

Honda Accord 2008-2009 2.4L

Engine Mechanical

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Engine Mechanical

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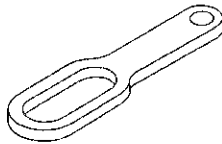
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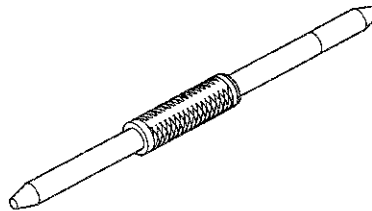
Engine Assembly

Special Tools

Ref. No.	Tool Number	Description	Qty
①	07AAK-SNAA120	Universal Eyelet	1
②	070AG-SJAA10S	Subframe Alignment Pin	1



①



②





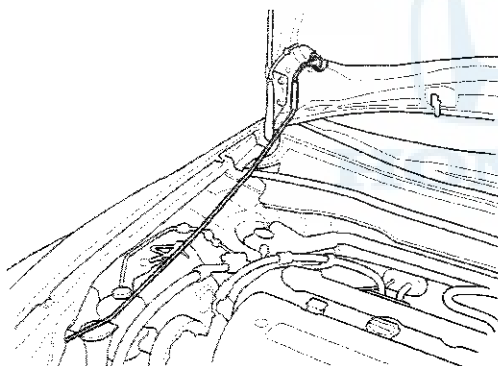
Engine Removal

Special Tools Required

- Engine hanger adapter VSB02C000015 *
 - Engine support hanger, A and Reds AAR-T1256 *
 - Front subframe adapter VSB02C000016 *
 - Universal eyelet 07AAK-SNAA120
- * : These special tools are available through the Honda Tool and Equipment Program, 888-424-6857

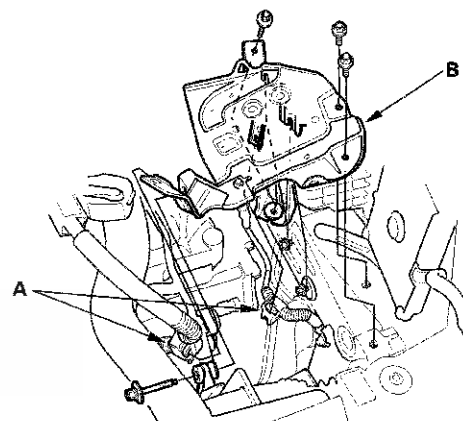
NOTE:

- Use fender covers to avoid damaging painted surfaces.
 - To avoid damaging the wiring and terminals, unplug the wiring connectors carefully while holding the connector portion.
 - 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. Remove the hood support rod, then use it as shown to prop the hood in the wide-open position.

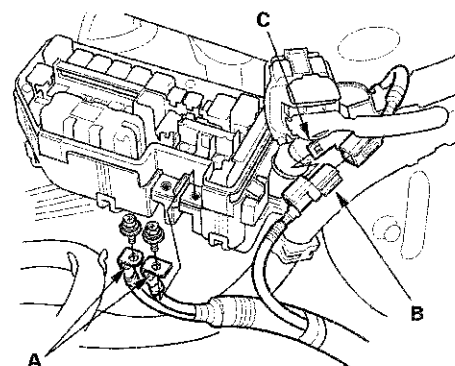


2. Remove the front grille cover:
 - 2-door (see page 20-257)
 - 4-door (see page 20-257)
3. Remove the strut brace (if equipped) (see page 20-289).
4. Relieve the fuel pressure (see page 11-332).
5. Do the battery removal procedure (see page 22-90).

6. Remove the intake air duct (see step 2 on page 10-12).
7. Remove the air cleaner assembly (see page 11-359).
8. Remove the harness clamps (A), then remove the battery base (B).



9. Remove the water separator (see step 3 on page 9-3).
10. Disconnect the battery cables (A) from the under-hood fuse/relay box.



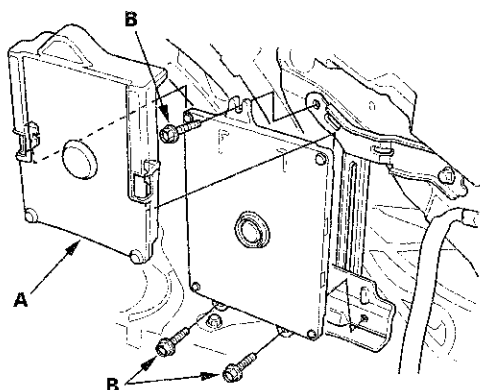
11. Disconnect the harness connector (B), and remove the harness connector from the bracket (C).

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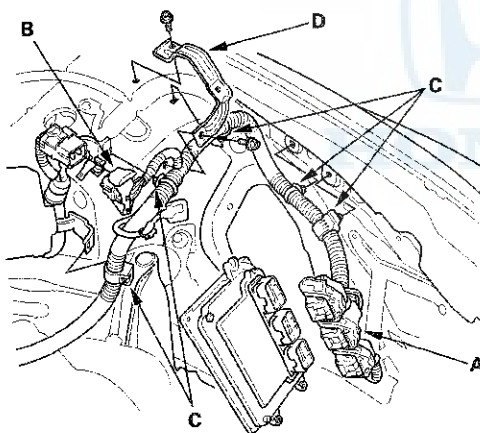
Engine Assembly

Engine Removal (cont'd)

12. Remove the engine control module (ECM)/powertrain control module (PCM) cover (A), then remove the three bolts (B) securing the ECM/PCM.

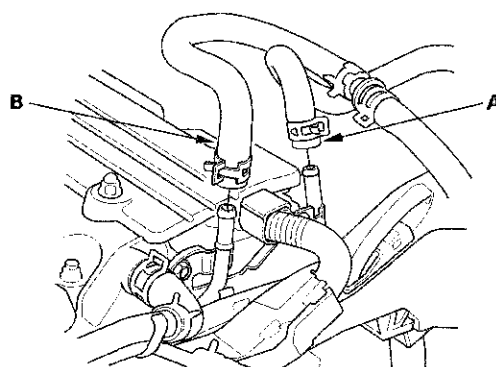


13. Disconnect the ECM/PCM connectors (A) and the engine wire harness connector (B).

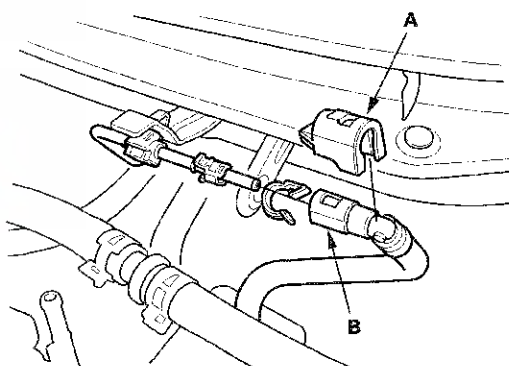


14. Remove the harness clamps (C) and the bracket (D).

15. Disconnect the evaporative emission (EVAP) canister hose (A) and the brake booster vacuum hose (B).



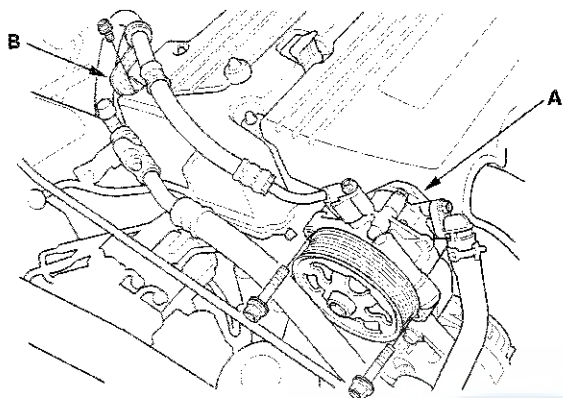
16. Remove the quick-connect fitting cover (A), then disconnect the fuel feed hose (B) (see page 11-340).





17. Remove the drive belt (see page 4-30).

18. Remove the power steering (P/S) pump (A) without disconnecting the P/S hoses, and the P/S hose bracket (B).



19. Wait until the engine is cool, then carefully remove the radiator cap.

20. Remove the A/C condenser fan shroud assembly (see page 10-13).

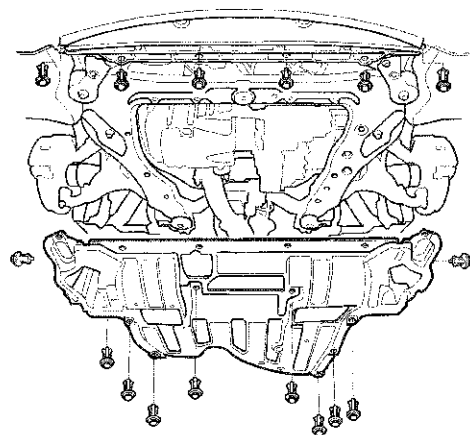
21. M/T model: Remove the three bolts securing the shift cable holder, then remove the shift cable and the select cable. Do not bend the cables excessively (see step 8 on page 13-8).

22. M/T model: Remove the clutch slave cylinder and the clutch line bracket mounting nut. Do not operate the clutch pedal once the slave cylinder has been removed (see step 6 on page 13-7).

23. Raise the vehicle on the lift.

24. Remove the front wheels.

25. Remove the splash shield.



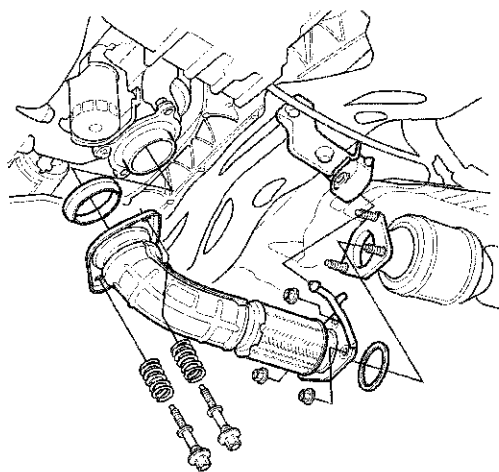
26. Loosen the drain plug in the radiator, and drain the engine coolant (see page 10-6).

27. Drain the engine oil (see page 8-9).

28. Drain the transmission fluid:

- Manual transmission (see page 13-5)
- Automatic transmission (see page 14-231)

29. Remove exhaust pipe A.



(cont'd)

Engine Assembly

Engine Removal (cont'd)

30. A/T model: Remove the shift cable:

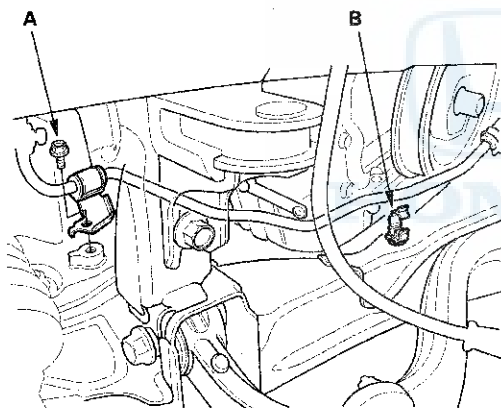
- For Saitama Factory-produced models (see step 44 on page 14-238).
- For Marysville, Ohio Factory-produced models (see step 46 on page 14-239).

31. Remove the damper fork (see page 18-31).

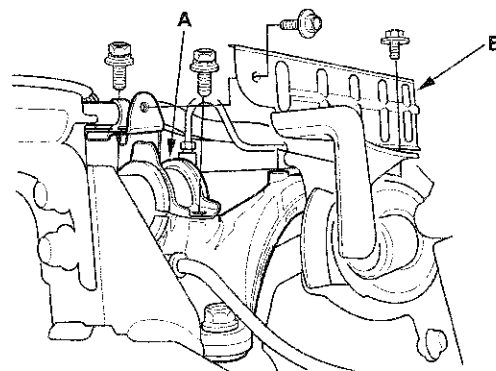
32. Separate the knuckles from the lower arms (see page 18-14).

33. Remove the driveshafts (see page 16-4). Coat all precision-finished surfaces with new engine oil. Tie a plastic bag over the driveshaft ends.

34. Remove the bolt (A) securing the P/S fluid line bracket, and unclamp the P/S fluid line clamp (B) on the front subframe.

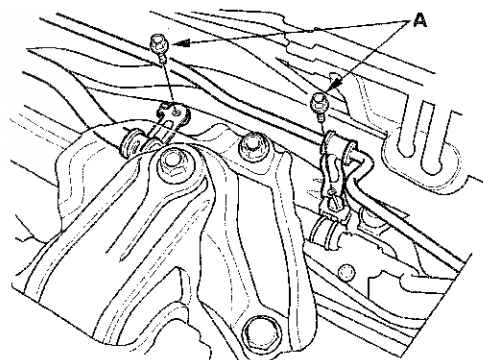


35. Remove the bolts securing the steering gearbox mounting bracket (A) and the heat shield (B). (right side)



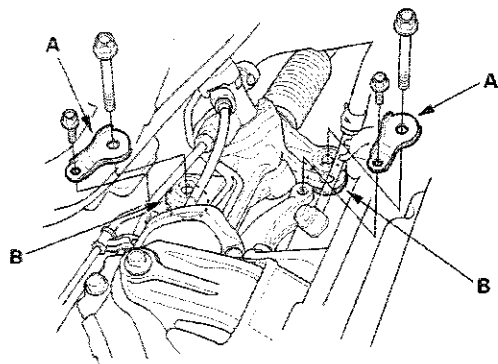
36. Lower the vehicle on the lift.

37. Remove the two bolts (A) securing the P/S fluid line brackets.

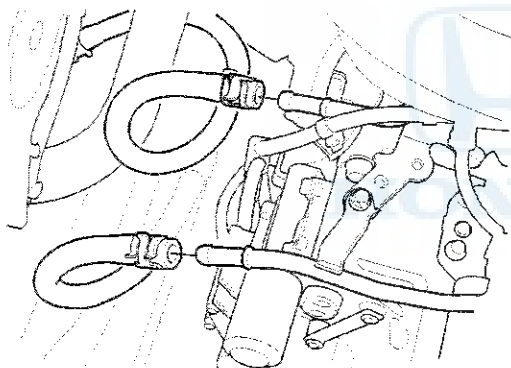




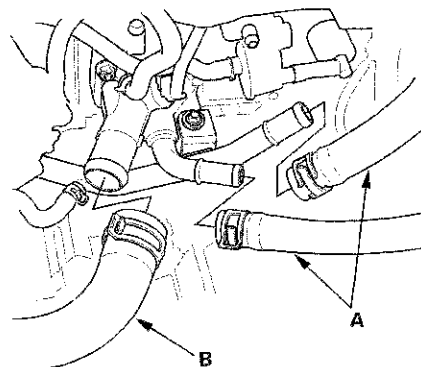
38. Remove the bolts securing the steering gearbox stiffeners (A) and the washers (B). (left side)



39. A/T model: Disconnect the ATF cooler hoses, then plug the lines and hoses.

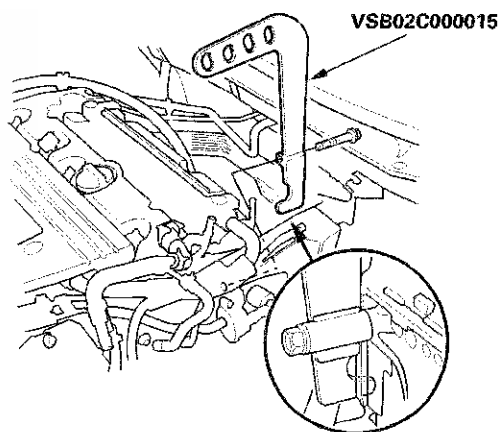


40. Disconnect the heater hoses (A) and the upper radiator hose (B).



41. Disconnect the quick connector from the thermostat cover (see step 3 on page 10-8).

42. Attach the engine hanger adapter (VSB02C000015) to the threaded hole in the cylinder head.



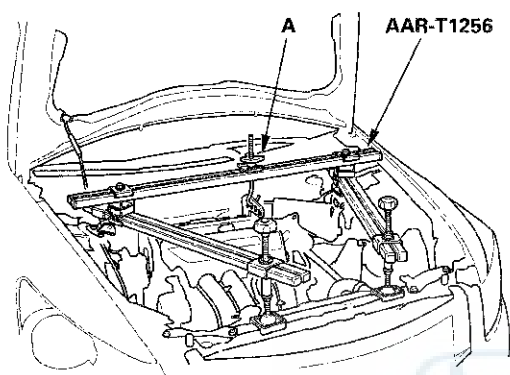
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Engine Assembly

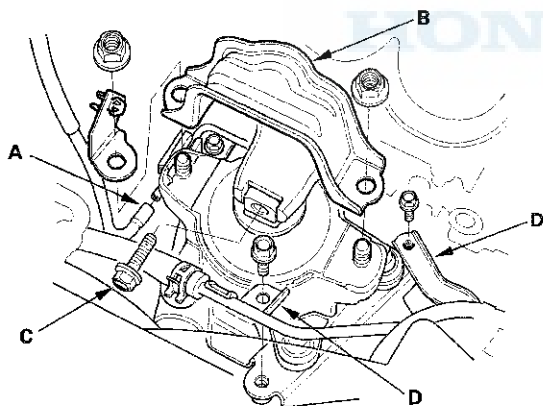
Engine Removal (cont'd)

43. Install the engine support hanger (AAR-T1256), then attach the hook to the slotted hole in the engine hanger adapter. Tighten the wing nut (A) by hand to lift and support the engine/transmission.

NOTE: Be careful when working around the windshield.

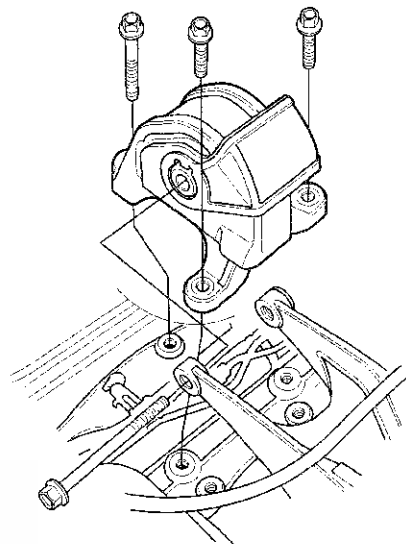


44. Disconnect the vacuum hose (A) and remove the front engine mount stop (B), then remove the front engine mount bolt (C).

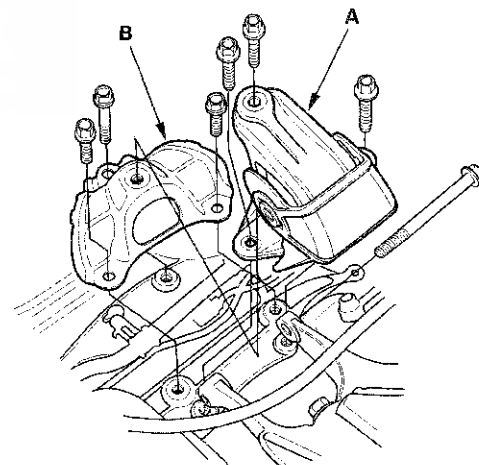


45. A/T model: Remove the ATF cooler pipe brackets (D).

46. M/T model: Remove the rear engine mount.

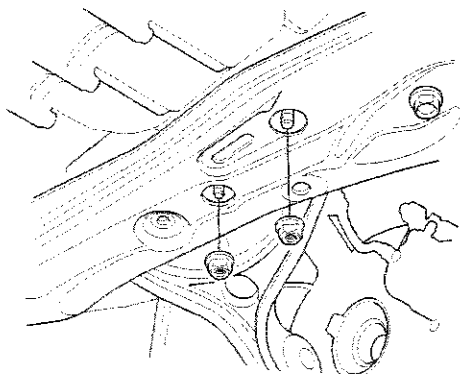


47. A/T model: Remove the rear engine mount (A), then remove the rear engine mount upper bracket (B).

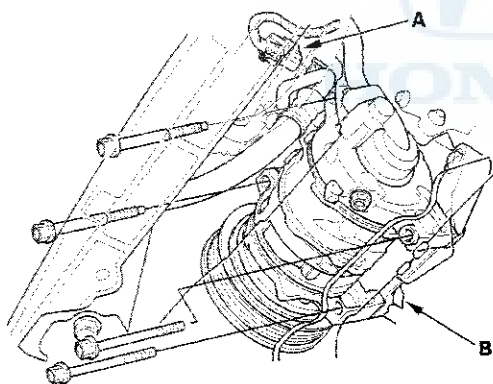




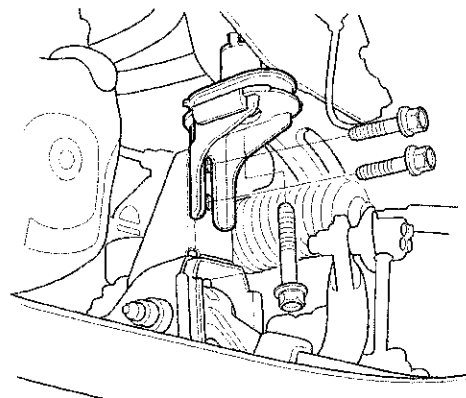
48. Raise the vehicle on the lift.
49. Remove the nuts securing the lower transmission mount.



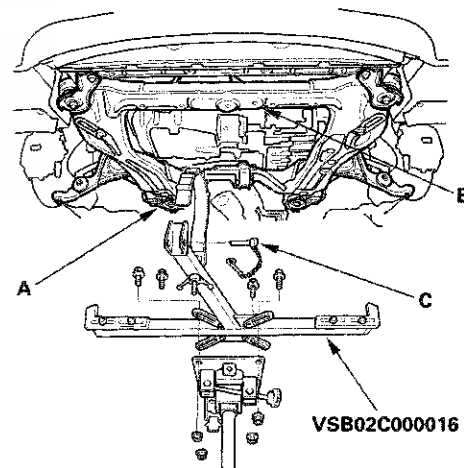
50. Disconnect the A/C compressor clutch connector (A), then remove the A/C compressor (B) without disconnecting the A/C hoses. Do not bend the A/C hoses excessively.



51. Remove the subframe middle mounts.



52. Attach the front subframe adapter (VSB02C000016) to the subframe and hang the belt (A) of the subframe adapter over the front of the subframe (B), then secure the belt with its stop (C).



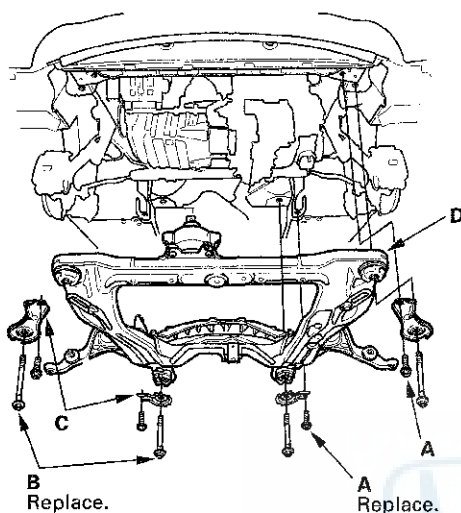
53. Raise the jack and line up the slots in the front subframe adapter arms with the bolt holes on the jack base, then securely attach them with four bolts.

(cont'd)

Engine Assembly

Engine Removal (cont'd)

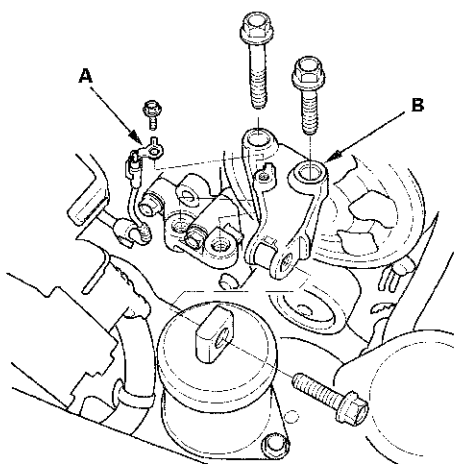
54. Remove the four 12 x 1.25 mm bolts (A), the front subframe mounting bolts (B) securing four stiffeners (C), then lower the front subframe (D).



55. Lower the vehicle on the lift.

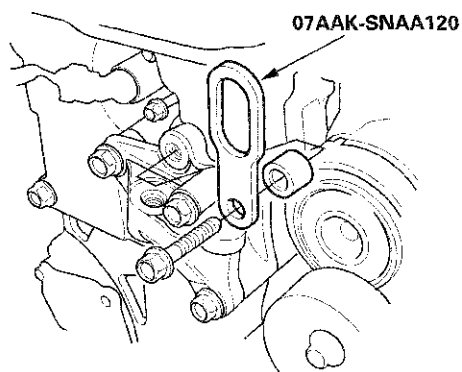
56. Support the engine with a jack and a wood block under the oil pan.

57. Remove the ground cable (A).

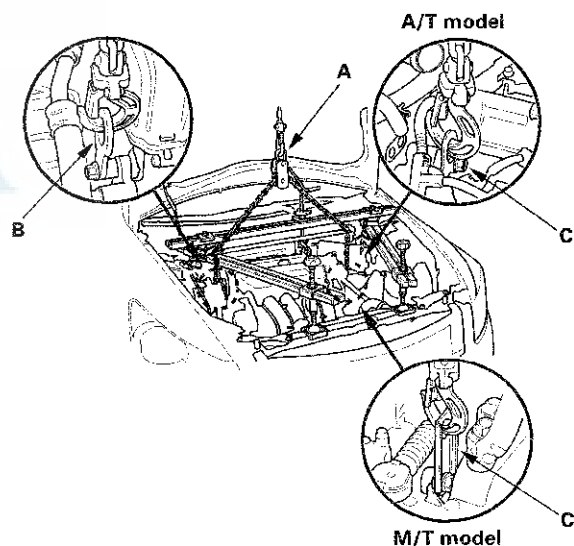


58. Remove the side engine mount bracket (B).

59. Install the universal eyelet (07AAK-SNAA120).



60. Attach a chain hoist (A) to the universal eyelet (B), and the transmission hook (C), then lift the engine/transmission until it is securely supported by the chain hoist, and remove the engine support hanger.

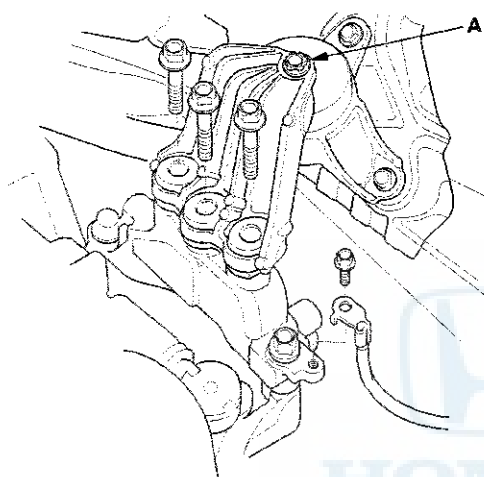




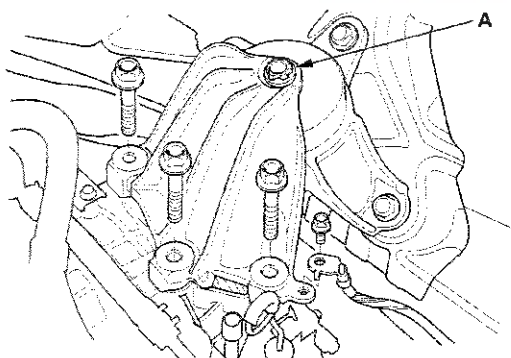
61. Remove the upper transmission mount bracket mounting bolts.

NOTE: Do not remove the TORX bolt (A) from the upper transmission mount. If the TORX bolt is removed, the upper transmission mount must be replaced as an assembly.

M/T model



A/T model



62. Remove the ground cable.

63. Check that the engine/transmission is completely free of vacuum hoses, fuel hoses, coolant hoses, and electrical wiring.

64. Slowly lower the engine/transmission about 150 mm (6 in.). Check once again that all hoses and electrical wiring are disconnected and free from the engine/transmission, then lower it all the way.

65. Disconnect the chain hoist from the engine/transmission.

66. Raise the vehicle, and remove the engine/transmission from under the vehicle.

Engine Assembly

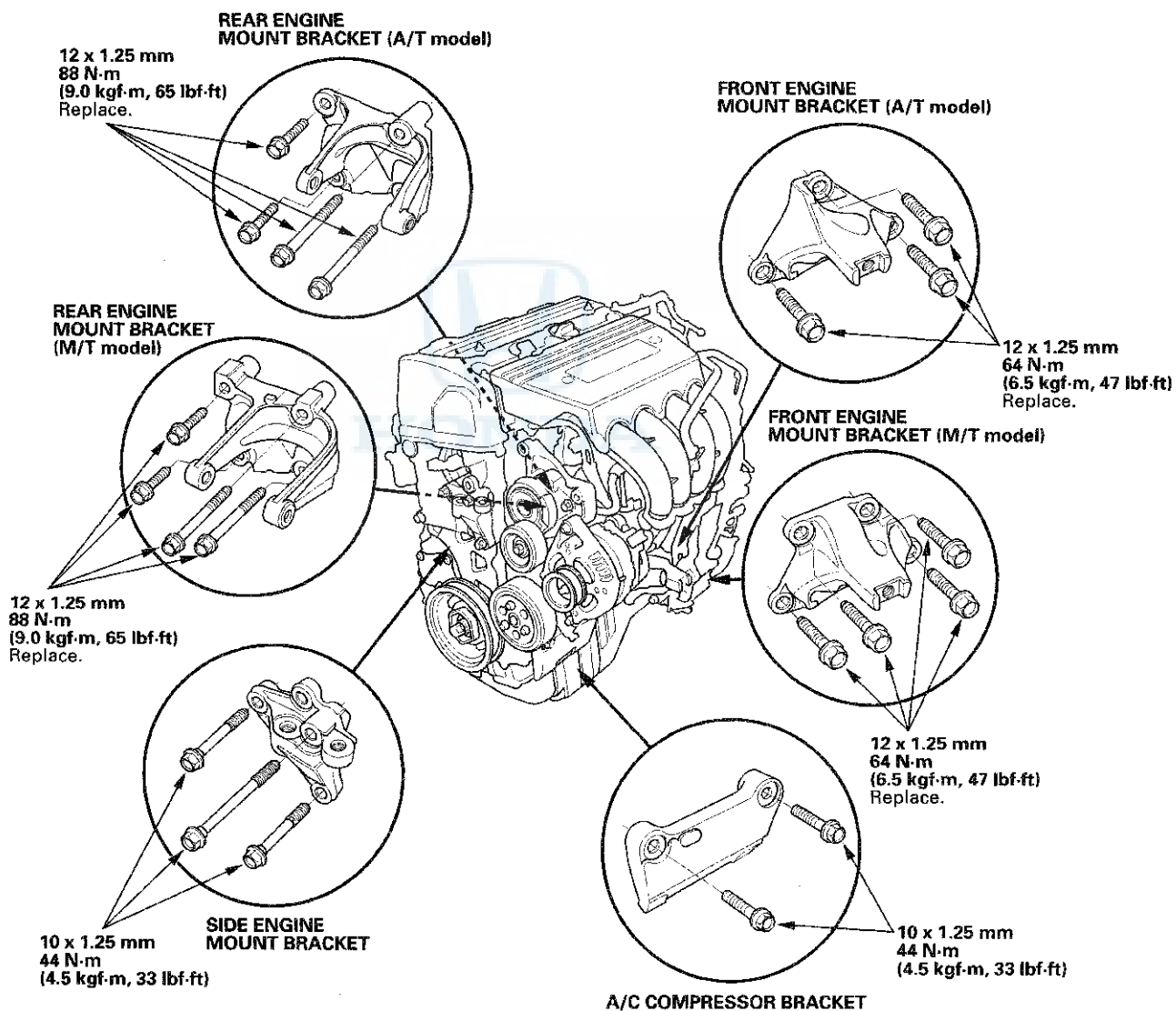
Engine Installation

Special Tools Required

- Universal eyelet 07AAK-SNAA120
- Engine hanger adapter VSB02C000015 *
- Engine support hanger, A and Reds AAR-T1256 *
- Front subframe adapter VSB02C000016 *
- Subframe alignment pin 070AG-SJAA10S

* : These special tools are available through the Honda Tool and Equipment Program, 888-424-6857

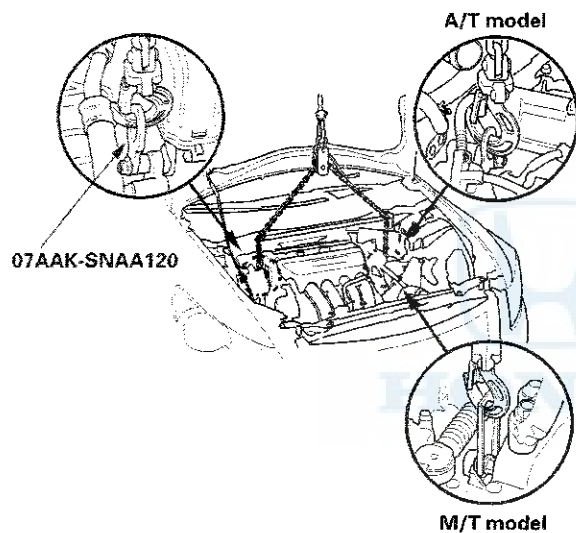
1. Install the engine mount brackets and the accessory brackets, then tighten their bolts to the specified torque.



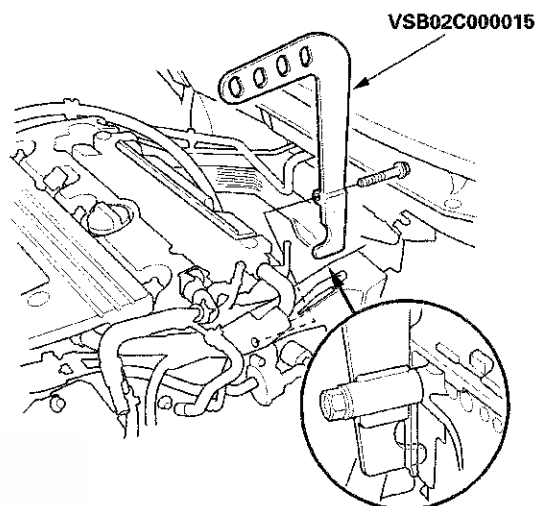


2. Raise the vehicle on the lift, and position the engine/transmission under the vehicle. Lower the vehicle, and install the universal eyelet (07AAK-SNAA120). Attach a chain hoist to the universal eyelet and the transmission hook, then lift the engine into position in the vehicle.

NOTE: Reinstall the mounting bolts and support nuts in the sequence given in the following steps. Failure to follow this sequence may cause excessive noise and vibration, and reduce engine mount life.

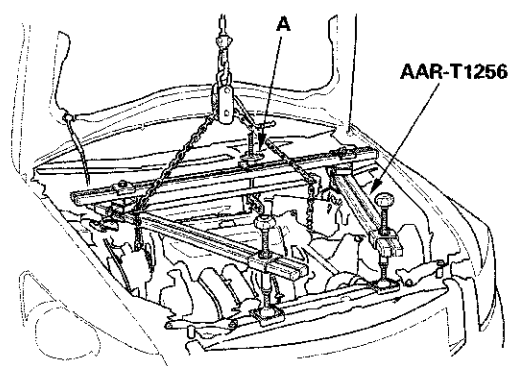


3. Attach the engine hanger adapter (VSB02C000015) to the threaded hole in the cylinder head.



4. Install the engine support hanger (AAR-T1256), then attach the hook to the slotted hole in the engine hanger adapter. Tighten the wing nut (A) by hand to lift and support the engine/transmission.

NOTE: Be careful when working around the windshield.



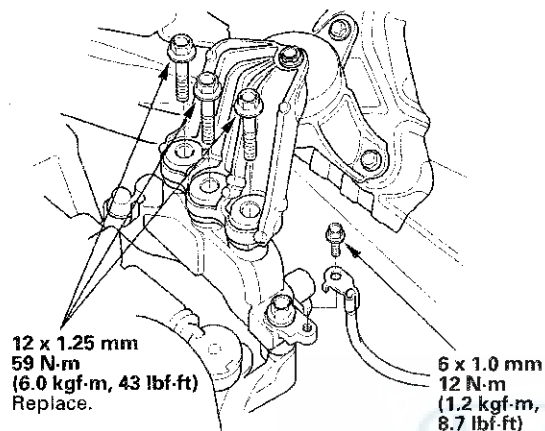
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Engine Assembly

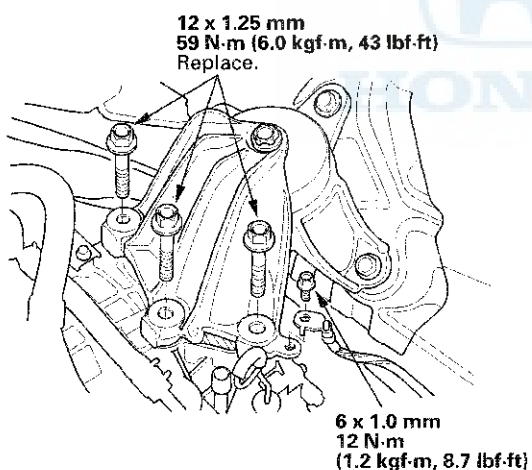
Engine Installation (cont'd)

5. Tighten the upper transmission mount bracket mounting bolts to the specified torque.

M/T model



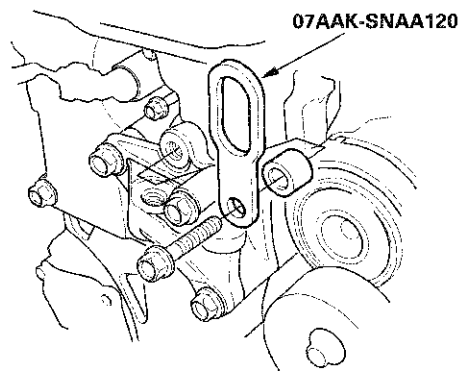
A/T model



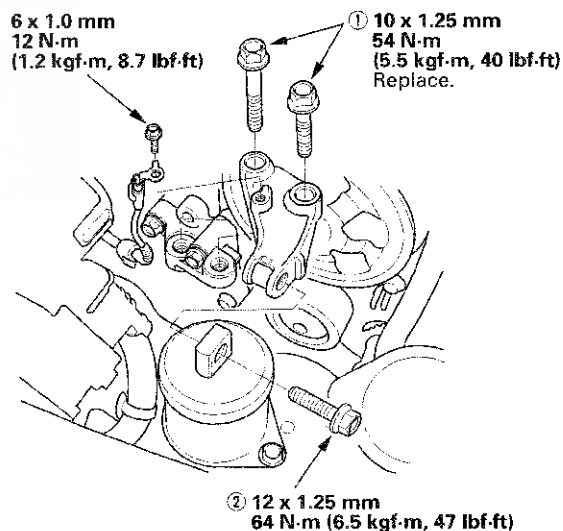
6. Install the ground cable.
7. Support the engine with a jack and a wood block under the oil pan.

8. Remove the chain hoist.

9. Remove the universal eyelet.



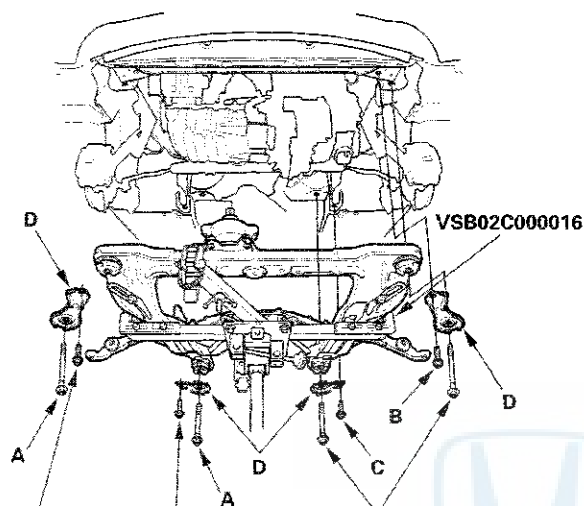
10. Install the side engine mount bracket, then tighten the side engine mount bracket mounting bolts in the numbered sequence shown.



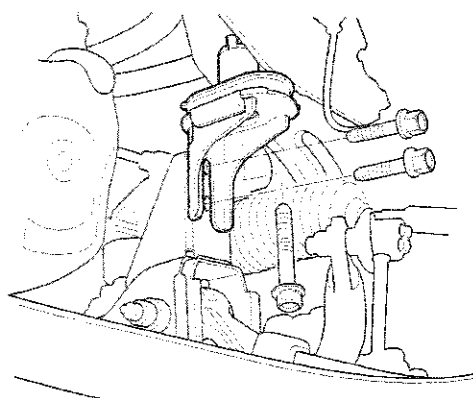
11. Install the ground cable.



12. Raise the vehicle on the lift.
13. Using the front subframe adapter (VSB02C000016) and a jack, raise the front subframe up to the body.

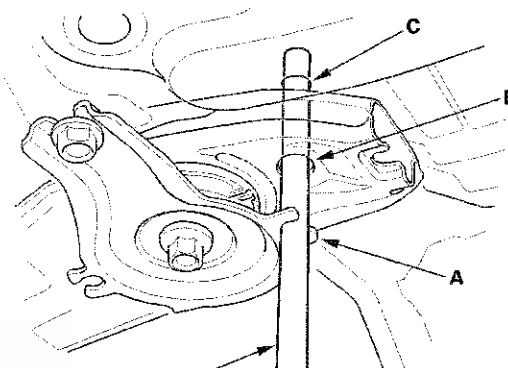


- | | | |
|--|---|--|
| <p>B
12 x 1.25 mm
54 N·m
(5.5 kgf·m,
40 lbf·ft)</p> | <p>C
12 x 1.25 mm
93 N·m
(9.5 kgf·m, 69 lbf·ft)
Replace.</p> | <p>A
14 x 1.5 mm
103 N·m
(10.5 kgf·m, 75.9 lbf·ft)
Replace.</p> |
|--|---|--|
14. Loosely install the new front subframe mounting bolts (four) (A), the 12 x 1.25 mm bolts (four) (B) (C), and the stiffeners (four) (D).
 15. Loosely install the subframe middle mount.



16. Remove the jack and the front subframe adapter.

17. Insert the subframe alignment pin (070AG-SJAA10S) through the positioning slot (A) on the right rear stiffener, through the positioning hole (B) on the subframe, and into the positioning hole (C) on the body, then loosely tighten the subframe right rear mounting bolt.



070AG-SJAA10S
NOTE: Use 15.7 mm side.

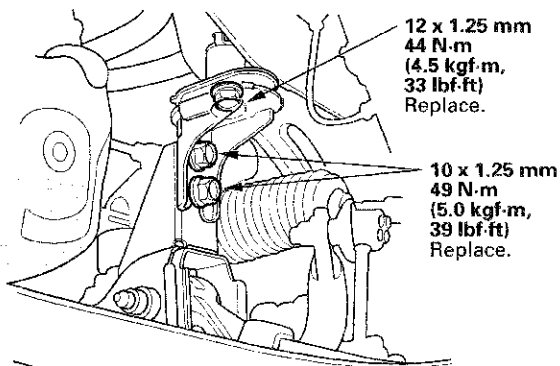
18. Insert the subframe alignment pin through the positioning slot on the left rear stiffener, through the positioning hole on the subframe, and into the positioning hole on the body, then loosely tighten the subframe left rear mounting bolt.
19. Using the subframe alignment pin in place, tighten the right rear mounting bolt.
20. Using the subframe alignment pin in place, tighten the left rear mounting bolt.
21. Tighten the stiffener mounting bolts to the specified torque.
22. Tighten the front and rear subframe mounting bolts to the specified torque.
23. Check that the positioning slots on the right/left rear stiffener, the positioning holes on the subframe, and the positioning holes on the body are aligned using the subframe alignment pin.

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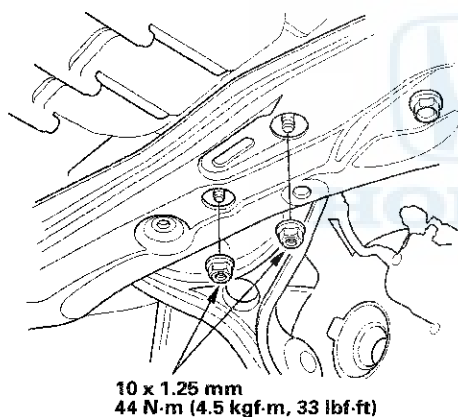
Engine Assembly

Engine Installation (cont'd)

24. Tighten the bolts securing the subframe middle mounts.



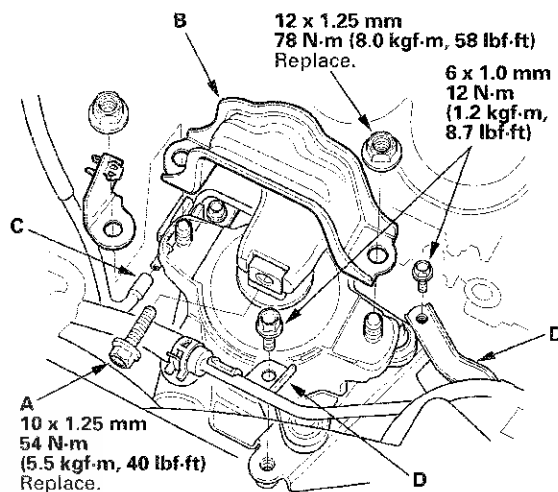
25. Tighten the nuts securing the lower transmission mount.



26. Lower the vehicle on the lift.

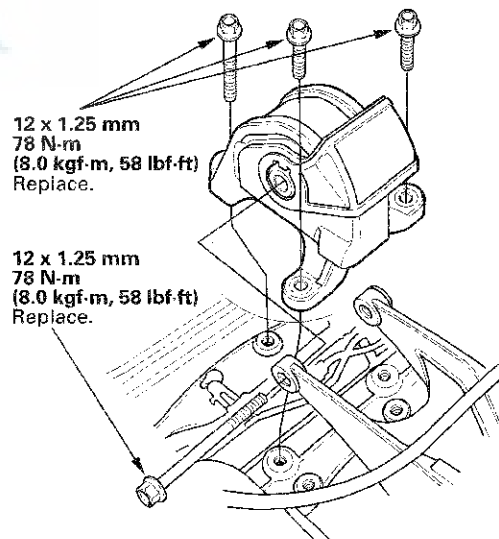
27. Remove the engine support hanger and the engine hanger adapter.

28. Tighten the front engine mount bolt (A), then install the front engine mount stop (B) and connect the vacuum hose (C).



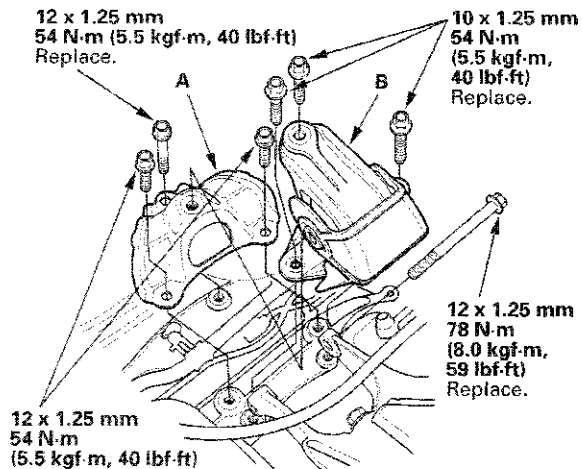
29. A/T model: Install the ATF cooler pipe brackets (D).

30. M/T model: Install the rear engine mount.

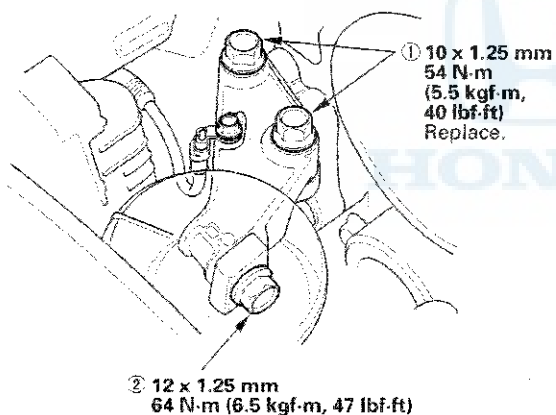




31. A/T model: Install the rear engine mount upper bracket (A), then install the rear engine mount (B).

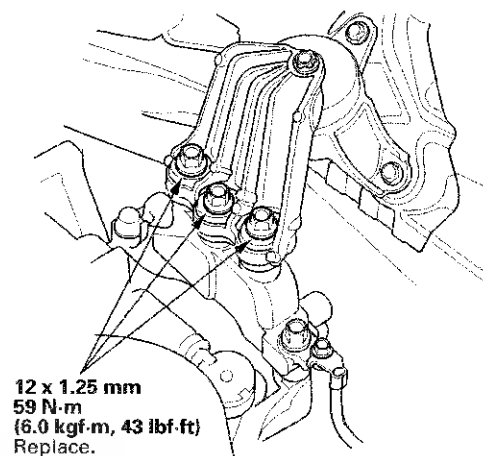


32. Loosen the mounting bolts for the side engine mount bracket, then retighten the bolts in the numbered sequence shown.

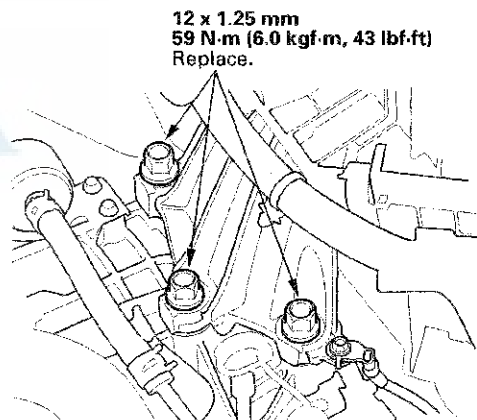


33. Loosen the mounting bolts for the upper transmission mount bracket, then retighten them to the specified torque.

M/T model



A/T model



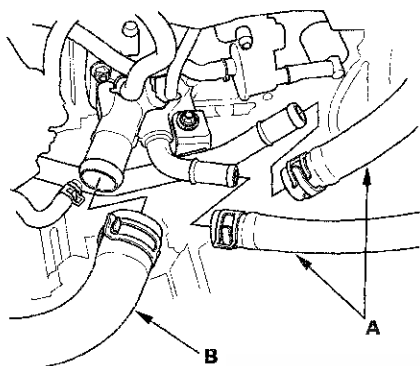
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Engine Assembly

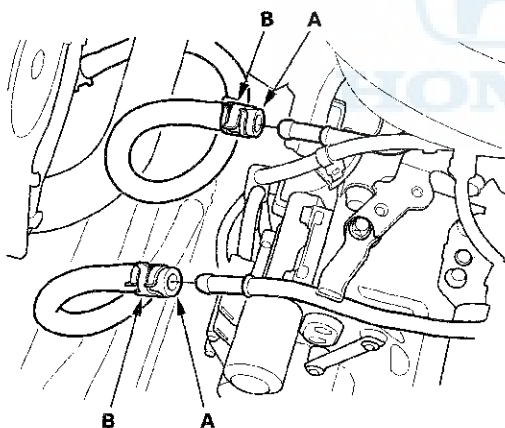
Engine Installation (cont'd)

34. Connect the quick connector to the thermostat cover (see step 11 on page 10-8).

35. Connect the heater hoses (A) and the upper radiator hose (B).

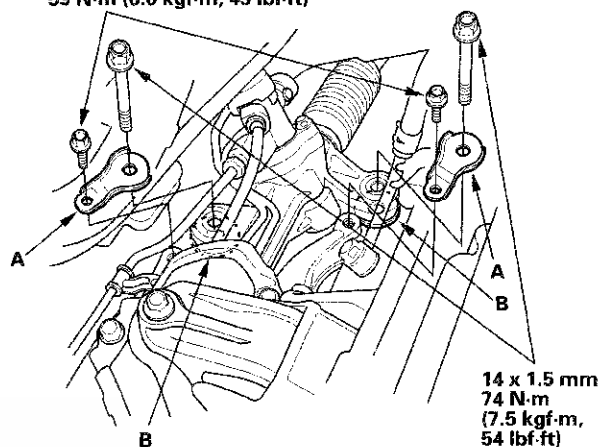


36. A/T model: Connect the ATF cooler hoses (A), and secure the hoses with the clips (B) (see page 14-260).



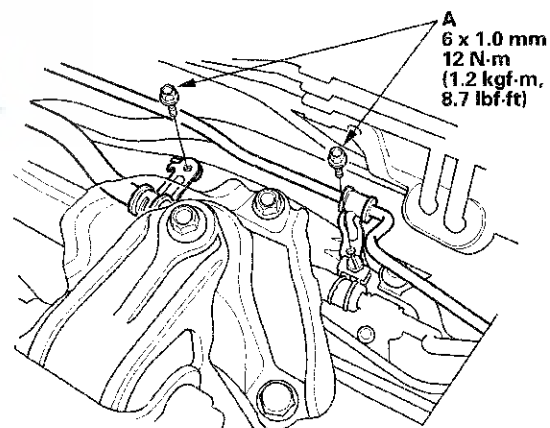
37. Install the bolts securing the steering gearbox stiffeners (A) and the washers (B). (left side)

10 x 1.25 mm
59 N·m (6.0 kgf·m, 43 lbf·ft)



14 x 1.5 mm
74 N·m
(7.5 kgf·m,
54 lbf·ft)

38. Install the two bolts (A) securing the power steering (P/S) fluid line brackets.

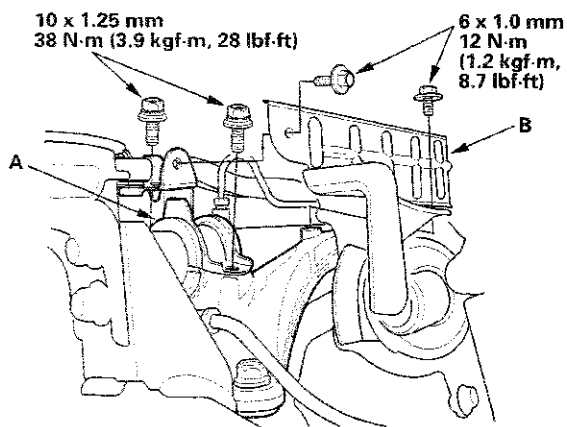


A
6 x 1.0 mm
12 N·m
(1.2 kgf·m,
8.7 lbf·ft)

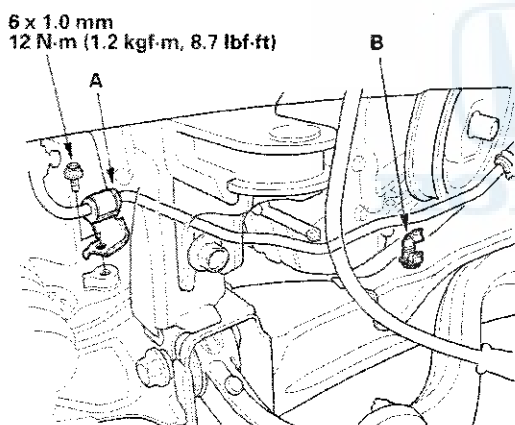
39. Raise the vehicle on the lift.



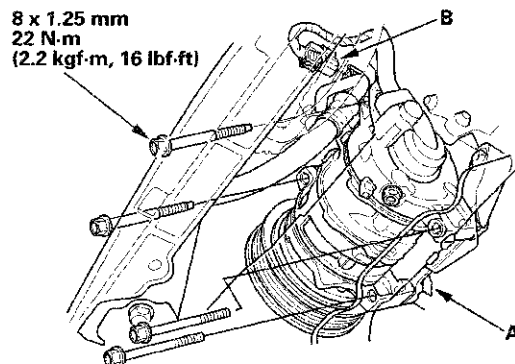
40. Install the bolts securing the steering gearbox mounting bracket (A) and the heat shield (B). (right side)



41. Install the P/S fluid line bracket (A), and secure the hose with the hose clamp (B).



42. Install the A/C compressor (A), then connect the A/C compressor clutch connector (B).



43. Install a new set ring on the end of each driveshaft, then install the driveshafts (see page 16-20). Make sure each ring "clicks" into place in the differential and the intermediate shaft.
44. Connect the lower arms to the knuckles (see step 5 on page 18-21).
45. Install the damper fork (see step 3 on page 18-21).
46. A/T model: Install the shift cable:

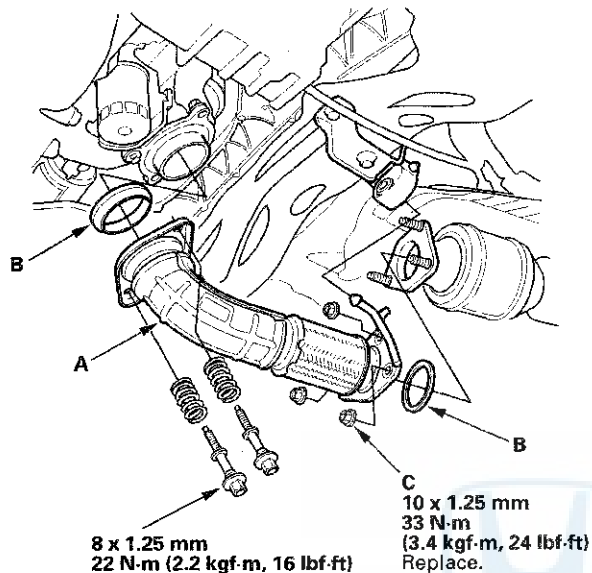
- For Saitama Factory-produced models (see step 32 on page 14-248).
- For Marysville, Ohio Factory-produced models (see step 35 on page 14-249).

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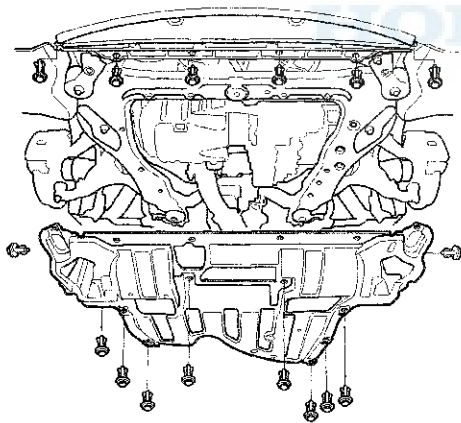
Engine Assembly

Engine Installation (cont'd)

47. Install exhaust pipe A using new gaskets (B) and new self-locking nuts (C).



48. Install the splash shield.



49. Install the front wheels.

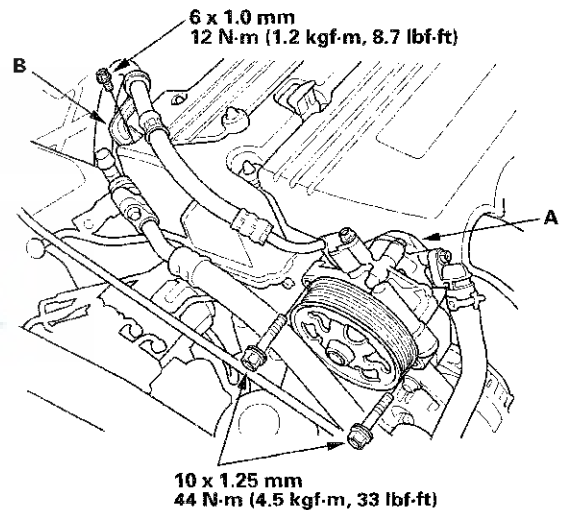
50. Lower the vehicle on the lift.

51. M/T model: Install the clutch slave cylinder and the clutch line bracket mounting nut (see step 49 on page 13-23).

52. M/T model: Install the shift cable and the select cable, then tighten the three bolts securing the shift cable holder (see step 47 on page 13-23).

53. Install the A/C condenser fan shroud assembly (see page 10-13).

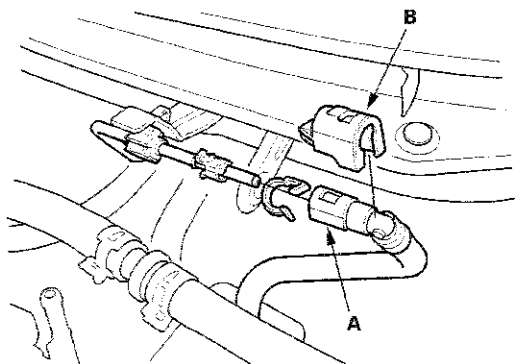
54. Install the P/S pump (A), and the P/S hose bracket (B).



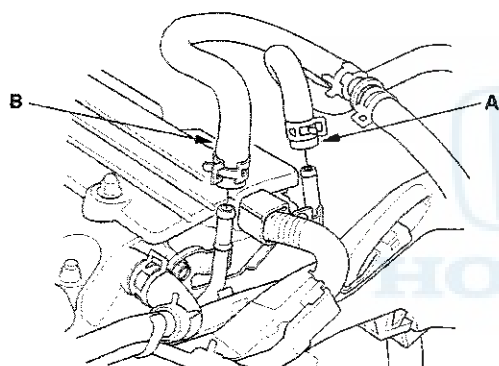
55. Install the drive belt (see page 4-30).



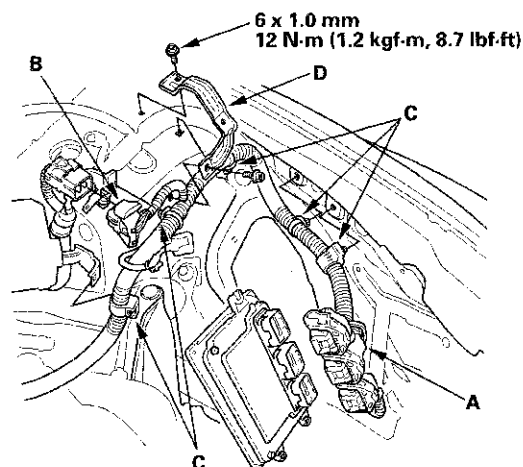
56. Connect the fuel feed hose (A) (see page 11-343), then install the quick-connect fitting cover (B).



57. Connect the evaporative emission (EVAP) canister hose (A) and the brake booster vacuum hose (B).

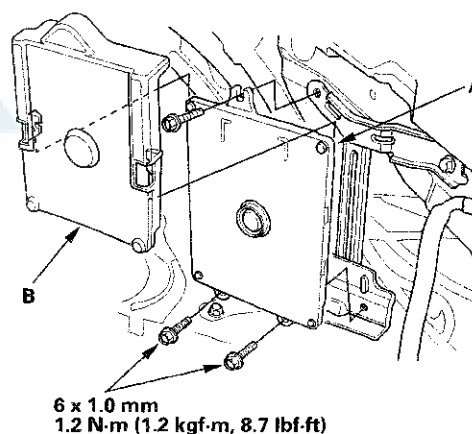


58. Connect the engine control module (ECM)/powertrain control module (PCM) connectors (A) and the engine wire harness connector (B).



59. Install the harness clamps (C) and the bracket (D).

60. Install the ECM/PCM (A), then install the ECM/PCM cover (B).

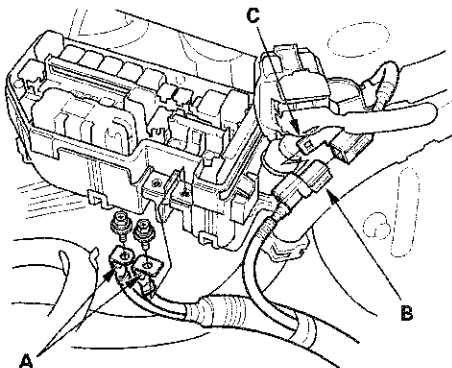


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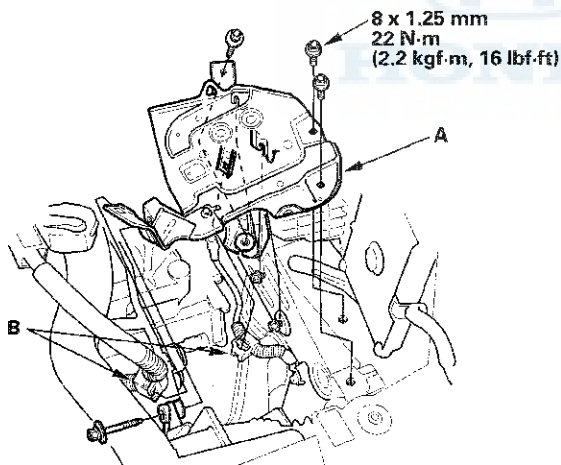
Engine Assembly

Engine Installation (cont'd)

61. Connect the battery cables (A) to the under-hood fuse/relay box.



62. Connect the harness connector (B), and install the harness connector to the bracket (C).
63. Install the water separator (see step 10 on page 9-7).
64. Install the battery base (A), then install the harness clamps (B).



