2009-11 ENGINE

Cylinder Head - Pilot

SPECIAL TOOLS

Ref.No.	Tool Number	Description	Qty
①	070AJ-001A101	VTEC Air Adapter	1
②	07742-0010100	Valve Guide Driver, 5.5 mm	1
③	07757-PJ1010A	Valve Spring Compressor Attachment	1
④	07AAJ-PNAA101	Air Pressure Regulator	1
⑤	07AAJ-R70A200	VTEC Air Stop Tool B	1
⑥	07HAH-PJ7A100	Valve Guide Reamer, 5.5 mm	1
⑦	07JAA-001020A	Socket, 19 mm	1
⑧	07JAB-001020B	Handle	1
⑨	07MAB-PY3010A	Holder Attachment, 50 mm, Offset	1
⑩	07PAD-0010000	Stem Seal Driver	1
⑪	07GAF-SD40330	Ball Joint Remover/Installer	1

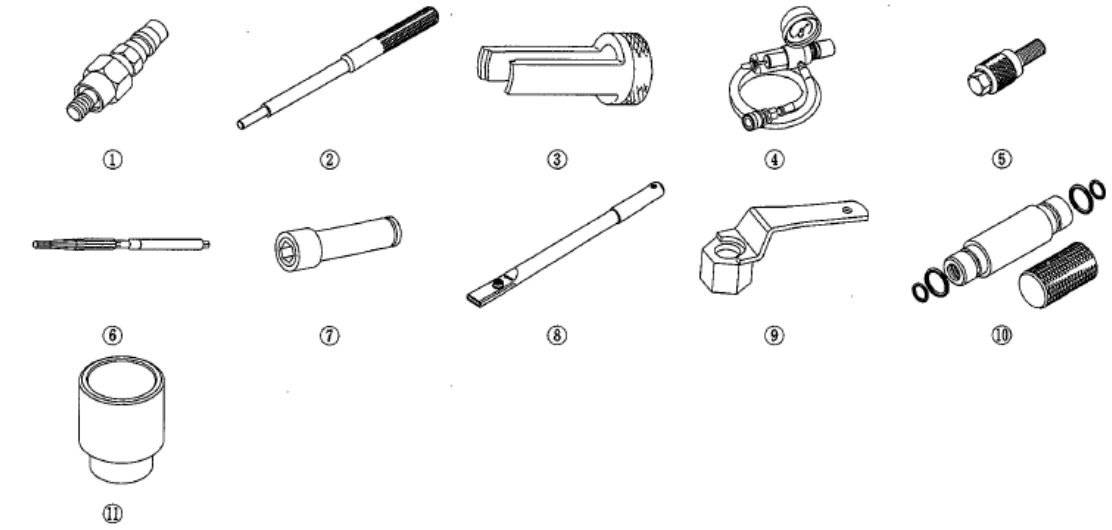


Fig. 1: Identifying Special Tools
Courtesy of AMERICAN HONDA MOTOR CO., INC.

COMPONENT LOCATION INDEX

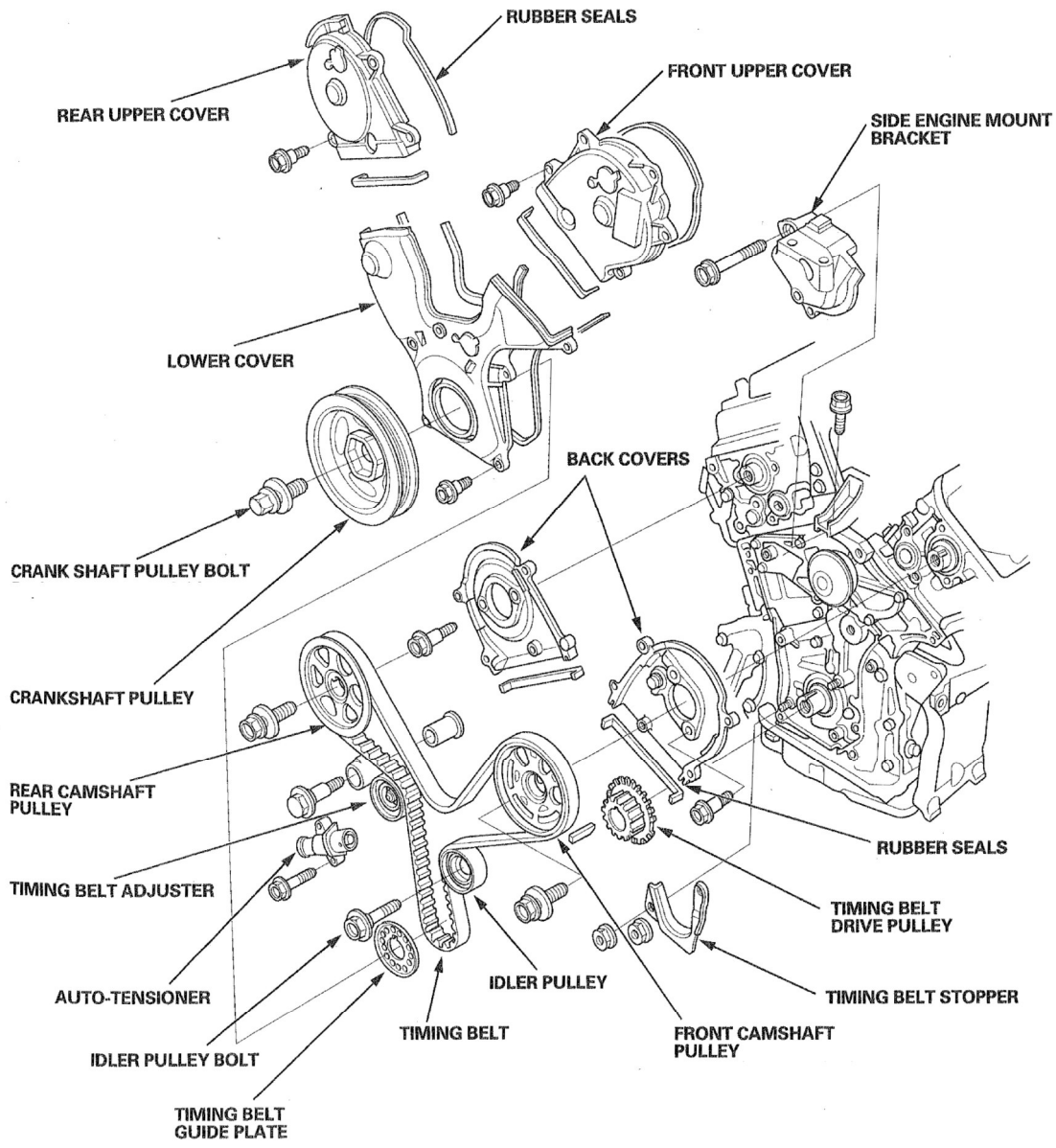


Fig. 2: Identifying Cylinder Head Replacement Components Location (1 Of 2)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

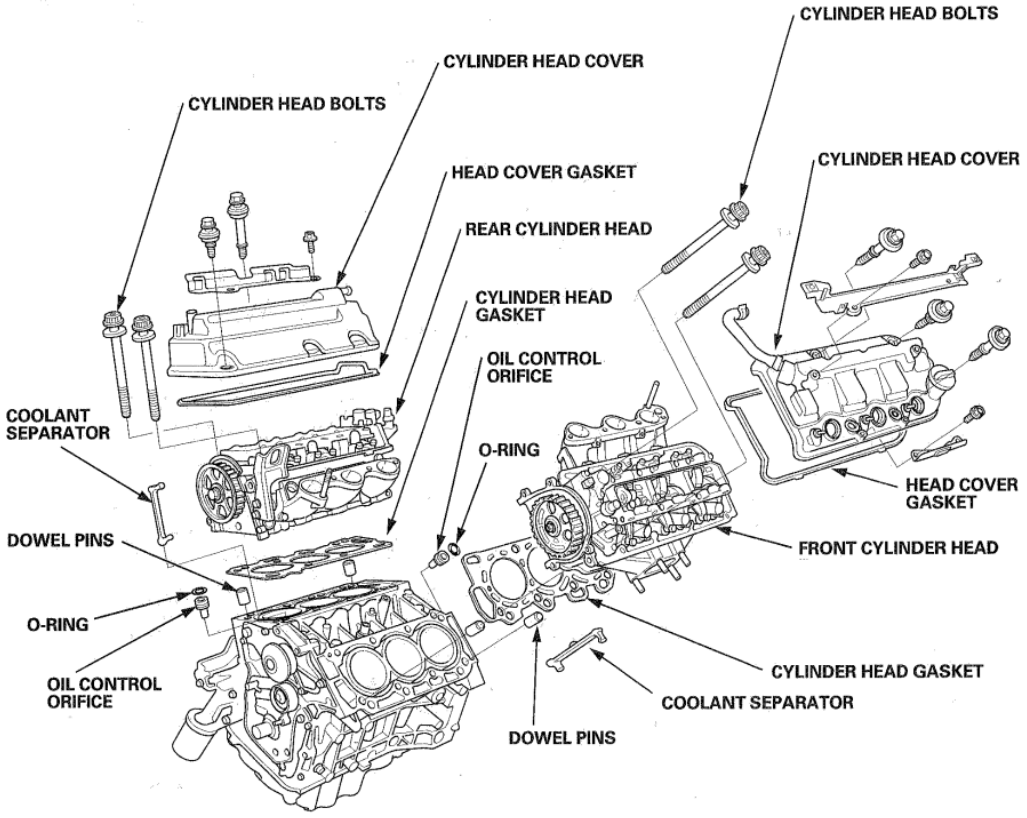


Fig. 3: Identifying Cylinder Head Replacement Components Location (2 Of 2)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

FRONT

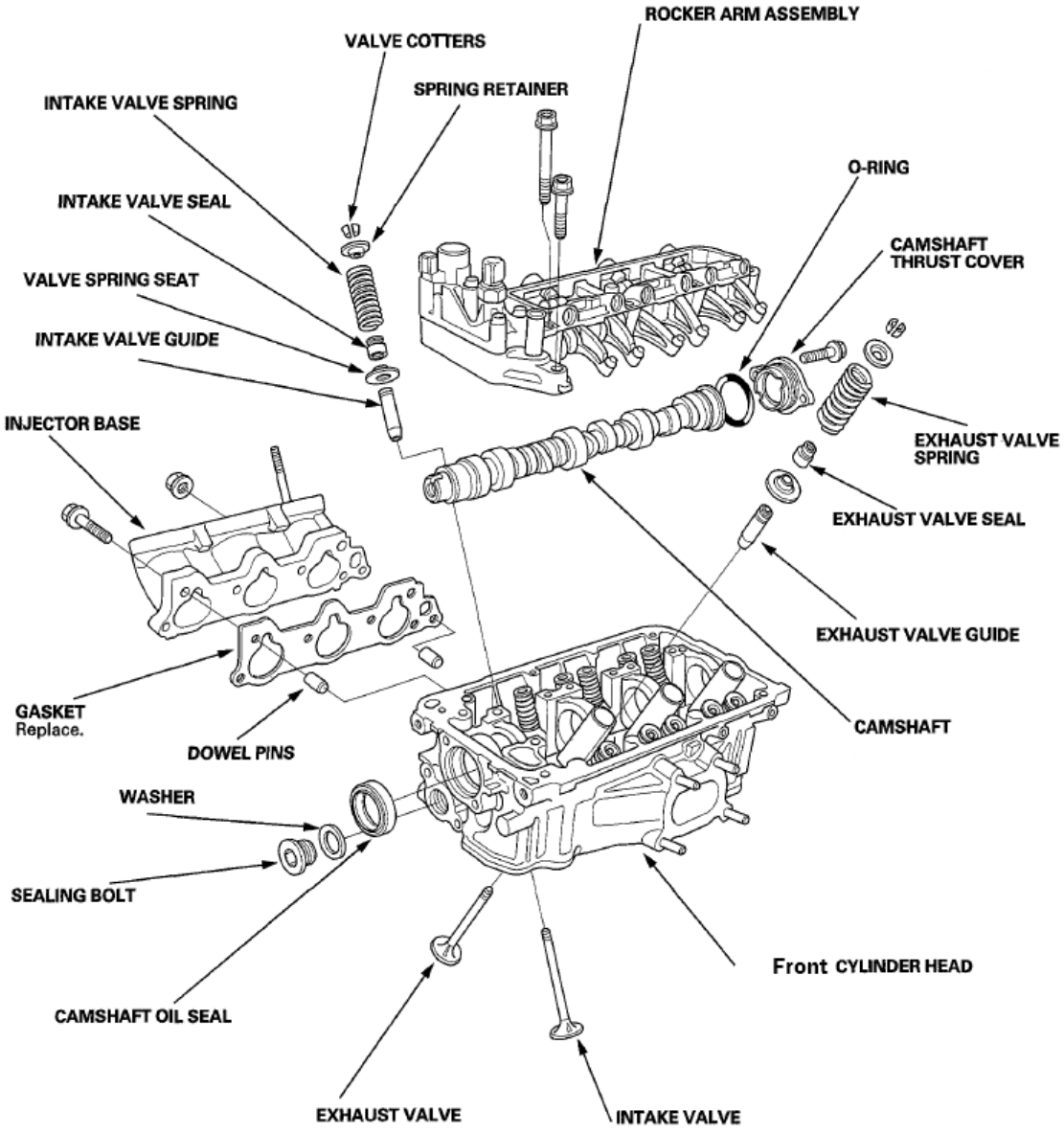


Fig. 4: Identifying Front Cylinder Head Replacement Components
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

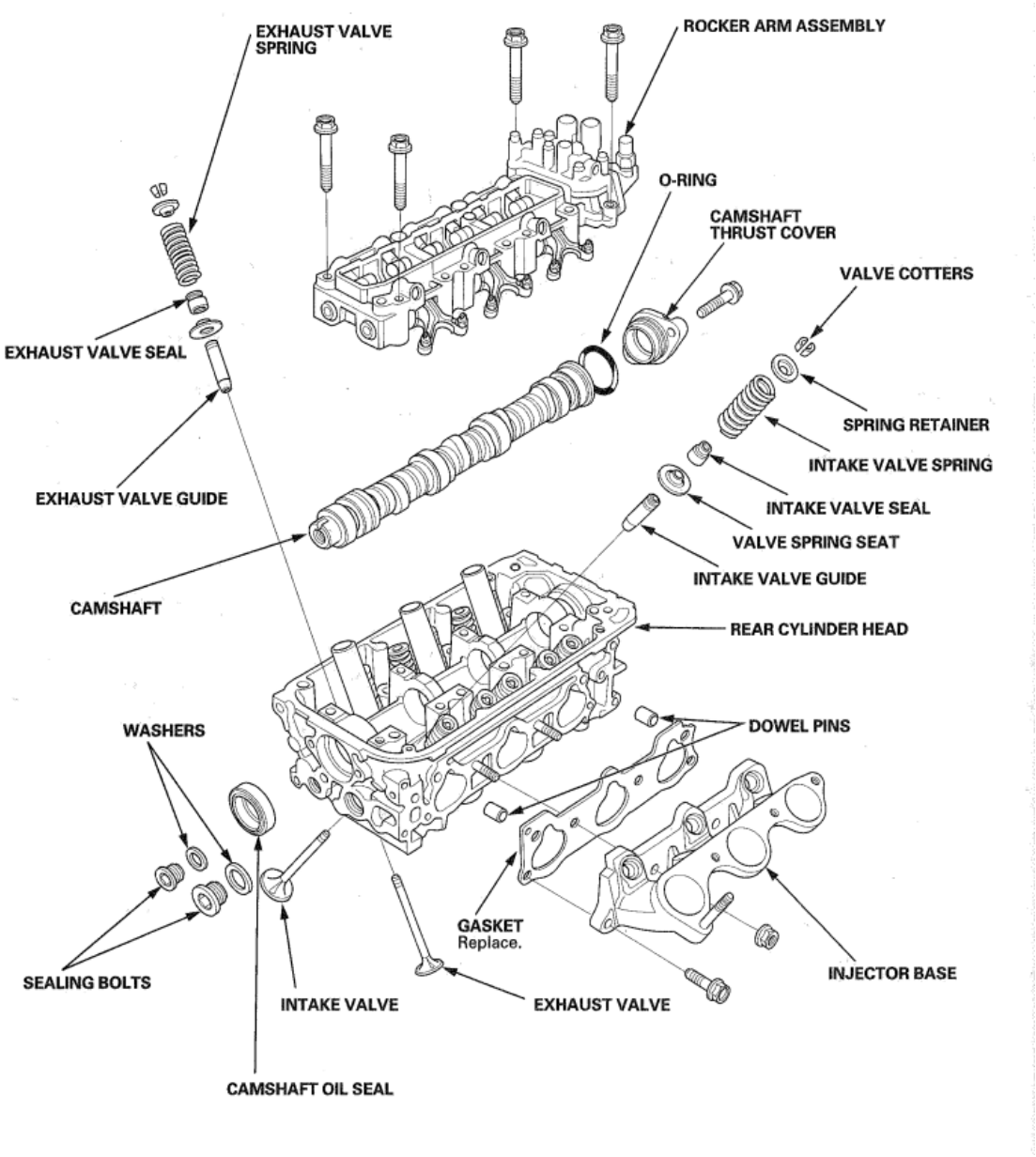


Fig. 5: Identifying Rear Cylinder Head Replacement Components
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ENGINE COMPRESSION INSPECTION

NOTE: After the inspection, you must reset the powertrain control module (PCM). Otherwise, the PCM will continue to stop the fuel injectors from functioning.

1. Warm up the engine to normal operating temperature (cooling fan comes on).
2. Turn the ignition switch to LOCK (0).
3. Connect the Honda Diagnostic System (HDS) to the data link connector (DLC) (see step 2 on **GENERAL TROUBLESHOOTING INFORMATION**).

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

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

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

    Compression Pressure:

    930 kPa (9.5 kgf/cm^2 , 135 psi)

11. Measure the compression on the remaining cylinders.

    Maximum Variation:

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

12. If the compression is not within specifications, check the following items, then remeasure the compression.
    - Incorrect valve clearance
    - Confirmation of cam timing
    - Damaged or worn cam lobes
    - Damaged or worn valves and seats

- Damaged cylinder head gaskets
- Damaged or worn piston rings
- Damaged or worn piston and cylinder bore

13. Remove the compression gauge from the spark plug hole.
14. Install the six ignition coils & six spark plugs.(see **IGNITION COIL REMOVAL/INSTALLATION**)
15. Select PCM reset (see **GENERAL TROUBLESHOOTING INFORMATION**) in the PGM-FI to cancel ALL INJECTORS STOP with the HDS.

VARIABLE CYLINDER MANAGEMENT ROCKER ARM TEST

SPECIAL TOOLS REQUIRED

- VTEC Air Adapter 070AJ-001A101
- VTEC Air Stop Tool B 07AAJ-R70A200
- Air Pressure Regulator 07AAJ-PNAA101

1. Start the engine and let it run for 5 minutes, then turn the ignition switch to LOCK (0).
2. Remove the six ignition coils and six spark plugs.
3. Remove the cylinder head covers, (see **CYLINDER HEAD COVER REMOVAL**)
4. Rotate the crankshaft pulley clockwise. Make sure that the intake primary rocker arm (A) and the intake secondary rocker arm (B) are mechanically connected by the pistons and that the intake primary rocker arm and the intake secondary rocker arm should move together.
   - If the intake secondary rocker arm moves independently, remove the intake primary rocker arm and the intake secondary rocker arm as an assembly, and check that the pistons in the rocker arms move smoothly. If any intake rocker arm needs replacing, replace the primary and the secondary rocker arms as an assembly, then retest.
   - If the intake primary rocker arm and the intake secondary rocker arm move together, go to step 5.

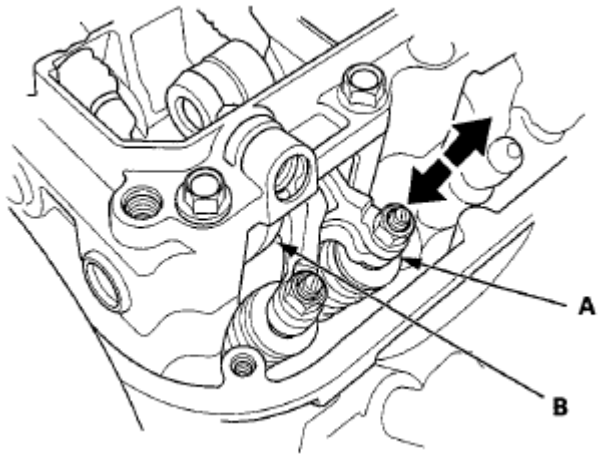


Fig. 7: Identifying Intake Primary & Secondary Rocker Arm Moving Position
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Rotate the crankshaft pulley clockwise. Make sure that the exhaust primary rocker arm (A) and the exhaust secondary rocker arm (B) are mechanically connected by the pistons and that the exhaust primary rocker arm and the exhaust secondary rocker arm should move together.
   - If the exhaust primary rocker arm moves independently, remove the exhaust primary rocker arm and the exhaust secondary rocker arm as an assembly, and check that the pistons in the rocker arms move smoothly. If any exhaust rocker arm needs replacing, replace the primary and the secondary rocker arms as an assembly, then retest.
   - If the exhaust primary rocker arm and the exhaust secondary rocker arm move together, go to step 6.

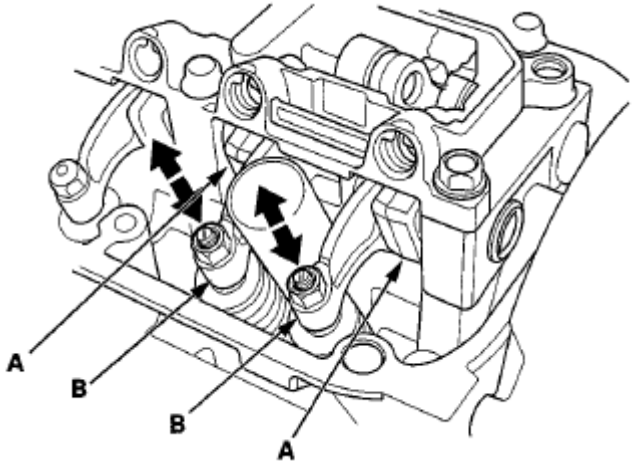


Fig. 8: Identifying Exhaust Primary & Secondary Rocker Arm Moving Position
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Check that the air pressure on the shop air compressor gauge indicates over 689 kPa (7.0 kgf/cm^2 , 100 psi).
7. Inspect the valve clearance (see **VALVE CLEARANCE ADJUSTMENT**).
8. Remove the sealing bolt, then install the VTEC air adapter (A) to the inspection hole and install the VTEC air stop tool B (B), then connect the air pressure regulator (C) as shown below.

FRONT

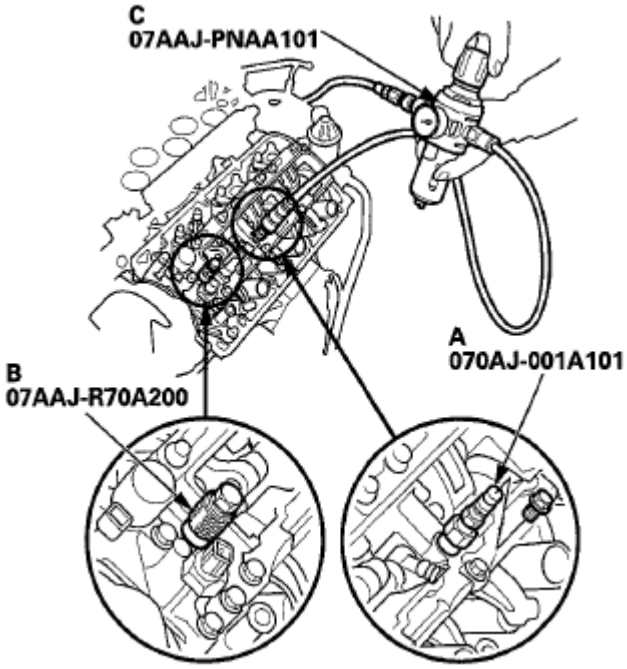


Fig. 9: Identifying Air Pressure Regulator - Front
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

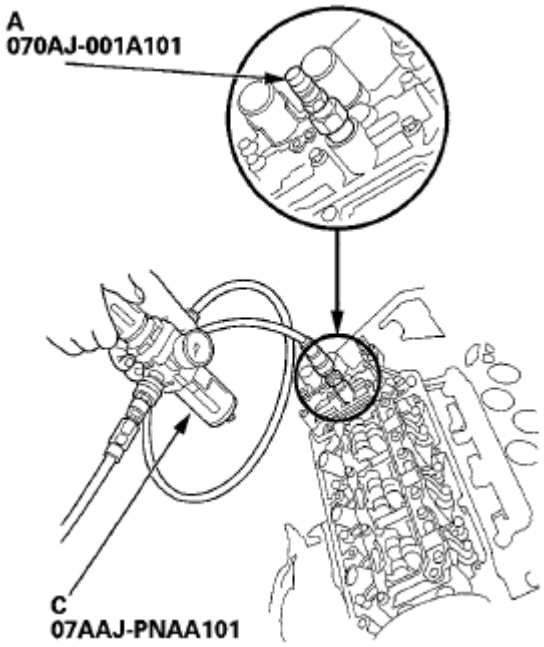


Fig. 10: Identifying Air Pressure Regulator - Rear
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Specified Air Pressure:

551-689 kPa (5.6-7.0 kgf/cm^2 , 80-100 psi)

10. With the specified air pressure applied, rotate the crankshaft pulley clockwise. The intake secondary rocker arm (A) should move independently of the intake primary rocker arm (B).
    - If the intake secondary rocker arm does not move independently, remove the intake primary rocker arm and the intake secondary rocker arm as an assembly, and check that the pistons in the rocker arms move smoothly. If any intake rocker arm needs replacing, replace the primary and the secondary rocker arms as an assembly, then retest.
    - If the intake secondary rocker arm moves independently, go to step 11.

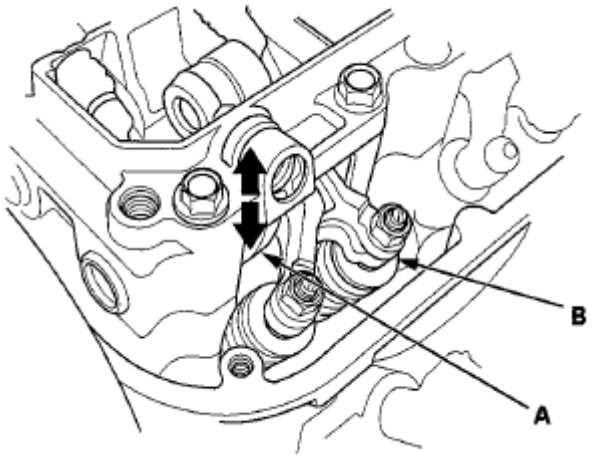


Fig. 11: Identifying Intake Secondary Rocker Arm Move Independently
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. With the specified air pressure applied, rotate the crankshaft pulley clockwise. The exhaust primary rocker arm (A) should move independently of the exhaust secondary rocker arm (B).
    - If the exhaust primary rocker arm does not move independently, remove the exhaust primary rocker arm and the exhaust secondary rocker arm as an assembly, and check that the pistons in the rocker arms move smoothly. If any exhaust rocker arm needs replacing, replace the primary and the secondary rocker arms as an assembly, then retest.
    - If the exhaust primary rocker arm moves independently, go to step 12.

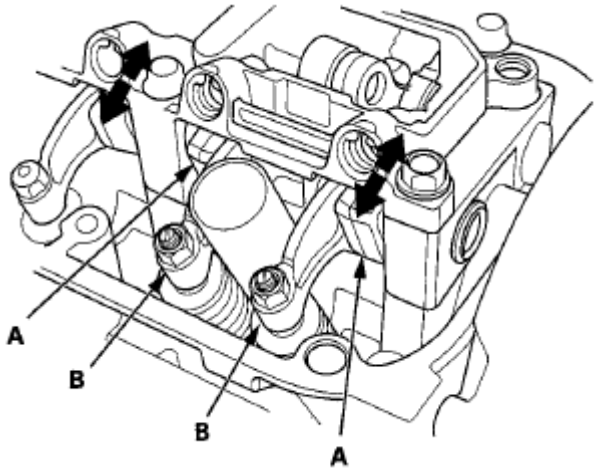


Fig. 12: Identifying Exhaust Primary & Secondary Rocker Arm Moving Position
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Remove the air pressure regulator, the VCM air adapter, and the VTEC ari stop tool B.
13. Tighten the sealing bolt to 22 N.m (2.2 kgf.mm, 16 lbf.ft)
14. Install the cylinder head covers (see **CYLINDER HEAD COVER INSTALLATION**).
15. Install the six ignition coils and 6 spark plugs.

VALVE CLEARANCE ADJUSTMENT

NOTE: Connect the Honda Diagnostic System (HDS) to the data link connector (DLC) (see step 2 on HOW TO USE THE HDS (HONDA DIAGNOSTIC SYSTEM) , and monitor the engine coolant temperature (ECT) sensor 1 with the HDS. Adjust the valve clearance only when the engine coolant temperature is less than 100°F (38°C).

1. Remove the cylinder head covers (see **CYLINDER HEAD COVER REMOVAL**).
2. Set the No. 1 piston at top dead center (TDC). Align the pointer (A) on the front upper cover with the No. 1 piston TDC mark (B) on the front camshaft pulley.

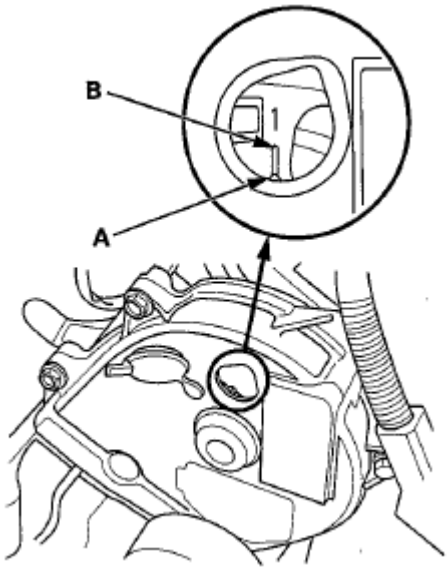


Fig. 13: Aligning Pointer On Front Upper Cover With No. 1 Piston TDC Mark On Front Camshaft Pulley
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Valve Clearance

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

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

REAR

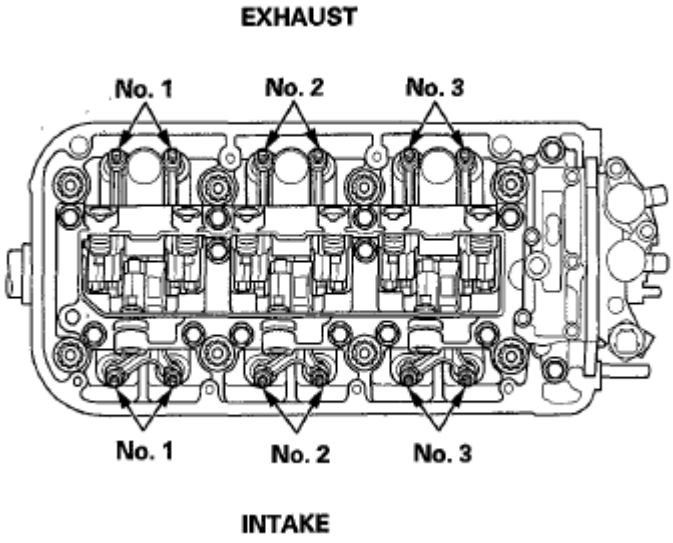


Fig. 14: Identifying Rear Exhaust Valve Clearance

Courtesy of AMERICAN HONDA MOTOR CO., INC.

FRONT

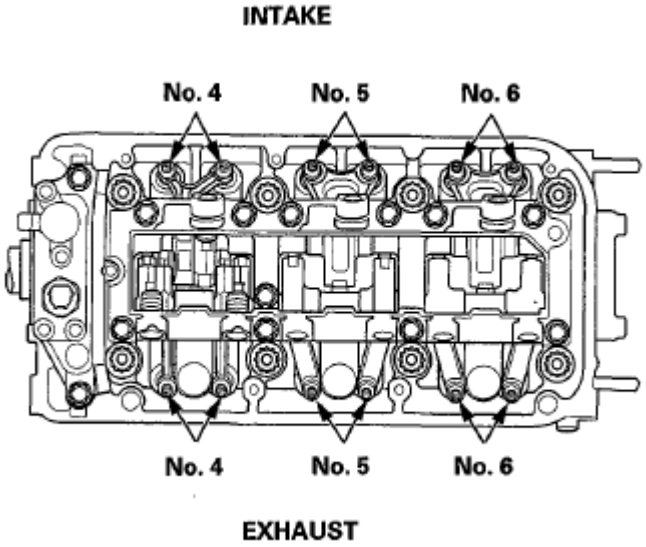


Fig. 15: Identifying Front Exhaust Valve Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

INTAKE

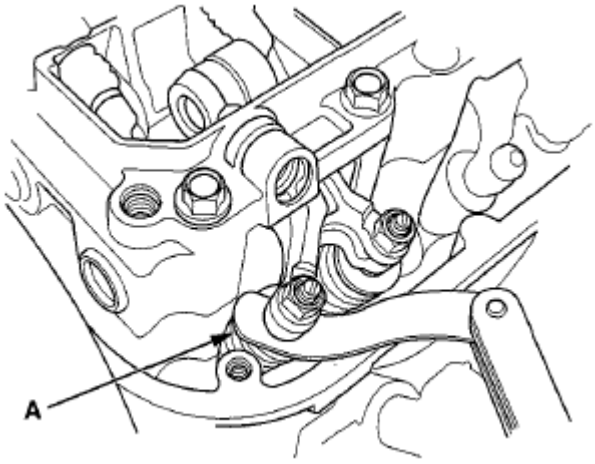


Fig. 16: Checking Intake Valve Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

EXHAUST

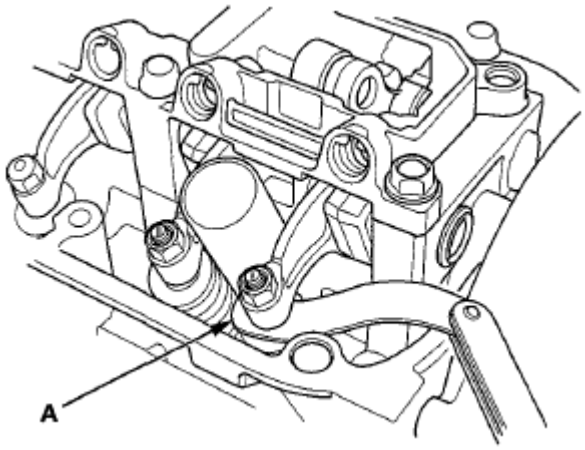


Fig. 17: Checking Exhaust Valve Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

INTAKE

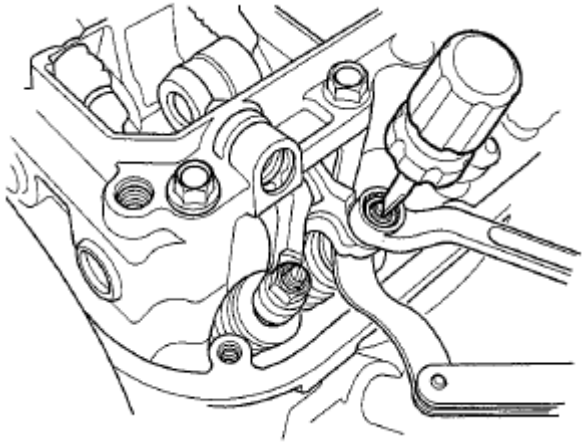


Fig. 18: Adjusting Intake Valve Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

EXHAUST

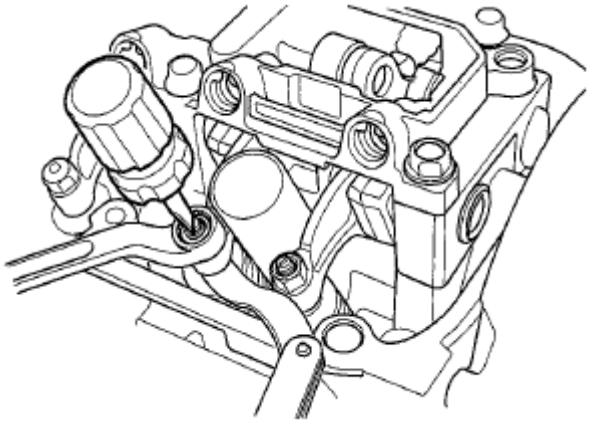


Fig. 19: Adjusting Exhaust Valve Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Specified Torque

   No. 1, No. 2, No. 3, and No. 4 cylinders:

   20 N.m (2.0 kgf.m, 14 lbf.ft)

   Apply new engine oil to the nut threads.

   No. 5 and No. 6 cylinders:

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

   Apply new engine oil to the nut threads.

7. Rotate the crankshaft clockwise. Align the pointer (A) on the front upper cover with the No. 4 piston TDC mark (B) on the front camshaft pulley.

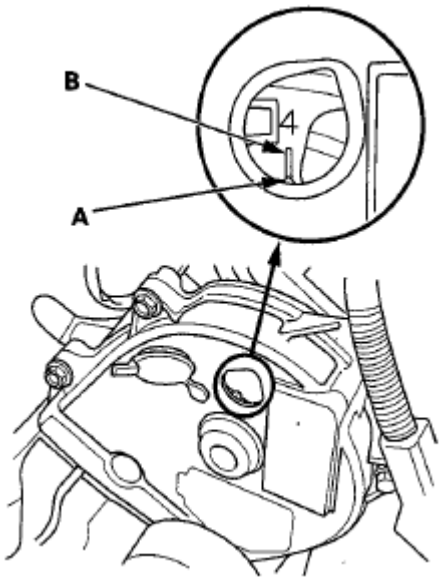


Fig. 20: Aligning Pointer On Front Upper Cover With No. 4 Piston TDC Mark On Front Camshaft Pulley
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

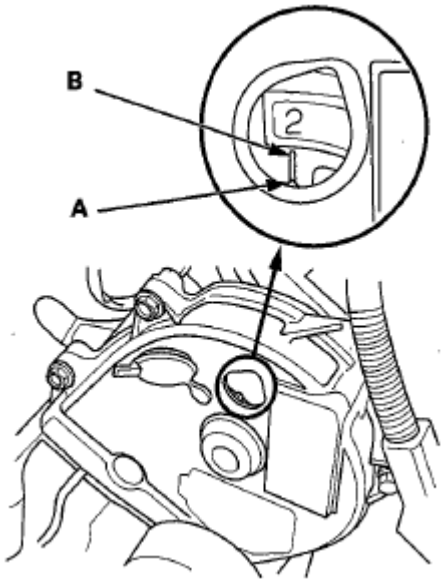


Fig. 21: Aligning Pointer On Front Upper Cover With No. 2 Piston TDC Mark On Front Camshaft Pulley
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Check and, if necessary, adjust the valve clearance on the No. 2 cylinder.

11. Rotate the crankshaft clockwise. Align the pointer (A) on the front upper cover with the No. 5 piston TDC mark (B) on the front camshaft pulley.

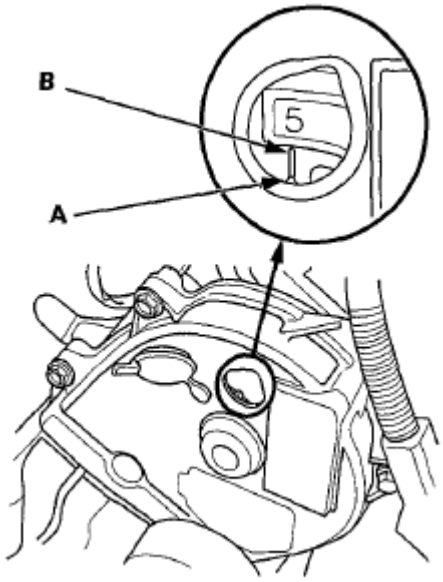


Fig. 22: Aligning Pointer On Front Upper Cover With No. 5 Piston TDC Mark On Front Camshaft Pulley
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

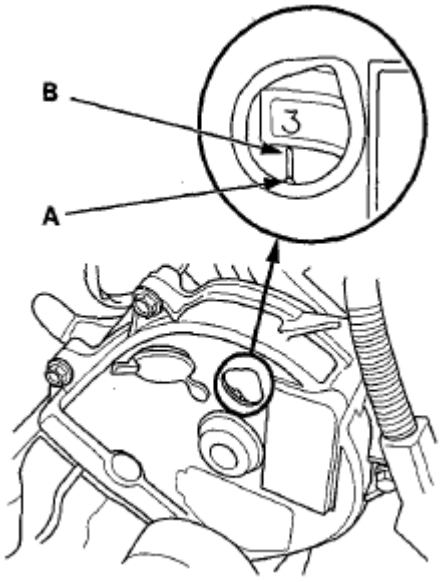


Fig. 23: Aligning Pointer On Front Upper Cover With No. 3 Piston TDC Mark On Front Camshaft Pulley

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

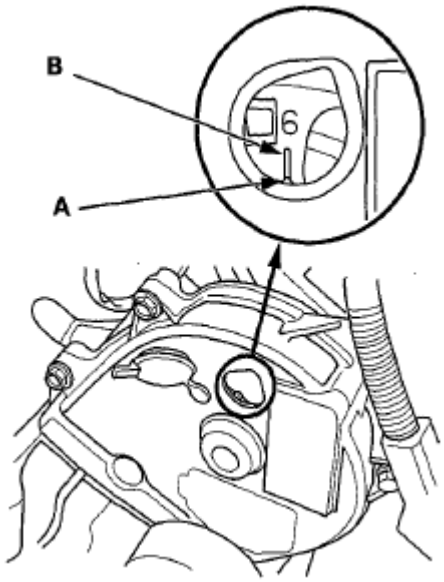


Fig. 24: Aligning Pointer On Front Upper Cover With No. 6 Piston TDC Mark On Front Camshaft Pulley
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

CRANKSHAFT PULLEY REMOVAL AND INSTALLATION

SPECIAL TOOLS REQUIRED

- Handle 07JAB-001020B
- Holder Attachment, 50 mm. Offset 07MAB-PY3010A
- Socket, 19 mm 07JAA-001020A or equivalent

REMOVAL

1. Raise the vehicle on the lift.
2. Remove the right front wheel.
3. Remove the splash shield (see **SPLASH SHIELD REPLACEMENT**).
4. Remove the drive belt (see **DRIVE BELT REPLACEMENT**).
5. Hold the pulley with the holder (A) and the holder attachment, 50 mm, offset (B).

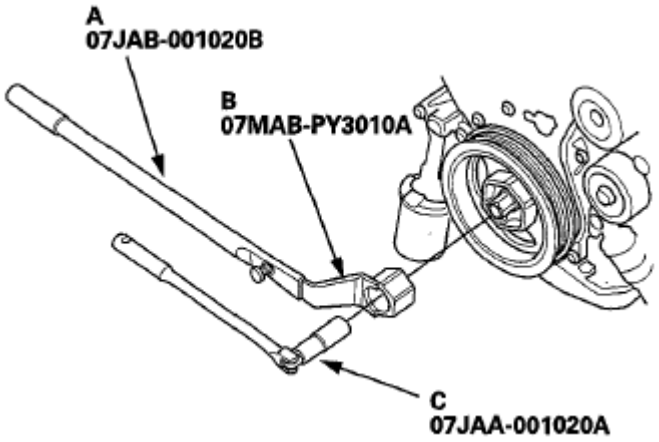


Fig. 25: View Of Crankshaft Pulley
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

INSTALLATION

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

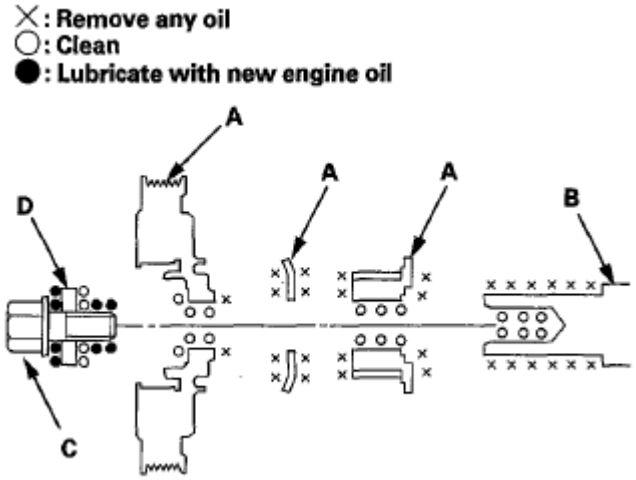


Fig. 26: Identifying Bolt Lubrication Applying Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

2. Install the crankshaft pulley, and tighten the bolt. Do not use an impact wrench.
    1. Hold the pulley with the handle (A) and the holder attachment, 50 mm, offset (B). Tighten the bolt to 64 N.m (6.5 kgf.m, 47 lbf.ft) with a torque wrench and a socket, 19 mm (C).
    2. Mark the bolt head (D) and the crankshaft pulley (E) as shown, then tighten the bolt an additional 60° (The mark on the bolt head lines up with the mark on the crankshaft pulley).

