

Engine Removal/Installation

Engine Removal/Installation

Removal	5-2
Installation	5-12



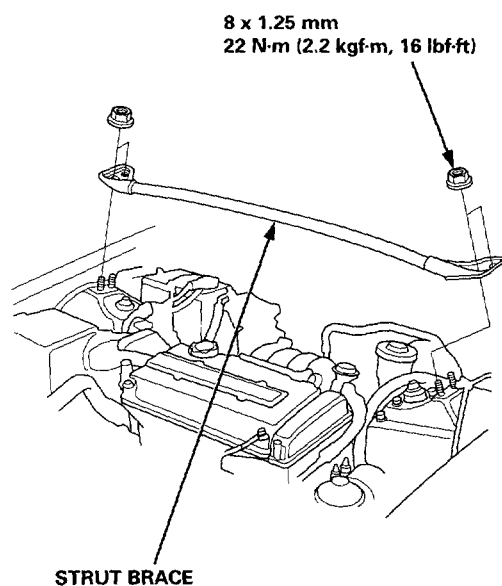
Engine Removal/Installation

Removal

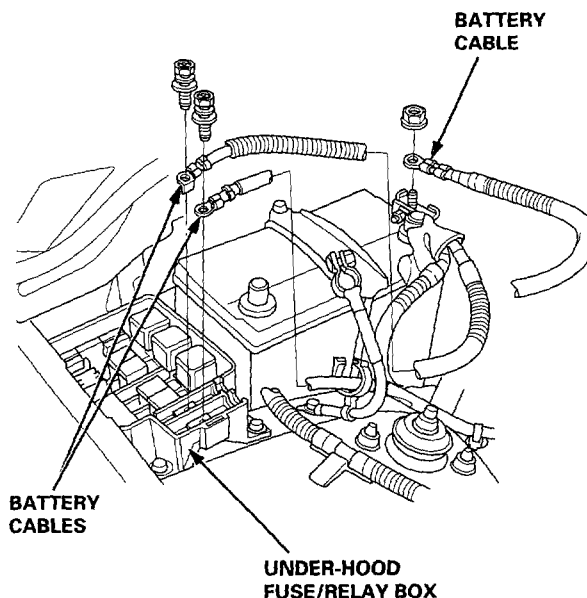
NOTE:

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

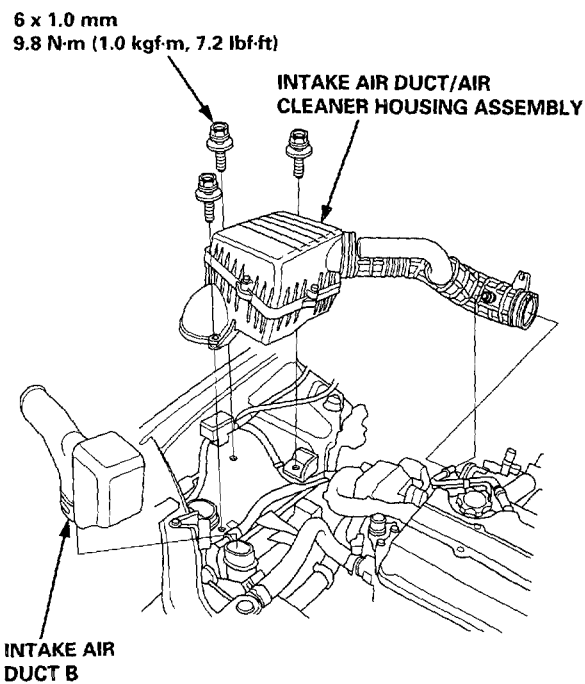
1. Secure the hood in the open as possible.
2. Disconnect the battery negative terminal first, then the positive terminal.
3. Remove the strut brace.



4. Disconnect the battery cables from the under-hood fuse/relay box and battery positive terminal.

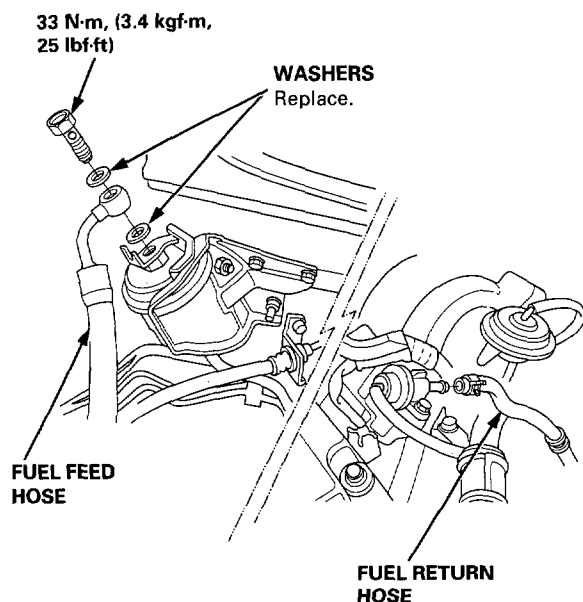


5. Remove the intake air duct B and intake air duct/air cleaner housing assembly.



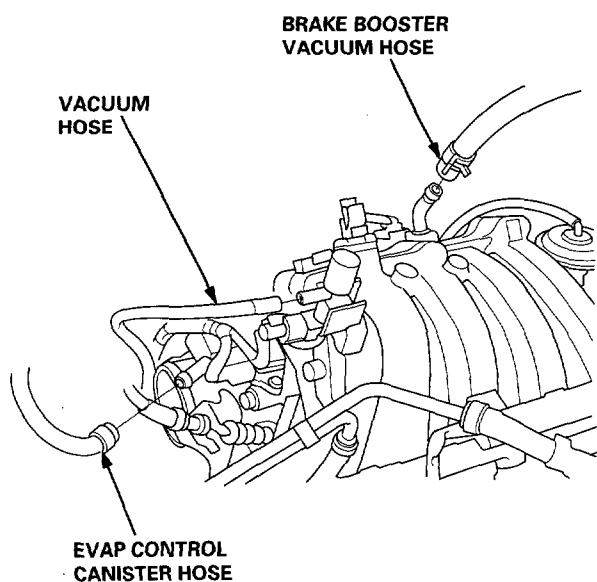


6. Relieve fuel pressure (see section 11).
7. Remove the fuel feed hose and fuel return hose.

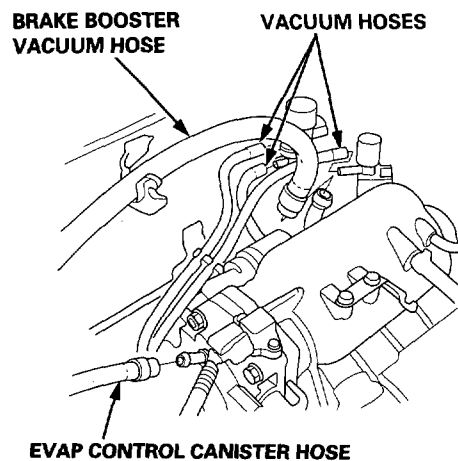


8. Remove the brake booster vacuum hose, evaporative emission (EVAP) control canister hose and vacuum hose.

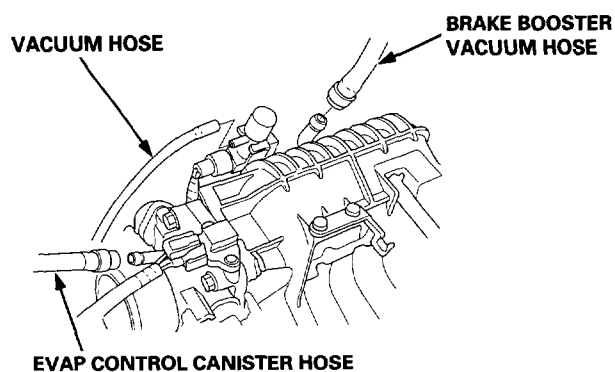
B18C4 engine:



D15Z8 engine:



Except B18C4, D15Z8 engines:

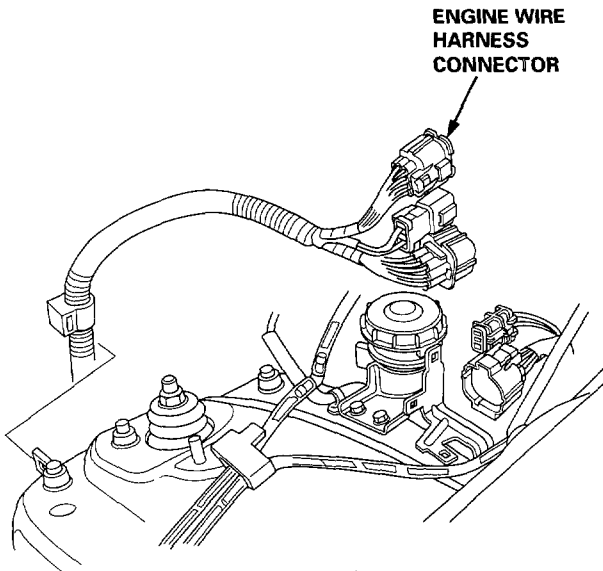


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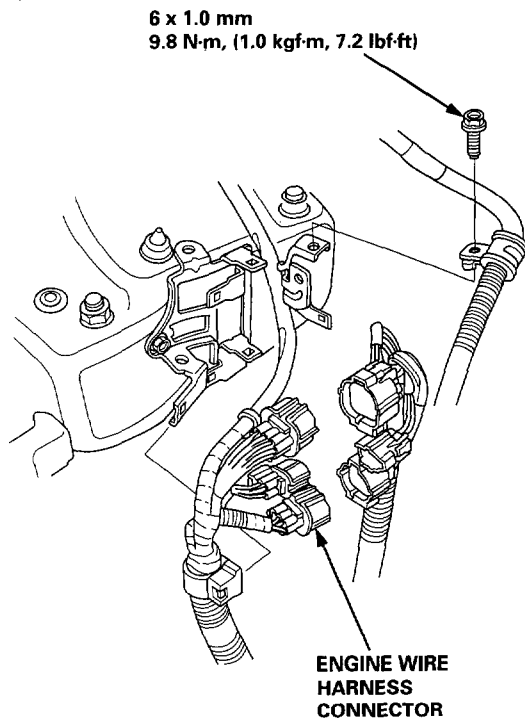
Engine Removal/Installation

Removal (cont'd)

9. Disconnect the engine wire harness connectors on the left side of the engine compartment.



10. Disconnect the engine wire harness connectors on the right side of the engine compartment.

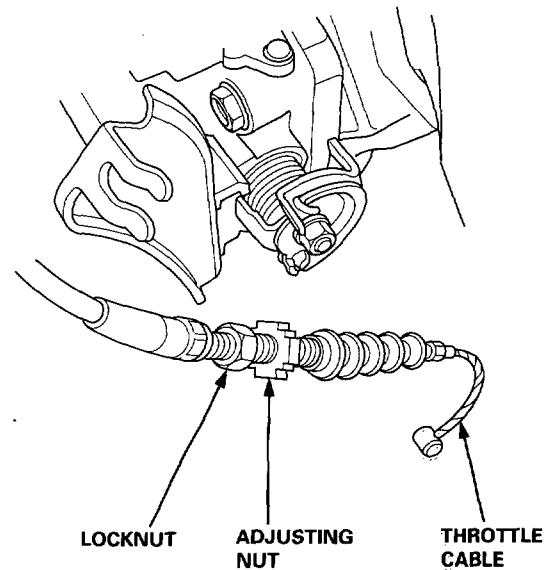


11. Remove the throttle cable by loosening the locknut then slip the cable end out of the accelerator linkage.

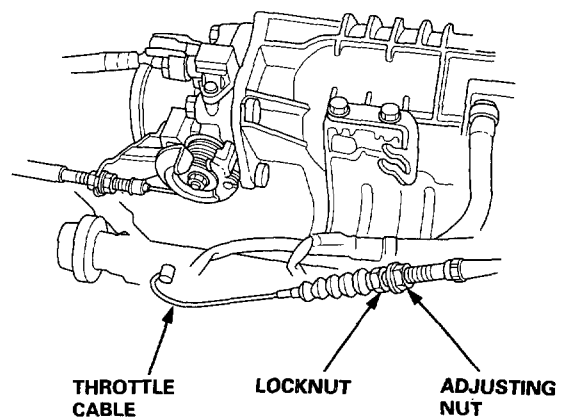
NOTE:

- Take care not to bend the cable when removing it. Always replace any kinked cable with a new one.
- Adjust the throttle cable when installing (see section 11).

