CYLINDER HEAD (R18A1)

NOTE: Refer to the CYLINDER HEAD (SUPPLEMENTAL) (GX) article for additional information for the GX model.

SPECIAL TOOLS

Ref. No.	Tool Number	Description	Qty
①	07AAJ-PNAA101	Air Pressure Regulator	1
②	07HAH-PJ7A100	Valve Guide Reamer, 5.5 mm	1
③	07JAA-001020A	Socket, 19 mm	1
④	07JAB-001020A	Holder Handle	1
⑤	07PAD-0010000	Stem Seal Driver	1
⑥	070AB-RJA0100	Crankshaft Pulley Holder	1
⑦	07742-0010100	Valve Guide Driver, 5.5 mm	1
⑧	07757-PJ1010A	Valve Spring Compressor Attachment	1

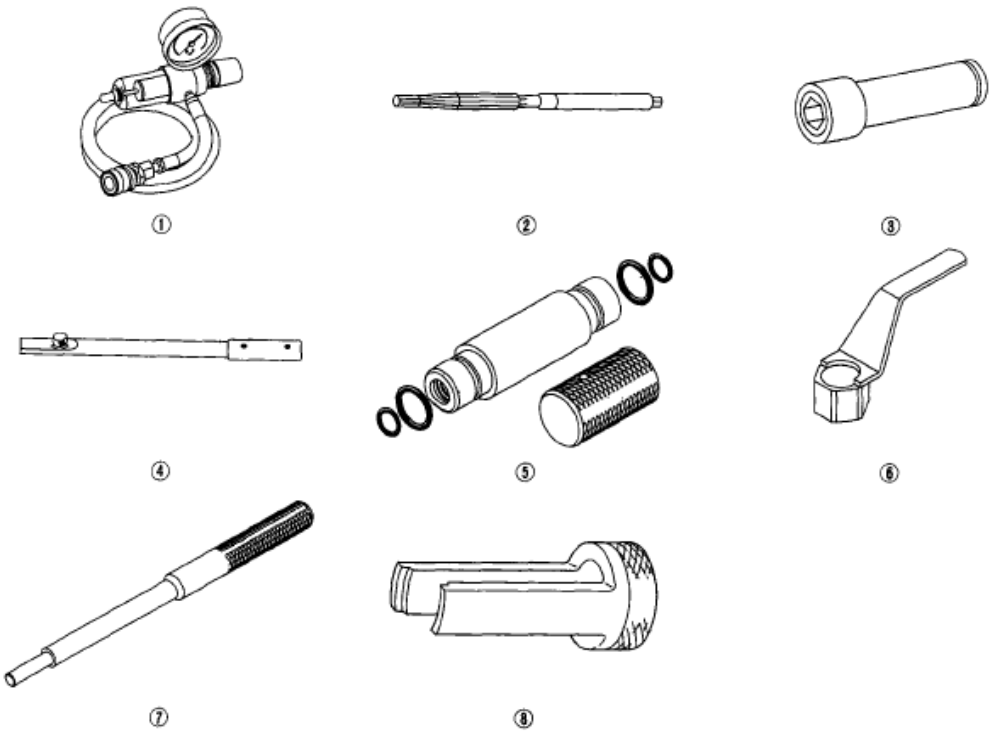


Fig. 1: Identifying Cylinder Head - Special Tools
Courtesy of AMERICAN HONDA MOTOR CO., INC.

COMPONENT LOCATION INDEX

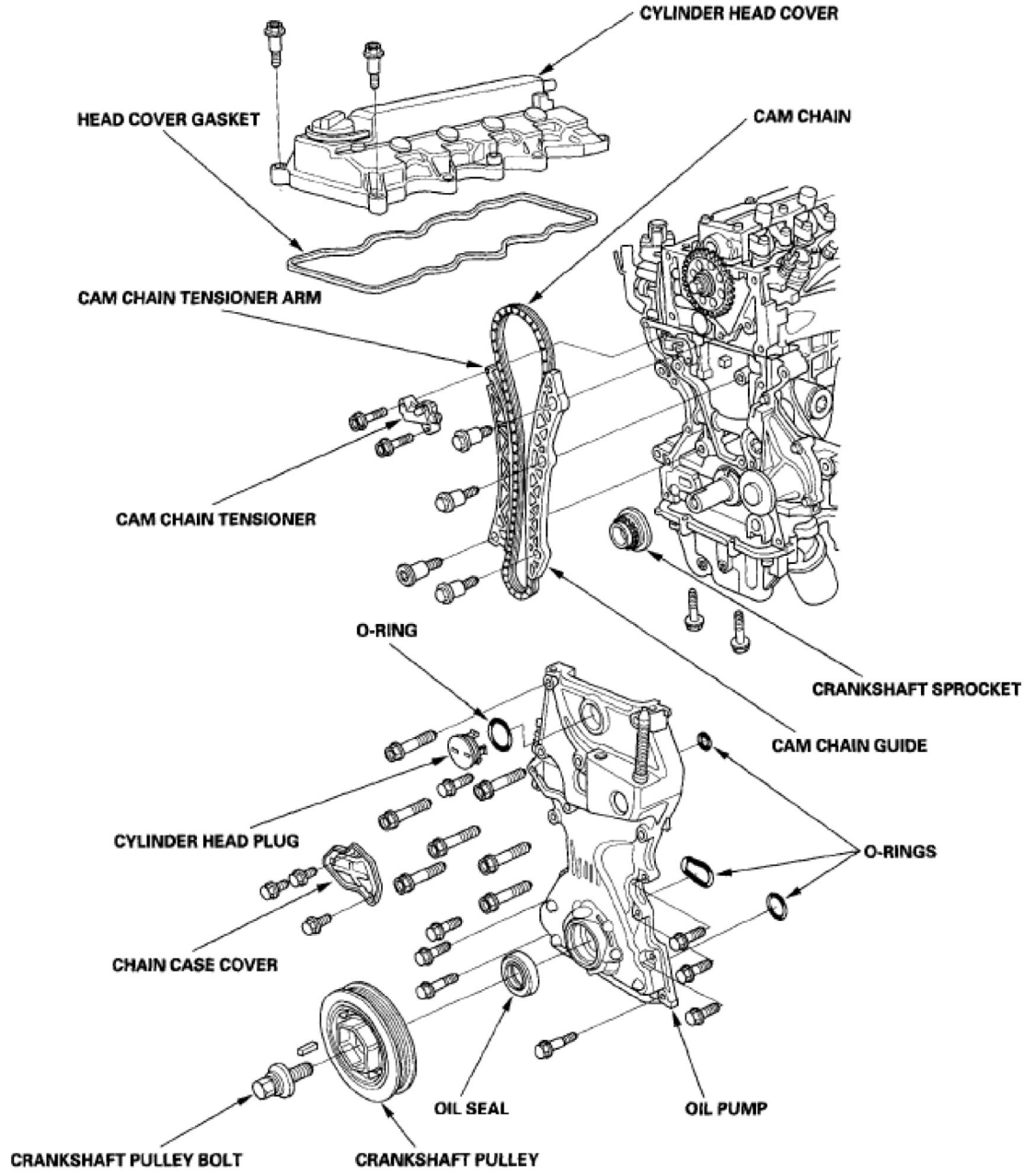


Fig. 2: Identifying Cylinder Head Component Location (1 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

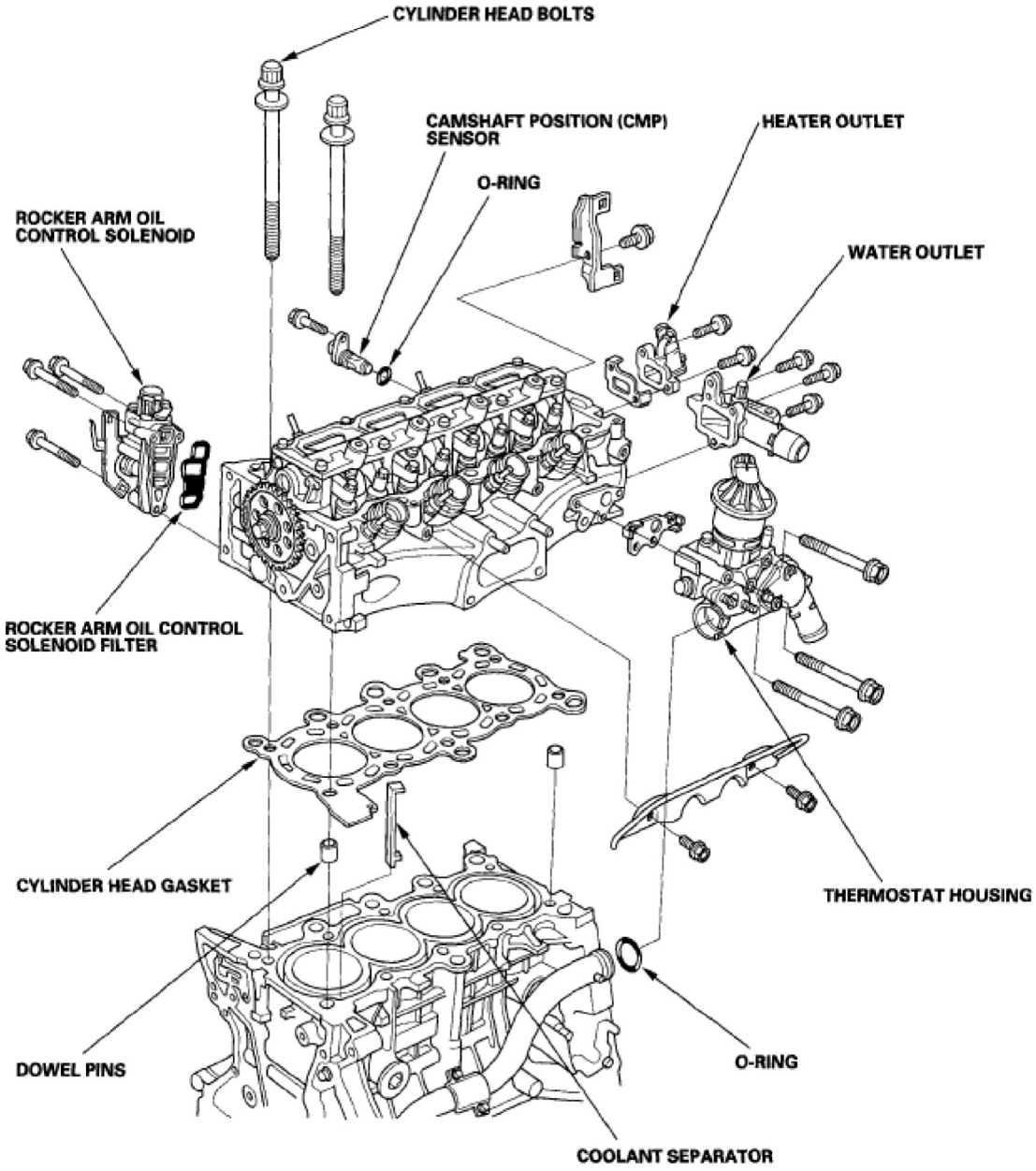


Fig. 3: Identifying Cylinder Head Component Location (2 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

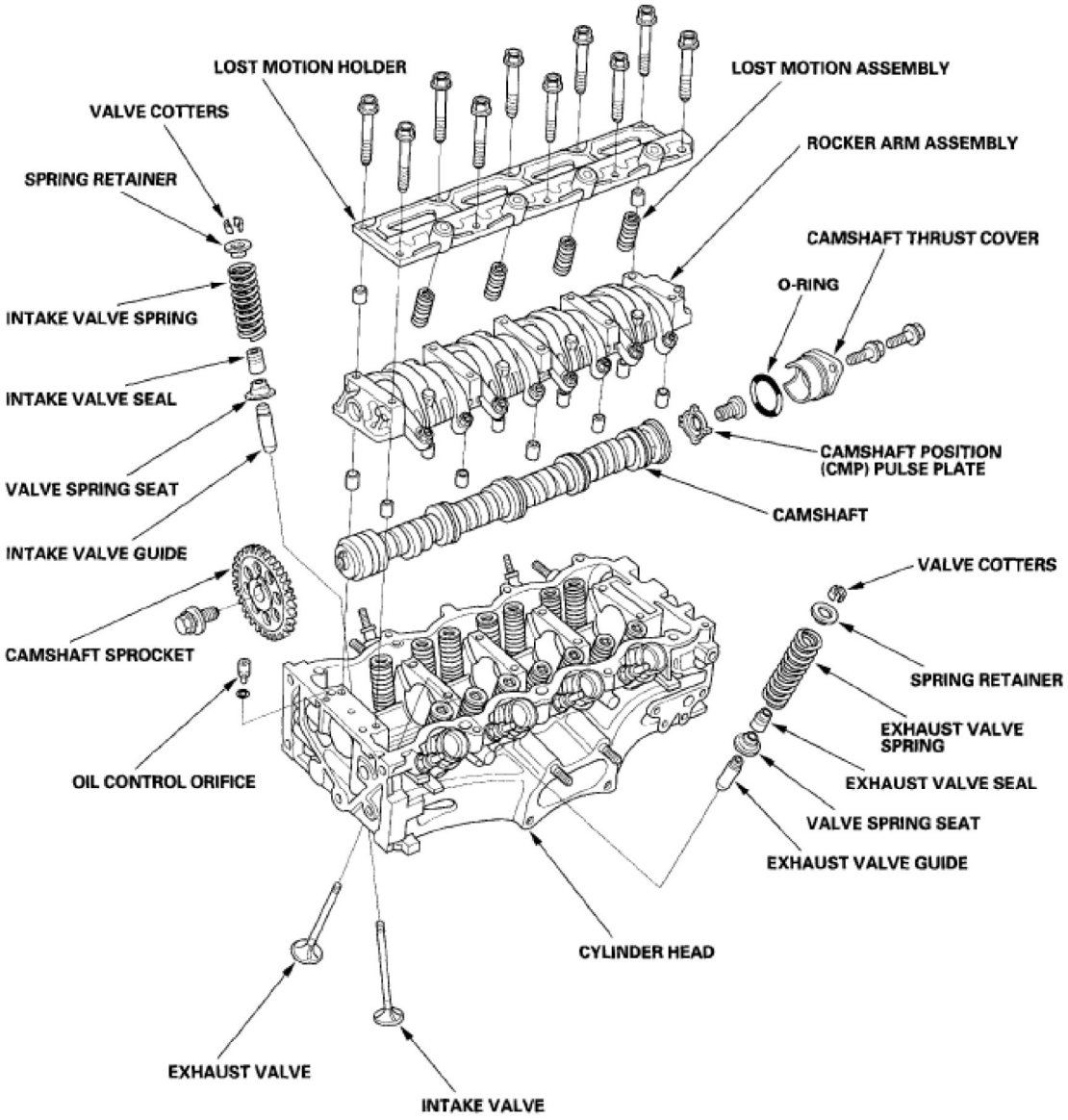


Fig. 4: Identifying Cylinder Head Component Location (3 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ENGINE COMPRESSION INSPECTION

NOTE: After this inspection, you must reset the engine control module (ECM)/ powertrain control module (PCM), otherwise the ECM/PCM will continue to stop the injectors from functioning.

1. Warm up the engine to normal operating temperature (cooling fan comes on).
2. Turn the ignition switch OFF.
3. Connect the HDS to the data link connector (DLC) (see step 2 on **HOW TO USE THE HDS (HONDA DIAGNOSTIC SYSTEM)**).

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

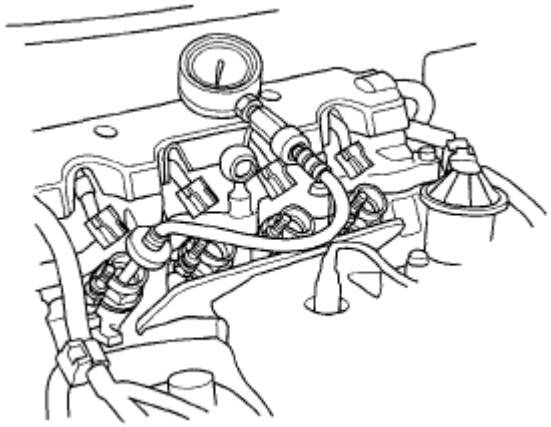


Fig. 5: Attaching Compression Gauge To Spark Plug Hole
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

    Compression Pressure:

    Above 880 kPa (9.0 kgf/cm^2 , 128 psi)

12. Measure the compression on the remaining cylinders.

    Maximum Variation:

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

13. If the compression is not within specifications, check the following items, then remeasure the compression.
    - Damaged or worn valves and seats
    - Damaged cylinder head gasket
    - Damaged or worn piston rings
    - Damaged or worn piston and cylinder bore
14. Remove the compression gauge from the spark plug hole.

15. Install the four spark plugs (see **SPARK PLUG INSPECTION**).
16. Install the four ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION**).
17. Select ECM/PCM reset (see **ECM/PCM RESET**) to cancel the ALL INJECTORS OFF function on the HDS.
18. Do the ECM/PCM idle learn procedure (see **ECM/PCM IDLE LEARN PROCEDURE**).

VTEC ROCKER ARM TEST

Special Tools Required

Air pressure regulator 07AAJ-PNAA101

1. Start the engine, and let it run for 5 minutes, then turn OFF the ignition switch.
2. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
3. Set the No. 1 piston at top dead center (TDC) (see step 2).
4. Move the intake secondary rocker arm A for the No. 1 cylinder. The secondary rocker arm A should move independently of the secondary rocker arm B.
   - If the intake secondary rocker arm A moves freely, go to step 5.
   - If the intake secondary rocker arm A does not move, remove the secondary rocker arms as an assembly, then check that the pistons in the secondary rocker arms move smoothly. If any rocker arm needs replacing, replace the secondary rocker arms as an assembly, and retest.

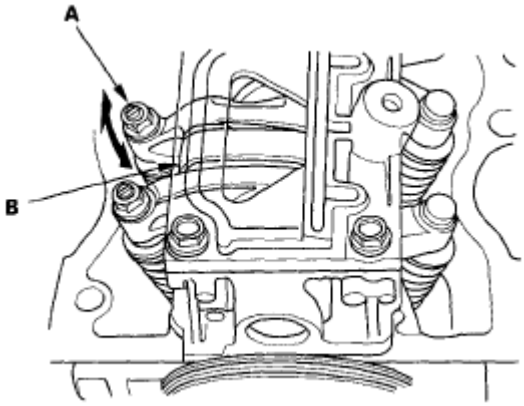


Fig. 6: Identifying Intake Secondary Rocker Arm
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Repeat step 4 on the remaining intake secondary rocker arms with each piston at TDC. When all the secondary rocker arms pass the test, go to step 6.
6. Check that the air pressure on the shop air compressor gauge indicates over 400 kPa (4.0 kgf/cm^2 , 57 psi).
7. Inspect the valve clearance (see **VALVE CLEARANCE ADJUSTMENT**).
8. Install a 10 x 1.0 mm adapter to the inspection hole, then connect the air pressure regulator.

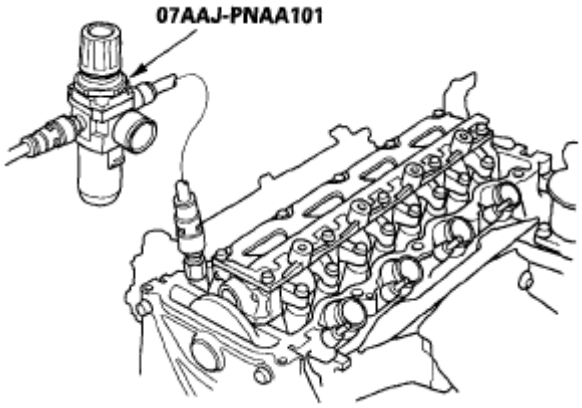


Fig. 7: Identifying Special Tools
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Specified Air Pressure:

   290 kPa (3.0 kgf/cm^2 , 42 psi)

10. With the specified air pressure applied, move the intake secondary rocker arm A for the No. 1 cylinder. The secondary rocker arm A and secondary rocker arm B should move together.

    If the intake secondary rocker arm A does not move, remove the secondary rocker arms as an assembly, and check that the pistons in the secondary rocker arms move smoothly. If any rocker arm needs replacing, replace the secondary rocker arms as an assembly, and retest.

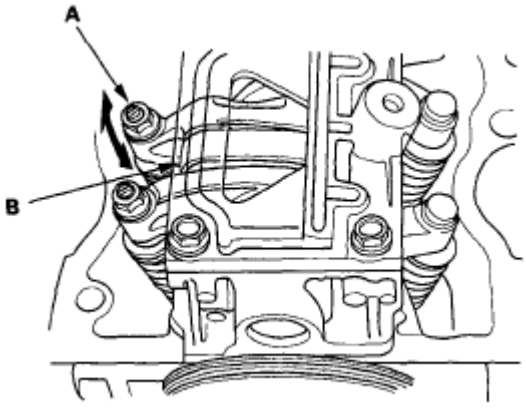


Fig. 8: Identifying Intake Secondary Rocker Arm
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Remove the air pressure regulator and the 10 x 1.0 mm adapter.
12. Install the cylinder head cover (see **CYLINDER HEAD COVER INSTALLATION**).

VALVE CLEARANCE ADJUSTMENT

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

1. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
2. Set the No. 1 piston at top dead center (TDC). The "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.

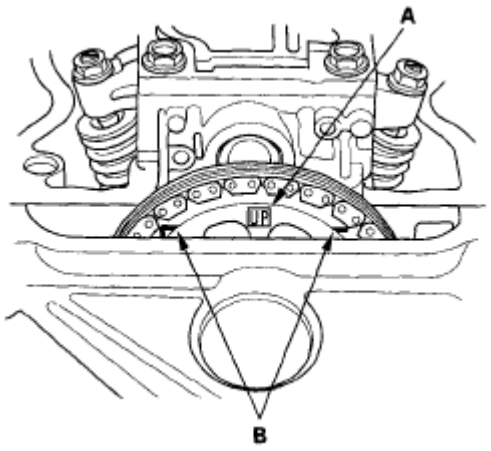


Fig. 9: Identifying UP Mark On Camshaft Sprocket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Valve Clearance

Intake: 0.18-0.22 mm (0.007-0.009 in.)

Exhaust: 0.23-0.27 mm (0.009-0.011 in.)

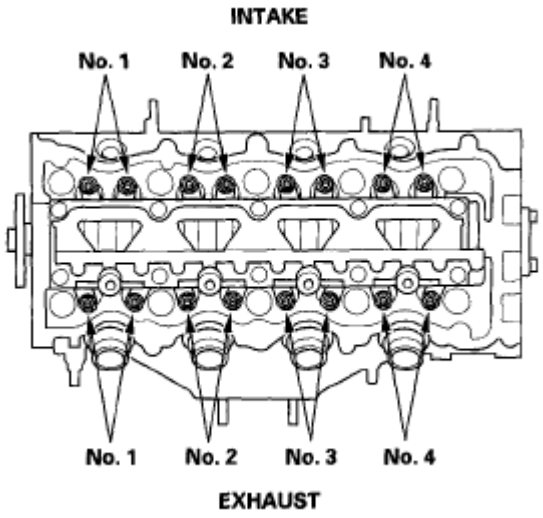


Fig. 10: Identifying Intake And Exhaust Valve
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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.

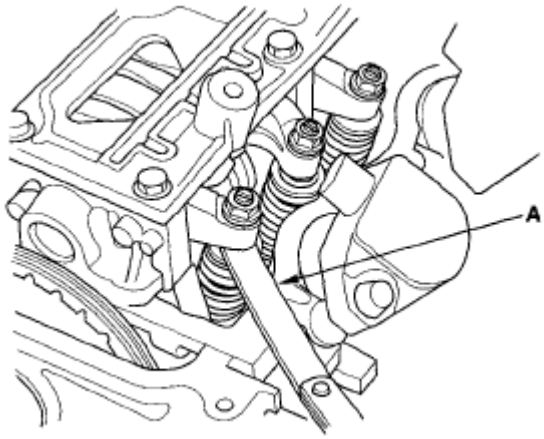


Fig. 11: Identifying Feeler Gauge
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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.

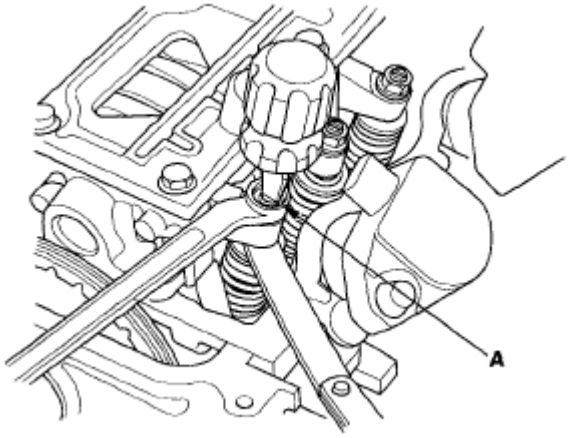


Fig. 12: Identifying Adjusting Screw
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Tighten the locknut and recheck the clearance. Repeat the adjustment, if necessary.
7. Tighten the locknut.

Specified Torque:

7 x 0.75 mm

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

8. Recheck the valve clearance. Repeat the adjustment if necessary.
9. Rotate the crankshaft clockwise. Align the No. 3 piston TDC groove (A) on the camshaft sprocket with the top edge of the head.

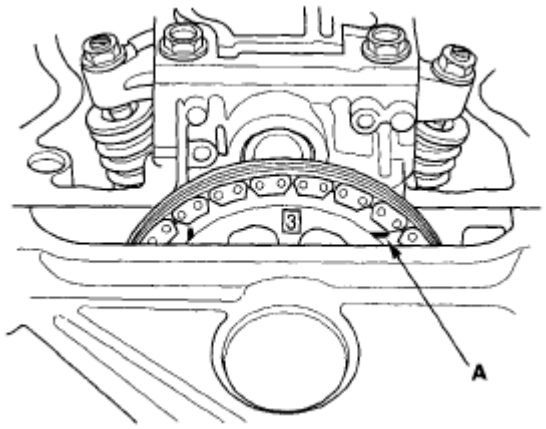


Fig. 13: Aligning No. 3 Piston TDC Groove On Camshaft Sprocket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

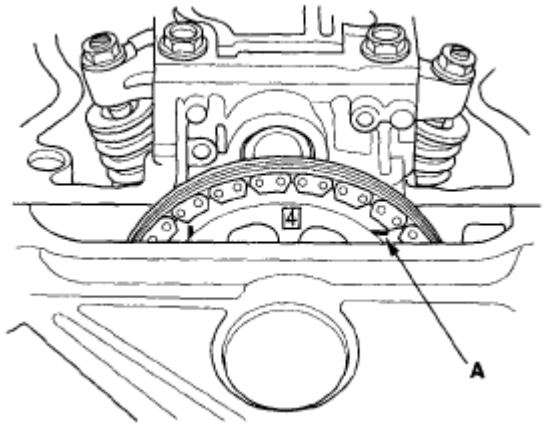


Fig. 14: Aligning No. 4 Piston TDC Groove On Camshaft Sprocket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

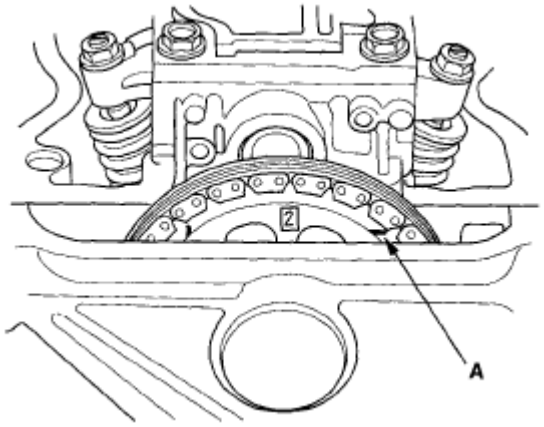


Fig. 15: Aligning No. 2 Piston TDC Groove On Camshaft Sprocket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

CRANKSHAFT PULLEY REMOVAL AND INSTALLATION

Special Tools Required

- Holder handle 07JAB-001020A
- Crankshaft pulley holder 070AB-RJA0100
- Socket, 19 mm 07JAA-001020A, or a commercially available 19 mm socket

Removal

1. Remove the right front wheel.
2. Remove the drive belt (see **DRIVE BELT INSPECTION**).
3. Hold the pulley with the holder handle (A) and holder (B).

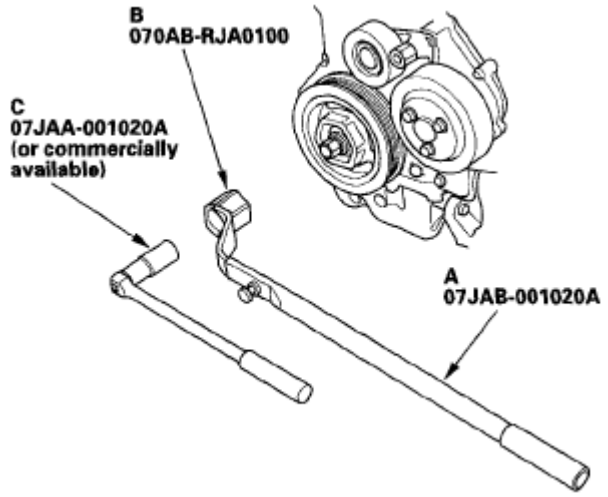


Fig. 16: Identifying Special Tools
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Installation

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

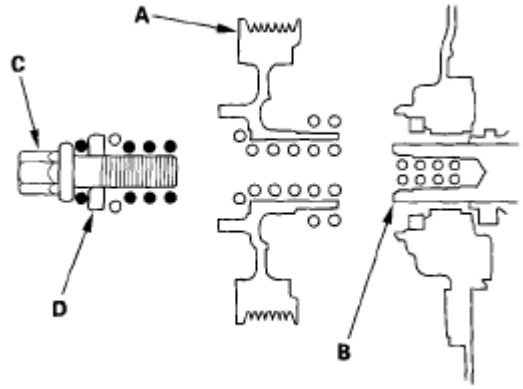


Fig. 17: Identifying Crankshaft Pulley Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Install the crankshaft pulley (A) onto the crankshaft (B) by aligning the flat sides (C) of the pulley with the flat sides (D) of the inner oil pump gear.

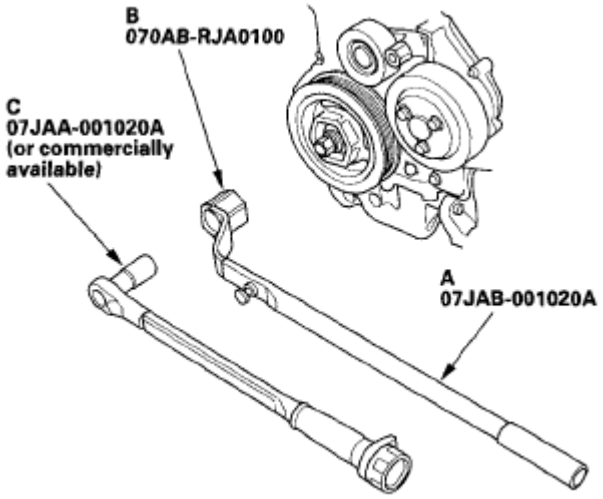


Fig. 18: Identifying Special Tools
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Hold the crankshaft pulley with the holder handle (A) and the holder attachment (B). Torque the bolt to 69 N*m (7.0 kgf*m, 51 lbf*ft) with a torque wrench and the socket, 19 mm (C). Do not use an impact wrench. If the pulley bolt or crankshaft are new, torque the bolt to 177 N*m (18.0 kgf*m, 130 lbf*ft), then remove the bolt and torque it to 69 N*m (7.0 kgf*m, 51 lbf*ft)
4. Mark the bolt head (A) and the crankshaft pulley (B) as shown, then tighten the bolt an additional 90° (The mark on the bolt head line up with the mark on the crankshaft pulley).