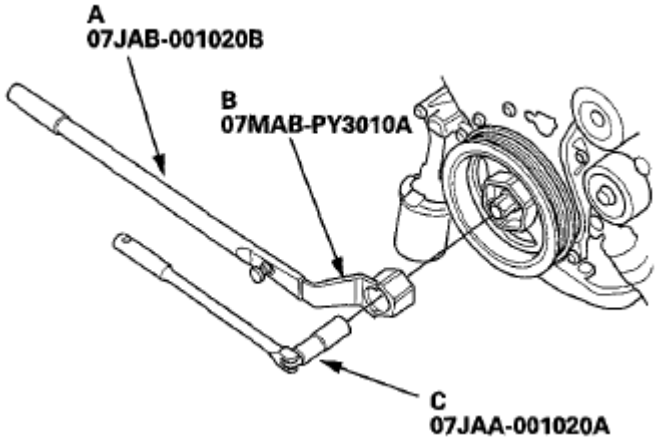


Fig. 27: Identifying Crankshaft Pulley
Courtesy of AMERICAN HONDA MOTOR CO., INC.

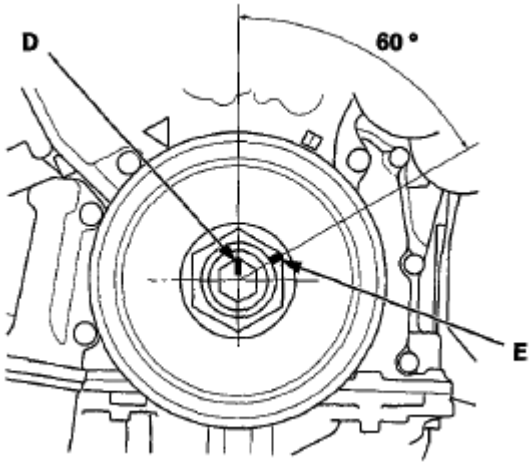


Fig. 28: Tightening Crankshaft Pulley Bolt 60° Angle
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the drive belt (see **DRIVE BELT REPLACEMENT**).
4. Install the splash shield (see **SPLASH SHIELD REPLACEMENT**).
5. Install the right front wheel.

TIMING BELT INSPECTION

1. Remove the drive belt auto-tensioner (see **DRIVE BELT AUTO-TENSIONER REPLACEMENT**).
2. Remove the front upper cover.

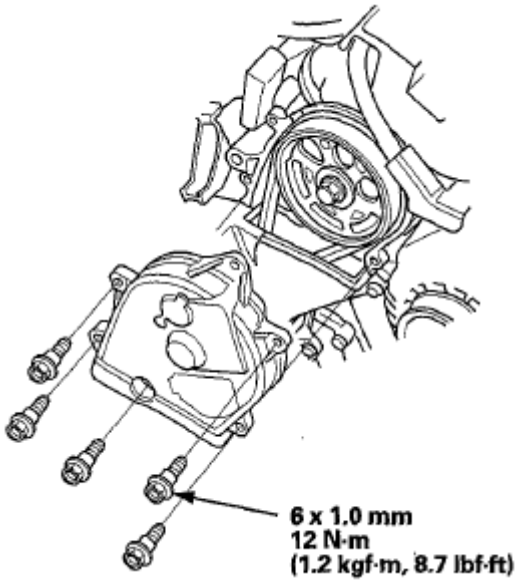


Fig. 29: Identifying Front Upper Cover & Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Inspect the timing belt for cracks and oil or coolant contamination. Replace the belt if it is cracked, or is contaminated with oil or coolant. Wipe off any oil or solvent that gets on the belt pulleys.

NOTE: If there is any leakage, repair them before replacing the belt.

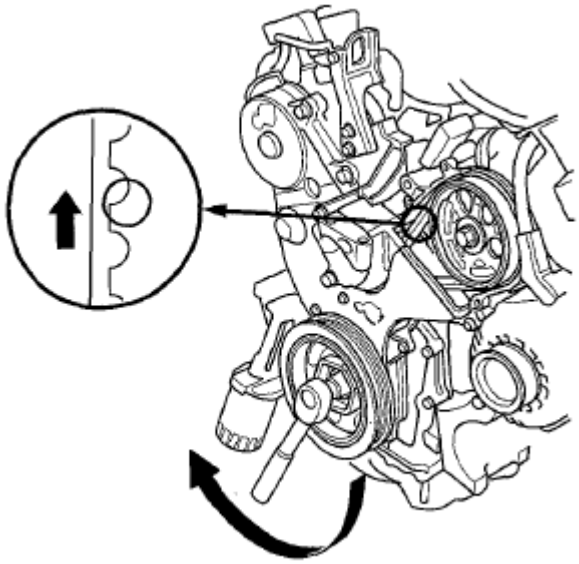


Fig. 30: Turning Crankshaft Pulley
Courtesy of AMERICAN HONDA MOTOR CO., INC.

TIMING BELT REMOVAL

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

NOTE: The other pointer (C) is not used.

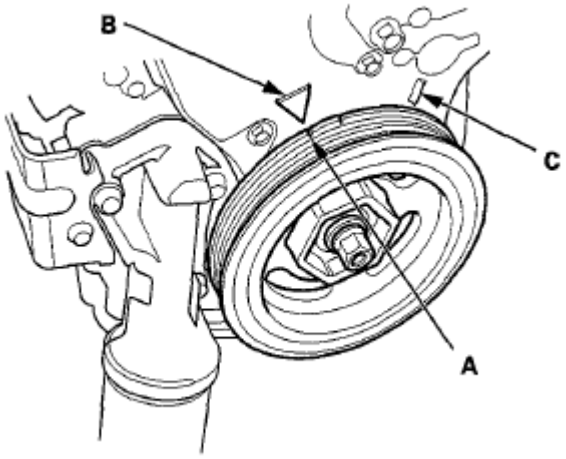


Fig. 31: Identifying Crankshaft Pulley Mark Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

NOTE: If the marks are not aligned, rotate the crankshaft 360 degrees, and recheck the camshaft pulley mark.

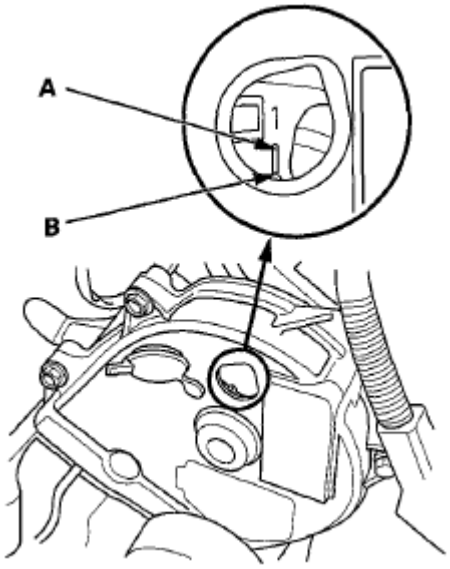


Fig. 32: Aligning No. 1 Piston Top Dead Center (TDC) Mark On Front Camshaft Pulley And Pointer On Front Upper Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Raise the vehicle on the lift, then remove the right front wheel.
4. Remove the splash shield (see **SPLASH SHIELD REPLACEMENT**).
5. Remove the drive belt auto-tensioner (see **DRIVE BELT AUTO-TENSIONER REPLACEMENT**).
6. Lift and support the engine with a jack and a wood block under the oil pan.
7. Remove the ground cable (A), then remove the upper half of the side engine mount bracket (B).

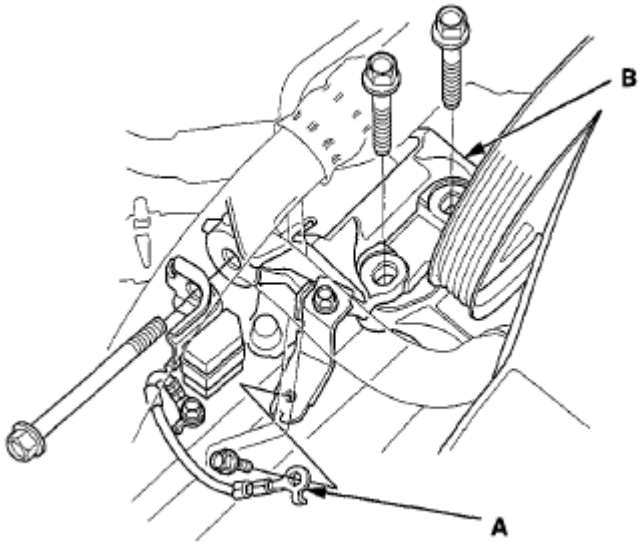


Fig. 33: Identifying Side Engine Mount Bracket & Ground Cable
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

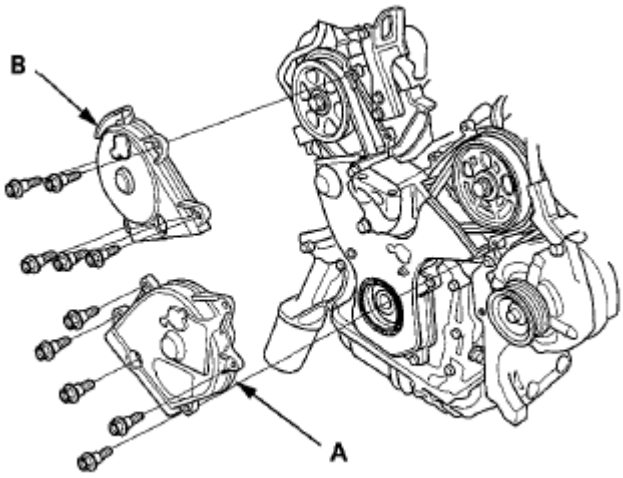


Fig. 34: Identifying Front Upper Cover & Rear Upper Cover With Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Remove the lower cover.

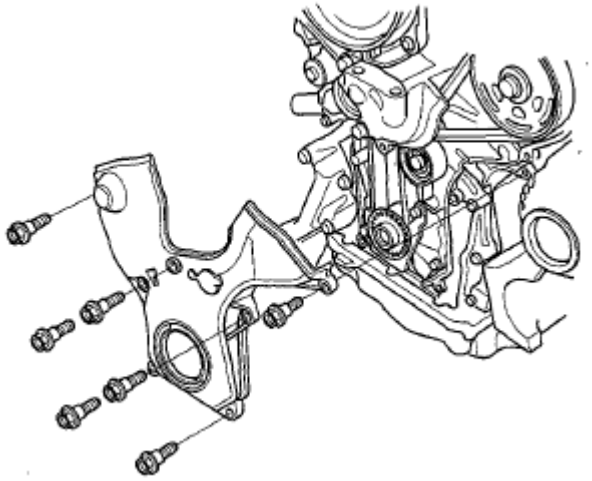


Fig. 35: Identifying Lower Cover With Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

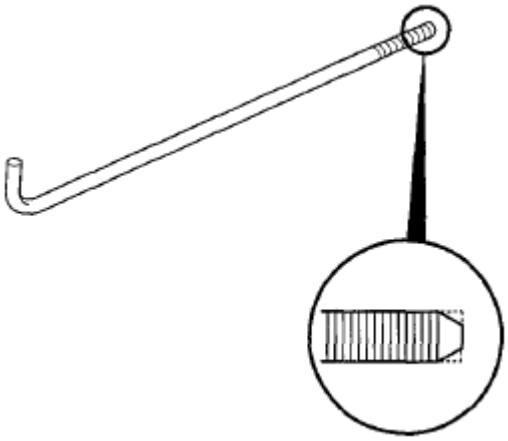


Fig. 36: Identifying Grind Position Of Battery Clamp Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

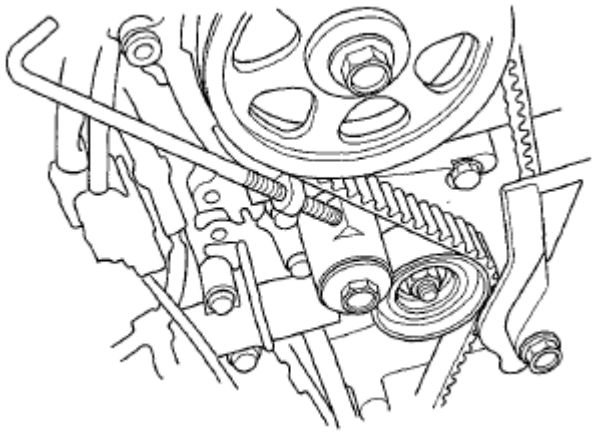


Fig. 37: Tightening Timing Belt Adjuster
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

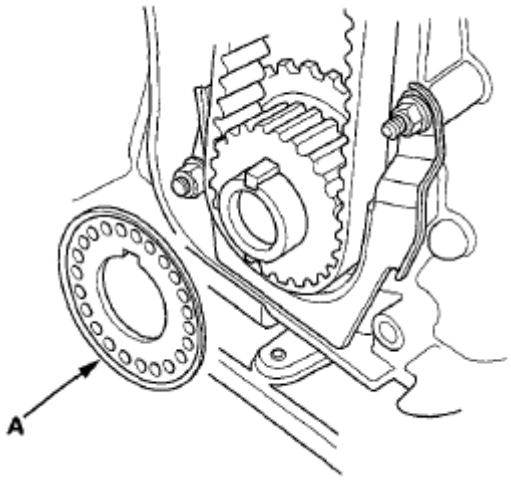


Fig. 38: Identifying Timing Belt Guide Plate
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Remove the lower half of the side engine mount bracket.

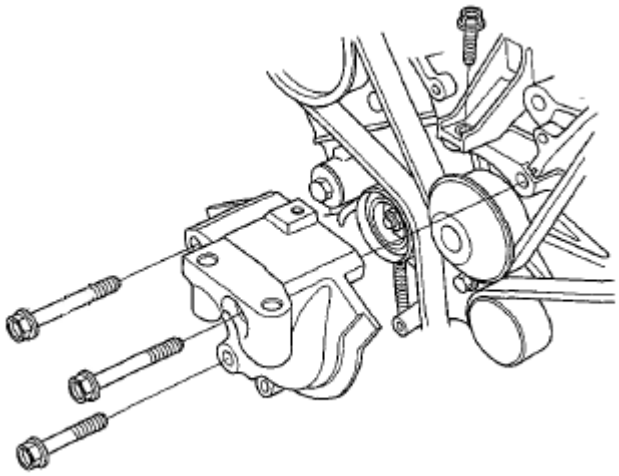


Fig. 39: Identifying Side Engine Mount Bracket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

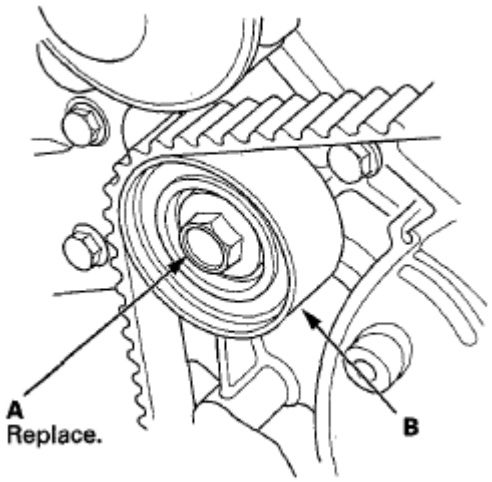


Fig. 40: Identifying Idler Pulley & Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

TIMING BELT INSTALLATION

NOTE: The following procedure is for installing a used timing belt. If you are installing a new belt, refer to the timing belt replacement procedure (see TIMING BELT REPLACEMENT).

1. Clean the timing belt pulleys, the timing belt guide plate, and the upper and lower covers.
2. Set the timing belt drive pulley to top dead center (TDC) by aligning the TDC mark (A) on the tooth of the timing belt drive pulley with the pointer (B) on the oil pump.

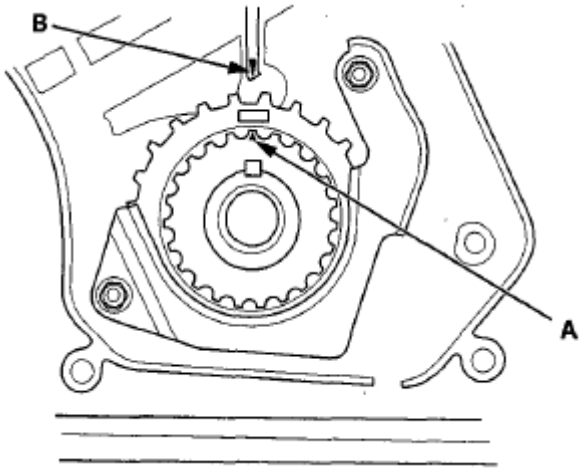


Fig. 41: Aligning TDC Mark On Tooth Of Timing Belt Drive Pulley With Pointer On Oil Pump
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

FRONT

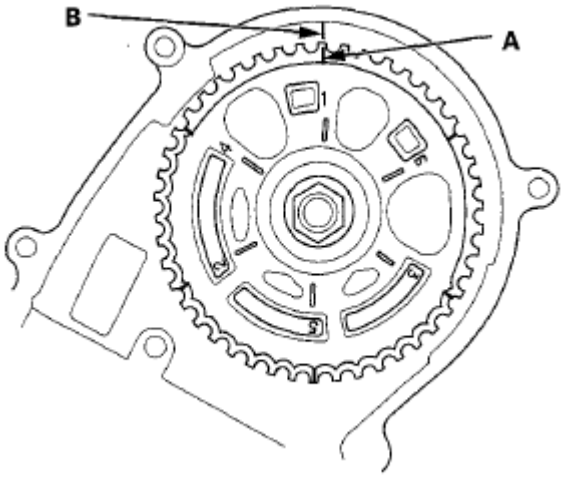


Fig. 42: Aligning TDC Marks On Front Camshaft Pulleys With Pointers On Back Covers
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

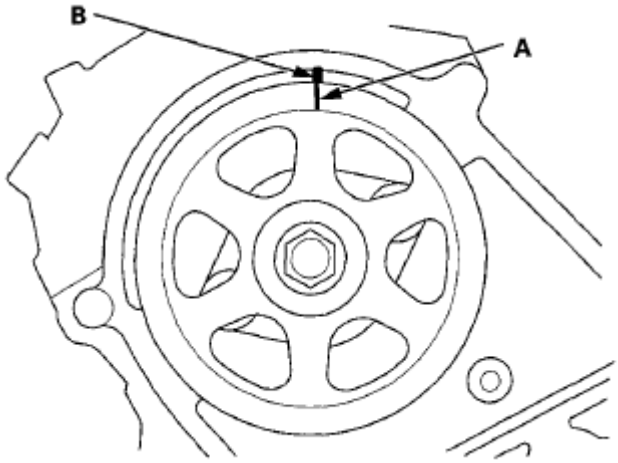


Fig. 43: Aligning TDC Marks On Rear Camshaft Pulleys With Pointers On Back Covers
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Loosely install the idler pulley using a new idler pulley bolt so the pulley can move but does not come off.
5. If the auto-tensioner has extended and the timing belt cannot be installed, do the timing belt replacement procedure (see **TIMING BELT REPLACEMENT**).
6. Install the timing belt in a counterclockwise sequence starting with the drive pulley. Take care not to damage the timing belt during installation.
    1. Drive pulley (A)
    2. Idler pulley (B)
    3. Front camshaft pulley (C)
    4. Water pump pulley (D)
    5. Rear camshaft pulley (E)
    6. Adjusting pulley (F)

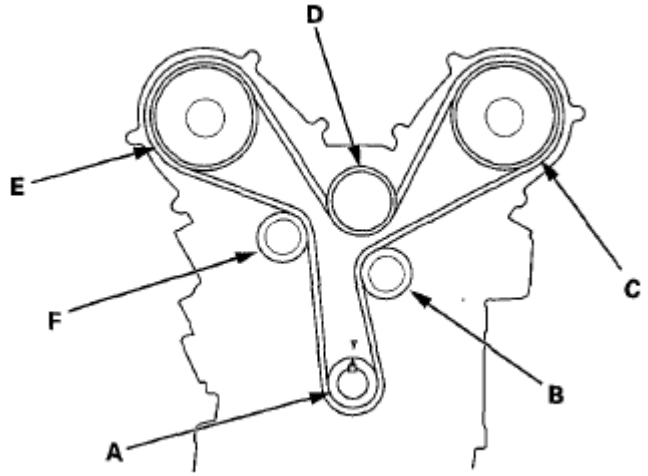


Fig. 44: Identifying Timing Belt Installation Position
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Tighten the idler pulley bolt.

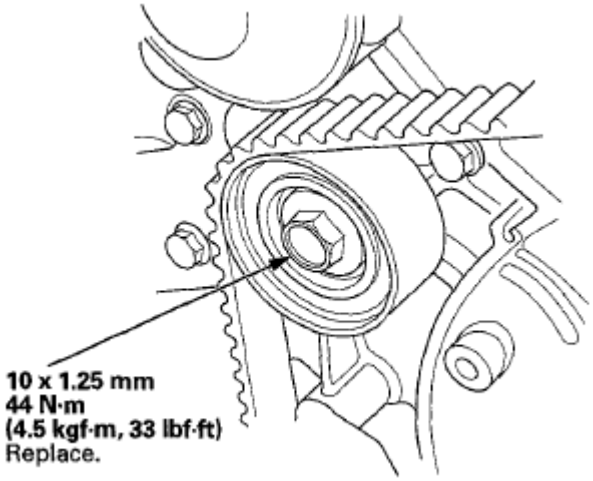


Fig. 45: Identifying Idler Pulley Bolt With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

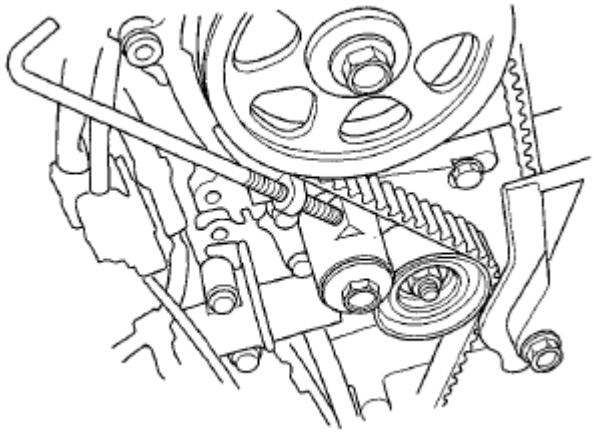


Fig. 46: Identifying Battery Clamp Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

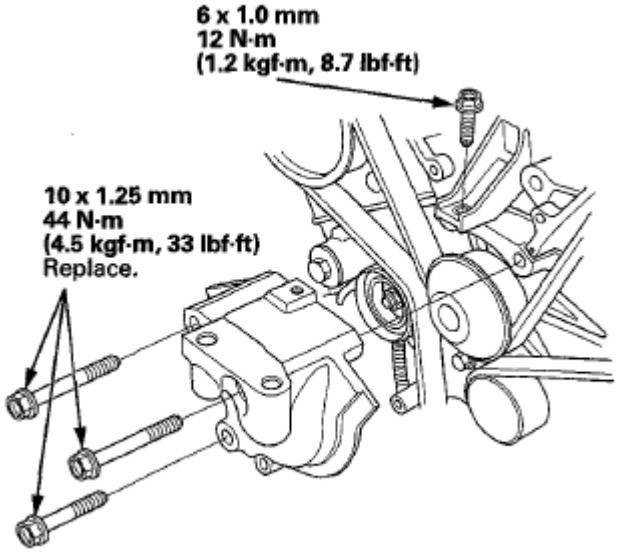


Fig. 47: Identifying Lower Half Of Side Engine Mount Bracket With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Install the timing belt guide plate as shown below.

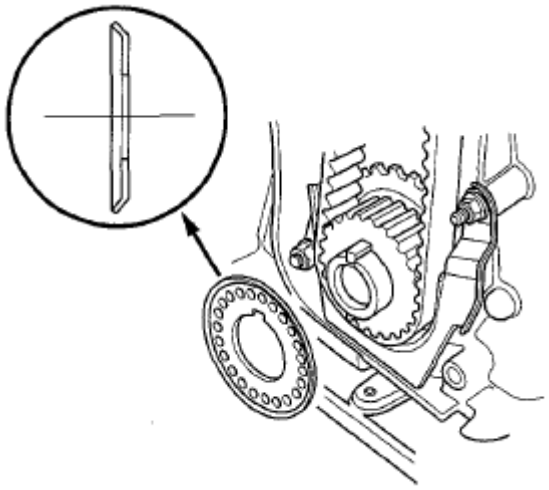


Fig. 48: Identifying Timing Belt Guide Plate
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Install the lower cover.

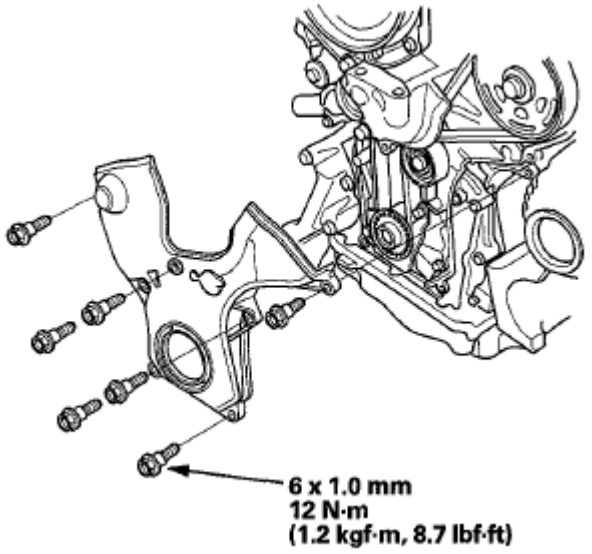


Fig. 49: Identifying Lower Cover Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

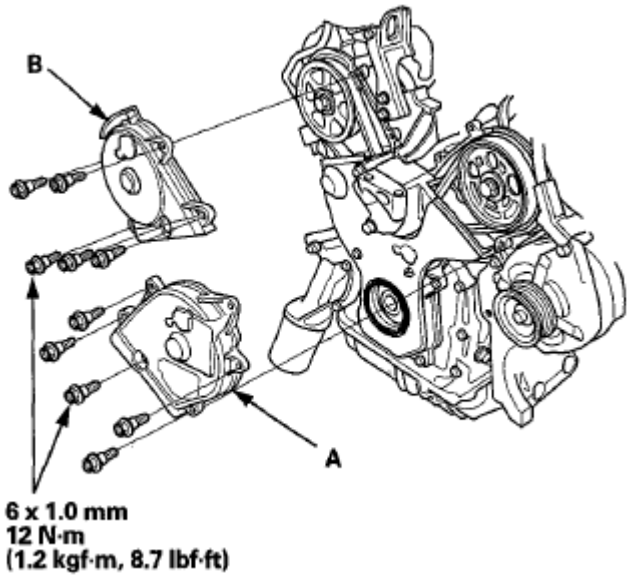


Fig. 50: Identifying Front And Rear Upper Cover With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

NOTE: The other pointer (C) is not used.

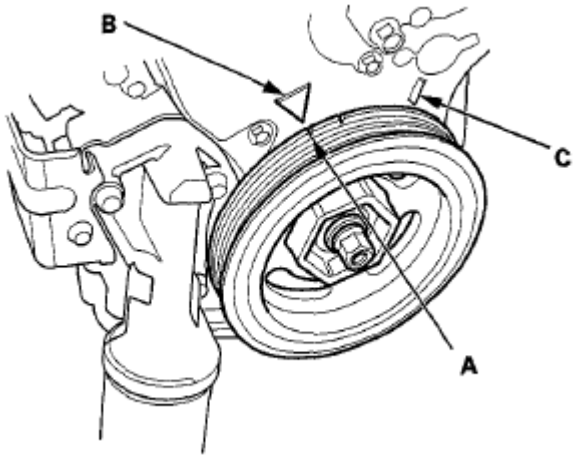


Fig. 51: Identifying Crankshaft Pulley Mark Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

16. Check the camshaft pulley marks.

NOTE: If the marks are not aligned, rotate the crankshaft 360 degrees, and recheck the camshaft pulley mark.

- If the camshaft pulley marks are at TDC, go to step 17.
- If the camshaft pulley marks are not at TDC, remove the timing belt (see **TIMING BELT REMOVAL**) and repeat steps 2 through 16.

FRONT

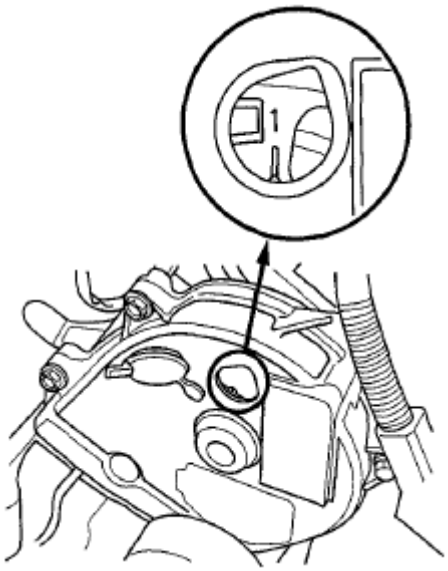


Fig. 52: Identifying Front Camshaft Pulley Marks Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

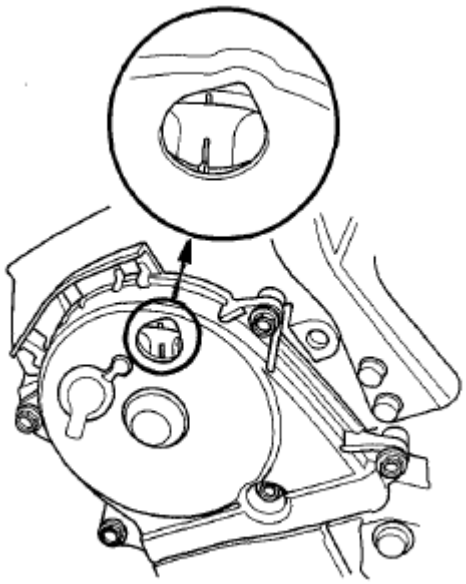


Fig. 53: Identifying Rear Camshaft Pulley Marks Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Install the upper half of the side engine mount bracket (A), and tighten the new mounting bolts (B), then tighten the mass damper mounting bolt (C).

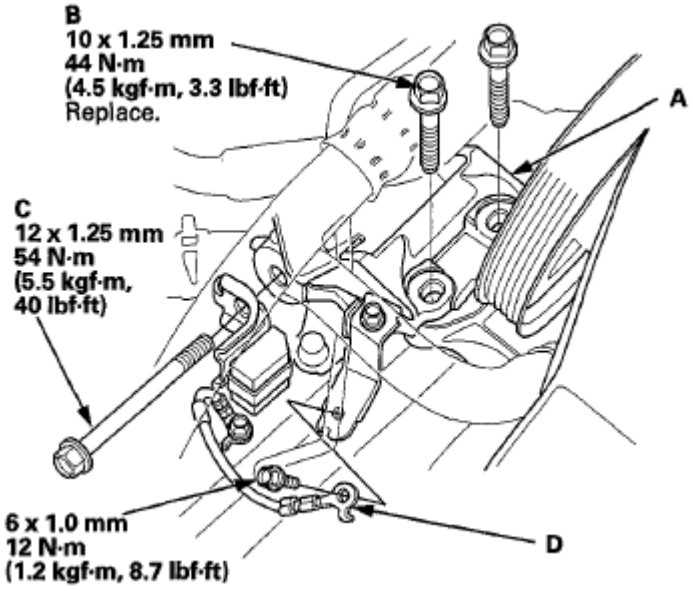


Fig. 54: Identifying Side Engine Mount Bracket & Mass Damper Mounting Bolt With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Install the ground cable (D).

19. Install the drive belt auto-tensioner (see **DRIVE BELT AUTO-TENSIONER REPLACEMENT**).
20. Install the splash shield (see **SPLASH SHIELD REPLACEMENT**).
21. Install the right front wheel.
22. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **CKP PATTERN CLEAR/CKP PATTERN LEARN**).

TIMING BELT REPLACEMENT

NOTE: The following procedure is for the installation of a new timing belt. If you are installing a used belt, refer to the timing belt installation procedure (see TIMING BELT INSTALLATION).

1. Remove the timing belt.
2. Clean the timing belt pulleys, timing belt guide plate, and the upper and lower covers.
3. Set the timing belt drive pulley to top dead center (TDC) by aligning the TDC mark (A) on the tooth of the timing belt drive pulley with the pointer (B) on the oil pump.

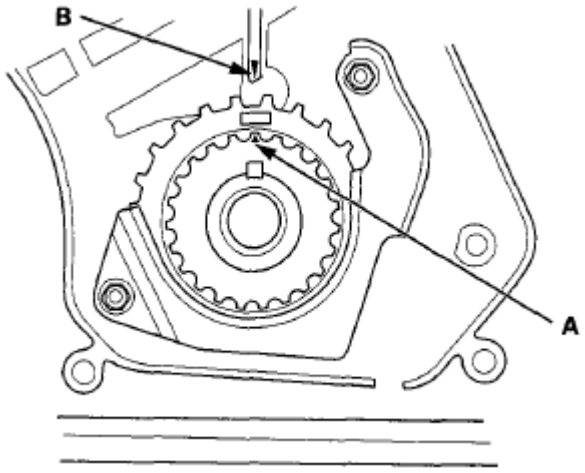


Fig. 55: Aligning TDC Mark On Tooth Of Timing Belt Drive Pulley With Pointer On Oil Pump
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

FRONT

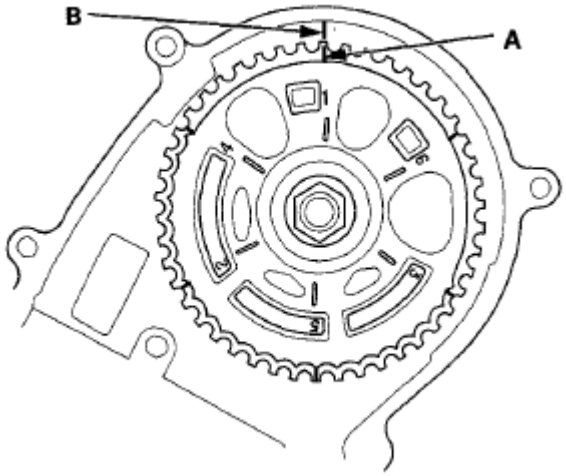


Fig. 56: Aligning TDC Marks On Front Camshaft Pulleys With Pointers On Back Covers
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

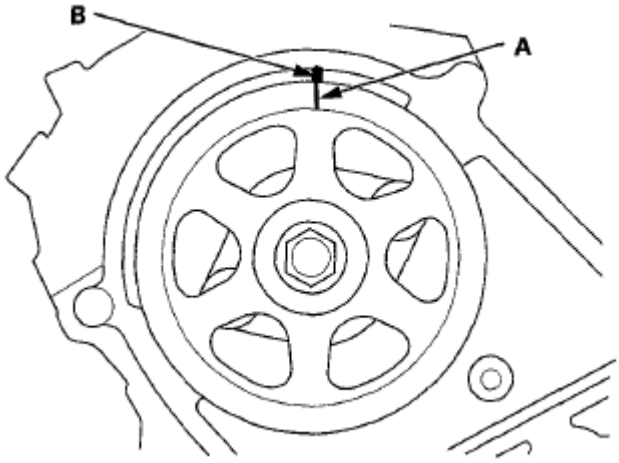


Fig. 57: Aligning TDC Marks On Rear Camshaft Pulleys With Pointers On Back Covers
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

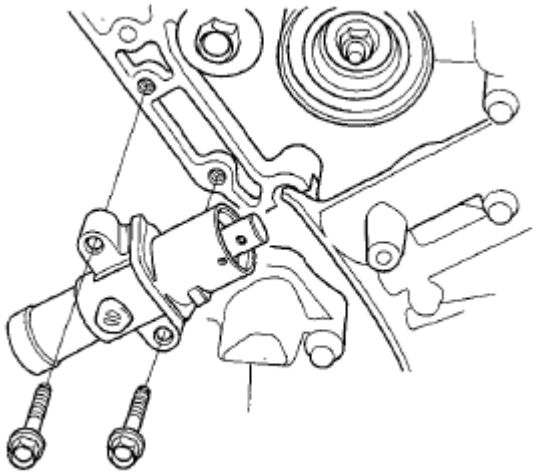


Fig. 58: Identifying Auto-Tensioner Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

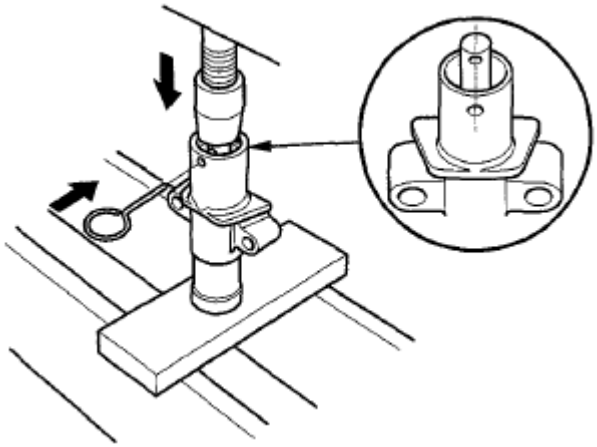


Fig. 59: Aligning Holes On Rod & Housing Of Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

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

9. Install the auto-tensioner.

NOTE: Make sure the pin stays in place.

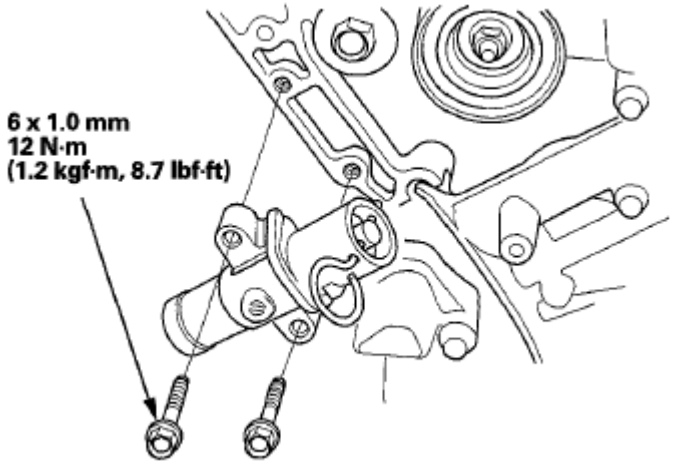


Fig. 60: Identifying Auto-Tensioner Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

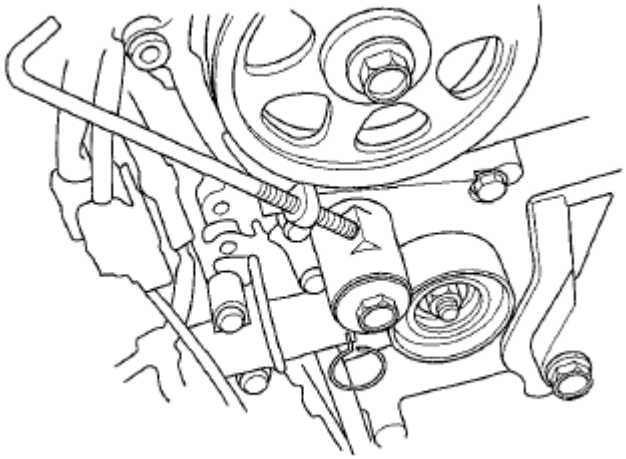


Fig. 61: Identifying Battery Clamp Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Loosely install the idler pulley with a new idler pulley bolt so the pulley can move but does not come off.
12. Install the timing belt in a counterclockwise sequence starting with the drive pulley.
    1. Drive pulley (A)
    2. Idler pulley (B)
    3. Front camshaft pulley (C)
    4. Water pump pulley (D)
    5. Rear camshaft pulley (E)
    6. Adjusting pulley (F)

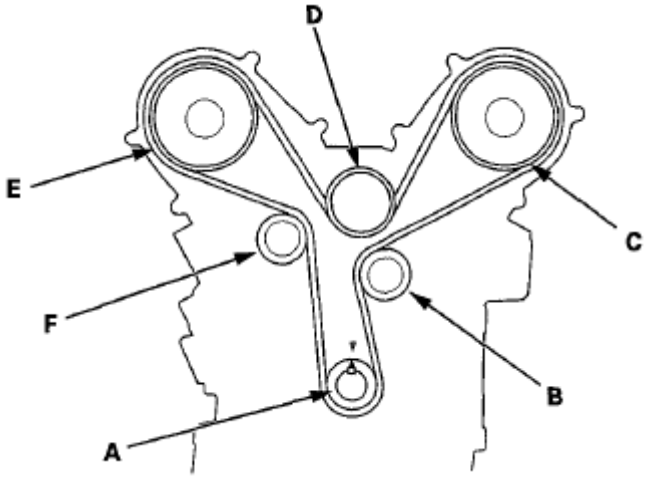


Fig. 62: Identifying Timing Belt Installation Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Tighten the idler pulley bolt.

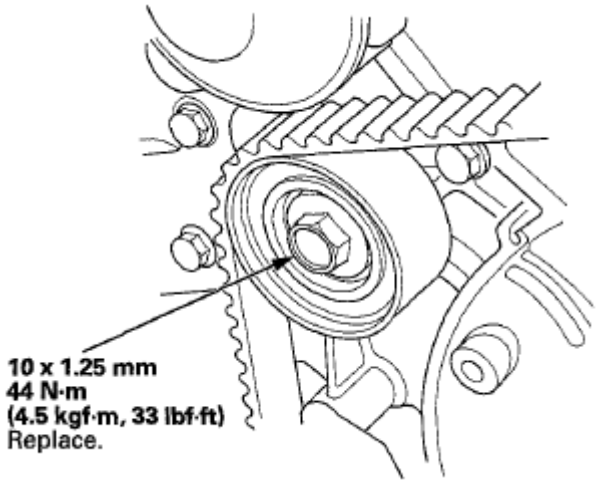


Fig. 63: Identifying Idler Pulley Bolt With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Remove the pin from the auto-tensioner.

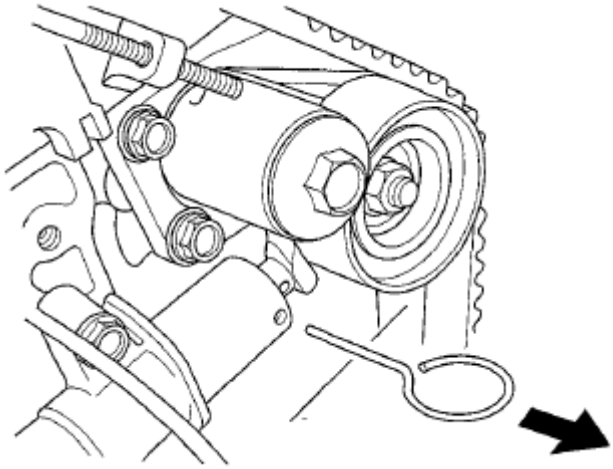


Fig. 64: Identifying Auto-Tensioner Pin
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

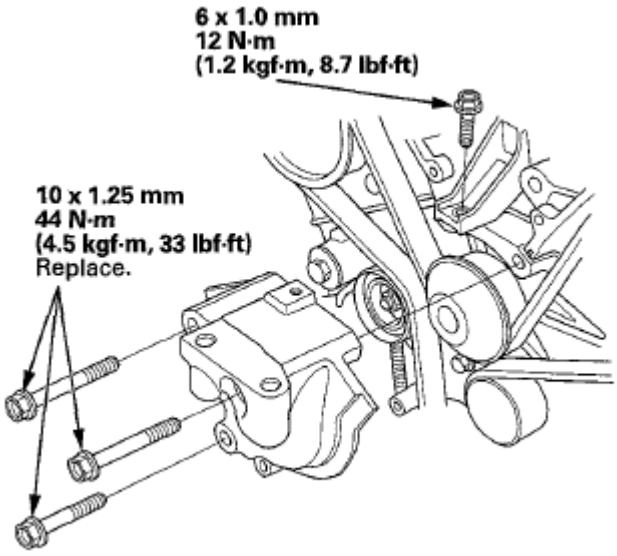


Fig. 65: Identifying Side Engine Mount Bracket With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. Install the timing belt guide plate as shown below.

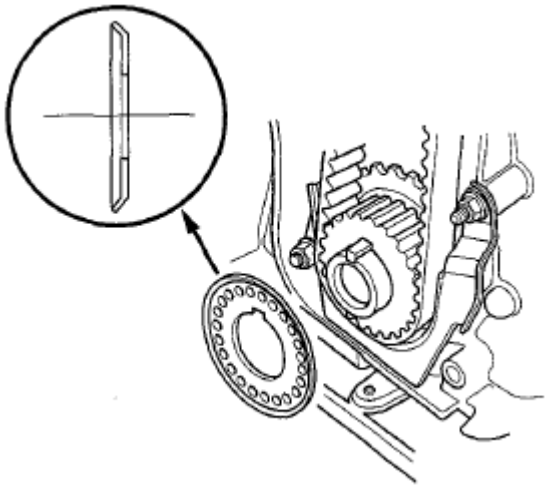


Fig. 66: Identifying Timing Belt Guide Plate
Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Install the lower cover.

