1999-2003 ENGINES

3.2L V6

ENGINE IDENTIFICATION

NOTE: For repair procedures not covered in this article, see ENGINE OVERHAUL PROCEDURES article in GENERAL INFORMATION.

ENGINE IDENTIFICATION CODE

Engine	Code
3.2L	J32A1
3.2L (2002-03)	J32A2

ADJUSTMENTS

VALVE CLEARANCE

1. Remove the cylinder head covers. See **CYLINDER HEAD COVER** under REMOVAL & INSTALLATION.
2. Remove the front upper cover. See **Fig. 111**.
3. Set No. 1 piston at top dead center (TDC). Align the pointer on the back cover with the No. 1 piston TDC on the front camshaft pulley. See **Fig. 1**.
4. Select the correct thickness feeler gauge for the valves you are going to check. See **VALVE CLEARANCE SPECIFICATIONS** table and **Fig. 2**.
5. Insert the feeler gauge (A) between the adjusting screw (B) and the end of the valve stem and slide it back and forth; you should feel a slight amount of drag. See **Fig. 3**.
6. If you feel too much or too little drag, loosen the locknut (A), and turn the adjusting screw (B) until the drag on the feeler gauge is correct. See **Fig. 4**.

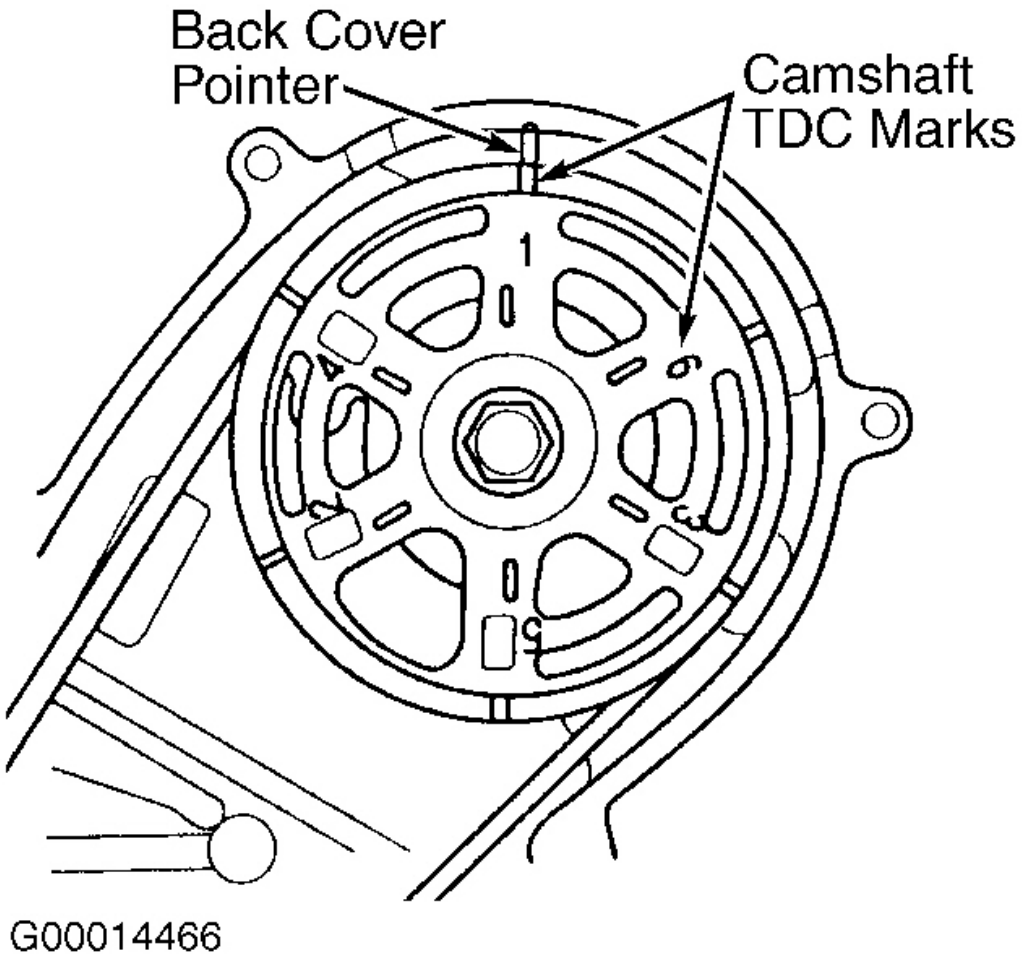

Fig. 1: Identifying Camshaft Pulley & TDC Marks
Courtesy of AMERICAN HONDA MOTOR CO., INC.

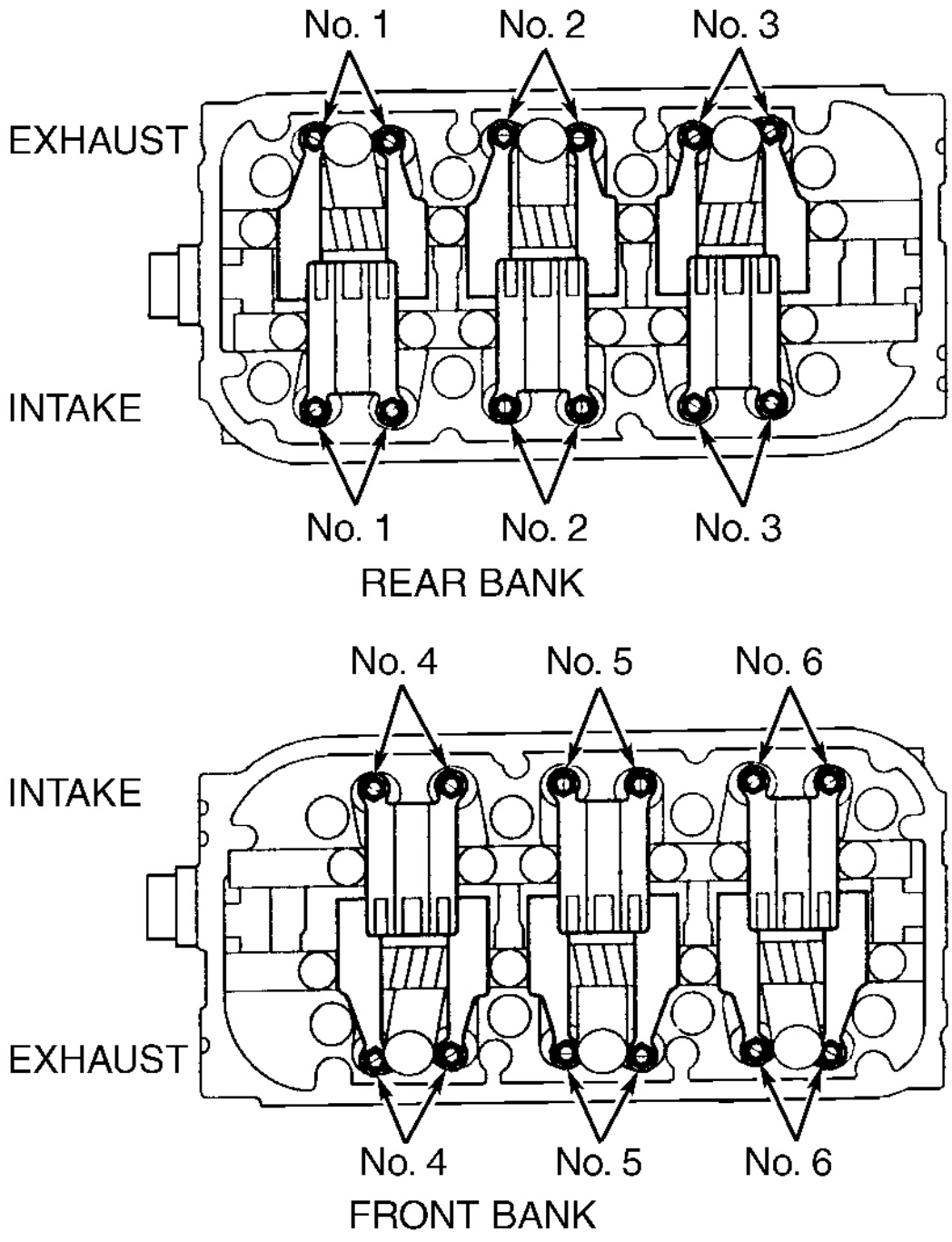

Fig. 2: Identifying Valve Adjusting Screw Locations
Courtesy of AMERICAN HONDA MOTOR CO., INC.

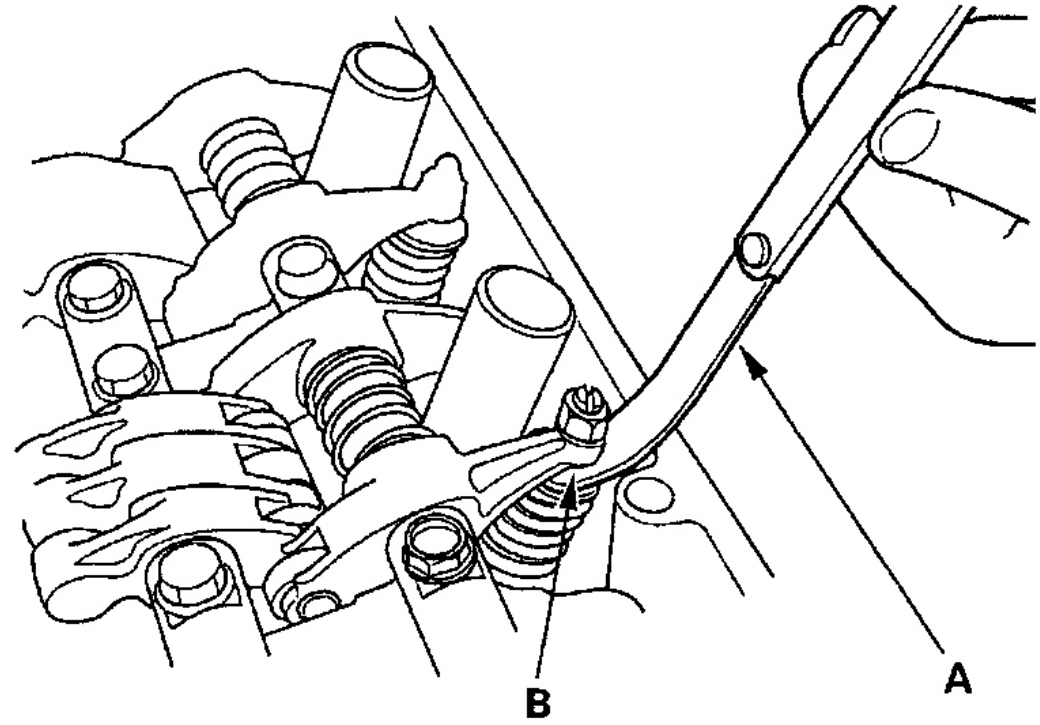

Fig. 3: Inserting Feeler Gauge Between Adjusting Screw & End Of Valve Stem
Courtesy of AMERICAN HONDA MOTOR CO., INC.

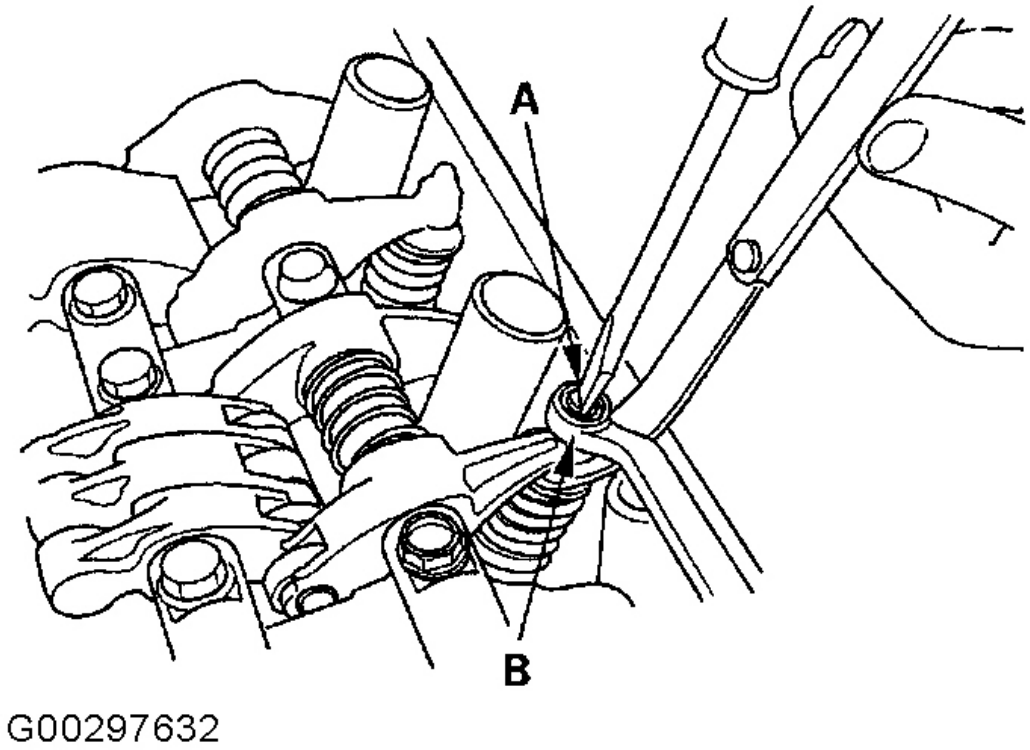

Fig. 4: Adjusting Screw Until Drag On Feeler Gauge Is Correct
Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVE CLEARANCE SPECIFICATIONS

Application	Specification - In. (mm)
Intake	.008-.009 (.20-.24)
Exhaust	.011-.013 (.28-.32)

7. Tighten the locknut and recheck the clearance. Repeat the adjustment if necessary.
8. Rotate the crankshaft clockwise. Align the pointer (A) on the back cover with the No. 4 piston TDC mark (B) on the front camshaft pulley. See **Fig. 1** and **Fig. 5**.
9. Check and, if necessary, adjust the valve clearance on No. 4 cylinder.
10. Rotate the crankshaft clockwise. Align the pointer (A) on the back cover with the No. 2 piston TDC mark (B) on the front camshaft pulley. See **Fig. 1** and **Fig. 5** .
11. Check and, if necessary, adjust the valve clearance on No. 2 cylinder.
12. Rotate the crankshaft clockwise. Align the pointer (A) on the back cover with the No. 5 piston TDC mark (B) on the front camshaft pulley. See **Fig. 5**.
13. Check and, if necessary, adjust the valve clearance on No. 5 cylinder.

14. Rotate the crankshaft clockwise. Align the pointer (A) on the back cover with the No. 3 piston TDC mark (B) on the front camshaft pulley. See **Fig. 5**.
15. Check and, if necessary, adjust the valve clearance on No. 3 cylinder.
16. Rotate the crankshaft clockwise. Align the pointer (A) on the back cover with the No. 6 piston TDC mark (B) on the front camshaft pulley. See **Fig. 5**.
17. Check and, if necessary, adjust the valve clearance on No. 6 cylinder.

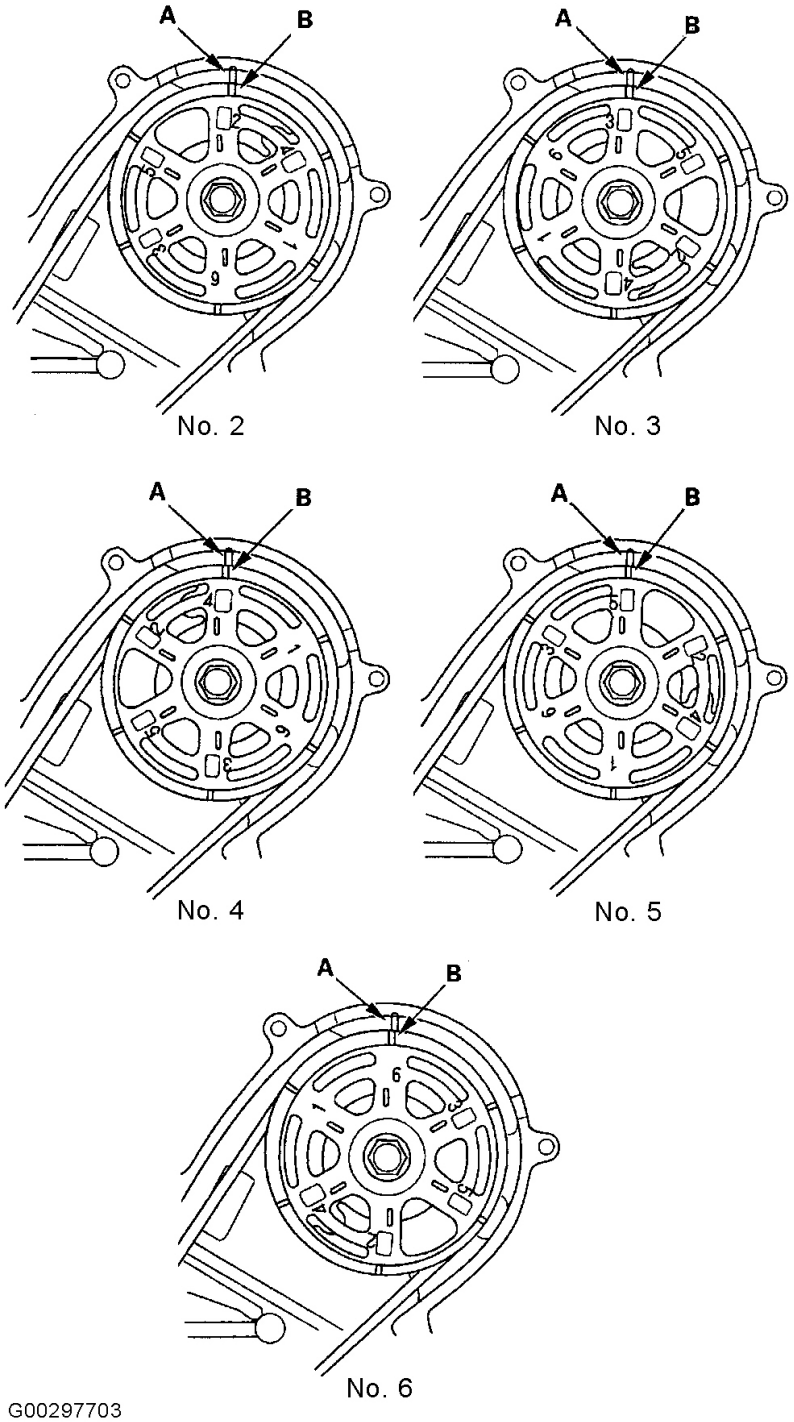

Fig. 5: Rotating Crankshaft Clockwise Aligning Pointer On Back Cover With No. Piston TDC Mark
Courtesy of AMERICAN HONDA MOTOR CO., INC.

THROTTLE CABLE

1. Push the throttle link (A) toward the throttle lever (B) until there is no clearance. See **Fig. 6**.
2. Check cable free play at the throttle linkage. See **Fig. 7**. Cable deflection should be 3/8-1/2" (10-12 mm).
3. If deflection is not within specs 3/8-1/2" (10-12 mm) loosen the locknut (B), turn the adjusting nut (C) until the deflection is as specified, then retighten the locknut.
4. With the cable properly adjusted, check the throttle valve to be sure it opens fully when you push the accelerator pedal to the floor. Also check the throttle valve to be sure it returns to the idle position whenever you release the accelerator pedal.

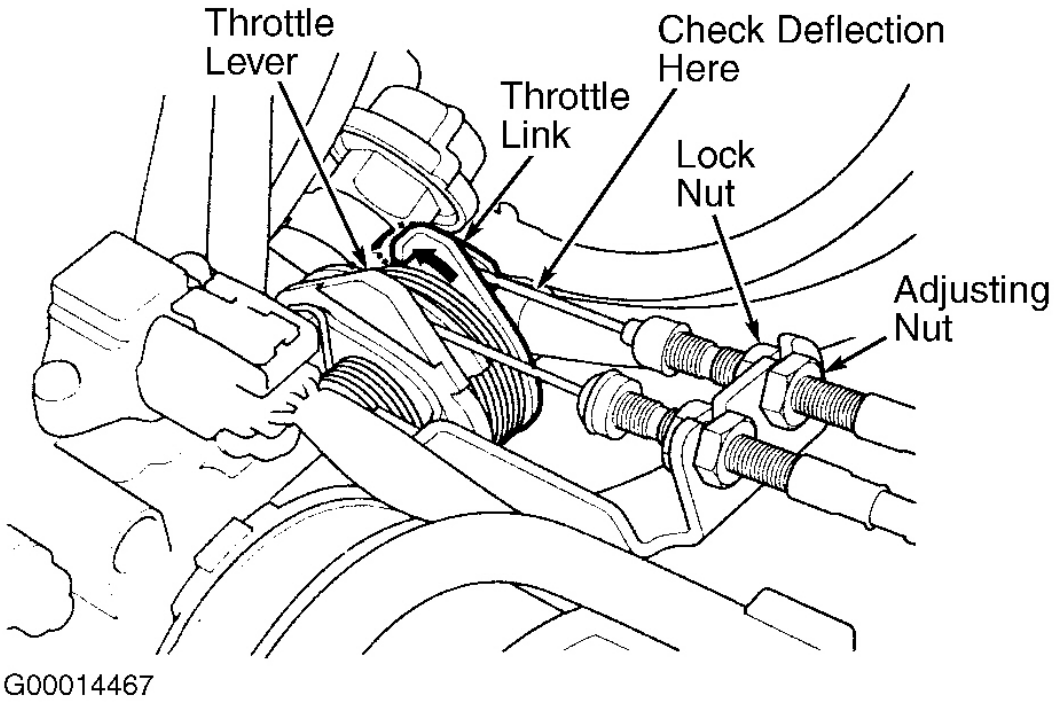

Fig. 6: Adjusting Throttle Cable
Courtesy of AMERICAN HONDA MOTOR CO., INC.

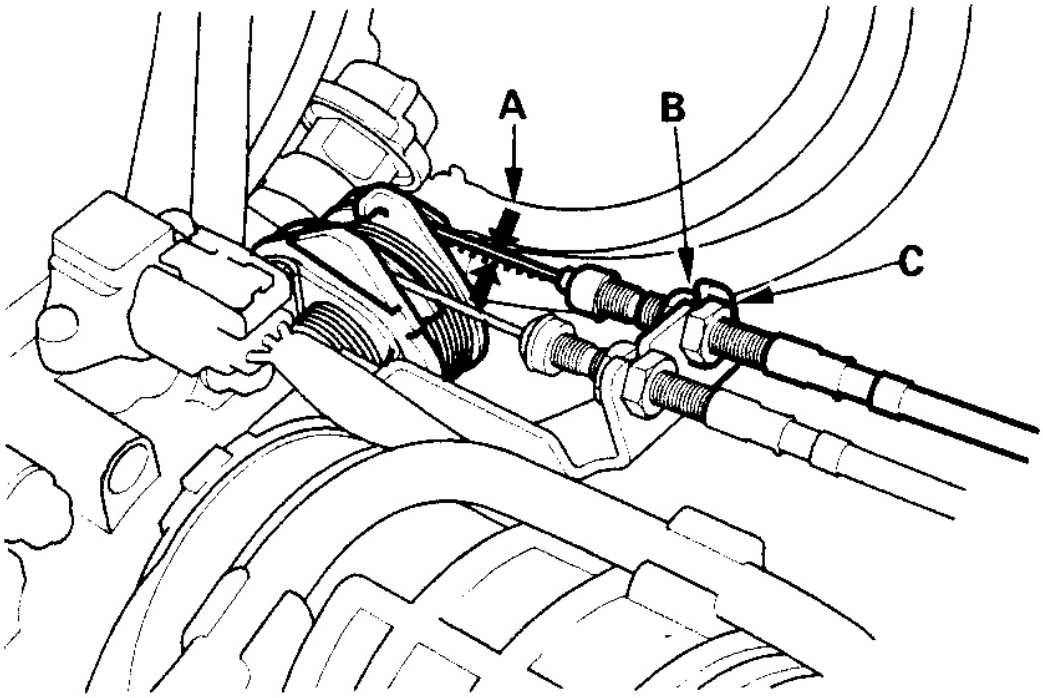

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Fig. 7: Checking Cable Free Play At Throttle Linkage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CRUISE CONTROL CABLE

1. Check the actuator cable (A) moves smoothly with no binding or sticking. See **Fig. 8**.
2. Start the engine. Hold the engine at 3000 rpm with no load (in Park or Neutral) until the radiator fan comes on, then let it idle.
3. Measure the amount of movement of the output linkage (B) until the engine speed starts to increase. At first, the output linkage should be located at the fully closed position (C). The free play (D) should be .13-.17" (3.70-3.80 mm).
4. If the free play is not within specification, move the cable to the point where the engine speed starts to increase, then tighten the locknut (A) and adjusting nut (B). See **Fig. 9**.
5. Turn the adjusting nut (A) until it is .13-.17" (3.70-3.80 mm) away from the bracket (B). See **Fig. 10**.
6. Pull the cable so that the adjusting nut (A) touches the bracket, then tighten the locknut (B). See **Fig. 9**.

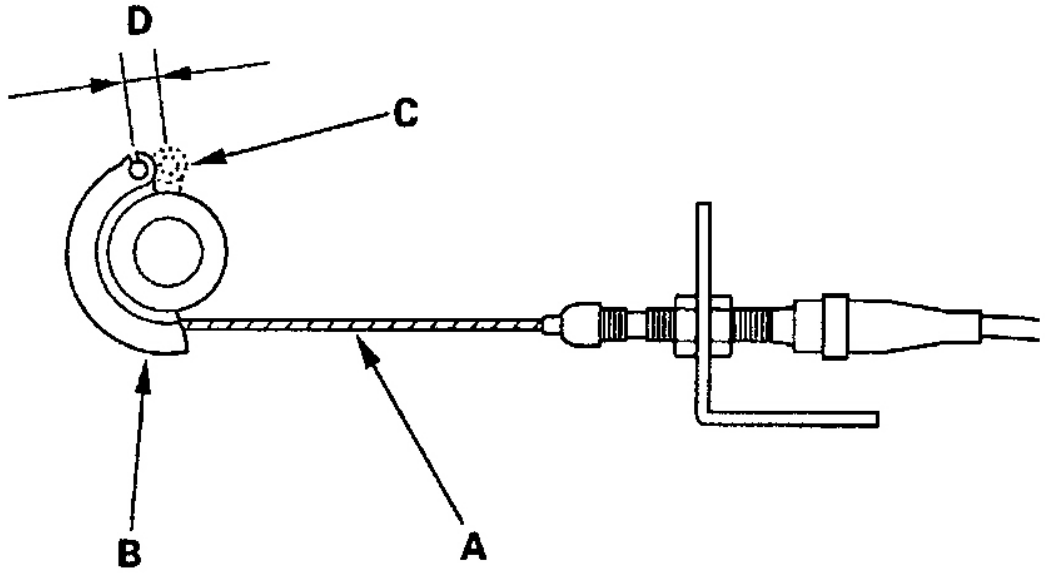

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Fig. 8: Checking Actuator Cable Moves Smoothly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

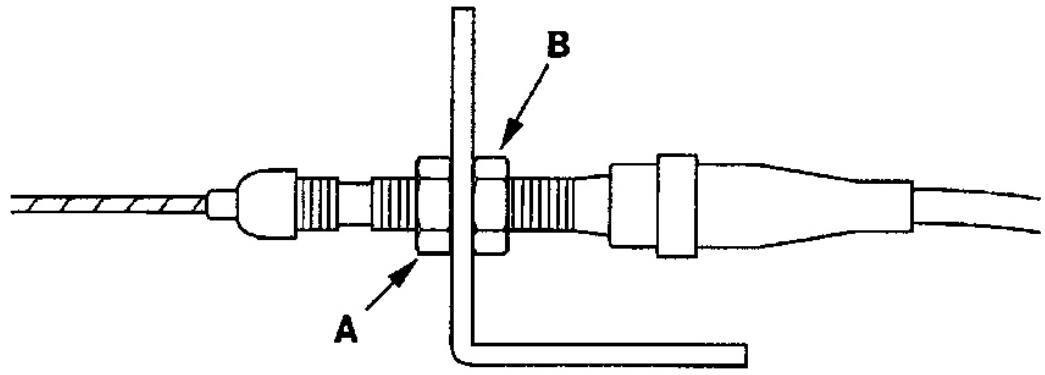

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Fig. 9: Tightening Locknut & Adjusting Nut
Courtesy of AMERICAN HONDA MOTOR CO., INC.

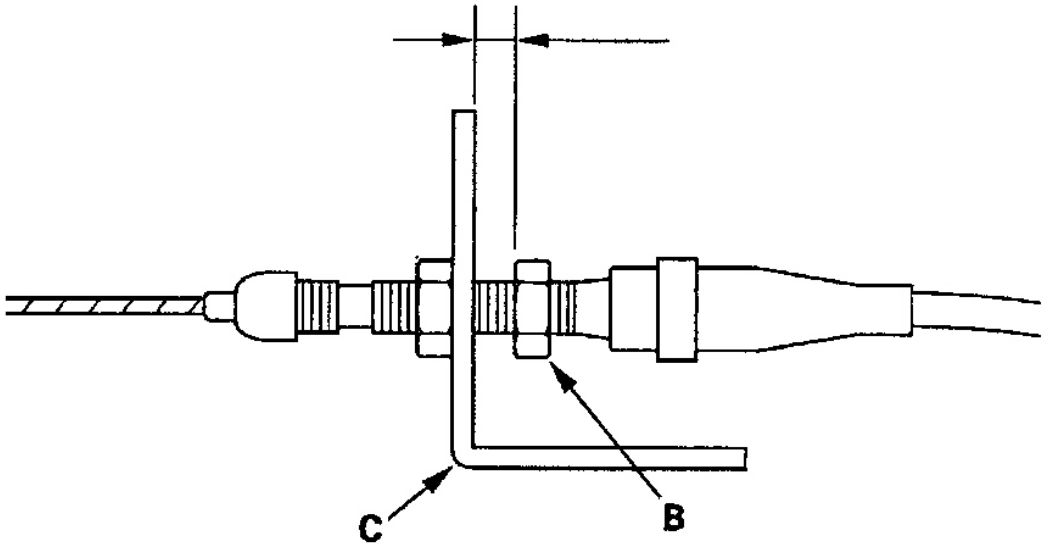


Fig. 10: Turning Adjusting Nut Away From Bracket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

TROUBLE SHOOTING

NOTE: To trouble shoot engine mechanical components, see ENGINE MECHANICAL in appropriate BASIC TROUBLE SHOOTING article in GENERAL INFORMATION.

TESTING

OIL PRESSURE SWITCH

1. Remove the YEL/RED wire (A) from the engine oil pressure switch (B). See **Fig. 11**.
2. Check for continuity between the positive terminal (C) and the engine (ground). There should be continuity with the engine stopped. There should be no continuity with the engine running.

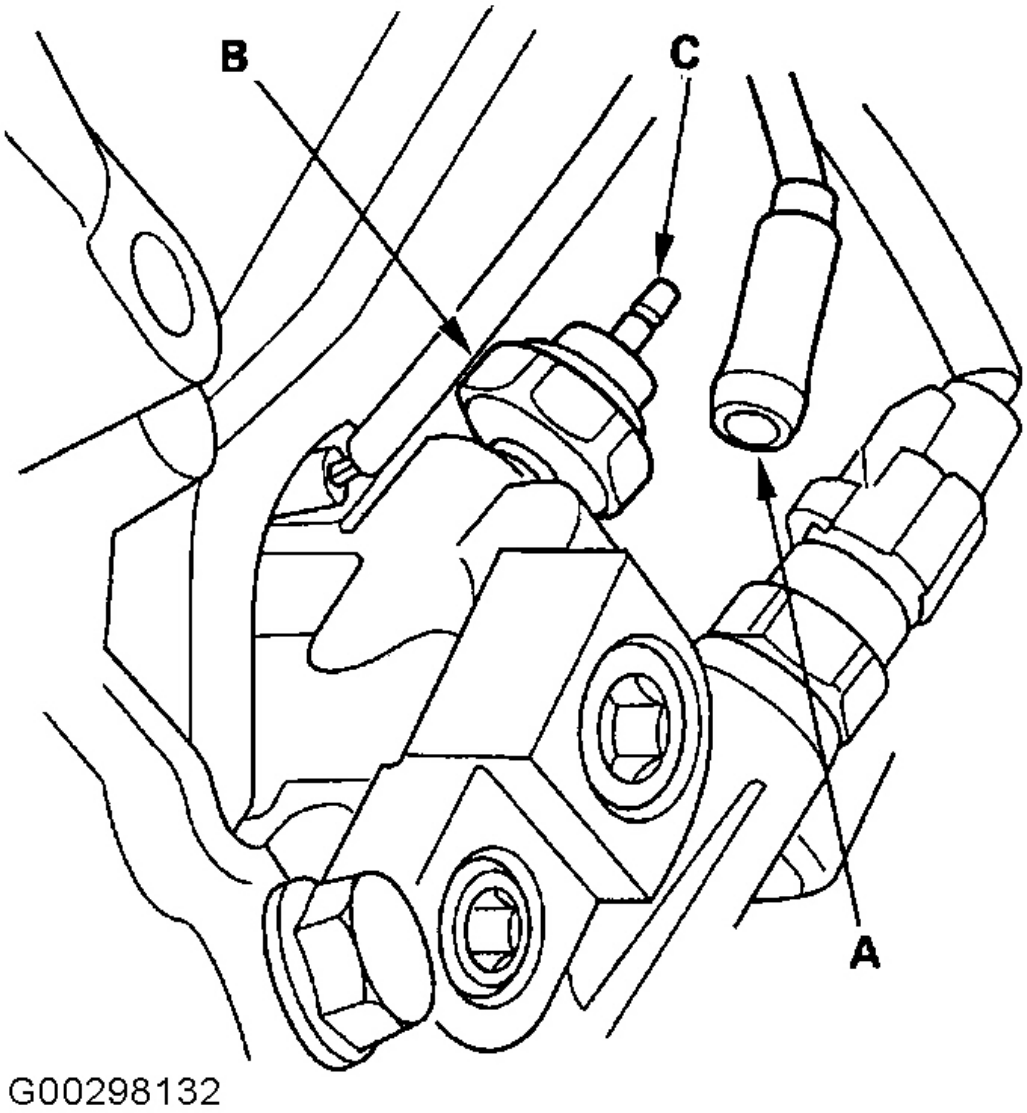


Fig. 11: Removing YEL/RED Wire From Engine Oil Pressure Switch
Courtesy of AMERICAN HONDA MOTOR CO., INC.

VTEC ROCKER ARM

1. Remove cylinder head covers. See **CYLINDER HEAD COVER** under REMOVAL & INSTALLATION.
2. Remove front upper cover. See **Fig. 111**.
3. Set the No. 1 piston at top dead center (TDC). See step 3 in VALVE CLEARANCE ADJUSTMENT.
4. Push on the intake mid rocker arm (A) for the No. 1 cylinder. The mid rocker arm should move

independently of the primary rocker arm (B) and secondary rocker arm (C). See **Fig. 12**.

- If the intake mid rocker arm does not move, remove the mid, primary, and secondary intake rocker arms as an assembly, and check that the pistons in the mid and primary rocker arms move smoothly. If any rocker arm needs replacing, replace the primary, mid and secondary rocker arms as an assembly, and retest.
- If the mid rocker arm moves freely, go to step 5.

5. Repeat step 4 on the remaining intake mid rocker arms with each piston at TDC. When all the mid rocker arms pass the test, then go to next step.
6. Check that the air pressure on the shop air compressor gauge indicates over 100 PSI (690 kPa).
7. Inspect the valve clearance. See **VALVE CLEARANCE** under ADJUSTMENTS.
8. Cover the timing belt with a shop towel to protect the belt.
9. Remove the 2 end intake rocker shaft mounting bolts, then install and connect the special tools and an air pressure regulator with a 0-100 PSI gauge (A). See **Fig. 13**.
10. Loosen the valve on the regulator, and apply air pressure of 64-78 PSI (440-540 kPa).

NOTE: If the synchronizing pistons A and B do not move after applying air pressure, move the primary or secondary rocker arm up and down manually.

11. Make sure that the intake primary rocker arm (B) and intake secondary rocker arm (C) are mechanically connected by the piston and that the mid rocker arm (A) does not move when pushed manually. See **Fig. 12**. If any intake mid rocker arm moves independently of the primary and secondary rocker arms, replace the rocker arms as a set.

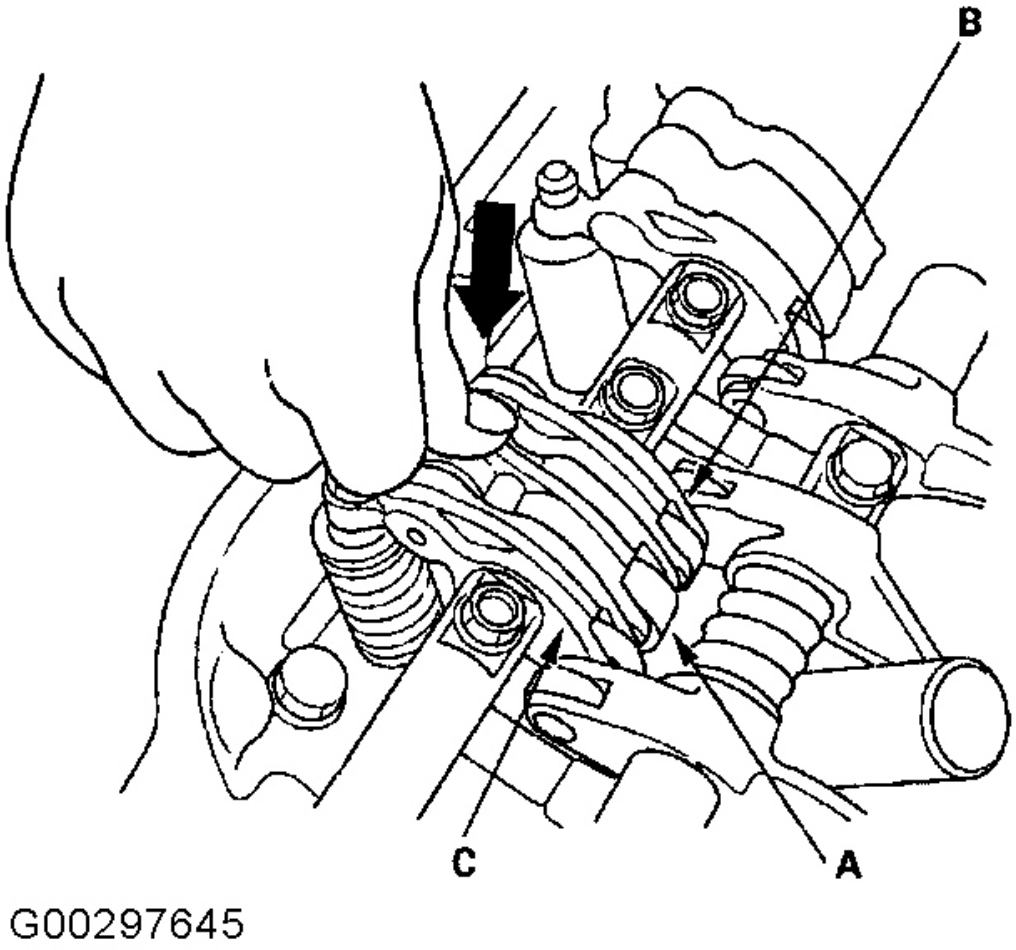
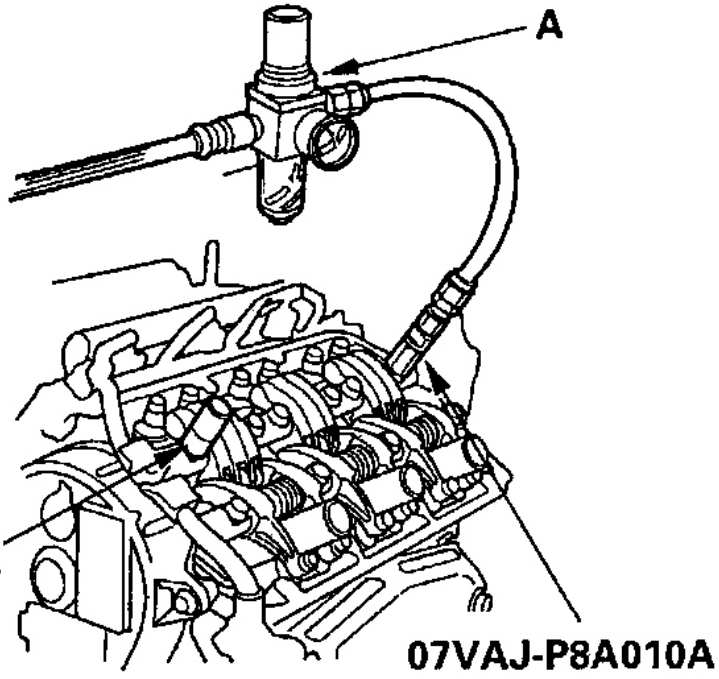


Fig. 12: Pushing On Intake Mid Rocker Arm For No. 1 Cylinder
Courtesy of AMERICAN HONDA MOTOR CO., INC.

FRONT:



REAR:

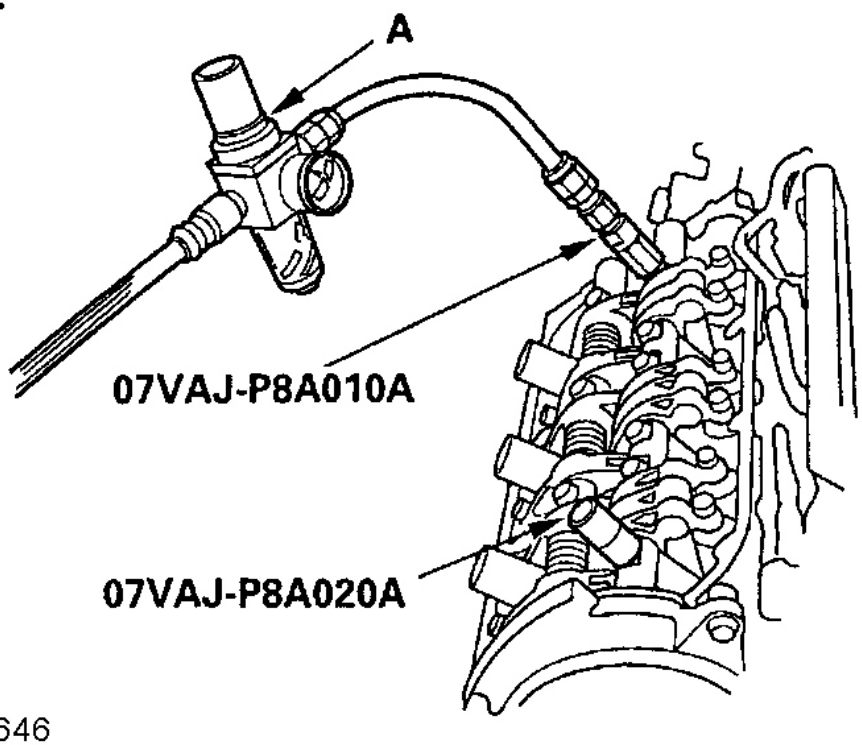


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Fig. 13: Removing 2 End Intake Rocker Shaft Mounting Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

VTEC SOLENOID VALVE

1. Disconnect connector from the VTEC solenoid valve.
2. Measure resistance between the terminal and body ground. See **Fig. 14**. Resistance should be 14-30 ohms.
3. If the resistance is within specifications, remove the VTEC solenoid valve/oil filter assembly (A) from oil pump, and check the VTEC solenoid valve filter (B) for clogging. If there is clogging, replace the engine oil filter and the engine oil. See **Fig. 15**.
4. If the filter is not clogged, push the VTEC solenoid valve with you finger and check its movement. If the VTEC solenoid valve is normal, check the engine oil pressure. See **Fig. 16**.

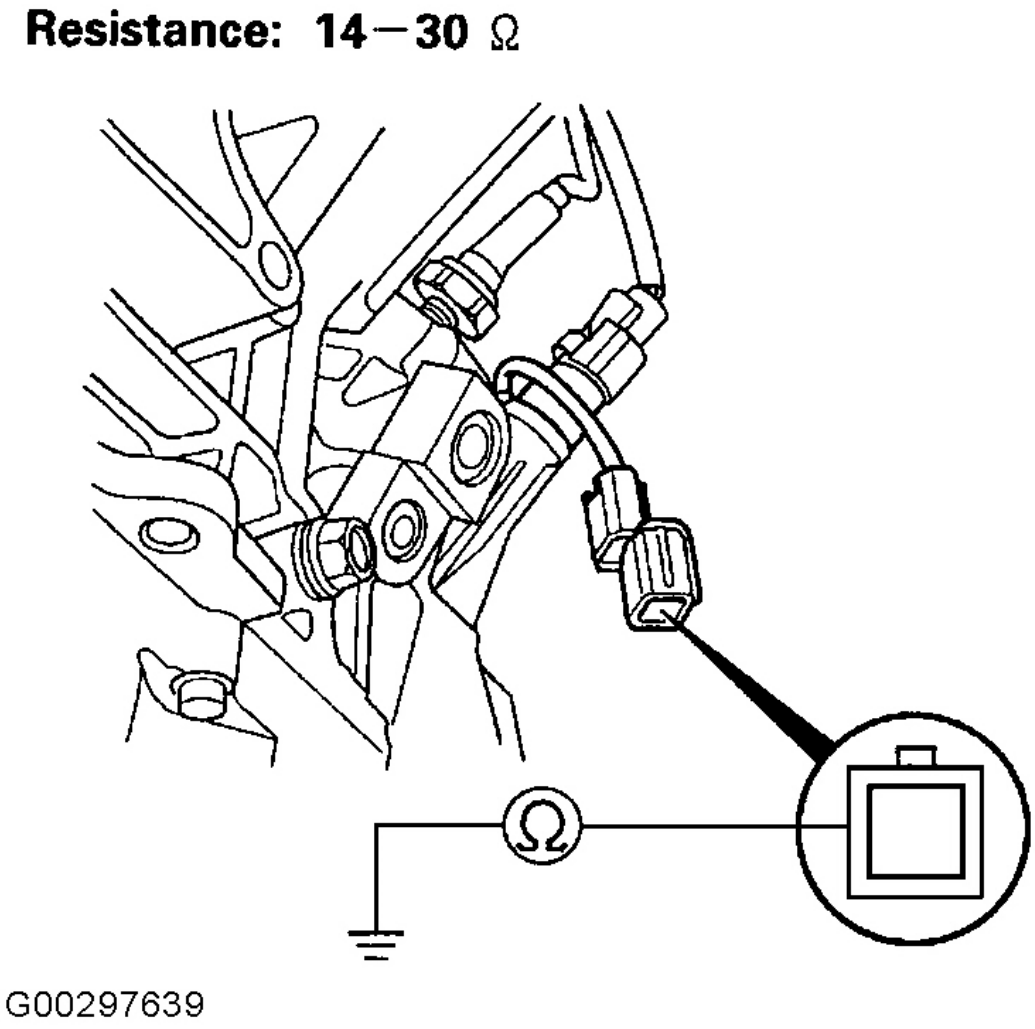

Fig. 14: Measuring Resistance Between Terminal & Body Ground
Courtesy of AMERICAN HONDA MOTOR CO., INC.

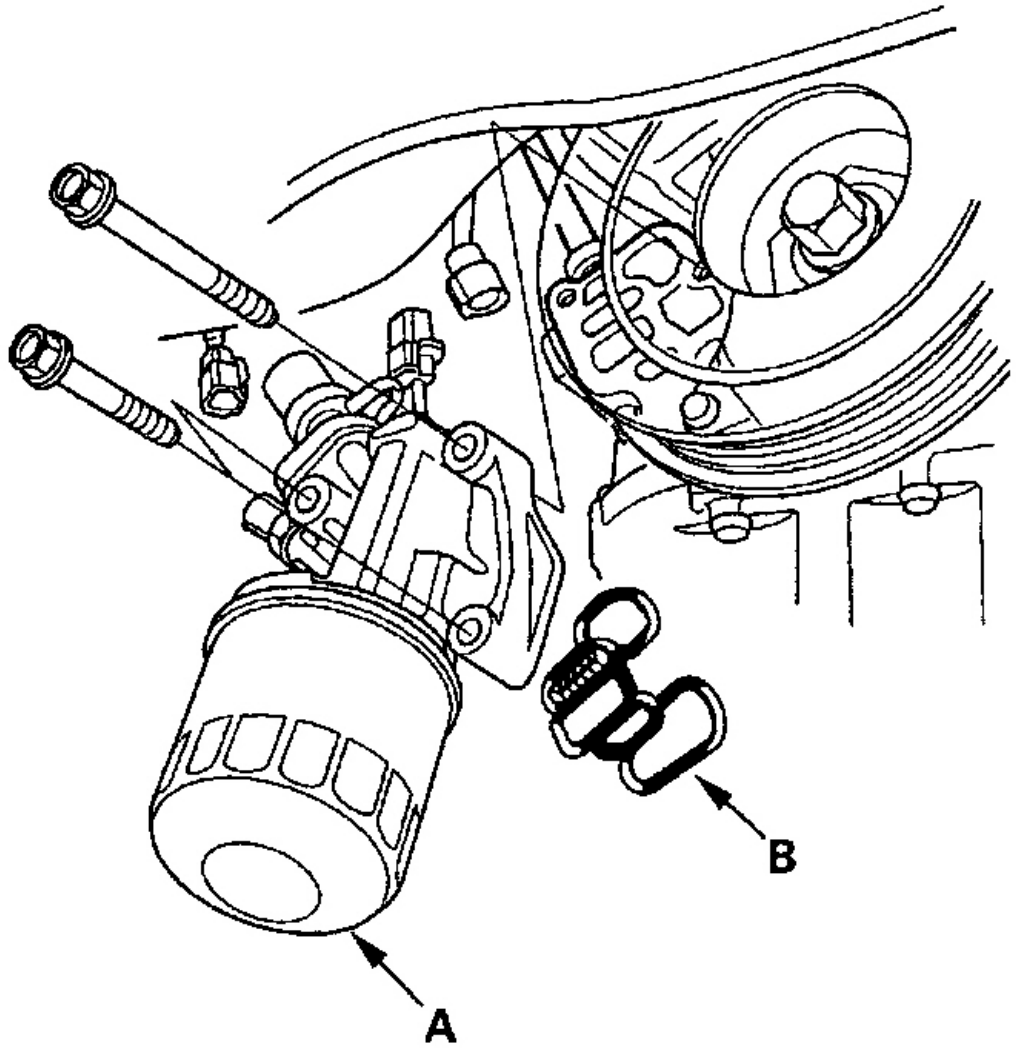

Fig. 15: Removing VTEC Solenoid Valve/Oil Filter Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

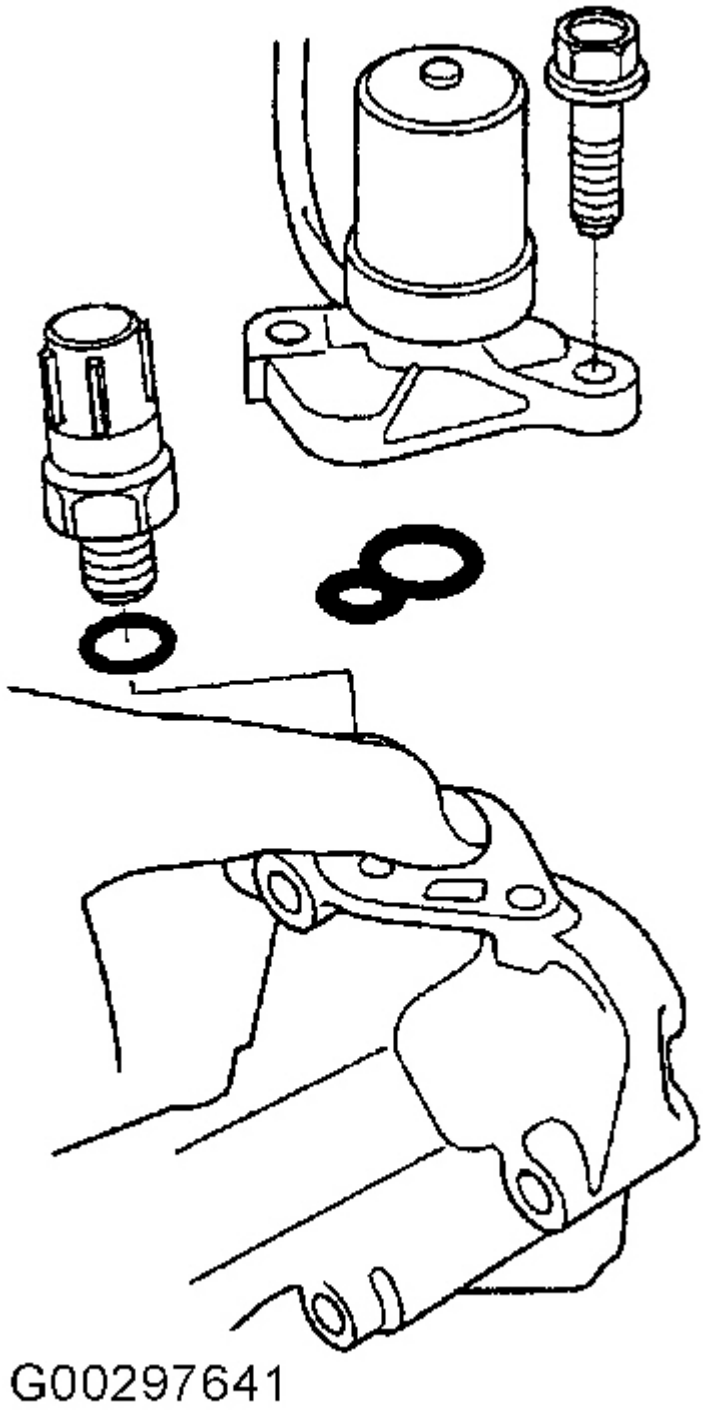

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Fig. 16: Pushing VTEC Solenoid Valve With Finger
Courtesy of AMERICAN HONDA MOTOR CO., INC.

REMOVAL & INSTALLATION

BLEEDING COOLING SYSTEM

Cooling system bleeding procedure not provided by manufacturer.

FUEL PRESSURE RELEASE

WARNING: Always relieve fuel pressure before disconnecting any fuel injection-related component. DO NOT allow fuel to contact engine or electrical components.

Before disconnecting the fuel pipes or hoses, release pressure from the system by loosening the fuel pulsation damper on top of the fuel rail.

1. Make sure you have the anti-theft codes for the radio and the navigation system, then write down the frequencies for the radio's preset buttons.
2. Disconnect the negative cable from the battery.
3. Remove the fuel fill cap.
4. Use a wrench on the fuel pulsation damper (A). See **Fig. 17**.
5. Place a rag or shop towel (B) over the fuel pulsation damper.

NOTE: Replace all washers whenever the fuel pulsation damper is loosened or removed.

6. Slowly loosen the fuel pulsation damper one complete turn.

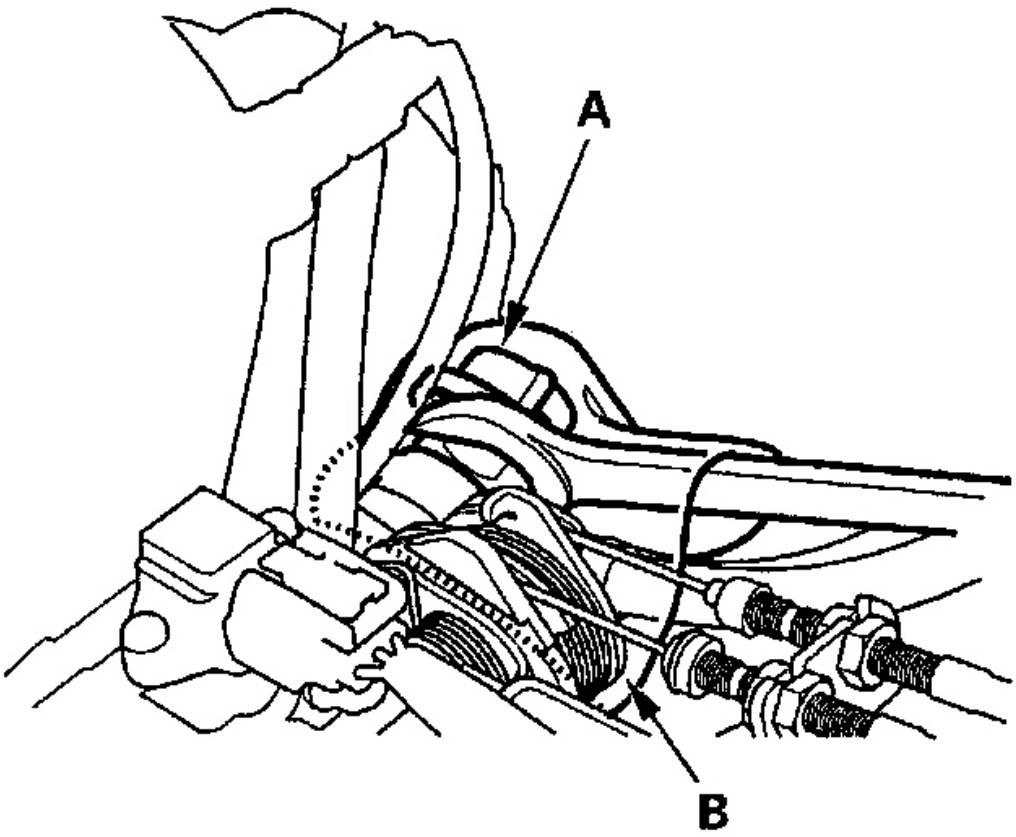

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Fig. 17: Using Wrench On Fuel Pulsation Damper
Courtesy of AMERICAN HONDA MOTOR CO., INC.

THROTTLE BODY

For throttle body removal and installation, see **Fig. 18**.

For throttle body disassembly/reassembly, see **Fig. 19**

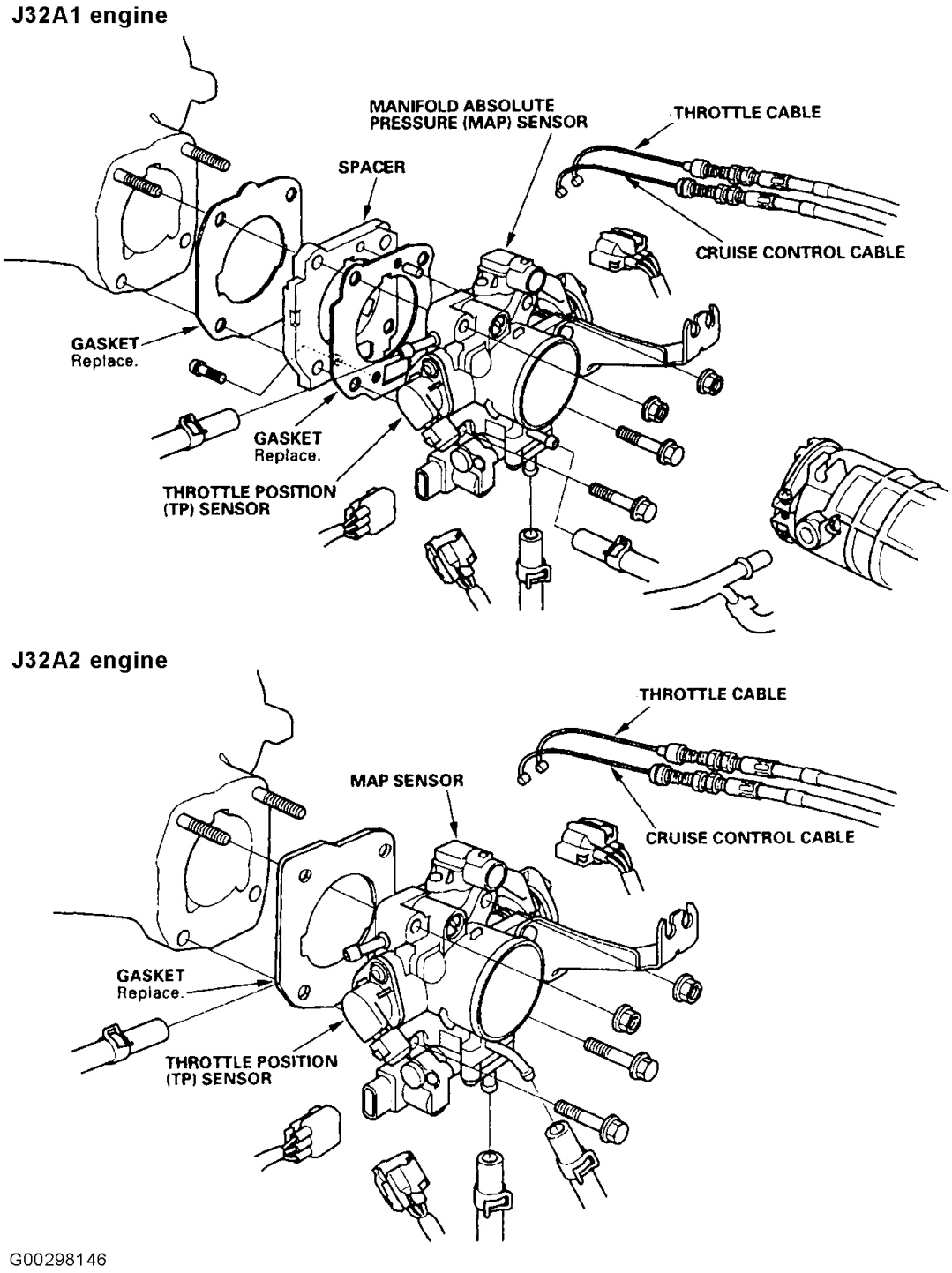

Fig. 18: Removal/Installation Of Throttle Body
Courtesy of AMERICAN HONDA MOTOR CO., INC.

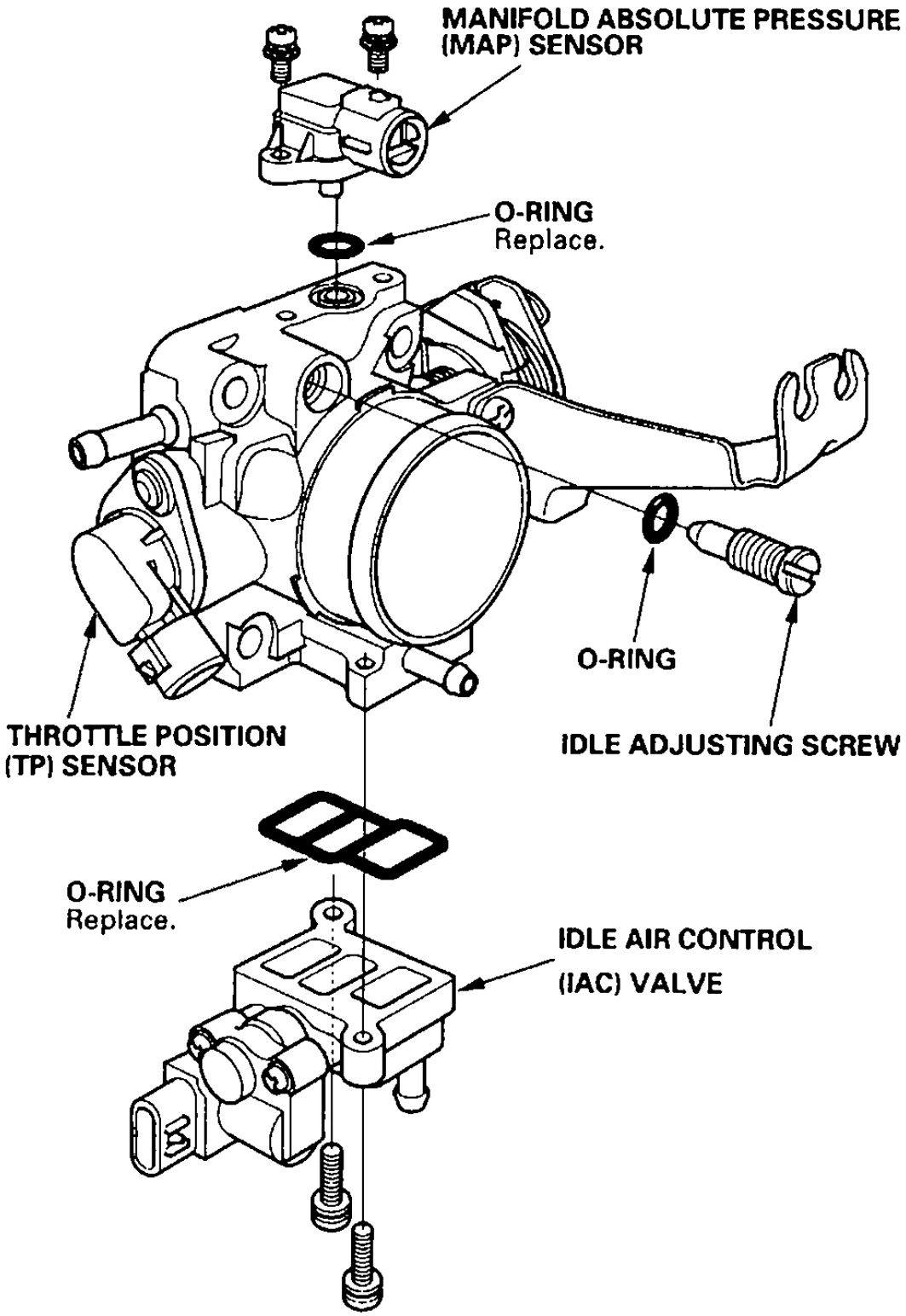

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Fig. 19: Exploded View Of Throttle Body
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ENGINE

Removal

NOTE:

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

NOTE: Do not attempt to close the hood with the support strut in the vertical position, as it will damage the support strut and hood.

1. Remove the support struts (A) from the engine hood. Move the hood to a vertical position, then reinstall the support strut. See **Fig. 20**.
2. Make sure you have the anti-theft code for the radio, then write down the frequencies for the radio's preset buttons.
3. Disconnect the negative cable from the battery first, then the positive cable.
4. Remove the battery.
5. Remove the intake manifold cover (if applicable). See **Fig. 21**.
6. Remove the water bypass hoses (A). See **Fig. 22**. Disconnect the TCS control valve actuator connector (B) and the TCS control valve angle sensor connector (C) from the TCS control valve assembly, then remove the bolt (D) securing the TCS control valve bracket (J32A2 engine).
7. Remove the Evaporative Emission (EVAP) canister hose (A) from the throttle body. See **Fig. 23**.
8. Remove the vacuum hose (B) and breather pipe (C), then remove the intake air duct (D).
9. Remove the harness clamp (A), then remove the battery base (B). See **Fig. 24**.
10. Remove the battery base bracket (C).
11. Remove the starter cable (A). See **Fig. 25**.
12. Remove the ground cable (B) (2002-03 models).

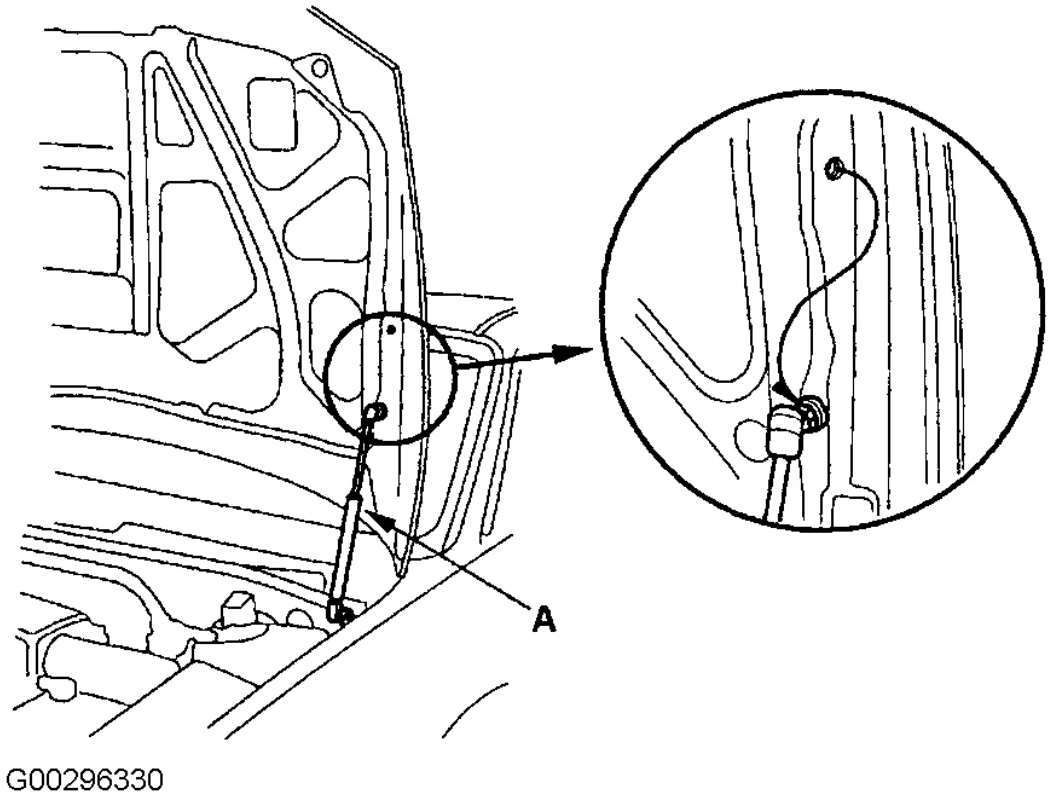


Fig. 20: Removing Support Struts From Engine Hood
Courtesy of AMERICAN HONDA MOTOR CO., INC.

J32A2 engine shown:

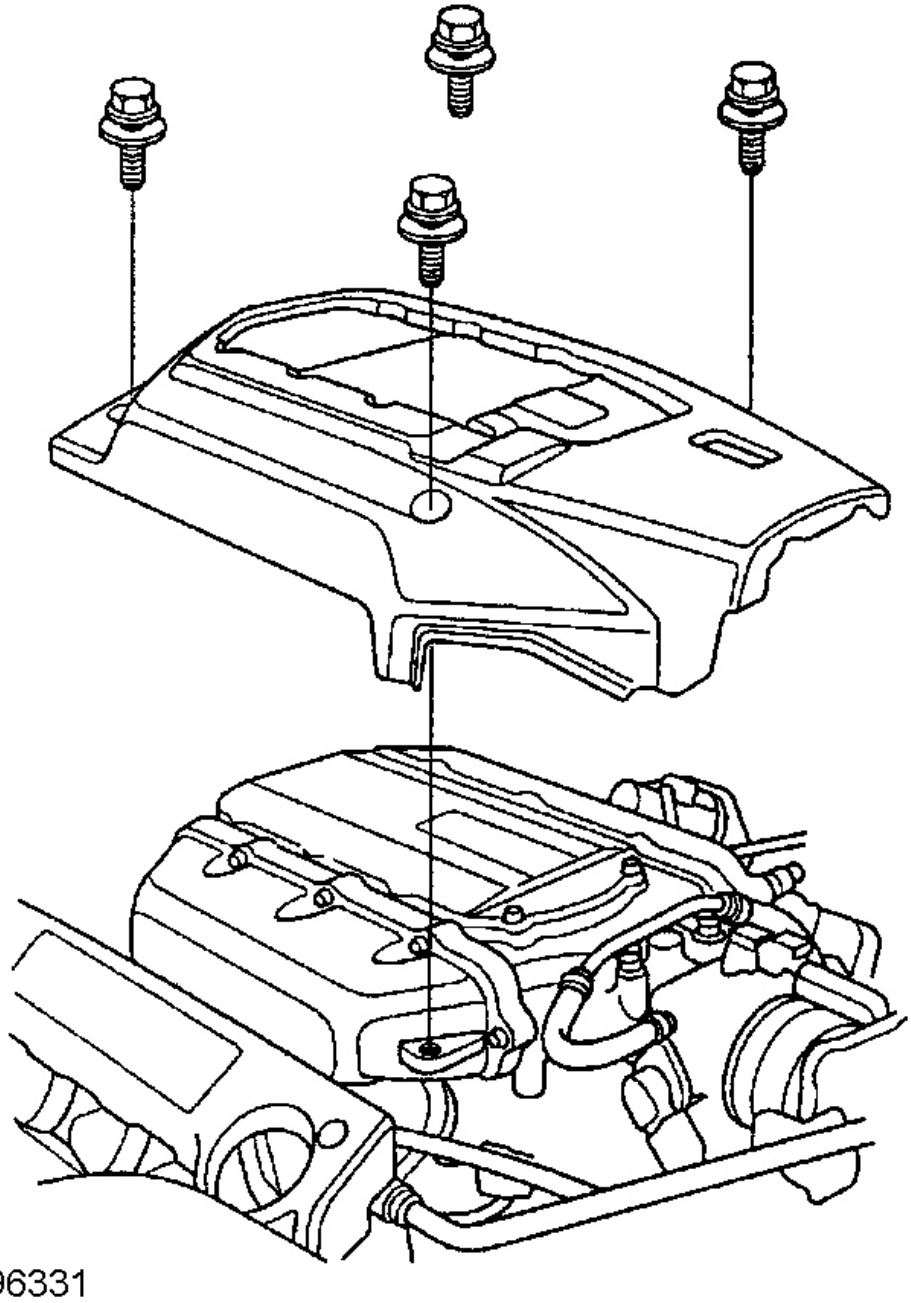


Fig. 21: Removing Intake Manifold Cover (2000-03 Models)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

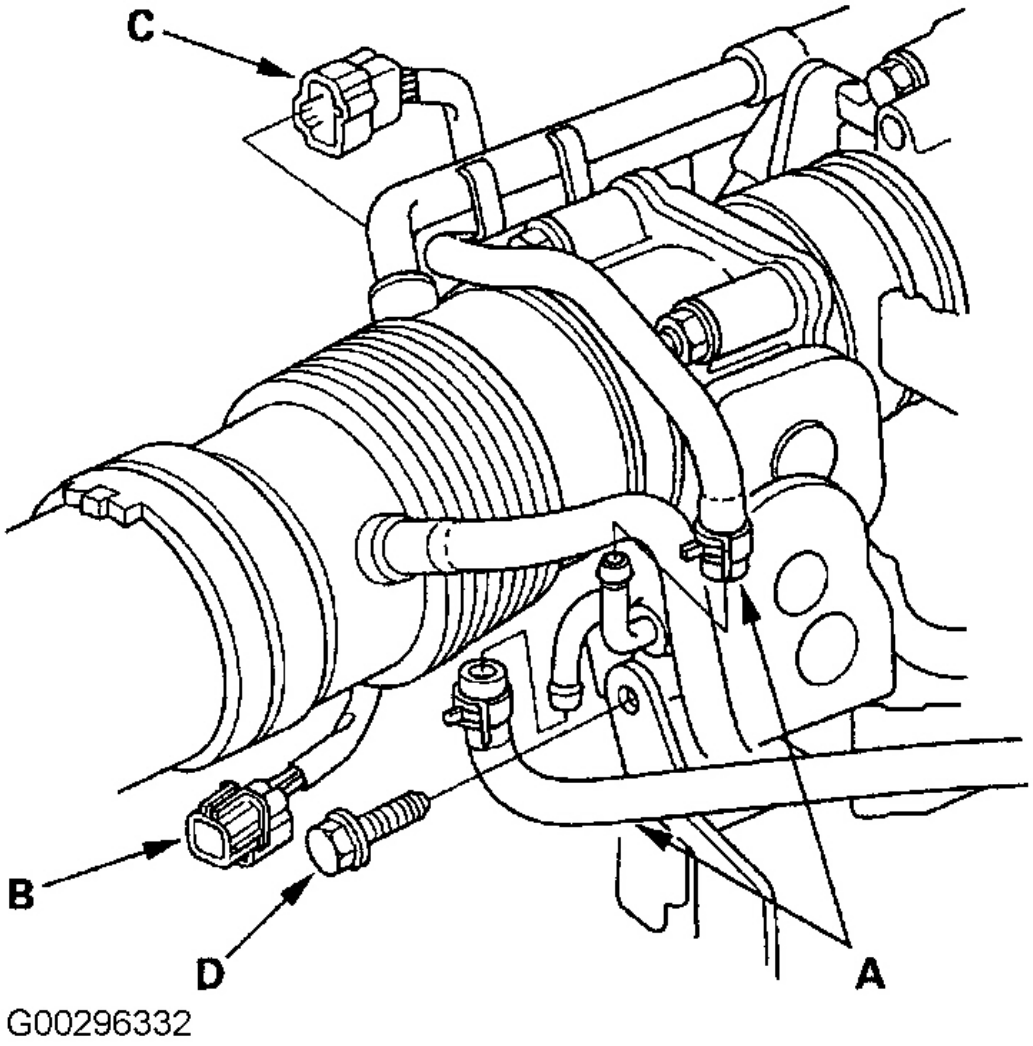
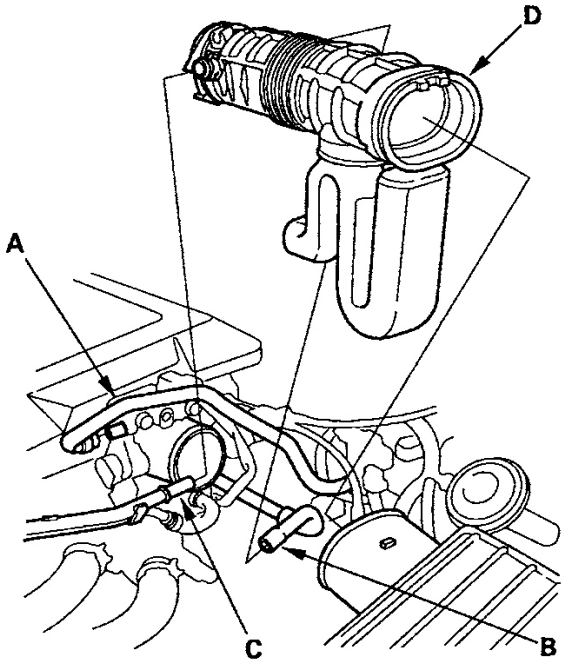


Fig. 22: Removing Water Bypass Hoses
Courtesy of AMERICAN HONDA MOTOR CO., INC.

'99 model:



'00-03 models (J32A2 engine shown):

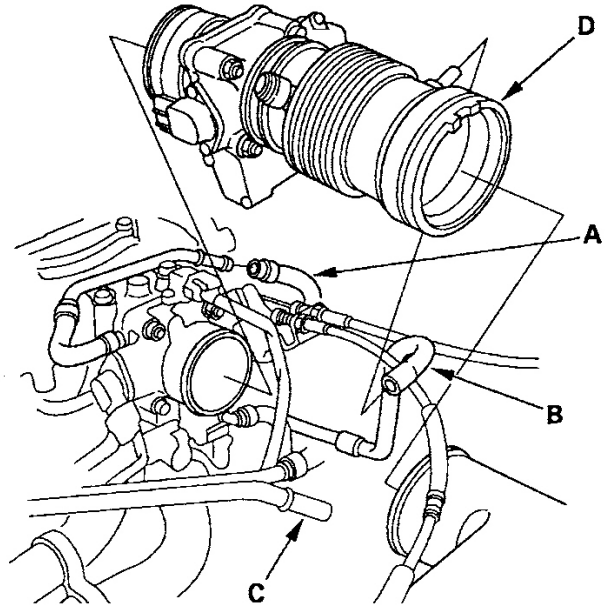


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Fig. 23: Removing Evaporative Emission Canister Hose From Throttle Body
Courtesy of AMERICAN HONDA MOTOR CO., INC.

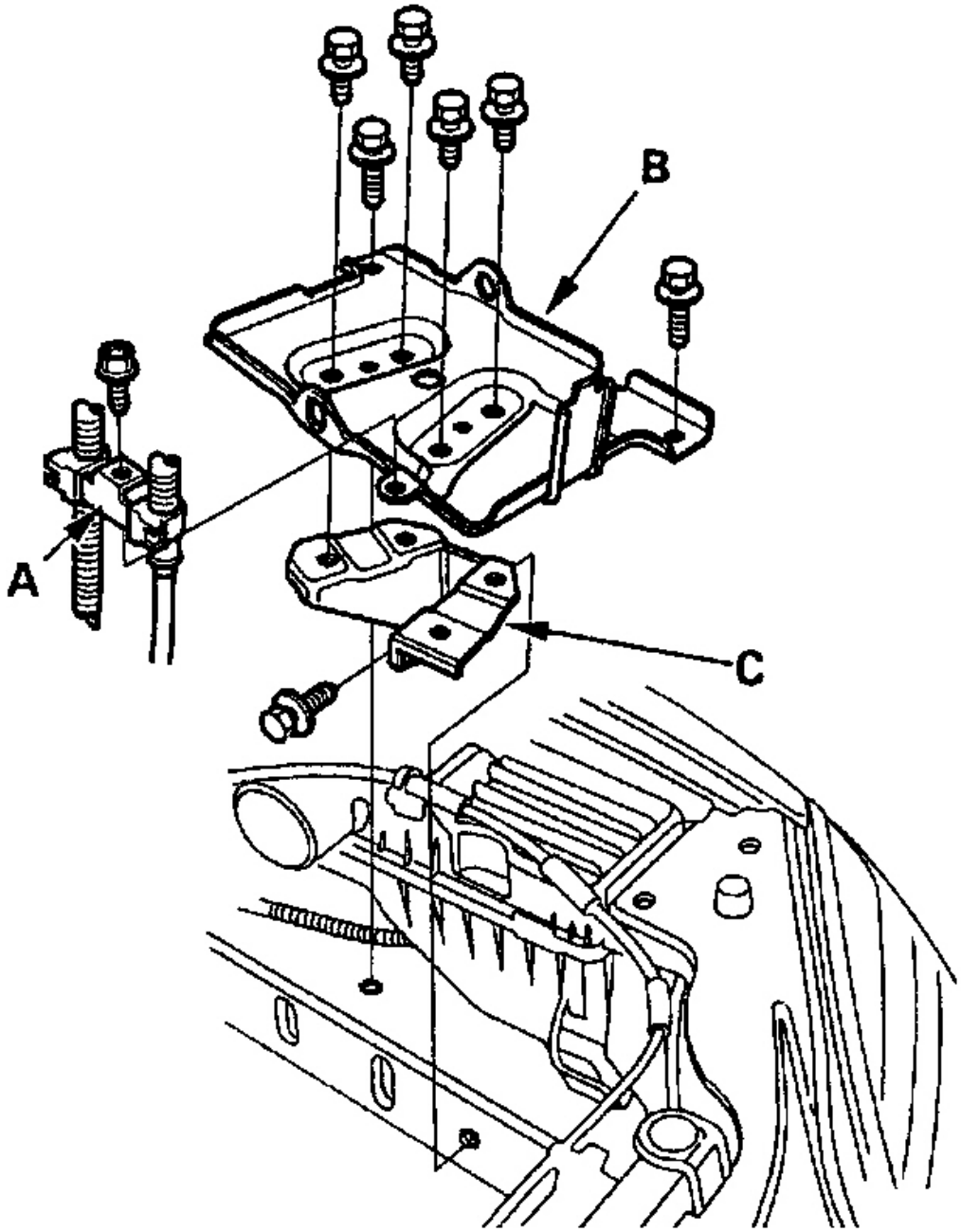

Fig. 24: Removing Battery Base
Courtesy of AMERICAN HONDA MOTOR CO., INC.

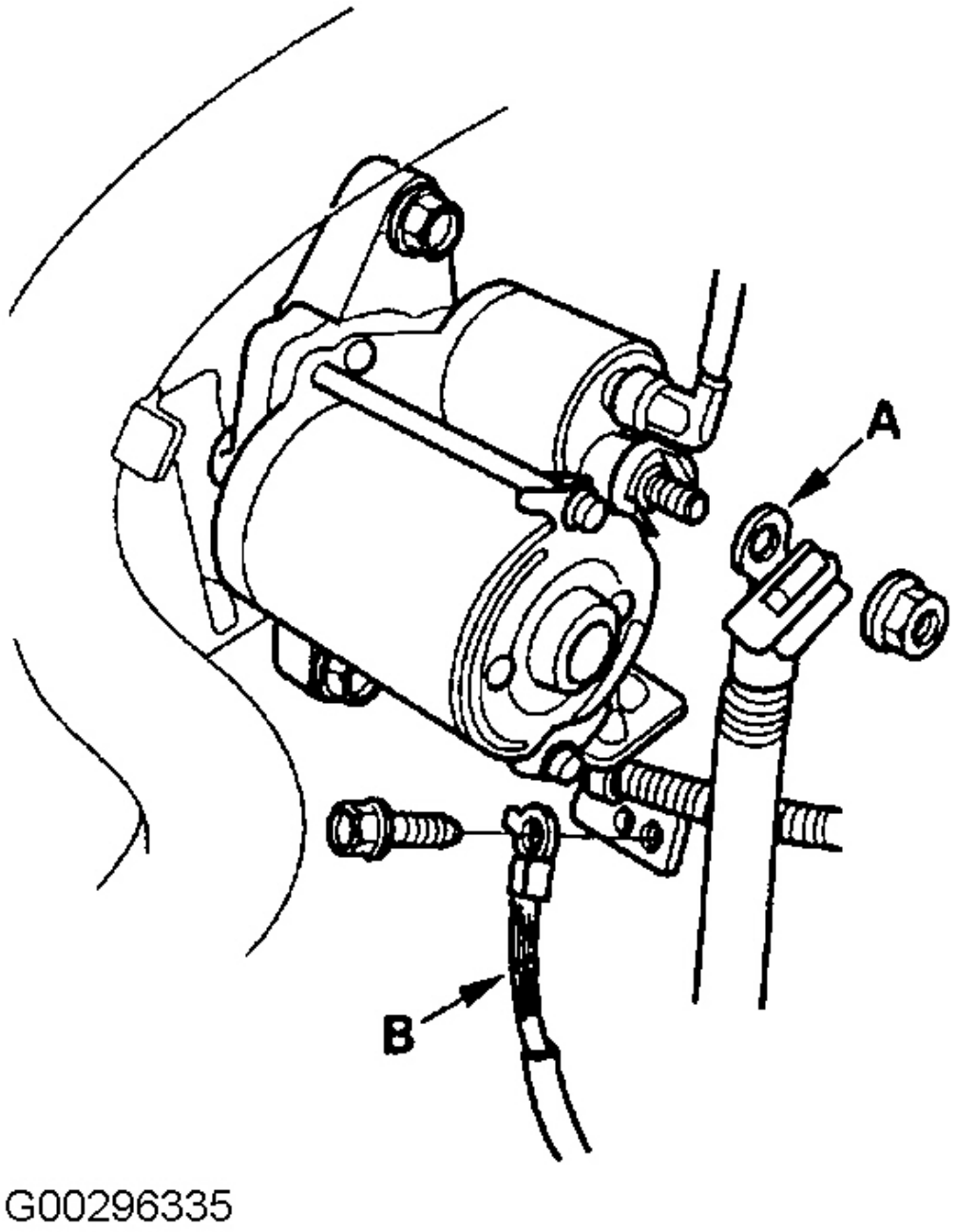

Fig. 25: Removing Starter Cable
Courtesy of AMERICAN HONDA MOTOR CO., INC.

13. Remove the throttle cable (A) and cruise control cable (B) by loosening the locknuts (C), then slip the

cable ends out of the accelerator linkage. See **Fig. 26**. Take care not to bend the cables when removing them. Always replace any kinked cable with a new one.

14. Remove the ground cable (A) and harness clamp (B) (J32A2 engine). See **Fig. 27**.
15. Disconnect the engine wire harness connectors (C), and remove the harness clamp (D) on the left side of the engine compartment.
16. Relieve fuel pressure. See **FUEL PRESSURE RELEASE**.
17. Remove the fuel feed hose (A) and fuel return hose (B). See **Fig. 28**.
18. Remove the brake booster vacuum hose (A) and vacuum hose (B). See **Fig. 29**.
19. Remove the engine wire harness clamps. See **Fig. 30**.

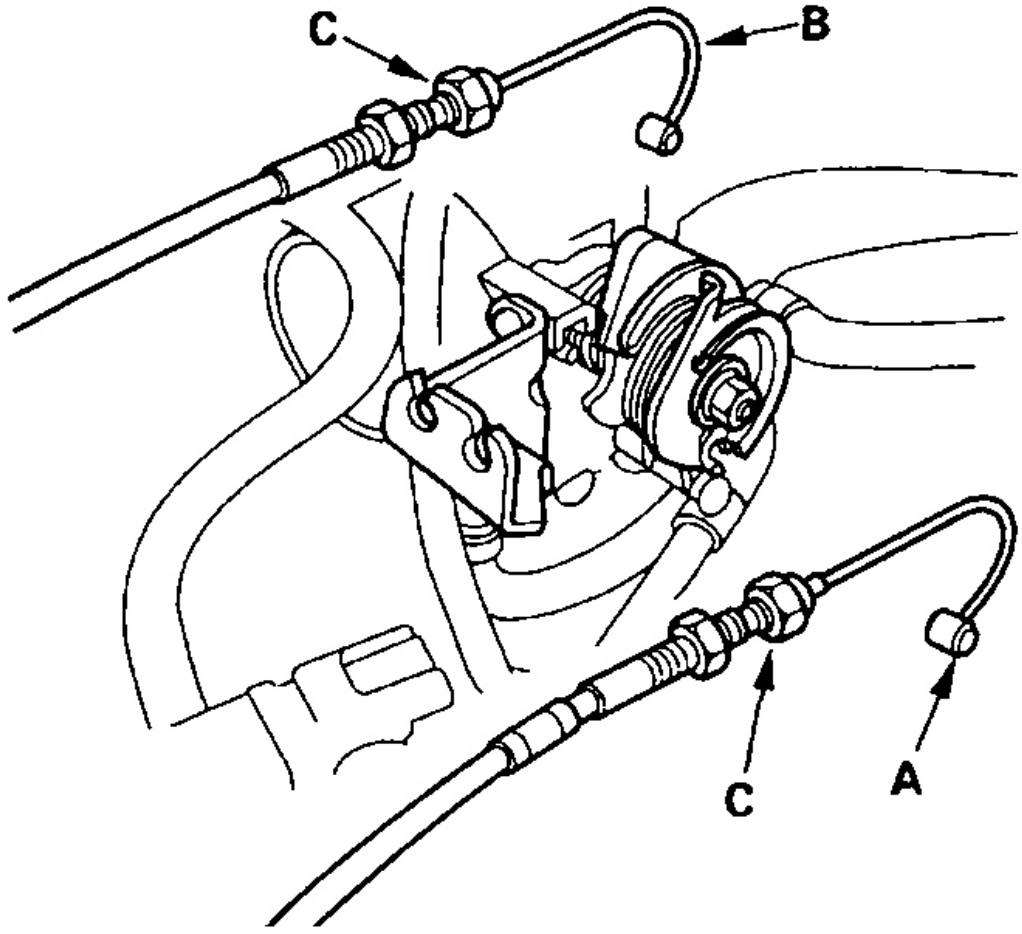

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Fig. 26: Removing Throttle Cable & Cruise Control Cable
Courtesy of AMERICAN HONDA MOTOR CO., INC.

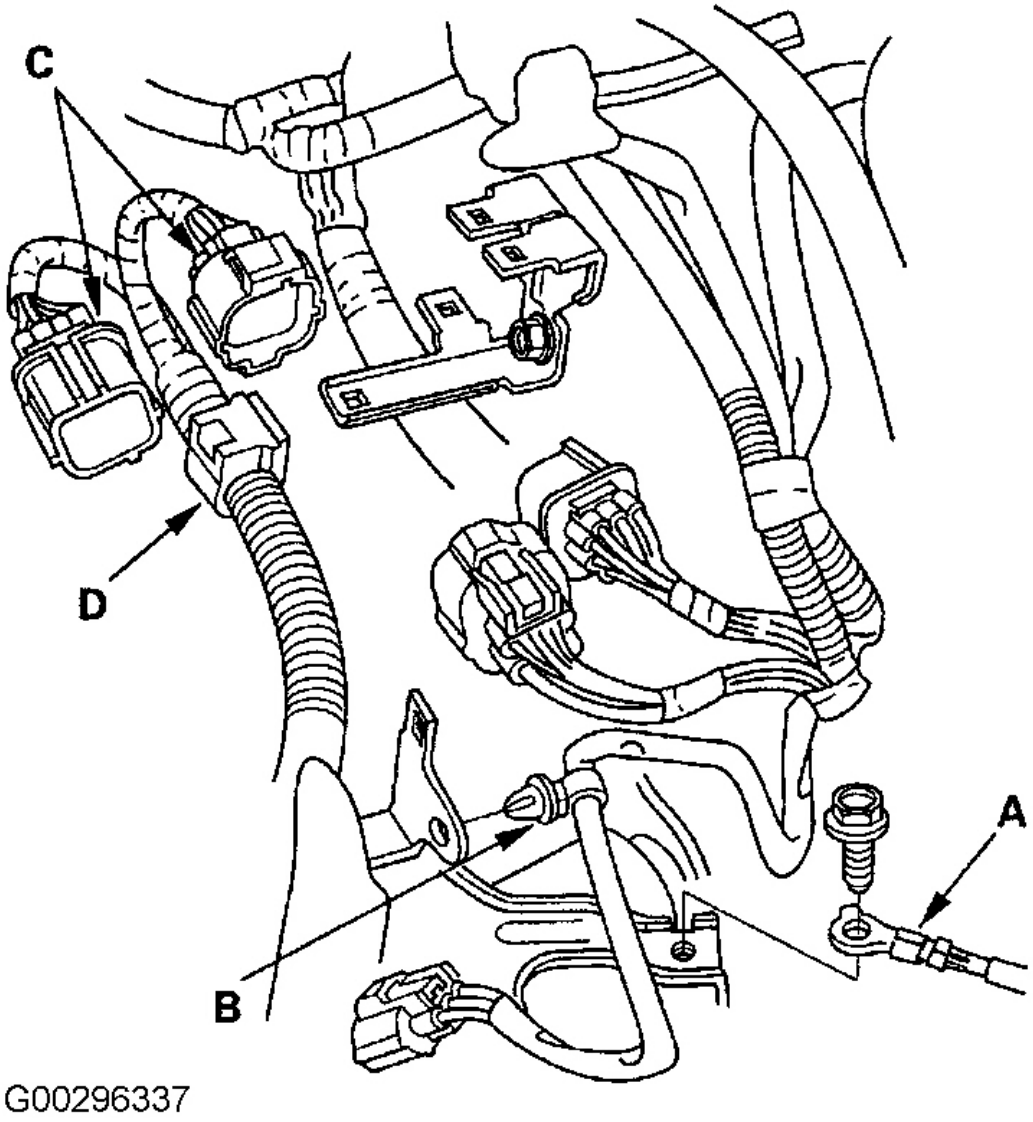
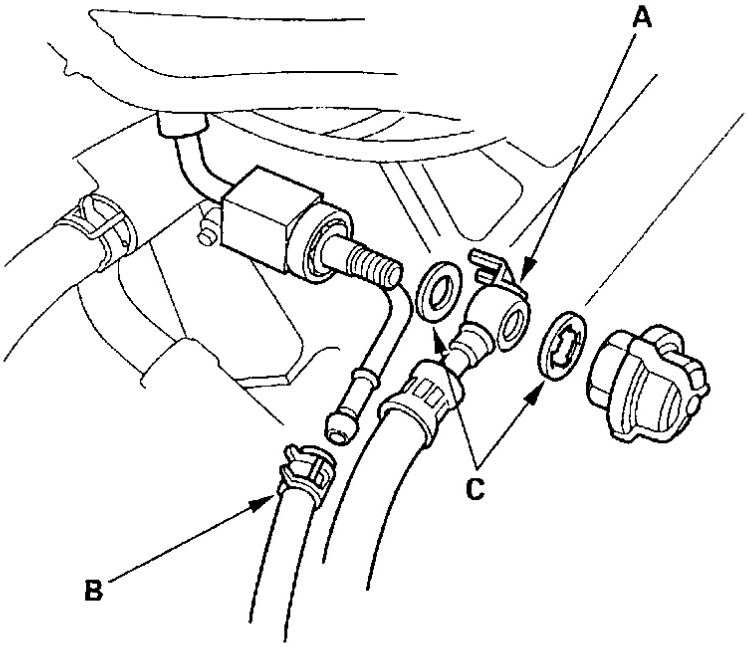


Fig. 27: Removing Ground Cable & Harness Clamp
Courtesy of AMERICAN HONDA MOTOR CO., INC.