B18C4 engine:



Except B18C4 engine:

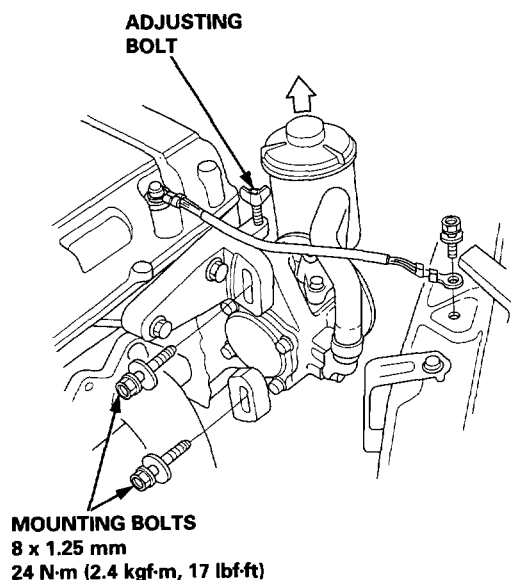




12. Remove power steering (P/S) pump belt and pump without disconnecting the P/S hoses.

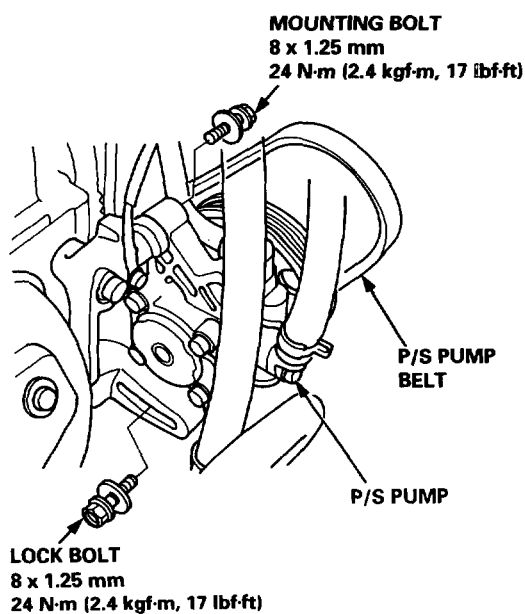
B18C4 engine:

- 1. Remove the adjusting bolt and mounting bolts, then remove the P/S pump belt and pump.



Except B18C4 engine:

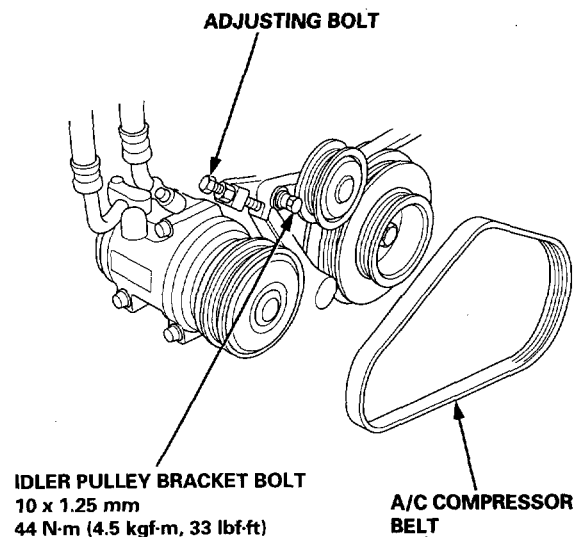
- 1. Remove the lock bolt and mounting bolt, then remove the P/S pump belt and pump.



13. Remove the air conditioning (A/C) compressor belt.

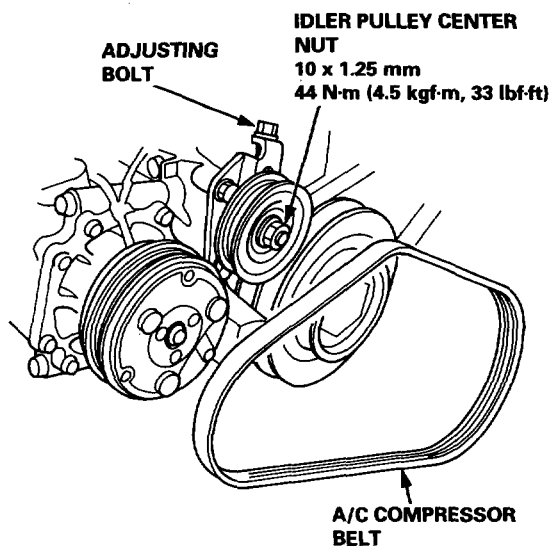
B18C4 engine:

- 1. Loosen the idler pulley bracket bolt and adjusting bolt, then remove the A/C compressor belt.



Except B18C4 engine:

- 1. Loosen the idler pulley center nut and adjusting bolt, then remove the A/C compressor belt.

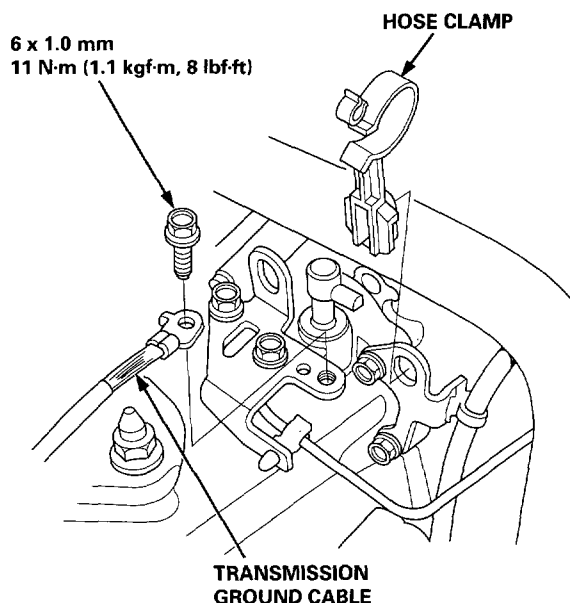


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Engine Removal/Installation

Removal (cont'd)

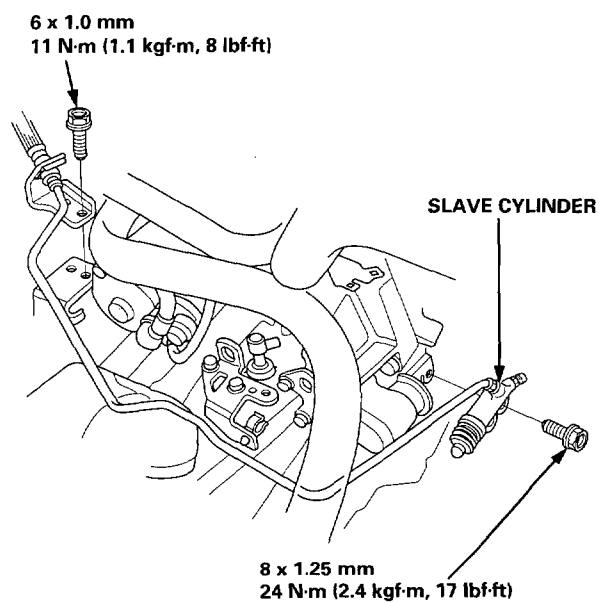
14. Remove the transmission ground cable and hose clamp.



15. Remove the clutch slave cylinder and line/hose assembly (M/T).

NOTE:

- Do not disconnect the line/hose assembly.
- Do not operate the clutch pedal once the slave cylinder has been removed.
- Take care not to bend the line.

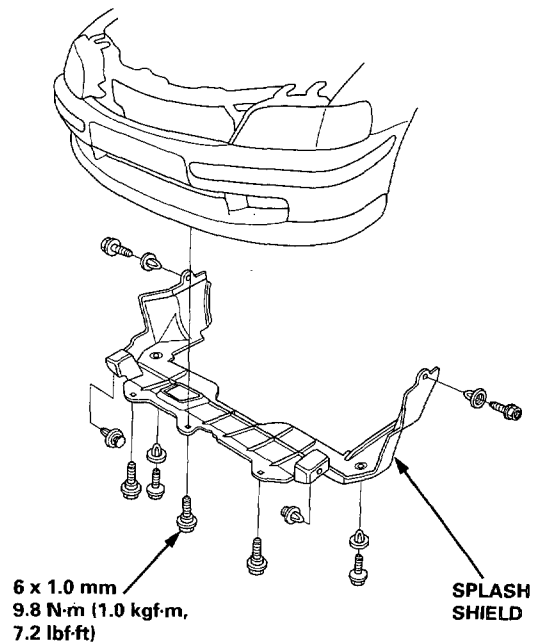


16. Remove the radiator cap.

17. Raise the hoist to full height.

18. Remove the front tires/wheels.

19. Remove the splash shield.



20. Loosen the drain plug in the radiator, drain the engine coolant (see page 10-7).

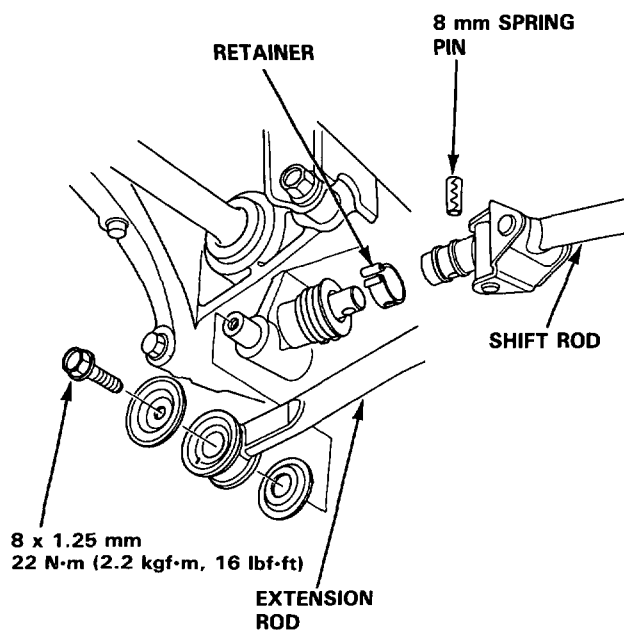
21. Drain the transmission oil or fluid. Reinstall the drain plug using a new washer (see section 13 (M/T) or section 14 (A/T)).

