

Engine Mechanical



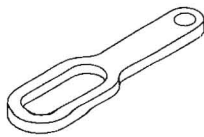
Engine Assembly

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Engine Assembly

Special Tools

Ref. No.	Tool Number	Description	Qty
①	07AAK-SNAA120	Universal Eyelet	1



①



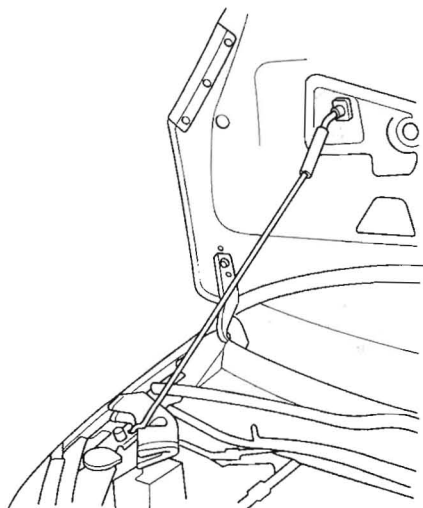
Engine Removal

Special Tools Required

- Universal eyelet 07AAK-SNAA120
- Engine hanger adapter VSB02C000015 *
- Front subframe adapter VSB02C000016 *
- CR-V engine hanger adapter VSB02C000032 *
- Engine support hanger, A and Reds AAR-T-12566 *
- * : Available through American Honda Tool and Equipment Program, 1-888-424-6857

NOTE:

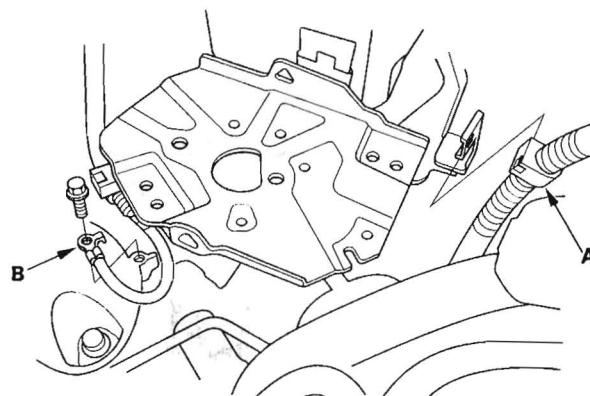
- Use fender covers to avoid damaging painted surfaces.
 - To avoid damaging the wiring and terminals, unplug the wiring connectors carefully while holding the connector portion.
 - Mark all wiring and hoses to avoid misconnection. Also, be sure that they do not contact other wiring or hoses, or interfere with other parts.
1. Make sure you have the anti-theft code for the audio system and the navigation system (if equipped), then write down the XM radio presets.
 2. Remove the hood support rod, then use it as shown to prop the hood in the wide-open position.



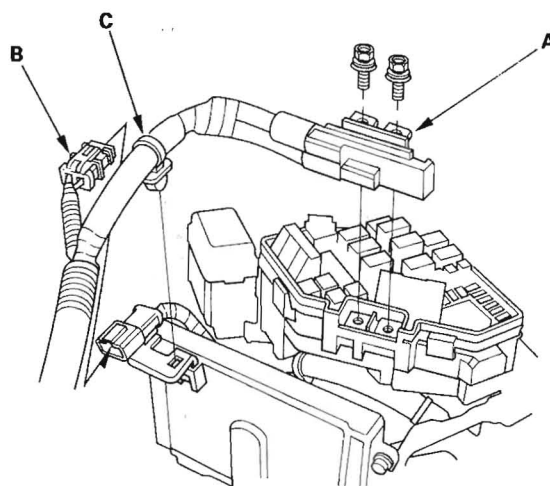
3. Relieve the fuel pressure (see page 11-317).
4. Disconnect the negative cable from the battery first, then disconnect the positive cable.
5. Remove the battery.

6. Remove the air cleaner housing assembly (see page 11-340).

7. Remove the harness clamp (A) and ground cable (B).



8. Remove the battery cables (A) from the under-hood fuse/relay box.



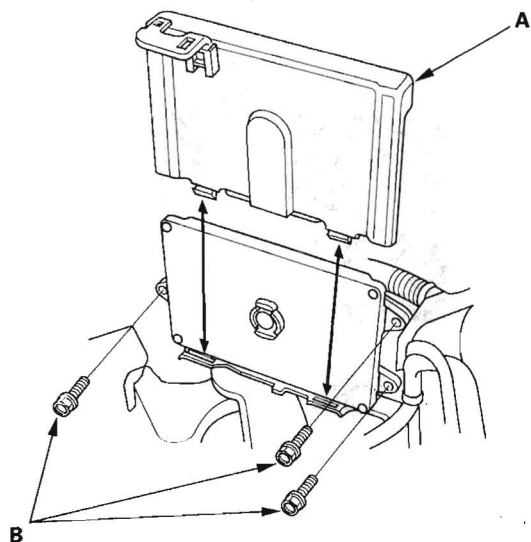
9. Disconnect the harness connector (B), and remove the harness clamp (C).

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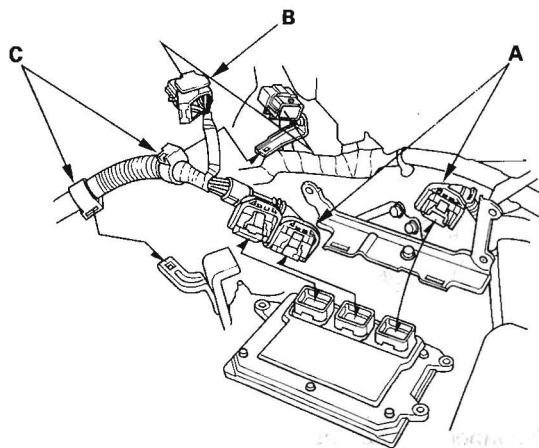
Engine Assembly

Engine Removal (cont'd)

10. Remove the powertrain control module (PCM) cover (A), then remove the three bolts (B) securing the PCM.

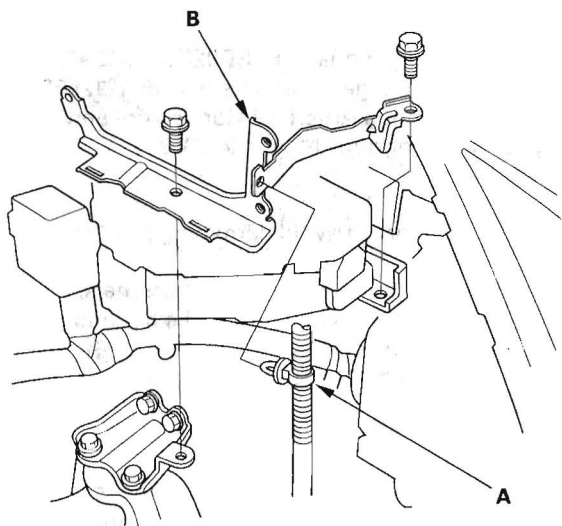


11. Disconnect the PCM connectors (A) and the engine wire harness connector (B).

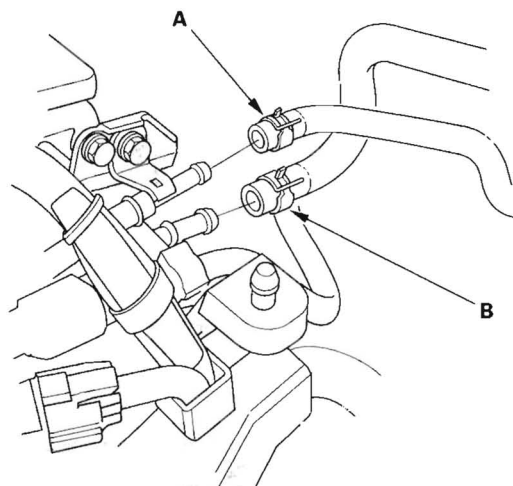


12. Remove the harness clamps (C).

13. Remove the harness clamp (A), then remove the PCM bracket (B).

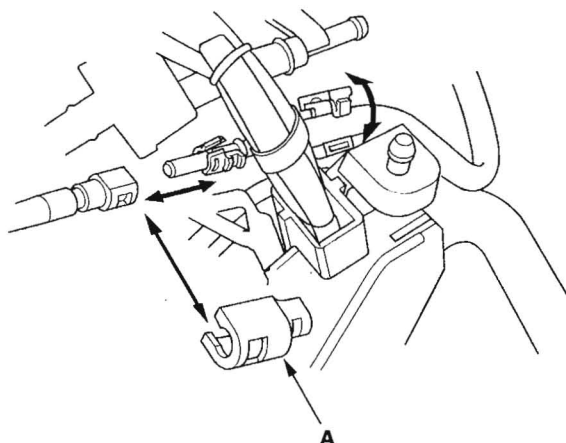


14. Remove the evaporative emission (EVAP) canister hose (A) and brake booster vacuum hose (B).

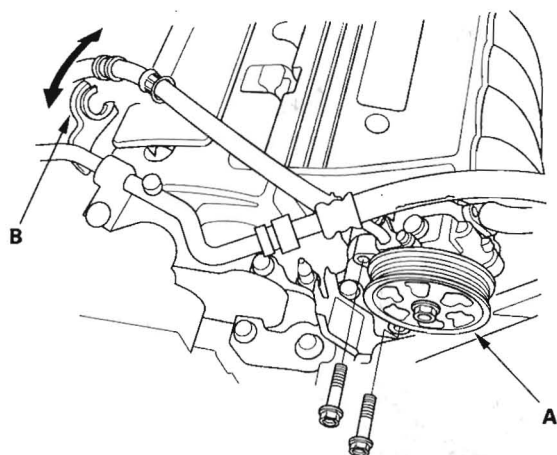




15. Remove the quick-connect fitting cover (A), then disconnect the fuel feed hose (see page 11-324).

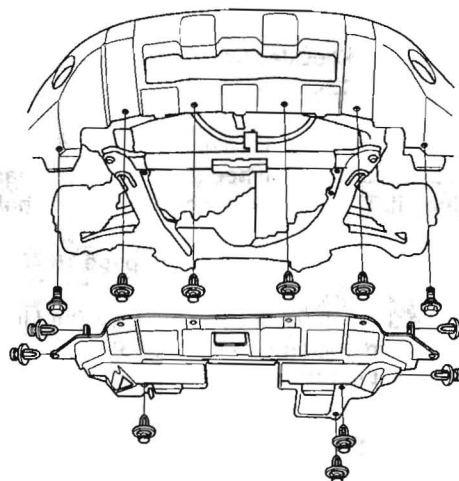


16. Remove the drive belt (see page 4-29).
17. Remove the power steering (P/S) pump (A) without disconnecting the P/S hoses, then remove the P/S hose from the clamp (B).

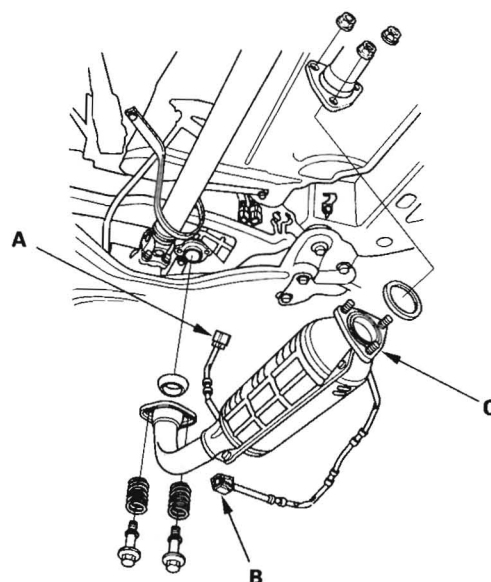


18. Remove the radiator cap.
19. Raise the vehicle on the lift to full height.
20. Remove the front wheels.

21. Remove the splash shield.



22. Loosen the drain plug in the radiator, and drain the engine coolant (see page 10-6).
23. Drain the engine oil (see page 8-10).
24. Drain the automatic transmission fluid (ATF) (see page 14-239).
25. Disconnect the air fuel ratio (A/F) sensor connector (A) and secondary heated oxygen sensor (secondary HO2S) connector (B).



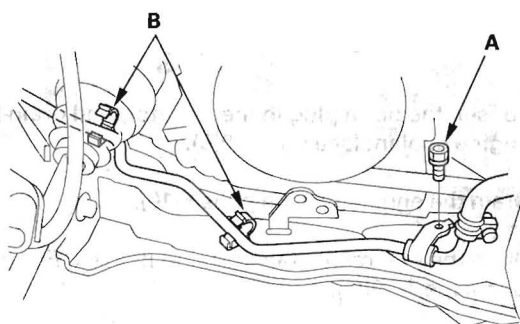
26. Remove the three way catalytic converter (TWC) (C).

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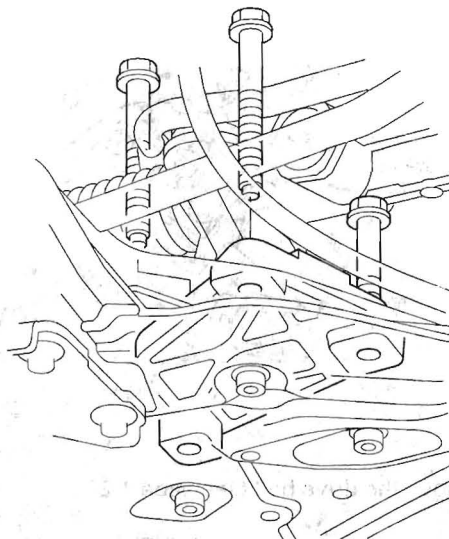
Engine Assembly

Engine Removal (cont'd)

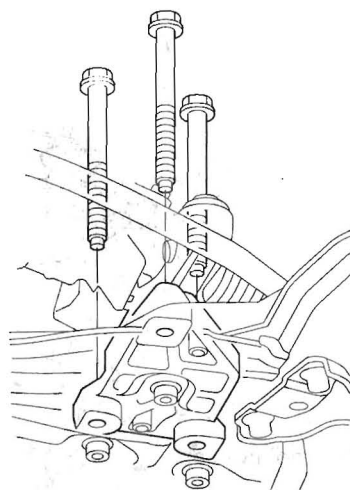
27. Remove the shift cable (see step 34 on page 14-251).
28. Separate the knuckles from the lower arms (see page 18-12).
29. Remove the driveshafts (see step 7 on page 16-5). Coat all precision-finished surfaces with clean engine oil. Tie plastic bags over the driveshaft ends.
30. Remove the propeller shaft (see page 16-40).
31. Remove the bolt (A) securing the P/S fluid line bracket, and unclamp the P/S fluid line clamps (B) on the front subframe.



32. Remove the bolts securing the left steering gearbox mounting bracket.

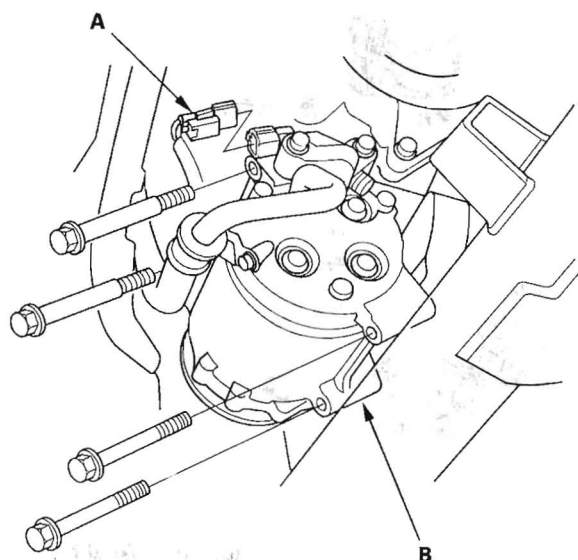


33. Remove the bolts securing the right steering gearbox mounting brackets.

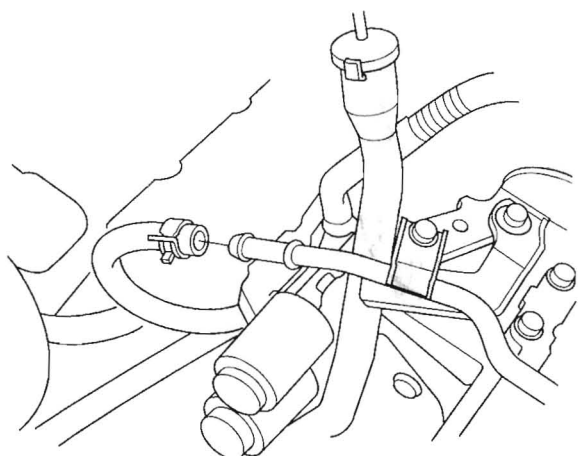




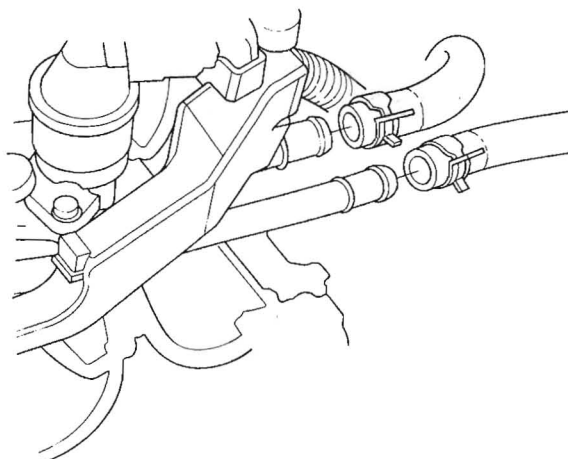
34. Disconnect the A/C compressor clutch connector (A), then remove the A/C compressor (B) without disconnecting the A/C hoses.



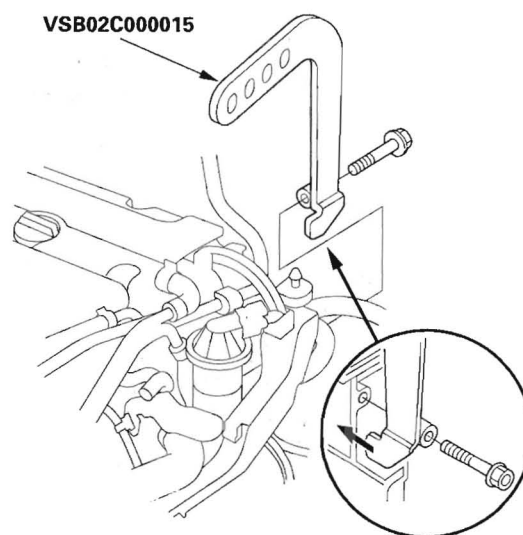
35. Lower the vehicle on the lift.
36. Remove the radiator (see page 10-18).
37. Remove the ATF cooler hose, then plug the line and hose.



38. Remove the heater hoses.



39. Install the front bulkhead (see step 16 on page 10-20).
40. Attach the special tool adapter (VSB02C000015) to the threaded hole (A) in the cylinder head.

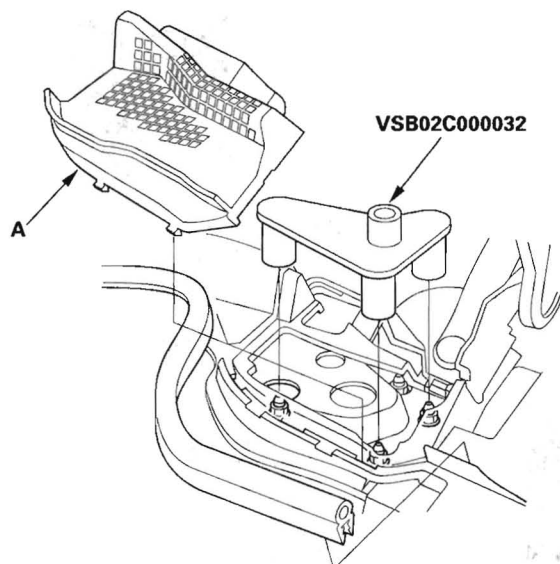


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Engine Assembly

Engine Removal (cont'd)

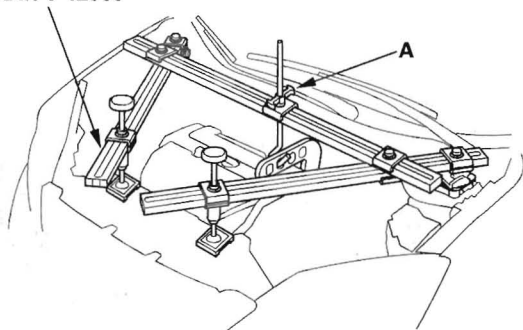
41. Remove both lids (A) from the cowl cover. Position the engine hanger adapters (VSB02C000032) over the damper flange nuts.



42. Install the engine support hanger (AAR-T-12566), then attach the hook to the slotted hole in the hanger adapter. Tighten the wing nut (A) by hand to lift and support the engine/transmission assembly.

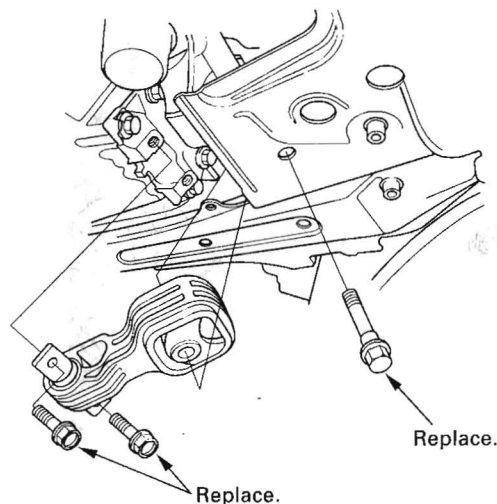
NOTE: Be careful when working around the windshield.

AAR-T-12566

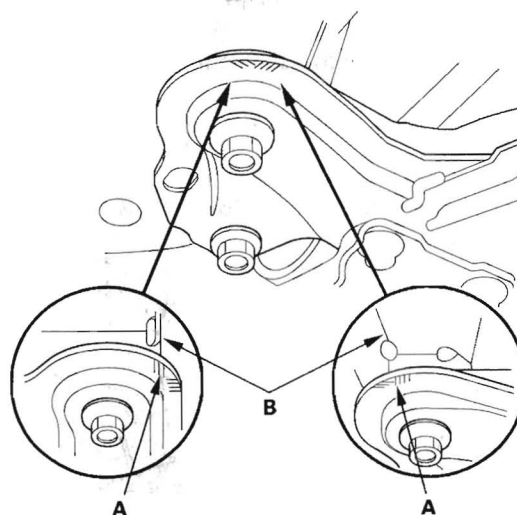


43. Raise the lift to full height.

44. Remove the lower torque rod.

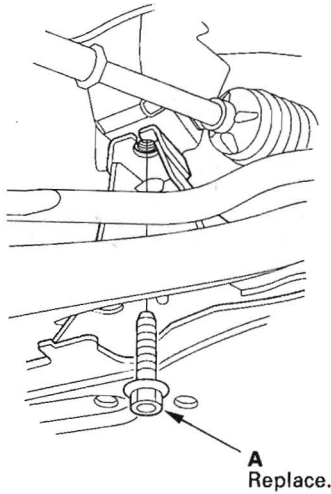


45. Make the appropriate reference lines (A) at both ends of the subframe that line up with the body (B).

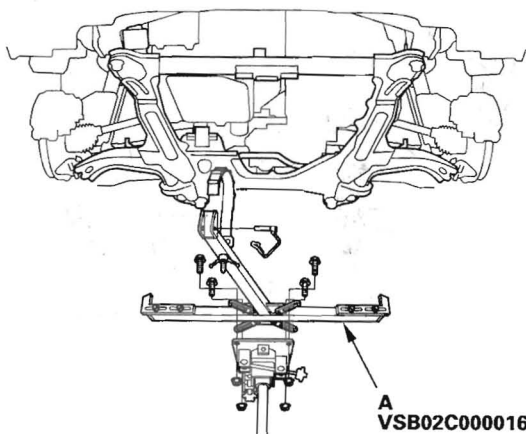




46. Remove the subframe mounting bolts (A) on both sides.

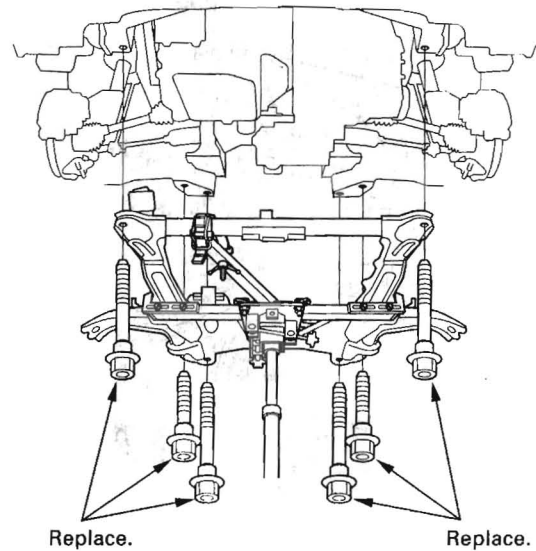


47. Attach the subframe adapter (A) to the subframe and hang the belt of the subframe adapter over the front of the subframe, then secure the belt with its stop.



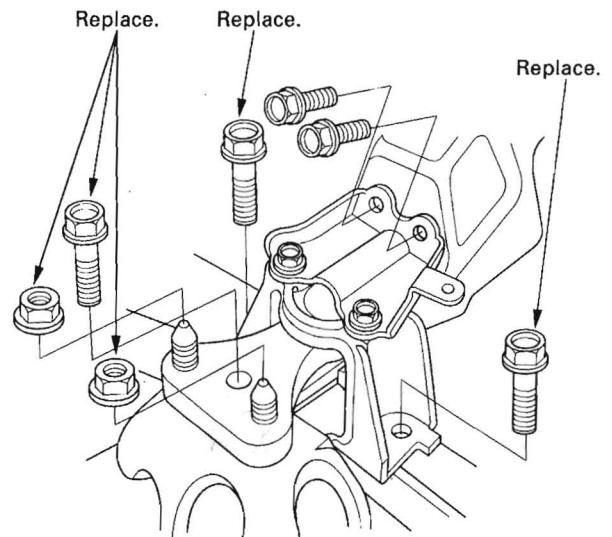
48. Raise the jack and line up the slots in the arms with the bolt holes on the corner of the jack base, then attach them with bolts securely.

49. Remove the subframe.



50. Lower the vehicle on the lift.

51. Remove the transmission mount.

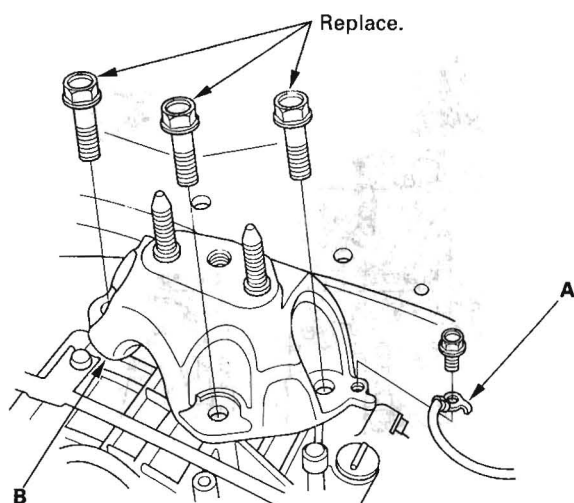


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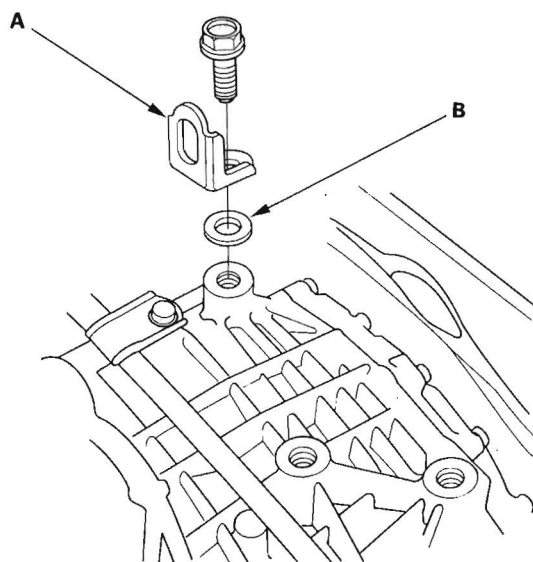
Engine Assembly

Engine Removal (cont'd)

52. Remove the ground cable (A), then remove the transmission mount bracket (B).

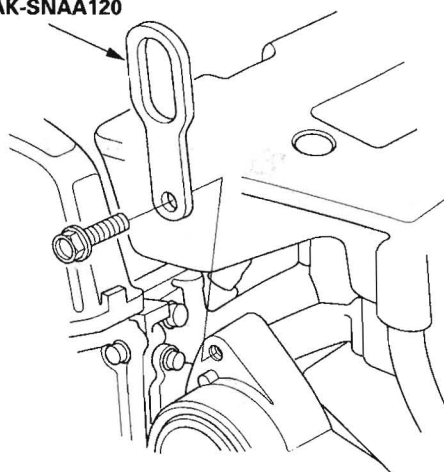


53. Install the transmission hanger bracket (P/N 21232-RCT-A00) (A) and washer (B) on the transmission.

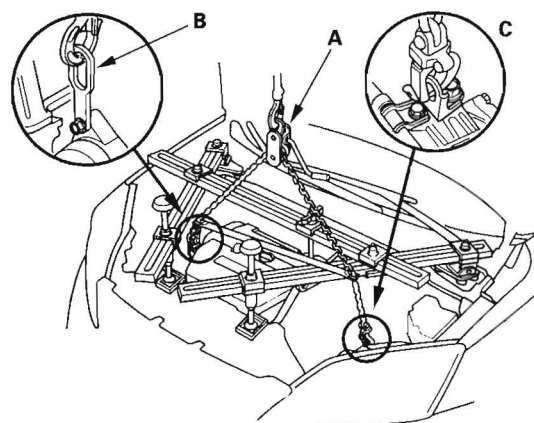


54. Install the universal eyelet.

07AAK-SNAA120

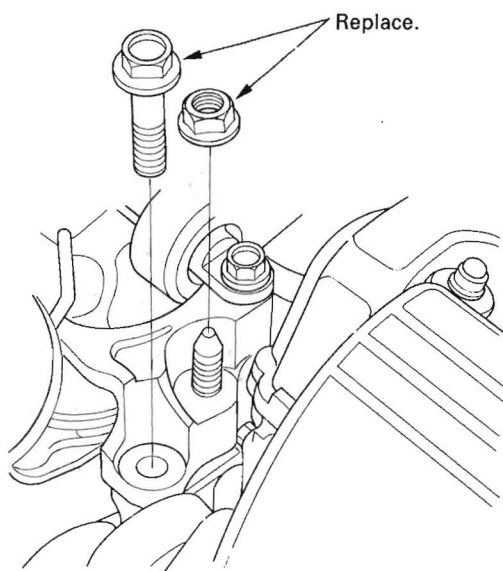


55. Attach a chain hoist (A) to the universal eyelet (B), and the transmission hook (C). Lift up on the engine/transmission assembly until it's securely supported by the chain hoist, and remove the engine support hanger.





56. Remove the side engine mount bracket mounting bolt and nut.



57. Check that the engine/transmission is completely free of vacuum hoses, fuel and coolant hoses, and electrical wiring.
58. Slowly lower the engine/transmission assembly 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.
59. Disconnect the chain hoist from the engine/transmission assembly.
60. Raise the vehicle all the way on the hoist, and remove the engine/transmission assembly from under the vehicle.

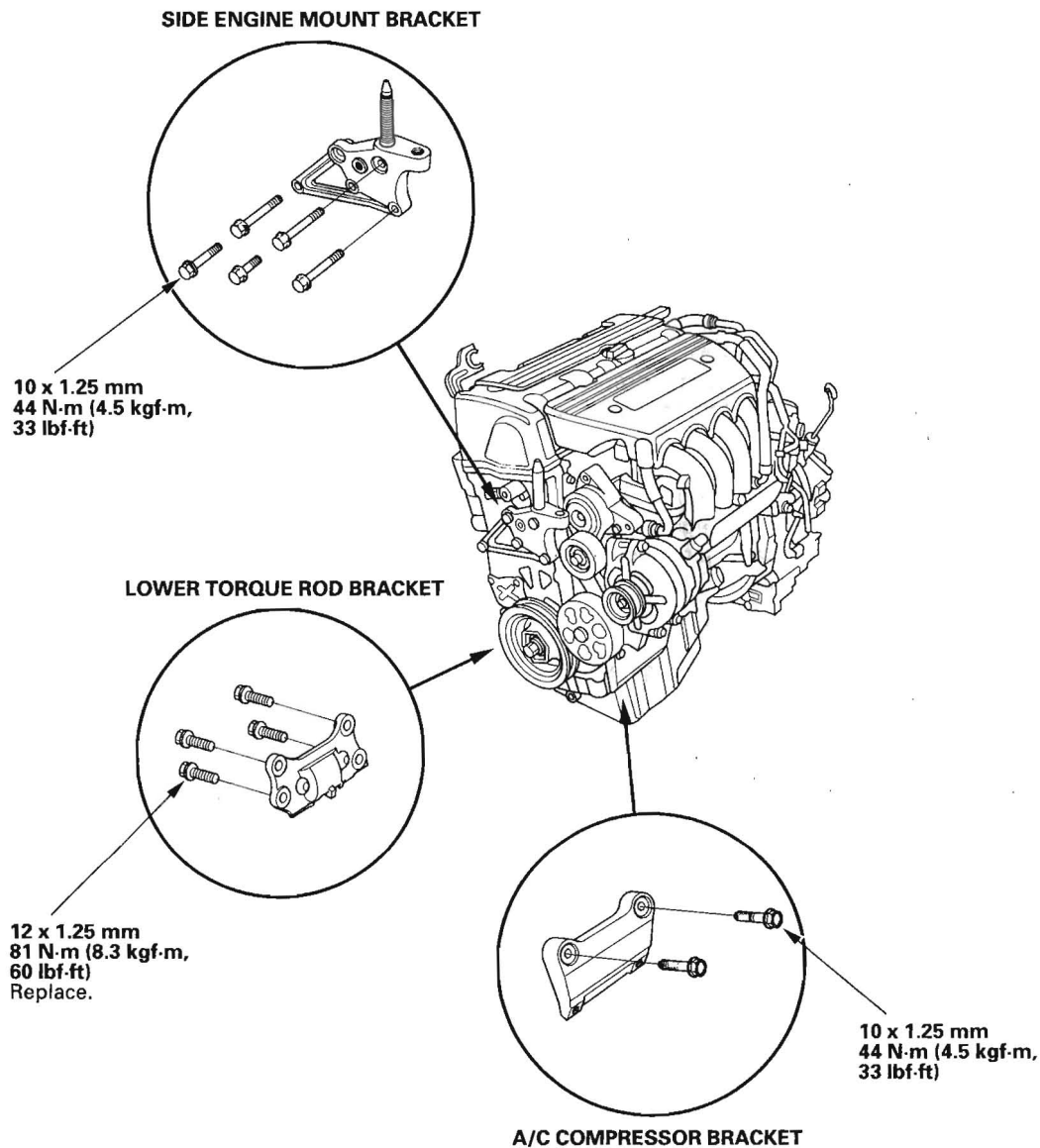
Engine Assembly

Engine Installation

Special Tools Required

- Universal eyelet 07AAK-SNAA120
- Engine hanger adapter VSB02C000015 *
- Front subframe adapter VSB02C000016 *
- CR-V engine hanger adapter VSB02C000032 *
- Engine support hanger, A and Reds AAR-T-12566 *
- * : Available through American Honda Tool and Equipment Program, 1-888-424-6857

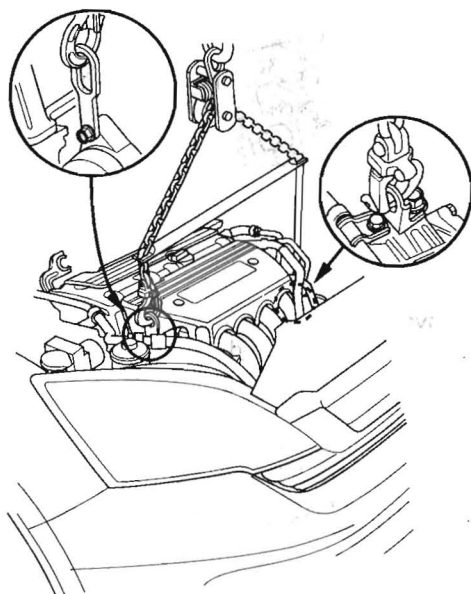
1. Install the accessory brackets, and tighten their bolts to the specified torques.



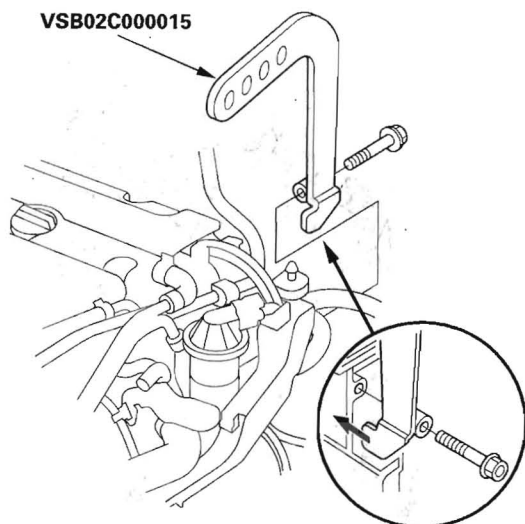


2. Raise the vehicle on the lift, and position the engine/transmission assembly under the vehicle. Lower the vehicle, and attach the special tool and chain hoist to the engine, then lift the engine into position in the vehicle.

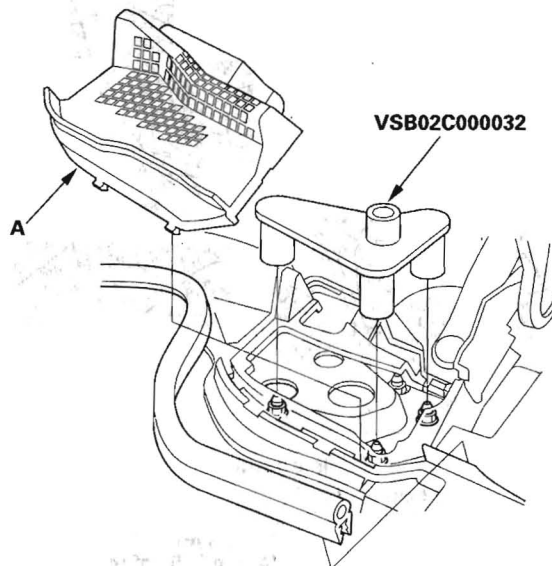
NOTE: Reinstall the mounting bolts and support nuts in the sequence given in the following steps. Failure to follow this sequence may cause excessive noise and vibration, and reduce engine mount life.



3. Attach the special tool adapter (VSB02C000015) to the threaded hole (A) in the cylinder head.

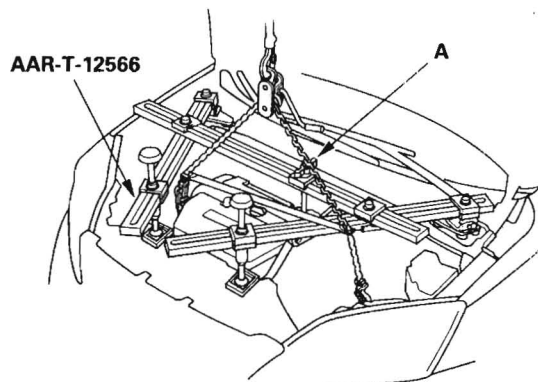


4. Remove both lids (A) from the cowl cover. Position the engine hanger adapters (VSB02C000032) over the damper flange nuts.



5. Install the engine support hanger (AAR-T-12566), then attach the hook to the slotted hole in the hanger adapter. Tighten the wing nut (A) by hand to lift and support the engine/transmission assembly.

NOTE: Be careful when working around the windshield.

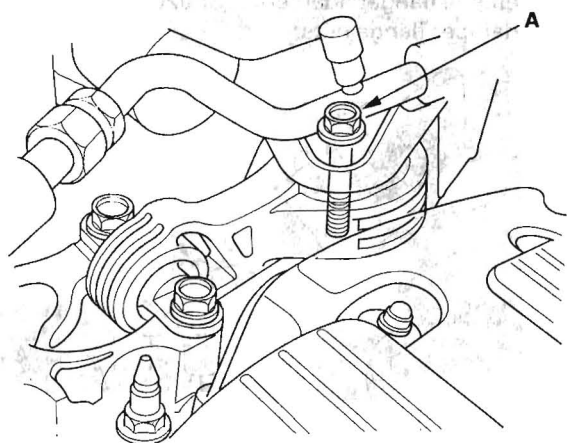


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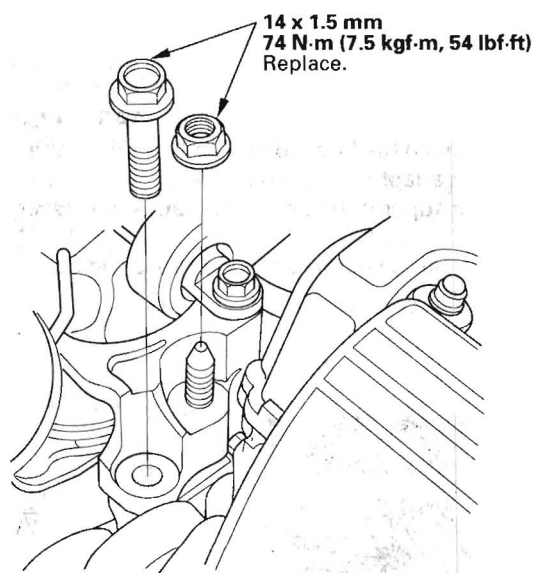
Engine Assembly

Engine Installation (cont'd)

6. Loosen the upper torque rod mounting bolt (A).



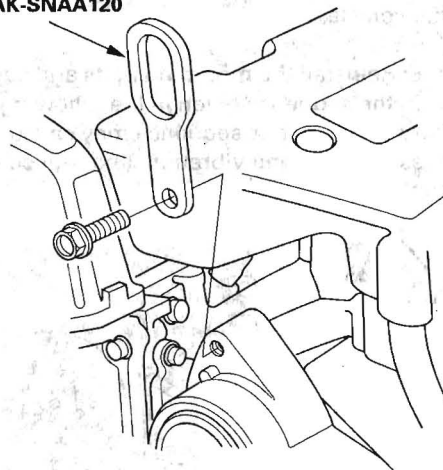
7. Tighten the new side engine mount bracket mounting bolt and nut.



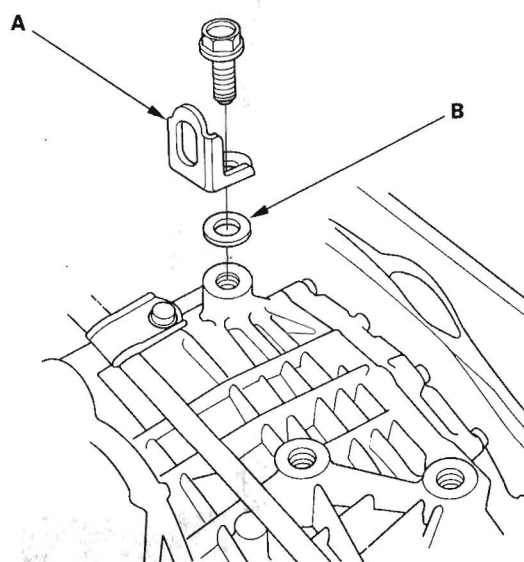
8. Remove the chain hoist.

9. Remove the universal eyelet.

07AAK-SNAA120

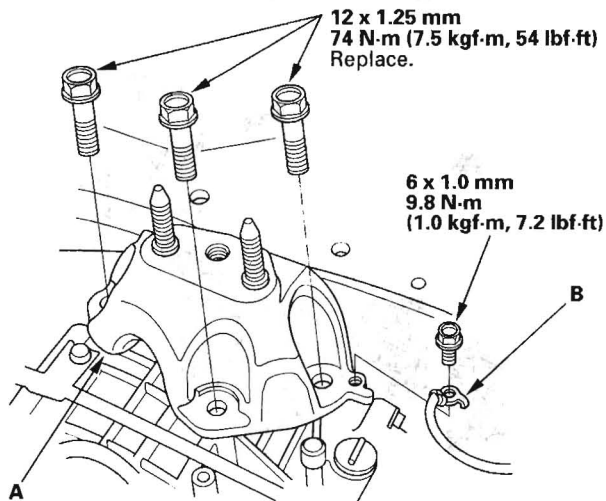


10. Remove the transmission hanger bracket (P/N 21232-RCT-A00) (A) and washer (B).

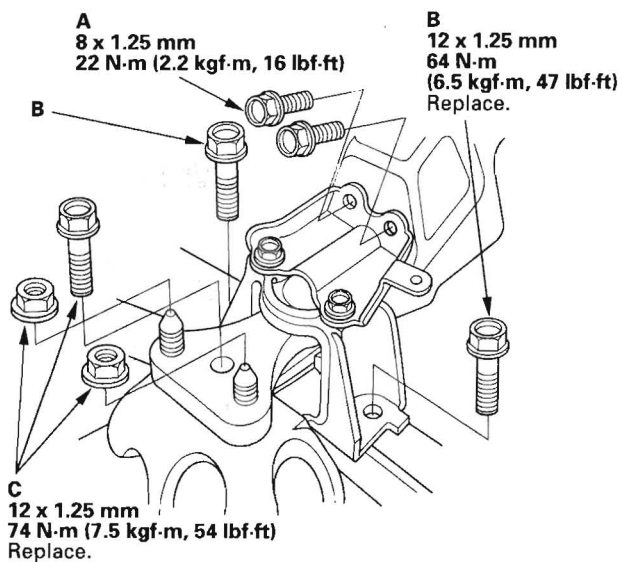




11. Install the transmission mount bracket (A), then install the ground cable (B).



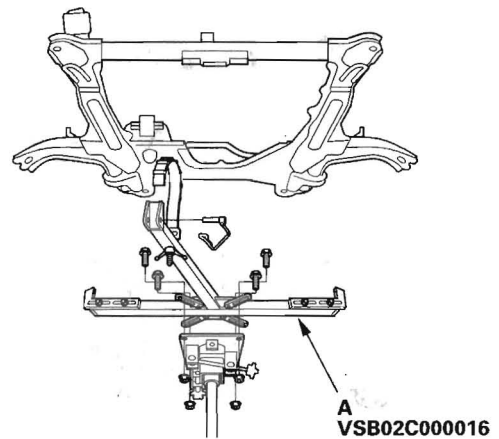
12. Install the transmission mount, then tighten the transmission mount stiffener mounting bolts (A) and the new transmission mount mounting bolts (B).



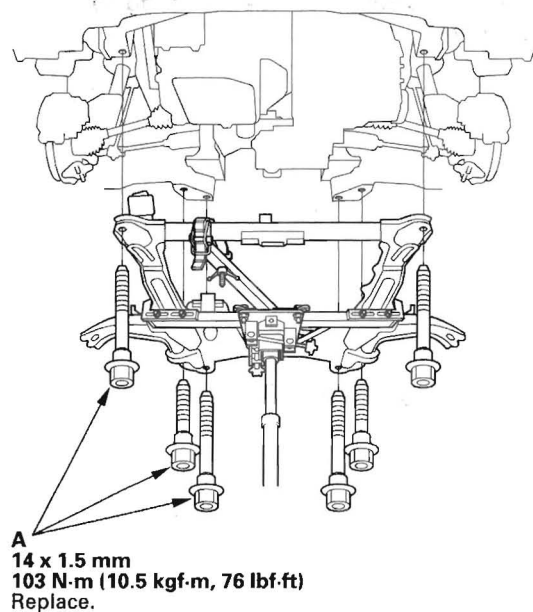
13. Tighten the new bolt and nuts (C).

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

15. Using the subframe adapter (A) and a jack, raise the subframe up to body.



16. Loosely install the new 14 x 1.5 mm bolts.

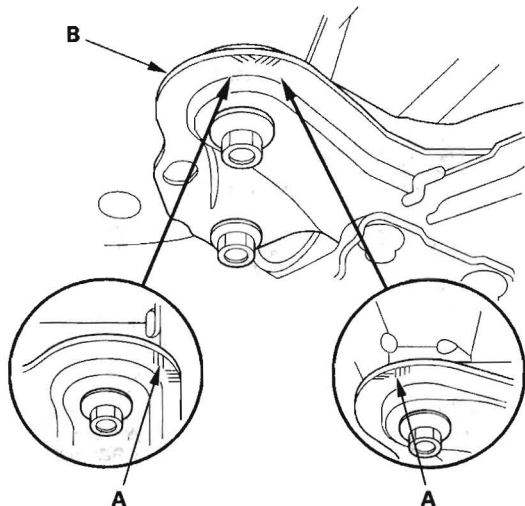


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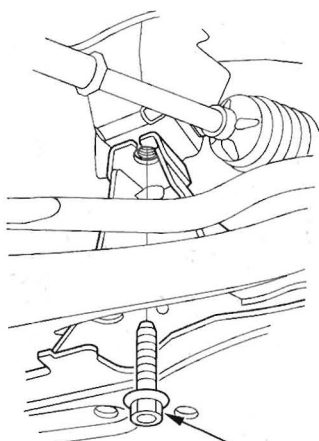
Engine Assembly

Engine Installation (cont'd)

17. 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.

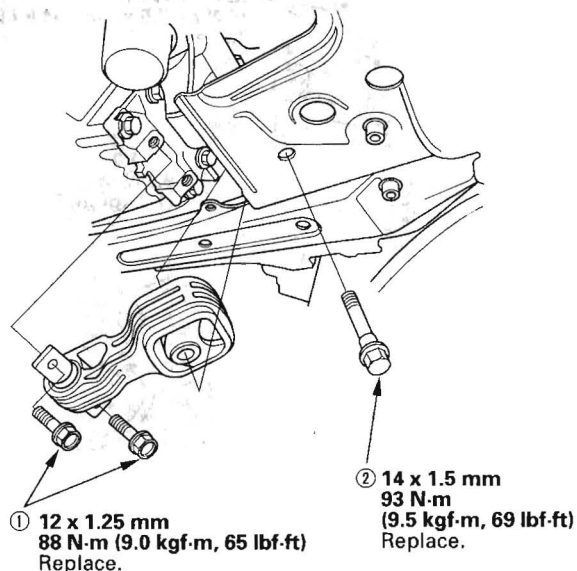


18. Tighten the new subframe mounting bolts (A) on both side.



12 x 1.25 mm
64 N-m (6.5 kgf-m, 47 lbf-ft)
Replace.