65. Install the air cleaner assembly (see page 11-359).
66. Install the intake air duct (see step 2 on page 10-12).
67. Install the strut brace (if equipped) (see page 20-289).
68. Install the front grille cover:
- 2-door (see page 20-257)
 - 4-door (see page 20-257)

69. Do the battery installation procedure (see page 22-90).

70. Inspect for fuel leaks. Turn the ignition switch to ON (II) (do not operate the starter) so the fuel pump runs for about 2 seconds and pressurizes the fuel line. Repeat this operation three times, then check for fuel leakage at any point in the fuel line.

71. Refill the engine with the recommended engine oil (see step 4 on page 8-9).

72. Refill the transmission with fluid:

- Manual transmission (see page 13-5)
- Automatic transmission (see page 14-231)

73. A/T model: Move the shift lever to each gear, and verify that the A/T gear position indicator follows the transmission range switch.

74. M/T model: Check that the transmission shifts into all gears smoothly.

75. Refill the radiator with engine coolant, and bleed the air from the cooling system with the heater valve open (see step 6 on page 10-6).

76. Do the ECM/PCM reset procedure (see page 11-4).

77. Do the ECM/PCM idle learn procedure (see page 11-317).

78. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see page 11-5).

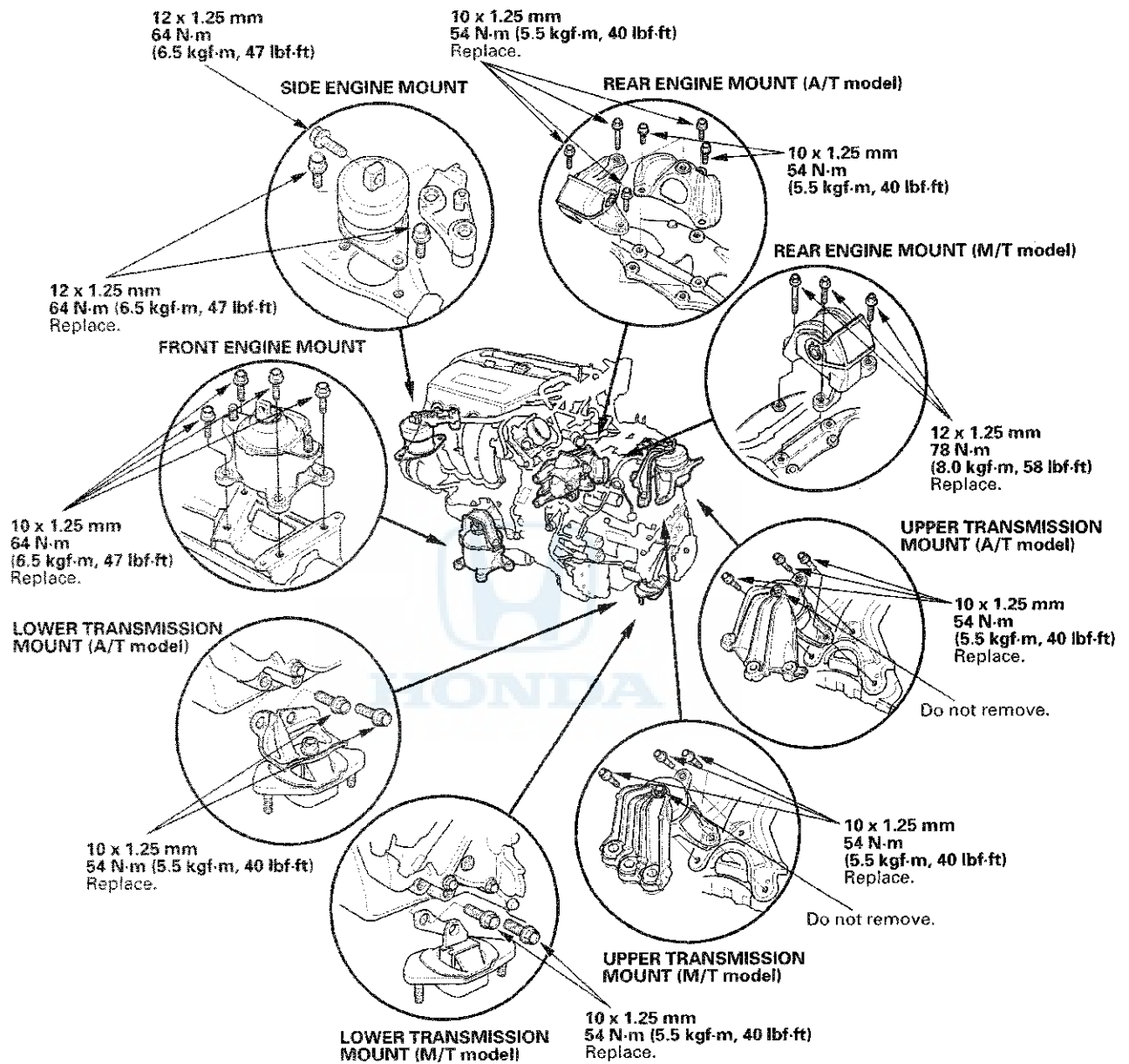
79. Inspect the idle speed (see page 11-316).

80. Inspect the ignition timing (see page 4-19).

81. Check the wheel alignment (see page 18-5).



Engine Mount Replacement



Navigation Tools: Click on the "Table of Contents" below, or use the Bookmarks to the left.

Engine Mechanical

Cylinder Head (All Models Except PZEV)

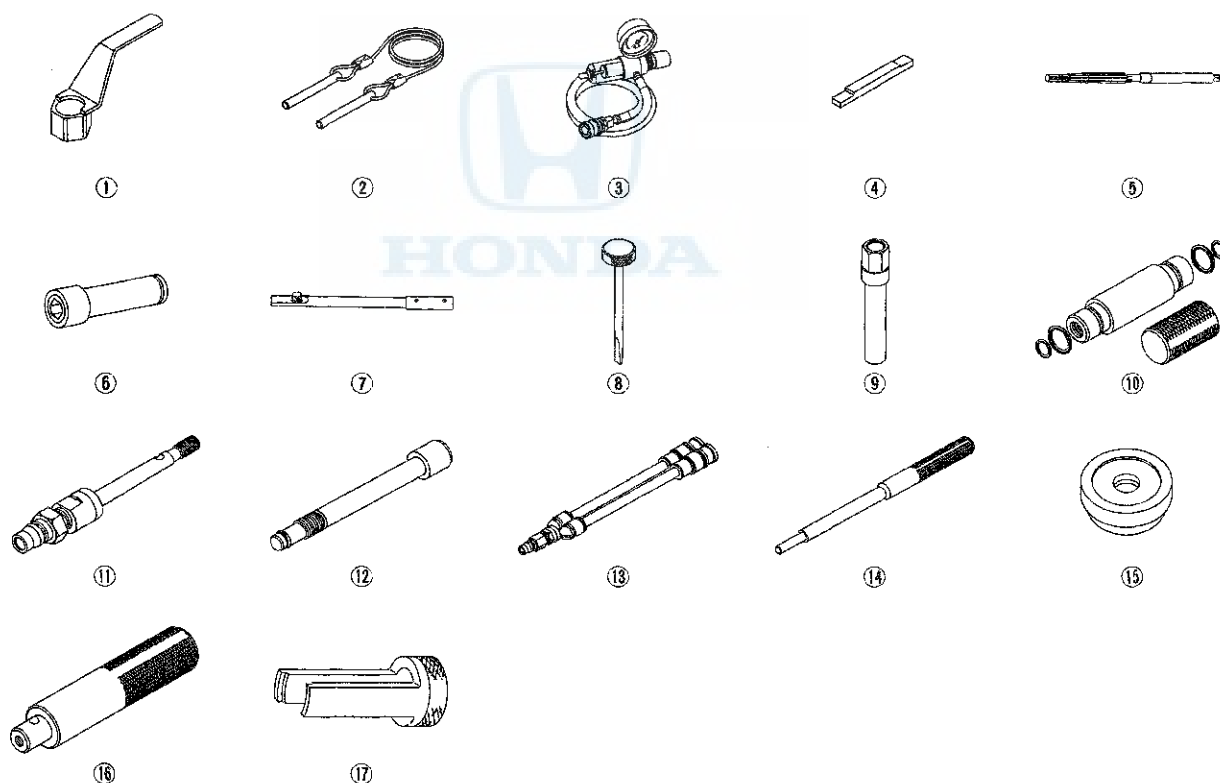
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Cylinder Head

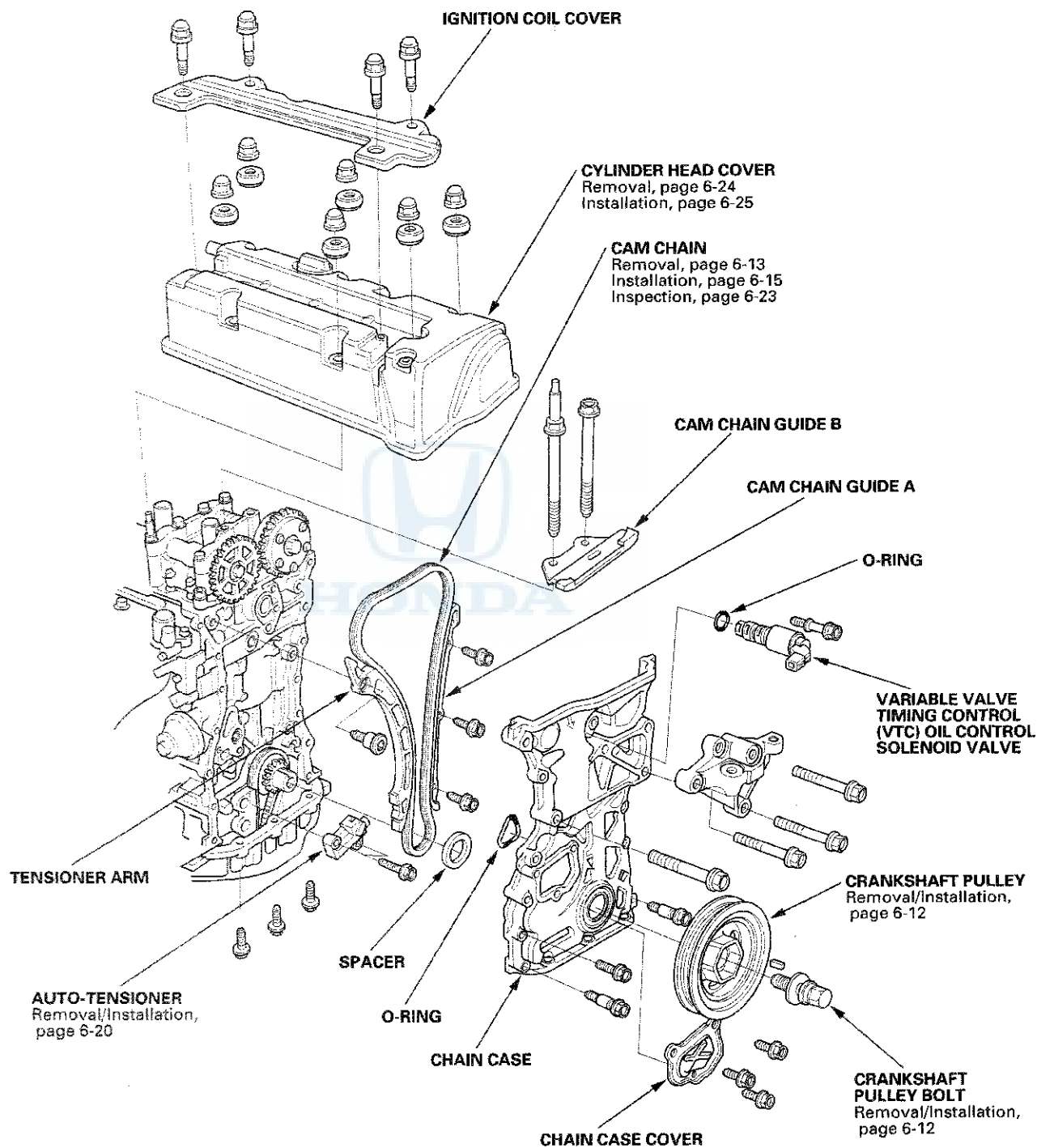
Special Tools

Ref. No.	Tool Number	Description	Qty
①	07AAB-RJAA100	Crankshaft Pulley Holder	1
②	07AAB-RWCA120	Camshaft Lock Pin Set	1
③	07AAJ-PNAA101	Air Pressure Regulator	1
④	07AAJ-RWCA100	Cam Chain Inspection Gauge	1
⑤	07HAH-PJ7A100	Valve Guide Reamer, 5.5 mm	1
⑥	07JAA-001020A	Socket, 19 mm	1
⑦	07JAB-001020B	Holder Handle	1
⑧	07MAA-PR70110	Adjuster	1
⑨	07MAA-PR70120	Locknut Wrench	1
⑩	07PAD-0010000	Stem Seal Driver	1
⑪	07ZAJ-PNAA101	VTEC Air Adapter	2
⑫	07ZAJ-PNAA200	VTEC Air Stopper	1
⑬	07ZAJ-PNAA300	Air Joint Adapter	1
⑭	07742-0010100	Valve Guide Driver, 5.5 mm	1
⑮	07746-0010400	Attachment, 52 x 55 mm	1
⑯	07749-0010000	Driver	1
⑰	07757-PJ1010A	Valve Spring Compressor Attachment	1





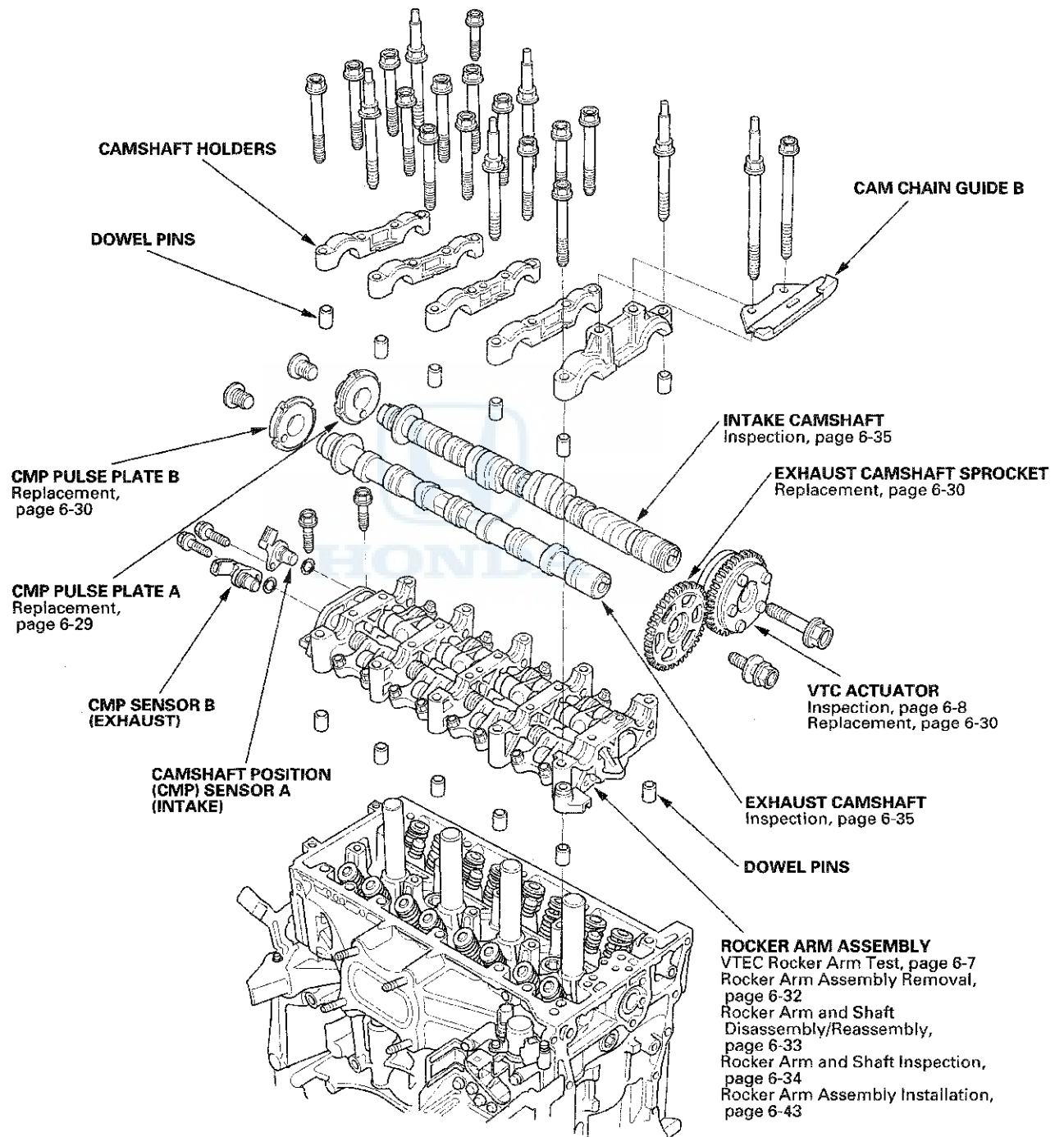
Component Location Index

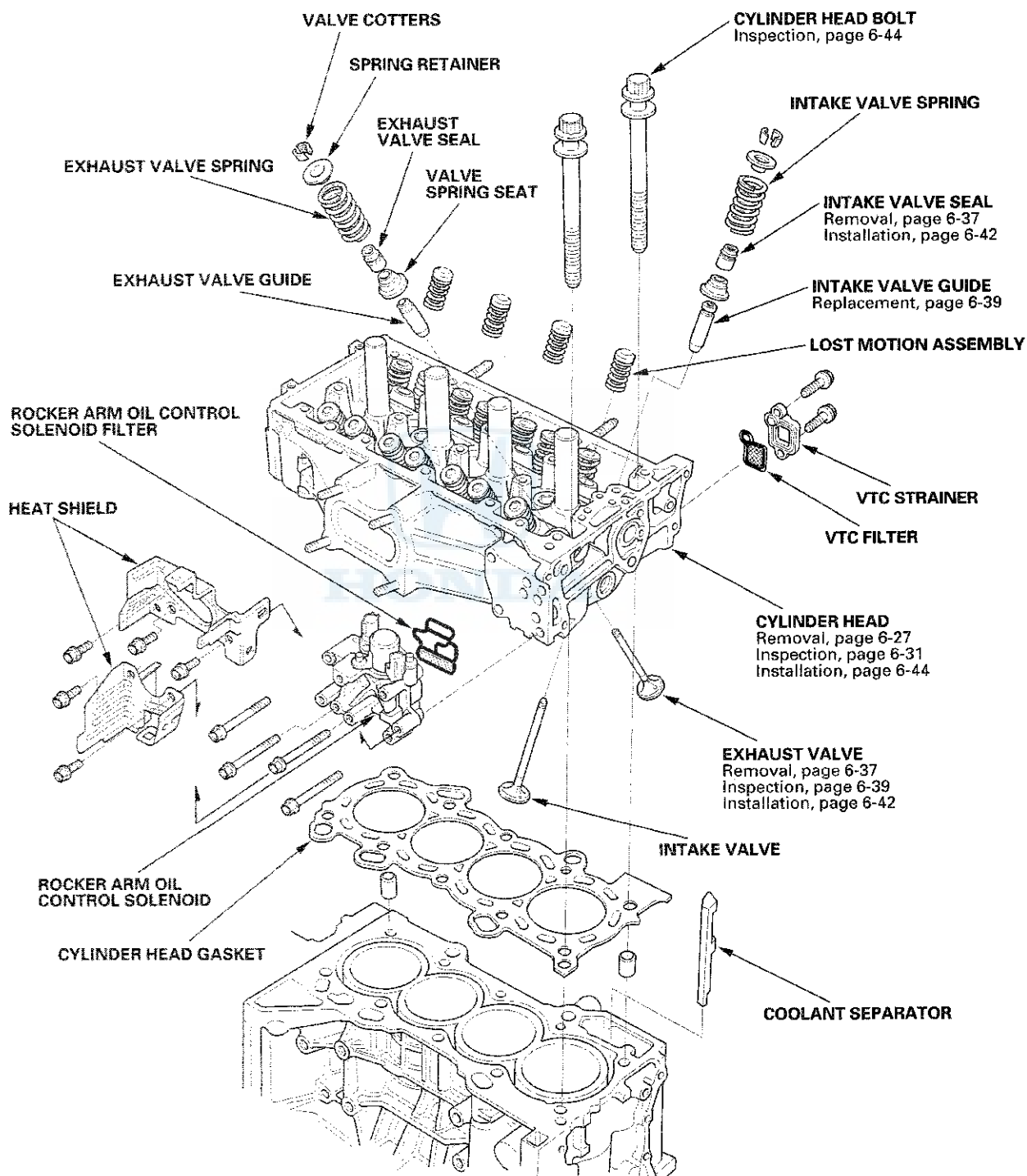


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Cylinder Head

Component Location Index (cont'd)



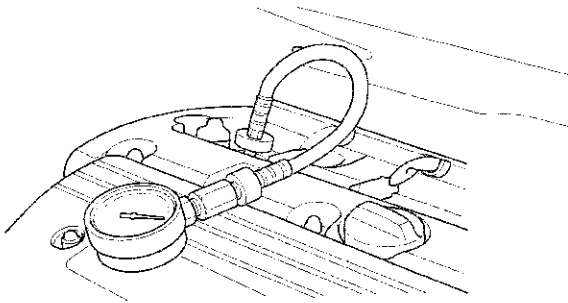


Cylinder Head

Engine Compression Inspection

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

1. Warm up the engine to normal operating temperature (cooling fan comes on).
2. Turn the ignition switch to LOCK (0).
3. Connect the Honda Diagnostic System (HDS) to the data link connector (DLC) (see step 2 on page 11-3).
4. Turn the ignition switch to ON (II).
5. Make sure the HDS communicates with the vehicle and the ECM/PCM. If it does not communicate, troubleshoot the DLC circuit (see page 11-192).
6. Select ALL INJECTORS STOP in the PGM-FI, INSPECTION menu with the HDS.
7. Turn the ignition switch to LOCK (0).
8. Remove the four ignition coils (see page 4-20).
9. Remove the four spark plugs.
10. Attach a compression gauge to the spark plug hole.



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

Compression Pressure:

Above 930 kPa (9.5 kgf/cm², 135 psi)

12. Measure the compression on the remaining cylinders.

Maximum Variation:

Within 200 kPa (2.0 kgf/cm², 28 psi)

13. If the compression is not within specifications, check the following items, then remeasure the compression.
 - Incorrect valve clearance
 - Confirmation of cam timing
 - Damaged or worn cam lobes
 - Damaged or worn valves and seats
 - Damaged cylinder head gasket
 - Damaged or worn piston rings
 - Damaged or worn piston and cylinder bore
14. Remove the compression gauge from the spark plug hole.
15. Install the four spark plugs.
16. Install the four ignition coils (see page 4-20).
17. Select ECM/PCM reset (see page 11-4) in the PGM-FI, INSPECTION menu to cancel ALL INJECTORS STOP with the HDS.

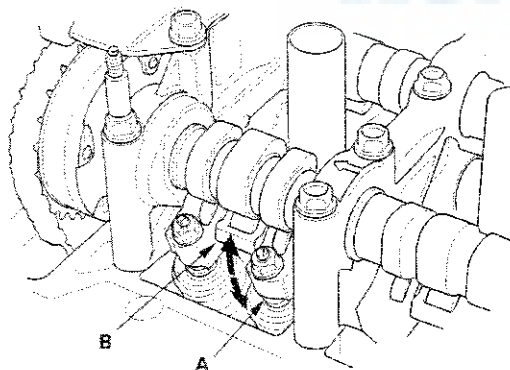


VTEC Rocker Arm Test

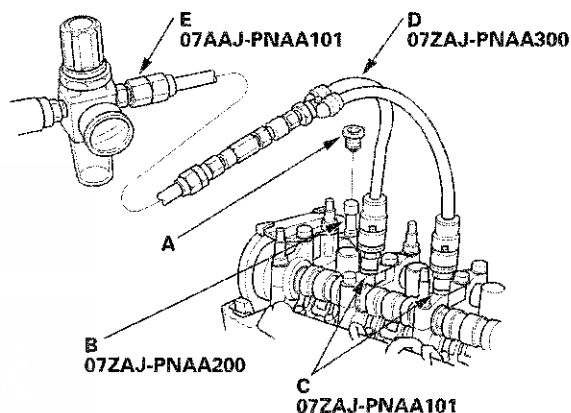
Special Tools Required

- VTEC air stopper 07ZAJ-PNAA200
- VTEC air adapter 07ZAJ-PNAA101
- Air joint adapter 07ZAJ-PNAA300
- Air pressure regulator 07AAJ-PNAA101

1. Start the engine, and let it run for 5 minutes, then turn the ignition switch to LOCK (0).
2. Remove the cylinder head cover (see page 6-24).
3. Set the No. 1 piston at top dead center (TDC) (see step 5 on page 6-13).
4. Move the secondary rocker arm (A) for the No. 1 cylinder. The secondary rocker arm should move independently of the mid rocker arm (B).
 - If the secondary rocker arm moves freely, go to step 5.
 - If the secondary rocker arm does not move independently, remove the mid, primary, and secondary rocker arms as an assembly, and check that the pistons in the rocker arms move smoothly. If any rocker arm needs replacing, replace the mid, primary, and secondary rocker arms as an assembly, then retest.



5. Repeat step 4 on the remaining secondary rocker arms with each piston at TDC. When all the secondary rocker arms pass the test, go to step 6.
6. Check that the air pressure on the shop air compressor gauge indicates over 400 kPa (4.0 kgf/cm², 57 psi).
7. Inspect the valve clearance (see page 6-9).
8. Remove the sealing bolt (A) from the relief hole, and install the VTEC air stopper (B).



9. Remove the No. 2 and No. 3 camshaft holder bolts, and install the VTEC air adapters (C) finger-tight.
10. Connect the air joint adapter (D) and the air pressure regulator (E).
11. Loosen the valve on the air pressure regulator, and apply the specified air pressure.

Specified Air Pressure:
290 kPa (3.0 kgf/cm², 42 psi)

NOTE: If the rocker arm piston does not move after applying air pressure; move the rocker arm up and down manually by rotating the crankshaft clockwise.

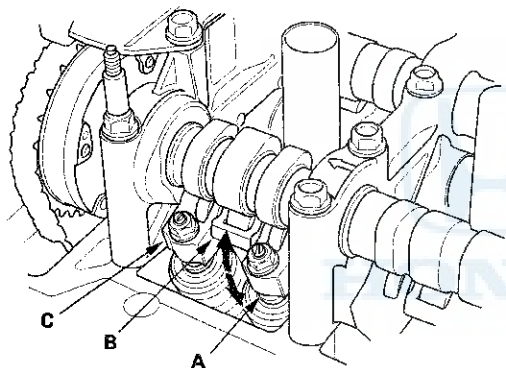
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Cylinder Head

VTEC Rocker Arm Test (cont'd)

12. With the specified air pressure applied, move the secondary rocker arm (A) for the No. 1 cylinder. The mid rocker arm (B), the primary rocker arm (C), and the secondary rocker arm should move together.

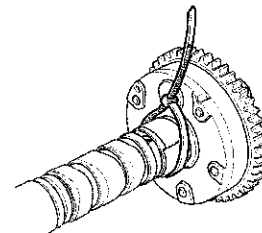
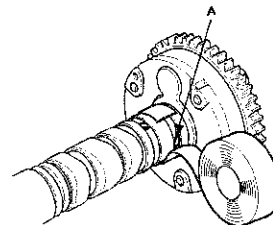
- If the mid, primary, and secondary rocker arms move together, go to step 13.
- If the mid and primary rocker arms do not move together with the secondary rocker arm, remove the mid, primary, and the secondary rocker arms as an assembly, and check that the pistons in the rocker arms move smoothly. If any rocker arm needs replacing, replace the mid, the primary, and the secondary rocker arms as an assembly, then retest.



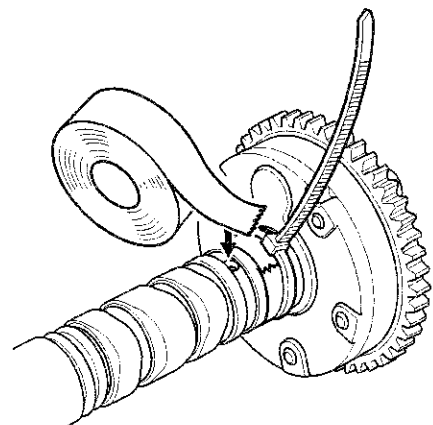
13. Repeat step 12 on the remaining secondary rocker arms with each piston at TDC. When all the secondary rocker arms pass the test, go to step 14.
14. Remove the air pressure regulator, the air joint adapter, the VTEC air adapters, and the VTEC air stopper.
15. Tighten the camshaft holder mounting bolts to 22 N·m (2.2 kgf·m, 16 lbf·ft).
16. Tighten the sealing bolt to 10 N·m (1.0 kgf·m, 7.2 lbf·ft).
17. Install the cylinder head cover (see page 6-25).

VTC Actuator Inspection

1. Remove the cam chain (see page 6-13).
2. Loosen the rocker arm adjusting screws (see step 2 on page 6-32).
3. Remove the camshaft holder (see step 3 on page 6-32).
4. Remove the intake camshaft.
5. Check that the variable valve timing control (VTC) actuator is locked by turning the VTC actuator counterclockwise. If it is not locked, turn the VTC actuator clockwise until it stops, then recheck it. If it is still not locked, replace the VTC actuator.
6. Seal the retard holes (A) in the No. 1 camshaft journal with tape and a wire tie.



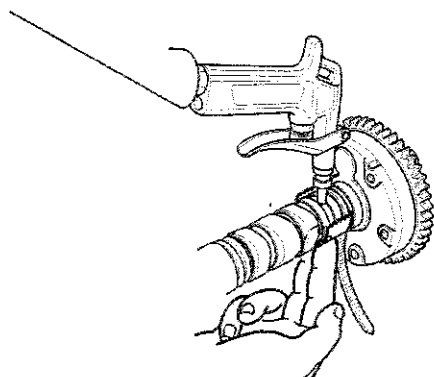
7. Seal one of the advance holes (A) with tape.



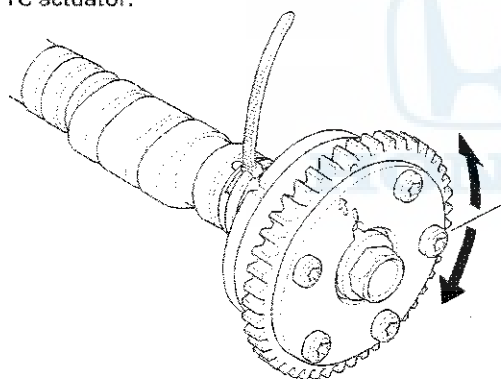


Valve Clearance Adjustment

8. Apply air to the unsealed advance hole to release the lock.



9. Check that the VTC actuator moves smoothly. If the VTC actuator does not move smoothly, replace the VTC actuator.



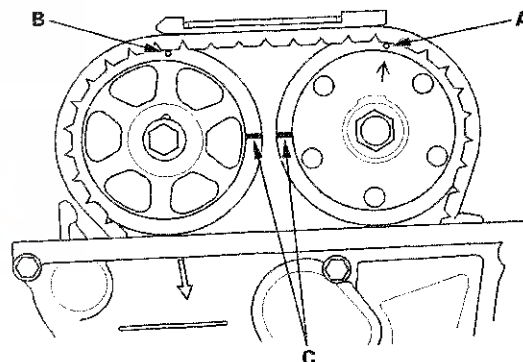
10. Remove the wire tie, the tape, and the adhesive residue from the camshaft journal.
11. Make sure the punch marks on the VTC actuator and the exhaust camshaft sprocket are facing up, then set the camshafts in the head (see step 6 on page 6-44).
12. Set the camshaft holders and cam chain guide B in place (see step 7 on page 6-44).
13. Tighten the camshaft holder bolts to the specified torque (see step 8 on page 6-44).
14. Hold the camshaft, and turn the VTC actuator clockwise until you hear it click. Make sure to lock the VTC actuator by turning it.
15. Install the cam chain (see page 6-15).
16. Adjust the valve clearance (see page 6-9).

Special Tools Required

- Locknut wrench 07MAA-PR70120
- Adjuster 07MAA-PR70110

NOTE: Connect the Honda Diagnostic System (HDS) to the data link connector (DLC) and monitor the engine coolant temperature (ECT) sensor 1 with the HDS. Adjust the valve clearance only when the ECT sensor 1 temperature is less than 100 °F (38 °C).

1. Remove the cylinder head cover (see page 6-24).
2. Set the No. 1 piston at top dead center (TDC). The punch mark (A) on the variable valve timing control (VTC) actuator and the punch mark (B) on the exhaust camshaft sprocket should be at the top. Align the TDC marks (C) on the VTC actuator and the exhaust camshaft sprocket.



(cont'd)

Cylinder Head

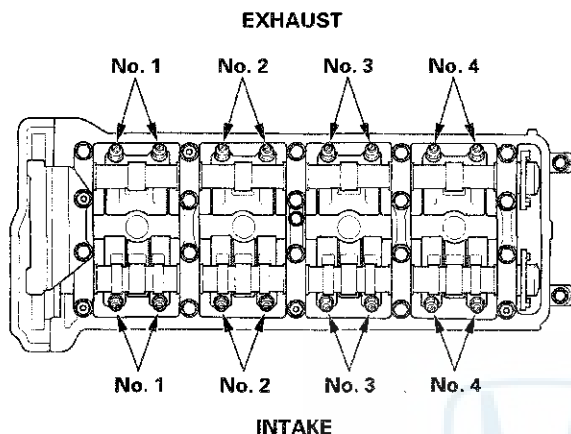
Valve Clearance Adjustment (cont'd)

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

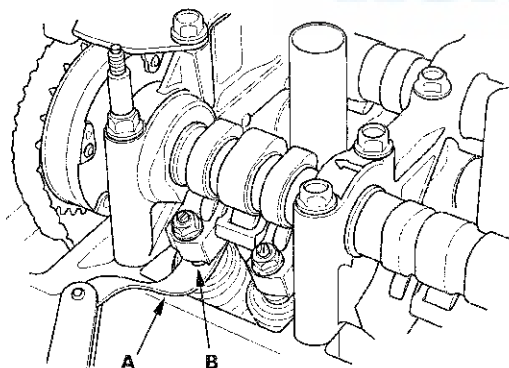
Valve Clearance

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

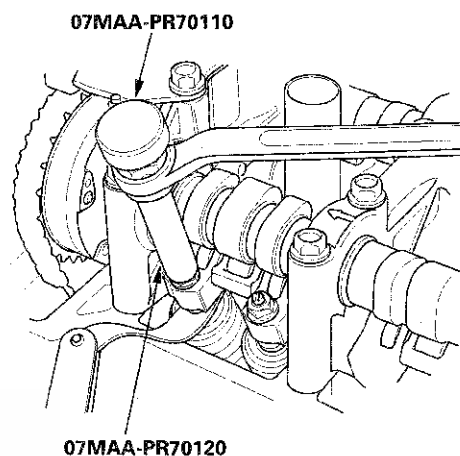
Exhaust: 0.25–0.29 mm (0.010–0.011 in.)



4. 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.



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



6. Tighten the locknut to the specified torque, and recheck the clearance. Repeat the adjustment if necessary.

Specified Torque

Intake:

7 x 0.75 mm

14 N·m (1.4 kgf·m, 10 lbf·ft)

Apply new engine oil to the nut threads.

Exhaust:

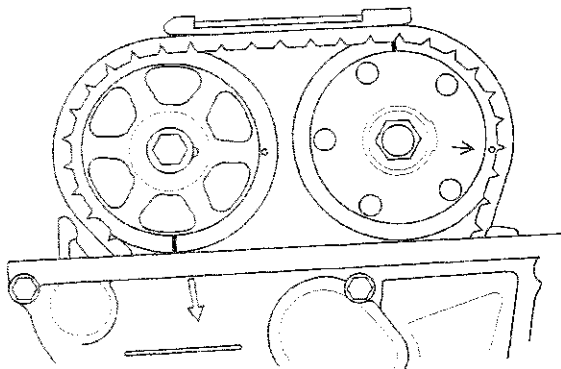
7 x 0.75 mm

14 N·m (1.4 kgf·m, 10 lbf·ft)

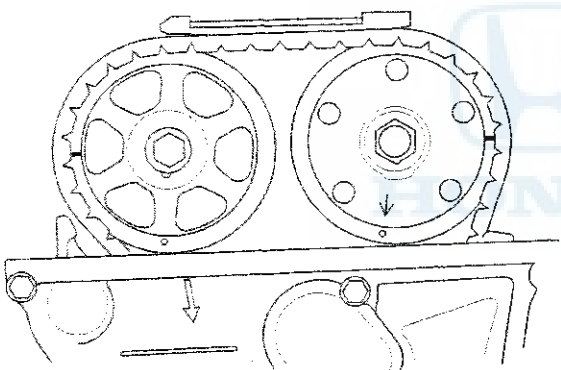
Apply new engine oil to the nut threads.



7. Rotate the crankshaft 180 ° clockwise (camshaft pulley turns 90 °).

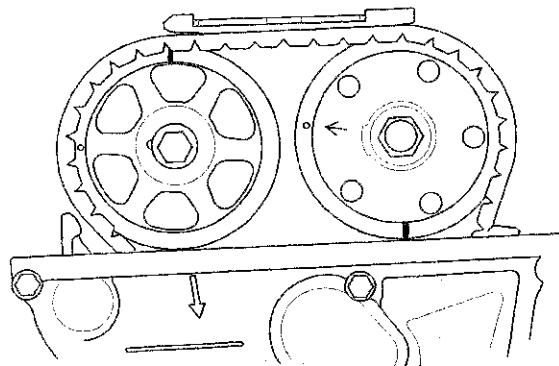


8. Check and, if necessary, adjust the valve clearance on the No. 3 cylinder.
9. Rotate the crankshaft 180 ° clockwise (camshaft pulley turns 90 °).



10. Check and, if necessary, adjust the valve clearance on the No. 4 cylinder.

11. Rotate the crankshaft 180 ° clockwise (camshaft pulley turns 90 °).



12. Check and, if necessary, adjust the valve clearance on the No. 2 cylinder.
13. Install the cylinder head cover (see page 6-25).

Cylinder Head

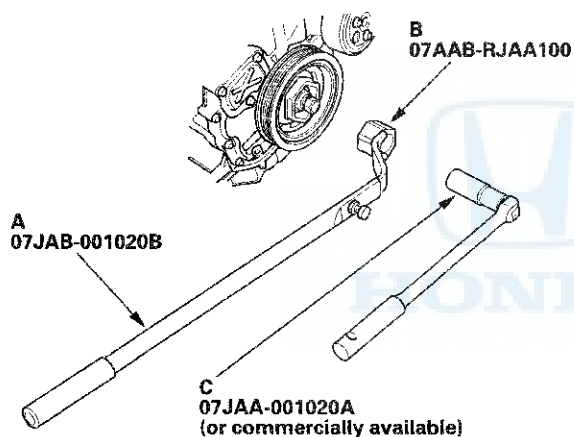
Crankshaft Pulley Removal and Installation

Special Tools Required

- Holder handle 07JAB-001020B
- Crankshaft pulley holder 07AAB-RJAA100
- Socket, 19 mm 07JAA-001020A or a commercially available 19 mm socket

Removal

1. Remove the front wheels.
2. Remove the splash shield (see step 25 on page 5-5).
3. Remove the drive belt (see page 4-30).
4. Hold the pulley with the holder handle (A) and the crankshaft pulley holder (B).

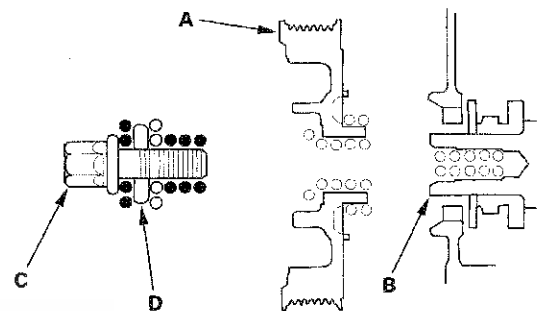


5. Remove the bolt with a socket, 19 mm (C) and a breaker bar, then remove the crankshaft pulley.

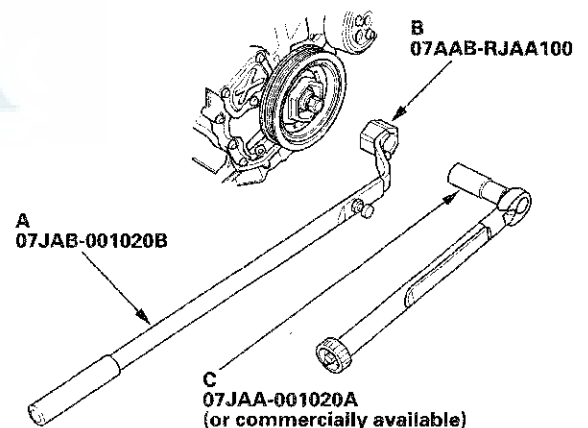
Installation

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

○ : Clean
● : Lubricate



2. Install the crankshaft pulley, and hold the pulley with the holder handle (A) and the crankshaft pulley holder (B).



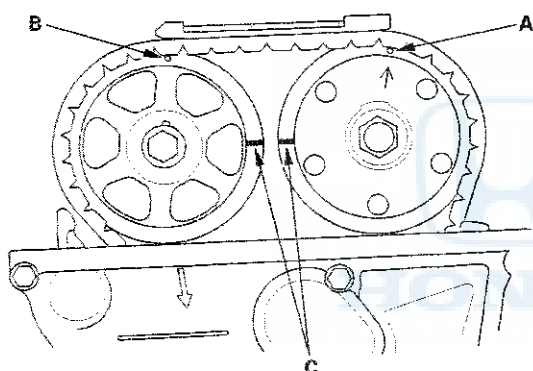
3. Tighten the bolt to 49 N·m (5.0 kgf·m, 36 lbf·ft) with a torque wrench and socket, 19 mm (C). Do not use an impact wrench. If the pulley bolt or crankshaft are new, tighten the bolt to 177 N·m (18.0 kgf·m, 130 lbf·ft), then remove the bolt and tighten it to 49 N·m (5.0 kgf·m, 36 lbf·ft).
4. Tighten the pulley bolt an additional 90°.
5. Install the drive belt (see page 4-30).
6. Install the splash shield (see step 48 on page 5-20).
7. Install the front wheels.



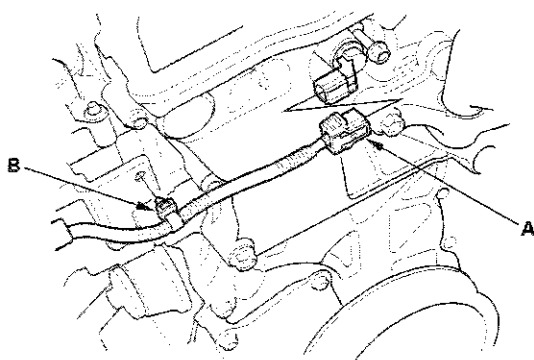
Cam Chain Removal

NOTE: Keep the cam chain away from magnetic fields.

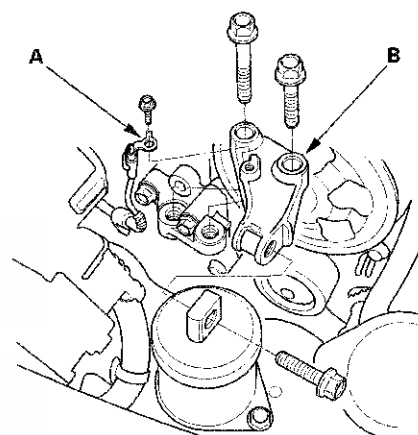
1. Remove the front wheels.
2. Remove the splash shield (see step 25 on page 5-5).
3. Remove the drive belt (see page 4-30).
4. Remove the cylinder head cover (see page 6-24).
5. Set the No. 1 piston at top dead center (TDC). The punch mark (A) on the variable valve timing control (VTC) actuator and the punch mark (B) on the exhaust camshaft sprocket should be at the top. Align the TDC marks (C) on the VTC actuator and the exhaust camshaft sprocket.



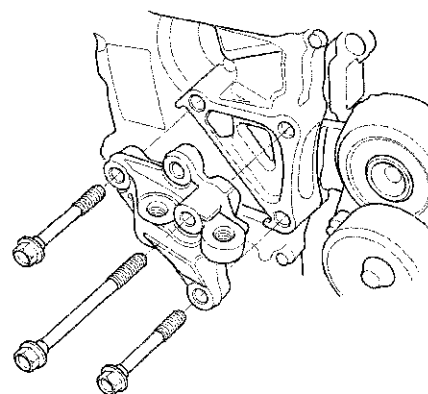
6. Disconnect the VTC oil control solenoid valve connector (A) and remove the harness clamp (B).



7. Remove the VTC oil control solenoid valve (see page 11-300).
8. Remove the crankshaft pulley (see page 6-12).
9. Support the engine with a jack and a wood block under the oil pan.
10. Remove the ground cable (A), then remove the side engine mount bracket (B).



11. Remove the side engine mount bracket mounting bolts.

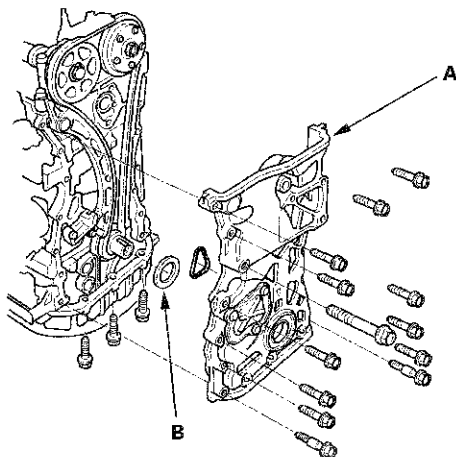


(cont'd)

Cylinder Head

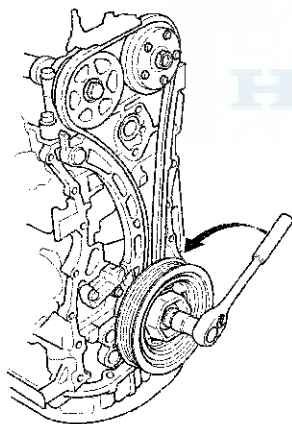
Cam Chain Removal (cont'd)

12. Remove the cam chain case (A) and the spacer (B).



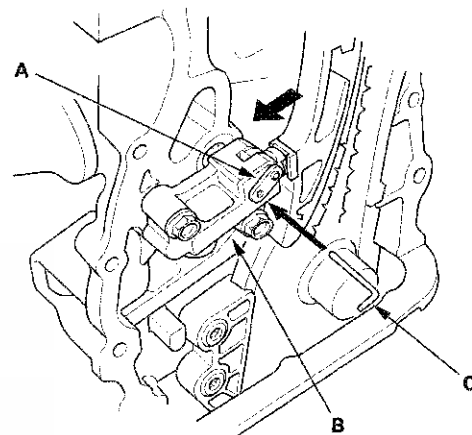
13. Loosely install the crankshaft pulley.

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

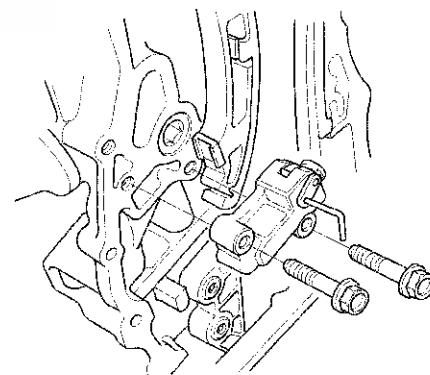


15. Align the holes on the lock (A) and the auto-tensioner (B), then insert a 1.2 mm (0.05 in.) diameter pin or lock pin (P/N 14511-PNA-003) (C) into the holes. Turn the crankshaft clockwise to secure the pin.

NOTE: Check the auto-tensioner cam position. If the position are not aligned, set the first cam to the first edge of the rack.



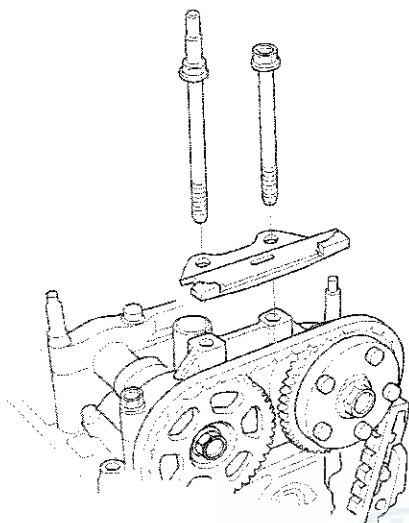
16. Remove the auto-tensioner.



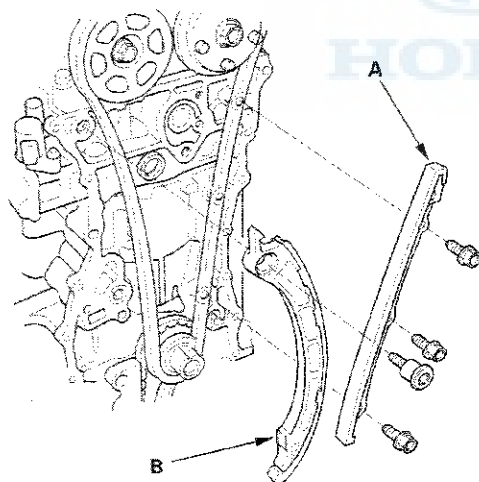


Cam Chain Installation

17. Remove cam chain guide B.



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



19. Remove the cam chain.

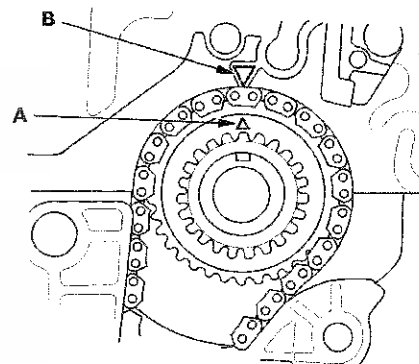
Special Tools Required

Camshaft lock pin set 07AAB-RWCA120

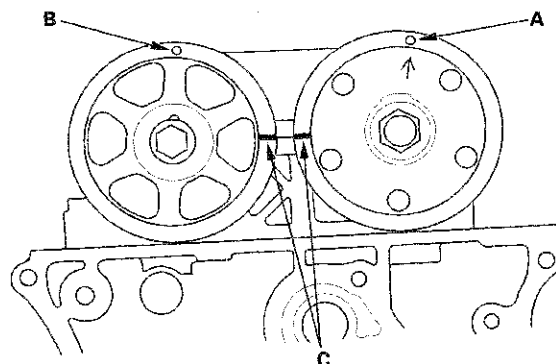
NOTE:

- Keep the cam chain away from magnetic fields.
- Before doing this procedure, check that the variable valve timing control (VTC) actuator is locked by turning the VTC actuator counterclockwise. If not locked, turn the VTC actuator clockwise until it stops, then recheck it. If it is still not locked, replace the VTC actuator.

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



2. Set the camshafts to TDC. The punch mark (A) on the VTC actuator and the punch mark (B) on the exhaust camshaft sprocket should be at the top. Align the TDC marks (C) on the VTC actuator and the exhaust camshaft sprocket.

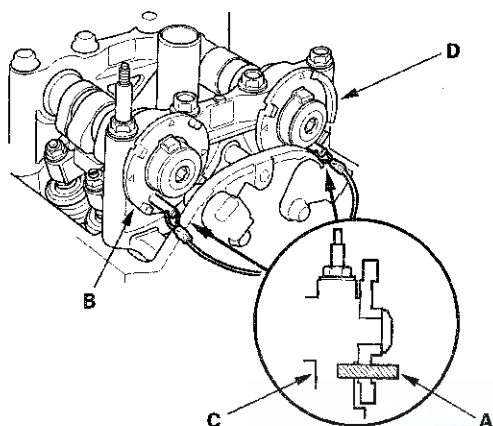


(cont'd)

Cylinder Head

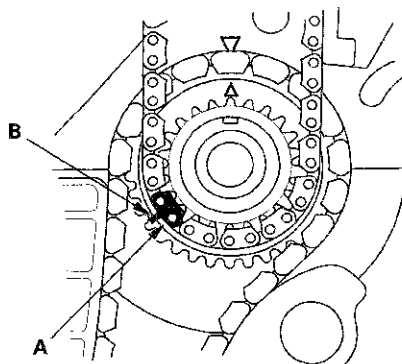
Cam Chain Installation (cont'd)

3. To hold the intake camshaft, insert a camshaft lock pin (07AAB-RWCA120) (A) into the maintenance hole in camshaft position (CMP) pulse plate A (B) and through the No. 5 rocker shaft holder (C).

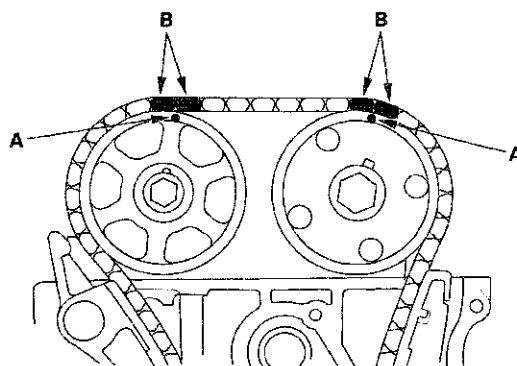


4. To hold the exhaust camshaft, insert a camshaft lock pin (A) into the maintenance hole in CMP pulse plate B (D) and through the No. 5 rocker shaft holder (C).

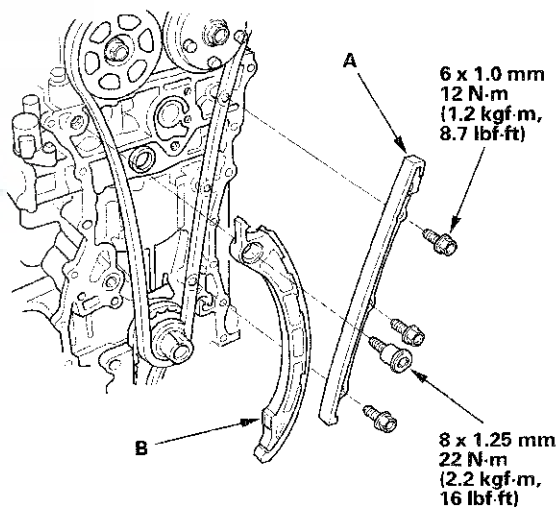
5. Install the cam chain on the crankshaft sprocket with the colored link plate (A) aligned with the mark (B) on the crankshaft sprocket.



6. Install the cam chain on the VTC actuator and the exhaust camshaft sprocket with the punch marks (A) aligned with the center of the two colored link plates (B).



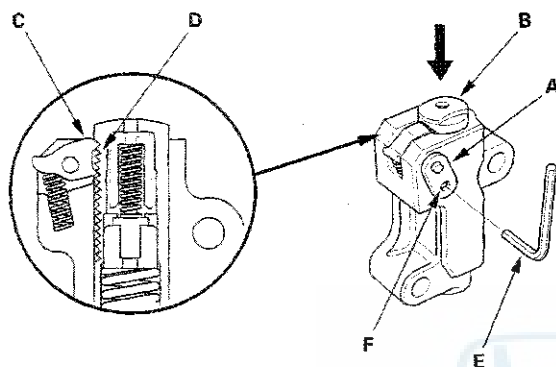
7. Install cam chain guide A and the tensioner arm (B).



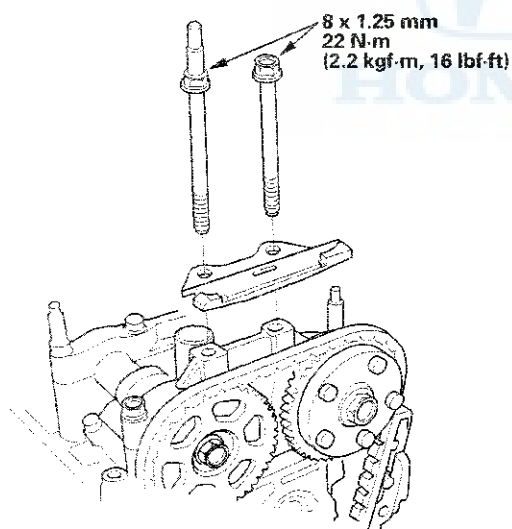


8. Compress the auto-tensioner when replacing the cam chain. Remove the pin from the auto-tensioner. Turn the plate (A) counterclockwise, to release the lock, then press the rod (B), and set the first cam (C) to the first edge of the rack (D). Insert the 1.2 mm (0.05 in.) diameter pin or lock pin (P/N 14511-PNA-003) (E) into the holes (F).

NOTE: If the chain tensioner is not set up as described, the tensioner will become damaged.

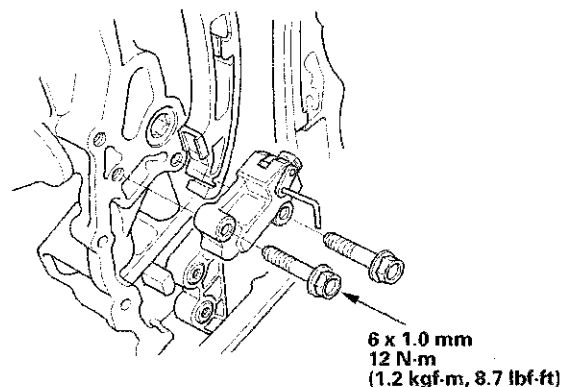


9. Install cam chain guide B.

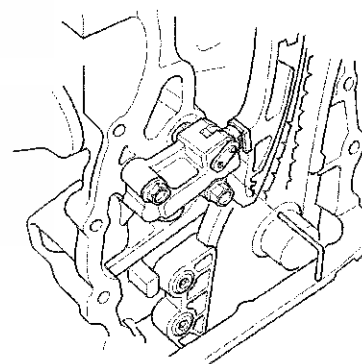


10. Install the auto-tensioner.

NOTE: Check the auto-tensioner cam position. If the position is not aligned, set the first cam to the first edge of the rack.



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

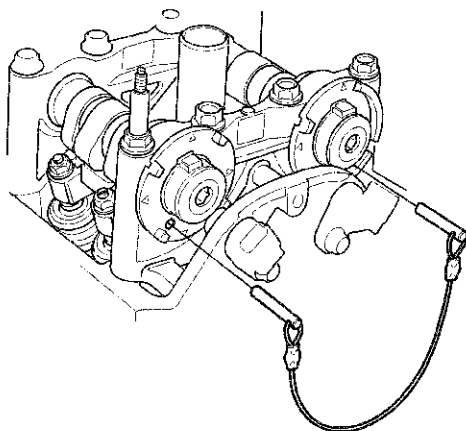


(cont'd)

Cylinder Head

Cam Chain Installation (cont'd)

12. Remove the camshaft lock pin set.



13. Check the chain case oil seal for damage. If the oil seal is damaged, replace the chain case oil seal (see page 6-22).

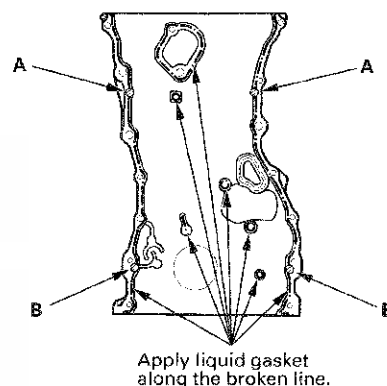
14. Remove the old liquid gasket from the chain case mating surfaces, the bolts, and the bolt holes.

15. Clean and dry the chain case mating surfaces.

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

NOTE:

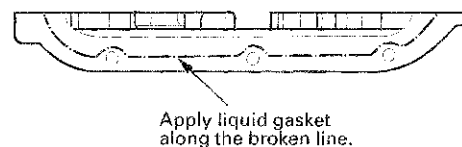
- If you apply liquid gasket P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply new liquid gasket.



17. Apply liquid gasket to the engine block upper surface contact areas (A) on the chain case and lower block upper surface contact areas (B) on the chain case.
18. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the oil pan mating surface of the chain case, and to the inside edge of the threaded bolt holes. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

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

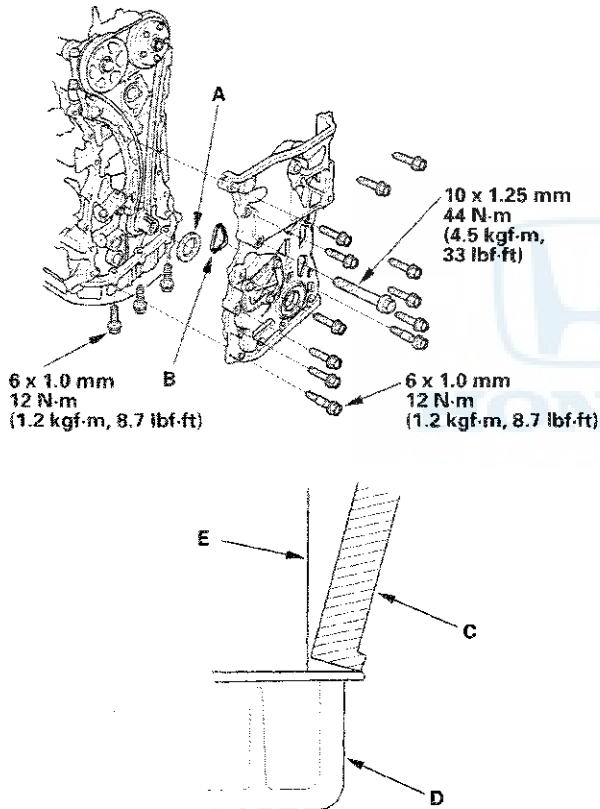




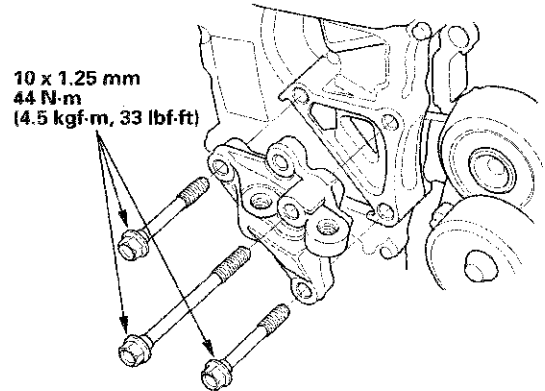
19. Install the spacer (A), then install the new O-ring (B) on the chain case. Set the edge of the chain case (C) to the edge of the oil pan (D), then install the chain case on the engine block (E). Wipe off the excess liquid gasket on the oil pan and chain case mating surface.