22. Drain the engine oil. Reinstall the drain bolt using a new washer (see page 8-5).

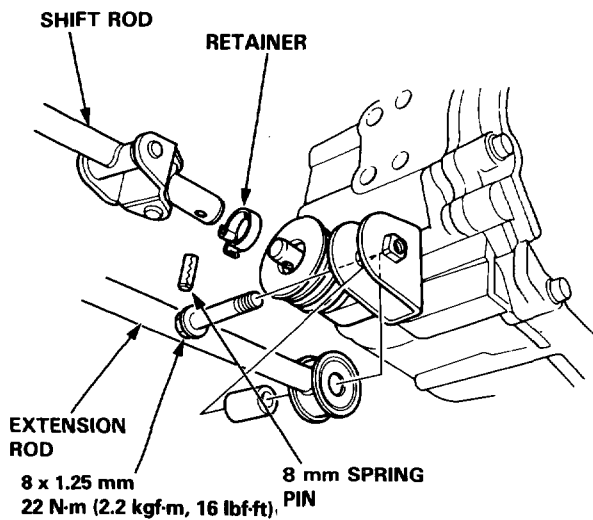


23. Remove the shift rod and extension rod (M/T).

B18C4 engine:



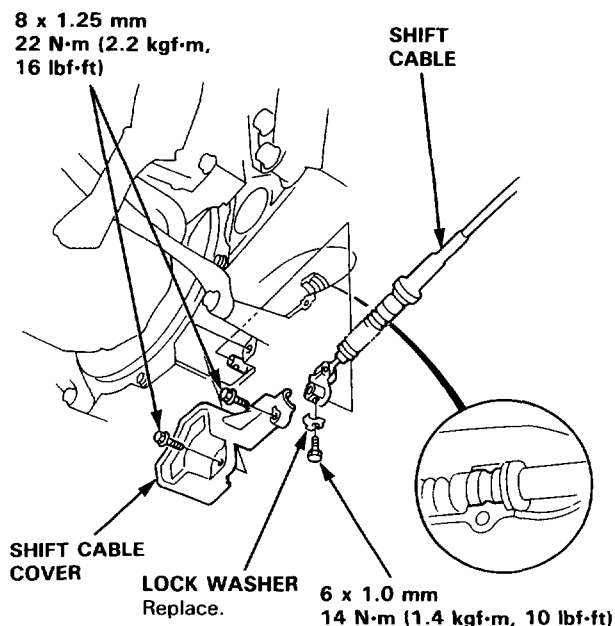
Except B18C4 engine:



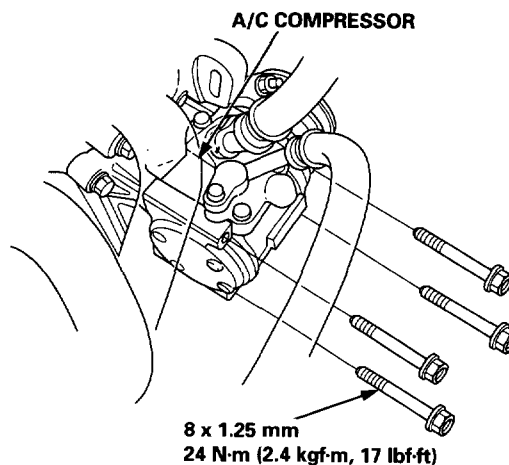
24. Remove the shift cable (A/T).

NOTE:

- Take care not to bend the cable when removing it. Always replace any kinked cable with a new one.
- Adjust the shift cable when installing (see section 14).



25. Remove the air conditioning (A/C) compressor without disconnecting the A/C hoses.



(cont'd)

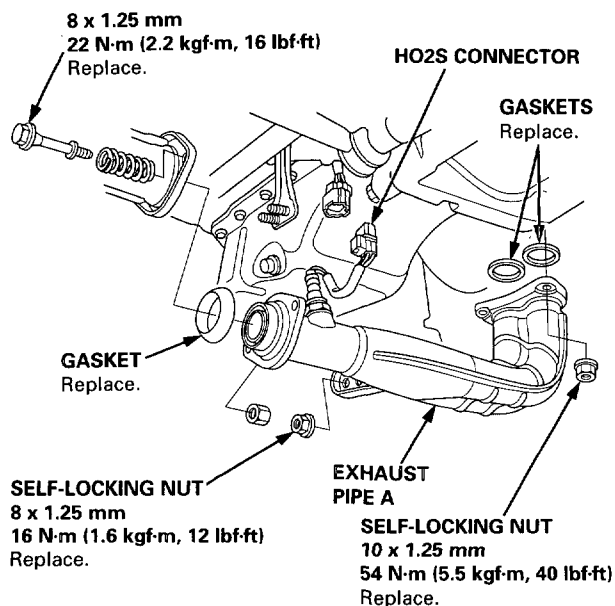
Engine Removal/Installation

Removal (cont'd)

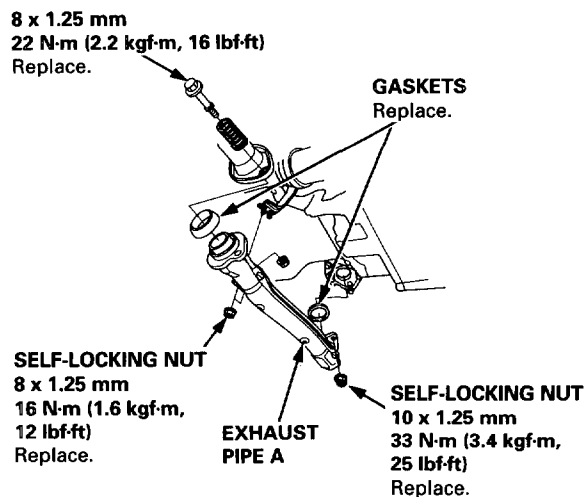
26. Disconnect the heated oxygen sensor (HO2S) connector (B18C4 engine).

27. Remove exhaust pipe A.

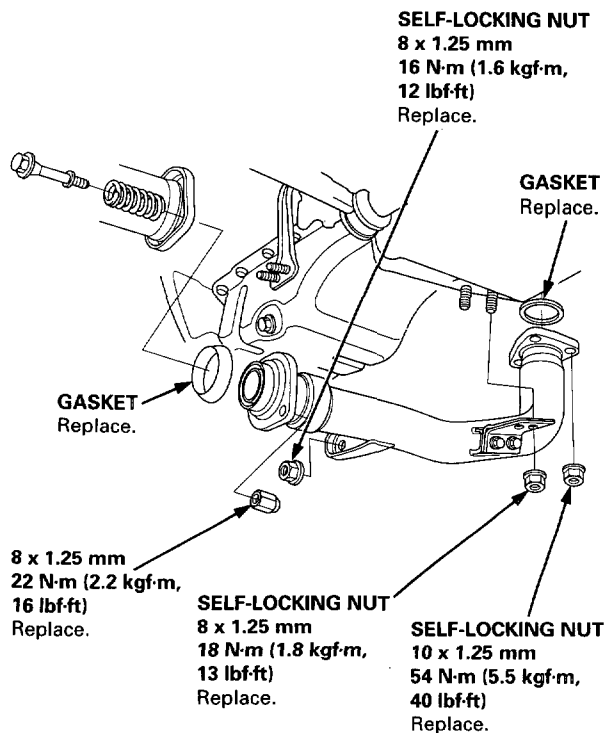
B18C4 engine:



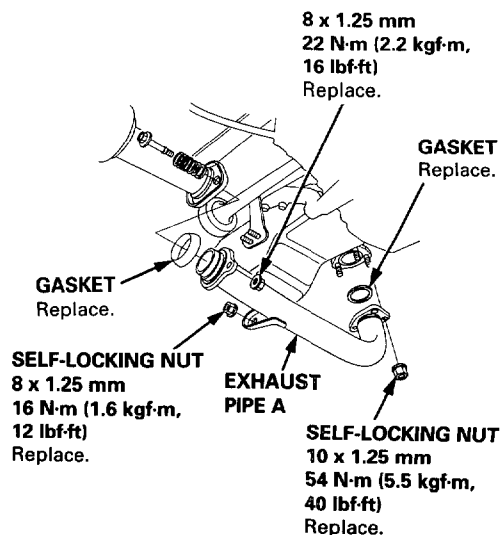
D15Z8 engine:



D16B2 engine:



D14A7, D14A8 engines:

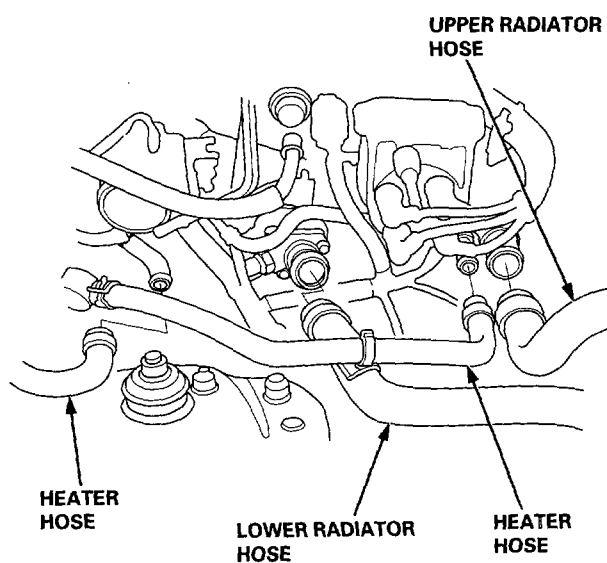




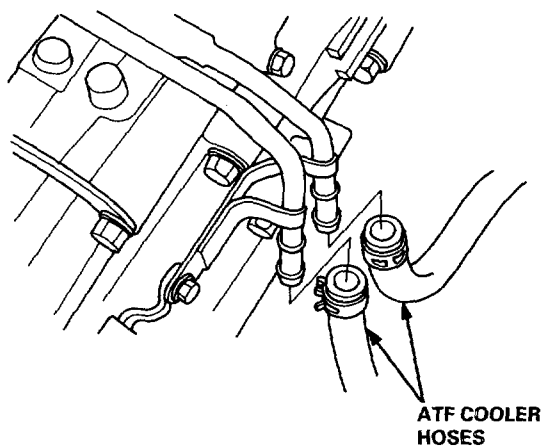
28. Remove the damper fork (see section 18).
29. Disconnect the suspension lower arm ball joints (see section 18).
30. Remove the driveshafts (see section 16).