'99 model:



'00-03 models:

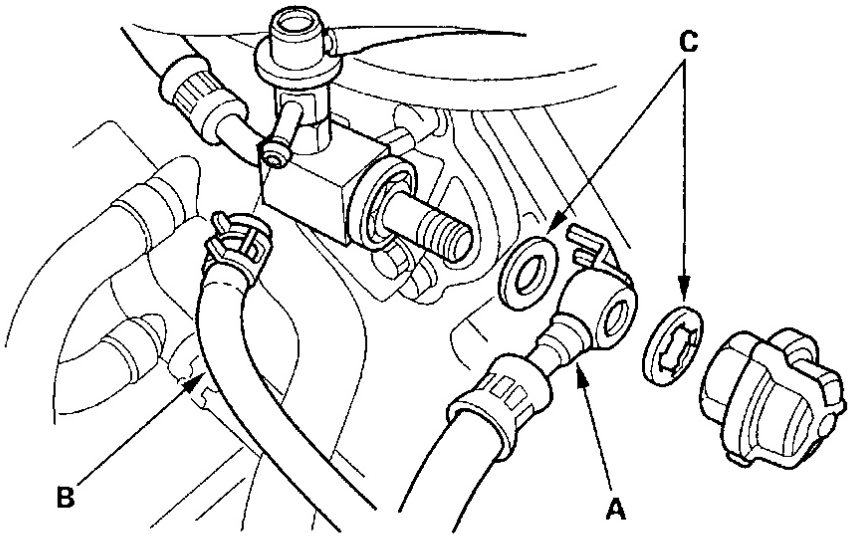


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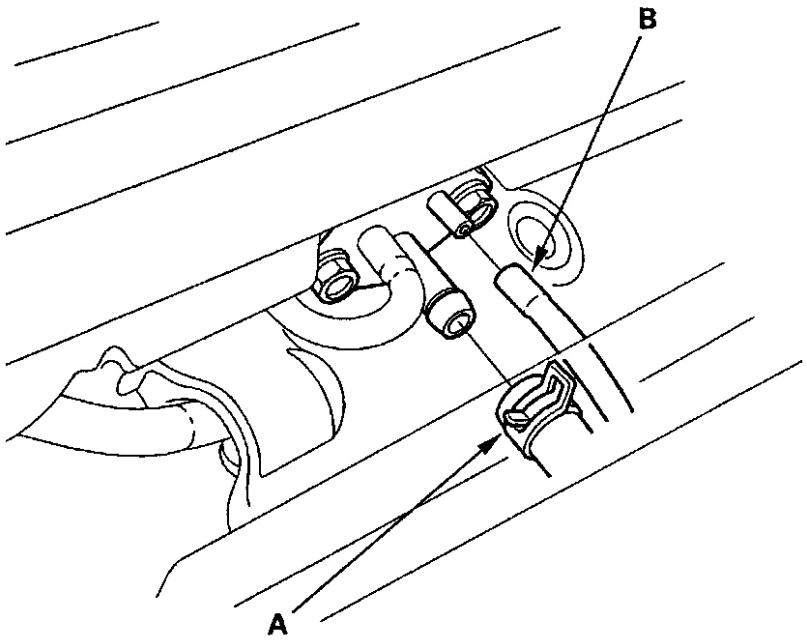
Fig. 28: Removing Fuel Feed Hose & Fuel Return Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

'99 model:



'00-03 models:

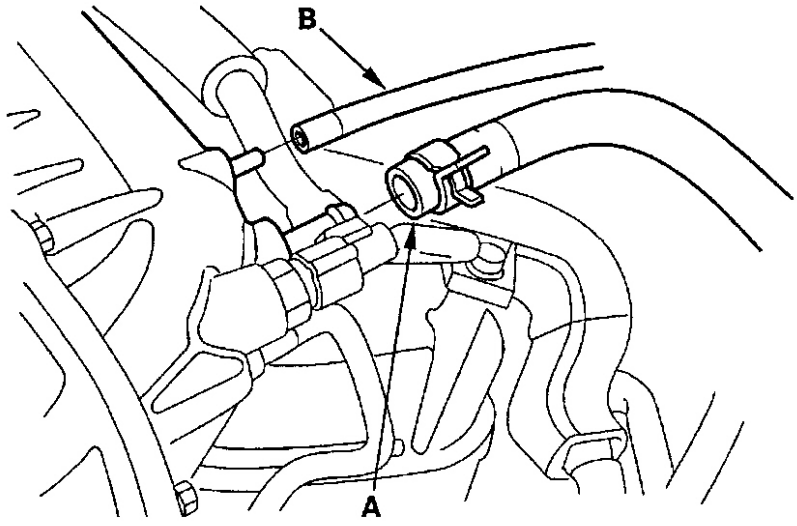


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Fig. 29: Removing Brake Booster Vacuum Hose & Vacuum Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

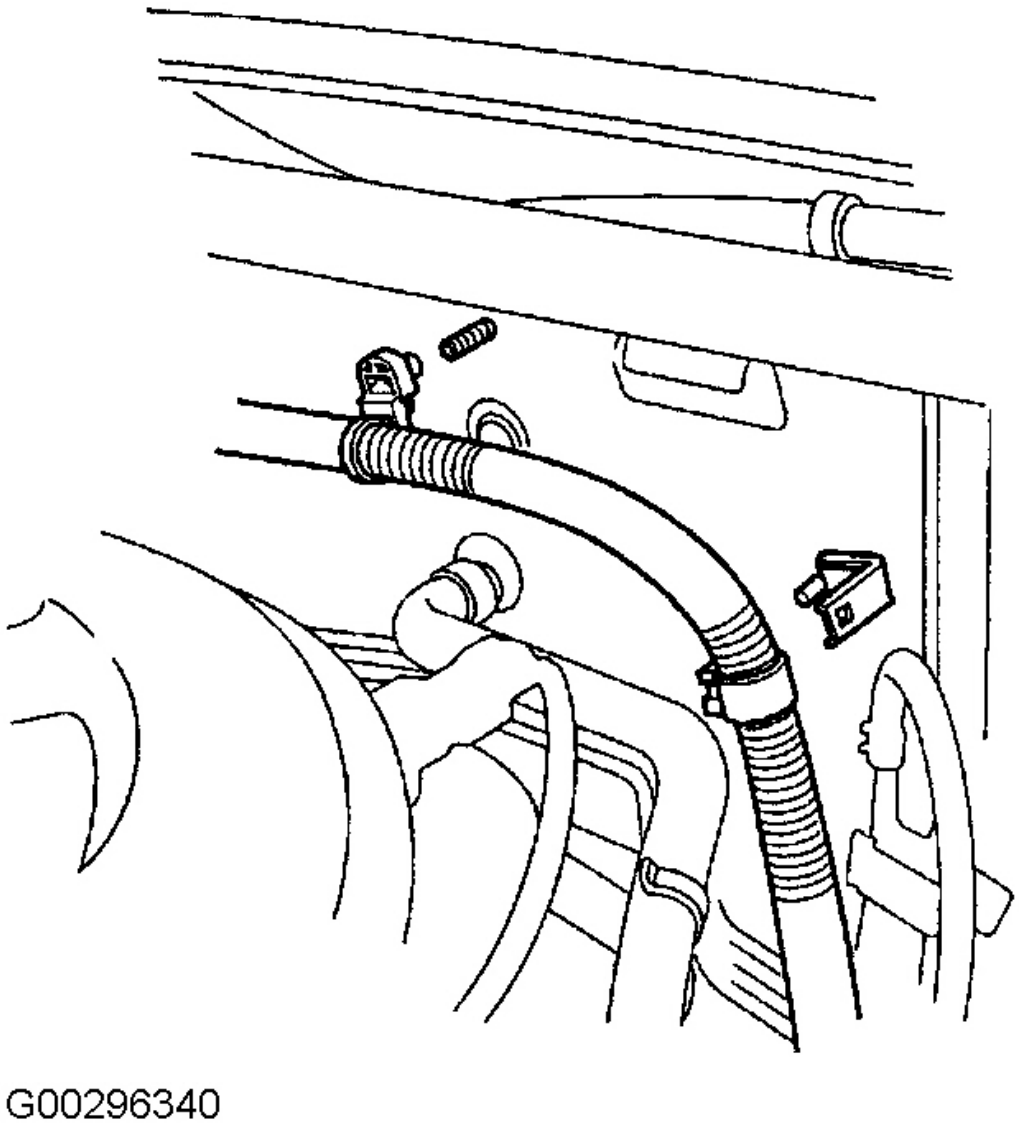

Fig. 30: Removing Engine Wire Harness Clamps
Courtesy of AMERICAN HONDA MOTOR CO., INC.

20. Remove the vacuum hose (A), then disconnect the primary Heated Oxygen Sensor (primary HO2S) connector (B). See **Fig. 31**.
21. Remove the battery cables (A) from the under-hood fuse relay box (B). See **Fig. 32**.
22. Remove the flange bolt (C), then remove the under-hood fuse relay box.
23. Remove the harness clamps (D).
24. Disconnect the Engine Control Module (ECM)/Powertrain Control Module (PCM) connectors (A) from

the ECM/PCM, and remove the harness clamps (B). See **Fig. 33**.

25. Remove the grommet mounting nuts (A), then pull out the engine wire harness. See **Fig. 34**.
26. Move the auto-tensioner (A) to remove tension from the alternator belt (B), then remove the alternator belt. See **Fig. 35**.
27. Loosen adjusting nut (A), remove the locknut (B) and mounting bolt (C), then remove the power steering (P/S) pump belt (D) and pump without disconnecting the P/S hoses. See **Fig. 36**.
28. Remove P/S hose clamp (E).

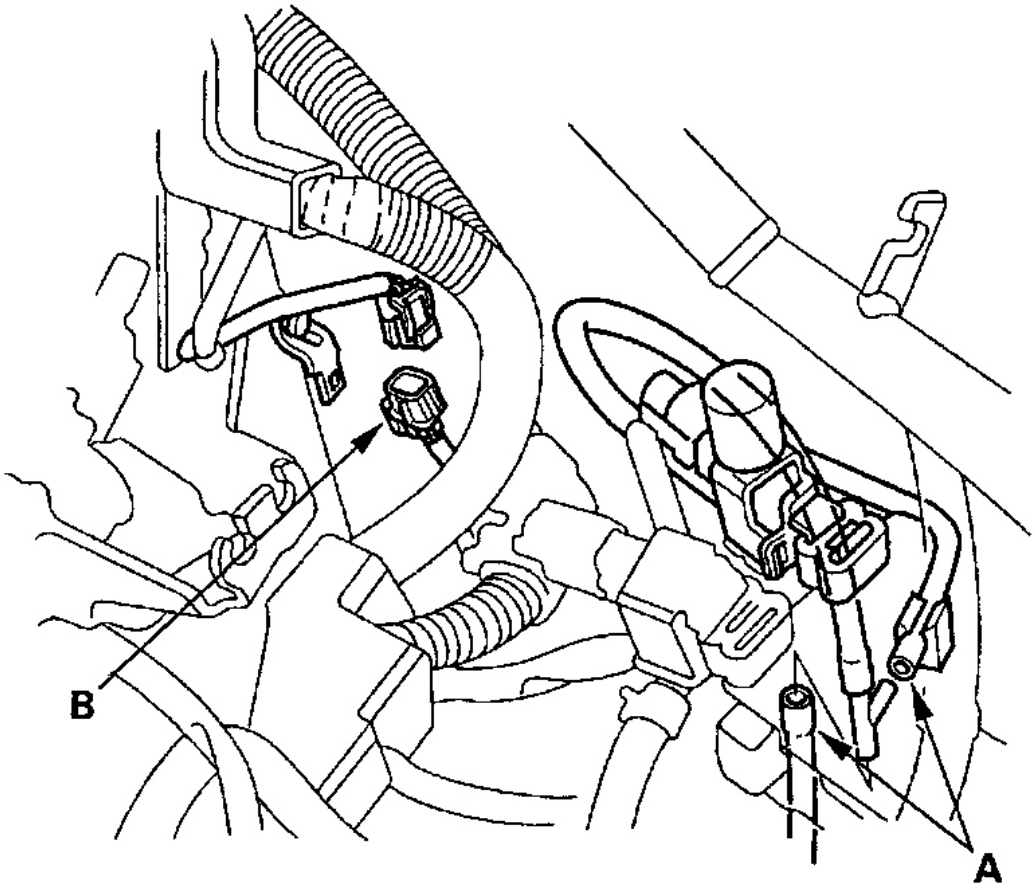

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Fig. 31: Removing Vacuum Hoses
Courtesy of AMERICAN HONDA MOTOR CO., INC.

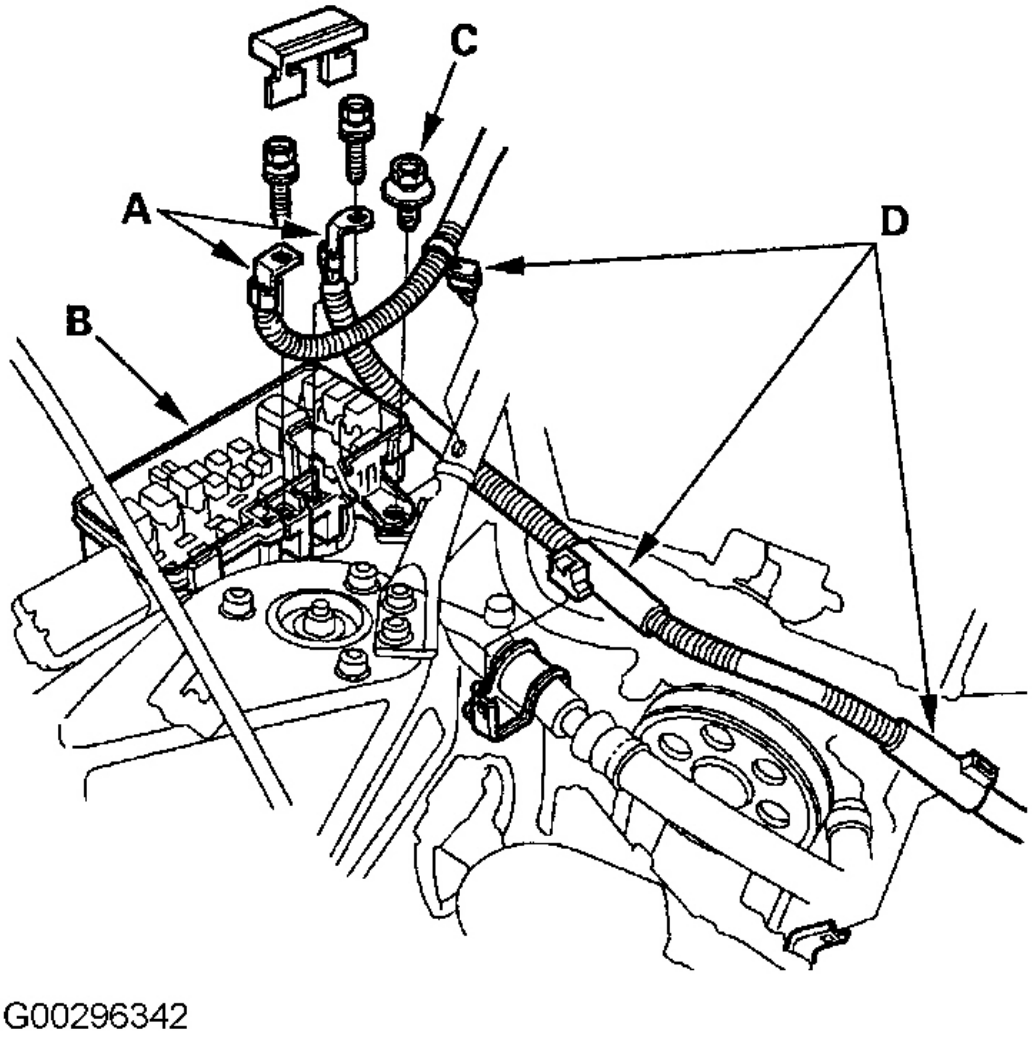

Fig. 32: Removing Battery Cables From Under-Hood Fuse From Relay Box
Courtesy of AMERICAN HONDA MOTOR CO., INC.

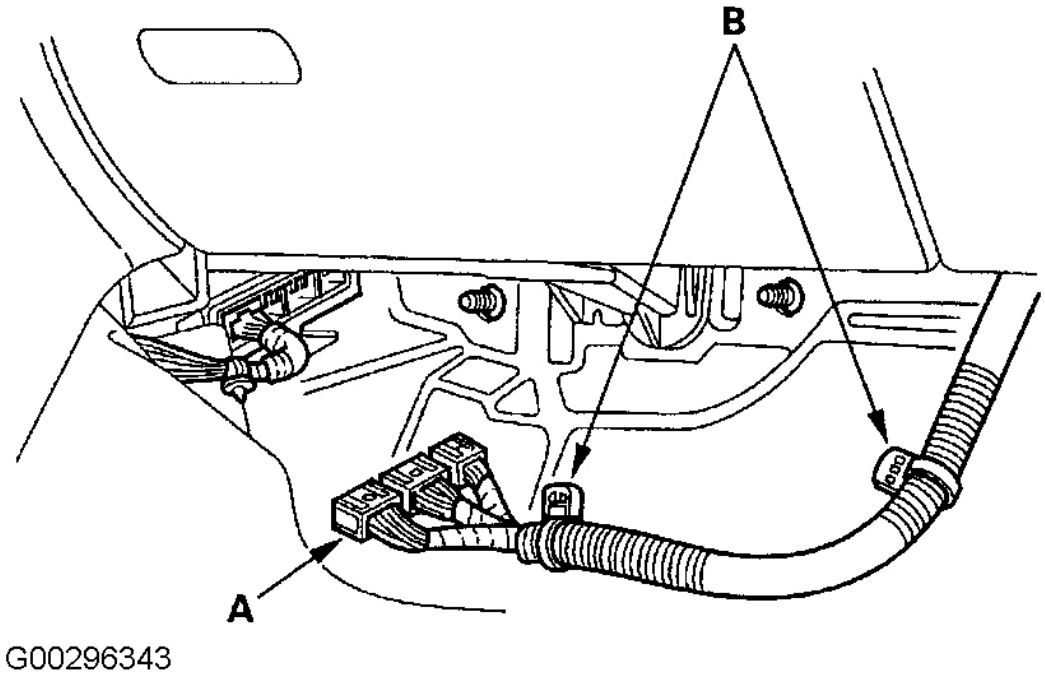

Fig. 33: Disconnecting Powertrain Control Module Connectors
Courtesy of AMERICAN HONDA MOTOR CO., INC.

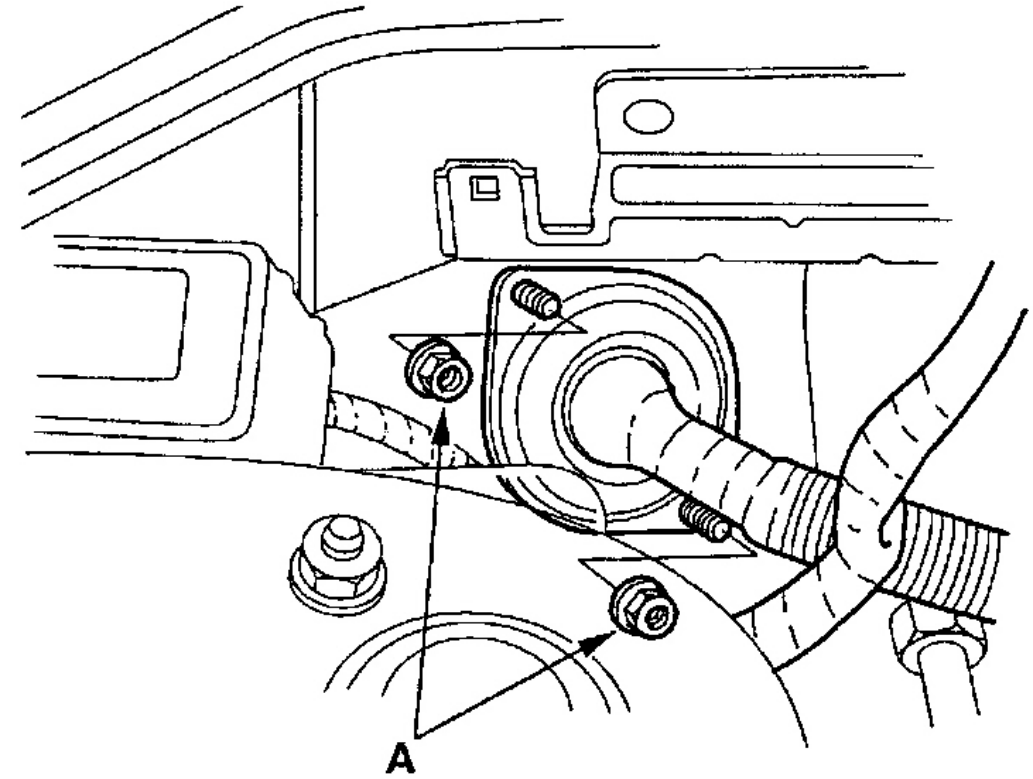

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Fig. 34: Removing Grommet Mounting Nuts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

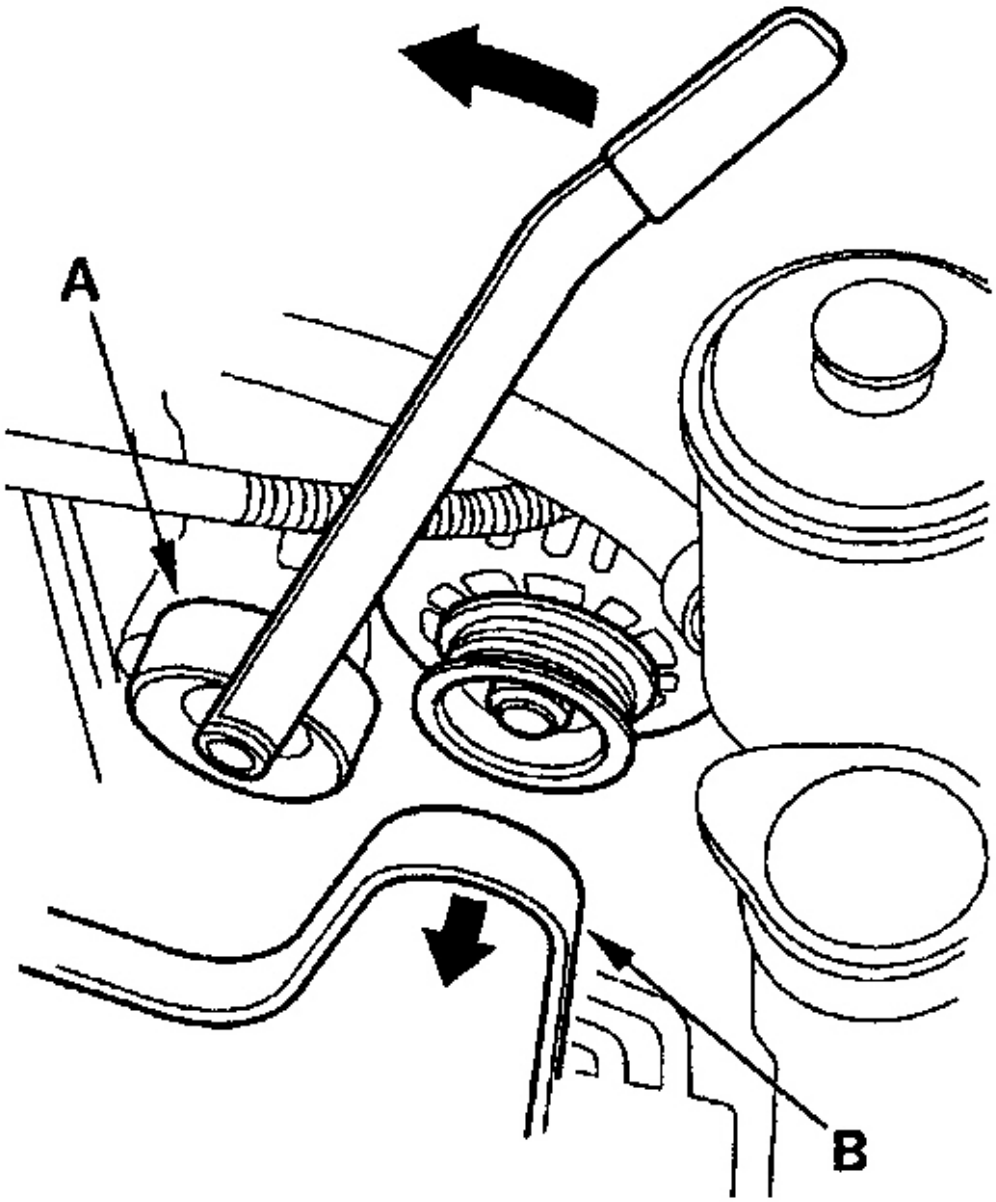

Fig. 35: Moving Auto-Tensioner To Remove Tension From Alternator Belt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

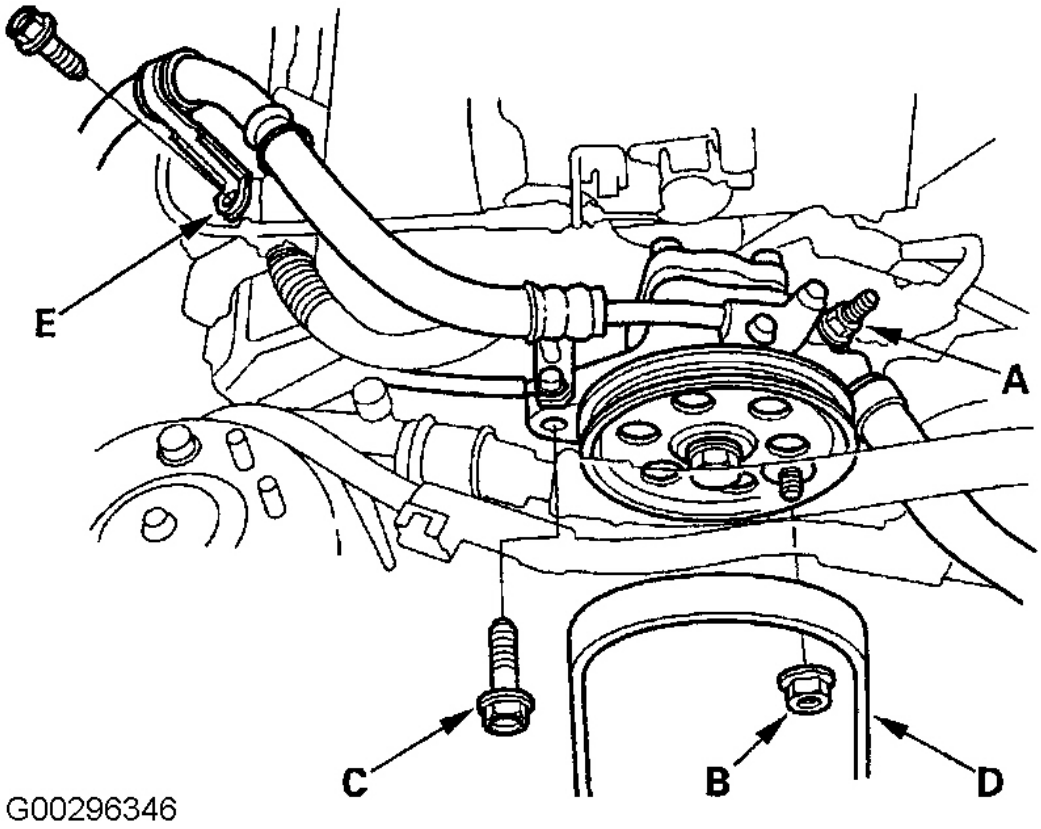

Fig. 36: Loosening Adjusting Nut
Courtesy of AMERICAN HONDA MOTOR CO., INC.

29. Disconnect the Vehicle Speed Sensor (VSS) connector (A) (1999 model). See **Fig. 37**.
30. Remove the power steering speed sensor (B). Do not remove the hoses.
31. Remove radiator cap.
32. Raise the hoist to full height.
33. Remove the front tires/wheels.
34. Remove the splash shield. See **Fig. 38**.
35. Loosen the drain plug in the radiator to drain the engine coolant.
36. Drain the Automatic Transmission Fluid (ATF). See appropriate SERVICING article in TRANSAXLE/TRANSMISSIONS.
37. Drain the engine oil. Reinstall the drain bolt using a new washer. See **ENGINE OIL** under ENGINE OILING.
38. Remove exhaust pipe "A". See **Fig. 39**.

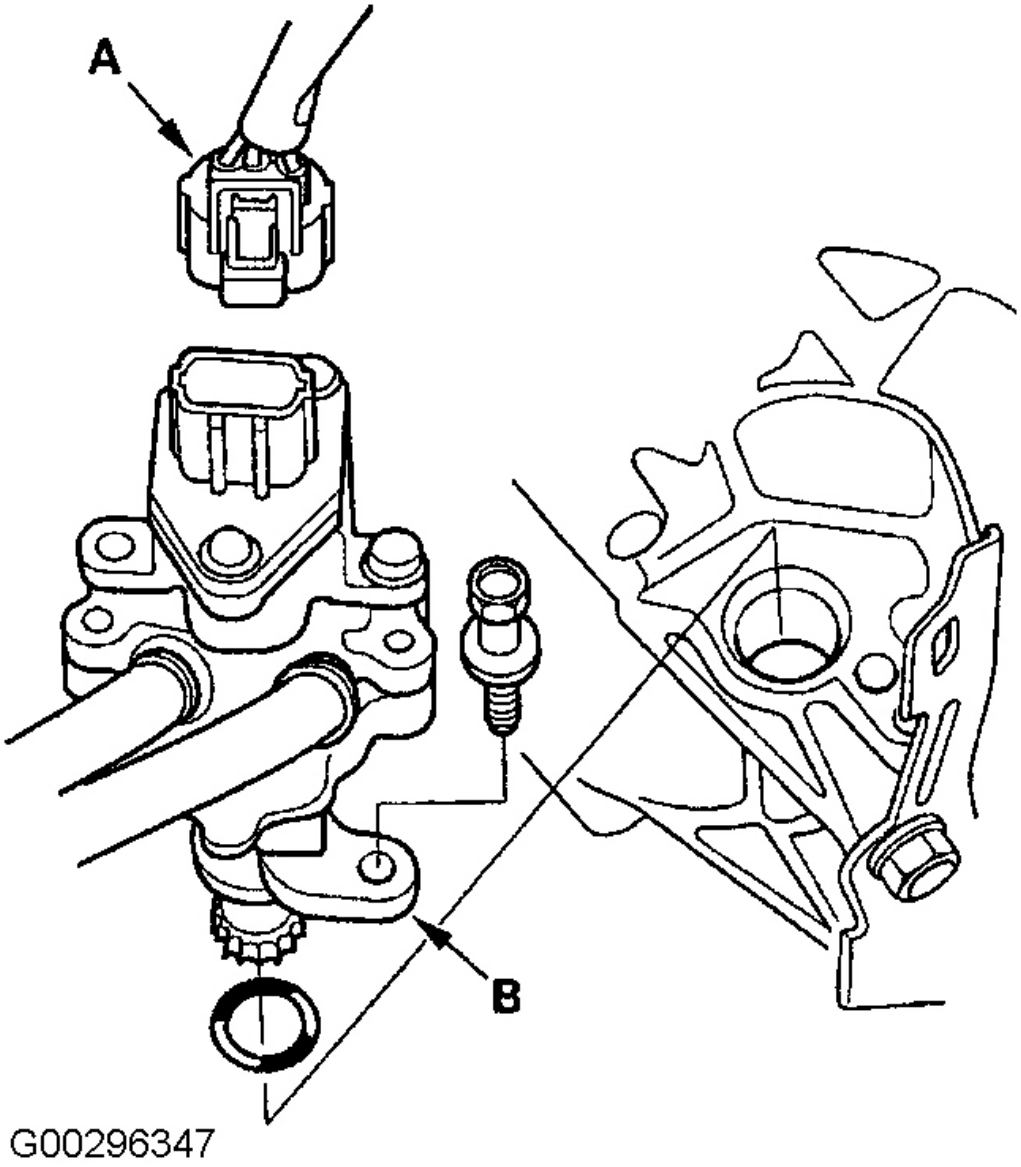

Fig. 37: Disconnecting Vehicle Speed Sensor (1999 Model)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

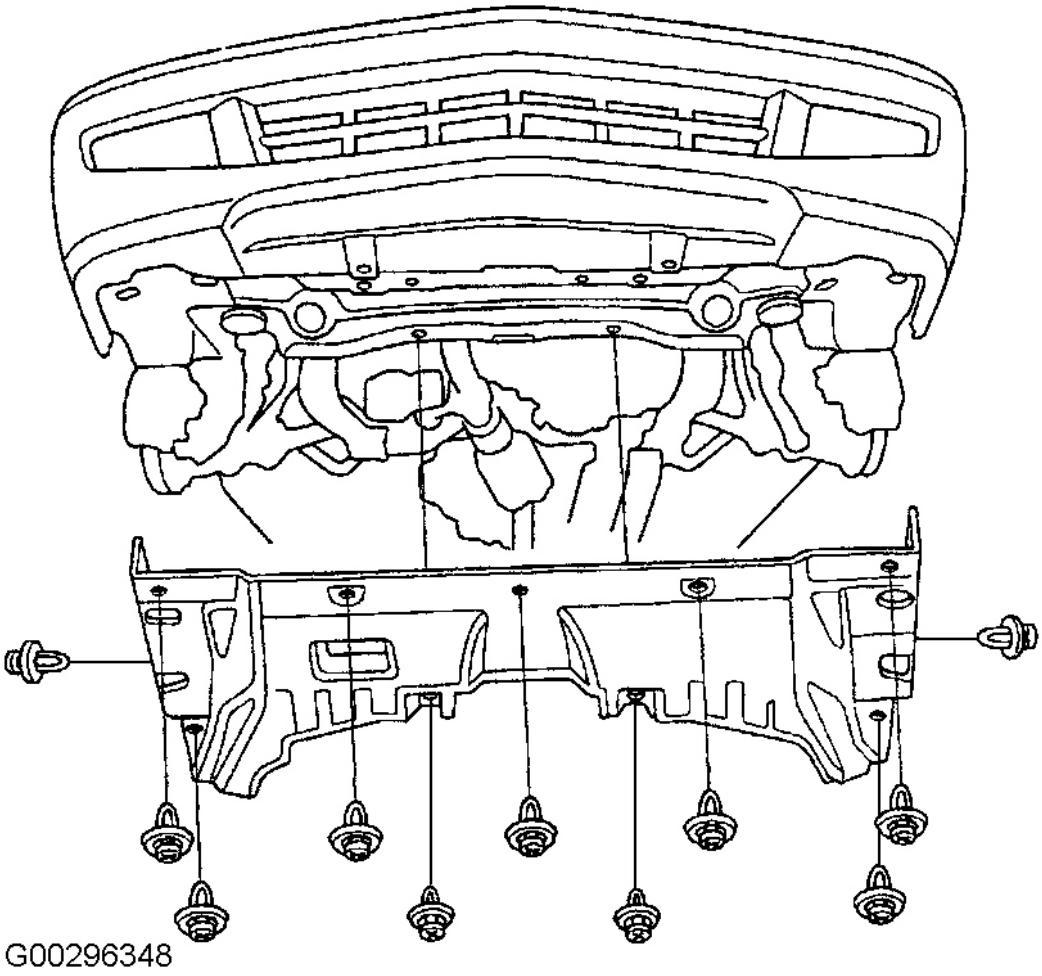

Fig. 38: Removing Splash Shield
Courtesy of AMERICAN HONDA MOTOR CO., INC.

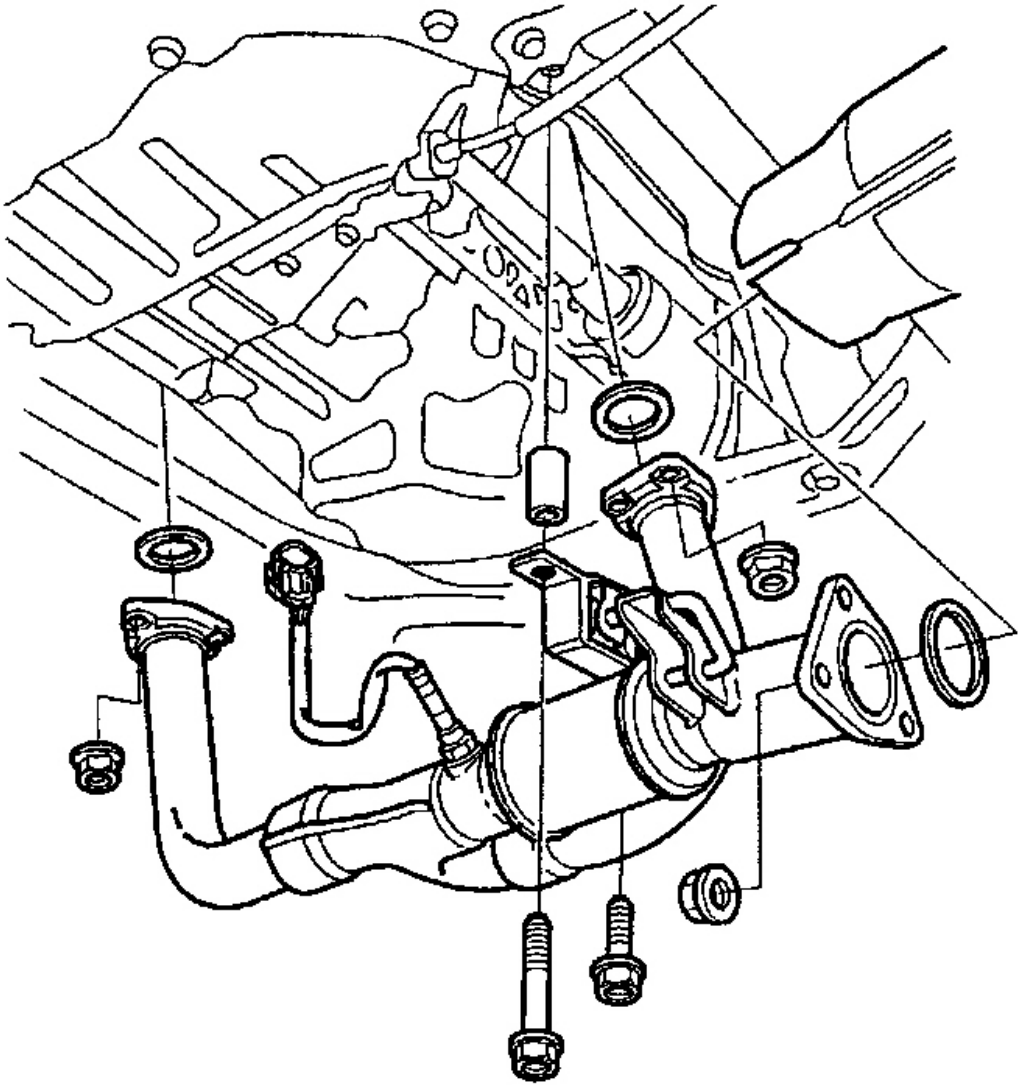

Fig. 39: Removing Exhaust Pipe
Courtesy of AMERICAN HONDA MOTOR CO., INC.

39. Remove the damper forks. See appropriate FRONT article in SUSPENSION.
40. Disconnect the suspension lower arm ball joints. See appropriate FRONT article in SUSPENSION.
41. Remove the axle shafts. See appropriate AXLE SHAFTS article in DRIVELINE/AXLES. Coat all precision finished surfaces with clean engine oil. Tie plastic bags over the driveshaft ends.
42. Remove the bolts (A) securing the shift cable holder (B), then remove the shift cable cover (C). See **Fig. 40**. To prevent damage to the control lever joint, be sure to remove the bolts securing the shift cable

holder before removing the bolts securing the shift cable cover.

43. Remove the lock bolt (D) securing the control lever (E), then remove the shift cable (F) with the control lever. Take care not to bend the shift cable while removing it.
44. Unplug the P/S hose clamps (A), and disconnect the engine mount control vacuum hose (B). See **Fig. 41**.
45. Lower the hoist, then remove the upper radiator hose (A), and the lower radiator hose (B). See **Fig. 42**.
46. Remove heater hoses. See **Fig. 43**.
47. Remove the ATF cooler hoses (A), then plug the ATF cooler hoses and lines (1999 model). See **Fig. 44**.
48. Remove the ground cable (B).
49. Remove the P/S hose clamp from the rear beam. See **Fig. 45**.

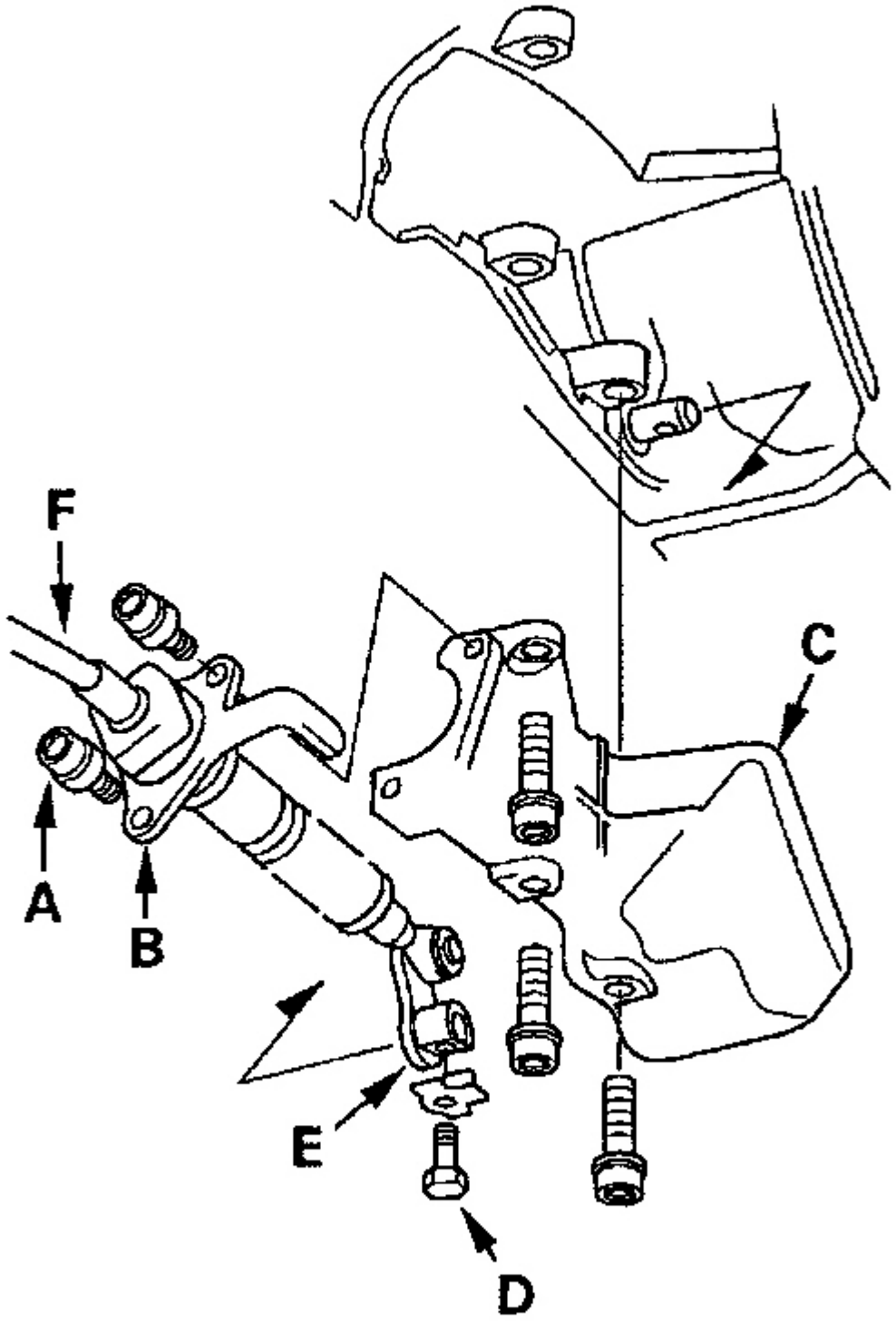

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Fig. 40: Removing Bolts Securing Shift Cable Holder
Courtesy of AMERICAN HONDA MOTOR CO., INC.

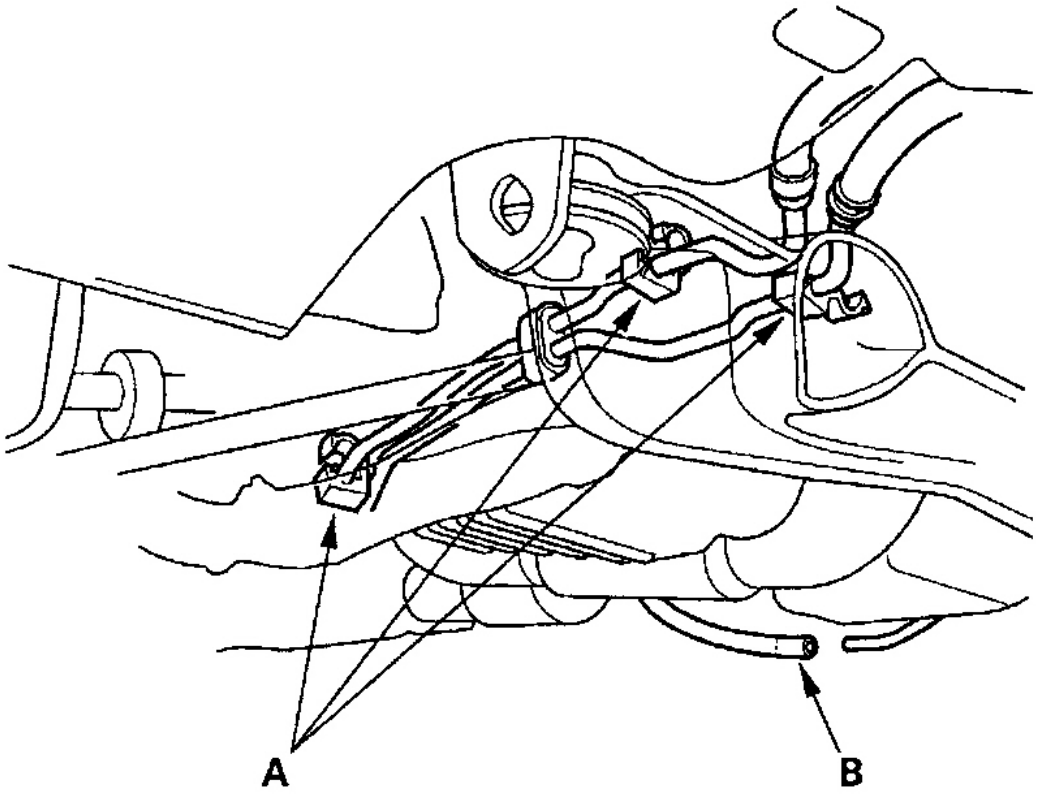

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Fig. 41: Unplugging P/S Hose Clamps
Courtesy of AMERICAN HONDA MOTOR CO., INC.

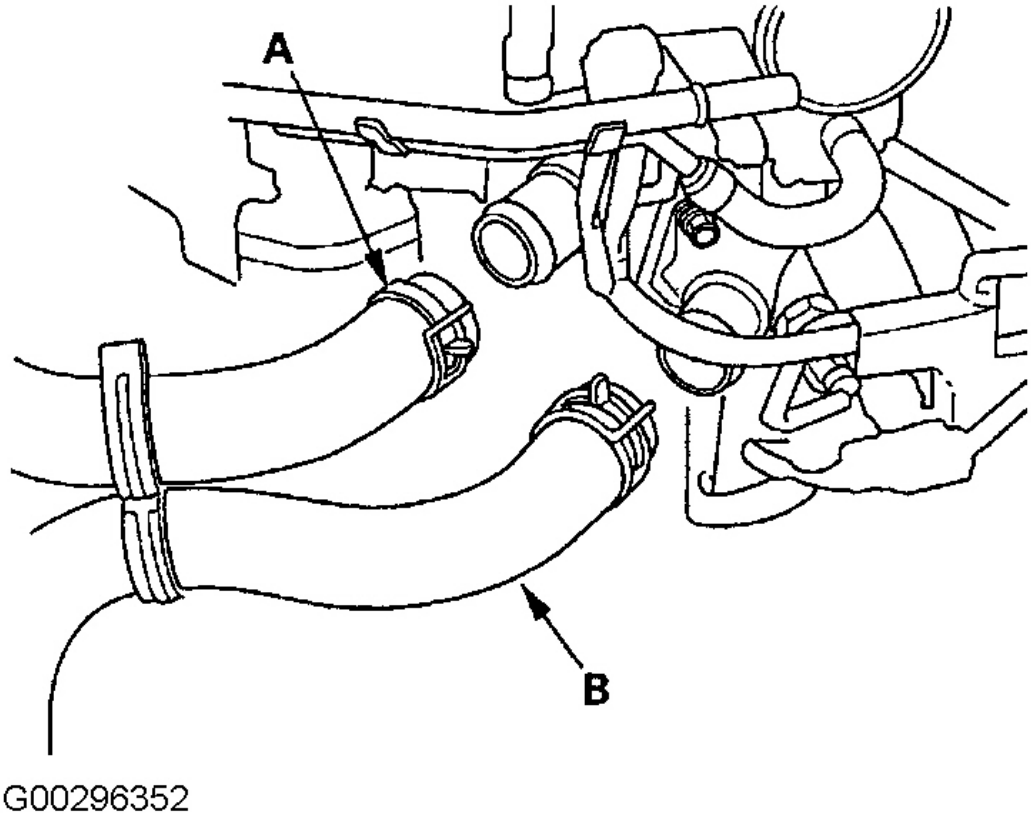
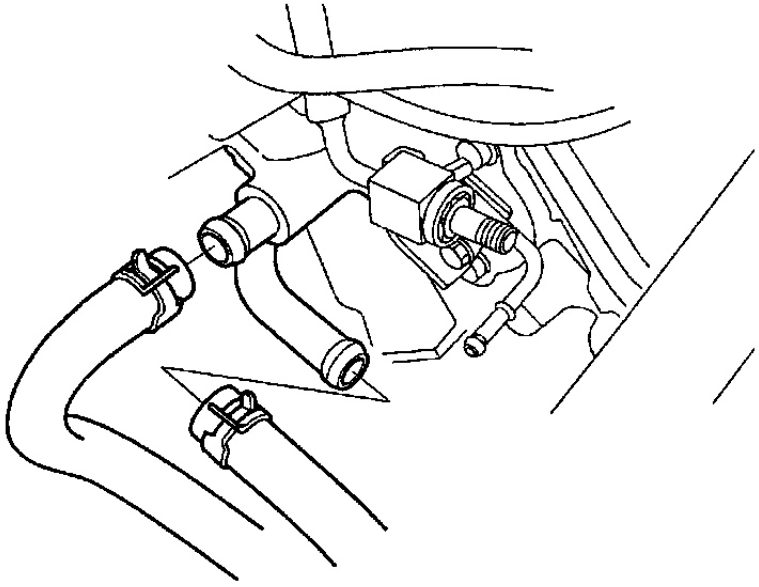


Fig. 42: Removing Upper Radiator Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

'99 model:



'00-03 models:

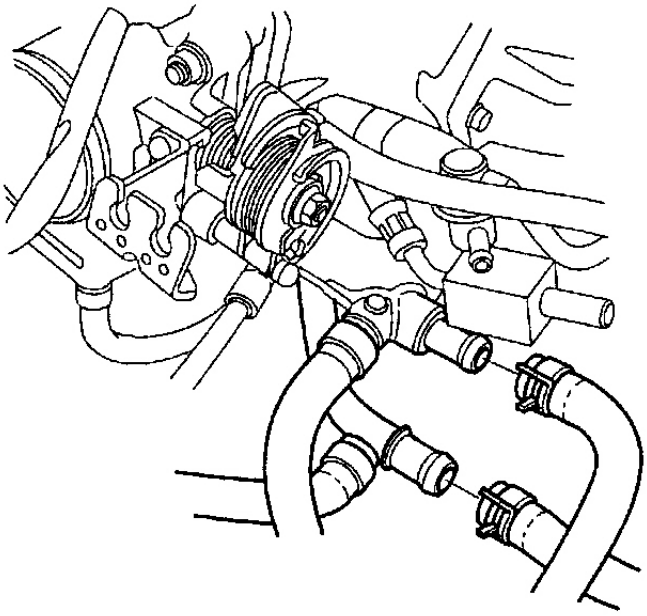


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Fig. 43: Removing Heater Hoses
Courtesy of AMERICAN HONDA MOTOR CO., INC.

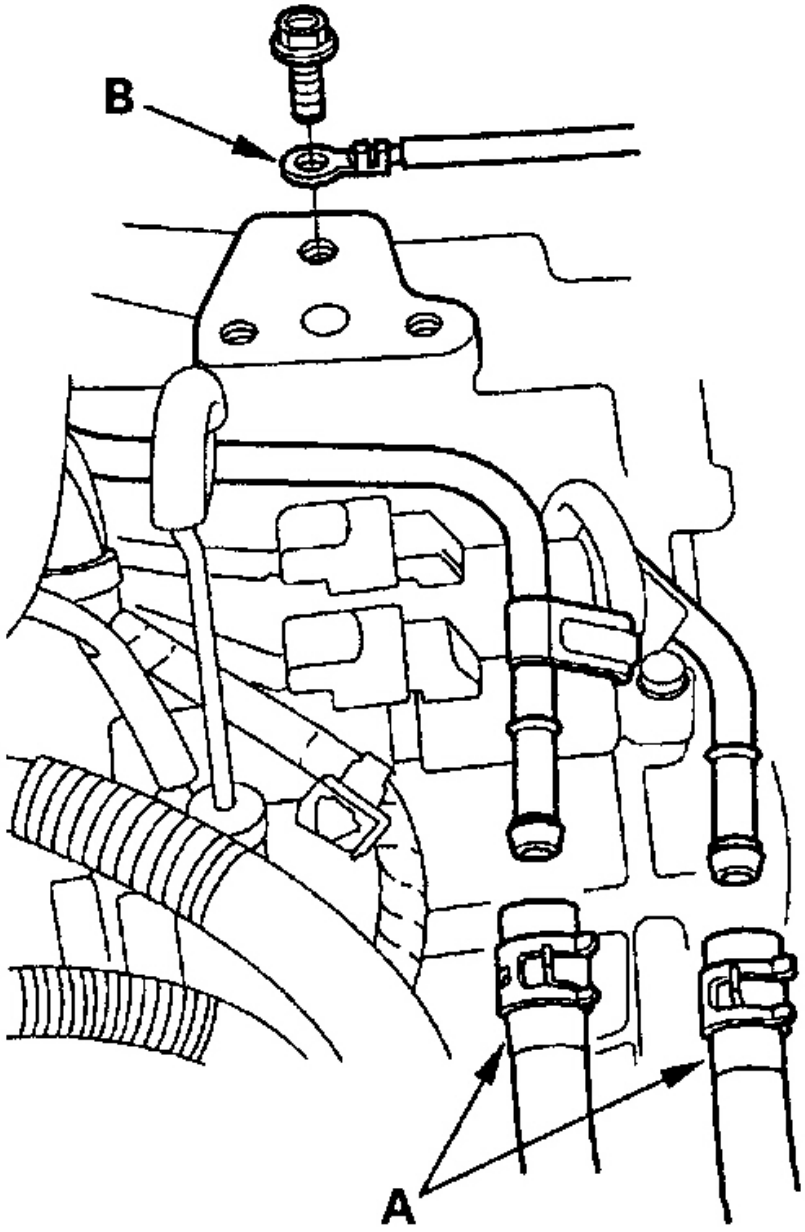


Fig. 44: Removing ATF Cooler Hoses
Courtesy of AMERICAN HONDA MOTOR CO., INC.

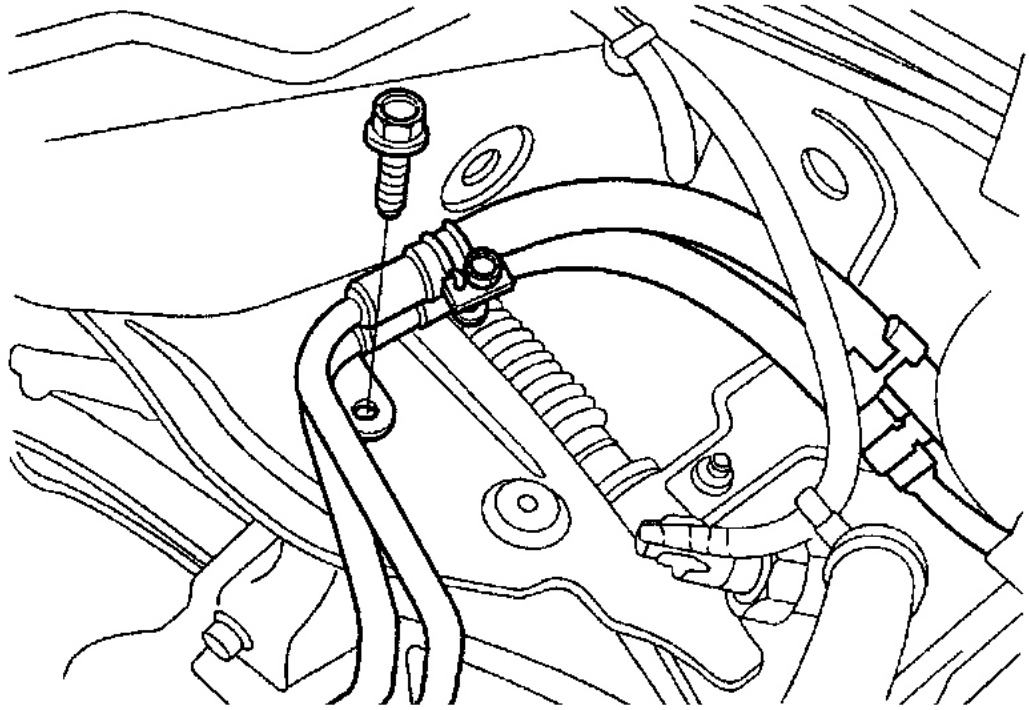


Fig. 45: Removing P/S Hose Clamp From Rear Beam
Courtesy of AMERICAN HONDA MOTOR CO., INC.

50. Attach the chain hoist to the engine. See **Fig. 46**.
51. Remove the side engine mount bracket. See **Fig. 47**.
52. Remove the rear mount bracket support nut (A) and mounting bolt (B). See **Fig. 48**.
53. Remove the front mount bracket support nut. See **Fig. 49**.
54. Make sure the hoist brackets are positioned properly. Raise the hoist to full height.
55. Remove the flange bolts securing the radius rods. See **Fig. 50**.

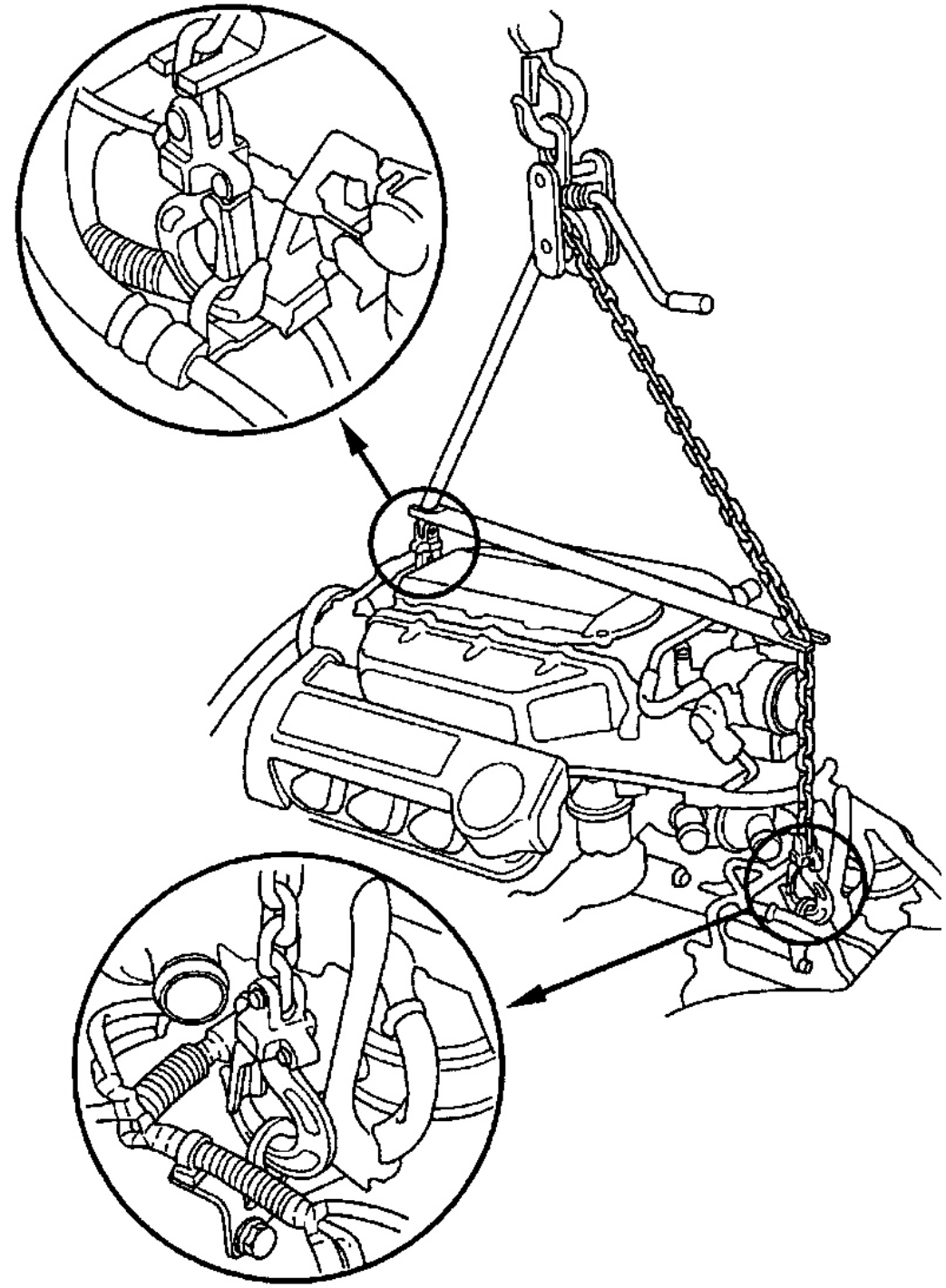


Fig. 46: Attaching Chain Hoist To Engine

Courtesy of AMERICAN HONDA MOTOR CO., INC.

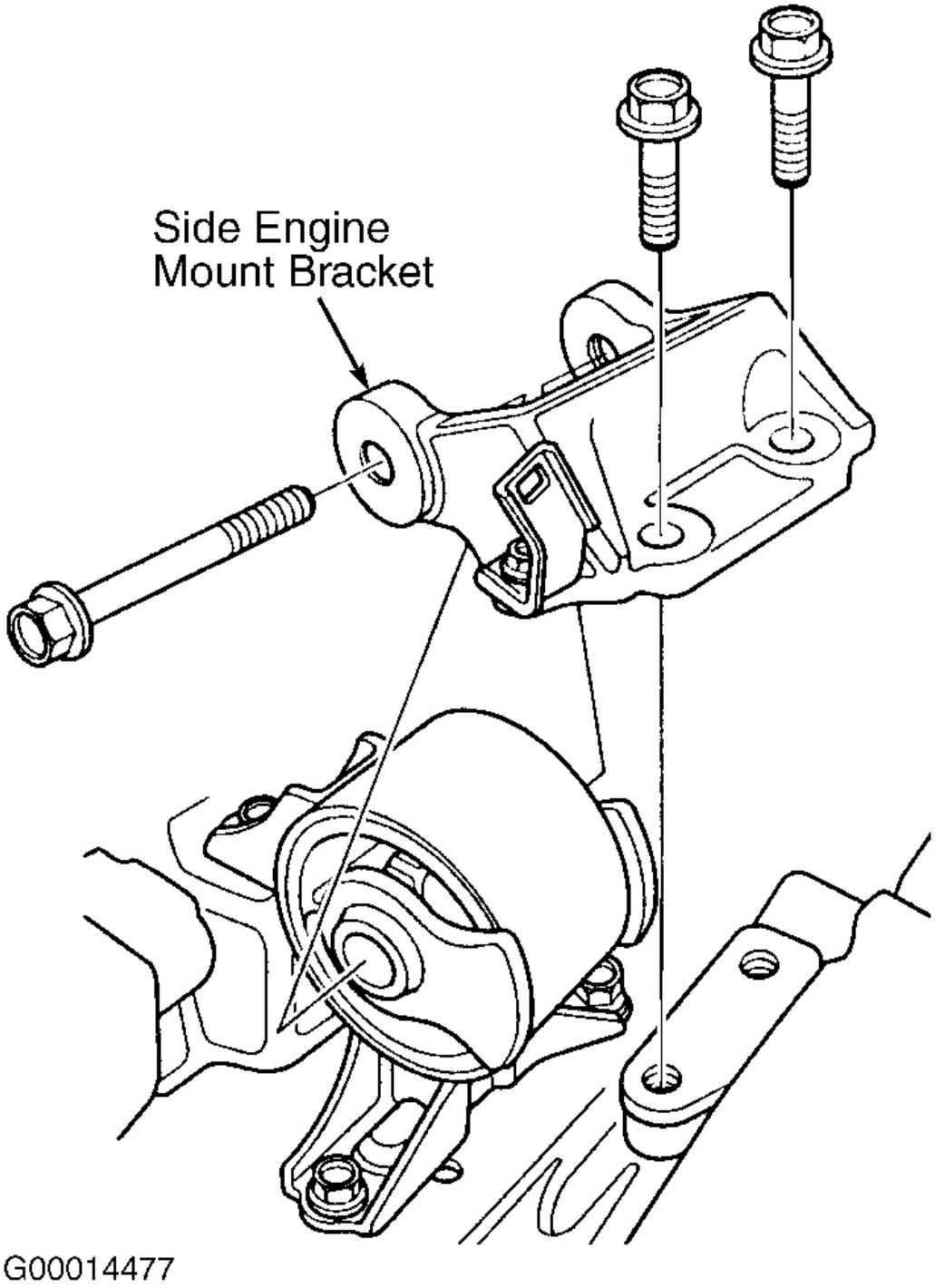


Fig. 47: Removing Side Engine Mount Bracket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

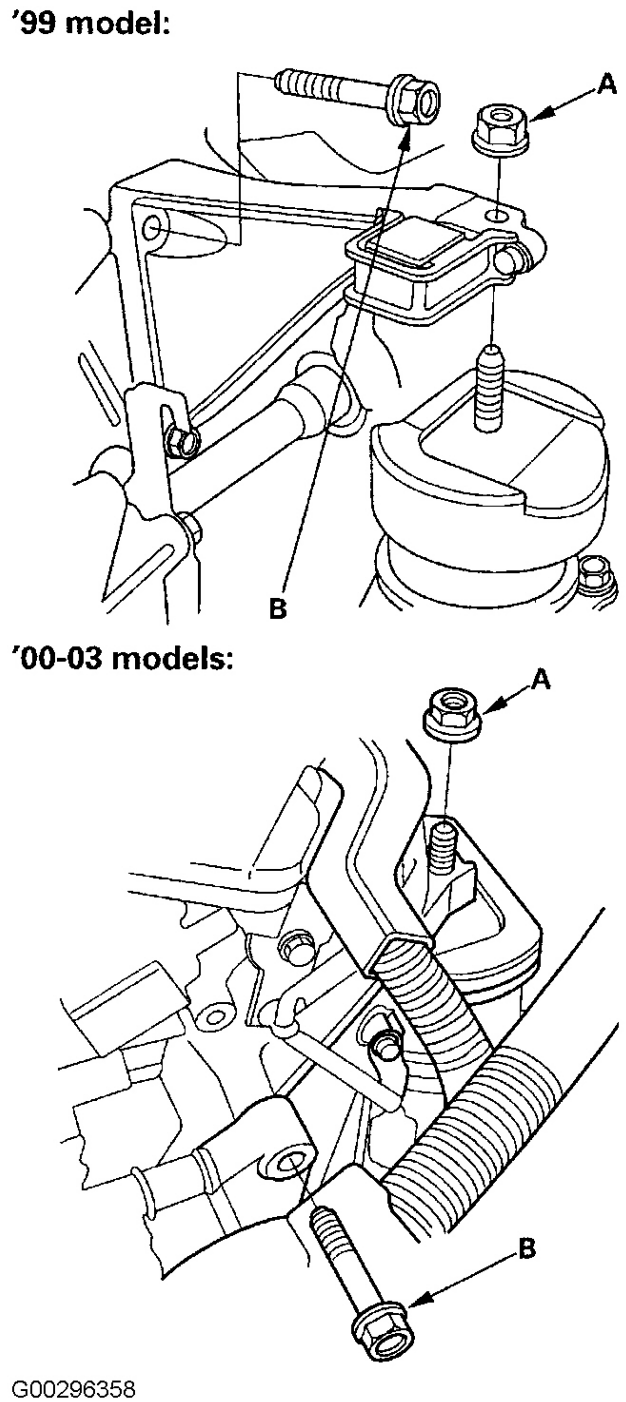


Fig. 48: Removing Rear Mount Bracket Support Nut & Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

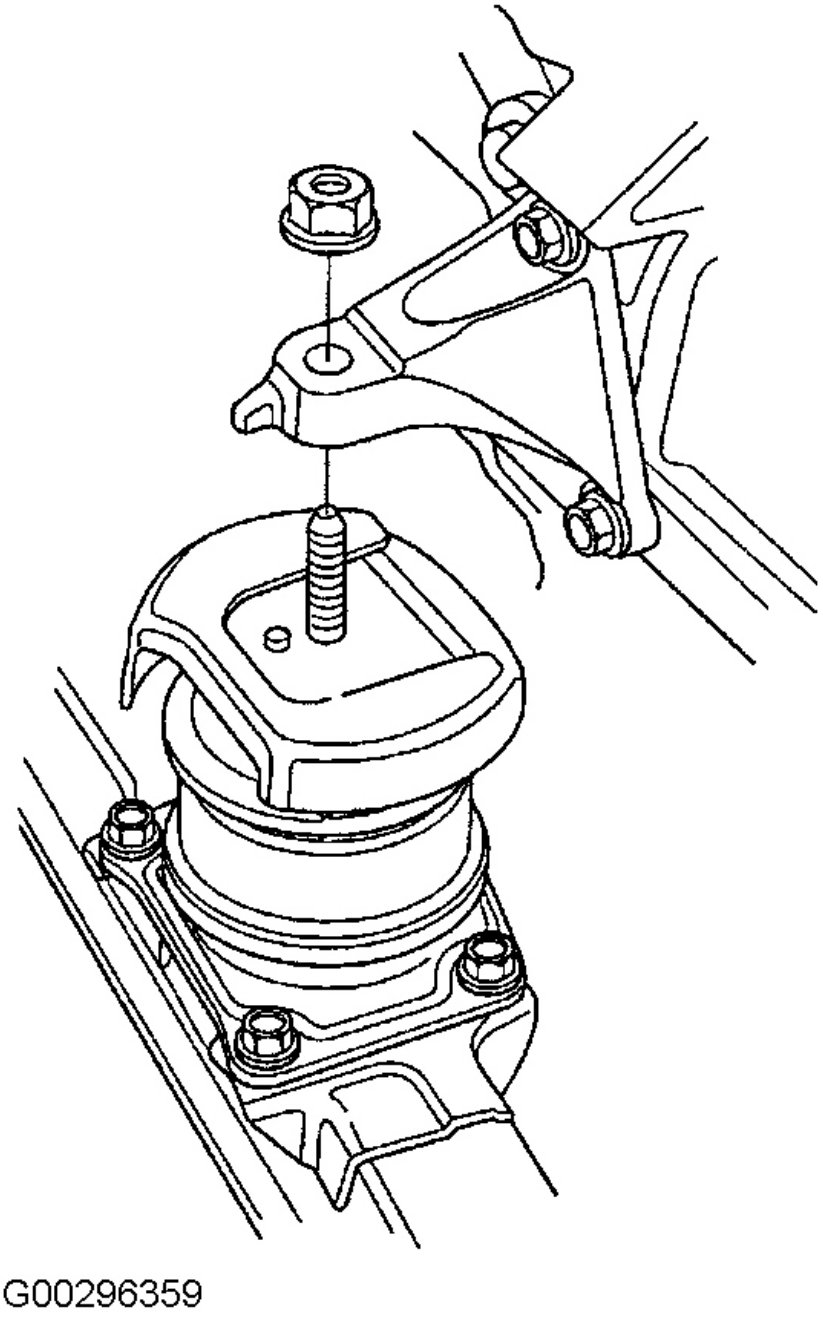


Fig. 49: Removing Front Mount Bracket Support Nut
Courtesy of AMERICAN HONDA MOTOR CO., INC.

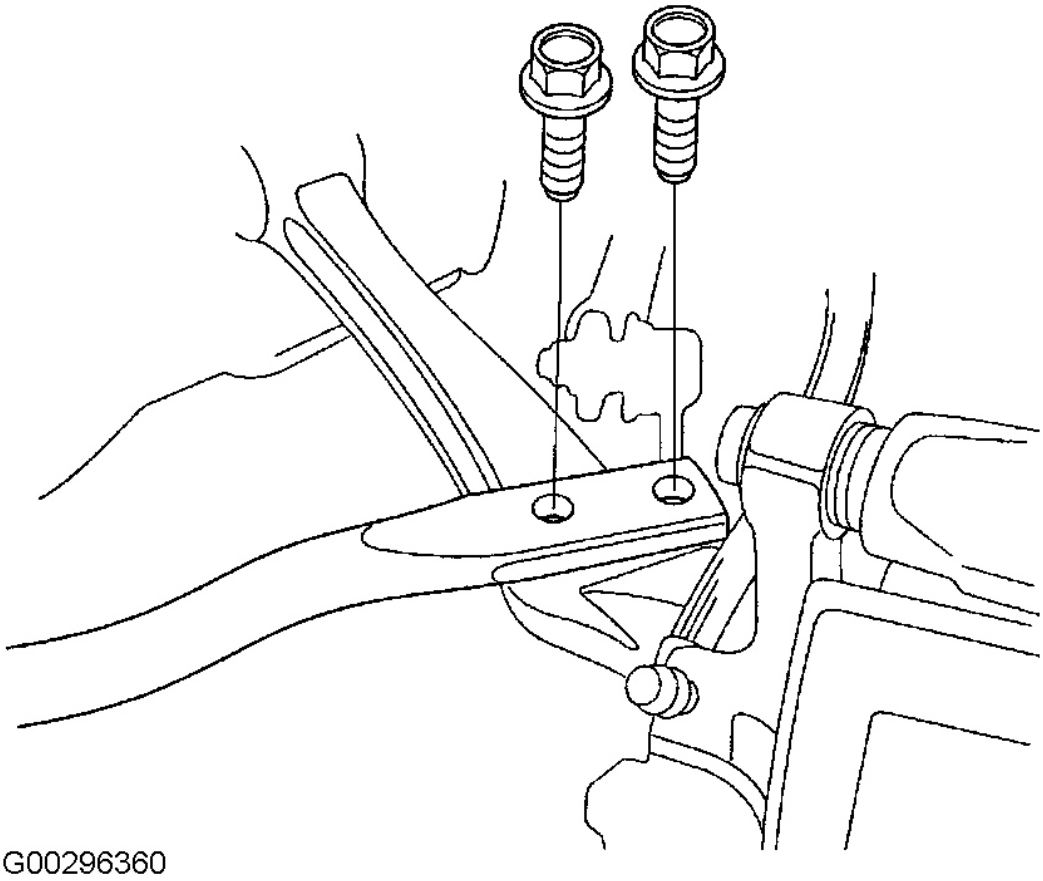


Fig. 50: Removing Flange Bolts Securing Radius Rods
Courtesy of AMERICAN HONDA MOTOR CO., INC.

56. Make a mark (A) on the front beam (B) and rear beam (C), then remove the front beam. See **Fig. 51**.
57. Remove the A/C compressor without disconnecting the A/C hoses. See **Fig. 52**. Secure compressor with wire. Do not let compressor hang by hoses.
58. Remove the rear mount bracket. See **Fig. 53**.
59. Remove the transmission lower rear mount. See **Fig. 54**.
60. Check that the engine/transmission is completely free of vacuum hoses, fuel and coolant hoses and electrical wiring.
61. Slowly lower the engine about 6" (150 mm). Check once again that all hoses and wires are disconnected from the engine/transmission.
62. Lower the engine all the way. Disconnect the chain hoist from the engine.
63. Remove the engine from under the vehicle.

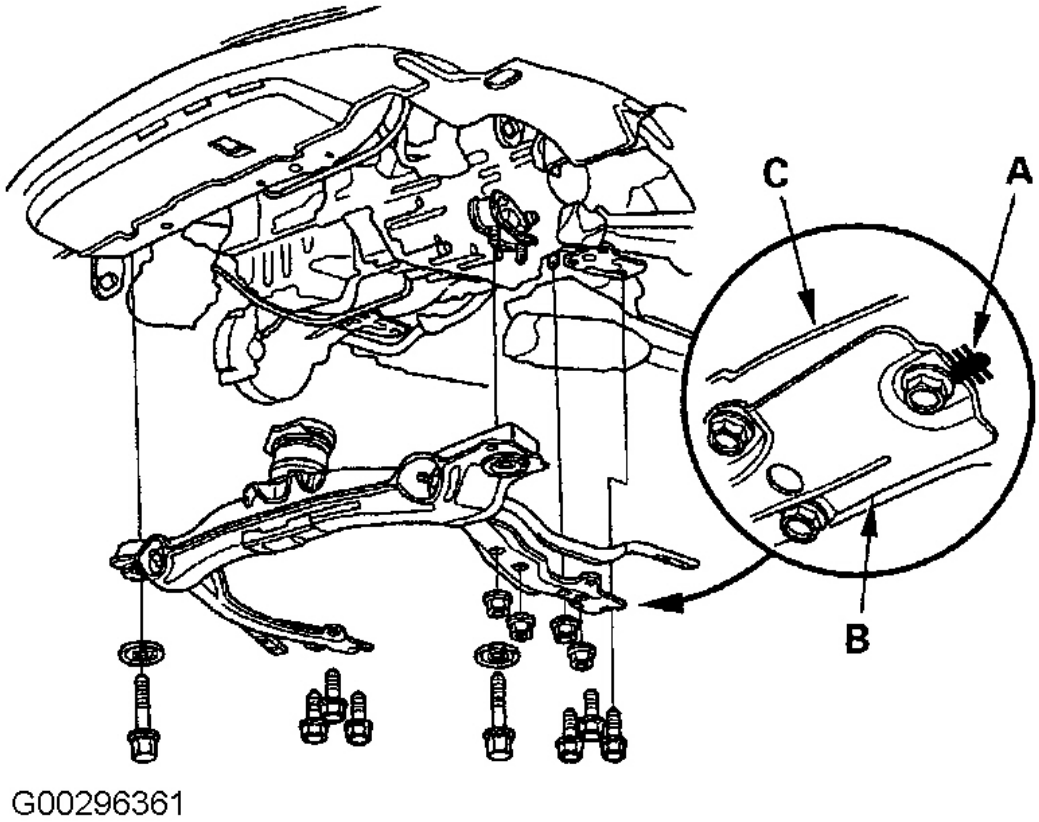


Fig. 51: Making "A" Mark On Front & Rear Beam
Courtesy of AMERICAN HONDA MOTOR CO., INC.

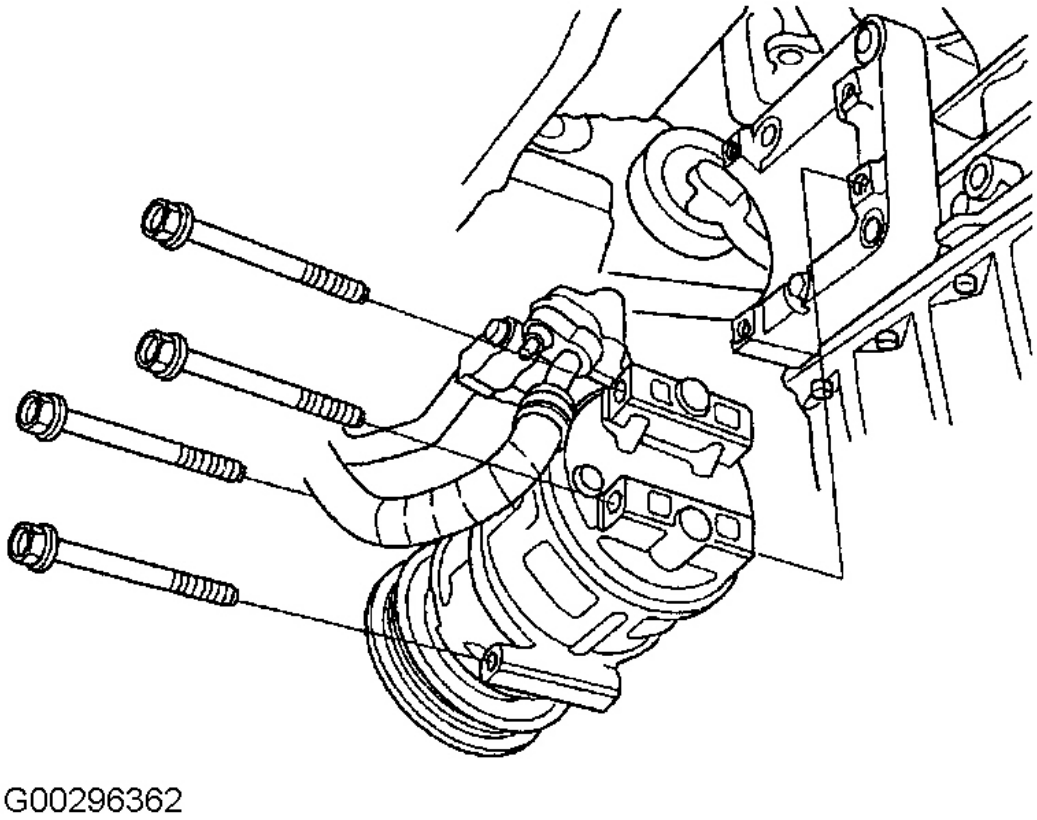
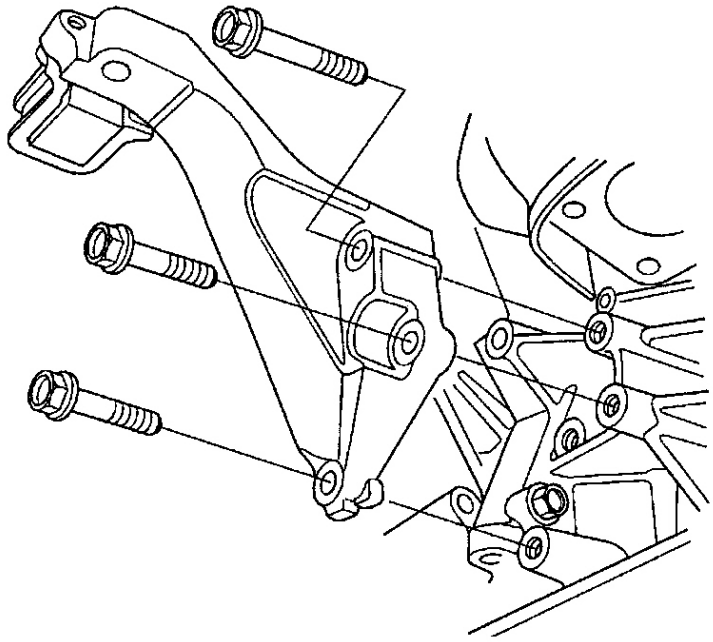


Fig. 52: Removing A/C Compressor Without Disconnecting A/C Hoses
Courtesy of AMERICAN HONDA MOTOR CO., INC.

'99 model:



'00-03 models:

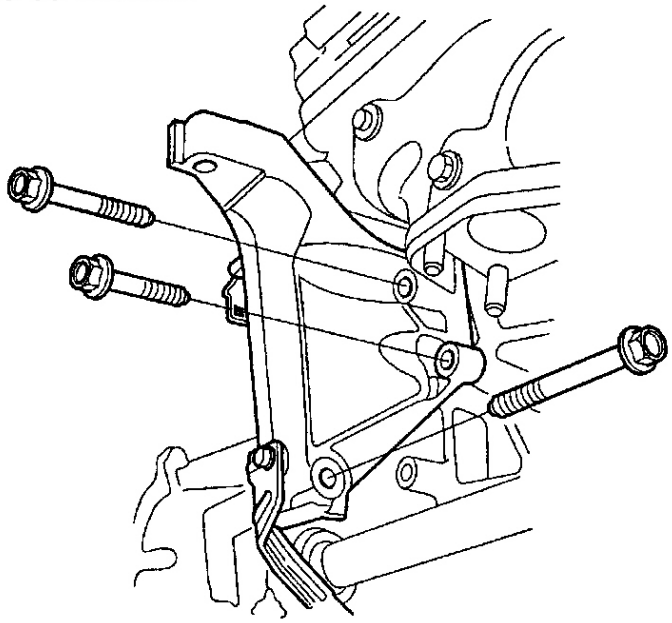


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Fig. 53: Removing Rear Mount Bracket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

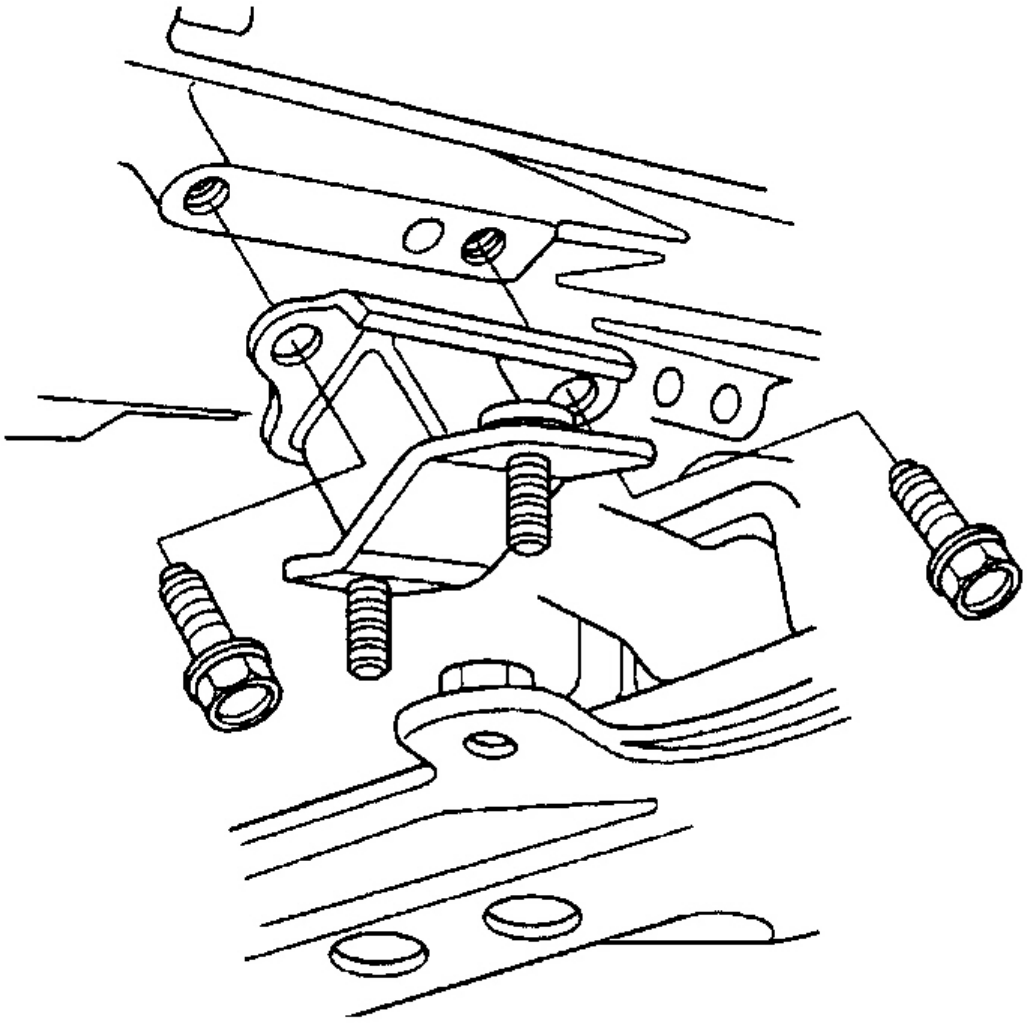


Fig. 54: Removing Transmission Lower Rear Mount
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Installation

1. Install the accessory brackets. Tighten their bolts and nuts to specification. See **Fig. 55** and **TORQUE SPECIFICATIONS**.
2. Position the engine under the vehicle. Attach the chain hoist to the engine, then lift the engine into position in the vehicle.

NOTE: Reinstall the mounting bolts/nuts in the sequence given. Failure to follow

this sequence may cause excessive noise and vibration, and reduce bushing life.

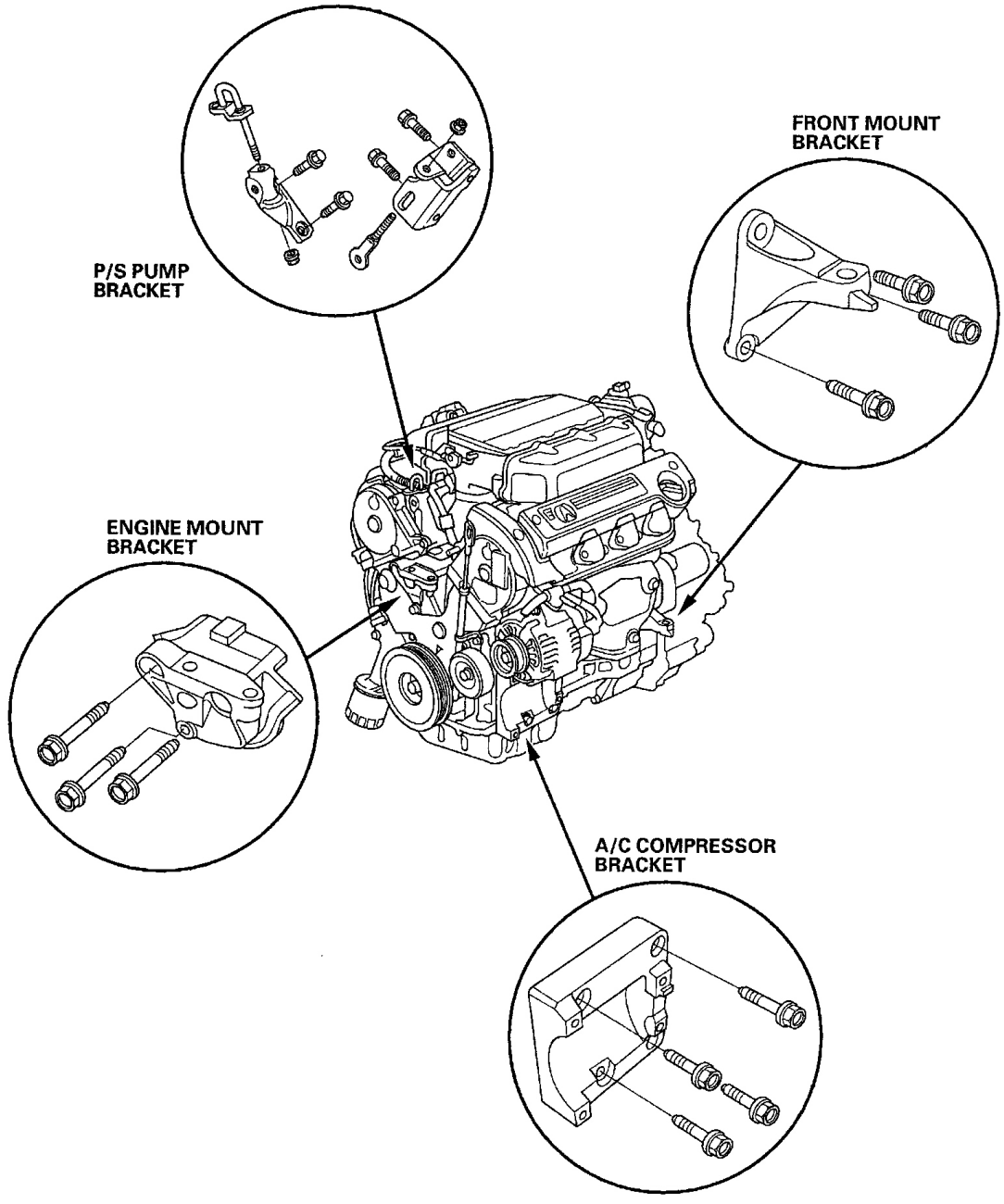


Fig. 55: Installing Accessory Brackets
Courtesy of AMERICAN HONDA MOTOR CO., INC.