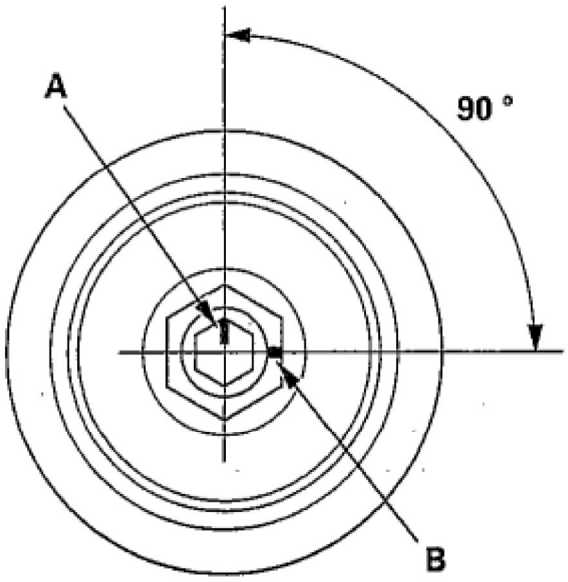


Fig. 19: Marking The Bolt Head And The Crankshaft Pulley
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

6. Install the right front wheel.

CAM CHAIN REMOVAL

NOTE: Keep the cam chain away from magnetic fields.

1. Remove the front wheels.
2. Remove the splash shield.
3. Remove the drive belt auto-tensioner (see **DRIVE BELT AUTO-TENSIONER REMOVAL/INSTALLATION**).
4. Remove the cylinder head cover (see **CYLINDER HEAD COVER REMOVAL**).
5. 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.

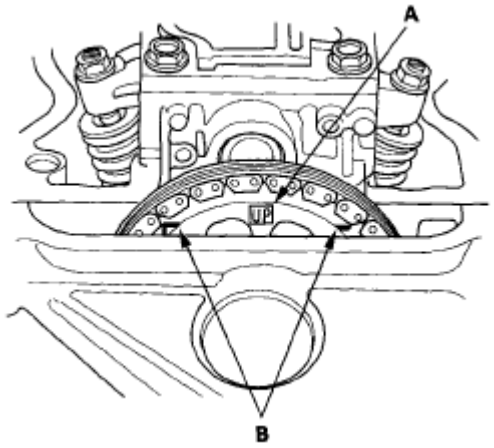


Fig. 20: Identifying UP Mark On Camshaft Sprocket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the positive crankcase ventilation (PCV) hose.

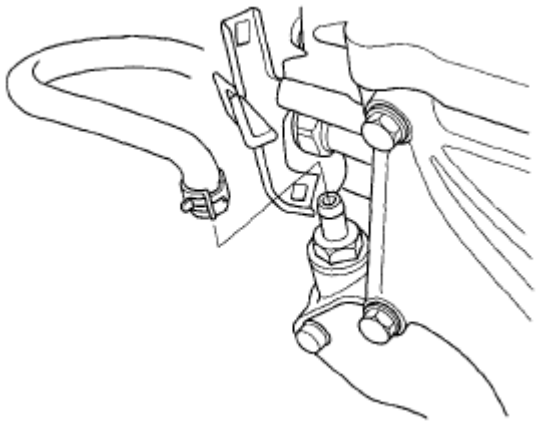


Fig. 21: Identifying Positive Crankcase Ventilation (PCV) Hose

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the crankshaft pulley (see **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
8. Support the engine with a jack and a wood block under the oil pan.
9. Remove the bolt (A) securing the A/C line, then remove the upper torque rod (B).

M/T

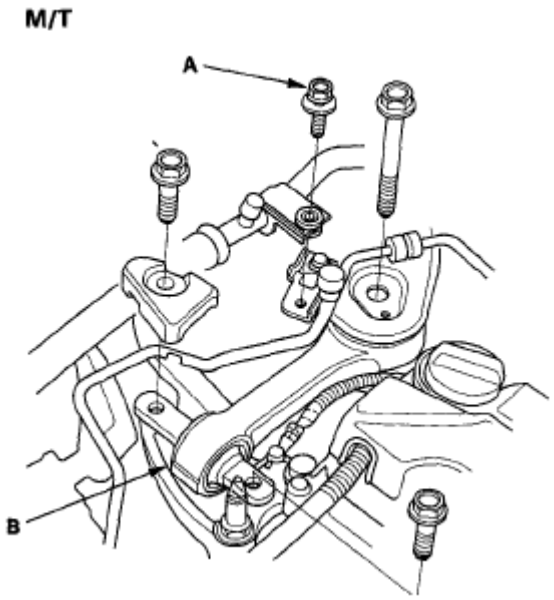


Fig. 22: Identifying A/C Line Bolt - M/T
Courtesy of AMERICAN HONDA MOTOR CO., INC.

A/T

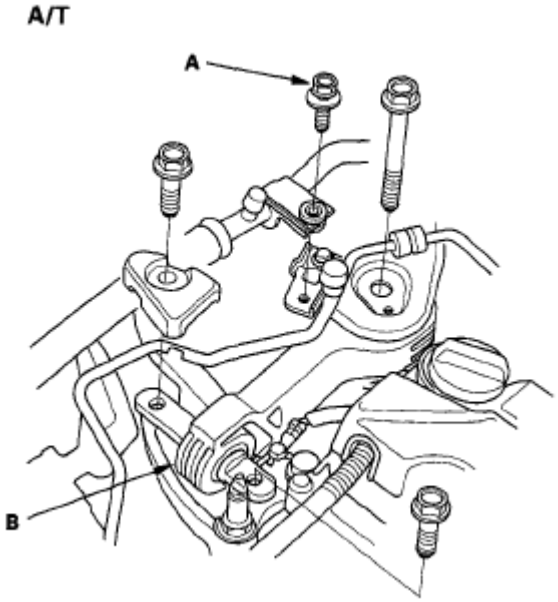


Fig. 23: Identifying A/C Line Bolt - A/T
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Remove the ground cable (A), then remove the side engine mount bracket (B).

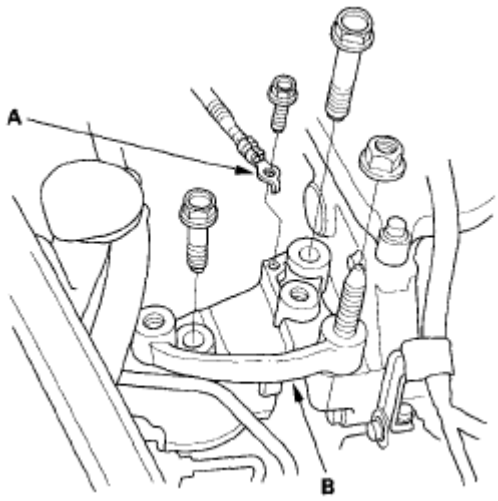


Fig. 24: Identifying Ground Cable And Side Engine Mount Bracket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Remove the oil pump.

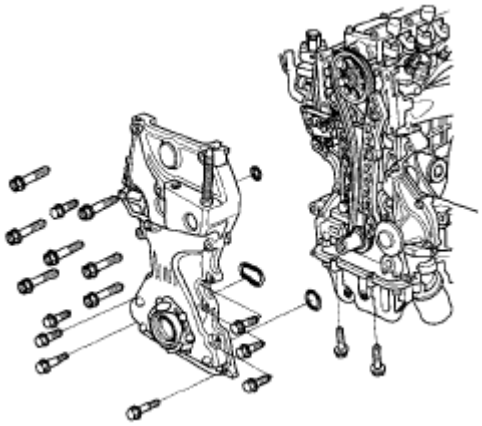


Fig. 25: Identifying Oil Pump
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Measure the tensioner rod length between the tensioner body and bottom of the flat surface section on the tensioner rod. If the length is more than the service limit, replace the cam chain.

    Tensioner Rod Length

    Service Limit: 14.5 mm (0.57 in.)

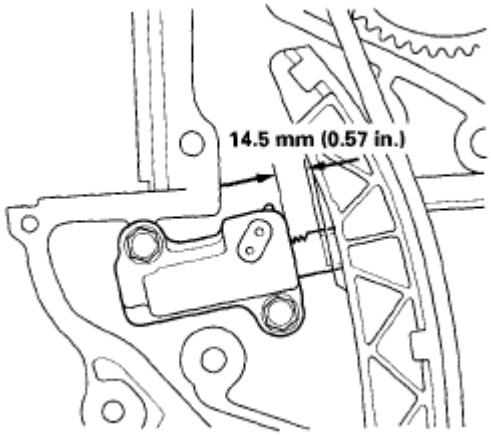


Fig. 26: Measuring Tensioner Rod Length Between Tensioner Body And Bottom Of Flat Surface Section On Tensioner Rod
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Loosely install the crankshaft pulley.
14. Turn the crankshaft counterclockwise to compress the auto-tensioner.

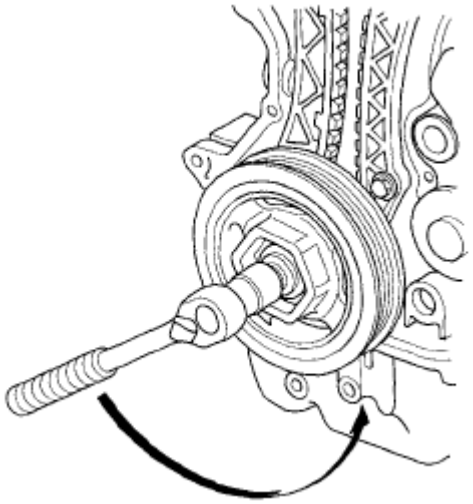


Fig. 27: Turning Crankshaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Align the holes on the lock (A) and the auto-tensioner (B), then insert a 1.0 mm (0.04 in.) diameter pin (C) into the holes. Turn the crankshaft clockwise to secure the pin.

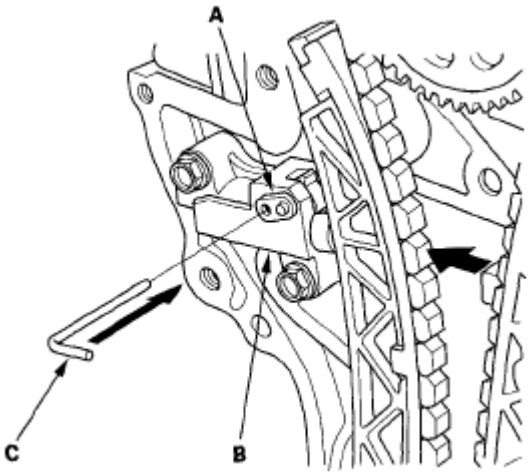


Fig. 28: Aligning Holes On Lock And Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

16. Remove the auto-tensioner.

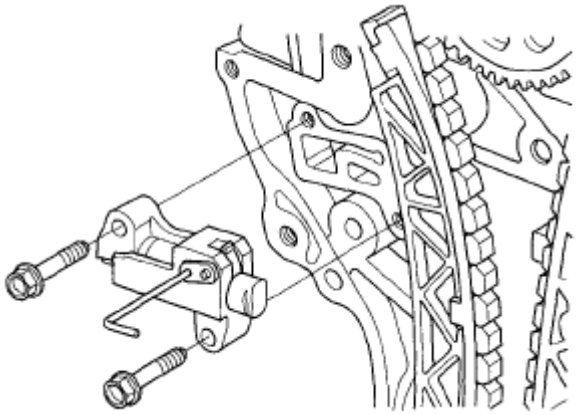


Fig. 29: Identifying Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Remove the crankshaft pulley.
18. Remove the cam chain guide (A) and cam chain tensioner arm (B).

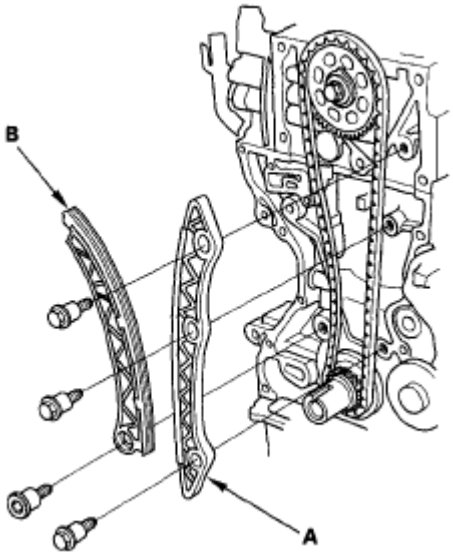


Fig. 30: Identifying Cam Chain Guide
Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Remove the cam chain.

CAM CHAIN INSTALLATION

NOTE: Keep the cam chain away from magnetic 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 engine block.

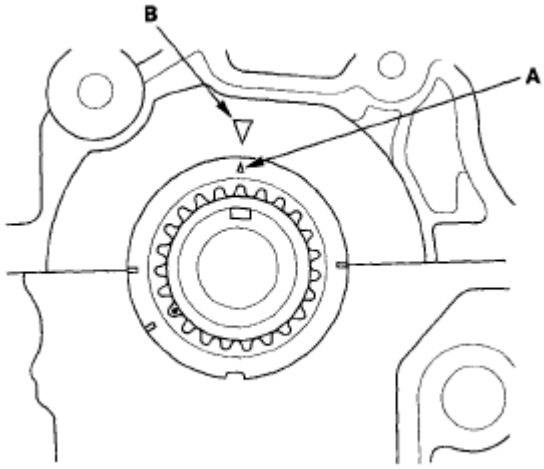


Fig. 31: Aligning TDC Mark On Crankshaft Sprocket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. 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.

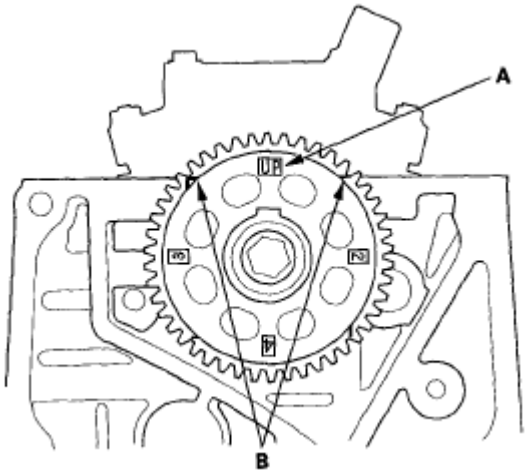


Fig. 32: Identifying UP Mark On Camshaft Sprocket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

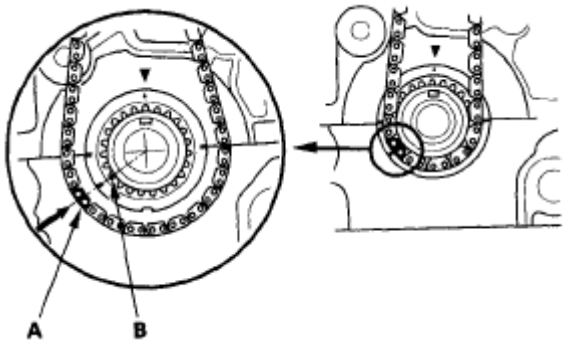


Fig. 33: Aligning Mark On Crankshaft Sprocket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Install the cam chain on the camshaft sprocket with the colored link plate (A) aligned with the mark (B) on the camshaft sprocket.

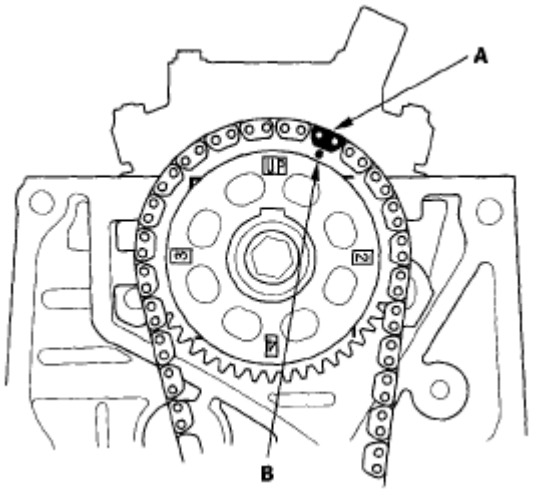


Fig. 34: Identifying Colored Link Plate
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

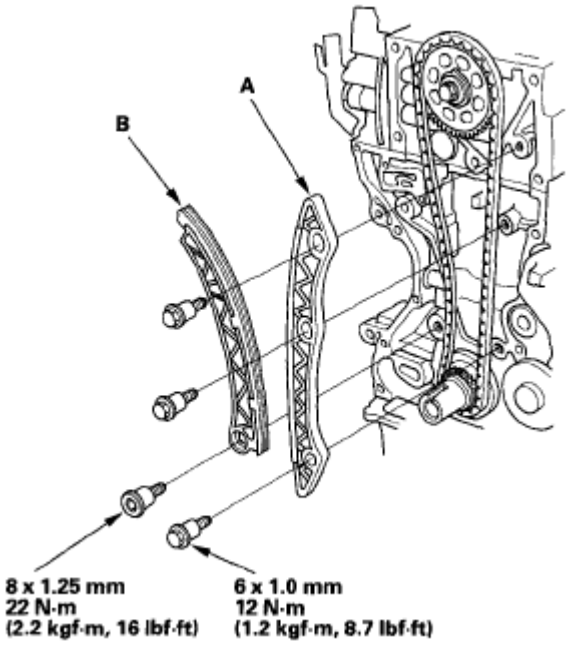


Fig. 35: Identifying Cam Chain Guide
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Install the auto-tensioner.

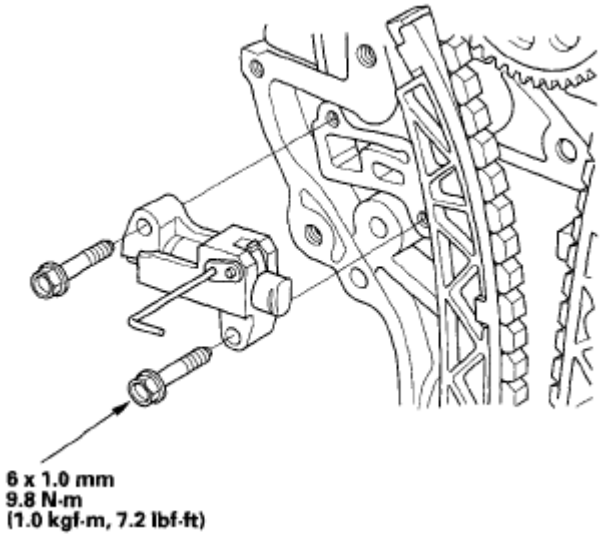


Fig. 36: Identifying Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the pin or lock pin from the auto-tensioner.

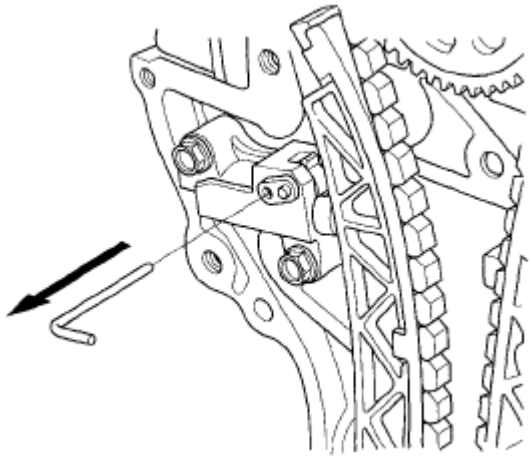


Fig. 37: Locating Pin Or Lock Pin
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Check the oil pump oil seal for damage. If the oil seal is damaged, replace the oil seal (see **PULLEY END CRANKSHAFT OIL SEAL INSTALLATION**).
9. Remove all of the old liquid gasket from the oil pump mating surfaces, bolts, and bolt holes.
10. Clean, and dry the oil pump mating surfaces.
11. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0002, 08718-0003, or 08718-0009, evenly to the engine block mating surface of the oil pump.

NOTE:

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

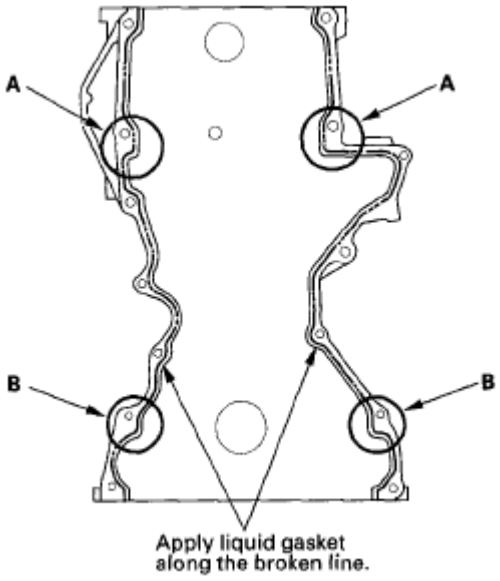


Fig. 38: Identifying Applying Area Of Liquid Gasket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Apply liquid gasket to the engine block upper surface contact areas (A) on the oil pump and lower block upper surface contact areas (B) on the oil pump.
13. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0002, 08718-0003, or 08718-0009, evenly to the oil pan mating surface of the oil pump.

NOTE:

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

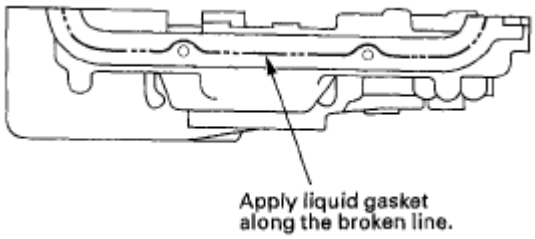


Fig. 39: Identifying Applying Liquid Gasket Broken Line
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Install new O-rings (A) on the oil pump. Set the edge of the oil pump (B) to the edge of the oil pan (C), then install the oil pump on the engine block (D). Loosely install the dowel bolts (E), then tighten the 8 mm bolts (F). Tighten the 6 mm bolts (G) and dowel bolts. Wipe off the excess liquid gasket on the oil pan and oil pump mating area.

NOTE:

- **When installing the oil pump, do not slide the bottom surface onto the oil pan mounting surface.**
- **Wait at least 30 minutes to allow liquid gasket to cure before filling the engine with oil.**
- **Do not run the engine for at least 3 hours to allow liquid gasket to cure after installing the oil pump.**

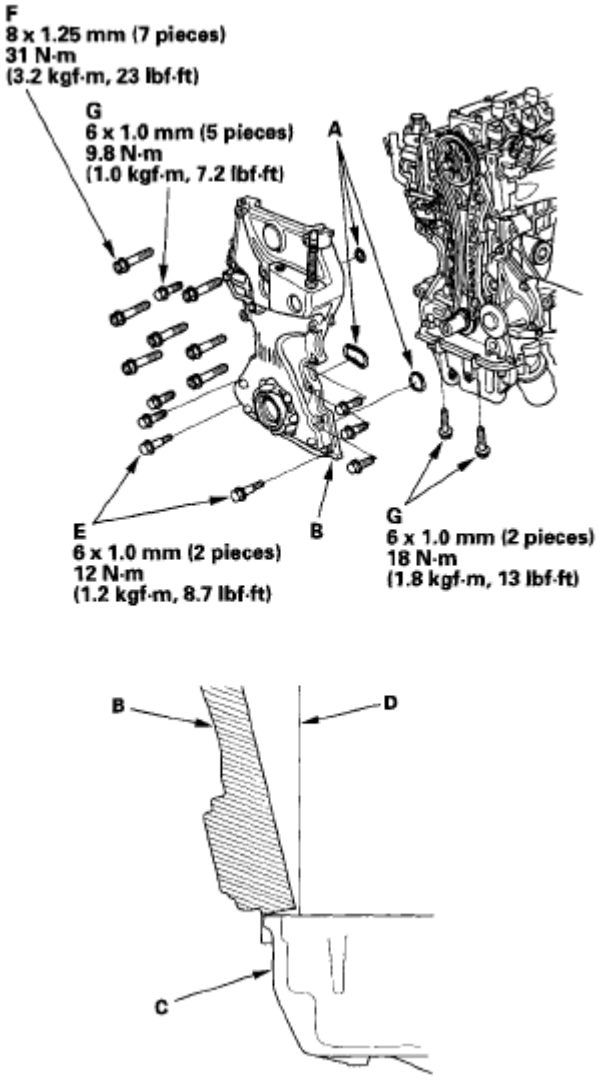


Fig. 40: Installing Oil Pump (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Install the side engine mount bracket (A), then loosely tighten the new bolt and nut (B), and loosely tighten the bolt (C).

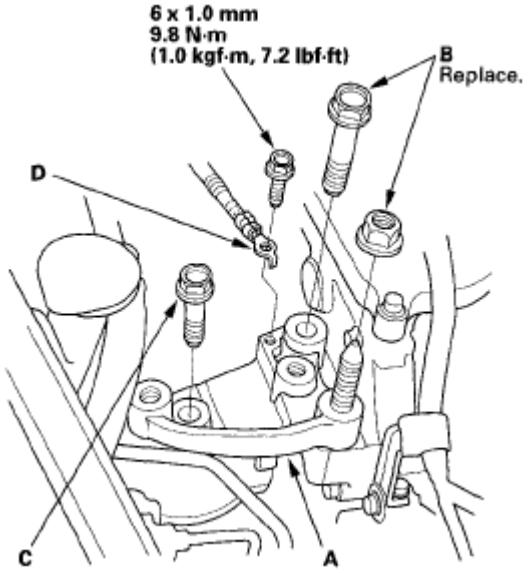


Fig. 41: Identifying Side Engine Mount Bracket (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

16. Install the ground cable (D).
17. Remove the air cleaner assembly (see **THROTTLE BODY CLEANING**).
18. Loosen the transmission mounting bolt and nuts (A).

M/T

Fig. 42: Identifying Transmission Mounting Bolt And Nuts - M/T
Courtesy of AMERICAN HONDA MOTOR CO., INC.

A/T

A/T

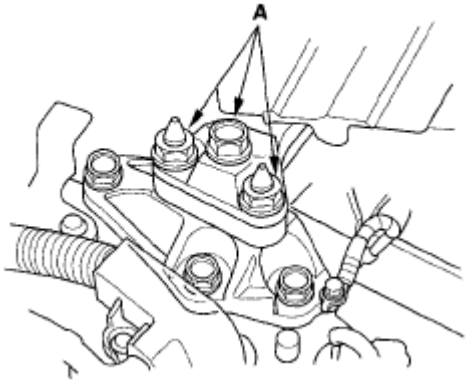


Fig. 43: Identifying Transmission Mounting Bolt And Nuts - A/T
Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Raise the vehicle on the lift to full height.
20. Loosen the lower torque rod mounting bolt (A).

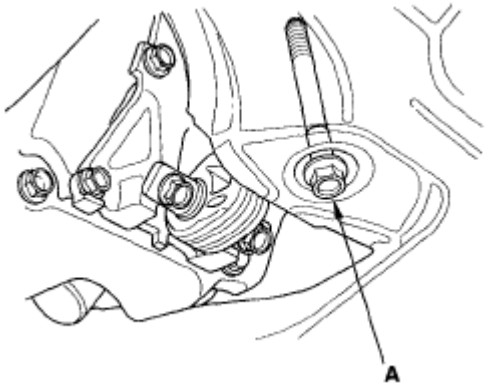


Fig. 44: Identifying Lower Torque Rod Mounting Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

21. Lower the vehicle on the lift.
22. Tighten the side engine mount mounting bolts and nut.

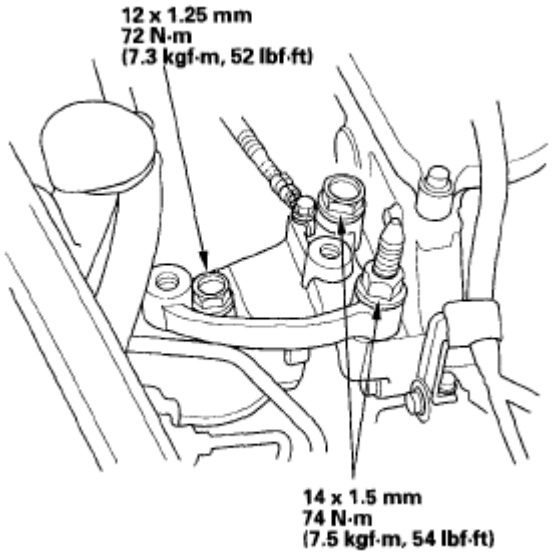


Fig. 45: Identifying Side Engine Mount Mounting Bolts And Nut (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

23. Tighten the transmission mounting bolt and nuts.

M/T

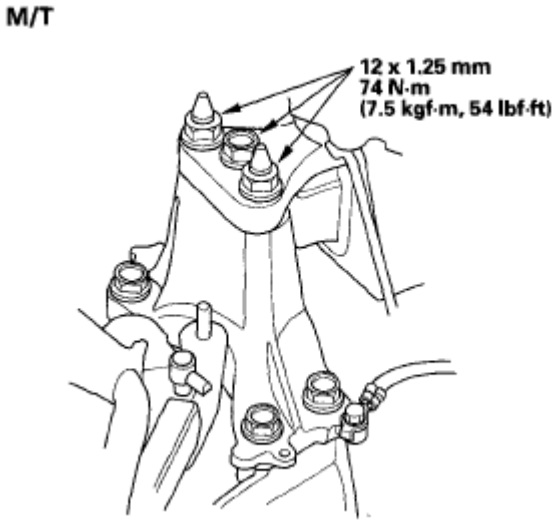


Fig. 46: Identifying Transmission Mounting Bolt And Nuts - M/T (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

A/T

A/T

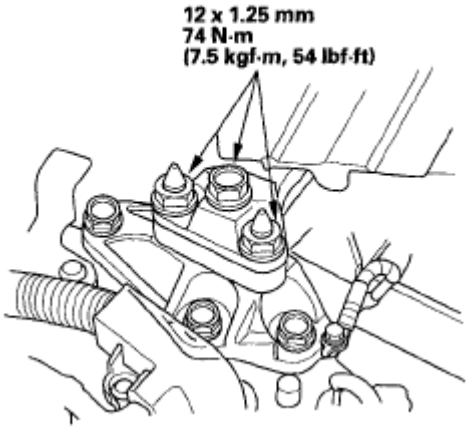


Fig. 47: Identifying Transmission Mounting Bolt And Nuts - A/T (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

24. Raise the vehicle on the lift to full height.
25. Tighten the lower torque rod mounting bolt.

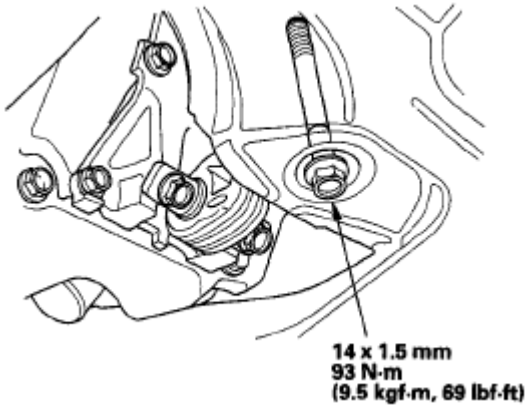


Fig. 48: Identifying Lower Torque Rod Mounting Bolt (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

26. Lower the vehicle on the lift.
27. Install the air cleaner assembly (see **THROTTLE BODY CLEANING**).
28. Install the upper torque rod (A), then tighten the new upper torque rod mounting bolts in the numbered sequence shown.