NOTE:

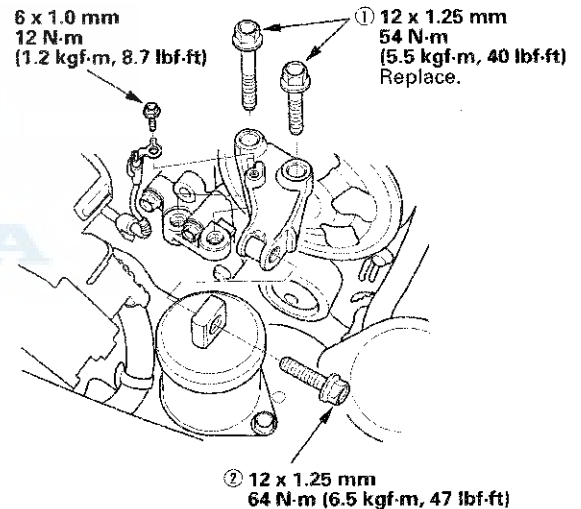
- When installing the chain case, do not slide the bottom surface onto the oil pan mounting surface.
- Wait at least 30 minutes before filling the engine with oil.
- Do not run the engine for at least 3 hours after installing the chain case.



20. Install the side engine mount bracket, then tighten the side engine mount bracket mounting bolts.



21. Tighten the new side engine mount bracket mounting bolts in the numbered sequence shown.



22. Install the ground cable.

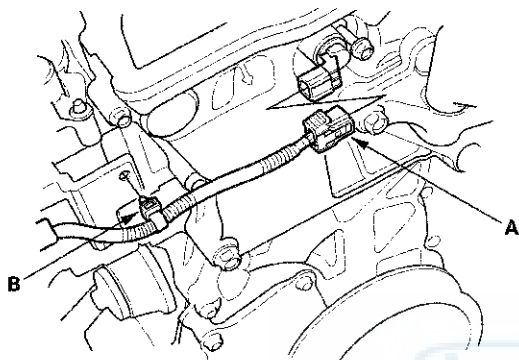
23. Remove the jack and the wood block.

(cont'd)

Cylinder Head

Cam Chain Installation (cont'd)

24. Install the crankshaft pulley (see page 6-12).
25. Install the VTC oil control solenoid valve (see page 11-300).
26. Connect the VTC oil control solenoid valve connector (A) and install the harness clamp (B).

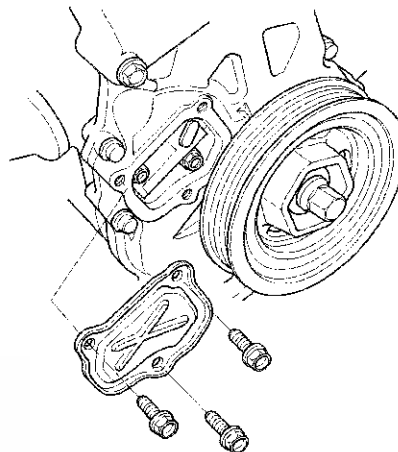


27. Install the cylinder head cover (see page 6-25).
28. Install the drive belt (see page 4-30).
29. Install the splash shield (see step 48 on page 5-20).
30. Install the front wheels.
31. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see page 11-5).

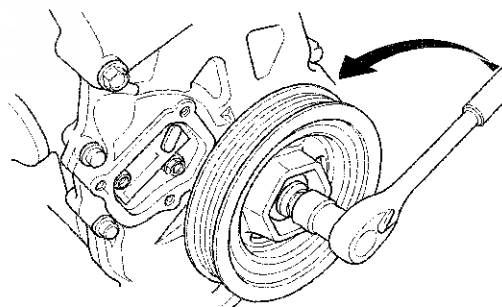
Auto-tensioner Removal and Installation

Removal

1. Remove the chain case cover.



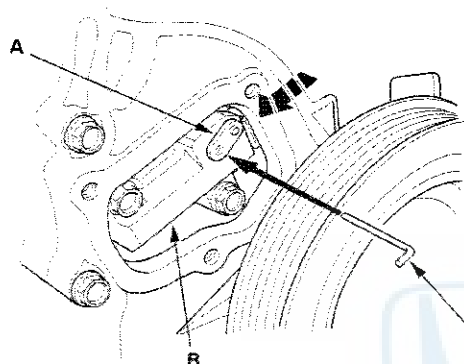
2. Turn the crankshaft counterclockwise to compress the auto-tensioner.



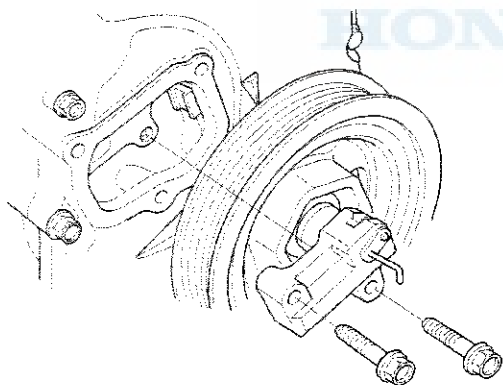


3. Align the holes on the lock (A) and the auto-tensioner (B), then insert a 1.2 mm (0.05 in.) diameter pin or lock pin (P/N 14511-PNA-003) (C) into the holes. Turn the crankshaft clockwise to secure the pin.

NOTE: Check the auto-tensioner cam position. If the position is not aligned, set the first cam to the first edge of the rack (see step 8 on page 6-17).



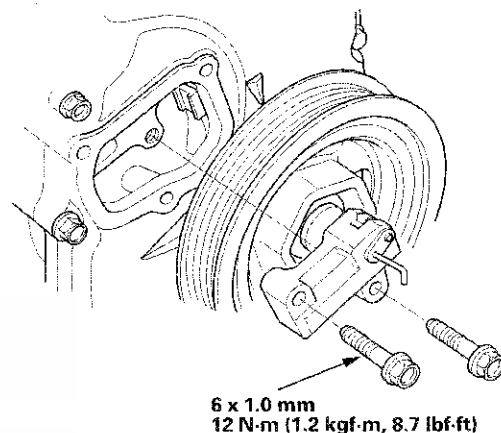
4. Remove the auto-tensioner.



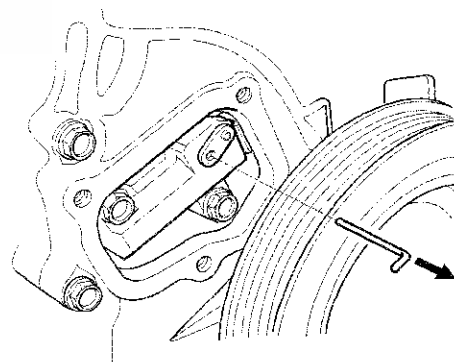
Installation

1. Install the auto-tensioner.

NOTE: Check the auto-tensioner cam position. If the position is not aligned, set the first cam to the first edge of the rack.



2. Remove the 1.2 mm (0.05 in.) diameter pin or lock pin (P/N 14511-PNA-003) from the auto-tensioner.



3. Remove all of the old liquid gasket from the chain case cover mating surfaces, the bolts, and the bolt holes.
4. Clean and dry the chain case cover mating surfaces.

(cont'd)

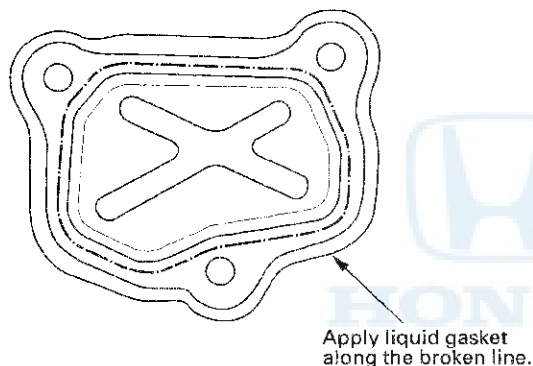
Cylinder Head

Auto-tensioner Removal and Installation (cont'd)

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

NOTE:

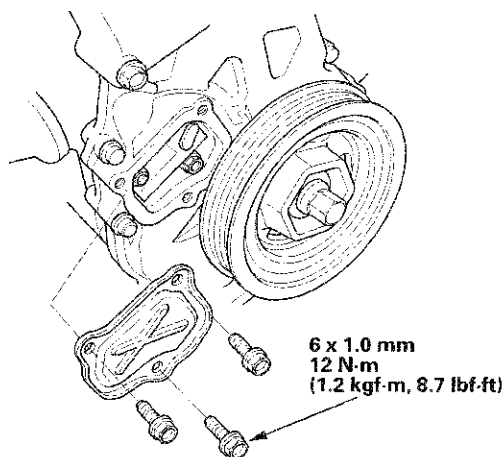
- If you apply liquid gasket P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply new liquid gasket.



6. Install the chain case cover.

NOTE:

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

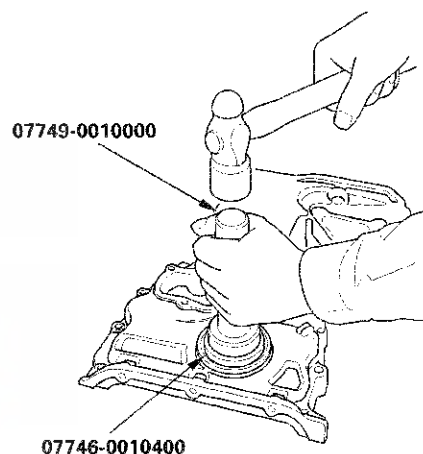


Chain Case Oil Seal Installation

Special Tools Required

- Driver 07749-0010000
- Attachment, 52 x 55 mm 07746-0010400

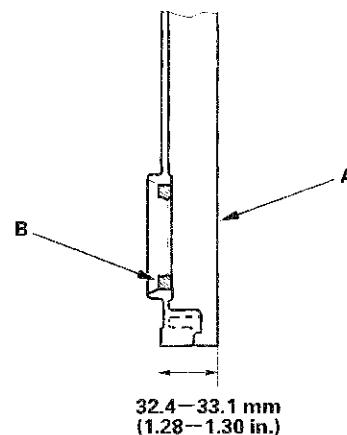
1. Apply a light coat of new engine oil around the crankshaft.
2. Apply a light coat of new engine oil to the lip of the chain case oil seal.
3. Use the handle driver and attachment, 52 x 55 mm to drive a new oil seal squarely into the chain case to the specified installed height.



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

Oil Seal Installed Height:

32.4—33.1 mm (1.28—1.30 in.)



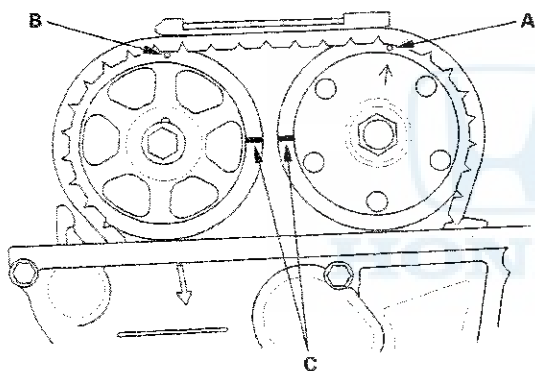


Cam Chain Inspection

Special Tools Required

Cam chain inspection gauge 07AAJ-RWCA100

1. Remove the front wheels.
2. Remove the splash shield (see step 25 on page 5-5).
3. Remove the cylinder head cover (see page 6-24).
4. Rotate the crankshaft pulley two turns clockwise.
5. Set the No. 1 piston at top dead center (TDC). The punch mark (A) on the variable valve timing control (VTC) actuator and the punch mark (B) on the exhaust camshaft sprocket should be at the top. Align the TDC marks (C) on the VTC actuator and the exhaust camshaft sprocket.



6. Measure the clearance between the cam chain (A) and the tensioner arm (B) with the cam chain inspection gauge (07AAJ-RWCA100).

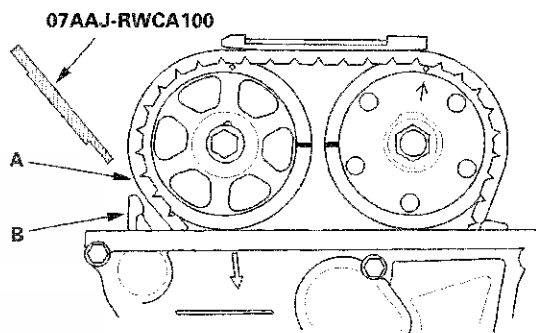
- If the clearance is OK, go to step 17.
- If the clearance is more than the service limit, go to step 7.

Chain-to-Arm Clearance

Service Limit:

MIL on with P0341: 4.3 mm (0.17 in.)

Without MIL: 5.5 mm (0.22 in.)



7. Remove the oil pan (see page 7-11).
8. Support the engine with a jack and a wood block under the engine block.

NOTE: Do not hit the oil pump and the baffle plate when placing the jack on the edge of the engine block.

9. Remove the cam chain (see page 6-13), and check the teeth on the crankshaft sprocket, the VTC actuator, and the exhaust camshaft sprocket for wear and damage. If any of them are worn or damaged, replace if necessary.
10. Check the oil passage on the auto-tensioner for clogs. If the auto-tensioner is clogged, replace it.

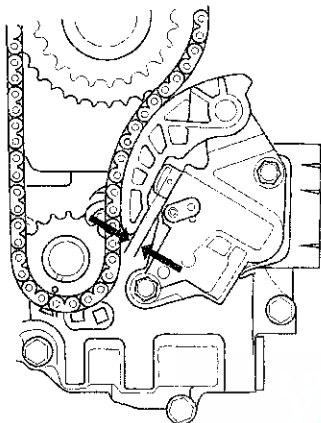
(cont'd)

Cylinder Head

Cam Chain Inspection (cont'd)

11. Measure the length of the oil pump chain auto-tensioner rod.

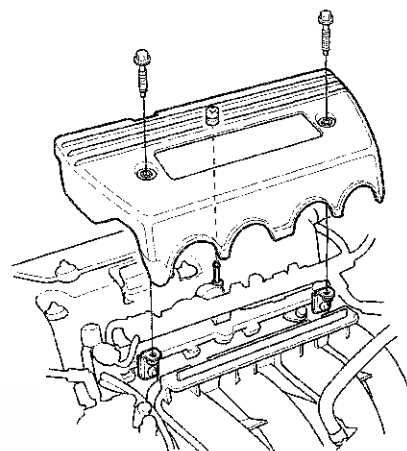
Oil Pump Chain Auto-Tensioner Rod Length
Service Limit: 13 mm (0.51 in.)



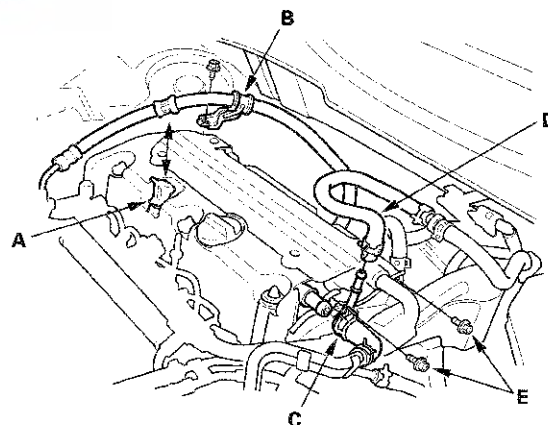
12. If the length is over the service limit, replace the oil pump chain (see page 8-23). When replacing, check the teeth on the crankshaft sprocket and oil pump sprocket for wear and damage. If any of them are worn or damaged, replace if necessary.
13. Check the oil passage on the oil pump chain auto-tensioner for clogs. If the auto-tensioner is clogged, replace it.
14. Install the new cam chain (see page 6-15).
15. Remove the jack and the wood block.
16. Install the oil pan (see page 7-31).
17. Install the cylinder head cover (see page 6-25).
18. Install the splash shield (see step 48 on page 5-20).
19. Install the front wheels.

Cylinder Head Cover Removal

1. Remove the strut brace (if equipped) (see page 20-289).
2. Remove the engine cover.



3. Remove the four ignition coils (see page 4-20).
4. Remove the dipstick (A) and the power steering (P/S) hose bracket (B) and disconnect the breather hose (C) and the brake booster vacuum hose (D).

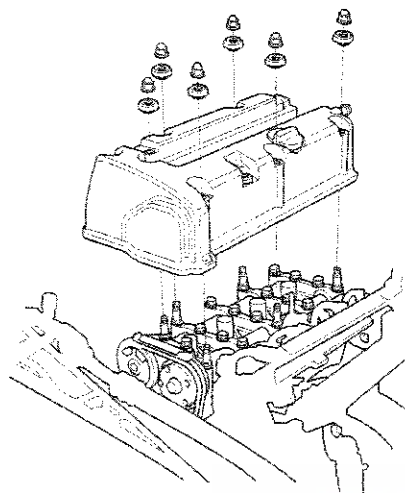


5. Remove the two bolts (E) securing the evaporative emission (EVAP) canister purge valve bracket.

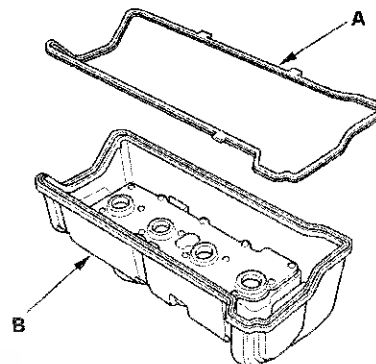


Cylinder Head Cover Installation

6. Remove the cylinder head cover.



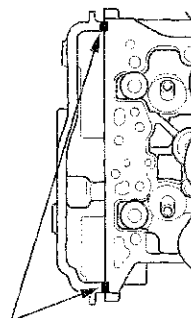
1. Thoroughly clean the head cover gasket and the groove.
2. Install the head cover gasket (A) in the groove of the cylinder head cover (B).



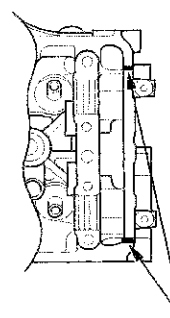
3. Check that the mating surfaces are clean and dry.
4. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, on the chain case and the No. 5 rocker shaft holder mating areas. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

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



Apply liquid gasket to these points.



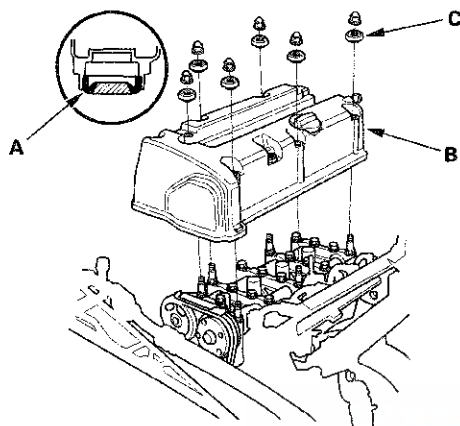
Apply liquid gasket to these points.

(cont'd)

Cylinder Head

Cylinder Head Cover Installation (cont'd)

5. Set the spark plug seals (A) on the spark plug tubes. Place the cylinder head cover (B) on the cylinder head, then slide the cover slightly back and forth to seat the head cover gasket.

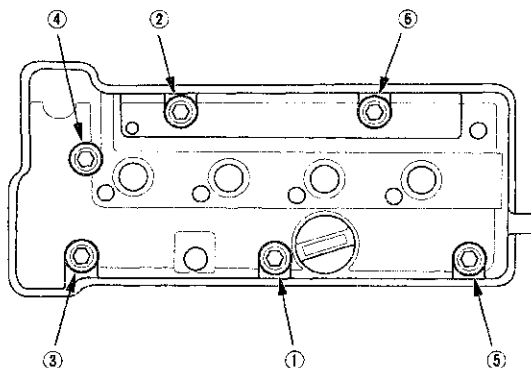


6. Inspect the cover washers (C). Replace any washer that is damaged or deteriorated.

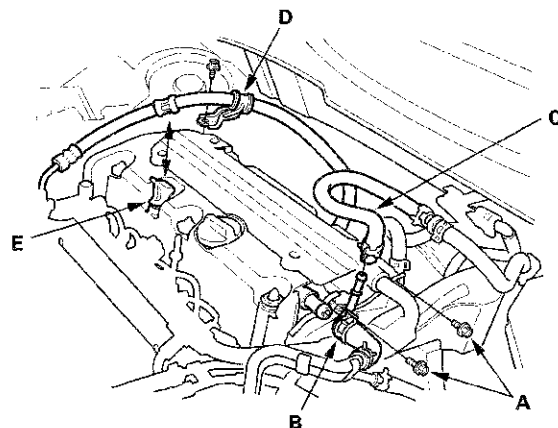
7. Tighten the bolts in three steps. In the final step tighten all bolts, in sequence, to 12 N·m (1.2 kgf·m, 8.7 lbf·ft).

NOTE:

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



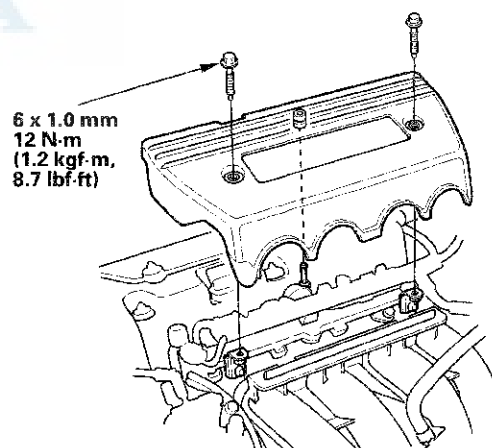
8. Install the two bolts (A) securing the evaporative emission (EVAP) canister purge valve bracket.



9. Connect the breathe hose (B) and the brake booster vacuum hose (C) and install the power steering (P/S) hose bracket (D), and the dipstick (E).

10. Install the four ignition coils (see page 4-20).

11. Install the engine cover.



12. Install the strut brace (if equipped) (see page 20-289).

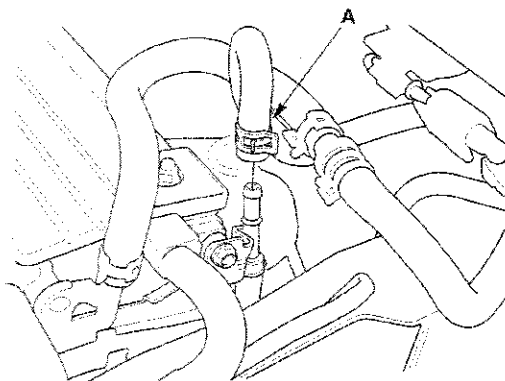


Cylinder Head Removal

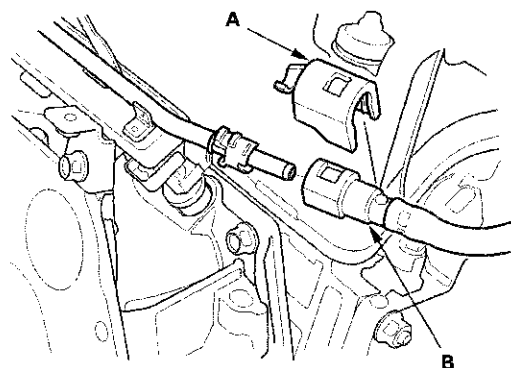
NOTE:

- Use fender covers to avoid damaging painted surfaces.
- To avoid damage, unplug the wiring connectors carefully while holding the connector portion.
- Connect the Honda Diagnostic System (HDS) to the data link connector (DLC), and monitor the engine coolant temperature (ECT) sensor 1. To avoid damaging the cylinder head, wait until the ECT sensor 1 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.

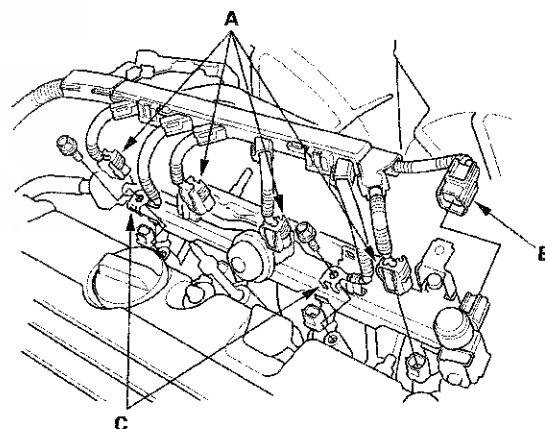
1. Remove the strut brace (if equipped) (see page 20-289).
2. Relieve the fuel pressure (see page 11-332).
3. Drain the engine coolant (see page 10-6).
4. Remove the drive belt (see page 4-30).
5. Remove the intake manifold (see page 9-3).
6. Remove the catalytic converter (see page 11-367).
7. Disconnect the evaporative emission (EVAP) canister hose (A).



8. Remove the quick-connect fitting cover (A), then disconnect the fuel feed hose (B) (see page 11-340).



9. Disconnect the four fuel injector connectors (A), the engine mount control solenoid valve connector (B), and remove the ground cables (C).

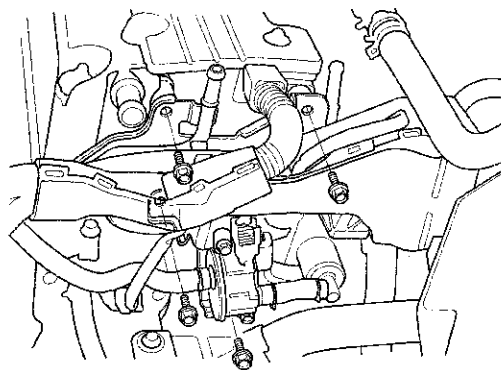


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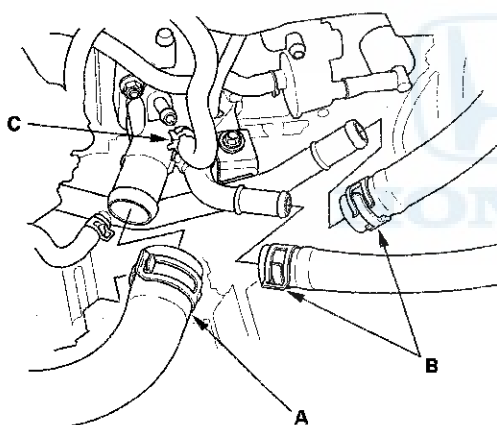
Cylinder Head

Cylinder Head Removal (cont'd)

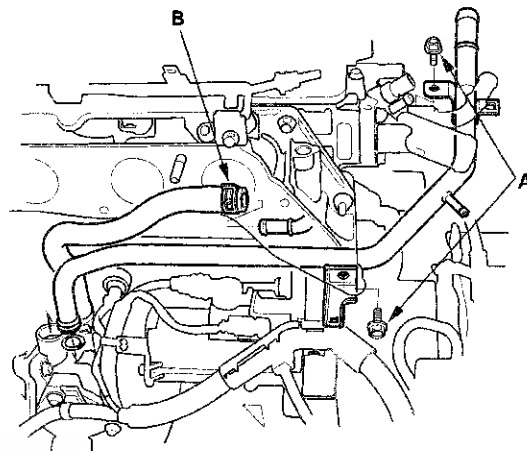
10. Remove the four bolts securing the EVAP canister purge valve bracket.



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



12. Remove the two bolts (A) securing the connecting pipe.



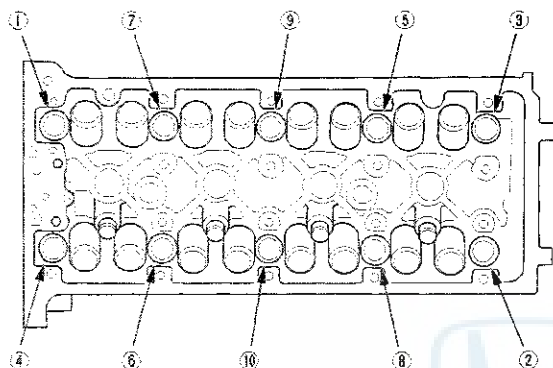
13. Disconnect the water bypass hose (B).
14. Disconnect the following engine wire harness connectors and remove the wire harness clamps from the cylinder head:

- Engine coolant temperature (ECT) sensor 1 connector
- Camshaft position (CMP) sensor A (Intake) connector
- Camshaft position (CMP) sensor B (Exhaust) connector
- Rocker arm oil control valve connector
- Rocker arm oil pressure switch connector
- EVAP canister purge valve connector
- Variable valve timing control (VTC) oil control solenoid valve connector
- Engine oil pressure switch connector



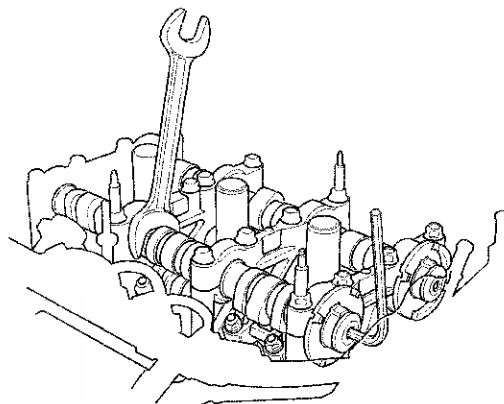
CMP Pulse Plate A Replacement

15. Remove the cam chain (see page 6-13).
16. Remove the rocker arm assembly (see page 6-32).
17. Remove the cylinder head bolts. To prevent warpage, loosen the bolts in sequence 1/3 turn at a time; repeat the sequence until all bolts are loosened.

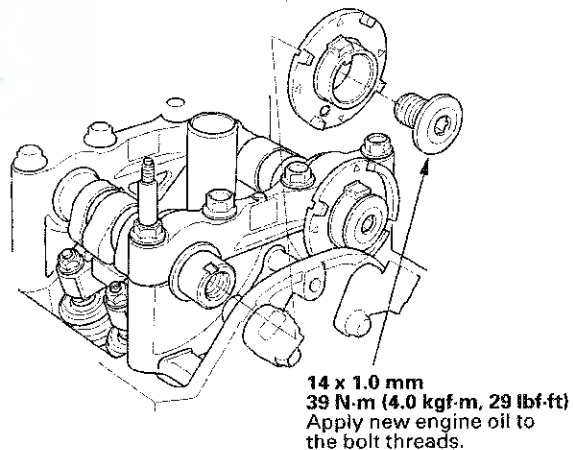


18. Remove the cylinder head.

1. Remove the cylinder head cover (see page 6-24).
2. Remove camshaft position (CMP) sensor A (see page 11-301).
3. Hold the camshaft with an open-end wrench, then loosen the bolt.



4. Remove CMP pulse plate A.

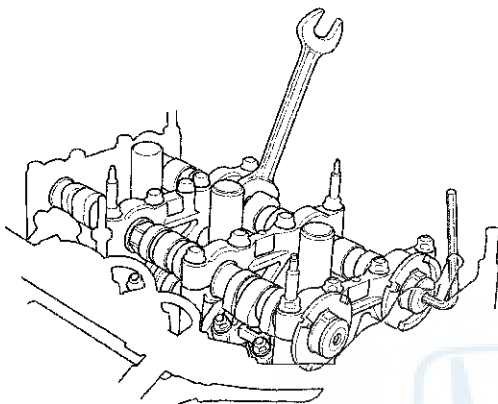


5. Install CMP pulse plate A in the reverse order of removal.

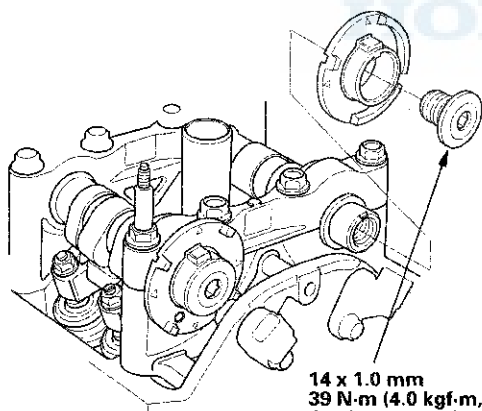
Cylinder Head

CMP Pulse Plate B Replacement

1. Remove the cylinder head cover (see page 6-24).
2. Remove camshaft position (CMP) sensor B (see page 11-210).
3. Hold the camshaft with an open-end wrench, then loosen the bolt.



4. Remove CMP pulse plate B.



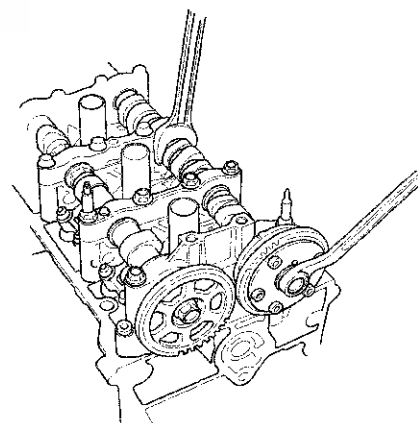
14 x 1.0 mm
39 N·m (4.0 kgf·m, 29 lbf·ft)
Apply new engine oil to
the bolt threads.

5. Install CMP pulse plate B in the reverse order of removal.

VTC Actuator, Exhaust Camshaft Sprocket Replacement

Removal

1. Remove the cam chain (see page 6-13).
NOTE: For exhaust camshaft sprocket removal, do steps 3 and 4.
2. If the VTC actuator will be reused, do these steps to avoid damaging the actuator lock pin.
 - 1 Remove the intake camshaft from the cylinder head, and seat the retard holes in the No. 1 camshaft journal with tape and a wire tie (see step 6 on page 6-8).
 - 2 Seal over one of the advance holes with tape (see step 7 on page 6-8).
 - 3 Apply air to the unsealed advance hole to release the lock (see step 8 on page 6-9).
 - 4 Remove the wire tie, the tape, and the adhesive residue from the camshaft journal.
 - 5 Temporarily reinstall the camshaft and the cam journals on the cylinder head.
3. Hold the camshaft with an open end wrench, then loosen the variable valve timing control (VTC) actuator mounting bolt or the exhaust camshaft sprocket mounting bolt.



4. Remove the VTC actuator and/or the exhaust camshaft sprocket from the camshaft.

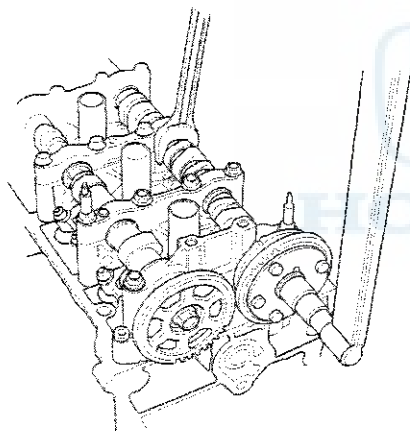


Installation

1. Install the VTC actuator and/or the exhaust camshaft sprocket onto the camshaft.

NOTE: To avoid damage to the VTC actuator, it must be installed in the unlocked position. If necessary, temporarily install the VTC actuator mount bolt hand-tight, and unlock the actuator (see step 2 of removal).

2. Apply new engine oil to the threads of the VTC actuator mounting bolt and the exhaust camshaft mounting bolt, then install them.
3. Hold the camshaft with an open-end wrench, then tighten the bolts.



Specified Torque

VTC Actuator Mounting Bolt:

12 x 1.25 mm

113 N·m (11.5 kgf·m, 83 lbf·ft)

Exhaust Camshaft Sprocket Mounting Bolt:

10 x 1.25 mm

72 N·m (7.3 kgf·m, 53 lbf·ft)

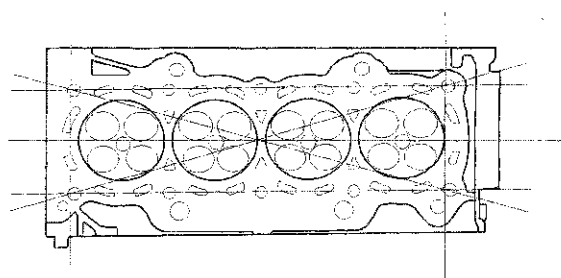
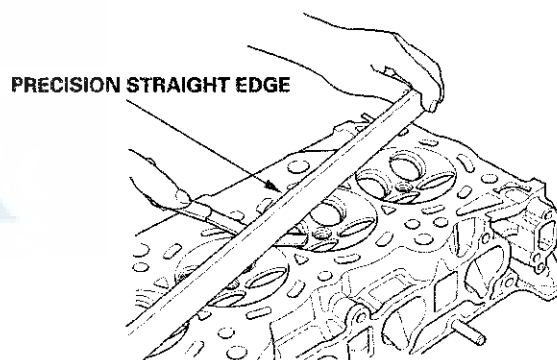
4. Hold the camshaft with an open-end wrench, and turn the VTC actuator by hand clockwise until you hear and feel the actuator lock pin click into place.
5. Install the cam chain (see page 6-15).

Cylinder Head Inspection for Warpage

1. Remove the cylinder head (see page 6-27).
2. Inspect the camshaft (see page 6-35).
3. Check the cylinder head for warpage. Measure along the edges, and three ways across the center.
 - If warpage is less than 0.05 mm (0.002 in.) cylinder head resurfacing is not required.
 - If warpage is between 0.05 mm (0.002 in.) and 0.2 mm (0.008 in.), resurface the cylinder head.
 - The maximum resurface limit is 0.2 mm (0.008 in.) based on a height of 104 mm (4.09 in.).

Cylinder Head Height

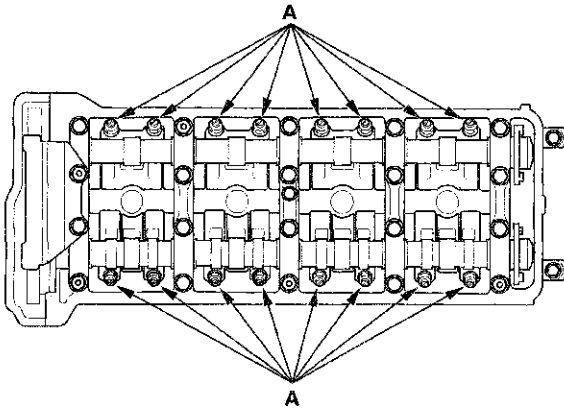
Standard (New): 103.95—104.05 mm
(4.093—4.096 in.)



Cylinder Head

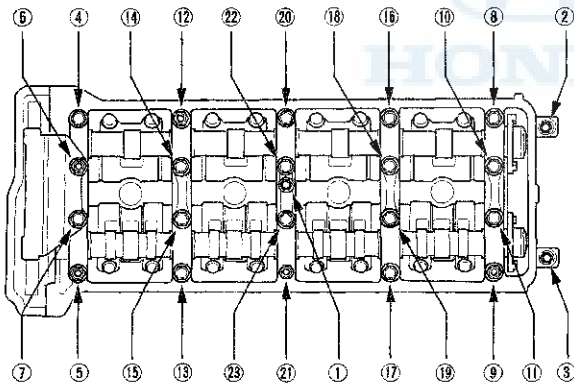
Rocker Arm Assembly Removal

1. Remove the cam chain (see page 6-13).
2. Loosen the rocker arm adjusting screws (A).

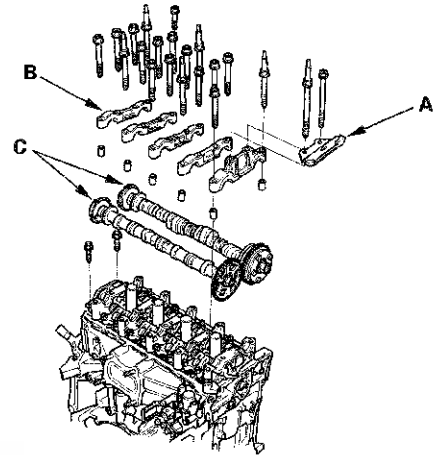


3. Remove the camshaft holder bolts. To prevent damaging the camshafts, loosen the bolts, in sequence, two turns at a time.

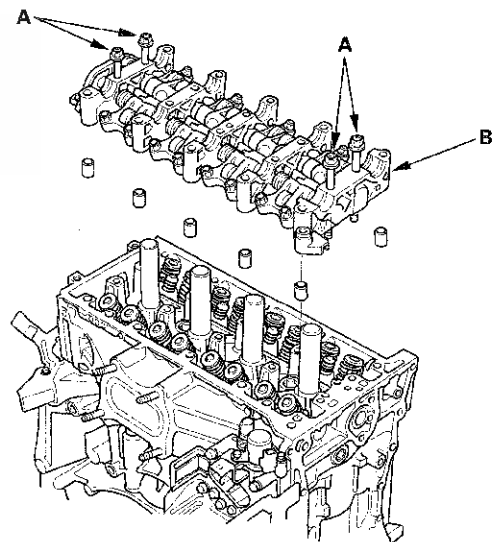
NOTE: Bolt ① is not on all engines.



4. Remove cam chain guide B (A), the camshaft holders (B), and the camshafts (C).



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

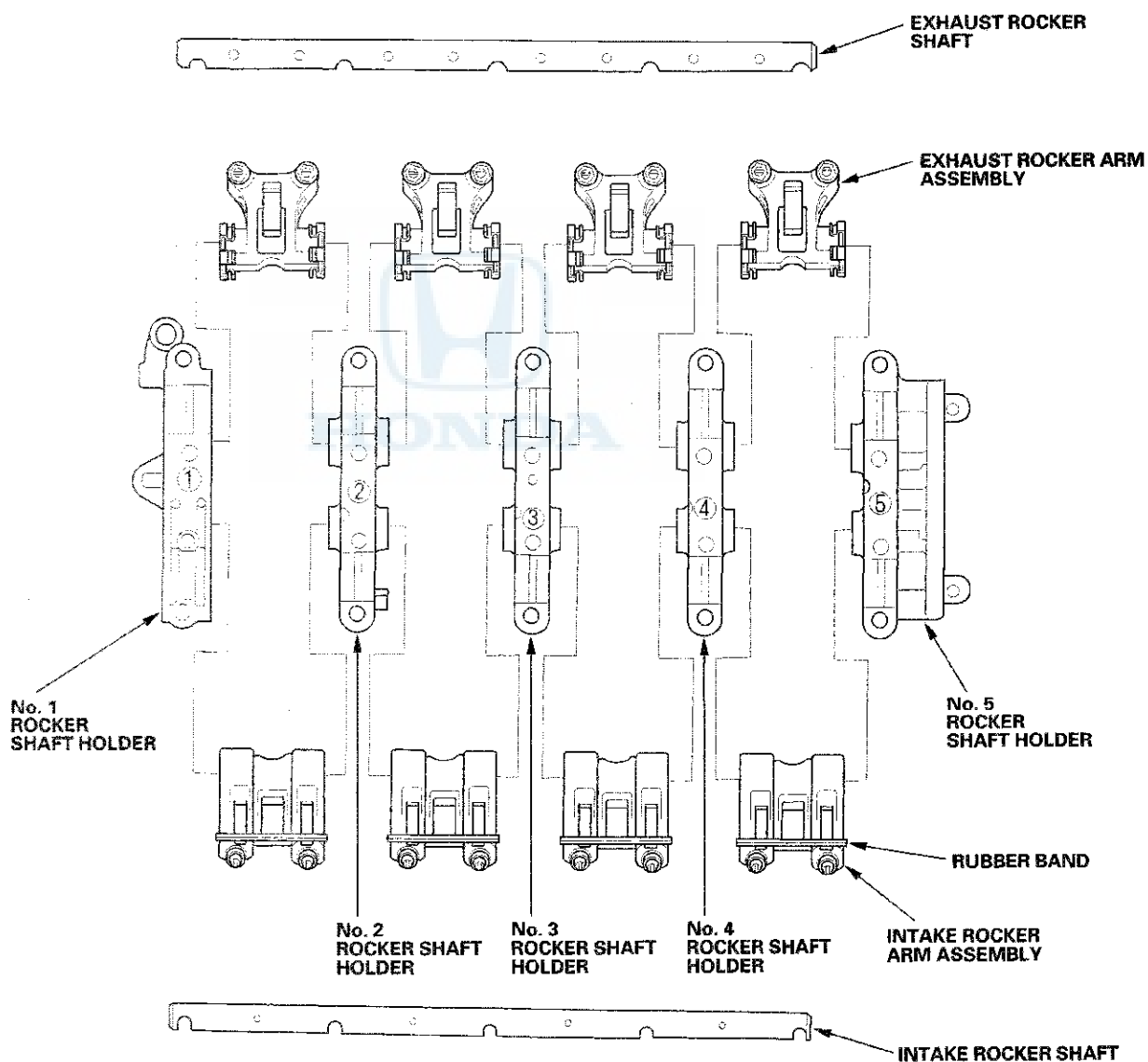




Rocker Arm and Shaft Disassembly/Reassembly

NOTE:

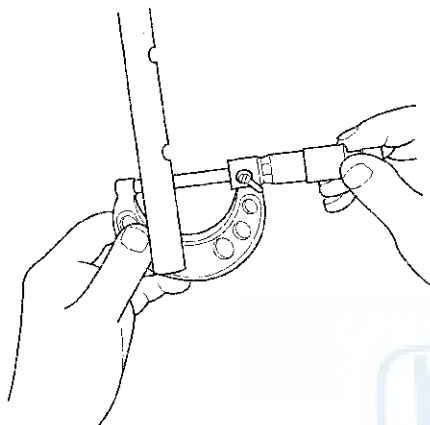
- Identify each part as it is removed so that each item can be reinstalled in its original position.
- Inspect the rocker arm shaft and rocker arms (see page 6-34).
- If reused, the rocker arms must be installed in the same positions.
- When removing, or installing the rocker arm assembly, do not remove the camshaft holder bolts. The bolts will keep the holders and rocker arms on the shaft.
- Prior to reassembling, clean all the parts in solvent, dry them, and apply new engine oil to any contact points.
- Bundle the intake rocker arms with rubber bands to keep them together as a set.
- When replacing the intake rocker arm assembly, remove the fastening hardware from the new intake rocker arm assembly.



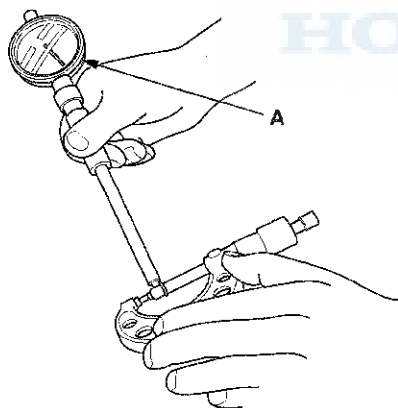
Cylinder Head

Rocker Arm and Shaft Inspection

1. Remove the rocker arm assembly (see page 6-32).
2. Disassemble the rocker arm assembly (see page 6-33).
3. Measure the diameter of the shaft at the first rocker location.



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



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

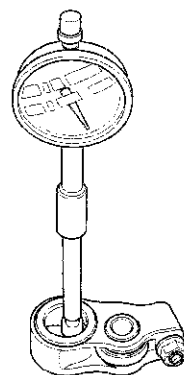
Rocker Arm-to-Shaft Clearance

Standard (New):

Intake: 0.018—0.059 mm
(0.0007—0.0023 in.)

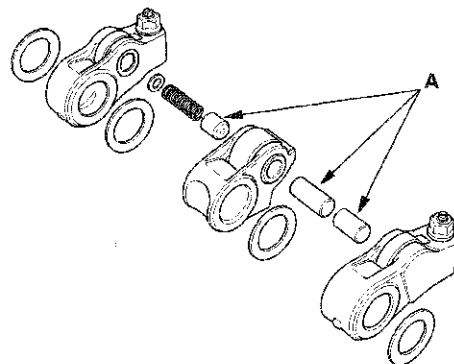
Exhaust: 0.018—0.056 mm
(0.0007—0.0022 in.)

Service Limit: 0.08 mm (0.003 in.)



6. Repeat for all rocker arms and both shafts. If the clearance is beyond the service limit, replace the rocker shaft and all out of service limit rocker arms. If any VTEC rocker arm needs replacement, replace the rocker arms (primary, mid, and secondary), as a set.
7. Inspect the rocker arm pistons (A). Push on each piston manually. If it does not move smoothly, replace the rocker arm set.

NOTE: Apply new engine oil to the rocker arm pistons when reassembling.



8. Install the rocker arm assembly (see page 6-43).



Camshaft Inspection

NOTE: Do not rotate the camshaft during inspection.

1. Remove the rocker arm assembly (see page 6-32).
2. Put the rocker shaft holders, camshaft, and camshaft holders on the cylinder head, then tighten the bolts, in sequence, to the specified torque.

NOTE: If the engine does not have bolt ②①, skip it and continue the torque sequence.

Specified Torque

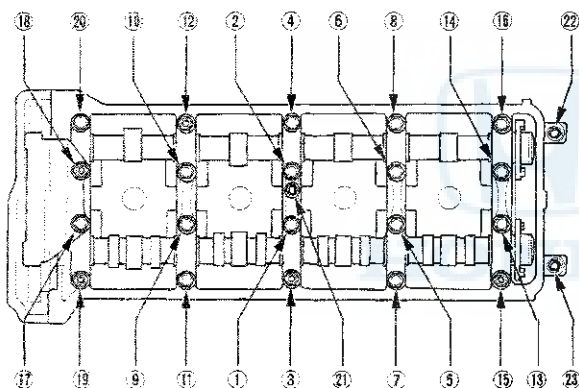
8 x 1.25 mm

22 N·m (2.2 kgf·m, 16 lbf·ft)

6 x 1.0 mm

12 N·m (1.2 kgf·m, 8.7 lbf·ft)

6 x 1.0 mm Bolts: ②①, ②②, ②③



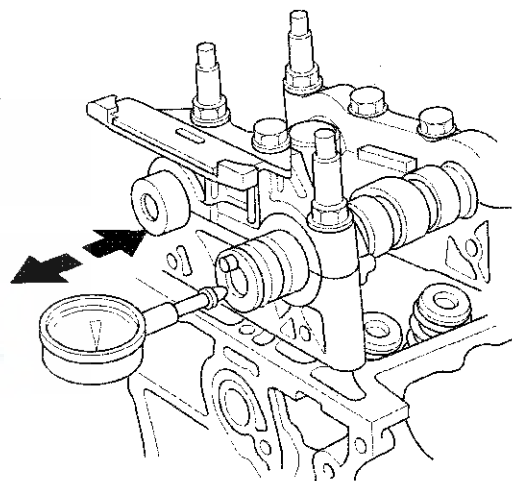
3. Seat the camshaft by pushing it away from the camshaft pulley end of the cylinder head.
4. Zero the dial indicator against the end of the camshaft, then push the camshaft back and forth, and read the end play. If the end play is beyond the service limit, replace the cylinder head and recheck. If it is still beyond the service limit, replace the camshaft.

Camshaft End Play

Standard (New): 0.05—0.20 mm

(0.002—0.008 in.)

Service Limit: 0.4 mm (0.02 in.)



(cont'd)

Cylinder Head

Camshaft Inspection (cont'd)

5. Loosen the camshaft holder bolts two turns at a time, in a crisscross pattern. Then remove the camshaft holders from the cylinder head.
6. Lift the camshafts out of the cylinder head, and wipe them clean, then inspect the lift ramps. Replace the camshaft if any lobes are pitted, scored, or excessively worn.
7. Clean the camshaft journal surfaces in the cylinder head, then set the camshafts back in place. Place a plastigage strip across each journal.
8. Install the camshaft holders, then tighten the bolts to the specified torque as shown in step 2.
9. Remove the camshaft holders. Measure the widest portion of plastigage on each journal.
 - If the camshaft-to-holder clearance is within the service limits, go to step 11.
 - 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 10.

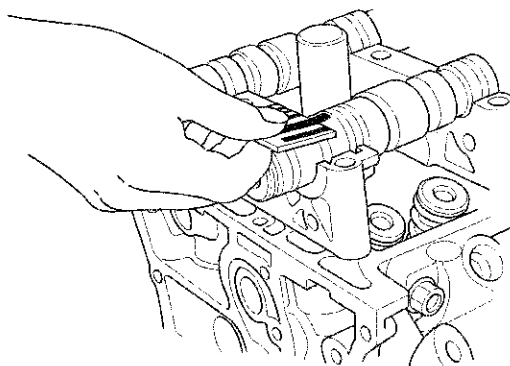
Camshaft-to-Holder Oil Clearance

Standard (New):

No. 1 Journal: 0.030—0.069 mm
(0.0012—0.003 in.)

No. 2, 3, 4, 5 Journals: 0.060—0.099 mm
(0.002—0.004 in.)

Service Limit: 0.15 mm (0.006 in.)



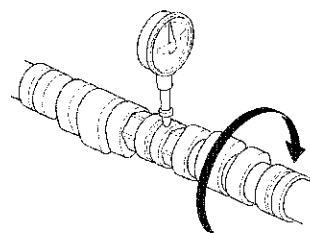
10. Check the total runout with the camshaft supported on V-blocks.

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

Camshaft Total Runout

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

Service Limit: 0.04 mm (0.002 in.)

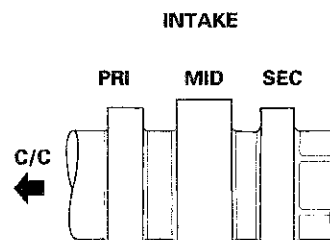


11. Measure the cam lobe height.

Cam Lobe Height Standard (New):

	INTAKE	EXHAUST
PRI	33.744 mm (1.3285 in.)	34.291 mm (1.3500 in.)
MID	35.456 mm (1.3959 in.)	
SEC	33.744 mm (1.3285 in.)	

PRI: Primary MID: Mid SEC: Secondary
C/C: Cam Chain





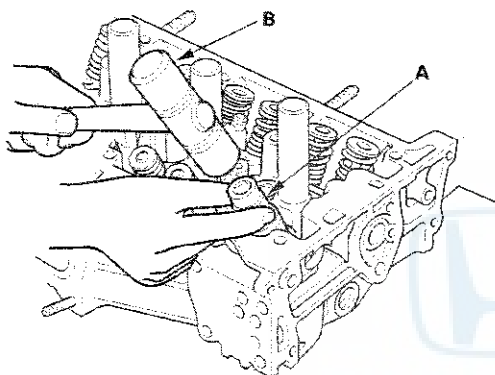
Valve, Spring, and Valve Seal Removal

Special Tools Required

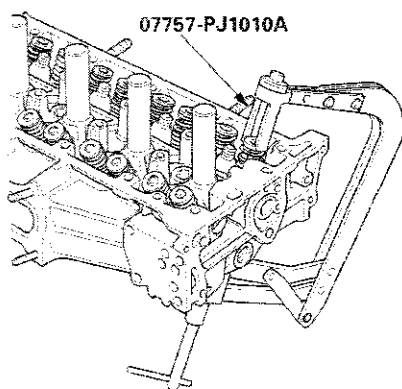
Valve spring compressor attachment 07757-PJ1010A

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

1. Remove the cylinder head (see page 6-27).
2. Using an appropriate-sized socket (A) and plastic mallet (B), lightly tap the spring retainer to loosen the valve cotters.

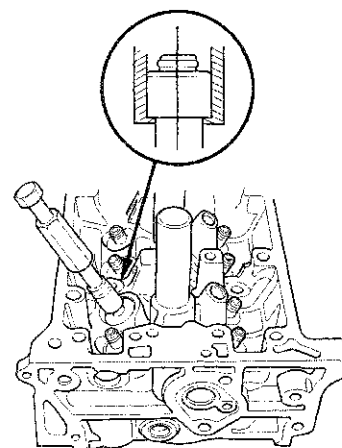


3. Install the valve spring compressor attachment and the valve spring compressor. Compress the spring, and remove the valve cotters.

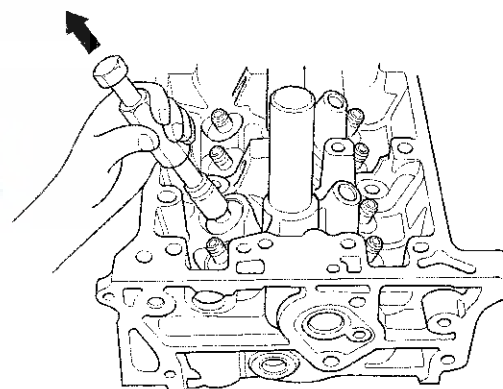


4. Remove the valve spring compressor and the valve spring compressor attachment, then remove the spring retainer and the valve spring.

5. Install the valve guide seal remover.



6. Remove the valve seal.



Cylinder Head

Valve Inspection

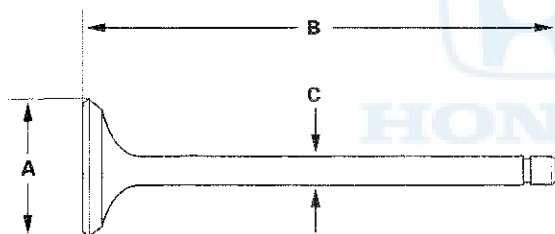
1. Remove the valves (see page 6-37).
2. Measure the valve in these areas.

Intake Valve Dimensions

A Standard (New): 35.85—36.15 mm
(1.411—1.423 in.)
B Standard (New): 108.5—109.1 mm
(4.272—4.295 in.)
C Standard (New): 5.475—5.485 mm
(0.2156—0.2159 in.)
C Service Limit: 5.445 mm (0.214 in.)

Exhaust Valve Dimensions

A Standard (New): 30.85—31.15 mm
(1.215—1.226 in.)
B Standard (New): 108.4—109.0 mm
(4.268—4.291 in.)
C Standard (New): 5.450—5.460 mm
(0.2146—0.2150 in.)
C Service Limit: 5.42 mm (0.213 in.)



Valve Stem-to-Guide Clearance Inspection

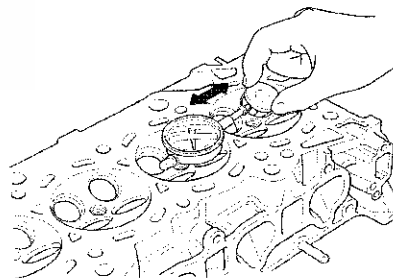
1. Remove the valves (see page 6-37).
2. Slide the valve out of its guide about 10 mm (0.39 in.), then measure the stem-to-guide clearance with a dial indicator while rocking the stem in the direction of normal thrust (wobble method).
 - If the measurement exceeds the service limit, recheck it using a new valve.
 - If the measurement is now within the service limit, reassemble using a new valve.
 - If the measurement with a new valve still exceeds the service limit, go to step 3.

Intake Valve Stem-to-Guide Clearance

Standard (New): 0.06—0.11 mm
(0.002—0.004 in.)
Service Limit: 0.16 mm (0.006 in.)

Exhaust Valve Stem-to-Guide Clearance

Standard (New): 0.11—0.16 mm
(0.004—0.006 in.)
Service Limit: 0.22 mm (0.009 in.)



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

Intake Valve Stem-to-Guide Clearance

Standard (New): 0.030—0.055 mm
(0.0012—0.0022 in.)
Service Limit: 0.08 mm (0.003 in.)

Exhaust Valve Stem-to-Guide Clearance

Standard (New): 0.055—0.080 mm
(0.0022—0.0031 in.)
Service Limit: 0.11 mm (0.0043 in.)

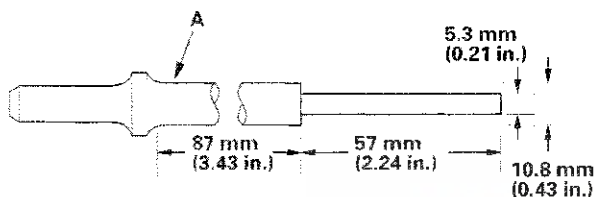


Valve Guide Replacement

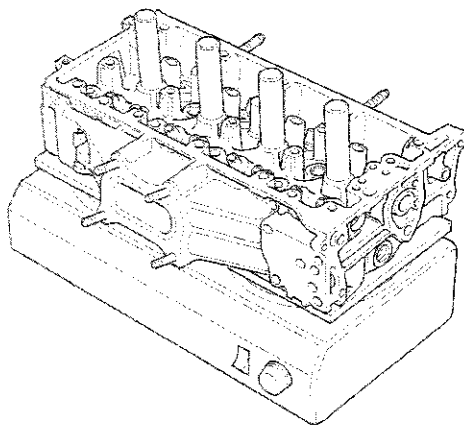
Special Tools Required

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

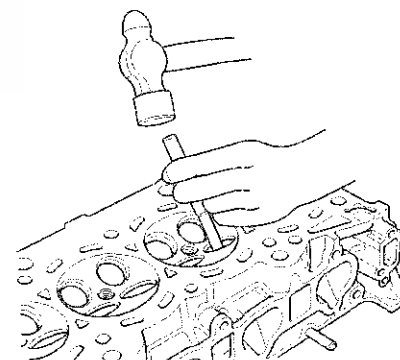
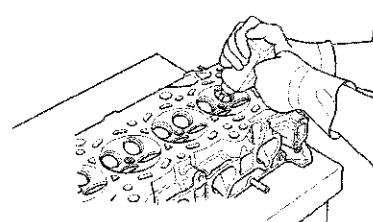
1. Inspect the valve stem-to-guide clearance (see page 6-38).
2. As illustrated, use a commercially available air-impact valve guide driver (A) modified to fit the diameter of the valve guides. In most cases, the same procedure can be done using the valve guide driver, 5.5 mm and a conventional hammer.



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



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



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

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

8. Remove the new guide(s) from the freezer, one at a time, as you need them.

(cont'd)

Cylinder Head

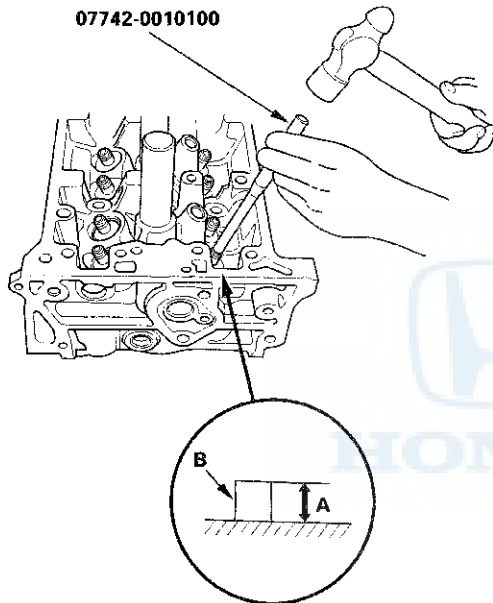
Valve Guide Replacement (cont'd)

9. Apply a thin coat of new engine oil to the outside of the new valve guide. Install the guide from the camshaft side of the head; use the valve guide driver to drive the guide in to the specified installed height (A) of the guide (B). If you have all 16 guides to do, you may have to reheat the head.

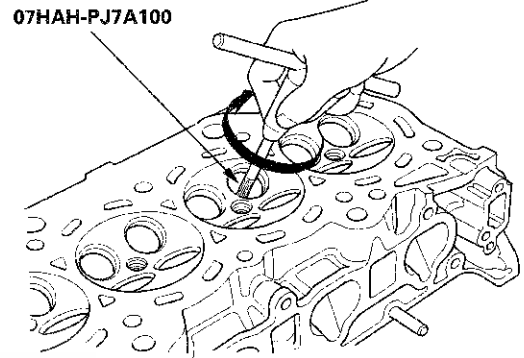
Valve Guide Installed Height

Intake: 15.2—16.2 mm (0.598—0.638 in.)

Exhaust: 15.5—16.5 mm (0.610—0.650 in.)



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

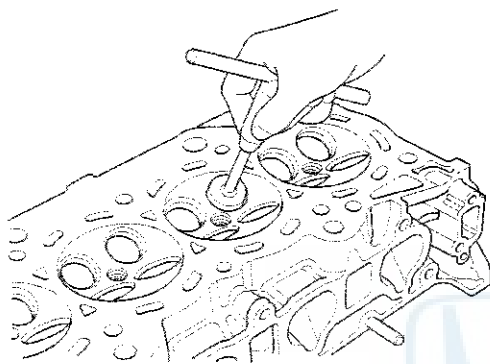


12. Continue to rotate the reamer clockwise while removing it from the bore.
13. Thoroughly wash the guide in detergent and water to remove any cutting residue.
14. Check the clearances with a valve (see page 6-38). Verify that a valve slides into the intake and exhaust valve guides without sticking.
15. Inspect the valve seating, if necessary renew the valve seat using a valve seat cutter (see page 6-41).

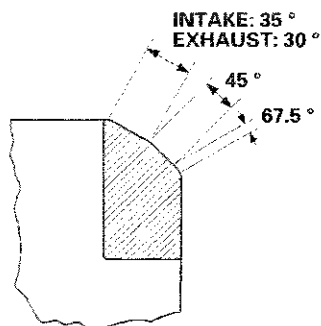


Valve Seat Reconditioning

1. Inspect the valve stem-to-guide clearance (see page 6-38). If the valve guides are worn, replace them (see page 6-39) before cutting the valve seats.
2. Renew the valve seats in the cylinder head using a valve seat cutter.