3. Install transmission lower rear mount. See **Fig. 54**.

4. Install the rear mount bracket. See **Fig. 53**.
5. Install the A/C compressor. See **Fig. 52**.
6. Install the front beam. Align mark (A) on the rear beam (B) and front beam (C), then tighten the bolts. See **Fig. 51**.
7. Tighten the transmission lower rear mount mounting nuts (D) and transmission lower front mount mounting nuts (E).
8. Tighten the flange bolts on the radius rods. See **Fig. 50**.
9. Lower the hoist.
10. Tighten the front mount bracket support nut. See **Fig. 49**.
11. Tighten the rear mount bracket support nut (A) and mounting bolt (B). See **Fig. 48**.
12. Install the side engine mount bracket, then tighten the mounting bolts in the numbered sequence. See **Fig. 47**.
13. Remove the chain hoist from the engine.
14. Raise the hoist to full height.
15. Install a new spring clip on the end of each axle shaft, then install the axle shafts. Make sure each clip "clicks" into place in the differential and intermediate shaft.
16. Connect the suspension lower arm ball joints. Use new cotter pins. See appropriate FRONT article in SUSPENSION.
17. Install the damper fork. See appropriate FRONT article in SUSPENSION.
18. Install exhaust pipe (A) using new gasket (B) and new self locking nuts (C). See **Fig. 39**.
19. Install the control lever (A) with the shift cable, on the control shaft. Do not bend the shift cable any more than is necessary to install the control lever. See **Fig. 40**.
20. Install the lock bolt (B) with a new lock washer (C), then bend the lock tab of the lock washer.
21. Install the shift cable cover (D), then install the shift cable holder (E) on the shift cable cover.
22. Install the power steering (P/S) hose on the clamps (A), and connect the engine mount control vacuum hose (B). See **Fig. 41**.
23. Install the splash shield. See **Fig. 38**.
24. Install front tires/wheels.
25. Lower hoist.
26. Install P/S hose clamp. See **Fig. 45**.
27. Install the upper radiator hose (A) and lower radiator hose (B). See **Fig. 42**.
28. Install heater hoses. See **Fig. 43**.
29. Install the ATF cooler hoses (A) (1999 model). See **Fig. 44**.
30. Install the ground cable (B).
31. Install the alternator belt.
32. Loosely install the P/S pump belt and pump.
33. Adjust the P/S pump belt.
34. Install the power steering speed sensor (B) with a new "O" ring (B). See **Fig. 37**.
35. Connect the VSS connector (A) (1999 model).

36. Push the PCM connectors through the bulkhead. Install the grommet, and tighten the mounting nuts (A). See **Fig. 34**.
37. Connect the PCM connector (A), and install the harness clamps (B). See **Fig. 33**.
38. Install the under-hood fuse relay box (A), and tighten the flange bolt (B). See **Fig. 32**.
39. Install the battery cables (C) on the upper-hood fuse relay box. Install the harness clamps (D). Install the battery cable grommet (E).
40. Install the engine wire harness clamps. See **Fig. 30**.
41. Install the vacuum hoses (A), then connect the primary HO2S connector (B). See **Fig. 31**.
42. Install the brake booster vacuum hose (A) and vacuum hose (B). See **Fig. 29**.
43. Install the fuel feed hose (A) and fuel return hose (B) with new washers (C). See **Fig. 28**.
44. Install the starter cable (A). See **Fig. 25**.
45. Install the ground cable (B) (2002-03 models).
46. Install the ground cable (A) and harness clamp (B). See **Fig. 27**.
47. Connect the engine wire harness connectors (C), and install the harness clamp (D) on the left side of the engine compartment.
48. Install the battery base bracket (C), then install the battery base (B) and harness clamp (A). See **Fig. 24**.
49. Install the intake air duct (A), then install the vacuum hose (B) and breather pipe (C). See **Fig. 23**.
50. Install the EVAP canister hose (A).
51. Install and adjust the cruise control cable. See **CRUISE CONTROL CABLE** under ADJUSTEMENTS.
52. Install and adjust the throttle cable. See **THROTTLE CABLE** under ADJUSTEMENTS.
53. Tighten the bolt (D) securing the TCS control valve bracket. Connect the TCS control valve angle sensor connector (B), TCS control valve actuator connector (C) and water bypass hoses (A) on the TCS control valve assembly (J32A2 engine). See **Fig. 22**.
54. Install the intake manifold cover (2000-03 models). See **Fig. 21**.
55. Install the battery. Clean the battery posts and cable terminals with sandpaper, then assemble them and apply grease to prevent corrosion.
56. Refill the engine with engine oil. See **ENGINE OIL** under ENGINE OILING.
57. Refill the ATF. See appropriate SERVICING article in TRANSAXLE/TRANSMISSIONS.
58. Refill the radiator with engine coolant, and bleed air from the cooling system with the heater valve open.
59. Move the shift lever to each gear, and verify that the A/T gear position indicator follows the transmission range switch.
60. Inspect for fuel leaks. Turn the ignition switch ON (II) (DO NOT operate the starter) so the fuel pump runs for about 2 seconds and pressurizes the fuel line. Repeat this operation 2 or 3 times, then check for fuel leakage at any point in the fuel line.
61. Perform the PCM idle learn procedure. See appropriate COMPUTER RELEARN article in GENERAL INFORMATION.
62. Perform the power window control unit reset procedure (2002-03 models). See appropriate POWER WINDOWS article in ACCESSORIES & EQUIPMENT.
63. Inspect the idle speed. See IDLE SPEED under appropriate BASIC DIAGNOSTIC PROCEDURE article in ENGINE PERFORMANCE.

64. Inspect the ignition timing. See IGNITION TIMING under appropriate BASIC DIAGNOSTIC PROCEDURE article in ENGINE PERFORMANCE.
65. Enter the anti-theft code for the radio, then enter the customer's radio station presets.

INTAKE MANIFOLD

Illustration for intake manifold, see **Fig. 56**, **Fig. 57** or **Fig. 58** .

Removal

1. Remove the intake manifold cover (A) and ignition coil cover(s) (B). See **Fig. 59**.
2. Remove the water bypass hoses (A) Disconnect the TCS control actuator connector (B) and the TCS control valve angel sensor connector (C) from the TCS control valve assembly, then remove the bolt (D) securing the TCS control valve bracket (J32A2 engine). See **Fig. 22**.
3. Remove the Evaporative Emission (EVAP) canister hose (A) from the throttle body. See **Fig. 23**.
4. Remove the vacuum hose (B) and breather pipe (C), then remove the intake air duct (D).
5. Remove the throttle cable (A) and cruise control cable (B) by loosening the locknuts (C), then slipping the cable ends out of the accelerator linkage. Take care not to bend the cables when removing them. Always replace any kinked cable with a new one. See **Fig. 26**.
6. Remove the following engine wire harness connectors and wire harness clamps from the intake manifold:
   - Intake Air Temperature (IAT) sensor connector.
   - Isle Air Control (IAC) valve connector.
   - Throttle Position (TP) sensor connector.
   - Manifold Absolute Pressure (MAP) sensor connector.
7. Remove the Intake Manifold Runner Control (IMRC) cable from the intake manifold side.
8. Remove the brake booster vacuum hose (A), vacuum hoses (B) and Positive Crankcase Ventilation (PCV) hose (C). See **Fig. 60**.
9. Remove the breather hose (A) and water bypass hoses (B). See **Fig. 61**.
10. Remove the intake manifold (1999 model). See **Fig. 62**.
11. Remove the upper cover (A), then remove the intake manifold (B) (2000-03 models). See **Fig. 63**.

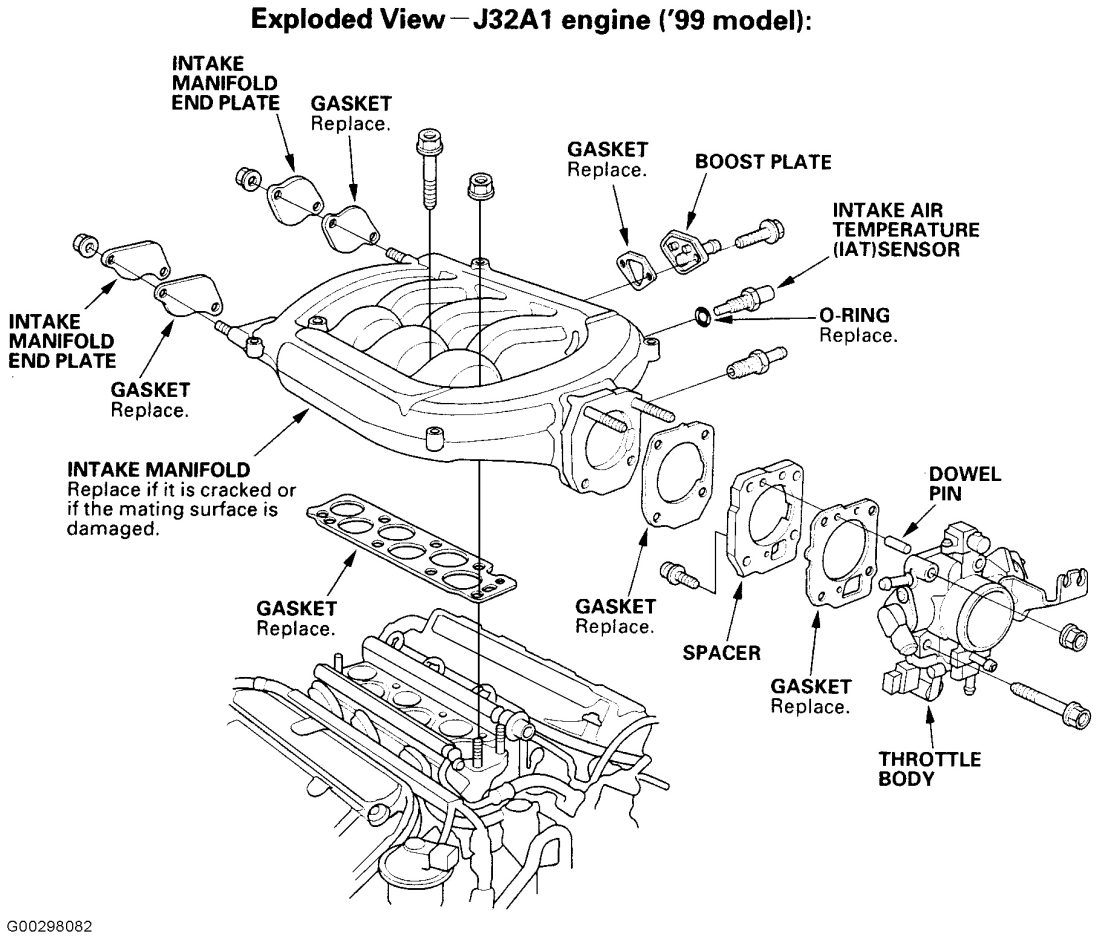


Fig. 56: Identifying Intake Manifold & Related Components (J32A1 Engine - 1999 Model)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

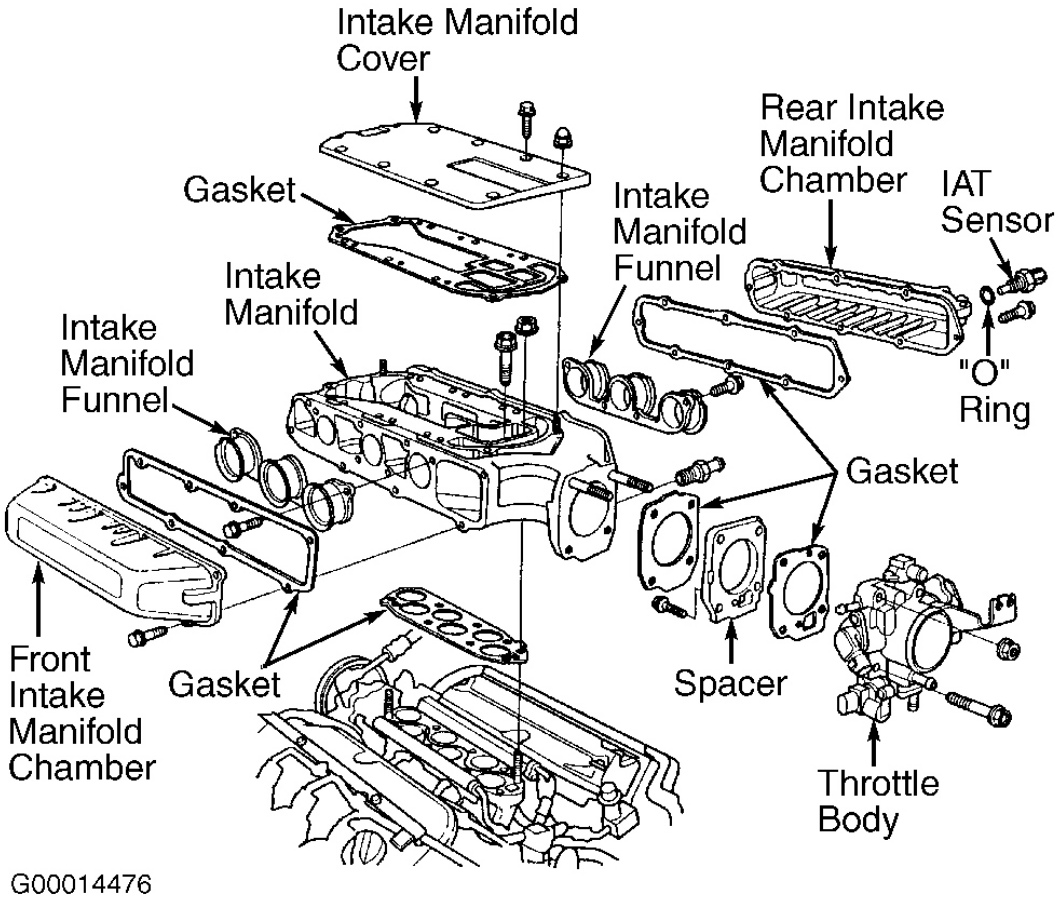


Fig. 57: Identifying Intake Manifold & Related Components (J32A1 Engine - 2000-03 Models)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

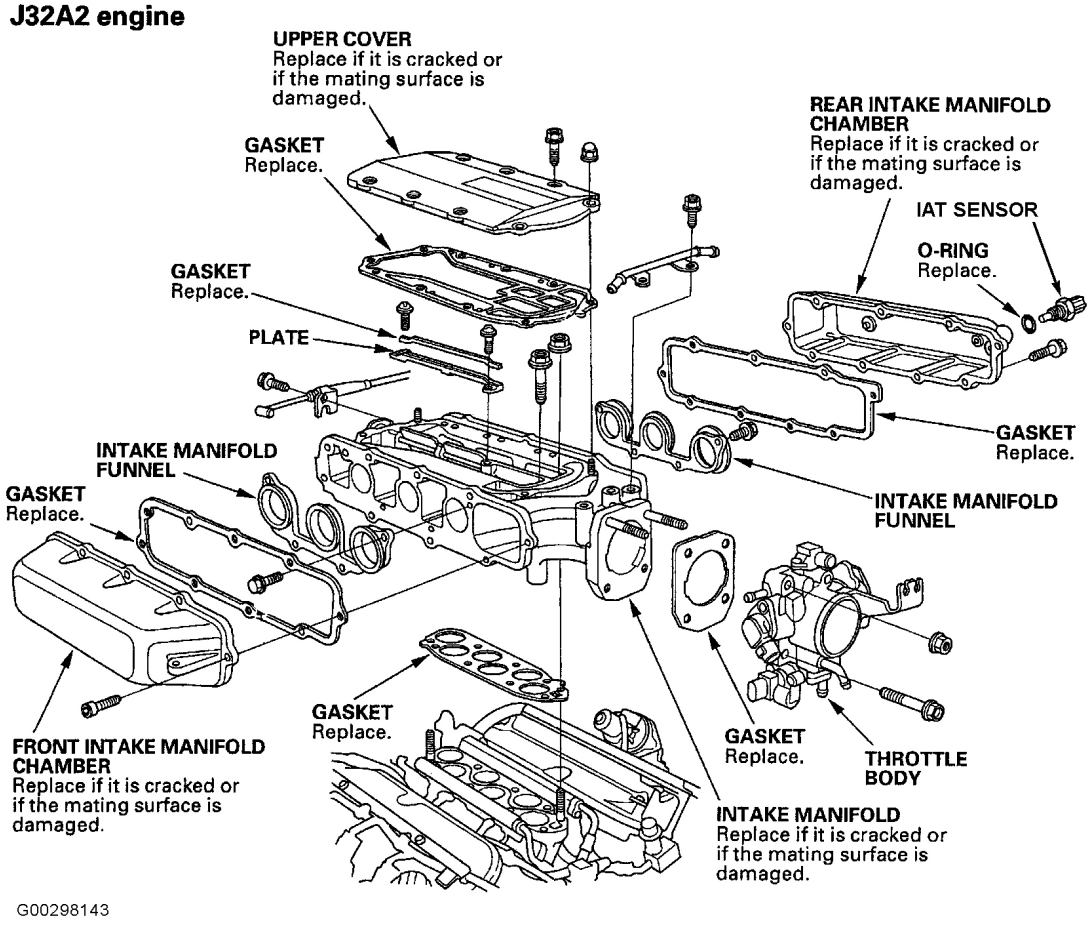
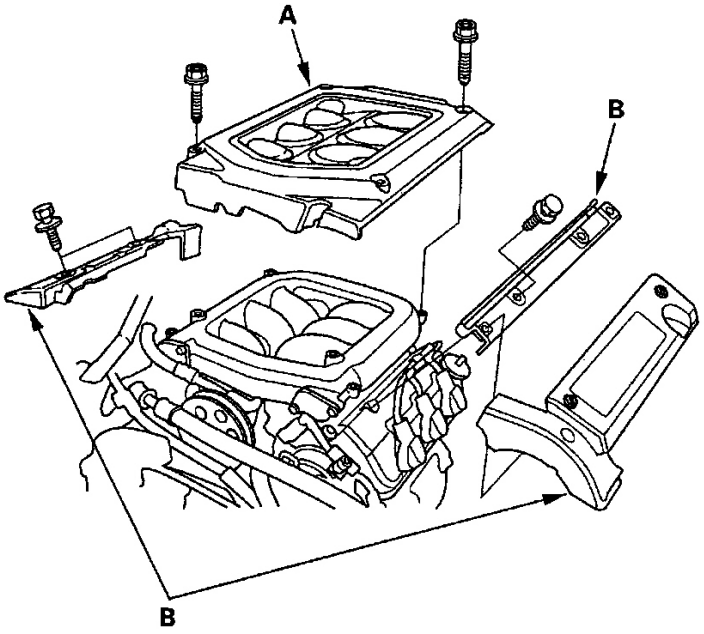


Fig. 58: Identifying Intake Manifold & Related components (J32A2 Engine)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

'99 model:



'00-03 models (J32A2 engine shown):

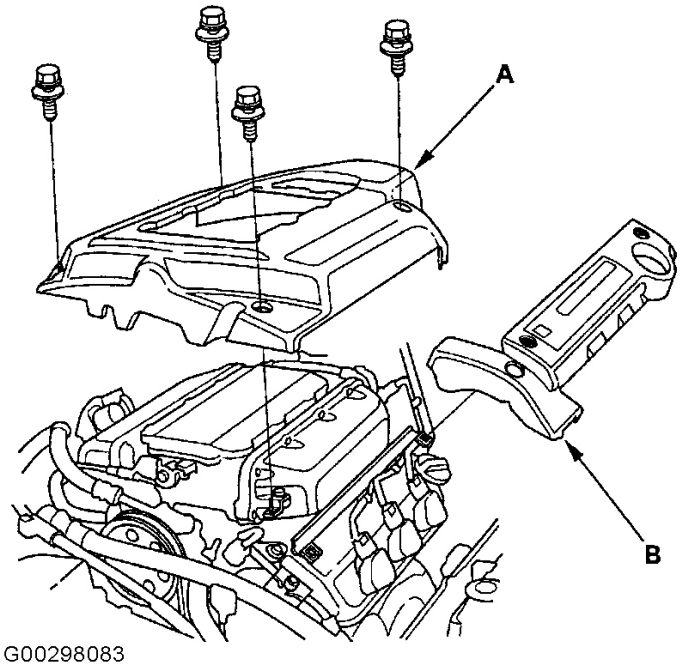
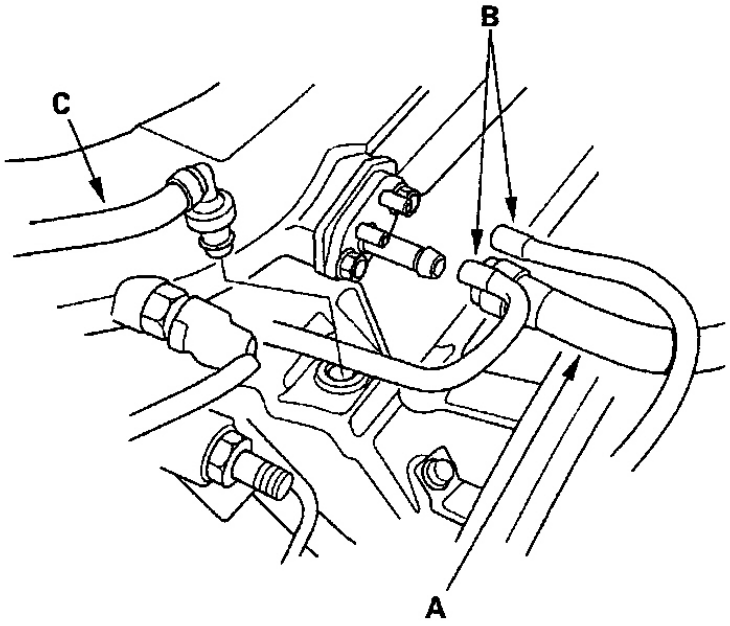


Fig. 59: Removing Intake Manifold Cover & Ignition Coil Cover(s)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

'99 model:



'00-03 models:

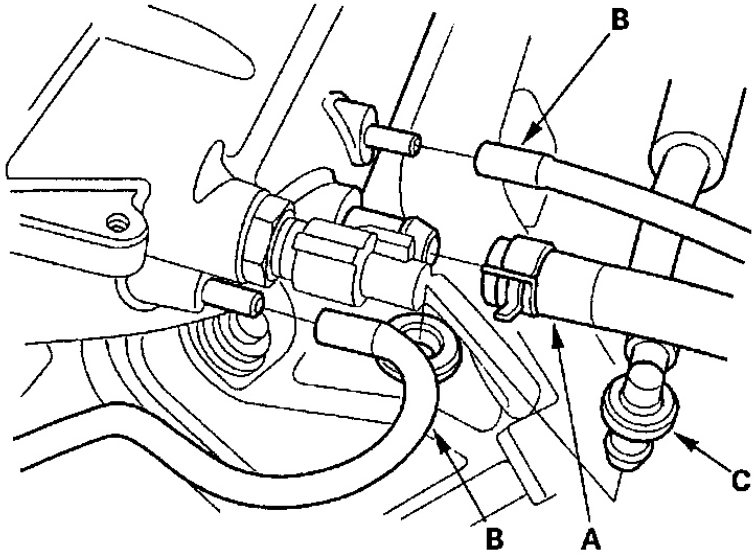


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Fig. 60: Removing Brake Booster Vacuum Hose
Courtesy of AMERICAN HONDA MOTOR CO., INC.

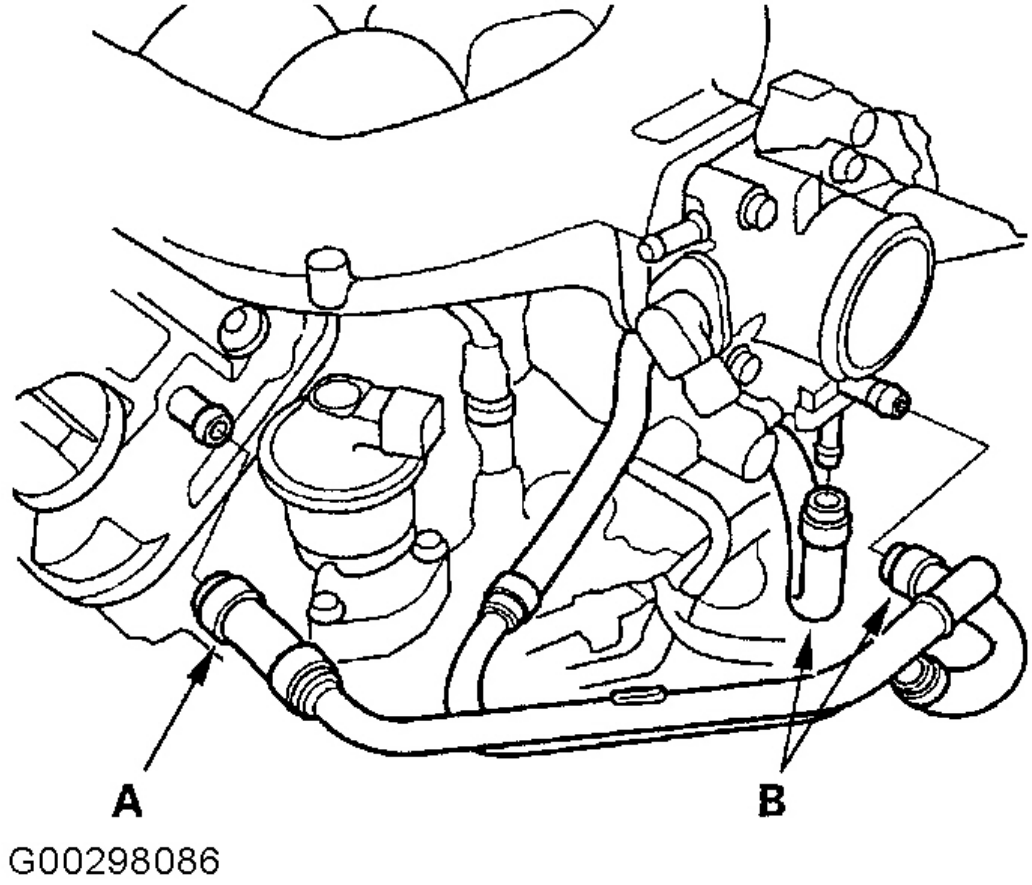

Fig. 61: Removing Breather Hose & Water Bypass Hoses
Courtesy of AMERICAN HONDA MOTOR CO., INC.

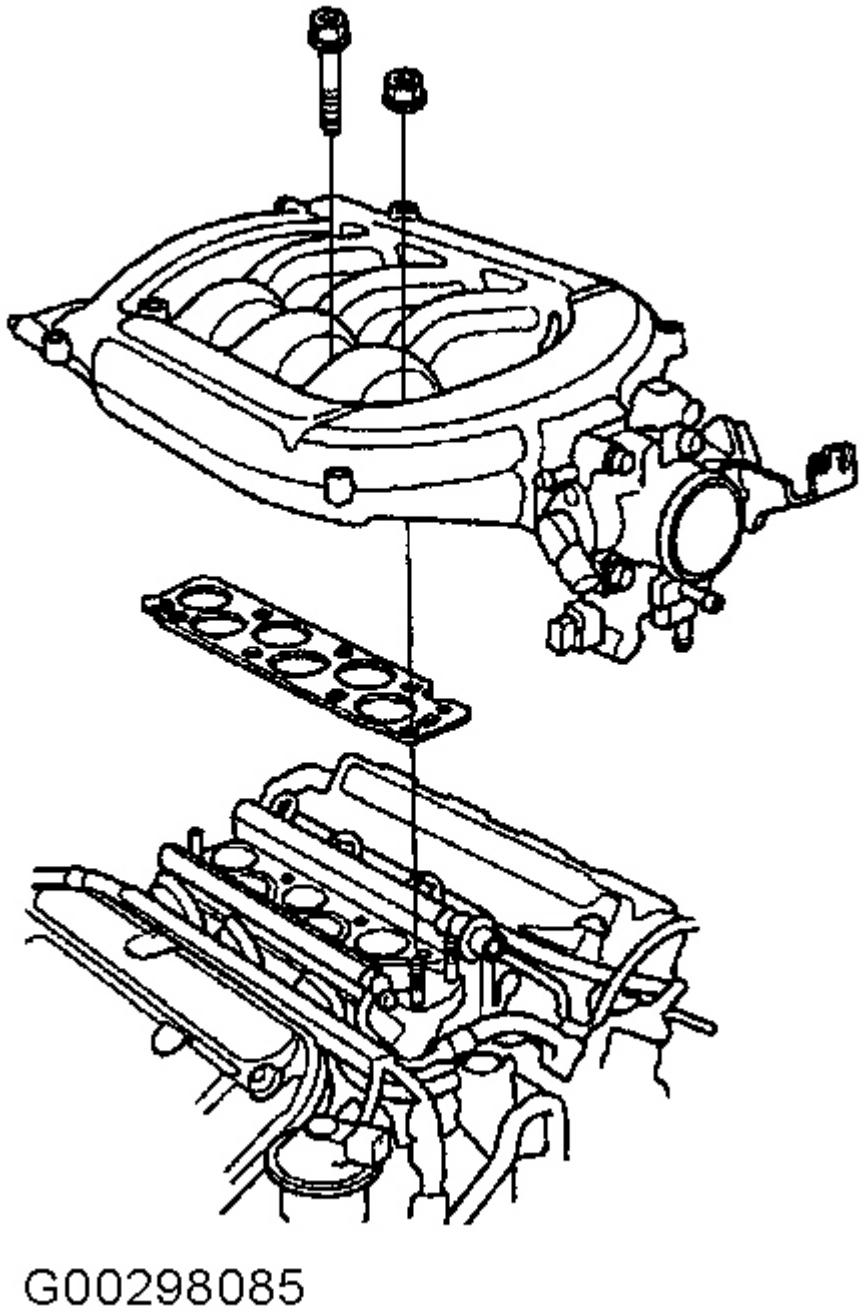

Fig. 62: Removing Intake Manifold (1999 Model)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

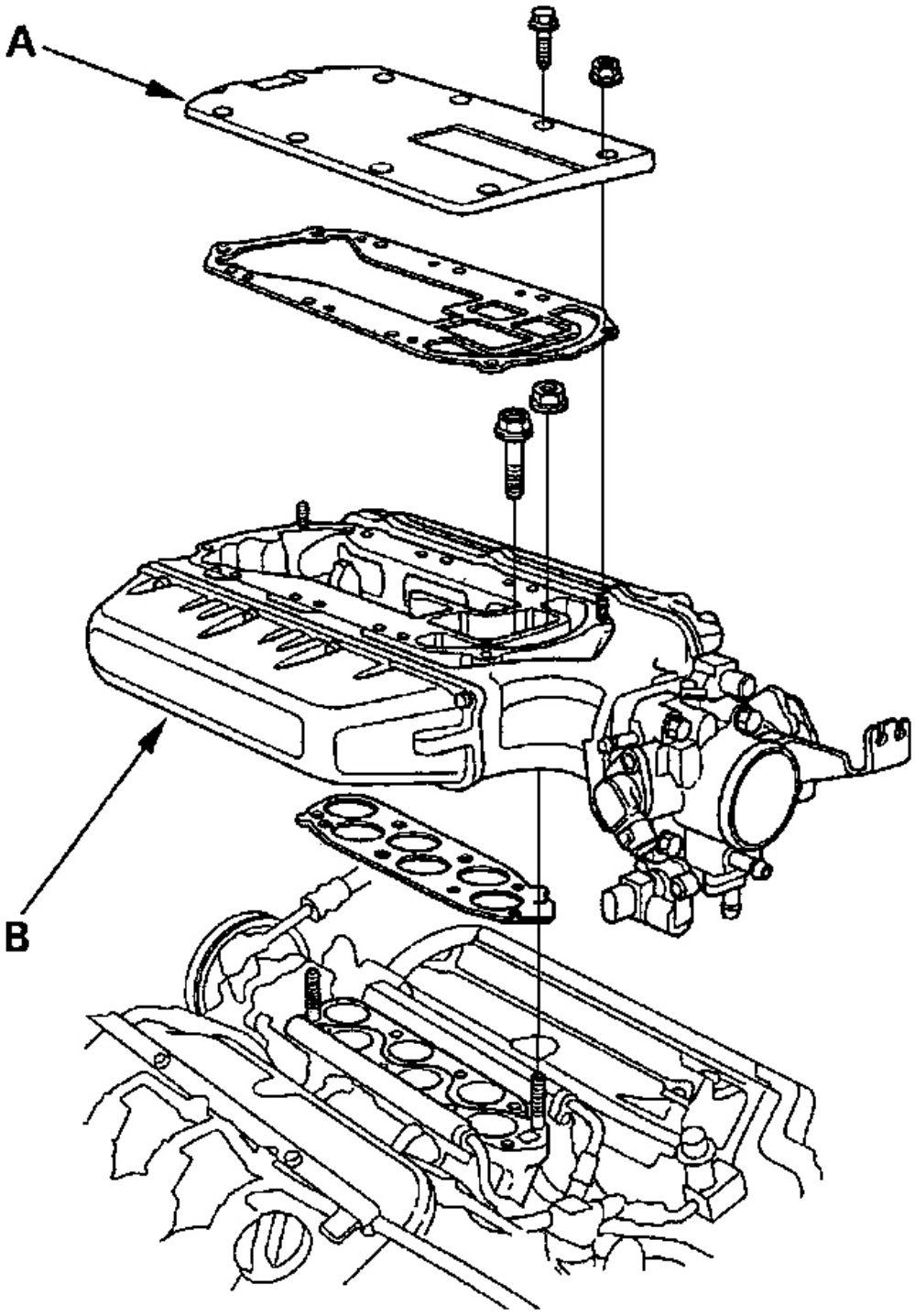

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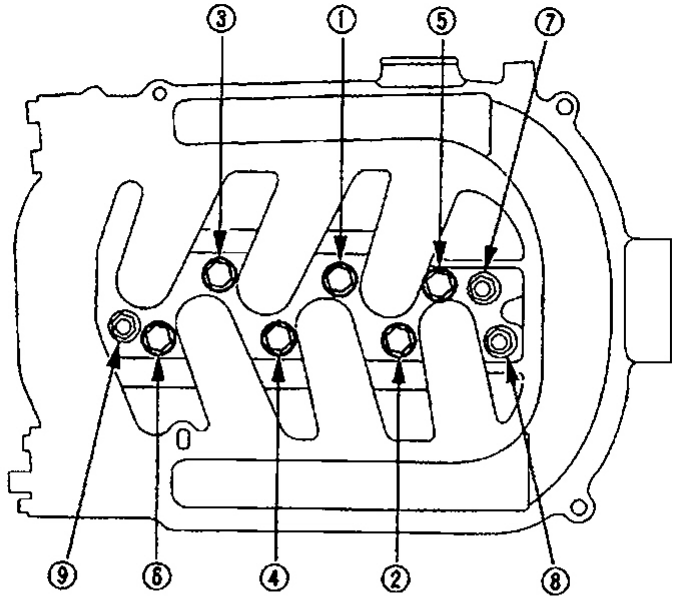
Fig. 63: Removing Upper Cover & Removing Intake Manifold (2000-03 Models)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Installation

1. Install the intake manifold. Tighten bolt and nuts to sequence. See **TORQUE SPECIFICATIONS** and **Fig. 64**. Always use a new intake manifold gasket.
2. Install the upper cover. Tighten bolts and nuts sequentially 2 or 3 steps. Always use a new gasket (2000-03 models). See **Fig. 65**.
3. Install the brake booster vacuum (A), vacuum hoses (B) and Positive Crankcase Ventilation (PCV) hose (C). See **Fig. 60**.
4. Install the breather hose (A) and water bypass hoses (B). See **Fig. 61**.
5. Install the throttle cable, then adjust the cable. See **THROTTLE CABLE** under ADJUSTMENTS.
6. Install the cruise control cable, then adjust the cable. See **CRUISE CONTROL CABLE** under ADJUSTMENTS.
7. Install the intake air duct (A), then install the vacuum hose (B) and breather pipe (C). See **Fig. 60**.
8. Install the Evaporative Emission (EVAP) canister hose (D).
9. Tighten the bolt (D) securing the TCS control valve bracket. Connect the TCS control valve angle sensor connector (C), TCS control valve actuator connector (B) and water bypass (A) on the TCS control valve assembly (J32A2 engine). See **Fig. 22**.
10. Install the ignition coil cover(s) (B) and intake manifold cover (A). See **Fig. 59**.
11. Clean up any spilled engine coolant.
12. After installation, check that all tubes, hoses and connectors are installed correctly.
13. Refill the radiator with engine coolant, and bleed air from the cooling system with the heater valve open.

'99 model:



'00-03 models:

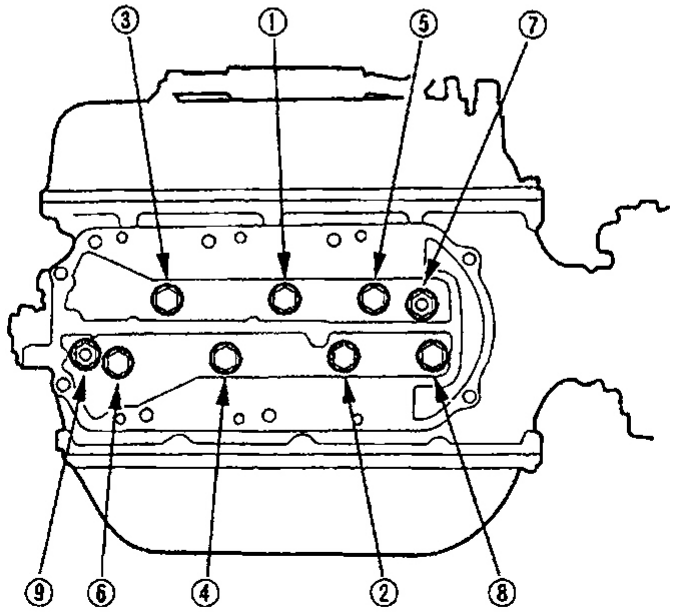


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Fig. 64: Installing Intake Manifold & Tightening Bolt & Nuts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

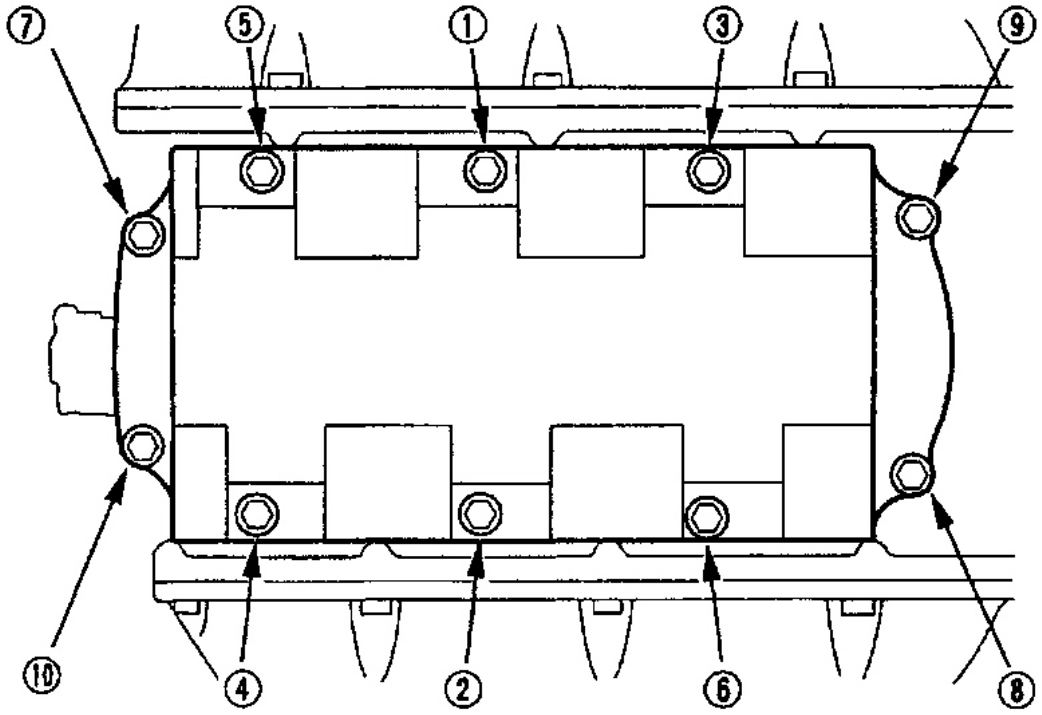

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Fig. 65: Installing Upper Cover & Tightening Bolts & Nuts Sequentially
Courtesy of AMERICAN HONDA MOTOR CO., INC.

EXHAUST MANIFOLD

Removal & Installation

NOTE: Use new gaskets and self-locking nuts when reassembling. Check for folds or scratches on the surfaces of the gasket.

For exhaust manifold removal and installation, see **Fig. 66**.

For exhaust pipe and muffler removal and installation, see **Fig. 67** or **Fig. 68** .

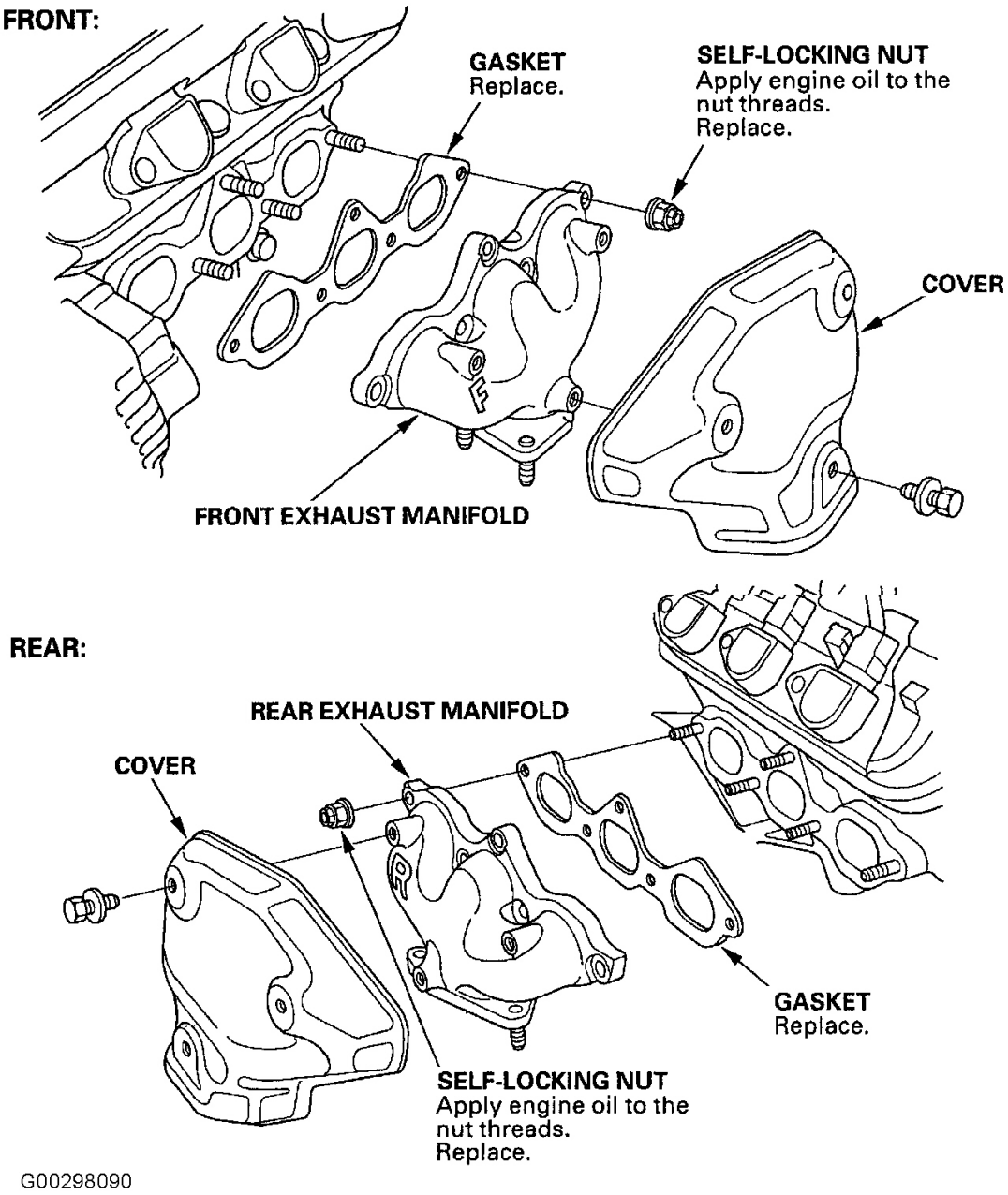

Fig. 66: Exploded View Of Exhaust Manifold
Courtesy of AMERICAN HONDA MOTOR CO., INC.

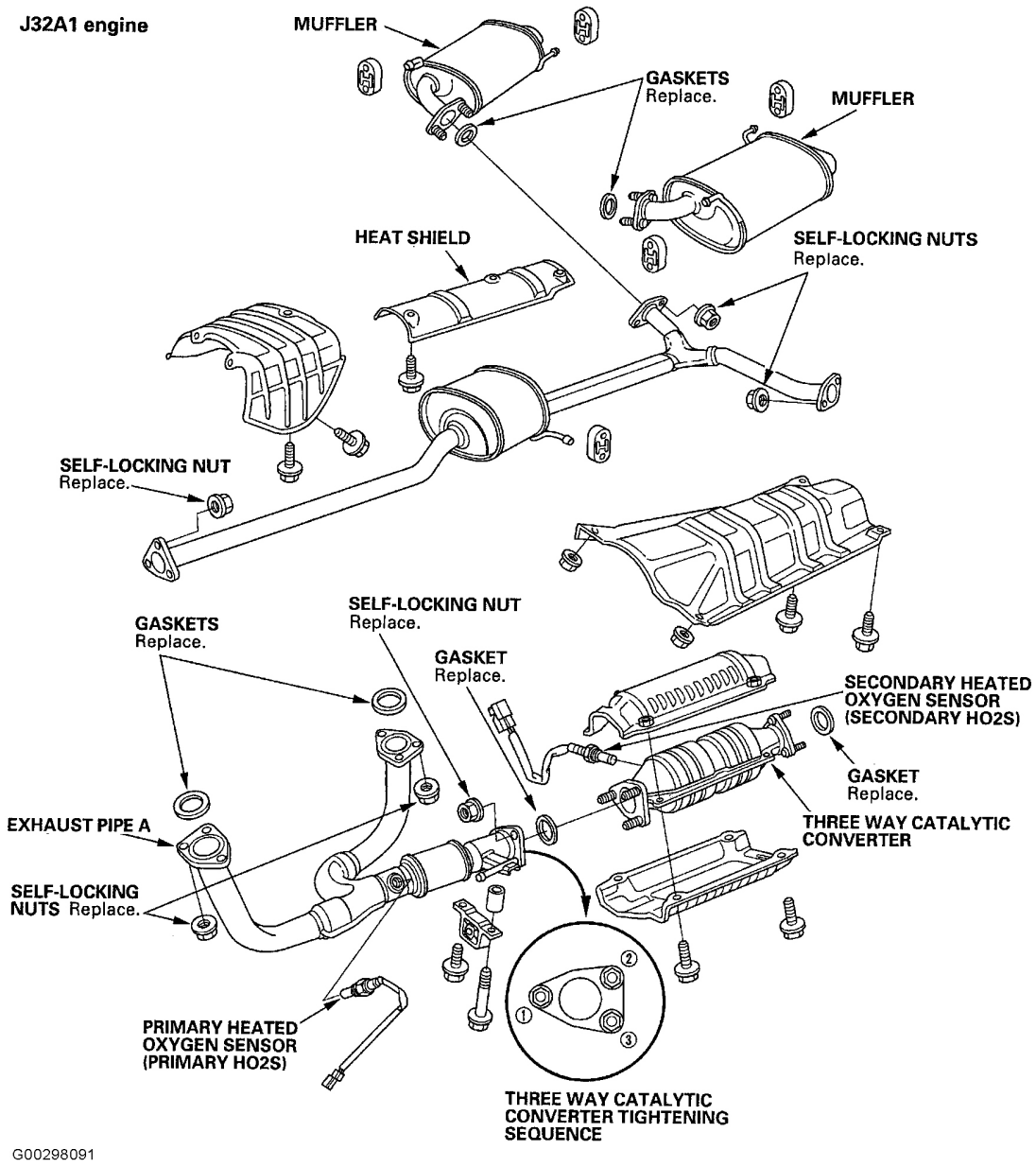

Fig. 67: Exploded View Of Exhaust Pipe & Muffler (J32A1 Engine)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

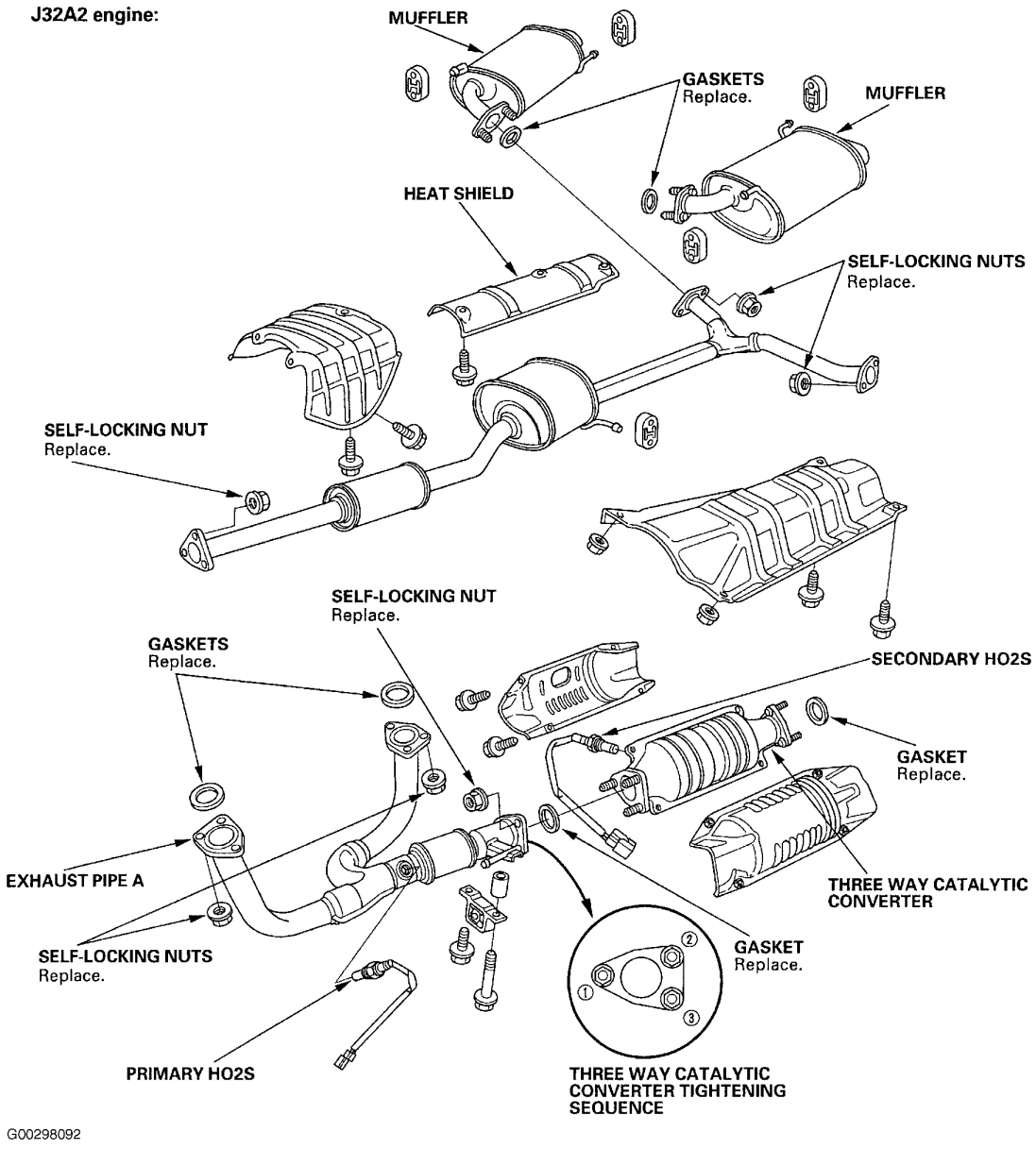

Fig. 68: Exploded View Of Exhaust Pipe & Muffler (J32A2 Engine)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER HEAD COVER

Removal

1. Remove strut brace. See **Fig. 69**.
2. Remove the Power Steering (P/S) hose clamp (A). See **Fig. 70**.
3. Disconnect the Intake Manifold Runner Control (IMRC) actuator connector (B), then remove the IMRC actuator (C) (J32A2 engine).

4. Remove the 2 bolts securing the wire harness holder (J32A2 engine). See **Fig. 71**.
5. Remove 6 ignition coils from and rear cylinder head. See **Fig. 72**.
6. Remove intake manifold. See **INTAKE MANIFOLD**.
7. Remove cylinder head cover. See **Fig. 73**.

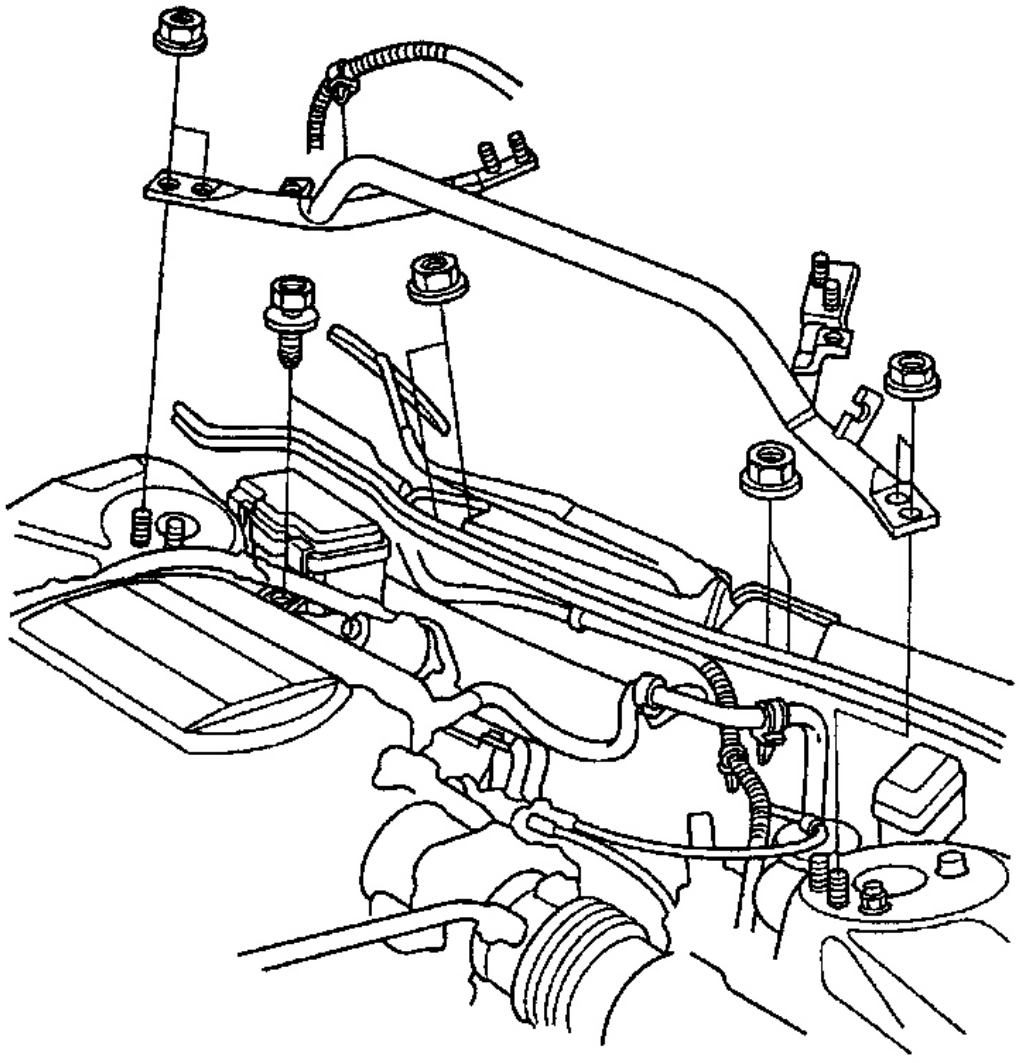

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Fig. 69: Removing Strut Brace
Courtesy of AMERICAN HONDA MOTOR CO., INC.

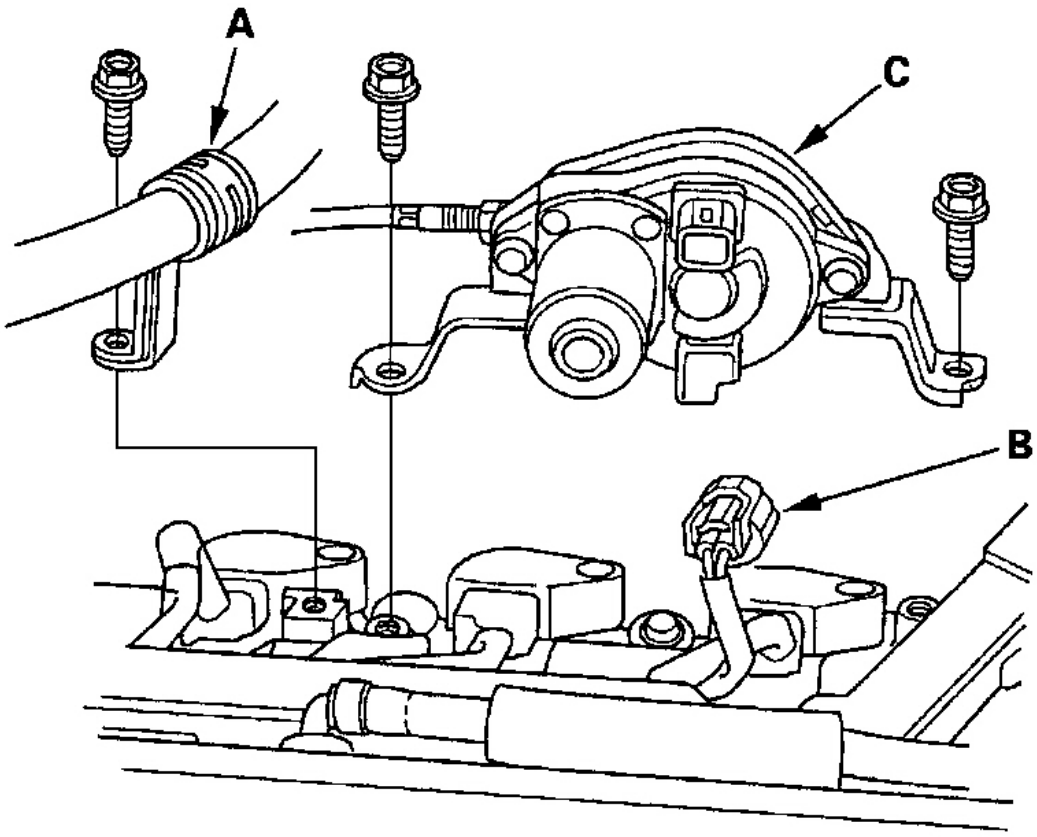

Fig. 70: Removing Power Steering Hose Clamp
Courtesy of AMERICAN HONDA MOTOR CO., INC.

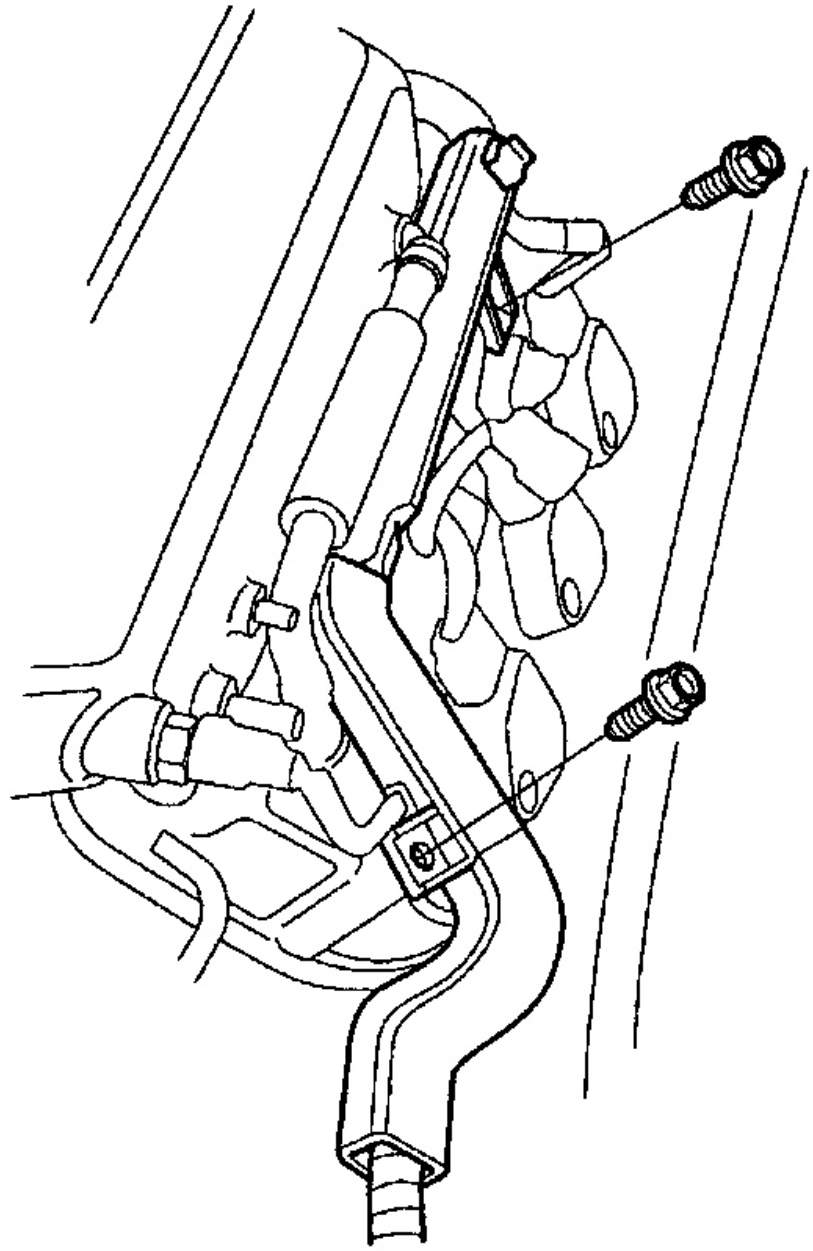

Fig. 71: Removing 2 Bolt Securing Wire Harness Holder (J32A2 Engine)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

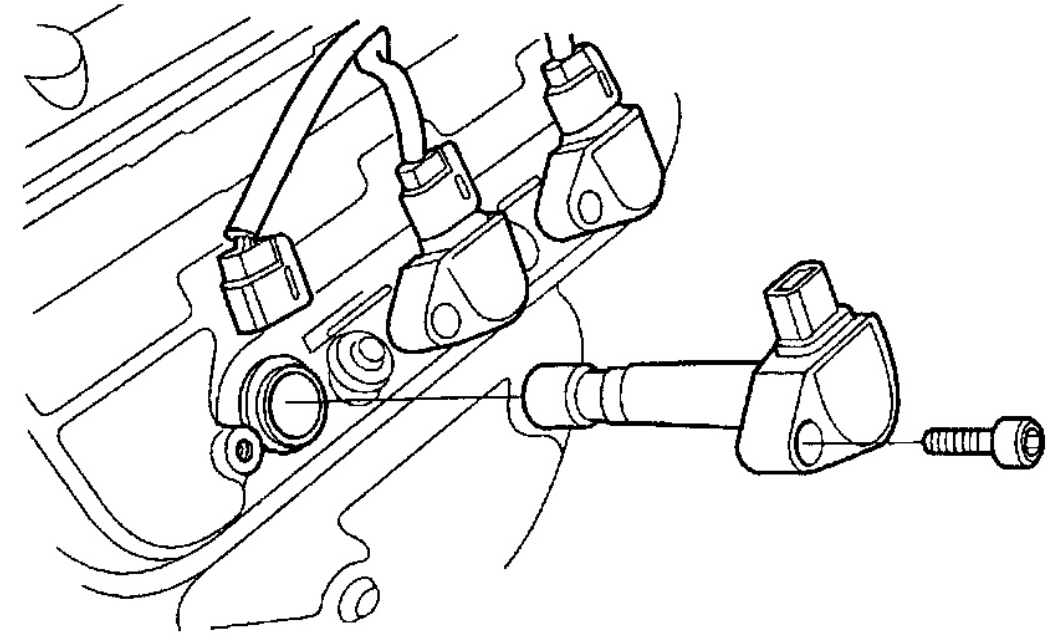

Fig. 72: Removing Ignition Coils From Front & Rear Cylinder Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

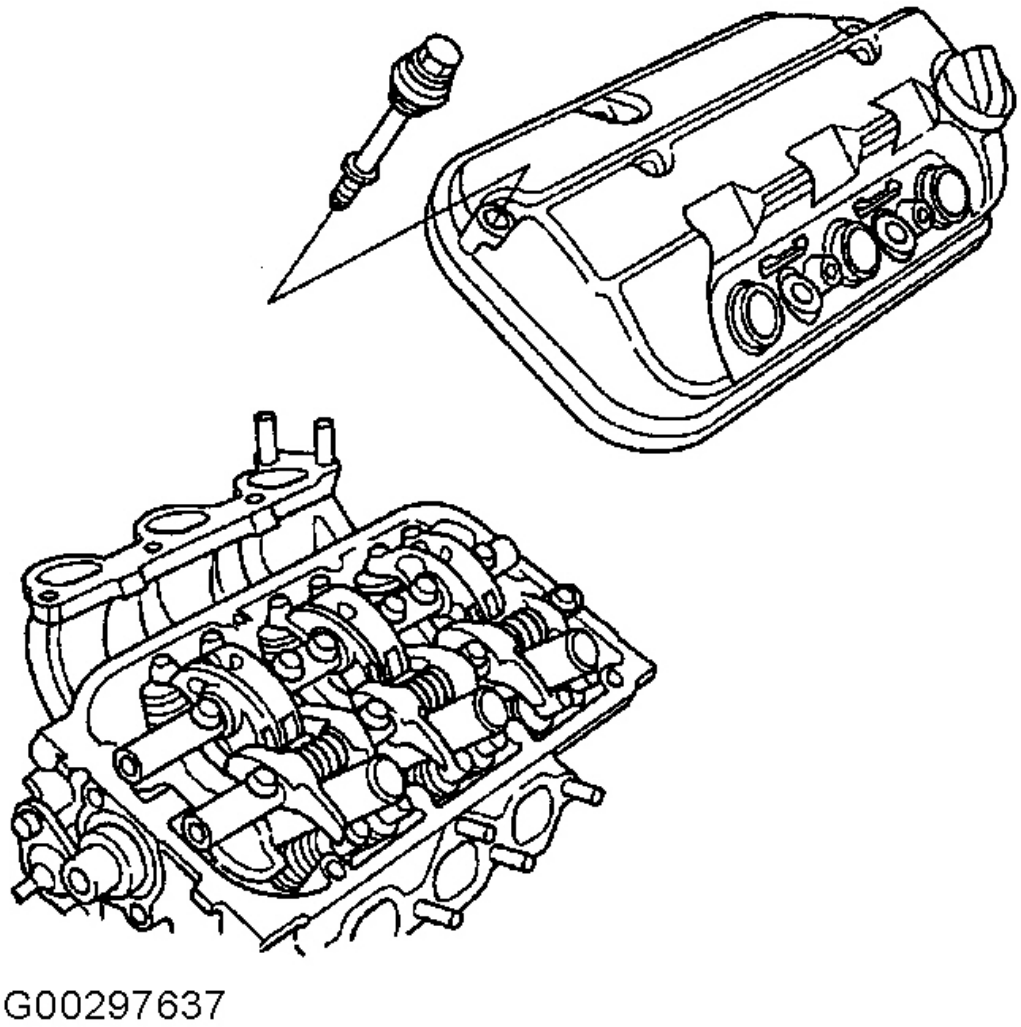

Fig. 73: Removing Cylinder Head Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Installation

NOTE:

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

1. Install the cylinder head covers. See **Fig. 73**.
2. Tighten the nuts in 2 or 3 steps. In the final step, tighten all nuts, in sequence. See **Fig. 74** and **TORQUE SPECIFICATIONS**.
3. Install intake manifold. See **INTAKE MANIFOLD**.
4. Install 6 ignition coils. See **Fig. 72**.
5. Install the wire harness holder, then secure the bolts (J32A2 engine). See **Fig. 71**.
6. Install the IMRC actuator (C), then connect the IMRC actuator connector (B) (J32A2 engine). See **Fig. 70**.
7. Install the P/S hose clamp (A).
8. Install strut brace. See **Fig. 69**.

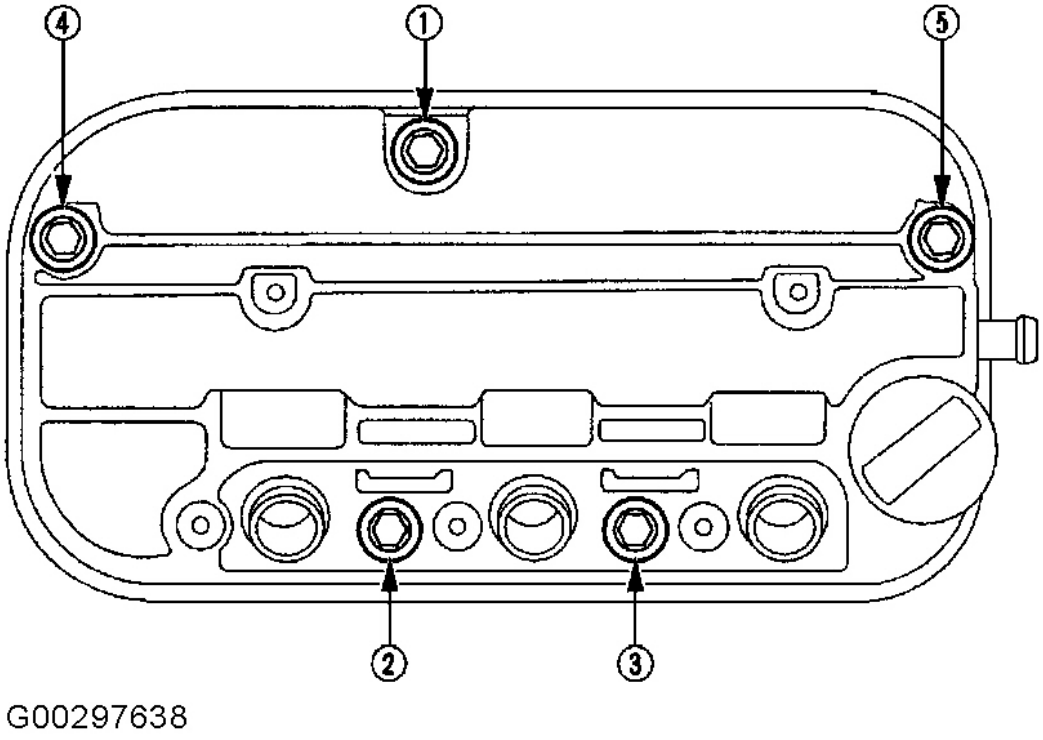

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Fig. 74: Tightening Cylinder Head Cover In Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CYLINDER HEAD

Removal

NOTE:

- **Use fender covers to avoid damaging painted surfaces.**

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

1. Make sure you have the anti-theft code for the radio, then write down the frequencies for the radio's preset buttons.
2. Disconnect the negative cable from the battery.
3. Drain the engine coolant.
4. Remove the alternator belt. Move the auto-tensioner (A) to remove tension from the alternator belt (B), then remove alternator belt. See **Fig. 35**.
5. Loosen the adjusting nut (A), and remove the locknut (B) and mounting bolt (C), then remove the Power Steering (P/S) pump belt (D) and pump without disconnecting the P/S hoses. See **Fig. 36**.
6. Remove the ground cable (E) (2000-03 models).
7. Remove the alternator. See appropriate GENERATORS & REGULATORS article in ELECTRICAL.
8. Relieve fuel pressure. See **FUEL PRESSURE RELEASE**.
9. Remove the fuel feed hose (A) and fuel return hose (B). See **Fig. 28**.
10. Remove intake manifold. See **INTAKE MANIFOLD**.
11. Remove timing belt. See **TIMING BELT**.
12. Remove the following engine wire harness connectors and wire harness clamps from the cylinder head.
    - 6 injector connectors.
    - Engine Coolant Temperature (ECT) sensor connector.
    - Radiator fan switch "A" connector.
    - Radiator fan switch "B" connector.
    - Coolant temperature gauge sending unit connector (1999 model).
    - Crankshaft Position (CKP) sensor connector.
    - Camshaft Position (CMP) (Top Dead Center (TDC)) sensor connector.
    - Exhaust Gas Recirculation (EGR) valve connector.
    - VTEC solenoid valve connector.
    - VTEC oil pressure switch connector.
    - Oil pressure switch connector.
13. Remove the vacuum hoses (A) from the intake air bypass control valve (B). See **Fig. 75**.
14. Remove the fuel rails. See **Fig. 76**.
15. Remove heater hoses. See **Fig. 43**.
16. Remove the upper radiator hose (A) and lower radiator hose (B). See **Fig. 42**.
17. Remove the front and rear exhaust manifolds. **EXHAUST MANIFOLD**.

18. Remove water passage. See **Fig. 77**.
19. Remove camshaft pulleys (A) and back covers (B). See **Fig. 78**.
20. Remove cylinder head covers. See **CYLINDER HEAD COVER**.
21. Remove the cylinder head bolts. To prevent warpage, unscrew the bolt in sequence 1/3 turn at a time; repeat the sequence until all bolts are loosened. See **Fig. 79**.
22. Remove cylinder heads.

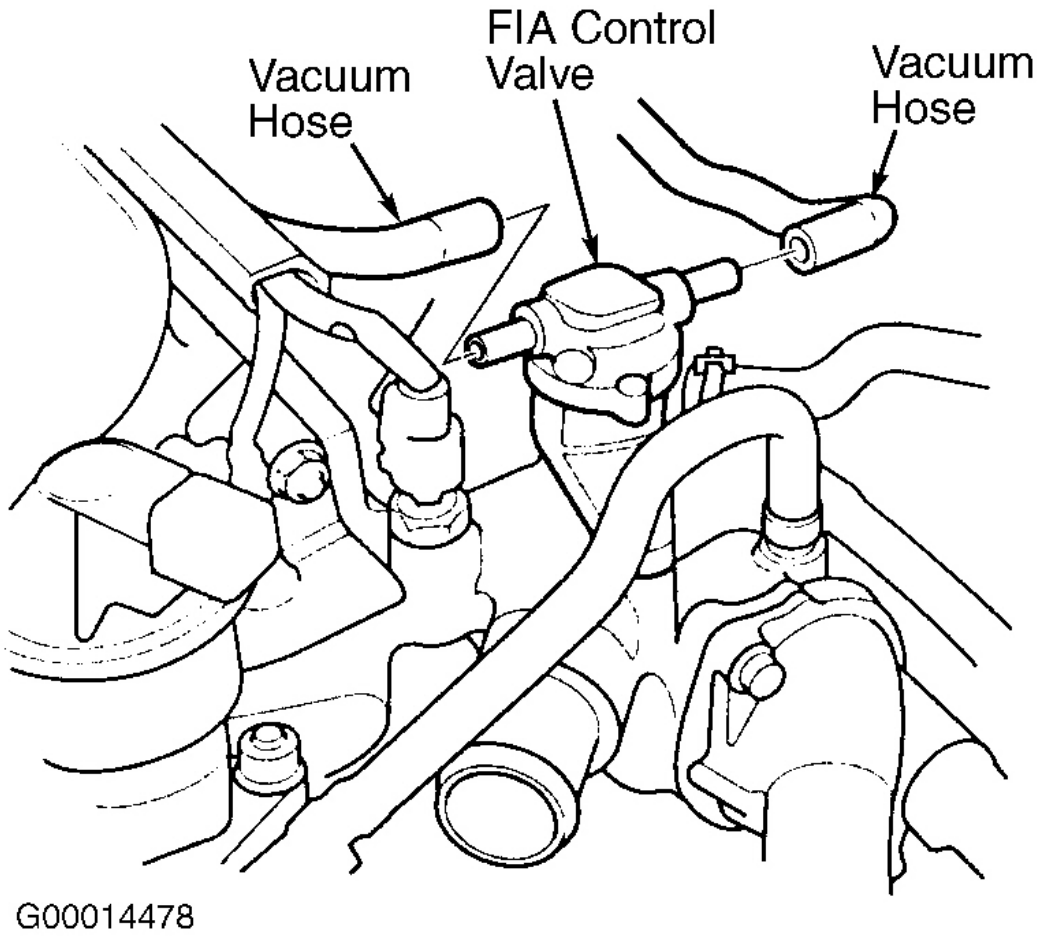
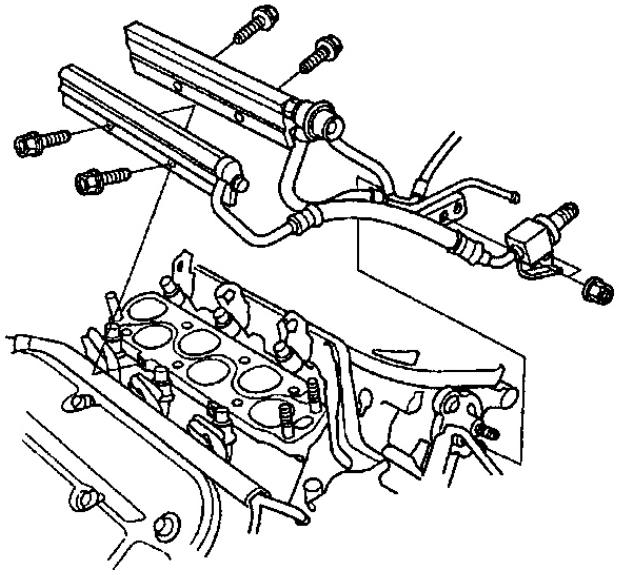


Fig. 75: Identifying Fuel Injection Air Control Valve
Courtesy of AMERICAN HONDA MOTOR CO., INC.

'99 model:



'00-03 models:

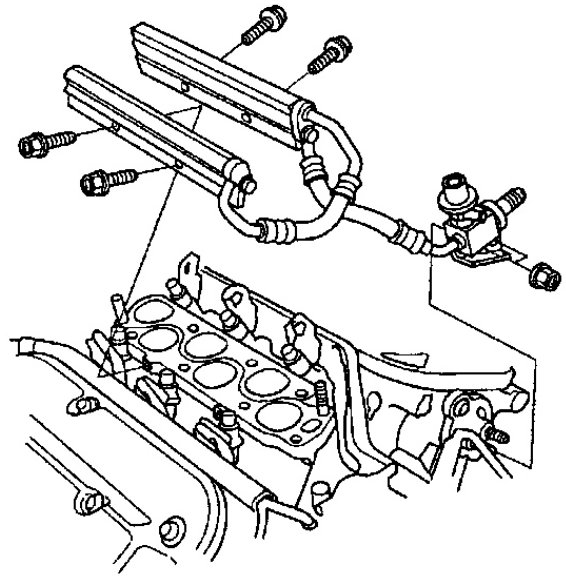


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Fig. 76: Removing Fuel Rails
Courtesy of AMERICAN HONDA MOTOR CO., INC.

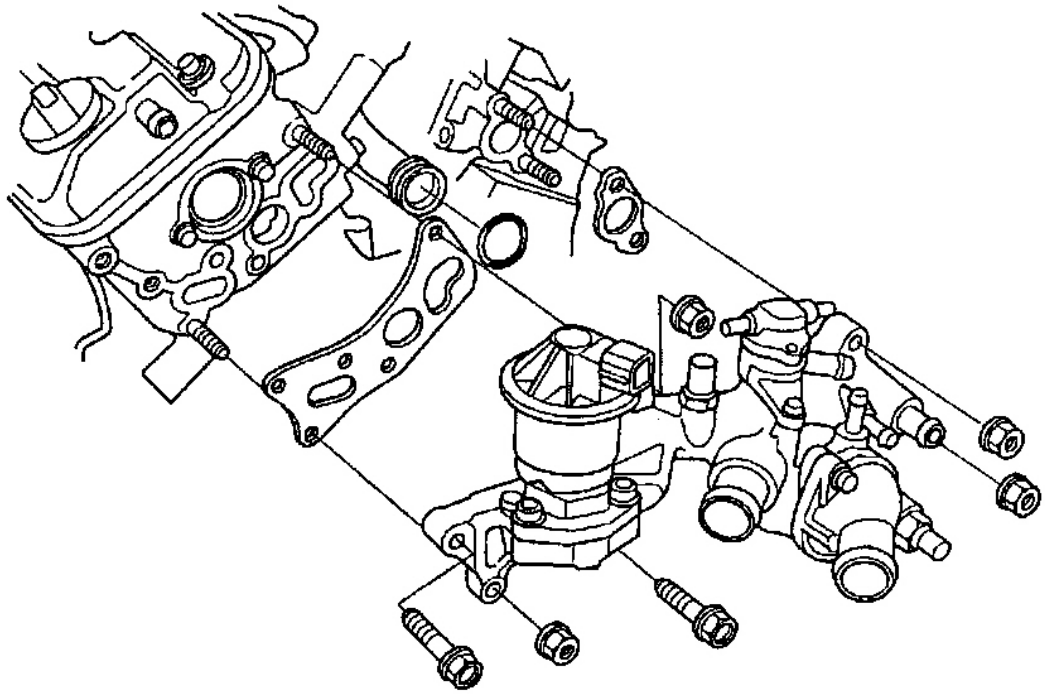

Fig. 77: Removing Water Passage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

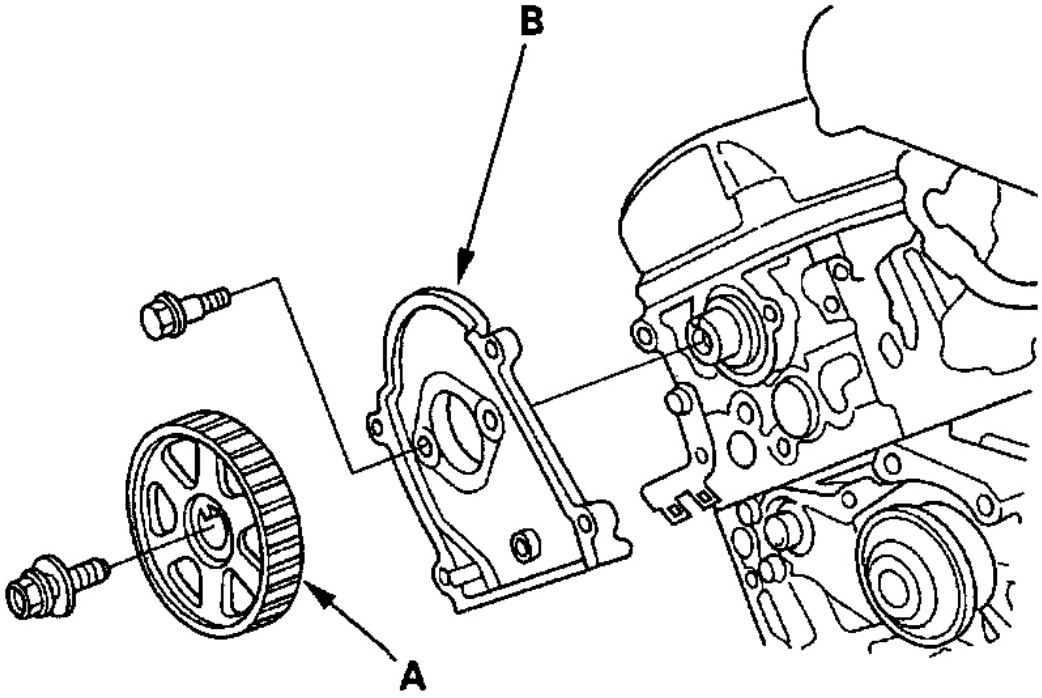

Fig. 78: Removing Camshaft Pulleys & Back Covers
Courtesy of AMERICAN HONDA MOTOR CO., INC.

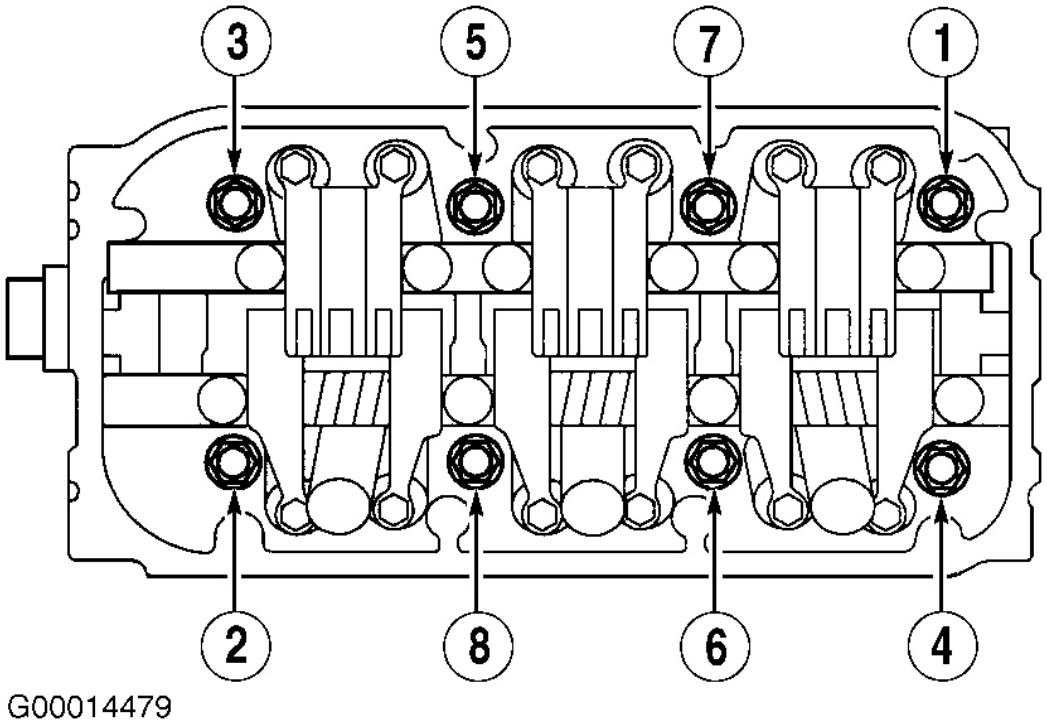

Fig. 79: Cylinder Head Bolt Loosening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Inspection For Warpage

1. Remove cylinder head. See **CYLINDER HEAD**.
2. Inspect the camshaft. See **CAMSHAFT INSPECTION** in ROCKER ARM ASSEMBLY.
3. Check the cylinder head for warpage. See **Fig. 80**. Measure along edges, and 3 ways across the center.
    - If warpage is less than .002" (.05 mm), cylinder head resurfacing is not required.
    - If warpage is between .002" (.05 mm) and .008" (.2 mm), resurface the cylinder head.
    - Maximum resurface limit is .008" (.2 mm) based on a height of 4.76" (121 mm).

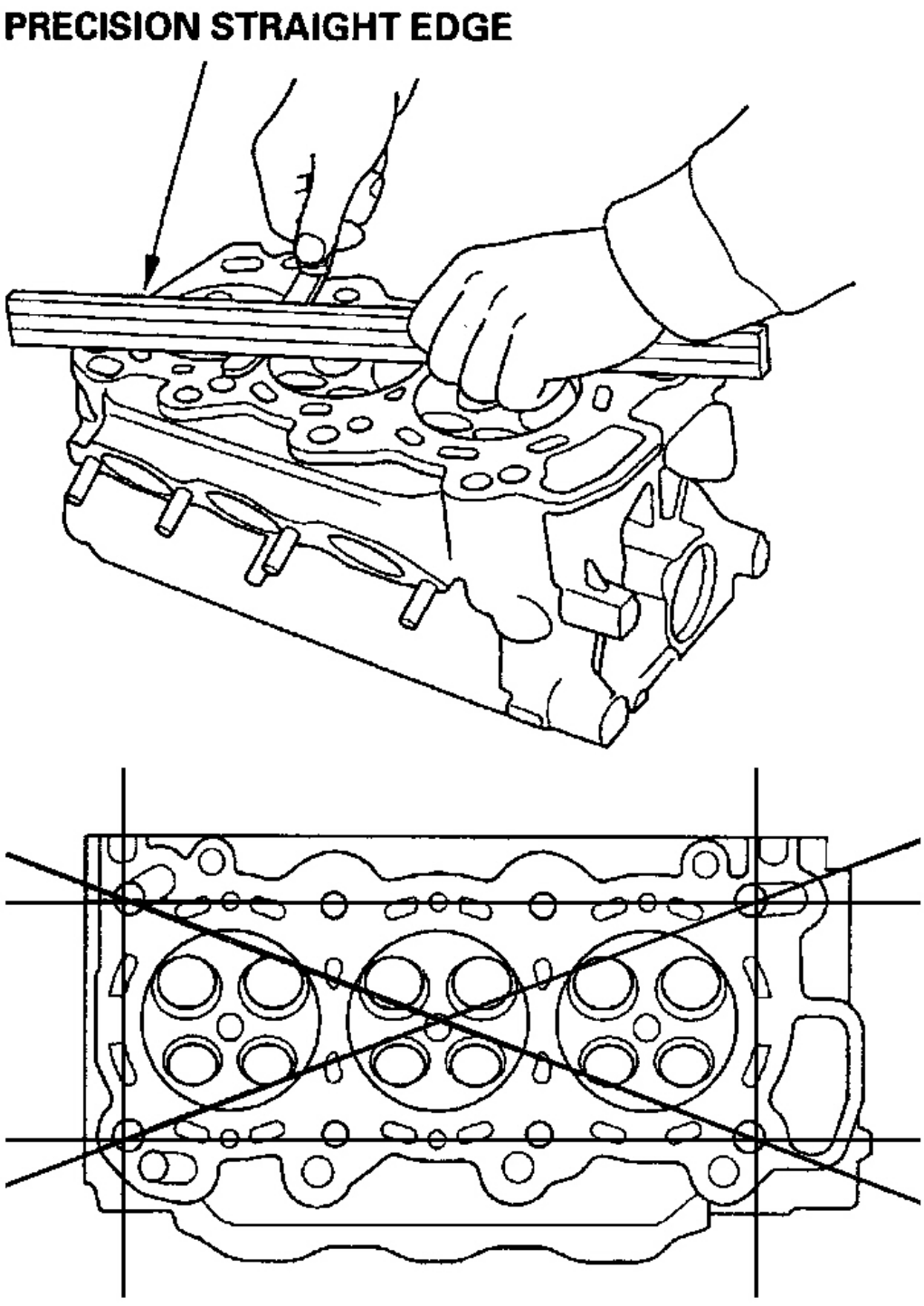

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Fig. 80: Checking Cylinder Head For Warpage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Installation

Install the cylinder head in reverse order of removal:

1. Clean the cylinder head and block surface.
2. Clean and install the oil control orifices (A) with the new "O" rings (B). See **Fig. 81**.
3. Install the dowel pins (C) and new cylinder head gaskets (D).
4. Cleaning the timing belt drive pulley.
5. Set the timing belt drive pulley to TDC by aligning the TDC on the tooth of the timing belt drive pulley with the pointer on the oil pump. See **Fig. 82**.
6. Clean the camshaft pulleys. Set the camshaft pulleys to TDC by aligning the TDC marks (A) on the camshaft pulleys with the pointers (B) on the back covers. See **Fig. 83**.

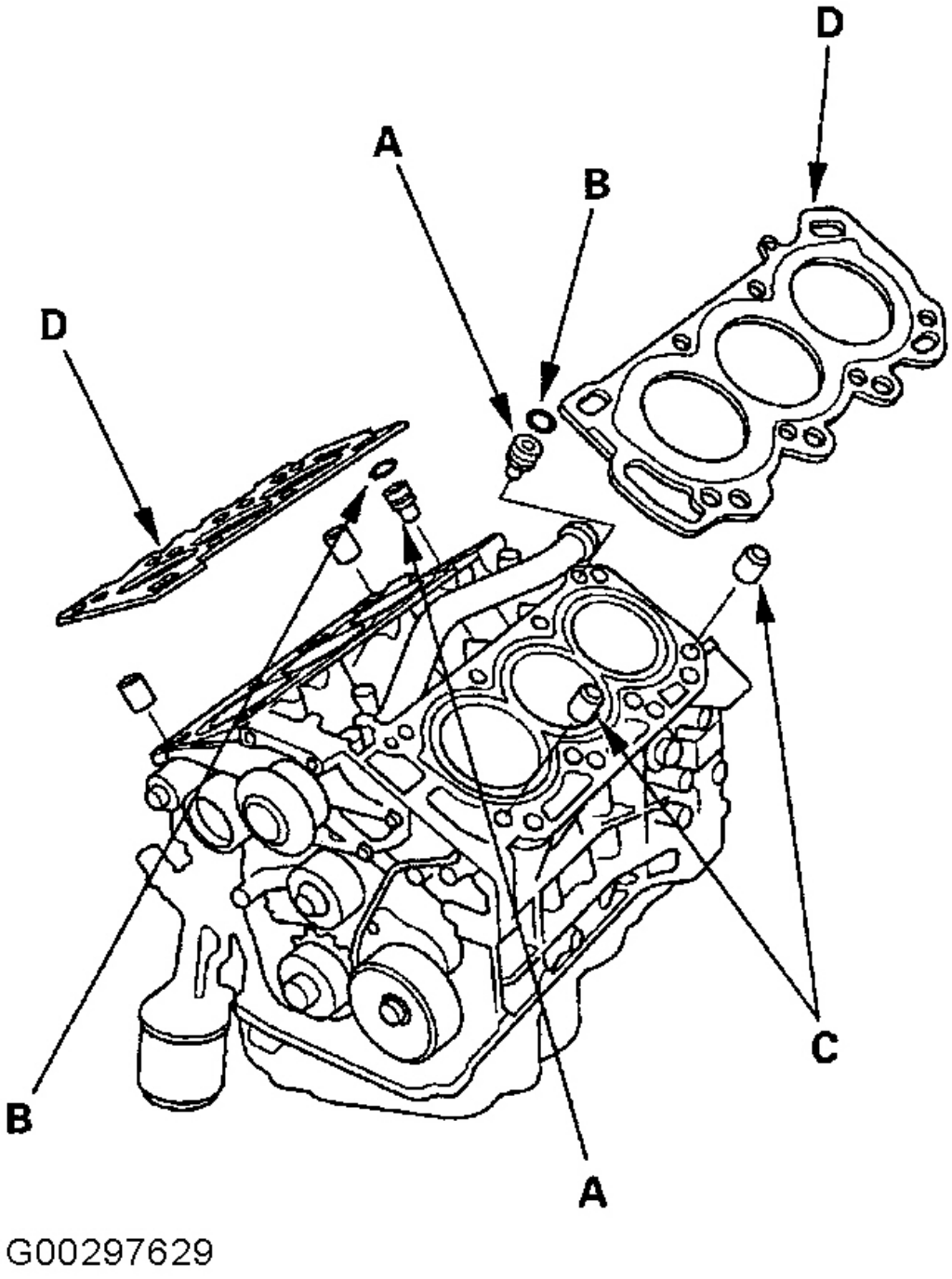


Fig. 81: Cleaning & Installing Oil Control Orifices With New "O" Rings
Courtesy of AMERICAN HONDA MOTOR CO., INC.