M/T

M/T

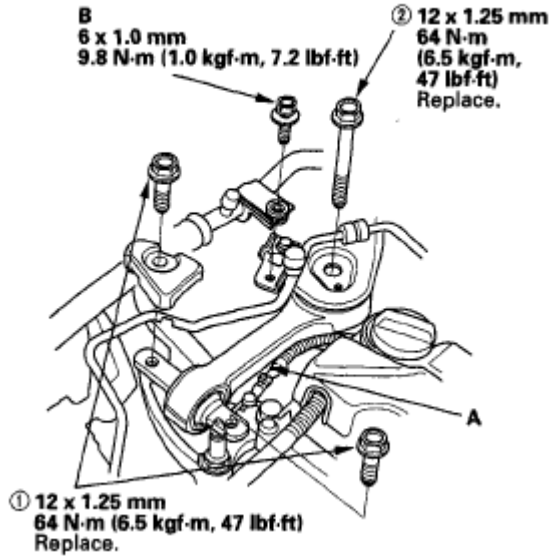


Fig. 49: Identifying Upper Torque Rod Mounting Bolts - M/T (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

A/T

A/T

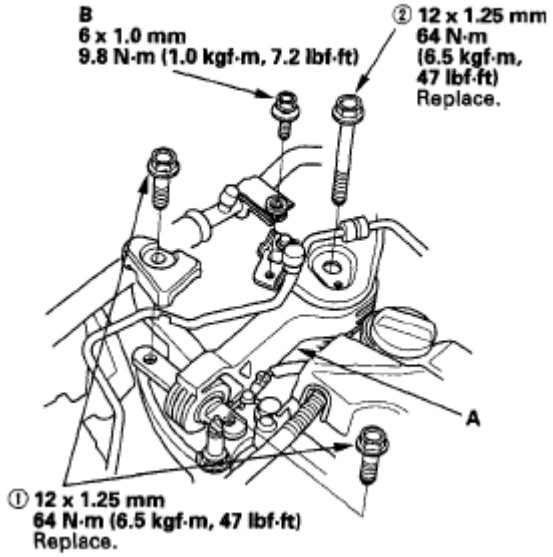


Fig. 50: Identifying Upper Torque Rod Mounting Bolts - A/T (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

29. Install the bolt (B) securing the A/C line.
30. Install the crankshaft pulley (see **INSTALLATION**).
31. Install the positive crankcase ventilation (PCV) hose.

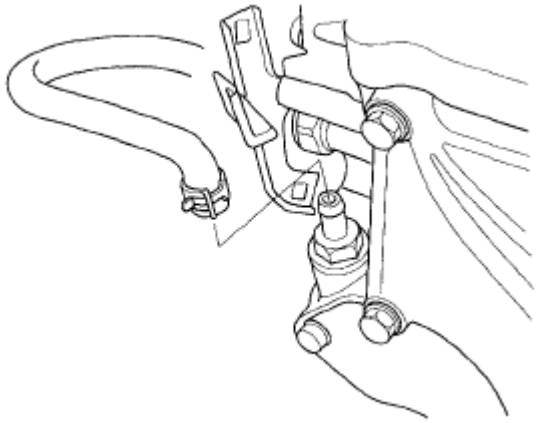


Fig. 51: Identifying Positive Crankcase Ventilation (PCV) Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

32. Install the cylinder head cover (see **CYLINDER HEAD COVER INSTALLATION**).
33. Install the drive belt auto-tensioner (see **DRIVE BELT AUTO-TENSIONER REMOVAL/INSTALLATION**).
34. Install the splash shield.
35. Install the front wheels.
36. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **ECM/PCM RESET**).

AUTO-TENSIONER REMOVAL AND INSTALLATION

Removal

1. Remove the chain case cover.

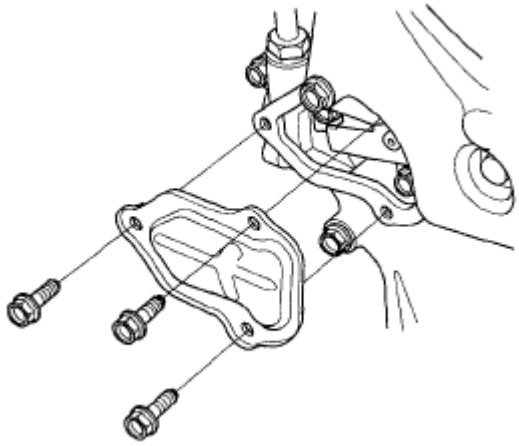


Fig. 52: Identifying Chain Case Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Turn the crankshaft counterclockwise to compress the auto-tensioner.

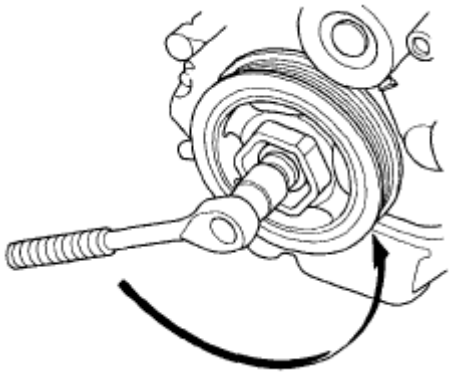


Fig. 53: Turning Crankshaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Align the holes on the lock (A) and the auto-tensioner (B), then insert a 1.0 mm (0.04 in.) diameter pin (C) into the holes. Turn the crankshaft clockwise to secure the pin.

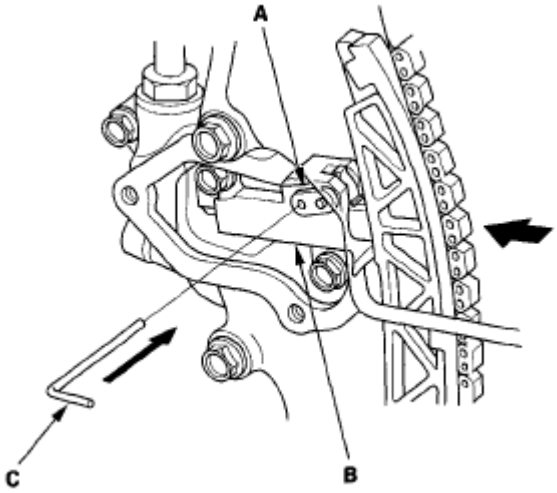


Fig. 54: Aligning Holes On Lock And Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the auto-tensioner.

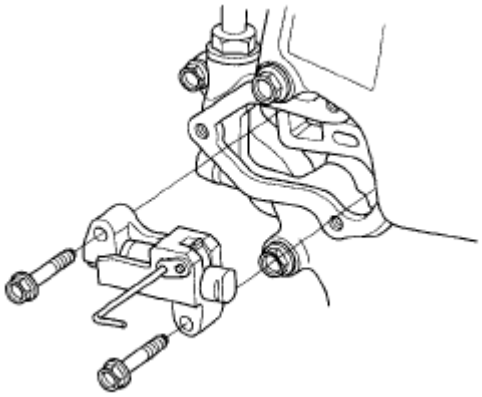


Fig. 55: Identifying Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Installation

1. Install the auto-tensioner.

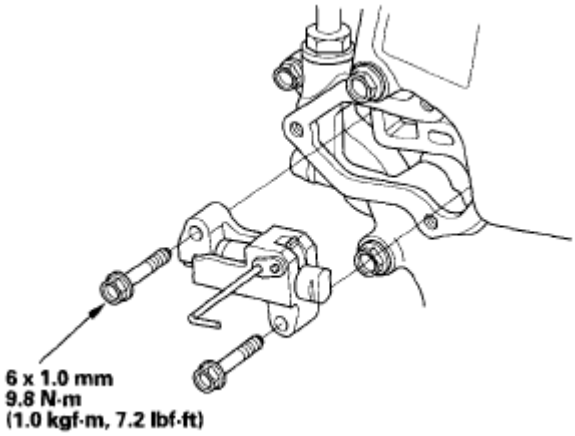


Fig. 56: Identifying Auto-Tensioner (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Remove the pin from the auto-tensioner.

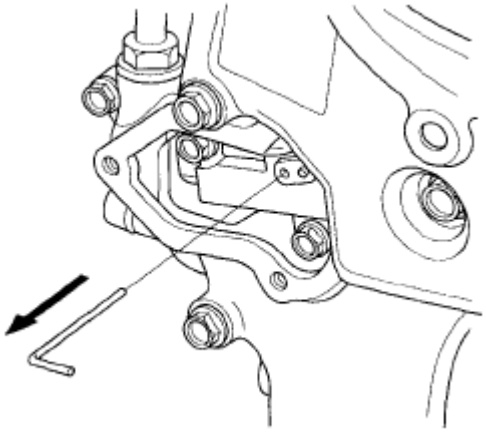


Fig. 57: Identifying Pin
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove all of the old liquid gasket from the chain case cover mating surfaces, bolts, and bolt holes.
4. Clean and dry the chain case cover mating surfaces.
5. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0002, 08718-0003, or 08718-0009, evenly to the oil pump mating surface of the chain case cover.

NOTE: Do not install components if too much time has passed after applying the liquid gasket (for P/N 08718-0002, no more than 4 minutes, for all others, no more than 5 minutes). Instead, remove the old residue and reapply the liquid gasket.

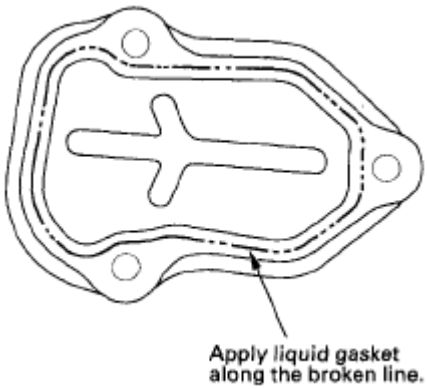


Fig. 58: Identifying Broken Line Of Liquid Gasket Applying Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Install the chain case cover.

NOTE:

- **Wait at least 30 minutes to allow liquid gasket to cure before filling the engine with oil.**
- **Do not run the engine for at least 3 hours to allow liquid gasket to**

cure after installing the chain case.

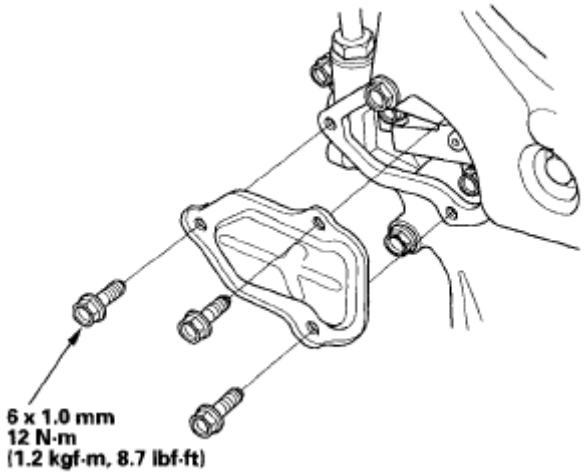


Fig. 59: Identifying Chain Case Cover (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER HEAD COVER REMOVAL

1. Remove the harness cover.

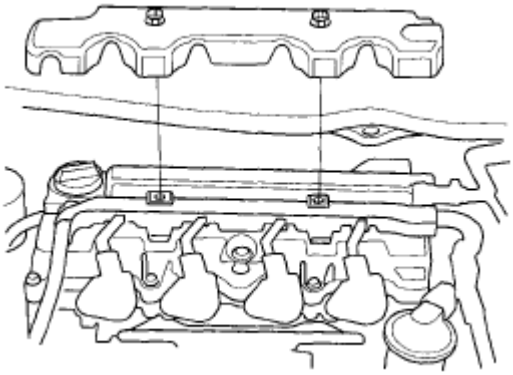


Fig. 60: Identifying Harness Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Remove the injector cover.

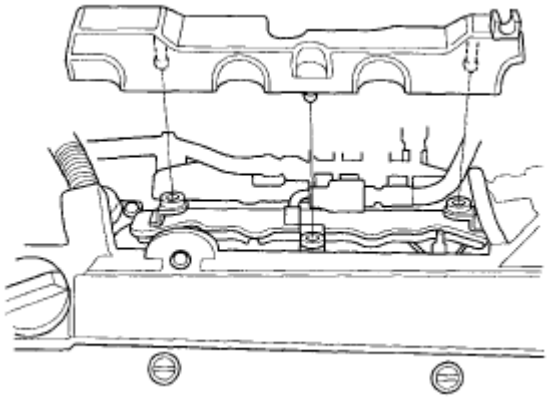


Fig. 61: Identifying Injector Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Disconnect the four ignition coil connectors. Remove the four bolts (A) securing the harness holders, then remove the front harness holder (B) from the bracket.

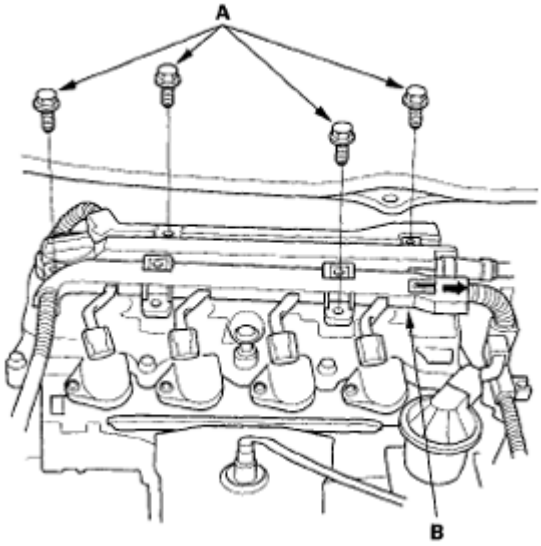


Fig. 62: Identifying Harness Holders Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Disconnect the alternator connector (A) and BLK wire (B) from the alternator.

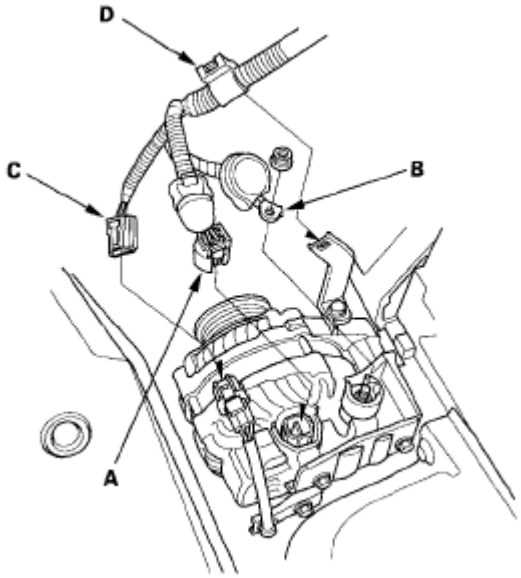


Fig. 63: Identifying Alternator Connector And BLK Wire
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Disconnect the A/C compressor clutch connector (C), and remove the harness clamp (D).
6. Remove the dipstick (A) and breather hose (B).

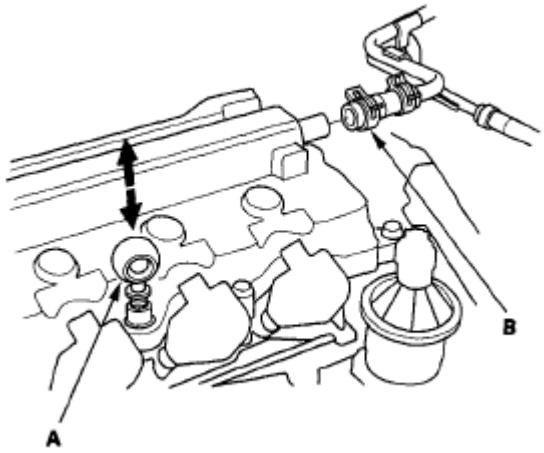


Fig. 64: Identifying Dipstick And Breather Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the cylinder head cover.

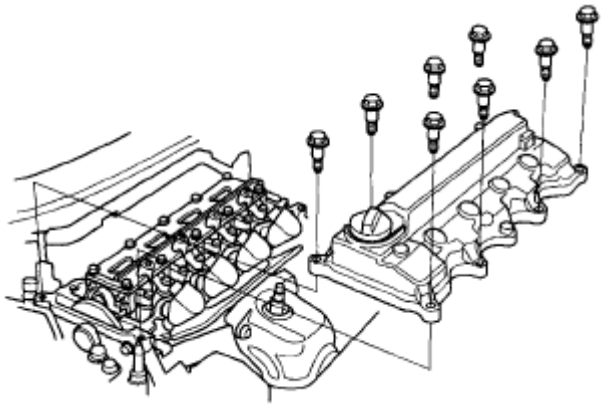


Fig. 65: Identifying Cylinder Head Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER HEAD COVER INSTALLATION

1. Thoroughly clean the head cover gasket and the groove.
2. Install the head cover gasket (A) in the groove of the cylinder head cover (B).

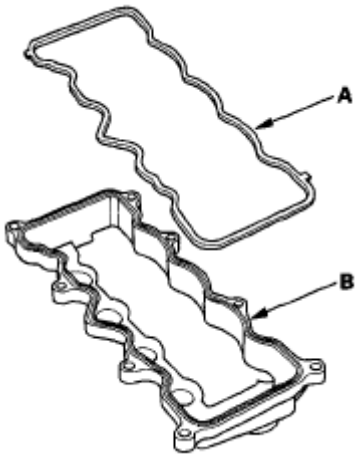


Fig. 66: Identifying Head Cover Gasket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Check that the mating surfaces are clean and dry.
4. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0002, 08718-0003, or 08718-0009, on the oil pump mating areas.

NOTE:

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

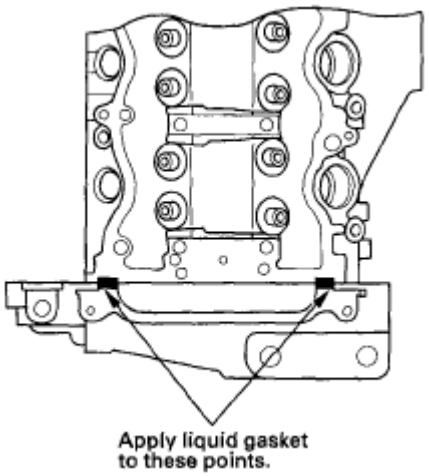


Fig. 67: Identifying Liquid Gasket Applying Points
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Install the cylinder head cover, and tighten the bolts in two or three steps. In the final step, tighten all the bolts, in sequence, to 9.8 N.m (1.0 kgf.m, 7.2 lbf.ft).

NOTE:

- **Wait at least 30 minutes to allow liquid gasket to cure before filling the engine with oil.**
- **Do not run the engine for at least 3 hours to allow liquid gasket to cure after installing the head cover.**

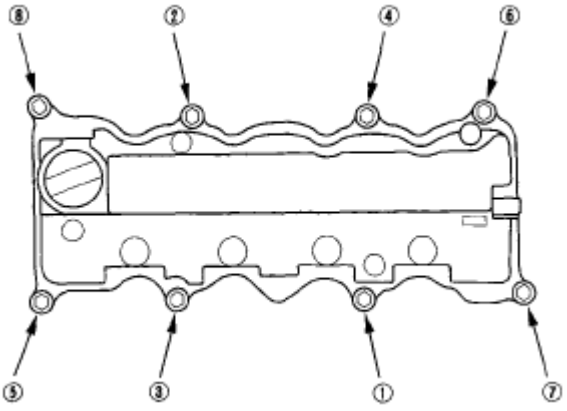


Fig. 68: Identifying Bolts Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Install the dipstick (A) and breather hose (B).

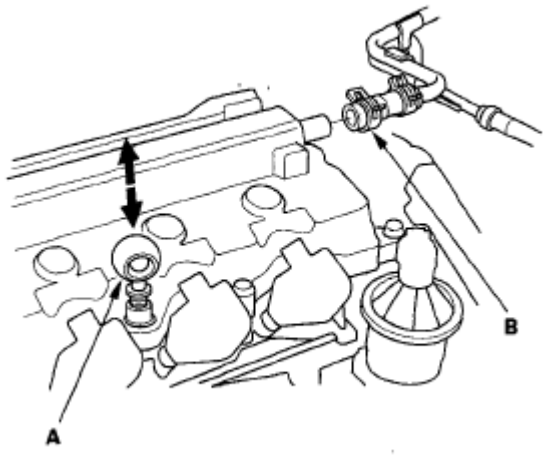


Fig. 69: Identifying Dipstick And Breather Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Connect the alternator connector (A) and BLK wire (B) to the alternator.

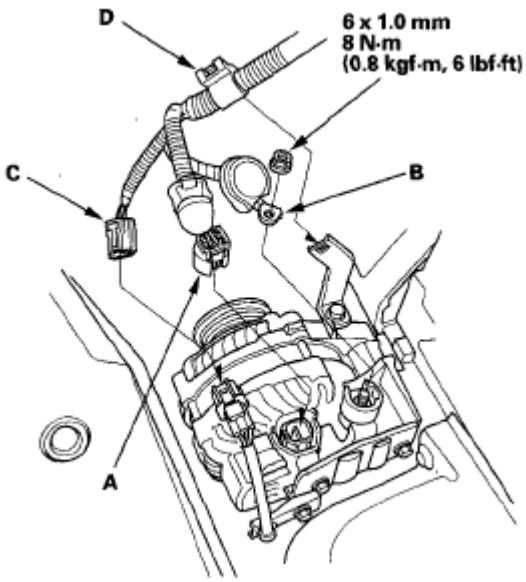


Fig. 70: Identifying Alternator Connector And BLK Wire (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Connect the A/C compressor clutch connector (C), and install the harness clamp (D).
9. Install the front harness holder (A) to the bracket, then tighten the four bolts (B) securing the harness holders.

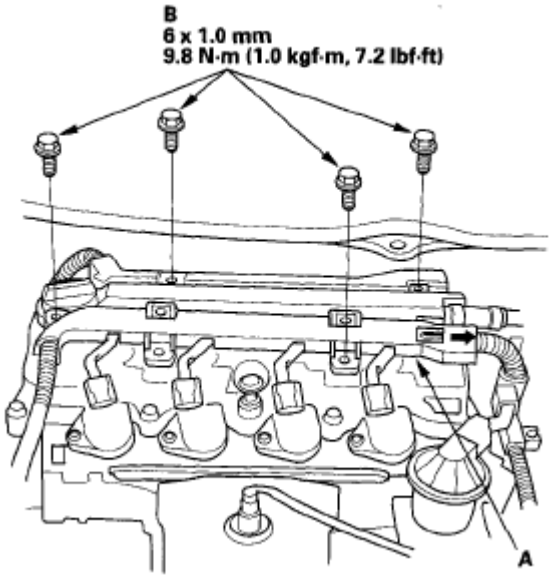


Fig. 71: Identifying Front Harness Holder (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Connect the four ignition coil connectors.
11. Install the injector cover.

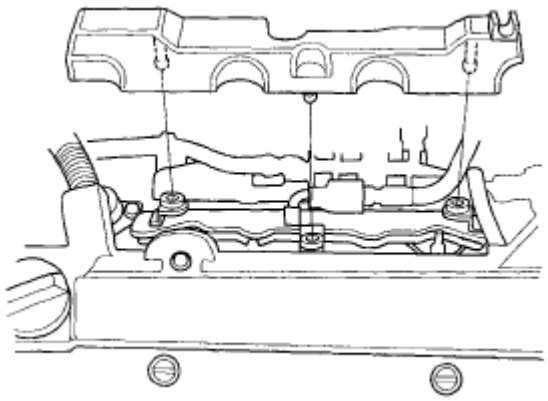


Fig. 72: Identifying Injector Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Install the harness cover.

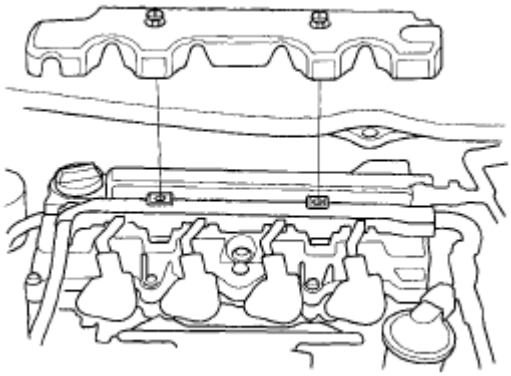


Fig. 73: Identifying Harness Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER HEAD REMOVAL

NOTE:

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

1. Make sure you have the anti-theft code for the audio system and the navigation system (if equipped), then write down the audio presets.
2. Relieve the fuel pressure (see **FUEL PRESSURE RELIEVING**).
3. Disconnect the negative cable from the battery.
4. Drain the engine coolant (see **COOLANT REPLACEMENT**).
5. Remove the drive belt (see **DRIVE BELT INSPECTION**).
6. Remove the intake manifold (see **REMOVAL**).
7. Remove the harness clamps (A), and remove the positive crankcase ventilation (PCV) hose from the clamp (B).

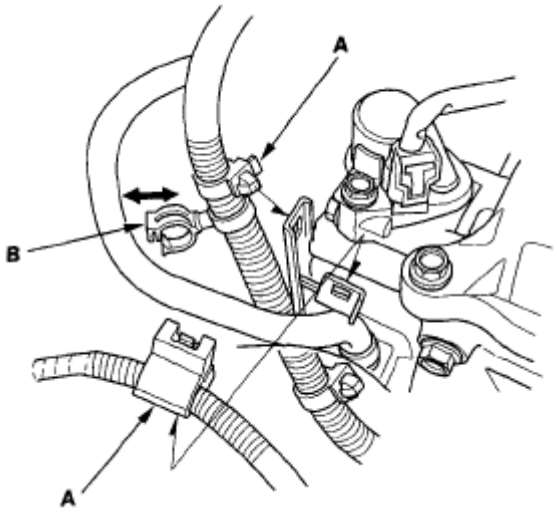


Fig. 74: Identifying Positive Crankcase Ventilation Hose Clamp
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Remove the air cleaner housing bracket (A), then remove the harness holder (B) from the cylinder head.

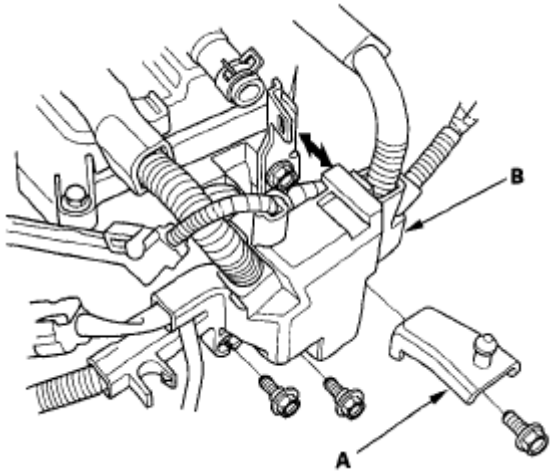


Fig. 75: Identifying Air Cleaner Housing Bracket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. M/T model: Remove the upper radiator hose (A) and heater hose (B).

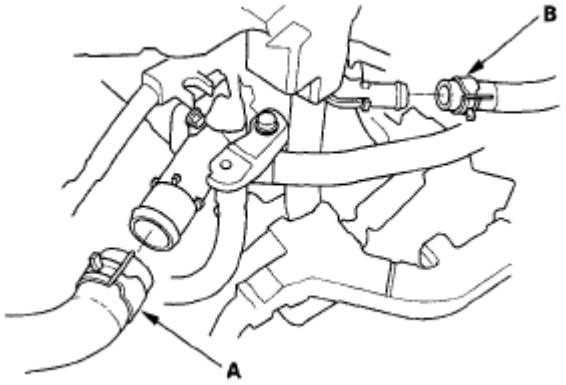


Fig. 76: Identifying Upper Radiator Hose And Heater Hose - M/T Model
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. A/T model: Remove the upper radiator hose (A), heater hose (B), and water bypass hose (C).

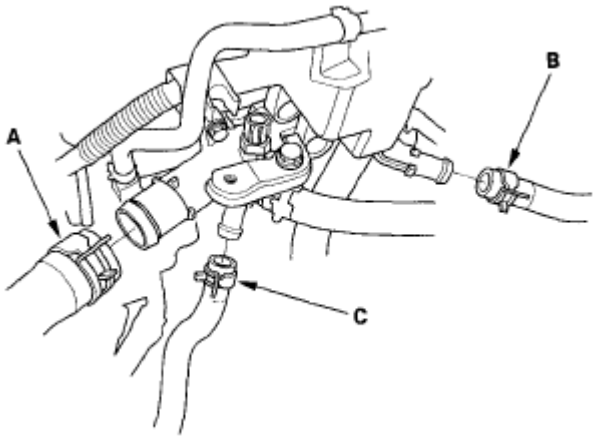


Fig. 77: Identifying Upper Radiator Hose And Heater Hose - A/T Model
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Remove the engine wire harness connectors and wire harness clamps from the cylinder head.
    - Four fuel injector connectors
    - Engine coolant temperature (ECT) sensor 1 connector
    - Air fuel ratio (A/F) sensor connector
    - Secondary heated oxygen sensor (secondary HO2S) connector
    - Exhaust gas recirculation (EGR) valve connector
    - Rocker arm oil control solenoid connector
    - Rocker arm oil pressure switch connector
12. Remove the four ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION**).
13. Remove the three way catalytic converter (TWC) (see **CATALYTIC CONVERTER REMOVAL/INSTALLATION**).
14. Remove the thermostat housing (see **THERMOSTAT HOUSING REMOVAL AND**

INSTALLATION).

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

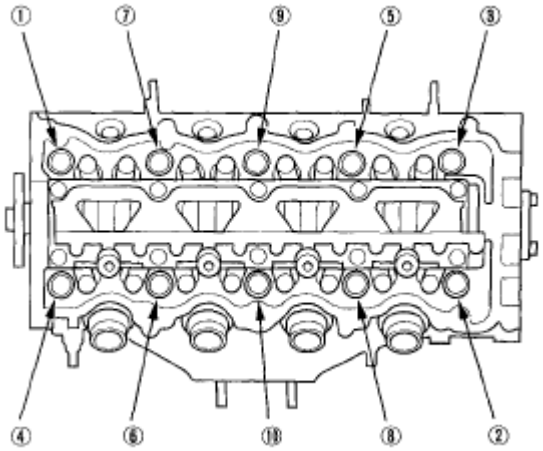


Fig. 78: Identifying Cylinder Head Bolts Loosening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Remove the cylinder head.

CMP PULSE PLATE REMOVAL AND INSTALLATION

Removal

1. Remove the air cleaner assembly (see **THROTTLE BODY CLEANING**).
2. Remove the air cleaner housing bracket (A), then remove the harness holder (B) from the cylinder head.

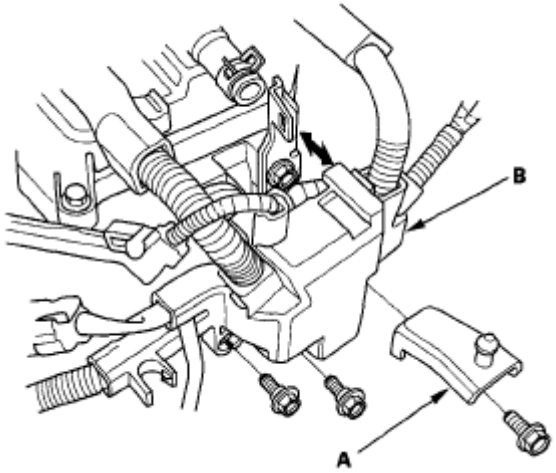


Fig. 79: Identifying Air Cleaner Housing Bracket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove the rocker arm assembly (see **ROCKER ARM ASSEMBLY REMOVAL**).
4. Remove the camshaft thrust cover.

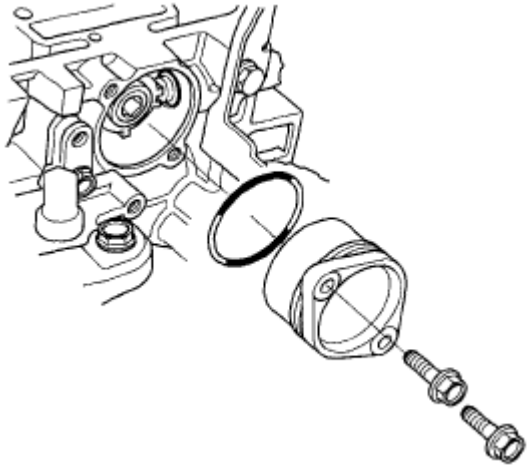


Fig. 80: Identifying Camshaft Thrust Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Hold the camshaft with a 27 mm open-end wrench, then loosen the bolt.

