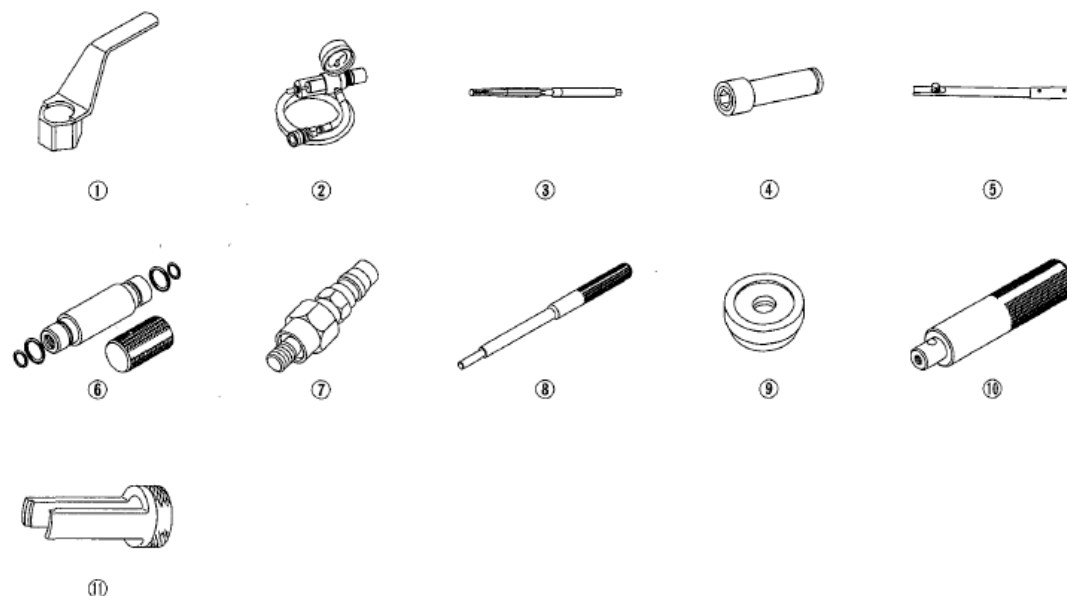


2009-12 ENGINE

Cylinder Head - Fit

SPECIAL TOOLS

Ref. No.	Tool Number	Description	Qty
①	07AAB-RJAA100	Crankshaft Pulley Holder	1
②	07AAJ-PNAA101	Air Pressure Regulator	1
③	07HAH-PJ7A100	Valve Guide Reamer, 5.5 mm	1
④	07JAA-001020A	Socket, 19 mm	1
⑤	07JAB-001020B	Holder Handle	1
⑥	07PAD-0010000	Stem Seal Driver	1
⑦	070AJ-001A101	VTEC Air Adapter	1
⑧	07742-0010100	Valve Guide Driver, 5.35 mm	1
⑨	07746-0010400	Attachment, 52 x 55 mm	1
⑩	07749-0010000	Driver Handle	1
⑪	07757-PJ1010A	Valve Spring Compressor Attachment	1

**Fig. 1: Identifying Special Tools**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

COMPONENT LOCATION INDEX

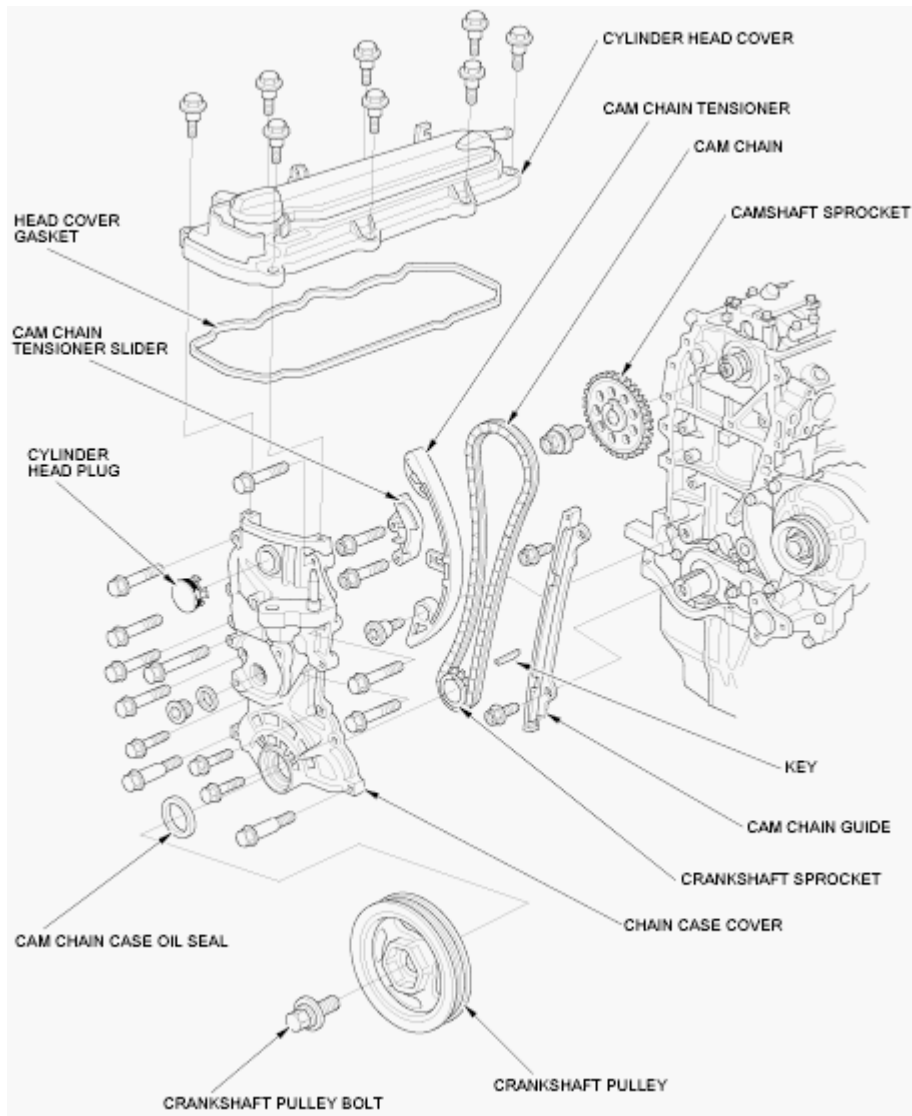


Fig. 2: Identifying Cylinder Head Replacement Components (1 Of 3)
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

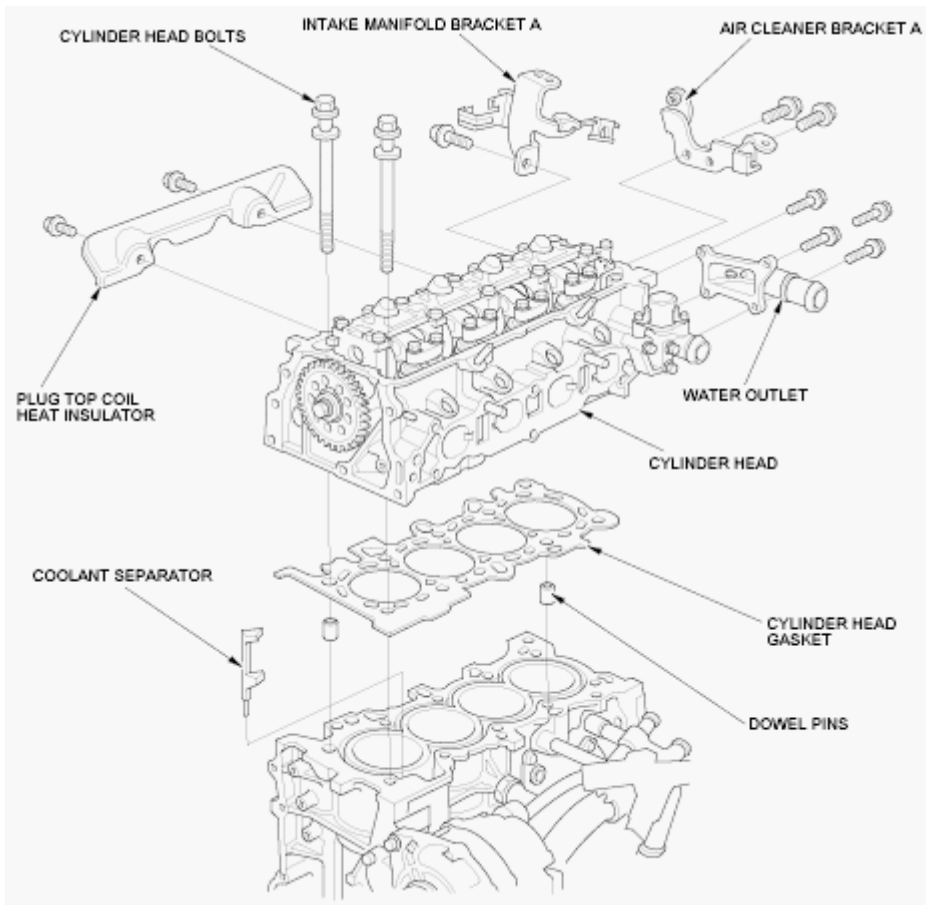


Fig. 3: Identifying Cylinder Head Replacement Components (2 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.



NOTE: After the inspection, you must reset the ECM/PCM. Otherwise, the ECM/PCM will continue to stop the injectors from operating. (See GENERAL TROUBLESHOOTING INFORMATION).

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

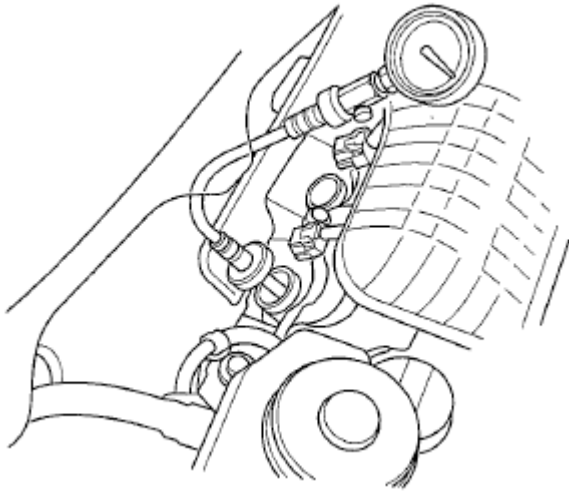


Fig. 5: Attaching Compression Gauge To Spark Plug Hole
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Compression Pressure:

Above 980 kPa (10.00 kgf/cm² , 142.2 psi)

11. Measure the compression on the remaining cylinders.

Maximum Variation:

Within 196 kPa (2.00 kgf/cm² , 28.4 psi)

12. If the compression is not within specifications, perform a cylinder leak down test to determine the problem area. Then check the following items, and remeasure the compression.
 - Incorrect valve clearance
 - Confirmation of cam timing
 - Damaged or worn cam lobes
 - Damaged or worn piston rings

- Damaged cylinder head gasket
 - Damaged or worn valves and seats
 - Damaged or worn piston and cylinder bore
13. Remove the compression gauge from the spark plug hole.
 14. Install the four spark plugs and the four ignition coils.
 - 15.
 16. Select ECM/PCM reset in the PGM-FI INSPECTION menu (see **HDS CLEAR COMMAND**) to cancel the ALL INJECTORS STOP function on the HDS.

VTEC ROCKER ARM TEST

SPECIAL TOOLS REQUIRED

- Air pressure regulator 07AAJ-PNAA101
 - VCM air adapter 070AJ-001A101
1. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
 2. Rotate the crankshaft pulley clockwise. Make sure that the primary rocker arm (A) and the secondary rocker arm (B) are separated and that the primary rocker arm should move independently.
 - If the primary rocker arm and the secondary rocker arm move together, remove the primary rocker arm and the secondary rocker arm as an assembly, and check that the pistons in the primary and secondary rocker arms move smoothly (see **ROCKER ARM AND SHAFT INSPECTION**). If any rocker arm needs replacing, replace the rocker arm set, then retest.
 - If all the primary rocker arms and secondary rocker arms move freely, go to step 3.

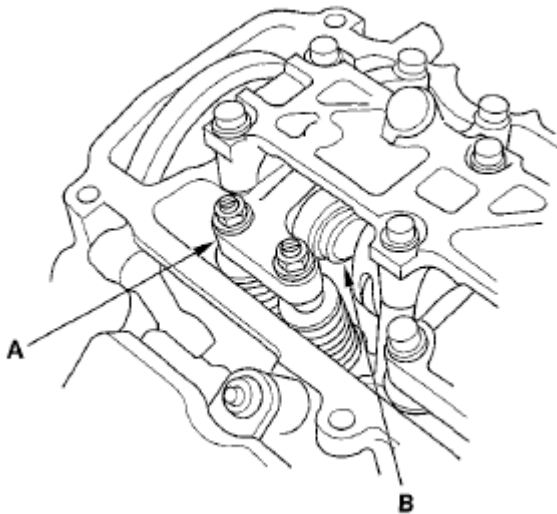


Fig. 6: Identifying Primary Rocker Arms & Secondary Rocker Arms
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Check that the air pressure on the shop air compressor gauge indicates over 400 kPa (4.08 kgf/cm², 58.0

psi).

4. Inspect the valve clearance (see step 7 **VALVE CLEARANCE ADJUSTMENT**).
5. Install the VCM air adapter (A) to the inspection hole, then connect the air pressure regulator (B) as shown below.

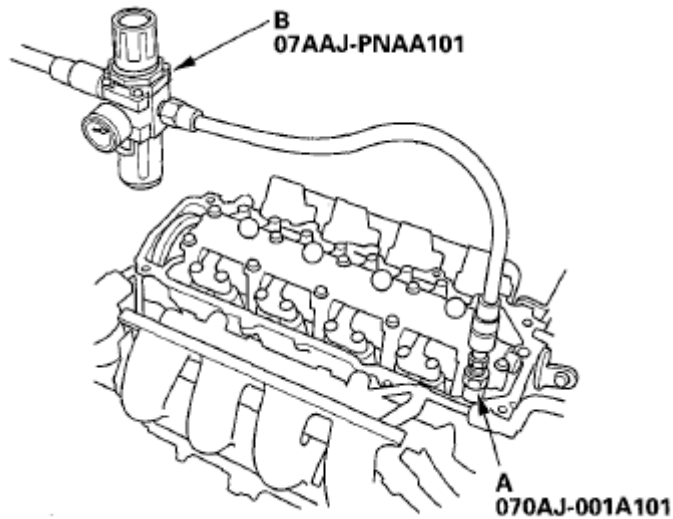


Fig. 7: Identifying VTEC Air Adapter & Air Pressure Regulator
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Specified Air Pressure:

340 kPa (3.47 kgf/cm² , 59.3 psi)

7. With the specified air pressure applied, rotate the crankshaft pulley clockwise. The primary rocker arm (A) should move together with the secondary rocker arm (B):
 - If the primary rocker arm and the secondary rocker arm move independently of each other, remove the primary rocker arm and the secondary rocker arm as an assembly, and check that the pistons in the primary and secondary rocker arms move smoothly. If any rocker arm needs replacing, replace the rocker arm set, then retest. (see **ROCKER ARM AND SHAFT INSPECTION**). If any rocker arm needs replacing, replace the rocker arm set, then retest.
 - If all the primary rocker arms and the secondary rocker arms move together, go to step 8.

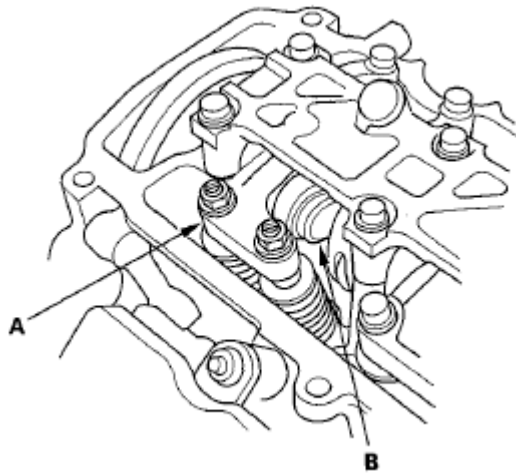


Fig. 8: Identifying Primary Rocker Arms & Secondary Rocker Arms
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Remove the air pressure regulator and the VCM air adapter.
9. Install the cylinder head cover (see CYLINDER HEAD COVER INSTALLATION).

VALVE CLEARANCE ADJUSTMENT

NOTE: Connect the HDS to the DLC, and monitor ECT SENSOR 1 (see GENERAL TROUBLESHOOTING INFORMATION). 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 "UP" mark (A) on the camshaft sprocket should be at the top, and the TDC grooves (B) on the camshaft sprocket should line up with the top edge of the head.

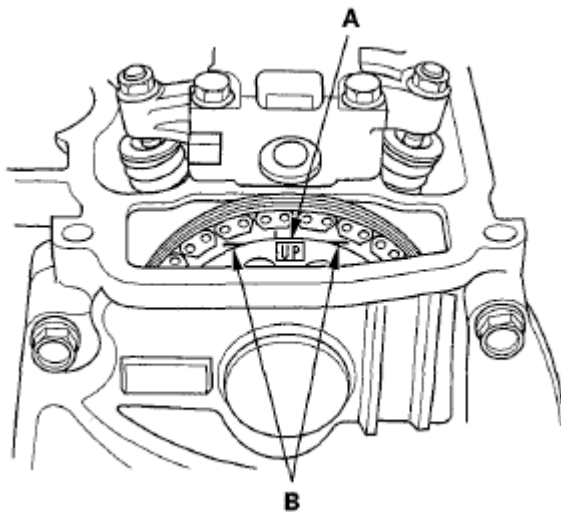


Fig. 9: Identifying Up Mark On Camshaft Sprocket

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Select the correct feeler gauge for the valve clearance you are going to check.

Valve Clearance

Intake: 0.15-0.19 mm (0.006-0.007 in.)

Exhaust: 0.26-0.30 mm (0.010-0.012 in.)

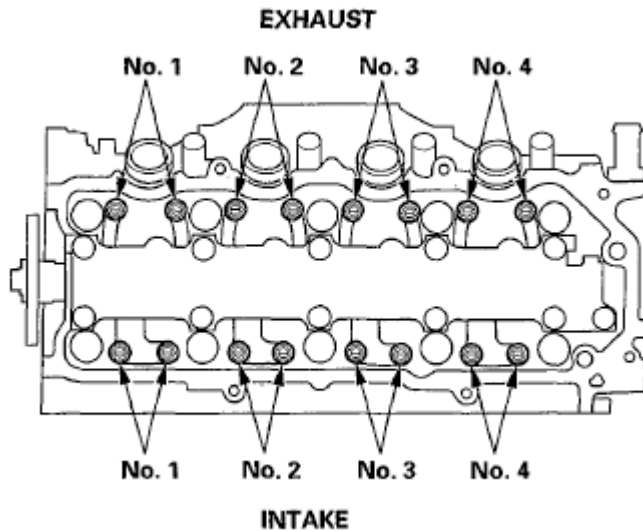


Fig. 10: Identifying Intake & Exhaust Valve

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

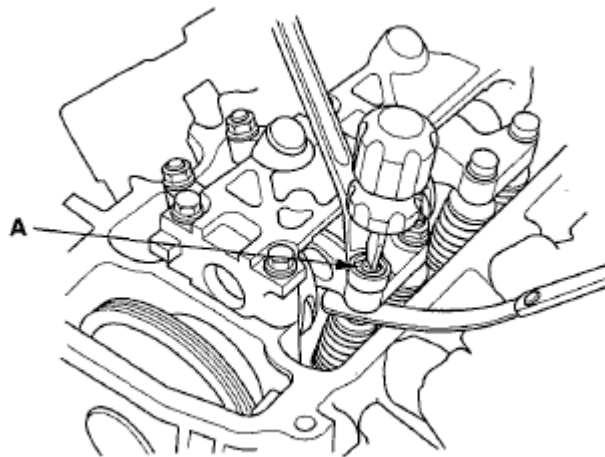


Fig. 11: Inserting Feeler Gauge Between Adjusting Screw & End Of Valve Stem On No. 1 Cylinder

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

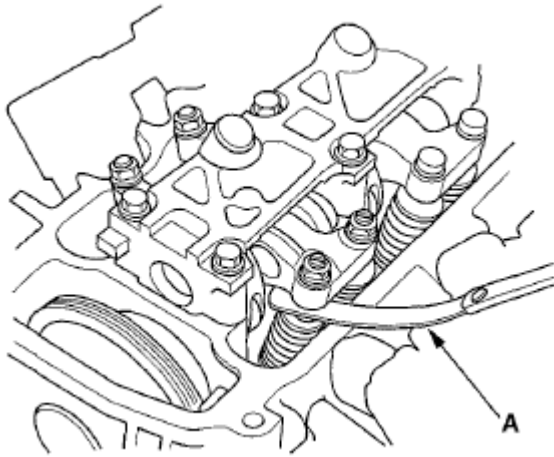


Fig. 12: Identifying Adjusting Screw

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Specified Torque

7 x 0.75 mm, 14 N.m (1.4 kgf.m, 10 lbf.ft)

Apply new engine oil to the nut threads.

7. Rotate the crankshaft pulley clockwise. Align the No. 3 piston TDC groove (A) on the camshaft sprocket with the top edge of the head.

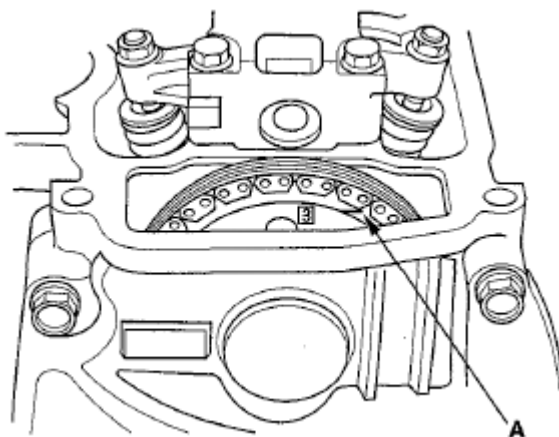


Fig. 13: Identifying TDC Groove On Camshaft Sprocket

Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Check and, if necessary, adjust the valve clearance on the No. 3 cylinder.
9. Rotate the crankshaft clockwise. Align the No. 4 piston TDC groove (A) on the camshaft sprocket with the top edge of the head.

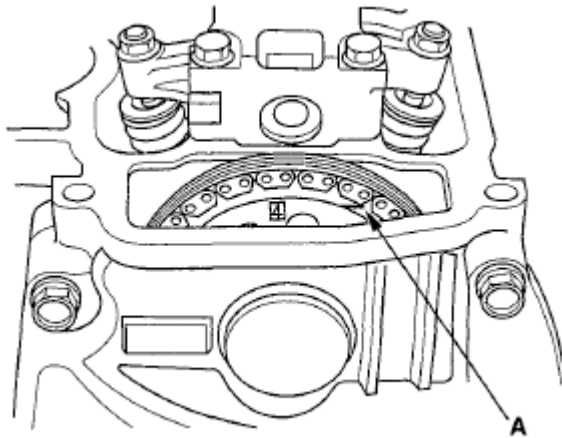


Fig. 14: Identifying No. 4 Piston TDC Groove On Camshaft Sprocket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Check and, if necessary, adjust the valve clearance on the No. 4 cylinder.
11. Rotate the crankshaft clockwise. Align the No. 2 piston TDC groove (A) on the camshaft sprocket with the top edge of the head.

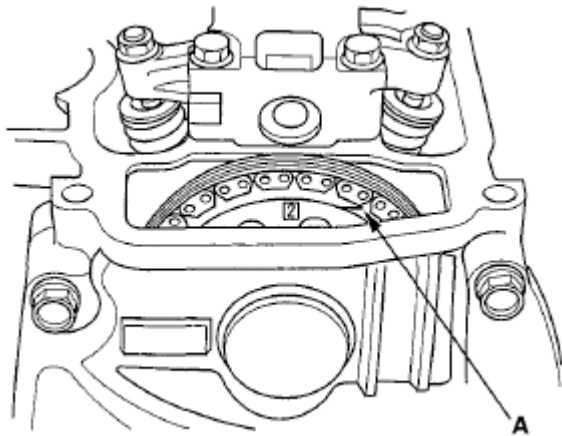


Fig. 15: Identifying No. 2 Piston TDC Groove On Camshaft Sprocket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

CRANKSHAFT PULLEY REMOVAL AND INSTALLATION

SPECIAL TOOLS REQUIRED

- Crankshaft pulley holder 07AAB-RJAA100
- Socket, 19 mm 07JAA-001020A
- Holder handle 07JAB-001020B

REMOVAL

1. Raise the vehicle on the lift.
2. Remove the right front wheel.
3. Remove the splash shield.
4. Remove the drive belt (see **DRIVE BELT REMOVAL/INSTALLATION**).
5. Hold the pulley with the handle (A) and the crankshaft pulley holder (B).

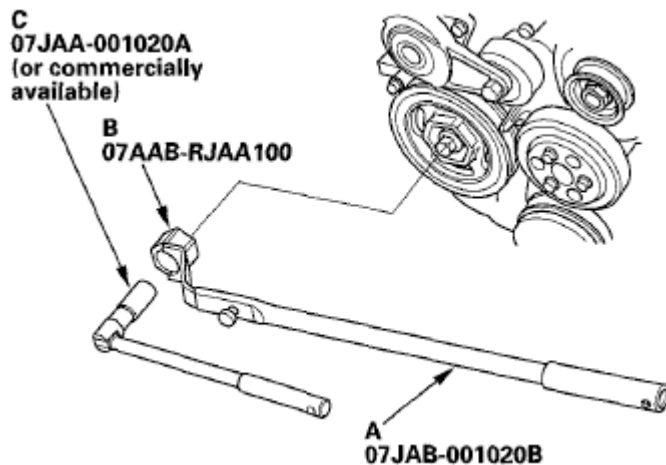


Fig. 16: Identifying Handle, Crankshaft Pulley Holder & Socket
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

INSTALLATION

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

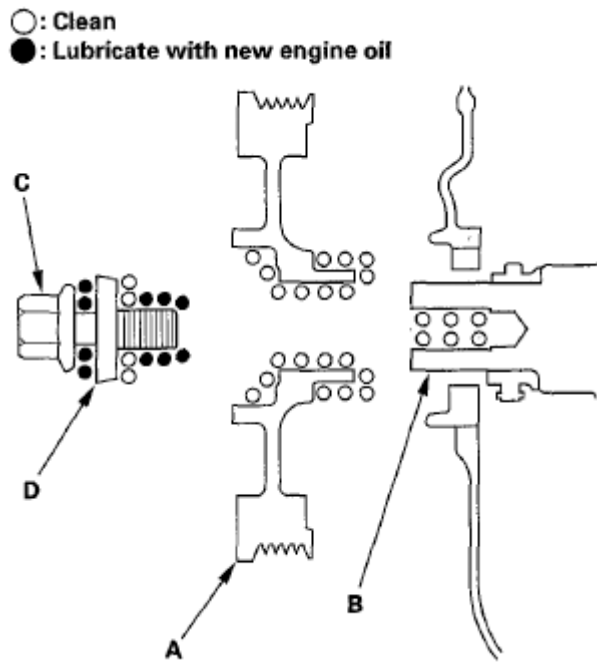


Fig. 17: Identifying Cleaning & Lubrication Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Install the crankshaft pulley.
3. When a new crankshaft or a new pulley bolt is installed: Tighten the crankshaft pulley bolt. Do not use an impact wrench.
 - Hold the pulley with the holder handle (A) and crankshaft pulley holder (B), tighten the bolt to 177 N.m (18.0 kgf.m, 130 lbf.ft) with a torque wrench and a socket (C), then remove the bolt.
 - Tighten the bolt to 39 N.m (4.0 kgf.m, 29 lbf.ft) with a torque wrench and a socket.
 - Tighten the bolt an additional 94 °

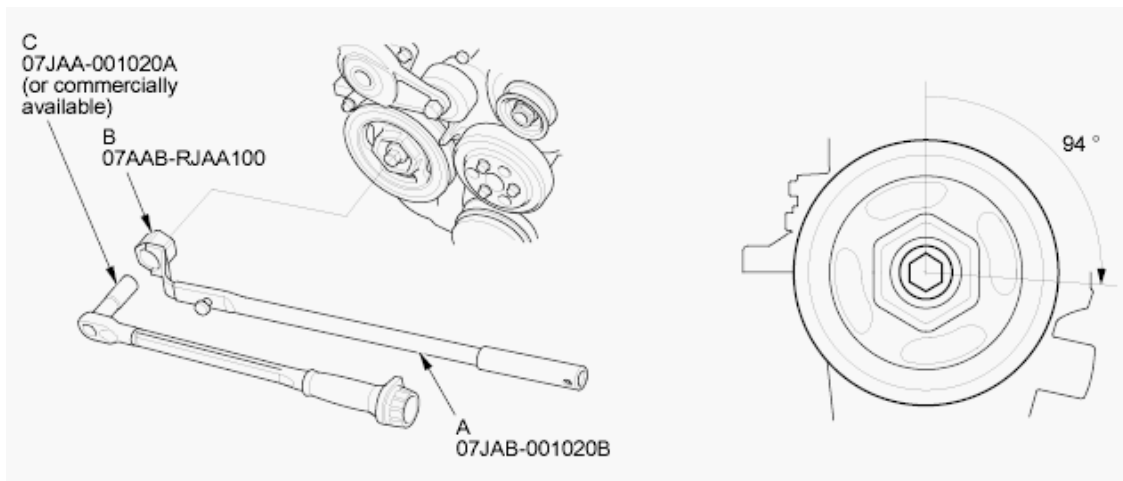


Fig. 18: Tightening Crankshaft Pulley Bolt An Additional 94 Degrees (New Crankshaft Or Pulley Bolt)

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. When the crankshaft or the pulley bolt is reused: Tighten the crankshaft pulley bolt. Do not use an impact wrench.
 1. Hold the pulley with the holder handle (A) and crankshaft pulley holder (B), then tighten the bolt to 37 N.m (3.8 kgf.m, 27 lbf.ft) with a torque wrench and a socket (C).
 2. Tighten the bolt an additional 90 °.

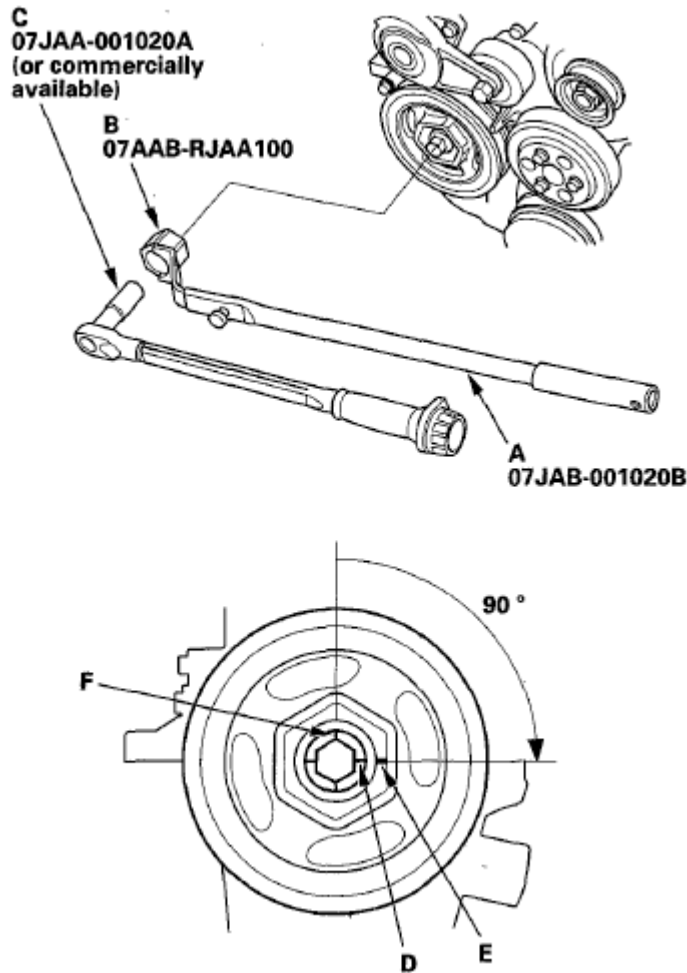


Fig. 19: Tightening Crankshaft Pulley Bolt An Additional 90 Degrees (Used Crankshaft Or Pulley Bolt)

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Install the drive belt (see **DRIVE BELT REMOVAL/INSTALLATION**).
6. Install the splash shield.
7. Install the right front wheel.

CAM CHAIN REMOVAL

NOTE: Keep the cam chain away from magnetic fields.

1. Turn the crankshaft pulley so its top dead center (TDC) mark (A) lines up with the pointer (B).

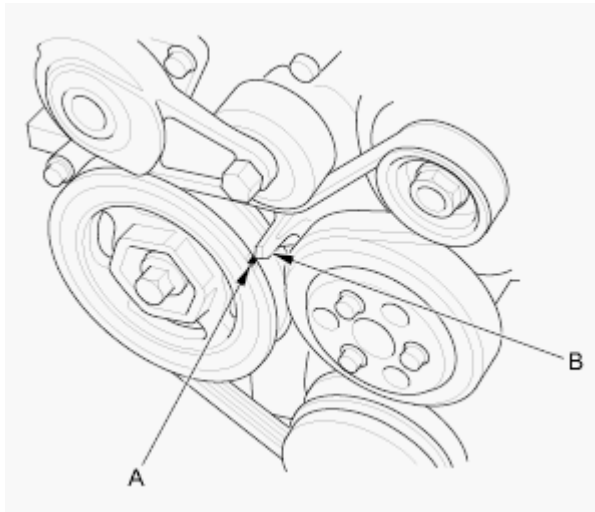


Fig. 20: Identifying Crankshaft Pulley At Top Dead Center (TDC)
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
3. Check the No. 1 piston at TDC. The "UP" mark (A) on the camshaft sprocket should be at the top, and the TDC grooves (B) on the camshaft sprocket should line up with the top edge of the head.

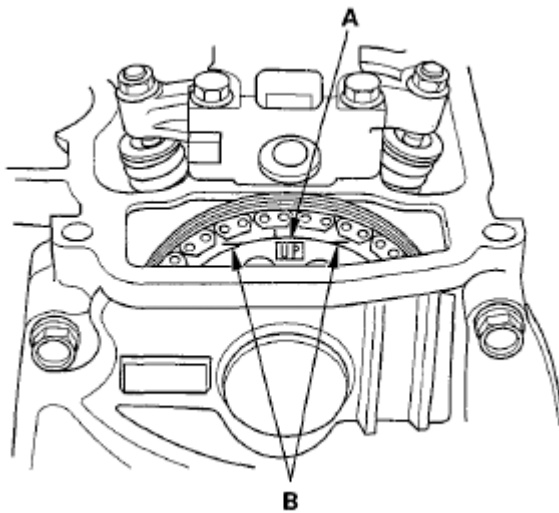


Fig. 21: Identifying UP Mark On Camshaft Sprocket
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the right front wheel.
5. Remove the splash shield.
6. Loosen the water pump pulley mounting bolts (A). (See **Fig. 22**)
7. Remove the drive belt (see **DRIVE BELT REMOVAL/INSTALLATION**).

8. Remove the water pump pulley (B).

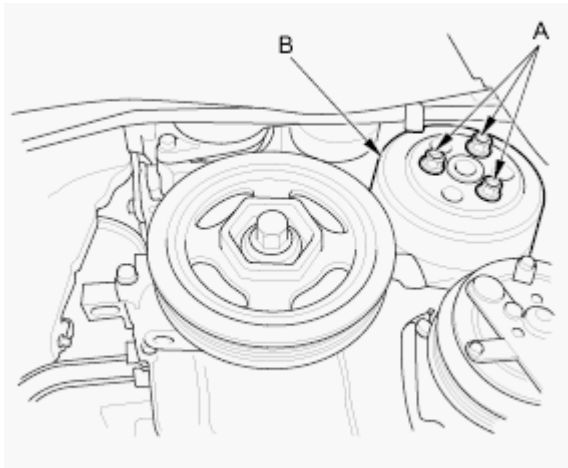


Fig. 22: Identifying Water Pump Pulley And Mounting Bolts
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Remove the crankshaft pulley (see CRANKSHAFT PULLEY REMOVAL AND INSTALLATION).
10. Remove the drive belt auto-tensioner (see DRIVE BELT AUTO-TENSIONER REMOVAL/INSTALLATION).
11. Support the engine with a jack and a wood block under the oil pan.
12. Remove the ground cable (A), then remove the side engine mount/bracket assembly (B).

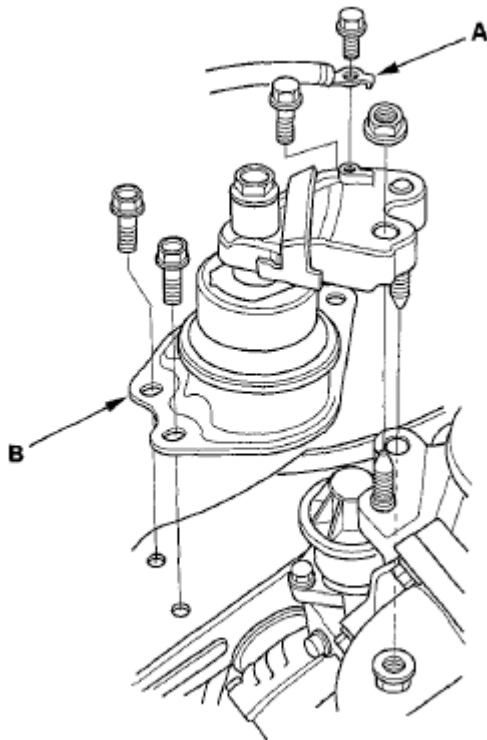


Fig. 23: Identifying Ground Cable & Side Engine Mount/Bracket Assembly

Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Remove the chain case.