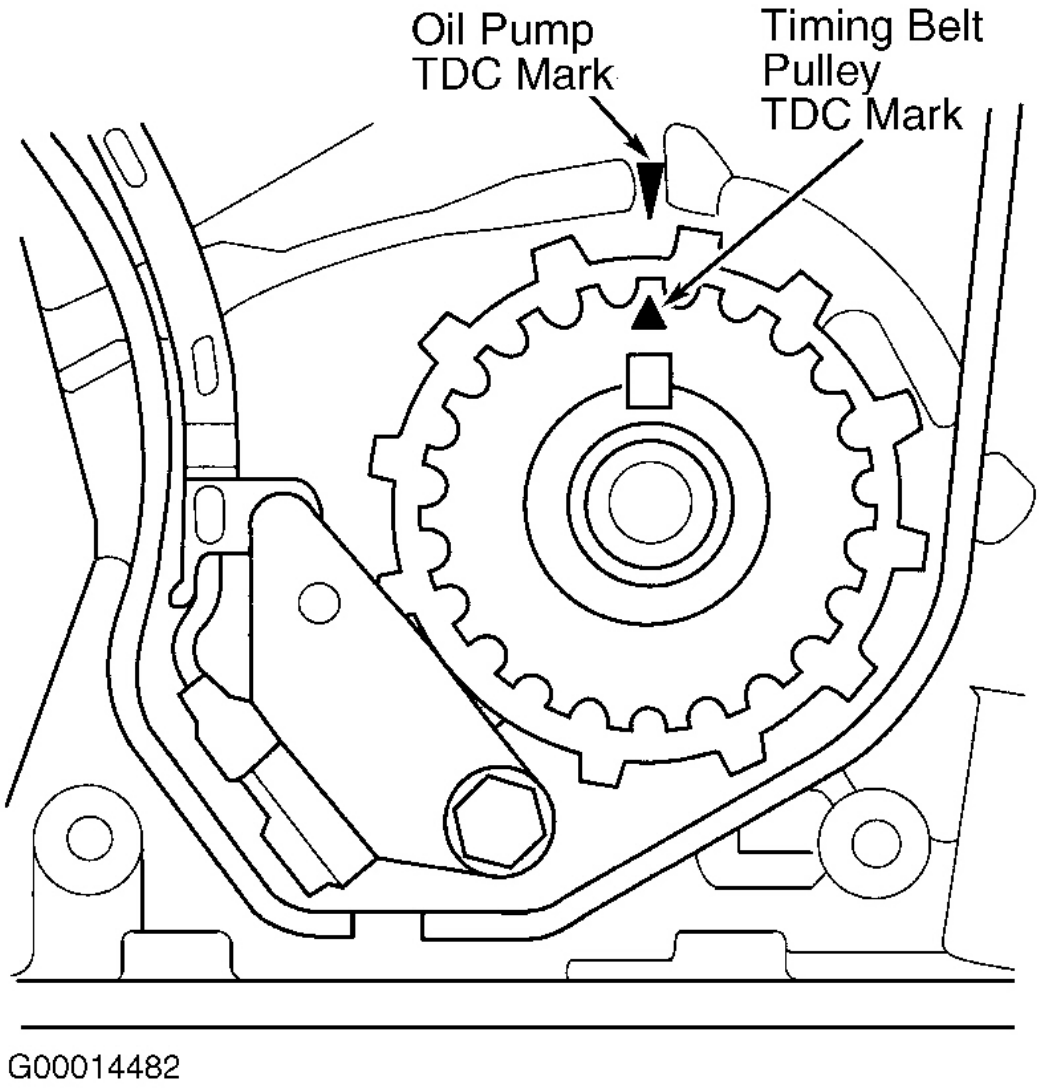
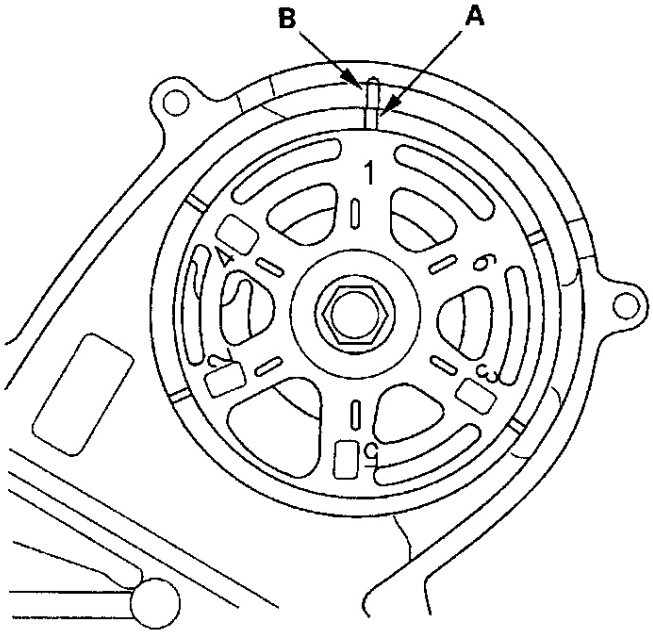


Fig. 82: Aligning TDC Marks On Timing Belt Pulley & Oil Pump
Courtesy of AMERICAN HONDA MOTOR CO., INC.

FRONT:



REAR:

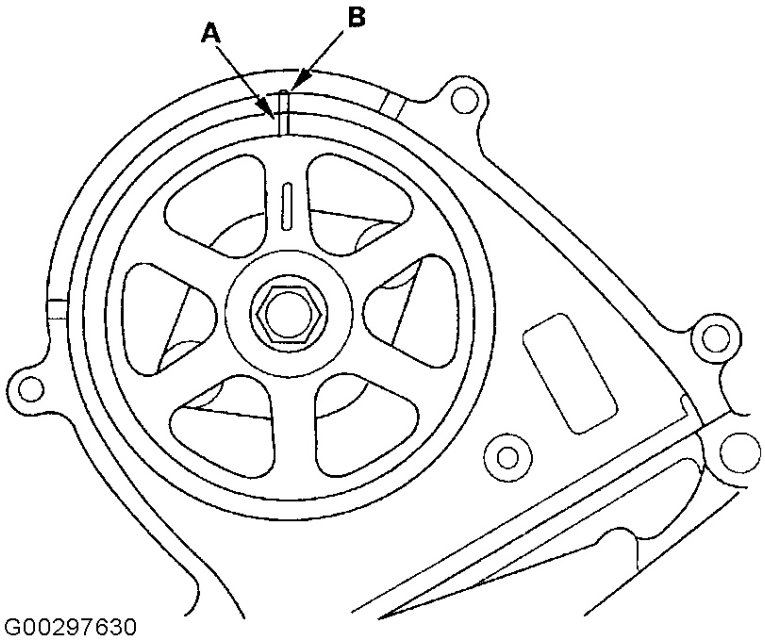


Fig. 83: Setting Camshaft Pulleys To TDC
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Apply clean engine oil to the threads and flanges of the cylinder head bolts.
8. Tighten the cylinder head bolts to sequence. See **Fig. 84** and **TORQUE SPECIFICATIONS**. Use a

beam-type torque wrench. When using a pre-set torque wrench, be sure to tighten slowly and not to overtighten. If a bolt makes any noise while you are torquing it, loosen the bolt, and retighten it from the 1st step.

9. Install timing belt. See **TIMING BELT**.
10. Adjust the valve clearance. See **VALVE CLEARANCE** under ADJUSTMENTS.
11. Install the cylinder head cover. See **CYLINDER HEAD COVER**.
12. Install the exhaust manifold and tighten the nuts in a crisscross pattern in 2 or 3 steps, beginning with the inner nut. See **EXHAUST MANIFOLD**. Always use new exhaust manifold gasket.
13. Install the nuts securing the exhaust pipe A and exhaust manifold, then install the cover on the exhaust manifold.
14. Install the water passage (A). Always use a new "O" ring (B) and new gaskets (C). See **Fig. 77**.
15. Install fuel rails. See **Fig. 76**.
16. Install vacuum hoses (A) on the intake air bypass control thermal valve (B). **Fig. 75**.
17. Install heater hoses. See **Fig. 43**.
18. Install the upper radiator hose (A) and lower radiator hose (B). See **Fig. 42**.
19. Install the intake manifold. See **INTAKE MANIFOLD**.
20. Loosely install the P/S pump and P/S pump belt.
21. Adjust the P/S pump belt.
22. Install the alternator. See appropriate GENERATORS & REGULATORS article in ELECTRICAL.
23. Install the alternator belt.
24. Install the fuel feed hose (A) and fuel return hose (B), using new washers (C). See **Fig. 28**.
25. Clean the battery posts and cable terminals with sandpaper, then assemble them and apply grease to prevent corrosion.
26. After installation, check that all tubes, hoses and connectors are installed correctly.
27. Inspect for fuel leaks. Turn the ignition switch ON (II) (DO NOT operate the starter) so the fuel pump runs for about 2 seconds and pressurizes the fuel line. Repeat this operation 2 or 3 times, then check for fuel leakage at any point in the fuel line.
28. Refill the radiator with engine coolant, and bleed air from the cooling system with the heater valve open.
29. Perform the idle learn procedure. See appropriate COMPUTER RELEARN article in GENERAL INFORMATION.
30. Perform the power window control unit reset procedure (2002-03 models). See appropriate POWER WINDOWS article in ACCESSORIES & EQUIPMENT.
31. Inspect the idle speed. See IDLE SPEED under appropriate BASIC DIAGNOSTIC PROCEDURE article in ENGINE PERFORMANCE.
32. Inspect the ignition timing. See IGNITION TIMING under appropriate BASIC DIAGNOSTIC PROCEDURE article in ENGINE PERFORMANCE.

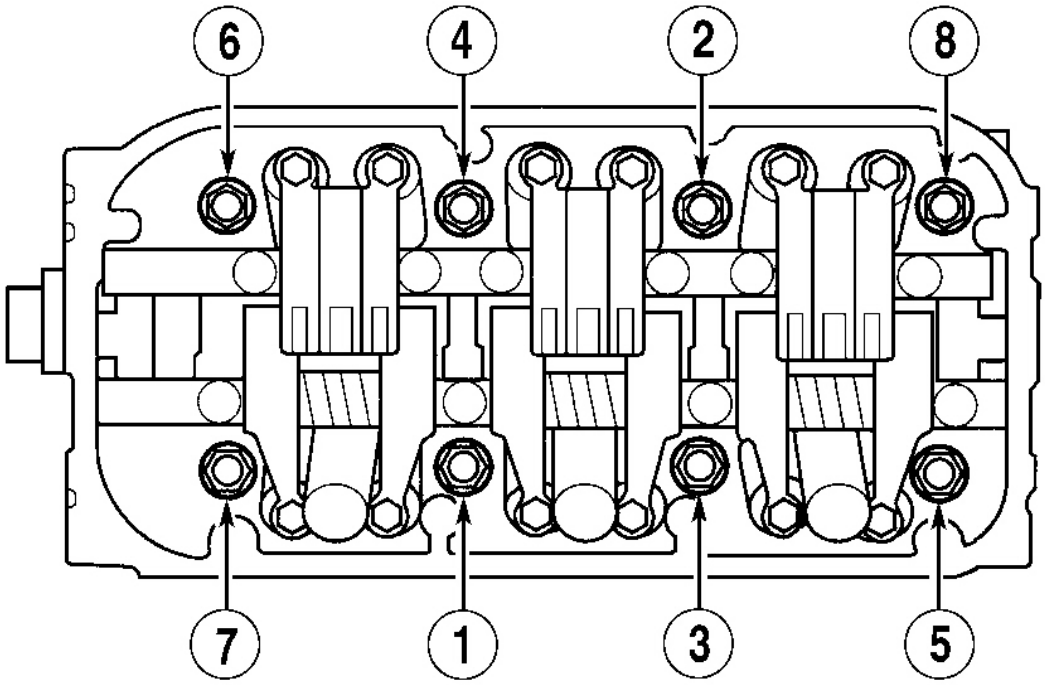


Fig. 84: Cylinder Head Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CAMSHAFT POSITION (TDC) SENSOR

Removal & Installation

1. Set the No. 1 piston at Top Dead Center (TDC). See **TIMING BELT**.
2. Remove upper covers.
3. To hold the timing belt adjuster in its current position, thread in the battery clamp bolt hand-tight. See step 13 in TIMING BELT.
4. Loosen the idler pulley bolt about 5 or 6 turns, then remove the timing belt from the front camshaft pulley. See step 16 in TIMING BELT.
5. Remove the front camshaft pulley. See **Fig. 85**.
6. Disconnect the Camshaft Position (CMP) sensor A/B (TDC sensor 1/2) connector, then remove the back cover. See **Fig. 86**.
7. Remove the CMP (TDC 1/TDC 2) sensor from the back cover. See **Fig. 87**.
8. Install the CMP (TDC 1/TDC 2) sensor in reverse order of removal. Reinstall the timing belt, see **TIMING BELT**.

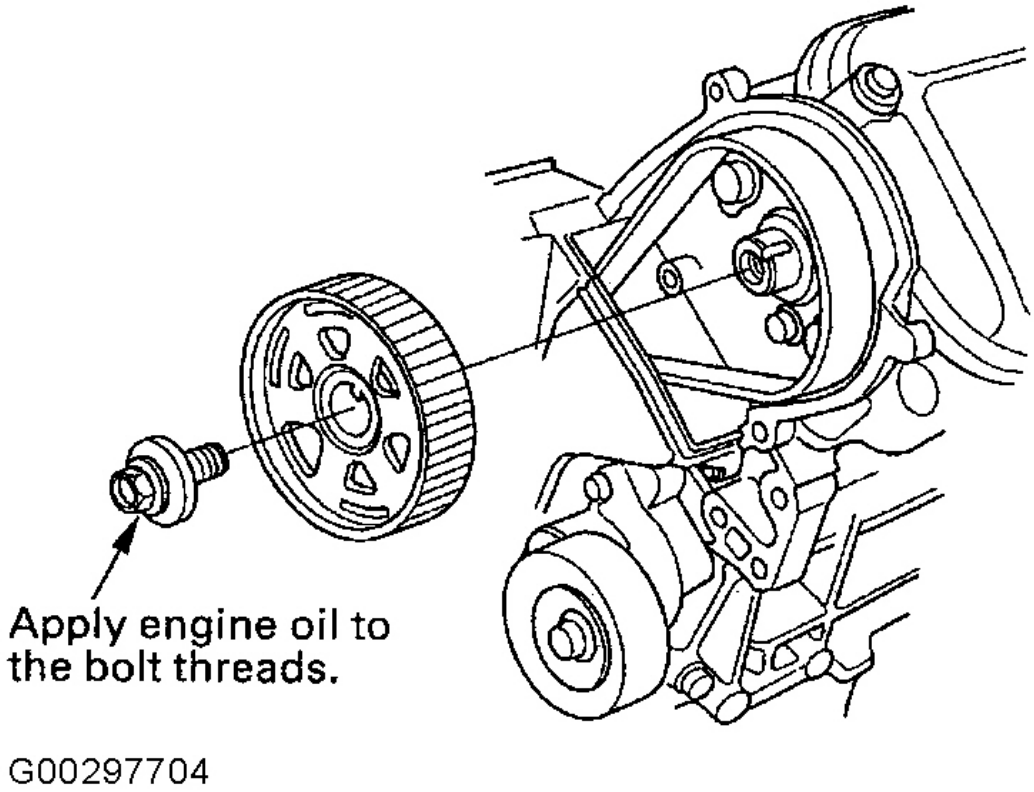


Fig. 85: Removing Front Camshaft Pulley
Courtesy of AMERICAN HONDA MOTOR CO., INC.

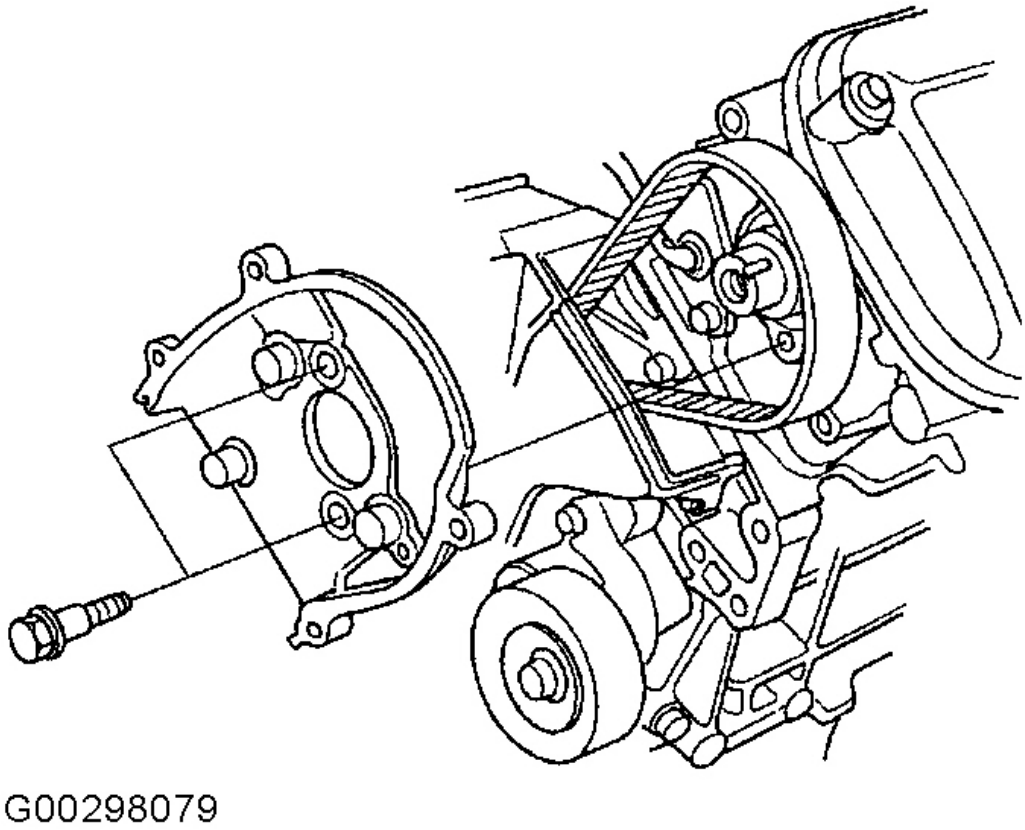


Fig. 86: Disconnecting Camshaft Position Sensor
Courtesy of AMERICAN HONDA MOTOR CO., INC.

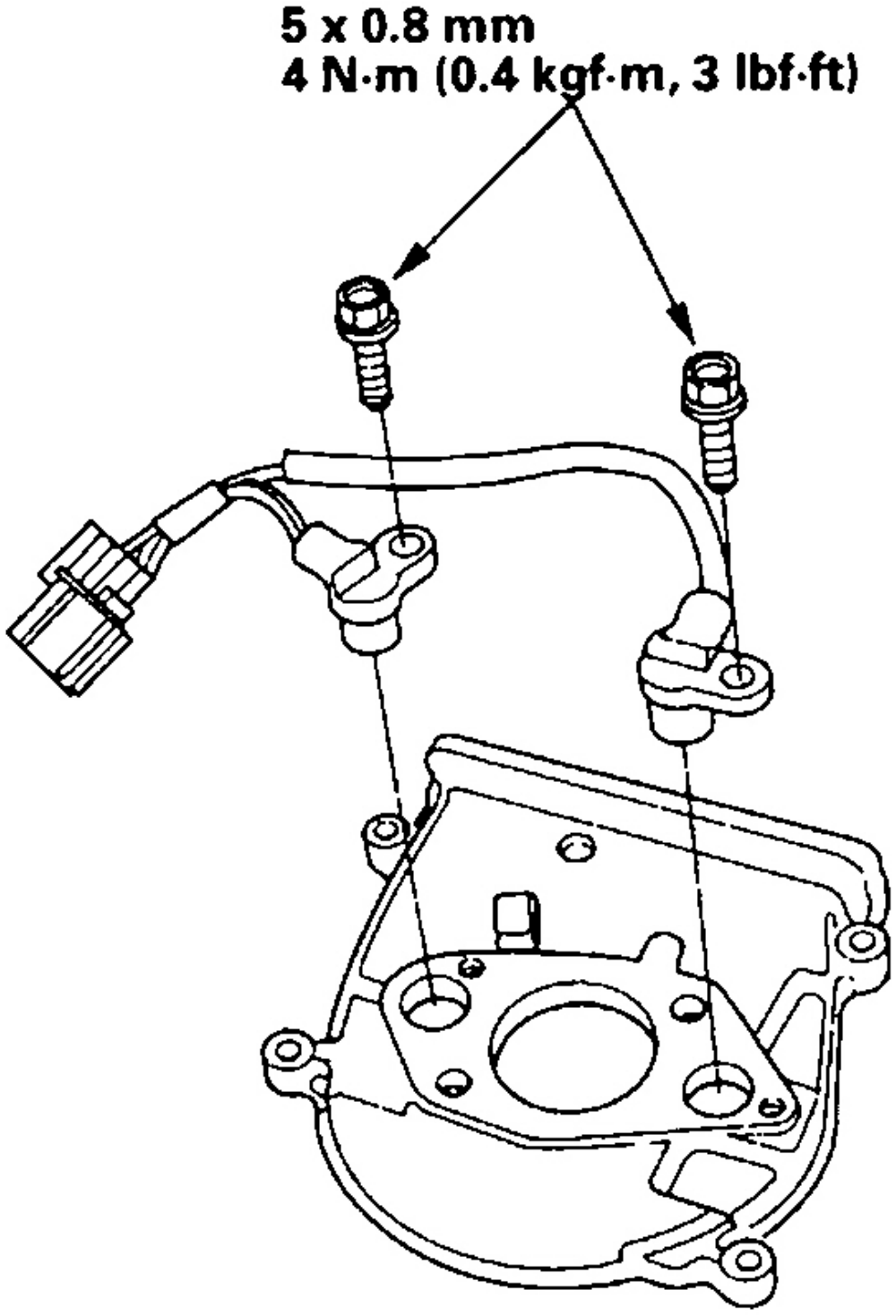


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Fig. 87: Removing CMP (TDC 1/TDC 2) Sensor From Back Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CRANKSHAFT PULLEY

Removal

1. Hold the pulley with the holder (A) and holder attachment (B). See **Fig. 88**.
2. Remove the bolt with a heavy duty 19-mm socket (C) and breaker bar.

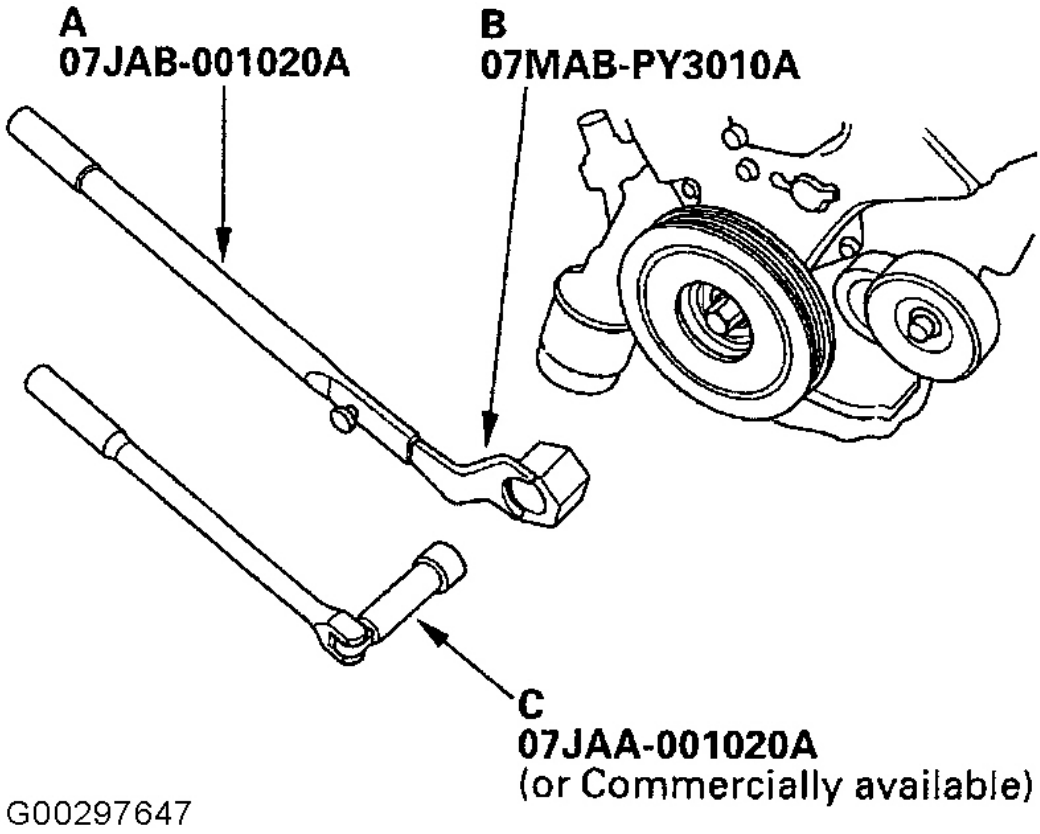

Fig. 88: Holding Pulley With Holder Handle & Holder Attachment
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Installation

1. Remove any oil from the pulleys (A), crankshaft (B), bolt (C) and washer (D). See **Fig. 89**. Clean and lubricate the points.
2. Install the crankshaft pulley and tighten to specifications. See **TORQUE SPECIFICATIONS** . DO NOT use an impact wrench. Use following procedure;

a. Hold the pulley with the holder handle (A) and holder attachment (B). See **Fig. 88**.
b. Tighten the bolt with a torque wrench and 19-mm socket (C).

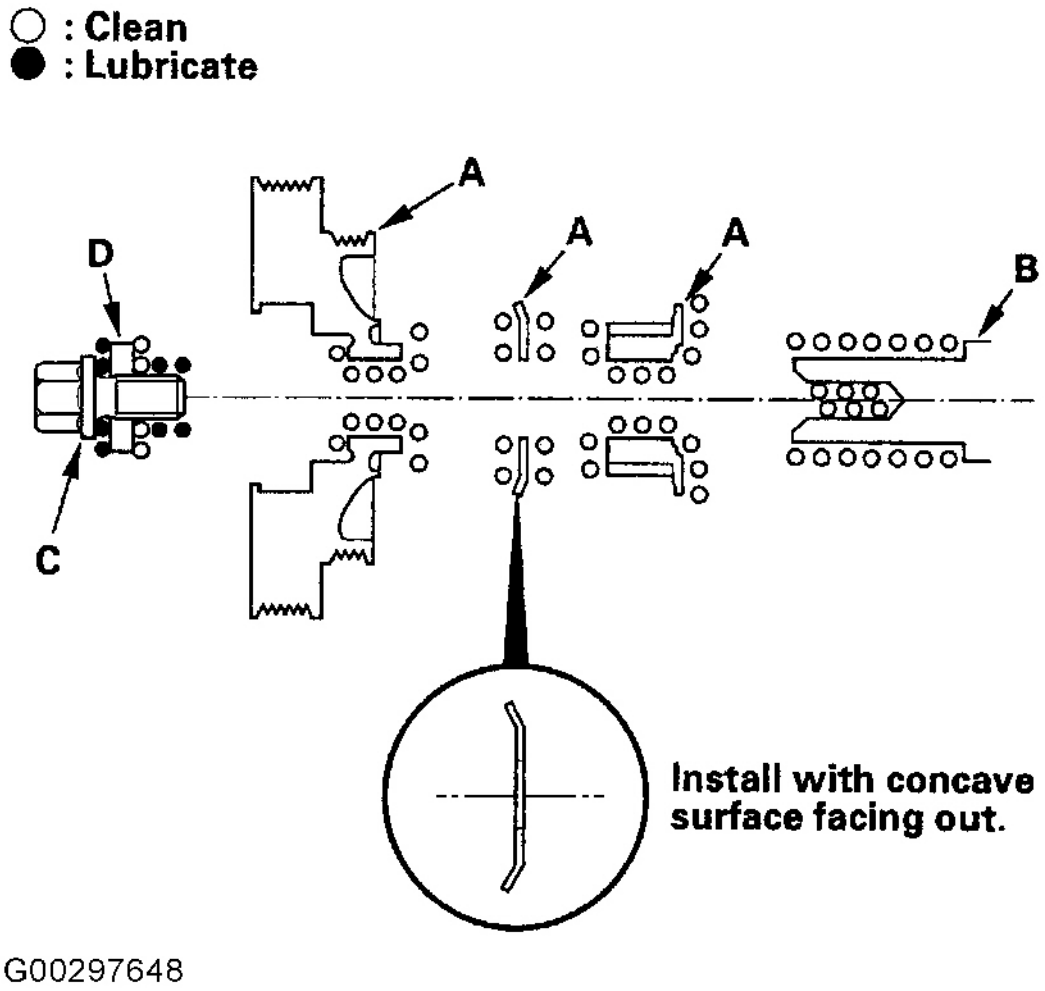

Fig. 89: Identifying Lubrication Points
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CRANKSHAFT POSITION SENSOR

Removal & Installation

1. Move the auto-tensioner to remove tension from the alternator belt, then remove the alternator belt. See step 5 in TIMING BELT.
2. Loosen the adjusting bolt, locknut and mounting bolt, then remove the Power Steering (P/S) pump belt. See step 6 in TIMING BELT.

3. Remove the dipstick and tube. See step 9 in TIMING BELT.
4. Remove the crankshaft pulley. See step 10 in TIMING BELT.
5. Remove the upper and lower covers. See step 12 in TIMING BELT.
6. Remove the Crankshaft Position (CKP) sensor from the oil pump. See **Fig. 90**.
7. Install the CKP sensor in the reverse order of removal.

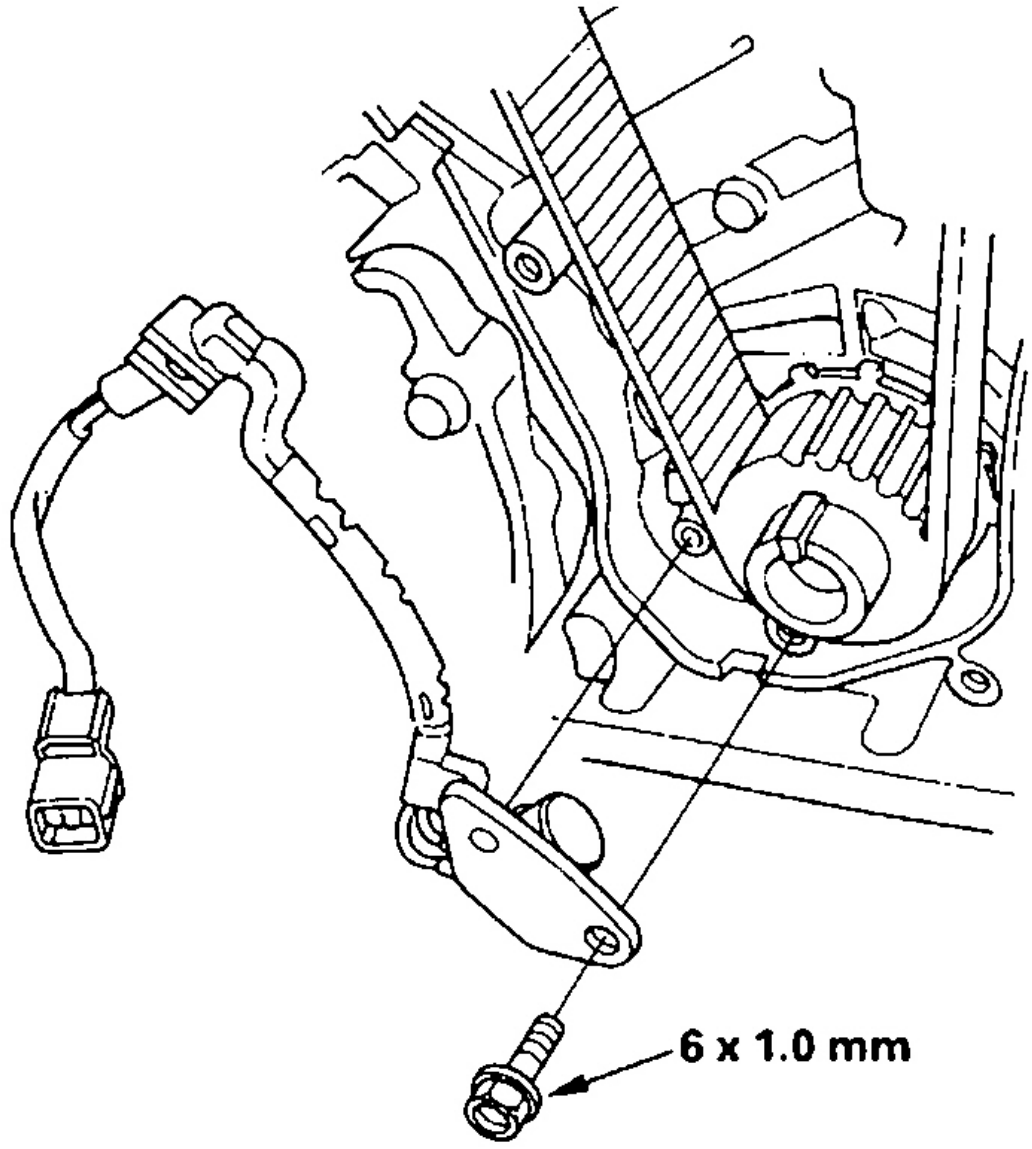

Fig. 90: Removing Crankshaft Position Sensor From Oil Pump

Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROCKER ARM ASSEMBLY

Removal

1. Remove the cylinder head cover. See **CYLINDER HEAD COVER**.
2. Loosen adjusting screws (A). See **Fig. 91**.
3. Remove the bolts and the rocker arm assembly. See **Fig. 92** and use the following procedure;
   a. Unscrew the rocker shaft mounting bolts 2 turns at a time, in a crisscross pattern, to prevent damaging the valves or rocker arm assembly.
   b. When removing the rocker arm assembly, DO NOT remove the rocker shaft mounting bolts. The bolts will keep the springs and the rocker arms on the shafts.

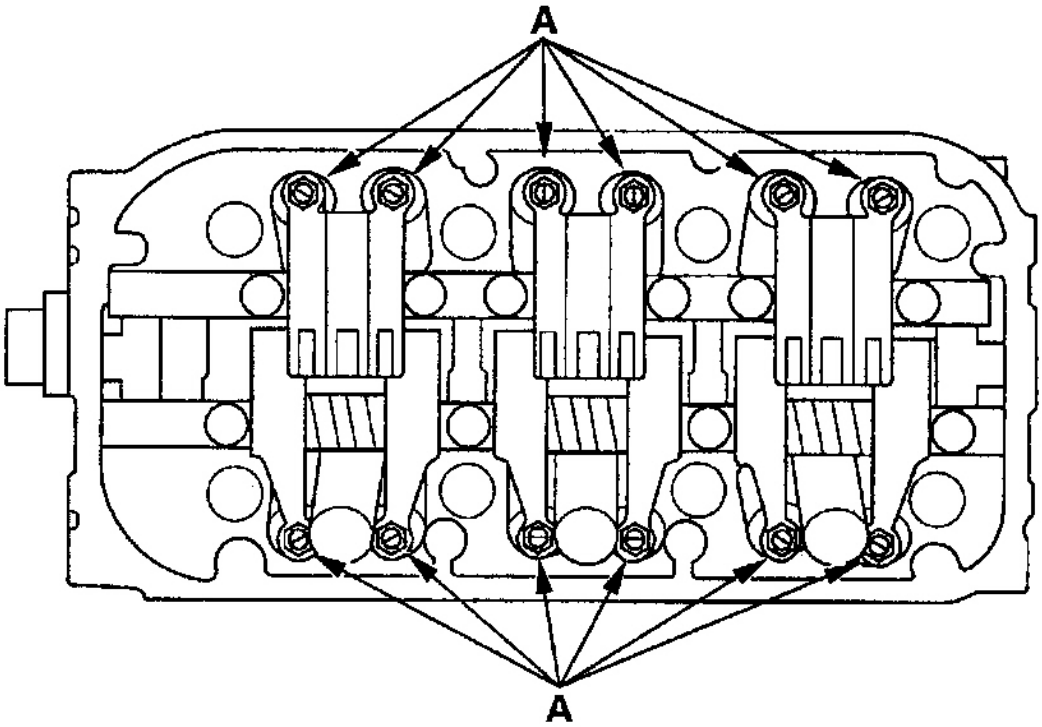

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Fig. 91: Loosening Adjusting Screws
Courtesy of AMERICAN HONDA MOTOR CO., INC.

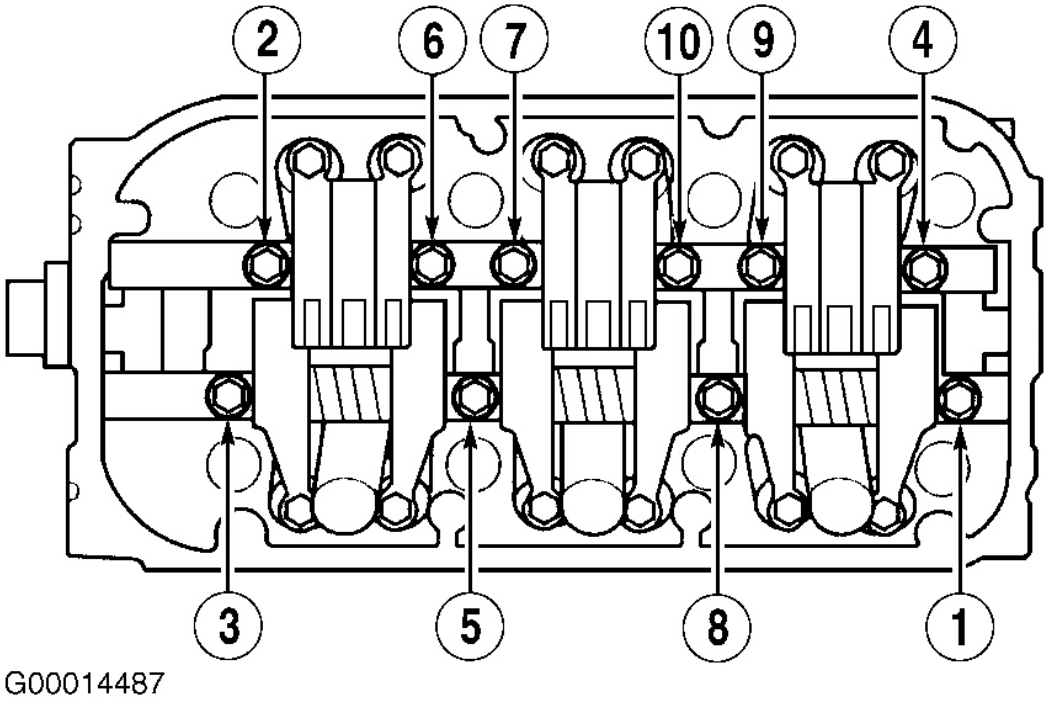

Fig. 92: Camshaft Holder Bolt Loosening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Rocker Arms & Shafts Disassembly/Reassembly

NOTE:

- **Identify parts as they are removed so they can be reinstalled in their original locations. See Fig. 93.**
- **Inspect the rocker shafts and rocker arms. See ROCKER ARMS & SHAFTS INSPECTION.**
- **Rocker arms must be installed in the same positions if reused.**
- **When removing or installing the rocker arm assembly, DO NOT remove the rocker shaft mounting bolts. The bolts will keep the springs and rocker arms on the shaft.**
- **Bundle the rocker arms with rubber bands to keep them together as a set.**
- **Prior to reassembling, clean all the parts in solvent, dry them and apply lubricant to any contact points.**

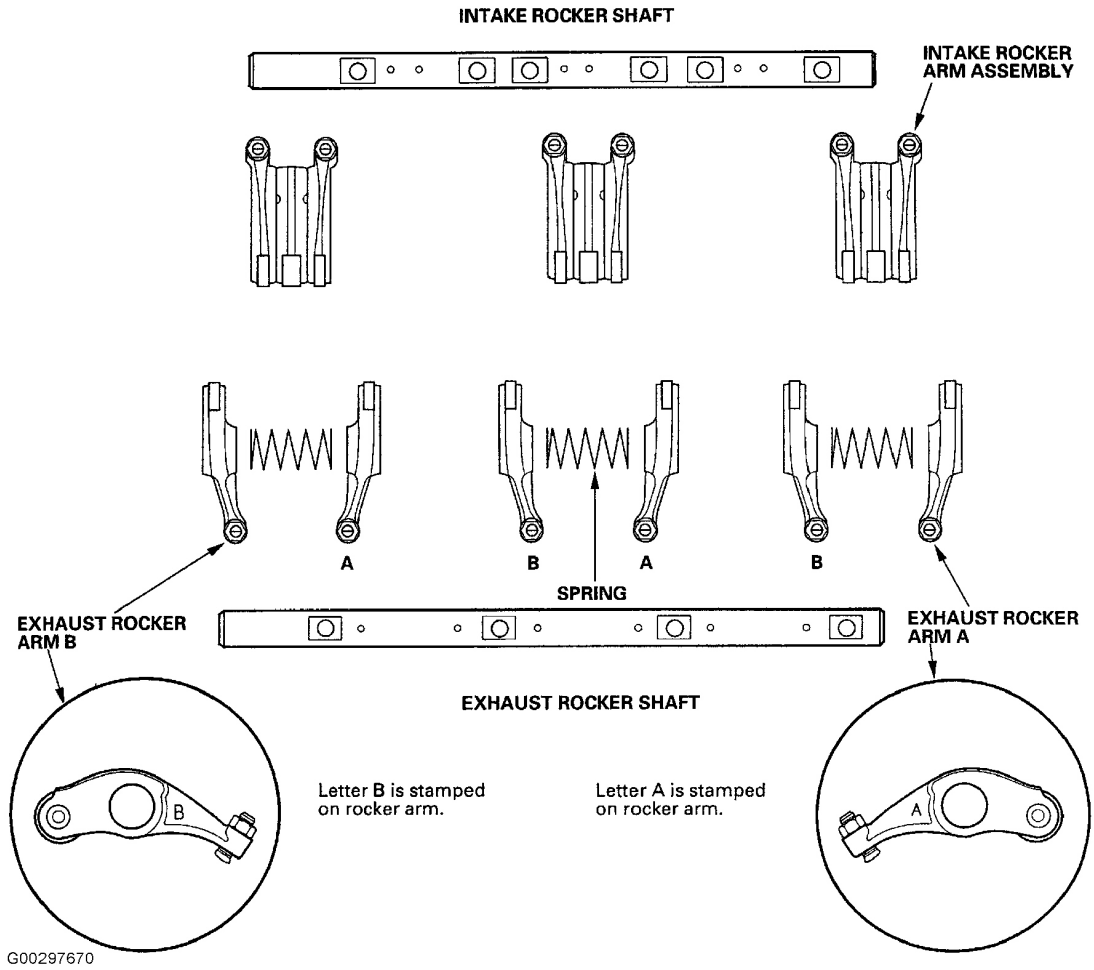

Fig. 93: Exploded View Of Rocker Arms & Shafts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Camshaft/Rocker Arms, Camshaft Seal & Pulley Installation

1. Apply a light coat of oil around the camshaft oil seal.
2. Gently tab the new camshaft oil seal (A) into the cylinder head. See **Fig. 94** and use the following procedure;
   a. Tap the camshaft oil seal in squarely.
   b. Install the oil seal about .02-.06" (.5-1.5 mm) below the surface of the cylinder head.
3. Insert the camshaft (B) into the cylinder head, then install the camshaft thrust cover (C). Always use a new "O" ring (D).
4. Check that the oil seal lips are not distorted.
5. Loosen the valve adjusting screws.
6. 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.

7. Tighten each bolt 2 turns at a time in sequence, see **Fig. 84** to ensure that the rockers do not bind on the valves.
8. Install the injector base (A). See **Fig. 95**. Always use a new gasket (B).
9. Install the back cover (B), then install the camshaft pulley (A). See **Fig. 78**.

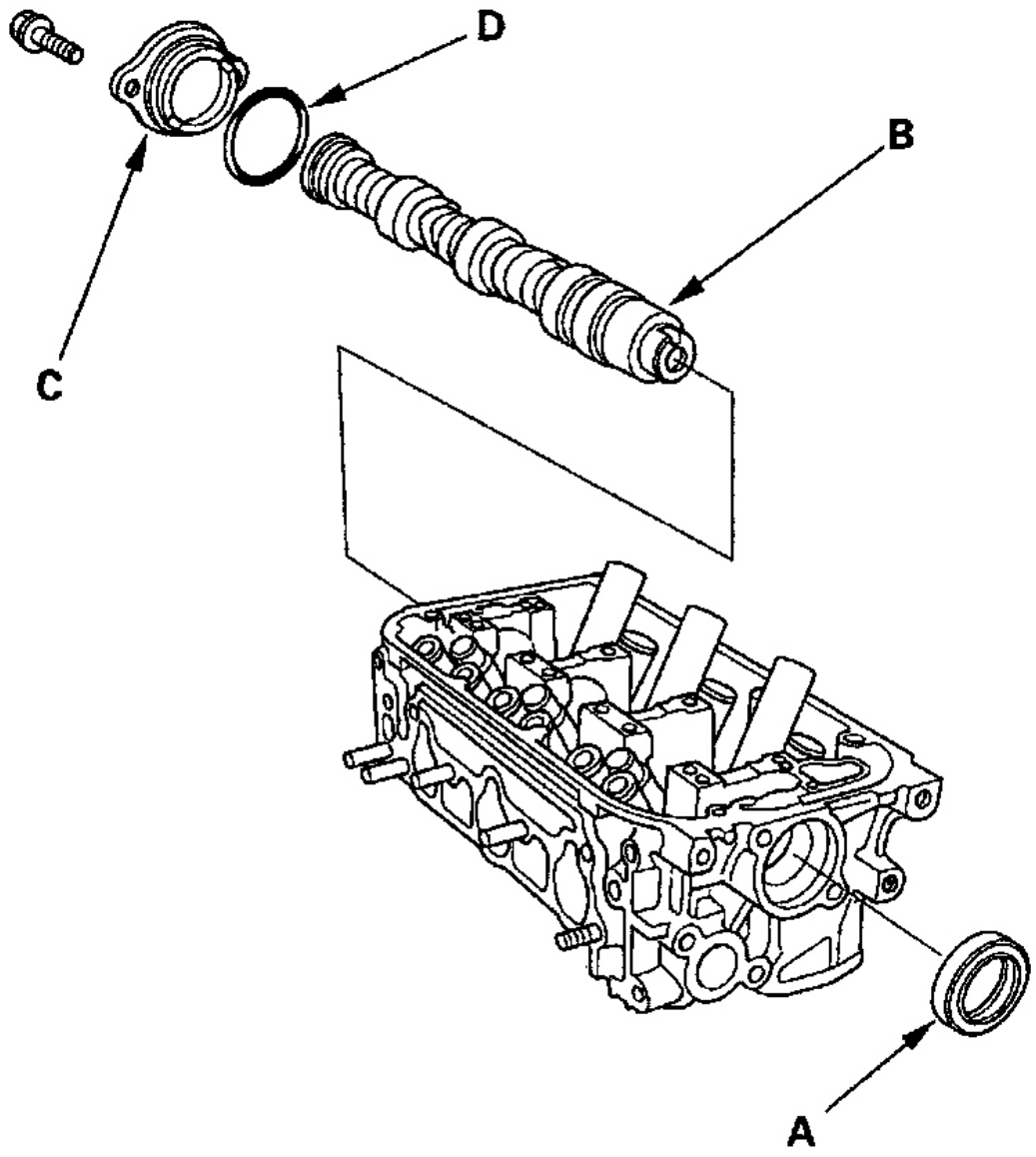

Fig. 94: Gently Tapping New Camshaft Oil Seal Into Cylinder Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

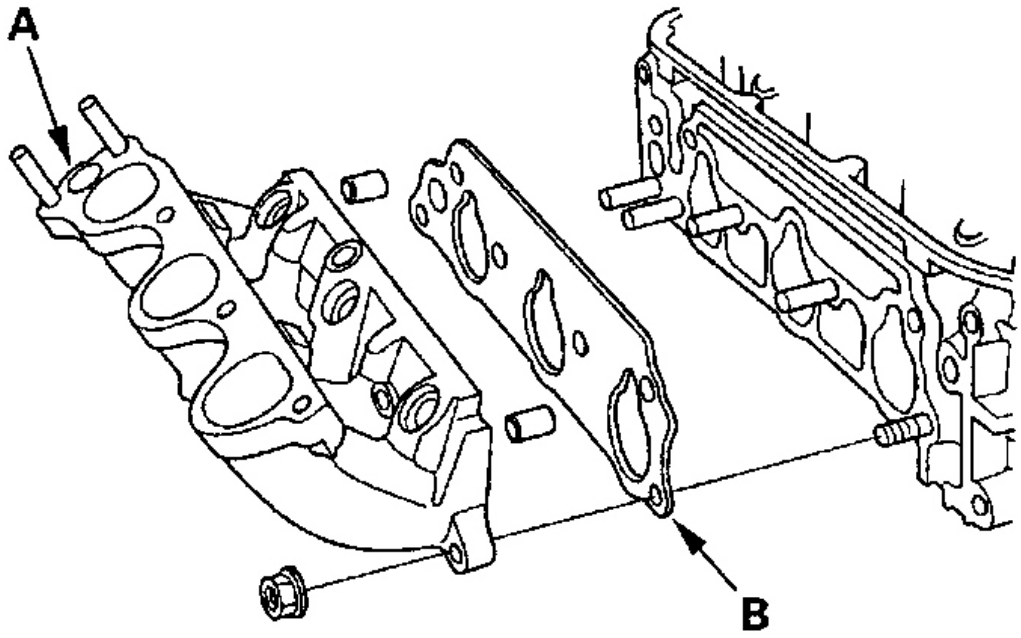

Fig. 95: Installing Injector Base
Courtesy of AMERICAN HONDA MOTOR CO., INC.

DRIVE PLATE

Removal & Installation

1. Remove transaxle. See appropriate REMOVAL & INSTALLATION article in TRANSAXLES/TRANSMISSIONS.
2. Remove the eight drive plate bolts, then separate the drive plate from the crankshaft flange. See **Fig. 96**. After installation, tighten the bolts in sequence. See **TORQUE SPECIFICATIONS**.
3. Install drive plate reverse order of removal.

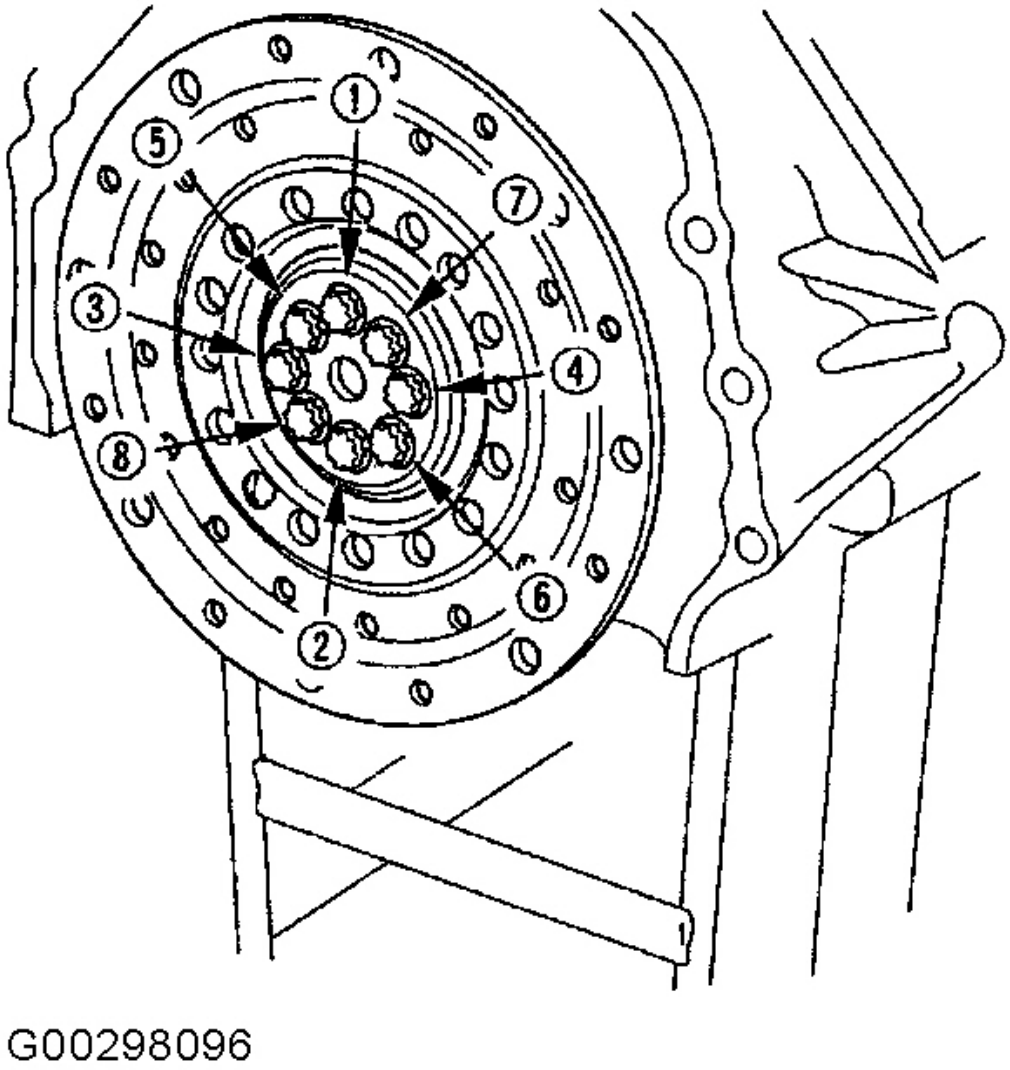

Fig. 96: Removing Eight Drive Plate Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

RADIATOR & FANS

Removal & Installation

1. Drain engine coolant.
2. Remove the upper and lower radiator hoses. See **Fig. 97** or **Fig. 98** .
3. Remove the ATF cooler hoses (1999 model).

4. Disconnect the fan motor connectors.
5. Remove the radiator upper brackets, then pull up the radiator.
6. Remove the fan shroud assemblies and other parts from the radiator.
7. Install the radiator in the reverse order of removal.
8. Set the upper and lower cushions securely.
9. Fill the radiator with engine coolant and bleed the air.

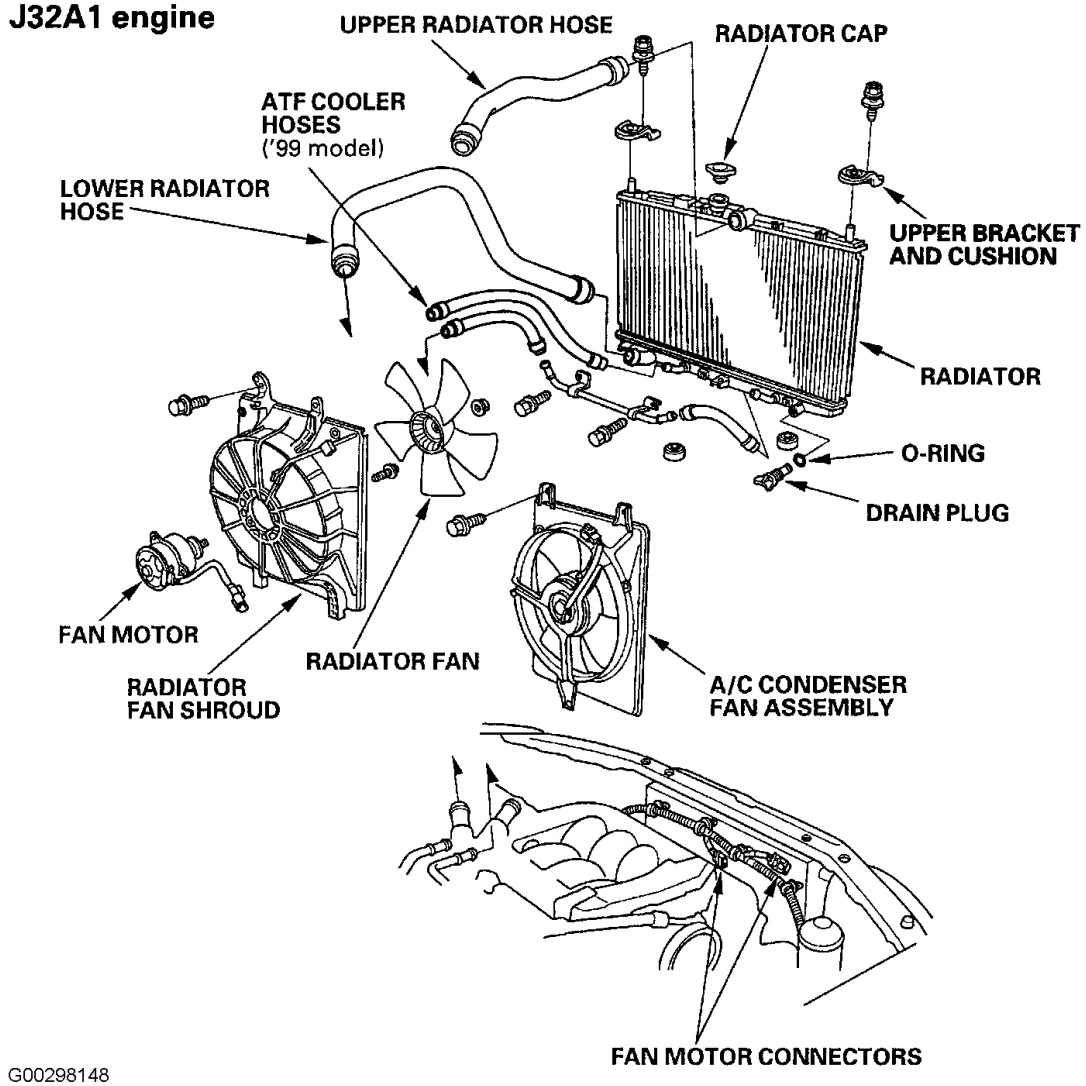

Fig. 97: Exploded View Of Radiator & Fan Assembly (J32A1 Engine)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

J32A2 engine:

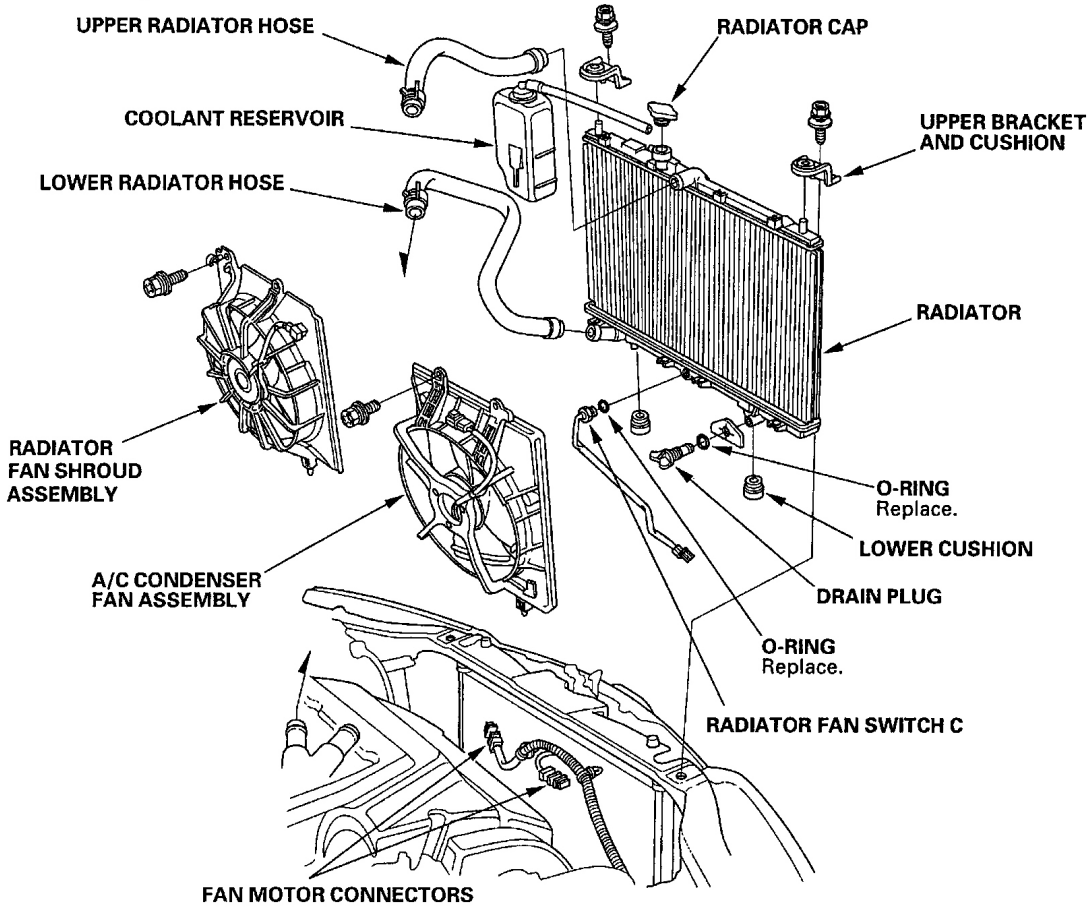

Fig. 98: Exploded View Of Radiator & Fan Assembly (J32A2 Engine)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

THERMOSTAT

NOTE: Use new "O" rings when reassembling.

For removal and installation for thermostat, see **Fig. 99**.

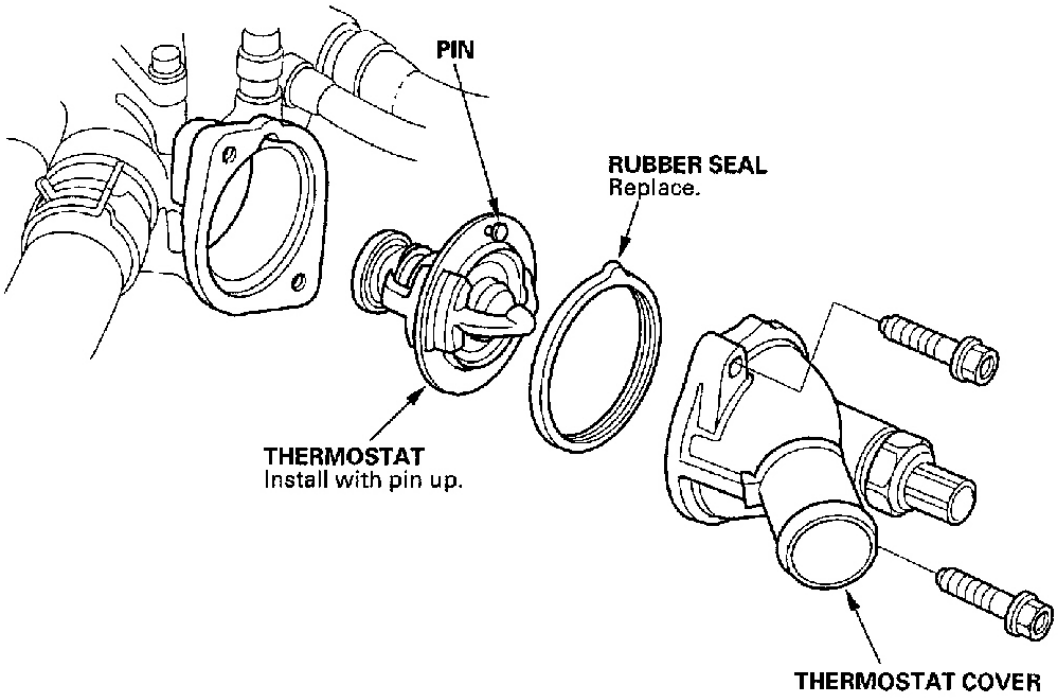

Fig. 99: Removing & Installing Thermostat
Courtesy of AMERICAN HONDA MOTOR CO., INC.

WATER PUMP

Removal & Installation

1. Remove the timing belt. See **TIMING BELT**.
2. Remove the timing belt tensioner.
3. Remove the water pump (A) by removing five bolts. See **Fig. 100**.
4. Inspect and clean the "O" ring groove and mating surface with the cylinder block.
5. Install the water pump with a new "O" ring (B) in the reverse order of removal.
6. Clean up any spilled engine coolant.

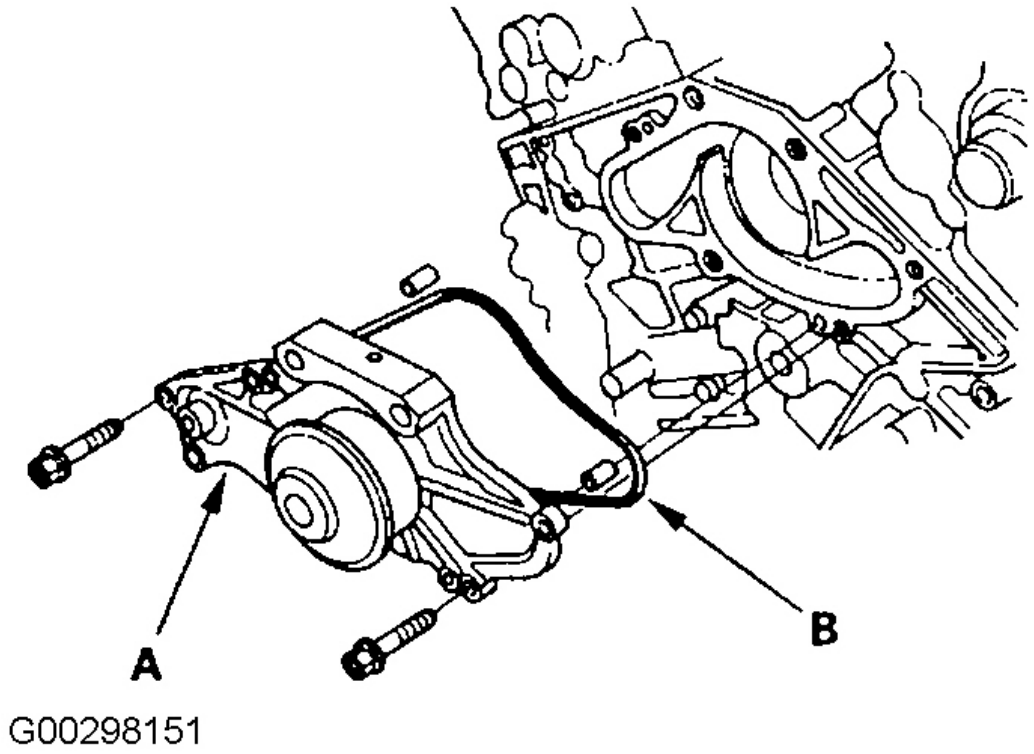

Fig. 100: Removing Water Pump
Courtesy of AMERICAN HONDA MOTOR CO., INC.

TIMING BELT

Removal

1. Turn the crankshaft so its white mark (A) lines up with the pointer (B). See **Fig. 101**.
2. Check that the rear camshaft pulley mark (A) and rear upper cover mark (B) are aligned. See **Fig. 102**.
3. Remove front tires/wheels.
4. Remove splash shield. See **Fig. 38**.
5. Move auto-tensioner (A) to remove tension from the alternator belt (B), then remove the alternator belt. See **Fig. 35**.
6. Loosen the adjusting nut (A), locknut (B) and mounting bolt (C), then remove the power steering (P/S) pump belt (D). See **Fig. 103**.
7. Support the engine with a jack and wood block under the oil pan.
8. Remove the side engine mount bracket. See **Fig. 47**.
9. Remove the dipstick and tube (A); Discard the "O" ring (B). See **Fig. 104**.

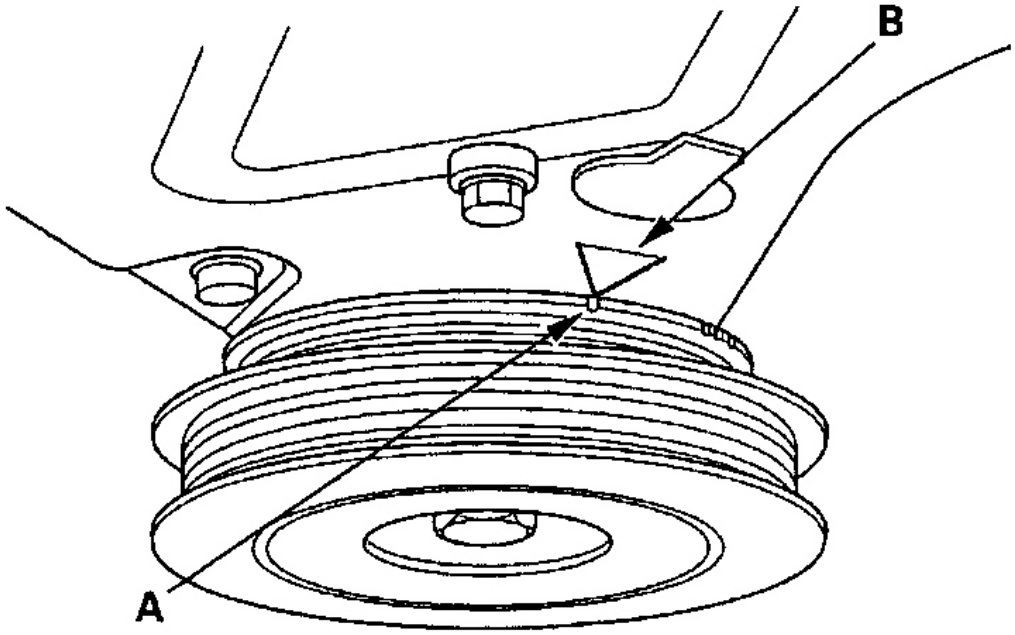

Fig. 101: Turning Crankshaft So White Mark Lines Up With Pointer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

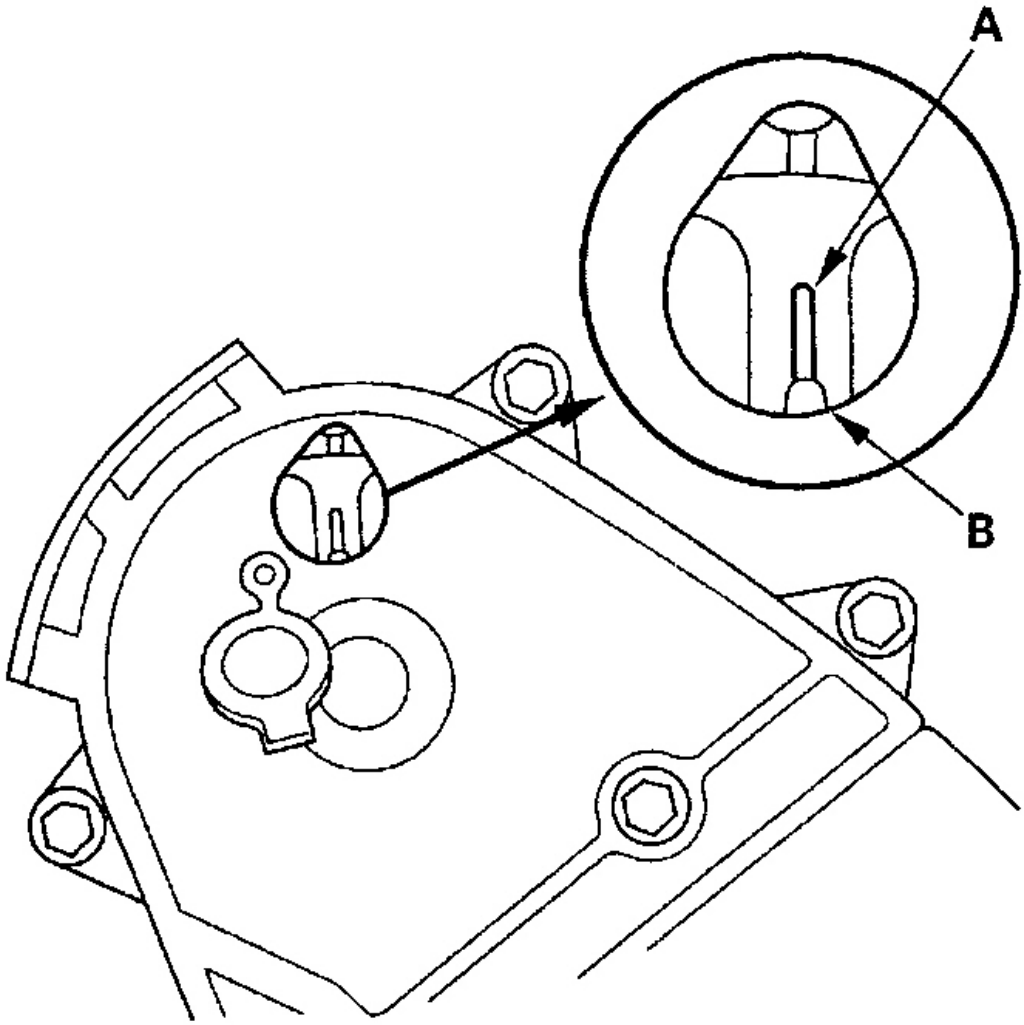

Fig. 102: Checking Rear Camshaft Pulley & Rear Upper Cover Are Aligned
Courtesy of AMERICAN HONDA MOTOR CO., INC.

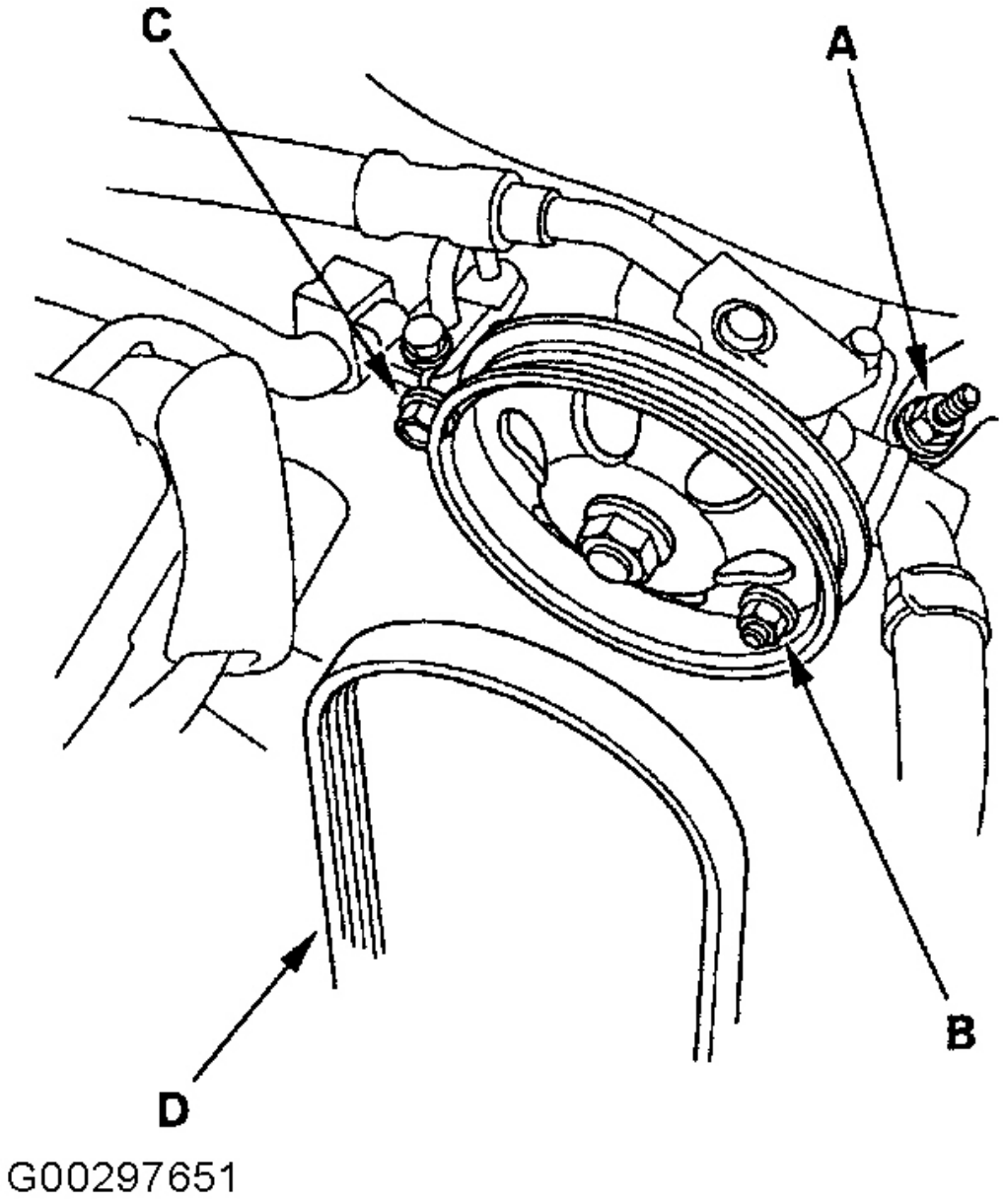

Fig. 103: Loosening PS Adjusting Nut & Mounting Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

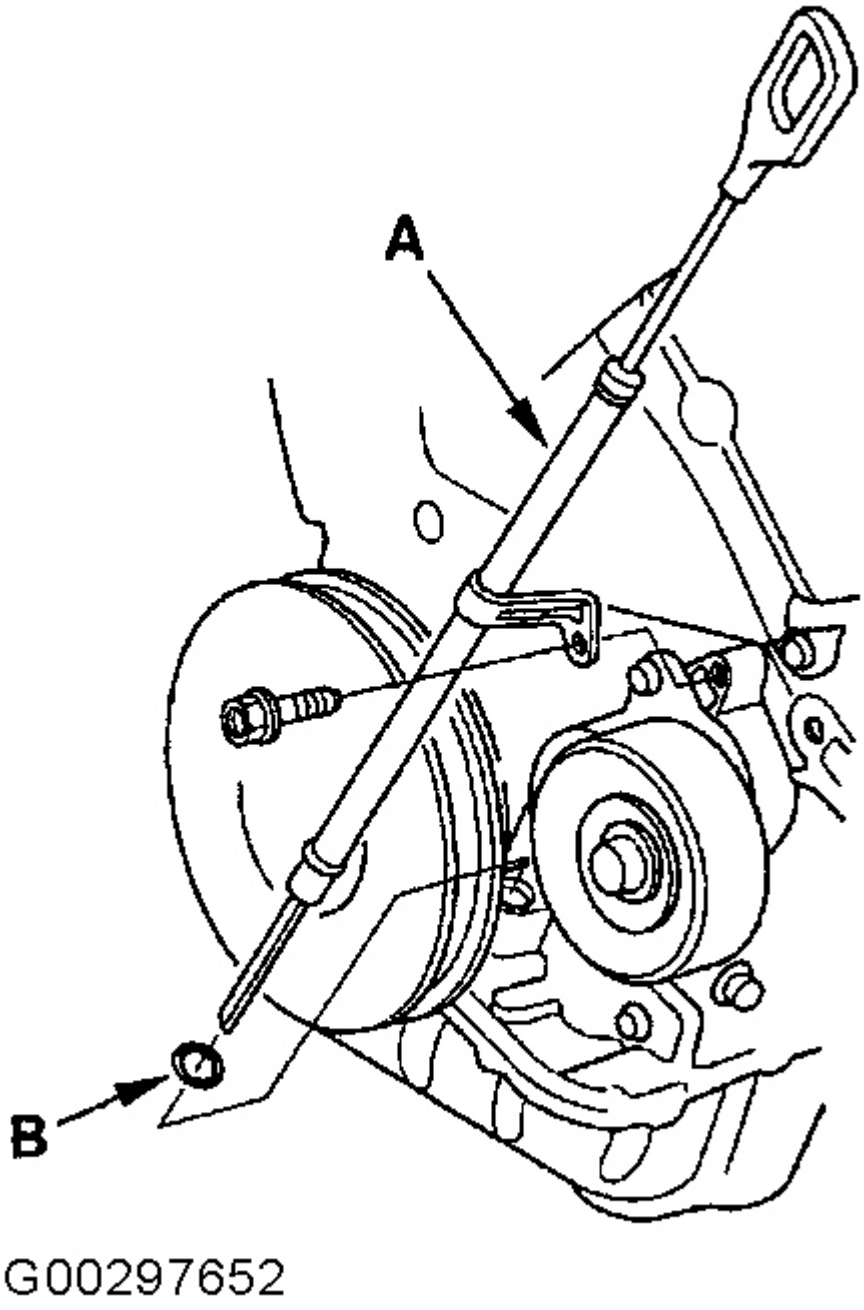

Fig. 104: Removing Dipstick & Tube
Courtesy of AMERICAN HONDA MOTOR CO., INC.

10. Hold the pulley with the holder handle (A) and holder attachment (B). See **Fig. 88**.
11. Remove the bolt with a heavy duty 19-mm socket (C) and breaker bar.
12. Remove the front upper cover (A), rear upper cover (B) and lower cover (C). See **Fig. 105**.
13. Remove one of the battery clamp bolts from the battery tray and grind the end of it. See **Fig. 106**.
14. Screw the battery clamp bolt to hold timing belt adjuster in its current position. See **Fig. 107**. Tighten it by hand, DO NOT use a wrench.
15. Remove the engine mount bracket. See **Fig. 108**.
16. Loosen the idler pulley bolt (A) about 5 or 6 turns, then remove the timing belt. See **Fig. 109**.

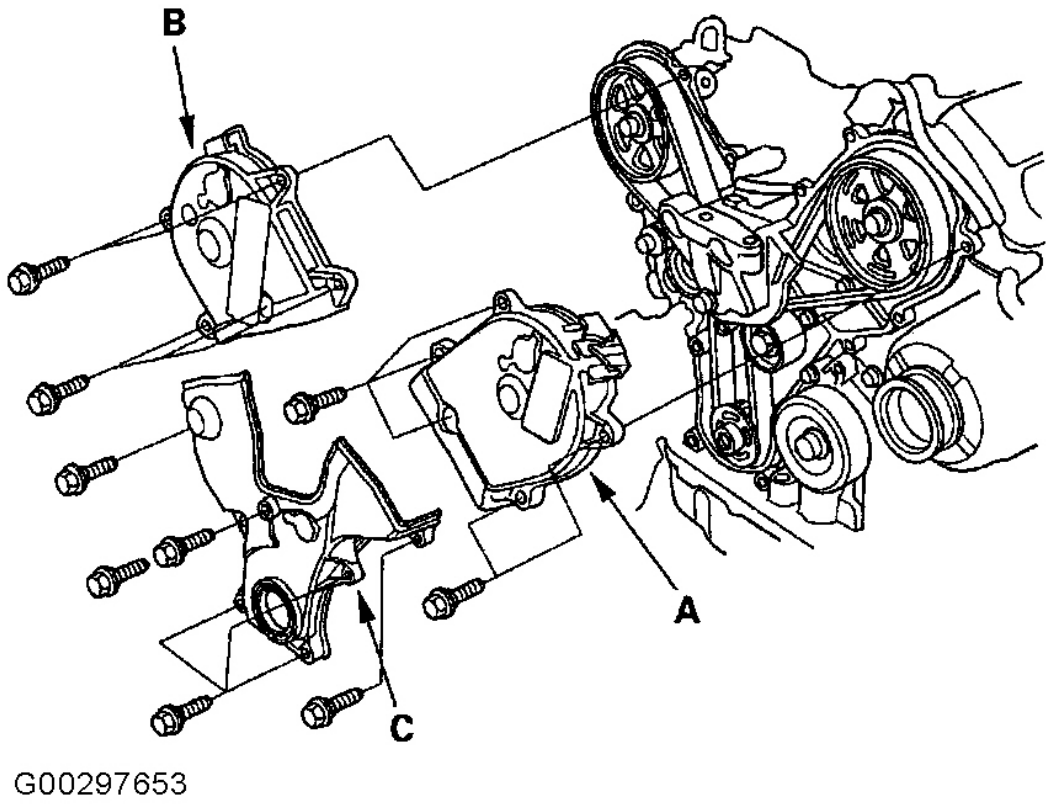

Fig. 105: Removing Front Upper Cover & Rear Upper & Lower Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

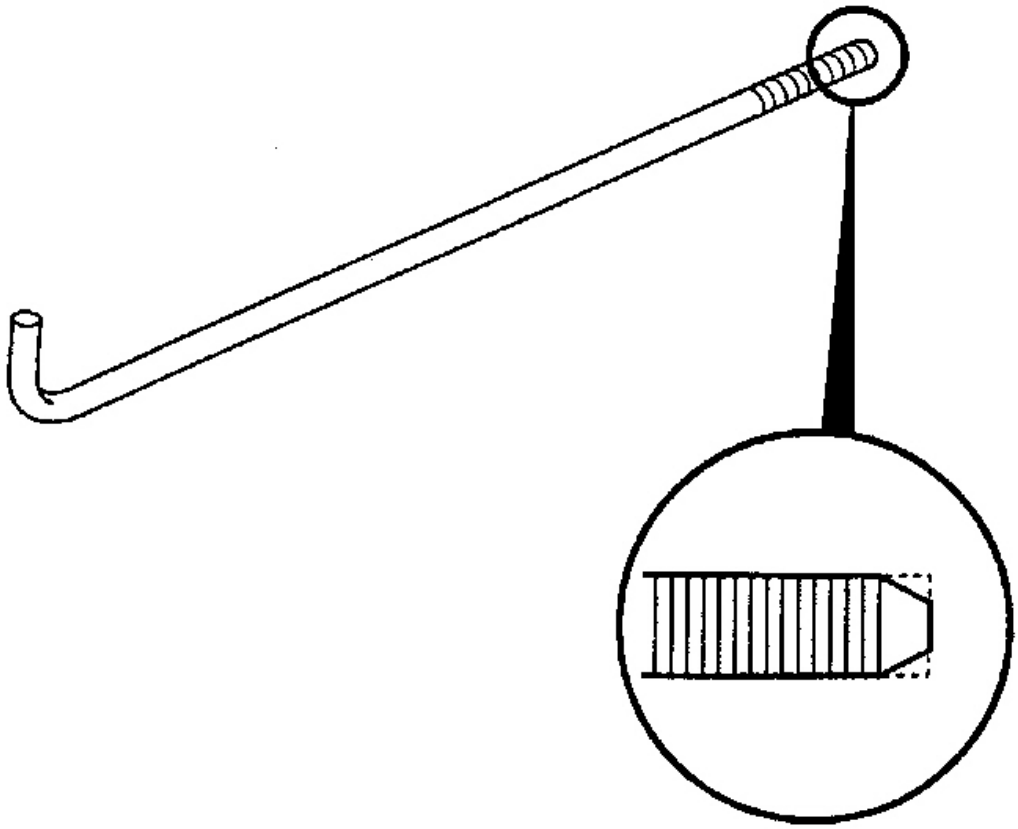

Fig. 106: Preparing Battery Hold-Down Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

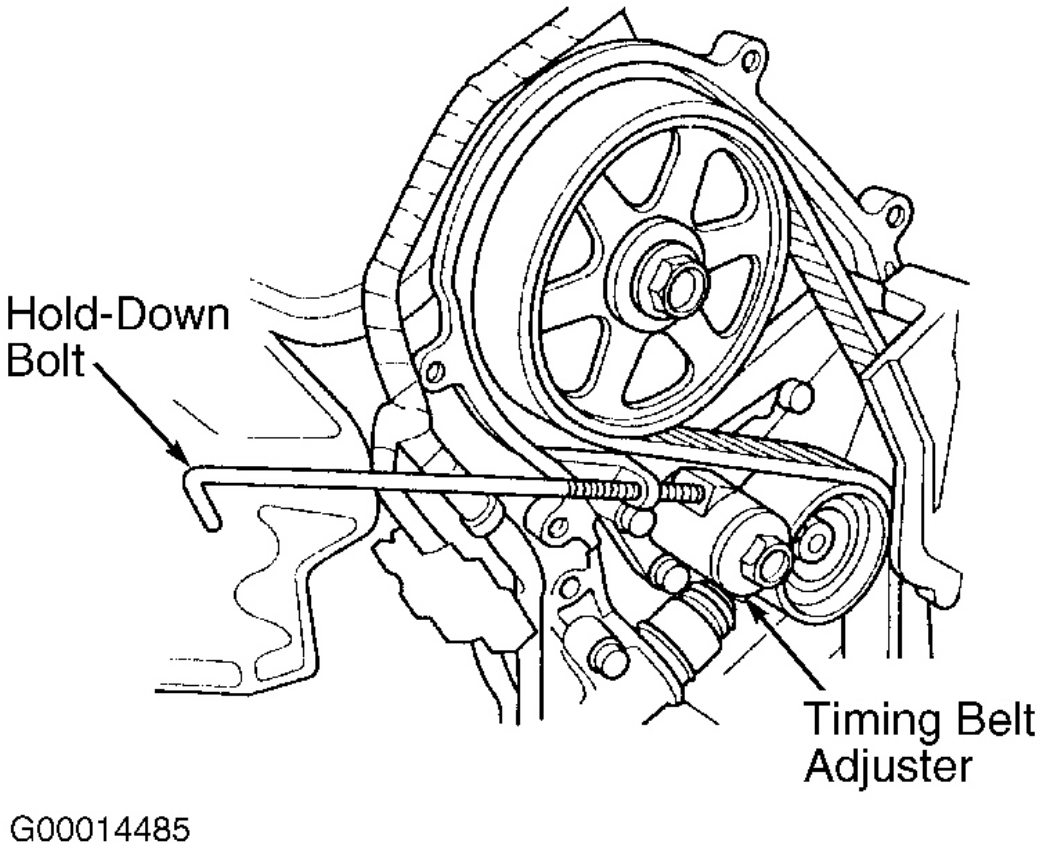

Fig. 107: Installing Hold-Down Bolt To Hold Timing Belt Adjuster In Position
Courtesy of AMERICAN HONDA MOTOR CO., INC.

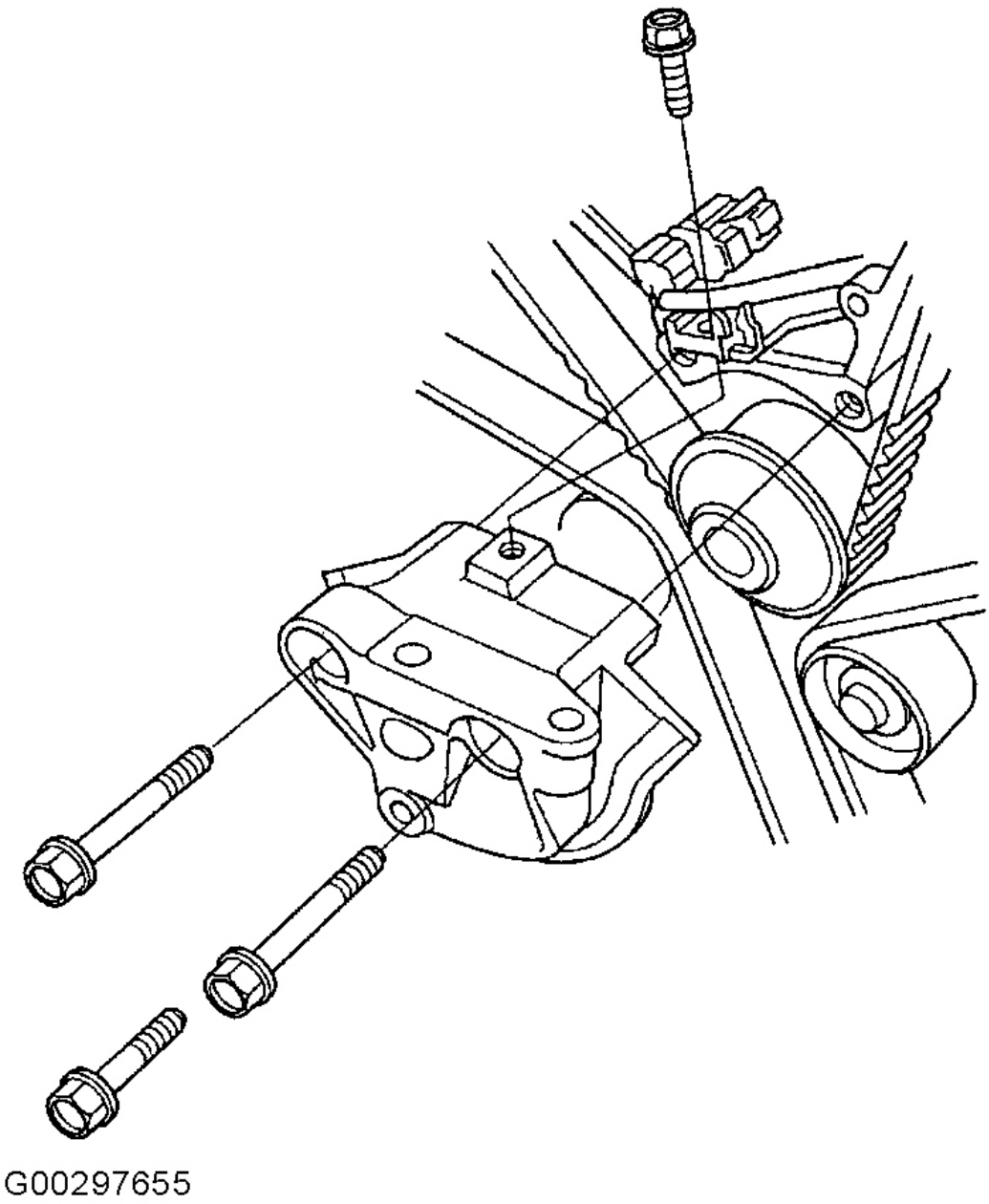

Fig. 108: Removing Engine Mount Bracket
Courtesy of AMERICAN HONDA MOTOR CO., INC.