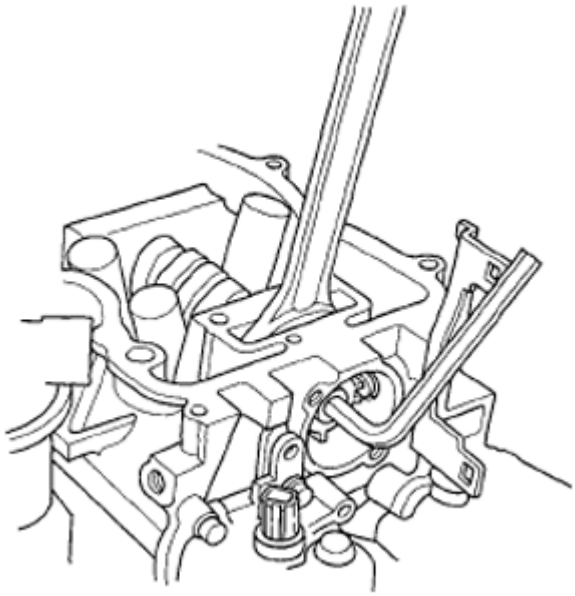


Fig. 81: Holding Camshaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

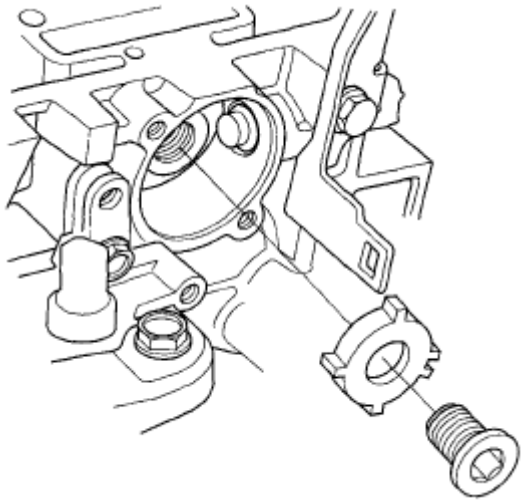


Fig. 82: Identifying Camshaft Position Pulse Plate
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Installation

1. Install the CMP pulse plate.

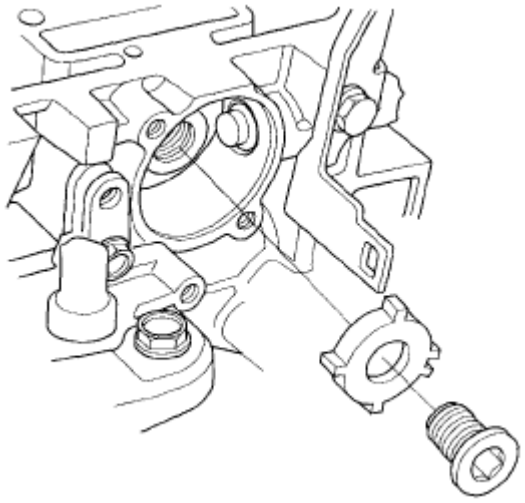


Fig. 83: Identifying CMP Pulse Plate
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Hold the camshaft with a 27 mm open-end wrench, then tighten the bolt.

   Specified Torque:

   14 x 1.5 mm

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

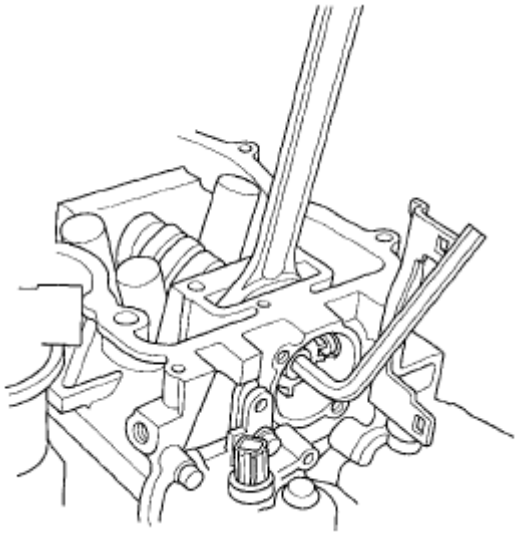


Fig. 84: Holding Camshaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the camshaft thrust cover (A), use a new O-ring (B).

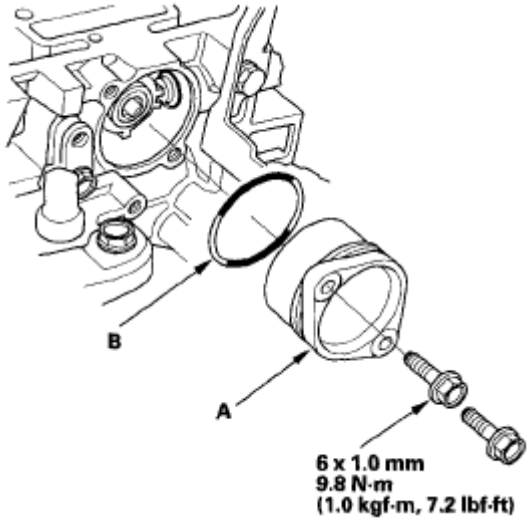


Fig. 85: Identifying Camshaft Thrust Cover (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Install the rocker arm assembly (see **CAMSHAFT INSTALLATION**).
5. Install the harness holder (A) on the cylinder head, then Install the air cleaner housing bracket (B).

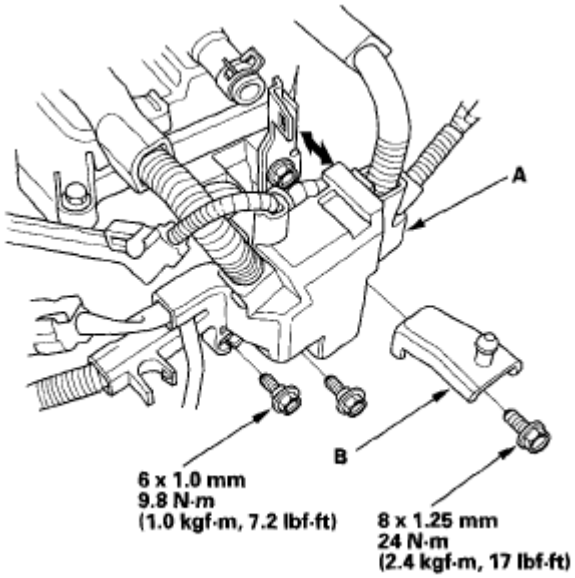


Fig. 86: Identifying Air Cleaner Housing Bracket (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Install the air cleaner assembly (see **THROTTLE BODY CLEANING**).

CAMSHAFT SPROCKET REMOVAL AND INSTALLATION

Removal

1. Remove the cam chain (see **CAM CHAIN REMOVAL**).
2. Remove the rocker arm assembly (see **ROCKER ARM ASSEMBLY REMOVAL**).
3. Hold the camshaft with a 27 mm open-end wrench, then loosen the bolt.

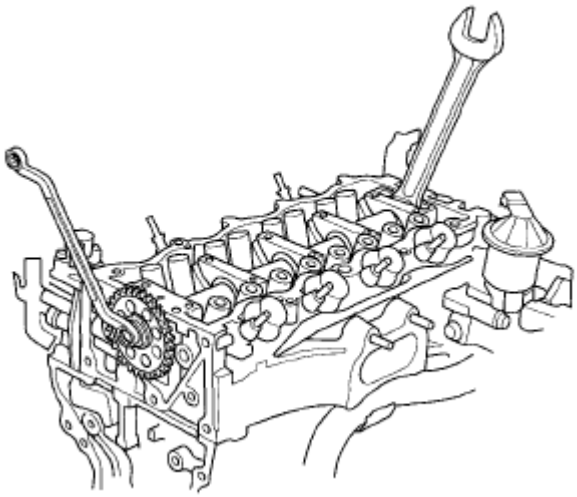


Fig. 87: Holding Camshaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the camshaft sprocket.

Installation

1. Install the camshaft sprocket.
2. Apply new engine oil to the threads of the camshaft sprocket mounting bolt, and install it. Hold the camshaft with a 27 mm open-end wrench, then tighten the bolt.

   Specified Torque:

   10 x 1.25 mm

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

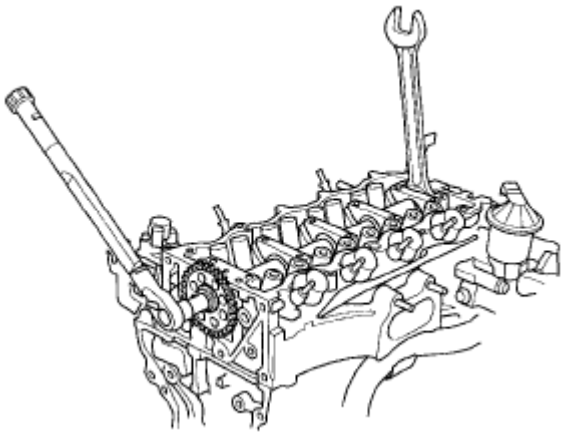


Fig. 88: Tightening Camshaft Sprocket Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the rocker arm assembly (see **CAMSHAFT INSTALLATION**).
4. Install the cam chain (see **CAM CHAIN 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.
   - If warpage is between 0.08 mm (0.003 in.) and 0.2 mm (0.008 in.), resurface the cylinder head.
   - Maximum resurface limit is 0.2 mm (0.008 in.) based on a height of 115 mm (4.53 in.).

   Cylinder Head Height

   Standard (New): 114.95-115.05 mm (4.526-4.530 in.)

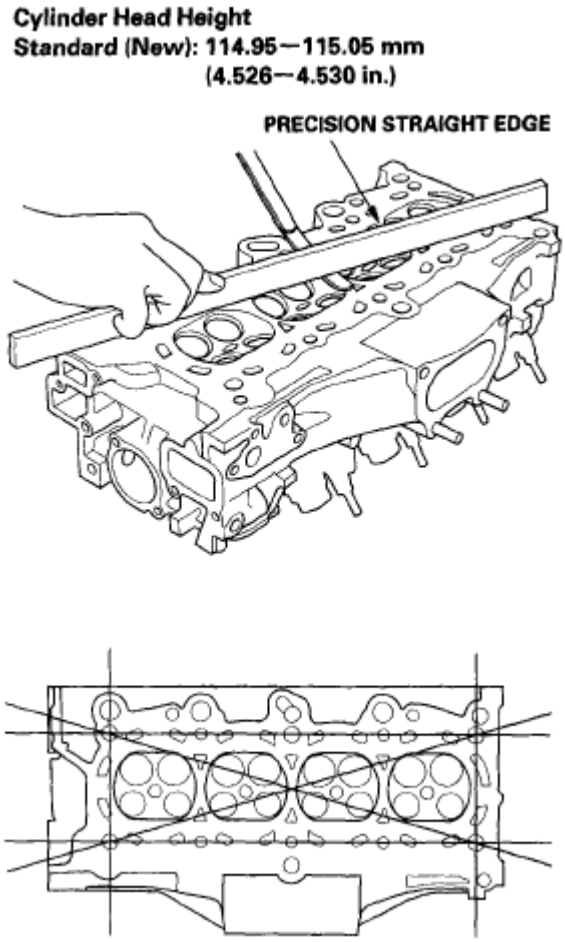


Fig. 89: Checking Cylinder Head For Warpage (With Specification)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM ASSEMBLY REMOVAL

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

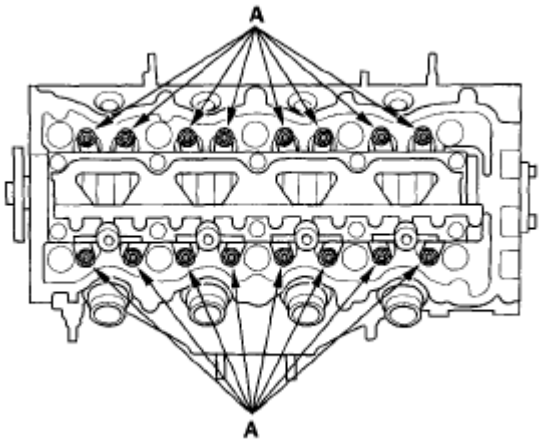


Fig. 90: Identifying Rocker Arm Adjusting Screws
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Remove the lost motion holder bolts. To prevent damaging the lost motion holder and rocker shaft, unscrew the bolts, in sequence, two turns at a time.

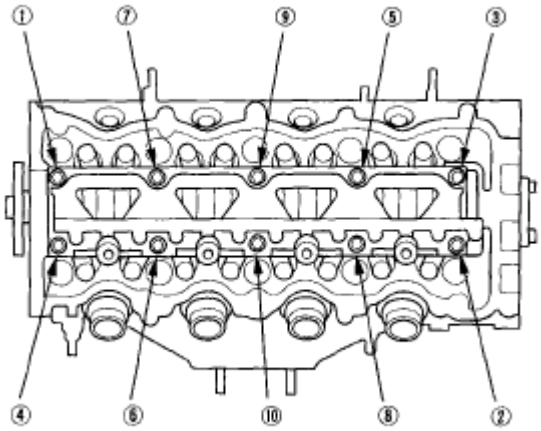


Fig. 91: Identifying Bolts Loosening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the lost motion holder (A) and lost motion assemblies (B).

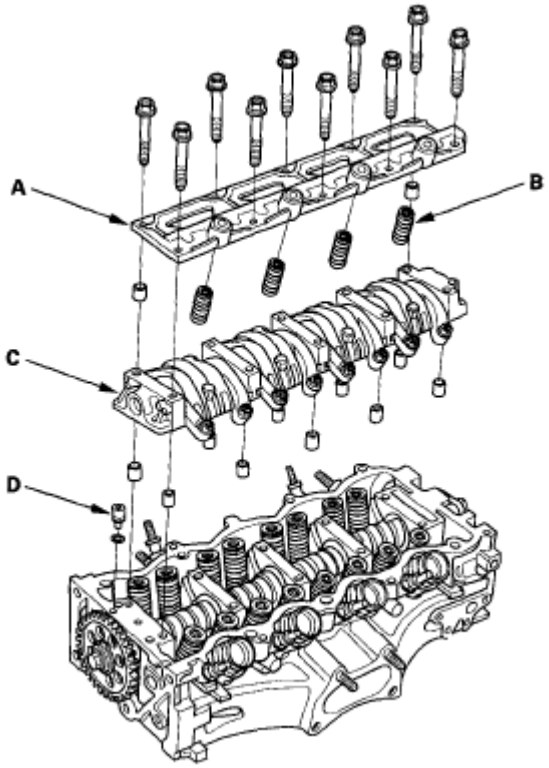


Fig. 92: Identifying Lost Motion Holder And Lost Motion Assemblies
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Remove the rocker arm assembly (C), then remove the oil control orifice (D).

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 rocker arms (see ROCKER ARM AND SHAFT INSPECTION).**
- **If reused, the rocker arms must be installed in the same positions.**
- **When removing, or installing the rocker arm assembly, do not remove the camshaft holder bolts. The bolts will keep the holders and rocker arms on the shaft.**
- **Remove the rocker shaft bolt before removing the rocker shaft from the No. 5 rocker shaft holder.**
- **Prior to reassembling, clean all the parts in solvent, dry them, and apply new engine oil to any contact points.**
- **Bundle the intake secondary rocker arms with rubber bands to keep them together as a set.**
- **When replacing the intake rocker arm assembly, remove the fastening hardware from the new intake rocker arm assembly.**

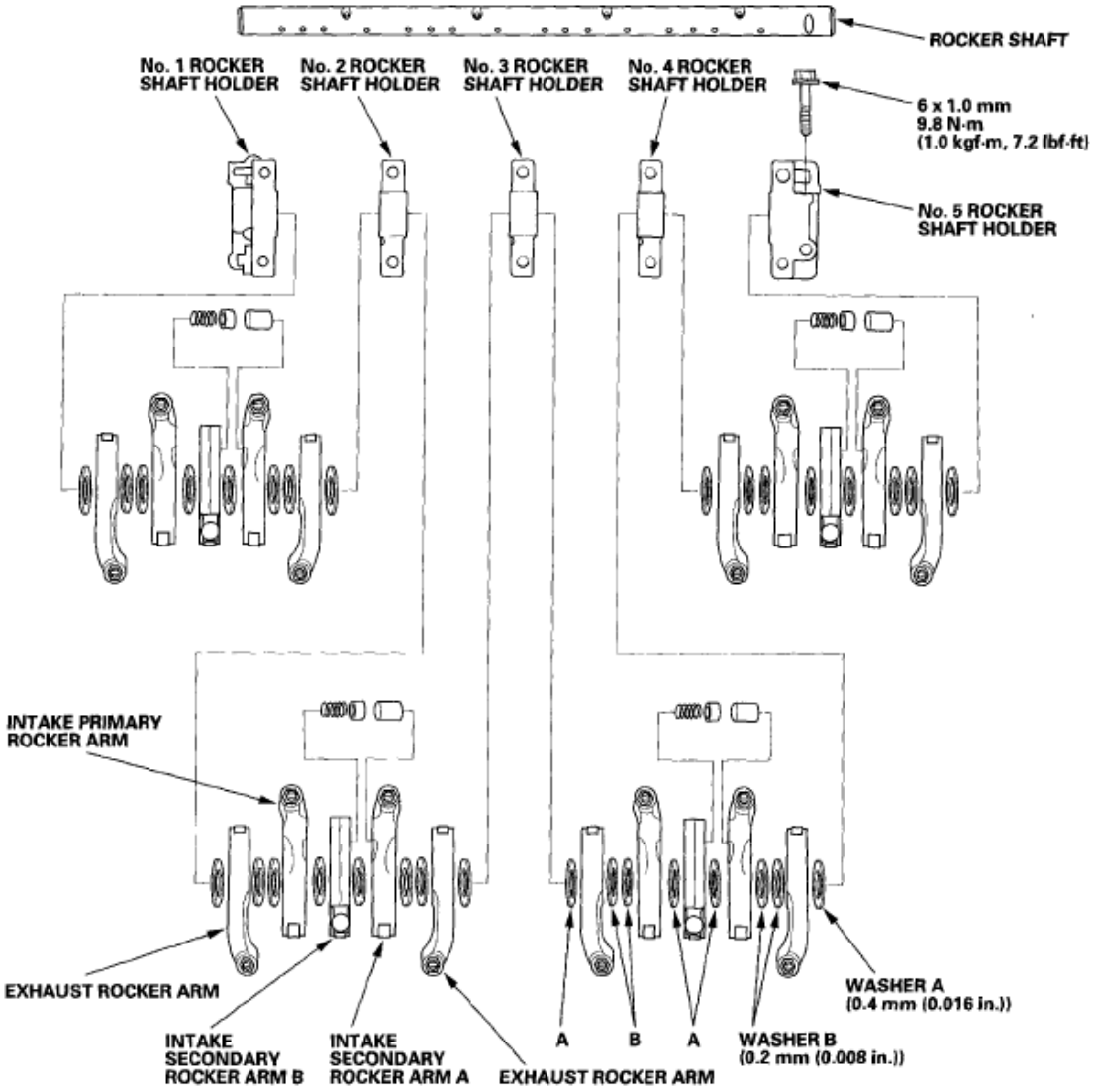


Fig. 93: Exploded View Of Rocker Arm And Shaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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.

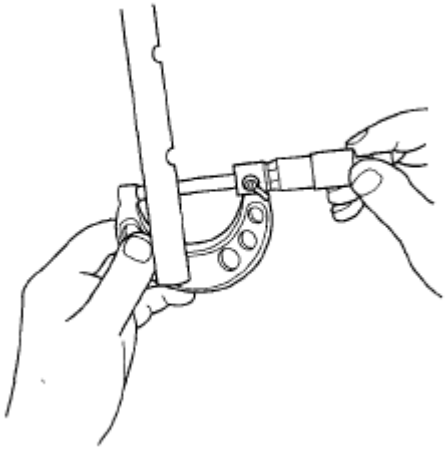


Fig. 94: Measuring Diameter Of Shaft First Rocker Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

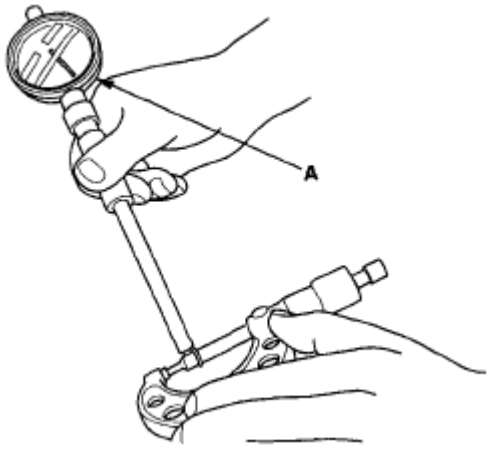


Fig. 95: Checking Shaft Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Rocker Arm-to-Shaft Clearance

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

   Service Limit: 0.08 mm (0.0031 in.)

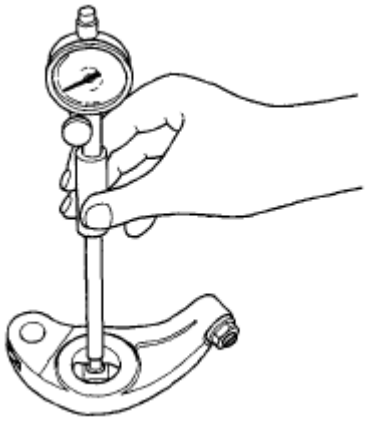


Fig. 96: Measuring Inside Diameter Of Rocker Arm
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Repeat for all rockers and both shafts. If the clearance is beyond the service limit, replace the rocker shaft and all out of service limit rocker arms. If any intake secondary rocker arm needs replacement, replace the secondary 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 pistons when reassembling.**
- **When reassembling secondary rocker arm A, carefully apply air pressure to the oil passage of the rocker arm.**

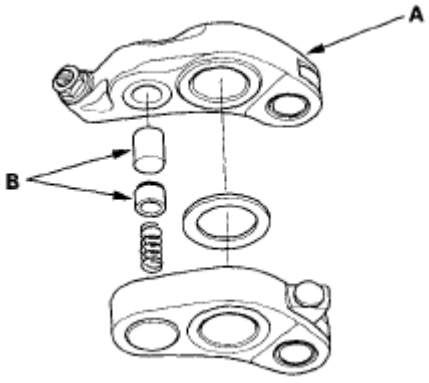


Fig. 97: Identifying Secondary Rocker Arm
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

CAMSHAFT REMOVAL

1. Remove the cylinder head (see **CYLINDER HEAD REMOVAL**).
2. Remove the rocker arm assembly (see **ROCKER ARM ASSEMBLY REMOVAL**).
3. Remove the camshaft sprocket (see **CAMSHAFT SPROCKET REMOVAL AND INSTALLATION**).
4. Remove the camshaft position (CMP) sensor (see **CKP SENSOR REPLACEMENT**).
5. Remove the camshaft thrust cover (A), then pull out the camshaft (B).

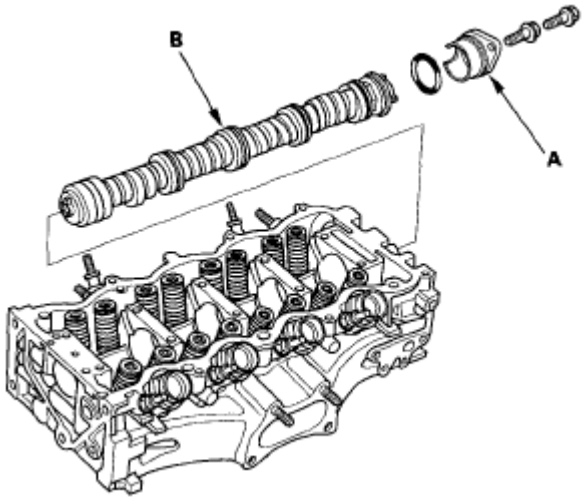


Fig. 98: Identifying Camshaft Thrust Cover And Camshaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CAMSHAFT INSPECTION

1. Remove the camshaft sprocket (see **CAMSHAFT SPROCKET REMOVAL AND INSTALLATION**).
2. Remove the rocker arm assembly (see **ROCKER ARM ASSEMBLY REMOVAL**).
3. Put the rocker shaft holders on the cylinder head, then tighten the bolts, in sequence, to the specified torque.

   Specified Torque:

   6 x 1.0 mm

   15 N.m (1.5 kgf.m, 11 lbf.ft)

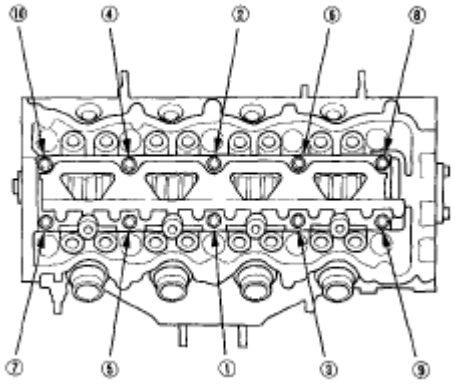


Fig. 99: Identifying Bolts Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Camshaft End Play

   Standard (New): 0.050-0.250 mm (0.002-0.010 in.)

   Service Limit: 0.4 mm (0.02 in.)

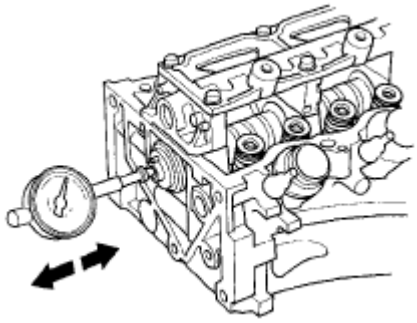


Fig. 100: Measuring Camshaft End Play
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the camshaft (see **CAMSHAFT INSPECTION**).
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.

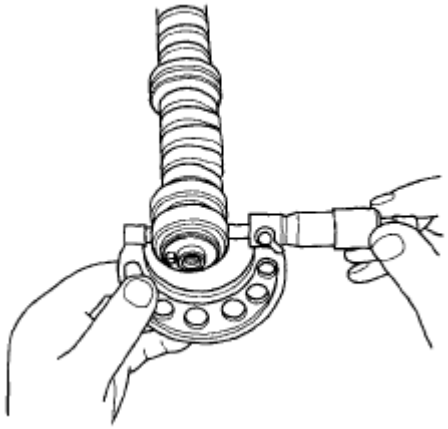


Fig. 101: Measuring Diameter Of Camshaft Journal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Zero the gauge to the journal diameter.

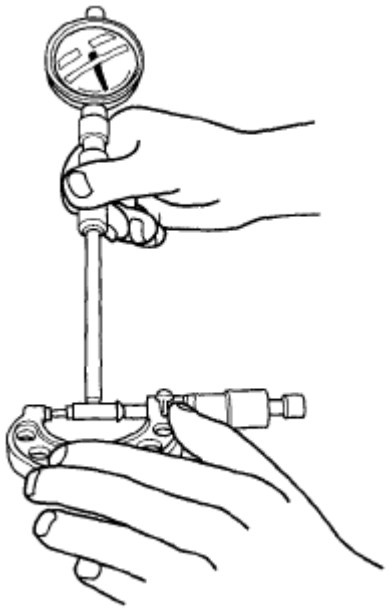


Fig. 102: Checking Journal Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Camshaft-to-Holder Oil Clearance

Standard (New): 0.045-0.084 mm (0.0018-0.0033 in.)

Service Limit: 0.15 mm (0.006 in.)

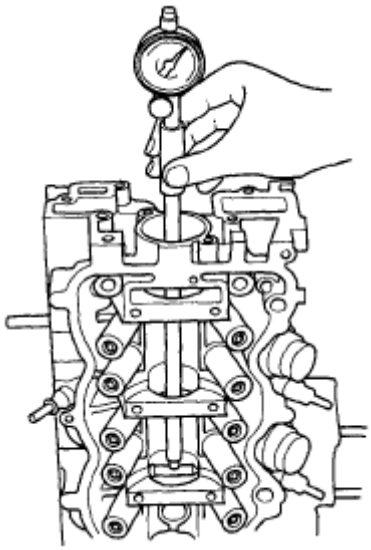


Fig. 103: Checking Camshaft-To-Holder Oil Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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 (0.001 in.) max.

Service Limit: 0.04 mm (0.002 in.)

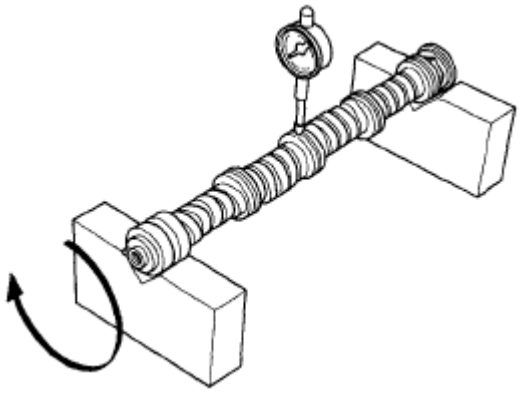


Fig. 104: Checking Camshaft Total Runout
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Measure cam lobe height.

CAM LOBE HEIGHT STANDARD

	INTAKE	EXHAUST
PRI	35.754 mm (1.4076 in.)	
SEC A	35.358 mm (1.3920 in.)	35.813 mm (1.4100 in.)
SEC B	36.027 mm (1.4184 in.)	

PRI: Primary

EX: Exhaust

SEC: Secondary

C/C: Cam Chain

IN: Intake

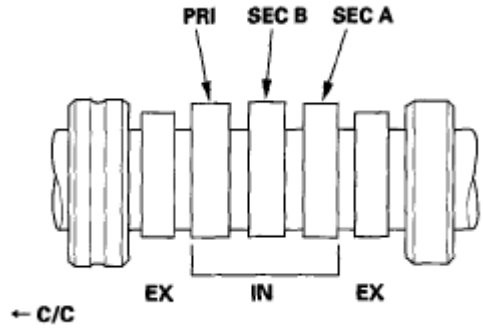


Fig. 105: Checking Cam Lobe Height
Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVE, SPRING, AND VALVE SEAL REMOVAL

Special Tools Required

Valve spring compressor attachment 07757-PJ1010A

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

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

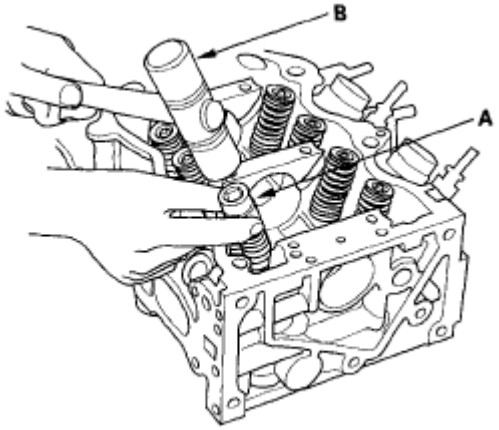


Fig. 106: Tapping Valve Retainer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

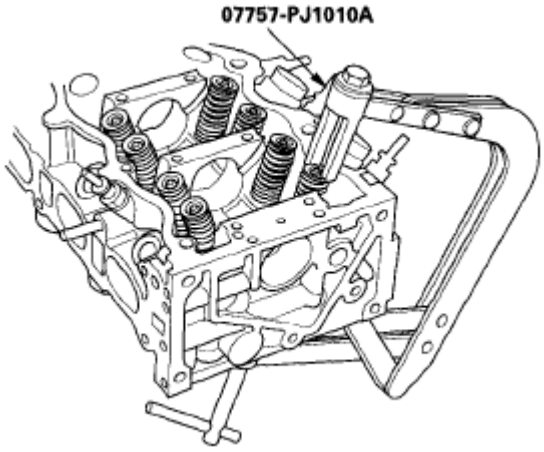


Fig. 107: Compressing Spring
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the valve spring compressor, valve spring compressor attachment, spring retainer, and spring.

