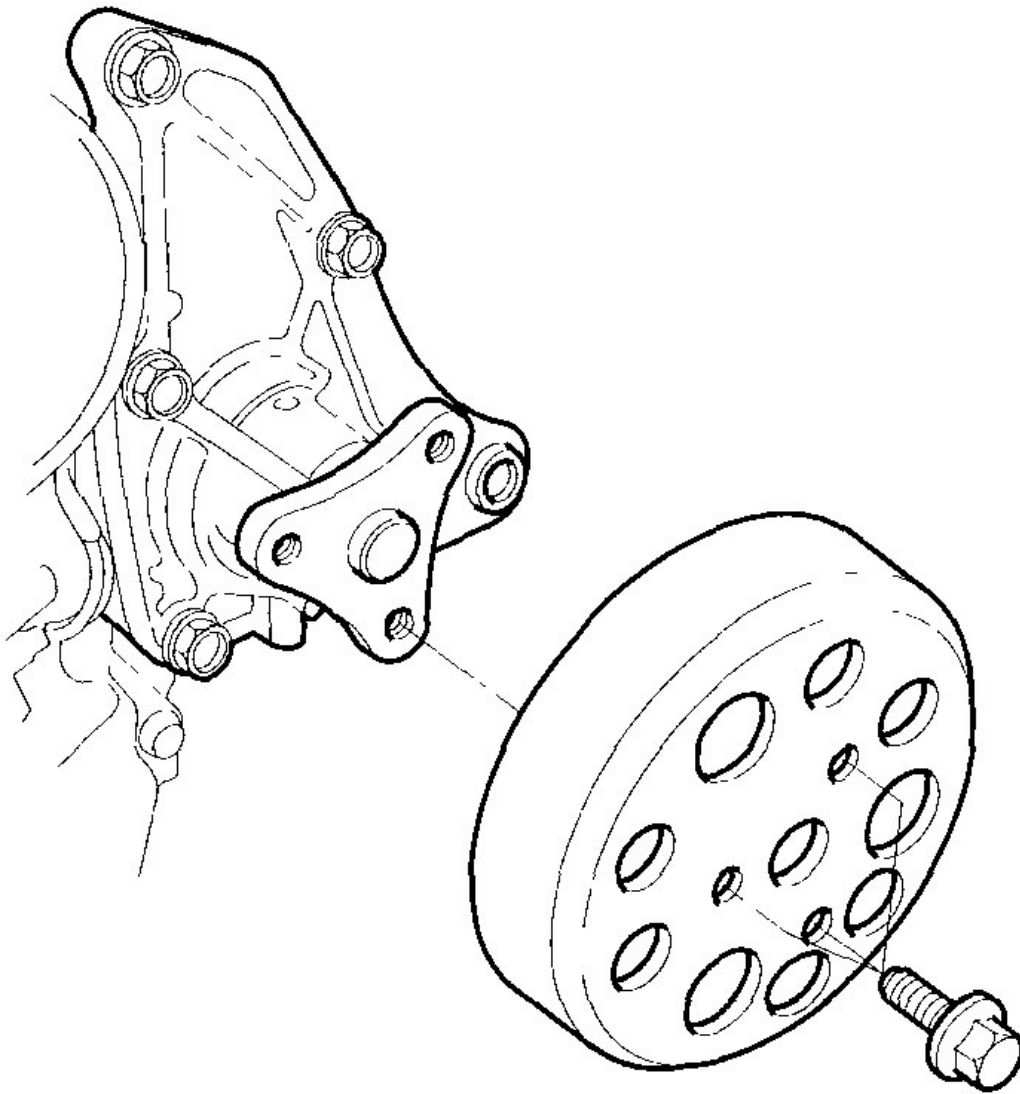


Fig. 21: Removing Water Bypass Hose And Water Bypass Tube
Courtesy of AMERICAN HONDA MOTOR CO., INC.

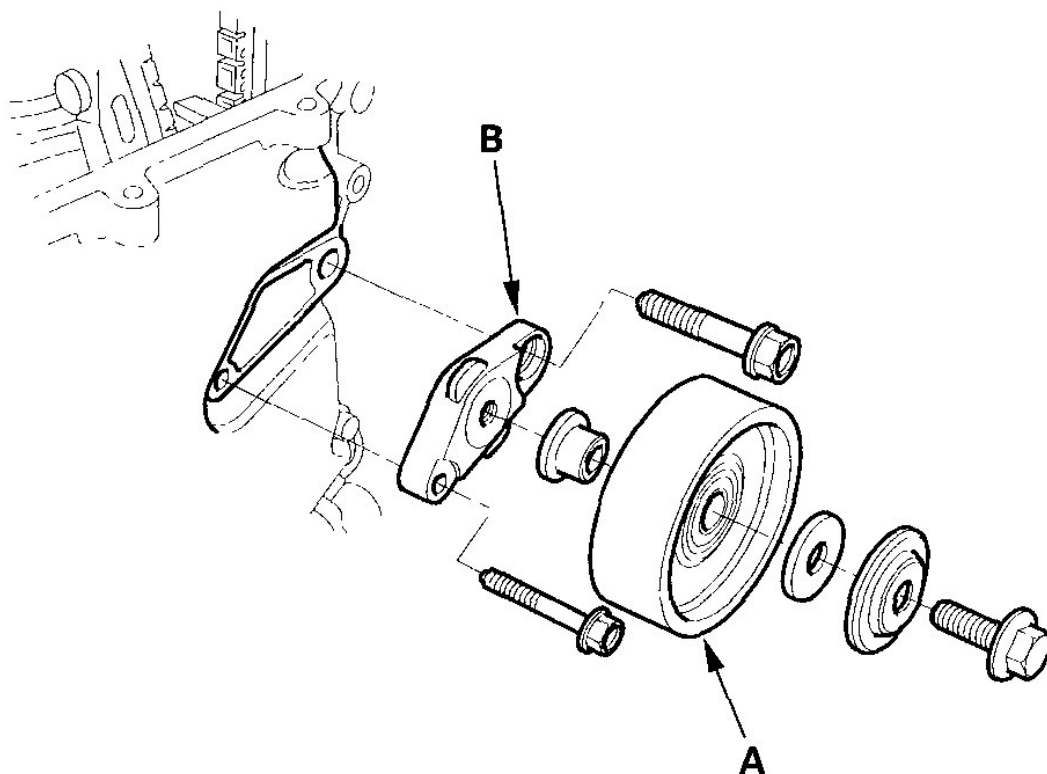
10. Remove the water pump pulley.



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Fig. 22: Removing Water Pump Pulley
Courtesy of AMERICAN HONDA MOTOR CO., INC.

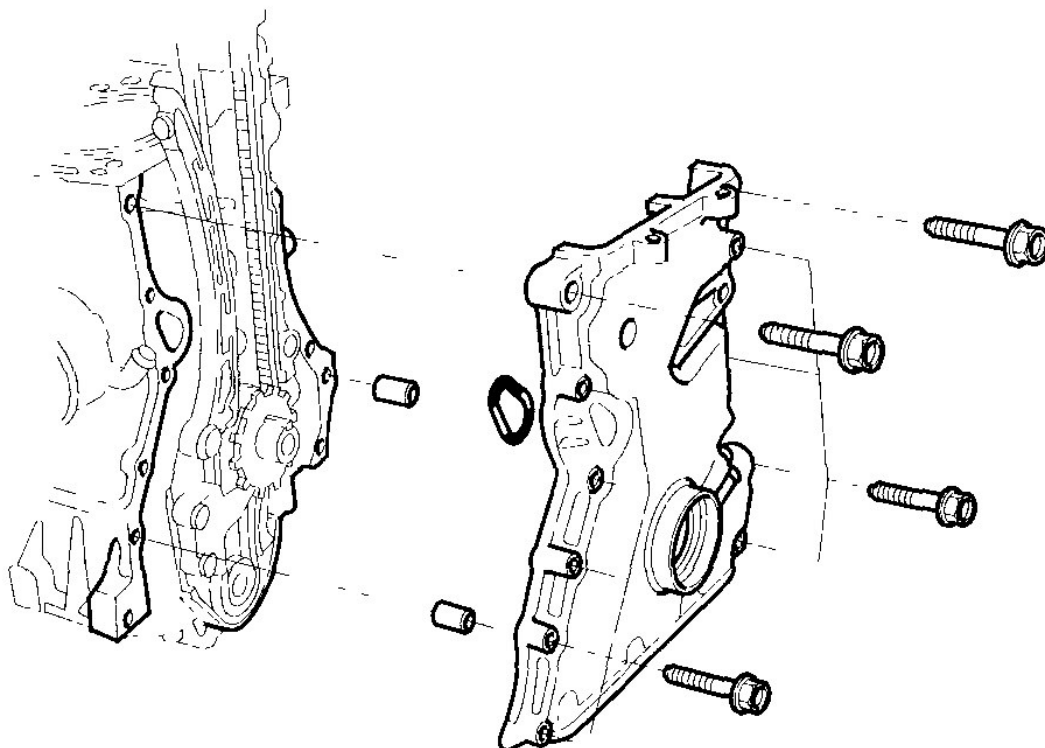
11. Remove the auto-tensioner (see **DRIVE BELT AUTO-TENSIONER REPLACEMENT**).
12. Remove the alternator (see **ALTERNATOR REMOVAL AND INSTALLATION**).
13. Remove the idler pulley (A), then remove the idler pulley base (B).



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Fig. 23: Removing Idler Pulley And Idler Pulley Base
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Remove the oil pan (see **OIL PAN REMOVAL**).
15. Remove the crankshaft pulley (see **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
16. Remove the chain case.

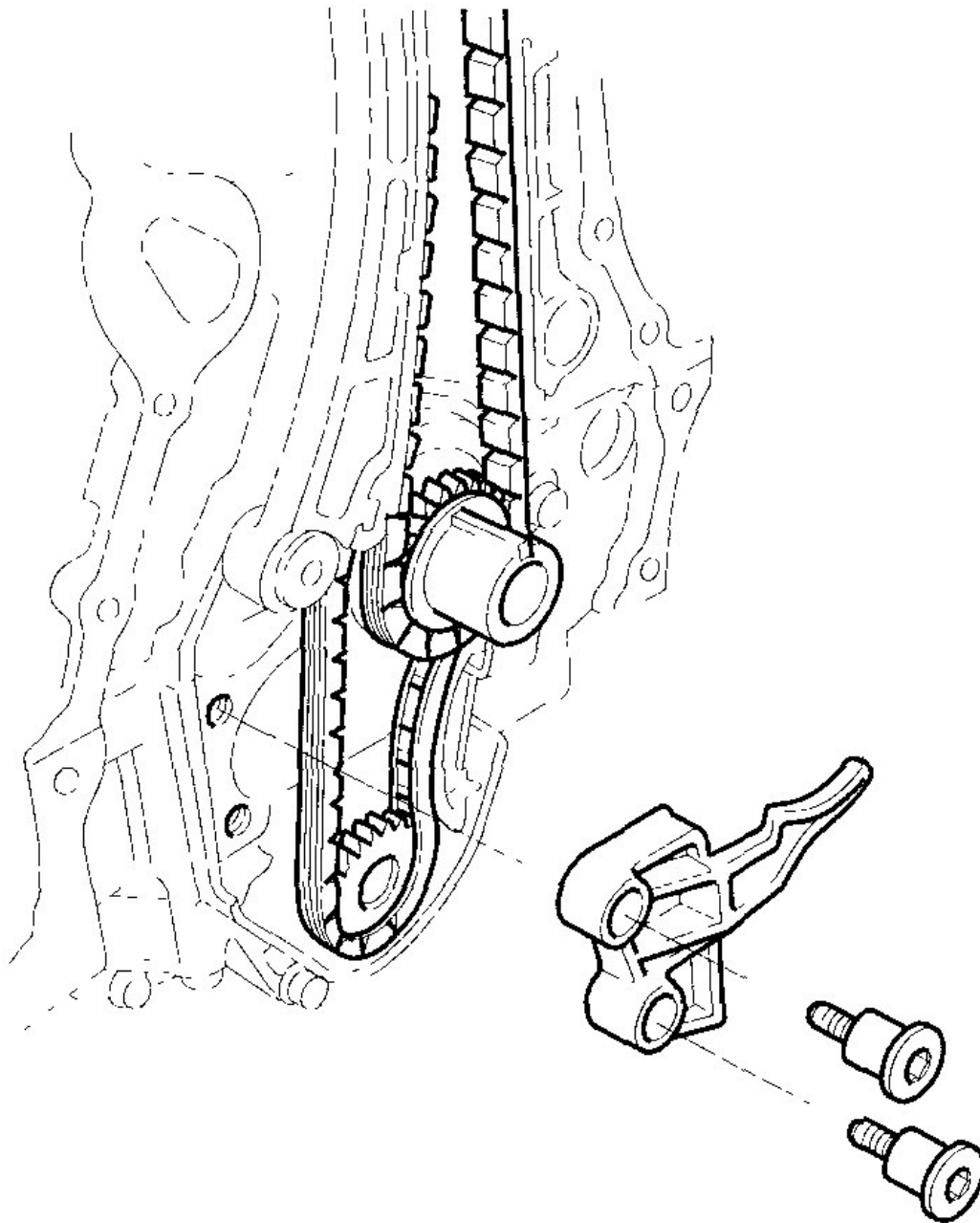


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Fig. 24: Removing Chain Case

Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Remove the CKP pulse plate (see **CKP PULSE PLATE REPLACEMENT**).
18. Remove the oil pump chain guide.



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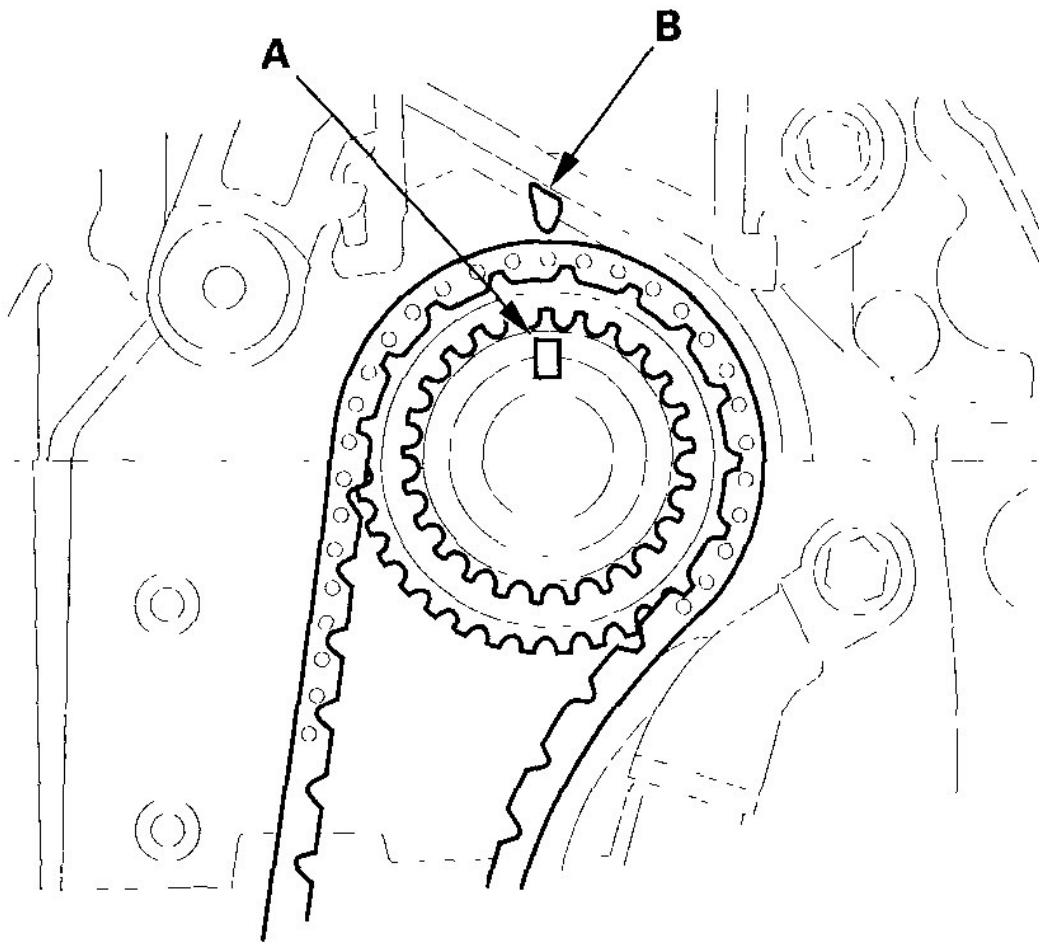
Fig. 25: Removing Oil Pump Chain Guide
Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Remove the cam chain.

CAM CHAIN INSTALLATION

NOTE: Keep the cam chain away from magnetic field.

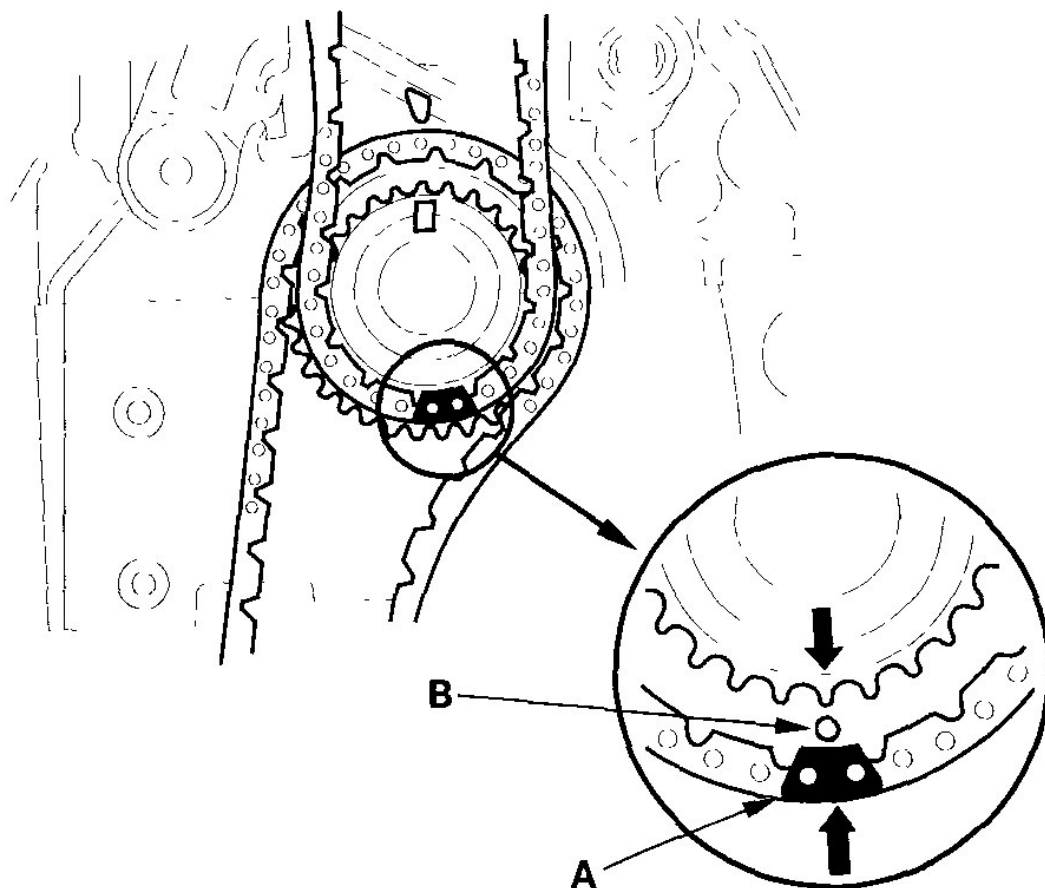
1. Set the crankshaft sprocket so that the No. 1 piston is at top dead center (TDC). Align the key (A) on the sprocket and crankshaft with the pointer (B) on the engine block.



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Fig. 26: Aligning Key On Sprocket And Crankshaft With Pointer On Engine Block
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Install the cam chain with the colored piece (A) aligned with the punch mark (B) on the crankshaft sprocket.

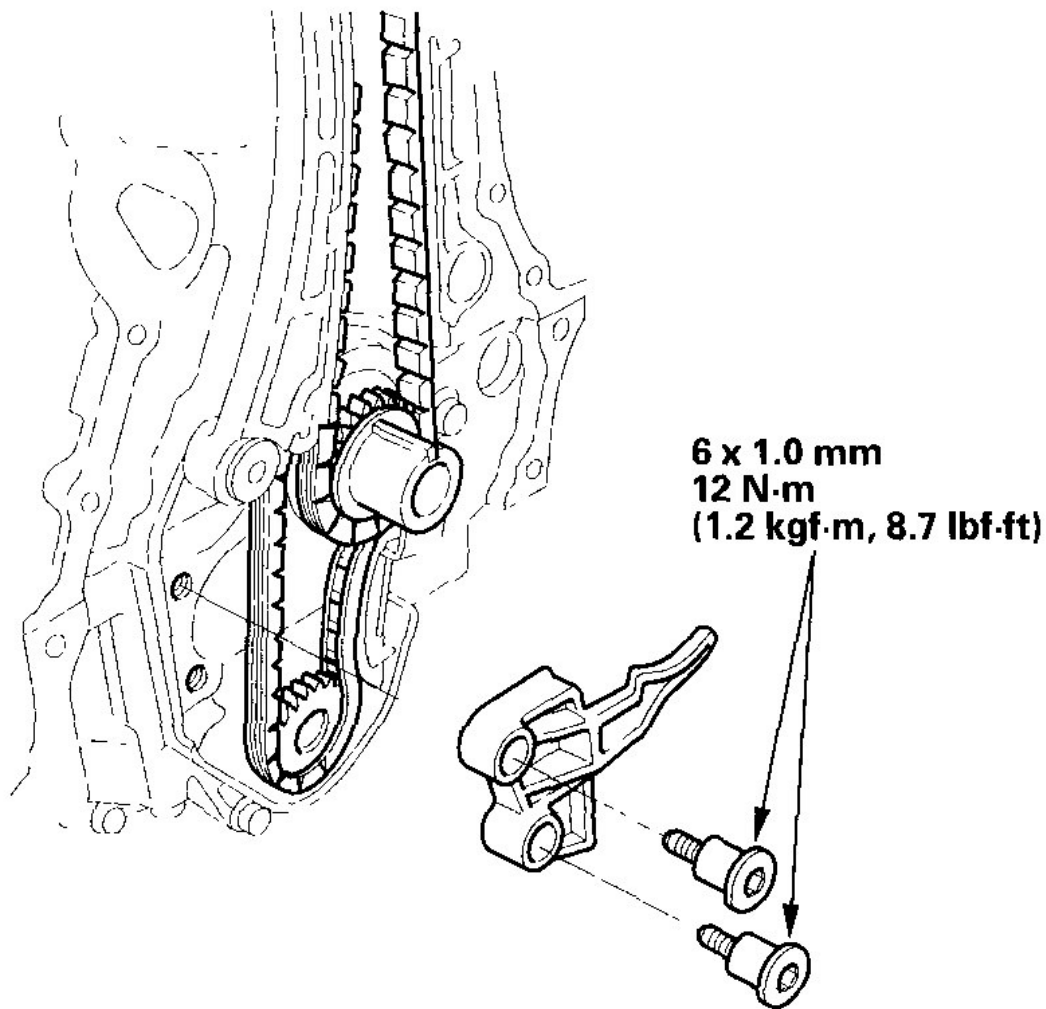


G03692280

Fig. 27: Installing Cam Chain With Colored Piece Aligned With Punch Mark On Crankshaft Sprocket

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the oil pump chain guide.

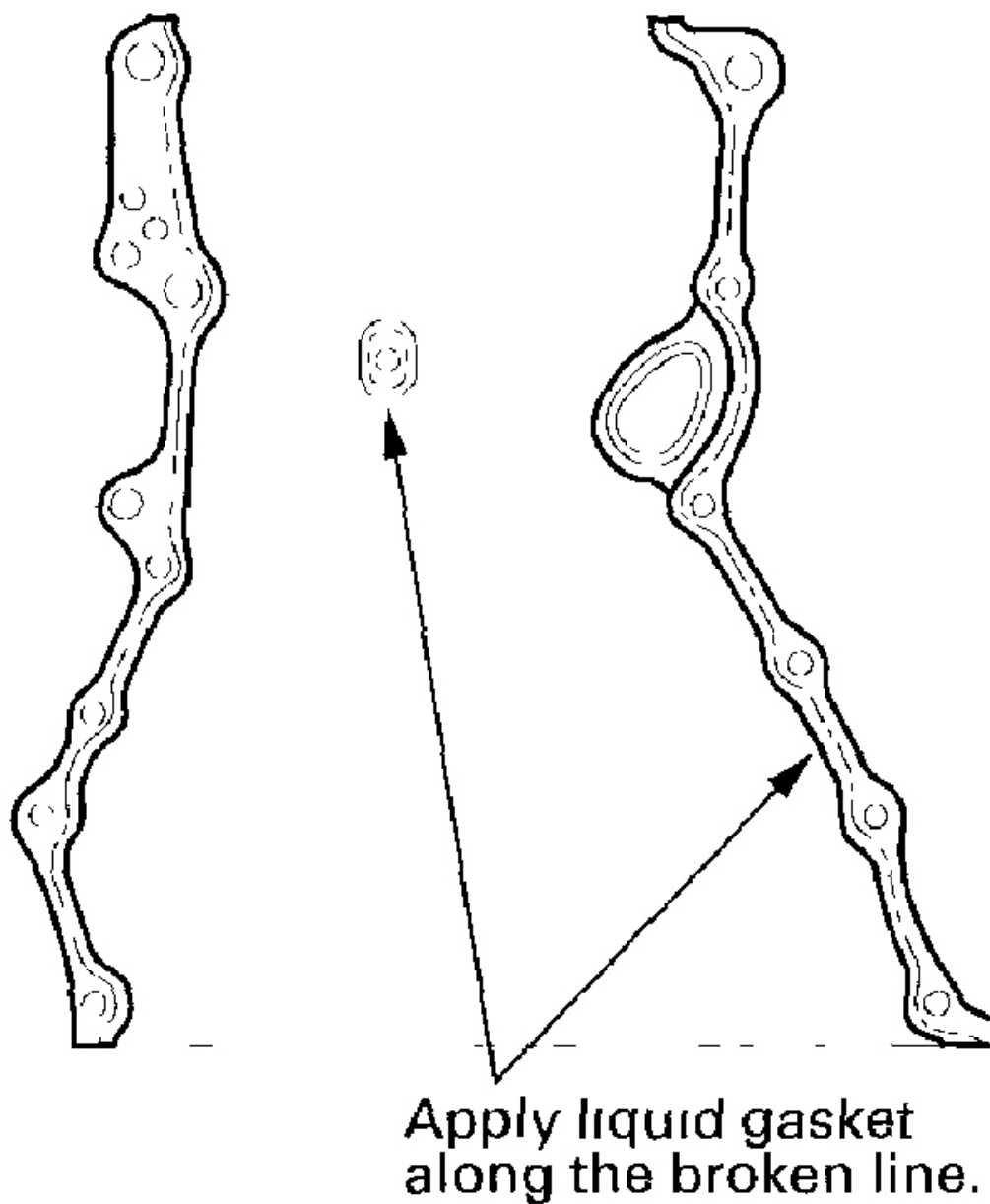


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Fig. 28: Installing Oil Pump Chain Guide With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Install the CKP pulse plate (see **CKP PULSE PLATE REPLACEMENT**).
5. Check the chain case oil seal for damage. If the oil seal is damaged, replace the chain case oil seal (see **CHAIN CASE OIL SEAL INSTALLATION**).
6. Remove any old liquid gasket from the chain case mating surfaces, bolts, and bolt holes.
7. Clean and dry the chain case mating surfaces.
8. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the engine block mating surface of the chain case.

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.

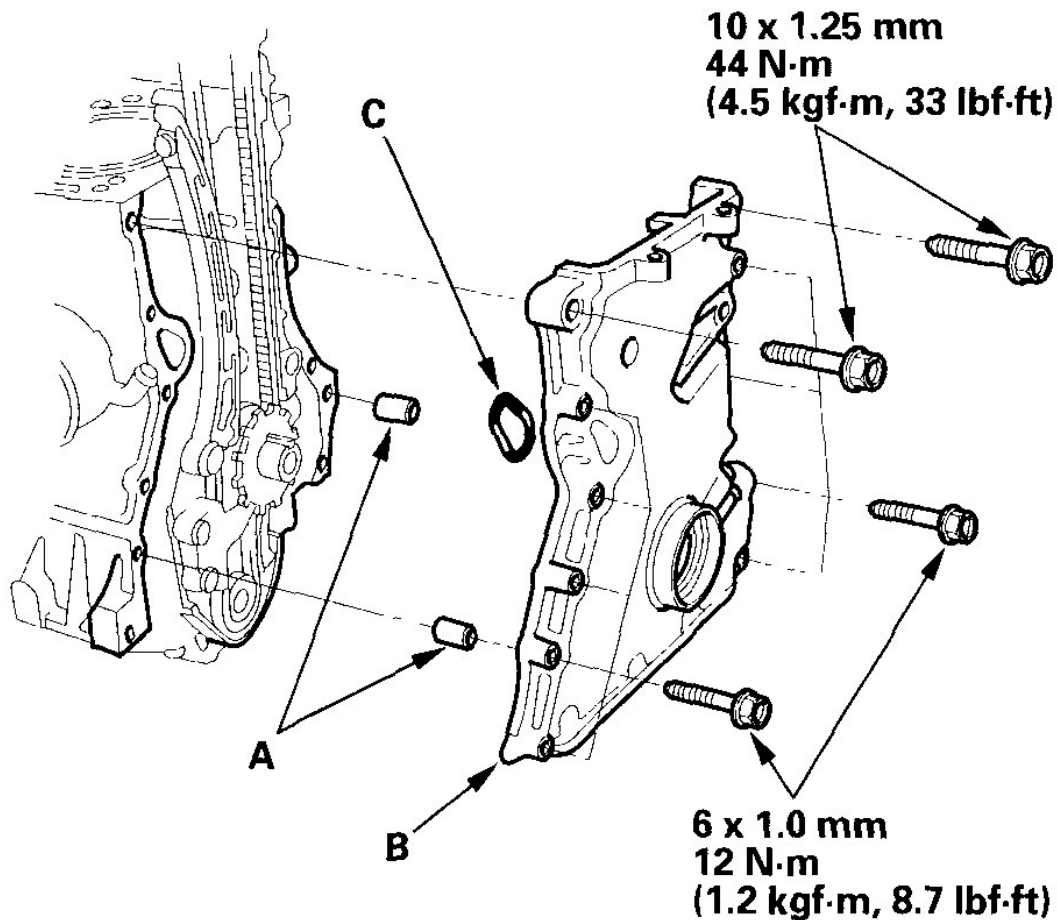


G03692282

Fig. 29: Identifying Chain Case For Applying Liquid Gasket

Courtesy of AMERICAN HONDA MOTOR CO., INC.

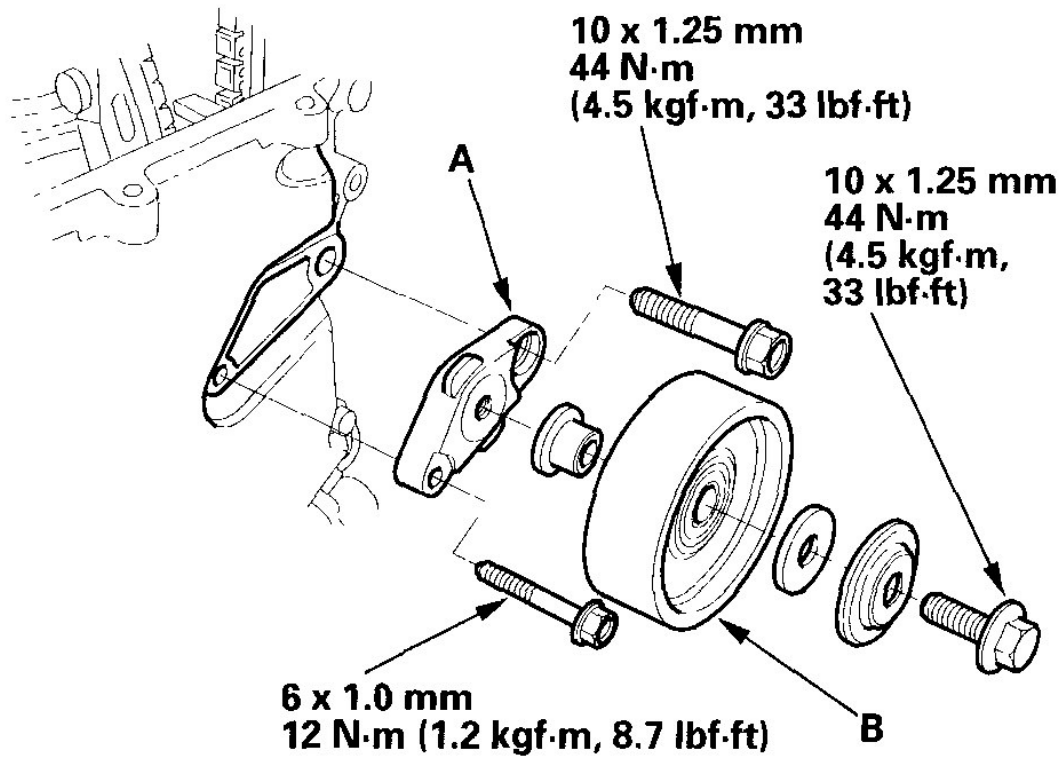
9. Apply a light coat of new engine oil to the lip of the chain case oil seal, then install the dowel pins (A) and the chain case (B) using a new O-ring (C).



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Fig. 30: Installing Dowel Pins And Chain Case Using New O-Ring With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

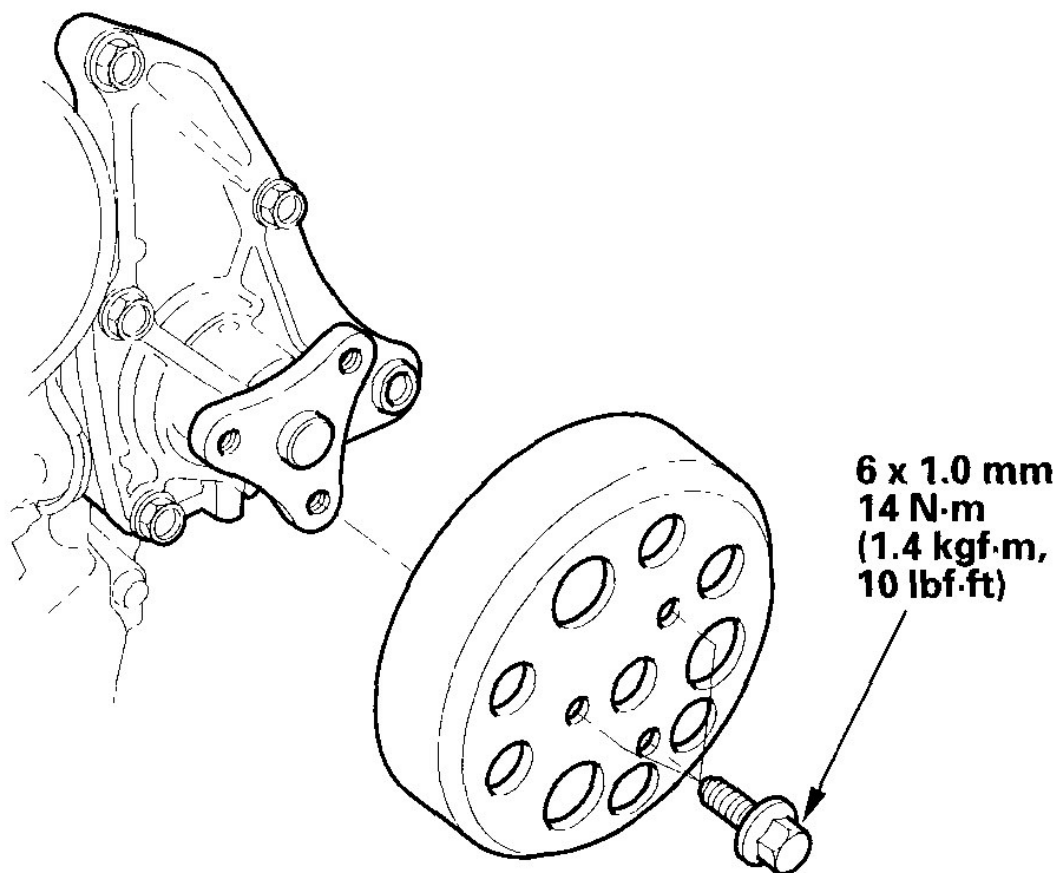
10. Install the crankshaft position (CKP) sensor.
11. Install the crankshaft pulley (see **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
12. Install the oil pan (see **OIL PAN INSTALLATION**).
13. Install the idler pulley base (A), then install the idler pulley (B).



G03692284

Fig. 31: Installing Idler Pulley Base And Idler Pulley With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Install the alternator (see ALTERNATOR REMOVAL AND INSTALLATION).
15. Install the auto-tensioner (see DRIVE BELT AUTO-TENSIONER REPLACEMENT).
16. Install the water pump pulley.



G03692285

Fig. 32: Installing Water Pump Pulley With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Connect the water bypass hose (A), and tighten the three bolts (B) securing the water bypass tube.

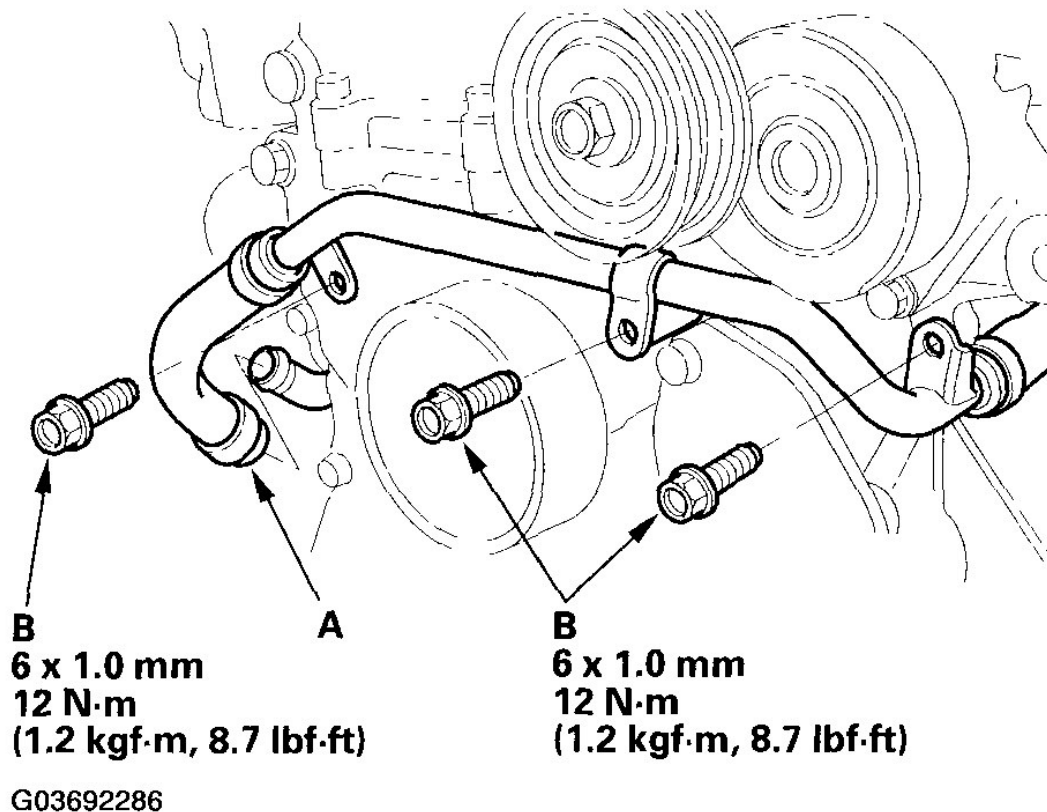
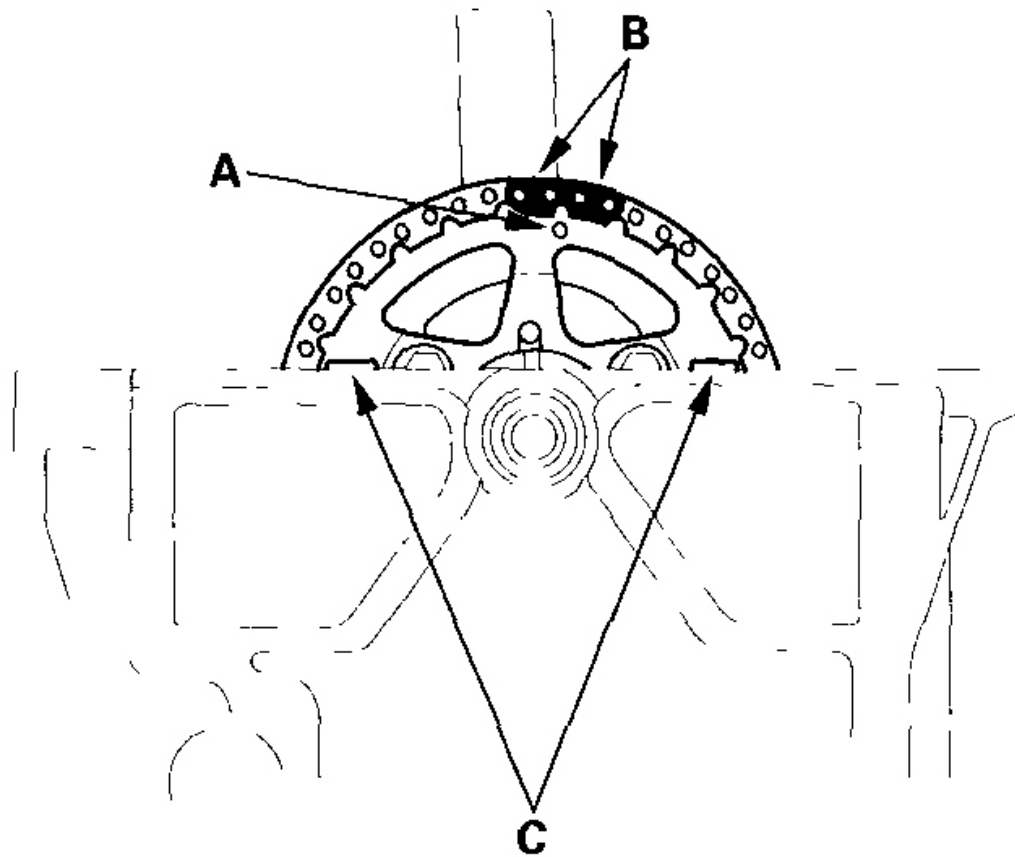


Fig. 33: Installing Water Bypass Hose And Water Bypass Tube With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Install the cylinder head (see **CAMSHAFT GEAR INSTALLATION**) with using the following process by installing the cam chain sprocket assembly.
 - Make sure the crankshaft pulley is at TDC.
 - Place the idler gear/cam chain sprocket assembly and idler gear collar into the cylinder head.
 - Install the cam chain on the sprocket with the one punch mark (A) aligned with the center of the two colored pieces (B).
 - Fit the cam chain sprocket assembly into the cylinder head.
 - Turn the cam chain sprocket assembly counterclockwise to relieve cam chain free play, and check the alignment of the TDC mark (C) on the cam chain sprocket with the cylinder head surface. If the cam chain sprocket is not positioned at TDC, remove the assembly from the cylinder head and reposition the cam chain to bring the cam chain sprocket to TDC.

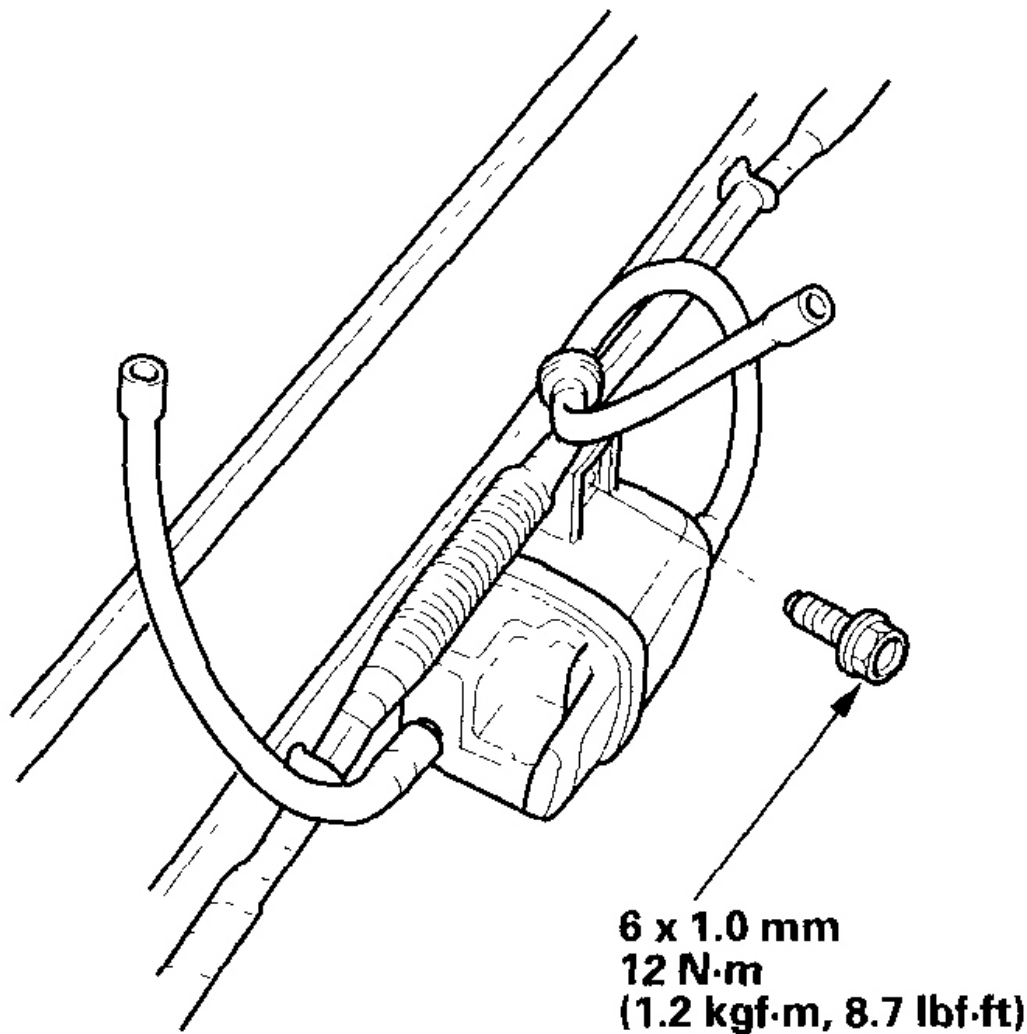


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Fig. 34: Installing Cam Chain On Sprocket With One Punch Mark Aligned With Center Of Two Colored Pieces

Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Install the drive belt (see **DRIVE BELT REPLACEMENT**).
20. Install the vacuum tank.



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Fig. 35: Installing Vacuum Tank With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

21. After installation, check that all tubes, hoses, and connectors are installed correctly.
22. After assembly, wait at least 30 minutes before filling the engine with oil.
23. Do the battery terminal reconnection procedure. (see **RECONNECTION**).
24. Inspect for fuel leaks. Turn the ignition switch ON (II) (do not operate the starter) so that 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.

25. Refill the engine with engine oil (see **OIL PRESSURE TEST**).
26. Refill the radiator with engine coolant, and bleed air from the cooling system with the heater valve open (see **COOLANT REPLACEMENT**).
27. 2000-2005 models: Do the engine control module (ECM) idle learn procedure (see **IDLE SPEED INSPECTION**).
28. 2006-09 model: Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **HDS CLEAR COMMAND**).
29. Inspect the idle speed:
 - 2000-2005 models (see **IDLE SPEED INSPECTION**).
 - 2006-09 model (see **IDLE SPEED INSPECTION**).
30. Inspect the ignition timing (see **IGNITION TIMING INSPECTION**).

CHAIN CASE OIL SEAL INSTALLATION

Special Tools Required

- Attachment, 52 x 55 mm 07746-0010400
 - Driver 07749-0010000
1. Apply a light coat of new engine oil around the chain case oil seal.
 2. Use the driver and the attachment to drive a new oil seal squarely into the chain case to the specified installed height.

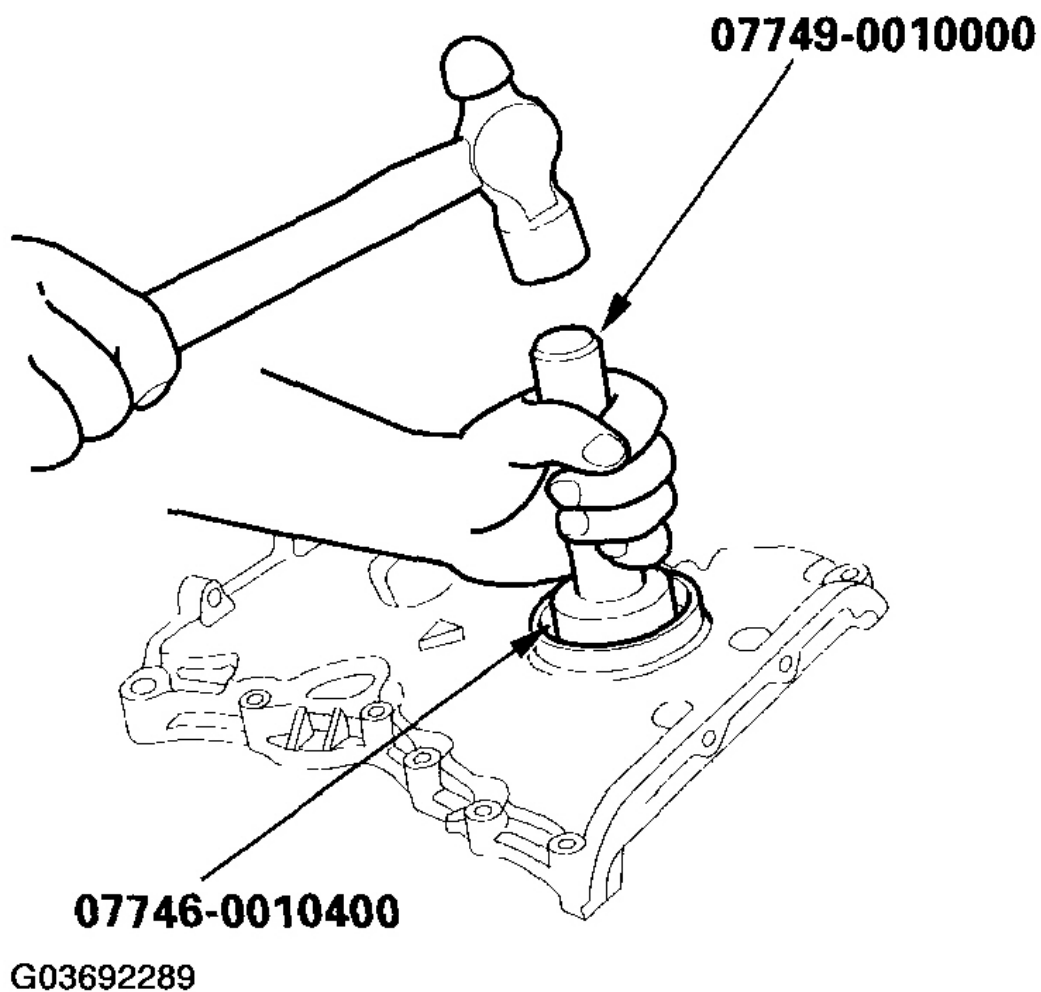
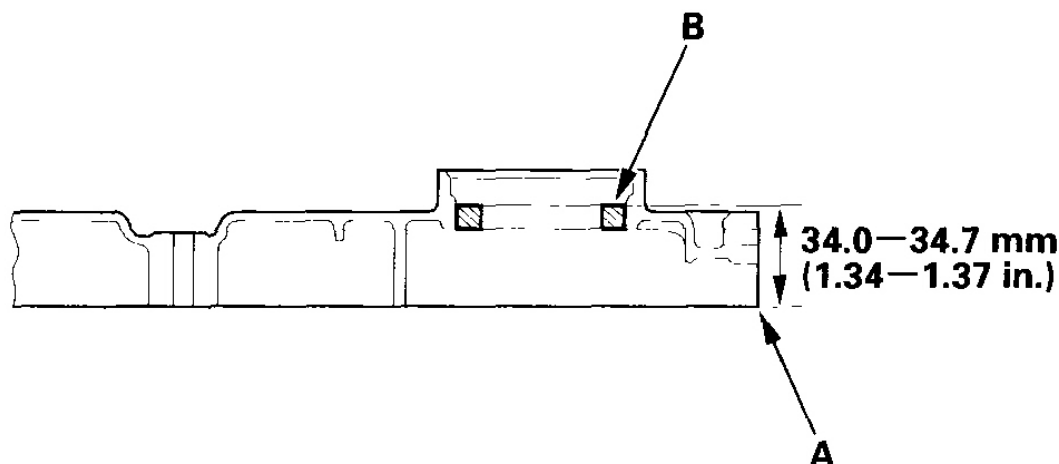


Fig. 36: Installing Oil Seal Into Chain Case
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Oil Seal Installed Height:

34.0-34.7 mm (1.34-1.37 in.)



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Fig. 37: Identifying Distance Between Chain Case Surface And Oil Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CKP PULSE PLATE REPLACEMENT

NOTE:

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

1. Relieve fuel pressure:

- 2000-2005 models (see FUEL PRESSURE RELIEVING)
- 2006-09 model (see FUEL PRESSURE RELIEVING)

2. Do the battery terminal disconnection procedure (see DISCONNECTION).

3. Drain the engine coolant (see COOLANT REPLACEMENT).

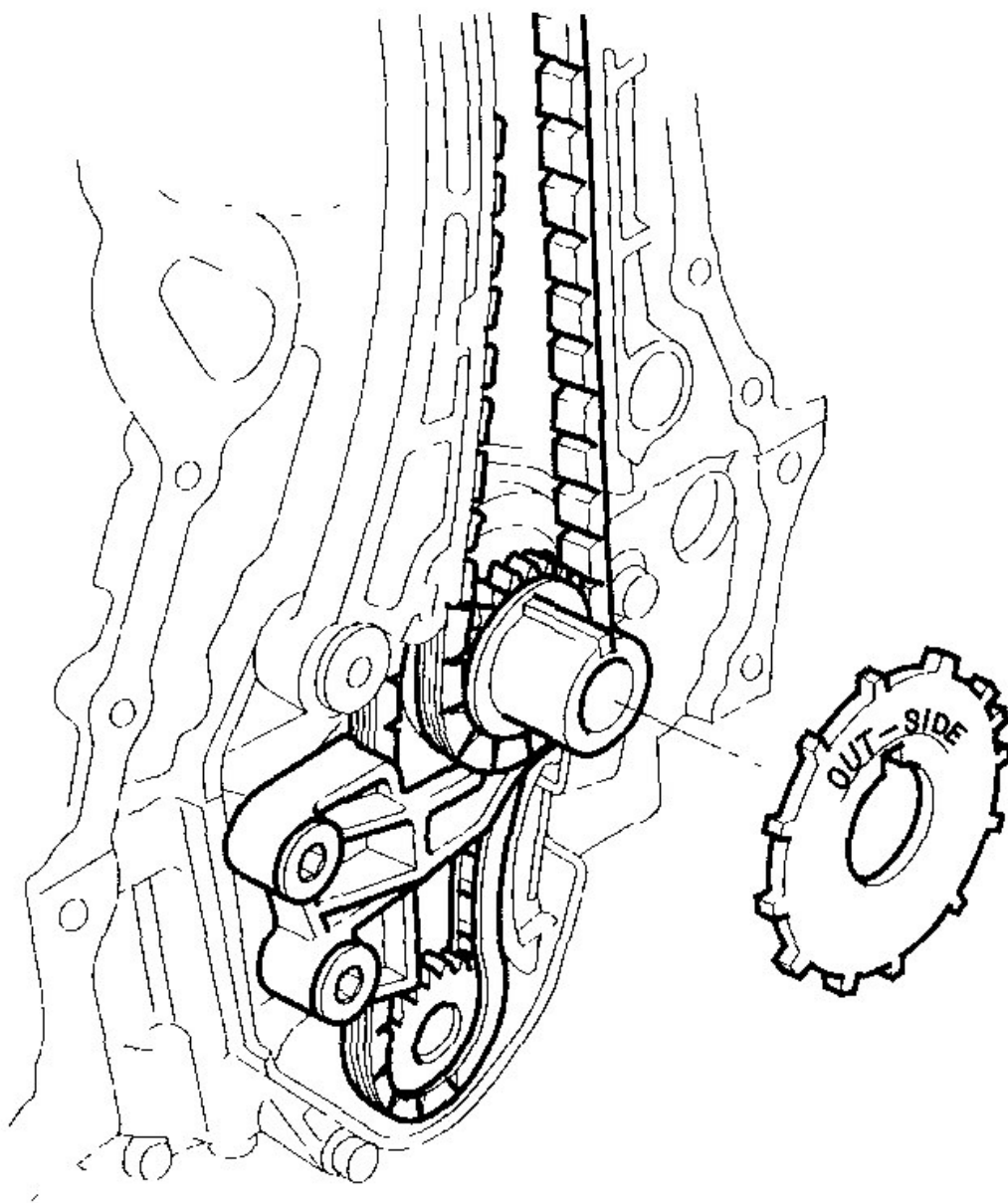
4. Drain the engine oil (see OIL PRESSURE TEST).

5. Loosen the water pump pulley bolts.

6. Remove the drive belt (see DRIVE BELT REPLACEMENT).

7. Remove the cylinder head (see CYLINDER HEAD REMOVAL).

8. 2000-2005 models: Remove the vacuum tank (see step 8).
9. Disconnect the water bypass hose, then remove the three bolts securing the water bypass tube (see step 9).
10. Remove the water pump pulley (see step 10).
11. Remove the auto-tensioner (see **DRIVE BELT AUTO-TENSIONER REPLACEMENT**).
12. Remove the alternator (see **ALTERNATOR REMOVAL AND INSTALLATION**).
13. Remove the idler pulley, then remove the idler pulley base (see step 13).
14. Remove the oil pan (see **OIL PAN REMOVAL**).
15. Remove the crankshaft pulley (see **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
16. Remove the crankshaft position (CKP).
17. Remove the chain case.
18. Remove the CKP pulse plate.



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Fig. 38: Removing CKP Pulse Plate

Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Install the CKP pulse plate.
20. Check the chain case oil seal for damage. If the oil seal is damaged, replace the chain case oil seal (see

CHAIN CASE OIL SEAL INSTALLATION).

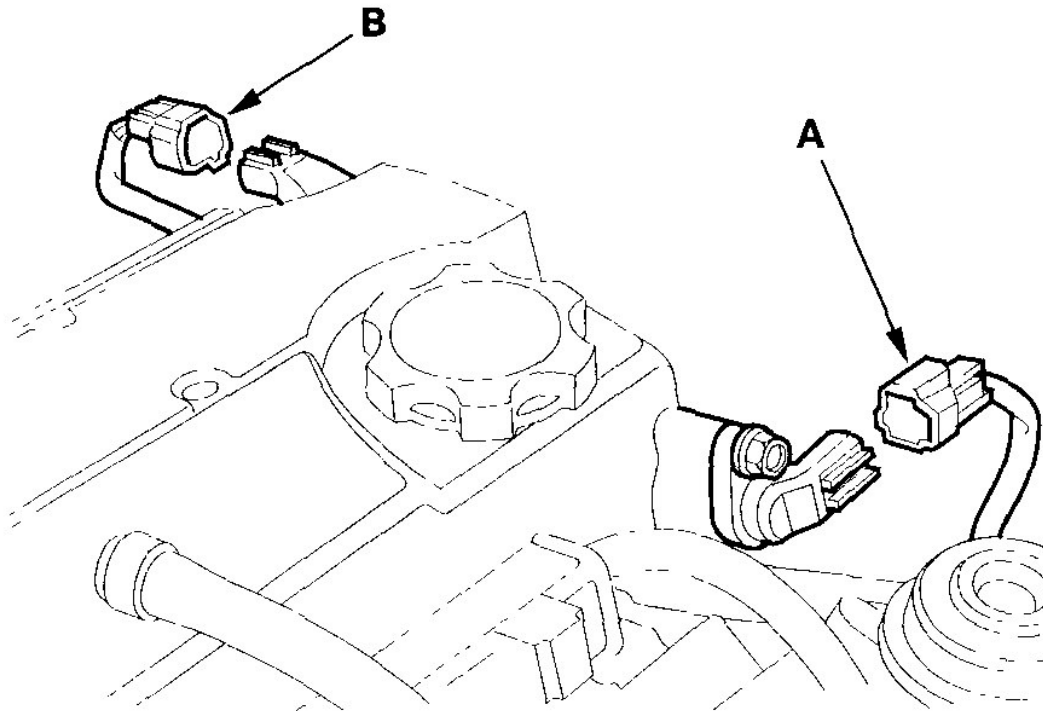
21. Remove any old liquid gasket from the chain case mating surfaces, bolt, and bolt holes.
22. Clean and dry the chain case mating surfaces.
23. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the cylinder block mating surface of the chain case (see **CAM CHAIN INSTALLATION**).

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.**

24. Apply a light coat of new engine oil around the chain case oil seal, then install the dowel pins and the chain case using a new O-ring.
25. Install the CKP sensor.
26. Install the crankshaft pulley (see **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
27. Install the oil pan (see **OIL PAN INSTALLATION**).
28. Install the idler pulley base, then install the idler pulley (see step 13).
29. Install the alternator (see **ALTERNATOR REMOVAL AND INSTALLATION**).
30. Install the auto-tensioner (see **DRIVE BELT AUTO-TENSIONER REPLACEMENT**).
31. Install the water pump pulley (see step 16).
32. Install the water bypass hose, and tighten the three bolts securing the water bypass tube (see step 17).
33. Install the cylinder head (see **CAMSHAFT GEAR INSTALLATION**).
34. Install the drive belt (see **DRIVE BELT REPLACEMENT**).
35. Install the vacuum tank (see step 20).
36. After installation, check that all tubes, hose, and connectors are installed correctly.
37. After assembly, wait at least 30 minutes before filling the engine with oil (see **OIL PRESSURE TEST**).
38. Do the battery terminal reconnection procedure (see **RECONNECTION**).
39. Inspect for fuel leaks. Turn the ignition switch ON (II) (do not operate the starter) so that 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.
40. Refill the engine with engine oil (see **OIL PRESSURE TEST**).
41. Refill the radiator with engine coolant, and bleed air from the cooling system with the heater valve open (see **COOLANT REPLACEMENT**).
42. 2000-2005 models: Do the engine control module (ECM) idle learn procedure (see **IDLE SPEED INSPECTION**).
43. 2006-09 model: Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **HDS CLEAR COMMAND**).
44. Inspect the idle speed:
 - 2000-2005 models (see **IDLE SPEED INSPECTION**)
 - 2006-09 model (see **IDLE SPEED INSPECTION**)
45. Inspect the ignition timing (see **IGNITION TIMING INSPECTION**).

CYLINDER HEAD COVER REMOVAL

1. 2000-2005 models: Disconnect the camshaft position (CMP) sensor A (top dead center (TDC) sensor 1) connector and CMP sensor B (TDC sensor 2) connector.

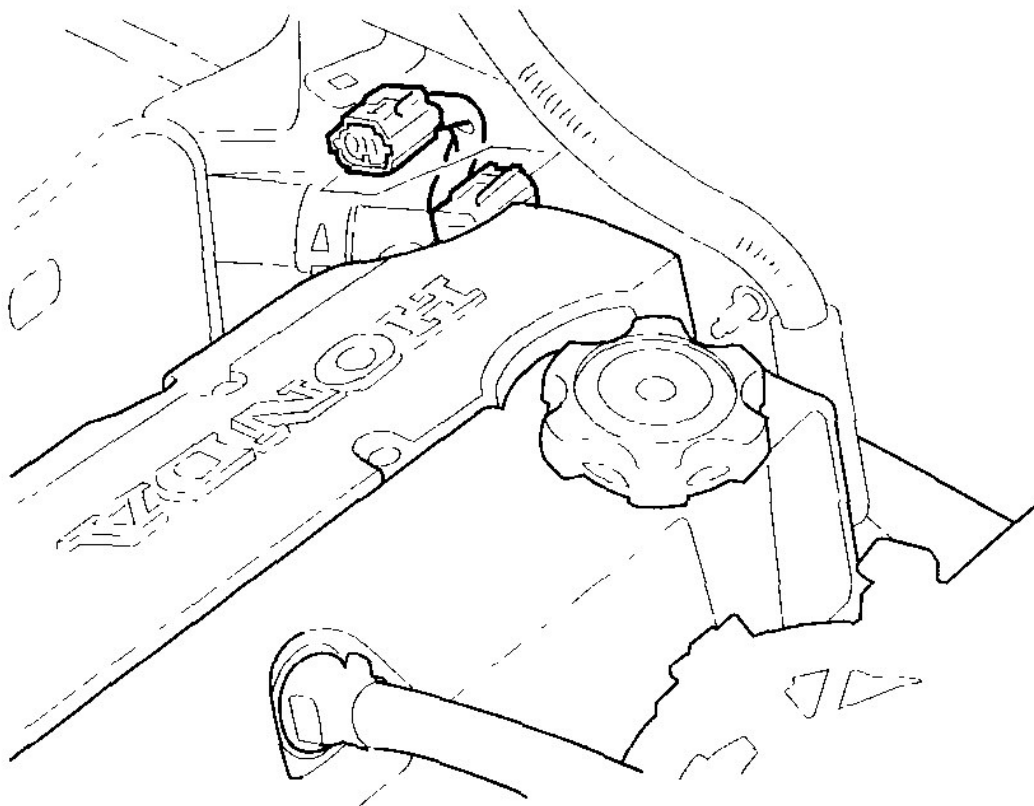


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Fig. 39: Disconnecting Camshaft Position (CMP) Sensor A Connector And CMP Sensor B Connector - 2000-2005 Models

Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. 2006-08 model: Disconnect the camshaft position (CMP) sensor connector.

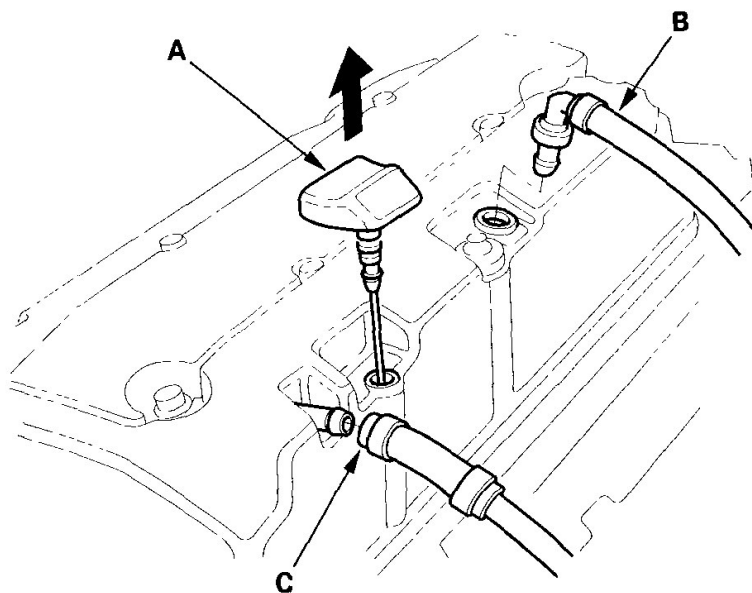


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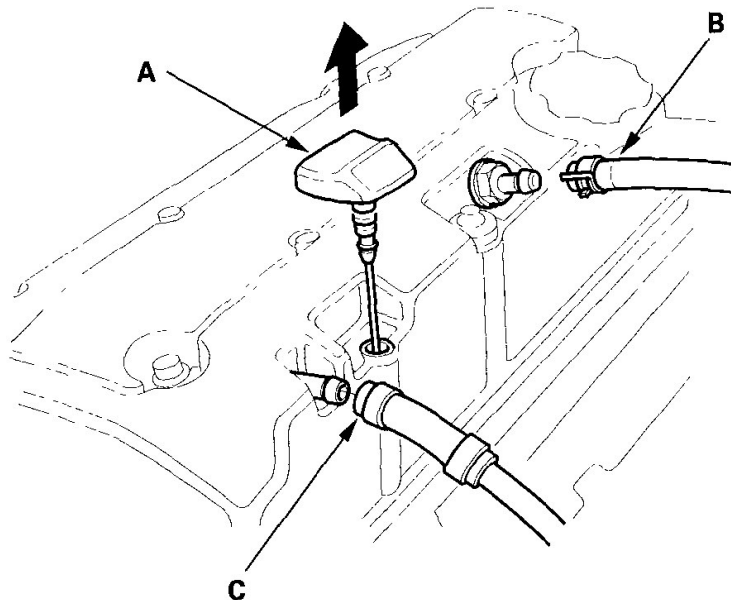
Fig. 40: Disconnecting Camshaft Position (CMP) Sensor Connector - 2006-08 Model
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove the dipstick (A), positive crankcase ventilation (PCV) hose (B), and breather hose (C).

2000-2003 models



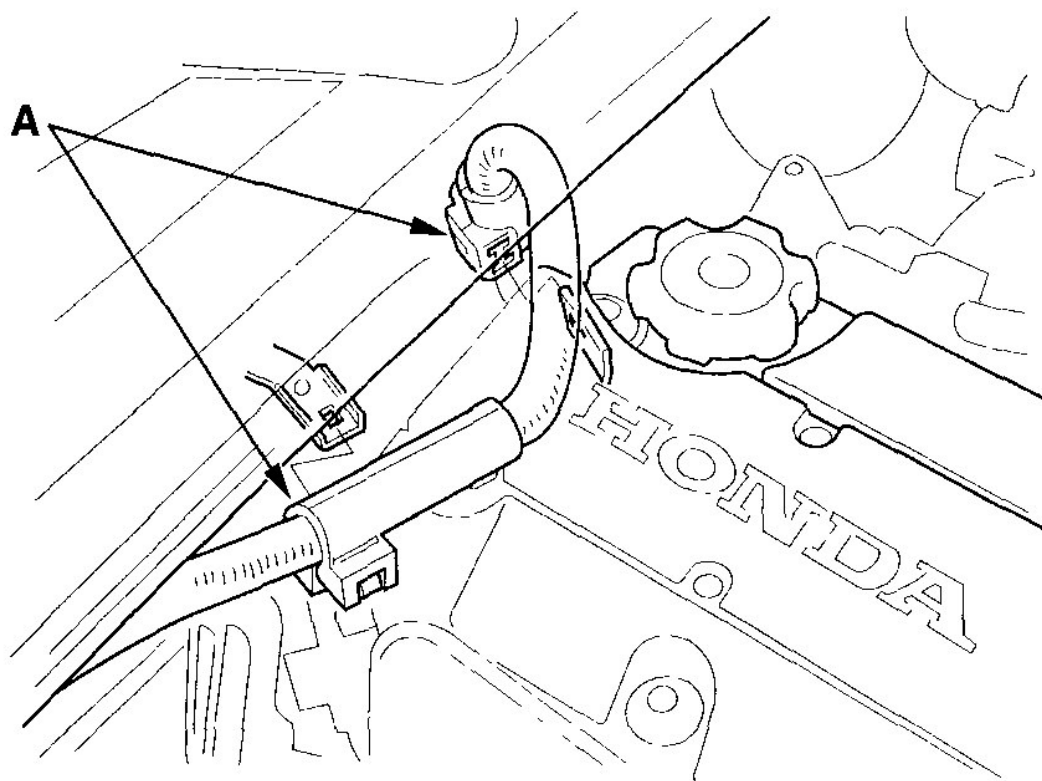
2004-2008 models



G03692294

Fig. 41: Removing Dipstick, Positive Crankcase Ventilation (PCV) Hose And Breather Hose
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the harness clamps (A).

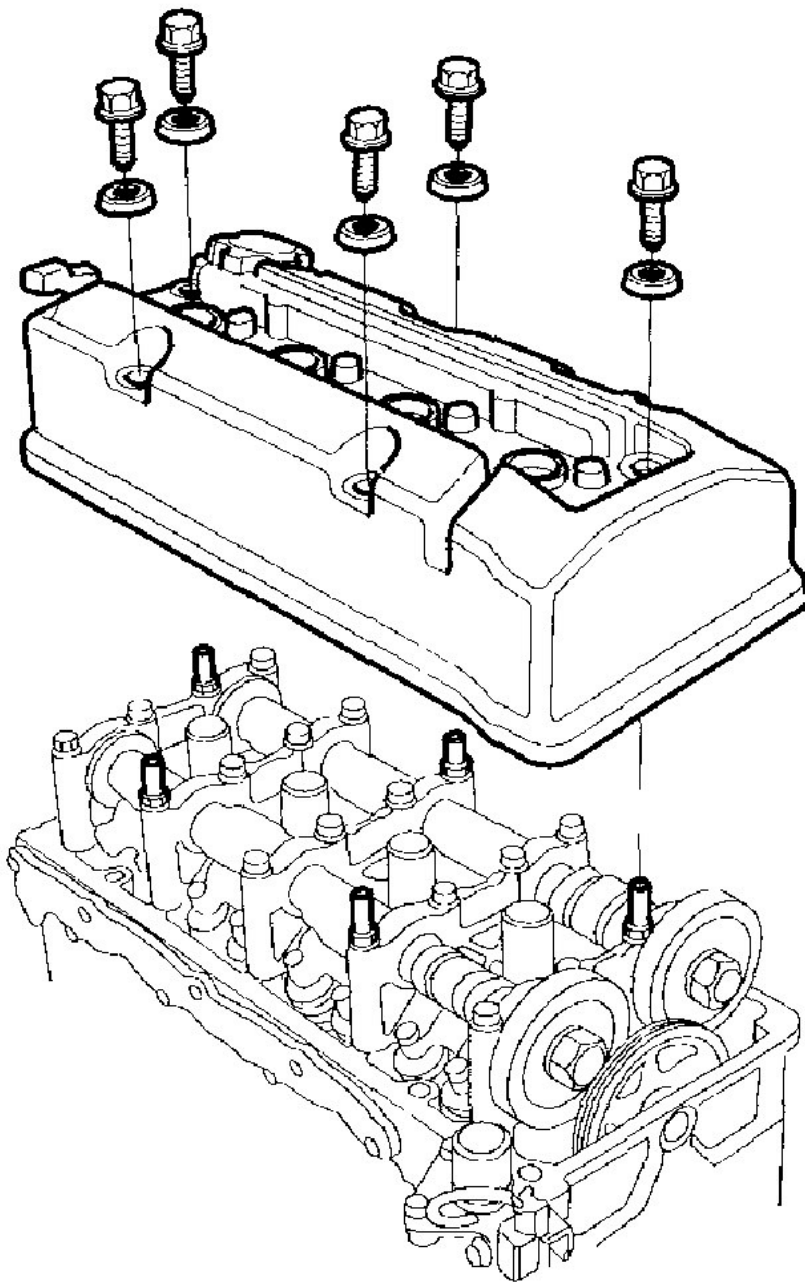


G03692295

Fig. 42: Removing Harness Clamps

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Remove the ignition coil (see IGNITION COIL REMOVAL/INSTALLATION).
6. Remove the cylinder head cover.



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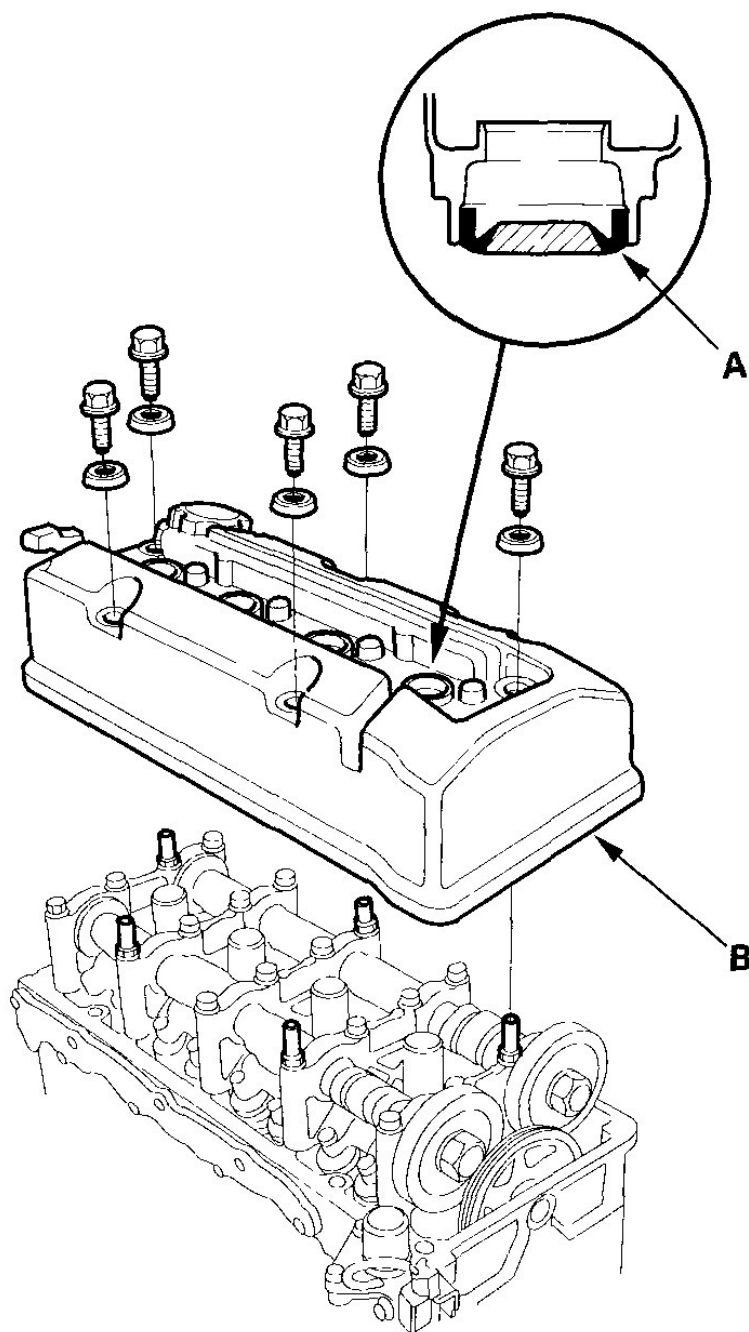
Fig. 43: Removing Cylinder Head Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER HEAD COVER INSTALLATION

1. Thoroughly clean the head cover gasket and the groove.
2. Install the head cover gasket in the groove of the cylinder head cover.
3. Set the spark plug seal (A) on the spark plug tube. Install the cylinder head cover (B) on the cylinder head.

NOTE:

- **Take care not to damage the spark plug seals when installing the cylinder head cover.**
- **Visually inspect the spark plug seals for damage.**

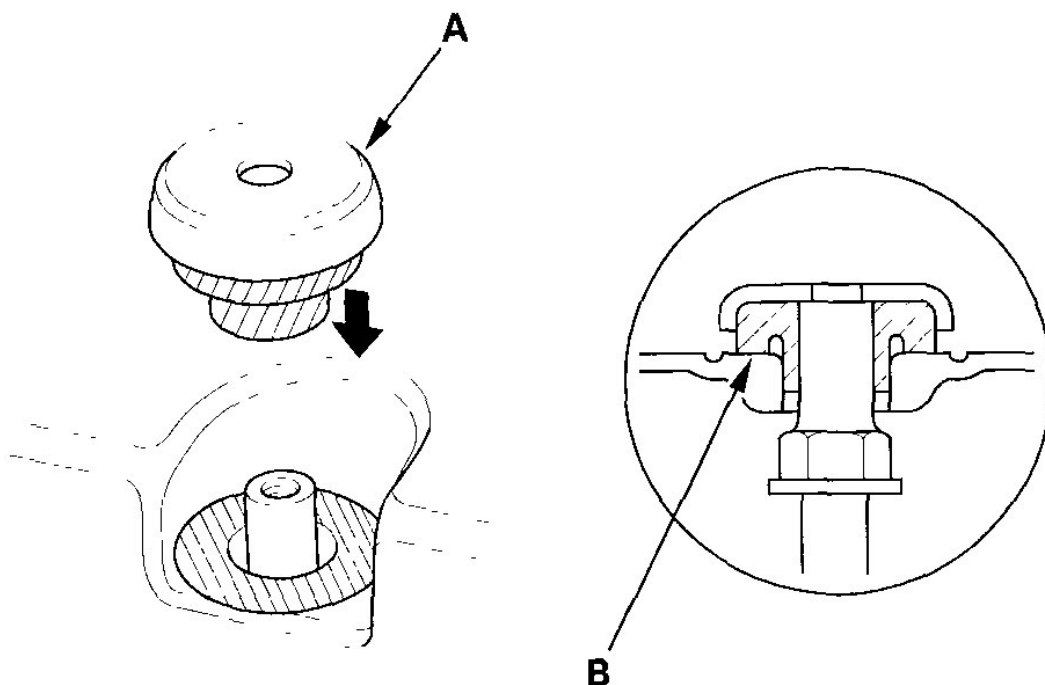


G03692297

Fig. 44: Setting Spark Plug Seal On Spark Plug Tube
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Inspect the cylinder head cover washers. Replace any washers and rubber seals that are damaged or deteriorated.