19. Install the lower torque rod, then tighten the new lower torque rod mounting bolts in the numbered sequence shown.

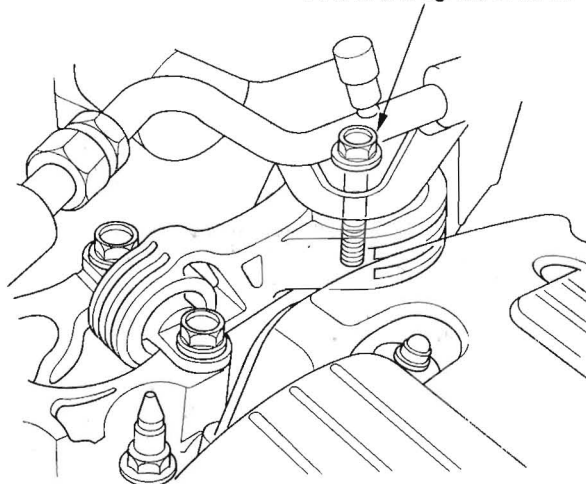


20. Lower the vehicle on the lift.

21. Remove the engine support hanger from the vehicle. Remove the adapter from the cylinder head.

22. Tighten the upper torque rod mounting bolt.

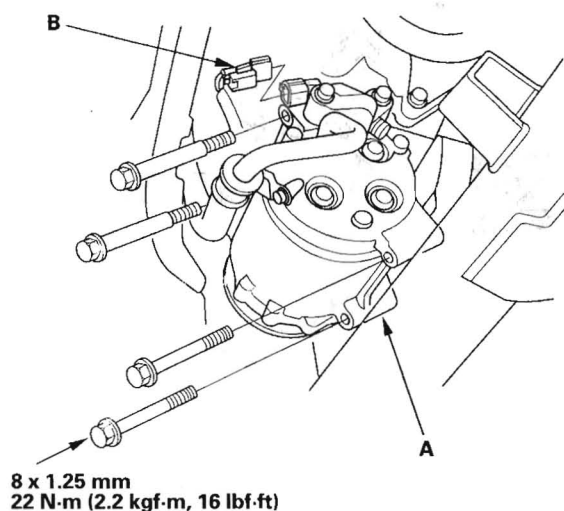
12 x 1.25 mm
54 N-m (5.5 kgf-m, 40 lbf-ft)



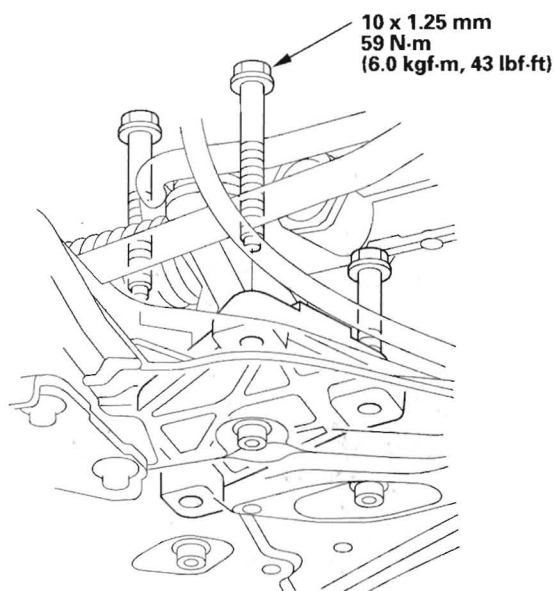


23. Raise the vehicle on the lift to full height.

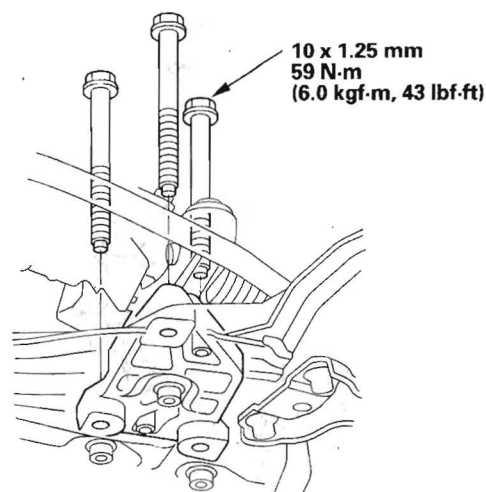
24. Install the A/C compressor (A), then connect the A/C compressor clutch connector (B).



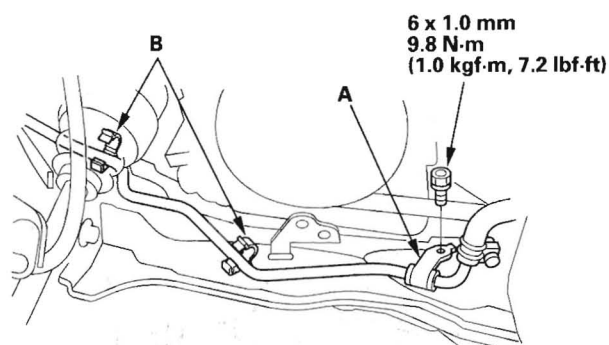
25. Install the bolts securing the left steering gearbox mounting bracket.



26. Install the bolts securing the right steering gearbox mounting bracket.



27. Install the power steering (P/S) fluid line bracket (A), and secure the hose with the hose clamps (B).



28. Install the propeller shaft (see page 16-41).

29. 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.

30. Connect the lower arms to the knuckles (see step 8 on page 18-20).

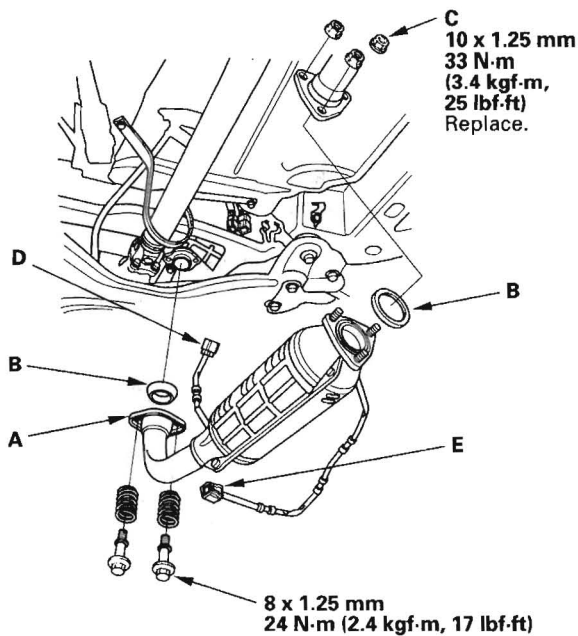
31. Install the shift cable (see step 34 on page 14-262).

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Engine Assembly

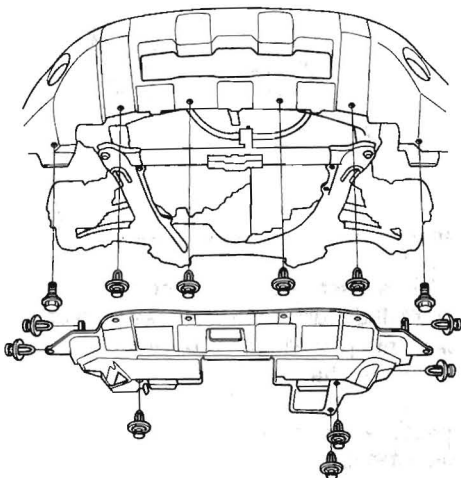
Engine Installation (cont'd)

32. Install the three way catalytic converter (TWC) (A). Use new gaskets (B) and new self-locking nuts (C).
Use new gaskets (B) and new self-locking nuts (C).



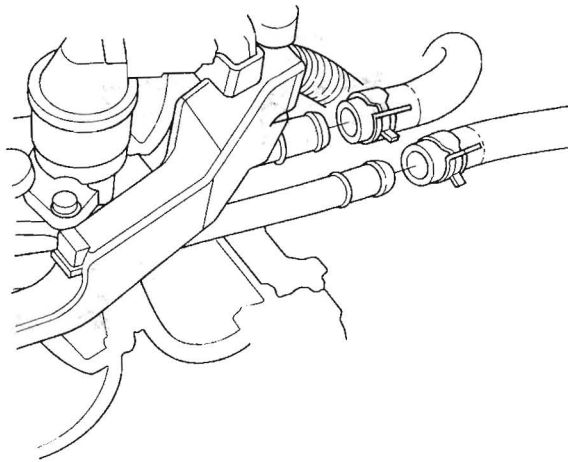
33. Connect the air fuel ratio (A/F) sensor connector (D) and secondary heated oxygen sensor (secondary HO2S) connector (E).

34. Install the splash shield.



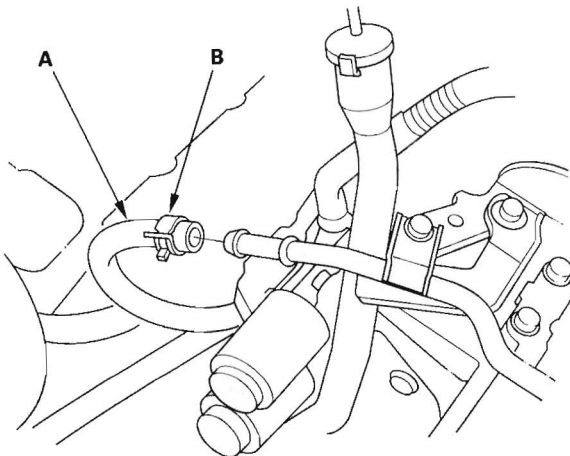
35. Lower the vehicle on the lift.

36. Install the heater hoses.



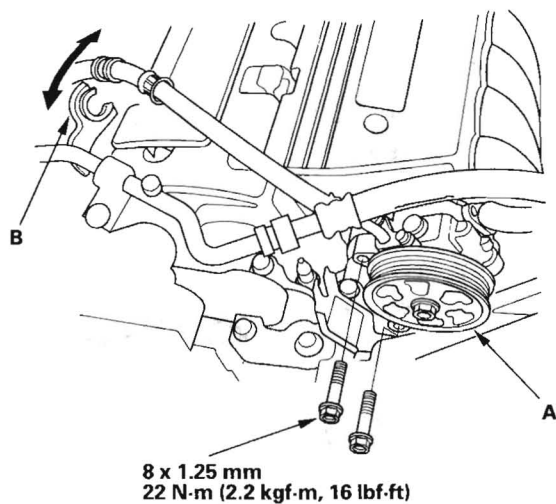
37. Install the radiator (see page 10-18).

38. Install the automatic transmission fluid (ATF) cooler hose (A), and secure the hoses with the clip (B) (see page 14-270).



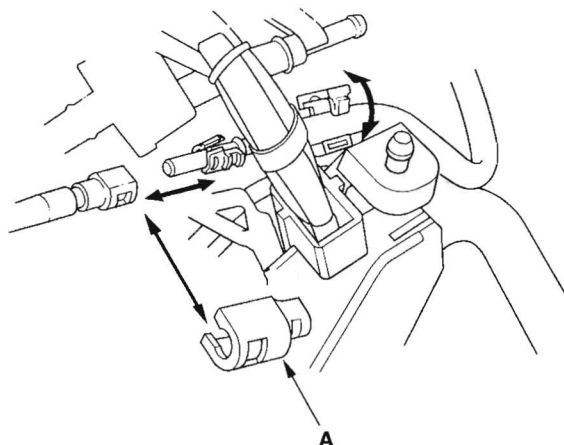


39. Install the P/S pump (A), then install the P/S hose to the clamp (B).

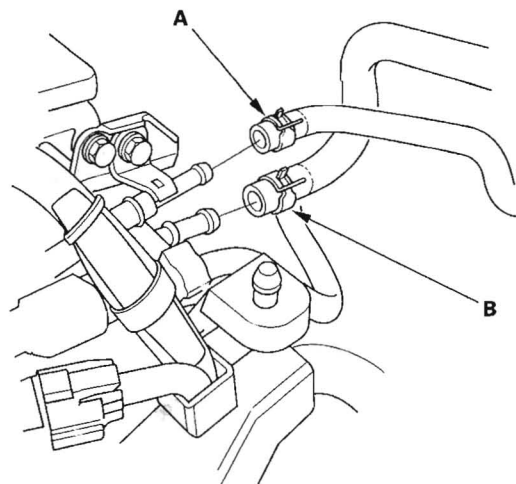


40. Install the drive belt (see page 4-29).

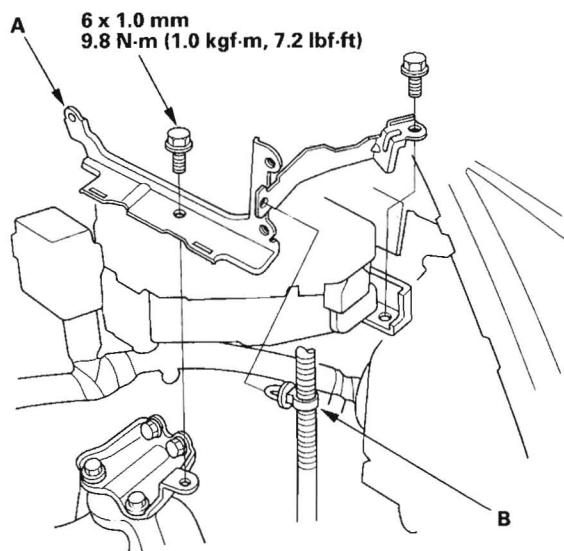
41. Connect the fuel feed hose (see page 11-326), then install the quick-connect fitting cover (A).



42. Install the evaporative emission (EVAP) canister hose (A) and brake booster vacuum hose (B).



43. Install the powertrain control module (PCM) bracket (A), then install the harness clamp (B).

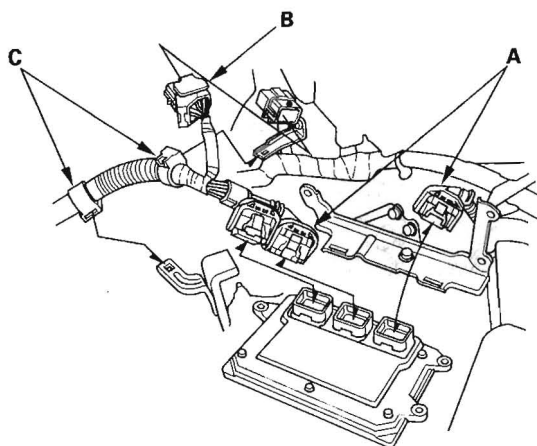


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Engine Assembly

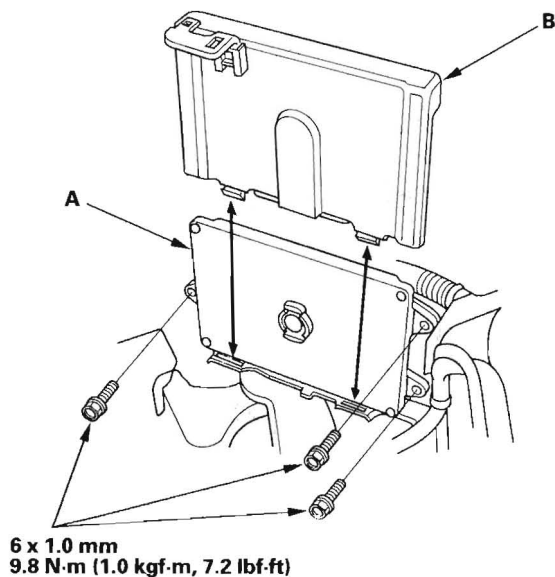
Engine Installation (cont'd)

44. Connect the PCM connectors (A) and engine wire harness connector (B).

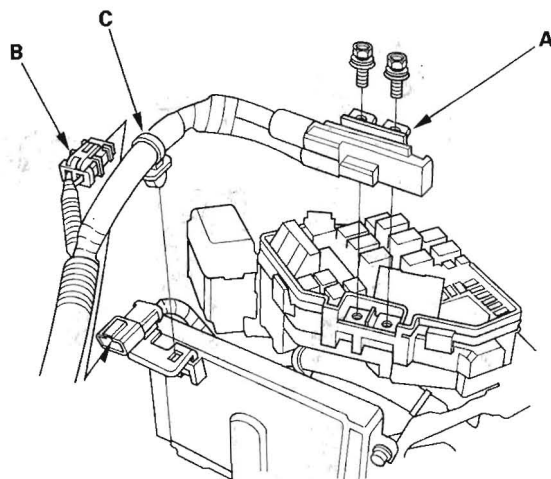


45. Install the harness clamps (C).

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



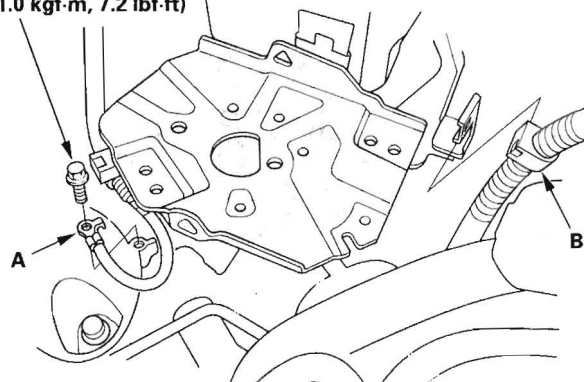
47. Install the battery cables (A) to the under-hood fuse/relay box.



48. Connect the harness connector (B), and install the harness clamp (C).

49. Install the ground cable (A) and harness clamp (B).

6 x 1.0 mm
9.8 N·m
(1.0 kgf·m, 7.2 lbf·ft)



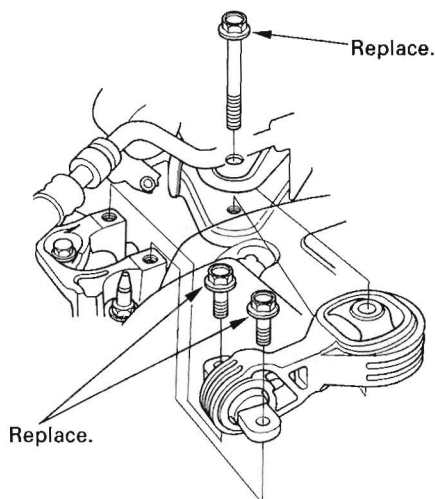


50. Install the air cleaner housing assembly (see page 11-340).
51. Install the front wheels.
52. Install the battery. Clean the battery posts and cable terminals with a battery post cleaner, then assemble them, and apply grease to prevent corrosion.
53. Move the shift lever to each gear, and verify that the A/T gear position indicator follows the transmission range switch.
54. Inspect for fuel leaks: Turn the ignition switch ON (II) (do not operate the starter) so the fuel pump runs for about 2 seconds and pressurizes the fuel line. Repeat this operation two or three times, then check for fuel leakage at any point in the fuel line.
55. Refill the engine with engine oil (see step 4 on page 8-10).
56. Refill the transmission with ATF (see step 3 on page 14-239).
57. Refill the radiator with engine coolant, and bleed air from the cooling system with the heater valve open (see step 6 on page 10-6).
58. Do the PCM reset procedure (see page 11-4).
59. Do the crankshaft position (CKP) pattern clear/CKP pattern learn procedure (see page 11-4).
60. Inspect the idle speed (see page 11-303).
61. Inspect the ignition timing (see page 4-18).
62. Check the wheel alignment (see page 18-5).
63. Enter the anti-theft code for the audio system and the navigation system (if equipped), then enter the MX radio presets.
64. Set the clock.

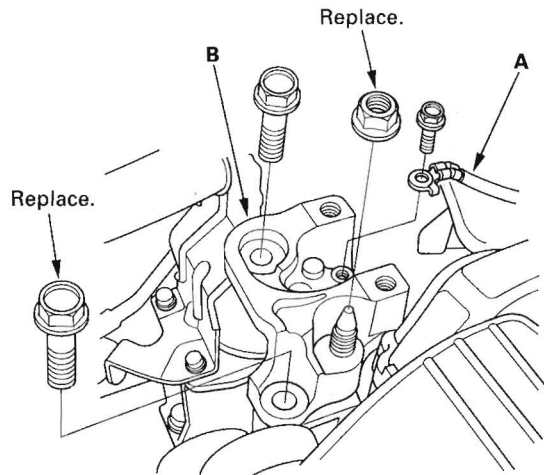
Engine Assembly

Side Engine Mount Replacement

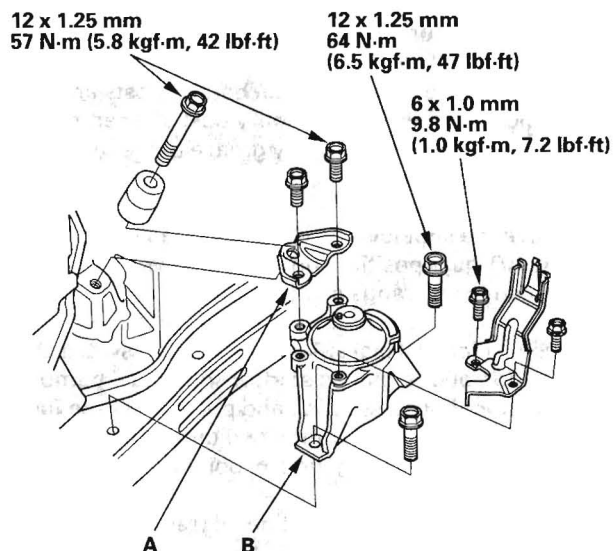
1. Support the engine with a jack and wood block under the oil pan.
2. Remove the power steering (P/S) fluid reservoir from the holder.
3. Remove the upper torque rod.



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

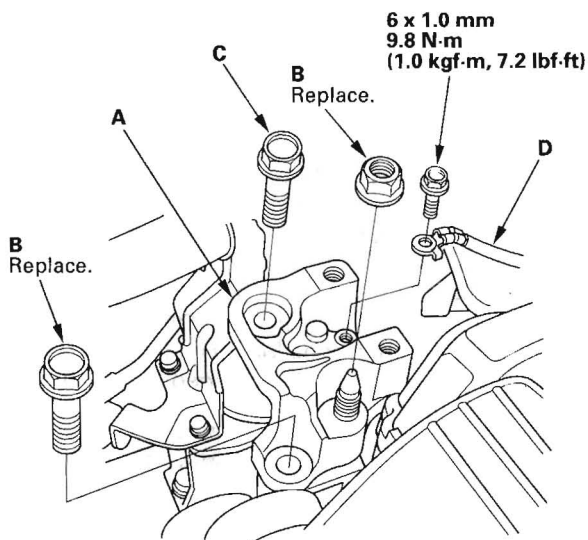


5. Remove the side engine mount stiffener (A), then remove the side engine mount (B).



6. Install the side engine mount, then install the side engine mount stiffener.

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

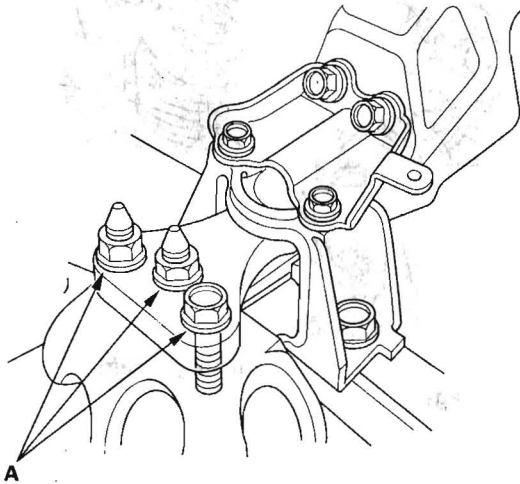


8. Install the ground cable (D).



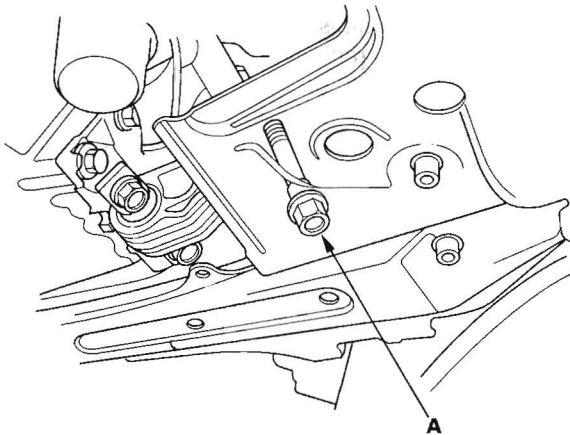
9. Remove the air cleaner housing assembly (see page 11-340).

10. Loosen the transmission mounting bolt and nuts (A).



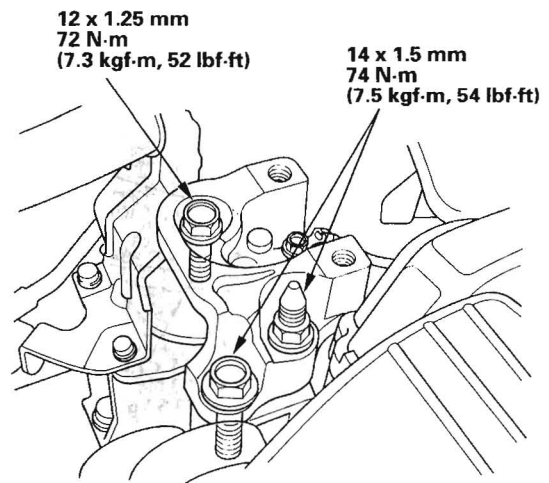
11. Raise the lift to full height.

12. Loosen the lower torque rod mounting bolt (A).

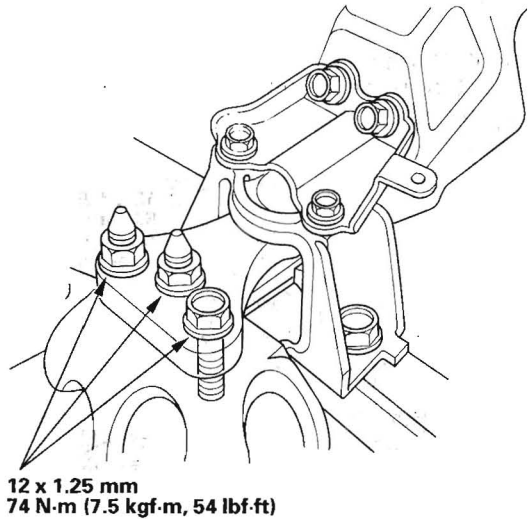


13. Lower the vehicle on the lift.

14. Tighten the side engine mount mounting bolts and nut.



15. Tighten the transmission mounting bolt and nuts.



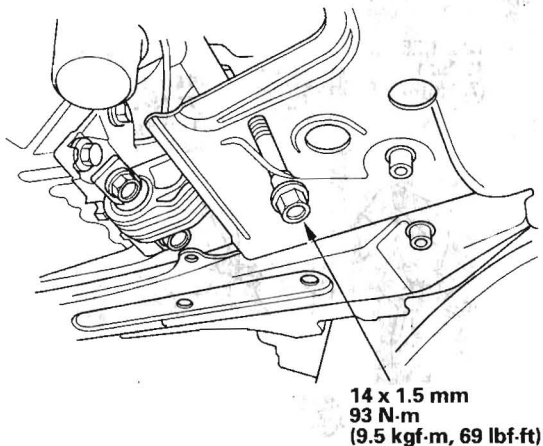
16. Raise the lift to full height.

(cont'd)

Engine Assembly

Side Engine Mount Replacement (cont'd)

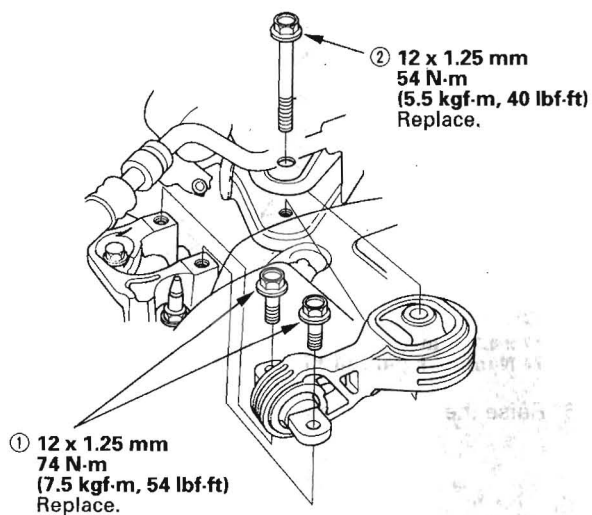
17. Tighten the lower torque rod mounting bolt.



18. Lower the vehicle on the lift.

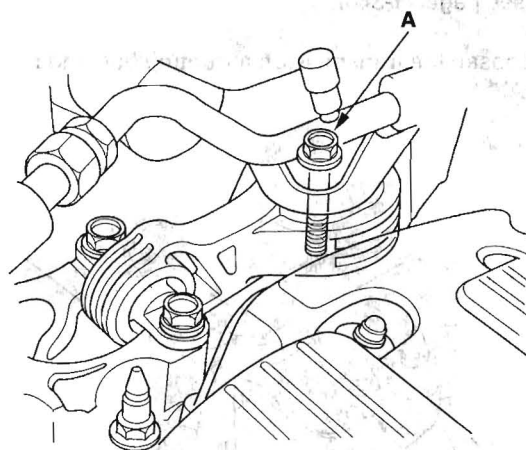
19. Install the air cleaner housing assembly (see page 11-340).

20. Install the upper torque rod, then tighten the new upper torque rod mounting bolts in the numbered sequence shown.



Transmission Mount Replacement

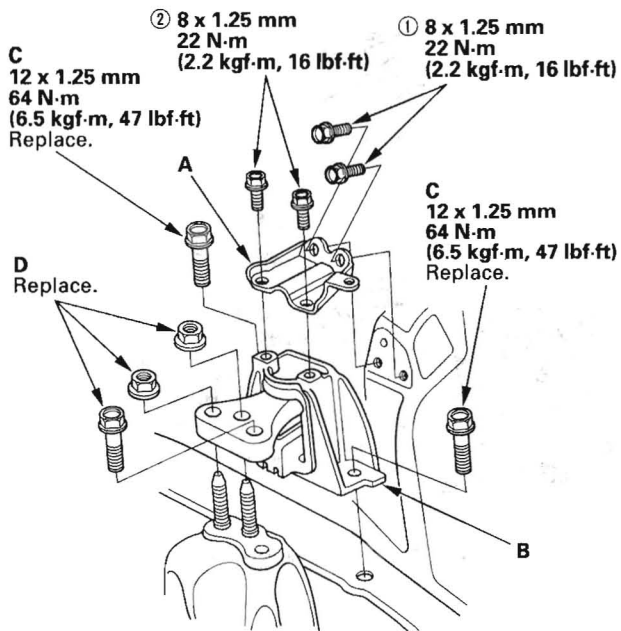
1. Loosen the upper torque rod mounting bolt (A).



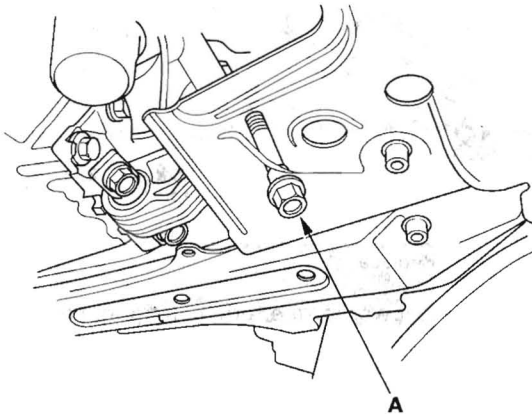
2. Remove the air cleaner housing assembly (see page 11-340).
3. Remove the powertrain control module (PCM) cover, then remove the three bolts securing the PCM.
4. Remove the PCM bracket.
5. Support the transmission with a jack and wood block under the transmission.



6. Remove the transmission mount stiffener (A) and transmission mount (B).

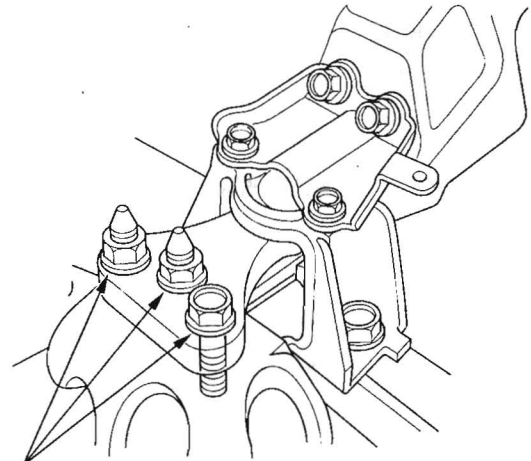


7. Install the transmission mount with the new mounting bolts (C), then install the transmission mount stiffener, and tighten the mounting bolts in the numbered sequence shown.
8. Loosely tighten the new bolt and nuts (D).
9. Raise the lift to full height.
10. Loosen the lower torque rod mounting bolt (A).



11. Lower the vehicle on the lift.

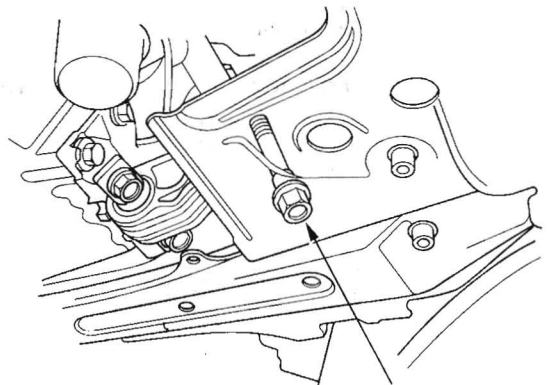
12. Tighten the transmission mounting bolt and nuts.



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

13. Raise the lift to full height.

14. Tighten the lower torque rod mounting bolt.



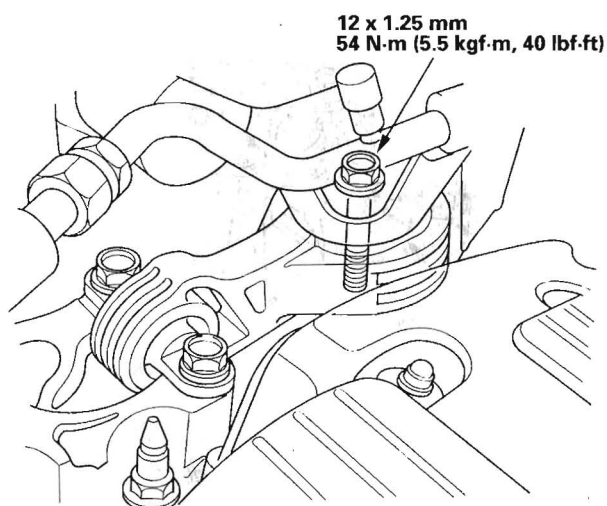
14 x 1.5 mm
93 N·m (9.5 kgf·m, 69 lbf·ft)

(cont'd)

Engine Assembly

Transmission Mount Replacement (cont'd)

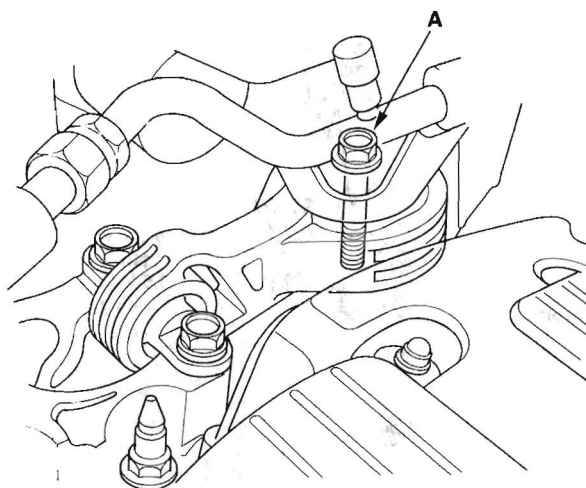
15. Lower the vehicle on the lift.
16. Tighten the upper torque rod mounting bolt.



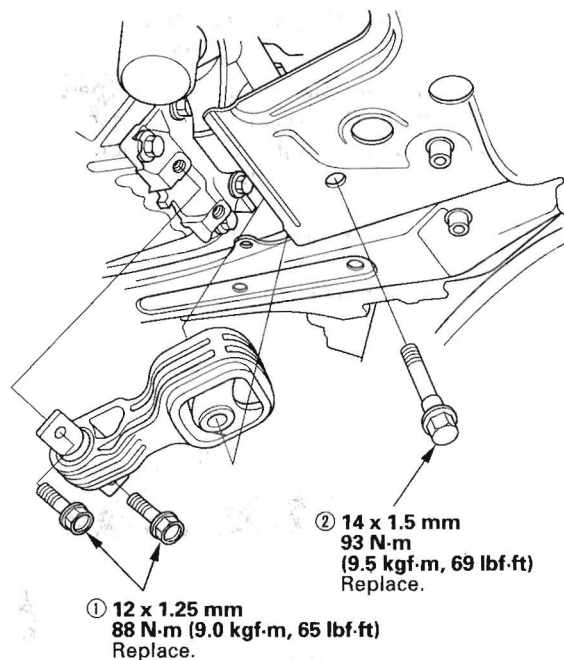
17. Install the PCM bracket.
18. Install the PCM, then install the PCM cover.
19. Install the air cleaner housing assembly (see page 11-340).

Lower Torque Rod Replacement

1. Loosen the upper torque rod mounting bolt (A).



2. Raise the lift to full height.
3. Remove the lower torque rod.

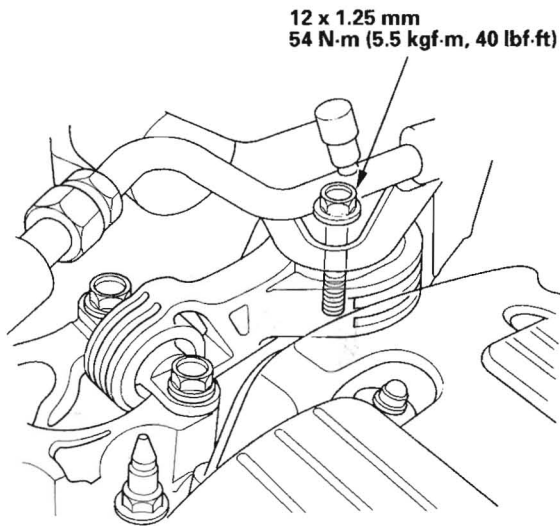


4. Install the lower torque rod, then tighten the new lower torque rod mounting bolts in the numbered sequence shown.

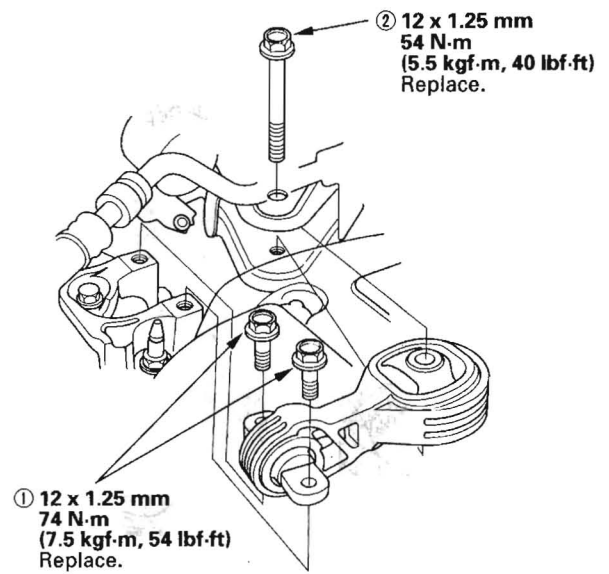


Upper Torque Rod Replacement

5. Lower the vehicle on the lift.
6. Tighten the upper torque rod mounting bolt.



1. Remove the upper torque rod (A).

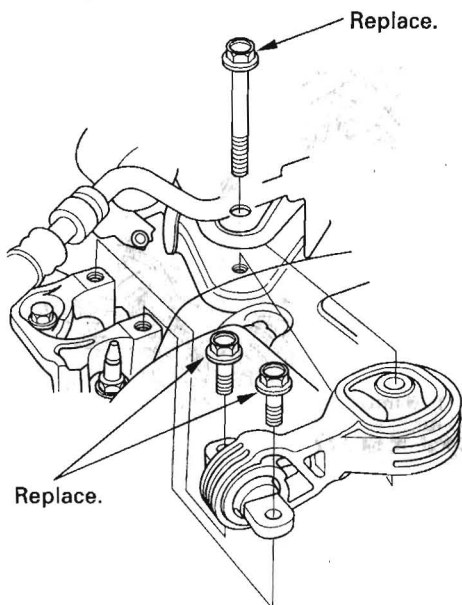


2. Install the upper torque rod, then tighten the new bolts in the numbered sequence shown.

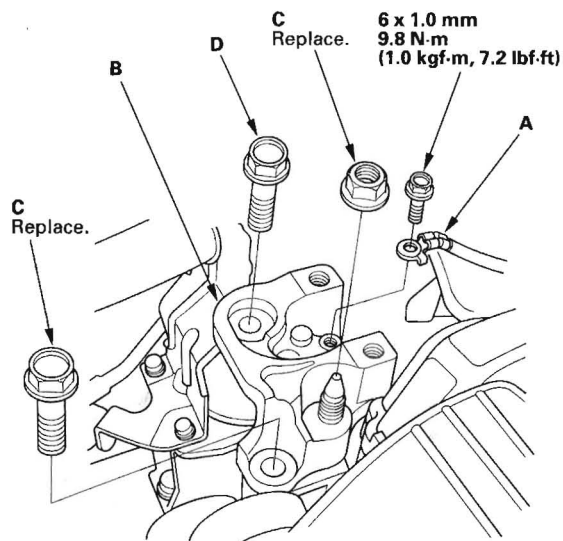
Engine Assembly

Side Engine Mount Bracket Replacement

1. Support the engine with a jack and wood block under the oil pan.
2. Remove the upper torque rod.

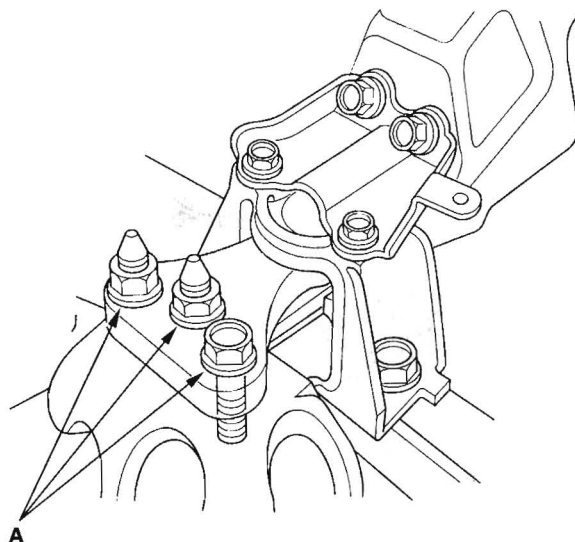


3. Remove the ground cable (A), then remove the side engine mount bracket (B).

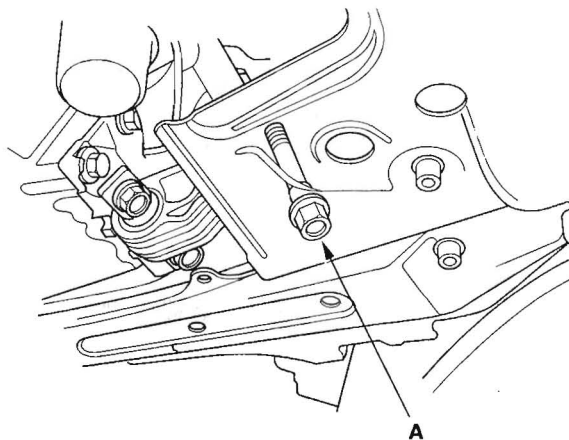


4. Install the side engine mount bracket, then loosely tighten the new bolt and nut (C), and loosely tighten the bolt (D).
5. Install the ground cable.

6. Remove the air cleaner housing assembly (see page 11-340).
7. Loosen the transmission mounting bolt and nuts (A).



8. Raise the lift to full height.
9. Loosen the lower torque rod mounting bolt (A).



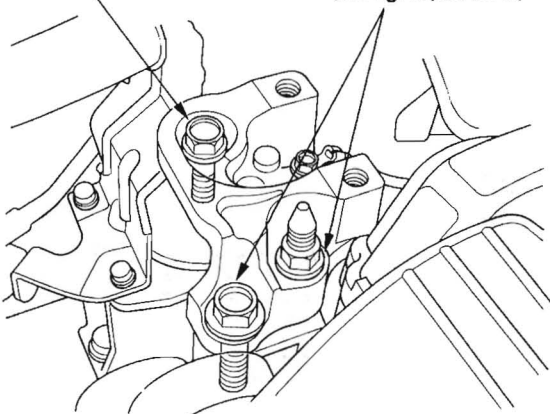


10. Lower the vehicle on the lift.

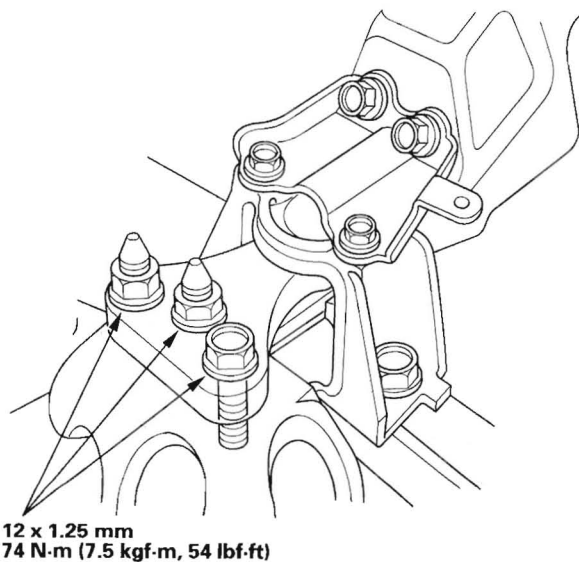
11. Tighten the side engine mount mounting bolts and nut.

12 x 1.25 mm
72 N·m (7.3 kgf·m, 52 lbf·ft)

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



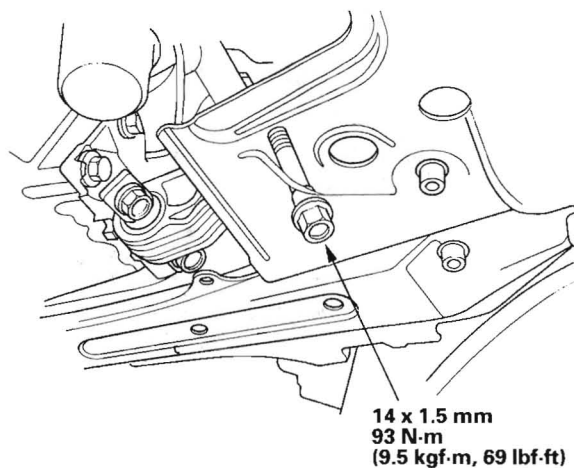
12. Tighten the transmission mounting bolt and nuts.