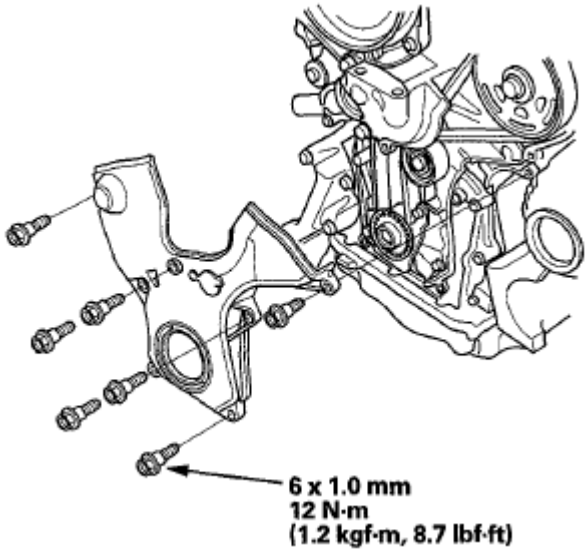


Fig. 67: Identifying Lower Cover & Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

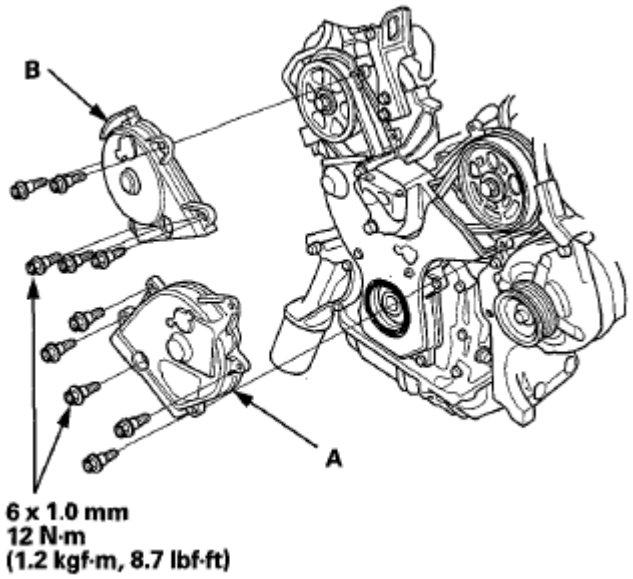


Fig. 68: Identifying Front & Rear Upper Cover Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

NOTE: The other pointer (C) is not used.

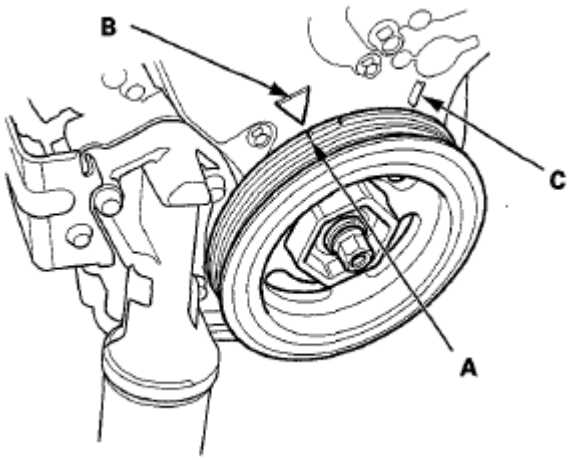


Fig. 69: Identifying Crankshaft Pulley Mark Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

23. Check the camshaft pulley marks.

NOTE: If the marks are not aligned, rotate the crankshaft 360 degrees, and recheck the camshaft pulley mark.

- If the camshaft pulley marks are at TDC, go to step 24.
- If the camshaft pulley marks are not at TDC, remove the timing belt (see **TIMING BELT REMOVAL**) and repeat steps 3 through 22.

FRONT

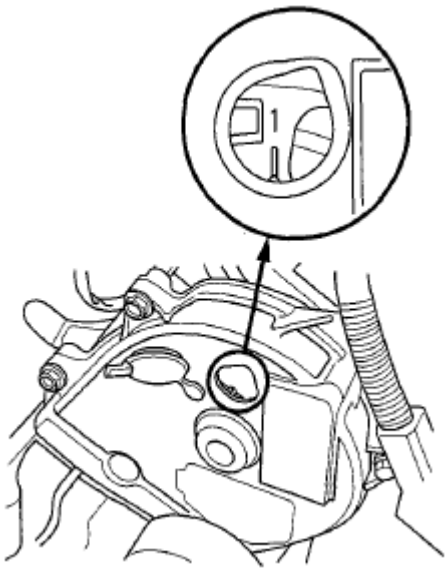


Fig. 70: Identifying Front Camshaft Pulley Marks Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

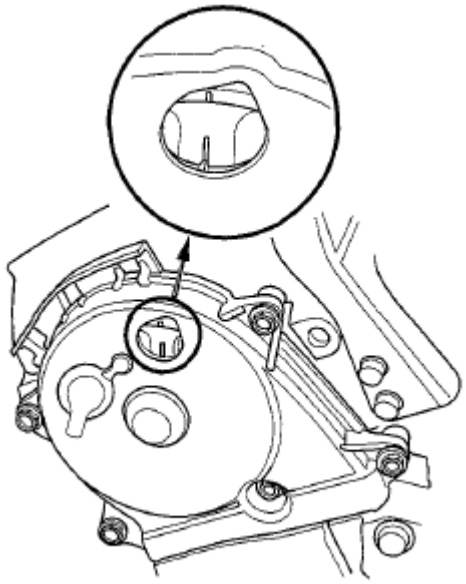


Fig. 71: Identifying Rear Camshaft Pulley Marks Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

24. Install the upper half of the side engine mount bracket (A), and tighten the new mounting bolts (B), then tighten the mass damper mounting bolt (C).

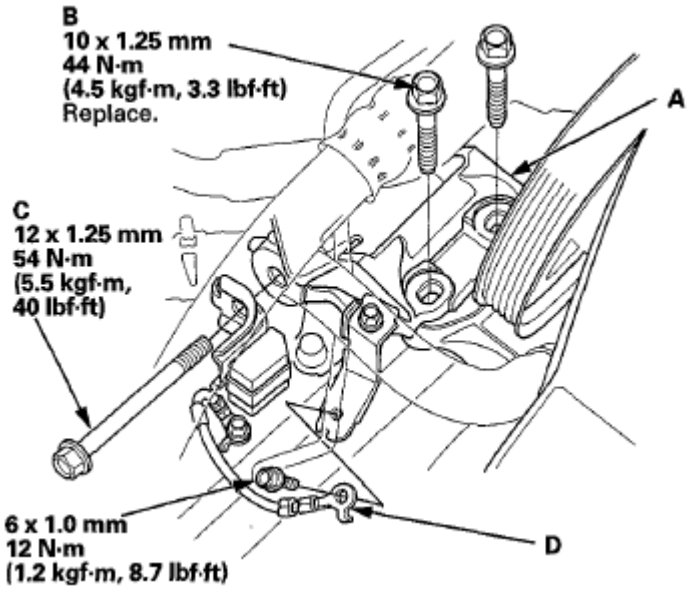


Fig. 72: Identifying Side Engine Mount Bracket & Mass Damper Mounting Bolt With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

25. Install the ground cable (D).
26. Install the drive belt auto-tensioner (see **DRIVE BELT AUTO-TENSIONER REPLACEMENT**).
27. Install the splash shield (see **SPLASH SHIELD REPLACEMENT**).
28. Install the right front wheel.
29. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **CKP PATTERN CLEAR/CKP PATTERN LEARN**).

TIMING BELT ADJUSTER REPLACEMENT

1. Remove the timing belt (see **TIMING BELT REMOVAL**).
2. Remove the battery clamp bolt from the back cover.
3. Remove the auto-tensioner (see step 6).
4. Remove the bolt (A), then remove the timing belt adjuster (B) and the collar (C).

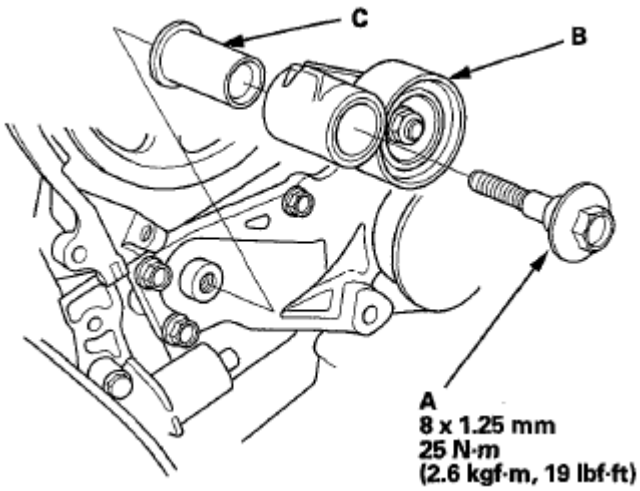


Fig. 73: Identifying Timing Belt Adjuster & Collar With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Install the timing belt adjuster in the reverse order of removal.
6. Install the timing belt (see **TIMING BELT INSTALLATION**).

TIMING BELT DRIVE PULLEY REPLACEMENT

1. Remove the timing belt (see **TIMING BELT REMOVAL**).
2. Remove the timing belt stopper (A), then remove the timing belt drive pulley (B) and the key (C).

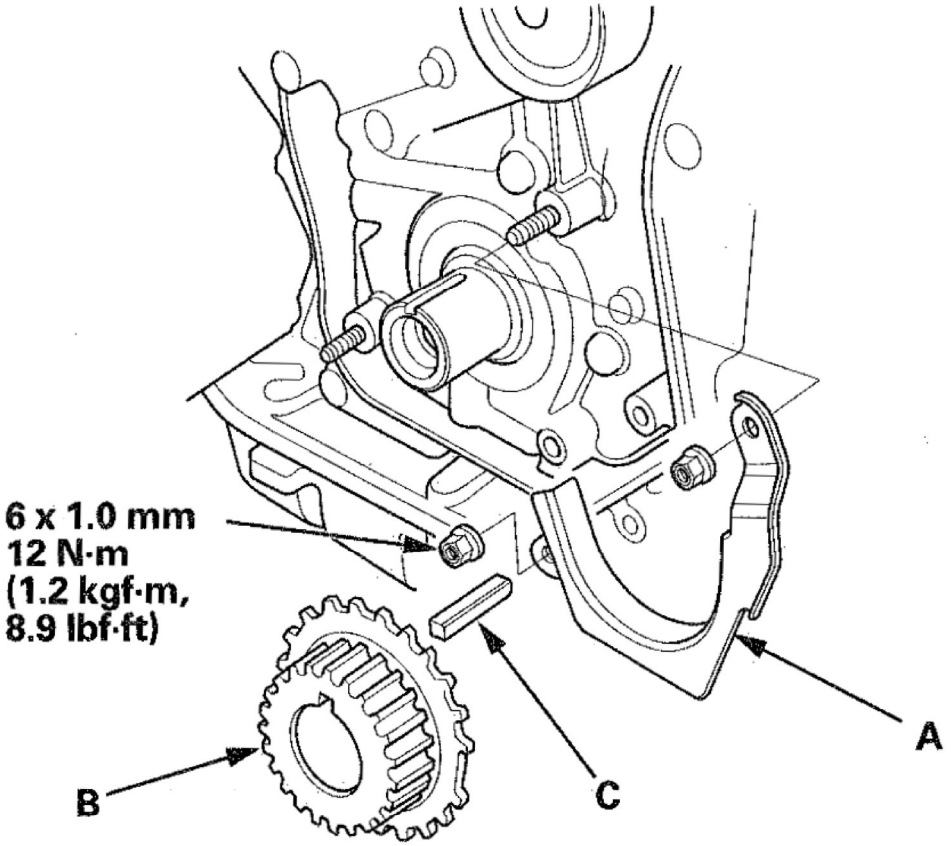


Fig. 74: Identifying Timing Belt Stopper, Drive Pulley & Key With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Inspect the timing belt drive pulley and the key for damage. If it is cracked or damaged, replace the timing belt drive pulley and the key.
4. Install the new timing belt drive pulley and the key, then install the timing belt stopper.
5. Install the timing belt (see **TIMING BELT INSTALLATION**).
6. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **CKP PATTERN CLEAR/CKP PATTERN LEARN**).

CYLINDER HEAD COVER REMOVAL

FRONT

1. Remove the intake manifold (see **INTAKE MANIFOLD REMOVAL AND INSTALLATION**).
2. Remove the three ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION**) from the front cylinder head.
3. Disconnect the engine coolant temperature (ECT) sensor 1 connector (A), the exhaust gas recirculation (EGR) valve connector (B), the front secondary heated oxygen (sensor 2) (secondary HO2S) connector (C), the front air fuel ratio (A/F) (sensor 1) connector (D), the rocker arm oil control solenoid A (BANK 2) connector (E), the front rocker arm oil pressure switch connector (F) the harness clamp (G) securing

the harness holder, and remove the dipstick (H).

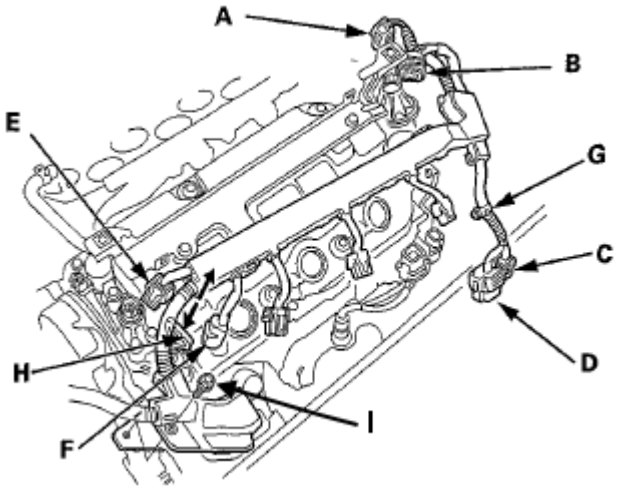


Fig. 75: Identifying Exhaust Gas Recirculation Valve Connector & Harness Clamp
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove the bolt (I) securing the harness holder.
5. Remove front cylinder head cover.

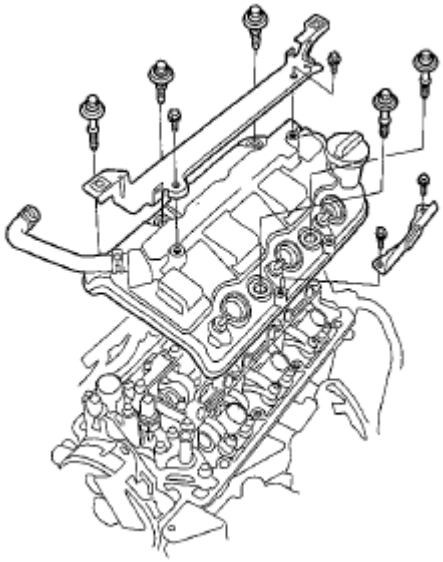


Fig. 76: Identifying Front Cylinder Head Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

1. Remove the intake manifold (see **INTAKE MANIFOLD REMOVAL AND INSTALLATION**).
2. Remove the three ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION**) from the rear cylinder head.

3. Remove the drive belt (see **DRIVE BELT REPLACEMENT**)
4. Remove the power steering (P/S) pump and the P/S hose bracket (see step 6) with its hoses connected.
5. Remove the harness holder mounting bolts (A) and the engine ground cable bolt (B).

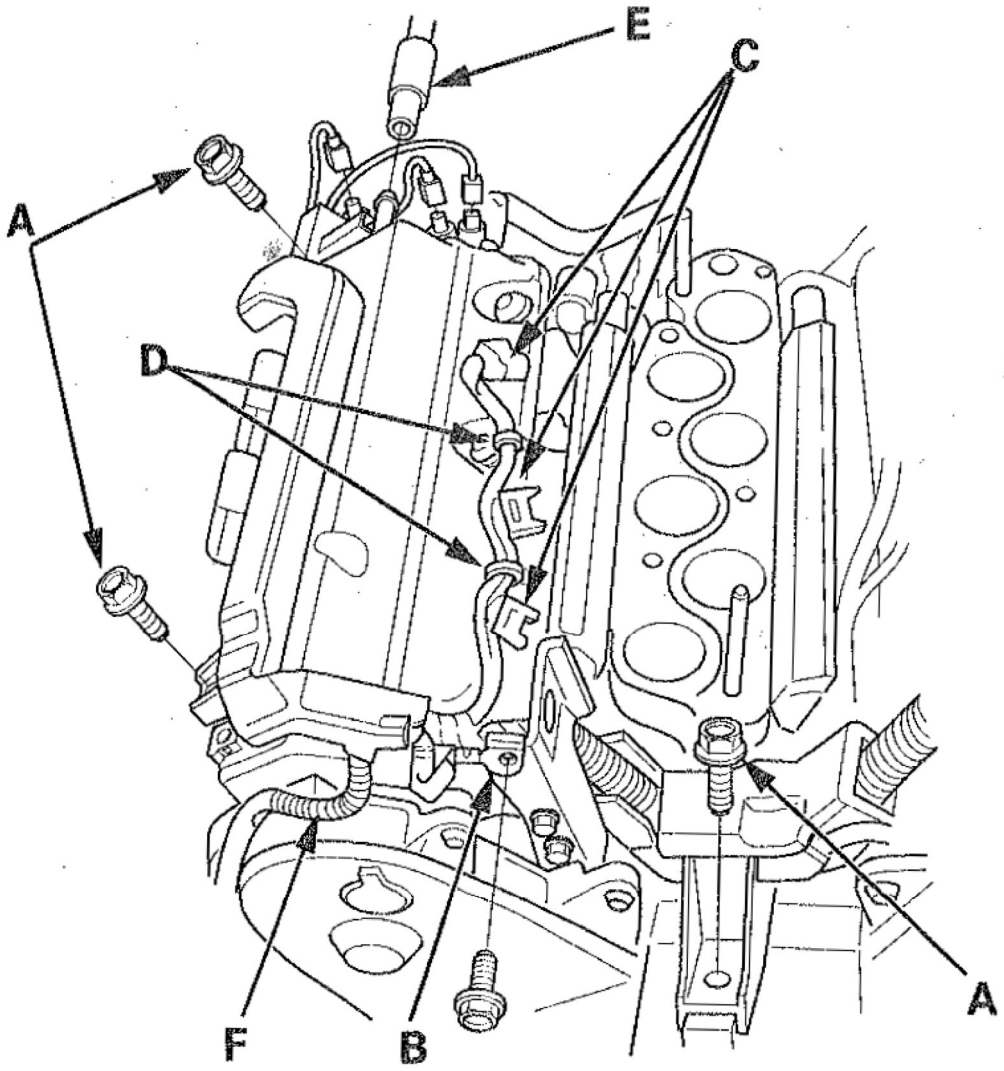


Fig. 77: Identifying Injector Connectors & Harness Clips
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Disconnect the three injector connectors (C) and the two harness clips (D).
7. Disconnect the breather hose (E).
8. Remove the harness (F) from the upper cover.
9. Disconnect the rear rocker arm oil pressure switch connector (A), the rocker arm oil control solenoid B (BANK 1) connector (B), the rocker arm oil control solenoid A (BANK 1) connector (C), the rear air fuel ratio (A/F) sensor 1 connector (D), the rear secondary heated oxygen sensor 2 (secondary HO2S) connector (E), and the harness clamps (F), then remove the harness holder (G).

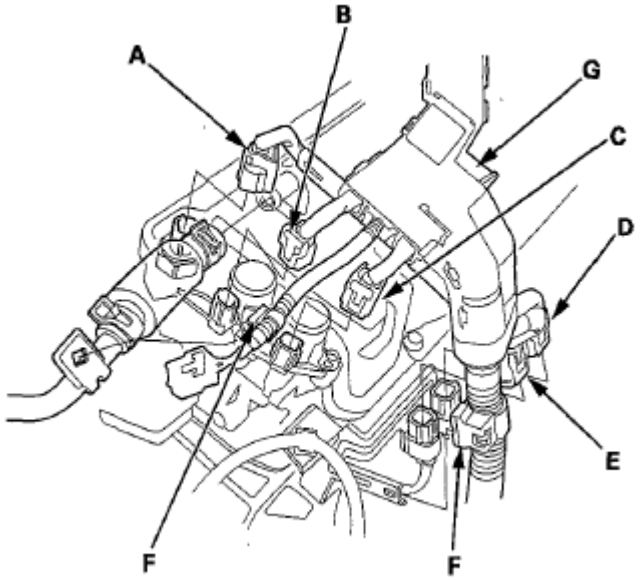


Fig. 78: Identifying Rear Rocker Arm Oil Pressure Switch Connector
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Disconnect the breather hose (H).
11. Remove the rear cylinder head cover.

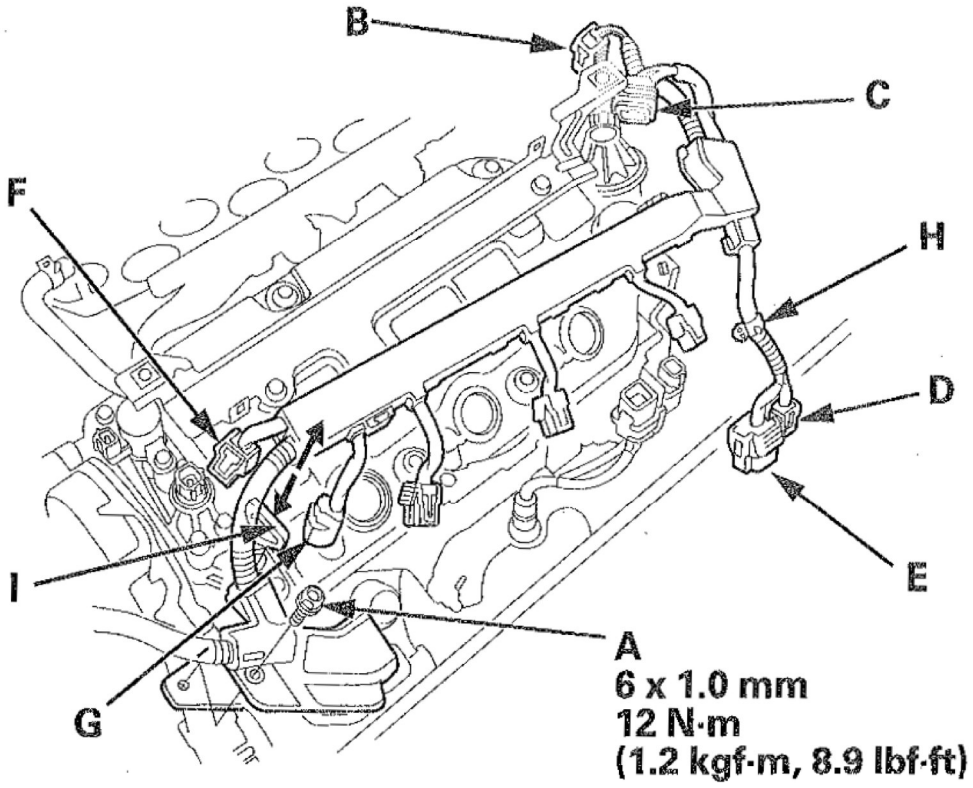


Fig. 79: Identifying Rear Cylinder Head Cover With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER HEAD COVER INSTALLATION

FRONT

1. Check the spark plug seals for damage. If any seal is damaged, replace it.
2. Thoroughly clean the head cover gasket and the groove of the cylinder head cover.

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

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

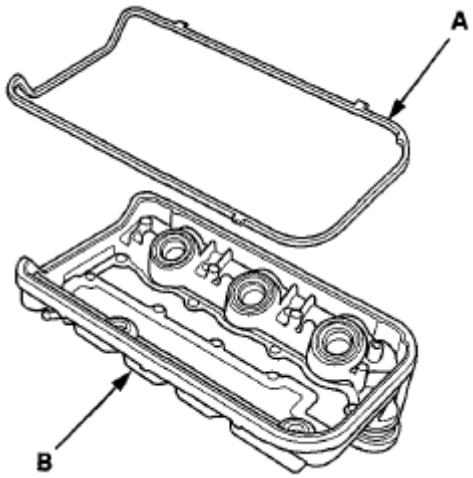


Fig. 80: Identifying Head Cover Gasket & Cylinder Head Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove all of the old liquid gasket from the rocker shaft holder and the cylinder head.
5. Clean the head cover contacting surfaces with a shop towel.
6. Apply liquid gasket, P/N 08717-0004,08718-0001, 08718-0003, or 08718-0009, evenly to the rocker shaft holder mating surface (A). Install the component within 5 minutes of applying the liquid gasket.

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 the new liquid gasket.**

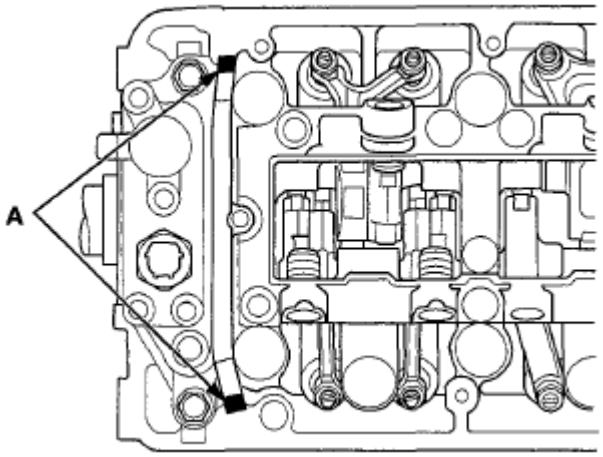


Fig. 81: Identifying Liquid Gasket Applying Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Set the spark plug seals (A) on the spark plug tubes, and install the front cylinder head cover (B).

NOTE:

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

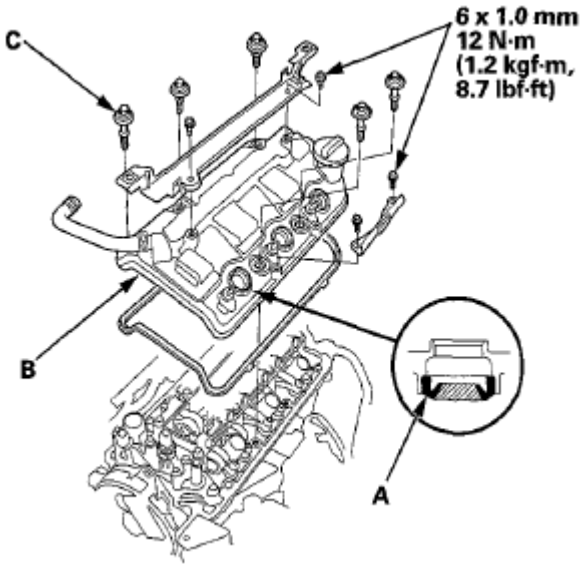


Fig. 82: Identifying Spark Plug Seals With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Inspect the spark plug seals for damage.
9. Inspect the cover washers (C). Replace any washer that is damaged or deteriorated.
10. Tighten the bolts in three steps. In the final step torque all bolts, in sequence, 12 N.m (1.2 kgf.m, 8.7 lbf.ft).

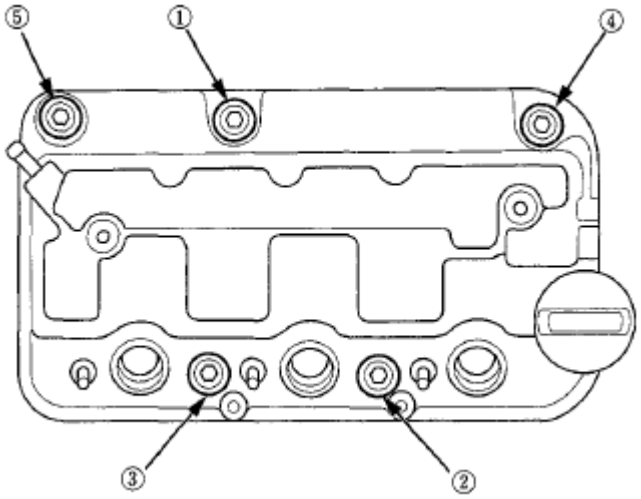


Fig. 83: Identifying Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Install bolt (A) securing the harness holder.

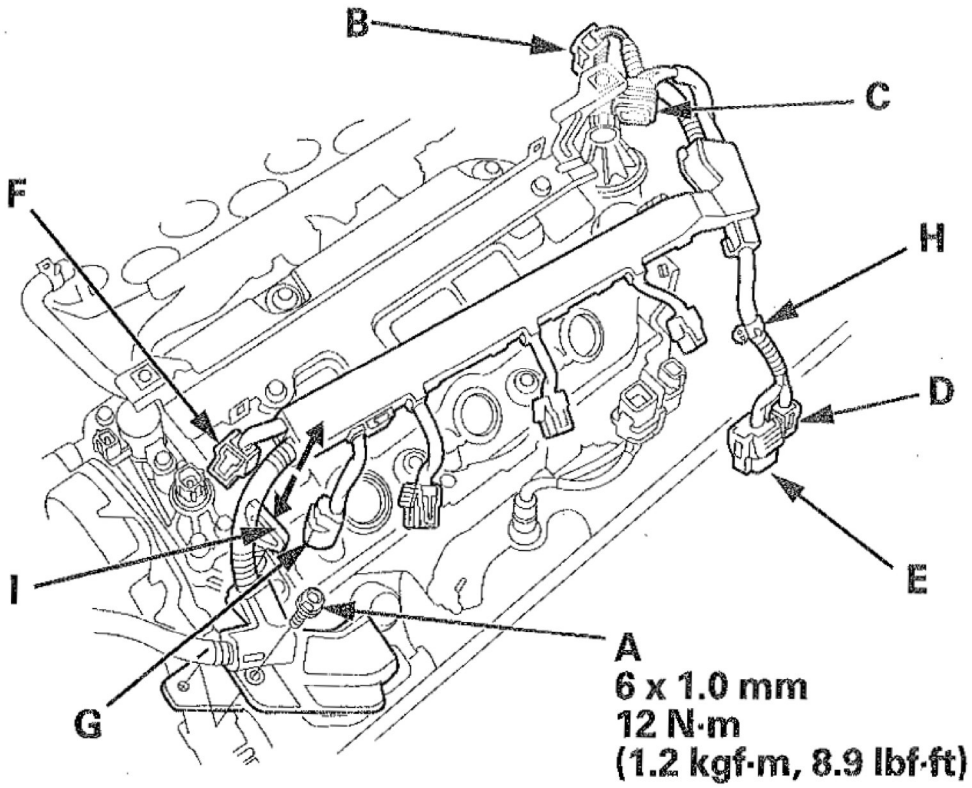


Fig. 84: Identifying Engine Coolant Temperature Sensor 1 & Exhaust Gas Recirculation Valve Connectors With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Connect the engine coolant temperature (ECT) sensor 1 connector (A), the exhaust gas recirculation

(EGR) valve connector (B), the front secondary heated oxygen (sensor 2) (secondary HO2S) connector (C), the front air fuel ratio (A/F) (sensor 1) connector (D), the rocker arm oil control solenoid A (BANK 2) connector (E), the front rocker arm oil pressure switch connector (F) and the harness clamp (G) securing the harness holder, and install the dipstick (H).

13. Install three ignition coils to the front cylinder head (see **IGNITION COIL REMOVAL/INSTALLATION** .)
14. Install the intake manifold (see **INTAKE MANIFOLD REMOVAL AND INSTALLATION**).

REAR

1. Check the spark plug seals for damage. If any seal is damaged, replace it.
2. Thoroughly clean the head cover gasket and the groove.
3. Install the head cover gasket (A) in the groove of the cylinder head cover (B). Make sure the head cover gasket is seated securely.

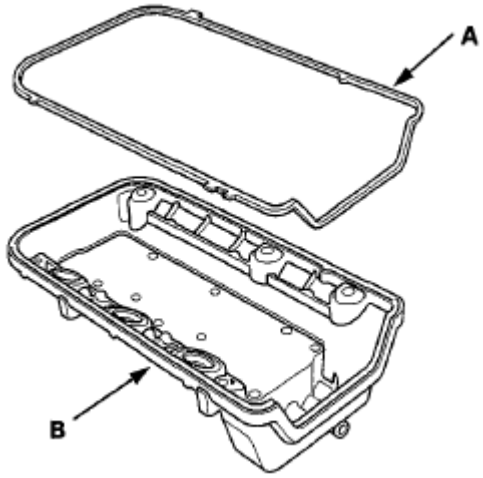


Fig. 85: Identifying Head Cover Gasket & Cylinder Head Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Remove all of the old liquid gasket from the rocker shaft holder and the cylinder head.
5. Clean the head cover contacting surfaces with a shop towel.
6. Apply liquid gasket, P/N 08717-0004,08718-0001, 08718-0003, or 08718-0009, evenly to the rocker shaft holder mating surface (A). Install the component within 5 minutes of applying the liquid gasket.

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 the new liquid gasket.**

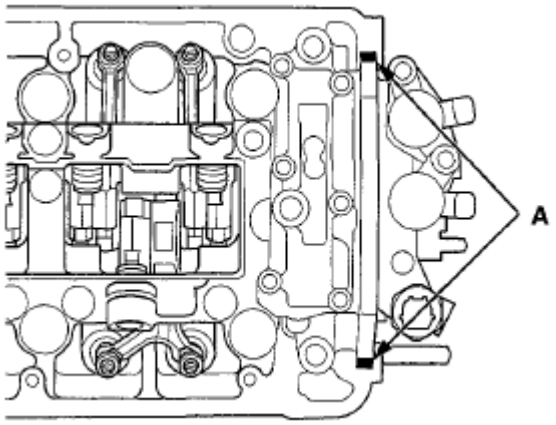


Fig. 86: Identifying Liquid Gasket Applying Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Set the spark plug seals (A) on the spark plug tubes, and install the rear cylinder head cover (B).

NOTE:

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

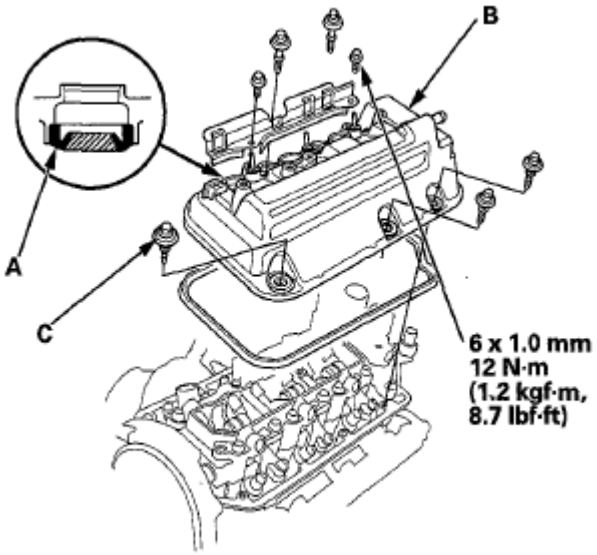


Fig. 87: Identifying Spark Plug Seals With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Inspect the spark plug seals for damage.
9. Inspect the cover washers (C). Replace any washer that is damaged or deteriorated.
10. Tighten the bolts in three steps. In the final step torque all bolts, in sequence, 12 N.m (1.2 kgf.m, 8.7 lbf.ft).

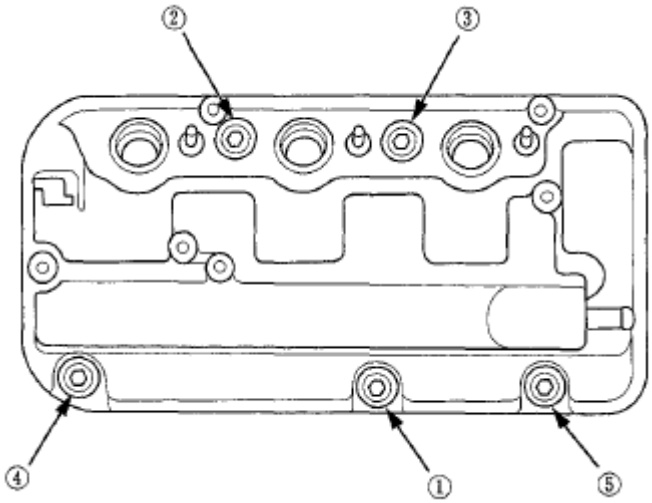


Fig. 88: Identifying Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Connect the rear rocker arm oil pressure switch connector (A), the rocker arm oil control solenoid B (BANK 1) connector (B), the rocker arm oil control solenoid A (BANK 1) connector (C), the rear air fuel ratio (A/F) (sensor 1) connector (D), the rear secondary heated oxygen (sensor 2) (secondary HO2S) connector (E), and the harness clamps (F), then install the harness holder (G).

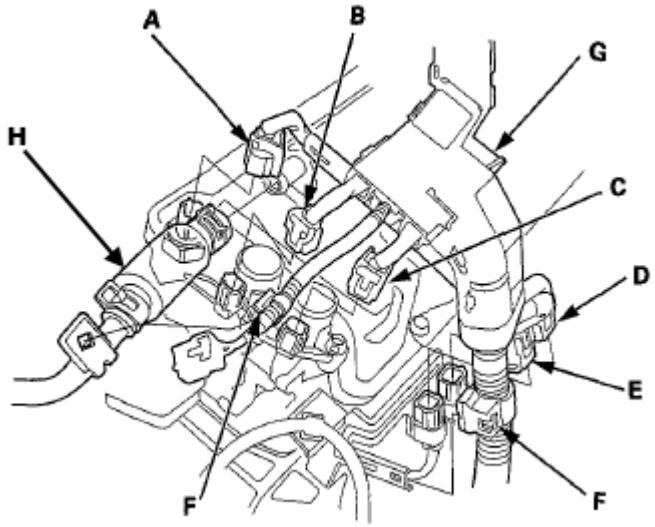


Fig. 89: Identifying Rear Rocker Arm Oil Pressure Switch Connector
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Connect the breather hose (H).
13. Tighten the harness holder mounting bolt (A).

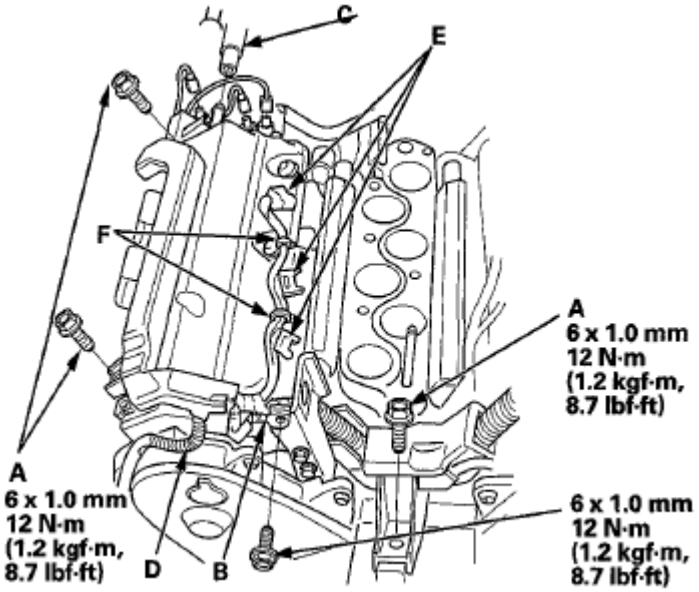


Fig. 90: Identifying Harness Holder Mounting Bolt & Engine Ground Cable With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Install the engine ground cable (B) and connect the breather hose (C), then install the harness (D) to the upper cover.
15. Reconnect the three injector connectors (E) and the two harness clips (F).
16. Install the power steering (P/S) pump and the P/S hose bracket (see step 6).
17. Install the drive belt (see **DRIVE BELT REPLACEMENT**).
18. Install the three ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION**) to the rear cylinder head.
19. Install the intake manifold (see **INTAKE MANIFOLD REMOVAL AND INSTALLATION**).

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.**
- **Connect the Honda Diagnostic System (HDS) to the data link connector (DLC), and monitor the engine coolant temperature (ECT) sensor 1. To avoid damaging the cylinder head, wait until the engine coolant temperature drops below 100°F (38°C) before loosening the cylinder head bolts.**
- **Mark all wiring and hoses to avoid misconnection. Also, be sure that they do not contact other wiring or hoses, or interfere with other parts.**

1. Relieve the fuel pressure (see **FUEL PRESSURE RELIEVING**).

2. Remove the air intake duct (see step 1 on **FRONT BULKHEAD COVER REPLACEMENT**).
3. Do the battery removal procedure (see **BATTERY REMOVAL AND INSTALLATION**).
4. Drain the engine coolant (see **COOLANT CHECK**).
5. Remove the drive belt (see **DRIVE BELT REPLACEMENT**).
6. Remove the power steering (P/S) pump (A) and the bolt (B) securing the P/S hose bracket (C).

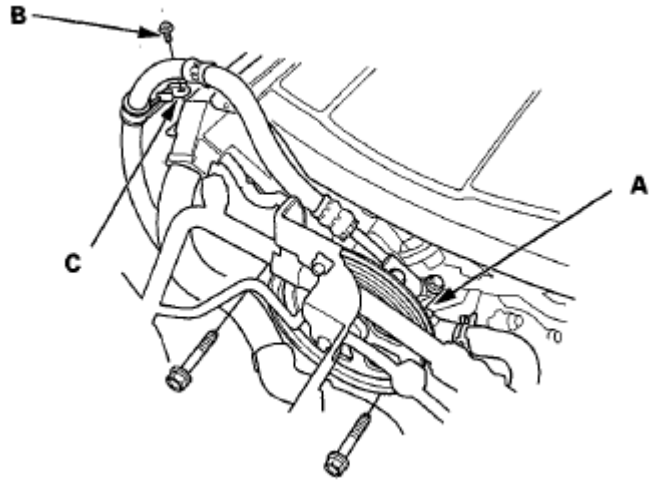


Fig. 91: Identifying Power Steering (P/S) Pump & Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the alternator (see **REMOVAL**).
8. Remove the timing belt (see **TIMING BELT REMOVAL**).
9. Remove the intake manifold (see **INTAKE MANIFOLD REMOVAL AND INSTALLATION**).
10. Remove the six ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION**).
11. Disconnect the following engine wire harness connectors and wire harness clamps from the cylinder head:
    - Six injector connectors
    - Engine coolant temperature (ECT) sensor 1 connector
    - Front rocker arm oil pressure switch connector
    - Rear rocker arm oil pressure switch connector
    - Camshaft position (CMP) sensor connector
    - Front air fuel ratio (A/F) (sensor 1) connector
    - Rear air fuel ratio (A/F) (sensor 1) connector
    - Front secondary heated oxygen (sensor 2) (secondary HO2S) connector
    - Rear secondary heated oxygen (sensor 2) (secondary HO2S) connector
    - Rocker arm oil control solenoid A (BANK 1) connector
    - Rocker arm oil control solenoid A (BANK 2) connector
    - Rocker arm oil control solenoid B (BANK 1) connector

- Knock sensor connector

12. Remove the front warm up three way catalytic converter (front WU-TWC) (see **FRONT**) and the rear warm up three way catalytic converter (rear WU-TWC) (see **REAR**)
13. Remove the quick-connect fitting cover (A), then disconnect the fuel feed hose (B) (see **FUEL LINE/QUICK-CONNECT FITTING REMOVAL**).

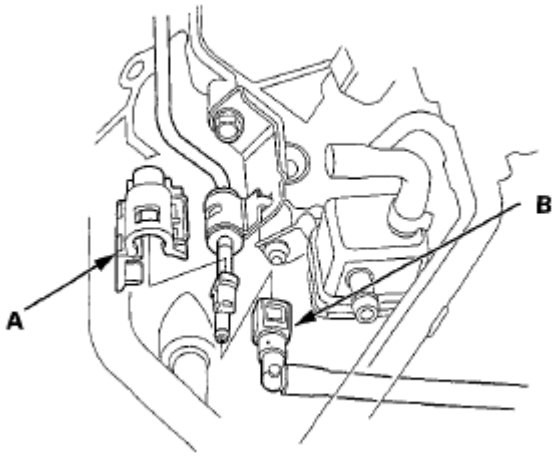


Fig. 92: Identifying Quick-Connect Fitting Cover & Fuel Feed Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Remove the connector bracket (A) from the front cylinder head.

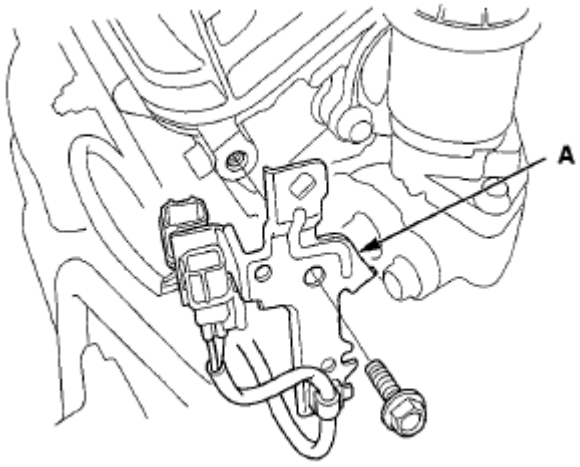


Fig. 93: Identifying Connector Bracket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Remove the harness clamp bracket (A) from the rear cylinder head.

