

Engine Mechanical



Engine Assembly

Engine Removal	5-2
Engine Installation	5-12
Engine Mount Replacement	5-23

Cylinder Head	6-1
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Engine Block	7-1
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Engine Lubrication	8-1
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Intake Manifold and Exhaust System	9-1
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Engine Assembly

Engine Removal

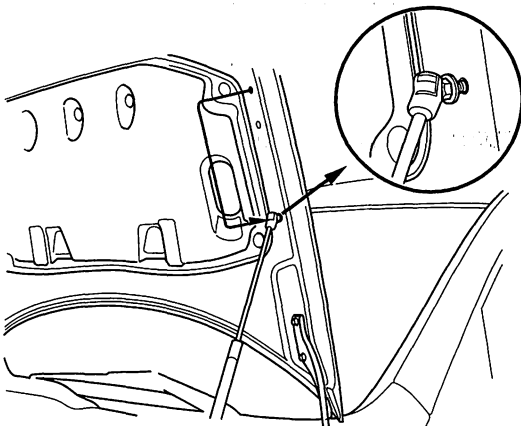
Special Tools Required

- Front subframe adapter EQS02BMDXSB0
 - Engine support hanger A and Reds AAR-T-12566
 - Engine hanger balance bar VSB02C000019
 - Engine hanger adapter set VSB02C000031
- These special tools are available through the American Honda Tool and Equipment program, 1-888-424-6857.

NOTE:

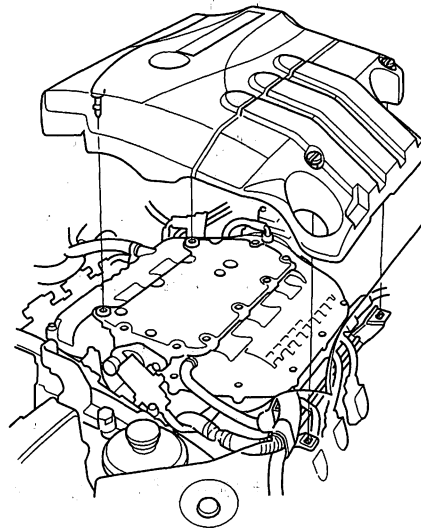
- Use fender covers to avoid damaging painted surfaces.
- To avoid damaging the wiring and terminals, unplug the wiring connectors carefully while holding the connector portion.
- Mark all wiring and hoses to avoid misconnection. Also, be sure that they do not contact other wiring, hoses, or interfere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

1. Remove the support struts from the engine hood. Move the engine hood to a vertical position, then reinstall the support strut as shown.

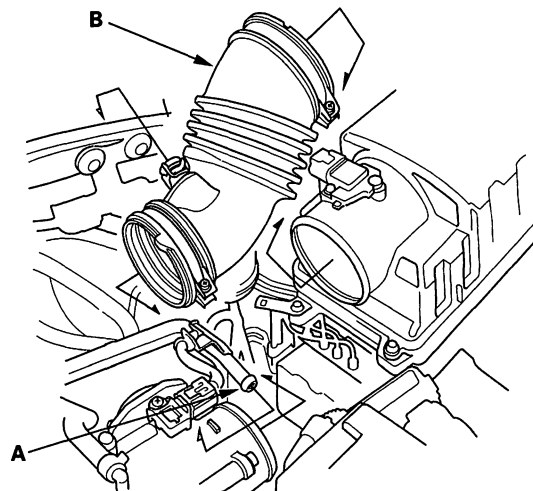


2. Relieve the fuel pressure (see page 11-330).
3. Drain the power steering system fluid, then plug the fluid reservoir and return hose (see page 17-13).
4. Remove the bulkhead cover (see page 20-203).

5. Make sure you have the anti-theft codes for the audio system and navigation system (if equipped).
6. Disconnect the negative cable from the battery first, then disconnect the positive cable.
7. Remove the battery.
8. Remove the engine cover.



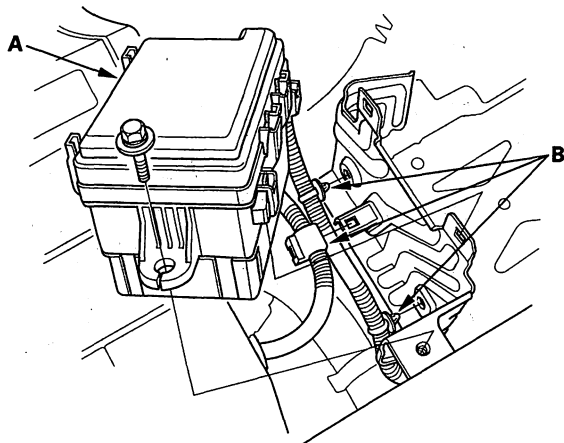
9. Remove the breather pipe (A), then remove the air intake duct (B).



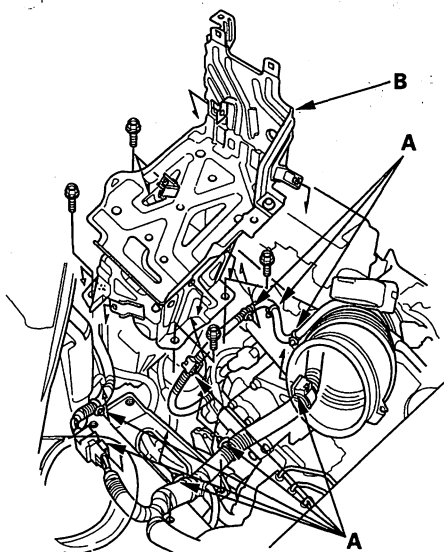
10. Remove the air cleaner assembly (see page 11-363).



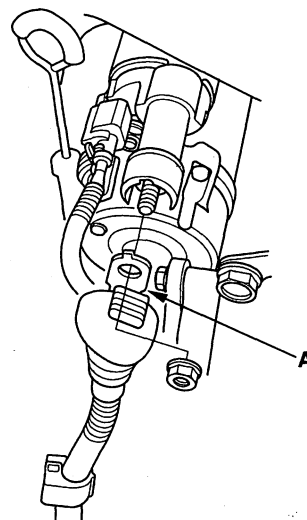
11. Remove the main under-hood fuse box (A), then remove the harness clamps (B).



12. Remove the harness clamps (A), then remove the battery base (B).

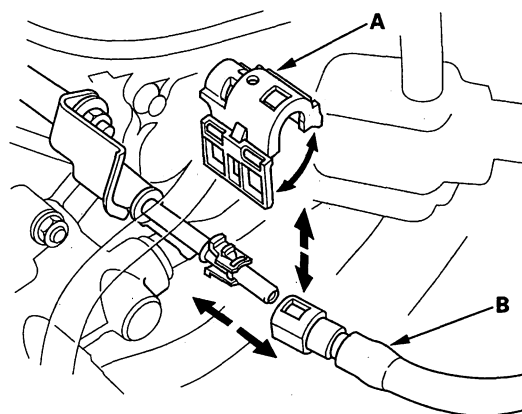


13. Remove the positive starter cable (A).



14. Remove the shift cable (see page 14-309).

15. Remove the quick-connect fitting cover (A), then disconnect the fuel feed hose (B) (see page 11-338).

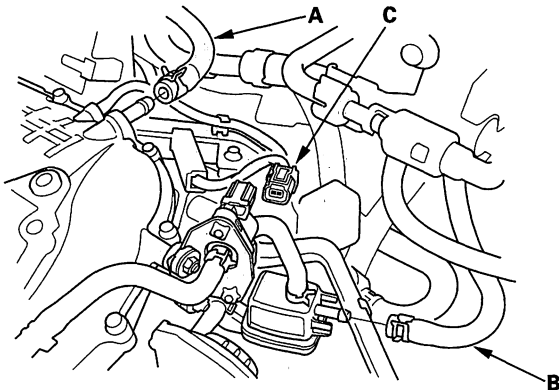


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Engine Assembly

Engine Removal (cont'd)

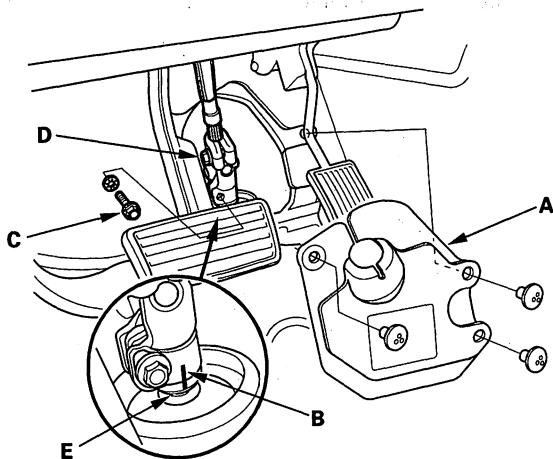
16. Remove the brake booster vacuum hose (A), and evaporative emission (EVAP) canister hose (B).



17. Disconnect the evaporative emission (EVAP) canister purge valve connector (C).

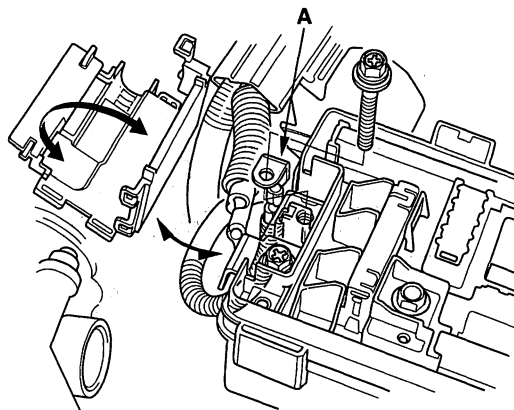
18. Remove the steering wheel (see page 17-22).

19. Remove the steering joint cover (A).



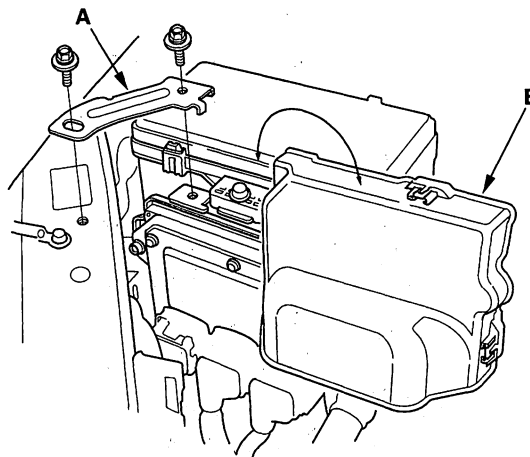
20. Make a reference mark (B) across the steering joint and steering gearbox pinion shaft. Remove the steering joint bolt (C), and loosen the steering joint bolt (D), then disconnect the steering joint from the steering gearbox pinion shaft (E).

21. Remove the alternator cable (A) from the main under-hood fuse box.



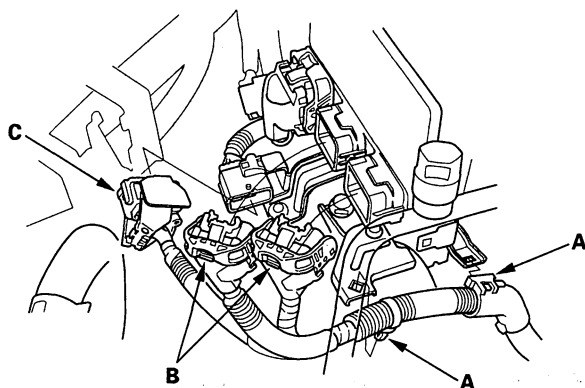
22. Remove the coolant reservoir from the bracket.

23. Remove the bracket (A), then remove the powertrain control module (PCM) cover (B).



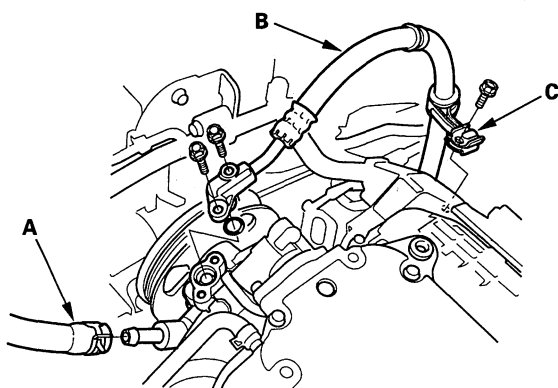


24. Remove the harness clamps (A), then disconnect the two PCM connectors (B) and engine wire harness connector (C).



25. Remove the drive belt (see page 4-33).

26. Remove the power steering (P/S) pump inlet hose (A) and P/S pump outlet hose (B) from the P/S pump, then plug the P/S lines and P/S pump.



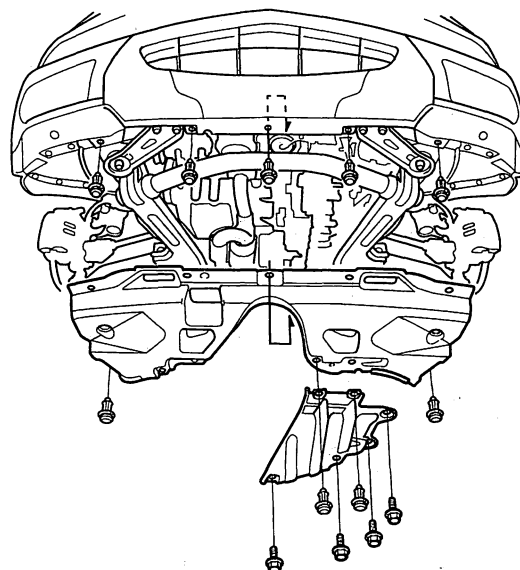
27. Remove the P/S hose clamp (C) from the cylinder head cover.

28. Remove the radiator cap.

29. Raise the vehicle on the lift to full height.

30. Remove the front wheels.

31. Remove the splash shield.

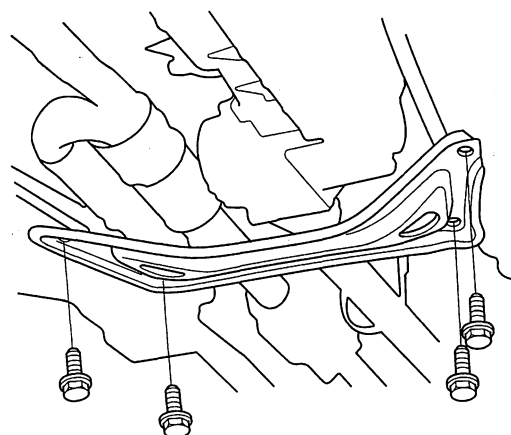


32. Loosen the drain plug in the radiator, and drain the engine coolant (see page 10-6).

33. Drain the automatic transmission fluid (ATF) (see page 14-303).

34. Drain the engine oil (see page 8-6).

35. Remove the front subframe stiffener.

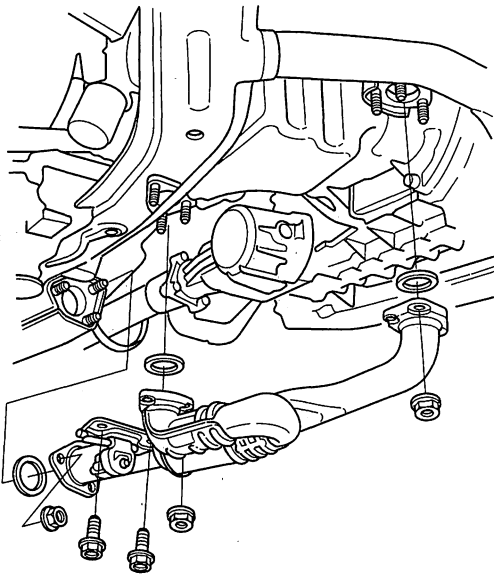


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Engine Assembly

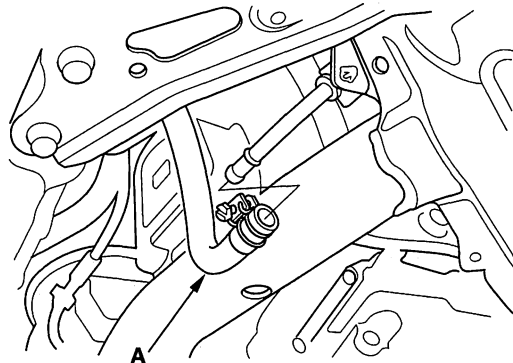
Engine Removal (cont'd)

36. Remove exhaust pipe A.

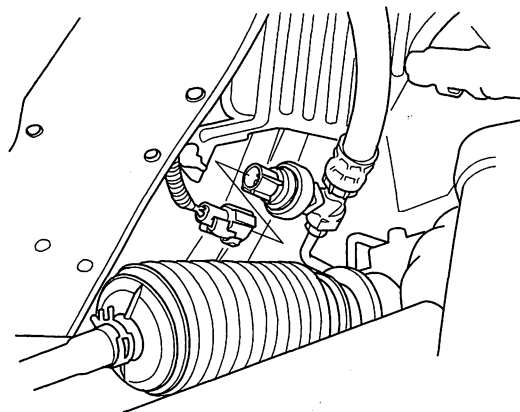


37. Separate the stabilizer links from the dampers (see page 18-20).
38. Separate the tie-rod end ball joints from the knuckles (see step 4 on page 18-15).
39. With active damper system: Remove the suspension stroke sensors from the lower arms.
40. Separate the knuckles from the lower arms (see step 7 on page 18-15).
41. Remove the driveshafts (see page 16-4). Coat all precision-finished surfaces with new engine oil. Tie plastic bags over the driveshaft ends.
42. Remove the propeller shaft from the transfer shaft flange (see page 16-39).
43. Remove the transfer assembly (see page 14-270).

44. Remove the P/S hose (A), then plug the line and hose.

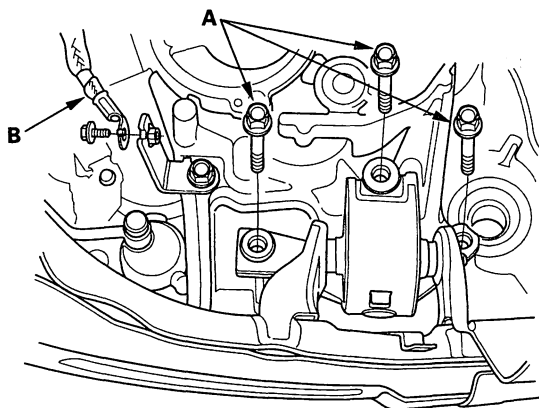


45. Disconnect the power steering pressure switch connector.

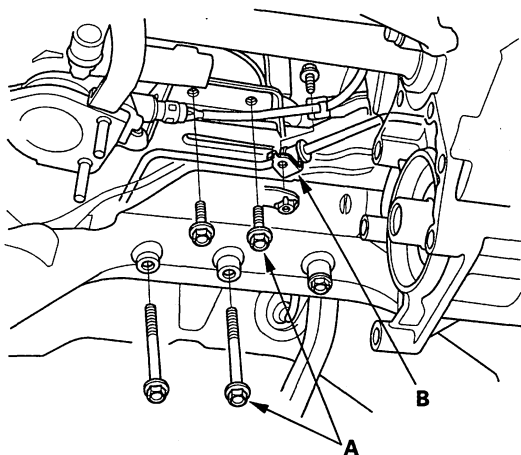




46. Remove the transmission lower mount bolts (A) and ground cable (B).

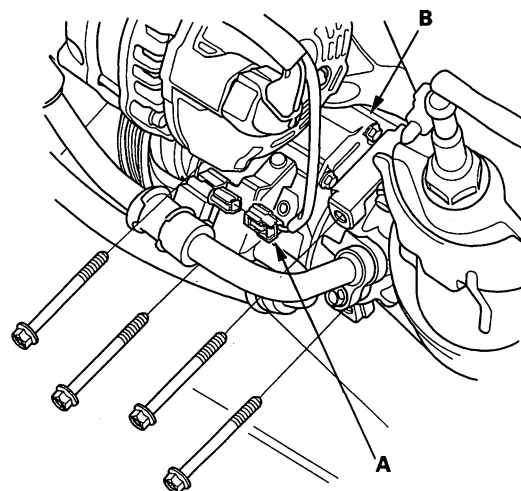


47. Remove the rear mount bolts (A), and power steering line bracket (B).

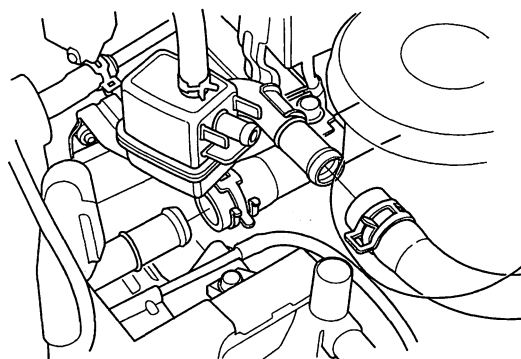


48. Lower the vehicle on the lift.

49. Disconnect the A/C compressor clutch connector (A), then remove the A/C compressor (B) without disconnecting the A/C hoses.



50. Remove the heater hoses.

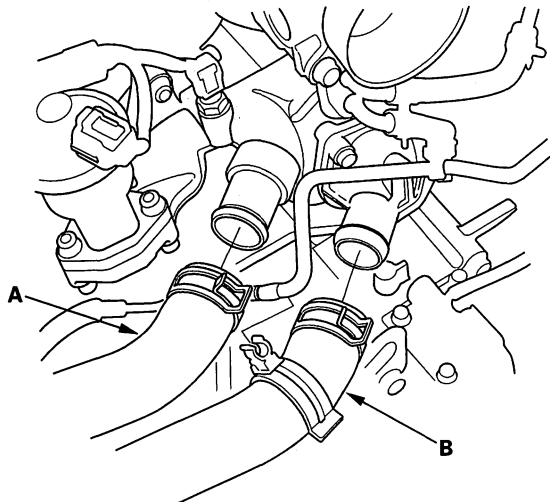


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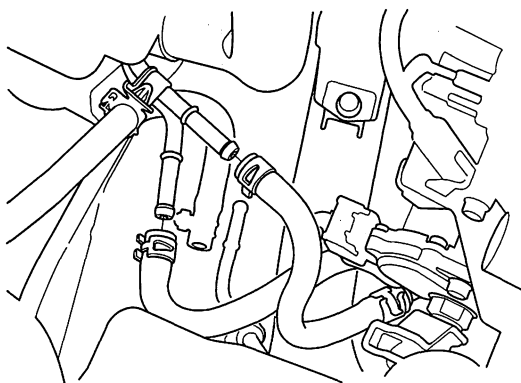
Engine Assembly

Engine Removal (cont'd)

51. Remove the upper radiator hose (A) and lower radiator hose (B).

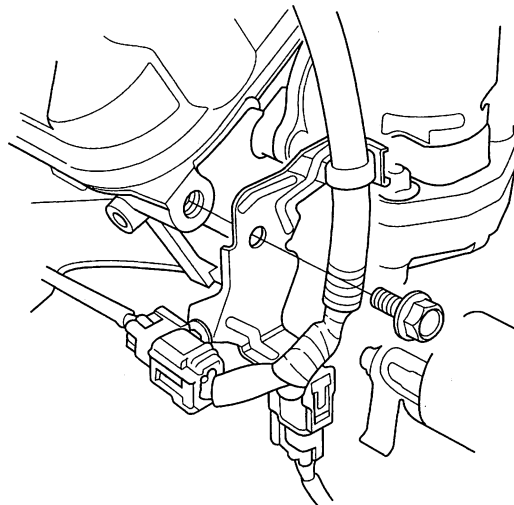


52. Remove the ATF cooler hoses from the transmission, then plug the ATF cooler hoses and lines.

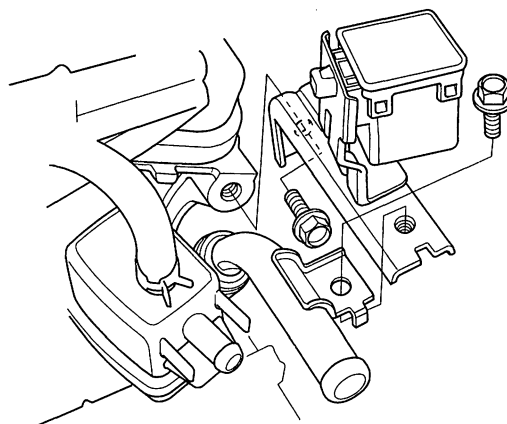


53. Remove the radiator (see page 10-10).

54. Remove the connector bracket from the front cylinder head; use the bracket bolt hole to attach the engine balancer bar front arm.

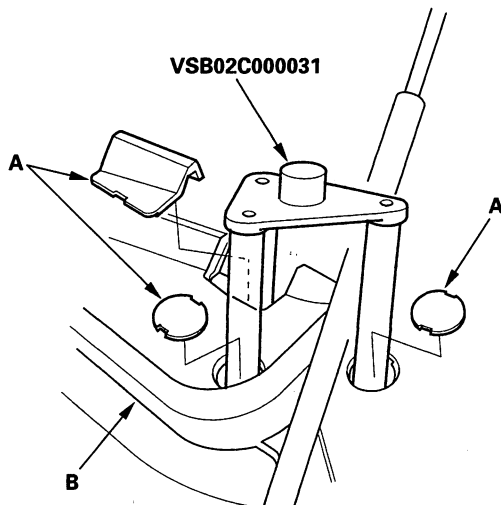


55. Remove the bracket from the rear cylinder head; use the bracket bolt hole to attach the engine balancer bar rear arm.

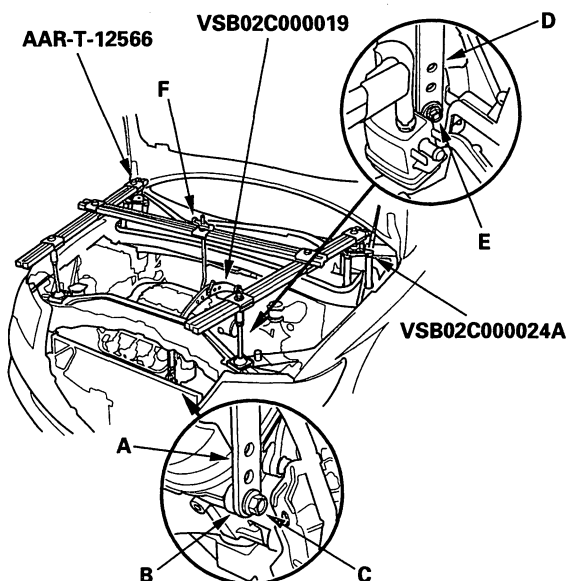




56. Remove the service caps (A) for the front damper flange nuts from the cowl cover (B). Position the engine hanger adapters (VSB02C000031) with the "FRONT" mark facing forward over the damper flange nuts.



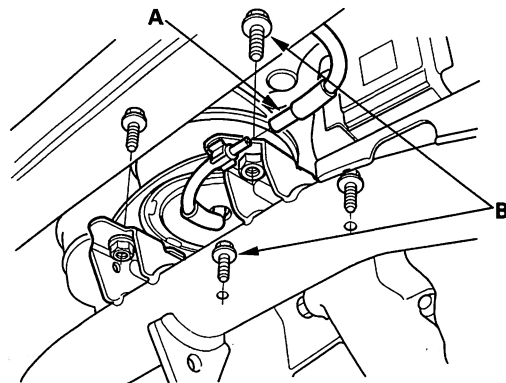
57. Install the engine hanger balance bar (VSB02C000019); attach the front arm (A) to the front cylinder head with a spacer (B) and 10 x 1.25 mm bolt (C), attach the rear arm (D) to the rear cylinder head with 8 x 1.25 mm bolt (E).



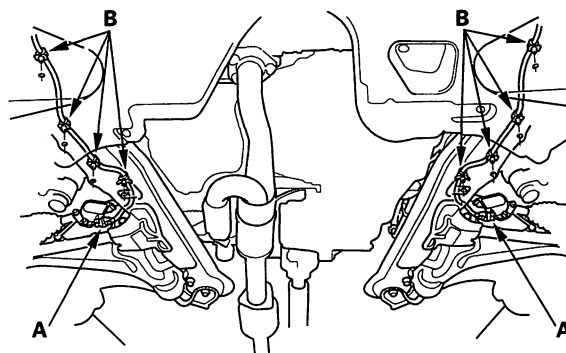
58. Install the engine support hanger (AAR-T-12566) to the vehicle, and attach the hook to the slotted hole in the engine hanger balance bar. Tighten the wing nut (F) by hand to lift and support the engine/transmission.

59. Raise the vehicle on the lift to full height.

60. Disconnect the front engine mount control solenoid valve tube (A), then remove the front engine mount bolts (B).



61. With active damper system: Disconnect the front suspension stroke sensor connectors (A), then remove the harness clamps (B).

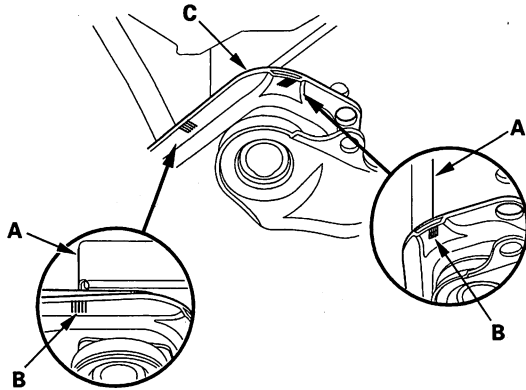


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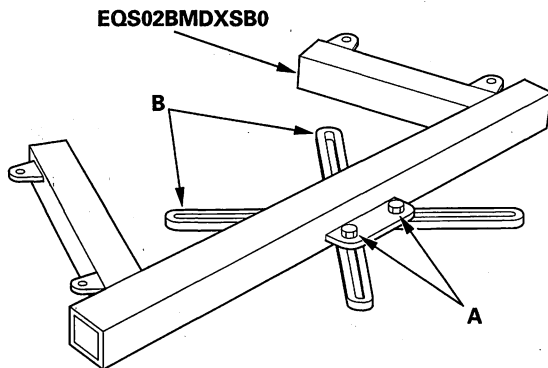
Engine Assembly

Engine Removal (cont'd)

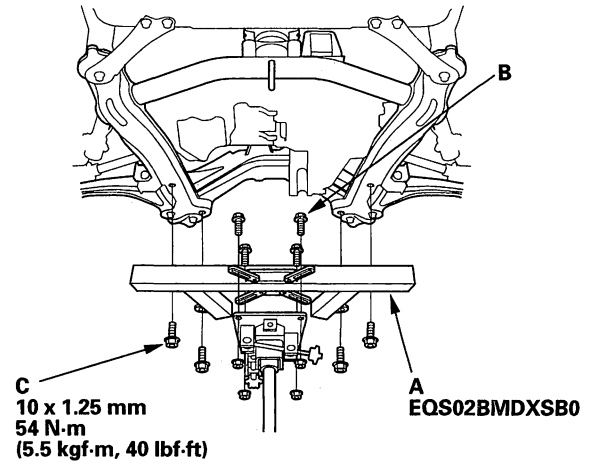
62. Make reference marks (A) on the body across the marks (B) on the edge of the front subframe (C).



63. Loosen the four bolts (A) holding the adjustable arms (B) of the front subframe adapter (EQS02 BMDXSBO) to its center plate.

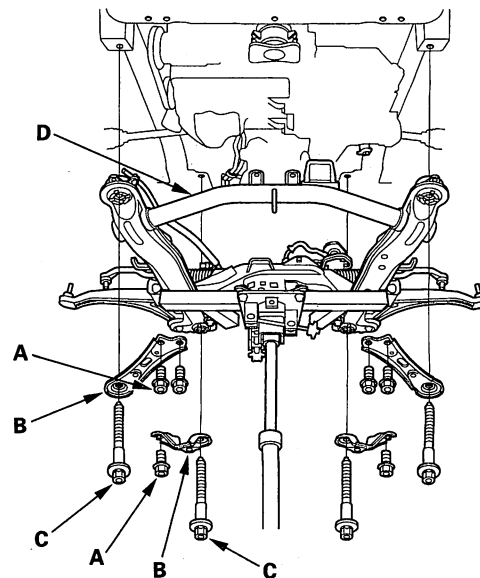


64. Line up the slots in the arms with the bolt holes on the corner of the jack base, then attach the front subframe adapter (A) to the jack base with the bolts (B) that came with the jack. Tighten all bolts securely.



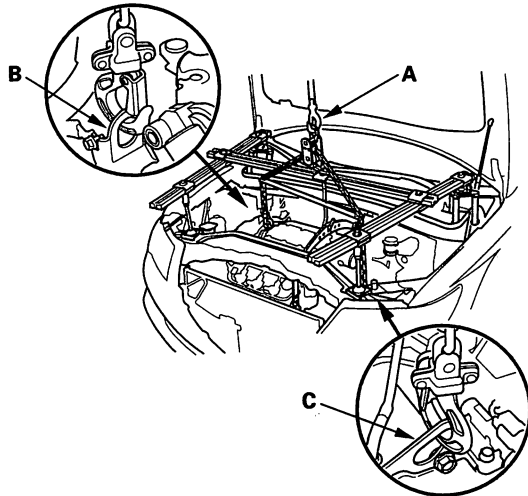
65. Raise the jack to vehicle height, then attach the front subframe adapter to the front subframe using the subframe stiffener mounting bolts (C) and bolt holes.

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

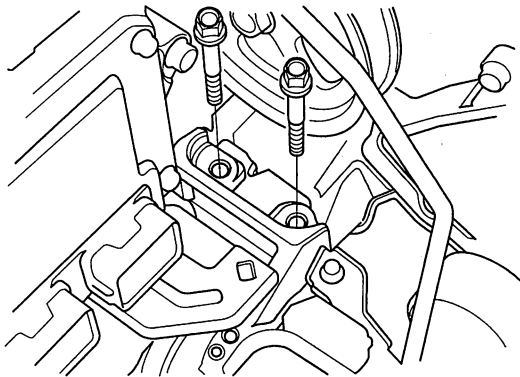




67. Lower the vehicle and attach a chain hoist (A) to the engine hook (B) and transmission hook (C). Lift up on the engine/transmission until it's securely supported by the chain hoist, and remove the engine support hanger from the engine and vehicle.



68. Remove the mounting bolts from the upper half of the side engine mount bracket.



69. Check that the engine/transmission is completely free of vacuum hoses, fuel and coolant hoses, and electrical wiring.
70. 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.
71. Disconnect the chain hoist from the engine/transmission.
72. Raise the vehicle all the way on the lift, and remove the engine/transmission from under the vehicle.

Engine Assembly

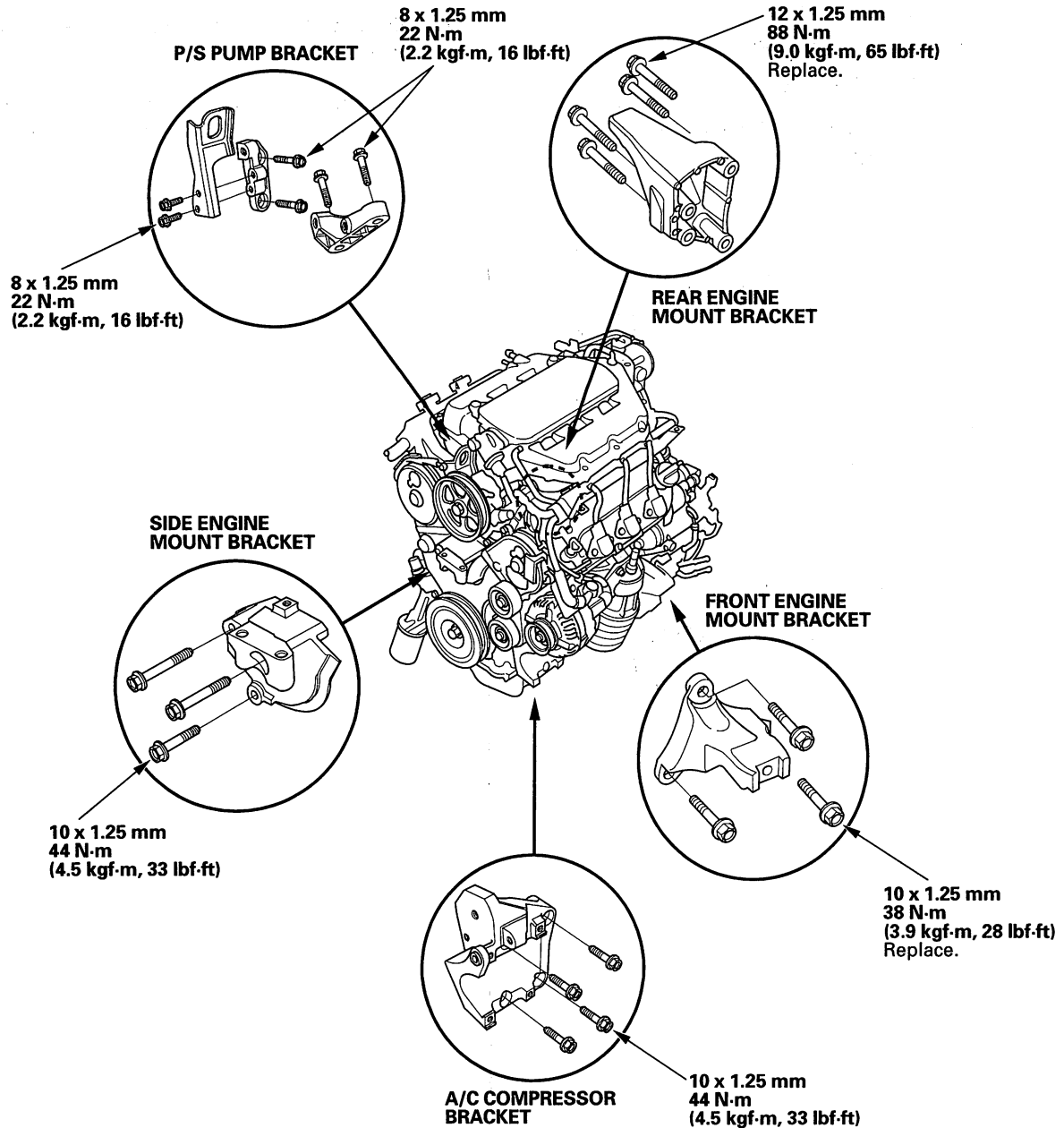
Engine Installation

Special Tools Required

- Front subframe adapter EQS02BMDXSB0
- Engine support hanger A and Reds AAR-T-12566
- Engine hanger balance bar VSB02C000019
- Engine hanger adapter set VSB02C000031

These special tools are available through the American Honda Tool and Equipment program, 1-888-424-6857.

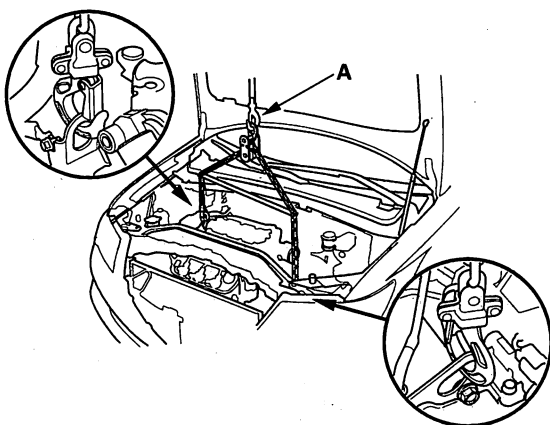
1. Install the engine mount bracket and accessory brackets, and tighten their bolts to the specified torque.



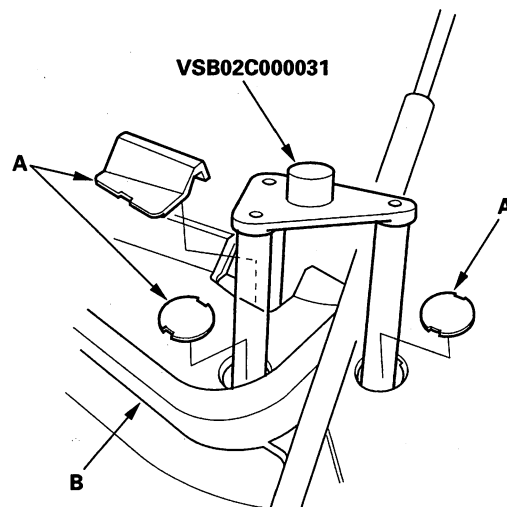


2. Position the engine/transmission under the vehicle. Be sure that they are properly aligned. Carefully lower the vehicle until the engine and transmission are properly positioned in the engine compartment. Make sure the vehicle is not resting on any part of the engine or transmission. Lift and support the engine with a chain hoist (A), and carefully raise the engine/transmission into place.

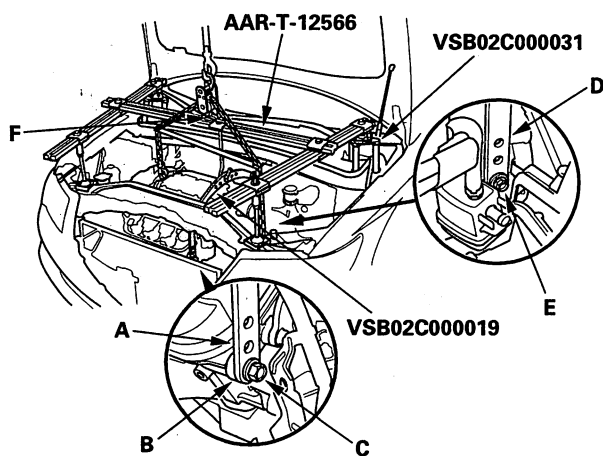
NOTE: Reinstall the mounting bolts/support nuts in the sequence given in the following steps. Failure to follow this sequence may cause excessive noise and vibration, and reduce engine mount life.



3. Remove the service caps (A) for the front damper flange nuts from the cowl cover (B). Position the engine hanger adapters (VSB02C000031) with the "FRONT" mark facing forward over the damper flange nuts.



4. Install the engine hanger balance bar (VSB02C000019); attach the front arm (A) to the front cylinder head with a spacer (B) and 10 x 1.25 mm bolt (C), attach the rear arm (D) to the rear cylinder head with 8 x 1.25 mm bolt (E).



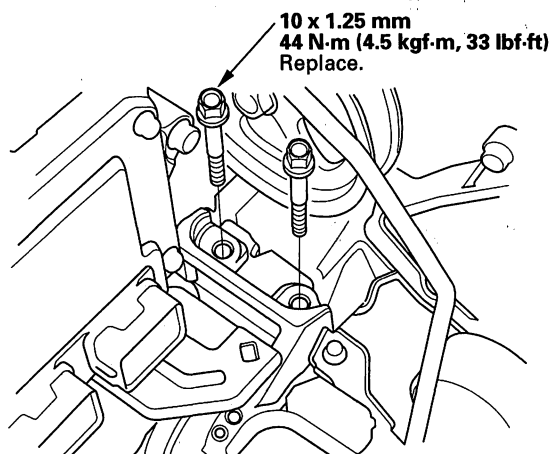
5. Install the engine support hanger (AAR-T-12566) to the vehicle, and attach the hook to the slotted hole in the engine hanger balance bar. Tighten the wing nut (F) by hand to lift and support the engine/transmission.

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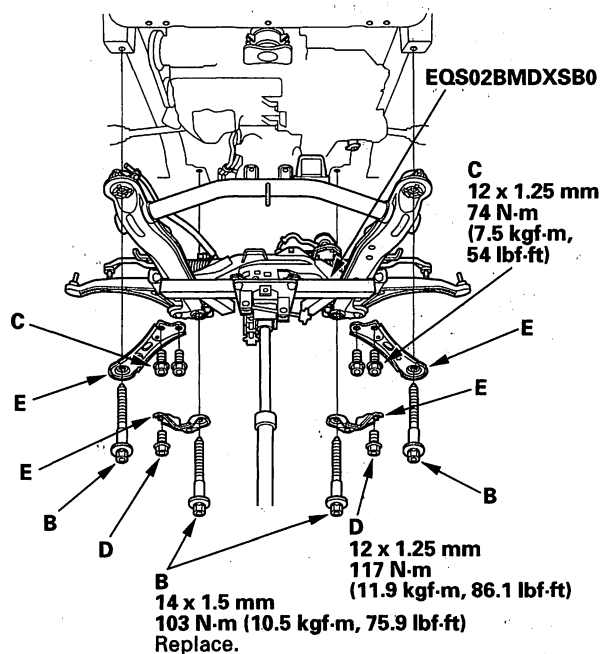
Engine Assembly

Engine Installation (cont'd)

6. Install new mounting bolts into the upper half of the side engine mount bracket. Tighten the bolts to the specified torque.

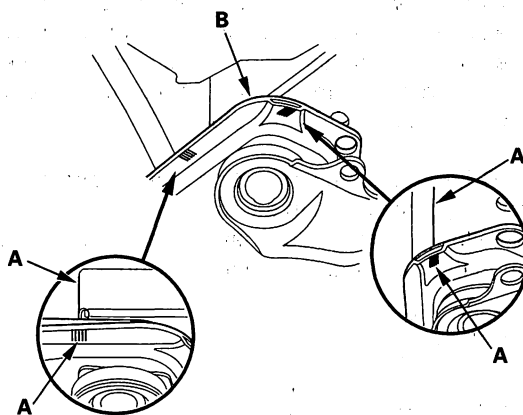


7. Remove the chain hoist, then raise the vehicle on the lift to full height.
8. Using the subframe adapter (EQS02BMDXSB0) and a jack, raise the front subframe up to the body.