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

13. Raise the lift to full height.

14. Tighten the lower torque rod mounting bolt.

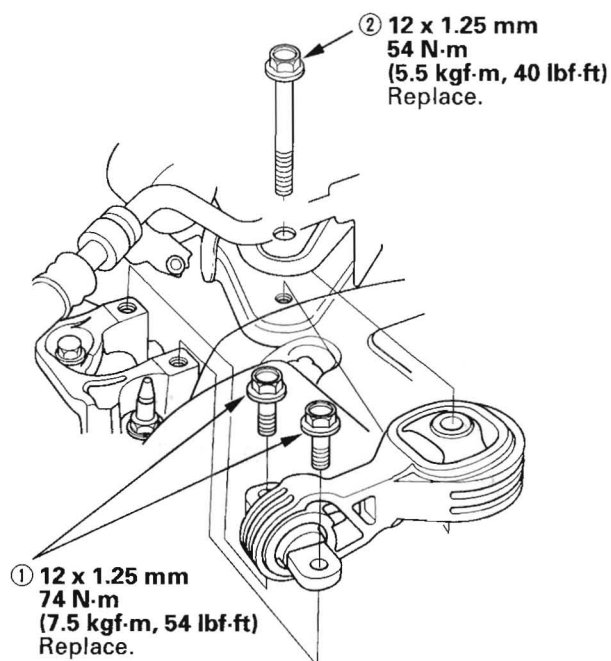


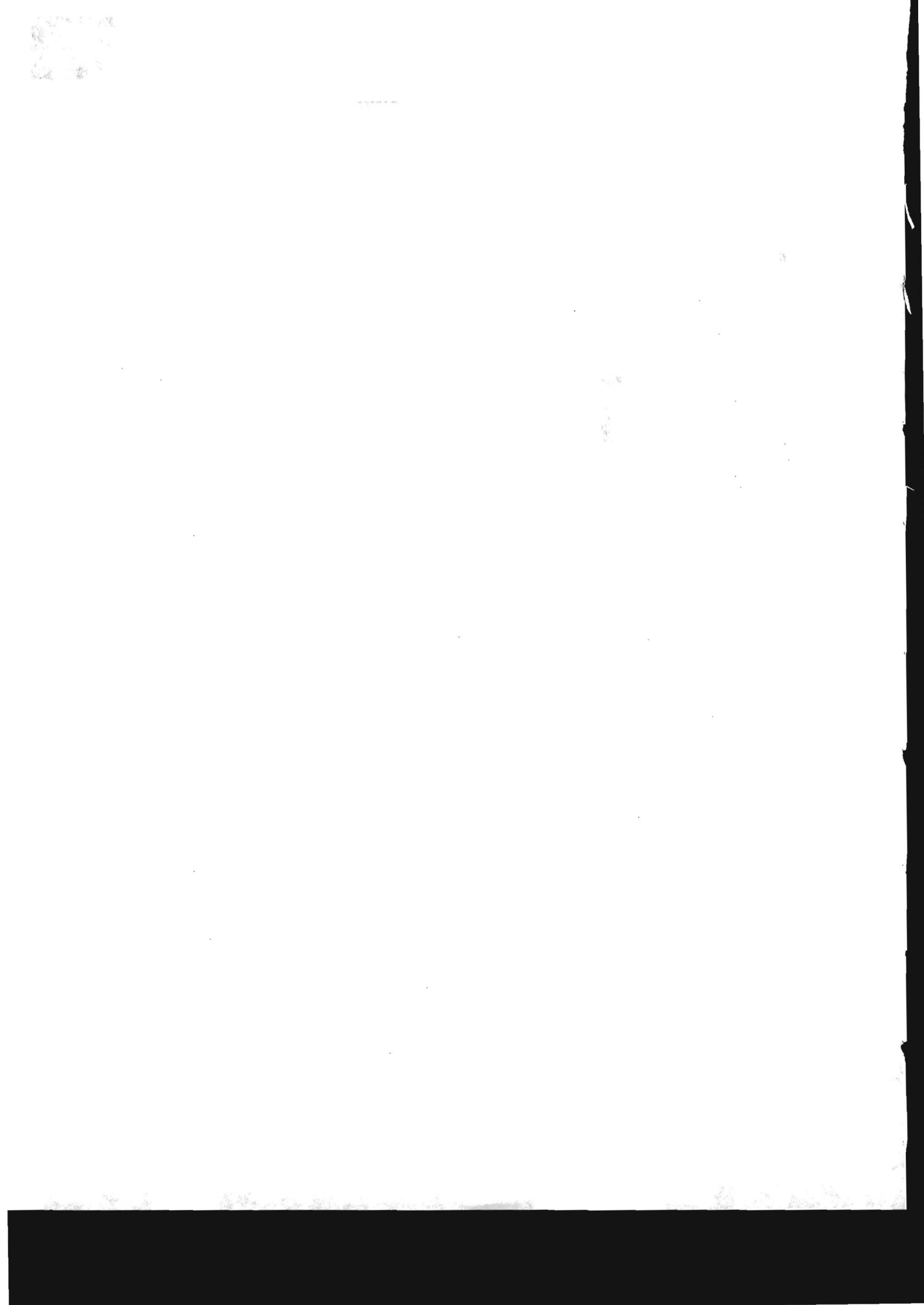
14 x 1.5 mm
93 N·m
(9.5 kgf·m, 69 lbf·ft)

15. Lower the vehicle on the lift.

16. Install the air cleaner housing assembly (see page 11-340).

17. Install the upper torque rod, then tighten the new upper torque rod mounting bolts in the numbered sequence shown.





Engine Mechanical

Cylinder Head

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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	07MAA-PR70110	Adjuster	1
⑥	07MAA-PR70120	Locknut Wrench	1
⑦	07PAD-0010000	Stem Seal Driver	1
⑧	07ZAJ-PNAA101	VTEC Air Adapter	2
⑨	07ZAJ-PNAA200	VTEC Air Stopper	1
⑩	07ZAJ-PNAA300	Air Joint Adapter	1
⑪	070AB-RJA0100	Crankshaft Pulley Holder	1
⑫	07742-0010100	Valve Guide Driver, 5.5 mm	1
⑬	07746-0010400	Attachment, 52 x 55 mm	1
⑭	07749-0010000	Driver	1
⑮	07757-PJ1010A	Valve Spring Compressor Attachment	1



①



②



③



④



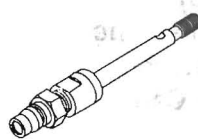
⑤



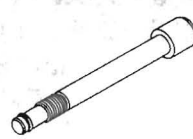
⑥



⑦



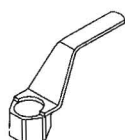
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⑨



⑩



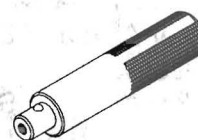
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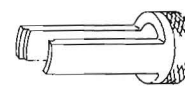
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⑬



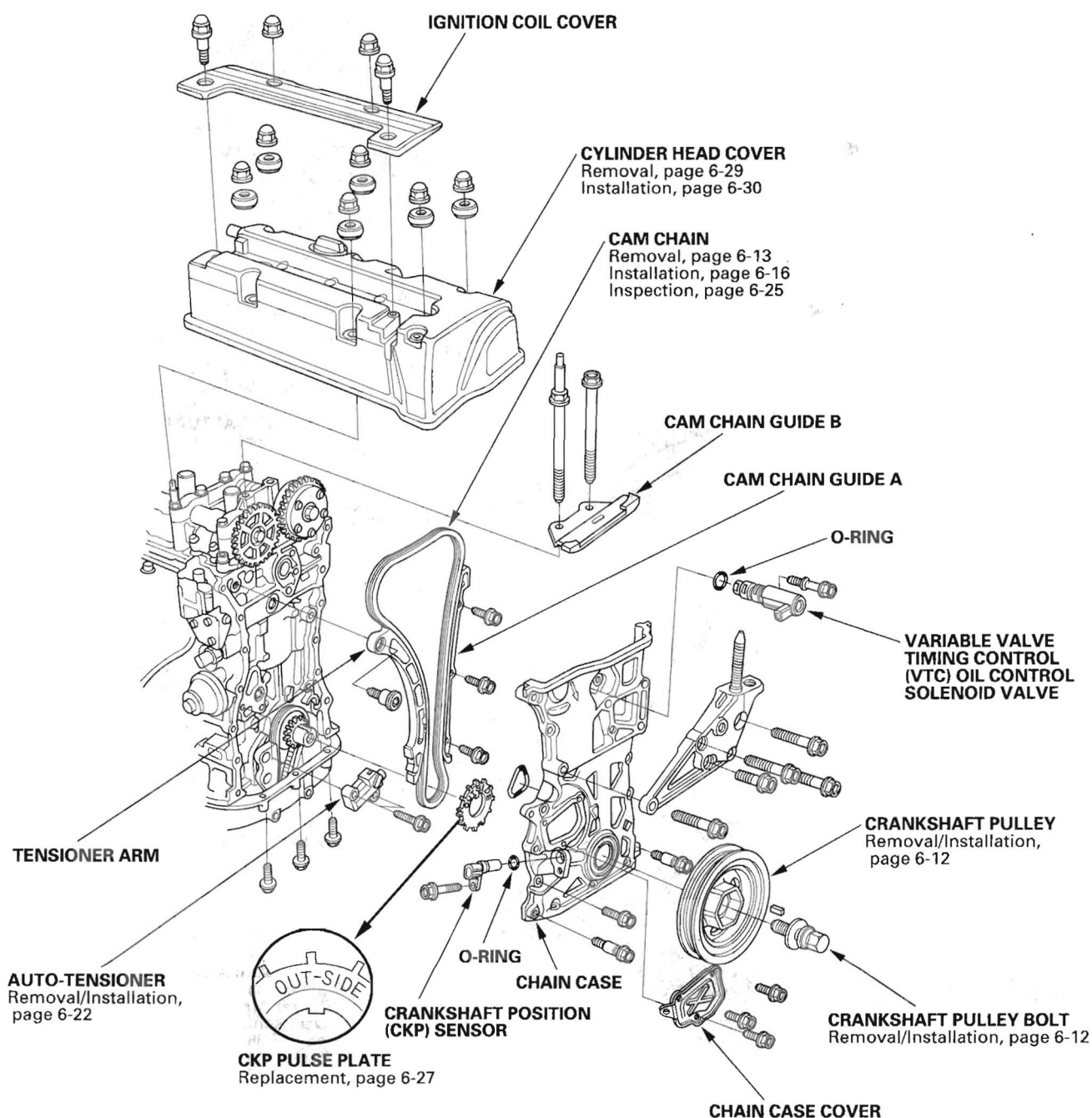
⑭



⑮



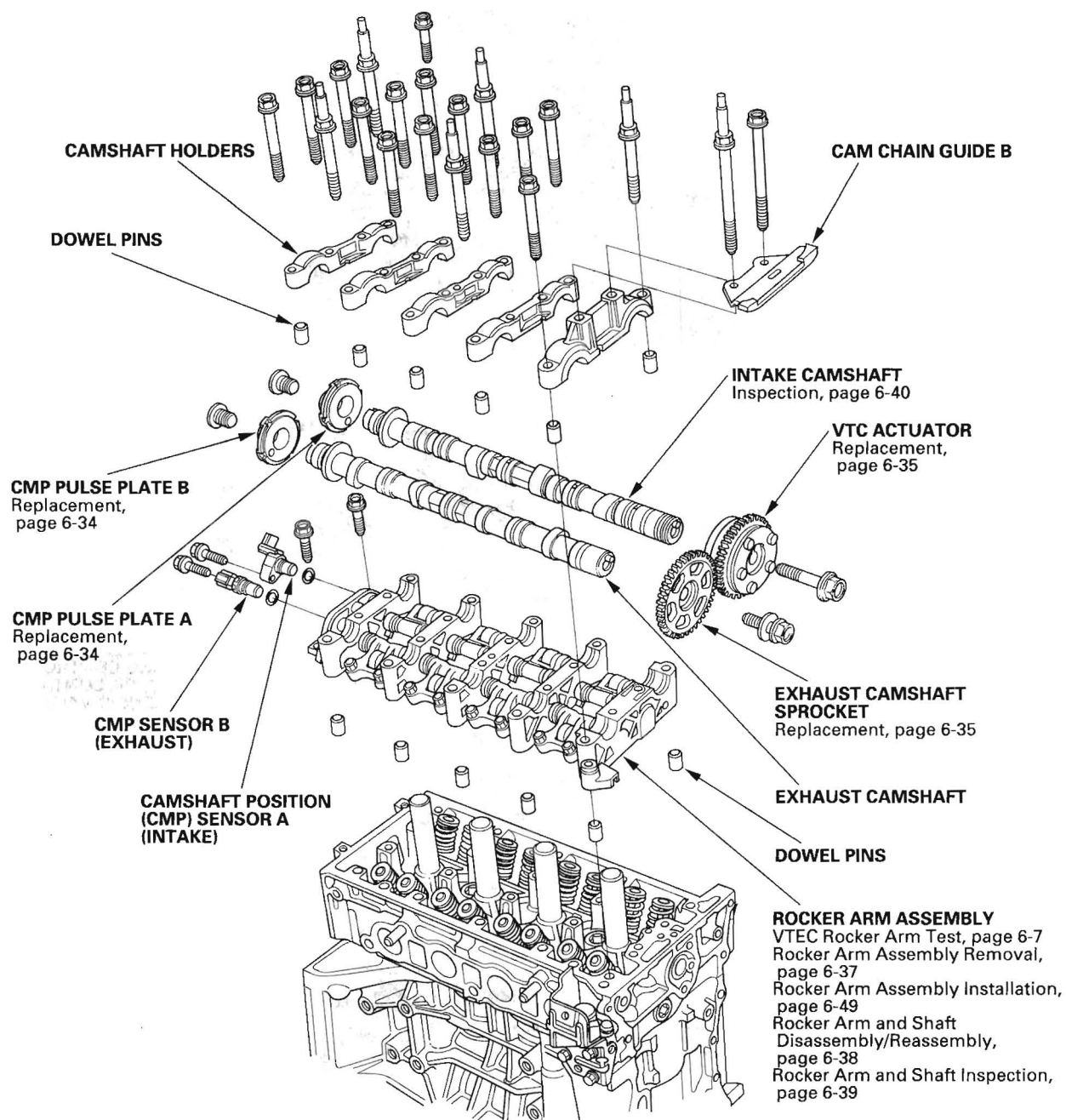
Component Location Index

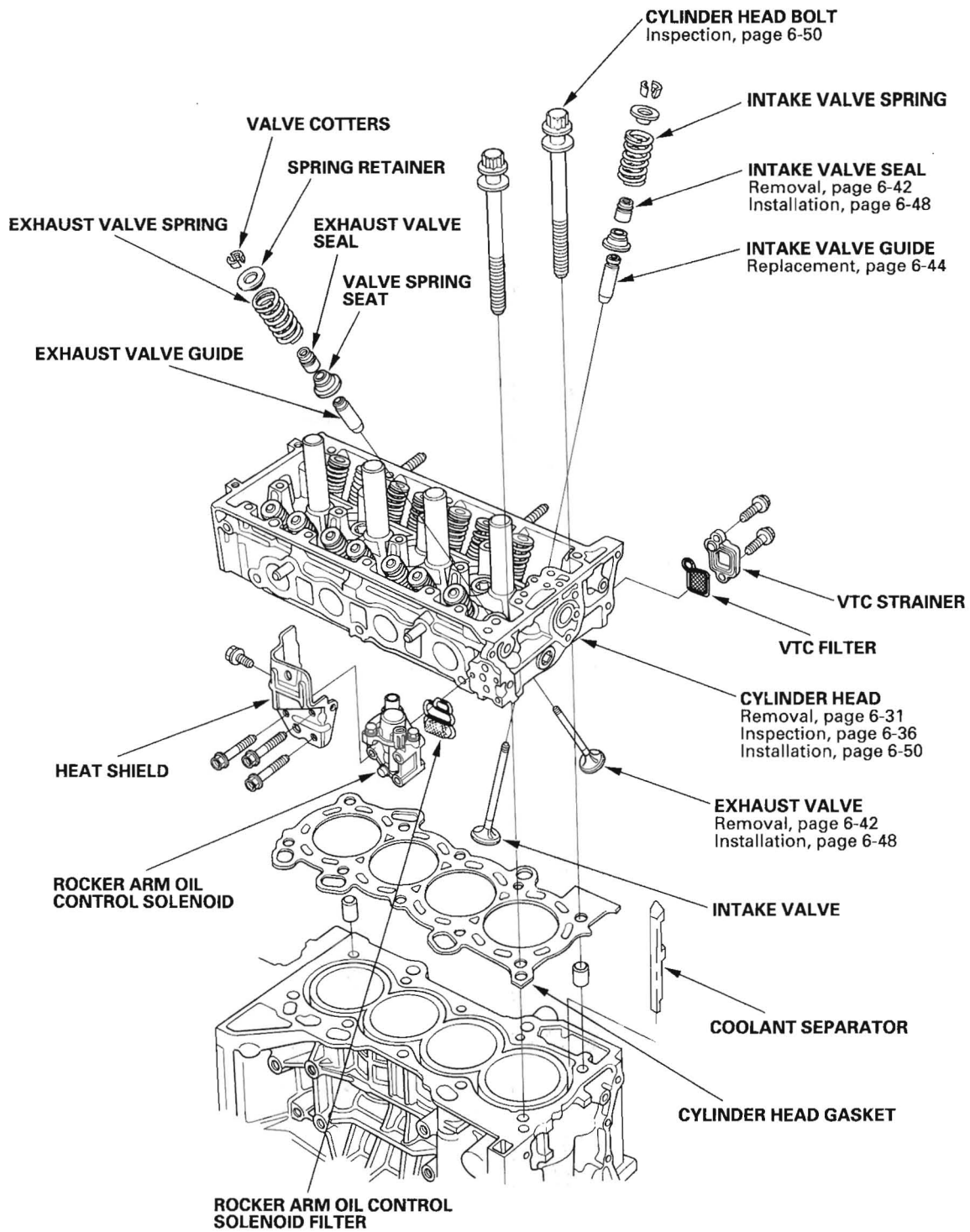


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Cylinder Head

Component Location Index (cont'd)



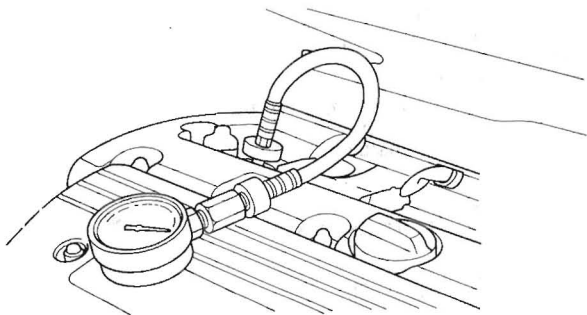


Cylinder Head

Engine Compression Inspection

NOTE: After this inspection, you must reset the powertrain control module (PCM), otherwise the PCM will continue to stop the injectors from functioning. Select PCM reset using the Honda Diagnostic System (HDS) (see page 11-4).

1. Warm up the engine to normal operating temperature (cooling fan comes on).
2. Turn the ignition switch OFF.
3. Connect the HDS to the data link connector (DLC) (see step 2 on page 11-3).
4. Turn the ignition switch ON (II).
5. Make sure the HDS communicate, with the vehicle and the PCM. If it doesn't communicate, troubleshoot the DLC circuit (see page 11-197).
6. Select PGM-FI, INSPECTION, then ALL INJECTORS OFF on the HDS.
7. Remove the four ignition coils (see page 4-19).
8. Remove the four spark plugs.
9. Attach the compression gauge to the spark plug hole.



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

Compression Pressure:

Above 930 kPa (9.5 kgf/cm², 135 psi)

11. Measure the compression on the remaining cylinders.

Maximum Variation:

Within 200 kPa (2.0 kgf/cm², 28 psi)

12. 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
13. Select the PCM reset (see page 11-4) to cancel the ALL INJECTORS OFF function on the HDS.

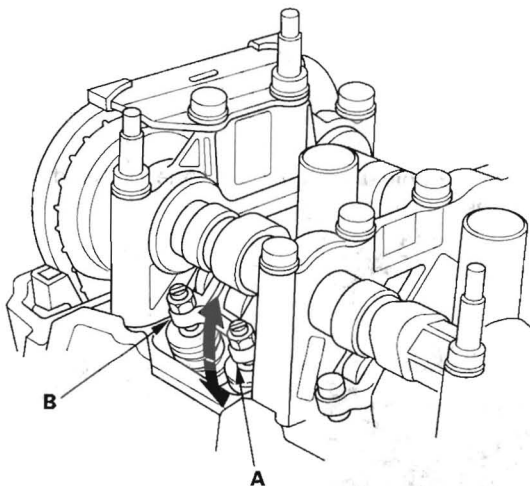


VTEC Rocker Arm Test

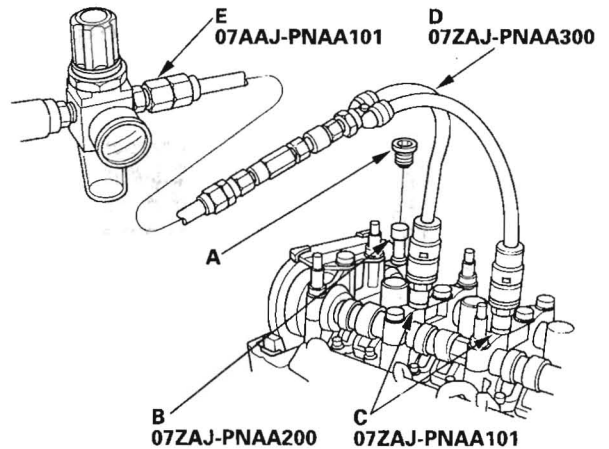
Special Tools Required

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

1. Start the engine, and let it run for 5 minutes, then turn the ignition switch OFF.
2. Remove the cylinder head cover (see page 6-29).
3. Set the No. 1 piston at top dead center (TDC) (see step 5 on page 6-13).
4. Verify that the intake primary rocker arm (A) moves independently of the intake secondary rocker arm (B).
 - If the intake primary rocker arm does not move, remove the primary and secondary rocker arms as an assembly and check that the pistons in the secondary and primary rocker arms move smoothly (see page 6-39). If any rocker arm needs replacing, replace the primary and secondary rocker arms as an assembly, and test.
 - If the intake primary rocker arm moves freely, go to step 5.



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



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

(cont'd)

Cylinder Head

VTEC Rocker Arm Test (cont'd)

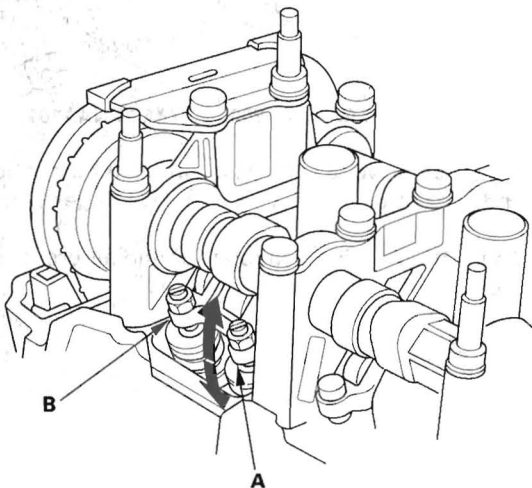
11. Loosen the valve on the regulator, and apply the specified air pressure.

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

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

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

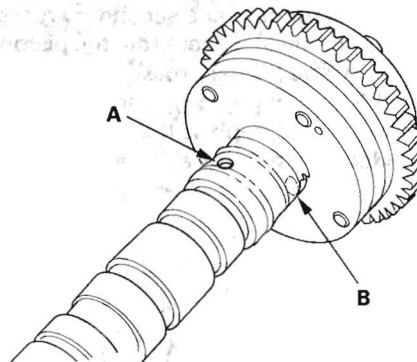
If the intake secondary rocker arm does not move, remove the primary and secondary rocker arms as an assembly, and check that the pistons in the primary and secondary rocker arms move smoothly. If any rocker arm needs replacing, replace the primary and secondary rocker arms as an assembly, and test.



13. Remove the special tools.
14. Tighten the camshaft holder mounting bolts to 22 N·m (2.2 kgf·m, 16 lbf·ft).
15. Tighten the sealing bolt to 20 N·m (2.0 kgf·m, 14 lbf·ft).
16. Install the cylinder head cover (see page 6-30).

VTC Actuator Inspection

1. Remove the cam chain (see page 6-13).
2. Loosen the rocker arm adjusting screws (see step 2 on page 6-37).
3. Remove the camshaft holder (see step 3 on page 6-37).
4. Remove the intake camshaft.
5. Check that the variable valve timing control (VTC) actuator is locked by turning the VTC actuator counterclockwise. If not locked, turn the VTC actuator clockwise until it stops, then recheck it. If it is still not locked, replace the VTC actuator.
6. Seal the advance holes (A) and retard holes (B) in the No. 1 camshaft journal with tape.

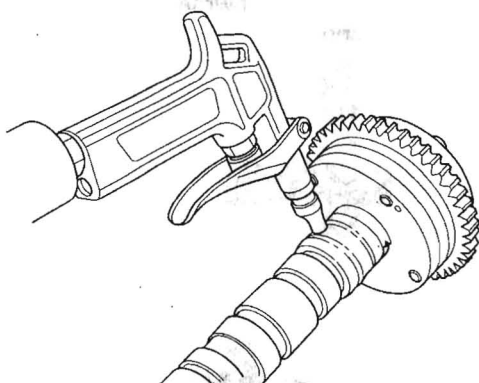


7. Punch a hole in the tape over one of the advance holes.

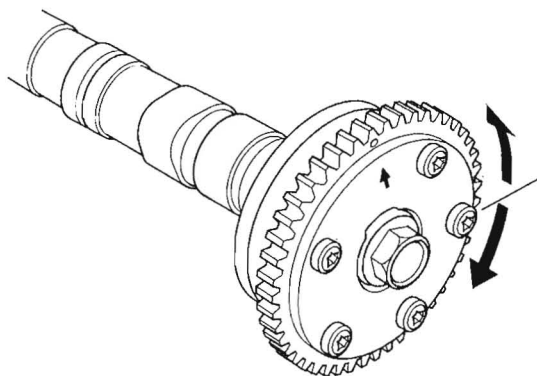


Valve Clearance Adjustment

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



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



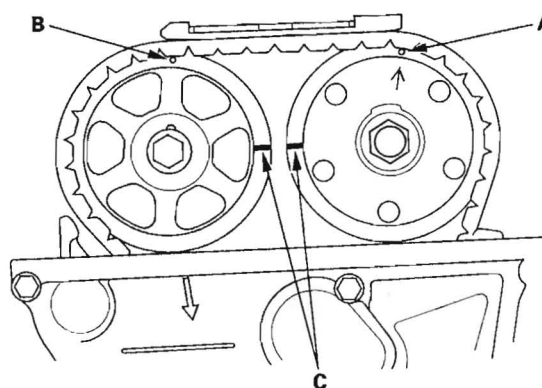
10. Remove the tape and adhesive residue from the camshaft journal.
11. Make sure the punch marks on the VTC actuator and exhaust camshaft sprocket are facing up, then set the camshafts in the head (see step 6 on page 6-49).
12. Set the camshaft holders and chain guide B in place (see step 7 on page 6-49).
13. Tighten the camshaft holder bolts to the specified torque (see step 8 on page 6-49).
14. Hold the camshaft, and turn the VTC actuator clockwise until you hear it click. Make sure to lock the VTC actuator by turning it.
15. Install the cam chain (see page 6-16).
16. Adjust the valve clearance (see page 6-9).

Special Tools Required

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

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

1. Remove the cylinder head cover (see page 6-29).
2. Set the No. 1 piston at top dead center (TDC). The punch mark (A) on the variable valve timing control (VTC) actuator and the punch mark (B) on the exhaust camshaft sprocket should be at the top. Align the TDC marks (C) on the VTC actuator and exhaust camshaft sprocket.



(cont'd)

Cylinder Head

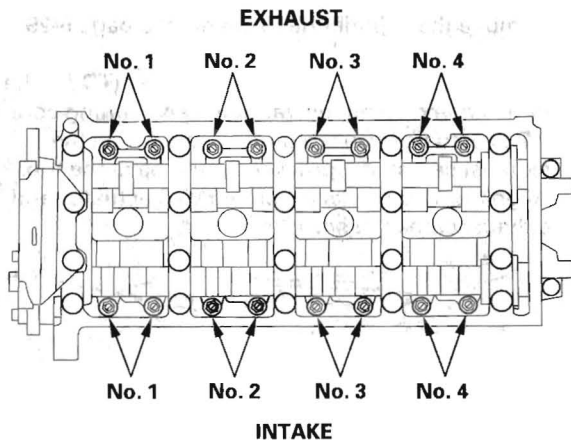
Valve Clearance Adjustment (cont'd)

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

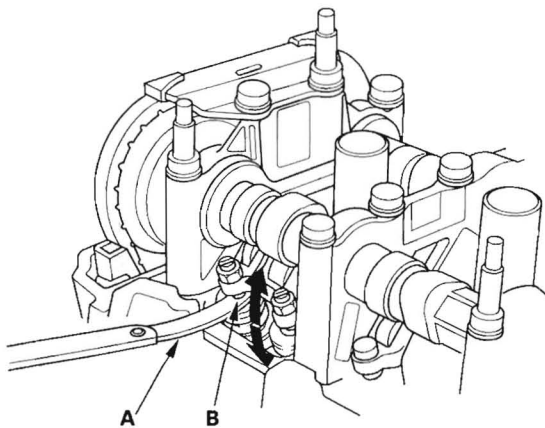
Valve Clearance

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

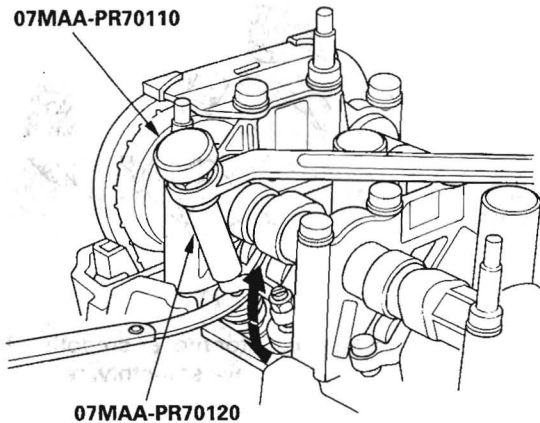
Exhaust: 0.28–0.32 mm (0.011–0.013 in.)



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



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



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

Specified Torque

Intake:

7 x 0.75 mm

20 N·m (2.0 kgf·m, 14 lbf·ft)

Apply engine oil to the nut threads.

Exhaust:

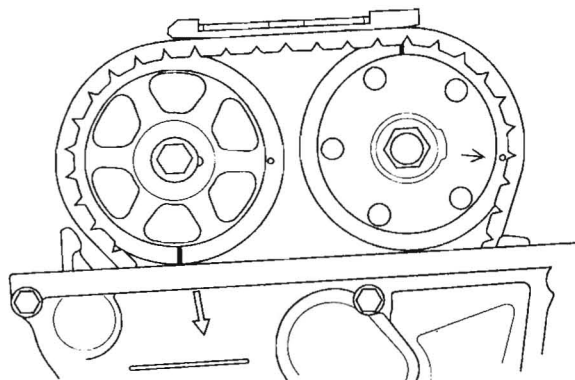
7 x 0.75 mm

14 N·m (1.4 kgf·m, 10 lbf·ft)

Apply engine oil to the nut threads.

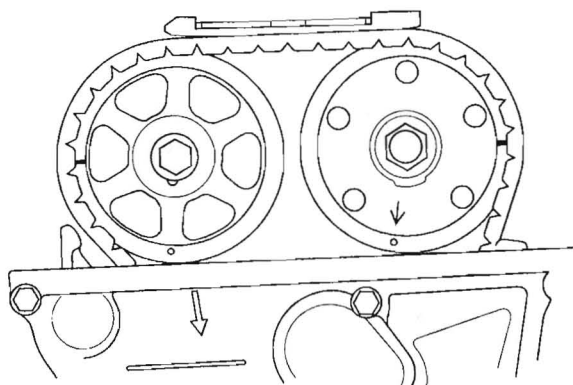


7. Rotate the crankshaft 180 ° clockwise (camshaft pulley turns 90 °).



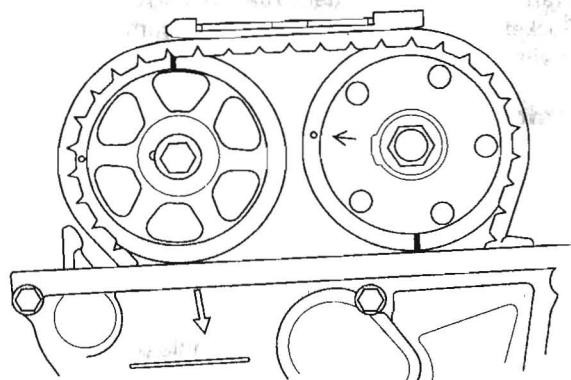
8. Check and, if necessary, adjust the valve clearance on No. 3 cylinder.

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



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

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



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

13. Install the cylinder head cover (see page 6-30).

Cylinder Head

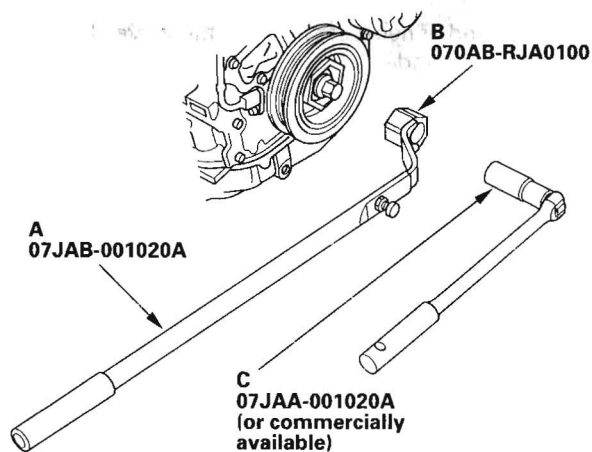
Crankshaft Pulley Removal and Installation

Special Tools Required

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

Removal

1. Remove the front wheels.
2. Remove the splash shield (see step 21 on page 5-5).
3. Remove the drive belt (see page 4-29).
4. Hold the pulley with holder handle (A) and holder attachment (B).

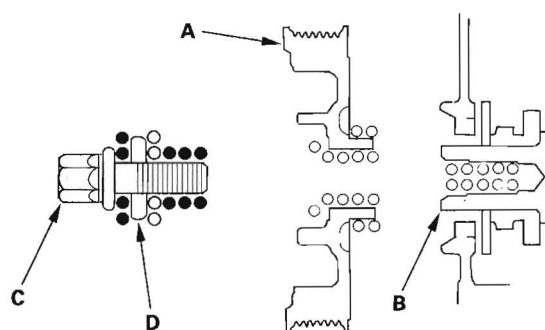


5. Remove the bolt with a 19 mm socket (C) and breaker bar, then remove the crankshaft pulley.

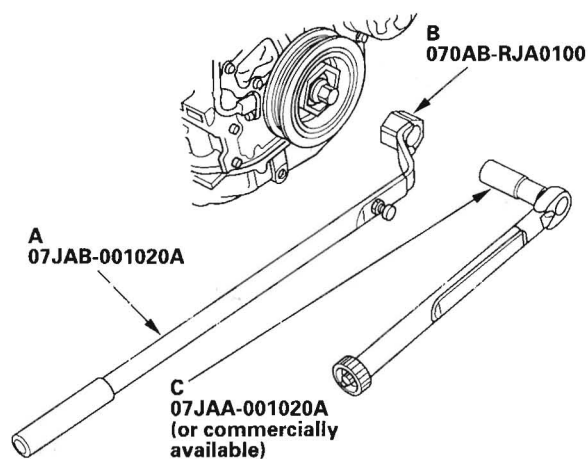
Installation

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

- : Clean
●: Lubricate



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



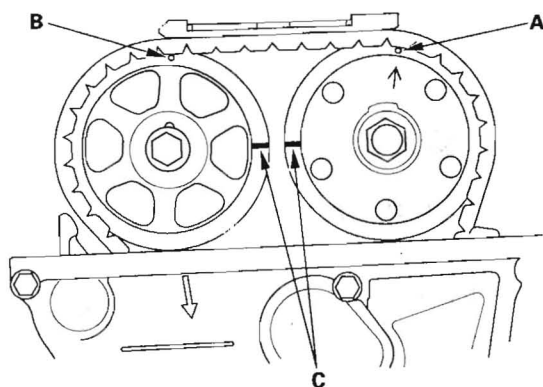
3. Tighten the bolt to 49 N·m (5.0 kgf·m, 36 lbf·ft) with a torque wrench and 19 mm socket (C). Do not use an impact wrench.
4. Tighten the pulley bolt an additional 90°.
5. Install the drive belt (see page 4-29).
6. Install the splash shield (see step 34 on page 5-18).
7. Install the front wheels.



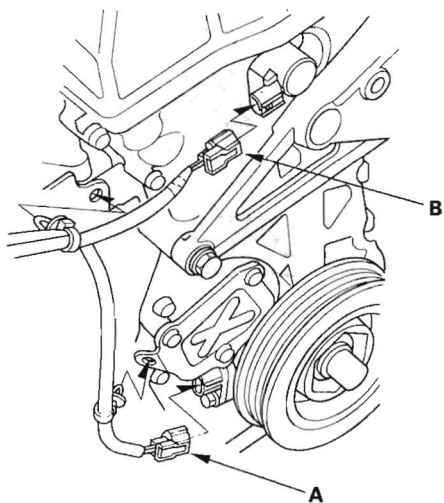
Cam Chain Removal

NOTE: Keep the cam chain away from magnetic fields.

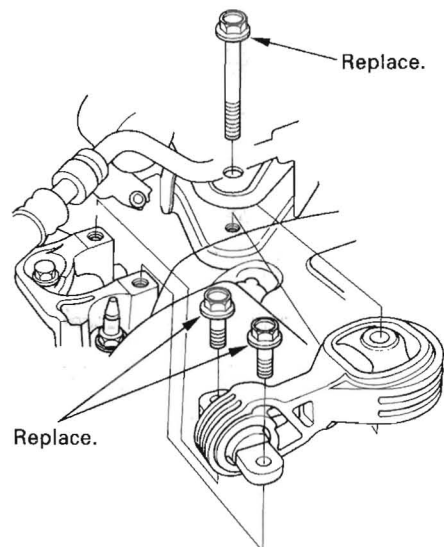
1. Remove the front wheels.
2. Remove the splash shield (see step 21 on page 5-5).
3. Remove the drive belt (see page 4-29).
4. Remove the cylinder head cover (see page 6-29).
5. Set the No. 1 piston at top dead center (TDC). The punch mark (A) on the variable valve timing control (VTC) actuator and the punch mark (B) on the exhaust camshaft sprocket should be at the top. Align the TDC marks (C) on the VTC actuator and exhaust camshaft sprocket.



6. Disconnect the crankshaft position (CKP) sensor connector (A) and VTC oil control solenoid valve connector (B).



7. Remove the VTC oil control solenoid valve (see page 11-284).
8. Remove the crankshaft pulley (see page 6-12).
9. Support the engine with a jack and a wood block under the oil pan.
10. Remove the upper torque rod.

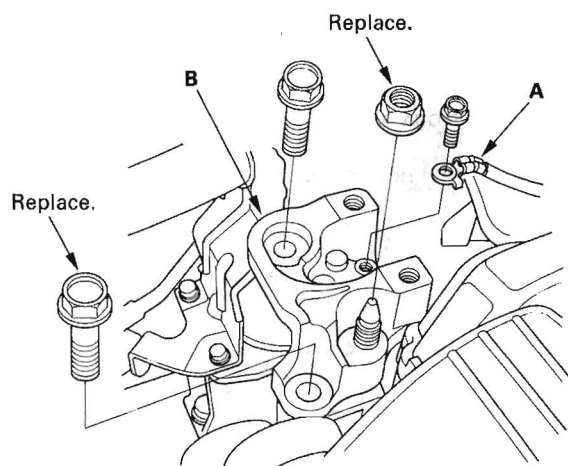


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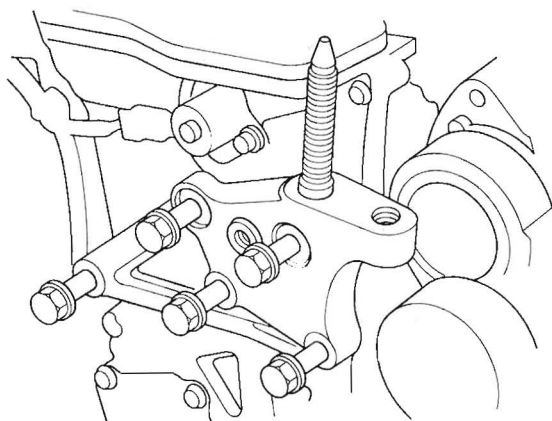
Cylinder Head

Cam Chain Removal (cont'd)

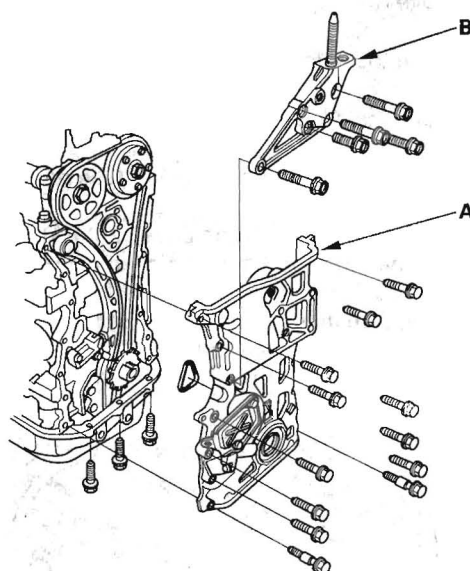
11. Remove the ground cable (A), then remove the side engine mount bracket (B).



12. Remove the side engine mount bracket mounting bolts.

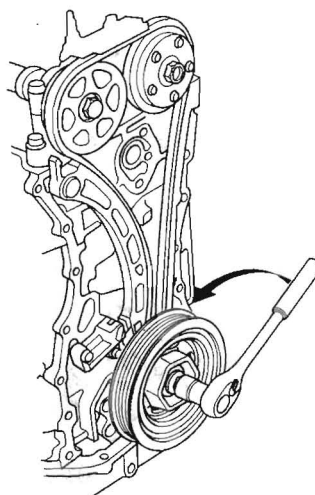


13. Remove the cam chain case (A) and side engine mount bracket (B).



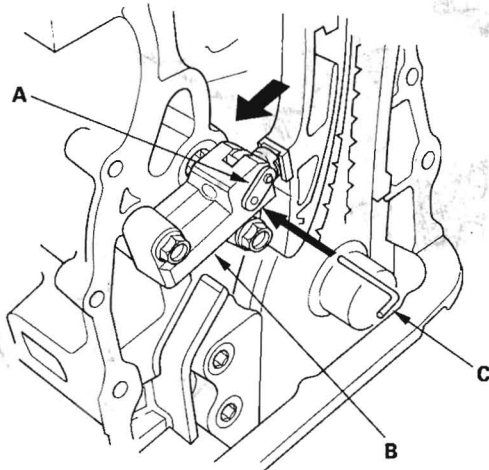
14. Loosely install the crankshaft pulley.

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

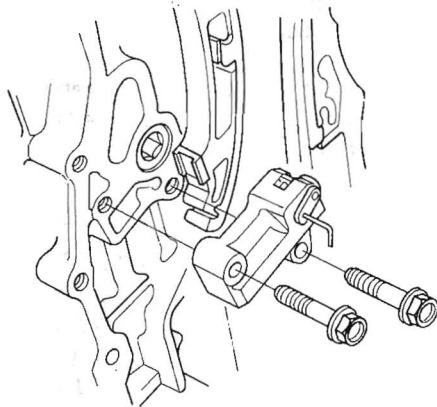




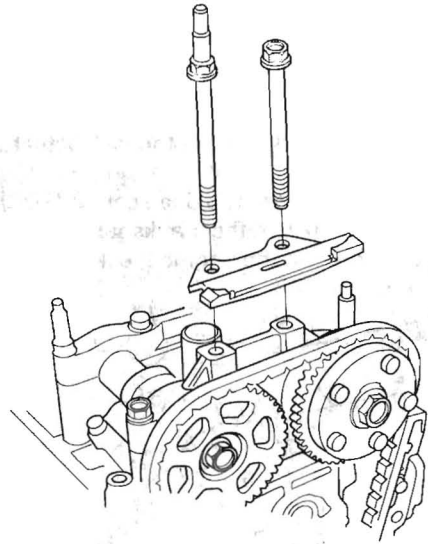
16. Align the holes on the lock (A) and the auto-tensioner (B), then insert a 1.2 mm (0.05 in.) diameter pin or lock pin (P/N 14511-PNA-003) (C) into the holes. Turn the crankshaft clockwise to secure the pin.



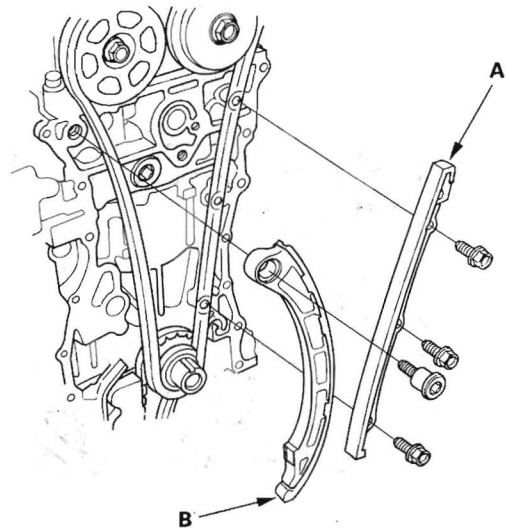
17. Remove the auto-tensioner.



18. Remove cam chain guide B.



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



20. Remove the cam chain.

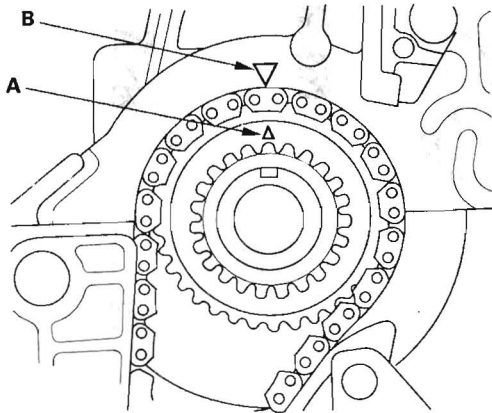
Cylinder Head

Cam Chain Installation

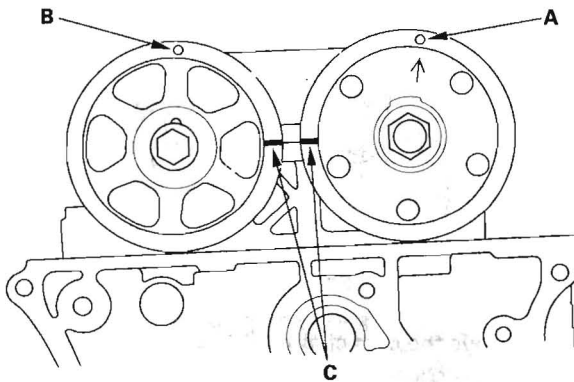
NOTE:

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

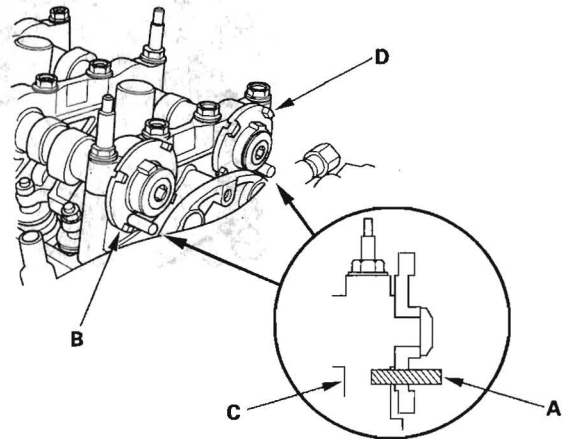
1. Set the crankshaft to top dead center (TDC). Align the TDC mark (A) on the crankshaft sprocket with the pointer (B) on the engine block.



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

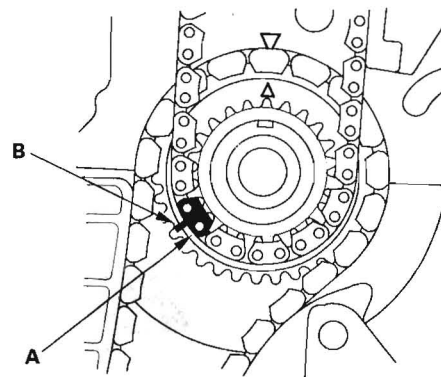


3. To hold the intake camshaft, insert a change detent arm shaft (P/N 24635-P6H-003) (A) into the maintenance hole in the camshaft position (CMP) pulse plate A (B) and through No. 5 rocker shaft holder (C).



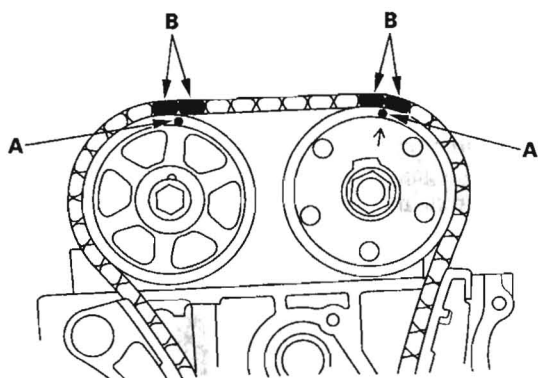
4. To hold the exhaust camshaft, insert a change detent arm shaft (P/N 24635-P6H-003) (A) into the maintenance hole in the CMP pulse plate B (D) and through No. 5 rocker shaft holder (C).

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

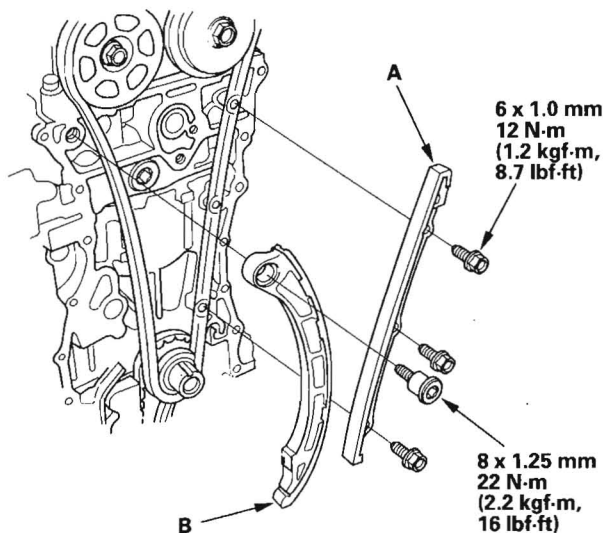




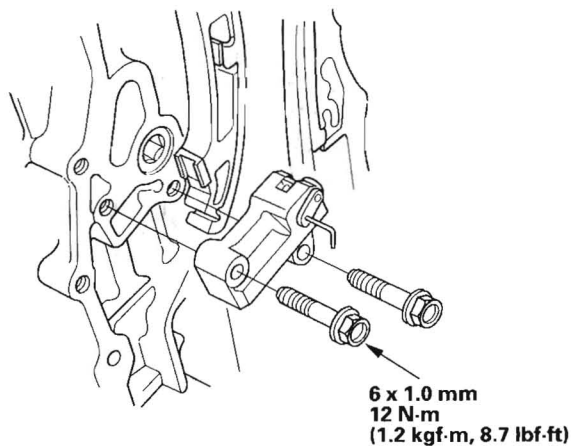
6. Install the cam chain on the VTC actuator and the exhaust camshaft sprocket with the punch marks (A) aligned with the center of the two colored link plates (B).



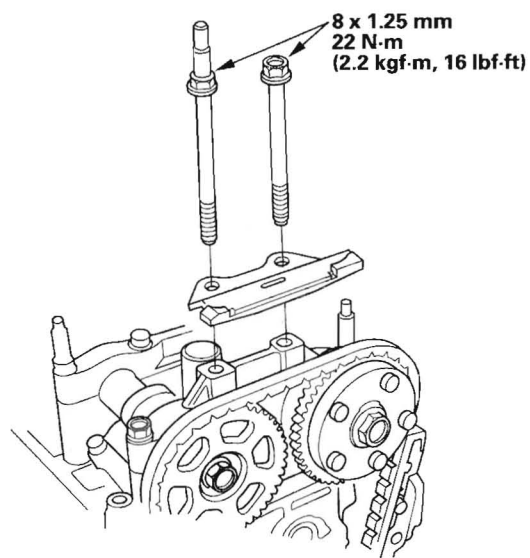
7. Install cam chain guide A and tensioner arm (B).



8. Install the auto-tensioner.



9. Install cam chain guide B.

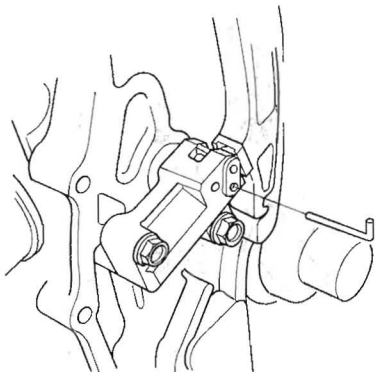


(cont'd)

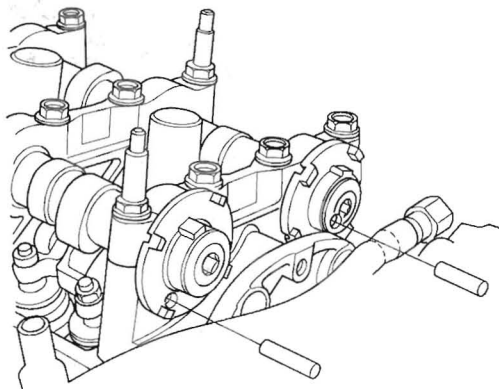
Cylinder Head

Cam Chain Installation (cont'd)

10. Remove the pin or lock pin (P/N 14511-PNA-003) from the auto-tensioner.



11. Remove the change detent arm shafts (P/N 24635-P6H-003).

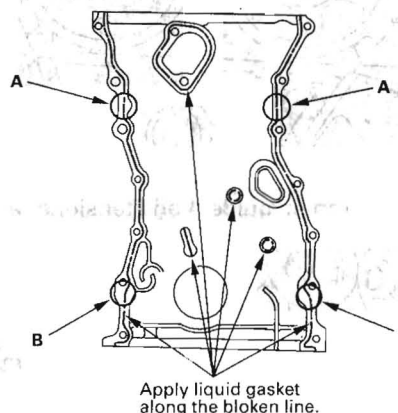


12. Check the chain case oil seal for damage. If the oil seal is damaged, replace the chain case oil seal (see page 6-24).
13. Remove old liquid gasket from the chain case mating surfaces, bolts, and bolt holes.
14. Clean and dry the chain case mating surfaces.

15. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the engine block mating surface of the chain case. 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.

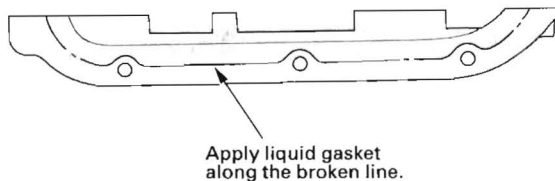


16. Apply liquid gasket to the engine block upper surface contact areas (A) on the chain case and lower block upper surface contact areas (B) on the chain case.

17. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the oil pan mating surface of the chain case. 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.

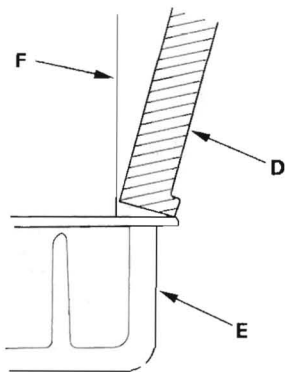
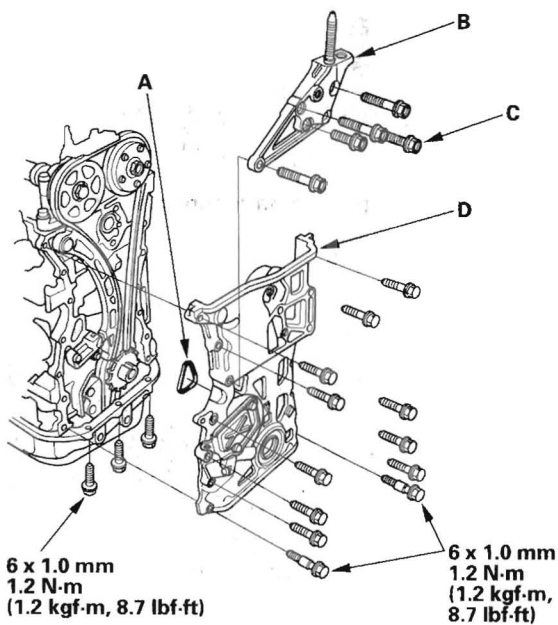




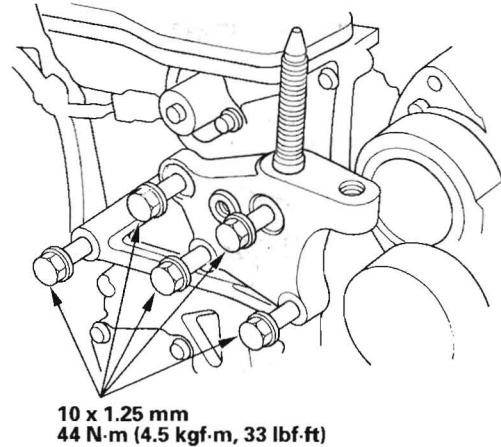
18. Install the new O-ring (A), side engine mount bracket (B), and mounting bolts (C) on the chain case. Set the edge of the chain case (D) to the edge of the oil pan (E), then install the chain case on the engine block (F). Wipe off the excess liquid gasket on the oil pan and chain case mating area.

NOTE:

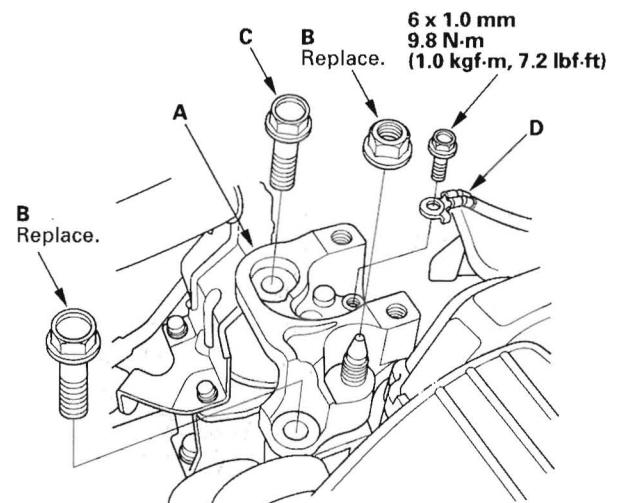
- When installing the chain case, do not slide the bottom surface onto the oil pan mounting surface.
- Wait at least 30 minutes before filling the engine with oil.
- Do not run the engine for at least 3 hours after installing the chain case.



19. Tighten the side engine mount bracket mounting bolts.



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



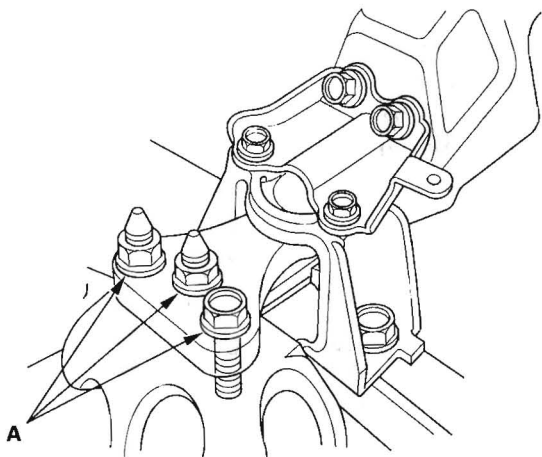
21. Install the ground cable (D).

(cont'd)

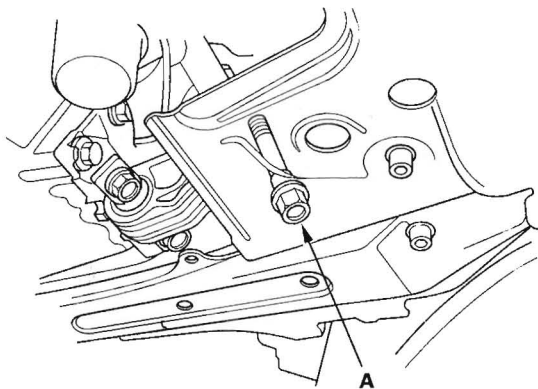
Cylinder Head

Cam Chain Installation (cont'd)

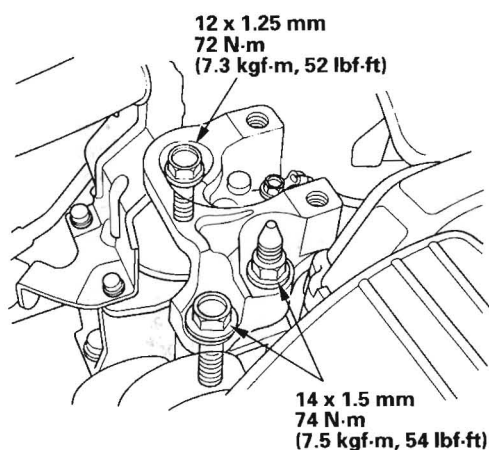
22. Remove the air cleaner housing assembly (see page 11-340).
23. Loosen the transmission mounting bolt and nuts (A).



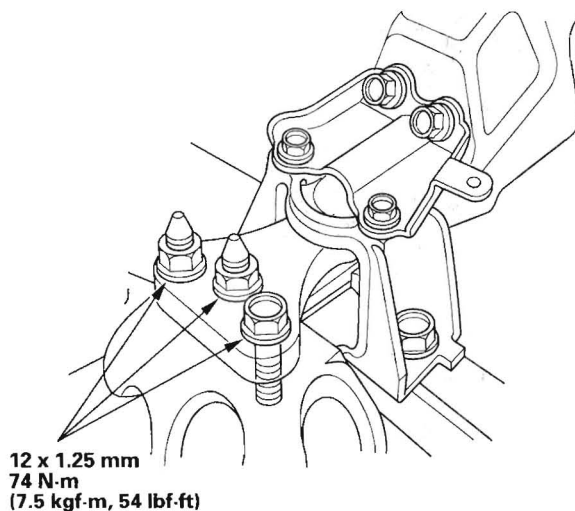
24. Raise the lift to full height.
25. Loosen the lower torque rod mounting bolt (A).



26. Lower the vehicle on the lift.
27. Tighten the side engine mount mounting bolts and nut.



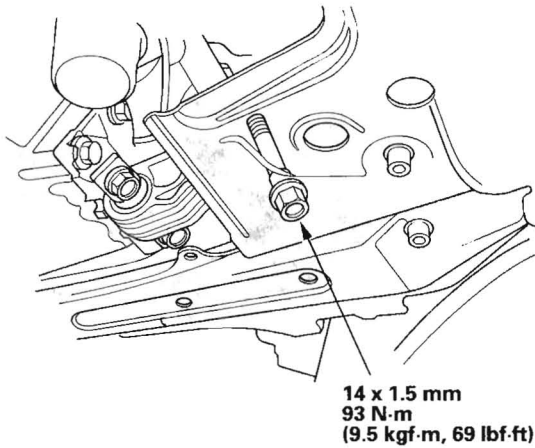
28. Tighten the transmission mounting bolt and nuts.





29. Raise the lift to full height.

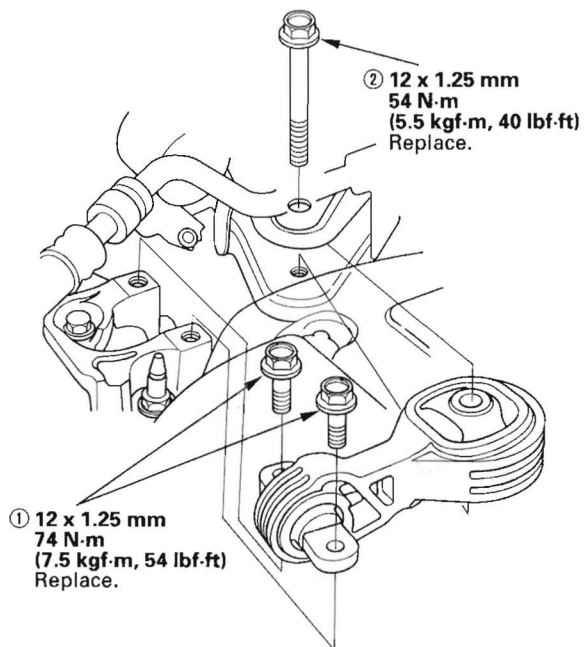
30. Tighten the lower torque rod mounting bolt.



31. Lower the vehicle on the lift.

32. Install the air cleaner housing assembly (see page 11-340).

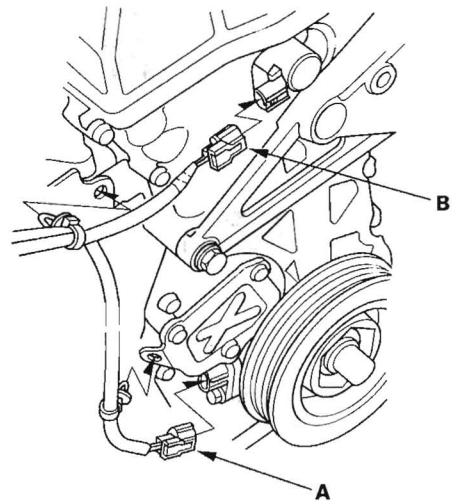
33. Install the upper torque rod, then tighten the new upper torque rod mounting bolts in the numbered sequence shown.



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

35. Install the VTC oil control solenoid valve (see page 11-284).

36. Connect the crankshaft position (CKP) sensor connector (A) and VTC oil control solenoid valve connector (B).



37. Install the cylinder head cover (see page 6-30).

38. Install the drive belt (see page 4-29).

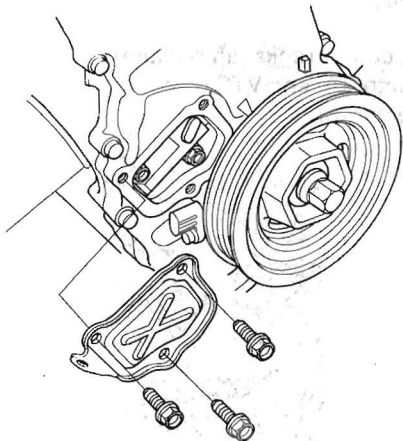
39. Do the CKP pattern clear/CKP learn procedure (see page 11-4).

Cylinder Head

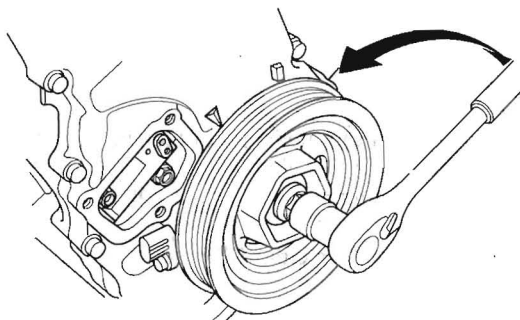
Auto-tensioner Removal and Installation

Removal

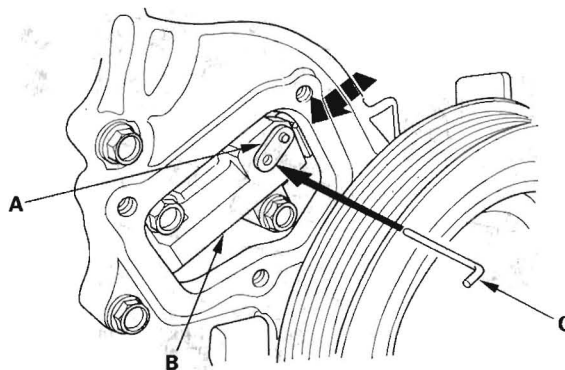
1. Remove the chain case cover.



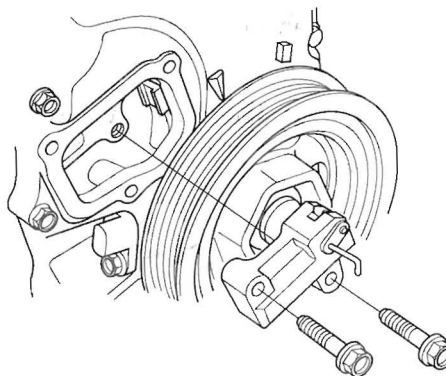
2. Turn the crankshaft counterclockwise to compress the auto-tensioner.



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



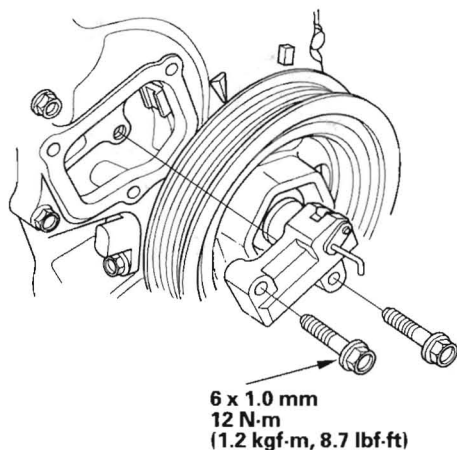
4. Remove the auto-tensioner.



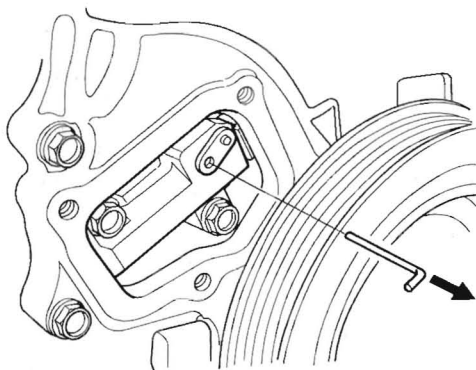


Installation

1. Install the auto-tensioner.



2. Remove the pin or lock pin (P/N 14511-PNA-003) from the auto-tensioner.

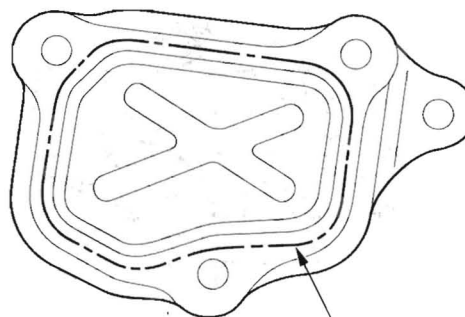


3. Remove old liquid gasket from the chain case cover mating surfaces, bolts, and bolt holes.
4. Clean and dry the chain case cover mating surfaces.

5. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the chain case mating surface of the chain case 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.

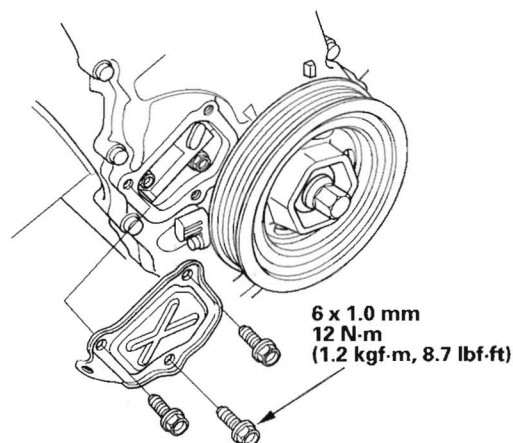


Apply liquid gasket
along the broken line.

6. Install the chain case cover.

NOTE:

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



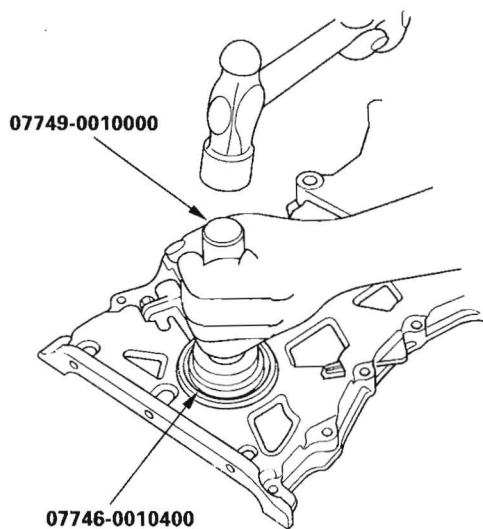
Cylinder Head

Chain Case Oil Seal Installation

Special Tools Required

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

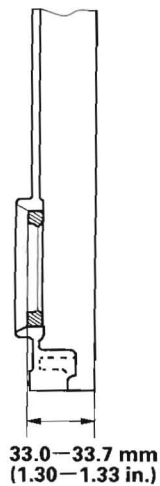
1. Use the driver and attachment to drive a new oil seal squarely into the chain case to the specified installed height.



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

Oil Seal Installed Height:

33.0—33.7 mm (1.30—1.33 in.)





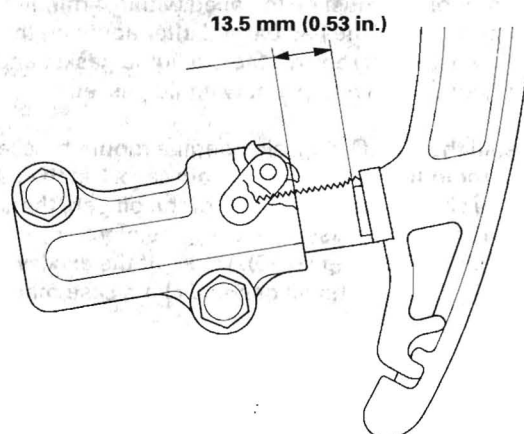
Cam Chain Inspection

1. Remove the front wheels.
2. Remove the splash shield (see step 21 on page 5-5).
3. Remove the drive belt (see page 4-29).
4. Remove the cylinder head cover (see page 6-29).
5. Set the No. 1 piston at top dead center (TDC). The punch mark on the variable valve timing control (VTC) actuator and the punch mark on the exhaust camshaft sprocket should be at the top. Align the TDC marks on the VTC actuator and exhaust camshaft sprocket (see step 5 on page 6-13).
6. Disconnect the crankshaft position (CKP) sensor connector and VTC oil control solenoid valve connector (see step 6 on page 6-13).
7. Remove the VTC oil control solenoid valve (see page 11-284).
8. Remove the crankshaft pulley (see page 6-12).
9. Support the engine with a jack and a wood block under the oil pan.
10. Remove the upper torque rod (see step 10 on page 6-13).
11. Remove the ground cable, then remove the side engine mount bracket (see step 11 on page 6-14).
12. Remove the side engine mount bracket mounting bolts (see step 12 on page 6-14).
13. Remove the cam chain case and side engine mount bracket (see step 13 on page 6-14).

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

Tensioner Rod Length

Service Limit: 13.5 mm (0.53 in.)



15. Check the chain case oil seal for damage. If the oil seal is damaged, replace the chain case oil seal (see page 6-24).
16. Remove all of the old liquid gasket from the chain case mating surfaces, bolts, and bolt holes.
17. Clean and dry the chain case mating surfaces.
18. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the engine block mating surface of the chain case. Install the component within 5 minutes of applying the liquid gasket (see step 15 on page 6-18).

NOTE:

- If you apply liquid gasket P/N 08718-0012, the component must be installed within 4 minutes.
 - If too much time has passed after applying the liquid gasket, remove the old liquid gasket and residue, then reapply new liquid gasket.
19. Apply liquid gasket to the engine block upper surface contact areas on the chain case and lower block upper surface contact areas on the chain case (see step 16 on page 6-18).

(cont'd)

Cylinder Head

Cam Chain Inspection (cont'd)

20. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the oil pan mating surface of the chain case. Install the component within 5 minutes of applying the liquid gasket (see step 17 on page 6-18).

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.

21. Install the new O-ring, side engine mount bracket, and mounting bolts on the chain case. Set the edge of the chain case to the edge of the oil pan, then install the chain case on the engine block (see step 18 on page 6-19). Wipe off the excess liquid gasket on the oil pan and chain case mating area.

NOTE:

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

22. Tighten the side engine mount bracket mounting bolts (see step 19 on page 6-19).
23. Install the side engine mount bracket, then loosely tighten the new bolt and nut, and loosely tighten the bolt. Install the ground cable (see step 20 on page 6-19).
24. Remove the air cleaner housing assembly (see page 11-340).
25. Loosen the transmission mounting bolt and nuts (see step 23 on page 6-20).
26. Raise the lift to full height.
27. Loosen the lower torque rod mounting bolt (see step 25 on page 6-20).
28. Lower the vehicle on the lift.
29. Tighten the side engine mount mounting bolts and nut (see step 27 on page 6-20).
30. Tighten the transmission mounting bolt and nuts (see step 28 on page 6-20).

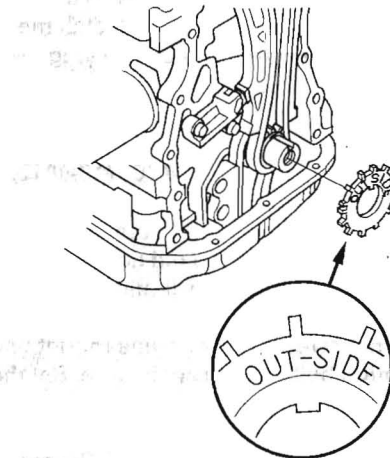
31. Raise the lift to full height.
32. Tighten the lower torque rod mounting bolt (see step 30 on page 6-21).
33. Lower the vehicle on the lift.
34. Install the air cleaner housing assembly (see page 11-340).
35. Install the upper torque rod, then tighten the new upper torque rod mounting bolts in the numbered sequence shown (see step 33 on page 6-21).
36. Install the VTC oil control solenoid valve (see page 11-284).
37. Connect the CKP sensor connector and VTC oil control solenoid valve connector (see step 36 on page 6-21).
38. Install the crankshaft pulley (see page 6-12).
39. Install the cylinder head cover (see page 6-30).
40. Install the drive belt (see page 4-29).
41. Do the CKP pattern clear/CKP learn procedure (see page 11-4).



CKP Pulse Plate Replacement

1. Remove the front wheels.
2. Remove the splash shield (see step 21 on page 5-5).
3. Remove the drive belt (see page 4-29).
4. Remove the cylinder head cover (see page 6-29).
5. Set the No. 1 piston at top dead center (TDC). The punch mark on the variable valve timing control (VTC) actuator and the punch mark on the exhaust camshaft sprocket should be at the top. Align the TDC marks on the VTC actuator and exhaust camshaft sprocket (see step 5 on page 6-13).
6. Disconnect the crankshaft position (CKP) sensor connector and VTC oil control solenoid valve connector (see step 6 on page 6-13).
7. Remove the VTC oil control solenoid valve (see page 11-284).
8. Remove the crankshaft pulley (see page 6-12).
9. Support the engine with a jack and a wood block under the oil pan.
10. Remove the upper torque rod (see step 10 on page 6-13).
11. Remove the ground cable, then remove the side engine mount bracket (see step 11 on page 6-14).
12. Remove the side engine mount bracket mounting bolts (see step 12 on page 6-14).
13. Remove the cam chain case and side engine mount bracket (see step 13 on page 6-14).

14. Remove the CKP pulse plate.



15. Install the CKP pulse plate.
16. Check the chain case oil seal for damage. If the oil seal is damaged, replace the chain case oil seal (see page 6-24).
17. Remove all of the old liquid gasket from the chain case mating surfaces, bolts, and bolt holes.
18. Clean and dry the chain case mating surfaces.
19. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the engine block mating surface of the chain case. Install the component within 5 minutes of applying the liquid gasket (see step 15 on page 6-18).

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.
20. Apply liquid gasket to the engine block upper surface contact areas on the chain case and lower block upper surface contact areas on the chain case (see step 16 on page 6-18).

(cont'd)

Cylinder Head

CKP Pulse Plate Replacement (cont'd)

21. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the oil pan mating surface of the chain case. Install the component within 5 minutes of applying the liquid gasket (see step 17 on page 6-18).

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.

22. Install the new O-ring, side engine mount bracket, and mounting bolts on the chain case. Set the edge of the chain case to the edge of the oil pan, then install the chain case on the engine block (see step 18 on page 6-19). Wipe off the excess liquid gasket on the oil pan and chain case mating area.

NOTE:

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

23. Tighten the side engine mount bracket mounting bolts (see step 19 on page 6-19).
24. Install the side engine mount bracket, then loosely tighten the new bolt and nut, and loosely tighten the bolt. Install the ground cable (see step 20 on page 6-19).
25. Remove the air cleaner housing assembly (see page 11-340).
26. Loosen the transmission mounting bolt and nuts (see step 23 on page 6-20).
27. Raise the lift to full height.
28. Loosen the lower torque rod mounting bolt (see step 25 on page 6-20).
29. Lower the vehicle on the lift.
30. Tighten the side engine mount mounting bolts and nut (see step 27 on page 6-20).

31. Tighten the transmission mounting bolt and nuts (see step 28 on page 6-20).

32. Raise the lift to full height.

33. Tighten the lower torque rod mounting bolt (see step 30 on page 6-21).

34. Lower the vehicle on the lift.

35. Install the air cleaner housing assembly (see page 11-340).

36. Install the upper torque rod, then tighten the new upper torque rod mounting bolts in the numbered sequence shown (see step 33 on page 6-21).

37. Install the VTC oil control solenoid valve (see page 11-284).

38. Connect the CKP sensor connector and VTC oil control solenoid valve connector (see step 36 on page 6-21).

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

40. Install the cylinder head cover (see page 6-30).

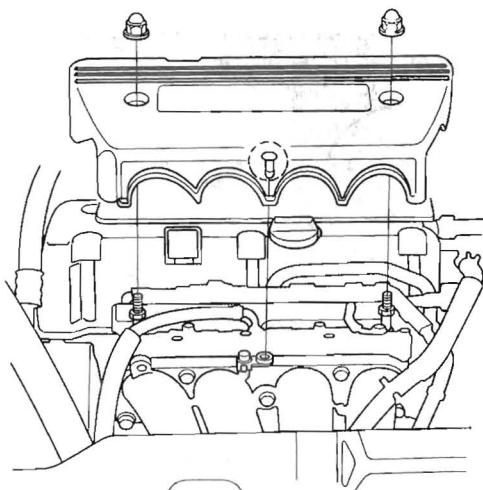
41. Install the drive belt (see page 4-29).

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

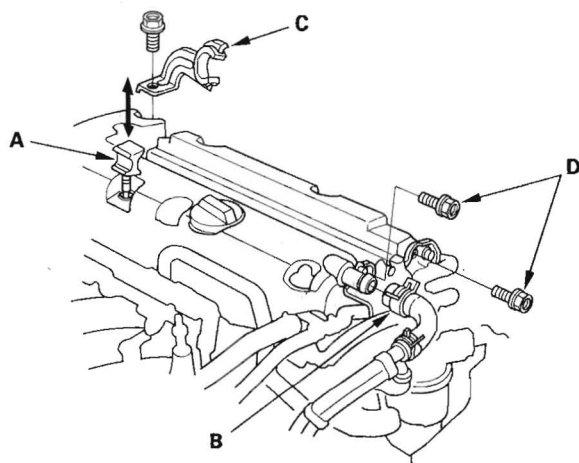


Cylinder Head Cover Removal

1. Remove the intake manifold cover.

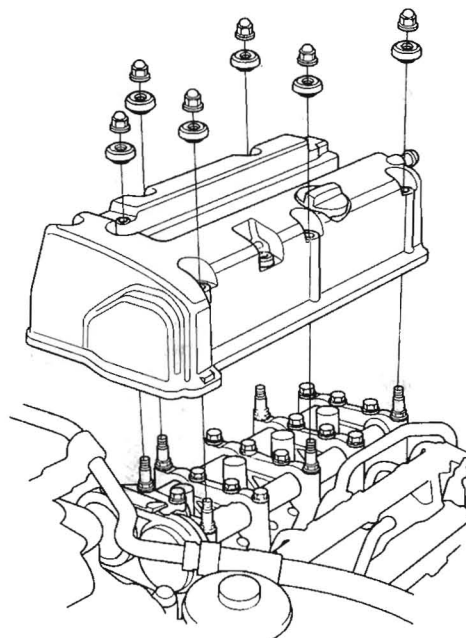


2. Remove the four ignition coils (see page 4-19).
3. Disconnect the evaporative emission (EVAP) canister purge valve connector.
4. Remove the dipstick (A), the breather hose (B), and power steering (P/S) hose clamp (C).



5. Remove two bolts (D) securing the EVAP canister purge valve bracket.

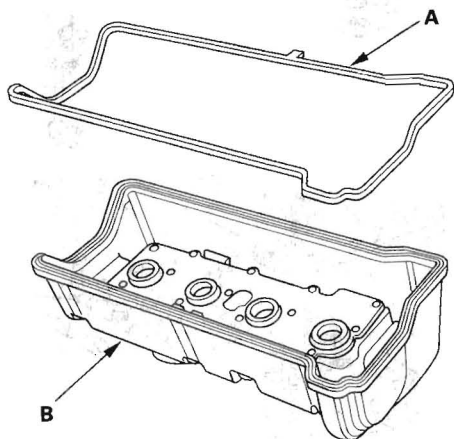
6. Remove the cylinder head cover.



Cylinder Head

Cylinder Head Cover Installation

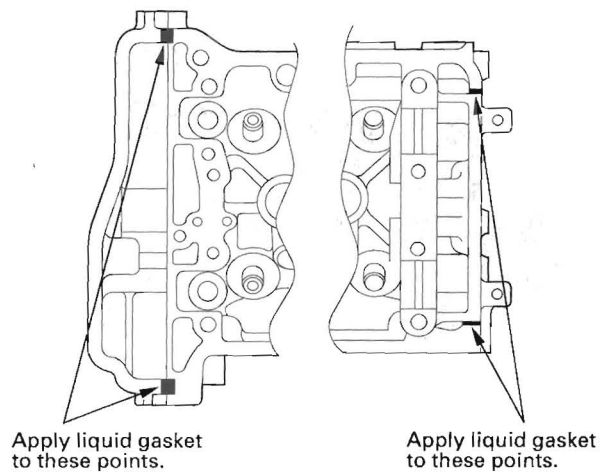
1. Thoroughly clean the head cover gasket and the groove.
2. Install the head cover gasket (A) in the groove of the cylinder head cover (B).



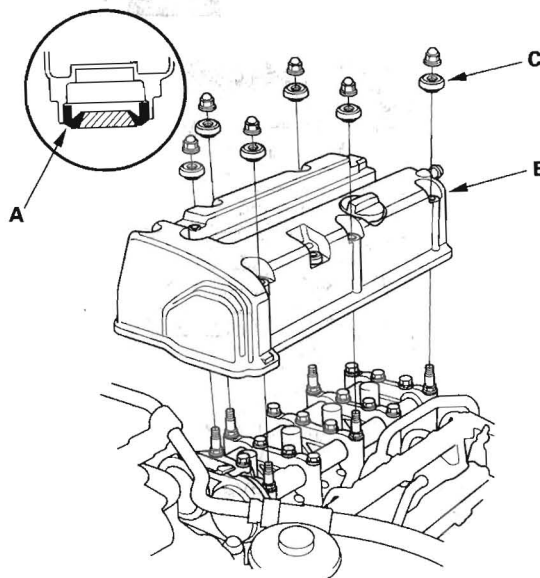
3. Check that the mating surfaces are clean and dry.
4. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, on the chain case and the No. 5 rocker shaft holder mating areas. Install the component within 5 minutes of applying the liquid gasket.

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.



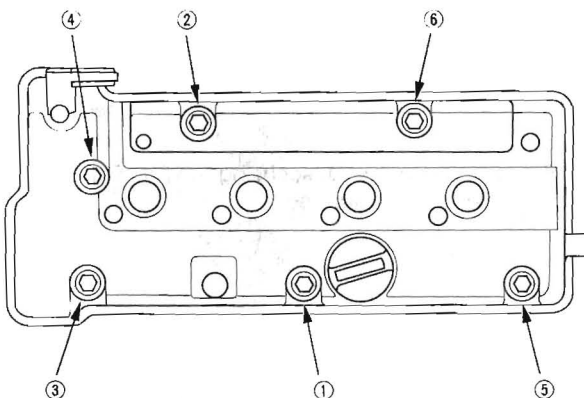
5. Set the spark plug seals (A) on the spark plug tubes. Place the cylinder head cover (B) on the cylinder head, then slide the cover slightly back and forth to seat the head cover gasket.



6. Inspect the cover washers (C). Replace any washer that is damaged or deteriorated.
7. Tighten the bolts in 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:

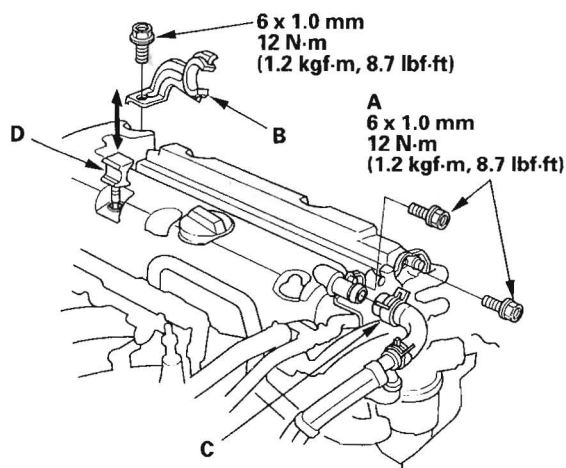
- Wait at least 30 minutes before filling the engine with oil.
- Do not run the engine for at least 3 hours after installing the head cover.



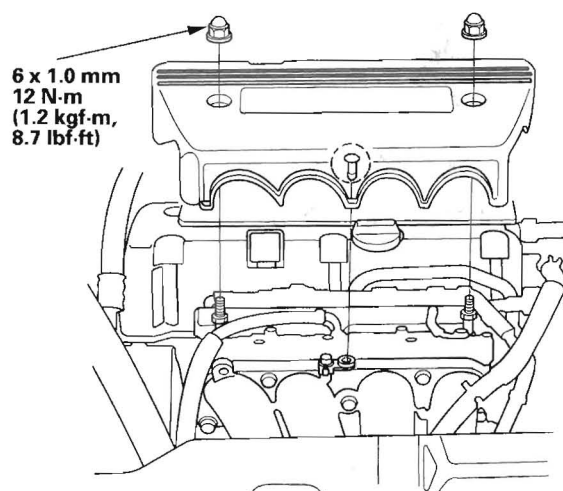


Cylinder Head Removal

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



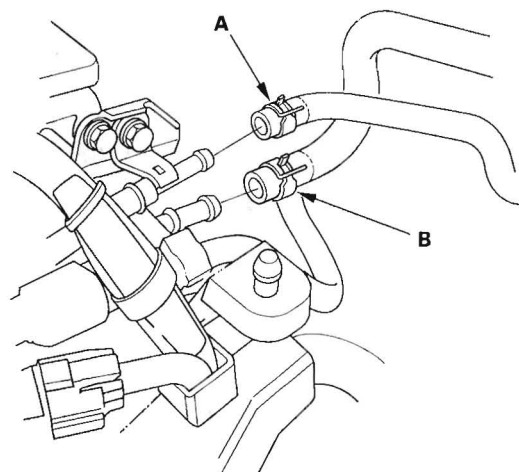
9. Install the power steering (P/S) hose clamp (B), breather hose (C), and the dipstick (D).
10. Connect the EVAP canister purge valve connector.
11. Install the four ignition coils. (see page 4-19).
12. Install the intake manifold cover.



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. Relieve fuel pressure (see page 11-317).
2. Drain the engine coolant (see page 10-6).
3. Remove the air cleaner housing (see page 11-340).
4. Remove the drive belt (see page 4-29).
5. Remove the intake manifold (see page 9-2).
6. Remove the exhaust manifold (see page 9-8).
7. Remove the evaporative emission (EVAP) canister hose (A) and brake booster vacuum hose (B).

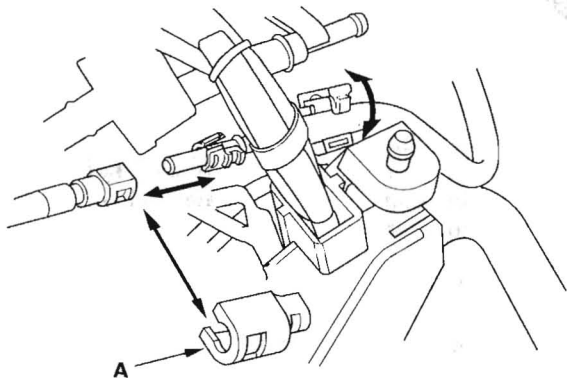


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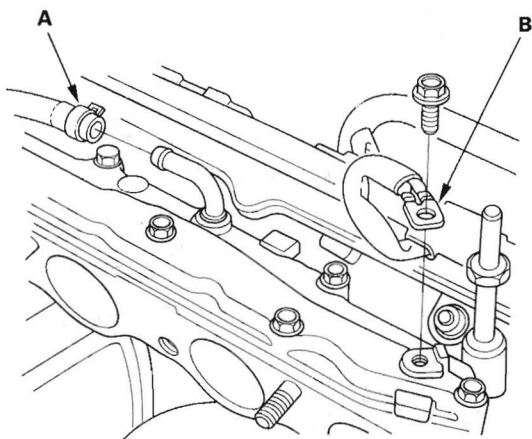
Cylinder Head

Cylinder Head Removal (cont'd)

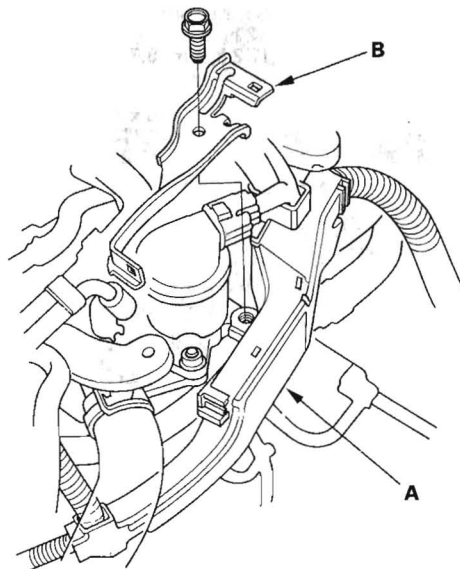
8. Remove the quick-connect fitting cover (A), then disconnect the fuel feed hose (see page 11-324).



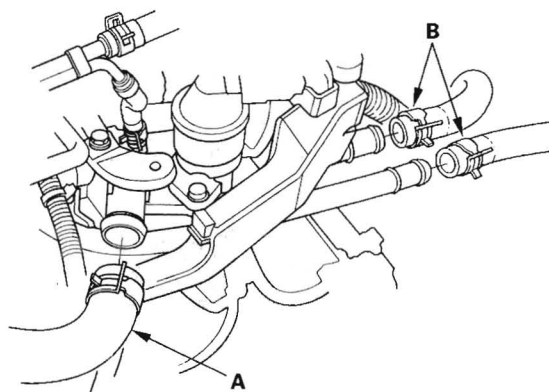
9. Remove the positive crankcase ventilation (PCV) hose (A) and ground cable (B).

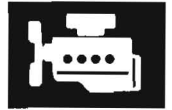


10. Remove the harness holder (A) from the bracket, then remove the harness holder bracket (B).

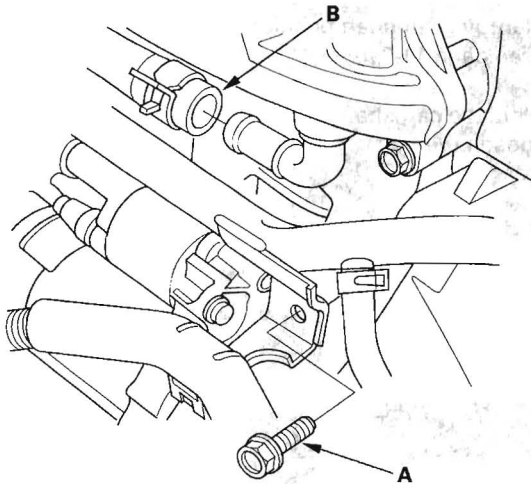


11. Remove the upper radiator hose (A) and heater hoses (B).





12. Remove the bolt (A) securing the connecting pipe.



13. Remove the water bypass hose (B).

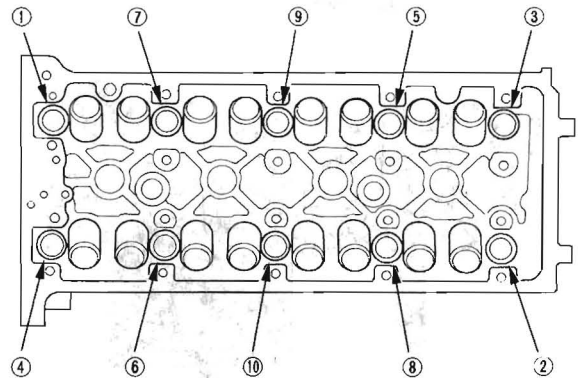
14. Remove the engine wire harness connectors and wire harness clamps from the cylinder head.

- Four fuel injector connectors
- Engine coolant temperature (ECT) sensor 1 connector
- Camshaft position (CMP) sensor A (Intake) connector
- Camshaft position (CMP) sensor B (Exhaust) connector
- Rocker arm oil control solenoid connector
- Rocker arm oil pressure switch connector
- EVAP canister purge valve connector
- Exhaust gas recirculation (EGR) valve connector

15. Remove the cam chain (see page 6-13).

16. Remove the rocker arm assembly (see page 6-37).

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

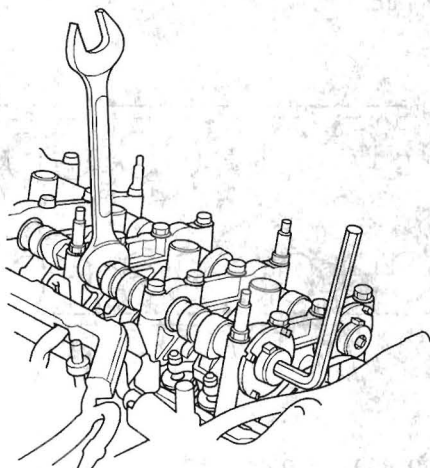


18. Remove the cylinder head.

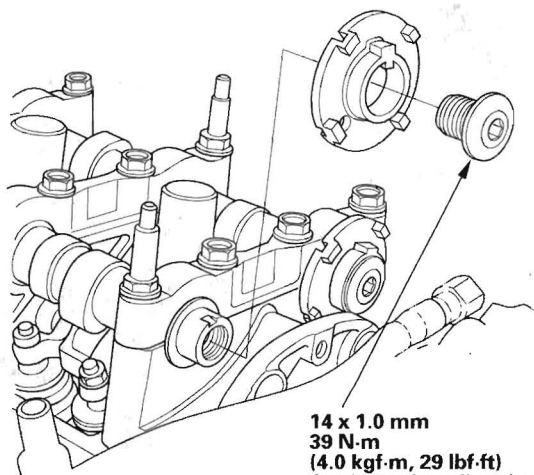
Cylinder Head

CMP Pulse Plate A Replacement

1. Remove the cylinder head cover (see page 6-29).
2. Remove camshaft position (CMP) sensor A (see page 11-285).
3. Hold the camshaft with an open-end wrench, then loosen the bolt.



4. Remove CMP pulse plate A.

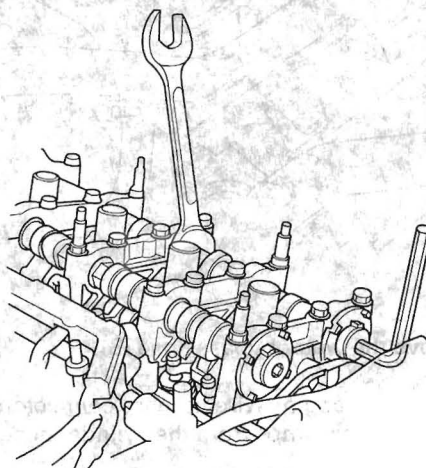


14 x 1.0 mm
39 N·m
(4.0 kgf·m, 29 lbf·ft)
Apply engine oil to the
bolt threads.

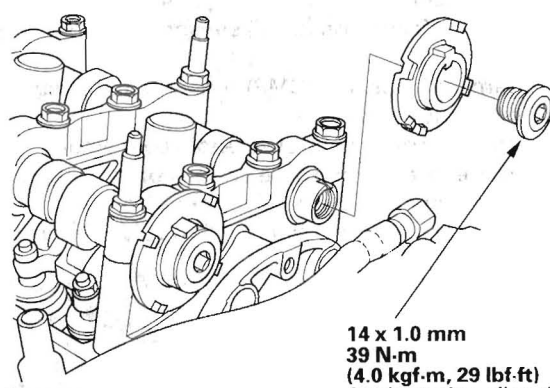
5. Install CMP pulse plate A in the reverse order of removal.

CMP Pulse Plate B Replacement

1. Remove the cylinder head cover (see page 6-29).
2. Remove camshaft position (CMP) sensor B (see page 11-215).
3. Hold the camshaft with an open-end wrench, then loosen the bolt.



4. Remove CMP pulse plate B.



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

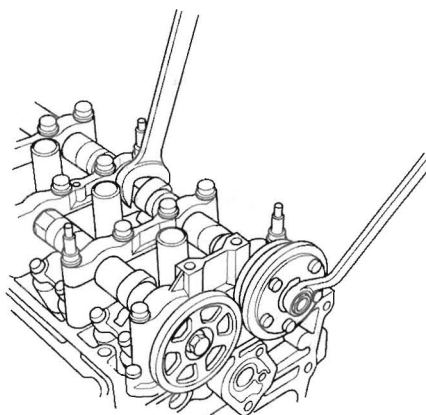
5. Install CMP pulse plate B in the reverse order of removal.



VTC Actuator, Exhaust Camshaft Sprocket Replacement

Removal

1. Remove the cam chain (see page 6-13).
2. Hold the camshaft with an open-end wrench, then loosen the variable valve timing control (VTC) actuator mounting bolt and exhaust camshaft sprocket mounting bolt.



3. If the VTC actuator will be reused, do these steps.
 - 1 Remove the intake camshaft, and seal the advance holes and retard holes in the No. 1 camshaft journal with tape (see step 6 on page 6-8).
 - 2 Punch a hole in the tape over one of the advance holes (see step 7 on page 6-8).
 - 3 Apply air to the advance hole to release the lock (see step 8 on page 6-9).
 - 4 Remove the tape and adhesive residue from the camshaft journal.

4. Remove the VTC actuator and exhaust camshaft sprocket.

Installation

1. Install the VTC actuator and exhaust camshaft sprocket.

NOTE: Install the VTC actuator to unlock position.

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

Specified Torque

VTC Actuator Mounting Bolt:

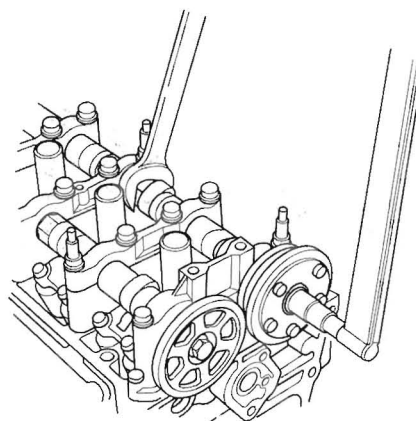
12 x 1.25 mm

113 N·m (11.5 kgf·m, 83 lbf·ft)

Exhaust Camshaft Sprocket Mounting Bolt:

10 x 1.25 mm

72 N·m (7.3 kgf·m, 53 lbf·ft)



4. Hold the camshaft, and turn the VTC actuator clockwise until you hear it click. Make sure to lock the VTC actuator by turning it.
5. Install the cam chain (see page 6-16).

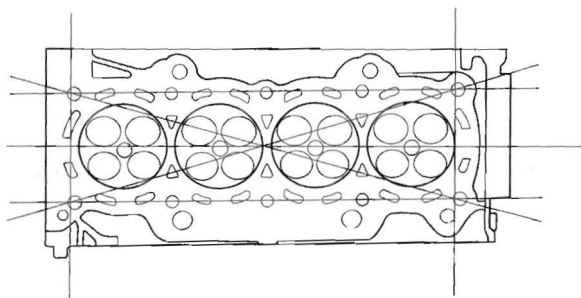
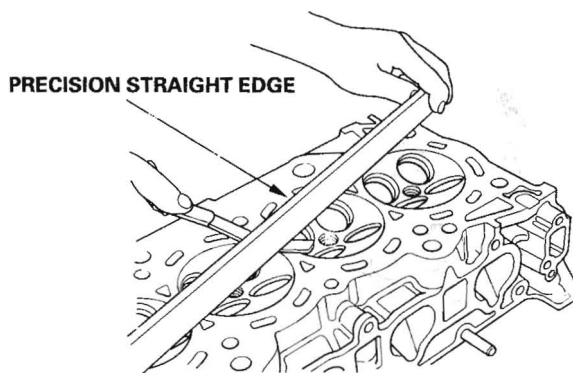
Cylinder Head

Cylinder Head Inspection for Warpage

1. Remove the cylinder head (see page 6-31).
2. Inspect the camshaft (see page 6-40).
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 104 mm (4.09 in.).

Cylinder Head Height

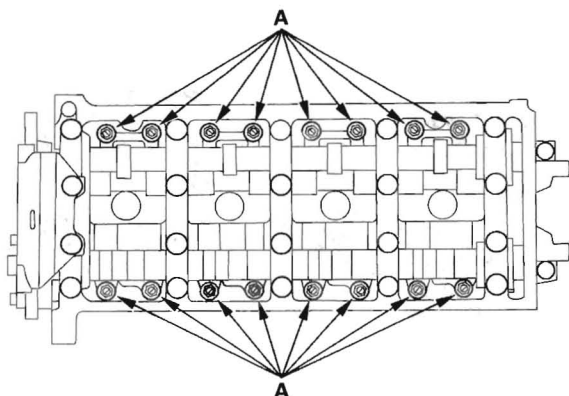
Standard (New): 103.95—104.05 mm
(4.093—4.096 in.)