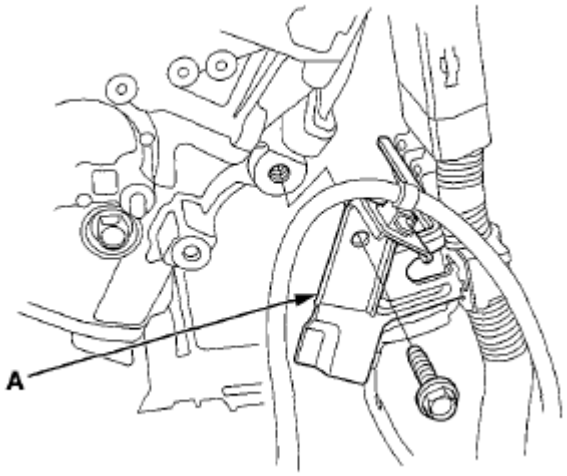


Fig. 94: Identifying Harness Clamp Bracket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

16. Remove the injector bases (see **INJECTOR BASE REMOVAL AND INSTALLATION**).
17. Remove the water passage (see **WATER PASSAGE REPLACEMENT**).
18. Remove the camshaft pulleys (A) and the back covers (B).

FRONT

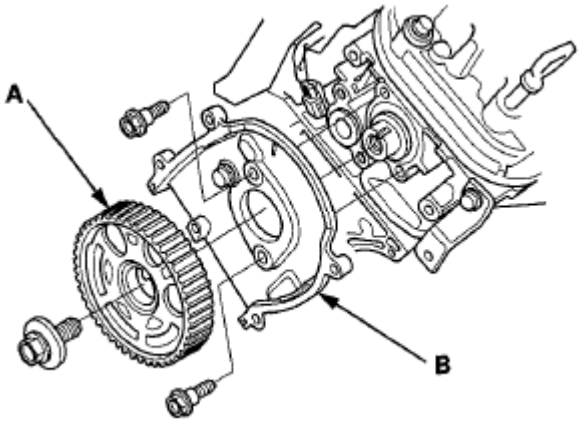


Fig. 95: Identifying Front Camshaft Pulley
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

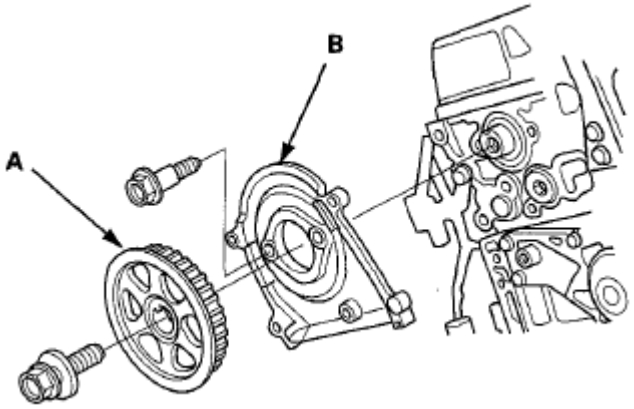


Fig. 96: Identifying Rear Camshaft Pulley
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

FRONT

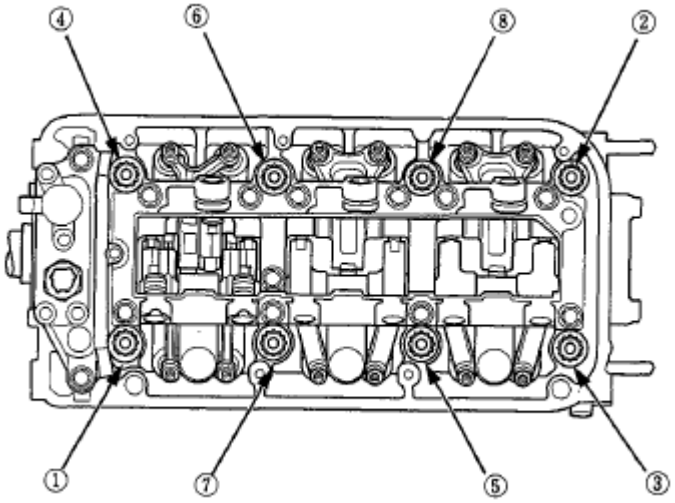


Fig. 97: Identifying Front Cylinder Head Cover Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

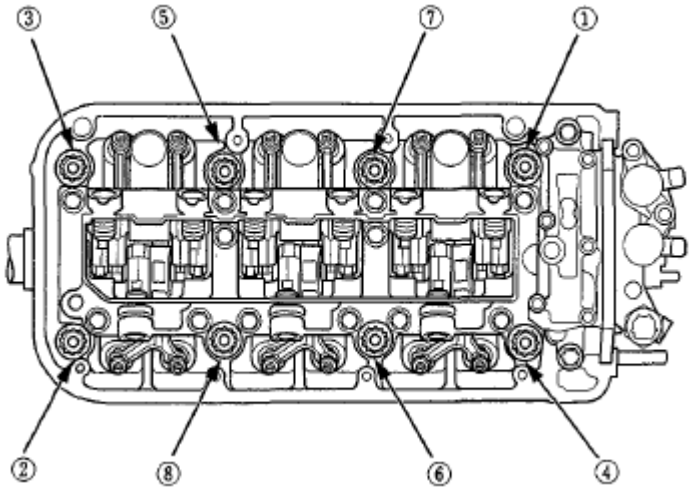


Fig. 98: Identifying Rear Cylinder Head Cover Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

21. Remove the cylinder head.

CAMSHAFT REPLACEMENT

FRONT

1. Remove the air intake duct (see step 1 on **FRONT BULKHEAD COVER REPLACEMENT**).
2. Do the battery removal procedure (see **BATTERY REMOVAL AND INSTALLATION**).
3. Remove the battery base (see step 9 on **ENGINE REMOVAL**).
4. Drain the engine coolant (see step 11 on **COOLANT REPLACEMENT**).
5. Disconnect the radiator hoses (A).

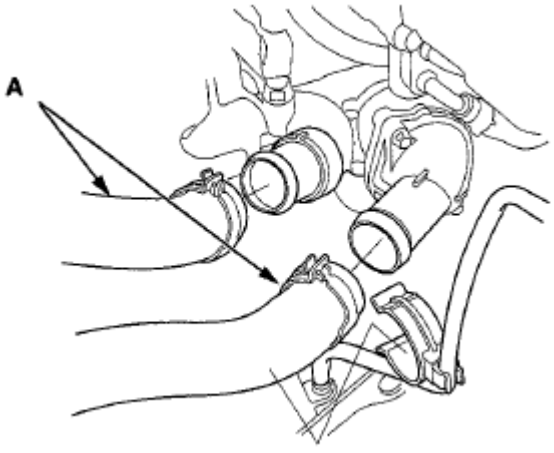


Fig. 99: Identifying Radiator Hoses
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the exhaust gas recirculation (EGR) valve (see **EGR VALVE REPLACEMENT**).
7. Remove the EGR valve stud bolts (A).

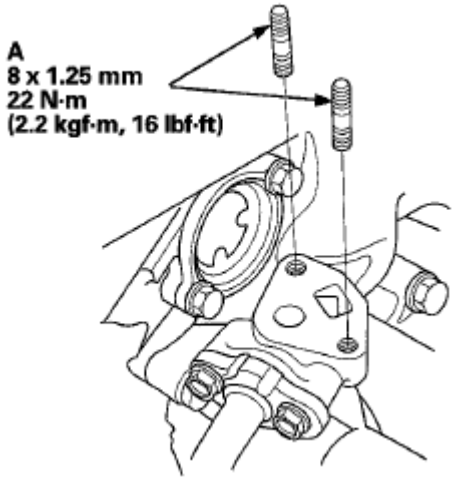


Fig. 100: Identifying EGR Valve Stud Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Remove the timing belt (see **TIMING BELT REMOVAL**).
9. Remove the rocker arm assembly (see **FRONT**).
10. Remove the front camshaft pulley (see **CYLINDER HEAD REMOVAL**).
11. Remove the thrust cover (A), then remove the camshaft (B).

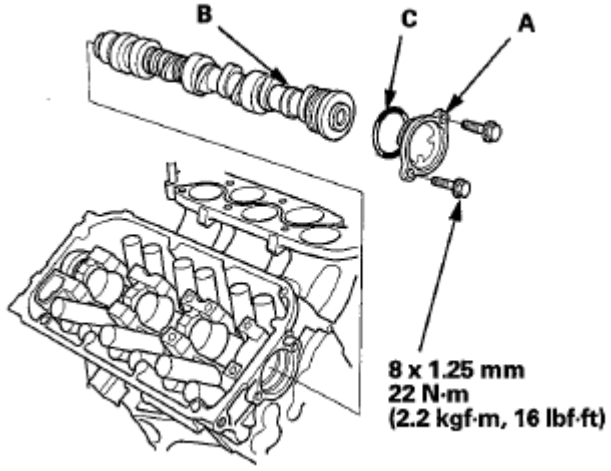


Fig. 101: Identifying Thrust Cover & Camshaft With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Install the camshaft in the reverse order of removal using a new O-ring (C). Apply new engine oil to the journals and cam lobes.
13. Apply new engine oil to the threads of the camshaft pulley mounting bolt, then install the front camshaft pulley (see step 12 on **REAR**).

14. Install the rocker arm assembly (see step 10 on **CAMSHAFT, ROCKER ARM ASSEMBLY, CAMSHAFT SEAL, AND PULLEY INSTALLATION**), then tighten the mounting bolts.
15. Install the timing belt (see **TIMING BELT INSTALLATION**).
16. Adjust the valve clearance (see **VALVE CLEARANCE ADJUSTMENT**).
17. Install the EGR valve stud bolts then install the EGR valve (see **EGR VALVE REPLACEMENT**).
18. Connect radiator hoses.
19. Install the battery base (see step 56 on **ENGINE INSTALLATION**).
20. Do the battery installation procedure (see **BATTERY REMOVAL AND INSTALLATION**).
21. Install the air intake duct (see **FRONT BULKHEAD COVER REPLACEMENT**).
22. Fill the radiator with engine coolant (see step 11 on **COOLANT REPLACEMENT**) and bleed the air from the cooling system with the heater valve open.
23. Do the crankshaft position (CKP) pattern clear/CKP pattern lean procedure (see **CKP PATTERN CLEAR/CKP PATTERN LEARN**).

REAR

1. Relieve the fuel pressure (see **FUEL PRESSURE RELIEVING**).
2. Drain the engine coolant (see **COOLANT CHECK**).
3. Remove the intake air duct (see **AIR CLEANER ELEMENT INSPECTION/REPLACEMENT**).
4. Remove the air cleaner assembly (see **AIR CLEANER REMOVAL/INSTALLATION**).
5. Remove the quick-connect fitting cover (A), then disconnect the fuel feed hose (B) (see **FUEL LINE/QUICK-CONNECT FITTING REMOVAL**).

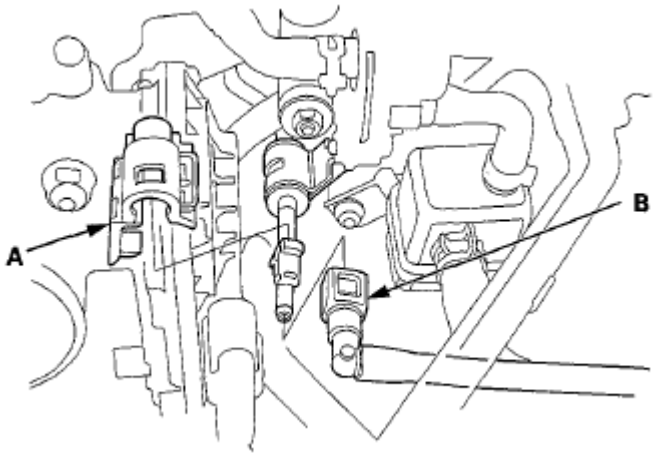


Fig. 102: Identifying Quick-Connect Fitting Cover & Fuel Feed Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Disconnect the heater hoses (A) and the evaporative emission (EVAP) canister hose (B), then remove the purge joint bracket (C).

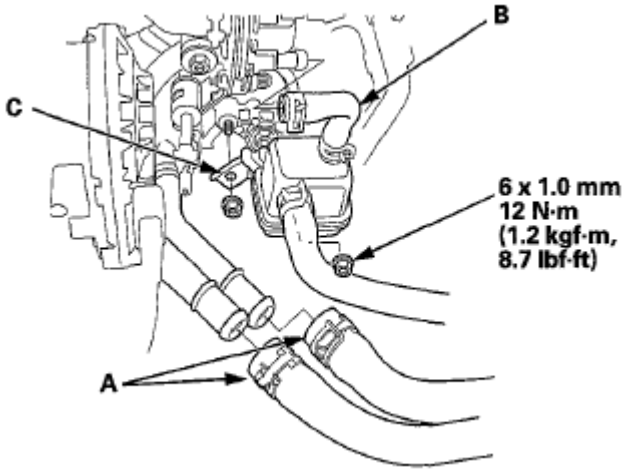


Fig. 103: Identifying Heater Hoses & Evaporative Emission Canister Hose With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the timing belt (see **TIMING BELT REMOVAL**).
8. Remove the rocker arm assembly (see **REAR**).
9. Remove the rear camshaft pulley (see **CYLINDER HEAD REMOVAL**).
10. Remove the thrust cover (A), then remove the rear camshaft (B).

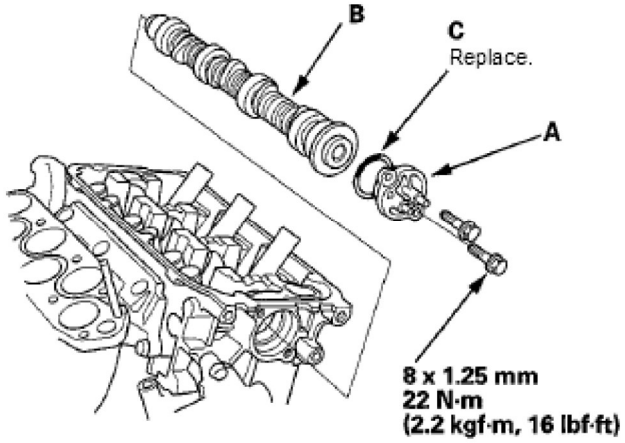


Fig. 104: Identifying Thrust Cover, Rear Camshaft & O-Ring With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Install the rear camshaft in the reverse order of removal using a new O-ring (C). Apply new engine oil to the journals and the cam lobes.
12. Apply new engine oil to the threads of the camshaft pulley mounting bolt, then install the rear camshaft pulley (see step 12 on **REAR**).
13. Install the rocker arm assembly (see step 10 on **CAMSHAFT, ROCKER ARM ASSEMBLY, CAMSHAFT SEAL, AND PULLEY INSTALLATION**), then tighten the mounting bolts.
14. Install the timing belt (see **TIMING BELT INSTALLATION**).

15. Adjust the valve clearance (see **VALVE CLEARANCE ADJUSTMENT**).
16. Install the heater hoses and the purge joint bracket.
17. Connect the fuel feed hose (see **FUEL LINE/QUICK-CONNECT FITTING INSTALLATION**), then install the quick-connect fitting cover.
18. Install the air cleaner assembly (see **AIR CLEANER REMOVAL/INSTALLATION**).
19. Install the intake air duct (see **AIR CLEANER ELEMENT INSPECTION/REPLACEMENT**).
20. Inspect for fuel leaks. Turn the ignition switch to ON (II) (do not operate the starter) so the fuel pump runs for about 2 seconds and pressurizes the fuel line. Repeat this operation three times, then check for fuel leakage at any point in the fuel line.
21. Fill the radiator with engine coolant (see step 11 on **COOLANT REPLACEMENT**), and bleed the air from the cooling system with the heater valve open.
22. Do the CKP pattern clear/CKP pattern learn procedure (see **CKP PATTERN CLEAR/CKP PATTERN LEARN**).

CYLINDER HEAD INSPECTION FOR WARPAGE

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

    Cylinder Head Height

    Standard (New): 120.95-121.05 mm

    (4.762-4.766 in)

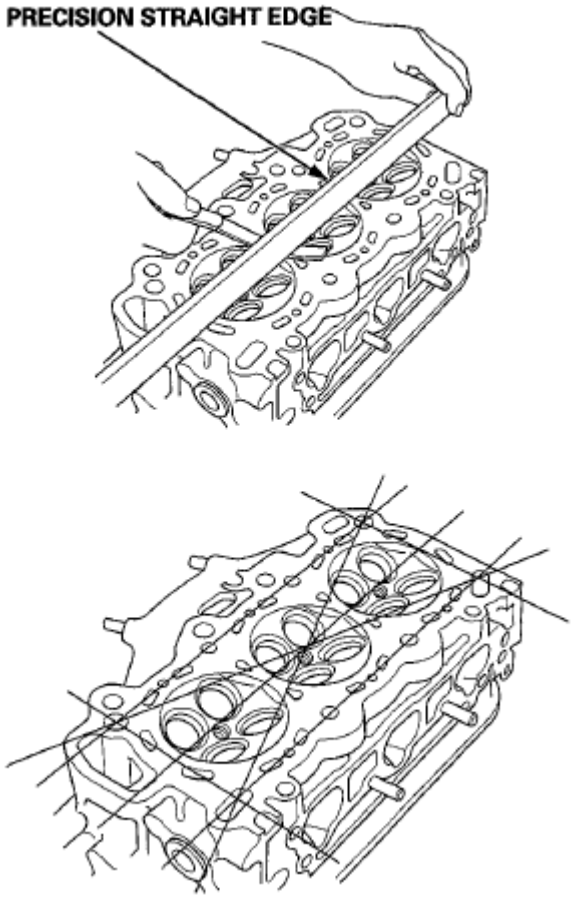


Fig. 105: Checking Cylinder Head For Warpage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM ASSEMBLY REMOVAL

FRONT

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

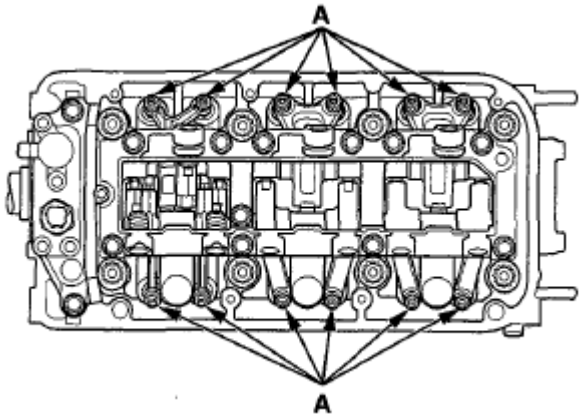


Fig. 106: Identifying Front Rocker Arm Locknuts & Adjusting Screws
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

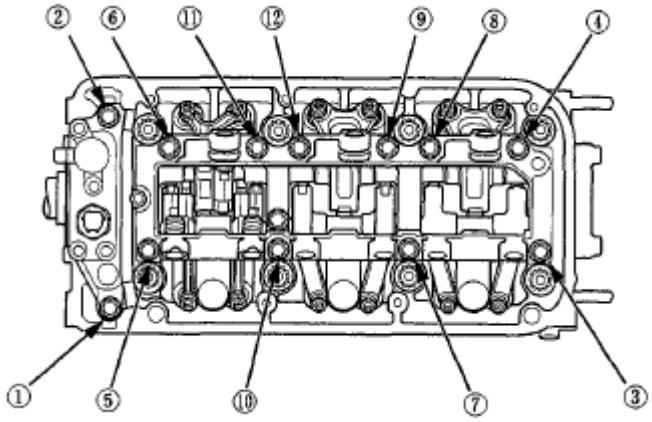


Fig. 107: Identifying Rocker Shaft Holder Mounting Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

1. Remove the cylinder head cover (see **REAR**).
2. Loosen the locknuts and the adjusting screws (A).

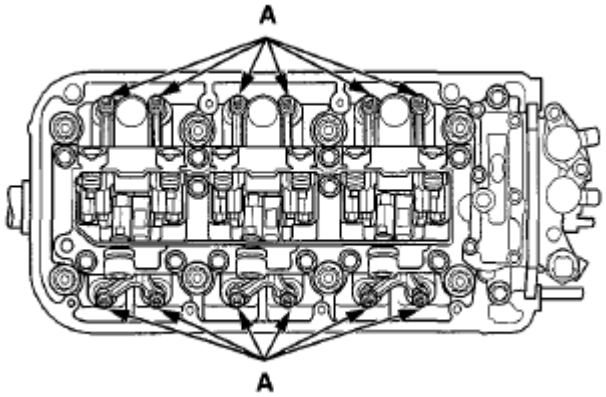


Fig. 108: Identifying Rear Rocker Arm Locknuts & Adjusting Screws
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

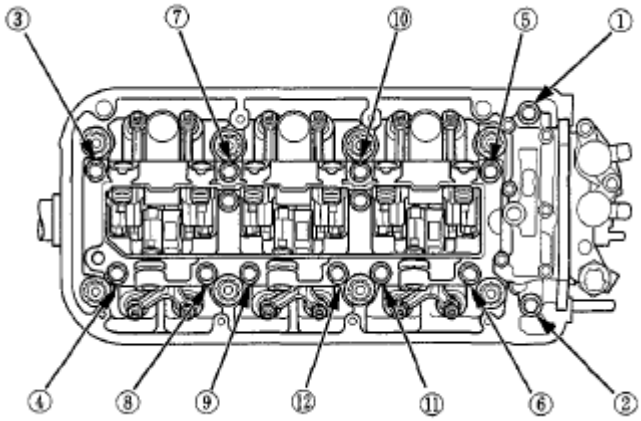


Fig. 109: Identifying Rocker Shaft Holder Mounting Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY

FRONT

NOTE:

- **Identify parts as they are removed so they can be reinstalled in their original locations.**
- **Inspect the rocker shafts and rocker arms (see ROCKER ARM AND SHAFT INSPECTION).**

- **If reused, the rocker arms must be installed in their original locations.**
- **When removing or installing the rocker arm assembly, do not remove the mounting bolts. The bolts will keep the rocker arms, the rocker shaft bridge, and the rocker shaft holder on the shaft.**
- **If the rocker shaft cannot be removed or installed by hand, remove or install the rocker shaft by heating the rocker shaft bridge.**
- **Bundle the rocker arms with rubber bands to keep them together as a set, and remove the bands after the rocker arms have been installed.**
- **Prior to reassembling, clean all the parts in solvent, dry them, and apply new engine oil to all contact points and bearing surfaces and lost motion assembly.**
- **When replacing the rocker arm assembly, remove the fastening hardware from the new rocker arm assembly.**
- **Never remove any of the circlips that retain the lost motion assemblies in the rocker shaft bridge. The circlips are not available separately, and are factory installed in the rocker shaft bridge. To remove the lost motion assemblies, first remove the rocker shafts and the rocker arms.**

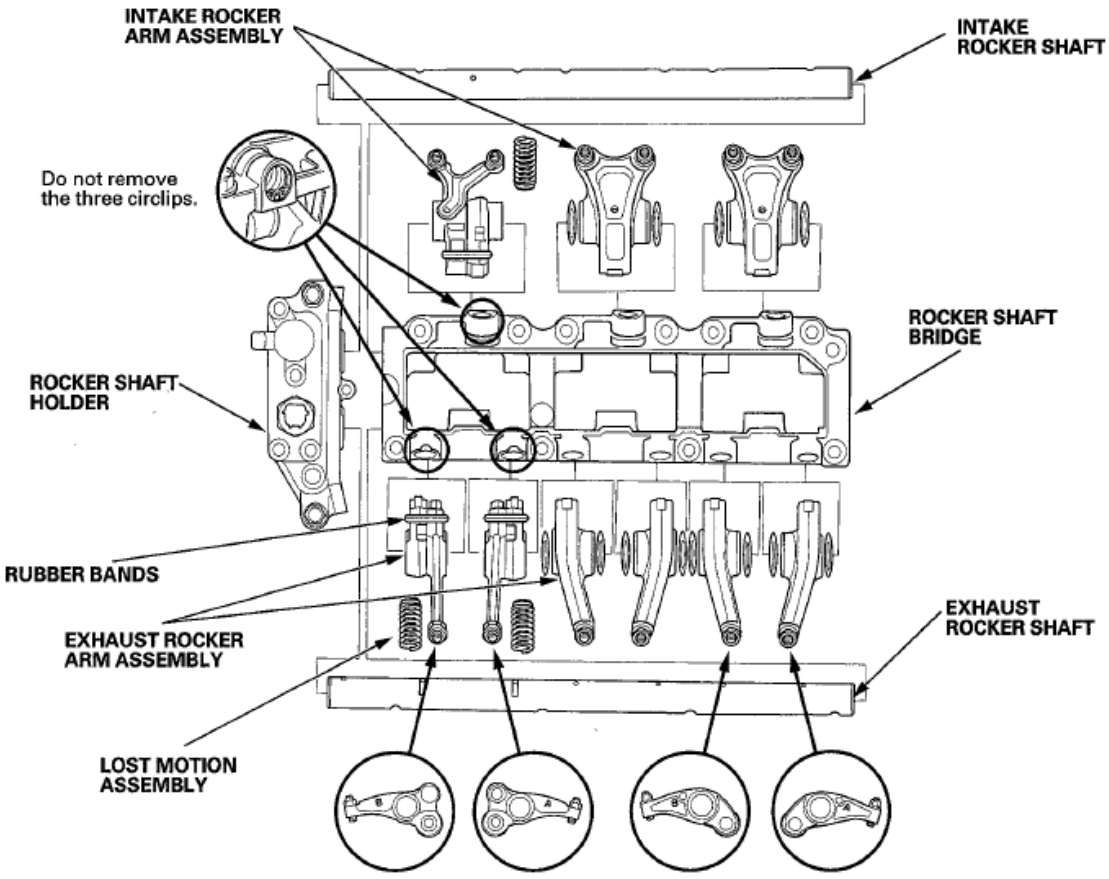


Fig. 110: Identifying Disassembling View Of Front Rocker Arm & Shaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

NOTE:

- **Identify parts as they are removed so they can be reinstalled in their original locations.**
- **Inspect the rocker shafts and rocker arms (see ROCKER ARM AND SHAFT INSPECTION).**
- **If reused, the rocker arms must be installed in their original locations.**
- **When removing or installing the rocker arm assembly, do not remove the mounting bolts. The bolts will keep the rocker arms, the rocker shaft bridge, and the rocker shaft holder on the shaft.**
- **If the rocker shaft cannot be removed or installed by hand, remove or install the rocker shaft by heating the rocker shaft bridge.**
- **Bundle the rocker arms with rubber bands to keep them together as a set, and remove the bands after the rocker arms have been installed.**
- **Prior to reassembling, clean all the parts in solvent, dry them, and apply new engine oil to all contact points and bearing surfaces, and the lost motion assembly.**
- **When replacing the rocker arm assembly, remove the fastening hardware from the new rocker arm assembly.**
- **Never remove any of the circlips that retain the lost motion assemblies in the rocker shaft bridge. The circlips are not available separately, and are factory installed in the rocker shaft bridge. To remove the lost motion assemblies, first remove the rocker shafts and the rocker arms.**

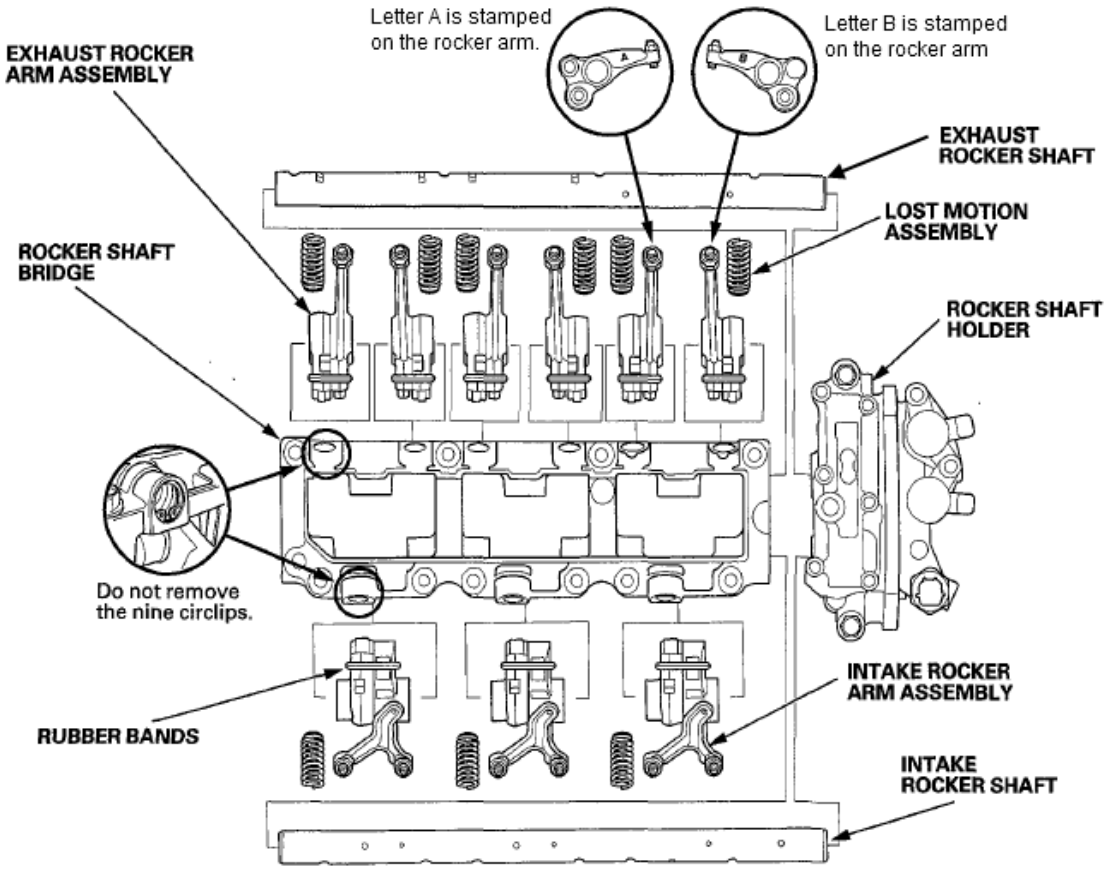


Fig. 111: Identifying Disassembling View Of Rear Rocker Arm & Shaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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.

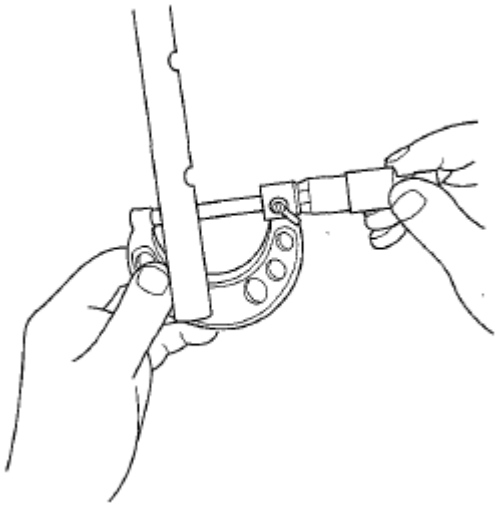


Fig. 112: Measuring Diameter Of Shaft First Rocker Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

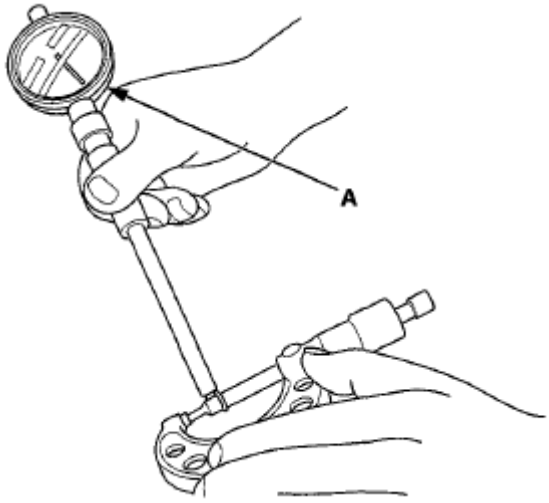


Fig. 113: Measuring Diameter Of Shaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   No. 1, No. 2, No. 3 and No. 4 CYLINDERS

   Intake Rocker Arm-to-Shaft Clearance:

   Standard (New): 0.015-0.046 mm

   (0.0006-0.0018 in)

Service Limit: 0.046 mm (0.0018 in)

No. 5, and No. 6 CYLINDERS

Intake Rocker Arm-to-Shaft Clearance:

Standard (New): 0.018-0.056 mm

(0.0007-0.0022 in)

Service Limit: 0.056 mm (0.0022 in)

No. 1, No. 2, No. 3 and No. 4 CYLINDERS

Exhaust Rocker Arm-to-Shaft Clearance

Standard (New): 0.015-0.046 mm

(0.0006-0.0018 in)

Service Limit: 0.046 mm (0.0018 in)

No. 5 and No. 6 CYLINDERS

Exhaust Rocker Arm-to-Shaft Clearance

Standard (New): 0.018-0.047 mm

(0.0007-0.0019 in)

Service Limit: 0.047 mm (0.0019 in)

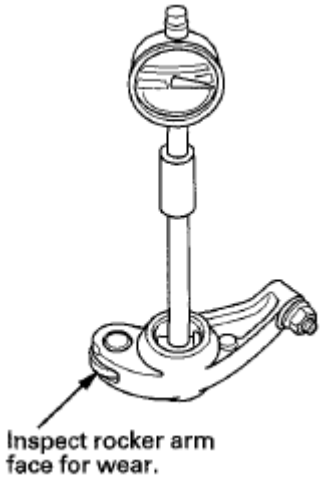


Fig. 114: Measuring Inside Diameter Of Rocker Arm

Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Repeat for all rockers and both shafts. If the clearance is over the limit, replace the rocker shaft and all over-tolerance rocker arms. If any variable cylinder management rocker arm needs replacement, replace all rocker arms in that set (primary and secondary).

Variable Cylinder Management Rocker Arms

7. Inspect the rocker arm pistons (A). Slide them into the rocker arms. If they do not move smoothly, replace the rocker arm set.

NOTE:

- **Apply new engine oil to the rocker arm pistons when reassembling.**
- **When removing the rocker arm pistons from the intake primary rocker arm (B) and the exhaust primary rocker arms (C), carefully apply air pressure to the oil passage of the rocker arm.**

INTAKE

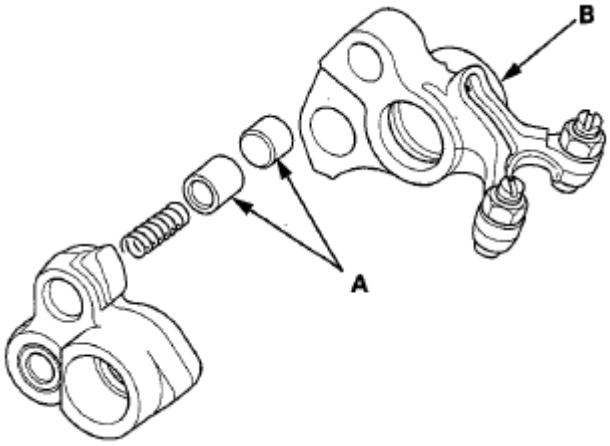


Fig. 115: Identifying Intake Rocker Arm Pistons & Intake Primary Rocker Arm
Courtesy of AMERICAN HONDA MOTOR CO., INC.

EXHAUST

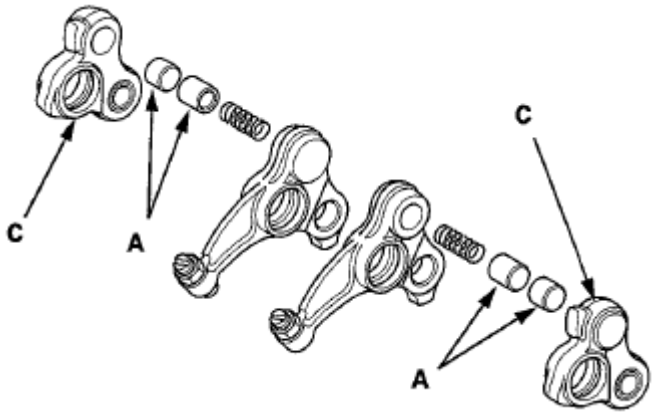


Fig. 116: Identifying Exhaust Rocker Arm Pistons & Exhaust Primary Rocker Arms
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Install the rocker arm assembly (see **CAMSHAFT, ROCKER ARM ASSEMBLY, CAMSHAFT SEAL, AND PULLEY INSTALLATION**).

CAMSHAFT INSPECTION

1. Remove the cylinder head (see **CYLINDER HEAD REMOVAL**).
2. Remove the rocker arm assembly (see **ROCKER ARM ASSEMBLY REMOVAL**).
3. Disassemble the rocker arm assembly (**Rocker Arm and Shaft Disassembly/Reassembly**)
4. Front: Put the rocker shafts bridge and the rocker shaft holder on the front cylinder head, then tighten the bolts to the specified torque.

   Specified Torque

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

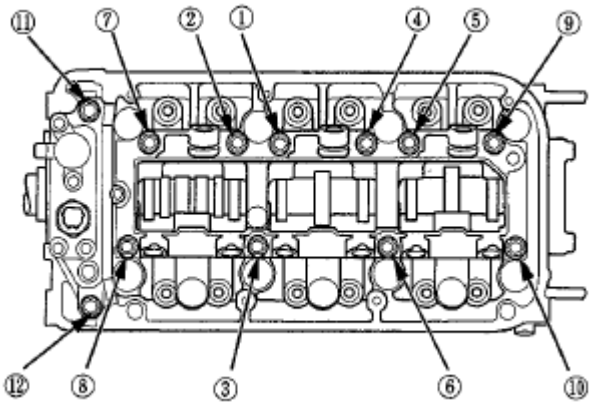


Fig. 117: Identifying Front Camshaft Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Rear: Put the rocker shaft bridge and the rocker shaft holder on the rear cylinder head, then tighten the

bolts to the specified torque.

Specified Torque

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

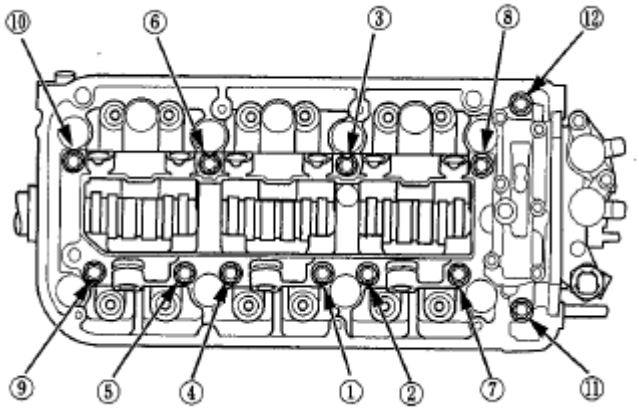


Fig. 118: Identifying Rear Camshaft Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Seat the camshaft by pushing it toward the rear of the cylinder head.
7. 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 t limit, replace the thrust cover and recheck. If it is still beyond the service limit, replace the camshaft.

Camshaft End Play

Standard (New): 0.05-0.20 mm

(0.002-0.008 in)

Service Limit: 0.20 mm (0.008 in)

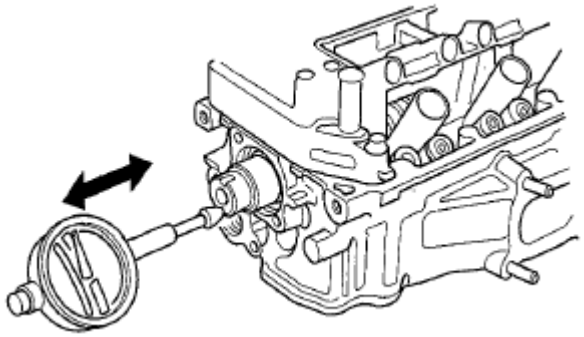


Fig. 119: Measuring Camshaft End Play
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

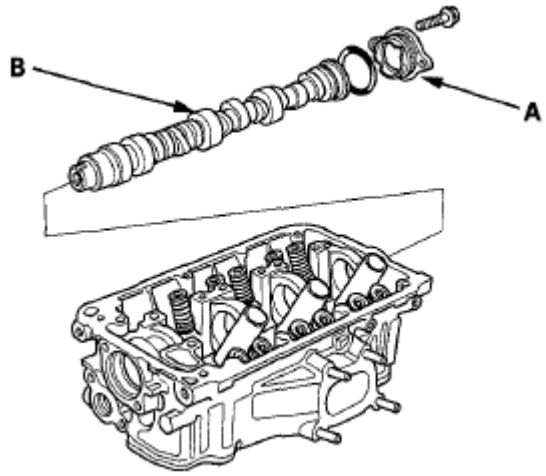


Fig. 120: Identifying Camshaft Thrust Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

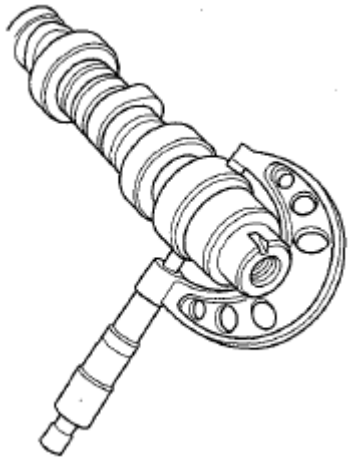


Fig. 121: Measuring Diameter Of Each Camshaft Journal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Zero the gauge to the journal diameter.

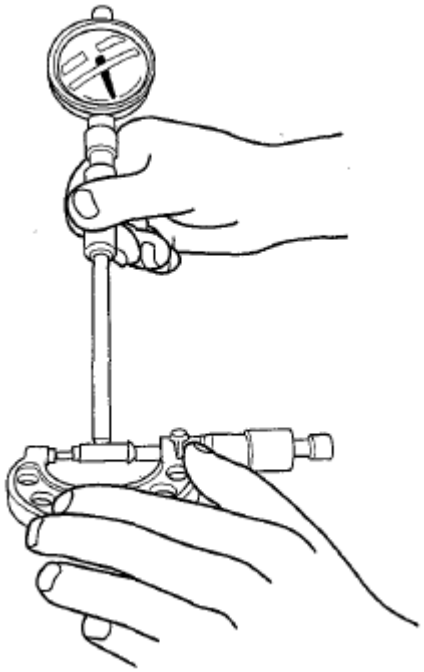


Fig. 122: Checking Diameter Of Camshaft Journal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. 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 the service limit, go to step 13.
    - 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 12.

    Camshaft-to-Holder Oil Clearance

    Standard (New): 0.050-0.089 mm

    (0.0020-0.0035 in)

    Service Limit: 0.15 mm (0.006 in)

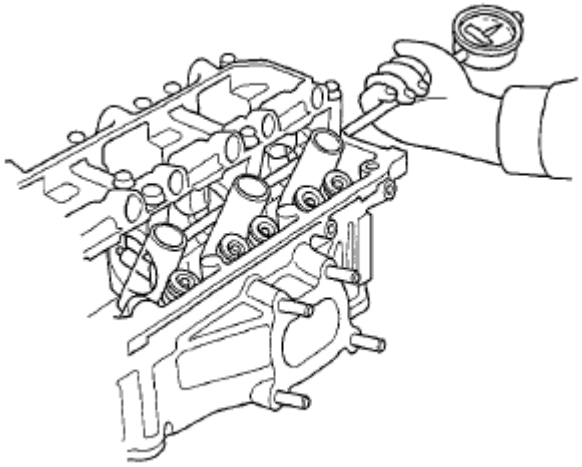


Fig. 123: Measuring Inside Diameter Of Camshaft Bearing Surface
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

    Camshaft Total Runout

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

    Service Limit: 0.04 mm (0.0016 in)

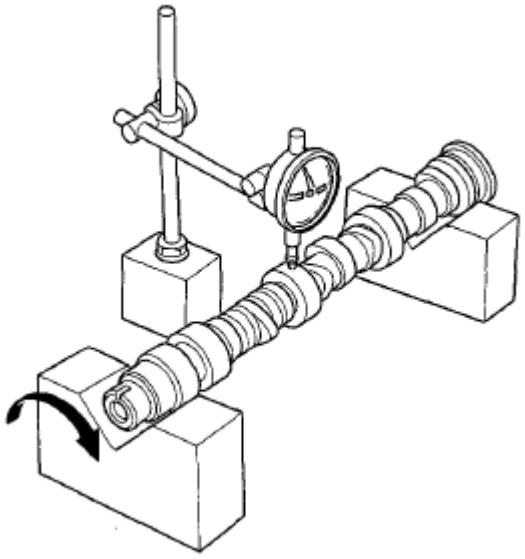


Fig. 124: Checking Total Runout With Camshaft Supported On V-Blocks
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Measure the cam lobe height.