5. Clean the washer mating surfaces of the cylinder head cover.
6. Install the head cover washers (A).

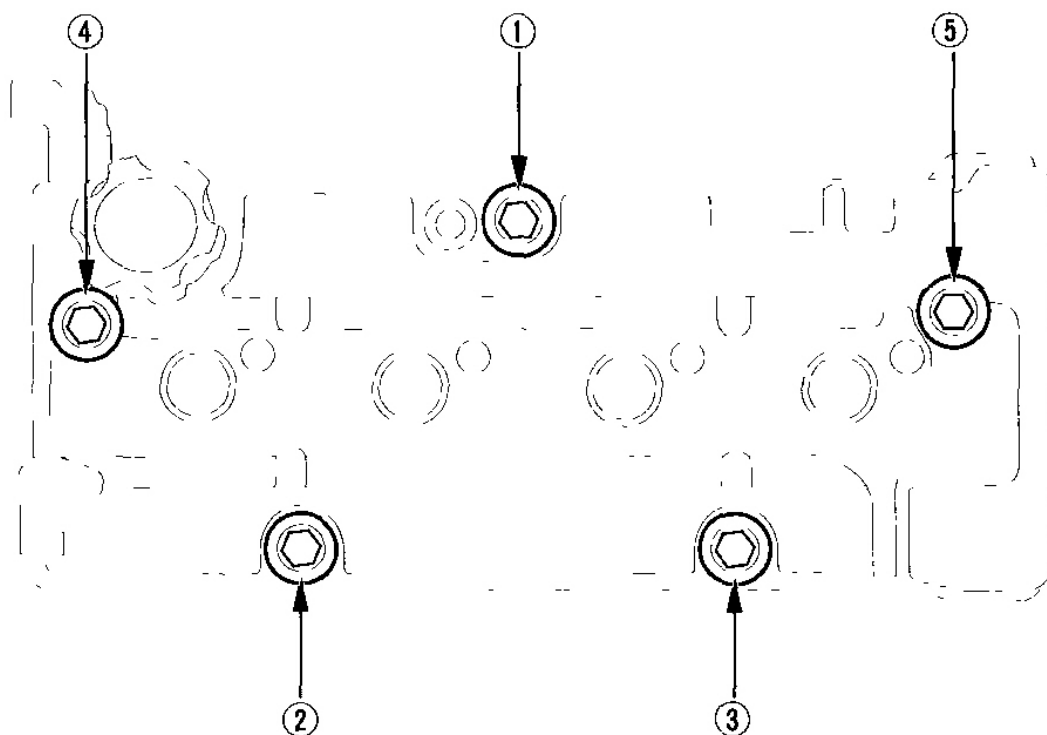


G03692298

Fig. 45: Installing Head Cover Washers

Courtesy of AMERICAN HONDA MOTOR CO., INC.

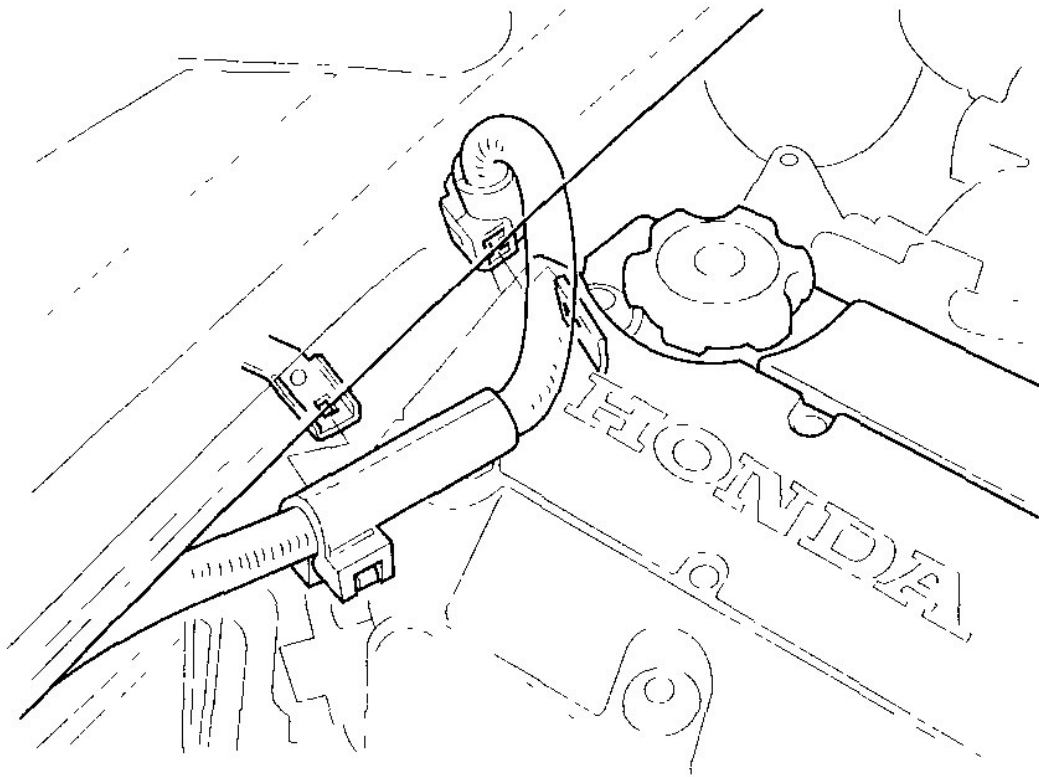
7. Make sure the rubber seals (B) are securely seated on the cylinder head cover.
8. Tighten the bolts in two or three steps. In the final step, tighten all bolts, in sequence, to 12 N.m (1.2 kgf.m, 8.7 lbf.ft).



G03692299

Fig. 46: Identifying Tightening Sequence Of Cylinder Head Cover Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Install the ignition coil (see **IGNITION COIL REMOVAL/INSTALLATION**).
10. Install the harness clams (A).



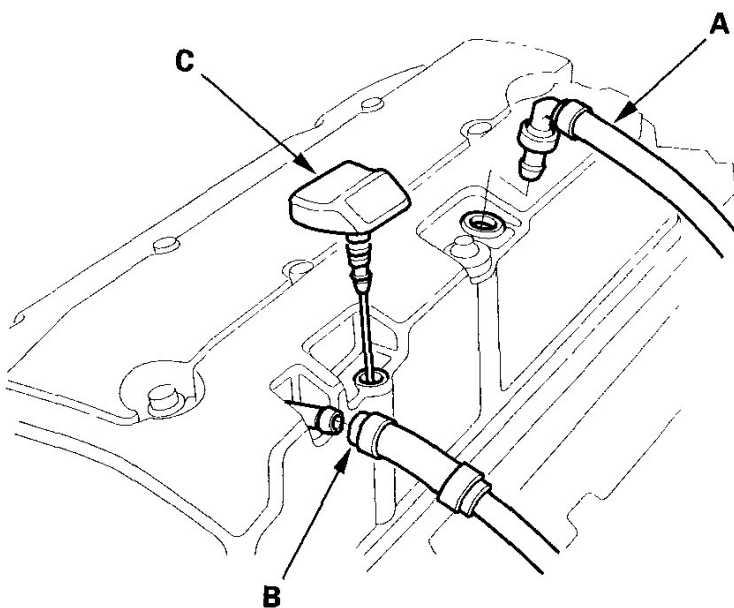
G03692300

Fig. 47: Installing Harness Clamps

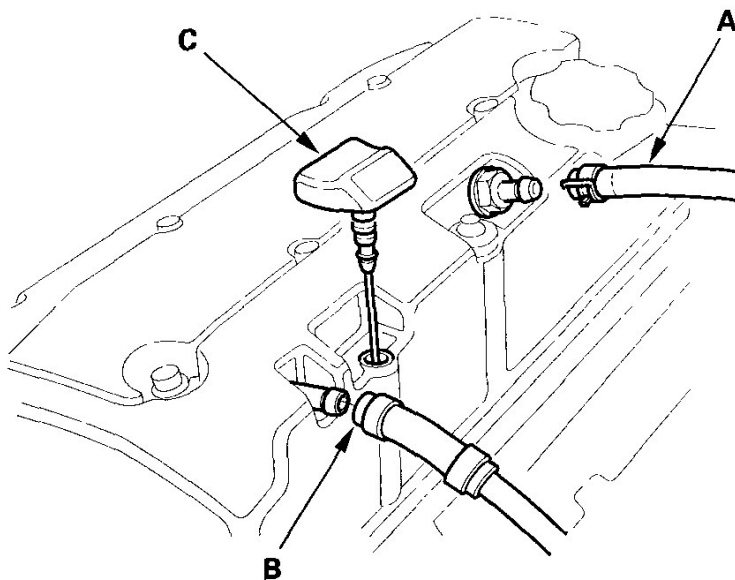
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Install the positive crankcase ventilation (PCV) hose (A) and breather hose (B), then insert the dipstick (C).

2000-2003 models



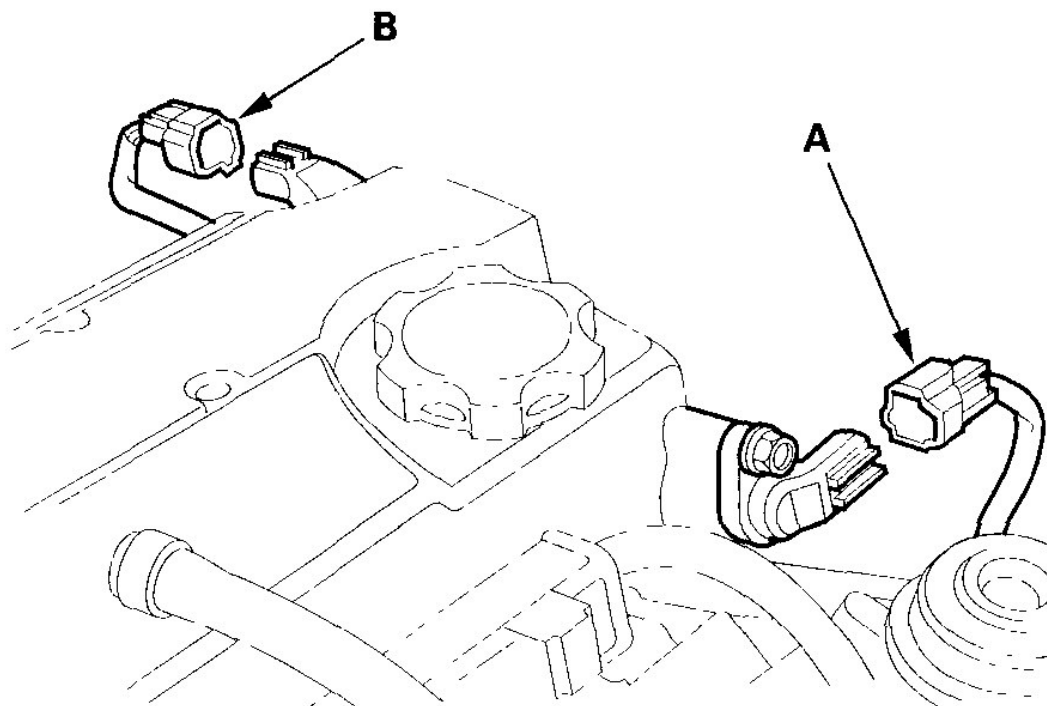
2004-2008 models



G03692301

Fig. 48: Installing Positive Crankcase Ventilation (PCV) Hose, Breather Hose And Dipstick
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. 2000-2005 models: Connect the camshaft position (CMP) sensor A (top dead center (TDC) sensor 1) connector and CMP sensor B (TDC sensor 2) connector.

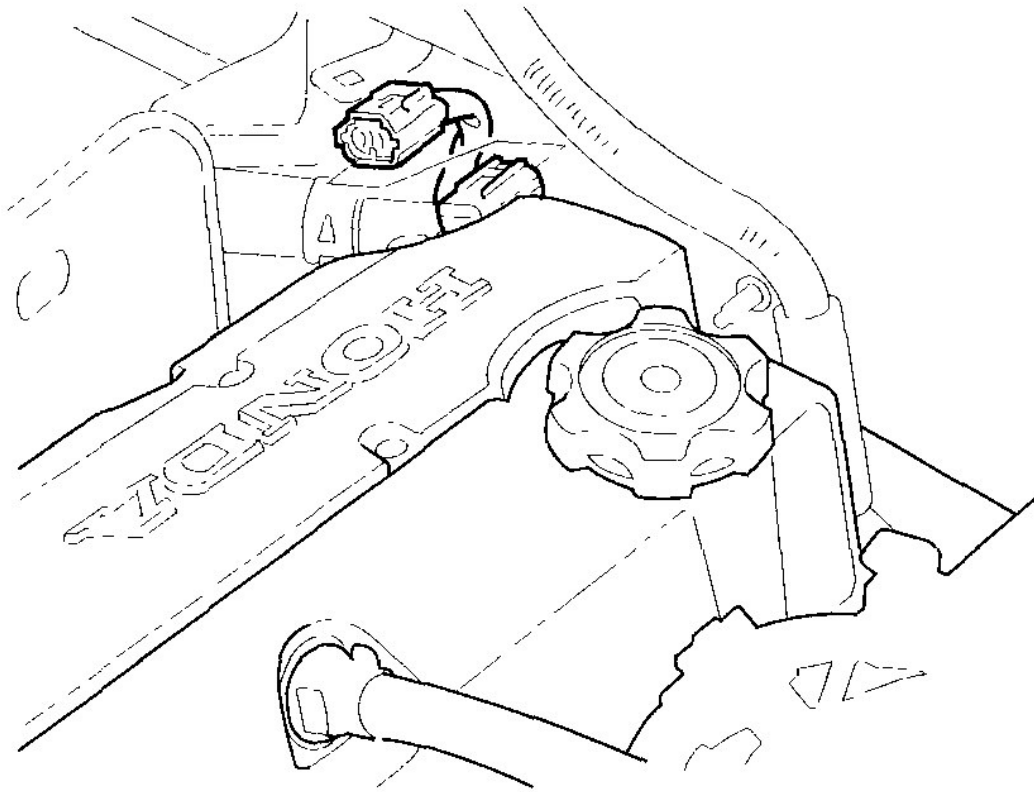


G03692302

Fig. 49: Connecting Camshaft Position (CMP) Sensor A Connector And CMP Sensor B Connector - 2000-2005 Models

Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. 2006-09 model: Connect the camshaft position (CMP) sensor connector.



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Fig. 50: Connecting Camshaft Position (CMP) Sensor Connector - 2006-08 Model
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER HEAD REMOVAL

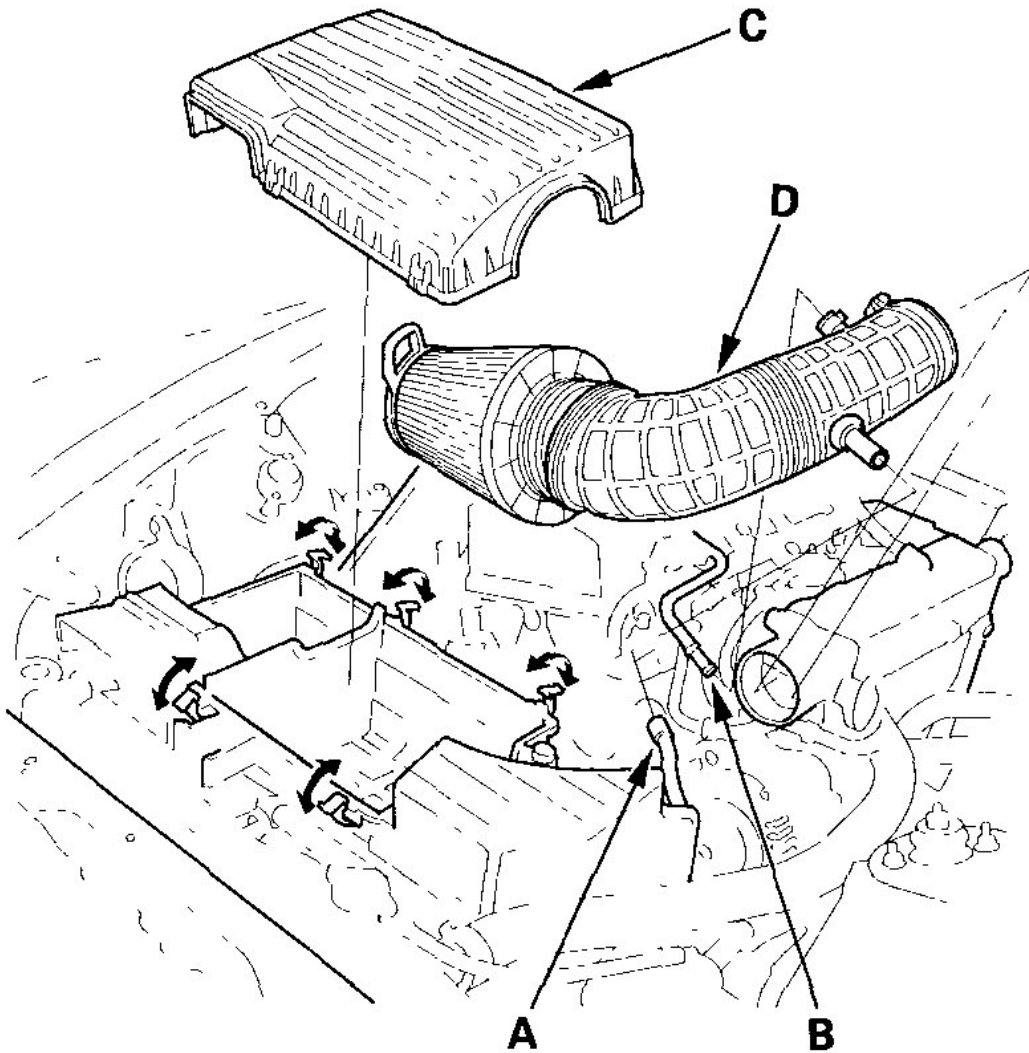
NOTE:

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

1. Relieve fuel pressure:

- 2000-2005 models (see **FUEL PRESSURE RELIEVING**)
- 2006-08 model (see **FUEL PRESSURE RELIEVING**)

2. Do the battery terminal disconnection procedure (see **DISCONNECTION**).
3. Drain the engine coolant (see **COOLANT REPLACEMENT**).
4. Drain the engine oil (see **OIL PRESSURE TEST**).
5. 2000-2005 models: Disconnect the air hose (A) and breather pipe (B), then remove the air cleaner housing cover (C) and air cleaner assembly (D).

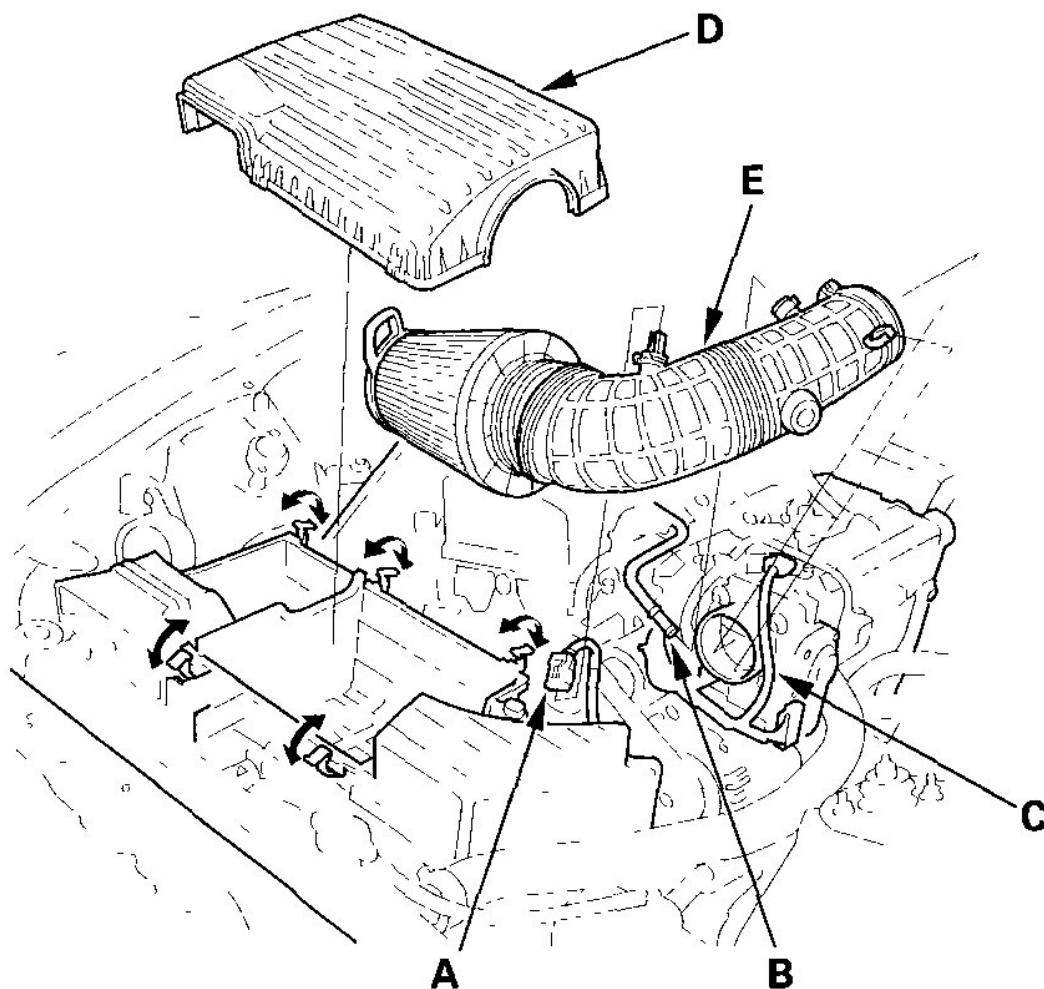


G03692304

Fig. 51: Removing Air Cleaner Housing Cover And Air Cleaner Assembly - 2000-2005 Models
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. 2006-09 model: Disconnect the intake air temperature (IAT) sensor connector (A) and breather pipe (B),

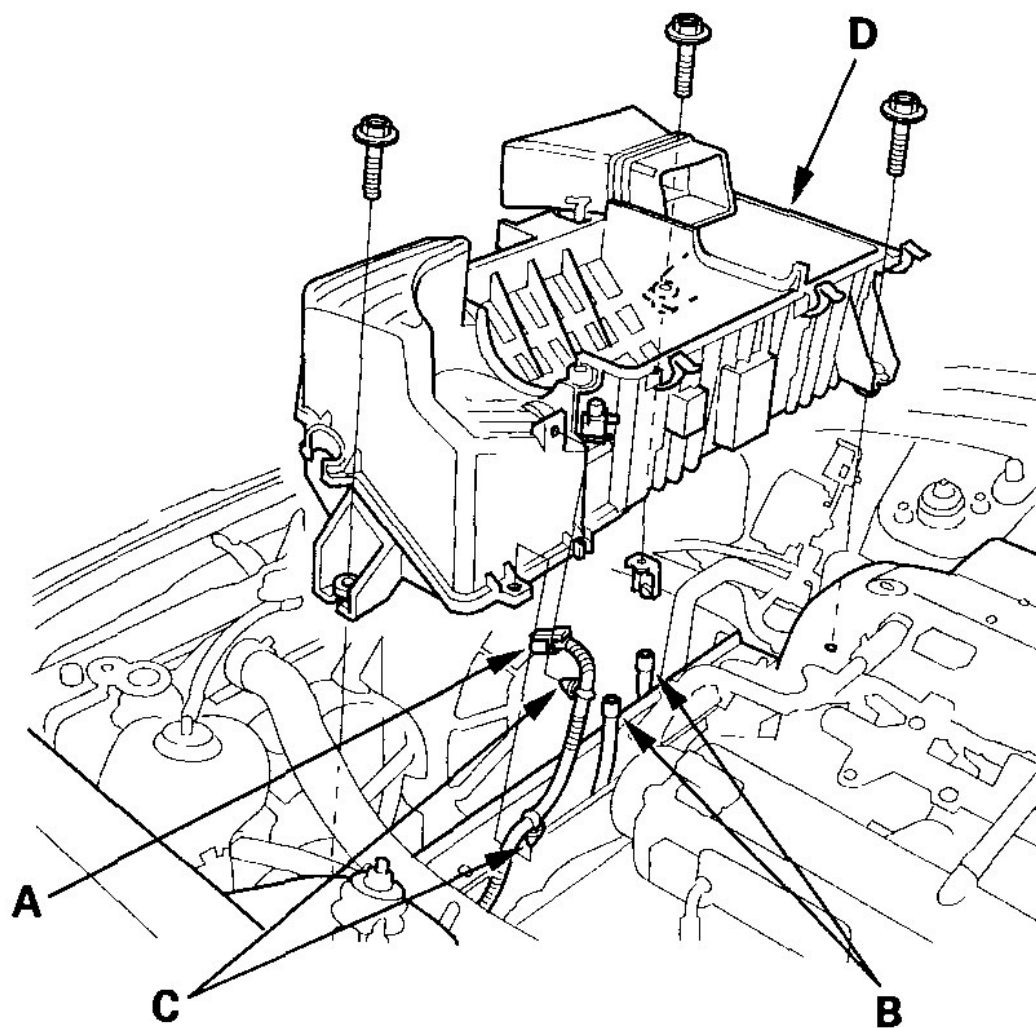
remove the manifold absolute pressure (MAP) sensor harness (C) from the holder, then remove the air cleaner housing cover (D) and air cleaner assembly (E).



G03692305

Fig. 52: Removing Air Cleaner Housing Cover And Air Cleaner Assembly - 2006-08 Model
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. 2000-2005 models: Disconnect the air control solenoid valve connector (A) and vacuum hoses (B), remove the harness clamps (C), then remove the intake air cleaner housing (D).

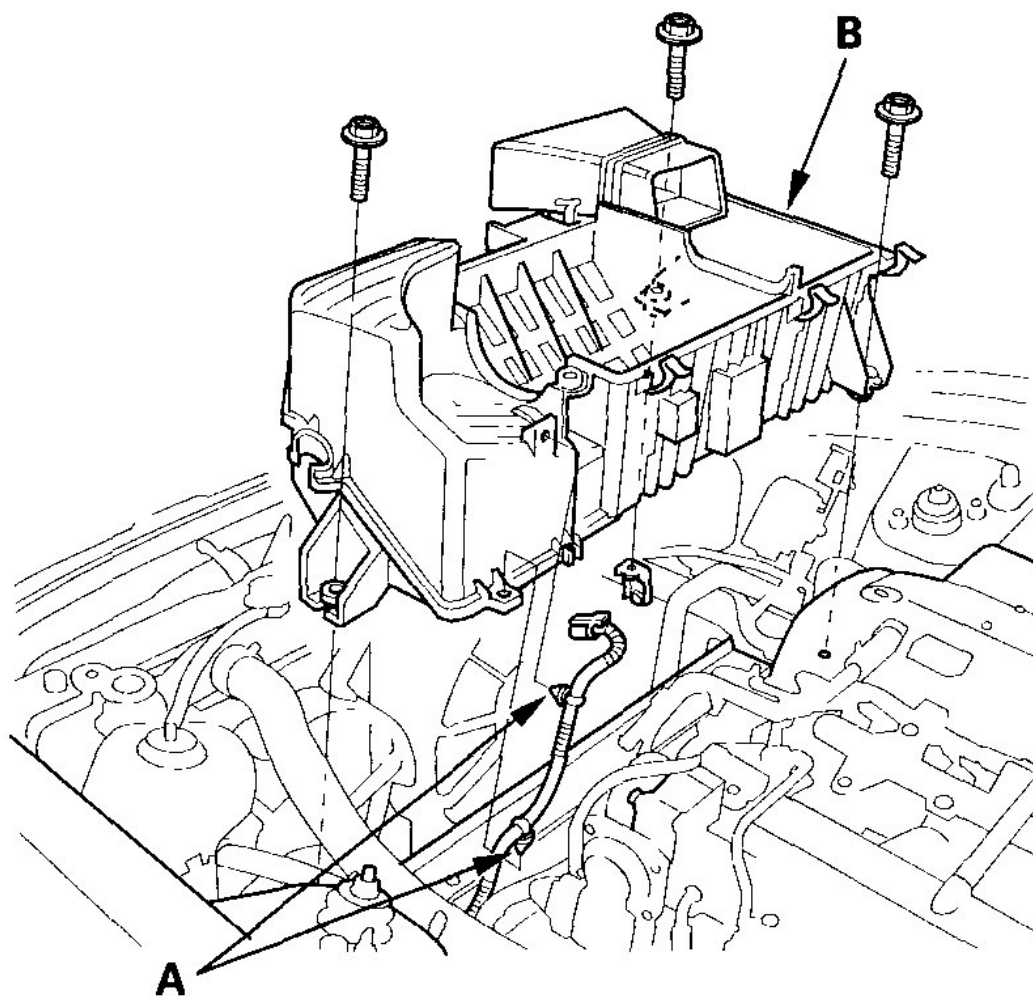


G03692306

Fig. 53: Removing Air Control Solenoid Valve Connector, Vacuum Hoses And Intake Air Cleaner Housing - 2000-2005 Models

Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. 2006-09 model: Remove the IAT sensor harness clamps (A), then remove the intake air cleaner housing (B).

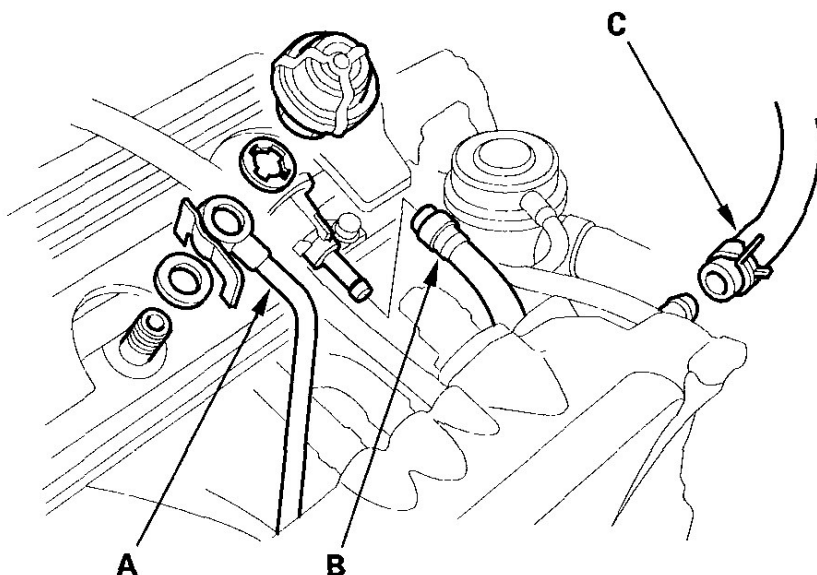


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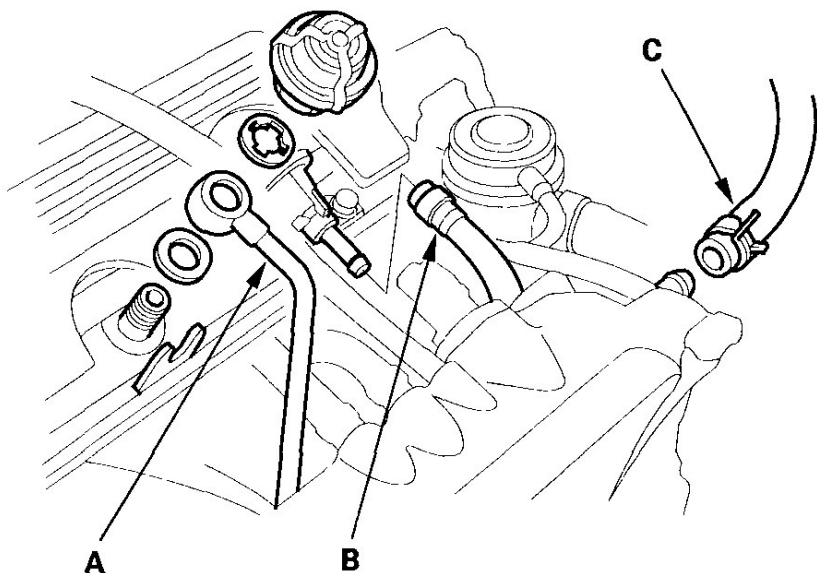
Fig. 54: Removing IAT Sensor Harness Clamps And Intake Air Cleaner Housing - 2006-08 Model
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Remove the drive belt (see **DRIVE BELT REPLACEMENT**).
10. 2000-2005 models: Remove the throttle cable.
11. 2000-2005 models: Remove the fuel feed hose (A), fuel return hose (B), and brake booster vacuum hose (C).

2000-2003 models



2004-2005 models

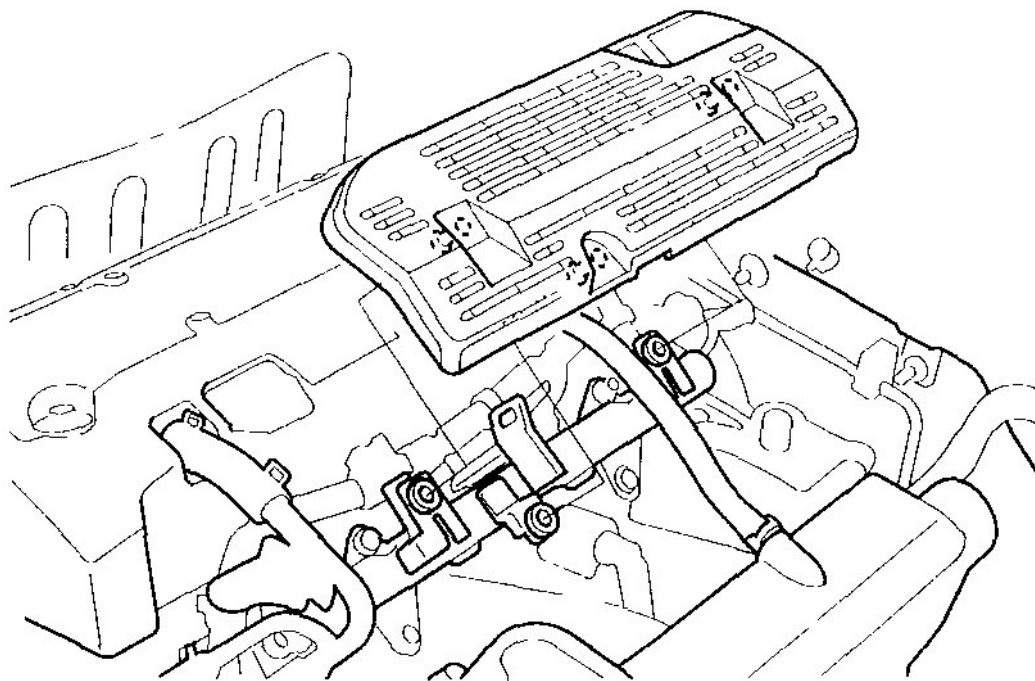


G03692308

Fig. 55: Removing Fuel Feed Hose, Fuel Return Hose And Brake Booster Vacuum Hose (2000-2005 Models)

Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. 2006-09 model: Remove the intake manifold cover.



G03692309

Fig. 56: Removing Intake Manifold Cover - 2006-08 Model
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. 2006-09 model: Remove the quick-connect fitting cover (A), then disconnect the fuel feed hose (B) and brake booster vacuum hose (C).

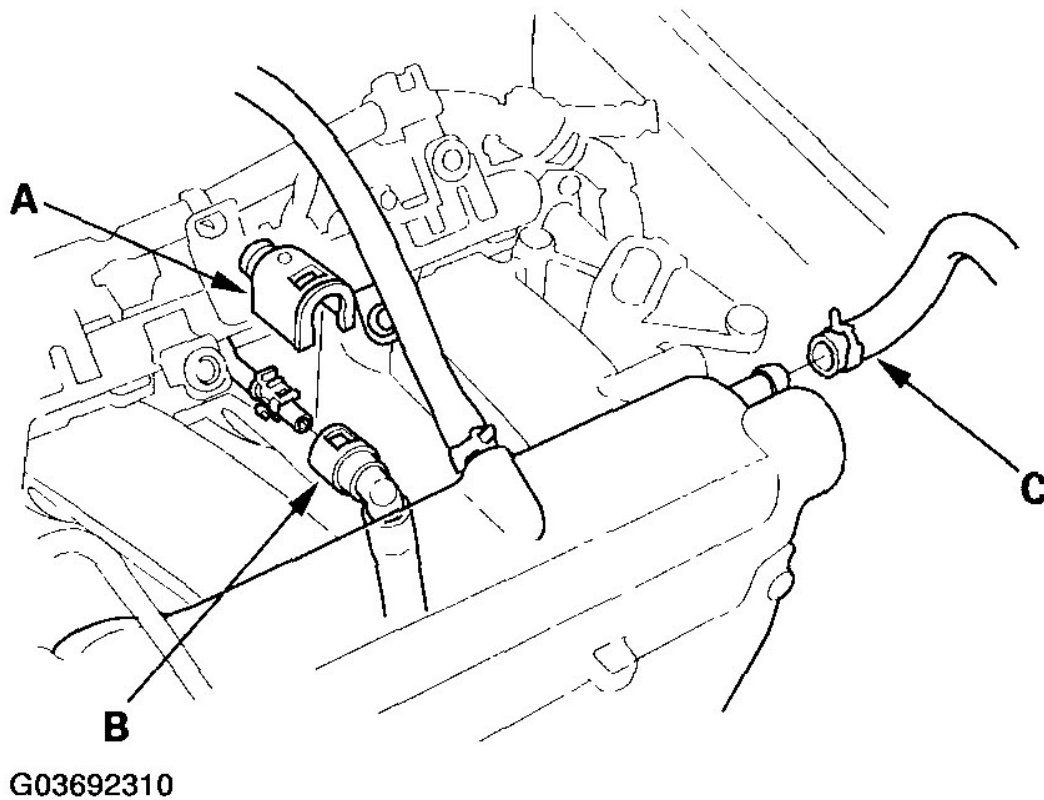
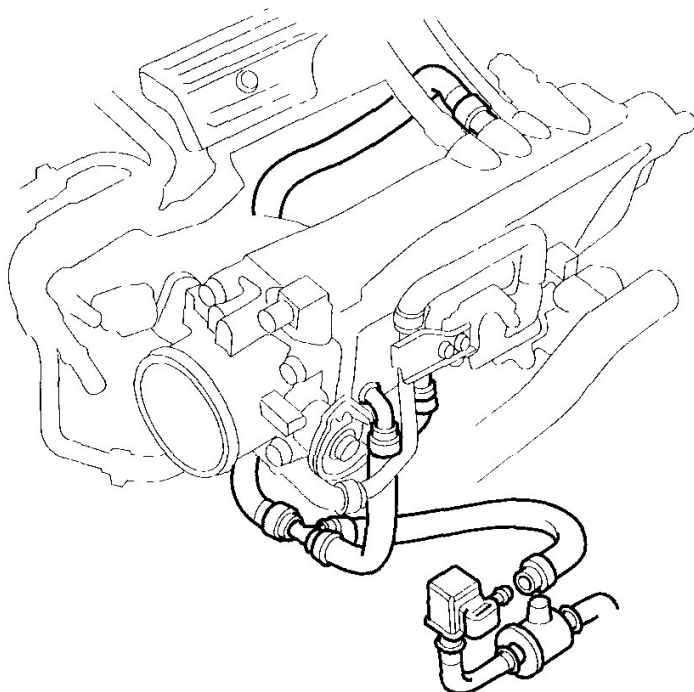


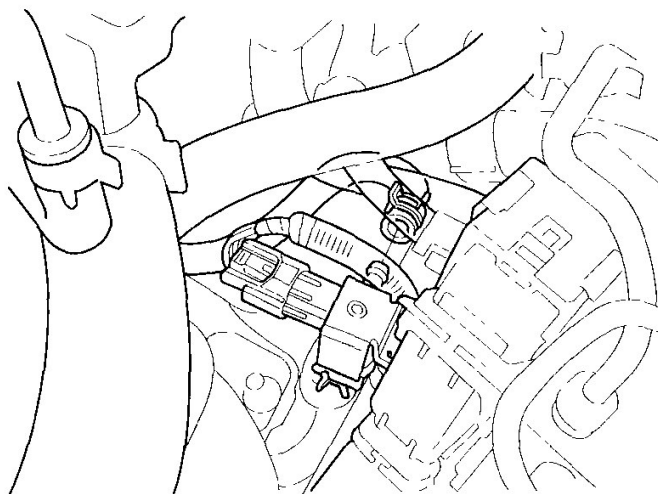
Fig. 57: Disconnecting Fuel Feed Hose And Brake Booster Vacuum Hose - 2006-08 Model
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Disconnect the evaporative emission (EVAP) canister hose.

2000-2005 models



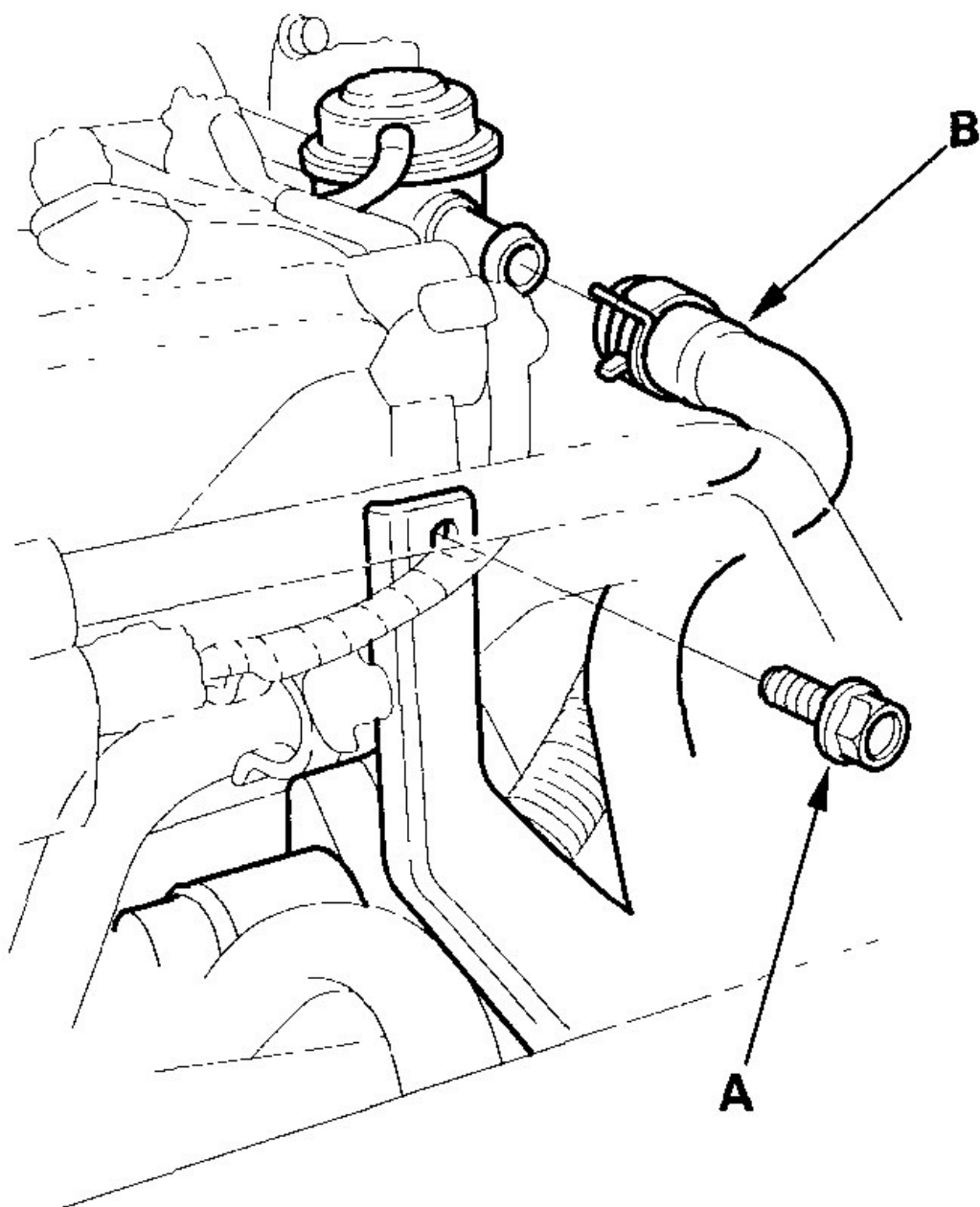
2006-2009 models



G03692311

Fig. 58: Disconnecting Evaporative Emission (EVAP) Canister Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

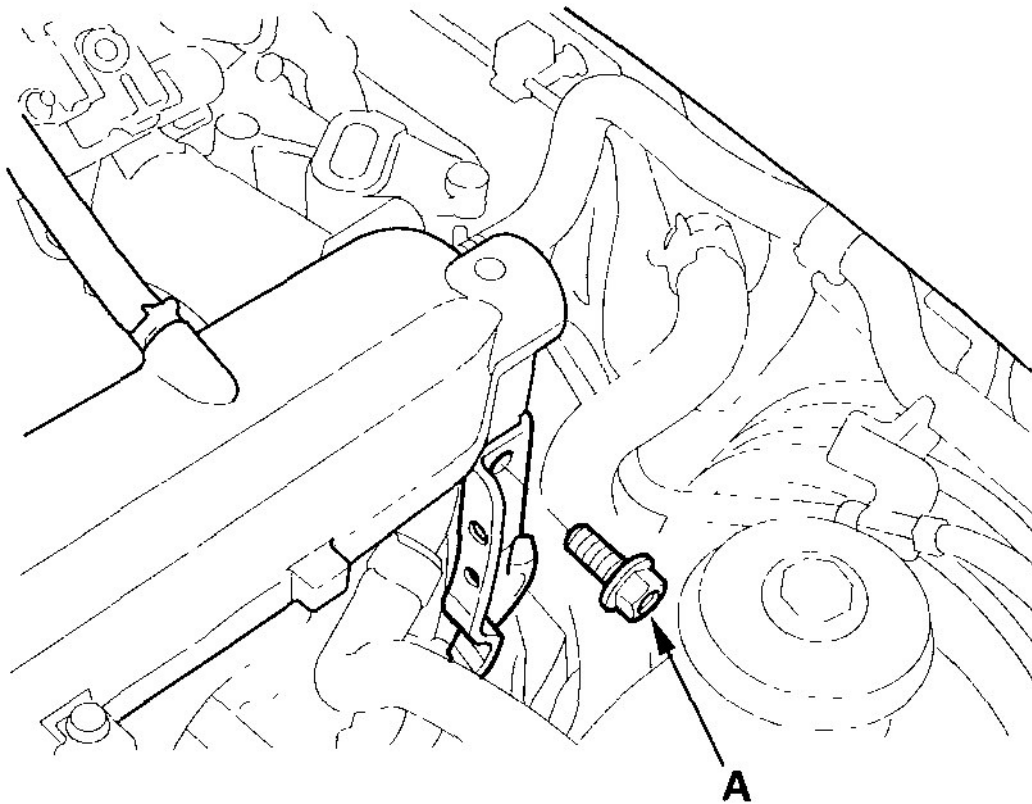
15. 2000-2005 models: Remove the bolt (A) securing the intake manifold bracket, and remove the air hose (B).



G03692312

Fig. 59: Removing Intake Manifold Bracket And Air Hose (2000-2005 Models)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

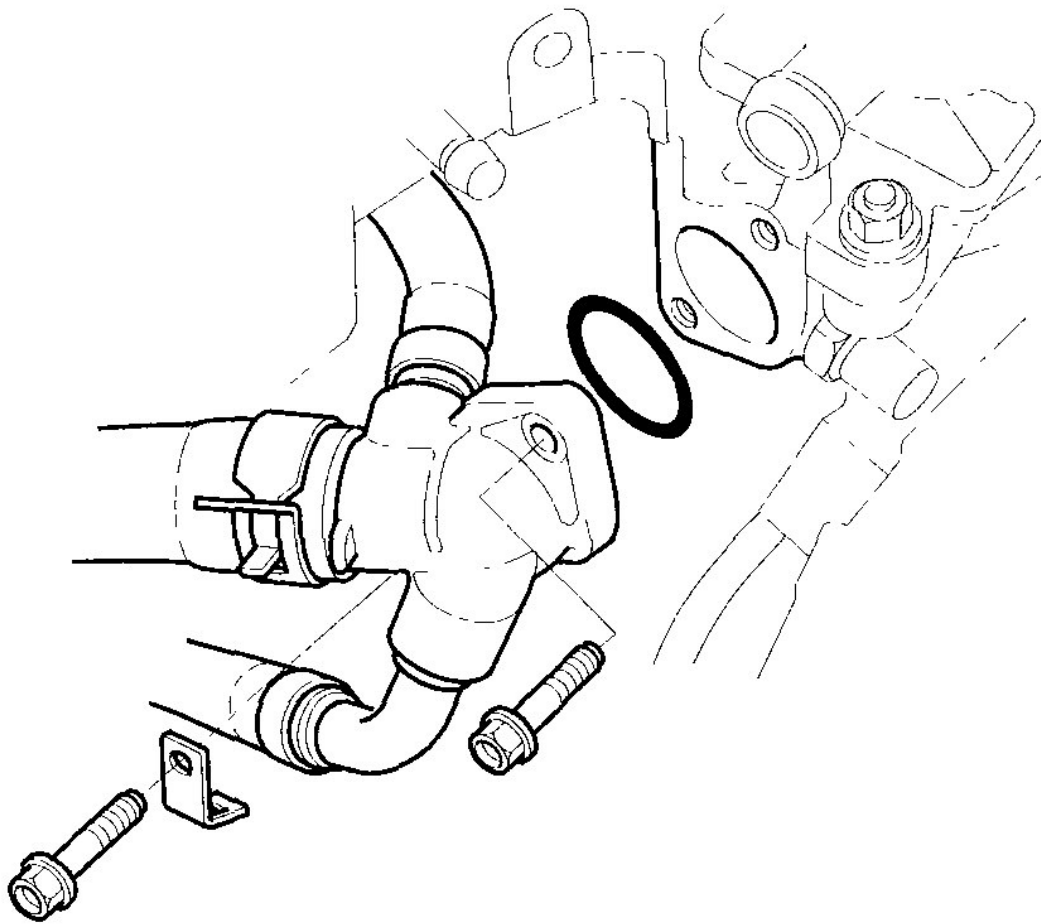
16. 2006-08 model: Remove the bolt (A) securing the intake manifold bracket.



G03692313

Fig. 60: Removing Intake Manifold Bracket - 2006-08 Model
Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Remove the water outlet cover.



G03692314

Fig. 61: Removing Water Outlet Cover

Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Remove the engine wire harness connectors and wire harness clamps from the cylinder head and intake manifold.
 - Four fuel injector connectors
 - Intake air temperature (IAT) sensor connector (2000-2005 models)
 - Idle air control (IAC) valve connector (2000-2005 models)
 - Throttle position (TP) sensor connector (2000-2005 models)
 - Throttle body connector (2006-08 model)
 - Manifold absolute pressure (MAP) sensor connector
 - Primary heated oxygen sensor (primary HO2S) connector (2000-2005 models)
 - A/F sensor connector (2006-08 model)

- Engine coolant temperature (ECT) sensor connector (2000-2005 models)
- Engine coolant temperature (ECT) sensor 1 connector (2006-08 model)
- Rocker arm oil control solenoid (VTEC solenoid valve) connector
- Rocker arm oil pressure switch (VTEC oil pressure switch) connector
- Crankshaft position (CKP) sensor connector

19. 2000-2005 models: Remove two bolts (A) securing the intake manifold bracket, and remove the water bypass hose (B).

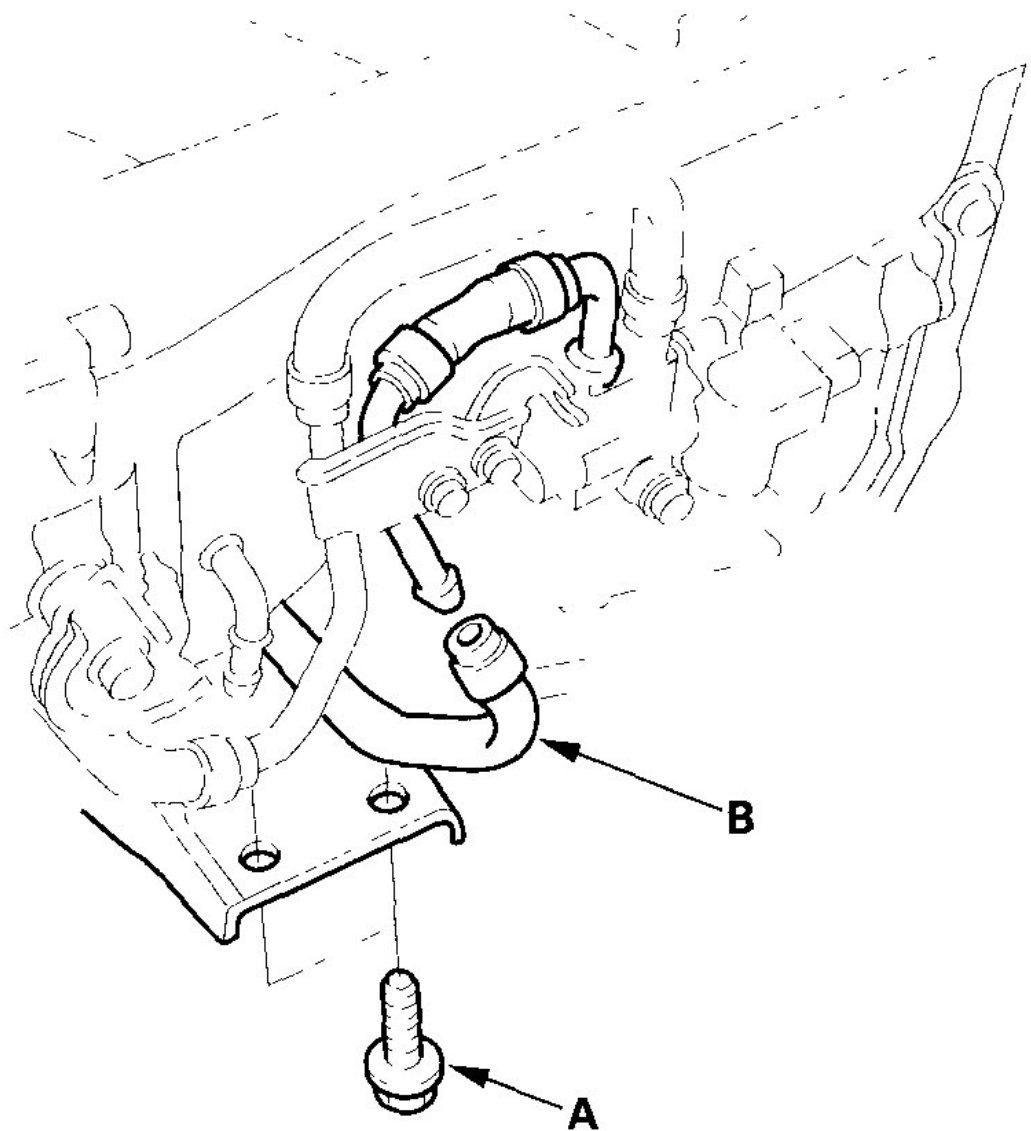
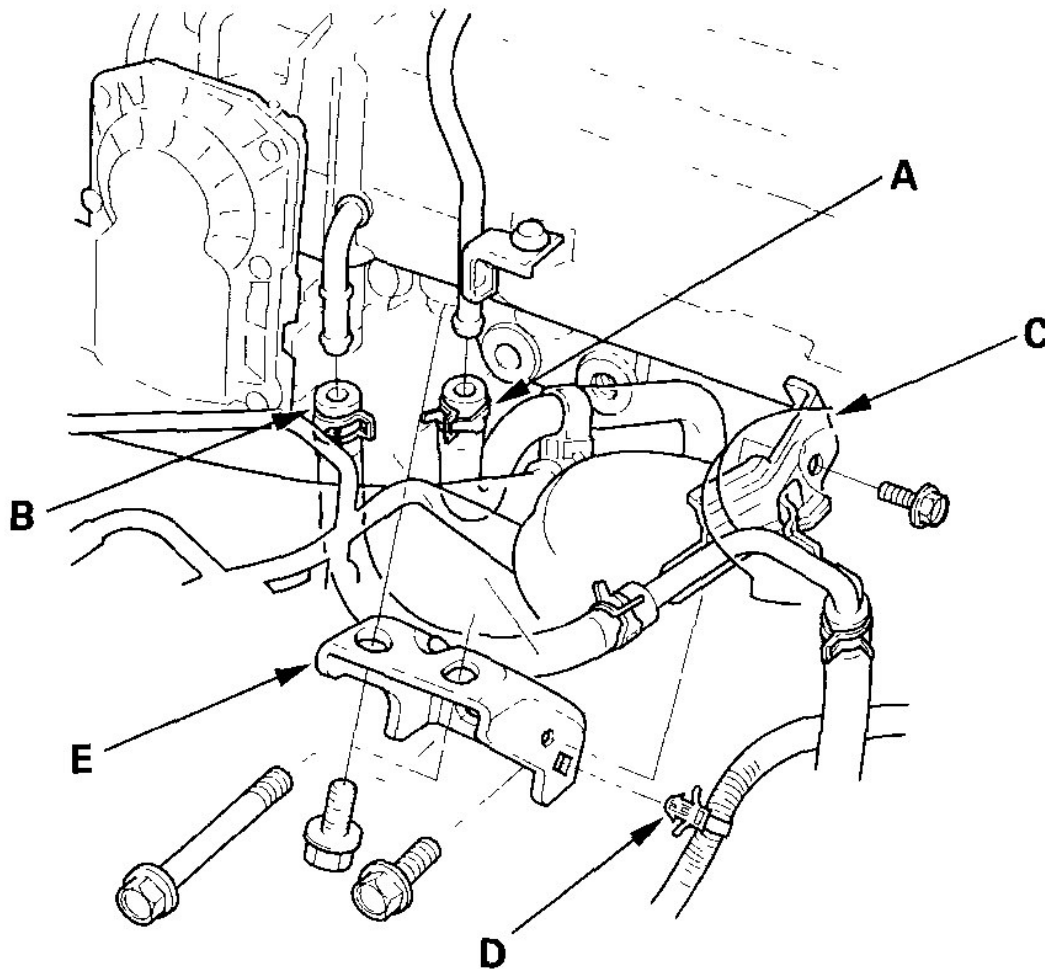
**G03692315**

Fig. 62: Removing Intake Manifold Bracket And Water Bypass Hose (2000-2005 Models)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

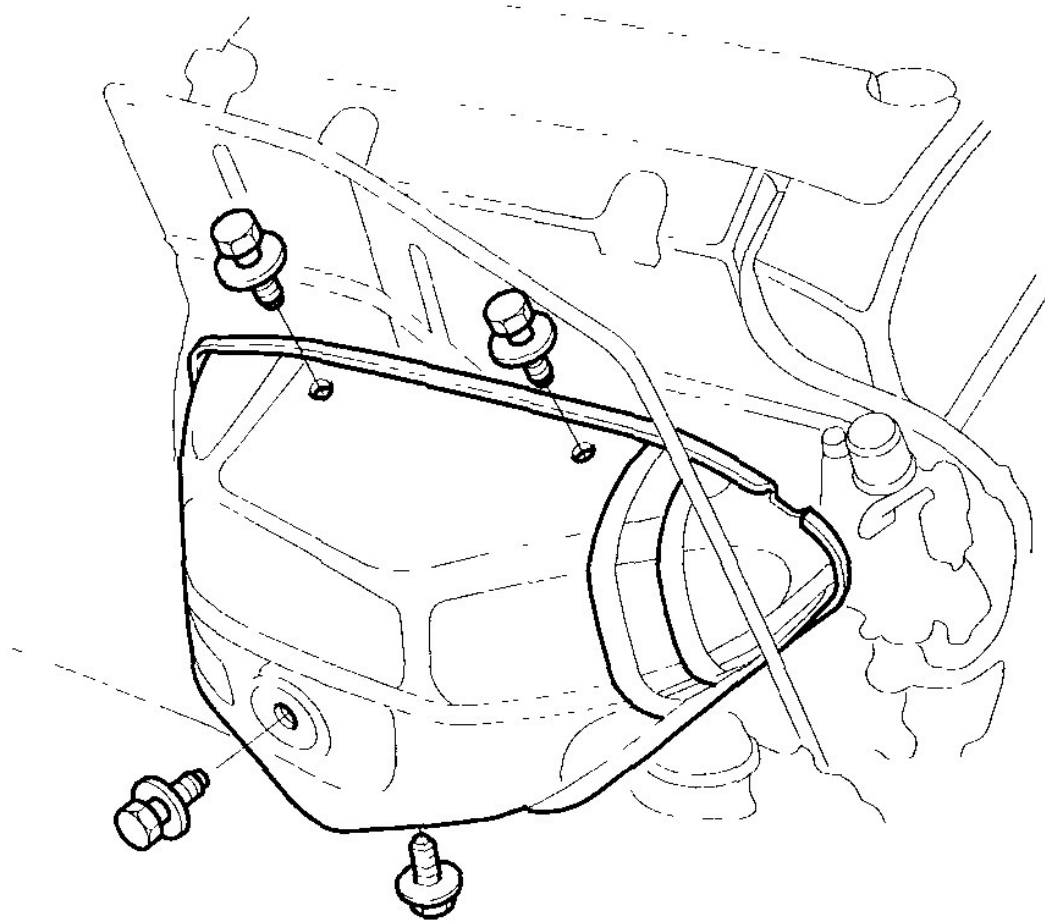
20. 2006-09 model: Remove the water bypass hose (A), remove the EVAP hose (B) and its bracket (C), remove wire harness clamp (D), then remove the intake manifold bracket (E).



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Fig. 63: Removing Water Bypass Hose, EVAP Hose And Intake Manifold Bracket (2006-08 Model)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

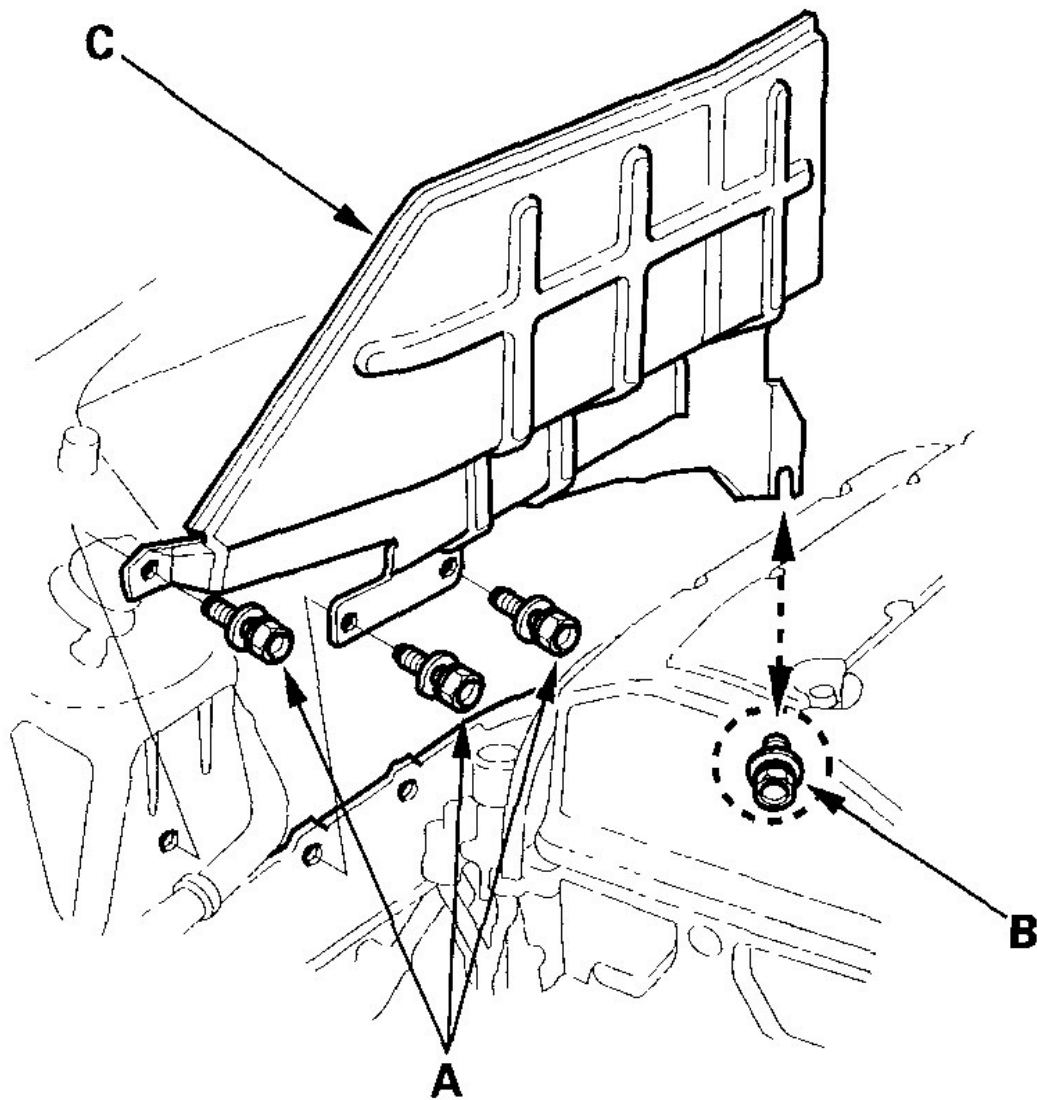
21. Remove the four bolts securing the exhaust manifold cover.



G03692317

Fig. 64: Removing Bolts Securing Exhaust Manifold Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

22. Remove the three bolts (A), and loosen the bolt (B), then remove the heat shield (C).

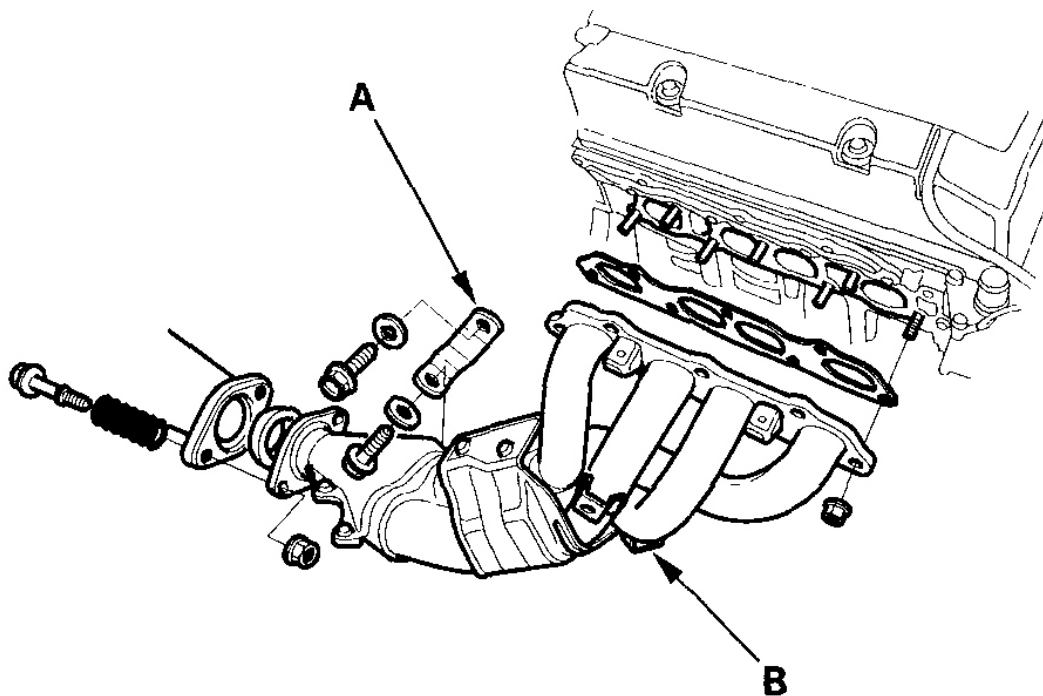


G03692318

Fig. 65: Removing Heat Shield

Courtesy of AMERICAN HONDA MOTOR CO., INC.

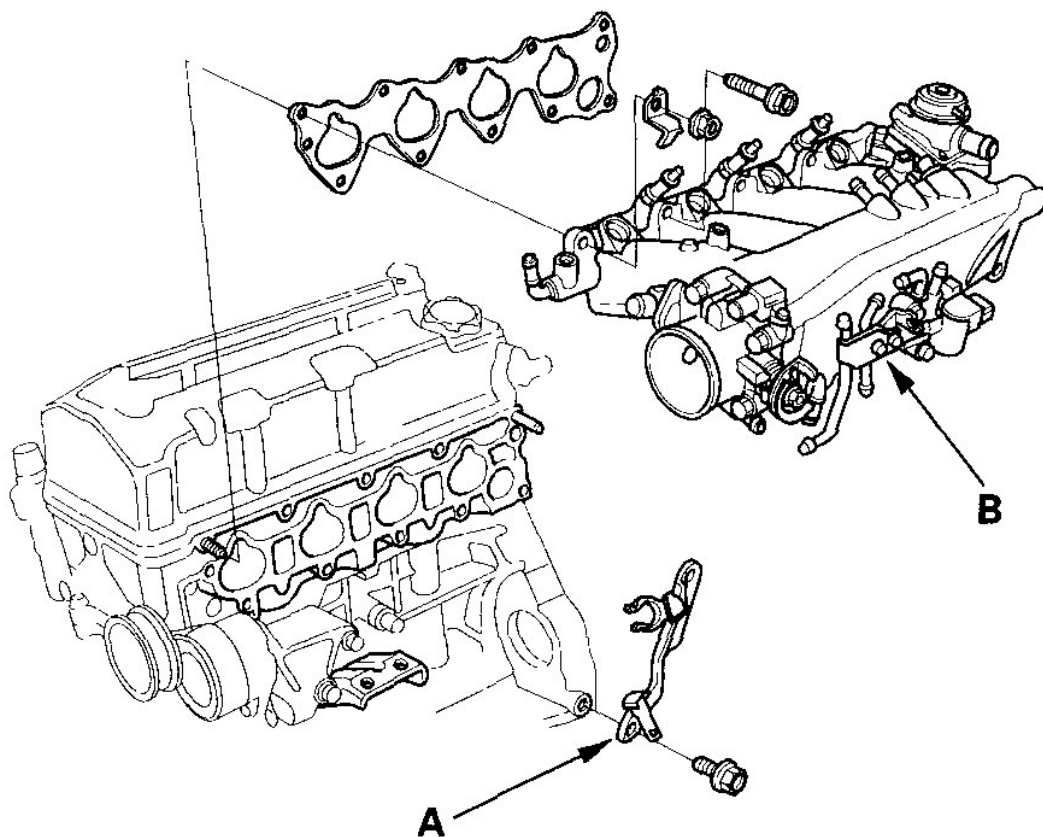
23. Remove the exhaust manifold cover, then remove the exhaust manifold bracket (A) and the exhaust manifold (B).



G03692319

Fig. 66: Removing Exhaust Manifold Bracket And Exhaust Manifold
Courtesy of AMERICAN HONDA MOTOR CO., INC.

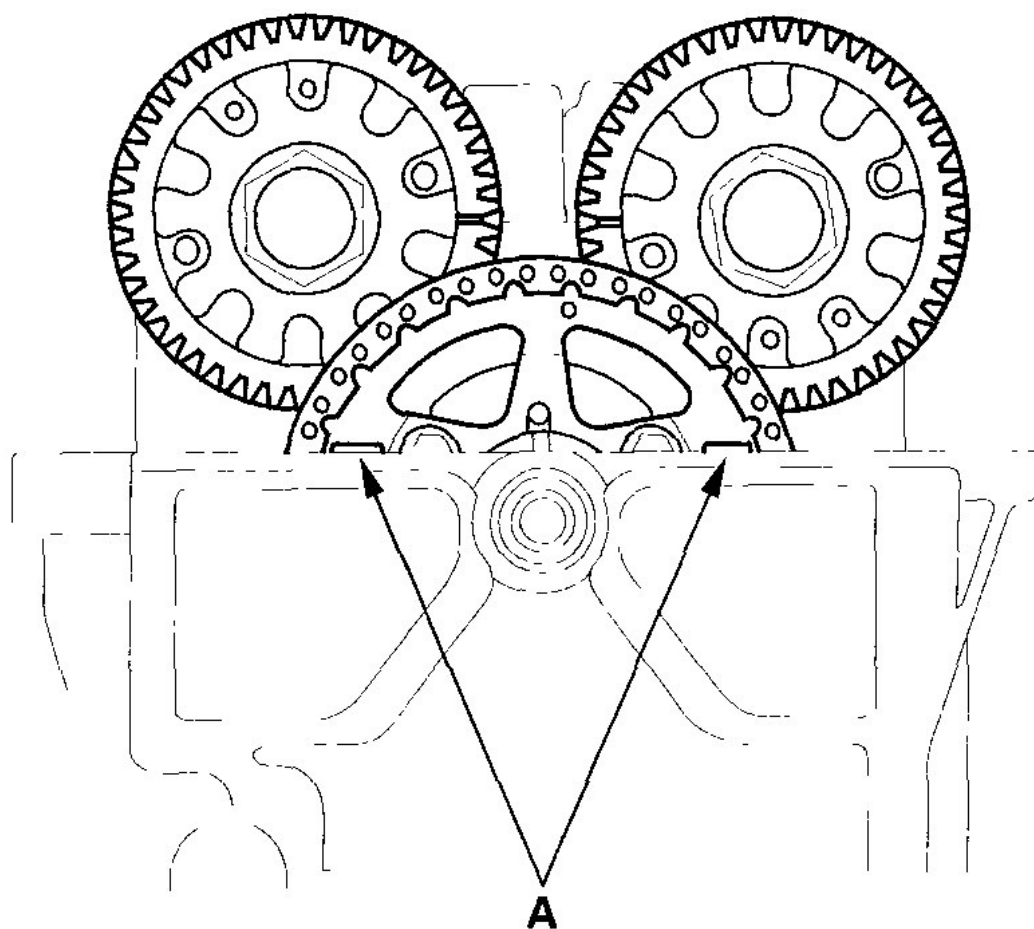
24. 2000-2005 models: Remove the injectors (see **INJECTOR REPLACEMENT**).
25. Remove the intake manifold stay (A) and the intake manifold (B).



G03692320

Fig. 67: Removing Intake Manifold Stay And Intake Manifold
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

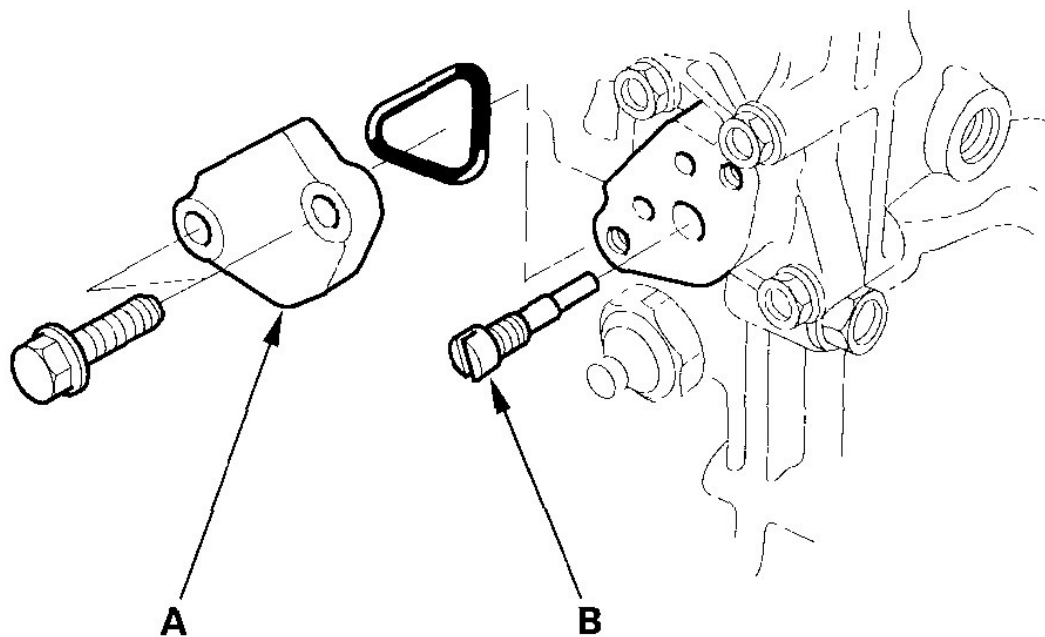
26. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
27. Set the No. 1 piston at top dead center (TDC). The TDC marks (A) on the cam chain sprocket should align with the cylinder head surface.



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Fig. 68: Aligning TDC Marks On Cam Chain Sprocket With Cylinder Head Surface
Courtesy of AMERICAN HONDA MOTOR CO., INC.

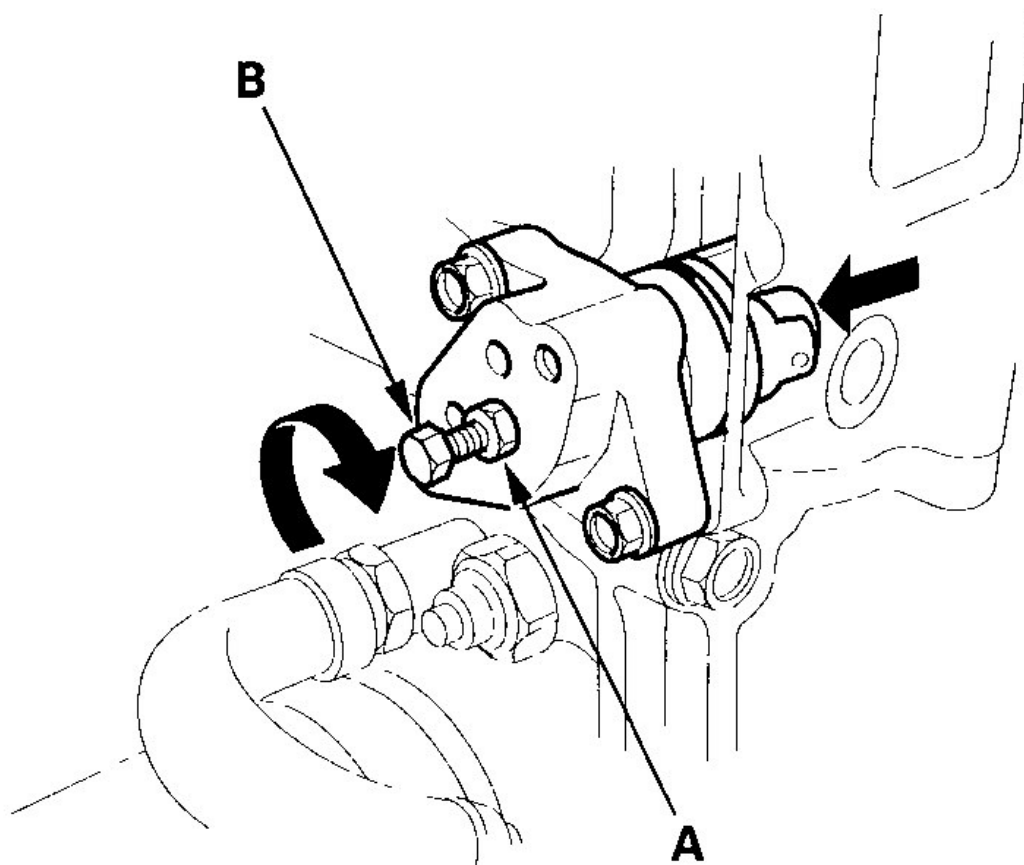
28. Remove the end cover (A) and nozzle (B) from the cam chain auto-tensioner.