NOTE: Coat all precision-finished with clean engine oil. Tie plastic bags over the driveshaft ends.

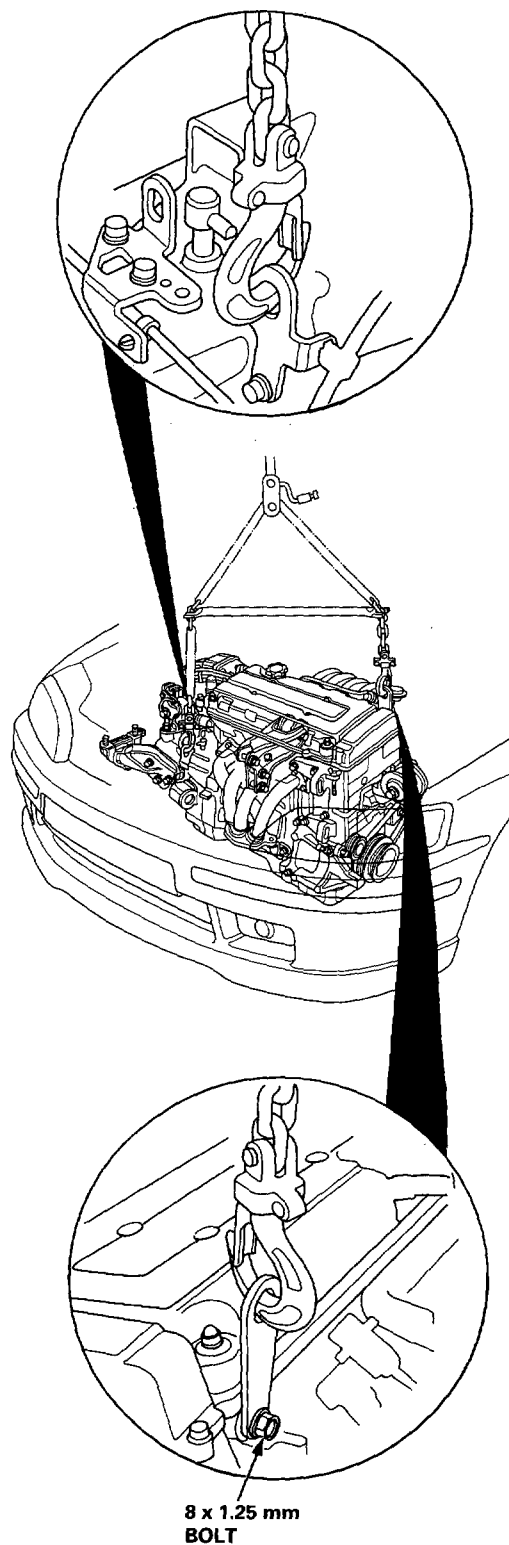
31. Lower the hoist, then remove the upper radiator hose, lower radiator hose and the heater hoses.



32. Remove the ATF cooler hoses, then plug the ATF cooler hoses and lines (A/T).



33. Attach the chain hoist to the engine as shown.

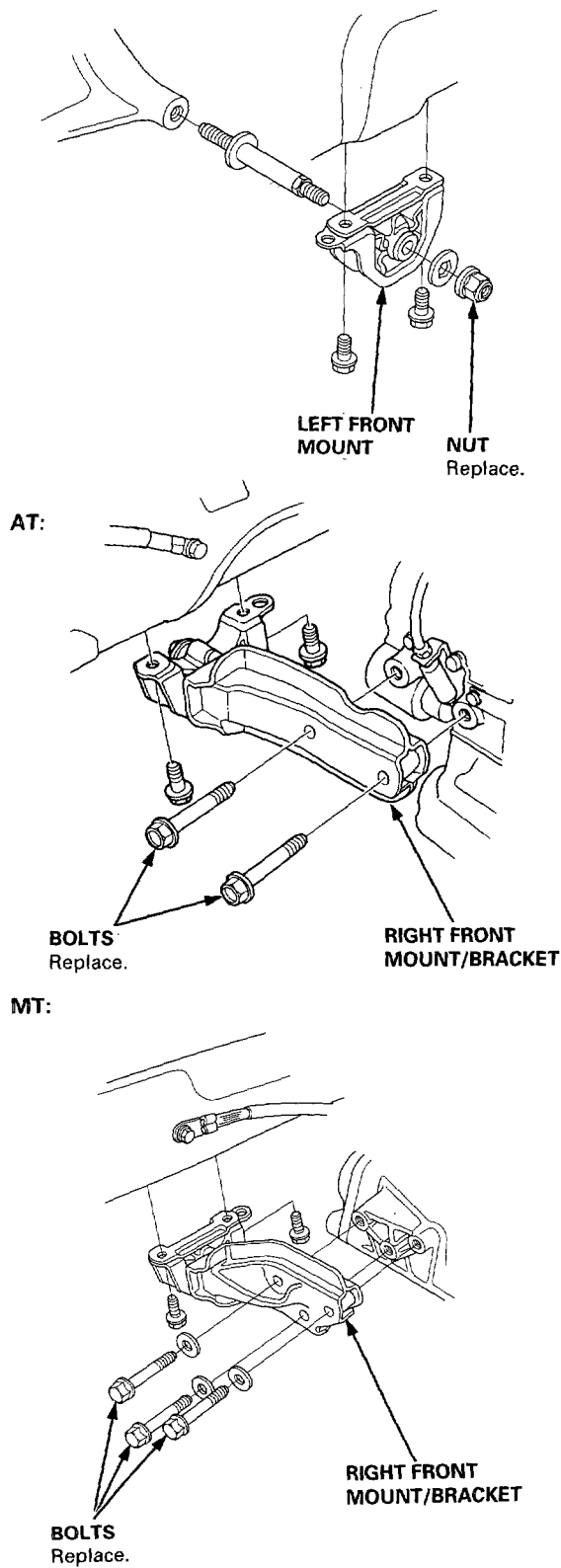


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Engine Removal/Installation

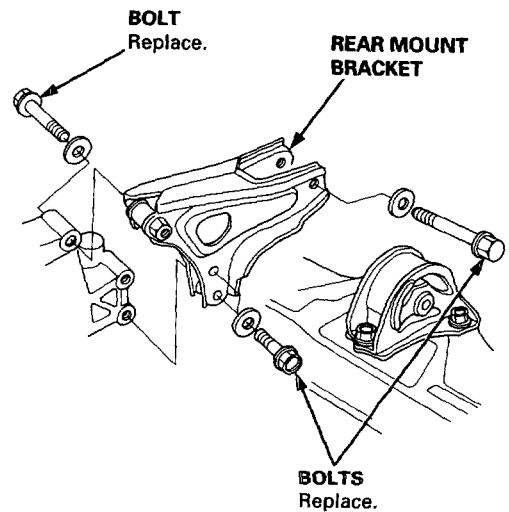
Removal (cont'd)

34. Remove the left and right front mount and bracket.

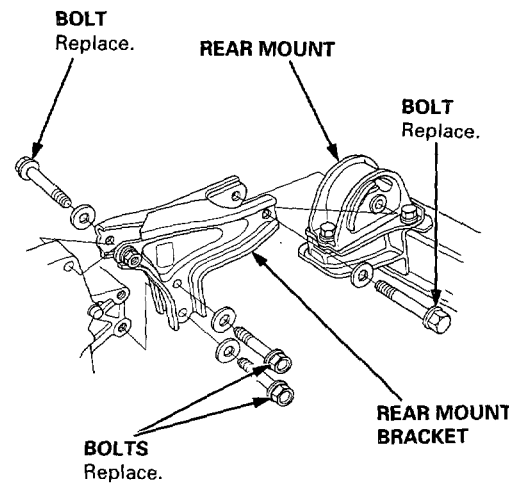


35. Remove the rear mount bracket.

Except B18C4 engine:

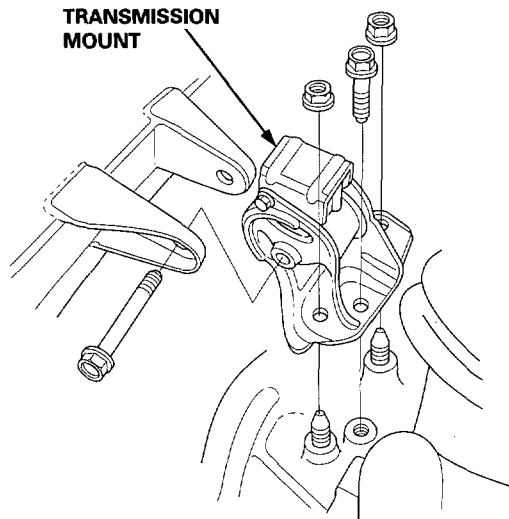


B18C4 engine:

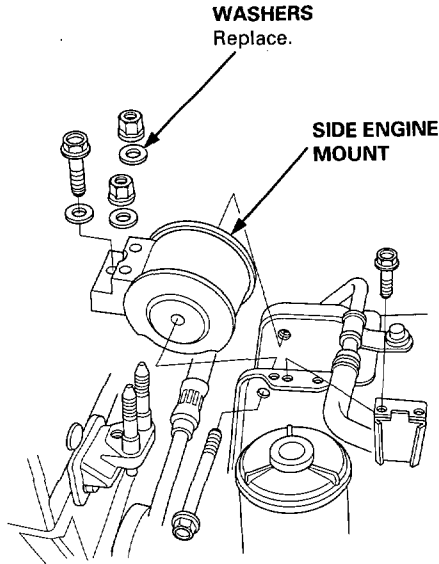




36. Remove the transmission mount.



37. Remove the side engine mount.

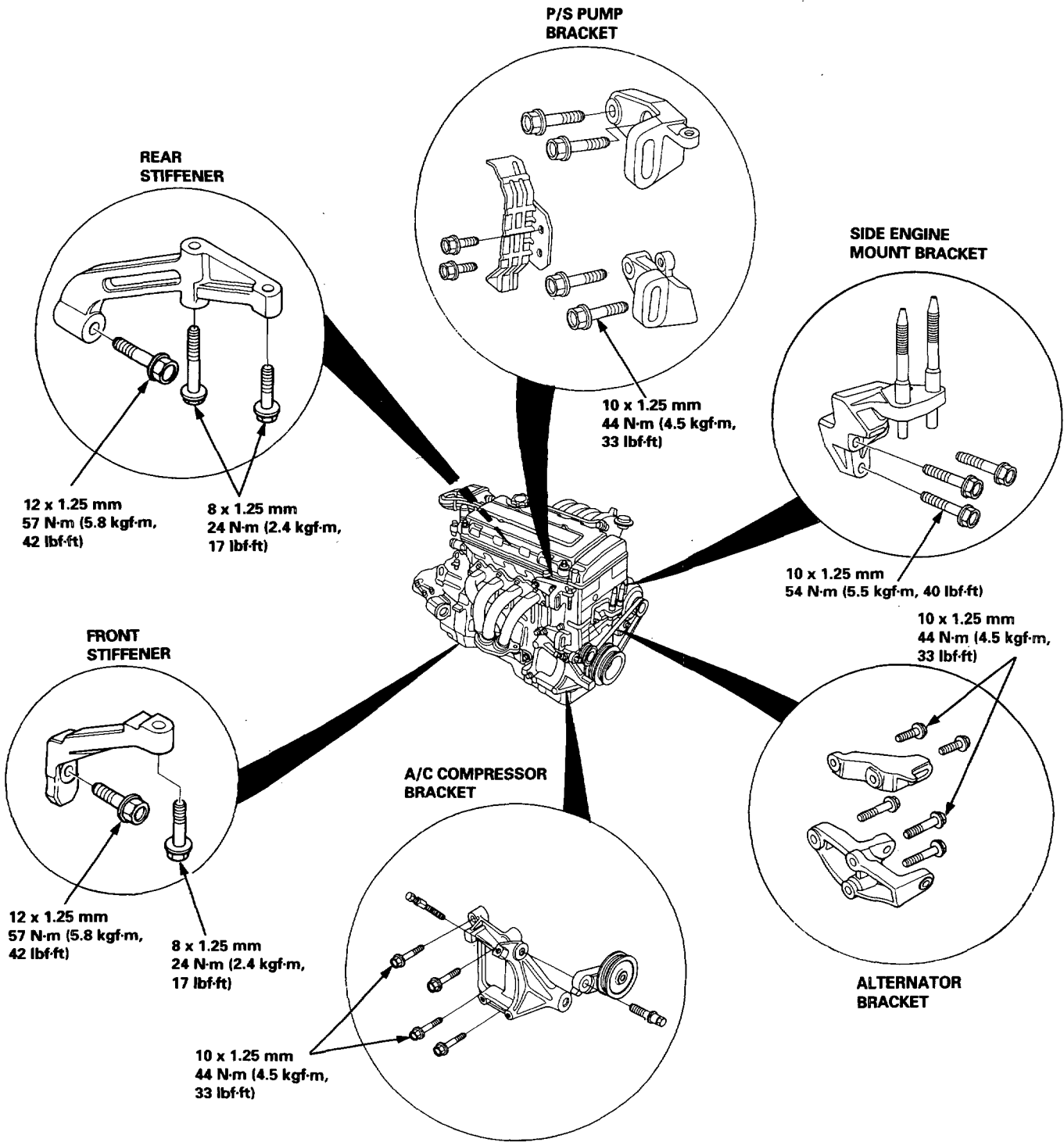


38. Check that the engine/transmission is completely free of vacuum hoses, fuel and coolant hoses and electrical wiring.
39. Slowly raise the engine approximately 150 mm (6 in). Check once again that all hoses and wires are disconnected from the engine/transmission.
40. Raise the engine all the way, and remove it from the vehicle.

Engine Removal/Installation

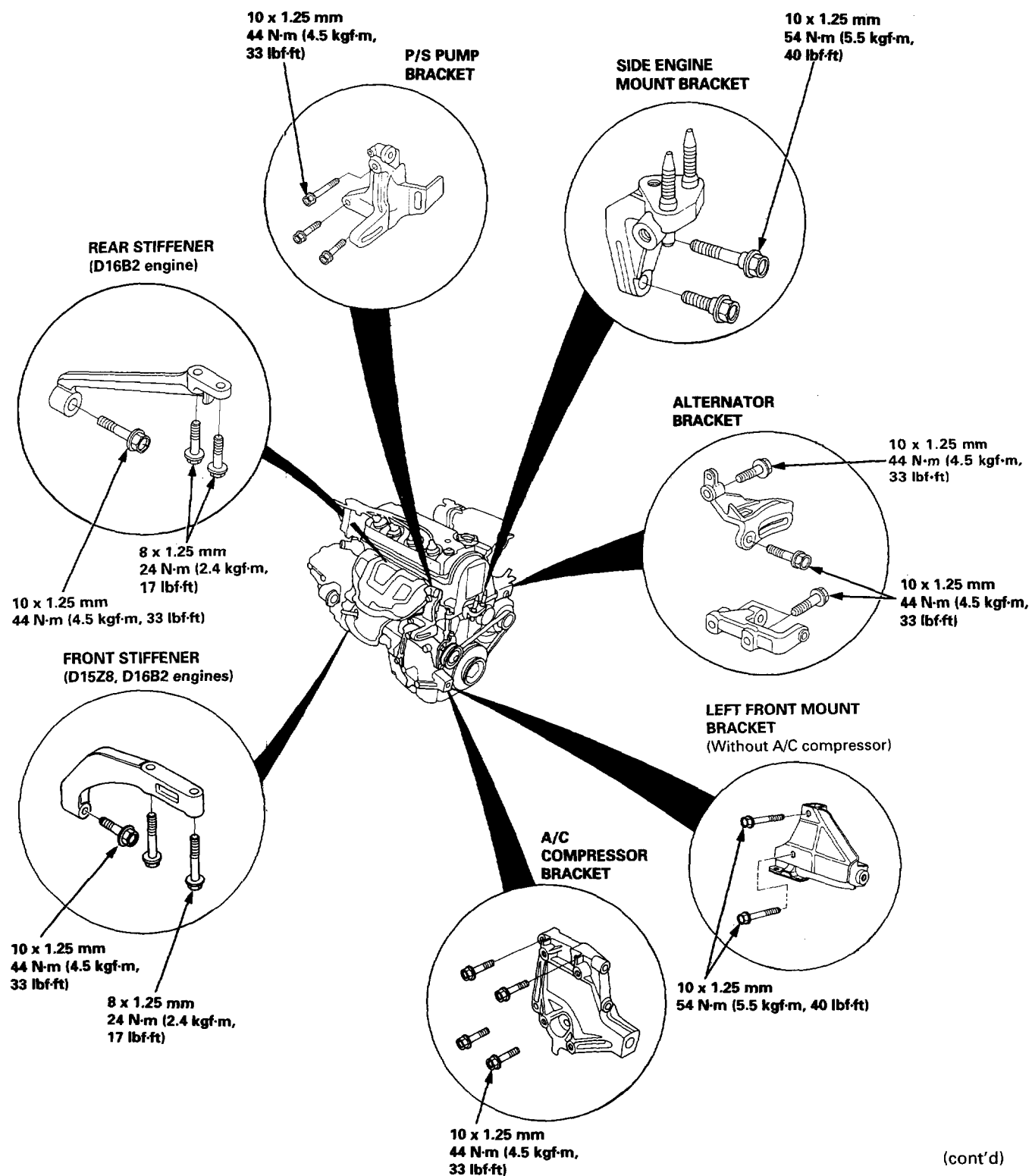
Installation

Bracket Bolts Torque Specifications:
B18C4 engine:





Bracket Bolts Torque Specifications:
Except B18C4 engine:



(cont'd)

Engine Removal/Installation

Installation (cont'd)

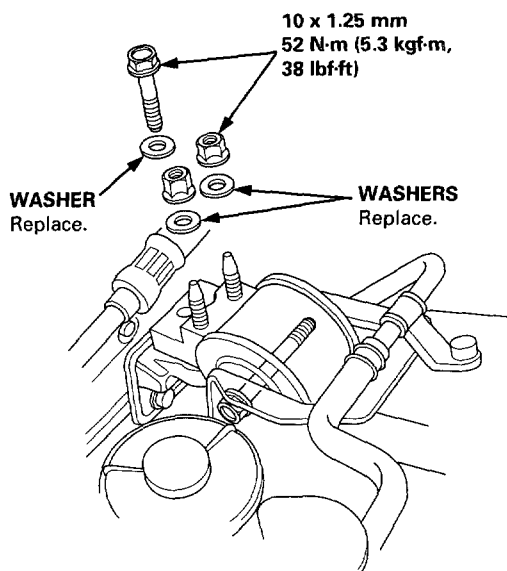
Engine Installation

Install the engine in the reverse order of removal.

Reinstall the mount bolts/nuts in the following sequence.

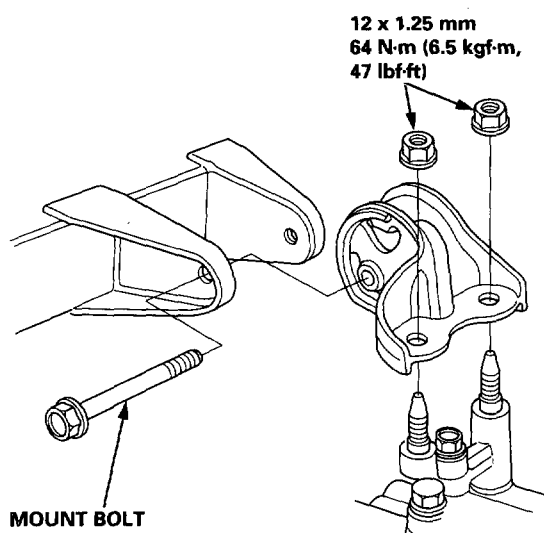
Failure to follow these procedures may cause excessive noise and vibration, and reduce bushing life.

1. Install the side engine mount, then tighten the bolt/nuts on the engine side. Leave the mount bolt loose.

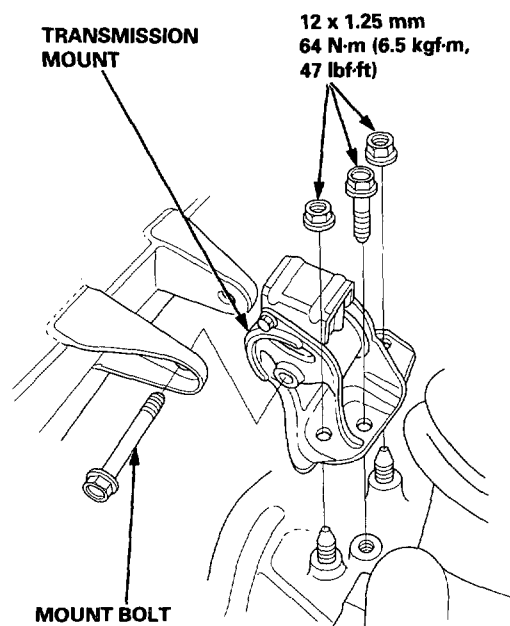


2. Install the transmission mount, then tighten the bolts/nuts on the frame side. Leave the mount bolt loose.

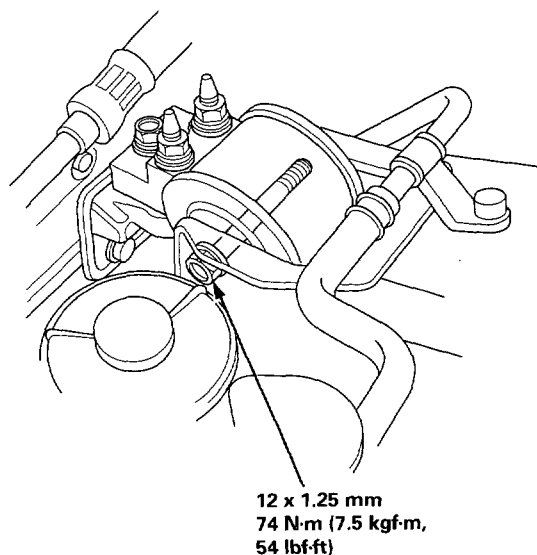
AT:



MT:



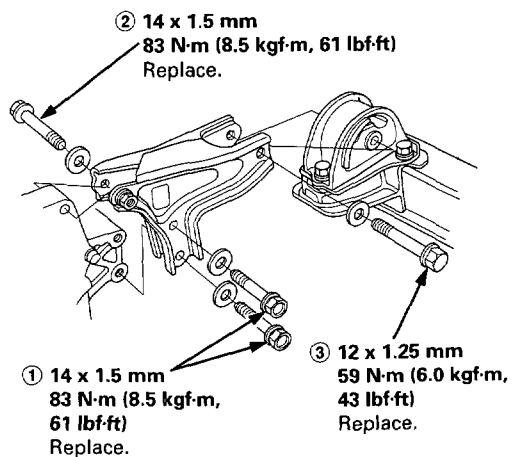
3. Tighten the mount bolt on the side engine mount.