NOTE:

- **When measuring the No. 1, No. 2, No. 3, and No. 4 cylinders intake cam lobe height of the camshaft, measure the secondary cam lobes.**
- **When measuring the No. 1, No. 2, No. 3, and No. 4 cylinders exhaust cam lobe height of the camshaft, measure the primary cam lobes.**

Cam Lobe Height Standard (New)

No. 1, No. 2, No. 3 and No. 4 CYLINDERS:

Intake: 35.162 mm (1.3843 in)

Exhaust: 36.537 mm (1.4385 in)

No. 5, and No. 6 CYLINDERS:

Intake: 35.155 mm (1.3841 in)

Exhaust: 36.512 mm (1.4375 in)

No. 1, No. 2, and No. 3 CYLINDERS

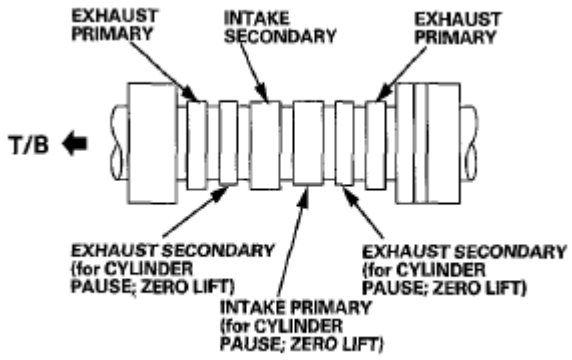


Fig. 125: Measuring Cam Lobe Height (No. 1, No. 2 & No. 3 Cylinders)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

No. 4 CYLINDER

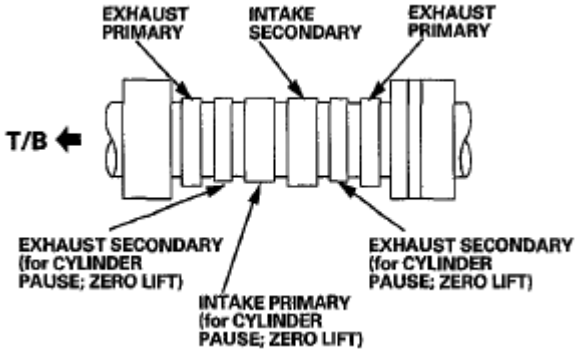


Fig. 126: Measuring Cam Lobe Height (No. 4 Cylinder)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

No. 5 and No. 6 CYLINDERS

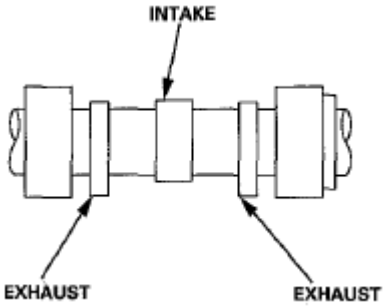


Fig. 127: Measuring Cam Lobe Height (No. 5 & No. 6 Cylinders)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVE, SPRING, AND VALVE SEAL REMOVAL

SPECIAL TOOLS REQUIRED

Valve Spring Compressor Attachment 07757-PJ1010A

Identify the valves and the 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**), then remove the rocker arm assembly (see **ROCKER ARM ASSEMBLY REMOVAL**).
2. Using an appropriate-sized socket (A) and a plastic mallet (B), lightly tap the spring retainer to loosen the valve cotters.

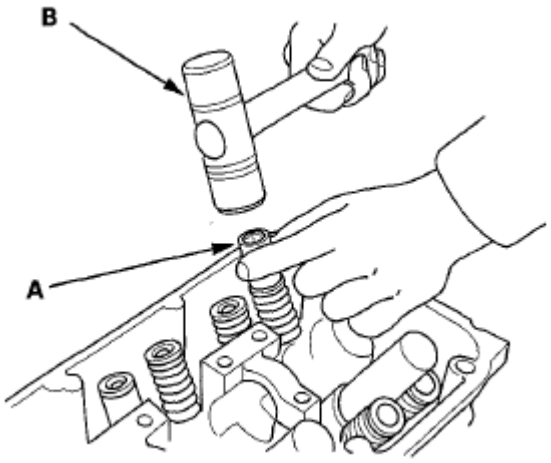


Fig. 128: Tapping Spring Retainer Using Socket & Plastic Mallet
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

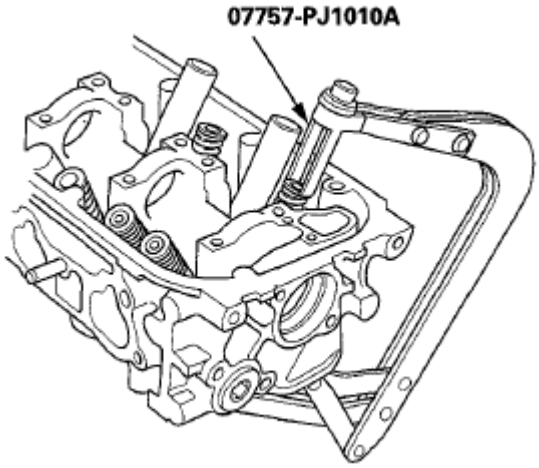


Fig. 129: Identifying Valve Spring Compressor Attachment
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

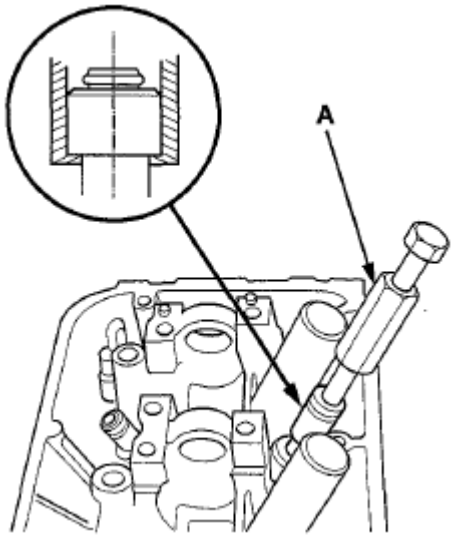


Fig. 130: Identifying Valve Guide Seal Remover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Remove the valve seal.

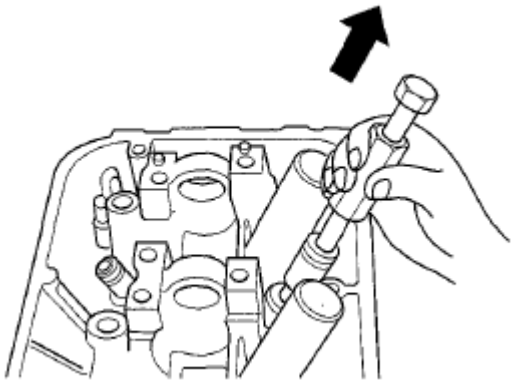


Fig. 131: Identifying Valve Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the valve spring seat.

VALVE INSPECTION

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

Intake Valve Dimensions

A Standard (New): 35.90-36.10 mm

(1.413-1.421 in.)

B Standard (New): 116.55-117.15 mm

(4.589-4.612 in.)

C Standard (New): 5.485-5.495 mm

(0.2159-0.2163 in.)

C Service Limit: 5.455 mm (0.2148 in.)

Exhaust Valve Dimensions

A Standard (New): 29.90-30.10 mm

(1.177-1.185 in.)

B Standard (New): 113.90-114.50 mm

(4.484-4.508 in.)

C Standard (New): 5.450-5.460 mm

(0.2146-0.2150 in.)

C Service Limit: 5.420 mm (0.2134 in.)

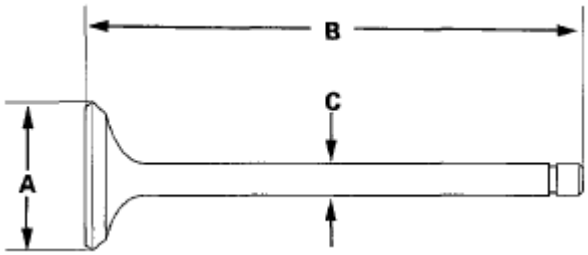


Fig. 132: Identifying Valve Dimensions
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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): 0.04-0.09 mm

(0.002-0.004 in.)

Service Limit: 0.16 mm (0.006 in.)

Exhaust Valve Stem-to-Guide Clearance

Standard (New): 0.11-0.16 mm

(0.004-0.006 in.)

Service Limit: 0.22 mm (0.009 in.)

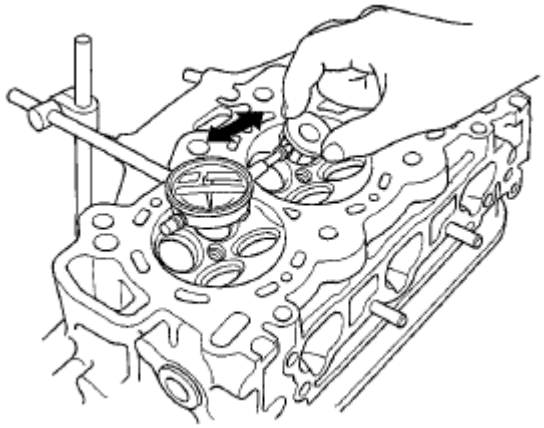


Fig. 133: Measuring Guide-To-Stem Clearance With Dial Indicator
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Intake Valve Stem-to-Guide Clearance

Standard (New): 0.020-0.045 mm

(0.0008-0.0018 in)

Service Limit: 0.08 mm (0.003 in)

Exhaust Valve Stem-to-Guide

Clearance

Standard (New): 0.055-0.080 mm

(0.0022-0.0031 in)

Service Limit: 0.11 mm (0.004 in)

VALVE GUIDE REPLACEMENT

SPECIAL TOOLS REQUIRED

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

1. Inspect valve stem-to-guide clearance (see **VALVE STEM-TO-GUIDE CLEARANCE 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 valve guide driver and a conventional hammer.

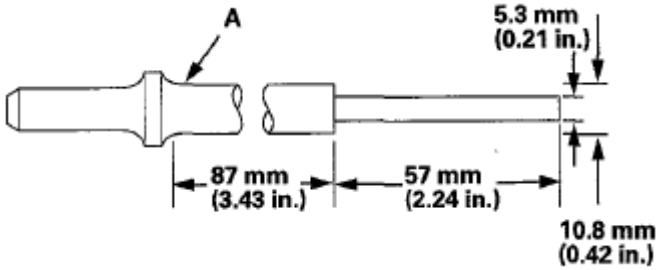


Fig. 134: Identifying Valve Stem-To-Guide Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Select the proper replacement guides, and chill them in the freezer section of a refrigerator for at least 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.

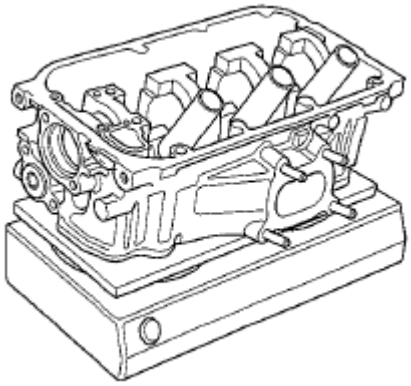


Fig. 135: Heating Cylinder Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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.

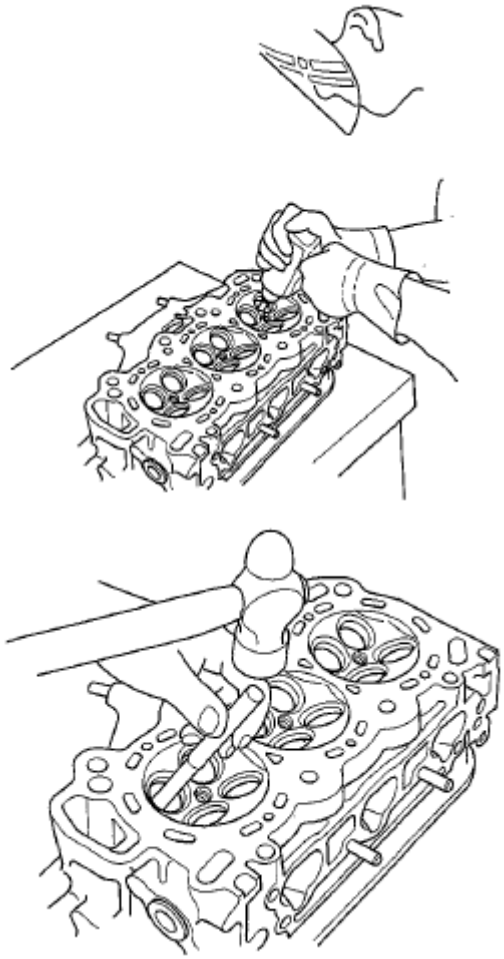


Fig. 136: Grinding Valve Seat
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. If a valve guide still won't move, drill it out with a 8 mm (0.3 in.) bit, then try again.

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

8. Remove the new guide(s) from the freezer, one at a time, as you need them.
9. Apply a thin coat of new engine oil to the outside of the new valve guide. Install the guide from the camshaft side of the head; use the valve guide driver, 5.35x9.7 mm to drive the guide to the specified installed height (A) of the guide (B). If you have all 12 guides to do, you may have to reheat the head.

Valve Guide Installed Height

Intake: 21.20-22.20 mm (0.8346-0.8740 in)

Exhaust: 20.60-21.60 mm (0.811-0.8504 in)

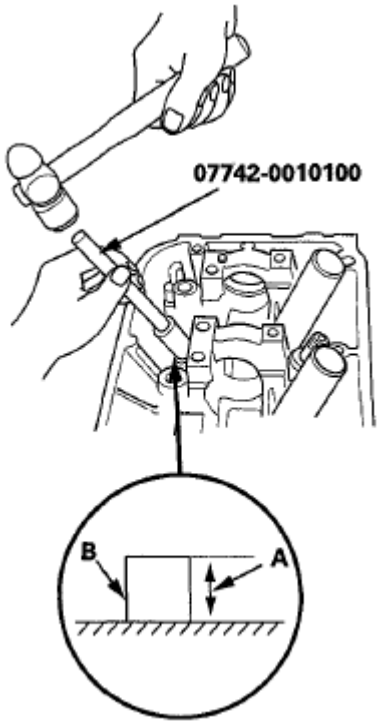


Fig. 137: Identifying Valve Guide Installation Position
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Coat both the valve guide reamer, 5.5 mm and the valve guide with cutting oil.
11. Rotate the valve guide reamer clockwise the full length of the valve guide bore.

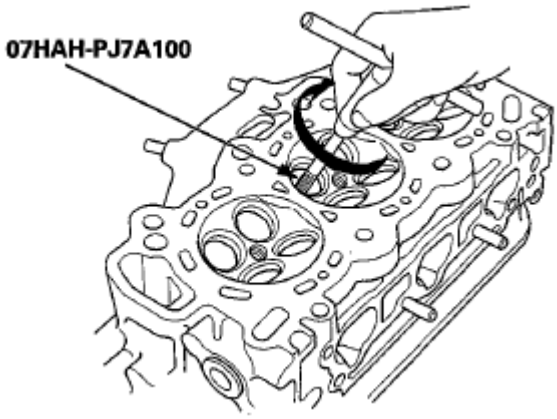


Fig. 138: Grinding Valve Guide Seat With Valve Guide Reamer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Continue to rotate the valve guide reamer clockwise while removing it from the bore.
13. Thoroughly wash the guide with detergent and water to remove any cutting residue.
14. Check the clearance with a valve (see **VALVE STEM-TO-GUIDE CLEARANCE INSPECTION**). Verify that a valve slides in the intake and exhaust valve guides without sticking.

VALVE SEAT RECONDITIONING

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

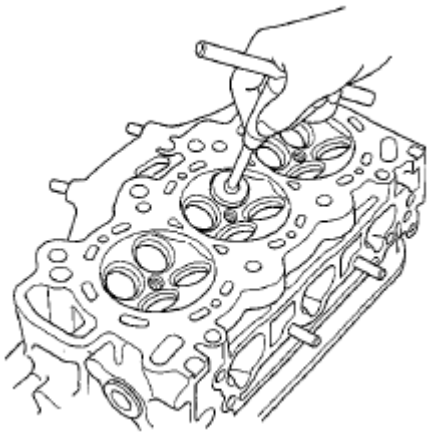


Fig. 139: Cutting Valve Seat
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Carefully cut a 45° seat, removing only enough material to ensure a smooth and concentric seat.
4. Bevel the upper and the lower edges shown in the illustration below. Check the width of the seat and adjust accordingly.

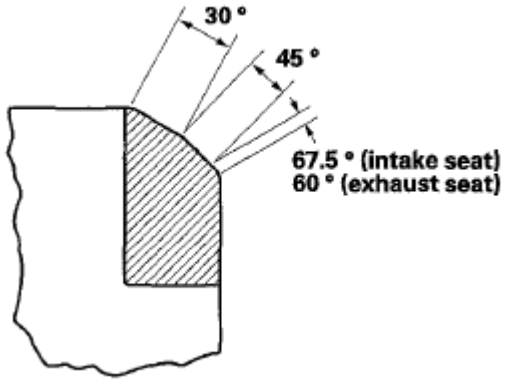


Fig. 140: Checking Width Of Seat & Adjust Accordingly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Valve Seat Width

Standard (New): 1.25-1.55 (0.049-0.061)

Service Limit: 2.00 mm (0.079 in)

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

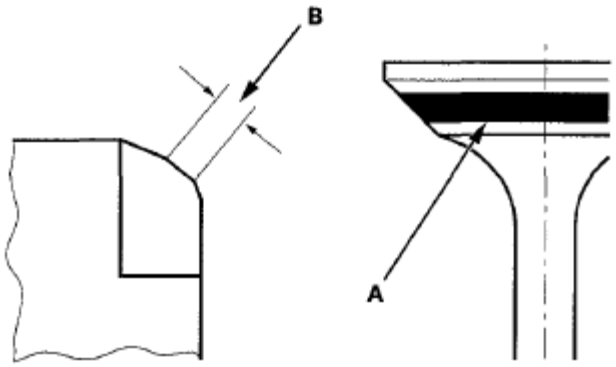


Fig. 141: Identifying Valve Seating Surface
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. The actual valve seating surface (B), as shown by the blue compound, should be centered on the seat.
   - If it is too high (closer to the valve stem), you must make a second cut with the 67.5° cutter (intake seat) or the 60° cutter (exhaust seat) to move it down, then one more cut with the 45° cutter to restore seat width.
   - If it is too low (closer to the valve edge), you must make a second cut with the 30° cutter to move it up, then one more cut with the 45° cutter to restore seat width.

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

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

Intake Valve Stem Installed Height

Standard (New): 46.75-47.55 mm

(1.8405 - 1.8720 in)

Service Limit: 47.80 mm (1.8819 in)

Exhaust Valve Stem Installed Height

Standard (New): 46.68-47.48 mm

(1.8378-1.8693 in)

Service Limit: 47.73 mm (1.8791 in)

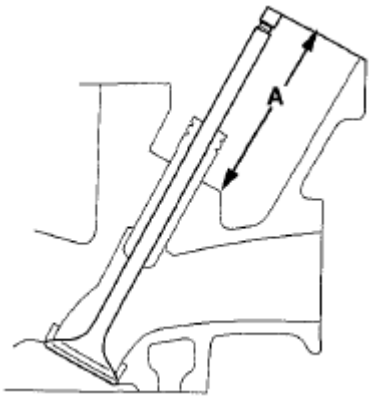


Fig. 142: Identifying Valve Stem Installed Height
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

VALVE, SPRING, AND VALVE SEAL INSTALLATION

SPECIAL TOOLS REQUIRED

- Stem Seal Driver 07PAD-0010000
- Valve Spring Compressor Attachment 07757-PJ1010A

1. Coat the valve stems with new engine oil. Install the valves in the valve guides.
2. Check that the valves move up and down smoothly.
3. Install the spring seats on the cylinder head.
4. Install the new valve seals (A) using the 5.5 mm side of 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.

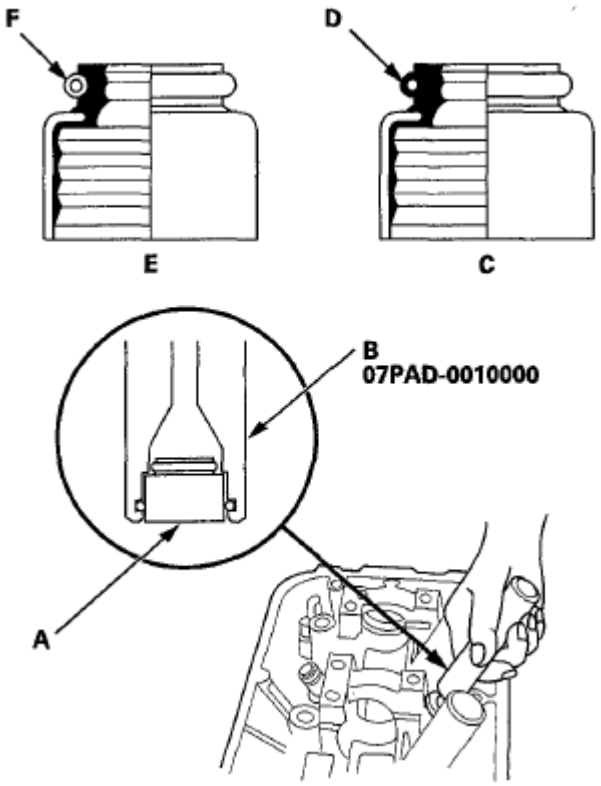


Fig. 143: Identifying Valve Seals
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Install the valve spring and the spring 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 the valve spring compressor. Compress the spring and install the valve cotters.

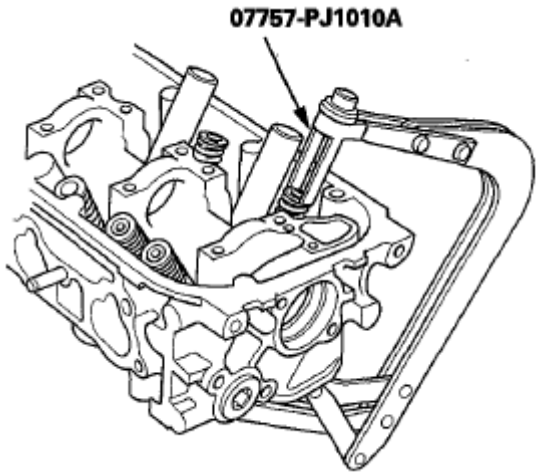


Fig. 144: Identifying Valve Spring Compressor Attachment
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the valve spring compressor and the valve spring compressor attachment, then remove the spring retainer, the valve spring, and the valve.
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.

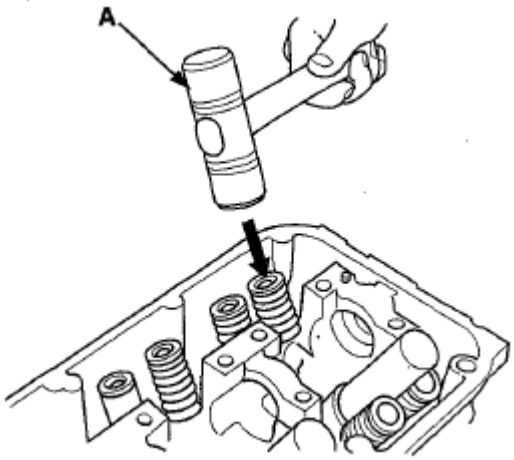


Fig. 145: Tapping Valve Stem
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CAMSHAFT, ROCKER ARM ASSEMBLY, CAMSHAFT SEAL, AND PULLEY INSTALLATION

FRONT

1. Loosen the locknuts and the adjusting screws.
2. Clean and dry the camshaft oil seal housing.
3. Apply a light coat of new engine oil to the lip of the camshaft oil seal.
4. Gently tap the new camshaft oil seal (A) into the cylinder head.
    1. Tap the camshaft oil seal in squarely.
    2. Install the oil seal about 0.5-1.5 mm (0.02-0.06 in.) below the surface of the cylinder head.

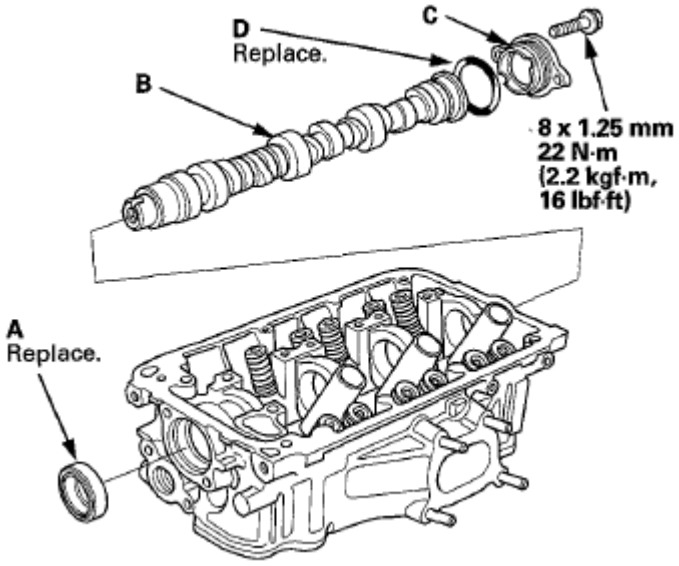


Fig. 146: Identifying Camshaft, Camshaft Thrust Cover & O-Ring With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Insert the camshaft (B) into the cylinder head, then install the camshaft thrust cover (C). Always use a new O-ring (D). Apply new engine oil to the journals and the cam lobes.
6. Clean the excess grease off the camshaft, check the oil seal lip is not distorted.
7. If the rocker arm assembly is disassembled, reassemble the rocker arm assembly (see **ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY**).Remove all of the old liquid gasket from the rocker shaft holder and the cylinder head.
8. Remove all of the old liquid gasket from the rocker shaft holder and the cylinder head.
9. Apply liquid gasket, P/N 08717-0004,08718-0001, 08718-0003, or 08718-0009, evenly to the rocker shaft holder mating surface of the cylinder head. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

- **Apply a 2.5 mm (0.10 in) diameter bead of liquid gasket along the broken line (A).**
- **If you apply liquid gasket P/N 08718-0012, the component must be installed within 4 minutes.**
- **If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply the new liquid gasket.**

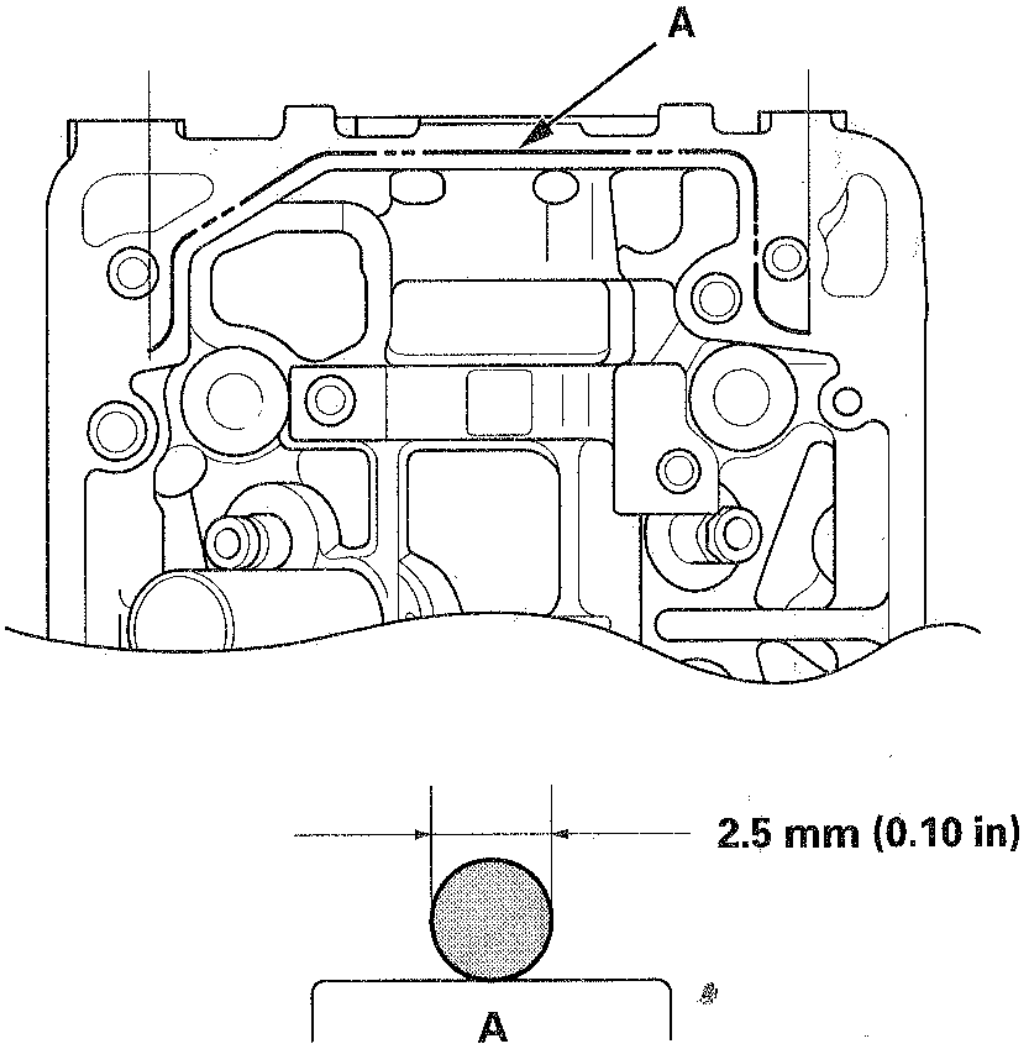


Fig. 147: Identifying Liquid Gasket Applying Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Set the rocker arm assembly in place, and loosely install the bolts. Make sure that the rocker arms are properly positioned on the valve stems.

NOTE:

- **Wait at least 30 minutes before filling the engine with oil.**
- **Do not run the engine for at least 3 hours after installing the rocker arm assembly.**

11. Tighten each bolt two turns at a time in the sequence as shown to ensure that the rockers do not bind on the valves.

Specified Torque

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

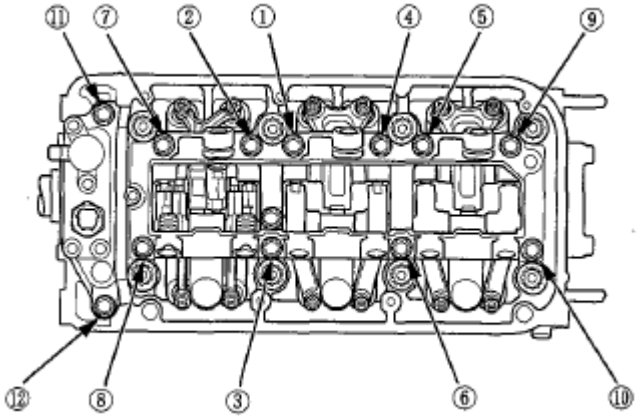


Fig. 148: Identifying Cylinder Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Install the injector base (A) using a new gasket (B).

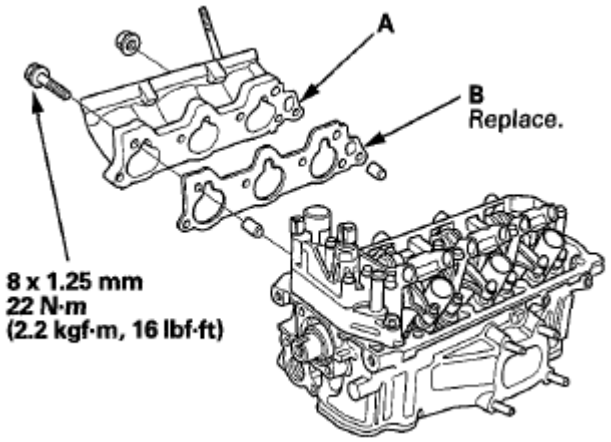


Fig. 149: Identifying Injector Base & Gasket With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Apply new engine oil to the threads of the camshaft pulley mounting bolt (A). Install the back cover (B), then install the camshaft pulley (C).

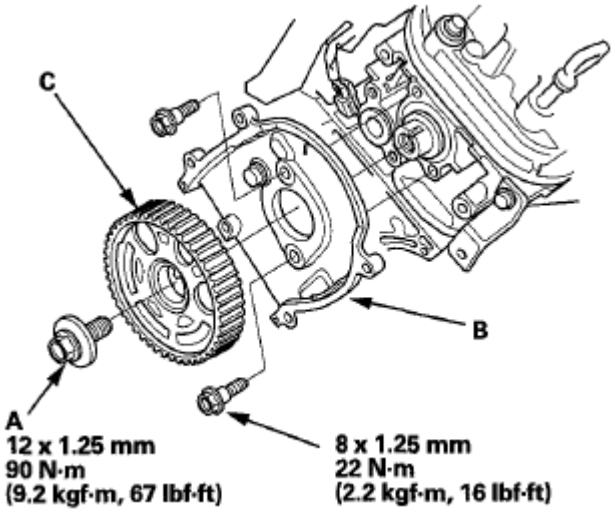


Fig. 150: Identifying Camshaft Pulley Mounting Bolt & Back Cover With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Set the camshaft pulleys to top dead center (TDC) before bolting them onto the engine block (see step 6).

REAR

1. Loosen the locknuts and the adjusting screws.
2. Clean and dry camshaft housing.
3. Apply a light coat of new engine oil around the camshaft oil seal, then gently tap the new camshaft oil seal (A) into the cylinder head.
4. Gently tap the new camshaft oil seal (A) into the cylinder head.
    1. Tap the camshaft oil seal in squarely.
    2. Install the oil seal about 0.5-1.5 mm (0.02-0.06 in.) below the surface of the cylinder head.

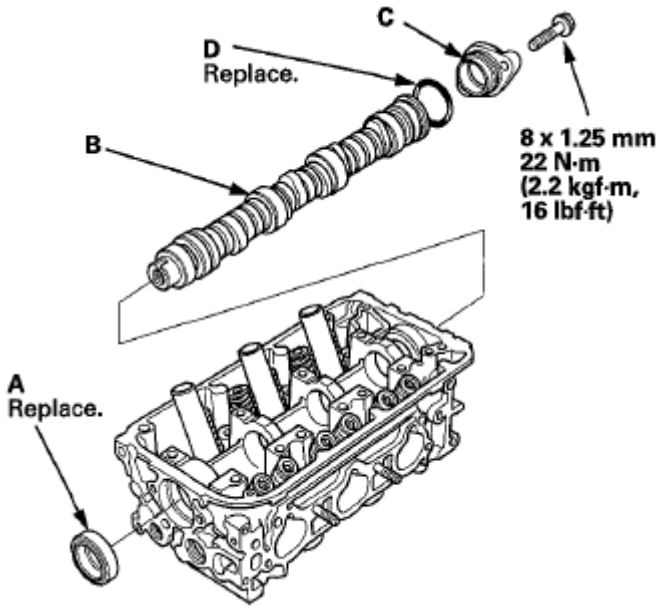


Fig. 151: Identifying Camshaft, Cylinder Head & Camshaft Oil Seal With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Insert the camshaft (B) into the cylinder head, then install the camshaft thrust cover (C) using a new O-ring (D). Apply new engine oil to the journals and the cam lobes.
6. Clean the excess grease off the camshaft, check the oil seal lip is not distorted. Check that the oil seal lips are not distorted.
7. If the rocker arm assembly is disassembled, reassemble the rocker arm assembly (see **ROCKER ARM AND SHAFT DISASSEMBLY/REASSEMBLY**).
8. Remove all of the old liquid gasket from the rocker shaft holder and the cylinder head.
9. Apply liquid gasket, P/N 08717-0004,08718-0001, 08718-0003, or 08718-0009, evenly to the rocker shaft holder mating surface of the cylinder head. Install the component within 5 minutes of applying the liquid gasket.

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 the new liquid gasket.**

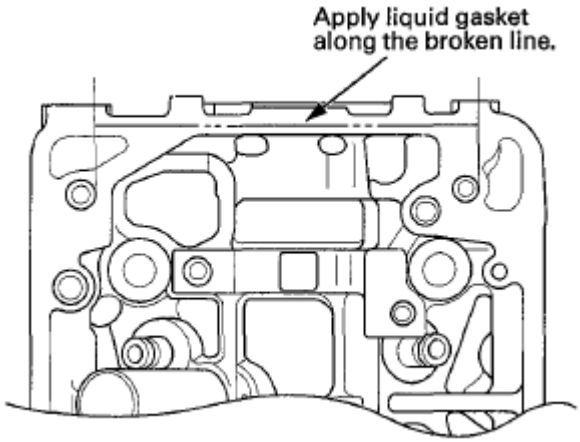


Fig. 152: Identifying Liquid Gasket Applying Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Set the rocker arm assembly in place, and loosely install the bolts. Make sure that the rocker arms are properly positioned on the valve stems.

NOTE:

- **Wait at least 30 minutes before filling the engine with oil.**
- **Do not run the engine for at least 3 hours after installing the rocker arm assembly.**

11. Tighten each bolt two turns at a time in the sequence shown below to ensure that the rockers do not bind on the valves.

Specified Torque

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

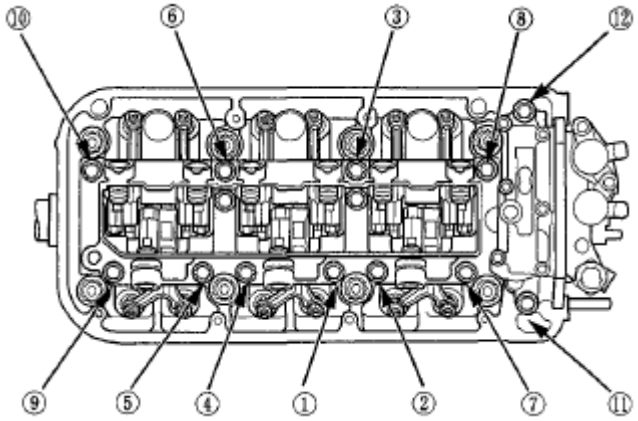


Fig. 153: Identifying Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Install the injector base (A) using a new gasket (B). Apply new engine oil to the threads of the camshaft pulley mounting bolt (A).

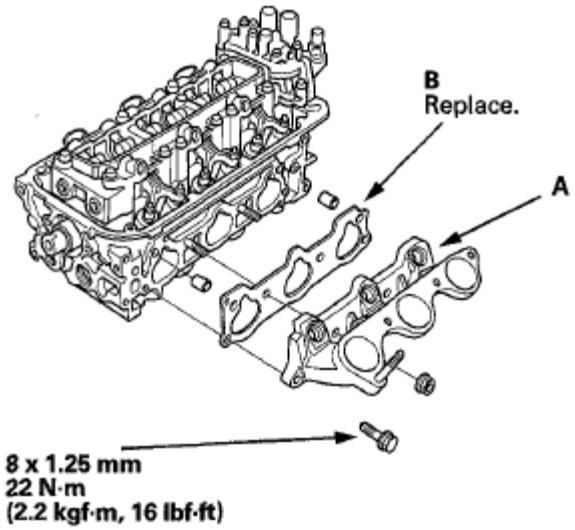


Fig. 154: Identifying Injector Base & Gasket With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Apply new engine oil to the thread of the camshaft pulley mounting bolt (A). Install the back cover (B), then install the camshaft pulley (C).

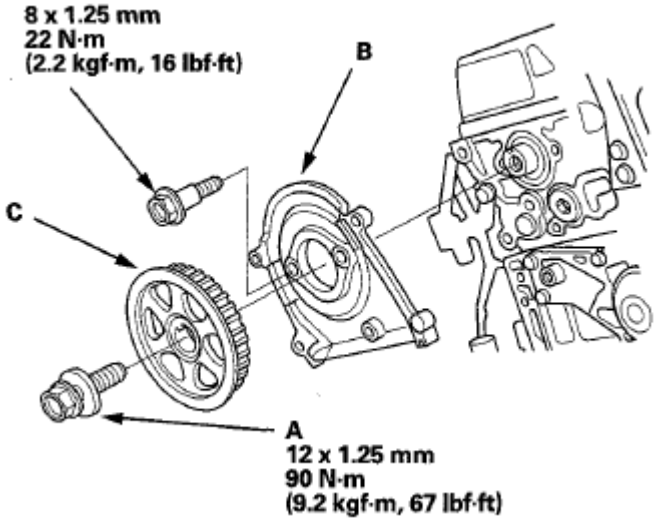


Fig. 155: Identifying Camshaft Pulley Mounting Bolt & Back Cover With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

14. Set the camshaft pulleys to TDC before bolting them onto the engine block (see step 6).

CYLINDER HEAD INSTALLATION

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

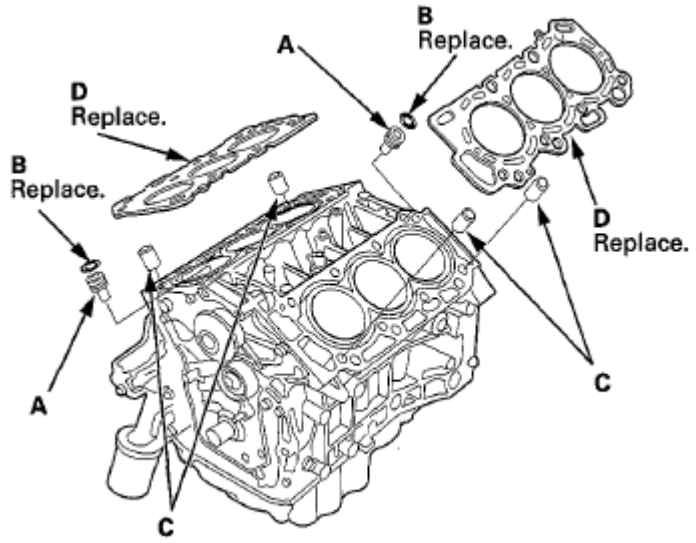


Fig. 156: Identifying Dowel Pins & Cylinder Head Gaskets With O-Ring
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

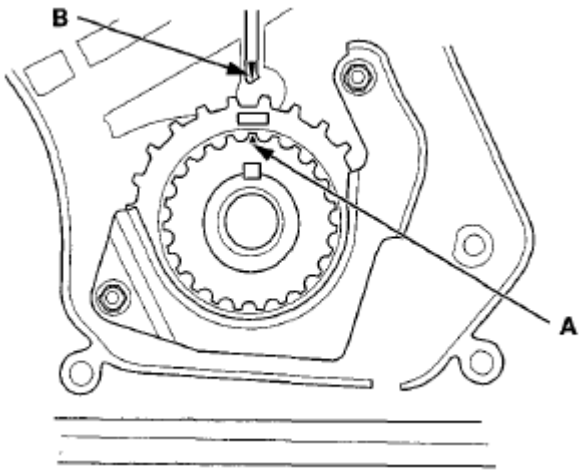


Fig. 157: Aligning TDC Mark On Tooth Of Timing Belt Drive Pulley With Pointer On Oil Pump
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

FRONT

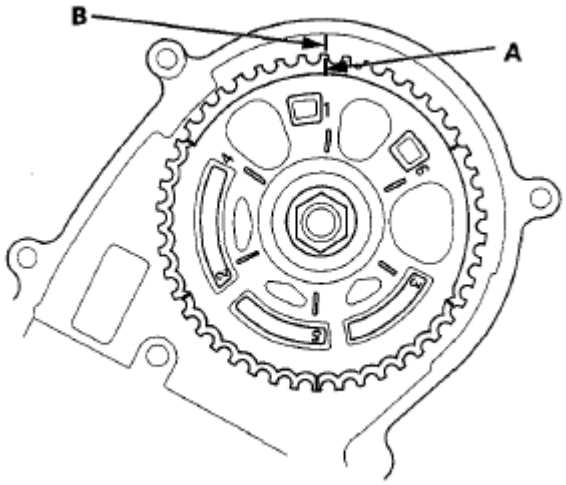


Fig. 158: Aligning TDC Marks On Front Camshaft Pulleys With Pointers On Back Covers
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

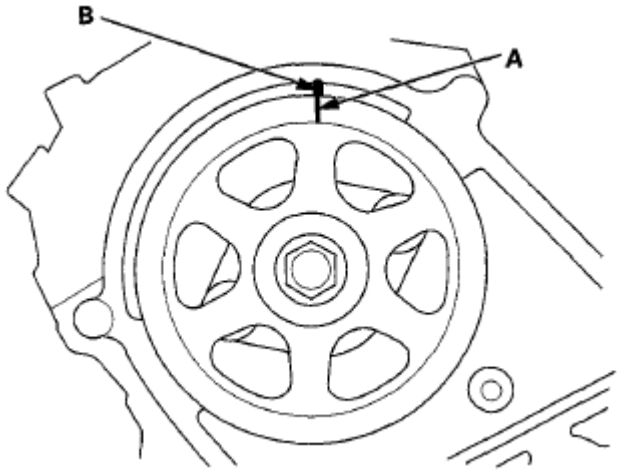


Fig. 159: Aligning TDC Marks On Rear Camshaft Pulleys With Pointers On Back Covers
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Put the cylinder head onto the engine block.
8. Measure the diameter of each cylinder head bolt at point A and point B.

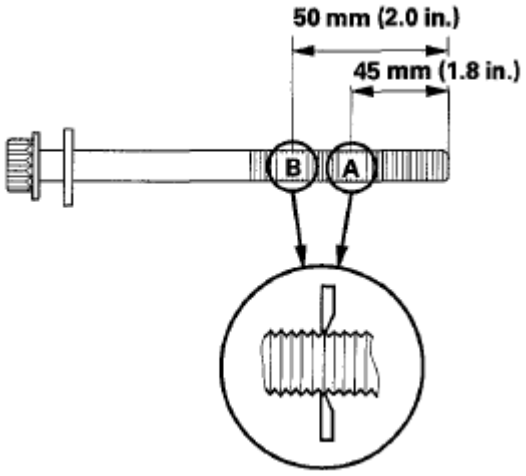


Fig. 160: Measuring Diameter Of Cylinder Head Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. If either diameter is less than 10.6 mm (0.42 in.), replace the cylinder head bolt.
10. Apply new engine oil to the threads and under the bolt heads of all cylinder head bolts.
11. Torque the cylinder head bolts in sequence to 29 N.m (3.0 kgf.m, 22 lbf.ft) using a beam-type torque wrench. When using a preset click-type torque wrench, be sure to torque slowly and do not over tighten. If a bolt makes any noise while you are torquing it, loosen the bolt and retighten it from the first step.