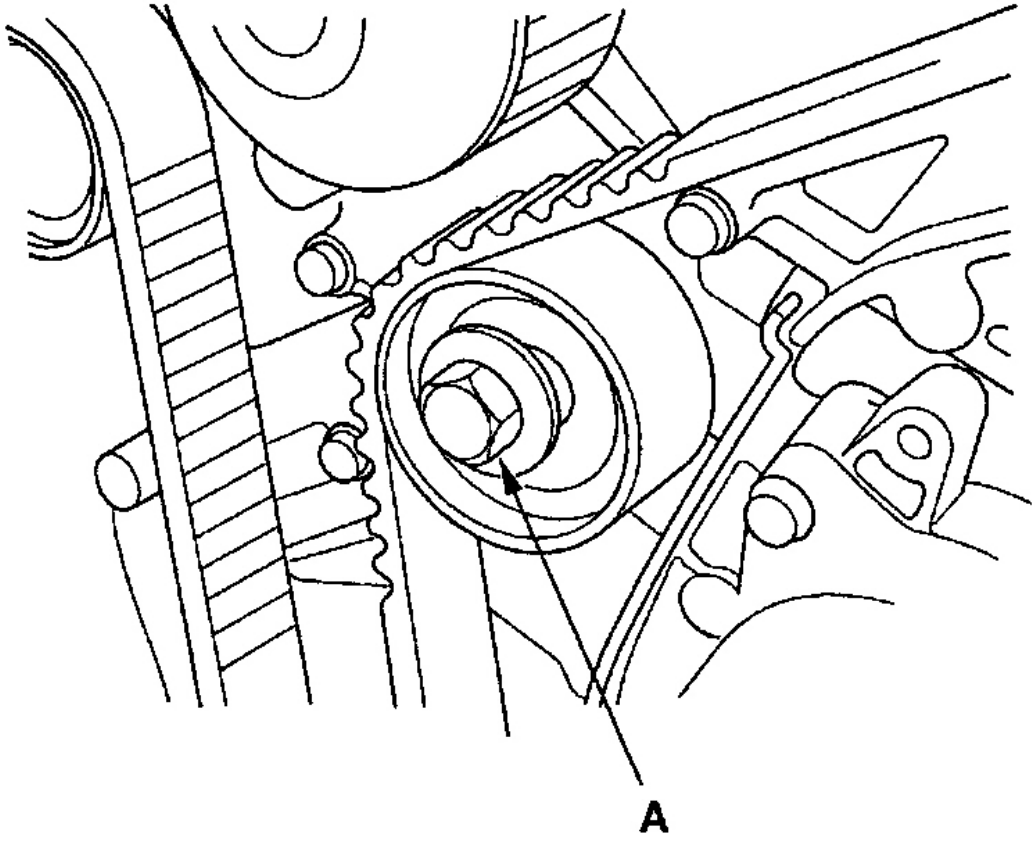

Fig. 109: Loosening Idler Pulley Bolt & Removing Timing Belt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Inspection

1. Remove ignition coil cover. See **Fig. 110**.
2. Remove the front upper cover. See **Fig. 111**.
3. Inspect the timing belt for cracks and oil or coolant soaking. Replace the belt if it is oil or coolant soaked. Remove any oil or solvent that gets on belt. See **Fig. 112**.

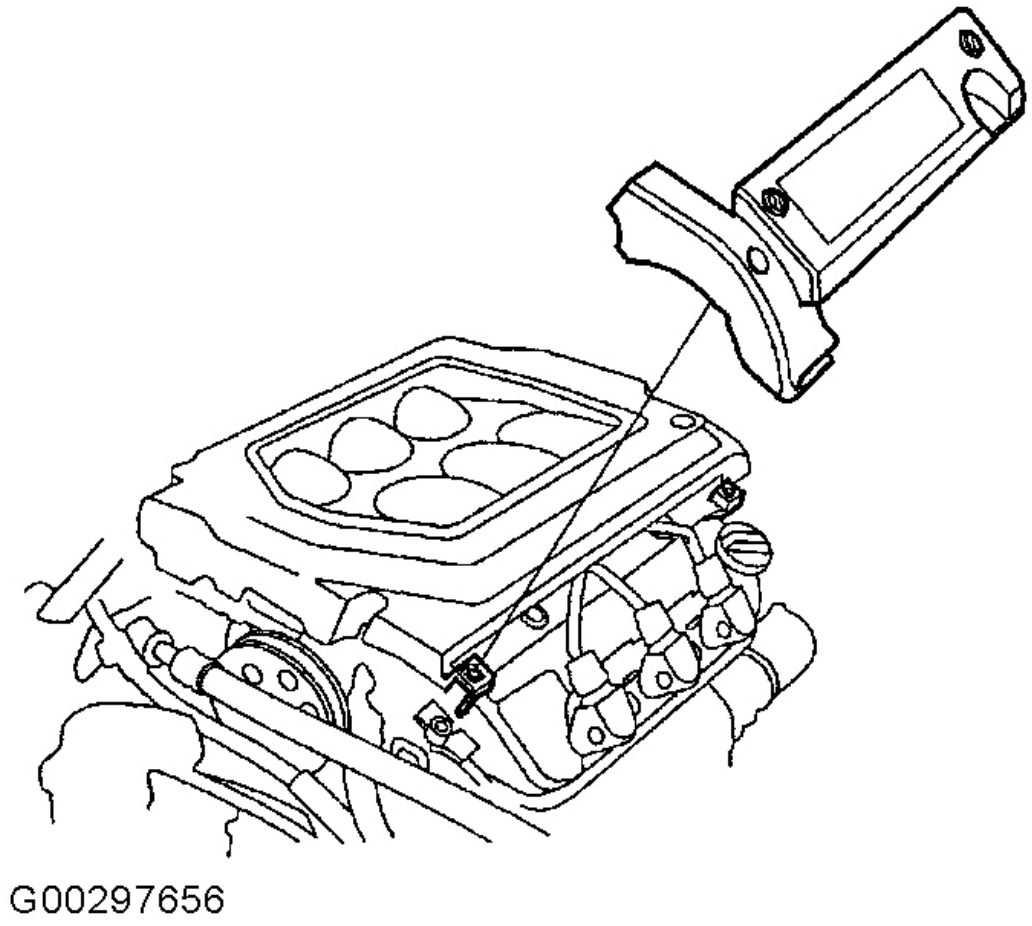

Fig. 110: Removing Ignition Coil Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

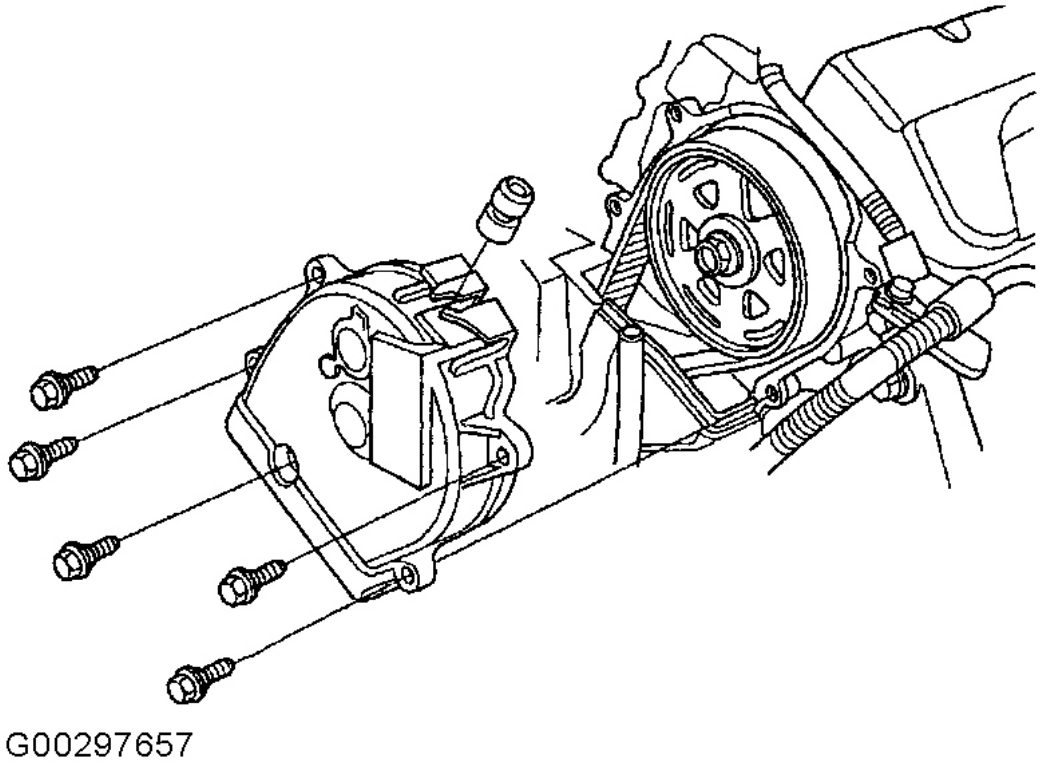

Fig. 111: Removing Front Upper Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

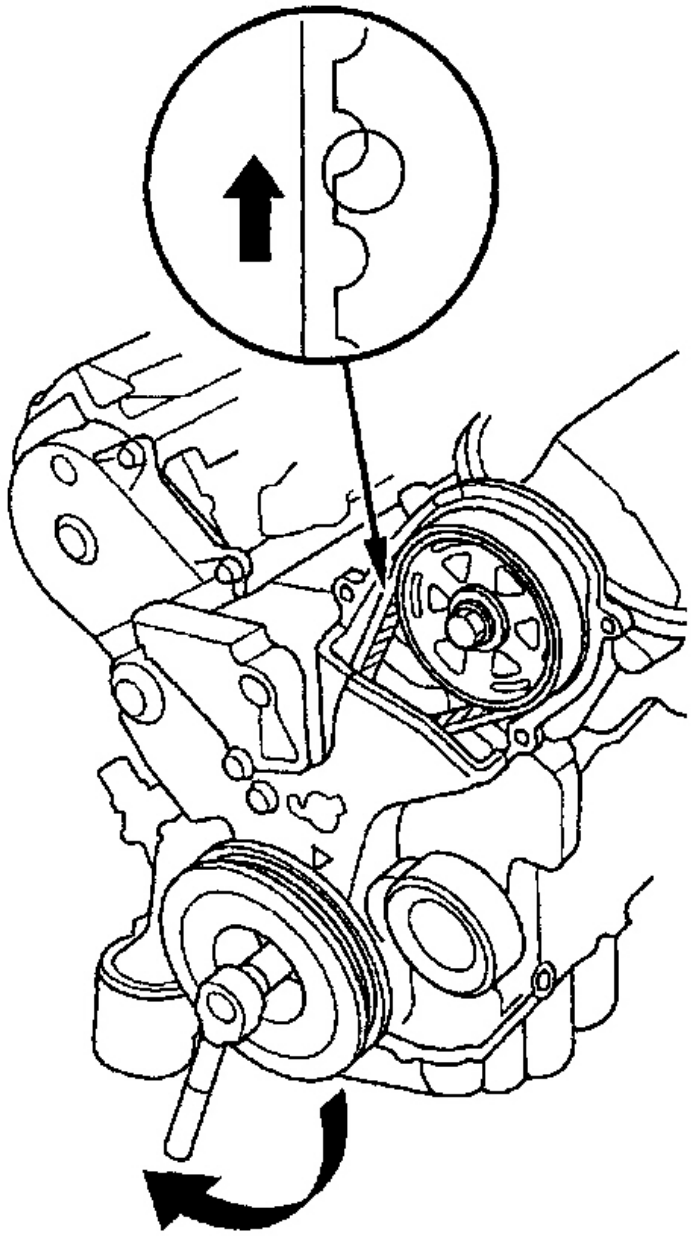

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Fig. 112: Inspecting Timing Belt For Cracks & Oil Or Coolant Soaking
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Installation (New Belt)

NOTE: The following procedure is for installing a new timing belt. If you are installing a used timing belt, see INSTALLATION (USED BELT).

1. Clean timing belt pulleys, and upper and lower covers.
2. Set the timing belt drive pulleys to top dead center (TDC) by aligning the TDC mark (A) on tooth of the timing belt drive pulley with the pointer (B) on the oil pump. See **Fig. 82**.
3. Clean the camshaft pulleys. Set the camshaft pulleys to TDC by aligning the TDC marks (A) on the camshaft pulleys with the pointers (B) on back covers. See **Fig. 83**.
4. Remove the battery clamp bolt from the back cover.
5. Remove the auto-tensioner.

NOTE: Handle the auto-tensioner carefully so the oil inside does not spill or leak. If any of the oil has spilled or leaked out of the auto-tensioner, refill it with 5W-30 motor oil. The total capacity is .22 fl oz. (6.5 ml)

6. Hold the auto-tensioner (A) with the maintenance bolt pointing up. Loosen and remove the maintenance bolt (B) (1999 model). See **Fig. 113**.
7. Clamp the boss of the auto-tensioner in a soft-jawed vise. DO NOT grip the housing of the auto-tensioner (1999 model).

NOTE: Take care not to damage the threads or the gasket contact surface with the screwdriver.

8. Insert a flat blade screwdriver (C) into the maintenance hole. Place the retainer (D) (P/N 14540-P8A-A01) on the auto-tensioner while turning the screwdriver clockwise to compress the bottom (1999 model).
9. Reinstall the maintenance bolt (A). Always use a new gasket (B) (1999 model). See **Fig. 114**.
10. Make sure no oil is leaking around the maintenance bolt.
11. Align the holes on the rod and housing of the auto-tensioner with a pin (A) (2000-03 models). See **Fig. 115**.
12. Set the auto-tensioner on the hydraulic press, then slowly compress the auto-tensioner. Insert a pin of .08" (2.0 mm) diameter through the housing and the rod (2000-03 models).

NOTE: The compression pressure should not exceed 2200 Lbs. (9800 N.m).

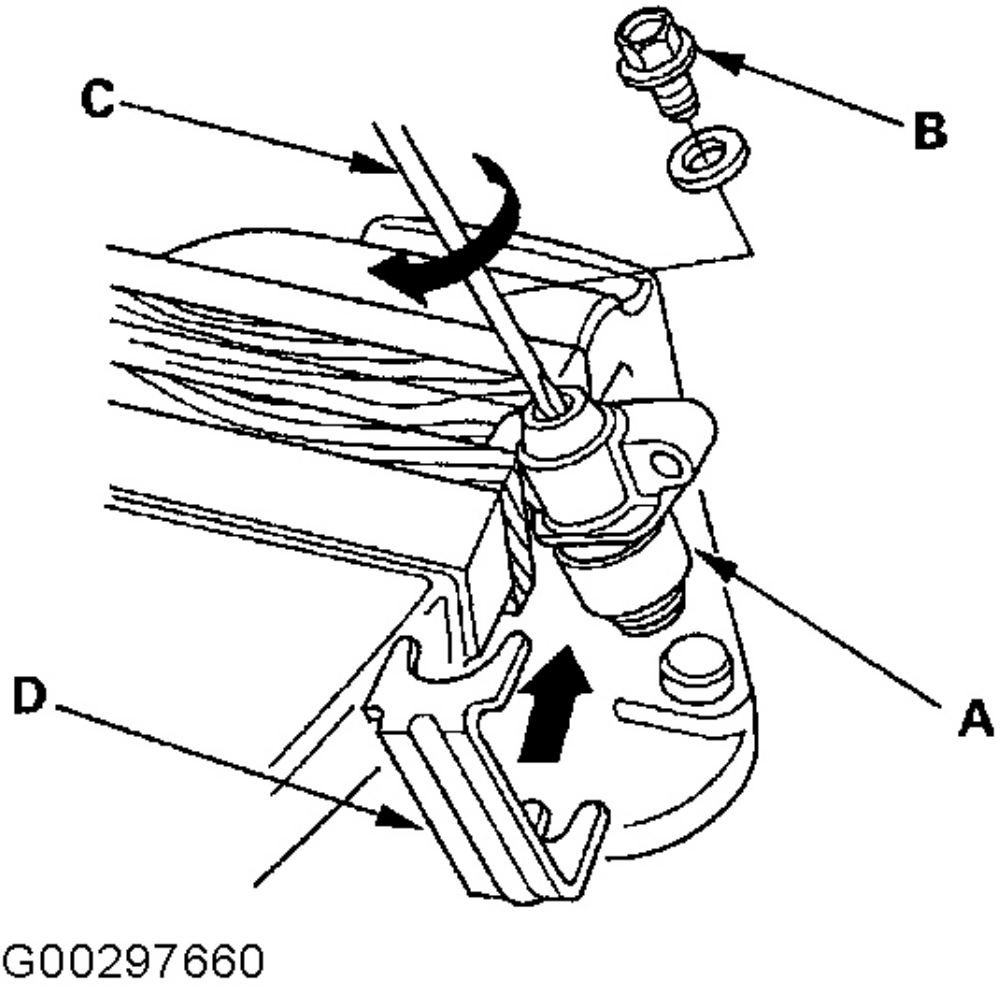


Fig. 113: Holding Auto-Tensioner With Maintenance Bolt Pointing Up (1999 Model)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

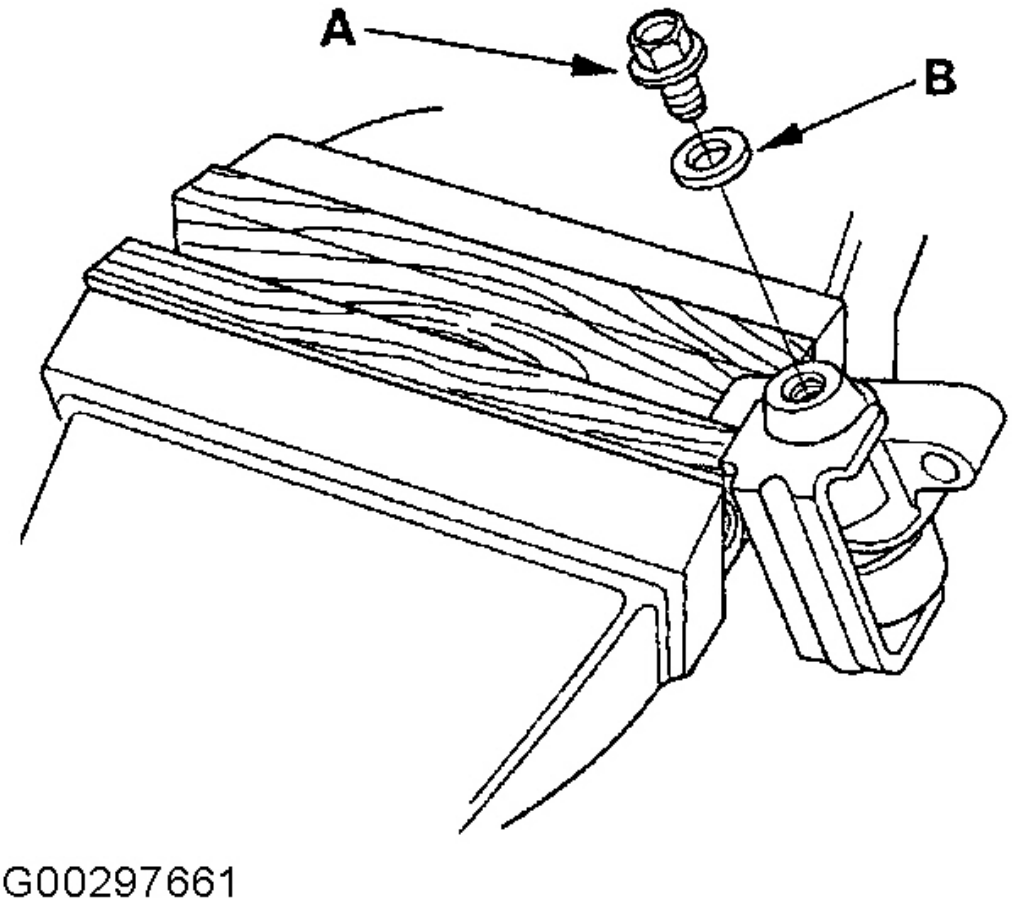


Fig. 114: Reinstalling Maintenance Bolt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

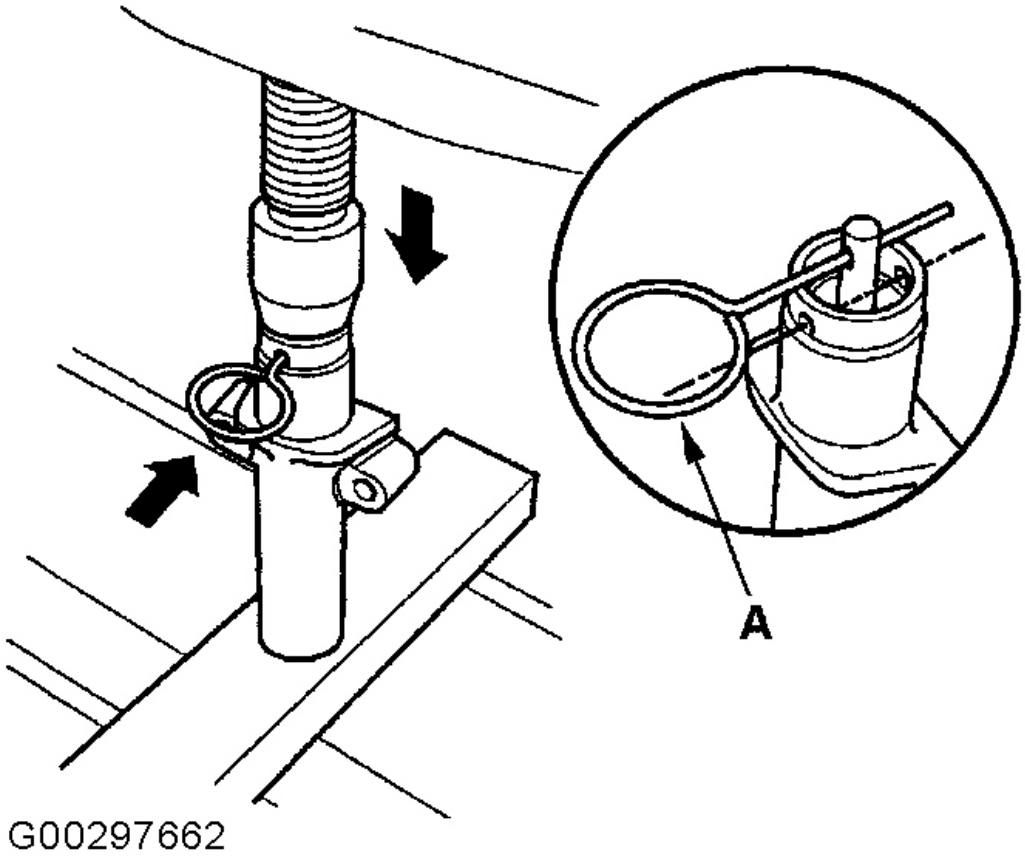


Fig. 115: Aligning Holes On Rod & Housing Of Auto-Tensioner (2000-03 Models)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

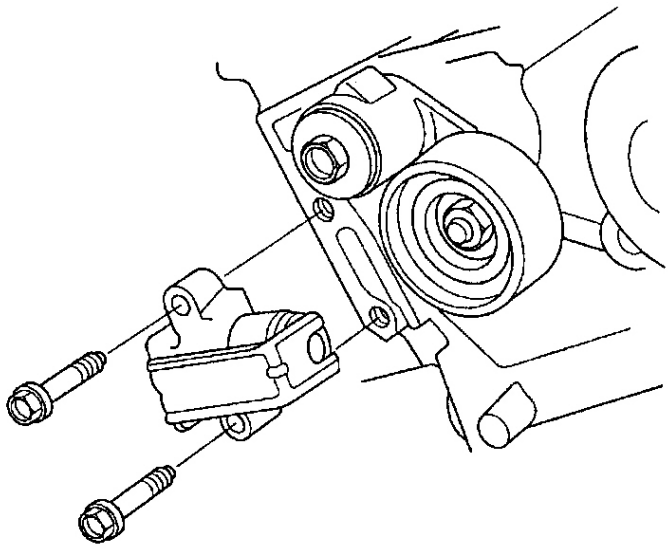
13. Install auto-tensioner. See **Fig. 116**.

NOTE: Make sure the retainer or pin stays in place.

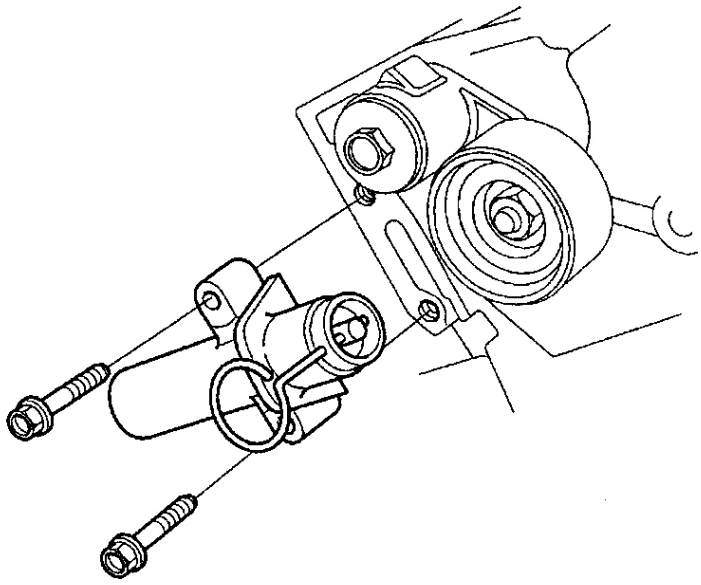
14. Install the timing belt in a counter clockwise sequence starting with the drive pulley. See **Fig. 117** and use the following installation sequence.
    a. Drive pulley (A).
    b. Idler pulley (B).
    c. Front camshaft pulley (C).
    d. Water pump pulley (D).
    e. Rear camshaft pulley (E).
    f. Adjusting pulley (F).

15. Tighten idler pulley bolt. See **Fig. 109**.
16. Remove the retainer or pin from the auto-tensioner. See **Fig. 118**.
17. Install engine mount bracket. See **Fig. 108**.
18. Install the lower cover (C), front upper cover (B) and rear upper cover (A). See **Fig. 105**.
19. Clean the crankshaft pulley bolt and washer.
20. Clean all oil off the inside face (A) of the crankshaft pulley, and apply lubricant to the pulley bolt (B) and washer (C). See **Fig. 119**.
21. Install the crankshaft pulley, and tighten the bolt to specification. See **TORQUE SPECIFICATIONS**. DO NOT use impact wrench. Use the following steps;
    a. Hold the pulley with holder handle (A) and holder attachment (B). See **Fig. 88**.
    b. Tighten the bolt with a torque wrench and 19-mm socket (C).
22. Rotate the crankshaft pulley about 5 or 6 turns clockwise so the timing belt positions on the pulleys.
23. Turn the crankshaft pulley so its white mark (A) lines up with the pointer (B). See **Fig. 101**.
24. Check the camshaft pulley marks. See **Fig. 120**.
    - If the camshaft pulley marks are at TDC, go to step 25.
    - If the camshaft pulley marks are not at TDC, remove the timing belt and repeat steps 2-21.
25. Install the dipstick and tube (A) with a new "O" Ring (B). See **Fig. 104**.
26. Install and adjust the P/S pump belt.
27. Install the alternator belt.
28. Install the side engine mount bracket, then tighten the mounting bolts in sequence. See **Fig. 47**.

'99 model:



'00-03 models:



G00297663

Fig. 116: Installing Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

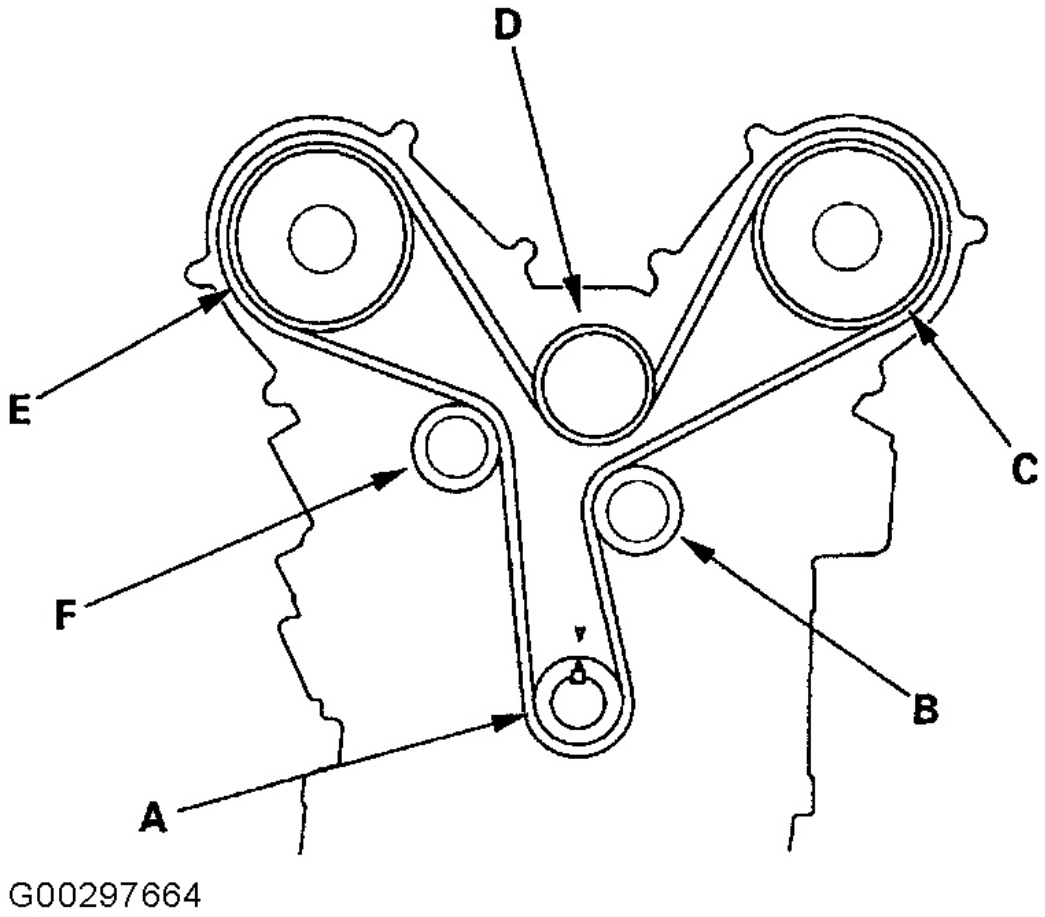
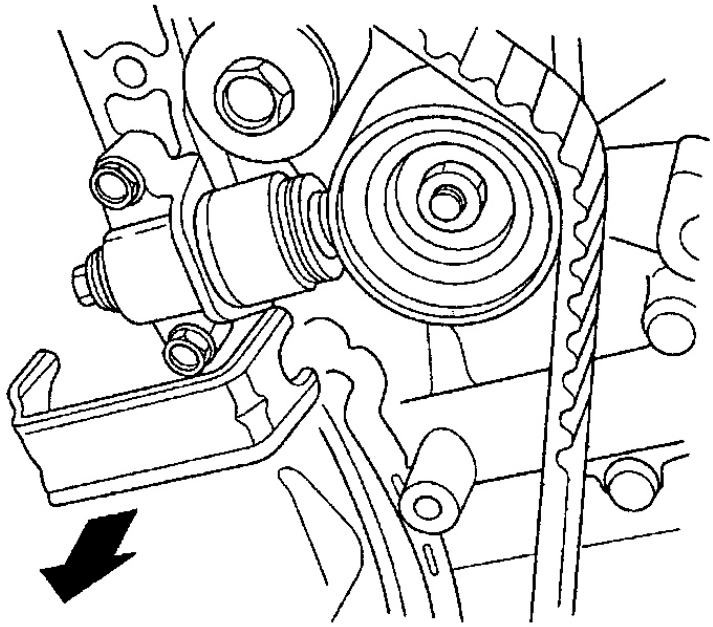


Fig. 117: Installing Timing Belt Counterclockwise Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

'99 model:



'00-03 models:

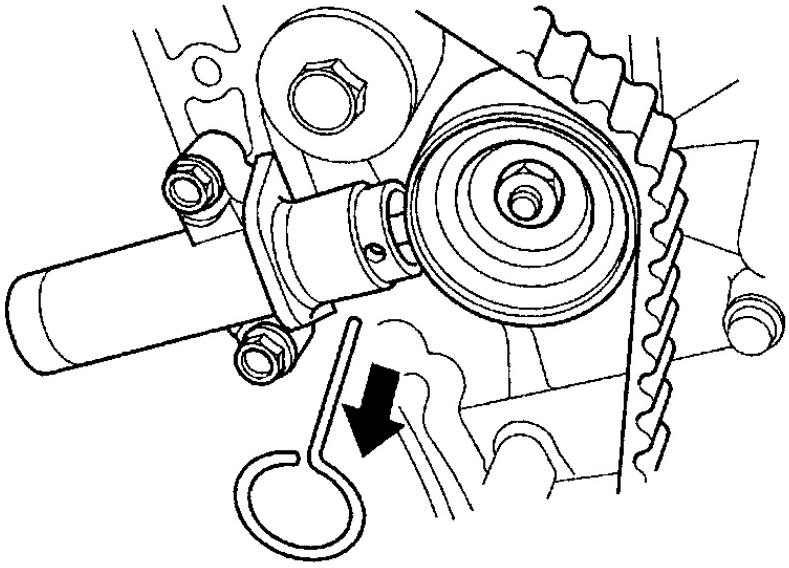


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Fig. 118: Removing Retainer Or Pin From Auto-Tensioner
Courtesy of AMERICAN HONDA MOTOR CO., INC.

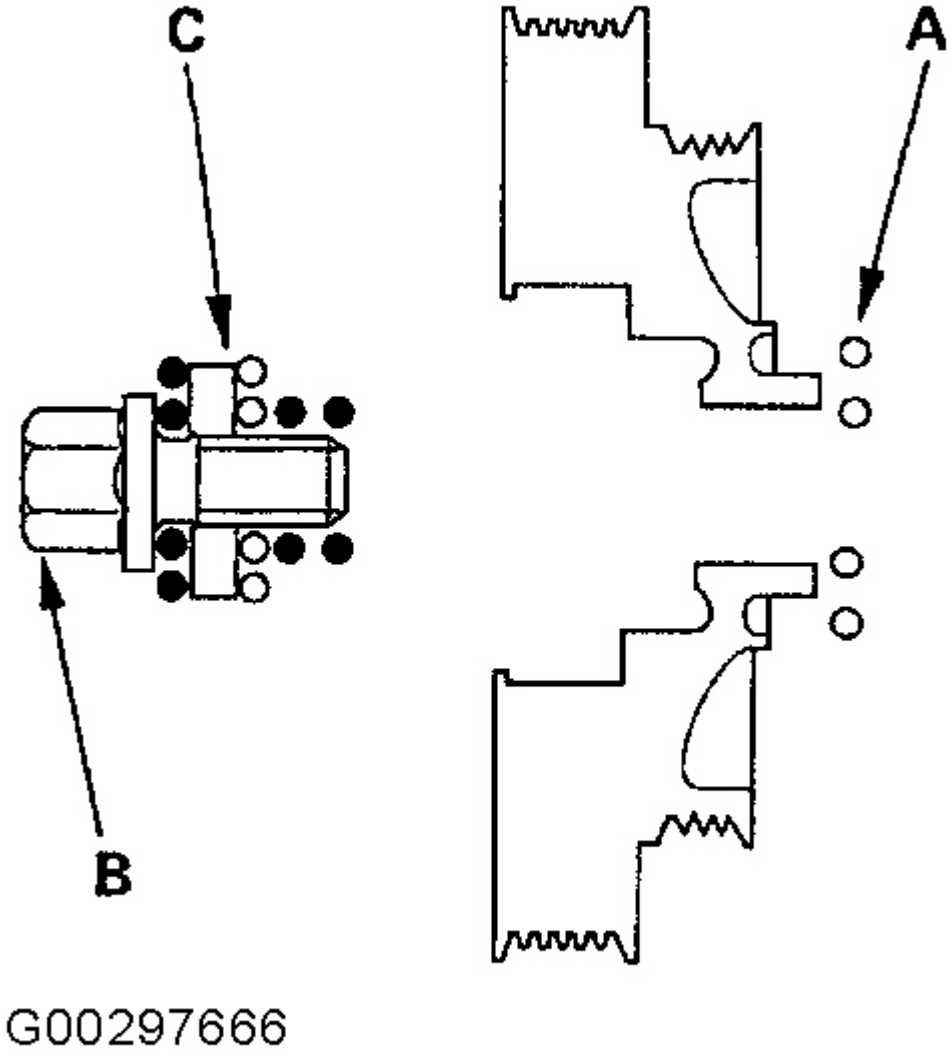
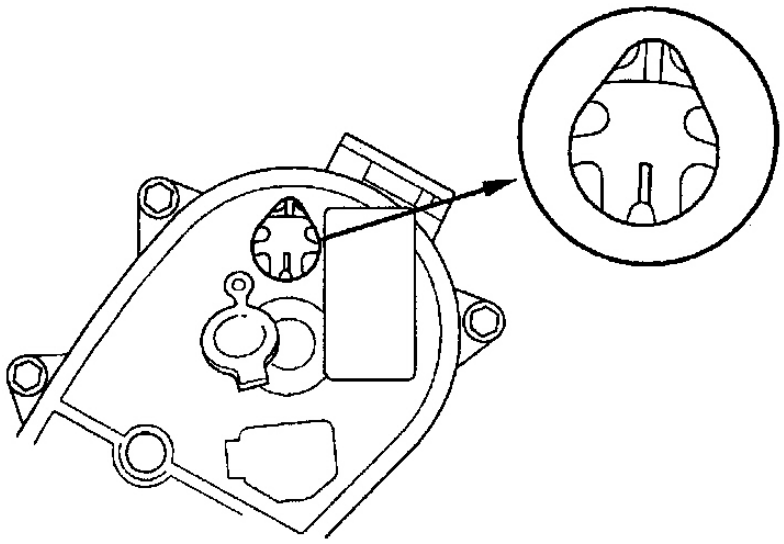


Fig. 119: Cleaning All Oil Off Inside Face
Courtesy of AMERICAN HONDA MOTOR CO., INC.

FRONT CAMSHAFT PULLEY:



REAR CAMSHAFT PULLEY:

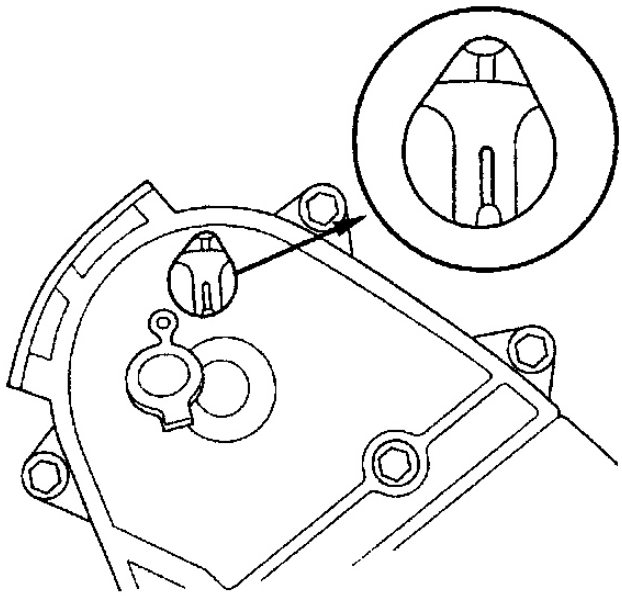


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Fig. 120: Checking Camshaft Pulley Marks
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Installation (Used Belt)

Follow this procedure when installing a used timing belt.

1. Clean the timing belt pulleys, and upper and lower covers.
2. Set the timing belt drive pulley to TDC by aligning the TDC mark (A) on the tooth of the timing belt drive pulley with the pointer (B) on the oil pump. See **Fig. 82**.
3. Clean the camshaft pulleys. Set the camshaft pulleys to TDC by aligning the TDC marks (A) on the camshaft pulleys with the pointers (B) on the back covers. See **Fig. 83**.
4. If the auto-tensioner has extended and the timing belt cannot be installed, remove and compress the auto-tensioner.
5. Install the timing belt in a counterclockwise sequence starting with the drive pulley. Take care not to damage the timing belt when install it. See **Fig. 117** and use the following installation sequence:
    a. Drive pulley (A).
    b. Idler pulley (B).
    c. Front camshaft pulley (C).
    d. Water pump pulley (D).
    e. Rear camshaft pulley (E).
    f. Adjusting pulley (F).
6. Tighten idler pulley bolt. See **Fig. 109**.
7. Remove the battery clamp bolt from the back cover. See **Fig. 107**.
8. Install engine mount bracket. See **Fig. 108**.
9. Install the lower cover (C), front upper cover (A) and rear upper cover (B). See **Fig. 105**.
10. Clean the crankshaft pulley bolt and washer.
11. Clean any oil off the inside face (A) of the crankshaft pulley, and apply lubricant to the pulley bolt (B) and washer (C). See **Fig. 119**.
12. Install the crankshaft pulley, and tighten the bolt to sequence. See **TORQUE SPECIFICATIONS**. DO NOT use an impact wrench.
    a. Hold the pulley with the holder handle (A) and holder attachment (B). See **Fig. 88**.
    b. Tighten the bolt with a torque wrench and 19-mm socket (C).
13. Rotate the crankshaft pulley about 5 or 6 turns clockwise so the timing belt positions on the pulleys.
14. Turn the crankshaft pulley so its white mark (A) lines up with the pointer (B). See **Fig. 101**.
15. Check the camshaft pulley marks. See **Fig. 120**.
    - If the camshaft pulley marks are at TDC, go to step 16.
    - If the camshaft pulley marks are not at TDC, remove the timing belt and repeat steps 2-11 .
16. Install the dipstick and tube (A) with a new "O" ring (B). See **Fig. 104**.
17. Install and adjust the P/S pump belt.
18. Install the alternator belt.
19. Install the side engine mount bracket, then tighten the mounting bolts in the number sequence. See **Fig. 47**.

OVERHAUL

CYLINDER HEAD

Rocker Arms & Shafts Inspection

1. Remove the rocker arm assembly. See **REMOVAL** under ROCKER ARM ASSEMBLY in REMOVAL & INSTALLATION.
2. Measure the diameter of the shaft at the first rocker location. See **Fig. 121**.
3. Zero the gauge (A) to the shaft diameter. See **Fig. 122**.
4. Measure the inside diameter of the rocker arm, and check it for out-of-round condition. See **Fig. 123** and **ROCKER ARM-TO-SHAFT CLEARANCE** table.
5. 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 intake rocker arm needs replacement, replace all 3 rocker arms in that set (primary, mid, and secondary).
6. **VTEC Rocker Arms** - Inspect the rocker arm pistons (A). See **Fig. 124**. Push them manually. If they do not move smoothly, replace the rocker arm assembly.

NOTE:

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

ROCKER ARM-TO-SHAFT CLEARANCE

Application	Specification - In. (mm)
Intake	
Standard (New)	.0010-.0026 (.026-.067)
Service Limit	.0026 (.067)
Exhaust	
Standard (New)	.0010-.0030 (.026-.077)
Service Limit	.0030 (.077)

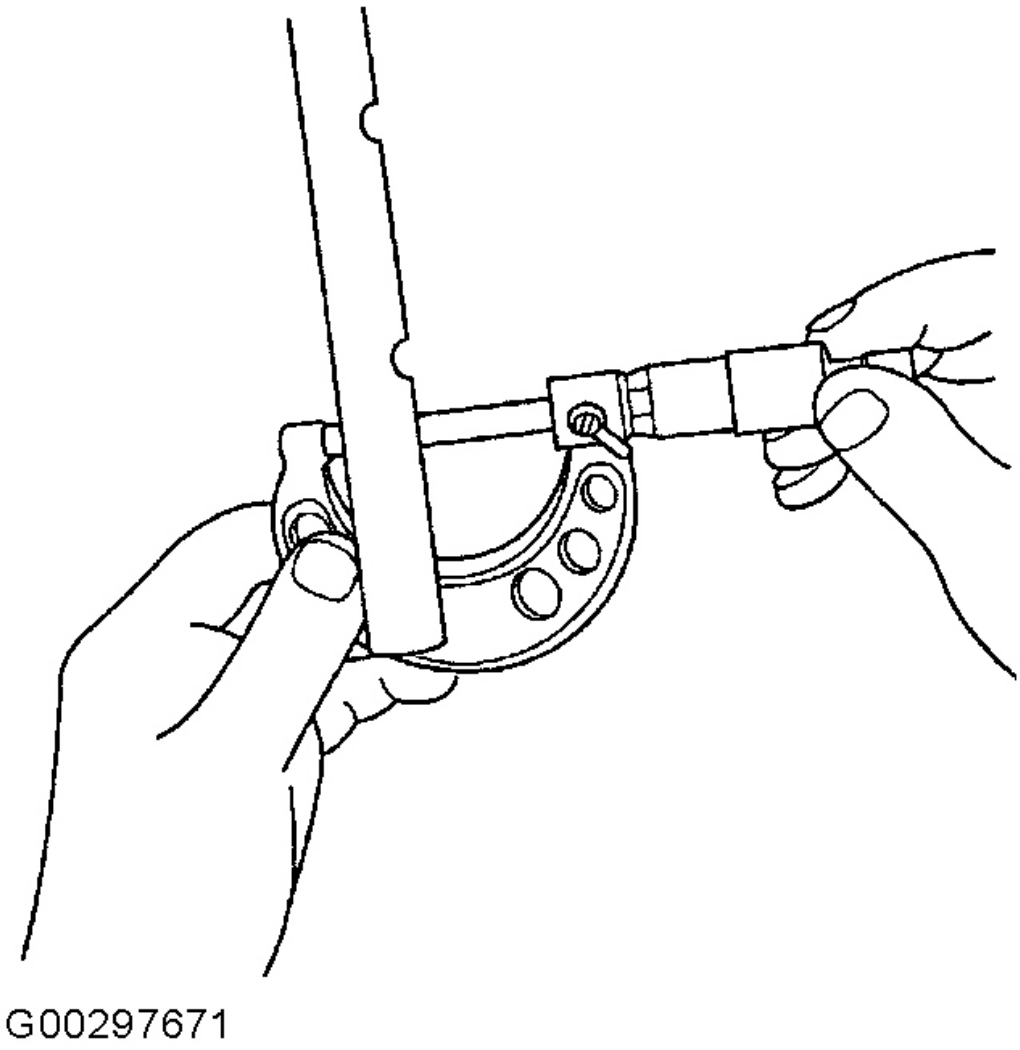

Fig. 121: Measuring Diameter Of Shaft At First Rocker Location
Courtesy of AMERICAN HONDA MOTOR CO., INC.

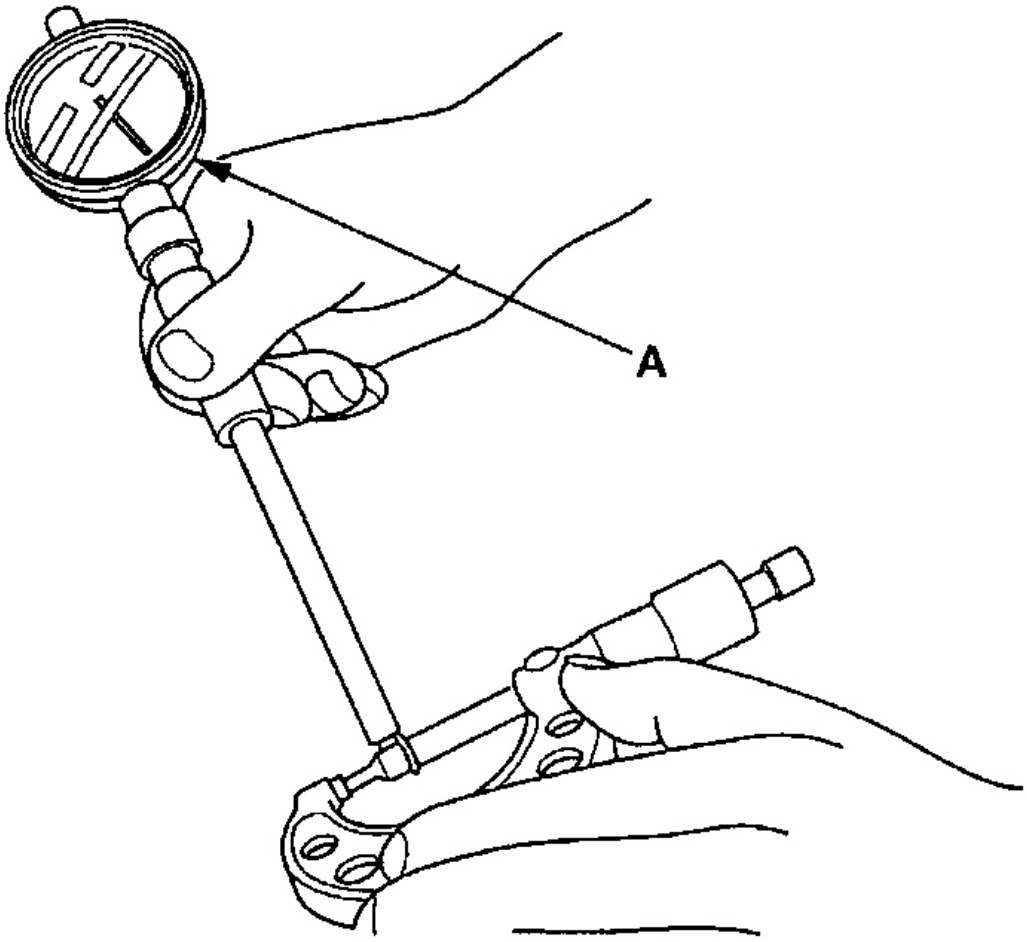

Fig. 122: Zero Gauge To Shaft Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

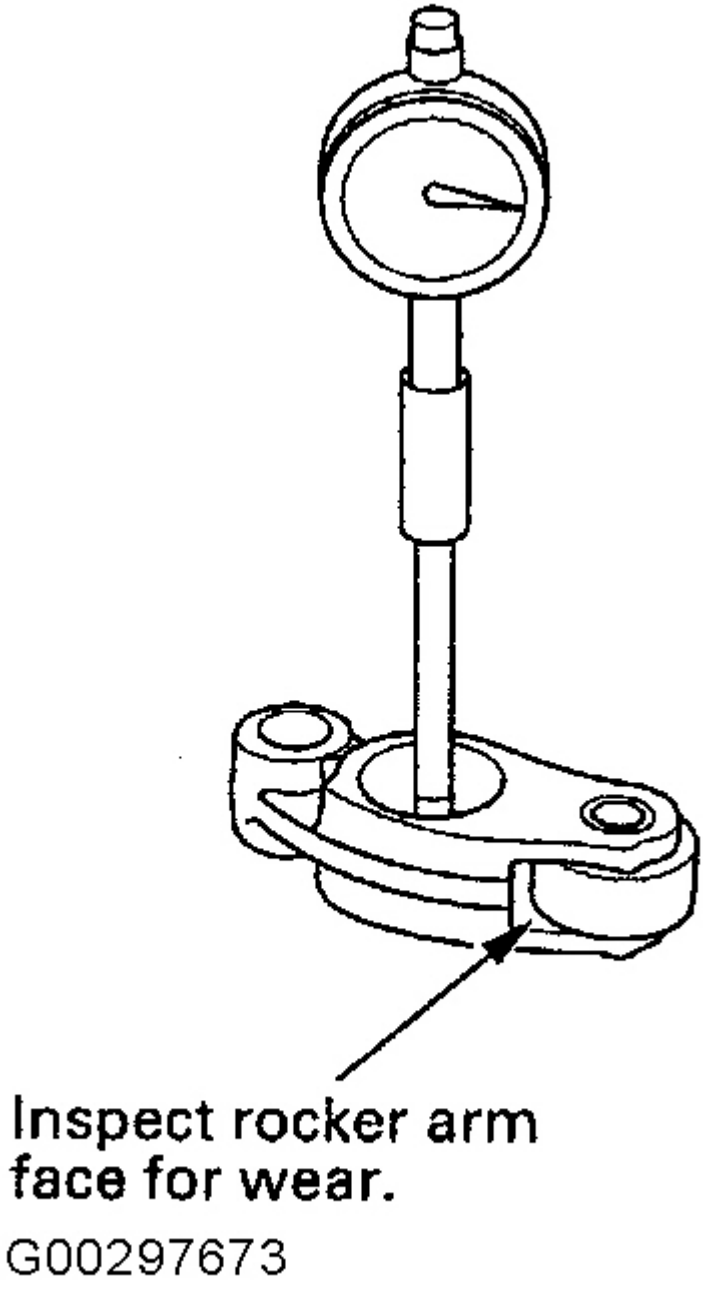

Fig. 123: Measuring Inside Diameter Of Rocker Arm
Courtesy of AMERICAN HONDA MOTOR CO., INC.

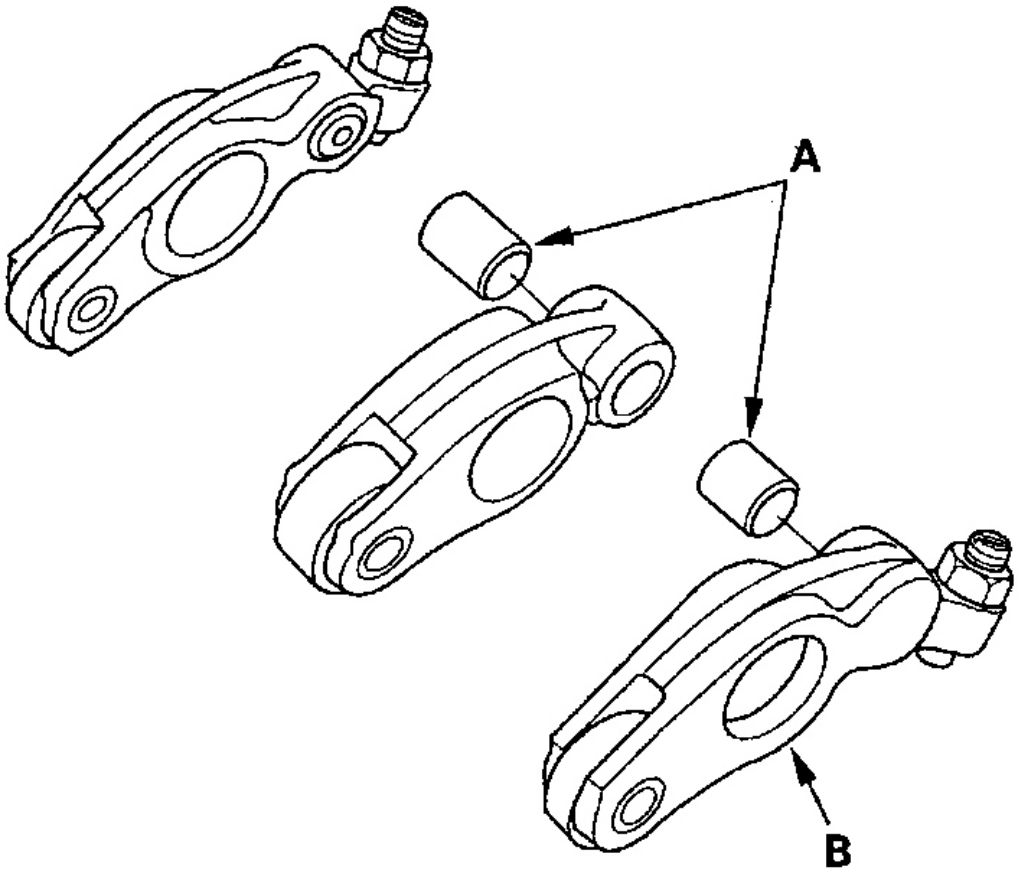

Fig. 124: Inspecting Rocker Arm Pistons
Courtesy of AMERICAN HONDA MOTOR CO., INC.

VTEC Lost Motion Assemblies Inspection

Push on the lost motion assembly (A) with your finger, if it does not move smoothly, replace it. See **Fig. 125**.

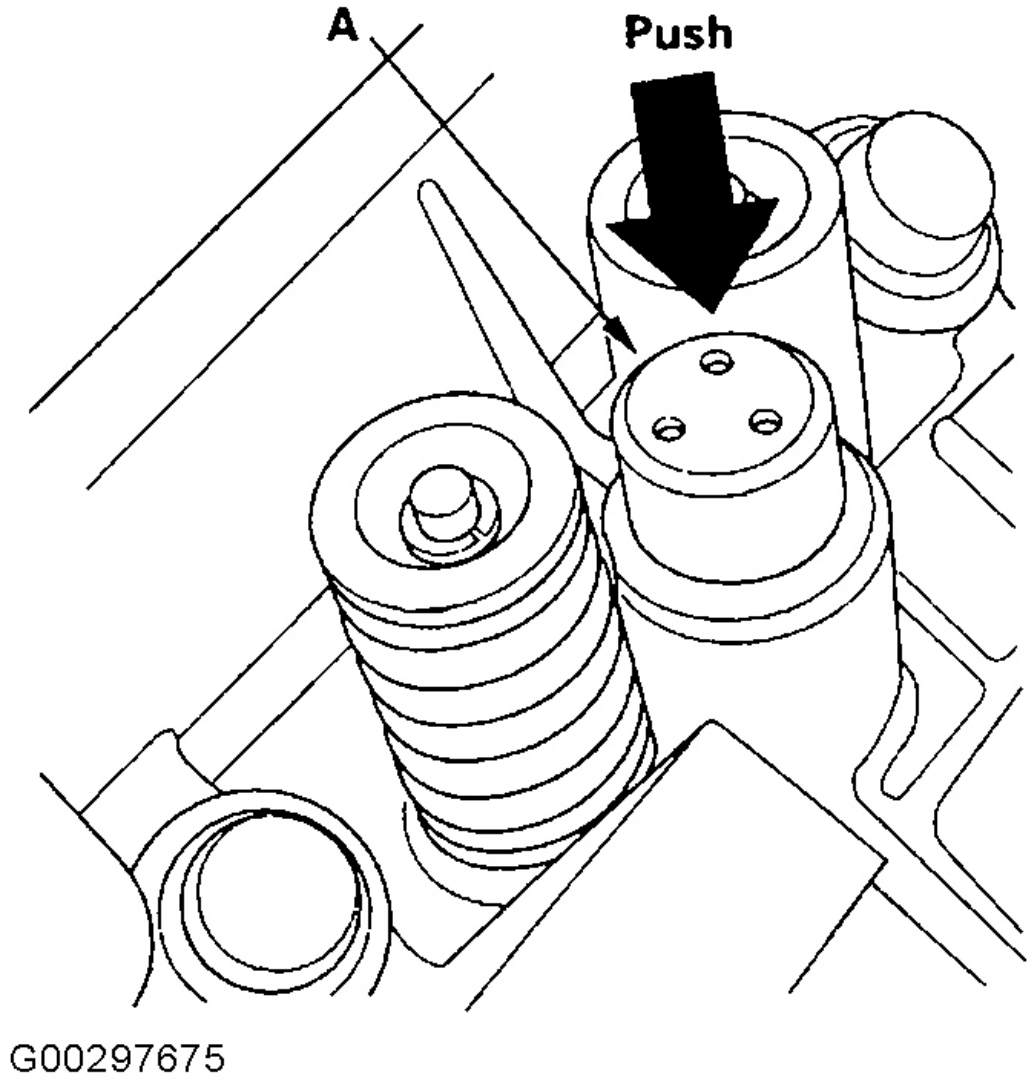

Fig. 125: Pushing On Lost Motion Assembly With Finger
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Camshaft Inspection

1. Remove timing belt. See **TIMING BELT** under REMOVAL & INSTALLATION.
2. Remove rocker arms.
3. Put the rocker shafts on the cylinder head, then tighten the bolts to the specified torque. See **Fig. 84** and **TORQUE SPECIFICATIONS**.
4. Seat the camshaft by pushing it toward the rear of the cylinder head.

5. Zero the dial indicator against the end of the camshaft. Push the camshaft back and forth and read the end play. If the end play is beyond the service limit, replace the thrust cover and recheck. If it is still beyond the service limit, replace the camshaft. See **Fig. 126** and **CAMSHAFT END PLAY** table.

CAMSHAFT END PLAY

Application	Specification - In. (mm)
Standard (New)	.002-.008 (.05-.20)
Service Limit	.008 (.20)

6. Remove the camshaft thrust cover (A), then pull out the camshaft (B). See **Fig. 127**.
7. Wipe the camshaft clean, then inspect the lift ramps. Replace the camshaft if any lobes are pitted, scored or excessively worn.
8. Measure the diameter of each camshaft journal. See **Fig. 128**.
9. Zero the gauge to the journal diameter. See **Fig. 122**.
10. Clean the camshaft bearing surfaces in the cylinder head. Measure the inside diameter of each camshaft bearing surface, and check for out-of-round condition. See **Fig. 129** and **CAMSHAFT-TO-HOLDER OIL CLEARANCE** table.
    - If the camshaft-to-holder clearance is within limits, go to step 12.
    - If the camshaft-to-holder clearance is beyond the service limit and the camshaft has been replaced, replace the cylinder head.
    - If the camshaft-to-holder clearance is beyond the service limit and the camshaft has not been replaced, go to step 11.

CAMSHAFT-TO-HOLDER OIL CLEARANCE

Application	Specification - In. (mm)
Standard (New)	.0035-.0020 (.050-.089)
Service Limit	.006 (.15)

11. Check total runout with the camshaft supported on V-blocks. See **Fig. 130** and **CAMSHAFT TOTAL RUNOUT** table.
    - 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

Application	Specification - In. (mm)
Standard (New)	.001 (.03) max.
Service Limit	.002 (.04)

12. Measure cam lobe height. See **Fig. 131**.

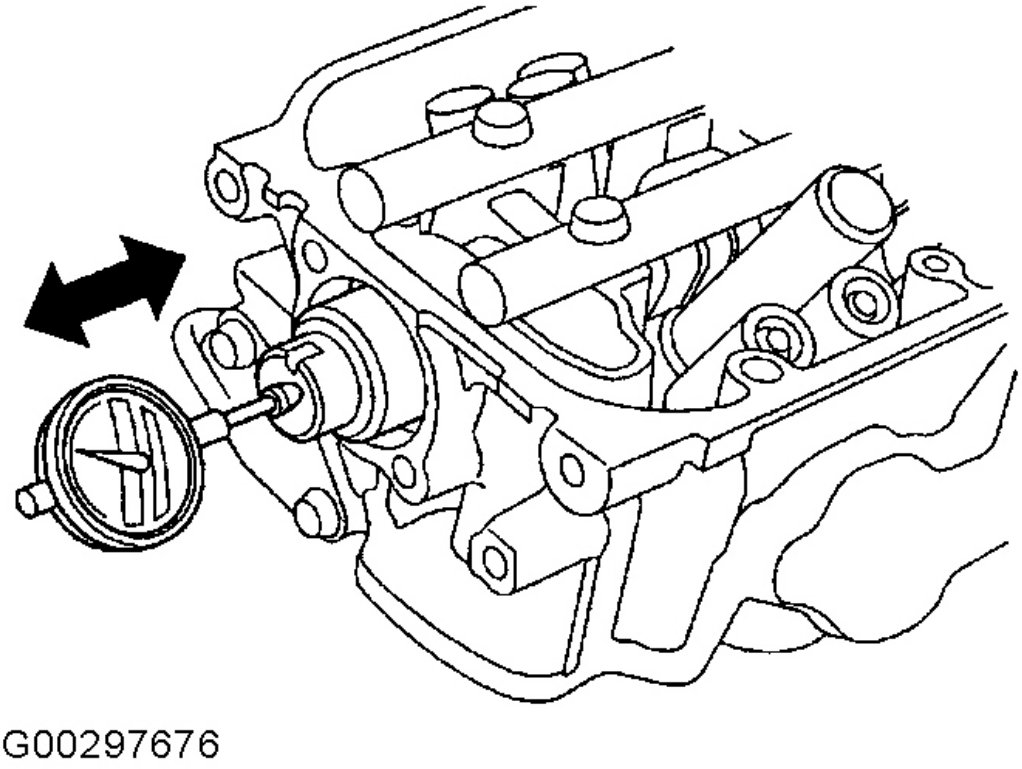

Fig. 126: Zero Dial Indicator Against End Of Camshaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

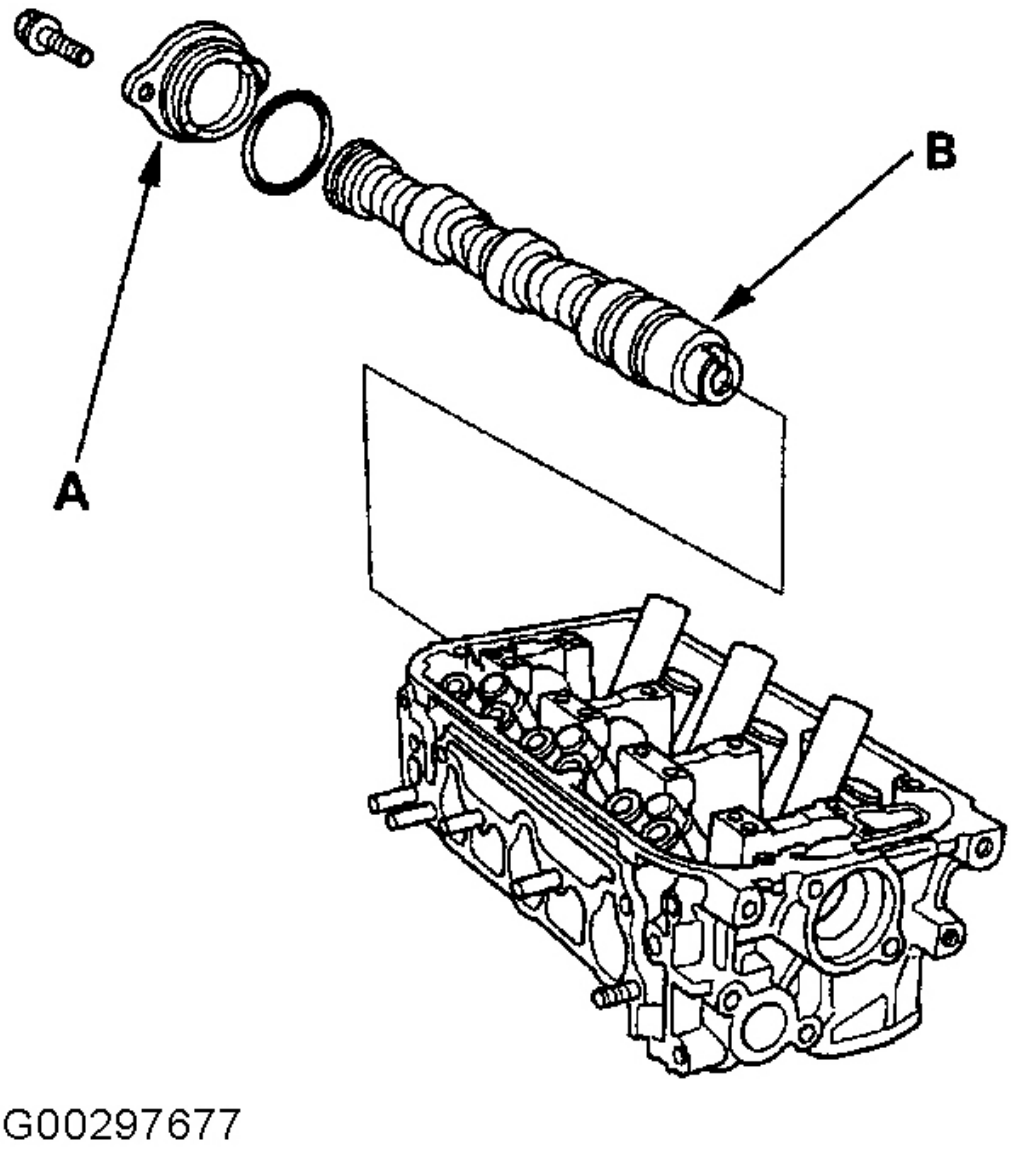

Fig. 127: Removing Camshaft Thrust Cover & Camshaft
Courtesy of AMERICAN HONDA MOTOR CO., INC.

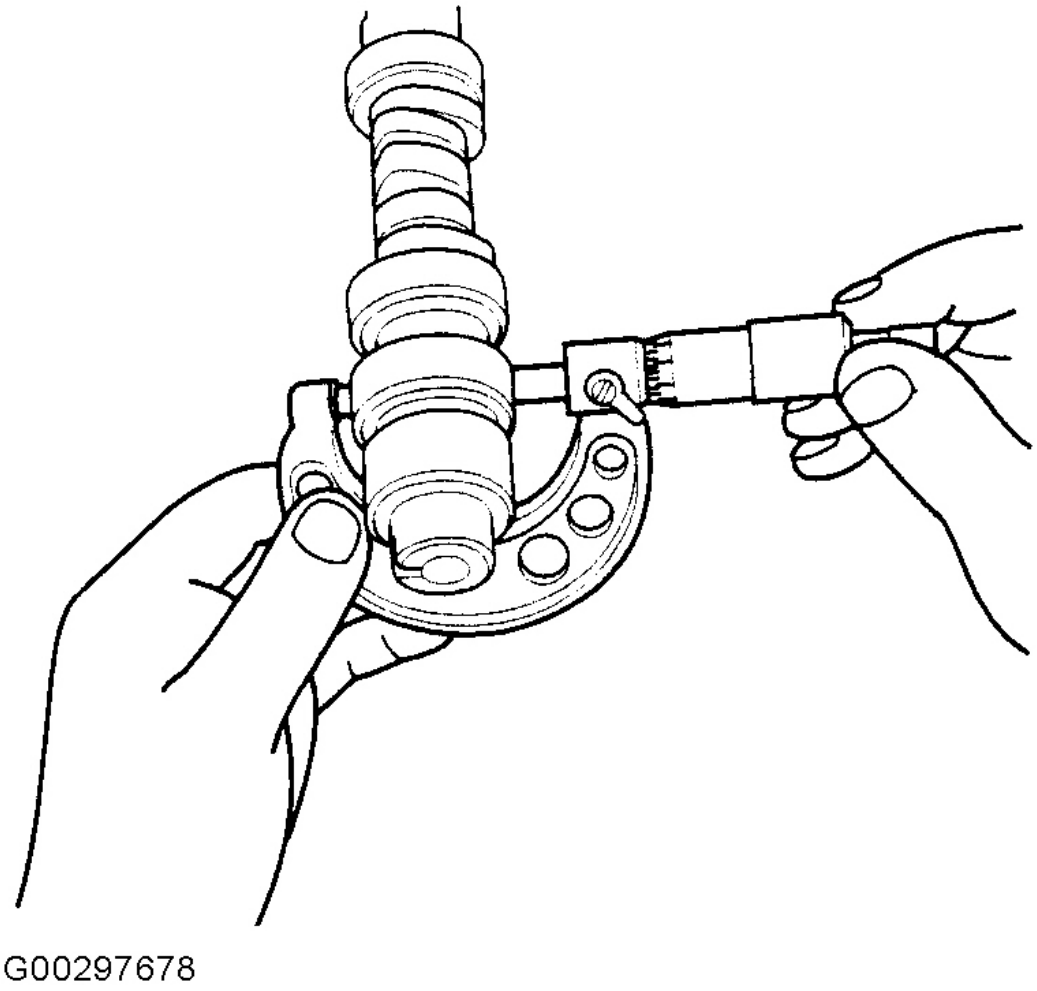

Fig. 128: Measuring Diameter Of Each Camshaft Journal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

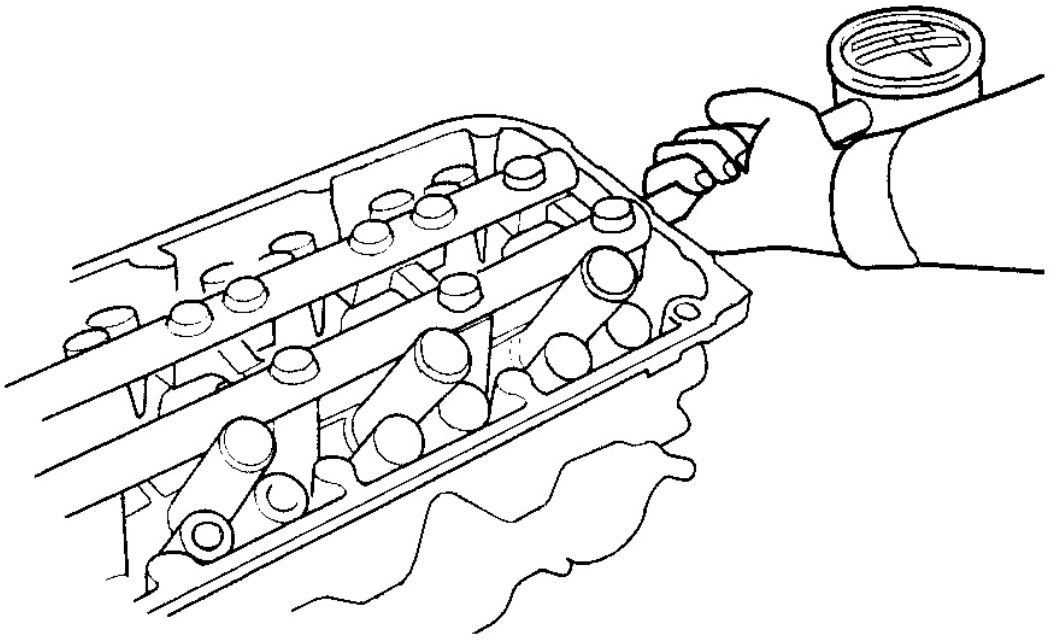

Fig. 129: Cleaning Camshaft Bearing Surfaces In Cylinder Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

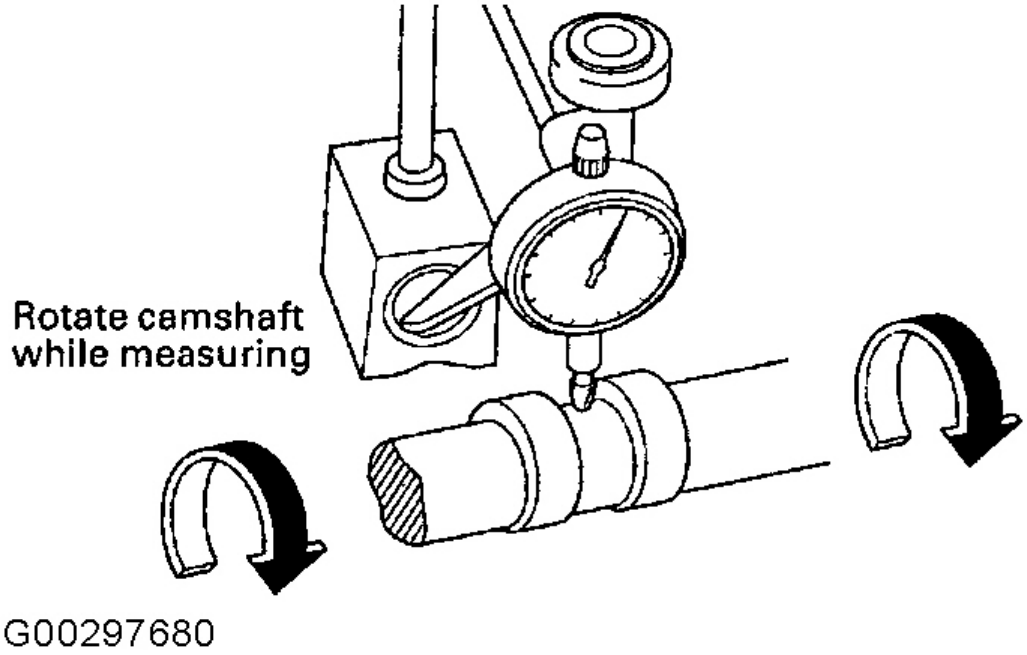

Fig. 130: Check Total Runout With Camshaft Supported On V-Blocks
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Cam Lobe Height Standard (New):

J32A1 engine ('99 model):

	INTAKE	EXHAUST
PRI	34.615 mm (1.3628 in.)	36.076 mm (1.4203 in.)
MID	36.272 mm (1.4280 in.)	
SEC	31.188 mm (1.2279 in.)	

J32A1 engine ('00-03) models:

	INTAKE	EXHAUST
PRI	34.737 mm (1.3676 in.)	36.326 mm (1.4302 in.)
MID	36.445 mm (1.4348 in.)	
SEC	34.919 mm (1.3748 in.)	

J32A2 engine:

	INTAKE	EXHAUST
PRI	34.737 mm (1.3676 in.)	36.389 mm (1.4326 in.)
MID	36.445 mm (1.4348 in.)	
SEC	34.919 mm (1.3748 in.)	

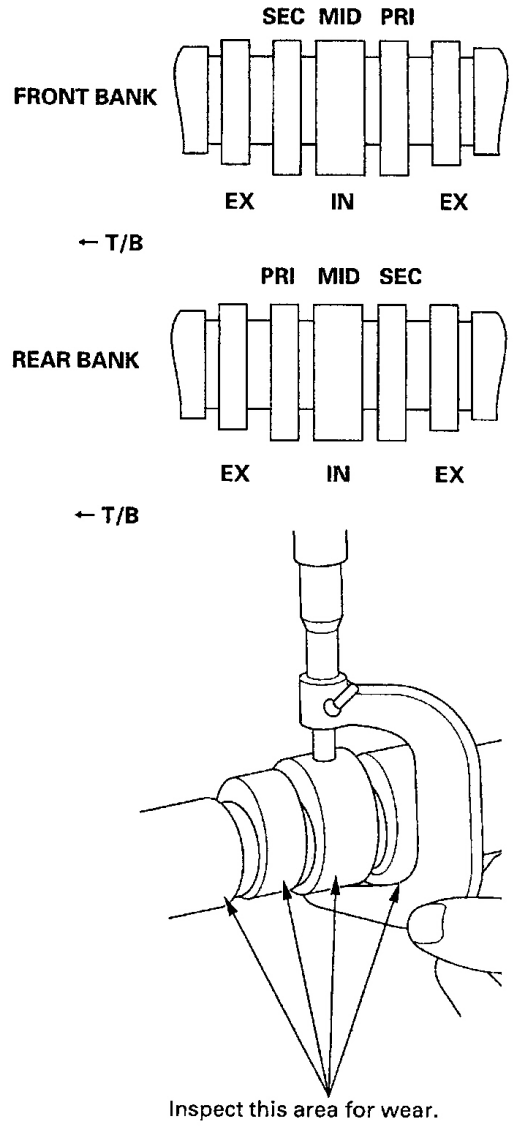

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Fig. 131: Measuring Cam Lobe Height
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Valves, Springs & Valve Seals (Removal)

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

1. Remove the cylinder head. See **CYLINDER HEAD** under REMOVAL & INSTALLATION.
2. Using an appropriate-sized socket (A) and plastic mallet (B), lightly tap the valve retainer to loosen the valve keepers. See **Fig. 132**.
3. Install the valve spring compressor. Compress the spring and remove the valve keepers. See **Fig. 133**.

4. Install the valve guide seal remover. See **Fig. 134**.
5. Remove valve seal. See **Fig. 135**.

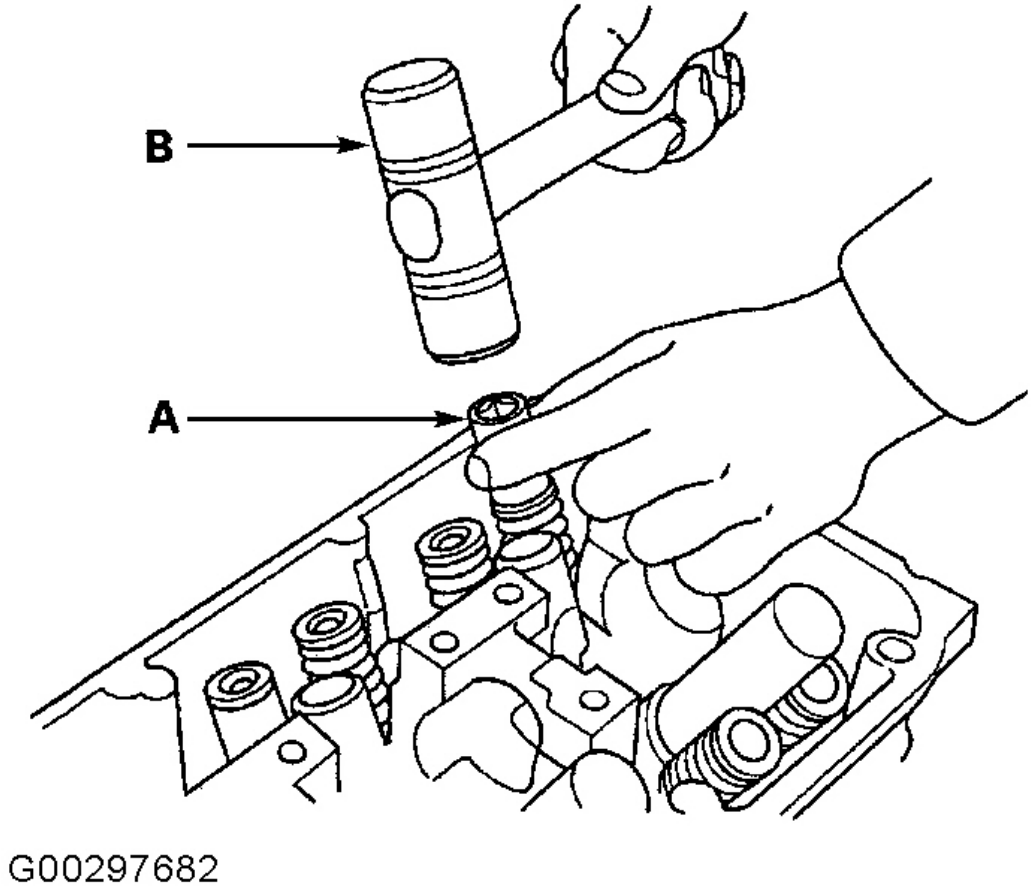


Fig. 132: Loosening Valve Retainer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

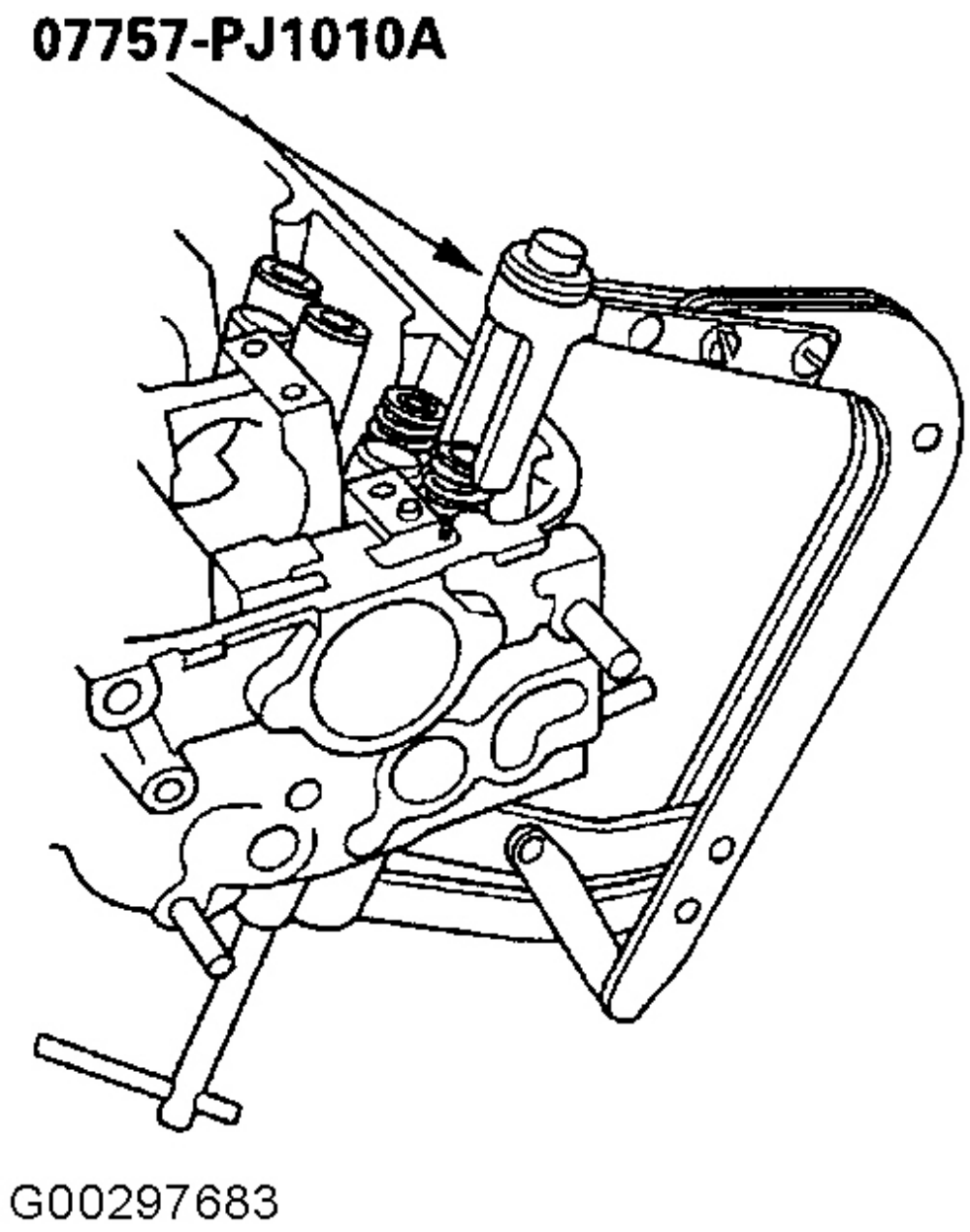


Fig. 133: Compressing Spring & Removing Valve Keepers
Courtesy of AMERICAN HONDA MOTOR CO., INC.

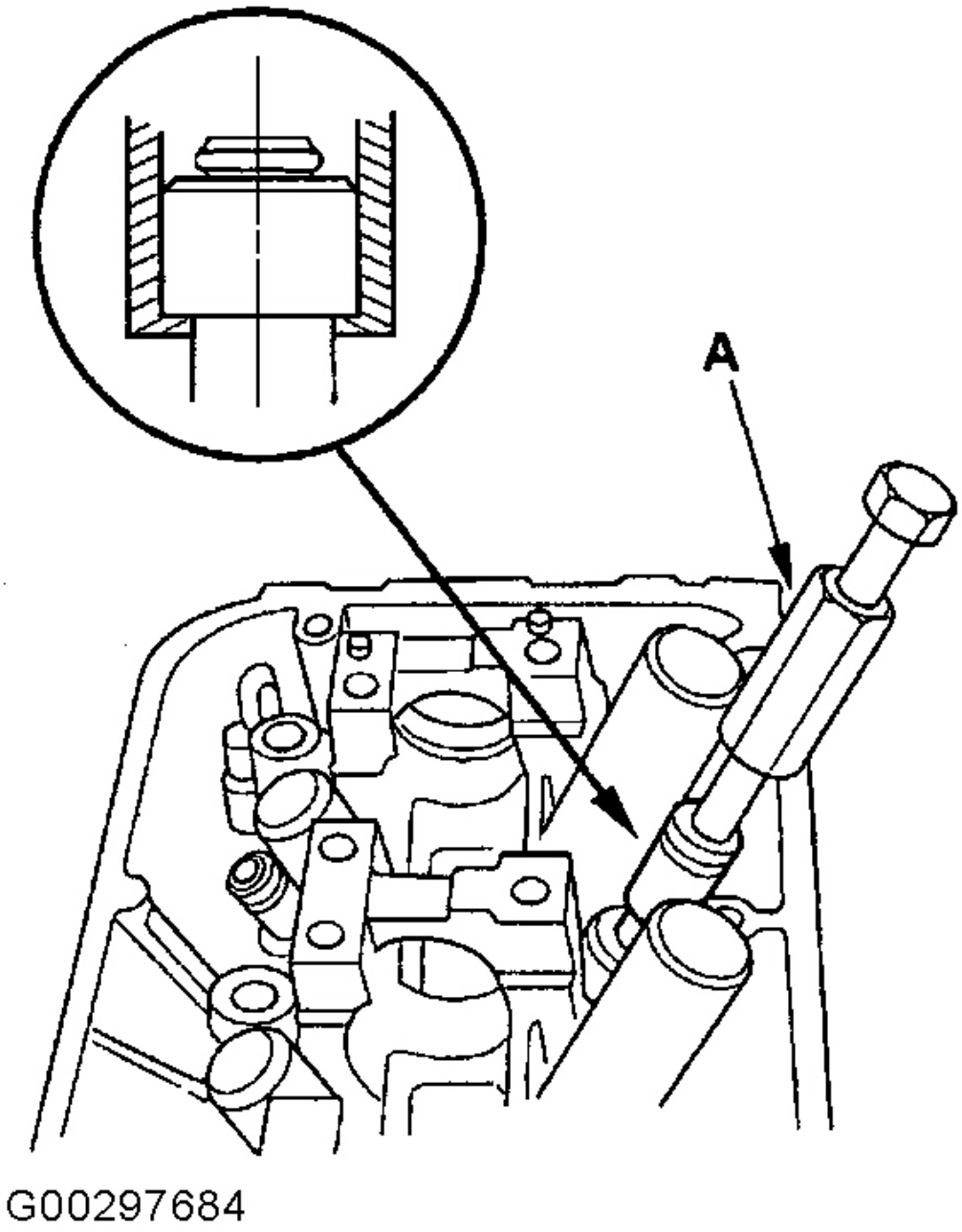


Fig. 134: Installing Valve Guide Seal Remover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

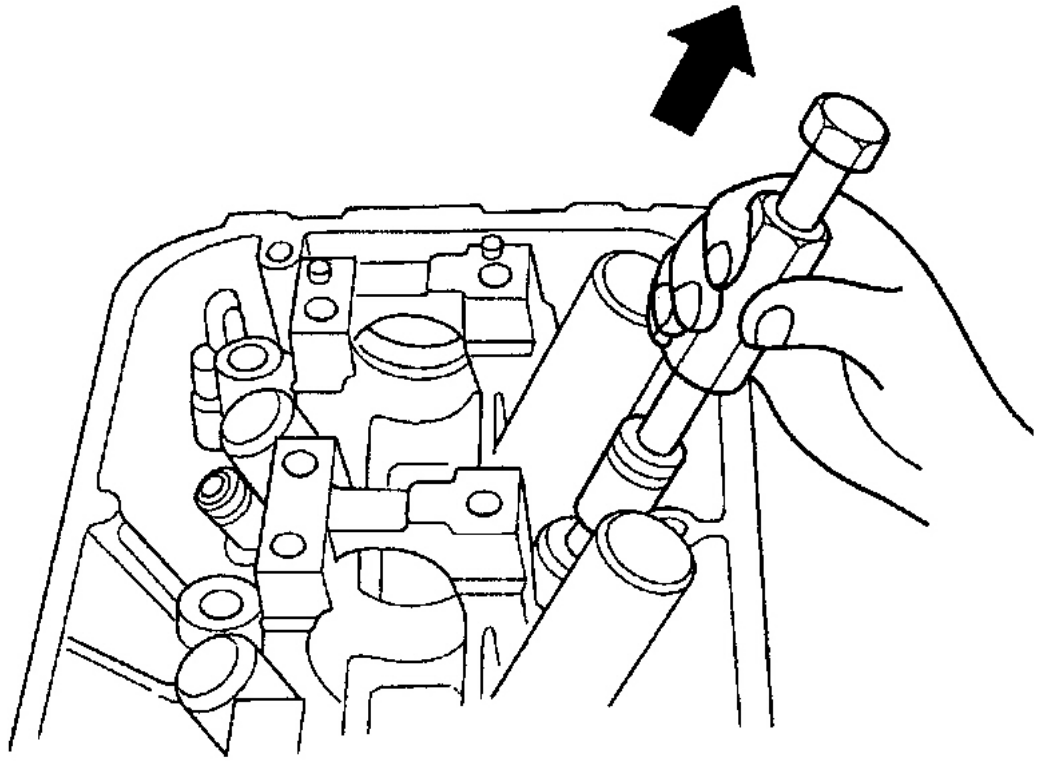


Fig. 135: Removing Valve Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Valve Stem-To-Guide Clearance Inspection

1. Remove the valves. See **VALVES, SPRINGS & VALVE SEALS (REMOVAL)**.
2. Slide the valve out of its guide about 10 mm, then measure the guide-to-stem clearance with a dial indicator while rocking the stem in the direction of normal thrust (wobble method). See **Fig. 136** and **INTAKE/EXHAUST STEM-TO-GUIDE CLEARANCE** table.
    - 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.

Fig. 136: Measuring Guide-To-Stem Clearance With Dial Indicator
Courtesy of AMERICAN HONDA MOTOR CO., INC.

INTAKE/EXHAUST STEM-TO-GUIDE CLEARANCE

Application	Specification - In. (mm)
Intake	
Standard (New)	.002-.004 (.04-.09)
Service Limit	.0006 (.16)
Exhaust	
Standard (New)	.004-.006 (.11-.16)
Service Limit	.009 (.24)

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, from the I.D. of the valve guide, measured with an inside

micrometer or ball gauge. Take the measurements in 3 places along the valve stem and 3 places inside the valve guide. The difference between the largest guide measurement and the smallest stem measurement should not exceed the service limit.

INTAKE/EXHAUST VALVE STEM-TO-GUIDE CLEARANCE

Application	Specification - In. (mm)
Intake	
Standard (New)	.0008-.0018 (.020-.045)
Service Limit	.003 (.08)
Exhaust	
Standard (New)	.0022-.0031 (.055-.080)
Service Limit	.005 (.12)

Valve Guide Replacement

1. Inspect valve stem-to-guide clearance. See **VALVE STEM-TO-GUIDE CLEARANCE INSPECTION**.
2. Use a commercially available air-impact valve guide driver (A) modified to fit the diameter of the valve guides. See **Fig. 137**. In most cases, the same procedure can be done using the special tool and a conventional hammer.
3. Select the proper replacement guides and chill them in the freezer section of a refrigerator for about an hour.
4. Use a hot plate or oven to evenly heat the cylinder head to 300°F (150°C). See **Fig. 138**. Monitor the temperature with a cooking thermometer. Do not get head hotter than 300°F (150°C); excessive heat may loosen the valve seats.
5. Working from the camshaft side, use the driver and an air hammer to drive the guide about .1" (2 mm) towards the combustion chamber. See **Fig. 139**. 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.