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



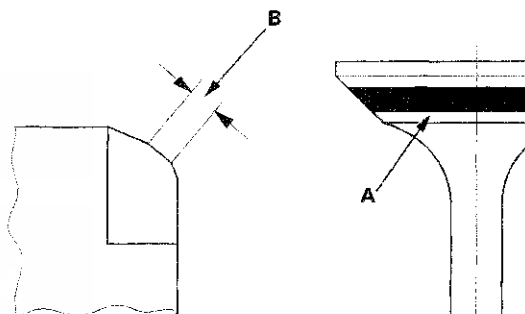
5. Make one more very light pass with the 45° cutter to remove any possible burrs caused by the other cutters.

Valve Seat Width

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

Service Limit: 2.00 mm (0.079 in.)

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



7. The actual valve seating surface (B), as shown by the blue compound, should be centered on the seat.

- If it is too high (closer to the valve stem), you must make a second cut with the 67.5° cutter 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 35° cutter (intake side) or the 30° cutter (exhaust side) 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.

(cont'd)

Cylinder Head

Valve Seat Reconditioning (cont'd)

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

Intake Valve Stem Installed Height

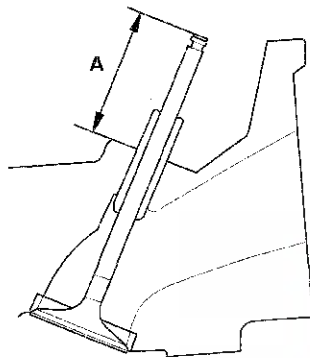
Standard (New): 44.0—44.5 mm (1.73—1.75 in.)

Service Limit: 44.7 mm (1.76 in.)

Exhaust Valve Stem Installed Height

Standard (New): 44.0—44.5 mm (1.73—1.75 in.)

Service Limit: 44.7 mm (1.76 in.)



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

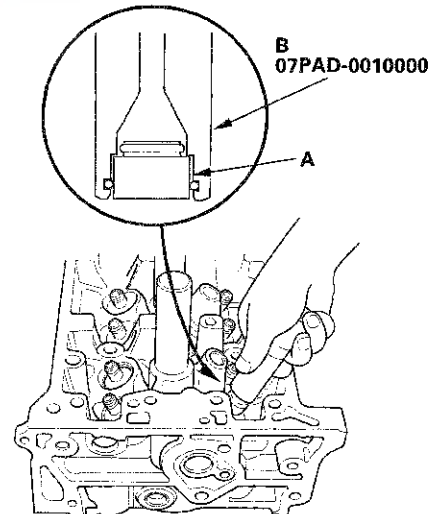
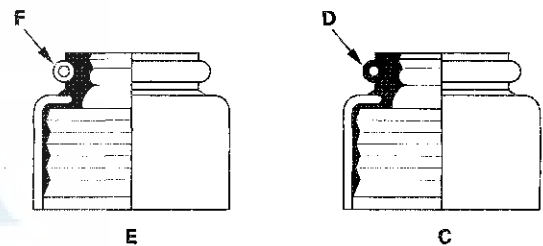
Valve, Spring, and Valve Seal Installation

Special Tools Required

- Stem seal driver 07PAD-0010000
- Valve spring compressor attachment 07757-PJ1010A

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

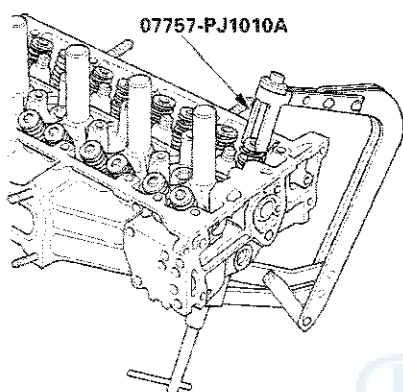
NOTE: The exhaust valve seal (C) has a black spring (D), and the intake valve seal (E) has a white spring (F). They are not interchangeable.



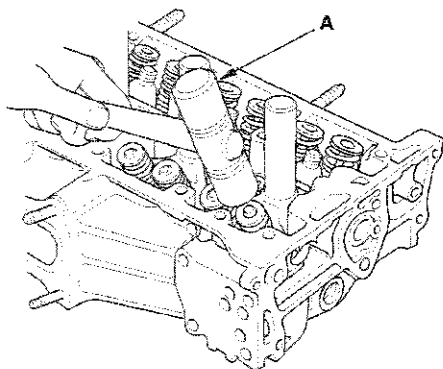


Rocker Arm Assembly Installation

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



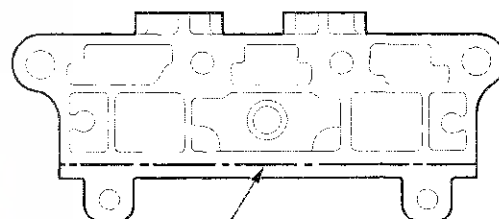
7. Remove the valve spring compressor and the valve spring compressor attachment.
8. Lightly tap the end of each valve stem two or three times with a plastic mallet (A) to ensure proper seating of the valve and the valve cotters. Tap the valve stem only along its axis so you do not bend the stem.



1. Reassemble the rocker arm assembly (see page 6-32).
2. Clean and dry the No. 5 rocker shaft holder mating surface.
3. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the cylinder head mating surface of the No. 5 rocker shaft holder, and to the inside edge of the threaded bolt holes. Install the component within 5 minutes of applying the liquid gasket.

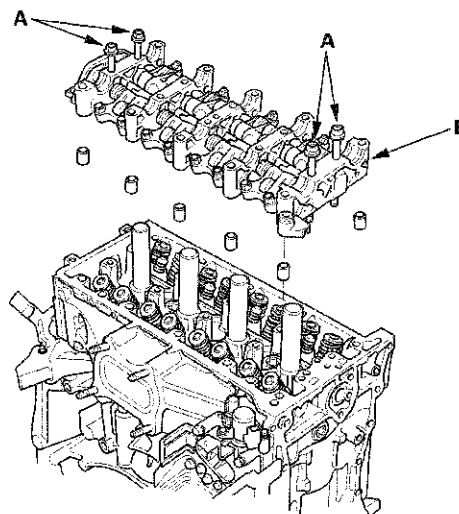
NOTE:

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



Apply liquid gasket along the broken line.

4. Insert the bolts (A) into the rocker shaft holder, then install the rocker arm assembly (B) on the cylinder head.



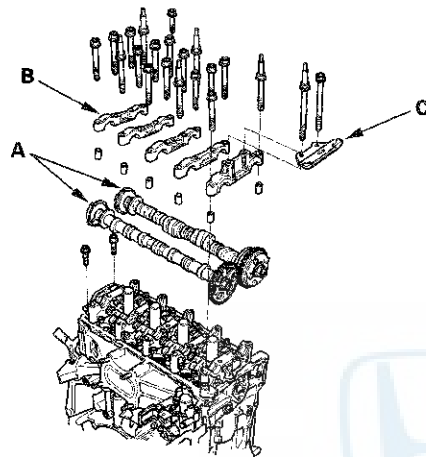
5. Remove the bolts from the rocker shaft holder.

(cont'd)

Cylinder Head

Rocker Arm Assembly Installation (cont'd)

- Make sure the punch marks on the variable valve timing control (VTC) actuator and the exhaust camshaft sprocket are facing up, then set the camshafts (A) in the holder. Apply new engine oil to the camshaft journals and lobes.



- Set the camshaft holders (B) and the cam chain guide B (C) in place.
- Tighten the bolts to the specified torque.

NOTE: If the engine does not have bolt ⑫, skip it and continue the torque sequence.

Specified Torque

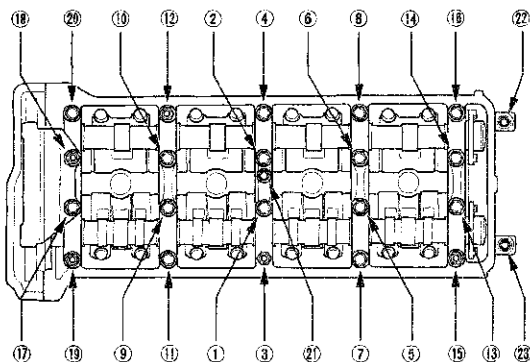
8 x 1.25 mm

22 N·m (2.2 kgf·m, 16 lbf·ft)

6 x 1.0 mm

12 N·m (1.2 kgf·m, 8.7 lbf·ft)

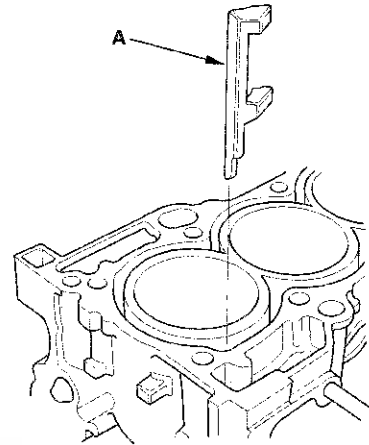
6 x 1.0 mm Bolts: ⑫, ⑭, ⑮



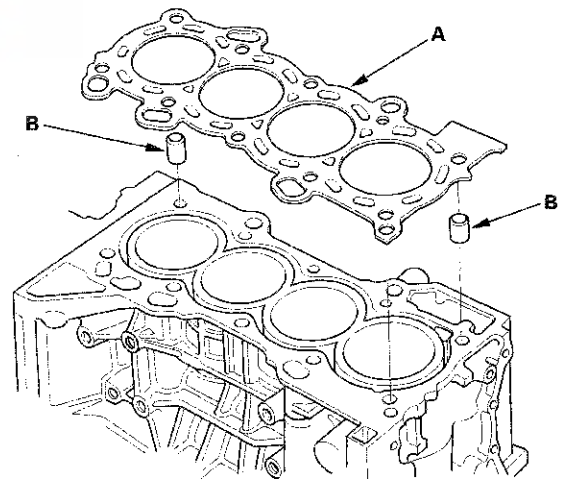
- Install the cam chain (see page 6-15), then adjust the valve clearance (see page 6-9).

Cylinder Head Installation

- Install a new coolant separator (A) in the engine block whenever the engine block is replaced.

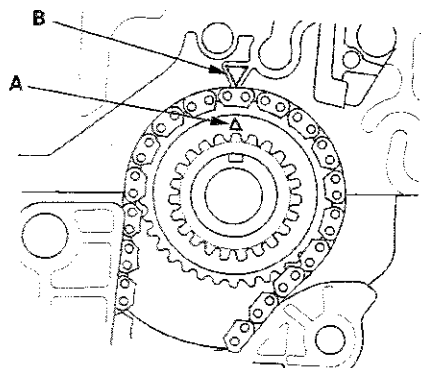


- Clean the cylinder head and the engine block surface.
- Install the new cylinder head gasket (A) and the dowel pins (B) on the engine block. Always use a new cylinder head gasket.

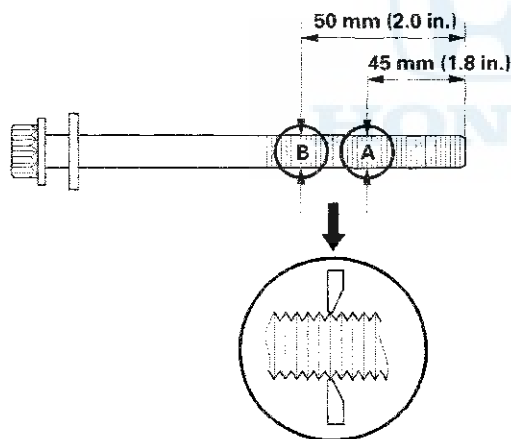




4. Set the crankshaft to top dead center (TDC). Align the TDC mark (A) on the crankshaft sprocket with the pointer (B) on the engine block.



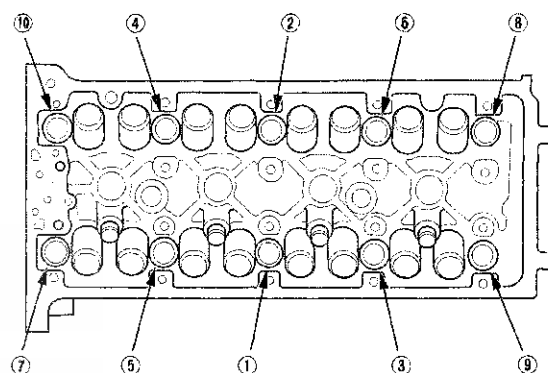
5. Install the cylinder head on the engine block.
6. Measure the diameter of each cylinder head bolt at point A and point B.



7. If either diameter is less than 10.6 mm (0.42 in.), replace the cylinder head bolt.

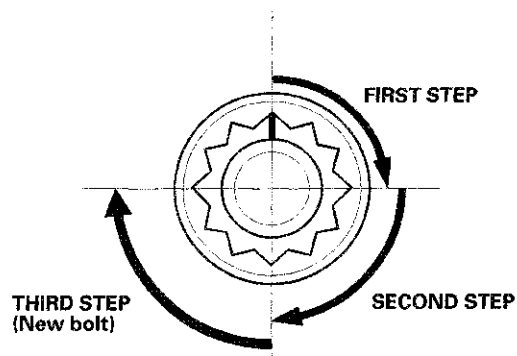
8. Apply new engine oil to the threads and under the bolt heads of all cylinder head bolts.

9. Tighten the cylinder head bolts in sequence to 39 N·m (4.0 kgf·m, 29 lbf·ft). Use a beam-type torque wrench. When using a preset click-type torque wrench, be sure to tighten slowly and do not overtighten. If a bolt makes any noise while you are torquing it, loosen the bolt and retighten it from the first step.



10. After torquing, tighten all cylinder head bolts in two steps (90° per step) using the sequence shown in step 9. If you are using a new cylinder head bolt, tighten the bolt an extra 90°.

NOTE: Remove the cylinder head bolt if you tightened it beyond the specified angle, and go back to step 6 of the procedure. Do not loosen it back to the specified angle.



(cont'd)

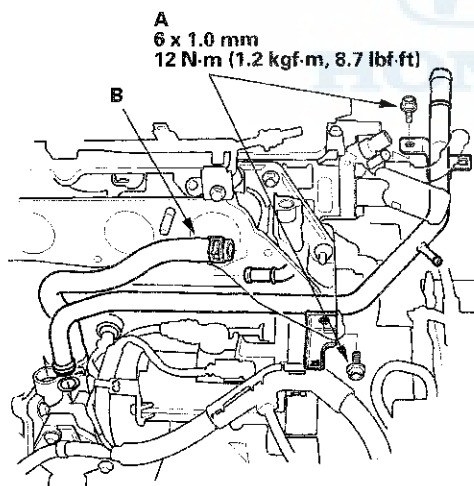
Cylinder Head

Cylinder Head Installation (cont'd)

11. Install the rocker arm assembly (see page 6-43).
12. Install the cam chain (see page 6-15).
13. Connect the following engine wire harness connectors, and install the wire harness clamps to the cylinder head:

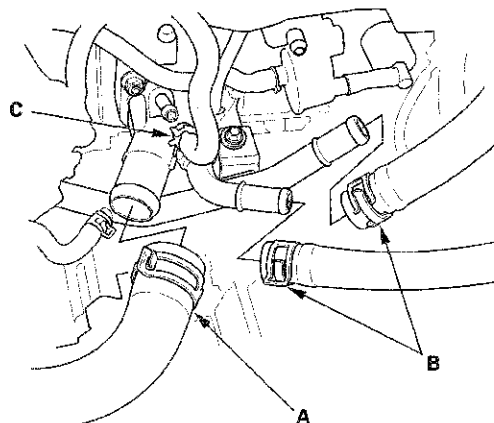
- Engine coolant temperature (ECT) sensor 1 connector
- Camshaft position (CMP) sensor A (Intake) connector
- Camshaft position (CMP) sensor B (Exhaust) connector
- Rocker arm oil control solenoid connector
- Rocker arm oil pressure switch connector
- Evaporative emission (EVAP) canister purge valve connector
- Variable valve timing control (VTC) oil control solenoid valve connector
- Engine oil pressure switch connector

14. Install the two bolts (A) securing the connecting pipe.

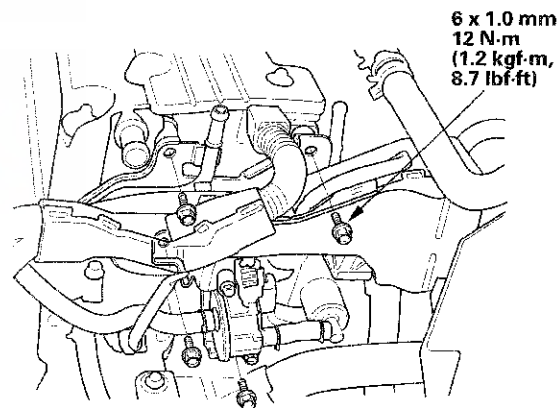


15. Connect the water bypass hose (B).

16. Connect the upper radiator hose (A), the heater hoses (B), and the water bypass hose (C).

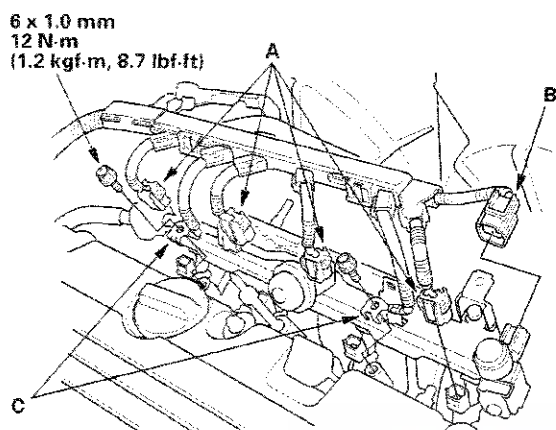


17. Install the four bolts securing the EVAP canister purge valve bracket.

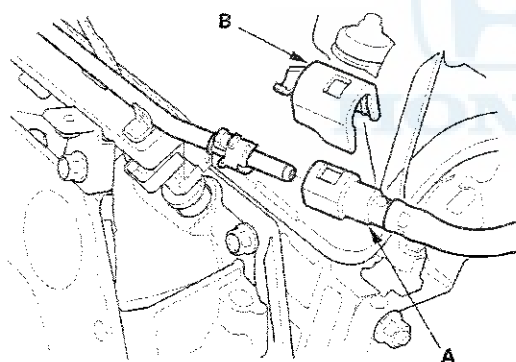




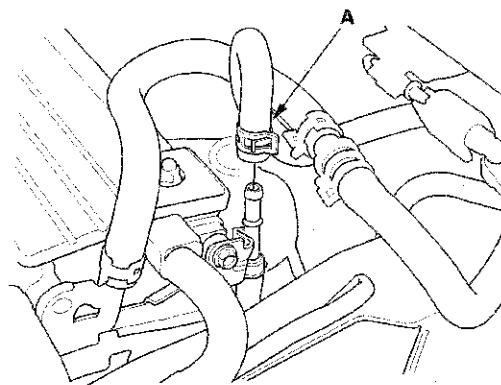
18. Connect the four fuel injector connectors (A), the engine mount control solenoid valve connector (B), and install the ground cables (C).



19. Connect the fuel feed hose (A) (see page 11-343), then install the quick-connect fitting cover (B).



20. Connect the EVAP canister hose (A).

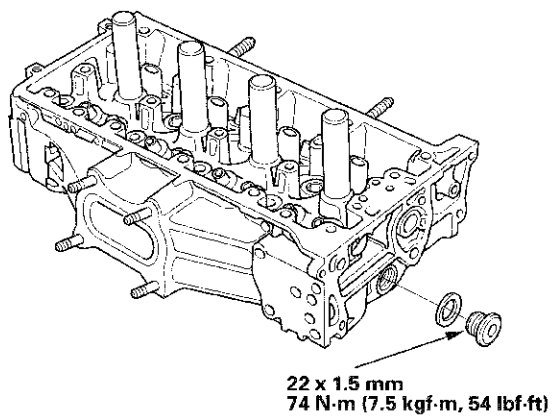


21. Install the catalytic converter (see page 11-367).
22. Install the intake manifold (see page 9-5).
23. Install the drive belt (see page 4-30).
24. Install the strut brace (if equipped) (see page 20-289).
25. After installation, check that all tubes, hoses, and connectors are installed correctly.
26. Inspect for fuel leaks. Turn the ignition switch to ON (II) (do not operate the starter) so the fuel pump runs for about 2 seconds and pressurizes the fuel line. Repeat this operation three times, then check for fuel leakage at any point in the fuel line.
27. Refill the radiator with engine coolant, and bleed the air from the cooling system with the heater valve open (see step 6 on page 10-6).
28. Check for fluid leaks.
29. Do the engine control module (ECM)/powertrain control module (PCM) idle lean procedure (see page 11-317).
30. Do the crankshaft position (CKP) pattern clear/CKP pattern lean procedure (see page 11-5).
31. Inspect the idle speed (see page 11-316).
32. Inspect the ignition timing (see page 4-19).

Cylinder Head

Sealing Bolt Installation

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



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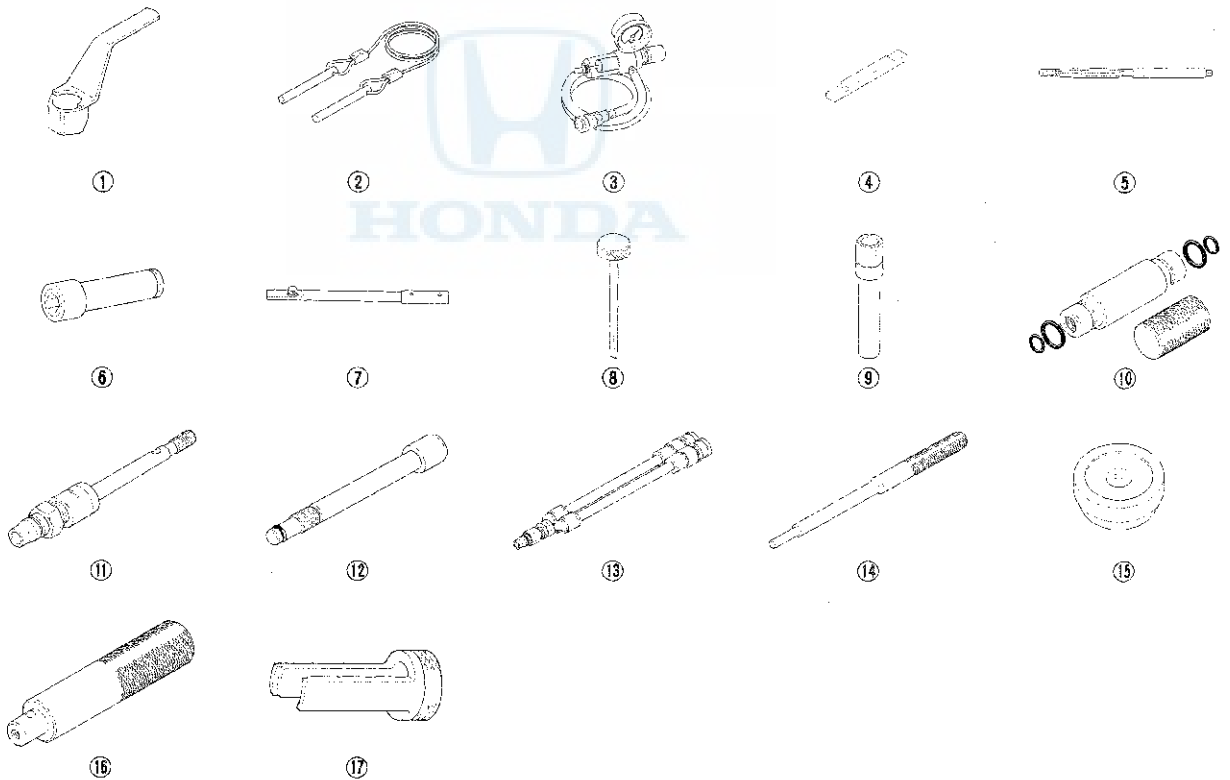
Cylinder Head (PZEV Model)

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Cylinder Head

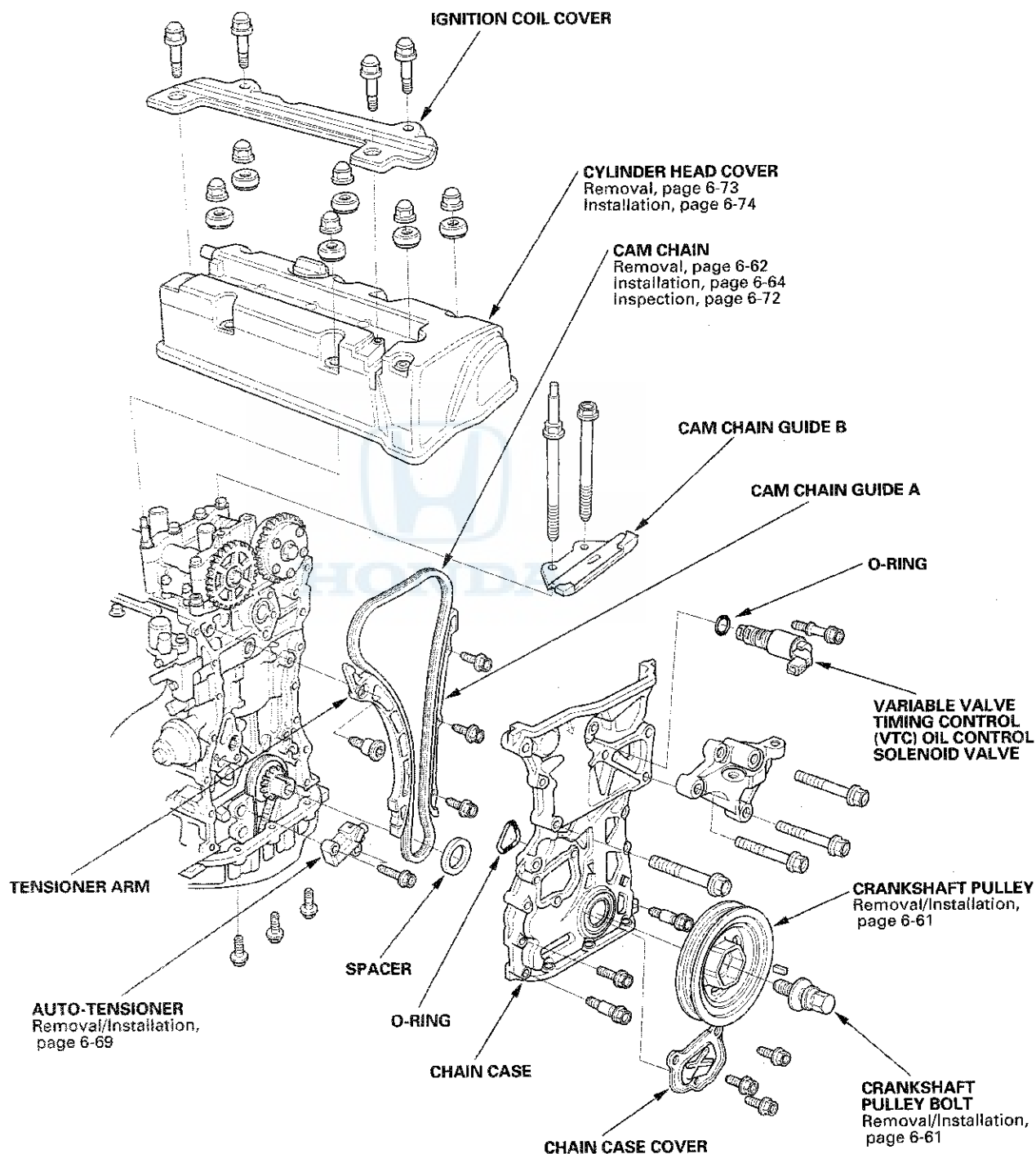
Special Tools

Ref. No.	Tool Number	Description	Qty
①	07AAB-RJAA100	Crankshaft Pulley Holder	1
②	07AAB-RWCA120	Camshaft Lock Pin Set	1
③	07AAJ-PNAA101	Air Pressure Regulator	1
④	07AAJ-RWCA100	Cam Chain Inspection Gauge	1
⑤	07HAH-PJ7A100	Valve Guide Reamer, 5.5 mm	1
⑥	07JAA-001020A	Socket, 19 mm	1
⑦	07JAB-001020B	Holder Handle	1
⑧	07MAA-PR70110	Adjuster	1
⑨	07MAA-PR70120	Locknut Wrench	1
⑩	07PAD-0010000	Stem Seal Driver	1
⑪	07ZAJ-PNAA101	VTEC Air Adapter	2
⑫	07ZAJ-PNAA200	VTEC Air Stopper	1
⑬	07ZAJ-PNAA300	Air Joint Adapter	1
⑭	07742-0010100	Valve Guide Driver, 5.5 mm	1
⑮	07746-0010400	Attachment, 52 x 55 mm	1
⑯	07749-0010000	Driver	1
⑰	07757-PJ1010A	Valve Spring Compressor Attachment	1





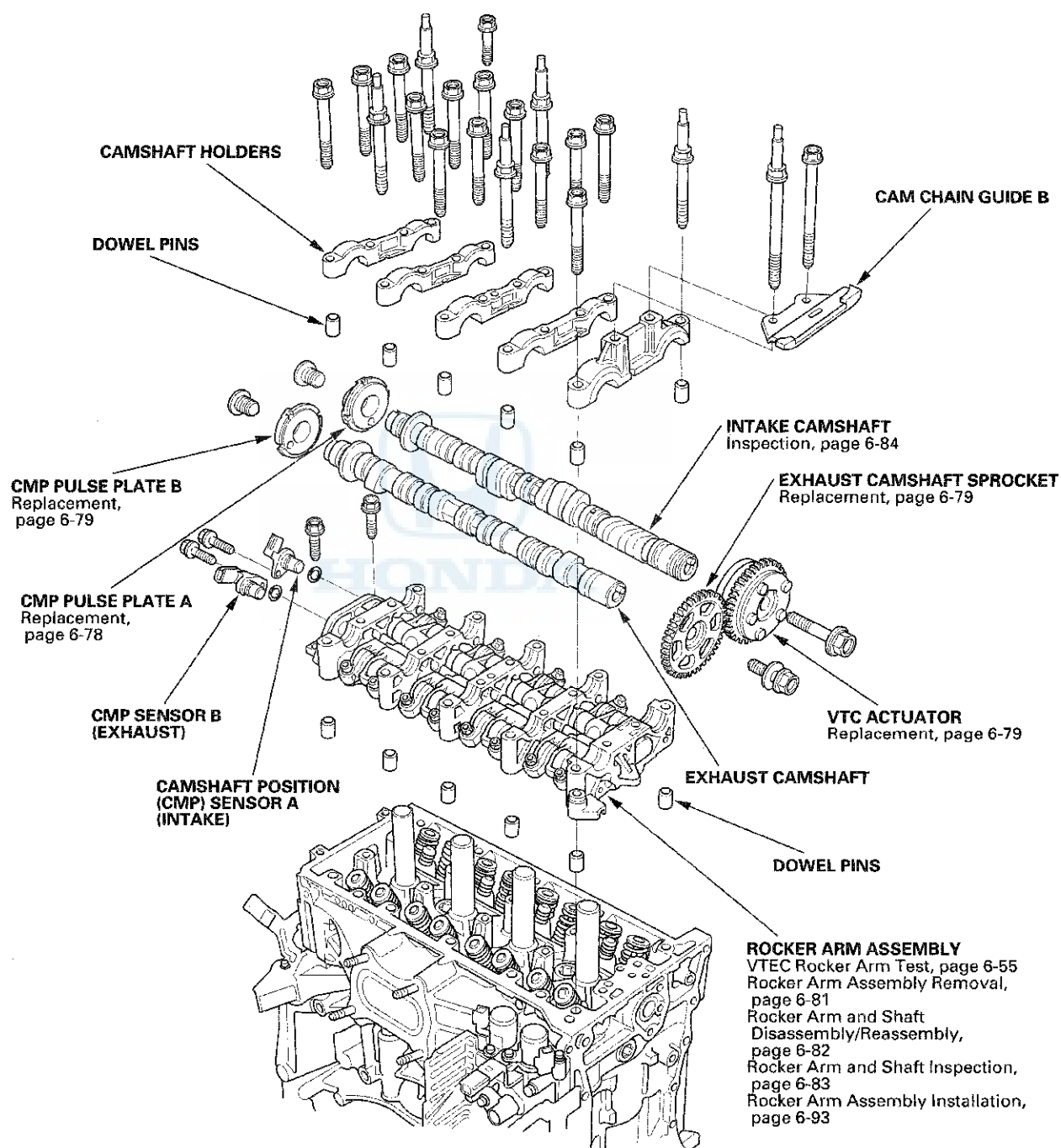
Component Location Index

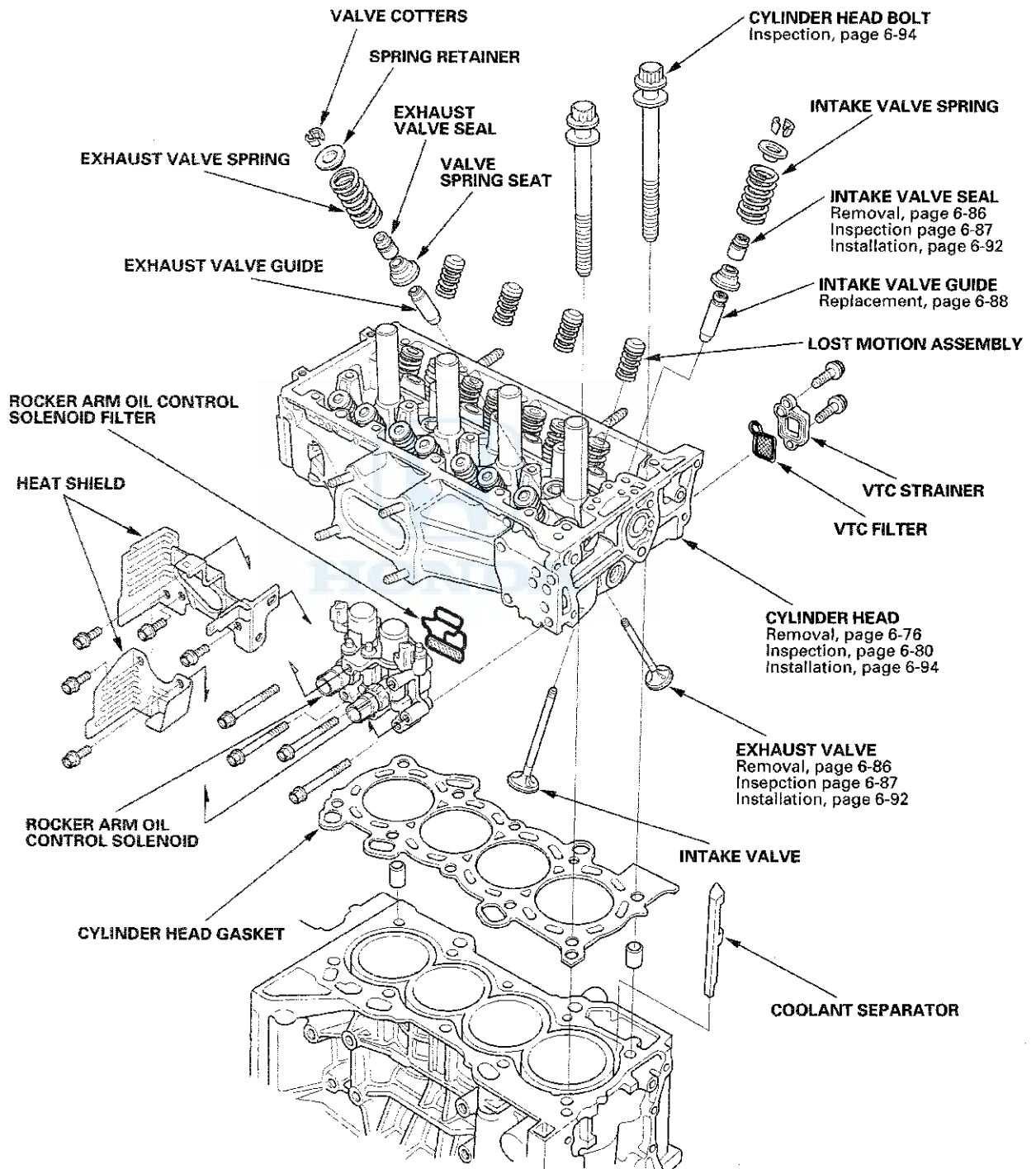


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Cylinder Head

Component Location Index (cont'd)



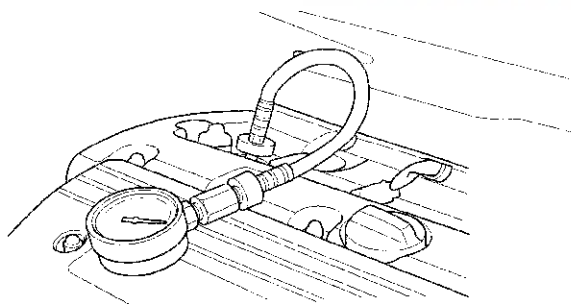


Cylinder Head

Engine Compression Inspection

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

1. Warm up the engine to normal operating temperature (cooling fan comes on).
2. Turn the ignition switch to LOCK (0).
3. Connect the HDS to the data link connector (DLC) (see step 2 on page 11-3).
4. Turn the ignition switch to ON (II).
5. Make sure the HDS communicates with the vehicle and the PCM. If it does not communicate, troubleshoot the DLC circuit (see page 11-192).
6. Select ALL INJECTORS STOP in the PGM-FI, INSPECTION menu with the HDS.
7. Turn the ignition switch to LOCK (0).
8. Remove the four ignition coils (see page 4-20).
9. Remove the four spark plugs.
10. Attach a compression gauge to the spark plug hole.



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

Compression Pressure:
Above 930 kPa (9.5 kgf/cm², 135 psi)

12. Measure the compression on the remaining cylinders.

Maximum Variation:
Within 200 kPa (2.0 kgf/cm², 28 psi)

13. If the compression is not within specifications, check the following items, then remeasure the compression.

- Incorrect valve clearance
- Confirmation of cam timing
- Damaged or worn cam lobes
- Damaged or worn valves and seats
- Damaged cylinder head gasket
- Damaged or worn piston rings
- Damaged or worn piston and cylinder bore

14. Remove the compression gauge from the spark plug hole.

15. Install the four spark plugs.

16. Install the four ignition coils (see page 4-20).

17. Select PCM reset (see page 11-4) in the PGM-FI, INSPECTION menu ALL INJECTORS STOP with the HDS.



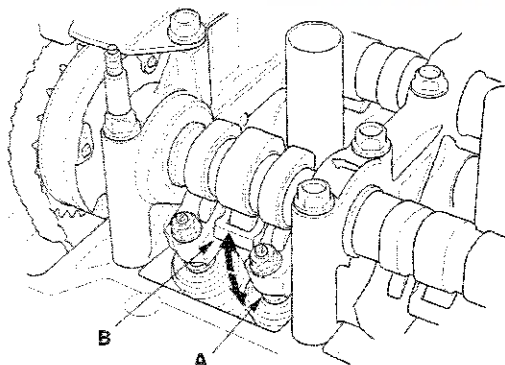
VTEC Rocker Arm Test

Special Tools Required

- VTEC air stopper 07ZAJ-PNAA200
- VTEC air adapter 07ZAJ-PNAA101
- Air joint adapter 07ZAJ-PNAA300
- Air pressure regulator 07AAJ-PNAA101

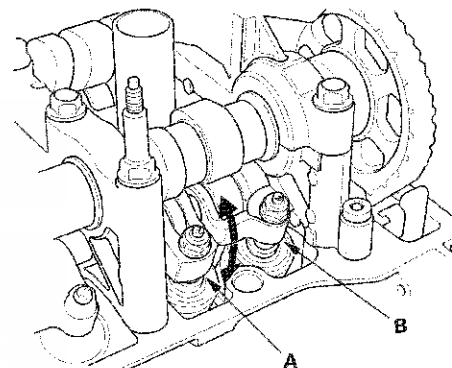
1. Start the engine, and let it run for 5 minutes, then turn the ignition switch to LOCK (0).
2. Remove the cylinder head cover (see page 6-73).
3. Set the No. 1 piston at top dead center (TDC) (see step 5 on page 6-62).
4. Intake side: Move the secondary rocker arm (A) for the No. 1 cylinder. The secondary rocker arm should move independently of the mid rocker arm (B).

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



5. Exhaust side: Move the secondary rocker arm (A) for the No. 1 cylinder. The secondary rocker arm should move independently of the primary rocker arm (B).

- If the secondary rocker arm moves freely, go to step 6.
- If the secondary rocker arm does not move independently, remove the primary and the secondary rocker arms as an assembly, and check that the pistons in the rocker arms move smoothly. If any rocker arm needs replacing, replace the primary and the secondary rocker arms as an assembly, then retest.



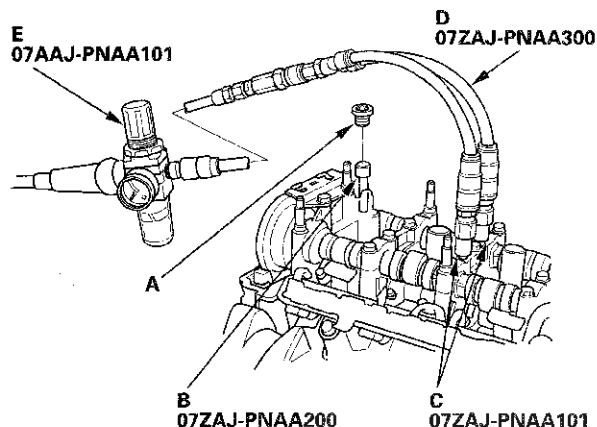
6. Repeat step 4 through 5 on the remaining secondary rocker arms with each piston at TDC. When all the secondary rocker arms pass the test, go to step 7.
7. Check that the air pressure on the shop air compressor gauge indicates over 400 kPa (4.0 kgf/cm², 57 psi).
8. Inspect the valve clearance (see page 6-58).

(cont'd)

Cylinder Head

VTEC Rocker Arm Test (cont'd)

9. Remove the sealing bolt (A) from the relief hole, and install the VTEC air stopper (B).



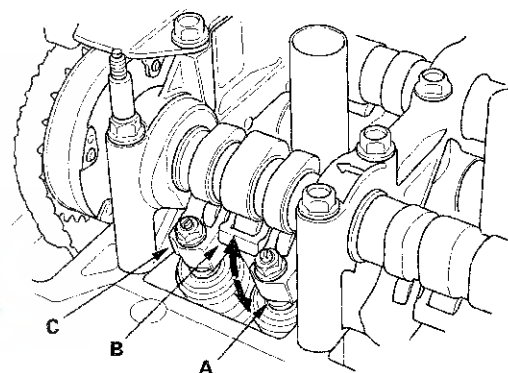
10. Remove the No. 3 camshaft holder bolts, and install the VTEC air adapters (C) finger-tight.
11. Connect the air joint adapter (D) and the air pressure regulator (E).
12. Loosen the valve on the air pressure regulator, and apply the specified air pressure.

Specified Air Pressure:
290 kPa (3.0 kgf/cm², 42 psi)

NOTE: If the rocker arm piston does not move after applying air pressure; move the rocker arm up and down manually by rotating the crankshaft clockwise.

13. Intake side: With the specified air pressure applied, move the secondary rocker arm (A) for the No. 1 cylinder. The mid rocker arm (B), the primary rocker arm (C), and the secondary rocker arm should move together.

- If the mid, the primary, and the secondary rocker arms move together, go to step 14.
- If the mid and primary rocker arms do not move together with the secondary rocker arm, remove the mid, primary, and secondary rocker arms as an assembly, and check that the pistons in the rocker arms move smoothly. If any rocker arm needs replacing, replace the mid, primary, and secondary rocker arms as an assembly, then retest.

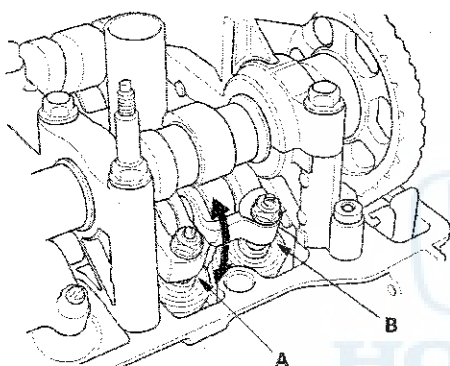




VTC Actuator Inspection

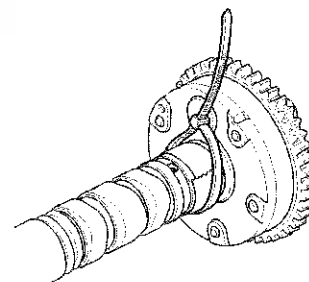
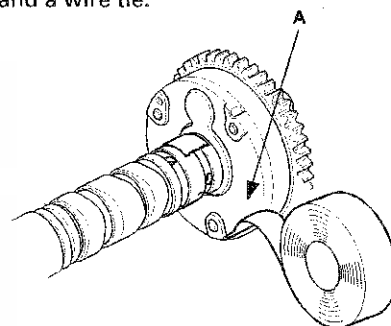
14. Exhaust side: With the specified air pressure applied, move the secondary rocker arm (A) for the No. 1 cylinder. The primary rocker arm (B) and the secondary rocker arm should move together.

- If the primary and the secondary rocker arms move together, go to step 15.
- If the primary rocker arms do not move together with the secondary rocker arm, remove the primary and the secondary rocker arms as an assembly, and check that the pistons in the rocker arms move smoothly. If any rocker arm needs replacing, replace the primary and the secondary rocker arms as an assembly, then retest.

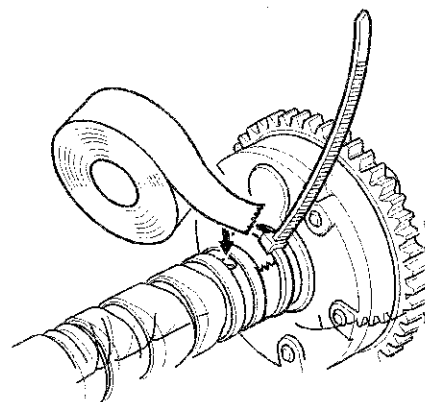


15. Repeat step 13 through 14 on the remaining secondary rocker arms with each piston at TDC. When all the secondary rocker arms pass the test, go to step 16.
16. Remove the air pressure regulator, the air joint adapter, the VTEC air adapter, and the VTEC air stopper.
17. Tighten the camshaft holder mounting bolts to 22 N·m (2.2 kgf·m, 16 lbf·ft).
18. Tighten the sealing bolt to 10 N·m (1.0 kgf·m, 7.4 lbf·ft).
19. Install the cylinder head cover (see page 6-74).

1. Remove the cam chain (see page 6-62).
2. Loosen the rocker arm adjusting screws (see step 2 on page 6-81).
3. Remove the camshaft holder (see step 3 on page 6-81).
4. Remove the intake camshaft.
5. Check that the variable valve timing control (VTC) actuator is locked by turning the VTC actuator counterclockwise. If it is not locked, turn the VTC actuator clockwise until it stops, then recheck it. If it is still not locked, replace the VTC actuator.
6. Seal the retard holes (A) in the No. 1 camshaft journal with tape and a wire tie.



7. Seal over one of the advance holes (A) with tape.

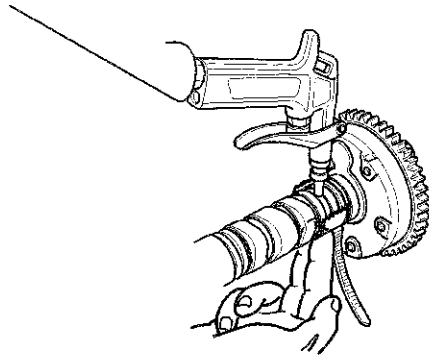


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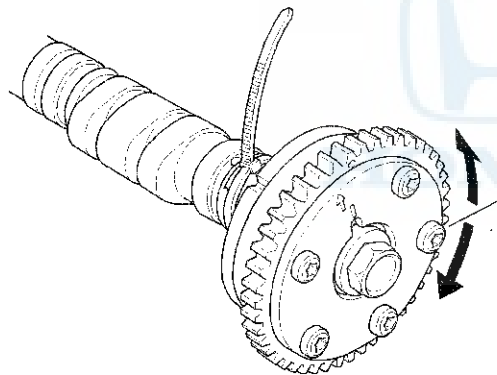
Cylinder Head

VTC Actuator Inspection (cont'd)

8. Apply air to the unsealed advance hole to release lock.



9. Check that the VTC actuator moves smoothly. If the VTC actuator does not move smoothly, replace the VTC actuator.



10. Remove the wire tie, the tape, and the adhesive residue from the No. 1 camshaft journal.
11. Make sure the punch marks on the VTC actuator and the exhaust camshaft sprocket are facing up, then set the camshafts in the head (see step 6 on page 6-93).
12. Set the camshaft holders and cam chain guide B in place (see step 7 on page 6-93).
13. Tighten the camshaft holder bolts to the specified torque (see step 8 on page 6-93).
14. Hold the camshaft, and turn the VTC actuator clockwise until you hear it click. Make sure to lock the VTC actuator by turning it.
15. Install the cam chain (see page 6-64).
16. Adjust the valve clearance (see page 6-58).

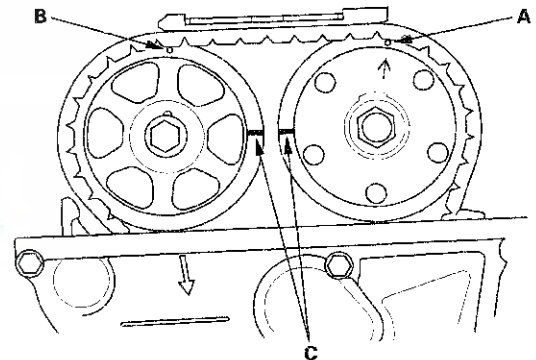
Valve Clearance Adjustment

Special Tools Required

- Locknut wrench 07MAA-PR70120
- Adjuster 07MAA-PR70110

NOTE: Connect the Honda Diagnostic System (HDS) to the data link connector (DLC) and monitor the engine coolant temperature (ECT) sensor 1 with the HDS. Adjust the valve clearance only when the ECT sensor 1 temperature is less than 100 °F (38 °C).

1. Remove the cylinder head cover (see page 6-73).
2. Set the No. 1 piston at top dead center (TDC). The punch mark (A) on the variable valve timing control (VTC) actuator and the punch mark (B) on the exhaust camshaft sprocket should be at the top. Align the TDC marks (C) on the VTC actuator and the exhaust camshaft sprocket.



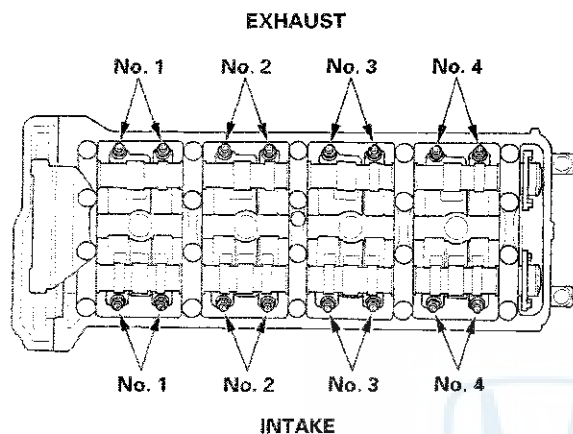


3. Select the correct feeler gauge for the valve clearance you are going to check.

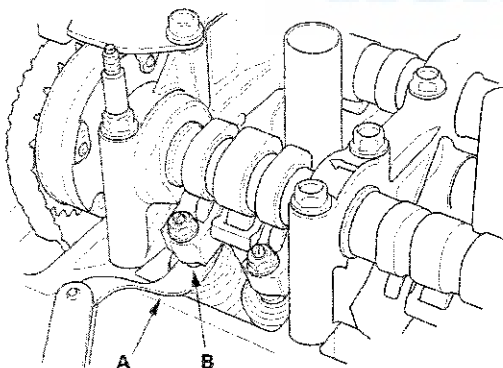
Valve Clearance

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

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

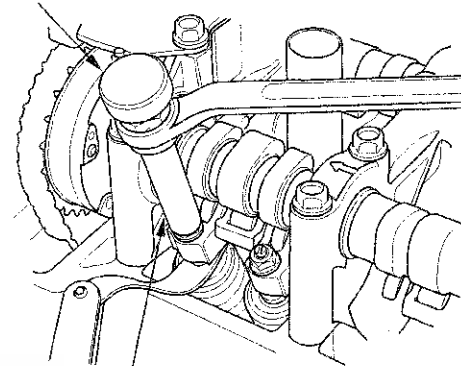


4. Insert the feeler gauge (A) between the adjusting screw (B) and the end of the valve stem, and slide it back and forth; you should feel a slight amount of drag.



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

07MAA-PR70110



07MAA-PR70120

6. Tighten the locknut to the specified torque, and recheck the clearance. Repeat the adjustment if necessary.

Specified Torque

Intake:

7 x 0.75 mm

14 N·m (1.4 kgf·m, 10 lbf·ft)

Apply new engine oil to the nut threads.

Exhaust:

7 x 0.75 mm

14 N·m (1.4 kgf·m, 10 lbf·ft)

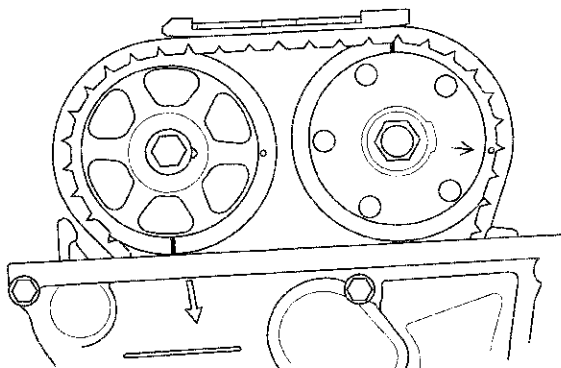
Apply new engine oil to the nut threads.

(cont'd)

Cylinder Head

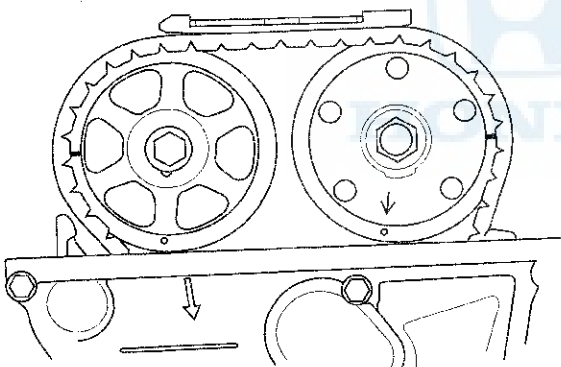
Valve Clearance Adjustment (cont'd)

7. Rotate the crankshaft 180 ° clockwise (camshaft pulley turns 90 °).



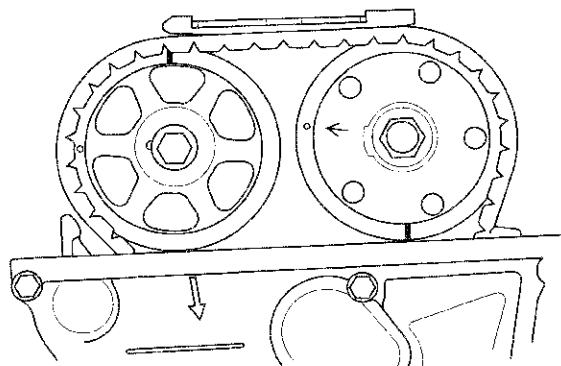
8. Check and, if necessary, adjust the valve clearance on the No. 3 cylinder.

9. Rotate the crankshaft 180 ° clockwise (camshaft pulley turns 90 °).



10. Check and, if necessary, adjust the valve clearance on the No. 4 cylinder.

11. Rotate the crankshaft 180 ° clockwise (camshaft pulley turns 90 °).



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

13. Install the cylinder head cover (see page 6-74).



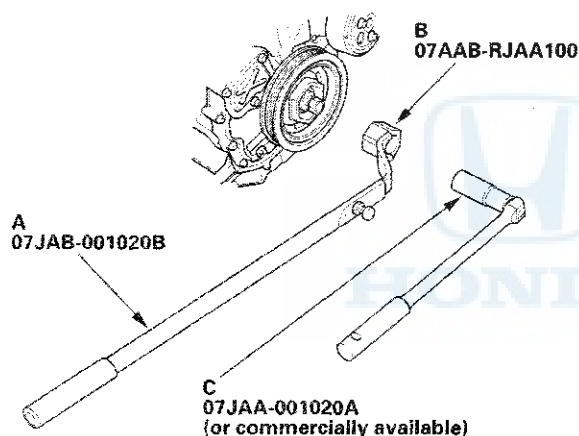
Crankshaft Pulley Removal and Installation

Special Tools Required

- Holder handle 07JAB-001020B
- Crankshaft pulley holder 07AAB-RJAA100
- Socket, 19 mm 07JAA-001020A or a commercially available 19 mm socket

Removal

1. Remove the front wheels.
2. Remove the splash shield (see step 24 on page 5-5).
3. Remove the drive belt (see page 4-30).
4. Hold the pulley with the holder handle (A) and the crankshaft pulley holder (B).

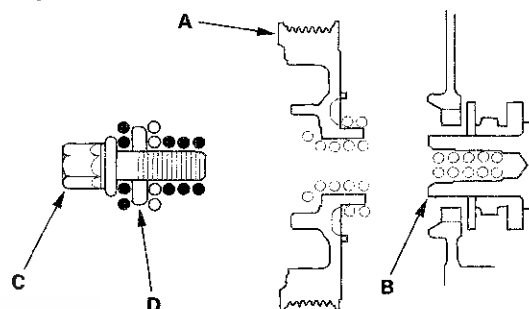


5. Remove the bolt with a socket, 19 mm (C) and a breaker bar, then remove the crankshaft pulley.

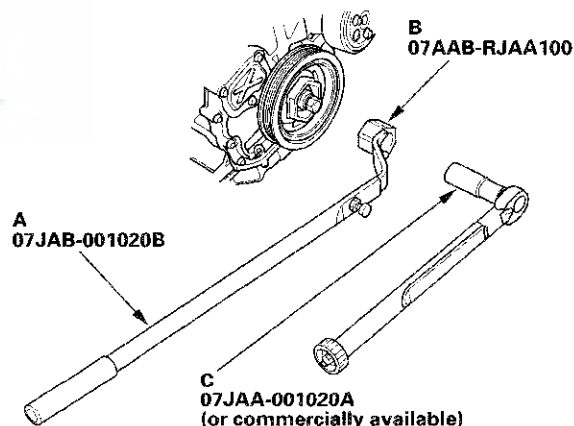
Installation

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

○ : Clean
● : Lubricate



2. Install the crankshaft pulley, and hold the pulley with the holder handle (A) and the crankshaft pulley holder (B).



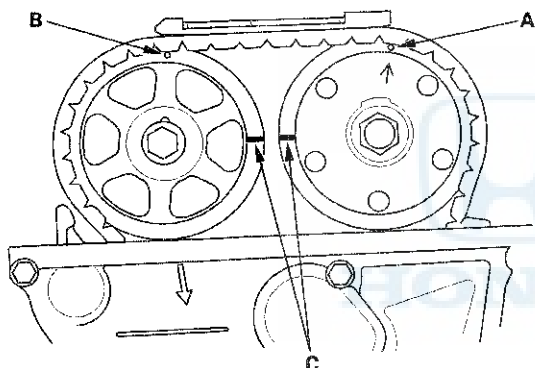
3. Tighten the bolt to 49 N·m (5.0 kgf·m, 36 lbf·ft) with a torque wrench and socket, 19 mm (C). Do not use an impact wrench. If the pulley bolt or crankshaft are new, tighten the bolt to 177 N·m (18.0 kgf·m, 130 lbf·ft), then remove the bolt and tighten it to 49 N·m (5.0 kgf·m, 36 lbf·ft).
4. Tighten the pulley bolt an additional 90°.
5. Install the drive belt (see page 4-30).
6. Install the splash shield (see step 48 on page 5-20).
7. Install the front wheels.

Cylinder Head

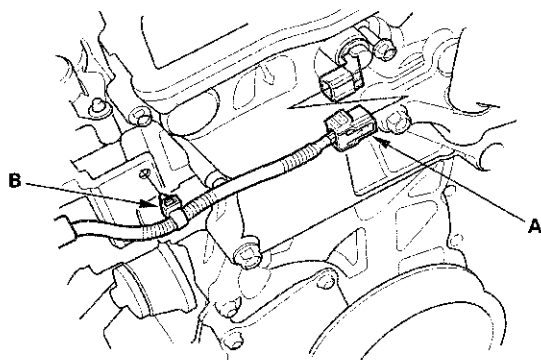
Cam Chain Removal

NOTE: Keep the cam chain away from magnetic fields.

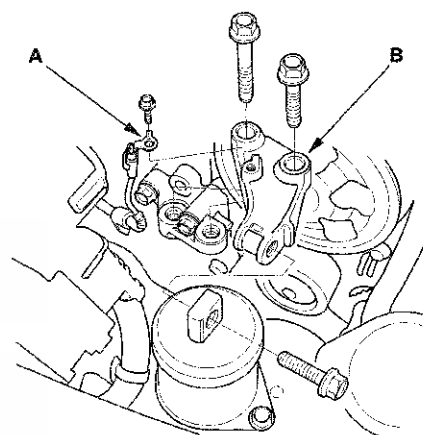
1. Remove the front wheels.
2. Remove the splash shield (see step 25 on page 5-5).
3. Remove the drive belt (see page 4-30).
4. Remove the cylinder head cover (see page 6-73).
5. Set the No. 1 piston at top dead center (TDC). The punch mark (A) on the variable valve timing control (VTC) actuator and the punch mark (B) on the exhaust camshaft sprocket should be at the top. Align the TDC marks (C) on the VTC actuator and the exhaust camshaft sprocket.



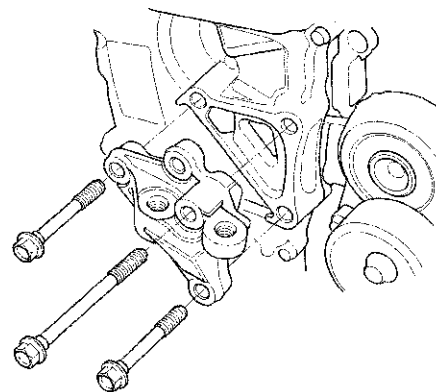
6. Disconnect the VTC oil control solenoid valve connector (A) and remove the harness clamp (B).



7. Remove the VTC oil control solenoid valve (see page 11-300).
8. Remove the crankshaft pulley (see page 6-61).
9. Support the engine with a jack and a wood block under the oil pan.
10. Remove the ground cable (A), then remove the side engine mount bracket (B).

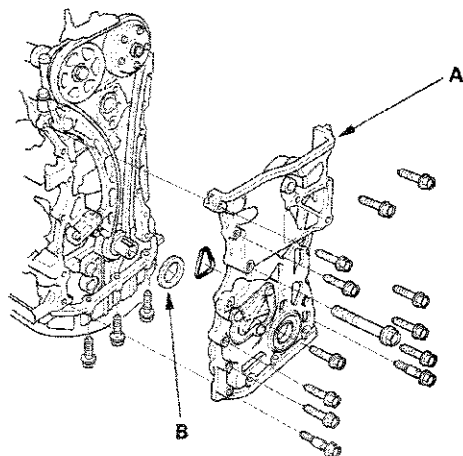


11. Remove the side engine mount bracket mounting bolts.



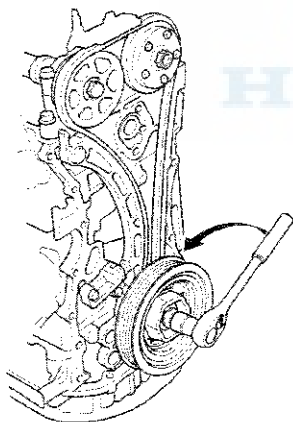


12. Remove the cam chain case (A) and spacer (B).



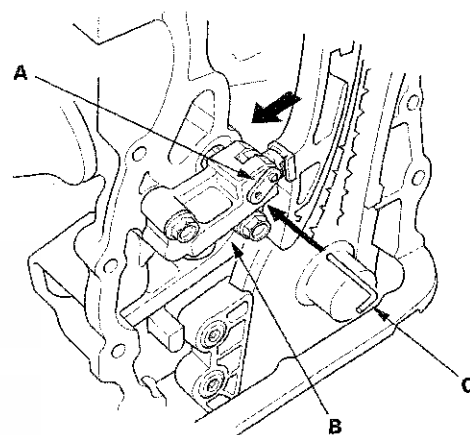
13. Loosely install the crankshaft pulley.