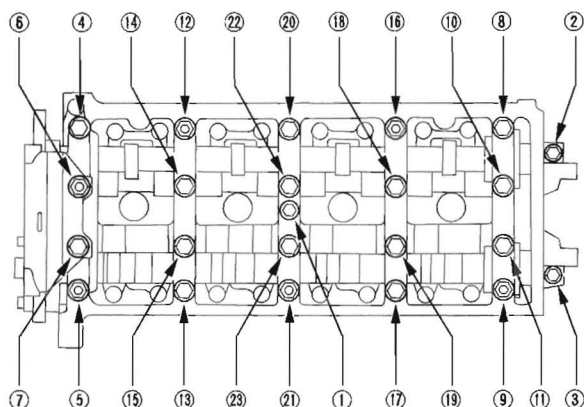
Rocker Arm Assembly Removal

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

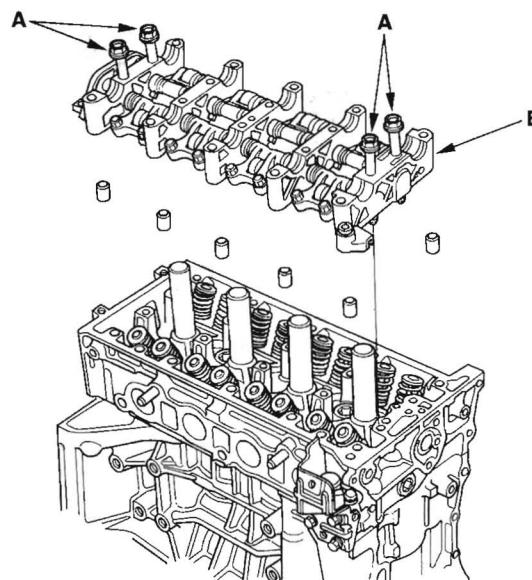


3. Remove the camshaft holder bolts. To prevent damaging the camshafts, unscrew the bolts, in sequence, two turns at a time.

NOTE: Bolt ① is not on all engines.



4. Remove cam chain guide B, camshaft holders, and camshafts.
5. Insert the bolts (A) into the rocker shaft holder, then remove the rocker arm assembly (B).

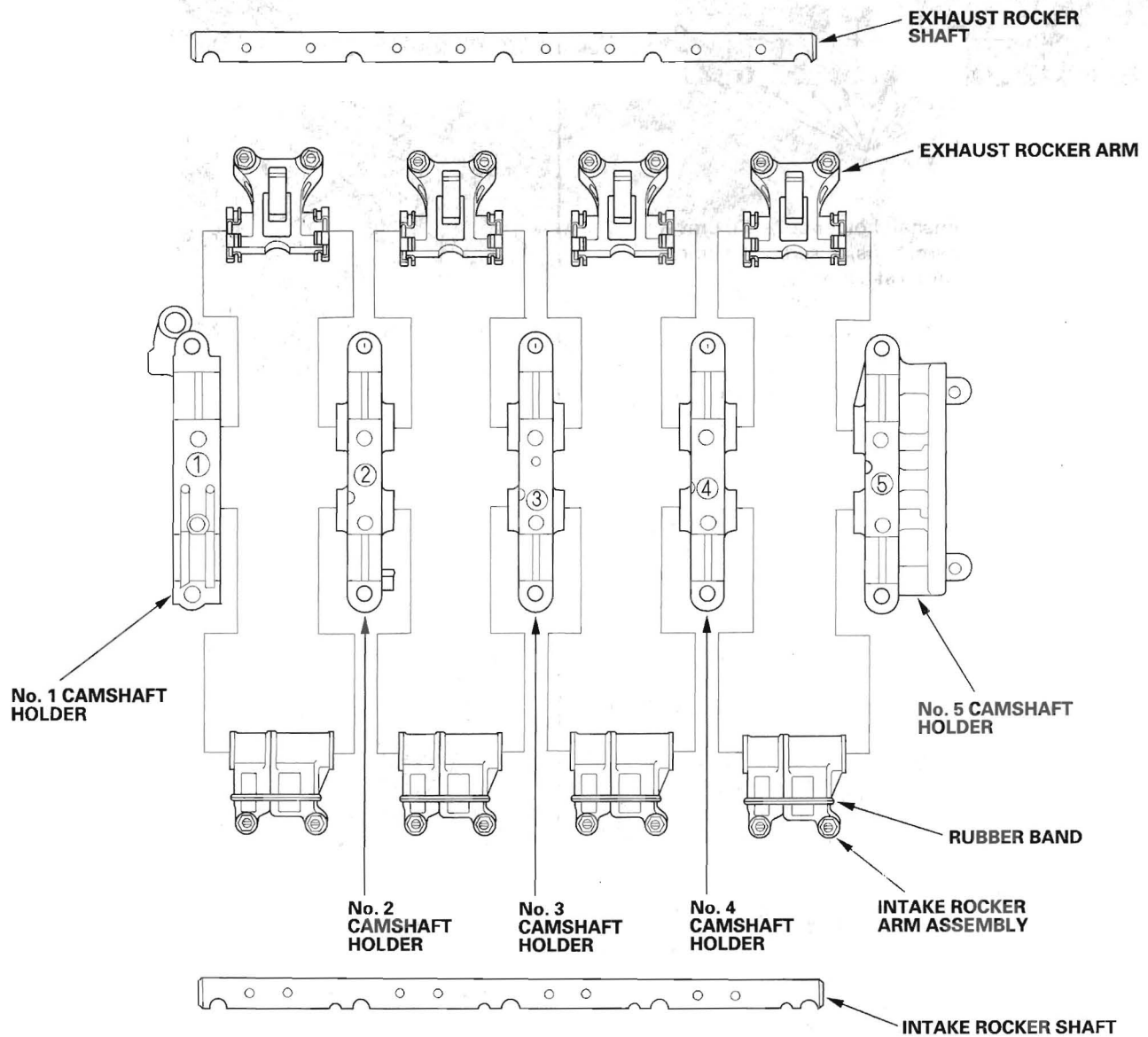


Cylinder Head

Rocker Arm and Shaft Disassembly/Reassembly

NOTE:

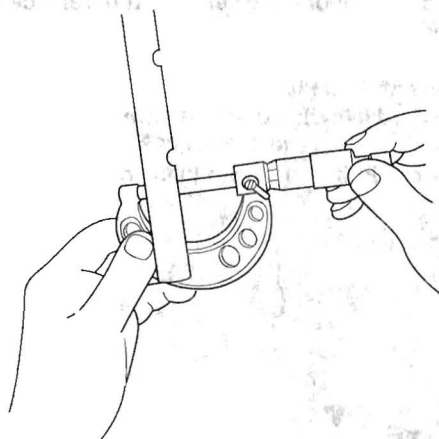
- Identify each part as it is removed so that each item can be reinstalled.
- Inspect the rocker arm shaft and rocker arms (see page 6-39).
- If reused, the rocker arms must be installed in the same positions.
- When removing, or installing the rocker arm assembly, do not remove the camshaft holder bolts. The bolts will keep the holders and rocker arms on the shaft.
- Prior to reassembling, clean all the parts in solvent, dry them, and apply lubricant to any contact points.
- Bundle the intake rocker arms with rubber bands to keep them together as a set.
- When replacing the intake rocker arm assembly, remove the fastening hardware from the new intake rocker arm assembly.



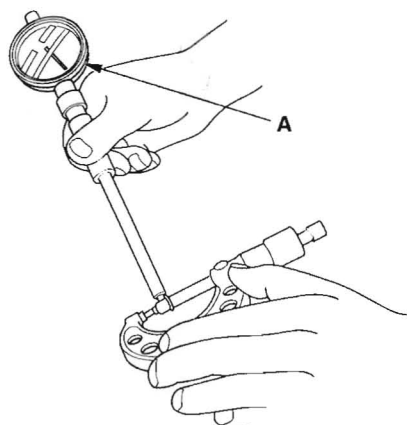


Rocker Arm and Shaft Inspection

1. Remove the rocker arm assembly (see page 6-37).
2. Disassemble the rocker arm assembly (see page 6-38).
3. Measure the diameter of the shaft at the first rocker location.



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



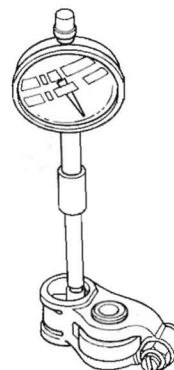
5. Measure the inside diameter of the rocker arm, and check it for an out-of-round condition.

Rocker Arm-to-Shaft Clearance Standard (New):

Intake: 0.025—0.052 mm
(0.0010—0.0020 in.)

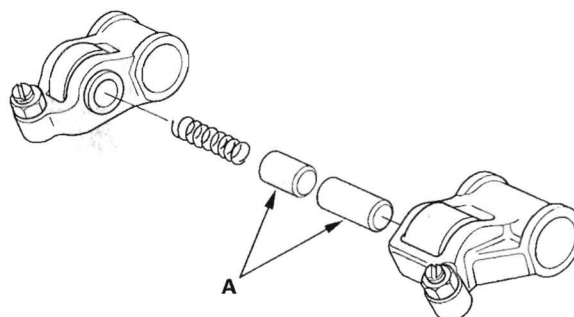
Exhaust: 0.018—0.056 mm
(0.0007—0.0022 in.)

Service Limit: 0.08 mm (0.003 in.)



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

NOTE: Apply oil to the pistons when reassembling.



8. Install the rocker arm assembly (see page 6-49).

Cylinder Head

Camshaft Inspection

NOTE: Do not rotate the camshaft during inspection.

1. Remove the rocker arm assembly (see page 6-37).
2. Put the rocker shaft holders, camshaft, and camshaft holders on the cylinder head, then tighten the bolts, in sequence, to the specified torque.

NOTE: If the engine does not have bolt ⑳, skip it and continue the torque sequence.

Specified Torque

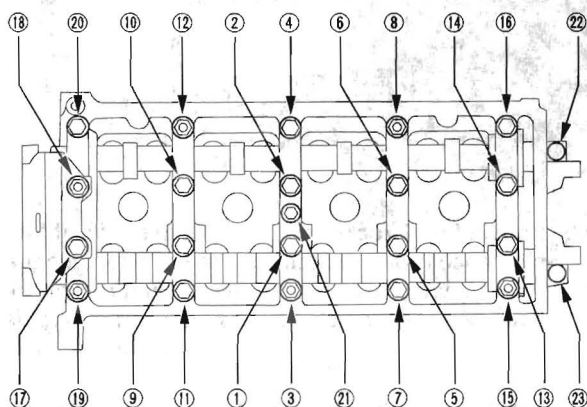
8 x 1.25 mm

22 N·m (2.2 kgf·m, 16 lbf·ft)

6 x 1.0 mm

12 N·m (1.2 kgf·m, 8.7 lbf·ft)

6 x 1.0 mm Bolts: ㉑, ㉒, ㉓



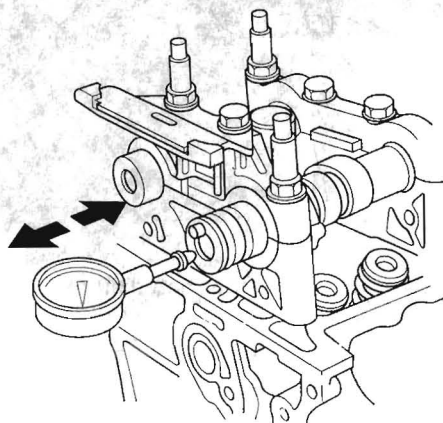
3. Seat the camshaft by pushing it away from the camshaft pulley end of the cylinder head.
4. Zero the dial indicator against the end of the camshaft, then push the camshaft back and forth, and read the end play. If the end play is beyond the service limit, replace the cylinder head and recheck. If it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

Camshaft End Play

Standard (New): 0.05—0.20 mm

(0.002—0.008 in.)

Service Limit: 0.4 mm (0.02 in.)





5. Unscrew the camshaft holder bolts two turns at a time, in a crisscross pattern. Then remove the camshaft holders from the cylinder head.
6. Lift the camshafts out of the cylinder head, wipe them clean, then inspect the lift ramps. Replace the camshaft if any lobes are pitted, scored, or excessively worn.
7. Clean the camshaft journal surfaces in the cylinder head, then set the camshafts back in place. Place a plastigage strip across each journal.
8. Install the camshaft holders, then tighten the bolts to the specified torque as shown in step 2.
9. Remove the camshaft holders. Measure the widest portion of plastigage on each journal.
 - If the camshaft-to-holder clearance is within limits, go to step 11.
 - If the camshaft-to-holder clearance is beyond the service limit, and the camshaft has been replaced, replace the cylinder head.
 - If the camshaft-to-holder clearance is beyond the service limit, and the camshaft has not been replaced, go to step 10.

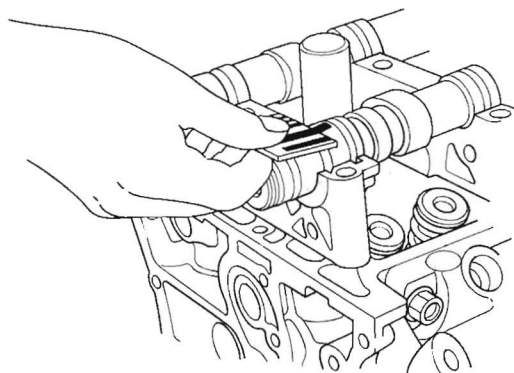
Camshaft-to-Holder Oil Clearance

Standard (New):

No. 1 Journal: 0.030—0.069 mm
(0.001—0.003 in.)

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

Service Limit: 0.15 mm (0.006 in.)



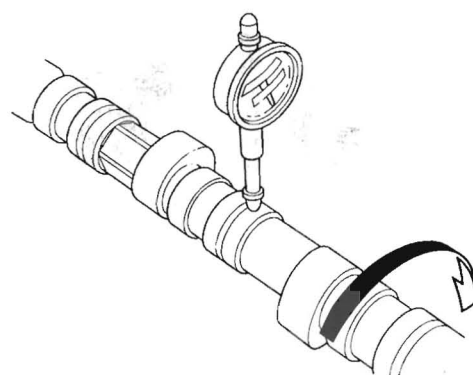
10. Check the total runout with the camshaft supported on V-blocks.

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

Camshaft Total Runout

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

Service Limit: 0.04 mm (0.002 in.)



11. Measure cam lobe height.

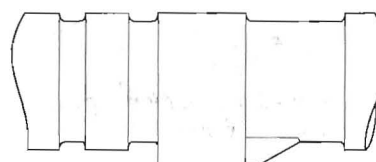
Cam Lobe Height Standard (New):

	INTAKE	EXHAUST
PRI	34.263 mm (1.3489 in.)	34.092 mm (1.3422 in.)
SEC	29.638 mm (1.1668 in.)	

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

INTAKE

SEC PRI



← C/C

Cylinder Head

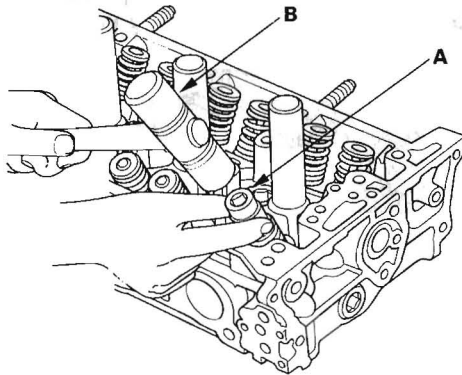
Valve, Spring, and Valve Seal Removal

Special Tools Required

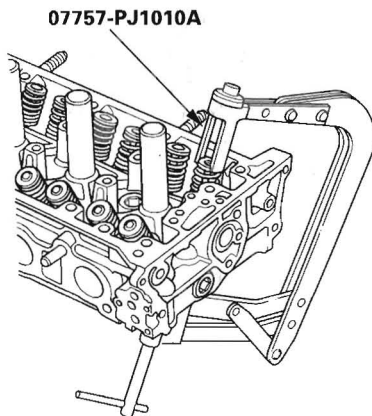
Valve spring compressor attachment 07757-PJ1010A

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 6-31).
2. Using an appropriate-sized socket (A) and plastic mallet (B), lightly tap the valve retainer to loosen the valve cotters.

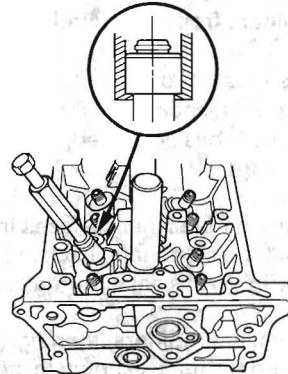


3. Install the valve spring compressor. Compress the spring, and remove the valve cotters.

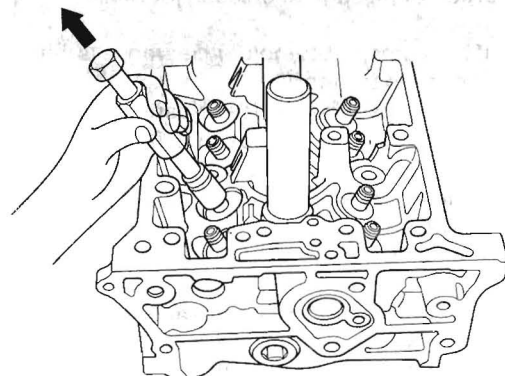


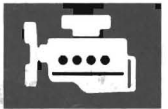
4. Remove the special tool, then remove the valve retainer and valve spring.

5. Install the valve guide seal remover.



6. Remove the valve seal.





Valve Inspection

1. Remove the valves (see page 6-42).
2. Measure the valve in these areas.

Intake Valve Dimensions

A Standard (New): 34.85—35.15 mm
(1.372—1.384 in.)

B Standard (New): 108.7—109.5 mm
(4.280—4.311 in.)

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

C Service Limit: 5.445 mm (0.214 in.)

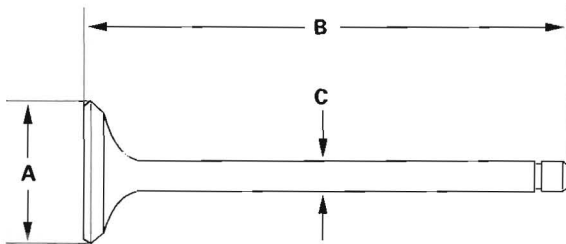
Exhaust Valve Dimensions

A Standard (New): 29.85—30.15 mm
(1.175—1.187 in.)

B Standard (New): 108.3—109.1 mm
(4.264—4.295 in.)

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

C Service Limit: 5.42 mm (0.213 in.)



Valve Stem-to-Guide Clearance Inspection

1. Remove the valves (see page 6-42).
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): 0.06—0.11 mm
(0.002—0.004 in.)

Service Limit: 0.16 mm (0.006 in.)

Exhaust Valve Stem-to-Guide Clearance

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

Service Limit: 0.22 mm (0.009 in.)



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

Intake Valve Stem-to-Guide Clearance

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

Service Limit: 0.08 mm (0.003 in.)

Exhaust Valve Stem-to-Guide Clearance

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

Service Limit: 0.11 mm (0.004 in.)

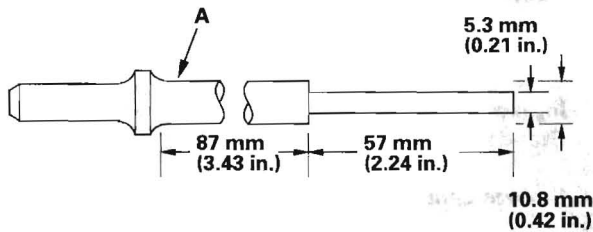
Cylinder Head

Valve Guide Replacement

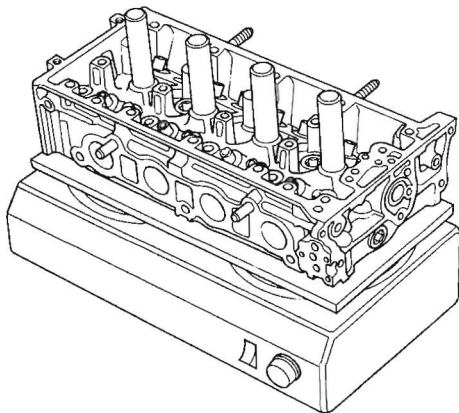
Special Tools Required

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

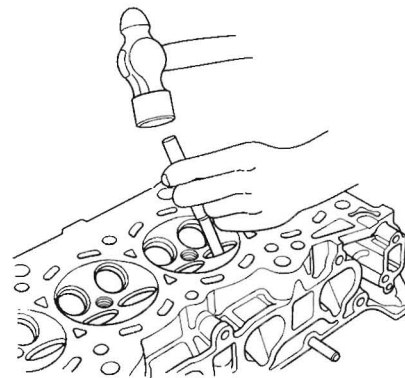
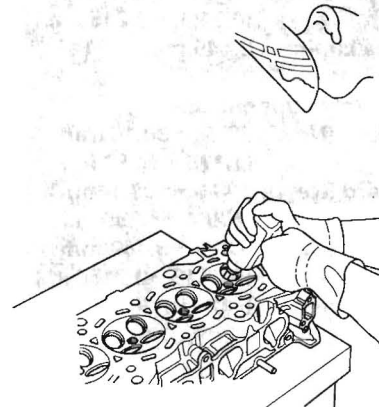
1. Inspect the valve stem-to-guide clearance (see page 6-43).
2. As illustrated, use a commercially available air-impact valve guide driver (A) modified to fit the diameter of the valve guides. In most cases, the same procedure can be done using the special tool and a conventional hammer.



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.
6. Turn the head over, and drive the guide out toward the camshaft side of the head.



7. If a valve guide won't move, drill it out with a 8 mm (5/16 in.) bit, then try again. Drill guides only in extreme cases; you could damage the cylinder head if the guide breaks.
8. Take out the new guide(s) from the freezer, one at a time, as you need them.

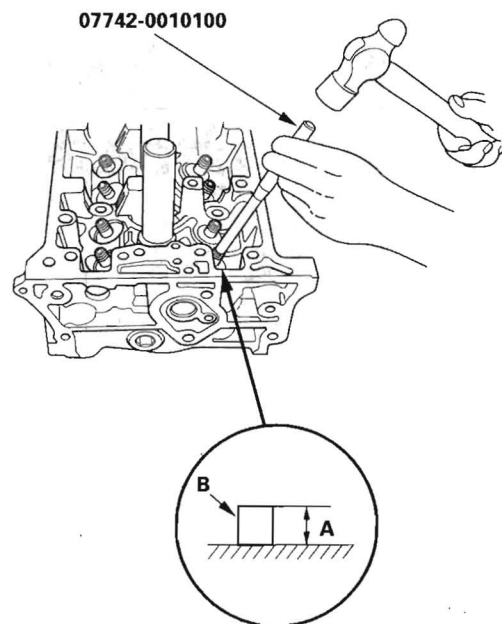


9. Apply a thin coat of clean engine oil to the outside of the new valve guide. Install the guide from the camshaft side of the head; use the 5.5 valve guide driver to drive the guide in to the specified installed height (A) of the guide (B). If you have all 16 guides to do, you may have to reheat the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

Valve Guide Installed Height

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

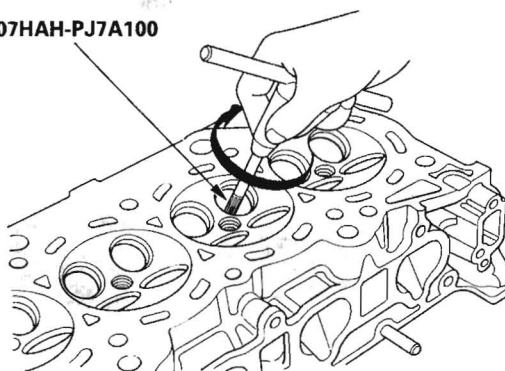
Exhaust: 15.5—16.5 mm (0.610—0.650 in.)



10. Coat both reamer and the valve guide with cutting oil.

11. Rotate the reamer clockwise to the full length of the valve guide bore.

07HAH-PJ7A100



12. Continue to rotate the reamer clockwise while removing it from the bore.

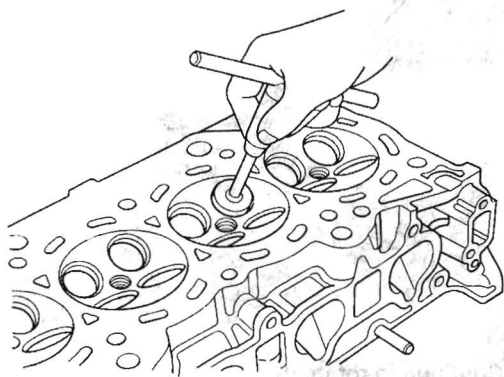
13. Thoroughly wash the guide in detergent and water to remove any cutting residue.

14. Check the clearances with a valve (see page 6-43). Verify that a valve slides into the intake and exhaust valve guides without getting stuck.

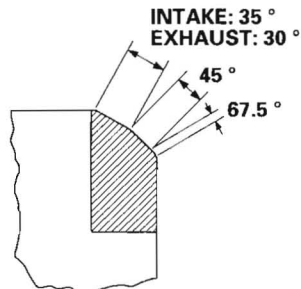
Cylinder Head

Valve Seat Reconditioning

1. Inspect the valve stem-to-guide clearance (see page 6-43). If the valve guides are worn, replace them (see page 6-44) before cutting the valve seats.
2. Renew the valve seats in the cylinder head using a valve seat cutter.



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



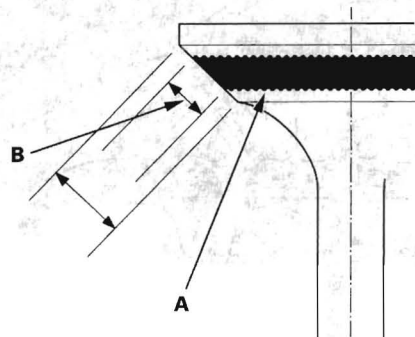
5. Make one more very light pass with the 45° cutter to remove any possible burrs caused by the other cutters.

Valve Seat Width

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

Service Limit: 2.00 mm (0.079 in.)

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



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

- If it is too high (closer to the valve stem), you must make a second cut with the 67.5° cutter to move it down, then one more cut with the 45° cutter to restore seat width.
- If it is too low (close to the valve edge), you must make a second cut with the 35° cutter (intake side) or the 30° cutter (exhaust side) to move it up, then make one more cut with the 45° cutter to restore seat width.

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



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

Intake Valve Stem Installed Height

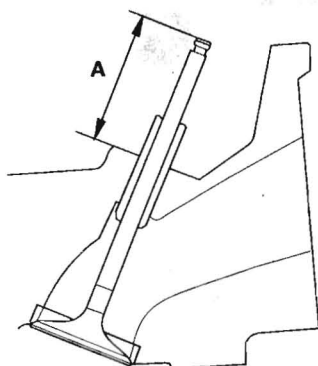
Standard (New): 44.0—44.5 mm (1.73—1.75 in.)

Service Limit: 44.7 mm (1.76 in.)

Exhaust Valve Stem Installed Height

Standard (New): 44.1—44.6 mm (1.74—1.76 in.)

Service Limit: 44.8 mm (1.76 in.)



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

Cylinder Head

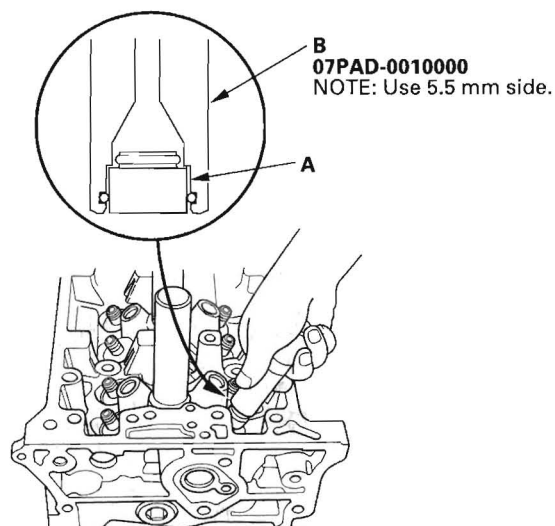
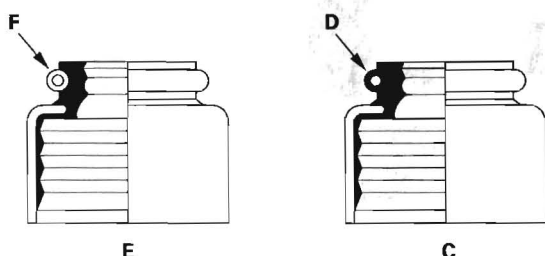
Valve, Spring, and Valve Seal Installation

Special Tools Required

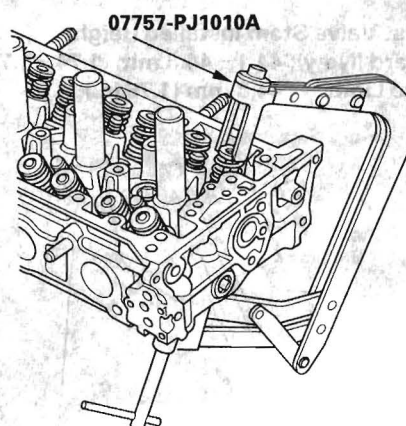
- Stem seal driver 07PAD-0010000
- Valve spring compressor attachment 07757-PJ1010A

1. Coat the valve stems with 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 valve guide seal installer (B).

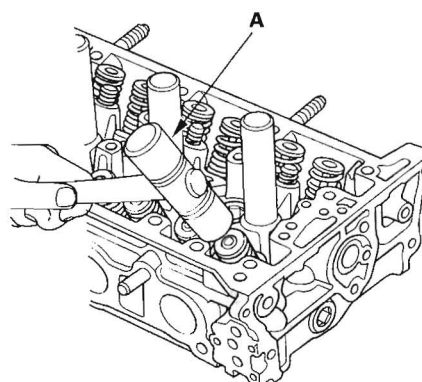
NOTE: The exhaust valve seal (C) has a black spring (D), and the intake valve seal (E) has a white spring (F). They are not interchangeable.



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



7. Remove the valve spring compressor.
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 keepers. Tap the valve stem only along its axis so you do not bend the stem.



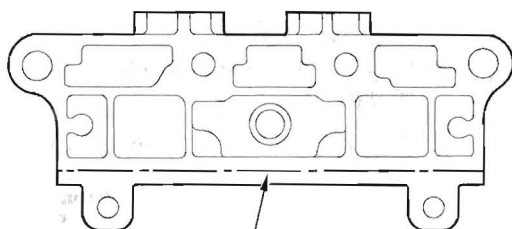


Rocker Arm Assembly Installation

1. Reassemble the rocker arm assembly (see page 6-38).
2. Clean and dry the No. 5 rocker shaft holder mating surface.
3. Apply liquid gasket, P/N 08717-0004, 08718-0001, 08718-0003, or 08718-0009, evenly to the cylinder head mating surface of the No. 5 rocker shaft holder. Install the component within 5 minutes of applying the liquid gasket.

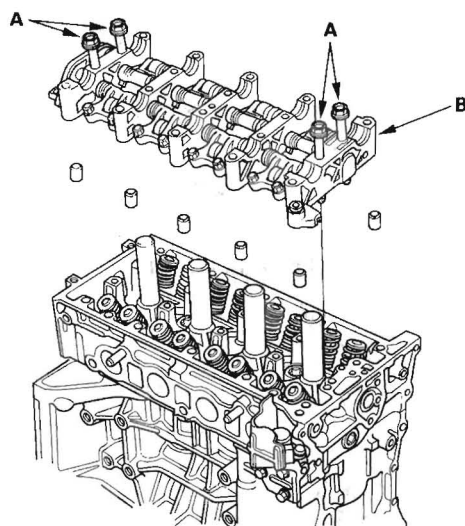
NOTE:

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



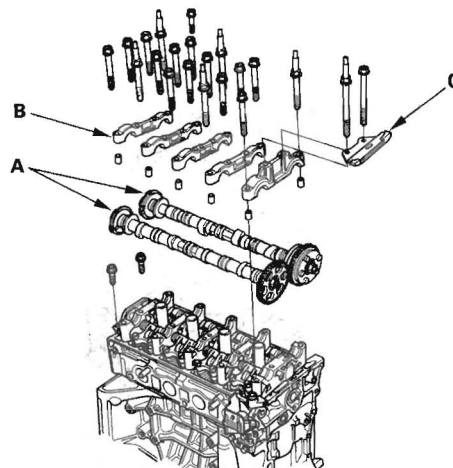
Apply liquid gasket along the broken line.

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



5. Remove the bolts from the rocker shaft holder.

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



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

NOTE: If the engine does not have bolt ②, skip it and continue the torque sequence.

Specified Torque

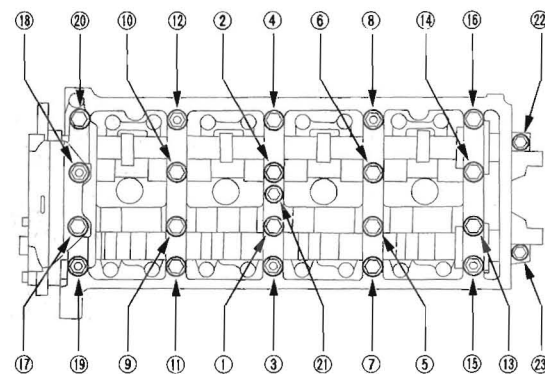
8 x 1.25 mm

22 N·m (2.2 kgf·m, 16 lbf·ft)

6 x 1.0 mm

12 N·m (1.2 kgf·m, 8.7 lbf·ft)

6 x 1.0 mm Bolts: ②, ②②, ②③

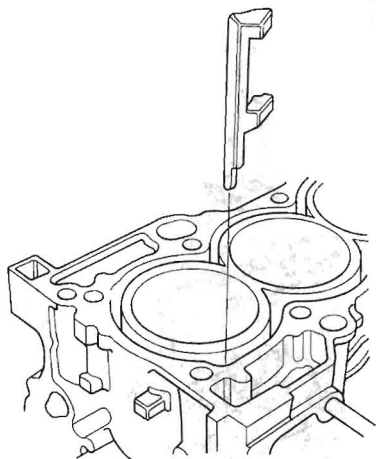


9. Install the cam chain (see page 6-16), and adjust the valve clearance (see page 6-9).

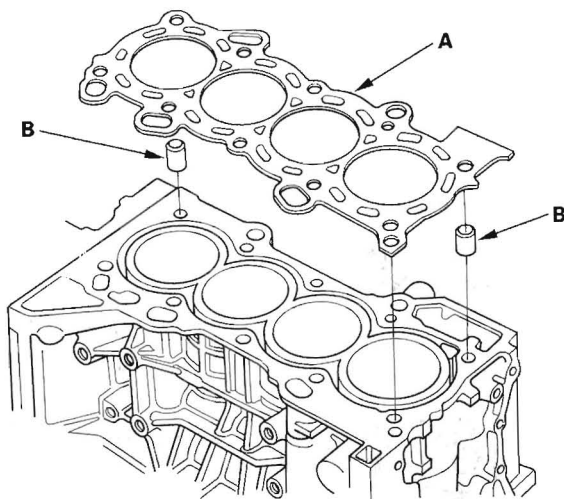
Cylinder Head

Cylinder Head Installation

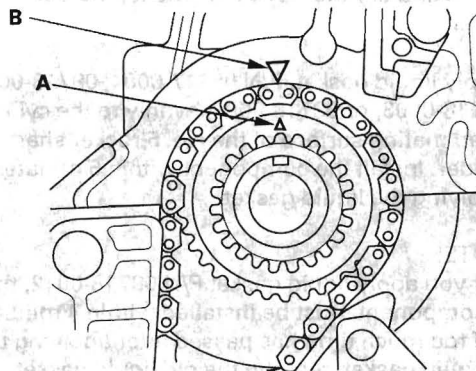
1. Install a new coolant separator in the engine block whenever the engine block is replaced.



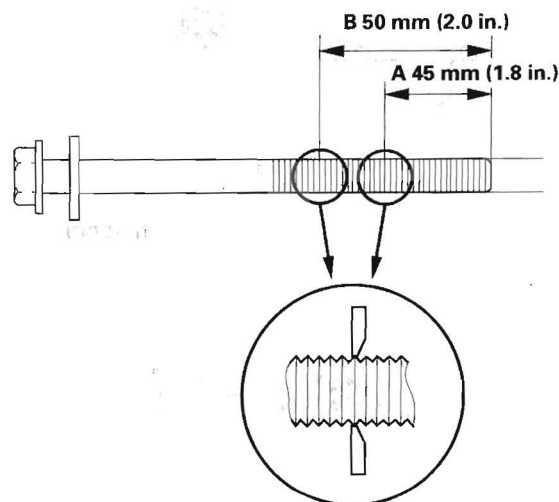
2. Clean the cylinder head and block surface.
3. Install the new cylinder head gasket (A) and dowel pins (B) on the engine block. Always use a new cylinder head gasket.



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



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

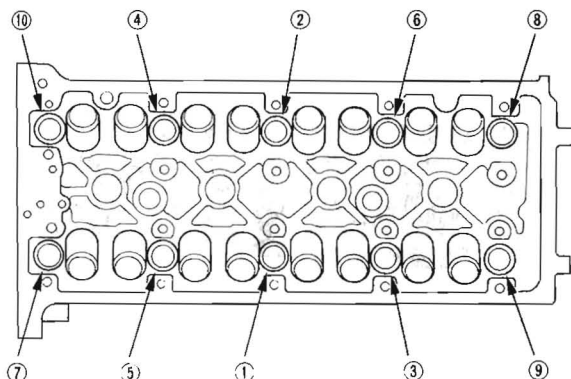


7. If either diameter is less than 10.6 mm (0.42 in.), replace the cylinder head bolt.



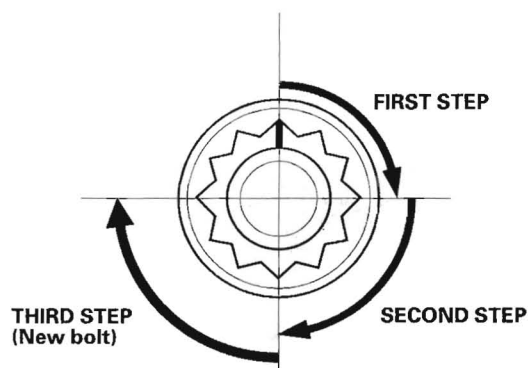
8. Apply engine oil to the threads and under the bolt heads of all cylinder head bolts.

9. **ט: תורידו את כל בולי ראש הצינדרים ל-39 N·m (4.0 kgf·m, 29 lbf·ft).** Use a beam-type torque wrench. When using a preset-type torque wrench, be sure to tighten slowly and do not overtighten. If a bolt makes any noise while you are torquing it, loosen the bolt and retighten it from the first step.



10. 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 6 of the procedure. Do not loosen it back to the specified angle.



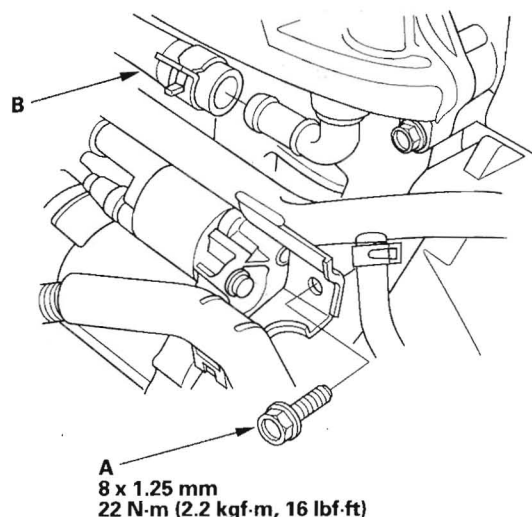
11. Install the rocker arm assembly (see page 6-49).

12. Install the cam chain (see page 6-16).

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

- Four fuel injector connectors
- Engine coolant temperature (ECT) sensor 1 connector
- Camshaft position (CMP) sensor A (Intake) connector
- Camshaft position (CMP) sensor B (Exhaust) connector
- Rocker arm oil control solenoid connector
- Rocker arm oil pressure switch connector
- EVAP canister purge valve connector
- Exhaust gas recirculation (EGR) valve connector

14. Install the bolt (A) securing the connecting pipe.



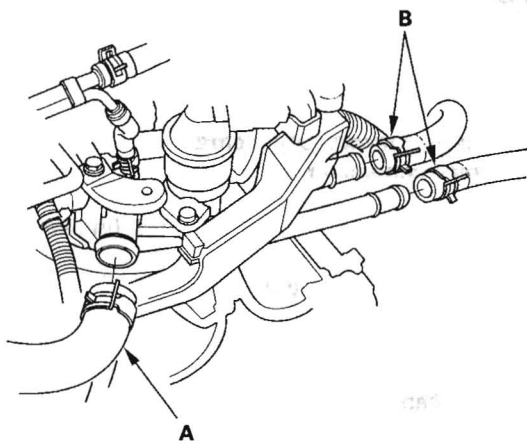
15. Install the water bypass hose (B).

(cont'd)

Cylinder Head

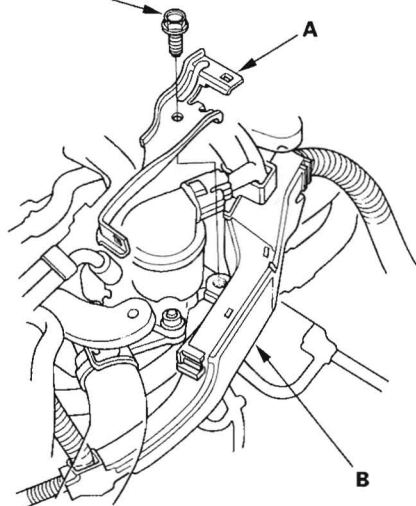
Cylinder Head Installation (cont'd)

16. Install the upper radiator hose (A) and heater hoses (B).

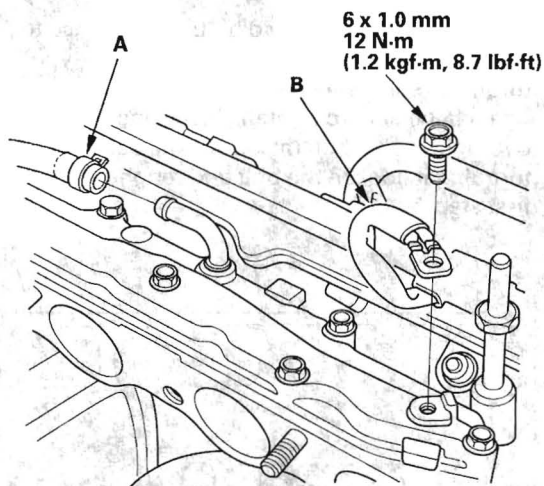


17. Install the harness holder bracket (A), then install the harness holder (B).

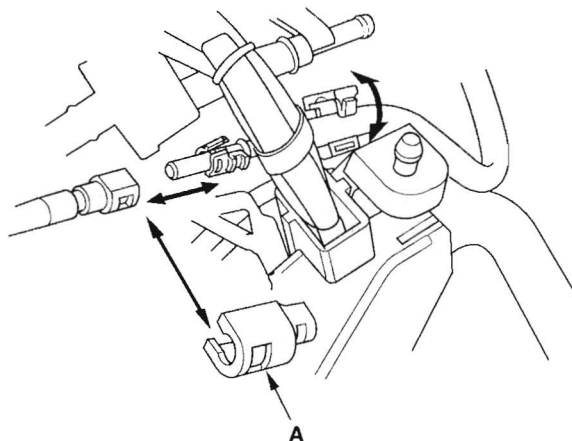
6 x 1.0 mm
12 N·m (1.2 kgf-m, 8.7 lbf-ft)



18. Install the positive crankcase ventilation (PCV) hose (A) and ground cable (B).



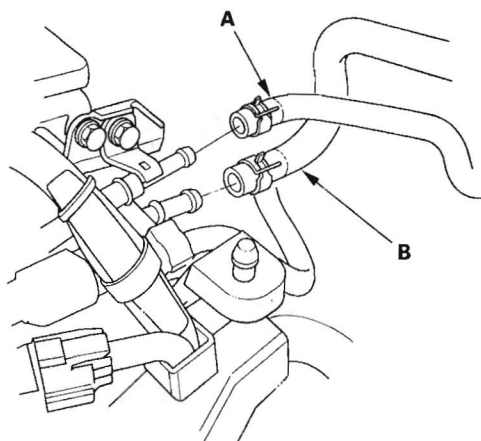
19. Connect the fuel feed hose (see page 11-326), then install the quick-connect fitting cover (A).





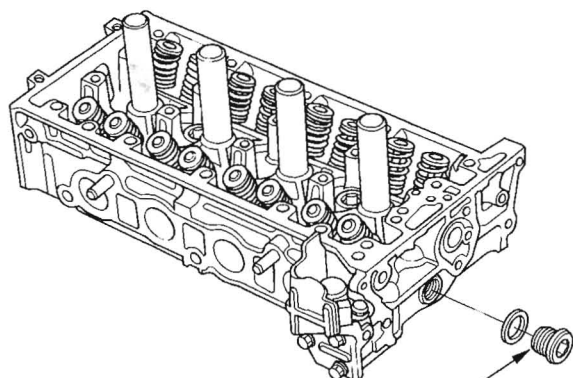
Sealing Bolt Installation

20. Install the evaporative emission (EVAP) canister hose (A) and brake booster vacuum hose (B).



21. Install the exhaust manifold (see page 9-8).
22. Install the intake manifold (see page 9-5).
23. Install the drive belt (see page 4-29).
24. Install the air cleaner housing (see page 11-340).
25. After installation, check that all tubes, hoses and connectors are installed correctly.
26. Inspect for fuel leaks. Turn the ignition switch ON (II) (do not operate the starter) so the fuel pump runs for about 2 seconds and pressurizes the fuel line. Repeat this operation two or three times, then check for fuel leakage at any point in the fuel line.
27. Refill the radiator with engine coolant, and bleed the air from the cooling system with the heater valve open (see step 6 on page 10-6).
28. Inspect the idle speed (see page 11-303).
29. Inspect the ignition timing (see page 4-18).

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



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

Revised 2011

3

4

Engine Mechanical

Engine Block

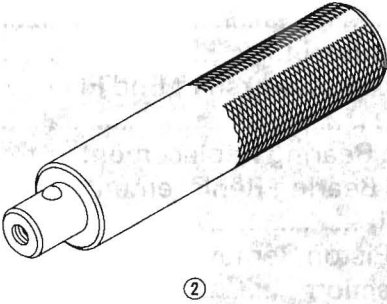
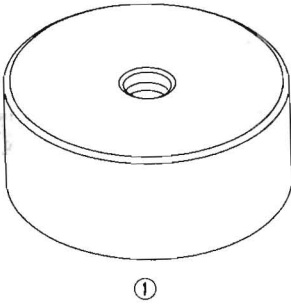
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Engine Block

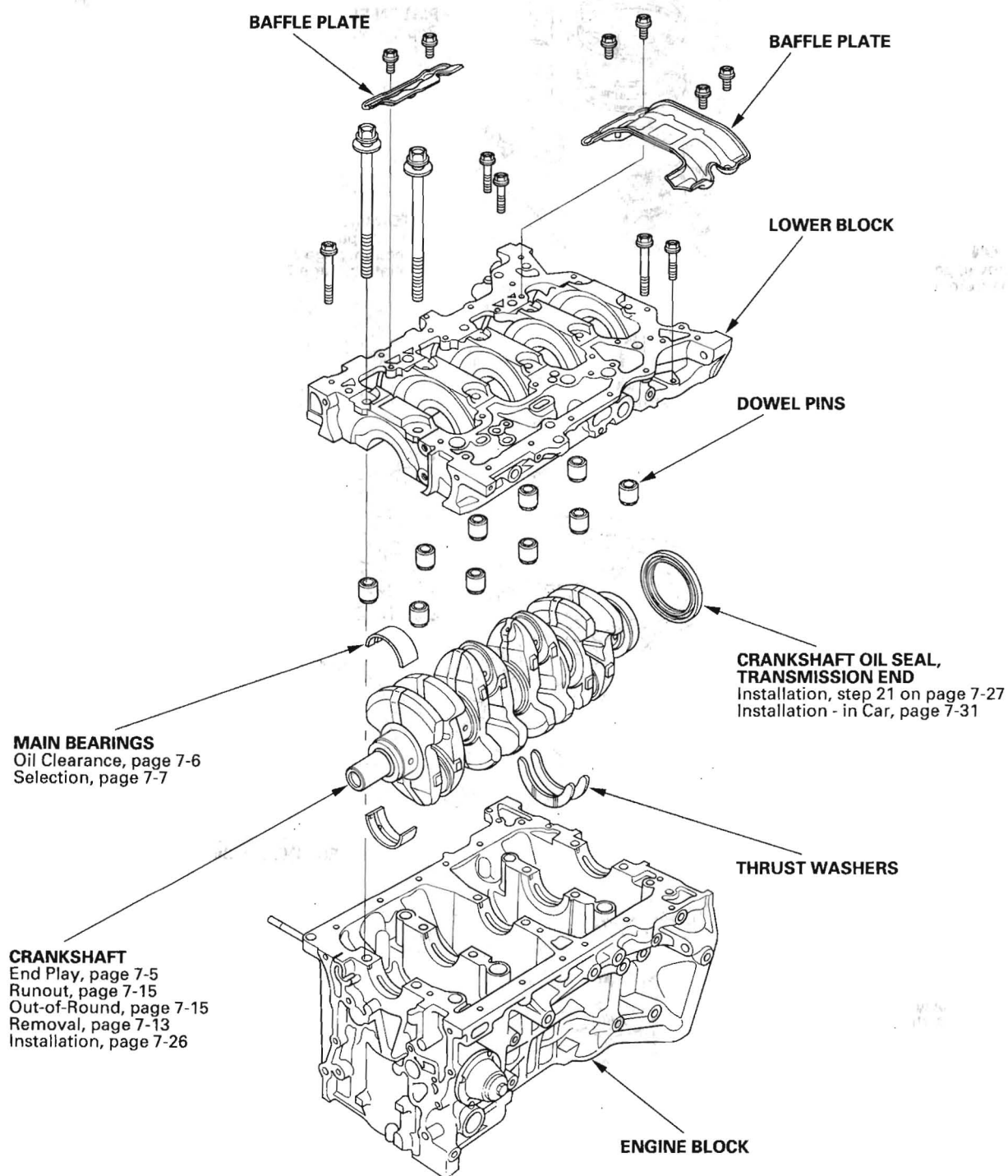
Special Tools

Ref. No.	Tool Number	Description	Qty
①	07ZAD-PNAA100	Oil Seal Driver Attachment, 96 mm	1
②	07749-0010000	Driver	1





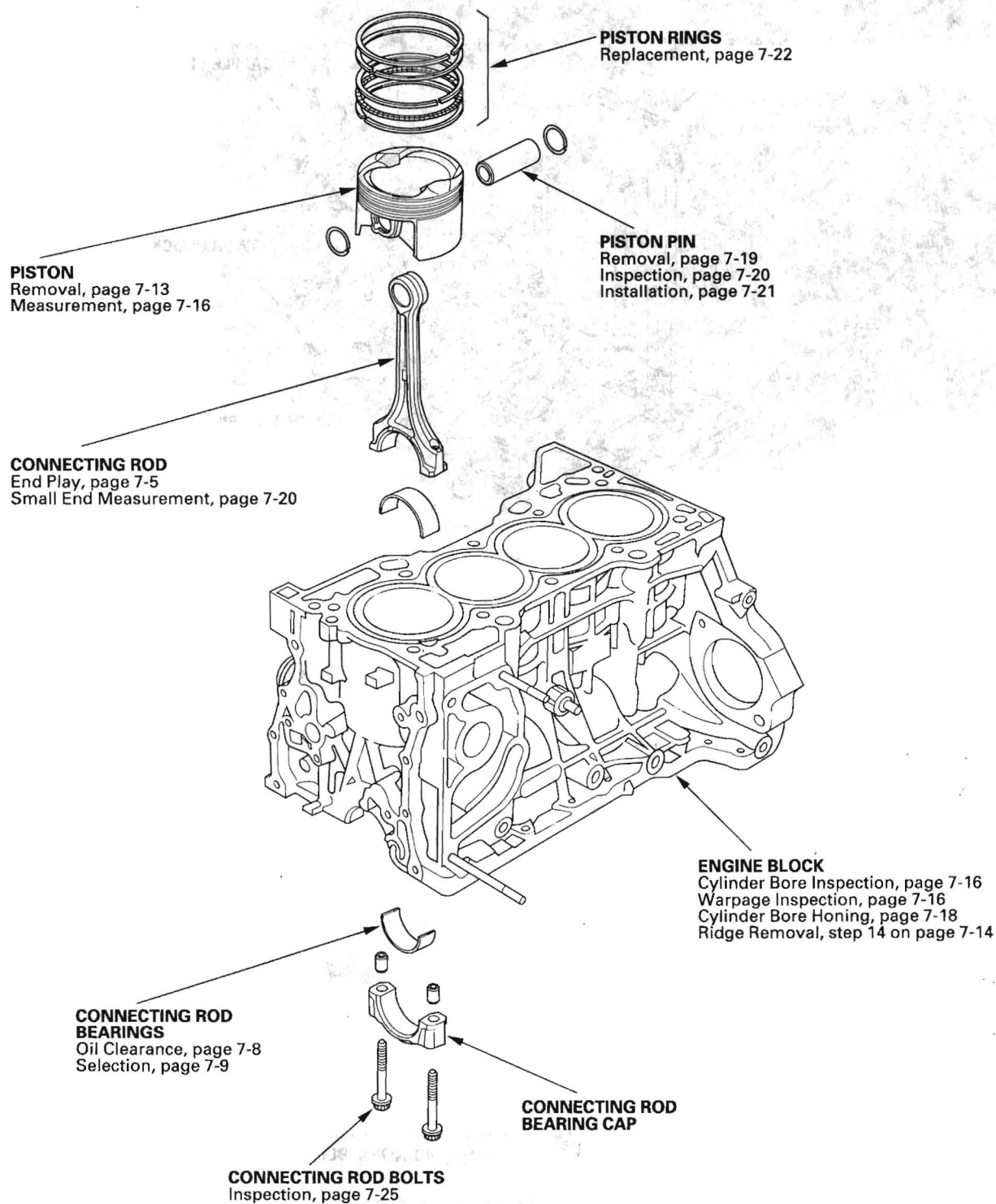
Component Location Index



(cont'd)

Engine Block

Component Location Index (cont'd)





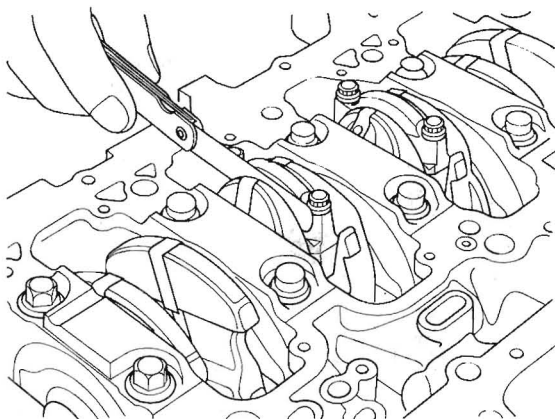
Connecting Rod and Crankshaft End Play Inspection

1. Remove the oil pump (see page 8-15).
2. Remove the baffle plates (see step 7 on page 7-13).
3. Measure the connecting rod end play with a feeler gauge between the connecting rod and crankshaft.