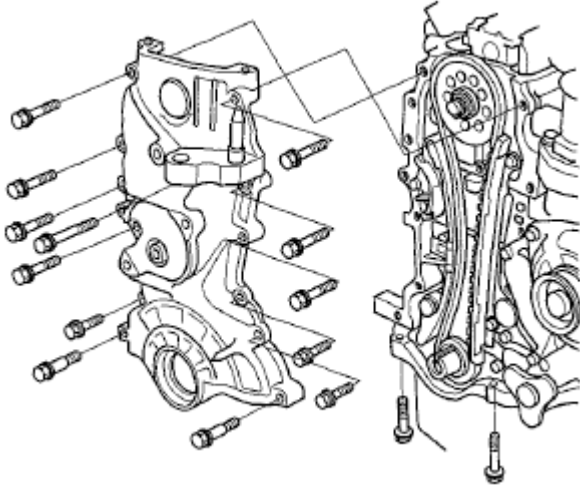


Fig. 24: Identifying Chain Case

Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Measure the cam chain separation. If the distance is less than the service limit, replace the cam chain and cam chain tensioner.

Standard Distance: 19 mm (0.75 in.)

Service Limit: 15 mm (0.59 in.)

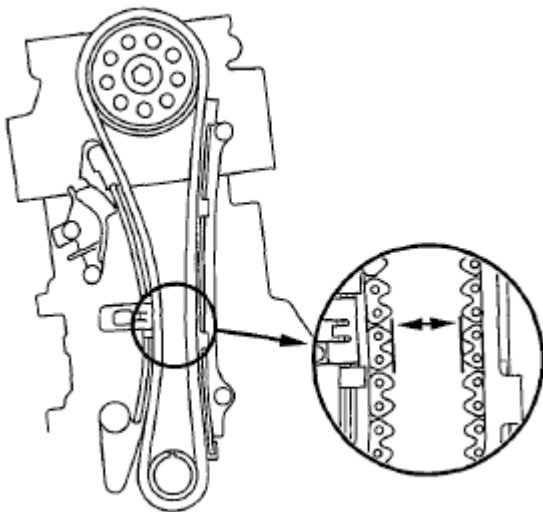


Fig. 25: Identifying Distance Between Cam Chain & Tensioner

Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Apply new engine oil to the sliding surface of the cam chain tensioner slider (A).

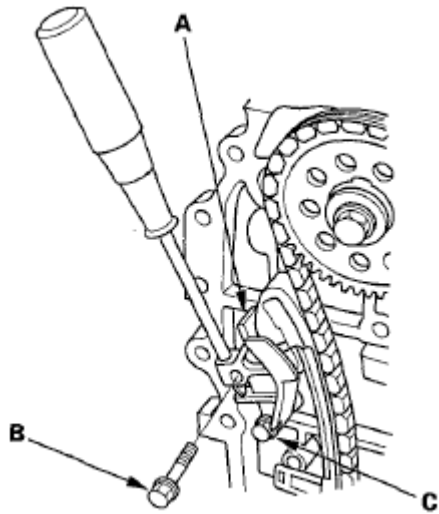


Fig. 26: Identifying Cam Chain Tensioner Slider & Bolt

Courtesy of AMERICAN HONDA MOTOR CO., INC.

16. Hold the cam chain tensioner slider with the screwdriver, then remove the bolt (B), and loosen the bolt (C).
17. Remove the cam chain tensioner slider.

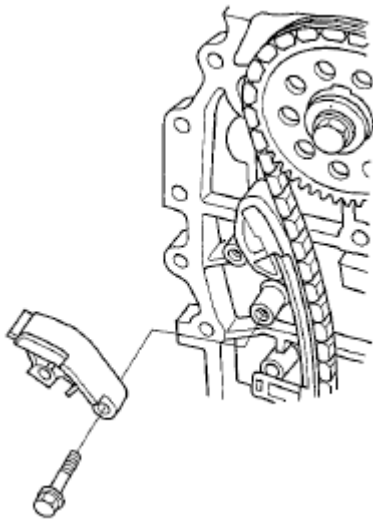


Fig. 27: Identifying Cam Chain Tensioner Slider

Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Remove the cam chain tensioner (A) and the cam chain guide (B).

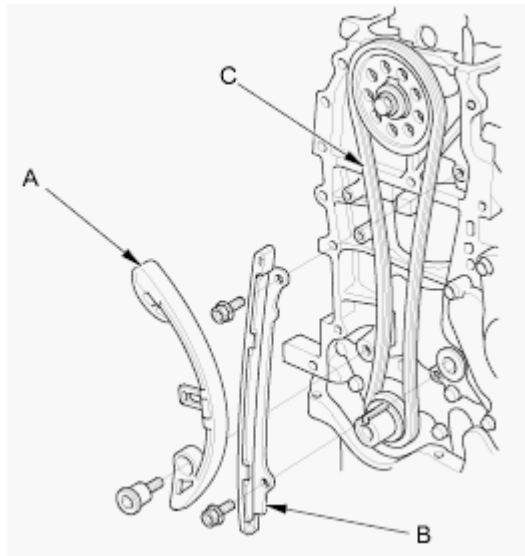


Fig. 28: Identifying Cam Chain Tensioner, Cam Chain Guide And Cam Chain
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Remove the cam chain.

CAM CHAIN INSTALLATION

NOTE: Keep the cam chain away from magnetic fields.

1. Set the crankshaft to top dead center (TDC). Align the TDC mark (A) on the crankshaft sprocket with the pointer (B) on the oil pump.

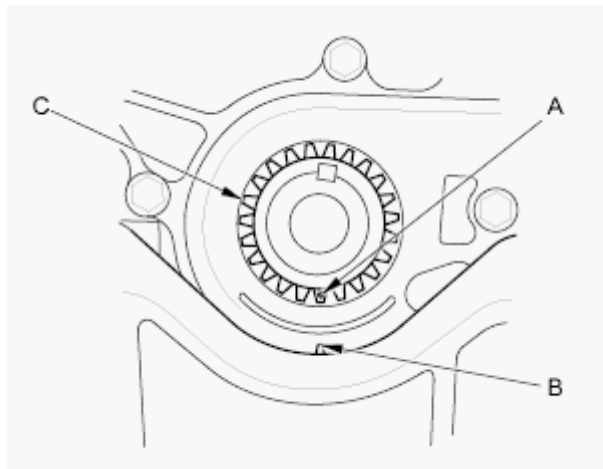


Fig. 29: Aligning TDC Mark On Crankshaft Sprocket With Pointer On Oil Pump
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Remove the crankshaft sprocket (C).
3. Set the camshaft to TDC. The "UP" mark (A) on the camshaft sprocket should be at the top, and the TDC grooves (B) on the camshaft sprocket should line up with the top edge of the head.

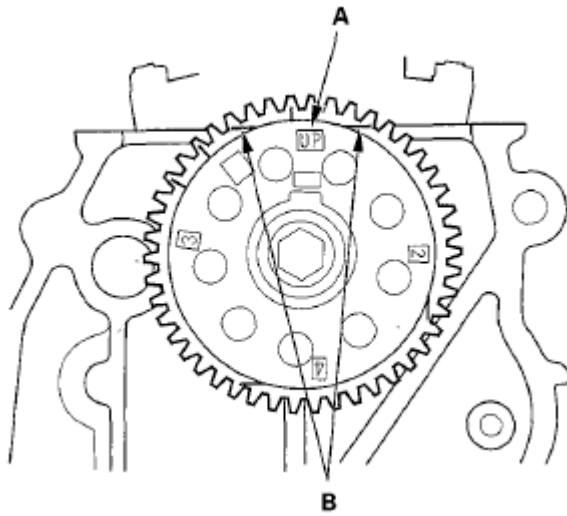


Fig. 30: Identifying UP Mark On Camshaft Sprocket
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Install the cam chain on the crankshaft sprocket with the colored piece (A) aligned with the TDC mark (B) on the crankshaft sprocket, then install the crankshaft sprocket with the key (C) to the crankshaft.

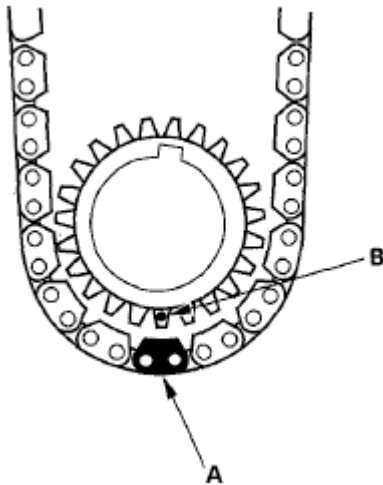


Fig. 31: Identifying TDC Mark On Crankshaft Sprocket
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Install the cam chain on the camshaft sprocket with the pointers (A) aligned with the three colored pieces (B) as shown below.

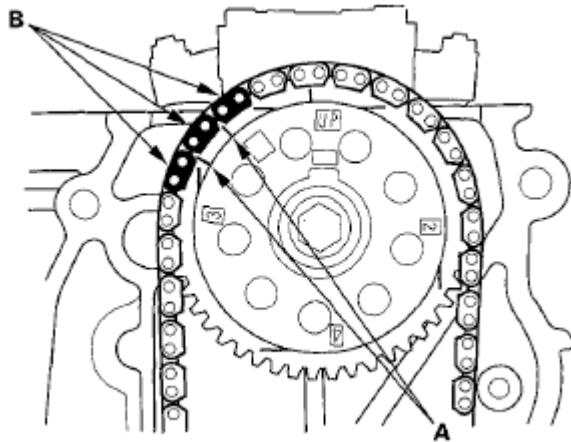


Fig. 32: Identifying Cam Chain On Camshaft Sprocket With Pointers
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Install the cam chain tensioner (A) and the cam chain guide (B).

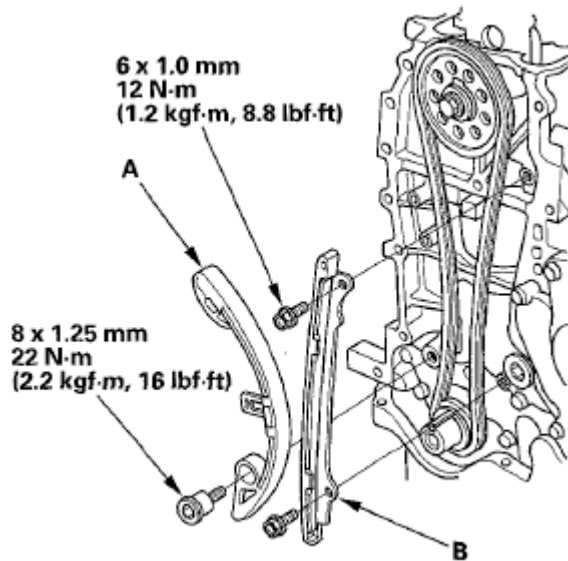


Fig. 33: Identifying Cam Chain Tensioner & Cam Chain Guide With Torque Specifications
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Install the cam chain tensioner slider, and loosely tighten the bolt.

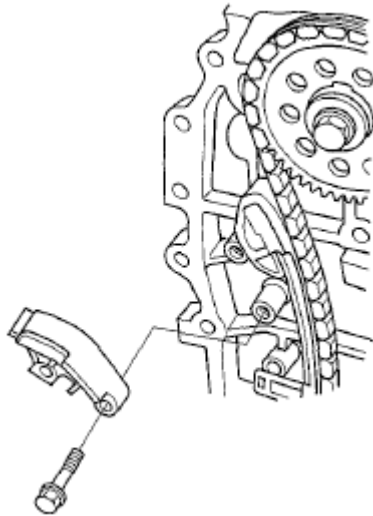


Fig. 34: Identifying Cam Chain Tensioner Slider Bolt
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Apply new engine oil to the sliding surface of the cam chain tensioner slider (A).

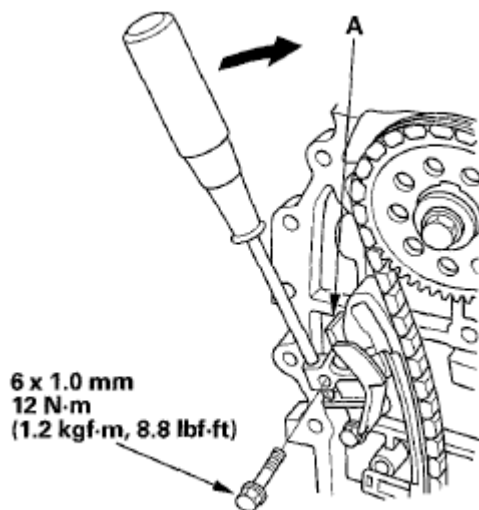


Fig. 35: Identifying Cam Chain Tensioner Slider With Torque Specifications
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Rotate the cam chain tensioner slider clockwise to compress the cam chain tensioner, and install the remaining bolt, then tighten the bolts.
10. 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**).
11. Remove the all of the old liquid gasket from the chain case mating surfaces, the bolts, and the bolt holes.
12. Clean and dry the chain case mating surfaces.
13. Apply liquid gasket (P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009) to the engine block mating surface of the chain case and to the inside edge of the bolt holes. Install the component within 5

minutes of applying the liquid gasket.

NOTE:

- Apply a 2.5 mm (0.098 in) diameter bead of liquid gasket along the broken line (A).
- Apply a 3.0 mm (0.118 in) diameter bead of liquid gasket along the broken line (B).
- If you apply liquid gasket P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply new liquid gasket.

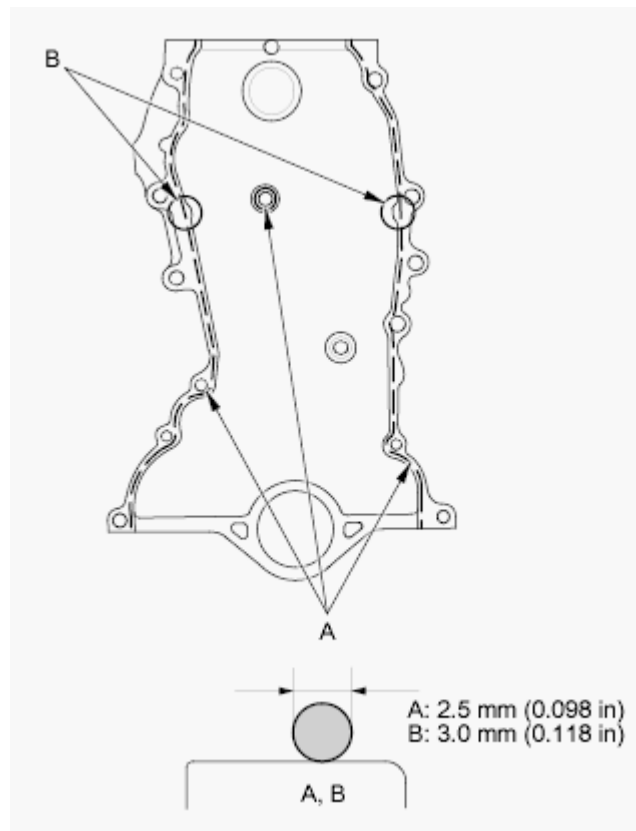


Fig. 36: Applying Liquid Gasket To Engine Block Mating Surface Of Chain Case

Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Apply liquid gasket (P/N 08717-0004, 08718-0003, 08718-0004, or 08718-0009) to the oil pan mating surface of the cam chain case and to the inside edge of the threaded bolt holes. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

- Apply liquid gasket about 2.5 mm (0.098 in.) diameter bead along the broken line (A).
- Apply liquid gasket about 5.0 mm (0.20 in.) diameter bead to the

shaded area (B).

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

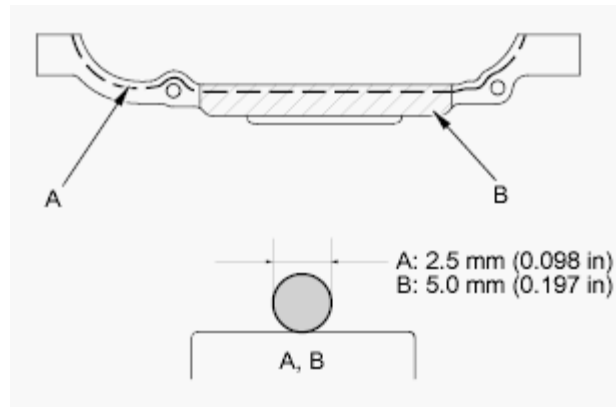


Fig. 37: Identifying Liquid Gasket Applying Area On Oil Pan Mating Surface Of Chain Case & Inside Edge Of Bolt Holes
Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Set the edge of the chain case (A) to the edge of the oil pan (B), then install the chain case on the engine block (C).

NOTE:

- When installing the chain case, do not slide the bottom surface onto the oil pan mounting surface.
- Wait at least 30 minutes before filling the engine with oil.
- Do not run the engine for at least 3 hours after installing the chain case.

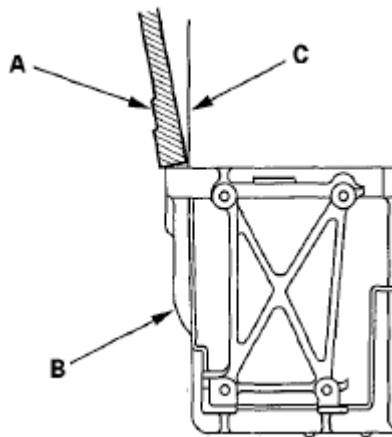


Fig. 38: Identifying Chain Case, Oil Pan & Engine Block
Courtesy of AMERICAN HONDA MOTOR CO., INC.

16. Tighten the chain case mounting bolts. Wipe off the excess liquid gasket on the oil pan and the chain case mating area.

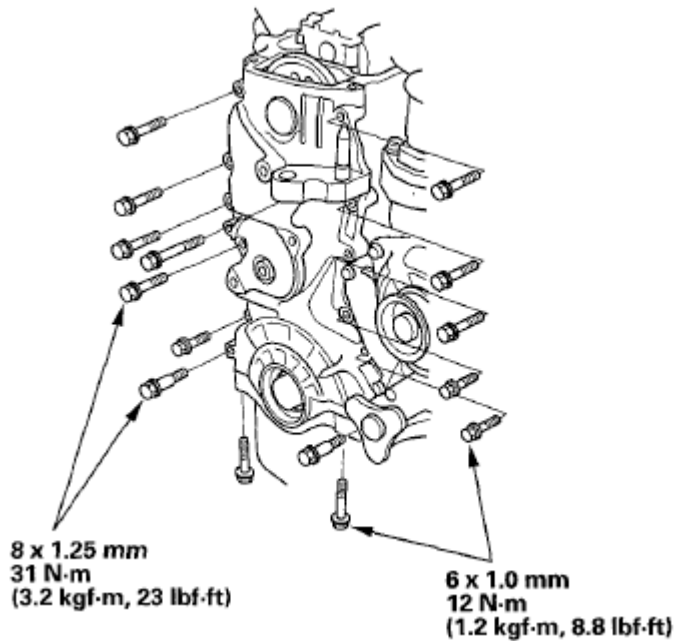


Fig. 39: Identifying Chain Case Mounting Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Install the cylinder head cover (see **CYLINDER HEAD COVER INSTALLATION**).
18. Install the side engine mount/bracket assembly (A), then tighten the new side engine mount/bracket assembly mounting bolts (B).

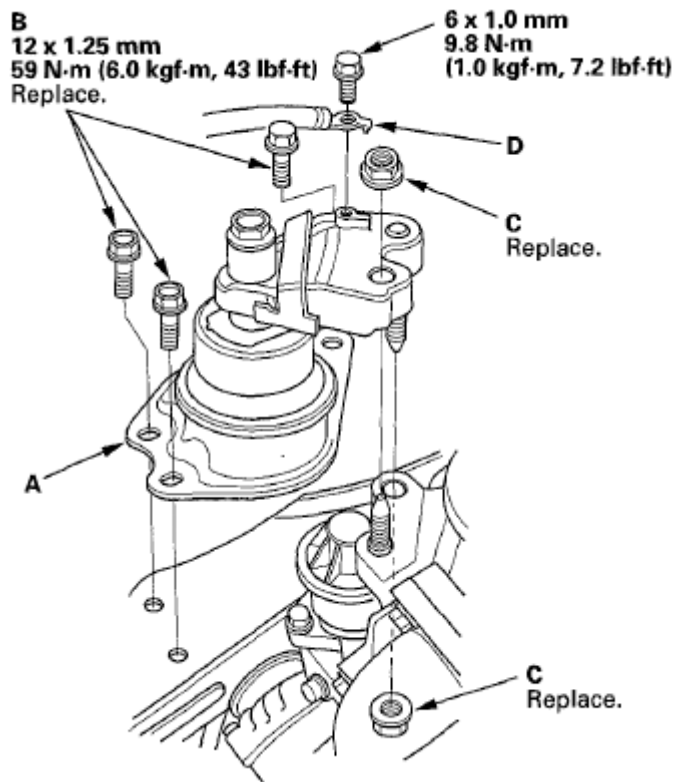


Fig. 40: Identifying Side Engine Mount/Bracket Assembly & Ground Cable With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Loosely tighten the new side engine mount/bracket assembly mounting nuts (C).
20. Install the ground cable (D).
21. Remove the jack and the wood block from under the oil pan.
22. Remove the air cleaner housing assembly (see AIR CLEANER REMOVAL/INSTALLATION).
23. Loosen the transmission mount bracket mounting bolts and nuts (A).

M/T model

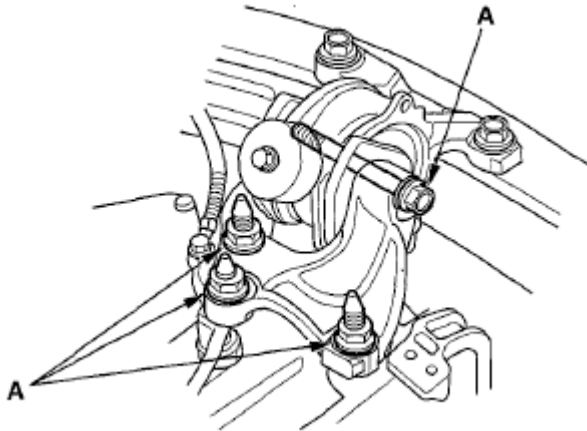


Fig. 41: Identifying Transmission Mount Bracket Mounting Bolts & Nuts - M/T Model
Courtesy of AMERICAN HONDA MOTOR CO., INC.

A/T model

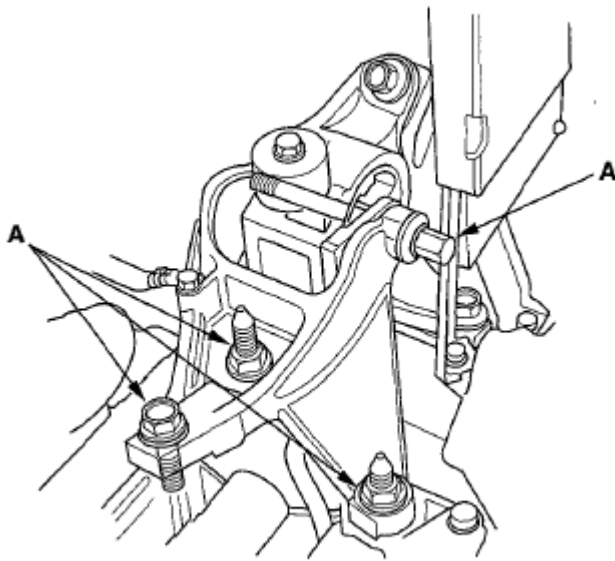


Fig. 42: Identifying Transmission Mount Bracket Mounting Bolts & Nuts - A/T Model
Courtesy of AMERICAN HONDA MOTOR CO., INC.

24. Raise the vehicle on the lift.
25. Loosen the torque rod mounting bolt and nut (A).

M/T model

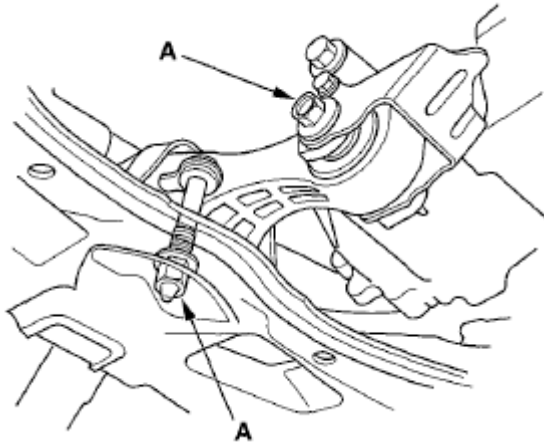


Fig. 43: Identifying Torque Rod Mounting Bolt & Nut - M/T Model
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

A/T model

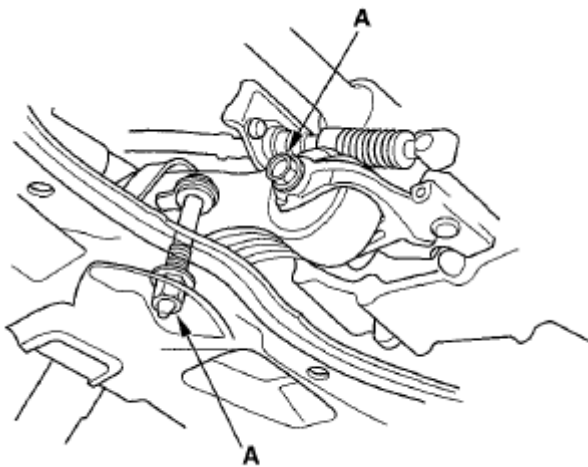


Fig. 44: Identifying Torque Rod Mounting Bolt & Nut - A/T Model
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

26. Lower the vehicle on the lift.
27. Tighten the side engine mount/bracket assembly mounting nuts in the numbered sequence shown below.

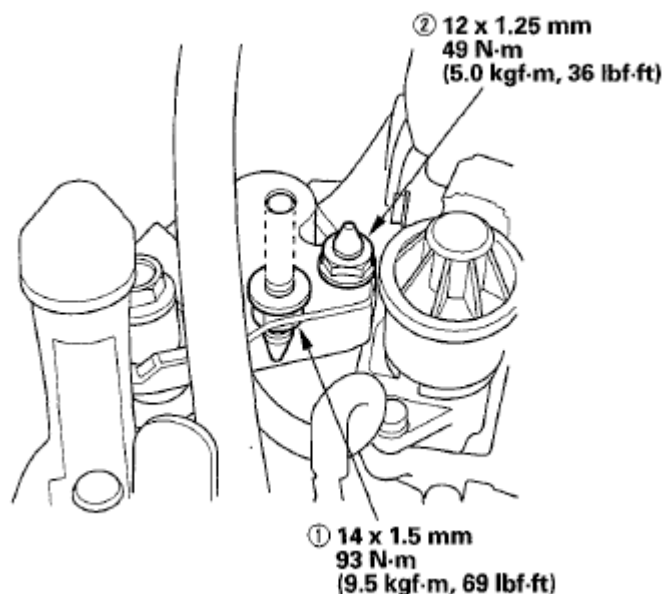


Fig. 45: Identifying Side Engine Mount/Bracket Assembly Mounting Nuts With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

28. Tighten the transmission mount mounting bolts and nuts in the numbered sequence shown below.

M/T model

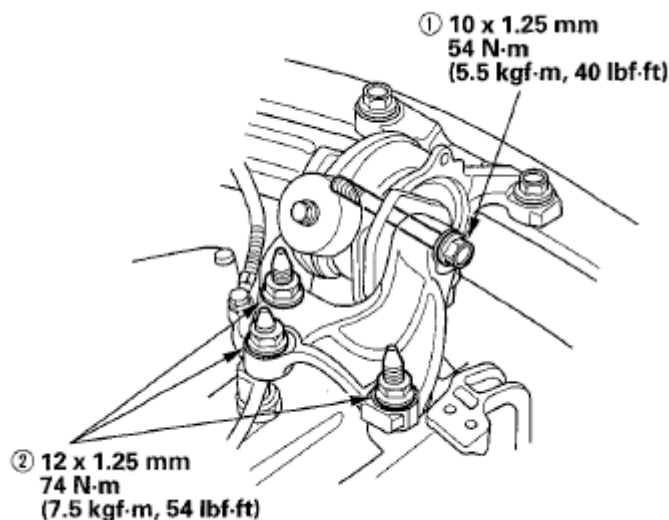


Fig. 46: Identifying Transmission Mount Mounting Bolts & Nuts Torque Sequence - M/T Model With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

A/T model

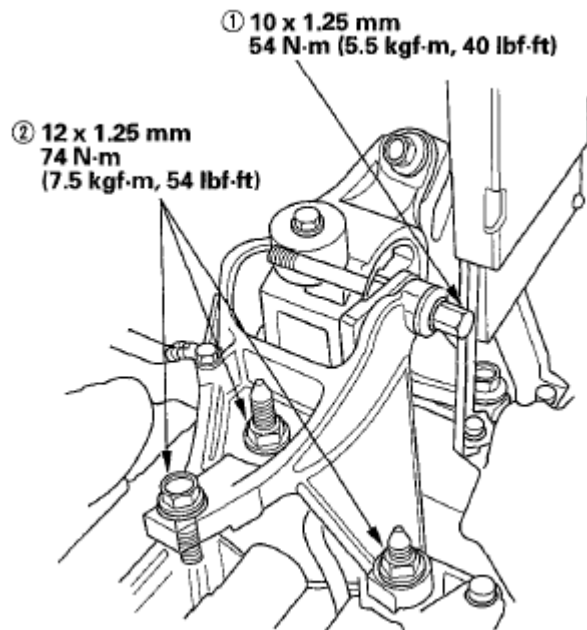


Fig. 47: Identifying Transmission Mount Mounting Bolts & Nuts Torque Sequence - A/T Model With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

29. Raise the vehicle on the lift.
30. Tighten the torque rod mounting bolt and nut in the numbered sequence shown below.

M/T model

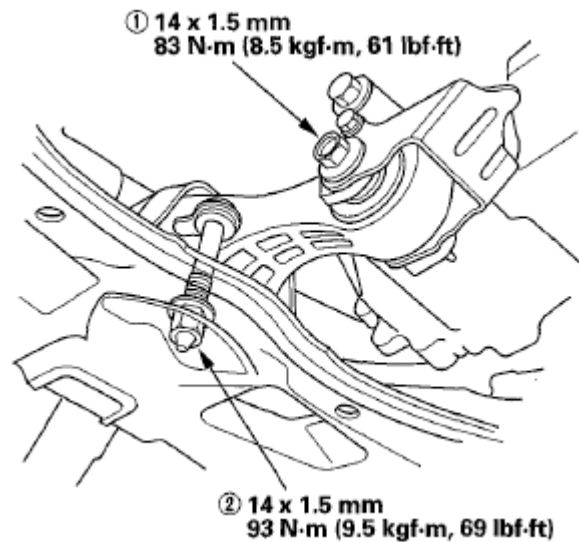


Fig. 48: Identifying Torque Rod Mounting Bolt & Nut Torque Sequence - M/T Model With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

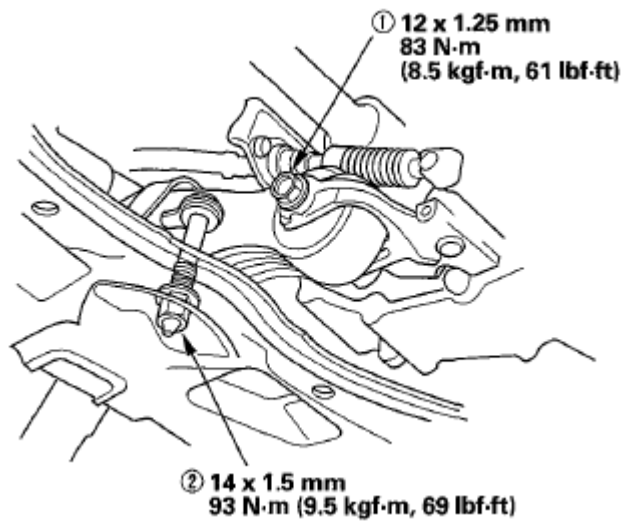
A/T model

Fig. 49: Identifying Torque Rod Mounting Bolt & Nut Torque Sequence - A/T Model With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

31. Lower the vehicle on the lift.
32. Install the air cleaner housing assembly (see **AIR CLEANER REMOVAL/INSTALLATION**).
33. Install the drive belt auto-tensioner (see **DRIVE BELT AUTO-TENSIONER REMOVAL/INSTALLATION**).
34. Install the crankshaft pulley (see **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
35. Install the water pump pulley (A), and loosely install the water pump pulley mounting bolts (B).

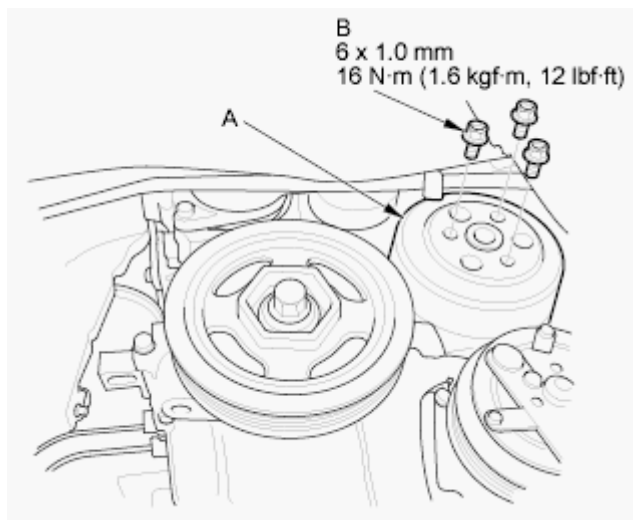


Fig. 50: Identifying Water Pump Pulley Bolts With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

36. Install the drive belt (see **DRIVE BELT REMOVAL/INSTALLATION**).

37. Tighten the water pump pulley mounting bolts (B), (see illustration above).
38. Install the splash shield.
39. Install the right front wheel.
40. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **CKP PATTERN CLEAR/CKP PATTERN LEARN**).

CHAIN CASE OIL SEAL INSTALLATION

SPECIAL TOOLS REQUIRED

- Driver Handle, 15 x 135L 07749-0010000
 - Bearing Driver Attachment, 52 x 55 mm 07746-0010400
1. Clean and dry the cam chain case oil seal housing.
 2. Apply a light coat of new engine oil to the lip of the cam chain case oil seal.
 3. Use the driver handle, 15 x 135L and the bearing driver attachment, 52 x 55 mm to drive a new oil seal squarely into the cam chain case to the specified installed height.

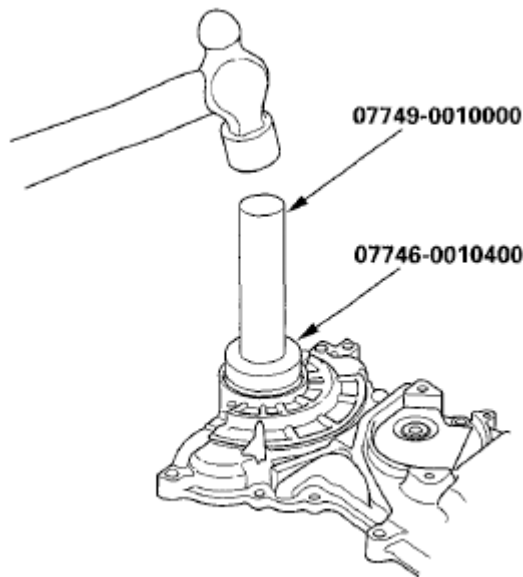


Fig. 51: Driving Oil Seal Squarely Into Chain Case Using Driver Handle & Bearing Driver Attachment

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Measure the distance between the chain case surface and the oil seal.

Oil Seal Installed Height:

30.3-31.0 mm (1.19-1.22 in.)

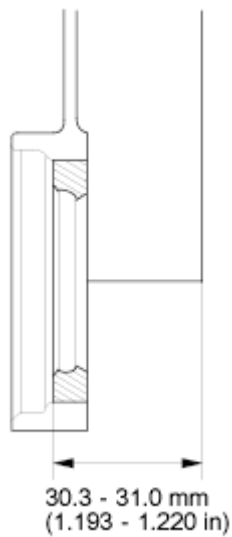


Fig. 52: Identifying Distance Between Chain Case Surface & Oil Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER HEAD COVER REMOVAL

1. Remove the intake manifold chamber (see **REMOVAL**).
2. Disconnect the four ignition coil connectors (A).
3. Remove the harness holder (B) and the breather hose (C).

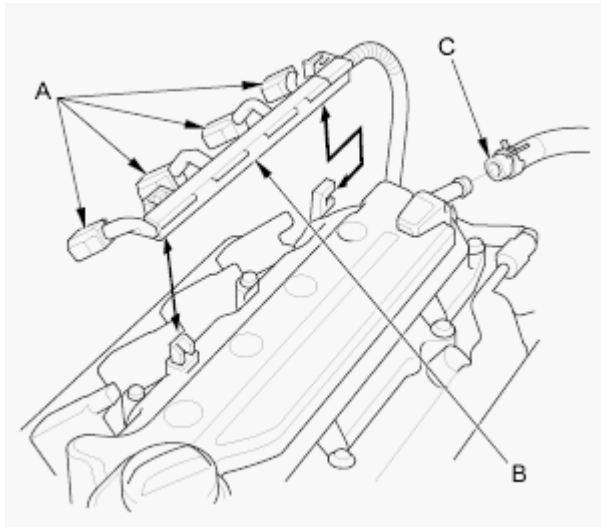


Fig. 53: Identifying Ignition Coil Connectors, Harness Holder & Breather Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the cylinder head cover.

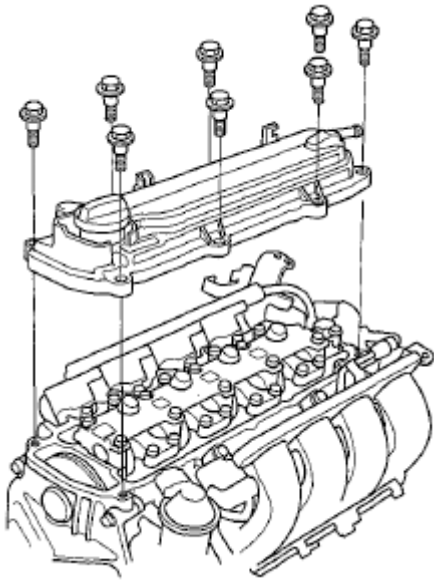


Fig. 54: Identifying Cylinder Head Cover And Fasteners
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER HEAD COVER INSTALLATION

1. Thoroughly clean the head cover gasket and the groove of the cylinder head cover.

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

2. Install the head cover gasket (A) in the groove of the cylinder head cover (B). Make sure the head cover gasket is seated securely.