5. Install the valve guide seal remover (A).

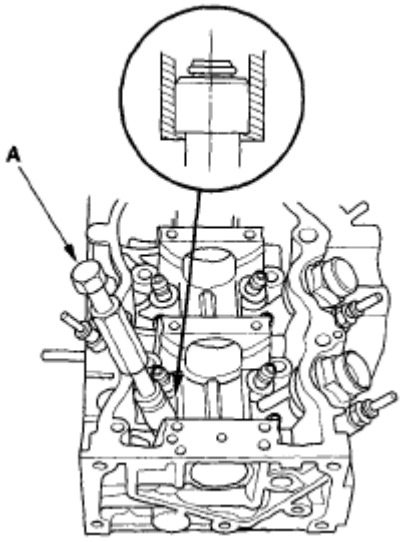


Fig. 108: Identifying Valve Guide Seal Remover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the valve seal.

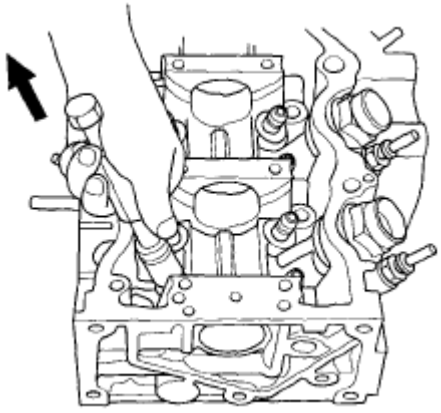


Fig. 109: Identifying Valve Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the valve spring seat and valve.

VALVE INSPECTION

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

Intake Valve Dimensions

A Standard (New): 31.85-32.15 mm (1.254-1.267 in.)

B Standard (New): 116.40-117.00 mm (4.583-4.606 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): 25.90-26.10 mm (1.020-1.028 in.)

B Standard (New): 115.65-116.25 mm (4.553-4.577 in.)

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

C Service Limit: 5.42 mm (0.213 in.)

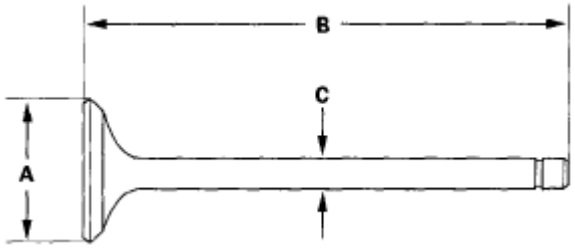


Fig. 110: Measuring Exhaust Valve Dimensions
Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVE STEM-TO-GUIDE CLEARANCE INSPECTION

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

Intake Valve Stem-to-Guide Clearance

Standard (New): 0.04-0.10 mm (0.002-0.004 in.)

Service Limit: 0.16 mm (0.006 in.)

Exhaust Valve Stem-to-Guide Clearance

Standard (New): 0.10-0.16 mm (0.004-0.006 in.)

Service Limit: 0.22 mm (0.009 in.)

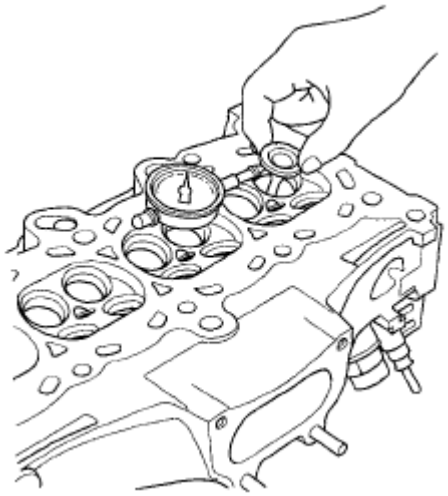


Fig. 111: Checking Intake Valve Stem-To-Guide Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Intake Valve Stem-to-Guide Clearance

   Standard (New): 0.02-0.05 mm (0.0008-0.0020 in.)

   Service Limit: 0.08 mm (0.003 in.)

   Exhaust Valve Stem-to-Guide Clearance

   Standard (New): 0.05-0.08 mm (0.0020-0.0031 in.)

   Service Limit: 0.11 mm (0.004 in.)

VALVE GUIDE REPLACEMENT

Special Tools Required

- Valve guide driver, 5.5 mm 07742-0010100
- Valve guide reamer, 5.5 mm 07HAH-PJ7A100

1. Inspect the valve stem-to-guide clearance (see **VALVE INSPECTION**).

2. As illustrated, use a commercially available air-impact valve guide driver (A) modified to fit the diameter of the valve guides. In most cases, the same procedure can be done using the special tool and a conventional hammer.

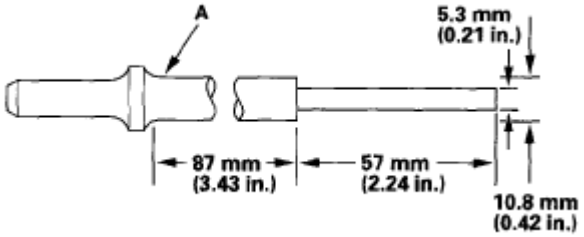


Fig. 112: Identifying Air-Impact Valve Guide Driver
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

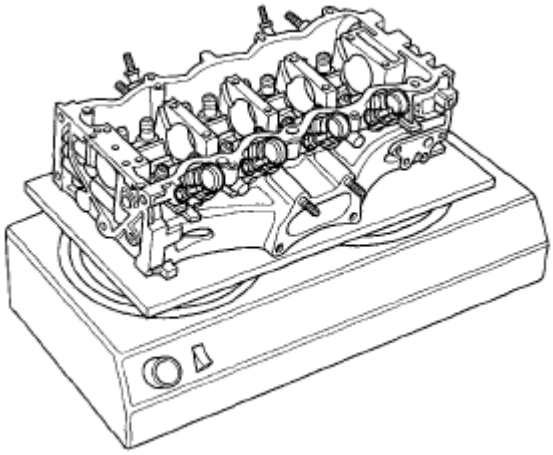


Fig. 113: Heating Cylinder Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

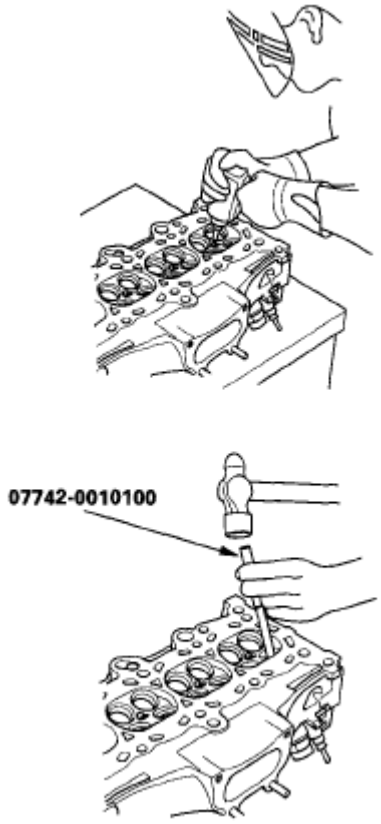


Fig. 114: Tapping Valve Guide
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. If a valve guide still won't move, drill it out with a 8 mm (5/16 in.) bit, then try again.

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

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

Valve Guide Installed Height 18.25-18.75 mm (0.719-0.738 in.)

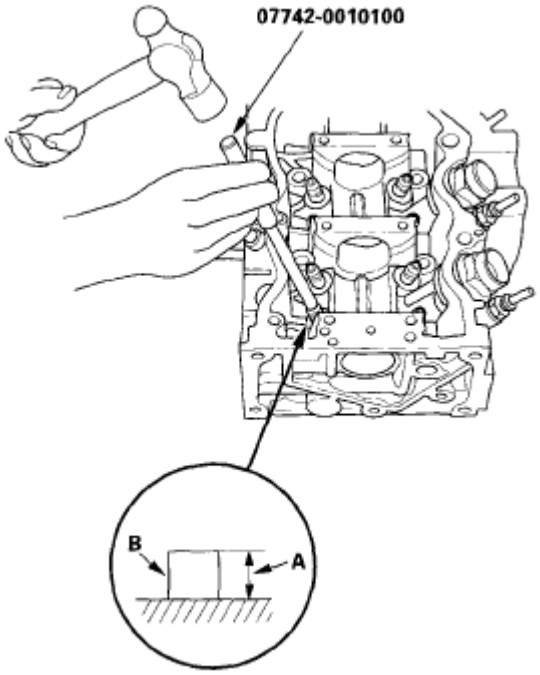


Fig. 115: Identifying Valve Guide Installed Height
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Fig. 116: Rotating Reamer To Valve Guide Bore
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Continue to rotate the reamer clockwise while drawing it from the bore.
13. Thoroughly wash the guide in detergent and water to remove any cutting residue.
14. Check the clearance with a valve (see **VALVE INSPECTION**). Verify that a valve slides into the intake and exhaust valve guides without getting stuck.

VALVE SEAT RECONDITIONING

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

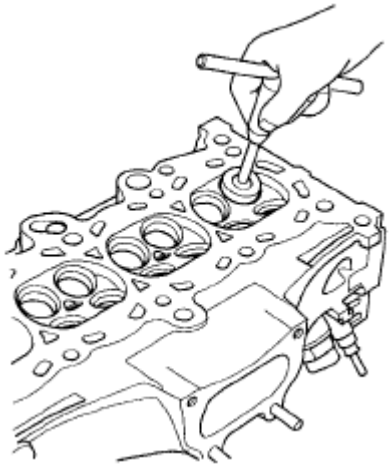


Fig. 117: Cutting Valve Seats Using Valve Seat Cutter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

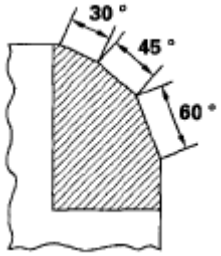


Fig. 118: Identifying Bevel Upper Edge Of Seat Angle
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Valve Seat Width

Intake:

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

Service Limit: 1.6 mm (0.06 in)

Exhaust:

Standard (New): 1.25-1.55 mm (0.049-0.061 in.)

Service Limit: 2.0 mm (0.08 in.)

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

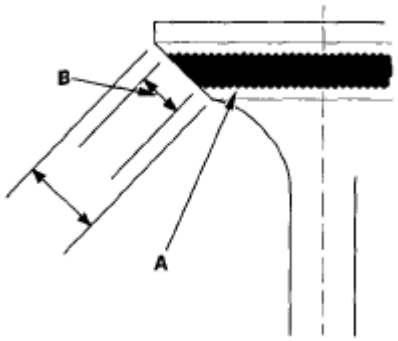


Fig. 119: Identifying Valve Seat Width
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. The actual valve seating surface (B), as shown by the blue compound, should be centered on the seat.
   - If it is too high (closer to the valve stem), you must make a second cut with the 60° cutter to move it down, then one more cut with the 45° cutter to restore seat width.
   - If it is too low (closer to the valve edge), you must make a second cut with the 30° cutter to move it up, then one more cut with the 45° cutter to restore seat width.

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

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

Intake Valve Stem Installed Height

Standard (New): 67.2-67.4 mm (2.646-2.654 in.)

Service Limit: 67.7 mm (2.665 in.)

Exhaust Valve Stem Installed Height

Standard (New): 58.4-58.6 mm (2.299-2.307 in.)

Service Limit: 58.9 mm (2.319 in.)

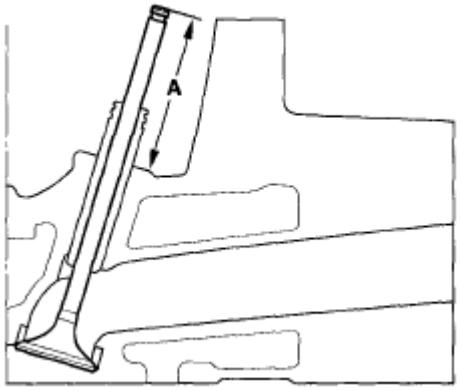


Fig. 120: Measuring Intake Valve Stem Installed Height
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. If the valve stem installed height is beyond the service limit, replace the valve and recheck. If it is still beyond 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 stem seal driver (B).

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

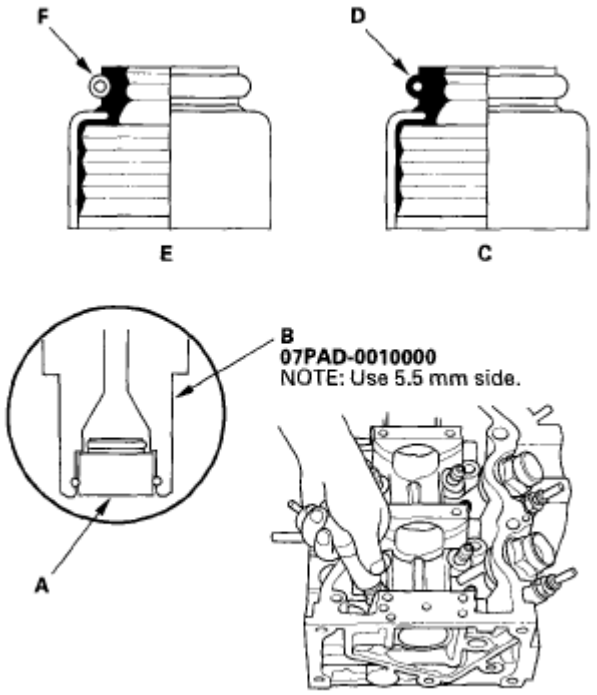


Fig. 121: Identifying Valve Seals
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

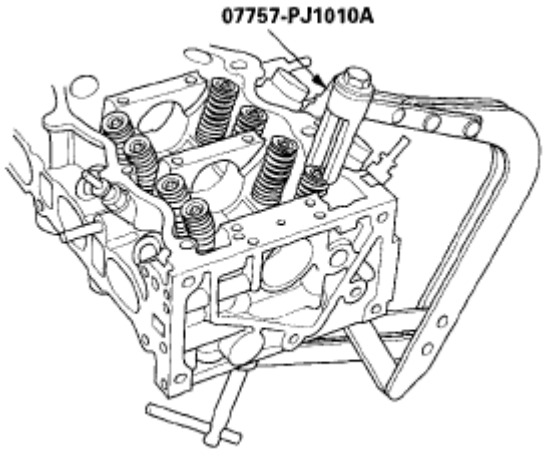


Fig. 122: Compressing Spring
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the valve spring compressor and valve spring compressor attachment.
8. Lightly tap the end of each valve stem two or three times with a plastic mallet (A) to ensure proper

seating of the valve and valve cotters. Tap the valve stem only along its axis so you do not bend the stem.

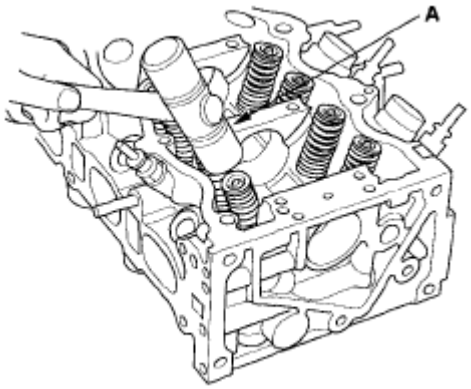


Fig. 123: Tapping End Of Valve Stem
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CAMSHAFT INSTALLATION

1. Install the camshaft (A) into the cylinder head, then install the camshaft thrust cover (B) with new O-ring (C).

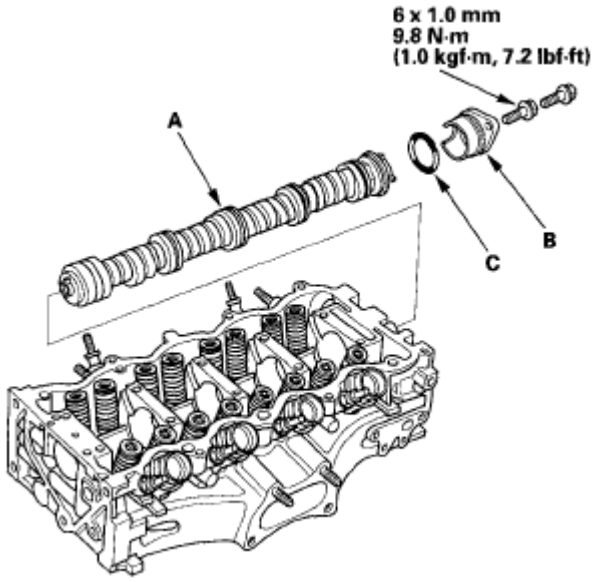


Fig. 124: Identifying Camshaft And Camshaft Thrust Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Install the camshaft position (CMP) sensor with a new O-ring (see **CKP SENSOR REPLACEMENT**).
3. Install the camshaft sprocket (see **CAMSHAFT SPROCKET REMOVAL AND INSTALLATION**).
4. Install the rocker arm assembly (see **CAMSHAFT INSTALLATION**).
5. Install the cylinder head (see **CYLINDER HEAD 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**).
2. Install the oil control orifice (A) with a new O-ring (B), then install the rocker arm assembly (C).

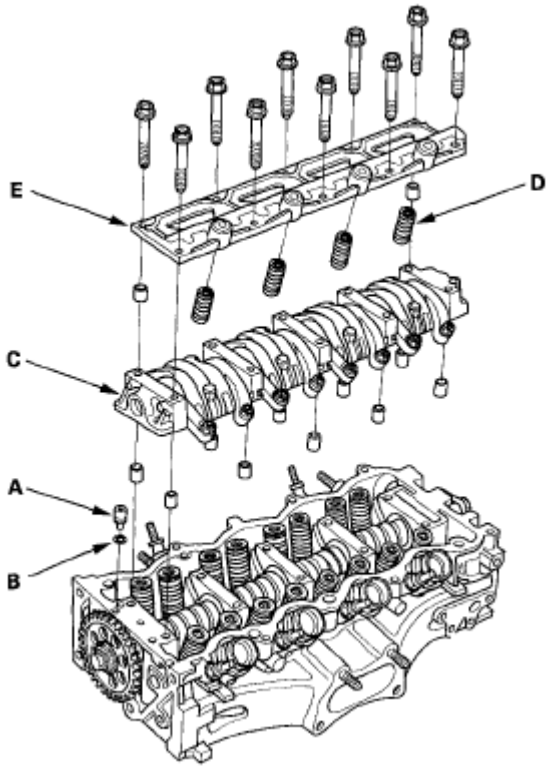


Fig. 125: Identifying Rocker Arm Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the lost motion assembles (D) and the lost motion holder (E).
4. Tighten each bolts two turns at a time in sequence.

Specified Torque:

6 x 1.0 mm 15 N.m (1.5 kgf.m, 11 lbf.ft)

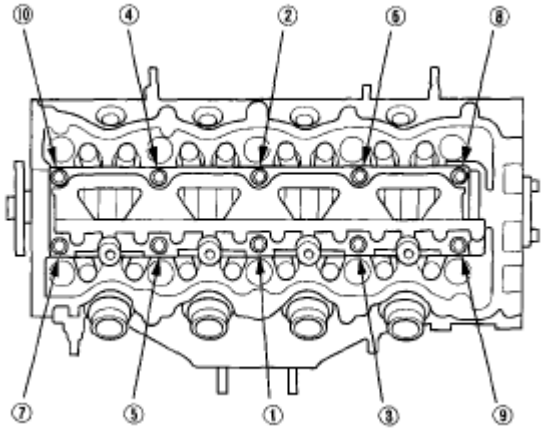


Fig. 126: Identifying Rocker Arm Assembly Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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 engine block surface.
2. Install the new coolant separator (A) in the engine block when replacing the engine block.

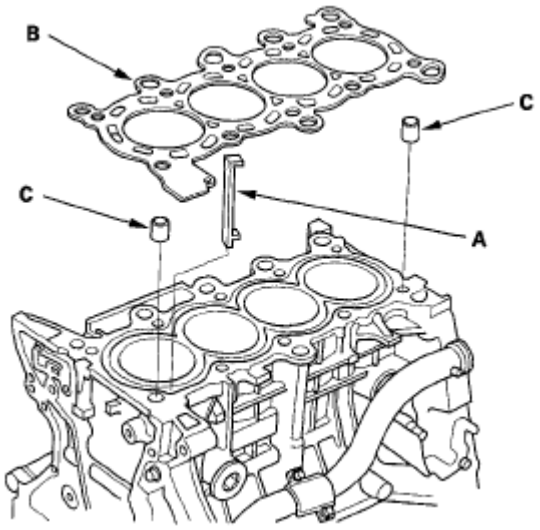


Fig. 127: Identifying Coolant Separator And Cylinder Head Gasket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the new cylinder head gasket (B) and 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 engine block.

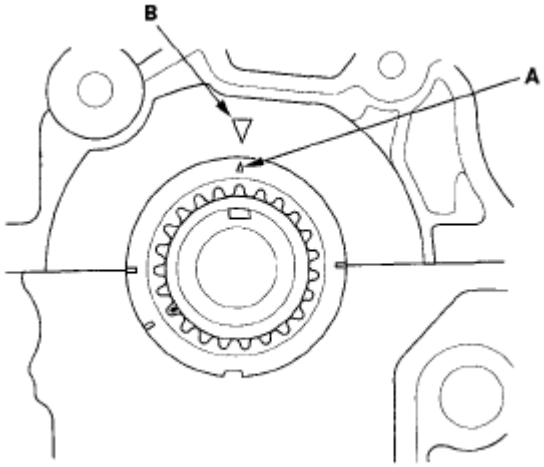


Fig. 128: Aligning TDC Mark On Crankshaft Sprocket With Pointer On Engine Block
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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.

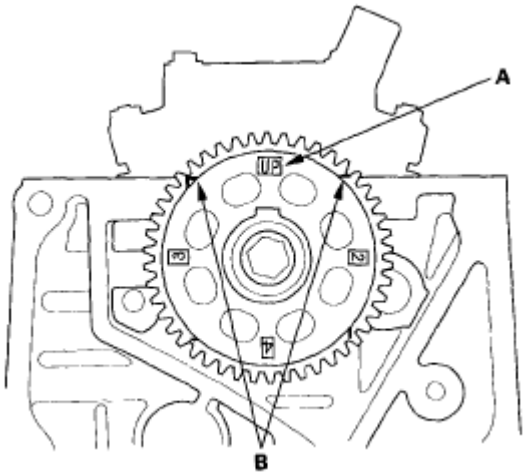


Fig. 129: Identifying UP Mark On Camshaft Sprocket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

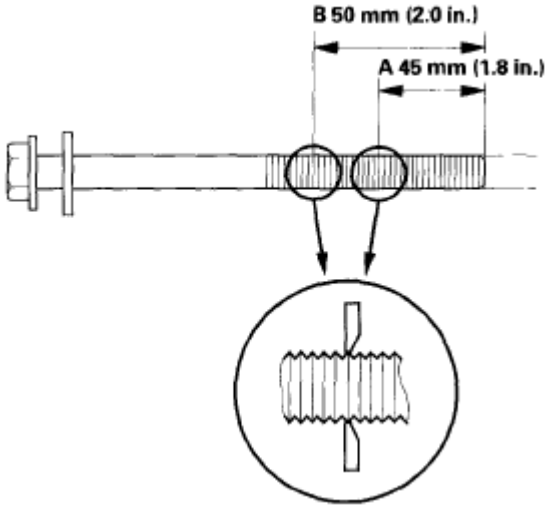


Fig. 130: Measuring Diameter Of Cylinder Head Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. If either diameter is less than 10.6 mm (0.42 in.), replace the cylinder head bolt.
9. Apply new engine oil to the threads and under the bolt heads of all cylinder head bolts.
10. Tighten the cylinder head bolts in sequence to 39 N.m (4.0 kgf.m, 29 lbf.ft). Use a beam-type torque wrench. When using a preset-type torque wrench, be sure to tighten slowly and do not overtighten. If a bolt makes any noise while you are torquing it, loosen the bolt and retighten it from the first step.

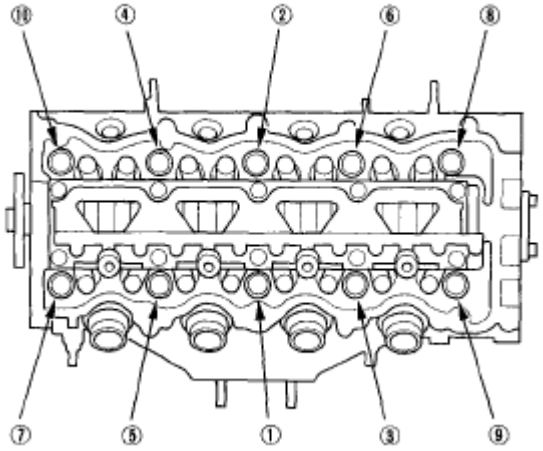


Fig. 131: Identifying Cylinder Head Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. After torquing, tighten all cylinder head bolts in two steps (90° per step). If you are using a new cylinder head bolt, tighten the bolt an extra 60 °.

NOTE: Remove the cylinder head bolt if you tightened it beyond the specified angle, and go back to step 7 of the procedure. Do not loosen it back to the specified angle.

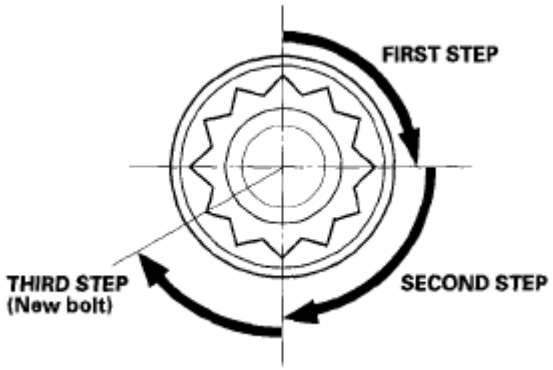


Fig. 132: Identifying Bolt Tightening Step
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Install the cam chain (see **CAM CHAIN INSTALLATION**).
13. Adjust the valve clearance (see **VALVE CLEARANCE ADJUSTMENT**).
14. Install the cylinder head cover (see **CYLINDER HEAD COVER INSTALLATION**).
15. Install the thermostat housing (see **INSTALLATION**).
16. Install the three way catalytic converter (TWC) (see **CATALYTIC CONVERTER REMOVAL/INSTALLATION**).
17. Install the four ignition coils.
18. Connect the engine wire harness connectors, and install the wire harness clamps to the cylinder head.
    - Four fuel injector connectors
    - Engine coolant temperature (ECT) sensor 1 connector
    - Air fuel ratio (A/F) sensor connector
    - Secondary heated oxygen sensor (secondary HO2S) connector
    - Exhaust gas recirculation (EGR) valve connector
    - Rocker arm oil control solenoid connector
    - Rocker arm oil pressure switch connector
19. M/T model: Install the upper radiator hose (A) and heater hose (B).

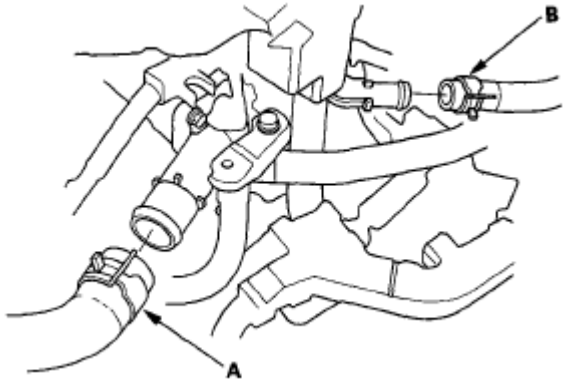


Fig. 133: Identifying Upper Radiator Hose - M/T

Courtesy of AMERICAN HONDA MOTOR CO., INC.

20. A/T model: Install the upper radiator hose (A), heater hose (B), and water bypass hose (C).

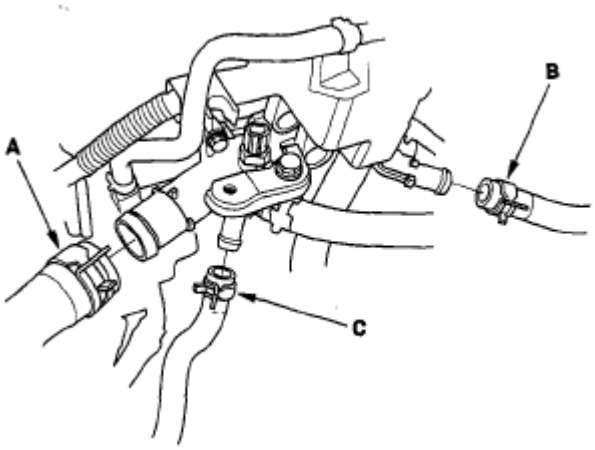


Fig. 134: Identifying Upper Radiator Hose - A/T
Courtesy of AMERICAN HONDA MOTOR CO., INC.

21. Install the harness holder (A) on the cylinder head, then install the air cleaner housing bracket (B).

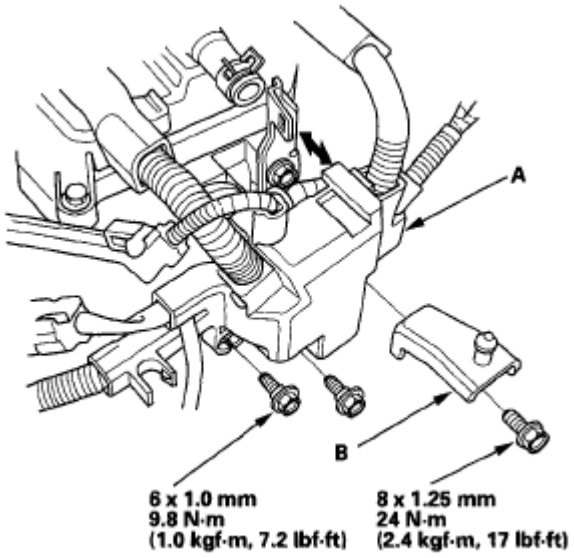


Fig. 135: Identifying Air Cleaner Housing Bracket (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

22. Install the harness clamps (A), and remove the positive crankcase ventilation (PCV) hose from the clamp (B).

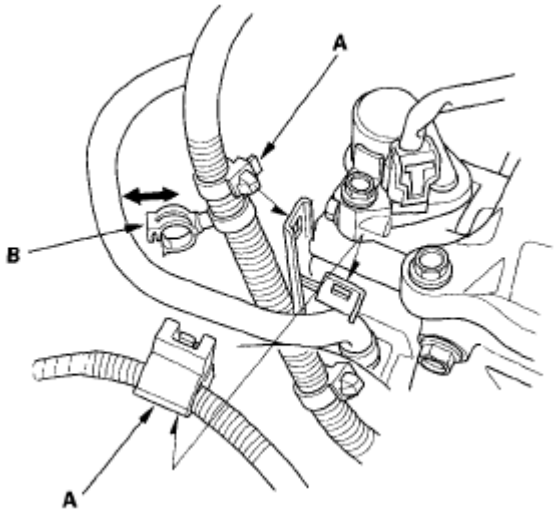


Fig. 136: Identifying Positive Crankcase Ventilation Hose Clamp
Courtesy of AMERICAN HONDA MOTOR CO., INC.

23. Install the intake manifold (see **INSTALLATION**).
24. Install the drive belt (see **DRIVE BELT INSPECTION**).
25. Install the air cleaner assembly.
26. Do the battery terminal reconnection procedure. (see **RECONNECTION**).
27. After installation, check that all tubes, hoses, and connectors are installed correctly.
28. Inspect for fuel leaks. Turn the ignition switch ON (II) (do not operate the starter) so the fuel pump runs for about 2 seconds and pressurizes the fuel line. Repeat this operation two or three times, then check for fuel leakage at any point in the fuel line.
29. Refill the radiator with engine coolant, and bleed air from the cooling system with the heater valve open (see step 8 on **COOLANT REPLACEMENT**).
30. Check for fluid leaks.
31. Do the engine control module (ECM)/ powertrain control module (PCM) idle lean procedure (see).
32. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **ECM/PCM RESET**).
33. Inspect the idle speed (see **IDLE SPEED INSPECTION**).
34. Inspect the ignition timing (see **IGNITION TIMING INSPECTION**).