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Fig. 69: Removing End Cover And Nozzle From Cam Chain Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

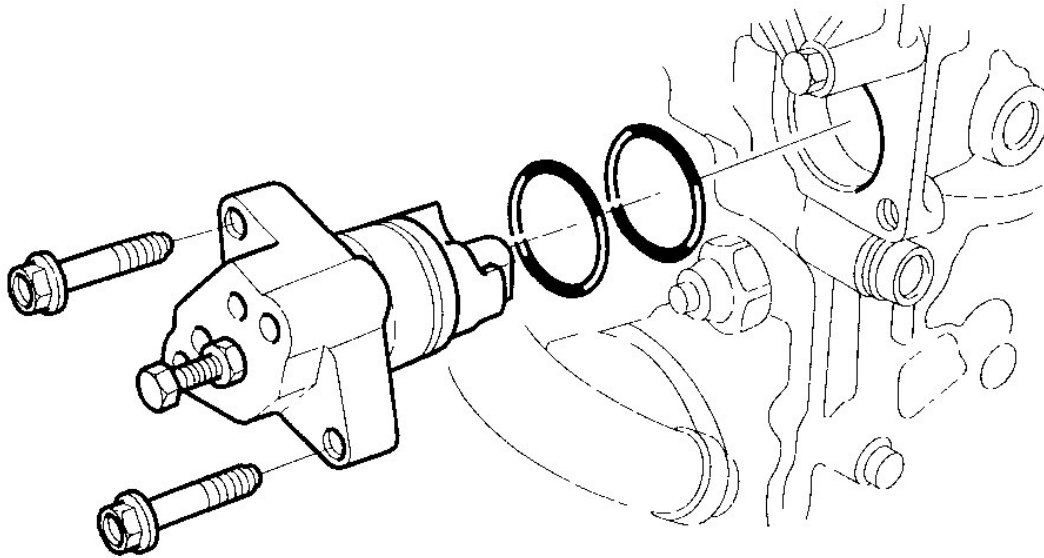
29. Thread a nut (A) onto a 5 x 0.8 mm bolt that is at least 40 mm long (B), then thread the bolt into the maintenance hole in the cam chain auto-tensioner.



G03692323

Fig. 70: Threading Bolt Into Maintenance Hole In Cam Chain Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

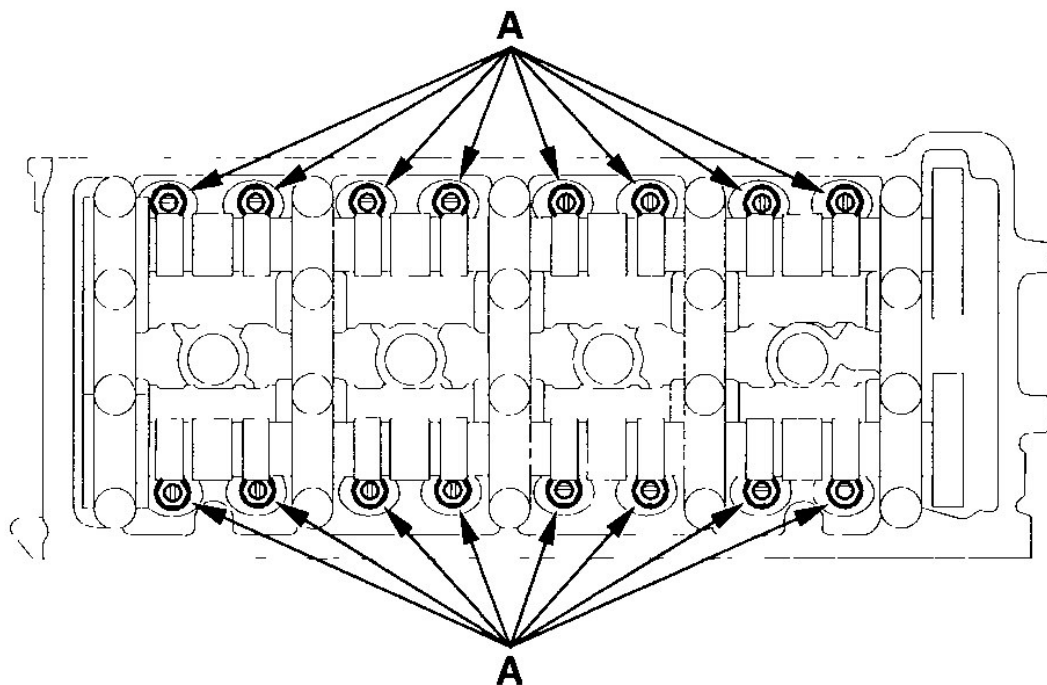
30. Turn the bolt clockwise to compress the cam chain auto-tensioner, and lock the bolt with the nut.
31. Remove the cam chain auto-tensioner.



G03692324

Fig. 71: Removing Cam Chain Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

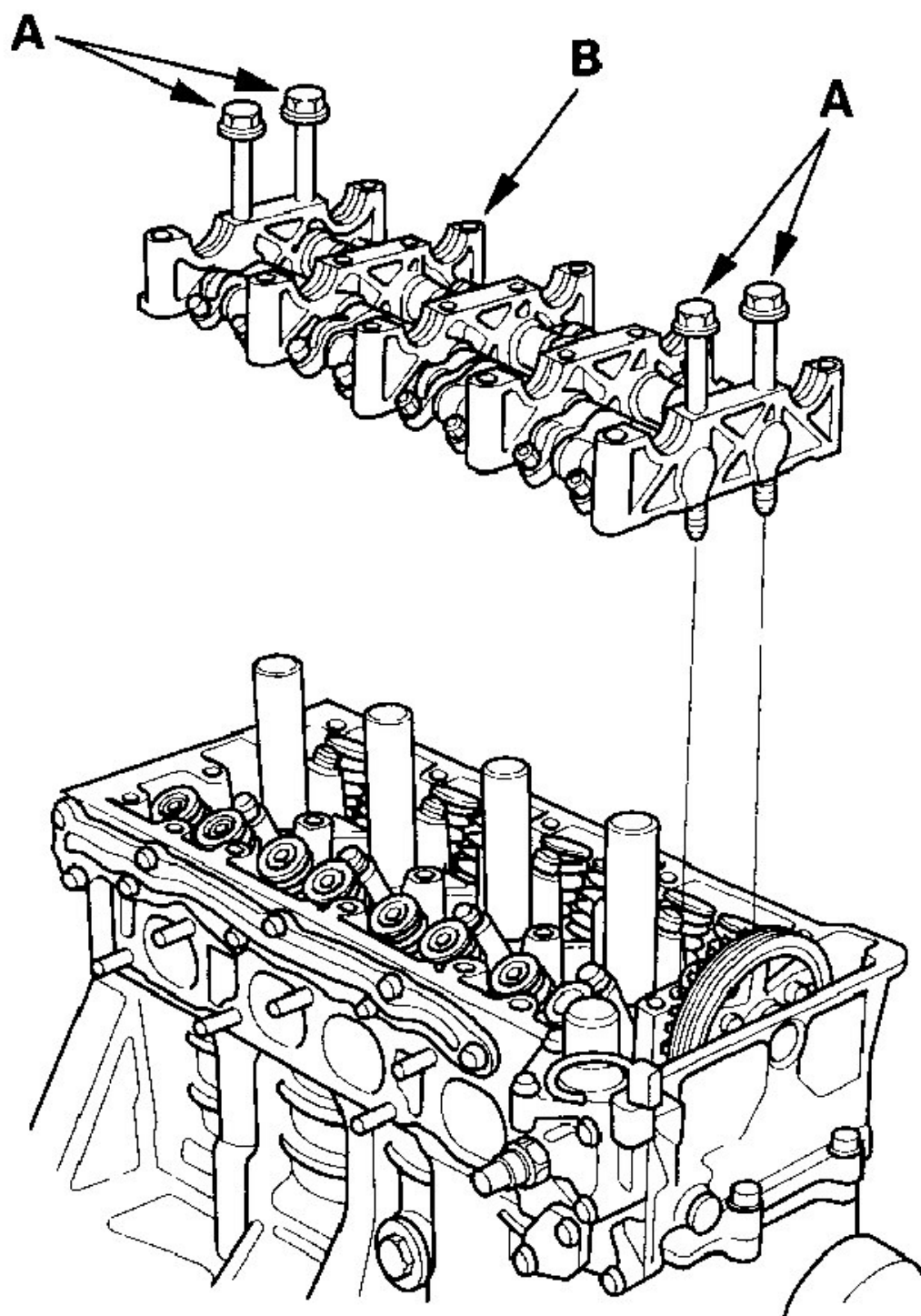
32. Loosen the rocker arm adjusting screws (A).



G03692325

Fig. 72: Loosening Rocker Arm Adjusting Screws
Courtesy of AMERICAN HONDA MOTOR CO., INC.

33. Remove the camshaft holders and camshafts. To prevent damaging the camshafts, unscrew the camshaft holder bolts two turns at a time, in a crisscross pattern.
34. Insert the bolts (A) into the rocker shaft holder, then remove the rocker arm assembly (B).

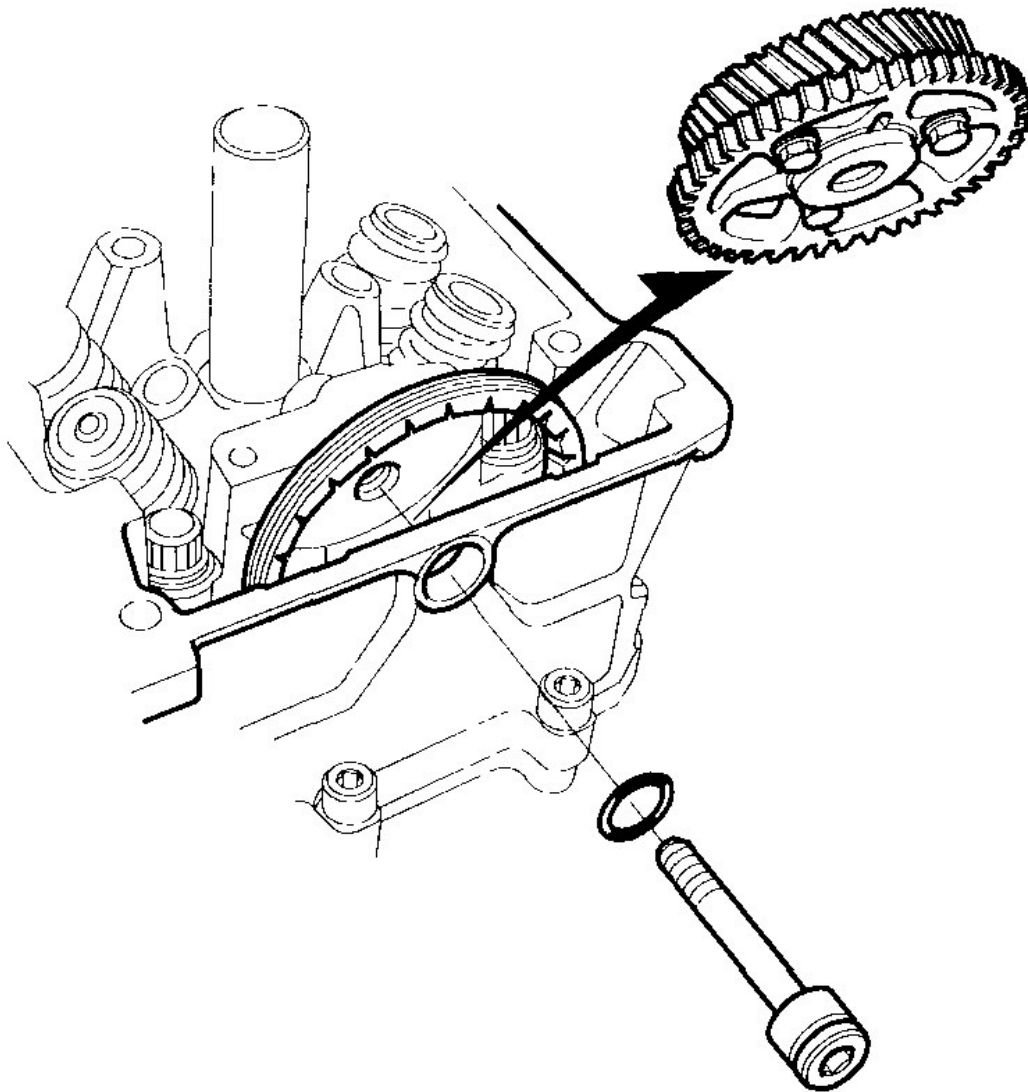


G03692326

Fig. 73: Removing Rocker Arm Assembly

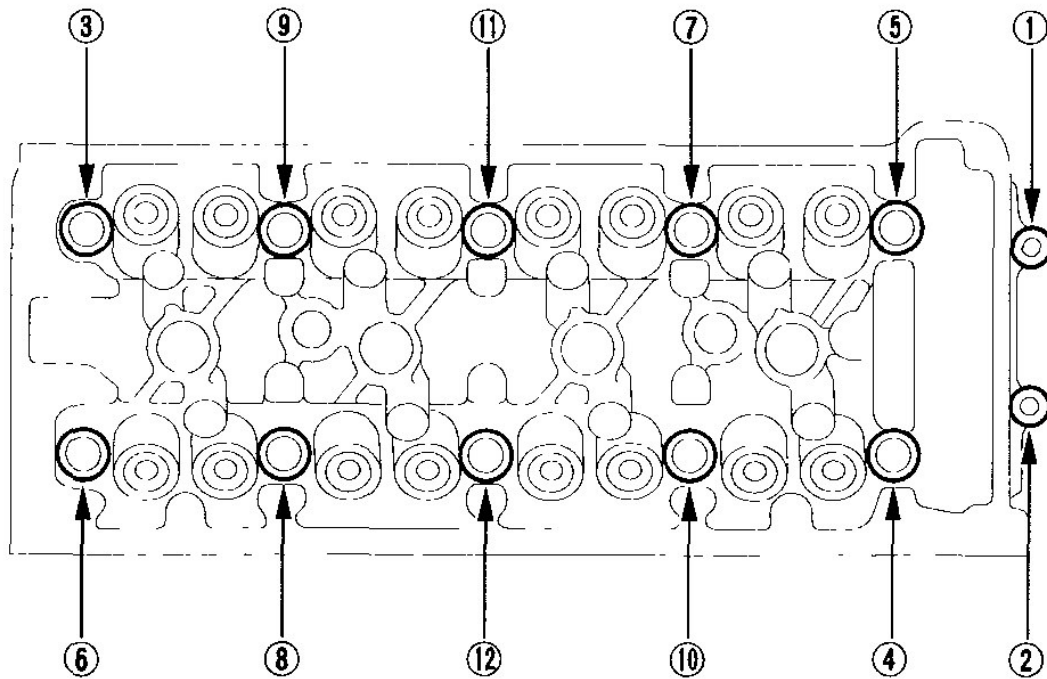
Courtesy of AMERICAN HONDA MOTOR CO., INC.

35. Remove the idler gear/cam chain sprocket assembly, idler gear collar, and washer.

**G03692327****Fig. 74: Removing Idler Gear/Cam Chain Sprocket Assembly, Idler Gear Collar And Washer**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

36. Remove the cylinder head bolts. To prevent warpage, unscrew the bolts in sequence 1/3 turn at a time; repeat the sequence until all the bolts are loose.



G03692328

Fig. 75: Identifying Removal Sequence Of Cylinder Head Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

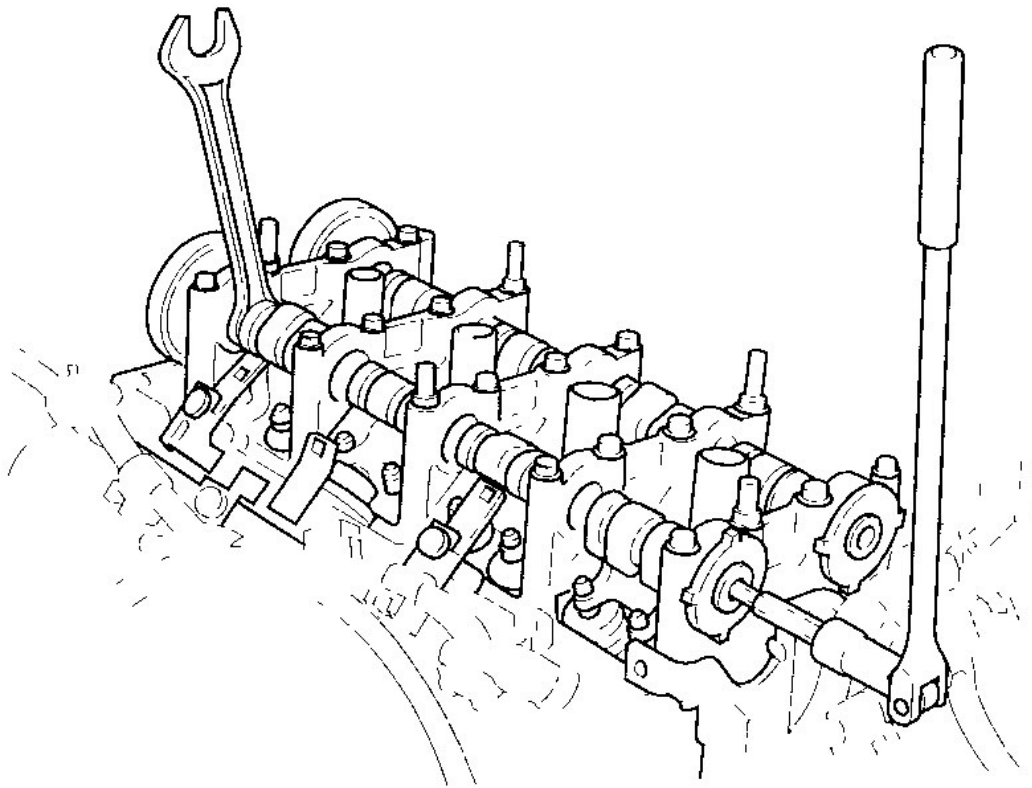
37. Remove the cylinder head.

CMP PULSE PLATE A REPLACEMENT

2000-2005 MODELS

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

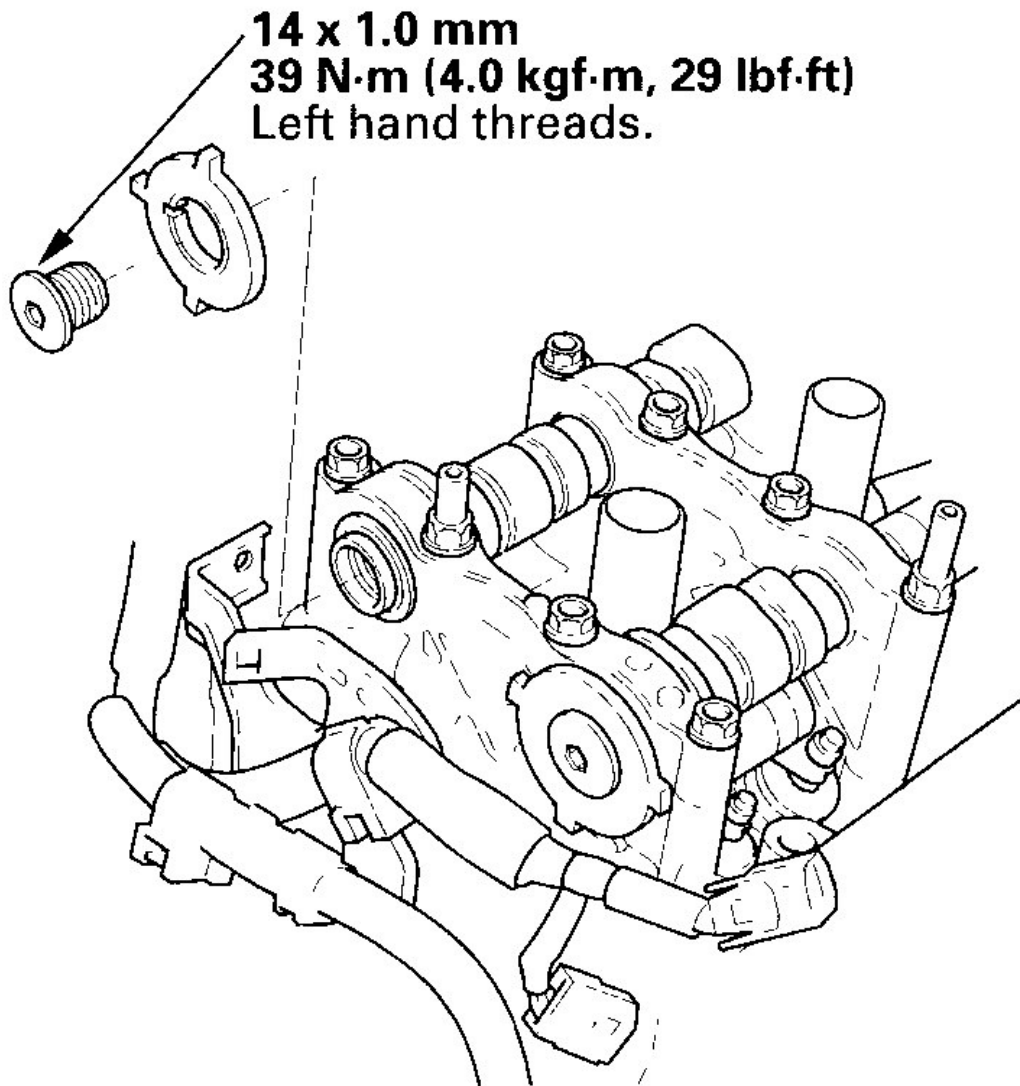
NOTE: This bolt has left hand threads.



G03692329

Fig. 76: Holding Camshaft With Open-End Wrench And Loosening Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



G03692330

Fig. 77: Removing Camshaft Position (CMP) Pulse Plate A With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

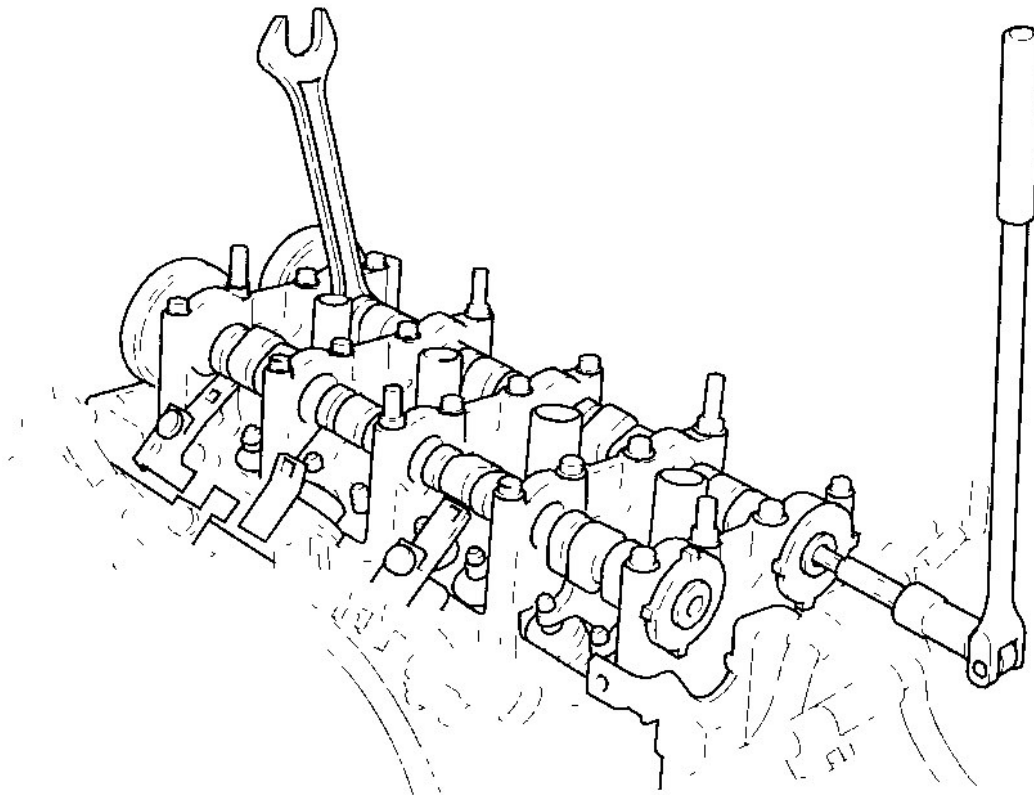
4. Clean the bolt, then apply new engine oil to the threads.
5. Align the CMP pulse plate A groove with the pin on the camshaft end, then install the CMP pulse plate A.
6. Install the cylinder head cover (see CYLINDER HEAD COVER INSTALLATION).

CMP PULSE PLATE B REPLACEMENT

2000-2005 MODELS

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

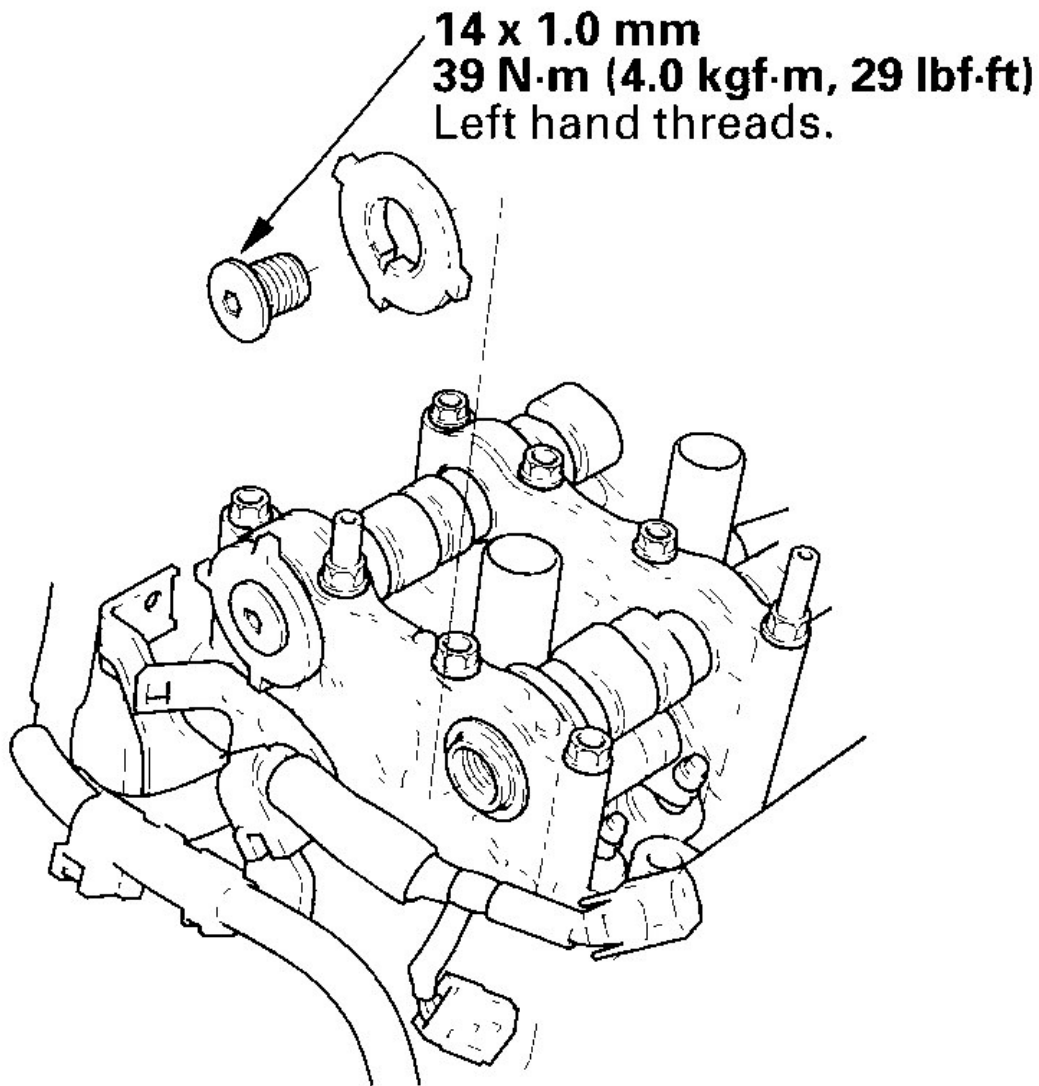
NOTE: **This bolt has left hand threads.**



G03692331

Fig. 78: Holding Exhaust Camshaft With Open-End Wrench And Loosening Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



G03692332

Fig. 79: Removing Camshaft Position (CMP) Pulse Plate B With Torque Specifications
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

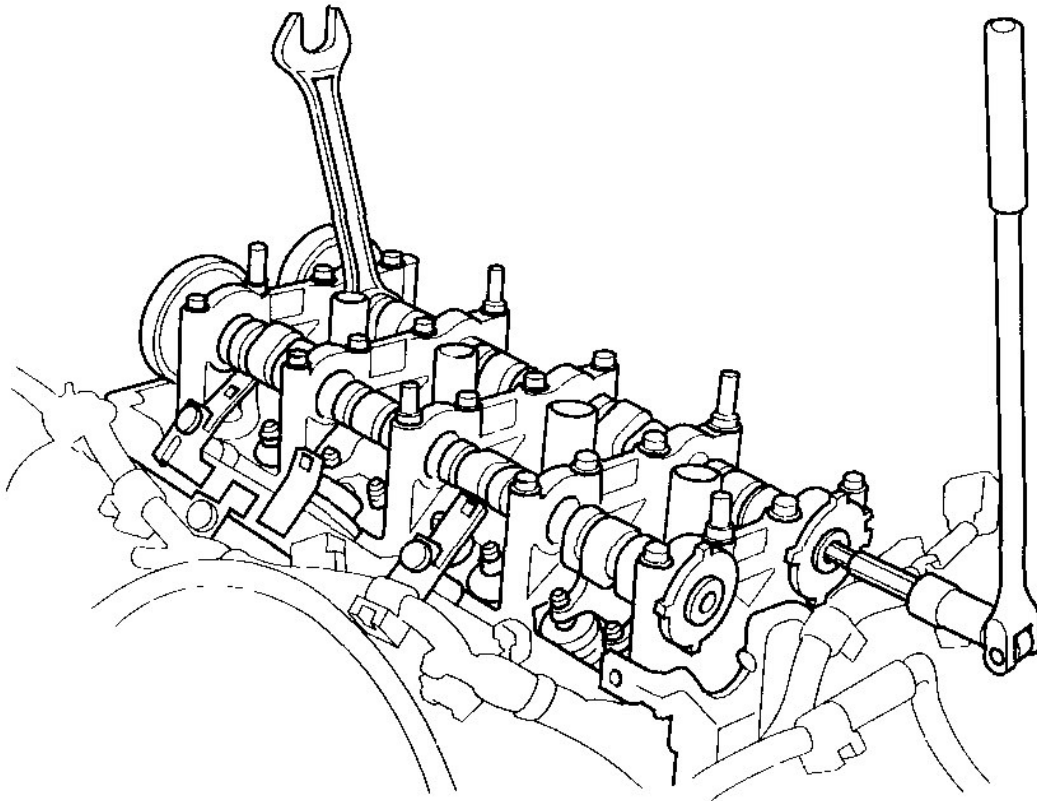
4. Clean the bolt, then apply new engine oil to the threads.
5. Align the CMP pulse plate B groove with the pin on the camshaft end, then install the CMP pulse plate B.
6. Install the cylinder head cover (see **CYLINDER HEAD COVER INSTALLATION**).

CMP PULSE PLATE REPLACEMENT

2006-09 MODEL

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

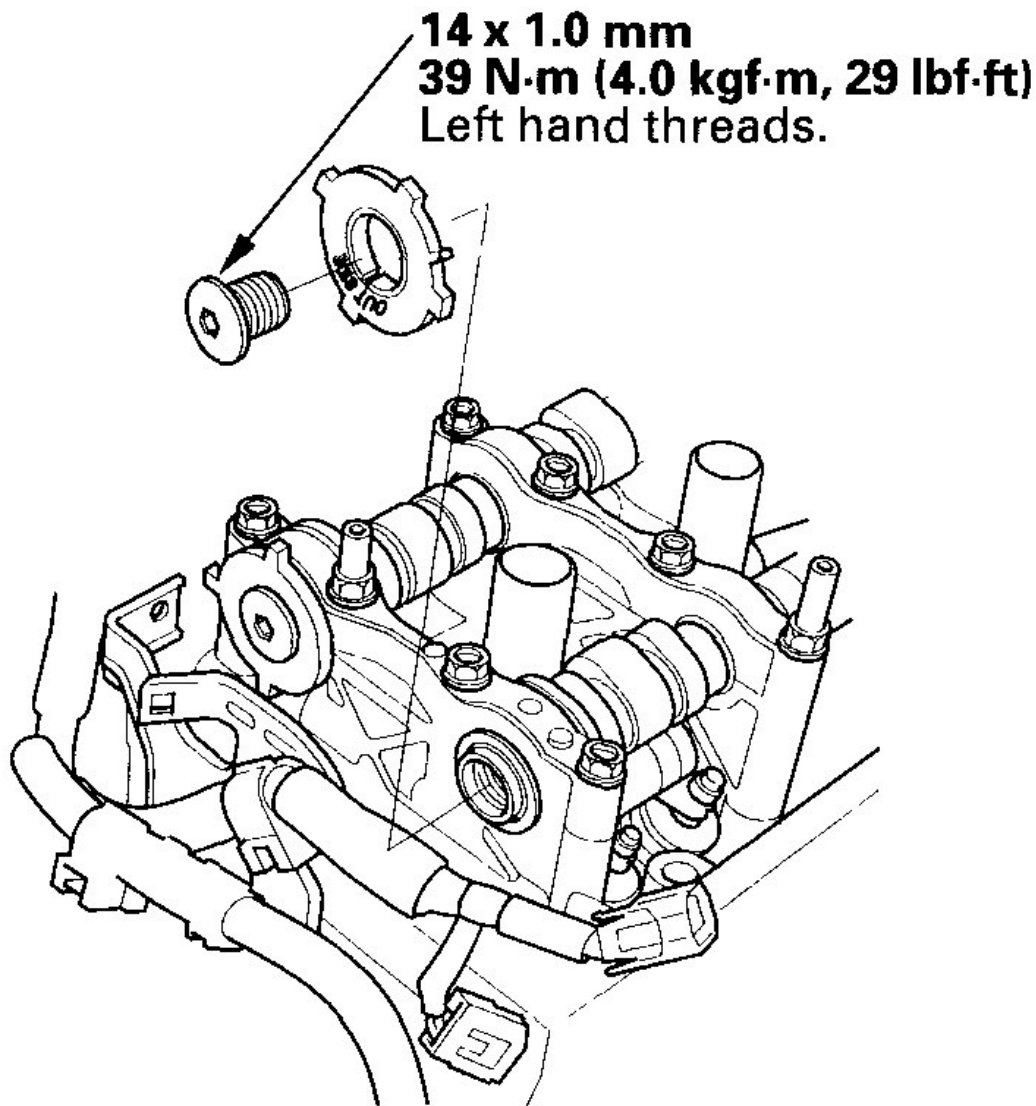
NOTE: **This bolt has left hand threads.**



G03692333

Fig. 80: Loosening Camshaft Bolt - 2006-08 Model
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



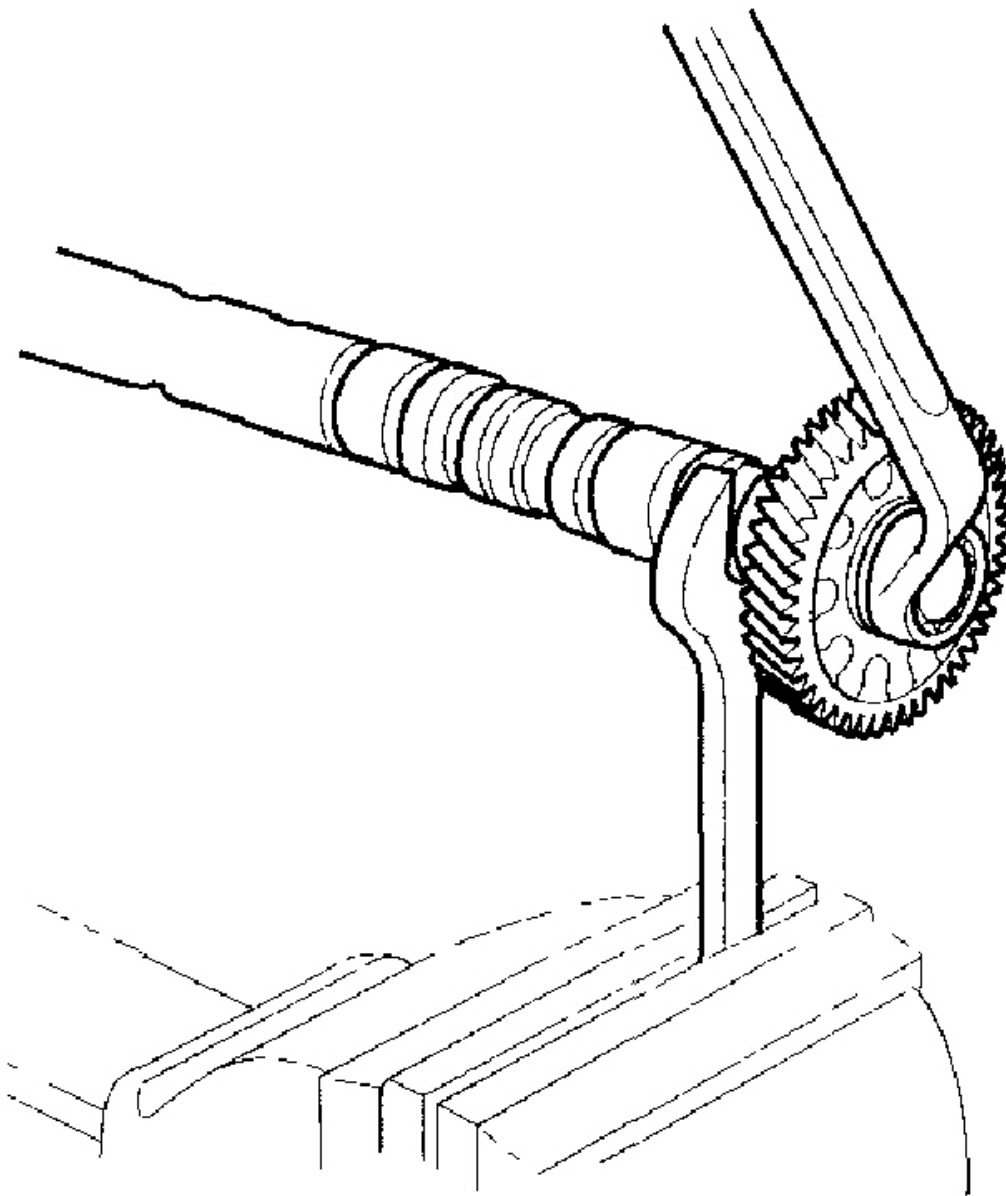
G03692334

Fig. 81: Removing Camshaft Position (CMP) Pulse Plate With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Clean the bolt, then apply new engine oil to the threads.
5. Locate the position mark to the outside and align the CMP pulse plate groove with the pin on the camshaft end, then install the CMP pulse plate.
6. Install the cylinder head cover (see **CYLINDER HEAD COVER INSTALLATION**).

CAMSHAFT GEAR REMOVAL

1. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
2. Loosen the rocker arm adjusting screws (see step 2).
3. Remove the camshaft holders and camshafts. To prevent damaging the camshafts, unscrew the camshaft holder bolts two turns at a time, in a crisscross pattern.
4. Hold the camshaft with an open-end wrench, then loosen the camshaft gear mounting nut.

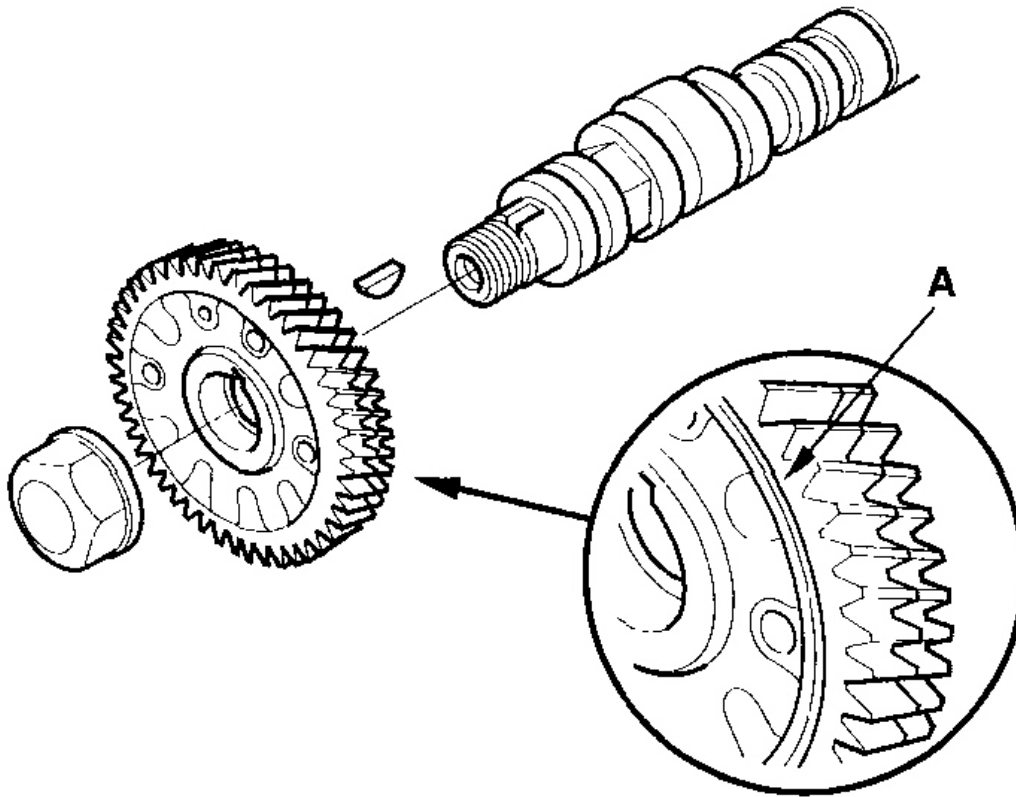


G03692335

Fig. 82: Removing Camshaft Gear Mounting Nut
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Remove the camshaft gear.

NOTE: The exhaust camshaft gear has a groove (A) in the face. The intake camshaft does not have a groove.



G03692336

Fig. 83: Removing Camshaft Gear

Courtesy of AMERICAN HONDA MOTOR CO., INC.

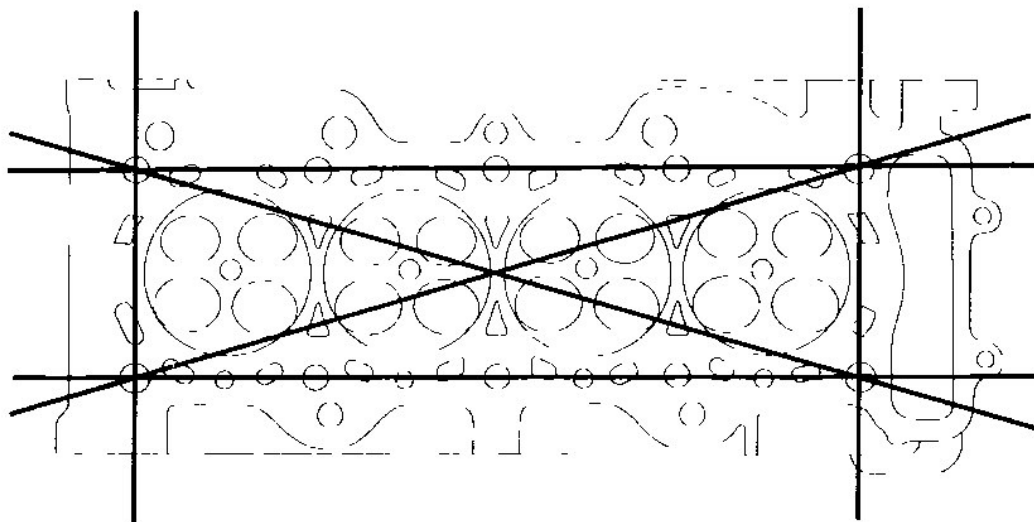
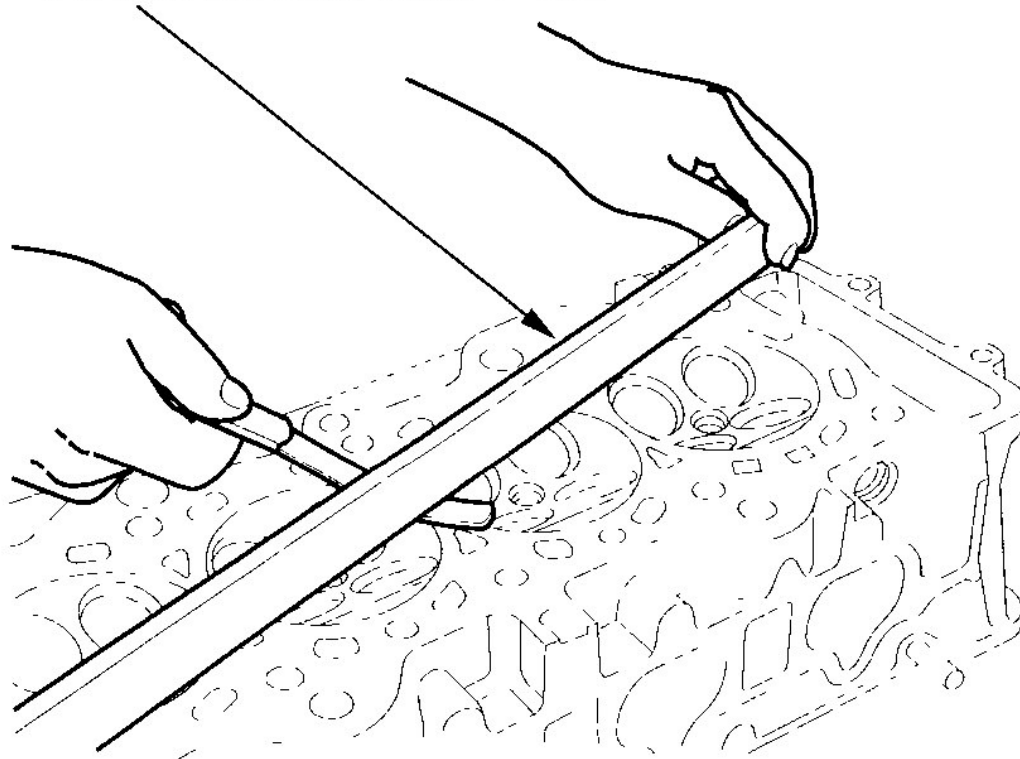
CYLINDER HEAD INSPECTION FOR WARPAGE

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 105 mm (4.13 in.).

Cylinder Head Height

Standard (New): 104.95-105.05 mm (4.132-4.136 in.)

PRECISION STRAIGHT EDGE

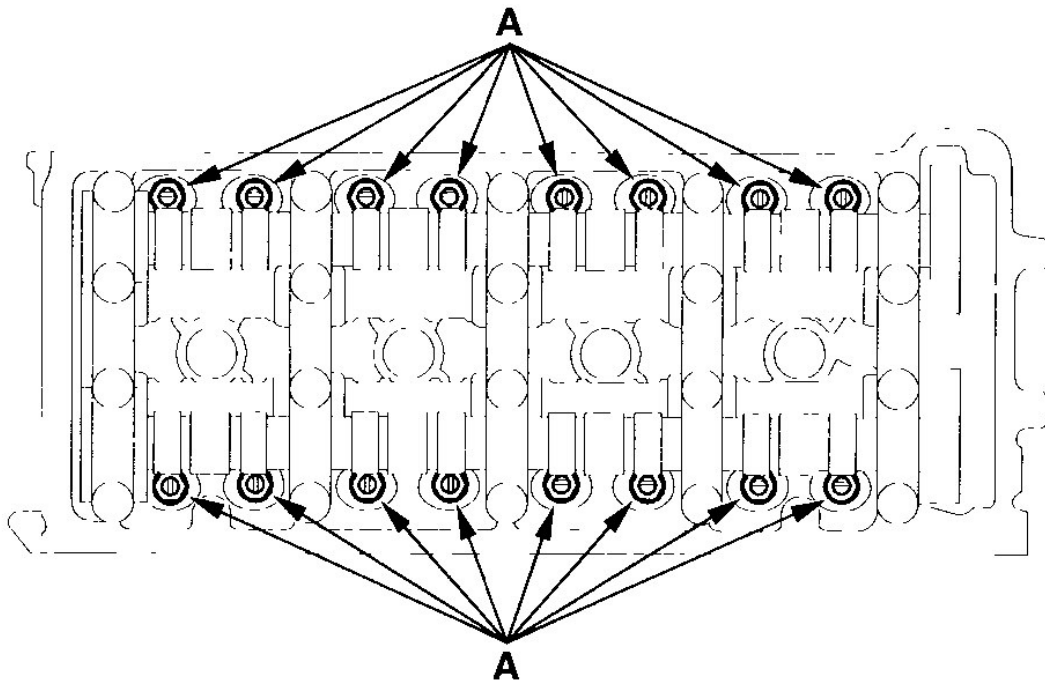


G03692337

Fig. 84: Checking Cylinder Head For Warpage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM ASSEMBLY REMOVAL

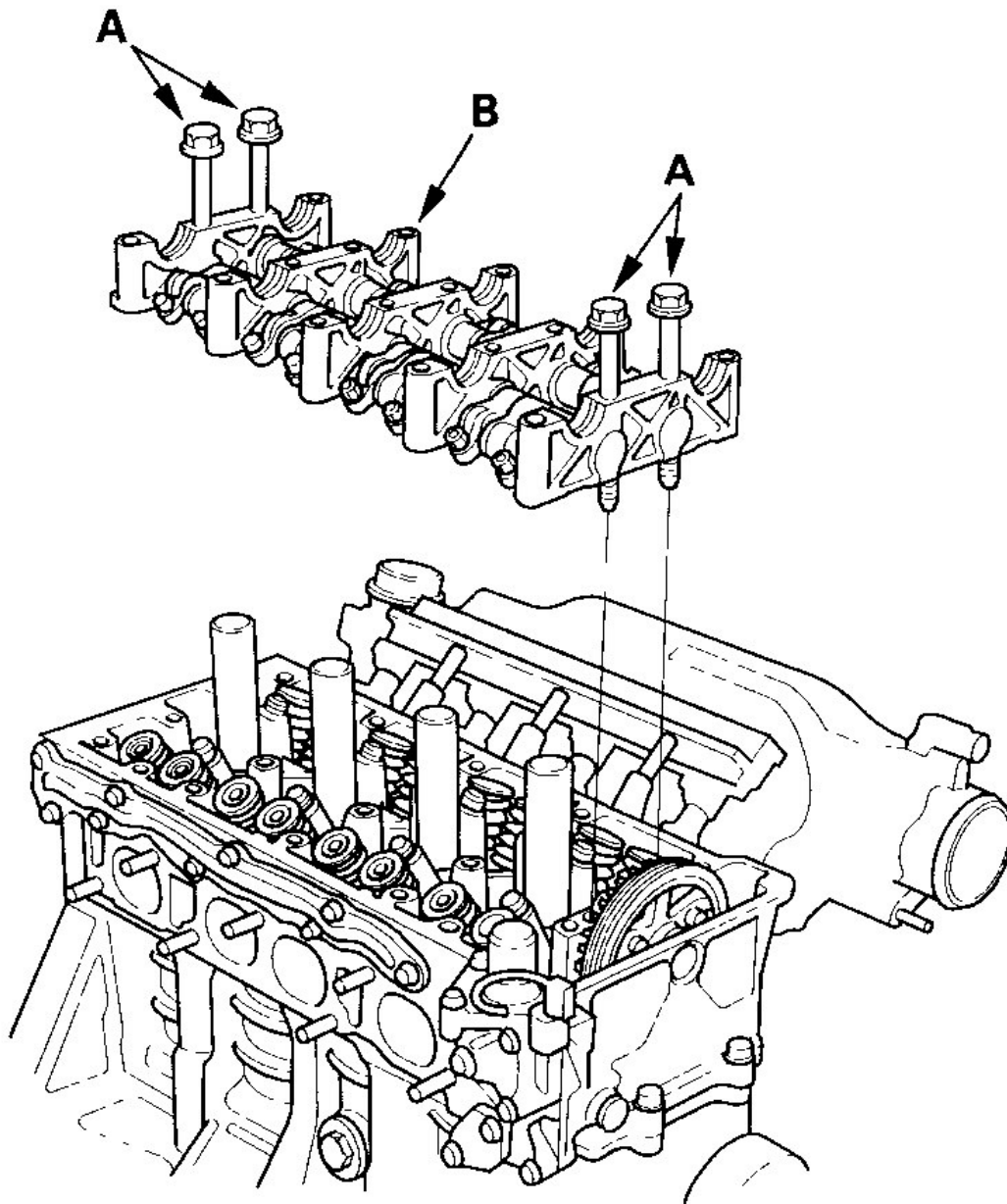
1. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
2. Loosen the rocker arm adjusting screws (A).



G03692338

Fig. 85: Loosening Rocker Arm Adjusting Screws
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove the camshaft holders and camshafts. To prevent damaging the camshafts, unscrew the camshaft holder bolts two turns at a time, in a crisscross pattern.
4. Insert the bolts (A) into the rocker shaft holder, then remove the rocker arm assembly (B).



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Fig. 86: Removing Rocker Arm Assembly

Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY

NOTE:

- Identify parts as they are removed to ensure reinstallation in their original locations.
- Inspect rocker shafts and rocker arms (see ROCKER ARM AND SHAFT INSPECTION).
- Rocker arms must be installed in the same position, if reused.
- Prior to reassembling, clean all the parts in solvent, dry them, and apply new engine oil to any contact points.
- Bundle the rocker arms with rubber bands to keep them together as a set.
- When replacing the VTEC rocker arm assembly, remove the fastening hardware from the new VTEC rocker arm assembly.

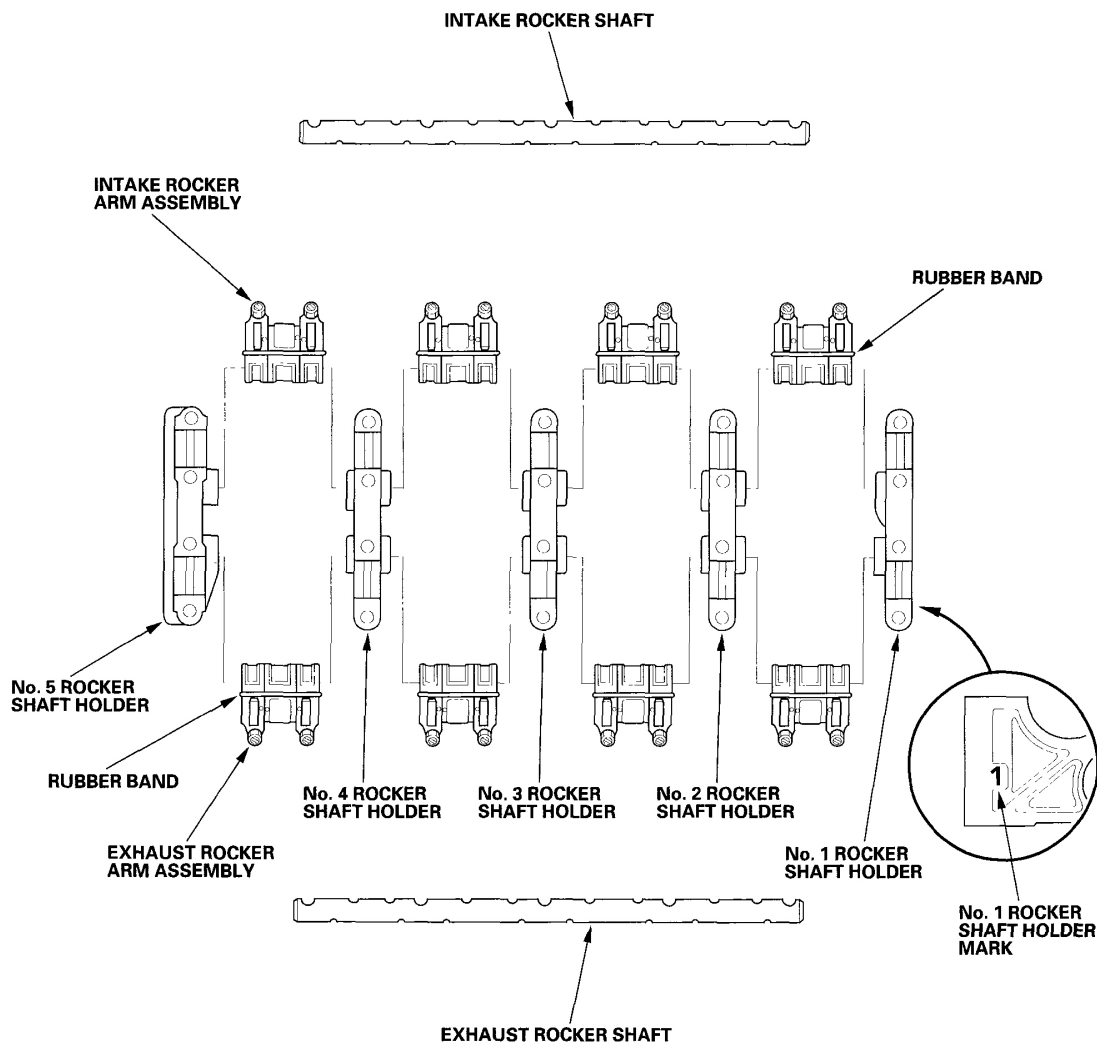
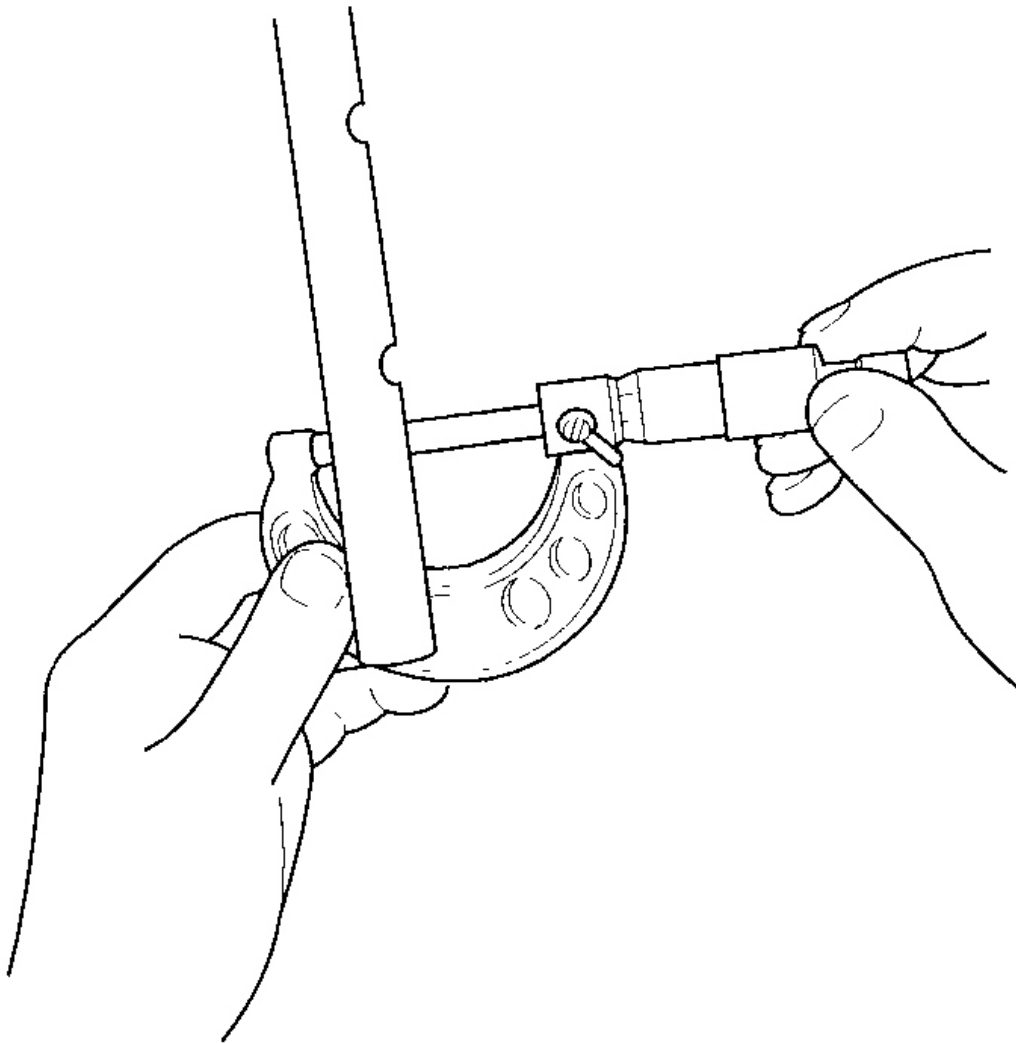


Fig. 87: Identifying Rocker Arm And Shaft Assembly
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM AND SHAFT INSPECTION

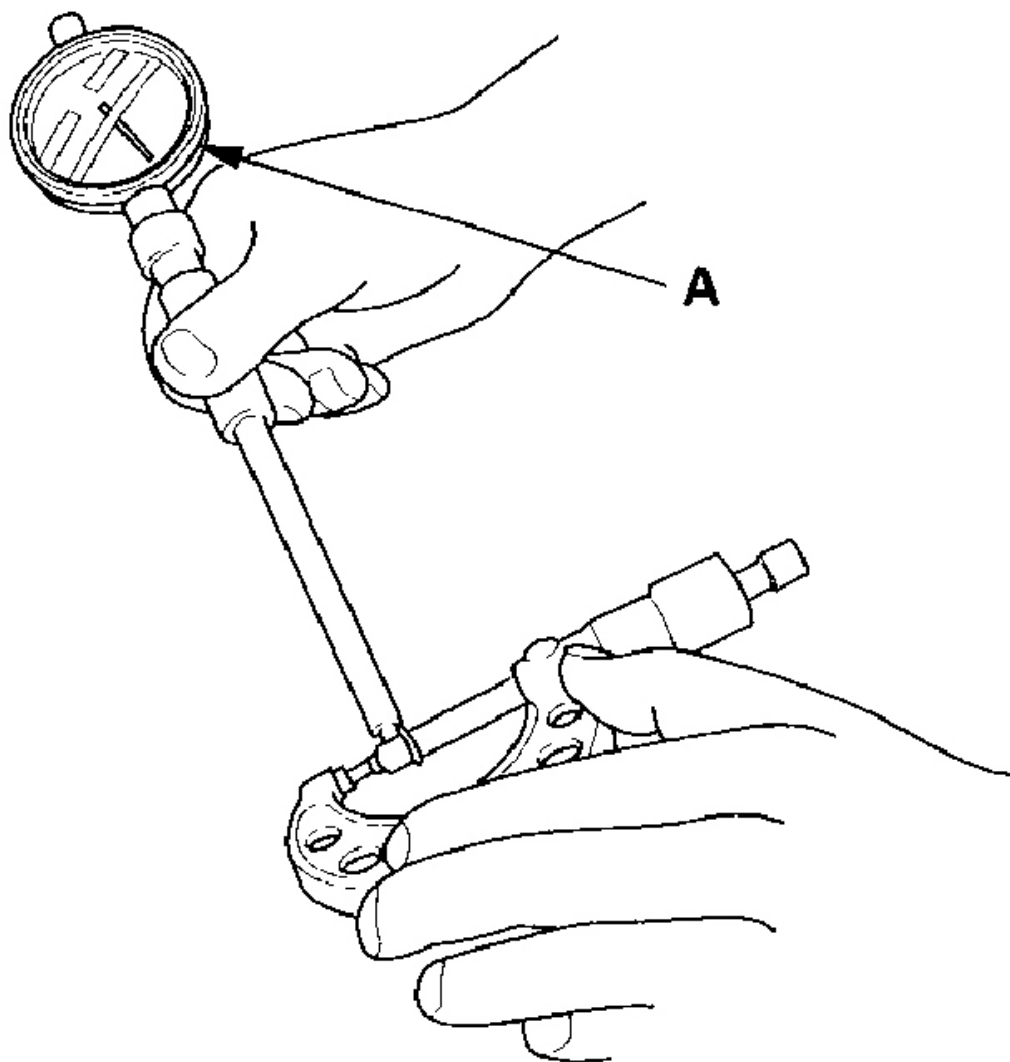
1. Remove the rocker arm assembly (see CYLINDER HEAD INSPECTION FOR WARPAGE).
2. Disassemble the rocker arm assembly (see ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY).
3. Measure the diameter of the shaft at the first rocker location.



G03692341

Fig. 88: Measuring Diameter Of Rocker Shaft At First Rocker Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



G03692342

Fig. 89: Identifying Gauge In Zero Position

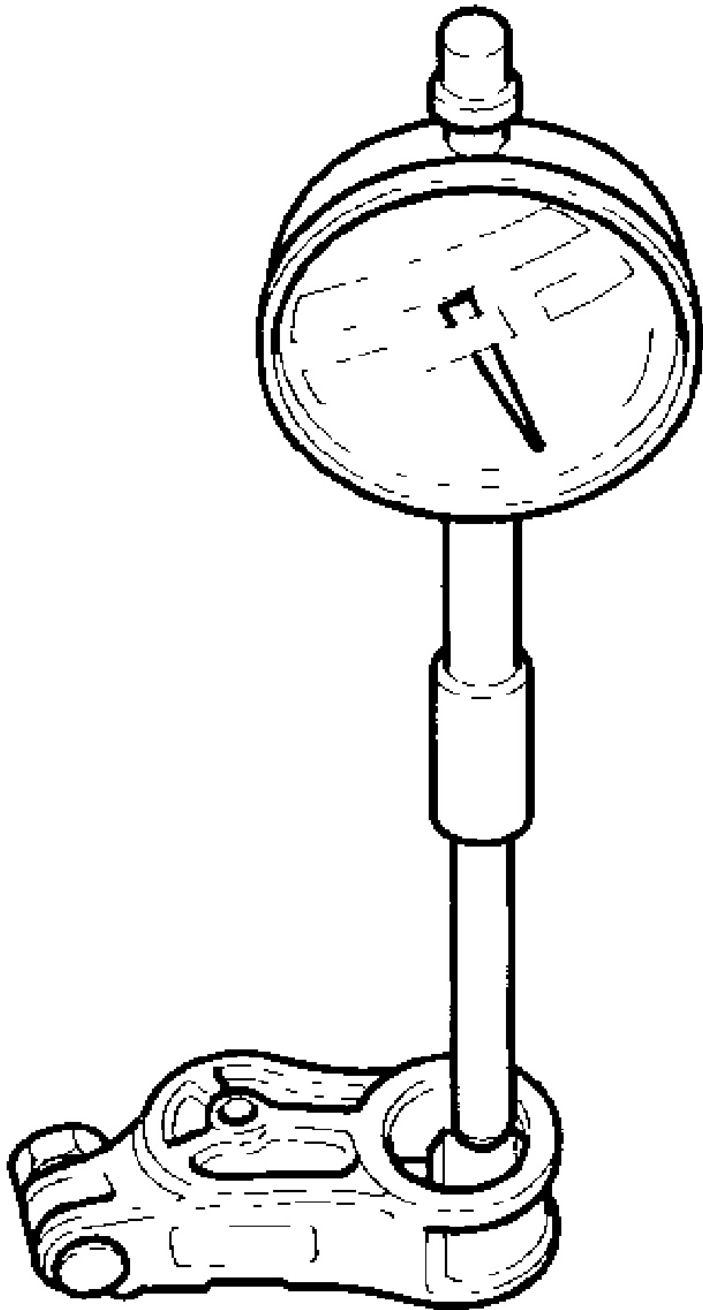
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Rocker Arm-to-Shaft Clearance:

Standard (New): 0.021-0.041 mm (0.0008-0.0016 in.)

Service Limit: 0.07 mm (0.003 in.)



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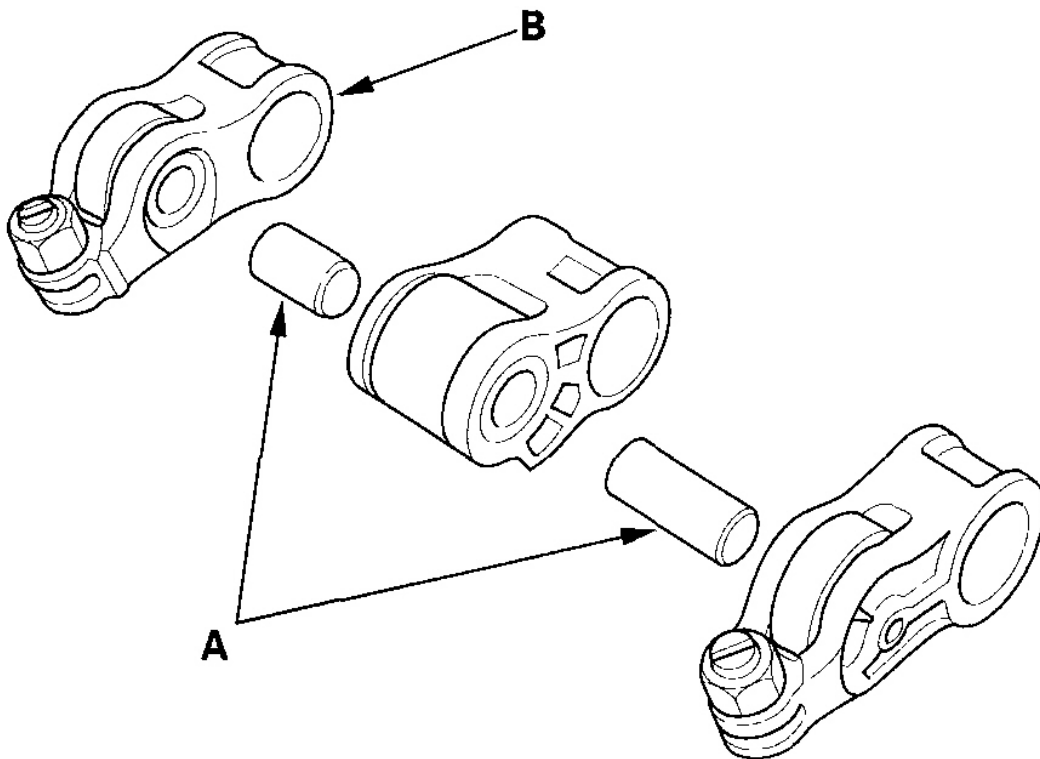
Fig. 90: Measuring Inside Diameter Of Rocker Arm

Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Repeat for all rocker arms and both shafts. If the clearance is over the limit, replace the rocker shaft and all over-tolerance rocker arms. If any rocker arm needs replacement, replace all three rocker arms in that set (primary, mid, and secondary).
7. Inspect the rocker arm synchronizing pistons (A). Push each piston manually. If it does not move smoothly, replace the rocker arm assembly.

NOTE:

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



G03692344

Fig. 91: Identifying Rocker Arm Synchronizing Pistons
Courtesy of AMERICAN HONDA MOTOR CO., INC.

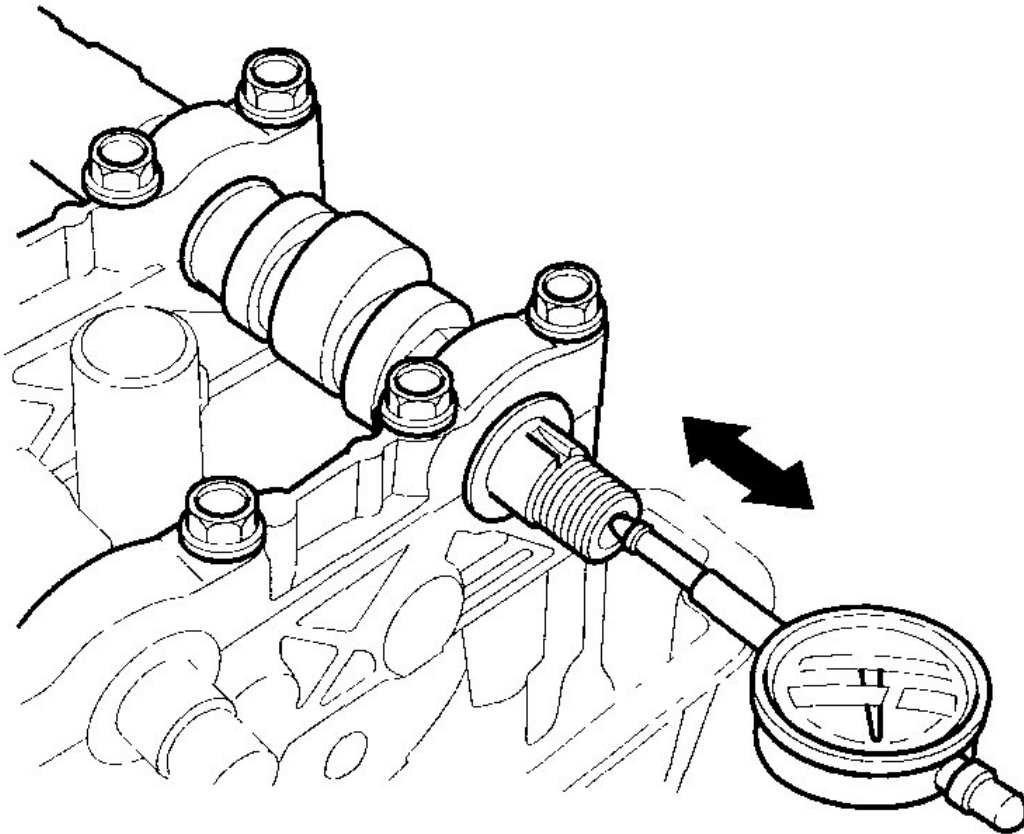
8. Reassemble the rocker arm assembly (see **ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY**).
9. Install the rocker arm assembly (see **ROCKER ARM ASSEMBLY INSTALLATION**).

4. Seat the camshafts by pushing them toward the rear end of the cylinder head.
5. Zero the dial indicator against the end of the camshaft, then push the camshaft back and forth and read the end play. If the end play is beyond the service limit, replace the cylinder head and recheck. If it is still beyond the service limit, replace the camshaft.

Camshaft End Play

Standard (New): 0.05-0.15 mm (0.002-0.006 in.)

Service Limit: 0.30 mm (0.012 in.)



G03692346

Fig. 93: Measuring Camshaft End Play

Courtesy of AMERICAN HONDA MOTOR CO., INC.

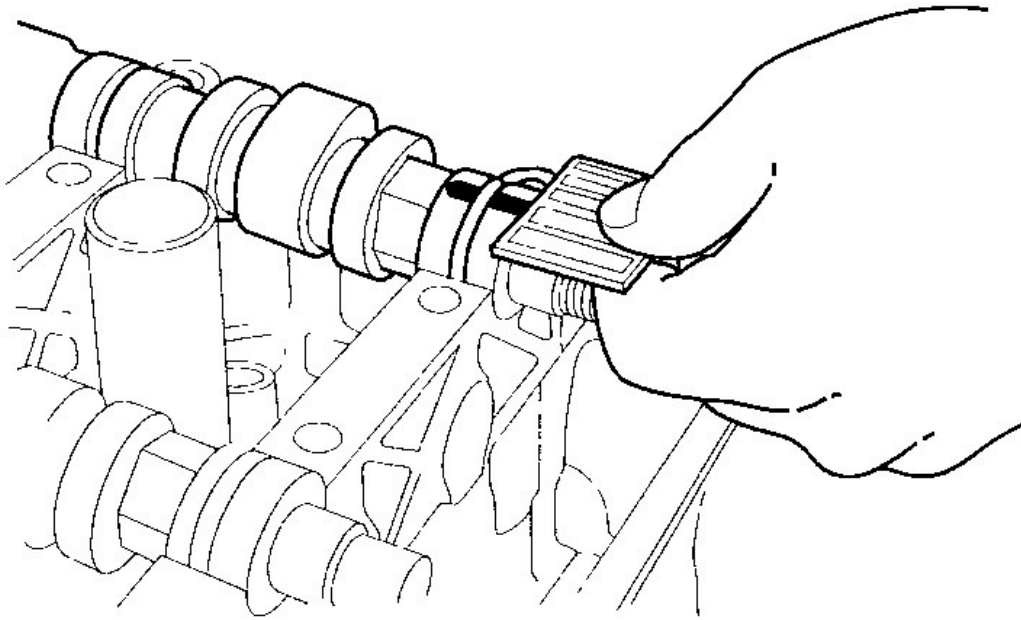
6. Remove the camshaft holders and the rocker shaft holders from the cylinder head.
7. Lift the camshafts out of the cylinder head, wipe them clean, then inspect the lift ramps. Replace the

- camshaft if any lobes are pitted, scored, or excessively worn.
8. Clean the camshaft journal surfaces in the cylinder head, then set the camshafts back in place. Place a plastigage strip across each journal.
 9. Install the camshaft holders, then tighten the bolts to the specified torque as shown in step 3.
 10. Remove the camshaft holders. Measure the widest part of plastigage on each journal.
 - 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): 0.060-0.099 mm (0.002-0.004 in.)

Service Limit: 0.15 mm (0.006 in.)



G03692347

Fig. 94: Measuring Widest Part Of Plastigage On Each Journal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

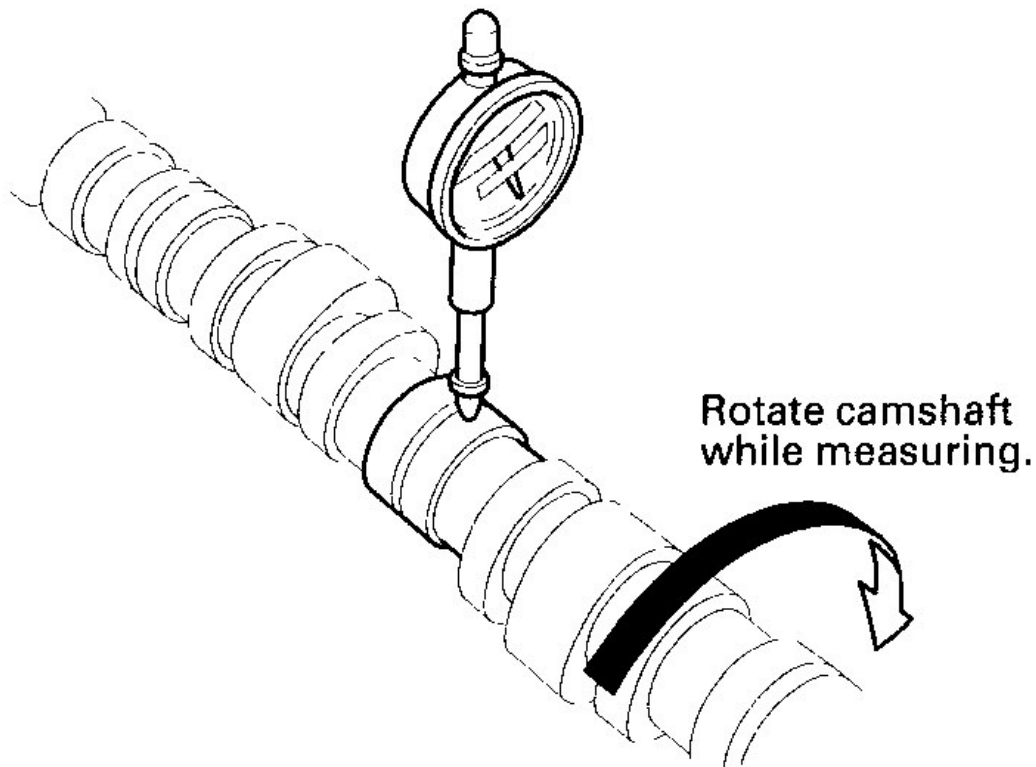
11. Check the total runout with the camshaft supported on V-blocks.

- If the total runout of the camshaft is within the service limit, replace the cylinder head.
- If the total runout is beyond the service limit, replace the camshaft and recheck the camshaft-to-holder oil clearance. If the oil clearance is still 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.)



G03692348

Fig. 95: Checking Total Runout Of Camshaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Measure cam lobe height.

Cam Lobe Height Standard (New):

CAM LOBE HEIGHT STANDARD SPECIFICATION (2000-2003 MODELS)

2009 Honda S2000

2000-09 ENGINE Cylinder Head - S2000

	INTAKE	EXHAUST
PRIMARY	33.677 mm (1.326 in.)	33.716 mm (1.327 in.)
MID	36.533 mm (1.438 in.)	35.928 mm (1.414 in.)
SECONDARY	33.961 mm (1.337 in.)	33.994 mm (1.338 in.)