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

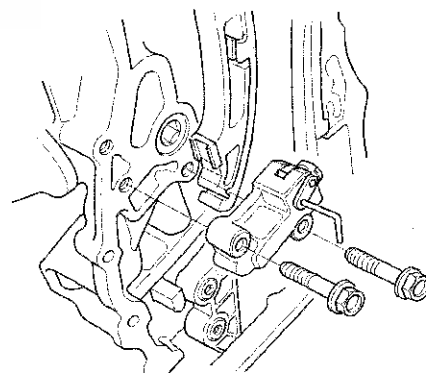


15. Align the holes on the lock (A) and the auto-tensioner (B), then insert a 1.2 mm (0.05 in.) diameter pin or lock pin (P/N 14511-PNA-003) (C) into the holes. Turn the crankshaft clockwise to secure the pin.

NOTE: Check the auto-tensioner cam position. If the position are not aligned, set the first cam to the first edge of the rack.



16. Remove the auto-tensioner.

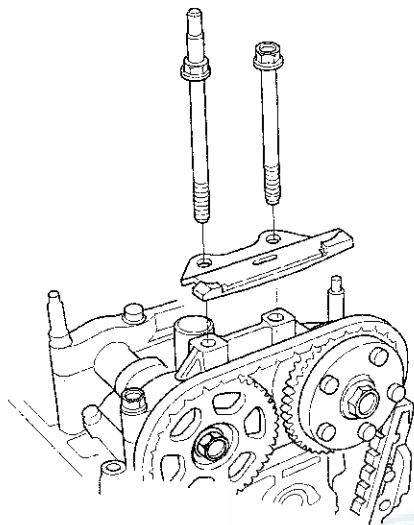


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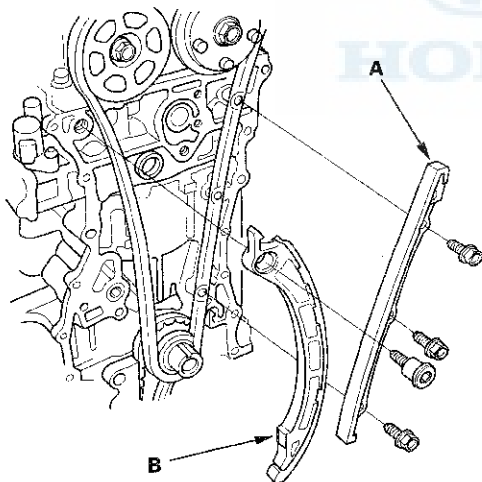
Cylinder Head

Cam Chain Removal (cont'd)

17. Remove cam chain guide B.



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



19. Remove the cam chain.

Cam Chain Installation

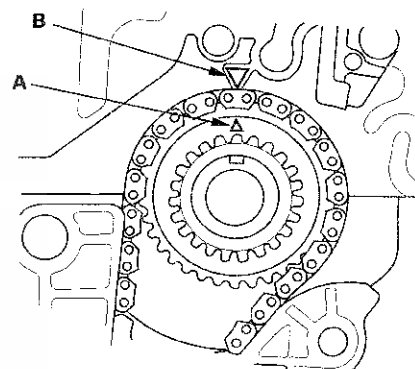
Special Tools Required

Camshaft lock pin set 07AAB-RWCA120

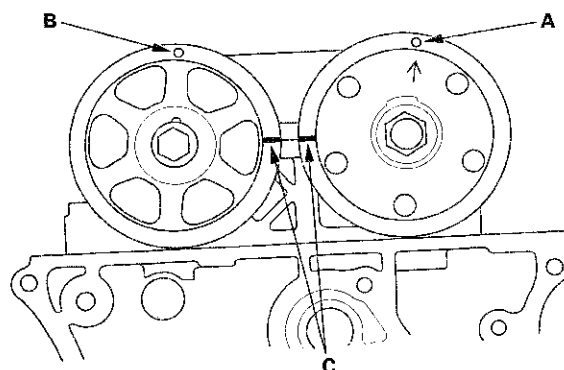
NOTE:

- Keep the cam chain away from magnetic fields.
- Before doing this procedure, check that the variable valve timing control (VTC) actuator is locked by turning the VTC actuator counterclockwise. If not locked, turn the VTC actuator clockwise until it stops, then recheck it. If it is still not locked, replace the VTC actuator.

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

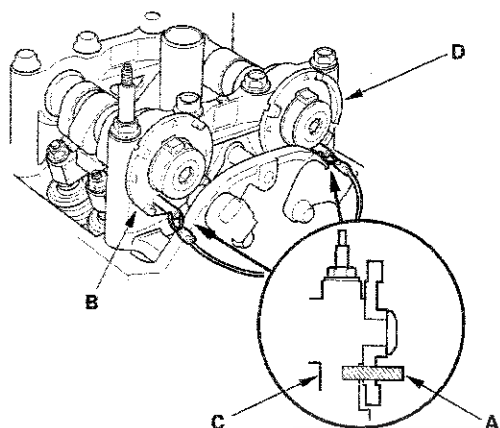


2. Set the camshafts to TDC. The punch mark (A) on the VTC actuator and the punch mark (B) on the exhaust camshaft sprocket should be at the top. Align the TDC marks (C) on the VTC actuator and the exhaust camshaft sprocket.

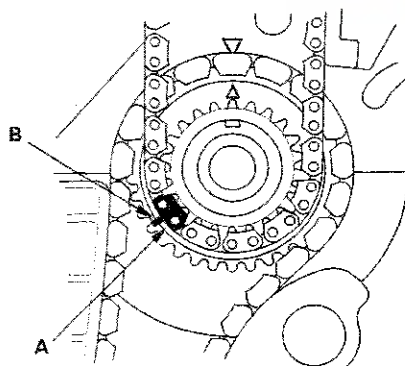




3. To hold the intake camshaft, insert a camshaft lock pin (P/N 07AAB-RWCA120) (A) into the maintenance hole in camshaft position (CMP) pulse plate A (B) and through the No. 5 rocker shaft holder (C).

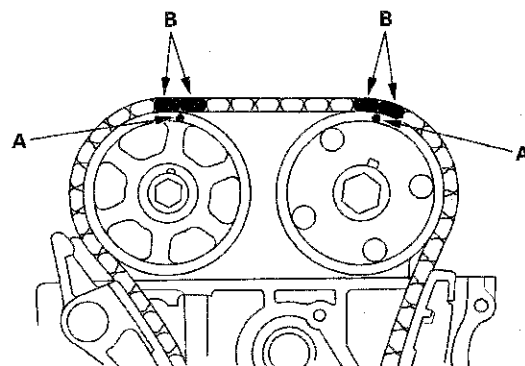


4. To hold the exhaust camshaft, insert a camshaft lock pin (A) into the maintenance hole in CMP pulse plate B (D) and through the No. 5 rocker shaft holder (C).

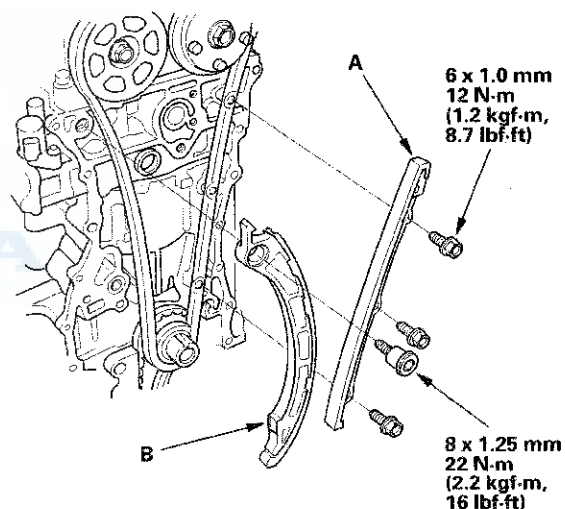


5. Install the cam chain on the crankshaft sprocket with the colored link plate (A) aligned with the mark (B) on the crankshaft sprocket.

6. Install the cam chain on the VTC actuator and the exhaust camshaft sprocket with the punch marks (A) aligned with the center of the two colored link plates (B).



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



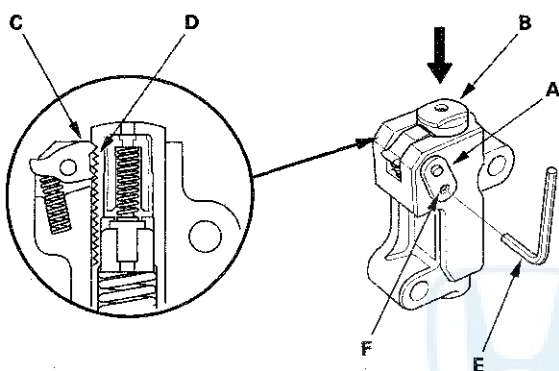
(cont'd)

Cylinder Head

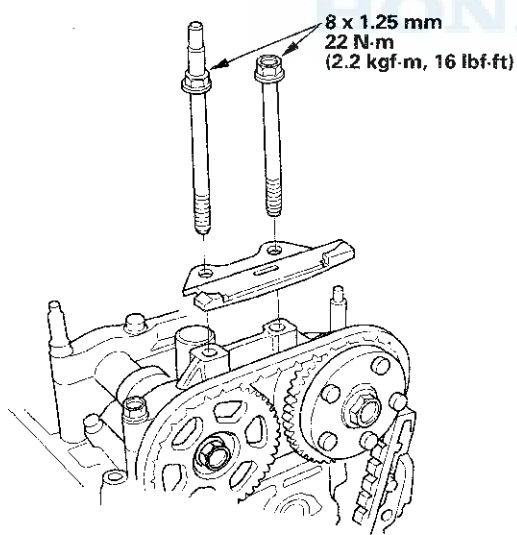
Cam Chain Installation (cont'd)

8. Compress the auto-tensioner when replacing the cam chain. Remove the pin from the auto-tensioner. Turn the plate (A) counterclockwise, to release the lock, then press the rod (B), and set the first cam (C) to the first edge of the rack (D). Insert the 1.2 mm (0.05 in.) diameter pin or lock pin (P/N 14511-PNA-003) (E) into the holes (F).

NOTE: If the chain tensioner is not set up as described, the tensioner will become damaged.

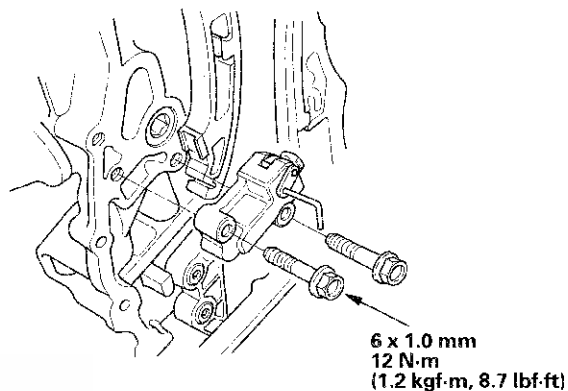


9. Install cam chain guide B.

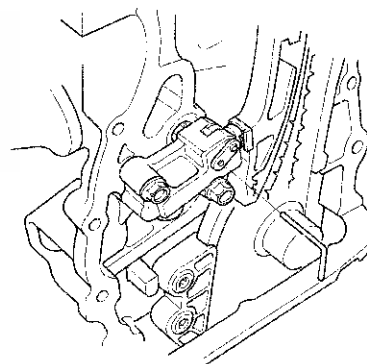


10. Install the auto-tensioner.

NOTE: Check the auto-tensioner cam position. If the position are not aligned, set the first cam to the first edge of the rack.

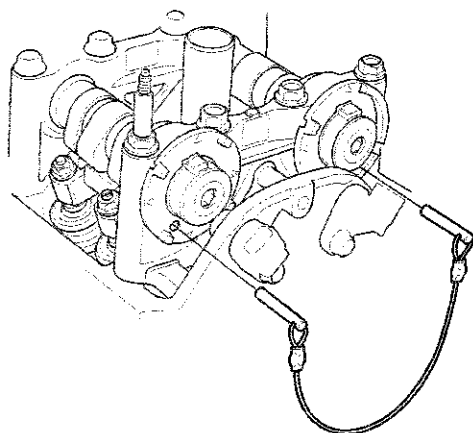


11. Remove the pin or lock pin from the auto-tensioner.





12. Remove the camshaft lock pin set.

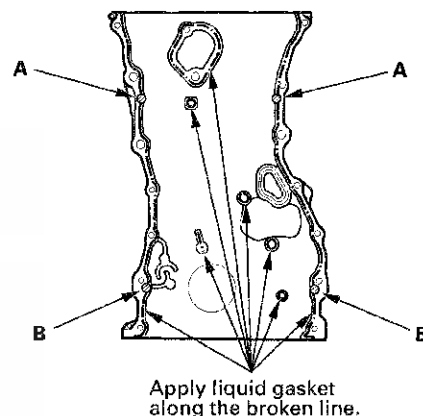


13. Check the chain case oil seal for damage. If the oil seal is damaged, replace the chain case oil seal (see page 6-71).
14. Remove the old liquid gasket from the chain case mating surfaces, the bolts, and the bolt holes.
15. Clean and dry the chain case mating surfaces.

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

NOTE:

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

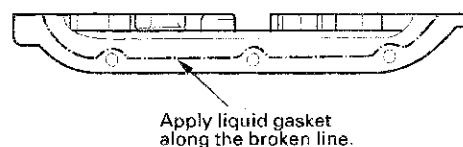


Apply liquid gasket along the broken line.

17. Apply liquid gasket to the engine block upper surface contact areas (A) on the chain case and lower block upper surface contact areas (B) on the chain case.
18. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the oil pan mating surface of the chain case, and to the inside edge of the threaded bolt holes. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

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



Apply liquid gasket along the broken line.

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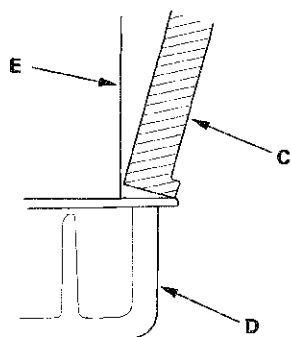
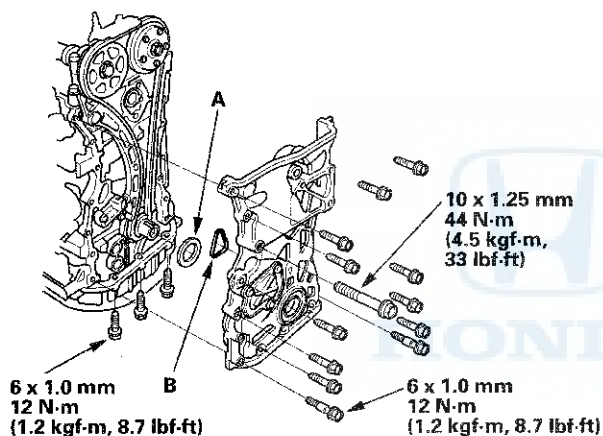
Cylinder Head

Cam Chain Installation (cont'd)

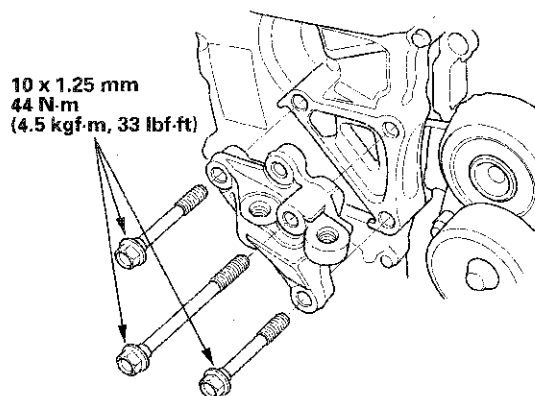
19. Install the spacer (A), then install the new O-ring (B) on the chain case. Set the edge of the chain case (C) to the edge of the oil pan (D), then install the chain case on the engine block (E). Wipe off the excess liquid gasket on the oil pan and chain case mating surface.

NOTE:

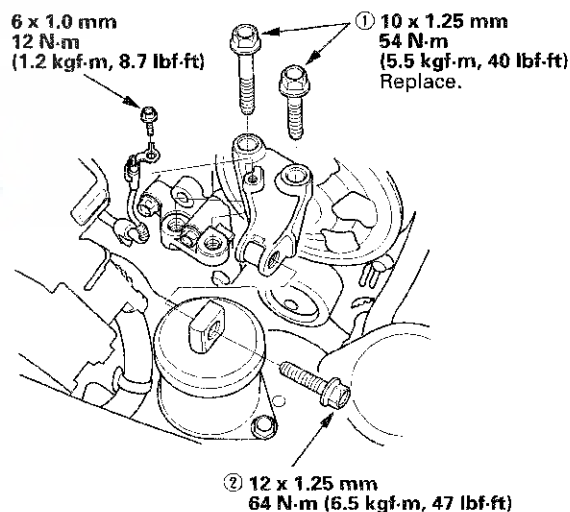
- When installing the chain case, do not slide the bottom surface onto the oil pan mounting surface.
- Wait at least 30 minutes before filling the engine with oil.
- Do not run the engine for at least 3 hours after installing the chain case.



20. Install the side engine mount bracket, then tighten the side engine mount bracket mounting bolts.



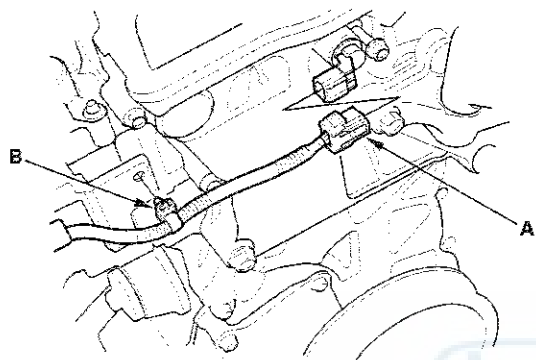
21. Tighten the new side engine mount bracket mounting bolts in the numbered sequence shown.



22. Install the ground cable.
23. Remove the jack and the wood block.



24. Install the crankshaft pulley (see page 6-61).
25. Install the VTC oil control solenoid valve (see page 11-300).
26. Connect the VTC oil control solenoid valve connector (A) and install the harness clamp (B).

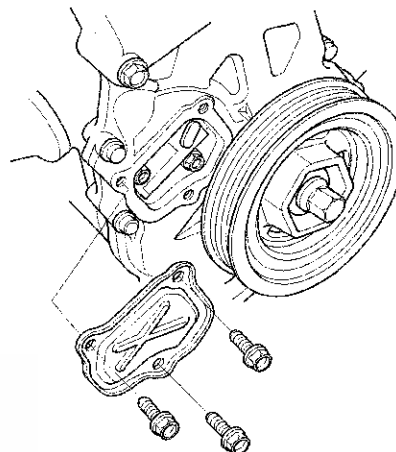


27. Install the cylinder head cover (see page 6-74).
28. Install the drive belt (see page 4-30).
29. Install the splash shield (see step 48 on page 5-20).
30. Install the front wheels.
31. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see page 11-5).

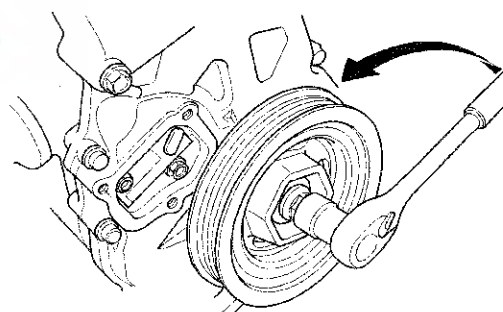
Auto-tensioner Removal and Installation

Removal

1. Remove the chain case cover.



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



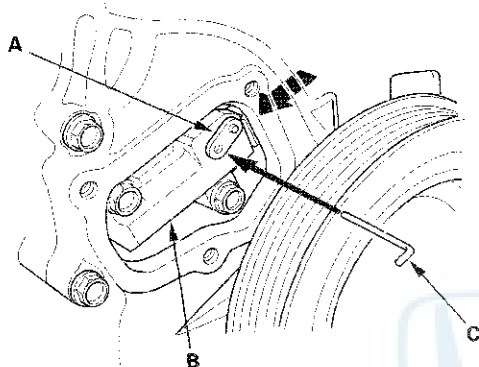
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Cylinder Head

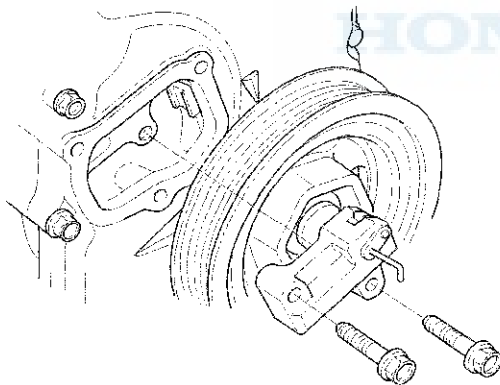
Auto-tensioner Removal and Installation (cont'd)

3. Align the holes on the lock (A) and the auto-tensioner (B), then insert a 1.2 mm (0.05 in.) diameter pin or lock pin (P/N 14511-PNA-003) (C) into the holes. Turn the crankshaft clockwise to secure the pin.

NOTE: Check the auto-tensioner cam position. If the position are not aligned, set the first cam to the first edge of the rack (see step 8 on page 6-66).



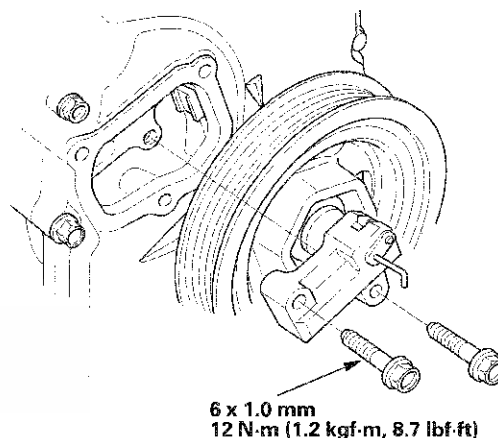
4. Remove the auto-tensioner.



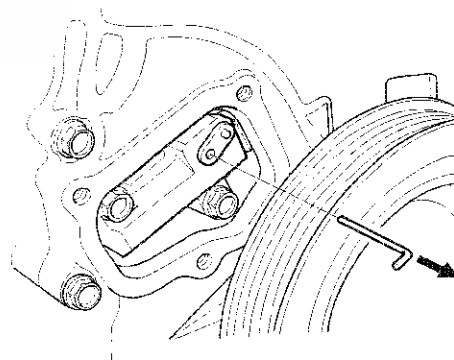
Installation

1. Install the auto-tensioner.

NOTE: Check the auto-tensioner cam position. If the position are not aligned, set the first cam to the first edge of the rack.



2. Remove the 1.2 mm (0.05 in.) diameter pin or lock pin (P/N 14511-PNA-003) from the auto-tensioner.



3. Remove the old liquid gasket from the chain case cover mating surfaces, the bolts, and the bolt holes.
4. Clean and dry the chain case cover mating surfaces.

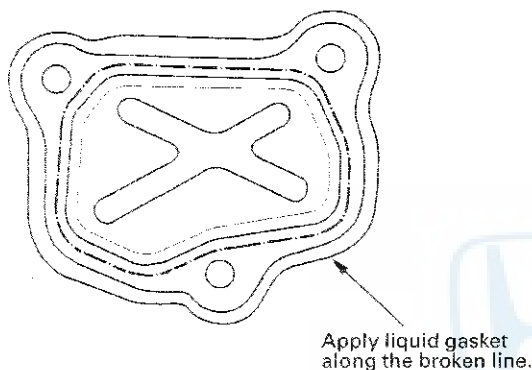


Chain Case Oil Seal Installation

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

NOTE:

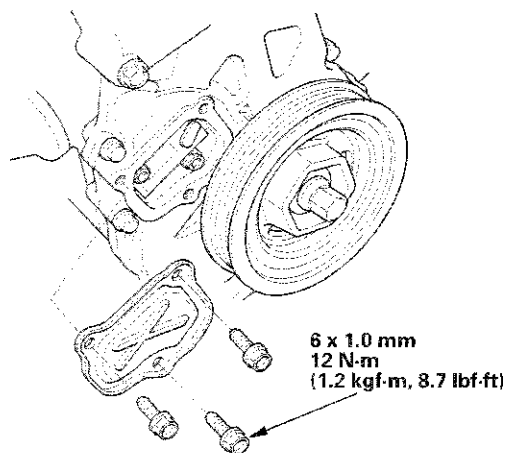
- If you apply liquid gasket P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply new liquid gasket.



6. Install the chain case cover.

NOTE:

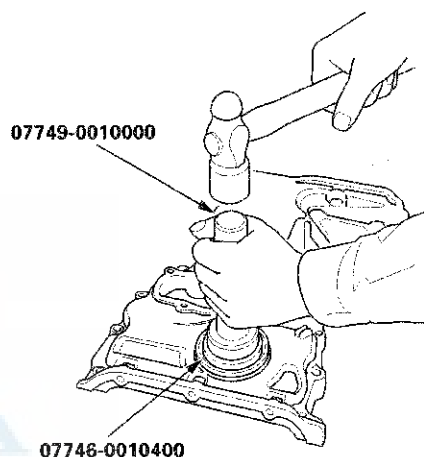
- Wait at least 30 minutes before filling the engine with oil.
- Do not run the engine for at least 3 hours after installing the chain case cover.



Special Tools Required

- Driver 07749-0010000
- Attachment, 52 x 55 mm 07746-0010400

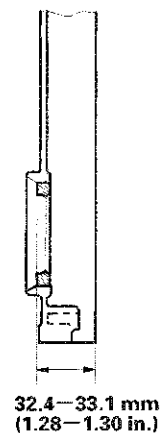
1. Apply a light coat of new engine oil around the crankshaft.
2. Apply a light coat of new engine oil to the lip of the chain case oil seal.
3. Use the driver and attachment, 52 x 55 mm to drive a new oil seal squarely into the chain case to the specified installed height.



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

Oil Seal Installed Height:

32.4—33.1 mm (1.28—1.30 in.)



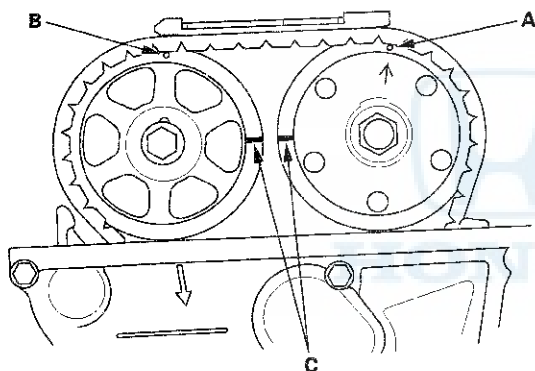
Cylinder Head

Cam Chain Inspection

Special Tools Required

Cam chain inspection gauge 07AAJ-RWCA100

1. Remove the front wheels.
2. Remove the splash shield (see step 25 on page 5-5).
3. Remove the cylinder head cover (see page 6-73).
4. Rotate the crankshaft pulley two turns clockwise.
5. Set the No. 1 piston at top dead center (TDC). The punch mark (A) on the variable valve timing control (VTC) actuator and the punch mark (B) on the exhaust camshaft sprocket should be at the top. Align the TDC marks (C) on the VTC actuator and the exhaust camshaft sprocket.



6. Measure the clearance between the cam chain (A) and the tensioner arm (B) with the cam chain inspection gauge (07AAJ-RWCA100).

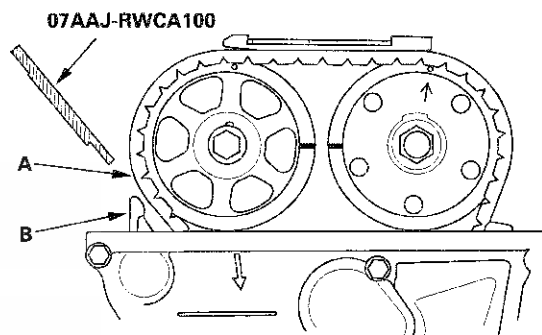
- If the clearance is OK, go to step 17.
- If the clearance is more than the service limit, go to step 7.

Chain-to-Arm Clearance

Service Limit:

MIL on with P0341: 4.3 mm (0.17 in.)

Without MIL: 5.5 mm (0.22 in.)



7. Remove the oil pan (see page 7-11).
8. Support the engine with a jack and a wood block under the engine block.

NOTE: Do not hit the oil pump and the baffle plate when placing the jack on the edge of the engine block.

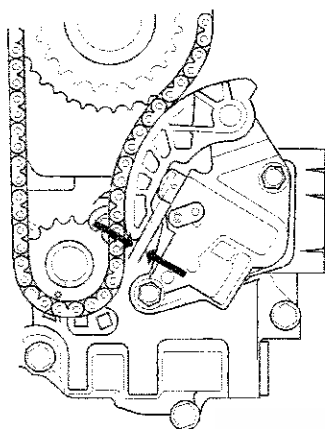
9. Remove the cam chain (see page 6-62), and check the teeth on the crankshaft sprocket, the VTC actuator, and the exhaust camshaft sprocket for wear and damage. If any of them are worn or damaged, replace if necessary.
10. Check the oil passage on the auto-tensioner for clogs. If the auto-tensioner is clogged, replace it.



Cylinder Head Cover Removal

11. Measure the oil pump chain auto-tensioner rod length.

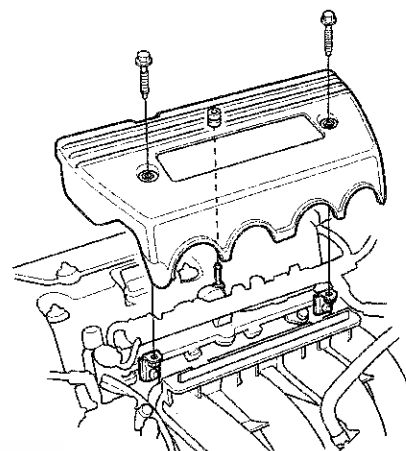
Oil Pump Chain Auto-Tensioner Rod Length
Service Limit: 13 mm (0.51 in.)



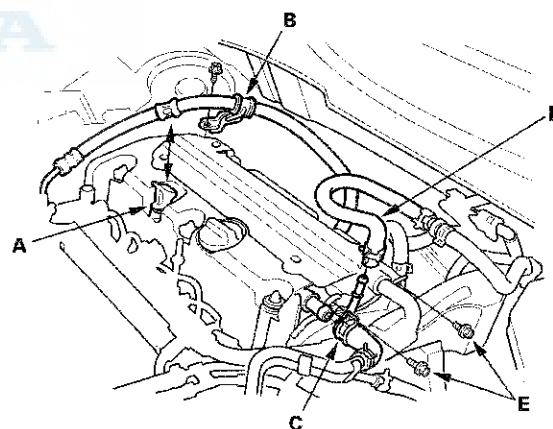
12. If the length is over the service limit, replace the oil pump chain (see page 8-23). When replacing, check the teeth on the crankshaft sprocket and the oil pump sprocket for wear and damage. If any of them are worn or damaged, replace if necessary.
13. Check the oil passage on the oil pump chain auto-tensioner for clogs. If the auto-tensioner is clogged, replace it.
14. Install the new cam chain (see page 6-64).
15. Remove the jack and the wood block.
16. Install the oil pan (see page 7-31).
17. Install the cylinder head cover (see page 6-74).
18. Install the splash shield (see step 48 on page 5-20).
19. Install the front wheels.

1. Remove the strut brace (if equipped) (see page 20-289).

2. Remove the intake manifold cover.



3. Remove the four ignition coils (see page 4-20).
4. Remove the dipstick (A), and the power steering (P/S) hose bracket (B) and disconnect the breather hose (C) and the brake booster vacuum hose (D).



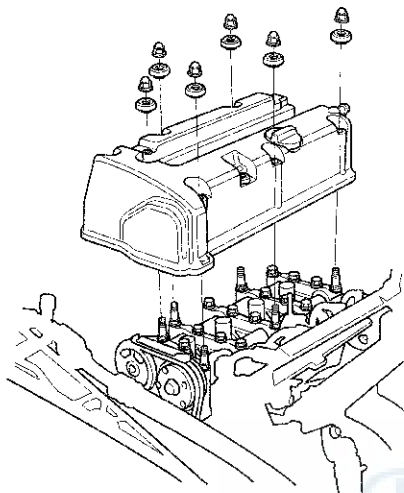
5. Remove the two bolts (E) securing the evaporative emission (EVAP) canister purge valve bracket.

(cont'd)

Cylinder Head

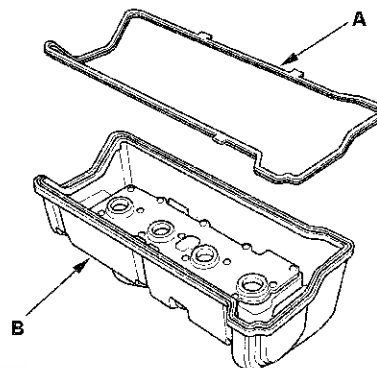
Cylinder Head Cover Removal (cont'd)

6. Remove the cylinder head cover.



Cylinder Head Cover Installation

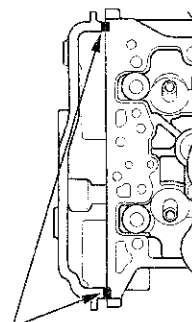
1. Thoroughly clean the head cover gasket and the groove.
2. Install the head cover gasket (A) in the groove of the cylinder head cover (B).



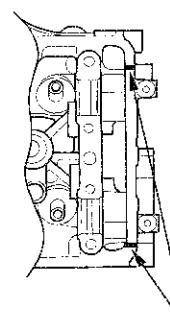
3. Check that the mating surfaces are clean and dry.
4. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, on the chain case and the No. 5 rocker shaft holder mating areas, and to the inside edge of the threaded bolt holes. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

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



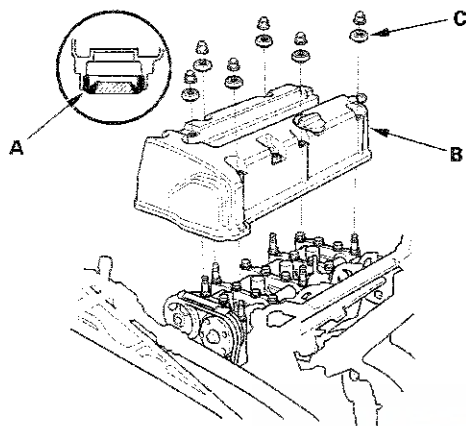
Apply liquid gasket to these points.



Apply liquid gasket to these points.



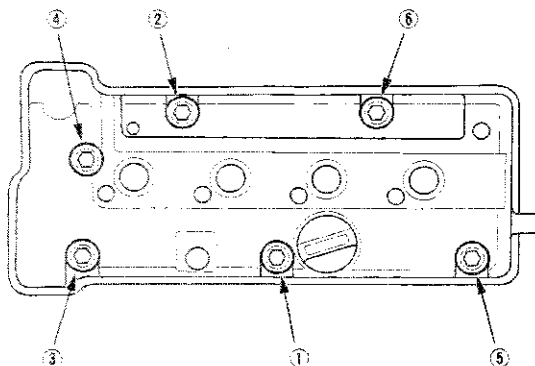
5. Set the spark plug seals (A) on the spark plug tubes. Place the cylinder head cover (B) on the cylinder head, then slide the cover slightly back and forth to seat the head cover gasket.



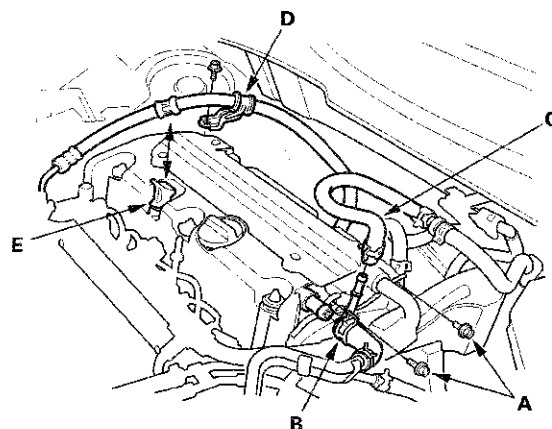
6. Inspect the cover washers (C). Replace any washer that is damaged or deteriorated.
7. Tighten the bolts in three steps. In the final step tighten all bolts, in sequence, to 12 N·m (1.2 kgf·m, 8.7 lbf·ft).

NOTE:

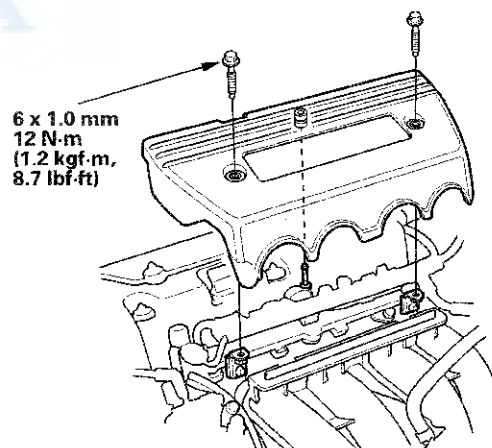
- Wait at least 30 minutes before filling the engine with oil.
- Do not run the engine for at least 3 hours after installing the head cover.



8. Install the two bolts (A) securing the evaporative emission (EVAP) canister purge valve bracket.



9. Connect the breather hose (B) and the brake booster vacuum hose (C) and install the power steering (P/S) hose bracket (D), and the dipstick (E).
10. Install the four ignition coils (see page 4-20).
11. Install the intake manifold cover.



12. Install the strut brace (if equipped) (see page 20-289).

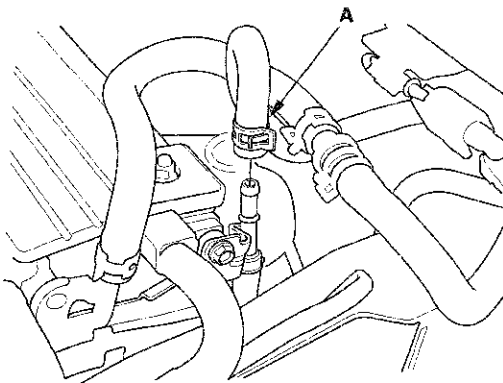
Cylinder Head

Cylinder Head Removal

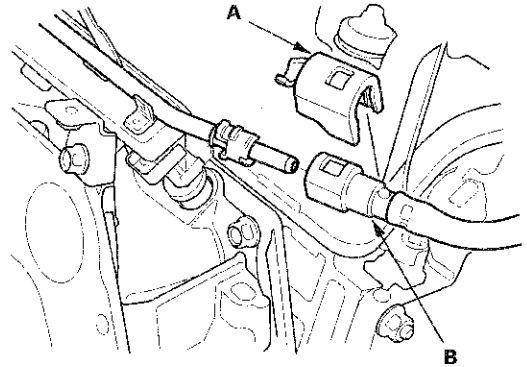
NOTE:

- Use fender covers to avoid damaging painted surfaces.
- To avoid damage, unplug the wiring connectors carefully while holding the connector portion.
- Connect the Honda Diagnostic System (HDS) to the data link connector (DLC), and monitor the engine coolant temperature (ECT) sensor 1. To avoid damaging the cylinder head, wait until the ECT sensor 1 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.

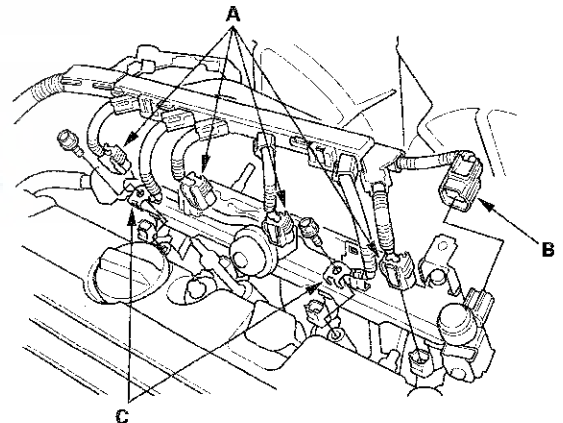
1. Remove the strut brace (if equipped) (see page 20-289).
2. Relieve the fuel pressure (see page 11-332).
3. Drain the engine coolant (see page 10-6).
4. Remove the drive belt (see page 4-30).
5. Remove the intake manifold (see page 9-3).
6. Remove the catalytic converter (see page 11-367).
7. Disconnect the evaporative emission (EVAP) canister hose (A).



8. Remove the quick-connect fitting cover (A), then disconnect the fuel feed hose (B) (see page 11-340).

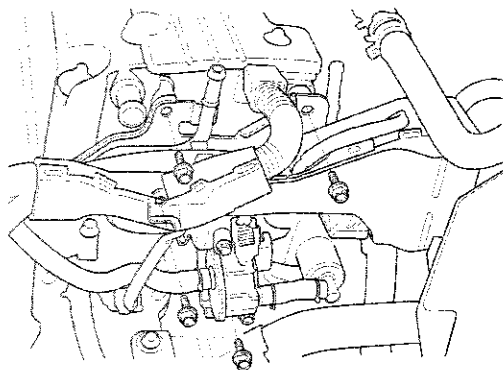


9. Disconnect the four fuel injector connectors (A), the engine mount control solenoid valve connector (B), and remove the ground cables (C).

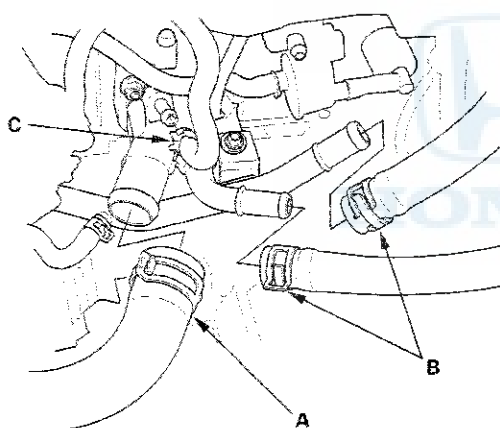




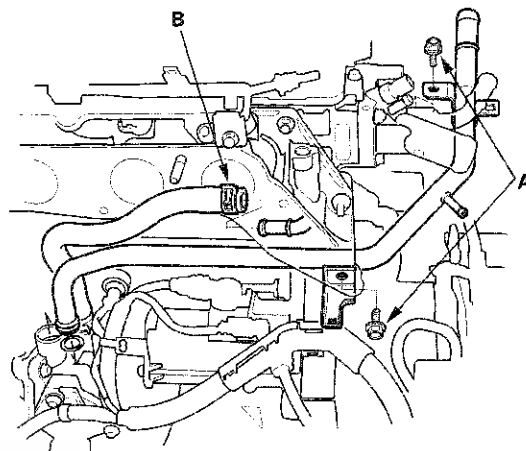
10. Remove the four bolts securing the EVAP canister purge valve bracket.



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



12. Remove the two bolts (A) securing the connecting pipe.



13. Disconnect the water bypass hose (B).

14. Disconnect the following engine wire harness connectors and wire harness clamps from the cylinder head:

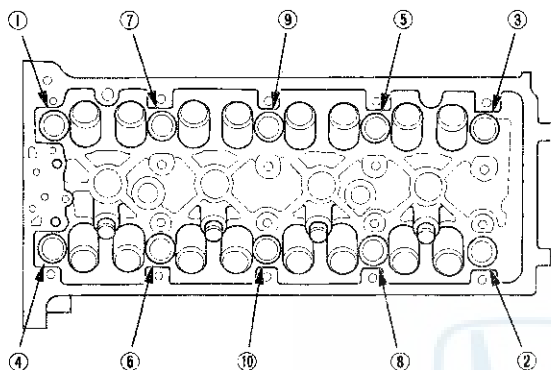
- Engine coolant temperature (ECT) sensor 1 connector
- Camshaft position (CMP) sensor A (Intake) connector
- Camshaft position (CMP) sensor B (Exhaust) connector
- Two rocker arm oil control solenoid connectors
- Two rocker arm oil pressure switch connectors
- EVAP canister purge valve connector
- Variable valve timing control (VTC) oil control solenoid valve connector
- Engine oil pressure switch connector

(cont'd)

Cylinder Head

Cylinder Head Removal (cont'd)

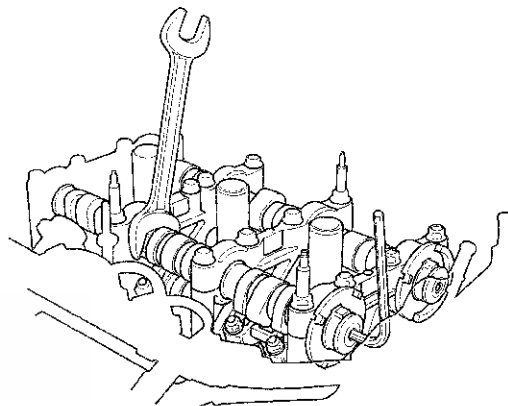
15. Remove the cam chain (see page 6-62).
16. Remove the rocker arm assembly (see page 6-81).
17. Remove the cylinder head bolts. To prevent warpage, loosen the bolts in sequence 1/3 turn at a time; repeat the sequence until all bolts are loosened.



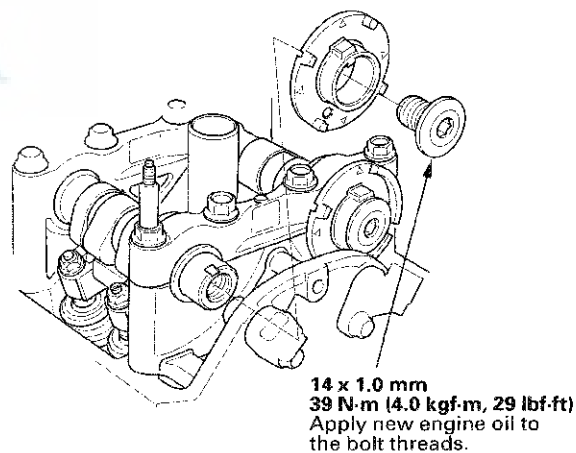
18. Remove the cylinder head.

CMP Pulse Plate A Replacement

1. Remove the cylinder head cover (see page 6-73).
2. Remove camshaft position (CMP) sensor A (see page 11-301).
3. Hold the camshaft with an open-end wrench, then loosen the bolt.



4. Remove CMP pulse plate A.

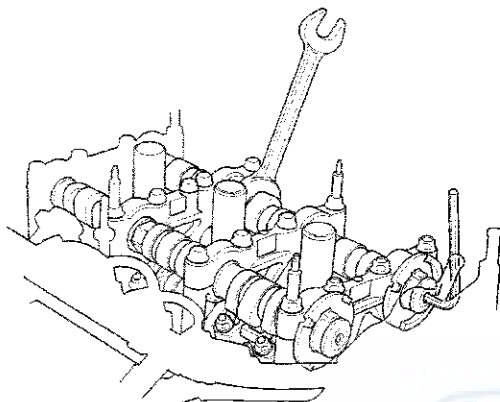


5. Install CMP pulse plate A in the reverse order of removal.

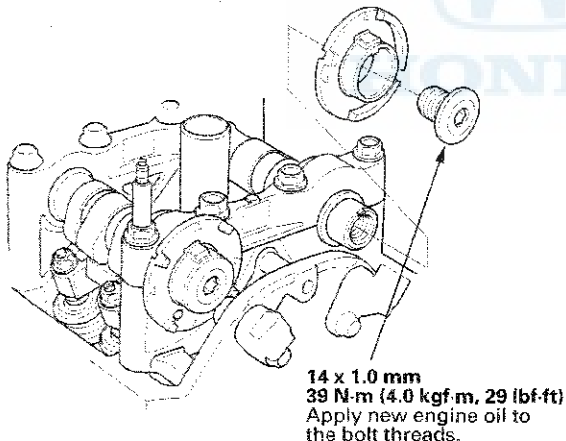


CMP Pulse Plate B Replacement

1. Remove the cylinder head cover (see page 6-73).
2. Remove camshaft position (CMP) sensor B (see page 11-210).
3. Hold the camshaft with an open-end wrench, then loosen the bolt.



4. Remove CMP pulse plate B.



5. Install CMP pulse plate B in the reverse order of removal.

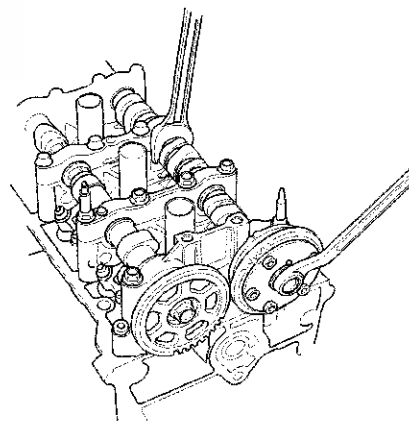
VTC Actuator, Exhaust Camshaft Sprocket Replacement

Removal

1. Remove the cam chain (see page 6-62).

NOTE: For exhaust camshaft sprocket removal, do steps 3 and 4.

2. If the VTC actuator will be reused, do these steps to avoid damaging the actuator lock pin.
 - 1 Remove the intake camshaft from the cylinder head, and seal the retard holes in the No. 1 camshaft journal with tape and a wire tie (see step 6 on page 6-57).
 - 2 Seal over one of the advance holes with tape (see page 7 on page 6-57).
 - 3 Apply air to the unsealed advance hole to release the lock (see step 8 on page 6-58).
 - 4 Remove the wire tie, the tape, and the adhesive residue from the camshaft journal.
 - 5 Temporarily reinstall the camshaft and the cam journals on the cylinder head.
3. Hold the camshaft with an open-end wrench, then loosen the variable valve timing control (VTC) actuator mounting bolt or the exhaust camshaft sprocket mounting bolt.



4. Remove the VTC actuator and/or the exhaust camshaft sprocket from the camshaft.

(cont'd)

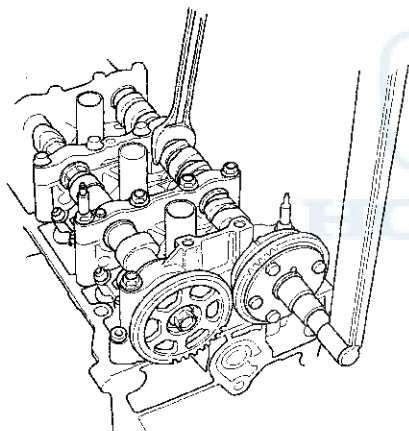
Cylinder Head

VTC Actuator, Exhaust Camshaft Sprocket Replacement (cont'd)

1. Install the VTC actuator or the exhaust camshaft sprocket onto the camshaft.

NOTE: To avoid damage to the VTC actuator, it must be installed in the unlocked position. If necessary, temporarily install the VTC actuator mount bolt hand-tight, and unlock the actuator (see step 2 of removal).

2. Apply new engine oil to the threads of the VTC actuator mounting bolt and the exhaust camshaft mounting bolt, then install them.
3. Hold the camshaft with an open-end wrench, then tighten the bolts.



Specified Torque

VTC Actuator Mounting Bolt:

12 x 1.25 mm

113 N·m (11.5 kgf·m, 83 lbf·ft)

Exhaust Camshaft Sprocket Mounting Bolt:

10 x 1.25 mm

72 N·m (7.3 kgf·m, 53 lbf·ft)

4. Hold the camshaft with an open-end wrench, and turn the VTC actuator by hand clockwise until you hear and feel the actuator lock pin click into place.

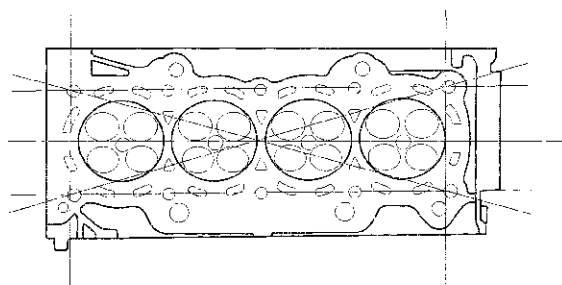
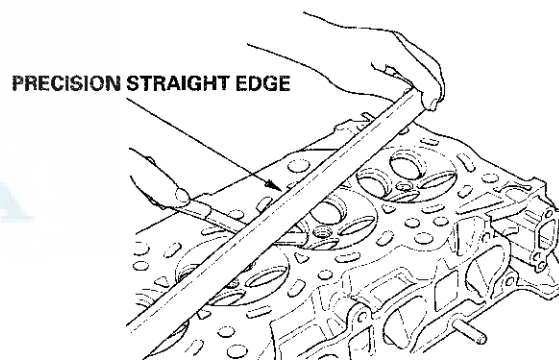
5. Install the cam chain (see page 6-64).

Cylinder Head Inspection for Warp

1. Remove the cylinder head (see page 6-76).
2. Inspect the camshaft (see page 6-84).
3. Check the cylinder head for warp. Measure along the edges, and three ways across the center.
 - If warp is less than 0.05 mm (0.002 in.) cylinder head resurfacing is not required.
 - If warp is between 0.05 mm (0.002 in.) and 0.2 mm (0.008 in.), resurface the cylinder head.
 - The maximum resurface limit is 0.2 mm (0.008 in.) based on a height of 104 mm (4.09 in.).

Cylinder Head Height

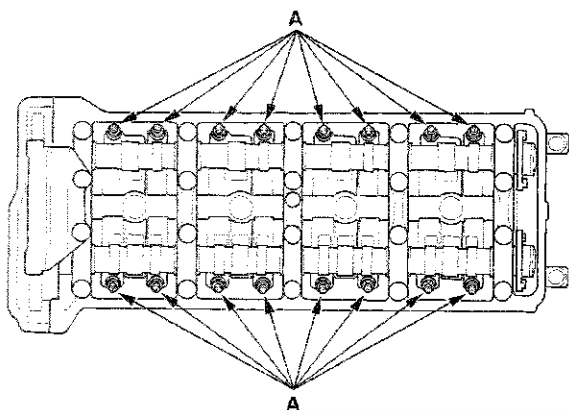
Standard (New): 103.95—104.05 mm
(4.0925—4.0965 in.)





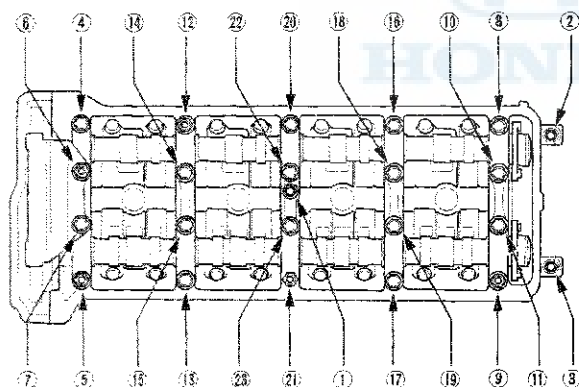
Rocker Arm Assembly Removal

1. Remove the cam chain (see page 6-62).
2. Loosen the rocker arm adjusting screws (A).

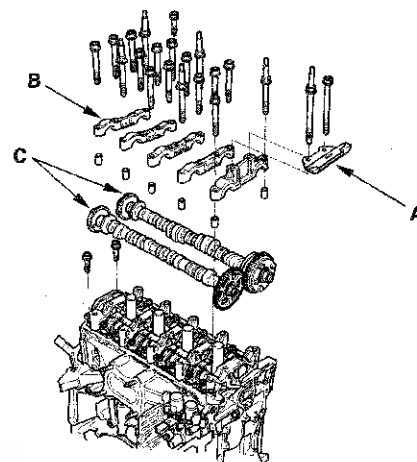


3. Remove the camshaft holder bolts. To prevent damaging the camshafts, loosen the bolts, in sequence, two turns at a time.

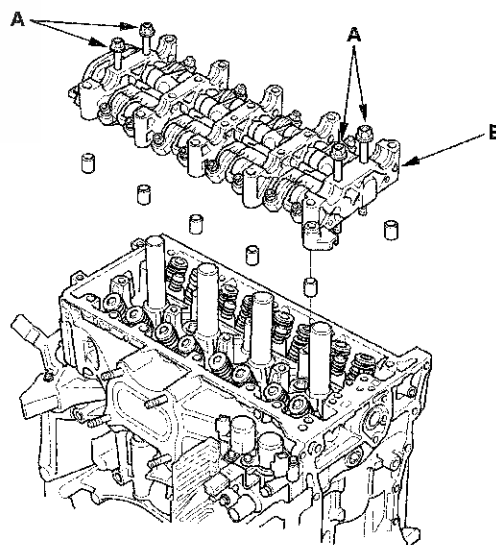
NOTE: Bolt ① is not on all engines.



4. Remove cam chain guide B (A), the camshaft holders (B), and the camshafts (C).



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

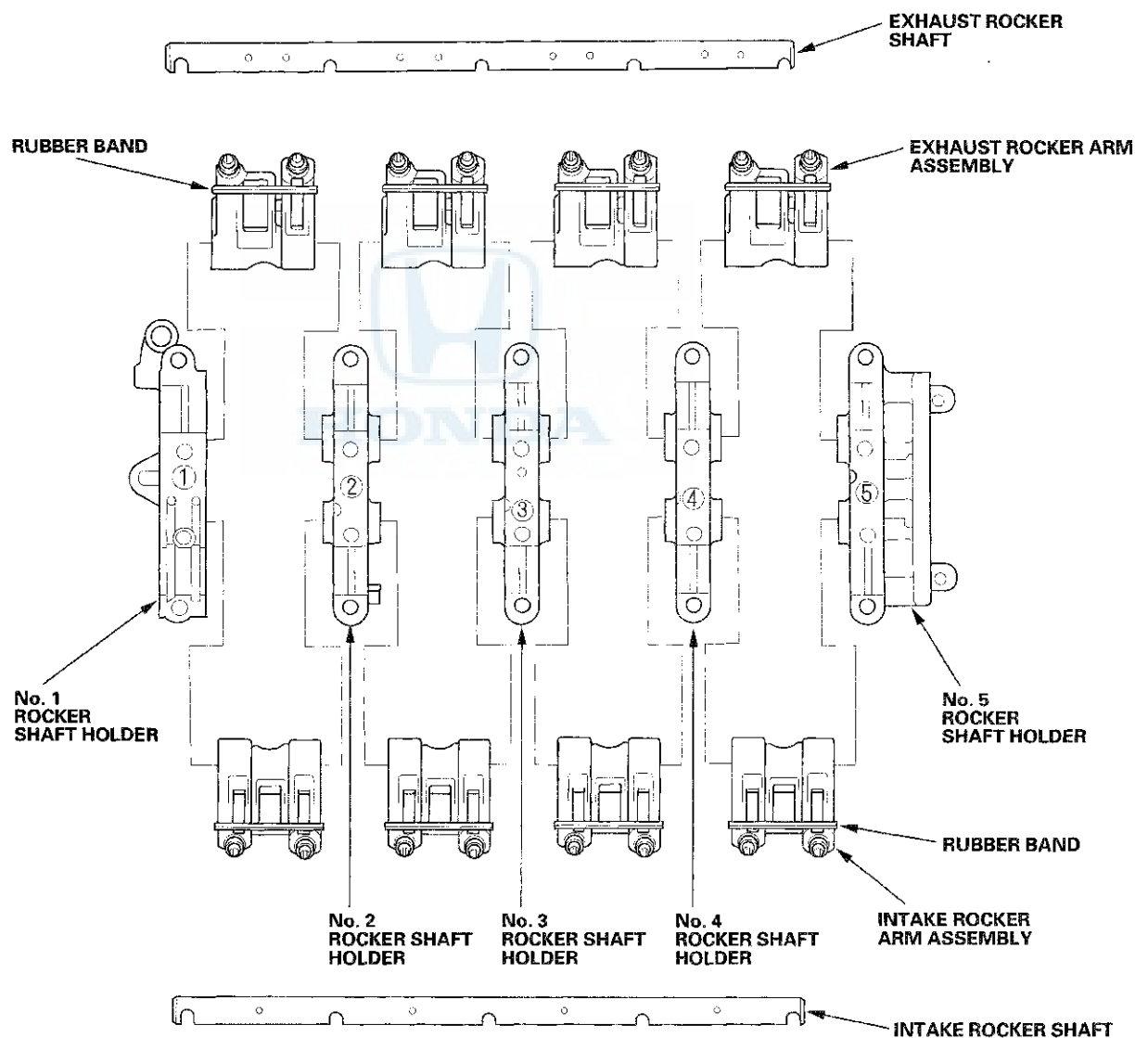


Cylinder Head

Rocker Arm and Shaft Disassembly/Reassembly

NOTE:

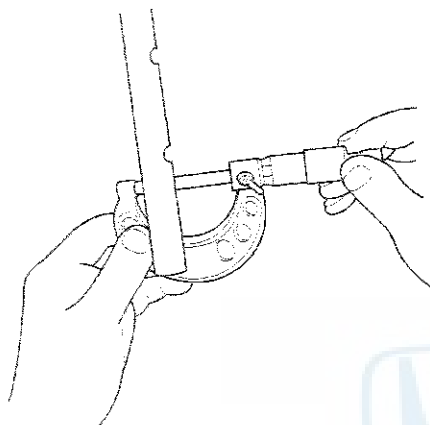
- Identify each part as it is removed so that each item can be reinstalled in its original position.
- Inspect the rocker arm shaft and rocker arms (see page 6-83).
- If reused, the rocker arms must be installed in the same positions.
- When removing, or installing the rocker arm assembly, do not remove the camshaft holder bolts. The bolts will keep the holders and rocker arms on the shaft.
- Prior to reassembling, clean all the parts in solvent, dry them, and apply lubricant to any contact points.
- Bundle the rocker arms with rubber bands to keep them together as a set.
- When replacing the VTEC rocker arm assembly, remove the fastening hardware from the new VTEC rocker arm assembly.



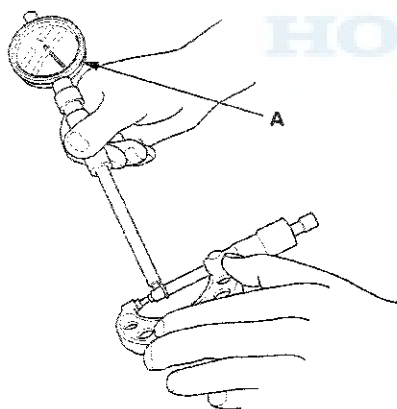


Rocker Arm and Shaft Inspection

1. Remove the rocker arm assembly (see page 6-81).
2. Disassemble the rocker arm assembly (see page 6-82).
3. Measure the diameter of the shaft at the first rocker location.



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

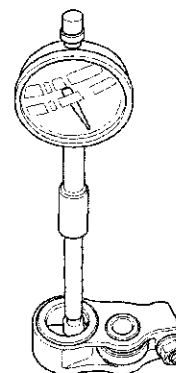


5. Measure the inside diameter of the rocker arm, and check it for an out-of-round condition.

Rocker Arm-to-Shaft Clearance

Standard (New): 0.018—0.059 mm
(0.0007—0.0023 in.)

Service Limit: 0.08 mm (0.003 in.)



6. Repeat for all intake rocker arms and intake shaft. If the clearance is beyond the service limit, replace the rocker shaft and all out of service limit rocker arms. If any VTEC rocker arm needs replacement, replace the intake rocker arms (primary, mid, and secondary), as a set.
7. Repeat for all exhaust rocker arms and exhaust shaft. If the clearance is beyond the service limit, replace the rocker shaft and all out of service limit rocker arms. If any VTEC rocker arm needs replacement, replace the exhaust rocker arms (primary and secondary), as a set.