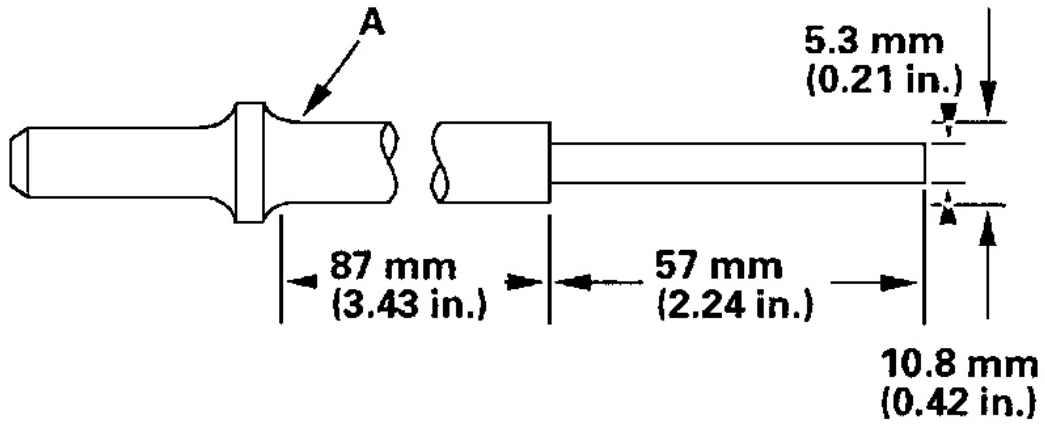


Fig. 137: Identifying Air-Impact Valve Driver
Courtesy of AMERICAN HONDA MOTOR CO., INC.

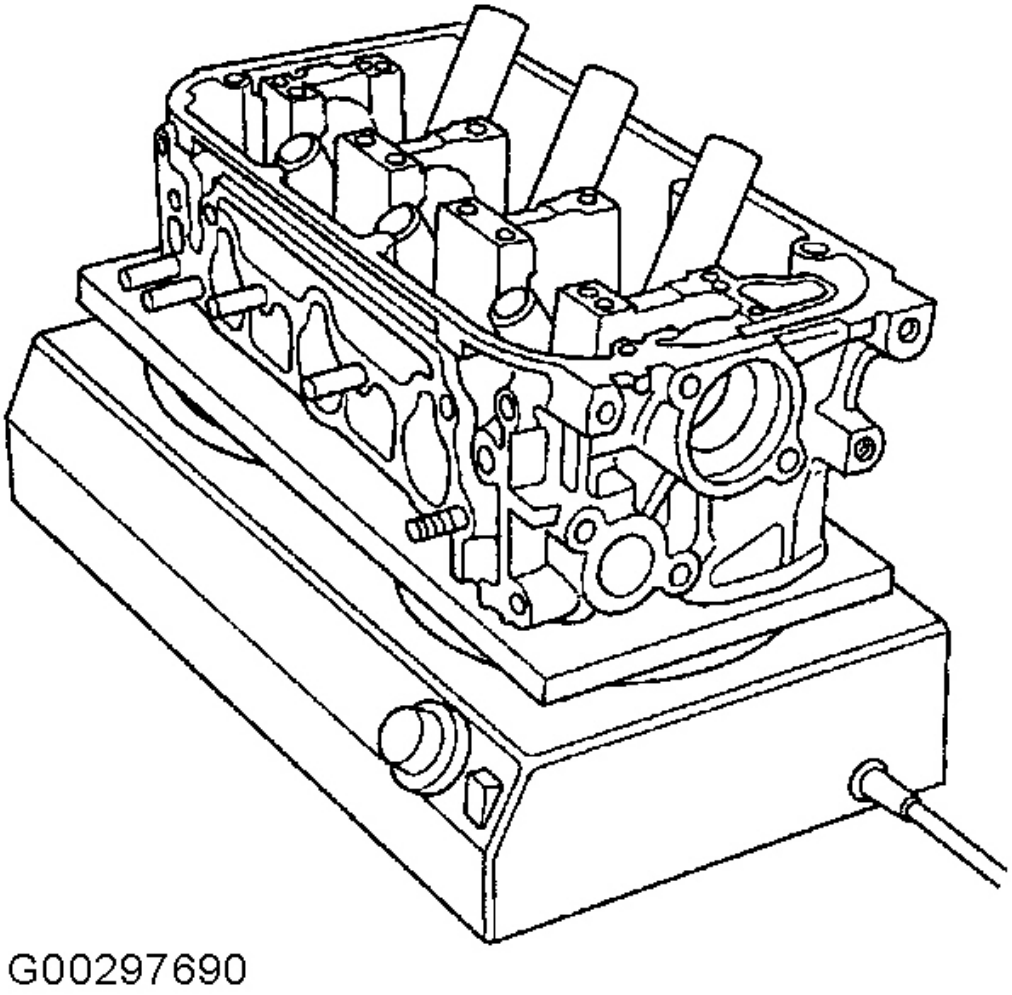


Fig. 138: Using Hot Plate Or Oven To Heat Cylinder Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

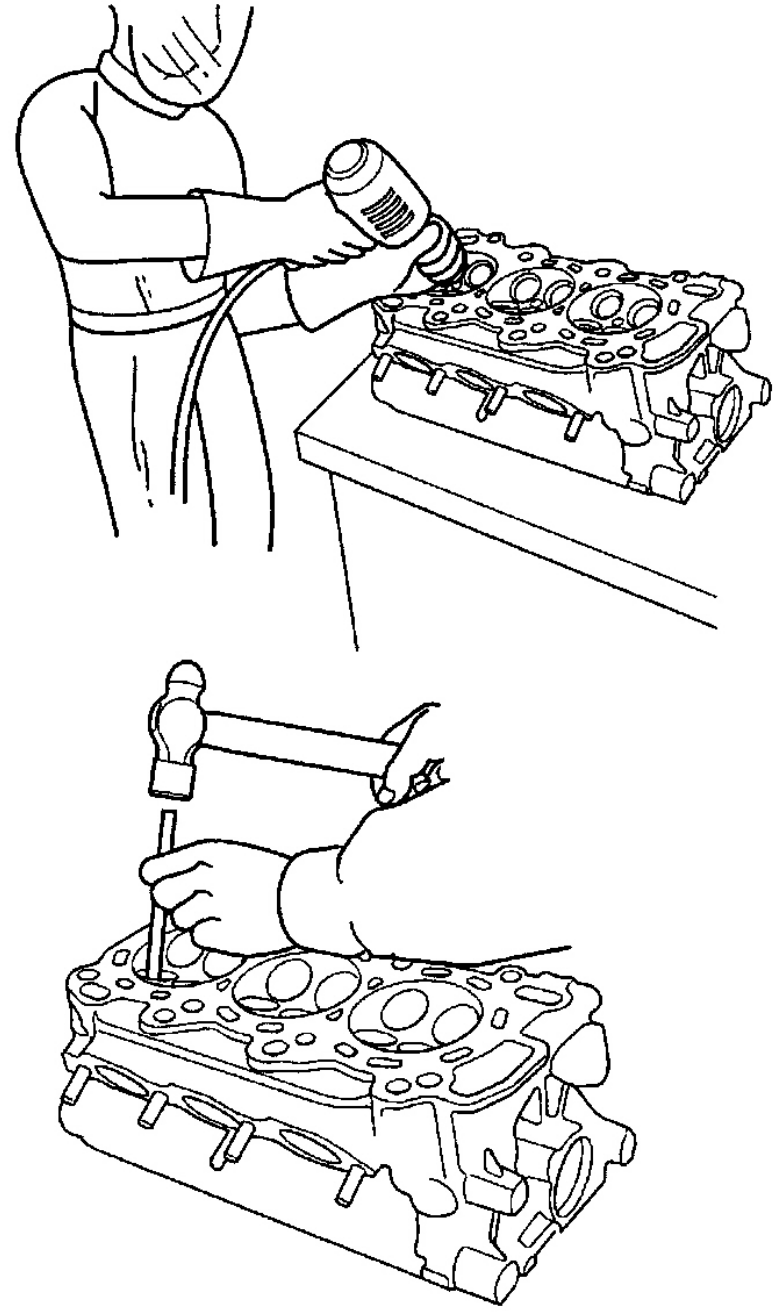


Fig. 139: Using Driver & Air Hammer To Drive Guide Towards Combustion Chamber
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

8. Remove the new guide(s) from the freezer, one at a time, as you need them.
9. Apply a thin coat of clean engine oil to the outside of the new valve guide. Install the guide from the camshaft side of the head; use the special tool to drive the guide in to the specified installed height (A) of the guide (B). See **Fig. 140** and **VALVE GUIDE INSTALLED HEIGHT** table. If you have all 12 guides to do, you may have to reheat the head.

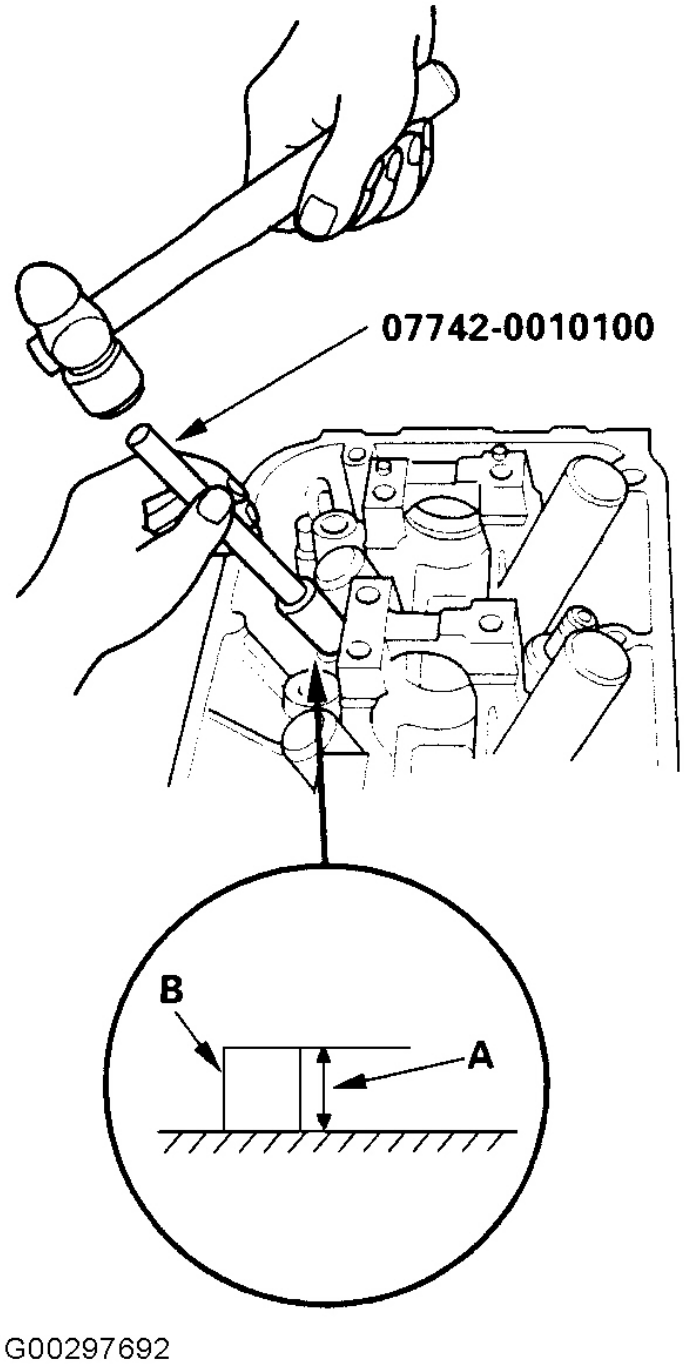


Fig. 140: Using Special Tool To Drive Guide Into Specified Height
Courtesy of AMERICAN HONDA MOTOR CO., INC.

VALVE GUIDE INSTALLED HEIGHT

Application	Specification - In. (mm)

Intake	.835-.874 (21.20-22.20)
Exhaust	.812-.852 (20.63-21.63)

10. Coat both the reamer and the valve guide with cutting oil.
11. Rotate the reamer clockwise the full length of the valve guide bore. See **Fig. 141**.
12. Continue to rotate the 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 the valve slides in the intake and exhaust valve guides without exerting pressure.

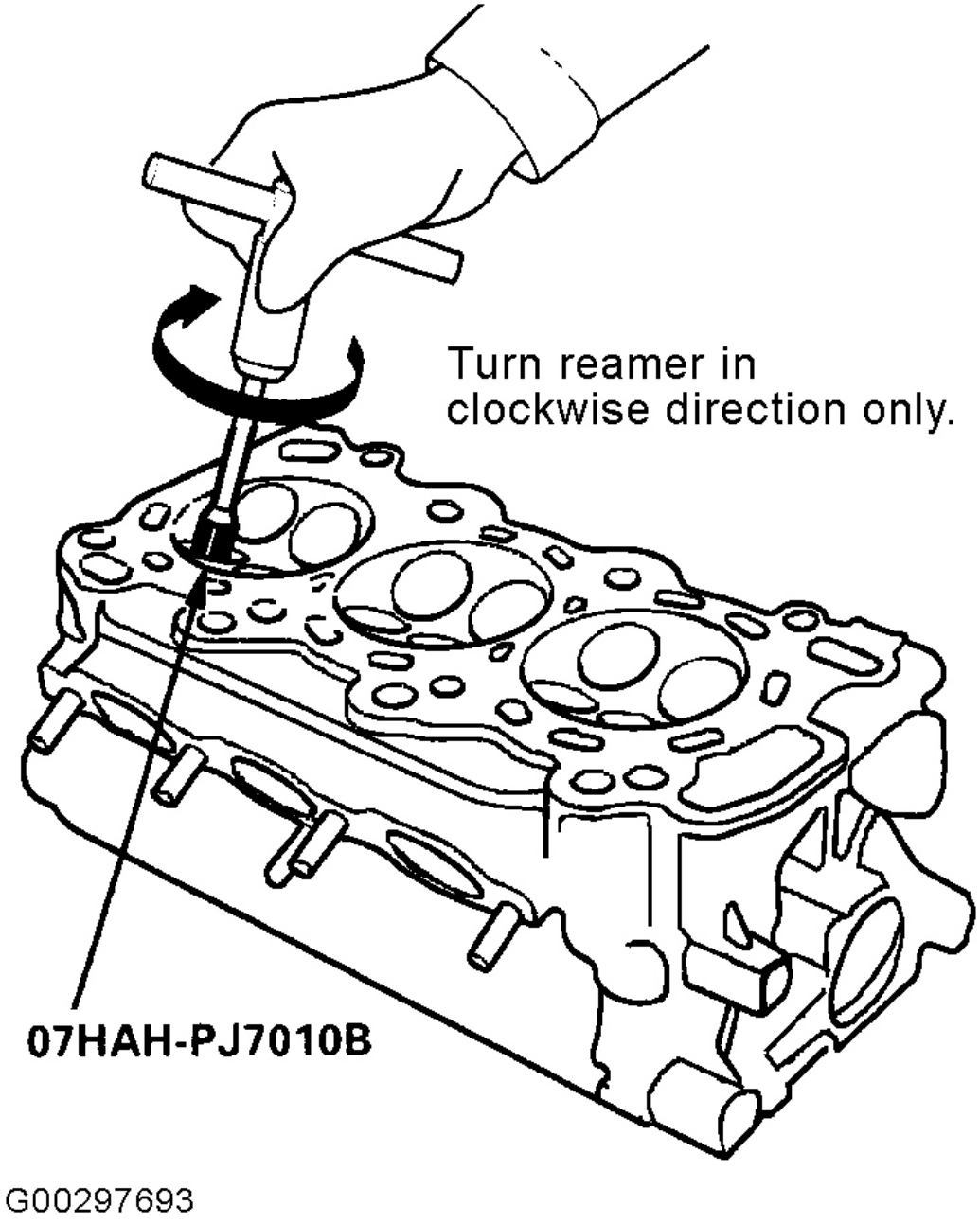


Fig. 141: Reaming Valve Guide
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Valve Seat Reconditioning

1. Inspect the 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. See **Fig. 142**.
3. Carefully cut a 45° seat, removing only enough material to ensure a smooth and concentric seat.
4. Bevel the upper and lower edges at the angles. See **Fig. 143**. Check the width of the seat and adjust accordingly.
5. Make one more very light pass with the 45° cutter to remove any possible burrs caused by the other cutters. See **VALVE SEAT WIDTH** table.

VALVE SEAT WIDTH

Application	Specification - In. (mm)
Standard (New)	.049-.061 (1.25-1.55)
Service Limit	.079 (2)

6. After surfacing the seat, inspect for even valve seating: Apply Prussian Blue compound (A) to the valve face. See **Fig. 144**. Insert the valve in its original location in the head, then lift it and snap it closed against the seat several times.
7. The actual valve seating surface (B), as shown by the blue compound, should be centered on the seat.
   - If it is too high (closer to the valve stem), you must make a second cut with the 60° cutter (1999 model and 2001-03 models exhaust side) or the 67.5° cutter (2001-03 models intake side) to move it down, then one more cut with the 45° cutter to restore seat width.
   - If it is too low (close to the valve edge), you must make a second cut with the 30° cutter to move it up, then make one more cut with the 45° cutter to restore seat width.

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

8. Insert the intake and exhaust valves in the head and measure the valve stem installed height (A). See **Fig. 145** and **INTAKE/EXHAUST STEM INSTALLED HEIGHT** table.
9. If the valve stem installed height is over the service limit, replace the valve and recheck. If it is still over the service limit, replace the cylinder head; the valve seat in the head it too deep.

INTAKE/EXHAUST STEM INSTALLED HEIGHT

Application	Specification - In. (mm)
Intake	
Standard (New)	.1.841-1.872 (46.75-47.55)
Service Limit	1.882 (47.80)
Exhaust	
Standard (New)	1.838-1.869 (46.68-47.48)
Service Limit	1.879 (47.73)

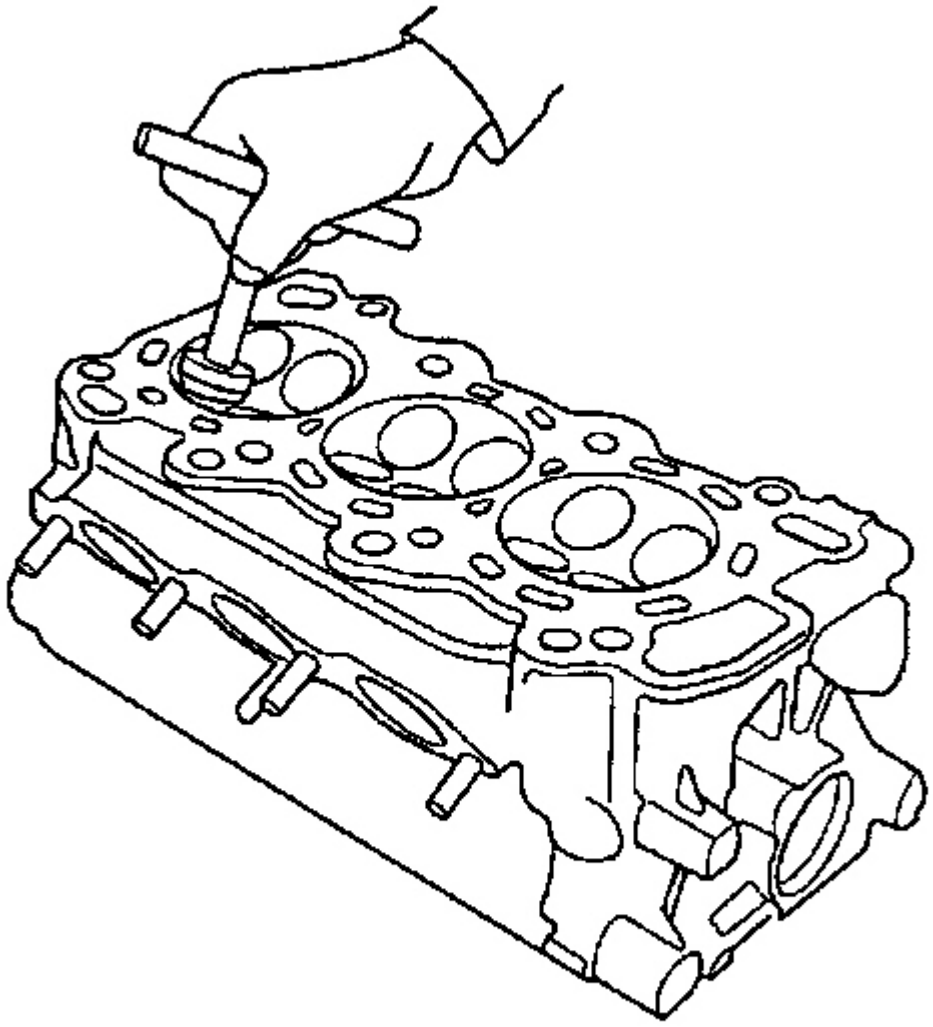


Fig. 142: Renewing Valve Seats In Cylinder Head Using Valve Seat Cutter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

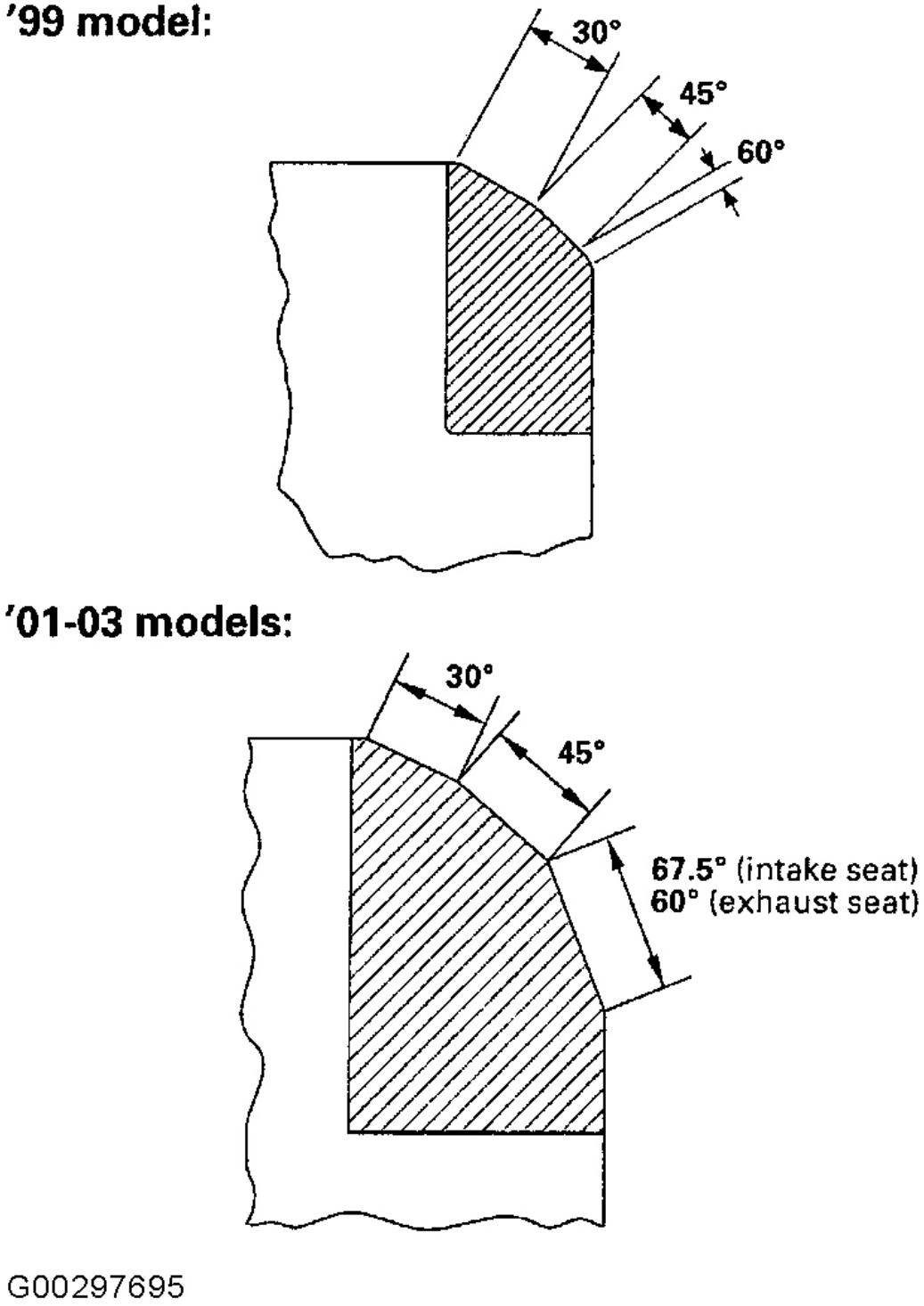


Fig. 143: Beveling Upper & Lower Edges

Courtesy of AMERICAN HONDA MOTOR CO., INC.

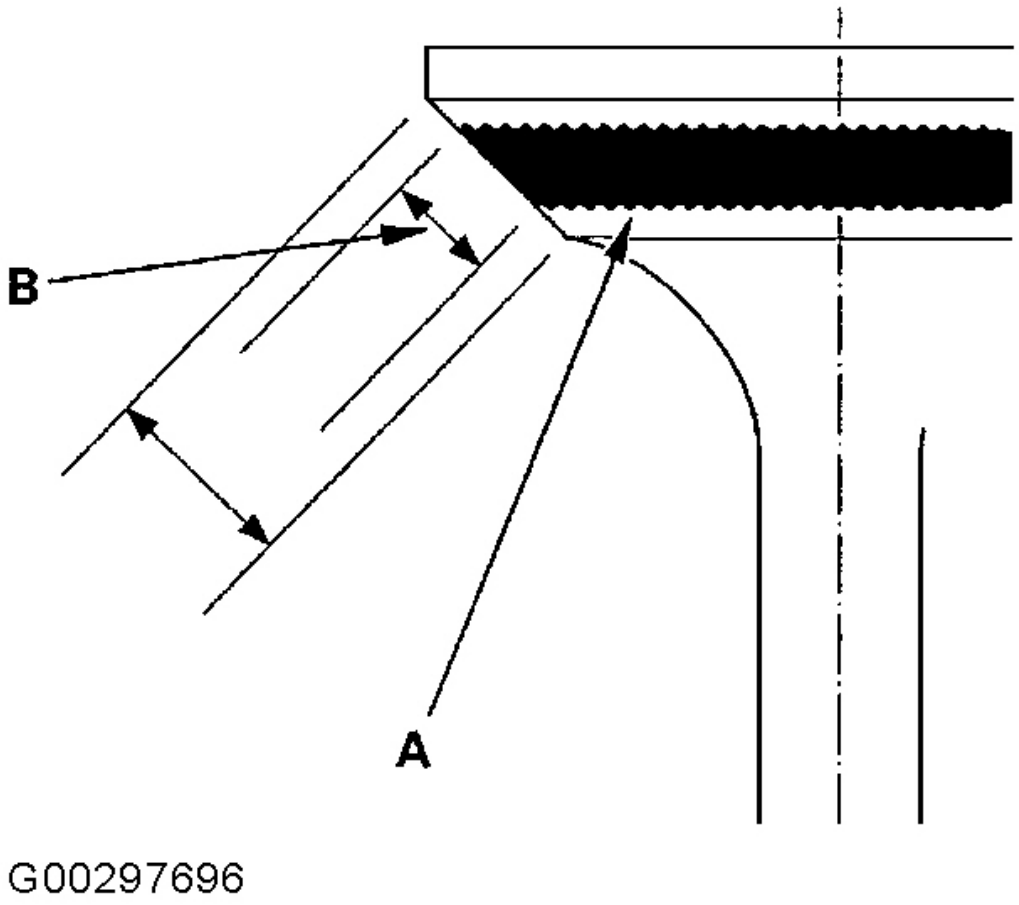


Fig. 144: Apply Prussian Blue Compound
Courtesy of AMERICAN HONDA MOTOR CO., INC.

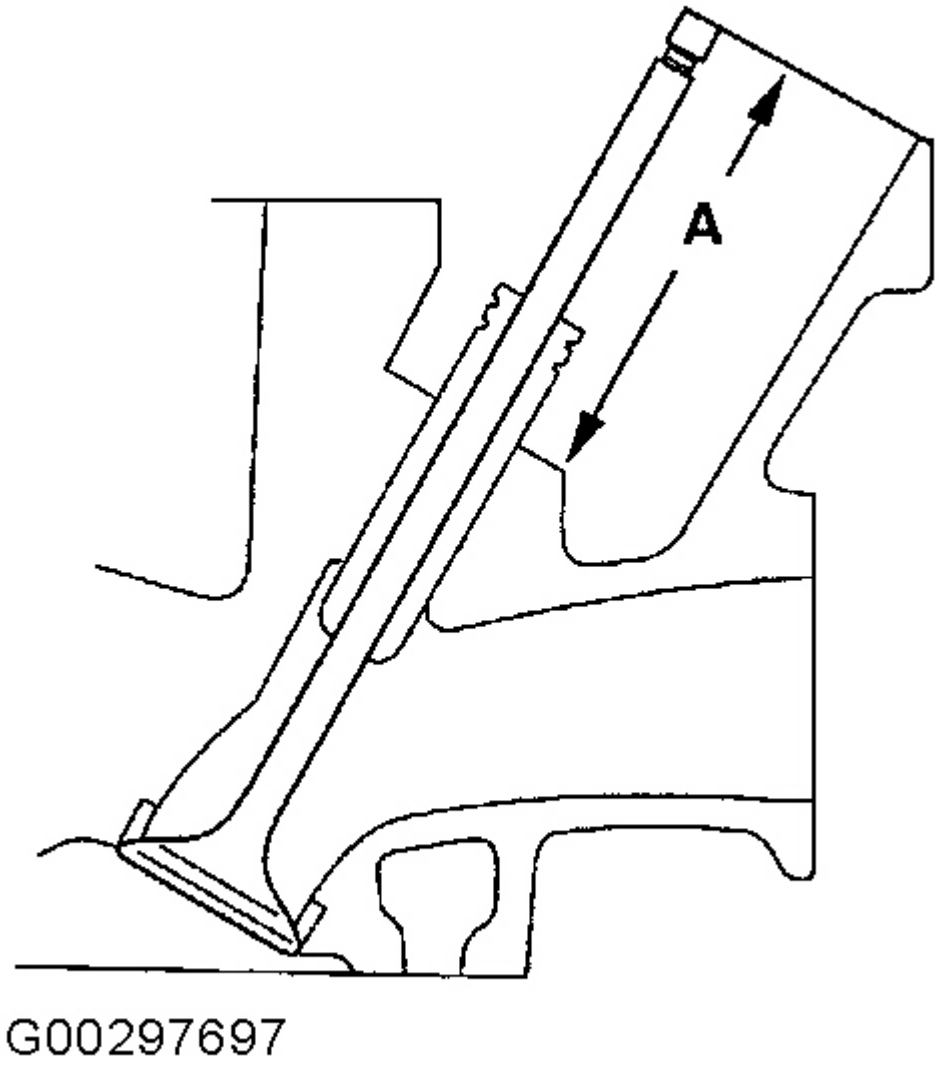


Fig. 145: Inserting Intake & Exhaust Valves & Measuring Valve Stem Installed Height
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Valve Inspection

1. Remove the valves. See **VALVES, SPRINGS & VALVE SEALS (REMOVAL)**.
2. Measure valve in these areas. See **Fig. 146** or **Fig. 147** and **INTAKE/EXHAUST VALVE DIMENSIONS** or **INTAKE/EXHAUST VALVE DIMENSIONS (2002-03 MODELS) (J32A1 ENGINE)** table(s).

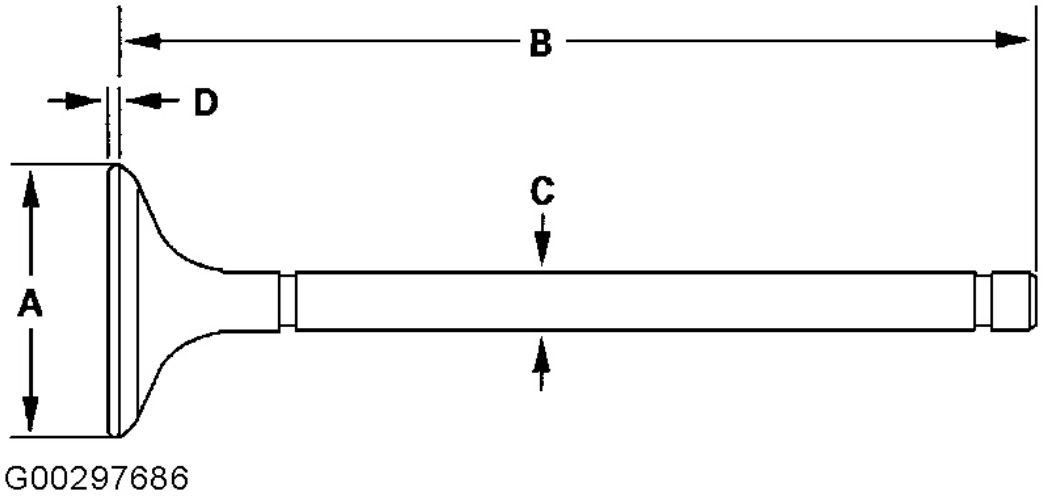


Fig. 146: Measuring Valve (1999-2001 Models)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

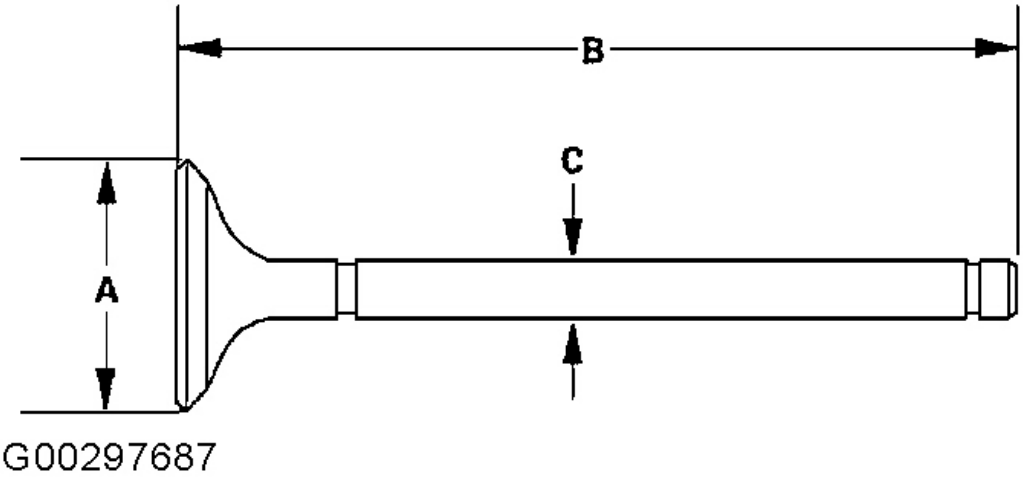


Fig. 147: Measuring Valve (2002-03 Models)
Courtesy of AMERICAN HONDA MOTOR CO., INC.

INTAKE/EXHAUST VALVE DIMENSIONS (1999-2001 Models)

Application	Specification - In. (mm)

Intake	
Standard (New) (1)	
A	1.335-1.343 (33.90-34.10)
B	4.522-4.533 (114.85-115.15)
C	.2159-.2163 (5.485-5.495)
D	.033-.045(.85-1.15)
Service Limit (1)	
C	.2148 (5.455)
D	.026 (.65)
Exhaust	
Standard (New) (1)	
A	1.138-1.146 (28.90-29.10)
B	4.443-4.455 (112.85-113.15)
C	.2146-.2150 (5.450-5.460)
D	.041-.0453 (1.05-1.35)
Service Limit (1)	
C	.2134 (5.420)
D	.037 (.95)
(1) See **Fig. 146**.	

INTAKE/EXHAUST VALVE DIMENSIONS (2002-03 MODELS) (J32A1 ENGINE)

Application	Specification - In. (mm)
Intake	
Standard (New) (1)	
A	1.374-1.382 (34.90-35.10)
B	4.555-4.579 (115.70-116.30)
C	.2159-.2163 (5.485-5.495)
Service Limit (1)	
C	.2148 (5.455)
Exhaust	
Standard (New) (1)	
A	1.177-1.185 (29.90-30.10)
B	4.484-4.508 (113.90-114.50)
C	.2146-.2150 (5.450-5.460)
Service Limit (1)	
C	.2134 (5.420)
(1) See **Fig. 147**.	

Valve, Springs & Valve Seals Installation

1. Coat the valve stems with engine oil. Install the valves in the valve guides.
2. Check that the valves move up and down smoothly.
3. Install the spring seats on the cylinder head.

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

4. Install the new valve seals (A) using the valve guide seal installer (B). See **Fig. 148**.
5. Install the valve spring and valve retainer. Place the end of the valve spring with closely wound coils toward the cylinder head.
6. Install the valve spring compressor. Compress the spring and install the valve keepers. See **Fig. 149**.
7. Lightly tap the end of each valve stem 2 or 3 times with a plastic mallet (A) to ensure proper seating of the valve and valve keepers. See **Fig. 150**. Tap the valve stem only along its axis so you do not bend the stem.

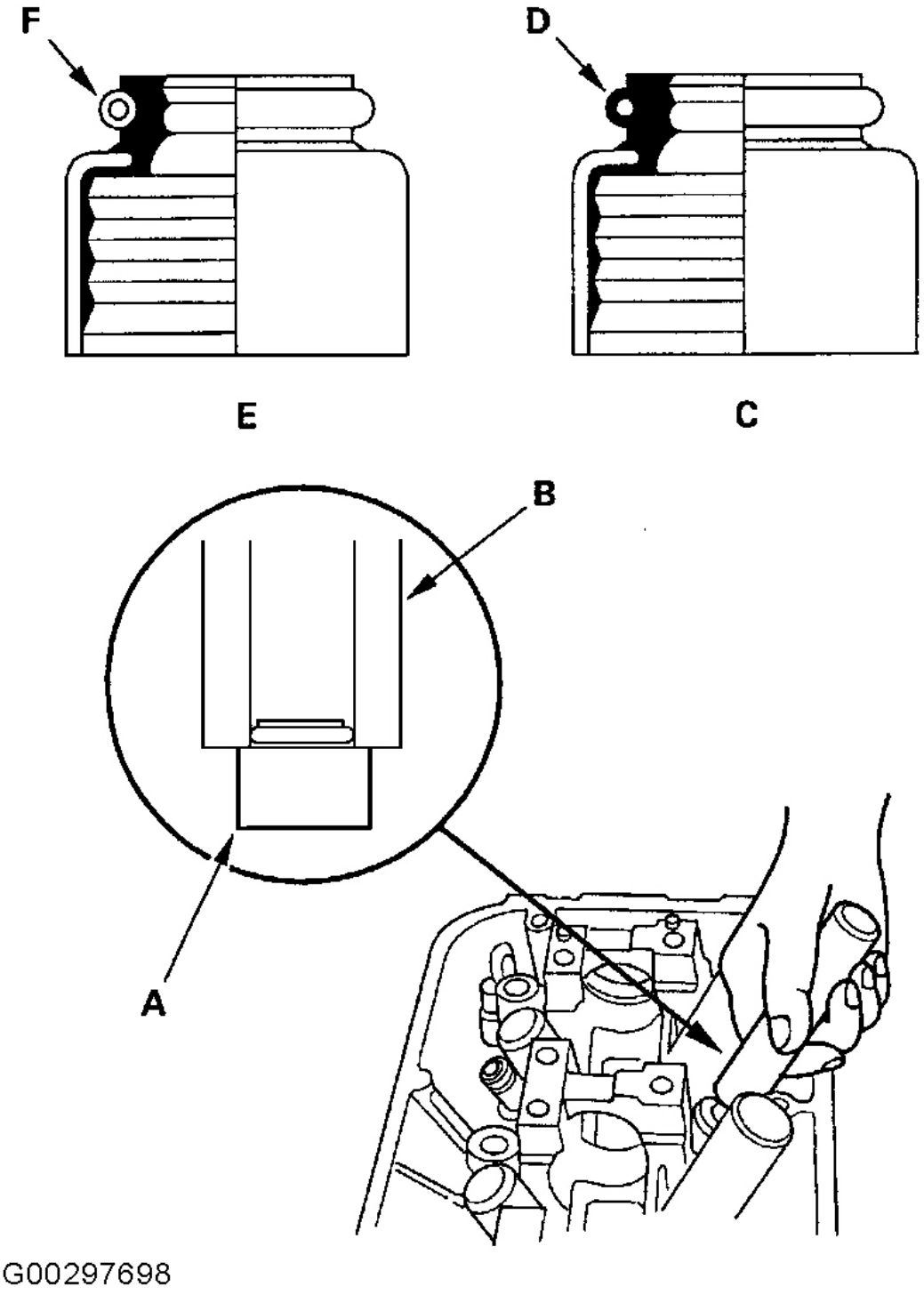


Fig. 148: Installing New Valve Seats Using Valve Guide Seal Installer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

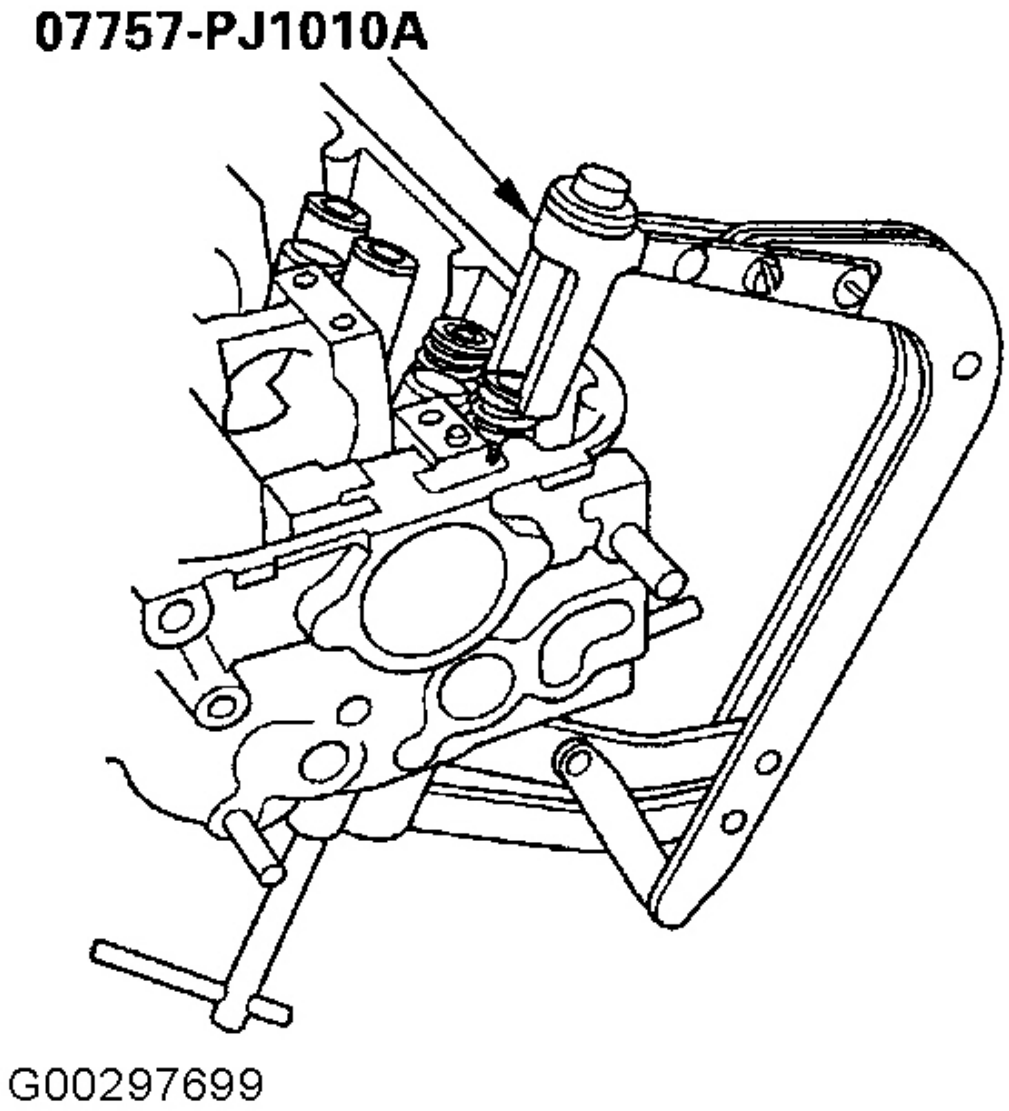


Fig. 149: Compressing Spring & Installing Valve Keepers
Courtesy of AMERICAN HONDA MOTOR CO., INC.

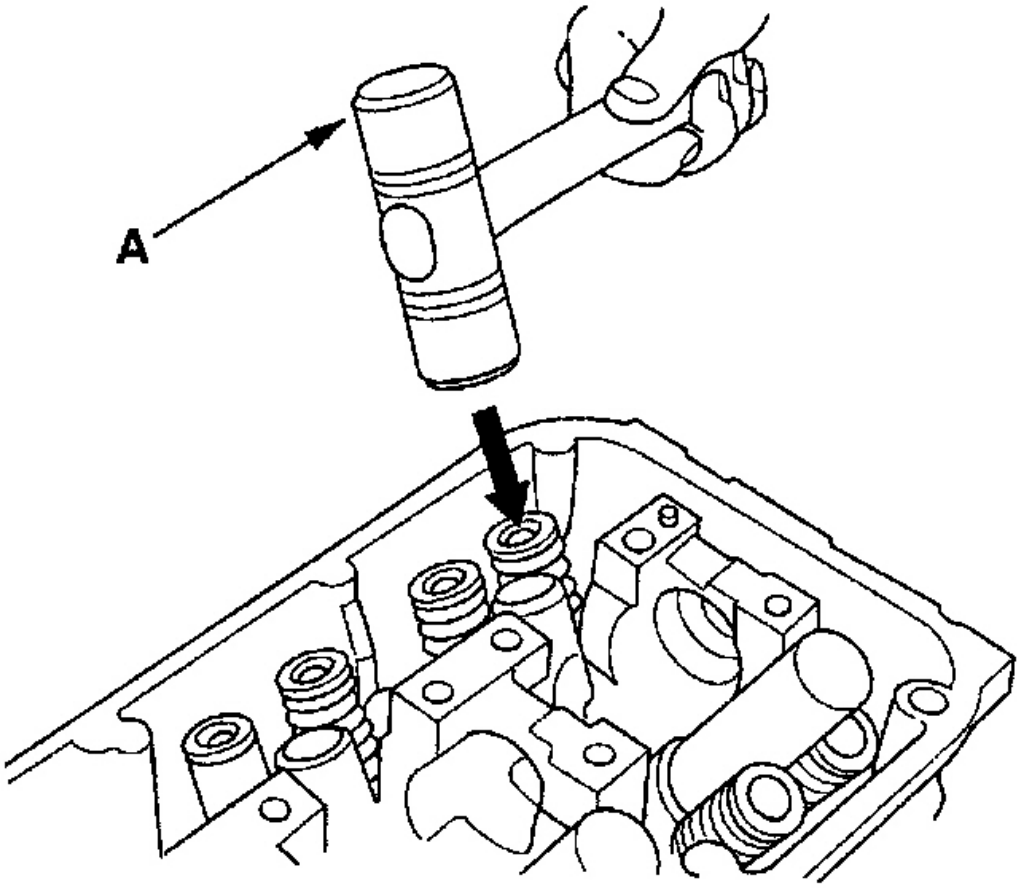


Fig. 150: Lightly Tapping End Of Each Valve Stem With Mallet
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CONNECTING ROD & CRANKSHAFT END PLAY INSPECTION

1. Remove the baffle plate. Remove the oil screen (A), baffle plate (B) and oil pump (C). See **Fig. 151**.
2. Measure the connecting rod end play with a feeler gauge (A) between the connecting rod (B) and crankshaft (C). See **Fig. 152** and **CONNECTING ROD END PLAY** table.

CONNECTING ROD END PLAY

Application	Specification - In. (mm)
Standard (New)	.006-.014 (.15-.35)
Service Limit	.018 (.45)

3. If the connecting rod end play is out-of-tolerance, install a new connecting rod and recheck. If it is still out-of-tolerance, replace the crankshaft. See **CRANKSHAFT & PISTON**.
4. Push the crankshaft firmly away from the dial indicator, and zero the dial against the end of the crankshaft. Then pull the crankshaft firmly back toward the indicator; dial reading should not exceed the service limit. See Fig. 153 and **CRANKSHAFT END PLAY** table.
5. If the end play is out-of-tolerance, replace the thrust washers and recheck. If it is still out-of-tolerance, replace the crankshaft.

CRANKSHAFT END PLAY

Application	Specification - In. (mm)
Standard (New)	.004-.014 (.10-.35)
Service Limit	.18 (.45)

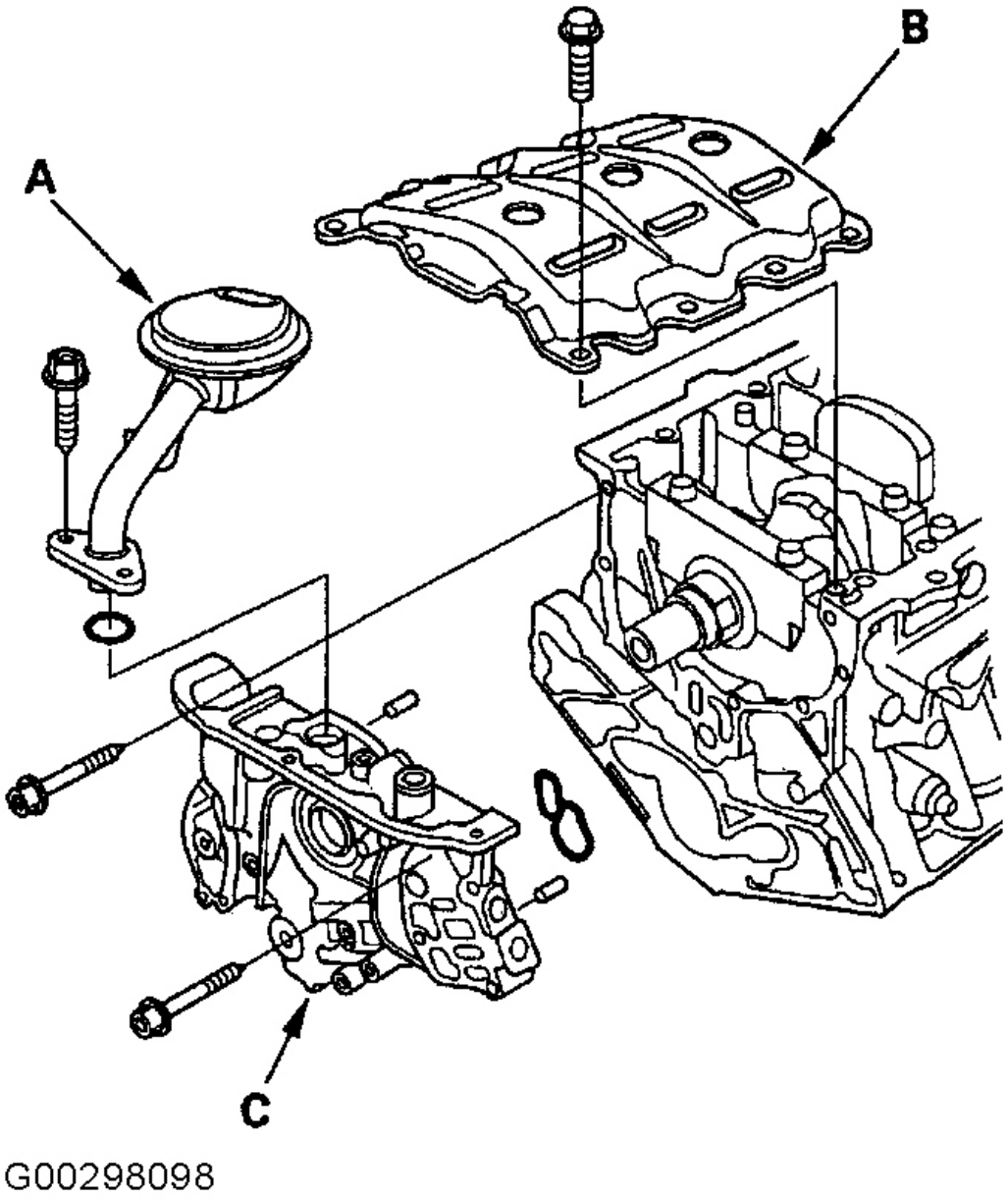


Fig. 151: Removing Oil Screen, Baffle Plate & Oil Pump
Courtesy of AMERICAN HONDA MOTOR CO., INC.

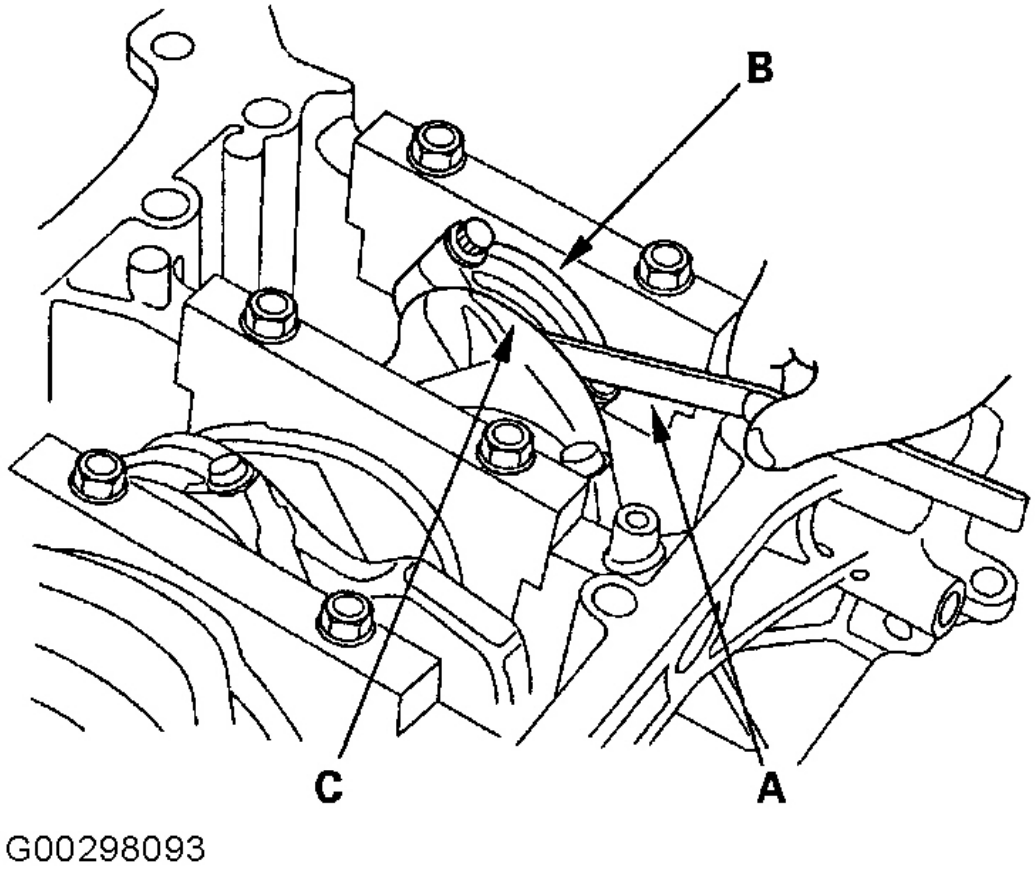


Fig. 152: Measuring Connecting Rod End Play With Feeler Gauge
Courtesy of AMERICAN HONDA MOTOR CO., INC.

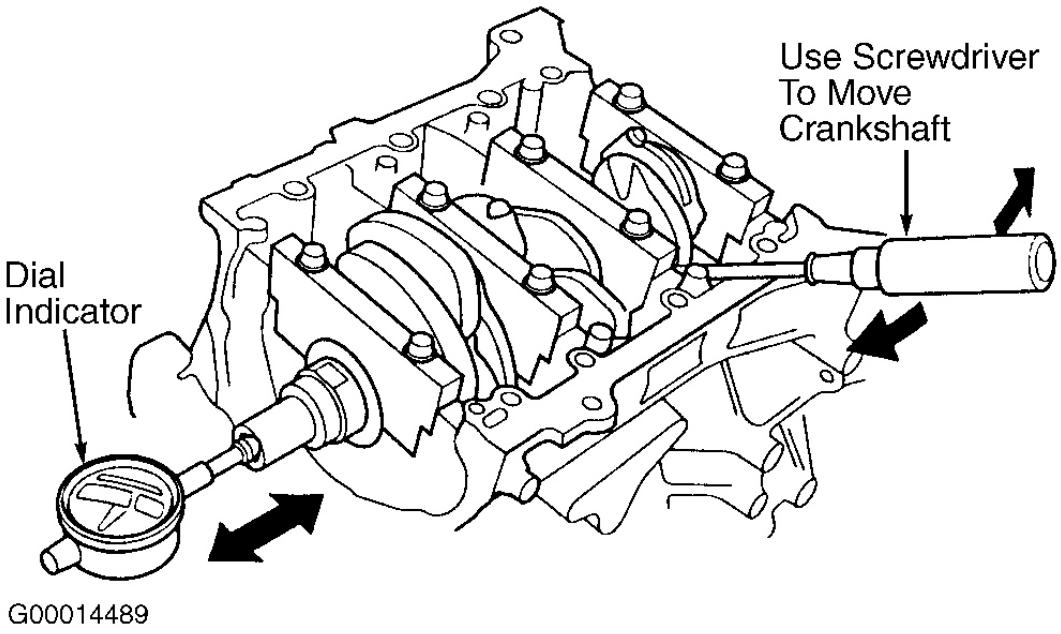


Fig. 153: Checking Crankshaft End Play
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CRANKSHAFT & PISTON

Removal

1. Remove the crankshaft position (CKP) sensor (A) from the oil pump, then remove the timing belt drive pulley (B). See **Fig. 90**.
2. Remove oil pan.
3. Remove the engine block end cover. See **Fig. 154**.
4. Remove the oil screen (A), baffle plate (B) and oil pump (C). See **Fig. 151**.
5. If you can feel a ridge of metal or hard carbon around the top of any cylinder, remove it with a ridge reamer (A). See **Fig. 155**. Follow the reamer manufacturer's instructions. If the ridge is not removed, it may damage the piston as its pushed out.
6. Remove the connecting rod caps after setting the crank pin at bottom dead center (BDC) for each cylinder. See **Fig. 156**. Remove the piston assembly by pushing on the connecting rod. Take care not to damage the crank pin or cylinder with the connecting rod.

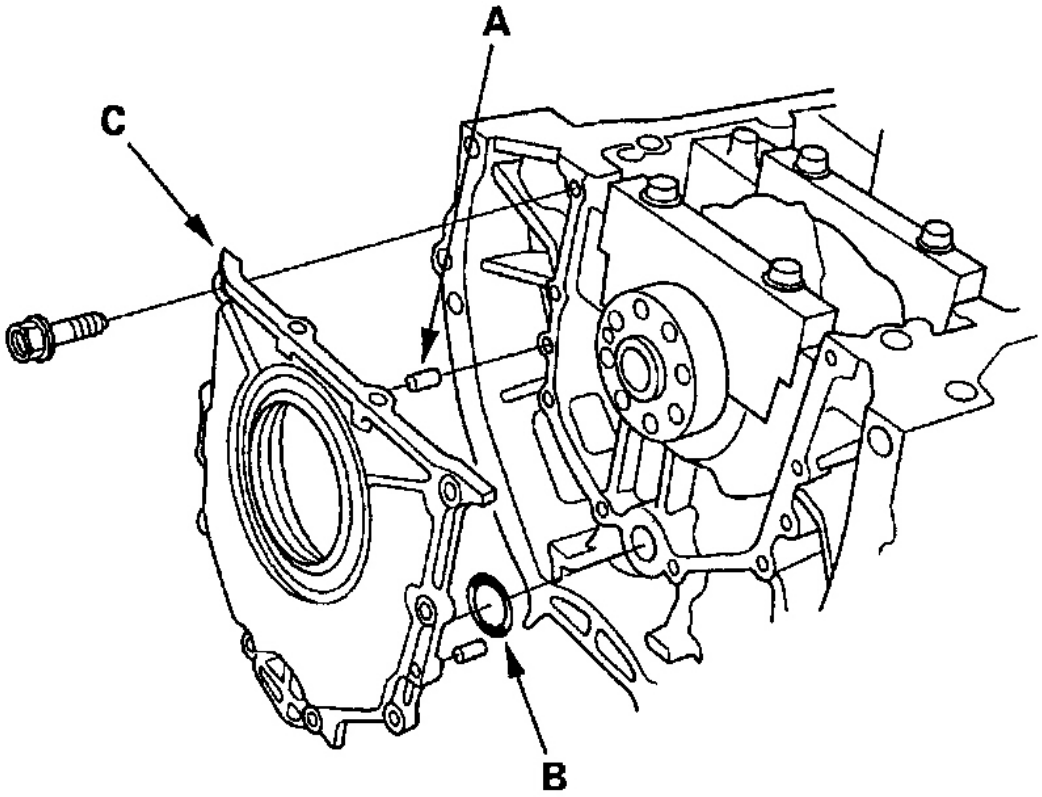


Fig. 154: Removing Engine Block End Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

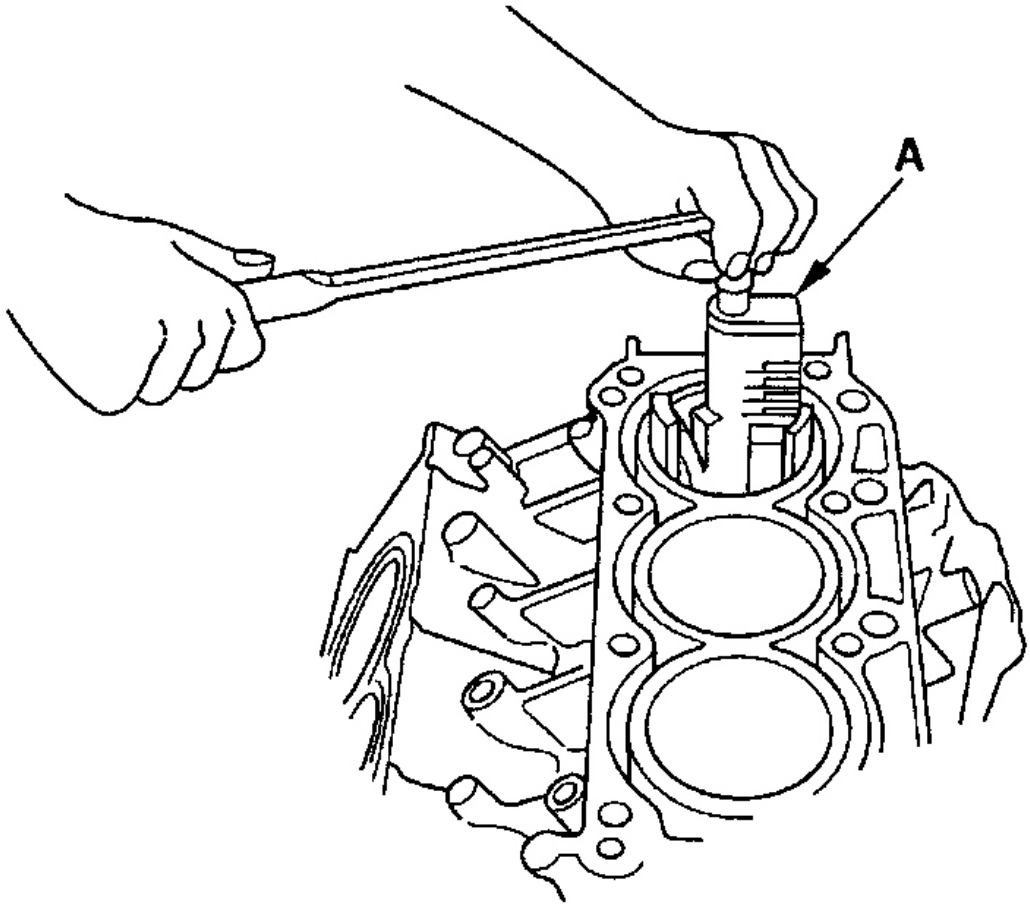


Fig. 155: Removing Ridge Using Reamer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

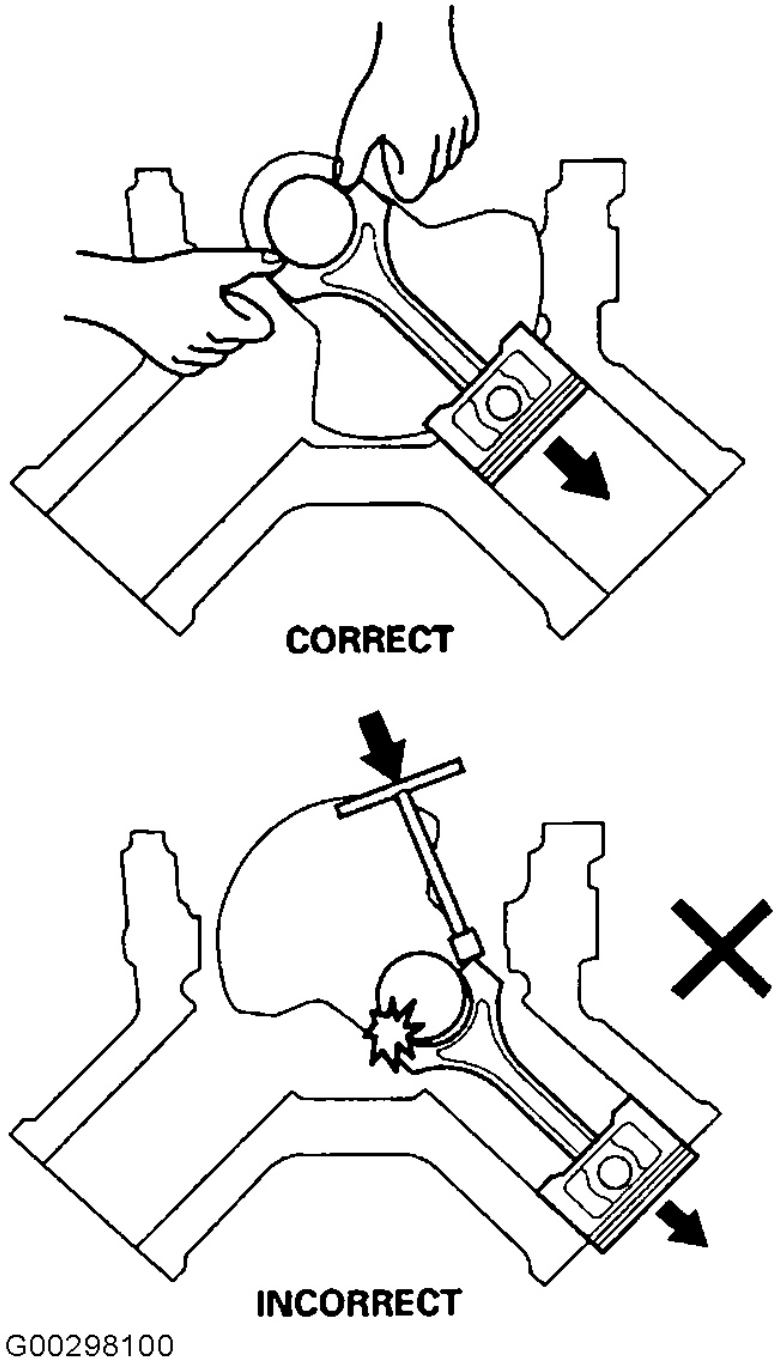


Fig. 156: Removing Connecting Rod Caps After Setting Crank Pin
Courtesy of AMERICAN HONDA MOTOR CO., INC.

7. Remove the bearing from the cap. Keep all caps/bearings in order.
8. Remove the upper bearing halves from the connecting rods and set them aside with their respective caps.

9. After removing a piston/connecting rod assembly, reinstall the cap on the rod.
10. To avoid mix up during reassembly, mark each piston/connecting rod assembly with its cylinder number.
11. Remove the bearing cap bolts (A) and bearing cap side bolts (B), then remove the bearing cap (C). See **Fig. 157**.
12. Lift the crankshaft (A) out of the cylinder block, being careful not to damage the journals. See **Fig. 158**.
13. Reinstall the main caps and bearings on the cylinder block in the proper order.

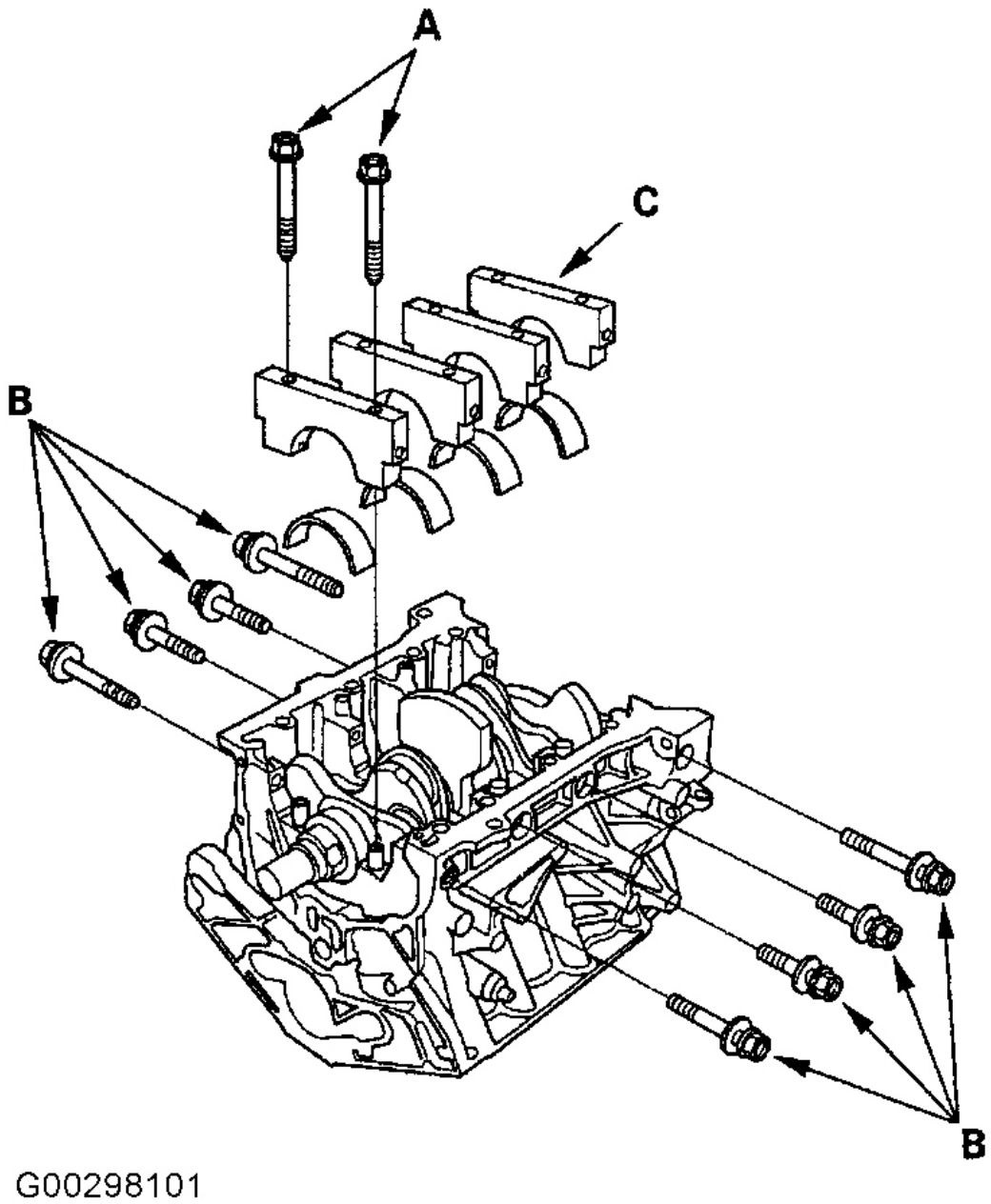


Fig. 157: Removing Bearing Cap Bolts & Side Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

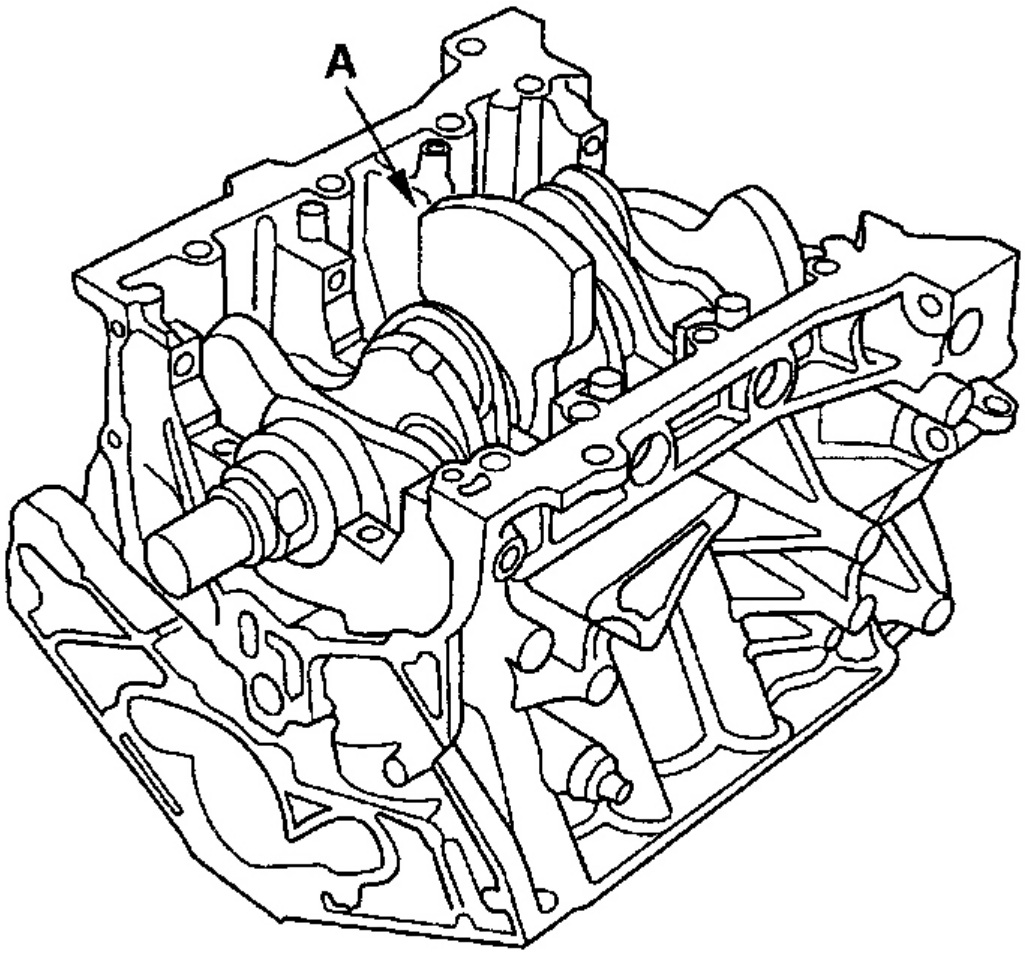


Fig. 158: Lifting Crankshaft Out Of Cylinder Block
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Installation

1. Measure the diameter of each connecting rod bolt at point A and point B. See **Fig. 159**.
2. Calculate the difference in diameter between point A and point B. Difference cannot exceed .004" (0-.1 mm).
3. If the difference is diameter is out of tolerance, replace the connecting rod bolt.
4. Check the connecting rod bearing clearance with plastigage. See **ROD BEARING CLEARANCE INSPECTION**.
5. Check the main bearing clearance with plastigage. See **MAIN BEARING CLEARANCE**

INSPECTION.

6. Install the bearing halves in the cylinder block and connecting rods.
7. Apply engine oil to the main bearings and rod bearings.
8. Lower the crankshaft (A) into the block. See **Fig. 158**.
9. Install the thrust washers (A) in the No. 3 journal. See **Fig. 160**.
10. Install the bearings (A) and bearing caps (B) with the arrow (C) facing the timing belt end of the engine. See **Fig. 161**.
11. Apply engine oil to the bolt threads and flange, then install the bearing cap bolts (D) and bearing cap side bolts (E).

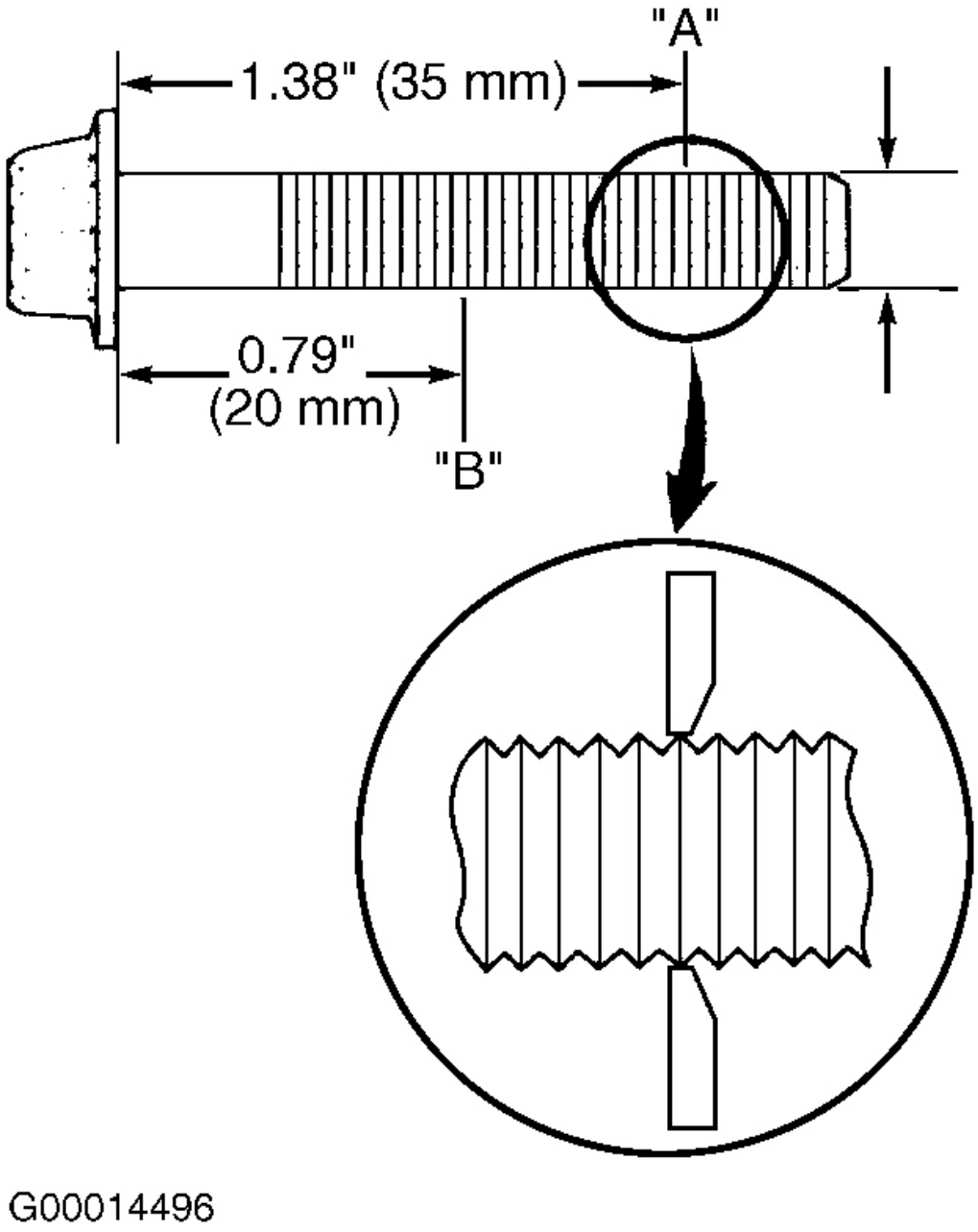


Fig. 159: Locating Measuring Points For Connecting Rod Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

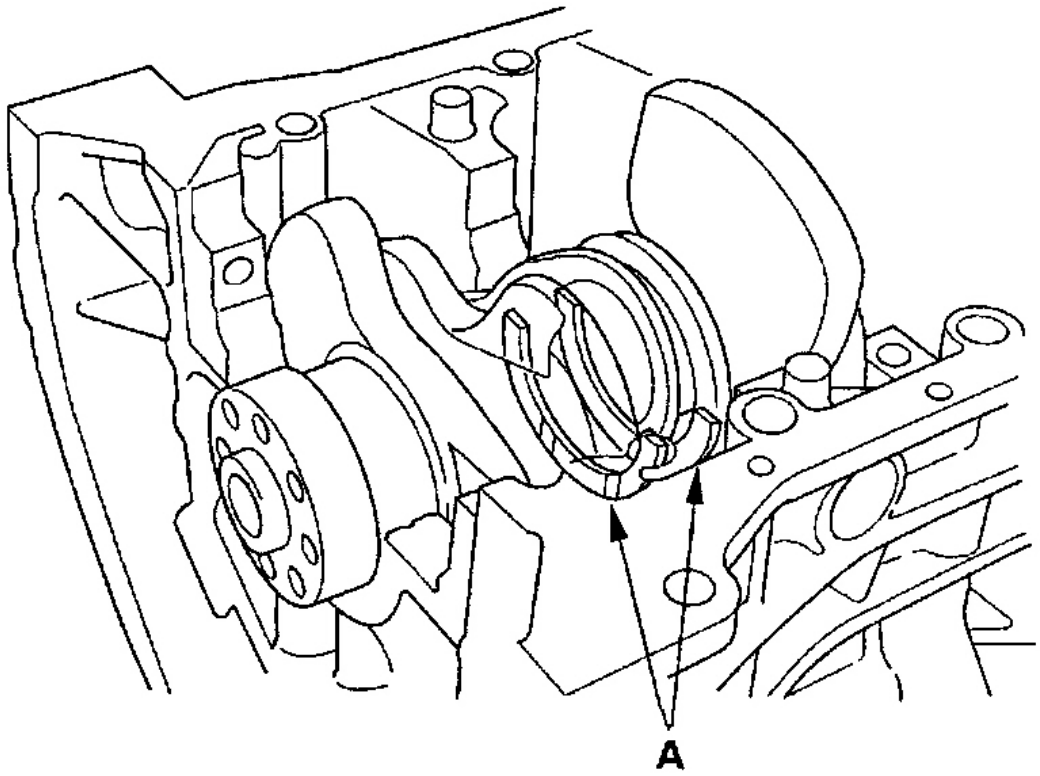


Fig. 160: Installing Thrust Washers
Courtesy of AMERICAN HONDA MOTOR CO., INC.

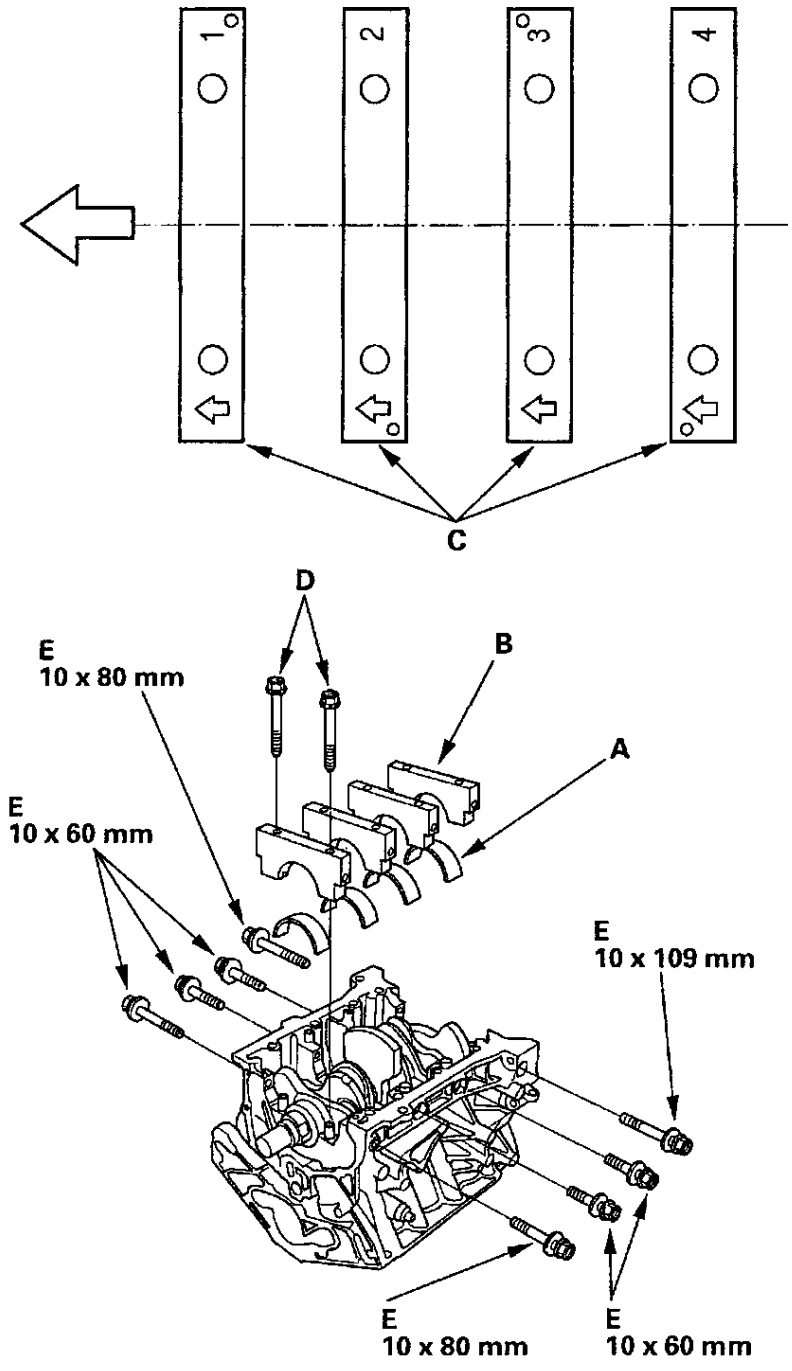


Fig. 161: Installing Bearings & Bearing Caps
Courtesy of AMERICAN HONDA MOTOR CO., INC.

12. Set the crankshaft to bottom dead center (BDC) for the cylinder you are working on.
13. Remove the connecting rod caps. Install the ring compressor, and check that the bearing is securely in

place.

14. Install the piston with the arrow (A) facing the timing belt side of the engine. See **Fig. 162**.
15. Position the piston in the cylinder, and tap it in using the wooden handle of a hammer (A). See **Fig. 163**. Maintain downward force on the ring compressor (B) to prevent the rings from expanding before entering the cylinder bore.
16. Stop after the ring compressor pops free and check the connecting rod-to-crank journal alignment before pushing the piston into place.
17. Line up the mark (A) on the connecting rod and cap, then install the cap. See **Fig. 164**.
18. Apply engine oil to the bolt threads. **Fig. 164** and **TORQUE SPECIFICATIONS**.
19. Mark the connecting rod (A) and bolt head (B). See **Fig. 165**.
20. Tighten the bolt until the mark on the bolt head lines up with the mark on the connecting rod (turn the bot 90°).

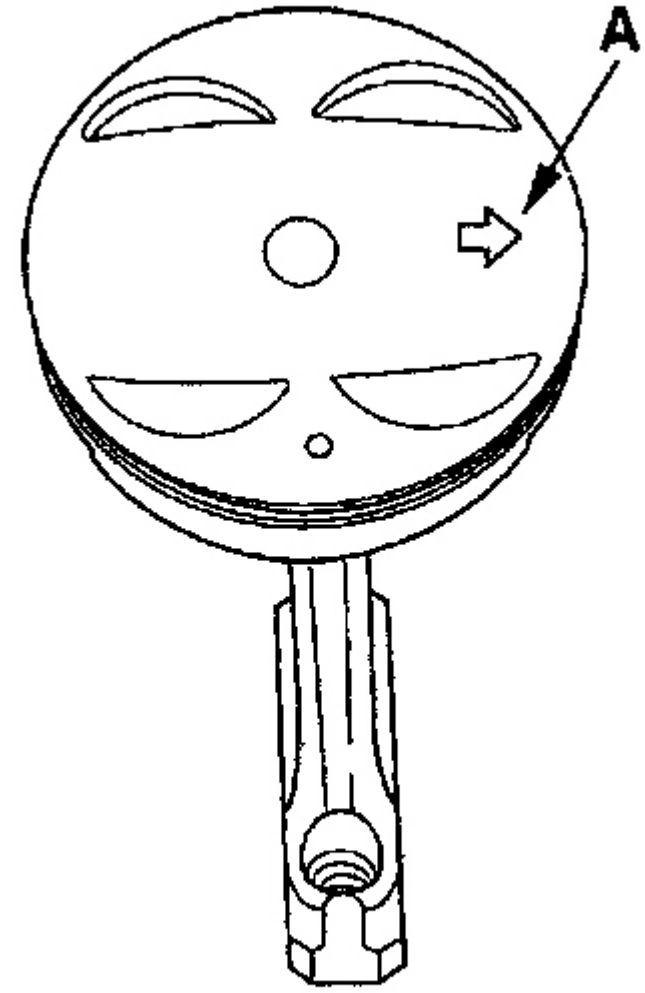


Fig. 162: Installing Piston With Arrow Facing Timing Belt Side Of Engine
Courtesy of AMERICAN HONDA MOTOR CO., INC.

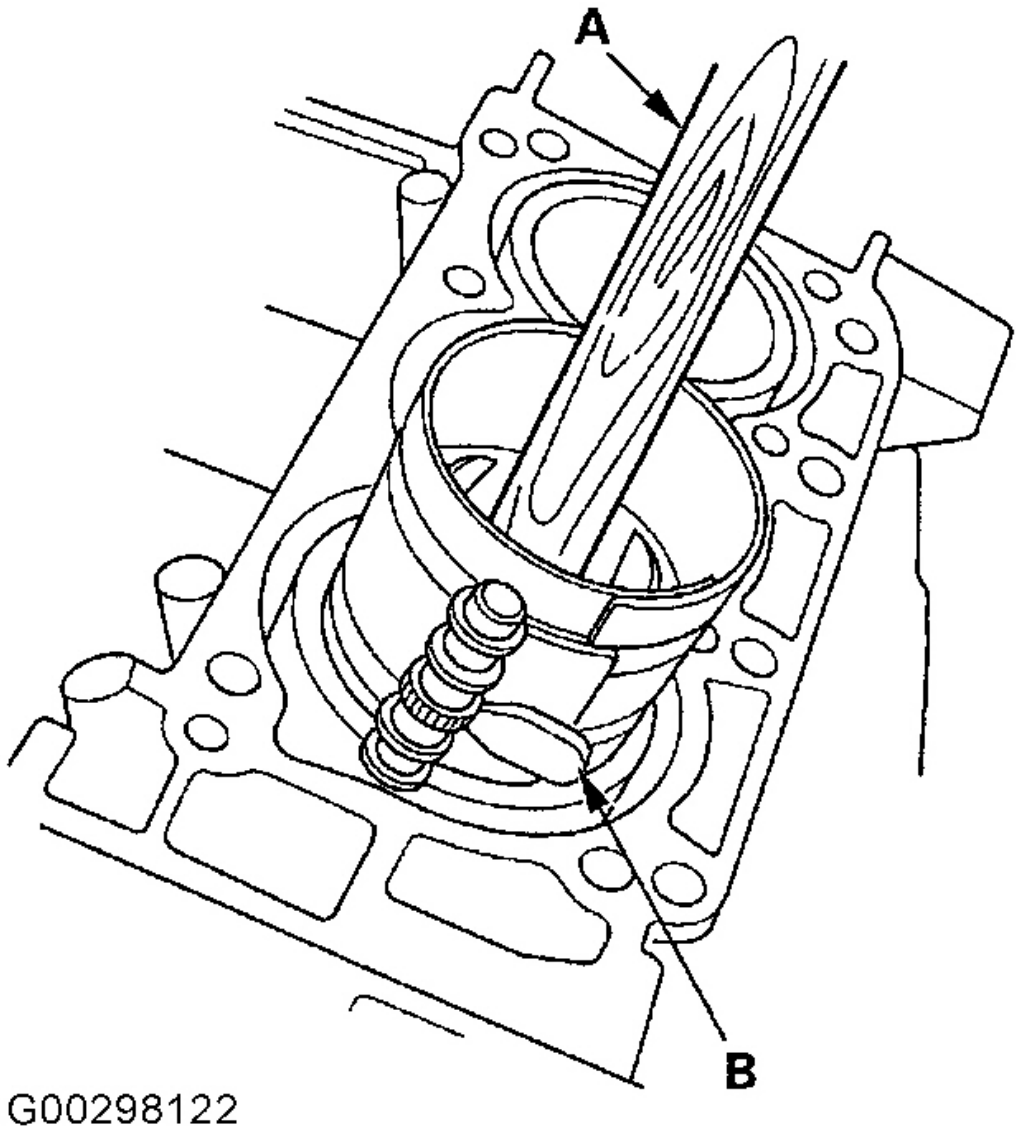


Fig. 163: Positioning Piston In Cylinder & Installing Using Wooden Handle Of Hammer
Courtesy of AMERICAN HONDA MOTOR CO., INC.

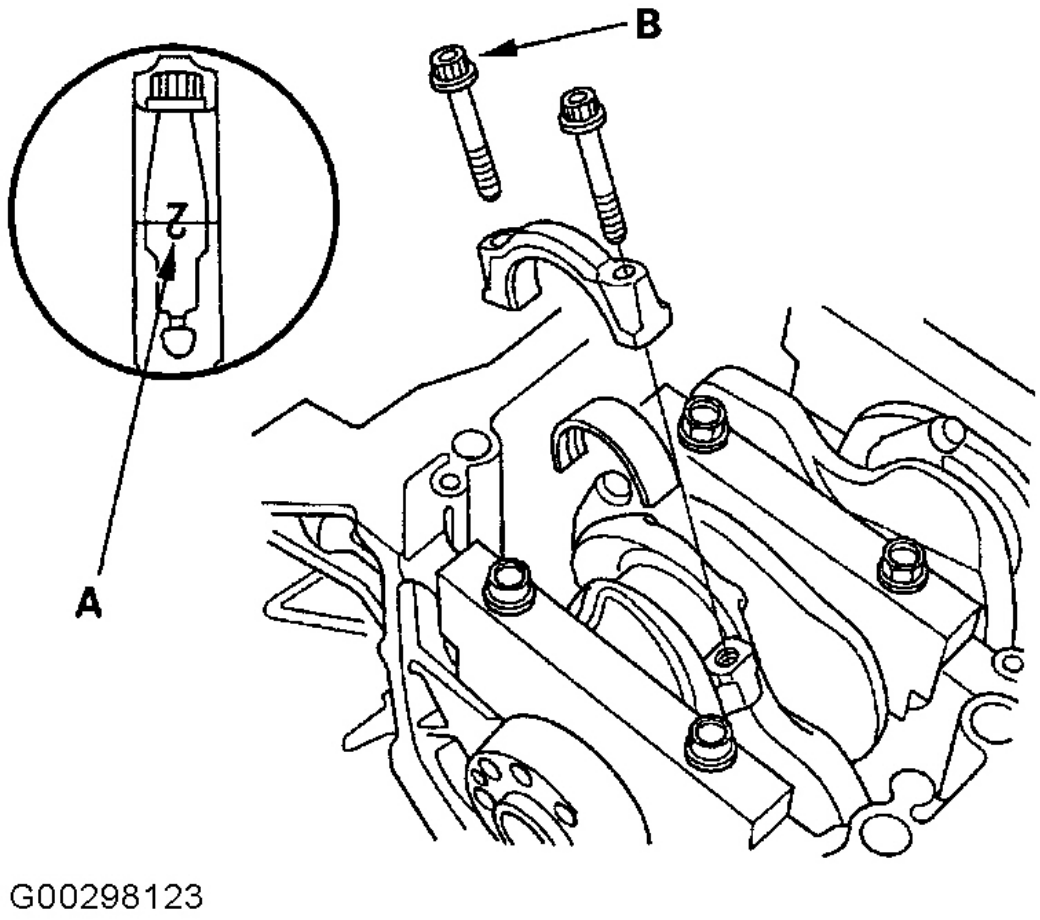


Fig. 164: Lining Up Mark On Connecting Rod & Cap
Courtesy of AMERICAN HONDA MOTOR CO., INC.