Front

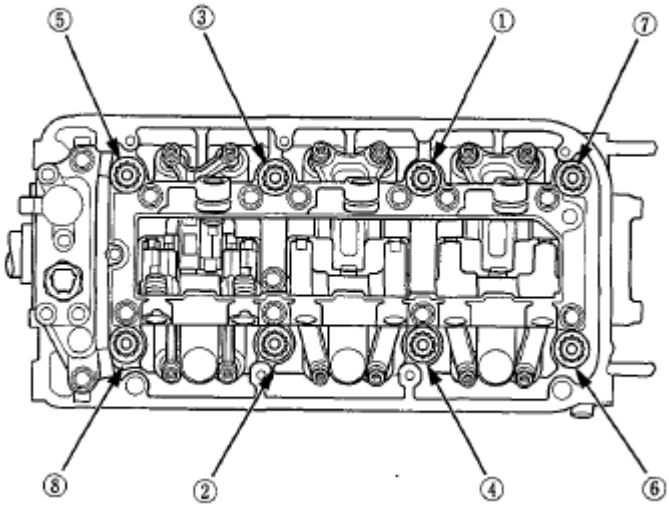


Fig. 161: Identifying Front Cylinder Head Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Rear

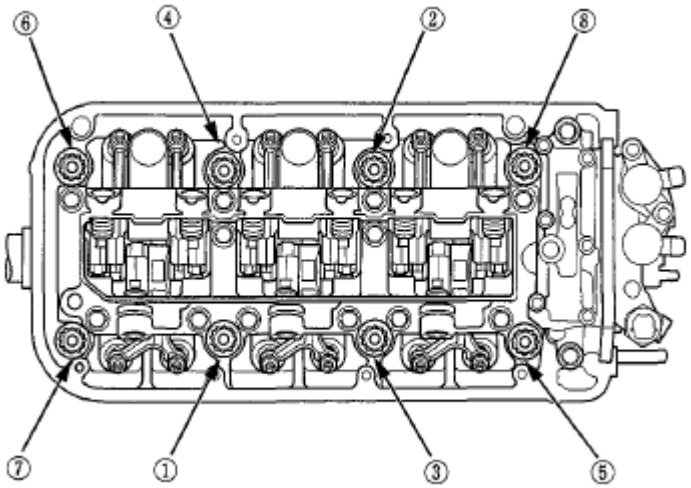


Fig. 162: Identifying Rear Cylinder Head Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

NOTE: Remove the cylinder head 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.

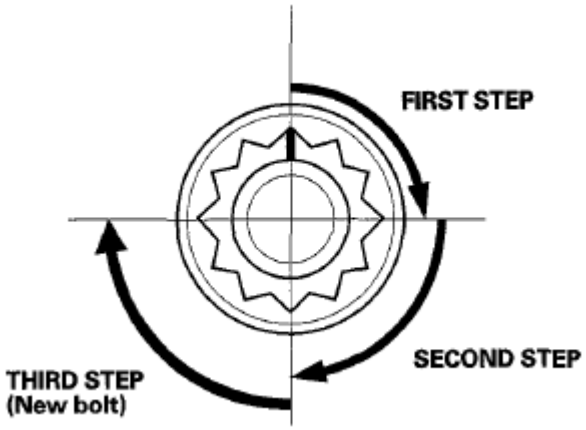


Fig. 163: Identifying Cylinder Head Bolt Tightening Angle Position
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Install the timing belt (see **TIMING BELT INSTALLATION**).
14. Adjust the valve clearance (see **VALVE CLEARANCE ADJUSTMENT**).
15. Install the cylinder head covers (see **CYLINDER HEAD COVER INSTALLATION**).
16. Install the water passage (see **WATER PASSAGE REPLACEMENT**).
17. Install the injector bases (see **INJECTOR BASE REMOVAL AND INSTALLATION**).

18. Install the connector bracket (A) to the front cylinder head.

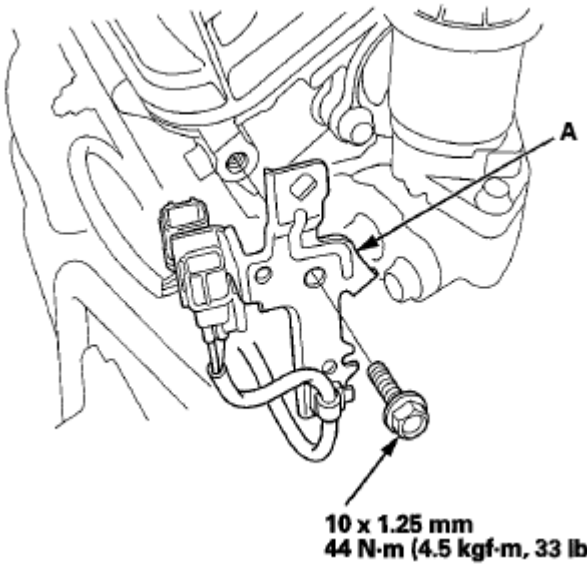


Fig. 164: Identifying Connector Bracket With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Install the harness clamp bracket (A) to the rear cylinder head.

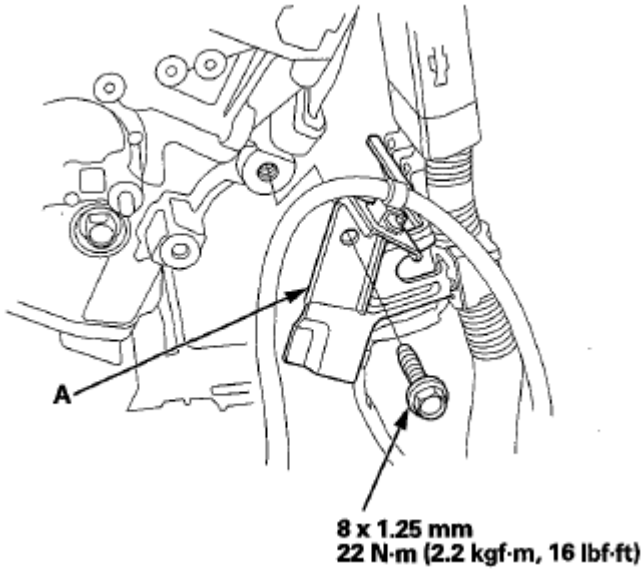


Fig. 165: Identifying Harness Clamp Bracket With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

20. Connect the fuel feed hose (A) (see **FUEL LINE/QUICK-CONNECT FITTING INSTALLATION**), then install the quick-connect fitting cover (B).

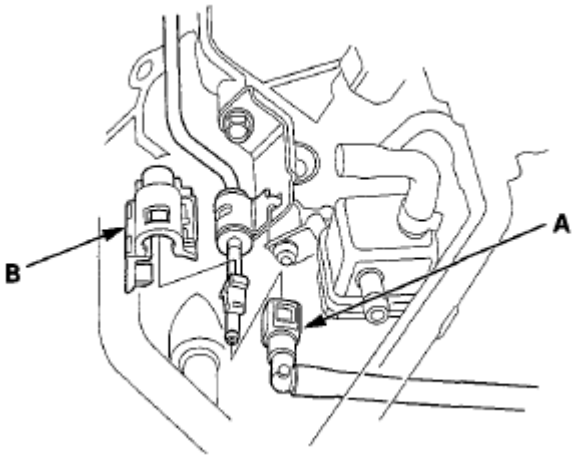


Fig. 166: Identifying Fuel Feed Hose & Quick-Connect Fitting Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

21. Install the front warm up three way catalytic converter (front WU-TWC) (see **FRONT**) and the rear warm up three way catalytic converter (rear WU-TWC) (see **REAR**).
22. Connect the following engine wire harness connectors, and install the wire harness clamps to the cylinder head:
    - Six injector connectors
    - Engine coolant temperature (ECT) sensor 1 connector
    - Front rocker arm oil pressure switch connector
    - Rear rocker arm oil pressure switch connector
    - Camshaft position (CMP) sensor connector
    - Front air fuel ratio (A/F) (sensor 1) connector
    - Rear air fuel ratio (A/F) (sensor 1) connector
    - Front secondary heated oxygen (sensor 2) (secondary HO2S) connector
    - Rear secondary heated oxygen (sensor 2) (secondary HO2S) connector
    - Rocker arm oil control solenoid A (BANK 1) connector
    - Rocker arm oil control solenoid A (BANK 2) connector
    - Rocker arm oil control solenoid B (BANK 1) connector
    - Knock sensor connector
23. Install the six ignition coils (see **IGNITION COIL REMOVAL/INSTALLATION**).
24. Install the intake manifold (see **INTAKE MANIFOLD REMOVAL AND INSTALLATION**).
25. Install the alternator (see **INSTALLATION**).
26. Install the power steering (P/S) pump (A) and tighten the bolt (B) securing the P/S hose bracket.

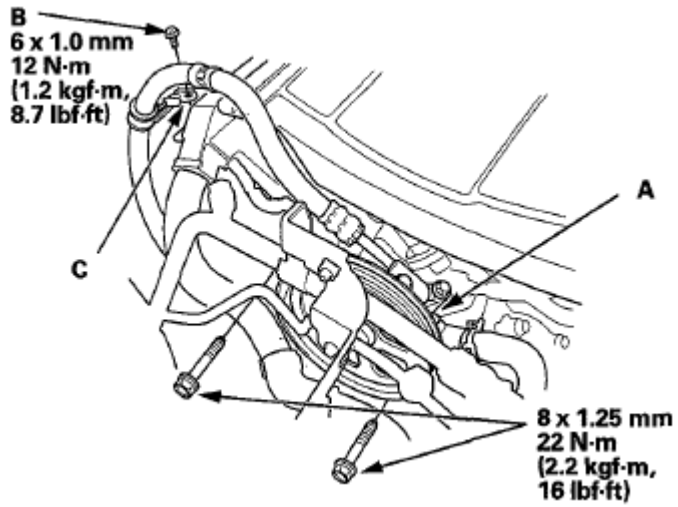


Fig. 167: Identifying Power Steering (P/S) Pump & Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

27. Install the drive belt (see **DRIVE BELT REPLACEMENT**).
28. Do the battery installation procedure (see **BATTERY REMOVAL AND INSTALLATION**).
29. Install the air intake duct (see **FRONT BULKHEAD COVER REPLACEMENT**).
30. After installation, check that all tubes, hoses, and connectors are installed correctly.
31. Inspect for fuel leaks. Turn the ignition switch to ON (II) (do not operate the starter) so the fuel pump runs for about 2 seconds and pressurizes the fuel line. Repeat this operation three times, then check for fuel leakage at any point in the fuel line.
32. Refill the radiator with engine coolant (see step 11 on **COOLANT REPLACEMENT**), and bleed the air from the cooling system with the heater valve open.
33. Check for fluid leaks.
34. Do the powertrain control module (PCM) idle learn procedure (see **PCM IDLE LEARN PROCEDURE**).
35. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see **CKP PATTERN CLEAR/CKP PATTERN LEARN**).
36. Inspect the idle speed (see **IDLE SPEED INSPECTION**).
37. Inspect the ignition timing (see **IGNITION TIMING INSPECTION**).

CAMSHAFT OIL SEAL INSTALLATION - IN CAR

SPECIAL TOOLS REQUIRED

Ball Joint Remover/Installer, 07GAF-SD40330

1. Remove timing belt (see **Timing Belt Removal**
2. Remove the camshaft pulley and the back cover (see step 18 on18).
3. Remove the camshaft oil seal.

4. Clean and Dry the camshaft oil seal housing.
5. Apply a light coat of new engine oil around the camshaft oil seal. Apply a light coat of new engine oil to the lip of the camshaft oil seal.
6. Using the ball joint remover/installer (A), a washer (B), and a 12 x 75 x 1.25 mm bolt (C), press in the camshaft oil seal (D) about 0.5-1.5 mm (0.02-0.06 in.) below the surface of the cylinder head.

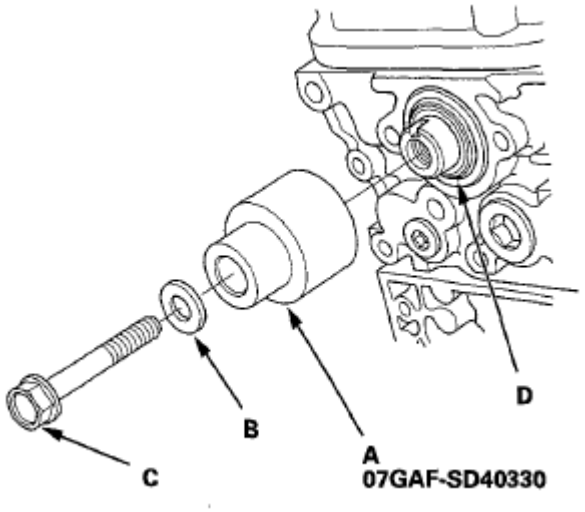


Fig. 168: Identifying Camshaft Oil Seal & Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Clean the excess grease off the camshaft, and check the oil seal lip is not distorted.
8. Apply new engine oil to the threads of the camshaft pulley mounting bolt. Install the back cover, then install the camshaft pulley:
   - Front (see step 13 on13)
   - Rear (see step 13 on13).
9. Install the timing belt (see **Timing Belt Installation**

SEALING BOLT INSTALLATION

NOTE: When installing the sealing bolt (A), use a new washer (B).

FRONT

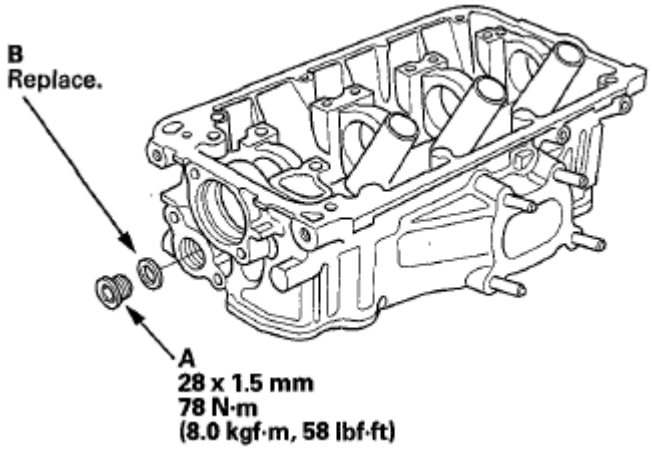


Fig. 169: Identifying Front Sealing Bolt With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR

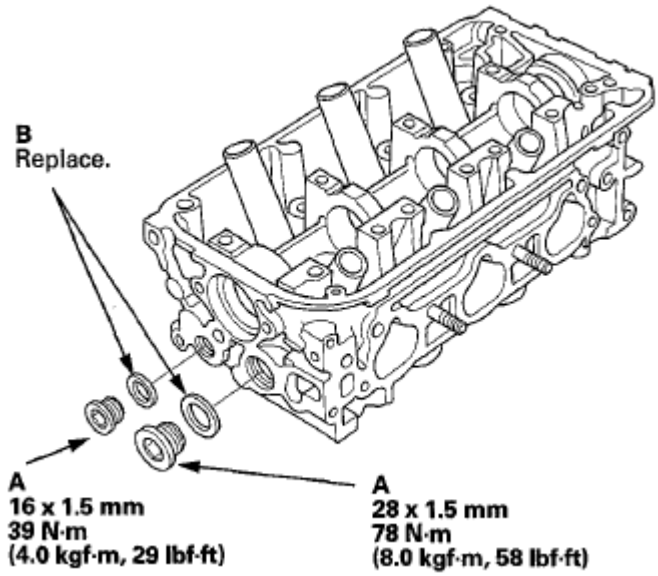


Fig. 170: Identifying Rear Sealing Bolt With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

FRONT ROCKER ARM OIL CONTROL VALVE REPLACEMENT

1. Remove the front rocker arm assembly (see **FRONT**).
2. Remove the front rocker arm oil control valve (A).

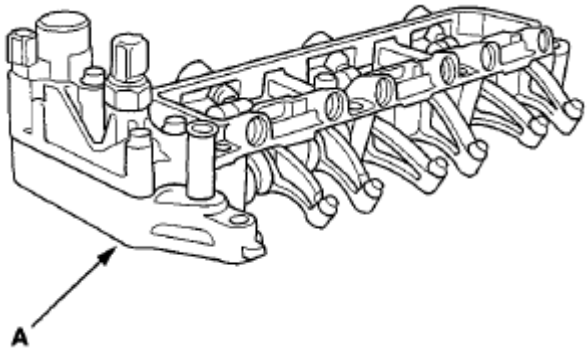


Fig. 171: Identifying Front Rocker Arm Oil Control Valve
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the front rocker arm oil control valve in the reverse order of removal.

REAR ROCKER ARM OIL CONTROL VALVE REPLACEMENT

1. Remove the rear rocker arm assembly (see **REAR**).
2. Remove the rocker arm oil control valve (A).

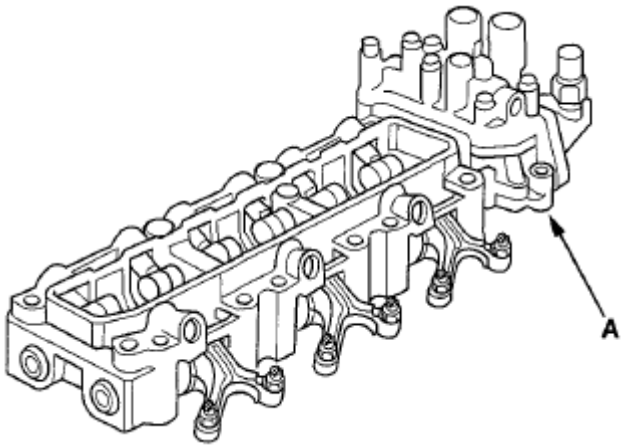


Fig. 172: Identifying Rear Rocker Arm Oil Control Valve
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install the rear rocker arm oil control valve in the reverse order of removal.

2009-11 ENGINE

Engine Block - Pilot

SPECIAL TOOLS

Ref.No.	Tool Number	Description	Qty
①	070AD-RCA0200	Oil Seal Driver Attachment, 106 mm	1
②	07749-0010000	Driver **Handle. 15 x 135L**	1
③	070AD-RCAA100	Oil Seal Driver, 64 mm	1

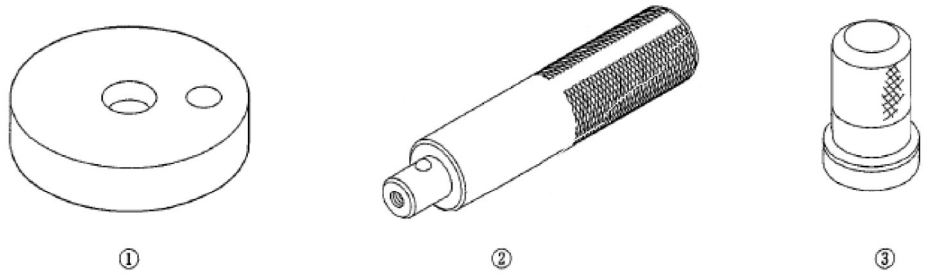


Fig. 1: Identifying Special Tools
Courtesy of AMERICAN HONDA MOTOR CO., INC.

COMPONENT LOCATION INDEX

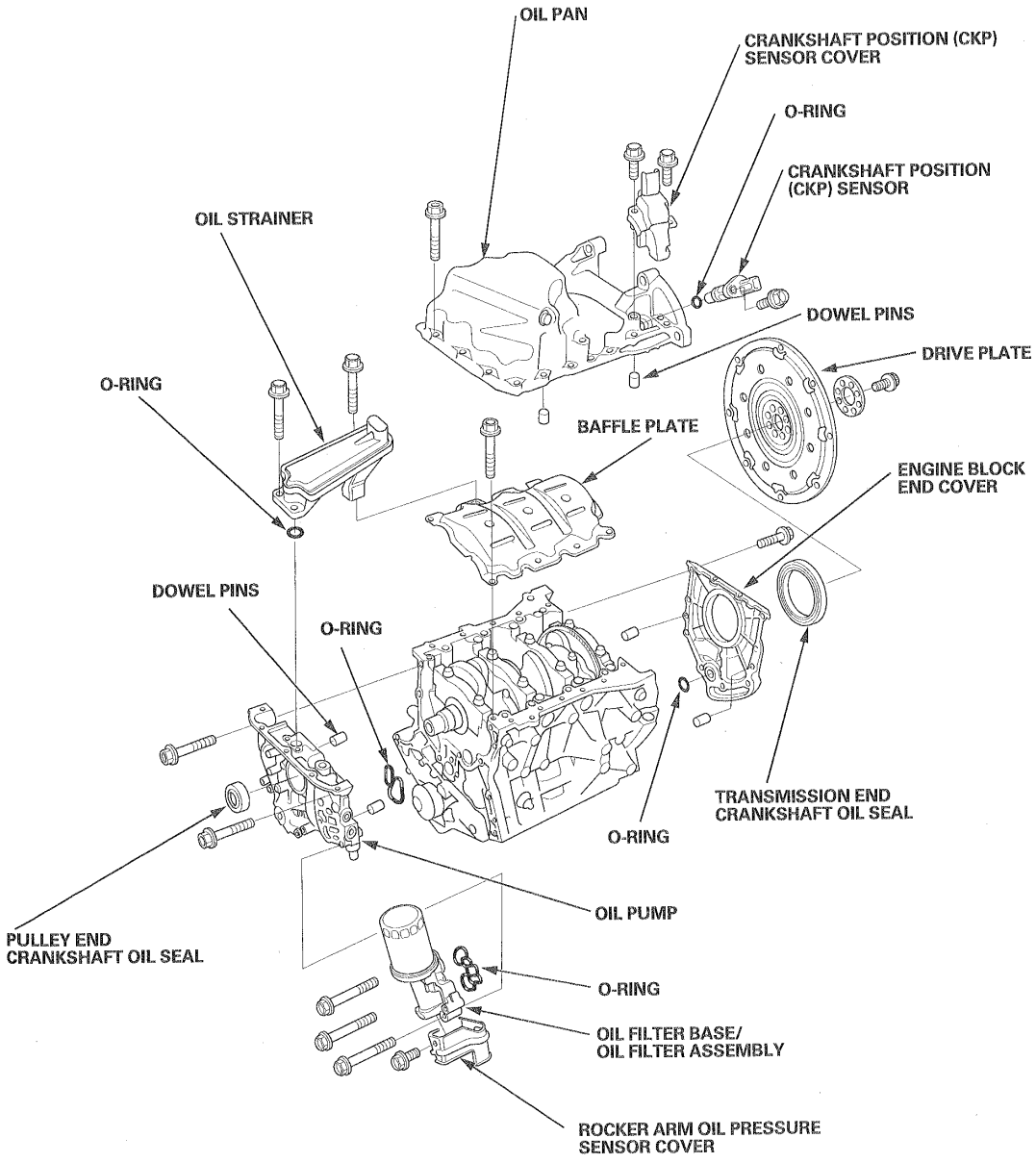


Fig. 2: Identifying Engine Block Replacement Components Location (1 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

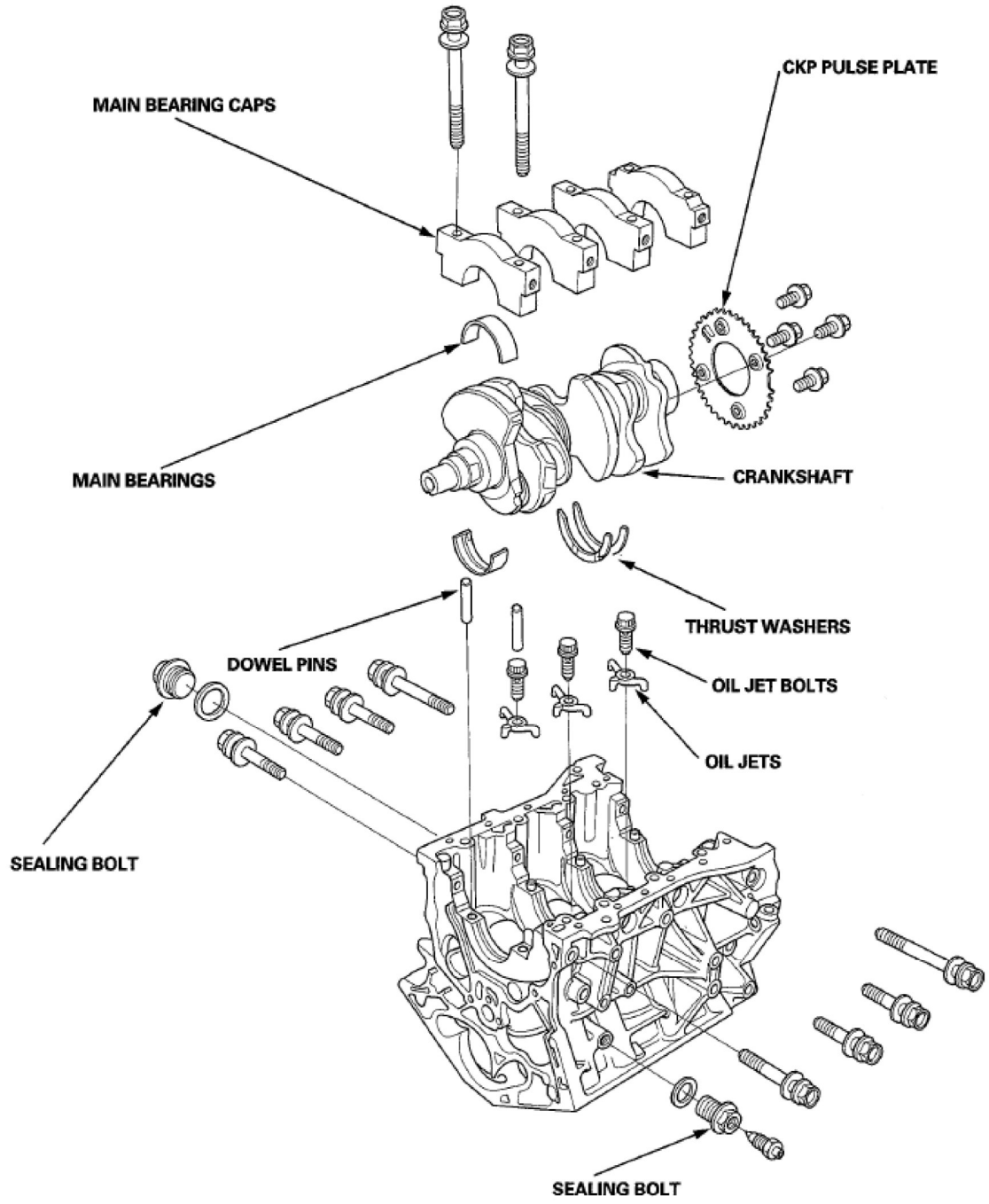


Fig. 3: Identifying Engine Block Replacement Components Location (2 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

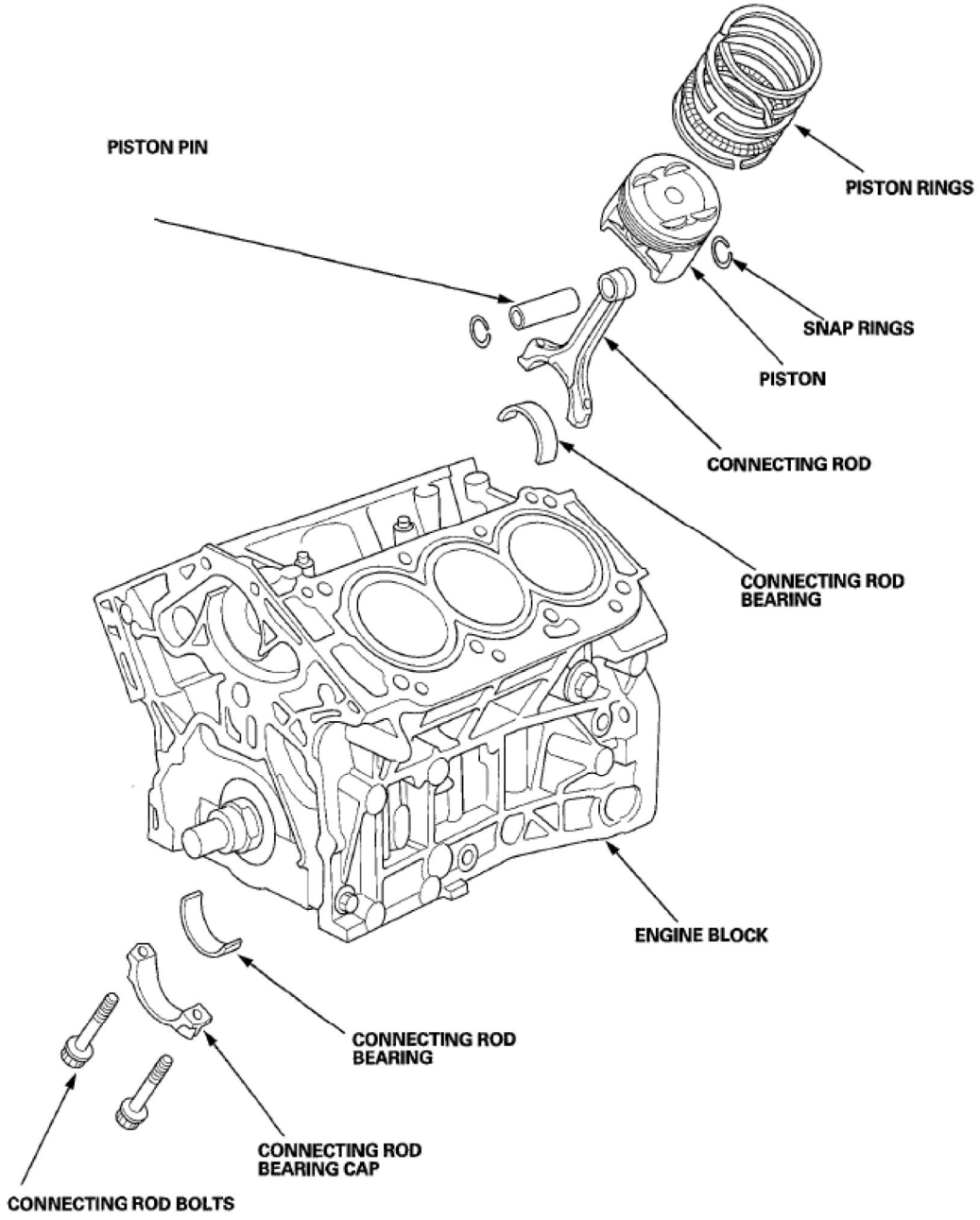


Fig. 4: Identifying Engine Block Replacement Components (3 Of 3)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CONNECTING ROD AND CRANKSHAFT END PLAY INSPECTION

1. Remove the oil pump (see **REMOVAL**).
2. Remove the baffle plate (see step 9).
3. Measure the connecting rod end play with a feeler gauge (A) between the connecting rod (B) and the crankshaft (C).

Connecting Rod End Play

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

Service Limit: 0.45 mm (0.018 in)

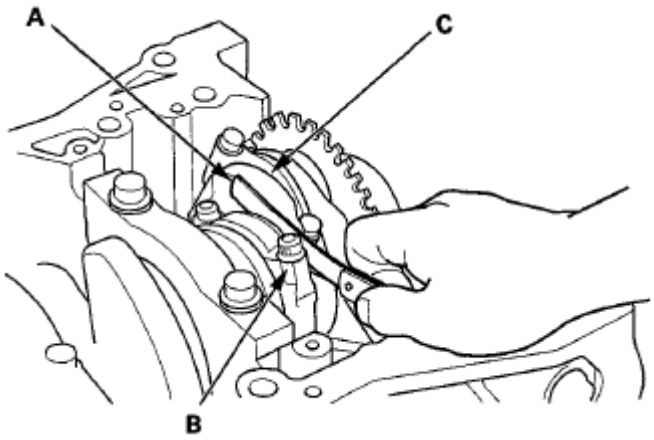


Fig. 5: Measuring Connecting Rod End Play With Feeler Gauge Between Connecting Rod & Crankshaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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)

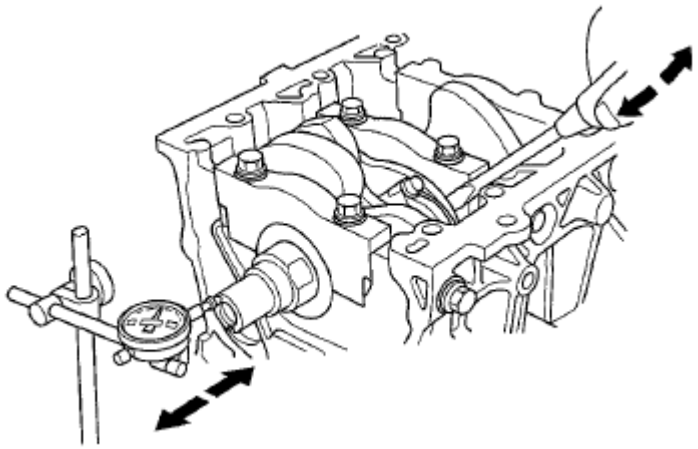


Fig. 6: Measuring Crankshaft End Play
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

CRANKSHAFT MAIN BEARING REPLACEMENT

MAIN BEARING CLEARANCE INSPECTION

1. Remove the main bearing caps and the bearing halves (see step 17 on **CRANKSHAFT AND PISTON REMOVAL**).
2. Clean each main journal and bearing half with a clean shop towel.
3. Place one strip of plastigage across each main journal.

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

4. Reinstall the bearings and the caps, then torque the bearing cap bolts to 74 N.m (7.5 kgf.m, 54 lbf.ft), and the bearing cap side bolts to 49 N.m (5.0 kgf.m, 36 lbf.ft) in the proper sequence. (see step 23 on **CRANKSHAFT AND PISTON INSTALLATION**)

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

5. Remove the caps and the bearing halves, and measure the widest part of the plastigage.

Main Bearing-to-Journal Oil Clearance

Standard (New): 0.019-0.045 mm (0.00075-0.00177 in)

Service Limit: 0.050 mm (0.00197 in)

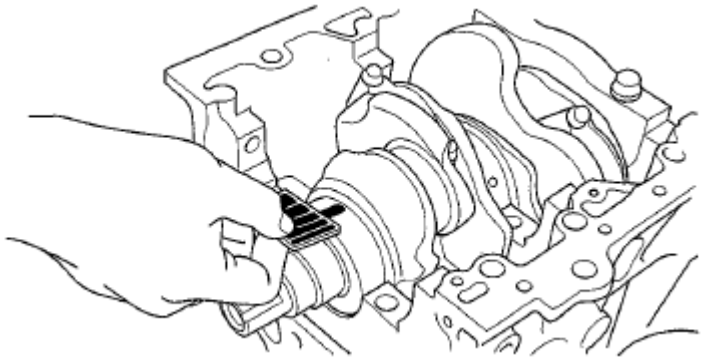


Fig. 7: Measuring Widest Part Of Plastigage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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, and recheck the clearance. Do not file, shim, or scrape the bearings or the caps to adjust clearance.
7. If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below that one), and check clearance again. If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over (see **CRANKSHAFT AND PISTON REMOVAL**).

MAIN BEARING SELECTION

Crankshaft Bore Code Location

Letters or bars have been stamped on the end of the engine block as a code for the size of each of the four main journal bores.

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

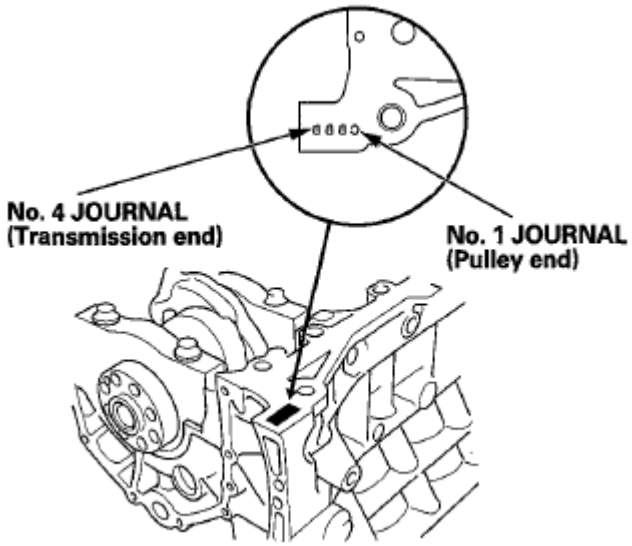


Fig. 8: Identifying Crankshaft Bore Code Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

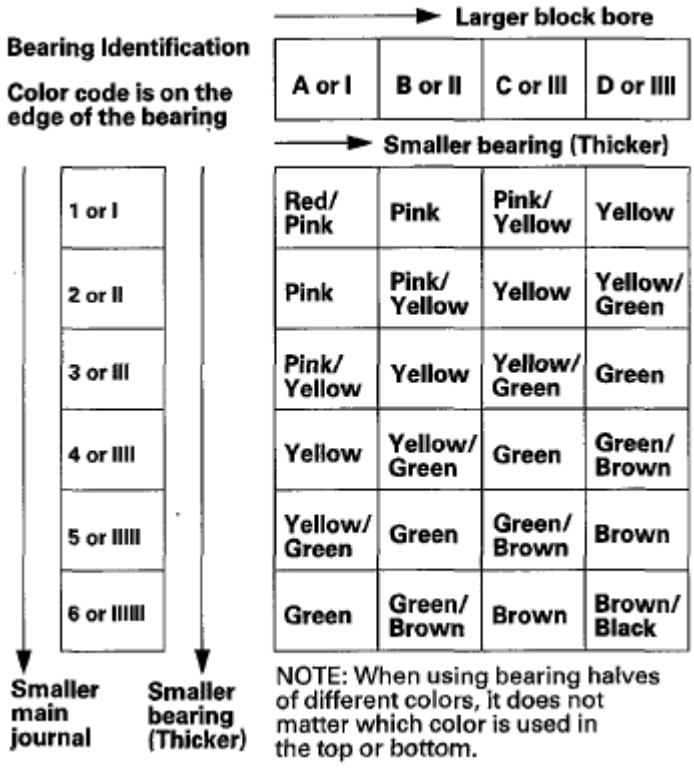


Fig. 9: Identifying Bearing Color Code Table
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Main Journal Code Locations (Numbers or Bars)

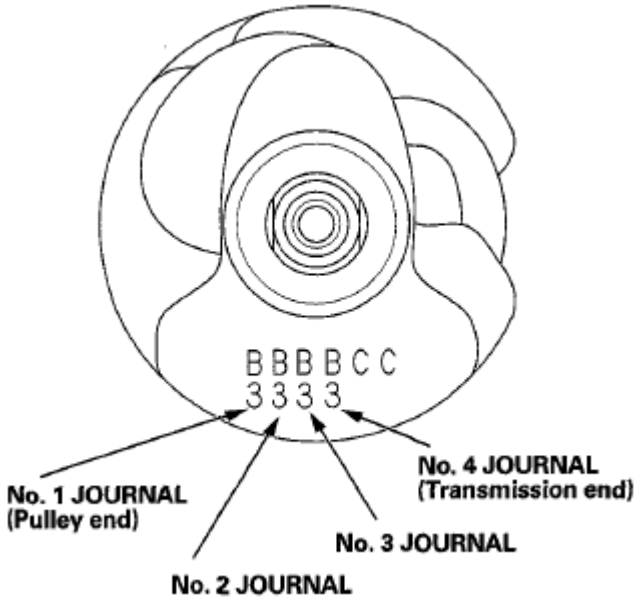


Fig. 10: Identifying Main Journal Code Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CONNECTING ROD BEARING REPLACEMENT

CONNECTING ROD BEARING CLEARANCE INSPECTION

1. Remove the connecting rod cap and the bearing half (see **CRANKSHAFT AND PISTON REMOVAL**).
2. Clean the connecting rod journal and bearing half with a clean shop towel.
3. Place a strip of plastigage across the rod journal.
4. Reinstall the bearing half and the cap, and tighten the connecting rod bolts to 20 N.m (2.0 kgf.m, 15 lbf.ft) +90°.

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

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

Connecting Rod Bearing-to-Journal Oil

Clearance

Standard (New): 0.020-0.044 mm (0.00079-0.00173 in)

Service Limit: 0.050 mm (0.00197 in)

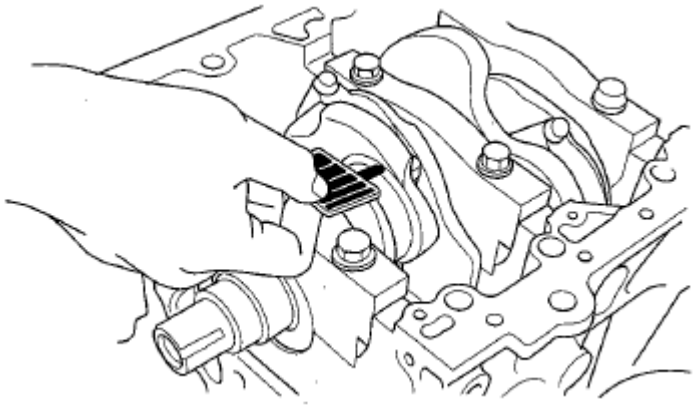


Fig. 11: Measuring Widest Part Of Plastigage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

CONNECTING ROD BEARING SELECTION

Each connecting rod falls into one of four tolerance ranges (from 0 to 0.024 mm (0.0009 in.), 0.006 mm (0.0002 in.) increments) depending on the size of its big end bore.

It's then stamped with a number or bar (1, 2, 3, or 4/I, II, III or IIII) indicating the range. You may find any combination of 1, 2, 3, or 4/I, II, III, or MM in any engine.

Big End Bore Size: 58.0 mm (2.283 in)

Inspect the connecting rod for cracks and heat damage.

Big End Bore Code Locations

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

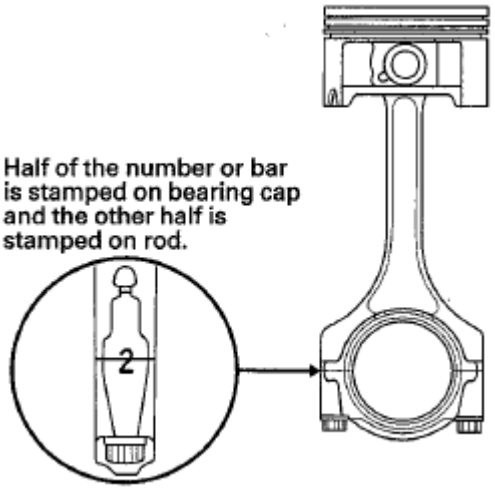


Fig. 12: Identifying Connecting Rod Journal Code Locations
Courtesy of AMERICAN HONDA MOTOR CO., INC.

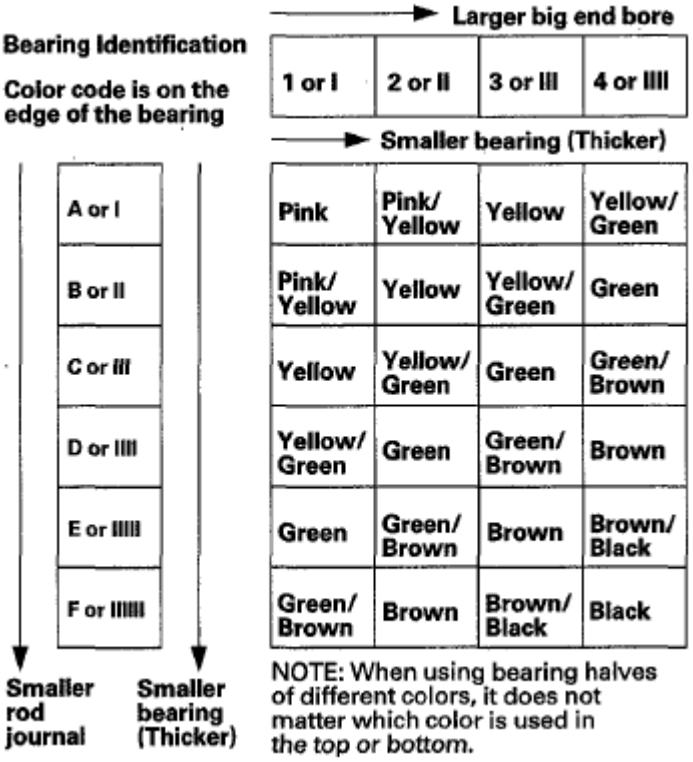


Fig. 13: Identifying Bearing Color Code Table
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Connecting Red Journal Code Locations (Letters or Bars)

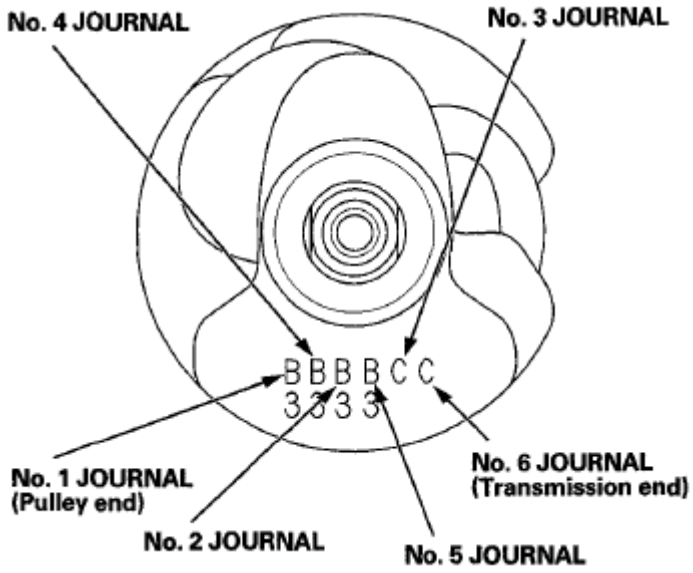


Fig. 14: Identifying Connecting Rod Journal Code Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

OIL PAN REMOVAL

1. If the engine is already out of the vehicle, go to step 6.
2. Raise the vehicle on the lift.
3. Drain the engine oil (see **ENGINE OIL REPLACEMENT**).
4. Remove the front subframe stiffener (see step 31 on **ENGINE REMOVAL**).
5. Remove exhaust pipe A (see step 32 on **ENGINE REMOVAL**).
6. Remove the rear warm up three way catalytic converter (rear WU-TWC) bracket.