ENGINE BLOCK (R18A1)

NOTE: Refer to the ENGINE BLOCK (SUPPLEMENT) (GX) article for additional information for the GX model.

SPECIAL TOOLS

Ref. No.	Tool Number	Description	Qty
①	07LAD-PT3010A	Oil Seal Driver	1
②	07ZAD-PNAA100	Oil Seal Driver Attachment 96	1
③	07746-0010700	Attachment, 24 x 26 mm	1
④	07749-0010000	Driver	1

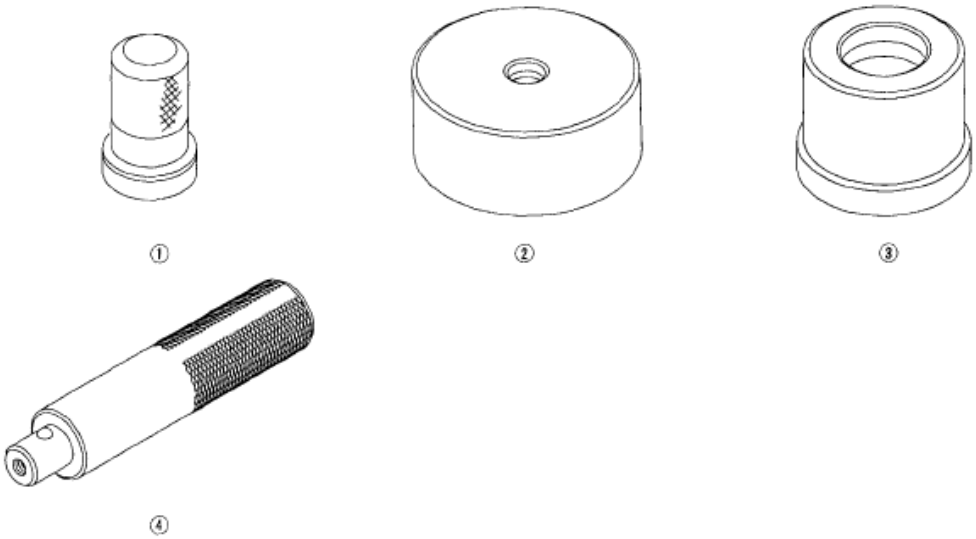


Fig. 1: Identifying Special Tools
Courtesy of AMERICAN HONDA MOTOR CO., INC.

COMPONENT LOCATION INDEX

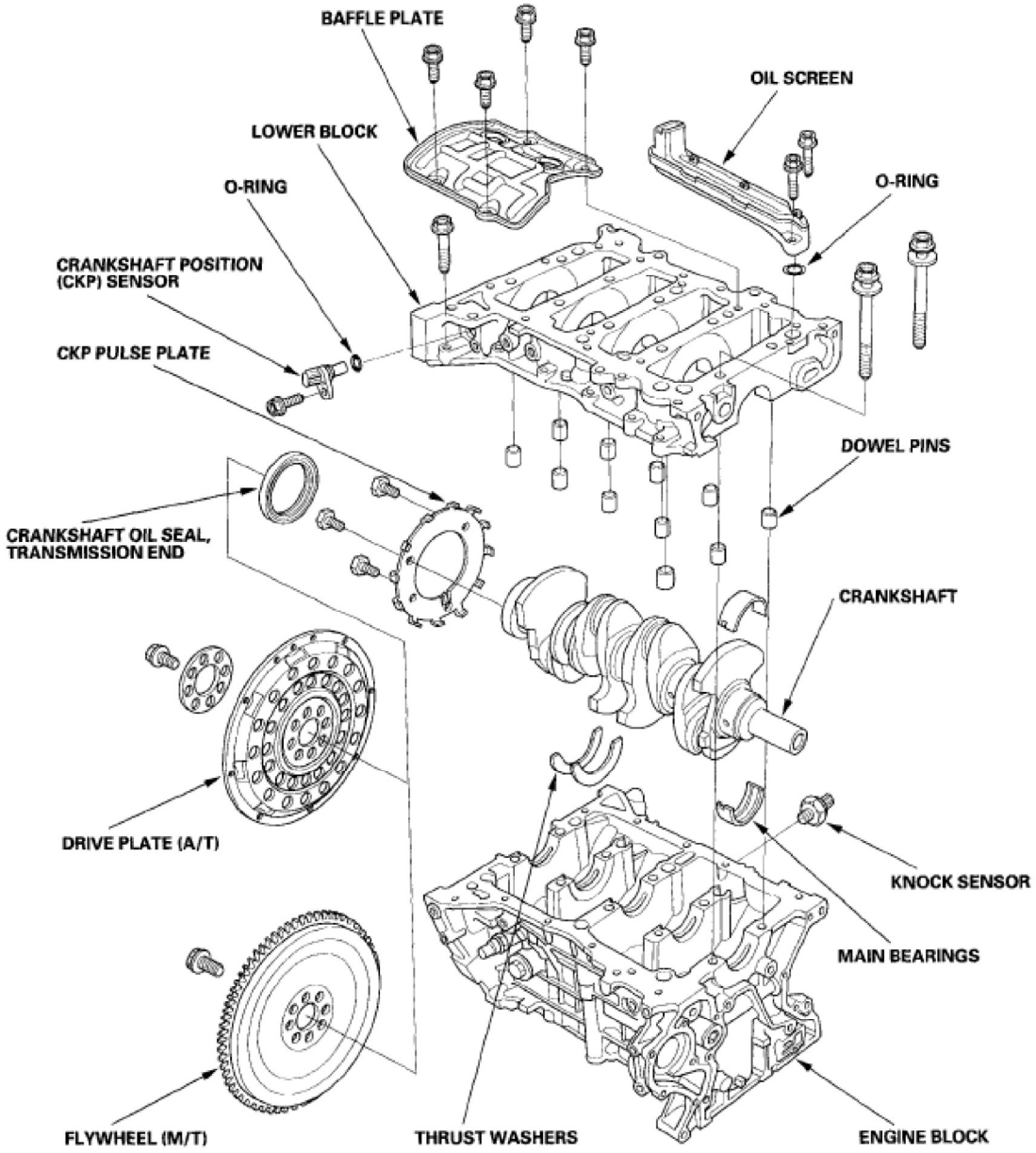


Fig. 2: Identifying Engine Block, Flywheel And Crankshaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

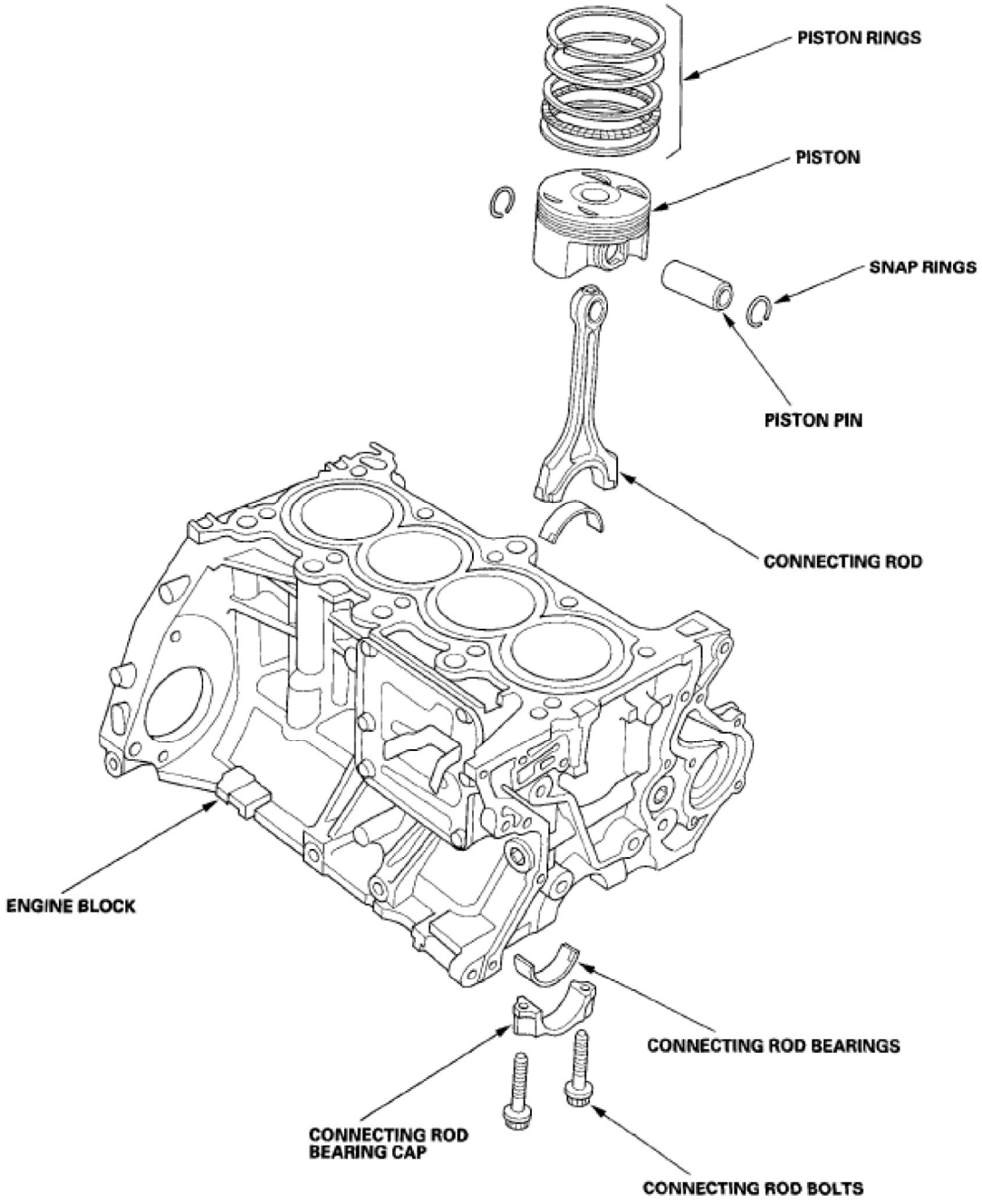


Fig. 3: Identifying Engine Block , Piston And Connecting Rod
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CONNECTING ROD AND CRANKSHAFT END PLAY INSPECTION

1. Remove the oil pan (see **OIL PAN REMOVAL**).
2. Remove the oil screen and baffle plate (see step 8).
3. Measure the connecting rod end play with a feeler gauge between the connecting rod and crankshaft.

Connecting Rod End Play

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

Service Limit: 0.45 mm (0.018 in.)

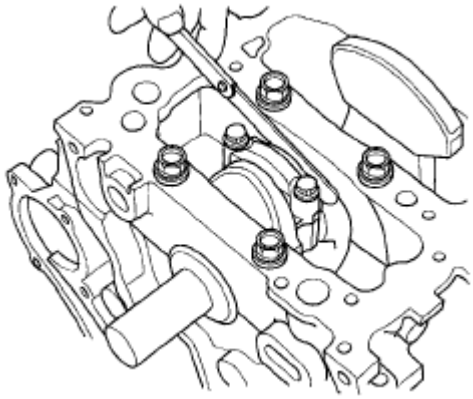


Fig. 4: Measuring Connecting Rod End Play
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Crankshaft End Play

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

Service Limit: 0.45 mm (0.018 in.)

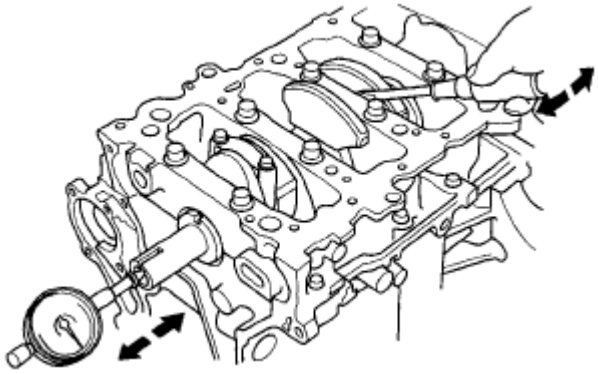


Fig. 5: Pushing Crankshaft Firmly Away From Dial Indicator
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. 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 the main bearing-to-journal oil clearance, remove the lower block 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 lower block, then torque the bolts to 25 N-m (2.5 kgf-m, 18 lbf-ft) + 57 degrees in the proper sequence (see step 19).

NOTE: Do not rotate the crankshaft during inspection.

5. Remove the lower block and bearings again, and measure the widest part of the plastigage.

   Main Bearing-to-Journal Oil Clearance

   Standard (New): 0.018 - 0.034 mm (0.0007 - 0.0013 in.)

   Service Limit: 0.045 mm (0.0018 in.)

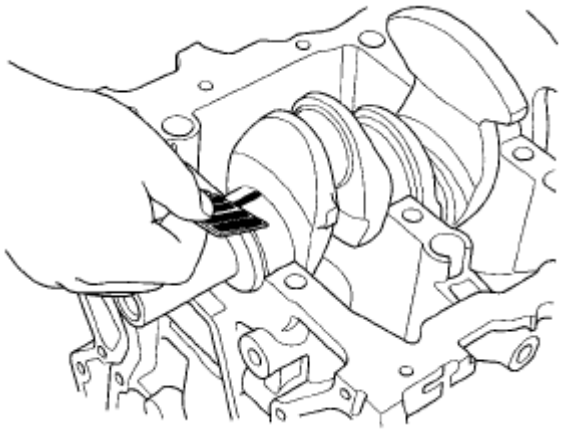


Fig. 6: Measuring Widest Part Of Plastigage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Main Bearing Selection

Crankshaft Bore Code Location

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

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

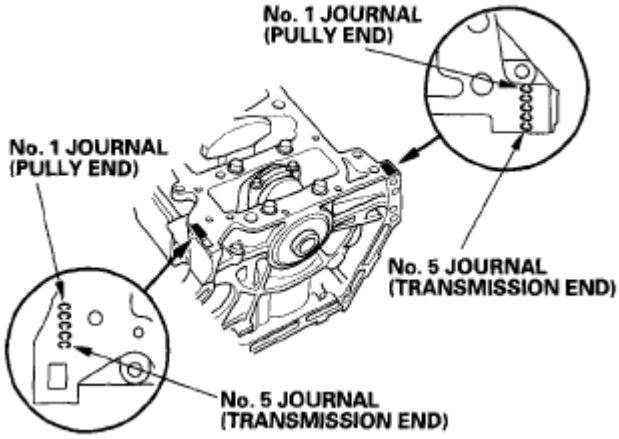


Fig. 7: Identifying Crankshaft Bore Code Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Main Journal Code Location

2. The main journal codes are stamped on the crankshaft.

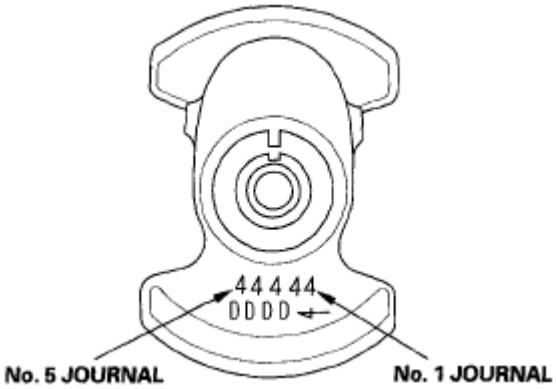


Fig. 8: Identifying Main Journal Code Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

NOTE:

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

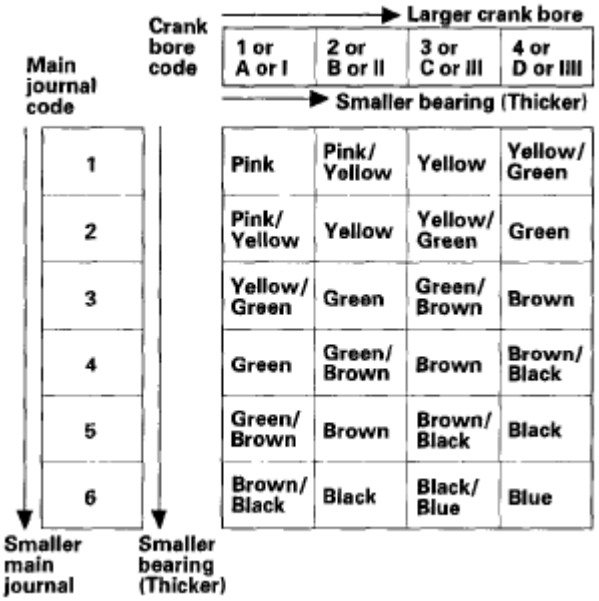


Fig. 9: Identifying Crank Bore Codes And Crank Journal Codes Reference
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CONNECTING ROD BEARING REPLACEMENT

Rod Bearing Clearance Inspection

1. Remove the oil pan (see **OIL PAN REMOVAL**).
2. Remove the oil screen and baffle plate (see step 8).
3. Remove the connecting rod cap and bearing half.
4. Clean the crankshaft rod journal and bearing half with a clean shop towel.
5. Place plastigage across the rod journal.
6. Reinstall the bearing half and cap, and torque the bolts to 20 N.m (2.0 kgf.m, 14 lbf.ft) + 90 degrees using a commercially available torque angle gauge.

NOTE: Do not rotate the crankshaft during inspection.

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

Connecting Rod Bearing-to-Journal Oil Clearance

Standard (New): 0.024-0.042 mm (0.0009-0.0017 in.)

Service Limit: 0.055 mm (0.0022 in.)

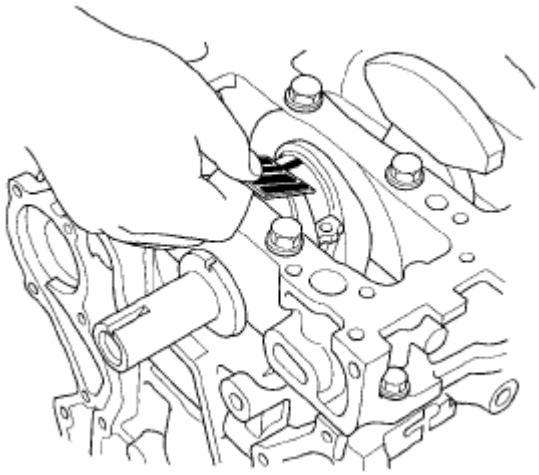


Fig. 10: Measuring Widest Part Of Plastigage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. 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.
9. 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, and start over.

Rod Bearing Selection

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

   Connecting Rod Big End Bore Code Locations

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

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

   Normal Bore Size: 48.0 mm (1.89 in.)

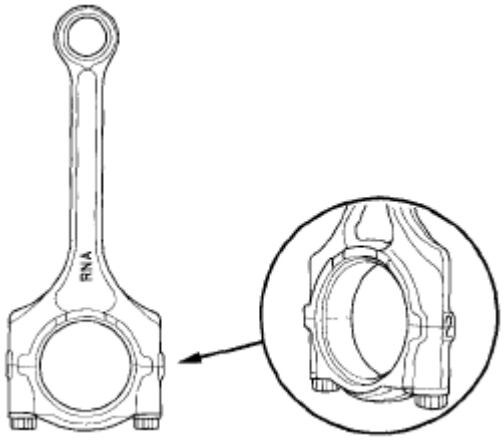


Fig. 11: Identifying Connecting Rod Big End Bore Code Locations
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Connecting Rod Journal Code Location

3. The connecting rod journal codes are stamped on the crankshaft.

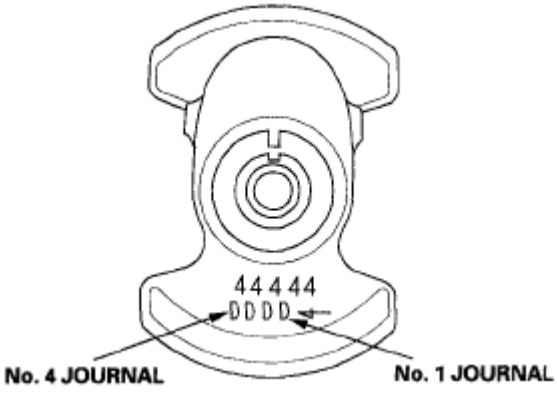


Fig. 12: Identifying Connecting Rod Journal Code Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

NOTE:

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

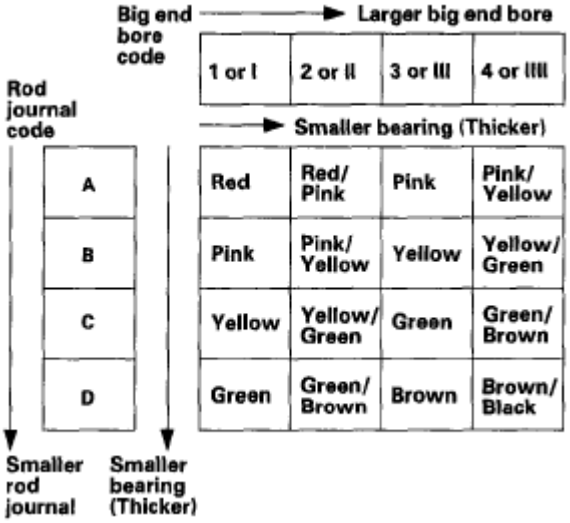
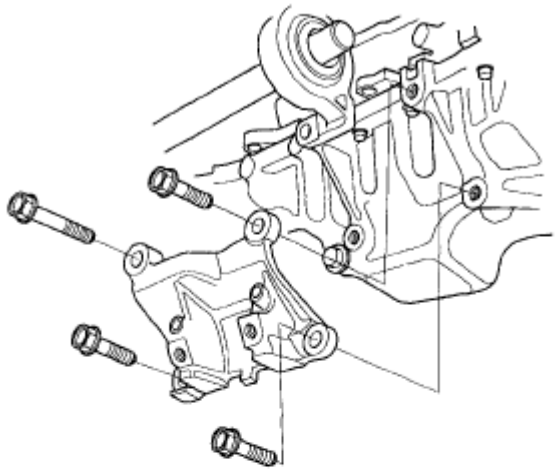


Fig. 13: Identifying Big End Bore Codes And Rod Journal Codes Reference
Courtesy of AMERICAN HONDA MOTOR CO., INC.

OIL PAN REMOVAL

1. If the engine is already out of the vehicle, go to step 12.
2. Remove the drive belt (see **DRIVE BELT INSPECTION**).
3. Remove the A/C condenser fan shroud (see **A/C COMPRESSOR REPLACEMENT**).
4. Disconnect the A/C compressor clutch connector, then remove the harness clamp. Remove the A/C compressor without disconnecting the A/C hoses (see step 39 on **ENGINE REMOVAL**).
5. Raise the vehicle on the hoist to full height.
6. Remove the splash shield (see step 23 on **ENGINE REMOVAL**).
7. Drain the engine oil (see **ENGINE OIL REPLACEMENT**).
8. Remove exhaust pipe A (see step 27 on **ENGINE REMOVAL**).
9. Support the oil pan with a jack.
10. Remove the lower torque rod (see step 46 on **ENGINE REMOVAL**).
11. Remove the jack.
12. Remove the lower torque rod bracket.

M/T



A/T

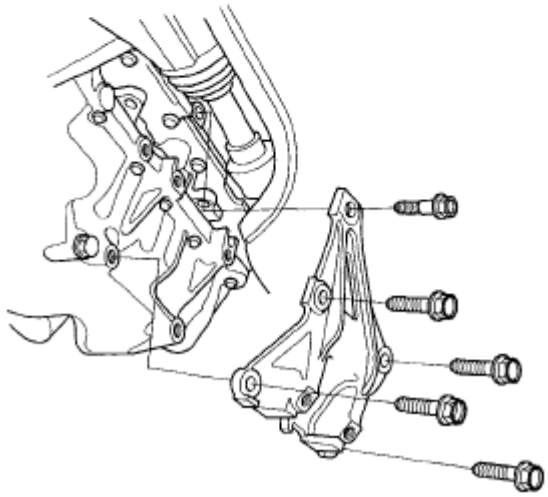


Fig. 14: Identifying Lower Torque Rod Bracket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Remove the A/C compressor bracket.

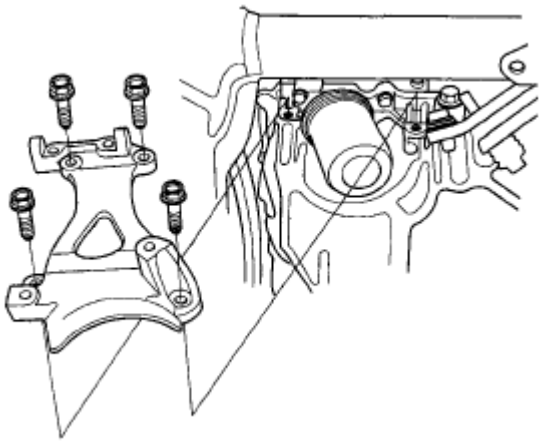


Fig. 15: Identifying A/C Compressor Bracket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. A/T model: Remove the shift cable cover.

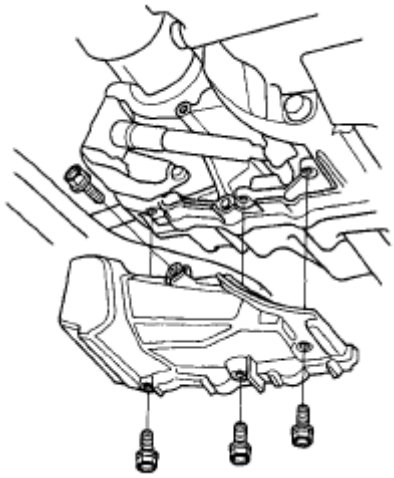


Fig. 16: Identifying Shift Cable Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Remove the clutch cover/torque converter cover (A), and remove the two bolts securing the transmission.

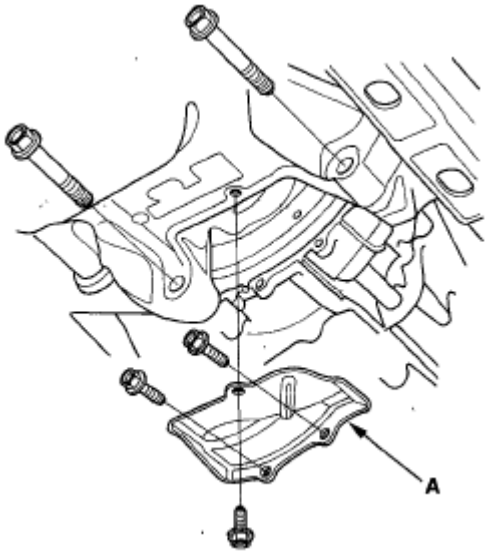


Fig. 17: Identifying Clutch Cover/Torque Converter Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

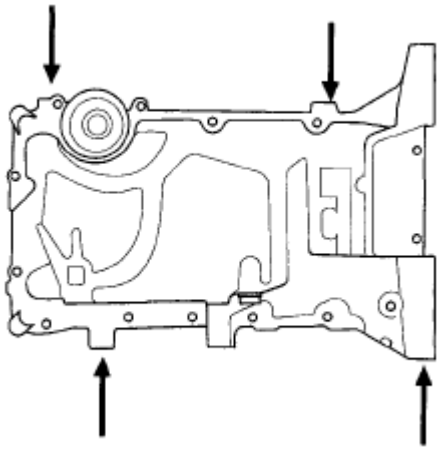


Fig. 18: Identifying Oil Pan Separation Points
Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Remove the oil pan.

CRANKSHAFT AND PISTON REMOVAL

1. Remove the engine assembly (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, clutch disc and flywheel (see **PRESSURE PLATE AND CLUTCH DISC REMOVAL (5-SPEED MODEL)**).
4. A/T model: Remove the drive plate (see **DRIVE PLATE REMOVAL AND INSTALLATION**).
5. Remove the oil pan (see **OIL PAN REMOVAL**).
6. Remove the oil pump (see **REMOVAL**).
7. Remove the cylinder head (see **CYLINDER HEAD REMOVAL**).
8. Remove the oil screen (A) and baffle plate (B).

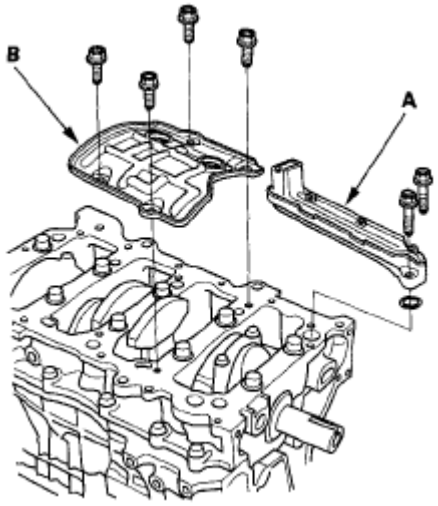


Fig. 19: Identifying Oil Screen And Baffle Plate
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Remove the 8 mm bolts.

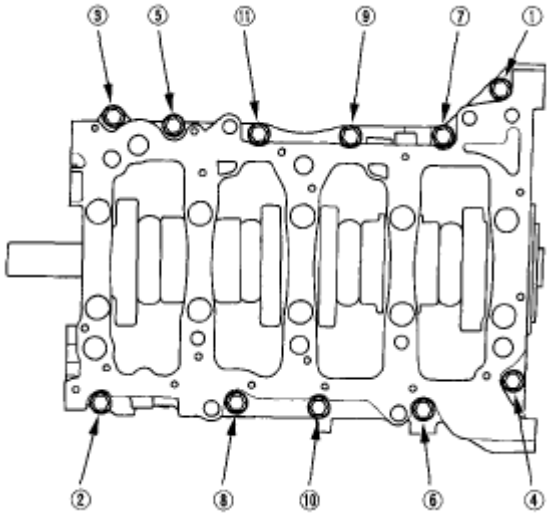


Fig. 20: Identifying 8mm Bolt Loosening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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.

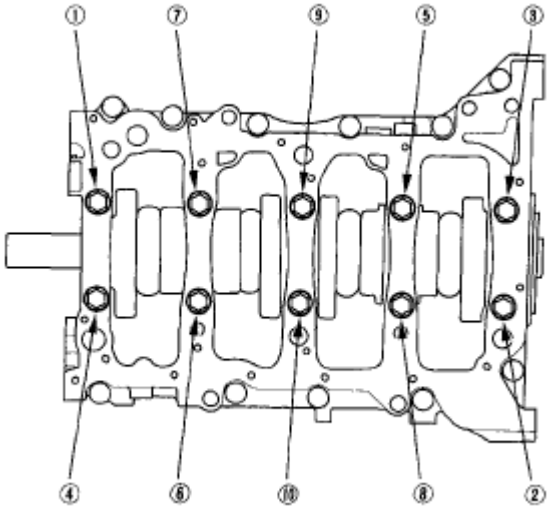


Fig. 21: Identifying Bearing Cap Bolt Loosening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Using a flat blade screwdriver, separate the lower block from the engine block in the places shown.

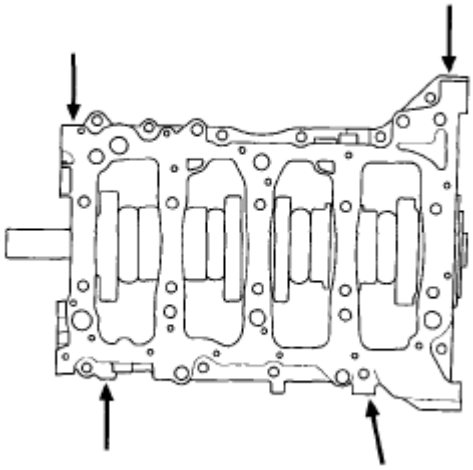


Fig. 22: Identifying Lower Block From Engine Block
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Remove the lower block and bearings. Keep all the bearings in order.
13. Remove the rod caps/bearings. Keep all caps/bearings in order.
14. Lift the crankshaft (A) out of the engine. Be careful not to damage the journals and the crankshaft position (CKP) pulse plate (B).