Connecting Rod End Play

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

Service Limit: 0.40 mm (0.016 in.)



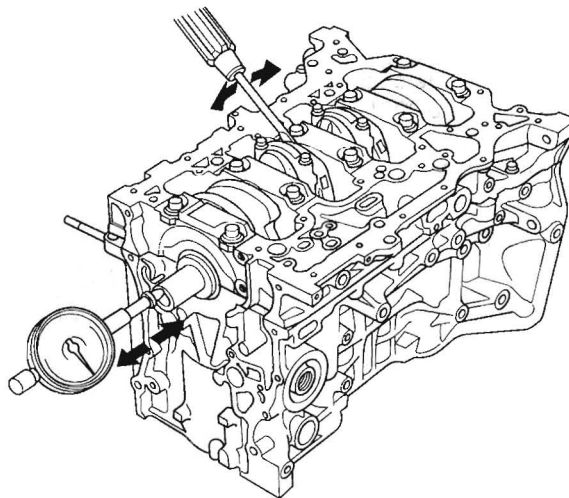
4. If the connecting rod end play is beyond service limit, install a new connecting rod, and recheck. If it is still beyond service limit; replace the crankshaft (see page 7-13).

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

Crankshaft End Play

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

Service Limit: 0.45 mm (0.018 in.)



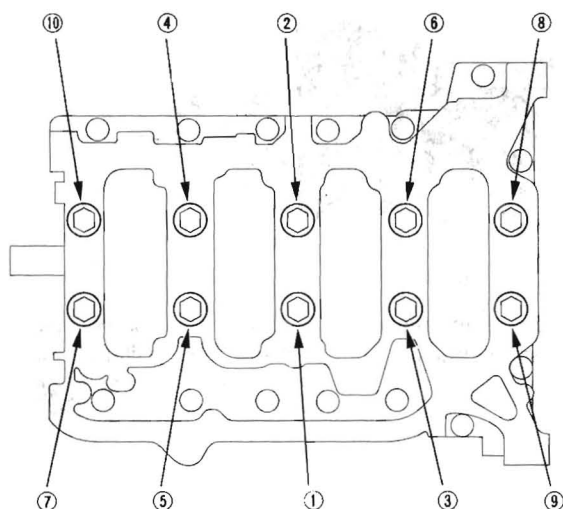
6. If the end play is beyond service limit, replace the thrust washers and recheck, if it is still beyond service limit, replace the crankshaft (see page 7-13).

Crankshaft Main Bearing Replacement

Main Bearing Clearance Inspection

1. To check main bearing-to-journal oil clearance, remove the lower block and bearing halves (see page 7-13).
2. Clean each main journal and bearing half with a clean shop towel.
3. Place one strip of plastigage across each main journal.
4. Reinstall the bearings and lower block, then torque the bolts to 29 N·m (3.0 kgf·m, 22 lbf·ft).

NOTE: Do not rotate the crankshaft during inspection.



5. Tighten the bearing cap bolts an additional 56°.

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

Main Bearing-to-Journal Oil Clearance

No. 1, 2, 4, 5 Journals:

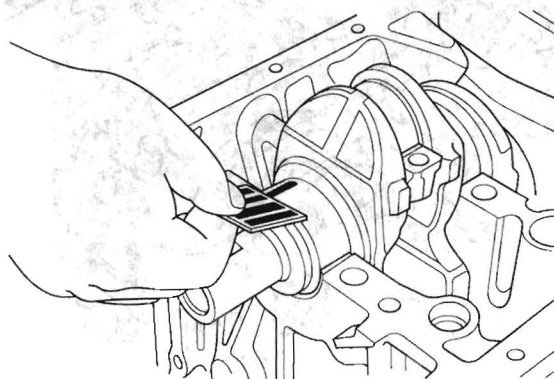
Standard (New): 0.017 — 0.041 mm
(0.0007 — 0.0016 in.)

Service Limit: 0.050 mm (0.0020 in.)

No. 3 Journal:

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

Service Limit: 0.055 mm (0.0022 in.)



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

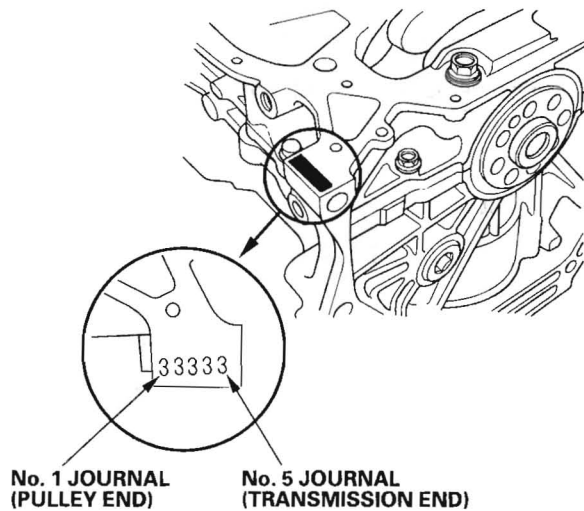


Main Bearing Selection

Crankshaft Bore Code Location

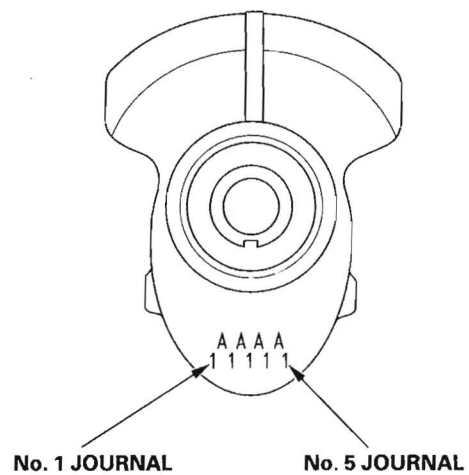
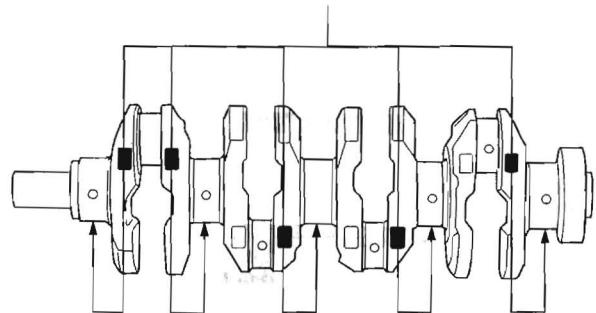
1. Numbers, letters, or bars have been stamped on the end of the block as a code for the size of each of the five main journal bores. Write down the crank bore codes.

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



Main Journal Code Location

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



(cont'd)

Engine Block

Crankshaft Main Bearing Replacement (cont'd)

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

NOTE:

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

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

Smaller main journal Smaller bearing (Thicker)

Connecting Rod Bearing Replacement

Rod Bearing Clearance Inspection

1. Remove the oil pump (see page 8-15).
2. Remove the baffle plates (see step 7 on page 7-13).
3. Remove the connecting rod cap and bearing half.
4. Clean the crankshaft rod journal and bearing half with a clean shop towel.

5. Place plastigage across the rod journal.

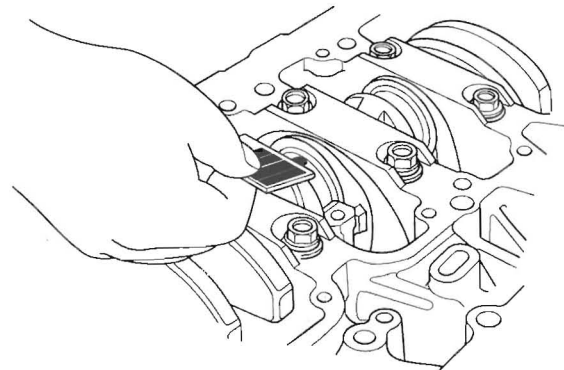
6. Reinstall the bearing half and cap, and torque the bolts to 20 N·m (2.0 kgf·m, 14 lbf·ft) + 90°

NOTE: Do not rotate the crankshaft during inspection.

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

Connecting Rod Bearing-to-Journal Oil Clearance Standard (New): 0.020—0.050 mm (0.0008—0.0020 in.)

Service Limit: 0.060 mm (0.0024 in.)





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

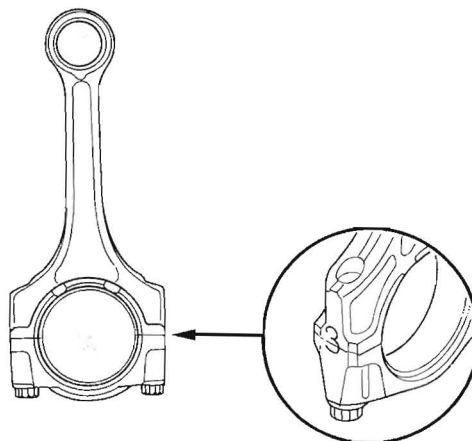
Rod Bearing Selection

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

Connecting Rod Big End Bore Code Locations

2. Each rod has a tolerance range from 0 to 0.024 mm (0.0009 in.), in 0.006 mm (0.0002 in.) increments, depending on the size of its big end bore. It'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 numbers and bars in any engine. (Half the number or bar is stamped on the bearing cap, the other half is on the rod.)
If you can't read the code because of an accumulation of oil and varnish, do not scrub it with a wire brush or scraper. Clean it only with solvent or detergent.

Normal Bore Size: 51.0 mm (2.01 in.)



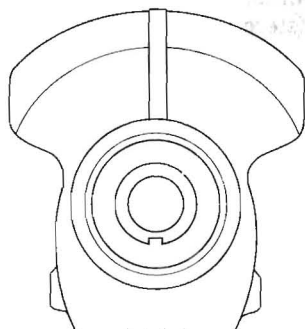
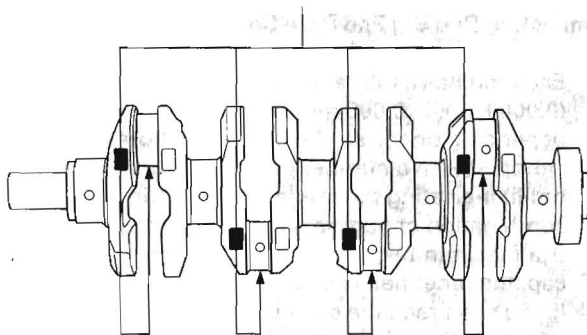
(cont'd)

Engine Block

Connecting Rod Bearing Replacement (cont'd)

Connecting Rod Journal Code Location

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



No. 1 JOURNAL No. 4 JOURNAL

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

NOTE:

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

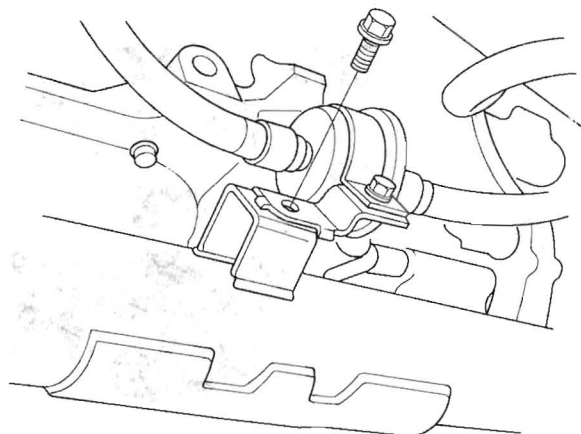
Rod journal code	Big end bore code → Larger big end bore			
	1 or I	2 or II	3 or III	4 or IIII
→ Smaller bearing (Thicker)				
A	Pink	Pink/Yellow	Yellow/Green	Green
B	Yellow	Yellow/Green	Green/Brown	Brown
C	Green	Green/Brown	Brown/Black	Black
D	Brown	Brown/Black	Black/Blue	Blue
↓ Smaller rod journal	↓ Smaller bearing (Thicker)			



Oil Pan Removal

1. If the engine is already out of the vehicle, go to step 20.
2. Raise the vehicle on the lift to full height.
3. Drain the engine oil (see page 8-10).
4. Remove the front wheels.
5. Remove the splash shield (see step 21 on page 5-5).
6. Disconnect the air fuel ratio (A/F) sensor connector and secondary heated oxygen sensor (secondary HO2S) connector, then remove the three way catalytic converter (TWC) (see step 25 on page 5-5).
7. Remove the shift cable (see page 14-284).
8. Separate the knuckles from the lower arms (see page 18-12).
9. Remove the propeller shaft (see page 16-40).
10. Remove a bolt securing the P/S fluid line bracket, and unclamp the P/S fluid line clamps on the front subframe (see step 31 on page 5-6).
11. Remove the bolts securing the left steering gearbox mounting bracket (see step 32 on page 5-6).
12. Remove the bolts securing the right steering gearbox mounting brackets (see step 33 on page 5-6).

13. Remove the bolt securing the automatic transmission fluid (ATF) filter.



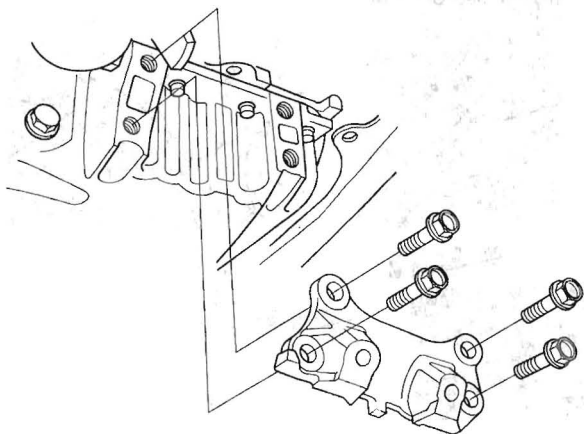
14. Remove the lower torque rod (see step 44 on page 5-8).
15. Make the appropriate reference lines at both ends of the subframe that line up with the body (see step 45 on page 5-8).
16. Remove the subframe mounting bolts on both side (see step 46 on page 5-9).
17. Attach the subframe adapter to the subframe and hang the belt of the subframe adapter over the front of the subframe, then secure the belt with its stop (see step 47 on page 5-9).
18. Raise the jack and line up the slots in the arms with the bolt holes on the corner of the jack base, then attach them with bolts securely (see step 48 on page 5-9).
19. Remove the subframe (see step 49 on page 5-9).

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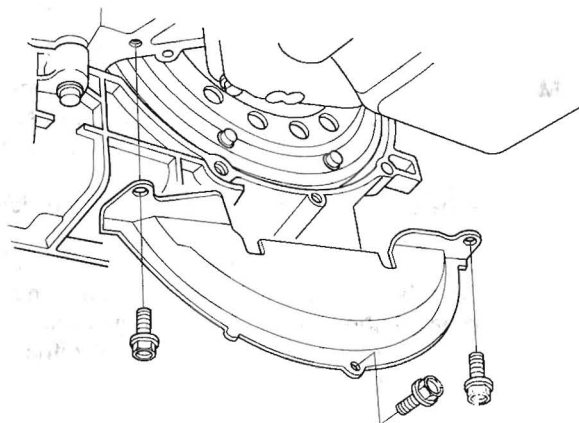
Engine Block

Oil Pan Removal (cont'd)

20. Remove the lower torque rod bracket.

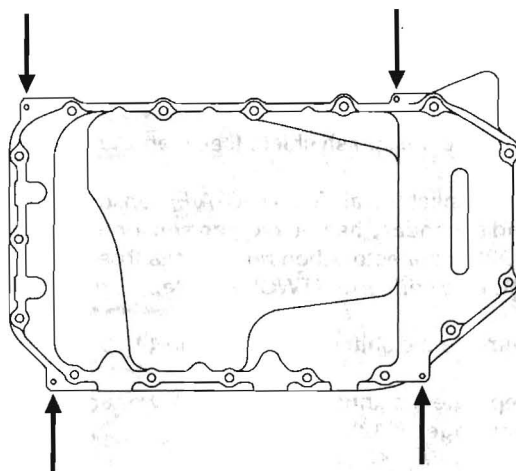


21. Remove the torque converter cover.



22. Remove the bolts securing the oil pan.

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

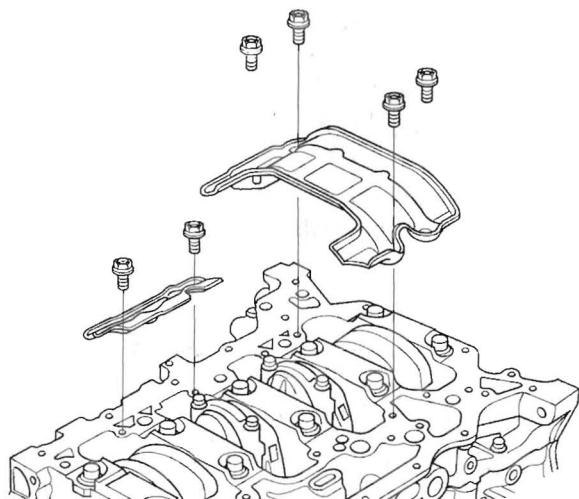


24. Remove the oil pan.

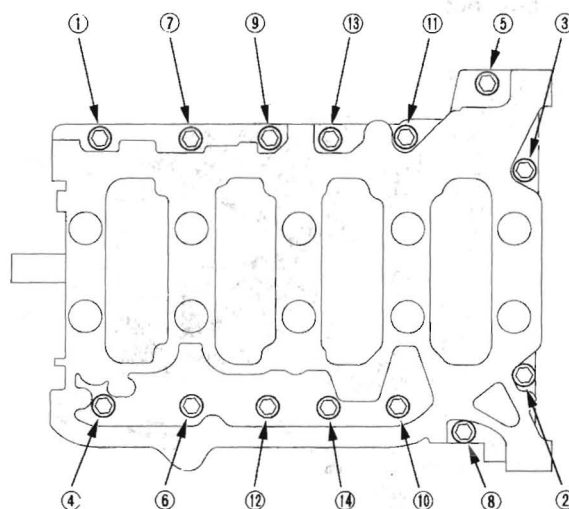


Crankshaft and Piston Removal

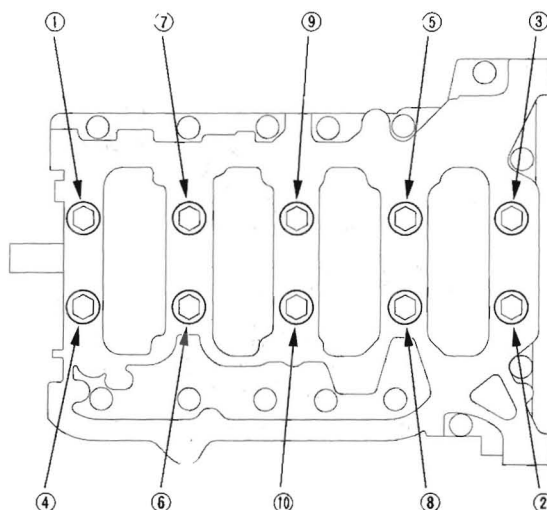
1. Remove the engine assembly (see page 5-3).
2. Remove the transmission (see page 14-246).
3. Remove the drive plate (see page 14-267).
4. Remove the oil pan (see page 7-11).
5. Remove the oil pump (see page 8-15).
6. Remove the cylinder head (see page 6-31).
7. Remove the baffle plates.



8. Remove the 8 mm bolts.



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

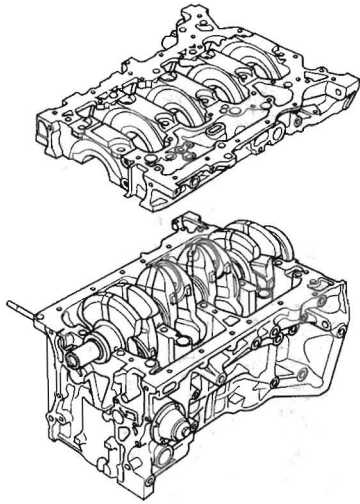


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Engine Block

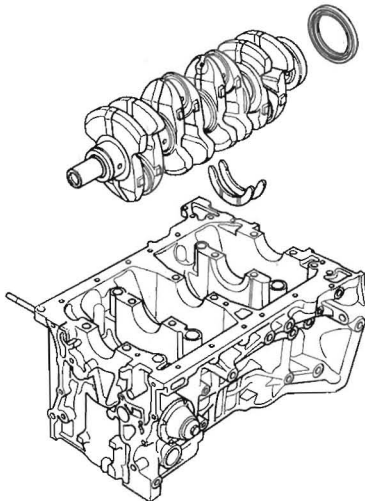
Crankshaft and Piston Removal (cont'd)

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



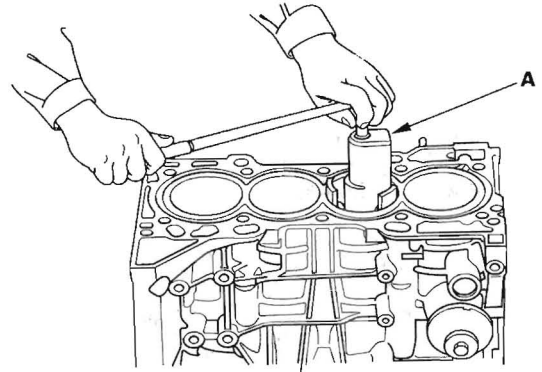
11. Remove the rod caps/bearings. Keep all caps/bearings in order.

12. Lift the crankshaft out of the engine. Be careful not to damage the journals.

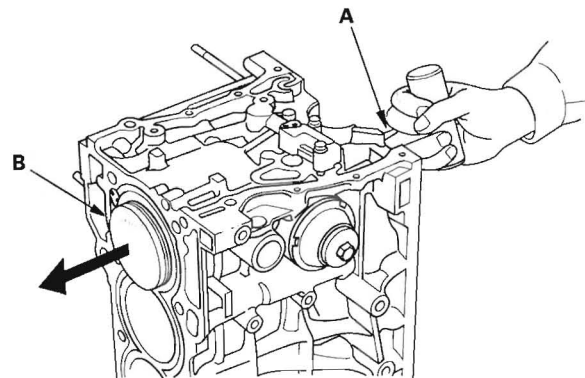


13. Remove the upper bearing halves from the connecting rods, and set them aside with their respective caps.

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



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



16. Reinstall the lower block and the bearings on the engine in the proper order.

17. Reinstall the connecting rod bearings and caps after removing each piston/connecting rod assembly.

18. Mark each piston/connecting rod assembly with its cylinder number to make sure they are reused in the original order.

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



Crankshaft Inspection

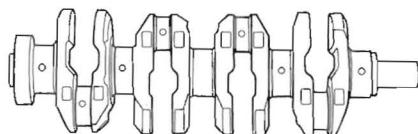
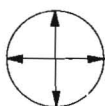
Out-of-Round and Taper

1. Remove the crankshaft from the engine block (see page 7-13).
2. Clean the crankshaft oil passages with pipe cleaners or a suitable brush.
3. Clean the keyway and threads.
4. Measure the out-of-round at the middle of each rod and main journal in two places. The difference between measurements on each journal must not be more than the service limit.

Journal Out-of-Round

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

Service Limit: 0.010 mm (0.0004 in.)



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

Journal Taper

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

Service Limit: 0.010 mm (0.0004 in.)

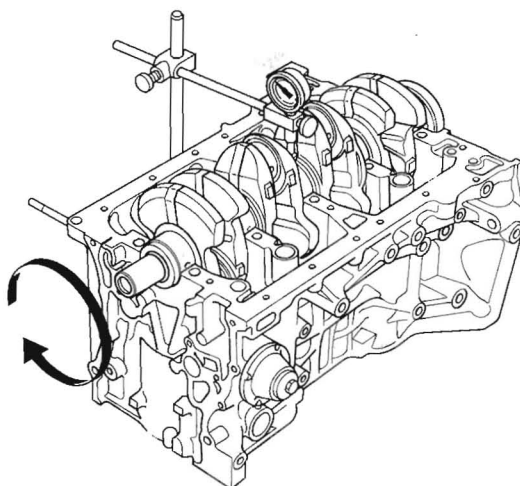
Straightness

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

Crankshaft Total Runout

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

Service Limit: 0.04 mm (0.0016 in.)



Engine Block

Block and Piston Inspection

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

Piston Diameter

Standard (New):

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

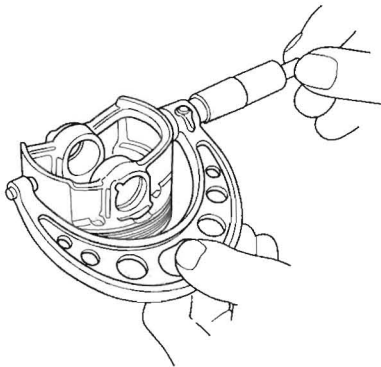
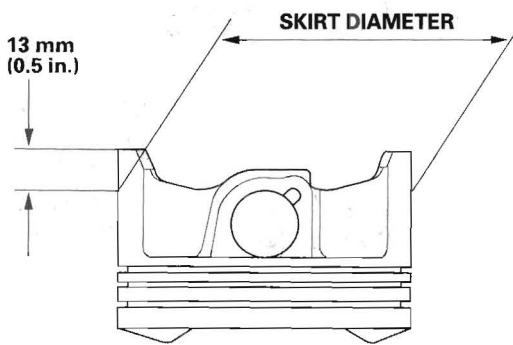
B: 86.970—86.980 mm
(3.4240—3.4244 in.)

Service Limit:

No Letter (or A): 86.930 mm (3.4224 in.)
B: 86.920 mm (3.4220 in.)

Oversize Piston Diameter

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



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

Cylinder Bore Size

Standard (New):

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

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

Service Limit: 87.070 mm (3.4279 in.)

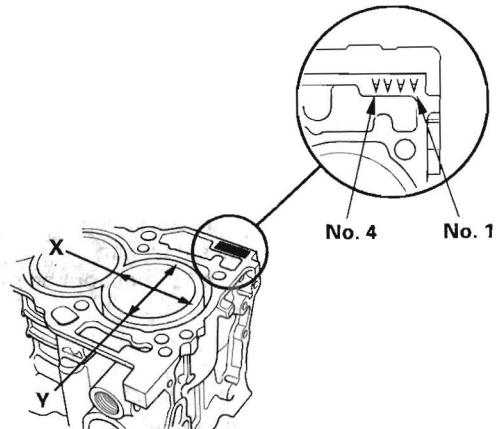
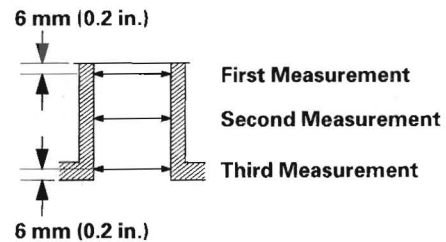
Oversize Bore

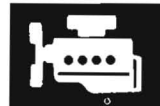
0.25: 87.250—87.260 mm (3.4350—3.4354 in.)

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

Bore Taper

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



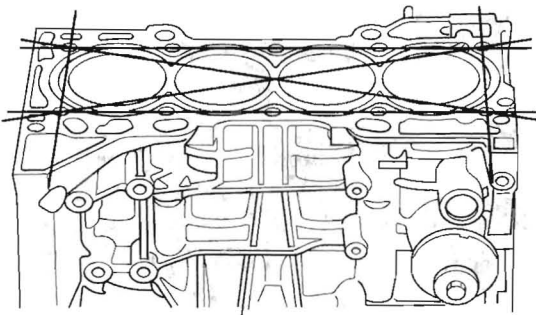


5. Scored or scratched cylinder bores must be honed.
6. Check the top of the block for warpage. Measure along the edges, and across the center as shown.

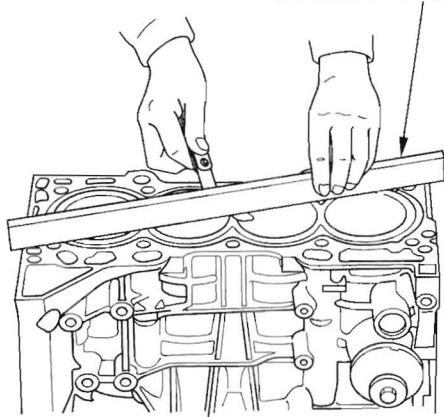
Engine Block Warpage

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

Service Limit: 0.10 mm (0.004 in.)



PRECISION STRAIGHT EDGE



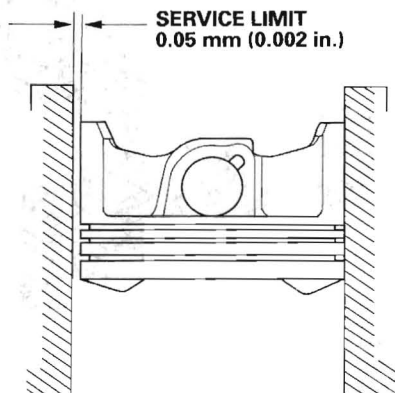
7. Calculate the difference between the cylinder bore diameter and the piston diameter. If the clearance is near or exceeds the service limit, inspect the piston and cylinder bore for excessive wear.

Piston-to-Cylinder Bore Clearance

Standard (New): 0.020—0.040 mm

(0.0008—0.0016 in.)

Service Limit: 0.05 mm (0.002 in.)

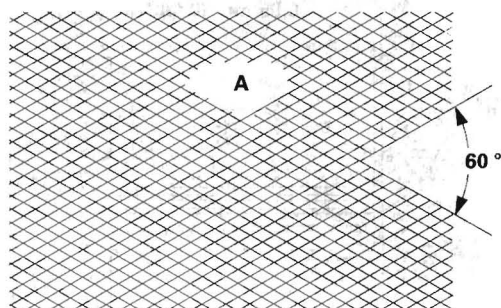


Engine Block

Cylinder Bore Honing

Only a scored or scratched cylinder bore must be honed.

1. Measure the cylinder bores (see page 7-16).
If the block is to be reused, hone the cylinders, and remeasure the bores.
2. Hone the cylinder bores with honing oil and a fine (400 grit) stone in a 60 degree cross-hatch pattern (A). Use only a rigid hone with 400 grit or finer stone such as Sunnen, Ammco, or equivalent. Do not use stones that are worn or broken.



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

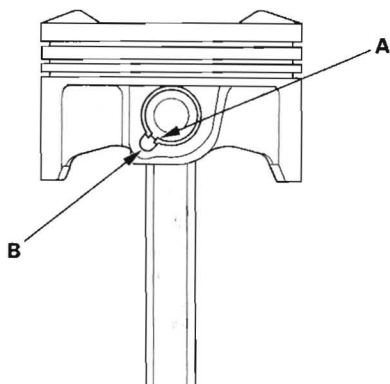


Piston, Pin, and Connecting Rod Replacement

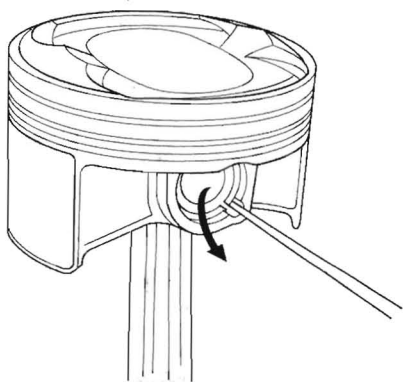
Disassembly

1. Remove the piston from the engine block (see page 7-13).
2. Apply new engine oil to the piston pin snap rings (A), and turn them in the ring grooves until the end gaps are lined up with the cutouts in the piston pin bores (B).

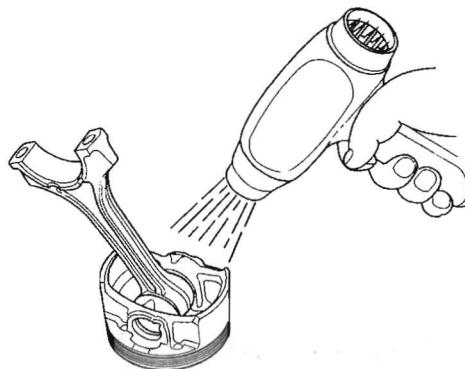
NOTE: Take care not to damage the ring grooves.



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



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



(cont'd)

Engine Block

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

Inspection

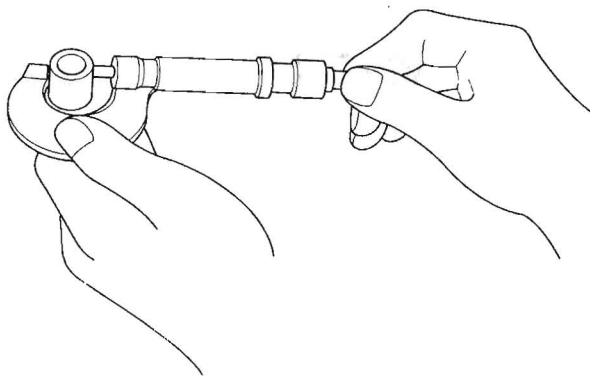
NOTE: Inspect the piston, piston pin, and connecting rod when they are at room temperature.

1. Measure the diameter of the piston pin.

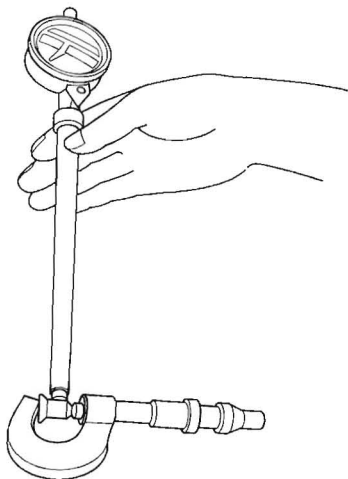
Piston Pin Diameter

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

Service Limit: 21.953 mm (0.8643 in.)



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



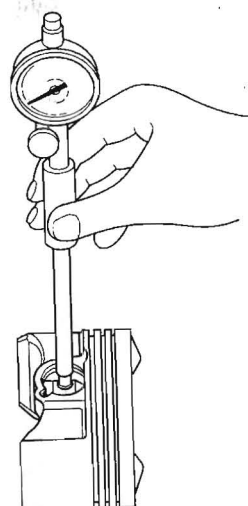
3. Check the difference between the piston pin diameter and piston pin hole diameter in the piston.

Piston Pin-to-Piston Clearance

Standard (New): -0.005 to +0.002 mm

(-0.00020 to +0.00008 in.)

Service Limit: 0.005 mm (0.0002 in.)



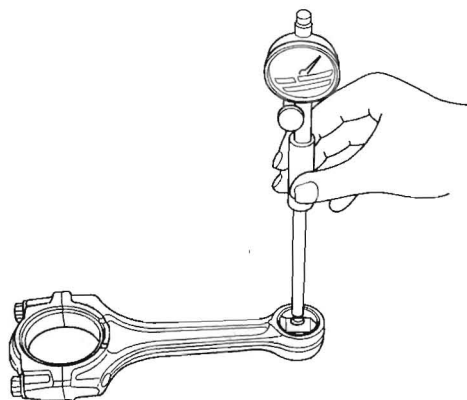
4. Measure the piston pin-to-connecting rod clearance.

Piston Pin-to-Connecting Rod Clearance

Standard (New): 0.005–0.015 mm

(0.0002–0.0006 in.)

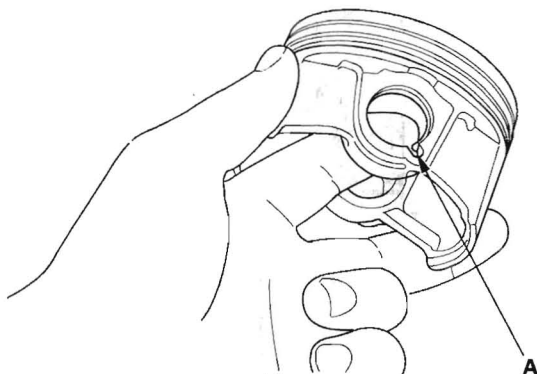
Service Limit: 0.02 mm (0.0008 in.)



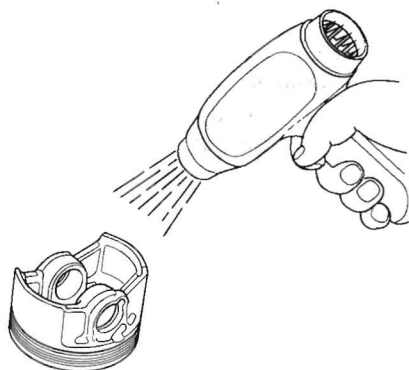


Reassembly

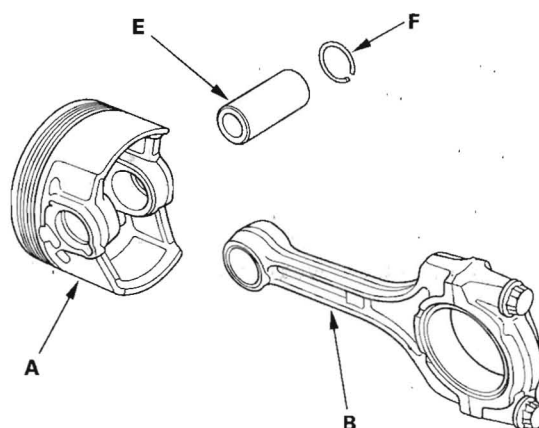
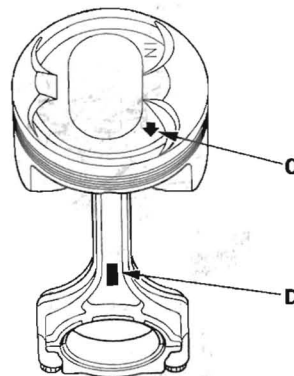
1. Install a piston pin snap ring (A).



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



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

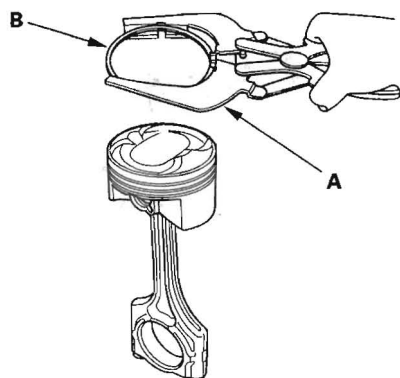


5. Install the remaining snap ring (F).
6. Turn the snap rings in the ring grooves until the end gaps are positioned at the bottom of the piston.

Engine Block

Piston Ring Replacement

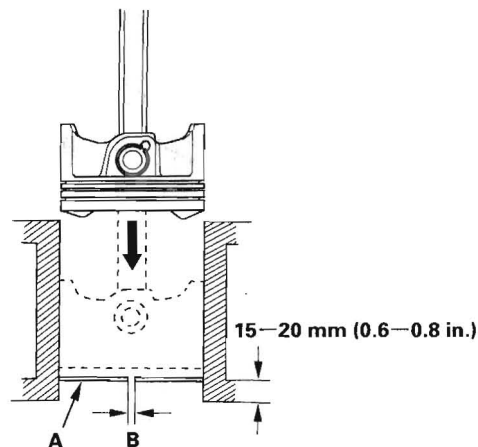
1. Remove the piston from the engine block (see page 7-13).
2. Using a ring expander (A), remove the old piston rings (B).



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

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

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



5. Measure the piston ring end-gap (B) with a feeler gauge:
 - If the gap is too small, check to see if you have the proper rings for your engine.
 - If the gap is too large, recheck the cylinder bore diameter against the wear limits (see page 7-16). If the bore is beyond the service limit, the engine block must be rebored.

Piston Ring End-Gap

Top Ring:

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

Service Limit: 0.60 mm (0.024 in.)

Second Ring:

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

Service Limit: 0.70 mm (0.028 in.)

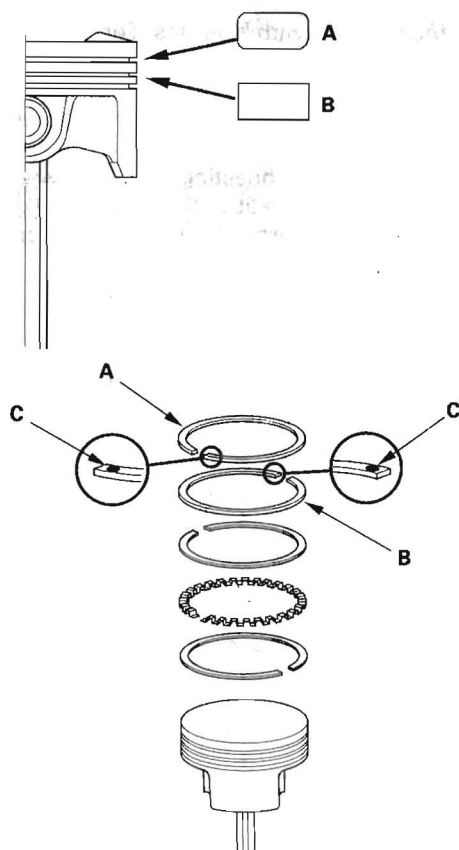
Oil Ring:

Standard (New): 0.25–0.65 mm
(0.010–0.026 in.)

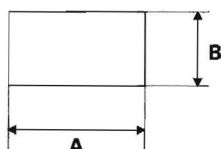
Service Limit: 0.75 mm (0.030 in.)



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



Piston Ring Dimensions

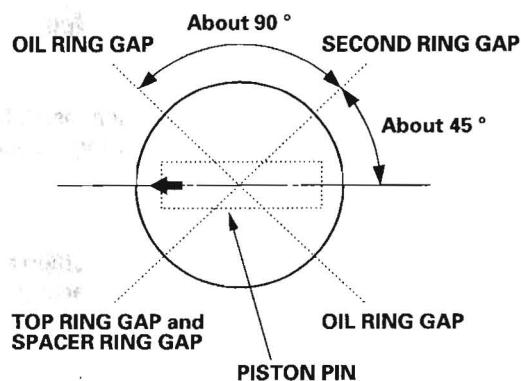


Top Ring (Standard):
A: 3.1 mm (0.12 in.)
B: 1.2 mm (0.05 in.)

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

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

8. Position the ring end gaps as shown:



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

Top Ring Clearance

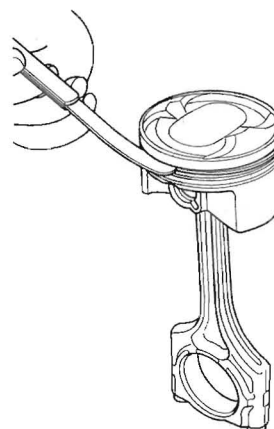
Standard (New): 0.035—0.060 mm
(0.0014—0.0024 in.)

Service Limit: 0.13 mm (0.005 in.)

Second Ring Clearance

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

Service Limit: 0.13 mm (0.005 in.)

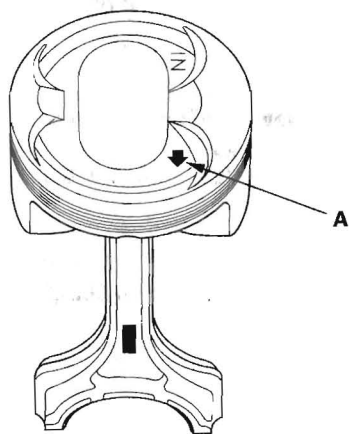


Engine Block

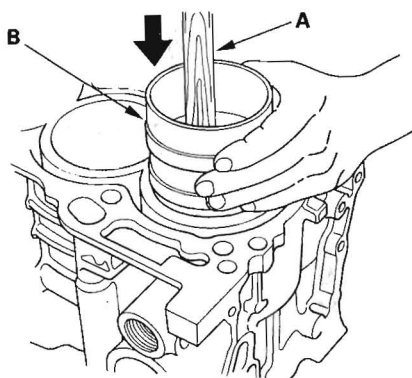
Piston Installation

If the Crankshaft is Already Installed

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



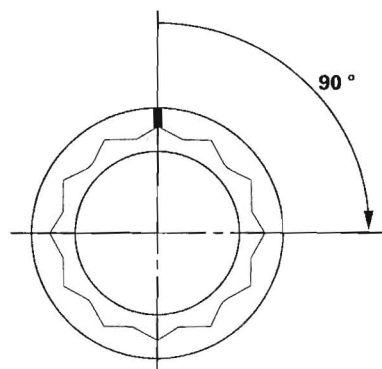
5. Position the piston in the cylinder, and tap it in using the wooden handle of a hammer (A). Push down on the ring compressor (B) to prevent the rings from expanding before entering the cylinder bore.



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

7. Check the connecting rod bearing clearance with plastigage (see page 7-8).
8. Inspect the connecting rod bolts (see page 7-25).
9. Install the rod caps with bearings. Torque the bolts to 20 N·m (2.0 kgf·m, 14 lbf·ft).
10. Tighten the connecting rod bolts an additional 90°.

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

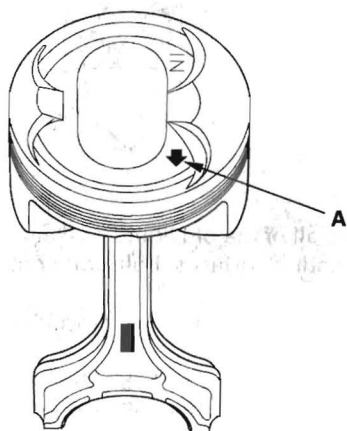




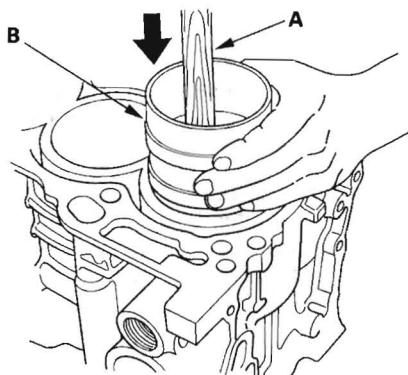
Connecting Rod Bolt Inspection

If the Crankshaft is Not Installed

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

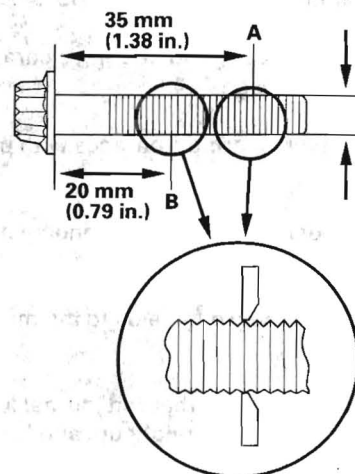


4. Position the piston in the cylinder, and tap it in using the wooden handle of a hammer (A). Push down on the ring compressor (B) to prevent the rings from expanding before entering the cylinder bore.



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

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



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

Point A—Point B = Difference in Diameter

Difference in Diameter

Specification: 0—0.1 mm (0—0.004 in.)