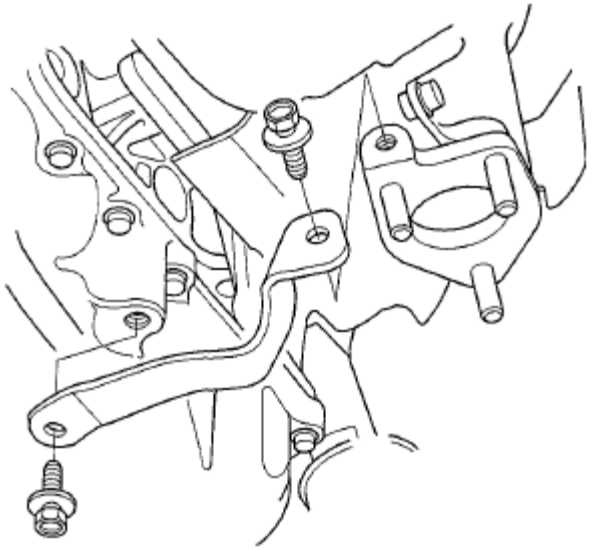


Fig. 15: Identifying Rear Warm Up Three Way Catalytic Converter (Rear WU-TWC) Bracket

Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the crankshaft position (CKP) sensor cover (A) and the bolt (B), then disconnect the CKP sensor connector (C).

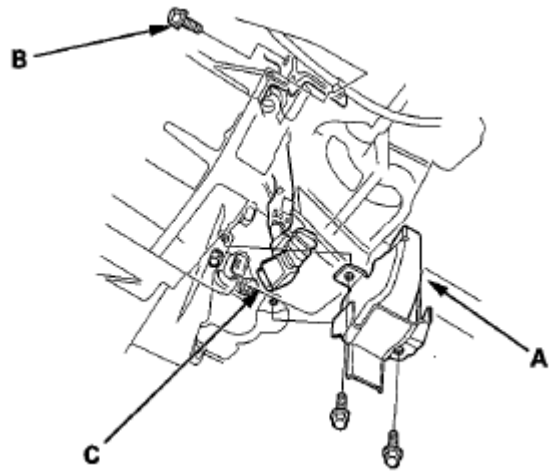


Fig. 16: Identifying CKP Sensor Connector
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Remove the torque converter cover (A) and the four bolts (B) securing the transmission.

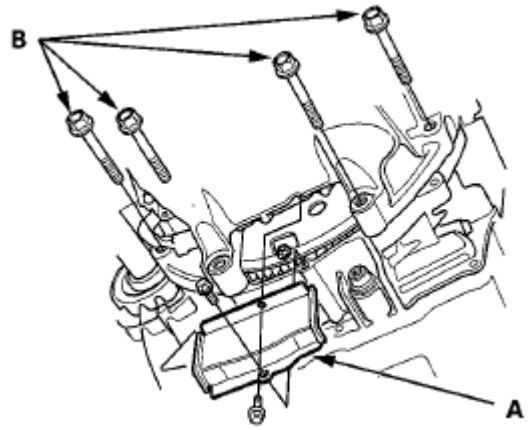


Fig. 17: Identifying Torque Converter Cover Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Remove the bolts securing the oil pan.
10. Using a flat blade screwdriver, separate the oil pan from the engine block in the places shown.

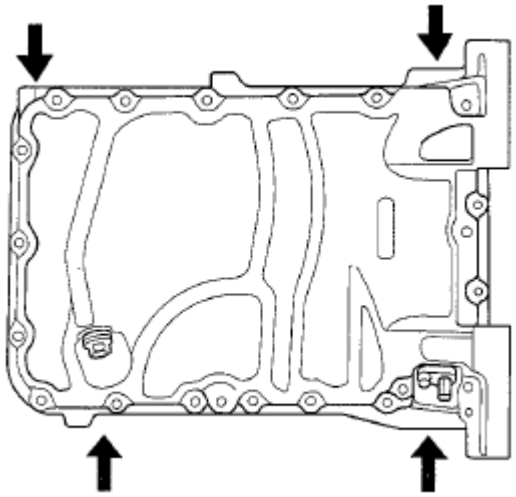


Fig. 18: Locating Oil Pan Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Remove the oil pan.

CRANKSHAFT AND PISTON REMOVAL

1. Remove the engine/transmission (see **ENGINE REMOVAL**).
2. Remove the transmission (see **TRANSMISSION REMOVAL**).
3. Remove the drive plate (see **DRIVE PLATE REMOVAL AND INSTALLATION**).
4. Remove the cylinder heads (see **CYLINDER HEAD REMOVAL**).
5. Remove the timing belt drive pulley from the crankshaft (see **TIMING BELT DRIVE PULLEY REPLACEMENT**).
6. Remove the oil pan (see **OIL PAN REMOVAL**).
7. Remove the engine block end cover.

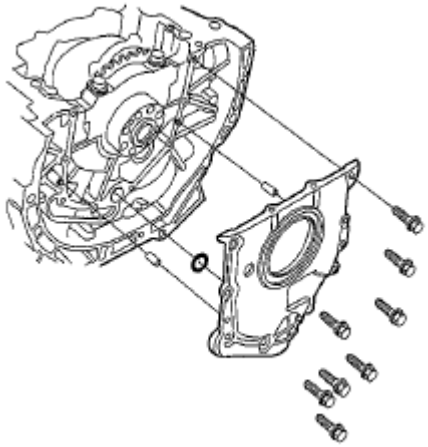


Fig. 19: Identifying Engine Block End Cover Bolts

Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Remove the rocker arm oil pressure sensor cover (A), then remove the oil filter base/oil filter assembly (B).

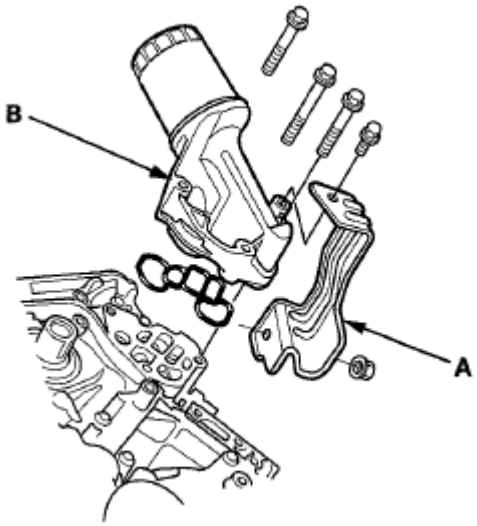


Fig. 20: Identifying Oil Filter Base & Oil Filter Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

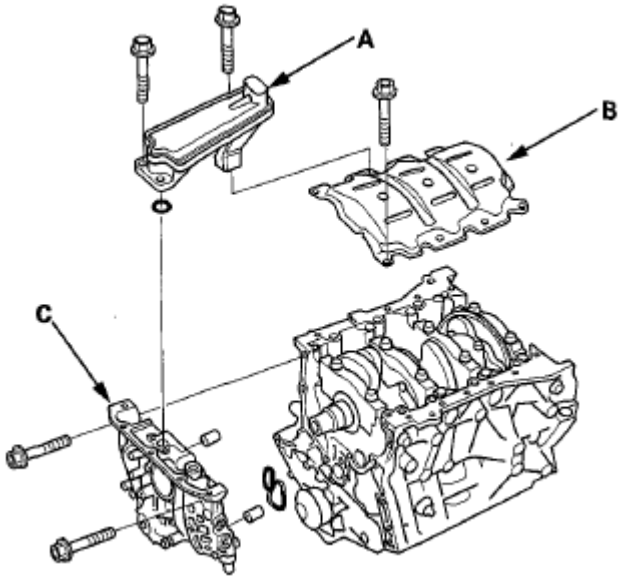


Fig. 21: Identifying Oil Screen, Baffle Plate & Oil Pump
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

piston as it's pushed out.

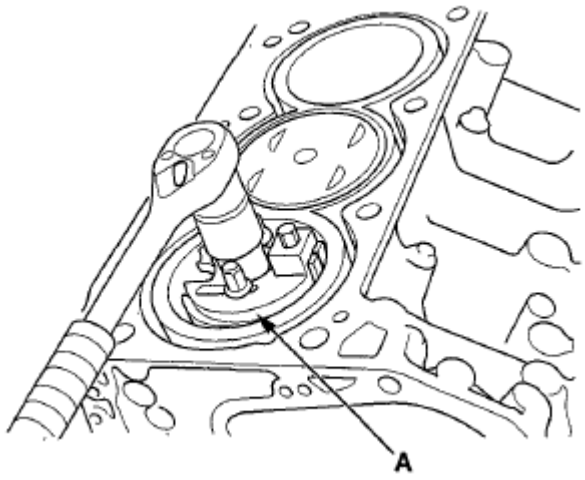


Fig. 22: Identifying Ridge Reamer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

11. Remove the connecting rod caps after setting the connecting rod at bottom dead center (BDC) for each cylinder. Remove the piston/connecting rod assembly by pushing on the connecting rod. Take care not to damage the oil jets, connecting rod journal, or the cylinder with the connecting rod.

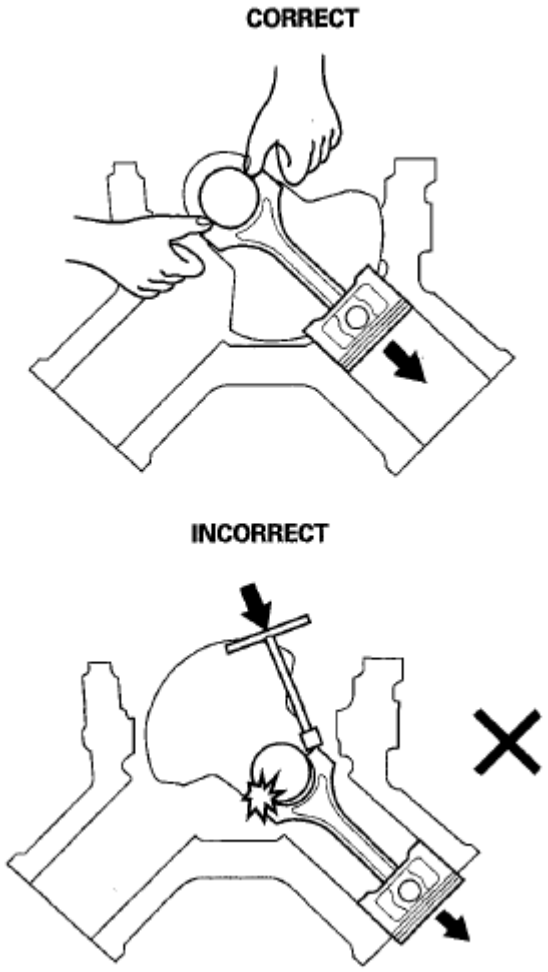


Fig. 23: Identifying Connecting Rod Correct & Incorrect Position
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

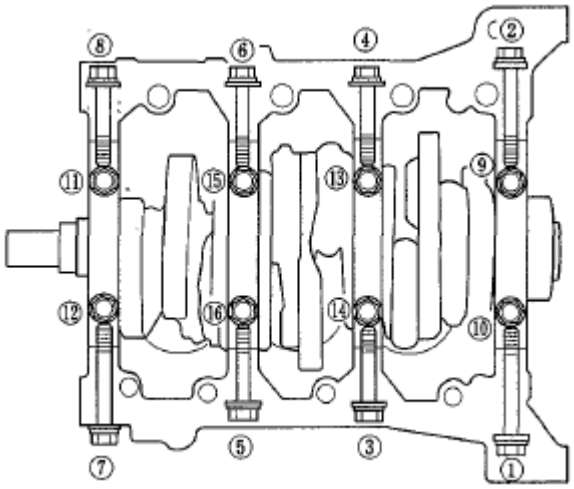


Fig. 24: Identifying Rod Bearing Cap Bolts with Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

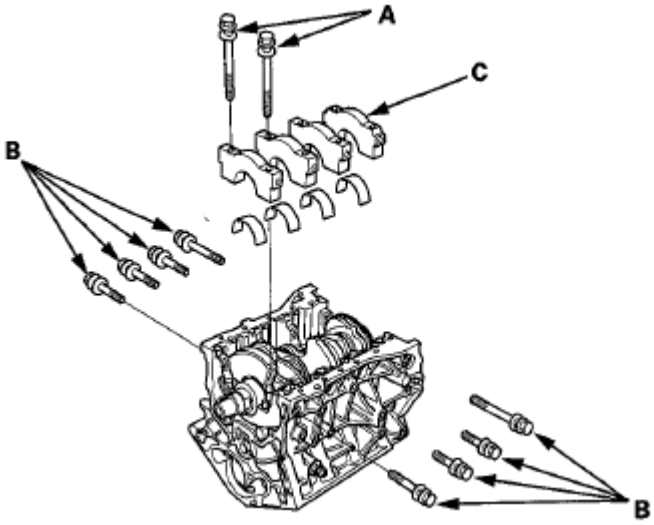


Fig. 25: Identifying Bearing Cap Bolts & Caps
Courtesy of AMERICAN HONDA MOTOR CO., INC.

18. Lift the crankshaft (A) out of the engine block, being careful not to damage the journals and the CKP pulse plate.

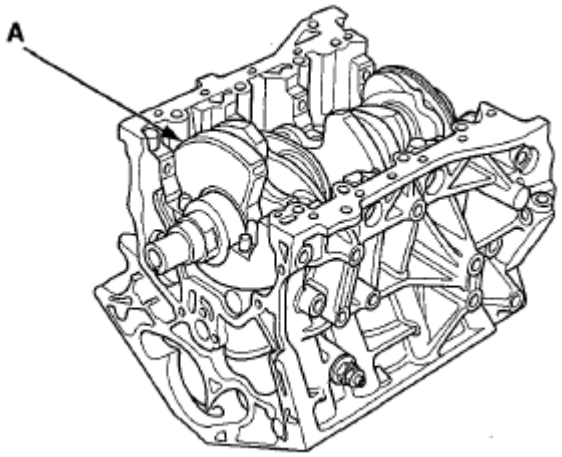


Fig. 26: Identifying Crankshaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

19. Remove the CKP pulse plate from the crankshaft (see **CKP PULSE PLATE REPLACEMENT**).
20. Reinstall the main caps and the bearings on the engine block in the proper order.

CRANKSHAFT INSPECTION

OUT-OF-ROUND AND TAPER

1. Remove the crankshaft from the engine block (see **CRANKSHAFT AND PISTON REMOVAL**).
2. Remove the crankshaft position (CKP) pulse plate from the crankshaft (see **CKP PULSE PLATE REPLACEMENT**).
3. Clean the crankshaft oil passages with pipe cleaners or a suitable brush.
4. Check the keyway slot and the threaded holes for damage.
5. 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)

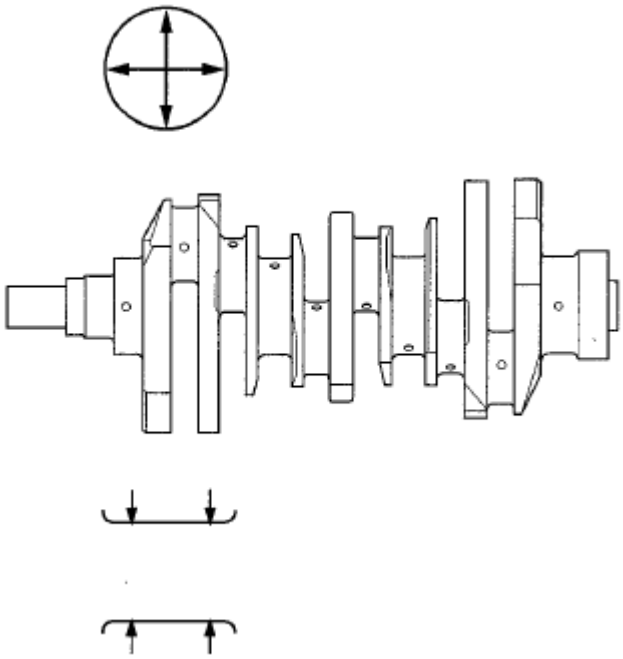


Fig. 27: Measuring Out-Of-Round Middle Of Each Rod & Main Journal In Two Places
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. 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

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

   Crankshaft Total Runout

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

   Service Limit: 0.03 mm (0.001 in)

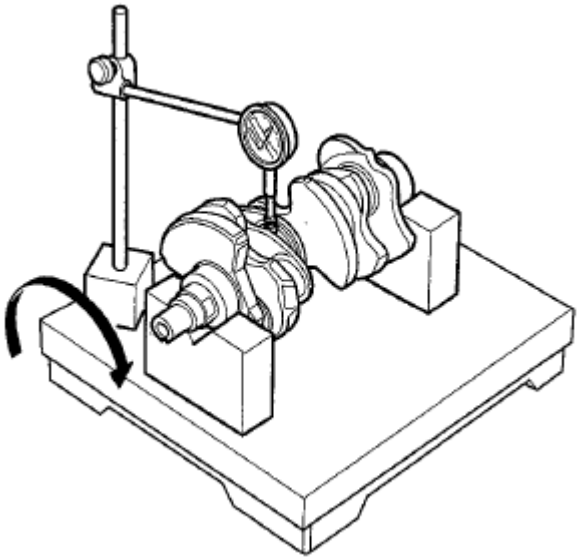


Fig. 28: Measuring Runout On Of Main Journals
Courtesy of AMERICAN HONDA MOTOR CO., INC.

BLOCK AND PISTON INSPECTION

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

Piston Skirt Diameter

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

Service Limit: 88.965 mm (3.5026 in)

Oversize Piston Skirt Diameter

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

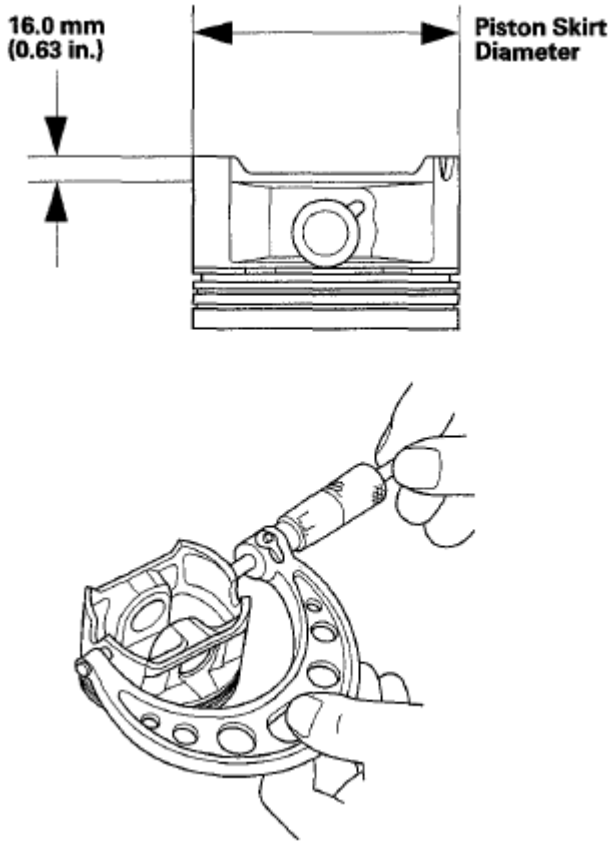


Fig. 29: Measuring Piston Skirt Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

4. Measure the wear and taper in direction X and Y at three levels in each cylinder as shown below. If measurements in any cylinder are beyond the oversize bore service limit, replace the engine block. If the engine block has to be rebored, refer to step 7 after reboring.

   Cylinder Bore Size

   Standard (New): 89.000-89.015 mm (3.5039-3.5045 in)

   Service Limit: 89.065 mm (3.5065 in)

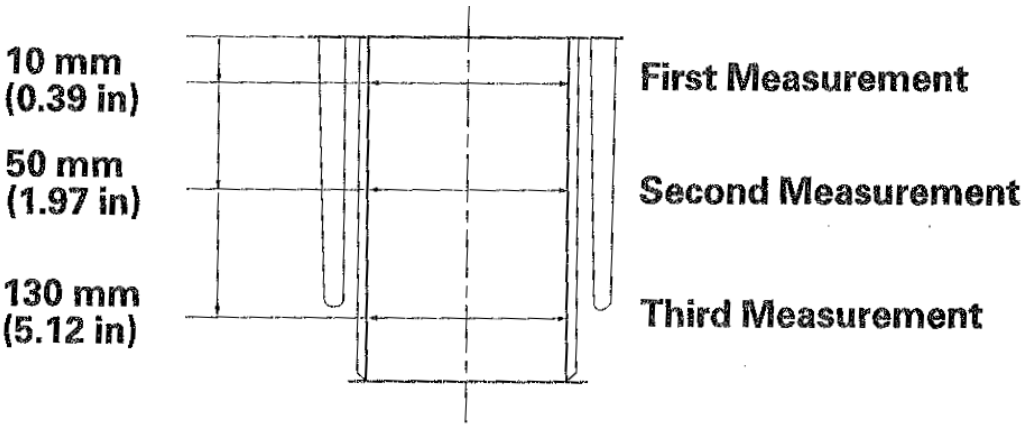
   Oversize

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

   Reboring Limit: 0.25 mm (0.010 in)

   Bore Taper

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



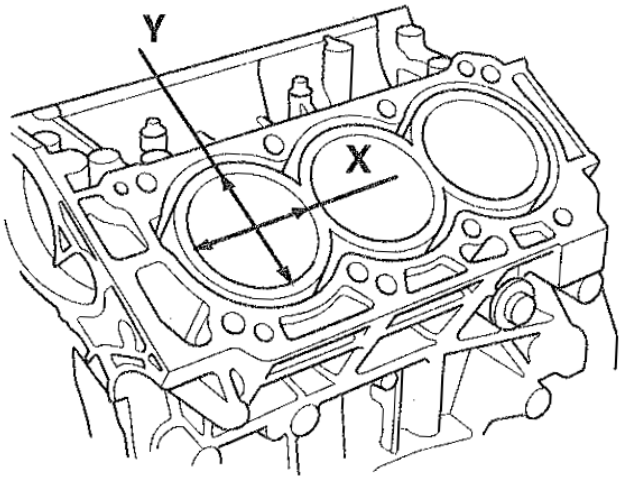


Fig. 30: Measuring Cylinder Bore Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Engine Block Warpage

Standard (New): 0.07 mm (0.0028 in) max.

Service Limit: 0.10 mm (0.0039 in)

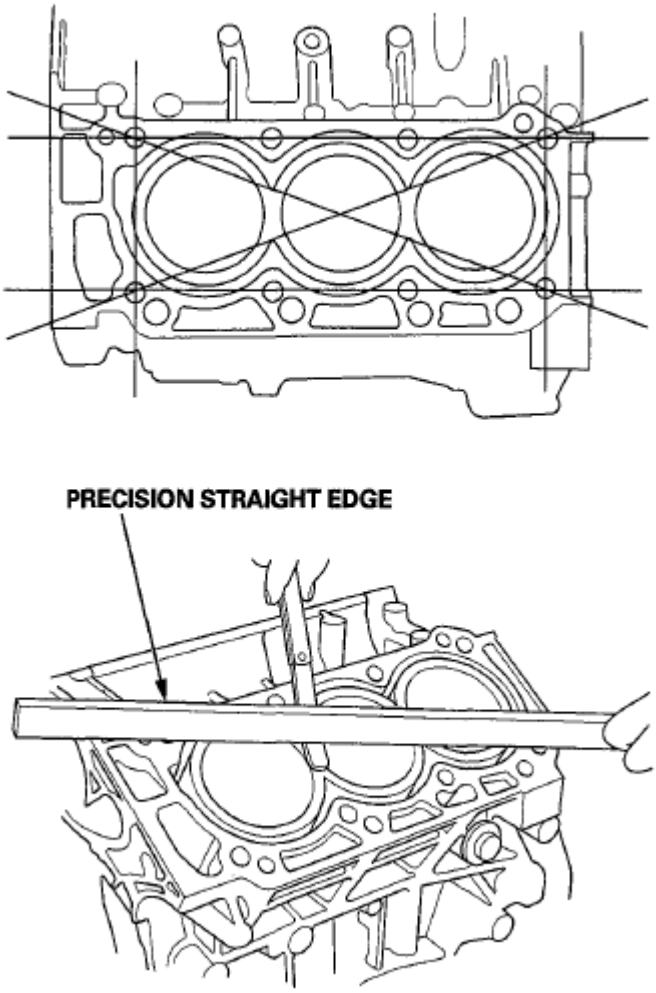


Fig. 31: Checking Top Of Engine Block For Warpage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Piston-to-Cylinder Bore Clearance

   Standard (New): 0.015-0.040 mm (0.00059-0.00157 in)

   Service Limit: 0.08 mm (0.0031 in)

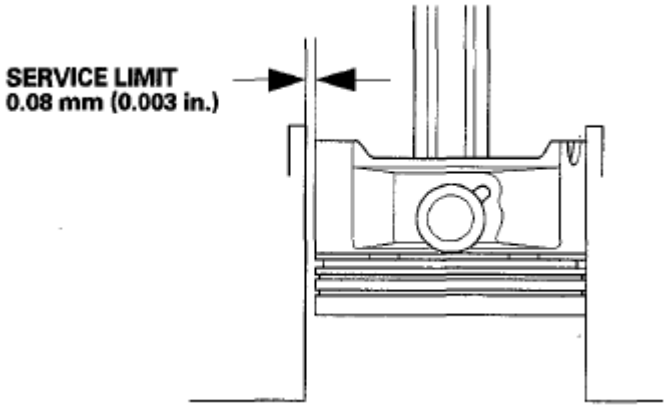


Fig. 32: Identifying Clearance Between Cylinder Bore Diameter & Piston Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER BORE HONING

1. Measure the cylinder bores (see step 4). If the engine block is to be reused, hone the cylinders and remeasure the bores. Only scored or scratched cylinder bores must be honed.
2. Remove the oil jets (see **OIL JET REPLACEMENT**).
3. Hone the cylinder bores with honing oil and a fine (400 grit) stone in a 60 degree Crosshatch pattern.

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

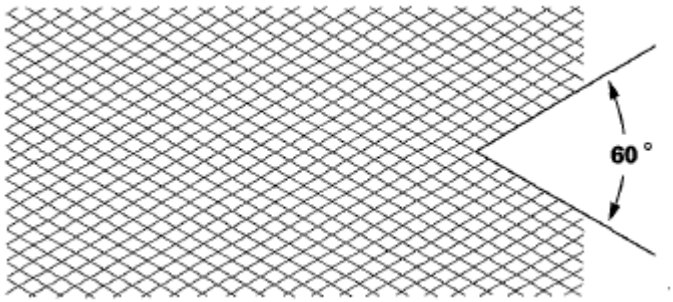


Fig. 33: Honing Cylinder Bores
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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.

NOTE: 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 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 oil jets (see **OIL JET REPLACEMENT**).

PISTON, PIN, AND CONNECTING ROD REPLACEMENT

DISASSEMBLY

1. Remove the pistons 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.

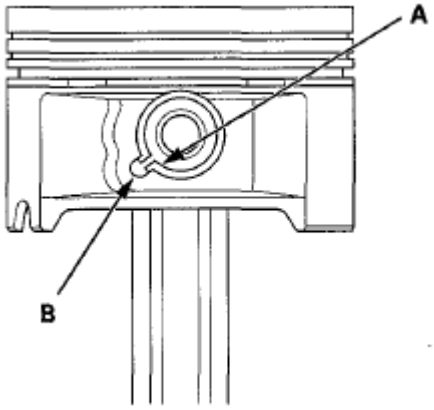


Fig. 34: Identifying Piston Pin Snap Rings
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

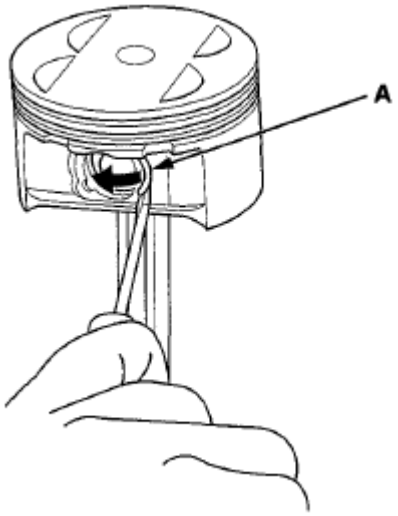


Fig. 35: Identifying Snap Rings
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

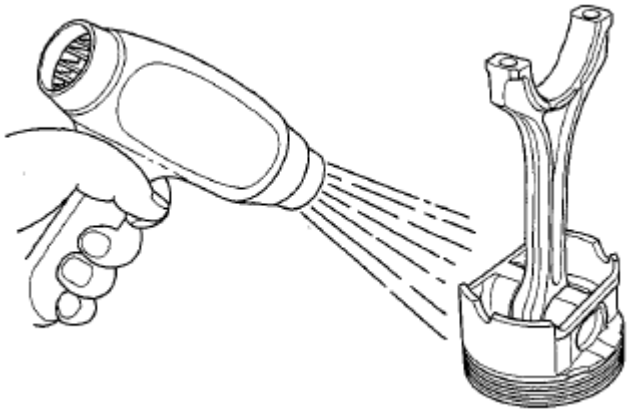


Fig. 36: Heating Piston & Connecting Rod Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

INSPECTION

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

1. Measure the diameter of the piston pin.

   Piston Pin Diameter

   Standard (New): 21.962-21.965 mm (0.86464-0.86476 in)

   Service Limit: 21.954 mm (0.86433 in)

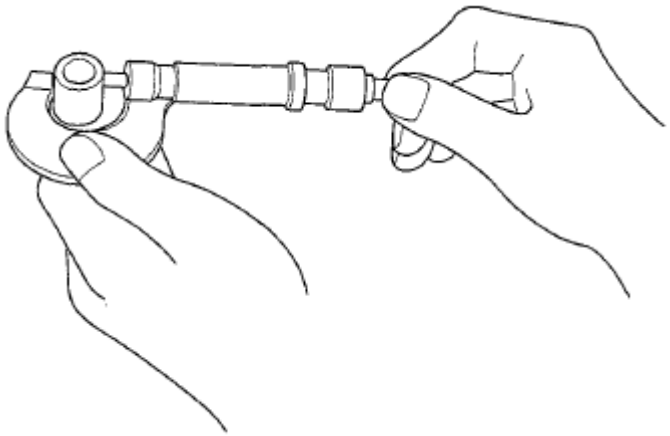


Fig. 37: Measuring Diameter Of Piston Pin
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

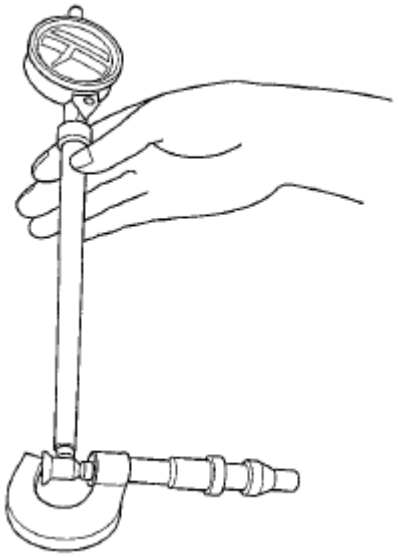


Fig. 38: Identifying Piston Pin Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Piston Pin-to-Piston Clearance

   Standard (New): -0.0050-0.0010 mm (-0.000197-0.000039 in)

   Service Limit: 0.004 mm (0.00016 in)

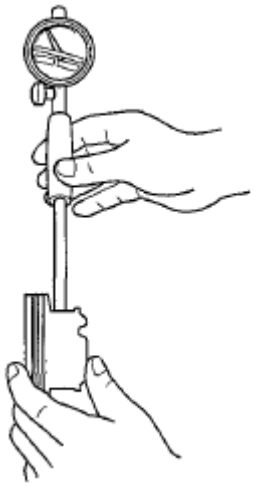


Fig. 39: Checking Clearance Between Piston Pin Diameter & Piston Pin Hole Diameter On Piston

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

   Piston Pin-to-Connecting Rod Clearance

   Standard (New): 0.005-0.014 mm (0.00020-0.00055 in)

   Service Limit: 0.019 mm (0.00075 in)

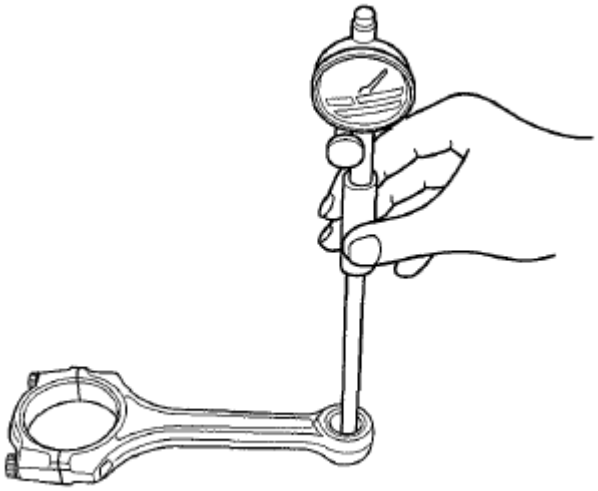


Fig. 40: Measuring Piston Pin-To-Connecting Rod Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REASSEMBLY

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

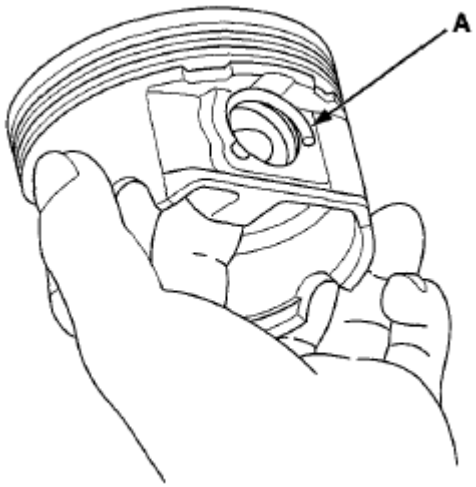


Fig. 41: Identifying Piston Pin Snap Ring

Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

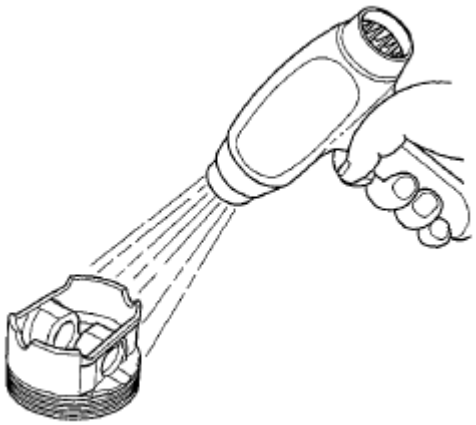


Fig. 42: Heating Piston
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

NOTE: Apply new engine oil to the piston pin.

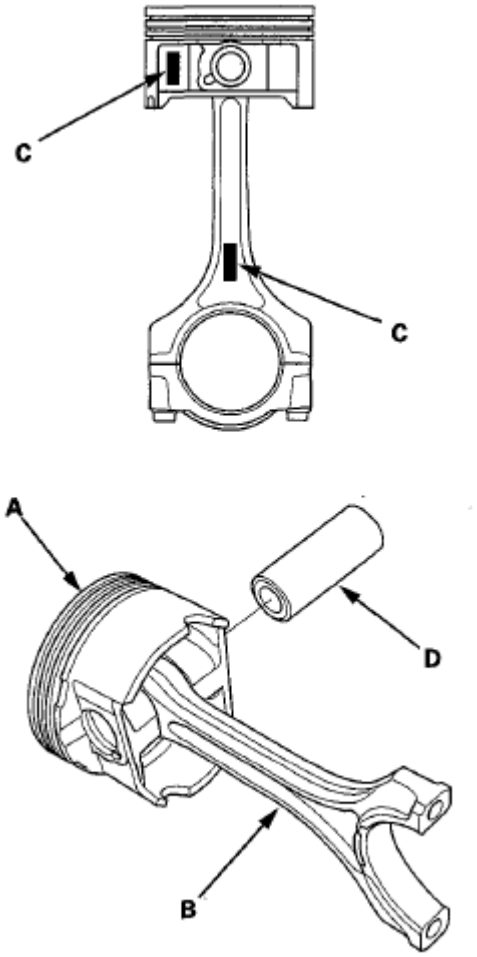


Fig. 43: Identifying Piston & Connecting Rod Mark Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Install the remaining snap ring.
6. Reassemble the other pistons the same way.

PISTON RING REPLACEMENT

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

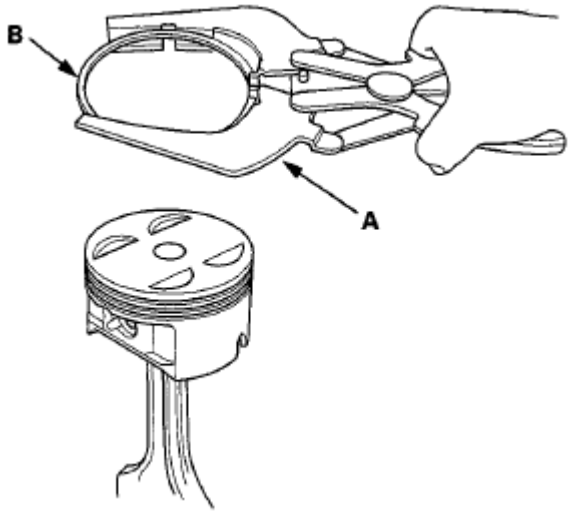


Fig. 44: Using Ring Expander To Remove Old Piston Rings
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Clean all the ring grooves thoroughly with a squared-off broken ring, or a ring groove cleaner with a blade to fit the piston grooves. File down the blade, if necessary. The top ring and second ring grooves are 1.2 mm (0.05 in.) wide, and the oil ring groove is 2.8 mm (0.11 in.) wide. Do not use a wire brush to clean the ring grooves, or cut the ring grooves deeper with the cleaning tool.

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

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

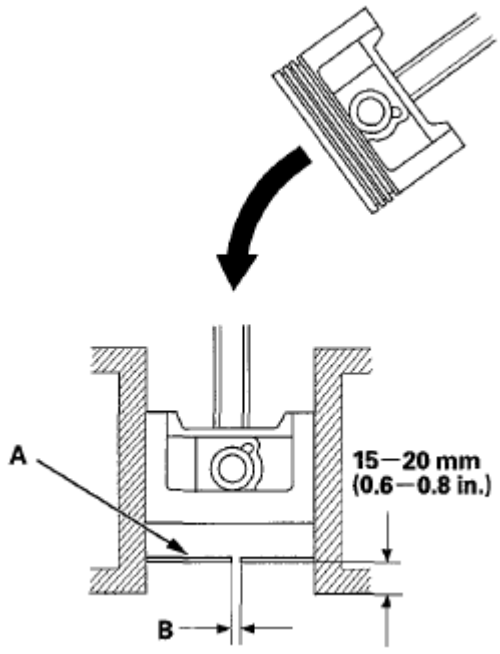


Fig. 45: Pushing Ring Into Cylinder Bore From Bottom Using Piston
Courtesy of AMERICAN HONDA MOTOR CO., INC.

5. Measure the piston ring end-gap (B) with a feeler gauge:
   - If the gap is too small, check to see if you have the proper rings for your engine.
   - If the gap is too large, recheck the cylinder bore diameter against the wear limits (see step 4 on **BLOCK AND PISTON INSPECTION**). If the bore is over the service limit, the engine block must be rebored.

   Piston Ring End-Gap

   Top ring:

   Standard (New): 0.20-0.35 mm (0.0079-0.0138 in)

   Service Limit: 0.60 mm (0.0236 in)

   Second Ring:

   Standard (New): 0.40-0.55 mm (0.0157-0.0217 in)

   Service Limit: 0.70 mm (0.0276 in)

   Oil Ring:

   Standard (New): 0.20-0.70 mm (0.0079-0.0276 in)

   Service Limit: 0.80 mm (0.0315 in)

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

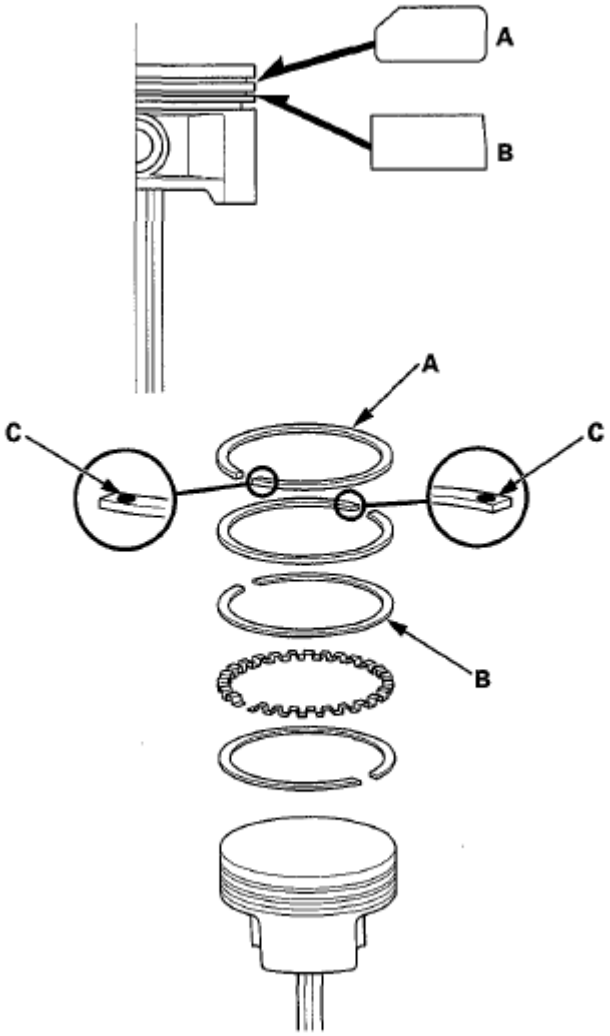
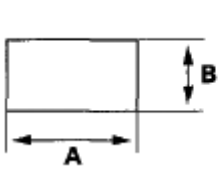


Fig. 46: Identifying Piston Ring Installation Position
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Piston Ring Dimensions:



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

Second Ring (Standard)
A: 3.6 mm (0.14 in.)
B: 1.2 mm (0.05 in.)

Fig. 47: Identifying Piston Ring Dimensions
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

Top Ring Clearance

Standard (New): 0.055-0.080 mm (0.0022-0.00315 in)

Service Limit: 0.15 mm (0.0059 in)

Second Ring Clearance

Standard (New): 0.030-0.055 mm (0.00118-0.00217 in)

Service Limit: 0.13 mm (0.0051 in)

Fig. 48: Measuring Ring-To-Groove Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

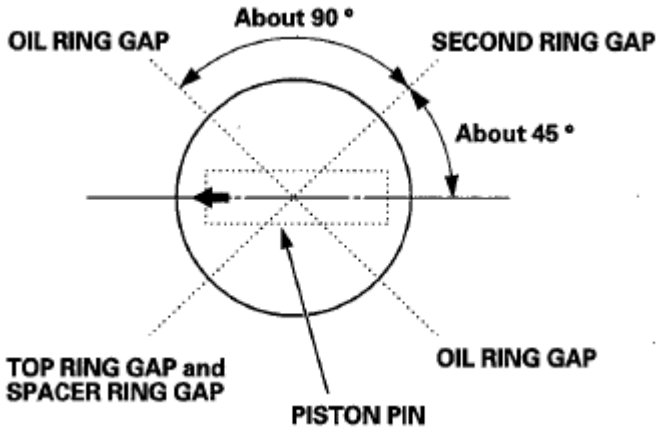


Fig. 49: Identifying Ring End Gaps
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CRANKSHAFT AND PISTON INSTALLATION

SPECIAL TOOLS REQUIRED

- Driver 07749-0010000
- Oil Seal Driver Attachment, 106 mm 070AD-RCA0200

1. Check the connecting rod bearing clearance with plastigage (see **CONNECTING ROD BEARING REPLACEMENT**).
2. Check the main bearing clearance with plastigage (see **CRANKSHAFT MAIN BEARING REPLACEMENT**).
3. Install the bearing halves in the engine block and connecting rods.
4. Apply new engine oil to the inside of the main bearings and the rod bearings.
5. Install the CKP pulse plate to the crankshaft (see **CKP PULSE PLATE REPLACEMENT**).
6. Lower the crankshaft (A) into the engine block, being careful not to damage the journals and the CKP pulse plate.