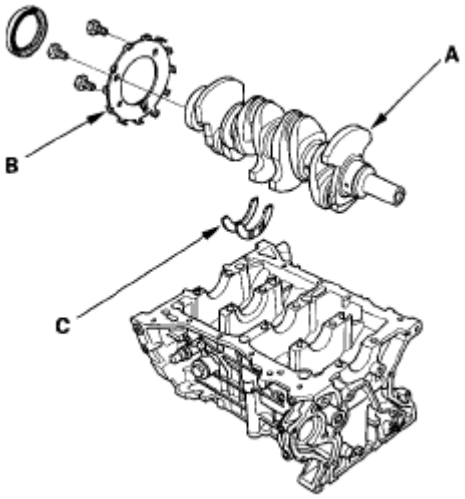


Fig. 23: Identifying Crankshaft Position (CKP) Pulse Plate And Crankshaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Remove the CKP pulse plate (B).
16. Remove the thrust washers (C).
17. Remove the upper bearing halves from the connecting rods, and set them aside with their respective caps.
18. 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.

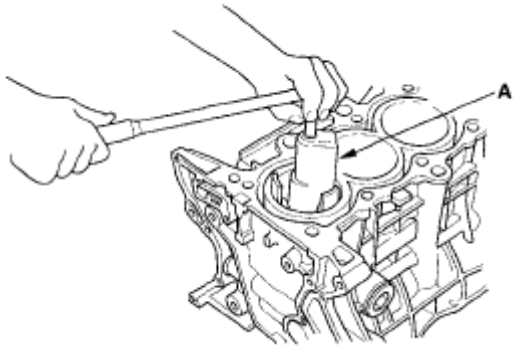


Fig. 24: Removing Upper Bearing Halves From Connecting Rods
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

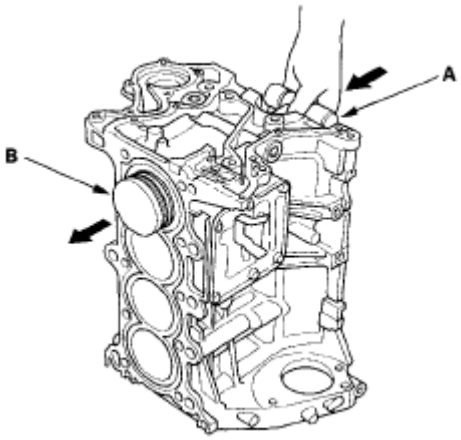


Fig. 25: Driving Out Piston/Connecting Rod Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

20. Reinstall the lower block and the bearings on the engine in the proper order.
21. Reinstall the connecting rod bearings and caps after removing each piston/connecting rod assembly.
22. Mark each piston/connecting rod assembly with its cylinder number to make sure they are reused in the 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 the threads.
4. Measure the out-of-round at the middle of each rod and main journal in two places. The difference between measurements on each journal must not be more than the service limit.

Journal Out-of-Round

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

Service Limit: 0.010 mm (0.0004 in.)

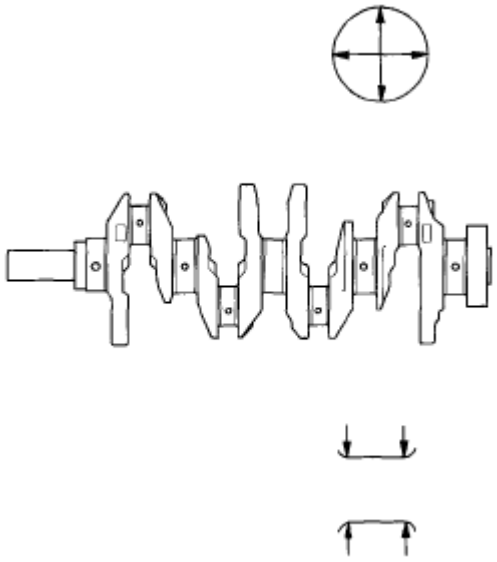


Fig. 26: Identifying Crankshaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Journal Taper

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

   Service Limit: 0.010 mm (0.0004 in.)

   Straightness

6. Place the engine block on the surface plate.
7. Clean and install the bearings on the No. 1 and No. 5 journals of the engine block.
8. Lower the crankshaft into the block.
9. Measure the runout on all of the main journals. Rotate the crankshaft two complete revolutions. The difference between measurements on each journal must not be more than the service limit.

   Crankshaft Total Runout

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

   Service Limit: 0.04 mm (0.0016 in.)

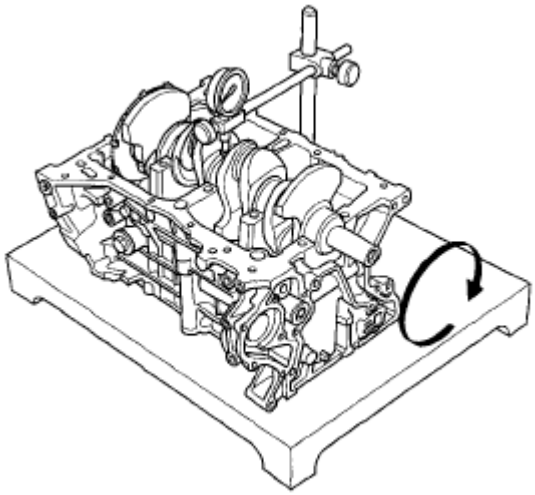


Fig. 27: Measuring Runout On Of Main Journals
Courtesy of AMERICAN HONDA MOTOR CO., INC.

BLOCK AND PISTON INSPECTION

1. Remove the crankshaft and pistons (see **CRANKSHAFT AND PISTON REMOVAL**).
2. Check the piston for distortion or cracks.
3. Measure the piston diameter at a point 14 mm (0.55 in.) from the bottom of the skirt.

Piston Diameter

Standard (New): 80.980-80.990 mm (3.1881-3.1886 in.)

Service Limit: 80.93 mm (3.186 in.)

Oversize Piston Diameter

0.25: 81.230-81.240 mm (3.1980-3.1984 in.)

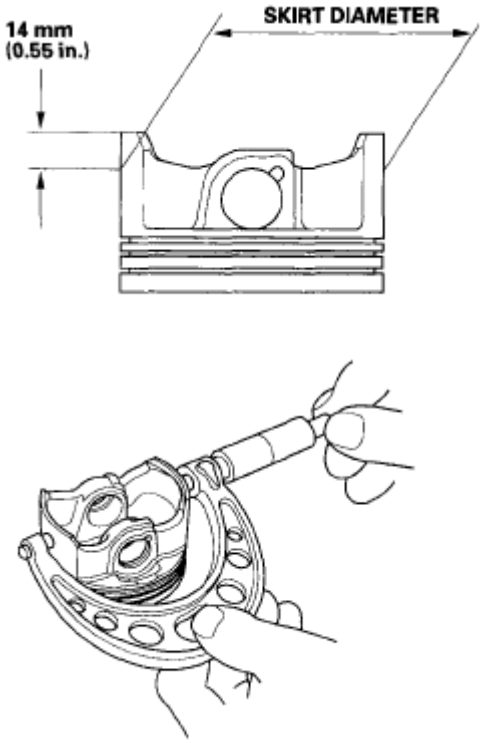


Fig. 28: Measuring Piston Diameter Point From Bottom Of Skirt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Cylinder Bore Size

   Standard (New): 81.000-81.015 mm (3.1890-3.1896 in.)

   Service Limit: 81.070 mm (3.1917 in.)

   Oversize Bore

   0.25: 81.250-81.265 mm (3.1988-3.1994 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.)

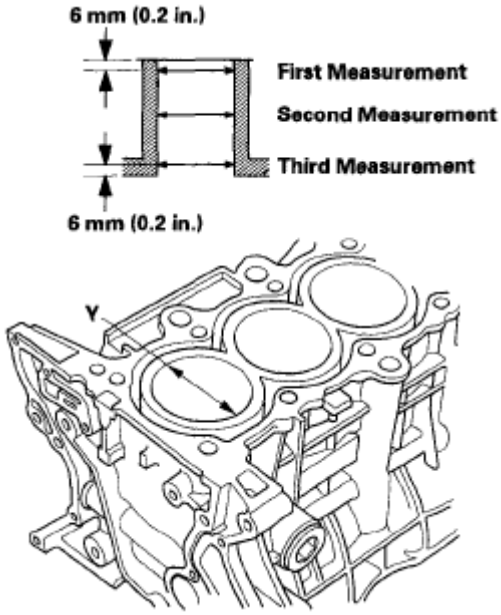


Fig. 29: Identifying Wear And Taper At Three Levels Inside Each Cylinder
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Engine Block Warpage

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

Service Limit: 0.10 mm (0.004 in.)

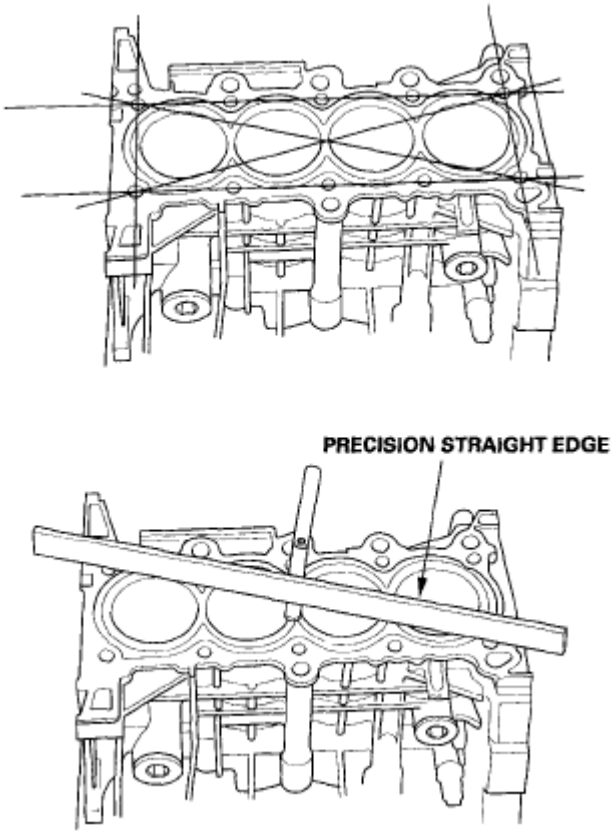


Fig. 30: Identifying Top Of Engine Block For Warpage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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 Bore Clearance

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

   Service Limit: 0.05 mm (0.002 in.)

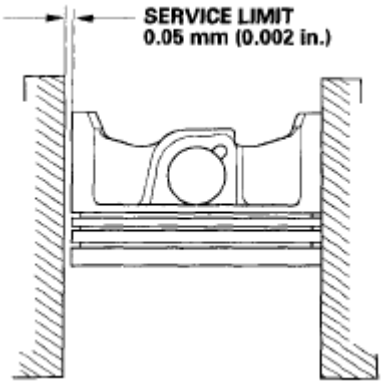


Fig. 31: Identifying Calculate Difference Between Cylinder Bore Diameter And Piston Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER BORE HONING

Only a scored or scratched cylinder bore must be honed.

1. Measure the cylinder bores (see **BLOCK AND PISTON INSPECTION**). If the engine block is to be reused, hone the cylinders, and remeasure the bores.
2. Remove and replace the oil jets (see **OIL JET REPLACEMENT**).
3. Hone the cylinder bores with honing oil and a fine (400 grit) stone.

Honing Pattern: Within 30-60 degree cross-hatch pattern (A)

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.

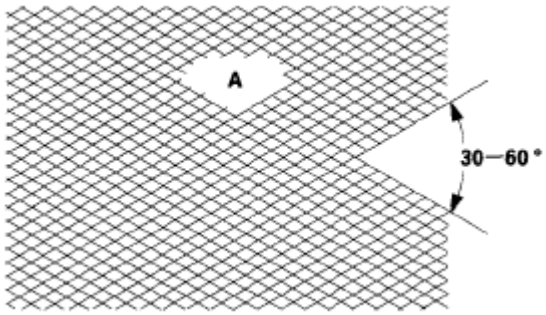


Fig. 32: Identifying Honing Pattern
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. When honing is complete, thoroughly clean the engine block of all metal particles. Wash the cylinder bores with hot soapy water, then dry and oil them immediately to prevent rusting. Never use solvent, it will only redistribute the grit on the cylinder walls.
5. If scoring or scratches are still present in the cylinder bores after honing 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.
6. Install the new oil jets (see **OIL JET REPLACEMENT**).

PISTON, PIN, AND CONNECTING ROD REPLACEMENT

Disassembly

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

NOTE: Take care not to damage the ring grooves.

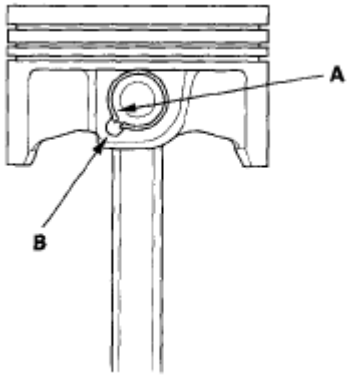


Fig. 33: Identifying Piston Pin Snap Rings And Piston Pin Bores
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

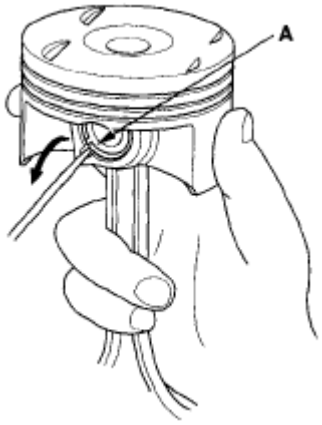


Fig. 34: Removing Both Snap Rings
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Fig. 35: Heating Piston And Connecting Rod Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Inspection

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

1. Measure the diameter of the piston pin.

   Piston Pin Diameter

   Standard (New): 19.960-19.964 mm (0.7858-0.7860 in.)

   Service Limit: 19.960 mm (0.7858 in.)

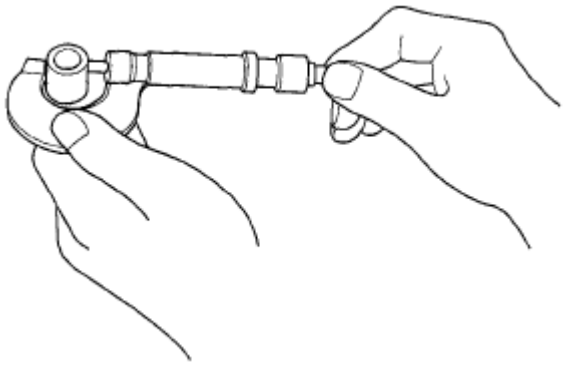


Fig. 36: Measuring Diameter Of Piston Pin
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

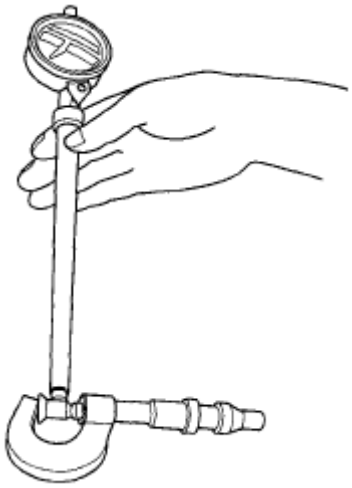


Fig. 37: Identifying Piston Pin Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Piston Pin-to-Piston Clearance

   Standard (New): -0.004 to +0.003 mm (-0.00016 to +0.00012 in.)

   Service Limit: 0.006 mm (0.0002 in.)

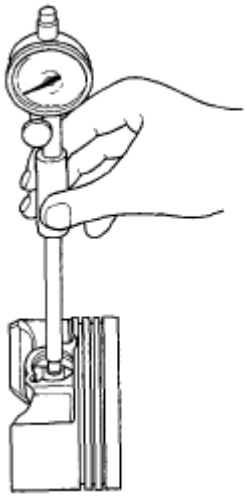


Fig. 38: Checking Difference Between Piston Pin Diameter And Piston Pin Hole Diameter In Piston
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Piston Pin-to-Connecting Rod Clearance

Standard (New): 0.005-0.015 mm (0.0002-0.0006 in.)

Service Limit: 0.02 mm (0.0008 in.)

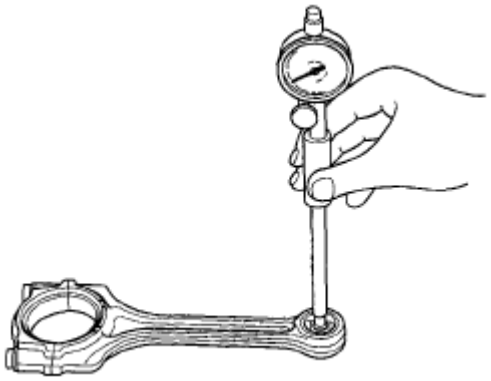


Fig. 39: Measuring Piston Pin-To-Connecting Rod Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Reassembly

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

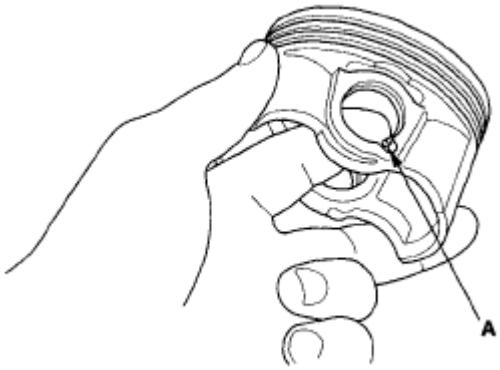


Fig. 40: Installing Piston Pin Snap Ring
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Fig. 41: Heating Piston
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

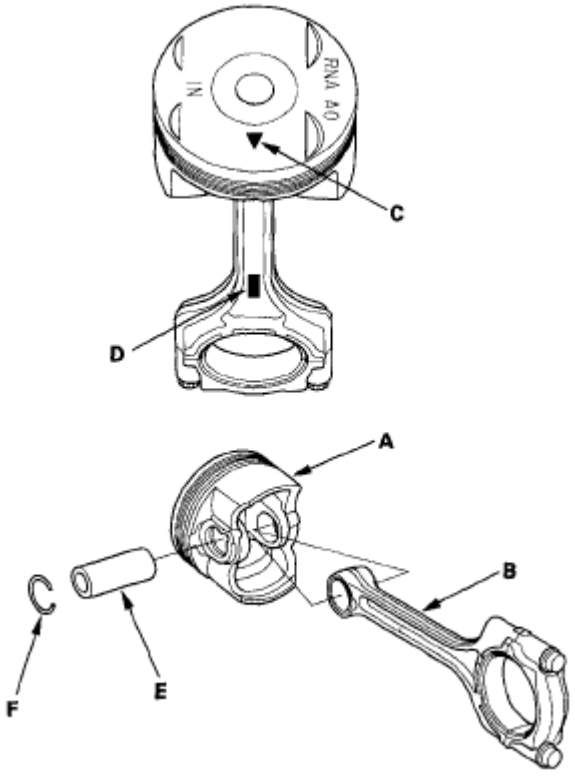


Fig. 42: Identifying Piston And Connecting Rod With Mark
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Install the remaining snap ring (F).
6. Turn the snap rings until the end gaps are positioned at the bottom of the piston.

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).

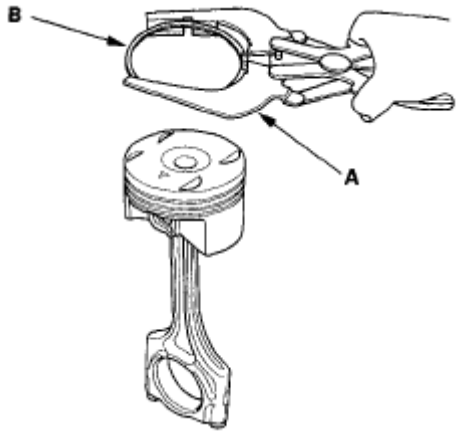


Fig. 43: Removing Old Piston Rings
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   The top and 2nd ring grooves are 1.2 mm (0.05 in.) wide. The oil ring groove is 2.0 mm (0.08 in.) wide. File down a blade if necessary. Do not use a wire brush to clean the ring grooves, or cut the ring grooves deeper with the cleaning tools.

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

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

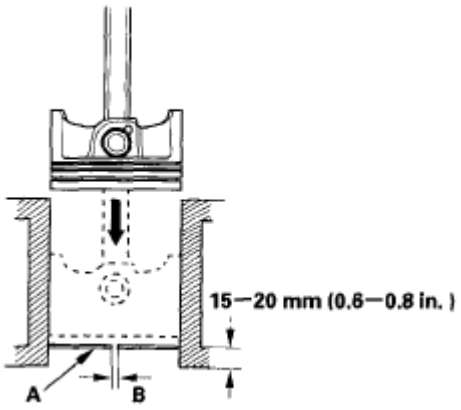


Fig. 44: Pushing Ring Into Cylinder Bore

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Piston Ring End-Gap

   Top Ring:

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

   Service Limit: 0.60 mm (0.024 in.)

   Second Ring:

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

   Service Limit: 0.70 mm (0.028 in.)

   Oil Ring:

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

   Service Limit: 0.80 mm (0.031 in.)

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

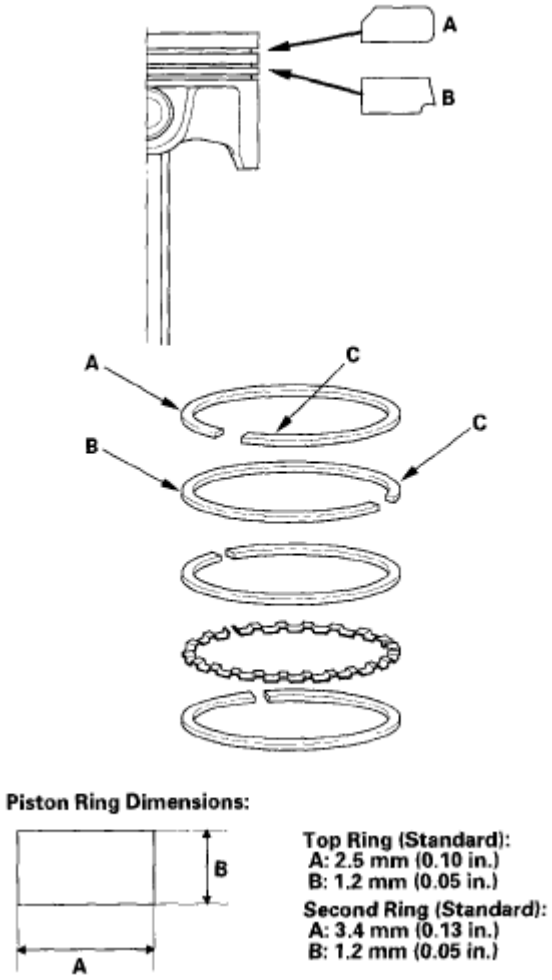


Fig. 45: Identifying Top Ring And Second Ring
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

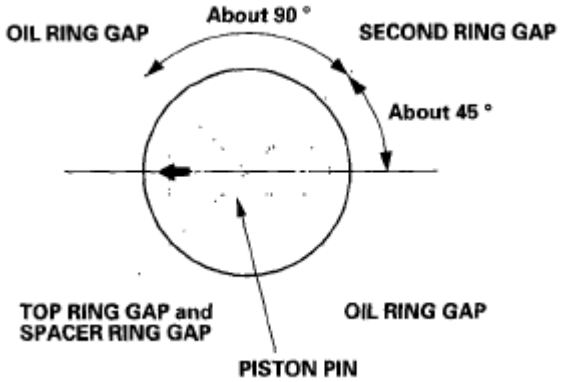


Fig. 46: Positioning Ring End Gaps
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Top Ring Clearance

   Standard (New): 0.045-0.070 mm (0.0018-0.0028 in.)

   Service Limit: 0.13 mm (0.005 in.)

   Second Ring Clearance

   Standard (New): 0.035-0.060 mm (0.0014-0.0024 in.)

   Service Limit: 0.13 mm (0.005 in.)

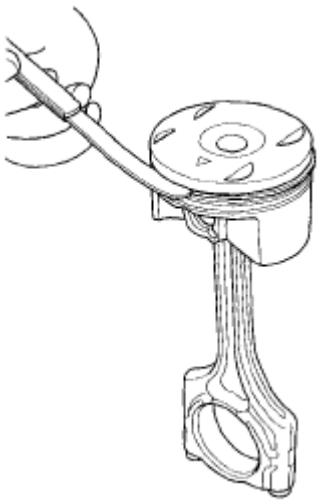


Fig. 47: Measuring Ring-To-Groove Clearances
Courtesy of AMERICAN HONDA MOTOR CO., INC.

PISTON INSTALLATION

If the Crankshaft is Already Installed

1. Set the crankshaft to bottom dead center (BDC) for each cylinder as its piston is installed.
2. Remove the connecting rod caps, then install the ring compressor. Check that the 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 mark (A) to face the cam chain side of the engine.

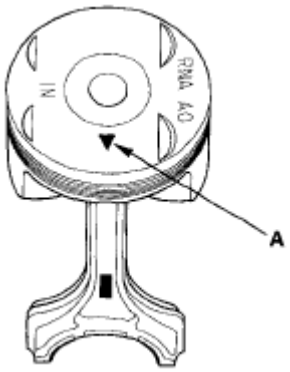


Fig. 48: Identifying Mark To Face Cam Chain Side Of Engine
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Position the piston in the cylinder, and tap it in using the wooden handle of a hammer (A). Push down on the ring compressor (B) to prevent the rings from expanding before entering the cylinder bore.

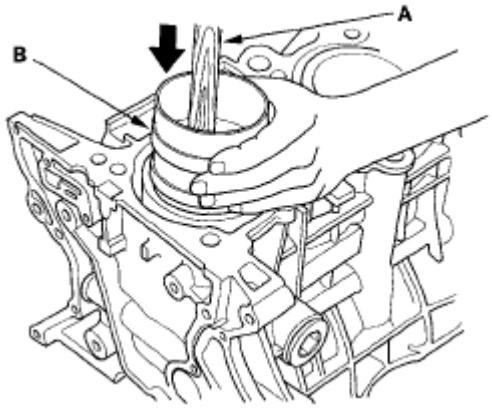


Fig. 49: Positioning Piston In Cylinder
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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 20 N.m (2.0 kgf.m, 14 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.

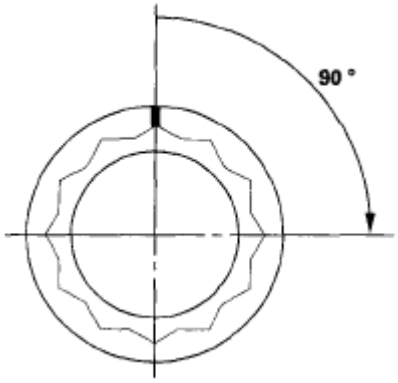


Fig. 50: Identifying Connecting Rod Bolt Tightening Angle
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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 mark (A) to face the cam chain side of the engine.

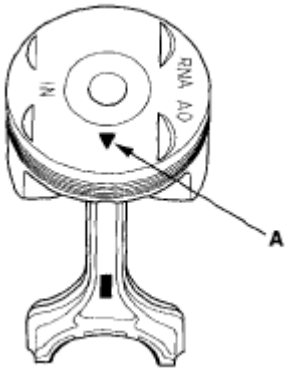


Fig. 51: Identifying Mark To Face Cam Chain Side Of Engine
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Position the piston in the cylinder, and tap it in using the wooden handle of a hammer (A). Push down on the ring compressor (B) to prevent the rings from expanding before entering the cylinder bore.

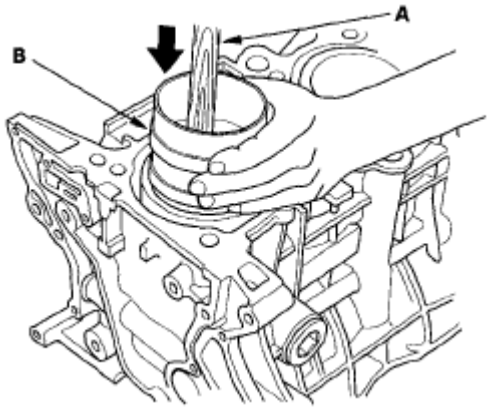


Fig. 52: Positioning Piston In Cylinder
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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.

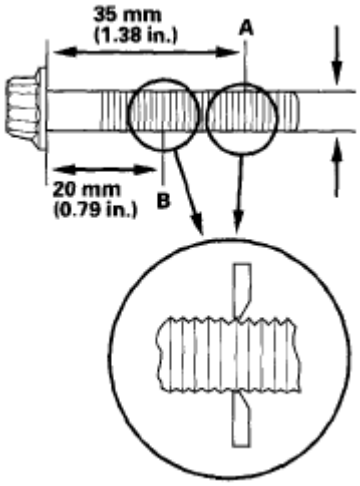


Fig. 53: Identifying Diameter Of Each Connecting Rod Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Point A-Point B = Difference in Diameter

   Difference in Diameter:

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

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

CRANKSHAFT INSTALLATION

Special Tools Required

- Driver 07749-0010000
- Attachment, 24 x 26 mm 07746-0010700
- Oil seal driver attachment 96 07ZAD-PNAA100

1. With a manual transmission, install the crankshaft end bushing when replacing the crankshaft. Using the special tools, drive in the crankshaft end bushing until the special tools bottom against the crankshaft.

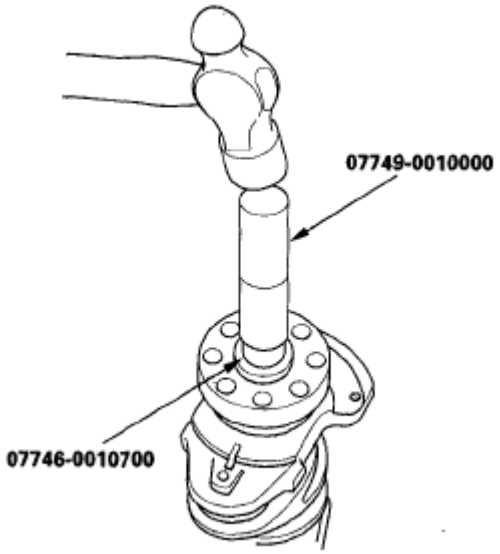


Fig. 54: Identifying Special Tool
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Check the connecting rod bearing clearance with plastigage (see **CONNECTING ROD BEARING REPLACEMENT**).
3. Check the main bearing clearance with plastigage (see **CRANKSHAFT MAIN BEARING REPLACEMENT**).
4. Install the bearing halves in the engine block and connecting rods.
5. Apply a coat of new engine oil to the main bearings and rod bearings.
6. Install the crankshaft position (CKP) pulse plate (A) to the crankshaft (B).

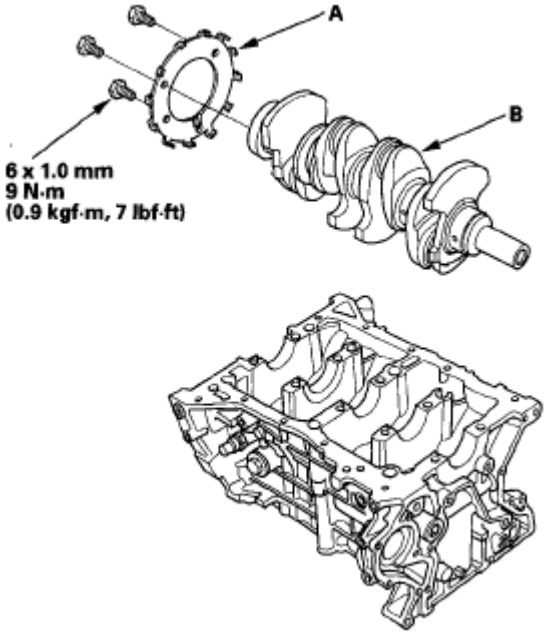


Fig. 55: Identifying Crankshaft Position (CKP) Pulse Plate To Crankshaft (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Hold the crankshaft so that rod journal No. 2 and rod journal No. 3 are straight up, and lower the crankshaft into the engine block.
8. Apply new engine oil to the thrust washer surfaces. Install the thrust washers (A) in the No. 4 journal of the engine block.