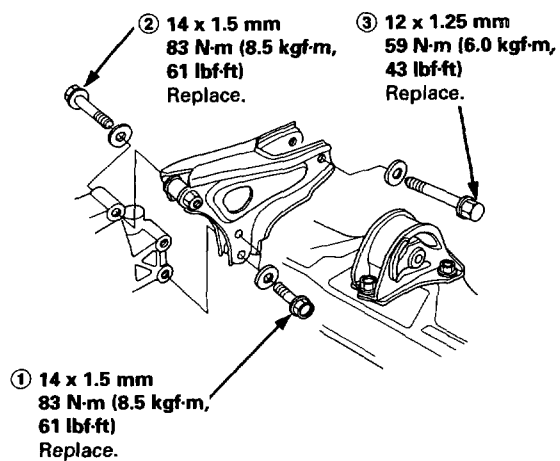


4. Install the rear mount bracket, then tighten the bolts in the numbered sequence shown (① - ③).

B18C4 engine:

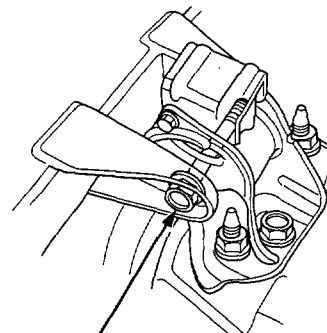


Except B18C4 engine:



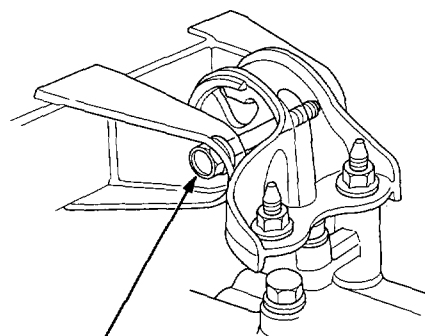
5. Tighten the mount bolt on the transmission mount.

MT:



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

AT:



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

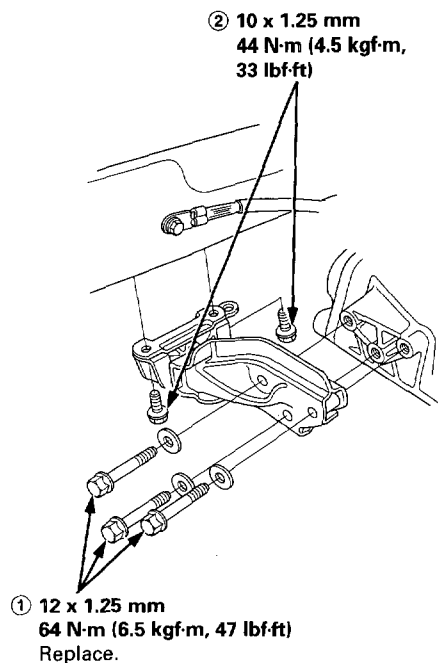
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Engine Removal/Installation

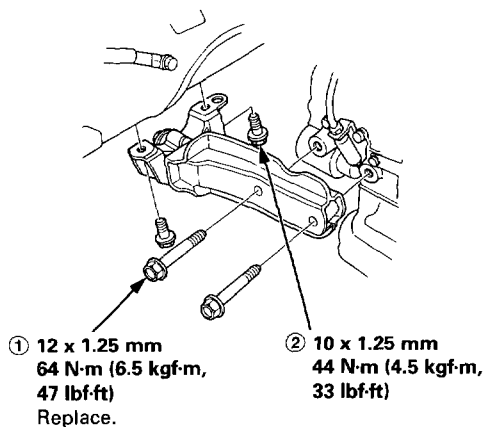
Installation (cont'd)

6. Tighten the bolts on the right front mount/bracket in the numbered sequence as shown (① - ②).

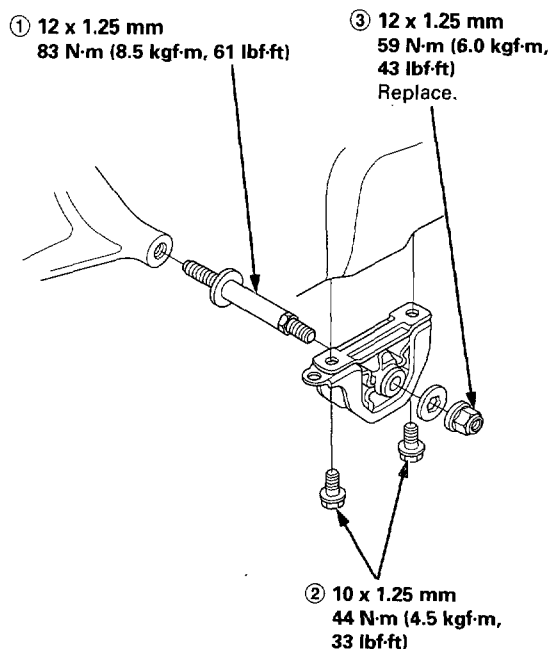
MT:



AT:



7. Tighten the bolts/nut on the left front mount in the numbered sequence as shown (① - ③).



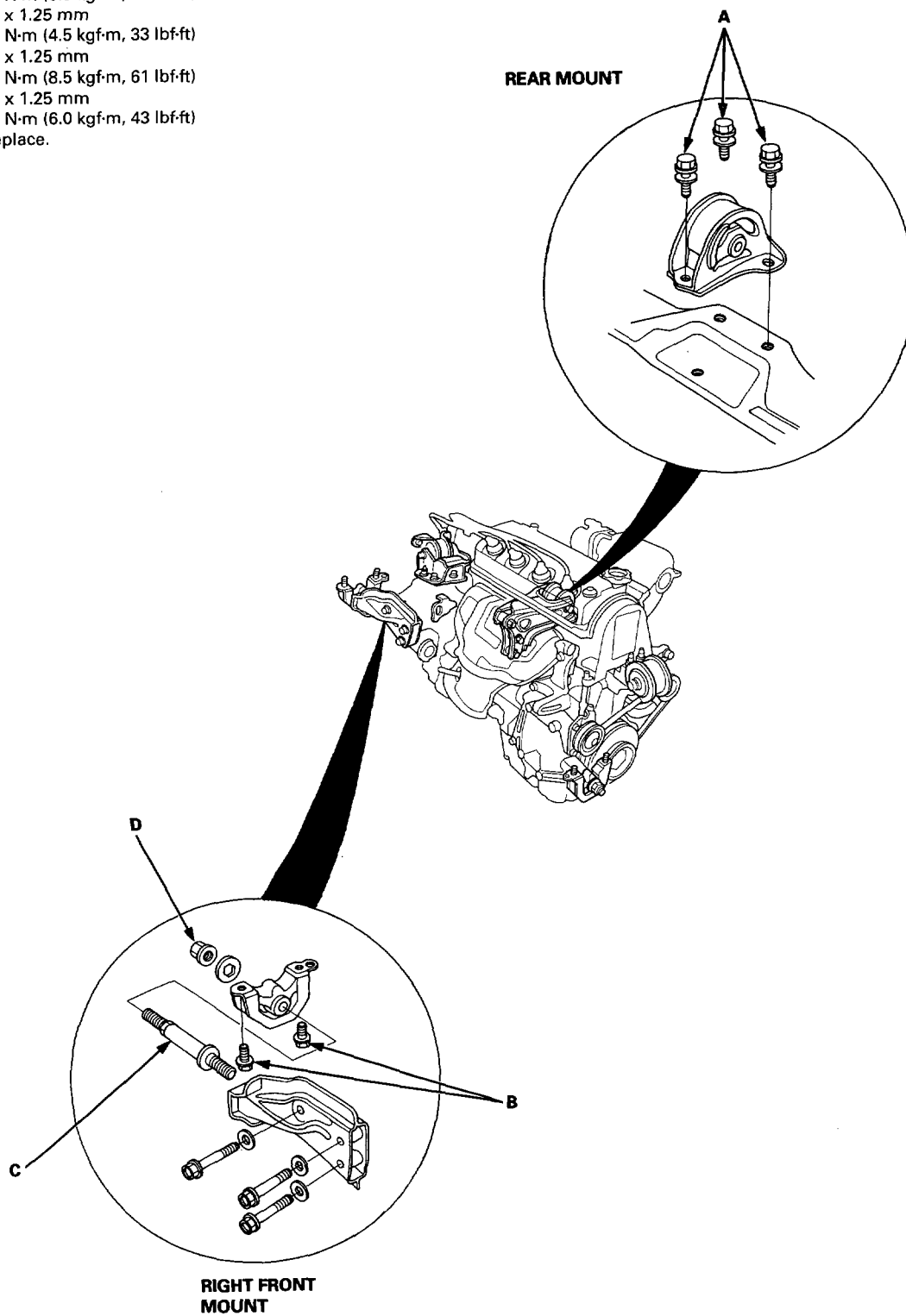
8. Adjust and make sure as follows:

- Clean the areas where the driveshaft(s) and the intermediate shaft contact the transmission (differential) thoroughly with solvent or carburetor cleaner, and dry with compressed air.
- Check that the set ring on the ends of the driveshaft and intermediate shaft set rings into place.
- Adjust the shift cable.
- Adjust the throttle cable.
- Refill the engine with engine oil.
- Refill the transmission with fluid.
- Refill the radiator with engine coolant.
- Bleed air from the cooling system.
- Clean the battery posts and cable terminals with sandpaper, assemble them, then apply grease to prevent corrosion.
- Inspect for fuel leakage.
 - After assembling fuel line parts, turn on (II) the ignition switch (do not operate the starter) so that the fuel pump operates for approximately two seconds and the fuel line pressurizes. Repeat this operation two or three times, and check for fuel leakage at any point in the fuel line.