(cont'd)

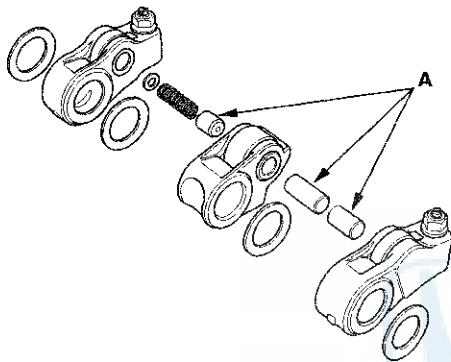
Cylinder Head

Rocker Arm and Shaft Inspection (cont'd)

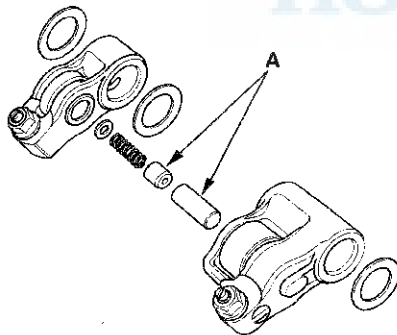
8. Inspect the rocker arm pistons (A). Push on each piston manually. If it does not move smoothly, replace the rocker arm set.

NOTE: Apply new engine oil to the rocker arm pistons when reassembling.

Intake side



Exhaust side



9. Install the rocker arm assembly (see page 6-93).

Camshaft Inspection

NOTE: Do not rotate the camshaft during inspection.

1. Remove the rocker arm assembly (see page 6-81).
2. Put the rocker shaft holders, the camshaft, and the camshaft holders on the cylinder head, then tighten the bolts, in sequence, to the specified torque.

NOTE: If the engine does not have bolt ②①, skip it and continue the torque sequence.

Specified Torque

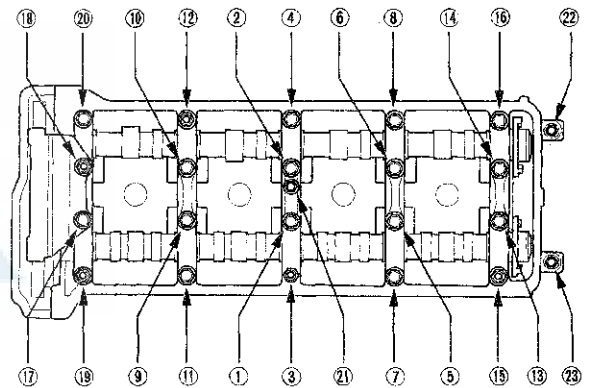
8 x 1.25 mm

22 N·m (2.2 kgf·m, 16 lbf·ft)

6 x 1.0 mm

12 N·m (1.2 kgf·m, 8.7 lbf·ft)

6 x 1.0 mm Bolts: ②①, ②②, ②③



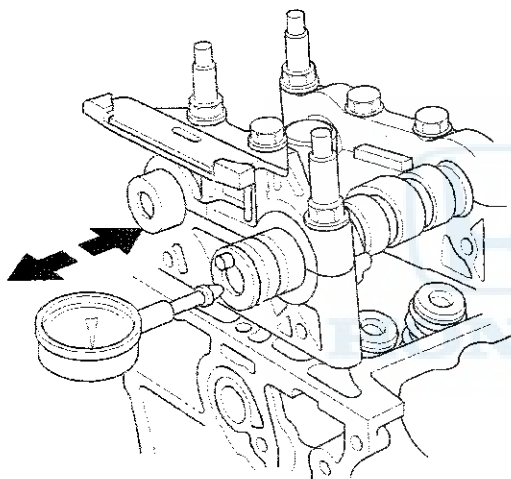


3. Seat the camshaft by pushing it away from the camshaft pulley end of the cylinder head.
4. Zero the dial indicator against the end of the camshaft, then push the camshaft back and forth, and read the end play. If the end play is beyond the service limit, replace the cylinder head and recheck. If it is still beyond the service limit, replace the camshaft.

Camshaft End Play

Standard (New): 0.05–0.20 mm
(0.002–0.008 in.)

Service Limit: 0.4 mm (0.02 in.)



5. Loosen the camshaft holder bolts two turns at a time, in a crisscross pattern. Then remove the camshaft holders from the cylinder head.
6. Lift the camshafts out of the cylinder head, wipe them clean, then inspect the lift ramps. Replace the camshaft if any lobes are pitted, scored, or excessively worn.
7. Clean the camshaft journal surfaces in the cylinder head, then set the camshafts back in place. Place a plastigage strip across each journal.
8. Install the camshaft holders, then tighten the bolts to the specified torque as shown in step 2.
9. Remove the camshaft holders. Measure the widest portion of plastigage on each journal.
 - If the camshaft-to-holder clearance is within the service limits, go to step 11.
 - 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 10.

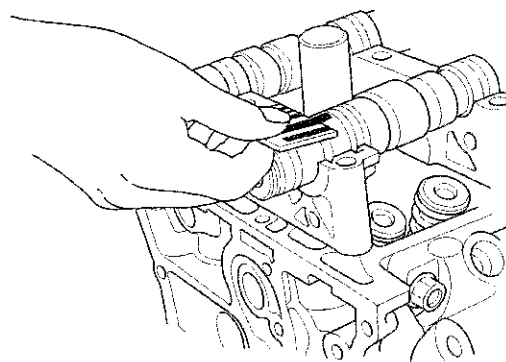
Camshaft-to-Holder Oil Clearance

Standard (New):

No. 1 Journal: 0.030–0.069 mm
(0.0012–0.003 in.)

No. 2, 3, 4, 5 Journals: 0.060–0.099 mm
(0.002–0.004 in.)

Service Limit: 0.15 mm (0.006 in.)



(cont'd)

Cylinder Head

Camshaft Inspection (cont'd)

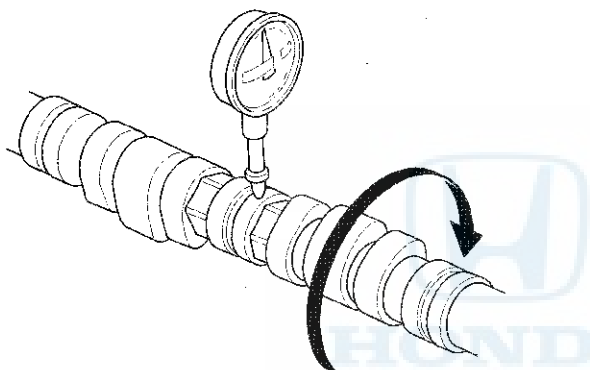
10. Check the total runout with the camshaft supported on V-blocks.

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

Camshaft Total Runout

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

Service Limit: 0.04 mm (0.002 in.)



11. Measure the cam lobe height.

Cam Lobe Height Standard (New):

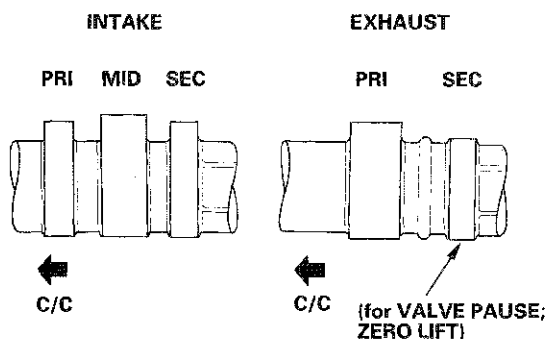
	INTAKE	EXHAUST
PRI	33.744 mm (1.3285 in.)	34.232 mm (1.3477 in.)
MID	35.456 mm (1.3959 in.)	
SEC	33.744 mm (1.3285 in.)	ZERO LIFT

PRI: Primary

MID: Mid

SEC: Secondary

C/C: Cam Chain



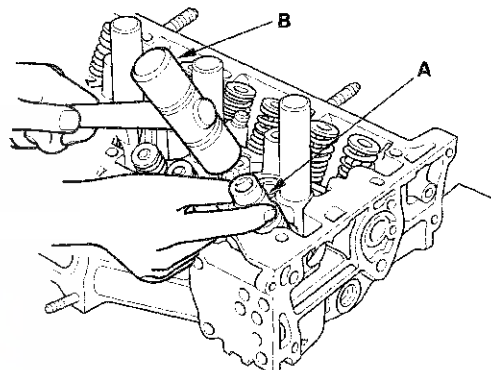
Valve, Spring, and Valve Seal Removal

Special Tools Required

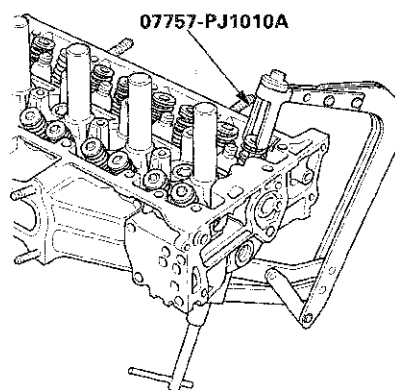
Valve spring compressor attachment 07757-PJ1010A

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

1. Remove the cylinder head (see page 6-76).
2. Using an appropriate-sized socket (A) and plastic mallet (B), lightly tap the spring retainer to loosen the valve cotters.



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

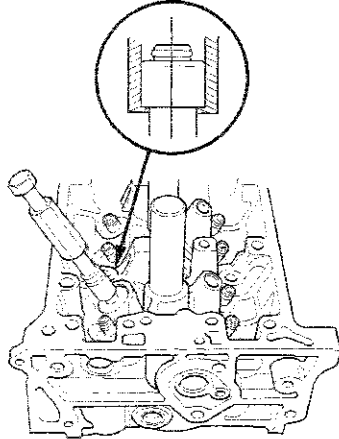


4. Remove the valve spring compressor and the valve spring compressor attachment, then remove the spring retainer and the valve spring.

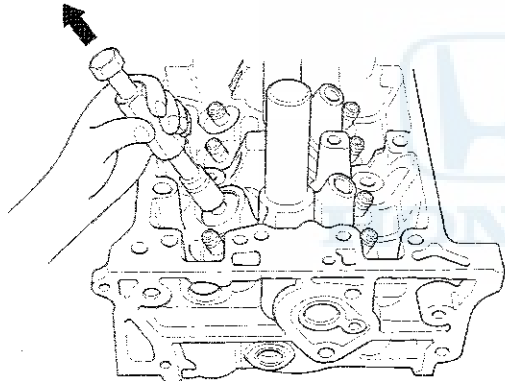


Valve Inspection

5. Install the valve guide seal remover.



6. Remove the valve seal.



1. Remove the valves (see page 6-86).

2. Measure the valve in these areas.

Intake Valve Dimensions

A Standard (New): 35.85—36.15 mm
(1.411—1.423 in.)

B Standard (New): 108.5—109.1 mm
(4.272—4.295 in.)

C Standard (New): 5.475—5.485 mm
(0.2156—0.2159 in.)

C Service Limit: 5.445 mm (0.214 in.)

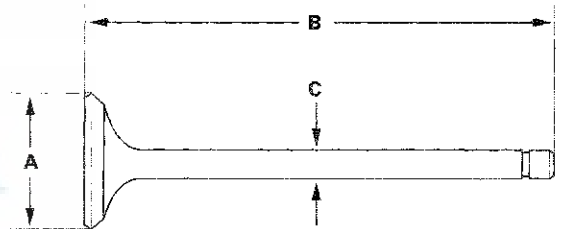
Exhaust Valve Dimensions

A Standard (New): 30.85—31.15 mm
(1.215—1.226 in.)

B Standard (New): 108.4—109.0 mm
(4.268—4.291 in.)

C Standard (New): 5.450—5.460 mm
(0.2146—0.2150 in.)

C Service Limit: 5.42 mm (0.213 in.)



Cylinder Head

Valve Stem-to-Guide Clearance Inspection

1. Remove the valves (see page 6-86).
2. Slide the valve out of its guide about 10 mm (0.39 in.), then measure the stem-to-guide clearance with a dial indicator while rocking the stem in the direction of normal thrust (wobble method).
 - If the measurement exceeds the service limit, recheck it using a new valve.
 - If the measurement is now within the service limit, reassemble using a new valve.
 - If the measurement with a new valve still exceeds the service limit, go to step 3.

Intake Valve Stem-to-Guide Clearance

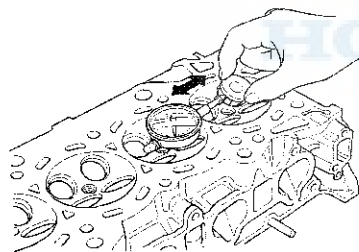
Standard (New): 0.06–0.11 mm
(0.002–0.004 in.)

Service Limit: 0.16 mm (0.006 in.)

Exhaust Valve Stem-to-Guide Clearance

Standard (New): 0.11–0.16 mm
(0.004–0.006 in.)

Service Limit: 0.22 mm (0.009 in.)



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

Intake Valve Stem-to-Guide Clearance

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

Service Limit: 0.08 mm (0.003 in.)

Exhaust Valve Stem-to-Guide Clearance

Standard (New): 0.055–0.080 mm
(0.0022–0.0031 in.)

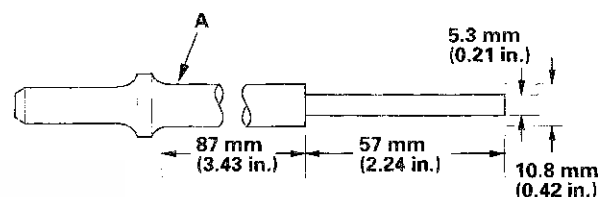
Service Limit: 0.11 mm (0.004 in.)

Valve Guide Replacement

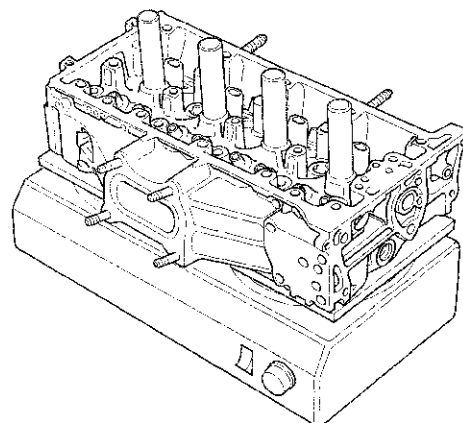
Special Tools Required

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

1. Inspect the valve stem-to-guide clearance (see page 6-88).
2. As illustrated, use a commercially available air-impact valve guide driver (A) modified to fit the diameter of the valve guides. In most cases, the same procedure can be done using the valve guide driver, 5.5 mm and a conventional hammer.

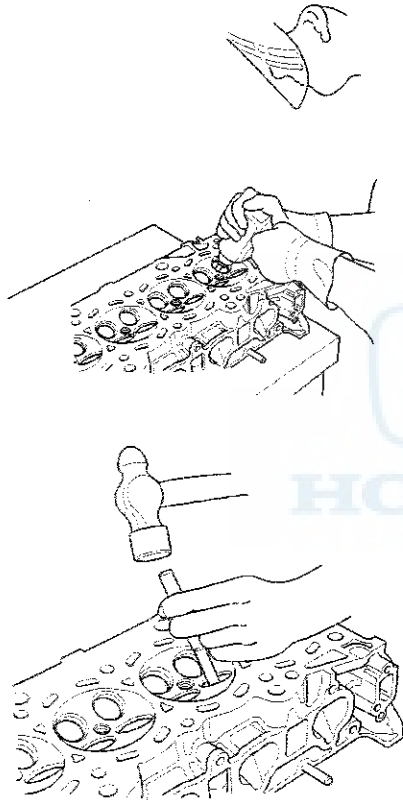


3. Select the proper replacement guides, and chill them in the freezer section of a refrigerator for at least an hour.
4. Use a hot plate or oven to evenly heat the cylinder head to 300 °F (150 °C). Monitor the temperature with a cooking thermometer. Do not get the head hotter than 300 °F (150 °C); excessive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





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



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

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

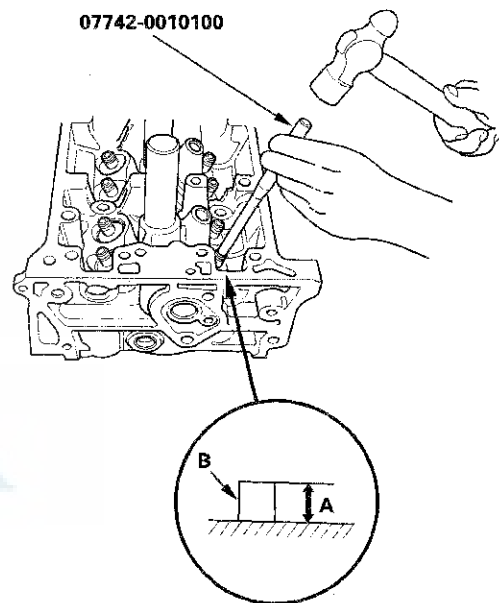
8. Remove the new guide(s) from the freezer, one at a time, as you need them.

9. Apply a thin coat of new engine oil to the outside of the new valve guide. Install the guide from the camshaft side of the head; use the valve guide driver, 5.5 mm to drive the guide in to the specified installed height (A) of the guide (B). If you have all 16 guides to do, you may have to reheat the head.

Valve Guide Installed Height

Intake: 15.2—16.2 mm (0.598—0.638 in.)

Exhaust: 15.5—16.5 mm (0.610—0.650 in.)



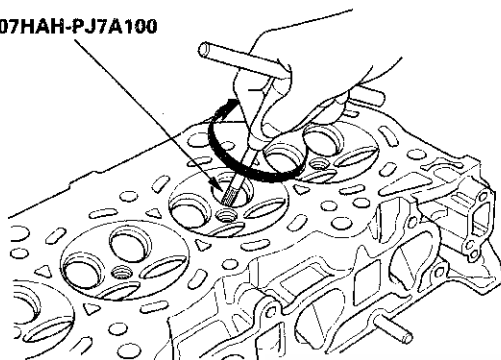
(cont'd)

Cylinder Head

Valve Guide Replacement (cont'd)

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

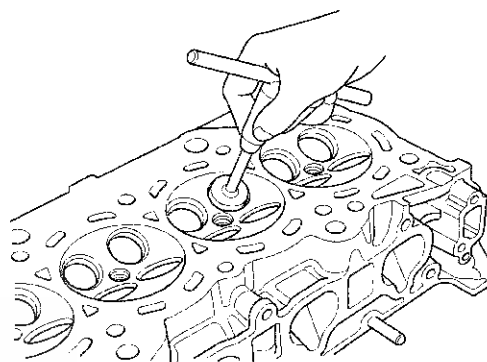
07HAH-PJ7A100



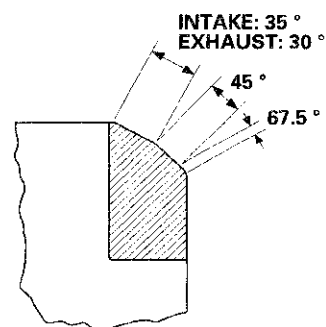
12. Continue to rotate the reamer clockwise while removing it from the bore.
13. Thoroughly wash the guide in detergent and water to remove any cutting residue.
14. Check the clearances with a valve (see page 6-88). Verify that a valve slides into the intake and exhaust valve guides without sticking.

Valve Seat Reconditioning

1. Inspect the valve stem-to-guide clearance (see page 6-88). If the valve guides are worn, replace them (see page 6-88) before cutting the valve seats.
2. Renew the valve seats in the cylinder head using a valve seat cutter.



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





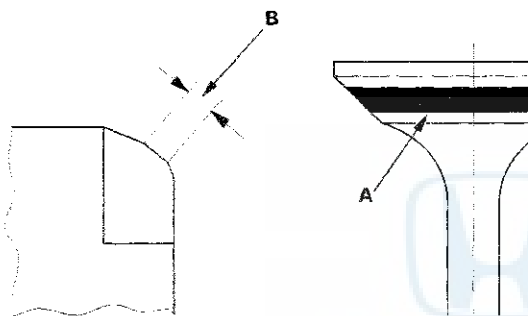
5. Make one more very light pass with the 45° cutter to remove any possible burrs caused by the other cutters.

Valve Seat Width

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

Service Limit: 2.00 mm (0.079 in.)

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



7. The actual valve seating surface (B), as shown by the blue compound, should be centered on the seat.

- If it is too high (closer to the valve stem), you must make a second cut with the 67.5° cutter 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 35° cutter (intake side) or the 30° cutter (exhaust side) 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).

Intake Valve Stem Installed Height

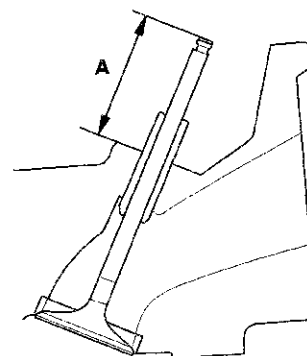
Standard (New): 44.0—44.5 mm (1.73—1.75 in.)

Service Limit: 44.7 mm (1.76 in.)

Exhaust Valve Stem Installed Height

Standard (New): 44.0—44.5 mm (1.73—1.75 in.)

Service Limit: 44.7 mm (1.76 in.)



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

Cylinder Head

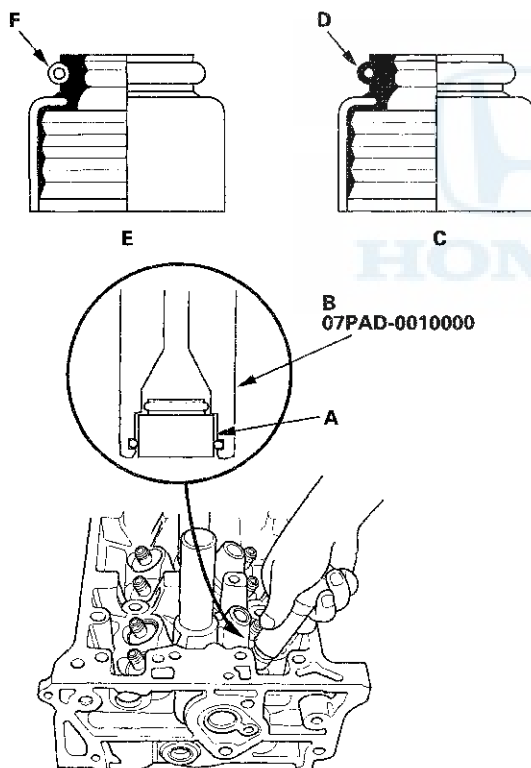
Valve, Spring, and Valve Seal Installation

Special Tools Required

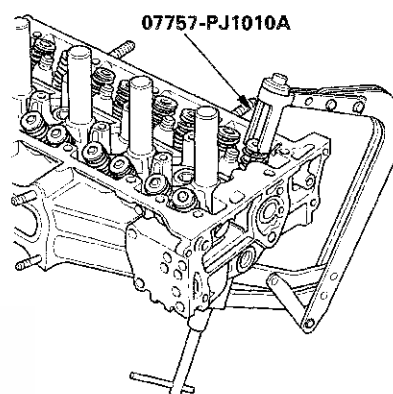
- Stem seal driver 07PAD-0010000
- Valve spring compressor attachment 07757-PJ1010A

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

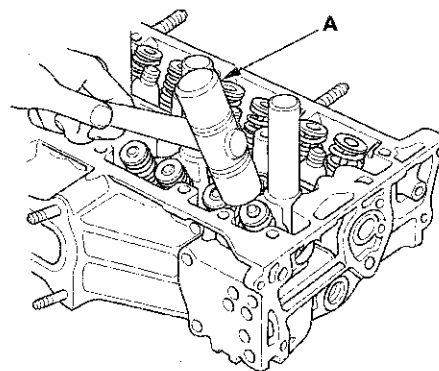
NOTE: The exhaust valve seal (C) has a black spring (D), and the intake valve seal (E) has a white spring (F). They are not interchangeable.



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



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



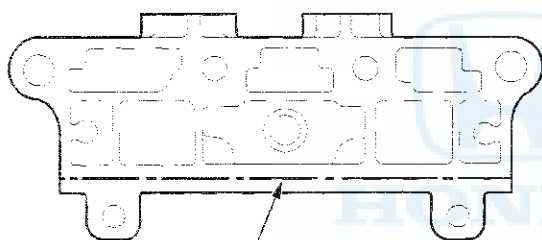


Rocker Arm Assembly Installation

1. Reassemble the rocker arm assembly (see page 6-82).
2. Clean and dry the No. 5 rocker shaft holder mating surface.
3. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the cylinder head mating surface of the No. 5 rocker shaft holder, and to the inside edge of the threaded bolt holes. Install the component within 5 minutes of applying the liquid gasket.

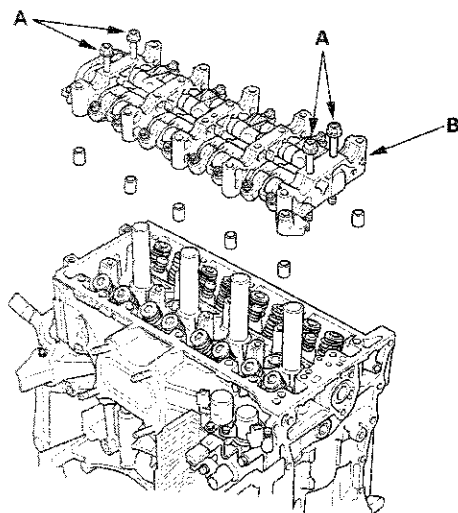
NOTE:

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



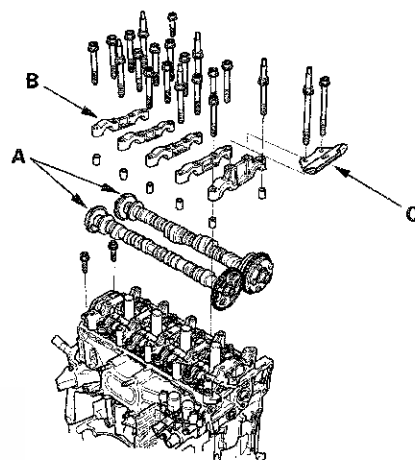
Apply liquid gasket along the broken line.

4. Insert the bolts (A) into the rocker shaft holder, then install the rocker arm assembly (B) on the cylinder head.



5. Remove the bolts from the rocker shaft holder.

6. Make sure the punch marks on the variable valve timing control (VTC) actuator and the exhaust camshaft sprocket are facing up, then set the camshafts (A) in the holder.



7. Set the camshaft holders (B) and cam chain guide (C) in place.
8. Tighten the bolts to the specified torque.

NOTE: If the engine does not have bolt ②①, skip it and continue the torque sequence.

Specified Torque

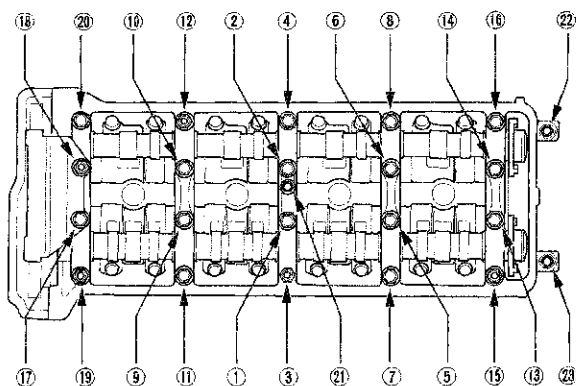
8 x 1.25 mm

22 N·m (2.2 kgf·m, 16 lbf·ft)

6 x 1.0 mm

12 N·m (1.2 kgf·m, 8.7 lbf·ft)

6 x 1.0 mm Bolts: ②①, ②②, ②③

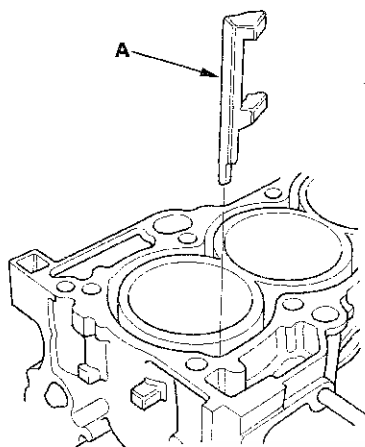


9. Install the cam chain (see page 6-64), then adjust the valve clearance (see page 6-58).

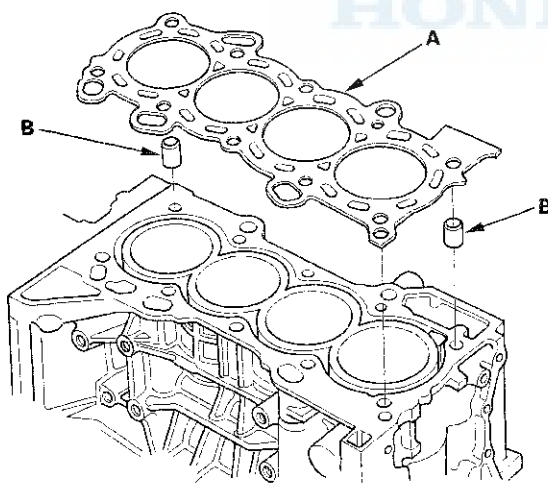
Cylinder Head

Cylinder Head Installation

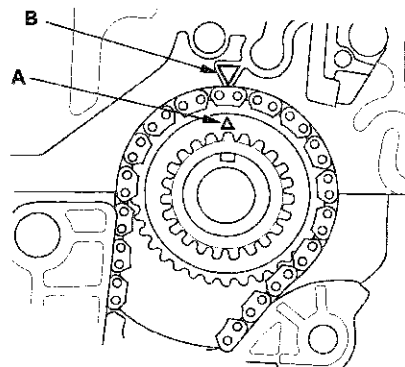
1. Install a new coolant separator (A) in the engine block whenever the engine block is replaced.



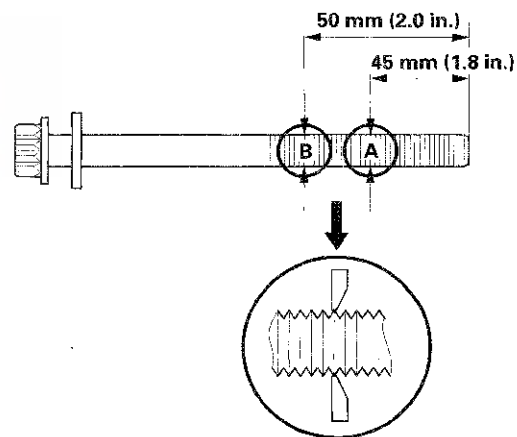
2. Clean the cylinder head and the engine block surface.
3. Install the new cylinder head gasket (A) and the dowel pins (B) on the engine block. Always use a new cylinder head gasket.



4. Set the crankshaft to top dead center (TDC). Align the TDC mark (A) on the crankshaft sprocket with the pointer (B) on the engine block.



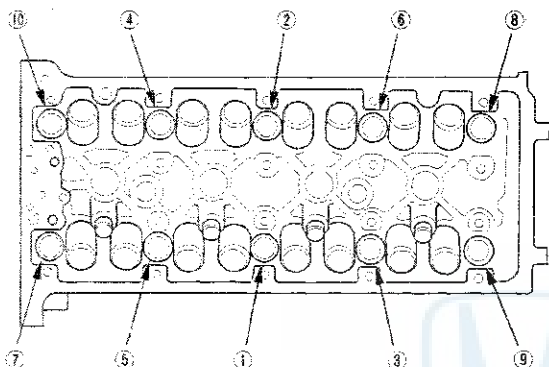
5. Install the cylinder head on the engine block.
6. Measure the diameter of each cylinder head bolt at point A and point B.



7. If either diameter is less than 10.6 mm (0.42 in.), replace the cylinder head bolt.

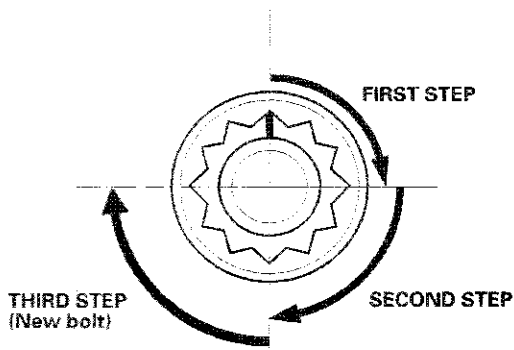


8. Apply new engine oil to the threads and under the bolt heads of all cylinder head bolts.
9. Tighten the cylinder head bolts in sequence to 39 N·m (4.0 kgf·m, 29 lbf·ft). Use a beam-type torque wrench. When using a preset click-type torque wrench, be sure to tighten slowly and do not overtighten. If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



10. After torquing, tighten all cylinder head bolts in two steps (90° per step) using the sequence shown in step 9. If you are using a new cylinder head bolt, tighten the bolt an extra 90°.

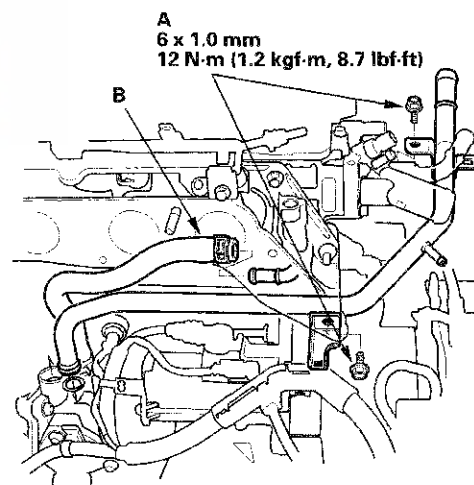
NOTE: Remove the cylinder head bolt if you tightened it beyond the specified angle, and go back to step 6 of the procedure. Do not loosen it back to the specified angle.



11. Install the rocker arm assembly (see page 6-93).
12. Install the cam chain (see page 6-64).
13. Connect the following engine wire harness connectors, and install the wire harness clamps to the cylinder head:

- Engine coolant temperature (ECT) sensor 1 connector
- Camshaft position (CMP) sensor A (Intake) connector
- Camshaft position (CMP) sensor B (Exhaust) connector
- Two rocker arm oil control solenoid connectors
- Two rocker arm oil pressure switch connectors
- Evaporative emission (EVAP) canister purge valve connector
- Variable valve timing control (VTC) oil control solenoid valve connector
- Engine oil pressure switch connector

14. Install the two bolts (A) securing the connecting pipe.



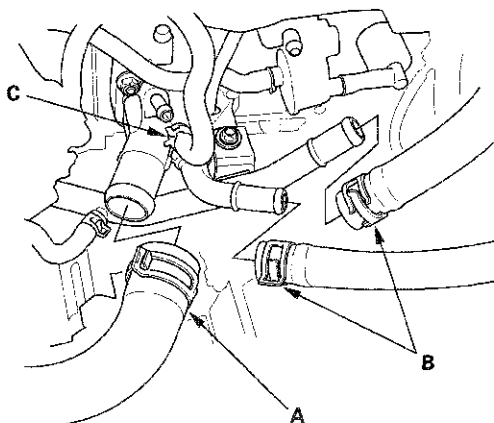
15. Connect the water bypass hose (B).

(cont'd)

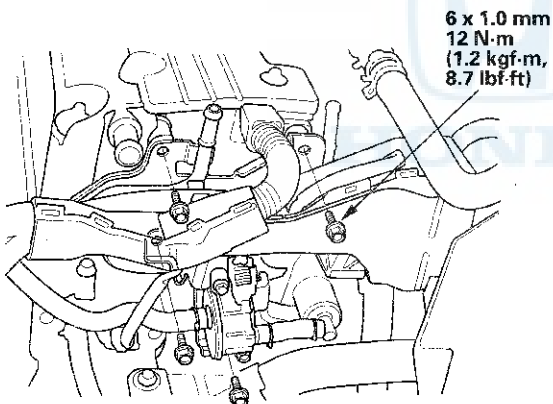
Cylinder Head

Cylinder Head Installation (cont'd)

16. Connect the upper radiator hose (A), the heater hoses (B), and the water bypass hose (C).

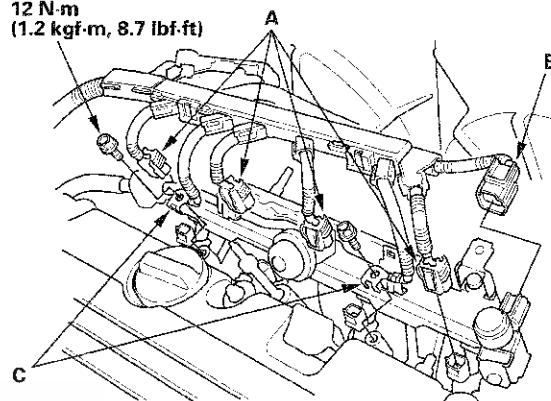


17. Install the four bolts securing the EVAP canister purge valve bracket.

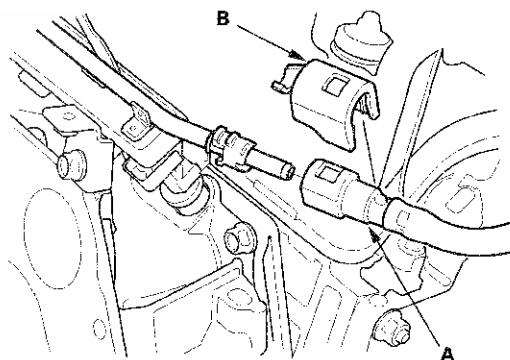


18. Connect the four fuel injector connectors (A), the engine mount control solenoid valve connector (B), and install the ground cables (C).

6 x 1.0 mm
12 N·m
(1.2 kgf·m, 8.7 lbf·ft)



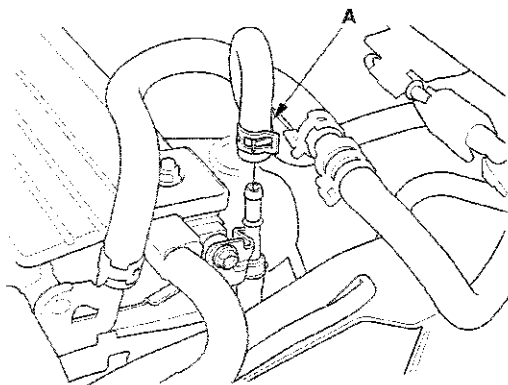
19. Connect the fuel feed hose (A) (see page 11-343), then install the quick-connect fitting cover (B).





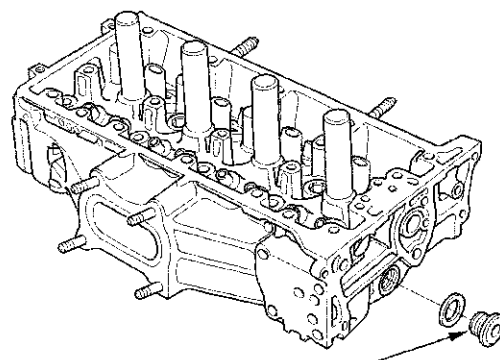
Sealing Bolt Installation

20. Connect the EVAP canister hose (A).



21. Install the catalytic converter (see page 11-367).
22. Install the intake manifold (see page 9-5).
23. Install the drive belt (see page 4-30).
24. Install the strut brace (if equipped) (see page 20-289).
25. After installation, check that all tubes, hoses, and connectors are installed correctly.
26. Inspect for fuel leaks. Turn the ignition switch to ON (II) (do not operate the starter) so the fuel pump runs for about 2 seconds and pressurizes the fuel line. Repeat this operation three times, then check for fuel leakage at any point in the fuel line.
27. Refill the radiator with engine coolant, and bleed the air from the cooling system with the heater valve open (see step 6 on page 10-6).
28. Check for fluid leaks.
29. Do the powertrain control module (PCM) idle lean procedure (see page 11-317).
30. Do the crankshaft position (CKP) pattern clear/CKP pattern lean procedure (see page 11-5).
31. Inspect the idle speed (see page 11-316).
32. Inspect the ignition timing (see page 4-19).

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



22 x 1.5 mm
74 N·m (7.5 kgf·m, 54 lbf·ft)

Navigation Tools: Click on the “Table of Contents”
below, or use the Bookmarks to the left.

Engine Mechanical

Engine Block

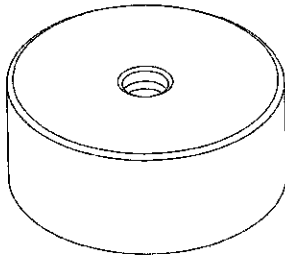
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Component Location Index	7-3
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Connecting Rod Bearing Replacement	7-9
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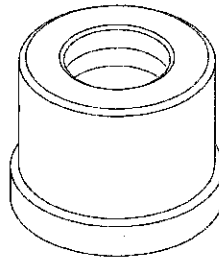
Engine Block

Special Tools

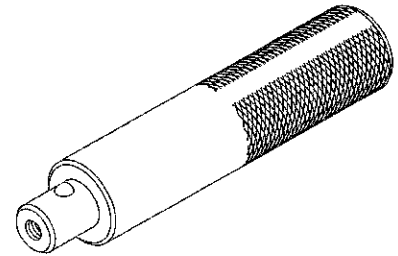
Ref. No.	Tool Number	Description	Qty
①	07ZAD-PNAA100	Oil Seal Driver Attachment 96	1
②	07746-0010700	Attachment, 24 x 26 mm	1
③	07749-0010000	Driver	1



①



②

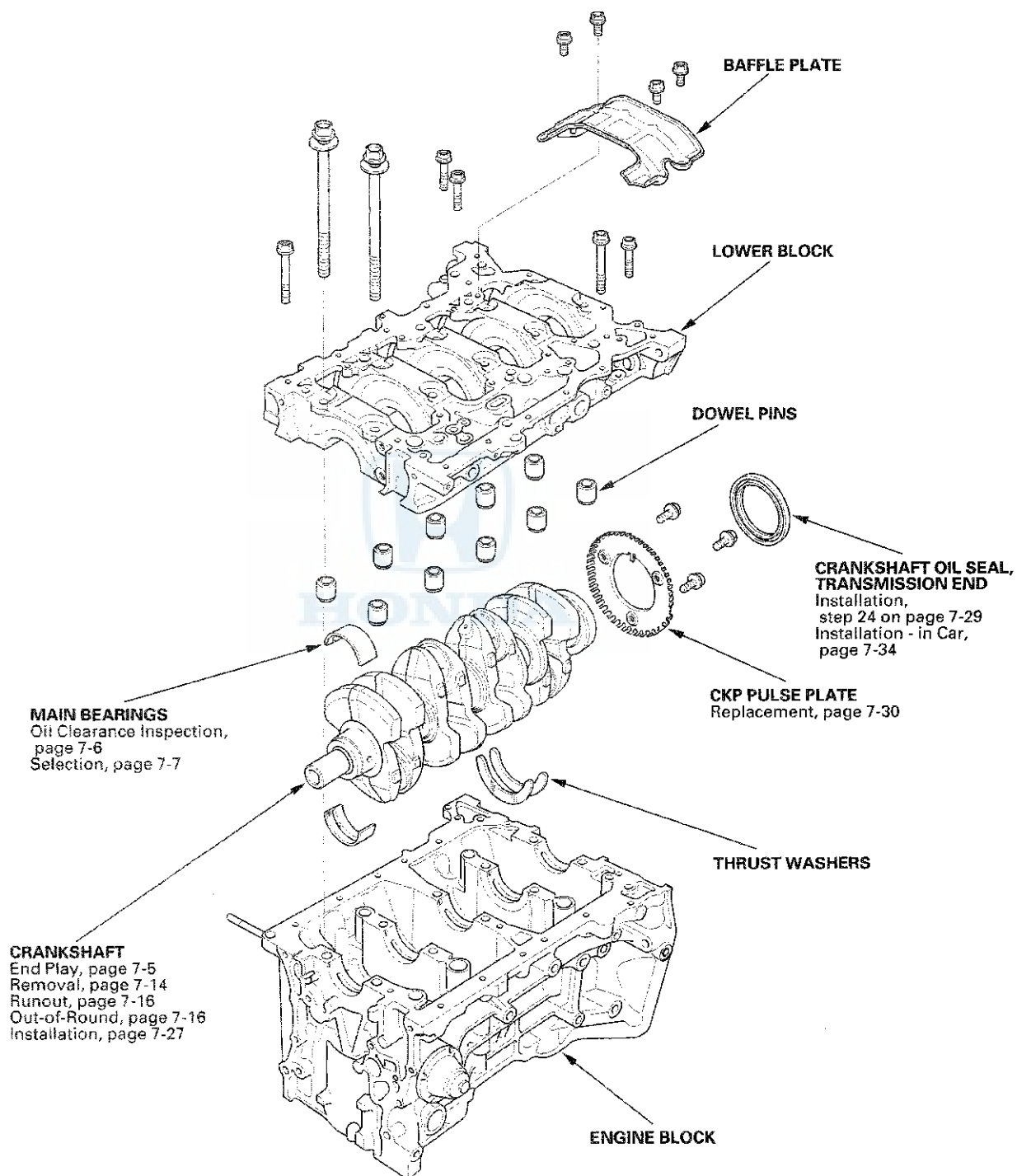


③





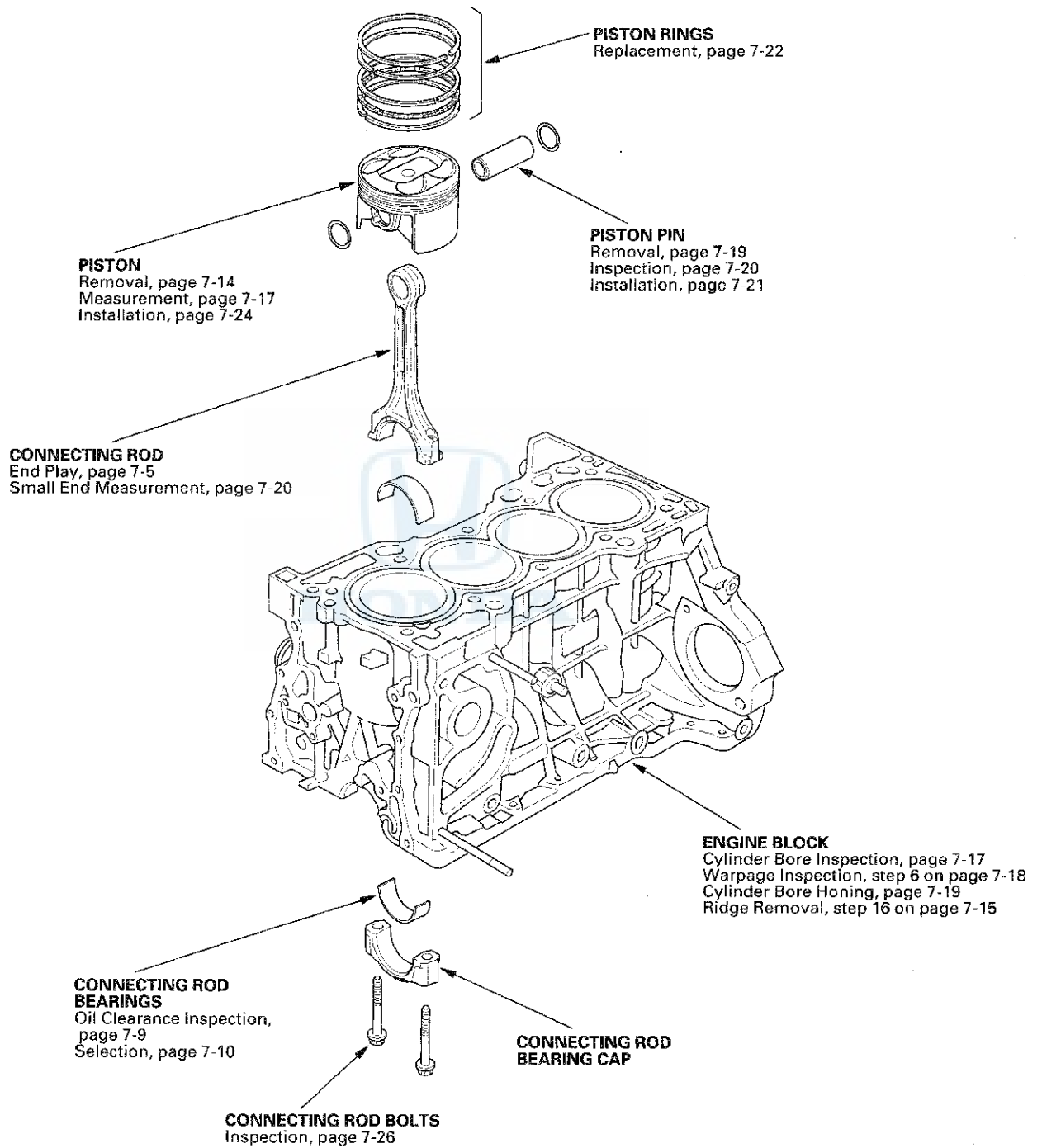
Component Location Index



(cont'd)

Engine Block

Component Location Index (cont'd)





Connecting Rod and Crankshaft End Play Inspection

1. Remove the oil pump (see page 8-14).
2. Remove the baffle plate (see step 8 on page 7-14).
3. Measure the connecting rod end play with a feeler gauge between the connecting rod and the crankshaft.

Connecting Rod End Play

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

Service Limit: 0.40 mm (0.016 in.)



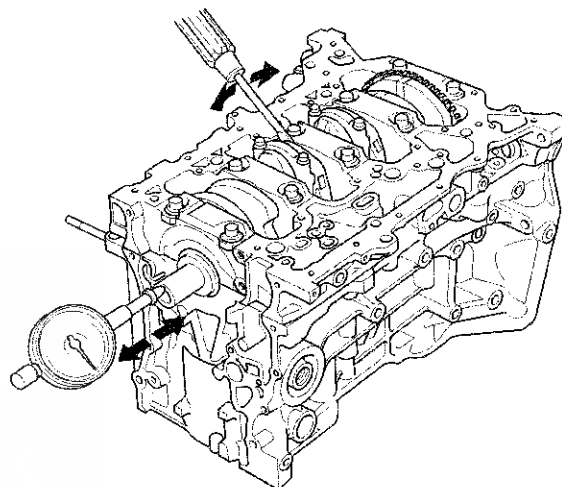
4. If the connecting rod end play is beyond the service limit, install a new connecting rod, and recheck. If it is still beyond the service limit, replace the crankshaft (see page 7-14).

5. Push the crankshaft firmly away from the dial indicator, and zero the dial against the end of the crankshaft. Then pull the crankshaft firmly back toward the indicator; the dial reading should not exceed the service limit.

Crankshaft End Play

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

Service Limit: 0.45 mm (0.018 in.)



6. If the end play is beyond the service limit, replace the thrust washers and recheck, if it is still beyond the service limit, replace the crankshaft (see page 7-14).

Engine Block

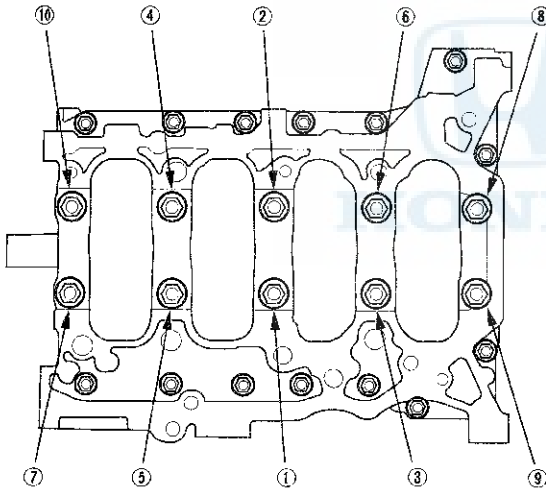
Crankshaft Main Bearing Replacement

Main Bearing Clearance Inspection

1. To check the main bearing-to-journal oil clearance, remove the lower block and the bearing halves (see page 7-14).
2. Clean each main journal and the bearing half with a clean shop towel.
3. Place one strip of plastigage across each main journal.
4. Reinstall the bearings and the lower block, then tighten the bolts to 29 N·m (3.0 kgf·m, 22 lbf·ft).

NOTE:

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



5. Tighten the bearing cap bolts an additional 48°.

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

Main Bearing-to-Journal Oil Clearance

No. 1, 2, 4, 5 Journals:

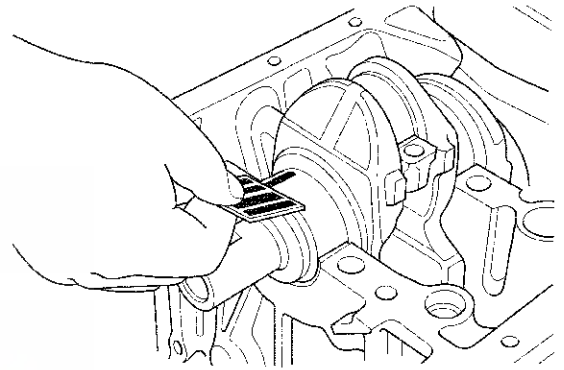
Standard (New): 0.017 — 0.041 mm
(0.0007 — 0.0016 in.)

Service Limit: 0.050 mm (0.0020 in.)

No. 3 Journal:

Standard (New): 0.025 — 0.049 mm
(0.0010 — 0.0019 in.)

Service Limit: 0.055 mm (0.0022 in.)



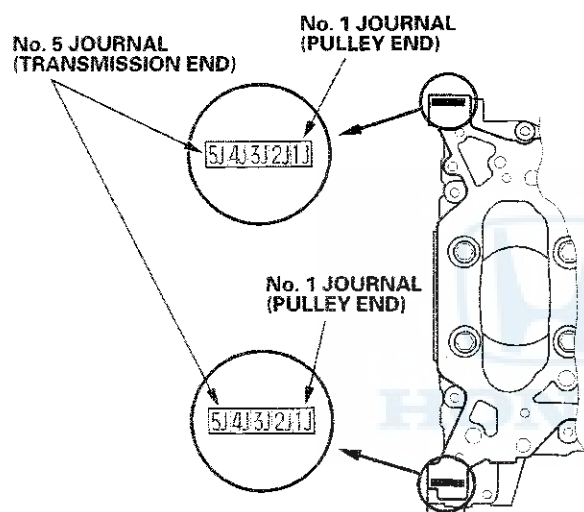
7. If the plastigage measures too wide or too narrow, remove the crankshaft, and remove the upper half of the bearing. Install a new, complete bearing with the appropriate color code(s), and recheck the clearance. Do not file, shim, or scrape the bearings or the caps to adjust clearance.
8. If the plastigage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



Main Bearing Selection

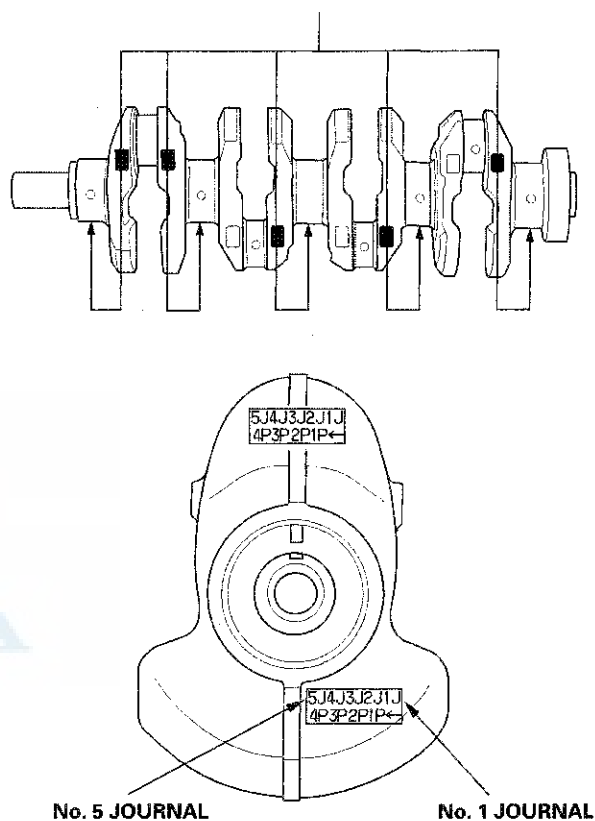
Crankshaft Bore Code Location

1. Numbers, letters, or bars have been stamped on the end of the engine block as a code for the size of each of the five main journal bores. Write down the crank bore codes.
If you cannot read the codes because of accumulated dirt and dust, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.



Main Journal Code Location

2. The main journal codes are stamped on the crankshaft in either location.



(cont'd)

Engine Block

Crankshaft Main Bearing Replacement (cont'd)

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

K24Z2 engine

Bearing Identification
Color code is on the edge of the bearing

		➔ Larger block bore			
		1 or A or I	2 or B or II	3 or C or III	4 or D or IIII
		➔ Smaller bearing (Thicker)			
Smaller main journal	1	Pink	Pink/Yellow	Yellow	Green
	2	Pink/Yellow	Yellow	Green	Green/Brown
	3	Yellow	Green	Green/Brown	Brown
	4	Green	Green/Brown	Brown	Black
	5	Green/Brown	Brown	Black	Black/Blue
	6	Brown	Black	Black/Blue	Blue

NOTE: When using bearing halves of different colors, it does not matter which color is used in the top or bottom.

K24Z3 engine

Bearing Identification
Color code is on the edge of the bearing

		➔ Larger block bore			
		1 or A or I	2 or B or II	3 or C or III	4 or D or IIII
		➔ Smaller bearing (Thicker)			
Smaller main journal	1	Red	Red/Pink	Pink	Yellow
	2	Red/Pink	Pink	Yellow	Yellow/Green
	3	Pink	Yellow	Yellow/Green	Green
	4	Yellow	Yellow/Green	Green	Brown
	5	Yellow/Green	Green	Brown	Brown/Black
	6	Green	Brown	Brown/Black	Black

NOTE: When using bearing halves of different colors, it does not matter which color is used in the top or bottom.



Connecting Rod Bearing Replacement

Connecting Rod Bearing Clearance Inspection

1. Remove the oil pump (see page 8-15).
2. Remove the baffle plate (see step 8 on page 7-14).
3. Remove the connecting rod cap and the bearing half.
4. Clean the crankshaft rod journal and the bearing half with a clean shop towel.
5. Place plastigage across the rod journal.
6. Reinstall the bearing half and the cap, and tighten the bolts to 41 N·m (4.2 kgf·m, 30 lbf·ft) +120°

NOTE:

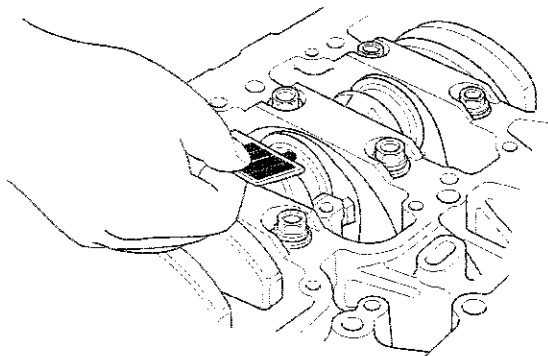
- Apply new engine oil to the bolt threads and flanges.
- Do not rotate the crankshaft during inspection.

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

Connecting Rod Bearing-to-Journal Oil Clearance

Standard (New): 0.032—0.066 mm
(0.0013—0.0026 in.)

Service Limit: 0.077 mm (0.0030 in.)



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

(cont'd)

Engine Block

Connecting Rod Bearing Replacement (cont'd)

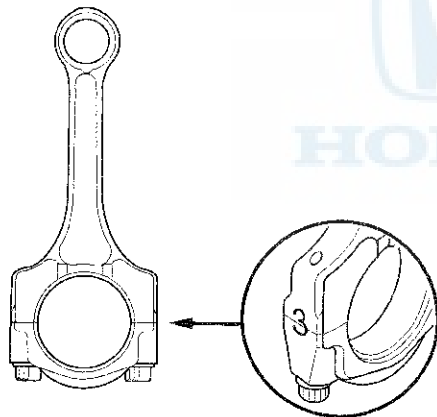
Connecting Rod Bearing Selection

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

Connecting Rod Big End Bore Code Locations

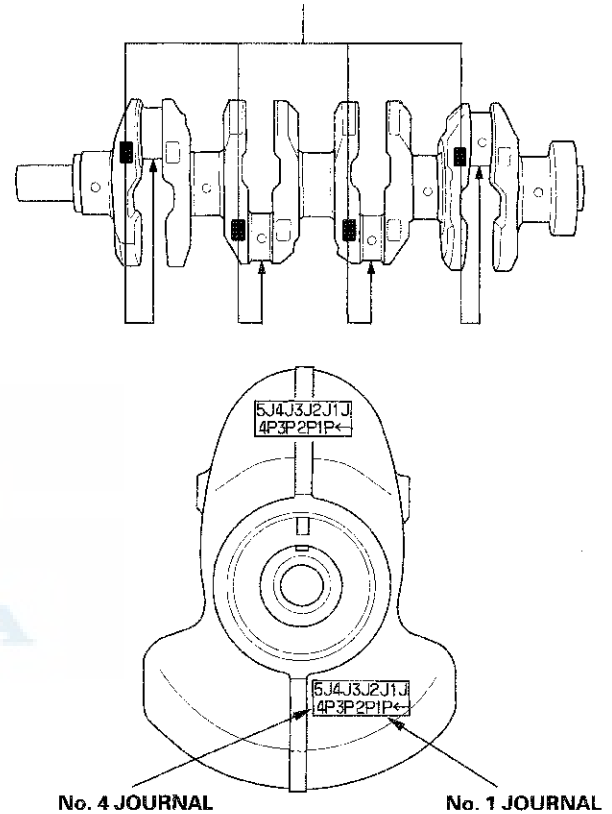
2. Each connecting rod has a tolerance range from 0 to 0.024 mm (0.0009 in.), in 0.006 mm (0.0002 in.) increments, depending on the size of its big end bore. It is then stamped with a number or bar (1, 2, 3, or 4/I, II, III, or IIII) indicating the range. You may find any combination of numbers and bars in any engine. (Half the number or bar is stamped on the bearing cap, the other half is on the rod.) If you cannot read the code because of an accumulation of oil and varnish, do not scrub it with a wire brush or scraper. Clean it only with solvent or detergent.

Normal Bore Size: 51.0 mm (2.01 in.)



Connecting Rod Journal Code Location

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





Oil Pan Removal

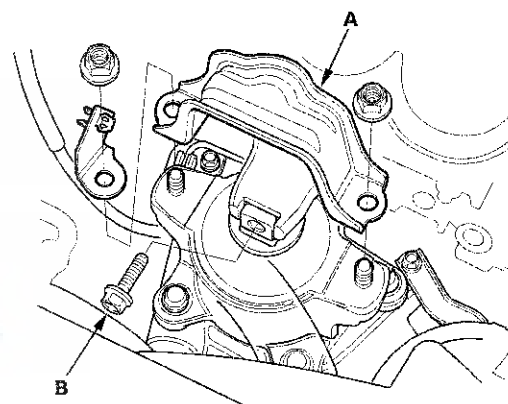
4. Use the big end bore codes and rod journal codes to select appropriate replacement bearings from the following table.

Bearing Identification
Color code is on the edge of the bearing

		Larger big end bore			
		1 or I	2 or II	3 or III	4 or IIII
		Smaller bearing (Thicker)			
Smaller rod journal	A	Red	Pink	Pink/Yellow	Yellow
	B	Pink	Yellow	Yellow/Green	Green
	C	Yellow	Green	Green/Brown	Brown
	D	Green	Brown	Brown/Black	Black
		Smaller bearing (Thinner)			

NOTE: When using bearing halves of different colors, it does not matter which color is used in the top or bottom.

1. If the engine is already out of the vehicle, go to step 19.
2. Remove the strut brace (if equipped) (see page 20-289).
3. Do the battery removal procedure (see page 22-90).
4. Remove the air cleaner assembly (see page 11-359).
5. Remove the harness clamps, then remove the battery base (see step 8 on page 5-3).
6. Remove the front engine mount stop (A), then remove the front engine mount bolt (B).