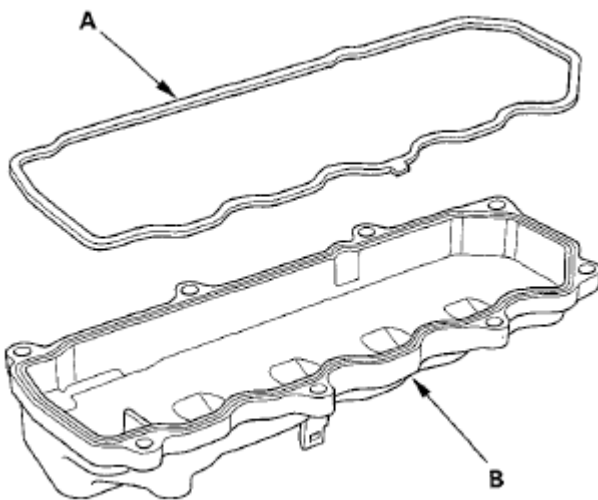


Fig. 55: Identifying Head Cover Gasket & Cylinder Head Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove all of the old liquid gasket from the cylinder head/cam chain case mating surfaces.
4. Check the head cover contacting surfaces with a shop towel.
5. Apply liquid gasket (P/N 08717-0004, 08718-0003, 08718-0004, or 08718-0009) to the cam chain case contact areas (A). Install the component within 5 minutes of applying the liquid gasket.

NOTE:

- Apply a 2.5 mm (0.098 in) diameter bead of liquid gasket to the cam chain case contact areas.
- If you apply liquid gasket P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply new liquid gasket.

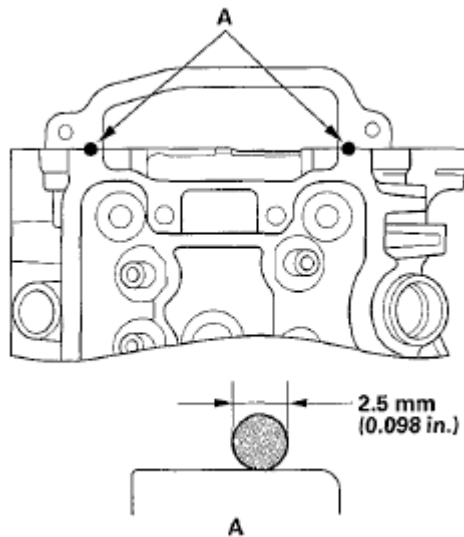


Fig. 56: Identifying Liquid Gasket Applying Area On Chain Case Contact Areas

Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Place the cylinder head cover (A) on the cylinder head, then slide the cover slightly back and forth to seat the head cover gasket.

NOTE:

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

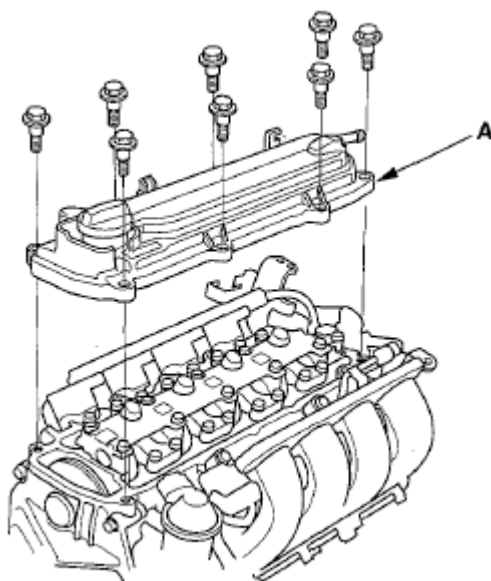


Fig. 57: Identifying Cylinder Head Cover
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Tighten the bolts in three steps. In the final step tighten all bolts, in sequence, to 9.8 N.m (1.0 kgf.m, 7.2 lbf.ft).

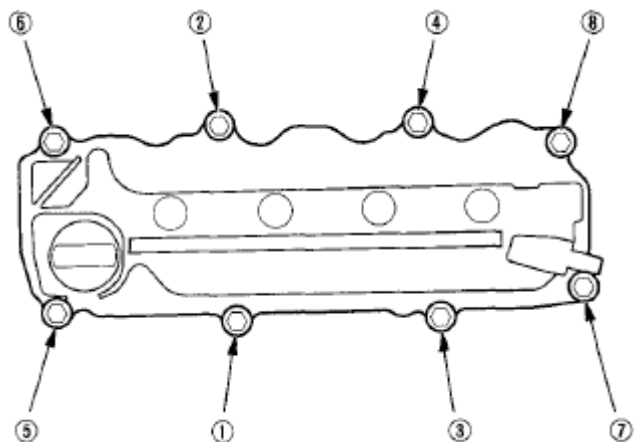


Fig. 58: Identifying Bolt Tightening Sequence
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Connect the breather hose (A), and install the harness holder (B).

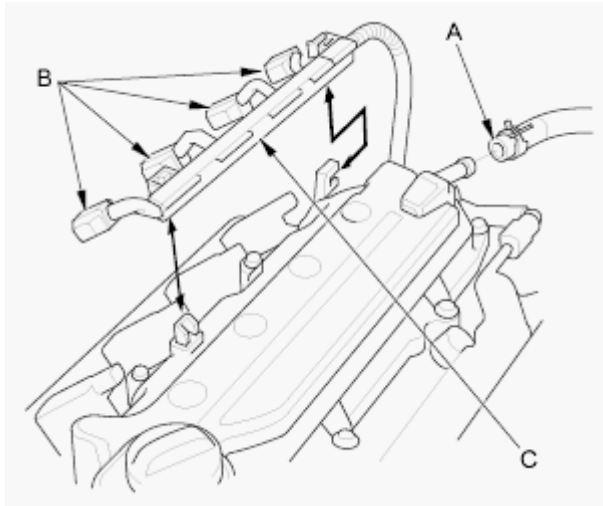


Fig. 59: Identifying Harness Holder & Breather Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Connect the four ignition coil connectors (C).
10. Install the intake manifold chamber (see **INSTALLATION**).

CYLINDER HEAD REMOVAL

NOTE:

- Use fender covers to avoid damaging painted surfaces.
- To avoid damage, unplug the wiring connectors carefully while holding the connector portion.
- To avoid damaging the cylinder head, wait until the engine coolant temperature drops below 100 °F (38 °C) before loosening the cylinder head bolts. Connect the HDS to the DLC, and monitor ECT SENSOR 1 (see **GENERAL TROUBLESHOOTING INFORMATION**).
- 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 fields.

1. Relieve fuel pressure (see **FUEL PRESSURE REGULATOR REPLACEMENT**).
2. Drain the engine coolant (see **COOLANT CHECK**).
3. Do the battery removal procedure (see **BATTERY REMOVAL AND INSTALLATION**).
4. Remove the air cleaner (see **AIR CLEANER REMOVAL/INSTALLATION**).
5. Remove the fuel feed hose clamp (A) and the quick-connect fitting cover (B), then disconnect the fuel feed hose (C) (see **FUEL LINE/QUICK-CONNECT FITTING REMOVAL**).

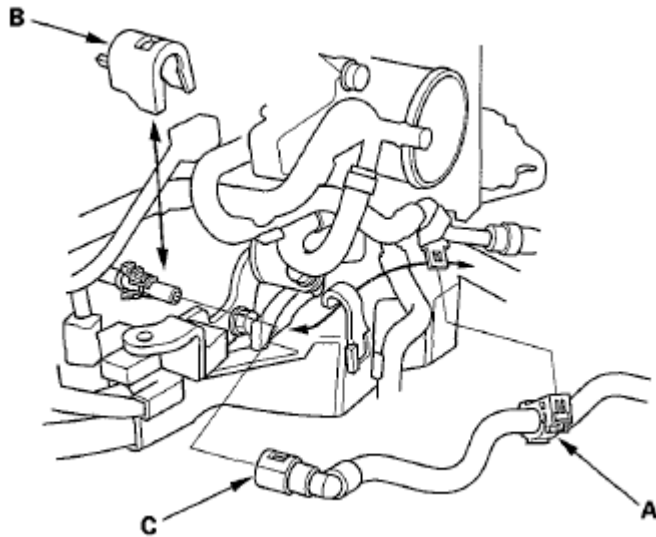


Fig. 60: Identifying Fuel Feed Hose Clamp, Quick-Connect Fitting Cover & Fuel Feed Hose
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Disconnect the upper radiator hose (A), the heater hose (B), and the water bypass hose (C).

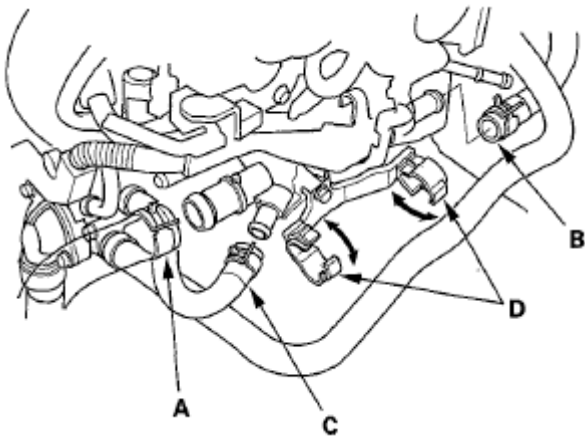


Fig. 61: Identifying Upper Radiator Hose, Heater Hose & Water Bypass Hose
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the heater hose from the clamps (D).
8. Remove the intake manifold/chamber assembly (see **REMOVAL**).
9. Remove the warm up three way catalytic converter (WU-TWC) (see **WARM UP TWC REMOVAL/INSTALLATION**).
10. Remove the following engine wire harness connectors and wire harness clamps from the cylinder head:
 - Four injector connector
 - Engine coolant temperature (ECT) sensor 1 connector
 - Camshaft position (CMP) sensor connector
 - Secondary heated oxygen sensor (secondary HO2S) connector

- Rocker arm oil control solenoid connector

11. Remove the harness holder (A) from the fuel rail.

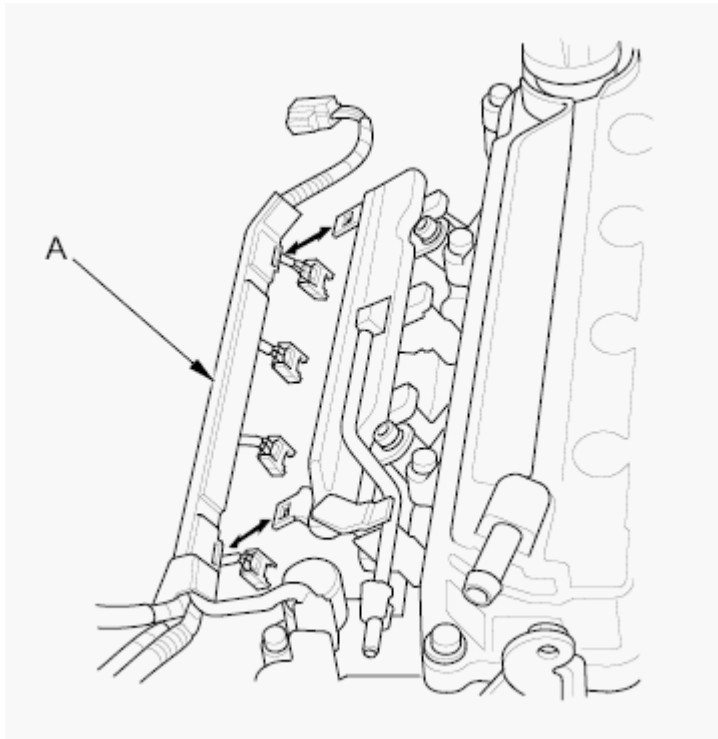


Fig. 62: Identifying Harness Holder

Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Remove the harness holder mounting bolt (A) and the ground cable (B), then remove the harness holder (C) from the bracket.

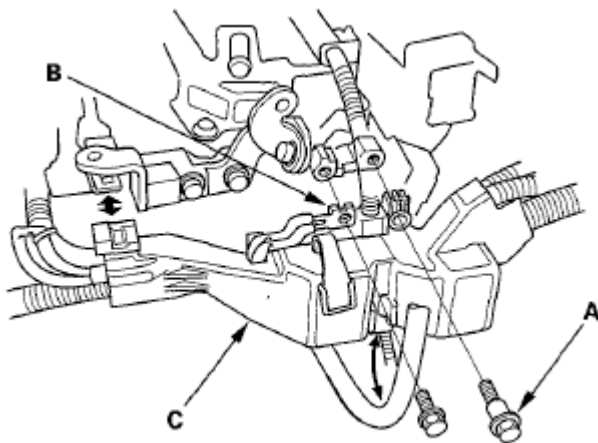


Fig. 63: Identifying Harness Holder Mounting Bolt, Ground Cable & Harness Holder

Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).

14. Remove the cam chain (see **CAM CHAIN REMOVAL**).
15. Remove the cylinder head bolts. To prevent warpage, loosen the bolts in sequence 1/3 turn at a time; repeat the sequence until all bolts are loosened.

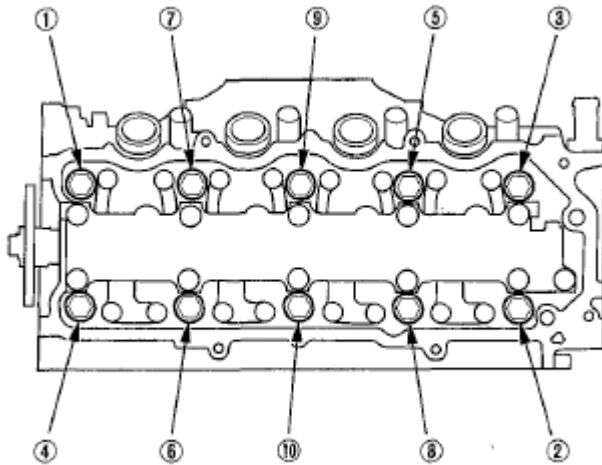


Fig. 64: Identifying Cylinder Head Bolt Loosening Sequence
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

16. Remove the cylinder head.

CMP PULSE PLATE REMOVAL AND INSTALLATION

REMOVAL

1. Remove the air cleaner (see **AIR CLEANER REMOVAL/INSTALLATION**).
2. Remove the intake manifold chamber (see **REMOVAL**).
3. Disconnect the following engine wire harness connectors and wire harness clamps from the cylinder head:
 - Four injector connector
 - Engine coolant temperature (ECT) sensor 1 connector
 - Camshaft position (CMP) sensor connector
 - Air fuel ratio (A/F) sensor connector
 - Secondary heated oxygen sensor (secondary HO2S) connector
4. Remove the harness holder mounting bolt and the ground cable, then remove the harness holder from the bracket (see step 12).
5. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
6. Remove the camshaft thrust cover (A).

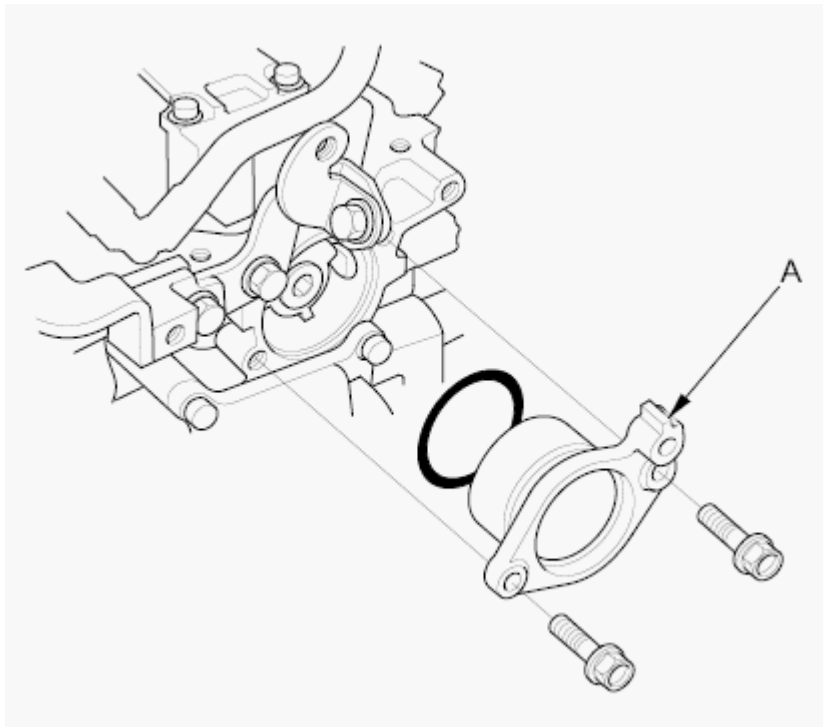


Fig. 65: Identifying Camshaft Thrust Cover

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Hold the camshaft with an open-end wrench, then loosen the bolt.

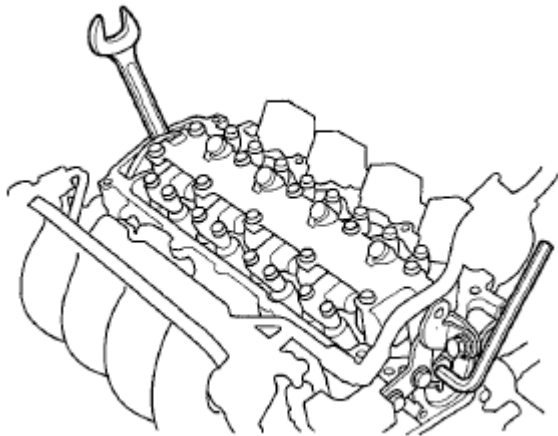


Fig. 66: Identifying Camshaft Bolt

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

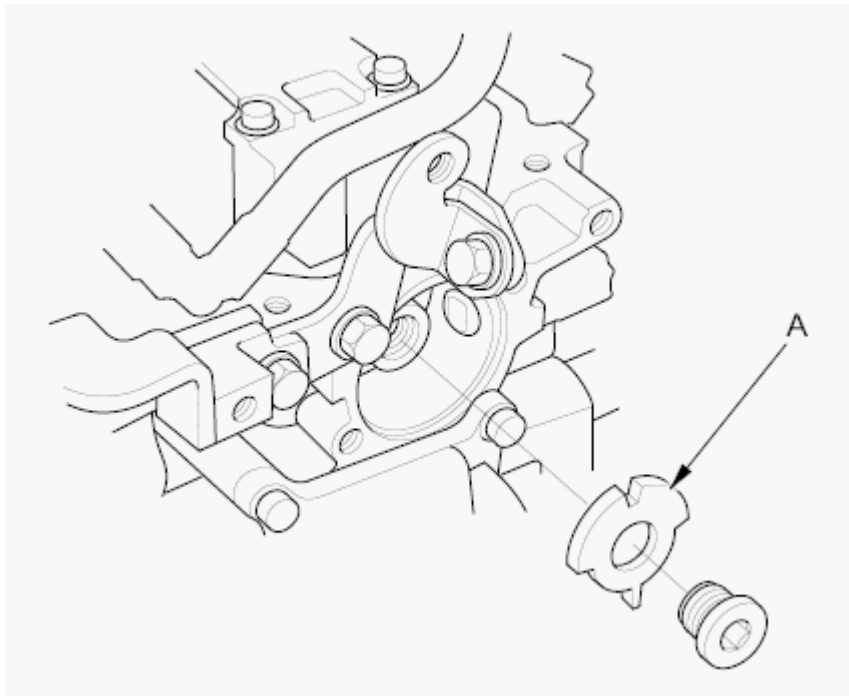


Fig. 67: Identifying Camshaft Position (CMP) Pulse Plate
Courtesy of AMERICAN HONDA MOTOR CO., INC.

INSTALLATION

1. Install the CMP pulse plate (A).

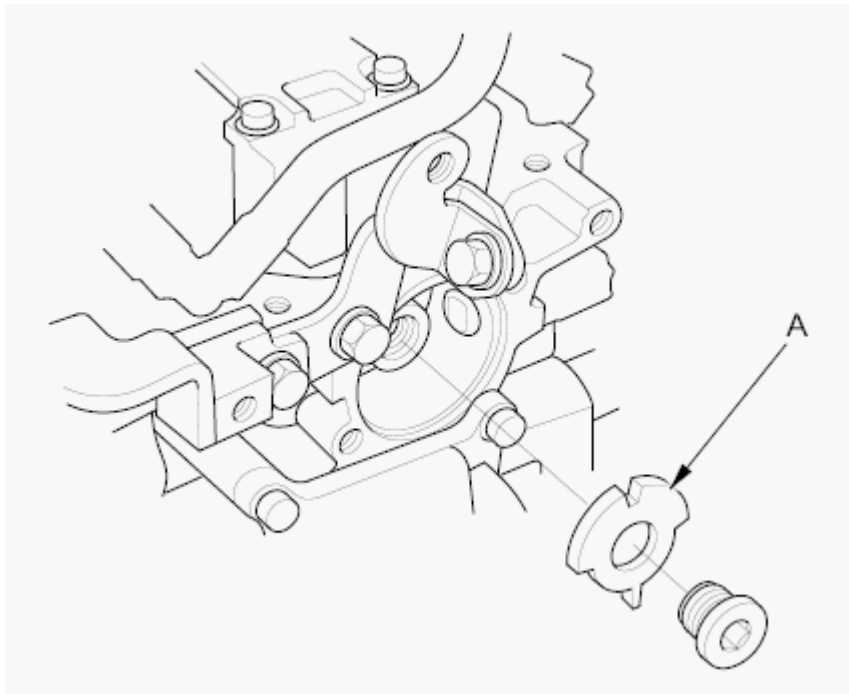


Fig. 68: Identifying Camshaft Position (CMP) Pulse Plate
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Hold the camshaft with an open-end wrench, then tighten the bolt.

Specified Torque

14 x 1.5 mm

34 N.m (3.5 kgf.m, 25 lbf.ft)

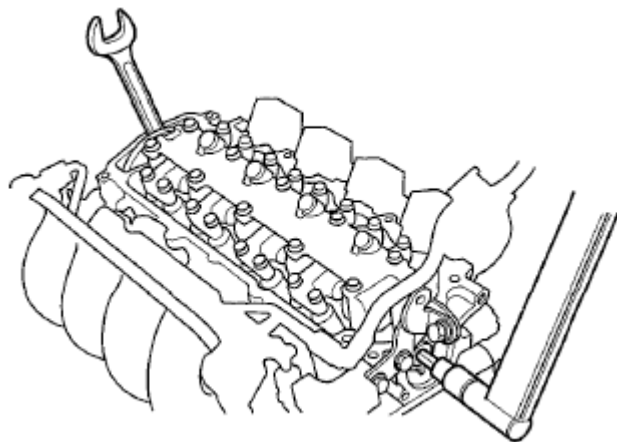


Fig. 69: Identifying Camshaft Bolt

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the camshaft thrust cover (A) with new O-ring (B).

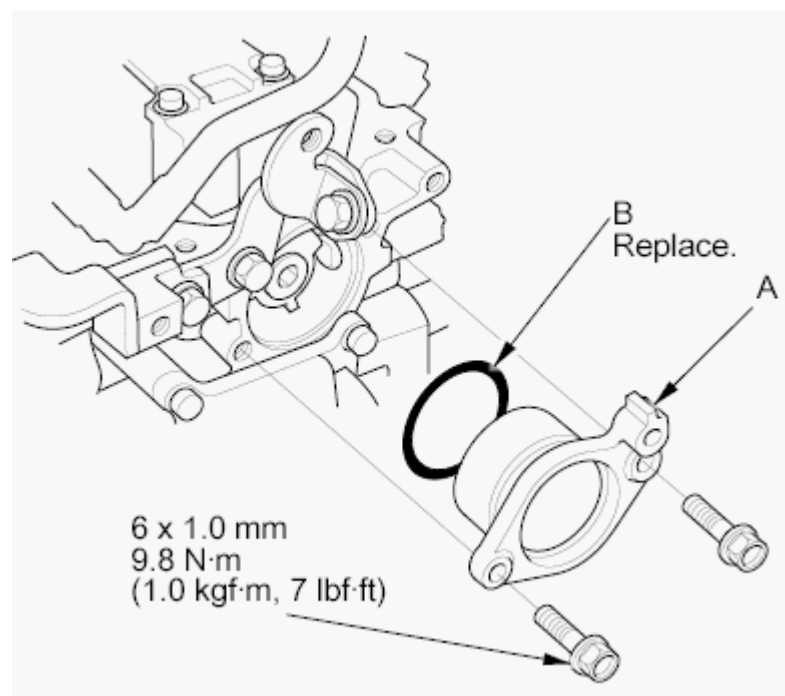


Fig. 70: Identifying Camshaft Thrust Cover & O-Ring With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Install the cylinder head cover (see **CYLINDER HEAD COVER INSTALLATION**).
5. Install the harness holder, then install the ground cable (see step 12).
6. Install the following engine wire harness connectors and wire harness clamps from the cylinder head:
 - Four injector connector
 - Engine coolant temperature (ECT) sensor 1 connector
 - Camshaft position (CMP) sensor connector
 - Air fuel ratio (A/F) sensor connector
 - Secondary heated oxygen sensor (secondary HO2S) connector
7. Install the intake manifold chamber (see **INSTALLATION**).
8. Install the air cleaner (see **AIR CLEANER REMOVAL/INSTALLATION**).

CAMSHAFT SPROCKET REMOVAL

NOTE: Keep the cam chain away from magnetic fields.

1. Remove the drive belt (see **DRIVE BELT REMOVAL/INSTALLATION**).
2. Remove the drive belt auto-tensioner (see **DRIVE BELT AUTO-TENSIONER REMOVAL/INSTALLATION**).
3. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
4. Make a reference mark (A) across the camshaft sprocket and cam chain.

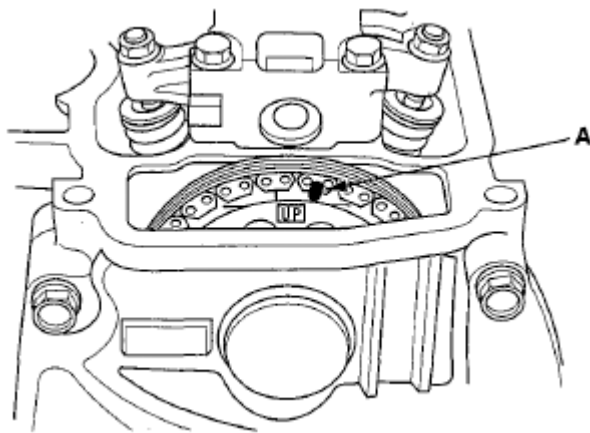


Fig. 71: Identifying Mark On Camshaft Sprocket & Cam Chain
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Apply new engine oil to the slider surface of the cam chain tensioner slider through the oil return hole in the cylinder head.

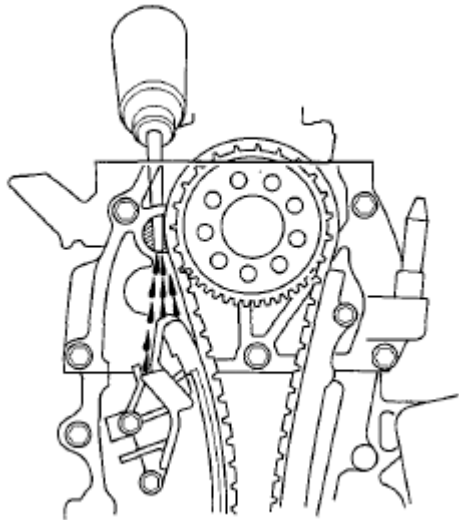


Fig. 72: Applying Engine Oil To Slider Surface Of Cam Chain Tensioner Slider
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the cylinder head plug.

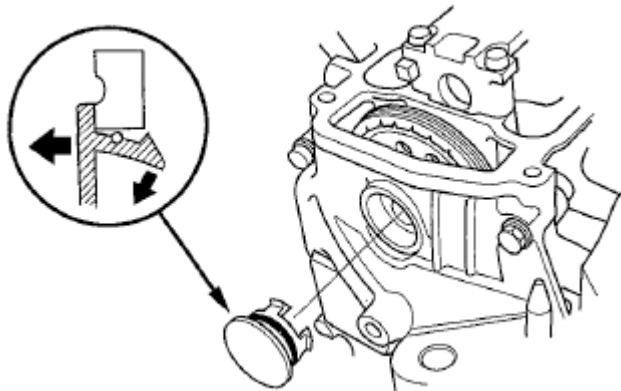


Fig. 73: Identifying Cylinder Head Plug
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Hold the crankshaft pulley and set the socket wrench (A) on the camshaft sprocket bolt.

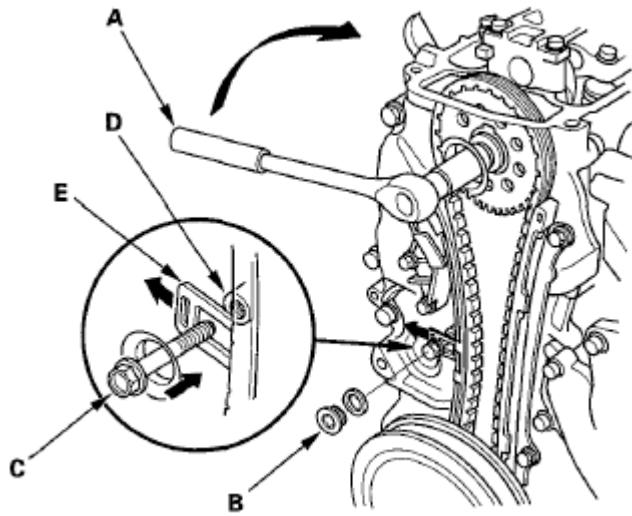


Fig. 74: Turning Camshaft Clockwise To Compressing Cam Chain Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Remove the maintenance bolt (B), and turn the camshaft clockwise to compress the cam chain tensioner, then install the 6 x 1.0 mm bolt (C) in the bolt hole (D) on the engine block through the maintenance hole and cam chain tensioner (E).

NOTE:

- Turning torque should not exceed 56 N.m (5.7 kgf.m, 41 lbf.ft), when turning the camshaft.
- Do not turn the camshaft counterclockwise.

9. Hold the camshaft with an open-end wrench, then remove the camshaft sprocket.

NOTE:

Hang the cam chain with a wire.

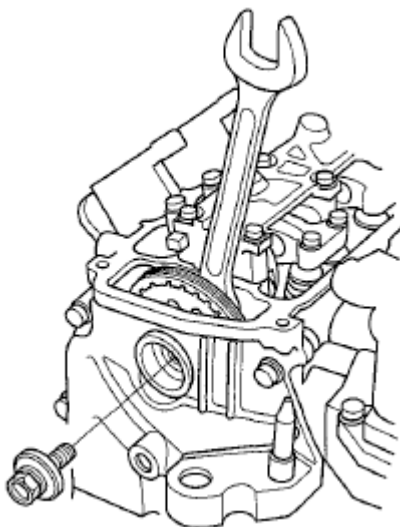


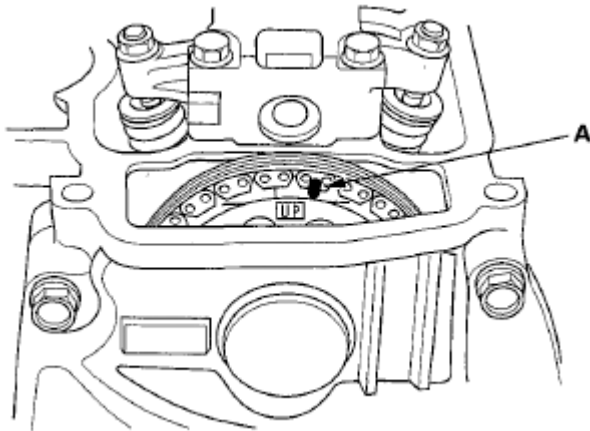
Fig. 75: Identifying Camshaft Sprocket

Courtesy of AMERICAN HONDA MOTOR CO., INC.

CAMSHAFT SPROCKET INSTALLATION

NOTE: Keep the cam chain away from magnetic fields.

1. Install the cam chain to the camshaft sprocket by aligning the reference mark (A), then install the camshaft sprocket on the camshaft.

**Fig. 76: Aligning Mark On Camshaft Sprocket & Camshaft**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Apply new engine oil to the threads and flange of camshaft sprocket bolt.
3. Hold the camshaft with a 27 mm open-end wrench, then tighten the bolt.

Specified torque:

56 N.m (5.7 kgf.m, 41 lbf.ft)

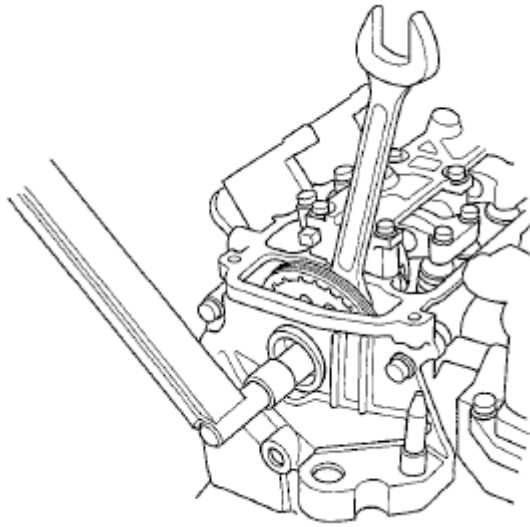


Fig. 77: Identifying Camshaft Bolt

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Apply new engine oil to the slider surface of the cam chain tensioner slider through the oil return hole in the cylinder head.

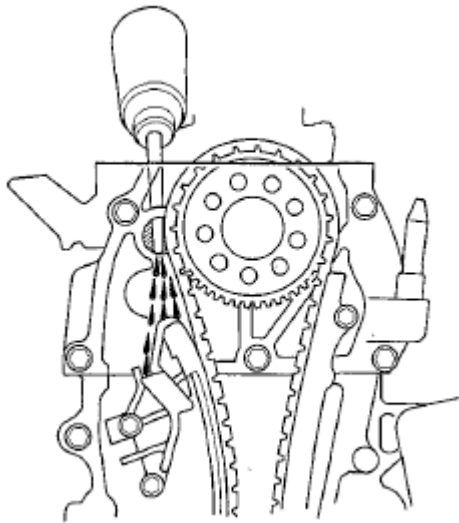


Fig. 78: Applying Engine Oil To Slider Surface Of Cam Chain Tensioner Slider

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Hold the crankshaft pulley and set the socket wrench (A) on the camshaft sprocket bolt.

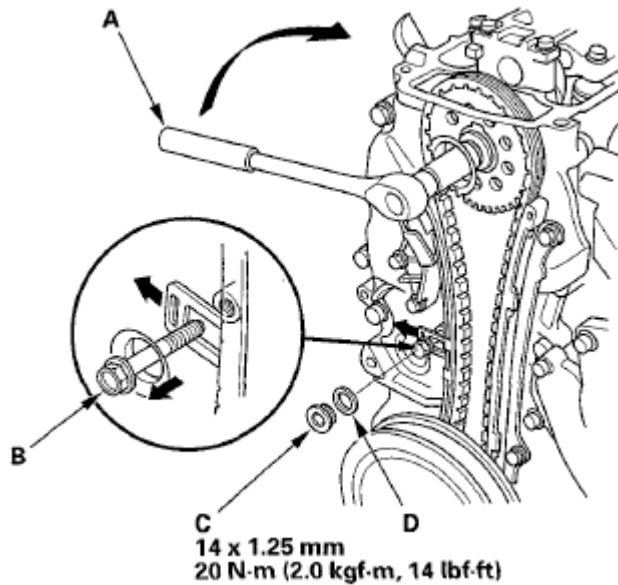


Fig. 79: Turning Camshaft Clockwise To Compressing Cam Chain Tensioner With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Turn the camshaft clockwise to compress the cam chain tensioner, then remove the 6 x 1.0 mm bolt (B).

NOTE:

- Turning torque should not exceed 56 N.m (5.7 kgf.m, 41 lbf.ft), when turning the camshaft.
- Do not turn the camshaft counterclockwise.

7. Install the maintenance bolt (C) with a new washer (D). (See **Fig. 79**)
8. Install the new cylinder head plug.

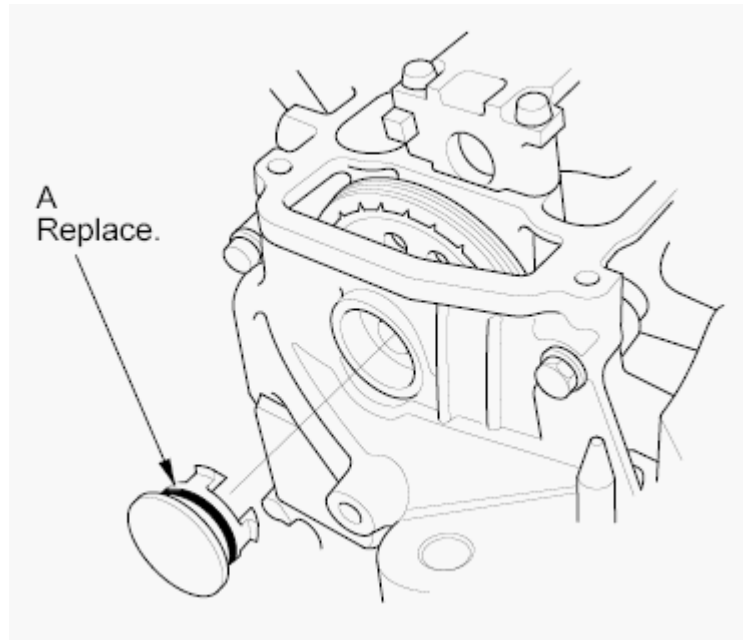


Fig. 80: Identifying Cylinder Head Plug
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Install the cylinder head cover (see CYLINDER HEAD COVER INSTALLATION).