Mount and Bracket Bolts/Nuts Torque Value Specifications:

- A: 10 x 1.25 mm
64 N·m (6.5 kgf·m, 47 lbf·ft)
- B: 10 x 1.25 mm
44 N·m (4.5 kgf·m, 33 lbf·ft)
- C: 12 x 1.25 mm
83 N·m (8.5 kgf·m, 61 lbf·ft)
- D: 12 x 1.25 mm
59 N·m (6.0 kgf·m, 43 lbf·ft)
Replace.



Cylinder Head/Valve Train

D14A7, D14A8, D15Z8, D16B2 engines	6-3
B18C4 engine	6-45



Cylinder Head/Valve Train

D14A7, D14A8, D15Z8, D16B2 engines

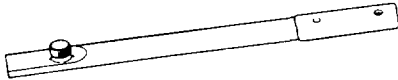
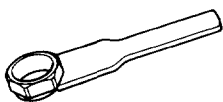
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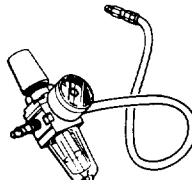
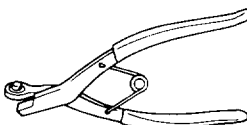
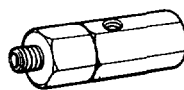
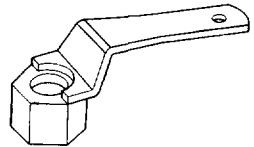
Special Tools

Ref. No.	Tool Number	Description	Qty	Remark
①	07HAH – PJ70100	Valve Guide Reamer, 5.525 mm	1	
②	07JAA – 0010100	Socket Wrench, 17 mm	1	
③	07JAB – 0010200	Handle	1	
④	07JAB – 0010400	Pulley Holder Attachment, HEX 50 mm	1	
⑤	07LAJ – PR30101	Valve Inspection Set	1	
⑥	07LAJ – PR30201	Air Stopper	1	
⑦	07NAJ – P070100	Oil Pressure Gauge Attachment	1	
⑧	07MAB – PY30100	Pulley Holder Attachment, HEX 50 mm	1	
⑨	07PAD – 0010000	Stem Seal Driver	1	
⑩	07406 – 0070001	Low Pressure Gauge	1	
⑪	07742 – 0010100	Valve Guide Driver, 5.5 mm	1	
⑫	07757 – 0010000	Valve Spring Compressor	1	

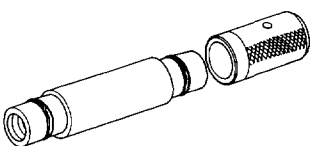
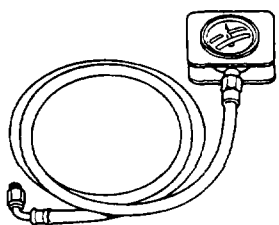
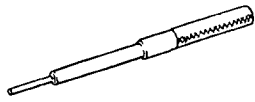
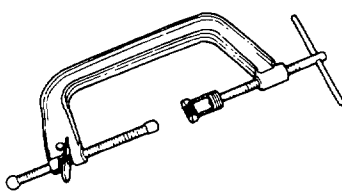


① ② ③ ④

⑤ ⑥ ⑦ ⑧

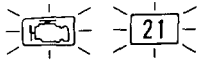





⑨ ⑩ ⑪ ⑫

Variable Valve Timing and Valve Lift Electronic Control (VTEC) Solenoid Valve



Troubleshooting Flowchart (D15Z8 engine)



The Malfunction indicator Lamp (MIL) indicates Diagnostic Trouble Code (DTC) 21: A problem in the VTEC Solenoid Valve circuit.

Refer to page 11-B-14 through 11-B-22 before troubleshooting.

- The MIL has been reported on.
- With the SCS short connector connected, code 21 is indicated.

Check the VTEC Control System:

1. Do the engine control module (ECM) reset procedure (see section 11).
2. Start the engine.
3. Warm up engine to normal operating temperature (cooling fan comes on).
4. Do the Road Test.*

* Road Test:

Accelerate in 1st gear to an engine speed over 3,000 rpm (min⁻¹). Hold that engine speed for at least two seconds. If the MIL does not come on during the first road test, repeat this test two more times.

Is MIL on and does it indicate code 21?

NO

Intermittent failure, system is OK at this time.
Check for poor connections or loose wires at VTEC solenoid valve and ECM.

YES

Test the VTEC Solenoid Valve:

1. Turn the ignition switch OFF.
2. Disconnect the VTEC solenoid valve connector.
3. Check for continuity between VTEC solenoid valve connector terminal and body ground.

Is there 14 – 30 Ω?

NO

Replace the VTEC solenoid valve.

YES

Test the VTEC Solenoid Valve Wire:

Check for continuity between VTEC solenoid valve connector terminal and A15 terminal on the ECM connector.

Is there continuity?

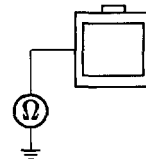
NO

Repair open in the GRN/YEL wire between the ECM (A15) and VTEC solenoid valve connector.

YES

(To page 6-6)

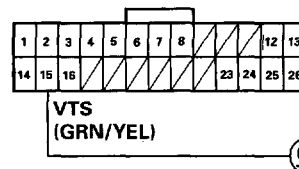
VTEC SOLENOID VALVE CONNECTOR



Terminal side of male terminal

ECM CONNECTOR A (26P)

VTEC SOLENOID VALVE CONNECTOR



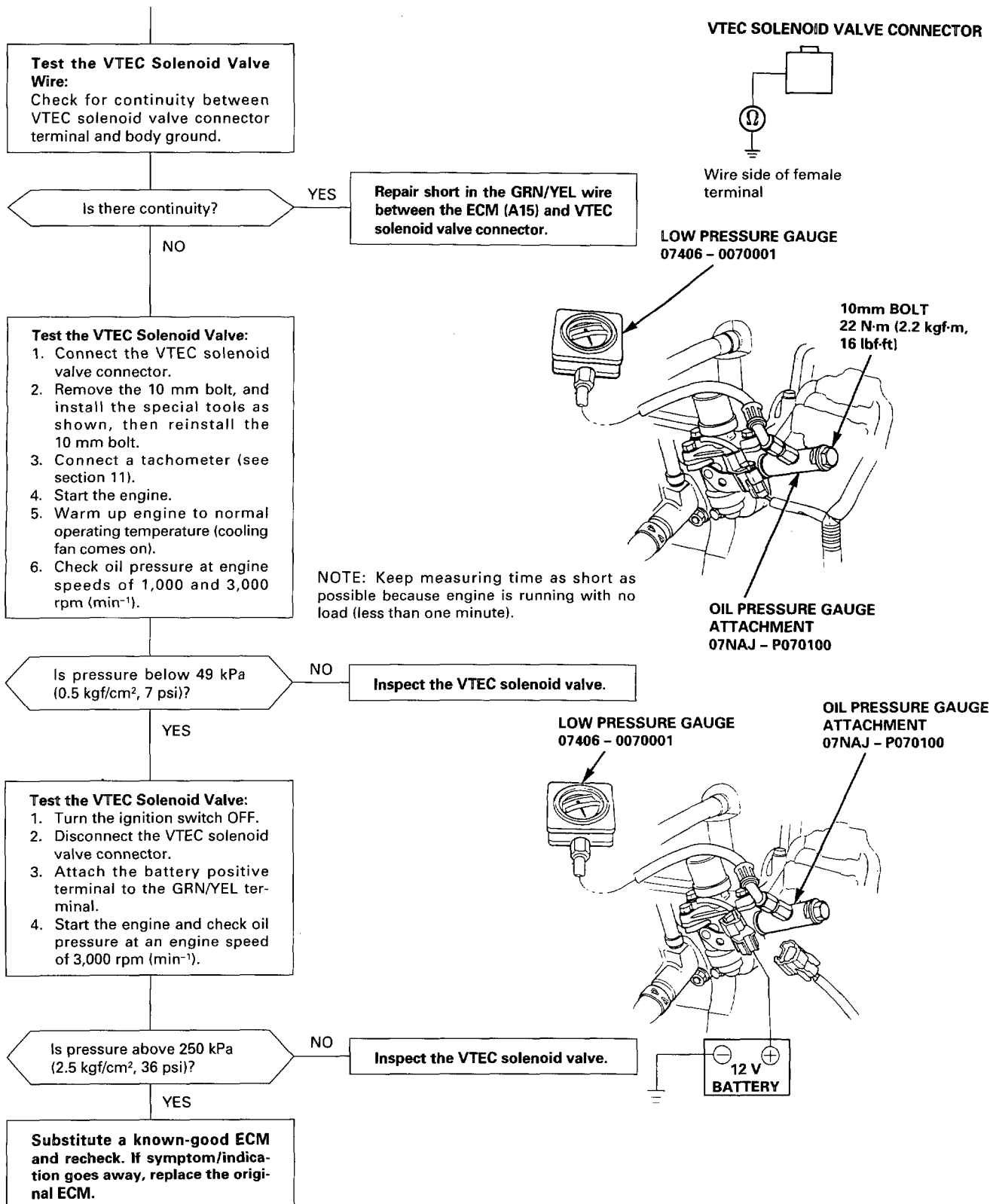
Wire side of female terminals

(cont'd)

VTEC Solenoid Valve

Troubleshooting Flowchart (D15Z8 engine) (cont'd)

(From page 6-5)



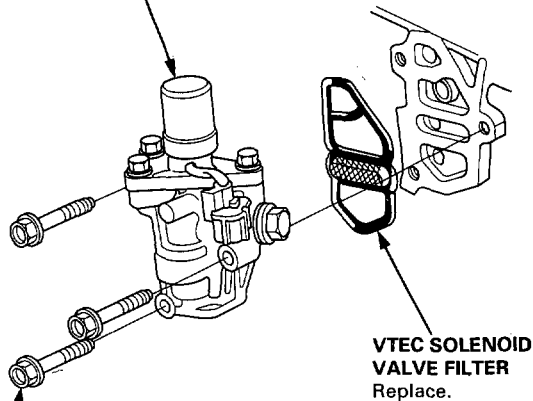


Inspection

1. Remove the VTEC solenoid valve assembly from the cylinder head, and check the VTEC solenoid valve filter for clogging.

- If there is clogging, replace the engine oil filter and engine oil.

VTEC SOLENOID VALVE ASSEMBLY



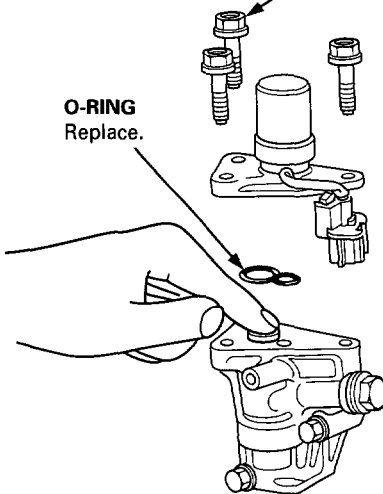
6 x 1.0 mm
12 N·m (1.2 kgf·m, 8.7 lbf·ft)

2. If the filter is not clogged, push the VTEC solenoid valve with your finger and check its movement.

- If the VTEC solenoid valve is normal, check the engine oil pressure.