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

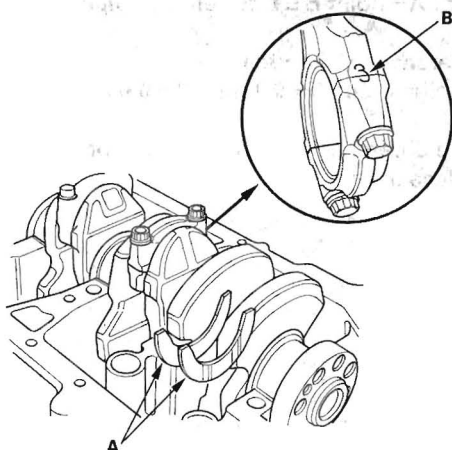
Engine Block

Crankshaft Installation

Special Tools Required

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

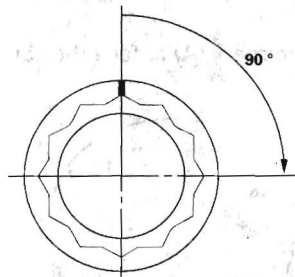
1. Check the connecting rod bearing clearance with plastigage (see page 7-8).
2. Check the main bearing clearance with plastigage (see page 7-6).
3. Install the bearing halves in the engine block and connecting rods.
4. Apply a coat of new engine oil to the main bearings and rod bearings.
5. Hold the crankshaft so that rod journal No. 2 and rod journal No. 3 are straight up, and lower the crankshaft into the block.
6. Apply new engine oil to the thrust washer surfaces. Install the thrust washers (A) in the No. 4 journal of the engine block.



7. Inspect the connecting rod bolts (see page 7-25).
8. Apply engine oil to the threads of the connecting rod bolts.
9. Seat the rod journals into connecting rod No. 1 and connecting rod No. 4. Line up the mark (B) on the connecting rod and cap, then install the caps and bolts finger-tight.
10. Rotate the crankshaft clockwise, and seat the journals into connecting rod No. 2 and connecting rod No. 3. Line up the mark on the connecting rod and cap, then install the caps and bolts finger-tight.

11. Tighten the connecting rod bolts to 20 N·m (2.0 kgf·m, 14 lbf·ft).
12. Tighten the connecting rod bolts an additional 90°.

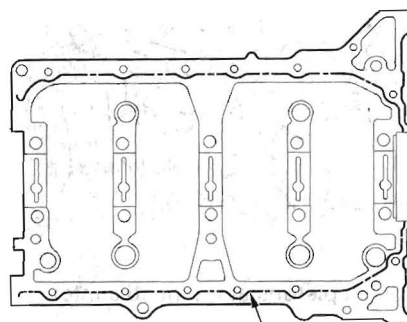
NOTE: Remove the connecting rod bolt if you tightened it beyond the specified angle, and go back to step 8 of the procedure. Do not loosen it back to the specified angle.



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

NOTE:

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

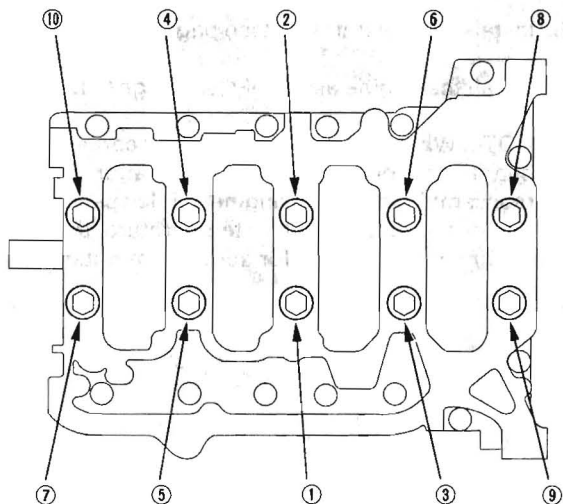




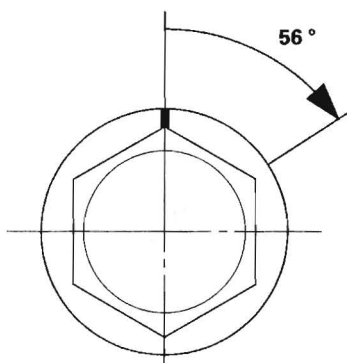
16. Put the lower block on the engine block.

17. Apply new engine oil to the threads of the bearing cap bolts.

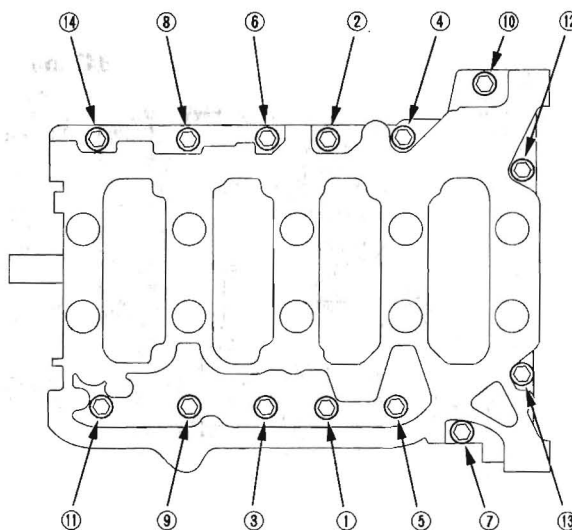
18. Tighten the bearing cap bolts, in sequence, to 29 N·m (3.0 kgf·m, 22 lbf·ft).



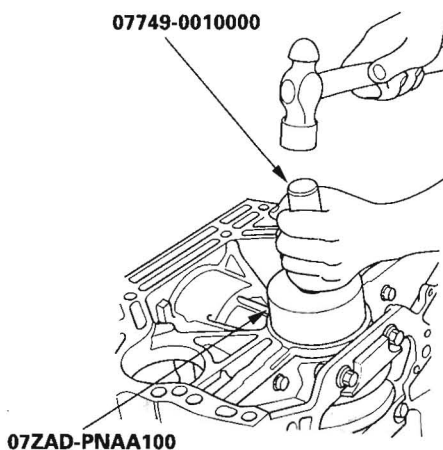
19. Tighten the bearing cap bolts an additional 56°.



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



21. Use the driver and attachment to drive a new oil seal squarely into the block to the specified installed height.



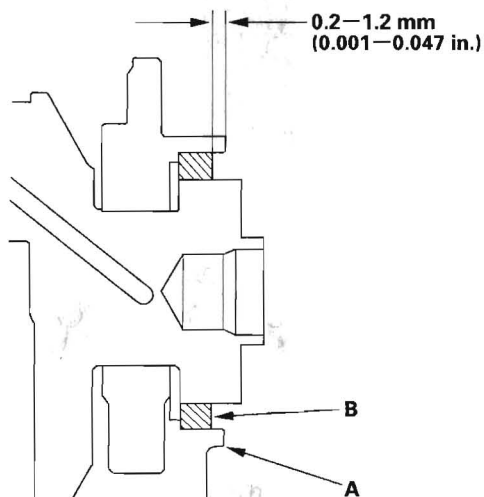
(cont'd)

Engine Block

Crankshaft Installation (cont'd)

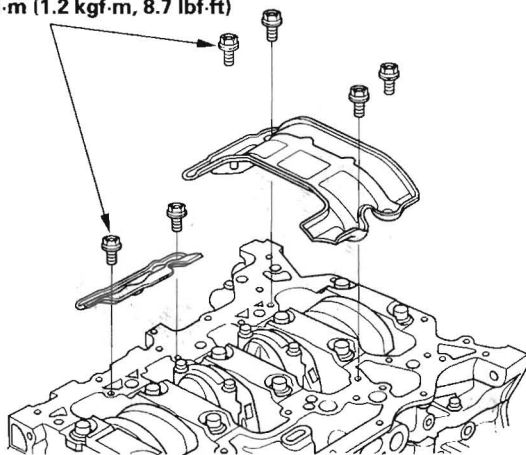
22. Measure the distance between the engine block (A) and oil seal (B).

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



23. Install the baffle plates.

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



24. Install the oil pump (see page 8-20).

25. Install the oil pan (see page 7-29).

26. Install the cylinder head (see page 6-50).

27. Install the drive plate (see page 14-267).

28. Install the transmission (see page 14-256).

29. Install the engine assembly (see page 5-12).

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

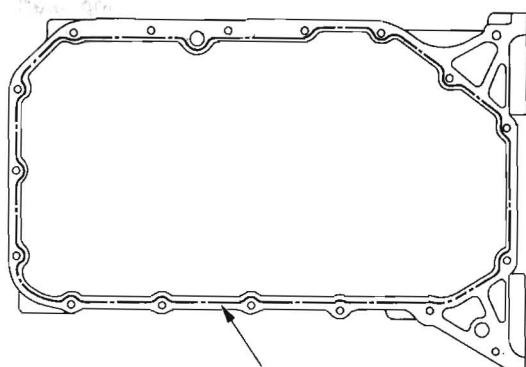


Oil Pan Installation

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 engine block mating surface of the oil pan and to the inner threads of the bolt holes. Install the component within 5 minutes of applying the liquid gasket.

NOTE:

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



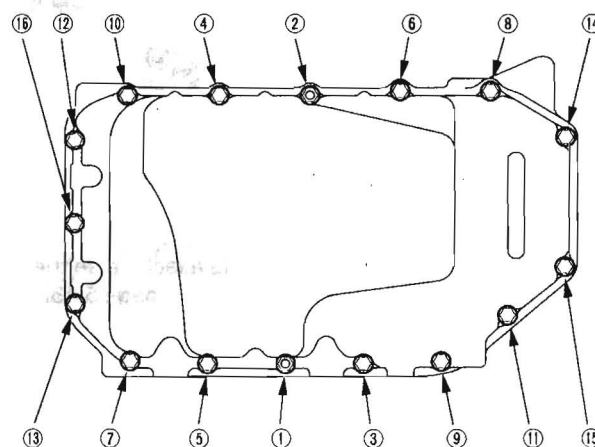
Apply liquid gasket
along the broken line.

4. Install the oil pan.

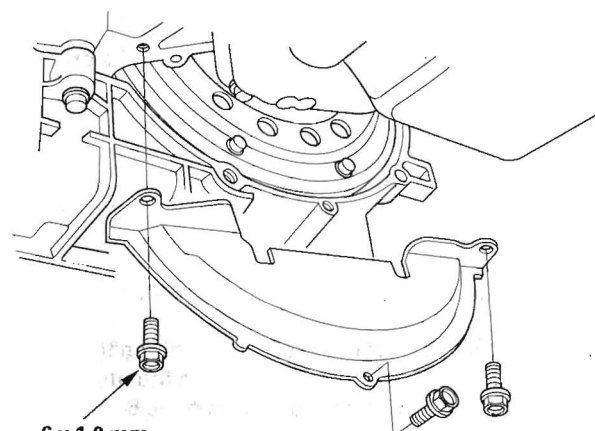
5. Tighten the bolts in two or three steps. In the final step, tighten all bolts, in sequence, to 12 N·m (1.2 kgf·m, 8.7 lbf·ft). Wipe off the excess liquid gasket on the each side of crankshaft pulley and drive plate.

NOTE:

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



6. Install the torque converter cover.



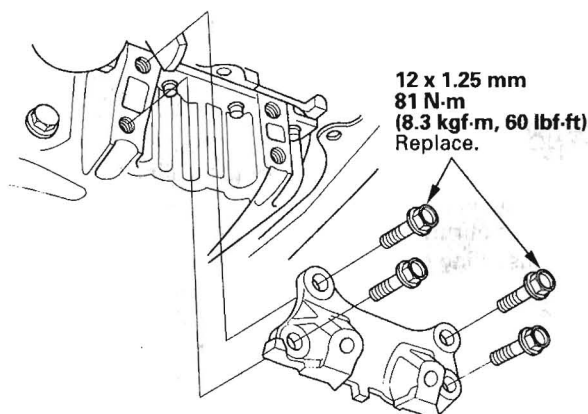
6 x 1.0 mm
12 N·m
(1.2 kgf·m, 8.7 lbf·ft)

(cont'd)

Engine Block

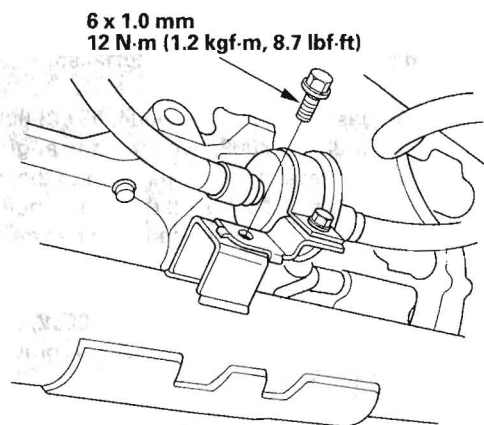
Oil Pan Installation (cont'd)

7. Install the lower torque rod bracket.



8. If the engine is still in the vehicle, do steps 9 through 30.
9. Using the subframe adapter and a jack, raise the subframe up to body (see step 15 on page 5-15).
10. Loosely install the new 14 x 1.5 mm bolts (see step 16 on page 5-15).
11. Align all reference marks on the front subframe with the body, then tighten the bolts on the front subframe to the specified torque (see step 17 on page 5-16).
12. Tighten the new subframe mounting bolts on both side (see step 18 on page 5-16).
13. Lower the vehicle on the lift.
14. Loosen the upper torque rod mounting bolt (see step 6 on page 5-14).
15. Raise the vehicle on the lift to full height.
16. Install the lower torque rod, then tighten the new lower torque rod mounting bolts in the numbered sequence shown (see step 19 on page 5-16).
17. Lower the vehicle on the lift.
18. Tighten the upper torque rod mounting bolt (see step 20 on page 5-16).

19. Install the automatic transmission fluid (ATF) filter.



20. Install the bolts securing the left steering gearbox mounting bracket (see step 25 on page 5-17).
21. Install the bolts securing the right steering gearbox mounting bracket (see step 26 on page 5-17).
22. Install the power steering (P/S) fluid line bracket, and secure the hose with the hose clamps (see step 27 on page 5-17).
23. Install the propeller shaft (see page 16-41).
24. 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.
25. Connect the lower arms to the knuckles (see page 18-12).
26. Install the shift cable (see page 14-284).
27. Install the three way catalytic converter (TWC). Use new gaskets and new self-locking nuts. Connect the air fuel ratio (A/F) sensor connector and secondary heated oxygen sensor (secondary HO2S) connector (see step 32 on page 5-18).
28. Install the splash shield (see step 34 on page 5-18).
29. Install the front wheels.
30. Check the wheel alignment (see page 18-5).

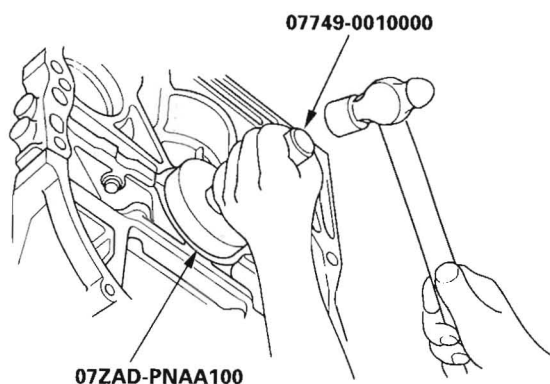


Transmission End Crankshaft Oil Seal Installation - In Car

Special Tools Required

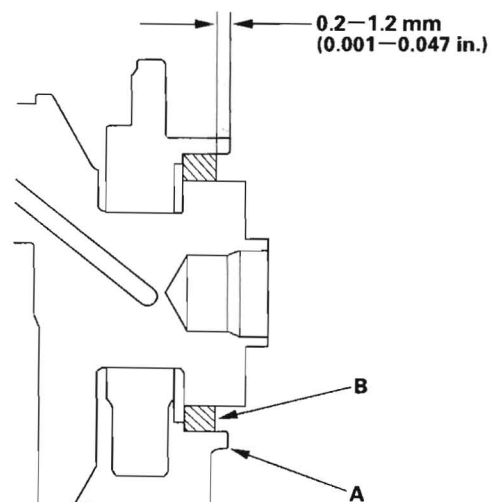
- Driver 07749-0010000
- Oil seal driver attachment 96 mm 07ZAD-PNAA100

1. Remove the transmission (see page 14-246).
2. Remove the drive plate (see page 14-267).
3. Clean and dry the crankshaft oil seal housing.
4. Use the driver and attachment to drive a new oil seal squarely into the block to the specified installed height.



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

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

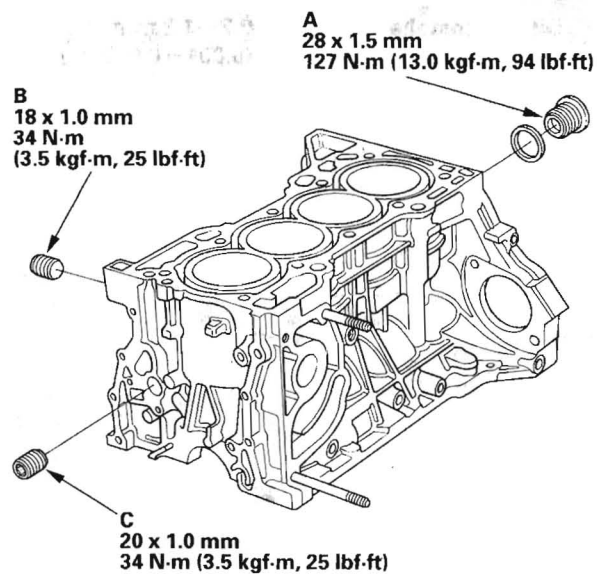


6. Install the drive plate (see page 14-267).
7. Install the transmission (see page 14-256).

Engine Block

Sealing Bolt Installation

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



Engine Mechanical

Engine Lubrication

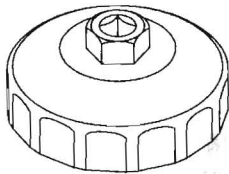
Special Tools	8-2
Component Location Index	8-3
Symptom Troubleshooting Index	8-4
Low Oil Pressure Indicator Circuit Diagram	8-5
Low Oil Pressure Indicator Circuit Troubleshooting (Open)	8-6
Low Oil Pressure Indicator Circuit Troubleshooting (Short)	8-7
Oil Pressure Switch Test	8-8
Oil Pressure Switch Replacement	8-8
Oil Pressure Test	8-9
Engine Oil Replacement	8-10
Engine Oil Filter Replacement	8-11
Oil Filter Base Replacement	8-12
Oil Filter Feed Pipe Replacement	8-12
Engine Oil Gallery Cap Replacement	8-13
Oil Pump Overhaul	8-14



Engine Lubrication

Special Tools

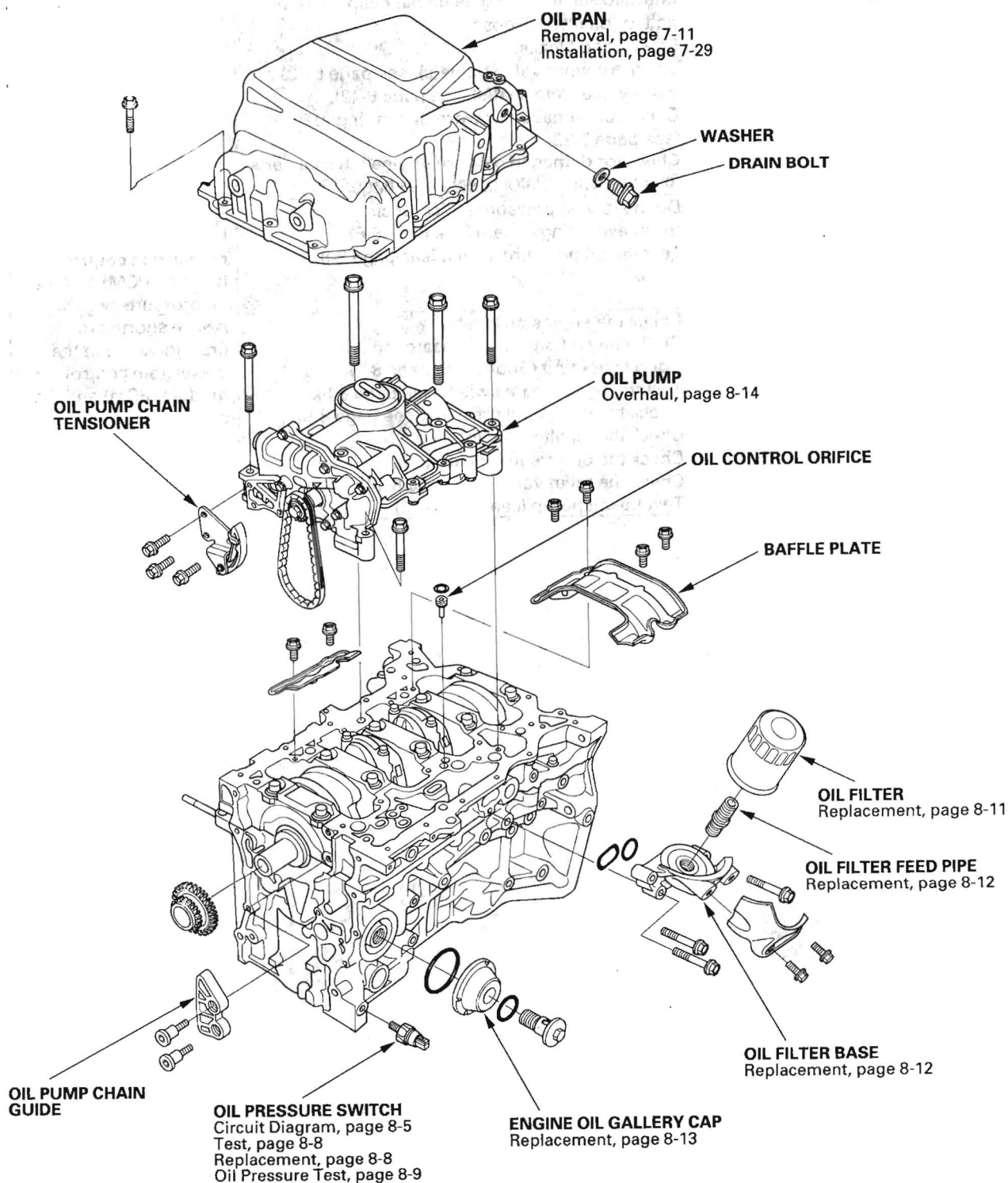
Ref. No.	Tool Number	Description	Qty
①	07AAA-PLLA100	Oil Filter Wrench	1



①



Component Location Index



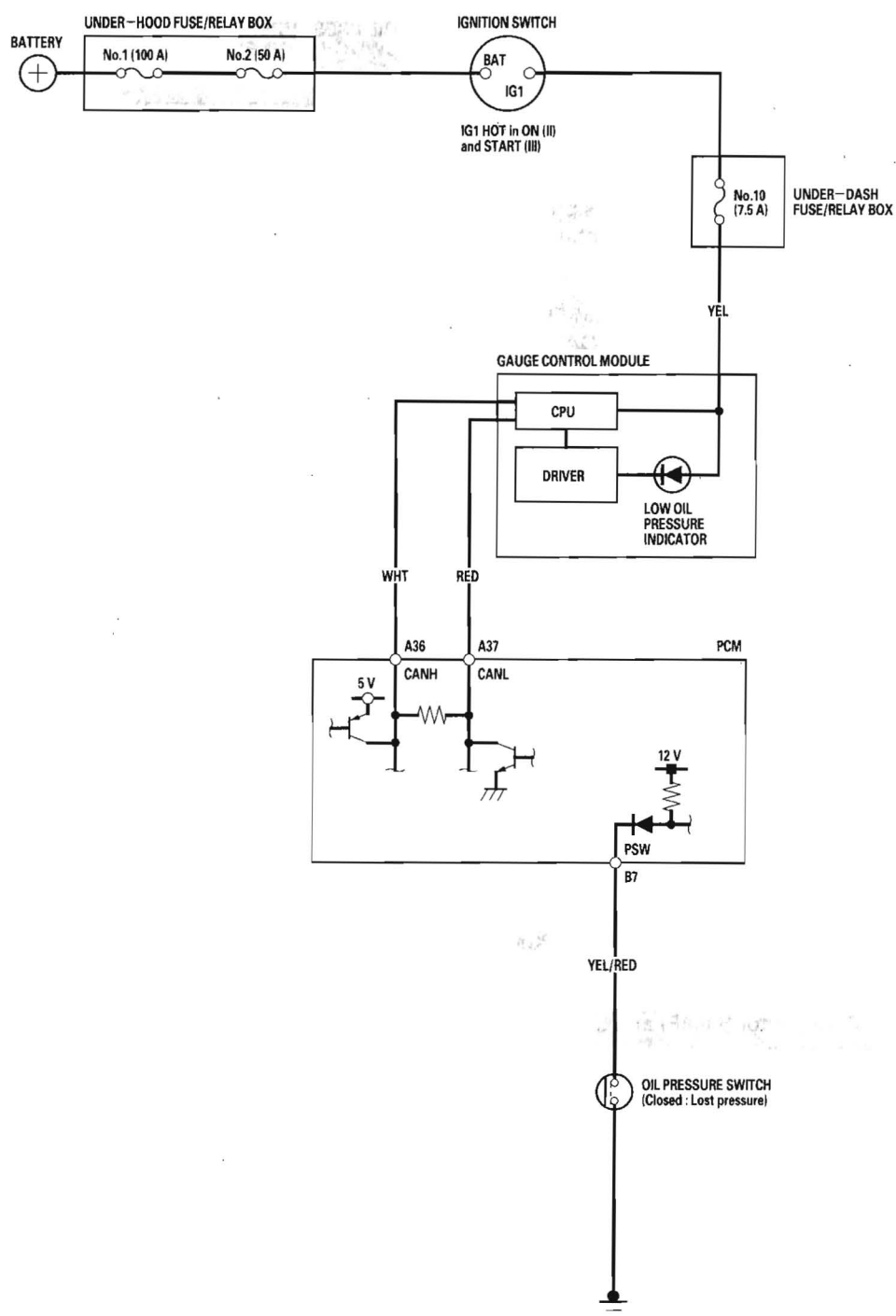
Engine Lubrication

Symptom Troubleshooting Index

Symptom	Diagnostic procedure	Also check for
Excessive engine oil consumption	1. Check to see if the engine oil filler cap, oil drain bolt, or oil filter is loose. 2. Check for oil leaks. 3. Check for worn valve guide(s) (see page 6-43) or worn valve stem seal(s) (see page 6-42). 4. Check for damaged or worn piston ring(s) (see page 7-22). 5. Check for damaged or worn engine internal parts (cylinder wall, pistons, etc.) (see page 7-16).	
Low oil pressure indicator does not come on with the ignition switch ON (II)	1. Do the low oil pressure indicator circuit troubleshooting (Open) (see page 8-6). 2. Test the oil pressure switch (see page 8-8).	An open in the wire between the powertrain control module (PCM) and the oil pressure switch
Low oil pressure indicator stays on	1. Check the engine oil level. 2. Do the low oil pressure indicator circuit troubleshooting (Short) (see page 8-7). 3. Test the oil pressure switch (see page 8-8). 4. Check the engine oil pressure (see page 8-9). 5. Check the oil filter for clogging. 6. Check the oil screen for clogging. 7. Check the relief valve (see page 8-14). 8. Test the oil pump (see page 8-16).	A wire shorted to ground between the powertrain control module (PCM) and the oil pressure switch



Low Oil Pressure Indicator Circuit Diagram



Engine Lubrication

Low Oil Pressure Indicator Circuit Troubleshooting (Open)

1. Connect the Honda Diagnostic System (HDS) to the data link connector (DLC) (see step 2 on page 11-3).
2. Turn the ignition switch ON (II).
3. 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 11-197).
4. Check for DTCs (see page 11-3). If a DTC is present, diagnose, and repair the cause before continuing with this test.
5. Turn the ignition switch ON (II), select PGM-FI, and check the OIL PRESSURE SWITCH in the DATA LIST with the HDS.

Is "ON" indicated?

YES—Replace the gauge control module (see page 22-248). ■

NO—Go to step 6.

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

Is the oil pressure switch OK?

YES—Go to step 7.

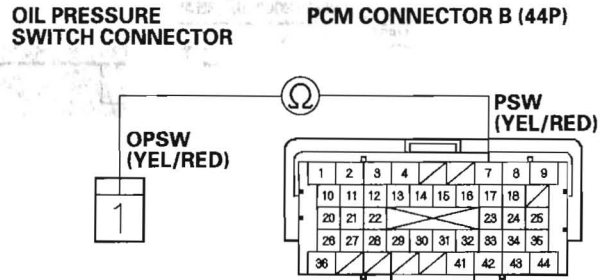
NO—Replace the oil pressure switch (see page 8-8). ■

7. Turn the ignition switch ON (II), and jump the SCS line with the HDS, then turn the ignition switch OFF.

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

8. Disconnect PCM connector B (44P) and the oil pressure switch connector.

9. Check for continuity between PCM connector terminal B7 and the oil pressure switch connector.



Is there continuity?

YES—Update the PCM if it does not have the latest software (see page 11-7), or substitute a known-good PCM (see page 11-8), then recheck. If the symptom/indication goes away with a known-good PCM, replace the original PCM (see page 11-219). ■

NO—Repair open in the wire between the oil pressure switch and the PCM. ■



Low Oil Pressure Indicator Circuit Troubleshooting (Short)

1. Connect the Honda Diagnostic System (HDS) to the data link connector (DLC) (see step 2 on page 11-3).
2. Turn the ignition switch ON (II).
3. 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 11-197).
4. Check for DTCs (see page 11-3). If a DTC is present, diagnose, and repair the cause before continuing with this test.
5. Start the engine, select PGM-FI, and check the OIL PRESSURE SWITCH in the DATA LIST with the HDS.

Is "OFF" indicated?

YES—Replace the gauge control module (see page 22-248). ■

NO—Go to step 6.

6. Turn the ignition switch OFF.
7. Disconnect the oil pressure switch connector.
8. Start the engine, and check the OIL PRESSURE SWITCH in the DATA LIST with the HDS.

Is "OFF" indicated?

YES—Go to step 9.

NO—Go to step 10.

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

Is the oil pressure switch OK?

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

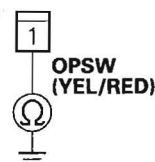
NO—Replace the oil pressure switch (see page 8-8). ■

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

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

11. Disconnect PCM connector B (44P) and the oil pressure switch connector.
12. Check for continuity between the oil pressure switch connector and body ground.

OIL PRESSURE SWITCH CONNECTOR



Terminal side of female terminal

Is there continuity?

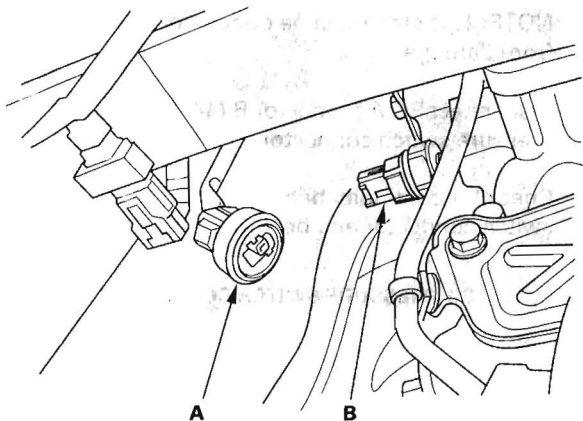
YES—Repair short in the wire between the oil pressure switch and the PCM. ■

NO—Update the PCM if it does not have the latest software (see page 11-7), or substitute a known-good PCM (see page 11-8), then recheck. If the symptom/indication goes away with a known-good PCM, replace the original PCM (see page 11-219). ■

Engine Lubrication

Oil Pressure Switch Test

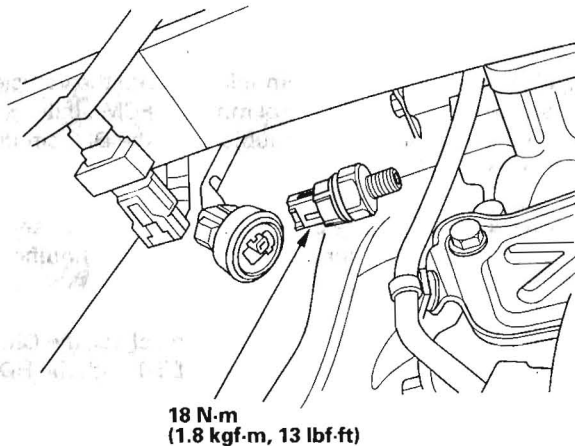
1. Remove the oil pressure switch connector (A) from the engine oil pressure switch (B).



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

Oil Pressure Switch Replacement

1. Disconnect the oil pressure switch connector, 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.

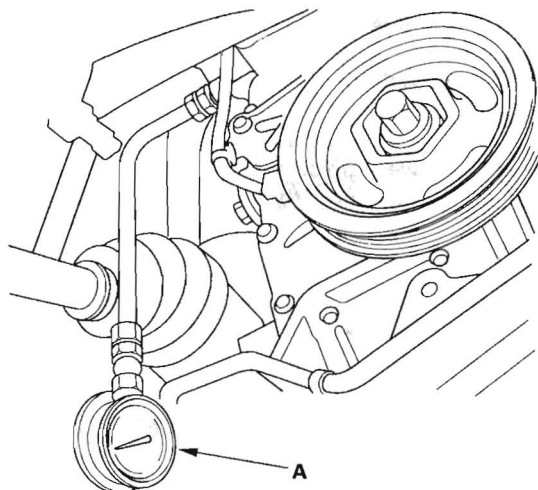
NOTE: Using too much liquid gasket may cause liquid gasket to enter the oil passage or the end of the new oil pressure switch.



Oil Pressure Test

NOTE: If the oil pressure warning light stays on with the engine running, check the engine oil level. If the oil level is correct:

1. Remove the oil pressure switch, and install an oil pressure gauge (A).



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

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

Engine Oil Pressure:

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

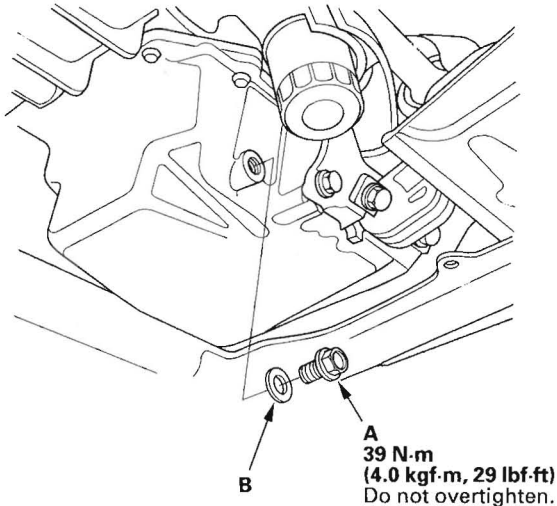
At 3,000 rpm: 300 kPa (3.1 kgf/cm², 44 psi) min.

4. If the oil pressure is out of specifications, inspect these items:
 - Replace the oil filter (see page 8-11).
 - Inspect the oil pressure relief valve (see page 8-14).
 - Check the oil screen for clogging.
 - Inspect the oil pump (see page 8-16).

Engine Lubrication

Engine Oil Replacement

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



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

Capacity

At Oil Change:

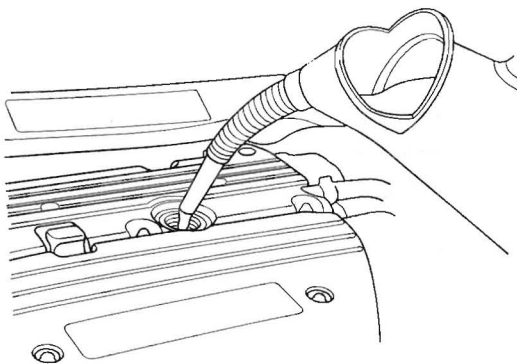
4.0 L (4.2 US qt)

At Oil Change Including Filter:

4.2 L (4.4 US qt)

After Engine Overhaul:

5.3 L (5.6 US qt)



5. If the maintenance minder required to replace the engine oil, reset the maintenance minder (see page 3-6) and this procedure is complete. If the maintenance minder did not require to replace the engine oil, go to step 6
 6. Connect the Honda Diagnostic System (HDS) to the data link connector (DLC) (see step 2 on page 11-3).
 7. Turn the ignition switch ON (II).
 8. Make sure the HDS communicates with the vehicle and the powertrain control module (PCM). If it doesn't troubleshoot the DLC circuit (see page 11-197).
 9. Select the BODY ELECTRICAL with the HDS.
 10. Select the ADJUSTMENT in GAUGE MENU with the HDS.
 11. Select the RESET in the MAINTENANCE MINDER with the HDS.
 12. Select the RESETTING THE ENGINE OIL LIFE with the HDS.
- NOTE: If you changed the automatic transmission fluid (ATF) at the same time with the engine oil, select RESETTING THE ENGINE OIL LIFE AND ATF with the HDS instead.
13. Run the engine for more than 3 minutes, then check for oil leaks.

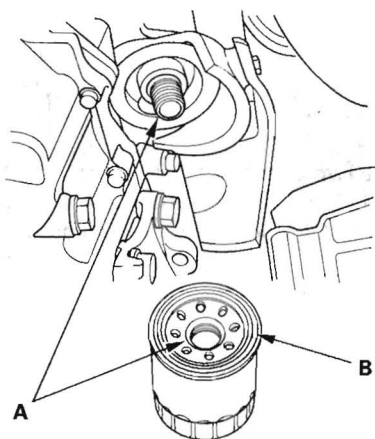


Engine Oil Filter Replacement

Special Tools Required

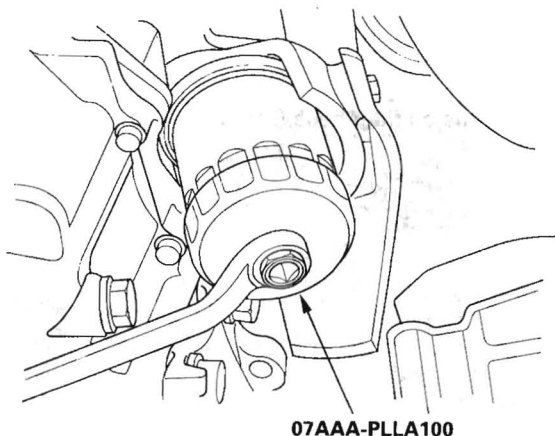
Oil filter wrench 07AAA-PLLA100

1. Remove the oil filter with the special 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.



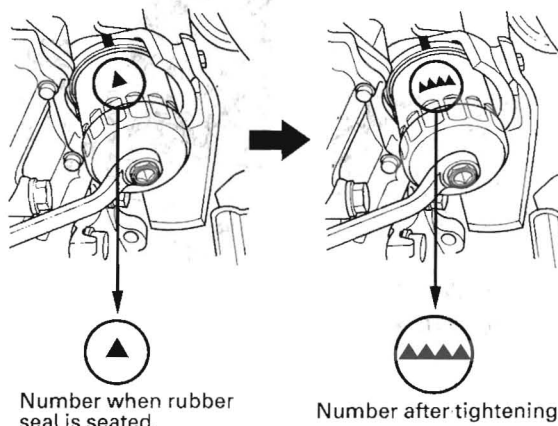
4. Install the oil filter by hand.
5. After the rubber seal seats, tighten the oil filter clockwise with the oil filter wrench

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



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

- Spin the filter on until its seal lightly seats against the 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 number 2 is at the bottom when the seal is seated, tighten the filter until the number 1 comes around the bottom.



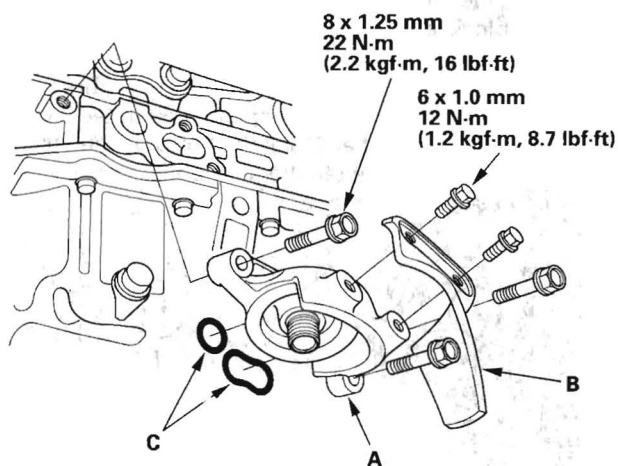
Number or Mark when rubber seal is seated	1 or ▼	2 or ▼▼	3 or ▼▼▼	4 or ▼▼▼▼
Number or Mark after tightening	4 or ▼▼▼▼	1 or ▼	2 or ▼▼	3 or ▼▼▼

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

Engine Lubrication

Oil Filter Base Replacement

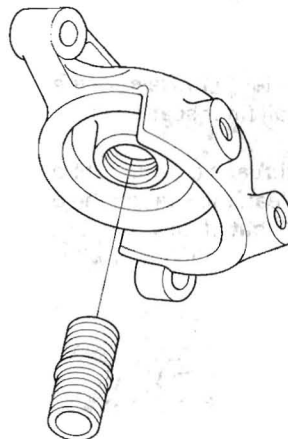
1. Remove the oil filter (see page 8-11).
2. Remove the oil filter base (A), then remove the oil filter cover (B).



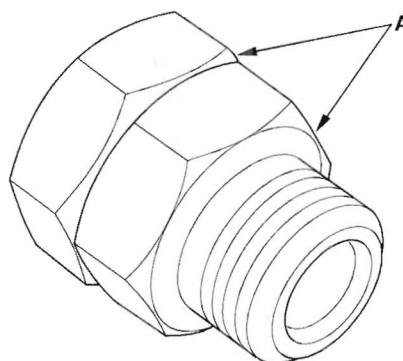
3. Clean the O-ring grooves and mating surface with the oil filter base.
4. Install the oil filter cover, then install the oil filter base with new O-rings (C).
5. Install the oil filter (see page 8-11).

Oil Filter Feed Pipe Replacement

1. Remove the oil filter base (see page 8-12).
2. Remove the oil filter holder.



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

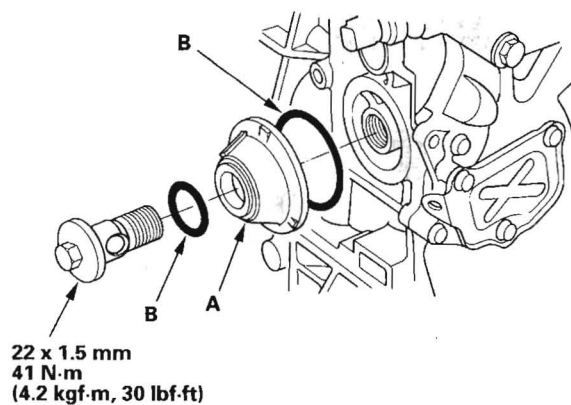


4. Tighten the oil filter feed pipe to the block to 49 N·m (5.0 kgf·m, 36 lbf·ft), then remove the nuts from the oil filter feed pipe.
5. Install the oil filter base (see page 8-12).



Engine Oil Gallery Cap Replacement

1. Remove the engine oil gallery cap (A).

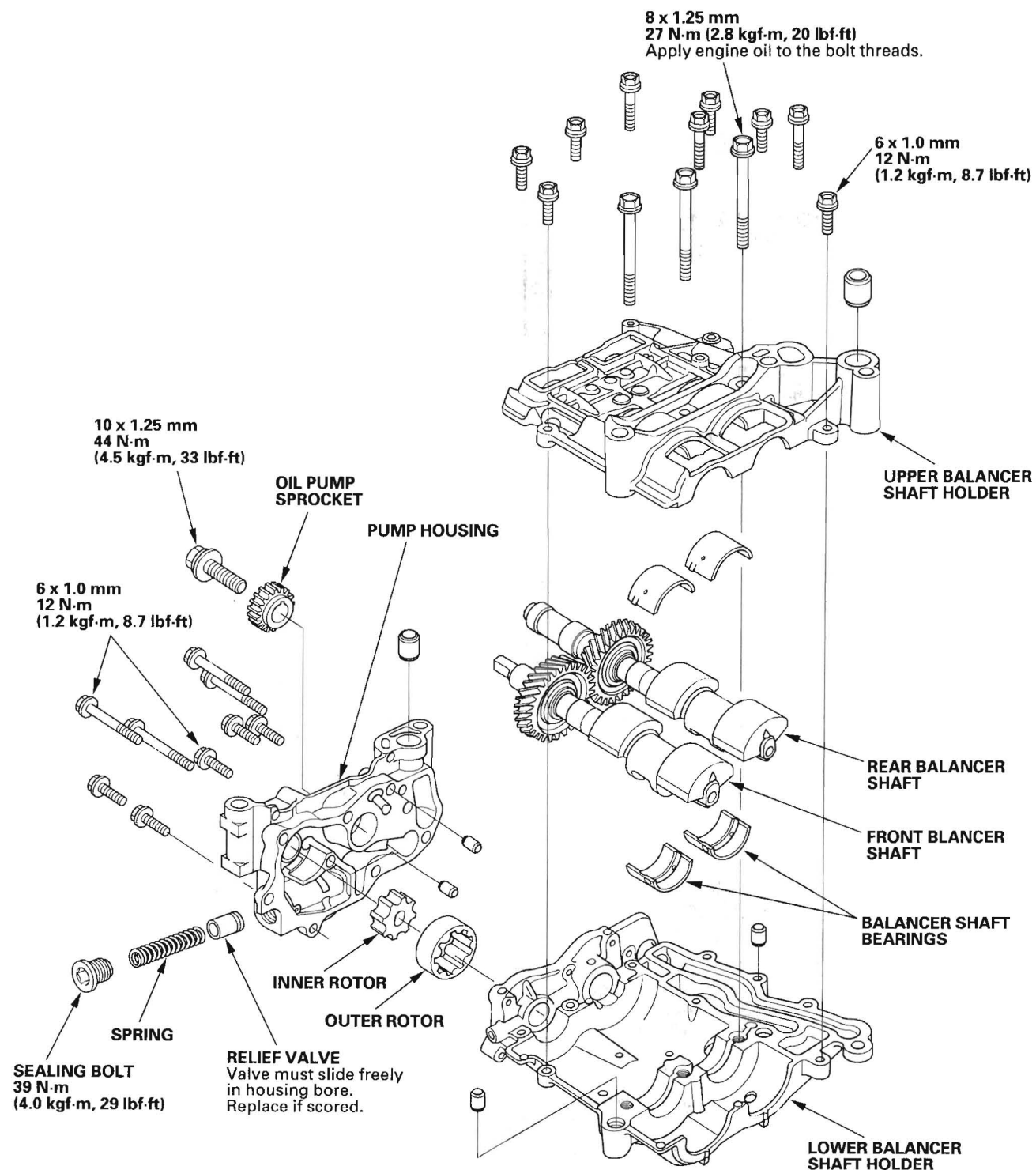


2. Clean the O-ring groove and mating surface with the engine oil gallery cap.
3. Install the engine oil gallery cap with new O-rings (B).

Engine Lubrication

Oil Pump Overhaul

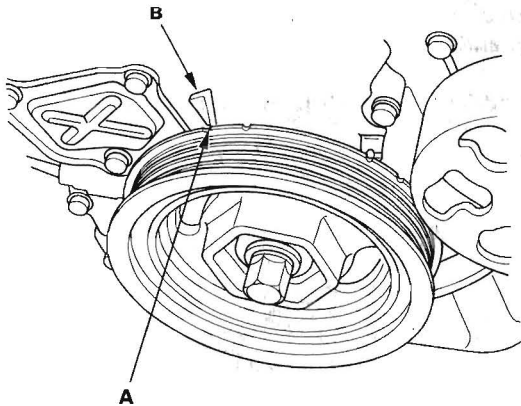
Exploded View



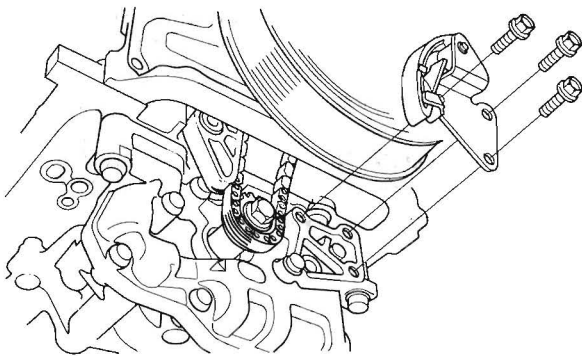


Oil Pump Removal

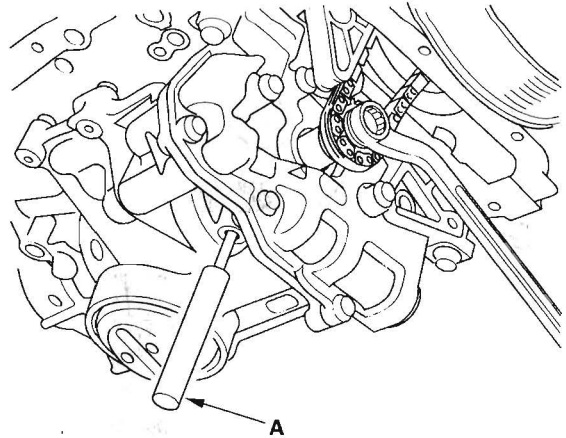
1. Turn the crankshaft pulley so its top dead center (TDC) mark (A) lines up with the pointer (B).



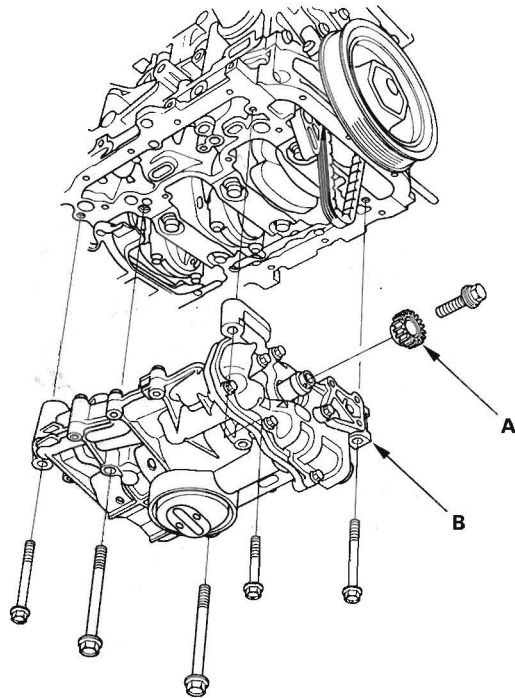
2. Remove the oil pan (see page 7-11).
3. Remove and discard the oil pump chain tensioner.



4. To hold the rear balancer shaft, insert a 6 mm pin driver (A) into the maintenance hole in the lower balancer shaft holder and through the rear balancer shaft.