CYLINDER HEAD INSPECTION FOR WARPAGE

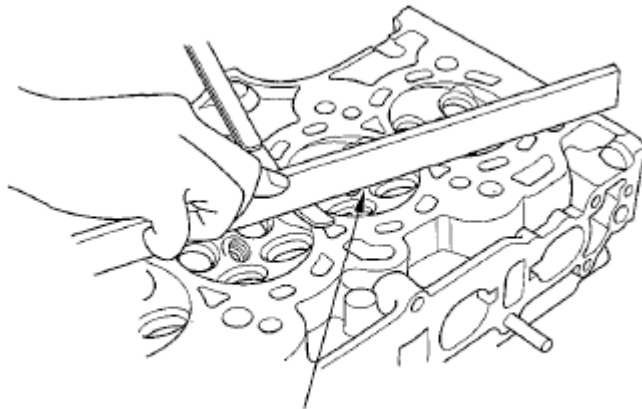
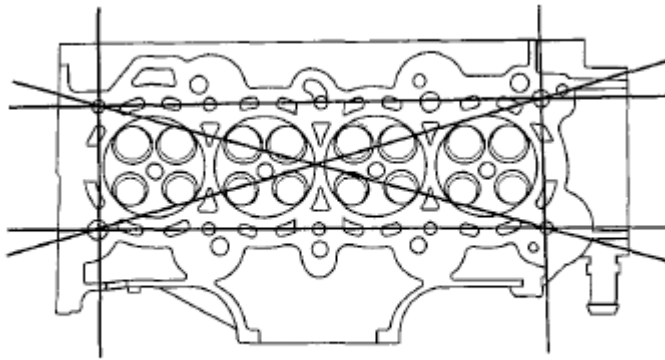
1. Remove the cylinder head (see CYLINDER HEAD REMOVAL).
2. Inspect the camshaft (see CAMSHAFT INSPECTION).
3. Check the cylinder head for warpage. Measure along the edges, and three ways across the center.
 - If warpage is less than 0.08 mm (0.003 in.) cylinder head resurfacing is not required.
 - Maximum resurface limit is 0.2 mm (0.008 in.) based on a height of 120 mm (4.72 in.).

Cylinder Head Warpage

Standard (New): 0.08 mm (0.003 in.)

Cylinder Head Height

Standard (New): 119.9-120.1 mm (4.720-4.728 in.)



PRECISION STRAIGHT EDGE

Fig. 81: Inspecting 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).

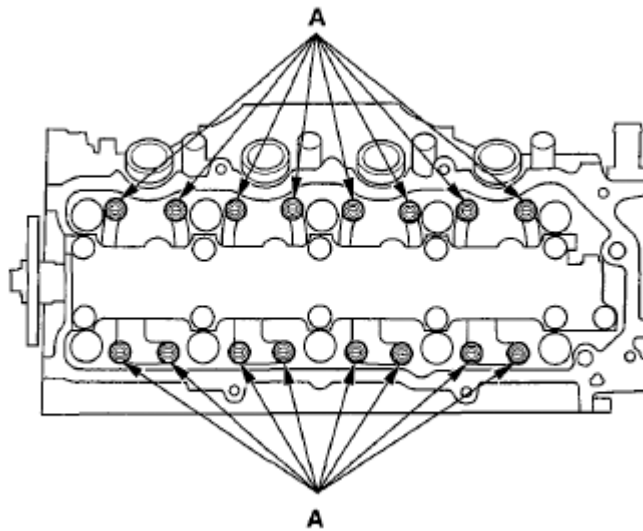


Fig. 82: Identifying Rocker Arm Adjusting Screws
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Unscrew the rocker shaft mounting bolts two turns at a time in sequence shown below.

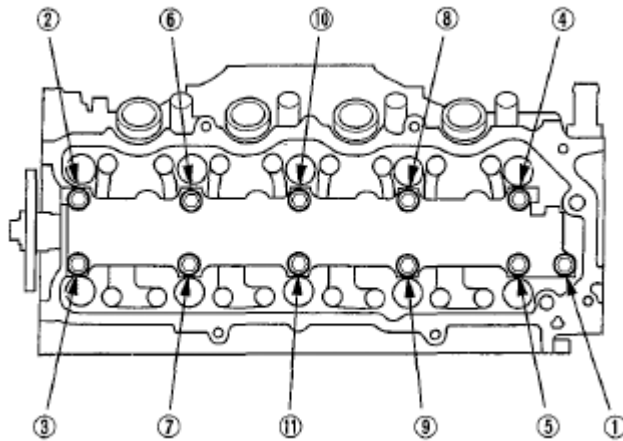


Fig. 83: Identifying Rocker Shaft Mounting Bolts Loosening Sequence
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the rocker shaft mounting bolts, then remove the rocker arm assembly.

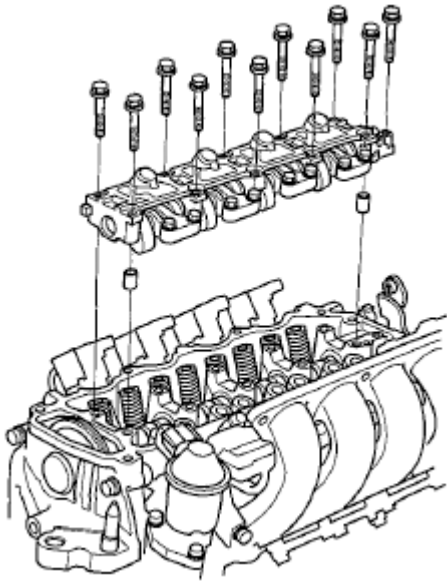


Fig. 84: Identifying Rocker Arm Assembly With Rocker Shaft Mounting Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY

NOTE:

- Identify each part as it is removed so that each item can be reinstalled in its original position.
- Inspect the rocker arm shaft and the rocker arms (see **ROCKER ARM AND SHAFT INSPECTION**).
- If reused, the rocker arms must be installed in the their original location.
- Remove the rocker shaft bolt before removing the rocker shaft from the rocker shaft holder bridge.
- Prior to reassembling, clean all the parts in solvent, dry them, and apply new engine oil to any contact points, the bearing surfaces, and lost motions.
- When replacing the rocker arm assembly, remove the fastening hardware from the new rocker arm assembly.

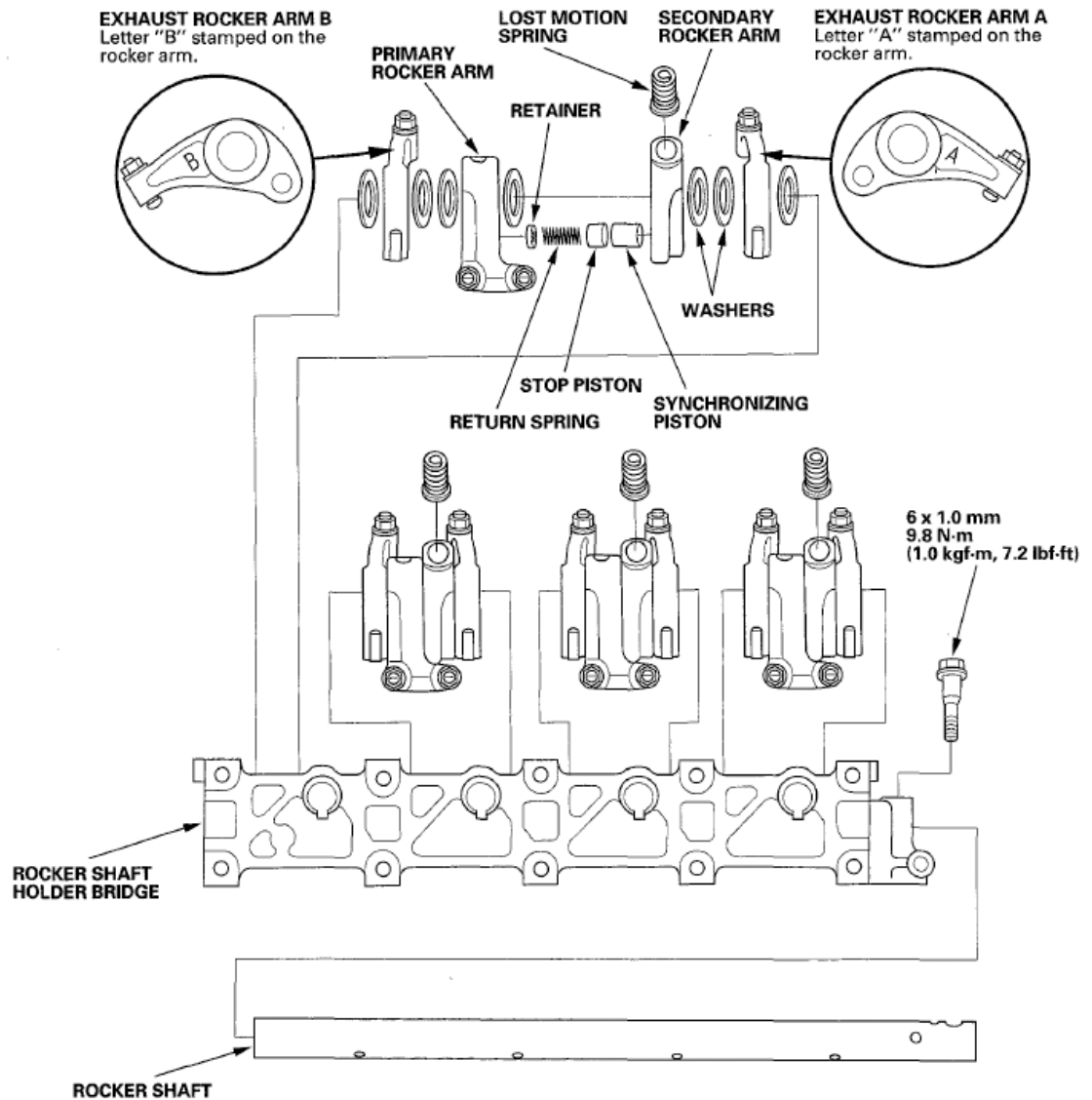


Fig. 85: Identifying Rocker Arm & Shaft Replacement Components With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM AND SHAFT INSPECTION

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

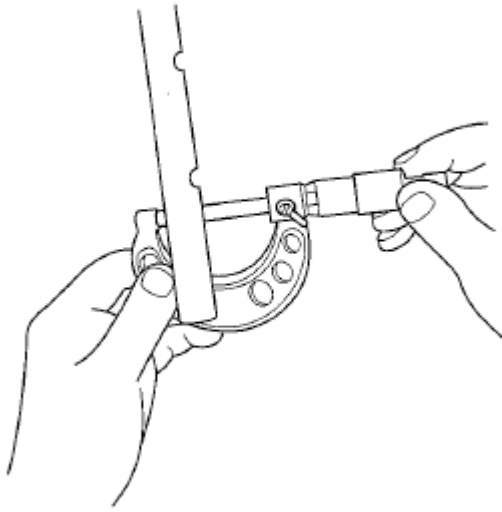


Fig. 86: Measuring Diameter Of Shaft At First Rocker Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

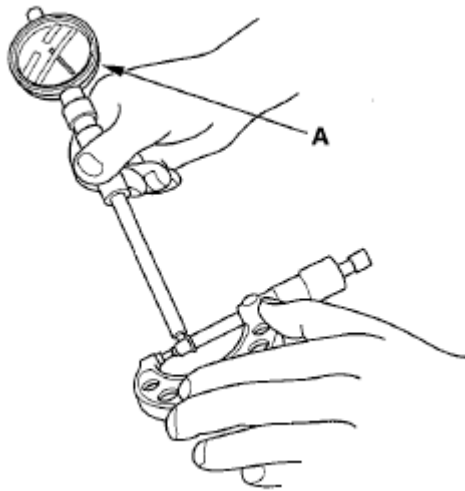


Fig. 87: Identifying Gauge
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Rocker Arm-to-Shaft Clearance

Intake:

Standard (New): 0.017-0.048 mm (0.0007-0.0019 in.)

Service Limit: 0.08 mm (0.0031 in.)

Exhaust:

Standard (New): 0.019-0.050 mm (0.0007-0.0020 in.)

Service Limit: 0.08 mm (0.0031 in.)

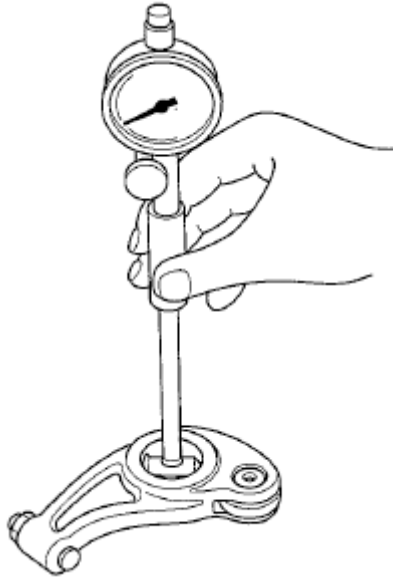


Fig. 88: Measuring Inside Diameter Of Rocker Arm
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Repeat for all rockers and shaft. If the clearance is beyond the service limit, replace the rocker shaft and all out of service limit rocker arms. If any VTEC rocker arm needs replacement, replace the rocker arms as an assembly.

VTEC Rocker Arms

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

NOTE:

- **Apply new engine oil to the rocker arm pistons when reassembling.**
- **When disassembling the secondary rocker arm A, carefully apply air pressure to the oil passage of the rocker arm to remove the pistons.**

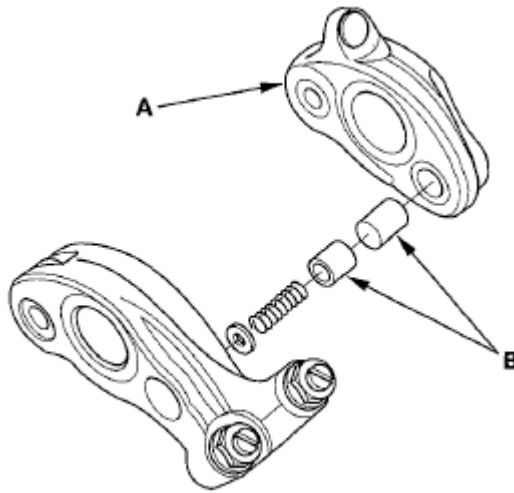


Fig. 89: Identifying Rocker Arm & Pistons
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

CAMSHAFT REMOVAL

1. Remove the air cleaner housing assembly (see **AIR CLEANER REMOVAL/INSTALLATION**).
2. Remove the intake manifold chamber (see **REMOVAL**).
3. Remove the following engine wire harness connectors and wire harness clamps from the cylinder head:
 - Four injector connectors
 - Engine coolant temperature (ECT) sensor 1 connector
 - Camshaft position (CMP) sensor connector
 - Air fuel ratio (A/F) sensor connector
 - Secondary heated oxygen sensor (secondary HO2S) connector
4. Remove the harness holder mounting bolt and the ground cable, then remove the harness holder from the bracket (see step 12).
5. Remove the camshaft sprocket (see **CAMSHAFT SPROCKET REMOVAL**).
6. Remove the rocker arm assembly (see **ROCKER ARM ASSEMBLY REMOVAL**).
7. Remove the CMP sensor (see **CMP SENSOR REPLACEMENT**).
8. Remove the camshaft thrust cover (A), then remove the camshaft (B).

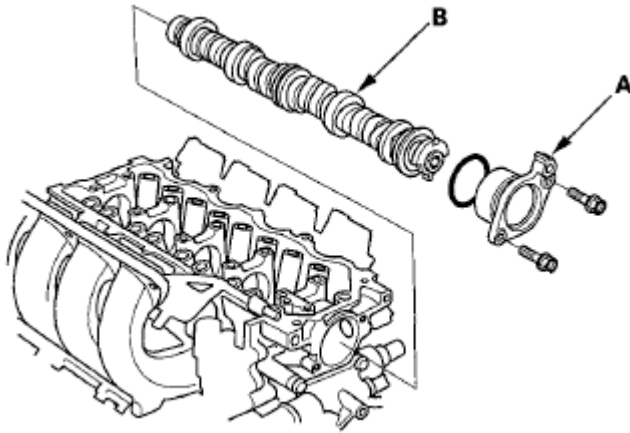


Fig. 90: Identifying Camshaft Thrust Cover & Camshaft
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

CAMSHAFT INSPECTION

1. Remove the camshaft sprocket (see CAMSHAFT SPROCKET REMOVAL).
2. Remove the rocker arm assembly (see ROCKER ARM ASSEMBLY REMOVAL), then disassemble the rocker arm (see ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY).
3. Put the rocker shaft holder bridge/rocker shaft holders on the cylinder head, then tighten the bolts to the specified torque.

Specified Torque

6 x 1.0 mm

(1)-(10): 15 N.m (1.5 kgf.m, 11 lbf.ft)

(11): 9.8 N.m (1.0 kgf.m, 7.2 lbf.ft)

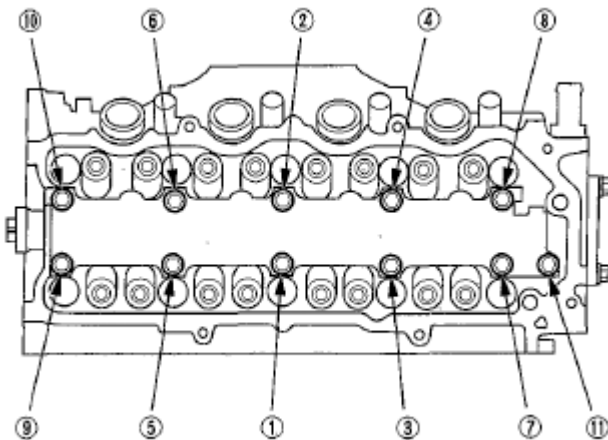


Fig. 91: Identifying Cylinder Head Bolt Torque Sequence

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Camshaft End Play

Standard (New): 0.05-0.25 mm (0.002-0.010 in.)

Service Limit: 0.5 mm (0.02 in.)

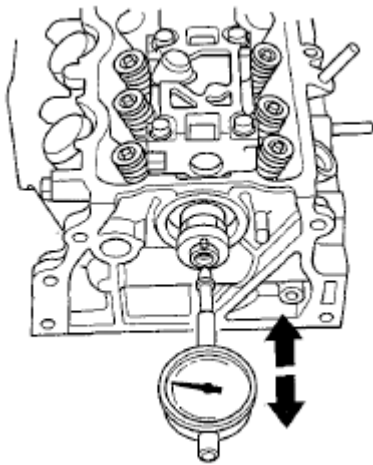


Fig. 92: Identifying Camshaft End Play

Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the camshaft (see **CAMSHAFT REMOVAL**).
7. Wipe the camshaft clean, then inspect the lift ramps. Replace the camshaft if any lobes are pitted, scored, or excessively worn.
8. Measure the diameter of each camshaft journal.

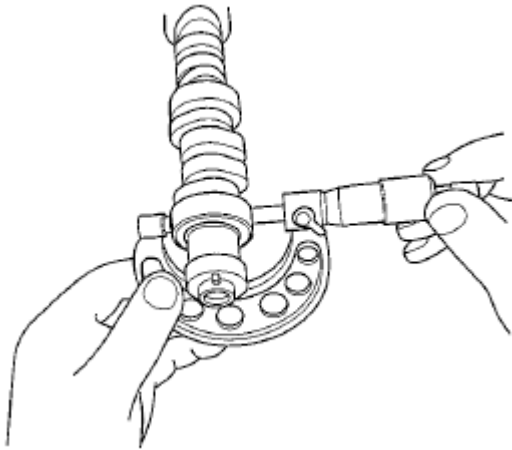


Fig. 93: Measuring Diameter Of Camshaft Journal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Zero the gauge (A) to the journal diameter.

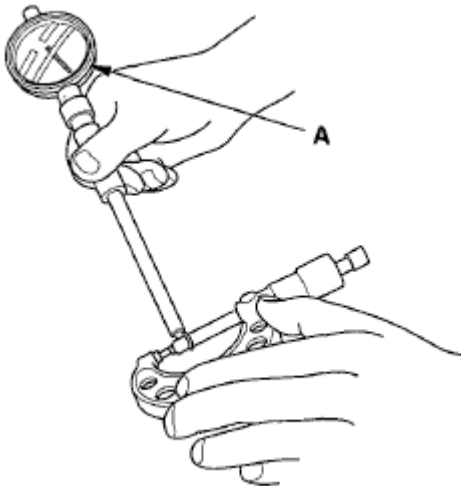


Fig. 94: Identifying Gauge
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Clean the camshaft bearing surfaces in the cylinder head. Measure the inside diameter of each camshaft bearing surface, and check for an out-of-round condition.
- If the camshaft-to-holder clearance is within limits, go to step 12.
 - If the camshaft-to-holder clearance is beyond the service limit, and the camshaft has been replaced, replace the cylinder head.
 - If the camshaft-to-holder clearance is beyond the service limit, and the camshaft has not been replaced, go to step 11.

Camshaft-to-Holder Oil Clearance

Standard (New): 0.045-0.084 mm

(0.0018-0.0033 in.)

Service Limit: 0.100 mm (0.004 in.)

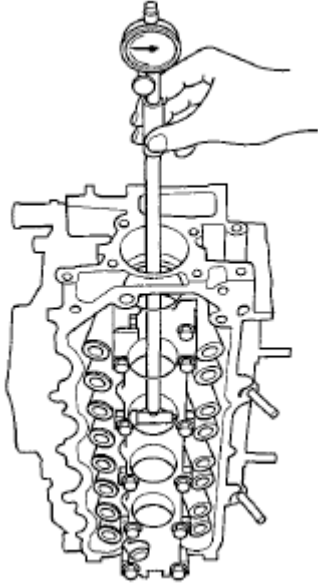


Fig. 95: Measuring Inside Diameter Of Camshaft-To-Holder Oil Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Camshaft Total Runout

Standard (New): 0.03 mm (0.0012 in.) max.

Service Limit: 0.04 mm (0.002 in.)

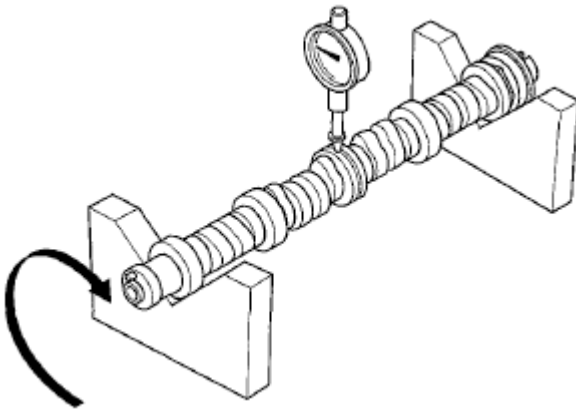


Fig. 96: Identifying Camshaft Total Runout
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Measure the cam lobe height.

Cam Lobe Height Standard (New):

CAM LOBE HEIGHT SPECIFICATION TABLE

-	INTAKE	EXHAUST
PRI	35.241 mm (1.3874 in.)	35.471 mm (1.3965 in.)
SEC	36.173 mm (1.4241 in.)	

PRI: Primary, SEC: Secondary

C/C: Cam Chain, IN: Intake, EX: Exhaust

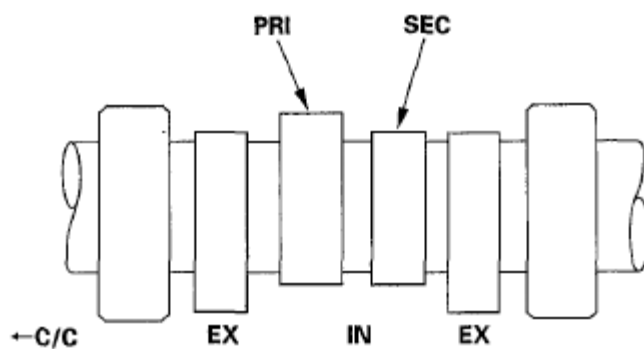


Fig. 97: Identifying Cam Lobe Height
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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. Remove the rocker arm assembly (see **ROCKER ARM ASSEMBLY REMOVAL**)
3. Remove the camshaft (see **CAMSHAFT REMOVAL**)
4. Using an appropriate-sized socket (A) and plastic mallet (B), lightly tap the spring retainer to loosen the valve cotters.

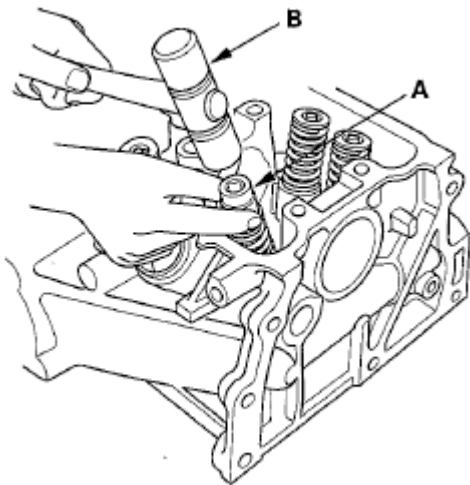


Fig. 98: Tapping Spring Retainer To Loosening Valve Cotters Using Socket & Plastic Mallet
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

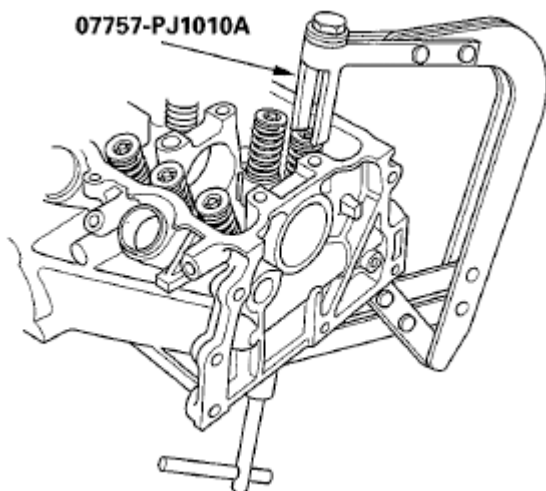


Fig. 99: Identifying Valve Spring Compressor & Attachment
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the valve spring compressor and the valve spring compressor attachment, then remove the spring retainer, the valve spring, and the valve.
7. Install the valve guide seal remover.

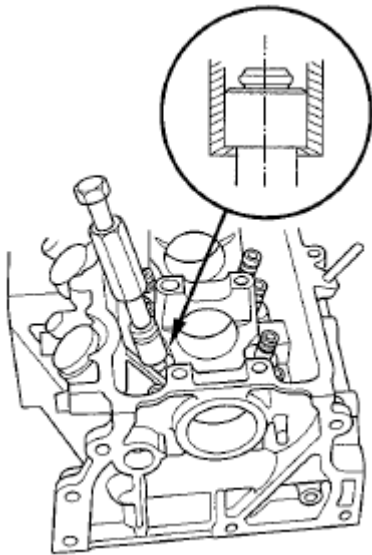


Fig. 100: Identifying Valve Guide Seal Remover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Remove the valve seal.

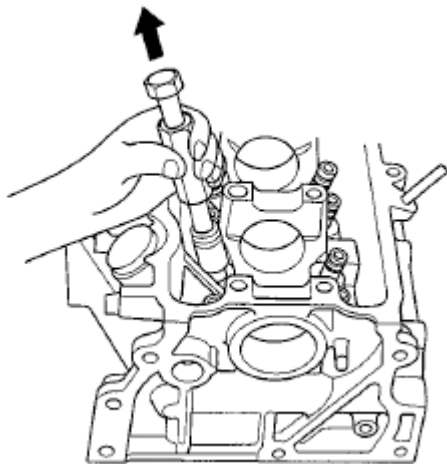


Fig. 101: Identifying Valve Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Remove the valve spring seat.

VALVE INSPECTION

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

Intake Valve Dimensions

A Standard (New): 27.85-28.15 mm (1.096-1.108 in.)

B Standard (New): 118.55-119.15 mm (4.667-4.691 in.)

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

C Service Limit: 5.45 mm (0.215 in.)

Exhaust Valve Dimensions

A Standard (New): 22.85-23.15 mm (0.900-0.911 in.)

B Standard (New): 117.25-117.85 mm (4.616-4.640 in.)

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

C Service Limit: 5.42 mm (0.213 in.)

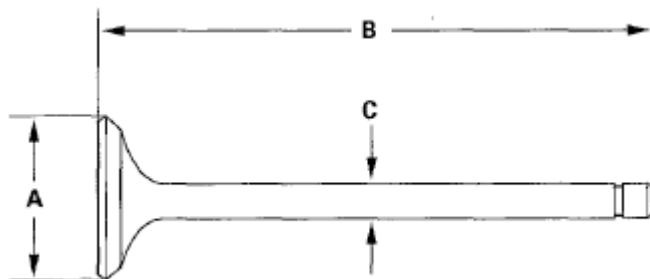


Fig. 102: Identifying Intake Valve Dimensions
Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVE STEM-TO-GUIDE CLEARANCE INSPECTION

1. Remove the valves (see VALVE, SPRING, AND VALVE SEAL REMOVAL).
2. Subtract the O.D. of the valve stem, measured with a micrometer, from the I.D. of the valve guide, measured with an inside micrometer or ball gauge. Take the measurements in three places along the valve stem and three places inside the valve guide. The difference between the largest guide measurement and the smallest stem measurement should not exceed the service limit.

Intake Valve Stem-to-Guide Clearance

Standard (New): 0.020-0.050 mm (0.0008-0.0020 in.)

Service Limit: 0.08 mm (0.003 in.)

Exhaust Valve Stem-to-Guide Clearance

Standard (New): 0.050-0.080 mm (0.0020-0.0031 in.)

Service Limit: 0.11 mm (0.004 in.)

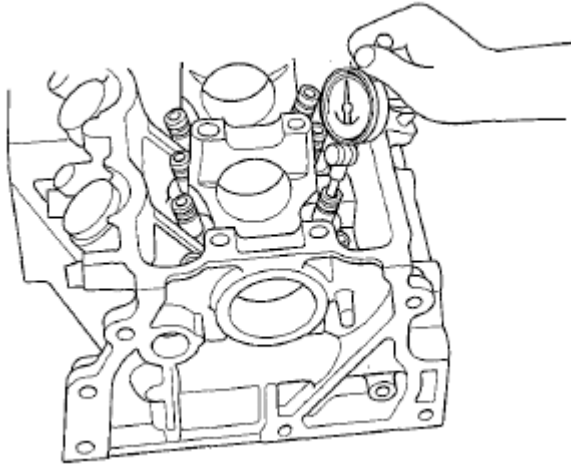


Fig. 103: Measuring Intake Valve Stem-To-Guide Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVE GUIDE REPLACEMENT

SPECIAL TOOLS REQUIRED

- Valve Guide Driver, 5.35 x 9.7 mm 07742-0010100
- Valve Guide Reamer, 5.5 mm 07HAH-PJ7A100

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

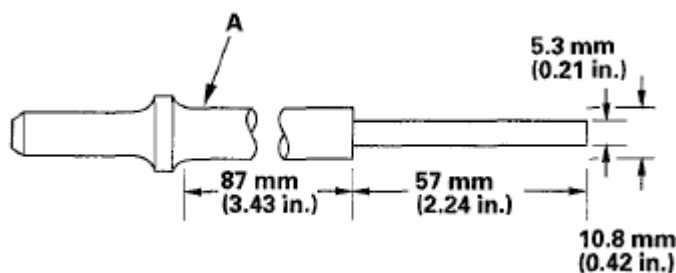


Fig. 104: Identifying Air-Impact Valve Guide Driver Dimensions
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

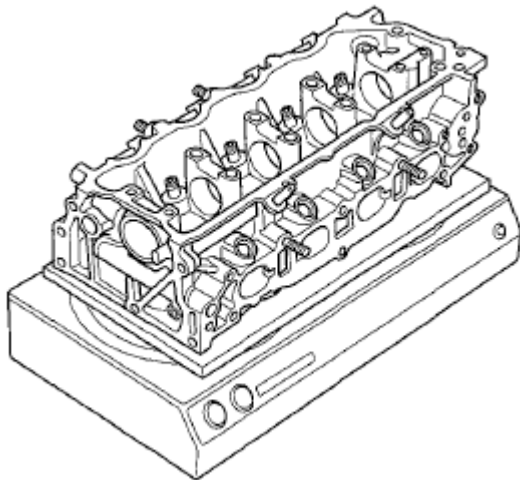


Fig. 105: Heating Cylinder Head Using Hot Plate Or Oven
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Working from the camshaft side, use the valve guide 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.
6. Turn the head over, and drive the guide out toward the camshaft side of the head.

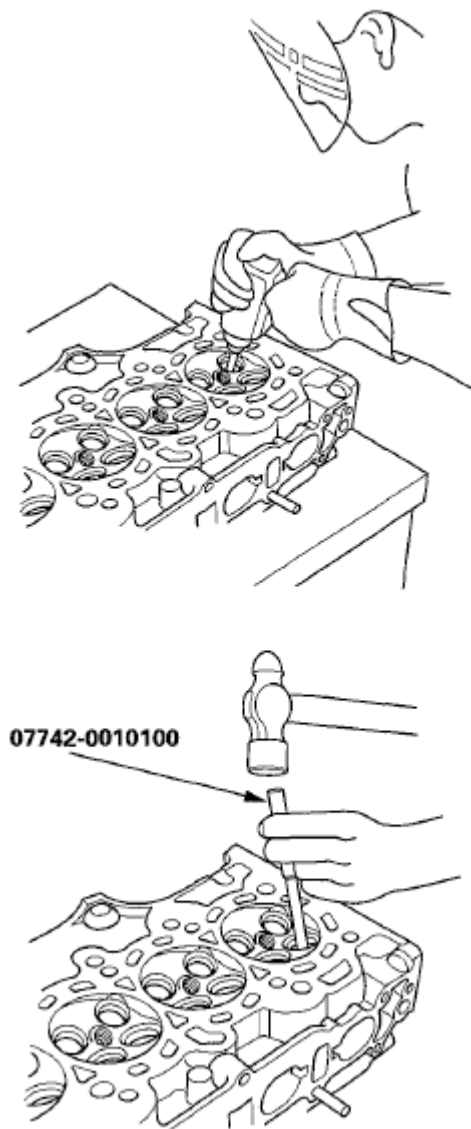


Fig. 106: Driving Guide Using Valve Guide Driver & Air Hammer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. If a valve guide will not move, drill it out with an 8 mm (5/16 in) drill bit, then try again.

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

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

Valve Guide Installed Height:

15.85-16.35 mm (0.6240-0.6437 in.)

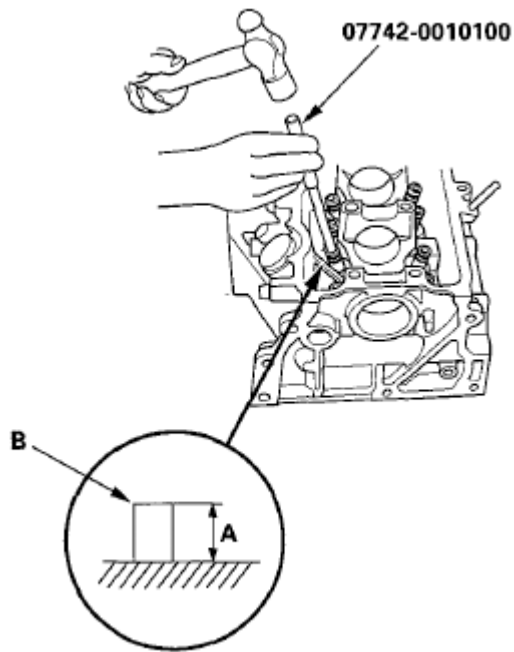


Fig. 107: View Of Guide From Camshaft Side Of Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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



Fig. 108: Rotating Reamer Of Valve Guide Bore
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Continue to rotate the reamer clockwise while removing it from the bore.
13. Thoroughly wash the guide in detergent and water to remove any cutting residue.

14. Check the clearances with a valve (see VALVE STEM-TO-GUIDE CLEARANCE INSPECTION). Verify that a valve slides in the intake and exhaust valve guides without sticking.
15. Inspect the valve seating. If necessary renew the valve seat using a valve seat cutter (see VALVE SEAT RECONDITIONING).

VALVE SEAT RECONDITIONING

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

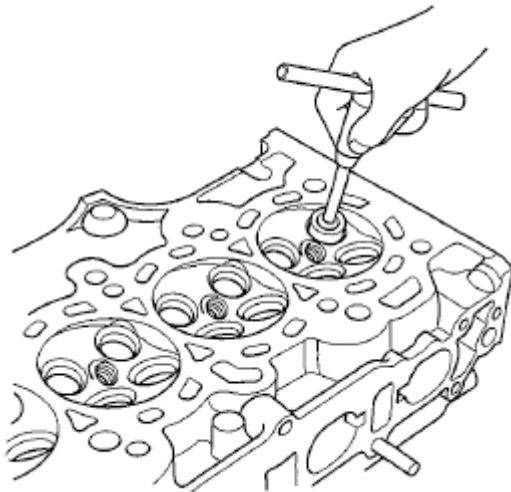


Fig. 109: Reconditioning Valve Seats In Cylinder Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Carefully cut a 45° seat, removing only enough material to ensure a smooth and concentric seat.
4. Bevel the upper and lower edges at the angles shown below.

Check the width of the seat and adjust accordingly.

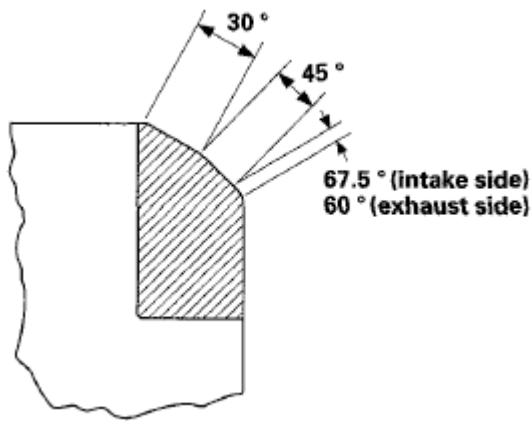


Fig. 110: Identifying Bevel Upper & Lower Angles
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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): 0.850-1.150 mm (0.0335-0.0453 in.)

Service Limit: 1.60 mm (0.063 in.)

Exhaust:

Standard (New): 1.250-1.550 mm (0.0492-0.0610 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.