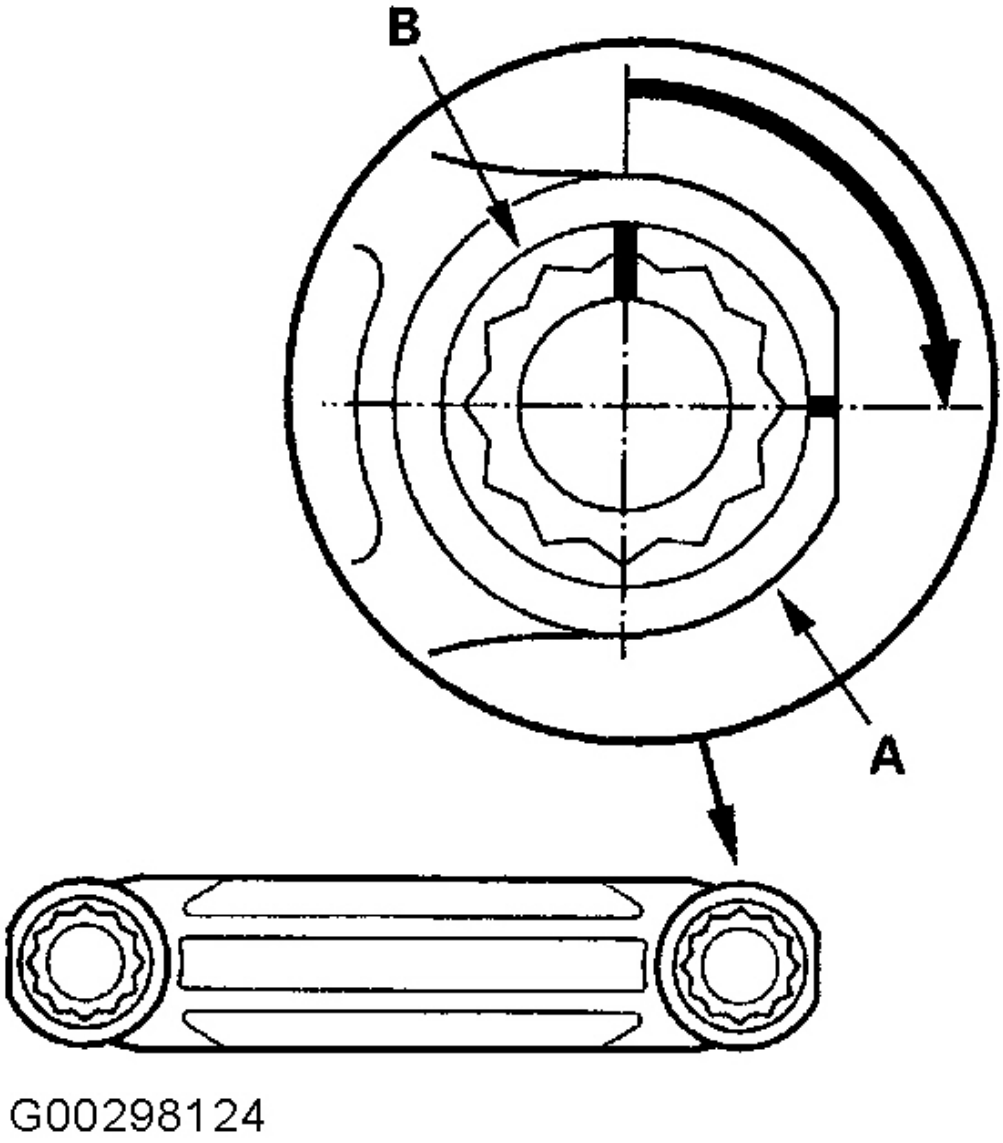
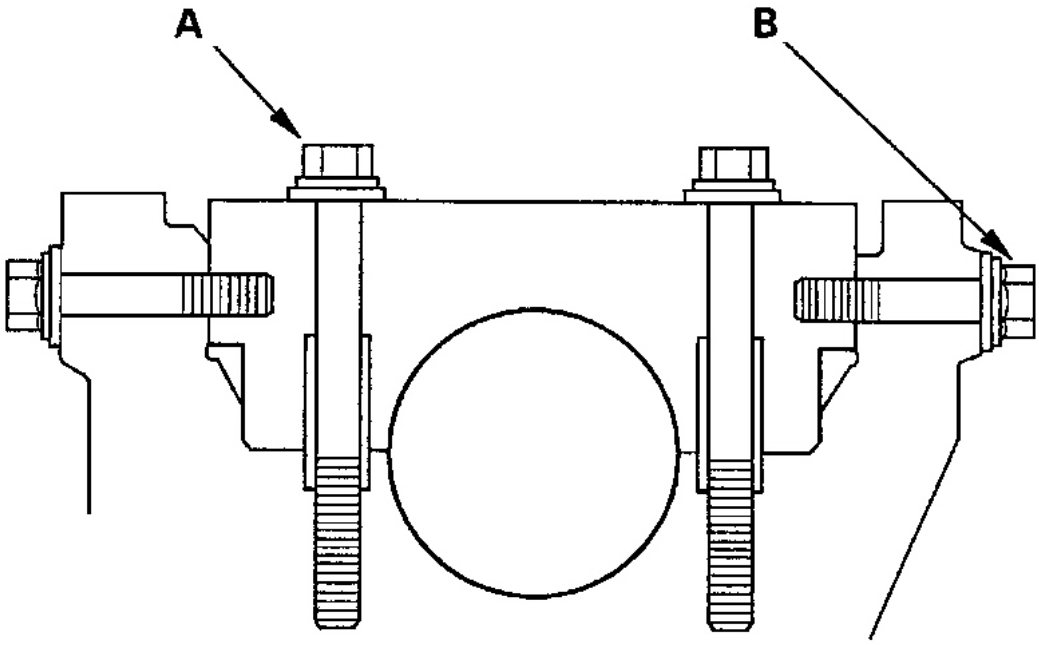


Fig. 165: Marking Connecting Rod & Bolt Head
Courtesy of AMERICAN HONDA MOTOR CO., INC.

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

21. Torque the bearing cap bolts (A), then torque the bearing cap side bolts (B). Follow the numbered sequence. See **Fig. 166**.
22. The seal mating surface on the engine block end cover should be dry. Apply a light coat of grease to the crankshaft and to the lip of the seal.
23. Drive the crankshaft oil seal squarely into the engine block and cover. See **Fig. 167**.
24. Confirm that the clearance is equal all the way around with a feeler gauge. Clearance should be between .01-.03" (.3-.7 mm). See **Fig. 168**.



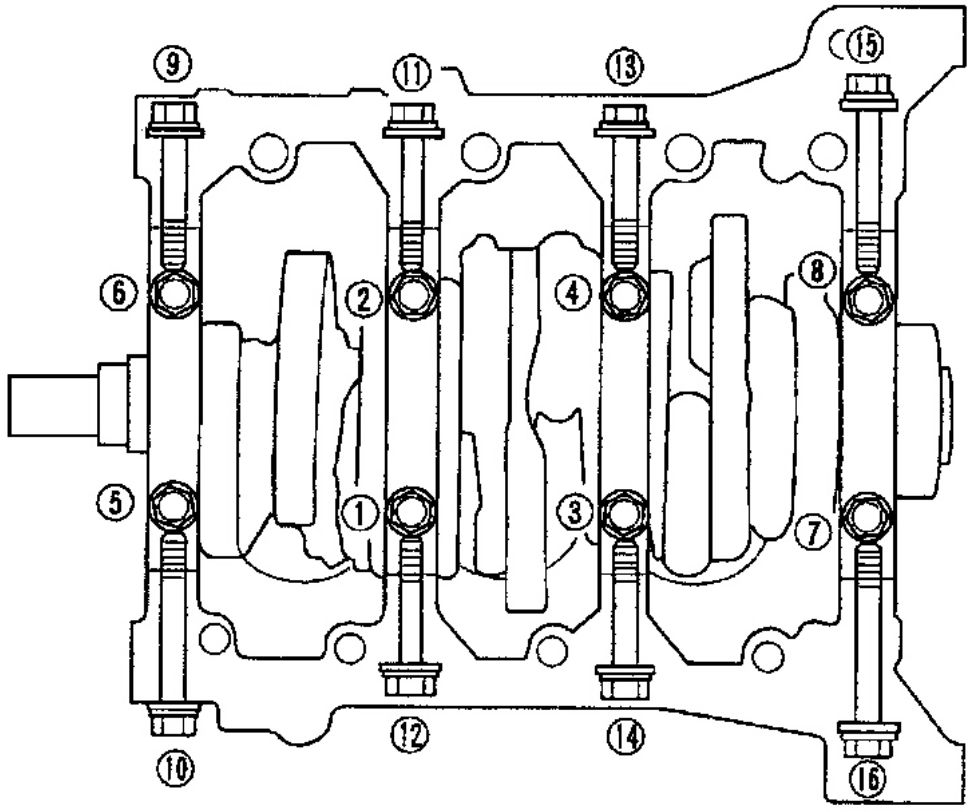


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Fig. 166: Tightening Bearing Cap Bolts & Bearing Cap Side Bolts
Courtesy of AMERICAN HONDA MOTOR CO., INC.

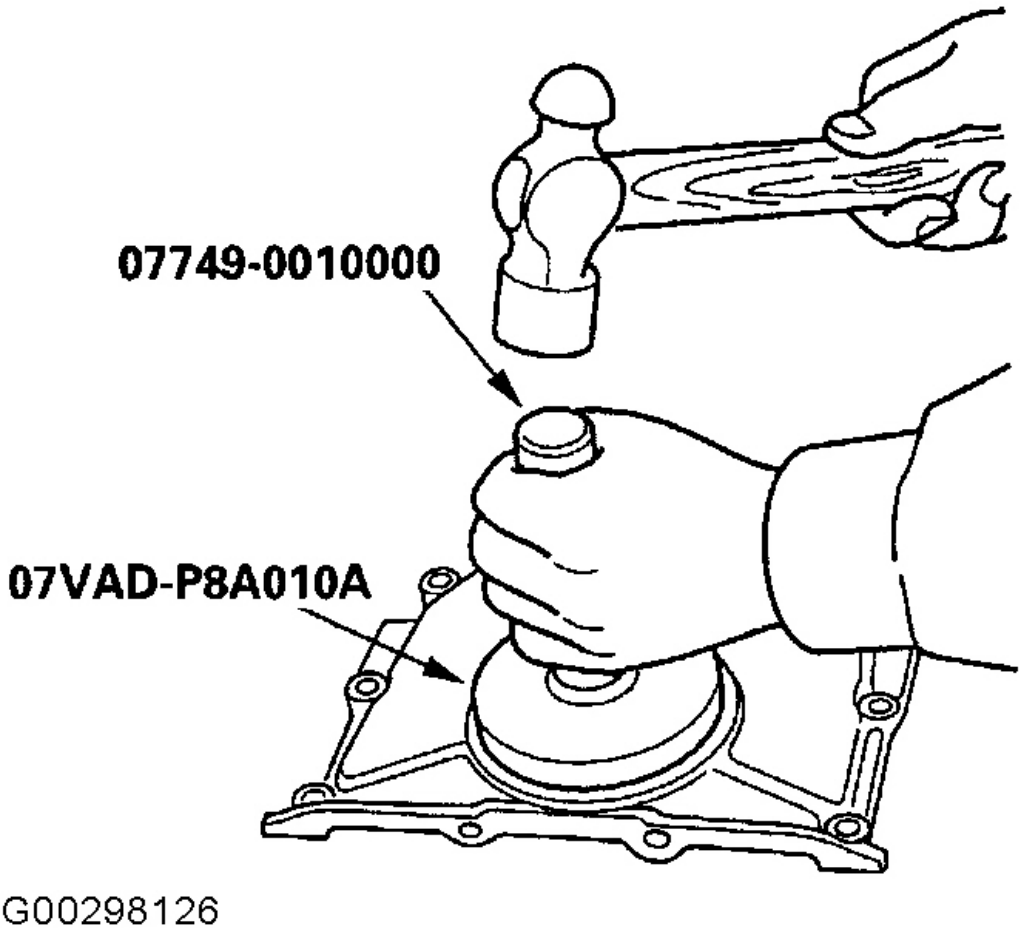


Fig. 167: Driving Crankshaft Oil Seal Squarely Into Engine Block End Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

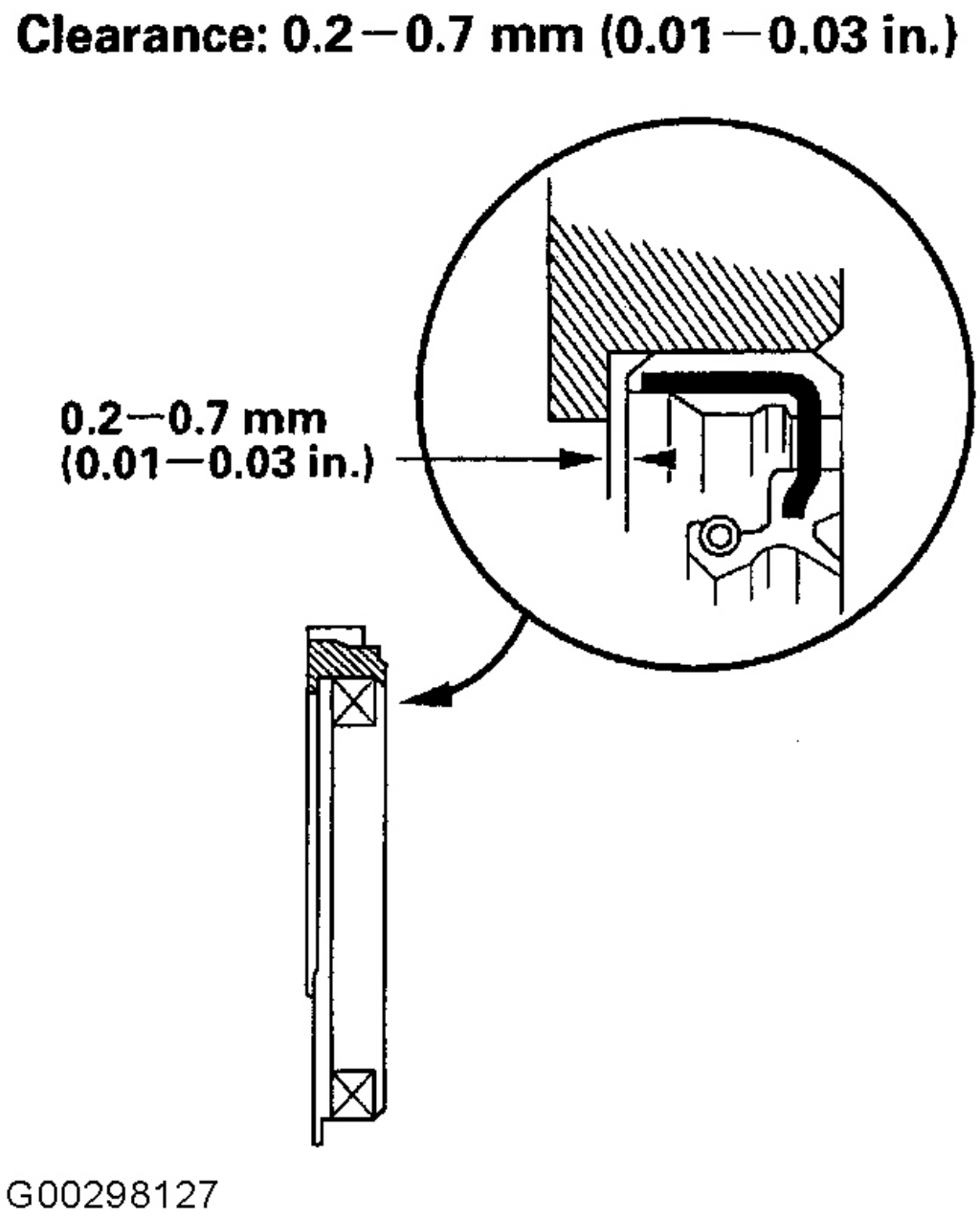


Fig. 168: Confirming Clearance Equal All Around With Feeler Gauge
Courtesy of AMERICAN HONDA MOTOR CO., INC.

25. Clean and dry the engine block and cover mating surfaces.

NOTE: DO NOT install the parts if 5 minutes or more have elapsed since applying

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

26. Apply liquid gasket, part No. 08718-001 or 08718-0003, evenly to the block mating surface of the engine block end cover and to the inner threads of the bolt holes. Install the dowel pins (A), new "O"ring (B) and the left side cover (C) on the cylinder block. See **Fig. 154**.
27. After assembly, wait at least 30 minutes before filling engine with oil.
28. Clean and dry the oil pump mating surfaces.
29. Install the oil pump (A). See **Fig. 169**. Use the following steps:
    a. Install a new crankshaft oil seal in the oil pump. See step 6under INSPECTION under OIL PUMP.

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

    b. Apply liquid gasket, part No. 08718-0001 or 08718-0003, evenly to the block mating surface of the oil pump and to the inner threads of the bolt holes.
    c. Grease the lip of the oil seal and apply oil to the new "O" ring (B).
    d. Install the dowel pins (C), then align the inner rotor with the crankshaft and install the oil pump.
    e. Clean the excess grease off the crankshaft and check the seal for distortion.
30. Install the baffle plate (D), then install the oil screen (E).
31. Clean and dry the oil pan mating surfaces.

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

32. Apply liquid gasket, part No. 08718-0001 or 08718-0003, evenly to the oil pan mating surface of the block and to the inner threads of the bolt holes.
33. Install oil pan. See **Fig. 170**.
34. Tighten the bolts in 2 or 3 steps. See **Fig. 171** and **TORQUE SPECIFICATIONS**.

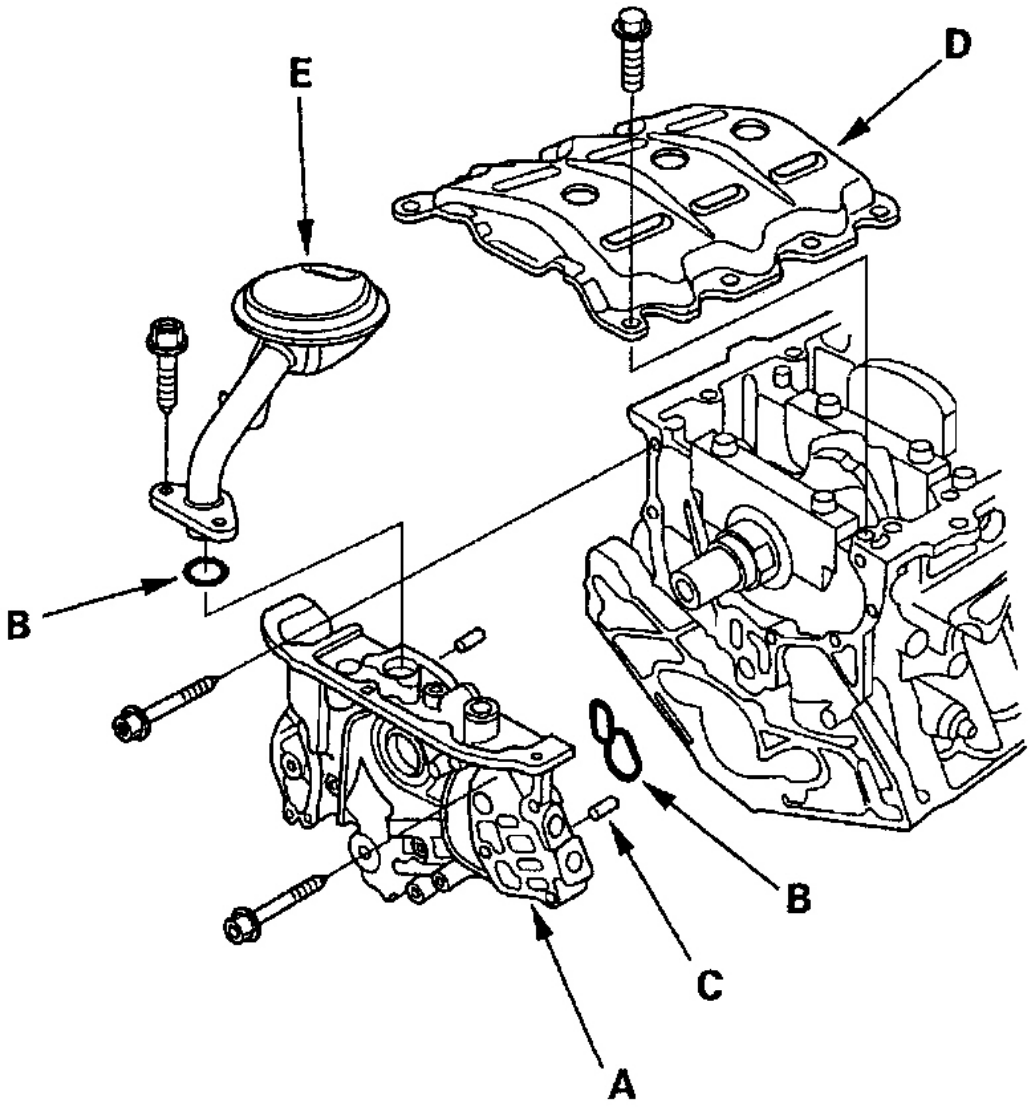


Fig. 169: Installing Oil Pump
Courtesy of AMERICAN HONDA MOTOR CO., INC.

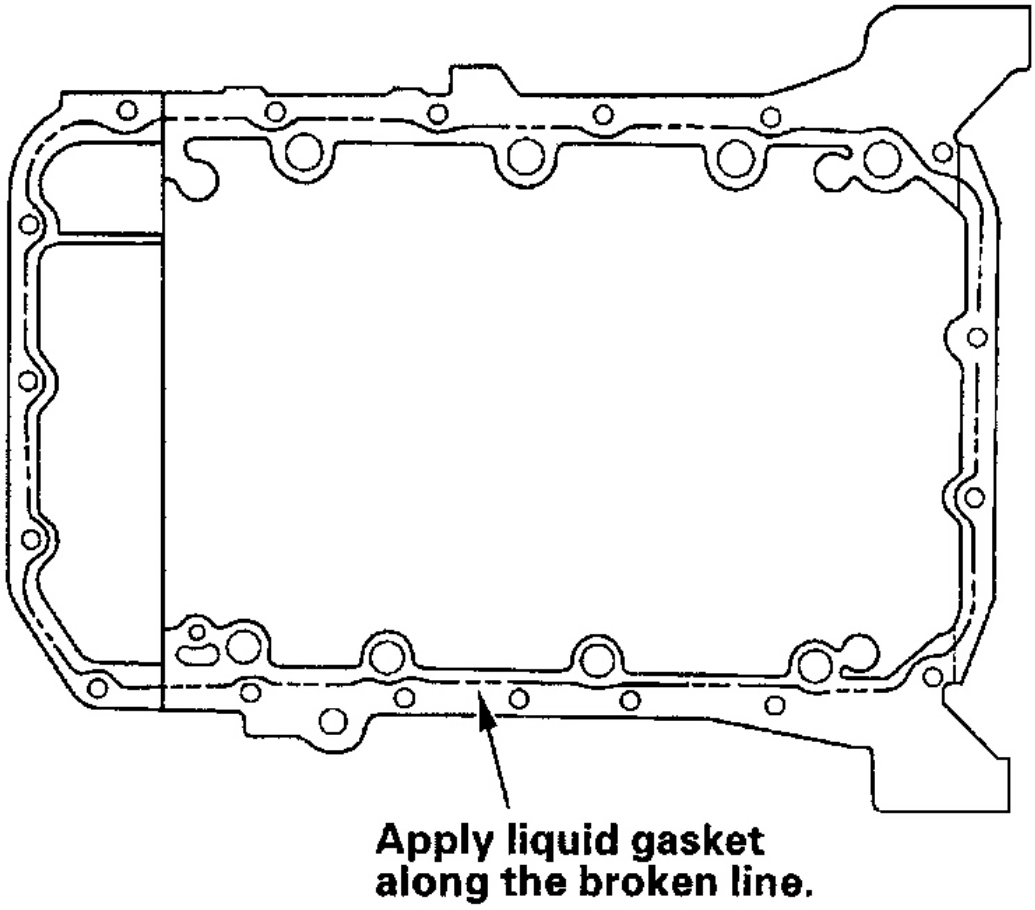


Fig. 170: Installing Oil Pan
Courtesy of AMERICAN HONDA MOTOR CO., INC.

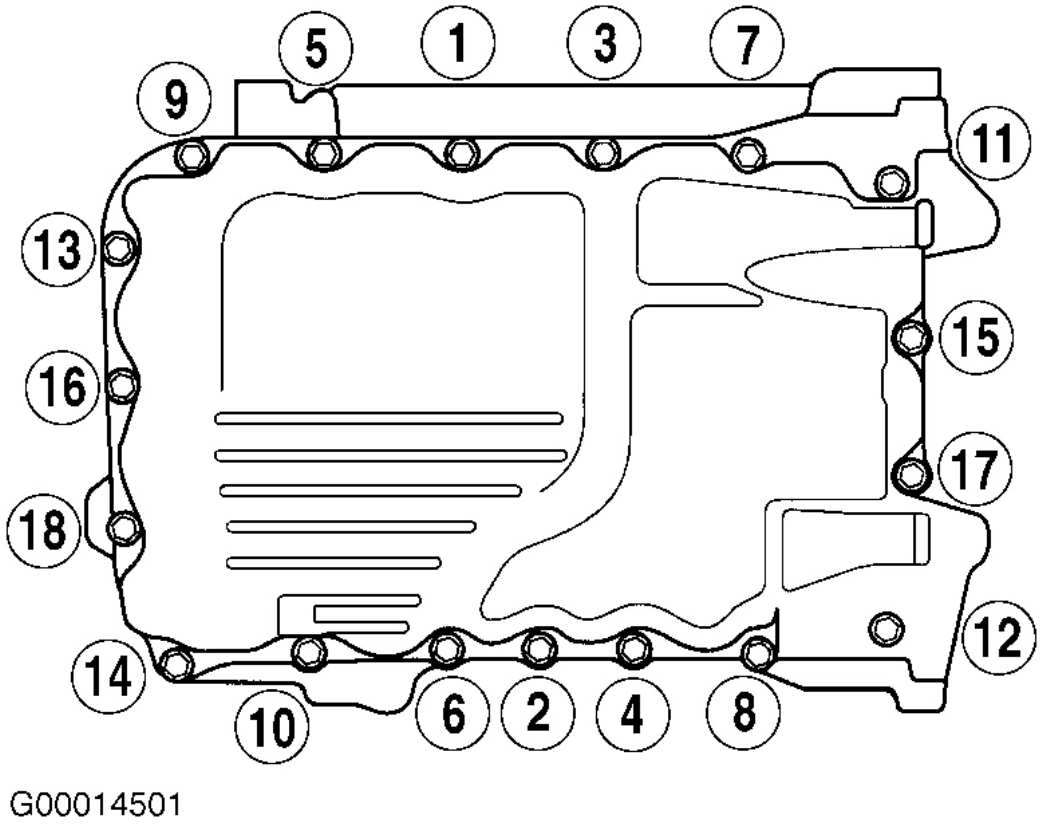


Fig. 171: Oil Pan Bolt Tightening Sequence
Courtesy of AMERICAN HONDA MOTOR CO., INC.

MAIN BEARING CLEARANCE INSPECTION

1. To check main bearing-to-journal oil clearance, remove the main caps and bearing halves.
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 car 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 caps, then torque the bolt. See 21 under CRANKSHAFT & PISTON. DO NOT rotate the crankshaft.
5. Remove the cap and bearing half, and measure the widest part of the plastigage. See **Fig. 172** and **MAIN**

BEARING-TO-JOURNAL OIL CLEARANCE table.

MAIN BEARING-TO-JOURNAL OIL CLEARANCE

Application	Specification - In. (mm)
Standard (New)	.0008-.0017 (.020-.044)
Service Limit	.0020 (.050)

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

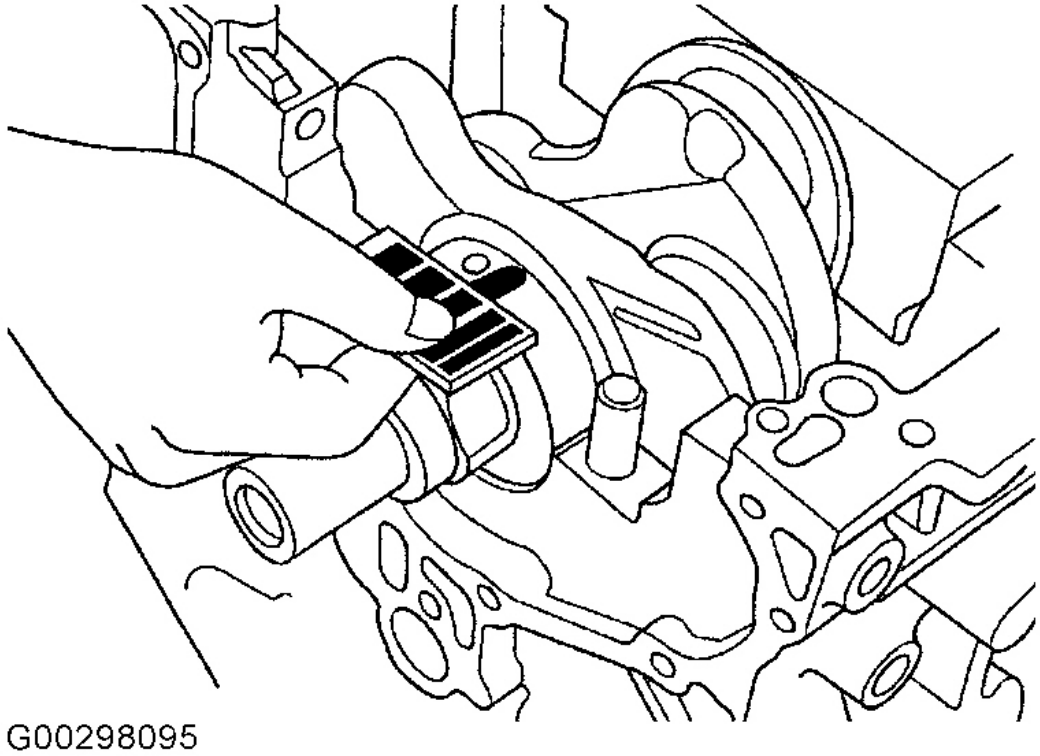


Fig. 172: Removing Cap & Bearing Half
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Main Bearing Selection

1. Crankshaft bore code location (letters or bars) have been stamped on the end of the block as a code for the

size of each of the 4 main journal bores. If you can not read the codes 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. See **Fig. 173**.

2. Main journal codes locations (numbers or bars) have been stamped on crankshaft No. 1 web as a code for main journal sizes. See **Fig. 174**.
3. Use the crankshaft bore codes and journal codes to select the appropriate main bearings from chart. See **Fig. 175**.

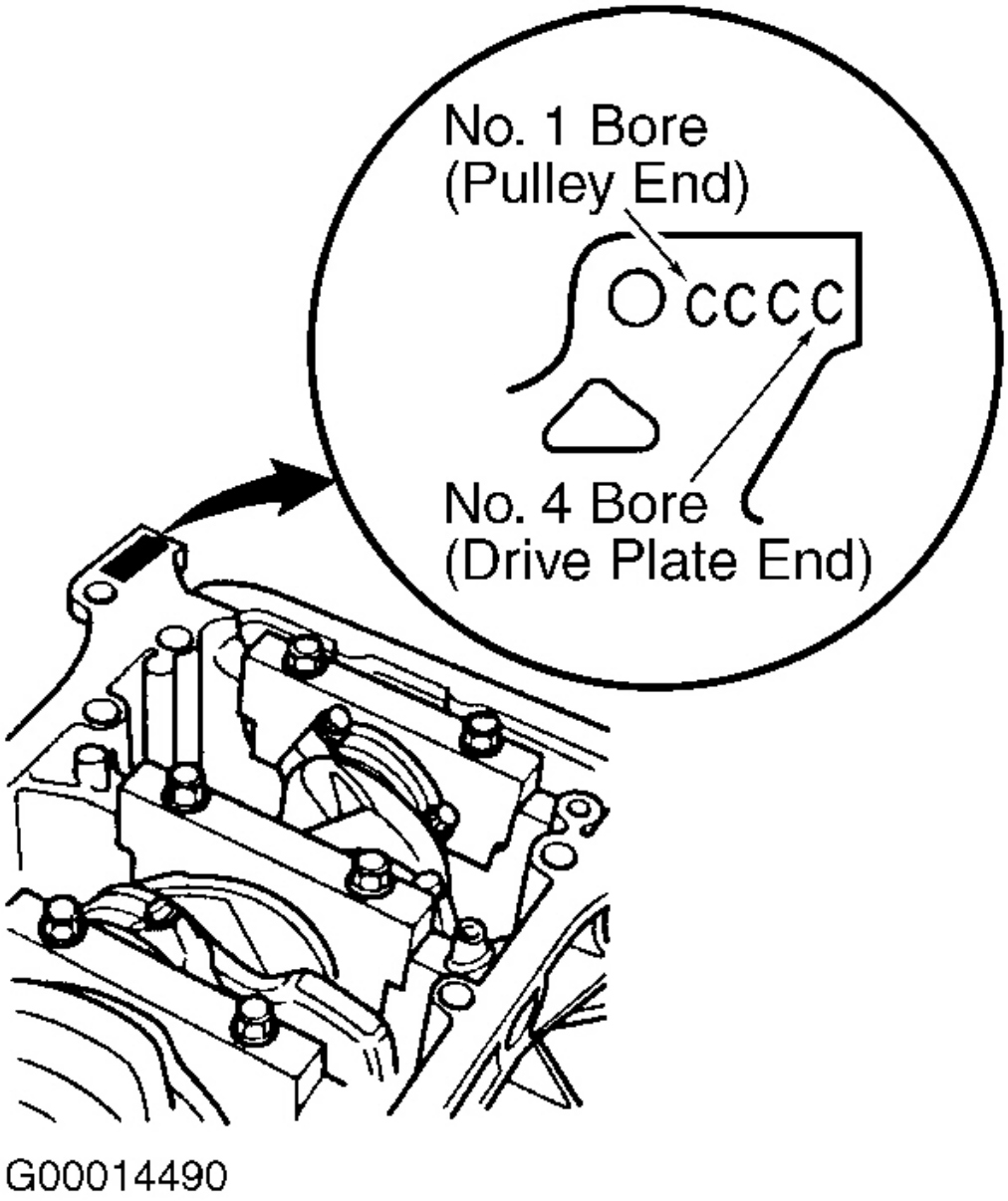


Fig. 173: Locating Engine Block Crankshaft Bore Codes
Courtesy of AMERICAN HONDA MOTOR CO., INC.

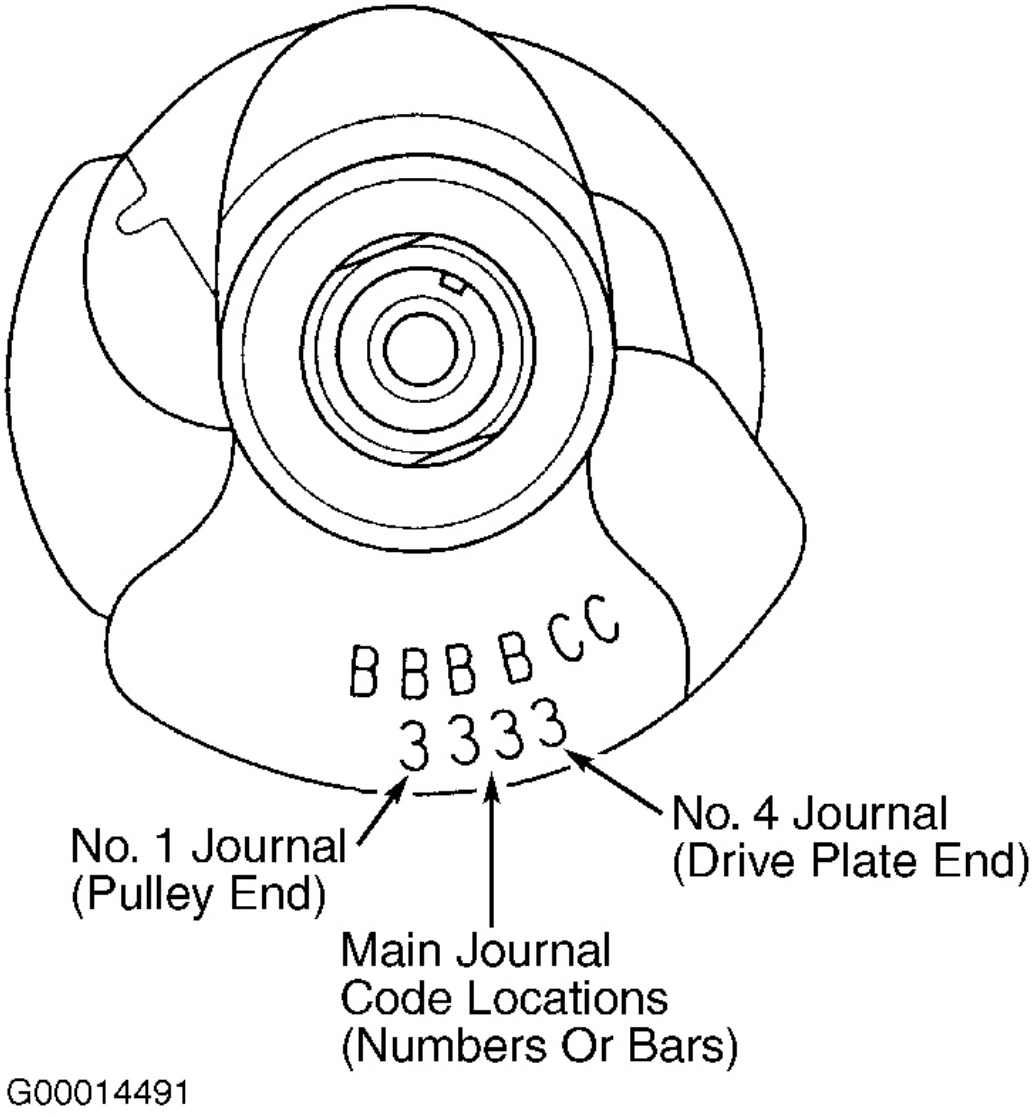


Fig. 174: Locating Crankshaft Main Journal Bore Codes
Courtesy of AMERICAN HONDA MOTOR CO., INC.

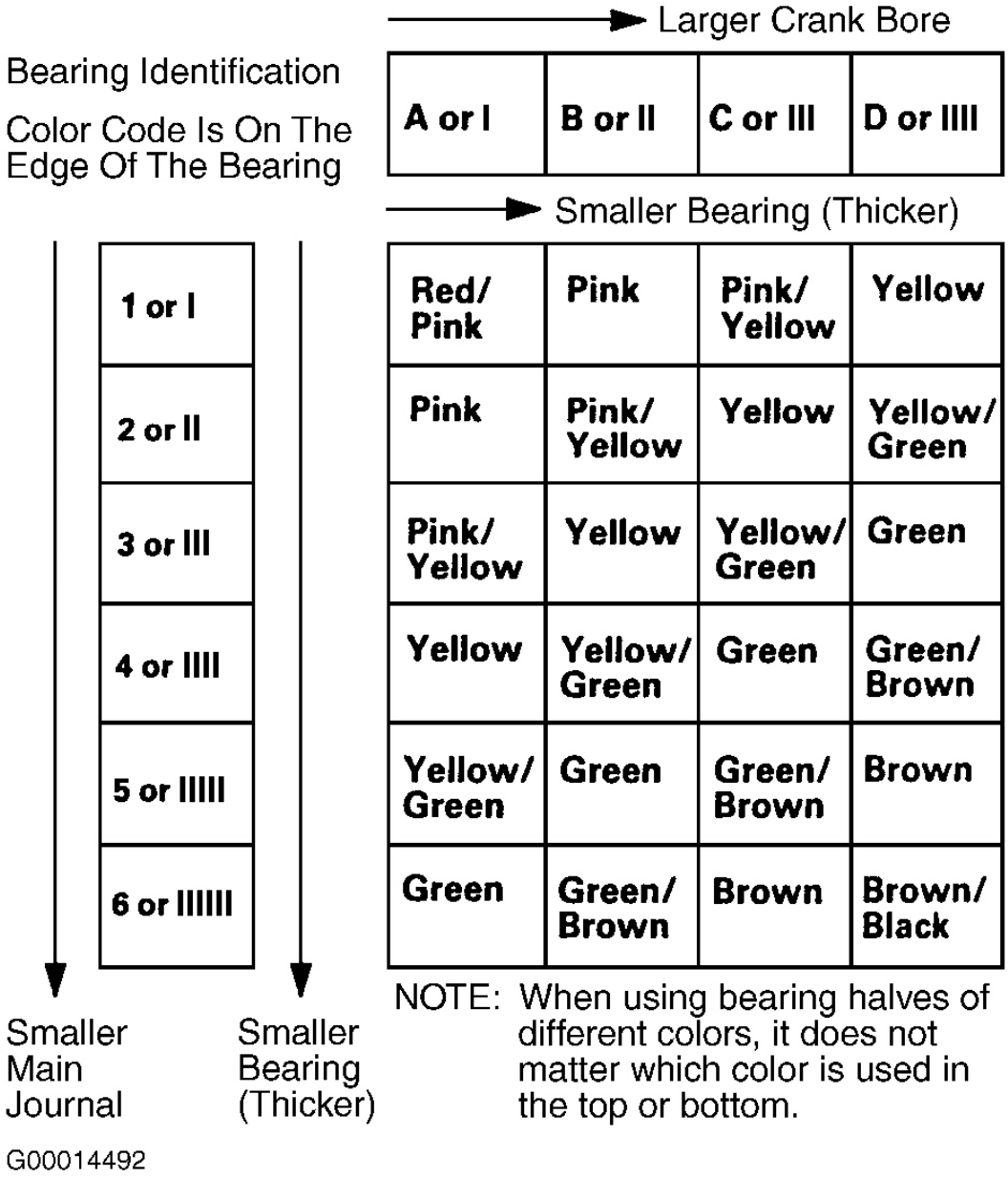


Fig. 175: Crankshaft Bearing Identification Code Chart
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ROD BEARING CLEARANCE INSPECTION

1. Remove the connecting rod cap and bearing half.
2. Clean the crankshaft rod journal and bearing half with a clean shop towel.
3. Place a strip of plastigage across the rod journal.

4. Reinstall the bearing half and cap, and torque the bolts. See step 18 under CRANKSHAFT & PISTON. DO NOT rotate the crankshaft.
5. Remove the rod cap and bearing half and measure the widest part of the plastigage. See **Fig. 176**.
6. If the plastigage measures too wide or too narrow, remove the upper half of the bearing, install a new, complete bearing with the same color code, and recheck the clearance. Do not file, shim, or scrape the bearings or the caps to adjust clearance.
7. If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below that one), and check clearance again. If proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over.

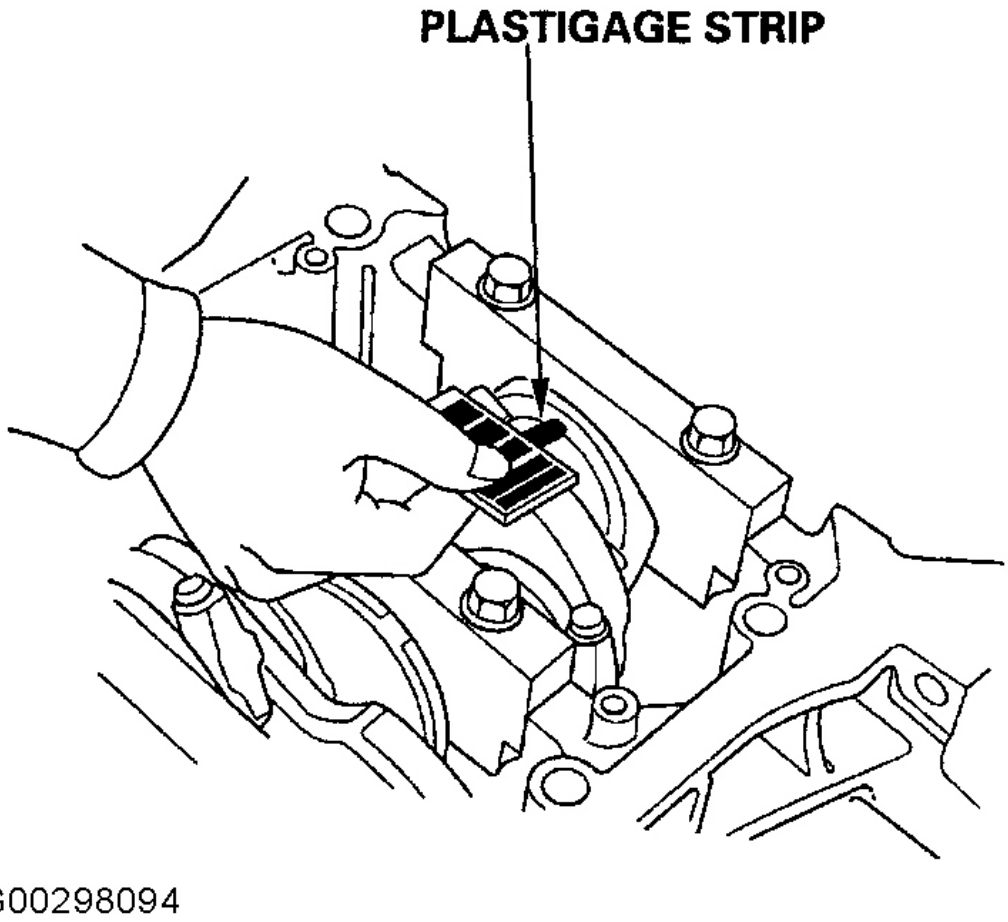


Fig. 176: Measuring Widest Part Of Plastigage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Rod Bearing Selection

1. Inspect the connecting rod for cracks and heat damage.
2. Each rod has a tolerance range (from .0009" (0-.024 mm), in .0002" (.006 mm) increments) depending on the size of its big end bore. It's then stamped with a code (1, 2, 3, or 4/I, II, III, or IIII in any engine. If you cannot read the codes because of an accumulation of dirt and dust, DO NOT scrub them with a wire brush or scraper. Clean them only with solvent or detergent. Half of the number or bar is stamped on the bearing cap and the other half is stamped on the rod. See **Fig. 177**.
3. Connecting rod journal code (letters or bars) have been stamped on crankshaft No. 1 web as a code for the rod journal sizes. See **Fig. 174**.
4. Use the connecting rod bore codes and journal codes to select the appropriate rod bearings from the chart. See **Fig. 178**.

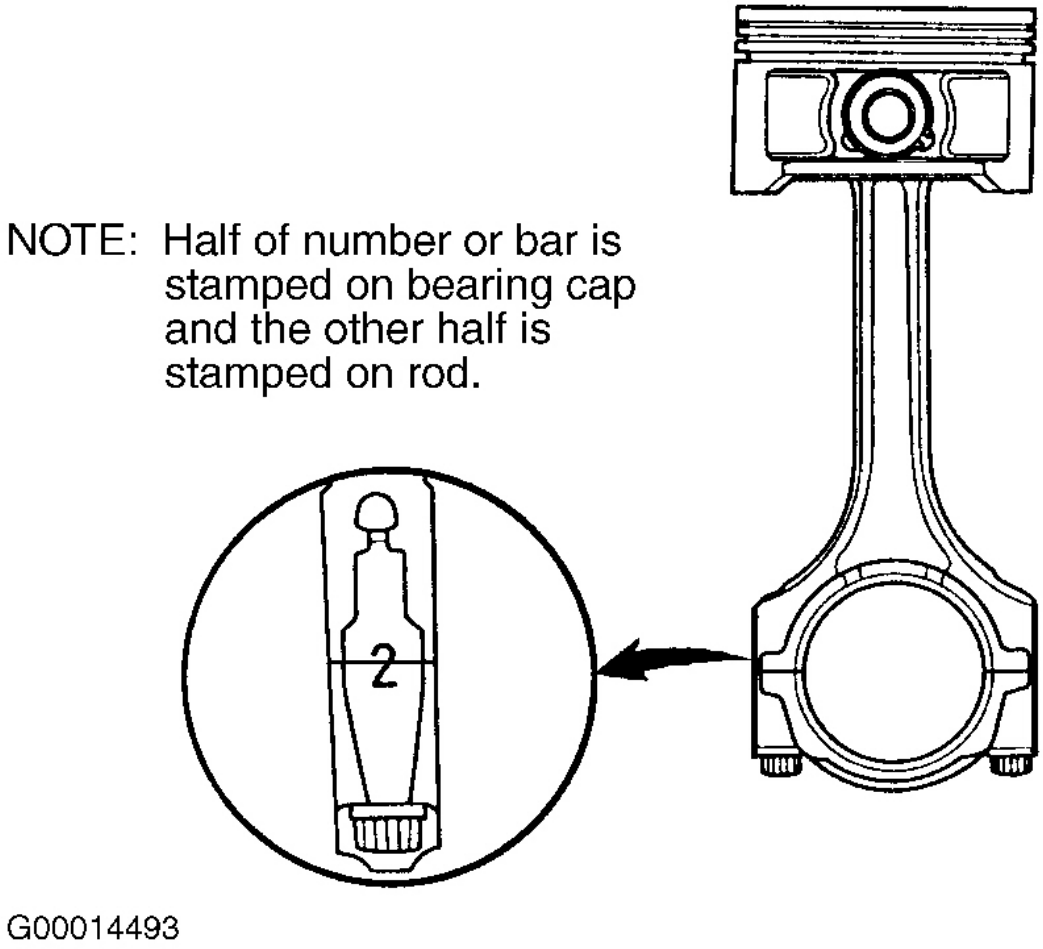


Fig. 177: Locating Connecting Rod Bearing Codes
Courtesy of AMERICAN HONDA MOTOR CO., INC.

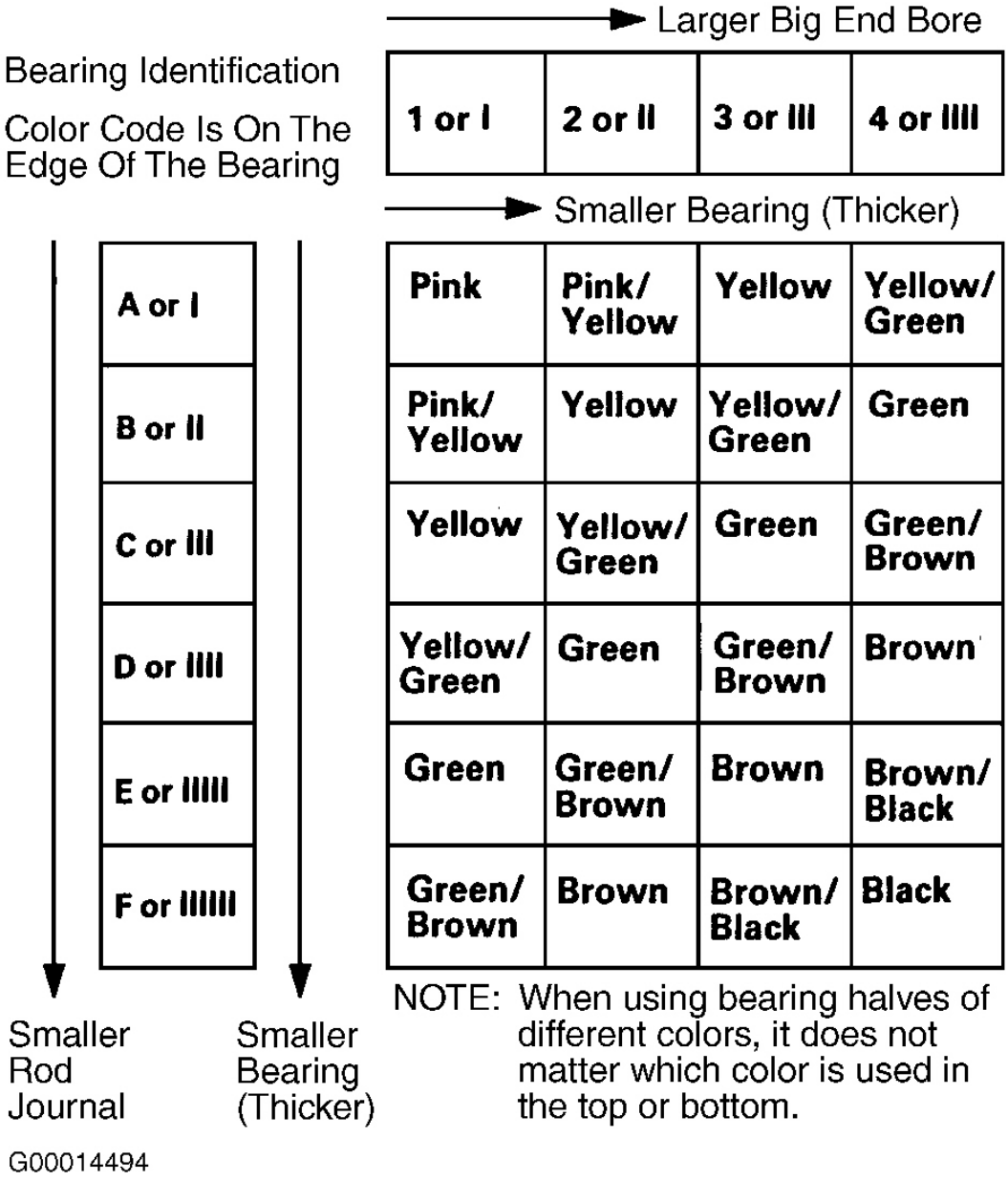


Fig. 178: Connecting Rod Bearing Identification Code Chart
Courtesy of AMERICAN HONDA MOTOR CO., INC.

CRANKSHAFT INSPECTION

1. Remove the crankshaft from the cylinder block. See **CRANKSHAFT & PISTON**.
2. Clean the crankshaft oil passages with pipe cleaners or a suitable brush.
3. Check the keyway and threads.

4. Measure out-of-round at the middle of each rod and main journal in 2 places. The difference between measurements on each journal must not be more than the service limit. See **Fig. 179** and **JOURNAL OUT-OF-JOURNAL** table.
5. Measure taper at the edges of each rod and main journal. The difference between measurements on each journal must not be more than the service limit. See **JOURNAL TAPER** table.
6. Place the cylinder block on the surface plate.
7. Clean and install the bearings on the No. 1 and No. 4 journal of the cylinder block.
8. Lower the crankshaft into the block.
9. Measure runout on all main journals. Rotate the crankshaft 2 complete revolutions. The difference between measurements on each journal must not be more than the service limit. See **Fig. 180** and **CRANKSHAFT TOTAL RUNOUT** table.

JOURNAL OUT-OF-JOURNAL

Application	Specification - In. (mm)
Standard (New)	.0002 (.005)
Service Limit	.0004 (.010)

JOURNAL TAPER

Application	Specification - In. (mm)
Standard (New)	.0002 (.005) max.
Service Limit	.0004 (.010)

CRANKSHAFT TOTAL RUNOUT

Application	Specifications - In. (mm)
Standard (New)	.0008 (.020)
Service Limit	.0012 (.030)

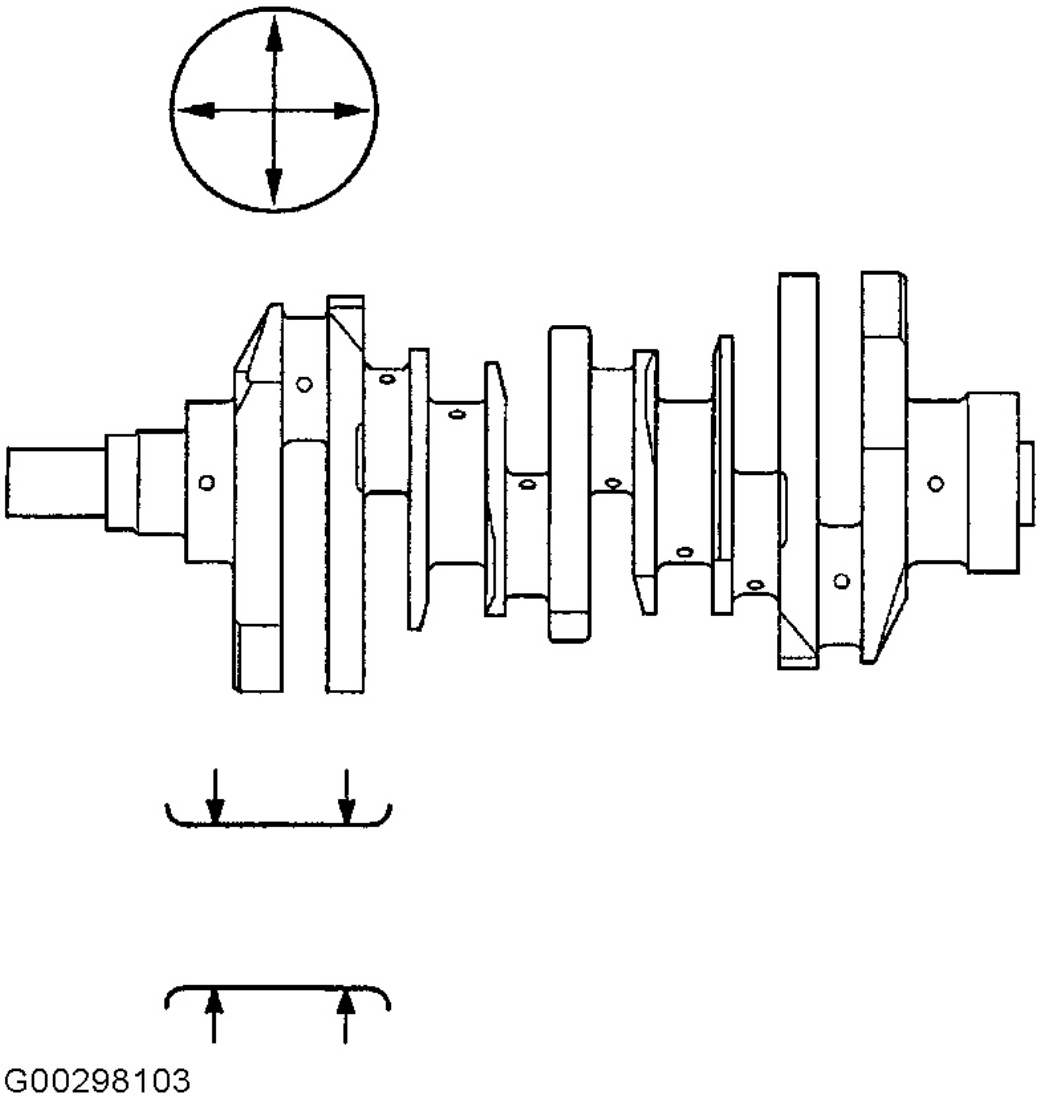


Fig. 179: Measuring Out-Of-Journal At Middle Of Each Rod
Courtesy of AMERICAN HONDA MOTOR CO., INC.

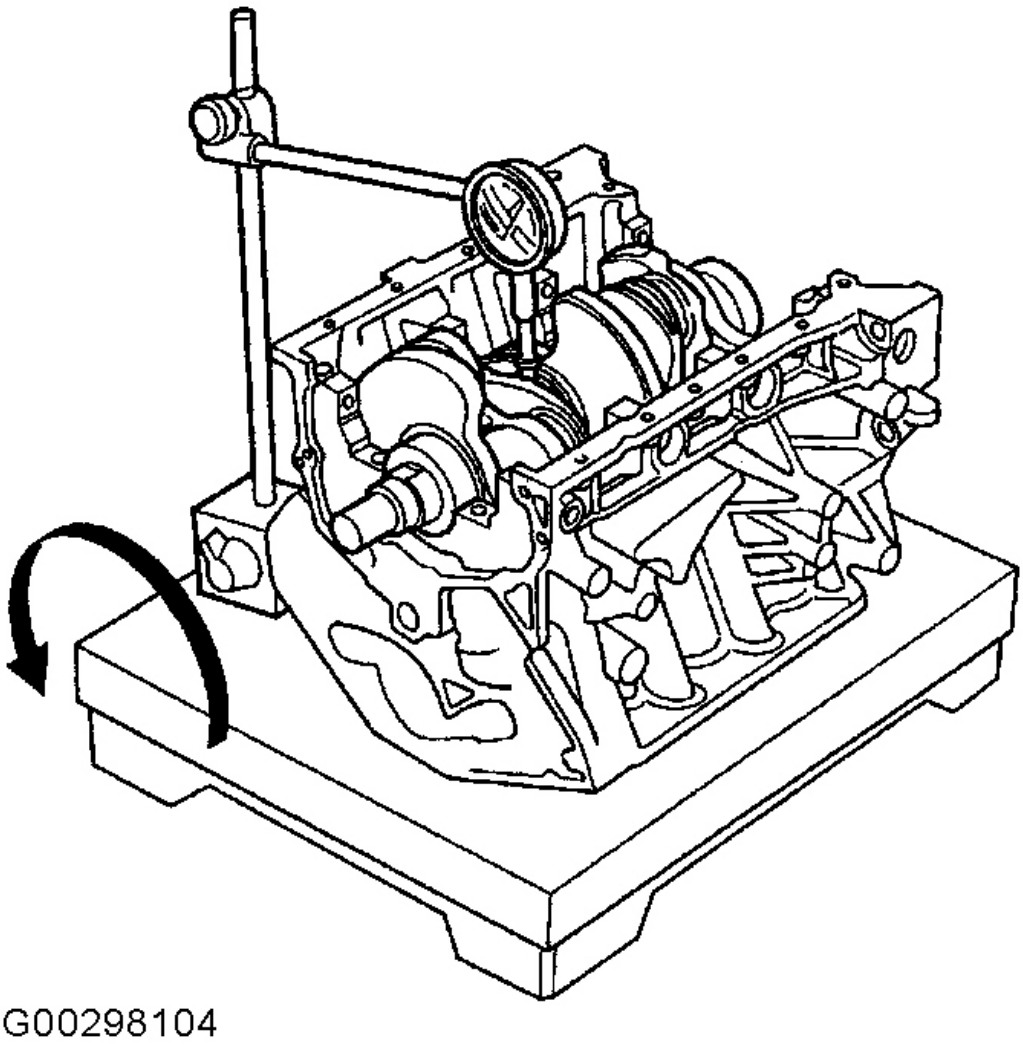


Fig. 180: Measuring Runout On All Main Journals
Courtesy of AMERICAN HONDA MOTOR CO., INC.

BLOCK & PISTON INSPECTION

1. Remove the piston from the cylinder block. See **CRANKSHAFT & PISTON**.
2. Check the piston for distortion or cracks.
3. Measure the piston diameter at a point .63" (16 mm) from the bottom of the skirt. See **Fig. 181** and **PISTON & OVERSIZE PISTON DIAMETER** table.

PISTON & OVERSIZE PISTON DIAMETER

Application	Specification - In. (mm)
Piston Diameter	
Standard (New)	3.5029-3.5033 (88.975-88.985)
Service Limit	3.5026 (88.965)
Oversize Piston Diameter	
.25	3.5128-3.15132 (89.225-89.235)
.50	3.5226-3.5230 (89.475-89.485)

4. Measure wear and taper in directions X and Y at 3 levels in each cylinder. See **Fig. 182**
   - If the measurements in any cylinder are beyond the oversize bore service limit, replace the cylinder block.
   - If the block is to be rebored, see step 6 after reboring.

CYLINDER BORE SIZE/OVERSIZE/BORE TAPER

Application	Specification - In. (mm)
Cylinder Bore Size	
Standard (New)	.3.5039-3.5045 (89-89.015)
Service Limit	3.5065 (89.065)
Oversize	
.25	3.5138-3.5144 (89.250-89.265)
.50	3.5236-3.5242 (89.500-89.515)
Reboring Limit	.02 (.5)
Bore Taper	
Limit (1)	.002 (.05)
(1) Difference between first and third measurement.	

5. Scored or scratched cylinder bores must be honed.
6. Check the top of the cylinder block for warpage. Measure along the edges and across the center. See **Fig. 183** and **CYLINDER BLOCK WARPAGE** table.

CYLINDER BLOCK WARPAGE

Application	Specification - In. (mm)
Standard (New)	.003 (.07)
Service Limit	.004 (.10)

7. Calculate the difference between cylinder bore diameter and piston. See **Fig. 184** and **PISTON-TO-BLOCK CLEARANCE** table.

PISTON-TO-BLOCK CLEARANCE

Application	Specification - In. (mm)
Standard (New)	.0006-.0016 (.015-.040)
Service Limit	.003 (.08)

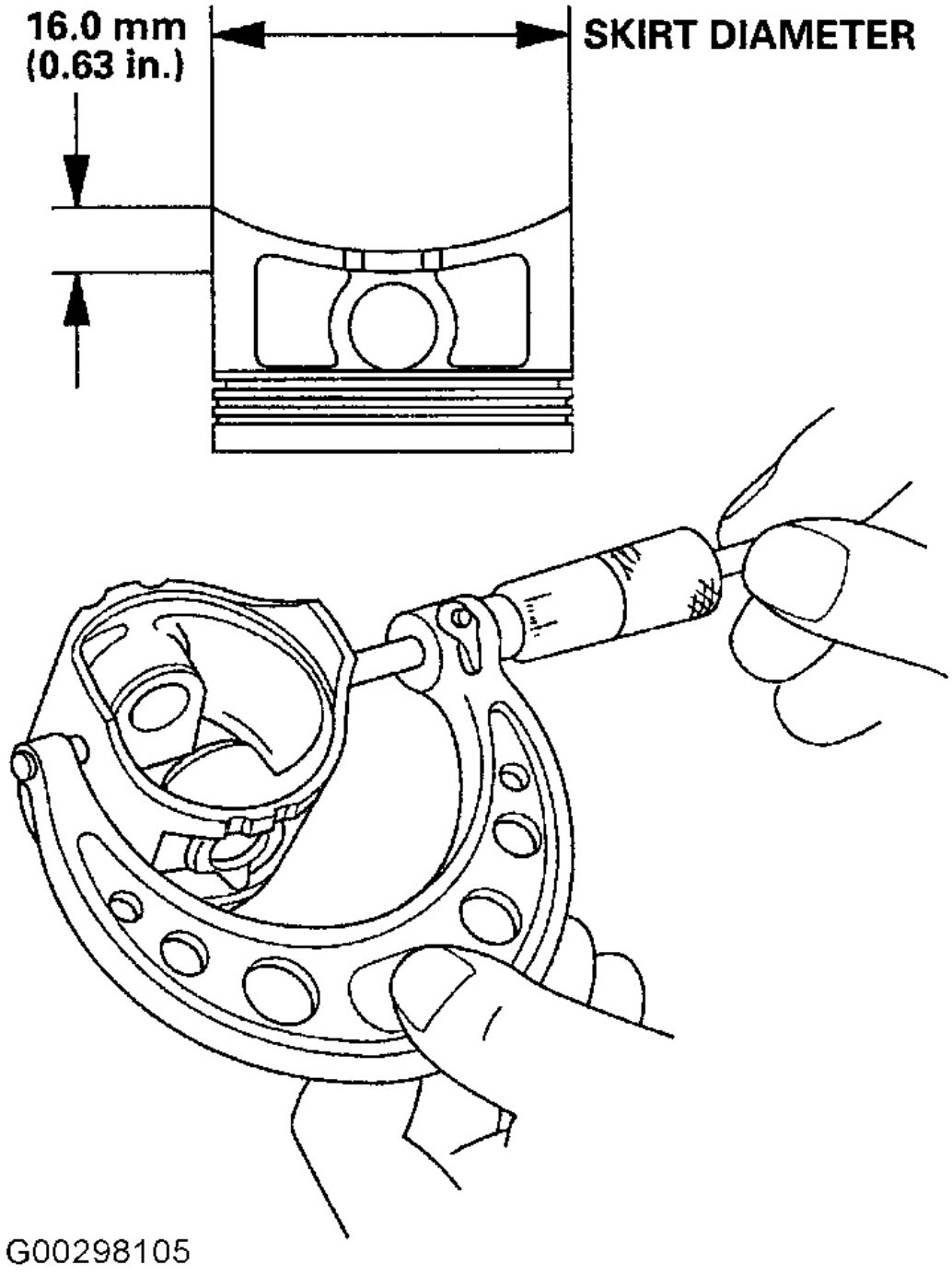


Fig. 181: Measuring Piston Diameter At Point From Bottom Of Skirt
Courtesy of AMERICAN HONDA MOTOR CO., INC.

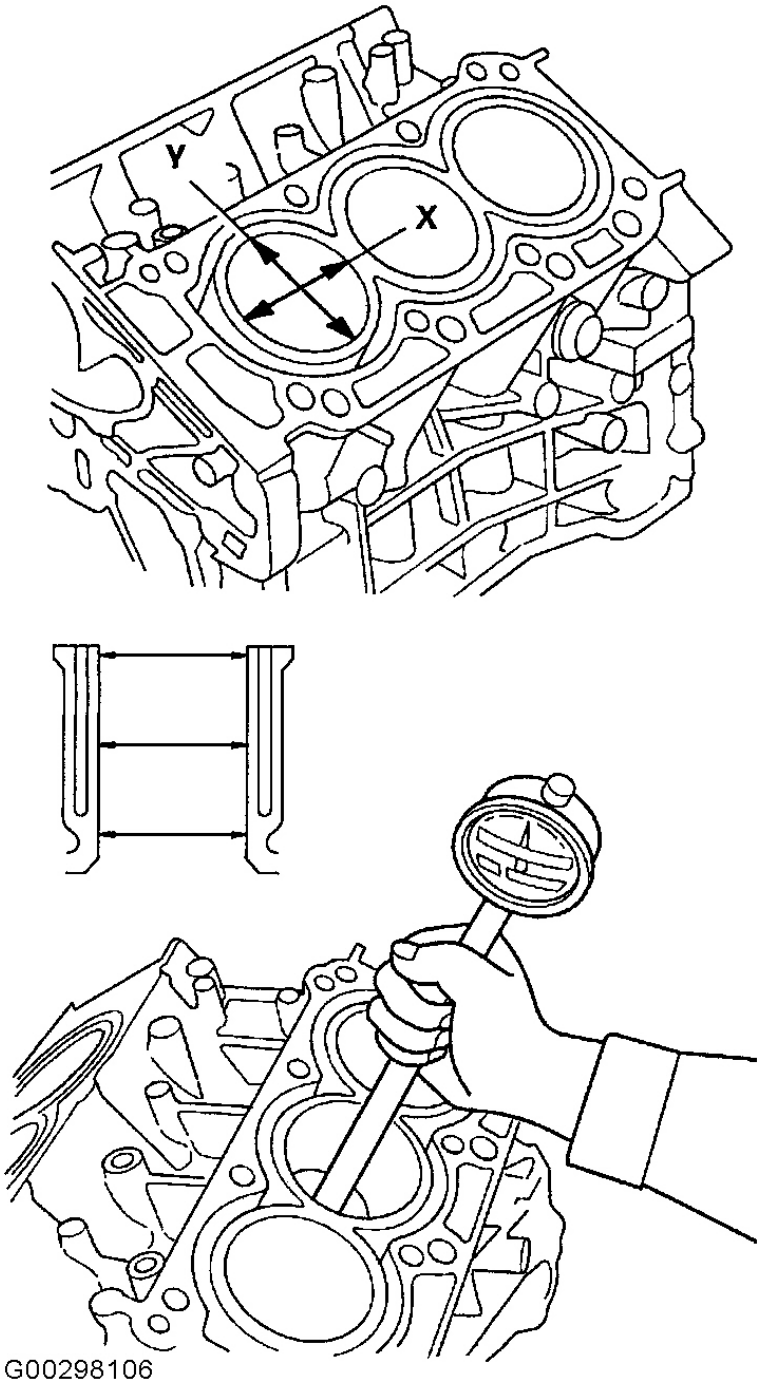
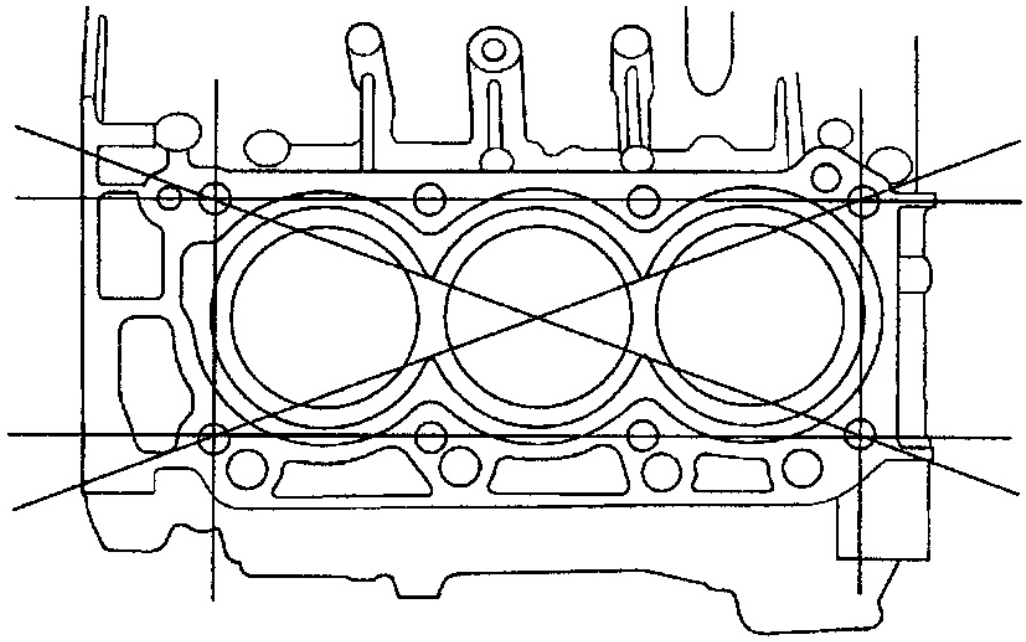


Fig. 182: Measuring Wear & Taper In Directions X & Y
Courtesy of AMERICAN HONDA MOTOR CO., INC.



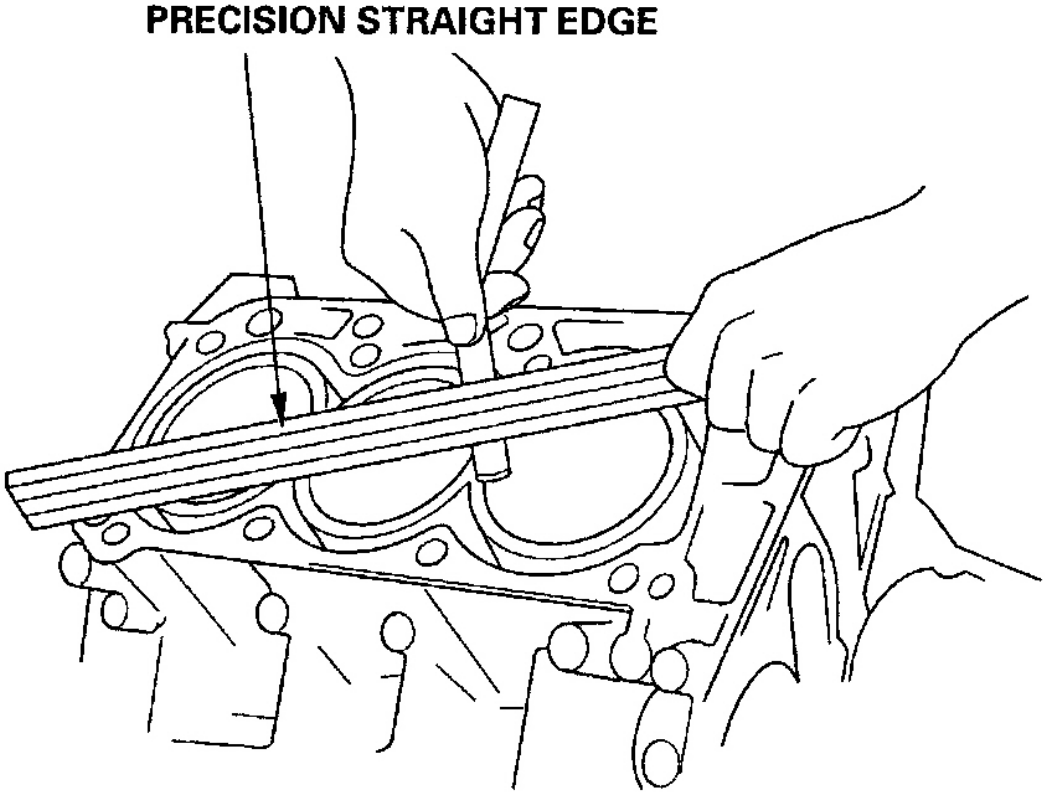


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Fig. 183: Checking Top Of Cylinder Block For Warpage
Courtesy of AMERICAN HONDA MOTOR CO., INC.

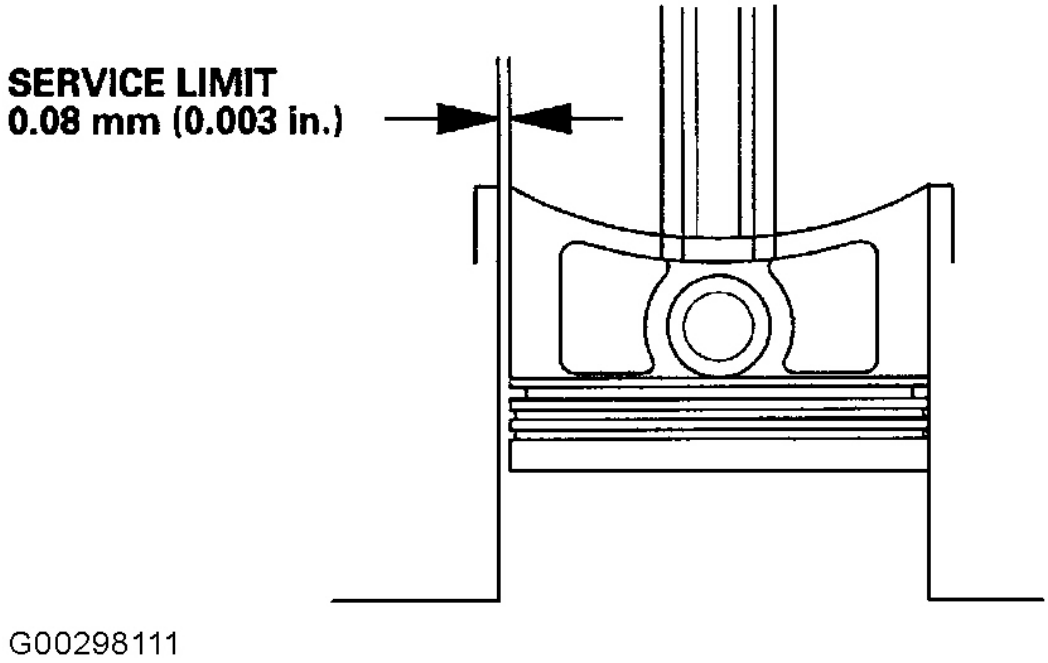

Fig. 184: Calculating Difference Between Cylinder Bore & Piston Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Cylinder Honing

1. Measure the cylinder bores. See step 3 under BLOCK & PISTON INSPECTION. If the cylinder block is to be reused, hone the cylinder bores must be honed.

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.

2. Hone the cylinder bores with honing oil and a fine (400 grit) stone in a 60 degree crosshatch pattern. See **Fig. 185**.
3. When honing is complete, thoroughly clean the cylinder block of all metal particles. Wash the cylinder bores with hot soapy water, then dry and oil them immediately to prevent rusting. Never use solvent, it will not only redistribute the grit on the cylinder walls.
4. If scoring or scratches are still present in the cylinder bores after honing to the service limit, rebore the cylinder block. Some light vertical scoring and scratching is acceptable if it is not deep enough to catch you fingernail and does not run the full length of the bore.

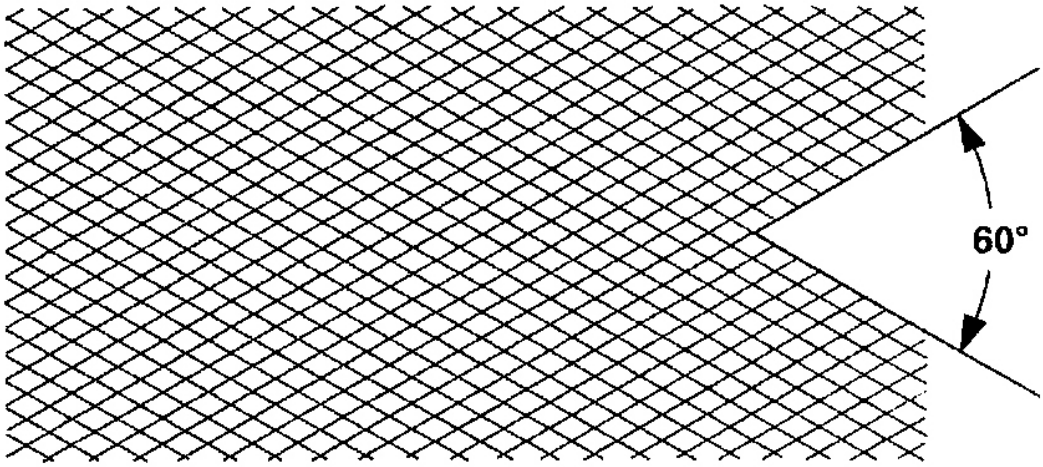

Fig. 185: Honing Cylinder Bores With Honing Oil & Fine In Crosshatch Pattern
Courtesy of AMERICAN HONDA MOTOR CO., INC.

PISTON, PIN & CONNECTING ROD

Removal

1. Remove the piston from the cylinder block. See **CRANKSHAFT & PISTON**.

NOTE: Take care not to damage the ring grooves.

2. Apply 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). See **Fig. 186**.
3. Remove both snap rings (A). Start at the cutout in the piston pin bore. Remove the snap rings carefully so they do not go flying or get lost. See **Fig. 187**. Wear eye protection.
4. Heat the piston and connecting rod assembly to about 158°F (70°C), then remove the piston pin. See **Fig. 188**.

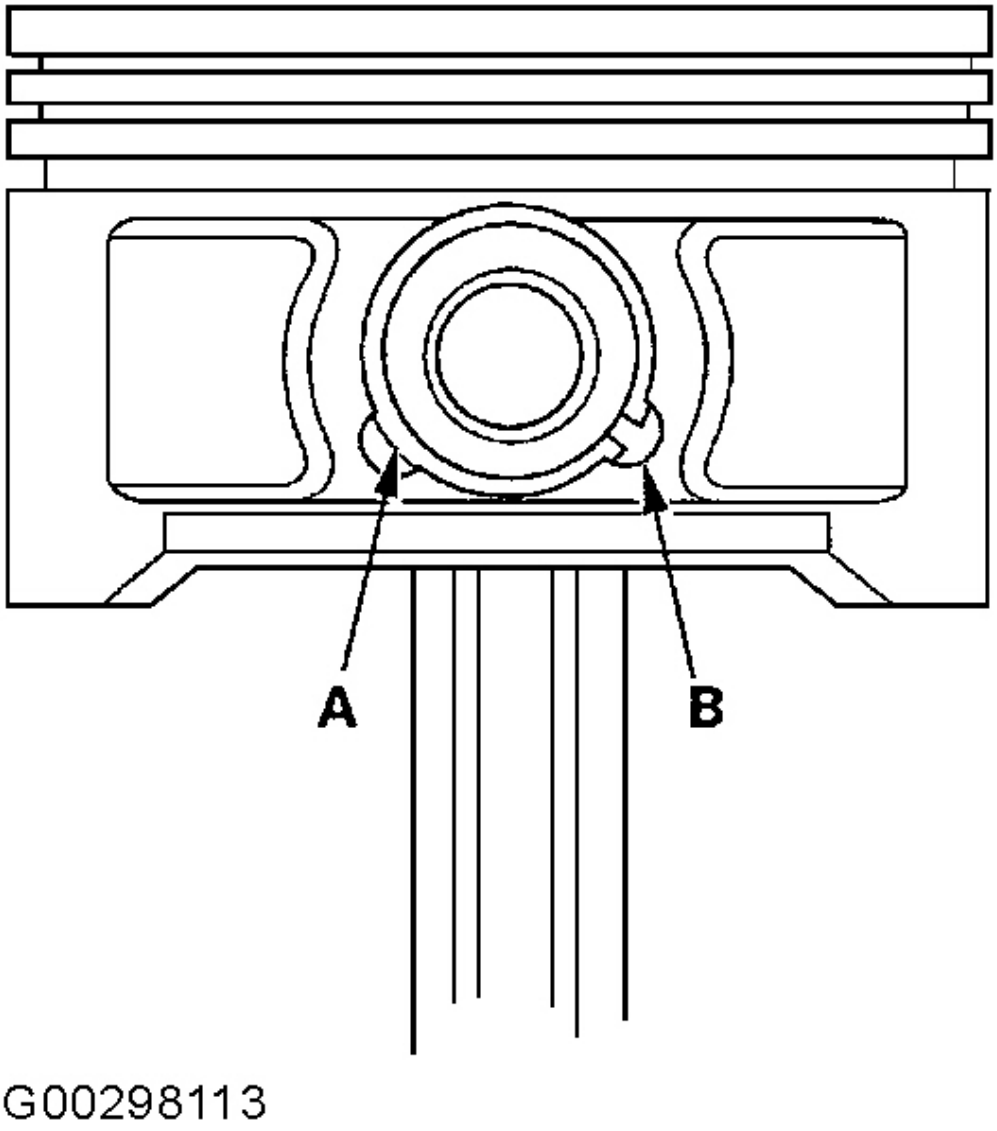

Fig. 186: Applying Engine Oil To Piston Pin Snap Rings
Courtesy of AMERICAN HONDA MOTOR CO., INC.

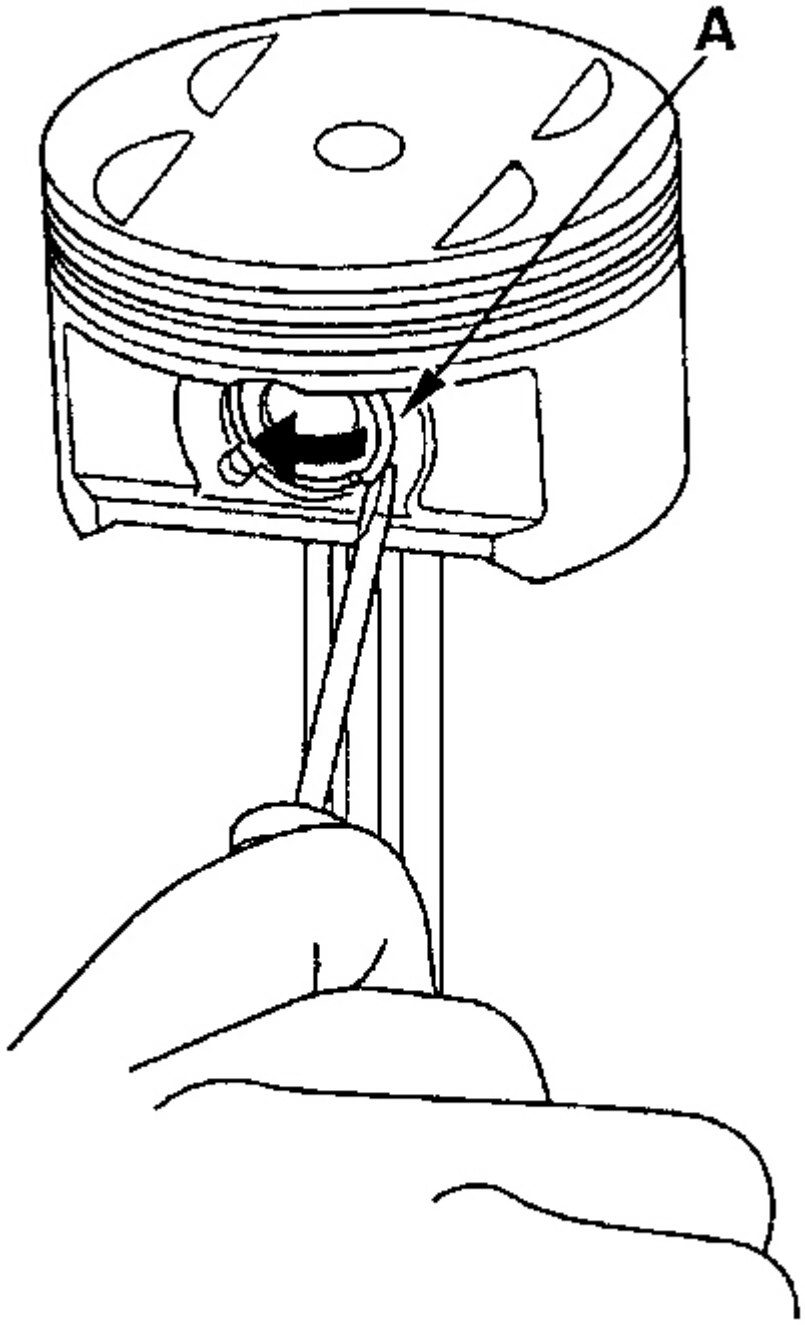

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Fig. 187: Removing Both Snap Rings
Courtesy of AMERICAN HONDA MOTOR CO., INC.

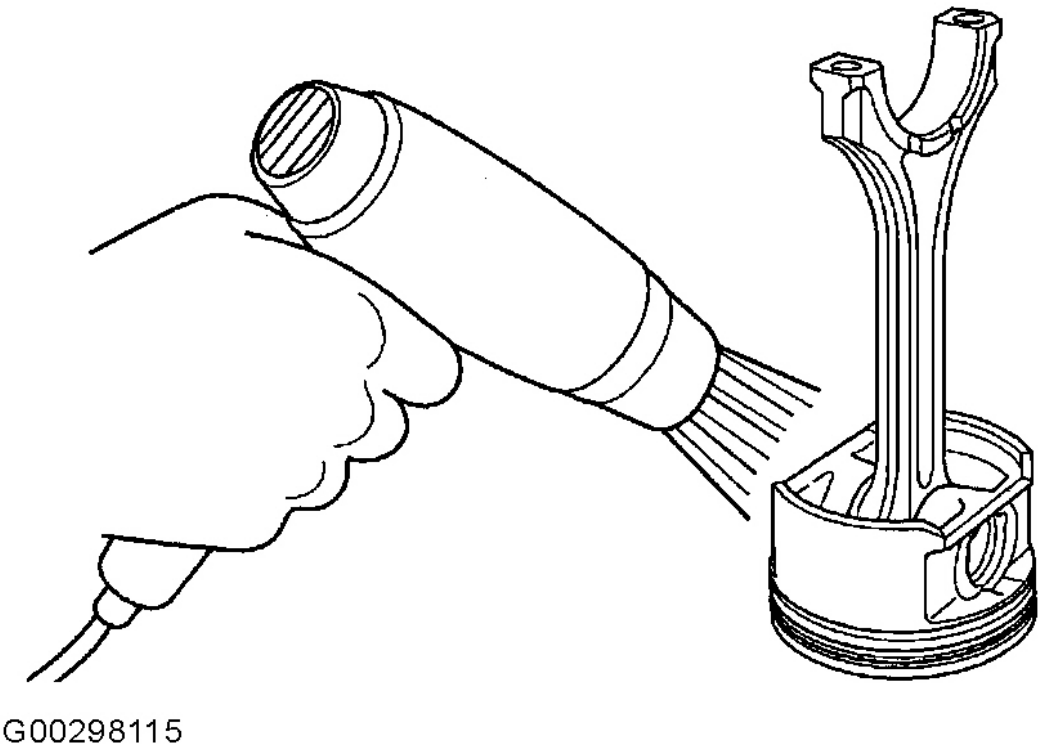

Fig. 188: Heating Piston & Connecting Rod Assembly
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Inspection

1. Measure the diameter of the piston pin. See **Fig. 189** and **PISTON PIN DIAMETER** table.
2. Zero the dial indicator to the piston pin diameter. See **Fig. 190**
3. Check the difference between the piston pin diameter and piston pin hole diameter on the piston. See **Fig. 191** and **PISTON PIN-TO-PISTON CLEARANCE** table.
4. Measure the piston pin-to-connecting rod clearance. See **Fig. 192** and **PISTON PIN-TO-CONNECTING ROD CLEARANCE** table.