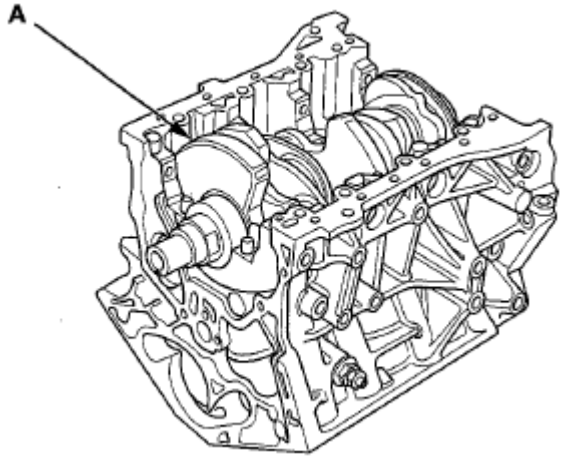


Fig. 50: Identifying Crankshaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

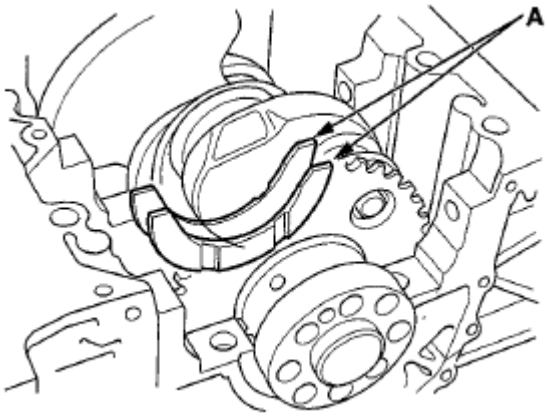


Fig. 51: Identifying Thrust Washers In No. 3 Journal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

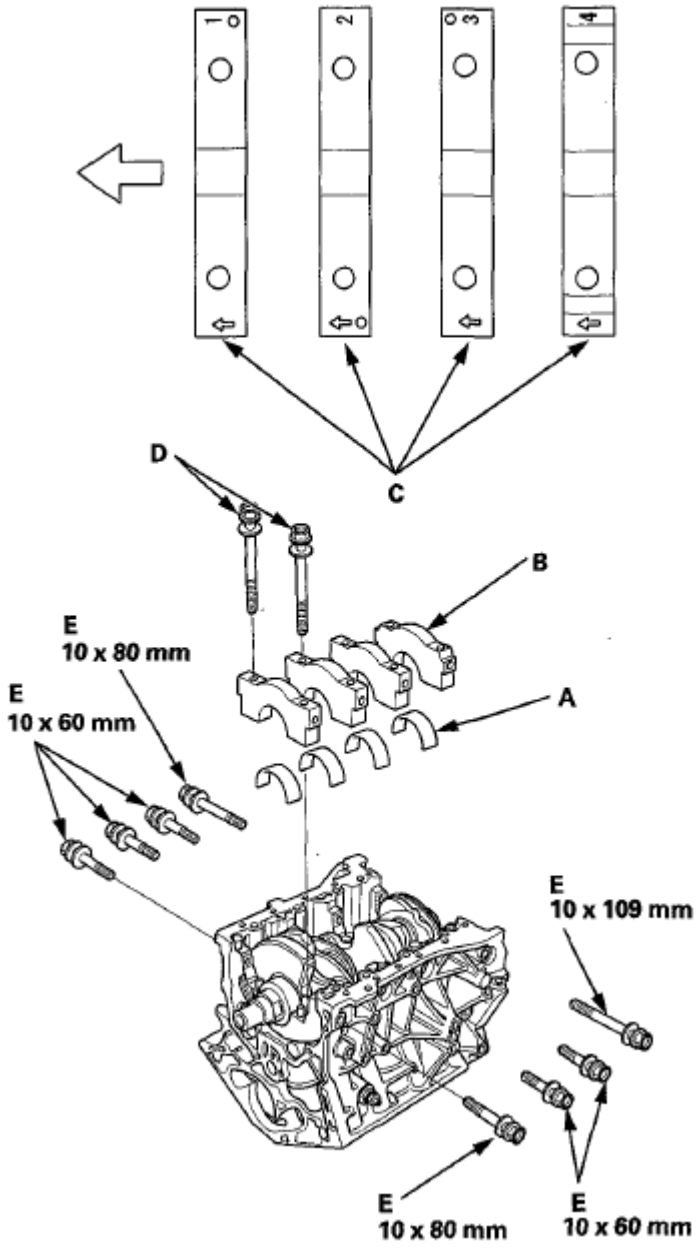


Fig. 52: Identifying Bearing Caps Installation Position
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. Apply new engine oil to the bolt threads and flanges, then loosely install the bearing cap bolts (D) and the bearing cap side bolts (E).
10. Set the crankshaft to bottom dead center (BDC) for the cylinder you are installing the piston in.
11. Apply new engine oil to the piston, inside of the ring compressor, and the cylinder bore.
12. Attach the ring compressor to the piston/connecting rod assembly, and check that the bearing is securely in place.
13. Position the piston/connecting rod assembly with the arrow (A) facing the timing belt side of the engine.

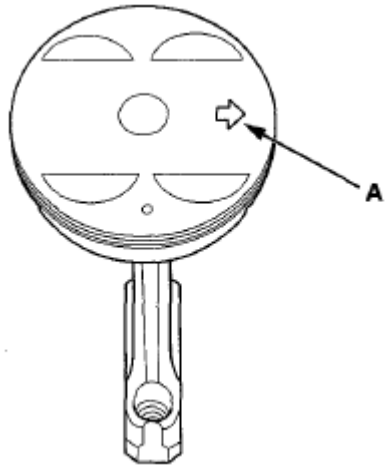


Fig. 53: Identifying Piston/Connecting Rod Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

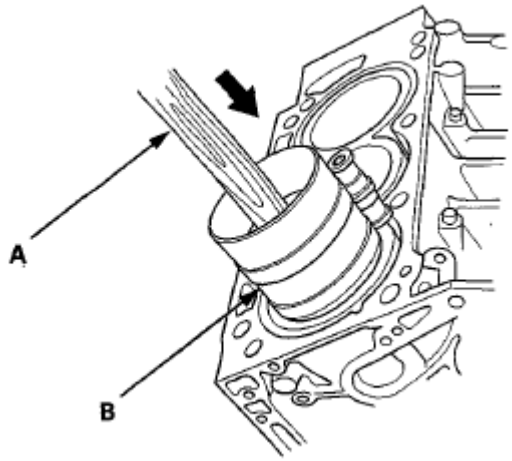


Fig. 54: Tapping Piston & Connecting Rod Assembly In Cylinder
Courtesy of AMERICAN HONDA MOTOR CO., INC.

15. Stop after the ring compressor pops free, and check the connecting rod-to-crank journal alignment before pushing the piston into place.
16. Measure the diameter of each connecting rod bolt at point A and point B.

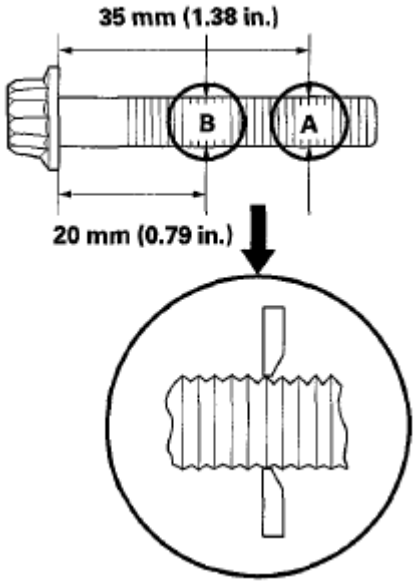


Fig. 55: Measuring Diameter Of Connecting Rod Bolt Point A & Point B
Courtesy of AMERICAN HONDA MOTOR CO., INC.

17. 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.)

18. If the difference in diameter is out of tolerance, replace the connecting rod bolt.
19. Install bearing (A) on the connecting rod and the cap, then line u the mark (B) on the connecting rod (C) and the rod cap (D).

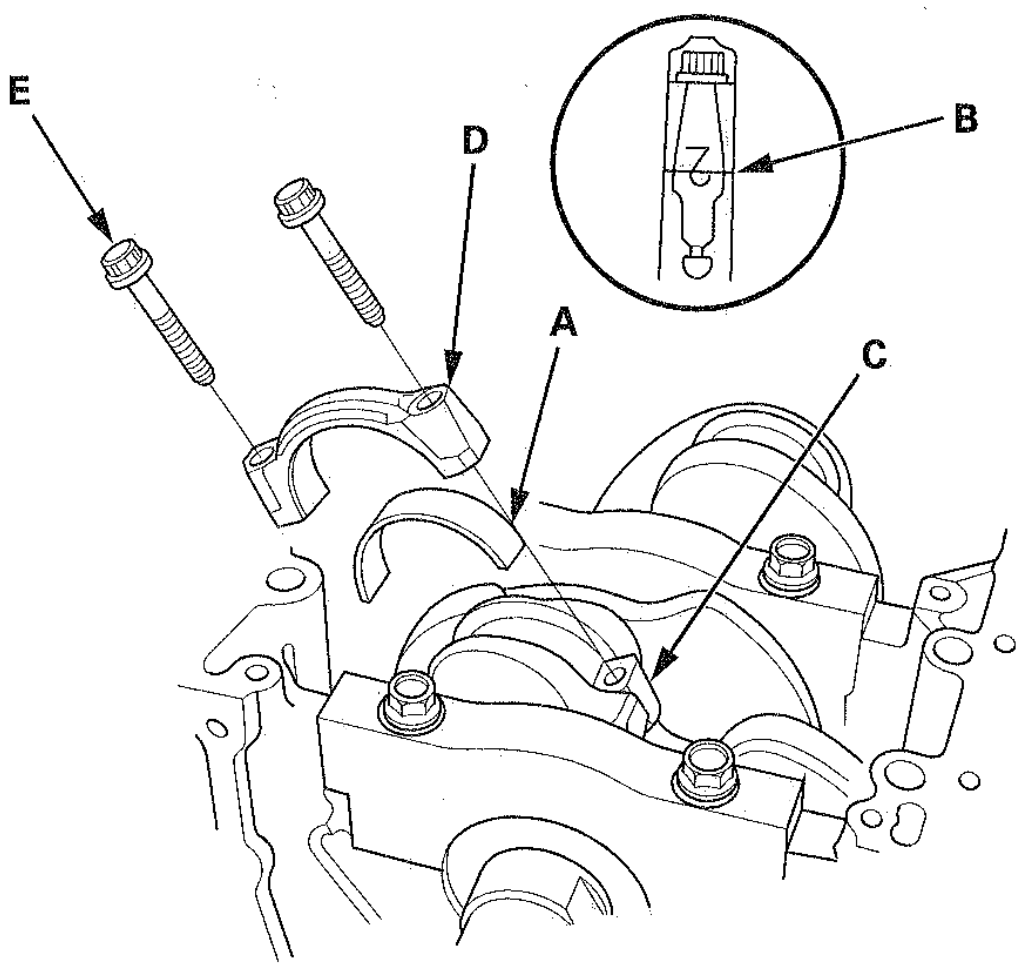


Fig. 56: Identifying Connecting Rod & Cap
Courtesy of AMERICAN HONDA MOTOR CO., INC.

20. Apply new engine oil to the bolt threads and flanges. Tighten the bolts (E) to 20 N.m (2.0 kgf.m, 15 lbf.ft).
21. Mark the connecting rod (A) and the bolt head (B) as shown below.

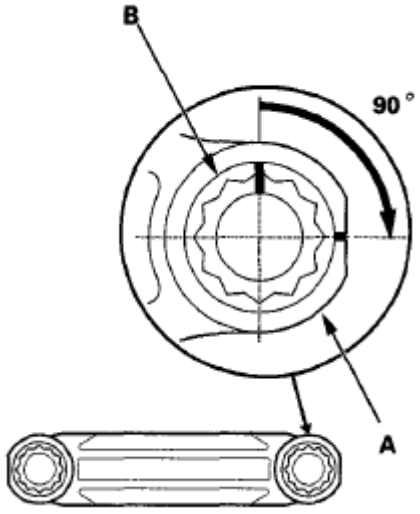


Fig. 57: Identifying Bolts Tightening Angle
Courtesy of AMERICAN HONDA MOTOR CO., INC.

22. Tighten the bolt until the mark on the bolt head lines up with the mark on the connecting rod (turn the bolt 90°).

NOTE: Remove the connecting rod bolt if you tightened it beyond the specified angle, and go back to step 16 of the procedure. Do not loosen it back to the specified angle. Repeat steps 10 to 22 for the remaining cylinders.

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

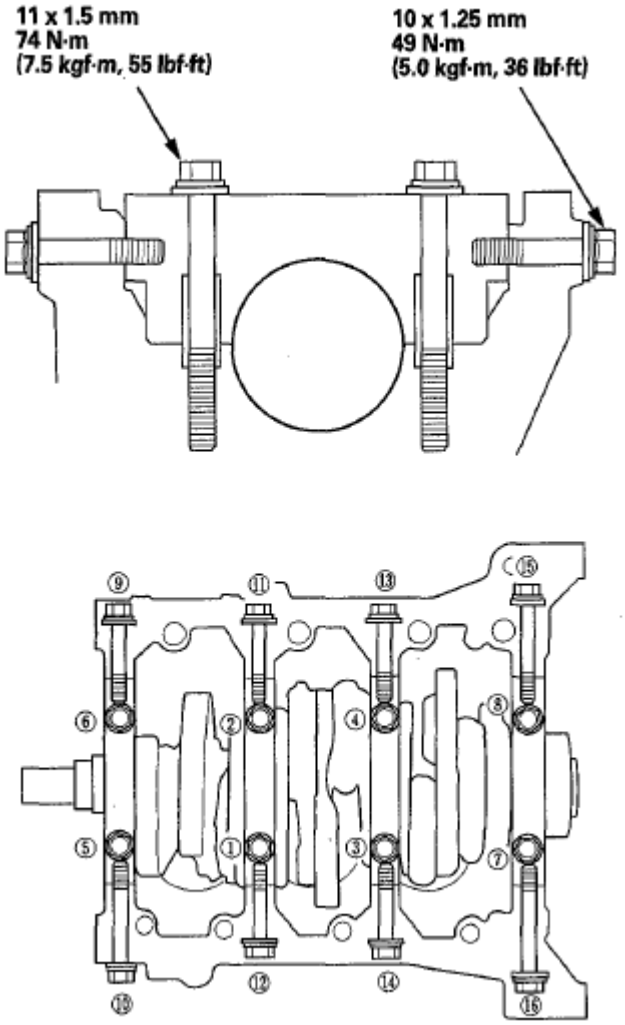


Fig. 58: Identifying Bearing Cap Bolts Tightening Sequence With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

24. Remove all of the old liquid gasket from the engine block end cover mating surfaces, the bolts, and the bolt holes.
25. Clean and dry the engine block end cover mating surfaces and the crankshaft oil seal housing.
26. Apply a light coat of new engine oil to the crankshaft and to the lip of the crankshaft oil seal.
27. Using the driver handle, 15 x 135L and the oil seal driver attachment, 106 mm, drive in the new crankshaft oil seal (A) until the oil seal driver attachment bottoms on the engine block end cover.

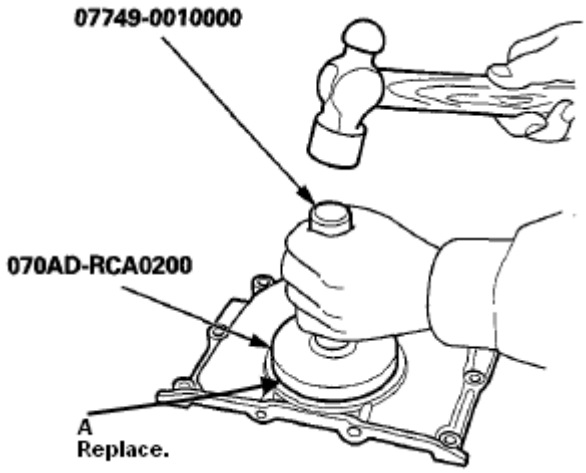


Fig. 59: Tapping Crankshaft Oil Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

28. Apply liquid gasket, P/N 08717-0004,08718-0001, 08718-0001, 08718-0003, or 08718-0009, to the engine block mating surface of the engine block end cover and to the inside edge of the threaded bolt holes. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

- **Apply a 2.5 mm (0.10 in) diameter bead of liquid gasket along the broken lin (A).**
- **If you apply liquid gasket P/N 08718-0012, the component must be installed within 4 minutes.**
- **If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply the new liquid gasket.**

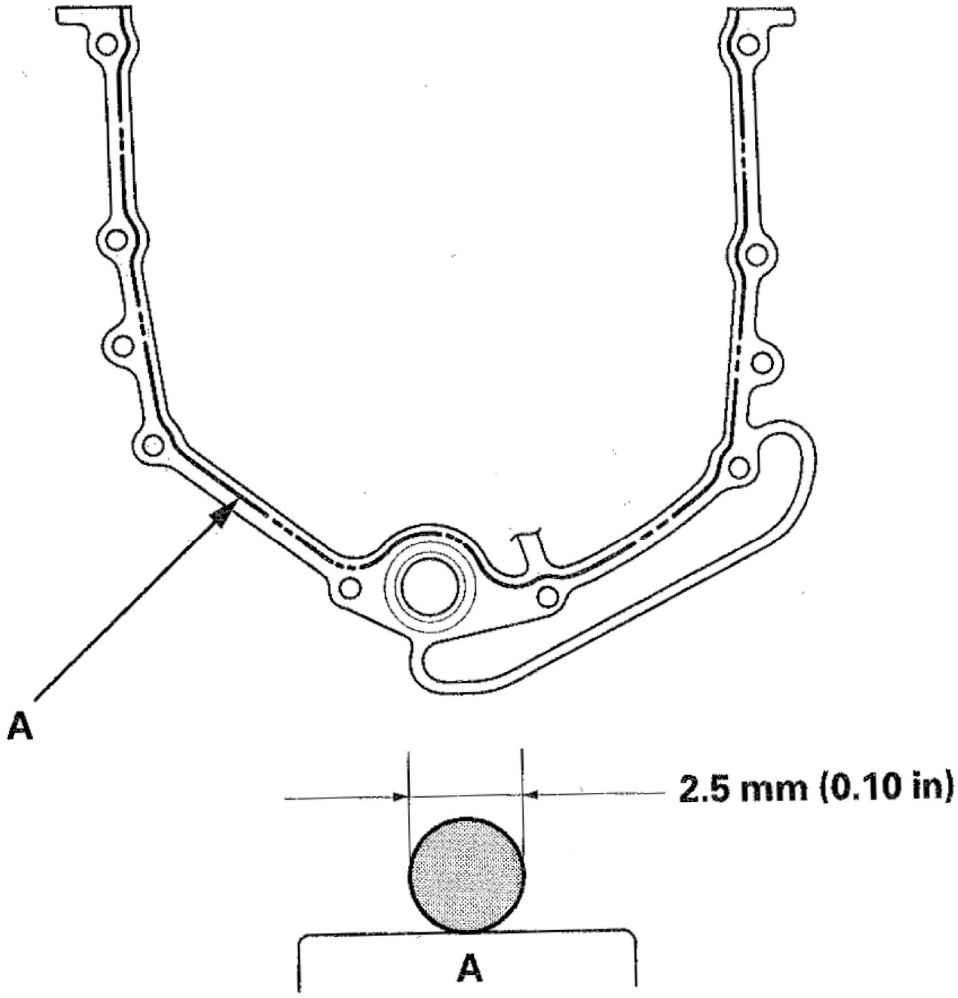


Fig. 60: Identifying Liquid Gasket Applying Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

29. Install the dowel pins (A), a new O-ring (B), and the engine block end cover (G) on the engine block.

NOTE:

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

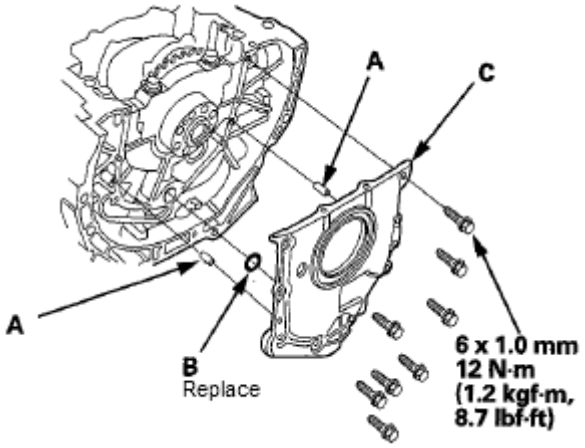


Fig. 61: Identifying Dowel Pins, O-Ring & Engine Block End Cover With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

30. Clean the excess grease off the crankshaft, and check the oil seal lip is not distorted.
31. Install a new crankshaft oil seal in the oil pump (see step 2 on **INSTALLATION**).
32. Remove all of the old liquid gasket from the oil pump mating surfaces, the bolts, and the bolt holes.
33. Clean and dry the oil pump mating surfaces.
34. Apply liquid gasket, P/N 08717-0004,08718-0001, 08718-0003, or 08718-0009, evenly to the engine block mating surface of the oil pump and to the inside edge of the threaded bolt holes. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

- **Apply a 2.5 mm (.10) in diameter bead of liquid gasket along the broken line (A).**
- **If you apply liquid gasket P/N 08718-0012, the component must be installed within 4 minutes.**
- **If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply the new liquid gasket.**

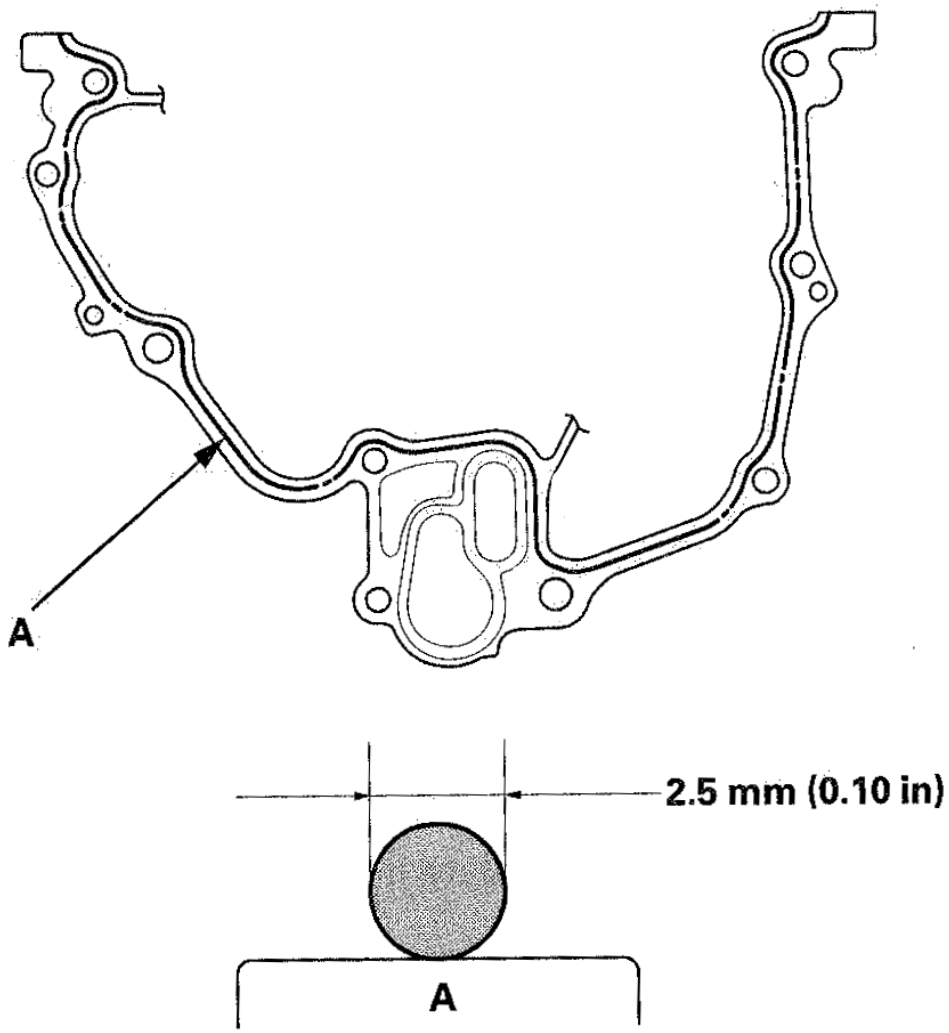


Fig. 62: Identifying Liquid Gasket Applying Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

35. Apply a light coat of new engine oil to the lip of the crankshaft oil seal, and apply new engine oil to the new O-ring (A).

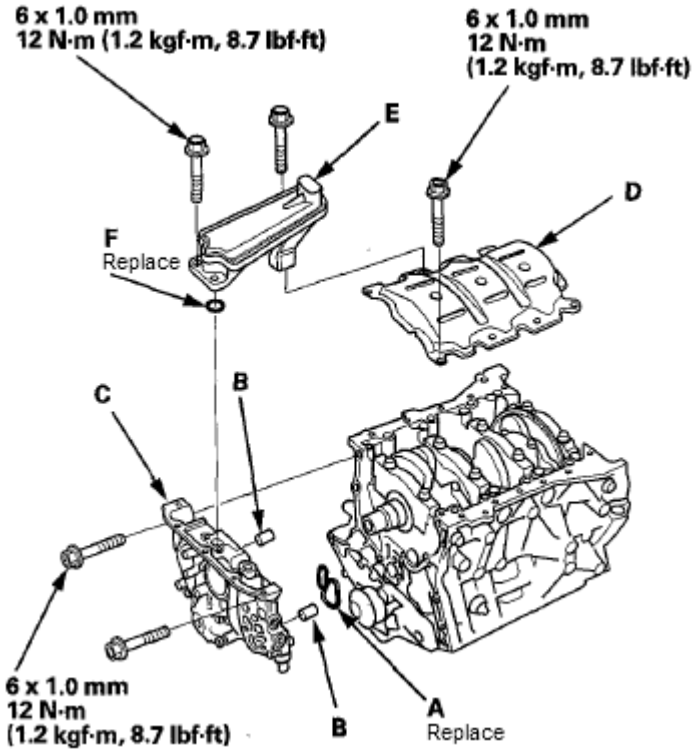


Fig. 63: Identifying Dowel Pins, O-Ring & Inner Rotor With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

36. Install the dowel pins (B), then align the inner rotor with the crankshaft, and install the oil pump (C).
37. Clean the excess grease off the crankshaft, and check the seal for distortion.
38. Install the baffle plate (D), then install the oil screen (E) using a new O-ring (F).
39. Install the oil filter base/oil filter assembly (A), using a new O-ring (B), then install the rocker arm oil pressure sensor cover (C).

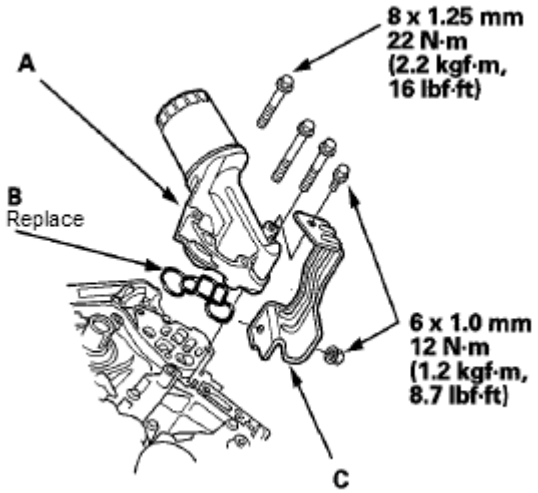


Fig. 64: Identifying Oil Filter Base & Oil Filter Assembly With Torque Specifications

Courtesy of AMERICAN HONDA MOTOR CO., INC.

40. Install the oil pan (see **OIL PAN INSTALLATION**).
41. Install the timing belt drive pulley (see **TIMING BELT DRIVE PULLEY REPLACEMENT**) to the crankshaft.
42. Install the cylinder heads (see **CYLINDER HEAD INSTALLATION**).
43. Install the drive plate (see **DRIVE PLATE REMOVAL AND INSTALLATION**).
44. Install the transmission (see **TRANSMISSION INSTALLATION**).
45. Install the engine/transmission (see **ENGINE INSTALLATION**).

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

CKP PULSE PLATE REPLACEMENT

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

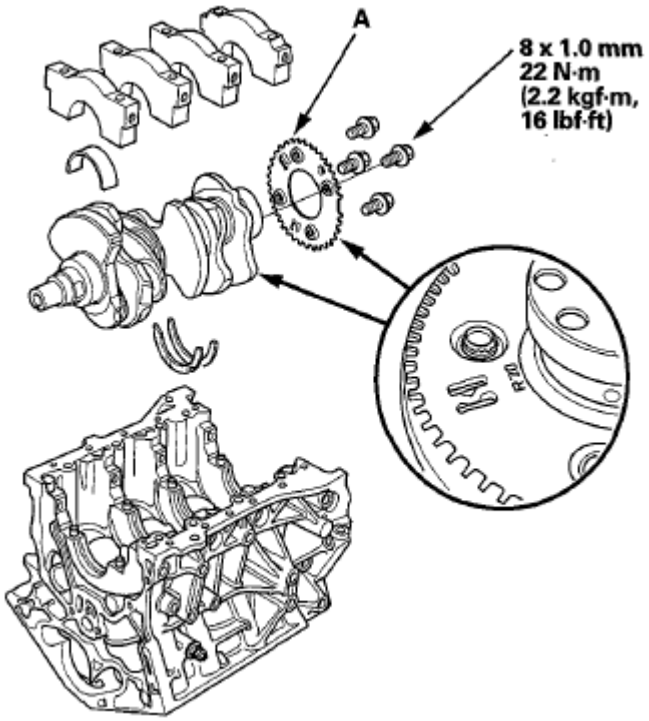


Fig. 65: Identifying CKP Pulse Plate With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

NOTE:

- **Apply a 2.5 mm (.10 in) diameter bead of liquid gasket along with broken line (A).**
- **If you apply liquid gasket P/N 08718-0012, the component must be installed within 4 minutes.**
- **If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply the new liquid gasket.**

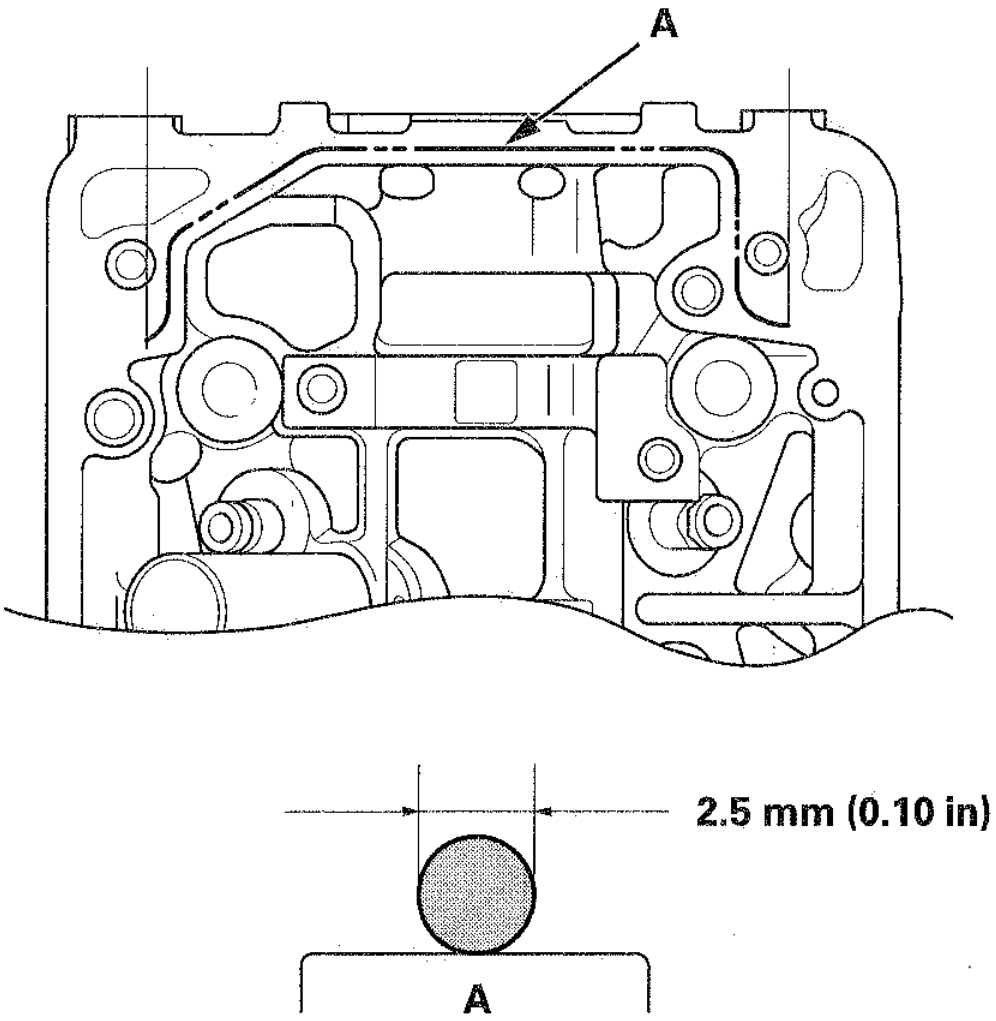


Fig. 66: Identifying Liquid Gasket Applying Area
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

NOTE:

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

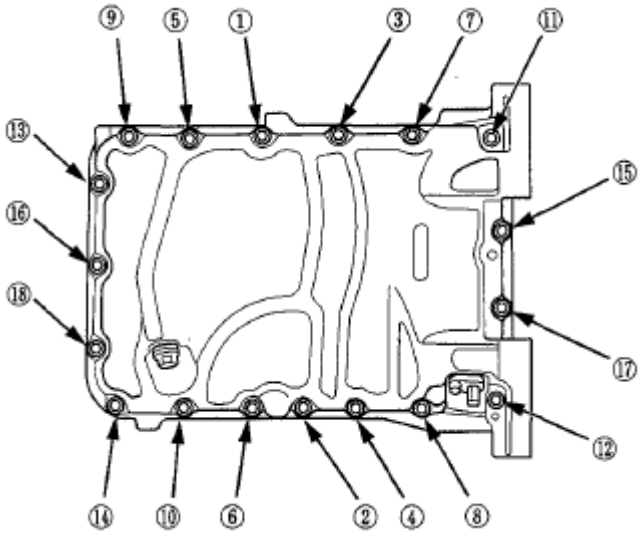


Fig. 67: Identifying Oil Pan Bolts Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

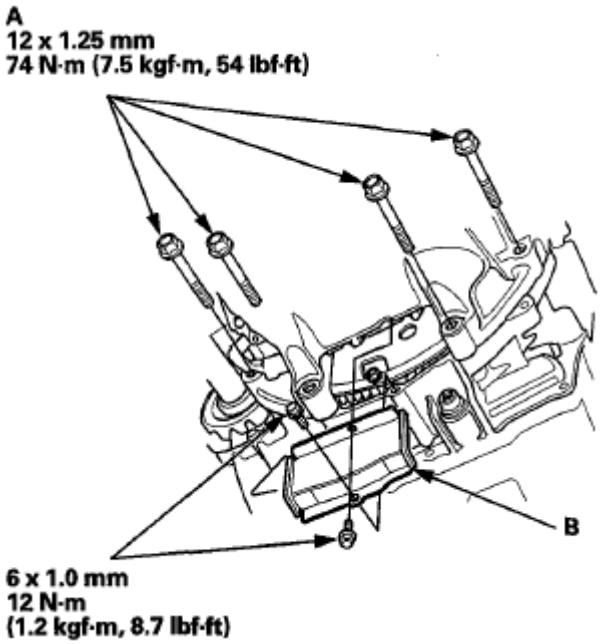


Fig. 68: Identifying Torque Converter Cover & Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Connect the crankshaft position (CKP) sensor connector (A), then install the CKP sensor cover (B) and the bolt (C).

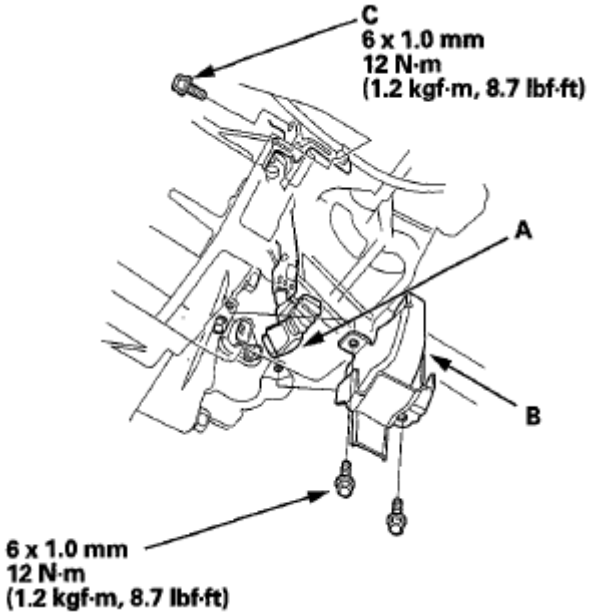


Fig. 69: Identifying Crankshaft Position Sensor Connector & Bolt With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

8. Install the rear warm up three way catalytic converter (rear WU-TWC) bracket.

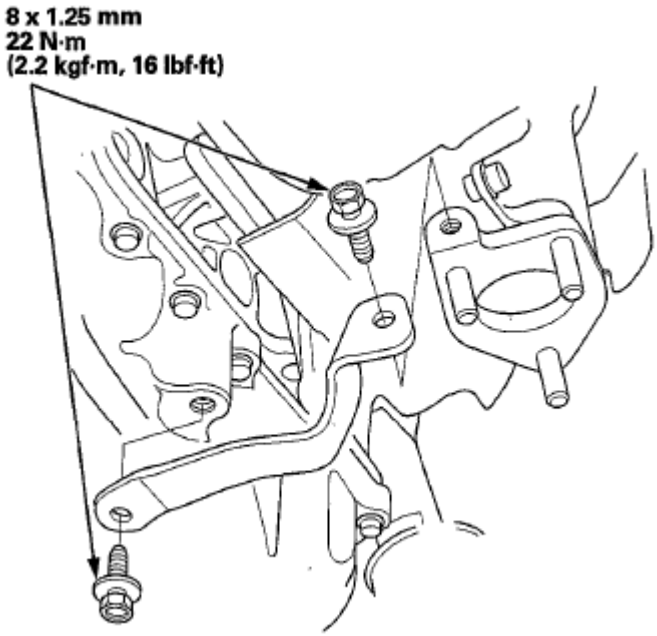


Fig. 70: Identifying Rear Warm Up Three Way Catalytic Converter (Rear WU-TWC) Bracket With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

9. If the engine is still in the vehicle, do the following steps.
10. Install exhaust pipe A using new gaskets and new self-locking nuts (see step 34 on **ENGINE**

INSTALLATION).

11. Install the front subframe stiffener (see step 35 on **ENGINE INSTALLATION**).
12. Refill the engine with recommended engine oil (see **ENGINE OIL REPLACEMENT**).

PULLEY END CRANKSHAFT OIL SEAL INSTALLATION - IN CAR

SPECIAL TOOLS REQUIRED

Oil Seal Driver, 64 mm 070AD-RCAA100

1. Remove the timing belt, the timing belt stopper, and the timing belt drive pulley (see **TIMING BELT DRIVE PULLEY REPLACEMENT**).
2. Remove the pulley end crankshaft oil seal.
3. Clean and dry the crankshaft oil seal housing.
4. Apply a light coat of new engine oil to the crankshaft and to the lip of the crankshaft oil seal.
5. Apply a light coat of new engine oil around the crankshaft oil seal, then using the oil seal driver, 64 mm, drive in the crankshaft oil seal until the driver bottoms against the oil pump.

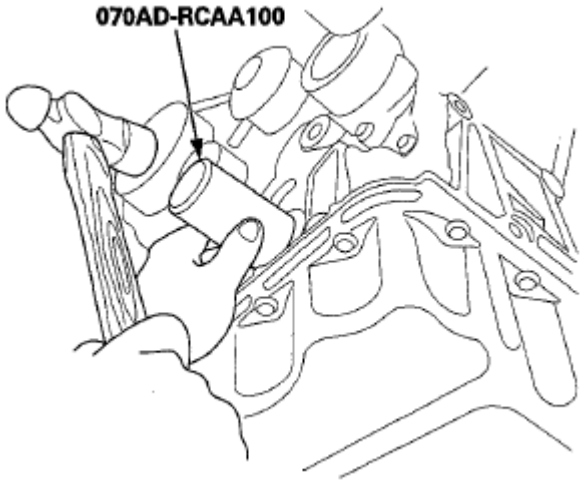


Fig. 71: Tapping Pulley Crankshaft Oil Seal Using Oil Seal Driver
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Clean the excess grease off the crankshaft, and check the oil seal lip is not distorted.
7. Install the timing belt drive pulley, the timing belt stopper, and the timing belt (see **TIMING BELT DRIVE PULLEY REPLACEMENT**).

TRANSMISSION END CRANKSHAFT OIL SEAL INSTALLATION - IN CAR

SPECIAL TOOLS REQUIRED

- Driver 07749-0010000

- Oil Seal Driver Attachment, 106 mm 070AD-RCA0200

1. Remove the transmission (see **TRANSMISSION REMOVAL**) and the drive plate (see **DRIVE PLATE REMOVAL AND INSTALLATION**).
2. Remove the transmission end crankshaft oil seal.
3. Clean and dry the crankshaft oil seal housing.
4. Apply a light coat of new engine oil to the crankshaft and to the lip of the crankshaft oil seal.
5. Using the driver handle, 15 x 135L and the oil seal driver attachment, 106 mm, drive in the new crankshaft oil seal (A) until the oil seal driver attachment bottoms against the engine block end cover. Align the hole in the driver attachment with the pin on the crankshaft.

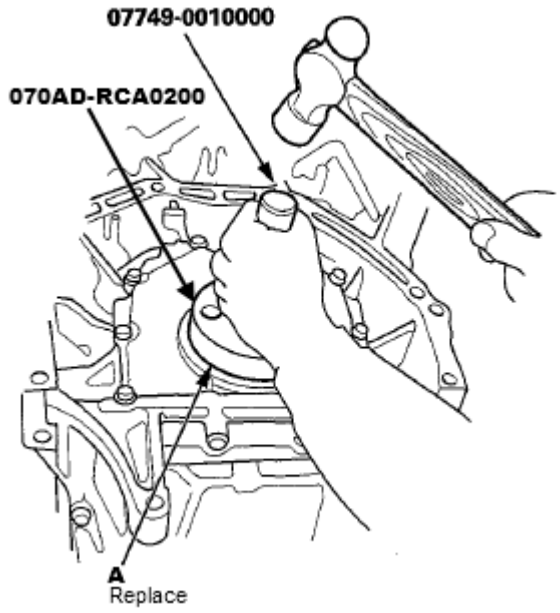


Fig. 72: Tapping Transmission Crankshaft Oil Seal Using Hammer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Clean any excess grease off the crankshaft, and check that the oil seal lip is not distorted.
7. Install the drive plate (see **DRIVE PLATE REMOVAL AND INSTALLATION**), and the transmission (see **TRANSMISSION INSTALLATION**).

SEALING BOLT INSTALLATION

NOTE: When installing the sealing bolts, always use new washers.

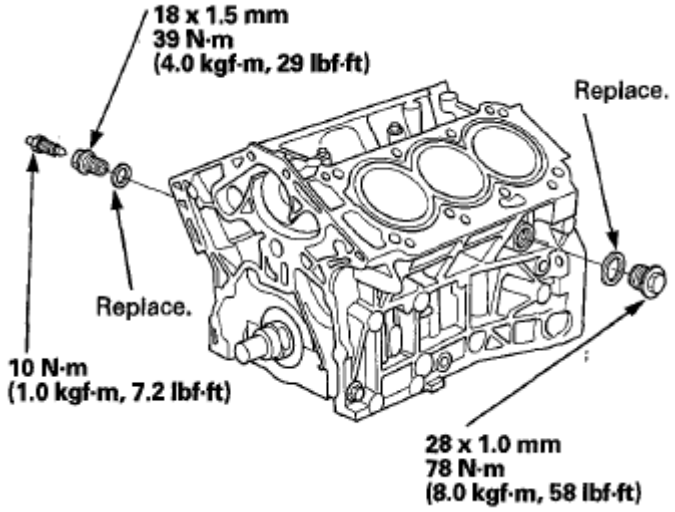


Fig. 73: Identifying Sealing Bolts With Torque Specifications
Courtesy of AMERICAN HONDA MOTOR CO., INC.