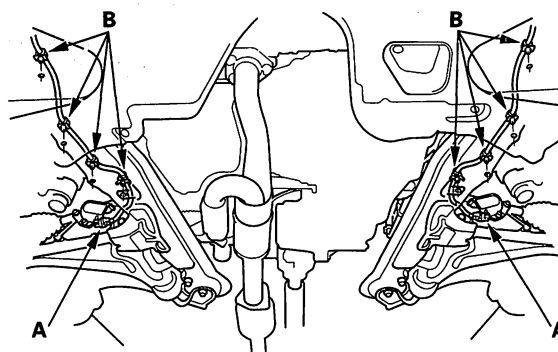


9. Loosely install the new front subframe mounting bolts (four) (B), the 12 x 1.25 mm bolts (six) (C) (D), and the stiffeners (E).

10. Align all reference marks (A) on the front subframe (B) with the body, then tighten the bolts on the front subframe to the specified torque.

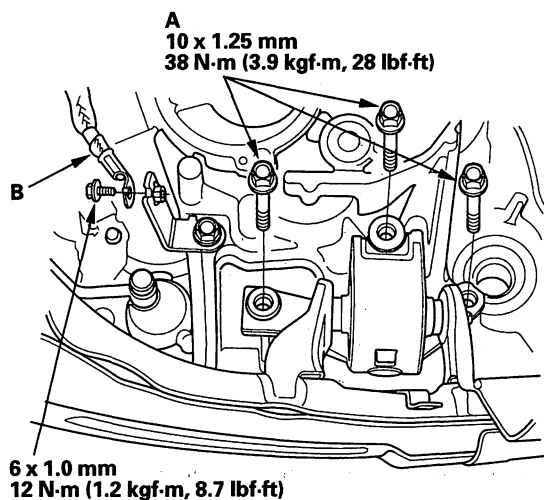


11. Remove the jack and front subframe adapter.
12. With active damper system: Connect the front suspension stroke sensor connectors (A), then install the harness clamps (B).

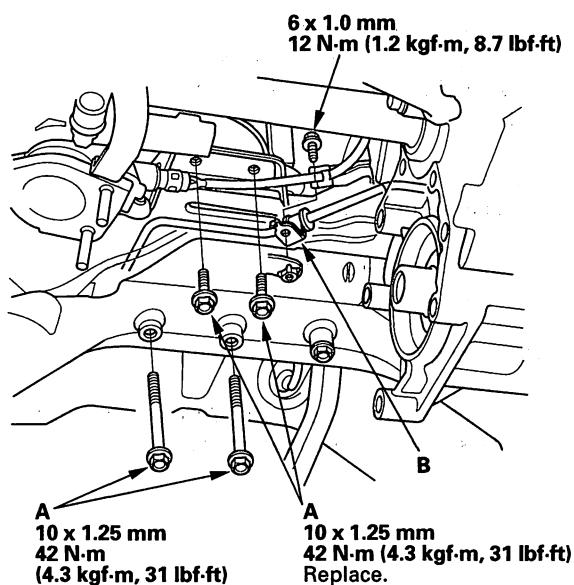




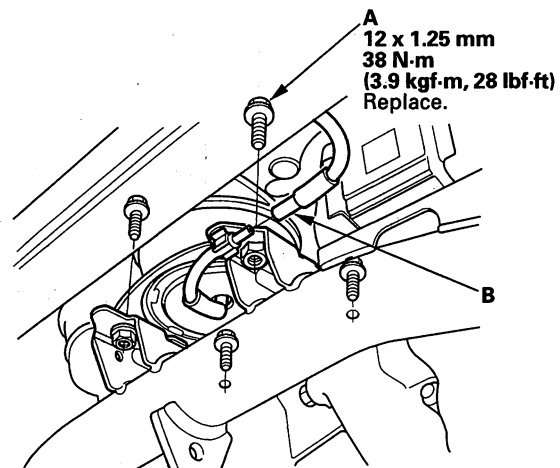
13. Tighten the transmission lower mount bolts (A) and ground cable (B).



14. Tighten the rear mount bolts (A) and power steering line bracket (B).

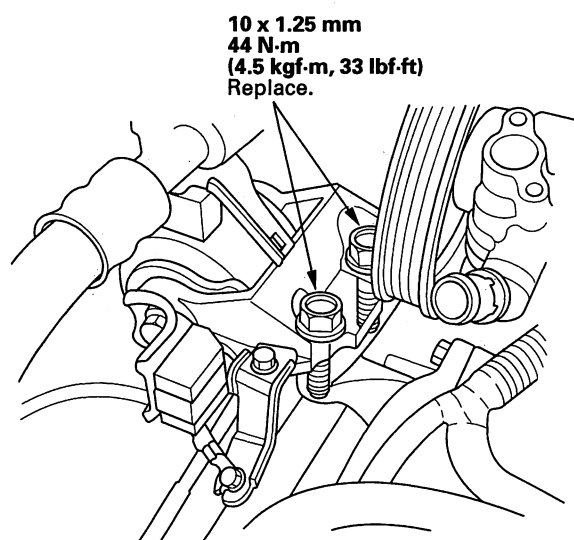


15. Tighten the front mount bolts (A), then connect the front engine mount control solenoid valve tube (B).



16. Lower the vehicle on the lift.

17. Loosen the mounting bolts for the upper half of the side engine mount bracket, then retighten them to the specified torque.



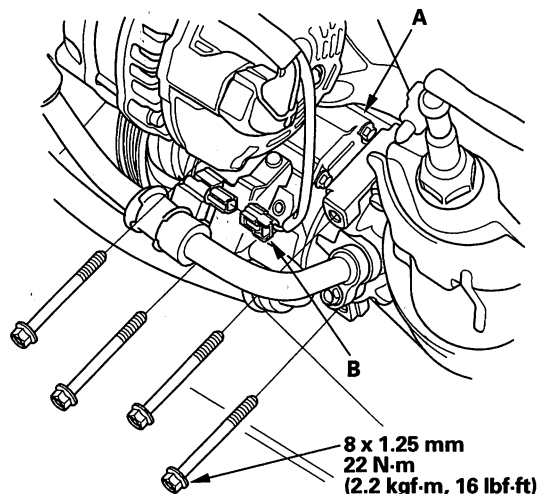
18. Remove the engine support hanger and engine hanger balance bar.

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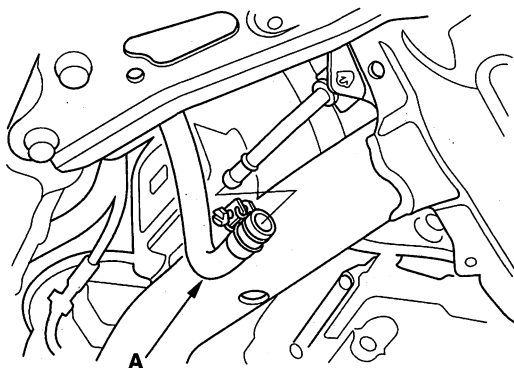
Engine Assembly

Engine Installation (cont'd)

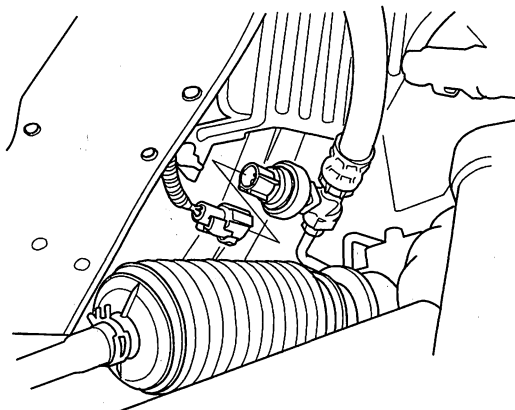
19. Install the A/C compressor (A), then connect the A/C compressor clutch connector (B).



20. Install the radiator (see page 10-10).
21. Raise the vehicle on the lift to full height.
22. Install the power steering (P/S) hose (A).



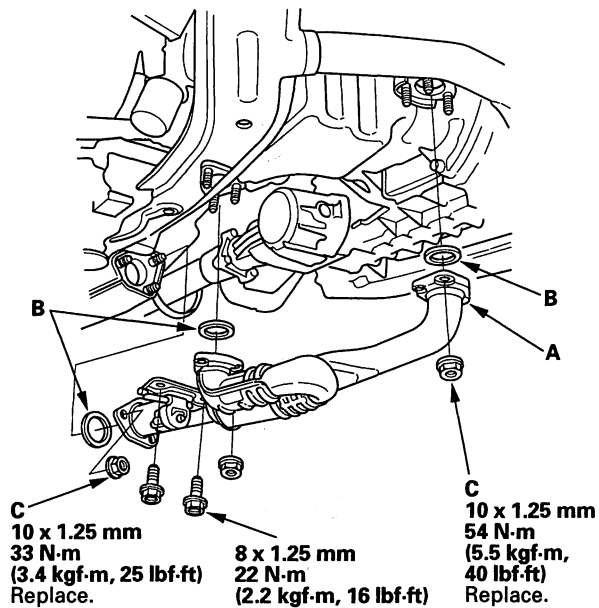
23. Connect the power steering pressure switch connector.



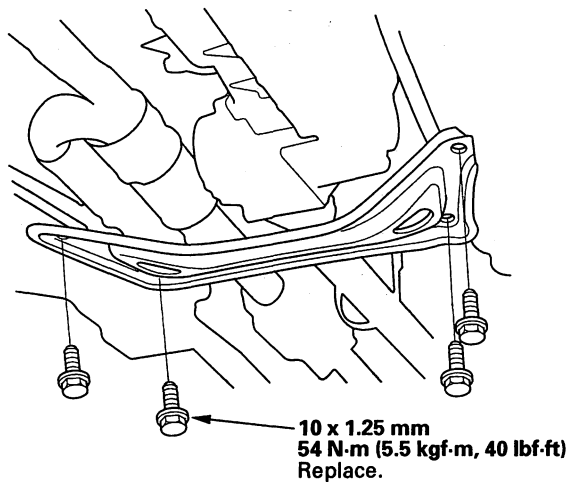
24. Install the transfer assembly (see page 14-272).
25. Install the propeller shaft on transfer shaft flange (see page 16-39).
26. Wipe the driveshaft clean. Install a new set ring on the end of each driveshaft, then install the driveshafts. Make sure each ring "clicks" into place in the differential and intermediate shaft.
27. Connect the suspension lower arms to the knuckles (see step 9 on page 18-18).
28. Connect the tie-rod end ball joints to the knuckles (see step 4 on page 18-17).
29. Connect the stabilizer links (see page 18-20).
30. With active damper system: Connect the suspension stroke sensors to the lower arms.



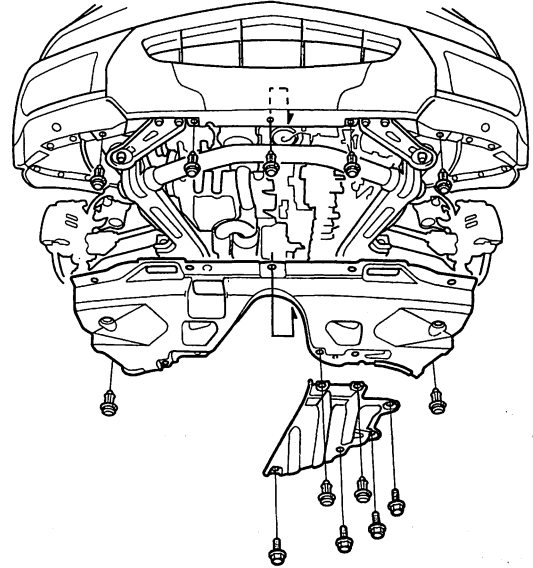
31. Install exhaust pipe A using new gaskets (B) and new self-locking nuts (C).



32. Install the front subframe stiffener using new bolts.



33. Install the splash shield.



34. Install the front wheels.

35. Lower the vehicle on the lift.

36. Install the upper radiator hose (A) and lower radiator hose (B).

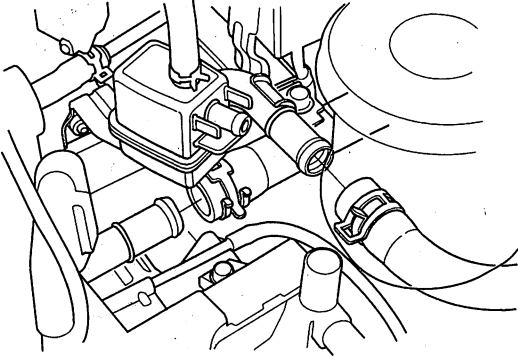


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Engine Assembly

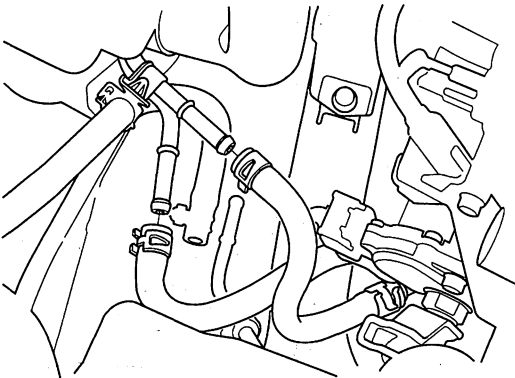
Engine Installation (cont'd)

37. Install the heater hoses.

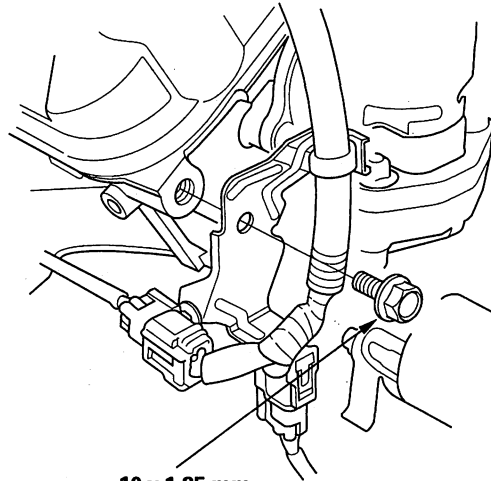


38. Install the automatic transmission fluid (ATF) cooler hoses to the transmission, and secure the hoses with the clamps.

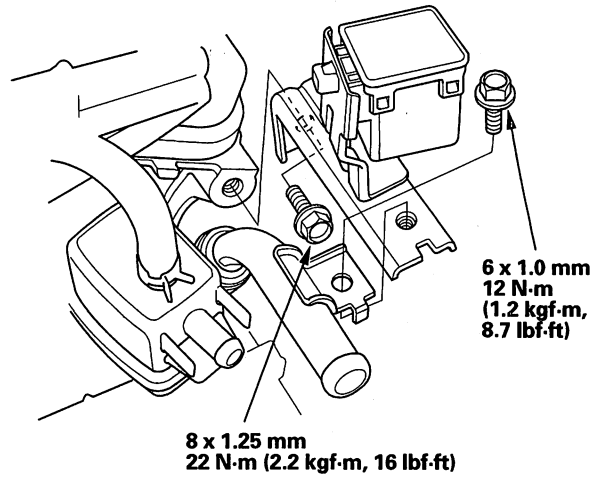
NOTE: Check the installation location of the clamps (see page 14-302).



39. Install the connector bracket to the front cylinder head.

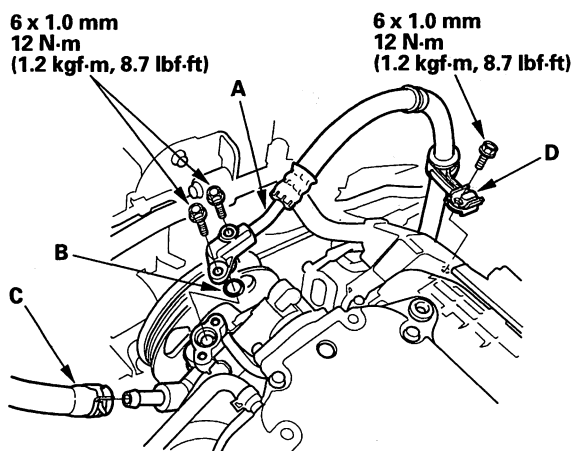


40. Install the bracket to the rear cylinder head.

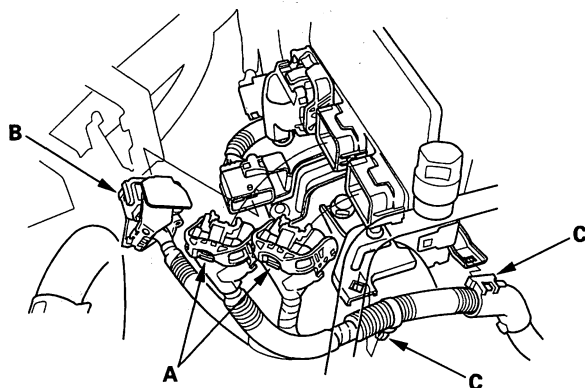




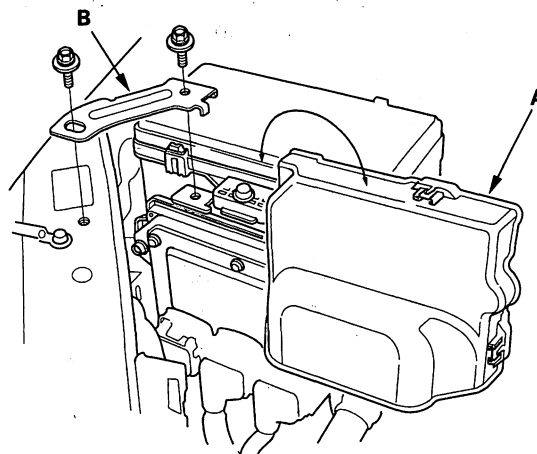
41. Install the power steering (P/S) pump outlet hose (A) with a new O-ring (B), and install the P/S pump inlet hose (C).



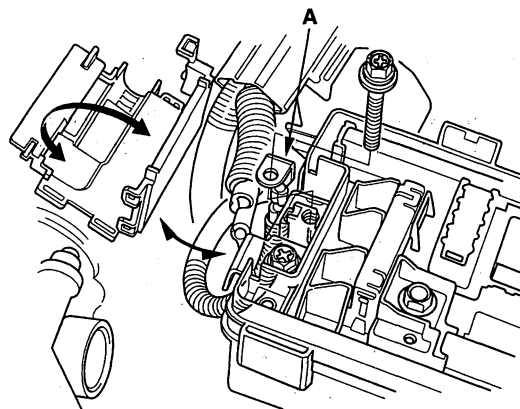
42. Install the P/S hose clamp (D) to the cylinder head cover.
43. Install the drive belt (see page 4-33).
44. Connect the powertrain control module (PCM) connectors (A) and engine wire harness connector (B), then install the harness clamps (C).



45. Install the PCM cover (A), then install the bracket (B).



46. Install the coolant reservoir to the bracket.
47. Install the alternator cable (A) to the main under-hood fuse box.

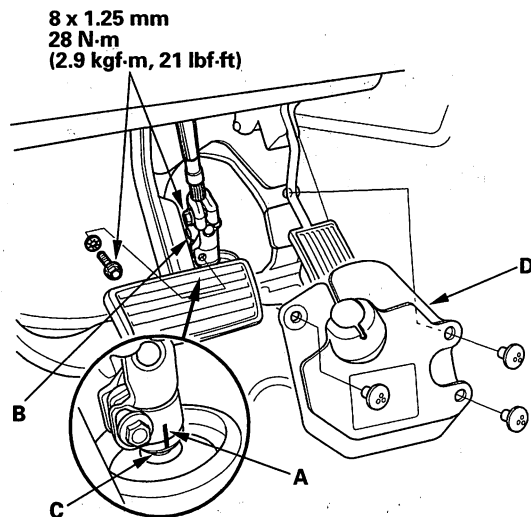


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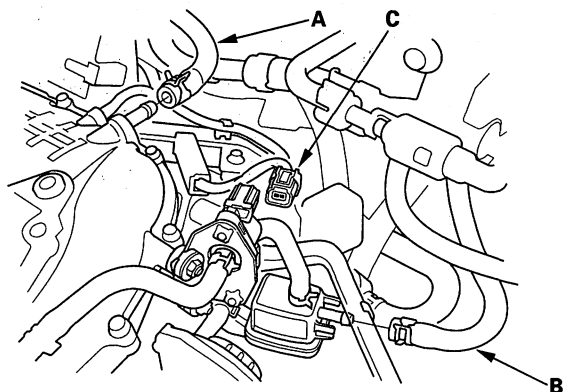
Engine Assembly

Engine Installation (cont'd)

48. Align the reference mark (A) on the steering joint and steering gearbox pinion shaft. Connect the steering joint (B) to the steering gearbox pinion shaft (C). Tighten the steering joint bolt.

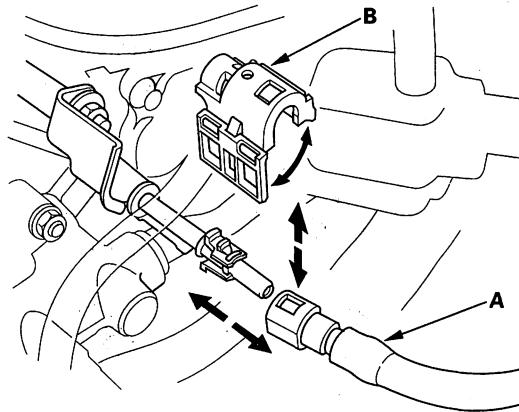


49. Install the steering joint cover (D).
50. Install the steering wheel (see page 17-24).
51. Install the brake booster vacuum hose (A) and evaporative emission (EVAP) canister hose (B).

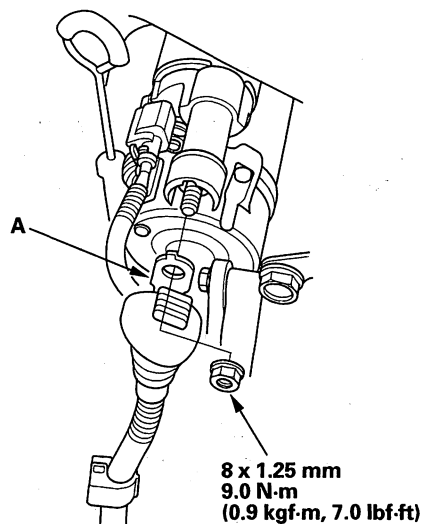


52. Connect the evaporative emission (EVAP) canister purge valve connector (C).

53. Connect the fuel feed hose (A) (see page 11-340), then install the quick-connect fitting cover (B).



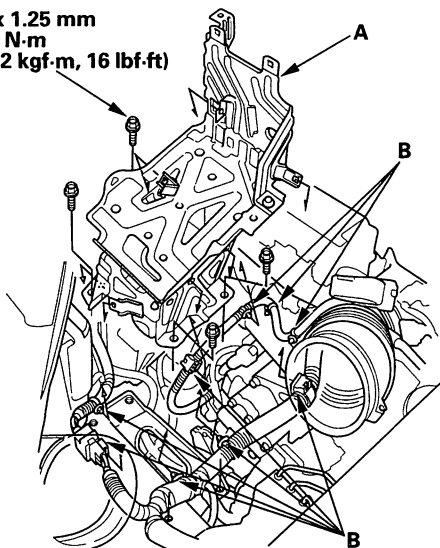
54. Install the shift cable (see page 14-309).
55. Install the positive starter cable (A).



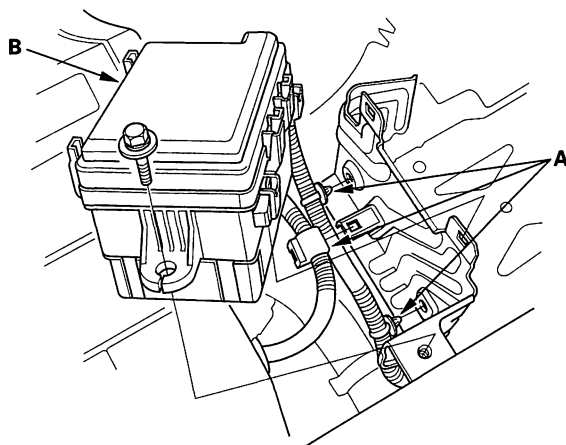


56. Install the battery base (A), then install the harness clamps (B).

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

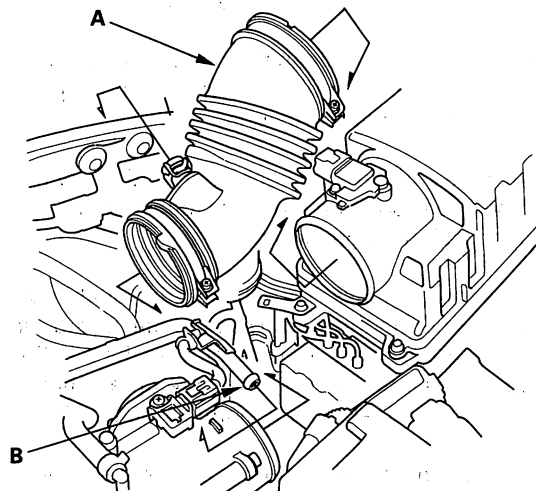


57. Install the harness clamps (A), then install the main under-hood fuse box (B).

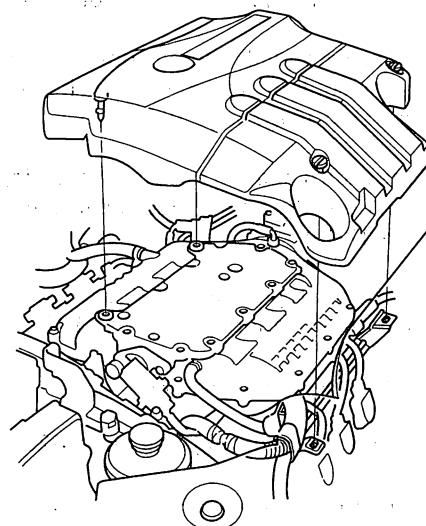


58. Install the air cleaner assembly (see page 11-363).

59. Install the air intake duct (A), then install the breather pipe (B).



60. Install the engine cover.



(cont'd)

Engine Assembly

Engine Installation (cont'd)

61. Install the bulkhead cover (see page 20-203).
62. Install the service caps on the cowl cover.
63. Install the battery. Clean the battery posts and cable terminals, then assemble them and apply grease to prevent corrosion.
64. Move the shift lever to each gear, and verify that the A/T gear position indicator follows the transmission range switch.
65. Check for fuel leaks. Turn the ignition switch ON (II) (do not operate the starter) so the fuel pump runs for about 2 seconds and pressurizes the fuel line. Repeat this operation two or three times, then check for fuel leaks at any point in the fuel line.
66. Refill the engine with engine oil (see step 4 on page 8-6).
67. Refill the transmission with ATF (see page 14-266).
68. Refill the radiator with engine coolant, and bleed air from the cooling system with the heater valve open (see step 10 on page 10-7).
69. Install the return hose to the power steering fluid reservoir. Refill the power steering system fluid (see page 17-13).
70. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see page 11-4).
71. Inspect the idle speed (see page 11-310).
72. Inspect the ignition timing (see page 4-20).
73. Do the steering column position memorization (see page 17-28).
74. Do the headlight initial position learning procedure (see page 22-231).
75. Enter the anti-theft codes for the audio system and navigation system (if equipped).
76. Set the clock.

BACK

Engine Mechanical

Cylinder Head

Special Tools	6-2
Component Location Index	6-3
Engine Compression Inspection	6-6
VTEC Rocker Arm Test	6-7
Valve Clearance Adjustment	6-8
Crankshaft Pulley Removal and Installation	6-11
Timing Belt Inspection	6-13
Timing Belt Removal	6-13
Timing Belt Installation	6-16
Timing Belt Replacement	6-20
Timing Belt Adjuster Replacement	6-24
Timing Belt Drive Pulley Replacement	6-25
Cylinder Head Cover Removal	6-26
Cylinder Head Cover Installation	6-27
Cylinder Head Removal	6-29
Camshaft Replacement	6-32
Cylinder Head Inspection for Warp	6-34
Rocker Arm Assembly Removal	6-34
Rocker Arm and Shaft	
Disassembly/Reassembly	6-35
Rocker Arm and Shaft Inspection	6-36
Camshaft Inspection	6-38
Valve, Spring, and Valve Seal Removal	6-41
Valve Inspection	6-42
Valve Stem-to-Guide Clearance Inspection	6-42
Valve Guide Replacement	6-43
Valve Seat Reconditioning	6-45
Valve, Spring, and Valve Seal Installation	6-47
Camshaft, Rocker Arm Assembly, Camshaft Seal, and Pulley Installation	6-48
Cylinder Head Installation	6-49
Camshaft Oil Seal Installation - In Car	6-54
Sealing Bolt Installation	6-54



Cylinder Head

Special Tools

Ref. No.	Tool Number	Description	Qty
①	07AAJ-PNAA101	Air Pressure Regulator	1
②	07HAH-PJ7A100	Valve Guide Reamer, 5.5 mm	1
③	07JAA-001020A	Socket, 19 mm	1
④	07JAB-001020A	Holder Handle	1
⑤	07MAB-PY3010A	Holder Attachment, 50 mm, Offset	1
⑥	07PAD-0010000	Stem Seal Driver	1
⑦	07PAF-0030100	Camshaft Oil Seal Driver	1
⑧	07VAJ-P8A010A	VTEC Air Adapter	1
⑨	070AJ-0030100	VTEC Air Stopper	1
⑩	07742-0010100	Valve Guide Driver, 5.5 mm	1
⑪	07757-PJ1010A	Valve Spring Compressor Attachment	1



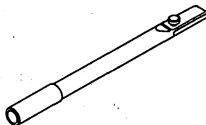
①



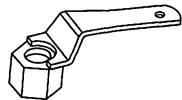
②



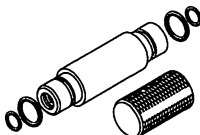
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④



⑤



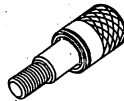
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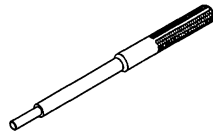
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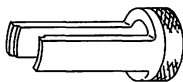
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⑨



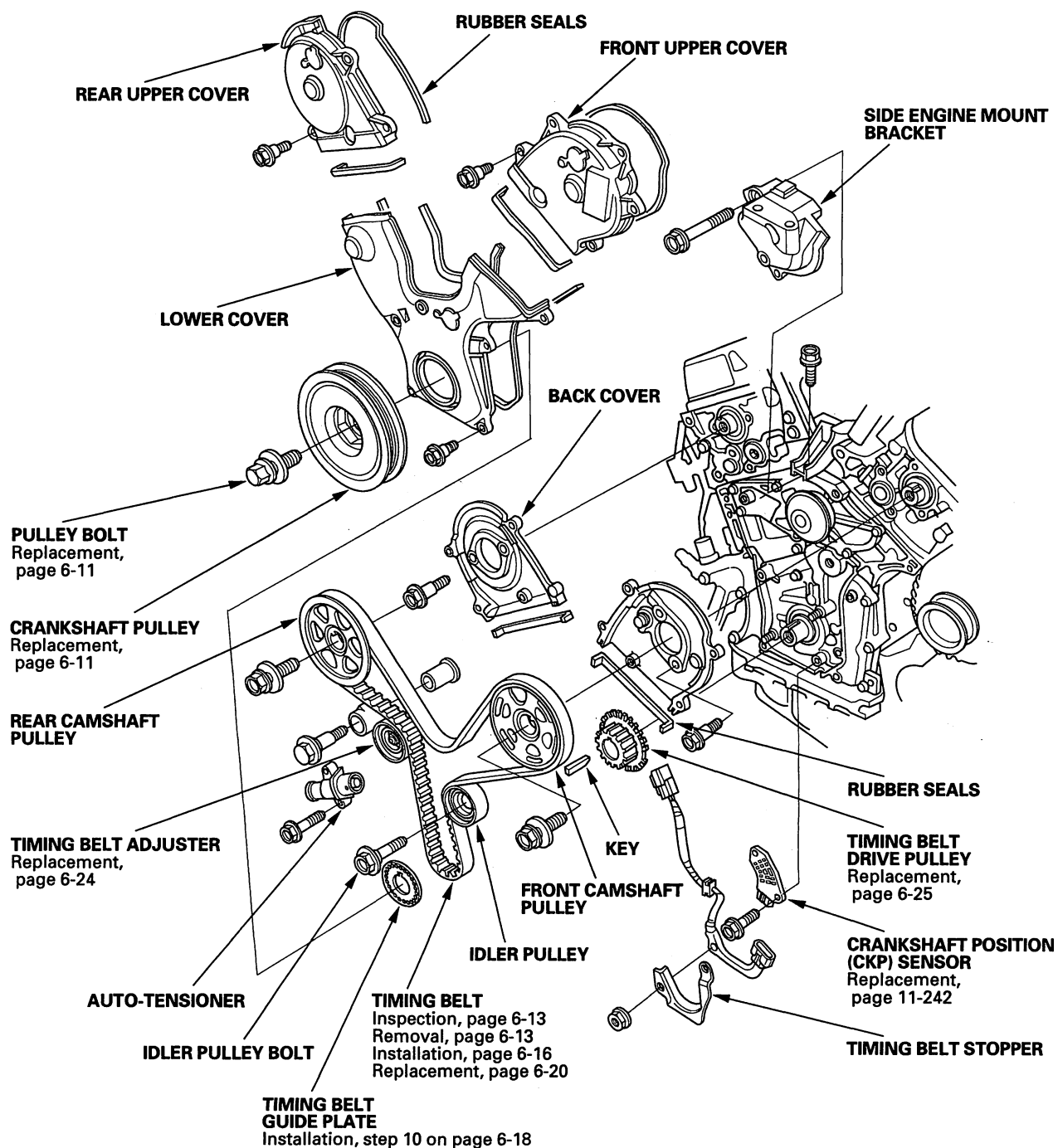
⑩



⑪



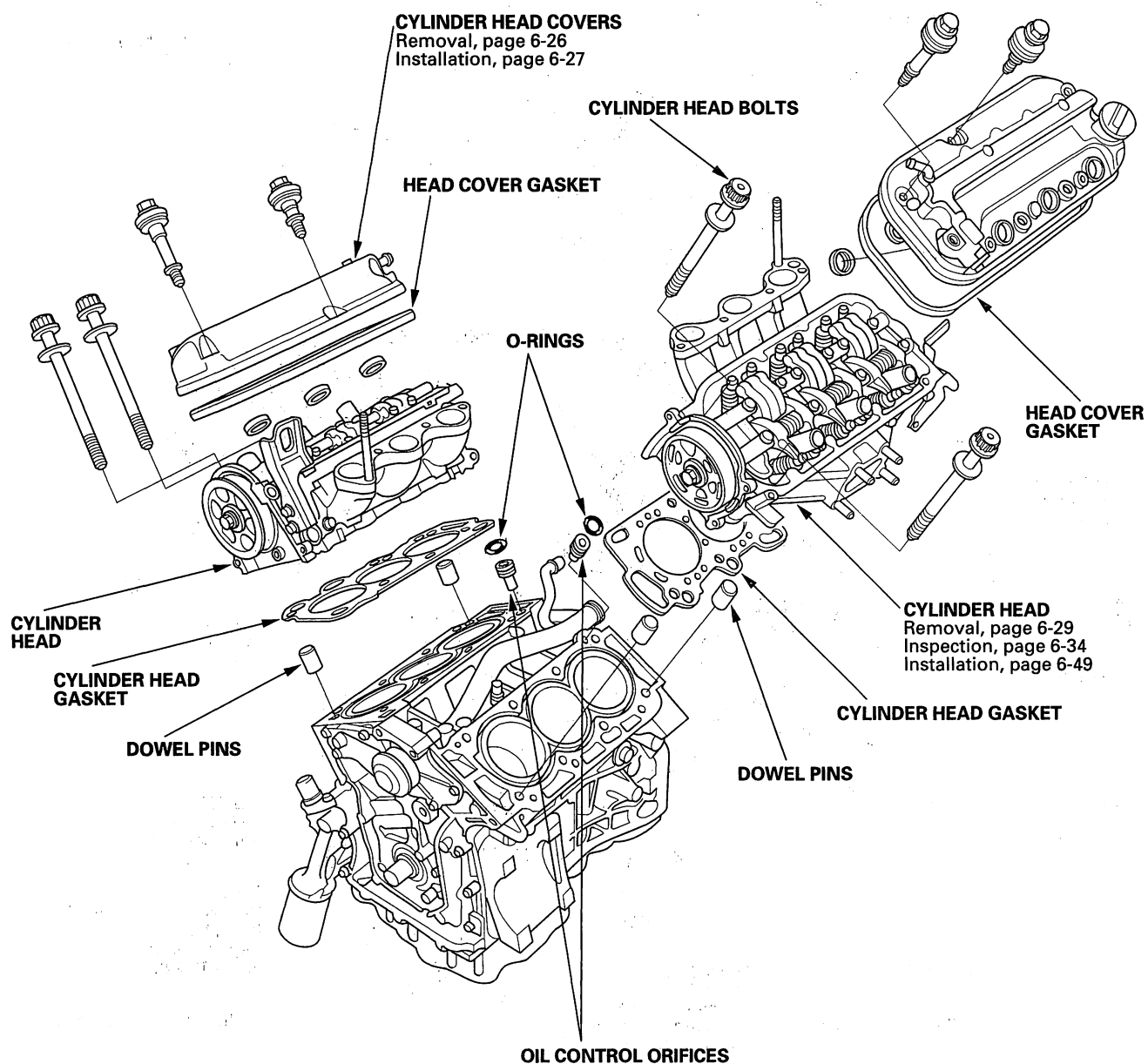
Component Location Index

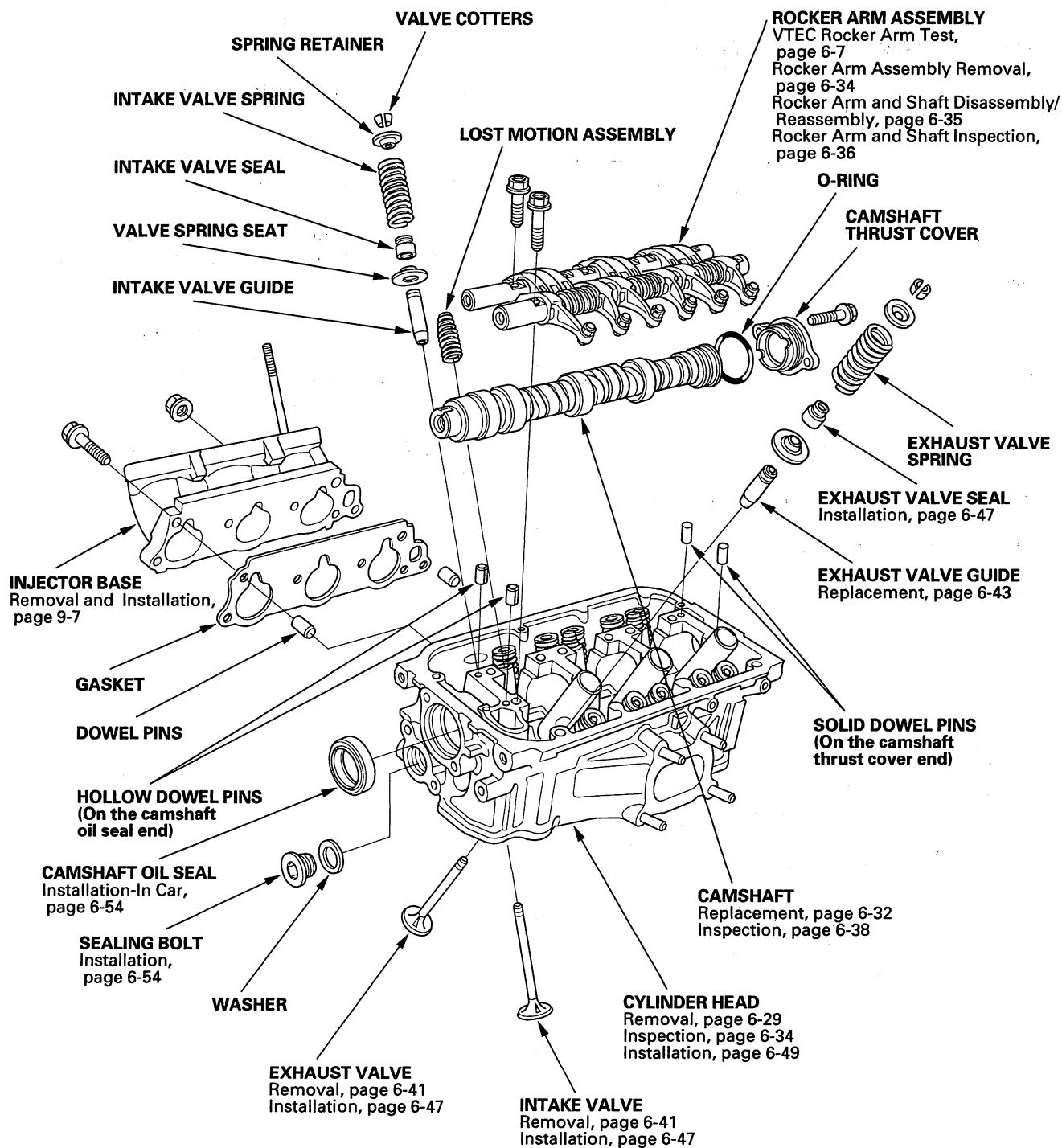


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Cylinder Head

Component Location Index (cont'd)



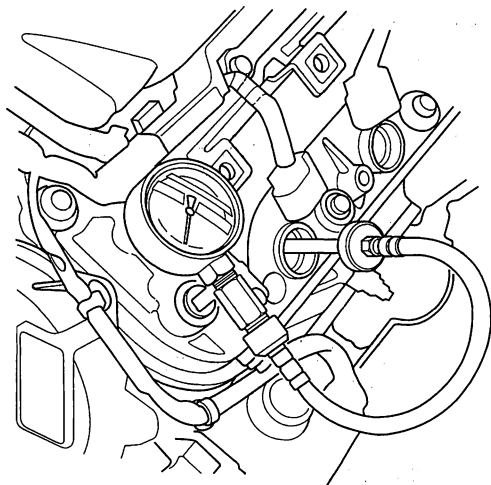


Cylinder Head

Engine Compression Inspection

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

1. Warm up the engine to normal operating temperature (cooling fan comes on).
2. Turn the ignition switch OFF.
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 ON (II).
5. Make sure the HDS communicates with the vehicle and the PCM. If it doesn't communicate, troubleshoot the DLC circuit (see page 11-223).
6. Select PGM-FI, INSPECTION, then ALL INJECTORS OFF function on the HDS.
7. Turn the ignition switch OFF.
8. Remove the six ignition coils (see page 4-21).
9. Remove the six spark plugs.
10. Attach the compression gauge to a spark plug hole.



11. Open the throttle fully, 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.
 - Damaged or worn valves and seats
 - Damaged cylinder head gasket
 - Damaged or worn piston rings
 - Damaged or worn piston and cylinder bore
14. Select PCM reset (see page 11-4) to cancel the ALL INJECTORS OFF function on the HDS.

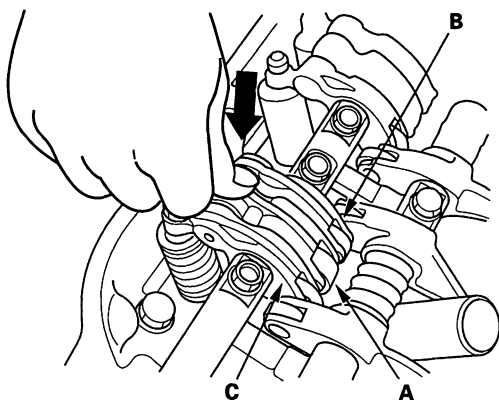


VTEC Rocker Arm Test

Special Tools Required

- VTEC air adapter 07VAJ-P8A010A
- VTEC air stopper 070AJ-0030100
- Air pressure regulator 07AAJ-PNAA101

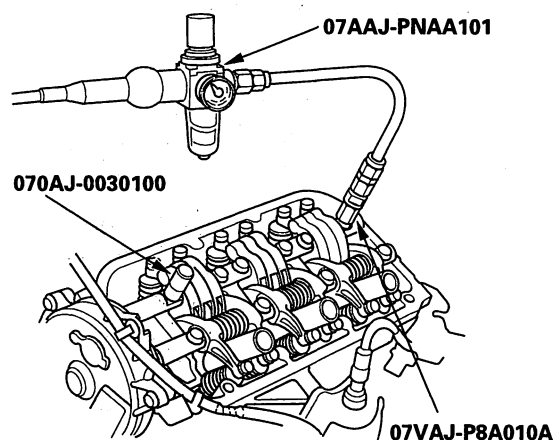
1. Start the engine and let it run for 5 minutes, then turn the ignition switch OFF.
2. Remove the intake manifold (see page 9-3).
3. Remove the cylinder head covers (see page 6-26).
4. Set the No. 1 piston at top dead center (TDC) (see step 3 on page 6-8).
5. Push on the intake mid rocker arm (A) for the No. 1 cylinder. The mid rocker arm should move independently of the primary rocker arm (B) and secondary rocker arm (C).
 - If the mid rocker arm moves freely, go to step 6.
 - If the intake mid rocker arm does not move, remove the mid, primary, and secondary intake rocker arms as an assembly, then check that the rocker arm pistons in the mid and primary rocker arms move smoothly. If any rocker arm needs replacing, replace the mid, primary, and secondary rocker arms as an assembly, and retest.