CAM LOBE HEIGHT STANDARD SPECIFICATION (2004-2006-08 MODELS)

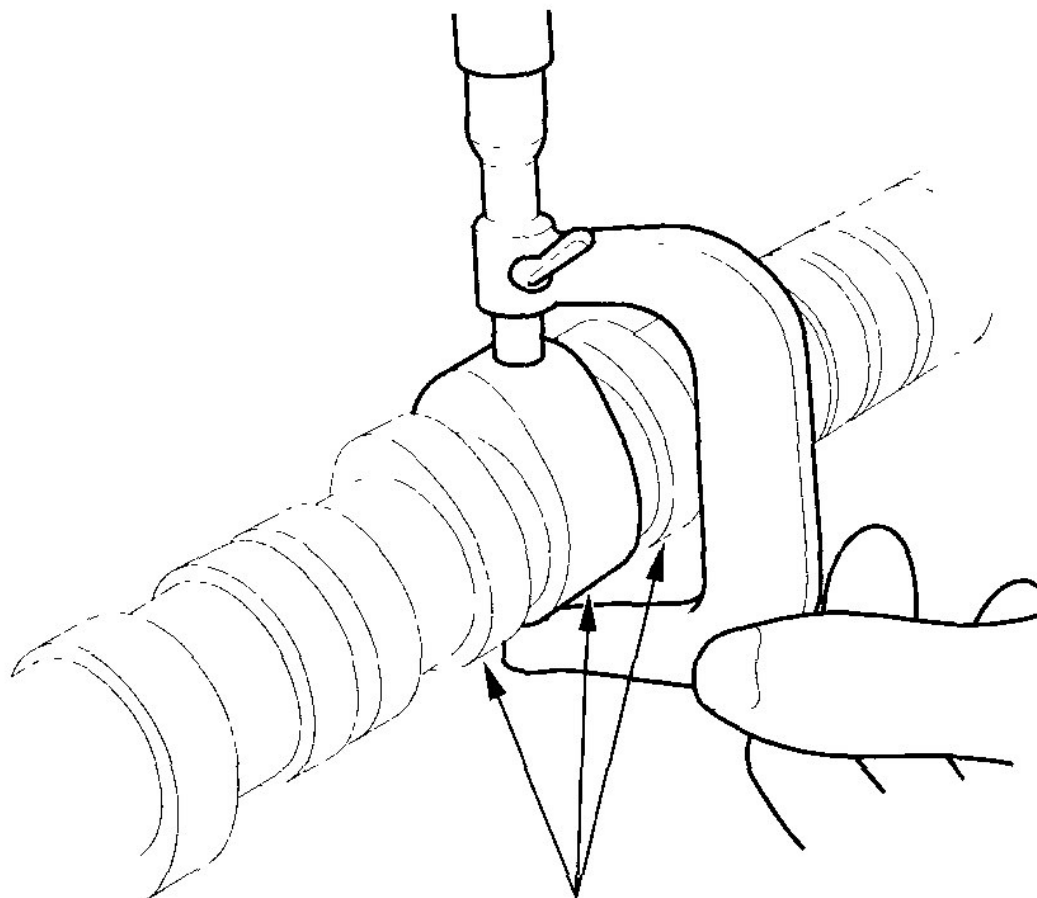
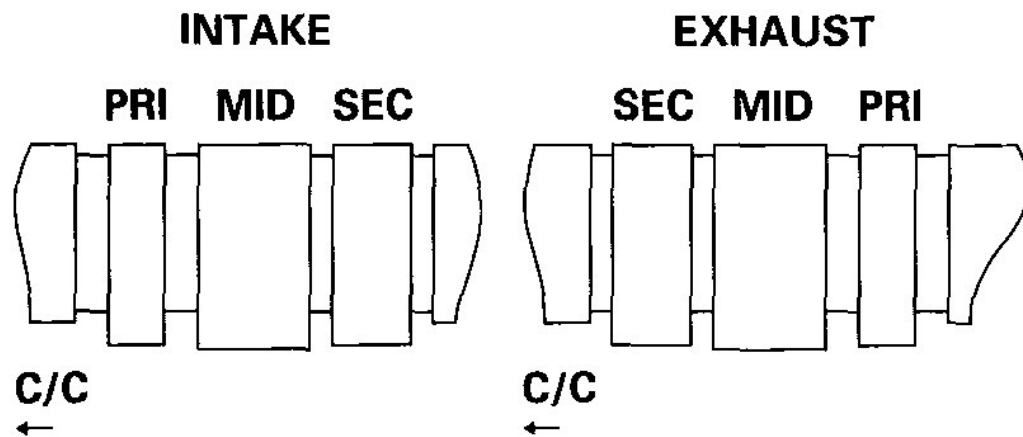
	INTAKE	EXHAUST
PRIMARY	33.961 mm (1.337 in.)	33.716 mm (1.327 in.)
MID	36.421 mm (1.434 in.)	35.660 mm (1.404 in.)
SECONDARY	33.961 mm (1.337 in.)	33.716 mm (1.327 in.)

PRI: PRIMARY

MID: MID

SEC: SECONDARY

C/C: CAM CHAIN



Inspect this area for wear.

G03692349

Fig. 96: Measuring Cam Lobe Height

Courtesy of AMERICAN HONDA MOTOR CO., INC.

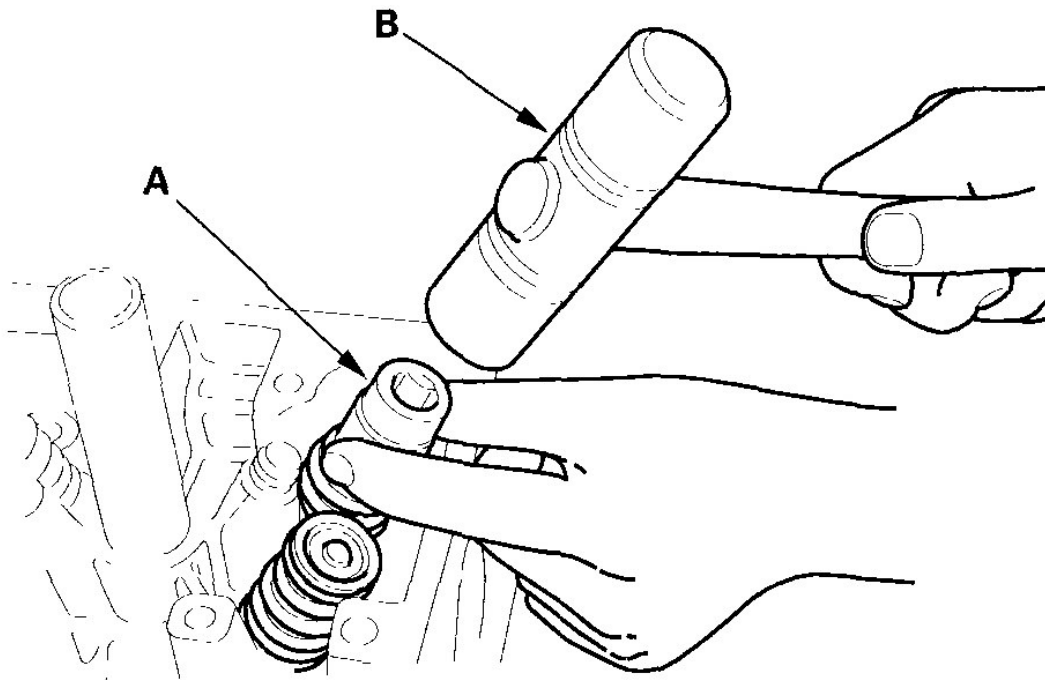
VALVE, SPRING, AND VALVE SEAL REMOVAL

Special Tools Required

Valve spring compressor attachment 07757-PJ1010A

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

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

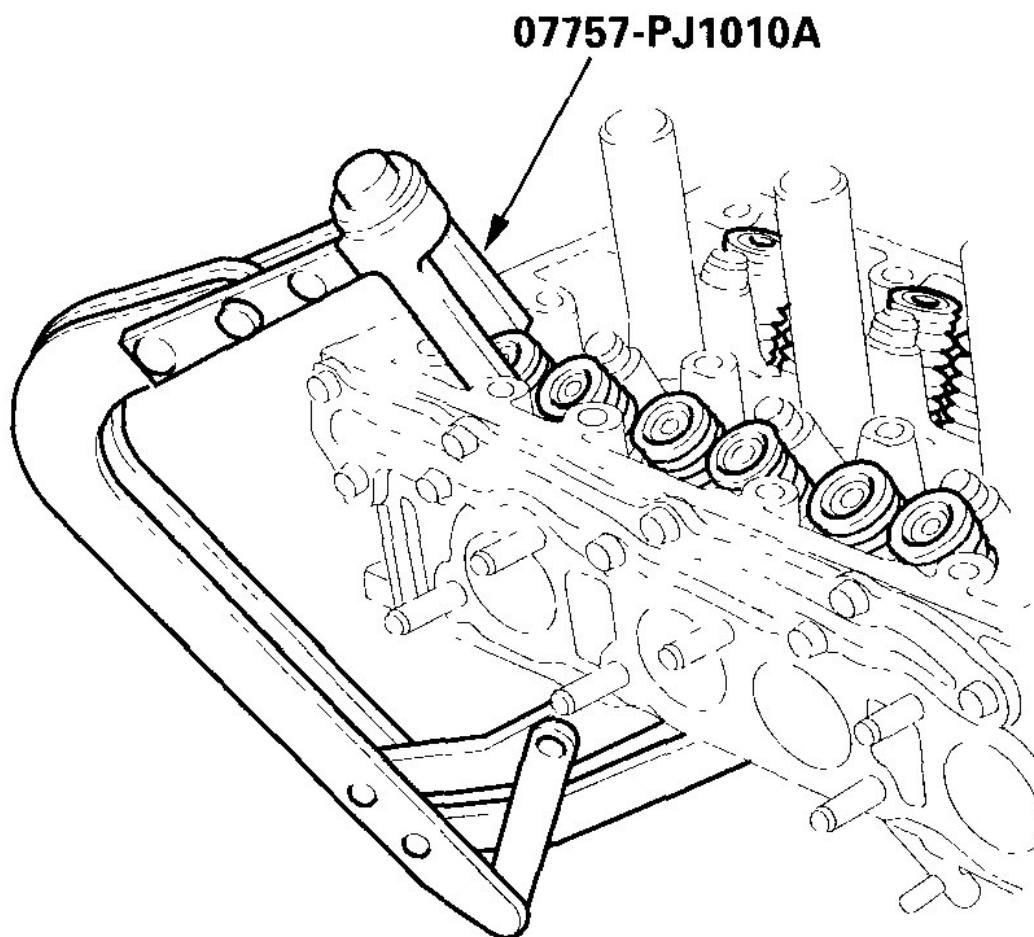


G03692350

Fig. 97: Taping Valve Retainer For Loosening Valve Cotters

Courtesy of AMERICAN HONDA MOTOR CO., INC.

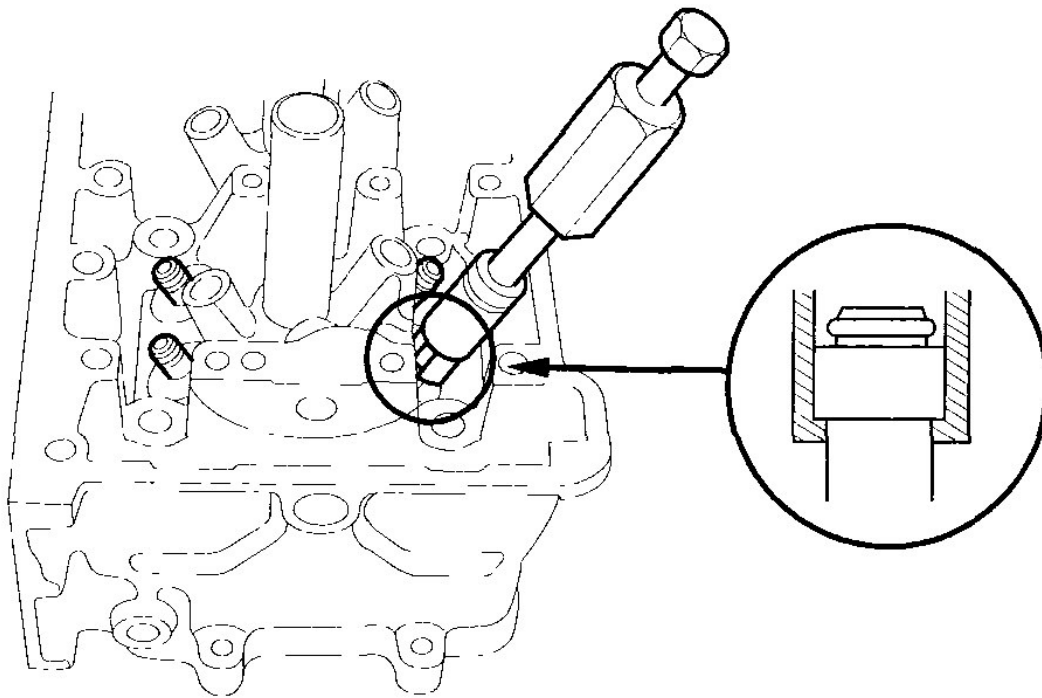
3. Install the valve spring compressor. Compress the spring and remove the valve cotters.



G03692351

Fig. 98: Compressing Spring And Removing Valve Cotters
Courtesy of AMERICAN HONDA MOTOR CO., INC.

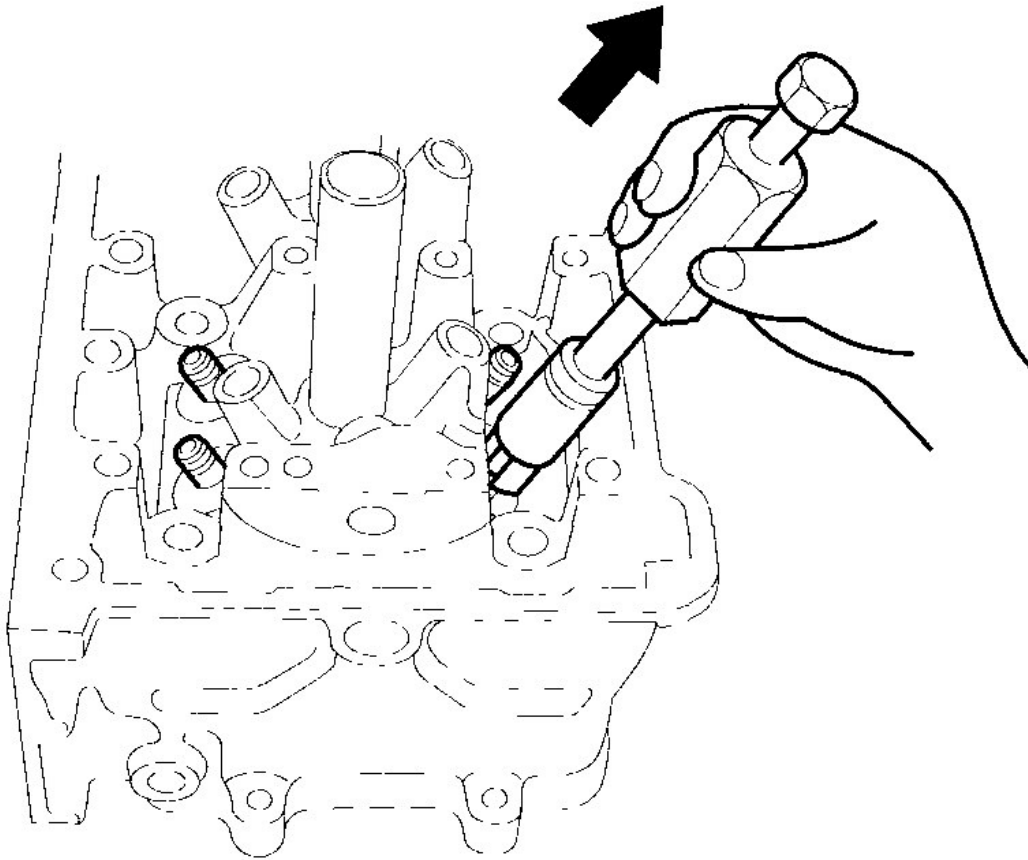
4. Remove the valve spring compressor, then remove the valve retainer and valve spring.
5. Install the valve guide seal remover.



G03692352

Fig. 99: Installing Valve Guide Seal Remover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the valve seal.



G03692353

Fig. 100: Removing Valve Seal

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the valve spring seat and valve.

VALVE INSPECTION

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

Intake Valve Dimensions

A Standard (New): 35.90-36.10 mm (1.413-1.421 in.)

B Standard (New): 108.85-109.15 mm (4.285-4.297 in.)

C Standard (New): 5.48-5.49 mm (0.2157-0.2161 in.)

C Service Limit: 5.45 mm (0.215 in.)

D Standard (New): 0.55-0.85 mm (0.022-0.033 in.)

D Service Limit: 0.40 mm (0.016 in.)

Exhaust Valve Dimensions

A Standard (New): 30.90-31.10 mm (1.217-1.224 in.)

B Standard (New): 107.60-107.90 mm (4.236-4.248 in.)

C Standard (New): 5.45-5.46 mm (0.2146-0.2150 in.)

C Service Limit: 5.42 mm (0.213 in.)

D Standard (New): 0.85-1.15 mm (0.033-0.045 in.)

D Service Limit: 0.70 mm (0.028 in.)

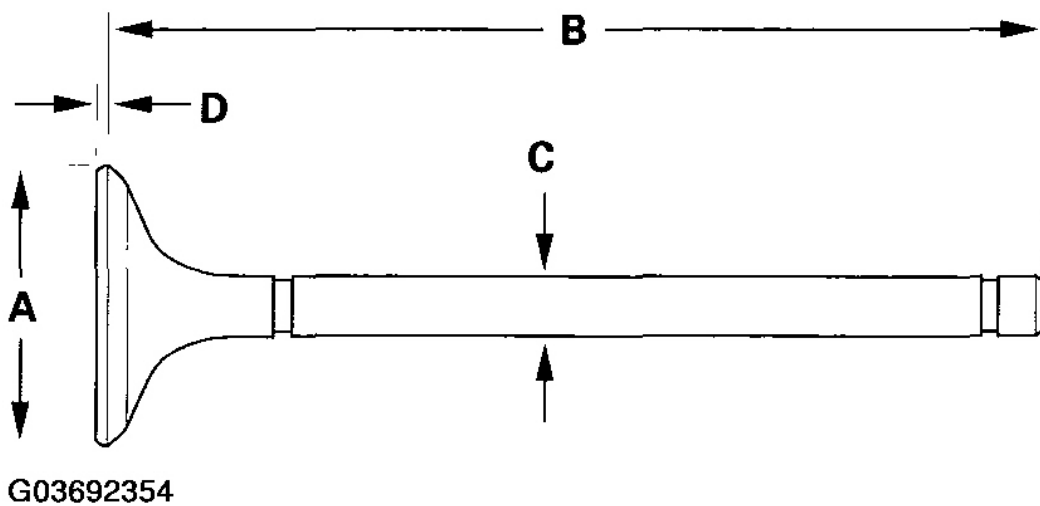


Fig. 101: Identifying Intake Valve All Dimensions
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVE STEM-TO-GUIDE CLEARANCE INSPECTION

1. Remove the valves (see VALVE, SPRING, AND VALVE SEAL REMOVAL).

2. 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): 0.04-0.10 mm (0.002-0.004 in.)****Service Limit: 0.16 mm (0.006 in.)****Exhaust Valve Stem-to-Guide Clearance****Standard (New): 0.10-0.16 mm (0.004-0.006 in.)****Service Limit: 0.22 mm (0.009 in.)**

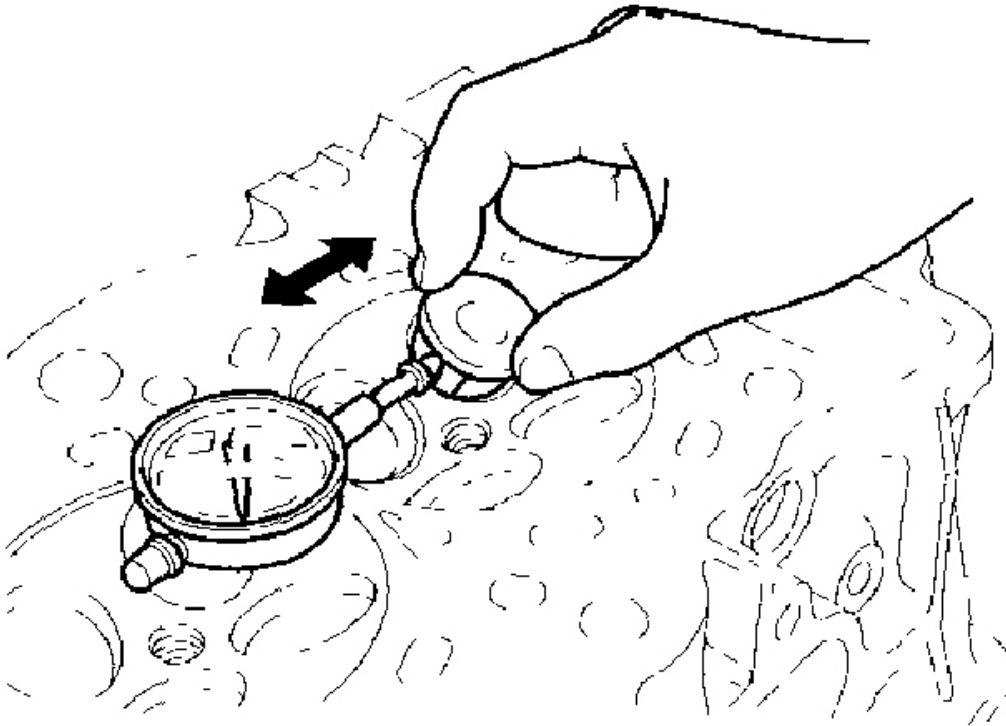
**G03692355**

Fig. 102: Measuring Guide-To-Stem Clearance With Dial Indicator
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): 0.02-0.05 mm (0.001-0.002 in.)

Service Limit: 0.08 mm (0.003 in.)

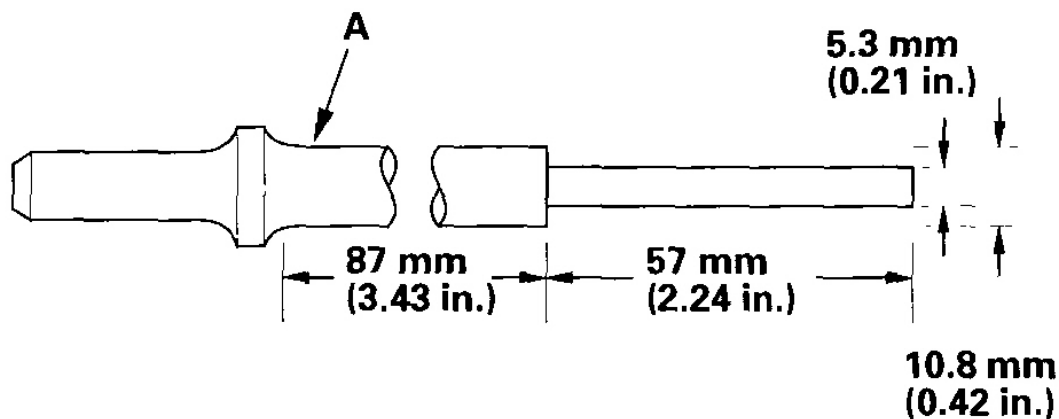
Exhaust Valve Stem-to-Guide Clearance Standard (New): 0.05-0.08 mm (0.002-0.003 in.)

Service Limit: 0.11 mm (0.004 in.)

VALVE GUIDE REPLACEMENT

Special Tools Required

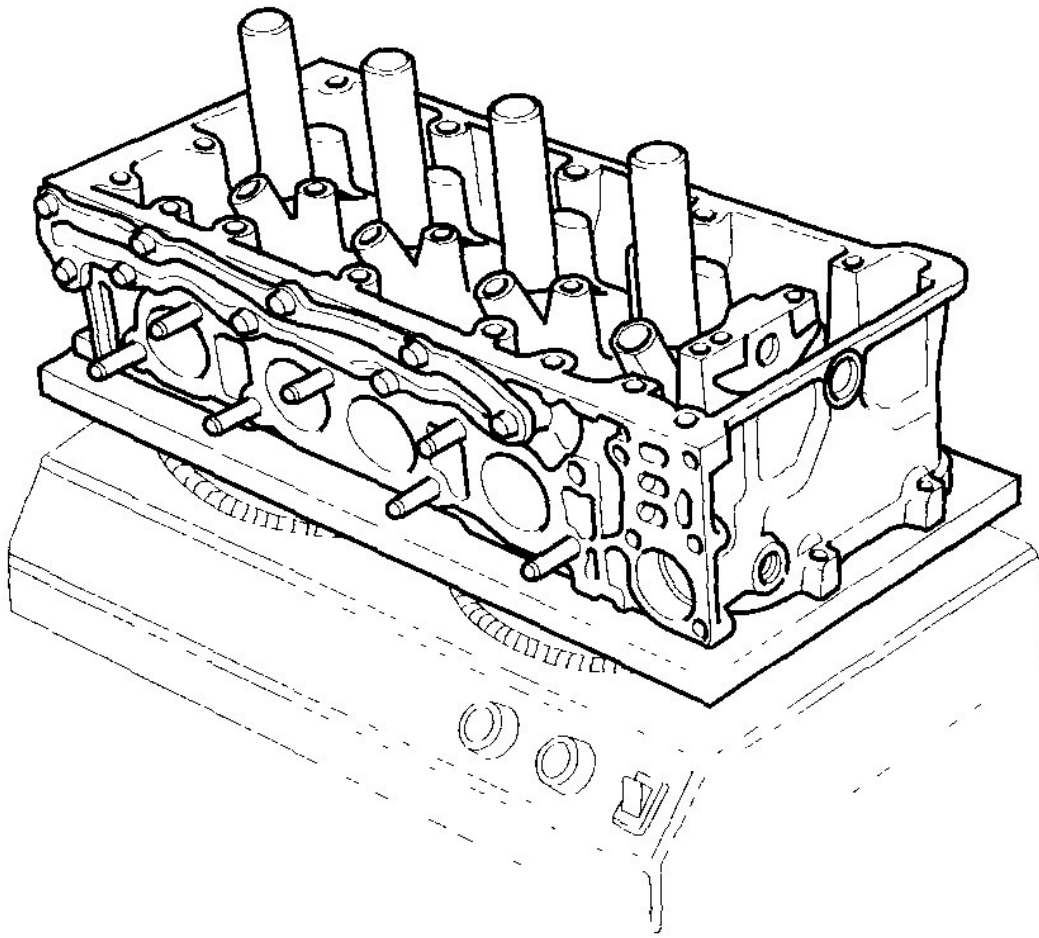
- Valve guide driver, 5.5 mm 07742-0010100
 - Valve guide reamer, 5.5 mm 07HAH-PJ7010B
1. Inspect valve stem-to-guide clearance (see **VALVE INSPECTION**).
 2. As illustrated, use a commercially available air-impact valve guide driver (A) modified to fit the diameter of the valve guides. In most cases, the same procedure can be done using the special tool and a conventional hammer.



G03692356

Fig. 103: [Identifying Air-Impact Valve Guide Driver]
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



G03692357

Fig. 104: Heating Cylinder Head

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



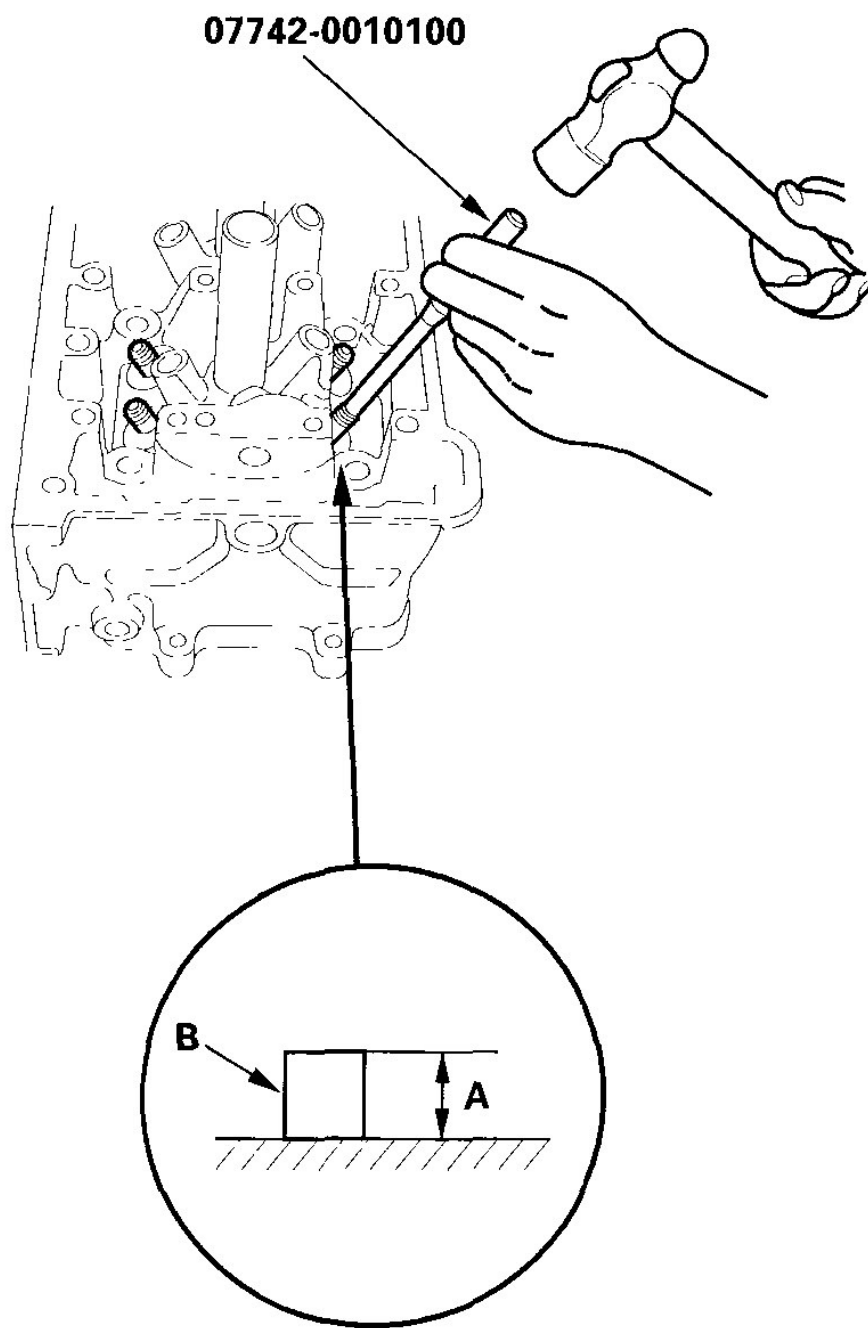
G03692358

Fig. 105: Removing Valve Guide**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

7. If a valve guide won't move, drill it out with a 8 mm (5/16 in.) bit, then try again. Drill guides only in extreme cases; you could damage the cylinder head if the guide breaks.

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

Valve Guide Installed Height**Intake: 15.2-16.2 mm (0.598-0.638 in.)****Exhaust: 16.0-17.0 mm (0.630-0.669 in.)**



G03692359

Fig. 106: Installing Valve Guide

Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Coat both reamer and valve guide with cutting oil.

11. Rotate the reamer clockwise the full length of the valve guide bore.

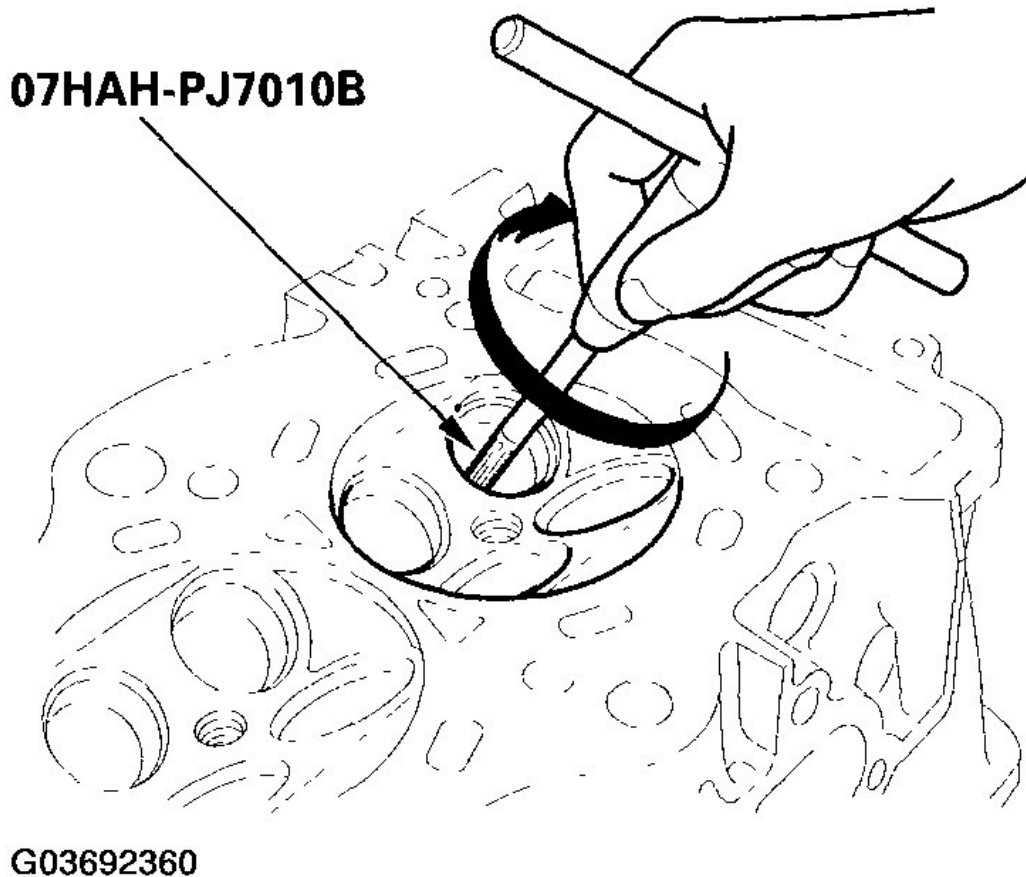


Fig. 107: Rotating Reamer Clockwise
Courtesy of AMERICAN HONDA MOTOR CO., INC.

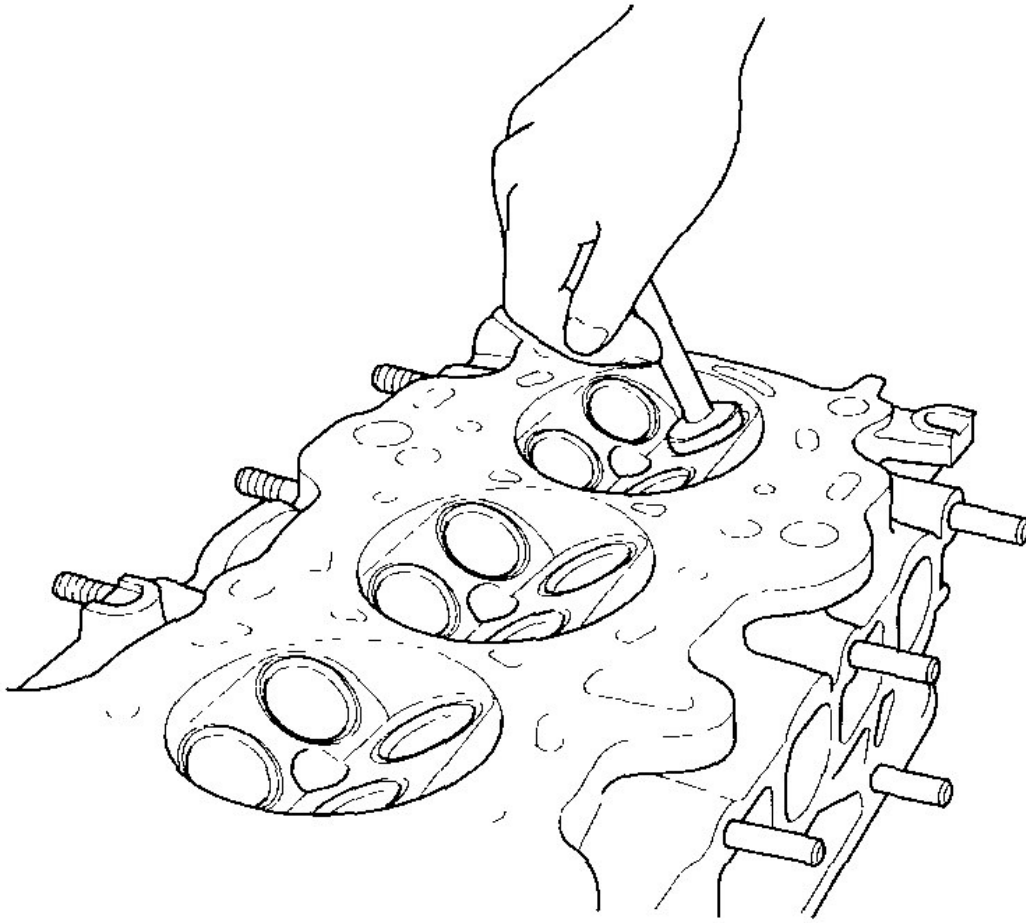
12. Continue to rotate the reamer clockwise while drawing it from the bore.
13. Thoroughly wash the guide in detergent and water to remove any cutting residue.
14. Check the clearances with a valve (see VALVE STEM-TO-GUIDE CLEARANCE INSPECTION).

Verify that a valve slides in the intake and exhaust valve guides without getting stuck.

15. Inspect the valve seating, if necessary renew the valve seat using a valve seat cutter (see VALVE SEAT RECONDITIONING).

VALVE SEAT RECONDITIONING

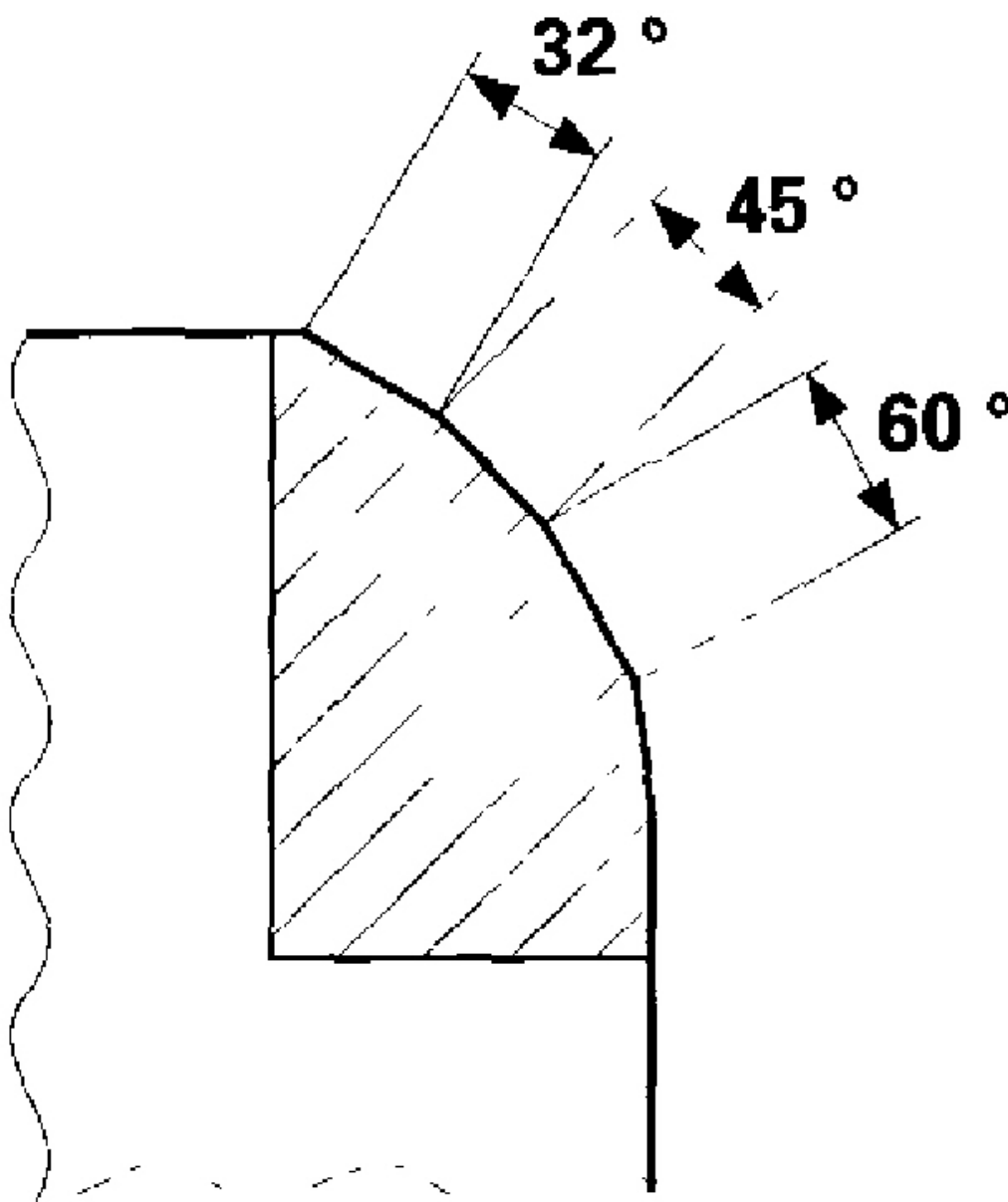
1. Inspect valve stem-to-guide clearance (see **VALVE STEM-TO-GUIDE CLEARANCE INSPECTION**). If the valve guides are worn, replace them (see **VALVE STEM-TO-GUIDE CLEARANCE INSPECTION**) before cutting the valve seats.
2. Renew the valve seats in the cylinder head using a valve seat cutter.



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Fig. 108: Renewing Valve Seats In Cylinder Head Using Valve Seat Cutter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Carefully cut a 45 ° seat, removing only enough material to ensure a smooth and concentric seat.
4. Bevel the upper edge of the seat with the 32 ° cutter and the lower edge of the seat with the 60 ° cutter. Check the width of the seat and adjust accordingly.



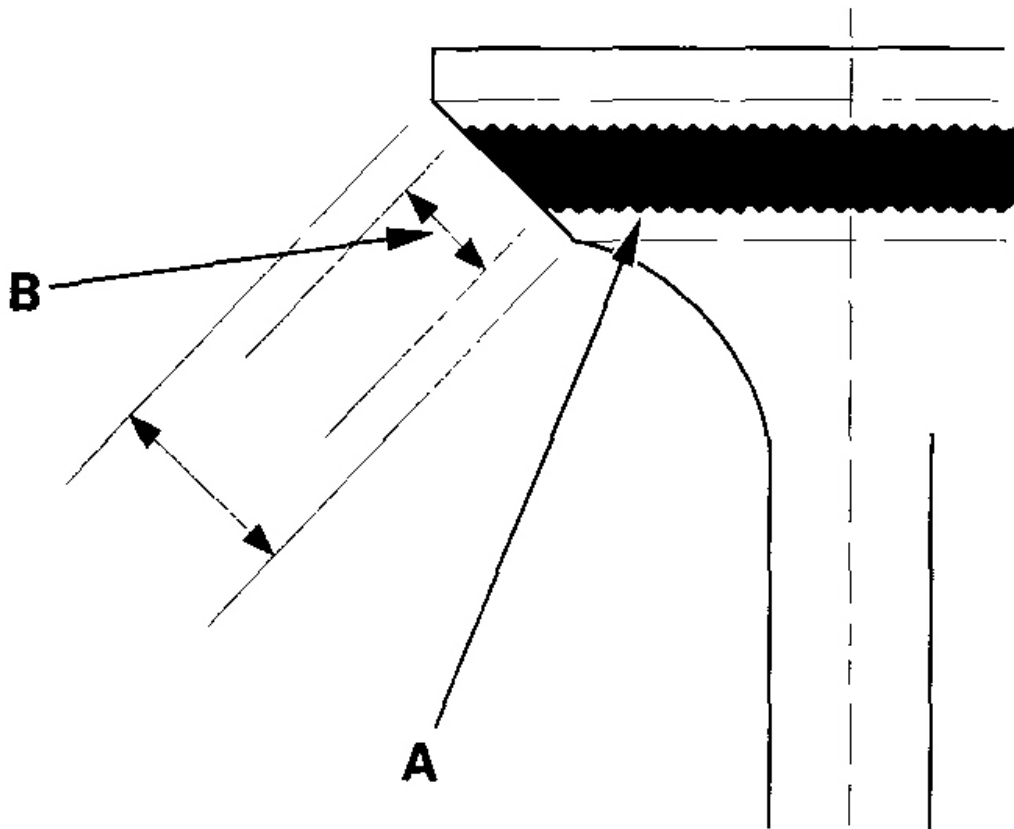
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Fig. 109: Identifying Cutter Degrees For Beveling Upper Edge Of Seat And Lower Edge Of Seat
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Valve Seat Width**Intake:****Standard (New): 1.05-1.35 mm (0.041-0.053 in.)****Service Limit: 1.80 mm (0.071 in.)****Exhaust:****Standard (New): 1.25-1.55 mm (0.049-0.061 in.)****Service Limit: 2.00 mm (0.079 in.)**

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



G03692363

Fig. 110: Applying Prussian Blue Compound To Valve Face
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 60 ° cutter to move it down, then one more cut with the 45 ° cutter to restore seat width.
 - If it is too low (close to the valve edge), you must make a second cut with the 32 ° cutter to move it up, then make one more cut with the 45 ° cutter to restore seat width.

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

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

Intake Valve Stem Installed Height

2009 Honda S2000

2000-09 ENGINE Cylinder Head - S2000

Standard (New): 44.1-44.4 mm (1.736-1.748 in.)

Service Limit: 44.7 mm (1.760 in.)

Exhaust Valve Stem Installed Height

Standard (New): 44.2-44.5 mm (1.740-1.752 in.)

Service Limit: 44.8 mm (1.764 in.)

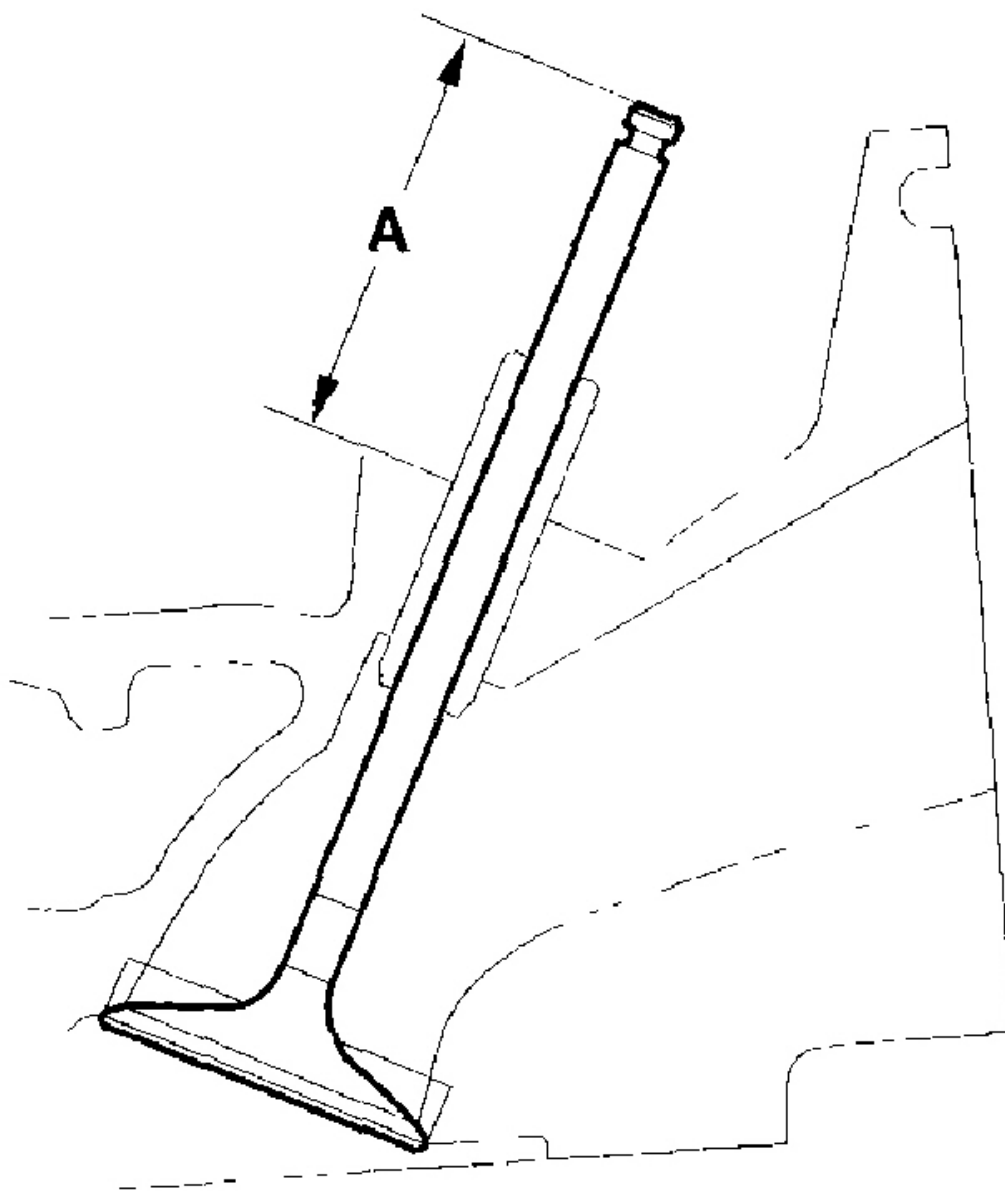
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Fig. 111: Identifying Valve Stem Installed Height
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

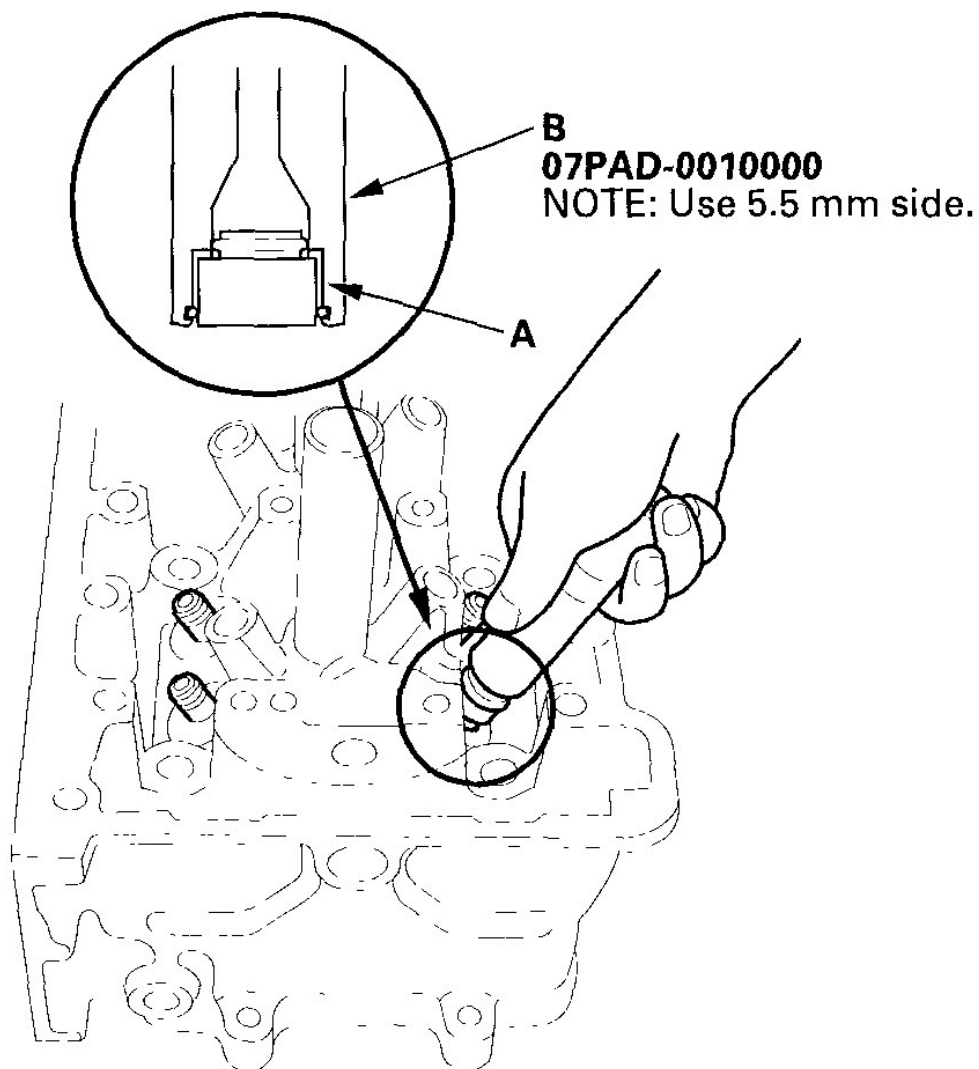
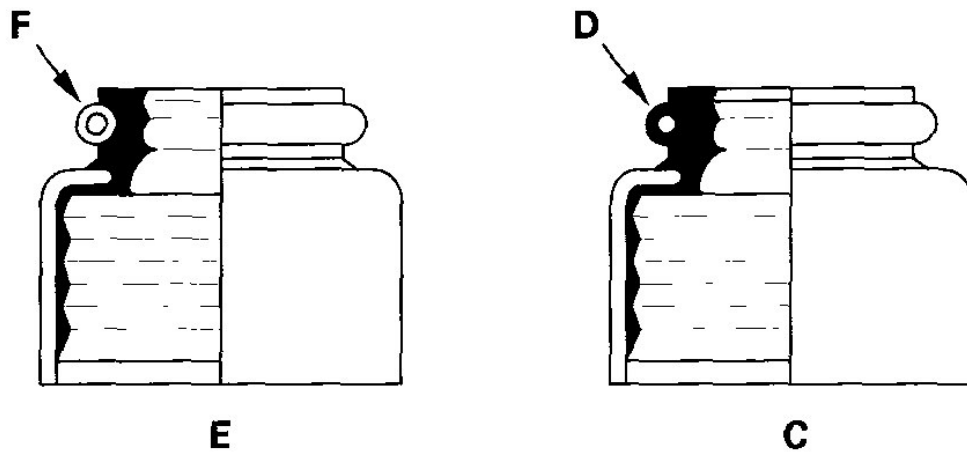
VALVE, SPRING, AND VALVE SEAL INSTALLATION

Special Tools Required

- Stem seal driver 07PAD-0010000
- Valve spring compressor attachment 07757-PJ 1010A

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

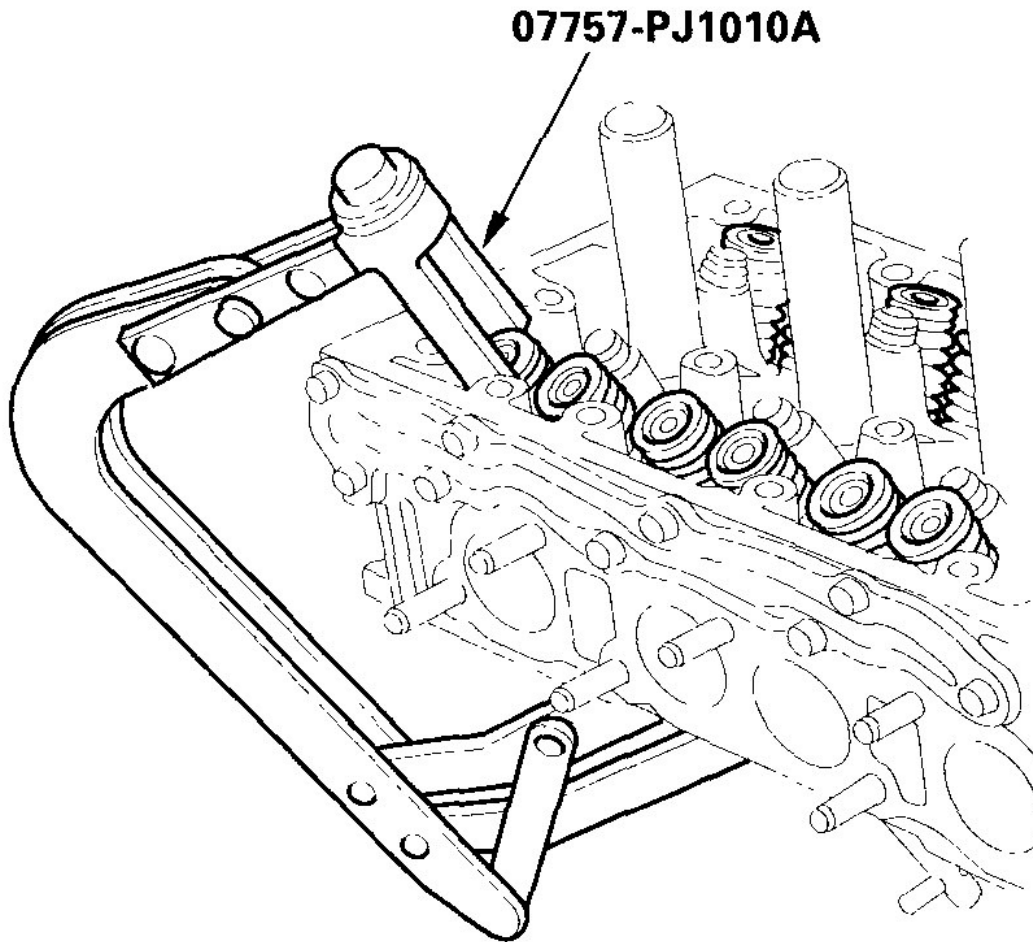
NOTE: **The exhaust valve seal (C) has a black spring (D), and the intake valve seal (E) has a white spring (F). They are not interchangeable.**



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Fig. 112: Installing New Valve Seals Using Valve Guide Seal Installer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

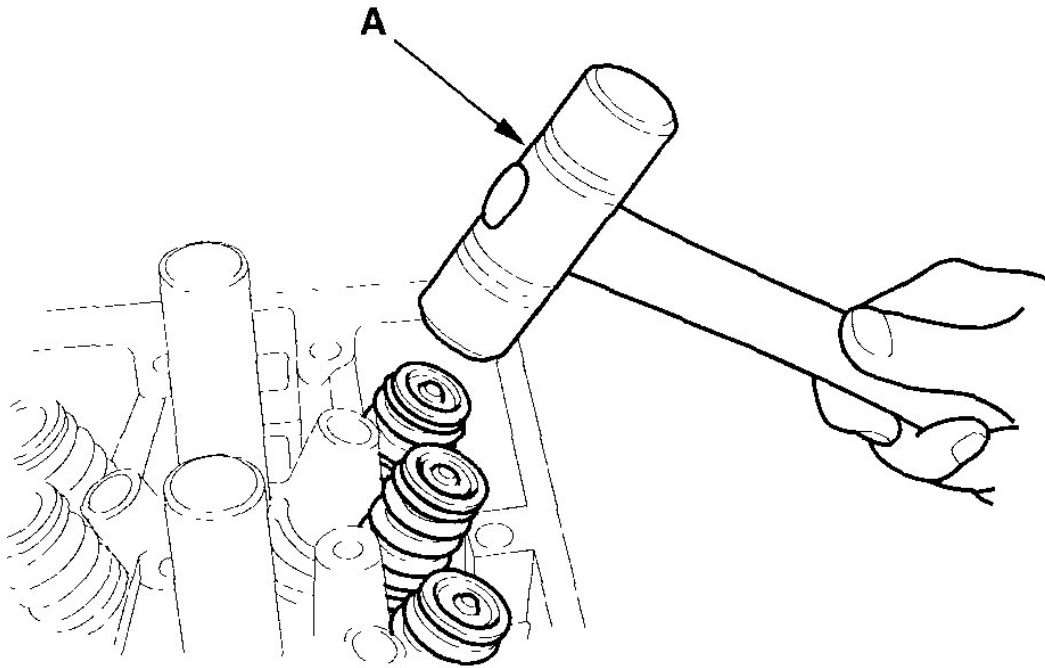
5. Install the valve spring and valve retainer. Place the end of the valve spring with closely wound coils toward the cylinder head.
6. Install the valve spring compressor. Compress the spring and install the valve cotters.



G03692366

Fig. 113: Compressing Spring Using Valve Spring Compressor
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



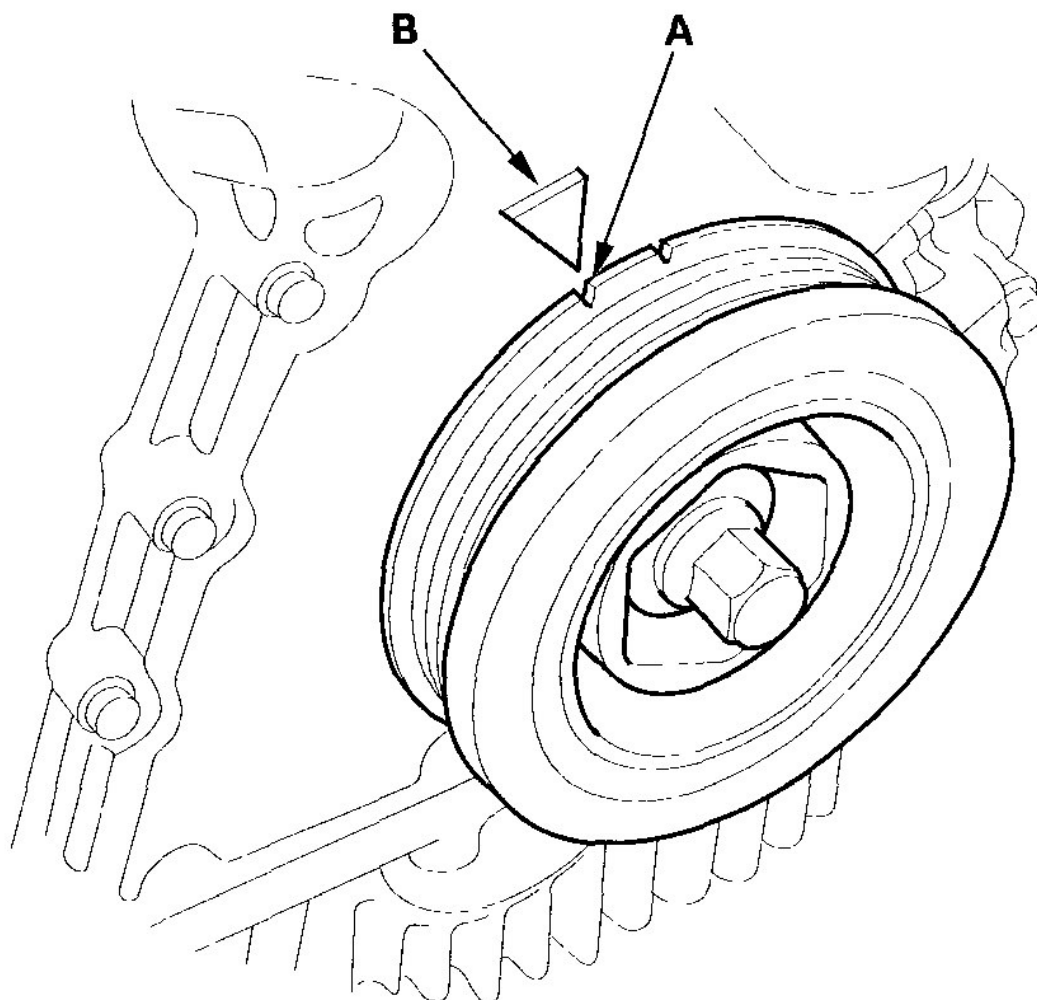
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Fig. 114: Taping End Of Each Valve Stem With Plastic Mallet For Ensuring Proper Seating Of Valve And Valve Cotteners

Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM ASSEMBLY INSTALLATION

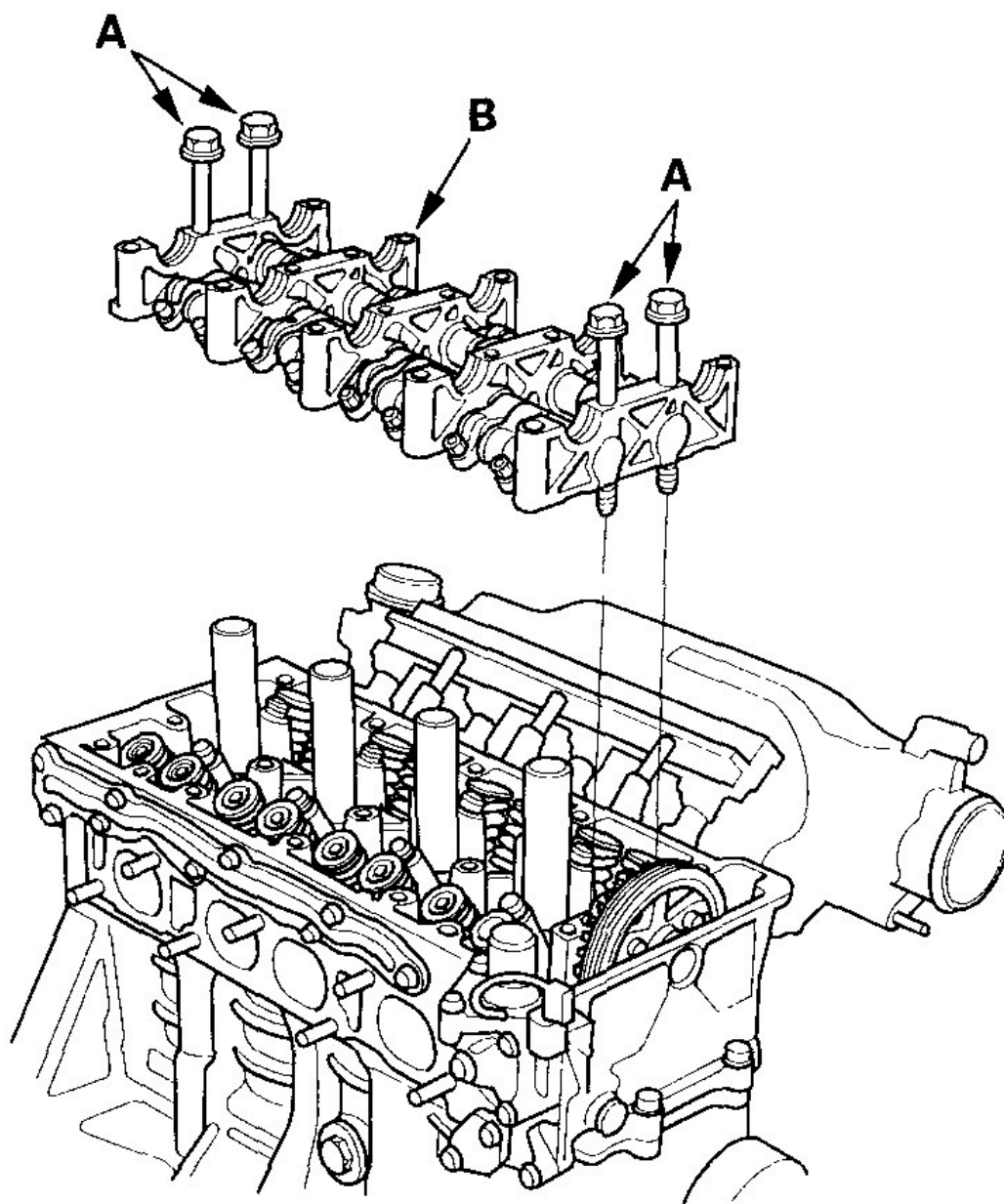
1. Make sure the crankshaft pulley is at top dead center (TDC). Align the TDC mark (A) on the crankshaft pulley with the pointer (B) on the chain case.



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Fig. 115: Aligning TDC Mark On Crankshaft Pulley With Pointer On Chain Case
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Insert the bolts (A) into the rocker shaft holder, then install the rocker arm assembly (B).

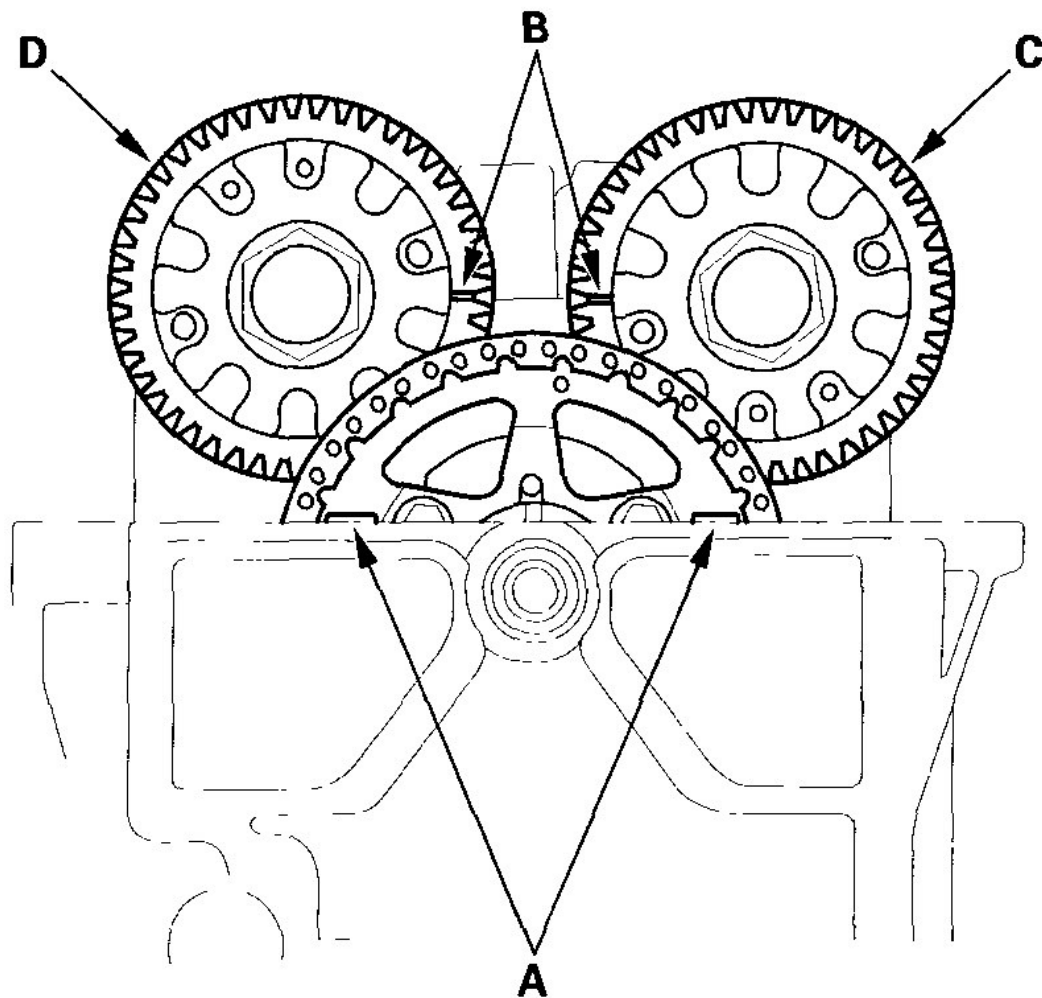


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Fig. 116: Installing Rocker Arm Assembly

Courtesy of AMERICAN HONDA MOTOR CO., INC.

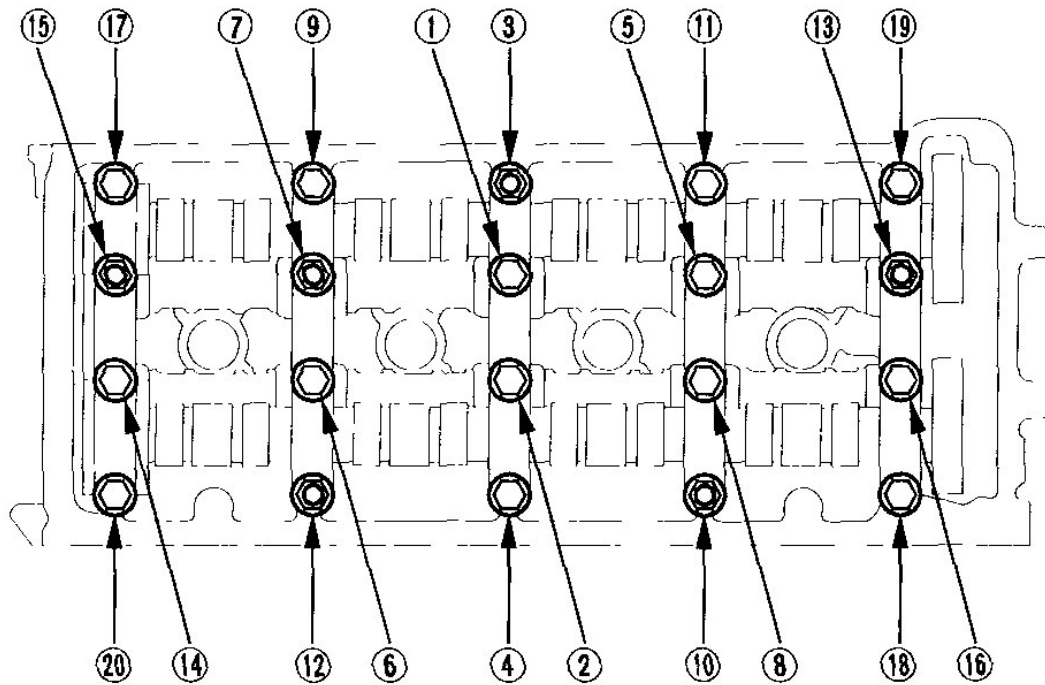
3. Check the alignment of the TDC marks (A) on the cam chain sprocket with the cylinder head surface.



G03692370

Fig. 117: Aligning TDC Marks On Intake Camshaft Gear And Exhaust Camshaft Gear
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Align the TDC marks (B) on the intake camshaft gear (C) and the exhaust camshaft gear (D), and install the camshafts.
5. Apply new engine oil to the bolt threads of all the camshaft holder bolts.
6. Put the camshaft holders on the cylinder head, then tighten all bolts to 22 N.m (2.2 kgf.m, 16 lbf.ft). To prevent damaging the camshafts, tighten the bolts two turns at a time, in the sequence shown.



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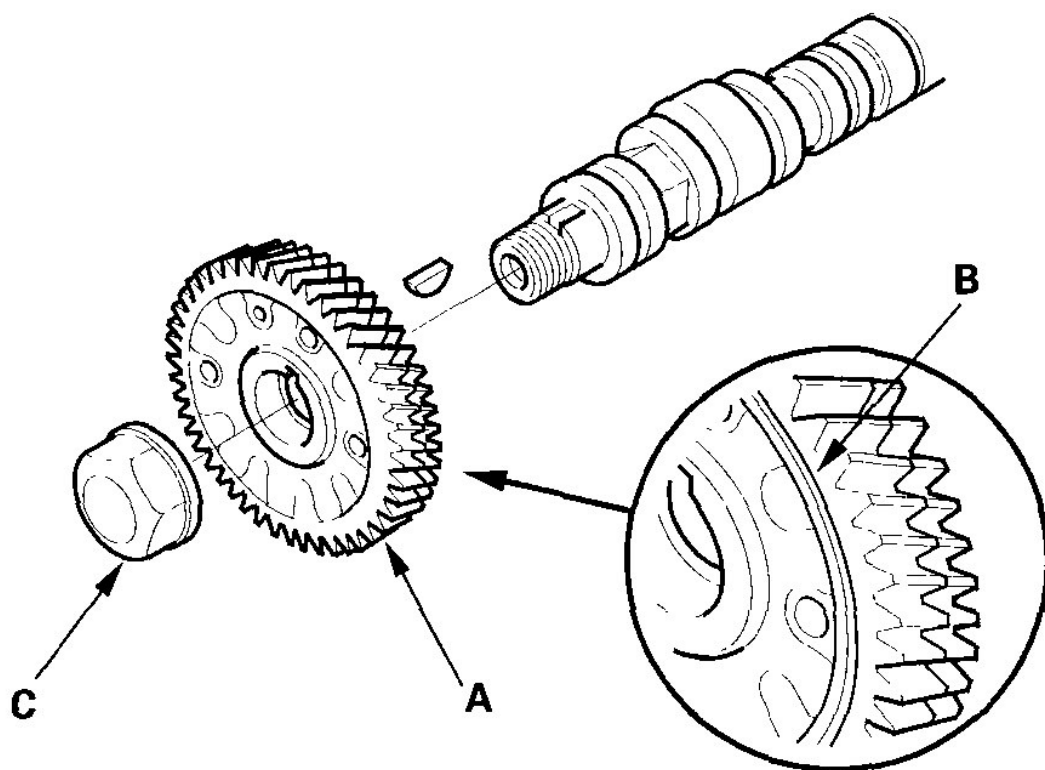
Fig. 118: Identifying Tightening Sequence Of Camshaft Bolts
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Adjust the valve clearance (see VALVE CLEARANCE ADJUSTMENT).
8. Install the cylinder head cover (see CYLINDER HEAD COVER INSTALLATION).

CAMSHAFT GEAR INSTALLATION

1. Install the camshaft gear (A).

NOTE: The exhaust camshaft gear has a groove (B) in the face. The intake camshaft gear does not have a groove. Be sure to install the correct camshaft gear on each camshafts.



G03692372

Fig. 119: Installing Camshaft Gear

Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Apply new engine oil to the threads of the camshaft gear mounting nut (C), then install it.
3. Hold the camshaft with an open-end wrench, then tighten the camshaft gear mounting nut.

Specified Torque:**118 N.m (12.0 kgf.m, 86.8 lbf.ft)**

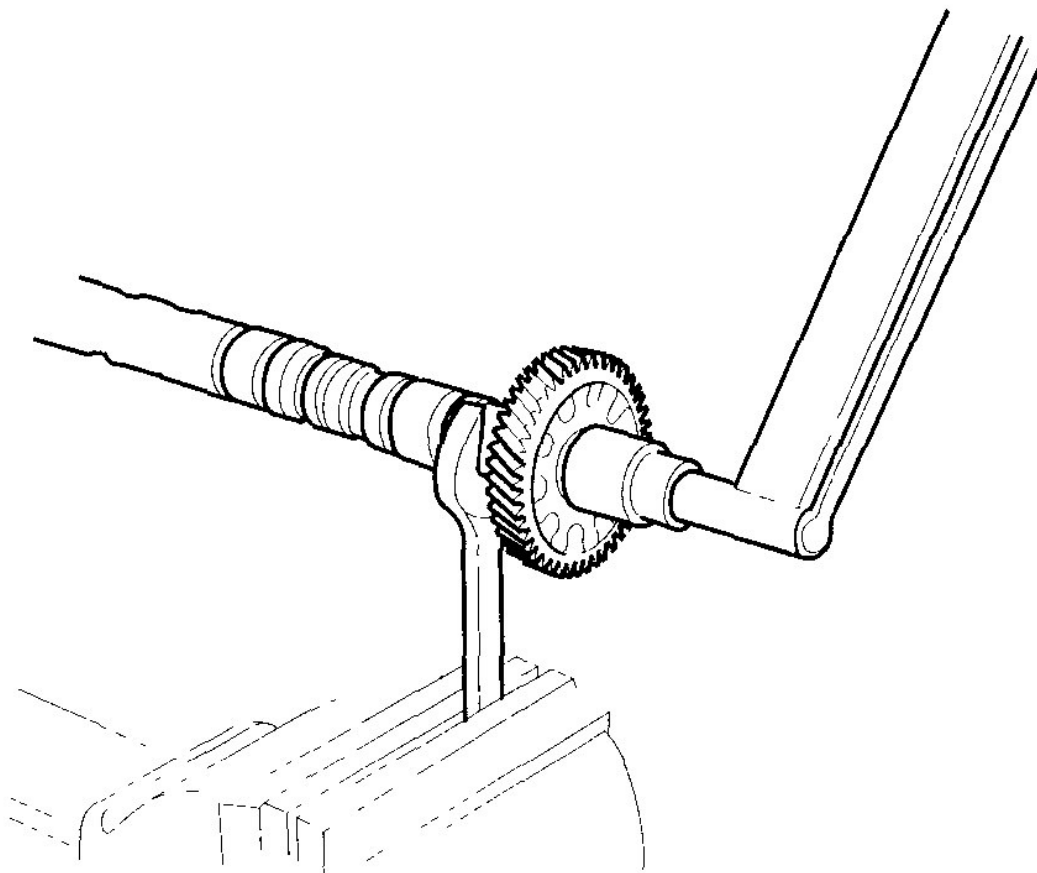
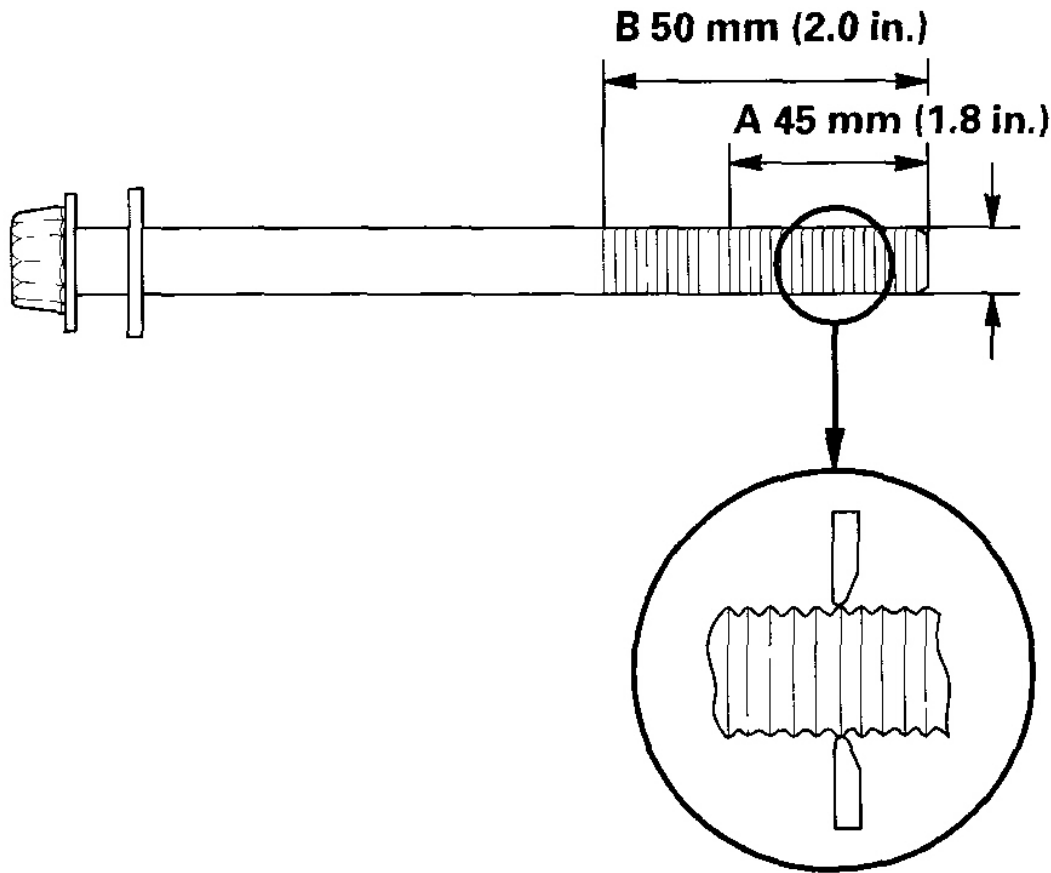
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Fig. 120: Tightening Camshaft Gear Mounting Nut
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER HEAD INSTALLATION

1. Measure the diameter of each cylinder head bolt at point A and point B. If either diameter is less than 11.5 mm (0.45 in.), replace the cylinder head bolt.