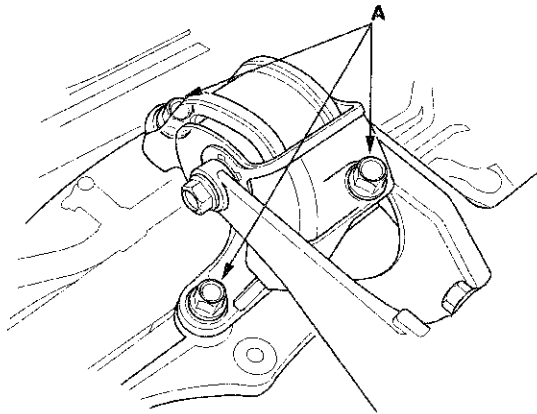
(cont'd)

Engine Block

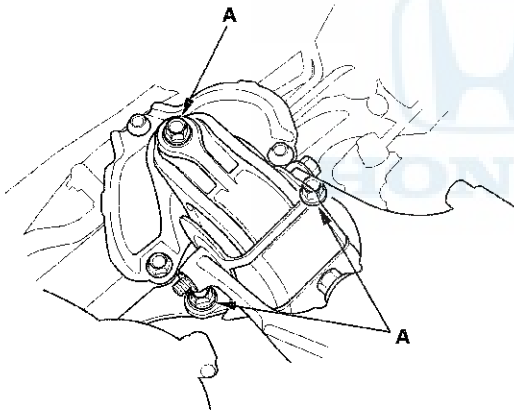
Oil Pan Removal (cont'd)

7. Loosen the rear engine mount mounting bolts (A).

M/T model

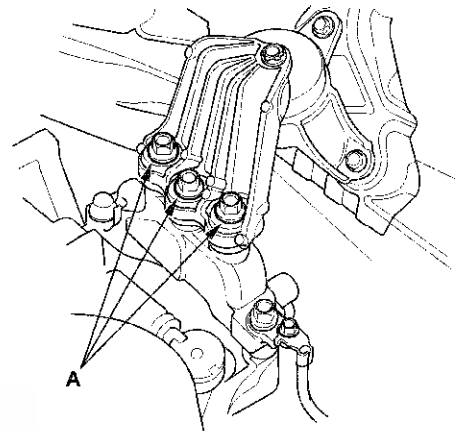


A/T model

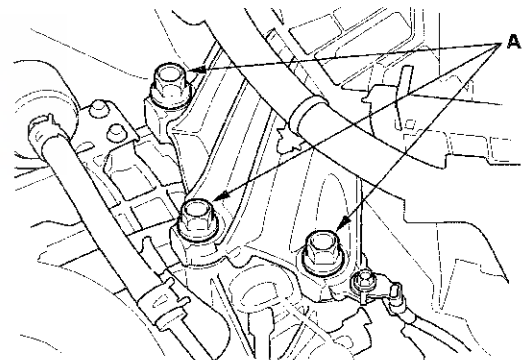


8. Loosen the upper transmission mount bracket mounting bolts (A).

M/T model

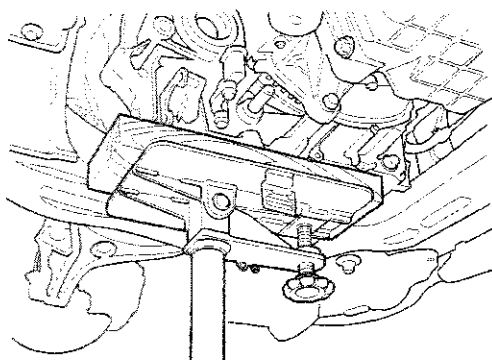


A/T model

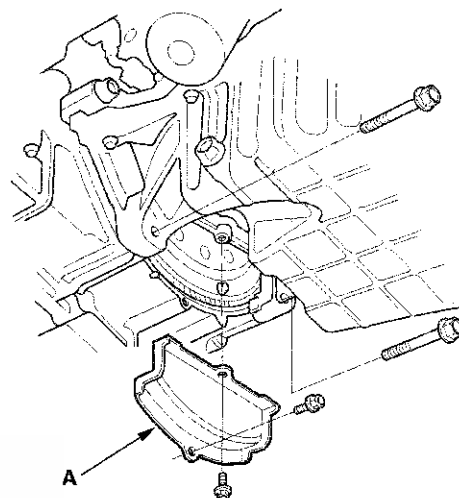




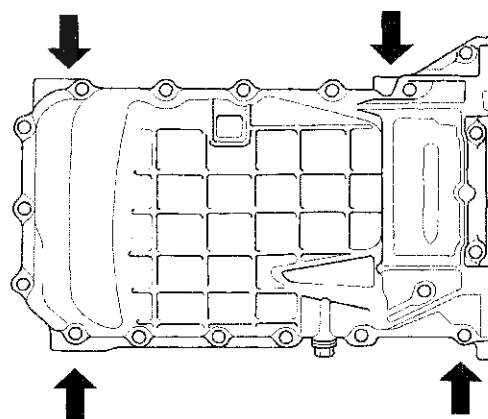
9. Raise the vehicle on the lift.
10. Remove the left front wheel.
11. Remove the splash shield (see step 25 on page 5-5).
12. Drain the engine oil (see page 8-9).
13. Separate the left side knuckle from the lower arm (see step 5 on page 18-21).
14. Remove the left side damper fork (see step 3 on page 18-21).
15. Remove the left side driveshaft (see page 16-4). Coat all precision-finished surface with new engine oil. Tie a plastic bag over the driveshaft end.
16. Remove the nuts securing the lower transmission mount (see step 49 on page 5-9).
17. A/T model: Remove the shift cable bracket.
 - Saitama Factory produced models (see step 44 on page 14-238).
 - Marysville, Ohio Factory produced models (see step 46 on page 14-239).
18. Use a transmission jack to lift the transmission 30—40 mm (1.2—1.6 in.).



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



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

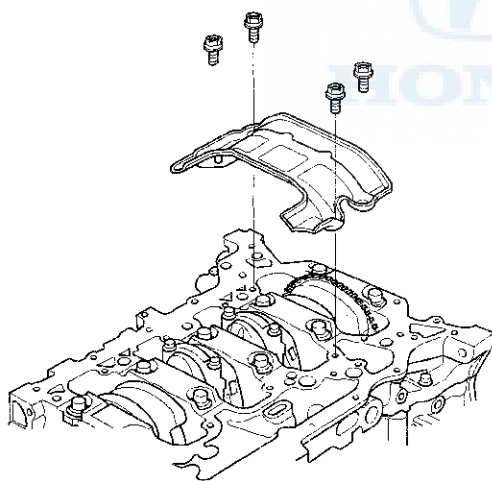


22. Remove the oil pan.

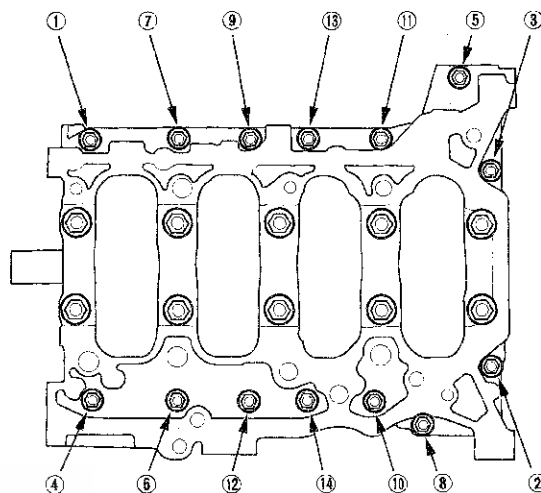
Engine Block

Crankshaft and Piston Removal

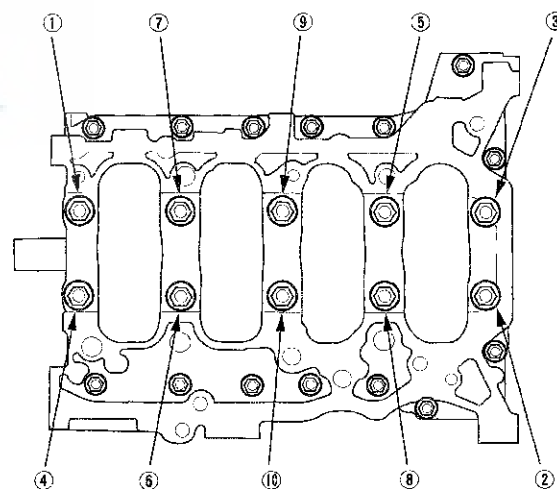
1. Remove the engine/transmission (see page 5-3).
2. Remove the transmission:
 - Manual transmission (see page 13-7)
 - Automatic transmission (see page 14-232)
3. M/T model: Remove the flywheel (see step 17 on page 12-19).
4. A/T model: Remove the drive plate (see page 14-257).
5. Remove the oil pan (see page 7-11).
6. Remove the oil pump (see page 8-15).
7. Remove the cylinder head:
 - All models except PZEV (see page 6-27)
 - PZEV model (see page 6-76)
8. Remove the baffle plate.



9. Remove the 8 mm bolts.

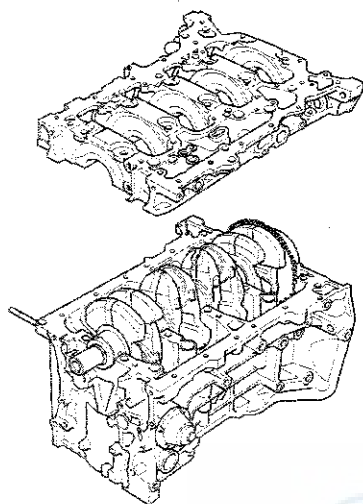


10. Remove the bearing cap bolts. To prevent warpage, loosen the bolts in sequence 1/3 turn at a time; repeat the sequence until all bolts are loosened.

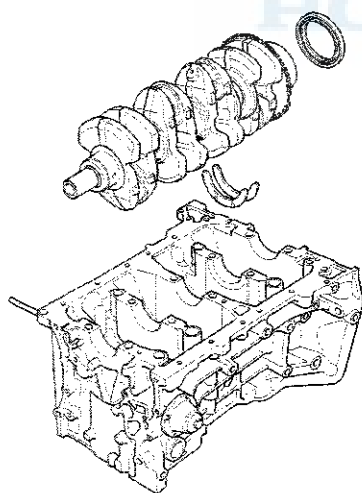




11. Remove the lower block and the bearings. Keep all the bearings in order.

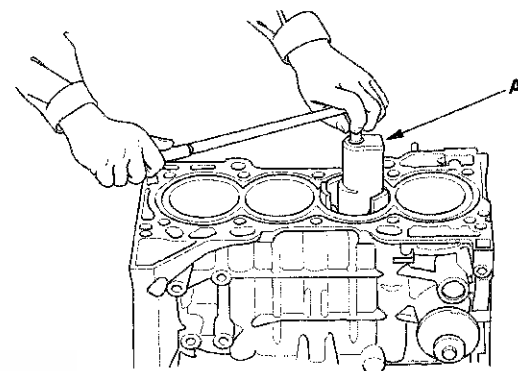


12. Remove the rod caps/bearings. Keep all the caps/bearings in order.
13. Lift the crankshaft out of the engine. Be careful not to damage the journals and the CKP pulse plate.

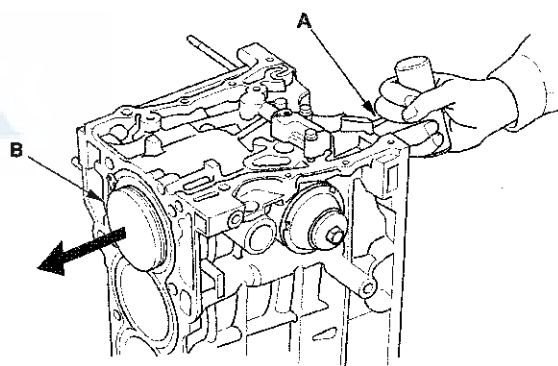


14. Remove the CKP pulse plate from the crankshaft (see page 7-30).
15. Remove the upper bearing halves from the connecting rods, and set them aside with their respective caps.

16. If you can feel a ridge of metal or hard carbon around the top of each cylinder, remove it with a ridge reamer (A). Follow the reamer manufacturer's instructions. If the ridge is not removed, it may damage the pistons as they are pushed out.



17. Use the wooden handle of a hammer (A) to drive out the piston/connecting rod assembly (B).



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

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

Engine Block

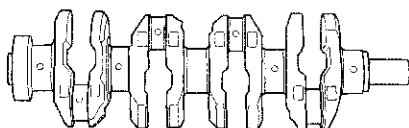
Crankshaft Inspection

Out-of-Round and Taper

1. Remove the crankshaft from the engine block (see page 7-14).
2. Remove the CKP pulse plate from the crankshaft (see page 7-30).
3. Clean the crankshaft oil passages with pipe cleaners or a suitable brush.
4. Clean the keyway and threads, and check for damage.
5. Measure the out-of-round at the middle of each rod and the main journal in two places. The difference between measurements on each journal must not be more than the service limit.

Journal Out-of-Round

Standard (New): 0.004 mm (0.0002 in.) max.
Service Limit: 0.010 mm (0.0004 in.)



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

Journal Taper

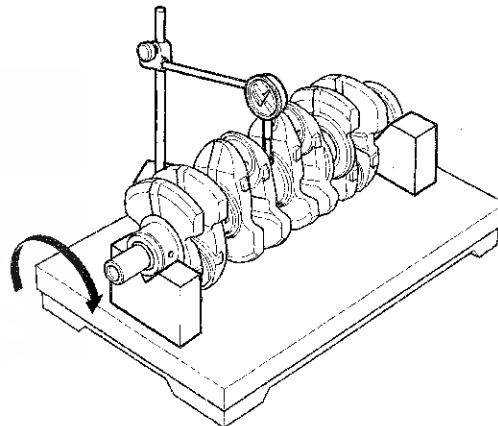
Standard (New): 0.005 mm (0.0002 in.) max.
Service Limit: 0.010 mm (0.0004 in.)

Straightness

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

Crankshaft Total Runout

Standard (New): 0.03 mm (0.0012 in.) max.
Service Limit: 0.04 mm (0.0016 in.)





Block and Piston Inspection

1. Remove the crankshaft and the pistons (see page 7-14).
2. Check the piston for distortion or cracks.
3. Measure the piston diameter at a point 13 mm (0.5 in.) from the bottom of the skirt. There are two standard-size pistons (No Letter or A, and B). The letter is stamped on the top of the piston. Letters are also stamped on the engine block as the cylinder bore sizes.

Piston Skirt Diameter

Standard (New):

No Letter (or A): 86.980–86.990 mm
(3.4244–3.4248 in.)

B: 86.970–86.980 mm
(3.4240–3.4244 in.)

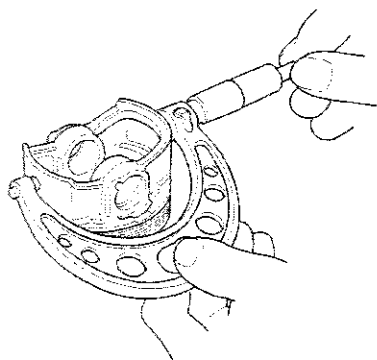
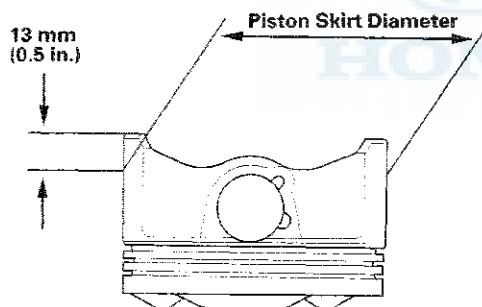
Service Limit:

No Letter (or A): 86.930 mm (3.4224 in.)

B: 86.920 mm (3.4220 in.)

Oversize Piston Skirt Diameter

0.25: 87.230–87.240 mm (3.4342–3.4346 in.)



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

Cylinder Bore Size

Standard (New):

A or I: 87.010–87.020 mm
(3.4256–3.4260 in.)

B or II: 87.000–87.010 mm
(3.4252–3.4256 in.)

Service Limit: 87.070 mm (3.4279 in.)

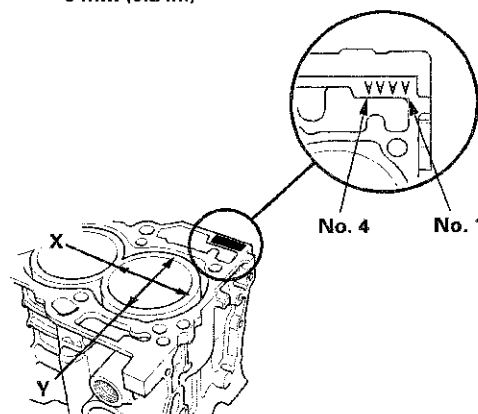
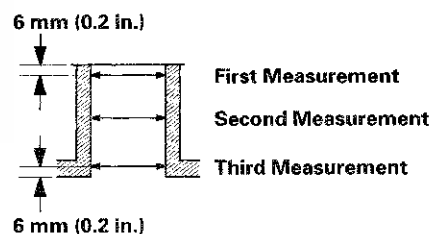
Oversize Bore

0.25: 87.250–87.260 mm (3.4350–3.4354 in.)

Reboring Limit: 0.25 mm (0.01 in.) max.

Bore Taper

Limit (Difference between first and third measurement): 0.02 mm (0.0008 in.)



(cont'd)

Engine Block

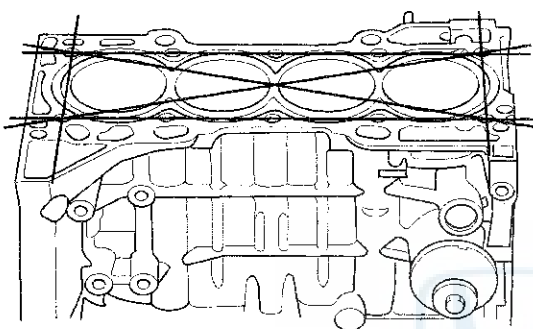
Block and Piston Inspection (cont'd)

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

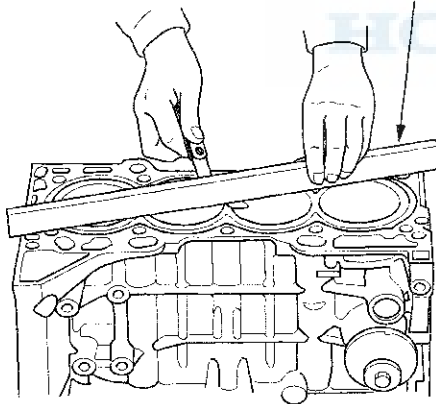
Engine Block Warpage

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

Service Limit: 0.10 mm (0.004 in.)



PRECISION STRAIGHT EDGE



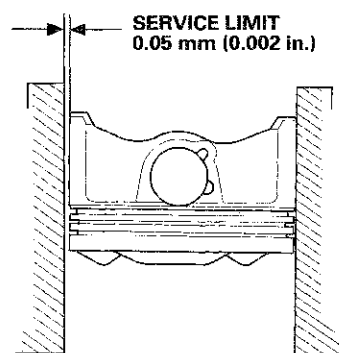
7. Calculate the difference between the cylinder bore diameter and the piston diameter. If the clearance is near or exceeds the service limit, inspect the piston and cylinder bore for excessive wear.

Piston-to-Cylinder Bore Clearance

Standard (New): 0.020—0.040 mm

(0.0008—0.0016 in.)

Service Limit: 0.05 mm (0.002 in.)

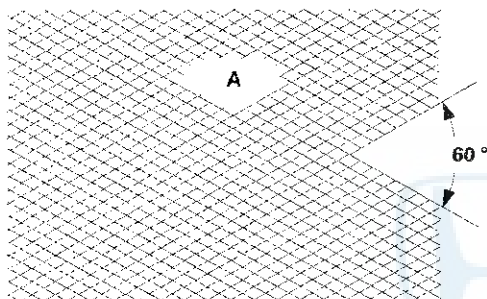




Cylinder Bore Honing

Only a scored or scratched cylinder bore must be honed.

1. Measure the cylinder bores (see page 7-17). If the engine block is to be reused, hone the cylinders, and remeasure the bores.
2. Remove the oil jets (see page 8-13).
3. Hone the cylinder bores with honing oil and a fine (400 grit) stone in a 60 degree cross-hatch pattern (A). 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.



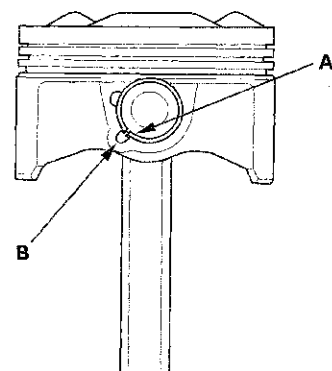
4. When honing is complete, thoroughly clean the engine block of all metal particles. Wash the cylinder bores with hot soapy water, then dry and oil them immediately to prevent rusting. Never use solvent, it will only redistribute the grit on the cylinder walls.
5. If scoring or scratches are still present in the cylinder bores after honing the engine block to the service limit, rebore the engine block. Some light vertical scoring and scratching is acceptable if it is not deep enough to catch your fingernail, and does not run the full length of the bore.
6. Install the oil jets (see page 8-13).

Piston, Pin, and Connecting Rod Replacement

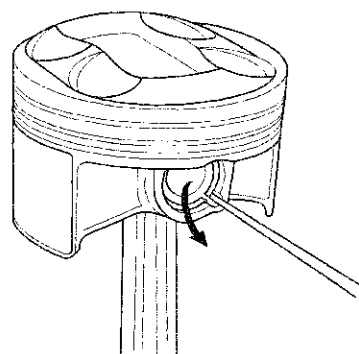
Disassembly

1. Remove the piston from the engine block (see page 7-14).
2. Apply new engine oil to the piston pin snap rings (A), and turn them in the ring grooves until the end gaps are lined up with the cutouts in the piston pin bores (B).

NOTE: Take care not to damage the ring grooves.



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



(cont'd)

Engine Block

Piston, Pin, and Connecting Rod Replacement (cont'd)

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



Inspection

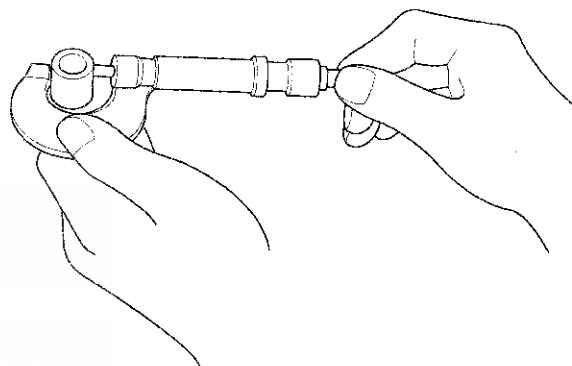
NOTE: Inspect the piston, the piston pin, and the connecting rod when they are at room temperature.

1. Measure the diameter of the piston pin.

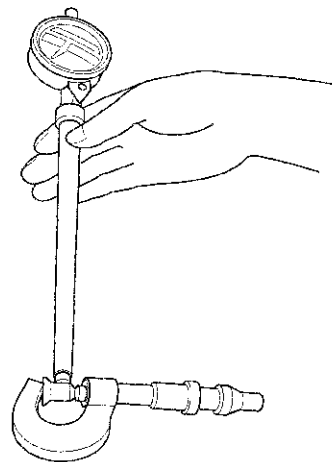
Piston Pin Diameter

Standard (New): 21.961—21.965 mm
(0.8646—0.8648 in.)

Service Limit: 21.953 mm (0.8643 in.)



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



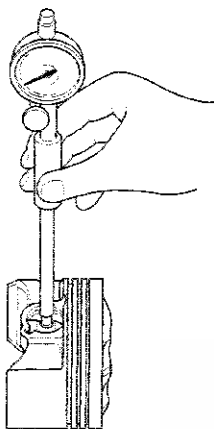


3. Check the difference between the piston pin diameter and the piston pin hole diameter in the piston.

Piston Pin-to-Piston Clearance

Standard (New): -0.005 to $+0.002$ mm
(-0.00020 to $+0.00008$ in.)

Service Limit: 0.005 mm (0.0002 in.)

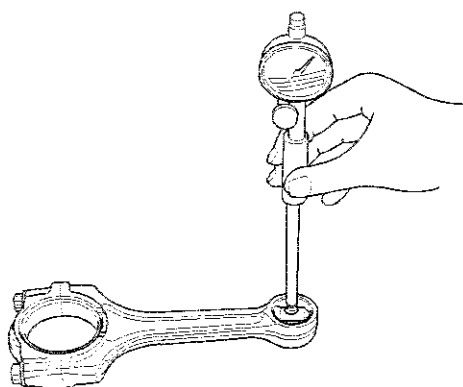


4. Measure the piston pin-to-connecting rod clearance.

Piston Pin-to-Connecting Rod Clearance

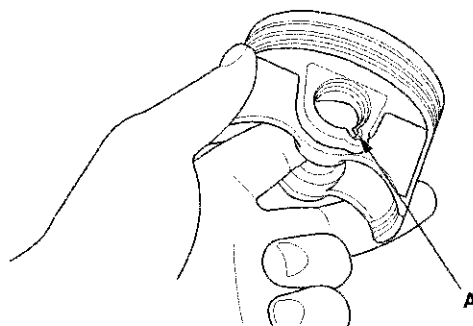
Standard (New): 0.005 — 0.015 mm
(0.0002 — 0.0006 in.)

Service Limit: 0.02 mm (0.0008 in.)



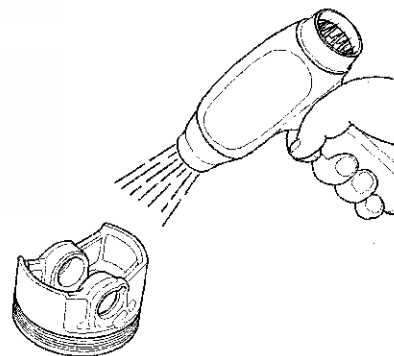
Reassembly

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



2. Coat the piston pin bore in the piston, the bore in the connecting rod, and the piston pin with new engine oil.

3. Heat the piston to about 158°F (70°C).

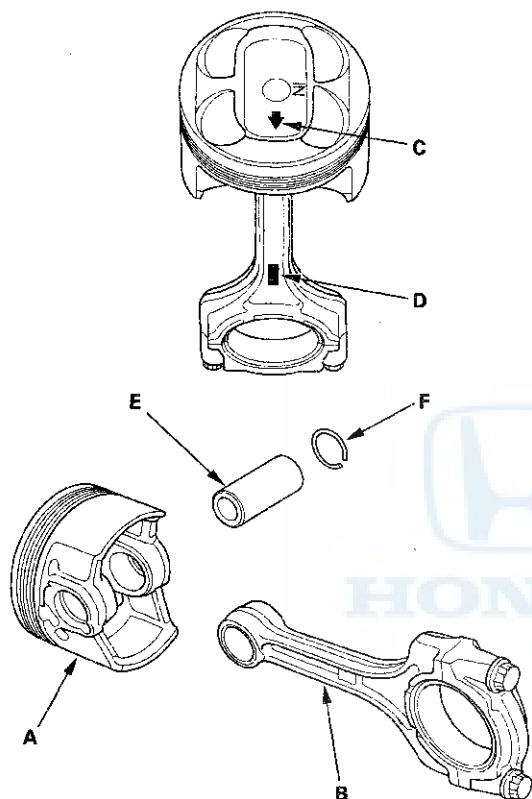


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Engine Block

Piston, Pin, and Connecting Rod Replacement (cont'd)

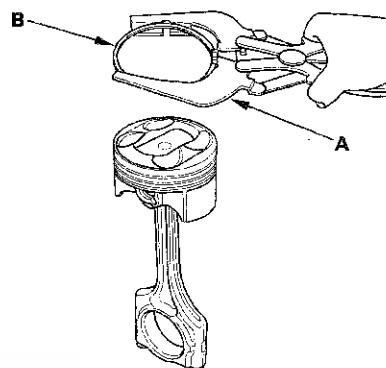
4. Assemble the piston (A) and the connecting rod (B) with the arrow (C) and the embossed mark (D) on the same side. Install the piston pin (E).



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

Piston Ring Replacement

1. Remove the piston from the engine block (see page 7-14).
2. Using a ring expander (A), remove the old piston rings (B).

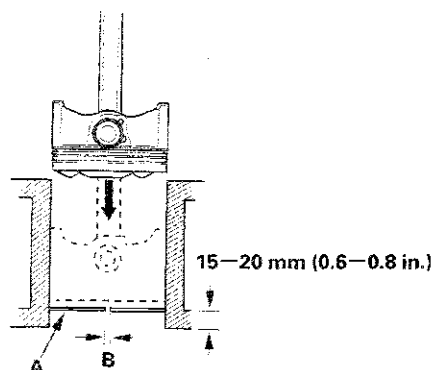


3. Clean all ring grooves thoroughly with a squared-off broken ring or ring groove cleaner with a blade to fit the piston grooves. The top and 2nd ring grooves are 1.2 mm (0.05 in.) wide. The oil ring groove is 2.0 mm (0.08 in.) wide. File down a blade if necessary. Do not use a wire brush to clean the ring grooves, or cut the ring grooves deeper with the cleaning tools.

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



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



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

- If the gap is too small, check to see if you have the proper rings for your engine.
- If the gap is too large, recheck the cylinder bore diameter against the wear limits (see page 7-17). If the bore is beyond the service limit, the engine block must be rebored.

Piston Ring End-Gap

Top Ring:

Standard (New): 0.20–0.35 mm

(0.008–0.014 in.)

Service Limit: 0.60 mm (0.024 in.)

Second Ring:

Standard (New): 0.50–0.65 mm

(0.020–0.026 in.)

Service Limit: 0.70 mm (0.028 in.)

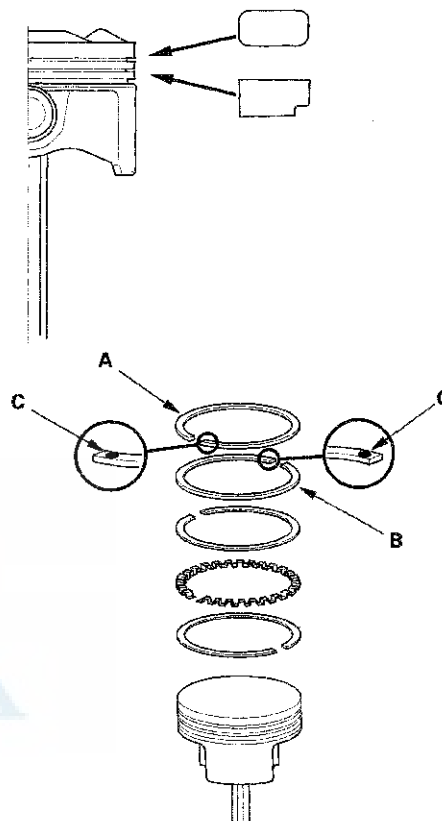
Oil Ring:

Standard (New): 0.20–0.70 mm

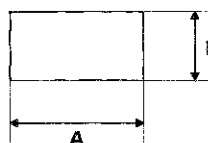
(0.008–0.028 in.)

Service Limit: 0.75 mm (0.030 in.)

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



Piston Ring Dimensions



Top Ring (Standard):

A: 2.7 mm (0.11 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.)

(cont'd)

Engine Block

Piston Ring Replacement (cont'd)

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

Top Ring Clearance

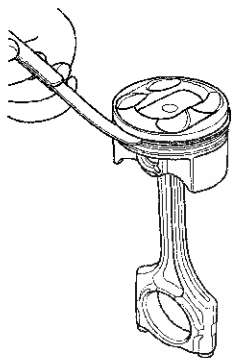
Standard (New): 0.060—0.085 mm
(0.0024—0.0033 in.)

Service Limit: 0.13 mm (0.005 in.)

Second Ring Clearance

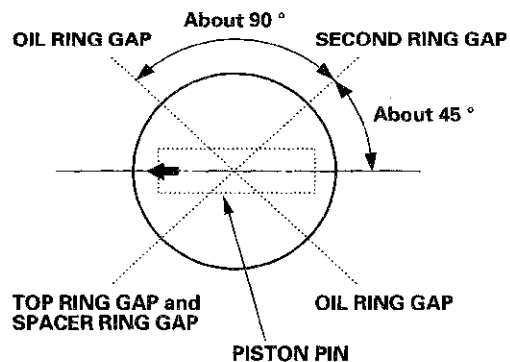
Standard (New): 0.040—0.065 mm
(0.0016—0.0026 in.)

Service Limit: 0.13 mm (0.005 in.)



8. Rotate the rings in their grooves to make sure they do not bind.

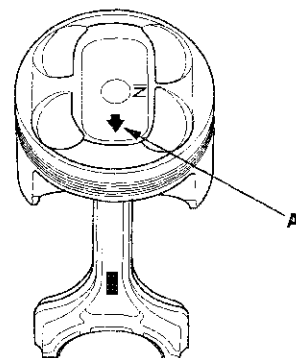
9. Position the ring end gaps as shown:



Piston Installation

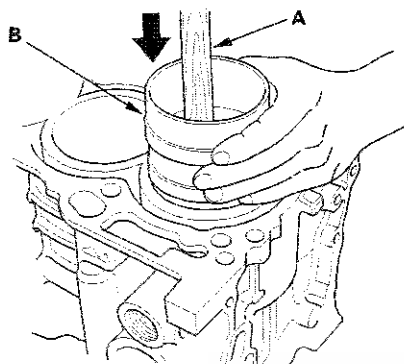
If the Crankshaft is Already Installed

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





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



6. Stop after the ring compressor pops free, and check the connecting rod-to-rod journal alignment before pushing the piston into place.

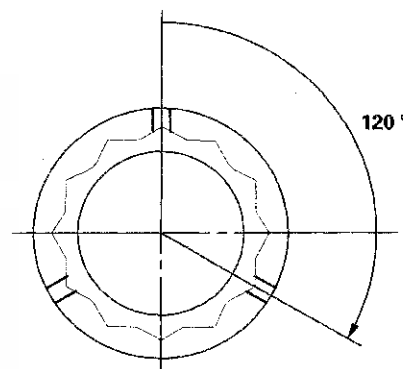
7. Check the connecting rod bearing clearance with plastigage (see page 7-9).

8. Inspect the connecting rod bolts (see page 7-26).

9. Apply new engine oil to the bolt threads, then install the connecting rod caps with bearings. Tighten the bolts to 41 N·m (4.2 kgf·m, 30 lbf·ft).

10. Tighten the connecting rod bolts an additional 120°.

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



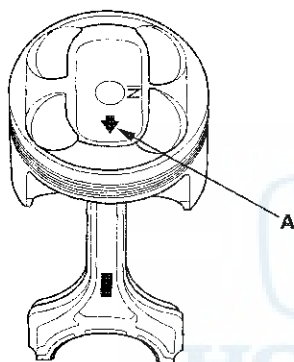
(cont'd)

Engine Block

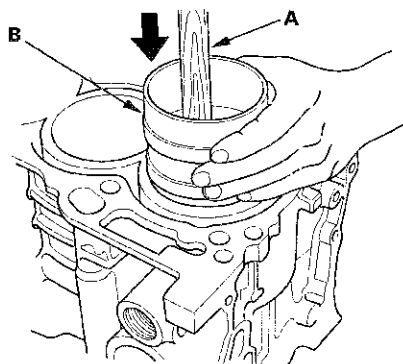
Piston Installation (cont'd)

If the Crankshaft is Not Installed

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



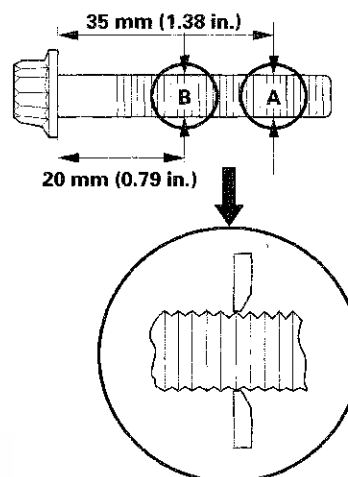
4. Position the piston in the cylinder, and tap it in using the wooden handle of a hammer (A). Push down on the ring compressor (B) to prevent the rings from expanding before entering the cylinder bore.



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

Connecting Rod Bolt Inspection

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



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

Point A — Point B = Difference in Diameter

Difference in Diameter

Specification: 0—0.1 mm (0—0.004 in.)

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

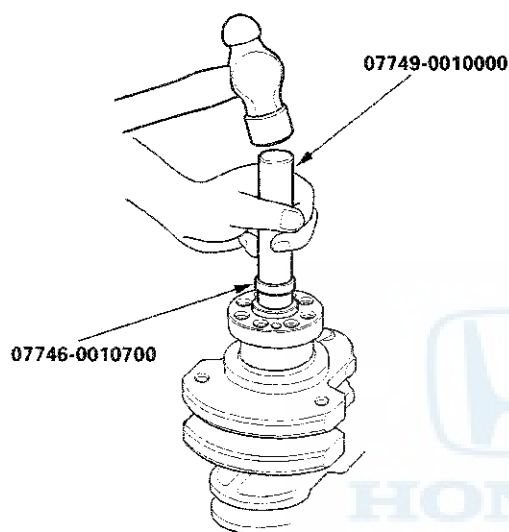


Crankshaft Installation

Special Tools Required

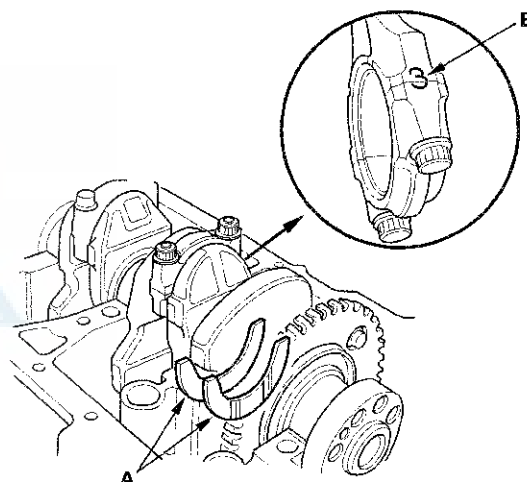
- Driver 07749-0010000
- Attachment, 24 x 26 mm 07746-0010700
- Oil seal driver attachment 96 07ZAD-PNAA100

1. M/T model: Install the crankshaft end bushing when replacing the crankshaft. Using the driver and the attachment, 24 x 26 mm, drive in the crankshaft end bushing until the driver and the attachment bottom against the crankshaft.



2. Check the connecting rod bearing clearance with plastigage (see page 7-9).
3. Check the main bearing clearance with plastigage (see page 7-6).

4. Install the bearing halves in the engine block and the connecting rods.
5. Apply a coat of new engine oil to the main bearings and the rod bearings.
6. Install the CKP pulse plate to the crankshaft (see page 7-30).
7. Hold the crankshaft so rod journal No. 2 and rod journal No. 3 are straight up, and lower the crankshaft into the engine block. Be careful not to damage the journals and the CKP pulse plate.
8. Apply new engine oil to the thrust washer surfaces. Install the thrust washers (A) in the No. 4 journal of the engine block.



9. Inspect the connecting rod bolts (see page 7-26).
10. Apply new engine oil to the threads of the connecting rod bolts.
11. Seat the rod journals into connecting rod No. 1 and connecting rod No. 4. Line up the mark (B) on the connecting rod and the cap, then install the caps and bolts finger-tight.
12. Rotate the crankshaft clockwise, and seat the journals into connecting rod No. 2 and connecting rod No. 3. Line up the mark on the connecting rod and the cap, then install the caps and bolts finger-tight.

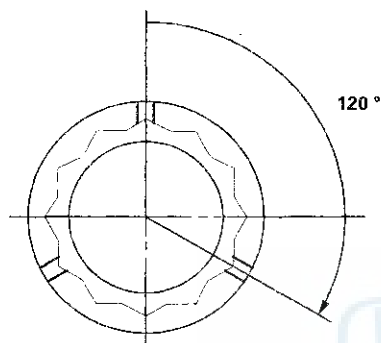
(cont'd)

Engine Block

Crankshaft Installation (cont'd)

13. Tighten the connecting rod bolts to 41 N·m (4.2 kgf·m, 30 lbf·ft).
14. Tighten the connecting rod bolts an additional 120°.

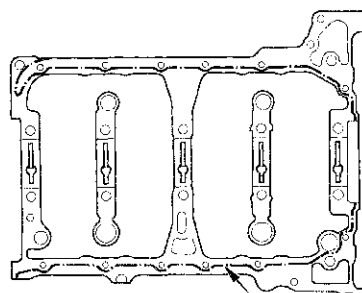
NOTE: Remove the connecting rod bolt if you tightened it beyond the specified angle, and go back to step 9 of the procedure. Do not loosen it back to the specified angle.



15. Remove all of the old liquid gasket from the lower block mating surfaces, the bolts, and the bolt holes.
16. Clean and dry the lower block mating surfaces.
17. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the engine block mating surface of the lower block, and to the inside edge of the threaded bolt holes. Install the component within 5 minutes of applying the liquid gasket.

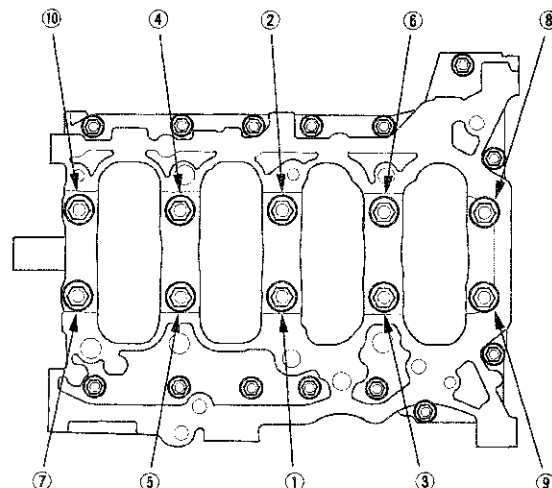
NOTE:

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

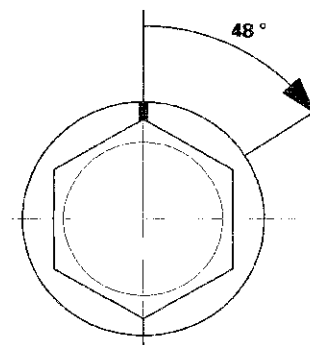


Apply liquid gasket along the broken line.

18. Put the lower block on the engine block.
19. Apply new engine oil to the threads of the bearing cap bolts. Tighten the bearing cap bolts in sequence, to 29 N·m (3.0 kgf·m, 22 lbf·ft).

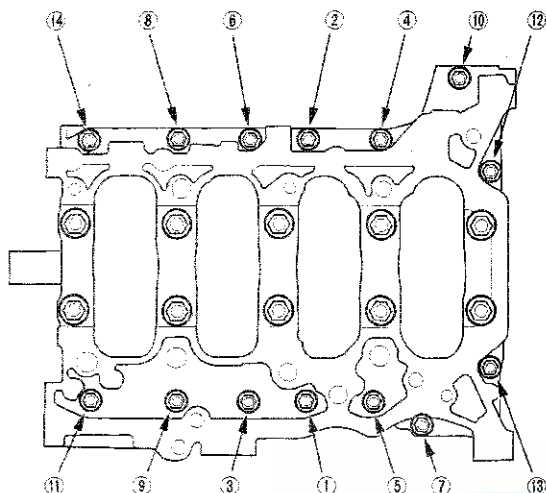


20. Tighten the bearing cap bolts an additional 48°.

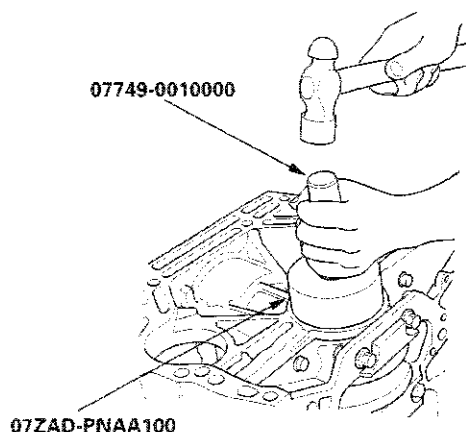




21. Tighten the 8 mm bolts in sequence to 22 N·m (2.2 kgf·m, 16 lbf·ft).

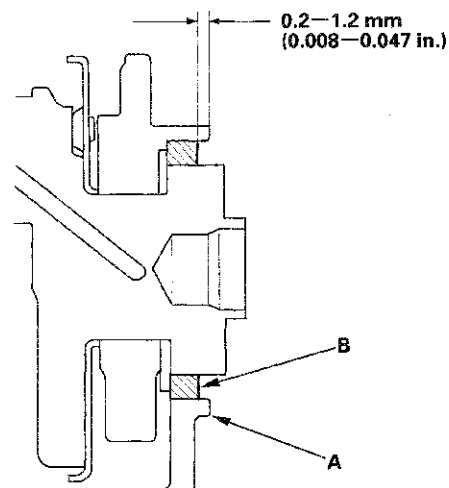


22. Apply a light coat of new engine oil around the crankshaft oil seal.
23. Apply a light coat of new engine oil to the lip of the crankshaft oil seal.
24. Use the driver and the oil seal driver attachment 96 to drive a new crankshaft oil seal squarely into the engine block to the specified installed height.

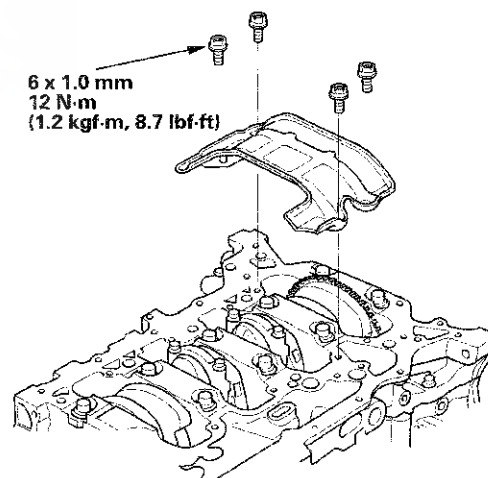


25. Measure the distance between the engine block (A) and the crankshaft oil seal (B).

Crankshaft Oil Seal Installed Height:
0.2–1.2 mm (0.008–0.047 in.)



26. Install the baffle plate.



(cont'd)

Engine Block

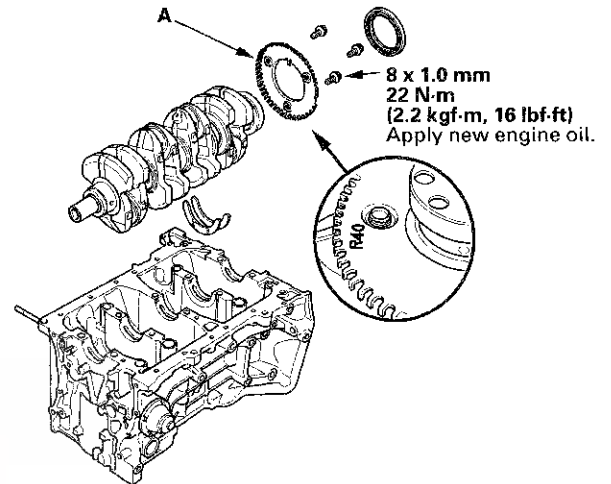
Crankshaft Installation (cont'd)

27. Install the oil pump (see page 8-21).
28. Install the oil pan (see page 7-31).
29. Install the cylinder head:
 - All models except PZEV (see page 6-44)
 - PZEV model (see page 6-94)
30. M/T model: Install the flywheel (see step 18 on page 12-19), the clutch disc (see step 26 on page 12-20), and the pressure plate (see step 27 on page 12-20).
31. A/T model: Install the drive plate (see page 14-257).
32. Install the transmission:
 - Manual transmission (see page 13-16)
 - Automatic transmission (see page 14-243)
33. Install the engine/transmission (see page 5-12).

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

CKP Pulse Plate Replacement

1. Remove the crankshaft from the engine block (see page 7-14).
2. Remove the CKP pulse plate (A) from the crankshaft.



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

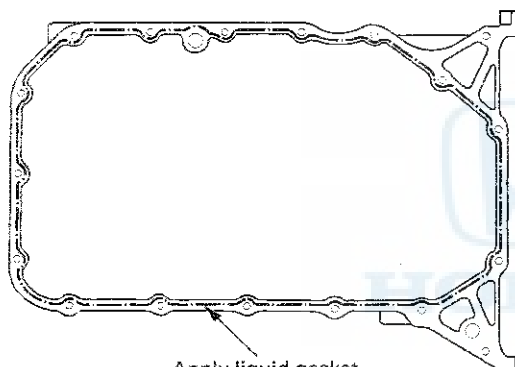


Oil Pan Installation

1. Remove all of the old liquid gasket from the oil pan mating surfaces, the bolts, and the bolt holes.
2. Clean and dry the oil pan mating surfaces.
3. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the engine block mating surface of the oil pan, and to the inside edge of the threaded bolt holes. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

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



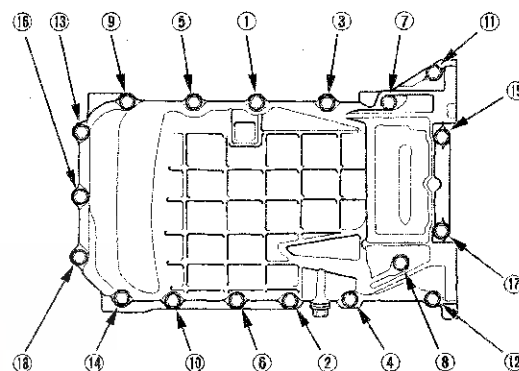
Apply liquid gasket
along the broken line.

4. Install the oil pan.

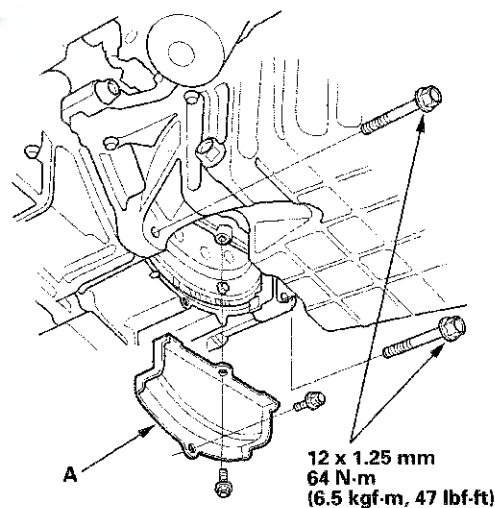
5. Tighten the bolts in three steps. In the final step, tighten all bolts, in sequence, to 12 N·m (1.2 kgf·m, 8.7 lbf·ft). Wipe off the excess liquid gasket on the each side of crankshaft pulley and the flywheel/drive plate.

NOTE:

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



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



(cont'd)

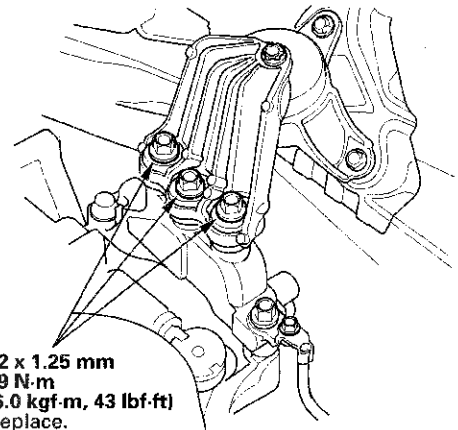
Engine Block

Oil Pan Installation (cont'd)

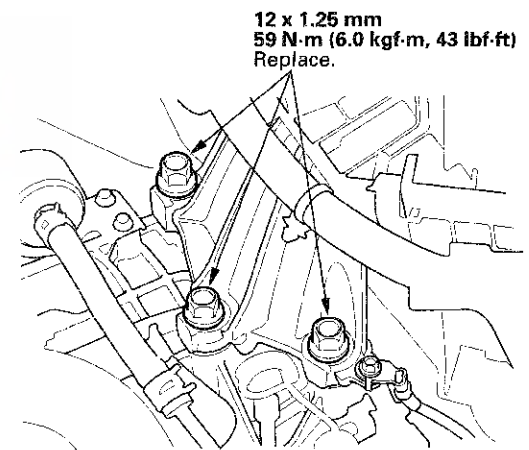
7. If the engine is still in the vehicle, do steps 8 through 24.
8. Lower the transmission jack from the transmission.
9. A/T model: Install the shift cable bracket.
 - Saitama Factory produced models (see step 33 on page 14-248).
 - Marysville, Ohio Factory produced models (see step 36 on page 14-249).
10. Tighten the nuts securing the lower transmission mount (see step 25 on page 5-16).
11. Install a new set ring on the end of driveshaft, then install the driveshaft (see page 16-20). Make sure the ring "clicks" into place in the differential.
12. Install the left side damper fork (see step 3 on page 18-21).
13. Connect the lower arm to the left side knuckle (see step 5 on page 18-21).
14. Install the splash shield (see step 48 on page 5-20).
15. Install the left front wheel.
16. Lower the vehicle on the lift.

17. Tighten the upper transmission mount bracket mounting bolts to the specified torque.

M/T model



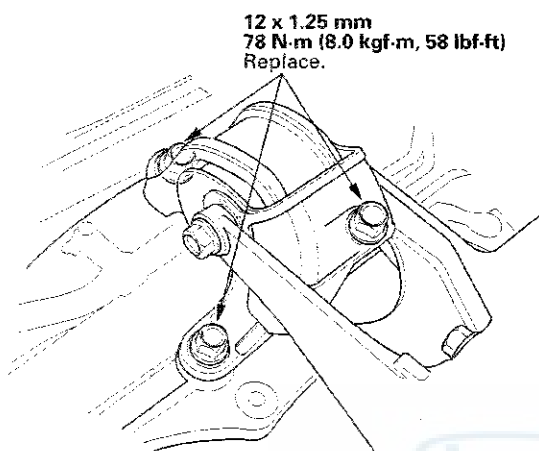
A/T model





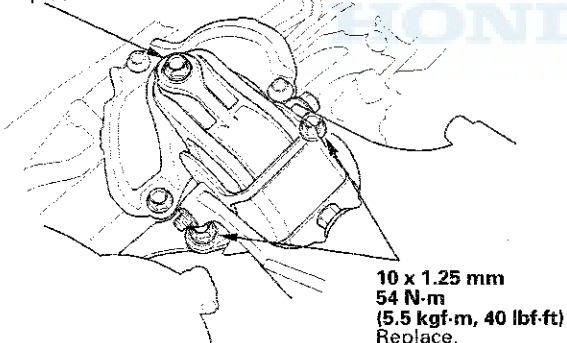
18. Tighten the rear engine mount mounting bolts to the specified torque.

M/T model

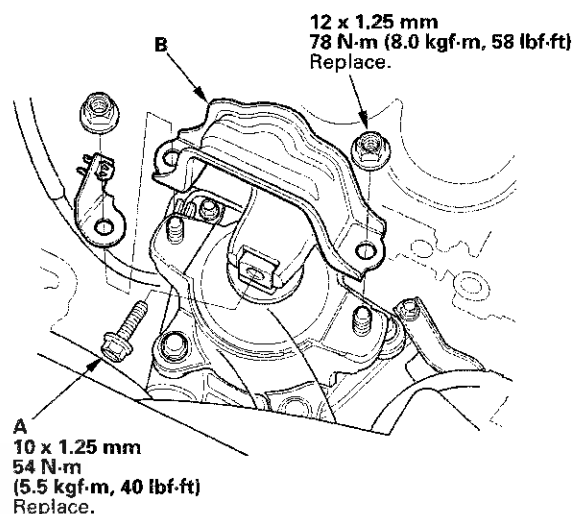


A/T model

10 x 1.25 mm
54 N·m (5.5 kgf·m, 40 lbf·ft)
Replace.



19. Tighten the front engine mount bolt (A), then install the front engine mount stop (B).



20. Install the battery base, then install the harness clamps (see step 64 on page 5-22).
21. Install the air cleaner assembly (see page 11-359).
22. Do the battery installation procedure (see page 22-90).
23. Install the strut brace (if equipped) (see page 20-289).
24. Refill the engine with the recommended engine oil (see step 4 on page 8-9).

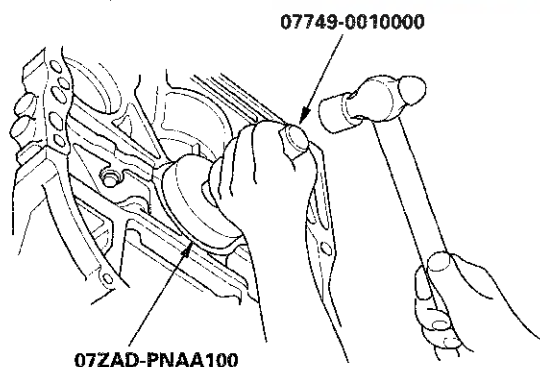
Engine Block

Transmission End Crankshaft Oil Seal Installation - In Car

Special Tools Required

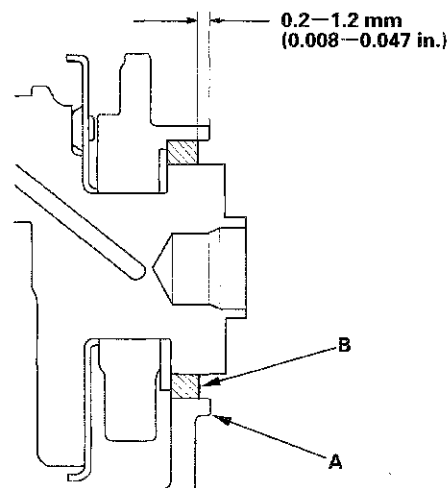
- Driver 07749-0010000
- Oil seal driver attachment 96 07ZAD-PNAA100

1. Remove the transmission:
 - Manual transmission (see page 13-7)
 - Automatic transmission (see page 14-232)
2. M/T model: Remove the flywheel (see step 17 on page 12-19), the clutch disc (see step 8 on page 12-17), and the pressure plate (see step 3 on page 12-16).
3. A/T model: Remove the drive plate (see page 14-257).
4. Clean and dry the crankshaft oil seal housing.
5. Apply a light coat of new engine oil around the crankshaft oil seal.
6. Apply a light coat of new engine oil to the lip of the crankshaft oil seal.
7. Use the driver and the oil seal driver attachment 96 to drive a new crankshaft oil seal squarely into the engine block to the specified installed height.



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

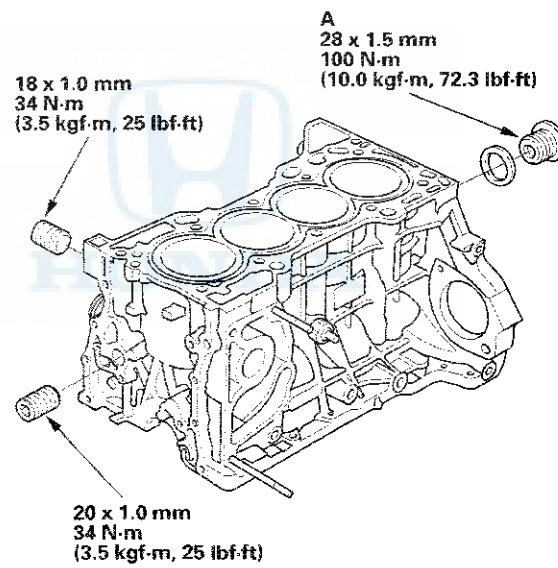
Oil Seal Installed Height: 0.2—1.2 mm
(0.008—0.047 in.)



9. M/T model: Install the flywheel (see step 18 on page 12-19), the clutch disc (see step 26 on page 12-20), and the pressure plate (see step 27 on page 12-20).
10. A/T model: Install the drive plate (see page 14-257).
11. Install the transmission:
 - Manual transmission (see page 13-16)
 - Automatic transmission (see page 14-243)

Sealing Bolt Installation

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



Navigation Tools: Click on the "Table of Contents" below, or use the Bookmarks to the left.