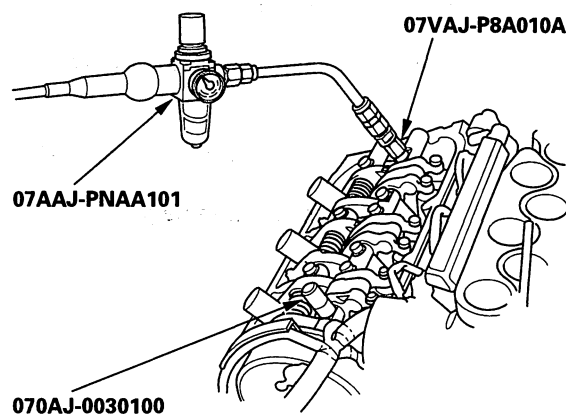
6. Repeat step 5 on the remaining intake mid rocker arms with each piston at TDC. When all the mid rocker arms pass the test, go to step 7.
7. Check that the air pressure on the shop air compressor gauge indicates over 690 kPa (7.0 kgf/cm², 100 psi).
8. Inspect the valve clearance (see page 6-8).

9. Remove the No. 1 and No. 6 intake rocker shaft mounting bolts, then install the VTEC air adapter and VTEC air stopper, and connect the air pressure regulator as shown.

FRONT:



REAR:



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

Specified Air Pressure:

440—540 kPa (4.5—5.5 kgf/cm², 64—78 psi)

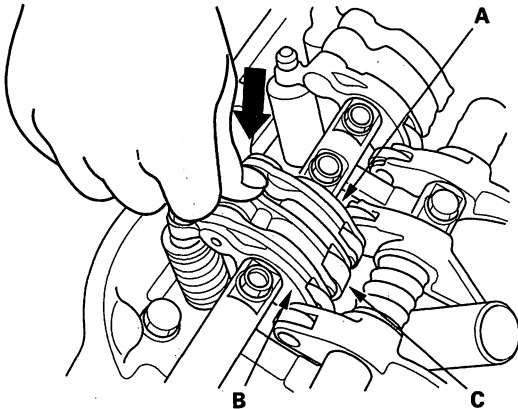
NOTE: If the rocker arm pistons do not move after applying air pressure; move the primary or secondary rocker arm up and down manually.

(cont'd)

Cylinder Head

VTEC Rocker Arm Test (cont'd)

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

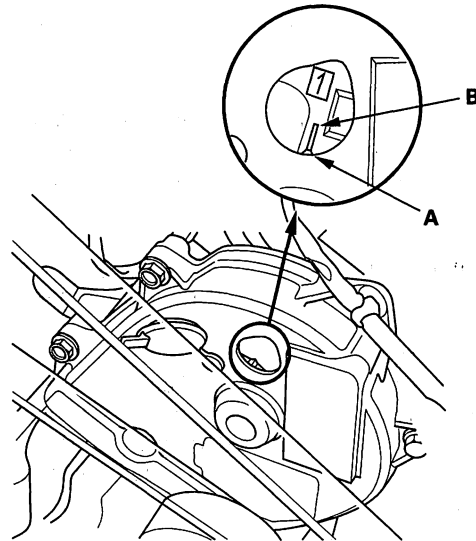


12. Remove the special tools.
13. Tighten the rocker shaft bolts to 24 N·m (2.4 kgf·m, 17 lbf·ft)
14. Install the cylinder head covers (see page 6-27).
15. Install the intake manifold (see page 9-5).

Valve Clearance Adjustment

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

1. Remove the intake manifold (see page 9-3).
2. Remove the cylinder head covers (see page 6-26).
3. Set the No. 1 piston at top dead center (TDC). Align the pointer (A) on the front upper cover with the No. 1 piston TDC mark (B) on the front camshaft pulley.





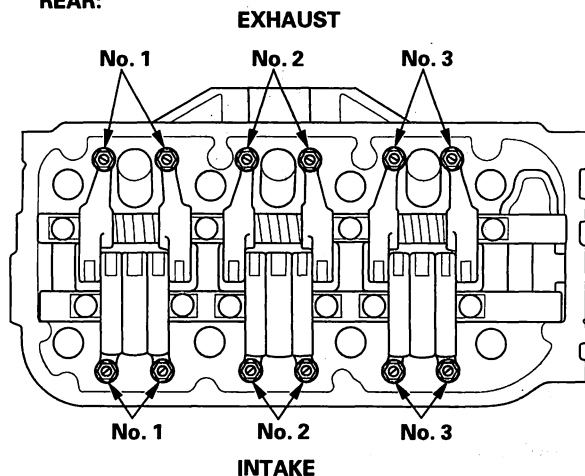
4. Select the correct thickness feeler gauge for the valves you're going to check.

Valve Clearance

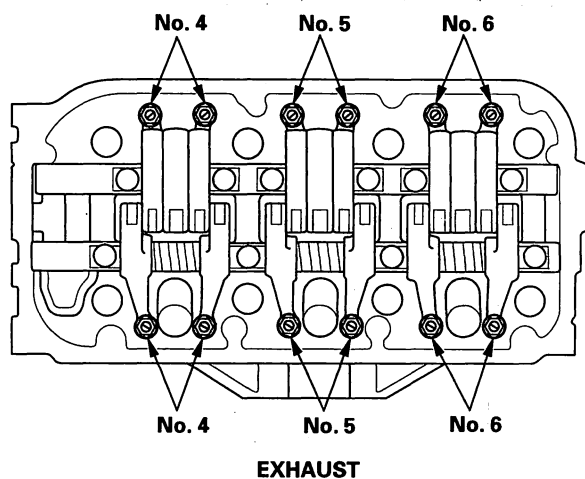
Intake: 0.20—0.24 mm (0.008—0.009 in.)

Exhaust: 0.28—0.32 mm (0.011—0.013 in.)

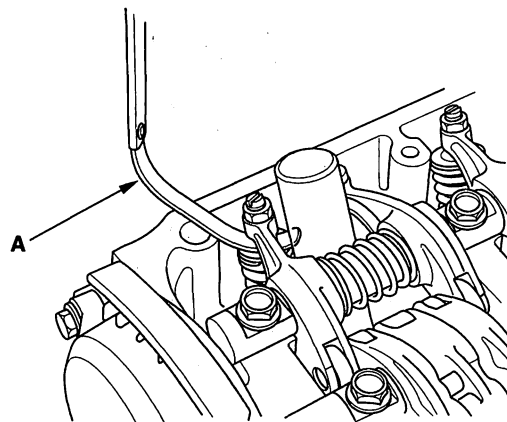
REAR:



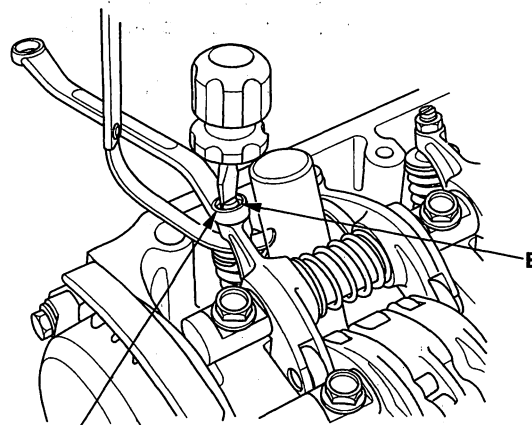
FRONT:



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



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



A
7 x 0.75 mm
20 N·m (2.0 kgf·m, 14 lbf·ft)

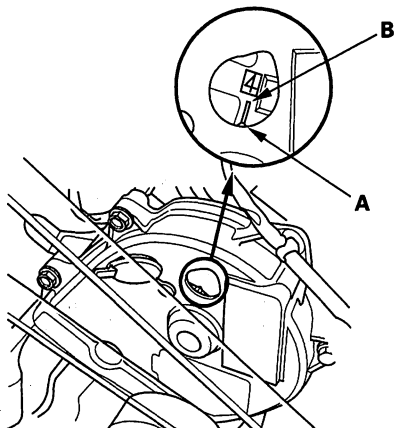
7. Tighten the locknut and recheck the clearance. Repeat the adjustment, if necessary.

(cont'd)

Cylinder Head

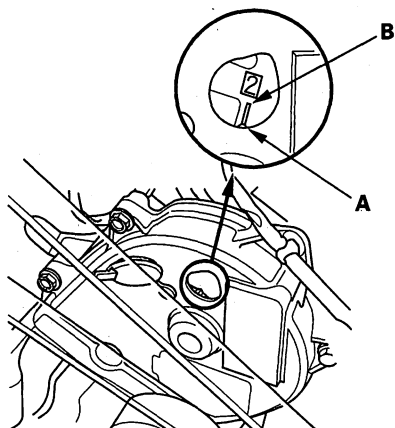
Valve Clearance Adjustment (cont'd)

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



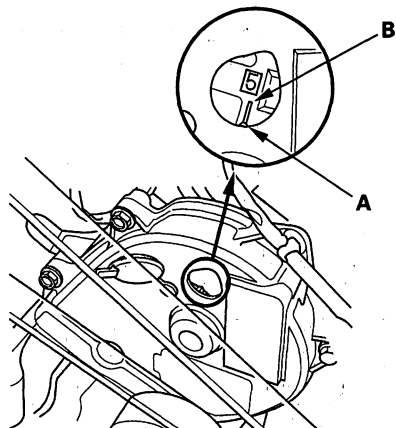
9. Check and, if necessary, adjust the valve clearance on No. 4 cylinder.

10. Rotate the crankshaft clockwise. Align the pointer (A) on the front upper cover with the No. 2 piston TDC mark (B) on the front camshaft pulley.



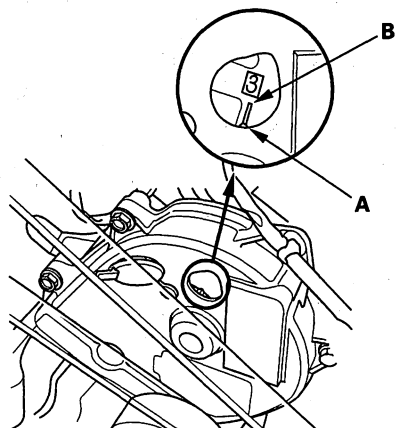
11. Check and, if necessary, adjust the valve clearance on No. 2 cylinder.

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



13. Check and, if necessary, adjust the valve clearance on No. 5 cylinder.

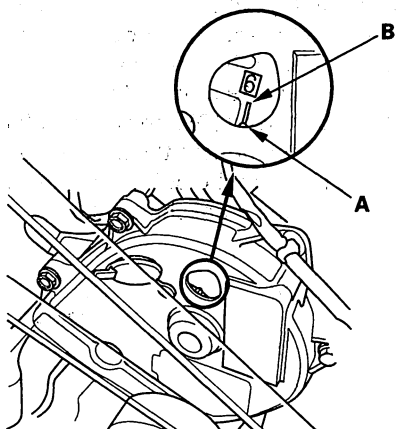
14. Rotate the crankshaft clockwise. Align the pointer (A) on the front upper cover with the No. 3 piston TDC mark (B) on the front camshaft pulley.



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



16. Rotate the crankshaft clockwise. Align the pointer (A) on the front upper cover with the No. 6 piston TDC mark (B) on the front camshaft pulley.



17. Check and, if necessary, adjust the valve clearance on No. 6 cylinder.
18. Install the cylinder head covers (see page 6-27).
19. Install the intake manifold (see page 9-5).

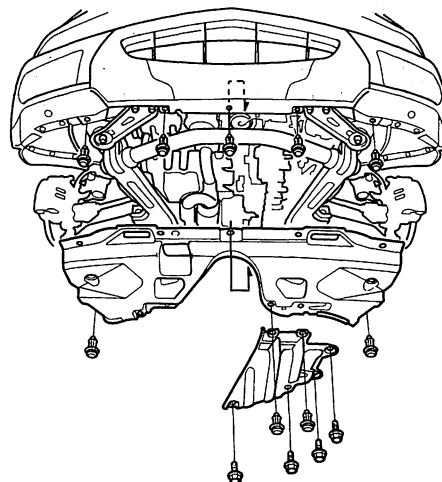
Crankshaft Pulley Removal and Installation

Special Tools Required

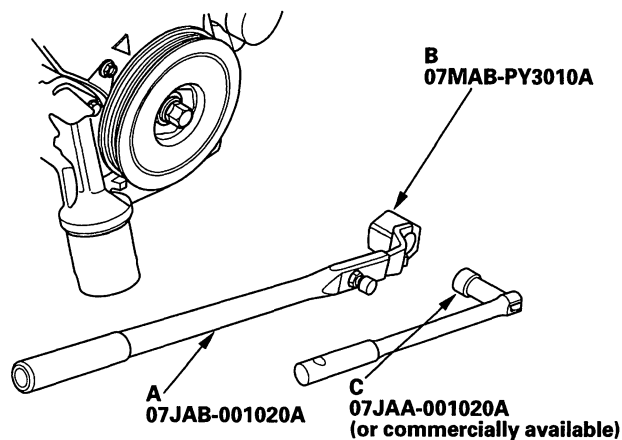
- Holder handle 07JAB-001020A
- Holder attachment, 50 mm, offset 07MAB-PY3010A
- Socket, 19 mm 07JAA-001020A , or a commercially available 19 mm socket

Removal

1. Remove the right front wheel.
2. Remove the splash shield.



3. Remove the drive belt (see page 4-33).
4. Hold the pulley with the holder handle (A) and holder attachment (B).



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

(cont'd)

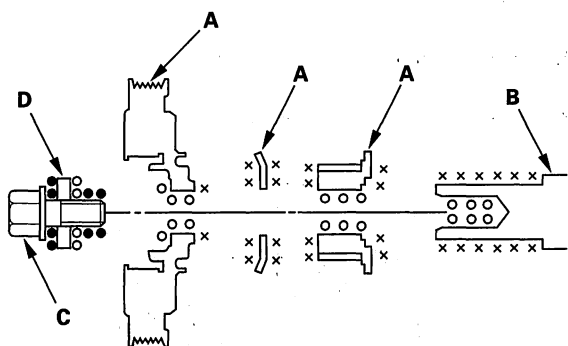
Cylinder Head

Crankshaft Pulley Removal and Installation (cont'd)

Installation

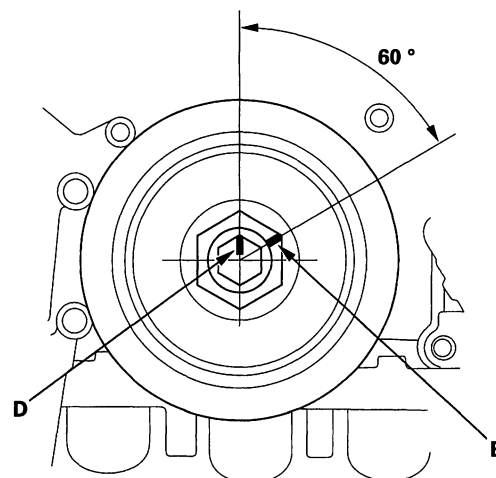
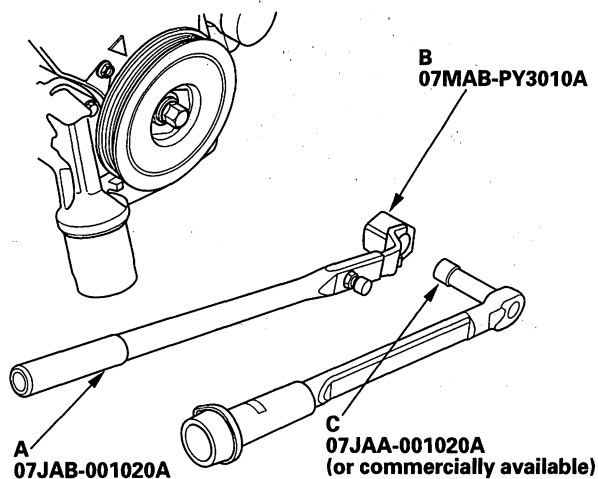
1. Remove any oil and clean the pulleys (A), crankshaft (B), bolt (C), and washer (D). Lubricate with new engine oil as shown.

- ✕: Remove any oil
- : Clean
- : Lubricate with new engine oil



2. Install the crankshaft pulley, and tighten the bolt. Do not use an impact wrench.

- 1 Hold the pulley with the holder handle (A) and holder attachment (B). Torque the bolt to 65 N·m (6.5 kgf·m, 47 lbf·ft) with a torque wrench and heavy duty 19 mm socket (C).
- 2 Mark the bolt head (D) and crankshaft pulley (E) as shown, then tighten the bolt an additional 60° (The mark on the bolt head lines up with the mark on the crankshaft pulley).

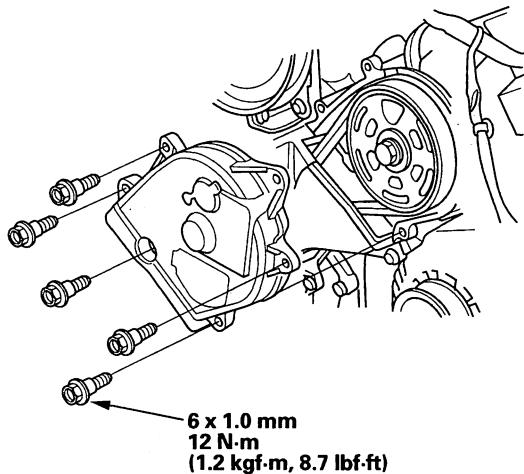


3. Install the drive belt (see page 4-33).
4. Install the splash shield.
5. Install the right front wheel.

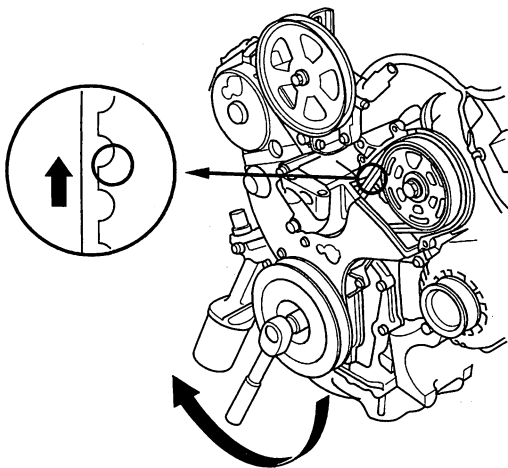


Timing Belt Inspection

1. Remove the drive belt (see page 4-33).
2. Remove the drive belt auto-tensioner (see page 4-35).
3. Remove the front upper cover.

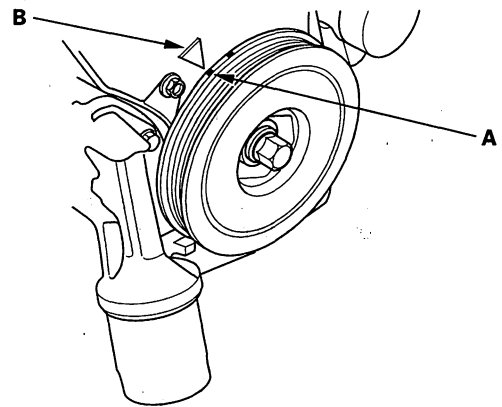


4. Inspect the timing belt for cracks and oil or coolant contamination. Replace the belt if it is cracked, or is contaminated with oil or coolant. Wipe off any oil or solvent that gets on the belt.



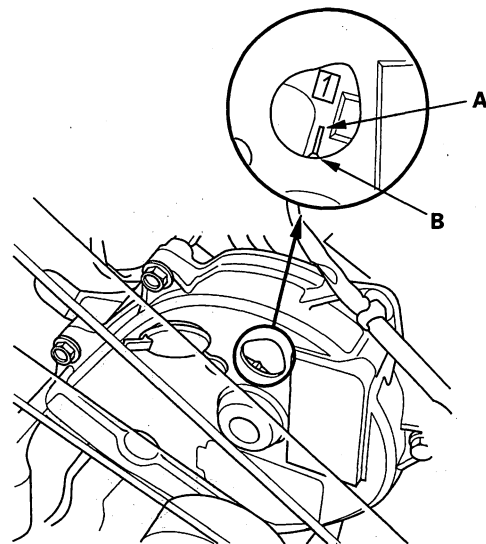
Timing Belt Removal

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



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

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

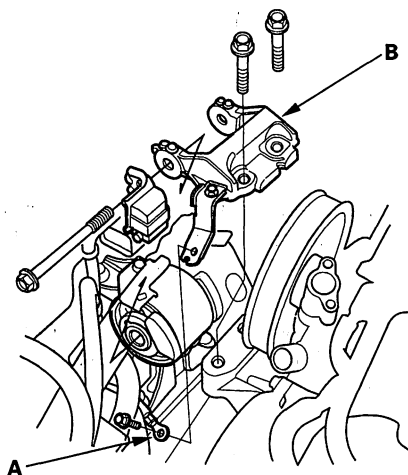


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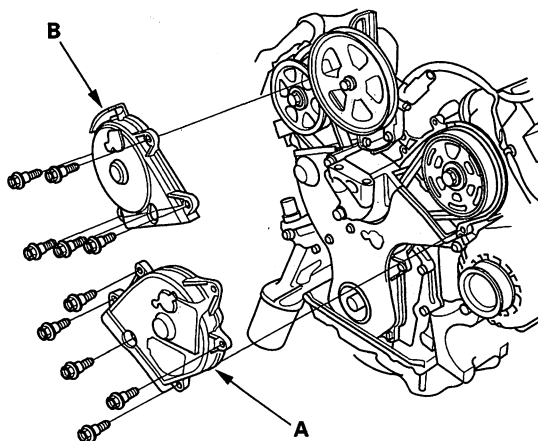
Cylinder Head

Timing Belt Removal (cont'd)

3. Remove the drive belt (see page 4-33).
4. Remove the drive belt auto-tensioner (see page 4-35).
5. For ease of removing the side engine mount, support the engine with a jack and wood block under the oil pan.
6. Remove the ground cable (A), then remove the upper half of the side engine mount bracket (B).

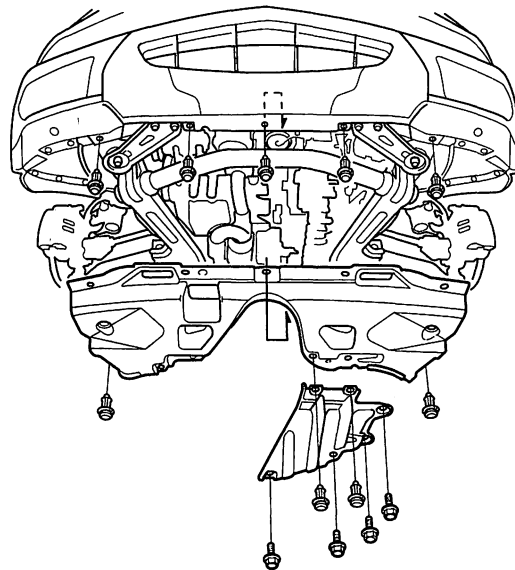


7. Remove the front upper cover (A) and rear upper cover (B).



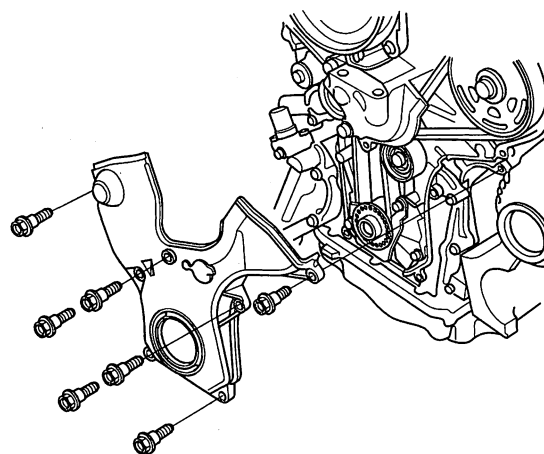
8. Raise the vehicle on the lift, then remove the right front wheel.

9. Remove the splash shield.



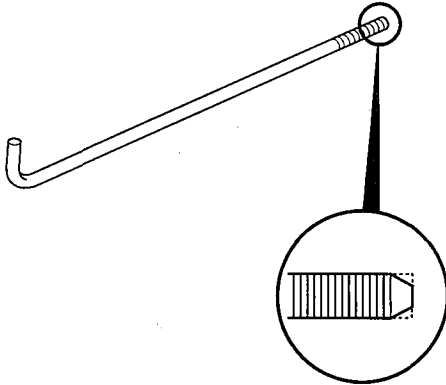
10. Remove the crankshaft pulley (see page 6-11).

11. Remove the lower cover.

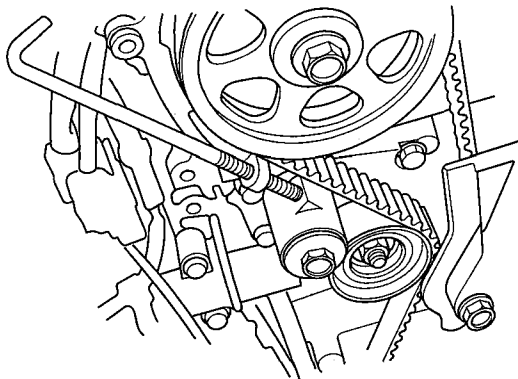




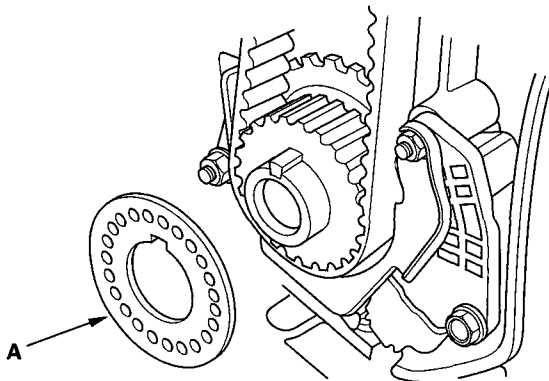
12. Remove one of the battery clamp bolts from the battery tray, and grind the end of it as shown.



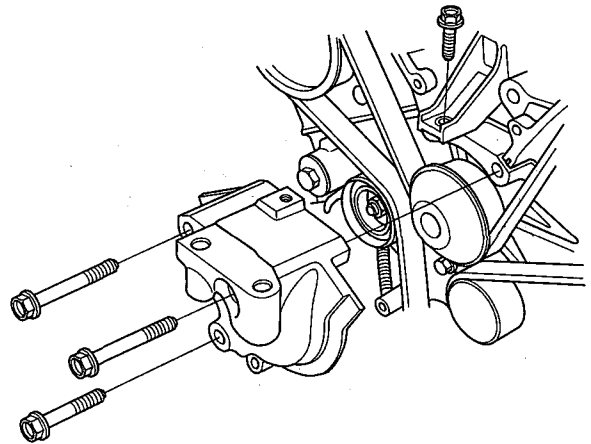
13. Thread the battery clamp bolt in as shown to hold the timing belt adjuster in its current position. Tighten it by hand; do not use a wrench.



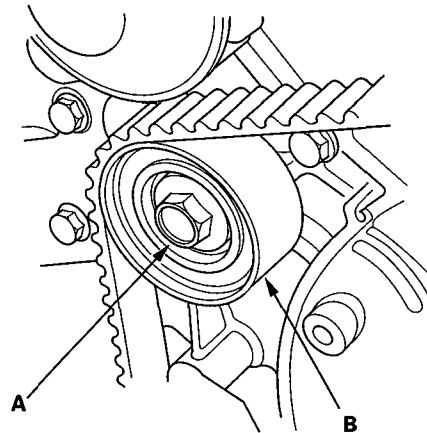
14. Remove the timing belt guide plate (A).



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



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

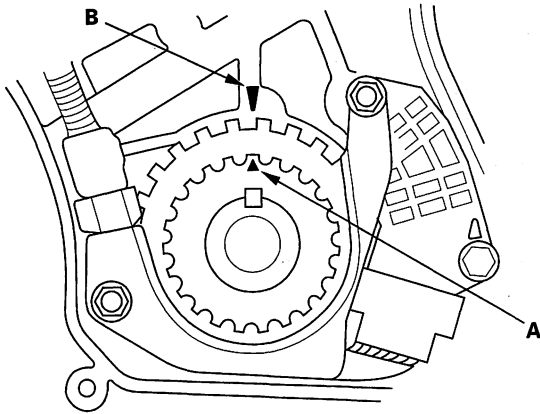


Cylinder Head

Timing Belt Installation

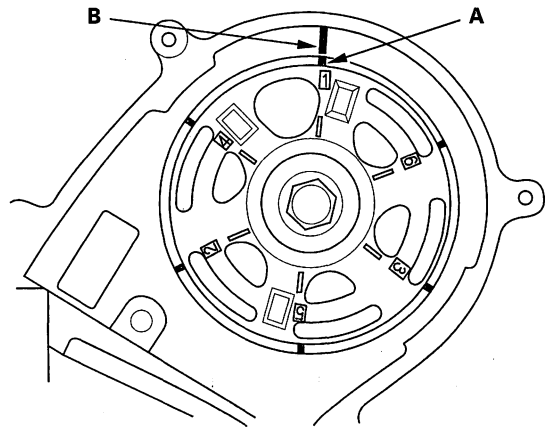
NOTE: The following is the installation procedure for a used belt. If you are installing a new belt, refer to the timing belt replacement procedure (see page 6-20).

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

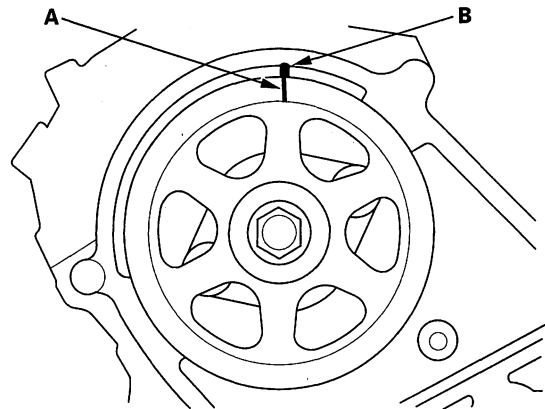


3. Set the camshaft pulleys to TDC by aligning the TDC marks (A) on the camshaft pulleys with the pointers (B) on the back covers.

FRONT:



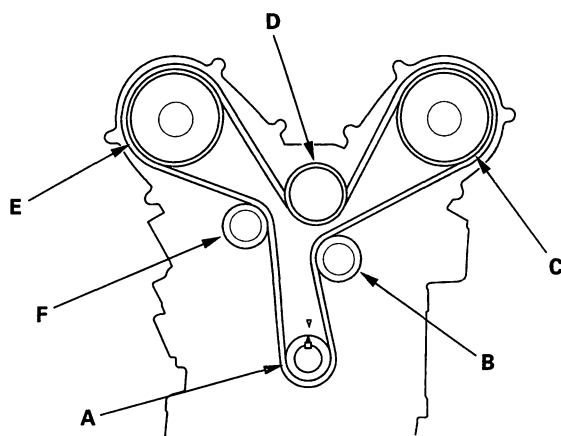
REAR:



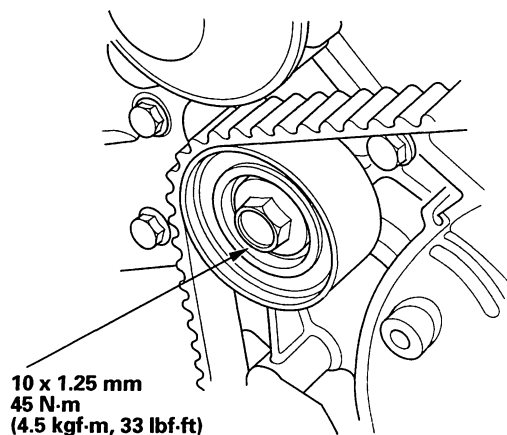


4. Loosely install the idler pulley with a new idler pulley bolt so the pulley can move but does not come off.
5. If the auto-tensioner has extended and the timing belt cannot be installed, do the timing belt replacement procedure (see page 6-20).
6. Install the timing belt in a counterclockwise sequence starting with the drive pulley. Take care not to damage the timing belt when installing it.

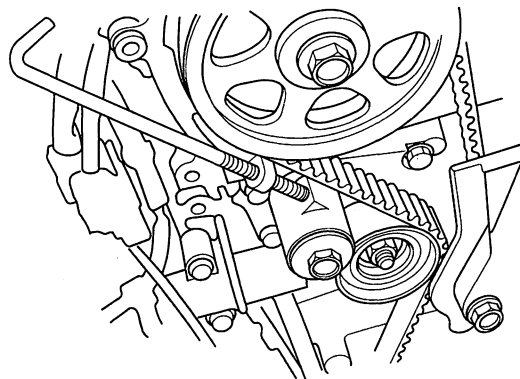
- 1 Drive pulley (A)
- 2 Idler pulley (B)
- 3 Front camshaft pulley (C)
- 4 Water pump pulley (D)
- 5 Rear camshaft pulley (E)
- 6 Adjusting pulley (F)



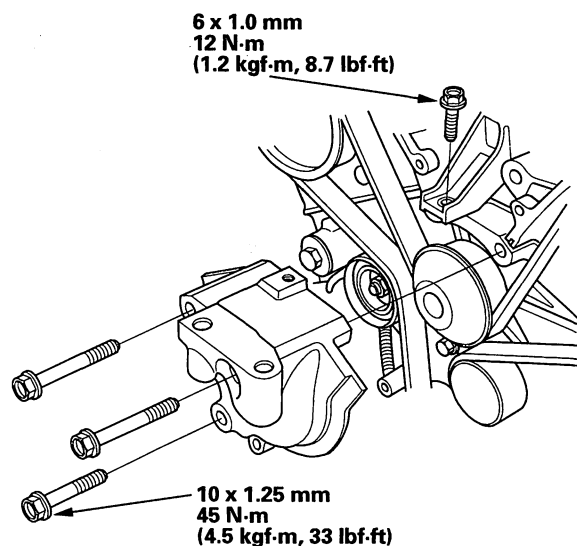
7. Tighten the idler pulley bolt.



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



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

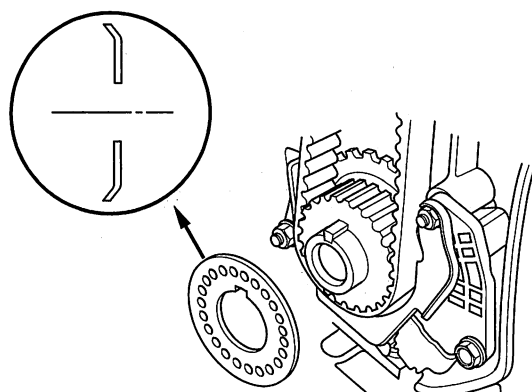


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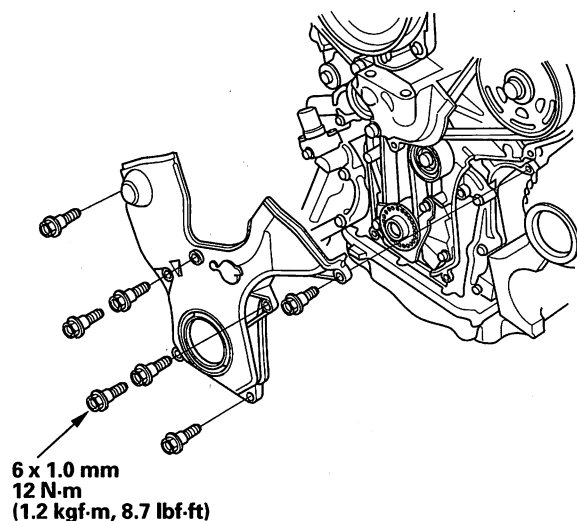
Cylinder Head

Timing Belt Installation (cont'd)

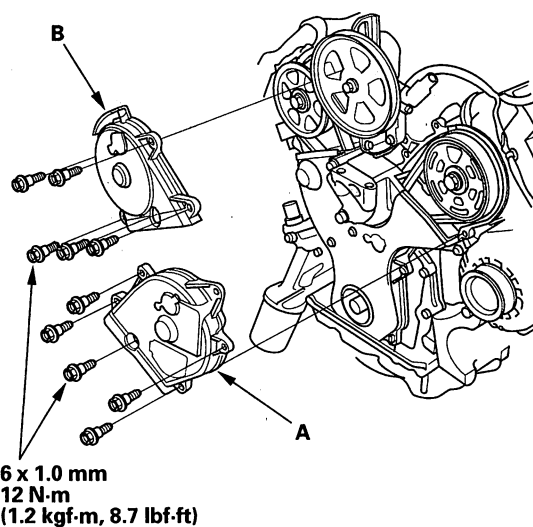
10. Install the timing belt guide plate as shown.



11. Install the lower cover.



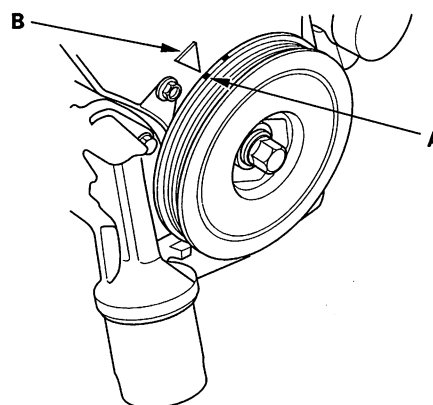
12. Install the front upper cover (A) and rear upper cover (B).



13. Install the crankshaft pulley (see page 6-12).

14. Rotate the crankshaft pulley about five or six turns clockwise so the timing belt positions itself on the pulleys.

15. Turn the crankshaft pulley so its white mark (A) lines up with the pointer (B).



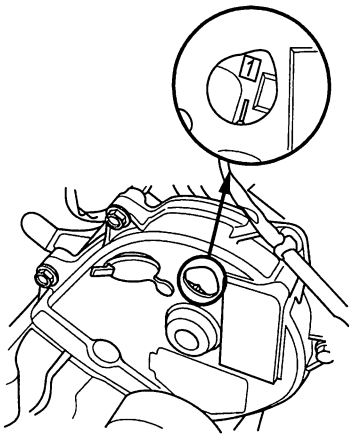


16. Check the camshaft pulley marks.

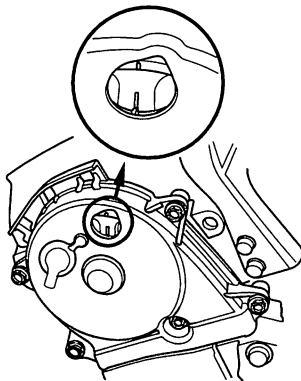
NOTE: If the marks are not aligned, rotate the crankshaft 360 degrees, and recheck the camshaft pulley mark.

- If the camshaft pulley marks are at TDC, go to step 17.
- If the camshaft pulley marks are not at TDC, remove the timing belt and repeat steps 2 through 16.

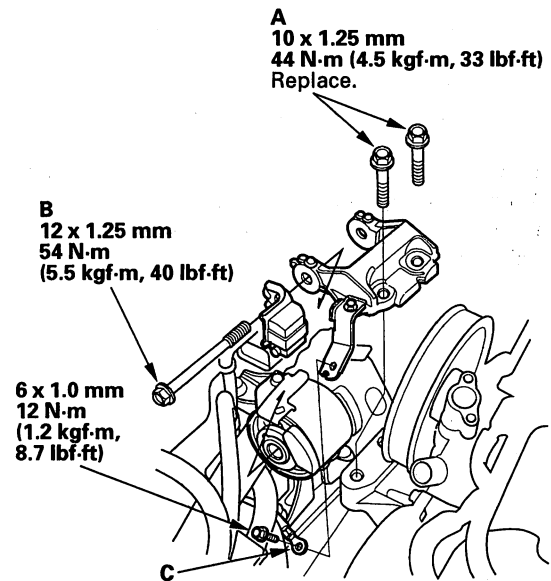
FRONT:



REAR:



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

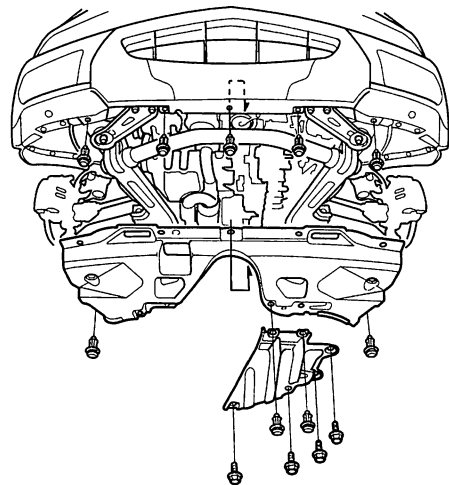


18. Install the ground cable (C).

19. Install the drive belt auto-tensioner (see page 4-35).

20. Install the drive belt (see page 4-33).

21. Install the splash shield.



22. Install the right front wheel.

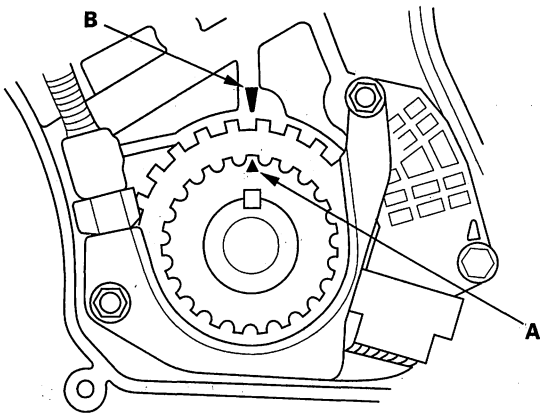
23. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see page 11-4).

Cylinder Head

Timing Belt Replacement

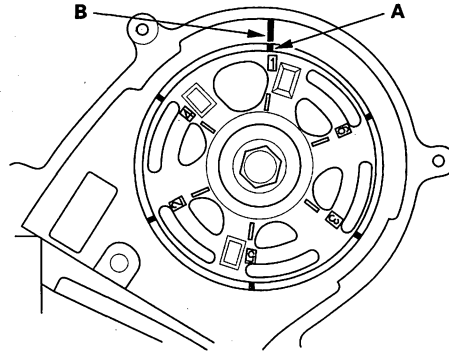
NOTE: The following procedure is for the installation of a new timing belt. If you are installing a used belt, refer to the timing belt installation procedure (see page 6-16).

1. Remove the timing belt (see page 6-13).
2. Clean the timing belt pulleys, timing belt guide plate, and the upper and lower covers.
3. Set the timing belt drive pulley to top dead center (TDC) by aligning the TDC mark (A) on the tooth of the timing belt drive pulley with the pointer (B) on the oil pump.

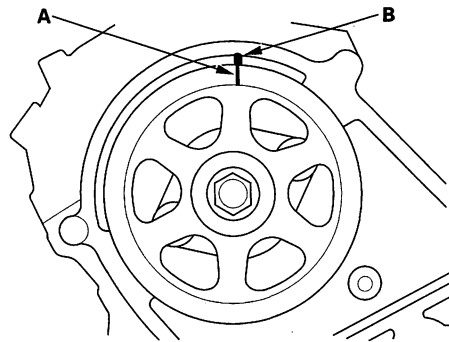


4. Set the camshaft pulleys to TDC by aligning the TDC marks (A) on the camshaft pulleys with the pointers (B) on the back covers.

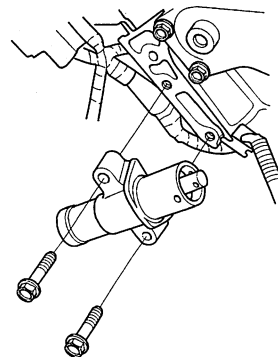
FRONT:



REAR:

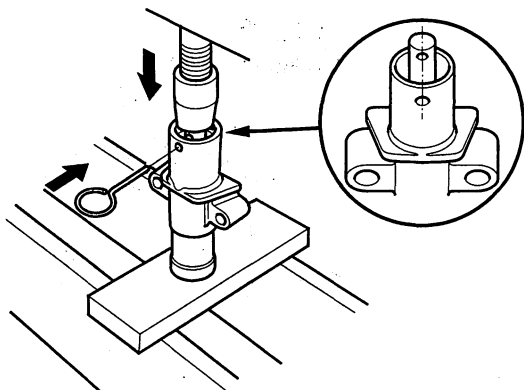


5. Remove the battery clamp bolt from the back cover.
6. Remove the auto-tensioner.





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

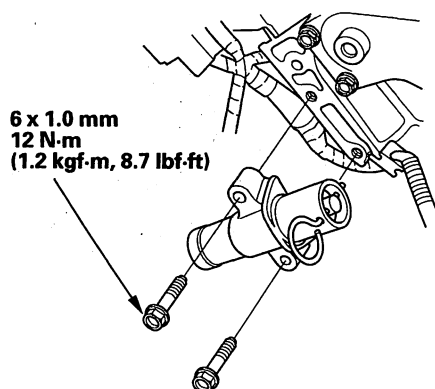


8. Use a hydraulic press to slowly compress the auto-tensioner. Insert a 2.0 mm (0.08 in.) pin through the housing and the rod.