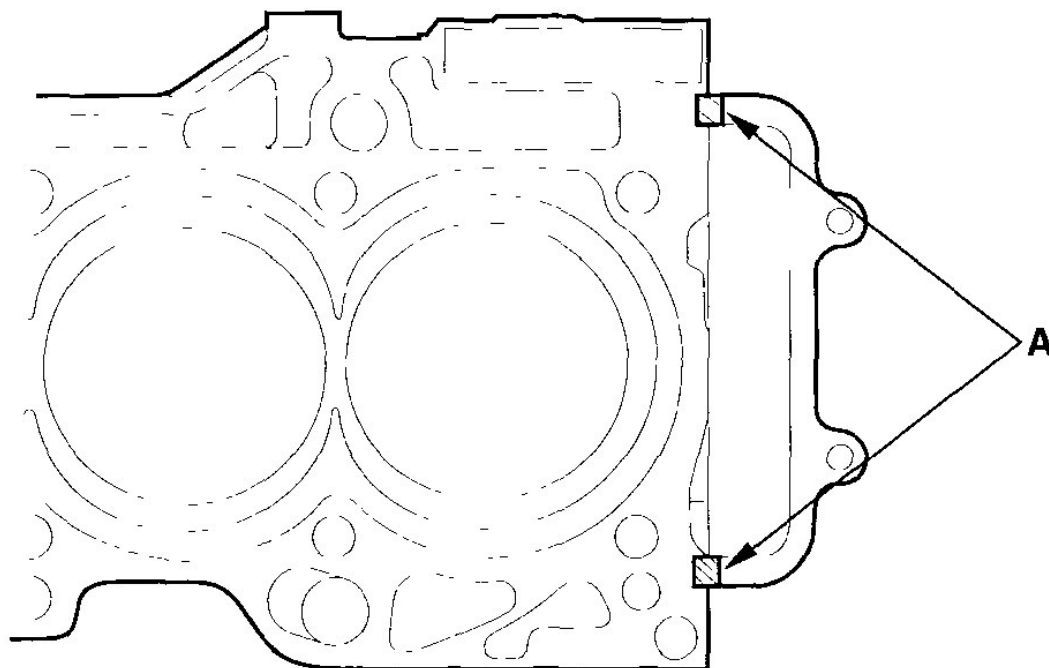


G03692374

Fig. 121: Identifying Diameter Of Each Cylinder Head Bolt At Point A And Point B
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Clean and dry the cylinder head, engine block, and chain case mating surfaces.
3. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, to the shaded areas (A) of the cylinder head gasket mating surface of the engine block and chain case.

NOTE: Do not install the parts if 5 minutes or more have elapsed since applying liquid gasket. Instead, reapply liquid gasket after removing the old residue.

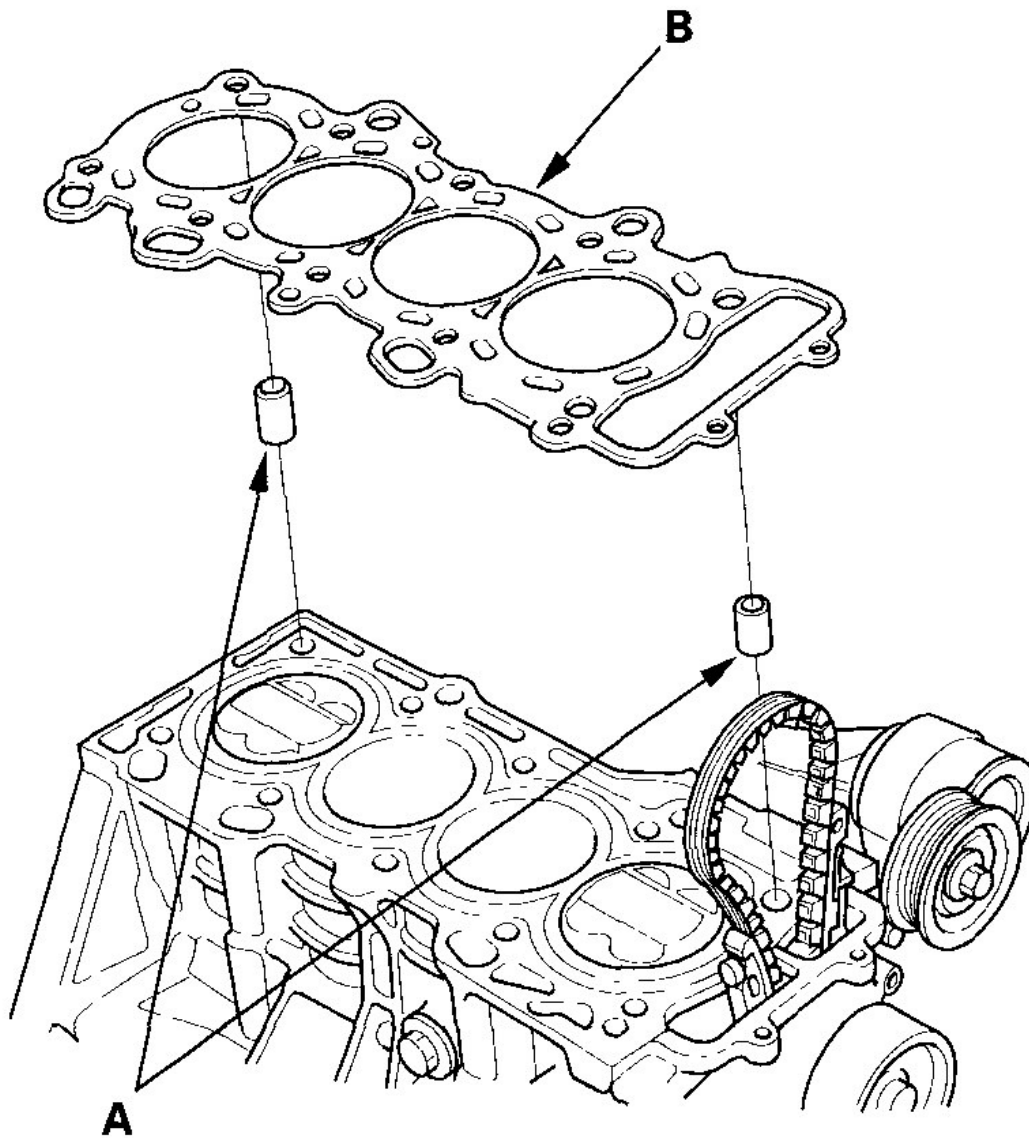


G03692375

Fig. 122: Identifying Cylinder Head Gasket Mating Surface Of Engine Block And Chain Case For Applying Liquid Gasket

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Install the dowel pins (A) and the new cylinder head gasket (B).



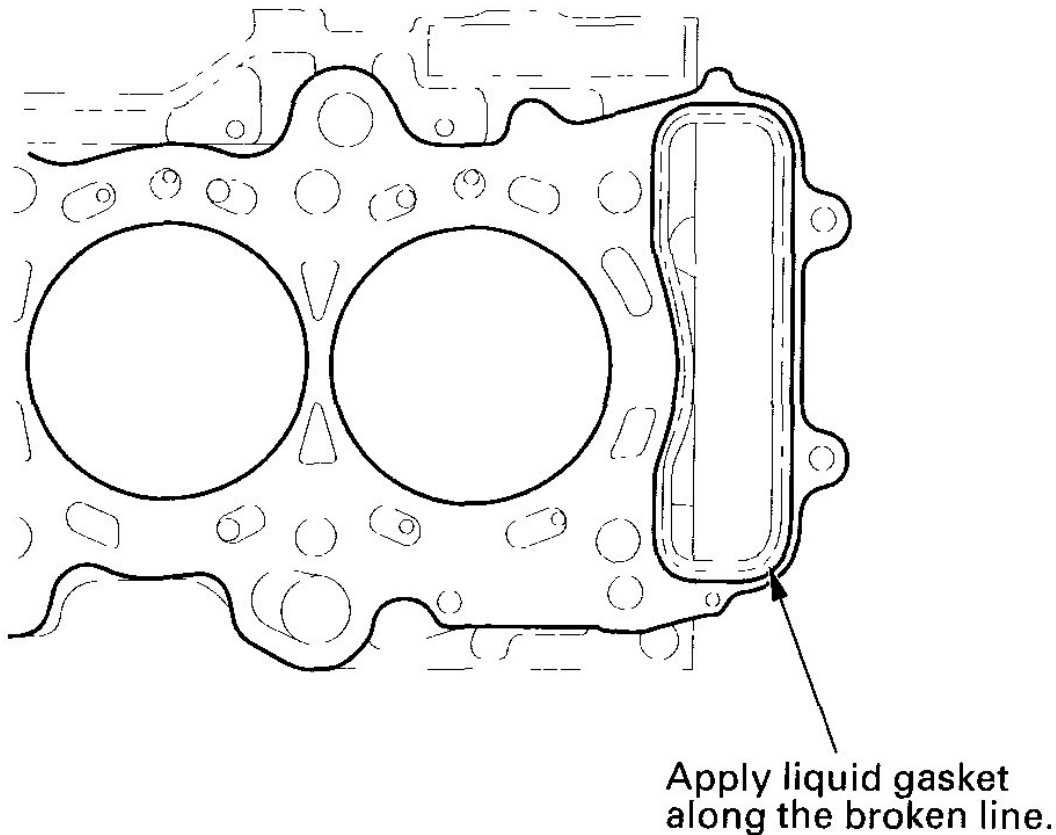
G03692376

Fig. 123: Installing Dowel Pins And New Cylinder Head Gasket

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, to the cylinder head mating surface of the block and chain case within 5 mm of the edge of the cylinder head gasket.

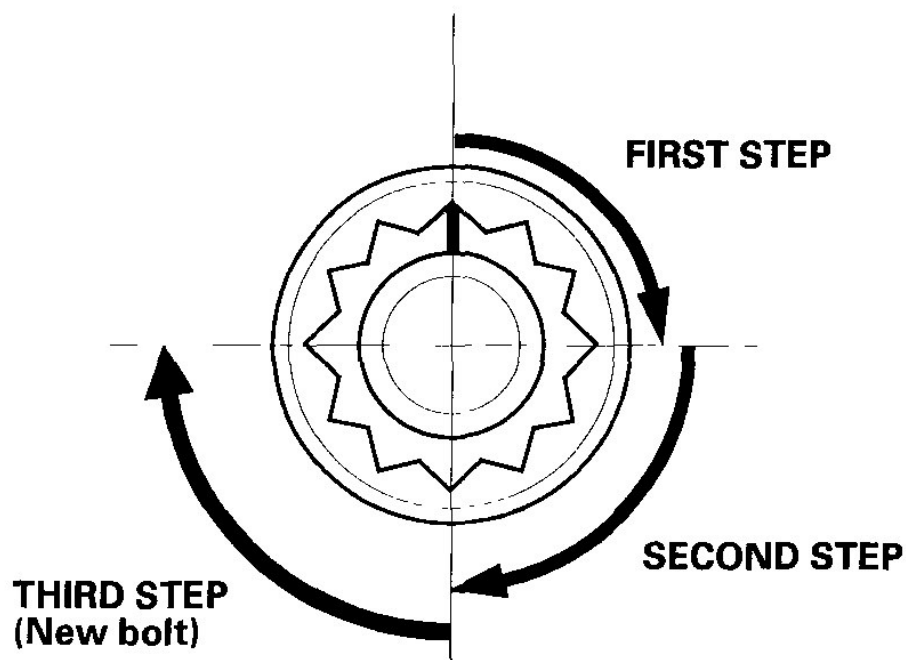
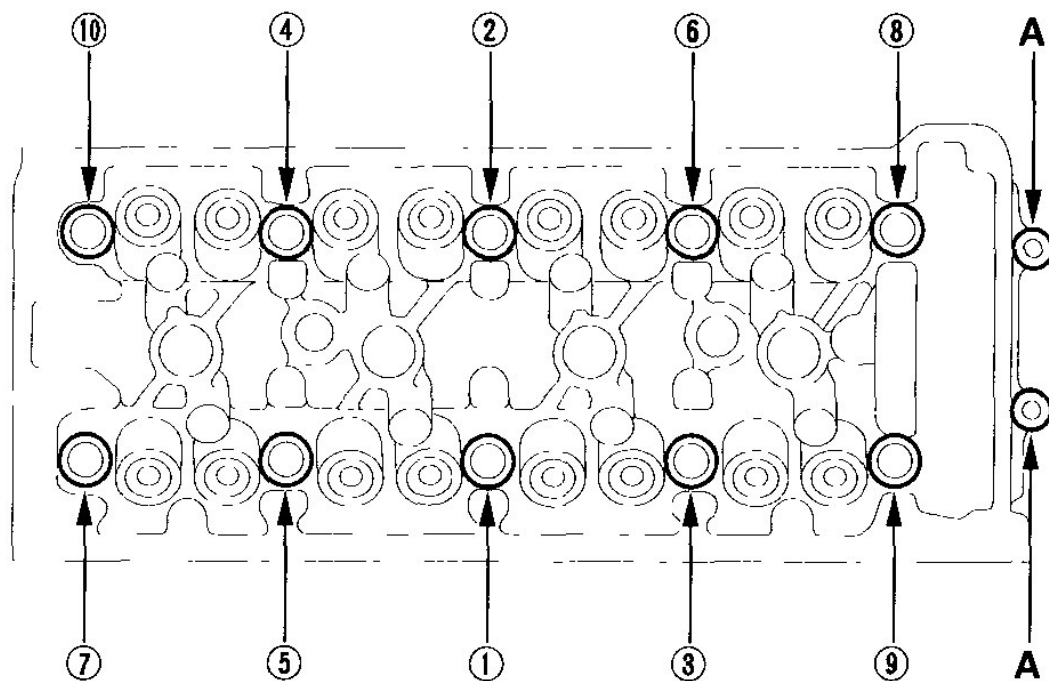
NOTE: Do not install the parts if 5 minutes or more have elapsed since applying liquid gasket. Instead, reapply liquid gasket after removing the old residue.



G03692377

Fig. 124: Identifying Cylinder Head Gasket Mating Surface Of Engine Block And Chain Case For Applying Liquid Gasket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Install the cylinder head on the engine block.
7. Apply new engine oil to the threads and flange of all the cylinder head bolts.
8. Tighten the cylinder head bolts in sequence to 29 N.m (3.0 kgf.m, 22 lbf.ft). Use a beam-type torque wrench. When using a preset-type torque wrench, be sure to tighten slowly and do not overtighten. If a bolt makes any noise while you are torquing it, loosen the bolt and retighten it.

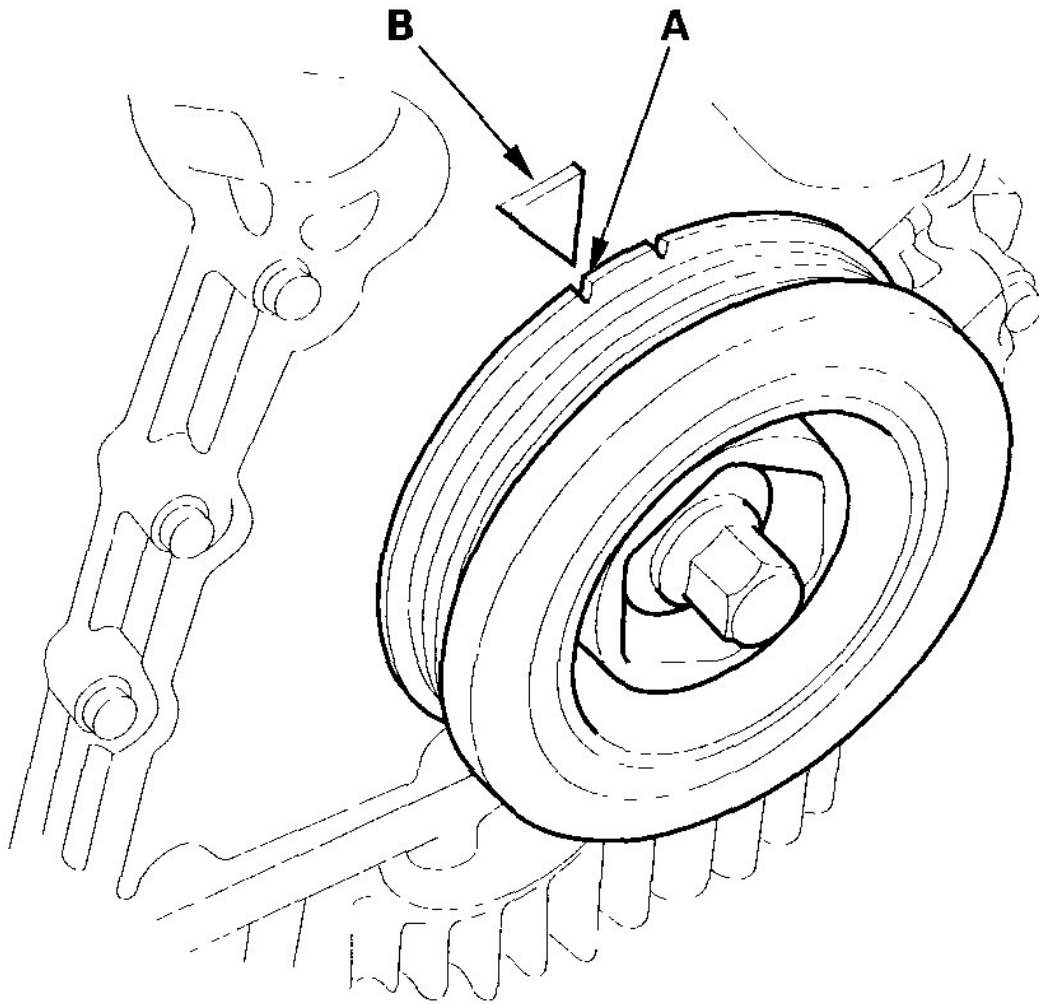


G03692378

Fig. 125: Identifying Tightening Sequence Of Cylinder Head Bolts

Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Tighten all cylinder head bolts in two steps (90 ° per step). If you are using a new cylinder head bolt, tighten the bolt an extra 90 °.
10. Tighten the 8 mm bolts (A) to 22 N.m (2.2 kgf.m, 16 lbf.ft).
11. Make sure the crankshaft pulley is at top dead center (TDC). Align the TDC mark (A) on the crankshaft pulley with the pointer (B) on the chain case.

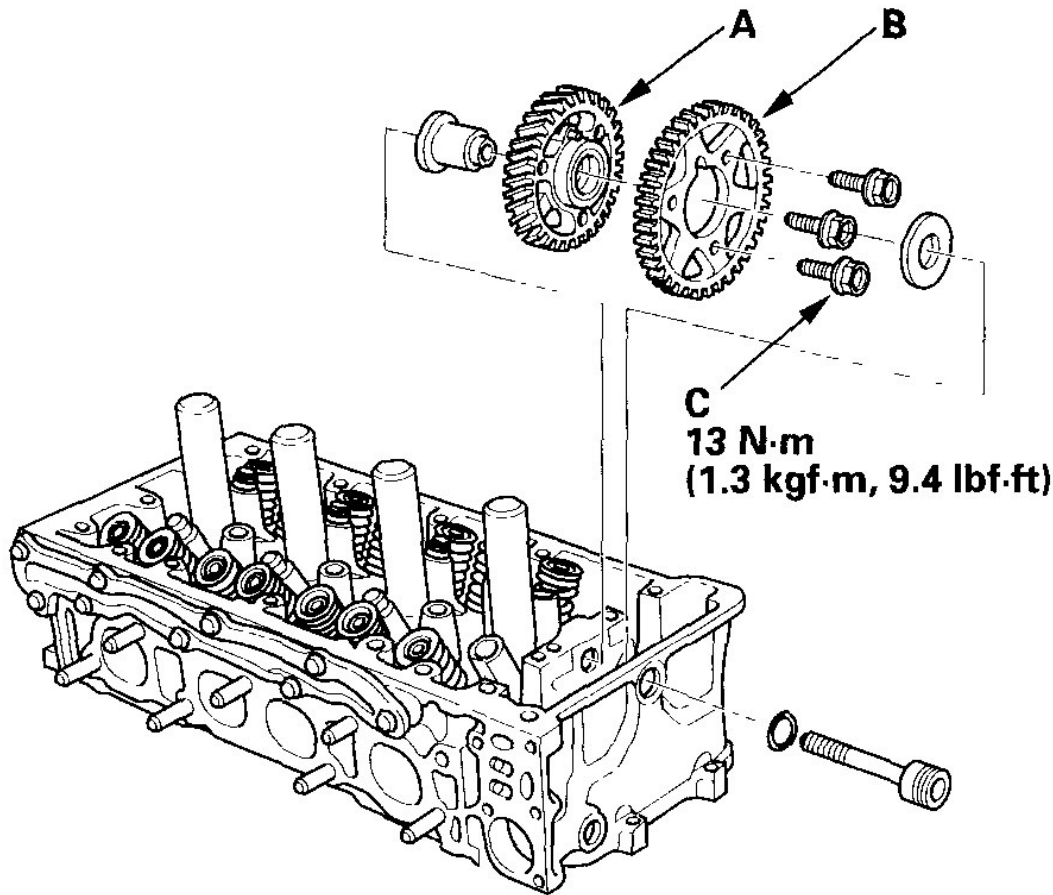


G03692379

Fig. 126: Aligning TDC Mark On Crankshaft Pulley With Pointer On Chain Case
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Assemble the idler gear (A) and cam chain sprocket (B) with three mounting bolts (C). Torque the bolts

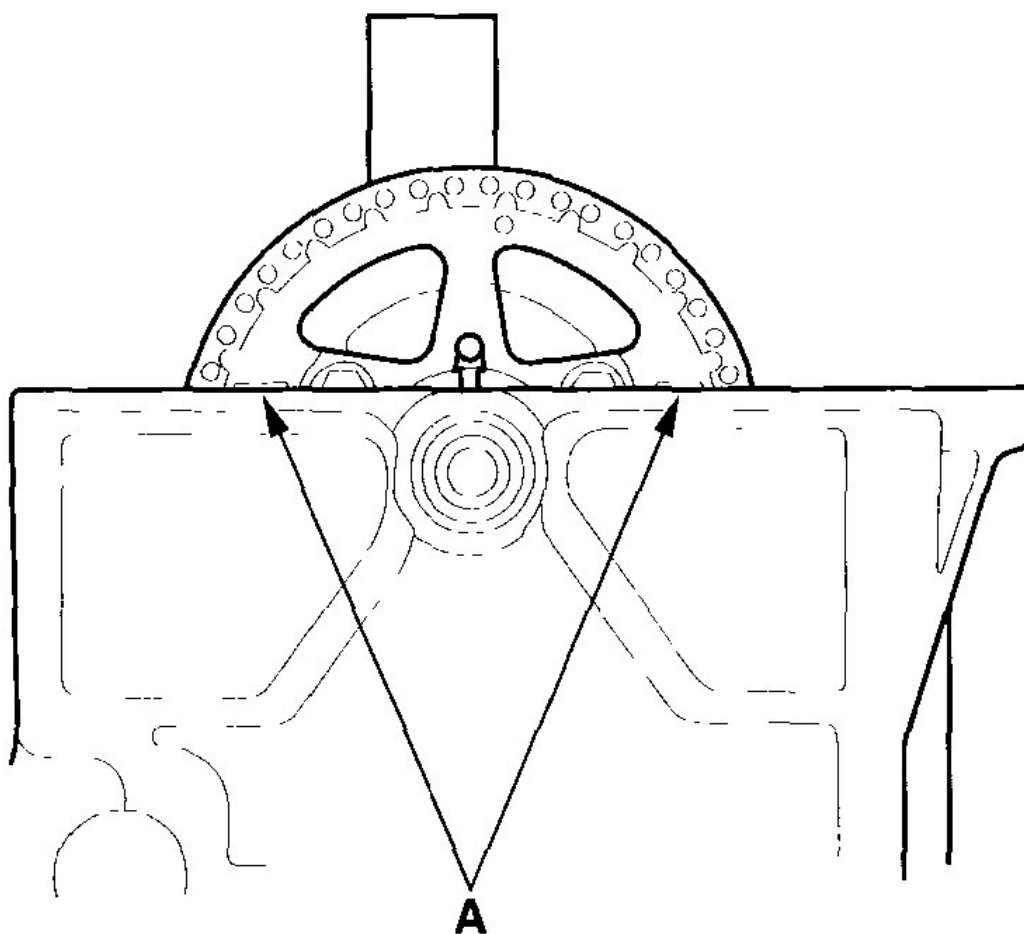
to 13 N.m (1.3 kgf.m, 9.4 lbf.ft).



G03692380

Fig. 127: Installing Idler Gear And Cam Chain Sprocket With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

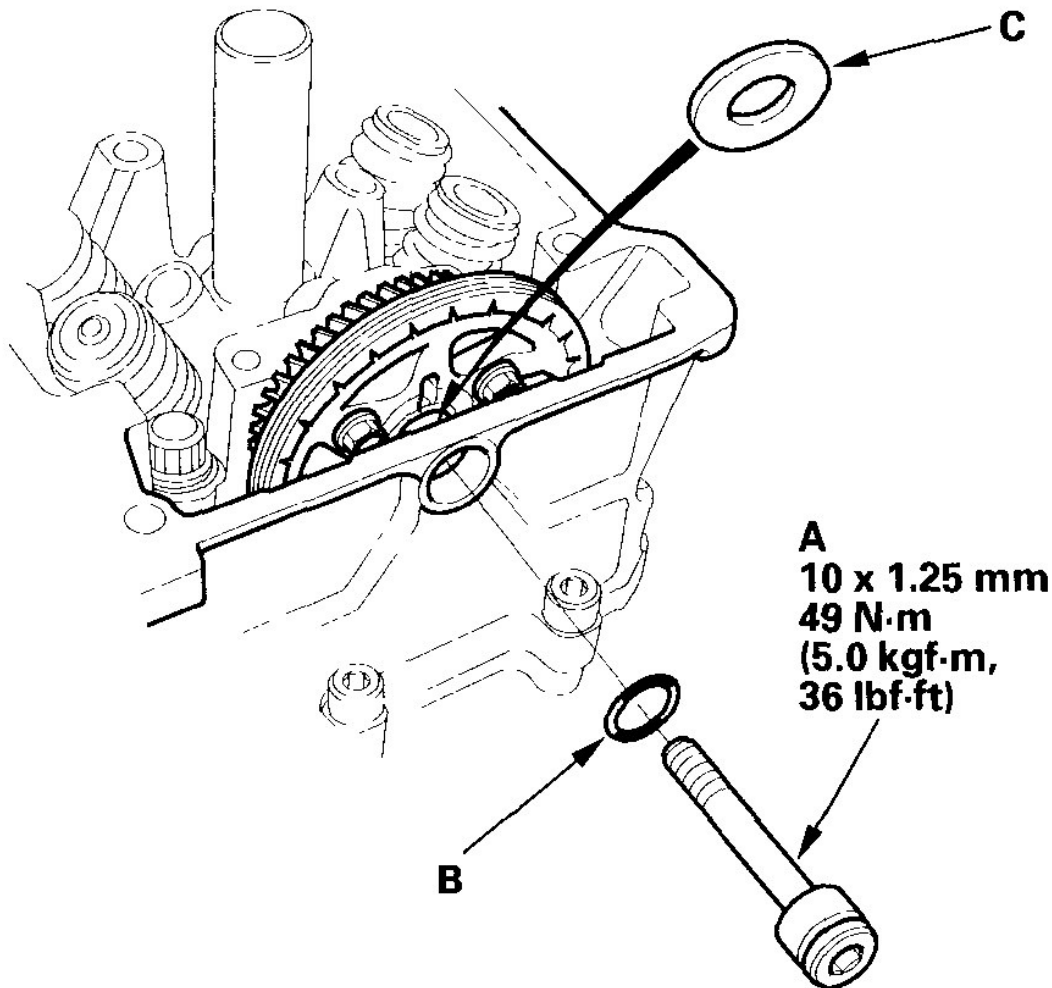
13. Place the idler gear/cam chain sprocket assembly and idler gear collar into the cylinder head.
14. Install the cam chain on the sprocket, then fit the assembly into the cylinder head.
15. Turn the idler gear counterclockwise to relieve cam chain free play, and check the alignment of the TDC marks (A) on the cam chain sprocket with the cylinder head surface. If the cam chain sprocket is not positioned at TDC, remove the idler gear from the cylinder head and reposition the cam chain to bring the cam chain sprocket to TDC.



G03692381

Fig. 128: Aligning TDC Marks On Cam Chain Sprocket With Cylinder Head Surface
Courtesy of AMERICAN HONDA MOTOR CO., INC.

16. Apply new engine oil to the idler gear/cam chain sprocket center bolt threads (A). Install a new O-ring (B) on the bolt.

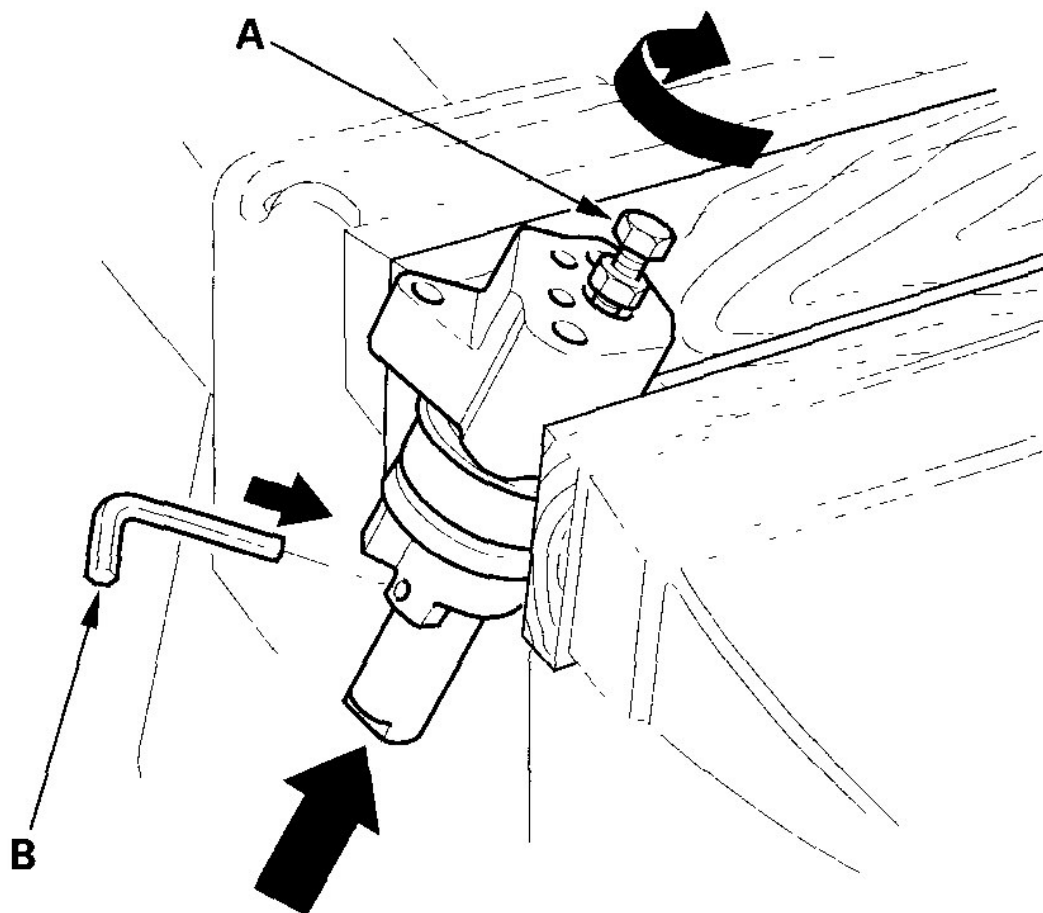


G03692382

Fig. 129: Installing New O-Ring On Idler Gear/Cam Chain Sprocket Center Bolt With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Install the washer (C) on the idler gear, and tighten the center bolt.
18. Clamp the cam chain auto-tensioner in a soft-jawed vise.
19. Turn the 5 x 0.8 mm bolt (A) clockwise to compress the bottom of the auto-tensioner, then insert the set pin (B), P/N 14511-PCX-005.

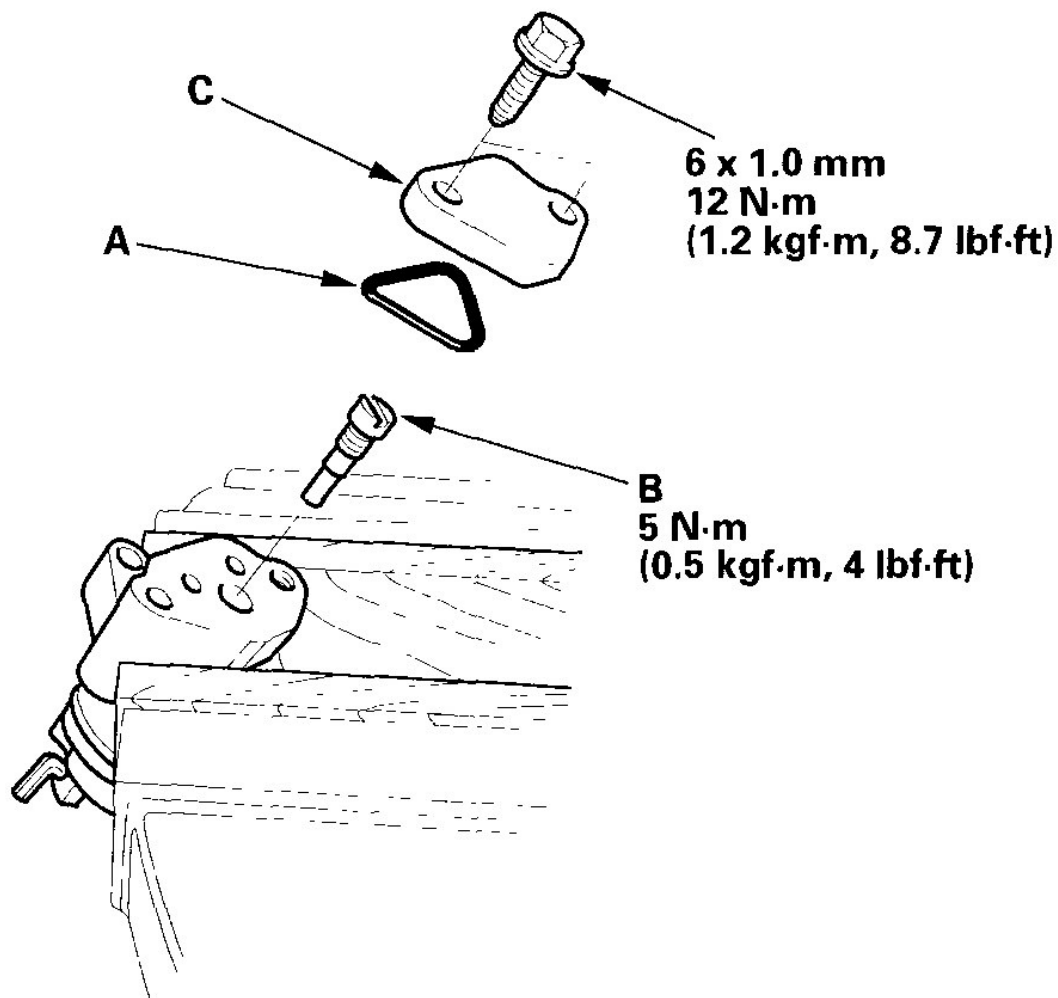


G03692383

Fig. 130: Inserting Set Pin

Courtesy of AMERICAN HONDA MOTOR CO., INC.

20. Remove the 5 x 0.8 mm bolt from the maintenance hole. Install a new O-ring (A), then install the nozzle (B) and end cover (C).



G03692384

Fig. 131: Installing Nozzle And End Cover With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

21. Install the cam chain auto-tensioner (A) in the cylinder head with new O-rings (B).

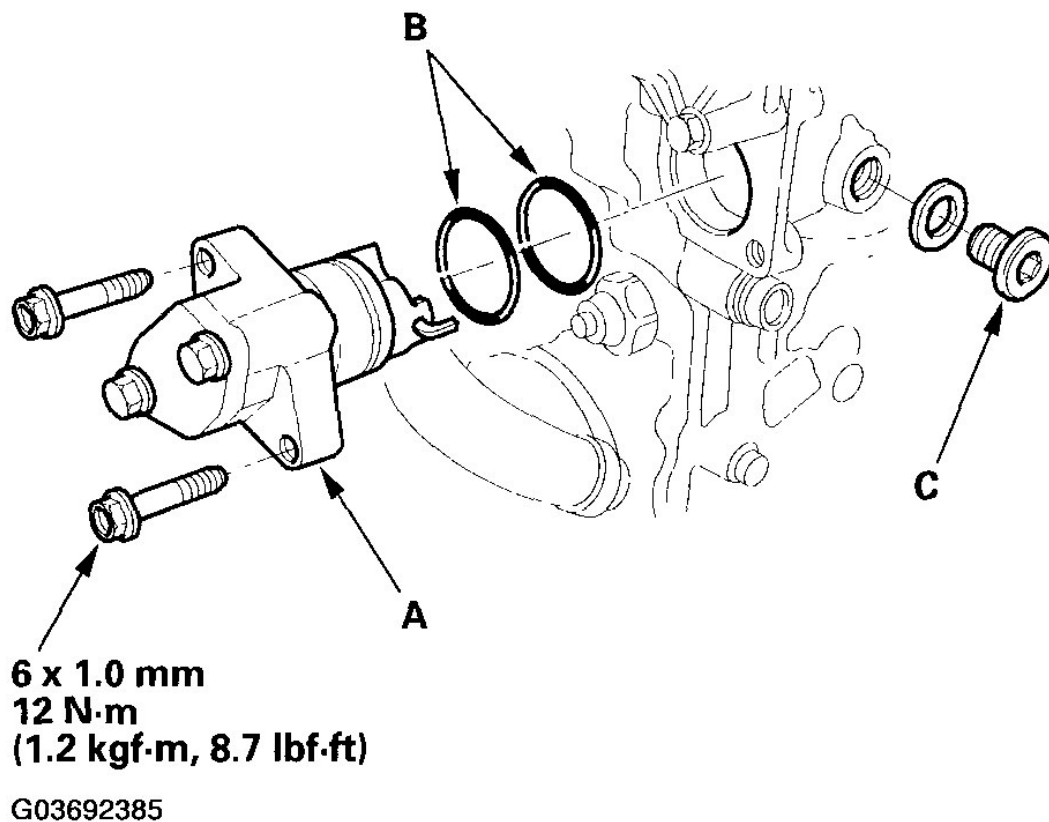
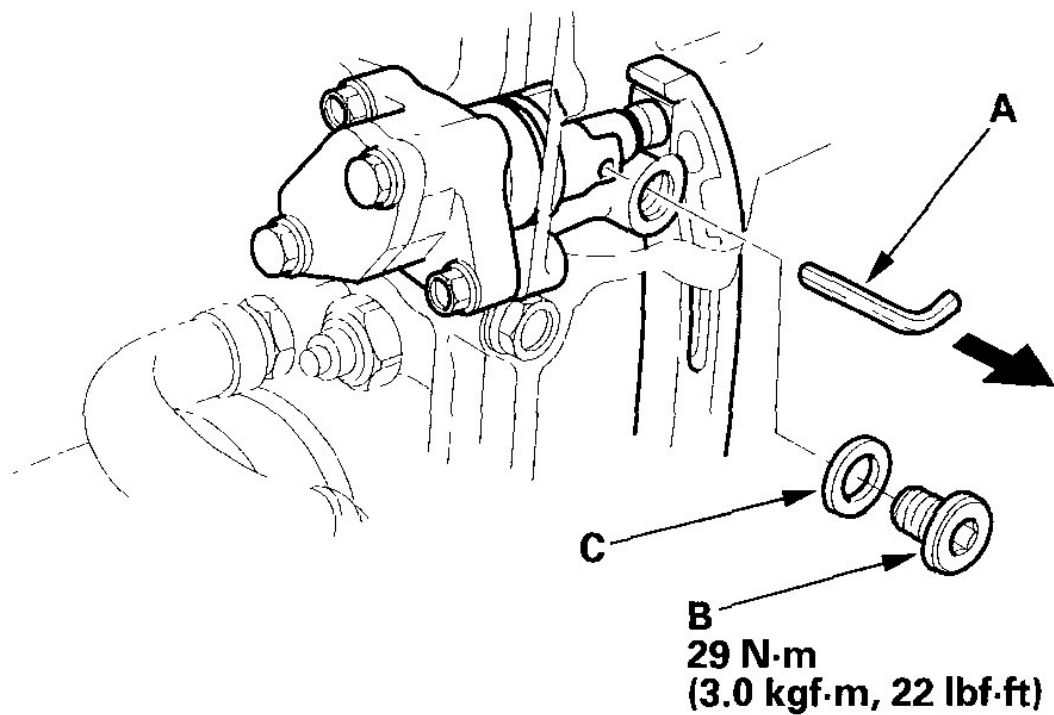


Fig. 132: Installing Cam Chain Auto-Tensioner In Cylinder Head With New O-Rings
Courtesy of AMERICAN HONDA MOTOR CO., INC.

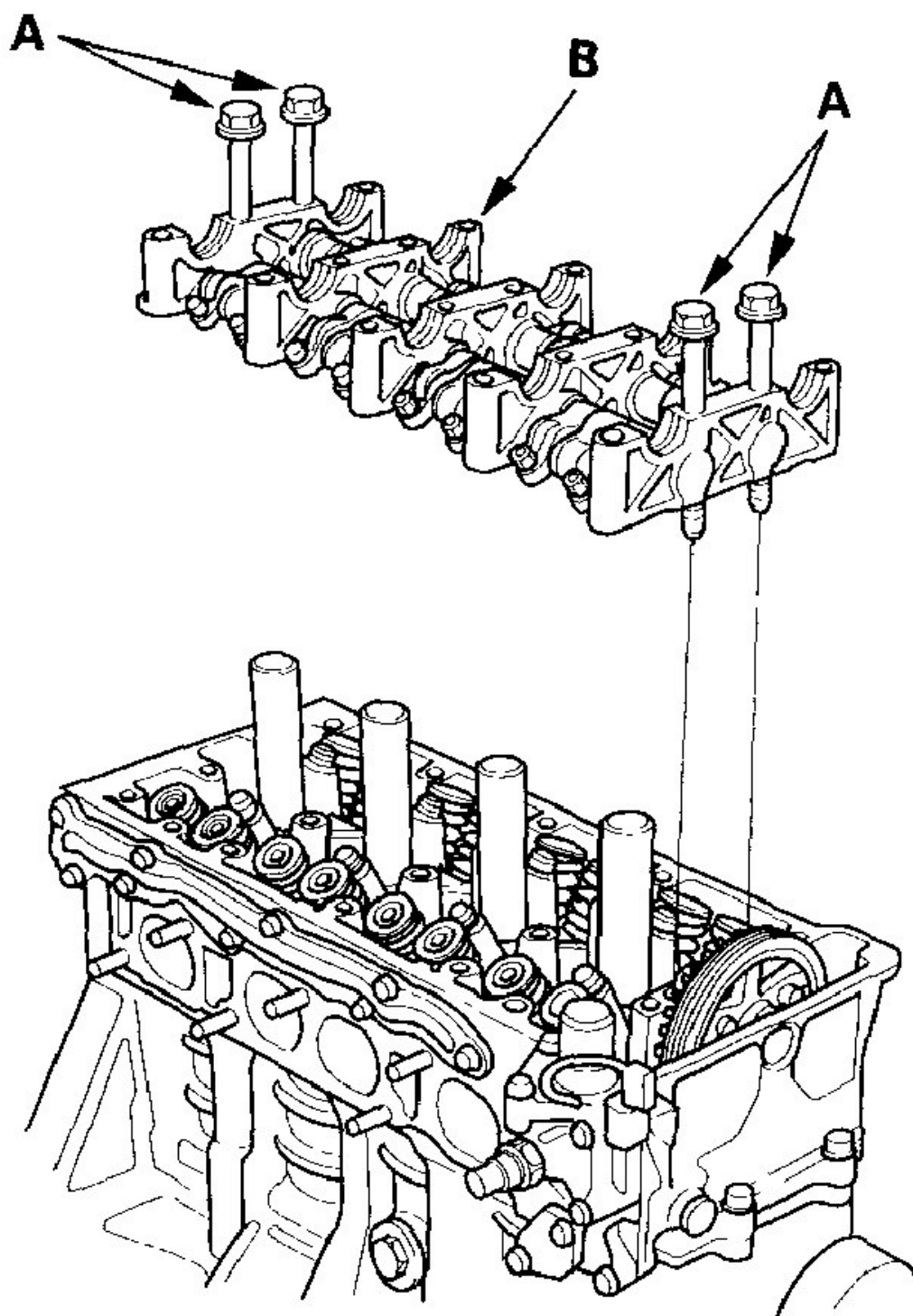
22. Remove the maintenance bolt (C) from the cylinder head.
23. Remove the set pin (A) from the cam chain auto-tensioner. Reinstall the maintenance bolt (B) with a new washer (C).



G03692386

Fig. 133: Removing Set Pin From Cam Chain Auto-Tensioner With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

24. Insert the bolts (A) into the rocker shaft holder, then install the rocker arm assembly (B).

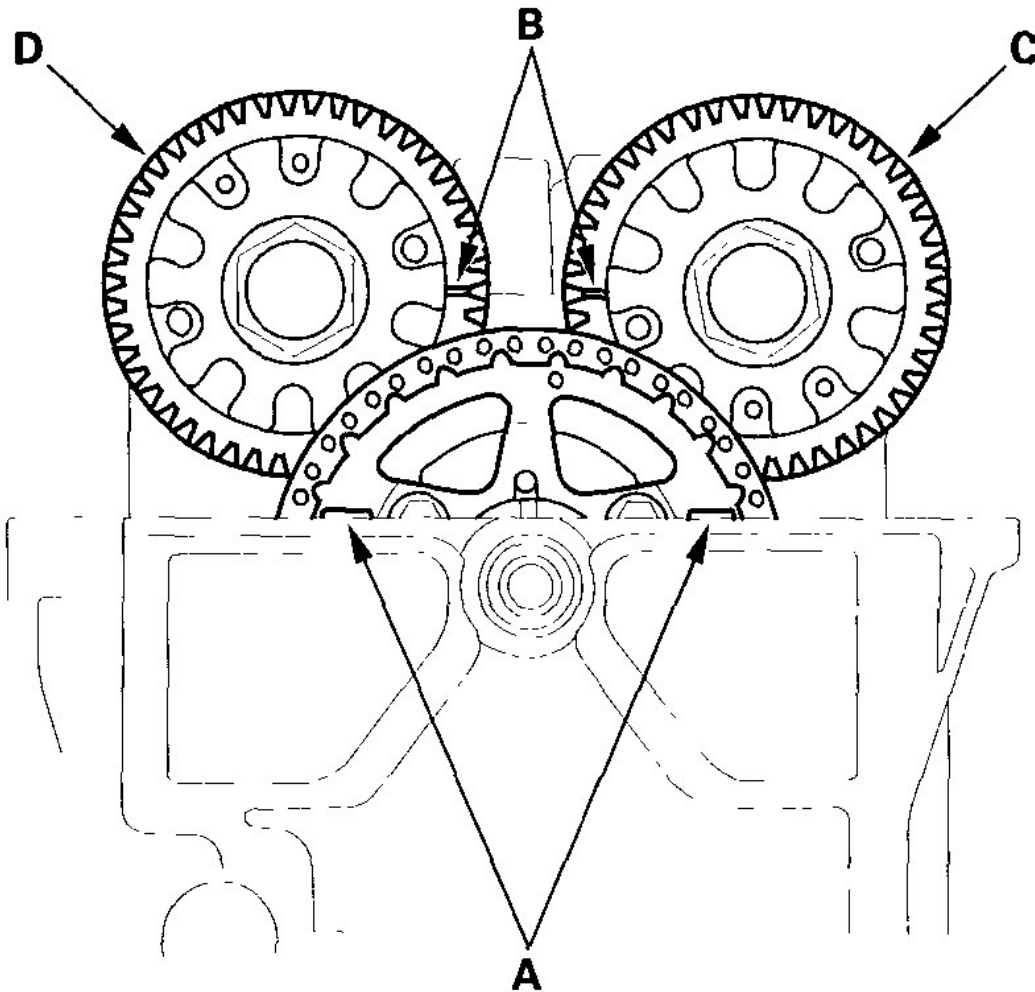


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Fig. 134: Installing Rocker Arm Assembly

Courtesy of AMERICAN HONDA MOTOR CO., INC.

25. Check the alignment of the TDC marks (A) on the cam chain sprocket with the cylinder head surface.



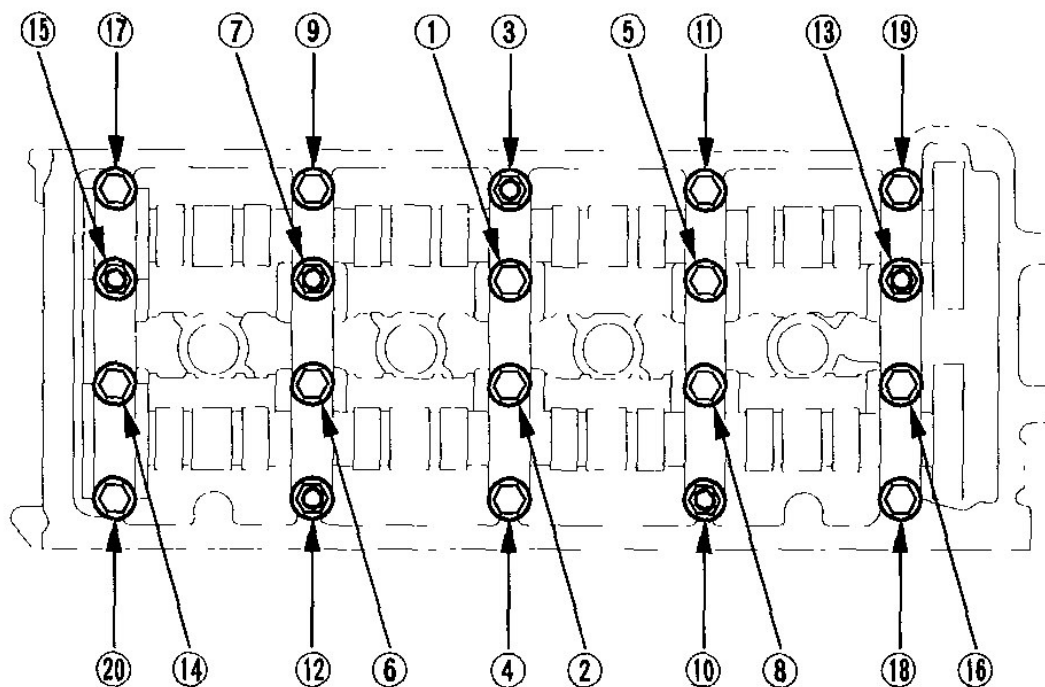
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Fig. 135: Aligning TDC Marks On Cam Chain Sprocket With Cylinder Head Surface

Courtesy of AMERICAN HONDA MOTOR CO., INC.

26. Align the TDC marks (B) on the intake camshaft gear (C) and the exhaust camshaft gear (D), and install the camshafts.
27. Apply new engine oil to the bolt threads of all the camshaft holder bolts.
28. Put the camshaft holders on the cylinder head, then tighten all bolts to 22 N.m (2.2 kgf.m, 16 lbf.ft). To

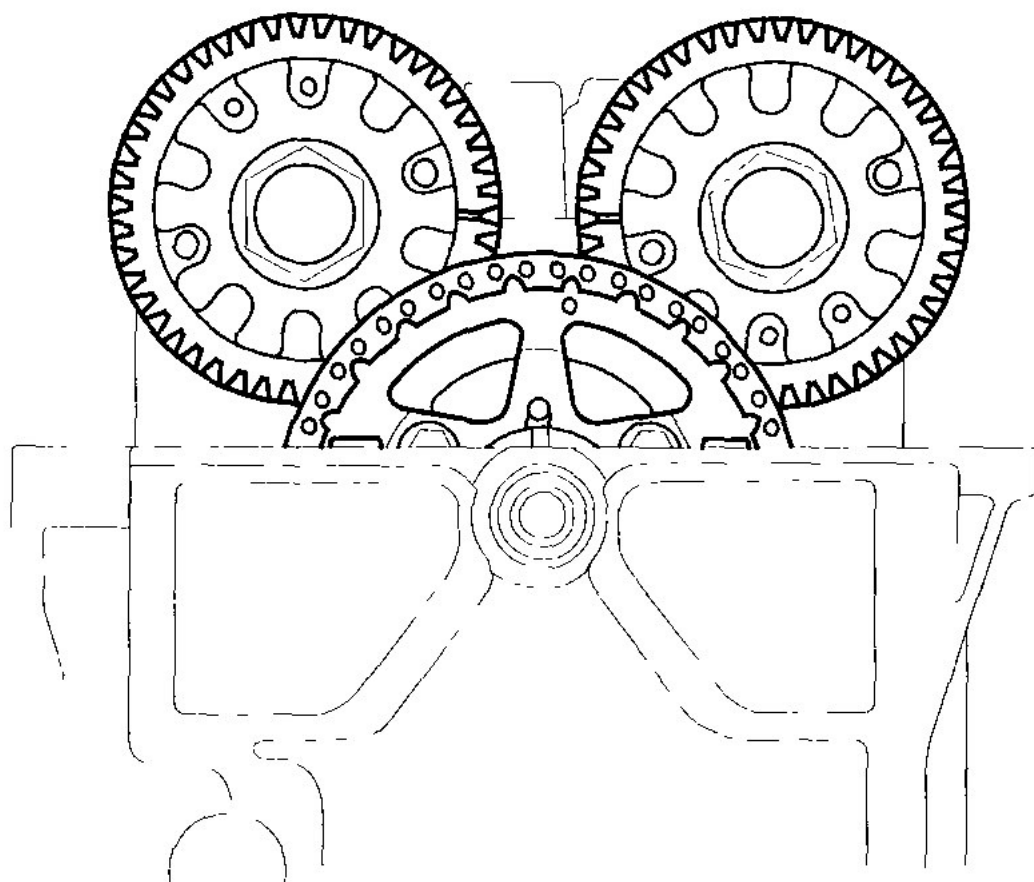
prevent damaging the camshafts, tighten the bolts two turns at a time, in the sequence shown.



G03692389

Fig. 136: Identifying Tightening Sequence Of Camshaft Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

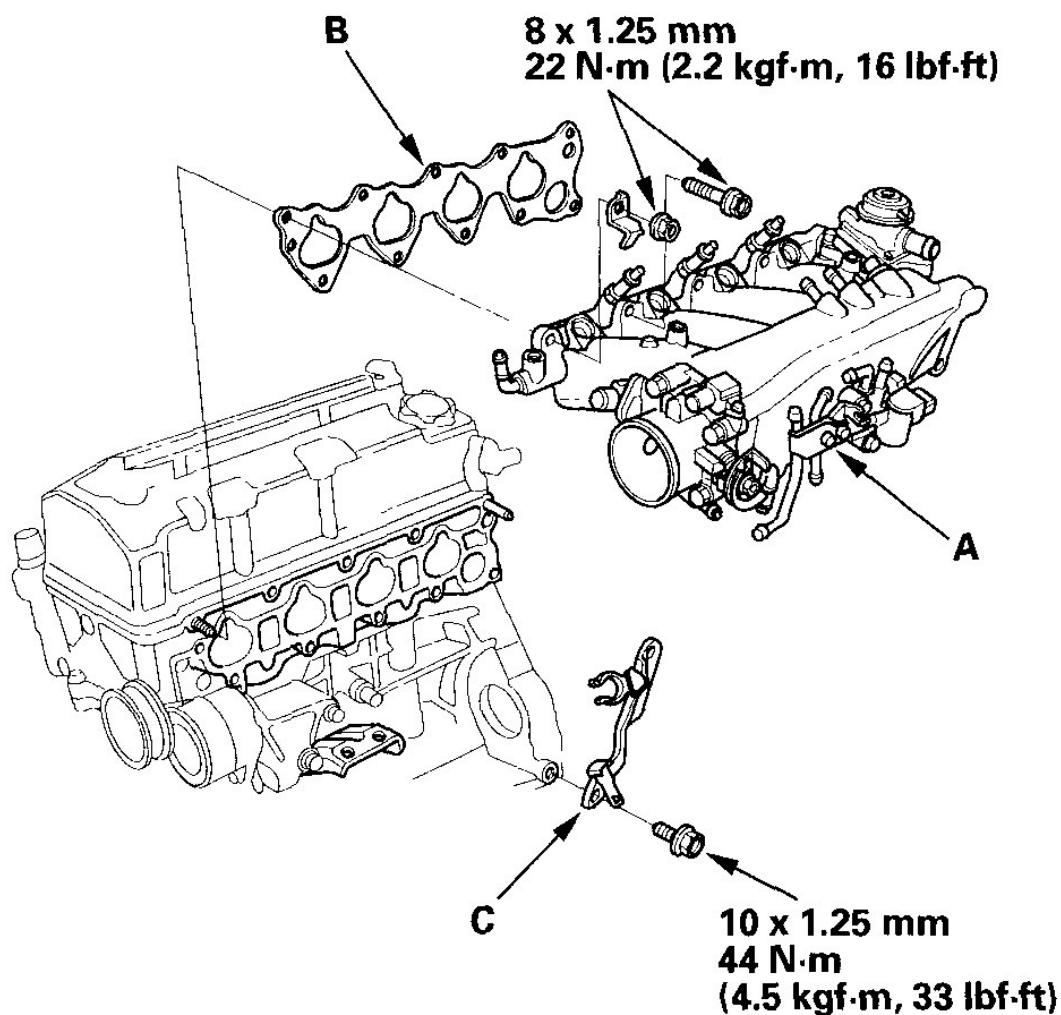
29. Make sure the camshaft gears are at TDC.



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Fig. 137: Identifying Camshaft Gears At TDC Position
Courtesy of AMERICAN HONDA MOTOR CO., INC.

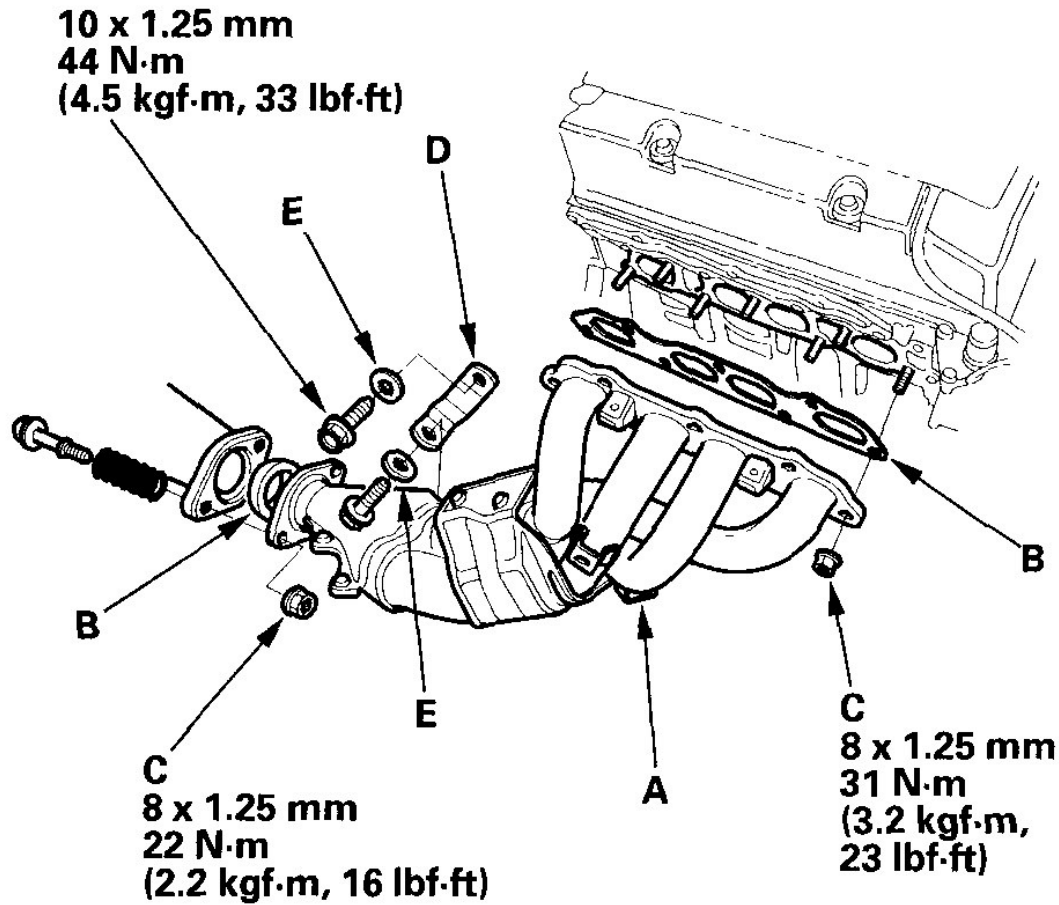
30. Adjust the valve clearance (see **VALVE CLEARANCE ADJUSTMENT**).
31. Install the cylinder head cover (see **CYLINDER HEAD COVER INSTALLATION**).
32. Install the intake manifold (A) with a new gasket (B), then install the intake manifold stay.



G03692391

Fig. 138: Installing Intake Manifold And Intake Manifold Stay With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

33. 2000-2005 models: Install the injectors (see **INJECTOR REPLACEMENT**).
34. Install the exhaust manifold (A) using new gaskets (B) and new self-locking nuts (C).

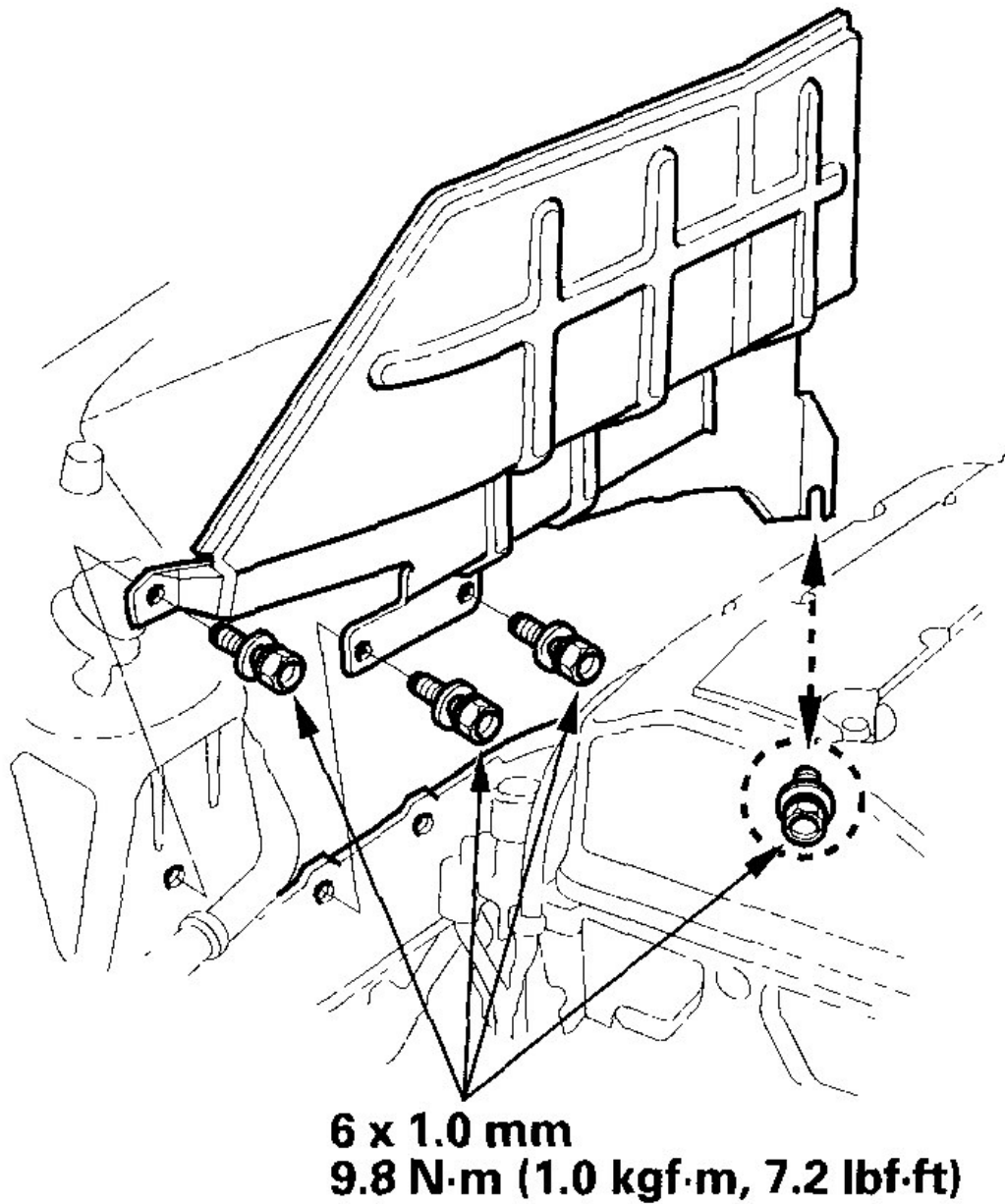


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Fig. 139: Installing Exhaust Manifold And Exhaust Manifold Bracket (2000-2005 Models) With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

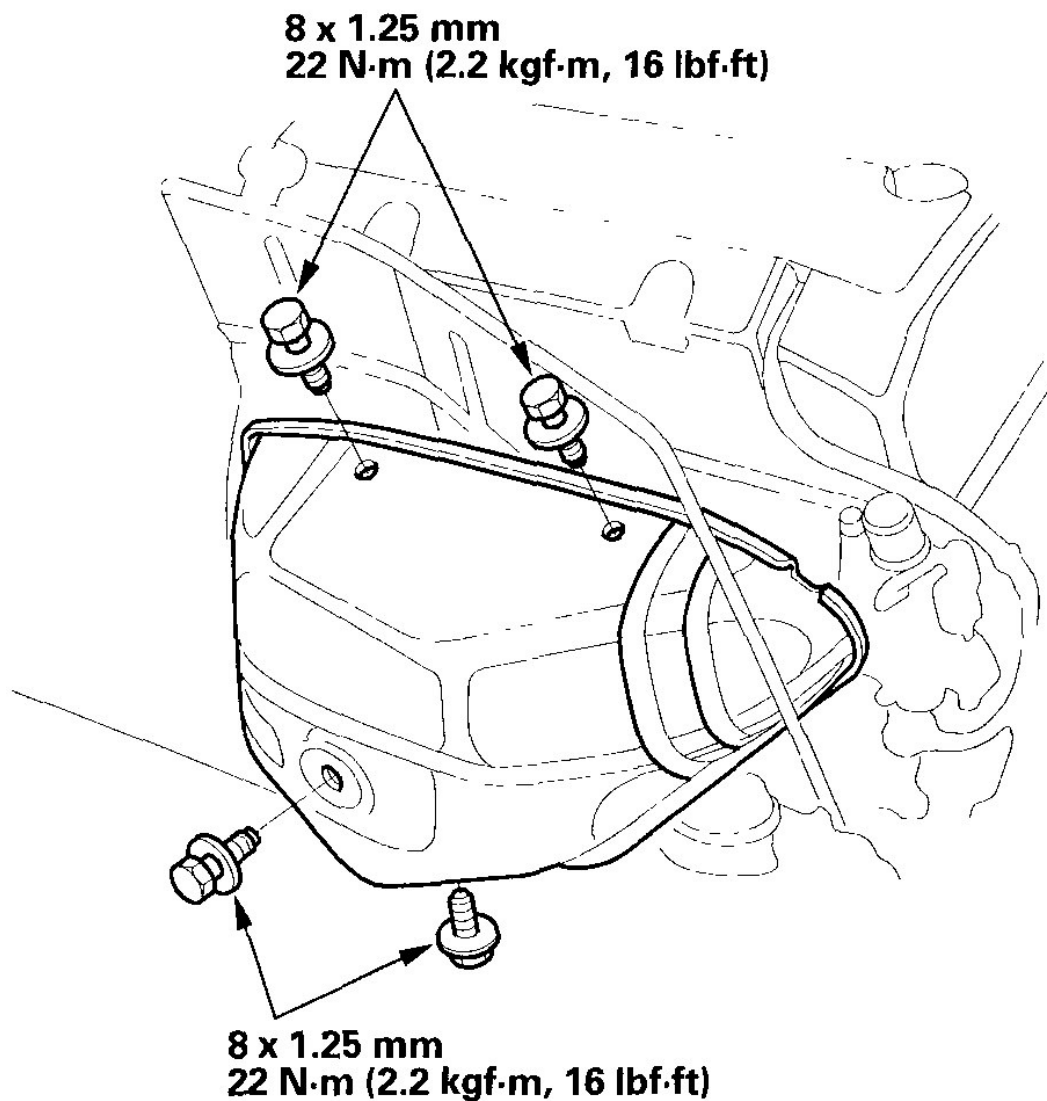
35. Install the exhaust manifold bracket (D). Make sure the smooth sides of the washers (E) face the exhaust manifold bracket.
36. Put the exhaust manifold cover on the exhaust manifold.
37. Install the heat shield.



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Fig. 140: Installing Heat Shield With Torque Specifications
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

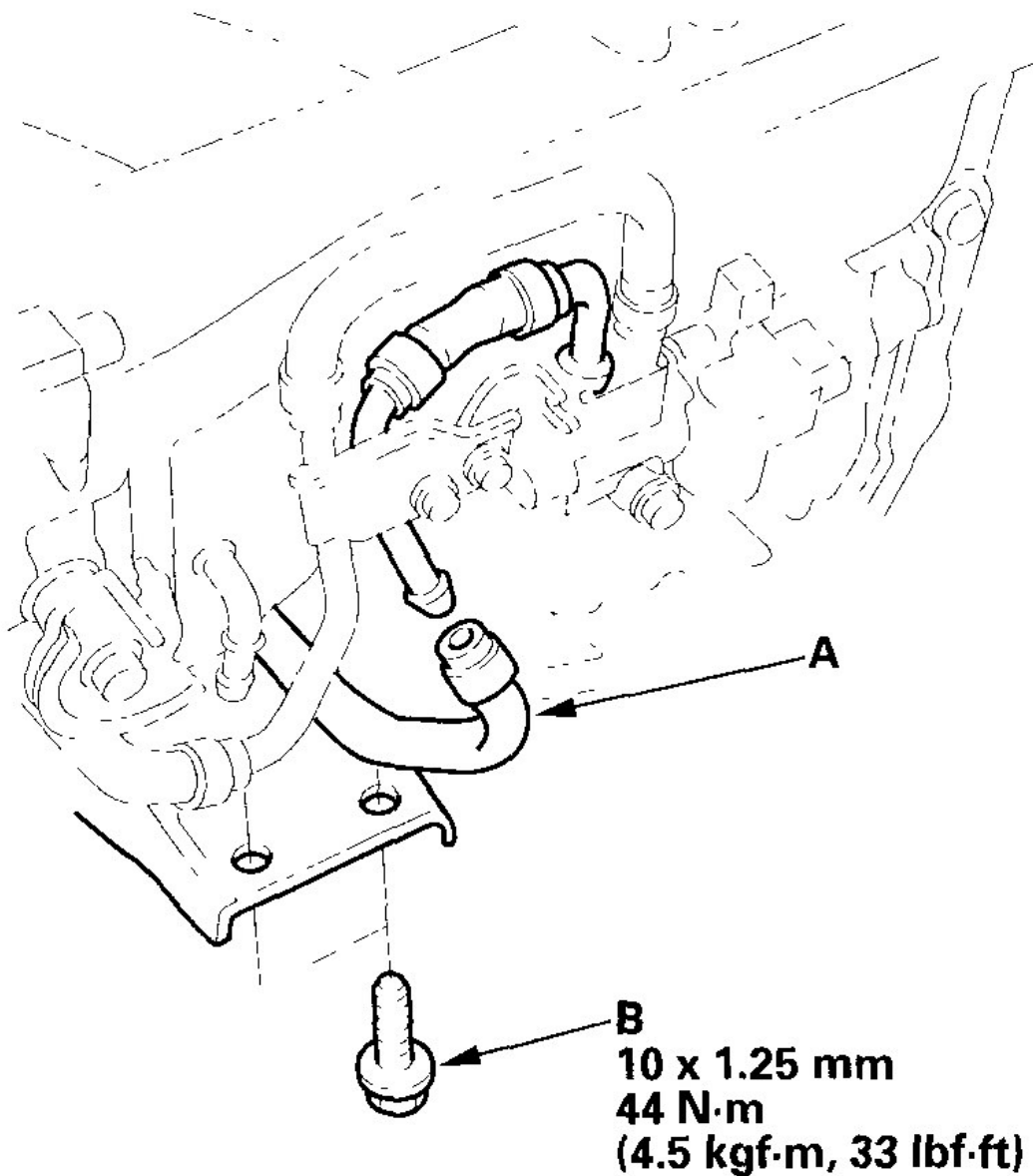
38. Tighten the four bolts securing the exhaust manifold cover.



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Fig. 141: Tightening Exhaust Manifold Cover Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

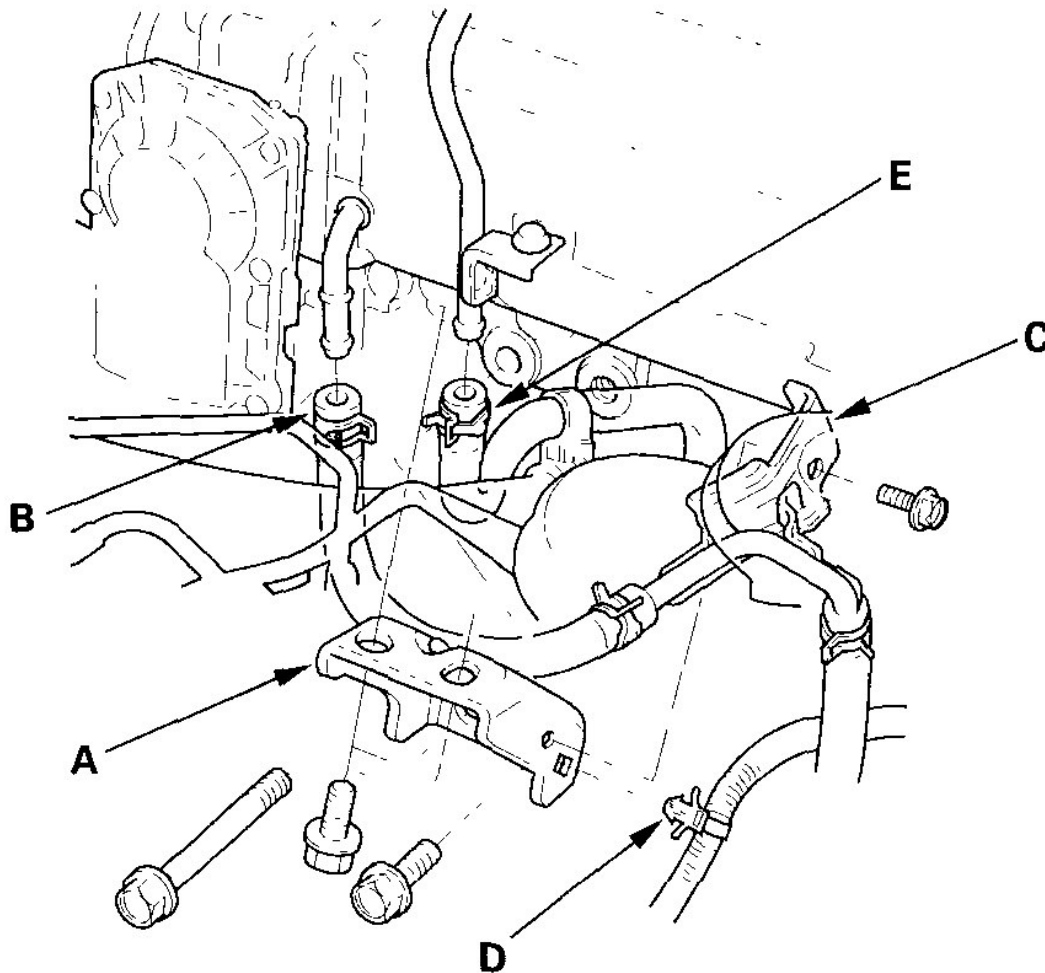
39. 2000-2005 models: Install the water bypass hose (A), and tighten the two bolts (B) securing the intake manifold bracket.



G03692395

Fig. 142: Installing Water Bypass Hose And Intake Manifold Bracket (2000-2005 Models) With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

40. 2006-08 model: Install the intake manifold bracket (A), then install the evaporative emission (EVAP) hose (B) and its bracket (C), install wire harness clamp (D) and the water bypass hose (E).



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Fig. 143: Installing Intake Manifold Bracket, Evaporative Emission (EVAP) Hose And Water Bypass Hose (2006-08 Model)

Courtesy of AMERICAN HONDA MOTOR CO., INC.