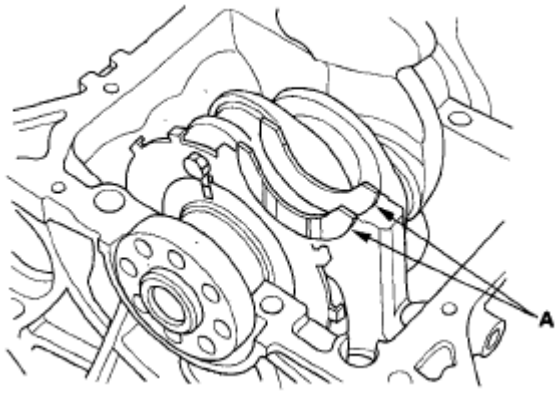


Fig. 56: Identifying Thrust Washers
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Inspect the connecting rod bolts (see **CONNECTING ROD BOLT INSPECTION**).
10. Seat the rod journals into connecting rod No. 1 and connecting rod No. 4. Line up the mark (A) on the connecting rod and cap, then install the caps and bolts finger-tight.

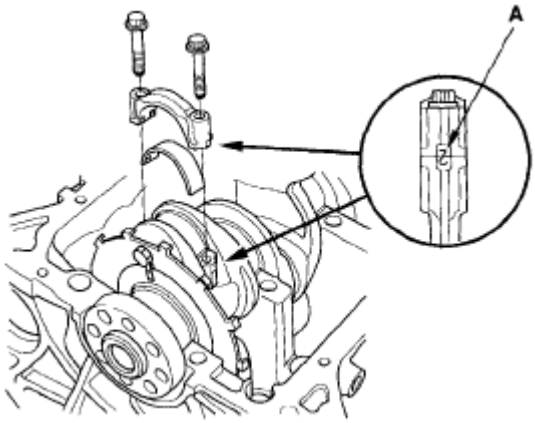


Fig. 57: Identifying Mark On Connecting Rod And Cap
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Rotate the crankshaft clockwise, and seat the journals into connecting rod No. 2 and connecting rod No. 3. Line up the mark on the connecting rod and cap, then install the caps and bolts finger-tight.
12. Tighten the connecting rod bolts to 20 N.m (2.0 kgf.m, 14 lbf.ft).
13. 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 9 of the procedure. Do not loosen it back to the specified angle.

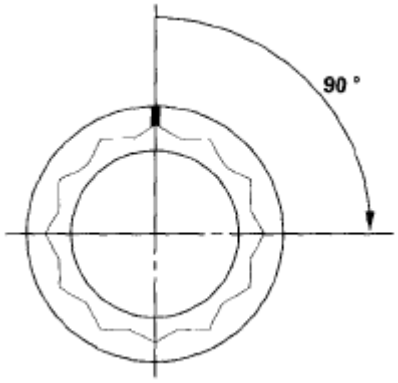


Fig. 58: Identifying Connecting Rod Bolt Tightening Angle
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Remove any old liquid gasket from the lower block mating surfaces, bolts, and bolt holes.
15. Clean, and dry the lower block mating surfaces.
16. Apply liquid gasket, P/N 08717-0004,08718-0001, 08718-0002, 08718-0003, or 08718-0009, evenly to the engine block mating surface of the lower block.

NOTE: Do not install components if too much time has passed after applying the

liquid gasket (for P/N 08718-0002, no more than 4 minutes, for all others, no more than 5 minutes). Instead, remove the old residue and reapply the liquid gasket.

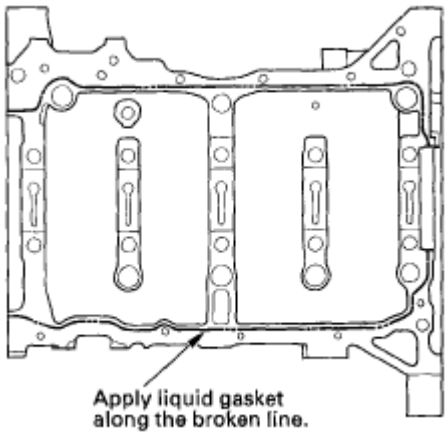


Fig. 59: Identifying Lower Block Mating Surfaces
Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Put the lower block on the engine block.

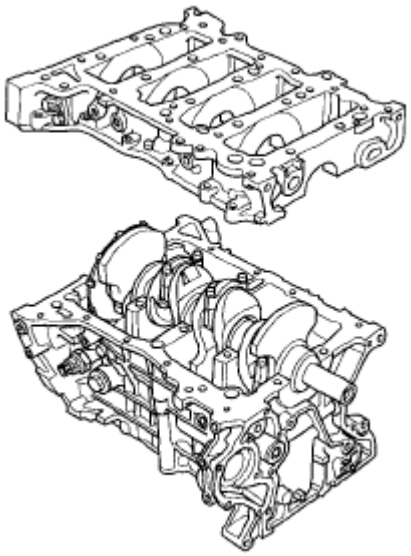


Fig. 60: Identifying Lower Block On Engine Block
Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Apply new engine oil to the threads and flange of the bearing cap bolts.
19. Tighten the bearing cap bolts, in sequence, to 25 N.m (2.5 kgf.m, 18 lbf.ft).

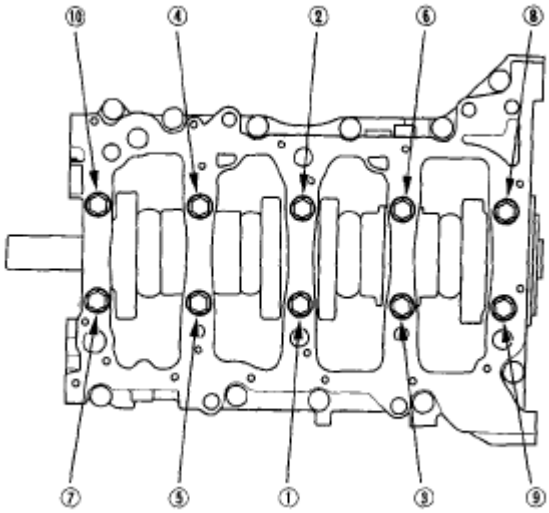


Fig. 61: Identifying Bearing Cap Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

20. Tighten the bearing cap bolts an additional 57 degrees.

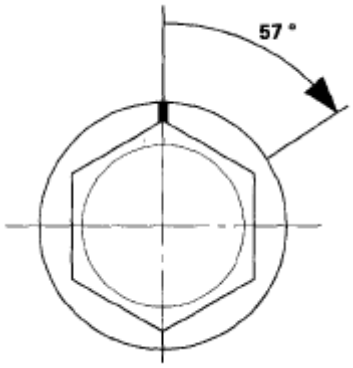


Fig. 62: Identifying Bearing Cap Bolts Tightening Angle
Courtesy of AMERICAN HONDA MOTOR CO., INC.

21. Tighten the 8 mm bolts, in sequence, to 24 N.m (2.4 kgf.m, 17 lbf-ft).

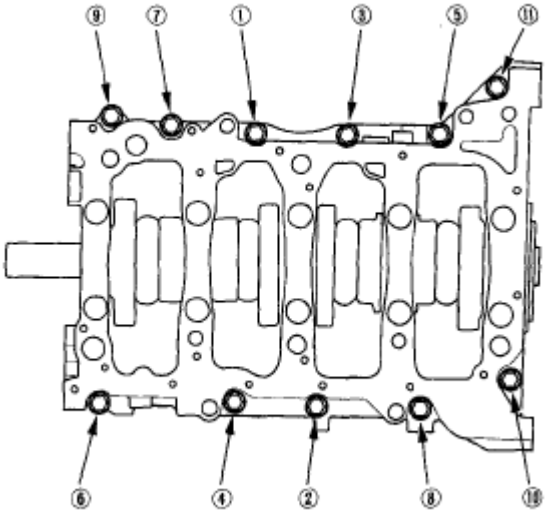


Fig. 63: Identifying 8mm Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

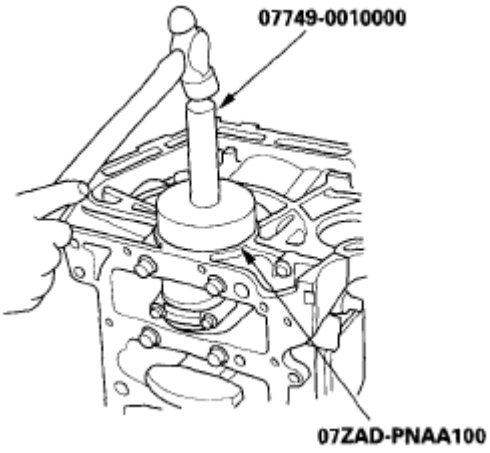


Fig. 64: Identifying Special Tool
Courtesy of AMERICAN HONDA MOTOR CO., INC.

23. Measure the distance between the engine block (A) and oil seal (B).

Oil Seal Installed Height: 0.2-1.2 mm (0.001-0.047 in.)

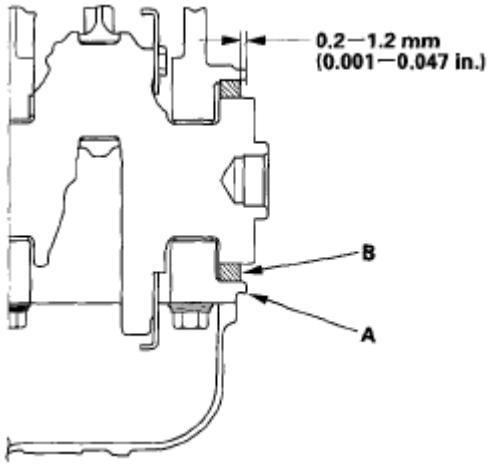


Fig. 65: Identifying Distance Between Engine Block And Oil Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

24. Install the baffle plate (A), then install the oil screen (B) with a new O-ring (C).

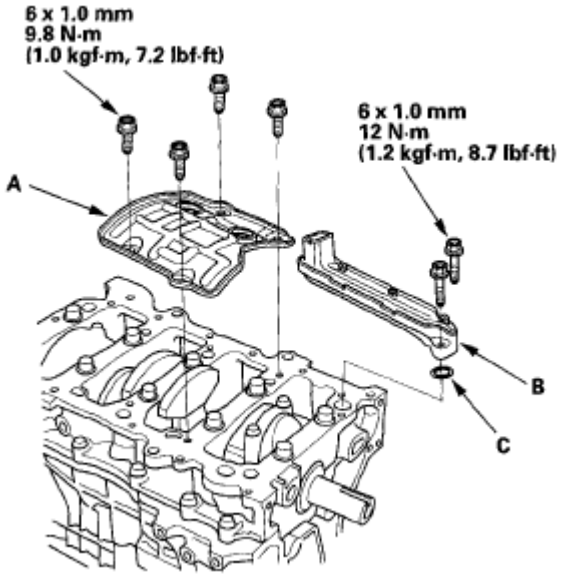


Fig. 66: Identifying Baffle Plate Oil Screen
Courtesy of AMERICAN HONDA MOTOR CO., INC.

25. Install the oil pump (see **INSTALLATION**).
26. Install the oil pan (see **OIL PAN INSTALLATION**).
27. Install the cylinder head (see **CYLINDER HEAD INSTALLATION**).
28. M/T model: Install the flywheel, clutch disc and pressure plate (see **PRESSURE PLATE AND CLUTCH DISC REMOVAL (5-SPEED MODEL)**).
29. A/T model: Install the drive plate (see **DRIVE PLATE REMOVAL AND INSTALLATION**).
30. Install the transmission:

- Manual transmission (see **TRANSMISSION INSTALLATION**)
- Automatic transmission (see **TRANSMISSION INSTALLATION**)

31. Install the engine assembly (see **ENGINE INSTALLATION**).

NOTE: Whenever any crankshaft or connecting rod bearing is replaced, it is necessary after reassembly to run the engine at idle speed until it reaches normal operating temperature, then continue running it for about 15 minutes.

CKP PULSE PLATE REPLACEMENT

1. Remove the crankshaft.
2. Remove the crankshaft position (CKP) pulse plate (A).

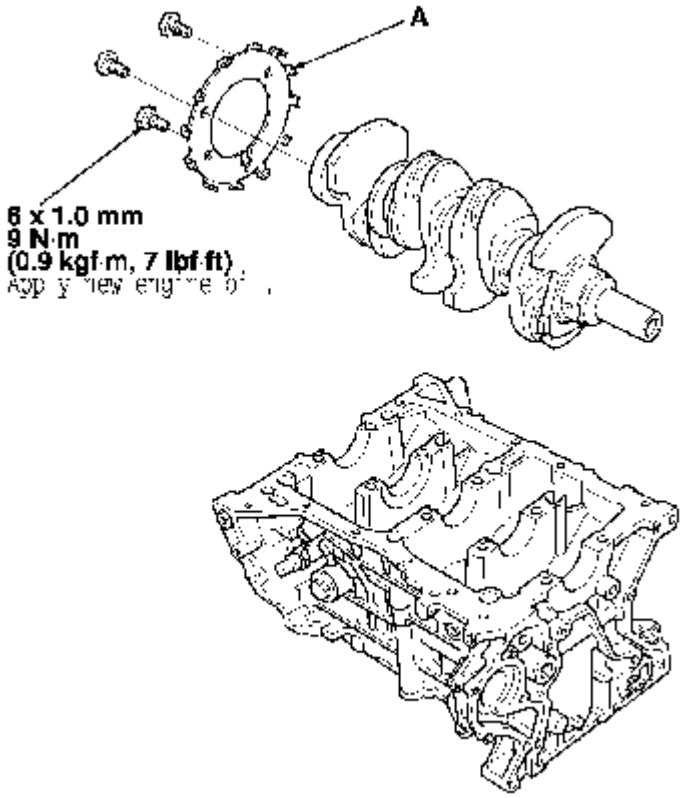


Fig. 67: Identifying CKP Pulse Plate Replacement
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

OIL PAN INSTALLATION

1. Remove all of the old liquid gasket from the oil pan mating surfaces, bolts, and bolt holes.

2. Clean, and dry the oil pan mating surfaces.
3. Apply liquid gasket, P/N 08717-00004, 08718-0001, 08718-0002, 08718-0003, or 08718-0009, evenly to the engine block mating surface of the oil pan.

NOTE: Do not install components if too much time has passed after applying the liquid gasket (for P/N 08718-0002, no more than 4 minutes, for all others, no more than 5 minutes). Instead, remove the old residue and reapply the liquid gasket.

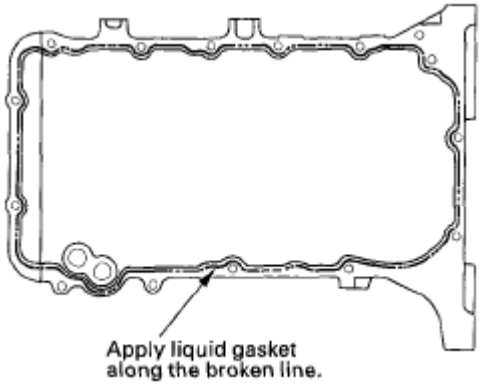


Fig. 68: Identifying Oil Pan Mating Surfaces
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Install the dowel pins (A), then install the oil pan (B) with new O-rings (C).

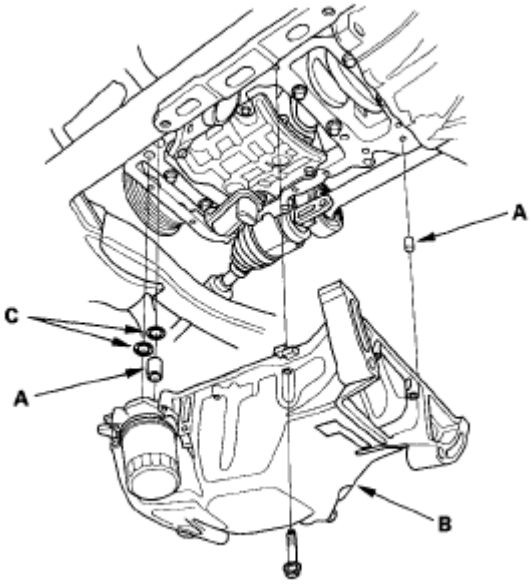


Fig. 69: Identifying Dowel Pins, Oil Pan And O-Rings
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Tighten the bolts in two or three steps. In the final step, tighten all bolts, in sequence, to 18 N.m (1.8

kgf.m, 13 lbf.ft). Wipe off the excess liquid gasket on the each side of crankshaft pulley and flywheel/drive plate.

NOTE:

- **Wait at least 30 minutes to allow liquid gasket to cure before filling the engine with oil.**
- **Do not run the engine for at least 3 hours to allow liquid gasket to cure after installing the oil pan.**

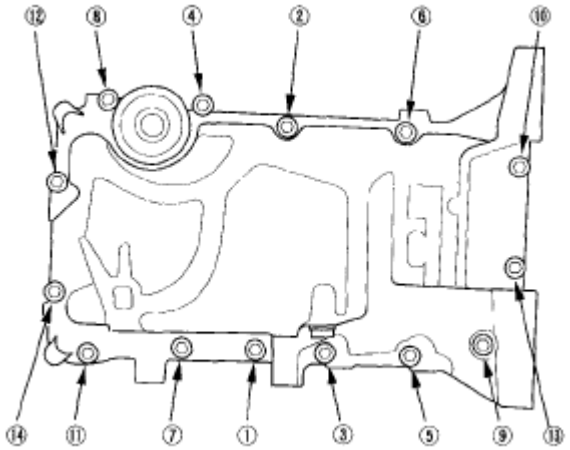


Fig. 70: Identifying Oil Pan Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Install the clutch cover/torque converter cover (A), and install the two bolts securing the transmission.

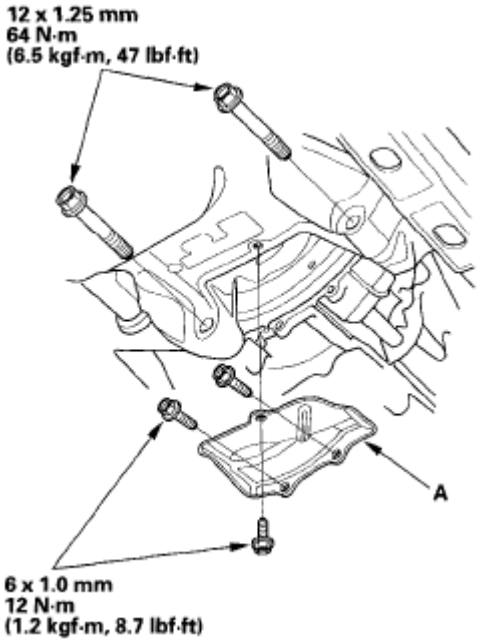


Fig. 71: Identifying Torque Converter Cover And Bolts (With Torque Specifications)

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. A/T model: Install the shift cable cover.

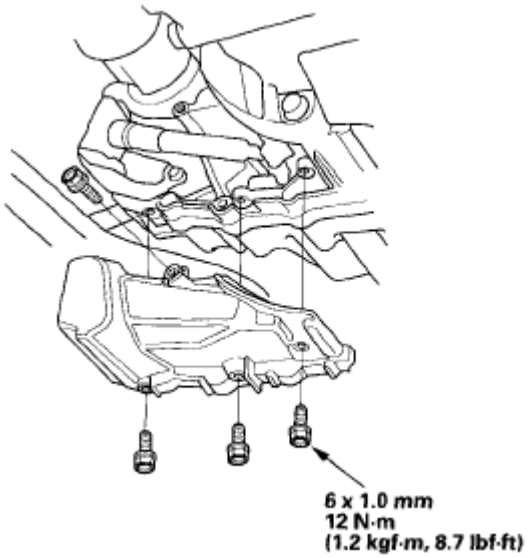


Fig. 72: Identifying Shift Cable Cover (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Install the A/C compressor bracket.

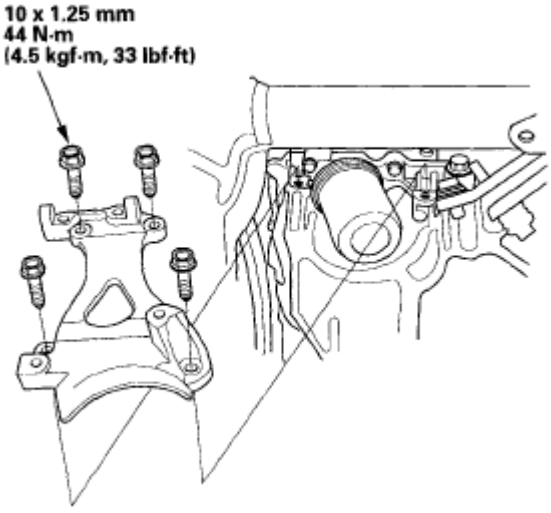


Fig. 73: Identifying A/C Compressor Bracket (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Remove the lower torque rod bracket. M/T

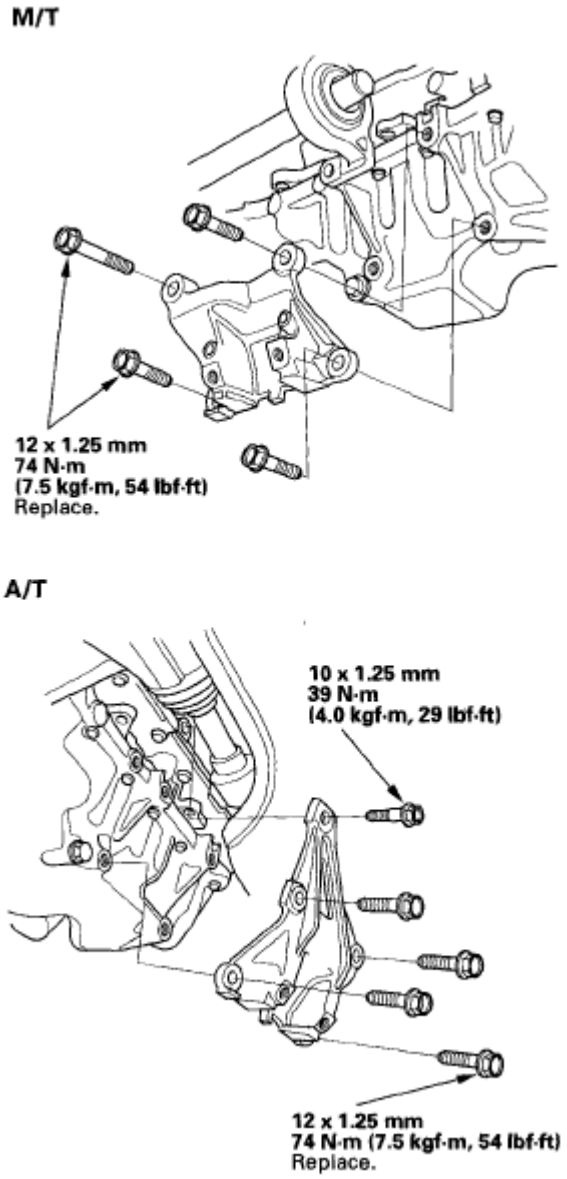


Fig. 74: Identifying Lower Torque Rod Bracket (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. If the engine is still in the vehicle, do the following steps.
11. Lower the vehicle on the lift.
12. Loosen the upper torque rod mounting bolt (see step 6 on **ENGINE INSTALLATION**).
13. Raise the vehicle on the lift to full height.
14. Install the lower torque rod (see step 16 on **ENGINE INSTALLATION**).
15. Lower the vehicle on the lift.
16. Tighten the upper torque rod mounting bolt (see step 18 on **ENGINE INSTALLATION**).
17. Raise the vehicle on the lift to full height.
18. Install exhaust pipe A (see step 30 on **ENGINE INSTALLATION**).

19. Lower the vehicle on the lift.
20. Install the A/C compressor. Install the harness clamp, then connect the A/C compressor clutch connector (see step 34 on **ENGINE INSTALLATION**).
21. Install the A/C condenser fan shroud (see step 5 on **A/C CONDENSER REPLACEMENT**).
22. Install the drive belt (see **DRIVE BELT INSPECTION**).
23. Refill the engine with engine oil (see step 4 on **ENGINE OIL REPLACEMENT**).
24. Install the splash shield (see step 31 on **ENGINE REMOVAL**).

PULLEY END CRANKSHAFT OIL SEAL INSTALLATION - IN CAR

Special Tools Required

Oil seal driver 07LAD-PT3010A

1. Remove the crankshaft pulley (see **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**).
2. Remove the pulley end crankshaft oil seal.
3. Clean, and dry the crankshaft oil seal housing.
4. Apply a light coat of multipurpose grease to the crankshaft and to the lip of the seal.
5. Using the seal driver, drive in the crankshaft oil seal until the driver bottoms against the oil pump. When the seal is in place, clean any excess grease off the crankshaft, and check that the oil seal lip is not distorted.

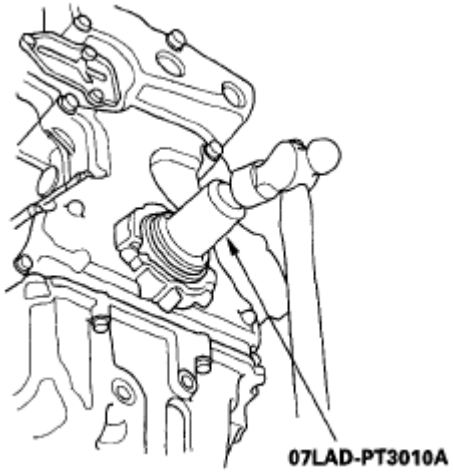


Fig. 75: Identifying Special Tool
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Install the crankshaft pulley (see **INSTALLATION**).

TRANSMISSION END CRANKSHAFT OIL SEAL INSTALLATION - IN CAR

Special Tools Required

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

1. Remove the transmission:
   - Manual transmission (see **TRANSMISSION REMOVAL**)
   - Automatic transmission (see **TRANSMISSION REMOVAL**)
2. M/T model: Remove the pressure plate, clutch disc and flywheel (see **PRESSURE PLATE AND CLUTCH DISC REMOVAL (5-SPEED MODEL)**).
3. A/T model: Remove the drive plate (see **DRIVE PLATE REMOVAL AND INSTALLATION**).
4. Remove the transmission end crankshaft oil seal.
5. Clean, and dry the crankshaft oil seal housing.
6. Apply a light coat of multipurpose grease to the crankshaft and to the lip of the seal.
7. Use the special tools to drive a new oil seal squarely into the engine block to the specified installed height.

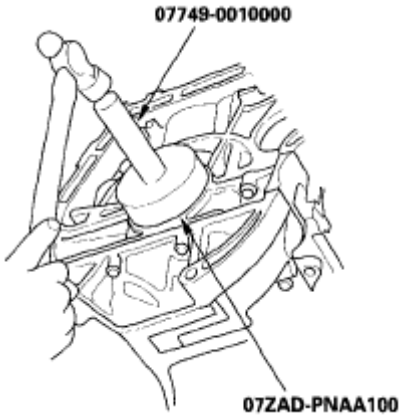


Fig. 76: Identifying Special Tool
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Measure the distance between the engine block (A) and oil seal (B).

   Oil Seal Installed Height: 0.2-1.2 mm (0.001-0.047 in.)

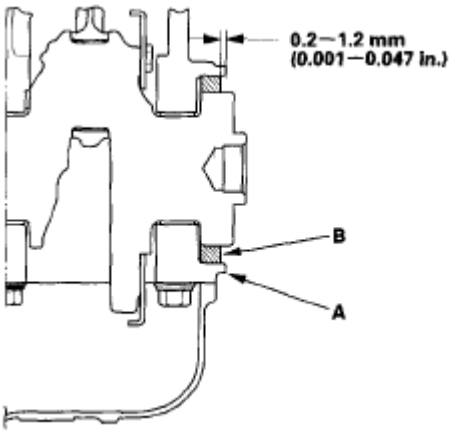


Fig. 77: Identifying Distance Between Engine Block And Oil Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. M/T model: Install the flywheel , clutch disc and pressure plate (see **PRESSURE PLATE AND CLUTCH DISC REMOVAL (5-SPEED MODEL)**).
10. A/T model: Install the drive plate (see **DRIVE PLATE REMOVAL AND INSTALLATION**).
11. Install the transmission:
    - Manual transmission (see **TRANSMISSION INSTALLATION**)
    - Automatic transmission (see **TRANSMISSION INSTALLATION**)

DRAIN BOLT/SEALING BOLT INSTALLATION

NOTE: When installing the drain bolt and/or sealing bolt, always use a new washer.

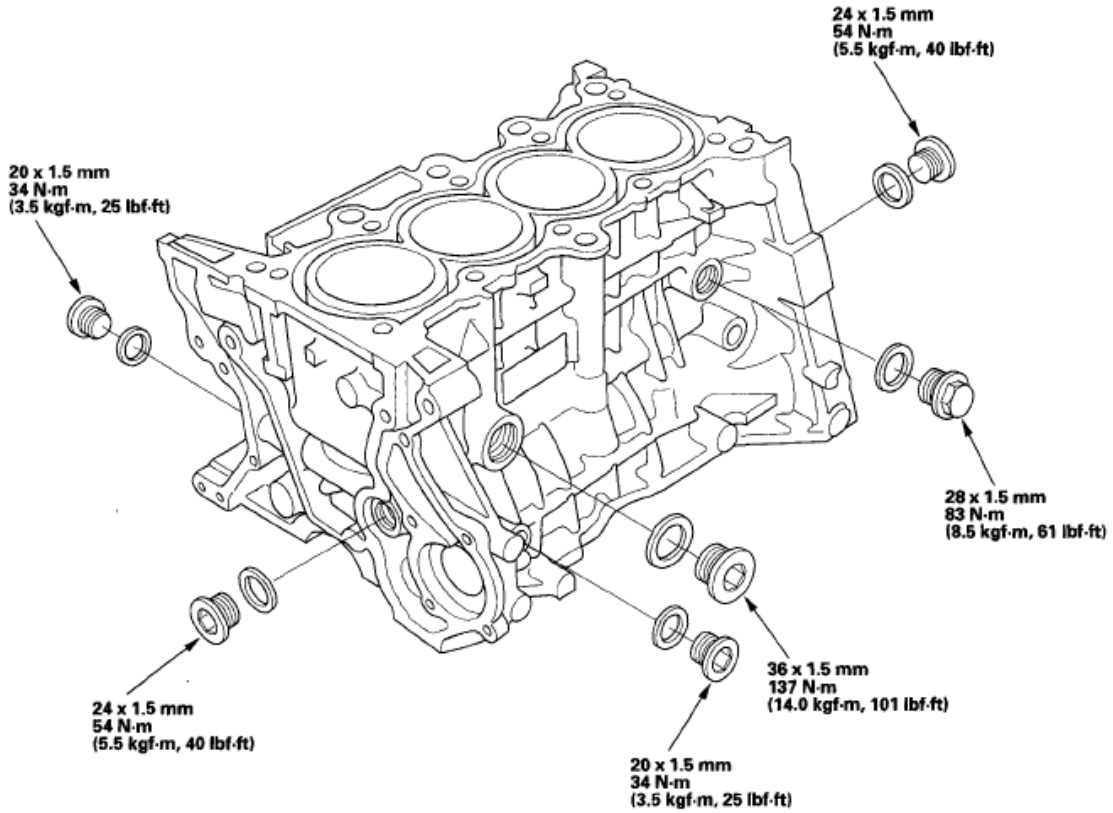


Fig. 78: Identifying Drain Bolt/Sealing Bolt (With Torque Specifications)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