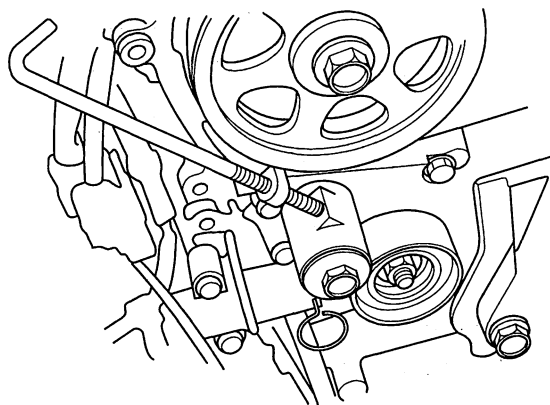
NOTE: The compression pressure should not exceed 9,800 N (1,000 kgf, 2,200 lbf).

9. Install the auto-tensioner.

NOTE: Make sure the pin stays in place.



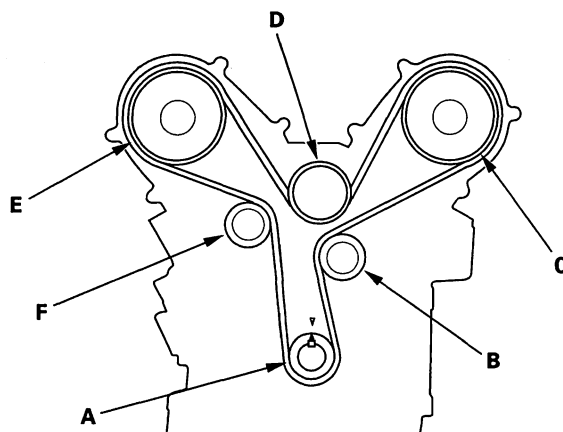
10. Thread the battery clamp bolt in as shown to hold the timing belt adjuster. Tighten it by hand; do not use a wrench.



11. Loosely install the idler pulley with a new idler pulley bolt so the pulley can move but does not come off.

12. Install the timing belt in a counterclockwise sequence starting with the drive pulley.

- 1 Drive pulley (A)
- 2 Idler pulley (B)
- 3 Front camshaft pulley (C)
- 4 Water pump pulley (D)
- 5 Rear camshaft pulley (E)
- 6 Adjusting pulley (F)

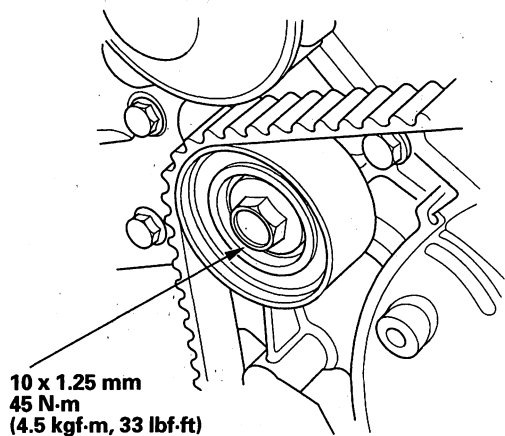


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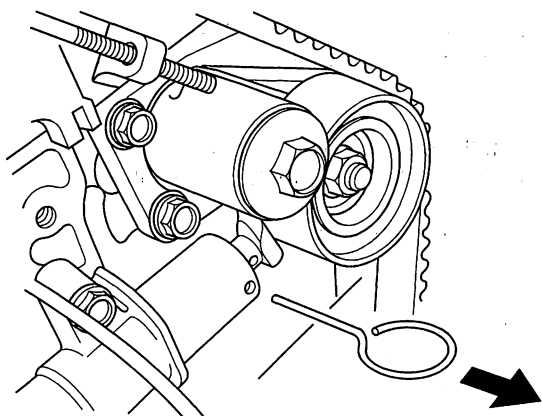
Cylinder Head

Timing Belt Replacement (cont'd)

13. Tighten the idler pulley bolt.

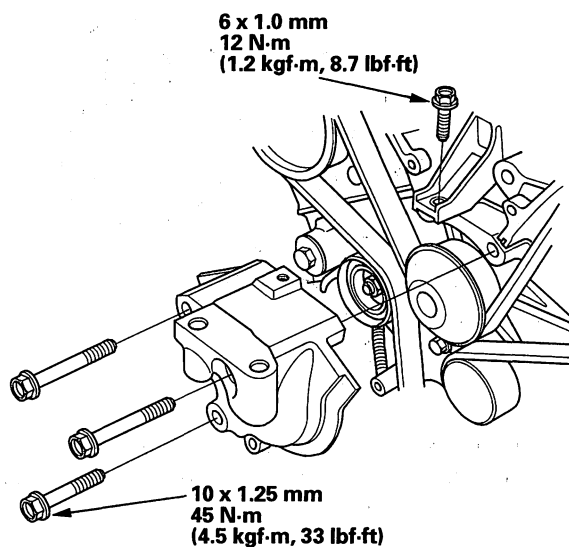


14. Remove the pin from the auto-tensioner.

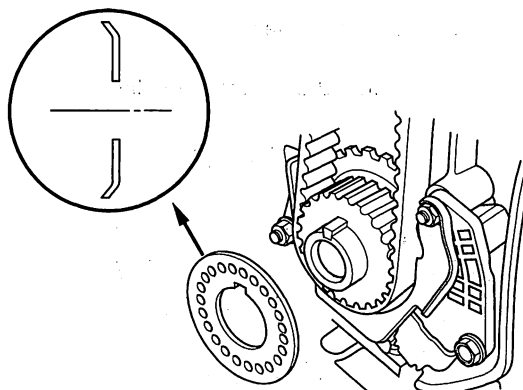


15. Remove the battery clamp bolt from the back cover.

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

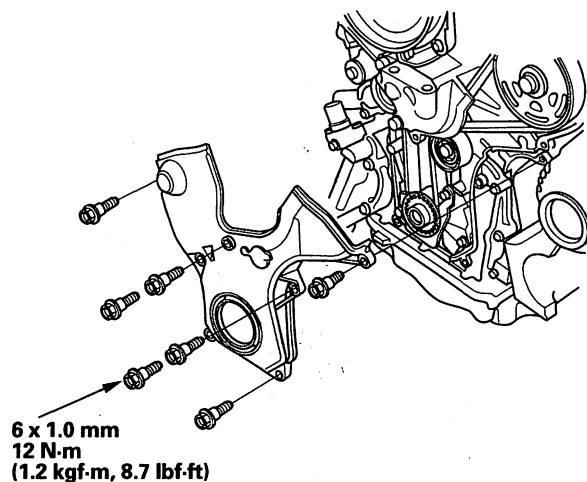


17. Install the timing belt guide plate as shown.

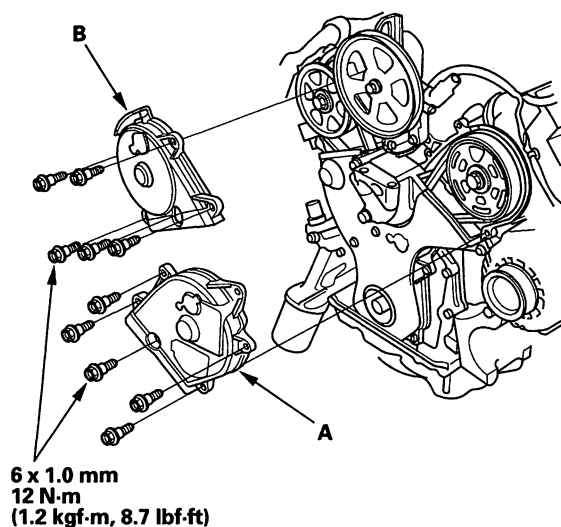




18. Install the lower cover.



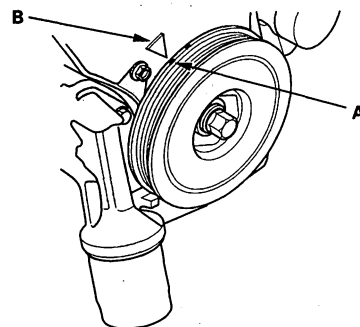
19. Install the front upper cover (A) and rear upper cover (B).



20. Install the crankshaft pulley (see page 6-12).

21. Rotate the crankshaft pulley about five or six turns clockwise so the timing belt positions itself on the pulleys.

22. Turn the crankshaft pulley so its white mark (A) lines up with the pointer (B).

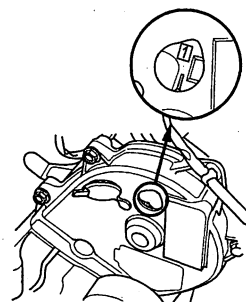


23. Check the camshaft pulley marks.

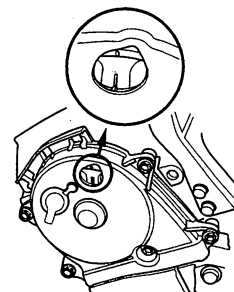
NOTE: If the marks are not aligned, rotate the crankshaft 360 degrees, and recheck the camshaft pulley mark.

- If the camshaft pulley marks are at TDC, go to step 24.
- If the camshaft pulley marks are not at TDC, remove the timing belt and repeat steps 3 through 22.

FRONT:



REAR:

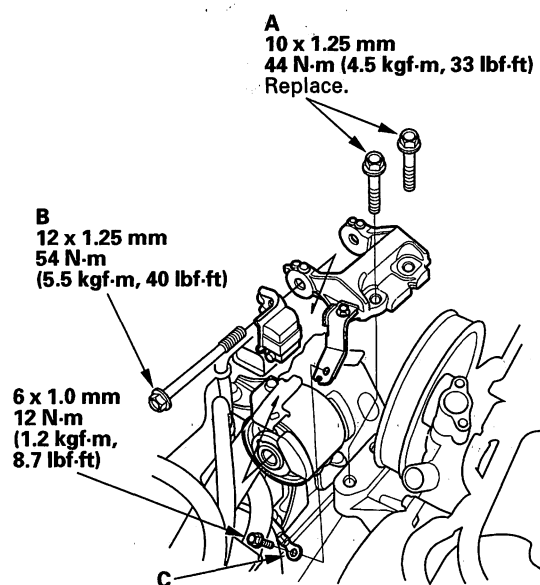


(cont'd)

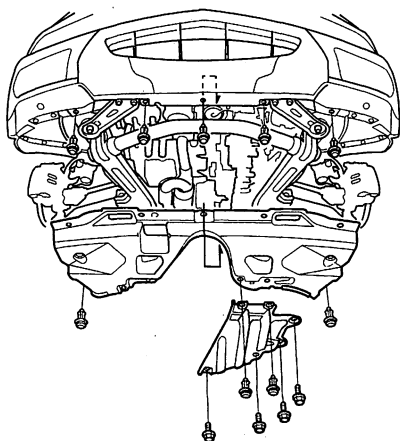
Cylinder Head

Timing Belt Replacement (cont'd)

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



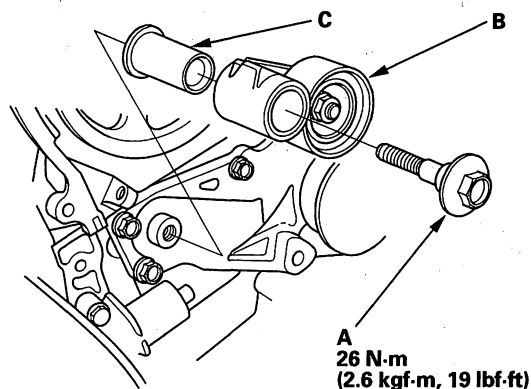
25. Install the ground cable (C).
26. Install the drive belt auto-tensioner (see page 4-35).
27. Install the drive belt (see page 4-33).
28. Install the splash shield.



29. Install the right front wheel.
30. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see page 11-4).

Timing Belt Adjuster Replacement

1. Remove the timing belt (see page 6-13).
2. Remove the battery clamp bolt from the back cover.
3. Remove the auto-tensioner.
4. Remove the bolt (A), then remove the timing belt adjuster (B) and collar (C).

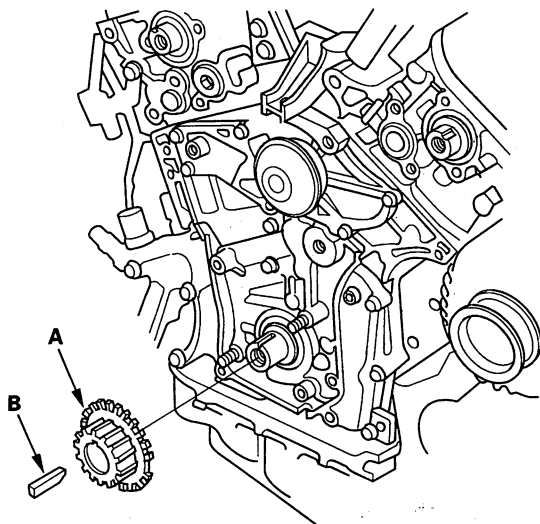


5. Replace the timing belt auto-tensioner and timing belt (see page 6-20).



Timing Belt Drive Pulley Replacement

1. Remove the timing belt (see page 6-13).
2. Remove the crankshaft position (CKP) sensor (see page 11-242).
3. Remove the timing belt drive pulley (A) and key (B).

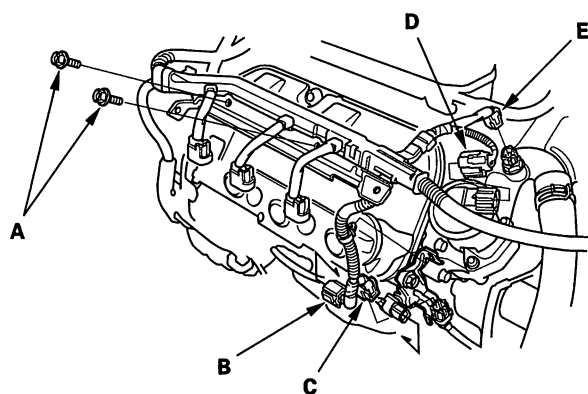


4. Inspect the timing belt drive pulley and key for damage. If it is cracked or damaged, replace the timing belt drive pulley.
5. Install the new timing belt drive pulley.
6. Install the CKP sensor (see page 11-242).
7. Install the timing belt (see page 6-16).
8. Do the CKP pattern clear/CKP pattern learn procedure (see page 11-4).

Cylinder Head

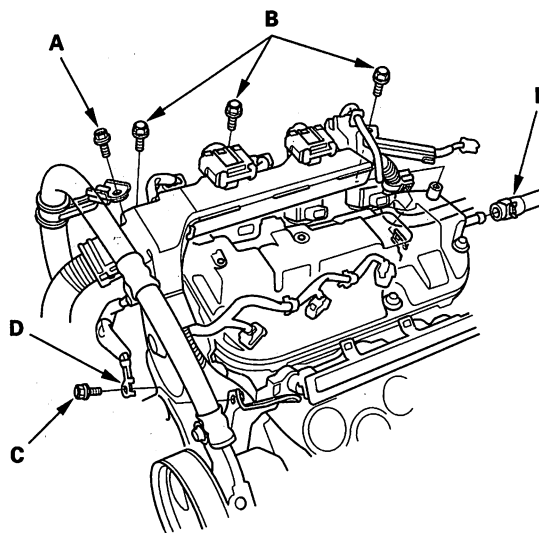
Cylinder Head Cover Removal

1. Remove the intake manifold (see page 9-3).
2. Remove the six ignition coils (see page 4-21).
3. Remove the dipstick.
4. Remove the two bolts (A) securing the harness holder, and disconnect the front air fuel ratio (A/F) sensor connector (B), front secondary heated oxygen sensor (secondary H02S) connector (C), exhaust gas recirculation (EGR) valve connector (D) and engine coolant temperature (ECT) sensor 1 connector (E).



5. Disconnect the three injector connectors from the injectors on the rear side cylinder head.

6. Remove the power steering hose bracket mounting bolt (A), the harness holder mounting bolts (B), and the engine ground cable bolt (C).



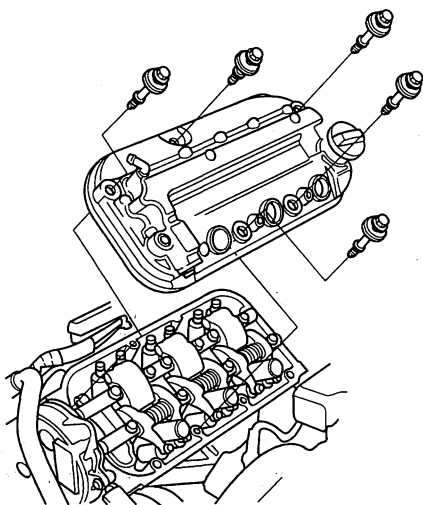
7. Remove the engine ground cable (D) and breather hose (E).



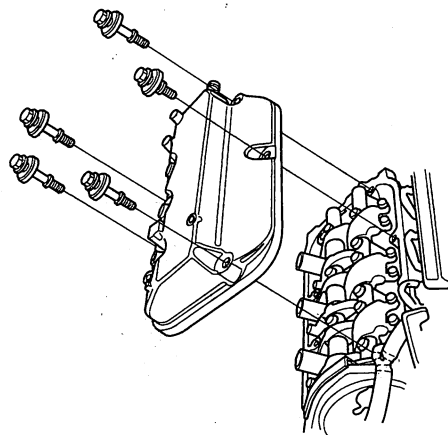
Cylinder Head Cover Installation

8. Remove the cylinder head cover.

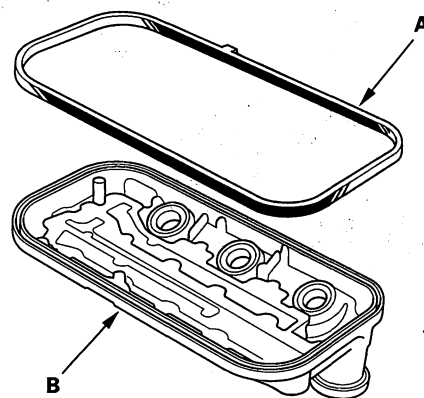
FRONT:



REAR:



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



4. Clean the head cover contacting surfaces with a shop towel.

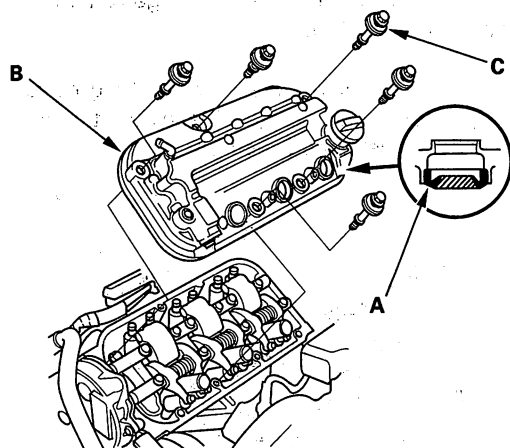
(cont'd)

Cylinder Head

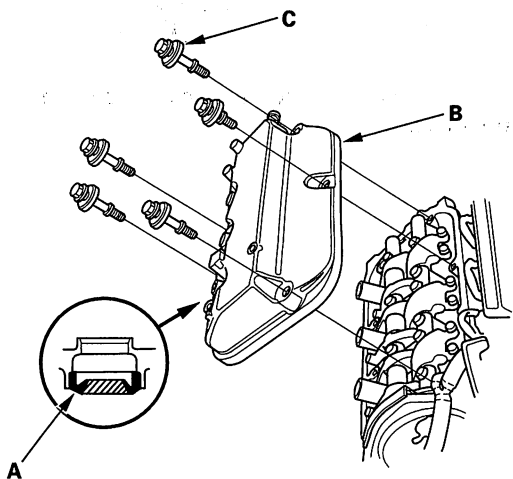
Cylinder Head Cover Installation (cont'd)

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

FRONT:

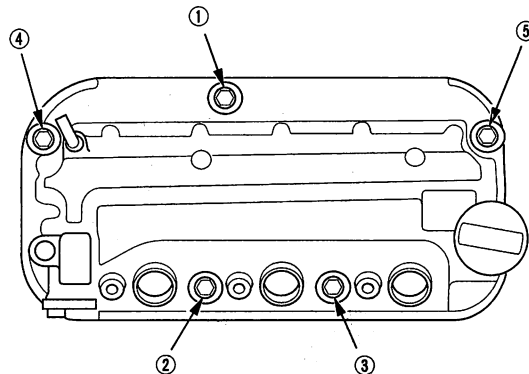


REAR:

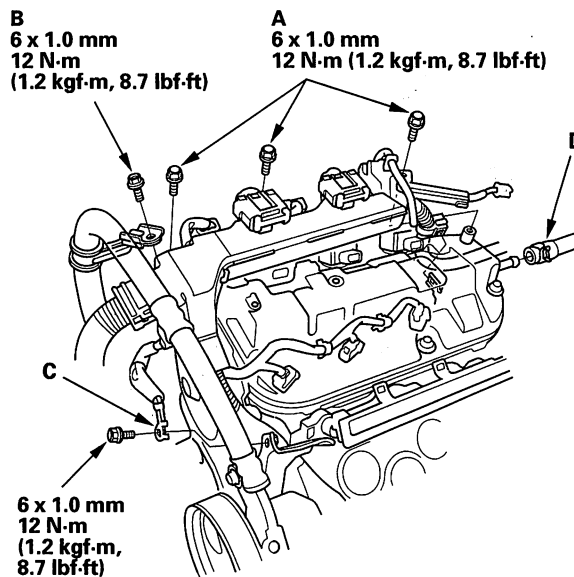


6. Inspect the cover washers (C). Replace any washer that is damaged or deteriorated.

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



8. Tighten the harness holder mounting bolts (A) and the power steering hose bracket mounting bolt (B).

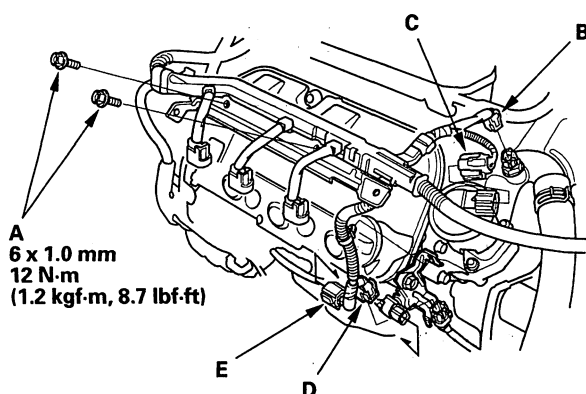


9. Install the engine ground cable (C) and breather hose (D).



Cylinder Head Removal

10. Connect the three injector connectors.
11. Tighten the two bolts (A) securing the harness holder, and connect the engine coolant temperature (ECT) sensor 1 connector (B), exhaust gas recirculation (EGR) valve connector (C), front secondary heated oxygen sensor (secondary H02S) connector (D) and front air fuel ratio (A/F) sensor connector (E).

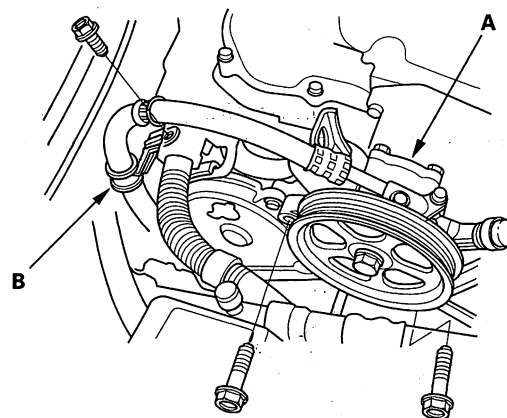


12. Install the dipstick.
13. Install the six ignition coils (see page 4-21).
14. Install the intake manifold (see page 9-5).

NOTE:

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

1. Make sure you have the anti-theft codes for the audio system and navigation system (if equipped).
2. Relieve the fuel pressure (see page 11-330).
3. Disconnect the negative cable from the battery.
4. Drain the engine coolant (see page 10-6).
5. Remove the drive belt (see page 4-33).
6. Remove the power steering (P/S) pump (A), and P/S hose clamp (B).

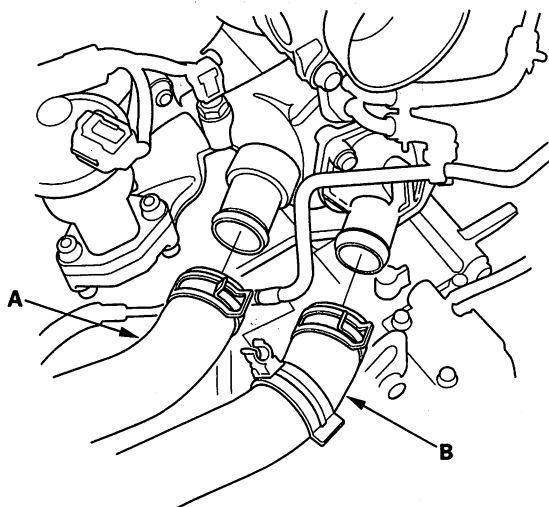


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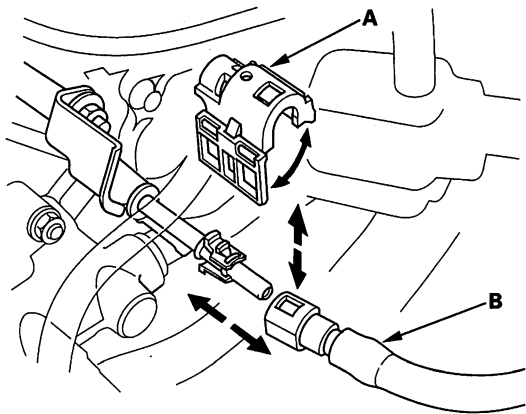
Cylinder Head

Cylinder Head Removal (cont'd)

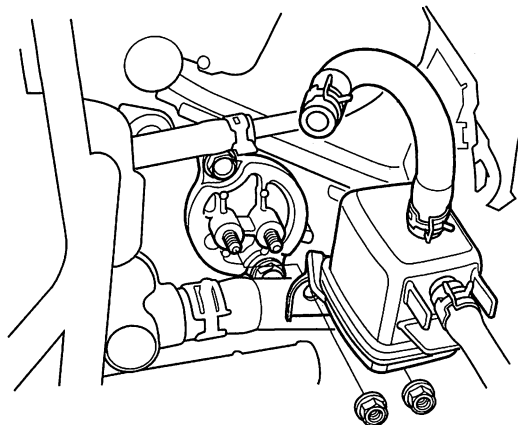
7. Remove the alternator (see page 4-36).
8. Remove the timing belt (see page 6-13).
9. Remove the intake manifold (see page 9-3).
10. Remove the six ignition coils (see page 4-21).
11. Remove the upper radiator hose (A) and lower radiator hose (B).



12. Remove the quick-connect fitting cover (A), then disconnect the fuel feed hose (B) (see page 11-338).



13. Remove the two nuts securing the purge joint.



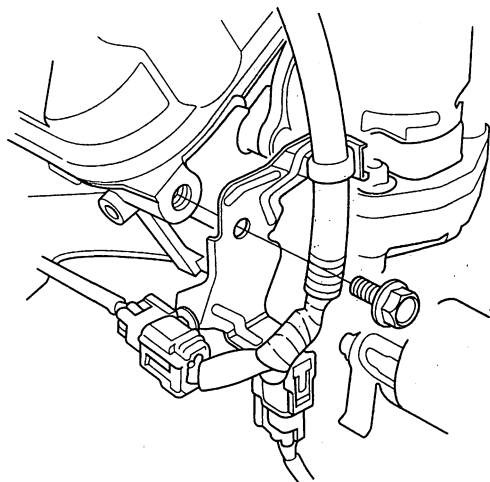
14. Remove the engine wire harness connectors and wire harness clamps from the cylinder head.

- Six injector connectors
- Engine coolant temperature (ECT) sensor 1 connector
- Crankshaft position (CKP) sensor connector
- Exhaust gas recirculation (EGR) valve connector
- Rocker arm oil control solenoid connector
- Rocker arm oil pressure switch connector
- Oil pressure switch connector
- Two air fuel ratio (A/F) sensor connectors
- Two secondary heated oxygen sensor (secondary HO2S) connectors

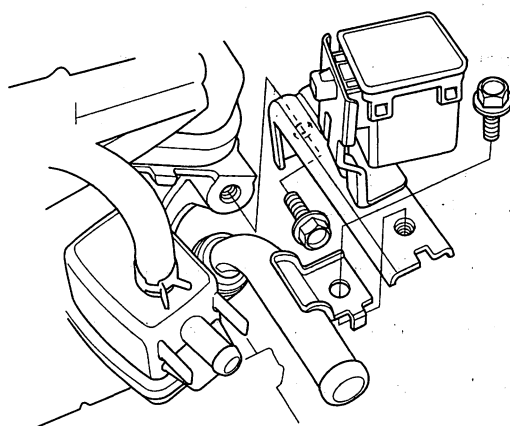
15. Remove the front warm up three way catalytic converter (front WU-TWC) (see page 11-370) and rear warm up three way catalytic converter (rear WU-TWC) (see page 11-371).



16. Remove the connector bracket from the front cylinder head.



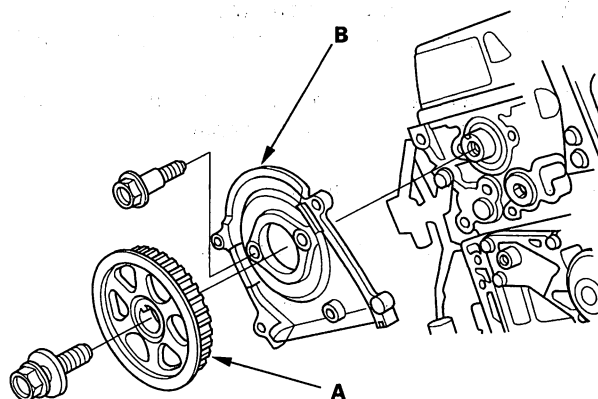
17. Remove the bracket from the rear cylinder head.



18. Remove the fuel rails (see page 11-312).

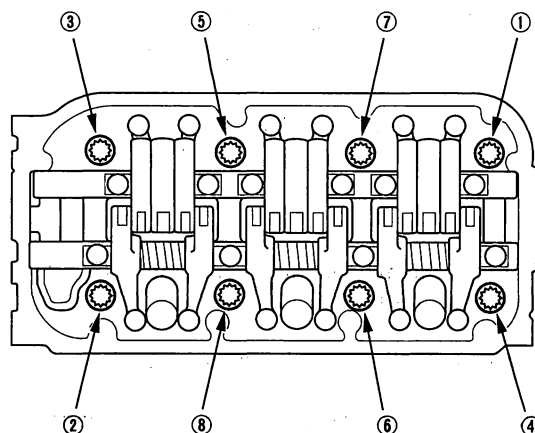
19. Remove the water passage (see page 10-9).

20. Remove the front and rear camshaft pulleys (A) and back covers (B).



21. Remove the cylinder head cover (see page 6-26).

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



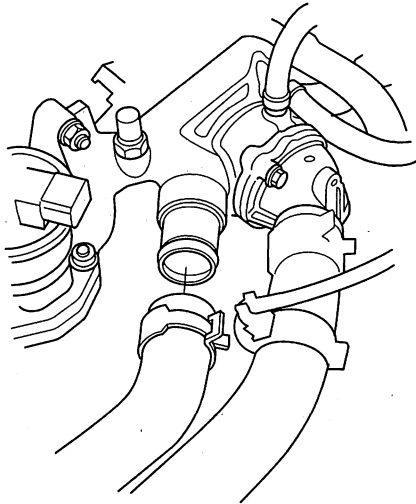
23. Remove the cylinder head.

Cylinder Head

Camshaft Replacement

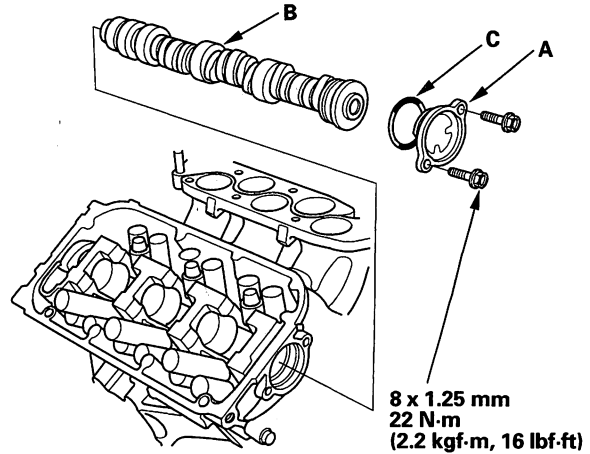
Front

1. Make sure you have the anti-theft codes for the audio system and navigation system (if equipped).
2. Disconnect the negative cable from the battery first, then disconnect the positive cable.
3. Remove the battery and battery box.
4. Drain the engine coolant (see page 10-6).
5. Remove the upper radiator hose.



6. Remove the exhaust gas recirculation (EGR) valve (see page 11-388).
7. Remove the timing belt (see page 6-13).
8. Remove the rocker arm assembly (see page 6-34).
9. Remove the front camshaft pulley.

10. Remove the thrust cover (A), then remove the camshaft (B).

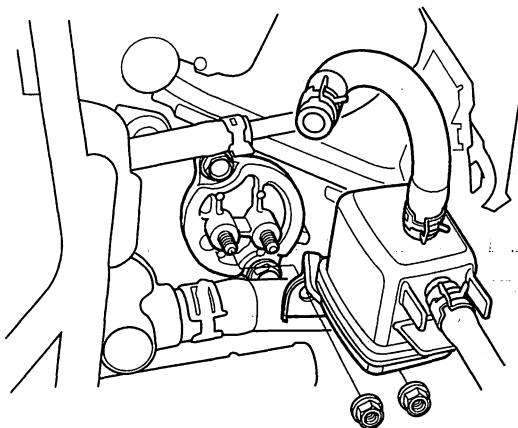


11. Install the camshaft in the reverse order of removal. Always use a new O-ring (C). Apply new engine oil to the journals and cam lobes.
12. Apply new engine oil to the threads of the camshaft pulley mounting bolt, then install the front camshaft pulley (see step 11 on page 6-49).
13. Install the rocker arm assembly, then tighten the mounting bolts (see step 8 on page 6-48).
14. Install the timing belt (see page 6-16).
15. Adjust the valve clearance (see page 6-8).
16. Install the upper radiator hose.
17. Install the battery and battery box. Clean the battery posts and cable terminals with sandpaper, then assemble them and apply grease to prevent corrosion.
18. Fill the radiator with engine coolant and bleed the air out from the system (see step 10 on page 10-7).
19. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see page 11-4).
20. Do the steering column position memorization (see page 17-28).
21. Enter the anti-theft codes for the audio system and navigation system (if equipped).
22. Set the clock.



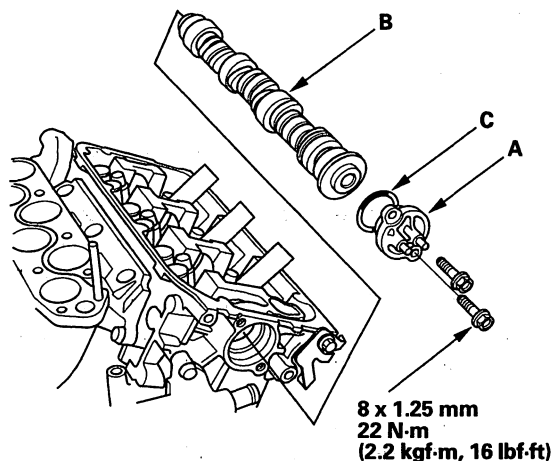
Rear

1. Remove the intake manifold (see page 9-3).
2. Remove the two nuts securing the purge joint.



3. Remove the brake lines from the master cylinder (see page 19-18).
4. Remove the timing belt (see page 6-13).
5. Remove the rocker arm assembly (see page 6-34).
6. Remove the rear camshaft pulley.

7. Remove the thrust cover (A), then remove the camshaft (B).



8. Install the camshaft in the reverse order of removal. Always use a new O-ring (C). Apply new engine oil to the journals and cam lobes.
9. Apply new engine oil to the threads of the camshaft pulley mounting bolt, then install the rear camshaft pulley (see step 11 on page 6-49).
10. Install the rocker arm assembly, then tighten the mounting bolts (see step 8 on page 6-48).
11. Install the timing belt (see page 6-16).
12. Adjust the valve clearance (see page 6-8).
13. Install the brake lines (see page 19-18) and do the brake system bleeding procedure (see page 19-9).
14. Do the CKP pattern clear/CKP pattern learn procedure (see page 11-4).

Cylinder Head

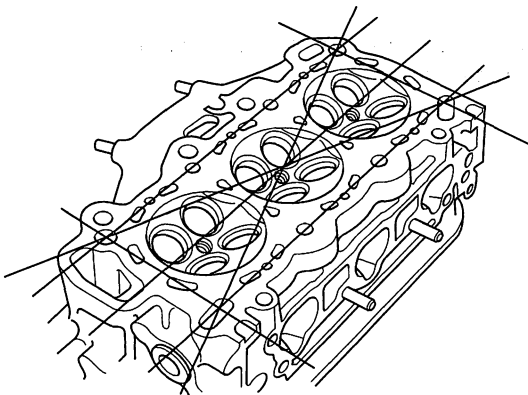
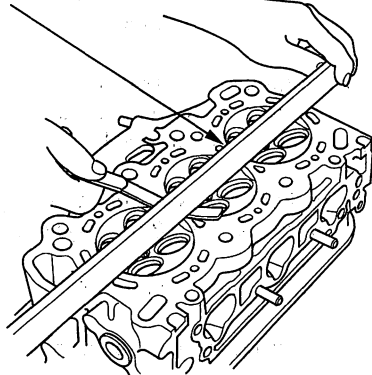
Cylinder Head Inspection for Warpage

1. Remove the cylinder head (see page 6-29).
2. Inspect the camshaft (see page 6-38).
3. Check the cylinder head for warpage. Measure along the edges, and three ways across the center.
 - If warpage is less than 0.05 mm (0.002 in.), cylinder head resurfacing is not required.
 - If warpage is between 0.05 mm (0.002 in.) and 0.2 mm (0.008 in.), resurface the cylinder head.
 - Maximum resurface limit is 0.2 mm (0.008 in.) based on a height of 121 mm (4.76 in.).

Cylinder Head Height

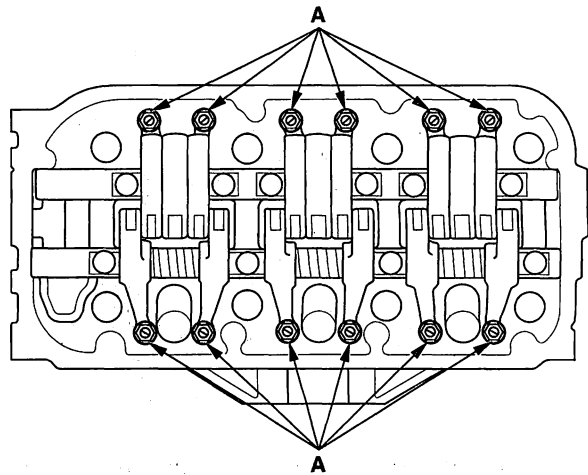
Standard (New): 120.95—121.05 mm
(4.7618—4.7657 in.)

PRECISION STRAIGHT EDGE

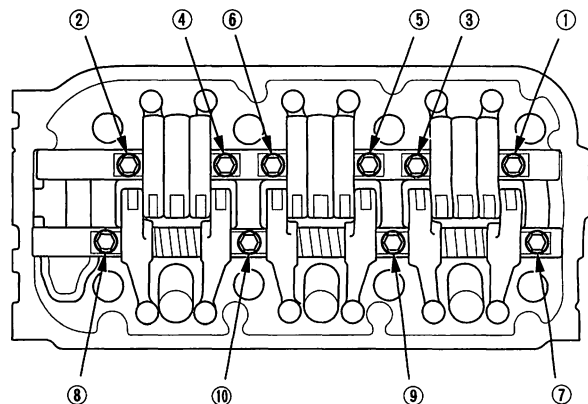


Rocker Arm Assembly Removal

1. Remove the intake manifold (see page 9-3).
2. Remove the cylinder head cover (see page 6-26).
3. Loosen the locknuts and adjusting screws (A).



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





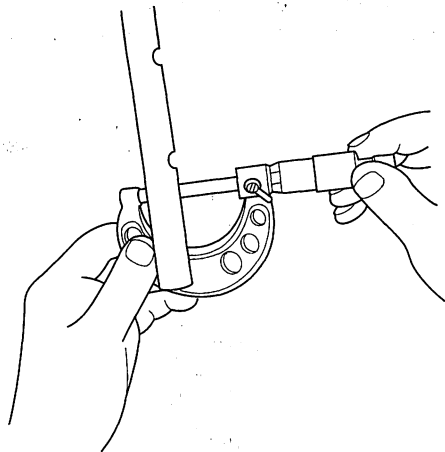
- Identify parts as they are removed so they can be reinstalled in their original locations.
- Inspect the rocker shafts and rocker arms (see page 6-36).
- If reused, the rocker arms must be installed in their original locations.
- When removing or installing the rocker arm assembly, do not remove the rocker shaft mounting bolts. The bolts will keep the springs and rocker arms on the shaft.
- Bundle the intake rocker arms with rubber bands to keep them together as a set.
- Prior to reassembling, clean all the parts in solvent, dry them and apply new engine oil to any contact points.
- When replacing the intake rocker arm assembly, remove the fastening hardware from the new intake rocker arm assembly.



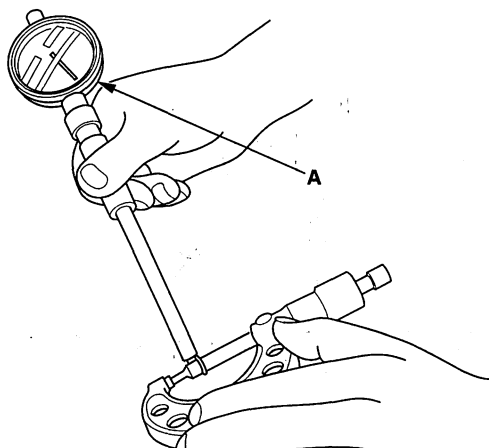
Cylinder Head

Rocker Arm and Shaft Inspection

1. Remove the rocker arm assembly (see page 6-34).
2. Disassemble the rocker arm assembly (see page 6-35).
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.

Intake Rocker Arm-to-Shaft Clearance

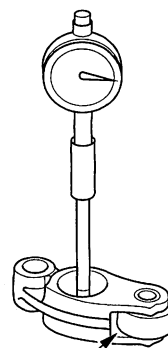
Standard (New): 0.026—0.067 mm
(0.0010—0.0026 in.)

Service Limit: 0.067 mm (0.0026 in.)

Exhaust Rocker Arm-to-Shaft Clearance

Standard (New): 0.026—0.077 mm
(0.0010—0.0030 in.)

Service Limit: 0.077 mm (0.0030 in.)



Inspect rocker arm
face for wear.

6. Repeat for all rockers and both shafts. If the clearance is beyond the service limit, replace the rocker shaft and all rocker arms that are beyond the service limit. If any intake rocker arm needs replacement, replace all three rocker arms in that set (primary, mid, and secondary).

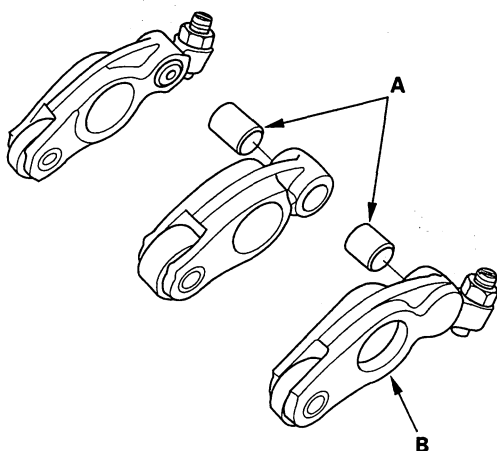


VTEC Rocker Arms

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

NOTE:

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



8. Reassemble the rocker arm assembly (see page 6-35).
9. Install the rocker arm assembly (see page 6-48).

Cylinder Head

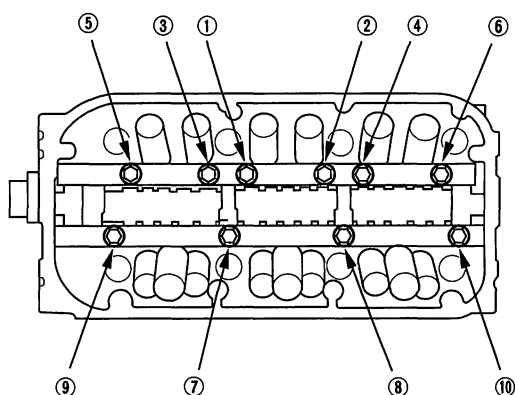
Camshaft Inspection

1. Remove the cylinder head (see page 6-29).
2. Remove the rocker arms (see page 6-34).
3. Put the rocker shafts on the cylinder head, then tighten the bolts to the specified torque.