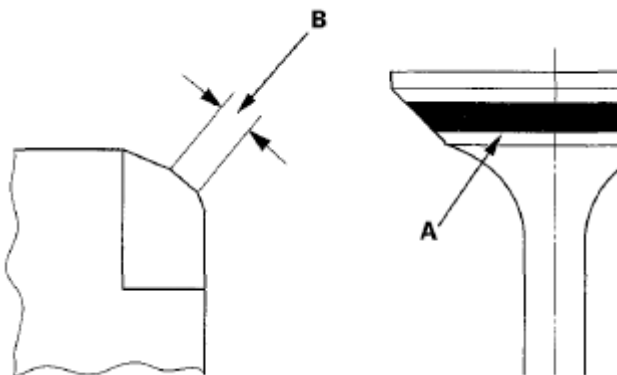


Fig. 111: Applying Prussian Blue Compound To Valve Face
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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 67.5° cutter (intake) or 60° cutter (exhaust) 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 30° 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

Standard (New): 46.1-46.5 mm (1.815-1.831 in.)

Service Limit: 46.8 mm (1.843 in.)

Exhaust Valve Stem Installed Height

Standard (New): 46.2-46.6 mm (1.819-1.835 in.)

Service Limit: 46.9 mm (1.846 in.)

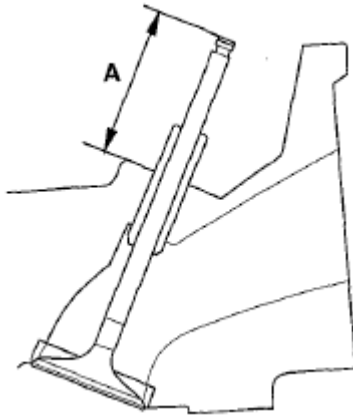


Fig. 112: Identifying Intake Valve Stem Installed Height
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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-PJ1010A

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

NOTE: 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.

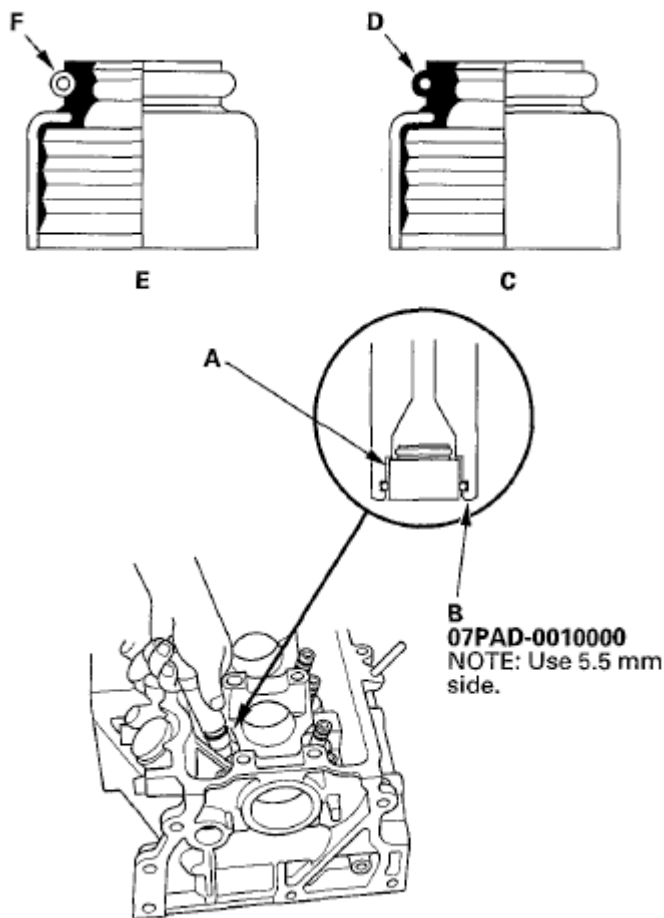


Fig. 113: View Of Valve Guide Seal Installer
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

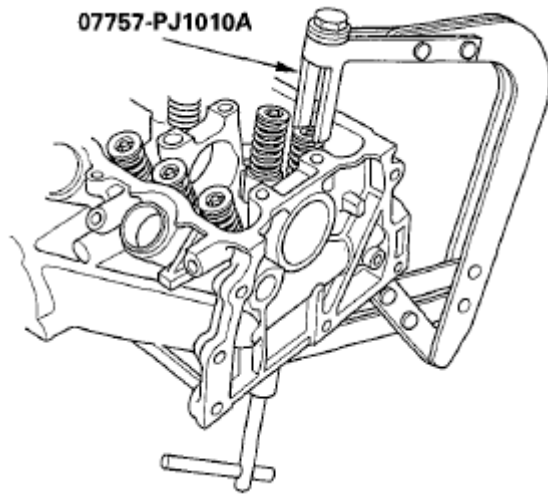


Fig. 114: Identifying Valve Cotters

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

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

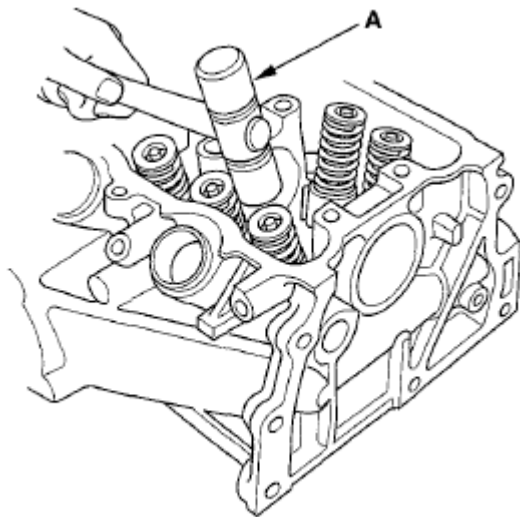


Fig. 115: Tapping End Of Each Valve Stem With Plastic Mallet

Courtesy of AMERICAN HONDA MOTOR CO., INC.

CAMSHAFT INSTALLATION

1. Install the camshaft (A).

NOTE: Apply new engine oil to the journals and the cam lobes.

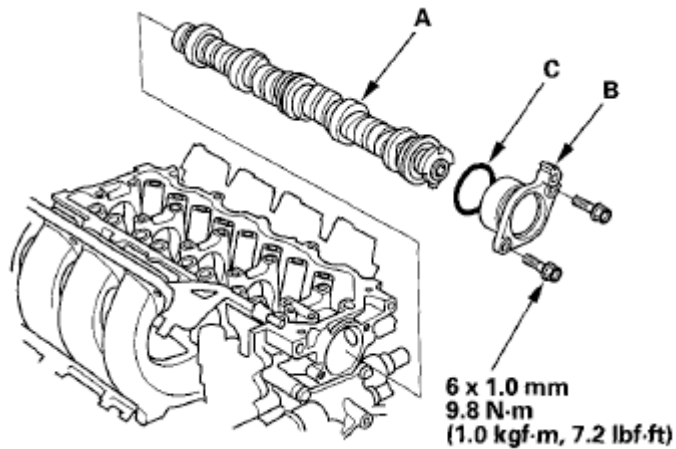


Fig. 116: Identifying Camshaft, Camshaft Thrust Cover & O-Ring
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Install the CMP pulse plate (see INSTALLATION).
3. Install the camshaft position (CMP) sensor (see CMP SENSOR REPLACEMENT).
4. Install the rocker arm assembly (see ROCKER ARM ASSEMBLY INSTALLATION).
5. Install the camshaft sprocket (see CAMSHAFT SPROCKET INSTALLATION).

ROCKER ARM ASSEMBLY INSTALLATION

1. If the rocker arm assembly is disassembled, reassemble the rocker arm assembly. (See ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY). Refer to Fig. 85.
2. Apply engine oil to the end of the valve stem.
3. Install the rocker arm assembly.

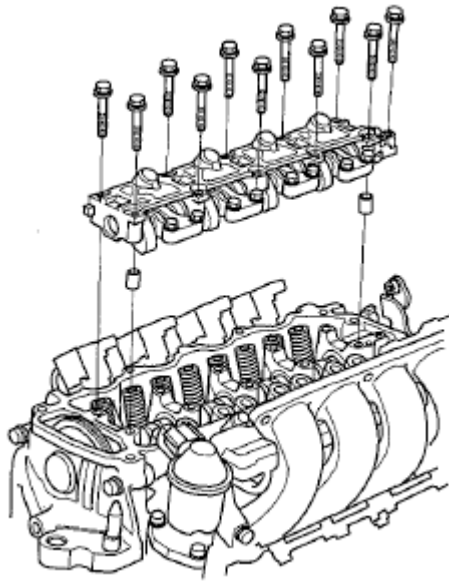


Fig. 117: Identifying Rocker Arm Assembly And Fasteners
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Tighten each bolts two turns at a time in the sequence shown below.

Specified Torque

6 x 1.0 mm

(1)-(10): 15 N.m (1.5 kgf.m, 11 lbf.ft)

(11): 9.8 N.m (1.0 kgf.m, 7.2 lbf.ft)

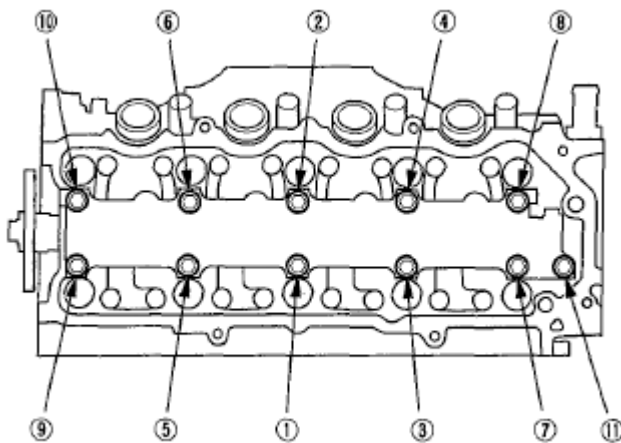


Fig. 118: Identifying Rocker Arm Assembly Bolts Tightening Sequence
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Adjust the valve clearance (see VALVE CLEARANCE ADJUSTMENT).

6. Install the cylinder head cover (see **CYLINDER HEAD COVER INSTALLATION**).

CYLINDER HEAD INSTALLATION

1. Clean the cylinder head and the block surface.
2. Install a new coolant separator (A) in the engine block whenever the engine block is replaced.

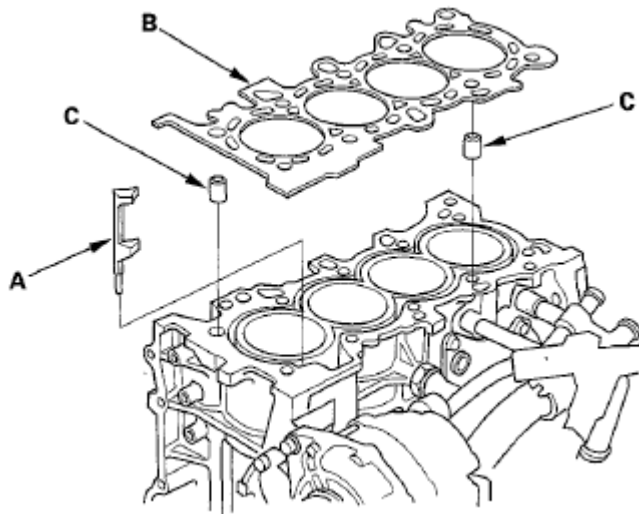


Fig. 119: Identifying Coolant Separator, Cylinder Head Gasket & Dowel Pins
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the new cylinder head gasket (B) and the dowel pins (C) on the engine block. Always use a new cylinder head gasket.
4. Set the crankshaft to top dead center (TDC). Align the TDC mark (A) on the crankshaft sprocket with the pointer (B) on the oil pump.

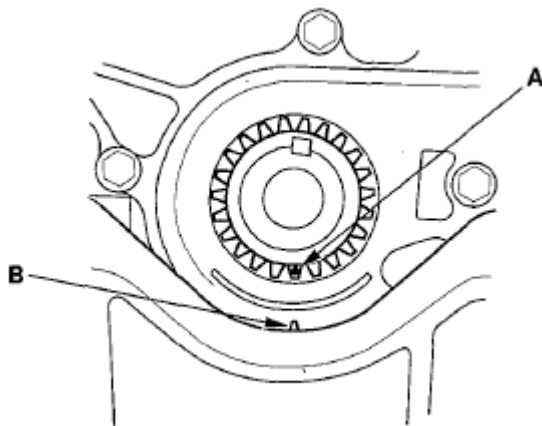


Fig. 120: Aligning TDC Mark On Crankshaft Sprocket With Pointer On Oil Pump
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Set the camshaft TDC. The "UP" mark (A) on the camshaft sprocket should be at the top, and the TDC grooves (B) on the camshaft sprocket should line up with the top edge of the head.

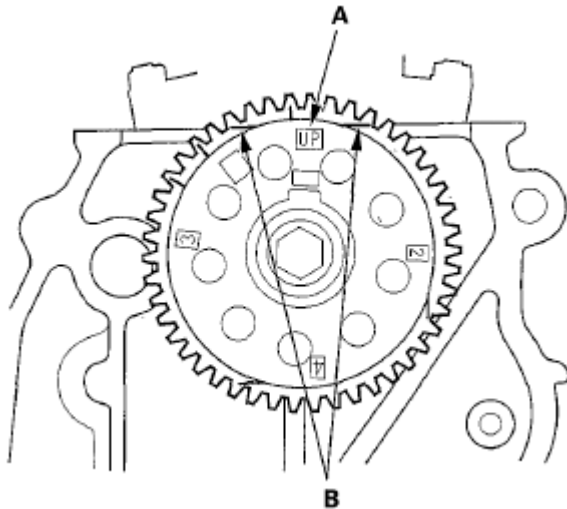


Fig. 121: Identifying UP Mark On Camshaft Sprocket
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

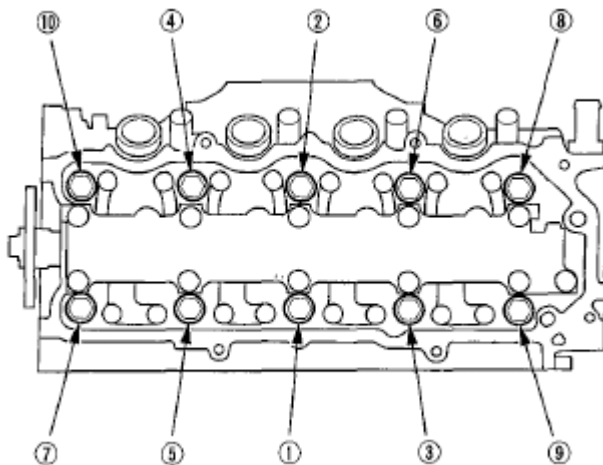


Fig. 122: Identifying Cylinder Head Bolt Tightening Sequence
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Tighten all cylinder head bolts an additional 130°.

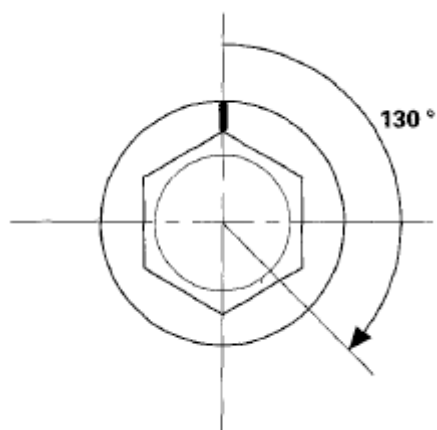


Fig. 123: Tightening Cylinder Head Bolts

Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Install the cam chain (see CAM CHAIN INSTALLATION).
11. Install the cylinder head cover (see CYLINDER HEAD COVER INSTALLATION).
12. Install the harness holder (A), then install the ground cable (B).

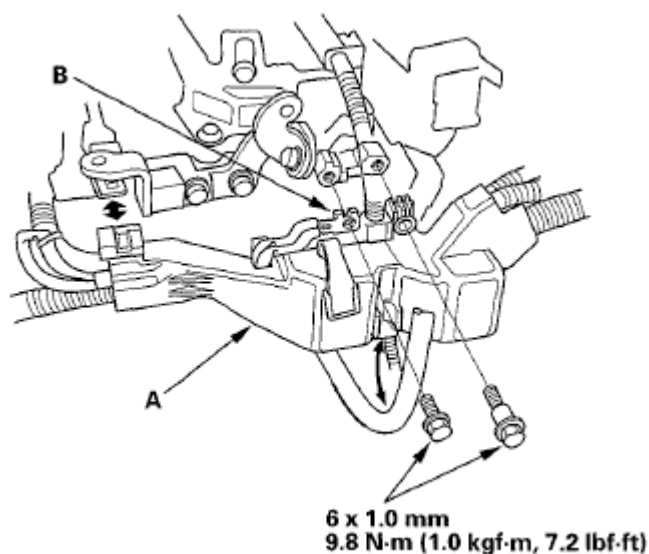


Fig. 124: Identifying Harness Holder & Ground Cable With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Install the harness holder to the fuel rail.

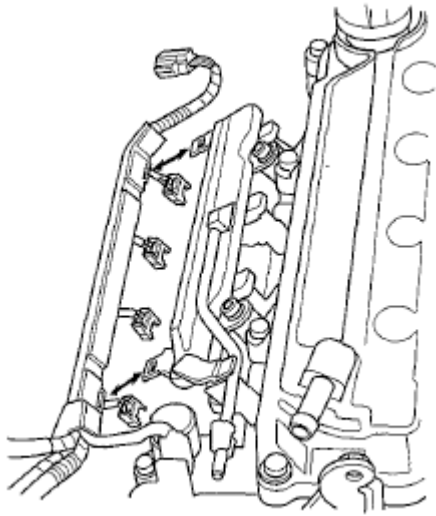


Fig. 125: Identifying Harness Holder

Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Connect the engine wire harness connectors, and install the wire harness clamps to the cylinder head.
 - Four injector connectors
 - Engine coolant temperature (ECT) sensor 1 connector
 - Camshaft position (CMP) sensor connector
 - Secondary heated oxygen sensor (secondary HO2S) connector
 - Rocker arm oil control solenoid connector
15. Install the warm up three way catalytic converter (WU-TWC) (see **WARM UP TWC REMOVAL/INSTALLATION**).
16. Install the intake manifold/chamber assembly (see **INSTALLATION**).
17. Install the upper radiator hose (A), the heater hose (B), and the water bypass hose (C).

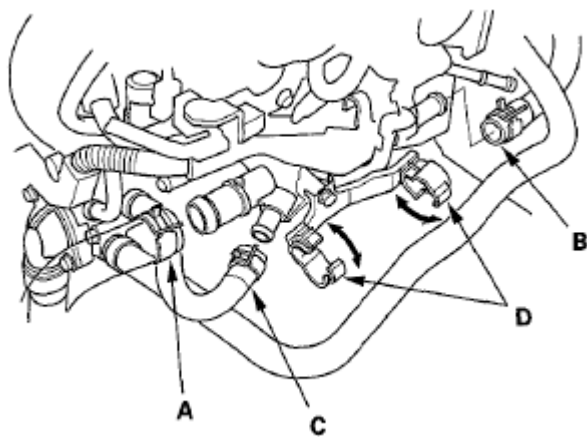


Fig. 126: Identifying Heater Hose To Clamps

Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Install the heater hose to the clamps (D).
19. Connect the fuel feed hose (A) (see **FUEL LINE/QUICK-CONNECT FITTING INSTALLATION**), then install the quick-connect fitting cover (B) and the fuel feed hose clamp (C).

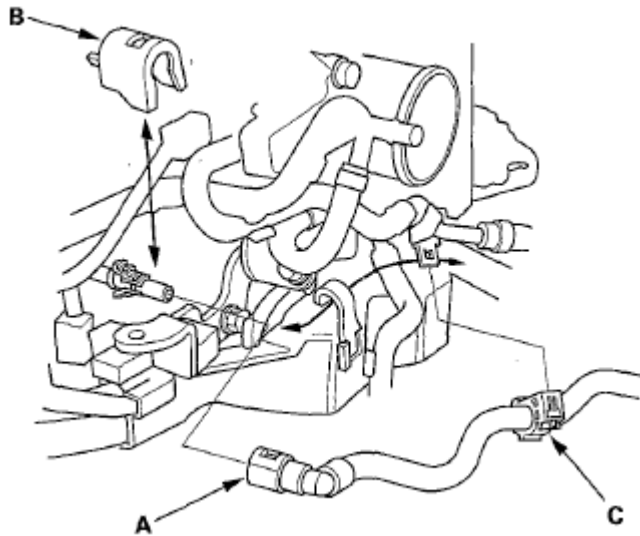


Fig. 127: Identifying Fuel Feed Hose, Quick-Connect Fitting Cover & Fuel Feed Hose Clamp
Courtesy of AMERICAN HONDA MOTOR CO., INC.

20. Install the air cleaner (see **AIR CLEANER REMOVAL/INSTALLATION**).
21. After installation, check that all tubes, hoses, and connectors are installed correctly.
22. Do the battery installation procedure (see **BATTERY REMOVAL AND INSTALLATION**).
23. Inspect for fuel leaks. Turn the ignition switch to ON (II) (DO NOT operate the starter) so the fuel pump runs for about 2 seconds and pressurizes the fuel line. Repeat this operation three times, then check for fuel leakage at any point in the fuel line.
24. Refill the radiator with engine coolant, and bleed air from the cooling system with the heater valve open (see step 9 on **COOLANT REPLACEMENT**).
25. Clean up any spilled engine coolant.
26. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **CKP PATTERN CLEAR/CKP PATTERN LEARN**).
27. Inspect the idle speed (see **IDLE SPEED INSPECTION**).
28. Inspect the ignition timing (see **IGNITION TIMING INSPECTION**).

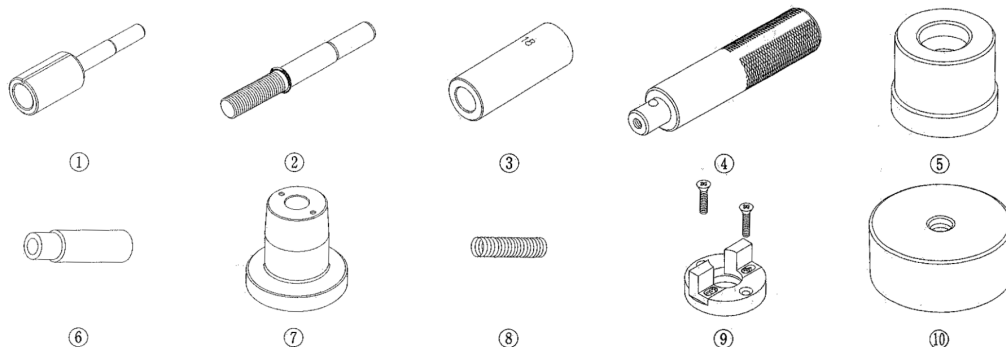
2009-12 ENGINE

Engine Block - Fit

SPECIAL TOOLS

Special Tools

Ref.No.	Tool Number	Description	Qty
①	070AF-PWC0110	Pilot Pin	1
②	070AF-PWC0120	Insert Adjust	1
③	070AF-PWC0130	Pilot Collar, O.D. 18 mm	1
④	07749-0010000	Driver Handle, 15 x 135L	1
⑤	07946-1870100	Bearing Driver Attachment, 28 x 30	1
⑥	07973-6570201	Adjustable Piston Pin Driver Head	1
⑦	07973-6570500	Piston Base	1
⑧	07973-6570600	Piston Base Spring	1
⑨	07TGF-001000A	Piston Base Head	1
⑩	07ZAD-PNAA100	Oil Seal Driver Attachment, 96 mm	1

**Fig. 1: Identifying Special Tools**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

COMPONENT LOCATION INDEX

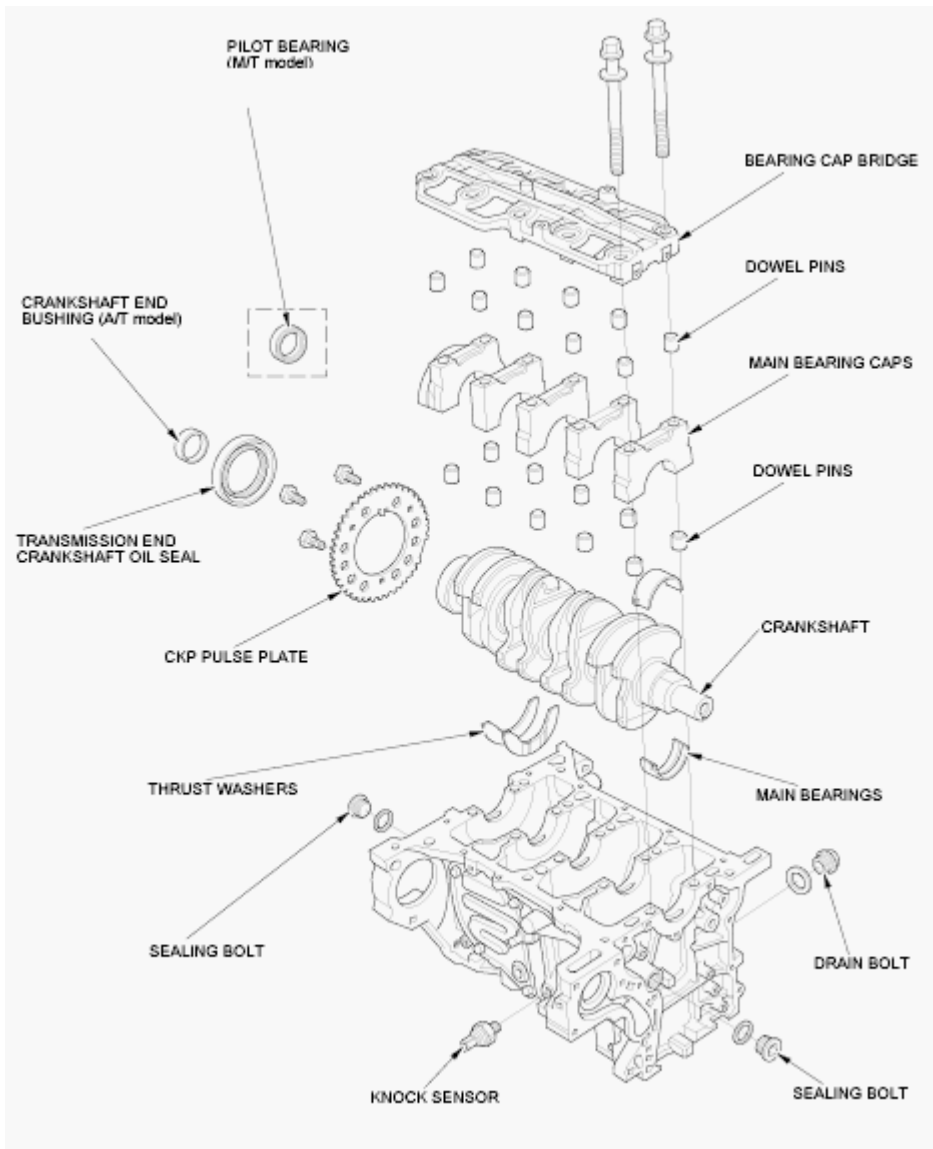


Fig. 2: Identifying Engine Block Replacement Components (1 Of 2)
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

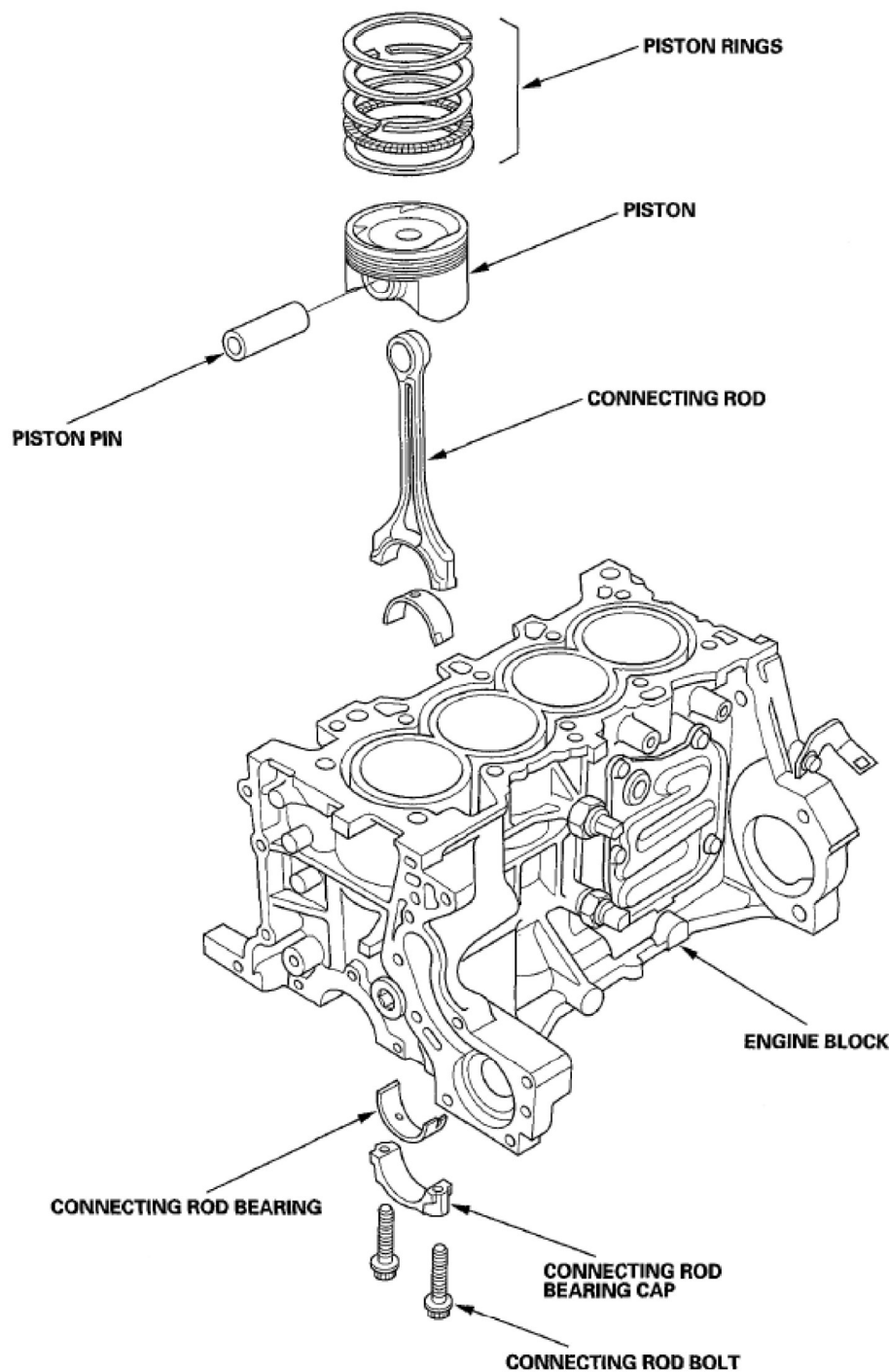


Fig. 3: Identifying Engine Block Replacement Components (2 Of 2)

Courtesy of AMERICAN HONDA MOTOR CO., INC.

CONNECTING ROD AND CRANKSHAFT END PLAY INSPECTION

1. Remove the oil pump (see **REMOVAL**).

2. Measure the connecting rod end play with a feeler gauge (A) between the connecting rod (B) and the crankshaft (C).

Connecting Rod End Play

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

Service Limit: 0.40 mm (0.016 in.)

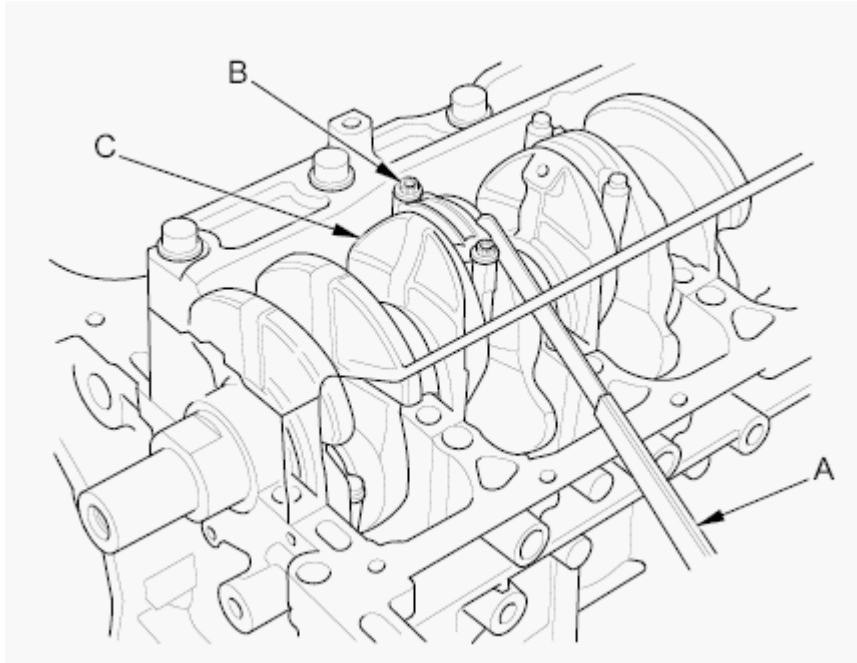


Fig. 4: Measuring Connecting Rod End Play With Feeler Gauge
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. If the connecting rod end play is beyond the service limit, install a new connecting rod, and recheck. If it is still beyond the service limit, replace the crankshaft (see **CRANKSHAFT AND PISTON REMOVAL**).
4. To check crankshaft end play, push the crankshaft firmly away from the dial indicator by prying, and zero the dial against the end of the crankshaft. Then pull the crankshaft firmly back toward the indicator by prying; the dial reading should not exceed the service limit.

Crankshaft End Play

Standard (New): 0.10-0.35 mm (0.0039-0.0138 in.)

Service Limit: 0.45 mm (0.0177 in.)

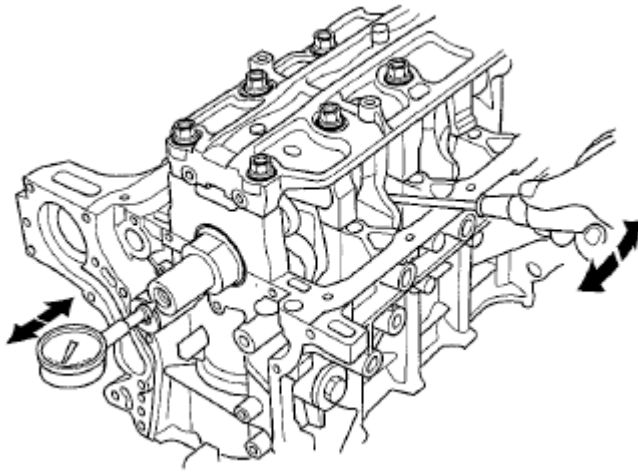


Fig. 5: Measuring Crankshaft End Play

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

CRANKSHAFT MAIN BEARING REPLACEMENT

MAIN BEARING CLEARANCE INSPECTION

1. To check main bearing-to-journal oil clearance, remove the bearing cap bridge and bearing halves (see CRANKSHAFT AND PISTON REMOVAL).
2. Clean each main journal and bearing half with a clean shop towel.
3. Place one strip of plastigage across each main journal.
4. Reinstall the bearings and bearing cap bridge, then tighten the bearing cap bolts to 25 N.m (2.5 kgf.m, 18 lbf.ft) in the proper sequence.

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

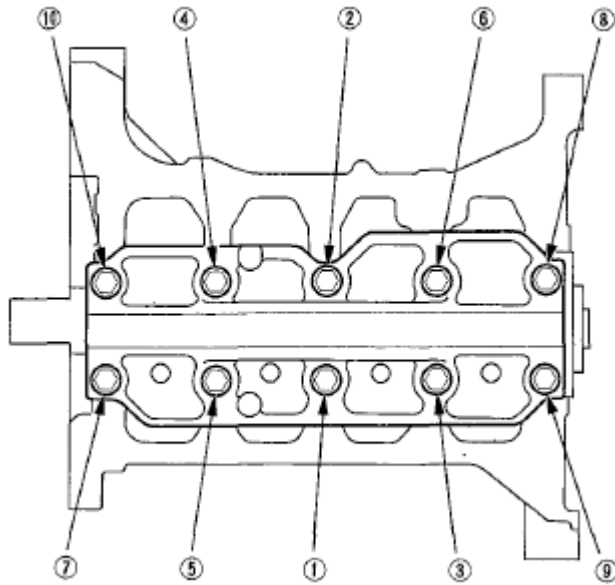


Fig. 6: Identifying Bearing Cap Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Tighten the bearing cap bolts an additional 40°.

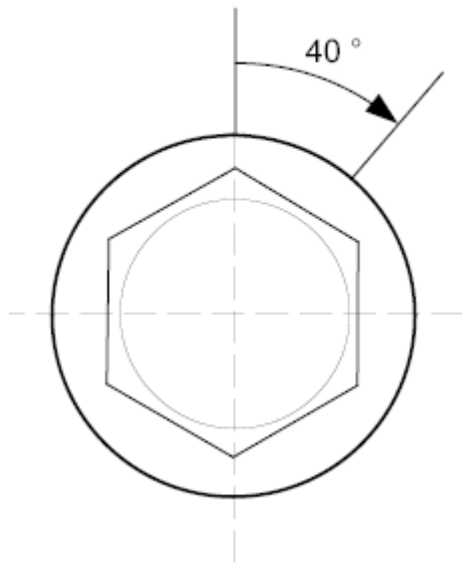


Fig. 7: Tightening Bolts An Additional 40 Degrees
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the bearing cap bridge and bearings again, and measure the widest part of the plastigage.

Main Bearing-to-Journal Oil Clearance

Standard (New): 0.018-0.036 mm (0.0007-0.0014 in.)

Service Limit: 0.050 mm (0.0020 in.)