5. Loosen the oil pump sprocket mounting bolt.
6. Remove the oil pump sprocket (A), then remove the oil pump (B).



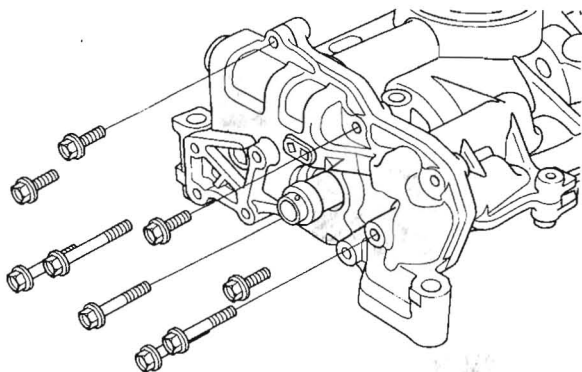
(cont'd)

Engine Lubrication

Oil Pump Overhaul (cont'd)

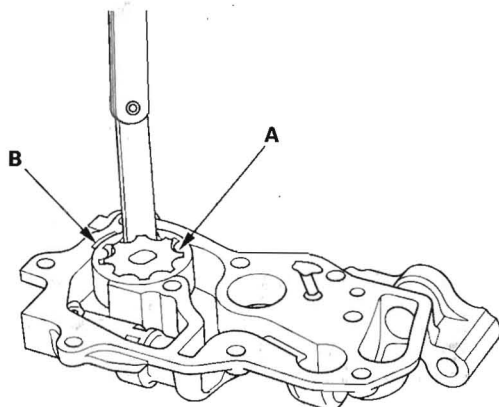
Oil Pump Inspection

1. Remove the pump housing.



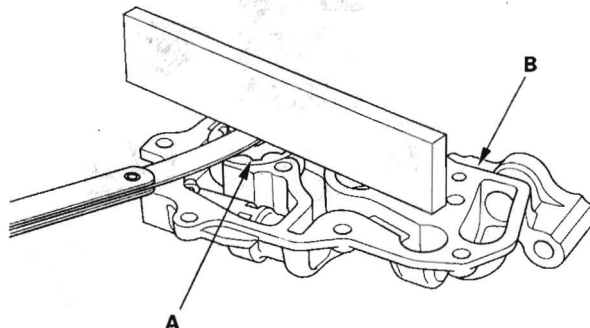
2. Check the inner-to-outer rotor radial clearance between the inner rotor (A) and outer rotor (B). If the inner-to-outer rotor radial clearance exceeds the service limit, replace the oil pump.

Inner Rotor-to-Outer Rotor Radial Clearance
Standard (New): 0.06—0.16 mm (0.002—0.006 in.)
Service Limit: 0.20 mm (0.008 in.)



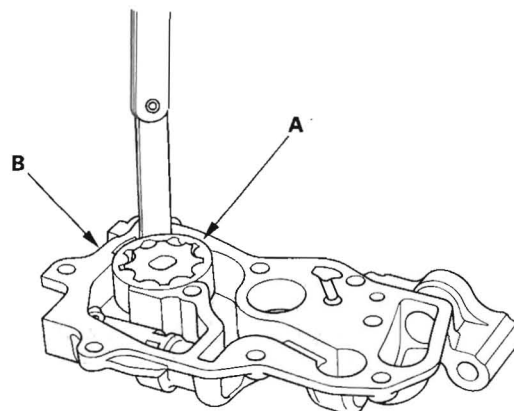
3. Check the housing-to-rotor axial clearance between the rotor (A) and pump housing (B). If the housing-to-rotor axial clearance exceeds the service limit, replace the oil pump.

Housing-to-Rotor Axial Clearance
Standard (New): 0.035—0.070 mm
(0.0014—0.0028 in.)
Service Limit: 0.12 mm (0.005 in.)



4. Check the 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.

Housing-to-Outer Rotor Radial Clearance
Standard (New): 0.15—0.21 mm (0.006—0.008 in.)
Service Limit: 0.23 mm (0.009 in.)



5. Inspect both rotors and the pump housing for scoring or other damage. Replace parts if necessary.



Balancer Shaft Inspection

1. Seat the balancer shaft by pushing it away from the oil pump sprocket end of the oil pump.
2. Zero the dial indicator against the end of the balancer shaft, then push the balancer shaft back and forth and read the end play.

Balancer Shaft End Play

Front Balancer Shaft:

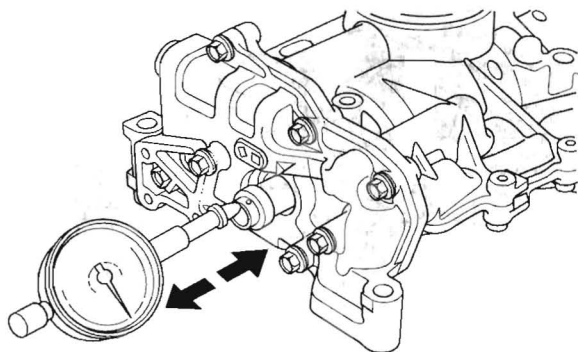
Standard (New): 0.063—0.108 mm
(0.0025—0.0043 in.)

Service Limit: 0.14 mm (0.0055 in.)

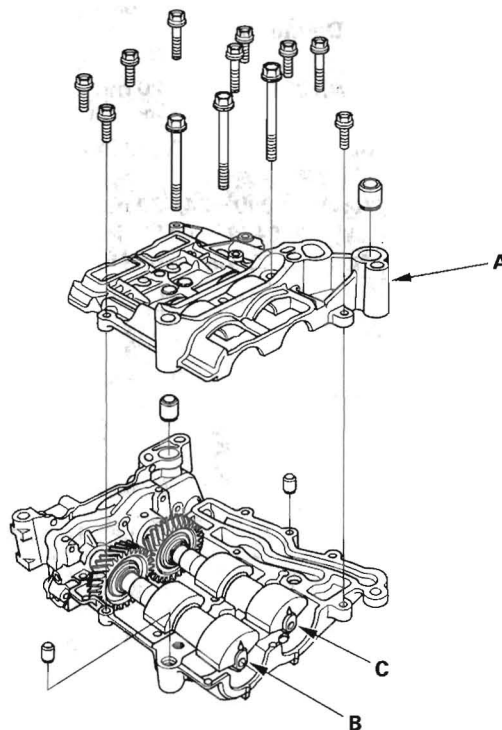
Rear Balancer Shaft:

Standard (New): 0.063—0.108 mm
(0.0025—0.0043 in.)

Service Limit: 0.14 mm (0.0055 in.)



3. Remove the upper balancer shaft holder (with bearings) (A), then remove the front balancer shaft (B) and rear balancer shaft (C).



(cont'd)

Engine Lubrication

Oil Pump Overhaul (cont'd)

4. Measure the inner diameter of the No. 1 bearing for the front balancer shaft hole and the rear balancer shaft hole.

Bearing Inner Diameter

Front:

Standard (New): 20.000—20.020 mm
(0.7874—0.7882 in.)

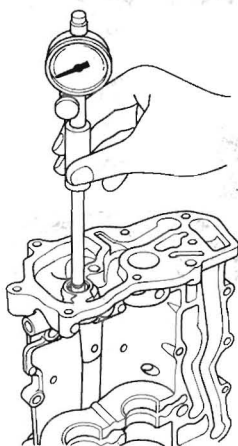
Service Limit: 20.03 mm (0.789 in.)

Rear:

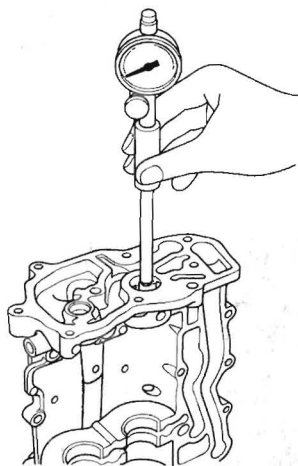
Standard (New): 24.000—24.020 mm
(0.9449—0.9457 in.)

Service Limit: 24.03 mm (0.946 in.)

Front



Rear



5. Measure the diameters of the No. 1 journals on the front balancer shaft and rear balancer shaft.

Journal Diameter

Front:

Standard (New): 19.938—19.950 mm
(0.7850—0.7854 in.)

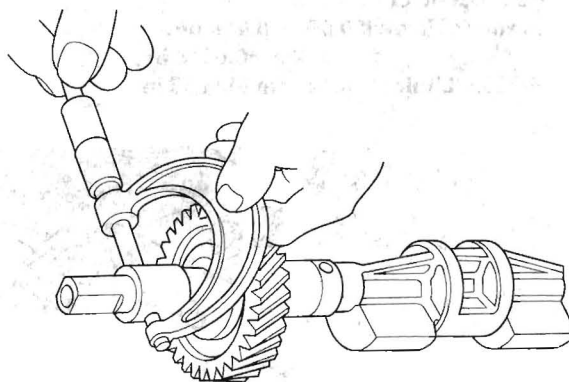
Service Limit: 19.92 mm (0.784 in.)

Rear:

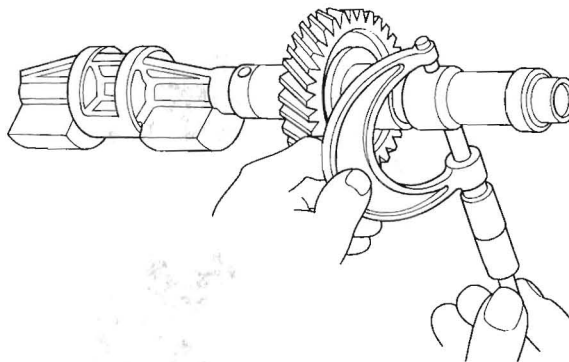
Standard (New): 23.938—23.950 mm
(0.9424—0.9429 in.)

Service Limit: 23.92 mm (0.942 in.)

Front



Rear





6. Clean both balancer shaft No. 2 journals and bearing halves with a clean shop towel.
7. Place one strip of plastigage across each No. 2 journal.
8. Reinstall the bearings and upper balancer shaft holder, then torque the bolts.

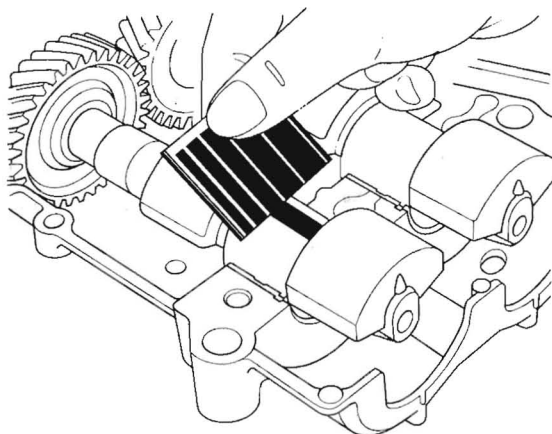
NOTE: Do not rotate the balancer shafts during inspection.

9. Remove the upper balancer shaft holder and bearings again, and measure the widest part with the plastigage. If the balancer shaft No. 2 journal oil clearance is out-of-tolerance, install new bearings, and recheck. If it is still out-of-tolerance, replace the balancer shafts.

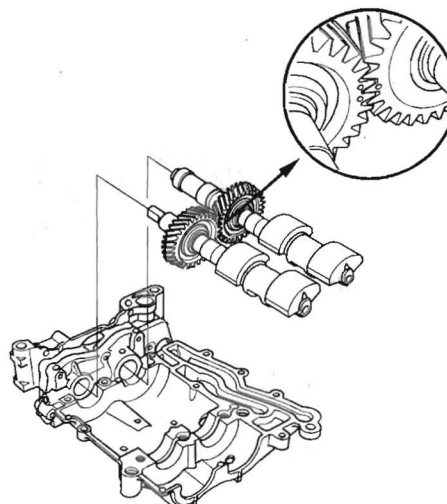
No. 2 Journal Oil Clearance

Standard (New): 0.060—0.120 mm
(0.0024—0.0047 in.)

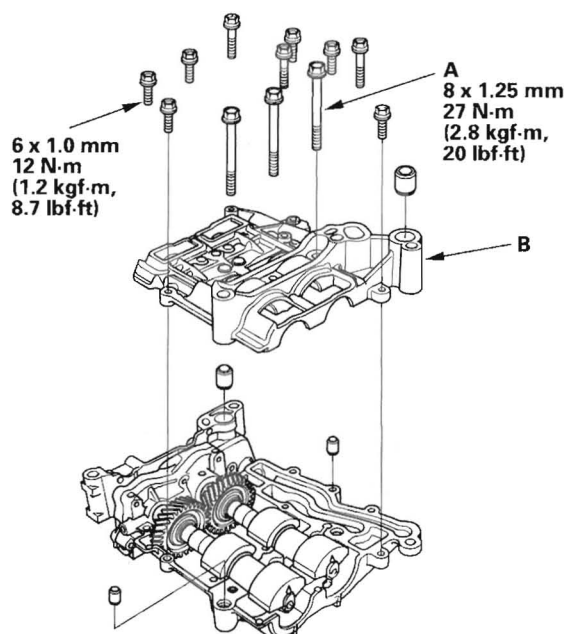
Service Limit: 0.15 mm (0.006 in.)



10. Align the punch mark on the rear balancer shaft in the center of the two punch marks on the front balancer shaft, then install the balancer shafts on the lower balancer shaft holder.



11. Apply engine oil to the threads of the 8 mm bolts (A).



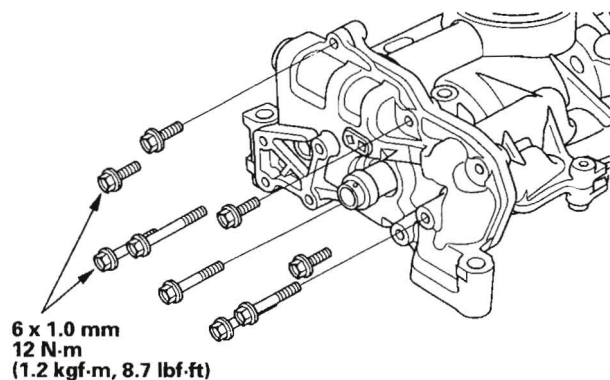
12. Install the upper balancer shaft holder (B).

(cont'd)

Engine Lubrication

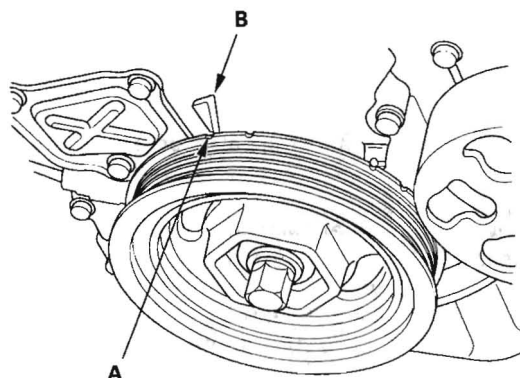
Oil Pump Overhaul (cont'd)

13. Install the pump housing.

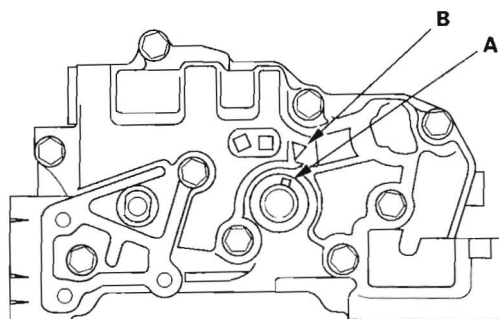


Oil Pump Installation

1. Make sure the No. 1 piston top dead center (TDC) mark (A) lines up with the pointer (B).

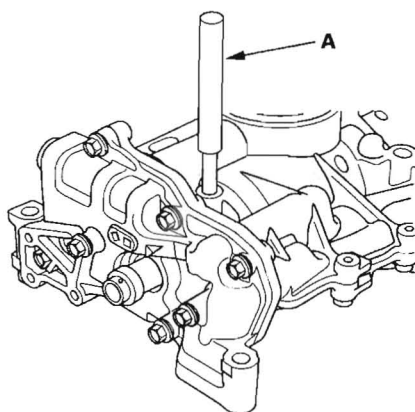


2. Align the dowel pin (A) on the rear balancer shaft with the mark (B) on the oil pump.

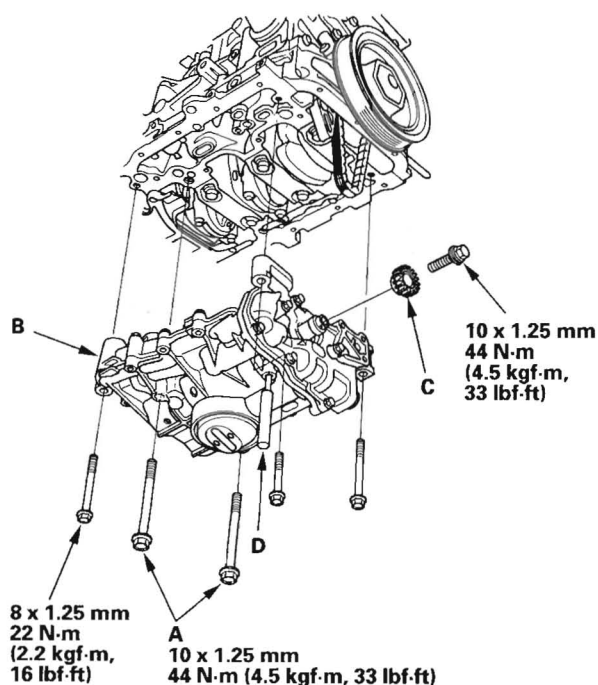




3. To hold the rear balancer shaft, insert a 6 mm pin driver (A) into the maintenance hole in the lower balancer shaft holder and through the rear balancer shaft.



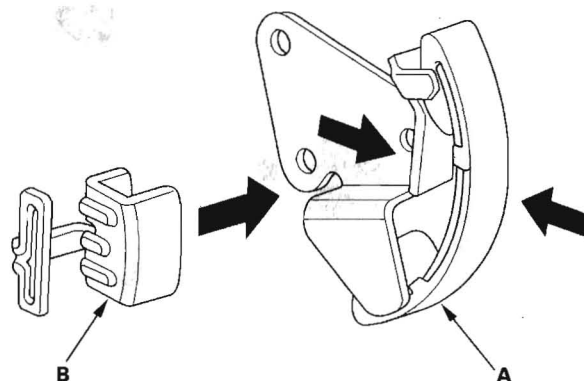
4. Apply engine oil to the threads of the oil pump mounting bolts (A).



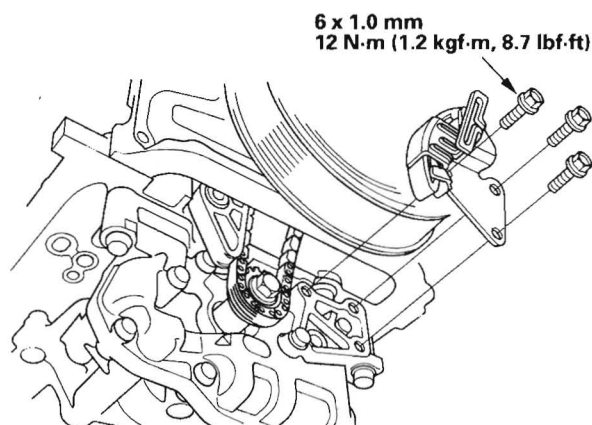
5. Loosely install the oil pump (B), then install the oil pump sprocket (C).
6. Remove the 6 mm pin driver (D).
7. Tighten the oil pump mounting bolts.

8. Squeeze the new oil pump chain tensioner (A), then install the set clip (B) on it as shown.

NOTE: The set clip is supplied with the oil pump chain tensioner.



9. Install the new oil pump chain tensioner.

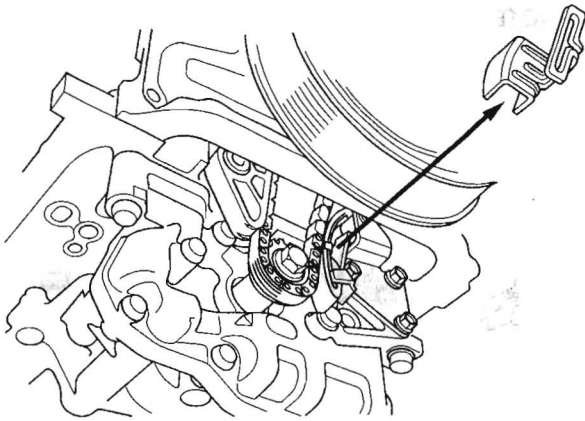


(cont'd)

Engine Lubrication

Oil Pump Overhaul (cont'd)

10. Remove the set clip from the oil pump chain tensioner.



11. Install the oil pan (see page 7-29).

Engine Mechanical



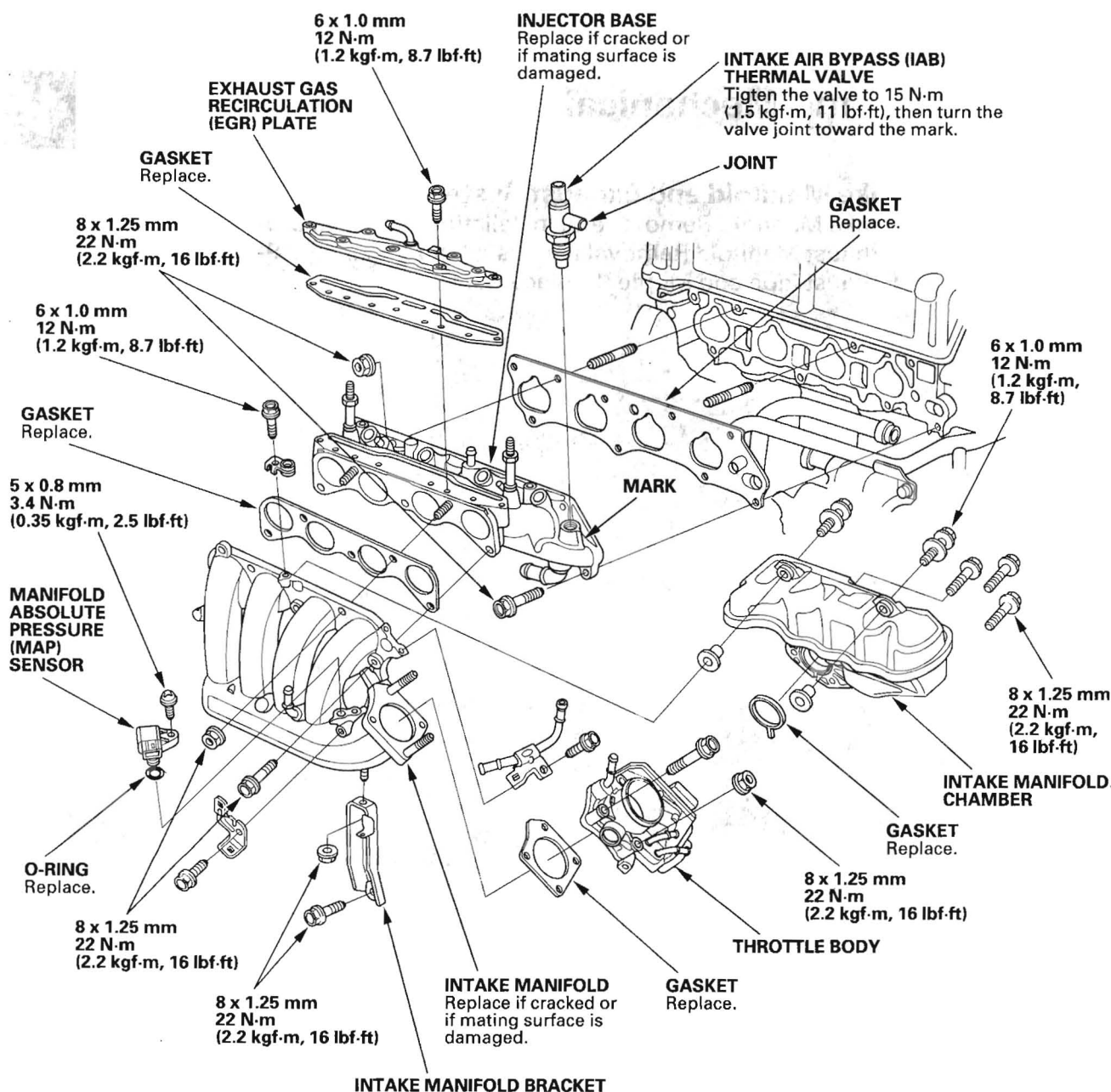
Intake Manifold and Exhaust System

Intake Manifold Removal and Installation	9-2
Exhaust Manifold Removal and Installation	9-8
Exhaust Pipe and Muffler Replacement	9-9

Intake Manifold and Exhaust System

Intake Manifold Removal and Installation

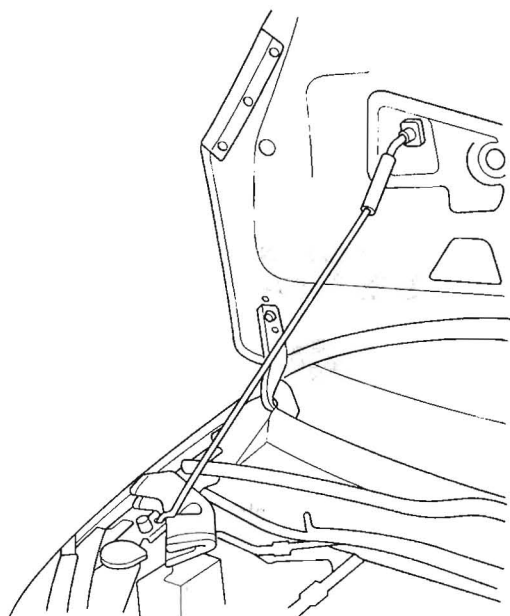
Exploded View



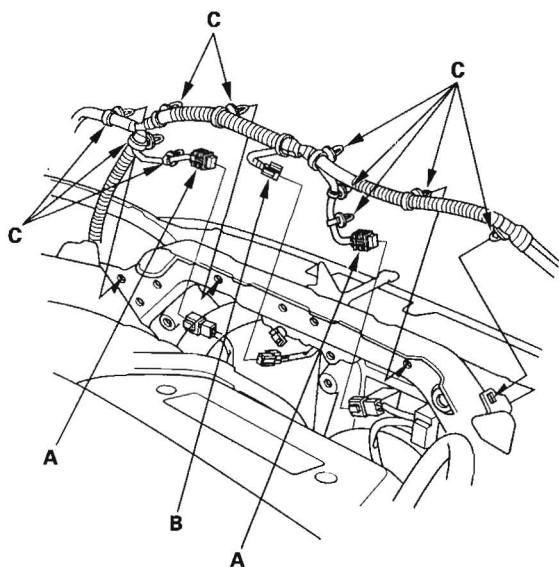


Removal

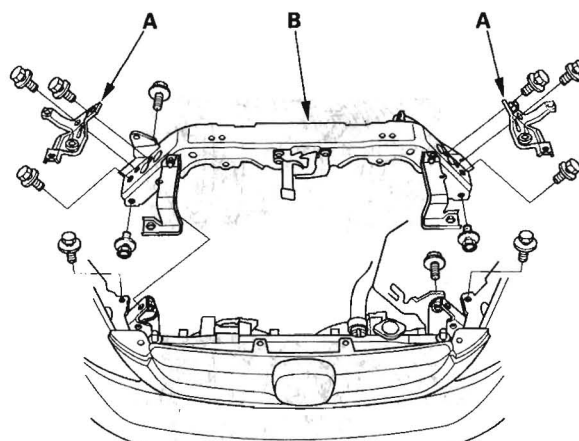
1. Remove the hood support rod, then use it as shown to prop the hood in the wide-open position.



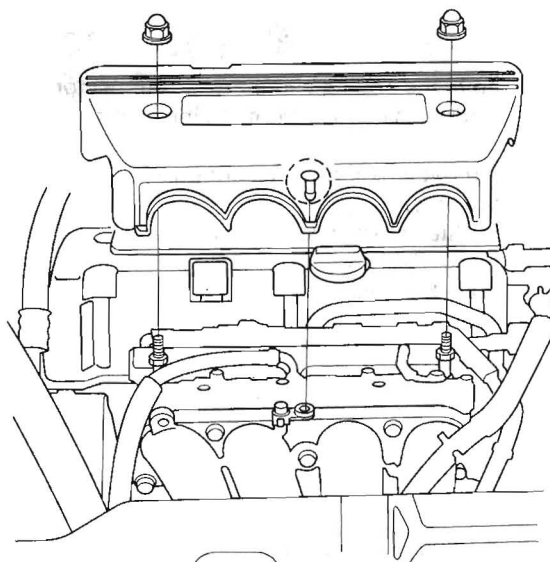
2. Remove the bulkhead cover (see page 20-149).
3. Disconnect the fan motor connectors (A) and hood switch connector (B), then remove the harness clips (C).



4. Remove the radiator upper brackets (A), then remove the front bulkhead (B).



5. Remove the intake manifold cover.

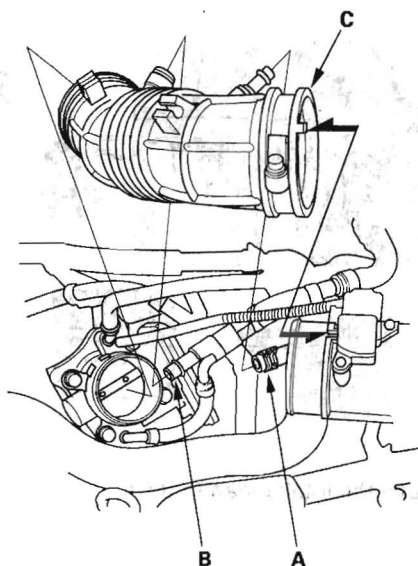


(cont'd)

Intake Manifold and Exhaust System

Intake Manifold Removal and Installation (cont'd)

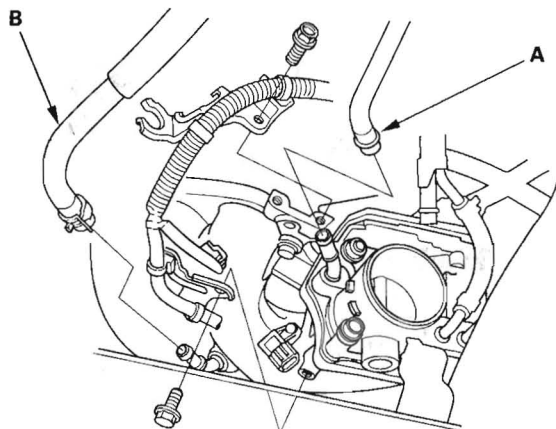
6. Remove the vacuum hose (A) and breather pipe (B), then remove the intake air duct (C).



7. Remove the engine wire harness connectors and wire harness clamps from the intake manifold.

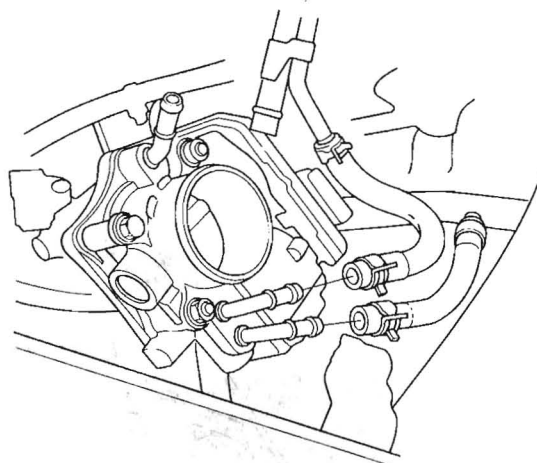
- Manifold absolute pressure (MAP) sensor connector
- Throttle actuator connector

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



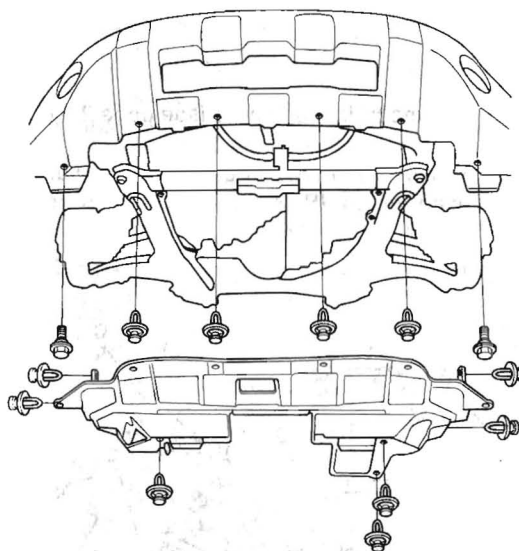
9. Remove the harness bracket mounting bolts.

10. Remove the water bypass hoses, then plug the water bypass hoses.



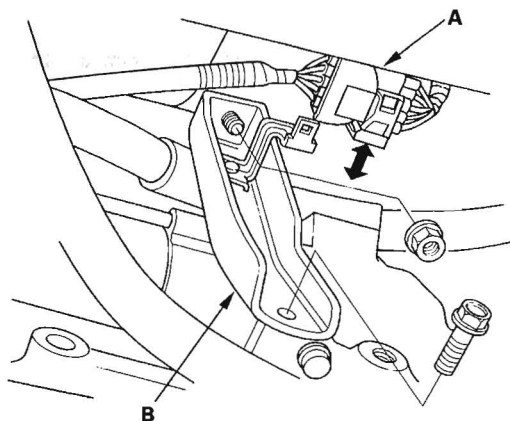
11. Raise the vehicle on the lift to full height.

12. Remove the splash shield.

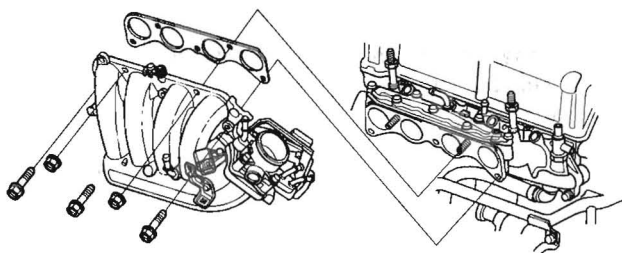




13. Remove the connector (A), then remove the intake manifold bracket (B).

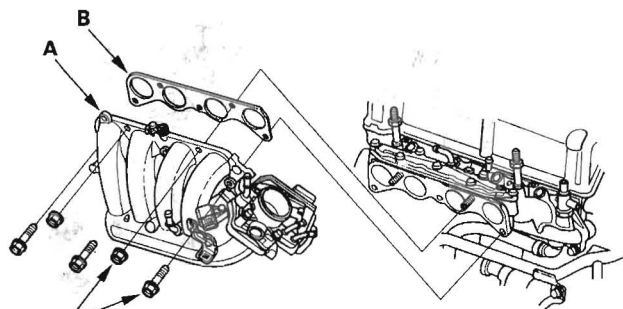


14. Lower the vehicle on the lift.
15. Remove the intake manifold.



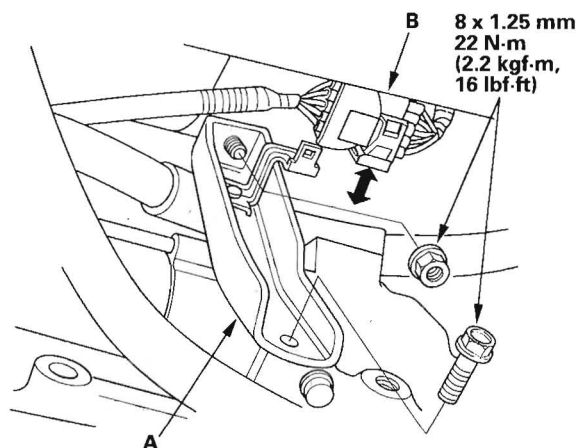
Installation

1. Install the intake manifold (A) with a new gasket (B), and tighten the bolts and nuts in a crisscross pattern in two or three steps, beginning with the inner bolt.



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

2. Raise the vehicle on the lift to full height.
3. Install the intake manifold bracket (A), then install the connector (B).

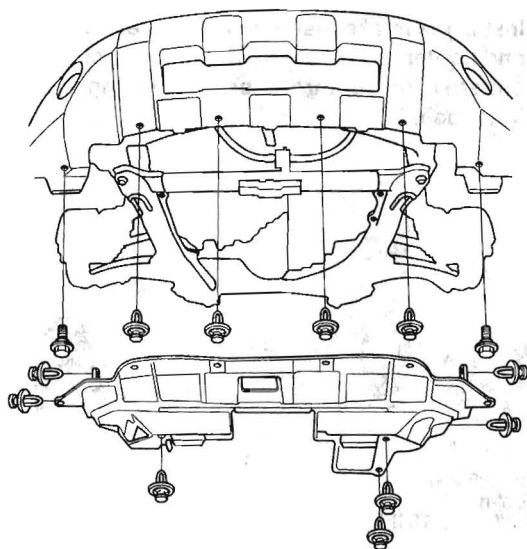


(cont'd)

Intake Manifold and Exhaust System

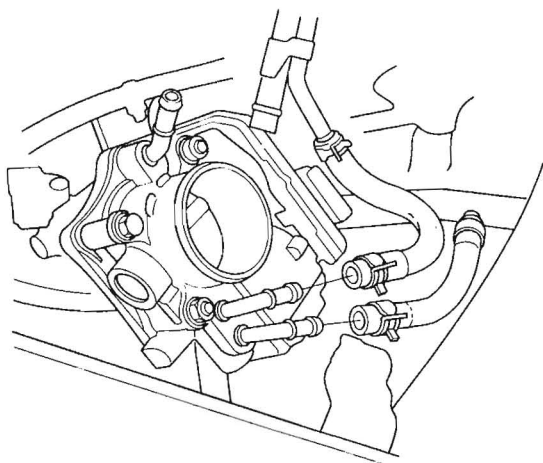
Intake Manifold Removal and Installation (cont'd)

4. Install the splash shield.

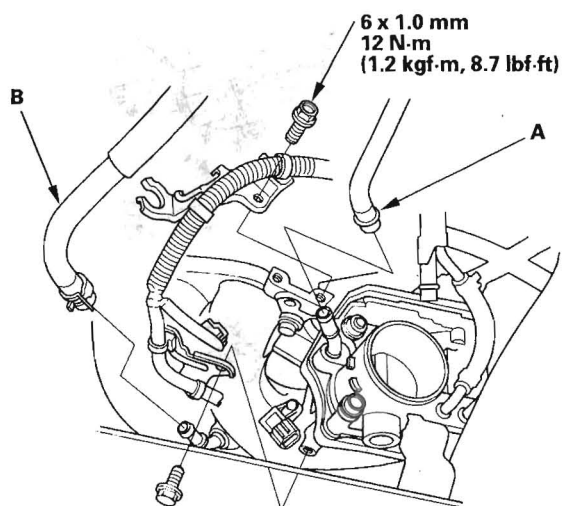


5. Lower the vehicle on the lift.

6. Install the water bypass hoses.



7. Install the EVAP canister hose (A) and brake booster vacuum hose (B).

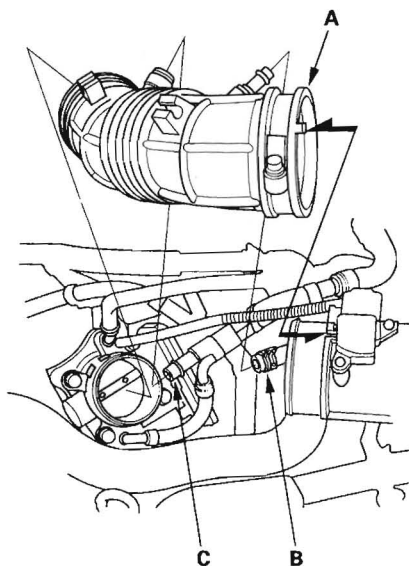


8. Install the harness bracket mounting bolts.

9. Connect the engine wire harness connectors, and install the wire harness clamps to the intake manifold.

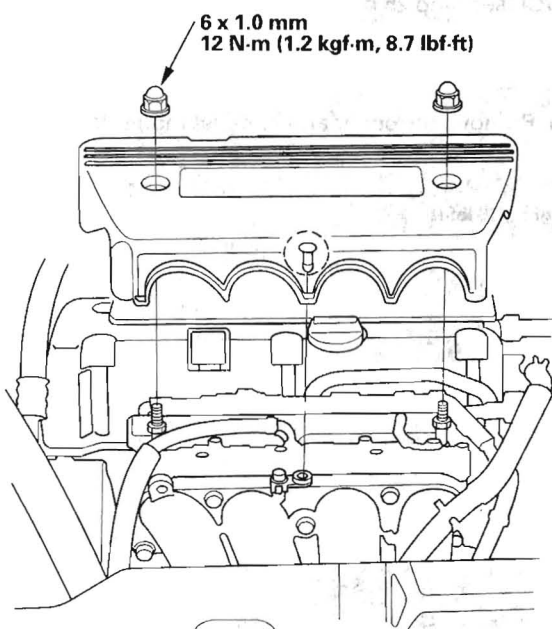
- MAP sensor connector
- Throttle actuator connector

10. Install the intake air duct (A), then install the vacuum hose (B) and breather pipe (C).

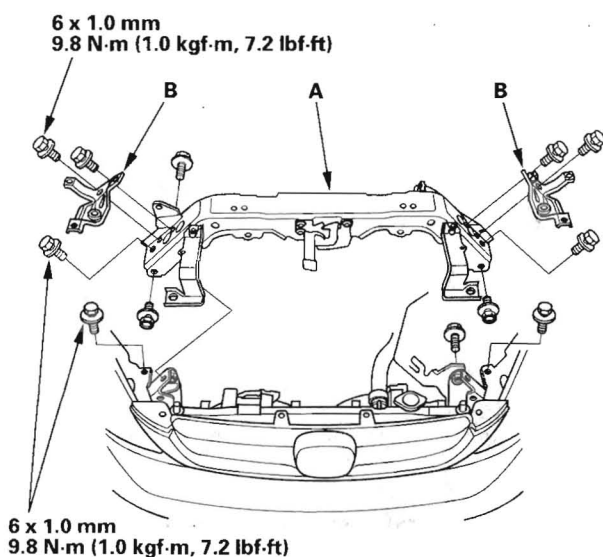




11. Install the intake manifold cover.

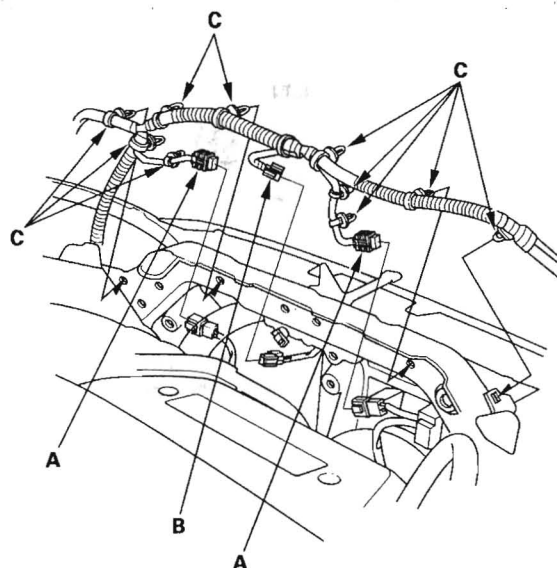


12. Install the front bulkhead (A), then install the radiator upper brackets (B).



13. Apply body paint to the bulkhead mounting bolts.

14. Connect the fan motor connectors (A) and hood switch connector (B), then install the harness clips (C).



15. Install the bulkhead cover (see page 20-149).

16. Clean up any spilled engine coolant.

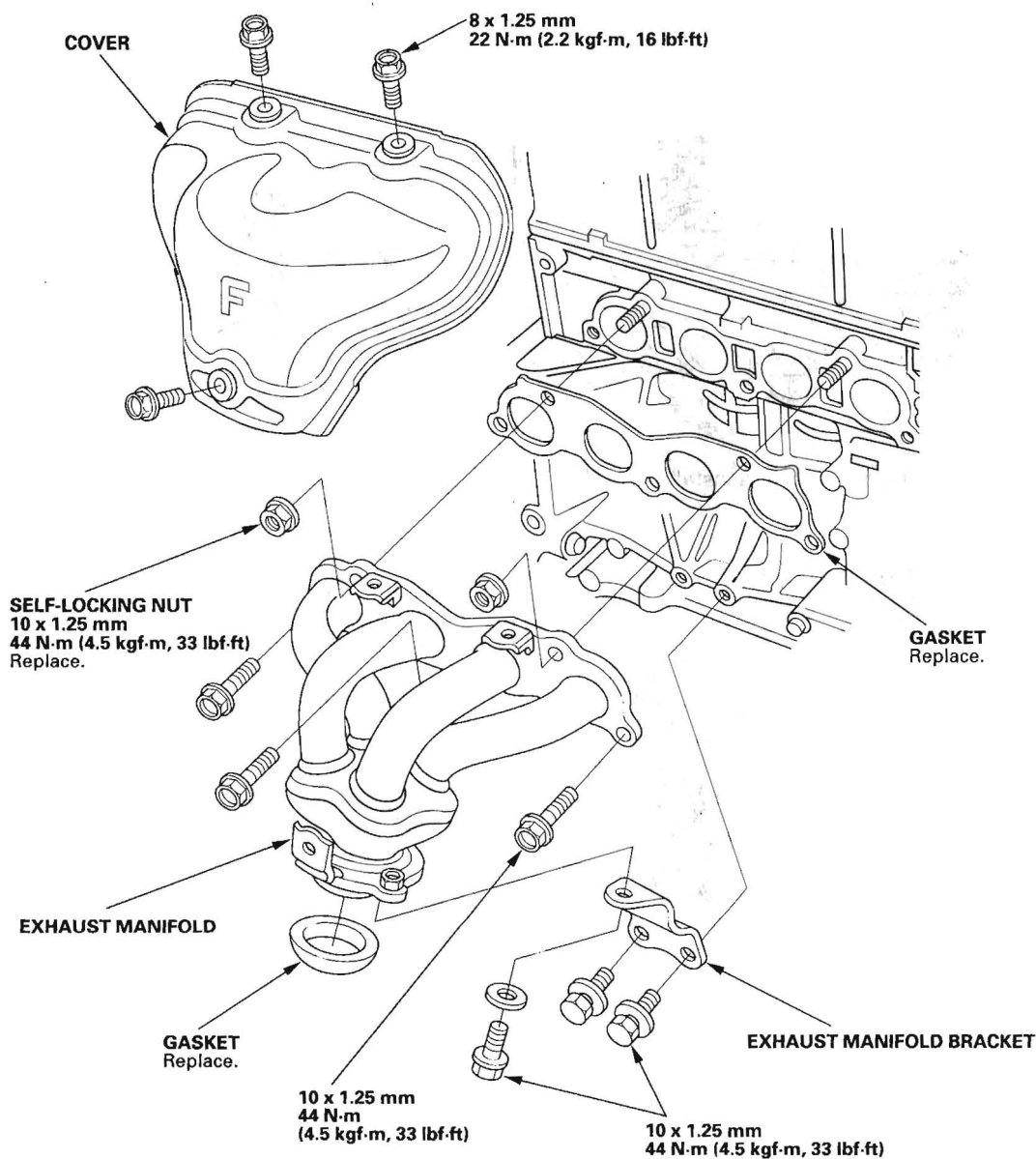
17. After installation, check that all tubes, hoses, and connectors are installed correctly.

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

Intake Manifold and Exhaust System

Exhaust Manifold Removal and Installation

1. Disconnect the air fuel ratio (A/F) sensor connector and secondary heated oxygen sensor (secondary HO2S) connector, then remove the three way catalytic converter (TWC) (see step 25 on page 5-6).
2. Remove the under-cowl cover (see page 20-167), then remove the strut brace (see page 20-159).
3. Remove the rocker arm oil control solenoid (see page 11-286). Remove the cover and exhaust manifold bracket, then remove the exhaust manifold.

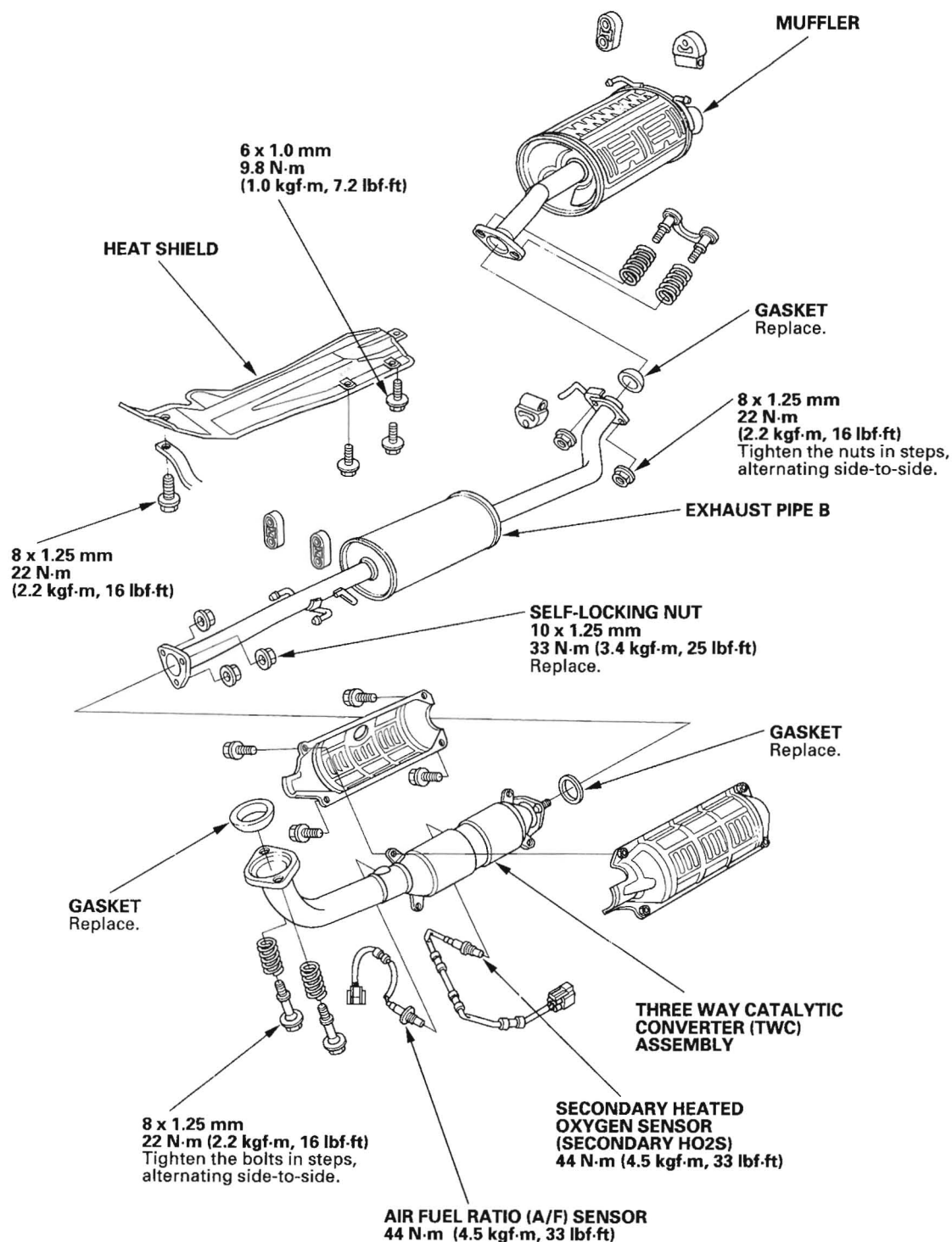


4. Install the exhaust manifold, and tighten the bolts and nuts in a crisscross pattern in two or three steps, beginning with the inner nut.
5. Install the other parts in the reverse order of removal.



Exhaust Pipe and Muffler Replacement

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



12

2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.

13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.

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