NOTE: Apply new engine oil to the threads and flange of the exhaust rocker shaft mounting bolts.

Specified Torque

8 x 1.25 mm: 24 N·m (2.4 kgf·m, 17 lbf·ft)

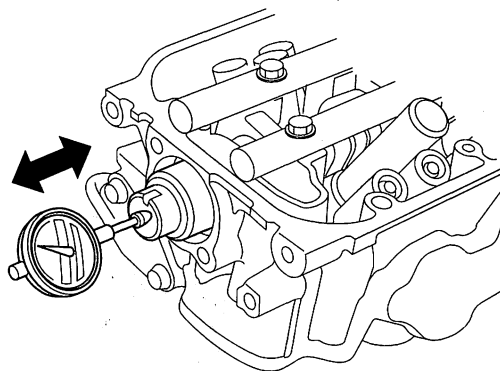


4. Seat the camshaft by pushing it toward the rear of the cylinder head.
5. Zero the dial indicator against the end of the camshaft. Push the camshaft back and forth and read the end play. If the end play is beyond the service limit, replace the thrust cover and recheck. If it is still beyond the service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

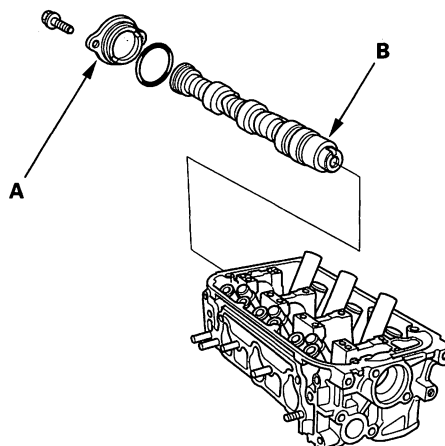
Camshaft End Play

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

Service Limit: 0.20 mm (0.008 in.)



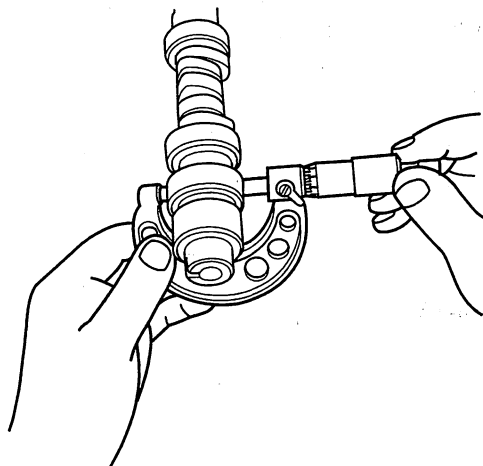
6. Remove the camshaft thrust cover (A), then pull out the camshaft (B).



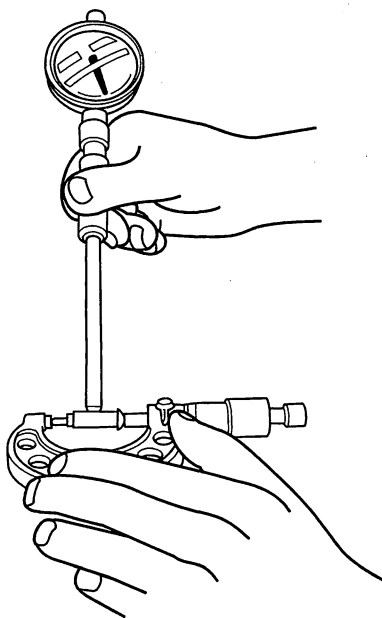


7. Wipe the camshaft clean, then inspect the lift ramps. Replace the camshaft if any lobes are pitted, scored, or excessively worn.

8. Measure the diameter of each camshaft journal.



9. Zero the gauge to the journal diameter.



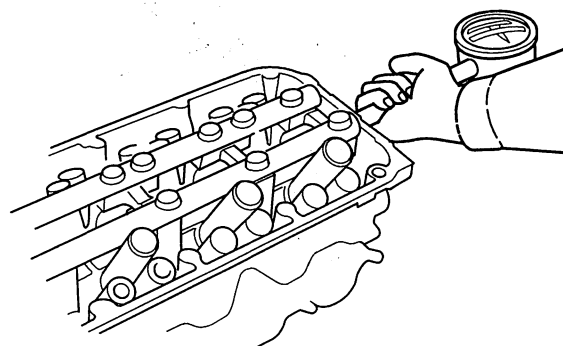
10. Clean the camshaft bearing surfaces in the cylinder head. Measure the inside diameter of each camshaft bearing surface, and check for an out-of-round condition.

- If the camshaft-to-holder clearance is within the service limit, go to step 12.
- If the camshaft-to-holder clearance is beyond the service limit and the camshaft has been replaced, replace the cylinder head.
- If the camshaft-to-holder clearance is beyond the service limit and the camshaft has not been replaced, go to step 11.

Camshaft-to-Holder Oil Clearance

Standard (New): 0.050—0.089 mm
(0.0020—0.0035 in.)

Service Limit: 0.15 mm (0.006 in.)



(cont'd)

Cylinder Head

Camshaft Inspection (cont'd)

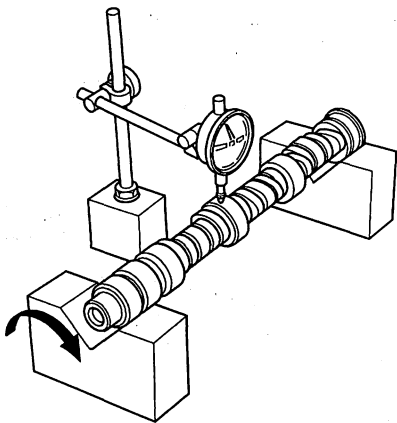
11. Check the total runout with the camshaft supported on V-blocks.

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

Camshaft Total Runout

Standard (New): 0.03 mm (0.001 in.) max.

Service Limit: 0.04 mm (0.002 in.)



12. Measure the cam lobe height.

Cam Lobe Height Standard (New):

	INTAKE	EXHAUST
PRI	35.112 mm (1.3824 in.)	36.389 mm (1.4326 in.)
MID	36.394 mm (1.4328 in.)	
SEC	35.112 mm (1.3824 in.)	

PRI: Primary

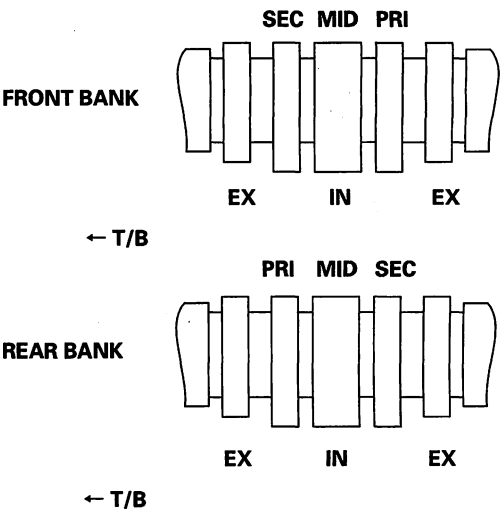
MID: Mid

SEC: Secondary

IN: Intake

EX: Exhaust

T/B: Timing Belt





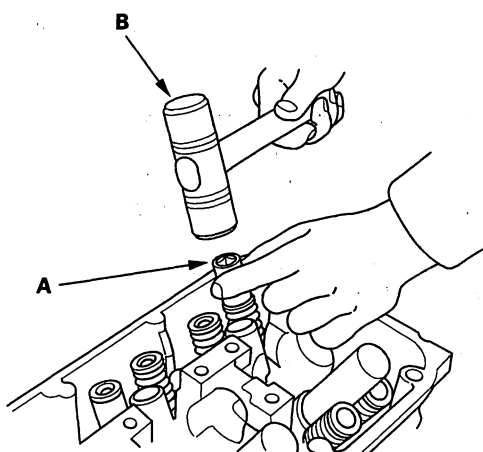
Valve, Spring, and Valve Seal Removal

Special Tools Required

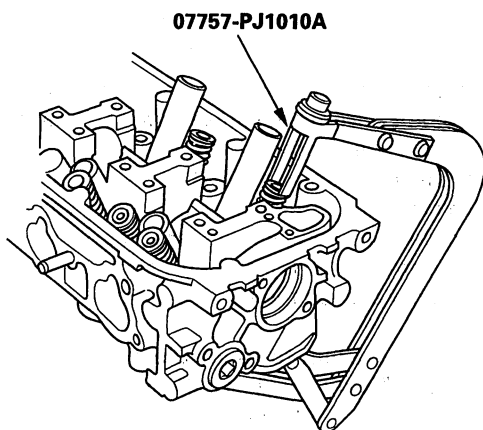
Valve spring compressor attachment
07757-PJ1010A

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

1. Remove the cylinder head (see page 6-29).
2. Using an appropriate-sized socket (A) and plastic mallet (B), lightly tap the valve retainer to loosen the valve cotters.

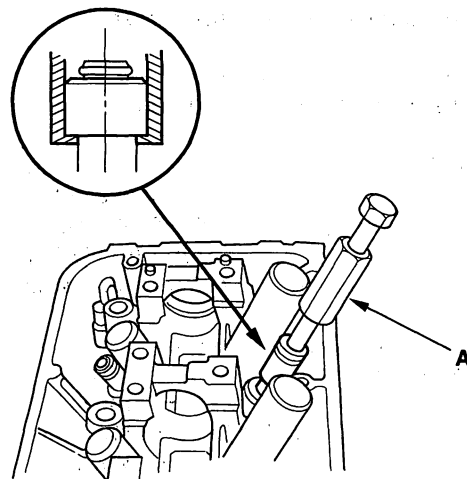


3. Install the valve spring compressor attachment and valve spring compressor. Compress the spring and remove the valve cotters.

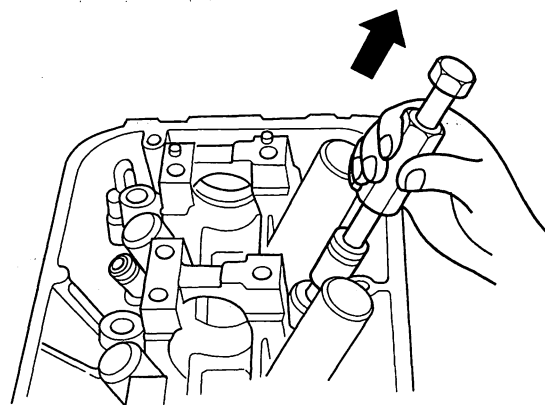


4. Remove the valve spring compressor, valve spring compressor attachment, spring retainer, and spring.

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



6. Remove the valve seal.



7. Remove the valve spring seat and valve.

Cylinder Head

Valve Inspection

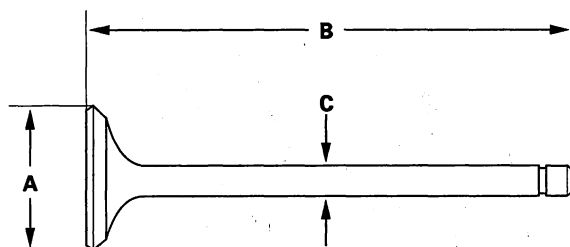
1. Remove the valves (see page 6-41).
2. Measure the valve in these areas.

Intake Valve Dimensions

A Standard (New): 35.90—36.10 mm
(1.413—1.421 in.)
B Standard (New): 116.55—117.15 mm
(4.589—4.612 in.)
C Standard (New): 5.485—5.495 mm
(0.2159—0.2163 in.)
C Service Limit: 5.455 mm (0.2148 in.)

Exhaust Valve Dimensions

A Standard (New): 29.90—30.10 mm
(1.177—1.185 in.)
B Standard (New): 113.90—114.50 mm
(4.484—4.508 in.)
C Standard (New): 5.450—5.460 mm
(0.2146—0.2150 in.)
C Service Limit: 5.420 mm (0.2134 in.)



Valve Stem-to-Guide Clearance Inspection

1. Remove the valves (see page 6-41).
2. Slide the valve out of its guide about 10 mm (0.39 in.), then measure the guide-to-stem clearance with a dial indicator while rocking the stem in the direction of normal thrust (wobble method).

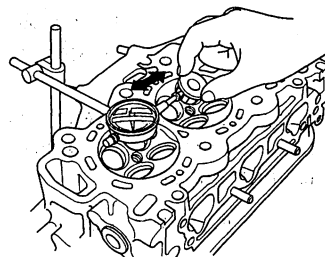
- If the measurement exceeds the service limit, recheck it using a new valve.
- If the measurement is now within the service limit, reassemble using a new valve.
- If the measurement with a new valve still exceeds the service limit, go to step 3.

Intake Valve Stem-to-Guide Clearance

Standard (New): 0.04—0.09 mm
(0.002—0.004 in.)
Service Limit: 0.16 mm (0.006 in.)

Exhaust Valve Stem-to-Guide Clearance

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



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

Intake Valve Stem-to-Guide Clearance

Standard (New): 0.020—0.045 mm
(0.0008—0.0018 in.)
Service Limit: 0.08 mm (0.003 in.)

Exhaust Valve Stem-to-Guide Clearance

Standard (New): 0.055—0.080 mm
(0.0022—0.0031 in.)
Service Limit: 0.11 mm (0.004 in.)

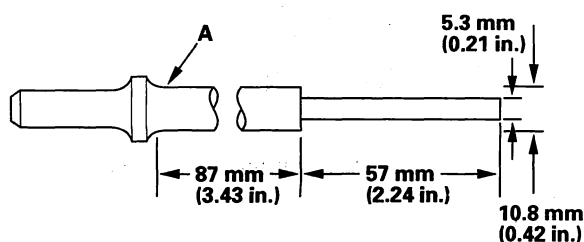


Valve Guide Replacement

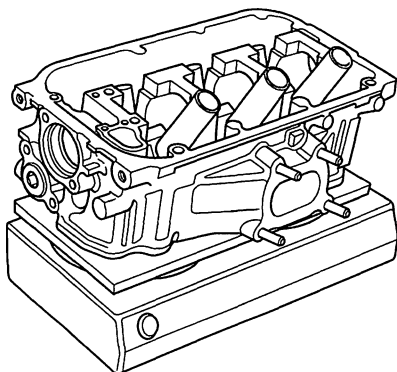
Special Tools Required

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

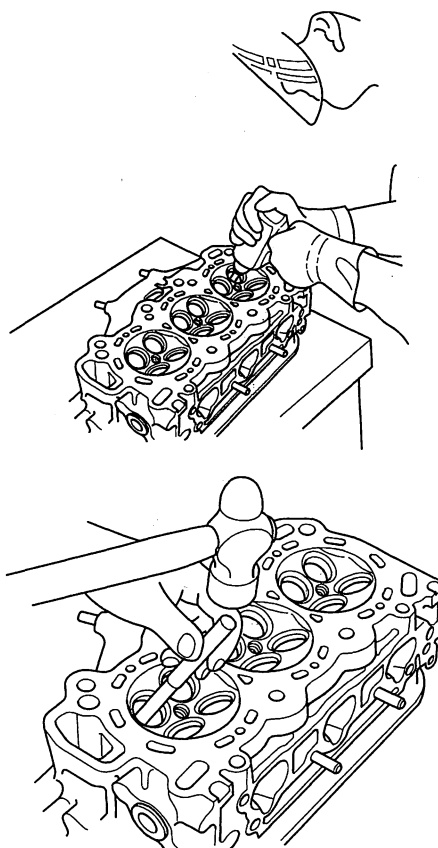
1. Inspect valve stem-to-guide clearance (see page 6-42).
2. As illustrated, use a commercially available air-impact valve guide driver (A) modified to fit the diameter of the valve guides. In most cases, the same procedure can be done using the special tool and a conventional hammer.



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



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



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

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

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

(cont'd)

Cylinder Head

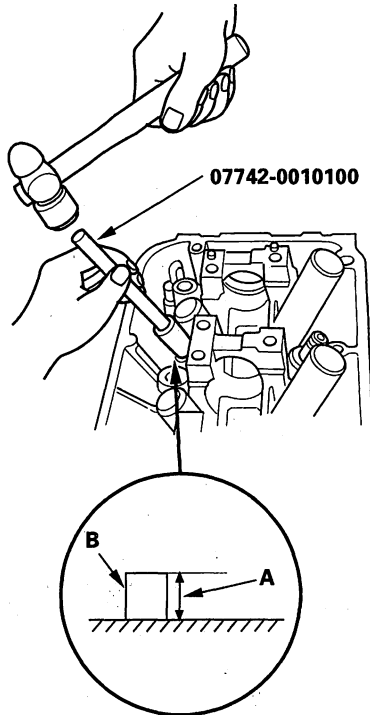
Valve Guide Replacement (cont'd)

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 to the specified installed height (A) of the guide (B). If you have all 12 guides to do, you may have to reheat the head.

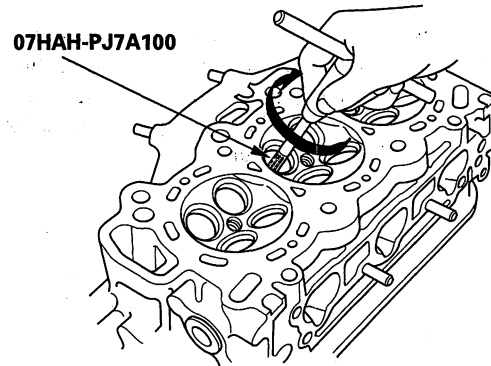
Valve Guide Installed Height

Intake: 21.20–22.20 mm (0.835–0.874 in.)

Exhaust: 20.60–21.60 mm (0.811–0.850 in.)



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

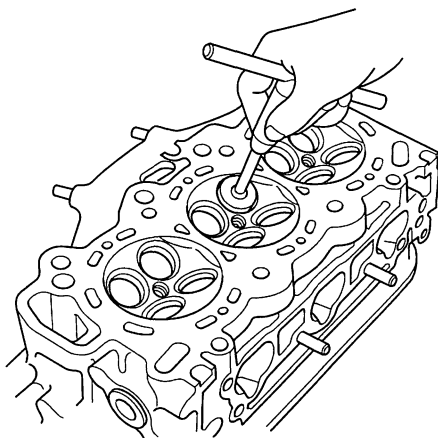


12. Continue to rotate the reamer clockwise while drawing it from the bore.
13. Thoroughly wash the guide in detergent and water to remove any cutting residue.
14. Check the clearance with a valve (see page 6-42). Verify that a valve slides in the intake and exhaust valve guides without being stuck.

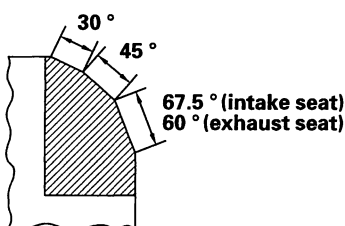


Valve Seat Reconditioning

1. Inspect valve stem-to-guide clearance (see page 6-42). If the valve guides are worn, replace them (see page 6-43) 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 edge of the seat with the 30 ° cutter and the lower edge of the seat with the 67.5 ° cutter (intake seat) or the 60 ° cutter (exhaust seat). Check the width of the seat and adjust accordingly.



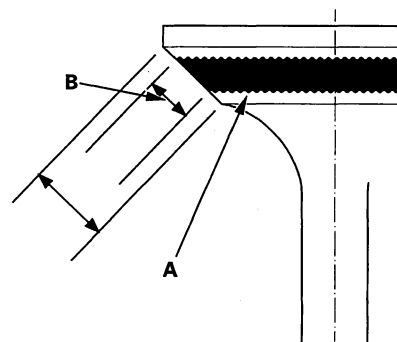
5. Make one more very light pass with the 45 ° cutter to remove any possible burrs caused by the other cutters.

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



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

- If it is too high (closer to the valve stem), you must make a second cut with the 67.5 ° cutter (intake seat) or the 60 ° cutter (exhaust seat) to move it down, then one more cut with the 45 ° cutter to restore seat width.
- If it is too low (closer to the valve edge), you must make a second cut with the 30 ° cutter to move it up, then one more cut with the 45 ° cutter to restore seat width.

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

(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

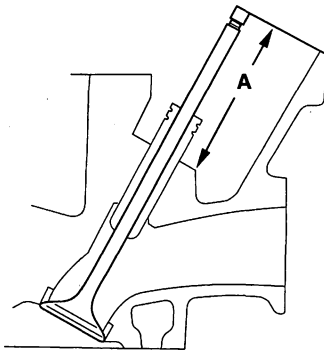
Standard (New): 46.75—47.55 mm
(1.841—1.872 in.)

Service Limit: 47.80 mm (1.882 in.)

Exhaust Valve Stem Installed Height

Standard (New): 46.68—47.48 mm
(1.838—1.869 in.)

Service Limit: 47.73 mm (1.879 in.)



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



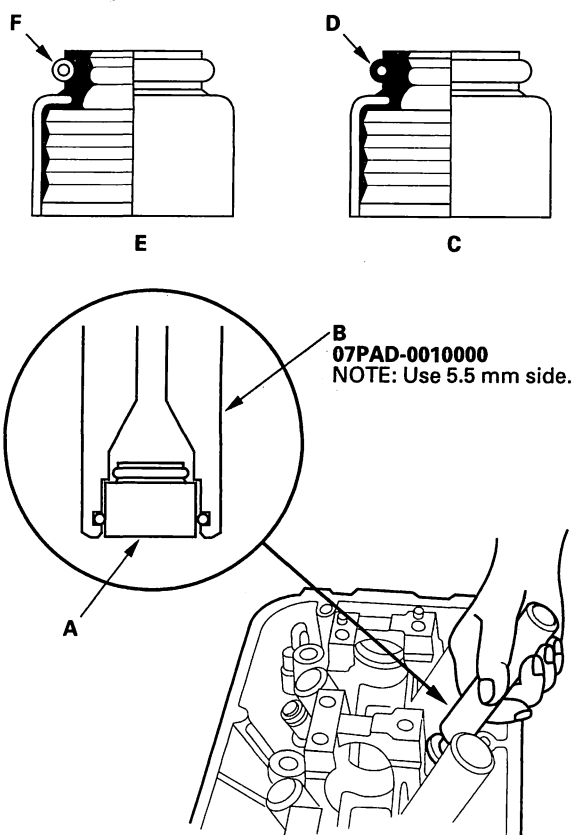
Valve, Spring, and Valve Seal Installation

Special Tools Required

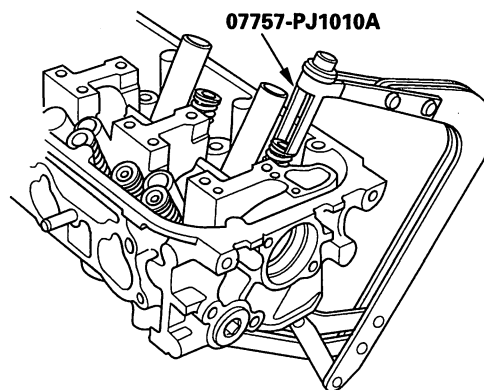
- Stem seal driver 07PAD-0010000
- Valve spring compressor attachment 07757-PJ1010A

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

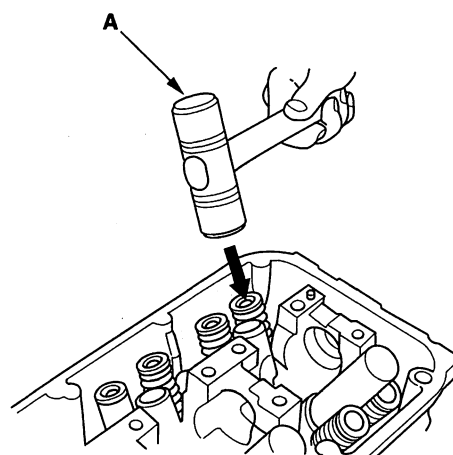
NOTE: Exhaust valve seals (C) have a black spring (D) and intake valve seals (E) have a white spring (F); they are not interchangeable.



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



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

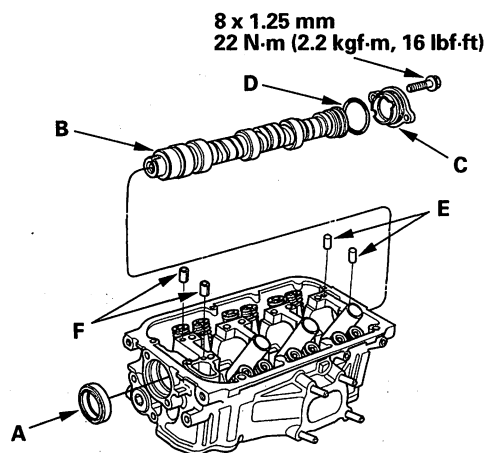


Cylinder Head

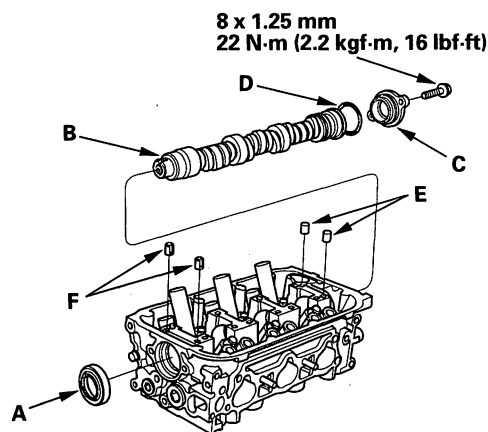
Camshaft, Rocker Arm Assembly, Camshaft Seal, and Pulley Installation

1. Apply a light coat of new engine oil around the camshaft oil seal.
2. Gently tap the new camshaft oil seal (A) into the cylinder head.
 - 1 Tap the camshaft oil seal in squarely.
 - 2 Install the oil seal about 0.5 —1.5 mm (0.02—0.06 in.) below the surface of the cylinder head.

FRONT:



REAR:



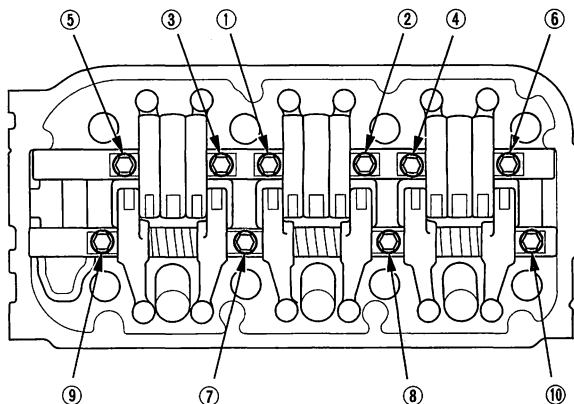
3. Insert the camshaft (B) into the cylinder head, then install the camshaft thrust cover (C). Always use a new O-ring (D).
4. Check that the oil seal lips are not distorted.

5. Install the solid dowel pins (E) and the hollow dowel pins (F).
6. Loosen the valve adjusting screws.
7. If the rocker arm assembly is disassembled, reassemble the rocker arm assembly (see page 6-35).
8. Set the rocker arm assembly in place, and loosely install the bolts. Make sure that the rocker arms are properly positioned on the valve stems.
9. Tighten each bolt two turns at a time in the sequence as shown to ensure that the rockers do not bind on the valves.

NOTE: Apply new engine oil to the threads and flange of the exhaust rocker shaft mounting bolts.

Specified Torque

8 x 1.25 mm: 24 N·m (2.4 kgf·m, 17 lbf·ft)



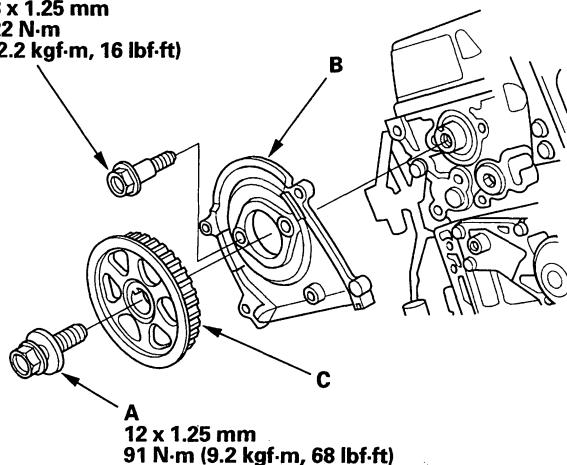
10. Install the front injector base and rear injector base. Always use a new gasket (see page 9-7).



Cylinder Head Installation

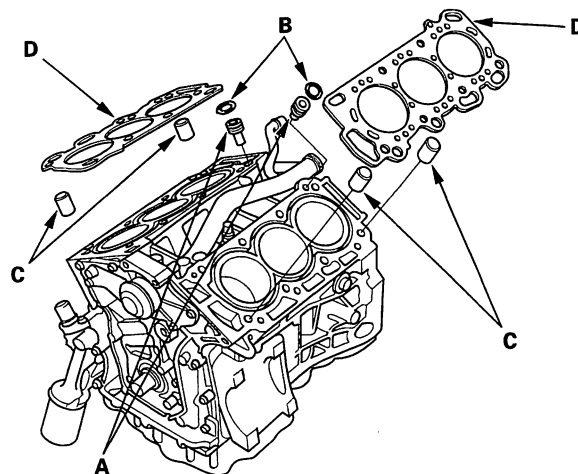
11. Apply new engine oil to the threads of the camshaft pulley mounting bolt (A). Install the back cover (B), then install the camshaft pulley (C).

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

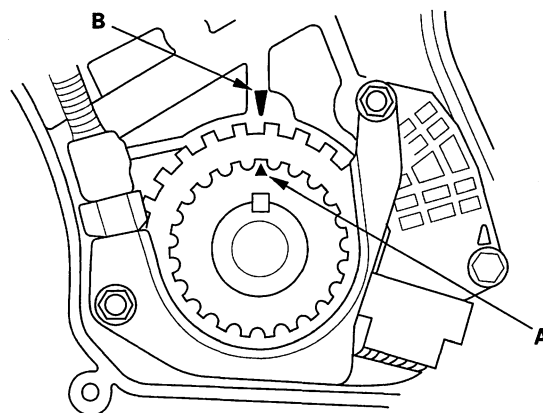


A
12 x 1.25 mm
91 N·m (9.2 kgf·m, 68 lbf·ft)

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



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



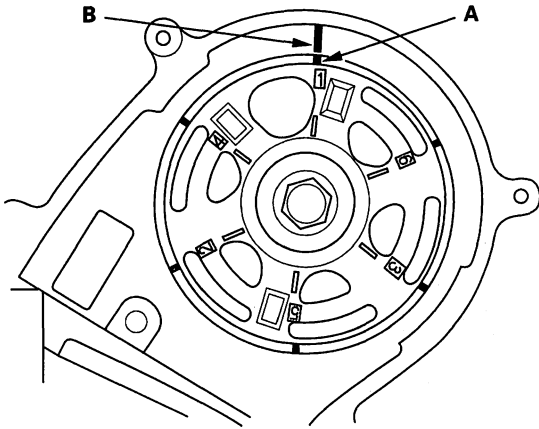
(cont'd)

Cylinder Head

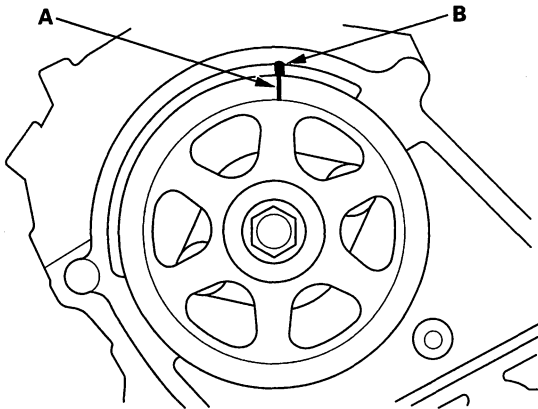
Cylinder Head Installation (cont'd)

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

FRONT:

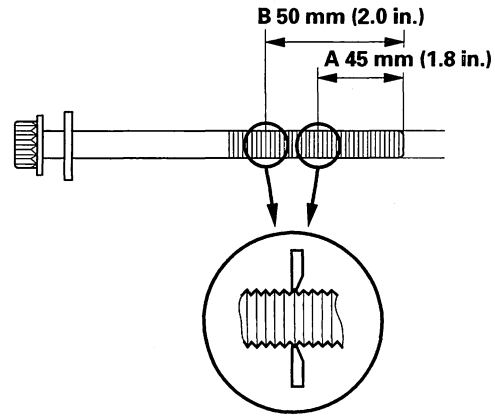


REAR:

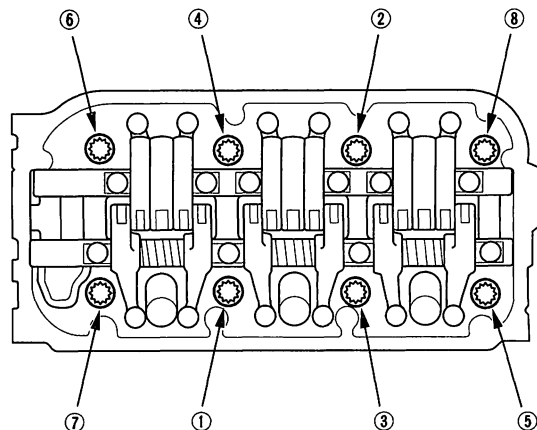


7. Put the cylinder head onto the engine block.

8. Measure the diameter of each cylinder head bolt at point A and point B.



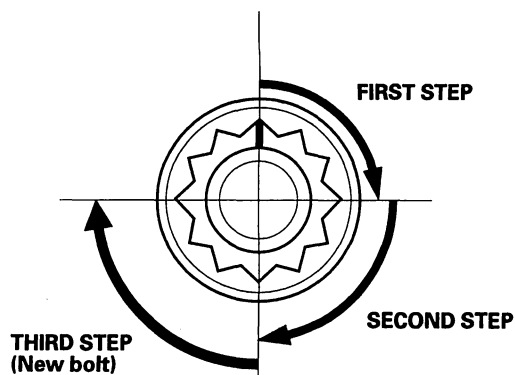
9. If either diameter is less than 11.3 mm (0.44 in.), replace the cylinder head bolt.
10. Apply new engine oil to the threads and under the bolt heads of all cylinder head bolts.
11. Tighten the cylinder head bolts in sequence to 30 N·m (3.0 kgf·m, 22 lbf·ft). Use a beam-type torque wrench. When using a preset-type torque wrench, be sure to tighten slowly and do not overtighten. If a bolt makes any noise while you are torquing it, loosen the bolt and retighten it from the first step.



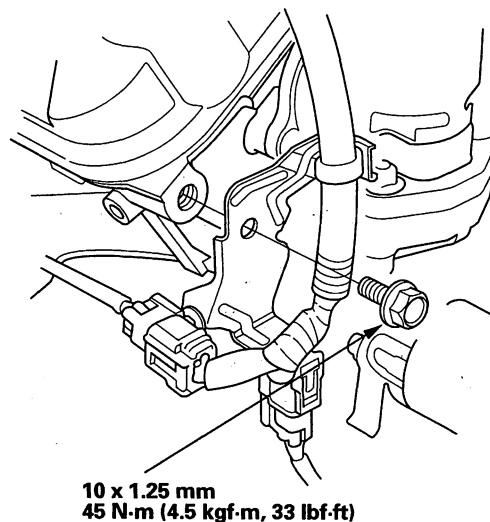


12. After torquing, tighten all cylinder head bolts in two steps (90 ° per step). If you are using a new cylinder head bolt, tighten the bolt an extra 90 °.

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



13. Install the timing belt (see page 6-16).
14. Adjust the valve clearance (see page 6-8).
15. Install the cylinder head covers (see page 6-27).
16. Install the water passage (see page 10-9).
17. Install the front warm up three way catalytic converter (front WU-TWC) (see page 11-370) and rear warm up three way catalytic converter (rear WU-TWC) (see page 11-371).
18. Install the fuel rails (see page 11-312).
19. Install the connector bracket to the front cylinder head.

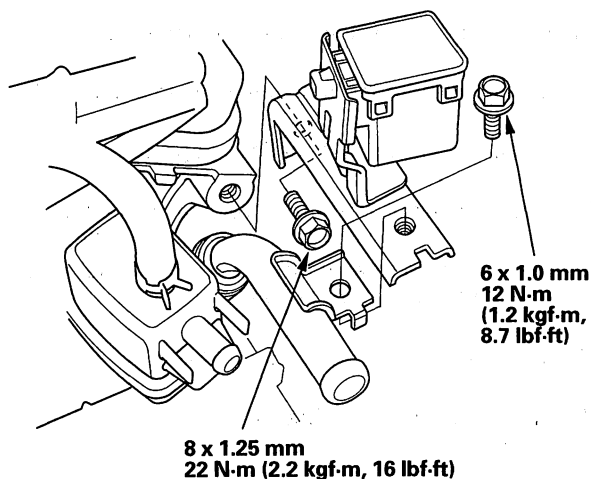


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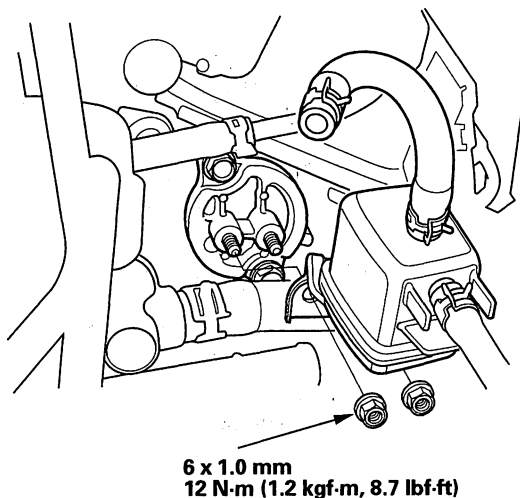
Cylinder Head

Cylinder Head Installation (cont'd)

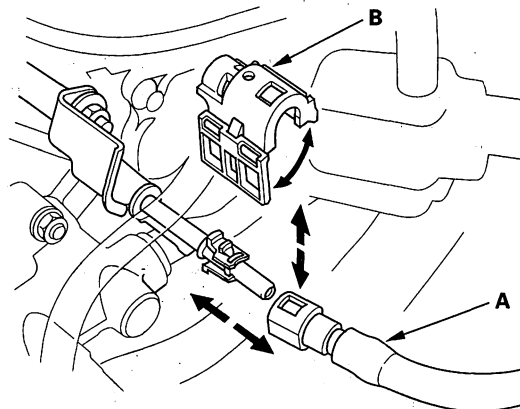
20. Install the bracket to the rear cylinder head.



21. Install the purge joint.



22. Connect the fuel feed hose (A) (see page 11-340), then install the quick-connect fitting cover (B).

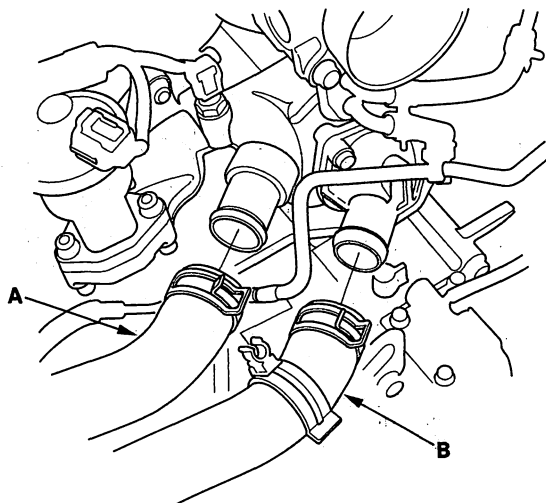


23. Connect the engine wire harness connectors, and install the wire harness clamps to the cylinder head.

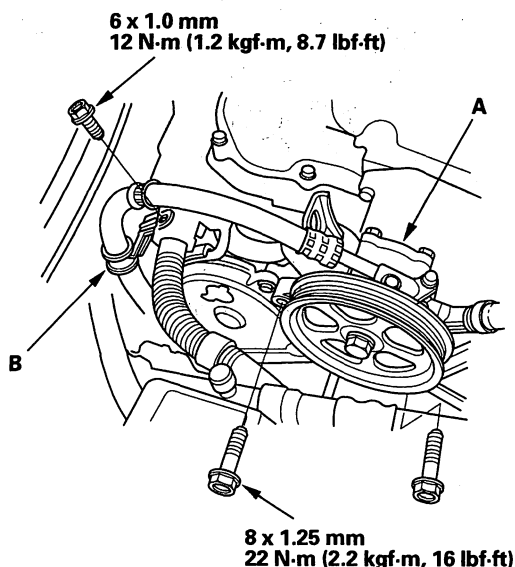
- Six injector connectors
- Engine coolant temperature (ECT) sensor 1 connector
- Crankshaft position (CKP) sensor connector
- Exhaust gas recirculation (EGR) valve connector
- Rocker arm oil control solenoid connector
- Rocker arm oil pressure switch connector
- Oil pressure switch connector
- Two air fuel ratio (A/F) sensor connectors
- Two secondary heated oxygen sensor (secondary HO2S) connectors



24. Install the upper radiator hose (A) and lower radiator hose (B).



25. Install the intake manifold (see page 9-5).
26. Install the alternator (see page 4-37).
27. Install the power steering (P/S) pump (A) and P/S hose bracket (B).



28. Install the drive belt (see page 4-33).

29. Clean the battery posts and cable terminals then connect them to the battery. Apply grease to the battery terminals to prevent corrosion.
30. After installation, check that all tubes, hoses and connectors are installed correctly.
31. Check for fuel leaks. Turn the ignition switch ON (II) (do not operate the starter) so the fuel pump runs for about 2 seconds and pressurizes the fuel line. Repeat this operation two or three times, then check for fuel leaks at any point in the fuel line.
32. Refill the radiator with engine coolant, and bleed air from the cooling system with the heater valve open (see step 10 on page 10-7).
33. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see page 11-4).
34. Inspect the idle speed (see page 11-310).
35. Inspect the ignition timing (see page 4-20).
36. Do the steering column position memorization (see page 17-28).
37. Enter the anti-theft codes for the audio system and navigation system (if equipped).
38. Set the clock.

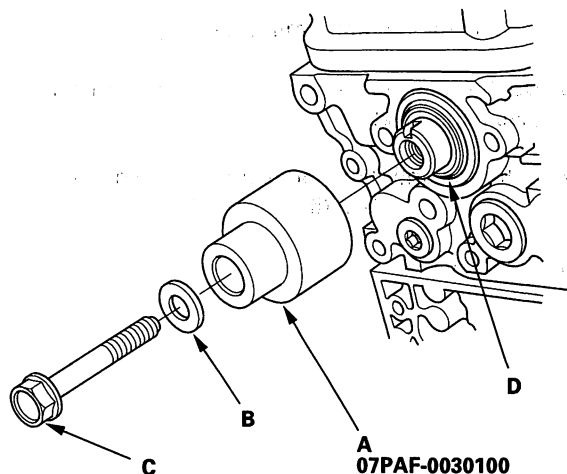
Cylinder Head

Camshaft Oil Seal Installation - In Car

Special Tools Required

Camshaft oil seal driver 07PAF-0030100

1. Remove the timing belt (see page 6-13).
2. Remove the camshaft pulley and back cover (see step 20 on page 6-31).
3. Remove the camshaft oil seal.
4. Dry the camshaft oil seal housing.
5. Apply a light coat of multipurpose grease to the lip of the camshaft oil seal.
6. Using the special tool (A), washer (B), and a 12 x 75 x 1.25 mm bolt (C), press in the camshaft oil seal (D) about 0.5—1.5 mm (0.02—0.06 in.) below the surface of the cylinder head.

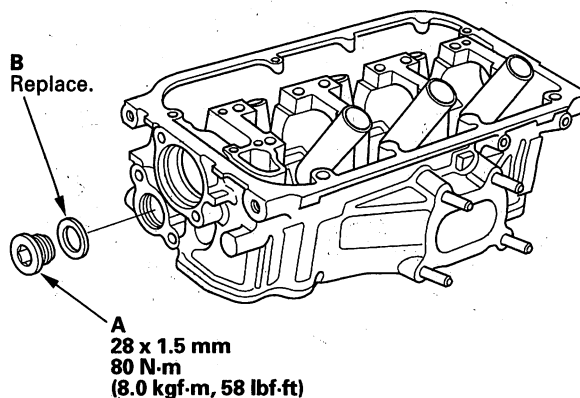


7. Apply new engine oil to the threads of the camshaft pulley mounting bolt. Install the back cover, then install the camshaft pulley (see step 11 on page 6-49).
8. Install the timing belt (see page 6-16).