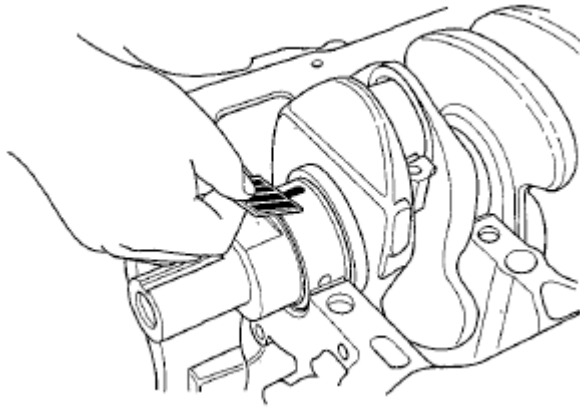


Fig. 8: Measuring Widest Part Of Plastigage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

MAIN BEARING SELECTION

Crankshaft Bore Code Location

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

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

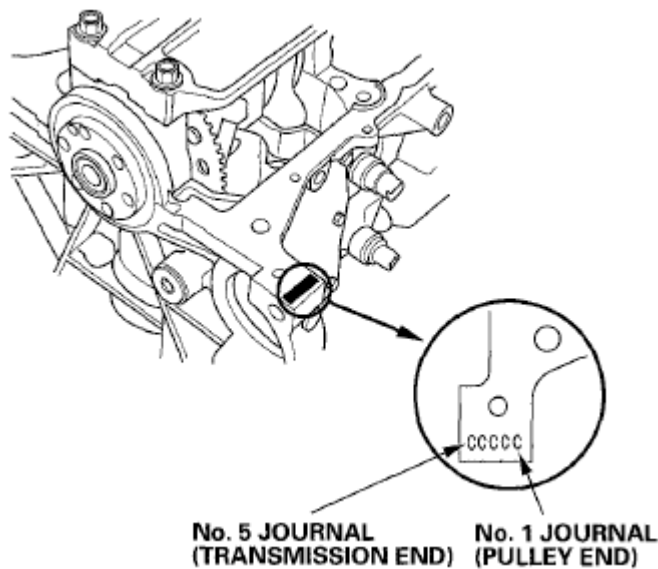


Fig. 9: Identifying Crankshaft Bore Code Location
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

Main Journal Code Location

- The main journal codes are stamped on the crankshaft.

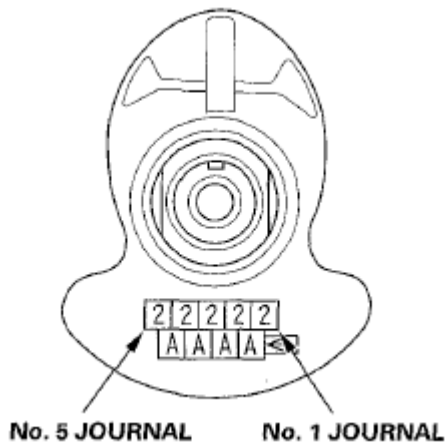


Fig. 10: Identifying Main Journal Code Location
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

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

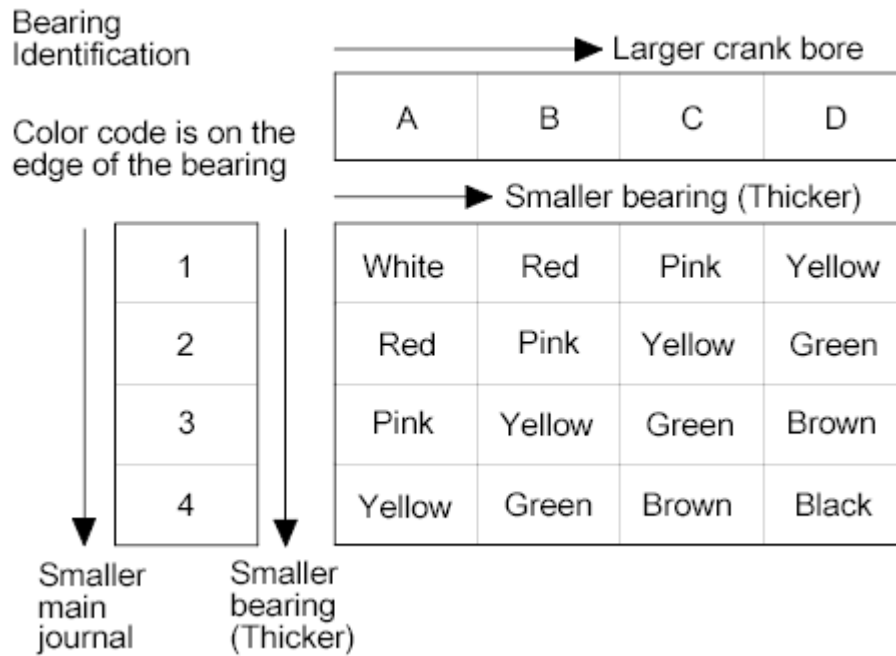


Fig. 11: Identifying Crank Bore Codes & Crank Journal Codes Chart
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

CONNECTING ROD BEARING REPLACEMENT

ROD BEARING CLEARANCE INSPECTION

1. To check rod bearing-to-journal oil clearance, remove the bearing cap bridge (see **CRANKSHAFT AND PISTON REMOVAL**).
2. Remove the connecting rod cap and the connecting rod bearing half.
3. Clean the connecting rod journal and the connecting rod bearing half with a clean shop towel.
4. Place one strip of plastigage across the connecting rod journal.
5. Reinstall the bearing half and cap, and torque the bolts to 9.8 N.m (1.0 kgf.m, 7.2 lbf.ft) + 90°.

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

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

Connecting Rod Bearing-to-Journal Oil Clearance

Standard (New): 0.020-0.038 mm (0.0008-0.0015 in.)

Service Limit: 0.050 mm (0.0020 in.)

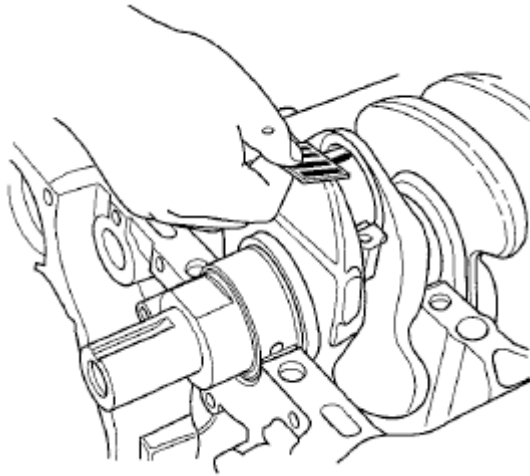


Fig. 12: Measuring Connecting Rod Bearing-To-Journal Oil Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

ROD BEARING SELECTION

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

Normal Bore Size: 43.0 mm (1.693 in.)

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

Connecting Rod Big End Bore Code Locations

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

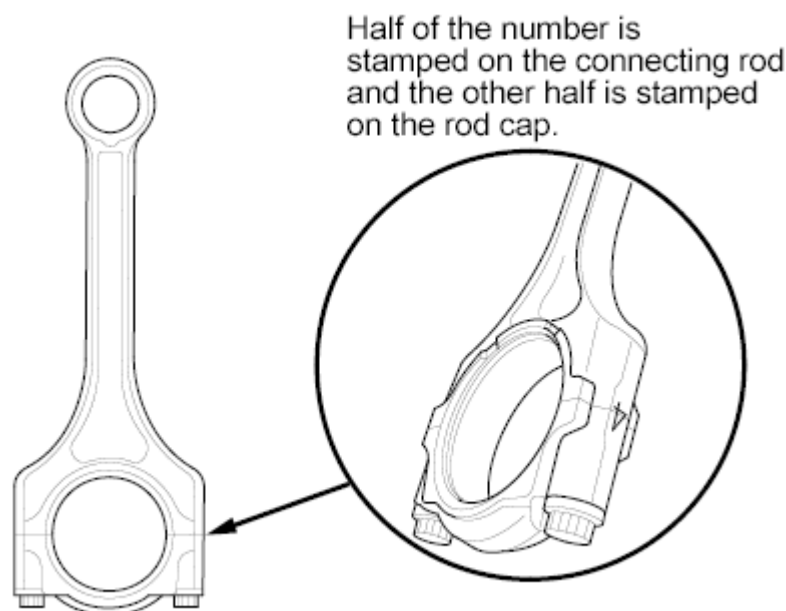


Fig. 13: Identifying Connecting Rod Journal Code Location
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

Bearing Identification		→ Larger big rod bore			
		1	2	3	4
Color code is on the edge of the bearing		→ Smaller bearing (Thicker)			
↓	A	Red	Pink	Yellow	Green
	B	Pink	Yellow	Green	Brown
	C	Yellow	Green	Brown	Black
	D	Green	Brown	Black	Blue
↓	Smaller rod journal	↓ Smaller bearing (Thicker)			

Fig. 14: Identifying Big End Bore Codes & Rod Journal Codes Chart
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Connecting Rod Journal Code Location

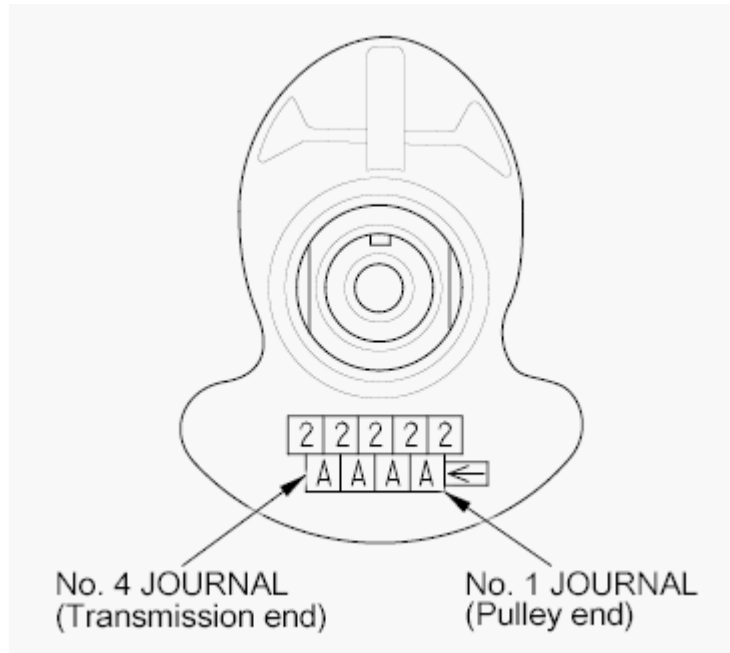


Fig. 15: Identifying Connecting Rod Journal Code Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

OIL PAN REMOVAL

1. If the engine is already out of the vehicle, go to step 7.
2. Drain the engine oil (see **ENGINE OIL LEVEL CHECK**).
3. Remove the drive belt (see **DRIVE BELT INSPECTION**).
4. Remove the driveshaft heat shield (see step 28 on **ENGINE REMOVAL**).
5. Remove the A/C compressor without disconnecting the A/C hoses (see step 31 on **ENGINE REMOVAL**).
6. A/T model: Remove the shift cable cover.

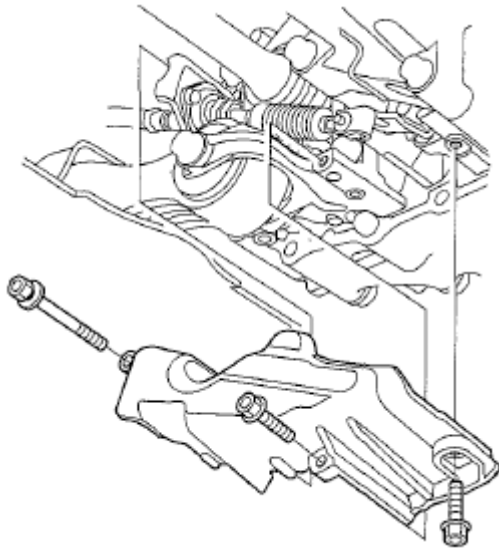


Fig. 16: Identifying Shift Cable Cover

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. M/T model: Remove the torque rod bracket (see **TORQUE ROD BRACKET REPLACEMENT**).
8. Remove the dipstick, then remove the dipstick tube.

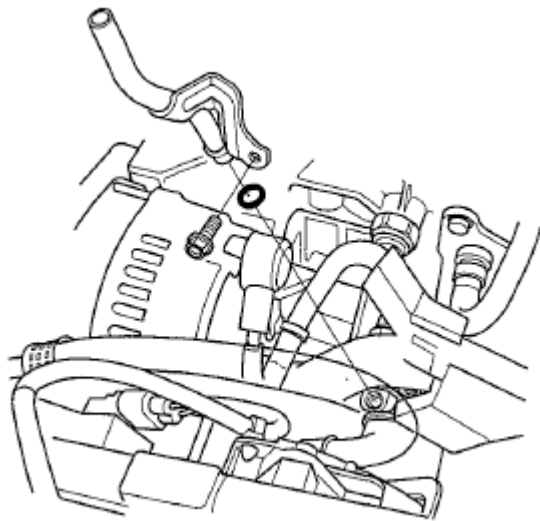


Fig. 17: Identifying Torque Rod Bracket & Dipstick Tube

Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Remove the crankshaft position (CKP) sensor cover (A), then disconnect the CKP sensor connector (B).

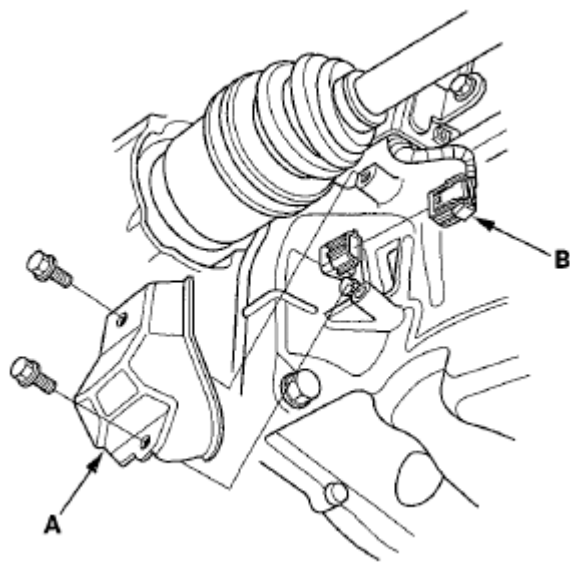


Fig. 18: Identifying Crankshaft Position (CKP) Sensor Cover & CKP Sensor Connector
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Remove the clutch cover/torque converter cover (A), and transmission mounting bolts (B).

M/T model

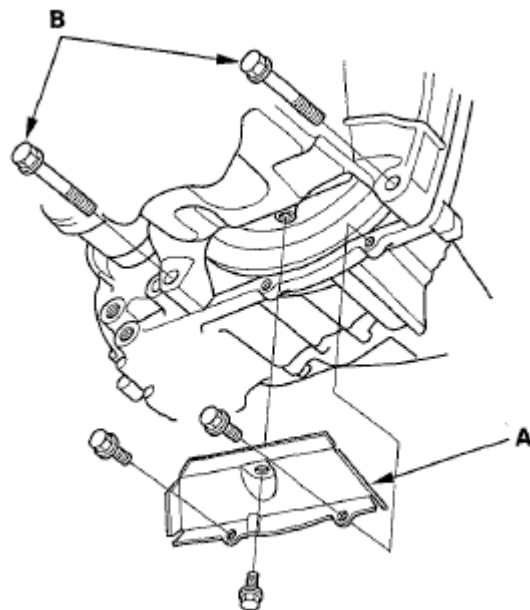


Fig. 19: Identifying Clutch Cover/Torque Converter Cover & Transmission Mounting Bolts - M/T Model
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

A/T model

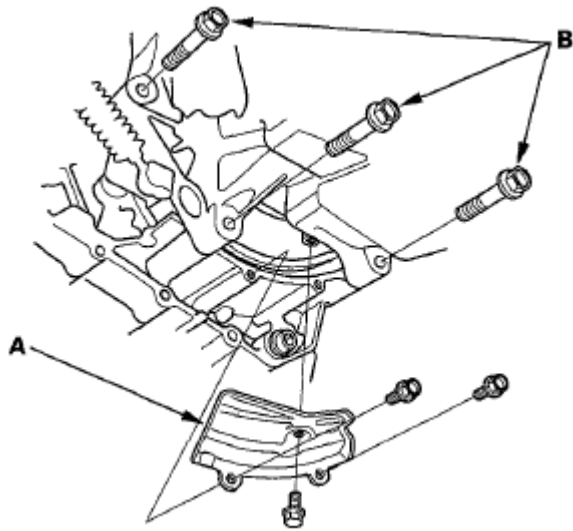


Fig. 20: Identifying Clutch Cover/Torque Converter Cover & Transmission Mounting Bolts - A/T Model

Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Remove the oil pan bolts. Note the bolt locations by their size.

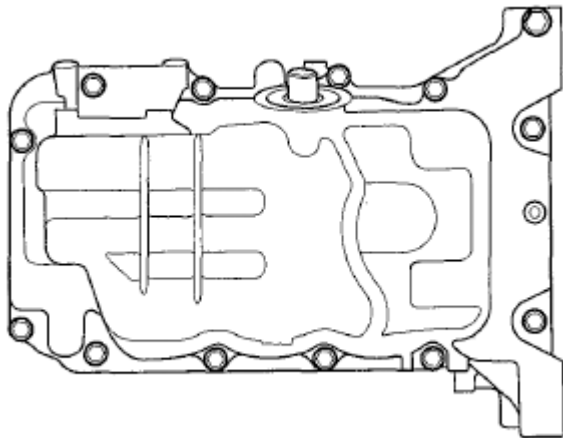


Fig. 21: Identifying Oil Pan Bolts

Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Using a flat blade screwdriver, separate the oil pan from the block in the places shown.

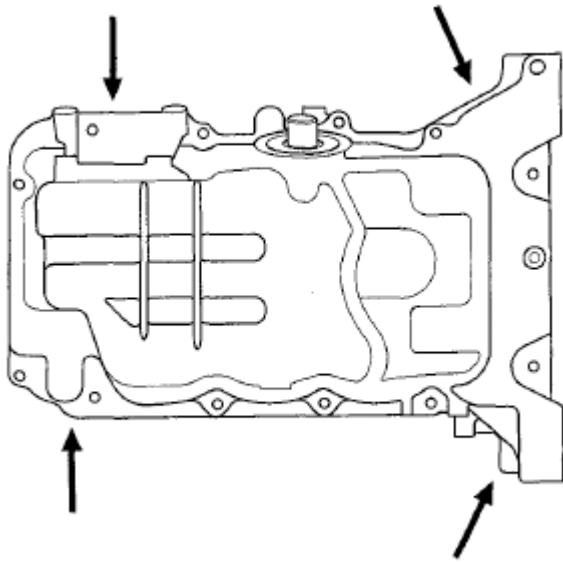


Fig. 22: Locating Oil Pan Block

Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Remove the oil pan.

CRANKSHAFT AND PISTON REMOVAL

1. Remove the engine/transmission (see ENGINE REMOVAL).
2. Remove the transmission:
 - Manual transmission (see TRANSMISSION REMOVAL)
 - Automatic transmission (see TRANSMISSION REMOVAL)
3. M/T model: Remove the pressure plate (see step 3 on CLUTCH REPLACEMENT), clutch disc (see step 8 on ENGINE SIDE), and flywheel (see step 16 on ENGINE SIDE).
4. A/T model: Remove the drive plate (see DRIVE PLATE REMOVAL AND INSTALLATION).
5. Remove the crankshaft position (CKP) sensor cover (A), then disconnect the CKP sensor connector (B).

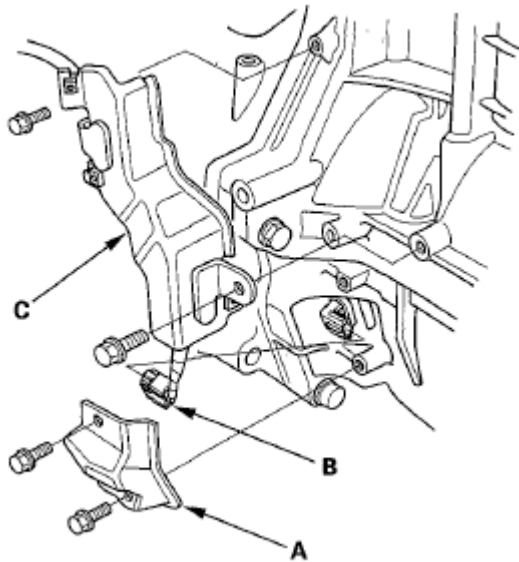


Fig. 23: Identifying Crankshaft Position (CKP) Sensor Cover, CKP Sensor Connector & Harness Cover

Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the harness cover (C).
7. Remove the oil pan (see **OIL PAN REMOVAL**).
8. Remove the cylinder head (see **CYLINDER HEAD REMOVAL**).
9. Remove the oil screen (A), then remove the oil pump (B), (see **REMOVAL**).

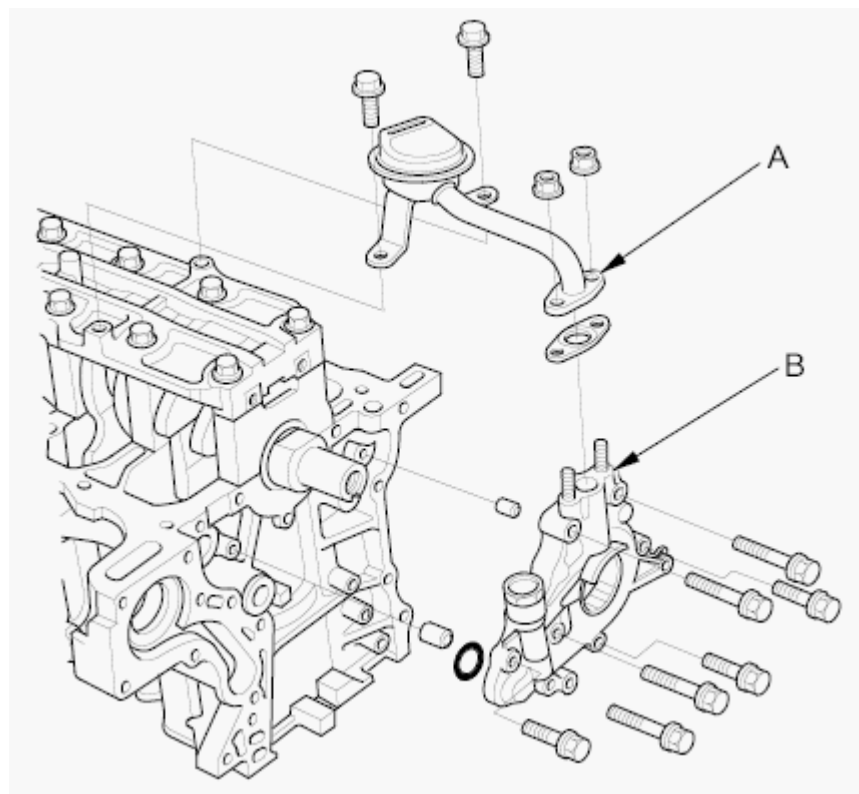


Fig. 24: Identifying Oil Screen, Oil Pump And Fasteners
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. 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.

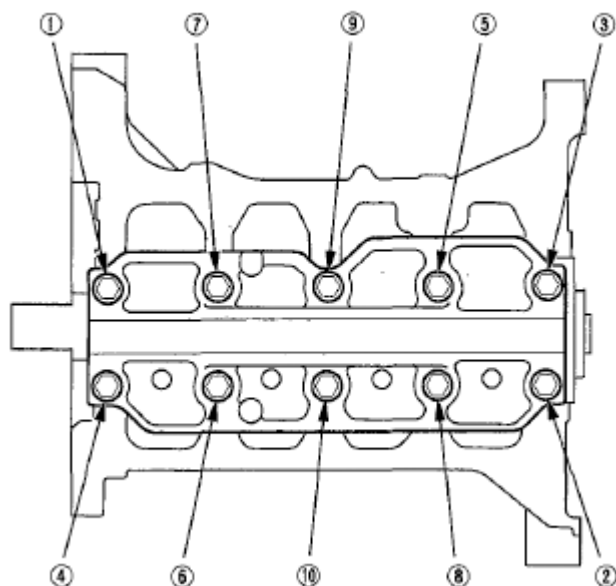


Fig. 25: Identifying Cap Bolts Loosening Sequence
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Remove the bearing cap bridge and the main bearing caps.
12. Remove the connecting rod caps/bearings. Keep all connecting rod caps/bearings in order.
13. Lift the crankshaft (A) out of the engine block, being careful not to damage the journals and the CKP pulse plate (B).

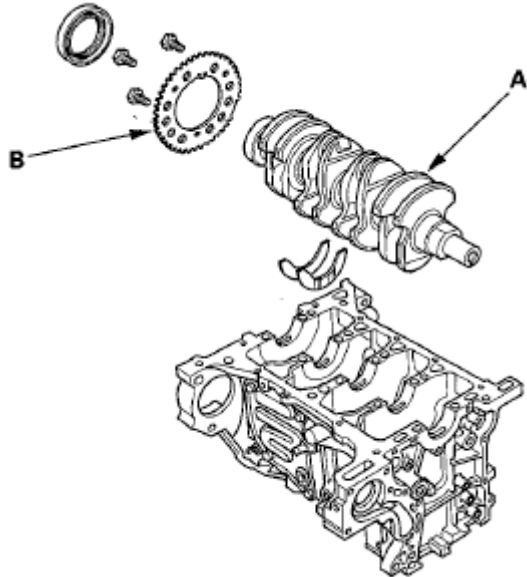


Fig. 26: Identifying Crankshaft & CKP Pulse Plate
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Remove the CKP pulse plate.
15. Remove the remaining upper bearing halves from the connecting rods, and set them aside with their respective caps.
16. If you can feel a ridge of metal or hard carbon around the top of each cylinder, remove it with a ridge reamer (A). Follow the reamer manufacturer's instructions. If the ridge is not removed, it may damage the pistons as they are pushed out.

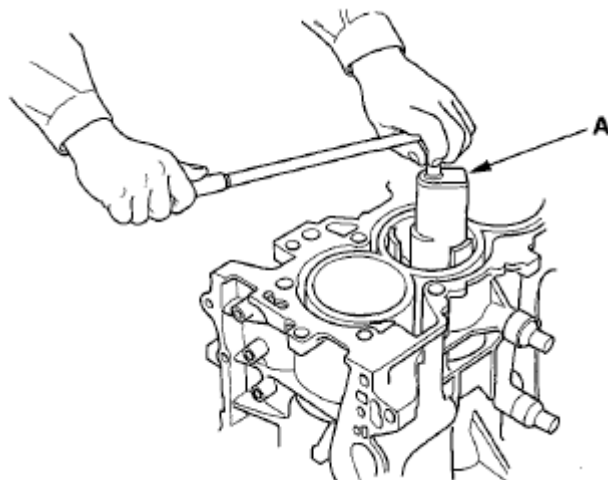
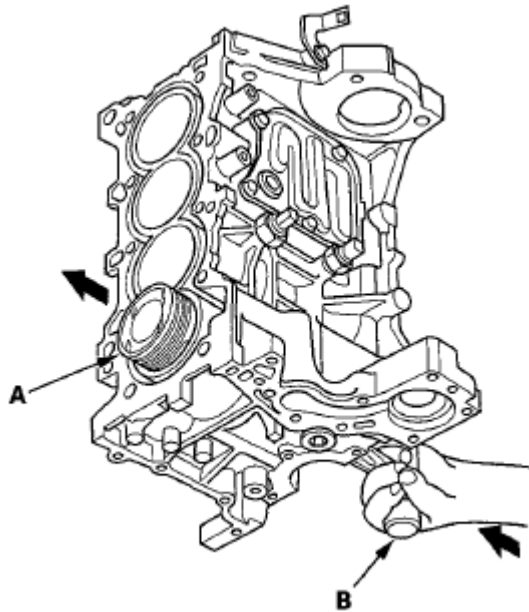


Fig. 27: Reaming Cylinder With Reamer

Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Use the wooden handle of a hammer (A) to drive out the piston/connecting rod assembly (B). Take care not to damage the cylinder with the connecting rod.

**Fig. 28: Driving Out Piston/Connecting Rod Assembly Using Wooden Handle Of Hammer**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Reinstall the main bearings, the main bearing caps, and the bearing cap bridge on the engine block in the proper order.
19. Reinstall the connecting rod bearings and the connecting rod caps after removing each piston/connecting rod assembly.
20. Mark each piston/connecting rod assembly with its cylinder number to make sure they are reused in original order.

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 CRANKSHAFT AND PISTON REMOVAL).
2. Clean the crankshaft oil passages with pipe cleaners or a suitable brush.
3. Clean the keyway and threads.
4. Measure the out-of-round at the middle of each rod and the main journal in two places. The difference between measurements on each journal must not be more than the service limit.

Journal Out-of-Round

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

Service Limit: 0.010 mm (0.0004 in.)

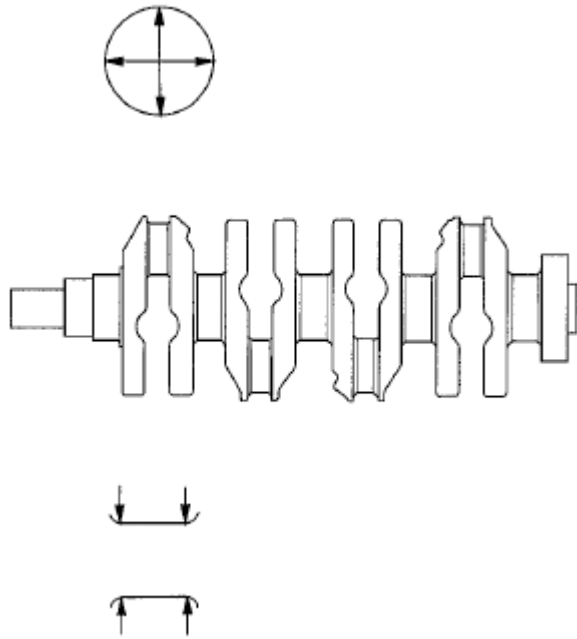


Fig. 29: Measuring Out-Of-Round & Taper
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Journal Taper

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

Service Limit: 0.010 mm (0.0004 in.)

STRAIGHTNESS

1. Place the engine block on a flat surface.
2. Check the total runout with the crankshaft supported on V-blocks.
3. Measure the runout on all of the main journals. Rotate the crankshaft two complete revolutions. The difference between measurements on each main journal must not be more than the service limit.

Crankshaft Total Runout

Standard (New): 0.03 mm (0.0012 in.) max.

Service Limit: 0.04 mm (0.0016 in.)

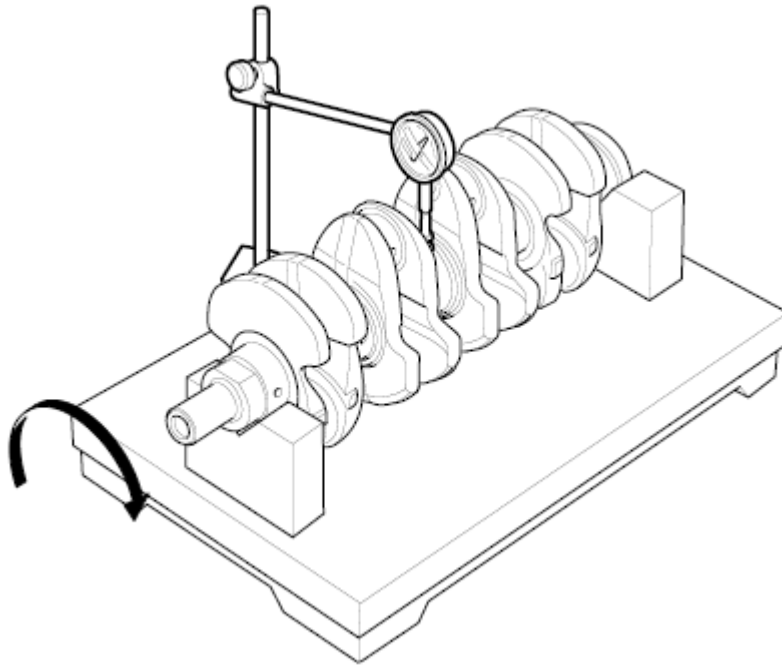


Fig. 30: Measuring Crankshaft Total Runout
Courtesy of AMERICAN HONDA MOTOR CO., INC.

BLOCK AND PISTON INSPECTION

1. Remove the crankshaft and the pistons (see **CRANKSHAFT AND PISTON REMOVAL**).
2. Check the piston for distortion or cracks.
3. Measure the piston diameter (A) at a point 16 mm (0.6 in.) from the bottom of the skirt.

Piston Diameter

Standard (New): 72.980-72.990 mm (2.8732-2.8736 in.)

Service Limit: 72.97 mm (2.8728 in.)

Oversize Piston Diameter

0.25: 73.230-73.240 mm (2.88307-2.88346 in.)

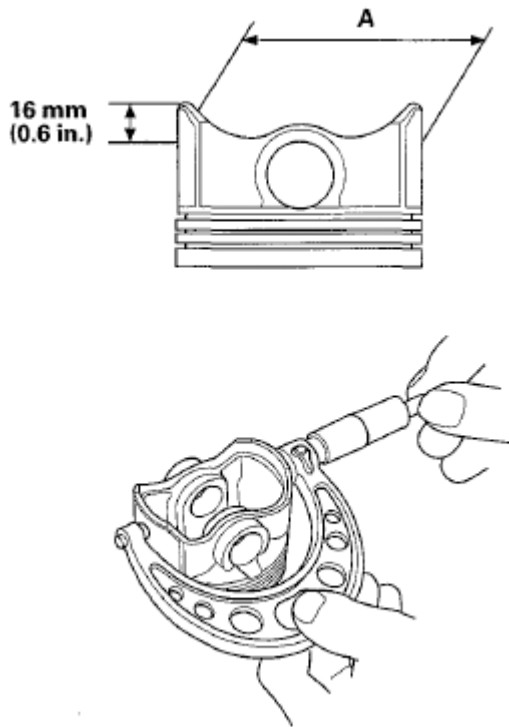


Fig. 31: Measuring Piston Diameter

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Measure wear and taper in direction Y at three levels in each cylinder as shown below. If measurements in any cylinder are beyond the Oversize Bore Service Limit, replace the engine block. If the engine block is to be rebored, refer to step 7 after reboring.

Cylinder Bore Size

Standard (New): 73.000-73.015 mm (2.8740-2.8746 in.)

Service Limit: 73.065 mm (2.8766 in.)

Oversize

0.25: 73.250-73.265 mm (2.8839-2.8844 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.)

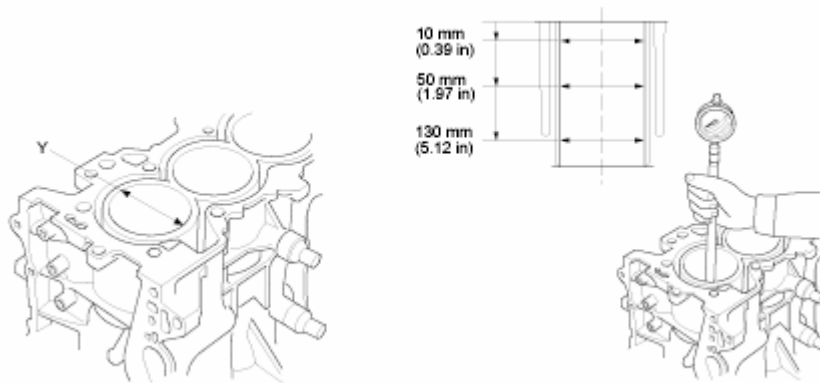


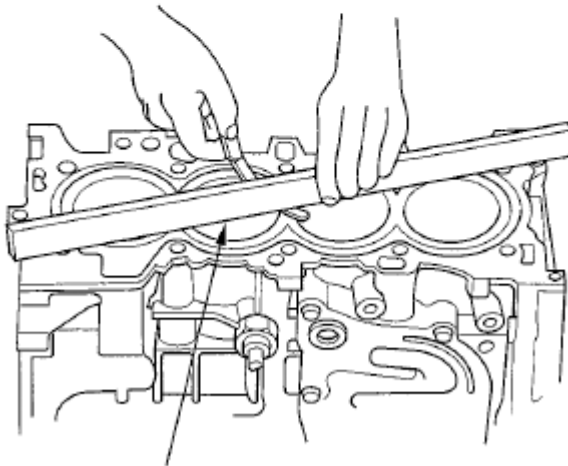
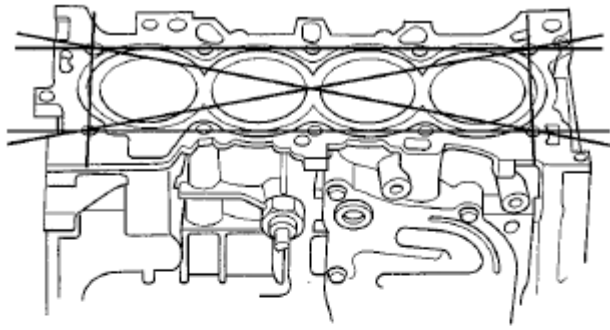
Fig. 32: Measuring Wear & Taper In Direction Y
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Scored or scratched cylinder bores must be honed (see **CYLINDER BORE HONING**).
6. Check the top of the engine block for warpage. Measure along the edges and across the center as shown below.

Engine Block Warpage

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

Service Limit: 0.10 mm (0.004 in.)



PRECISION STRAIGHT EDGE

Fig. 33: Checking Top Of Engine Block For Warpage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Piston-to-Cylinder Clearance

Standard (New): 0.010-0.035 mm (0.0004-0.0014 in.)

Service Limit: 0.05 mm (0.002 in.)

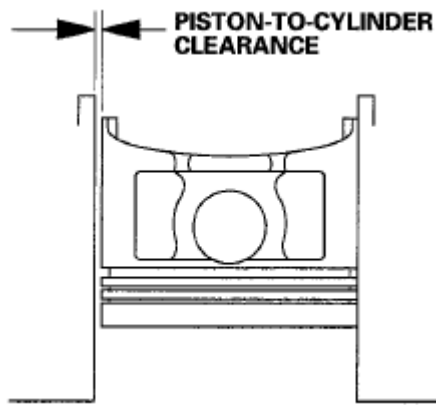


Fig. 34: Identifying Piston-To-Cylinder Clearance
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER BORE HONING

1. Measure the cylinder bores (see **BLOCK AND PISTON INSPECTION**).

NOTE: If the engine block is to be reused, hone the cylinders and remeasure the bores. Only scored or scratched cylinder bore must be honed.