41. Install the engine wire harness connectors and wire harness clamps to the cylinder head and intake manifold.
 - Four fuel injector connectors
 - Intake air temperature (IAT) sensor connector (2000-2005 models)
 - Idle air control (IAC) valve connector (2000-2005 models)
 - Throttle position (TP) sensor connector (2000-2005 models)
 - Throttle body connector (2006-08 model)
 - Manifold absolute pressure (MAP) sensor connector

- Primary heated oxygen sensor (primary HO2S) connector (2000-2005 models)
- A/F sensor connector (2006-08 model)
- Engine coolant temperature (ECT) sensor connector (2000-2005 models)
- Engine coolant temperature (ECT) sensor 1 connector (2006-08 model)
- Rocker arm oil control solenoid (VTEC solenoid valve) connector
- Rocker arm oil pressure switch (VTEC oil pressure switch) connector
- Crankshaft position (CKP) sensor connector

42. Install the water outlet cover (A) with a new O-ring (B).

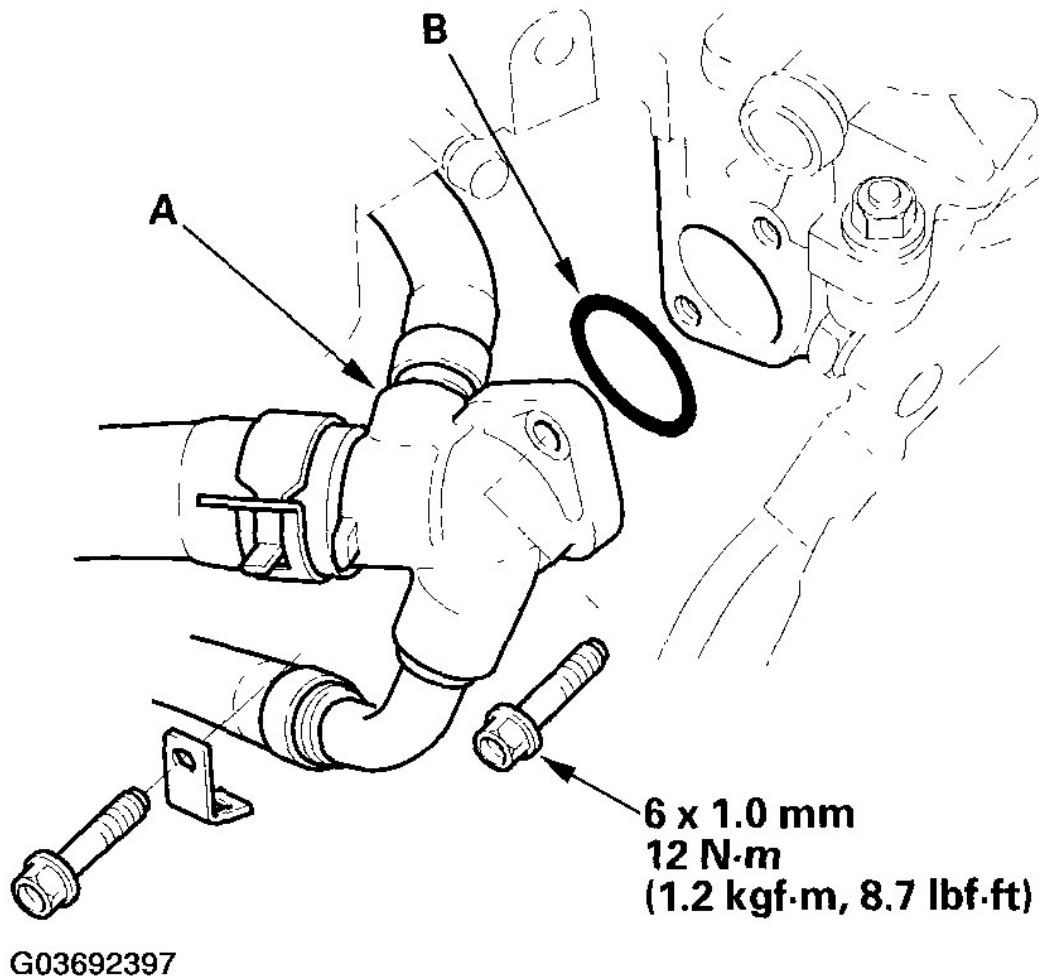
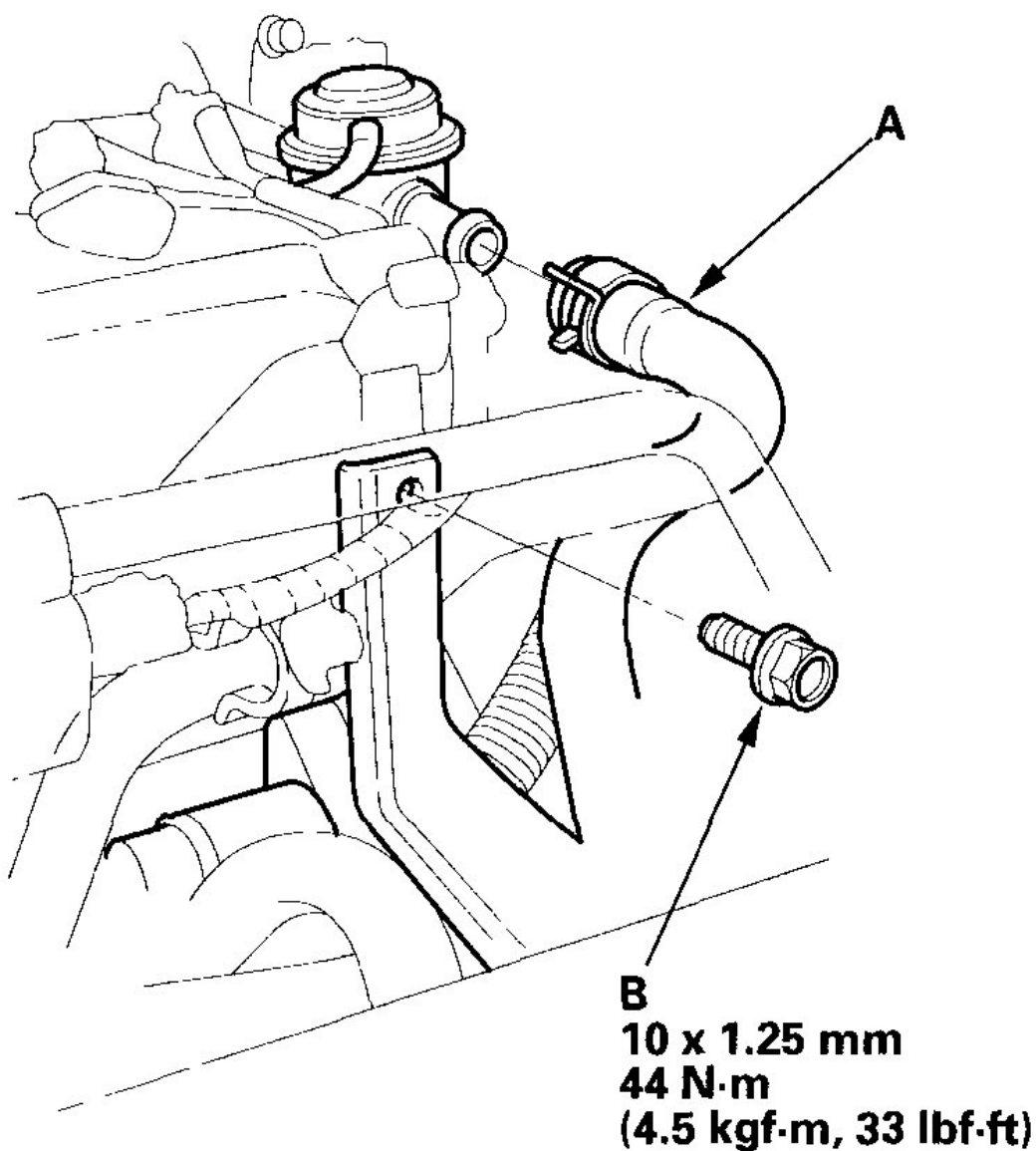


Fig. 144: Installing Water Outlet Cover With New O-Ring With Torque Specifications
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

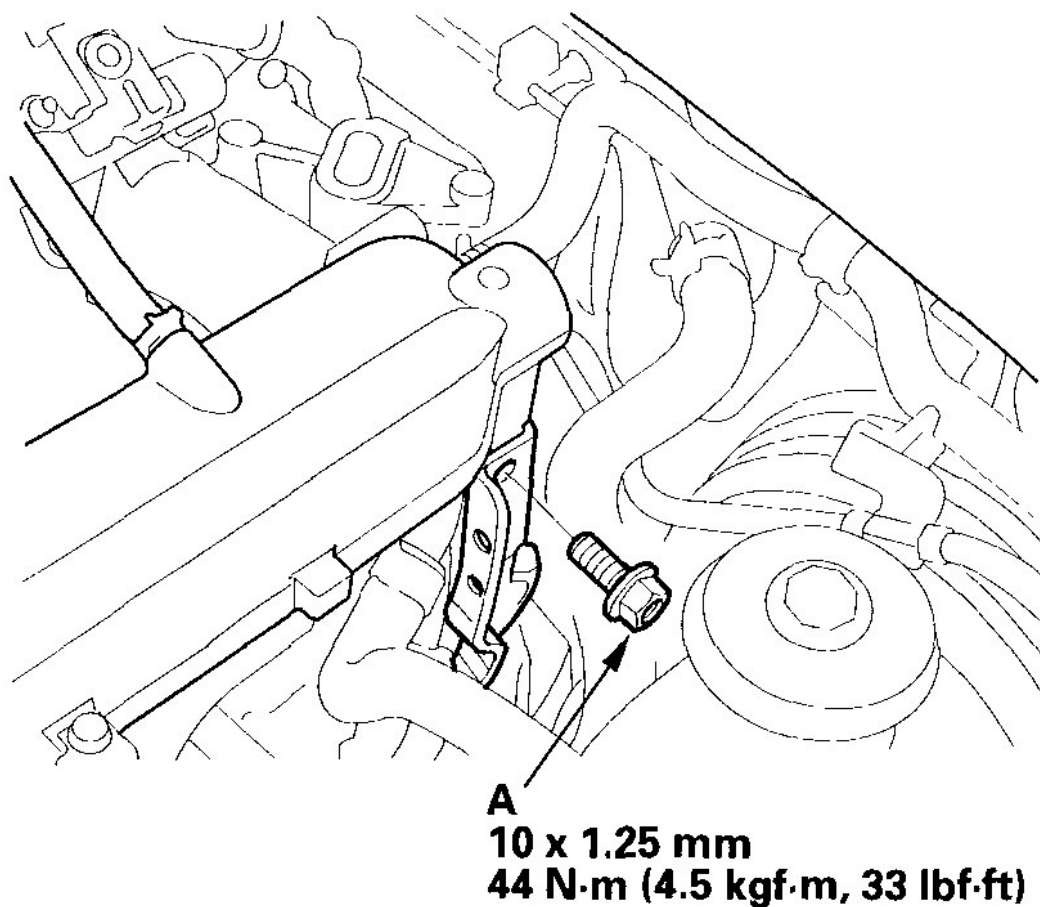
43. 2000-2005 models: Install the air hose (A), and tighten the bolt (B) securing the intake manifold bracket.



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Fig. 145: Installing Air Hose And Intake Manifold Bracket (2000-2005 Models) With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

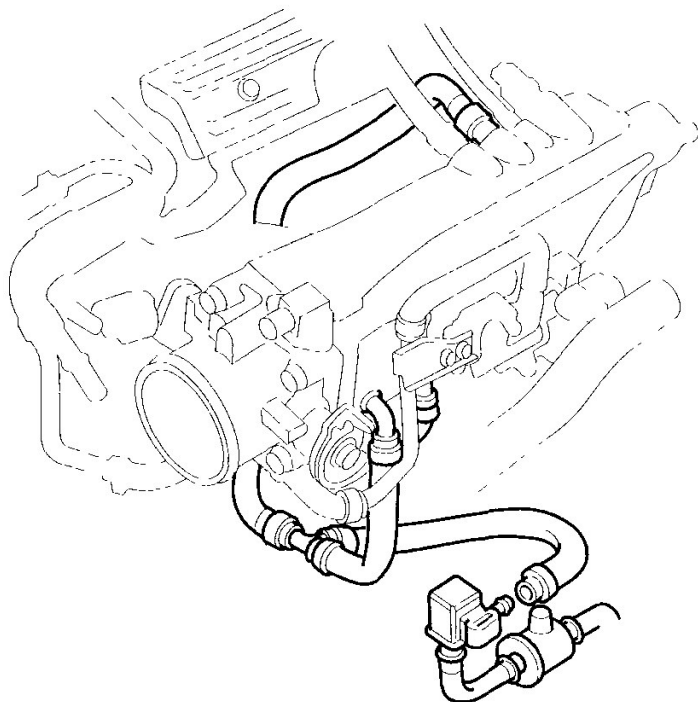
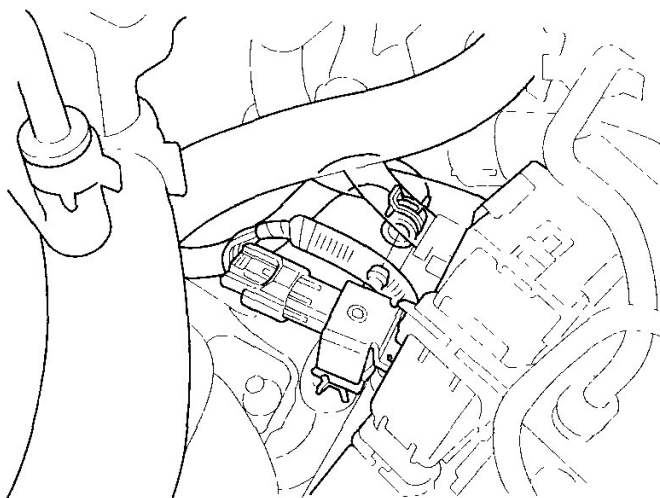
44. 2006-08 model: Install the bolt (A) securing the intake manifold bracket.



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Fig. 146: Installing Intake Manifold Bracket (2006-08 Model) With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

45. Connect the evaporative emission (EVAP) canister hose.

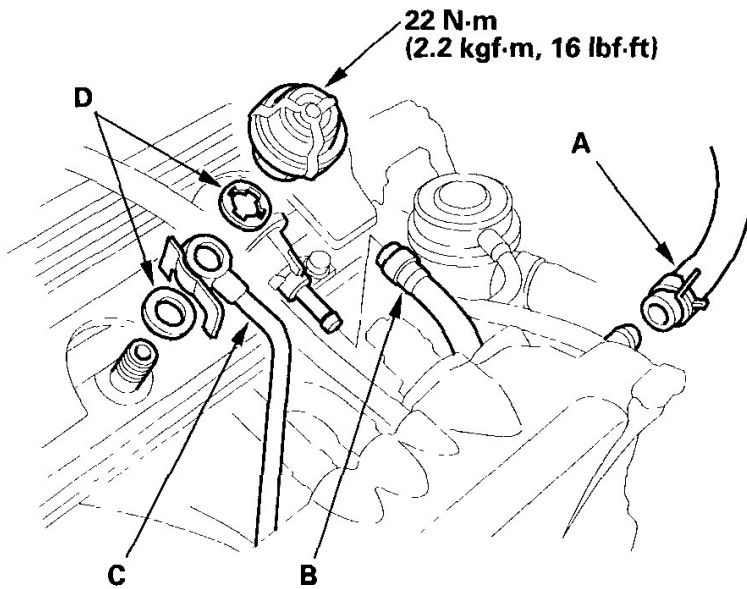
2000-2005 models**2006-2008 models**

G03692400

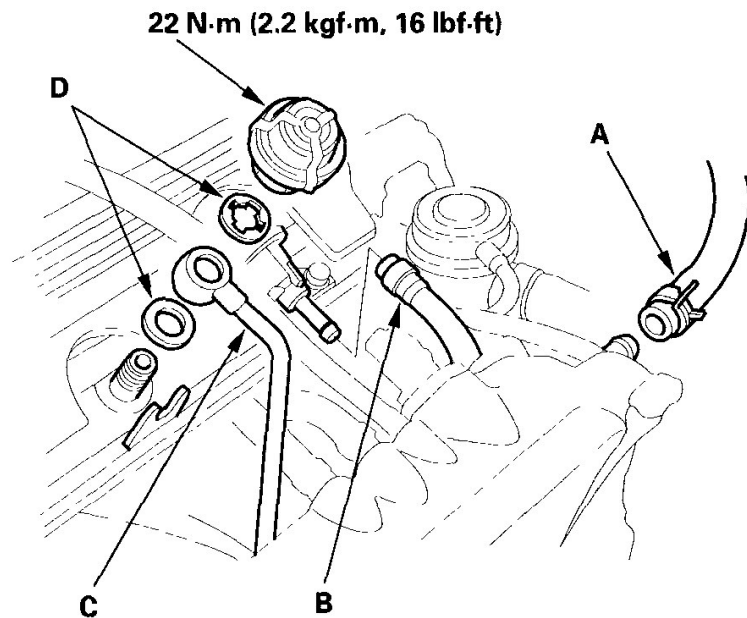
Fig. 147: Connecting Evaporative Emission (EVAP) Canister Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

46. 2000-2005 models: Install the brake booster vacuum hose (A), fuel return hose (B), and fuel feed hose (C), using new washers (D).

2000-2003 models



2004-2005 models



G03692401

Fig. 148: Installing Brake Booster Vacuum Hose, Fuel Return Hose And Fuel Feed Hose (2000-2005 Models) With Torque Specifications
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

47. 2006-08 model: Install the brake booster vacuum hose (A) and fuel feed hose (B), then quick-connect

fitting cover (C).

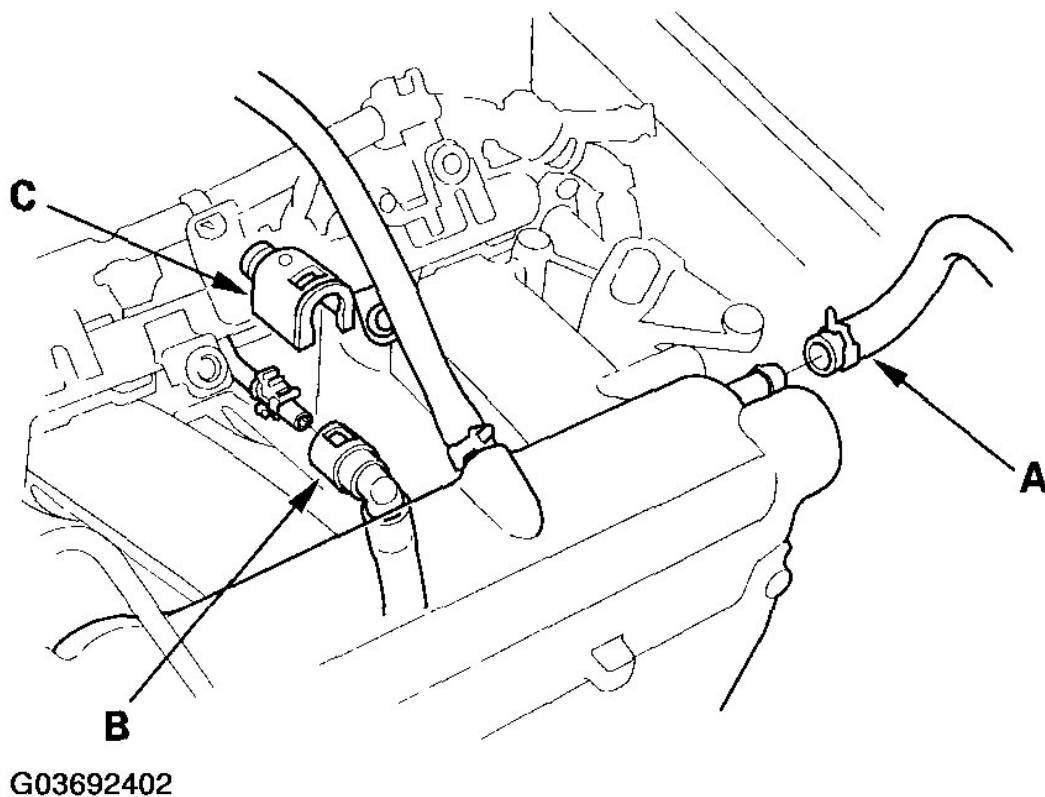


Fig. 149: Installing Brake Booster Vacuum Hose, Fuel Feed Hose And Quick-Connect Fitting Cover (2006-08 Model)

Courtesy of AMERICAN HONDA MOTOR CO., INC.

48. 2006-08 model: Install the intake manifold cover.

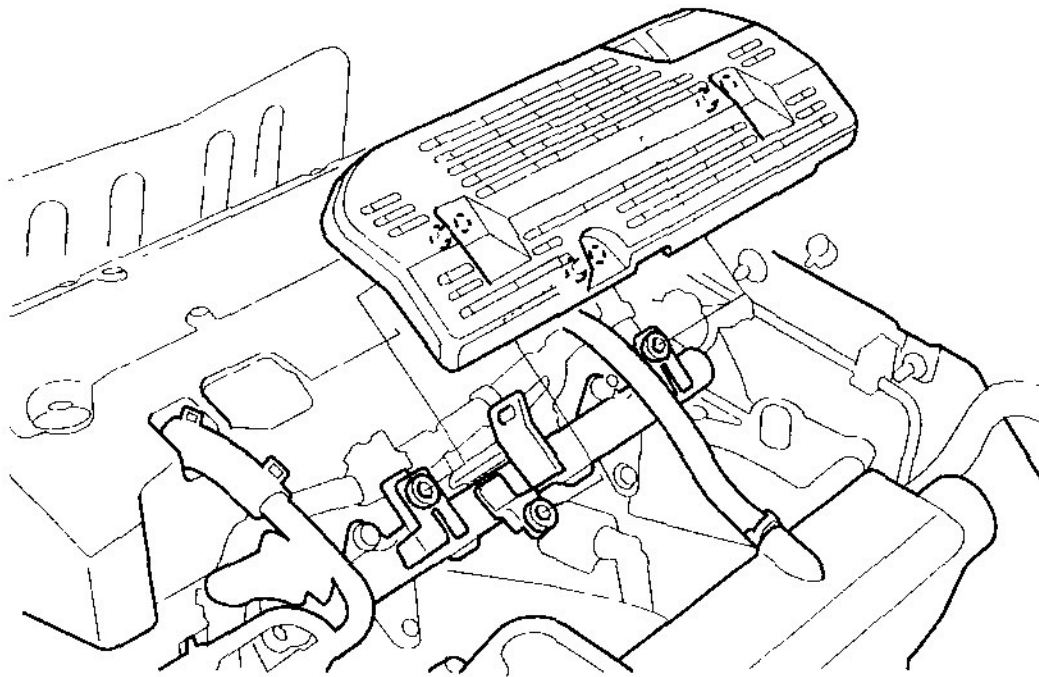
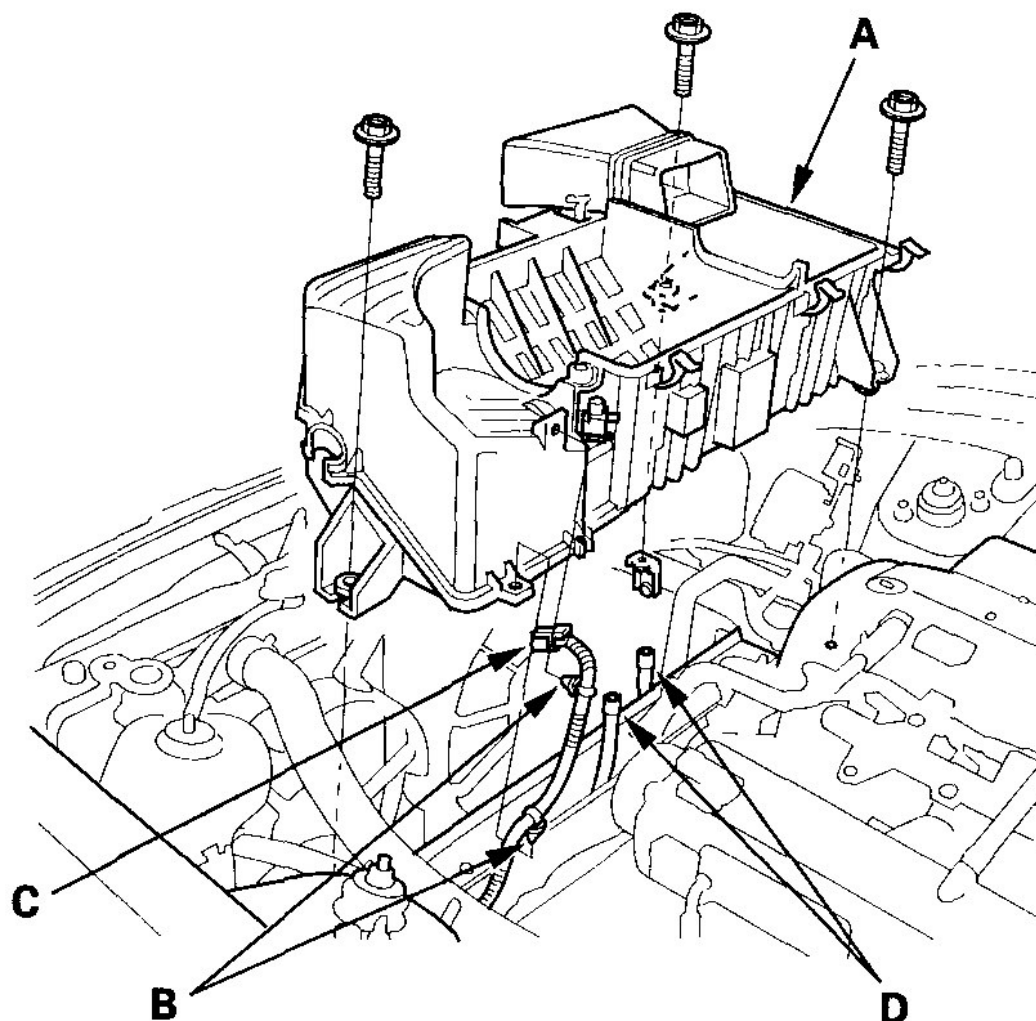
**G03692403**

Fig. 150: Installing Intake Manifold Cover (2006-08 Model)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

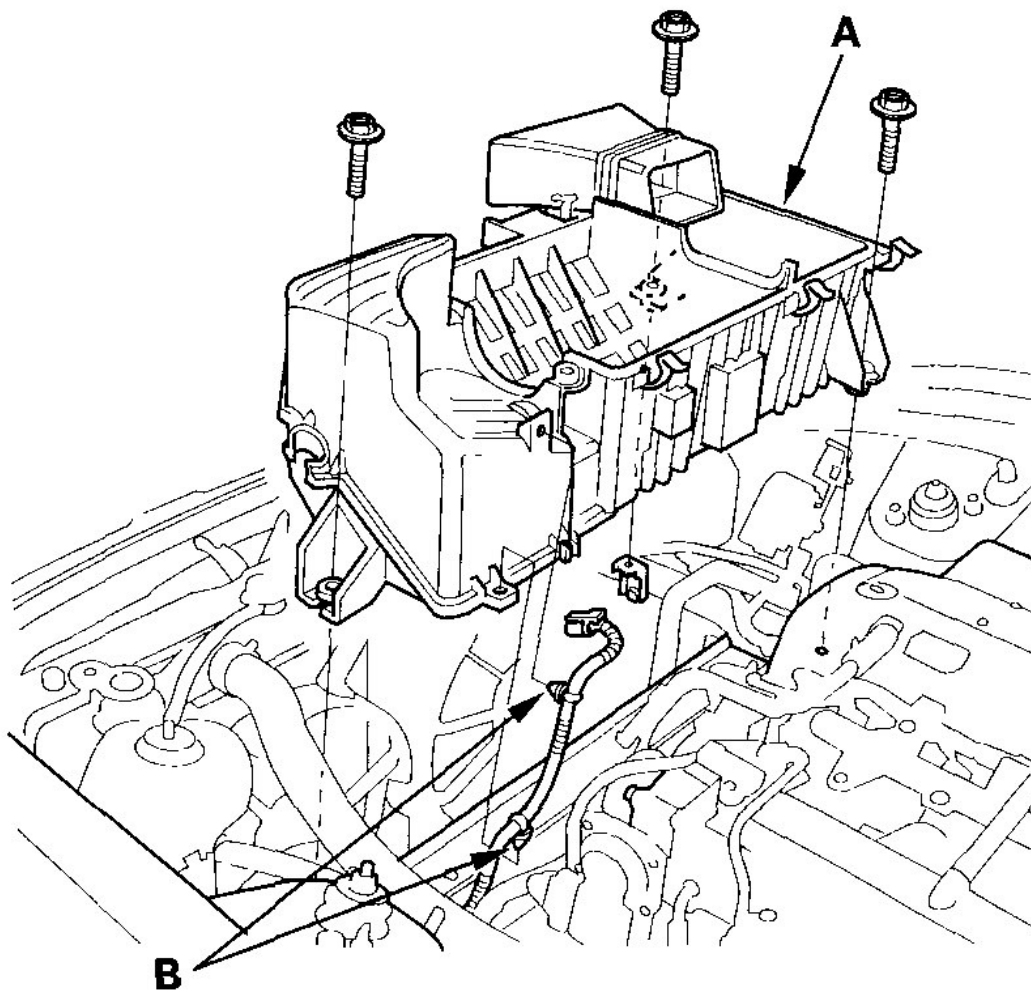
49. 2000-2005 models: Install the throttle cable (see **THROTTLE CABLE REMOVAL/INSTALLATION**), then adjust the cable (see **THROTTLE CABLE ADJUSTMENT**).
50. Install the drive belt (see **DRIVE BELT REPLACEMENT**).
51. 2000-2005 models: Install the intake air cleaner housing (A), then install the harness clamps (B), connect air control solenoid valve connector (C) and vacuum hoses (D).



G03692404

Fig. 151: Installing Intake Air Cleaner Housing And Harness Clamps (2000-2005 Models)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

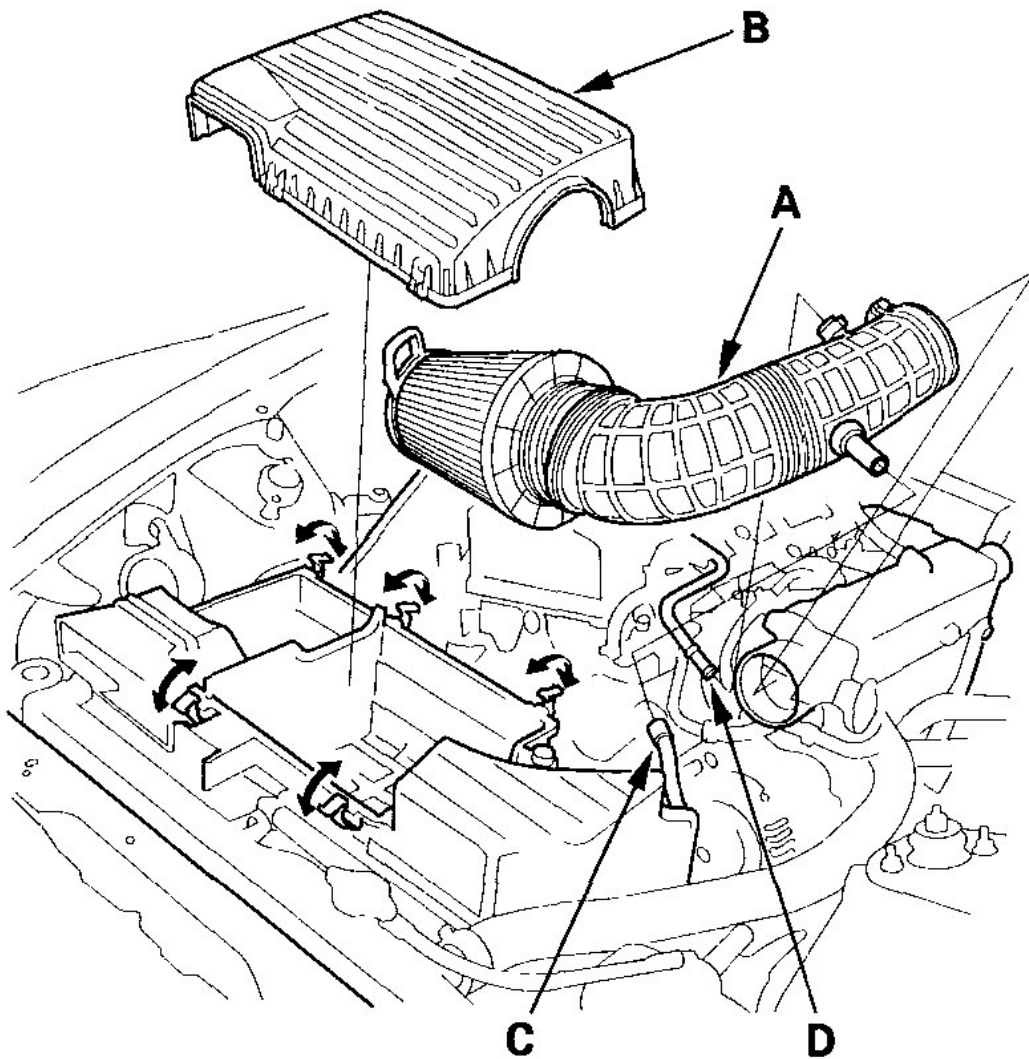
52. 2006-09 model: Install the intake air cleaner housing (A), then install the IAT sensor harness clamps (B).



G03692405

Fig. 152: Installing Intake Air Cleaner Housing And IAT Sensor Harness Clamps (2006-08 Model)
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

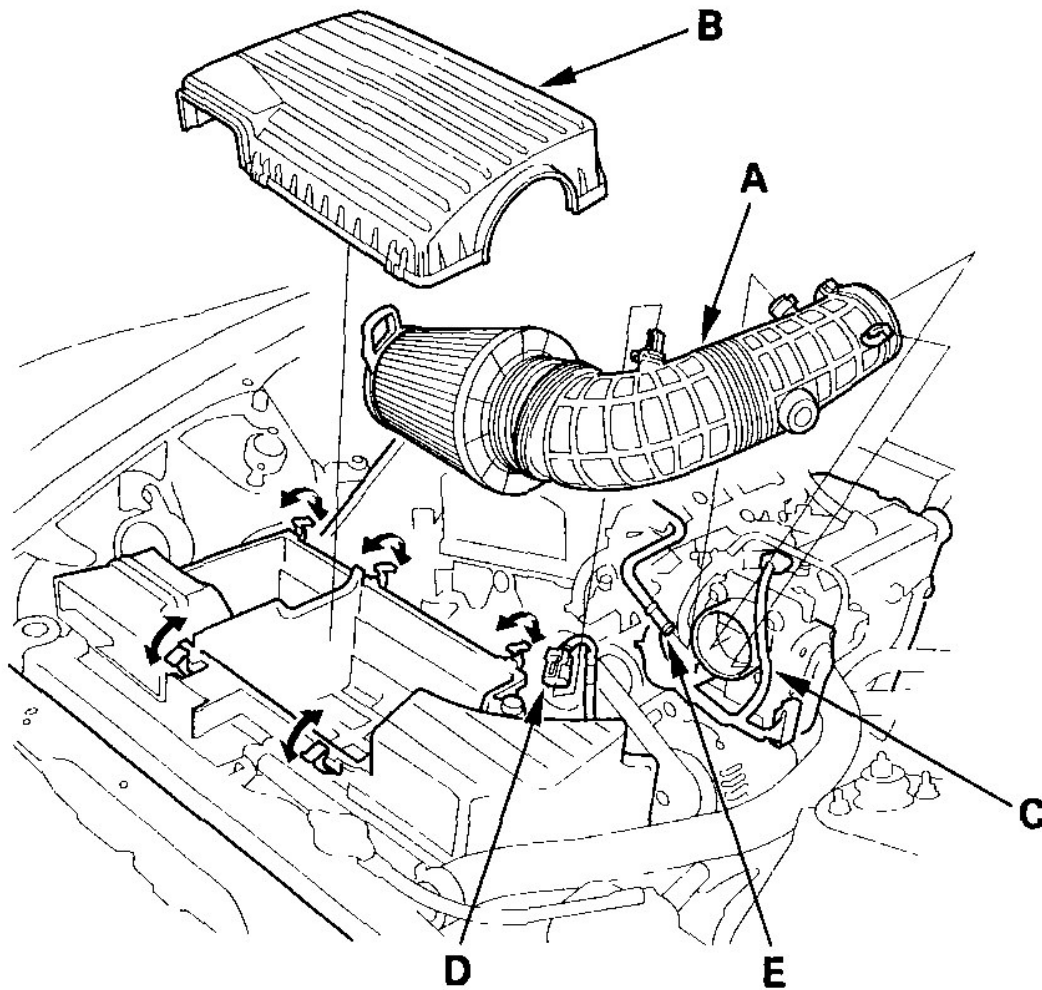
53. 2000-2005 models: Install the air cleaner assembly (A) and air cleaner housing cover (B), then connect the air hose (C) and breather pipe (D).



G03692406

Fig. 153: Installing Air Cleaner Assembly And Air Cleaner Housing Cover (2000-2005 Models)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

54. 2006-09 model: Install the air cleaner assembly (A) and air cleaner housing cover (B), then install the MAP sensor harness (C) to the holder, connect the IAT sensor connector (D) and breather pipe (E).



G03692407

Fig. 154: Installing Air Cleaner Assembly And Air Cleaner Housing Cover (2006-08 Model)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

55. After installation, check that all tubes, hoses, and connectors are installed correctly.
56. After assembly, wait at least 30 minutes before filling the engine with oil.
57. Clean the battery posts and cable terminals with sandpaper, then assemble them and apply grease to prevent corrosion.
58. Inspect for fuel leaks. Turn the ignition switch ON (II) (do not operate the starter) so that 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.
59. Refill the engine with engine oil (see **OIL PRESSURE TEST**).
60. Refill the radiator with engine coolant, and bleed air from the cooling system with the heater valve open

(see **COOLANT REPLACEMENT**).

61. 2000-2005 models: Do the engine control module (ECM) idle learn procedure (see **IDLE SPEED INSPECTION**).
62. 2006-08 model: Do the crankshaft position (CKP)/CKP learn procedure (see **HDS CLEAR COMMAND**).
63. Inspect the idle speed:
 - 2000-2005 models (see **IDLE SPEED INSPECTION**)
 - 2006-08 models (see **IDLE SPEED INSPECTION**)
64. Inspect the ignition timing (see **IGNITION TIMING INSPECTION**).

2009 Honda S2000

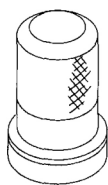
2000-09 ENGINE Engine Block - S2000

2000-09 ENGINE

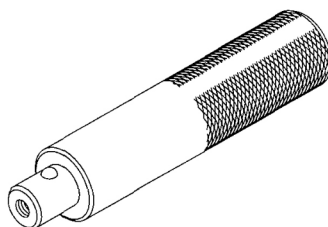
Engine Block - S2000

SPECIAL TOOLS

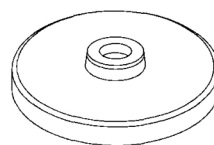
Ref. No.	Tool Number	Description	Qty
①	07LAD-PT3010A	Seal Driver	1
②	07749-0010000	Driver	1
③	07948-SB00101	Driver Attachment	1



①



②



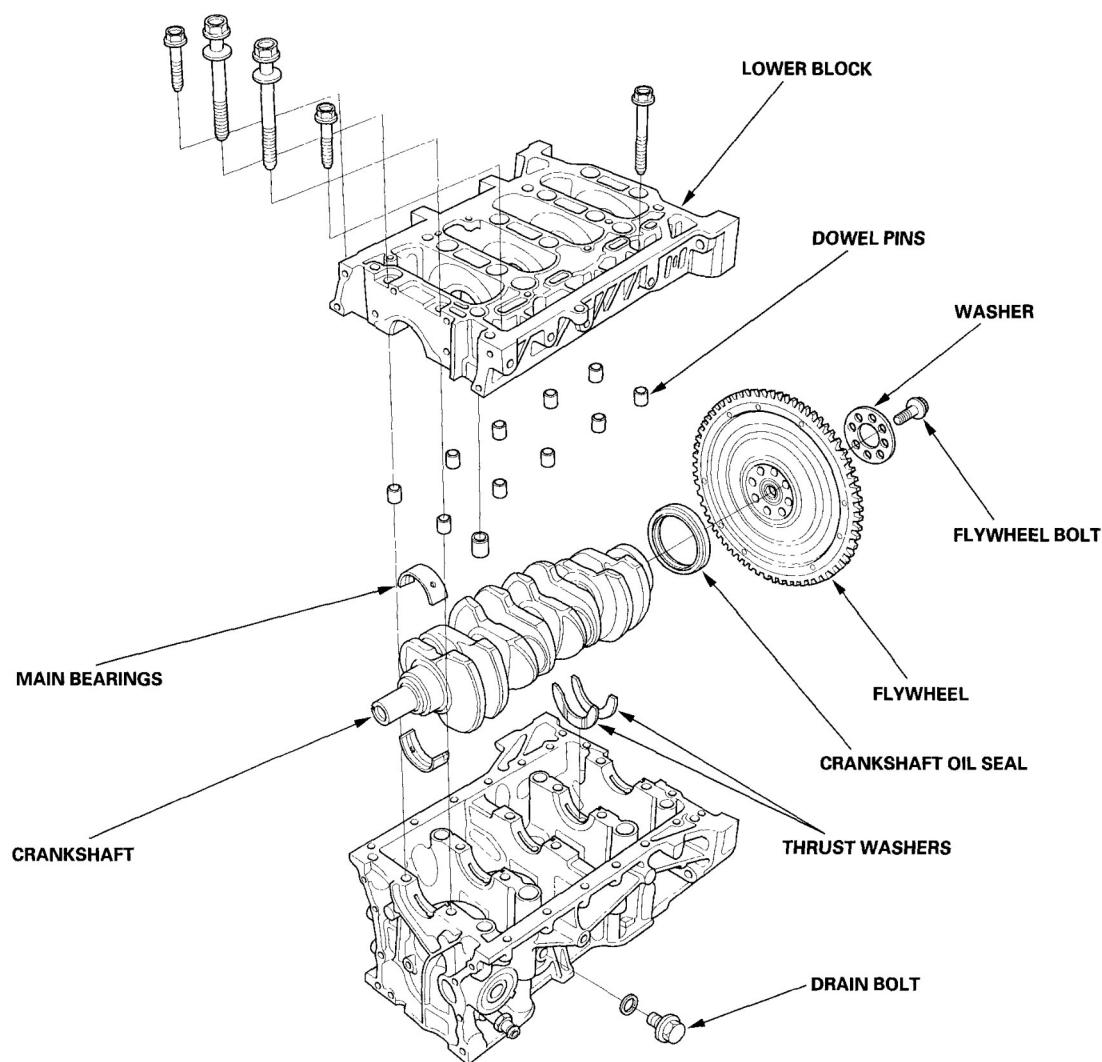
③

G03692408

Fig. 1: Identifying Special Tools

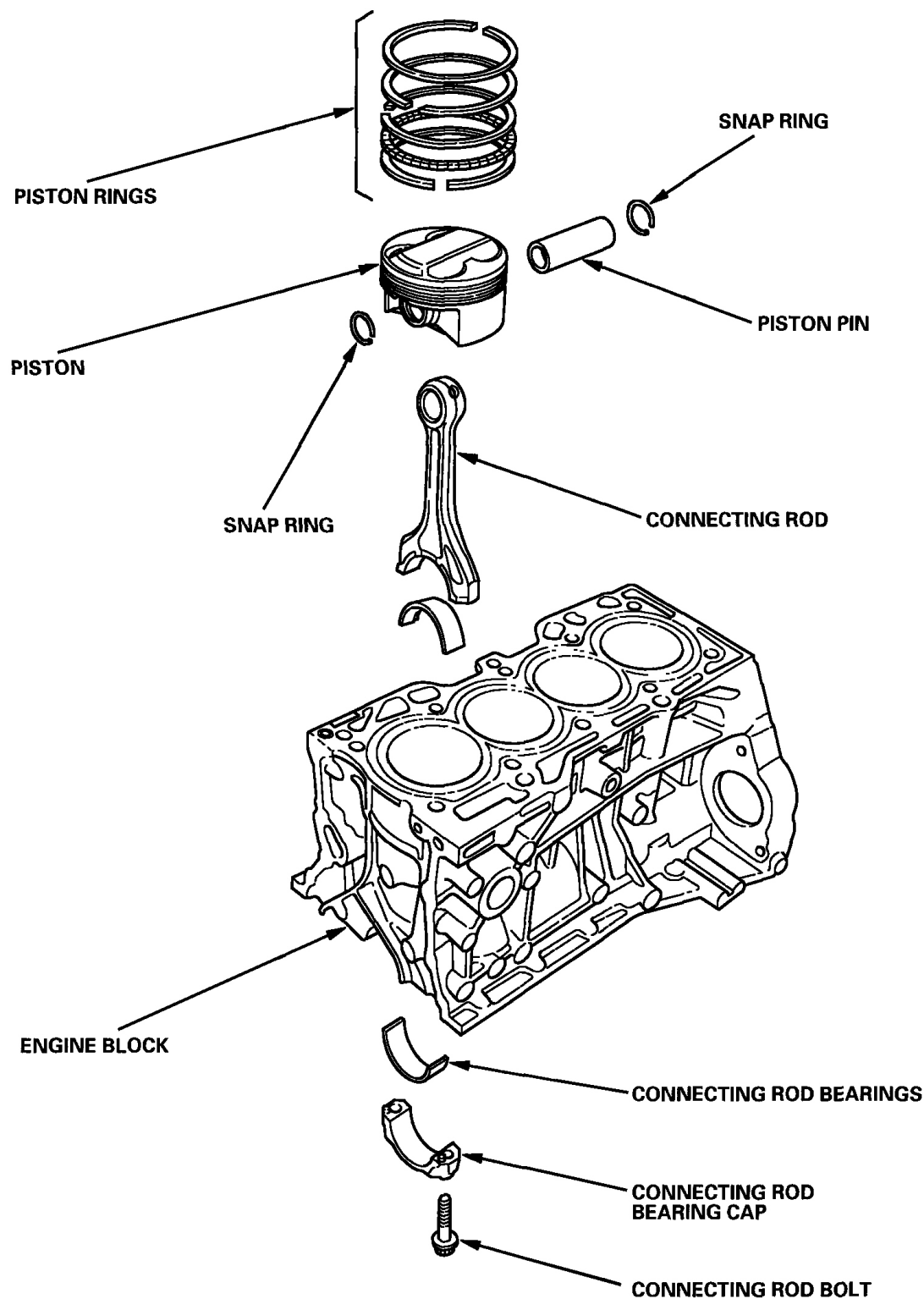
Courtesy of AMERICAN HONDA MOTOR CO., INC.

COMPONENT LOCATION INDEX



G03692409

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



G03692410

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

Courtesy of AMERICAN HONDA MOTOR CO., INC.

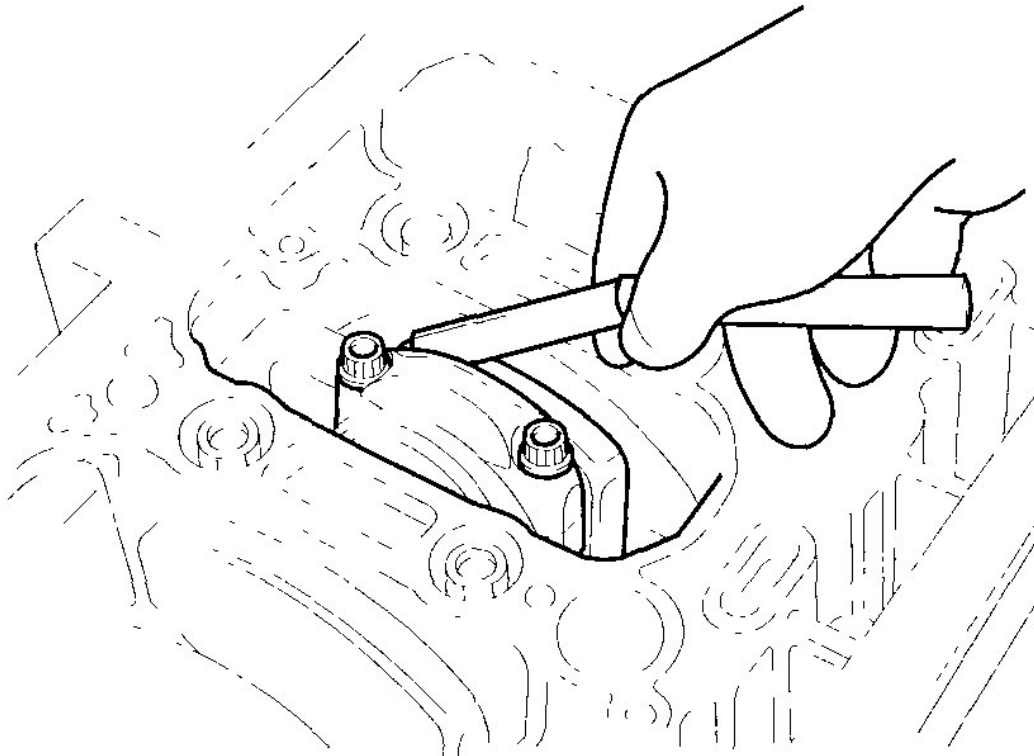
CONNECTING ROD AND CRANKSHAFT END PLAY INSPECTION

1. Remove the oil pump (see OIL PUMP OVERHAUL).
2. Measure the connecting rod end play with a feeler gauge between the connecting rod and crankshaft.

Connecting Rod End Play

Standard (New): 0.15-0.30 mm (0.006-0.012 in.)

Service Limit: 0.40 mm (0.016 in.)



G03692411

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

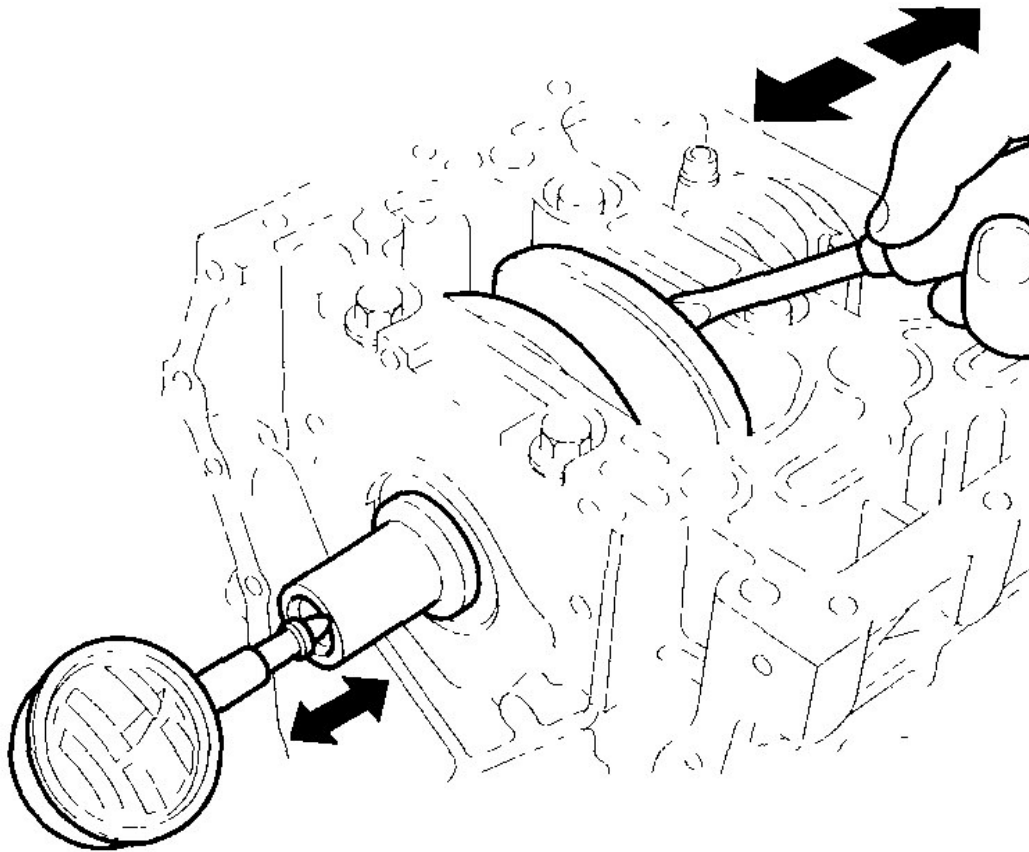
3. If the connecting rod end play is out-of-tolerance, install a new connecting rod, and recheck. If it is still out-of-tolerance, replace the crankshaft (see OIL PAN REMOVAL).
4. Push the crankshaft firmly away from the dial indicator, and zero the dial against the end of the

crankshaft. Then pull the crankshaft firmly back toward the indicator; the dial reading should not exceed the service limit.

Crankshaft End Play

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

Service Limit: 0.45 mm (0.018 in.)



G03692412

Fig. 5: Measuring Crankshaft End Play

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. If the end play is excessive, replace the thrust washers and recheck. If it is still out-of-tolerance, replace the crankshaft (see OIL PAN REMOVAL).

CRANKSHAFT MAIN BEARING REPLACEMENT

MAIN BEARING CLEARANCE INSPECTION

1. Remove the lower block and bearing halves (see **OIL PAN REMOVAL**).
2. Remove all of the old liquid gasket from the lower block mating surfaces, bolts, and bolt holes.
3. Remove the lower block mating surface.
4. Clean each main journal and bearing half with a clean shop towel.
5. Place one strip of plastigauge across each main journal.
6. Reinstall the bearings and lower block, then torque the bolts to 29 N.m (3.0 kgf.m, 22 lbf.ft) + 60 °.

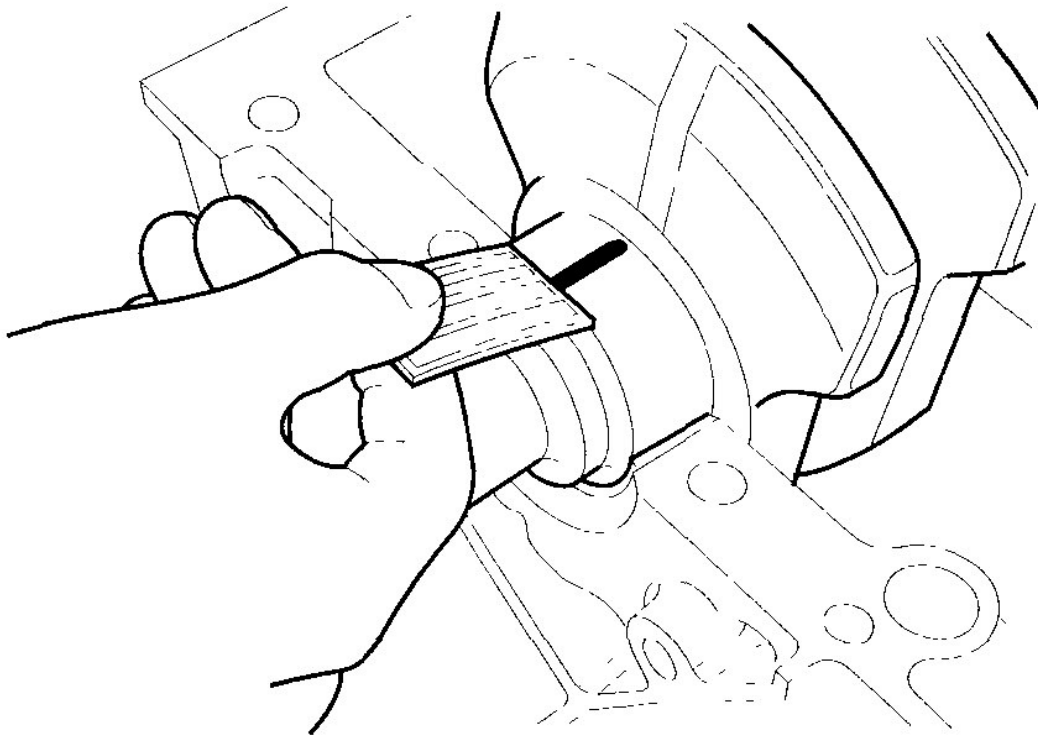
NOTE: **Do not rotate the crankshaft during inspection.**

7. Remove the lower block and bearings again, and measure the widest part of the plastigauge.

Main Bearing-to-Journal Oil Clearance

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

Service Limit: 0.050 mm (0.0020 in.)



G03692413

Fig. 6: Measuring Widest Part Of Plastigauge
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. If the plastigauge 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(s), and recheck the clearance. Do not file, shim, or scrape the bearings or the caps to adjust clearance.
9. If the plastigauge 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

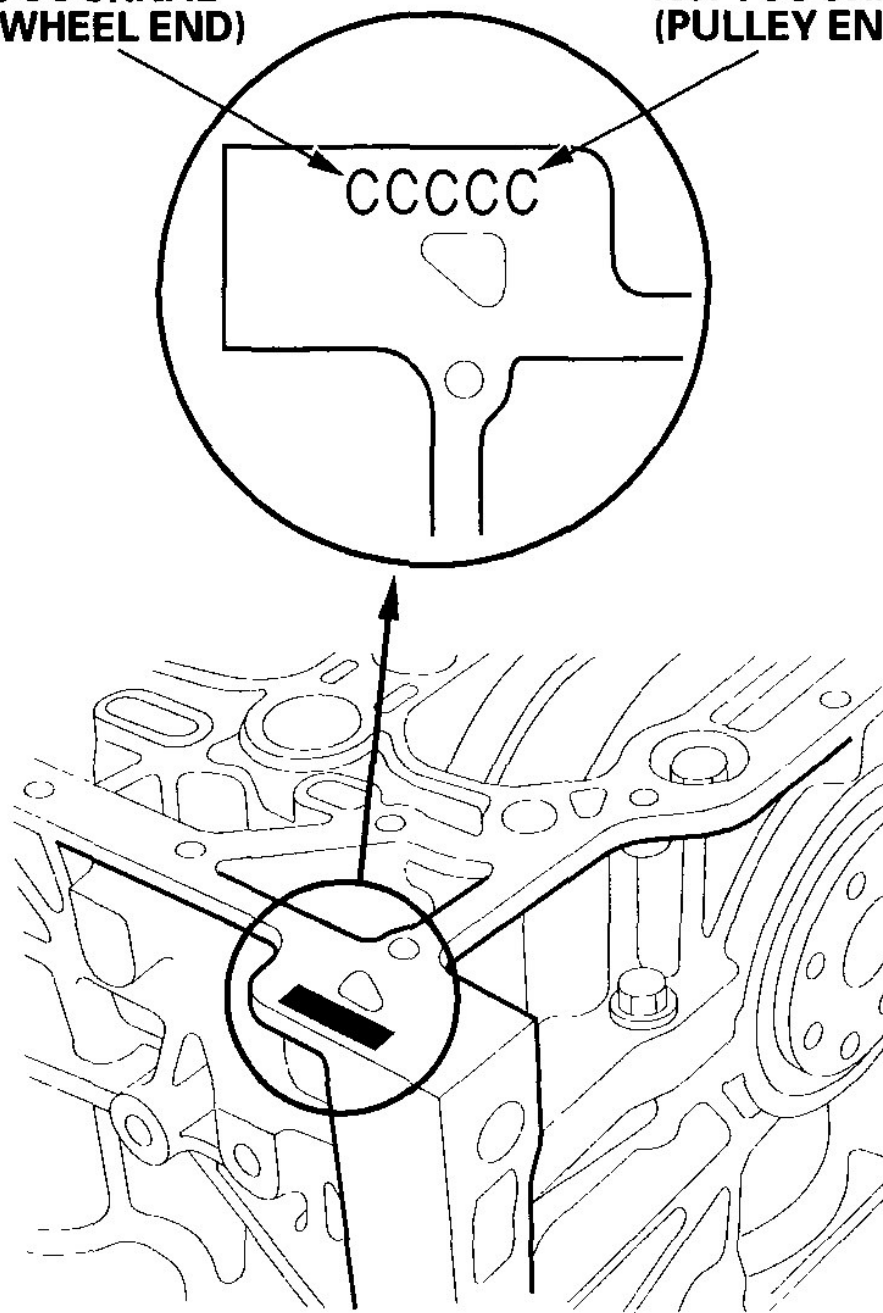
Crankshaft Bore Code Location

1. Numbers or letters or bars have been stamped on the end of the block as a code for the size of each of the five main journal bores. Write down the crank bore codes.

If you can't read the codes because of accumulated dirt and dust, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.

**No. 5 JOURNAL
(FLYWHEEL END)**

**No. 1 JOURNAL
(PULLEY END)**



G03692414

Fig. 7: Identifying Crankshaft Bore Code Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Main Journal Code Location

1. The main journal codes are stamped on the No. 1 web.

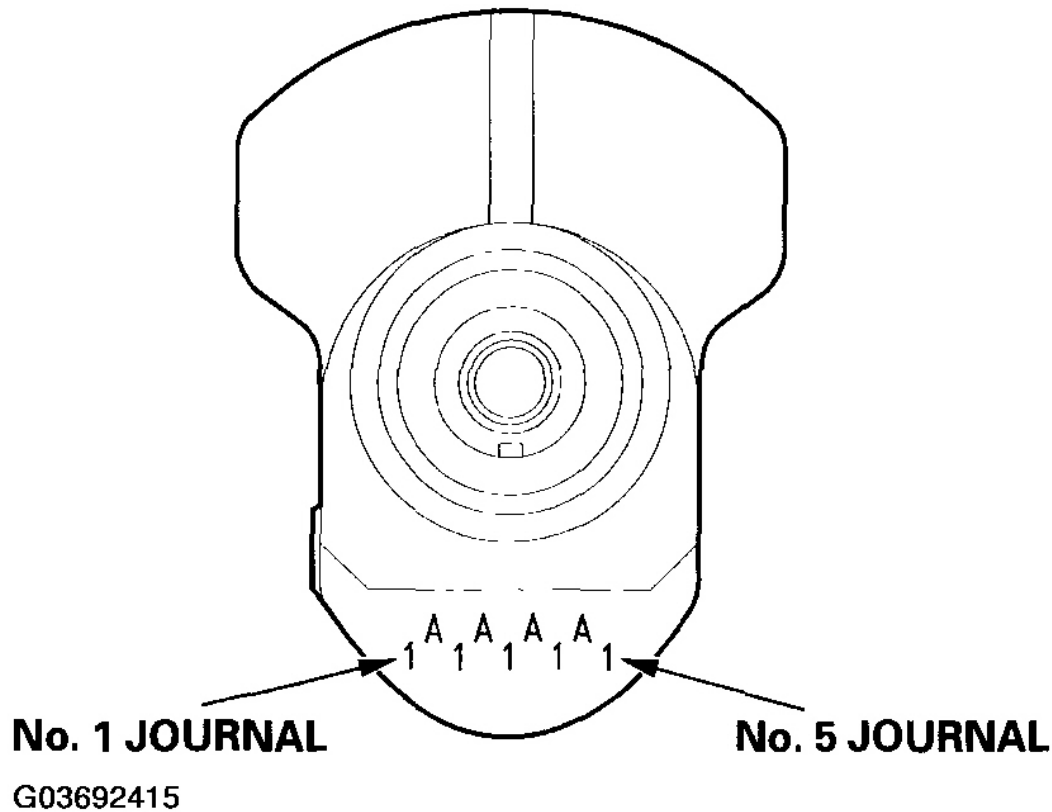


Fig. 8: Identifying Main Journal Codes

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

NOTE:

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

Main journal code	Crank bore code	Larger crank bore			
		1 or A or I	2 or B or II	3 or C or III	4 or D or IIII
		Smaller bearing (Thicker)			
Main journal code	1 or I	Pink/ Yellow	Yellow	Yellow/ Green	Green
	2 or II	Yellow	Yellow/ Green	Green	Green/ Brown
	3 or III	Yellow/ Green	Green	Green/ Brown	Brown
	4 or IIII	Green	Green/ Brown	Brown	Brown/ Black
	5 or IIIII	Green/ Brown	Brown	Brown/ Black	Black
	6 or IIIIII	Brown	Brown/ Black	Black	Black/ Blue
Smaller main journal	Smaller bearing (Thicker)				

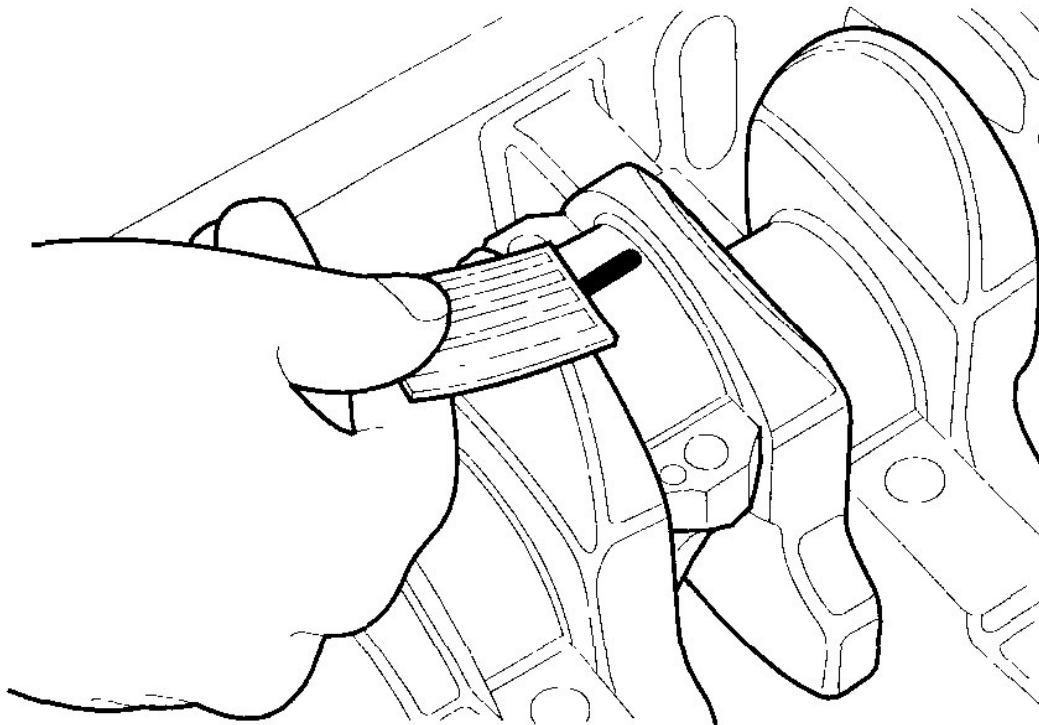
NOTE: Do not rotate the crankshaft during inspection.

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

Connecting Rod Bearing-to-Journal Oil Clearance

Standard (New): 0.030-0.054 mm (0.0012-0.0021 in.)

Service Limit: 0.060 mm (0.0024 in.)



G03692417

Fig. 10: Measuring Widest Part Of Plastigauge
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. If the plastigauge measures too wide or too narrow, remove the upper half of the bearing, install a new, complete bearing with the same color code(s), and recheck the clearance. Do not file, shim, or scrape the bearings or the caps to adjust clearance.
7. If the plastigauge 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 bearing, replace the crankshaft and start over.

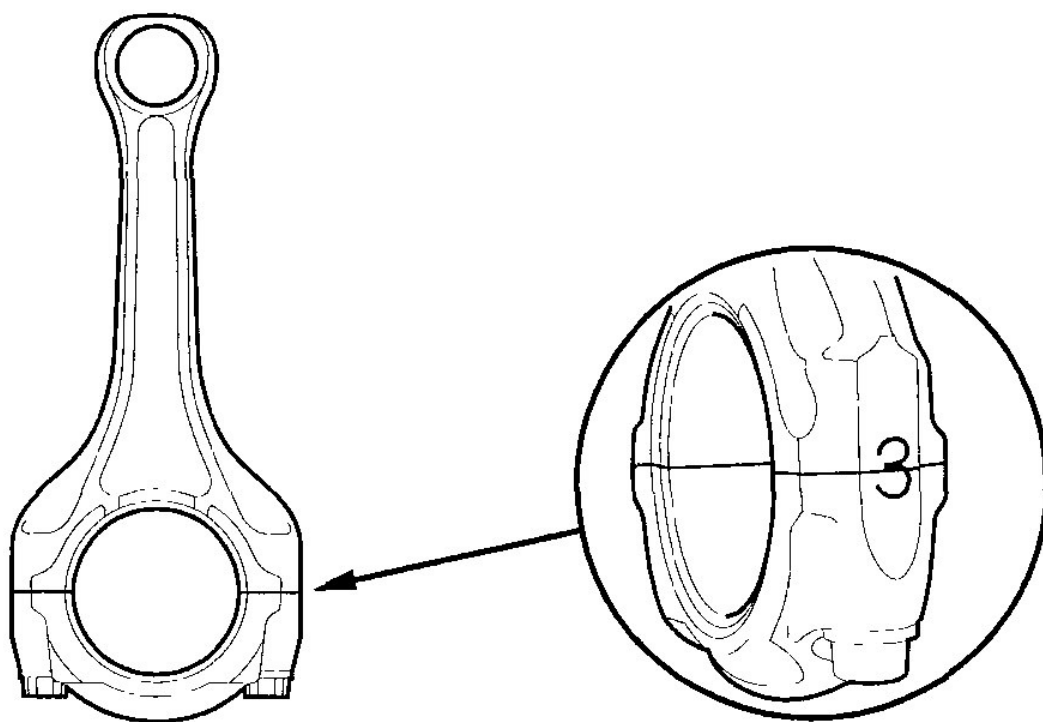
ROD BEARING SELECTION

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

Connecting Rod Big End Bore Code Location

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

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



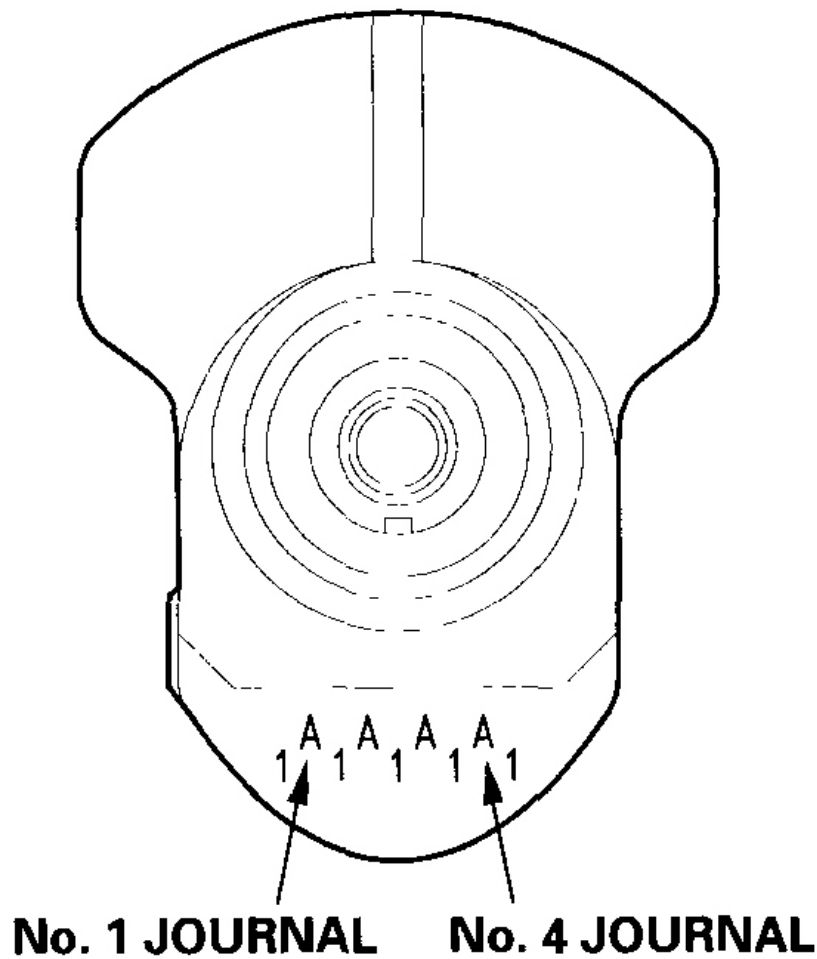
G03692418

Fig. 11: Identifying Connecting Rod Big End Bore Code Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Connecting Rod Journal Code Location

1. The connecting rod journal codes are stamped on the No. 1 web.

Connecting Rod Journal Code Location (Letters or Bars)

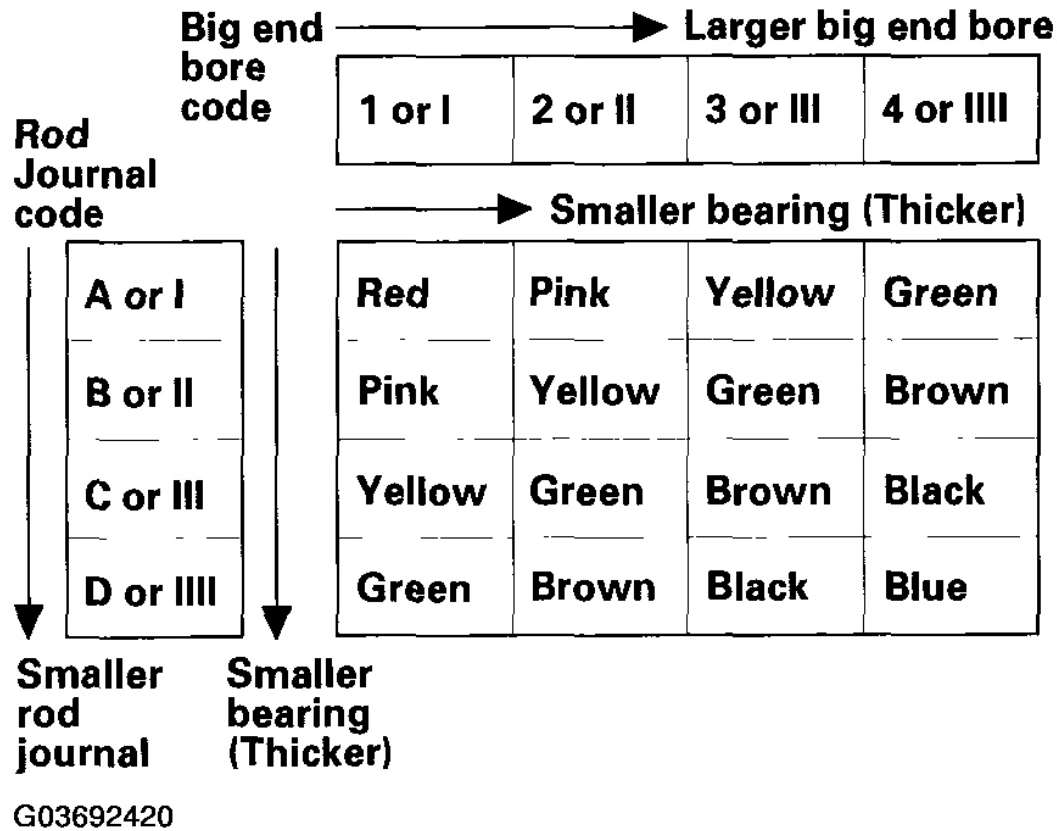


G03692419

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

2. Use the big end bore codes and rod journal codes to select appropriate replacement bearings from the following table.

NOTE: Color code is on the edge of the bearing.

**Fig. 13: Bearing Color Codes Chart**

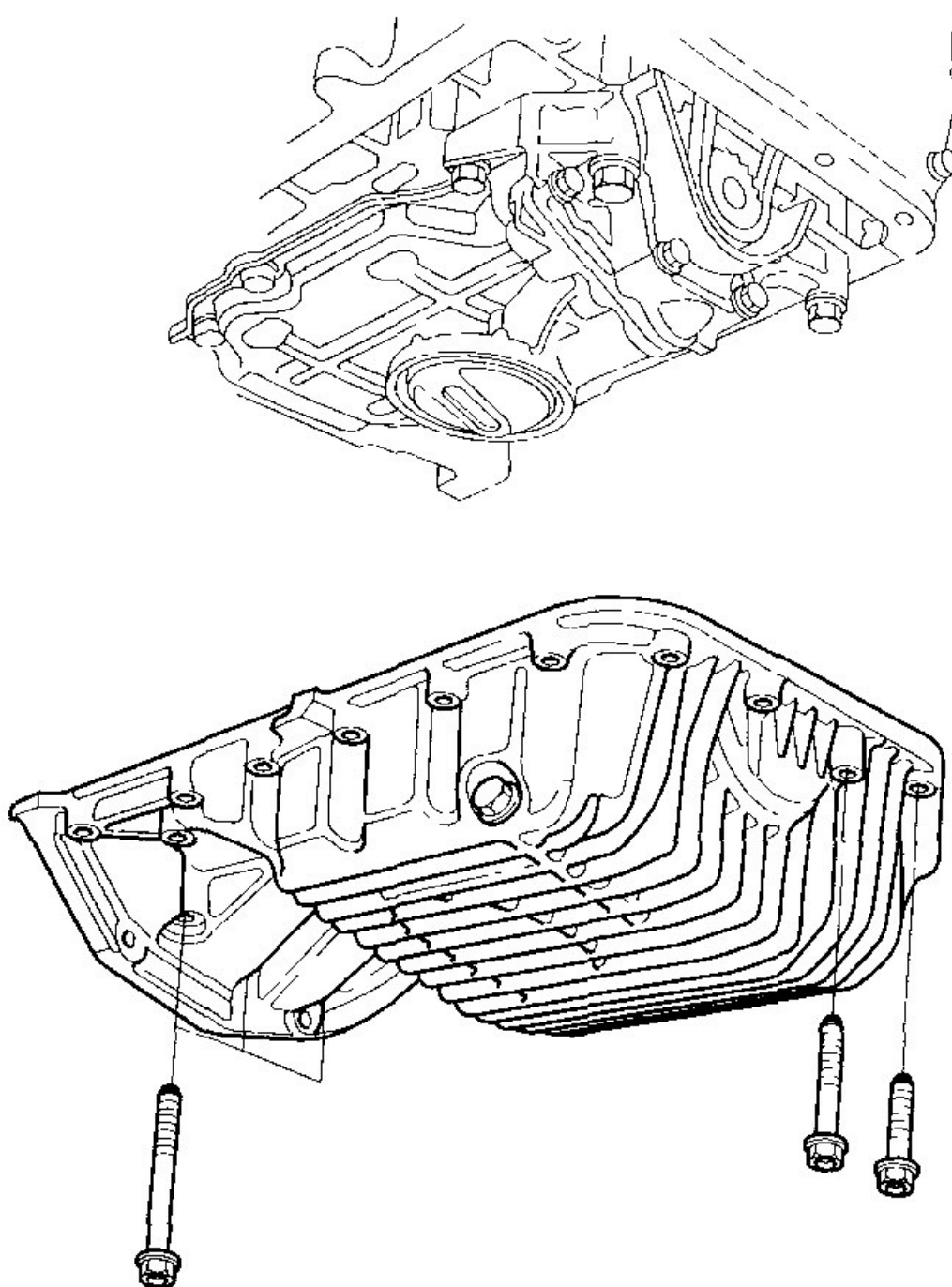
Courtesy of AMERICAN HONDA MOTOR CO., INC.

OIL PAN REMOVAL

OIL PAN REMOVAL

1. If the engine is out of the vehicle, go to step 3.
2. Drain the engine oil (see **OIL PRESSURE TEST**).
3. Remove the bolt securing the oil pan, then remove the oil pan.

NOTE: Cut the oil pan seal by using the oil seal cutter when oil pan doesn't come off easily.



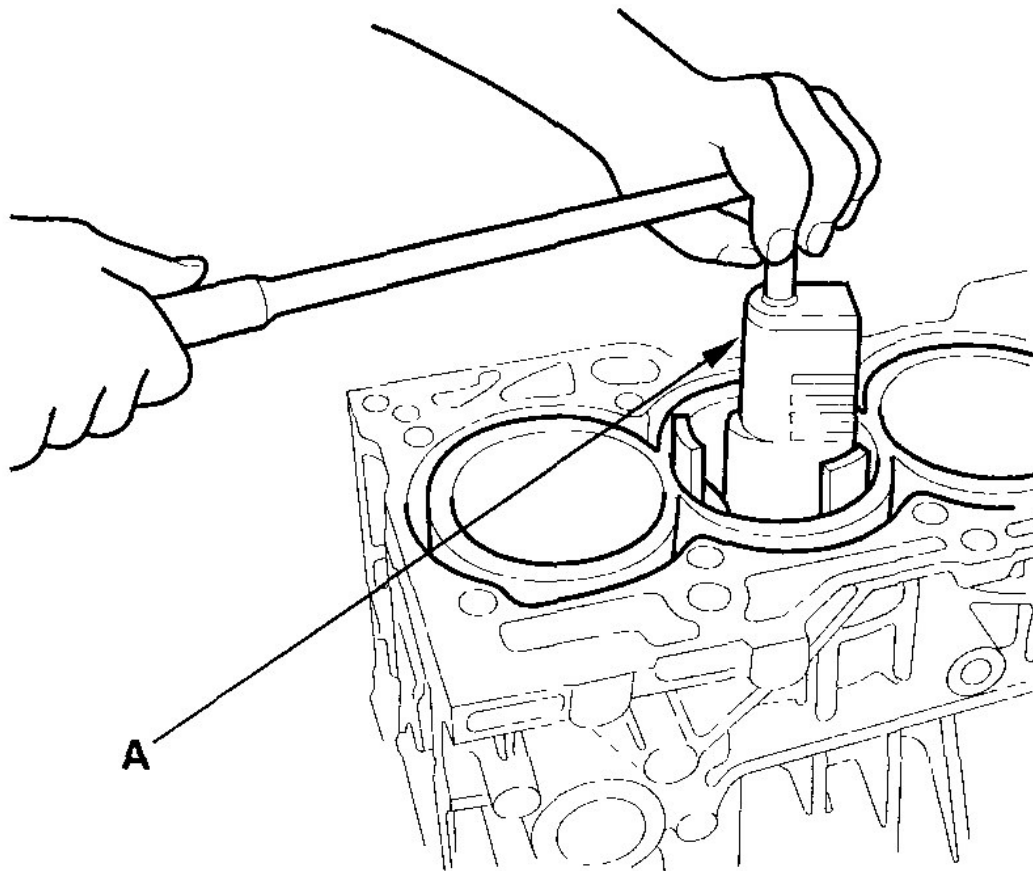
G03692421

Fig. 14: Removing Oil Pan

Courtesy of AMERICAN HONDA MOTOR CO., INC.