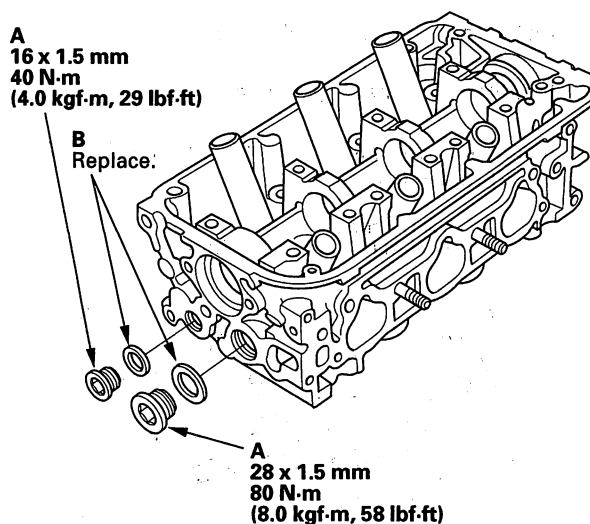
Sealing Bolt Installation

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

FRONT:



REAR:



Engine Mechanical

Engine Block

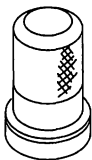
Special Tools	7-2
Component Location Index	7-3
Connecting Rod and Crankshaft End Play	
Inspection	7-6
Crankshaft Main Bearing Replacement	7-7
Connecting Rod Bearing Replacement	7-9
Oil Pan Removal	7-11
Crankshaft and Piston Removal	7-12
Crankshaft Inspection	7-14
Block and Piston Inspection	7-15
Piston, Pin, and Connecting Rod Replacement	7-18
Piston Ring Replacement	7-21
Crankshaft and Piston Installation	7-23
Oil Pan Installation	7-28
Pulley End Crankshaft Oil Seal Installation - In Car ...	7-30
Transmission End Crankshaft Oil Seal	
Installation - In Car	7-30
Drain Bolt Installation	7-31



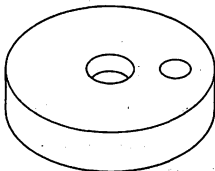
Engine Block

Special Tools

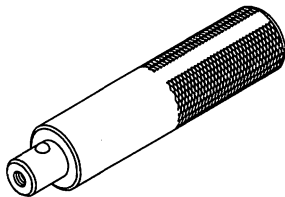
Ref. No.	Tool Number	Description	Qty
①	070AD-RCAA100	Oil Seal Driver, 64 mm	1
②	070AD-RCAA200	Driver Attachment, 106 mm	1
③	07749-0010000	Driver	1



①



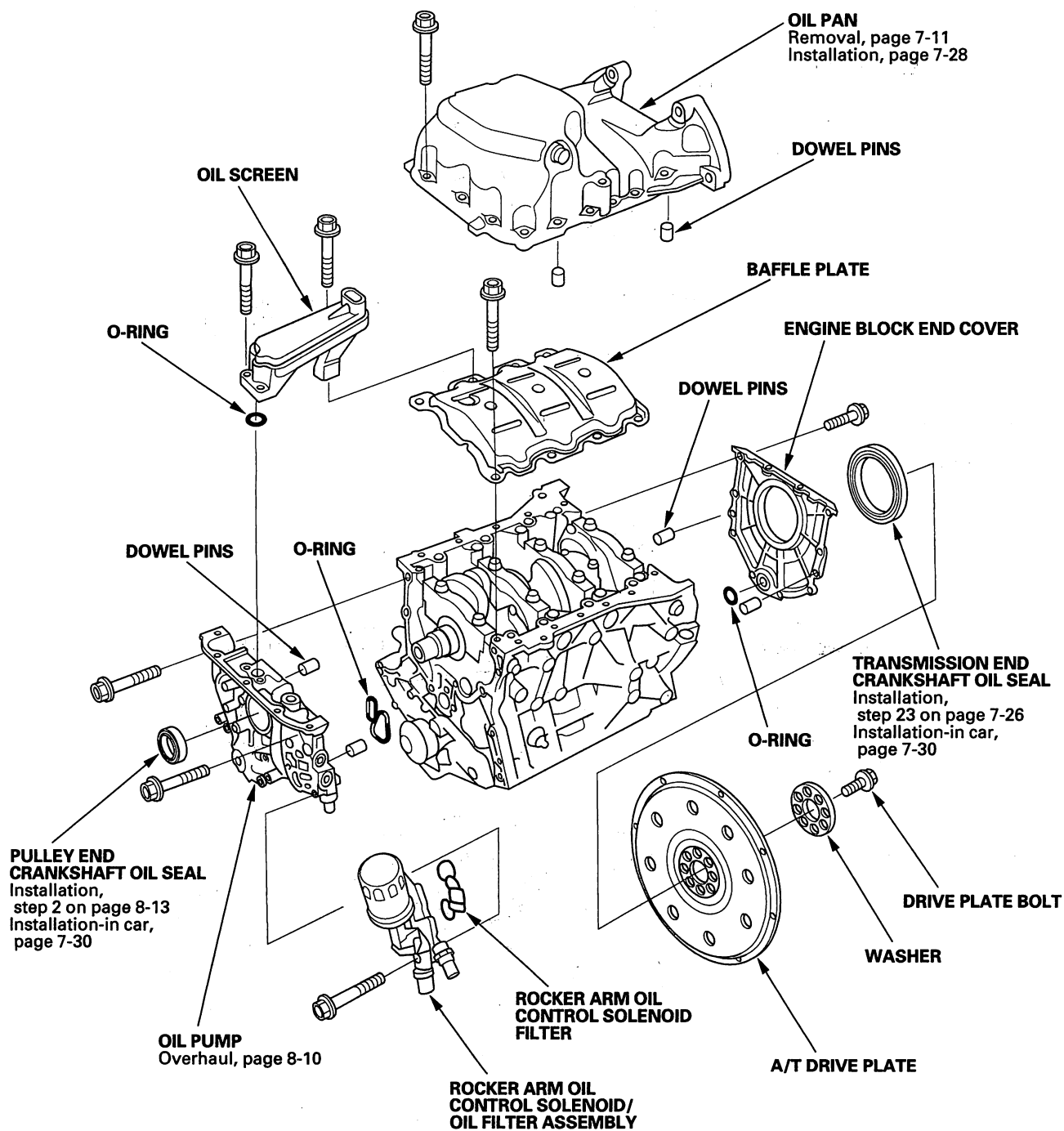
②



③



Component Location Index

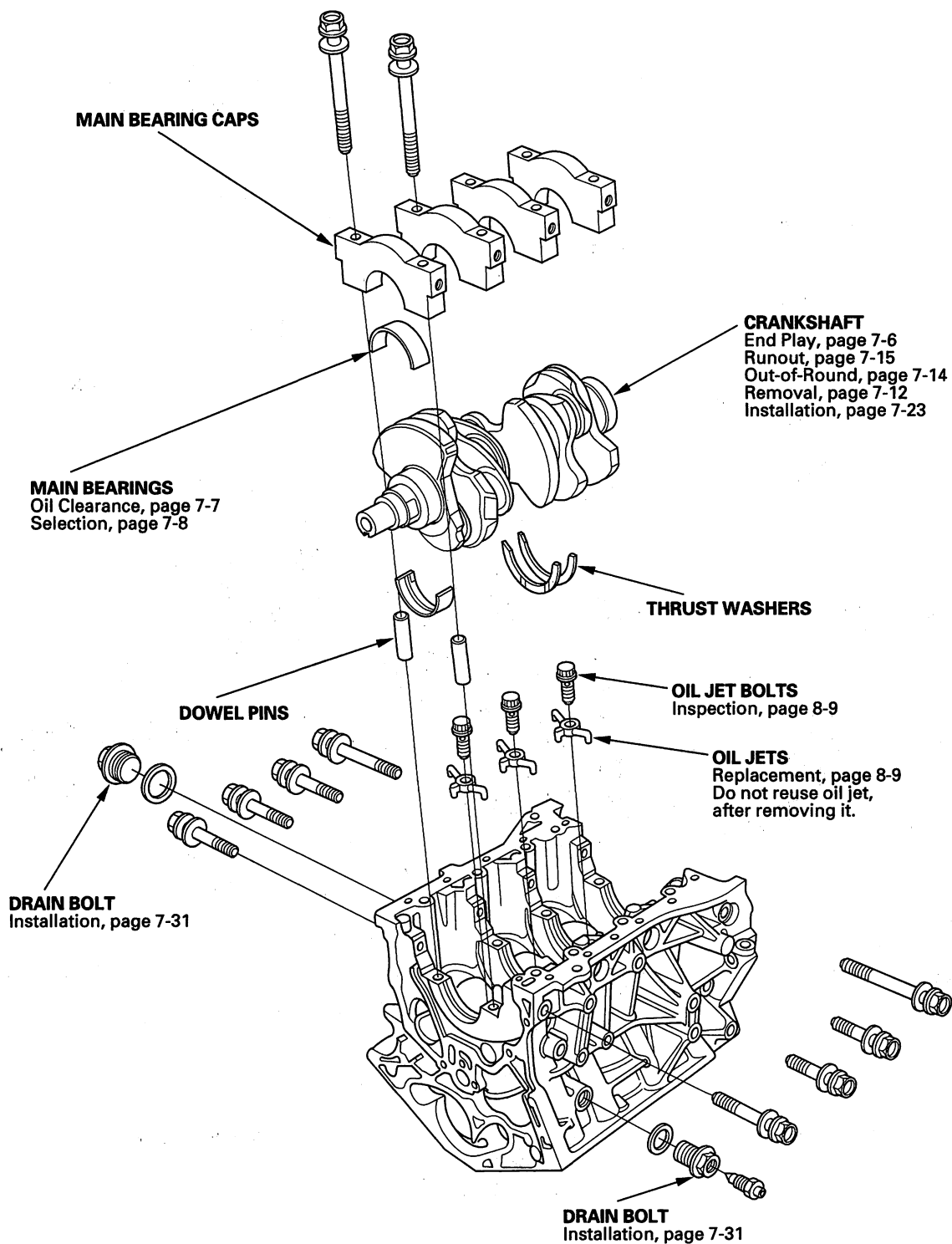


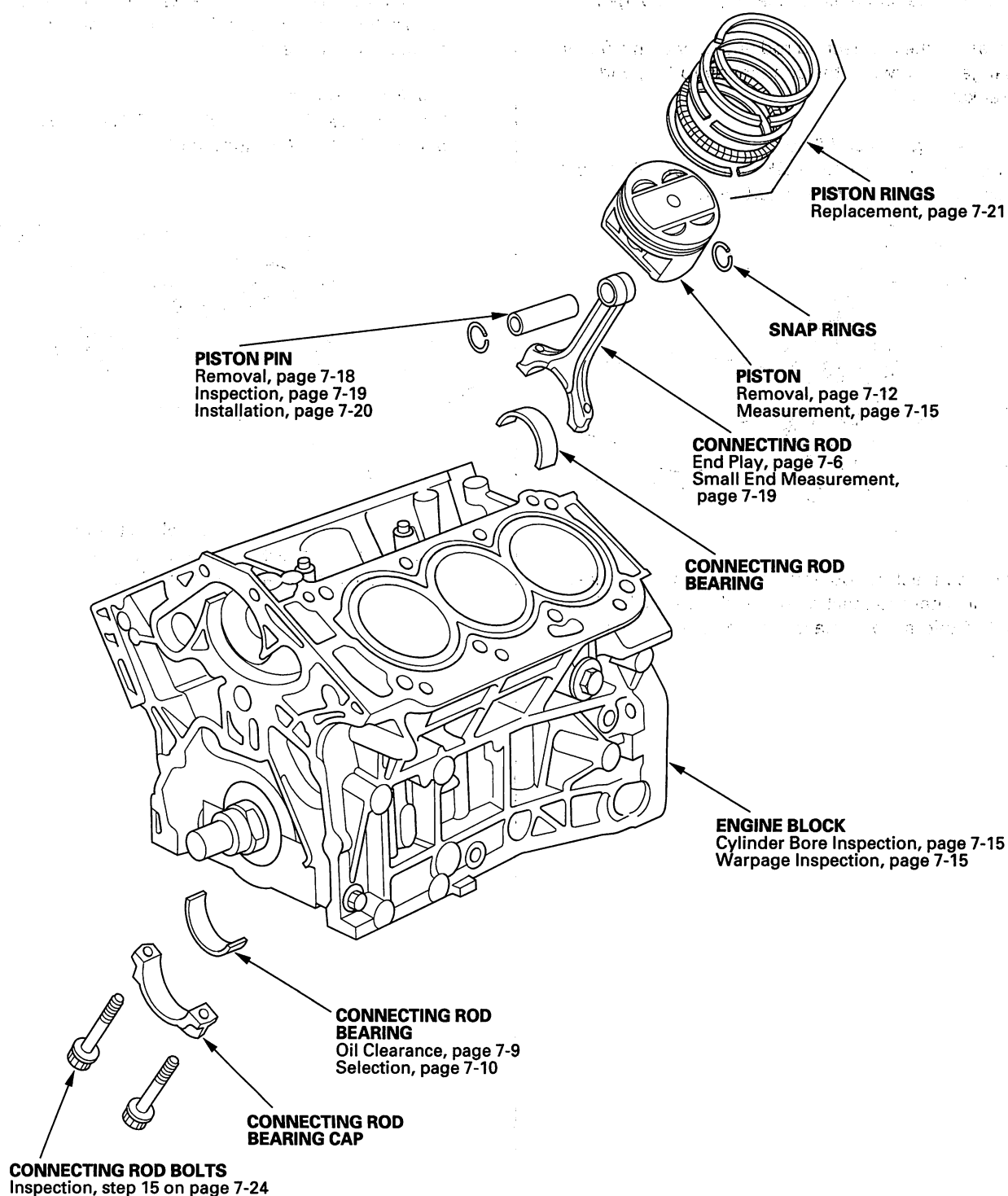
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BACK

Engine Block

Component Location Index (cont'd)





Engine Block

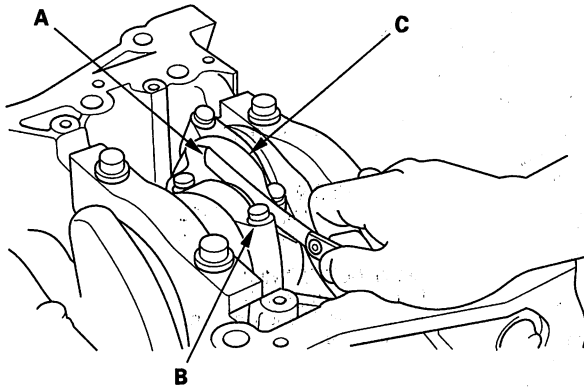
Connecting Rod and Crankshaft End Play Inspection

1. Remove the oil pump (see page 8-11).
2. Remove the baffle plate (see step 10 on page 7-12).
3. Measure the connecting rod end play with a feeler gauge (A) between the connecting rod (B) and crankshaft (C).

Connecting Rod End Play

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

Service Limit: 0.45 mm (0.018 in.)



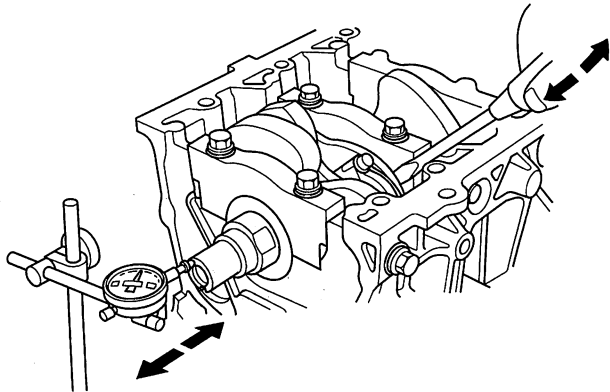
4. If the connecting rod end play is out-of-tolerance, install a new connecting rod and recheck. If it is still out-of-tolerance, replace the crankshaft (see page 7-12).

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 excessive, replace the thrust washers and recheck. If it is still out-of-tolerance, replace the crankshaft (see page 7-12).



Crankshaft Main Bearing Replacement

Main Bearing Clearance Inspection

1. Remove the main bearing caps and bearing halves (see page 7-12).
2. Clean each main journal and bearing half with a clean shop towel.
3. Place one strip of plastigage across each main journal.

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

4. Reinstall the bearings and caps, then torque the bearing cap bolts to 74 N·m (7.5 kgf·m, 54 lbf·ft), and the bearing cap side bolts to 49 N·m (5.0 kgf·m, 36 lbf·ft) in the proper sequence (see step 22 on page 7-25).

NOTE:

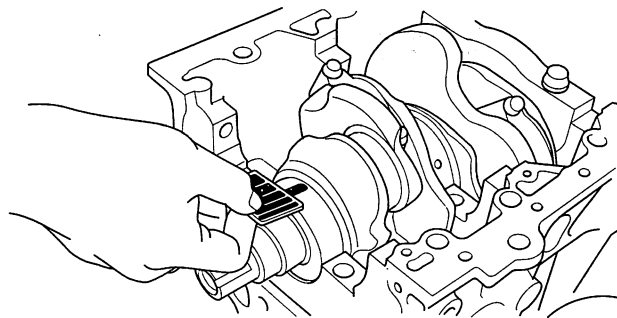
- Apply new engine oil to the bolt threads and flanges.
- Do not rotate the crankshaft during inspection.

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

Main Bearing-to-Journal Oil Clearance

Standard (New): 0.019—0.045 mm
(0.0007—0.0018 in.)

Service Limit: 0.050 mm (0.0020 in.)



6. If the plastigage measures too wide or too narrow, remove the crankshaft, and remove the upper half of the bearing. Install a new, complete bearing with the same color code, and recheck the clearance. Do not file, shim, or scrape the bearings or the caps to adjust clearance.
7. If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below that one), and check again. If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over (see page 7-12).

(cont'd)

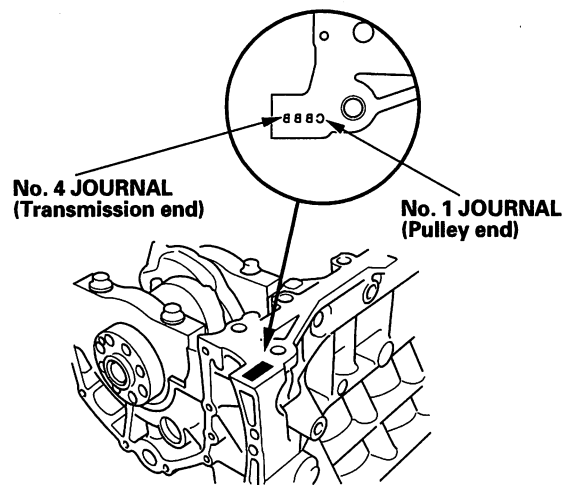
Engine Block

Crankshaft Main Bearing Replacement (cont'd)

Main Bearing Selection

Crankshaft Bore Code Location

Letters or bars have been stamped on the end of the block as a code for the size of each of the four main journal bores. Use them, and the numbers stamped on the crankshaft (codes for main journal size), to choose the correct bearings. If the codes are indecipherable because of an accumulation of dirt and dust, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.



Bearing Identification

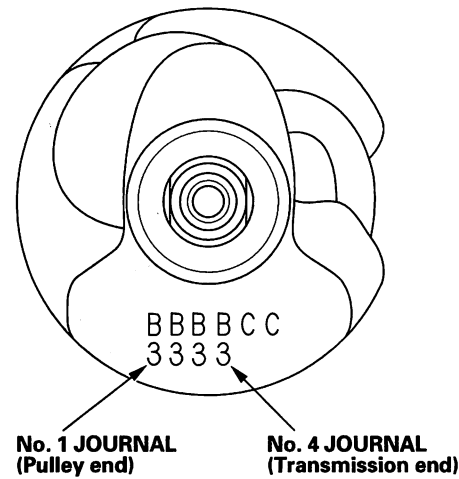
Color code is on the edge of the bearing

1 or I	Smaller main journal
2 or II	Smaller bearing (Thicker)
3 or III	
4 or IIII	
5 or IIIII	
6 or IIIIII	

Larger crank bore			
A or I	B or II	C or III	D or IIII
Smaller bearing (Thicker)			
Red/Pink	Pink	Pink/Yellow	Yellow
Pink	Pink/Yellow	Yellow	Yellow/Green
Pink/Yellow	Yellow	Yellow/Green	Green
Yellow	Yellow/Green	Green	Green/Brown
Yellow/Green	Green	Green/Brown	Brown
Green	Green/Brown	Brown	Brown/Black

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

Main Journal Code Locations (Numbers or Bars)





Connecting Rod Bearing Replacement

Rod Bearing Clearance Inspection

1. Remove the connecting rod cap and bearing half (see page 7-12).
2. Clean the crankshaft rod journal and bearing half with a clean shop towel.
3. Place a strip of plastigage across the rod journal.
4. Reinstall the bearing half and cap, and torque the bolts.

NOTE:

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

Tightening Torque:

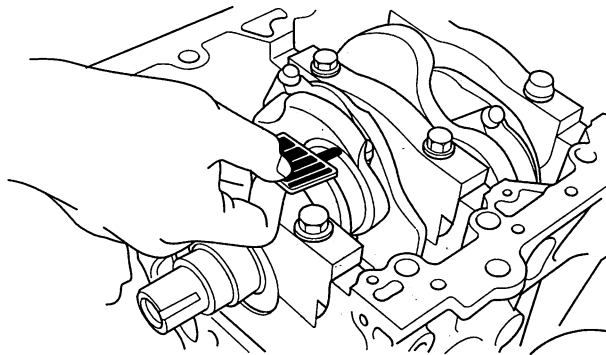
20 N·m (2.0 kgf·m, 14 lbf·ft) + 90°

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

Connecting Rod Bearing-to-Journal Oil Clearance

Standard (New): 0.020–0.044 mm
(0.0008–0.0017 in.)

Service Limit: 0.050 mm (0.0020 in.)



6. If the plastigage measures too wide or too narrow, remove the upper half of the bearing, then install a new, complete bearing with the same color code, and recheck the clearance. Do not file, shim, or scrape the bearings or the caps to adjust clearance.
7. If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below that one), and check clearance again. If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over (see page 7-12).

(cont'd)

Engine Block

Connecting Rod Bearing Replacement (cont'd)

Rod Bearing Selection

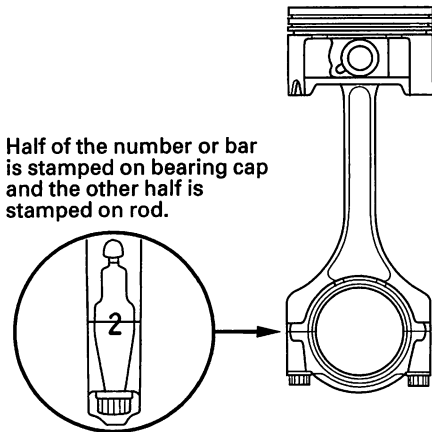
Each rod falls into one of four tolerance ranges, from 0 to 0.024 mm (0.0009 in.), in 0.006 mm (0.0002 in.) increments, depending on the size of its big end bore. It's then stamped with a number or bar (1, 2, 3, or 4/I, II, III, or IIII) indicating the range. You may find any combination of 1, 2, 3,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

Normal Bore Size: 60.0 mm (2.36 in.)

Inspect the connecting rod for cracks and heat damage.

Connecting Rod Journal Code Locations

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



Bearing Identification

Color code is on the edge of the bearing

A or I
B or II
C or III
D or IIII
E or IIIII
F or IIIIII

Smaller rod journal Smaller bearing (Thicker)

→ Larger big end bore

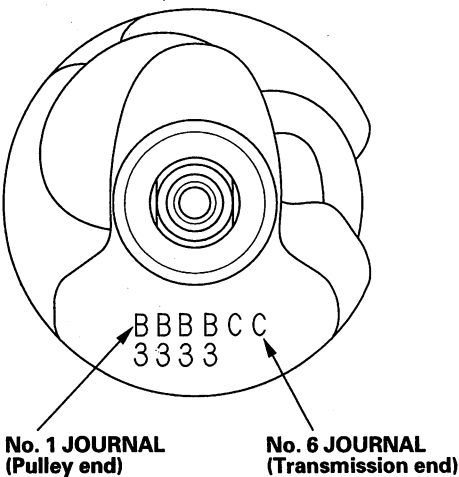
1 or I	2 or II	3 or III	4 or IIII
--------	---------	----------	-----------

→ Smaller bearing (Thicker)

Pink	Pink/Yellow	Yellow	Yellow/Green
Pink/Yellow	Yellow	Yellow/Green	Green
Yellow	Yellow/Green	Green	Green/Brown
Yellow/Green	Green	Green/Brown	Brown
Green	Green/Brown	Brown	Brown/Black
Green/Brown	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.

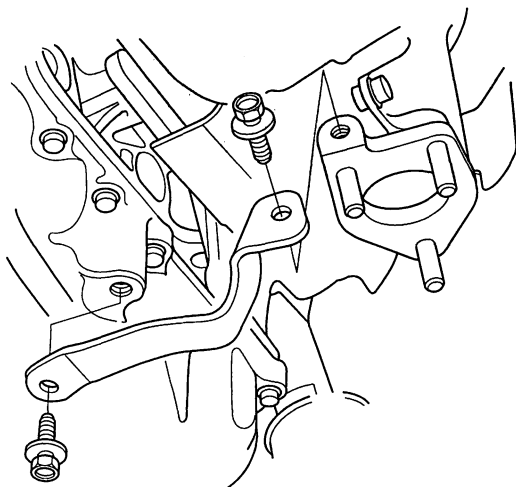
Connecting Rod Journal Code Locations (Letters or Bars)



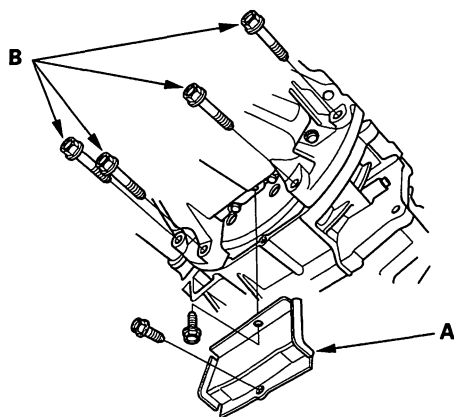


Oil Pan Removal

1. If the engine is already out of the vehicle, go to step 6.
2. Raise the vehicle on the lift to full height.
3. Drain the engine oil (see page 8-6).
4. Remove the splash shield (see step 31 on page 5-5).
5. Remove exhaust pipe A (see step 36 on page 5-6).
6. Remove the rear warm up three way catalytic converter (rear WU-TWC) bracket.

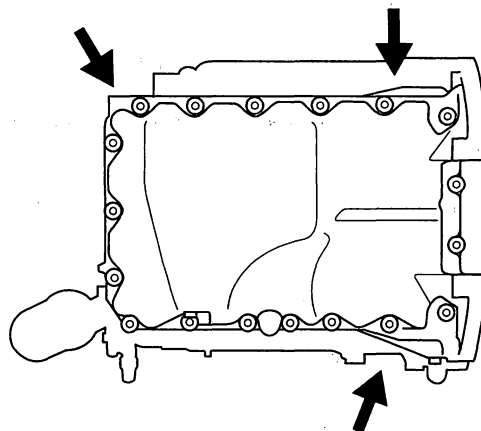


7. Remove the torque converter cover (A) and the four bolts (B) securing the transmission.



8. Remove the bolts securing the oil pan.

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

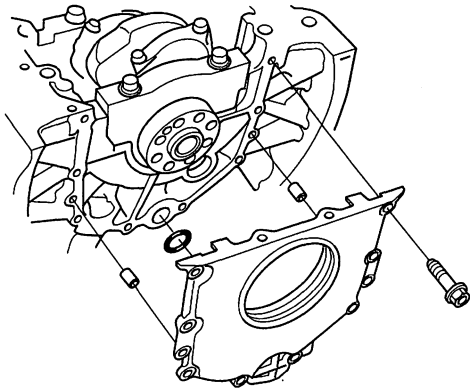


10. Remove the oil pan.

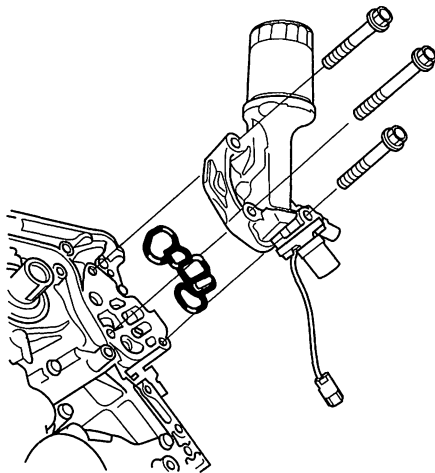
Engine Block

Crankshaft and Piston Removal

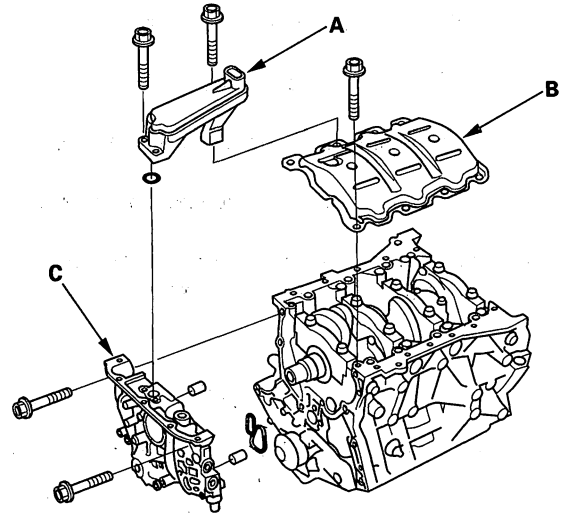
1. Remove the engine assembly (see page 5-2).
2. Remove the transmission (see page 14-275).
3. Remove the drive plate.
4. Remove the cylinder heads (see page 6-29).
5. Remove the crankshaft position (CKP) sensor (see page 11-242).
6. Remove the timing belt drive pulley from the crankshaft.
7. Remove the oil pan (see page 7-11).
8. Remove the engine block end cover.



9. Remove the rocker arm oil control solenoid/oil filter assembly.



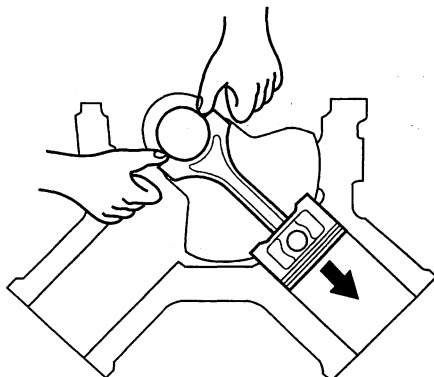
10. Remove the oil screen (A), baffle plate (B), and oil pump (C).



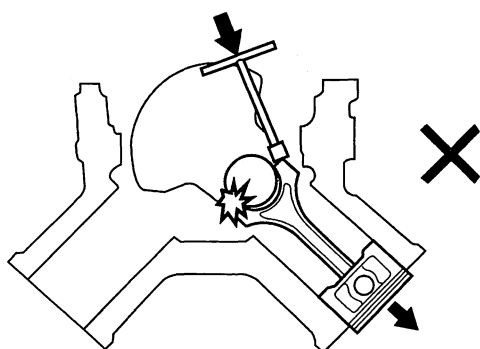


11. Remove the connecting rod caps after setting the crank pin at bottom dead center (BDC) for each cylinder. Remove the piston/connecting rod assembly by pushing on the connecting rod. Take care not to damage the crank pin or cylinder with the connecting rod.

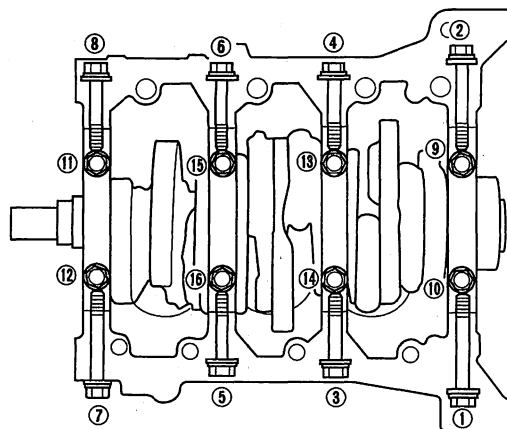
CORRECT



INCORRECT



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

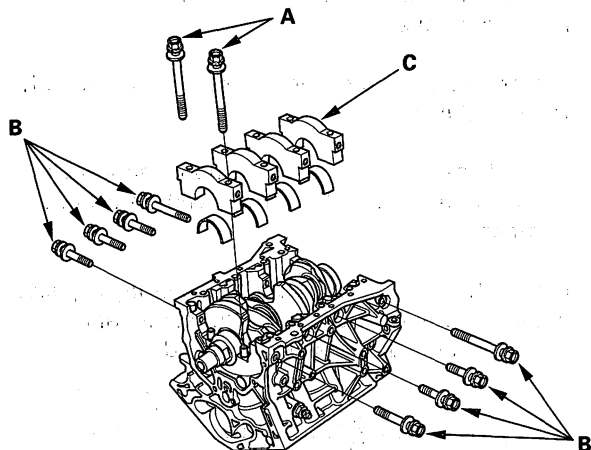


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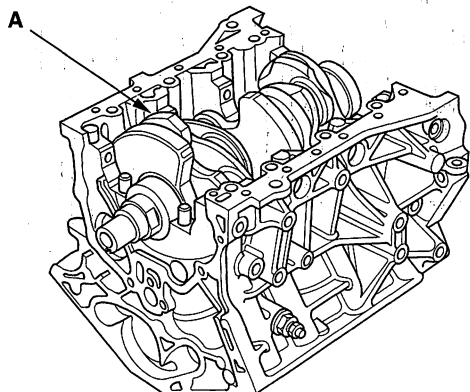
Engine Block

Crankshaft and Piston Removal (cont'd)

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



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



19. Reinstall the main caps and bearings on the engine block in the proper order.

Crankshaft Inspection

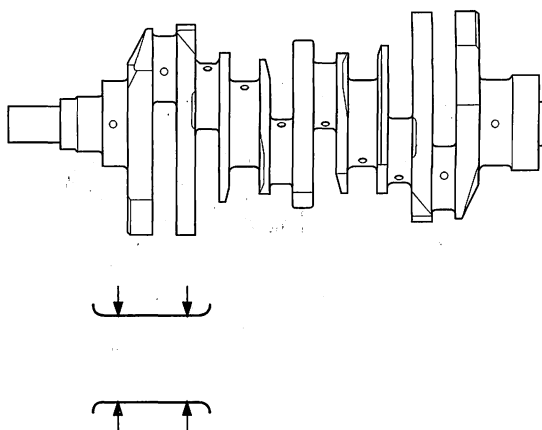
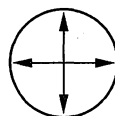
Out-of-Round and Taper

1. Remove the crankshaft from the engine block (see page 7-12).
2. Clean the crankshaft oil passages with pipe cleaners or a suitable brush.
3. Check the keyway and threads.
4. Measure out-of-round at the middle of each rod and main journal in two places. The difference between measurements on each journal must not be more than the service limit.

Journal Out-of-Round

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

Service Limit: 0.010 mm (0.0004 in.)



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

Journal Taper

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

Service Limit: 0.010 mm (0.0004 in.)



Block and Piston Inspection

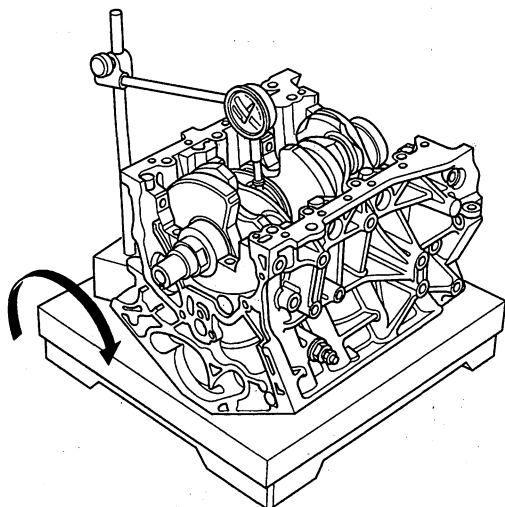
Straightness

6. Place the engine block on the surface plate.
7. Clean and install the bearings on the No. 1 and No. 4 journal of the engine block.
8. Lower the crankshaft into the engine block.
9. Measure the runout on all of the main journals. Rotate the crankshaft two complete revolutions. The difference between measurements on each journal must not be more than the service limit.

Crankshaft Total Runout

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

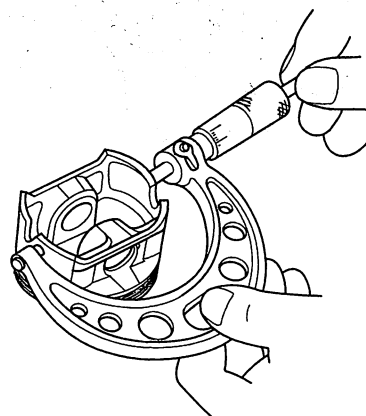
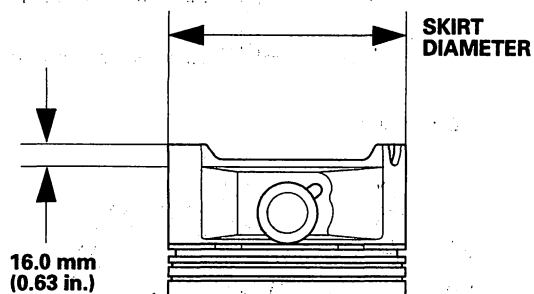
Service Limit: 0.030 mm (0.0012 in.)



1. Remove the piston from the engine block (see page 7-12).
2. Check the piston for distortion or cracks.
3. Measure the piston diameter at a point 16.0 mm (0.63 in.) from the bottom of the skirt.

Piston Diameter

Standard (New): 89.983—89.996 mm
(3.5426—3.5431 in.)



(cont'd)

Engine Block

Block and Piston Inspection (cont'd)

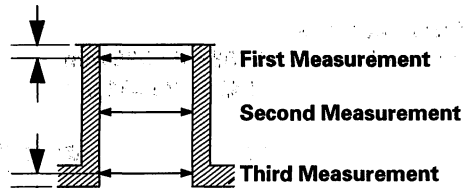
4. Measure wear and taper in direction X and Y at three levels in each cylinder as shown.

Cylinder Bore Size

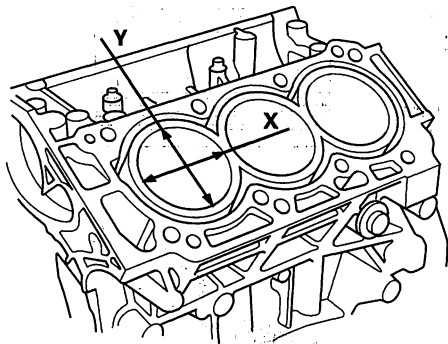
Standard (New): 90.000—90.015 mm

(3.5433—3.5439 in.)

6 mm (0.2 in.)



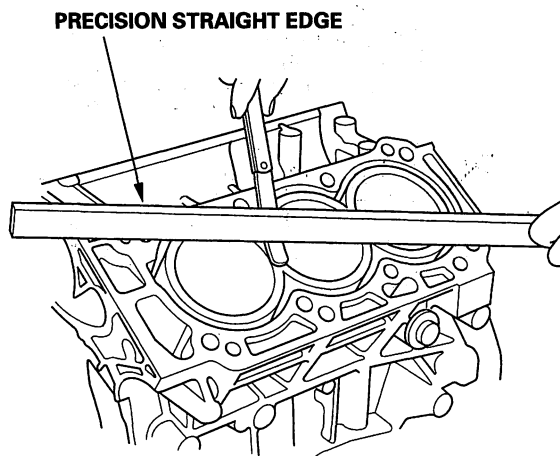
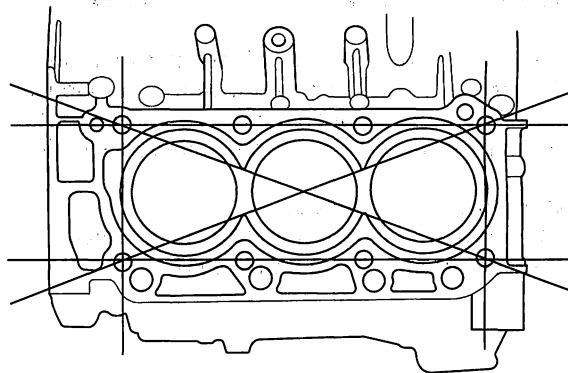
6 mm (0.2 in.)



5. 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.





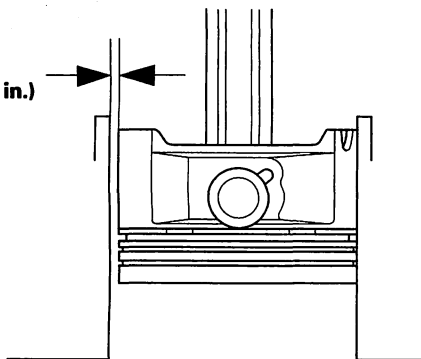
6. Calculate the difference between cylinder bore diameter and piston diameter. If the clearance is near or exceeds the service limit, inspect the piston and cylinder bore for excessive wear.

Piston-to-Cylinder Bore Clearance

Standard (New): 0.004–0.032 mm
(0.0002–0.0013 in.)

Service Limit: 0.08 mm (0.003 in.)

SERVICE LIMIT
0.08 mm (0.003 in.)



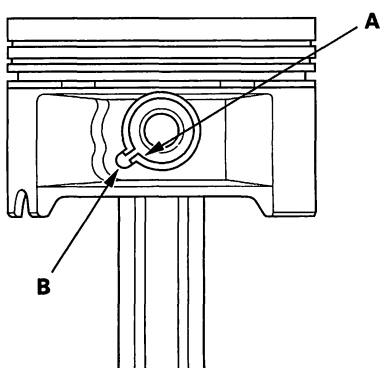
Engine Block

Piston, Pin, and Connecting Rod Replacement

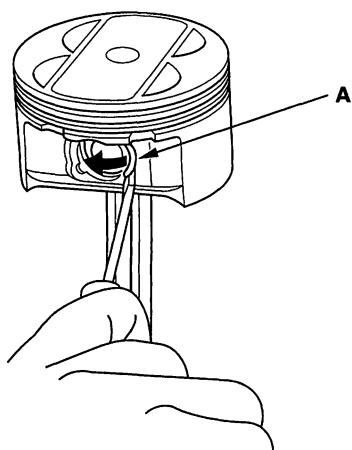
Disassembly

1. Remove the piston from the engine block (see page 7-12).
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).

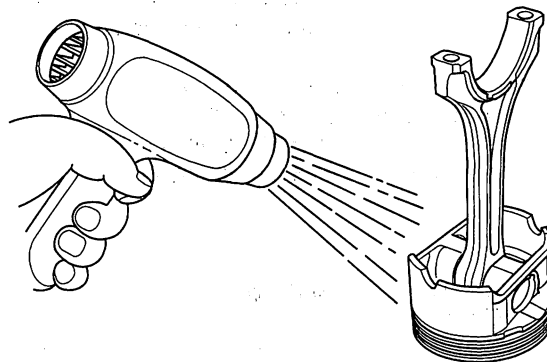
NOTE: Take care not to damage the ring grooves.



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



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





Inspection

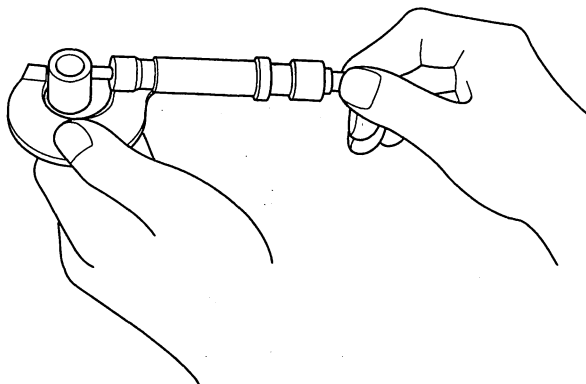
NOTE: Inspect the piston, piston pin, and connecting rod when they are at room temperature.

1. Measure the diameter of the piston pin.

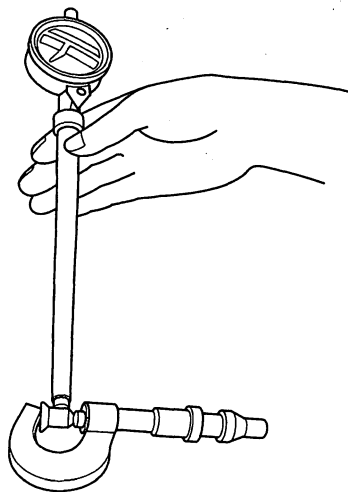
Piston Pin Diameter

Standard (New): 21.962—21.965 mm
(0.8646—0.8648 in.)