Engine Mechanical

Engine Lubrication

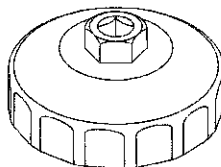
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Engine Lubrication

Special Tools

Ref. No.	Tool Number	Description	Qty
①	07AAA-PLCA100	Oil Filter Wrench	1

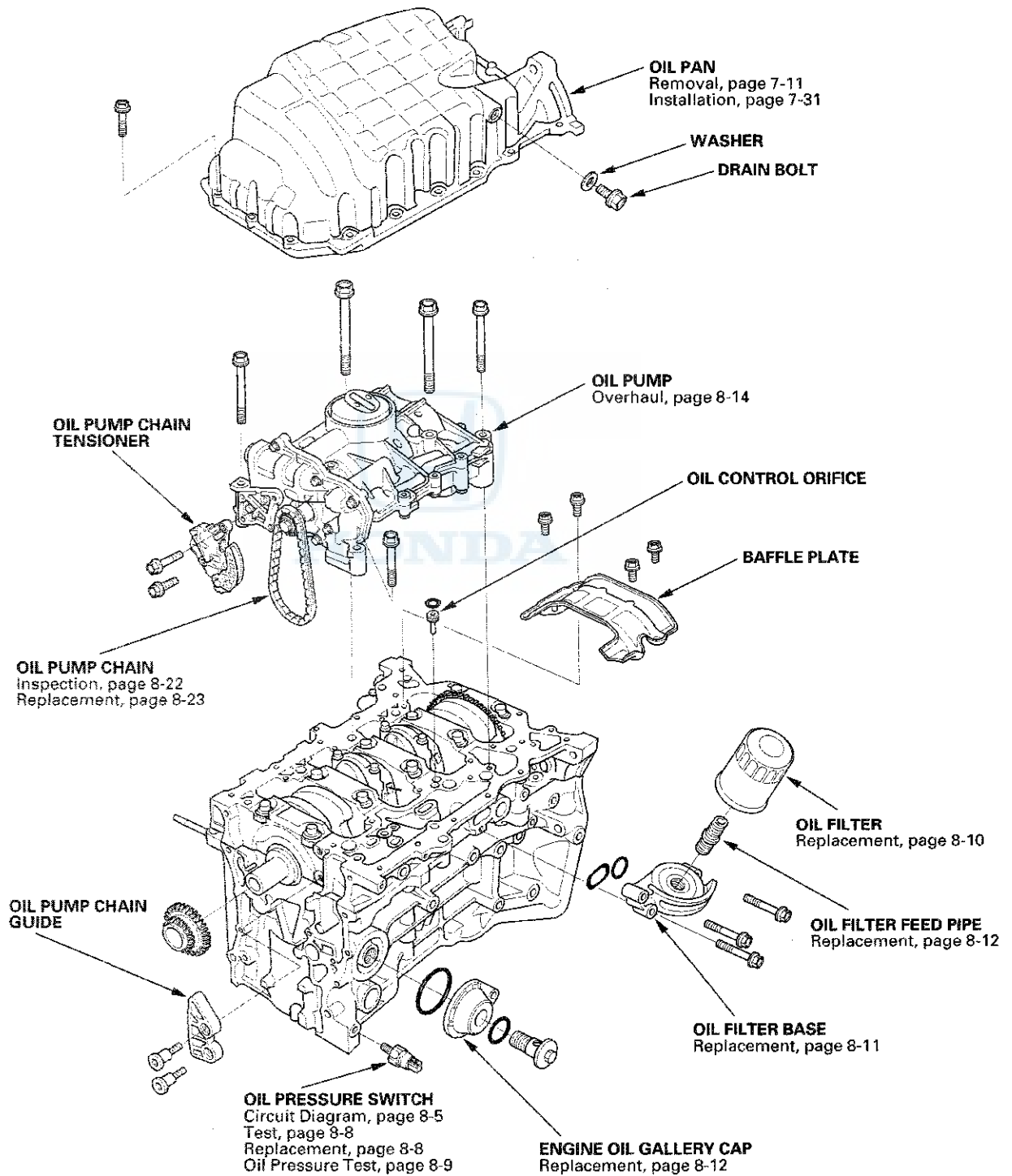


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Component Location Index



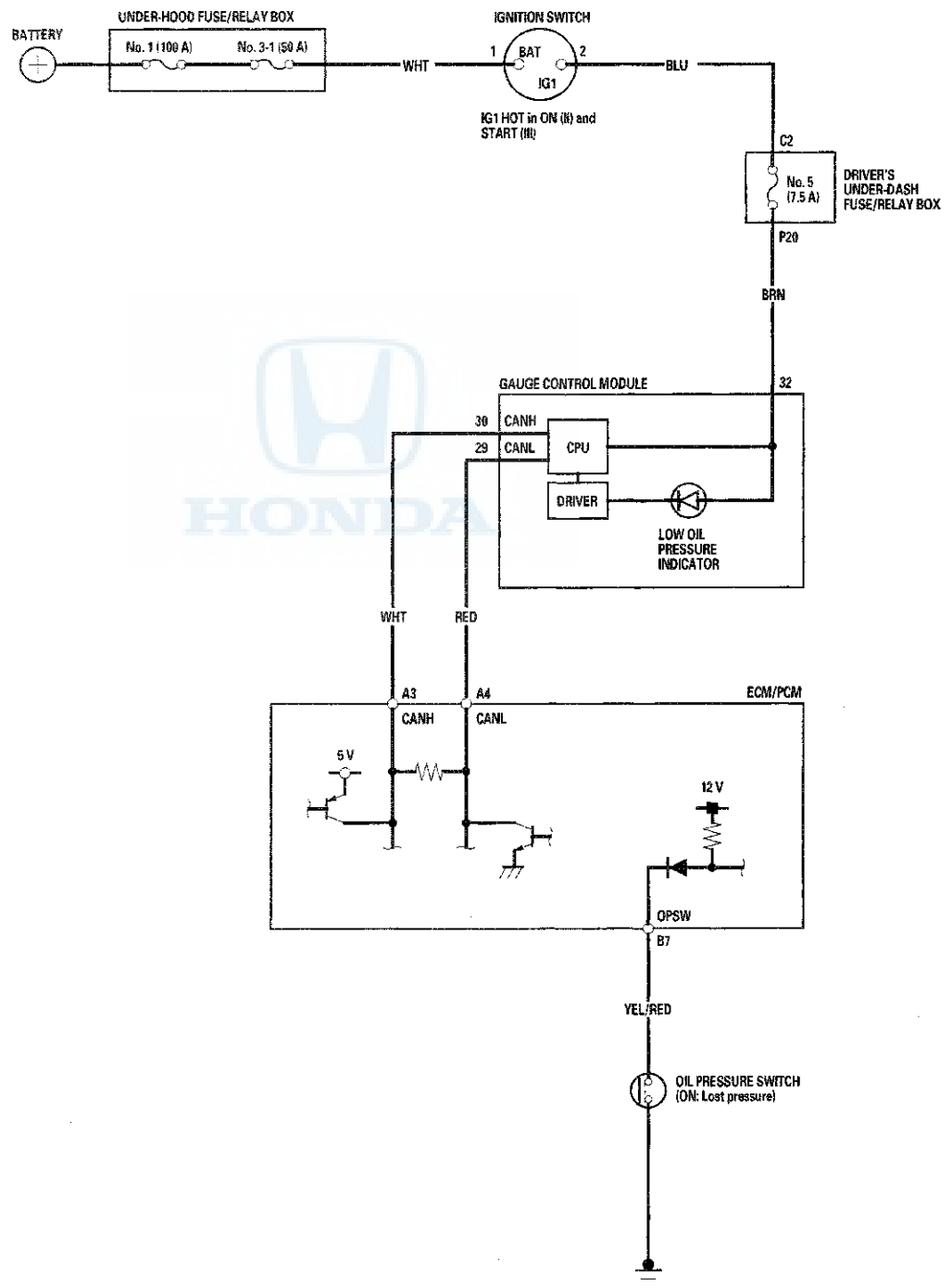
Engine Lubrication

Symptom Troubleshooting Index

Symptom	Diagnostic procedure	Also check for
Excessive engine oil consumption	<ol style="list-style-type: none"> 1. Verify the engine oil filler cap, the oil drain bolt, and the oil filter are tight. 2. Check for oil leaks. 3. Check for worn valve guide(s): <ul style="list-style-type: none"> • All models except PZEV (see page 6-38) • PZEV model (see page 6-88) or worn valve stem seal(s): <ul style="list-style-type: none"> • All models except PZEV (see page 6-38) • PZEV model (see page 6-88) 4. Check for damaged or worn piston ring(s) (see page 7-22). 5. Check for damaged or worn engine internal parts (cylinder wall, pistons, etc.) (see page 7-17). 	
Low oil pressure indicator does not come on with the ignition switch in ON (II)	<ol style="list-style-type: none"> 1. Do the low oil pressure indicator circuit troubleshooting (Open) (see page 8-6). 2. Test the oil pressure switch (see page 8-8). 	An open in the wire between the engine control module (ECM)/ powertrain control module (PCM) and the oil pressure switch
Low oil pressure indicator stays on	<ol style="list-style-type: none"> 1. Check the engine oil level. 2. Do the low oil pressure indicator circuit troubleshooting (Short) (see page 8-7). 3. Test the oil pressure switch (see page 8-8). 4. Check the engine oil pressure (see page 8-9). 5. Check the oil filter for clogging. 6. Check the oil screen for clogging. 7. Check the relief valve (see page 8-14). 8. Test the oil pump (see page 8-16). 	A wire shorted to ground between the ECM/PCM and the oil pressure switch



Low Oil Pressure Indicator Circuit Diagram



Engine Lubrication

Low Oil Pressure Indicator Circuit Troubleshooting (Open)

1. Connect the Honda Diagnostic System (HDS) to the data link connector (DLC) (see step 2 on page 11-3).
2. Turn the ignition switch to ON (II).
3. Make sure the HDS communicates with the vehicle and the engine control module (ECM)/powertrain control module (PCM). If it does not communicate, troubleshoot the DLC circuit (see page 11-192).
4. Check for DTCs (see page 11-3). If a DTC is present, diagnose, and repair the cause before continuing with this test.
5. Check the OIL PRESSURE SWITCH in the PGM-FI DATA LIST with the HDS.

Is ON indicated?

YES—Replace the gauge control module (see page 22-324). ■

NO—Go to step 6.

6. Turn the ignition switch to LOCK (0).
7. Check the oil pressure switch (see page 8-8).

Is the oil pressure switch OK?

YES—Go to step 8.

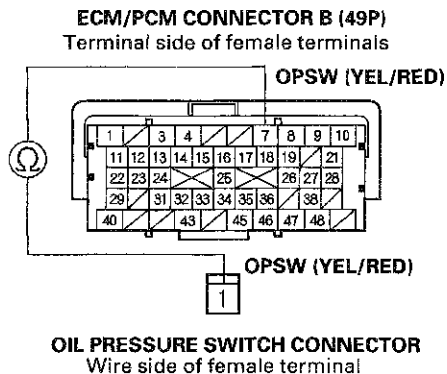
NO—Replace the oil pressure switch (see page 8-8). ■

8. Turn the ignition switch to ON (II), and jump the SCS line with the HDS, then turn the ignition switch to LOCK (0).

NOTE: This step must be done to protect the ECM/PCM from damage.

9. Disconnect ECM/PCM connector B (49P) and the oil pressure switch connector.

10. Check for continuity between ECM/PCM connector terminal B7 and the oil pressure switch connector.



Is there continuity?

YES—Update the ECM/PCM if it does not have the latest software (see page 11-215), or substitute a known-good ECM/PCM (see page 11-7), then recheck. If the symptom/indication goes away with a known-good ECM/PCM, replace the original ECM/PCM (see page 11-216). ■

NO—Repair open in the wire between the oil pressure switch and ECM/PCM connector terminal B7. ■



Low Oil Pressure Indicator Circuit Troubleshooting (Short)

1. Connect the Honda Diagnostic System (HDS) to the data link connector (DLC) (see step 2 on page 11-3).
2. Turn the ignition switch to ON (II).
3. Make sure the HDS communicates with the vehicle and the engine control module (ECM)/powertrain control module (PCM). If it does not communicate, troubleshoot the DLC circuit (see page 11-192).
4. Check for DTCs (see page 11-3). If a DTC is present, diagnose, and repair the cause before continuing with this test.

5. Start the engine, and check the OIL PRESSURE SWITCH in the PGM-FI DATA LIST with the HDS.

Is OFF indicated?

YES—Replace the gauge control module (see page 22-324). ■

NO—Go to step 6.

6. Turn the ignition switch to LOCK (0).
7. Disconnect the oil pressure switch connector.
8. Start the engine, and check the OIL PRESSURE SWITCH in the PGM-FI DATA LIST with the HDS.

Is OFF indicated?

YES—Turn the ignition switch to LOCK (0), then go to step 9.

NO—Turn the ignition switch to LOCK (0), then go to step 10.

9. Check the oil pressure switch (see page 8-8).

Is the oil pressure switch OK?

YES—Do the oil pressure test (see page 8-9).

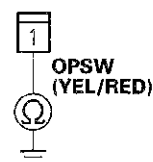
NO—Replace the oil pressure switch (see page 8-8). ■

10. Turn the ignition switch to ON (II), and jump the SCS line with the HDS, then turn the ignition switch to LOCK (0).

NOTE: This step must be done to protect the ECM/PCM from damage.

11. Disconnect ECM/PCM connector B (49P).
12. Check for continuity between the oil pressure switch connector and body ground.

OIL PRESSURE SWITCH CONNECTOR



Wire side of female terminal

Is there continuity?

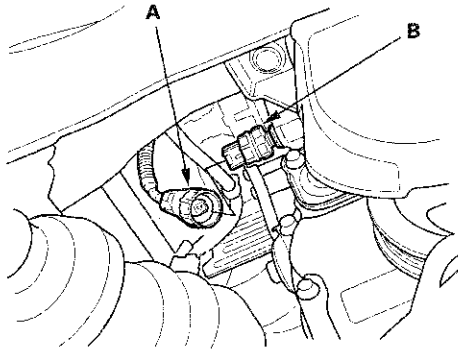
YES—Repair short to ground in the wire between the oil pressure switch and ECM/PCM connector terminal B7. ■

NO—Update the ECM/PCM if it does not have the latest software (see page 11-215), or substitute a known-good ECM/PCM (see page 11-7), then recheck. If the symptom/indication goes away with a known-good ECM/PCM, replace the original ECM/PCM (see page 11-216). ■

Engine Lubrication

Oil Pressure Switch Test

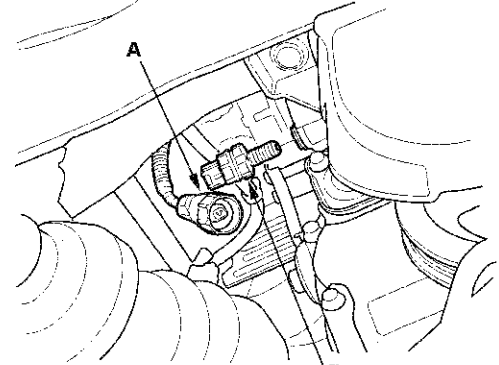
1. Disconnect the oil pressure switch connector (A) from the oil pressure switch (B).



2. Check for continuity between the oil pressure switch terminal and the engine (ground). There should be continuity with the engine stopped. There should be no continuity with the engine running.

Oil Pressure Switch Replacement

1. Disconnect the oil pressure switch connector (A), then remove the oil pressure switch (B).



B
18 N·m
(1.8 kgf·m, 13 lbf·ft)

2. Remove any old liquid gasket from the switch and switch mounting hole.
3. Apply a very small amount of liquid gasket to the oil pressure switch threads, then install the oil pressure switch.

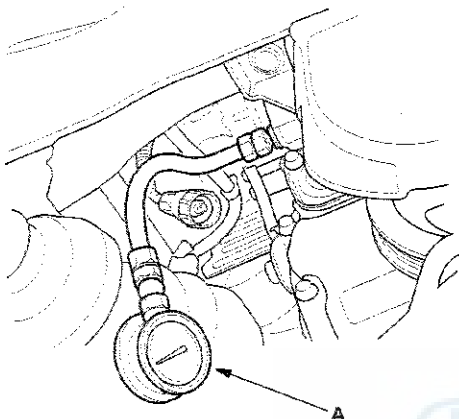
NOTE: Using too much liquid gasket may cause liquid gasket to enter the oil passage or the end of the new oil pressure switch.



Oil Pressure Test

NOTE: If the low oil pressure warning indicator stays on with the engine running, check the engine oil level. If the oil level is correct, do the following test:

1. With the engine stopped, remove the oil pressure switch (see page 8-8), and install an oil pressure gauge (A).



2. Start the engine. Shut it off immediately if the gauge registers no oil pressure. Repair the problem before continuing.
3. Allow the engine to reach operating temperature (fan comes on at least twice). The pressure should be:

Engine Oil Temperature: 176 °F (80 °C)

Engine Oil Pressure:

At Idle: 70 kPa (0.7 kgf/cm², 10 psi) min.

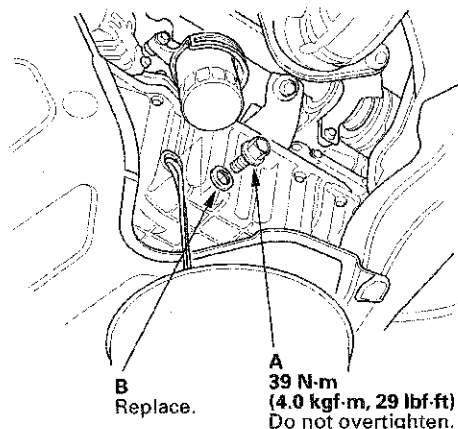
At 3,000 rpm: 300 kPa (3.1 kgf/cm², 44 psi) min.

4. If the oil pressure is out of specifications, inspect these items:

- Blocking of oil filter.
- Blocking of oil screen.
- Inspect the oil pressure relief valve (see page 8-14).
- Inspect the oil pump (see page 8-16).

Engine Oil Replacement

1. Warm up the engine.
2. Remove the drain bolt (A), and drain the engine oil.



3. Reinstall the drain bolt with a new washer (B).
4. Refill the engine with the recommended oil (see page 3-2).

Capacity

At Oil Change:

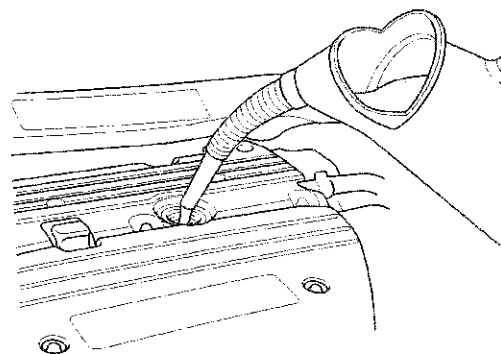
4.0 L (4.2 US qt)

At Oil Change Including Filter:

4.2 L (4.4 US qt)

After Engine Overhaul:

5.3 L (5.6 US qt)



5. Run the engine for more than 3 minutes, then check for oil leakage.

(cont'd)

Engine Lubrication

Engine Oil Replacement (cont'd)

6. If the maintenance minder required engine oil replacement, reset the maintenance minder (see page 3-4), and this procedure is complete. If the maintenance minder did not require engine oil replacement, go to step 7.
7. Turn the ignition switch to LOCK (0).
8. Connect the Honda Diagnostic System (HDS) to the data link connector (DLC) (see step 2 on page 11-3).
9. Turn the ignition switch to ON (II).
10. Make sure the HDS communicates with the vehicle and the engine control module (ECM)/powertrain control module (PCM). If it does not communicate, troubleshoot the DLC circuit (see page 11-192).
11. Select GAUGES in the BODY ELECTRICAL with the HDS.
12. Select ADJUSTMENT in GAUGES with the HDS.
13. Select SERVICE REMINDER in the ADJUSTMENT with the HDS.
14. Select RESET in the SERVICE REMINDER with the HDS.
15. Select RESETTNG THE ENGINE OIL LIFE with the HDS.

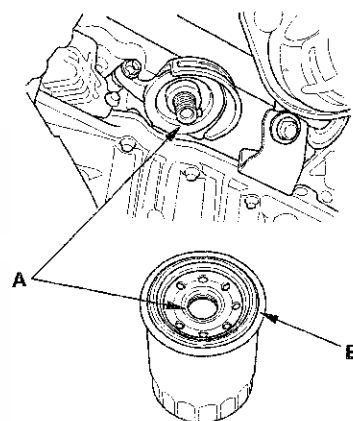
NOTE: If you changed the automatic transmission fluid (ATF) at the same time with the engine oil, select RESETTNG THE ENGINE OIL LIFE AND ATF with the HDS instead.

Engine Oil Filter Replacement

Special Tools Required

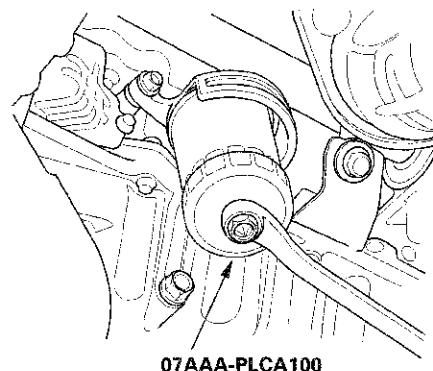
Oil filter wrench 07AAA-PLCA100

1. Remove the oil filter with the oil filter wrench.
2. Inspect the filter to make sure the rubber seal is not stuck to the oil filter seating surface of the engine.
3. Inspect the threads (A) and the rubber seal (B) on the new filter. Clean the seat on the oil filter base, then apply a light coat of new engine oil to the filter rubber seal. Use only filters with a built-in bypass system.



4. Install the oil filter by hand.
5. After the rubber seal seats, tighten the oil filter clockwise with the oil filter wrench.

Tighten: 3/4 Turn Clockwise
Tightening Torque: 12 N·m (1.2 kgf·m, 8.7 lbf·ft)

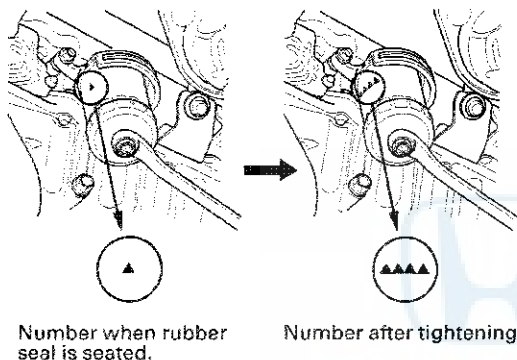




Oil Filter Base Replacement

6. If four numbers or marks (1 to 4 or ▼ to ▼▼▼▼) are printed around the outside of the filter, use the following procedure to tighten the filter.

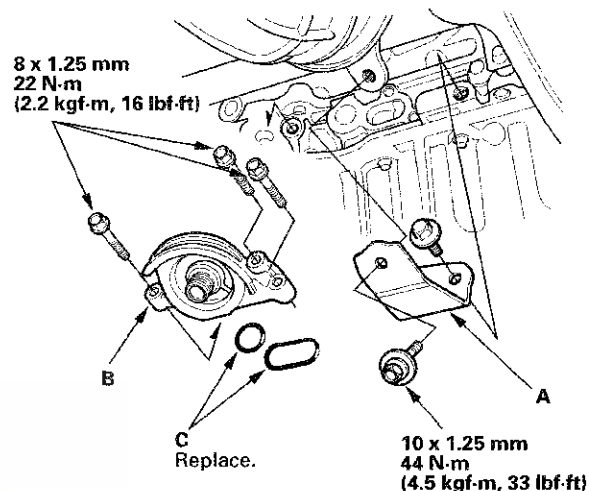
- Spin the filter on until its seal lightly seats against the oil filter base, and note which number or mark is at the bottom.
- Tighten the filter by turning it clockwise three numbers or marks from the one you noted. For example, if number 2 is at the bottom when the seal is seated, tighten the filter until the number 1 comes around the bottom.



Number or Mark when rubber seal is seated	1 or ▼	2 or ▼▼	3 or ▼▼▼	4 or ▼▼▼▼
Number or Mark after tightening	4 or ▼▼▼▼	1 or ▼	2 or ▼▼	3 or ▼▼▼

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

1. Remove the oil filter (see page 8-10).
2. Remove the exhaust pipe bracket (A), then remove the oil filter base (B).

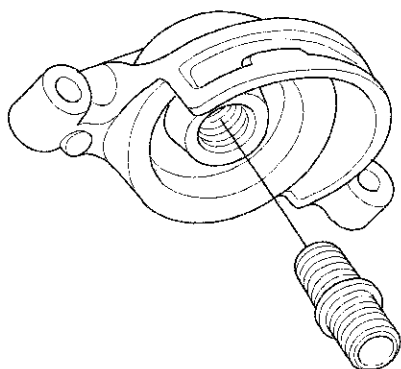


3. Clean the O-ring grooves and the mating surface with the oil filter base.
4. Install the oil filter base with new O-rings (C).
5. Install the oil filter (see page 8-10).

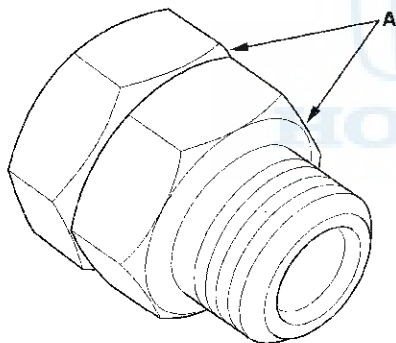
Engine Lubrication

Oil Filter Feed Pipe Replacement

1. Remove the oil filter base (see page 8-11).
2. Remove the oil filter feed pipe.



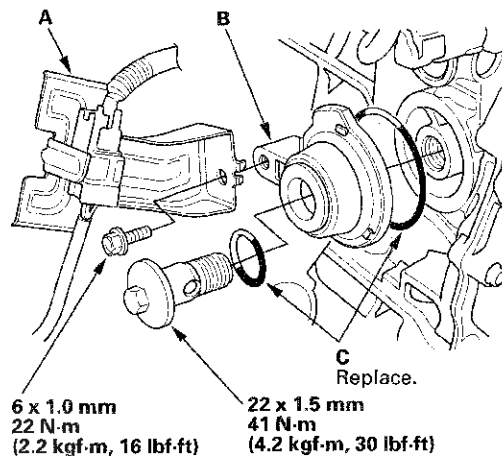
3. Install the two 20 x 1.5 mm nuts (A) onto the new oil filter feed pipe. Hold one nut with a wrench, then use a second wrench to tighten the other nut.



4. Tighten the oil filter feed pipe to the oil filter base to 49 N·m (5.0 kgf·m, 36 lbf·ft), then remove the nuts from the oil filter feed pipe.
5. Install the oil filter base (see page 8-11).

Engine Oil Gallery Cap Replacement

1. Remove the harness bracket (A), then remove the engine oil gallery cap (B).

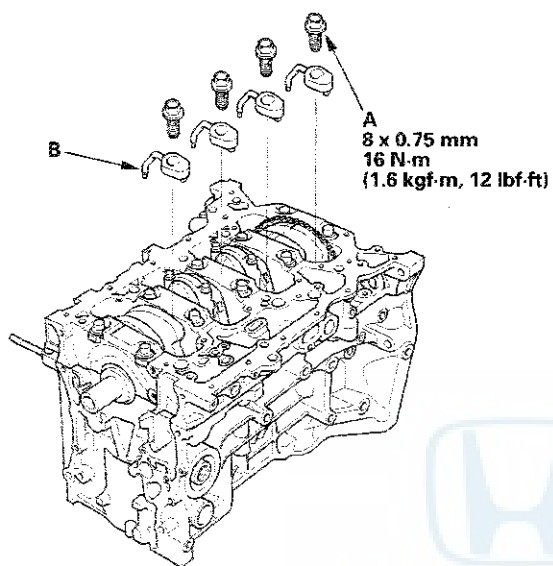


2. Clean the O-ring groove and mating surface with the engine oil gallery cap.
3. Install the engine oil gallery cap with new O-rings (C), then install the harness bracket.



Oil Jet Replacement

1. Remove the oil pump (see page 8-15).
2. Remove the baffle plate (see step 8 on page 7-14).
3. Remove the oil jet bolts (A), then remove the oil jets (B).



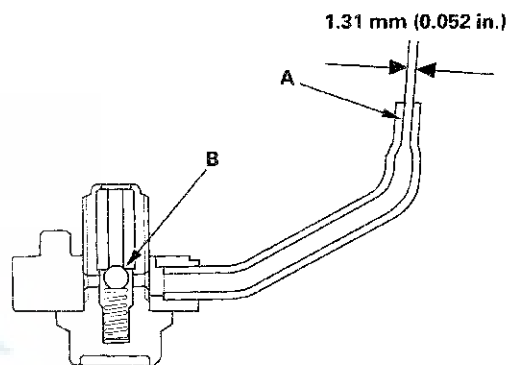
4. Carefully install the oil jets, and tighten the oil jet bolts.
5. Install the baffle plate (see step 26 on page 7-29).
6. Install the oil pump (see page 8-21).

Oil Jet Inspection

1. Remove the oil jet (see page 8-13), and inspect it as follows.

- Make sure that a 1.2 mm (0.05 in.) diameter drill will go through the nozzle hole (A) (1.31 mm (0.052 in.) diameter).
- Insert the other end of a 3.7 mm (0.15 in.) drill into the oil intake (3.8 mm (0.15 in.) diameter). Make sure the check ball (B) moves smoothly and has a stroke of about 2.0 mm (0.079 in.).
- Check the oil jet operation with an air nozzle. It should take at least 380 kPa (3.9 kgf/cm², 55 psi) to unseat the check ball.

NOTE: Replace the oil jet assembly, if the nozzle is damaged or bent.



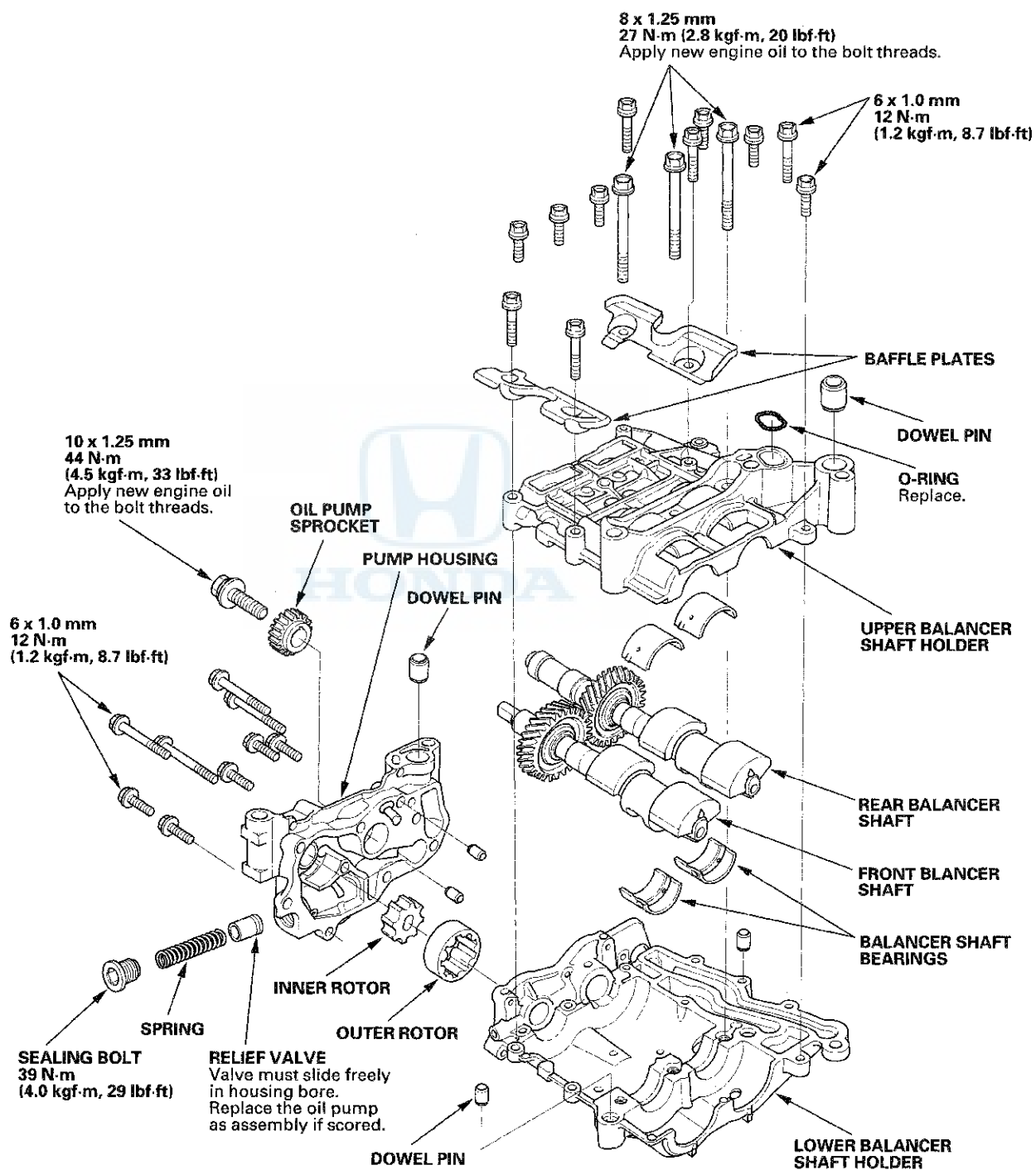
2. Carefully install the oil jet. The mounting torque is critical.

Specified Torque: 16 N-m (1.6 kgf-m, 12 lbf-ft)

Engine Lubrication

Oil Pump Overhaul

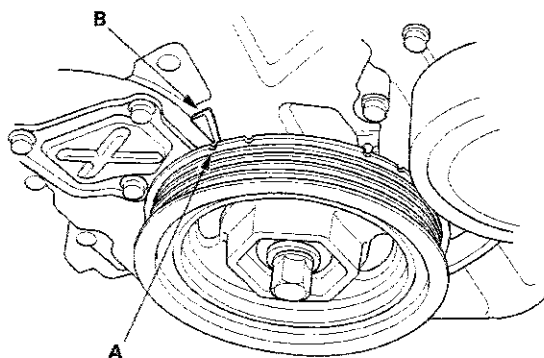
Exploded View



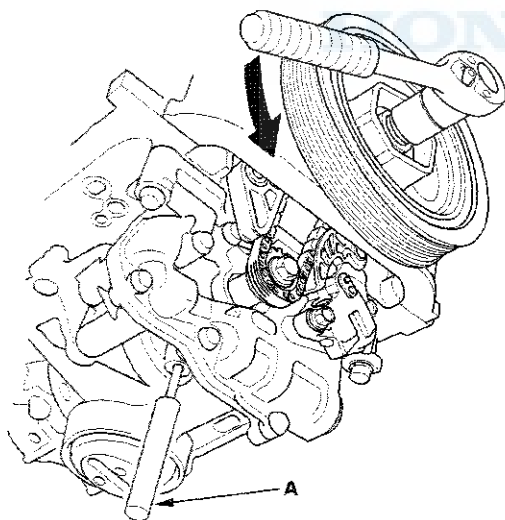


Oil Pump Removal

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



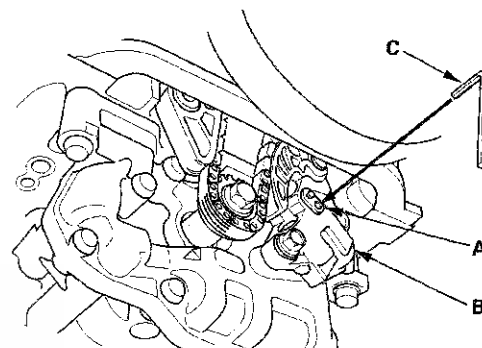
2. Remove the oil pan (see page 7-11).
3. To hold the rear balancer shaft, insert a 6 mm long pin punch (A) (Snap-on PPC108LA or equivalent) into the maintenance hole in the balancer shaft holder and through the rear balancer shaft.



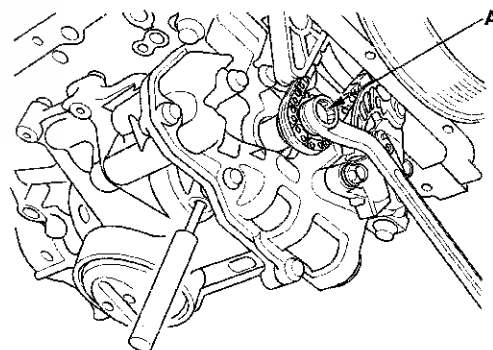
4. Turn the crankshaft counterclockwise to compress the oil pump chain auto-tensioner.

5. Align the holes on the lock (A) and the oil pump chain auto-tensioner (B), then insert a 3.0 mm (0.12 in.) diameter pin (C) into the holes. Turn the crankshaft clockwise to secure the pin.

NOTE: Check the oil pump chain auto-tensioner cam position. If the position is not aligned, set the first cam to the first edge of the rack.



6. Loosen the oil pump sprocket mounting bolt (A).

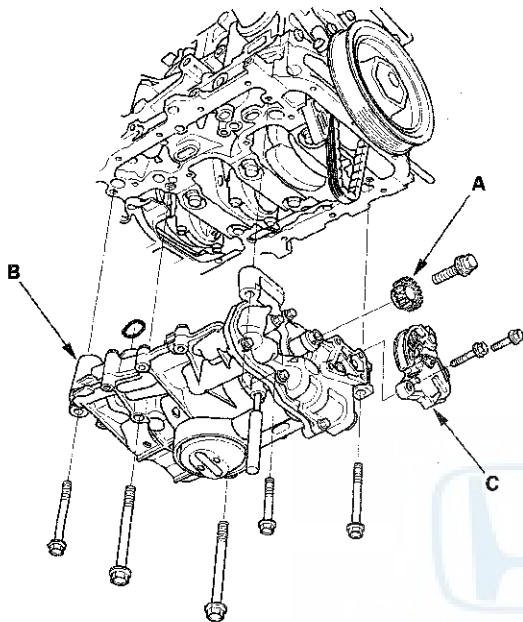


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Engine Lubrication

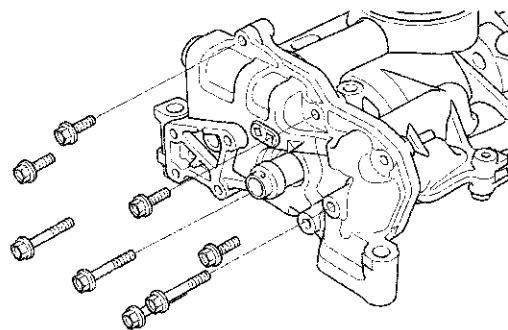
Oil Pump Overhaul (cont'd)

7. Remove the oil pump sprocket (A) and the oil pump (B), then remove the oil pump chain auto-tensioner (C).



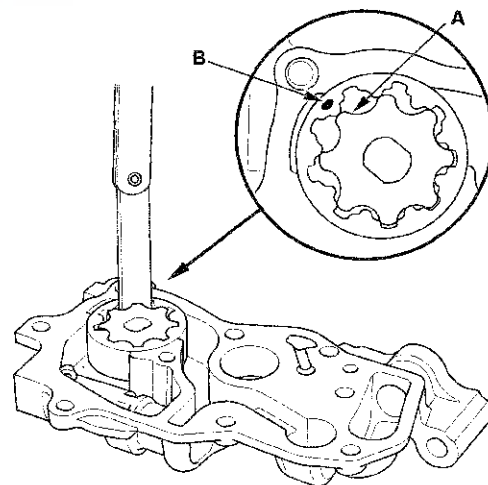
Oil Pump Inspection

1. Remove the pump housing.



2. Align the inner rotor tooth (A) with the mark (B) on the outer rotor, then check the inner-to-outer rotor radial clearance between the inner rotor and the outer rotor. If the inner-to-outer rotor radial clearance exceeds the service limit, replace the oil pump.

Inner Rotor-to-Outer Rotor Radial Clearance
Standard (New): 0.05—0.15 mm
(0.0020—0.0059 in.)
Service Limit: 0.19 mm (0.0075 in.)



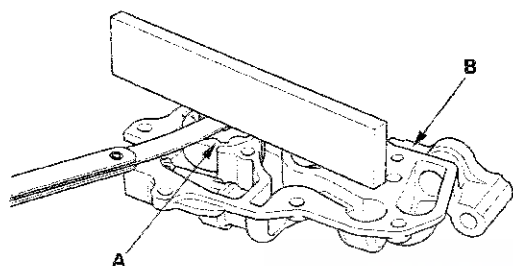


3. Check the pump housing-to-rotor axial clearance between the rotor (A) and the pump housing (B). If the pump housing-to-rotor axial clearance exceeds the service limit, replace the oil pump.

Pump Housing-to-Rotor Axial Clearance

Standard (New): 0.035—0.070 mm
(0.0014—0.0028 in.)

Service Limit: 0.12 mm (0.005 in.)

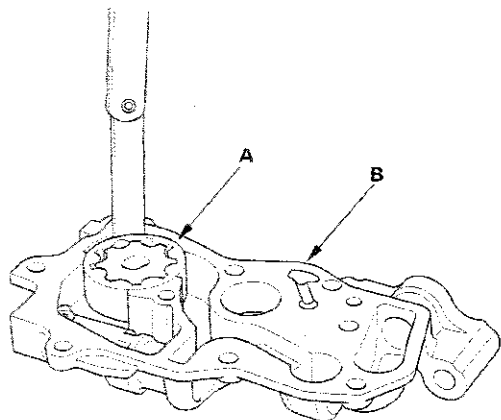


4. Check the pump housing-to-outer rotor radial clearance between the outer rotor (A) and the pump housing (B). If the pump housing-to-outer rotor radial clearance exceeds the service limit, replace the oil pump.

Pump Housing-to-Outer Rotor Radial Clearance

Standard (New): 0.150—0.210 mm
(0.0059—0.0083 in.)

Service Limit: 0.23 mm (0.009 in.)



Balancer Shaft Inspection

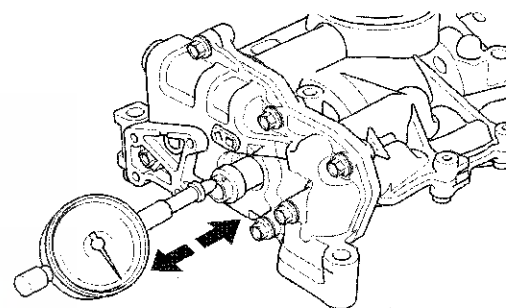
1. Seat the balancer shaft by pushing it away from the oil pump sprocket end of the oil pump.
2. Zero the dial indicator against the end of the balancer shaft, then push the balancer shaft back and forth and read the end play.

Balancer Shaft End Play

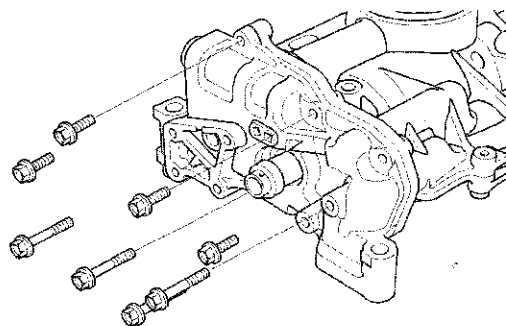
Front Balancer Shaft:

Standard (New): 0.063—0.108 mm
(0.0025—0.0043 in.)

Service Limit: 0.14 mm (0.006 in.)



3. Remove the pump housing.

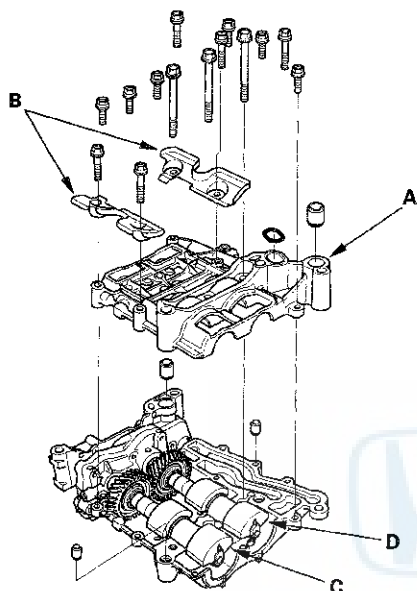


(cont'd)

Engine Lubrication

Oil Pump Overhaul (cont'd)

4. Remove the upper balancer shaft holder (with bearings) (A) and the baffle plates (B), then remove the front balancer shaft (C) and the rear balancer shaft (D).



5. Measure the inner diameter of the No. 1 bearing for the front balancer shaft hole and the rear balancer shaft hole.

Bearing Inner Diameter

Front:

Standard (New): 20.000—20.020 mm
(0.7874—0.7882 in.)

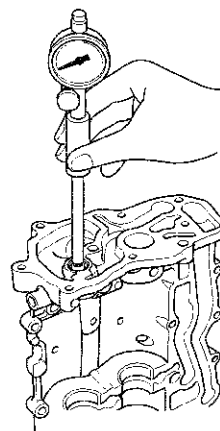
Service Limit: 20.03 mm (0.798 in.)

Rear:

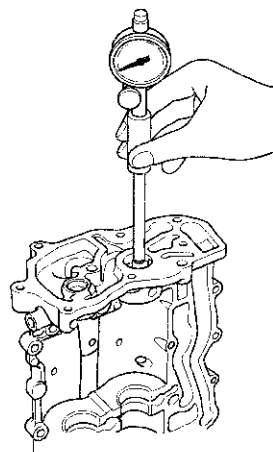
Standard (New): 24.000—24.020 mm
(0.9449—0.9457 in.)

Service Limit: 24.03 mm (0.946 in.)

Front



Rear





6. Measure the diameters of the No. 1 journals on the front balancer shaft and the rear balancer shaft.

Journal Diameter

Front:

Standard (New): 19.938—19.950 mm
(0.7850—0.7854 in.)

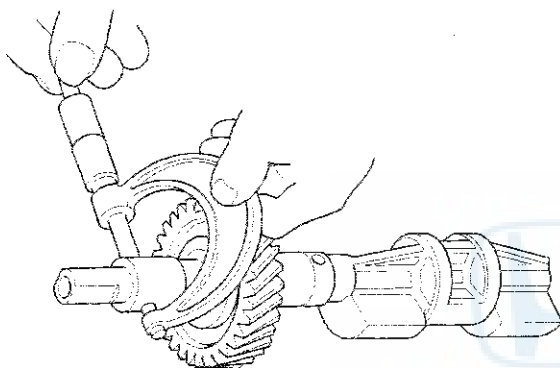
Service Limit: 19.92 mm (0.784 in.)

Rear:

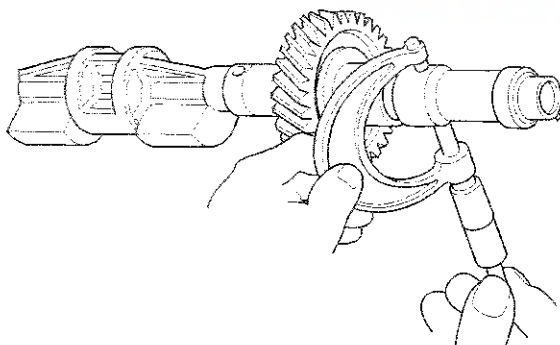
Standard (New): 23.938—23.950 mm
(0.9424—0.9429 in.)

Service Limit: 23.92 mm (0.942 in.)

Front



Rear

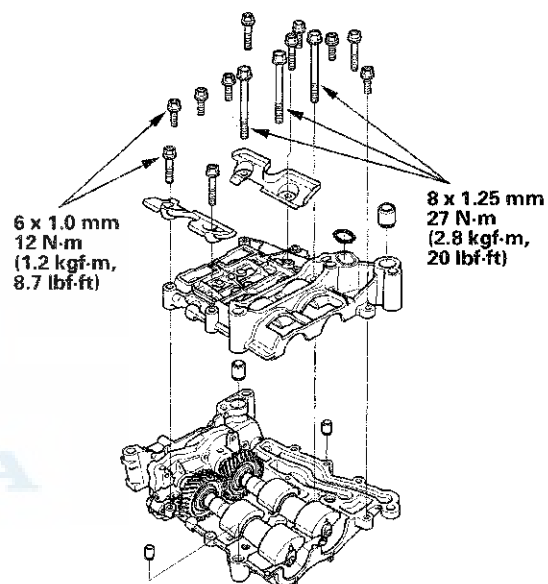


7. Clean both balancer shaft No. 2 journals and the bearing halves with a clean shop towel, then place both balancer shafts into the balancer holder.

8. Place one strip of plastigage across each No. 2 journal.

9. Reinstall the bearings and the upper balancer shaft holder, then tighten the bolts.

NOTE: Do not rotate the balancer shafts during inspection.



(cont'd)

Engine Lubrication

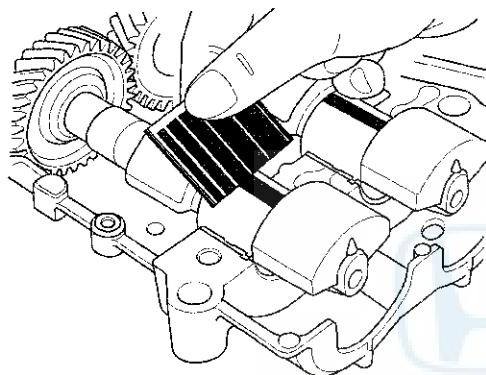
Oil Pump Overhaul (cont'd)

10. Remove the upper balancer shaft holder and the bearings again, and measure the widest part with the plastigage. If balancer shaft No. 2 journal oil clearance is out-of-tolerance, install new bearings, and recheck. If it is still out-of-tolerance, replace the balancer shafts.

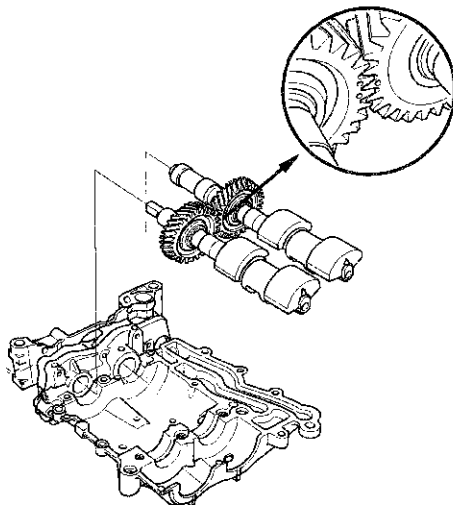
No. 2 Journal Oil Clearance

Standard (New): 0.060—0.120 mm
(0.0024—0.0047 in.)

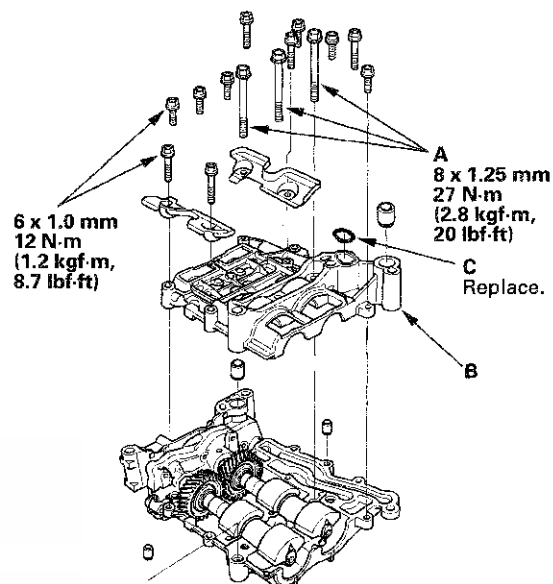
Service Limit: 0.15 mm (0.006 in.)



11. Align the punch mark on the rear balancer shaft in the center of the two punch marks on the front balancer shaft, then install the balancer shafts on the lower balancer shaft holder.

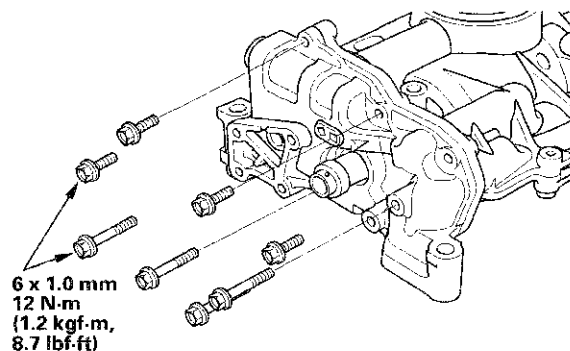


12. Apply new engine oil to the threads of the 8 mm bolts (A).



13. Install the upper balancer shaft holder (B) with a new O-ring (C).

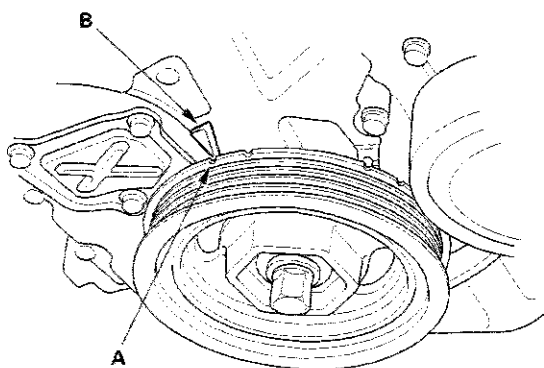
14. Install the pump housing.



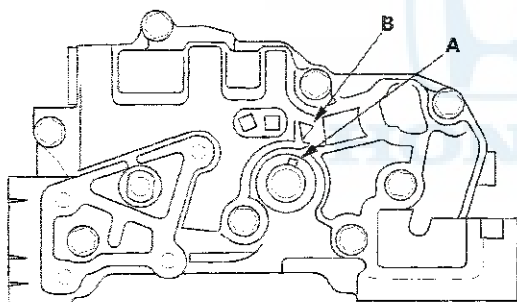


Oil Pump Installation

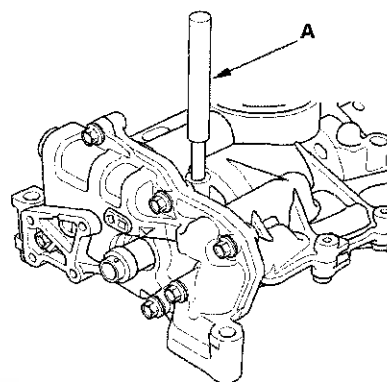
1. Make sure the No. 1 piston top dead center (TDC) mark (A) lines up with the pointer (B).



2. Align the dowel pin (A) on the rear balancer shaft with the mark (B) on the oil pump.

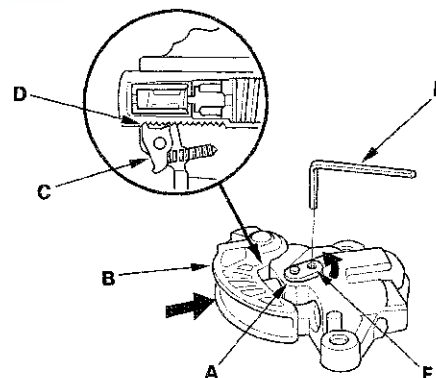


3. To hold the rear balancer shaft, insert a 6 mm long pin punch (A) (Snap-on PPC108LA or equivalent) into the maintenance hole in the balancer shaft holder and through the rear balancer shaft.



4. Turn the plate (A) counterclockwise, to release the lock, then push the oil pump chain auto-tensioner arm (B), and set the first cam (C) to the first edge of the rack (D). Insert a 3.0 mm (0.12 in.) diameter pin (E) into the hole (F).

NOTE: If the chain tensioner is not set up as described, the tensioner will become damaged.

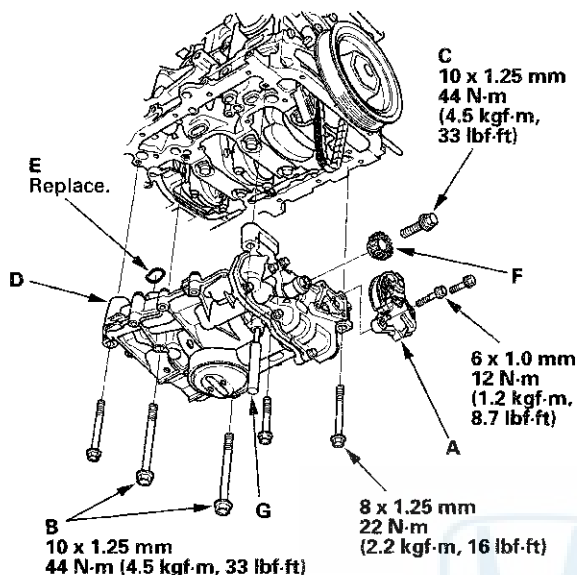


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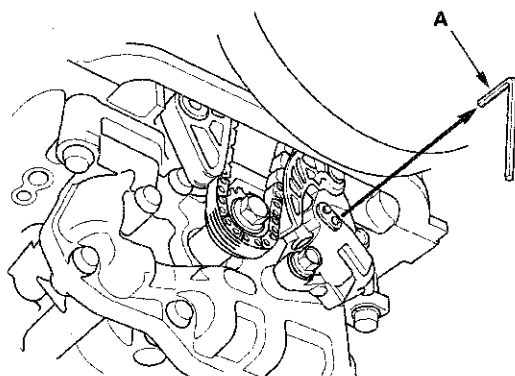
Engine Lubrication

Oil Pump Overhaul (cont'd)

5. Install the oil pump chain auto-tensioner (A).



6. Apply new engine oil to the threads of the oil pump mounting bolts (B) and the oil pump sprocket mounting bolt (C), then Loosely install the oil pump (D) with a new O-ring (E), then install the oil pump sprocket (F).
7. Tighten the oil pump mounting bolts and the oil pump sprocket mounting bolt.
8. Remove the 6 mm pin punch (G).
9. Remove the 3.0 mm (0.12 in.) diameter pin (A) from the oil pump chain auto-tensioner.

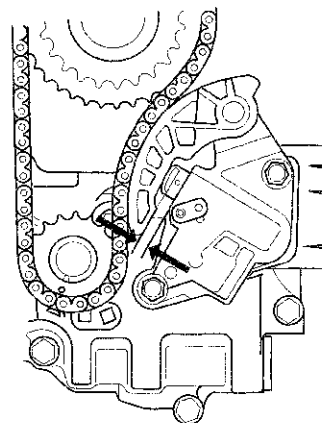


10. Install the oil pan (see page 7-31).

Oil Pump Chain Inspection

1. Remove the oil pan (see page 7-11).
2. Measure the oil pump chain auto-tensioner rod length. If the length is over the service limit, replace the oil pump chain (see page 8-23).

**Oil Pump Chain Auto-Tensioner Rod Length
Service Limit: 13 mm (0.51 in.)**



3. Install the oil pan (see page 7-31).



Oil Pump Chain Replacement

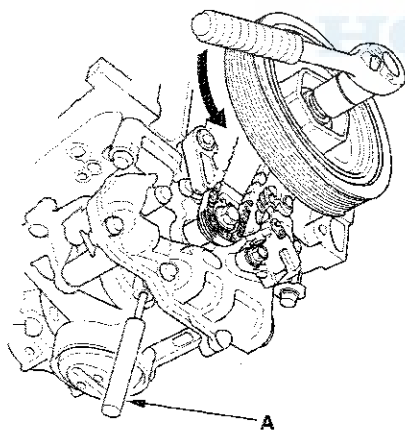
NOTE: Keep the oil pump chain away from magnetic fields.

Removal

1. Remove the drive belt (see page 4-30).
2. Remove the oil pan (see page 7-11).
3. Support the engine with a jack and a wood block under the edge of the engine block.

NOTE: Do not hit the oil pump and baffle plate when placing the jack on the edge of the engine block.

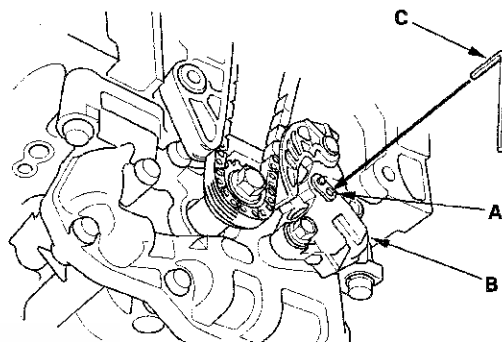
4. Remove the cam chain:
 - All models except PZEV (see page 6-13)
 - PZEV model (see page 6-62)
5. Loosely install the crankshaft pulley.
6. To hold the rear balancer shaft, insert a 6 mm long pin punch (A) (Snap-on PPC108LA or equivalent) into the maintenance hole in the balancer shaft holder and through the rear balancer shaft.



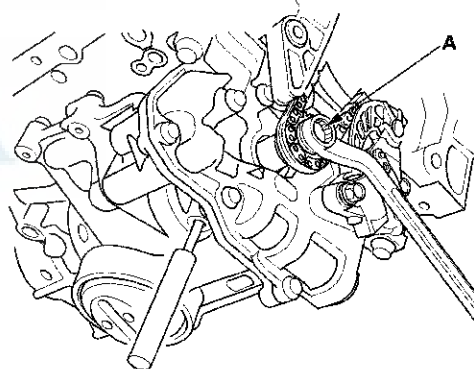
7. Turn the crankshaft counterclockwise to compress the oil pump chain auto-tensioner.
8. Remove the crankshaft pulley.

9. Align the holes on the lock (A) and the oil pump chain auto-tensioner (B), then insert a 3.0 mm (0.12 in.) diameter pin (C) into the holes. Turn the crankshaft clockwise to secure the pin.

NOTE: Check the oil pump chain auto-tensioner cam position is not aligned, set the first cam to the first edge of the rock.



10. Loosen the oil pump sprocket mounting bolt (A).

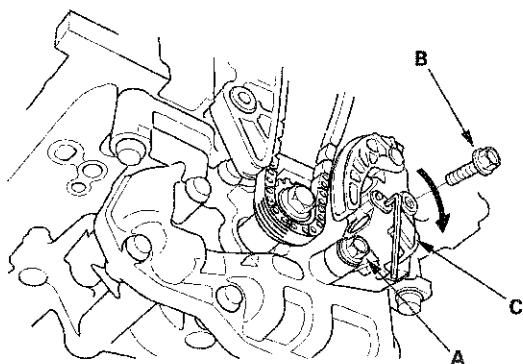


(cont'd)

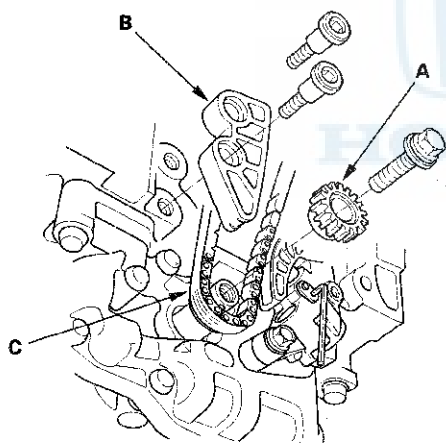
Engine Lubrication

Oil Pump Chain Replacement (cont'd)

11. Loosen the lower oil pump chain auto-tensioner bolt (A), then remove the upper oil pump chain auto-tensioner bolt (B), then turn the oil pump chain auto-tensioner clockwise (C).



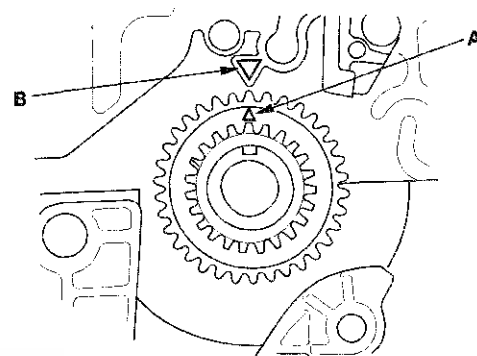
12. Remove the oil pump sprocket (A) and the oil pump chain guide (B).



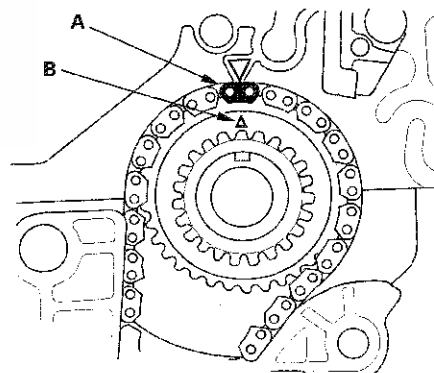
13. Remove the oil pump chain (C).

Installation

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



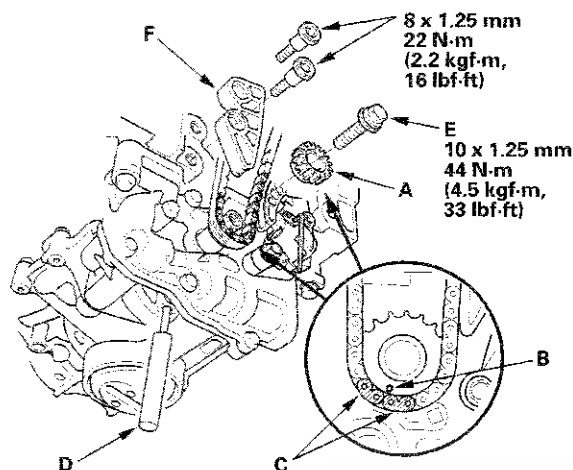
2. Install the oil pump chain on the crankshaft sprocket with the colored link plate (A) aligned with the TDC mark (B) on the crankshaft sprocket.



3. Check the auto-tensioner cam position. If the position is not aligned, set the first cam to the first edge of the rack (see step 4 on page 8-21).

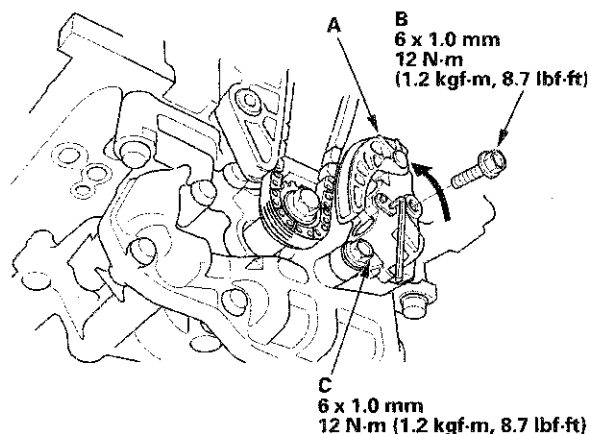


4. Set the oil pump chain on the oil pump chain sprocket (A) with the punch mark (B) aligned with the center of the colored link plates (C), then install the oil pump chain sprocket to the oil pump.

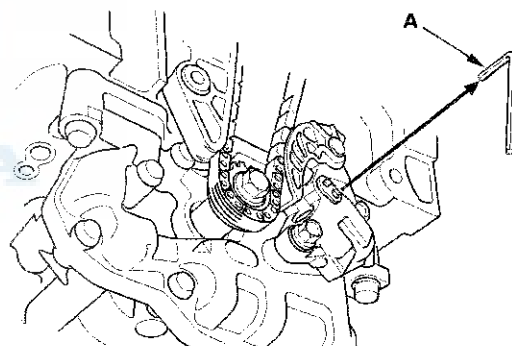


5. To hold the rear balancer shaft, insert a pin driver (D) (Snap-on PPC108LA or equivalent) into the maintenance hole in the balancer shaft holder and through the rear balancer shaft.
6. Apply new engine oil to the threads of the oil pump sprocket mounting bolt (E), then install the oil pump sprocket mounting bolt and oil pump chain guide (F).

7. Turn the oil pump chain auto-tensioner (A) counterclockwise, then install the upper oil pump chain auto-tensioner bolt (B), and tighten the lower oil pump chain auto-tensioner bolt (C).



8. Remove the 3.0 mm (0.12 in.) diameter pin (A) from the oil pump chain auto-tensioner.



9. Install the cam chain:

- All models except PZEV (see page 6-15)
- PZEV model (see page 6-64)

10. Remove the wood block and the jack.

11. Install the oil pan (see page 7-31).

12. Install the drive belt (see page 4-30).

Navigation Tools: Click on the "Table of Contents" below, or use the Bookmarks to the left.

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