CRANKSHAFT AND PISTON REMOVAL

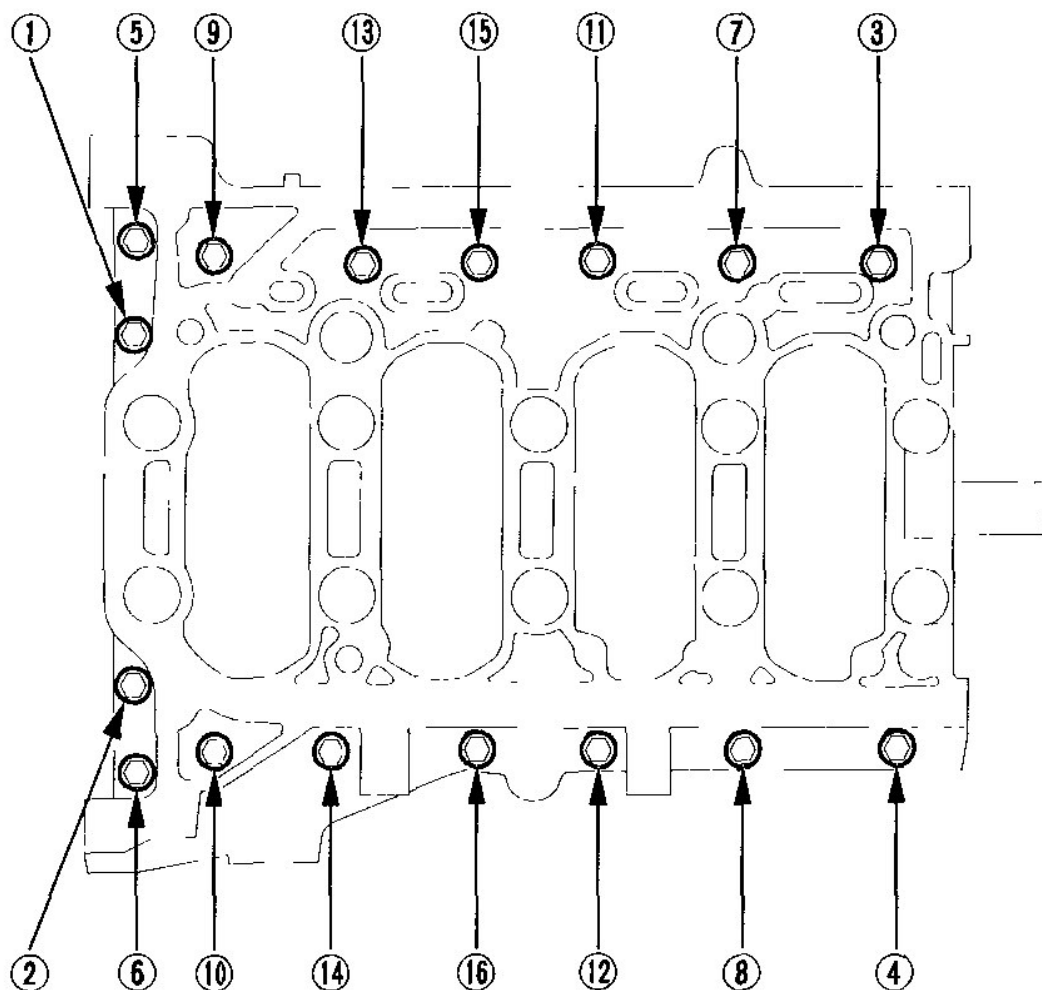
1. Remove the cam chain (see CAM CHAIN REMOVAL).
2. Remove the oil pump (see REMOVAL).
3. If you can feel a ridge of metal or hard carbon around the top of any cylinder, remove it with a ridge reamer (A). Follow the reamer manufacturer's instructions. If the ridge is not removed, it may damage the piston as it is pushed out.



G03692422

Fig. 15: Removing Ridge Of Metal Or Hard Carbon Around Top Of Cylinder With Ridge Reamer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the 8 mm bolts securing the lower block.

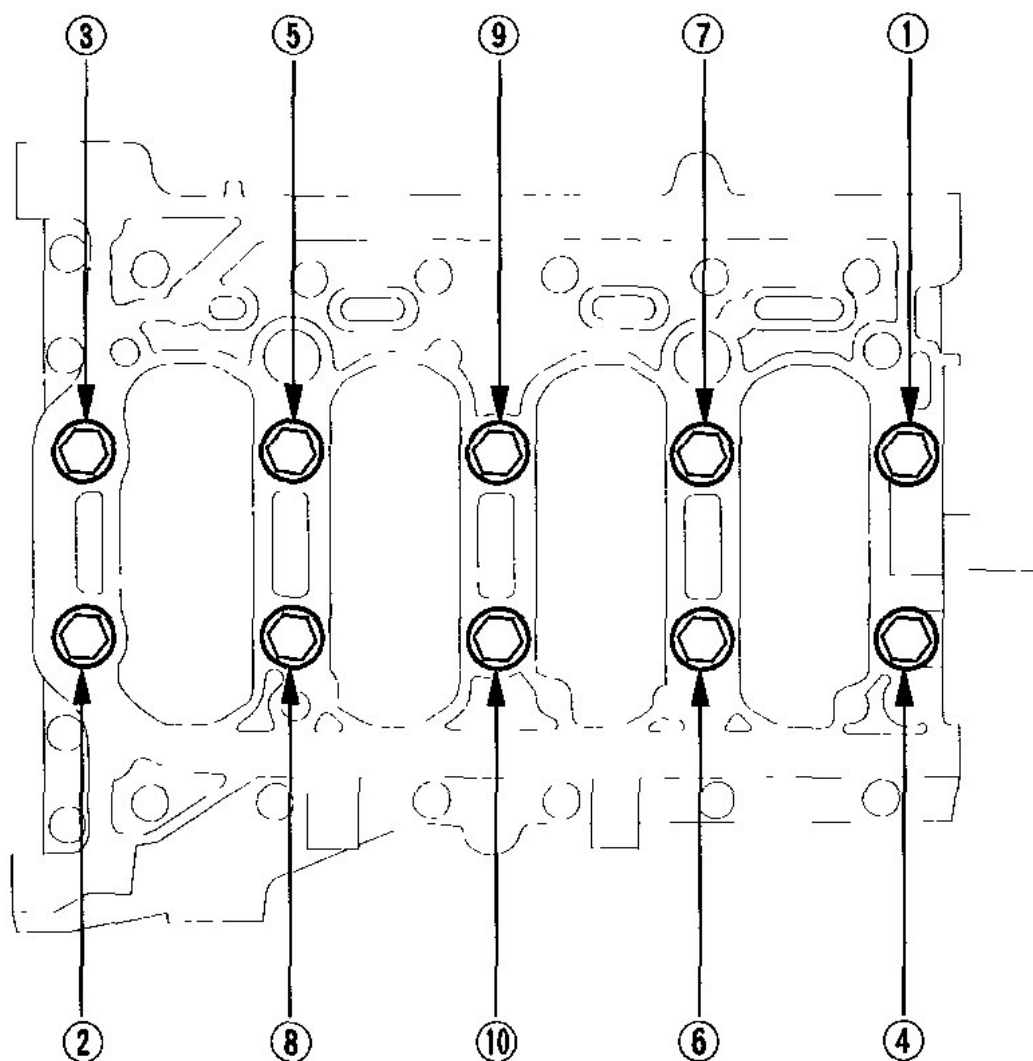


G03692423

Fig. 16: Identifying Removal Sequence Of Lower Block Bolts

Courtesy of AMERICAN HONDA MOTOR CO., INC.

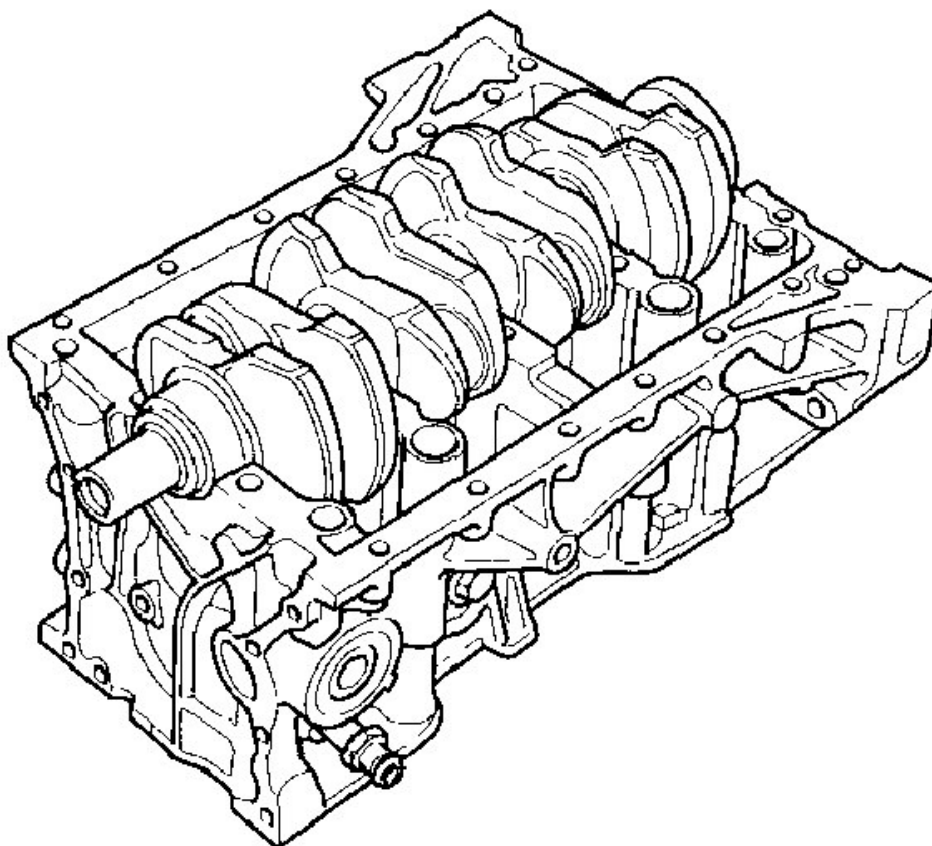
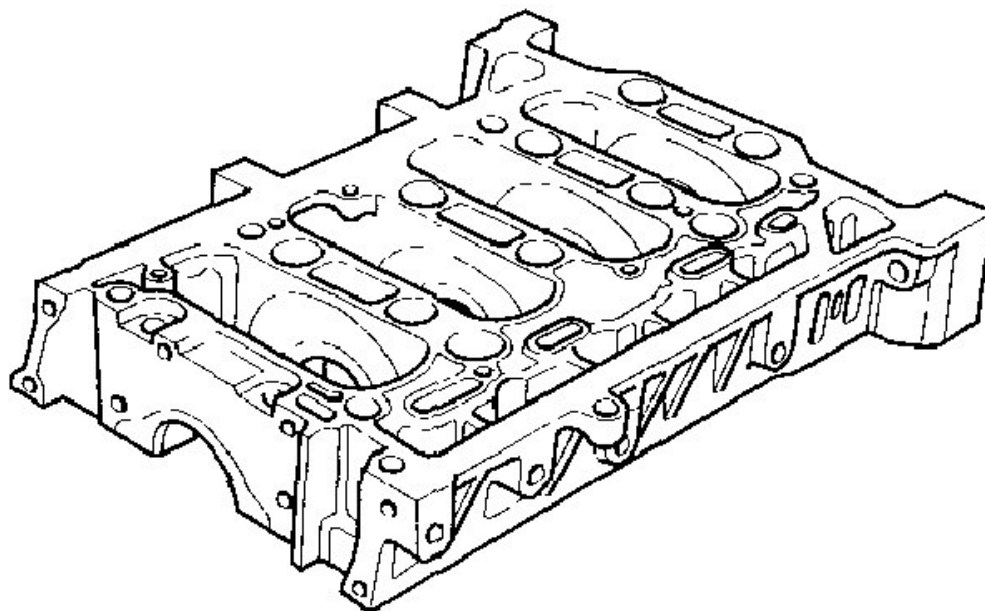
5. Remove the bearing cap bolts. To prevent warpage, unscrew the bolts in sequence 1/3 turn at a time; repeat the sequence until all bolts are loosened.



G03692424

Fig. 17: Identifying Removal Sequence Of Bearing Cap Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

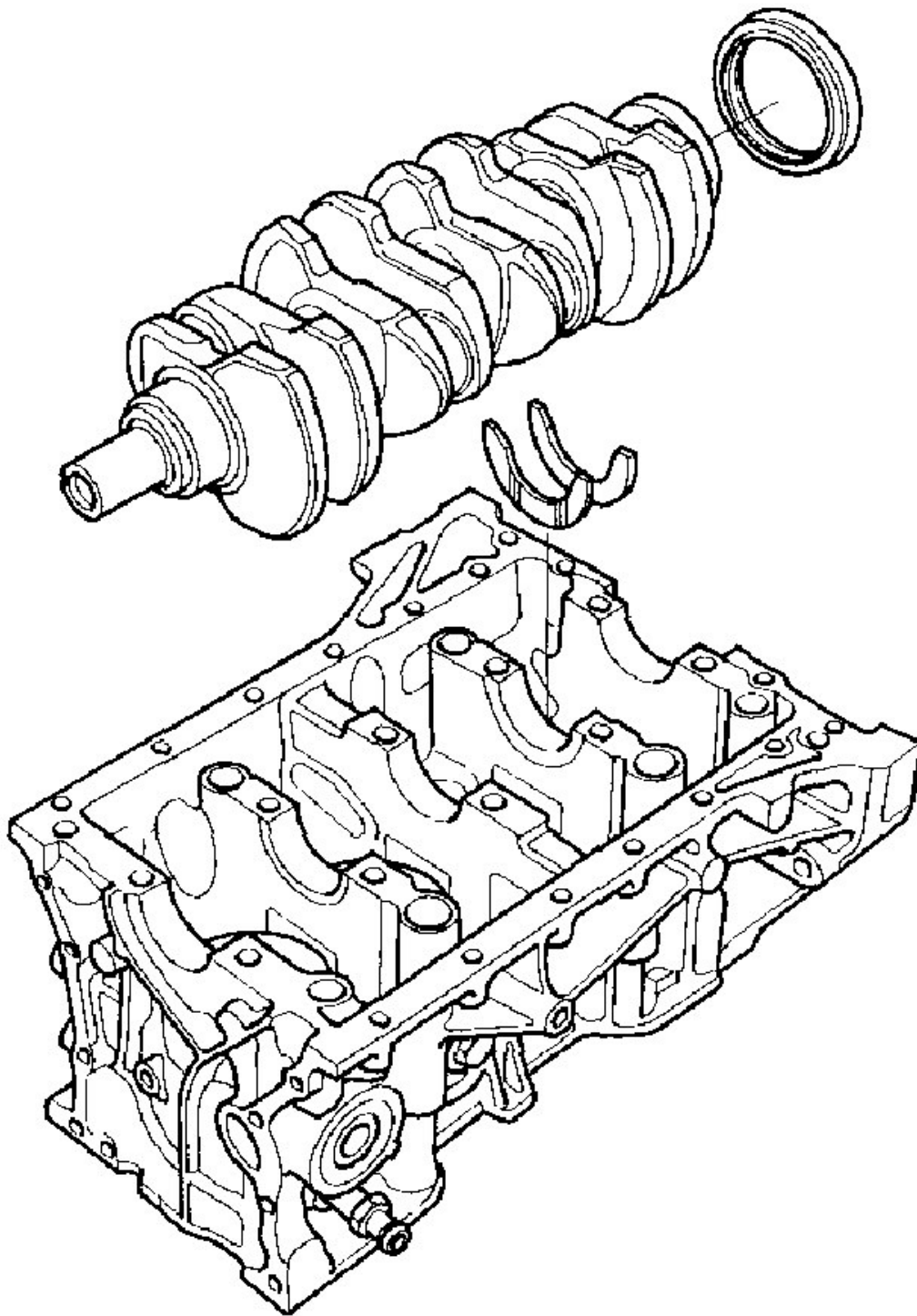
6. Remove the lower block and bearings. Keep all bearings in order.



G03692425

Fig. 18: Removing Lower Block**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

7. Remove the rod caps and bearings. Keep all caps and bearings in order.
8. Lift the crankshaft out of the engine, being careful not to damage the journals.

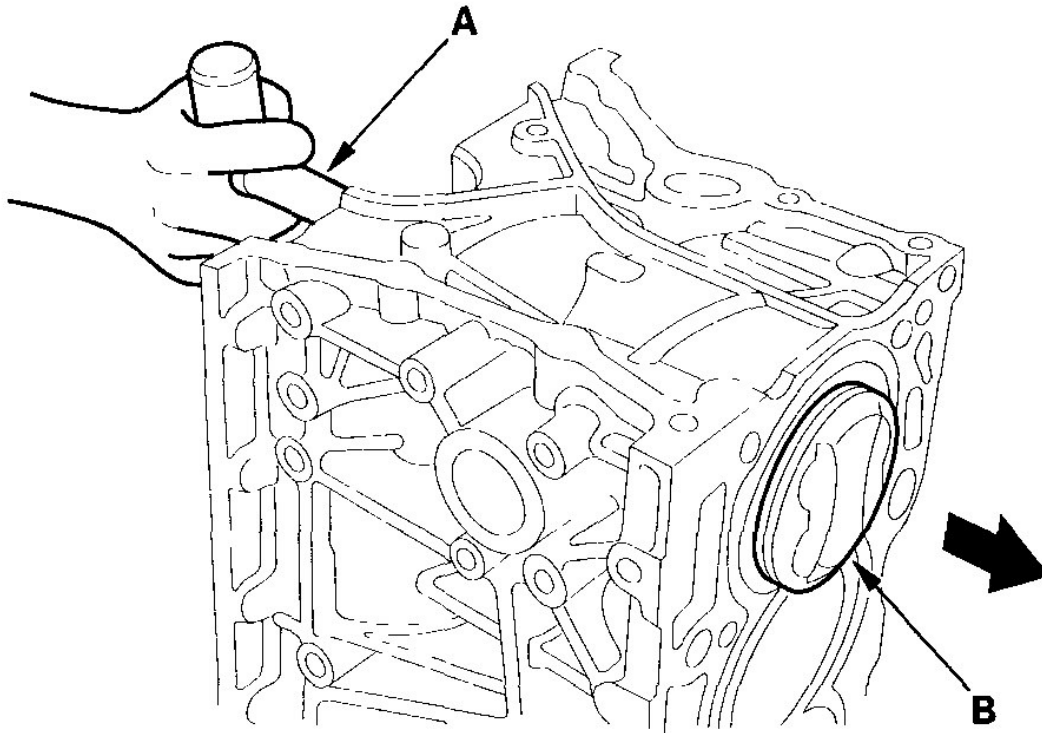


G03692426

Fig. 19: Removing Crankshaft

Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Use the wooden handle of a hammer (A) to drive out the pistons (B).



G03692427

Fig. 20: Removing Pistons Using Wooden Handle Of Hammer

Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Reinstall the connecting rod bearings and caps after removing each piston and connecting rod assembly.
11. To avoid mix-up on reassembly, mark each piston and connecting rod assembly with its cylinder number.

NOTE: The existing number on the connecting rod does not indicate its position in the engine, it indicates the rod bore size.

CRANKSHAFT INSPECTION

OUT-OF-ROUND AND TAPER

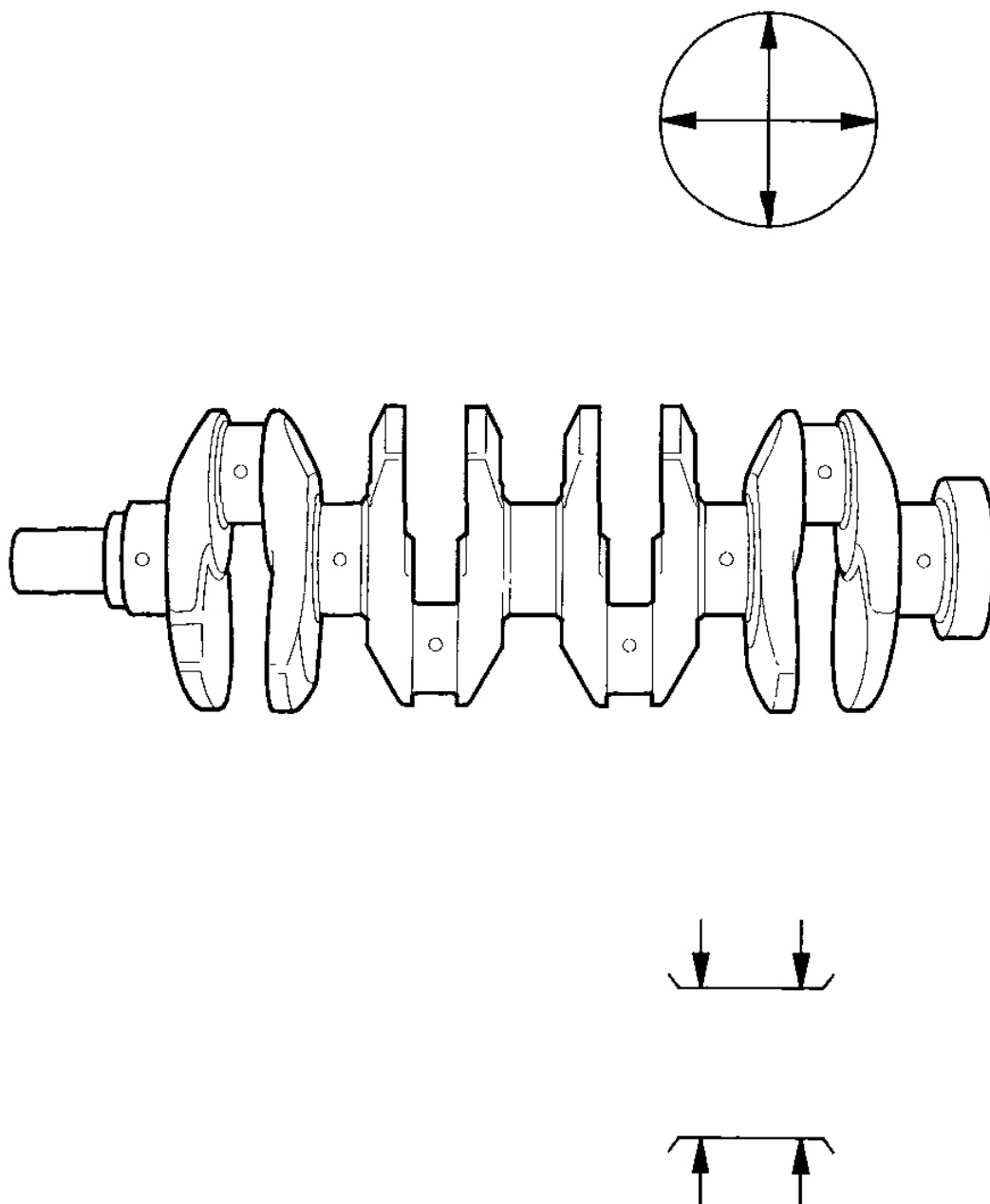
1. Remove the crankshaft from the engine block (see **OIL PAN REMOVAL**).
2. Clean the crankshaft oil passages with pipe cleaners or a suitable brush.

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

Journal Out-of-Round

Standard (New): 0.004 mm (0.0002 in.) max.

Service Limit: 0.006 mm (0.0002 in.)



G03692428

Fig. 21: Identifying Out-Of-Round At Middle Of Each Rod And Main Journal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Measure the taper at the edge 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: 0.006 mm (0.0002 in.)

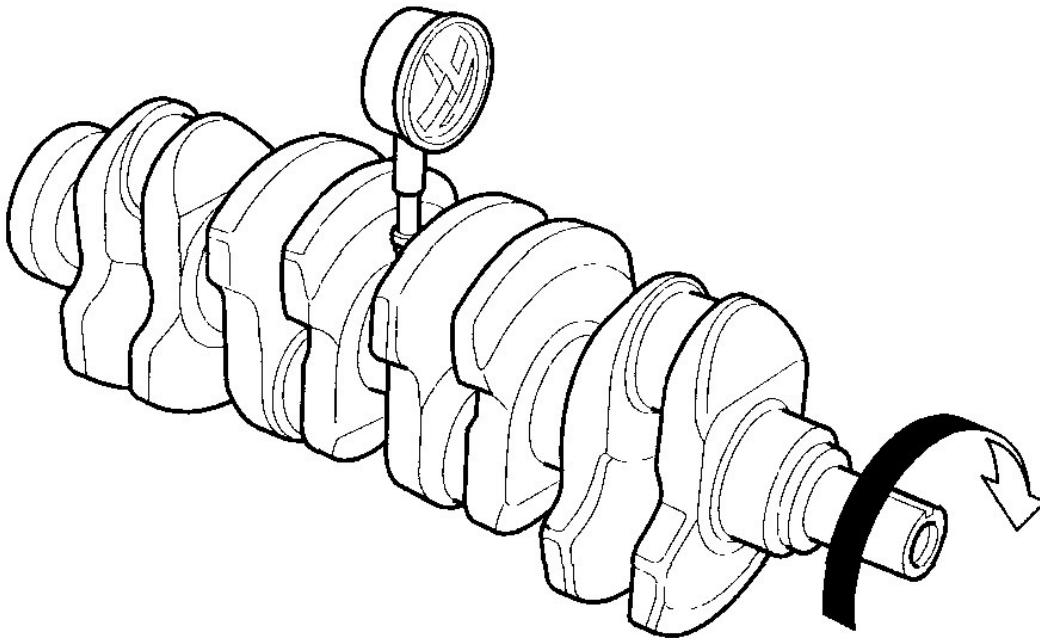
STRAIGHTNESS

1. Place the engine block on the surface plate.
2. Clean and install the bearings on the No. 1 and No. 5 journals of the engine block.
3. Lower the crankshaft into the engine block.
4. 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 Indicator Runout

Standard (New): 0.02 mm (0.0008 in.) max.

Service Limit: 0.04 mm (0.0016 in.)



G03692429

Fig. 22: Checking Main Journals Runout

Courtesy of AMERICAN HONDA MOTOR CO., INC.

BLOCK AND PISTON INSPECTION

1. Remove the crankshaft and pistons (see **OIL PAN REMOVAL**).
2. Check the piston for distortion or cracks.
3. Measure the piston diameter at a point 16 mm (0.6 in.) (2000-2003 models), or 10 mm (0.4 in.) (2004-2008 models) from the bottom of the skirt. There are two standard-size pistons (No Letter or A, and B). The letter is stamped on the top of the piston. Letters are also stamped on the engine block as cylinder bore sizes.

Piston Diameter

Standard (New):

No Letter (or A): 86.993-87.006 mm (3.4249-3.4254 in.)

B: 86.983-86.996 mm (3.4245-3.4250 in.)

Service Limit:

No Letter (or A): 86.980 mm (3.4244 in.)

B: 86.970 mm (3.4240 in.)

Oversize Piston Diameter

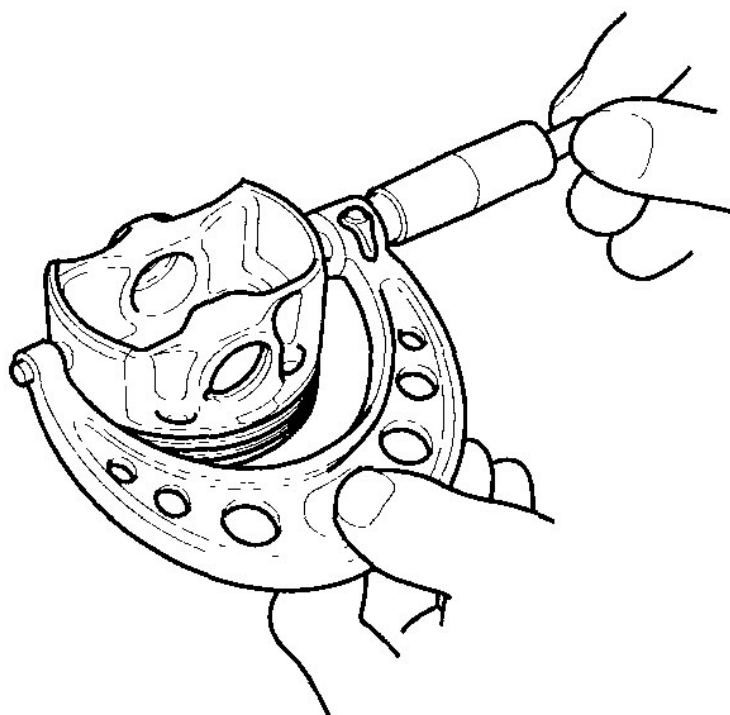
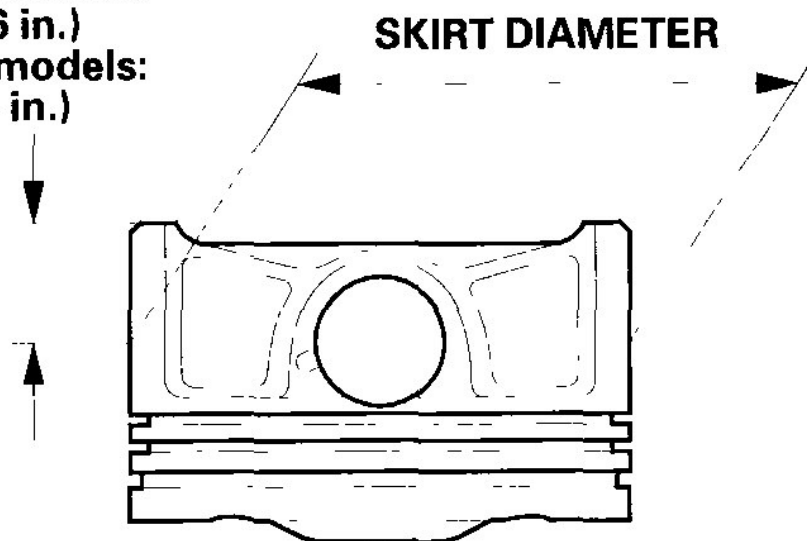
0.25: 87.233-87.246 mm (3.4344-3.4349 in.)

2000-2003 models:

16 mm (0.6 in.)

2004-2008 models:

10 mm (0.4 in.)

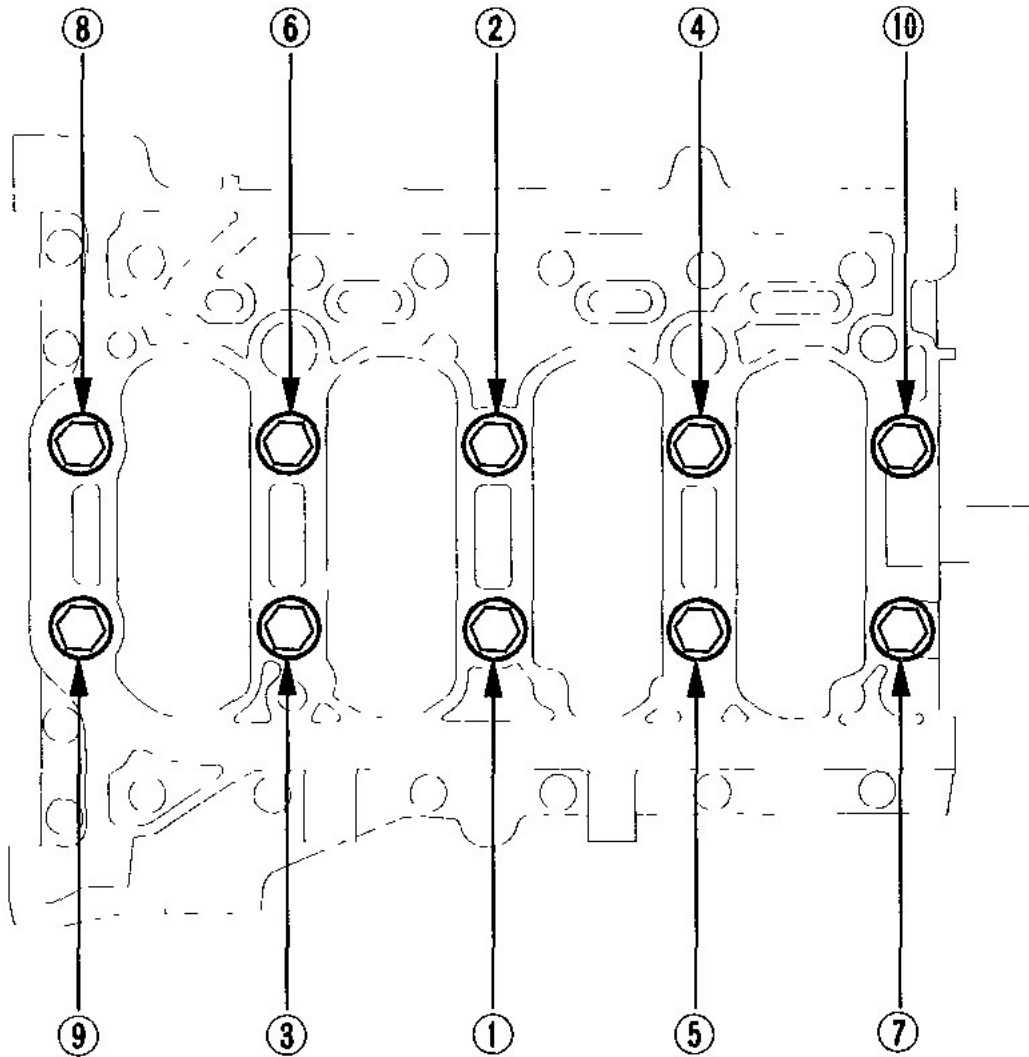


G03692430

Fig. 23: Measuring Piston Diameter

Courtesy of AMERICAN HONDA MOTOR CO., INC.

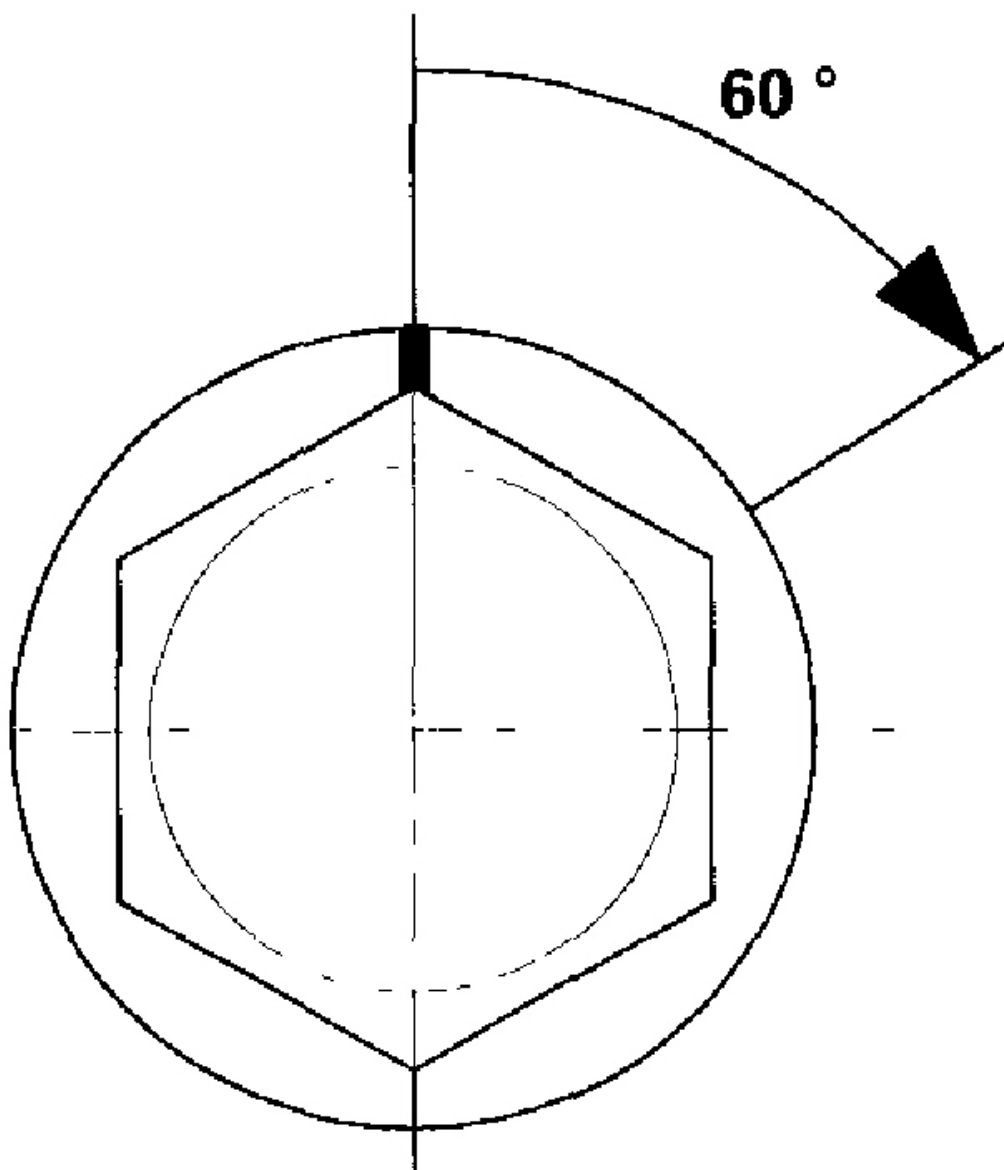
4. Remove all of the old liquid gasket from the lower block mating surfaces, bolts, and bolt holes.
5. Clean the lower block mating surfaces.
6. Put the lower block on the engine block.
7. Tighten the bearing cap bolts in sequence to 29 N.m (3.0 kgf.m, 22 lbf.ft).



G03692431

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

8. Tighten the bearing cap bolts an additional 60 °.



G03692432

Fig. 25: Identifying Bearing Cap Bolts Additional Tightening Angle
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Measure the wear and taper in direction X and Y at three levels in each cylinder as shown. If measurements in any cylinder are beyond the oversize bore service limit, replace the engine block. If the block is to be rebored, refer to step 12 after reboring.

Cylinder Bore Size**Standard (New)****A or I: 87.010-87.020 mm (3.4256-3.4260 in.)****B or II: 87.000-87.010 mm (3.4252-3.4256 in.)****Oversize****0.25: 87.250-87.260 mm (3.4350-3.4354 in.)****Reboring Limit: 0.25 mm (0.01 in.) max.****Bore Taper****Limit: (Difference between first and third measurement) 0.05 mm (0.002 in.)**

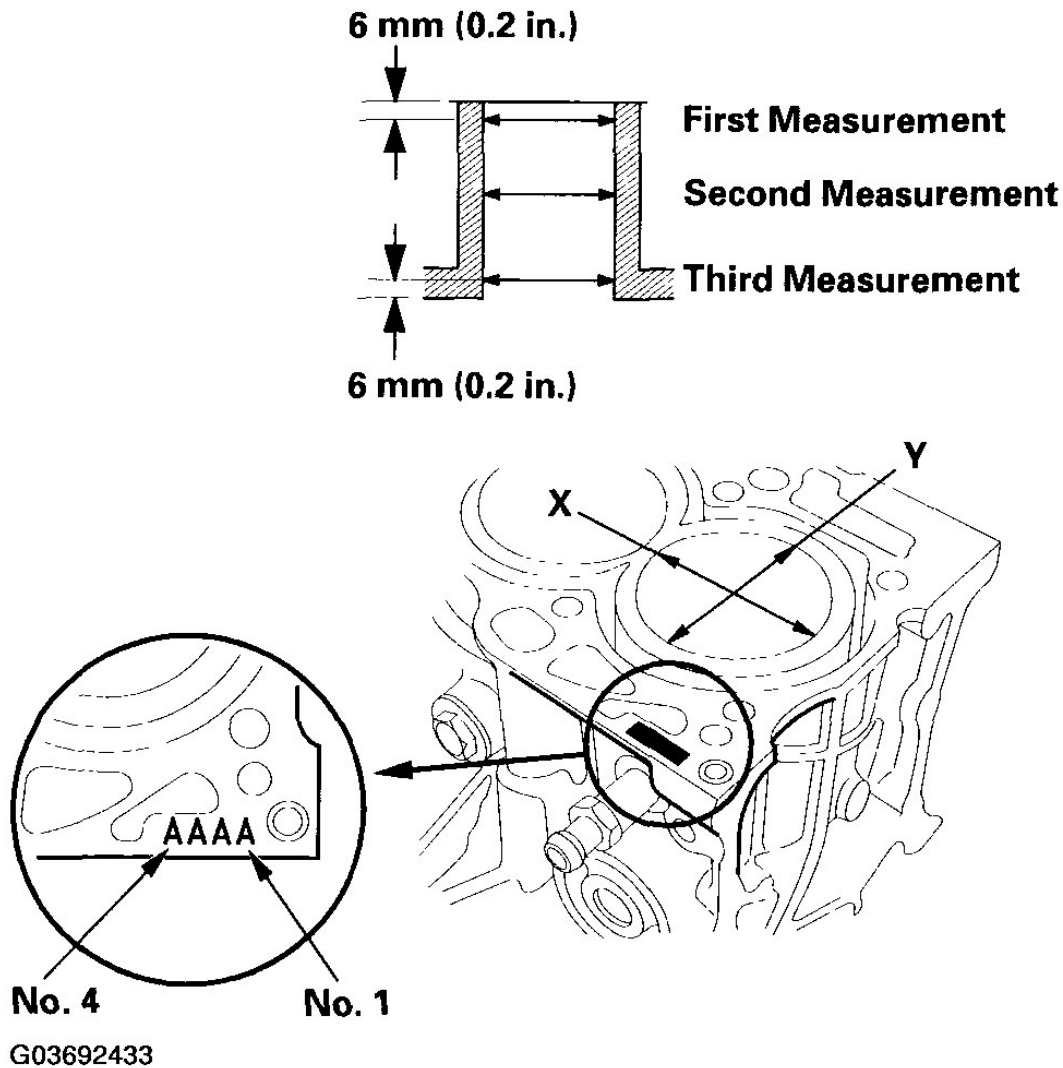


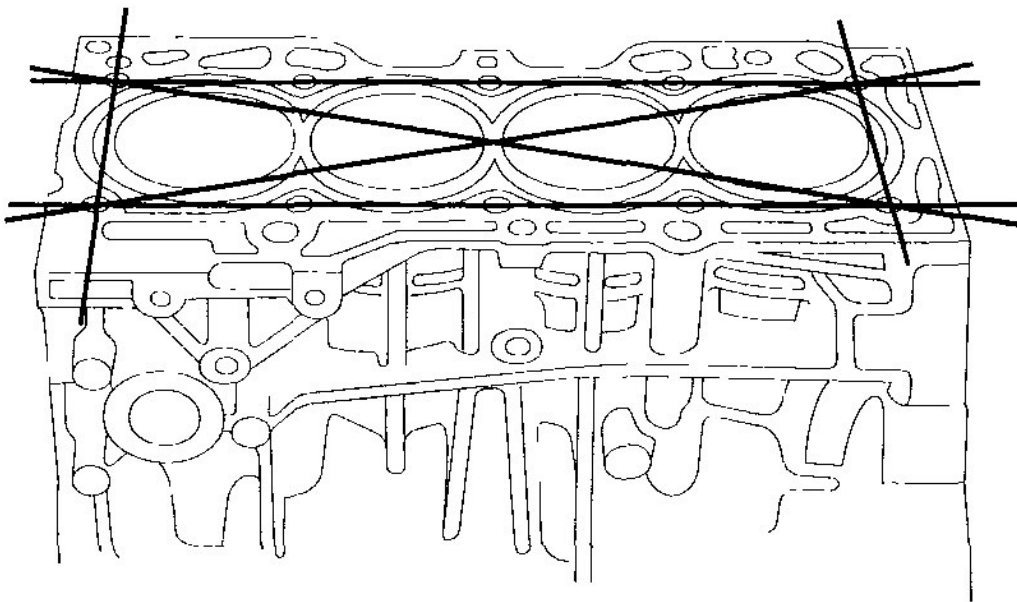
Fig. 26: Identifying Cylinder Bore Taper And Wear Measurement Levels
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

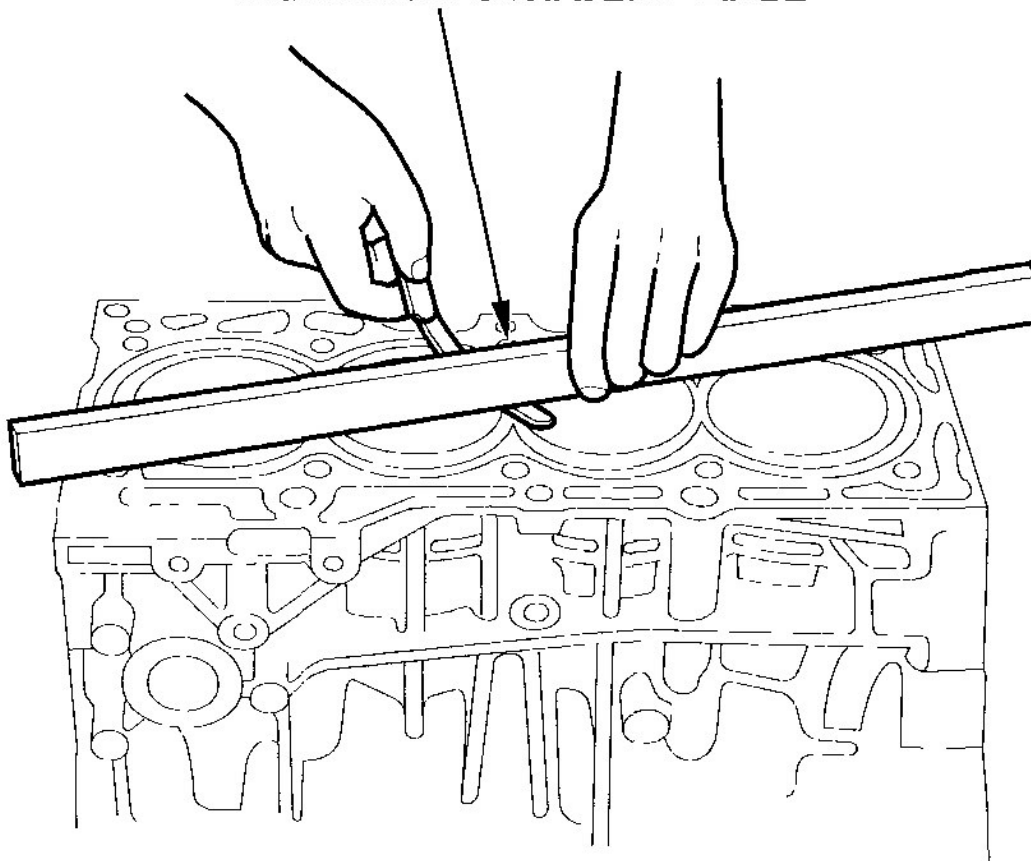
Engine Block Warpage

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

Service Limit: 0.10 mm (0.004 in.)



PRECISION STRAIGHT EDGE



G03692434

Fig. 27: Checking Top Of Cylinder Block For Warpage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Piston-to-Cylinder Clearance

Standard (New): 0.004-0.027 mm

(0.0002-0.0011 in.)

Service Limit: 0.004 mm (0.0002 in.)

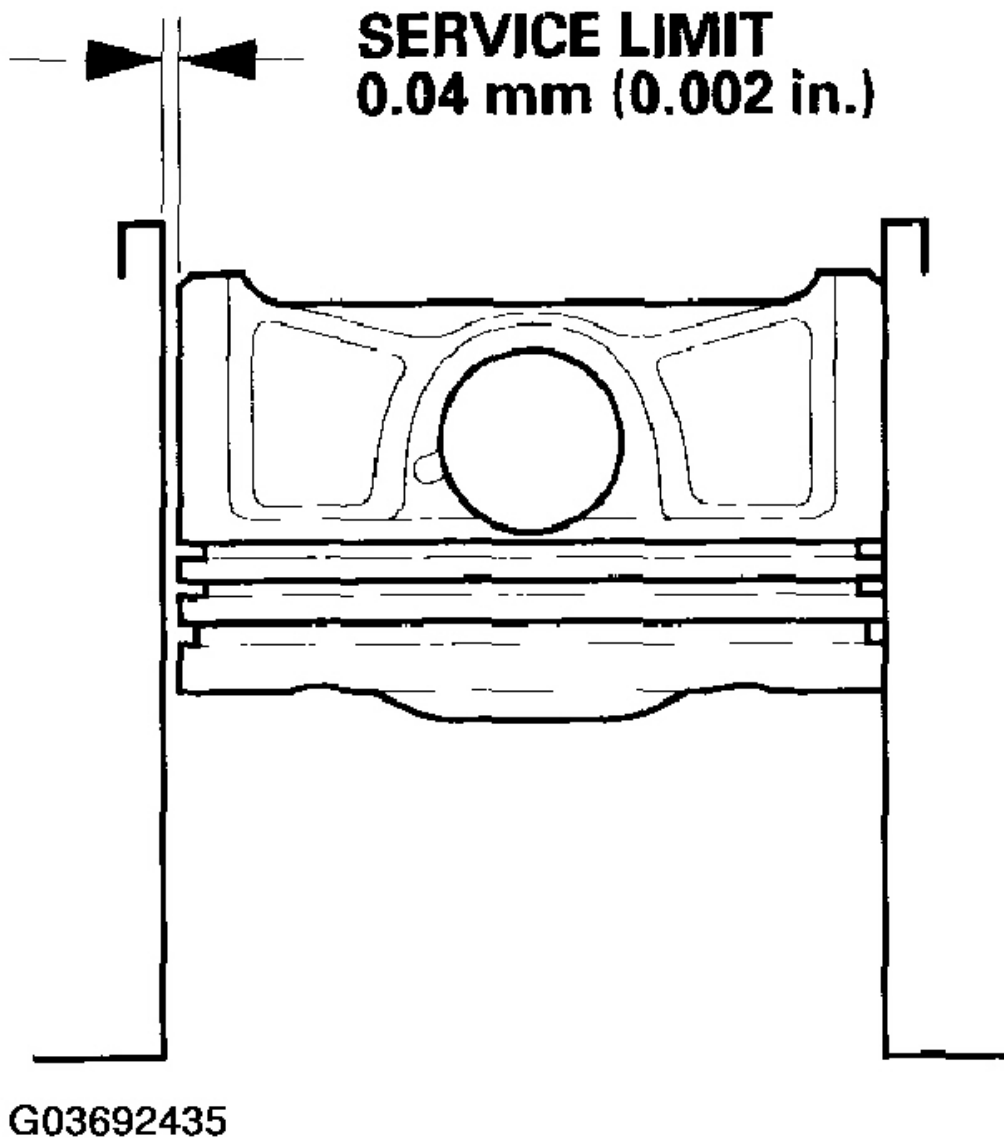


Fig. 28: Identifying Difference Between Cylinder Bore Diameter And Piston Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

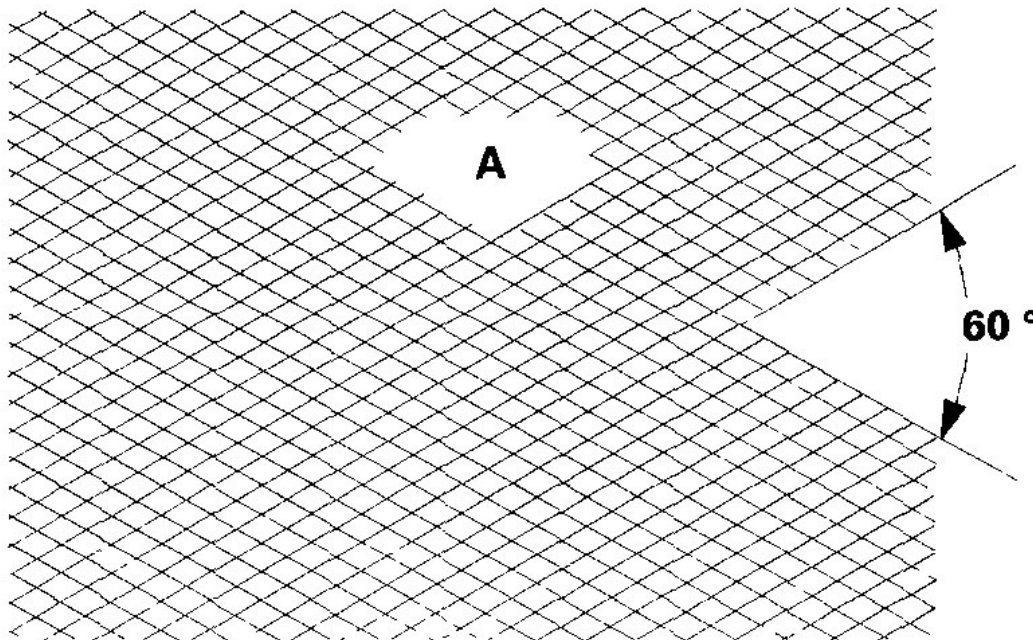
CYLINDER BORE HONING

The cylinder liners are made with FRM (fiber reinforced metal). Hone the cylinders only as described here.

1. Measure the cylinder bores (see **BLOCK AND PISTON INSPECTION**). If the engine block is to be reused, hone the cylinders and remeasure the bores. Scored or scratched cylinder bores must be honed.

2. Hone the cylinders using the following equipment, materials and methods:

- Use only a rigid hone.
- Honing stones: GC-600-J or finer stones for nonferrous metals
- Pressure: 200-300 kPa (2-3 kgf/cm² , 28-43 psi)
- Honing RPM: 45-50
- Honing thickness: Less than 0.02 mm (0.0008 in.) Do not hone more than 20 cycles.
- Honing lubricant: Oil type
- Honing pattern: 60 degree cross-hatch (A)
- Hone cleaning: Clean the stones every five cycles.



G03692436

Fig. 29: Identifying Cylinder Head Honing Pattern (60 Degree Cross-Hatch)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

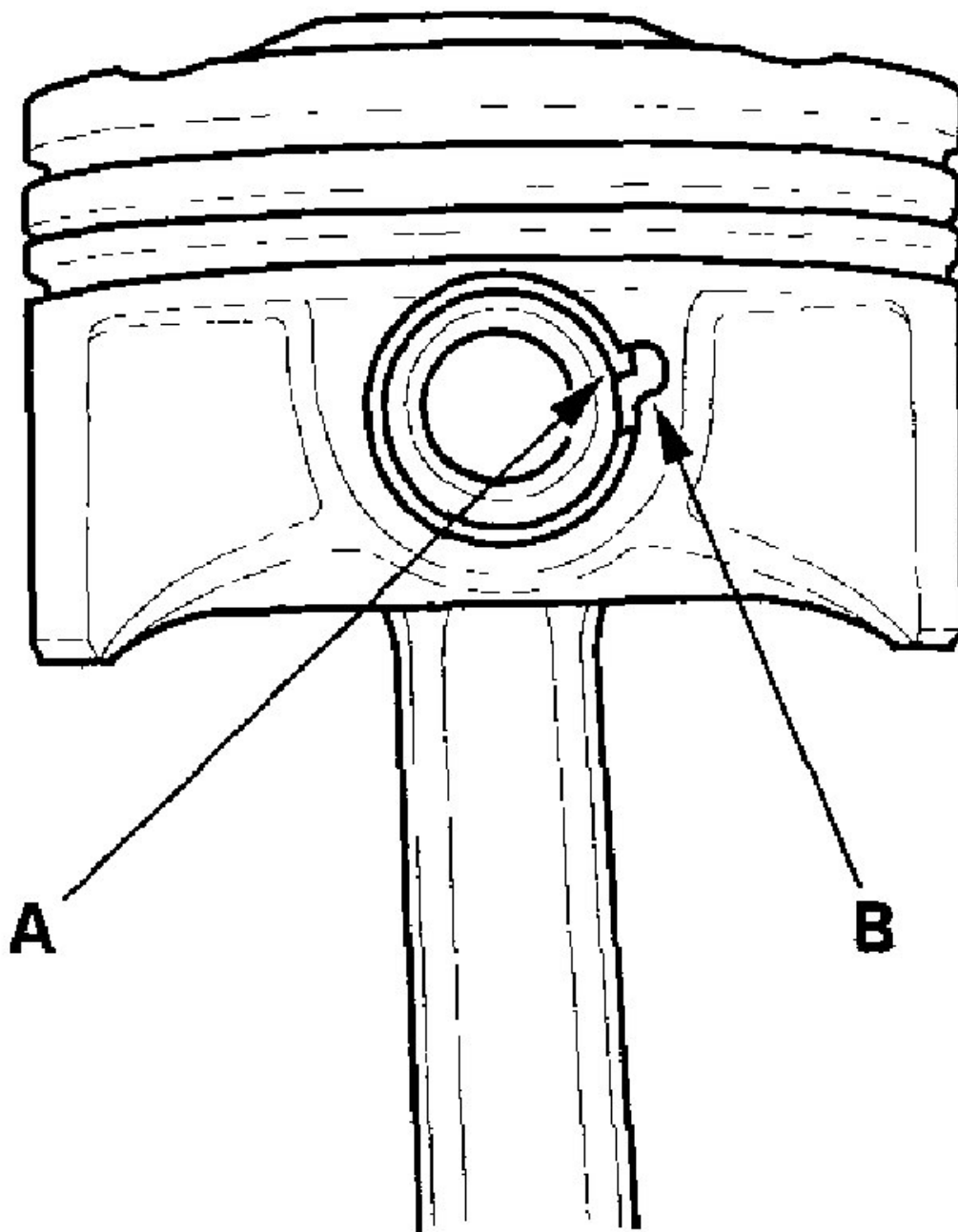
3. When honing is complete, thoroughly clean the engine block of all metal particles. Wash the cylinder bores with hot soapy water, then dry and oil them immediately to prevent rusting. Never use solvent, it will only redistribute the grit on the cylinder walls.
4. If scoring or scratches are still present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

PISTON, PIN, AND CONNECTING ROD REPLACEMENT

DISASSEMBLY

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

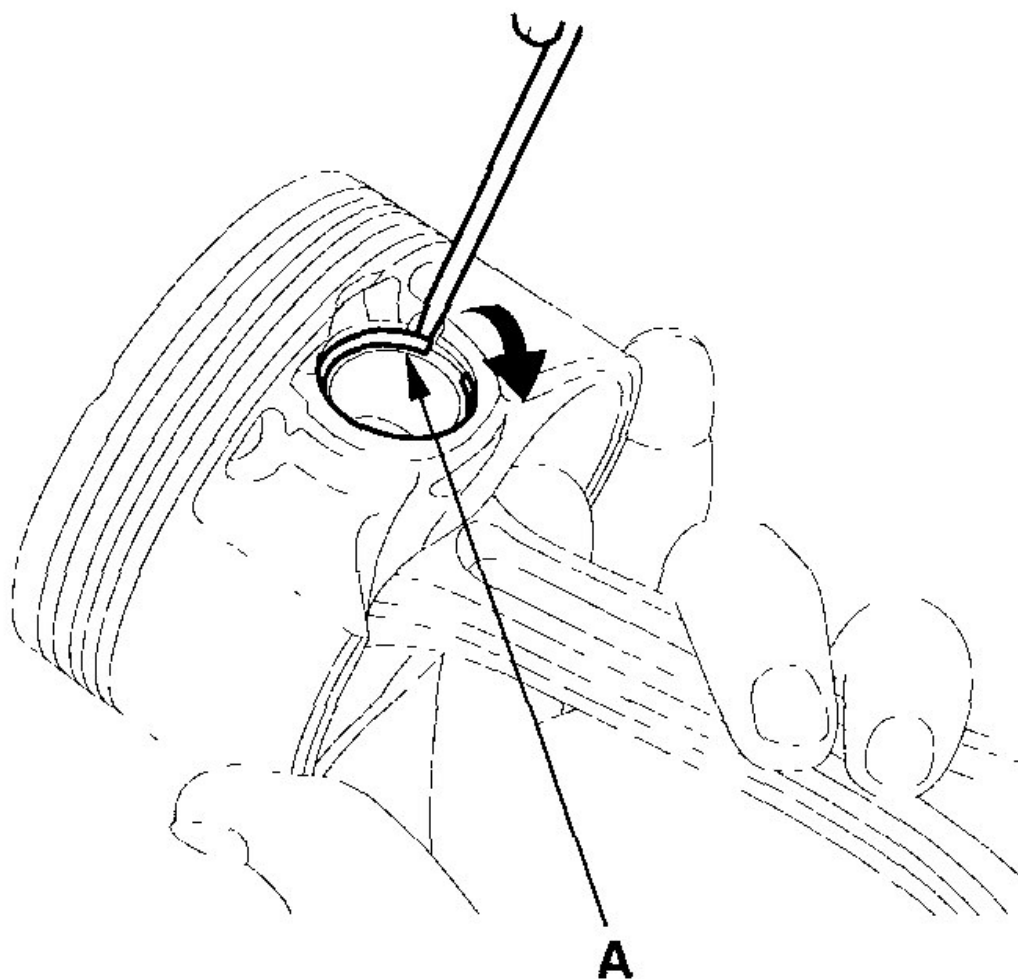
NOTE: **Take care not to damage the ring grooves.**



G03692437

Fig. 30: Identifying Piston Pin Snap Ring And Piston Pin Bore
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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.

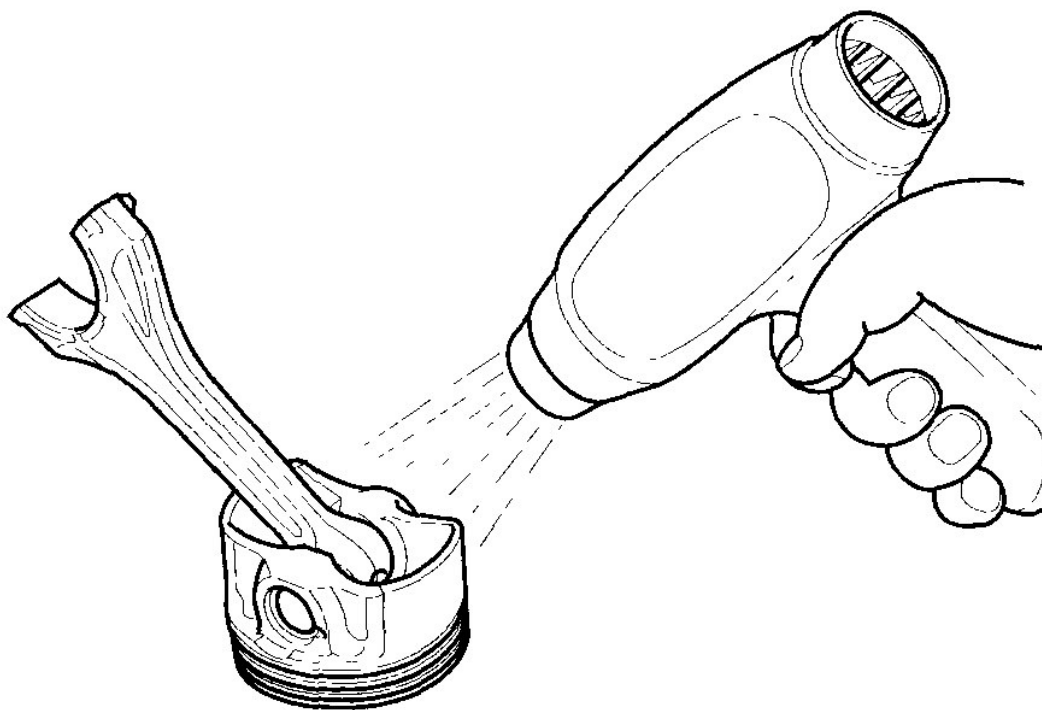


G03692438

Fig. 31: Removing Snap Ring

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



G03692439

Fig. 32: Heating Piston And Connecting Rod Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

INSPECTION

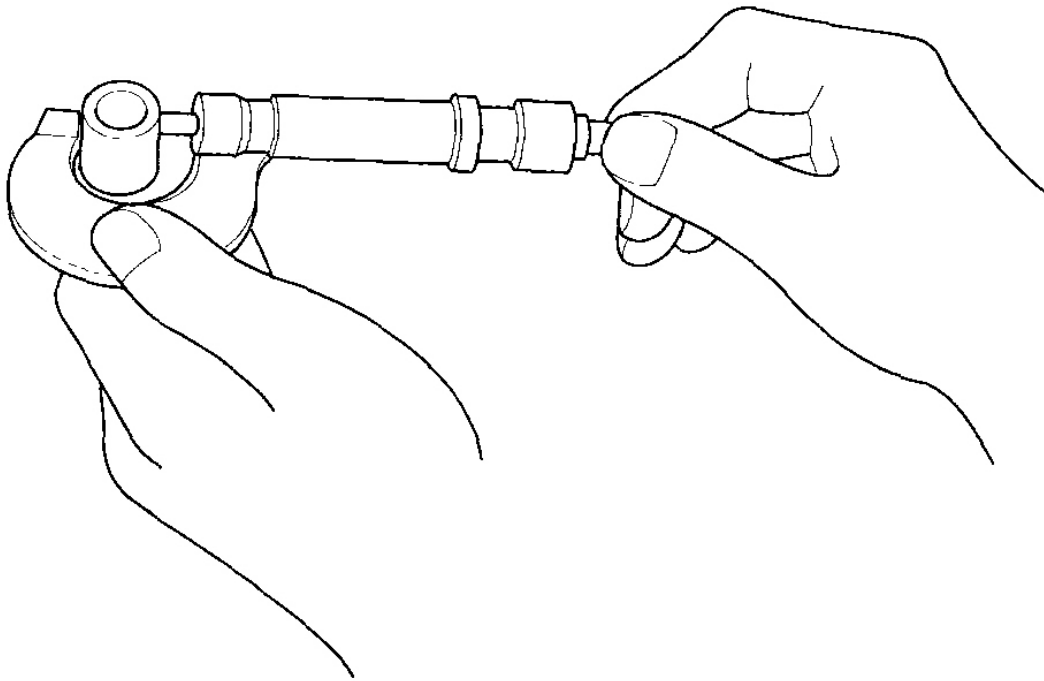
NOTE: **Inspect the piston, piston pin, and connecting rod when they are at room temperature.**

1. Measure the diameter of the piston pin.

Piston Pin Diameter

Standard (New): 22.961-22.965 mm (0.9040-0.9041 in.)

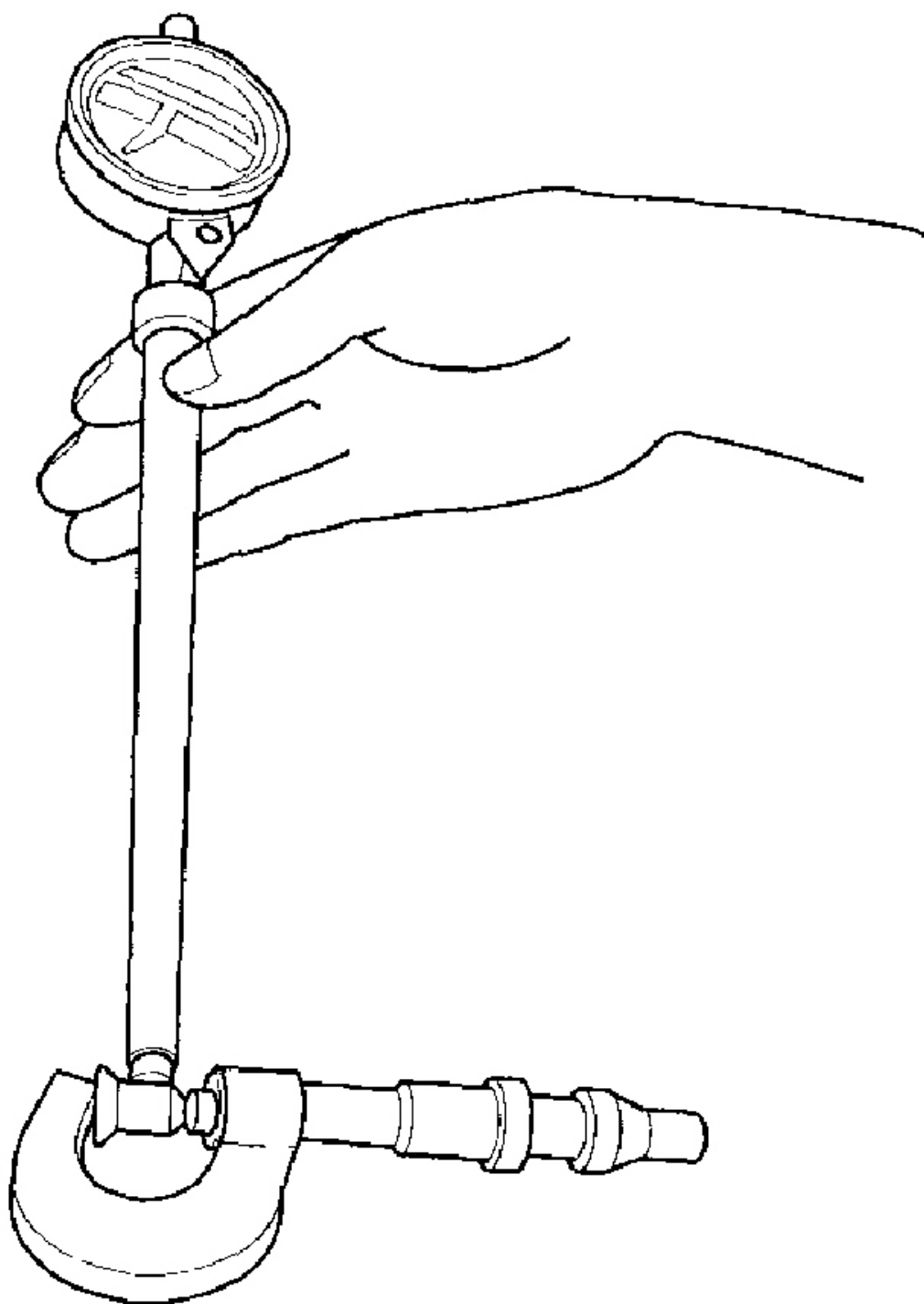
Service Limit: 22.953 mm (0.9037 in.)



G03692440

Fig. 33: Measuring Diameter Of Piston Pin
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

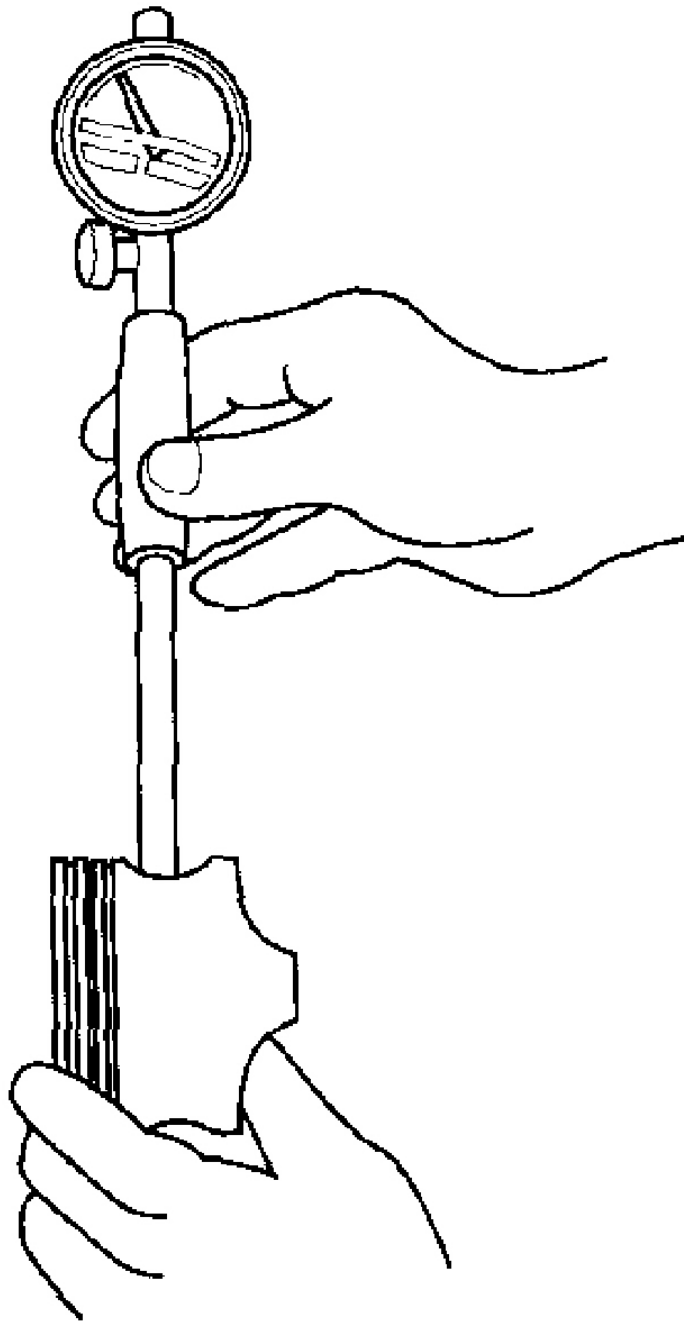


G03692441

Fig. 34: Setting Dial Indicator To Zero Position**Courtesy of AMERICAN HONDA MOTOR CO., INC.**

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

Piston Pin-to-Piston Clearance**Standard (New): -0.002 to +0.005 mm (-0.00008 to +0.00020 in.)****Service Limit: 0.010 mm (0.0004 in.)**



G03692442

Fig. 35: Checking Difference Between Piston Pin Diameter And Piston Pin Hole Diameter In Piston
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

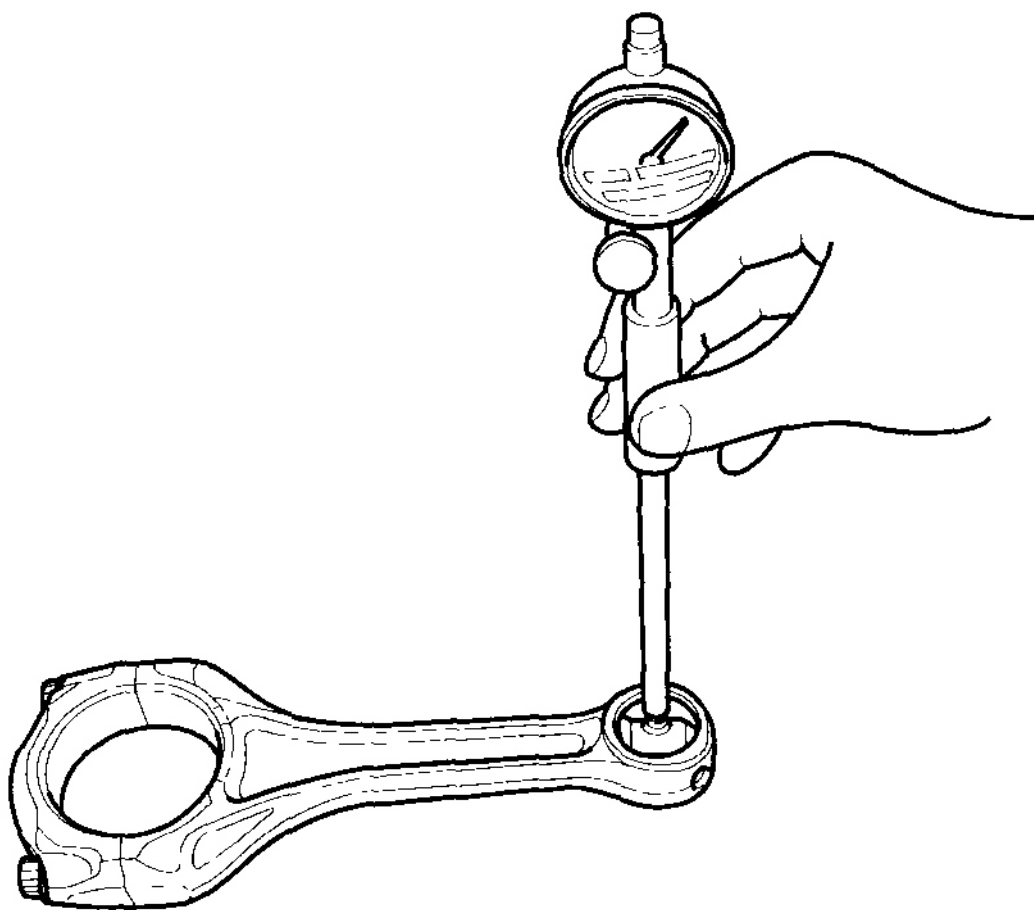
NOTE: When replacing the connecting rod, also replace the piston pin as a set.

Piston Pin-to-Connecting Rod Clearance

Standard (New): 0.018-0.035 mm

(0.0007-0.0014 in.)

Service Limit: 0.04 mm (0.0016 in.)



G03692443

Fig. 36: Measuring Piston Pin-To-Connecting Rod Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REASSEMBLY

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

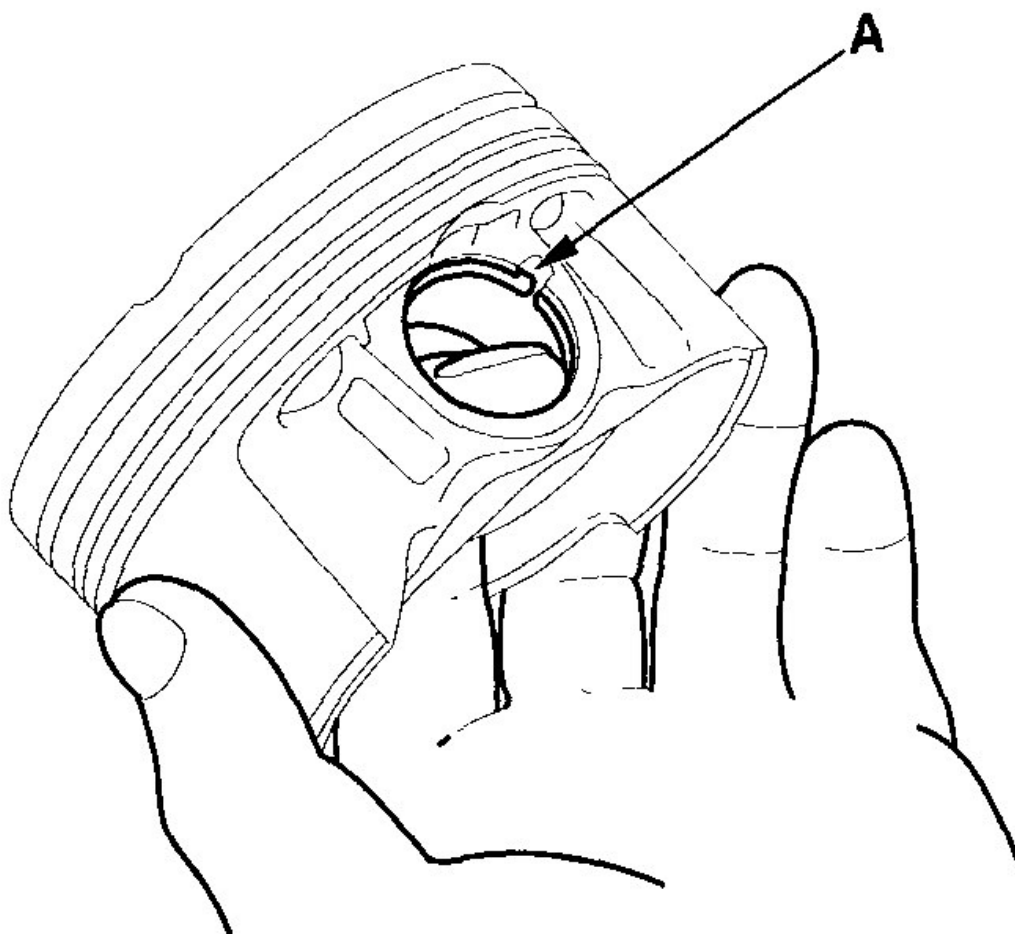
**G03692444**

Fig. 37: Installing New Piston Pin Snap Ring
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

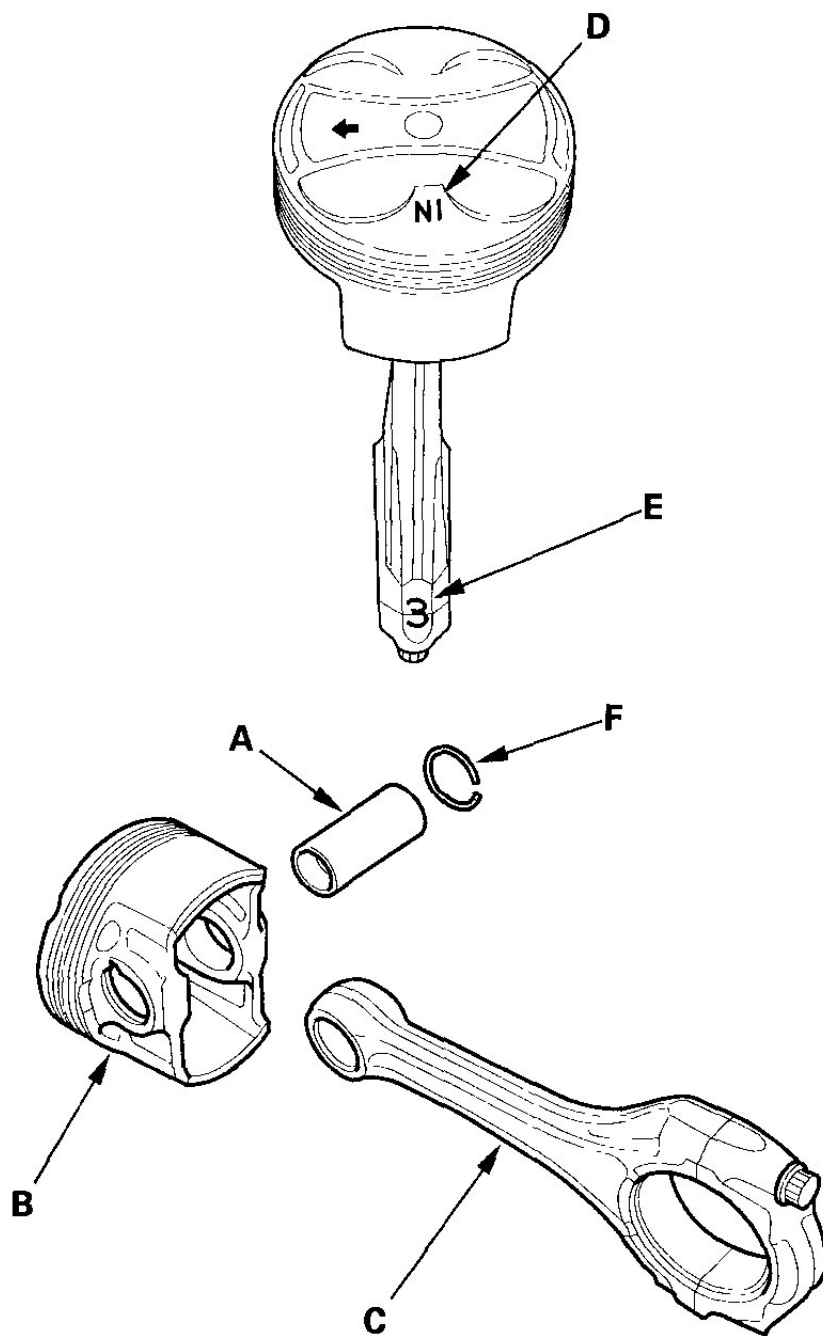


G03692445

Fig. 38: Heating Piston

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Install the piston pin (A). Assemble the piston (B) and connecting rod (C) with the "IN" mark (D) and the reference mark (E) on the same side.