2. Hone the cylinder bores with honing oil and a fine (400 grit) stone in a 60 degree cross-hatch pattern (A). (See **Fig. 35**)

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

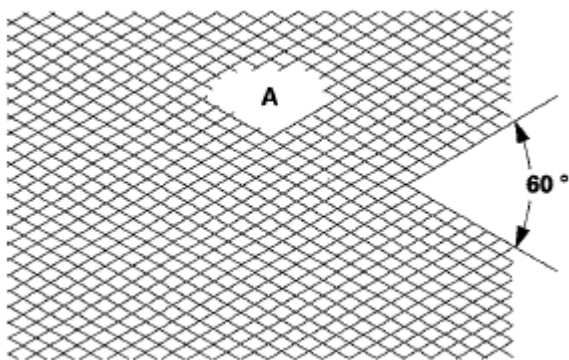


Fig. 35: Identifying Cylinder Bore Honing Cross-Hatch Pattern
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

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.

NOTE: 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 the engine block to the service limit, rebore the engine block. Some light vertical scoring and scratching is acceptable if it is not deep enough to catch your fingernail and does not run the full length of the bore.

PISTON, PIN, AND CONNECTING ROD REPLACEMENT

SPECIAL TOOLS REQUIRED

- Pilot pin 070AF-PWC0110
- Piston base 07973-6570500
- Piston base spring 07973-6570600
- Piston base head 07TGF-001000A
- Pilot collar, O.D. 18 mm 070AF-PWC0130
- Insert adjuster 070AF-PWC0120
- Adjustable piston pin driver head 07973-6570201

DISASSEMBLY

1. Remove the piston from the engine block.
2. Assemble the special tool as shown below.

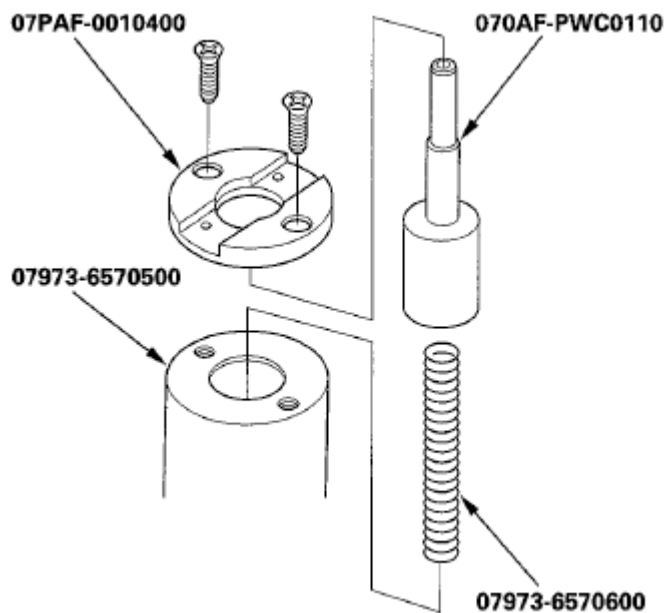


Fig. 36: Assembling Special Tool

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Temporarily install the pilot collar, O.D. 18 mm (A) over the pilot pin (B), and adjust the piston base head (C) as shown, then tighten the screws (D). Remove the pilot collar.

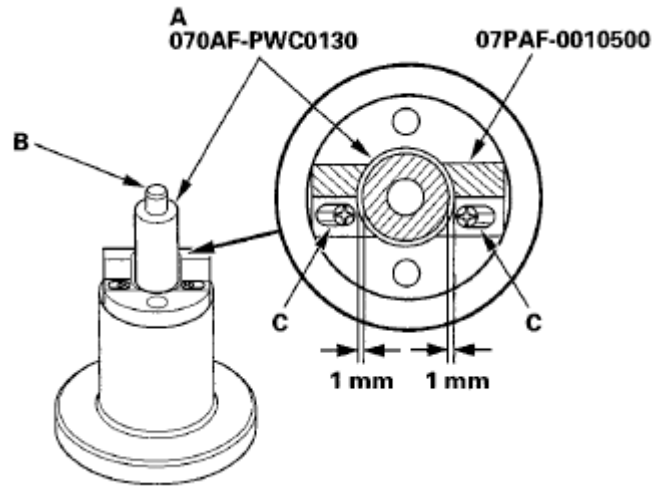


Fig. 37: Identifying Pilot Collar, Pilot Pin & Screws
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Assemble and adjust the length of the adjustable piston pin driver head (A) and insert adjust (B) to 45 mm (1.77 in).

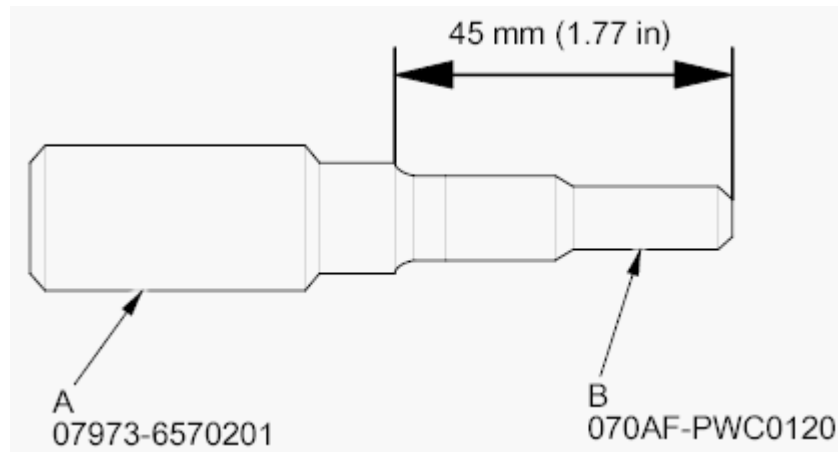


Fig. 38: Identifying Length Of Adjustable Piston Pin Driver Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. With the arrow on top of the piston pointing up, place the piston/connecting rod assembly (A) on the piston base head (B). Be sure you position the recessed flat area of the piston against the area of the piston base head (C) as shown.

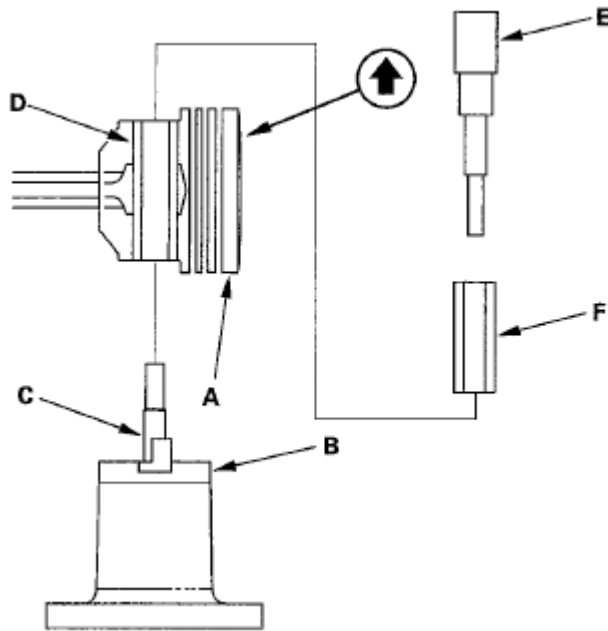


Fig. 39: Placing Piston Assembly On Special Tool
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Press the piston pin (D) out with the adjustable piston pin driver head and insert adjust (E), the pilot collar (F), and a hydraulic press.

INSPECTION

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

1. Measure the diameter of the piston pin.

Piston Pin Diameter

Standard (New): 17.996-18.000 mm (0.7085-0.7087 in.)

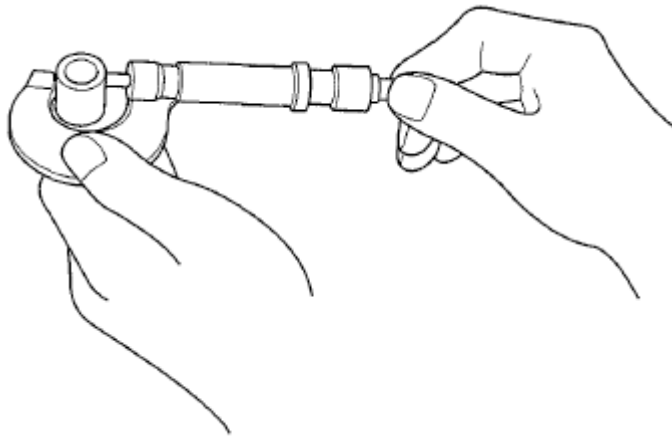


Fig. 40: Measuring Diameter Of Piston Pin
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

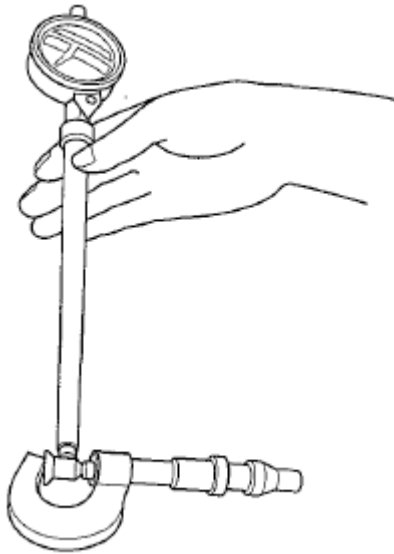


Fig. 41: Identifying Dial Indicator
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Piston Pin-to-Piston Clearance

Standard (New): 0.010-0.017 mm (0.0004-0.0007 in.)

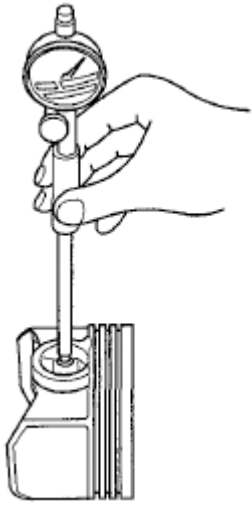


Fig. 42: Measuring Piston Pin-To-Piston Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Check the difference between the piston pin diameter and connecting rod small end diameter.

Piston Pin-to-Connecting Rod Interference

Standard (New): 0.019-0.036 mm (0.0007-0.0014 in.)

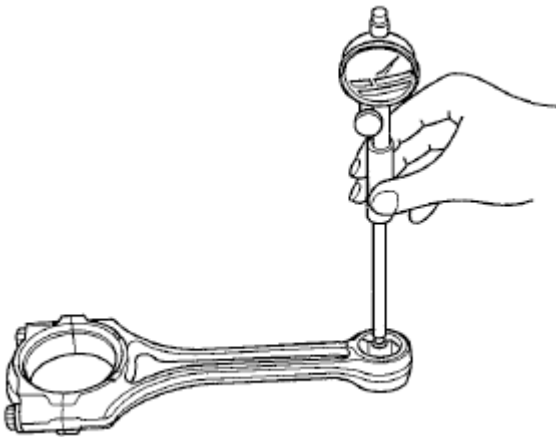


Fig. 43: Checking Piston Pin-To-Connecting Rod Interference
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REASSEMBLY

1. Assemble the piston and connecting rod with the arrow (A) and the embossed mark (B) on the same side.

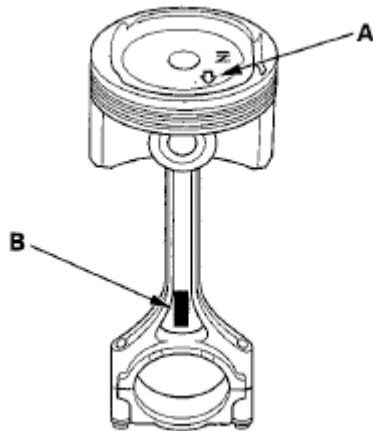


Fig. 44: Identifying Piston, Connecting Rod & Embossed Mark
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Insert the pilot collar (A) into the piston and the connecting rod.

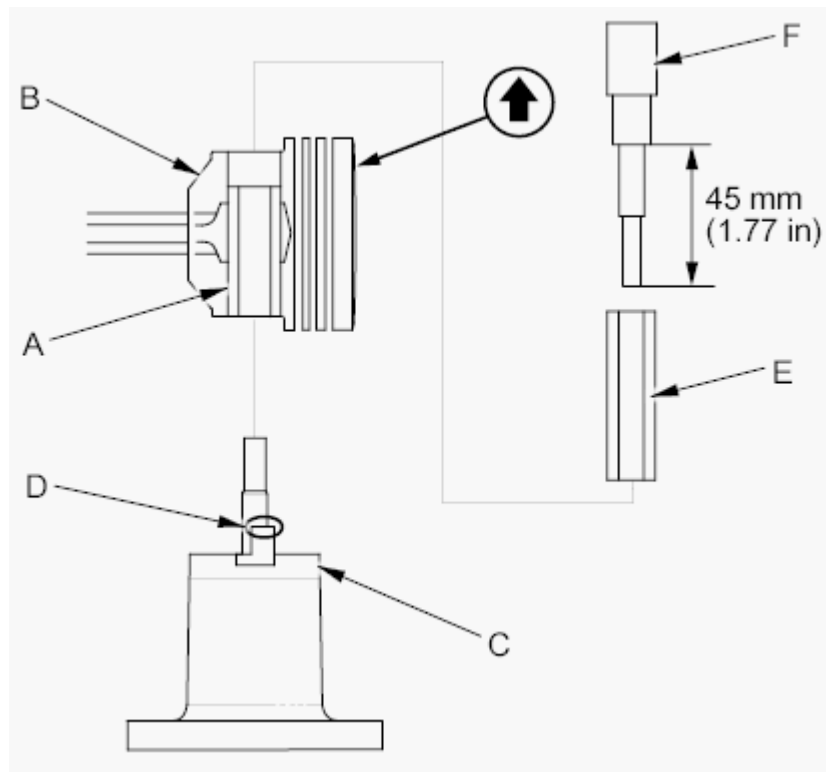


Fig. 45: Inserting Pilot Collar Into Piston & Connecting Rod
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. With the arrow on top of the piston and the embossed mark on the connecting rod facing up, place the piston/connecting rod assembly (B) on the piston base head (C). Be sure you position the recessed flat area of the piston against the area of the piston base head (D) as shown.
4. Press the piston pin (E) in with the adjustable piston pin driver head and insert adjust (F) and a hydraulic press.

PISTON RING REPLACEMENT

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

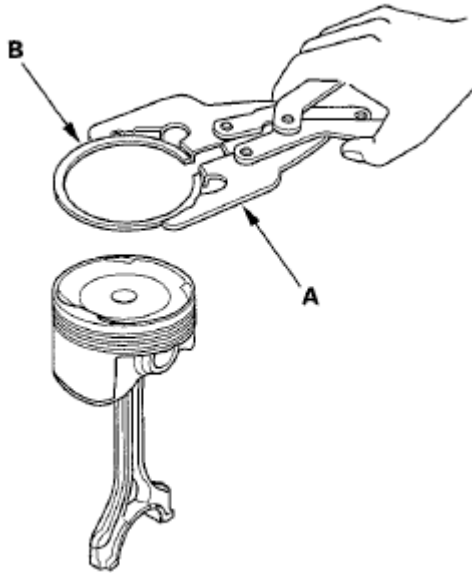


Fig. 46: Using Ring Expander To Remove Old Piston Rings
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Clean all the ring grooves thoroughly with a squared-off broken ring, or a ring groove cleaner with a blade to fit the piston grooves. File down the blade, if necessary. The top and second ring grooves are 1.0 mm (0.039 in) wide, and the oil ring groove is 2.0 mm (0.079 in) wide. Do not use a wire brush to clean the ring grooves, or cut the ring grooves deeper with the cleaning tool.

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

4. Using a piston, push a new ring (A) into the cylinder bore 15-20 mm (0.59-0.79 in) from the bottom.

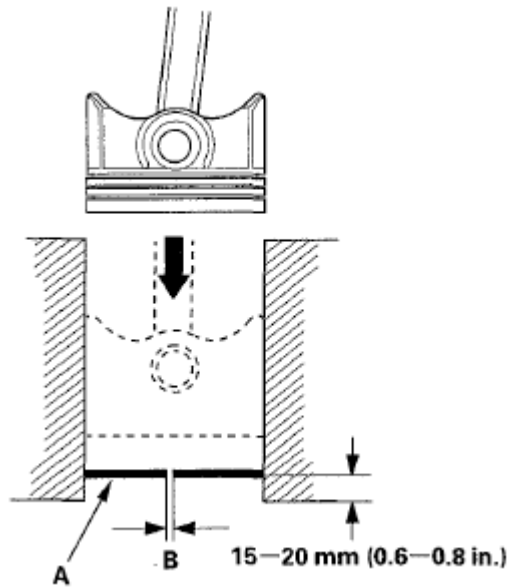


Fig. 47: Pushing Ring Into Cylinder Bore Using Piston
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Service Limit: 0.60 mm (0.024 in.)

Second Ring (RIKEN):

Standard (New): 0.30-0.42 mm (0.012-0.017 in.)

Service Limit: 0.65 mm (0.026 in.)

Second Ring (NIPPON PISTON RING):

Standard (New): 0.35-0.50 mm (0.014-0.020 in.)

Service Limit: 0.65 mm (0.026 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 R or 1N mark, and the second ring (B) has a 2R or 2N mark. The manufacturing marks (C) must be facing upward.

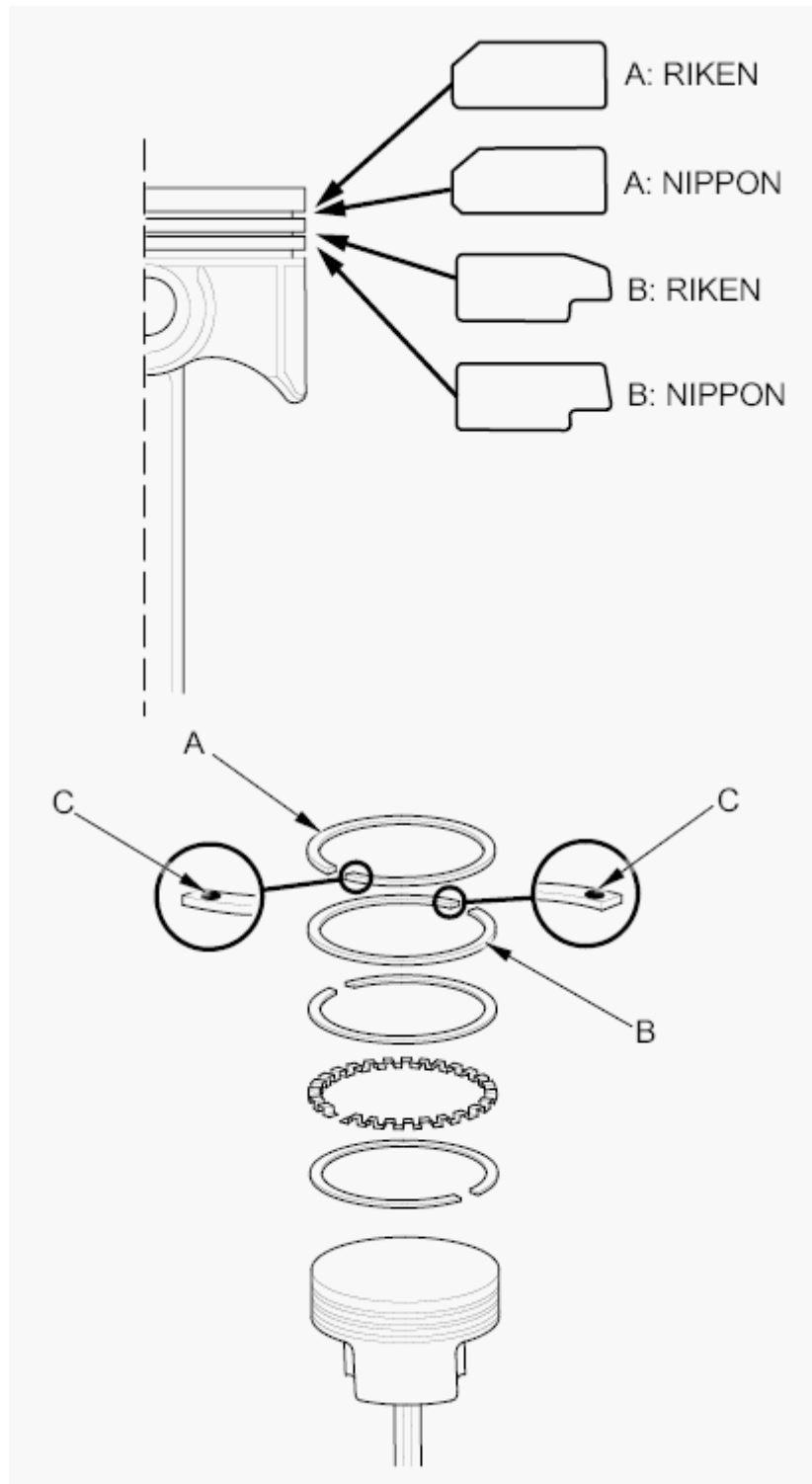


Fig. 48: Identifying Piston Top Ring & Second Ring
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Rotate the rings in their grooves to make sure they do not bind.
8. After installing a new set of rings, measure the ring-to-groove clearances:

Top Ring-to-groove Clearance**RIKEN:**

Standard (New): 0.065-0.090 mm (0.0026-0.0035 in.)

Service Limit: 0.15 mm (0.006 in.)

NIPPON PISTON RING:

Standard (New): 0.061-0.090 mm (0.0024-0.0035 in.)

Service Limit: 0.15 mm (0.006 in.)

Second Ring-to-groove Clearance

Standard (New): 0.030-0.055 mm (0.0012-0.0022 in.)

Service Limit: 0.12 mm (0.005 in.)

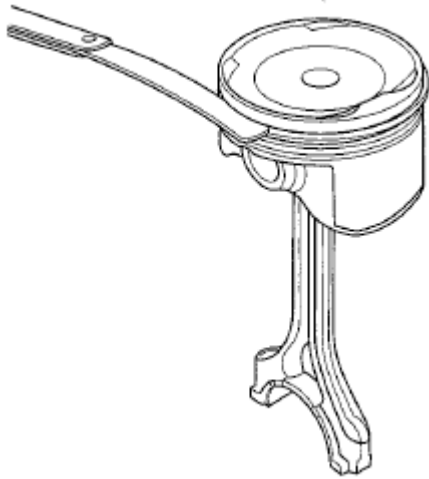


Fig. 49: Measuring Ring-To-Groove Clearances
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

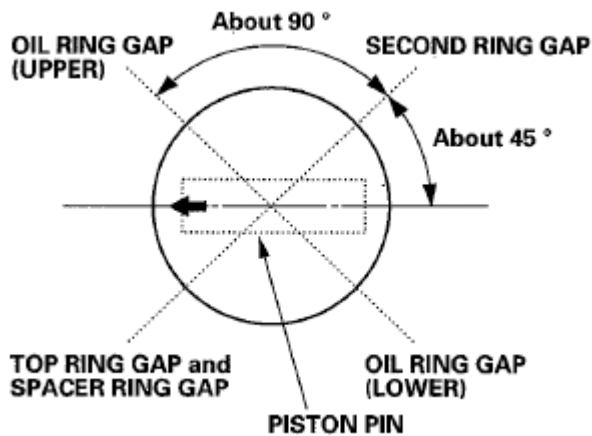


Fig. 50: Identifying Positions Of Piston Ring End Gaps
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

PISTON INSTALLATION

IF THE CRANKSHAFT IS ALREADY INSTALLED

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

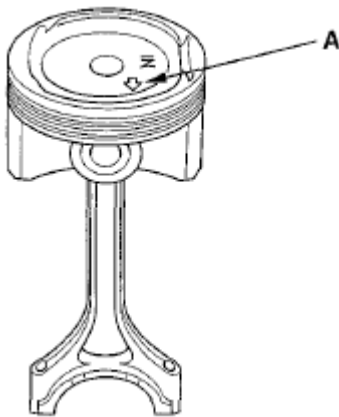


Fig. 51: Identifying Piston Arrow Mark
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

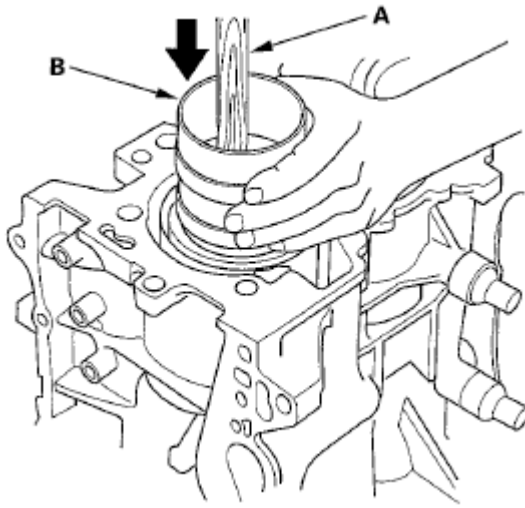


Fig. 52: Pushing Down On Ring Compressor

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 plastigage (see **CONNECTING ROD BEARING REPLACEMENT**).
8. Inspect the connecting rod bolts (see **CONNECTING ROD BOLT INSPECTION**).
9. Apply new engine oil to the bolt threads, then install the rod caps with bearings. Torque the bolts to 9.8 N.m (1.0 kgf.m, 7.2 lbf.ft).
10. Tighten the connecting rod bolts an additional 90°.

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

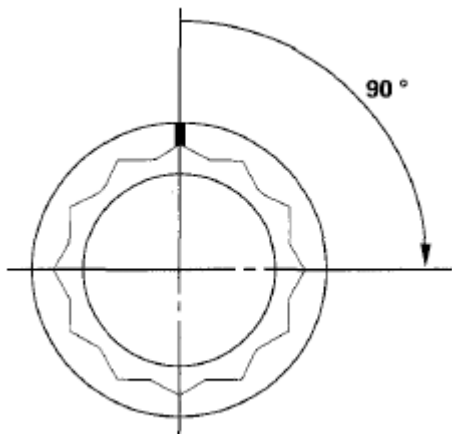
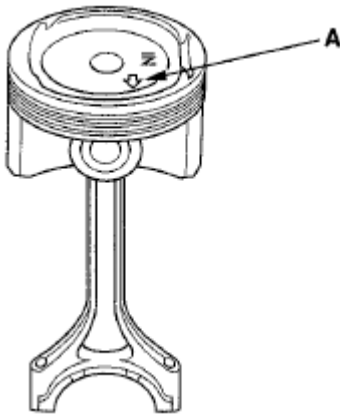


Fig. 53: Identifying Connecting Rod Bolt Angle

Courtesy of AMERICAN HONDA MOTOR CO., INC.

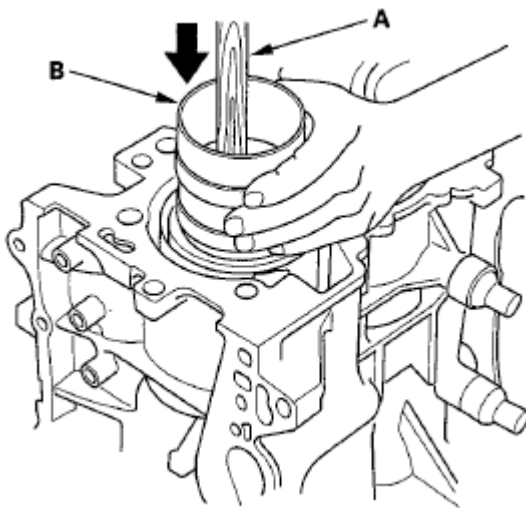
IF THE CRANKSHAFT IS NOT INSTALLED

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

**Fig. 54: Identifying Piston Arrow Mark**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

**Fig. 55: Pushing Down On Ring Compressor**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Position all pistons at top dead center (TDC).

CONNECTING ROD BOLT INSPECTION

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

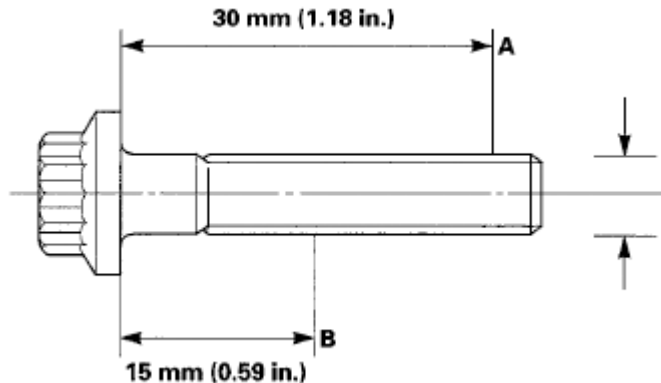


Fig. 56: Identifying Difference In Diameter Between Point A & Point B
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Point A-Point B = Difference in Diameter

Difference in Diameter:

Specification: 0-0.05 mm (0-0.002 in.)

3. If the difference in diameter is out of specification, replace the connecting rod bolt.

CRANKSHAFT INSTALLATION

SPECIAL TOOLS REQUIRED

- Driver Handle, 15 x 135L 07749-0010000
 - Bearing Driver Attachment, 28 x 30 mm 07946-1870100
 - Oil seal driver attachment, 96 mm 07ZAD-PN AA100
1. M/T model: Install the pilot bearing when replacing the crankshaft (see step 23 on **ENGINE SIDE**).
 2. A/T model: Install the crankshaft end bushing when replacing the crankshaft. Using the driver handle, 15 x 135L (A) and the bearing driver attachment, 28 x 30 mm (B), to drive the crankshaft end bushing squarely into the crankshaft to the specified installed height.

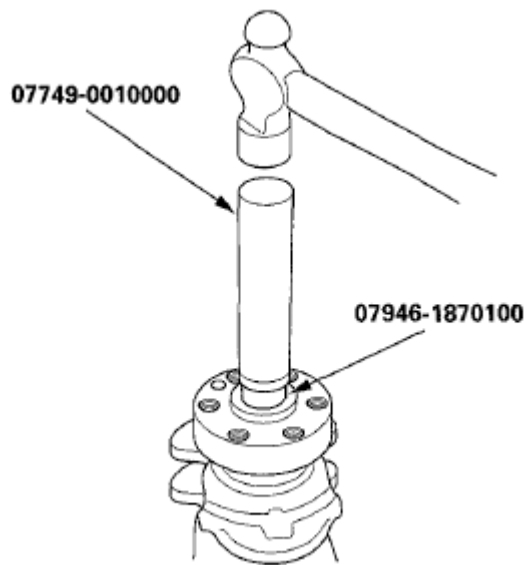


Fig. 57: Identifying Crankshaft End Bushing

Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. A/T model: Measure the distance between the crankshaft (A) surface and crankshaft end bushing (B).

Bushing Installed Height: 0.9-1.1 mm (0.035-0.043 in.)

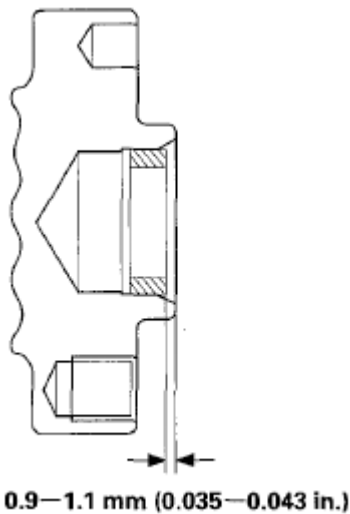


Fig. 58: Measuring Distance Between Crankshaft Surface & Crankshaft End Bushing

Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Check the main bearing clearance with plastigage (see **CRANKSHAFT MAIN BEARING REPLACEMENT**).
5. Check the connecting rod bearing clearance with plastigage (see **CONNECTING ROD BEARING REPLACEMENT**).
6. Install the bearing halves in the engine block and the connecting rods.

7. Apply a coat of new engine oil to the main bearings and the rod bearings.
8. Install the crankshaft position (CKP) pulse plate (A) on the crankshaft (B); face the marked side (C) opposite the crankshaft, and align the tab (D) on the CKP pulse plate with the groove (E) on the crankshaft.

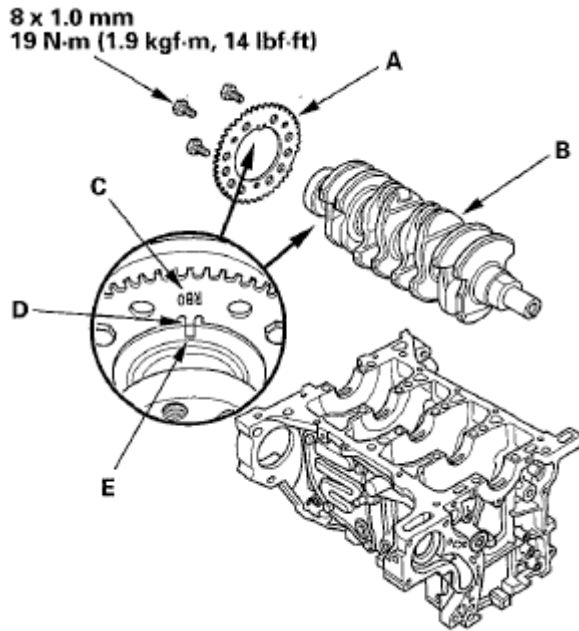


Fig. 59: Identifying Crankshaft Position (CKP) Pulse Plate, Crankshaft, Tab & Crankshaft Groove With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Hold the crankshaft so that connecting rod journal No. 2 and connecting rod journal No. 3 are straight up, and lower the crankshaft into the engine block.
10. Apply new engine oil to the side with the thrust washer groove. Install the thrust washers (A) in the No. 4 journal of the engine block.

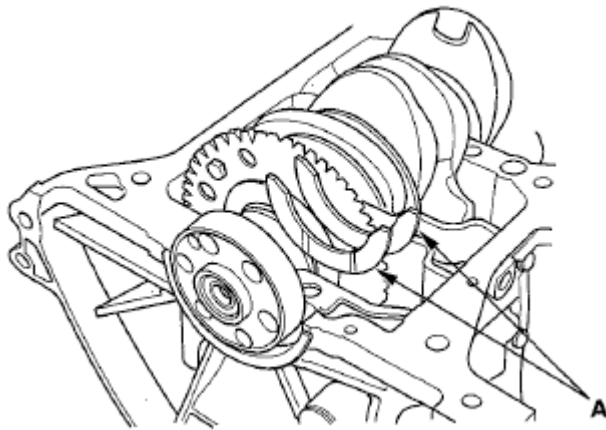


Fig. 60: Identifying Thrust Washers

Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Inspect the connecting rod bolts (see **CONNECTING ROD BOLT INSPECTION**).
12. Apply new engine oil to the threads and flange of the connecting rod bolts.
13. Seat the connecting rod journals into connecting rod No. 1 and connecting rod No. 4. Line up the mark (A) on the connecting rod and the connecting rod cap, then install the connecting rod caps and the connecting rod bolts finger-tight.

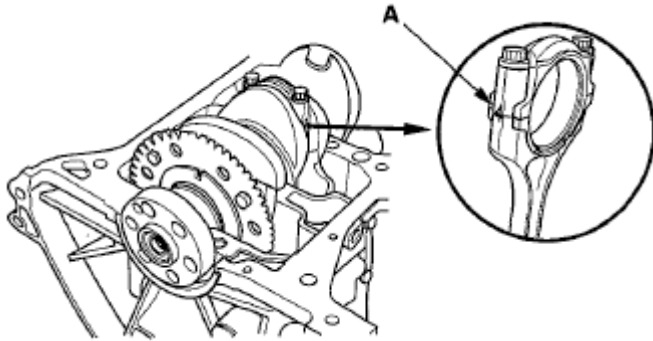


Fig. 61: Identifying Mark On Connecting Rod & Cap
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Rotate the crankshaft clockwise, and seat the connecting rod journals into connecting rod No. 2 and connecting rod No. 3. Line up the mark on the connecting rod and the connecting rod cap, then install the connecting rod caps and the connecting rod bolts finger-tight.
15. Tighten the connecting rod bolts to 9.8 N.m (1.0 kgf.m, 7.2 lbf.ft).
16. Tighten the connecting rod bolts an additional 90°.

NOTE: Remove the connecting rod bolt if you tightened it beyond the specified angle, and go back to step 11 of the procedure. Do not loosen it back to the specified angle.

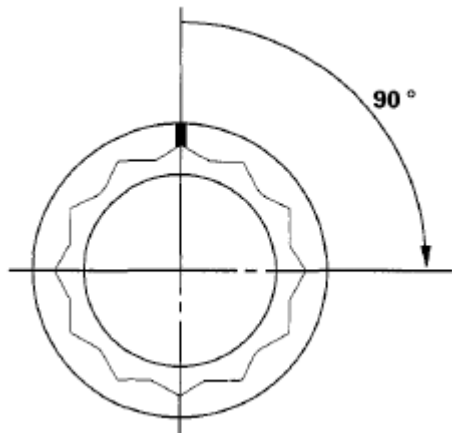


Fig. 62: Identifying Connecting Rod Bolt Angle
Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Install the main bearing caps with facing the arrows (A) the cam chain side on the bearing cap bridge.

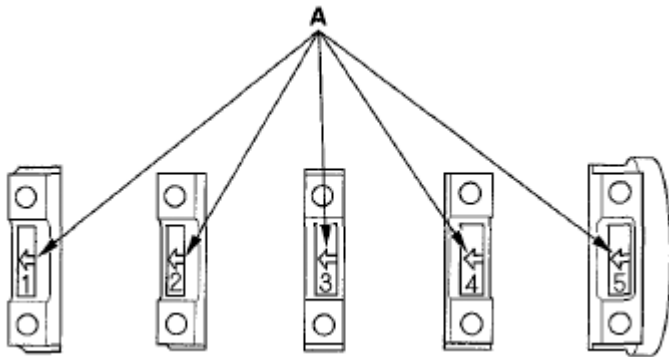


Fig. 63: Identifying Bearing Caps Arrows Mark
Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Remove all of the old liquid gasket from the bearing cap bridge/No. 5 main bearing cap mating surfaces.
19. Clean and dry the bearing cap bridge/No. 5 main bearing cap mating surfaces.
20. Apply liquid gasket (P/N 08717-0004, 08718-0003, 08718-0004, or 08718-0009) to the engine block mating surface of the bearing cap bridge/No. 5 main bearing cap. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

- Apply liquid gasket about 2.5 mm (0.098 in.) diameter bead along the broken line (A).
- If you apply liquid gasket P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply new liquid gasket.