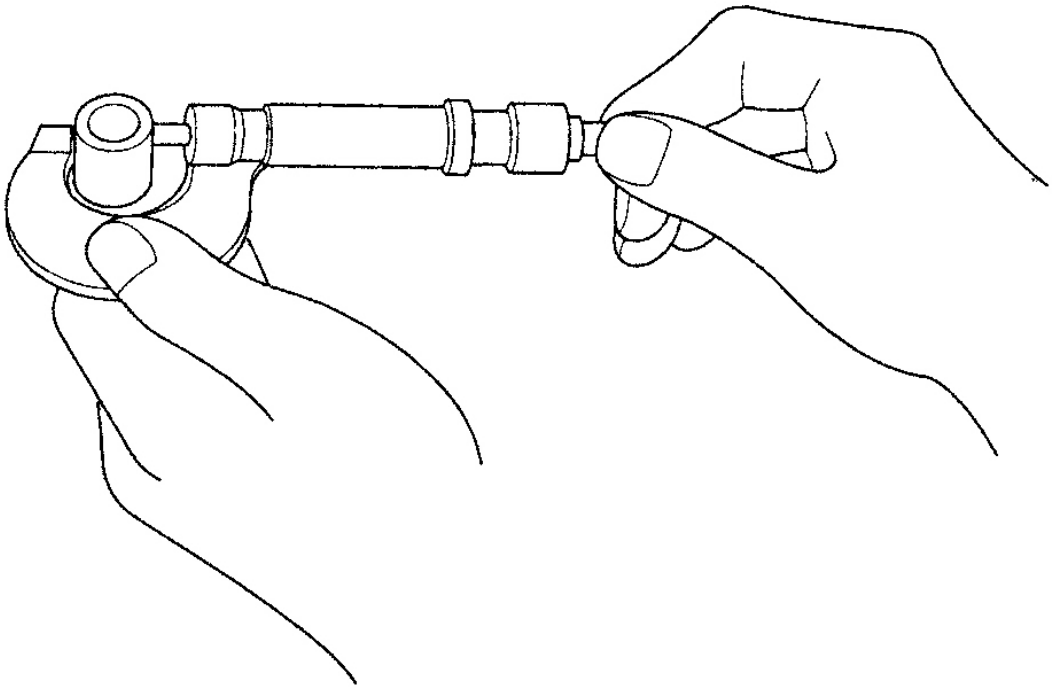

Fig. 189: Measuring Diameter Of Piston Pin
Courtesy of AMERICAN HONDA MOTOR CO., INC.

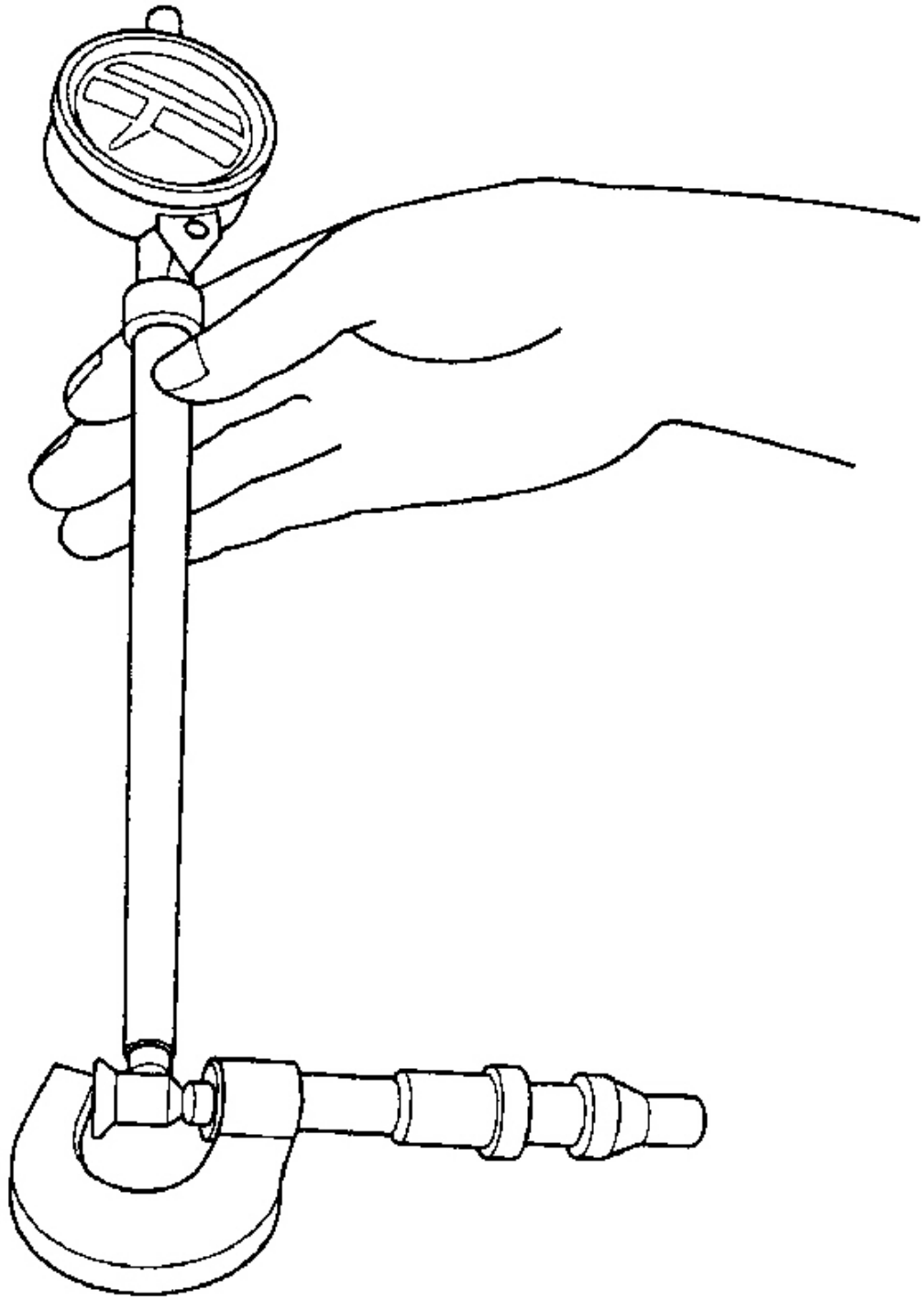

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Fig. 190: Zeroing Dial Indicator For Piston Pin Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

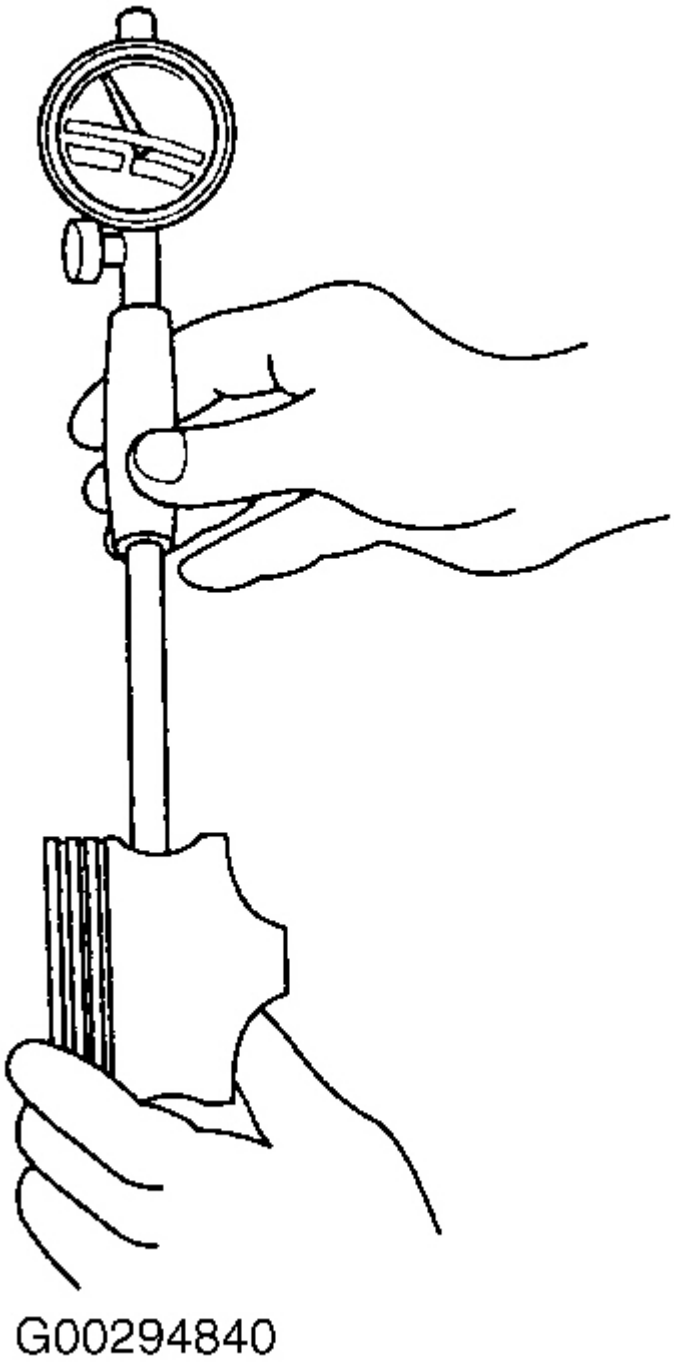


Fig. 191: Measuring Piston Pin Bore Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

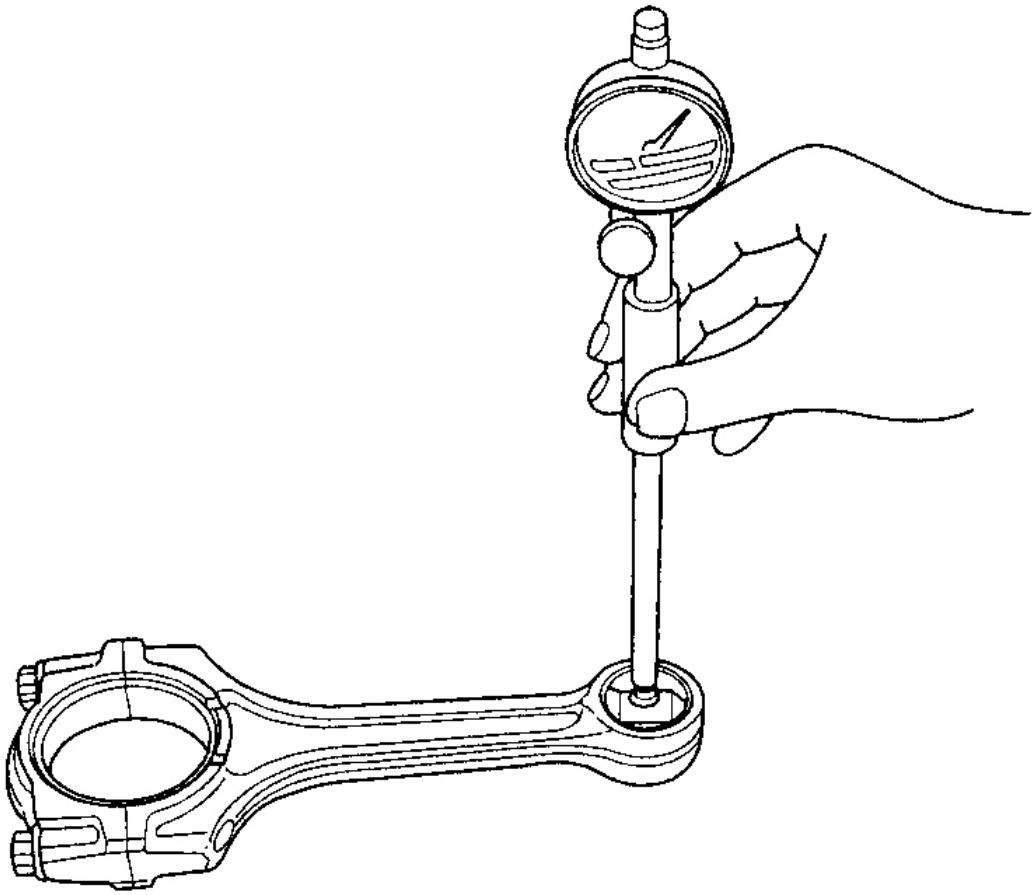


Fig. 192: Measuring Connecting Rod Piston Pin Bore Diameter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

PISTON PIN DIAMETER

Application	Specification - In. (mm)
Standard (New)	.8646-.8648 (21.962-21.965)
Service Limit	.8643 (21.954)

PISTON PIN-TO-PISTON CLEARANCE

Application	Specification - In. (mm)
Standard (New)	-.00020 To +.00004 (-.0050 To +.0010)
Service Limit	.0002 (.004)

PISTON PIN-TO-CONNECTING ROD CLEARANCE

Application	Specification - In. (mm)
Standard (New)	.0002-.0006 (.005-.014)
Service Limit	.0007 (.019)

Installation

1. Install a piston pin snap ring (A). See **Fig. 193**.
2. Coat the piston pin bore in the piston, the bore in the connecting rod, and the piston pin with engine oil.
3. Heat the piston to about 158°F (70°C). See **Fig. 194**.
4. Install the piston pin (A). Assembly the piston (B) and connecting rod (C) with the embosses marks (D) on the same side. See **Fig. 195**.
5. Install the remaining snap ring.

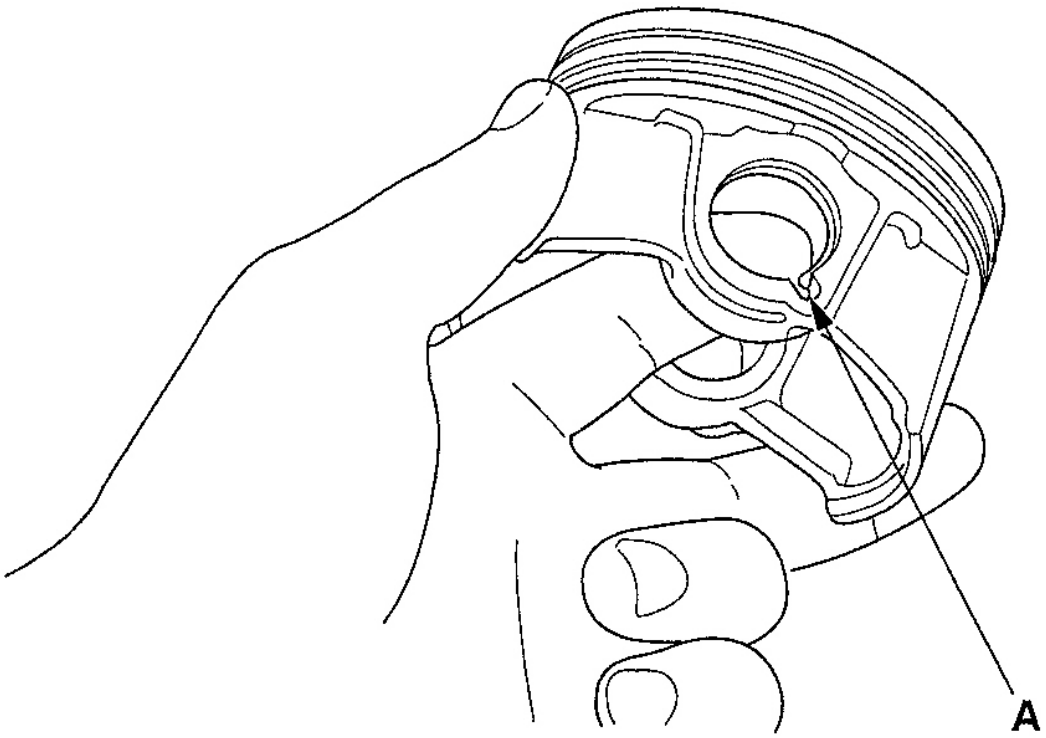


Fig. 193: Installing Piston Pin Snap Ring
Courtesy of AMERICAN HONDA MOTOR CO., INC.

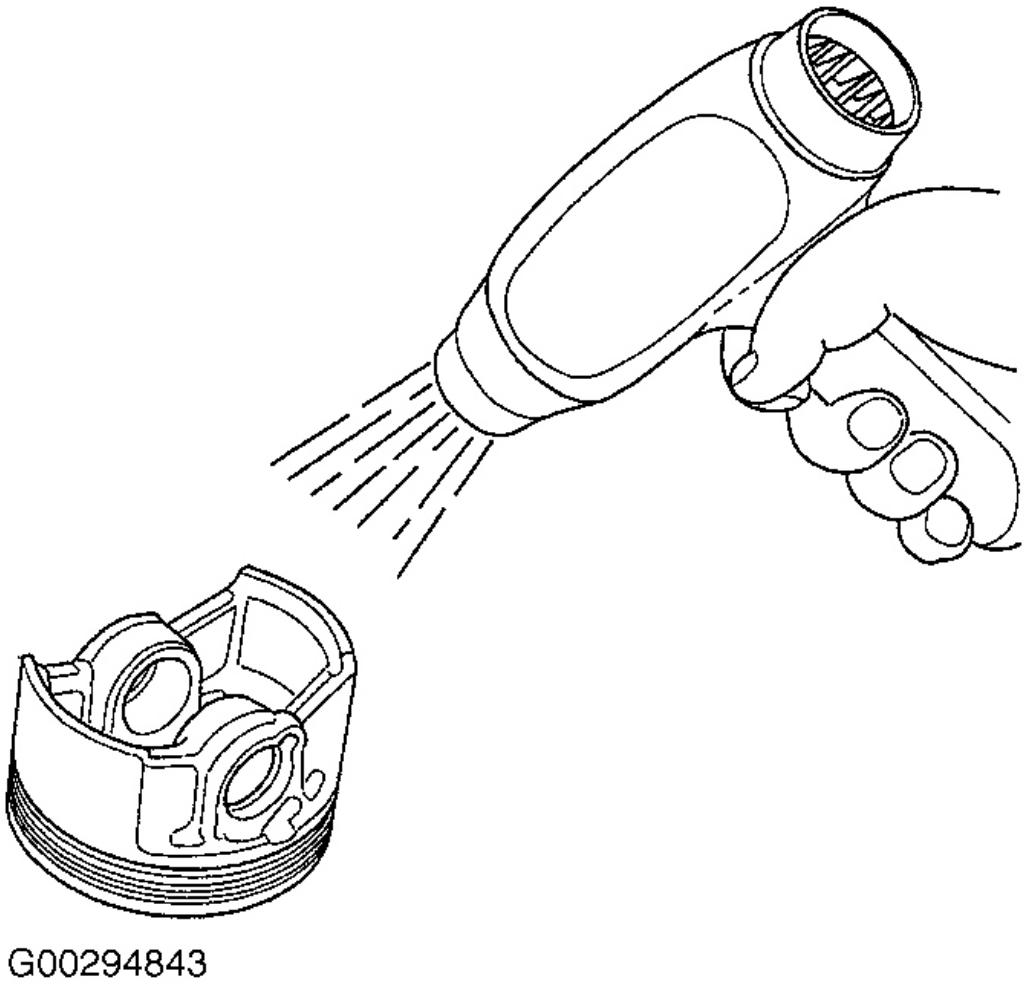


Fig. 194: Heating Piston
Courtesy of AMERICAN HONDA MOTOR CO., INC.

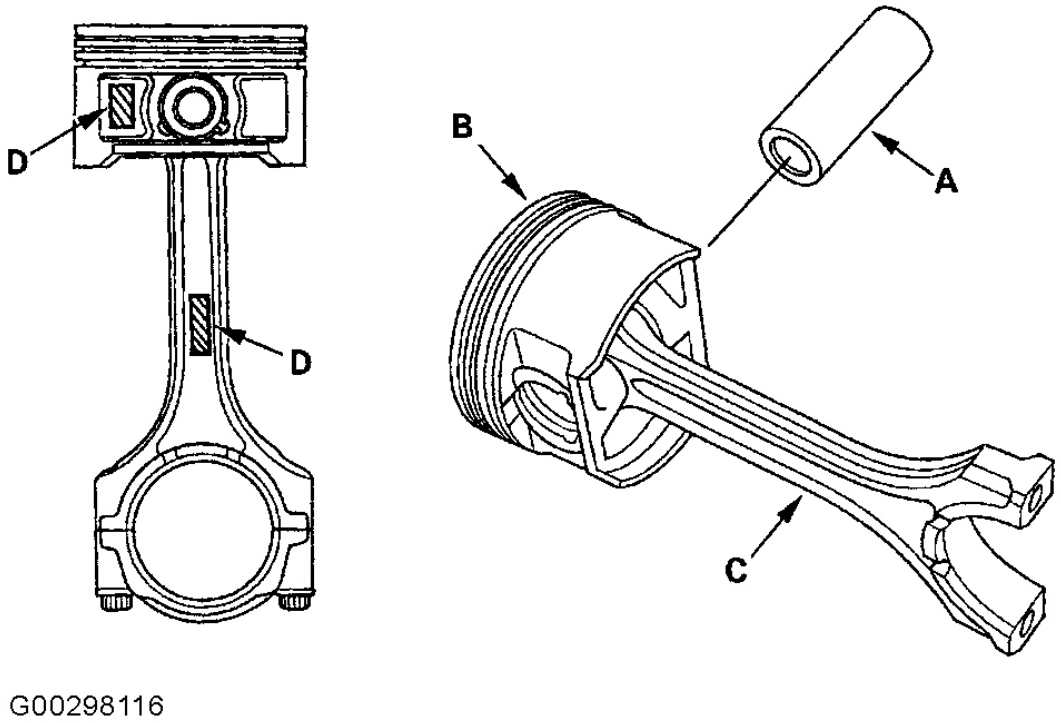


Fig. 195: Installing Piston Pin
Courtesy of AMERICAN HONDA MOTOR CO., INC.

PISTON RING

Removal

1. Remove the piston from the cylinder block. See **CRANKSHAFT & PISTON**.
2. Using a ring expander (A), remove the old piston rings (B). See **Fig. 196**.
3. Clean all the ring grooves thoroughly with a squared-off broken ring or ring groove cleaner with a blade to fit the piston grooves. File down the blade if necessary. Top ring and second ring grooves are .05" (1.2 mm) wide, and the oil ring groove is .11" (2.8 mm) 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 into the cylinder bore .6-.8" (15-20 mm) from the bottom. See **Fig. 197** and **PISTON RING END-GAP** table.
5. Measure the piston ring end-gap 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 under BLOCK & PISTON INSPECTION.

PISTON RING END-GAP

Application	Specification - In. (mm)
Top Ring	
Standard (New)	.008-.014 (.20-.35)
Service Limit	.024 (.60)
Second Ring	
Standard (New)	.016-.022 (.40-.55)
Service Limit	.028 (.70)
Oil Ring	
Standard (New)	.008-.028 (.20-.70)
Service Limit	.031 (.80)

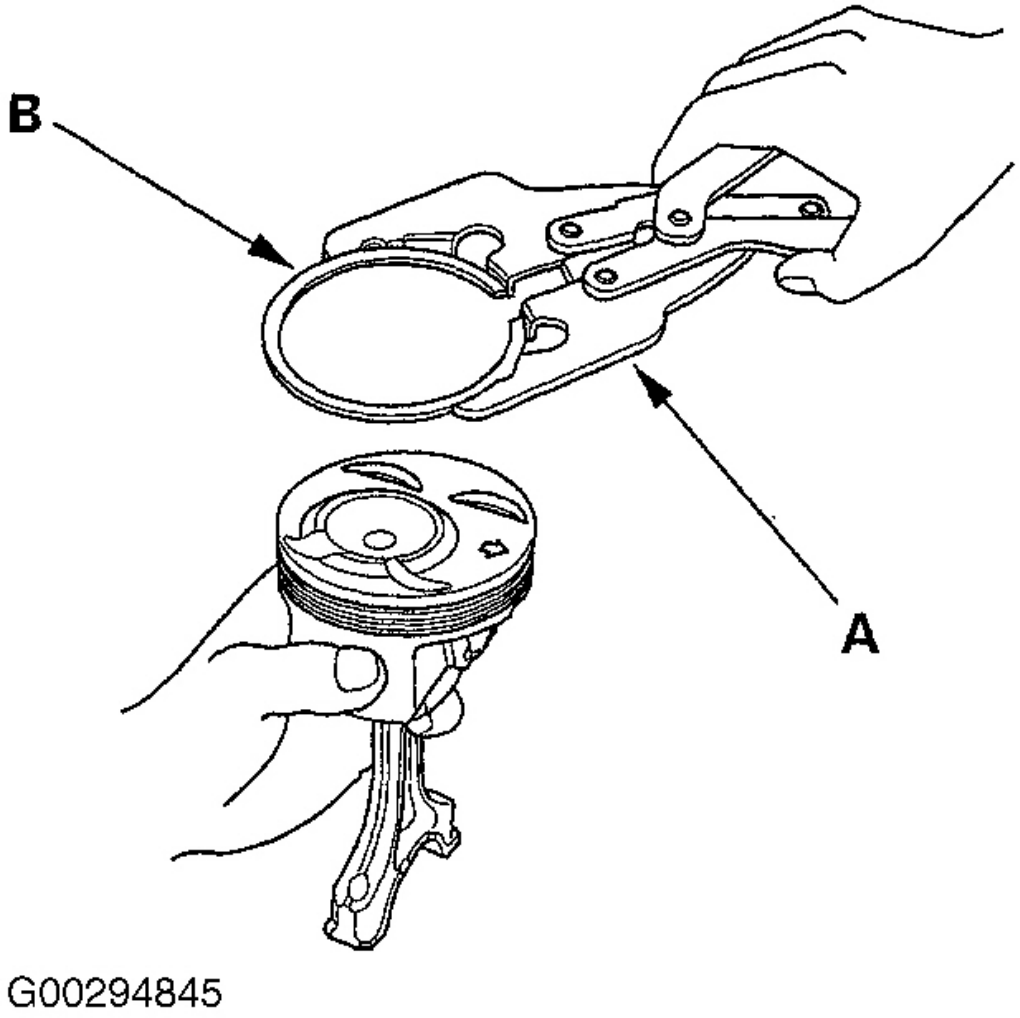


Fig. 196: Removing/Installing Piston Ring
Courtesy of AMERICAN HONDA MOTOR CO., INC.

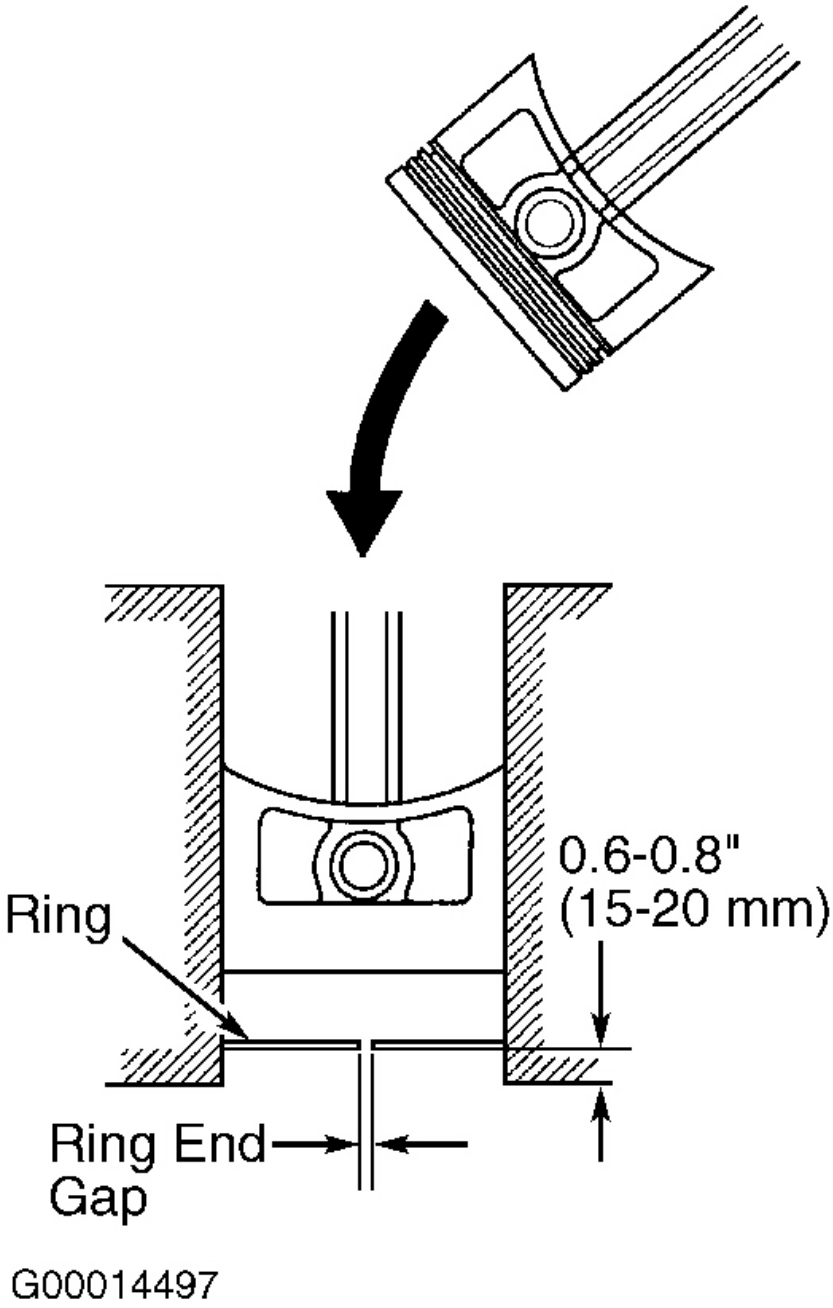
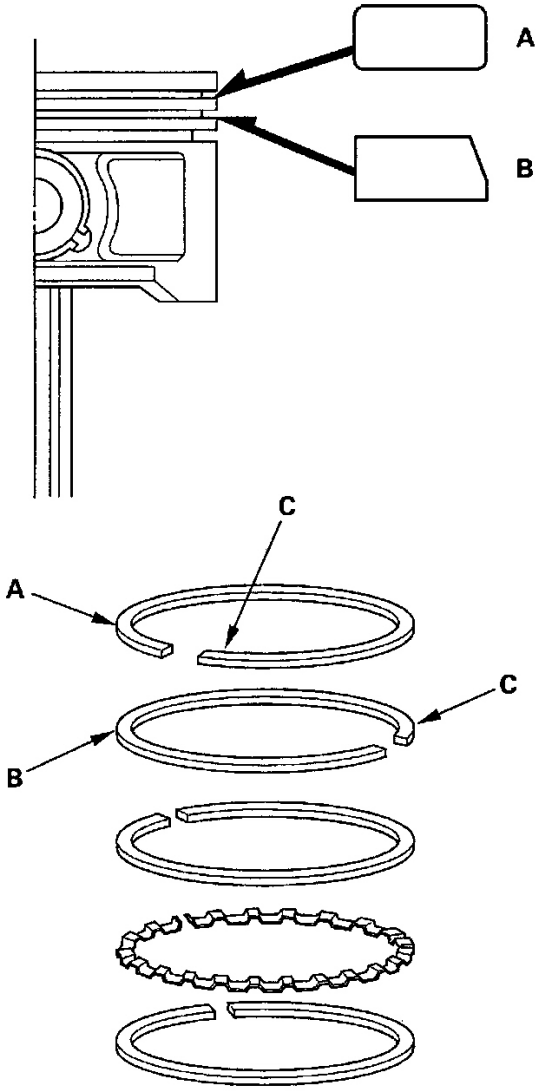


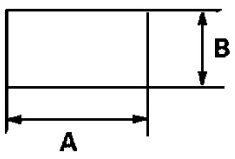
Fig. 197: Measuring Piston Ring End Gap
Courtesy of AMERICAN HONDA MOTOR CO., INC.

6. Install the rings. See **Fig. 198**. The top ring (A) has a 1C mark (J32A1 engine) or 1D mark (J32A2 engine) and the second ring (B) has a 2C mark. The manufacturing marks (C) must be facing upward.

7. Rotate the rings in their grooves to make sure they do not bind.
8. Position the ring end gaps. See **Fig. 199**.
9. After installing a new set of rings, measure the ring-to-groove clearance. See **Fig. 200** and **RING-TO-GROOVE CLEARANCE** table.



Piston Ring Dimensions:



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

Second Ring (Standard)
A: 3.4 mm (0.13 in.)
B: 1.2 mm (0.05 in.)

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Fig. 198: Installing Top & Second Ring
Courtesy of AMERICAN HONDA MOTOR CO., INC.

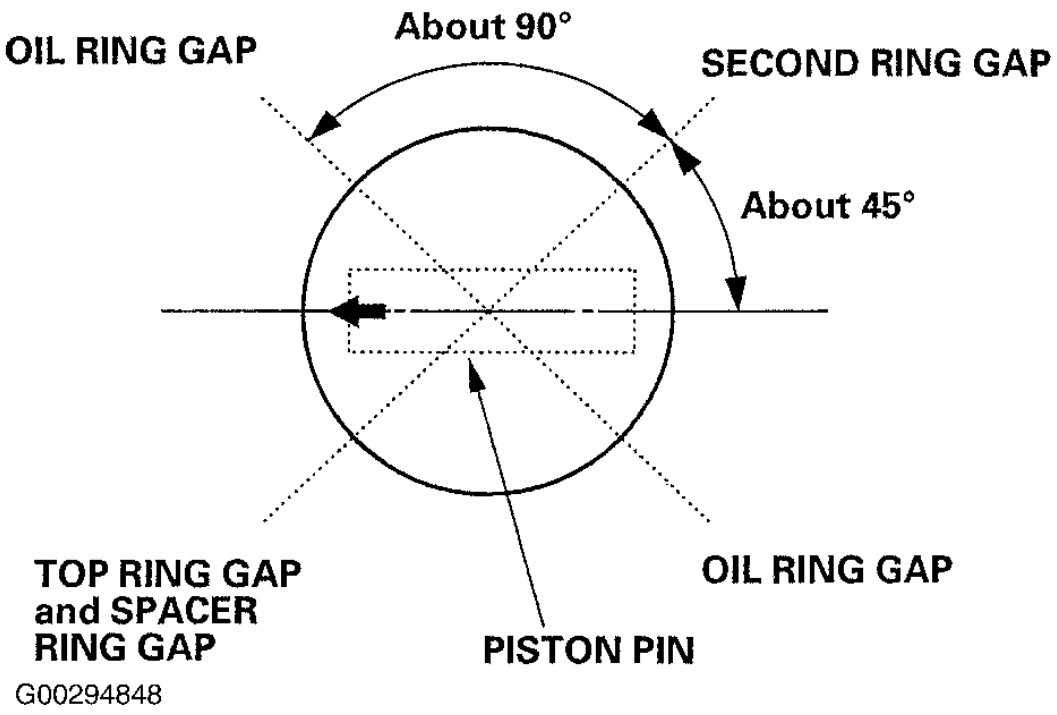


Fig. 199: Positioning Ring End Gaps
Courtesy of AMERICAN HONDA MOTOR CO., INC.

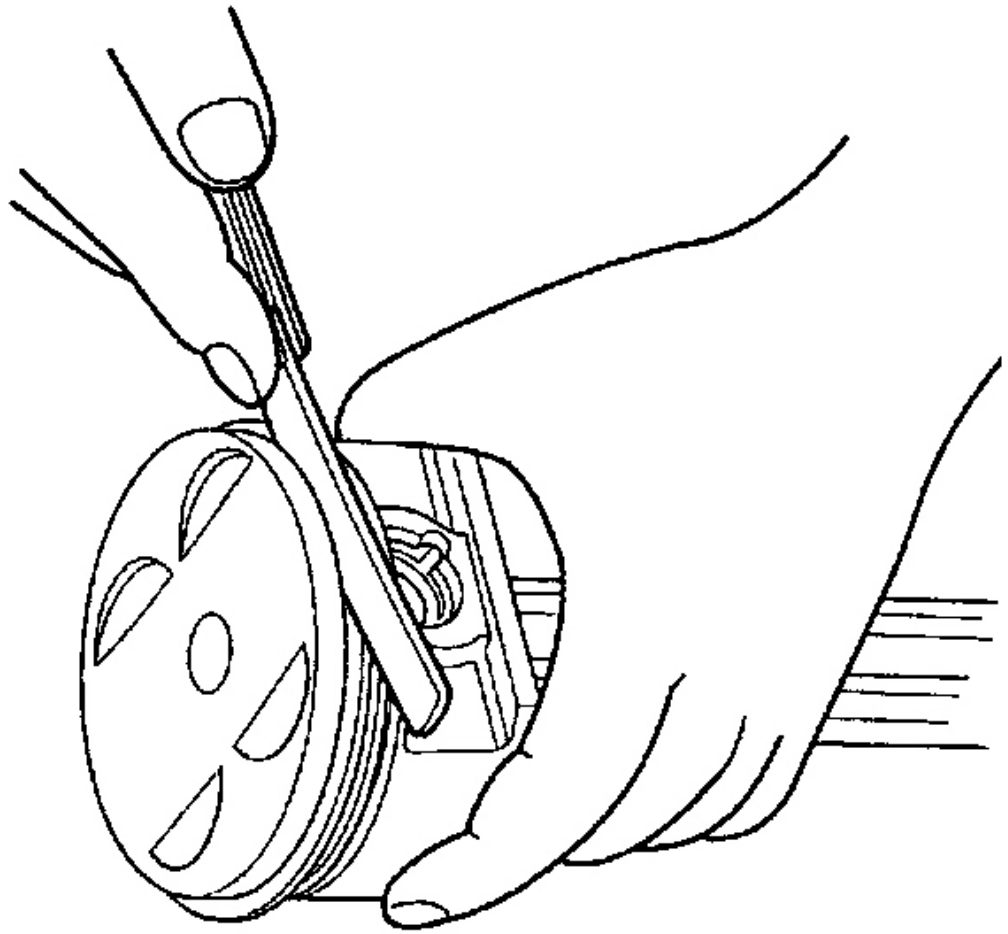


Fig. 200: Measuring Ring-To-Groove Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

RING-TO-GROOVE CLEARANCE

Application	Specification - In. (mm)
Top Ring Clearance	
J32A1	
Standard (New)	.0014-.0024 (.035-.060)
Service Limit	.005 (.13)
J32A2	
Standard (New)	.0022-.005 (.055-.080)

Service Limit	.005 (.13)
Second Ring Clearance	
Standard (New)	.0012-.0022 (.030-.055)
Service Limit	.005 (.13)

FRONT CRANKSHAFT SEAL (PULLEY END)

Installation

1. Dry the crankshaft oil seal housing.
2. Apply a light coat of grease to the crankshaft and to the lip of the seal.
3. Using the seal driver, drive in the crankshaft oil seal until the driver bottoms against the oil pump. See **Fig. 201**. When the seal is in place, clean any excess grease off the crankshaft, and check that the oil seal lip is not distorted.

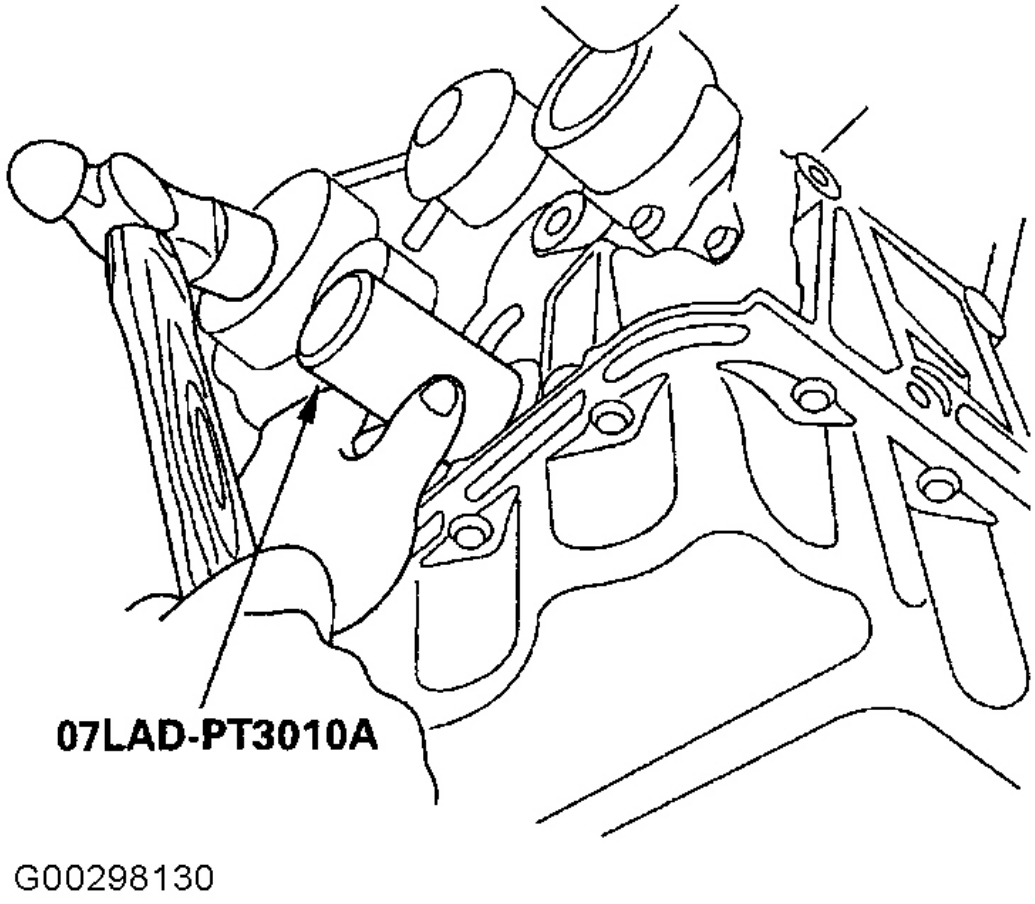


Fig. 201: Driving Crankshaft Oil Seal Until Driver Bottoms Against Oil Pump

Courtesy of AMERICAN HONDA MOTOR CO., INC.

REAR CRANKSHAFT SEAL (TRANSMISSION END)

Installation

1. Dry the crankshaft oil seal housing.
2. Apply a light coat of grease to the crankshaft and to the lip of the seal.
3. Using driver and oil seal driver attachment, drive the crankshaft oil seal into the engine block and cover until the driver attachment bottoms against the crankshaft. See **Fig. 202**. Align the hole in the driver attachment with the pin on the crankshaft.
4. Clean any excess grease off the crankshaft, and check that the oil seal lip is not distorted.

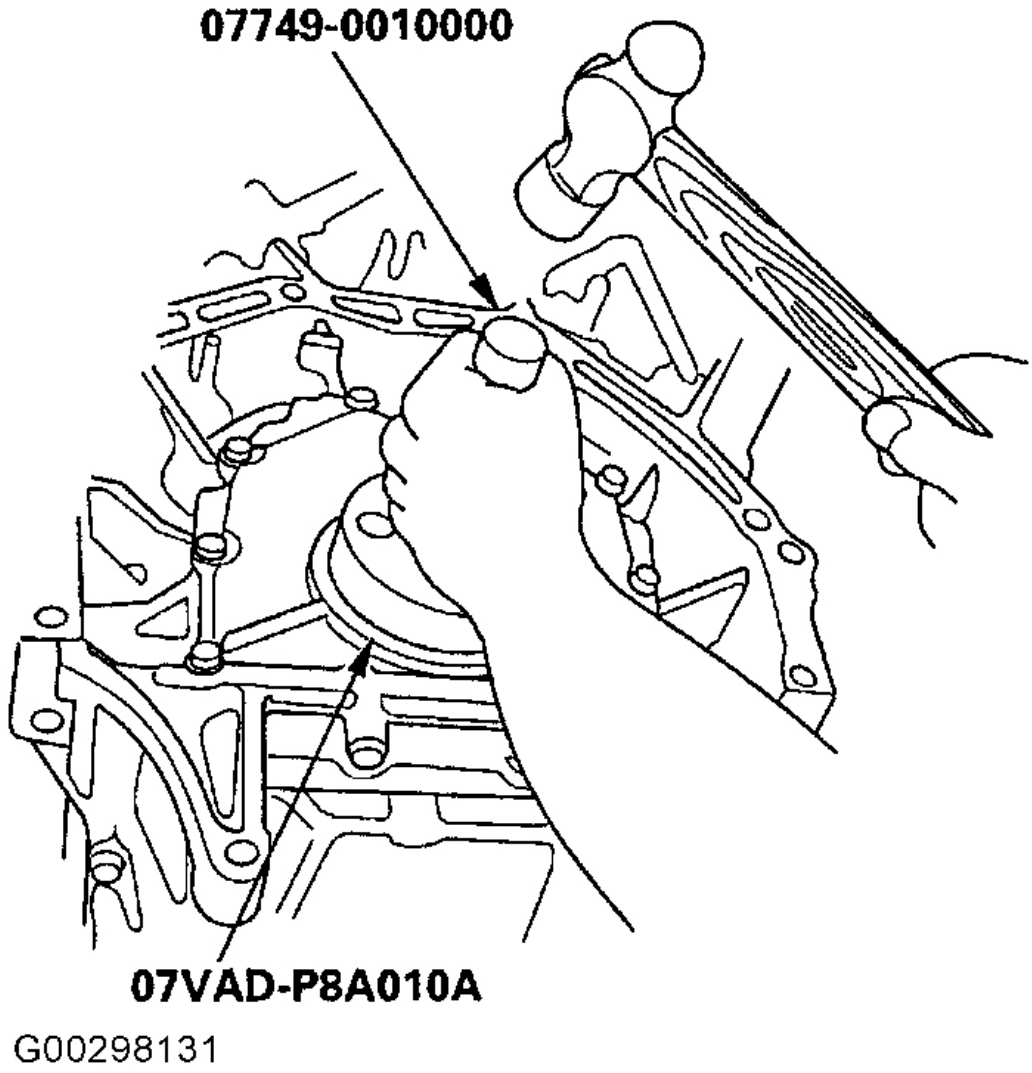


Fig. 202: Driving Crankshaft Oil Seal Into Engine Block End Cover
Courtesy of AMERICAN HONDA MOTOR CO., INC.

OIL PUMP

Illustration for oil pump, see **Fig. 203**.

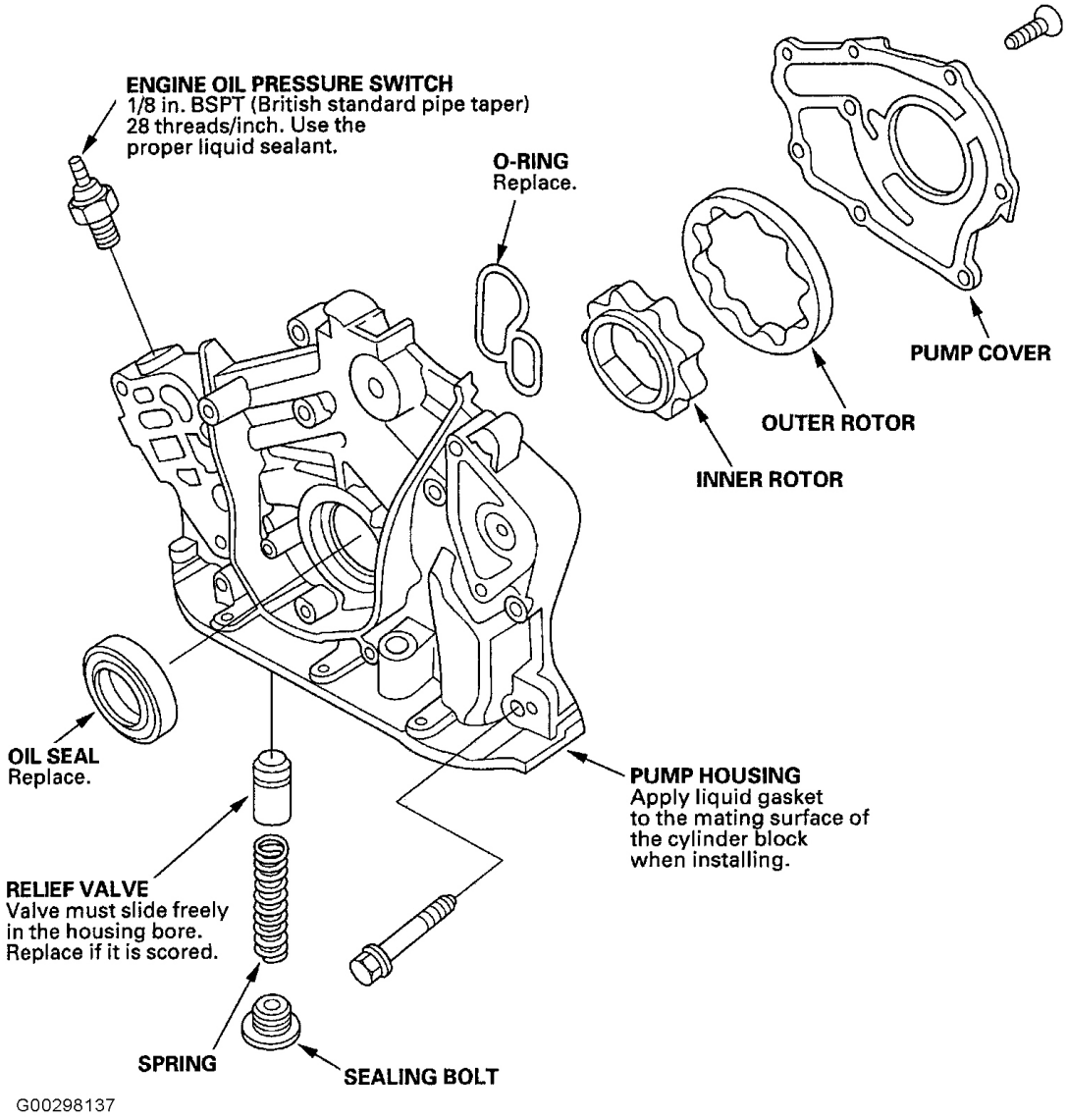


Fig. 203: Exploded View Of Oil Pump
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Removal

1. Drain engine oil.
2. Turn the crankshaft so that the No. 1 piston is at top dead center. See **TIMING BELT** under REMOVAL & INSTALLATION.
3. Remove timing belt. See **TIMING BELT** under REMOVAL & INSTALLATION.
4. Remove idler pulley.
5. Remove the Crankshaft Position (CKP) sensor, then remove the timing belt pulley. See **CRANKSHAFT POSITION SENSOR**.

6. Remove the VTEC solenoid valve and oil filter assembly. See **VTEC SOLENOID VALVE** under TESTING.
7. Remove the oil pan and the oil screen (A). See **Fig. 204**.
8. Remove the mounting bolts and the oil pump assembly (B).
9. Remove the screws from the pump housing, then separate the housing and cover.

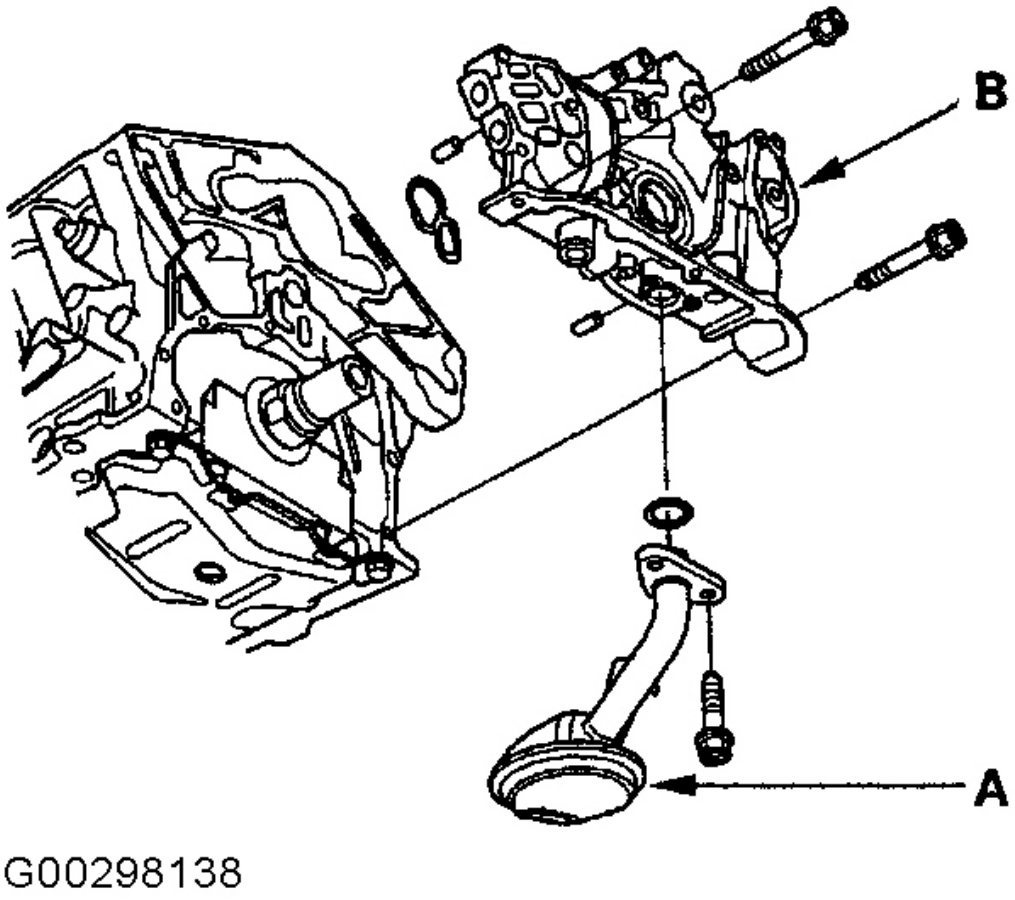


Fig. 204: Removing Oil Pan & Oil Screen
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Inspection

1. Check the inner-to-outer rotor radial clearance between the inner rotor (A) and outer rotor (B). See **Fig. 205** and **INNER ROTOR-TO-OUTER ROTOR RADIAL CLEARANCE** table. If the inner-to-outer rotor clearance exceeds the service limit, replace the oil pump assembly.

INNER ROTOR-TO-OUTER ROTOR RADIAL CLEARANCE

Application	Specification - In. (mm)
Standard (New)	.002-.006 (.04-.16)
Service Limit	.008 (.20)

2. Check the housing-to-rotor axial clearance between the rotors (A) and pump housing (B). See **Fig. 206** and **HOUSING-TO-ROTOR AXIAL CLEARANCE** table. If the housing-to-rotor axial clearance exceeds the service limit, replace the oil pump assembly.

HOUSING-TO-ROTOR AXIAL CLEARANCE

Application	Specification - In. (mm)
Standard (New)	.001-.003 (.02-.07)
Service Limit	.005 (.12)

3. Check the housing-to-outer rotor radial clearance between the out rotor (A) and pump housing (B). See **Fig. 205** and **HOUSING-TO-OUTER ROTOR RADIAL CLEARANCE** table. If the housing-to-outer rotor radial clearance exceeds the service limit, replace the oil pump assembly.

HOUSING-TO-OUTER ROTOR RADIAL CLEARANCE

Application	Specification - In. (mm)
Standard (New)	.006-.007 (.14-.19)
Service Limit	.008 (.20)

4. Inspect both rotors and the pump housing for scoring or other damage. Replace parts if necessary.
5. Remove the old oil seals from the oil pump.
6. Gently tap in the new oil seals until oil seal driver bottoms on the pump. See **Fig. 207**.
7. Apply liquid thread lock to the pump housing screws.

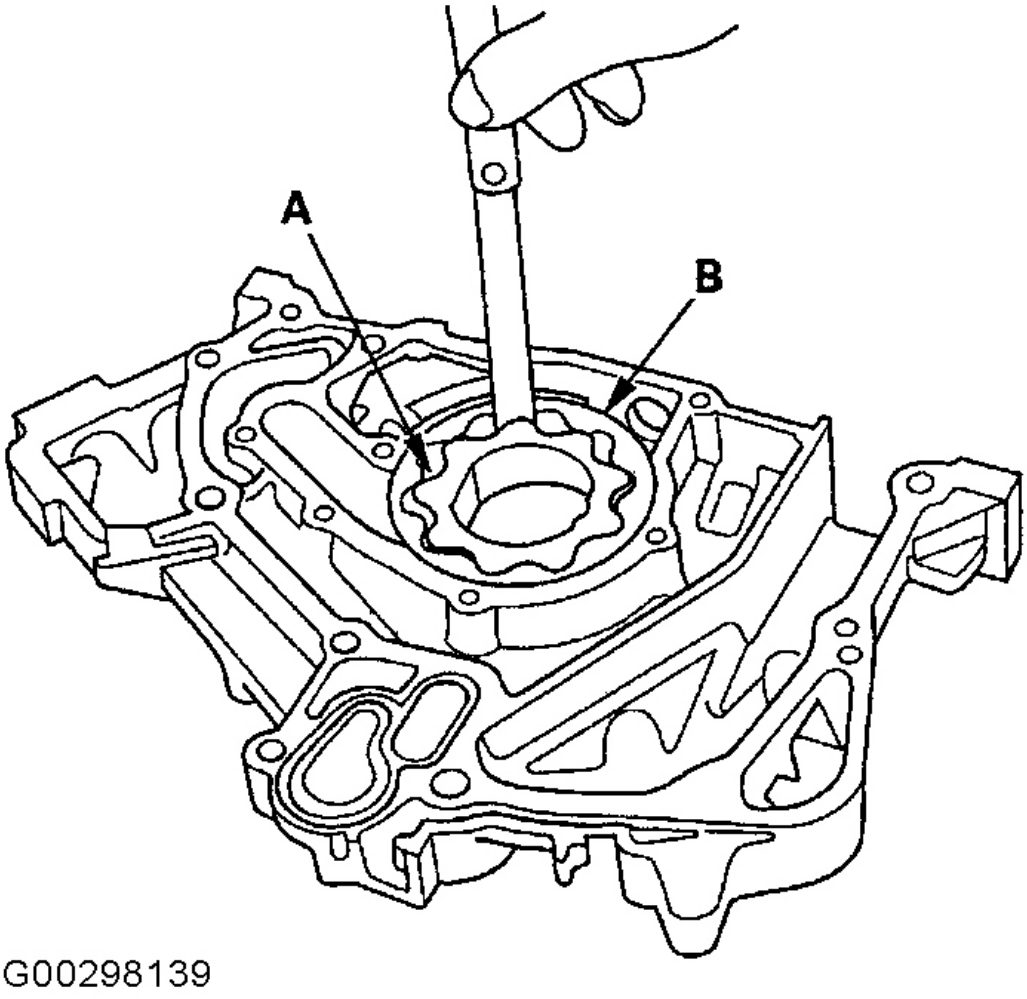


Fig. 205: Checking Inner-To-Outer Rotor Radial Clearance
Courtesy of AMERICAN HONDA MOTOR CO., INC.

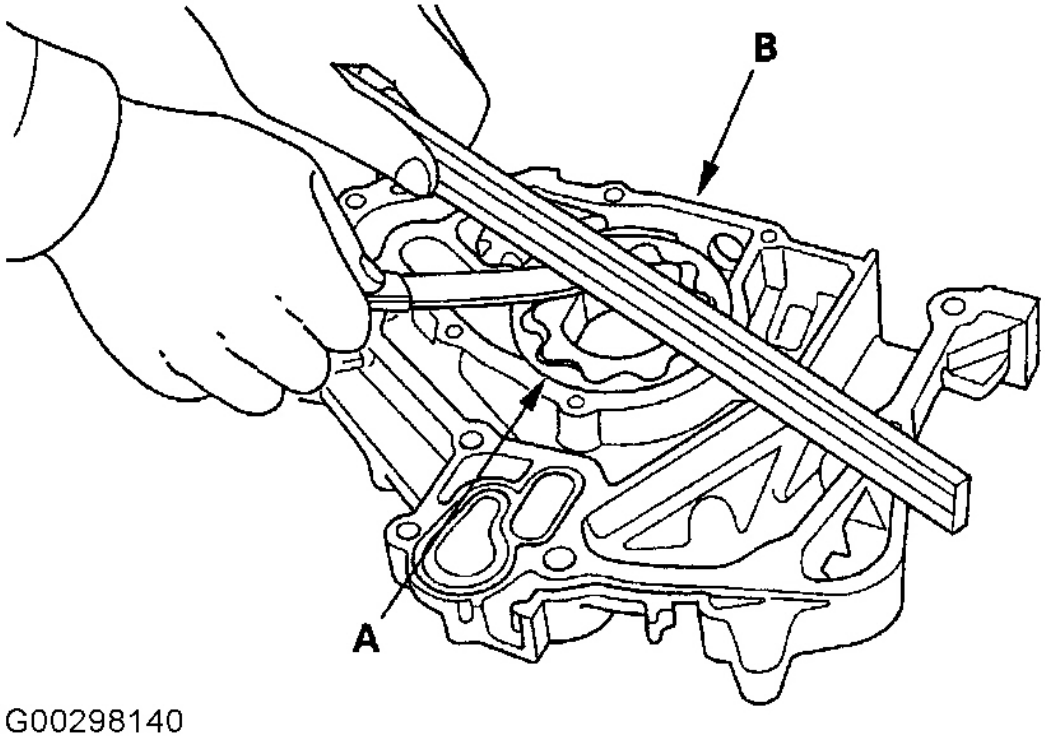


Fig. 206: Check Housing-To-Rotor Axial Clearance Between Rotors & Pump Housing
Courtesy of AMERICAN HONDA MOTOR CO., INC.

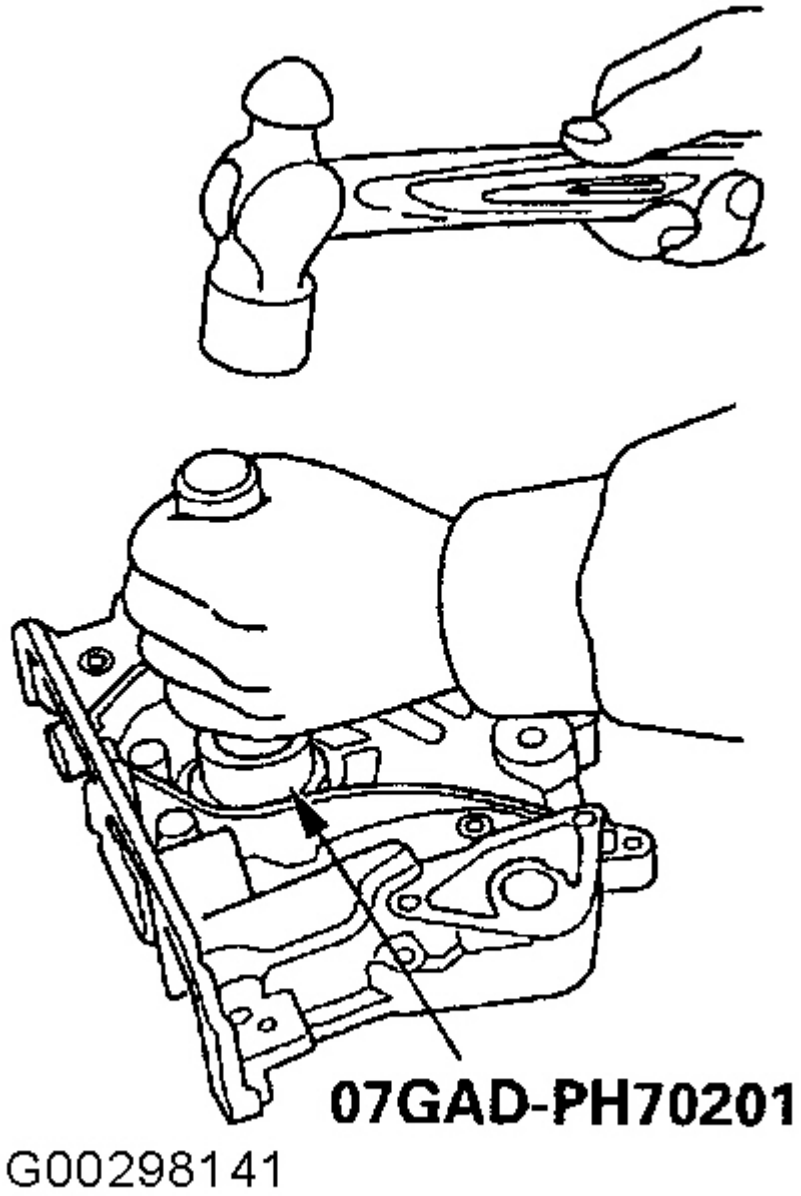


Fig. 207: Installing New Oil Seal
Courtesy of AMERICAN HONDA MOTOR CO., INC.

Installation

1. Reassemble the oil pump.

2. Check that the oil pump turns freely.
3. Clean and dry the oil pump mating surfaces.

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

4. Install the oil pump (A). See **Fig. 208** and use following steps;
   a. Apply liquid gasket, part No. 08718-0001 or 08718-0003, evenly to the block mating surface of the oil pump and to the inner threads of the bolt holes.
   b. Grease the lip of the oil seal and apply oil to the new "O" rings (B).
   c. Install the dowel pins (C), then align the inner rotor with the crankshaft and install the oil pump.
   d. Clean the excess grease off the crankshaft, and check the seal for distortion.
5. Install the oil screen (D).
6. Clean and dry the oil pan mating surfaces.

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

7. Apply liquid gasket, part No. 08718-0001 or 08718-0003, evenly to the oil pan mating surface of the block and to the inner threads of the bolt holes.
8. Install the oil pan. See **Fig. 170**.
9. Tighten the bolts in 2 or 3 steps. In the final step, tighten all bolts in sequence. See **Fig. 171** and **TORQUE SPECIFICATIONS**.

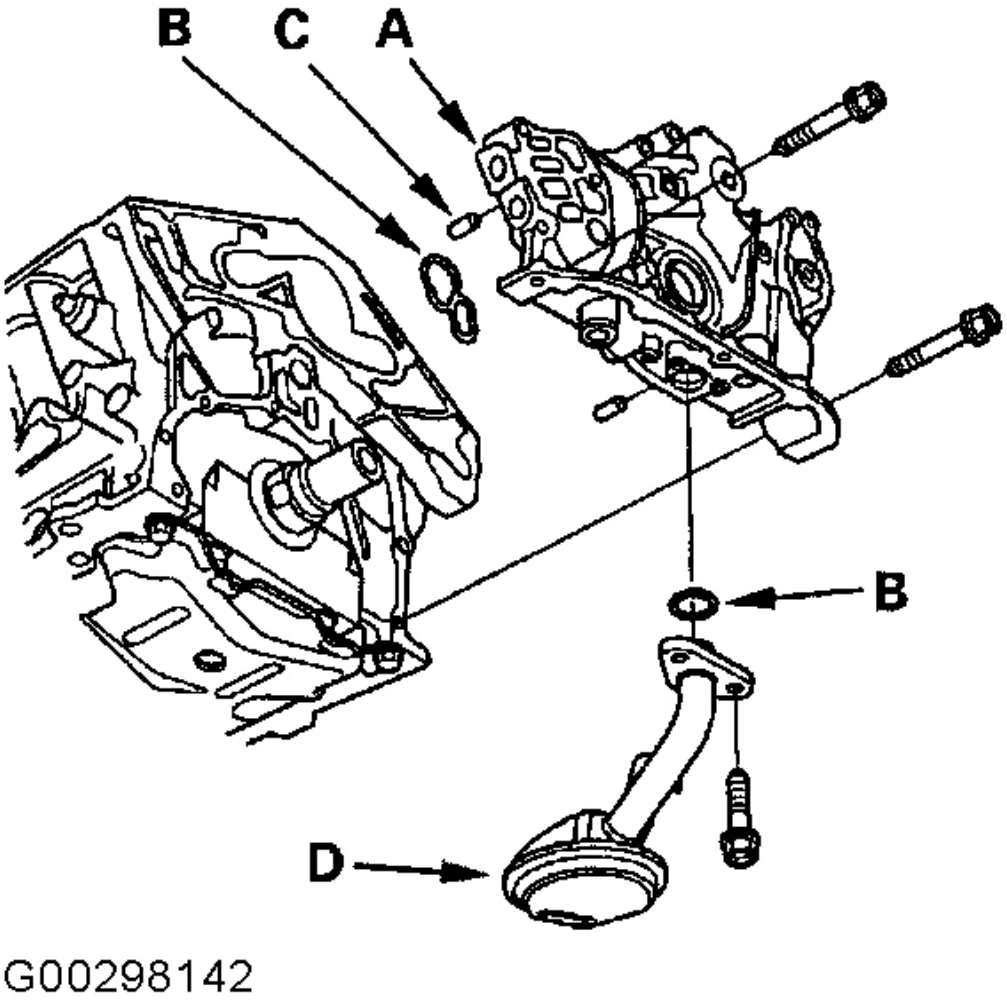


Fig. 208: Installing Oil Pump
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ENGINE OILING

OIL PRESSURE

If the oil pressure warning light stays on with the engine running, check the engine oil level. If the oil level is correct, see following steps.

1. Connect a tachometer.
2. Remove the engine oil pressure switch and install an oil pressure gauge (A). See **Fig. 209**.

3. Start the engine. Shut it off immediately if the gauge registers no oil pressure. Repair the problem before continuing.
4. Allow the engine to reach operating temperature (fan comes on at least twice). The pressure should be, see **ENGINE OIL TEMPERATURE & PRESSURE** table.
5. If oil pressure is NOT within specifications, inspect these items;
    - Check the oil screen for clogging.
    - Check the oil pump. See **OIL PUMP**.

ENGINE OIL TEMPERATURE & PRESSURE

Application	Specifications
Engine Oil Temperature	176°F (80°C)
Engine Oil Pressure	
At Idle	10 psi (70 kPa) min.
At 3000 RPM	71 psi (490 kPa) min.

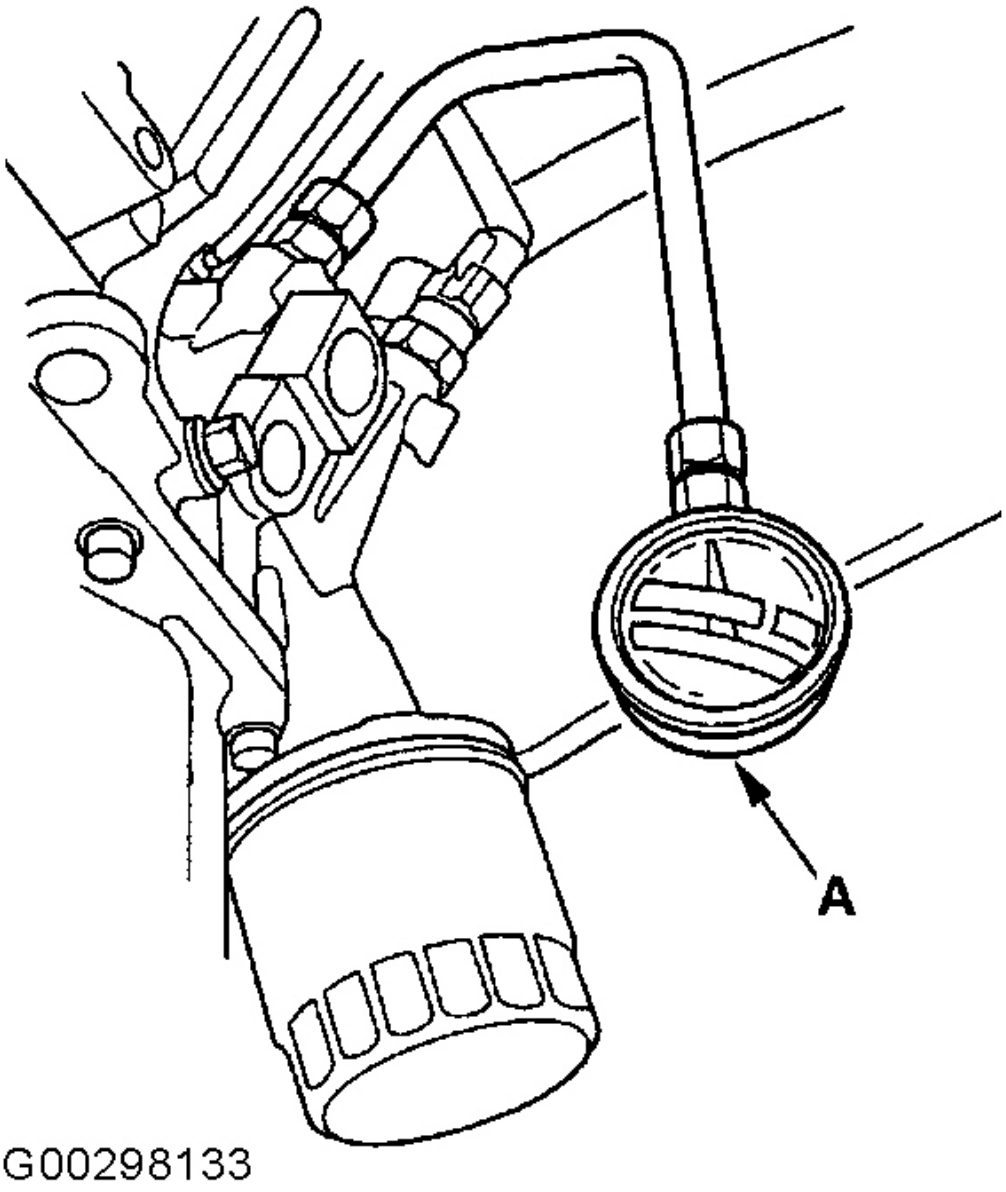


Fig. 209: Removing Engine Oil Pressure Switch & Installing Oil Pressure Gauge
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ENGINE OIL

Removal & Installation

NOTE: Under normal conditions, the oil filter should be replaced at every other oil change. Under sever conditions, the oil filter should be replaced at each oil change.

Change interval:

- Every 7500 miles (12000 km) or 12 months (Normal conditions)
- Every 3750 miles (6000 km) or 6 months (Severe conditions)

1. Warm up the engine.
2. Remove the drain bolt (A), and drain the engine oil. See **Fig. 210**.
3. Reinstall the drain bolt with a new washer (B).
4. Refill with the recommended amount of oil. See **OIL CAPACITY** table.
5. Run the engine for more than 3 minutes, then check for oil leakage.

OIL CAPACITY

Application	Specification - Qt. (L)
At Oil Change	3.5 (4)
At Oil Change Including Filter	3.9 (4.4)
After Engine Overhaul	4.4 (5)

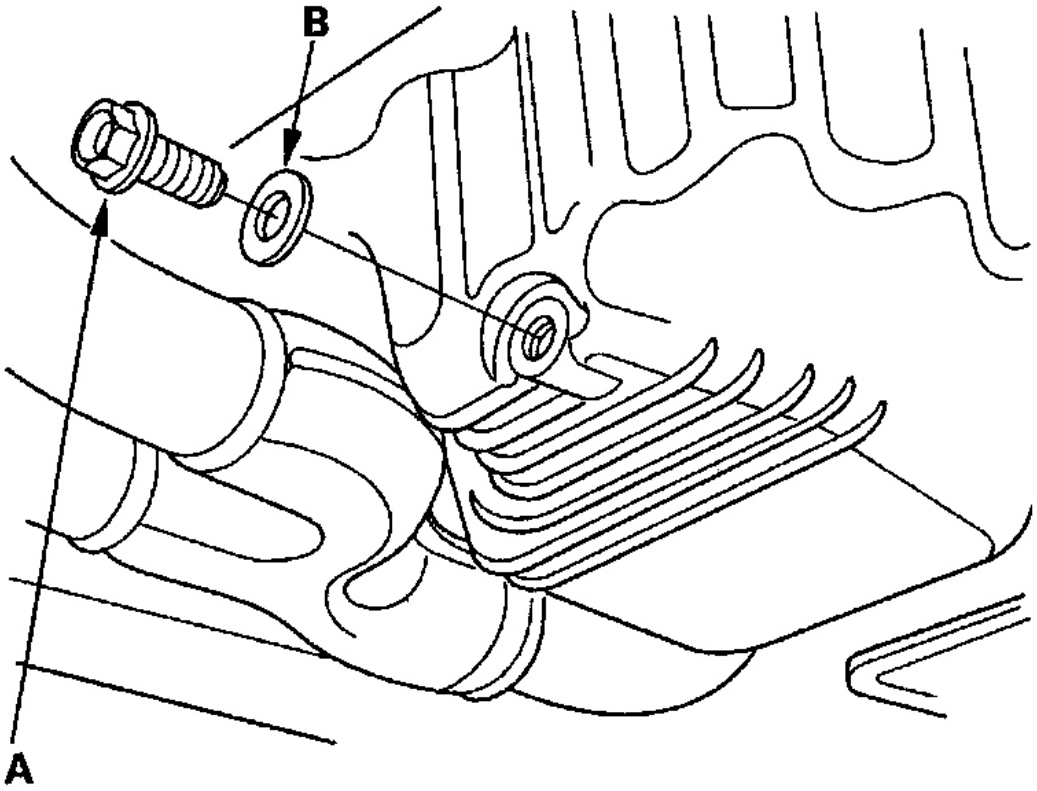


Fig. 210: Removing Drain Bolt & Draining Engine Oil
Courtesy of AMERICAN HONDA MOTOR CO., INC.

ENGINE OIL FILTER

Removal & Installation

1. Remove the oil filter with the oil filter wrench.
2. Inspect the threads (A) and rubber seal (B) on the new filter. See **Fig. 211**. Wipe off the seat on the engine block, then apply a light coat of oil to the filter rubber seal. Use only filters with a built-in bypass system.
3. Install the oil filter by hand.
4. After the rubber seal seats, tighten the oil filter clockwise with the oil filter wrench. See **TORQUE SPECIFICATIONS**.
5. If eight numbers (1 to 8) are printed around the outside of the filter, use the following procedure to tighten the filter and see **Fig. 212**;
    - Spin the filter on until its seal lightly seats against the block, and note which number is at the

bottom.

- Tighten the filter by turning it clockwise seven numbers from the one you noted. For example, if number 2 is at the bottom when the seal is lightly seated, tighten the filter until the number 1 comes around to the bottom.

6. After installation, fill the engine with oil up to the specified level, run the engine for more than 3 minutes, then check for oil leakage.

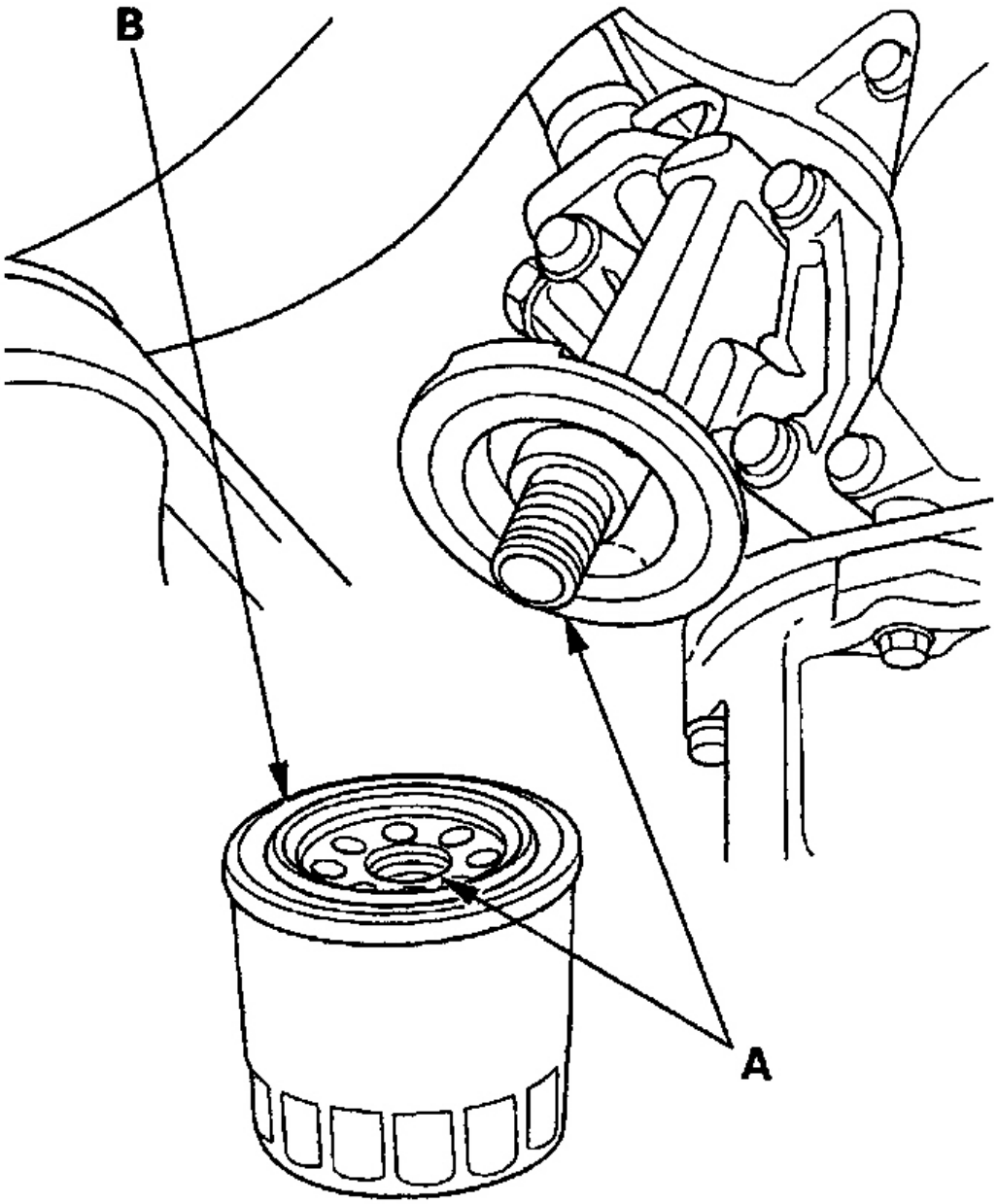
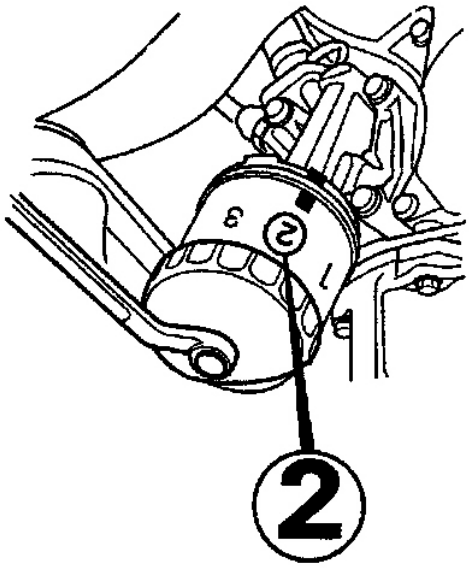
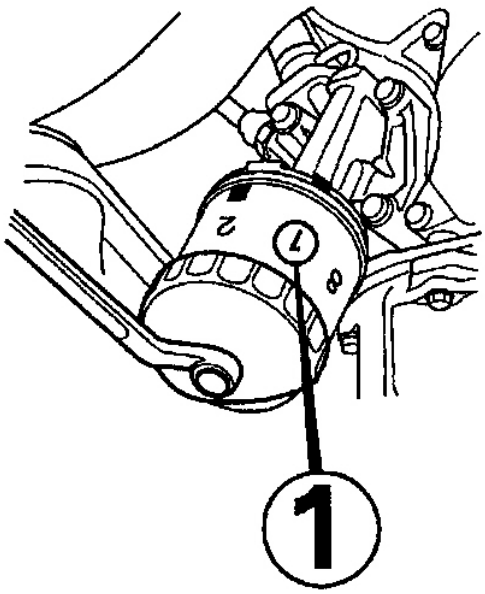


Fig. 211: Inspecting Threads & Rubber Seal On New Filter
Courtesy of AMERICAN HONDA MOTOR CO., INC.



Number when rubber seal is seated.



Number after tightening.

Number when rubber seal is seated	1	2	3	4	5	6	7	8
Number after tightening	8	1	2	3	4	5	6	7

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Fig. 212: Tightening Procedure For Filter
Courtesy of AMERICAN HONDA MOTOR CO., INC.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Lbs. (N.m)
A/C Compressor	
Bracket-To-Block Bolts	32 (44)
Compressor Mounting Bolts	16 (22)

Auto-Tensioner Bolt	(1)
Baffle Plate Bolt	(1)
Camshaft	
Back Cover Mounting Bolts	16 (22)
Pulley Bolt	66 (90)
Connecting Rod Bearing Cap Bolts	15 (20)
Crankshaft	
Rear Seal Cover Bolts	(1)
Pulley Bolt	181 (245)
Cylinder Head Bolts (2)	
1st Step	29 (39)
2nd Step	51 (69)
3rd Step	72 (98)
Cylinder Head Cover Bolts	(1) (3)
Drain Plug	29 (39)
Drive Plate	54 (74)
Engine Drive Plate Mounting Bolts	(4) 55 (75)
Engine Ground Strap Bolt	28 (38)
Engine Harness Cowl Cover Nuts	(1)
Engine Mount Bracket-To-Block Bolts	32 (44)
Engine Oil Bolt	14 (20)
Engine Radius Rod Flange Bolts	119 (161)
Engine Upper Cover Bolts	(1) (3)
Exhaust Manifold	
Cover Bolts	16 (22)
Self-Locking Nuts	23 (31)
Frame Sub-Assembly	
Front Mounting Bolts	76 (103)
Rear Extension Mounting Bolts	40 (54)
Rear Extension Nuts	28 (38)
Front Exhaust Pipe	
Pipe-To-Catalytic Converter Self-Locking Nuts	24 (33)
Pipe-To-Manifold Self-Locking Nuts	40 (54)
Vacuum Tube Bracket Bolts	28 (38)
Front Mount	
Bracket-To-Block Bolts	28 (38)
Bracket-To-Support Nut	40 (54)
Fuel Injector Base Nuts	16 (22)
Fuel Pulsation Damper	16 (22)
Ignition Coil Mounting Bolts	

	(1)
Intake Air Temperature Sensor	13 (18)
Intake Manifold	
Manifold Chamber Cover Bolts	(1)
Mounting Bolts/Nuts	(3) 16 (22)
Upper Cover Bolts/Nuts	(1)
Vacuum Nipple	20 (27)
Main Bearing Caps	
Side Bolts	36 (49)
Top Bolts	56 (76)
Oil Filter Housing Mounting Bolts	16 (22)
Oil Pan Mounting Bolts	(1)
Oil Pressure Switch	13 (18)
Oil Pump	
Cover Screws	(5)
Mounting Bolts	(1)
Relief Valve Sealing Bolt	29 (39)
Oil Screen Mounting Bolts	(1)
Power Steering Pump Bracket Bolts	16 (22)
Radiator Upper Mounting Bolts	(6)
Rear Mount	
Bracket-To-Block Bolts	28 (38)
Bracket-To-Support Nut	40 (54)
Rocker Shaft Mounting Bolts	(3) 18 (24)
Shift Control Lever	
Cable Cover Bolts	16 (22)
Cable Holder Bolts	(1)
End Bolt	(7)
Side Engine Mount Bracket	
Bracket-To-Body Vertical Bolts	32 (44)
Bracket-To-Support Horizontal Bolt	40 (54)
Thermostat Housing Bolts	(1)
Throttle Body Mounting Bolts/Nuts	16 (22)
Timing Belt	
Auto Tensioner Mounting Bolts	(1)
Idler Pulley Bolt	32 (44)
Lower Cover Bolts	(1)
Upper (Camshaft) Cover Bolts	16 (22)

Transmission Lower Rear Mount Bolts	28 (38)
Valve Adjusting Screw Lock Nut	14 (19)
VSP Speed Sensor Mount Bolts	16 (22)
VTEC Solenoid Valve Mounting Bolts	(1)
Water Passage Assembly Mounting Bolts	16 (22)
Water Pump Mounting Bolts	(1)

(1) Tighten to 106 INCH lbs. (12 N.m).

(2) Tighten in sequence shown in illustration. See **Fig. 84**.

(3) Tighten in 2-3 steps.

(4) Tighten in crisscross pattern.

(5) Tighten to 53 INCH lbs. (6 N.m).

(6) Tighten to 89 INCH lbs. (10 N.m).

(7) Tighten to 124 INCH lbs. (14 N.m).

ENGINE SPECIFICATIONS

GENERAL SPECIFICATIONS

GENERAL SPECIFICATIONS

Application	Specification
Displacement	196 Cu. In. (3.2L)
Bore	3.50" (89 mm)
Stroke	3.39" (86 mm)
Compression Ratio	
J32A1	9.8:1
J32A2	10.5:1
Fuel System	PGM-FI

CRANKSHAFT, MAIN BEARINGS & CONNECTING ROD BEARINGS SPECIFICATIONS

CRANKSHAFT, MAIN & CONNECTING ROD BEARINGS

Application	Specification - In. (mm)
Crankshaft	
End Play	
Standard	.002-.008 (.05-.20)
Service Limit	.008 (.20)
Runout	
Standard	.001 (.03) max
Service Limit	.002 (.04)

Main Bearings	
Journal Diameter	71.976-72.000 (2.8337-2.8346)
Journal Out-Of-Round	
Standard	.005 (.0002)
Service Limit	.010 (.0004)
Journal Taper	
Standard	.0002 (.005)
Service Limit	.010 (.0004)
Oil Clearance	
Standard	.0008-.0017 (.020-.044)
Service Limit	.0020 (.050)
Connecting Rod Bearings	
Journal Diameter	2.1644-2.1654 (54.976-55.000)
Journal Out-Of-Round	
Standard	.0002 (.005)
Service Limit	.0004 (.010)
Journal Taper	
Standard	.0002 (.005)
Service Limit	.0004 (.010)
Oil Clearance	
Standard	.0008-.0017 (.020-.044)
Service Limit	.0020 (.050)

CONNECTING RODS SPECIFICATIONS

CONNECTING RODS

Application	Specification - In. (mm)
End Play On Crankshaft	
Standard	.006-.014 (.015-.035)
Service Limit	.018 (.45)
Pin-To-Rod Clearance	
Standard	.0002-.0006 (.005-.014)
Service Limit	.0007 (.019)
Small End Bore Diameter	.8650-.8652 (21.970-21.976)
Large End Bore Diameter	2.28 (58.0)

PISTON, PISTON PINS & PISTON RINGS SPECIFICATIONS

PISTON, PINS & RINGS

Application	Specification - In. (mm)
Piston	
Clearance In Cylinder	

Standard	.0006-.0016 (.015-.040)
Service Limit	.003 (.08)
Diameter	
Standard	3.529-3.5033 (88.975-88.985)
Service Limit	3.5026 (88.965)
Pins	
Outside Diameter	
Standard	.8646-.8648 (21.961-21.965)
Service Limit	.8643 (21.953)
Pin-To-Piston Clearance	
Standard	-.00020- +.00004 (-.0050- +.0010)
Service Limit	.0002 (.004)
Ring Groove Width	
J32A1 Engine (Top)	
Standard	.0480-.0484 (1.220-1.230)
Service Limit	.049 (1.25)
J32A2 Engine (Top)	
Standard	.0488-.0492 (1.240-1.250)
Service Limit	.050 (1.27)
Second	
Standard	.0480-.0484 (1.220-1.230)
Service Limit	.049 (1.25)
Oil	
Standard	.1104-.1112 (2.805-2.825)
Service Limit	.112 (2.85)
Ring-To-Groove Clearance	
J32A1 Engine (Top)	
Standard	.0014-.0024 (.035-.060)
Service Limit	.005 (.13)
J32A2 Engine (Top)	
Standard	.0022-.0031 (.055-.080)
Service Limit	.005 (.13)
Second	
Standard	.0012-.0022 (.030-.055)
Service Limit	.005 (.13)
Ring End Gap	
Top	
Standard	.008-.014 (.20-.35)
Service Limit	.024 (.60)
Second	

Standard	.016-.022 (.40-.55)
Service Limit	.028 (.70)
Oil	
Standard	.008-.028 (.20-.70)
Service Limit	.031 (.80)

CYLINDER BLOCK SPECIFICATIONS

CYLINDER BLOCK

Application	Specification - In. (mm)
Cylinder Bore	
Standard (1)	3.5039-3.5045 (89.000-89.014)
Service Limit	3.5065 (89.065)
Maximum Taper	.002 (.05)
Maximum Rebore Limit	.02 (.5)
Deck Warpage	
Standard	.003 (.07)
Service Limit	.004 (.10)
(1) Cylinder bore identification letter is located on top of cylinder.	

ENGINE VALVES & VALVE SPRINGS SPECIFICATIONS

VALVES & VALVE SPRINGS

Application	Specification
Intake Valves	
Face Angle	45°
Head Diameter	
J32A18	1.335-1.343" (33.90-34.10 mm)
J32A2	1.413-1.421" (35.90-36.10 mm)
Margin	
Standard	0.033-0.045" (0.84-1.14 mm)
Service Limit	0.026" (0.66 mm)
Stem Diameter	
Standard	0.2159-0.2163" (5.485-5.495 mm)
Service Limit	0.215" (5.455 mm)
Valve Length	4.522-4.533" (114.86-115.14 mm)
Valve Stem Installed Height	
Standard	1.841-1.872" (46.75-47.55 mm)
Service Limit	1.882" (47.80 mm)
Exhaust Valves	
Face Angle	45°

Head Diameter	1.138-1.146" (28.91-29.11 mm)
Margin	
Standard	0.041-0.053" (1.04-1.35 mm)
Service Limit	0.037" (.94 mm)
Stem Diameter	
Standard	0.2146-0.2150" (5.450-5.460 mm)
Service Limit	0.213" (5.42 mm)
Valve Length	4.443-4.455" (112.85-113.16 mm)
Valve Stem Installed Height	
Standard	1.838-1.869" (46.68-47.48 mm)
Service Limit	1.879" (47.73 mm)
Valve Springs Free Length	
3.2 TL (2002-03 Models) & 3.2 CL (2001-03 Models	
Intake	2.029" (51.54 mm)
Exhaust	2.010" (51.06 mm)

CYLINDER HEAD SPECIFICATIONS

CYLINDER HEAD

Application	**Specification**
Cylinder Head	
Height	4.762-4.766" (120.95-121.05 mm)
Maximum Warpage(1)	.002" (.05 mm)
Valve Seats	
Intake & Exhaust	
Seat Width	
Standard	.049-.061" (1.24-1.55 mm)
Service Limit	.080" (2.00 mm)
Valve Guides	
Intake & Exhaust	
Valve Guide I.D.	
Standard	.217-0.218" (5.51-5.53 mm)
Service Limit	.219" (5.56 mm)
Valve Guide Installed Height	
Intake	.835-.874" (21.21-22.20)
Exhaust	.812-.852" (20.63-21.63)
Valve Stem-To-Guide Clearance	
Intake	
Standard	.0008-.0018" (0.020-0.045 mm)
Service Limit	0.003" (0.08 mm)
Exhaust	

Standard	.0022-.0031" (.055-.080 mm)
Service Limit	0.005" (0.12 mm)
(1) Maximum resurface limit is 0.008" (0.20 mm).	

CAMSHAFTS & ROCKER ARMS SPECIFICATIONS

CAMSHAFTS & ROCKER ARMS

Application	Specification - In. (mm)
End Play	
Standard	.002-.008 (.05-.20)
Service Limit	.008 (.20)
Journal Runout	
Standard	.001 (.03)
Service Limit	.002 (.04)
Lobe Height (Standard)	
J32A1	
Intake	
Primary	1.3676 (34.737)
Middle	1.4348 (36.445)
Secondary	1.3748 (34.919)
Exhaust (All)	1.4302 (36.326)
J32A2	
Intake	
Primary	1.3676 (34.737)
Middle	1.4348 (36.445)
Secondary	1.3748 (34.919)
Exhaust (All)	1.4326 (36.389)
Camshaft-To-Holder Oil Clearance	
Standard	.0020-.0035 (.050-.089)
Service Limit	.006 (.15)
Rocker Arm-To-Shaft Clearance	
Intake	
Standard	.0010-.0026 (.026-.067)
Service Limit	.0026 (.067)
Exhaust	
Standard	.0010-.0030 (.026-.077)
Service Limit	.0030 (.077)