G03692446

Fig. 39: Assembling Piston And Connecting Rod With "IN" Mark And Reference Mark On Same Side

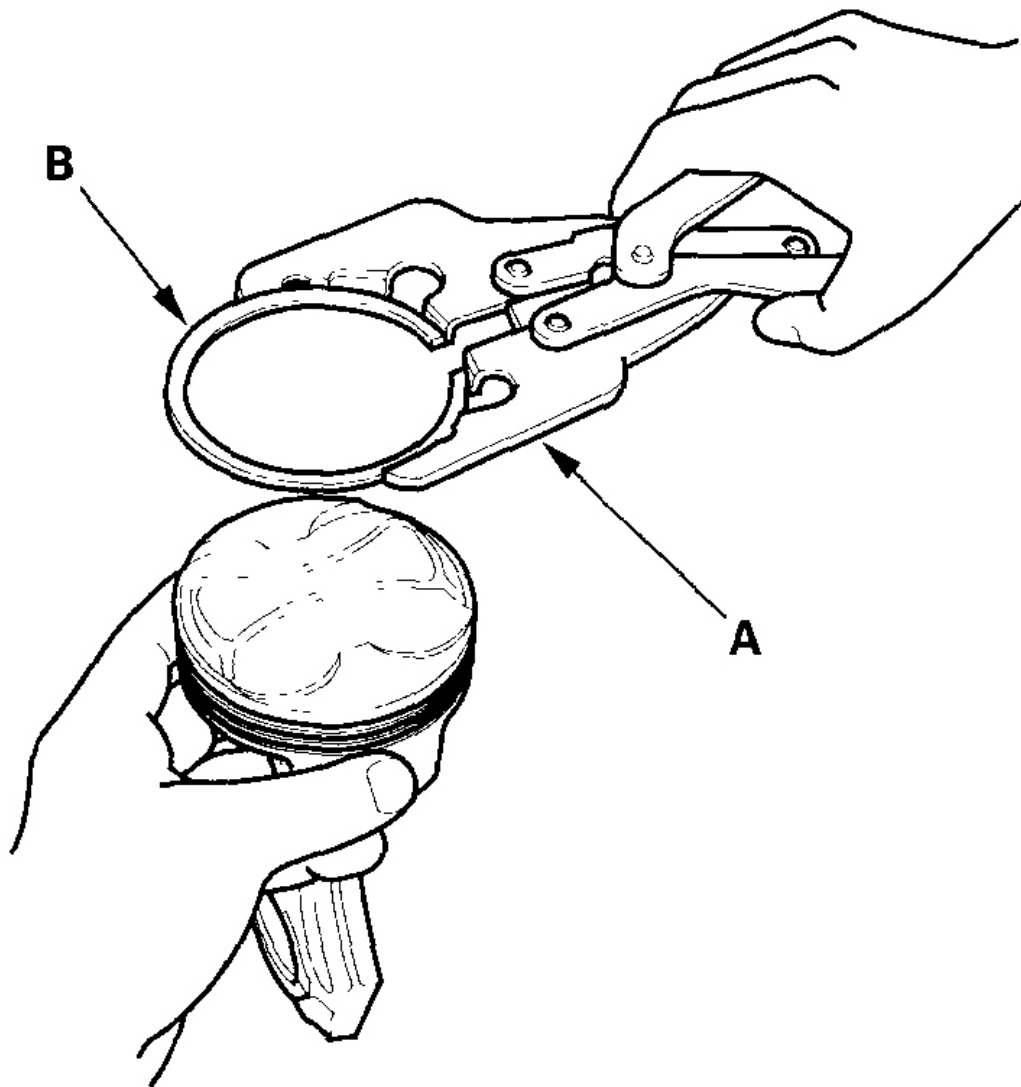
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Install the remaining new snap ring (F).

6. Turn the snap rings in the ring grooves until the end gaps are positioned at the bottom of the piston.

PISTON RING REPLACEMENT

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



G03692447

Fig. 40: Removing Old Piston Rings

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Clean all ring grooves thoroughly with a squared-off broken ring or ring groove cleaner with a blade to fit the piston grooves. The top and second ring grooves are 1.2 mm (0.05 in.) wide. The oil ring groove is 2.0 mm (0.08 in.) wide. File down a blade if necessary. Do not use a wire brush to clean the ring grooves, or cut the ring grooves deeper with the cleaning tools.

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

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

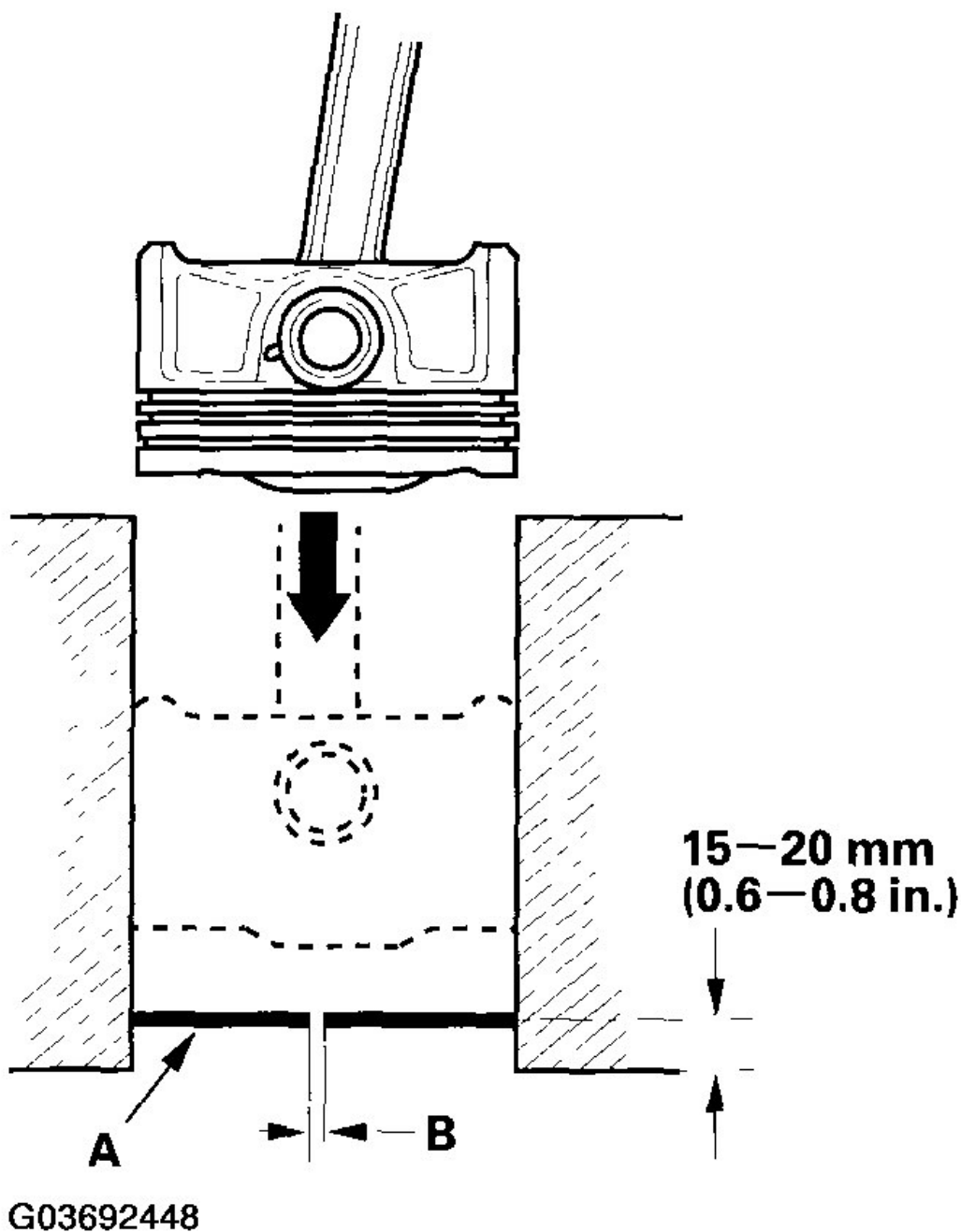


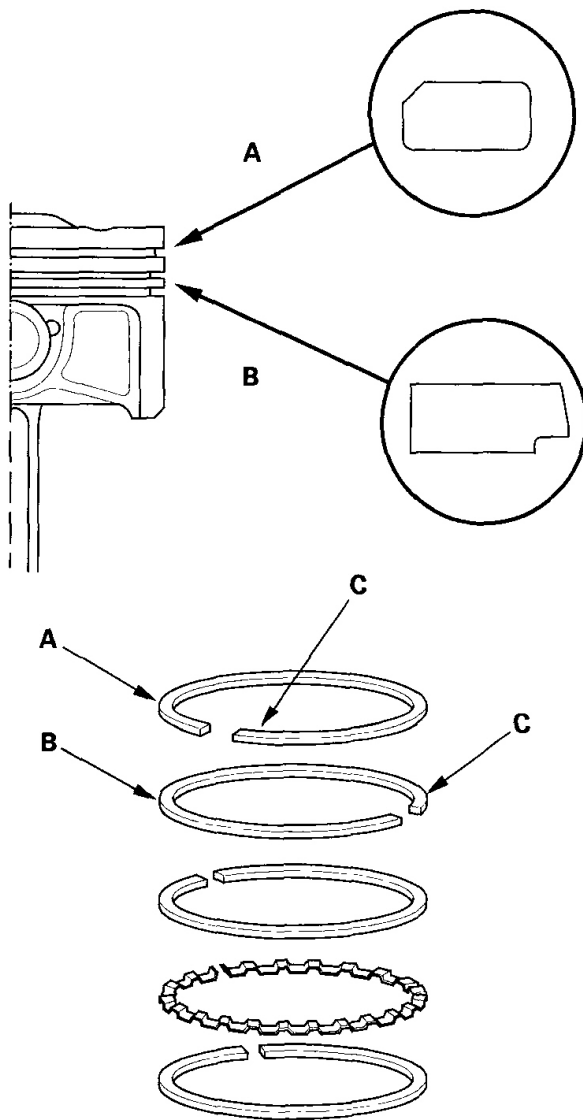
Fig. 41: Pushing New Ring Into Cylinder Bore From Bottom Using Piston
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

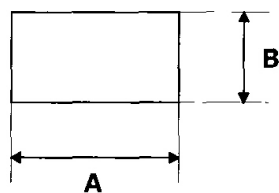
- If the gap is too small, check to see if you have the proper rings for your engine.
- If the gap is too large, recheck the cylinder bore diameter against the wear limits (see **BLOCK AND PISTON INSPECTION**). If the bore is over the service limit, the engine block must be rebored.

Piston Ring End-Gap**Top Ring:****Standard (New): 0.25-0.35 mm (0.010-0.014 in.)****Service Limit: 0.60 mm (0.024 in.)****Second Ring:****Standard (New): 0.60-0.75 mm (0.024-0.030 in.)****Service Limit: 0.90 mm (0.035 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 R1 mark and the second ring (B) has a R2 mark. The manufacturing marks (C) must be facing upward.



Piston Ring Dimensions:



G03692449

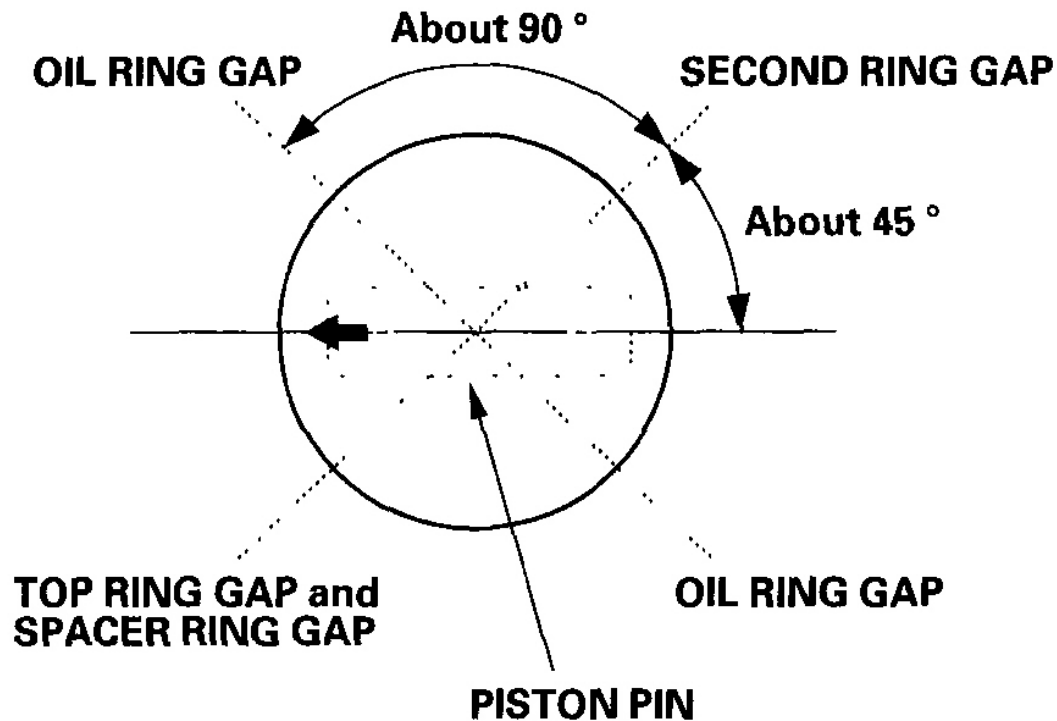
Top Ring (Standard):
 A: 2.8 mm (0.11 in.)
 B: 1.2 mm (0.05 in.)

Second Ring (Standard):
 A: 3.2 mm (0.13 in.)
 B: 1.2 mm (0.05 in.)

Fig. 42: Installing Piston Rings

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



G03692450

Fig. 43: Identifying Piston Ring End Gap Position
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Top Ring Clearance

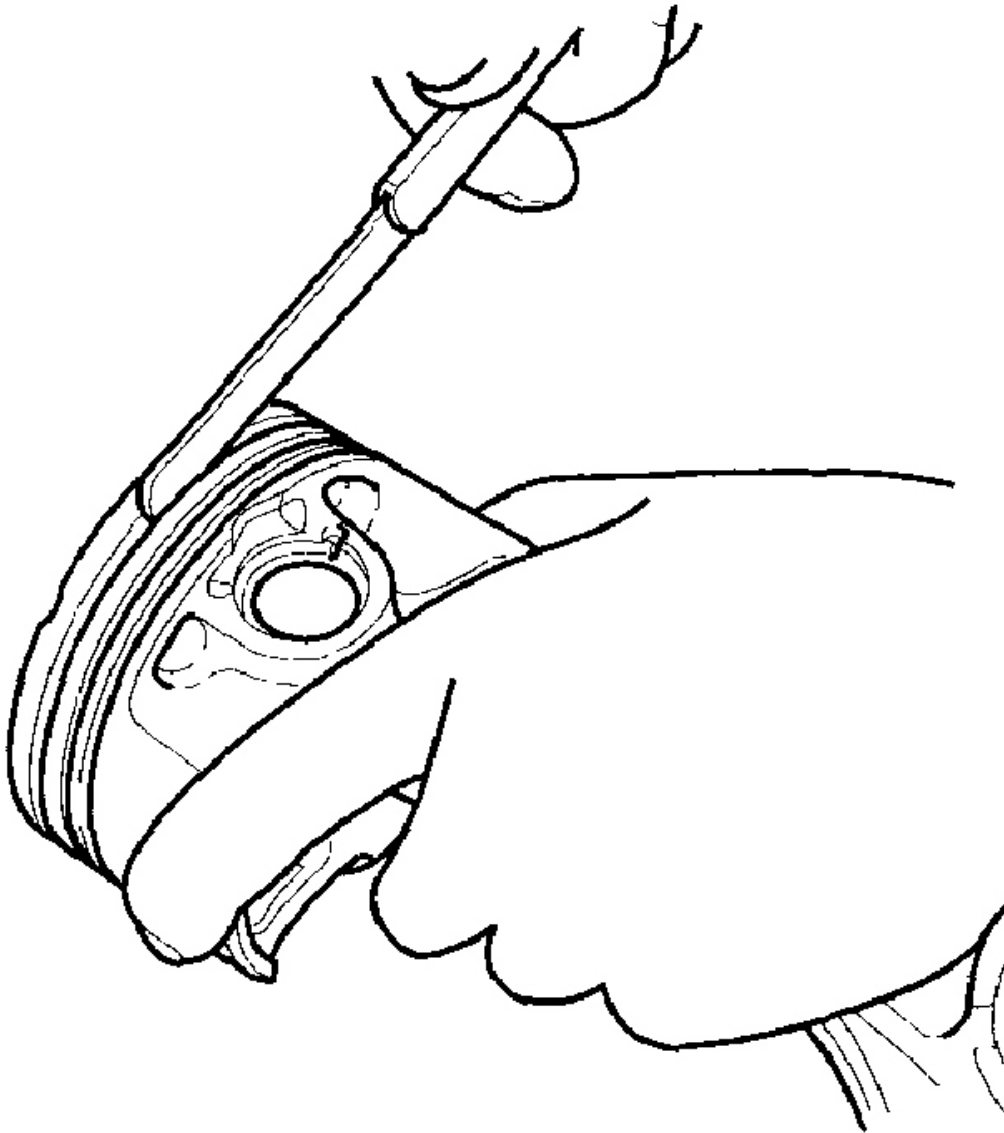
Standard (New): 0.045-0.090 mm (0.0018-0.0035 in.)

Service Limit: 0.135 mm (0.005 in.)

Second Ring Clearance

Standard (New): 0.040-0.070 mm (0.0016-0.0028 in.)

Service Limit: 0.13 mm (0.005 in.)



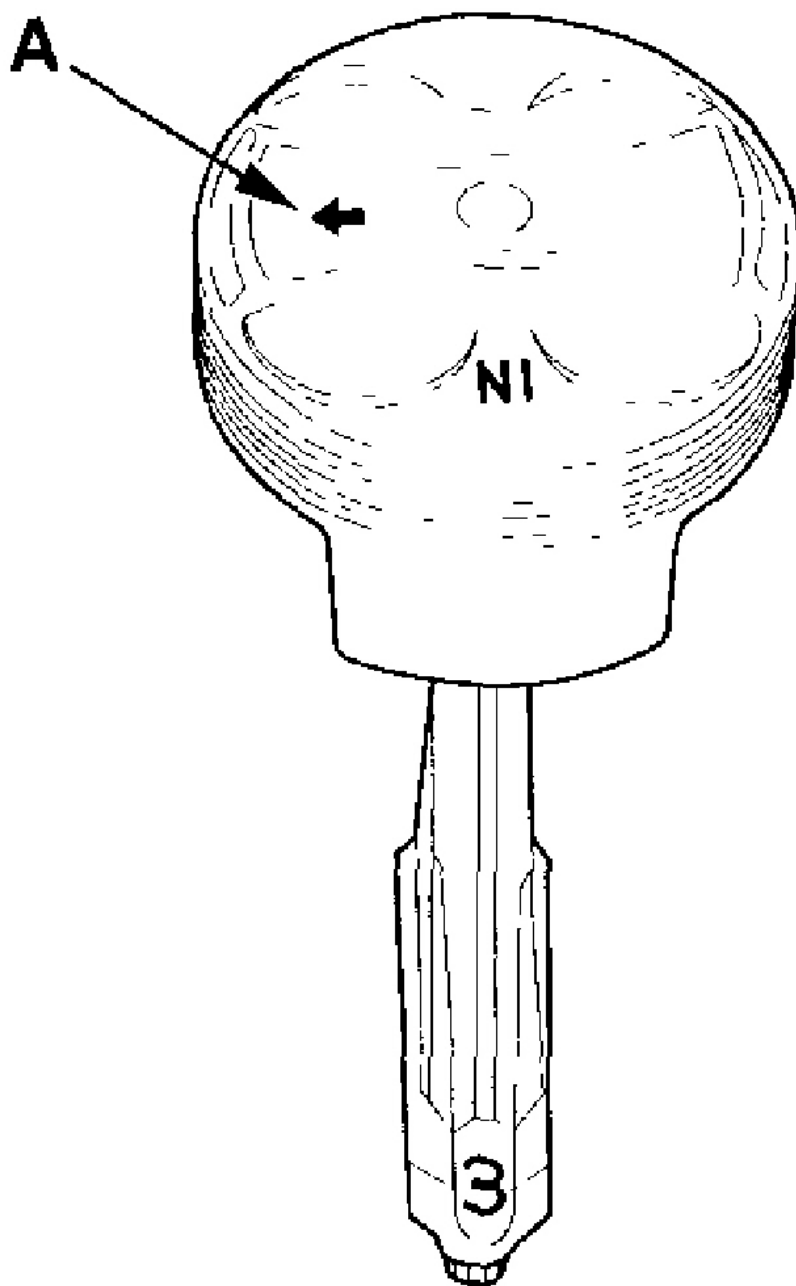
G03692451

Fig. 44: Measuring Ring-To-Groove Clearances:
Courtesy of AMERICAN HONDA MOTOR CO., INC.

PISTON INSTALLATION

IF THE CRANKSHAFT IS ALREADY INSTALLED

1. Set the crankshaft to bottom dead center (BDC) for each cylinder.
2. Apply new engine oil to the piston, inside the ring compressor, and the cylinder bore. Then attach the ring compressor to the piston.
3. Remove the connecting rod caps, then check that the bearing is securely in place.
4. Position the arrow (A) facing the cam chain side of the engine.

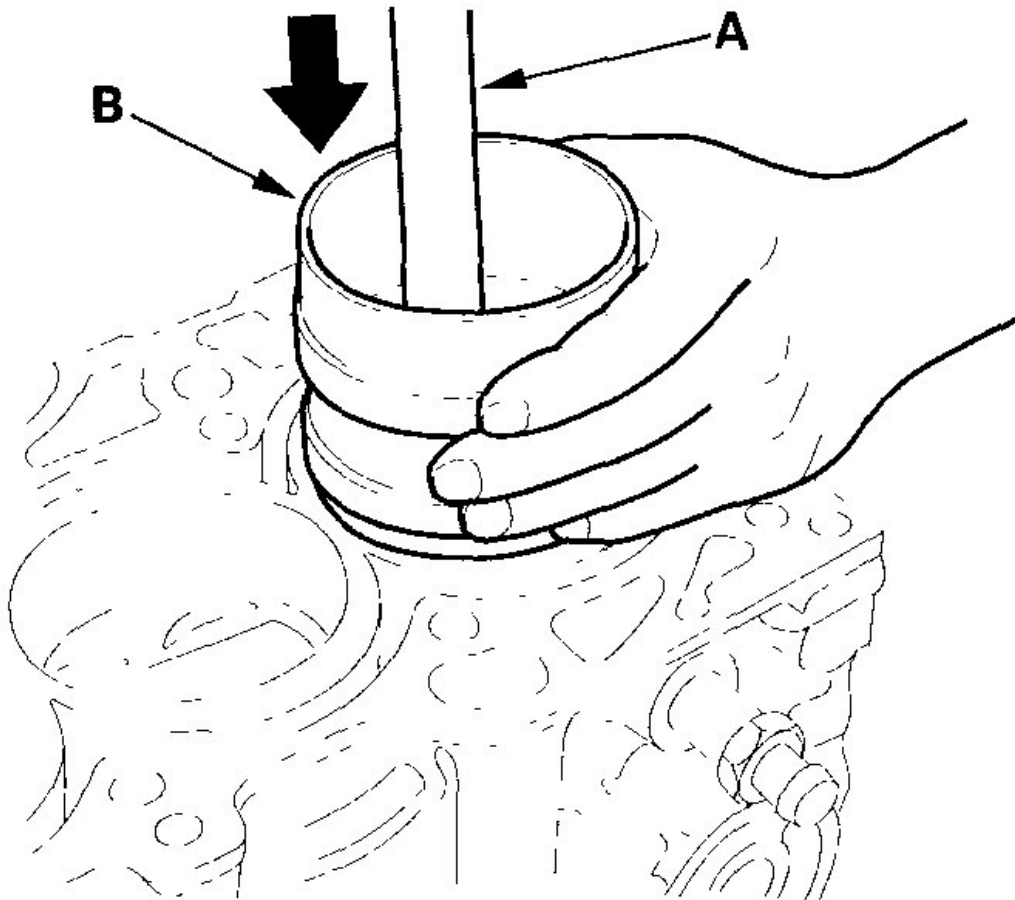


G03692452

Fig. 45: Identifying Arrow Position On Piston Facing Cam Chain Side Of Engine
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. 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.



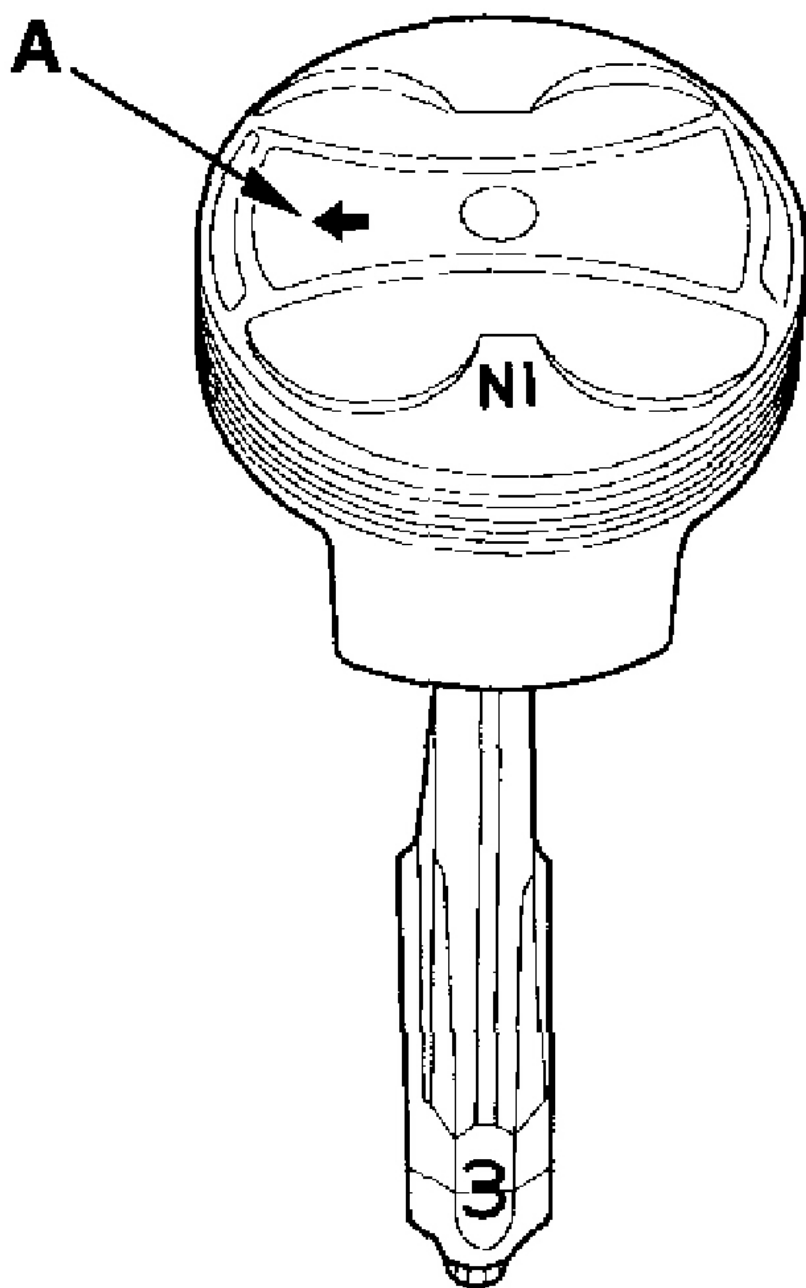
G03692453

Fig. 46: Positioning Piston In Cylinder And Taping In Using Wooden Handle Of Hammer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Stop after the ring compressor pops free, and check the connecting rod-to-crank journal alignment before pushing the piston into place.
7. Check the connecting rod bearing clearance with plastigauge (see **CONNECTING ROD BEARING REPLACEMENT**).
8. Apply new engine oil to the threads of the connecting rod bolts.
9. Install the rod caps with bearings, then tighten the connecting rod bolts in sequence to 25 N.m (2.5 kgf.m, 18 lbf.ft).
10. Tighten the connecting rod bolts an additional 90 °.

IF THE CRANKSHAFT IS NOT INSTALLED

1. Apply new engine oil to the piston, inside the ring compressor, and the cylinder bore. Then attach the ring compressor to the piston.
2. Remove the connecting rod caps, then check that the bearing is securely in place.
3. Position the arrow (A) facing the cam chain side of the engine.

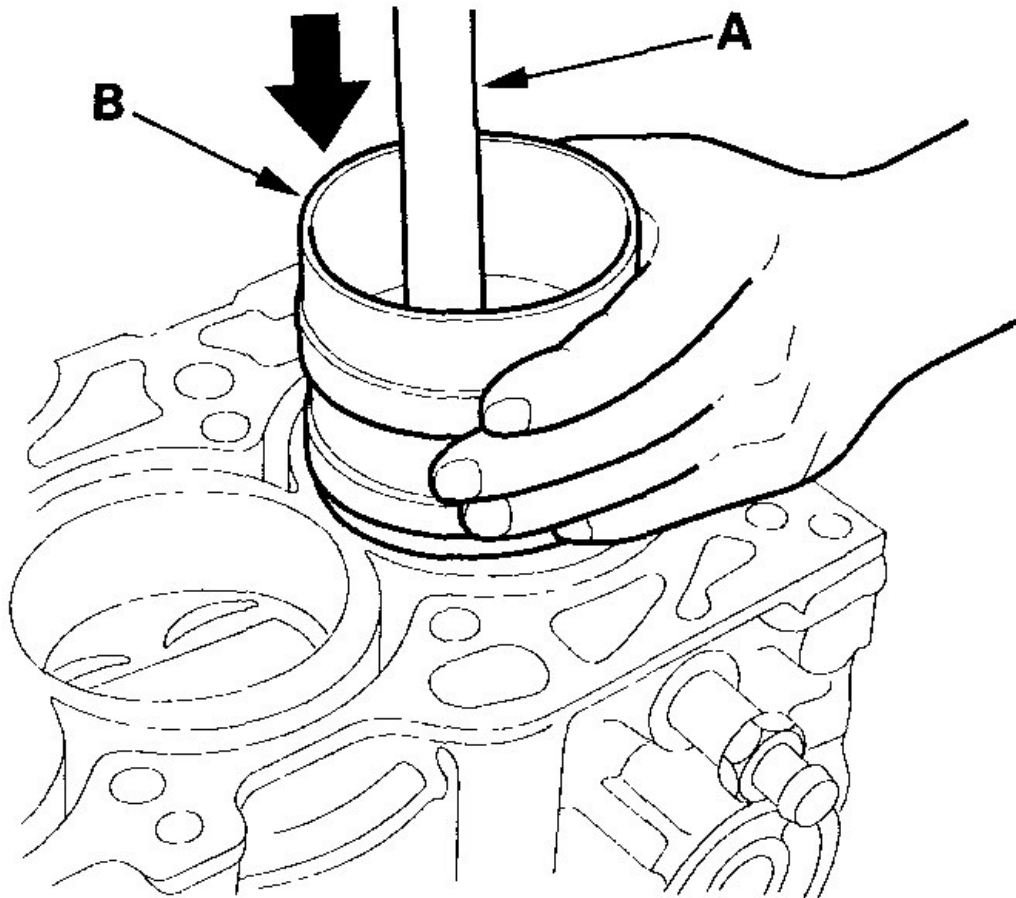


G03692454

Fig. 47: Identifying Arrow Position On Piston Facing Cam Chain Side Of Engine
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. 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.



G03692455

Fig. 48: Positioning Piston In Cylinder And Taping In Using Wooden Handle Of Hammer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

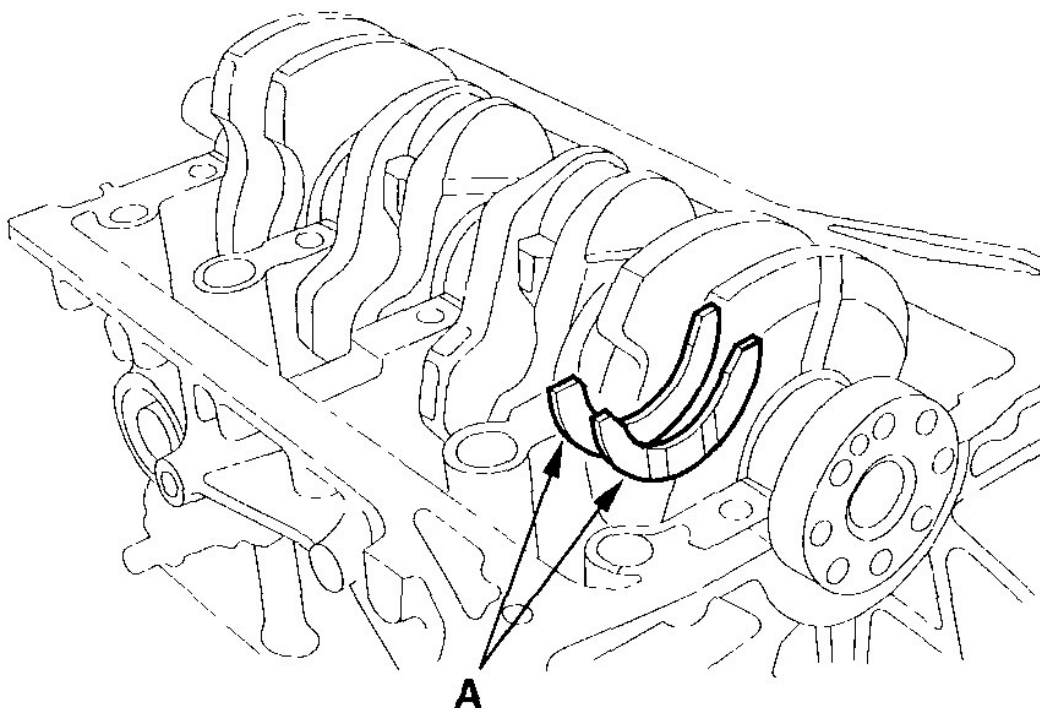
5. Position all pistons at top dead center.

CRANKSHAFT INSTALLATION

SPECIAL TOOLS REQUIRED

- Driver 07749-0010000
- Driver attachment 07948-SB00101

1. Remove all of the old liquid gasket from the lower block mating surfaces, bolt, and bolt holes.
2. Clean the lower block mating surfaces.
3. Check the connecting rod bearing clearance with plastigauge (see **CONNECTING ROD BEARING REPLACEMENT**).
4. Check the main bearing clearance with plastigauge (see **CRANKSHAFT MAIN BEARING REPLACEMENT**).
5. Install the bearing halves in the engine block and connecting rods.
6. Apply new engine oil to the main bearings and rod bearings.
7. Hold the crankshaft so rod journal No. 2 and rod journal No. 3 are straight up, and lower the crankshaft into the engine block.
8. Install the thrust washers (A) on both edges of the No. 4 main bearing recess.



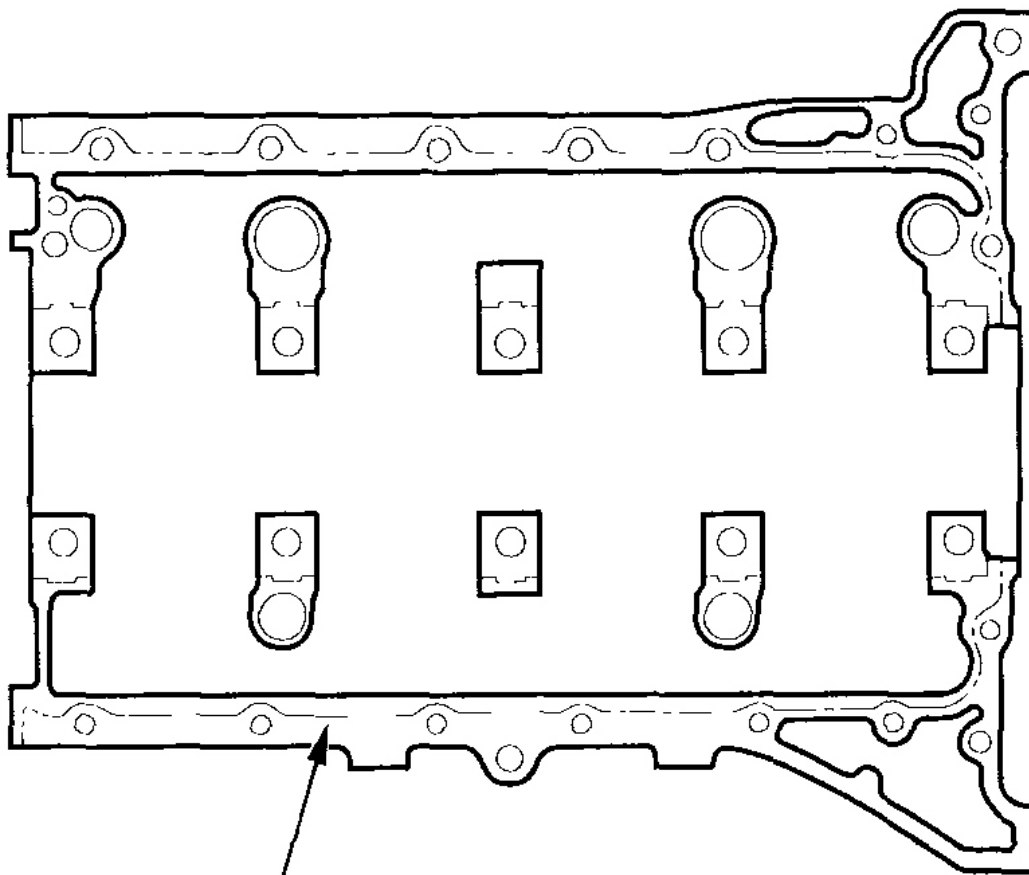
G03692456

Fig. 49: Installing Thrust Washers On Both Edges Of No 4 Main Bearing Recess
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Apply new engine oil to the threads of the connecting rod bolts.
10. Seat the rod journals into connecting rod No. 1 and connecting rod No. 4. Install the connecting rod caps and bolts finger-tight. Install the caps so the bearing recess is on the same side as the recess in the rod.
11. Rotate the crankshaft clockwise, and seat the journals into connecting rod No. 2 and connecting rod No.

3. Install the connecting rod caps and bolts finger-tight.
12. Tighten the connecting rod bolts in sequence to 25 N.m (2.5 kgf.m, 18 lbf.ft).
13. Tighten the connecting rod bolts an additional 90 °.
14. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the engine block mating surface of the lower block.

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

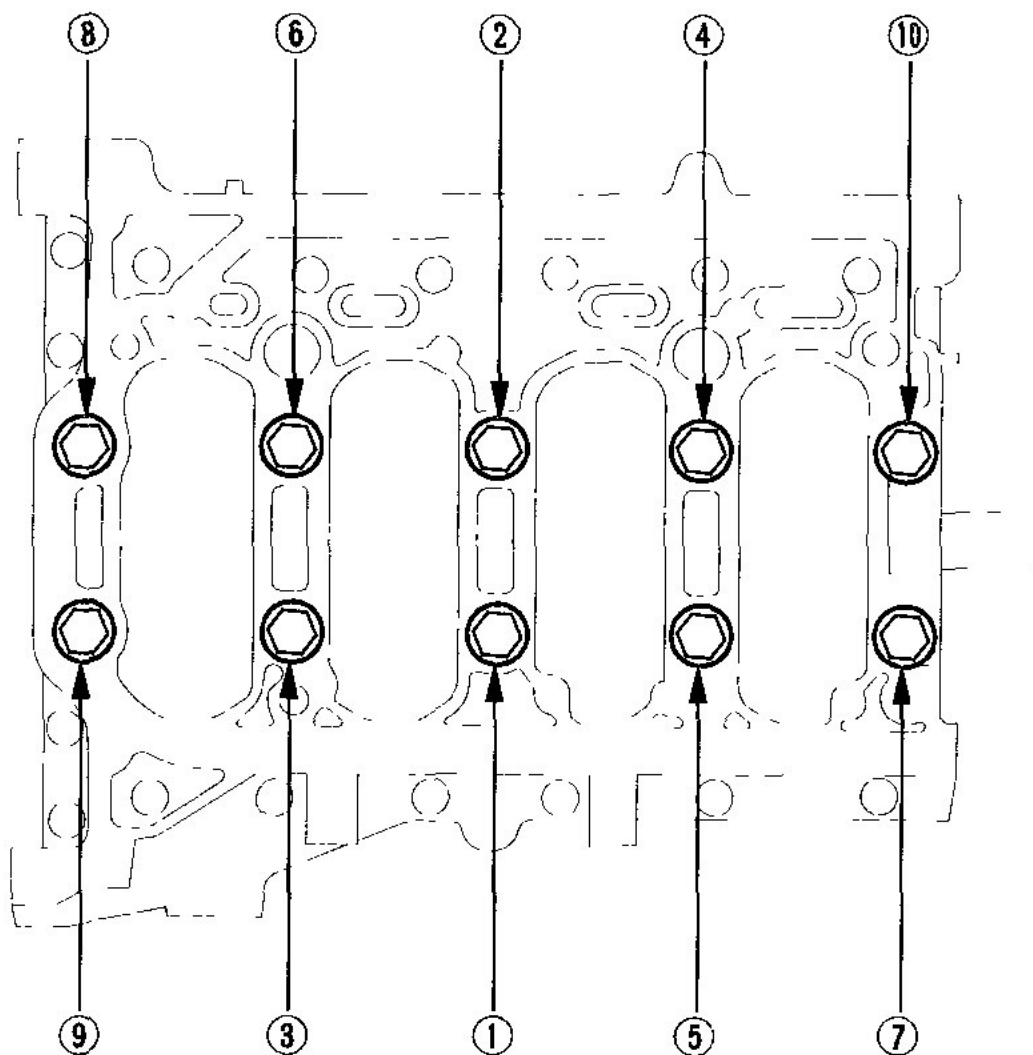


Apply liquid gasket along
the broken line.

G03692457

Fig. 50: Identifying Engine Block Mating Surface Of Lower Block For Applying Liquid Gasket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Put the lower block on the engine block.
16. Tighten the bearing cap bolts in sequence to 29 N.m (3.0 kgf.m, 22 lbf.ft).



G03692458

Fig. 51: Identifying Tightening Sequence Of Bearing Cap Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Tighten the bearing cap bolts an additional 60 °.

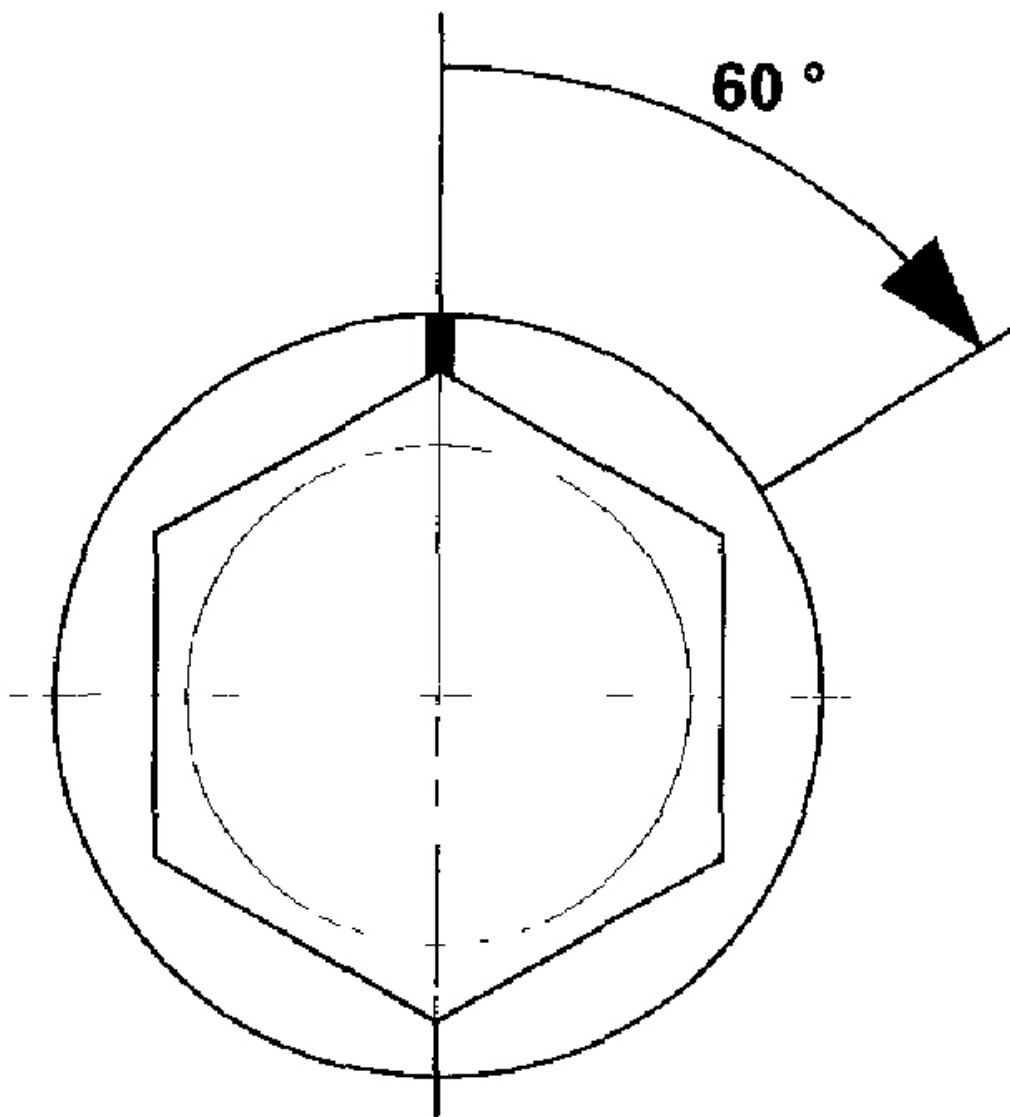
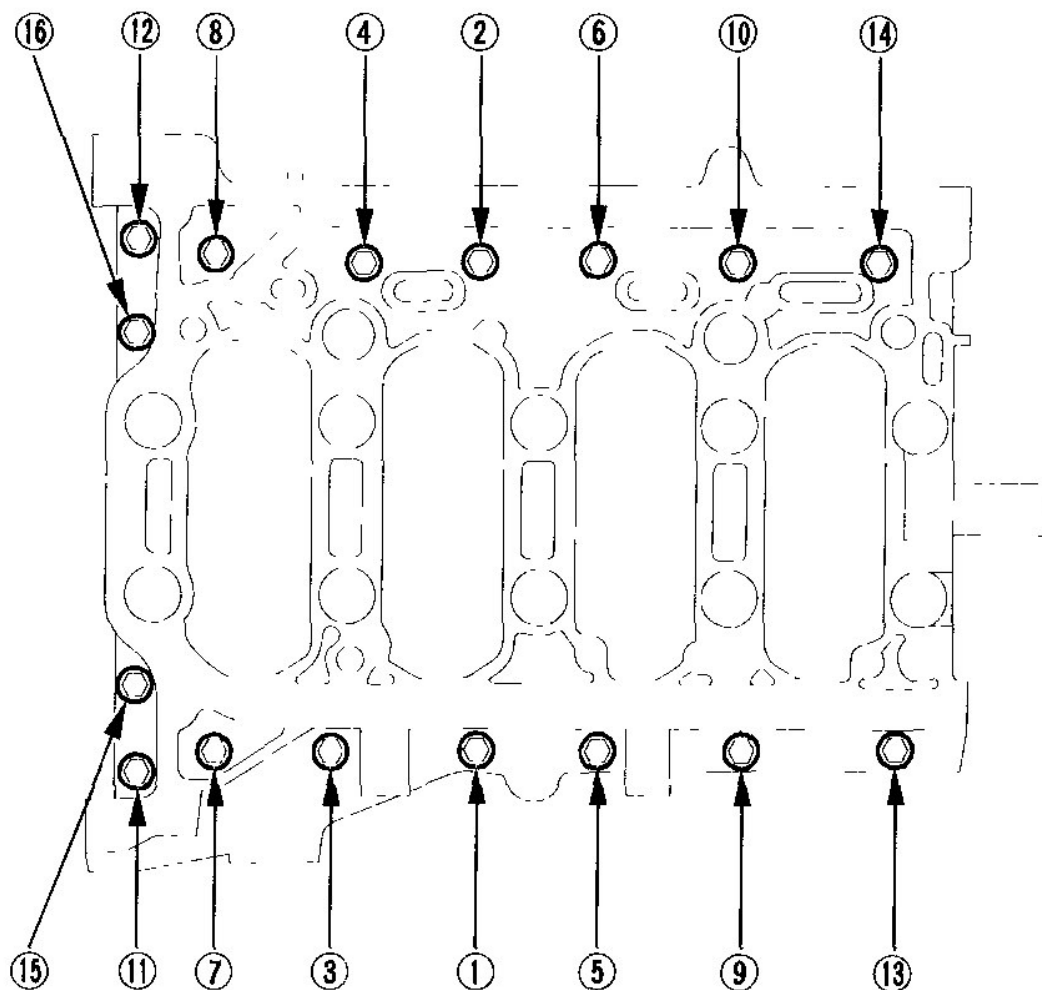
**G03692459**

Fig. 52: Identifying Bearing Cap Bolts Additional Tightening Angle
Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Tighten the 8 mm bolts in sequence to 22 N.m (2.2 kgf.m, 16 lbf.ft).



G03692460

Fig. 53: Identifying Tightening Sequence Of Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Use the special tools to drive a new oil seal squarely into the block to the specified installed height.

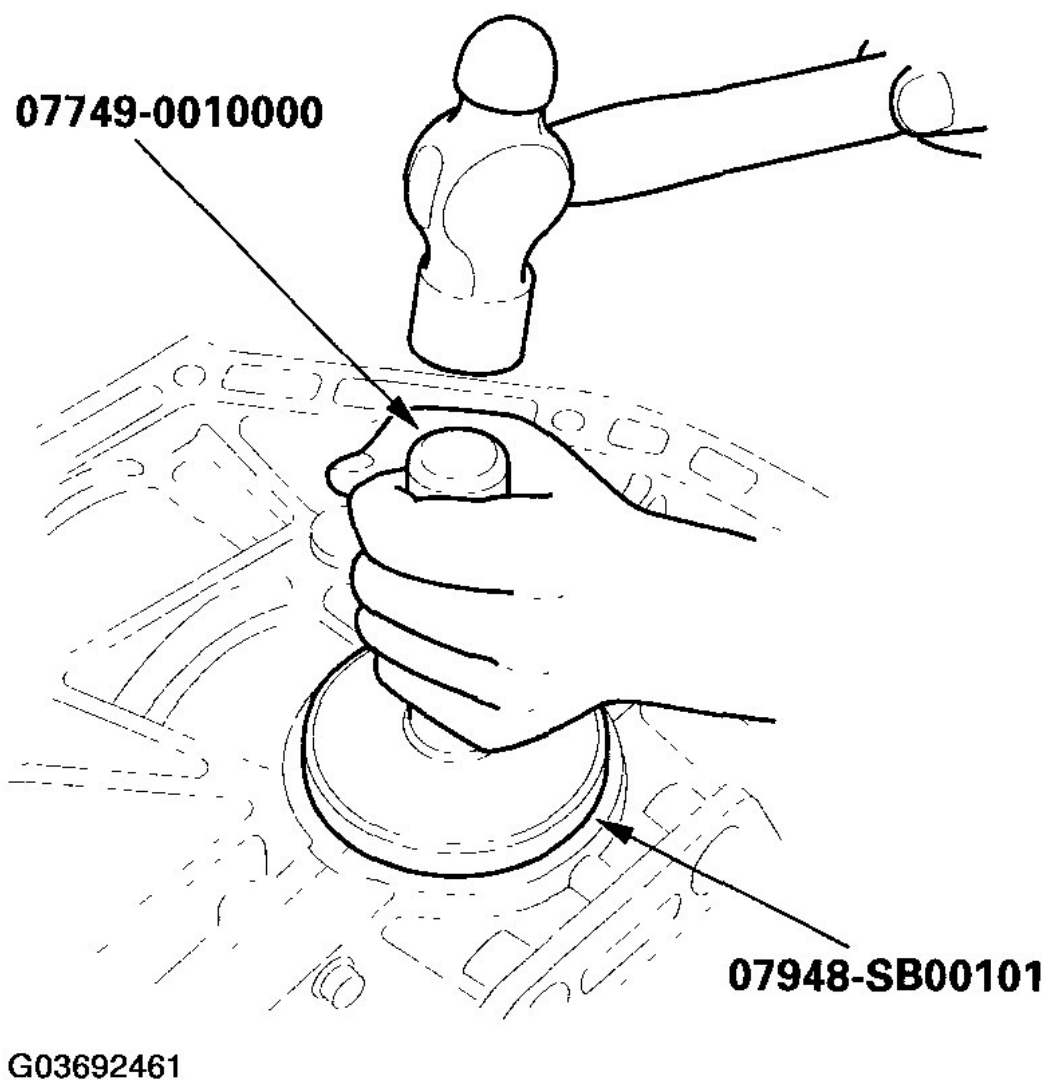
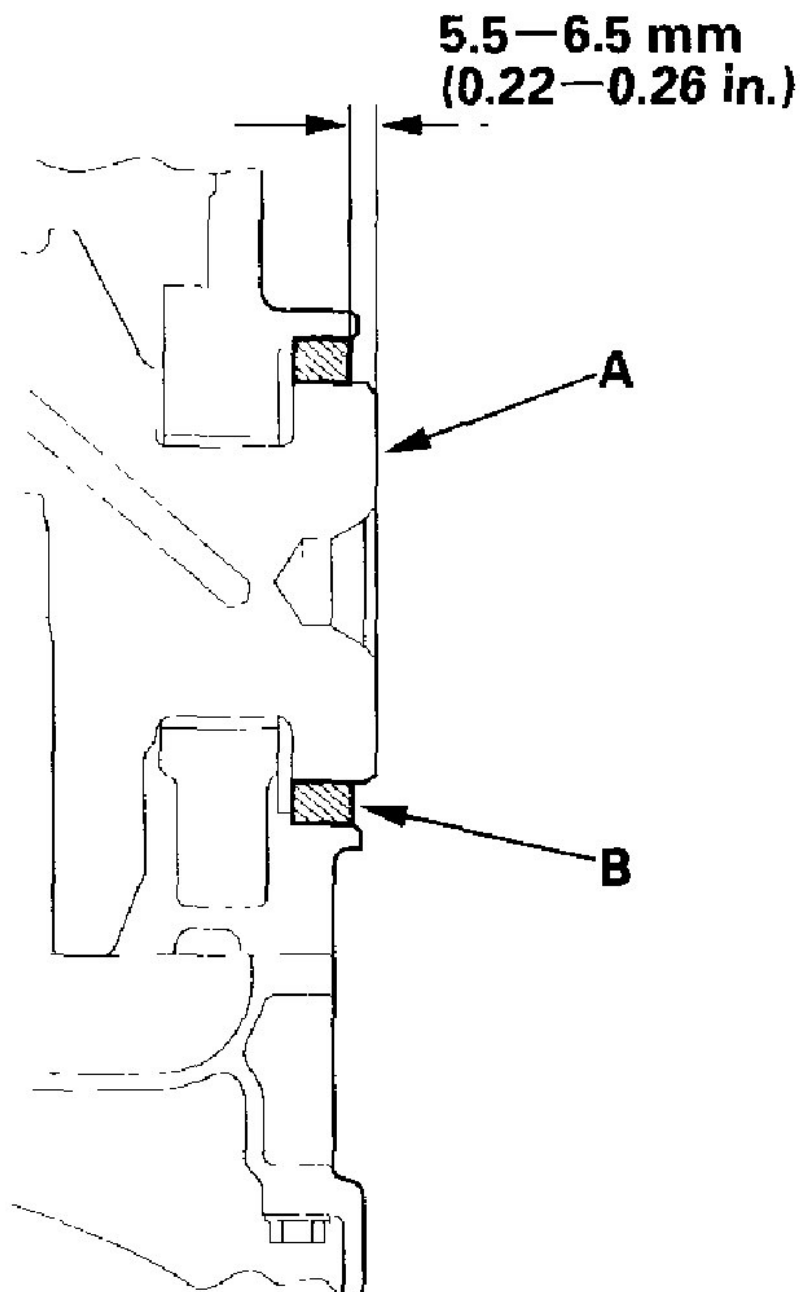


Fig. 54: Installing New Oil Seal Into Block

Courtesy of AMERICAN HONDA MOTOR CO., INC.

20. Measure the distance between the crankshaft (A) and oil seal (B).

Oil Seal Installed Height: 5.5-6.5 mm (0.22-0.26 in.)



G03692462

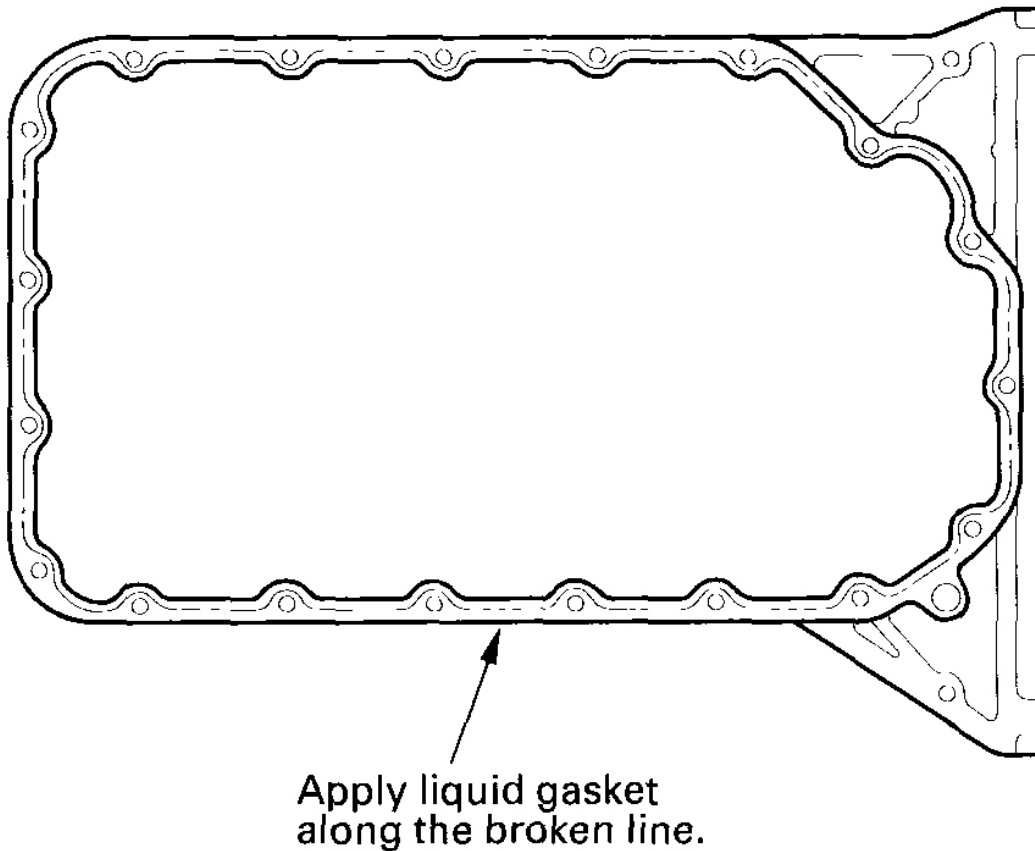
Fig. 55: Identifying Distance Between Crankshaft And Oil Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

21. Install the oil pump (see **INSTALLATION**).
22. Install the cam chain (see **CAM CHAIN INSTALLATION**).

OIL PAN INSTALLATION

1. Remove any old liquid gasket from the oil pan mating surfaces, bolts, and bolt holes.
2. Clean and dry the oil pan mating surfaces.
3. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the engine block mating surface of the oil pan. Install the oil pan.

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.



G03692463

Fig. 56: Identifying Engine Block Mating Surface Of Oil Pan For Applying Liquid Gasket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. 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).

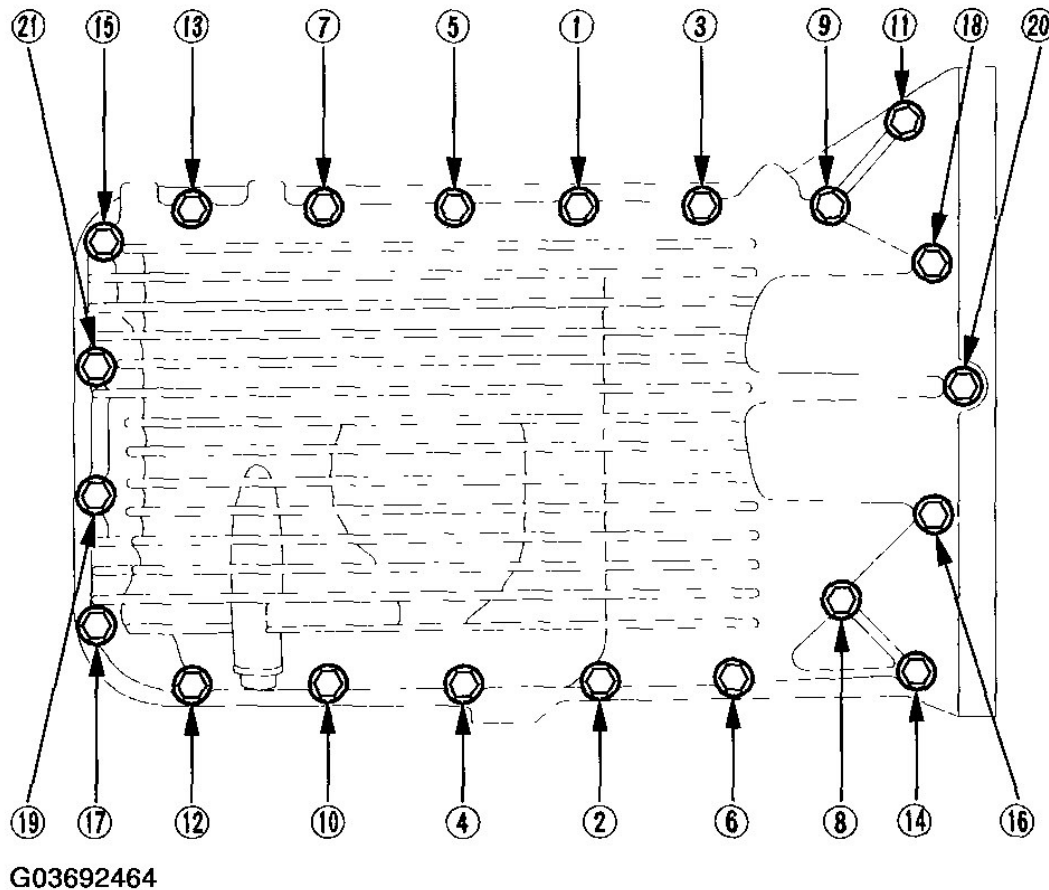


Fig. 57: Identifying Tightening Sequence Of Oil Pan Bolts
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. After assembly, wait at least 30 minutes before filling the engine with oil.

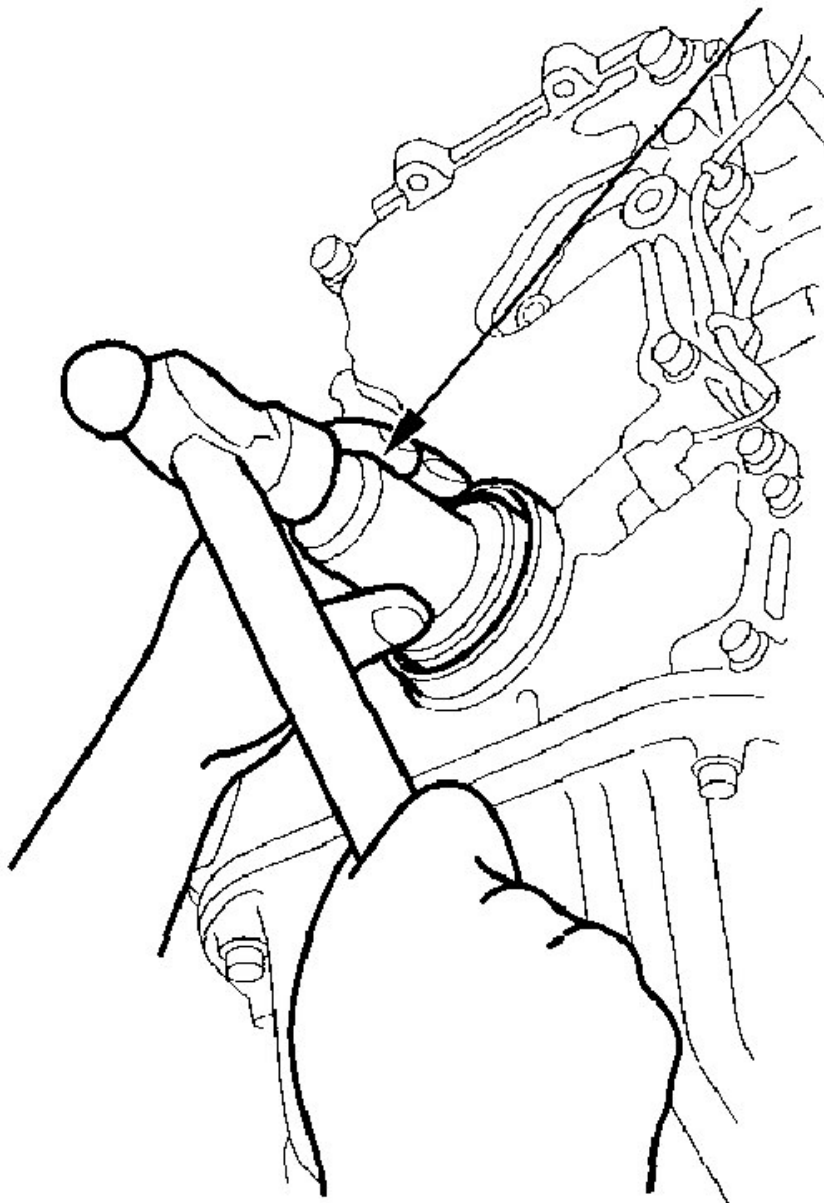
PULLEY END CRANKSHAFT OIL SEAL INSTALLATION - IN CAR

SPECIAL TOOLS REQUIRED

Seal driver 07LAD-PT3010A

1. Clean and dry the crankshaft oil seal housing.
2. Using the seal driver, drive in the crankshaft oil seal until the driver bottoms against the chain case.

07LAD-PT3010A



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Fig. 58: Installing Crankshaft Oil Seal

Courtesy of AMERICAN HONDA MOTOR CO., INC.

TRANSMISSION END CRANKSHAFT OIL SEAL INSTALLATION - IN CAR

SPECIAL TOOLS REQUIRED

- Driver 07749-0010000
 - Driver attachment 07948-SB00101
1. Clean and dry the crankshaft oil seal housing.
 2. Use the special tools to drive a new oil seal squarely into the block to the specified installed height.

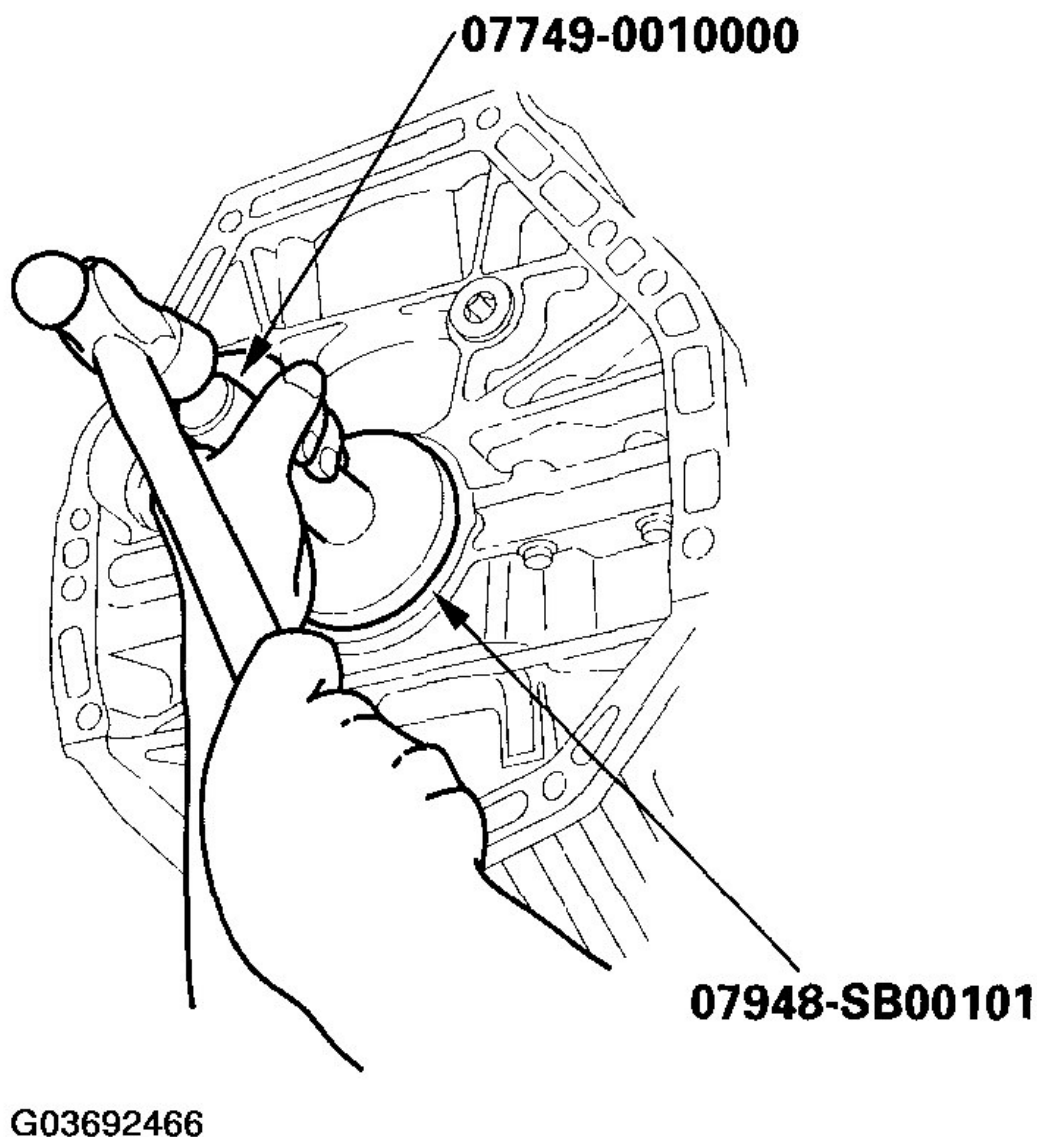
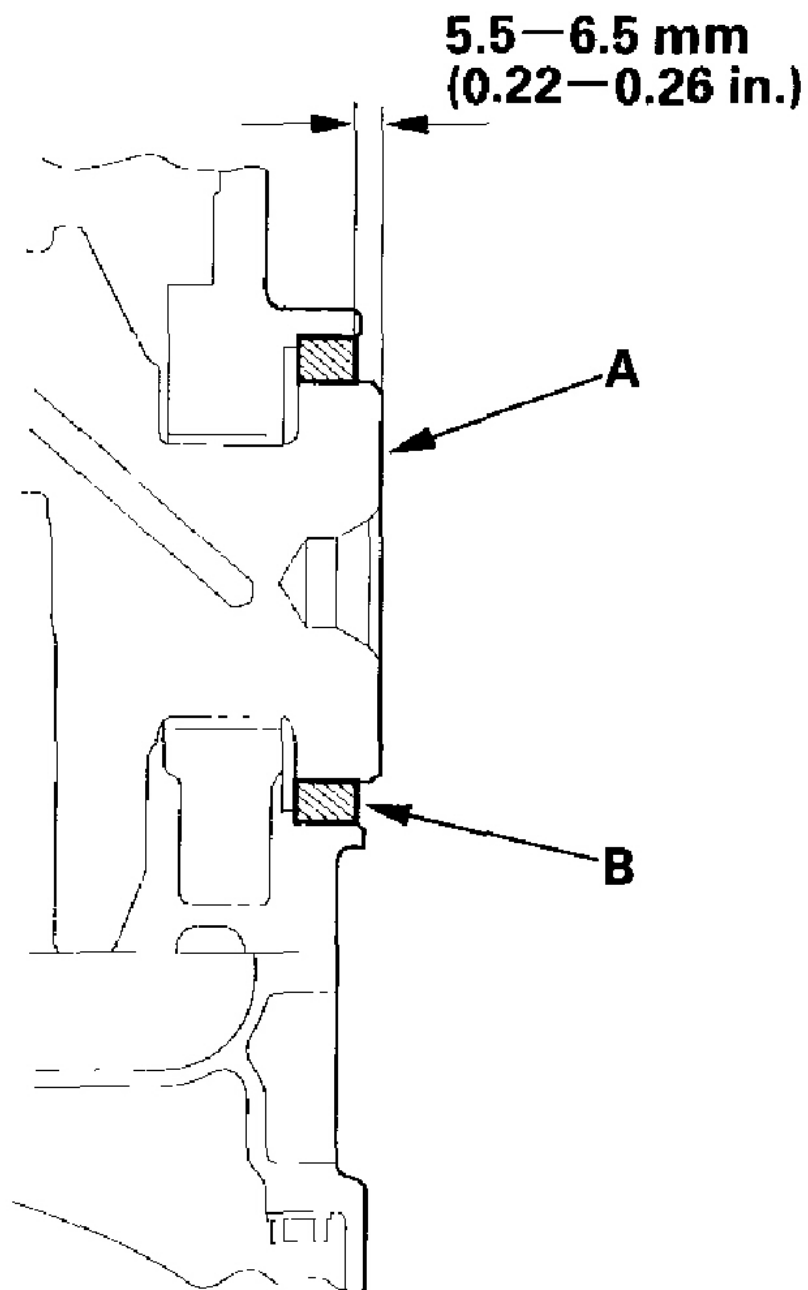


Fig. 59: Installing New Oil Seal Into Block
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Measure the distance between the crankshaft (A) and oil seal (B).

Oil Seal Installed Height: 5.5-6.5 mm (0.22-0.26 in.)

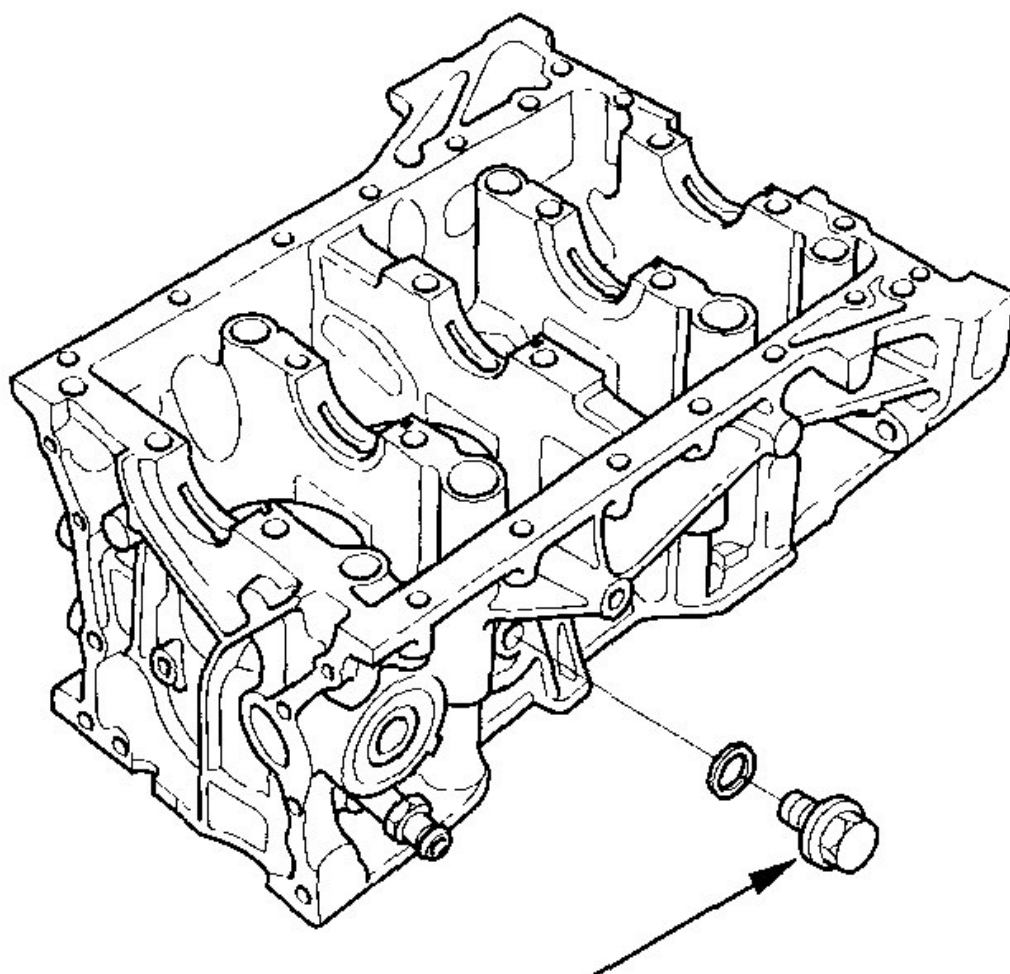


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Fig. 60: Identifying Distance Between Crankshaft And Oil Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

DRAIN BOLT INSTALLATION

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



**28 x 1.5 mm
83 N·m
(8.5 kgf·m, 61 lbf·ft)**

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Fig. 61: Installing Drain Bolt With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.