Service Limit: 21.954 mm (0.8643 in.)



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

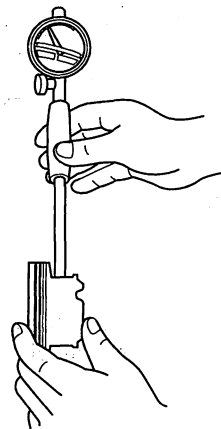


3. Check the difference between the piston pin diameter and piston pin hole diameter on the piston.

Piston Pin-to-Piston Clearance

Standard (New): -0.0050 to $+0.0010$ mm
(-0.00020 to $+0.00004$ in.)

Service Limit: 0.004 mm (0.0002 in.)

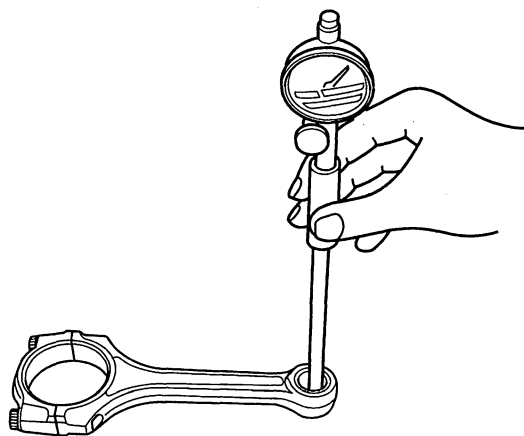


4. Measure the piston pin-to-connecting rod clearance.

Piston Pin-to-Connecting Rod Clearance

Standard (New): 0.005—0.014 mm
(0.0002—0.0006 in.)

Service Limit: 0.019 mm (0.0007 in.)



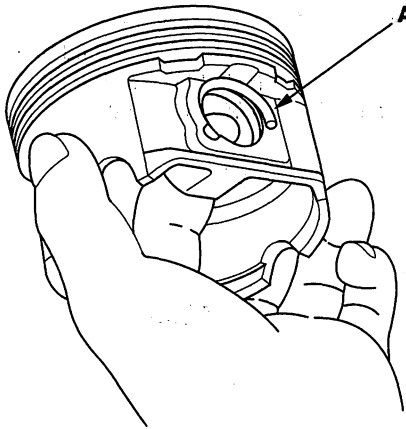
(cont'd)

Engine Block

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

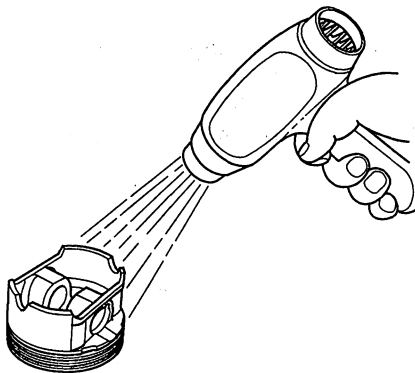
Reassembly

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



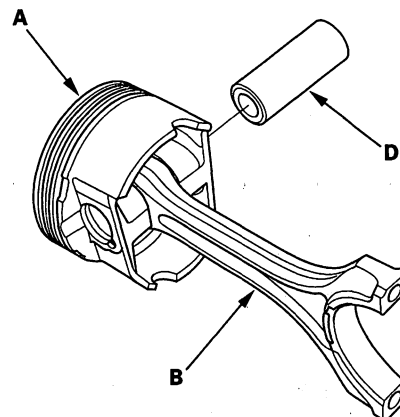
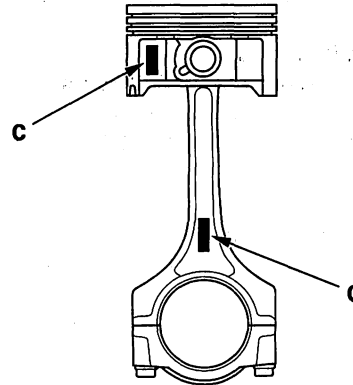
2. Coat the piston pin bore in the piston, the bore in the connecting rod, and the piston pin with new engine oil.

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



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

NOTE: Apply new engine oil to the piston pin.

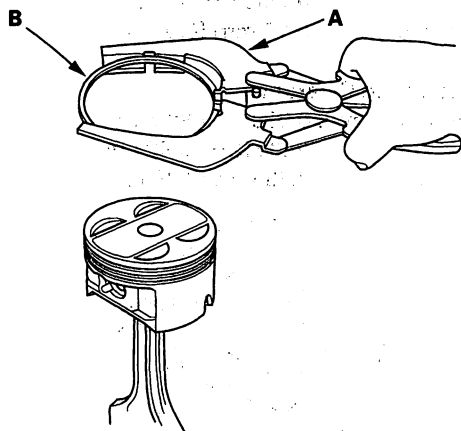


5. Install the remaining snap ring.



Piston Ring Replacement

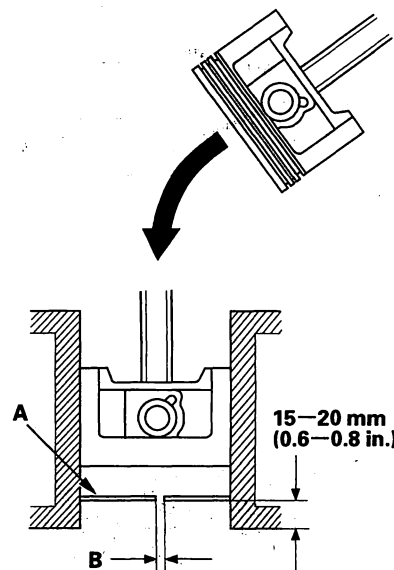
1. Remove the piston from the engine block (see page 7-12).
2. Using a ring expander (A), remove the old piston rings (B).



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

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

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



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

- If the gap is too small, check to see if you have the proper rings for your engine.
- If the gap is too large, recheck the cylinder bore diameter against the wear limits (see step 4 on page 7-16).

Piston Ring End-Gap

Top Ring:

Standard (New): 0.30–0.40 mm
(0.012–0.016 in.)

Service Limit: 0.60 mm (0.024 in.)

Second Ring:

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

Service Limit: 0.70 mm (0.028 in.)

Oil Ring:

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

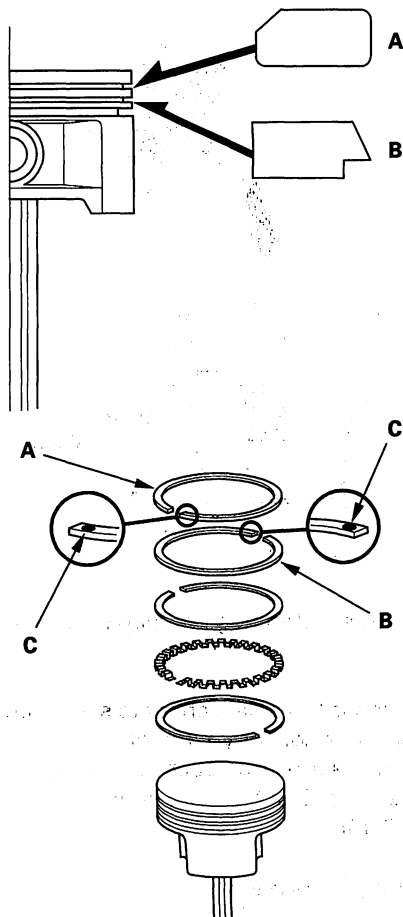
Service Limit: 0.80 mm (0.031 in.)

(cont'd)

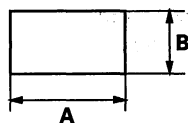
Engine Block

Piston Ring Replacement (cont'd)

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



Piston Ring Dimensions:



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

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

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

Top Ring Clearance

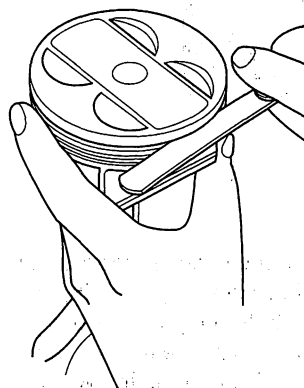
Standard (New): 0.055—0.085 mm
(0.0022—0.0033 in.)

Service Limit: 0.15 mm (0.006 in.)

Second Ring Clearance

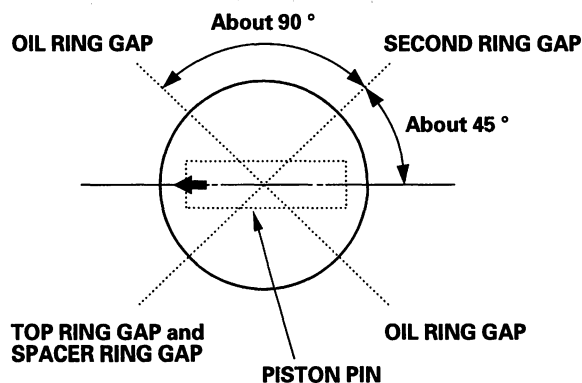
Standard (New): 0.030—0.060 mm
(0.0012—0.0024 in.)

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:



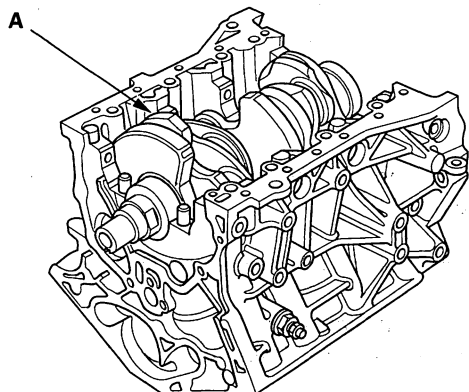


Crankshaft and Piston Installation

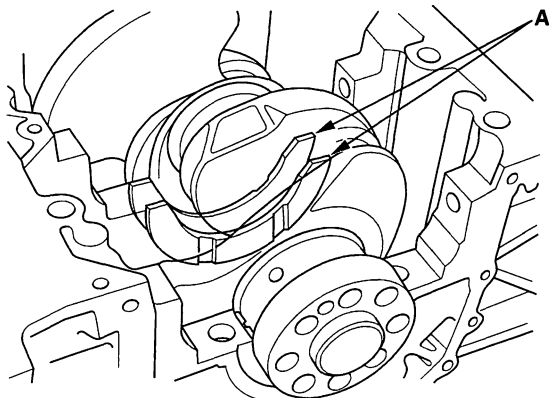
Special Tools Required

- Driver 07749-0010000
- Driver attachment, 106 mm 070AD-RCAA200

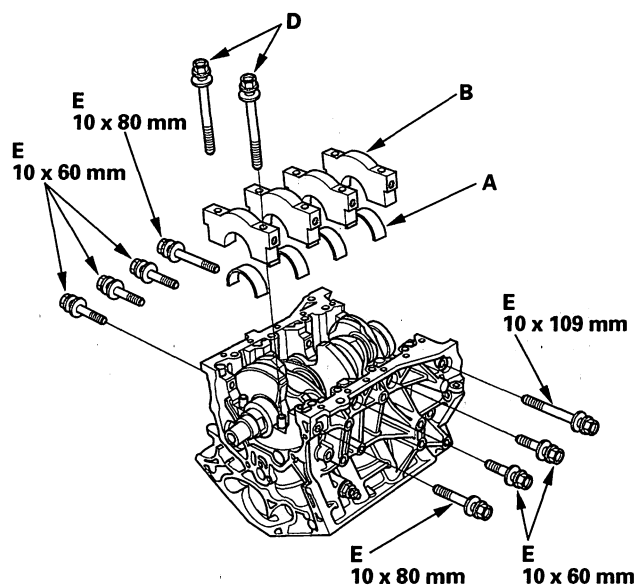
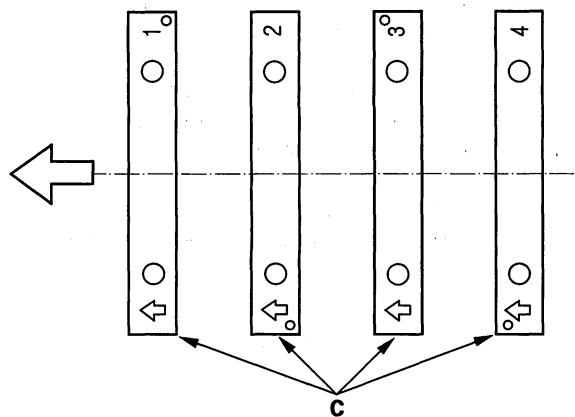
1. Check the connecting rod bearing clearance with plastigage (see page 7-9).
2. Check the main bearing clearance with plastigage (see page 7-7).
3. Install the bearing halves in the engine block and connecting rods.
4. Apply new engine oil to the inside of the main bearings and rod bearings.
5. Lower the crankshaft (A) into the engine block.



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



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



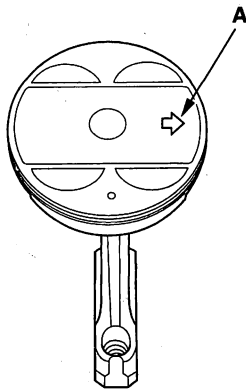
8. Apply new engine oil to the bolt threads and flanges, then loosely install the bearing cap bolts (D) and bearing cap side bolts (E).

(cont'd)

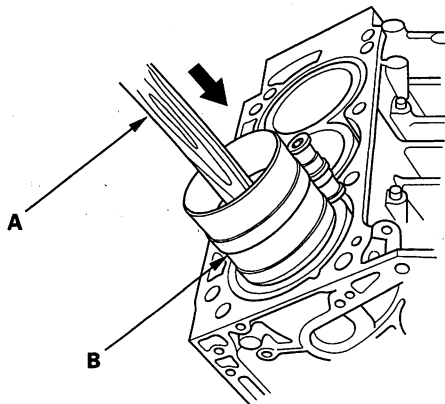
Engine Block

Crankshaft and Piston Installation (cont'd)

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

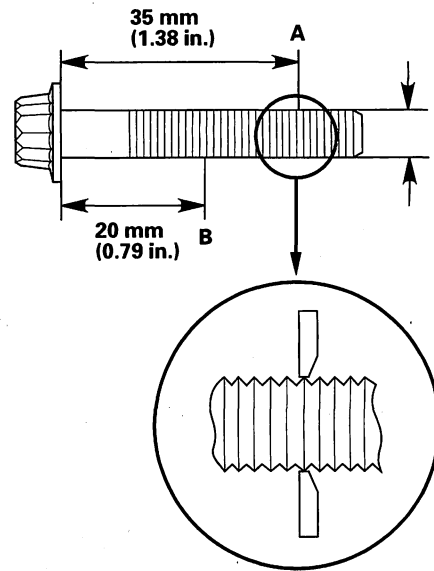


13. Position the piston/connecting rod assembly in the cylinder, and tap it in using the wooden handle of a hammer (A). Maintain downward force on the ring compressor (B) to prevent the rings from expanding before entering the cylinder bore.



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

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



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

Point A—Point B = Difference in Diameter

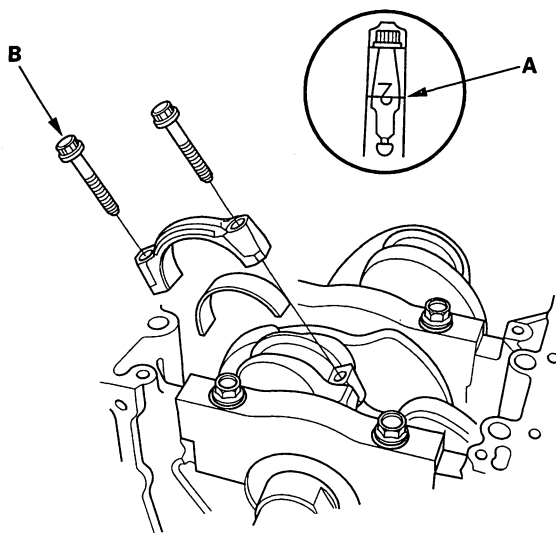
Difference in Diameter

Specification: 0—0.1 mm (0—0.004 in.)

17. If the difference in diameter is out of tolerance, replace the connecting rod bolt.

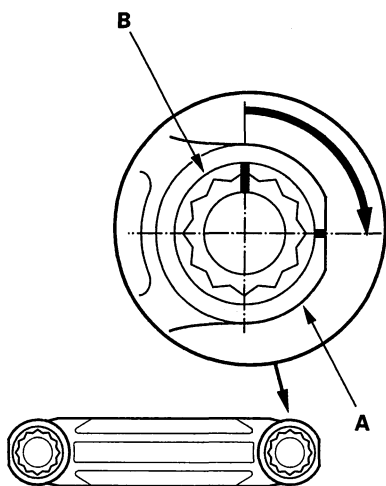


18. Line up the mark (A) on the connecting rod and cap, then install the cap.



19. Apply new engine oil to the bolt threads and flanges. Torque the bolts (B) to 20 N·m (2.0 kgf·m, 14 lbf·ft).

20. Mark the connecting rod (A) and bolt head (B) as shown.



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

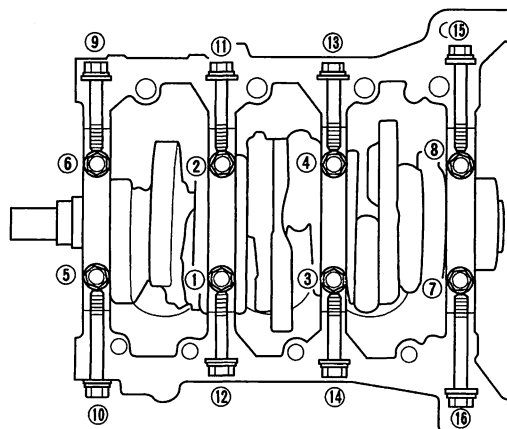
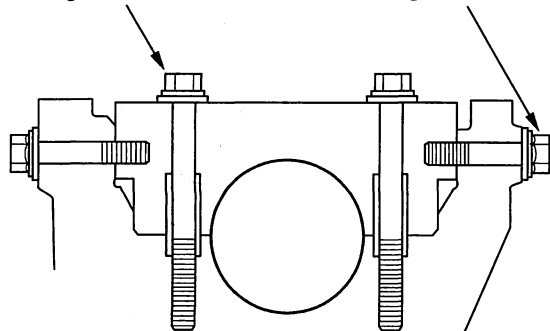
NOTE: Remove the connecting rod bolt if you tightened it beyond the specified angle, and go back to step 15 of the procedure. Do not loosen it back to the specified angle.

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

NOTE: Apply new engine oil to the bolt threads and flanges.

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

10 x 1.25 mm
49 N·m
(5.0 kgf·m, 36 lbf·ft)

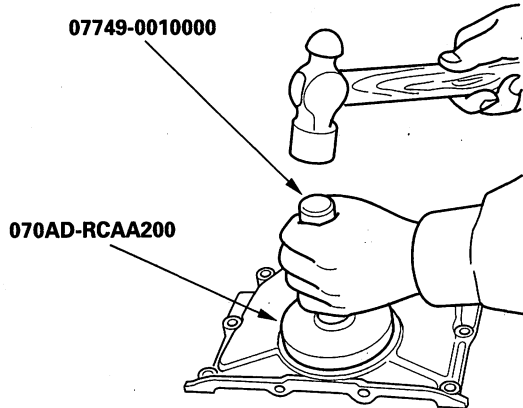


(cont'd)

Engine Block

Crankshaft and Piston Installation (cont'd)

23. Apply a light coat of multipurpose grease to the crankshaft and to the lip of the seal.
24. Drive the new crankshaft oil seal until the driver attachment bottoms on the engine block end cover.

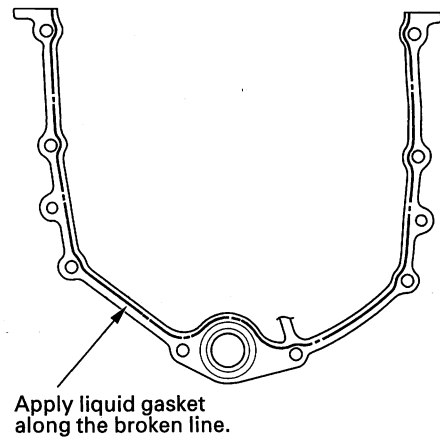


25. Remove all of the old liquid gasket from the engine block end cover mating surfaces, bolts, and bolt holes.
26. Clean and dry the engine block end cover mating surfaces.

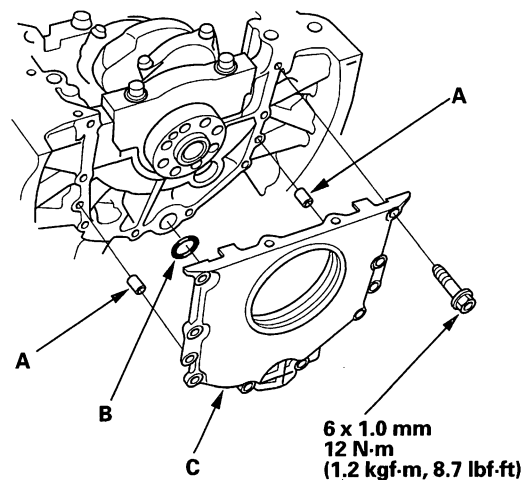
27. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the engine block mating surface of the engine block end cover. Install the component within 5 minutes of applying the liquid gasket.

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.



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



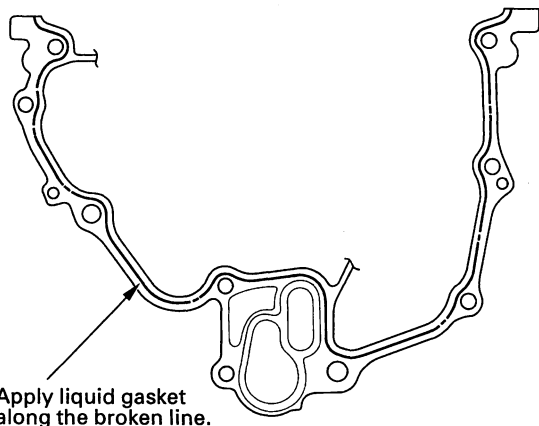
29. Clean the excess grease off the crankshaft, and check the seal for distortion.



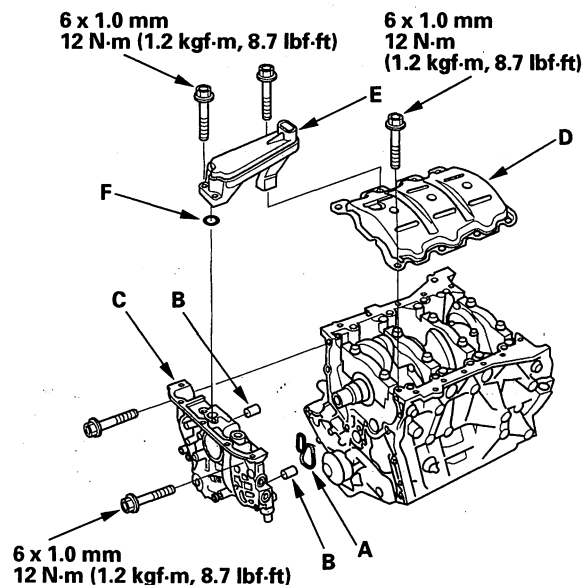
30. Install a new crankshaft oil seal in the oil pump (see step 2 on page 8-13).
31. Remove all of the old liquid gasket from the oil pump mating surfaces, bolts, and bolt holes.
32. Clean and dry the oil pump mating surfaces.
33. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the engine block mating surface of the oil pump. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

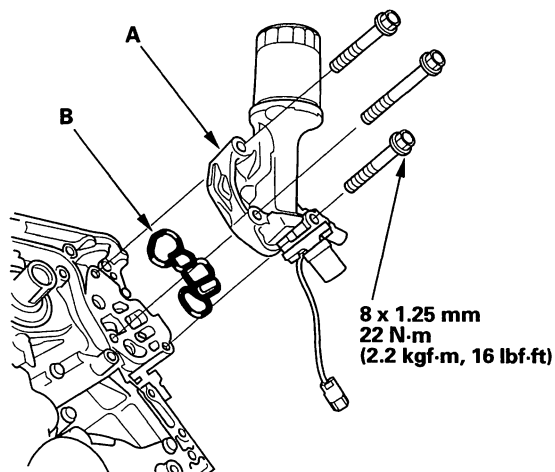
- If you apply liquid gasket P/N 08718-0012, the component must be installed within 4 minutes.
- If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply new liquid gasket.



34. Grease the lip of the oil seal, and apply oil to the new O-ring (A).



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



(cont'd)

Engine Block

Crankshaft and Piston Installation (cont'd)

39. Install the oil pan (see page 7-28).
40. Install the crankshaft position (CKP) sensor (see page 11-242).
41. Install the cylinder heads (see page 6-49).
42. Install the drive plate.
43. Install the transmission (see page 14-287).
44. Install the engine assembly (see page 5-12).

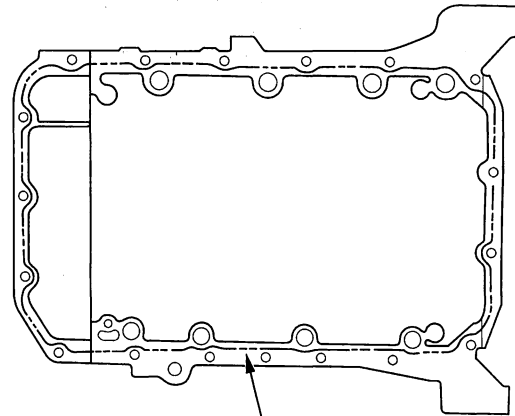
NOTE: When any crankshaft or connecting rod bearing is replaced, after assembly it is necessary to run the engine at idling speed until it reaches normal operating temperature, then continue to run it for about 15 minutes.

Oil Pan Installation

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



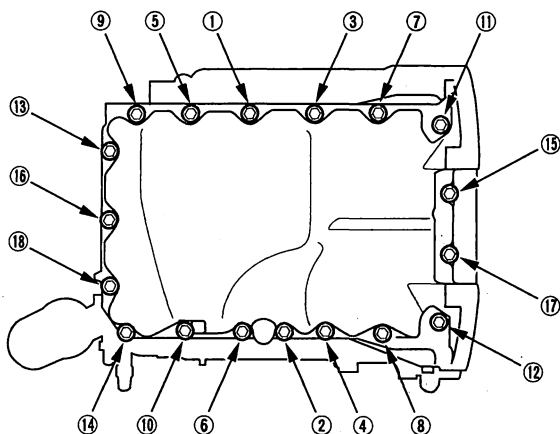
Apply liquid gasket
along the broken line.

4. Install the oil pan on the engine block.



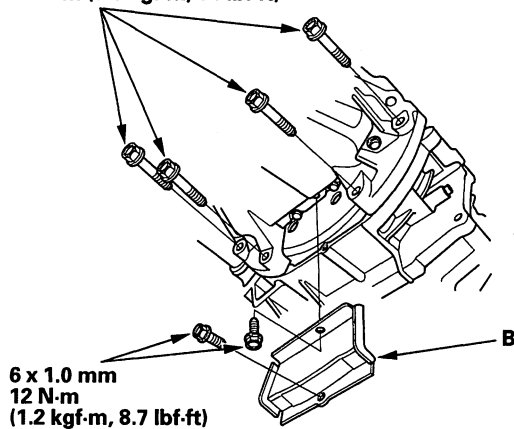
5. Tighten the bolts in two or three steps. In the final step, tighten all bolts, in sequence, to 12 N·m (1.2 kgf·m, 8.7 lbf·ft).

NOTE: After assembly, wait at least 30 minutes before filling the engine with oil.



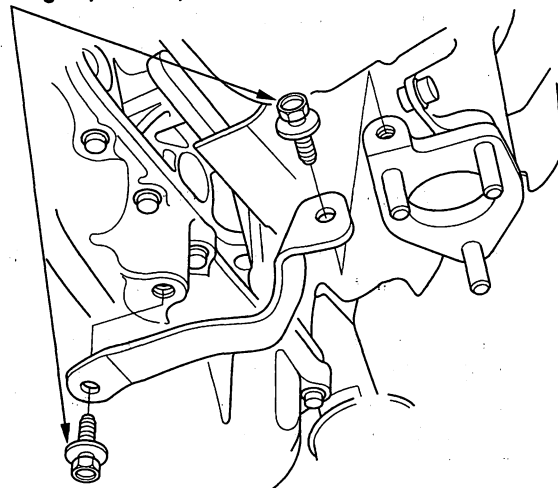
6. Tighten the four bolts (A) securing the transmission, then install the torque converter cover (B).

A
12 x 1.25 mm
74 N·m (7.5 kgf·m, 54 lbf·ft)



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

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



8. If the engine is still in the vehicle, do the following steps.
9. Install exhaust pipe A using new gaskets and new self-locking nuts (see step 31 on page 5-17).
10. Install the splash shield (see step 33 on page 5-17).
11. Refill the engine with engine oil (see step 4 on page 8-6).
12. Lower the vehicle on the lift.

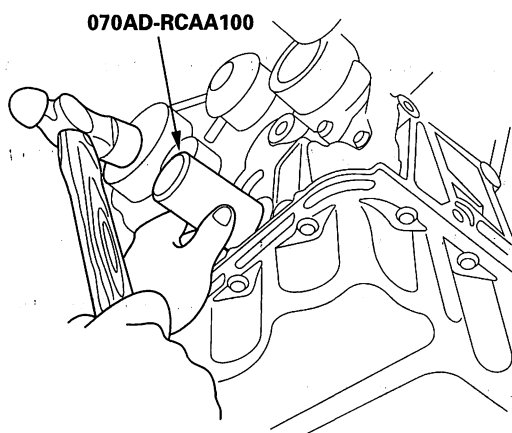
Engine Block

Pulley End Crankshaft Oil Seal Installation - In Car

Special Tools Required

Oil seal driver, 64 mm 070AD-RCAA100

1. Remove the crankshaft position (CKP) sensor, timing belt, and timing belt drive pulley (see page 6-25).
2. Remove the pulley end crankshaft oil seal.
3. Clean and dry the crankshaft oil seal housing.
4. Apply a light coat of multipurpose grease to the crankshaft and to the lip of the seal.
5. Using the seal driver, drive in the crankshaft oil seal until the driver bottoms against the oil pump. When the seal is in place, clean any excess grease off the crankshaft, and check that the oil seal lip is not distorted.



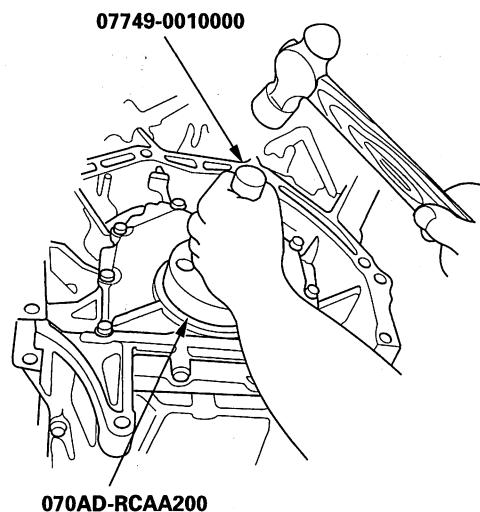
6. Install the timing belt drive pulley, timing belt, and CKP sensor (see page 6-25).

Transmission End Crankshaft Oil Seal Installation - In Car

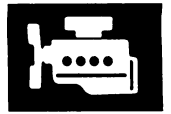
Special Tools Required

- Driver 07749-0010000
- Driver attachment, 106 mm 070AD-RCAA200

1. Remove the transmission (see page 14-275) and the drive plate.
2. Remove the transmission end crankshaft oil seal.
3. Clean and dry the crankshaft oil seal housing.
4. Apply a light coat of multipurpose grease to the crankshaft and to the lip of the seal.
5. Using the special tools, drive in the crankshaft oil seal until the driver attachment bottoms against the engine block end cover. Align the hole in the driver attachment with the pin on the crankshaft.

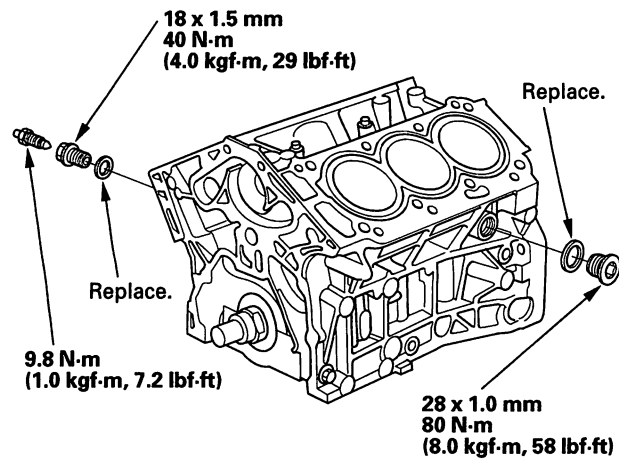


6. Clean any excess grease off the crankshaft, and check that the oil seal lip is not distorted.
7. Install the drive plate, and the transmission (see page 14-287).



Drain Bolt Installation

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



BACK

Engine Mechanical



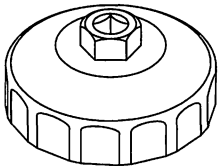
Engine Lubrication

Special Tools	8-2
Component Location Index	8-3
Symptom Troubleshooting Index	8-4
Oil Pressure Switch Test	8-5
Oil Pressure Switch Replacement	8-5
Oil Pressure Test	8-6
Engine Oil Replacement	8-6
Engine Oil Filter Replacement	8-7
Oil Filter Feed Pipe Replacement	8-8
Oil Jet Replacement	8-9
Oil Jet Bolt Inspection	8-9
Oil Pump Overhaul	8-10

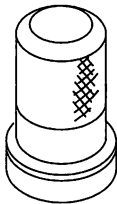
Engine Lubrication

Special Tools

Ref. No.	Tool Number	Description	Qty
①	07HAA-PJ70100	Oil Filter Wrench	1
②	070AD-RCAA100	Oil Seal Driver, 64 mm	1



①

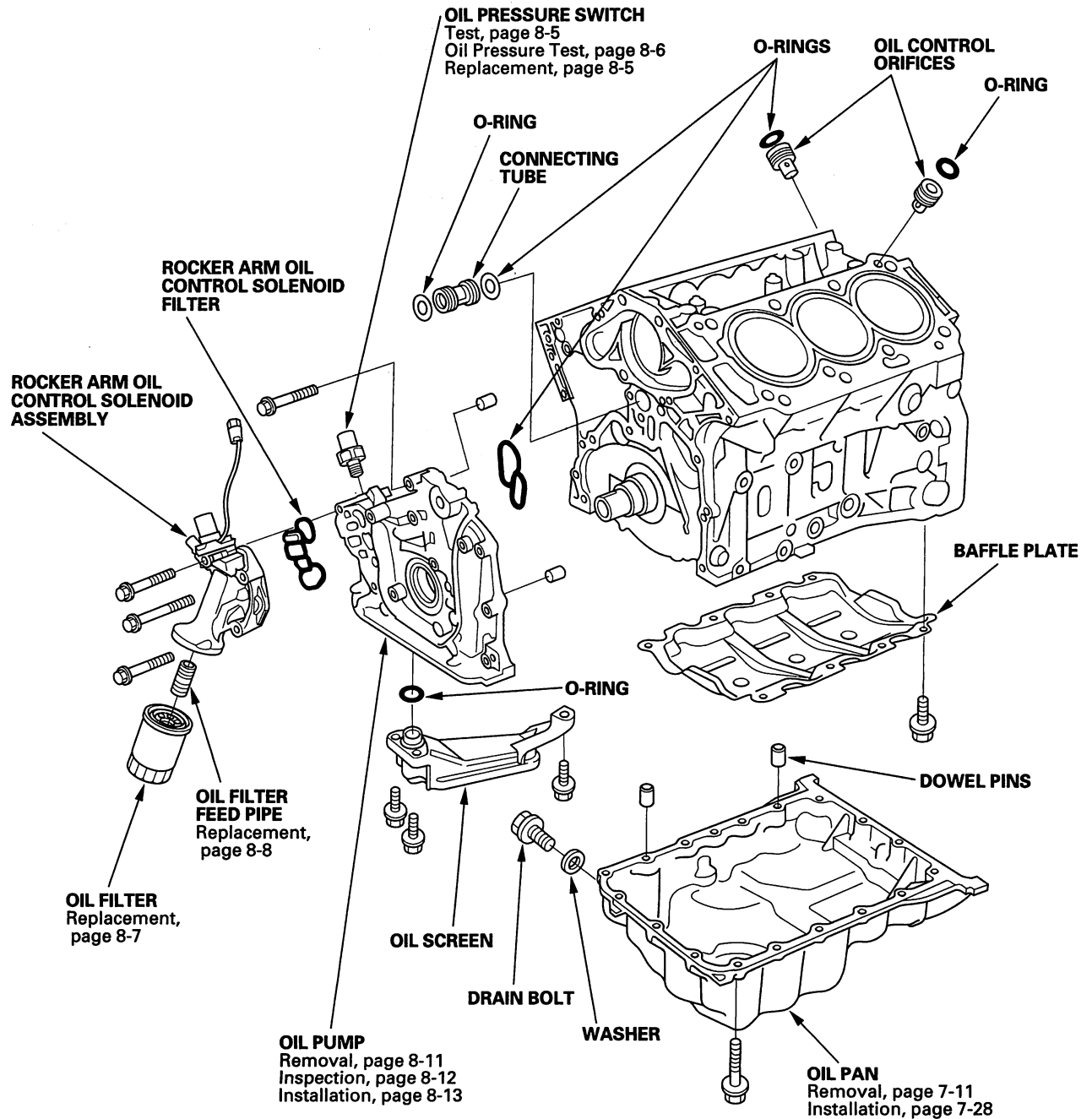


②

cardiagn.com



Component Location Index



Engine Lubrication

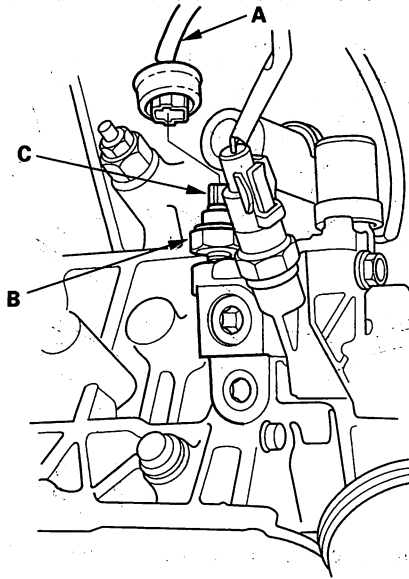
Symptom Troubleshooting Index

Symptom	Diagnostic procedure	Also check for
Excessive engine oil consumption	1. Check for a loose engine oil fill cap, oil drain bolt, or oil filter. 2. Check for oil leaks. 3. Check for worn valve guide(s) (see page 6-42) or worn valve stem seal(s) (see page 6-42). 4. Check for damaged or worn piston ring(s) (see page 7-21). 5. Check for damaged or worn engine internal parts (cylinder wall, pistons, etc.) (see page 7-15).	
Low oil pressure indicator does not come on with the ignition switch ON (II)	1. Do the gauge control module self-diagnostic function (see page 22-315). 2. Test the oil pressure switch (see page 8-5).	An open in the wire between the gauge control module and the oil pressure switch
Low oil pressure indicator stays on	1. Check the engine oil level. 2. Do the gauge control module self-diagnostic function (see page 22-315). 3. Test the oil pressure switch (see page 8-5). 4. Check the engine oil pressure (see page 8-6). 5. Check the oil filter for clogging. 6. Check the oil screen for clogging. 7. Check the relief valve. 8. Test the oil pump (see page 8-12).	A wire shorted to ground between the gauge control module and the oil pressure switch



Oil Pressure Switch Test

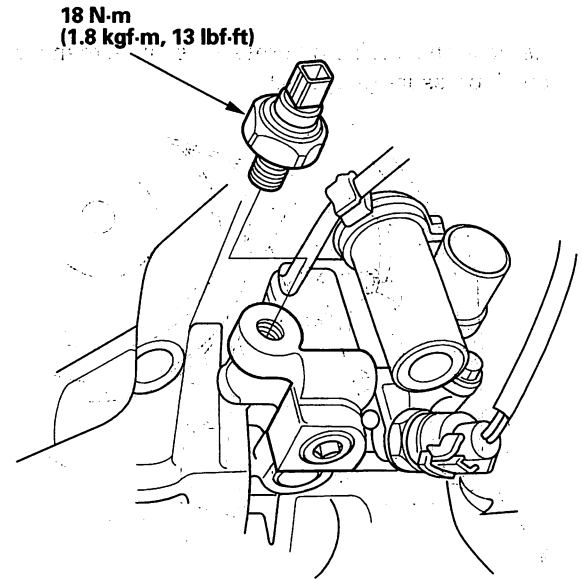
1. Remove the BLU/YEL wire (A) from the engine oil pressure switch (B).



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

Oil Pressure Switch Replacement

1. Disconnect the oil pressure switch connector; then remove the oil pressure switch.



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.

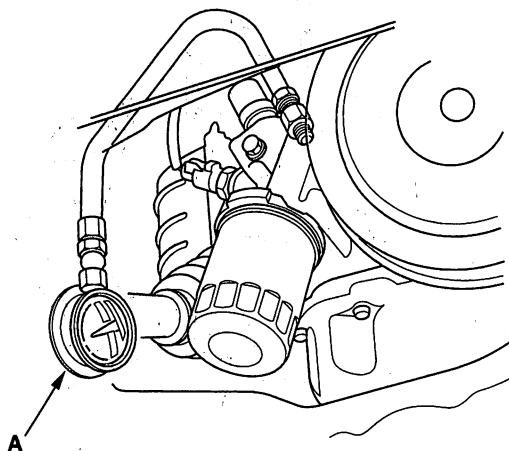
NOTE: Using too much liquid gasket may cause liquid gasket to enter the oil passage or the end of the new oil pressure switch.

Engine Lubrication

Oil Pressure Test

If the low oil pressure indicator stays on with the engine running, check the engine oil level. If the oil level is correct:

1. Remove the engine oil pressure switch, then 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.

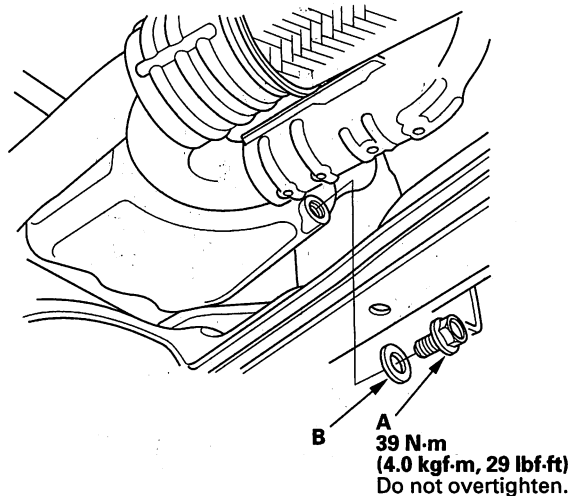
At 3,000 rpm: 490 kPa (5.0 kgf/cm², 71 psi) min.

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

- Inspect the oil pressure relief valve (see page 8-10).
- Check the oil screen for clogging.
- Inspect the oil pump (see page 8-12).

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 with the recommended oil (see page 3-2).

Capacity

At Oil Change:

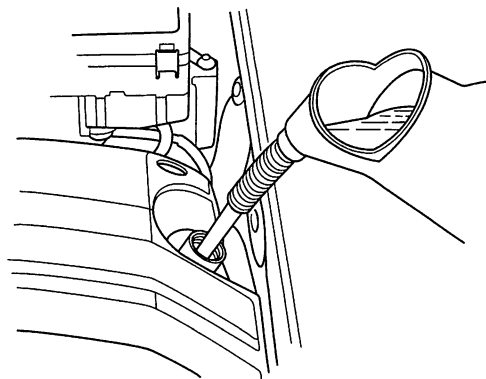
4.0 L (4.2 US qt)

At Oil Change including Filter:

4.3 L (4.5 US qt)

After Engine Overhaul:

5.0 L (5.3 US qt)





Engine Oil Filter Replacement

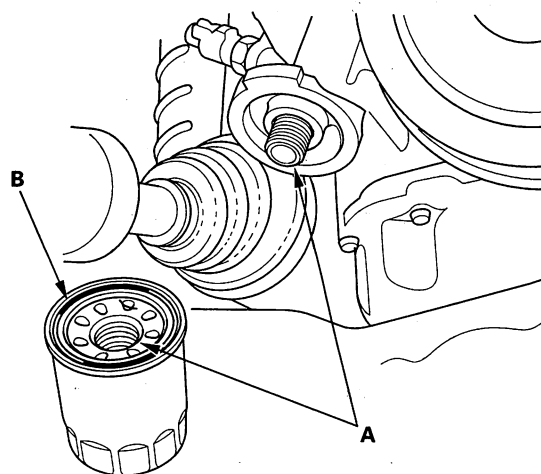
5. Connect the Honda Diagnostic System (HDS) to the data link connector (DLC) (see step 2 on page 11-3).
6. Turn the ignition switch ON (II).
7. Make sure the HDS communicates with the vehicle and the powertrain control module (PCM). If it doesn't communicate, troubleshoot the DLC circuit (see page 11-223).
8. Select BODY ELECTRICAL with the HDS.
9. Select ADJUSTMENT in the GAUGES MENU with the HDS.
10. Select RESET in the MAINTENANCE MINDER with the HDS.
11. Select RESETTING THE ENGINE OIL LIFE with the HDS.