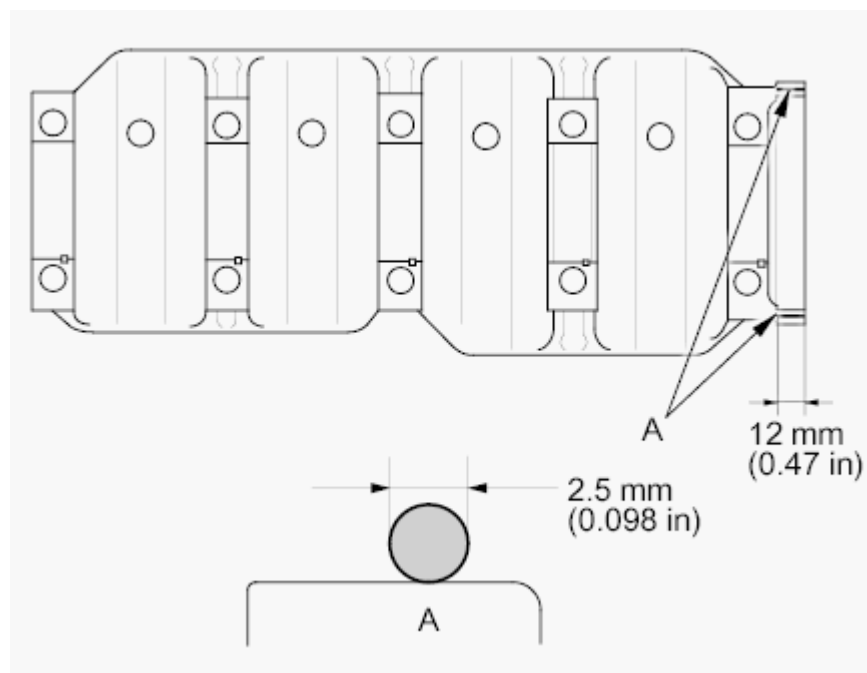


Fig. 64: Identifying Liquid Gasket Applying Area On Engine Block Mating Surfaces

Courtesy of AMERICAN HONDA MOTOR CO., INC.

21. Put the bearing cap bridge on the engine block.
22. Apply engine oil to the threads and the flange of the bearing cap bolts.
23. Tighten the bearing cap bolts in sequence to 25 N.m (2.5 kgf.m, 18 lbf.ft).

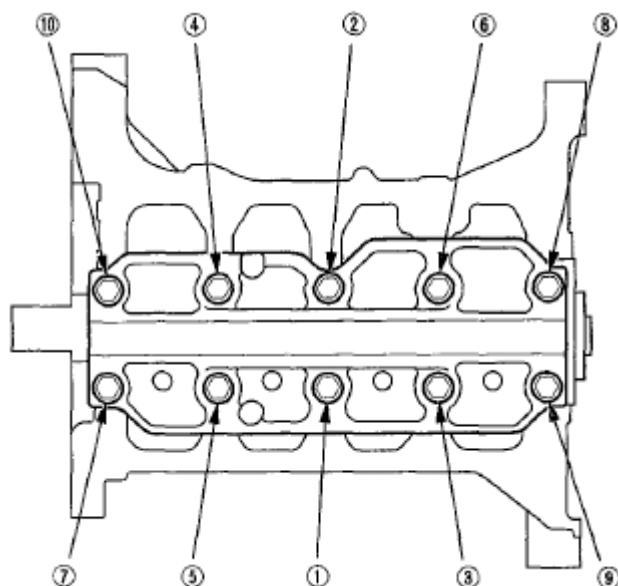


Fig. 65: Identifying Bearing Cap Bolts Tightening Sequence

Courtesy of AMERICAN HONDA MOTOR CO., INC.

24. Tighten the bearing cap bolts an additional 40°.

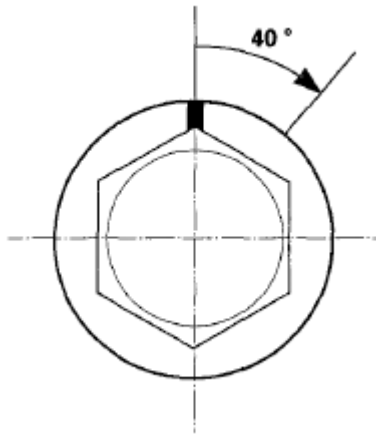


Fig. 66: Identifying Bearing Cap Bolts Angle
Courtesy of AMERICAN HONDA MOTOR CO., INC.

25. Clean the excess liquid gasket off the engine block.
26. Clean and dry the crankshaft oil seal housing.
27. Apply a light coat of new engine oil to the lip of the crankshaft oil seal.
28. Using the driver handle (A) and the oil seal driver attachment, 96 mm (B), to drive a new crankshaft oil seal squarely into the block to the specified installed height.

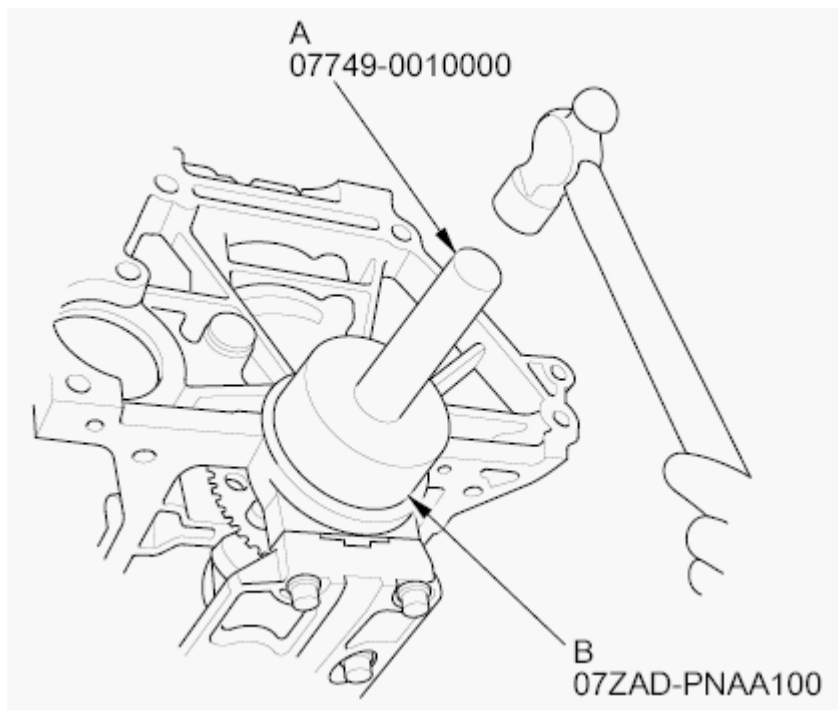


Fig. 67: Driving Oil Seal Into Block
Courtesy of AMERICAN HONDA MOTOR CO., INC.

29. Measure the distance between the cylinder block (A) and the crankshaft oil seal (B).

Oil Seal Installed Height: 0.2-1.2 mm (0.008-0.047 in)

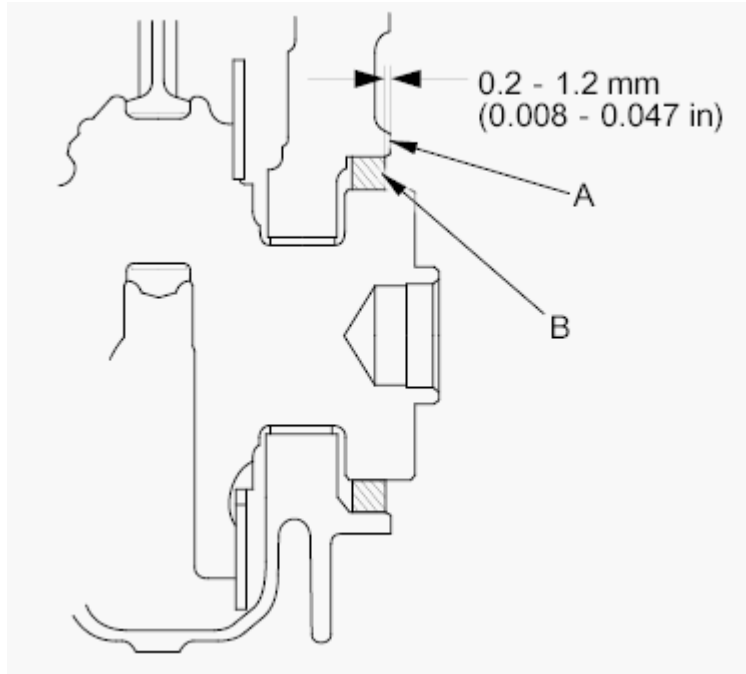


Fig. 68: Identifying Distance Between Crankshaft & Oil Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

30. Install the oil pump (A) with a new O-ring (B), see **INSTALLATION** .

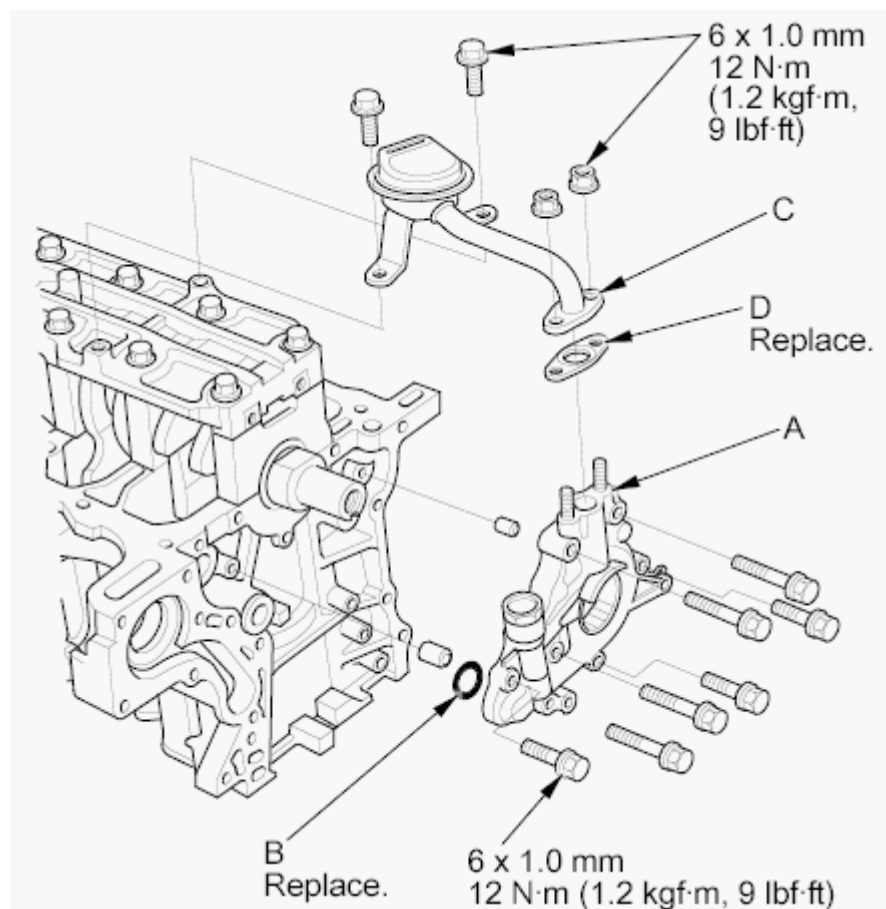


Fig. 69: Identifying Oil Screen, Oil Pump, O-Ring And Fasteners With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

31. Install the oil screen (C) with a new gasket (D). (See illustration above)
32. Install the oil pan (see **OIL PAN INSTALLATION**).
33. Install the cylinder head (see **CYLINDER HEAD INSTALLATION**).
34. Connect the CKP sensor connector (A), then install the CKP sensor cover (B).

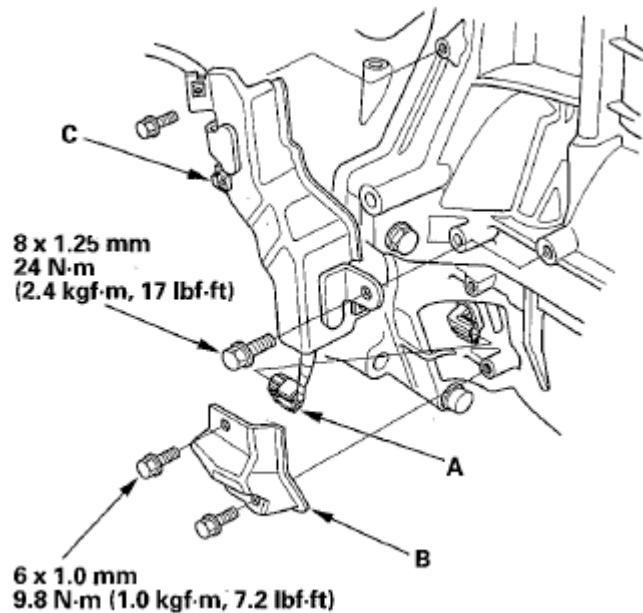


Fig. 70: Identifying CKP Sensor Connector, CKP Sensor Cover & Harness Cover With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

35. Install the harness cover (C).
36. M/T model: Install the flywheel (see step 19 on ENGINE SIDE), clutch disc (see step 25 on ENGINE SIDE), and pressure plate (see step 28 on ENGINE SIDE).
37. A/T model: Install the drive plate (see DRIVE PLATE REMOVAL AND INSTALLATION).
38. Install the transmission:
 - Manual transmission (see TRANSMISSION INSTALLATION)
 - Automatic transmission (see TRANSMISSION INSTALLATION)
39. Install the engine/transmission (see ENGINE INSTALLATION).

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

CKP PULSE PLATE REPLACEMENT

1. Remove the crankshaft (see CRANKSHAFT AND PISTON REMOVAL).
2. Remove the crankshaft position (CKP) pulse plate (A).

NOTE: Be careful not to damage the journals and the CKP pulse plate.

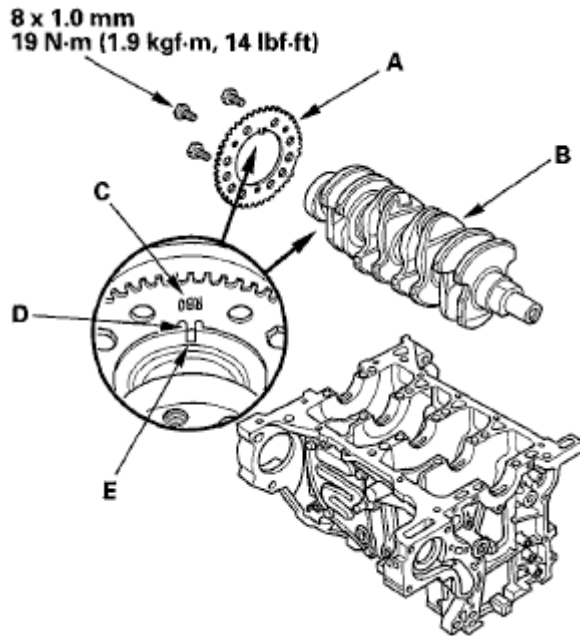


Fig. 71: Identifying Crankshaft Position (CKP) Pulse Plate, Crankshaft, Tab & Groove On Crankshaft With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the CKP pulse plate on the crankshaft (B): face the marked side (C) away from the crankshaft, and align the tab (D) on the CKP pulse plate with the groove (E) on the crankshaft.
4. Install the crankshaft (see **CRANKSHAFT 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 and the O-ring groove.
3. Install a new oil pan gasket (A), a new O-ring (B), and the dowel pins (C) on the oil pan.

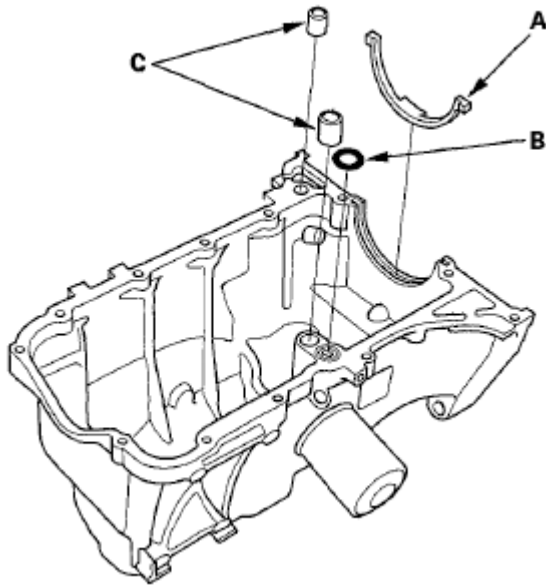


Fig. 72: Identifying Oil Pan Gasket, O-Ring & Dowel Pins
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

NOTE:

- Apply liquid gasket about 2.5 mm (0.098 in.) diameter bead along the broken line (A).
- Apply liquid gasket about 5.0 mm (0.20 in.) diameter bead along the broken line (B).
- Apply liquid gasket about 3.0 mm (0.118 in) diameter bead along the broken line (C).
- If you apply liquid gasket P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply new liquid gasket.

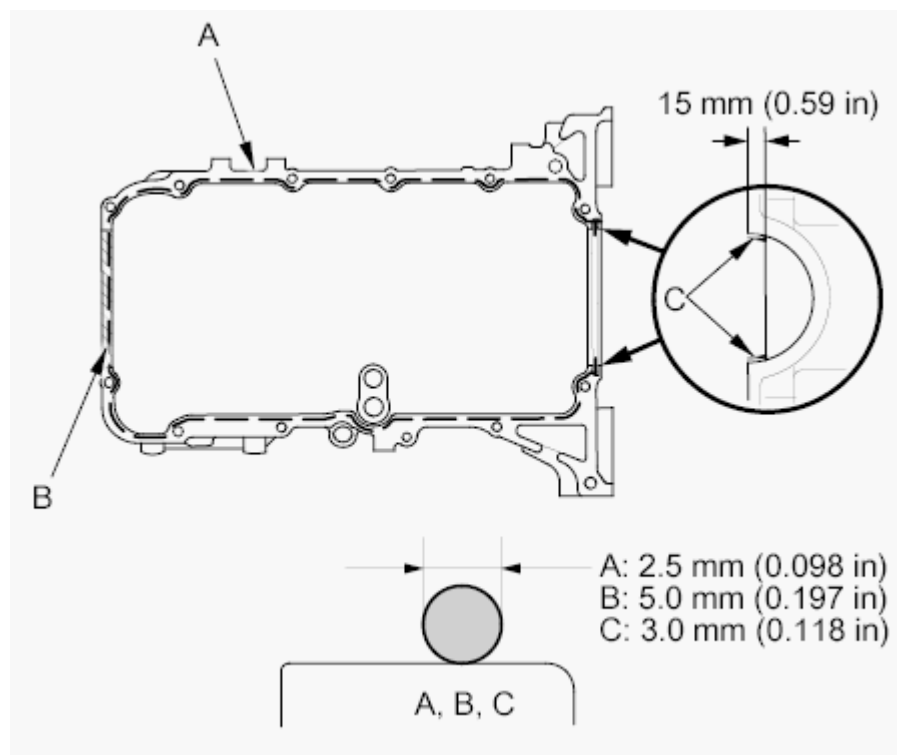


Fig. 73: Identifying Liquid Gasket Applying Area On Engine Block Mating Surface Of Oil Pan & To Inside Edge Of Bolt Holes
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Install the oil pan.

NOTE:

- Wait at least 30 minutes before filling the engine with oil.
- Do not run the engine for at least 3 hours after installing the oil pan.
- Make sure to install the bolts in the correct locations according to size.

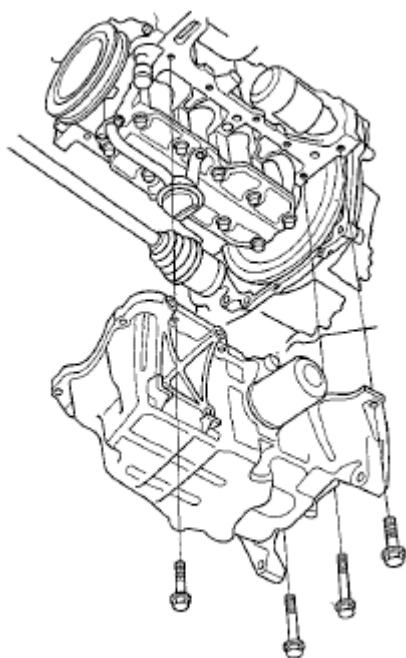


Fig. 74: Identifying Oil Pan Bolts
 Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Tighten the bolts/m three steps. Wipe off the excess liquid gasket on the each side of crankshaft pulley and the flywheel/drive plate.

Specified torque

(1): 24 N.m (2.4 kgf.m, 17 lbf.ft)

(2)-(13): 12 N.m (1.2 kgf.m, 8.8 lbf.ft)

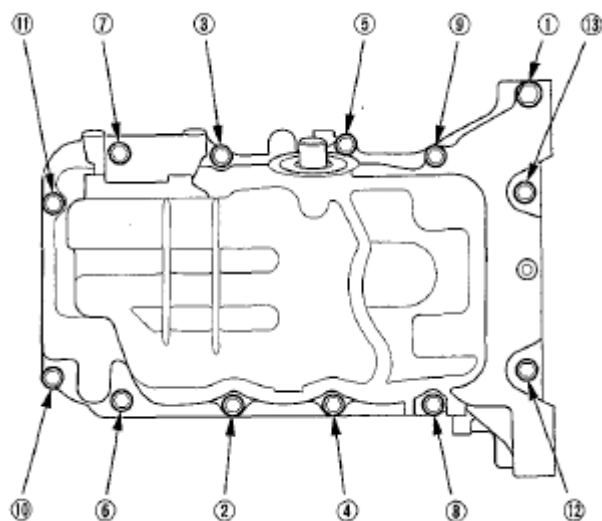
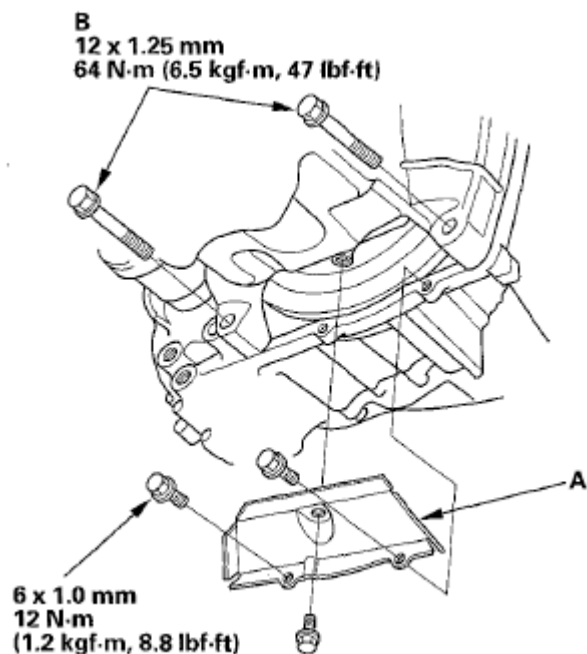


Fig. 75: Identifying Bolts Tightening Sequence

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Install the clutch cover/torque converter cover (A), and install the transmission mounting bolts (B).

M/T model**Fig. 76: Identifying Clutch Cover/Torque Converter Cover & Transmission Mounting Bolts - M/T Model With Torque Specifications**

Courtesy of AMERICAN HONDA MOTOR CO., INC.

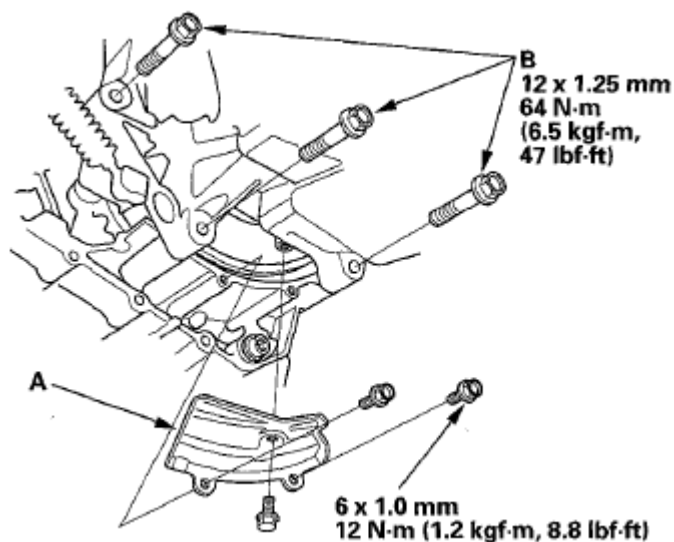
A/T model

Fig. 77: Identifying Clutch Cover/Torque Converter Cover & Transmission Mounting Bolts - A/T Model With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Connect the CKP sensor connector (A), then install the CKP sensor cover (B).

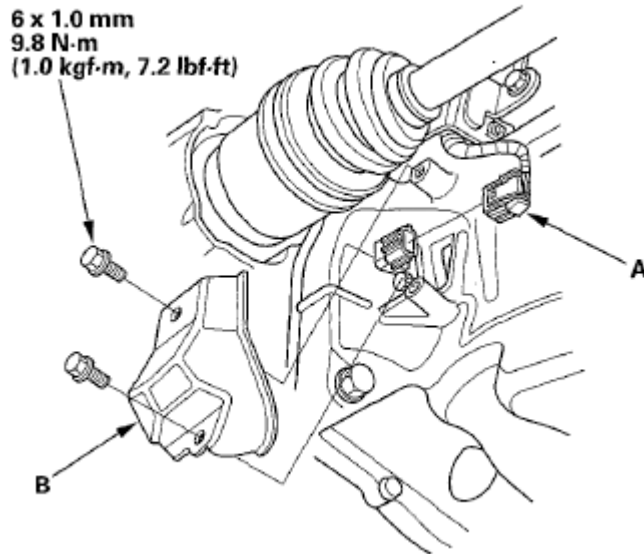


Fig. 78: Identifying CKP Sensor Connector & CKP Sensor Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Install the dipstick tube (A) with a new O-ring (B), then install the dipstick.

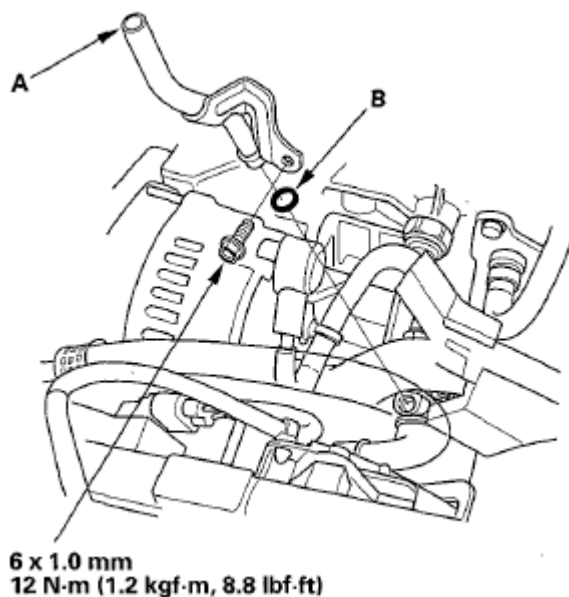


Fig. 79: Identifying Dipstick Tube & O-Ring
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. M/T model: Install the torque rod bracket (see **TORQUE ROD BRACKET REPLACEMENT**).
11. If the engine is still in the vehicle, do steps 12 through 16.
12. A/T model: Install the shift cable cover (A).

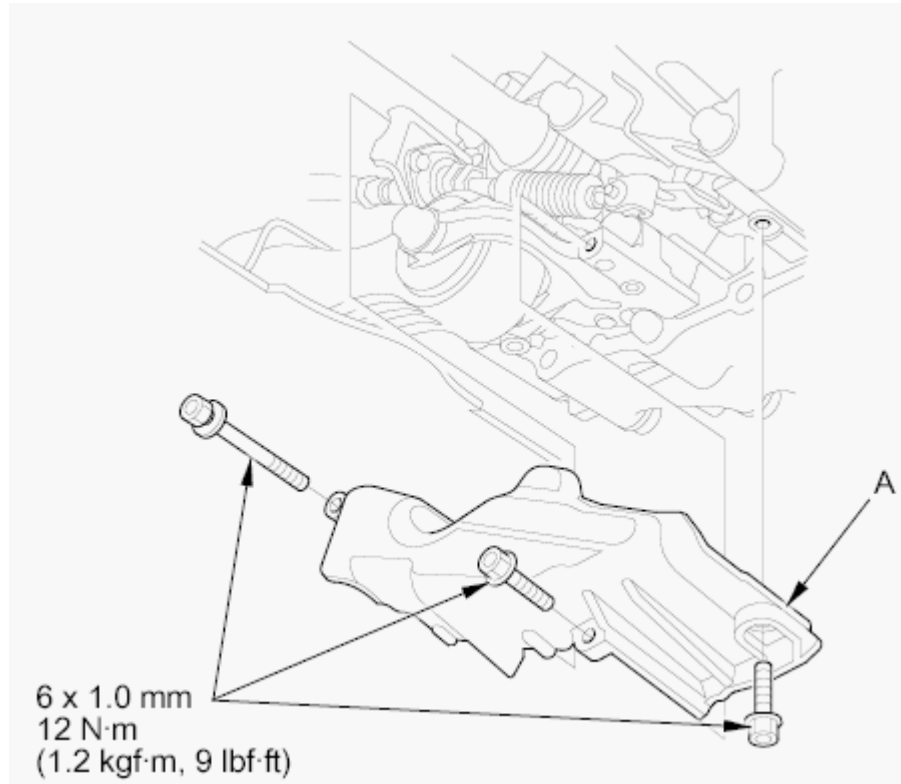


Fig. 80: Identifying Shift Cable Cover Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Install the A/C compressor (see step 26 on **SIDE ENGINE MOUNT REPLACEMENT**).
14. Install the driveshaft heat shield (see step 22 on **SIDE ENGINE MOUNT REPLACEMENT**).
15. Install the drive belt (see **DRIVE BELT REMOVAL/INSTALLATION**).
16. Refill the engine with engine oil (see step 4 on **ENGINE OIL LEVEL CHECK**).

TRANSMISSION END CRANKSHAFT OIL SEAL INSTALLATION - IN CAR

SPECIAL TOOLS REQUIRED

- Driver handle 07749-0010000
- Oil seal driver attachment, 96 mm 07ZAD-PNAA100

1. Remove the transmission:
 - Manual transmission (see **TRANSMISSION REMOVAL**)
 - Automatic transmission (see **TRANSMISSION REMOVAL**)
2. M/T model: Remove the pressure plate (see step 3 on **CLUTCH REPLACEMENT**), clutch disc (see

step 8 on **ENGINE SIDE**), and flywheel (see step 16 on **ENGINE SIDE**).

3. A/T model: Remove the drive plate (see **DRIVE PLATE REMOVAL AND INSTALLATION**).
4. Clean and dry the crankshaft oil seal housing.
5. Apply a light coat of new engine oil to the lip of the crankshaft oil seal.
6. Using the driver handle, 15 x 135 L (A), and the oil seal driver attachment, 96 mm (B), to drive a new crankshaft oil seal squarely into the engine block to the specified installed height.

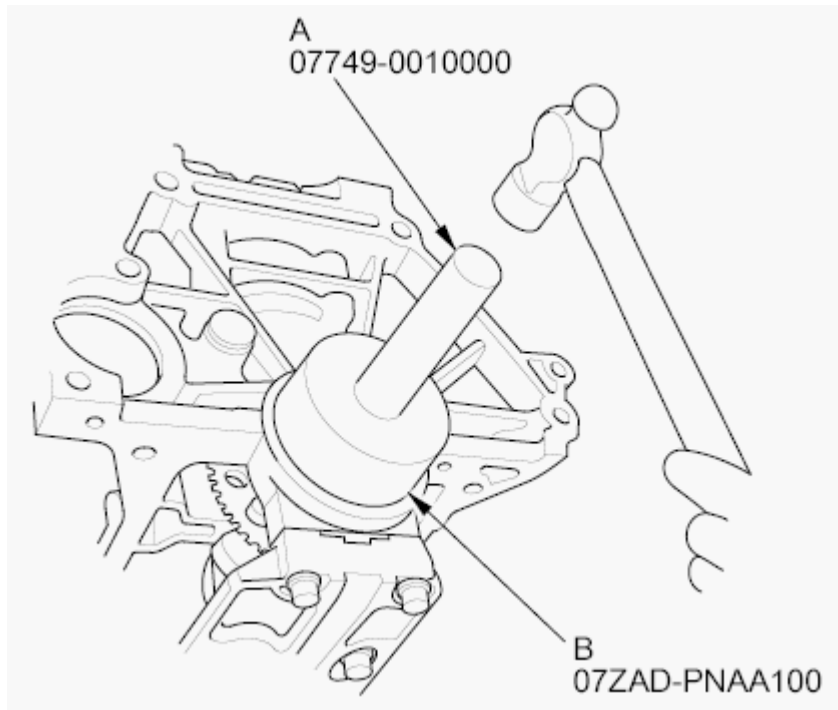


Fig. 81: Driving Oil Seal Into Block

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Measure the distance between the cylinder block (A) and the crankshaft oil seal (B).

Oil Seal Installed Height: 0.2-1.2 mm (0.008-0.047 in)

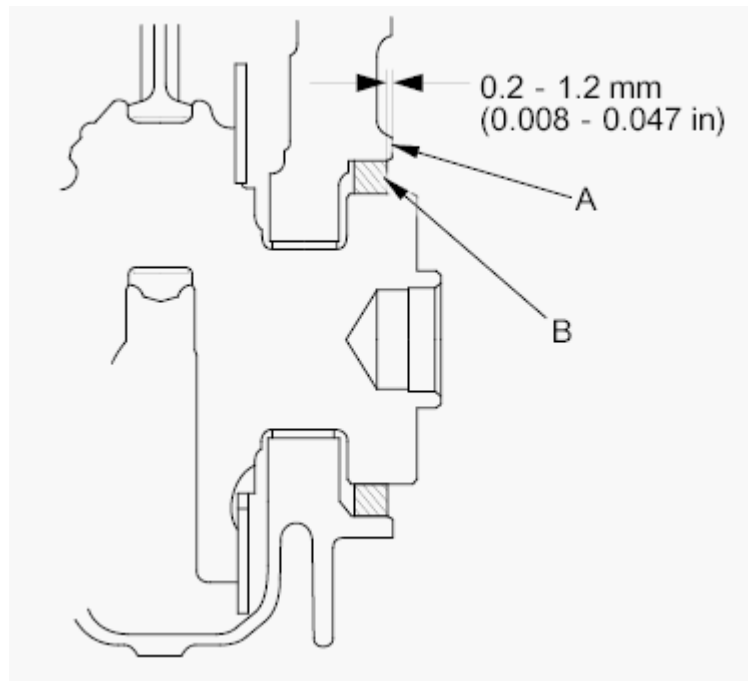


Fig. 82: Identifying Distance Between Crankshaft & Oil Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. M/T model: Install the flywheel (see step 19 on ENGINE SIDE), clutch disc (see step 25 on ENGINE SIDE), and pressure plate (see step 28 on ENGINE SIDE).
9. A/T model: Install the drive plate (see DRIVE PLATE REMOVAL AND INSTALLATION).
10. Install the transmission:
 - Manual transmission (see TRANSMISSION INSTALLATION)
 - Automatic transmission (see TRANSMISSION INSTALLATION)

DRAIN BOLT/SEALING BOLT INSTALLATION

NOTE: When installing the drain bolt (A), always use a new washer. When installing the sealing bolt(s) (B), always use a new bolt(s) and washer(s) (C).

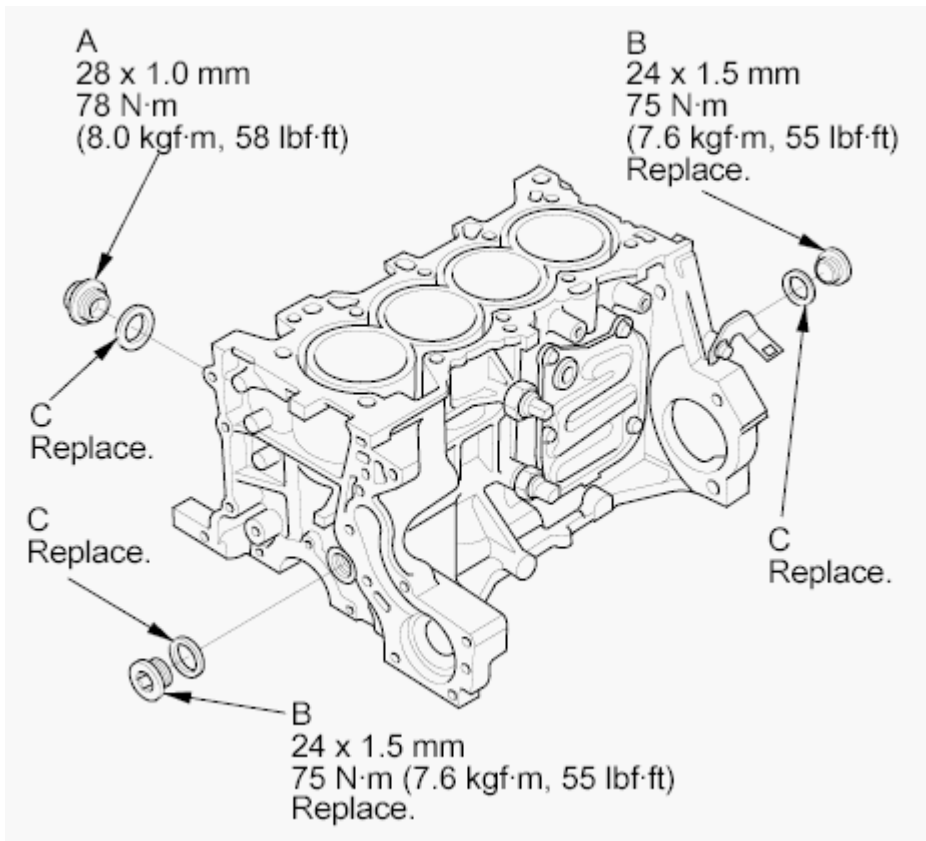


Fig. 83: Identifying Drain Bolt & Sealing Bolt With Torque Specifications
 Courtesy of AMERICAN HONDA MOTOR CO., INC.