NOTE: If you changed the ATF at the same time with the engine oil, select RESETTING THE ENGINE OIL LIFE AND ATF with the HDS instead.
12. Run the engine for more than 3 minutes, then check for oil leakage.
13. Reset the multi-information display (see page 3-6).

Special Tools Required

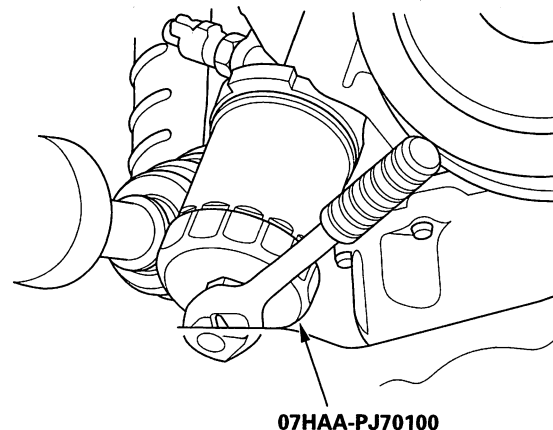
Oil filter wrench 07HAA-PJ70100

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 rubber seal (B) on the new filter. Clean the seat on the engine block, 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)



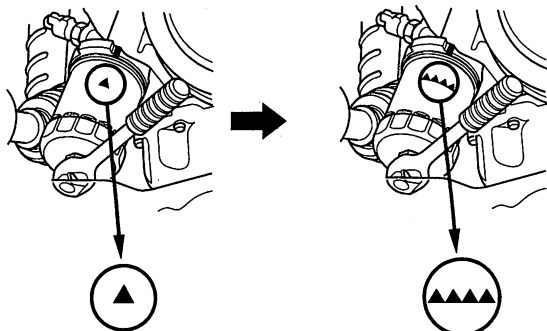
(cont'd)

Engine Lubrication

Engine Oil Filter Replacement (cont'd)

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

- Spin the filter on until its seal lightly seats against the block, 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 mark ▼ is at the bottom when the seal is lightly seated, tighten the filter until the mark ▼▼▼▼ comes around to the bottom.



Mark when rubber seal is seated.

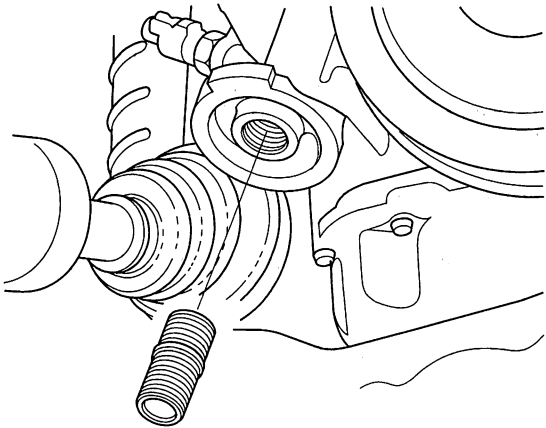
Mark after tightening.

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 ▼▼▼

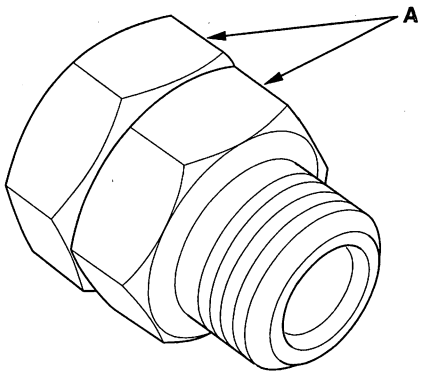
7. After installation, fill the engine with oil up to the specified level, run the engine for more than 3 minutes, then check for oil leakage.

Oil Filter Feed Pipe Replacement

1. Remove the oil filter (see page 8-7).
2. Remove the oil filter feed pipe.



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

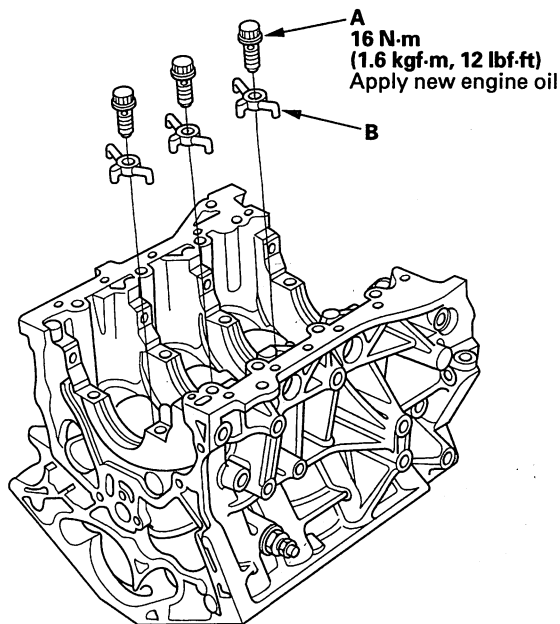


4. Tighten the oil filter feed pipe to 49 N·m (5.0 kgf·m, 36 lbf·ft), then remove the nuts from the oil filter feed pipe.



Oil Jet Replacement

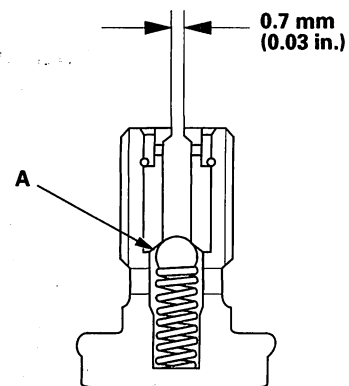
1. Remove the crankshaft from the engine block (see page 7-12).
2. Remove the oil jet bolt (A), then remove and discard oil jet (B).



3. Carefully install the new oil jet and tighten the oil jet bolt.
4. Install the crankshaft (see page 7-23).

Oil Jet Bolt Inspection

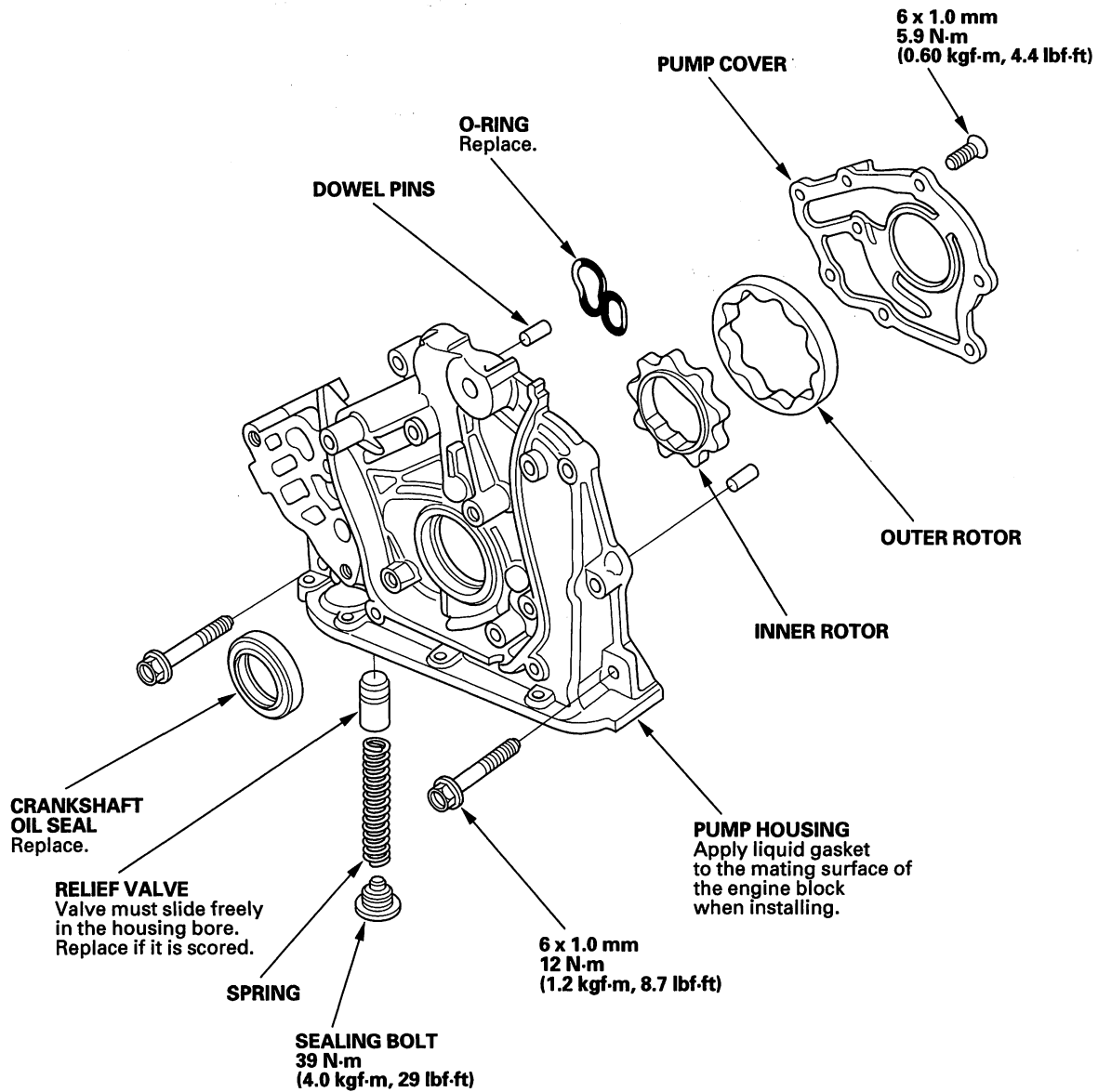
1. Remove the oil jet bolt (see page 8-9).
2. Inspect the oil jet bolt as follows.
 - Make sure that a 0.6 mm (0.02 in.) diameter drill will go through the oil intake (0.7 mm [0.03 in.] diameter). Make sure the check ball (A) moves smoothly and has a stroke of about 4.0 mm (0.16 in.)
 - Check the oil jet bolt operation with an air nozzle. It should take at least 120 kPa (1.2 kgf/cm, 17 psi) to unseat the check ball.



Engine Lubrication

Oil Pump Overhaul

Exploded View



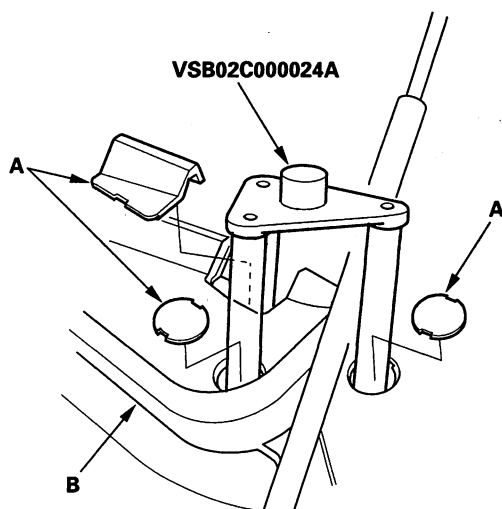


Special Tools Required

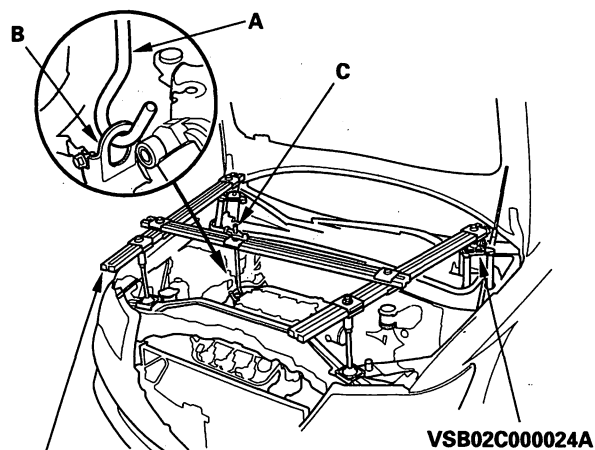
- Oil seal driver, 64 mm 070AD-RCAA100
 - Engine support hanger A and Reds AAR-T-12566
 - Engine hanger adapter set VSB02C000024A
- These special tools are available through the American HondaTool and Equipment program, 1-888-424-6857.

Removal

1. Remove the bulkhead cover (see page 20-203).
2. Remove the drive belt (see page 4-33).
3. Remove the power steering (P/S) pump and P/S line bracket (see step 6 on page 6-29).
4. Remove the service caps (A) for the front damper flange nuts from the cowl cover (B). Position the engine hanger adapters (VSB02C000024A) with the "FRONT" mark facing forward over the damper flange nuts.

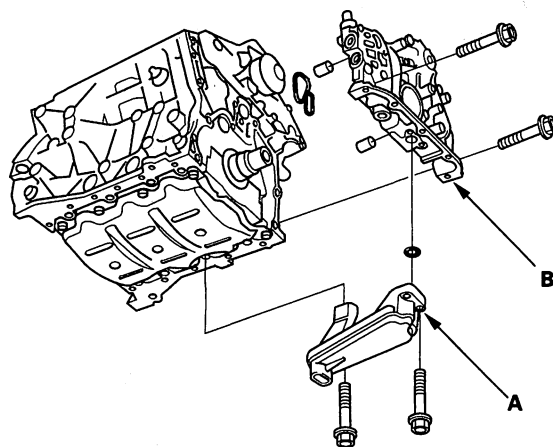


5. Install the engine support hanger (AAR-T-12566) to the vehicle, and attach the hook (A) to the engine hanger (B). Tighten the wing nut (C) by hand, and support the engine.



AAR-T-12566

6. Remove the timing belt (see page 6-13).
7. Remove the crankshaft position (CKP) sensor (see page 11-242).
8. Remove the rocker arm oil control solenoid/oil filter assembly (see step 9 on page 7-12).
9. Remove the oil pan (see page 7-11).
10. Remove the oil screen (A), then remove the oil pump (B).



(cont'd)

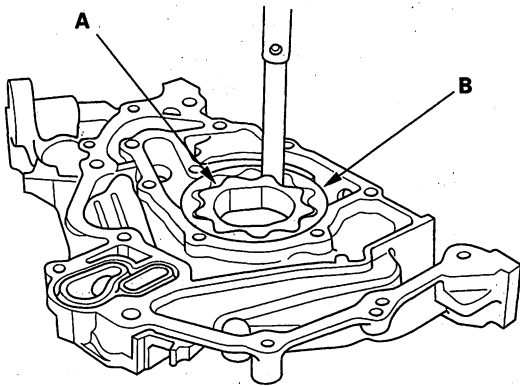
Engine Lubrication

Oil Pump Overhaul (cont'd)

Inspection

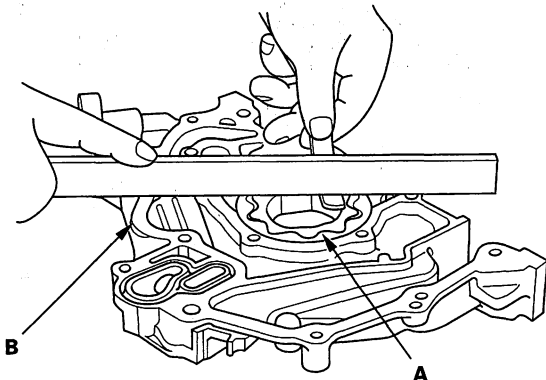
1. Remove the screws from the pump housing, then separate the housing and cover.
2. Check the inner-to-outer rotor radial clearance between the inner rotor (A) and outer rotor (B). If the inner-to-outer rotor clearance exceeds the service limit, replace the oil pump assembly.

Inner Rotor-to-Outer Rotor Radial Clearance
Standard (New): 0.04–0.16 mm
(0.002–0.006 in.)
Service Limit: 0.20 mm (0.008 in.)



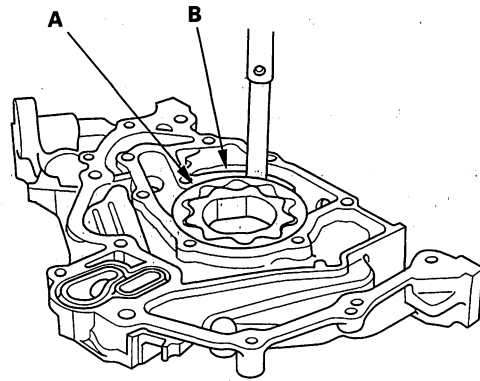
3. Check the housing-to-rotor axial clearance between the rotors (A) and pump housing (B). If the housing-to-rotor axial clearance exceeds the service limit, replace the oil pump assembly.

Housing-to-Rotor Axial Clearance
Standard (New): 0.02–0.07 mm
(0.001–0.003 in.)
Service Limit: 0.12 mm (0.005 in.)



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

Housing-to-Outer Rotor Radial Clearance
Standard (New): 0.10–0.19 mm
(0.004–0.007 in.)
Service Limit: 0.20 mm (0.008 in.)

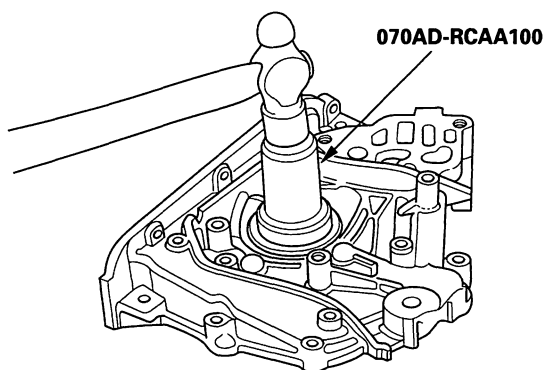


5. Inspect both rotors and pump housing for scoring or other damage. Replace the parts, if necessary.
6. Apply liquid thread lock to the pump housing screws, then install the oil pump cover.
7. Check that the oil pump turns freely.



Installation

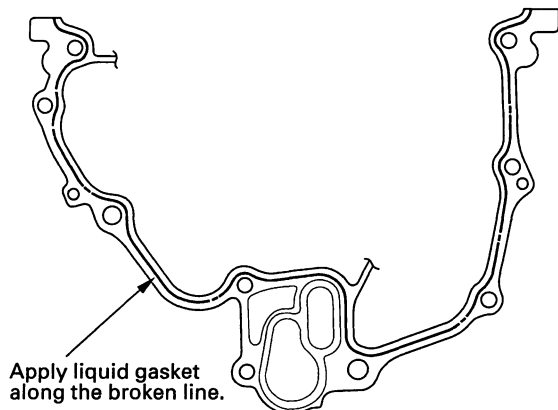
1. Remove the old oil seal from the oil pump.
2. Gently tap in the new oil seal until the oil seal driver bottoms on the pump.



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

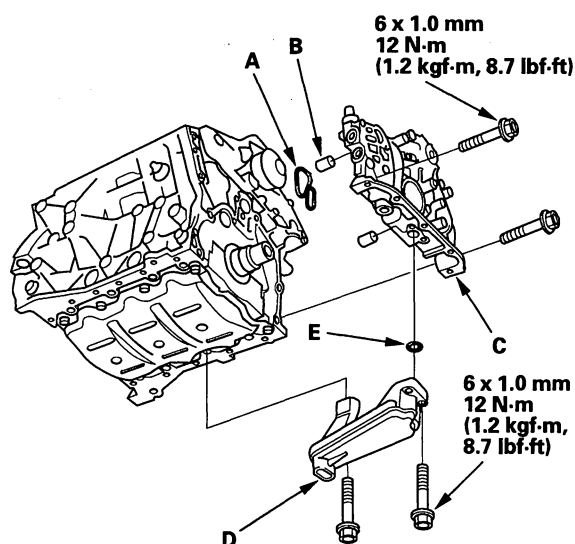
NOTE:

- 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.

6. Grease the lip of the oil seal, and apply oil to the new O-ring (A).



7. Install the dowel pins (B), then align the inner rotor with the crankshaft, and install the oil pump (C).
8. Clean the excess grease off the crankshaft, and check the seal for distortion.
9. Install the oil screen (D) with new O-ring (E).
10. Install the rocker arm oil control solenoid/oil filter assembly, with a new rocker arm oil control solenoid filter (see step 38 on page 7-27).
11. Install the oil pan (see page 7-28).
12. Install the crankshaft position (CKP) sensor (see page 11-242).
13. Install the timing belt (see page 6-16).
14. Remove the engine support hanger, and engine hanger adapters.
15. Install the service caps on the cowl cover.

(cont'd)

Engine Lubrication

Oil Pump Overhaul (cont'd)

16. Install the power steering (P/S) pump and P/S line bracket (see step 27 on page 6-53).
17. Install the drive belt (see page 4-33).
18. Install the bulkhead cover (see page 20-203).

Engine Mechanical



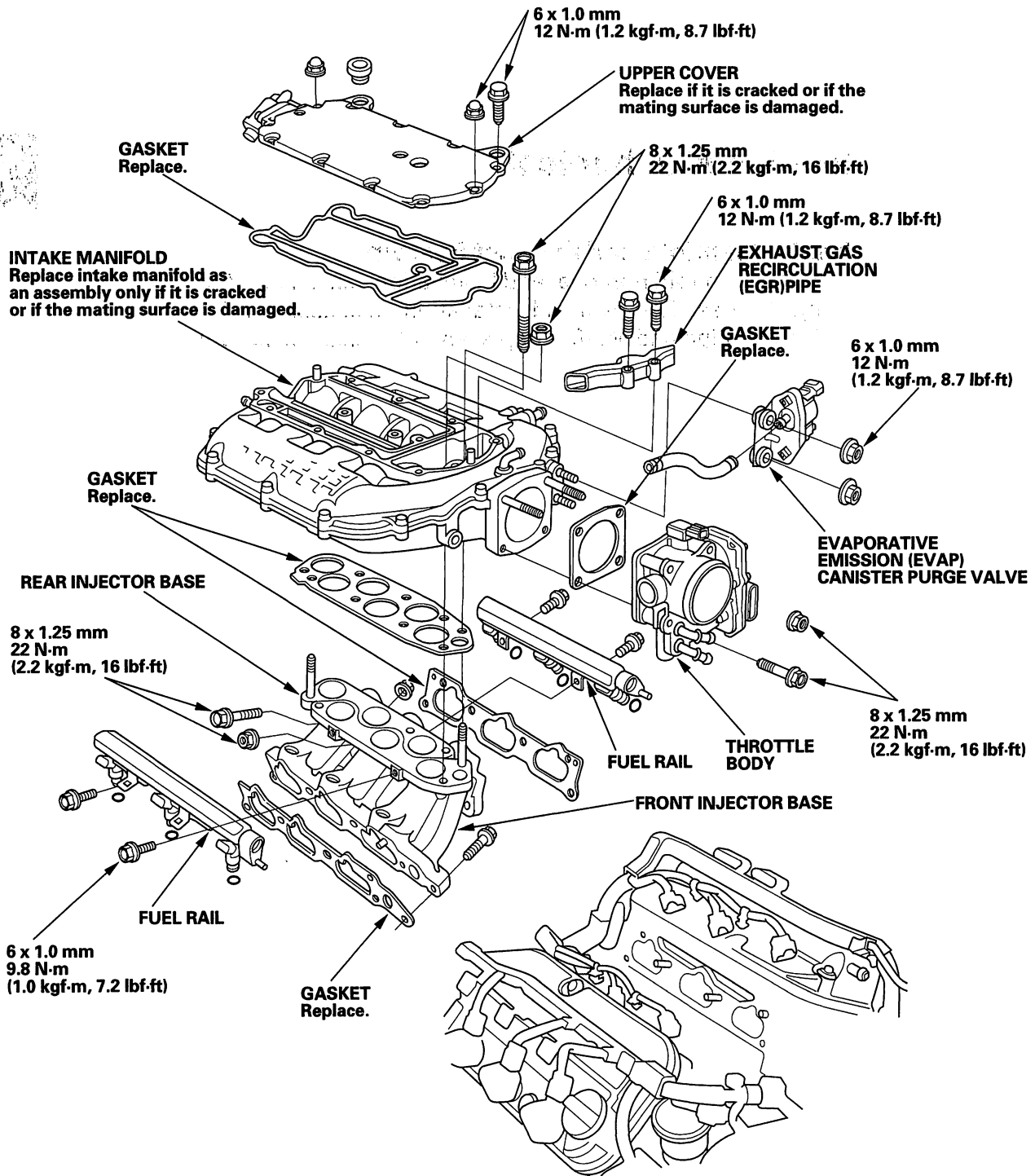
Intake Manifold and Exhaust System

Intake Manifold Removal and Installation	9-2
Injector Base Removal and Installation	9-7
Exhaust Pipe and Muffler Replacement	9-9

Intake Manifold and Exhaust System

Intake Manifold Removal and Installation

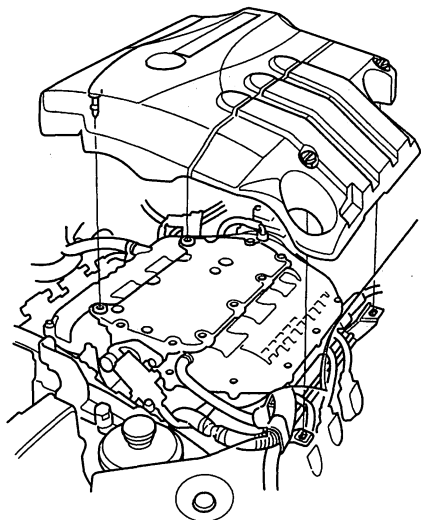
Exploded View



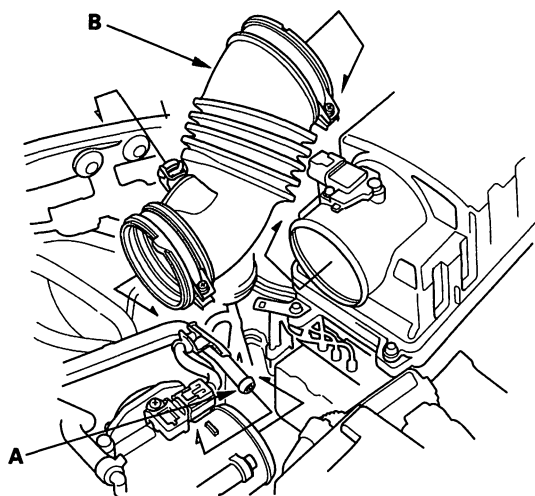


Removal

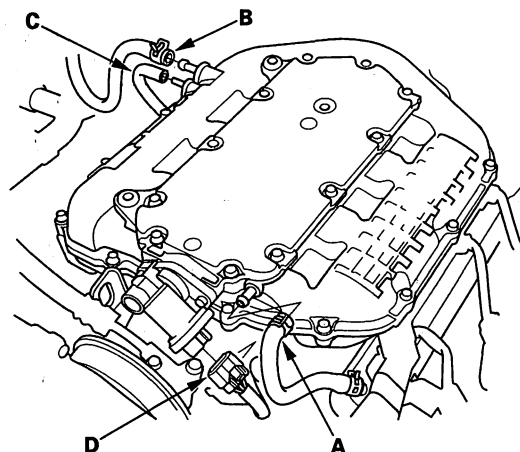
1. Remove the engine cover.



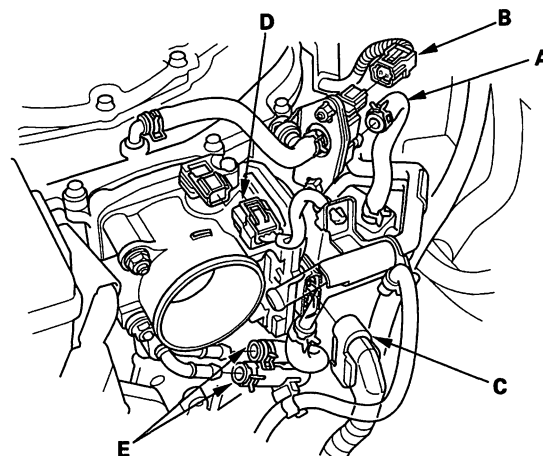
2. Remove the breather pipe (A), then remove the intake air duct (B).



3. Remove the positive crankcase ventilation (PCV) hose (A), brake booster vacuum hose (B), vacuum hose (C), and disconnect the intake manifold tuning (IMT) actuator connector (D).



4. Remove the evaporative emission (EVAP) canister hose (A), and disconnect the EVAP canister purge valve connector (B), throttle actuator connector (C), and manifold absolute pressure (MAP) sensor connector (D).



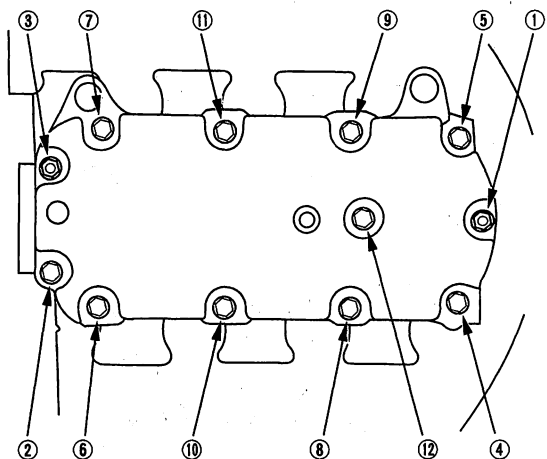
5. Remove and plug the water bypass hoses (E).

(cont'd)

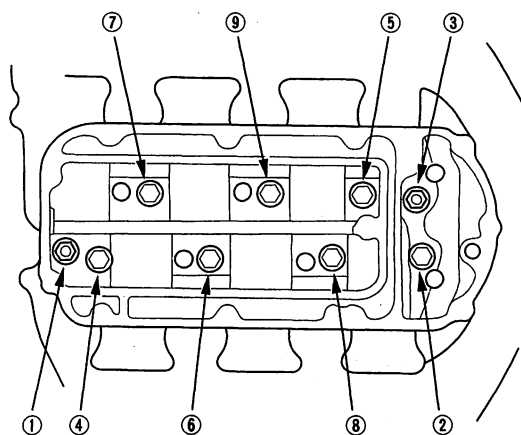
Intake Manifold and Exhaust System

Intake Manifold Removal and Installation (cont'd)

6. Remove the upper cover mounting bolts and nuts sequentially in two or three steps, then remove the upper cover.



7. Remove the intake manifold mounting bolts and nuts sequentially in two or three steps, then remove the intake manifold.



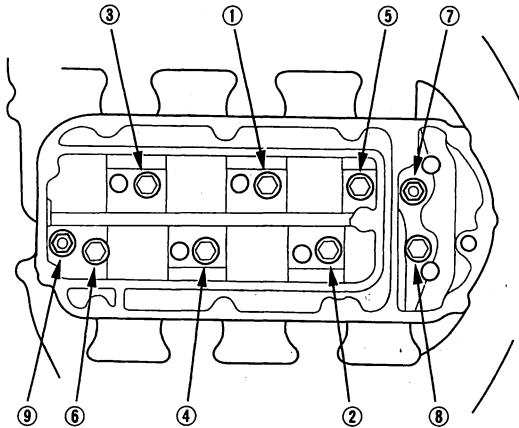


Installation

1. Install the gasket on the injector base.
2. Install the intake manifold. Tighten the bolts and nuts sequentially in two or three steps. Always use a new intake manifold gasket.

Specified Torque

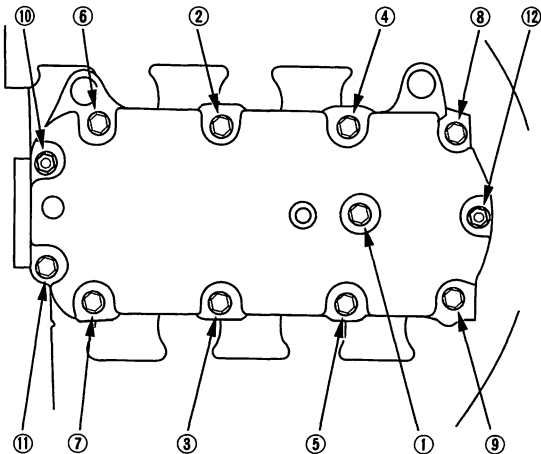
8 x 1.25 mm: 22 N·m (2.2 kgf·m, 16 lbf·ft)



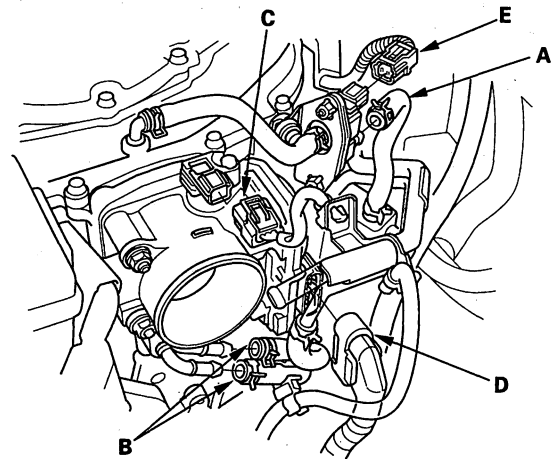
3. Install the upper cover. Tighten the bolts and nuts sequentially in two or three steps. Always use a new gasket.

Specified Torque

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



4. Install the evaporative emission (EVAP) canister hose (A) and water bypass hoses (B).



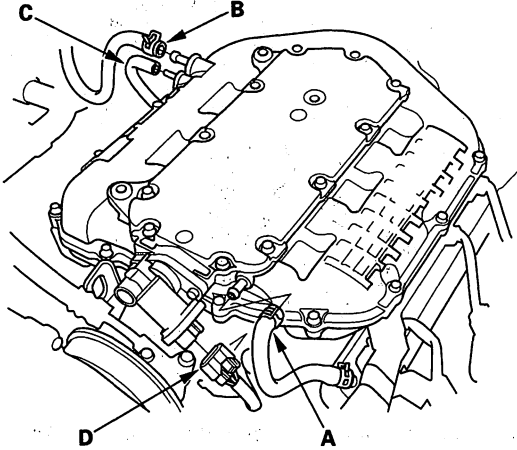
5. Connect the manifold absolute pressure (MAP) sensor connector (C), throttle actuator connector (D) and EVAP canister purge valve connector (E).

(cont'd)

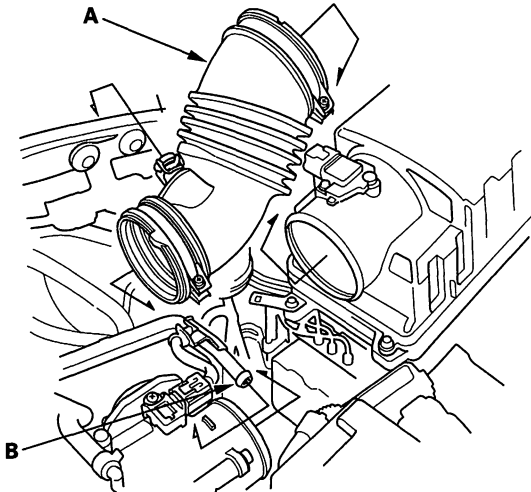
Intake Manifold and Exhaust System

Intake Manifold Removal and Installation (cont'd)

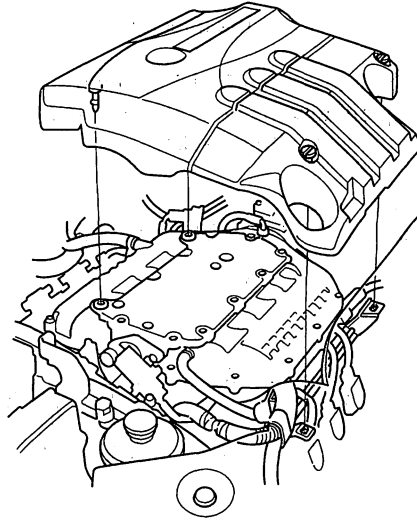
6. Install the positive crankcase ventilation (PCV) hose (A), brake booster vacuum hose (B), vacuum hose (C) and connect the intake manifold tuning (IMT) actuator connector (D).



7. Install the intake air duct (A), then install the breather pipe (B).



8. Install the engine cover.



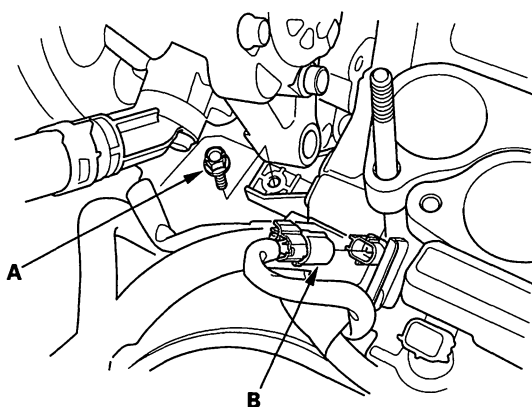
9. Clean up any spilled engine coolant.
10. After installation, check that all tubes, hoses, and connectors are installed correctly.
11. Refill the radiator with engine coolant, and bleed air from the cooling system with heater valve open (see step 10 on page 10-7).



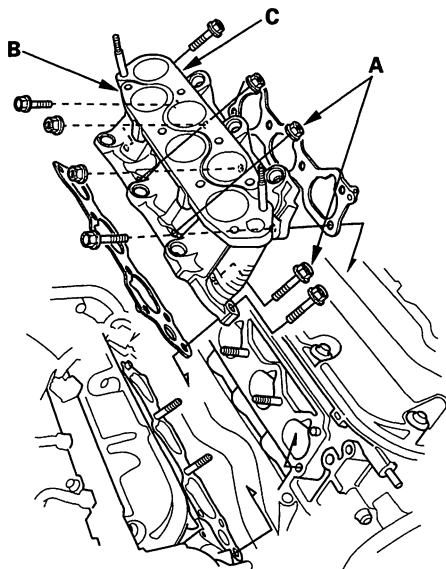
Injector Base Removal and Installation

Removal

1. Relieve the fuel pressure (see page 11-330).
2. Remove the power steering (P/S) pump and power steering line bracket (see step 6 on page 6-29).
3. Remove the intake manifold (see page 9-3).
4. Remove the injectors (see page 11-236).
5. Remove the harness bracket mount bolt (A) and the knock sensor connector (B).



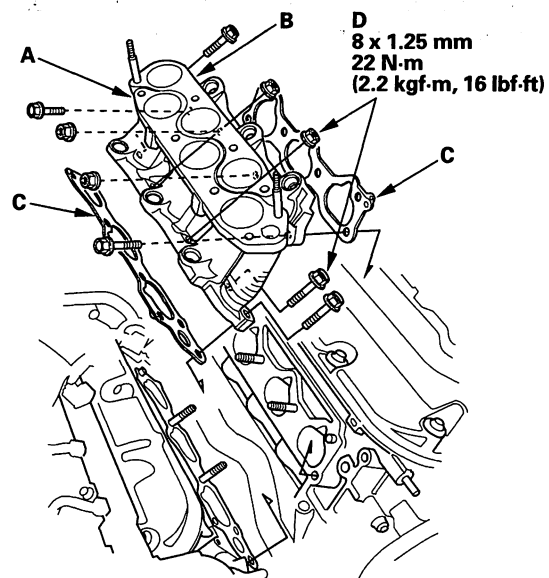
6. Remove the injector base mount bolts/nuts (A), then remove the front injector base (B) and rear injector base (C).



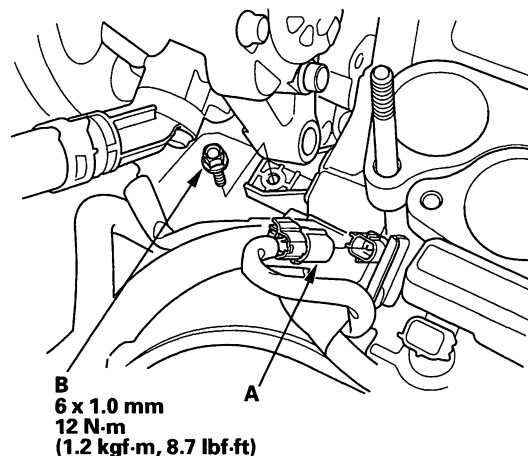
Installation

1. Install the front injector base (A) and rear injector base (B) with new gaskets (C), and tighten the bolts/nuts (D) in a crisscross pattern in two or three steps, beginning with the inner nuts.

NOTE: Front injector base gasket is different from rear one. Do not mix injector base gasket types.



2. Install the knock sensor connector (A) and harness bracket mount bolt (B).



(cont'd)

Intake Manifold and Exhaust System

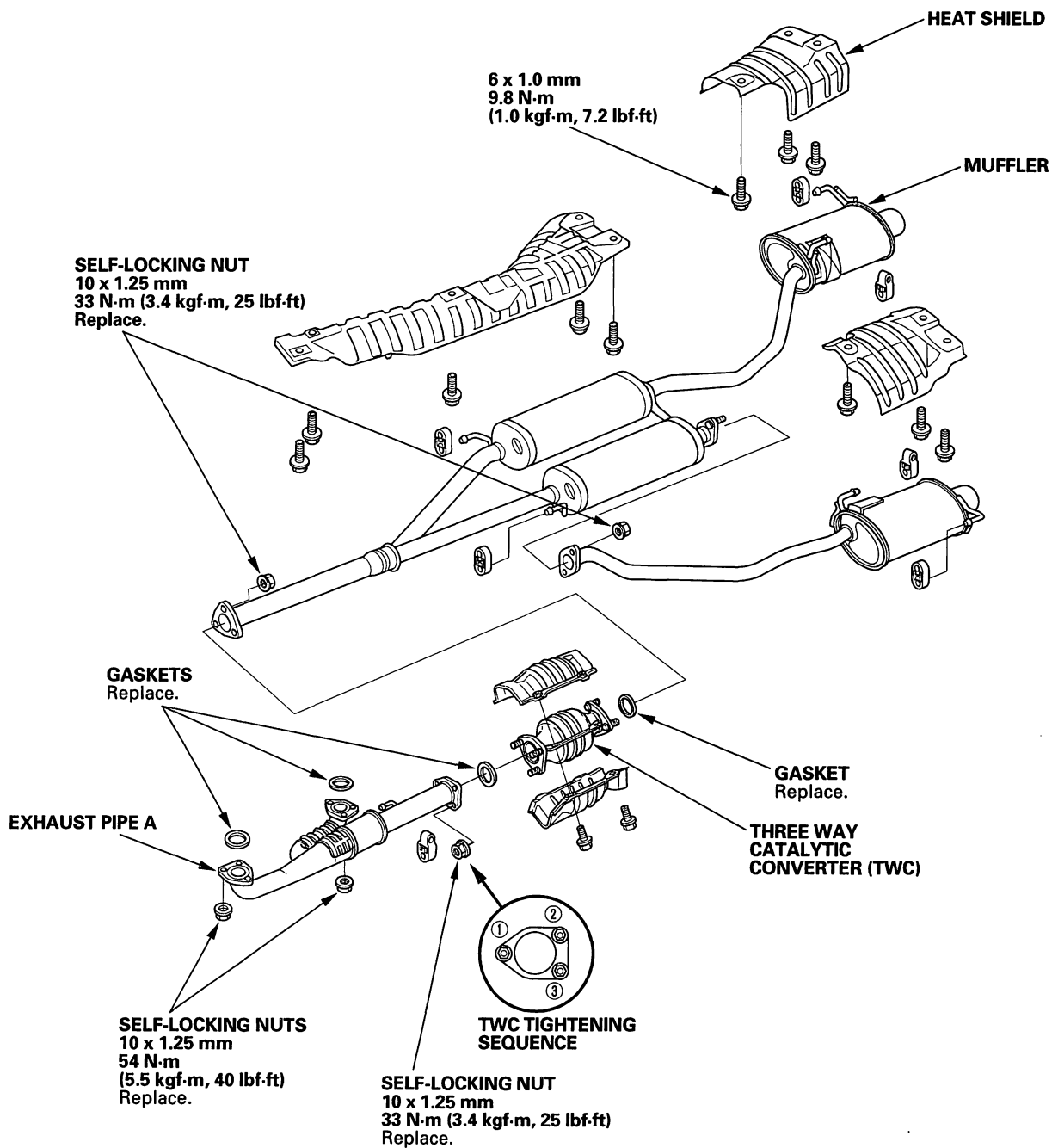
Injector Base Removal and Installation (cont'd)

3. Install the injectors (see page 11-236).
4. Install the intake manifold (see page 9-5).
5. Install P/S pump and P/S line bracket (see step 27 on page 6-53).
6. Turn the ignition switch ON (II), but do not operate the starter. After the fuel pump runs about 2 seconds, the fuel pressure in the fuel line rises. Repeat this two or three times, then check for fuel leaks.



Exhaust Pipe and Muffler Replacement

NOTE: Use new gaskets and self-locking nuts when reassembling.



BACK