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

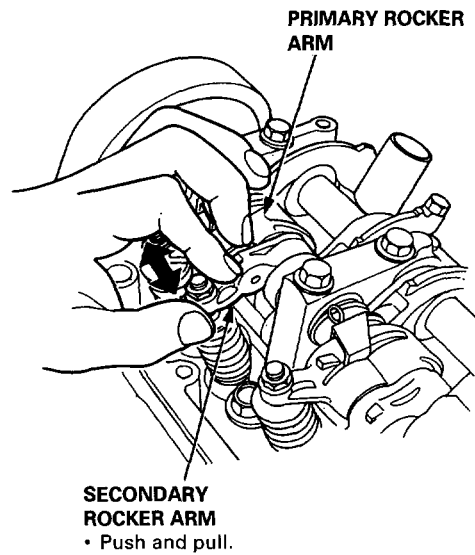
O-RING
Replace.



Manual Inspection (D16Z8 engine)

1. Set the No. 1 piston at TDC.
2. Remove the cylinder head cover.

NOTE: Refer to page 6-42 when installing cylinder head cover.
3. Move the intake secondary rocker arm on the No. 1 cylinder manually.
4. Check that the intake secondary rocker arm moves independently of the primary intake rocker arm.



5. Check the intake secondary rocker arm of each cylinder at TDC.

- If the intake secondary rocker arm does not move, remove the primary and secondary intake rocker arms as an assembly and check that the pistons in the secondary and primary rocker arms move smoothly.
- Replace the intake rocker arms as an assembly if there is any abnormality.

VTEC Rocker Arms

Inspection Using Special Tools (D15Z8 engine)

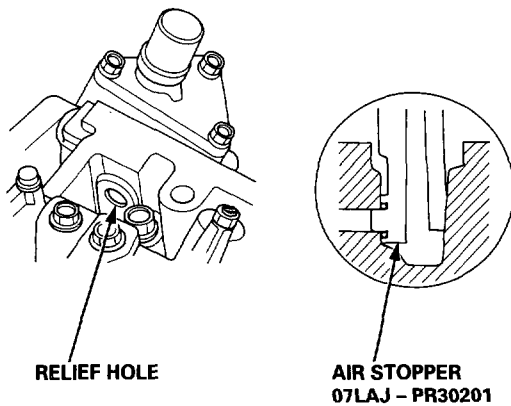
NOTE:

- Before using the Valve Inspection Tool, make sure that the air pressure gauge on the air compressor indicates over 400 kPa (4 kgf/cm², 57 psi).
- Inspect the valve clearance before rocker arm inspection.
- Cover the timing belt with a shop towel to protect the belt.
- Check the intake secondary rocker arm of each cylinder at TDC.

1. Remove the cylinder head cover.

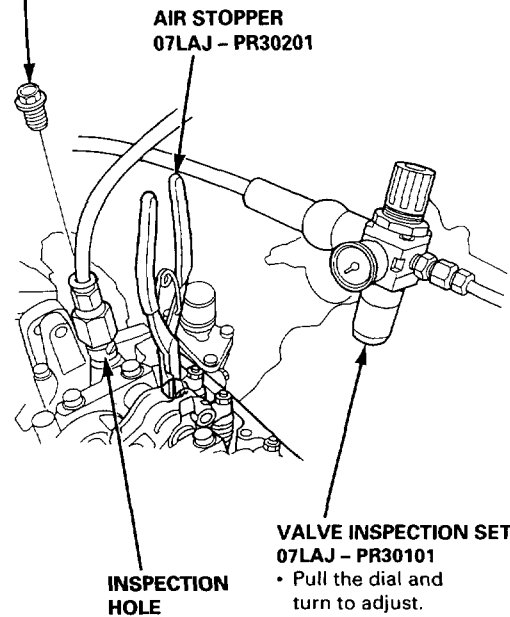
NOTE: Refer to page 6-42 when installing cylinder head cover.

2. Plug the relief hole with the special tool (Air Stopper).



3. Remove the sealing bolt from the inspection hole and connect the Valve Inspection Tool.

10 x 1.0 mm
SEALING BOLT
20 N·m (2.0 kgf·m,
14 lbf·ft)



4. Apply specified air pressure to the intake rocker arm timing piston, after loosening the regulator valve on the valve inspection set.

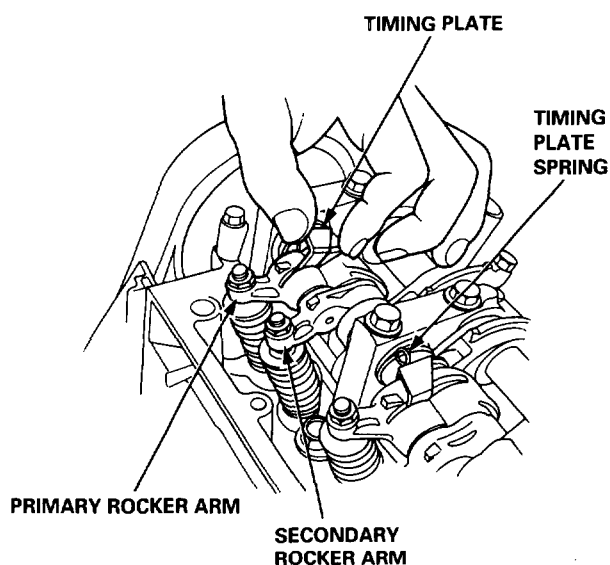
Specified Air Pressure:
250 kPa (2.5 kgf/cm², 36 psi)



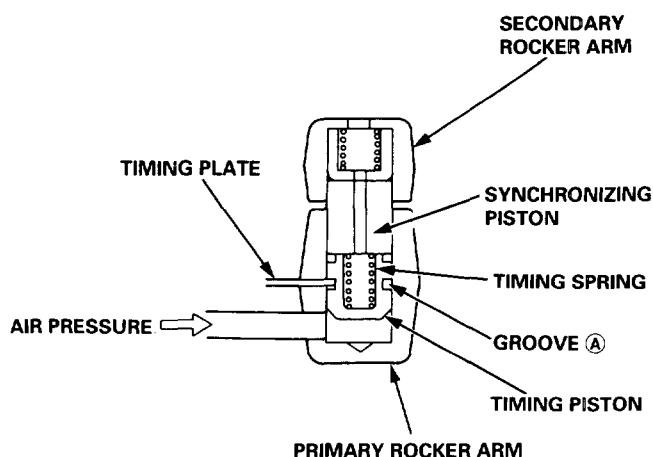
5. With the specified air pressure applied, push up the timing plate; the synchronizing piston will pop out and engage the intake secondary rocker arm. Visually check the engagement of the synchronizing piston.

NOTE:

- The synchronizing piston can be seen in the gap between the secondary and primary rocker arms.
- When the timing plate is engaged in the groove A on the timing piston, the piston will be locked in the pushed out position.



At High RPM:

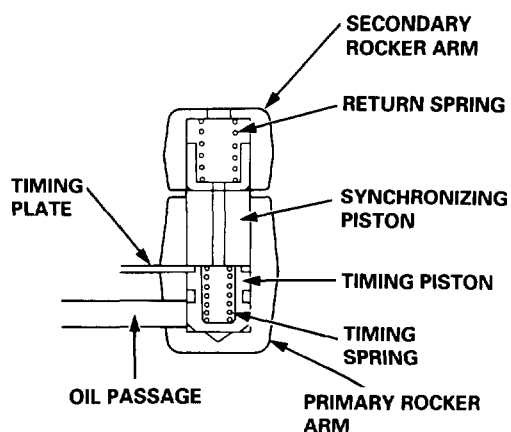


6. Stop applying air pressure and push up the timing plate; the synchronizing piston will return to its original position with a click. Visually check the disengagement of the synchronizing pistons.

NOTE:

- When the timing plate is pushed up, it will disengage the timing piston letting the synchronizing piston return to its original position by the return spring.
- Replace the intake rocker arms as an assembly if there is any abnormality.

At Low RPM:



7. Remove the special tools.
8. After inspection, check that the MIL does not come on.

Valve Clearance

Adjustment

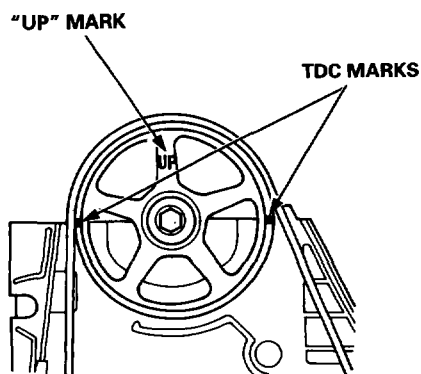
NOTE:

- Valves should be adjusted only when the cylinder head temperature is less than 38°C (100°F).
- After adjusting, loosen the crankshaft pulley bolt, then retorque the crankshaft pulley bolt to 20 N·m (2.0 kgf·m, 14 lbf·ft) + 90°.

1. Remove the cylinder head cover.

NOTE: Refer to page 6-42 when installing the cylinder head cover.

2. Remove the upper cover (see page 6-17).
3. Set the No. 1 piston at TDC. "UP" mark on the camshaft pulley should be at top, and TDC marks should align with the cylinder head upper surface.



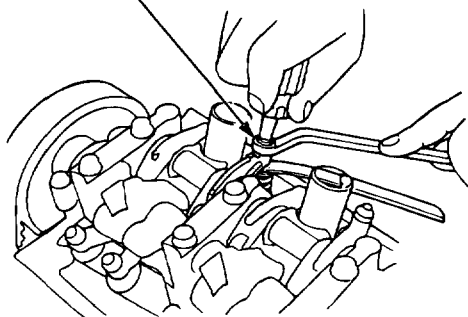
4. Adjust valves on No. 1 cylinder.

Intake: 0.18 – 0.22 mm (0.007 – 0.009 in)
Exhaust: 0.23 – 0.27 mm (0.009 – 0.011 in)

5. Loosen locknut and turn adjustment screw until feeler gauge slides back and forth with slight amount of drag.

D15Z8 engine:

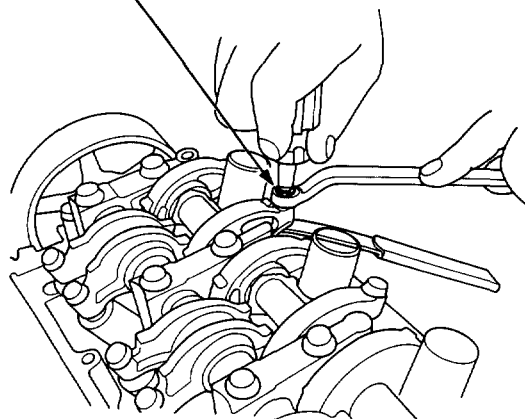
INTAKE and EXHAUST VALVE
LOCKNUTS
20 N·m (2.0 kgf·m, 14 lbf·ft)



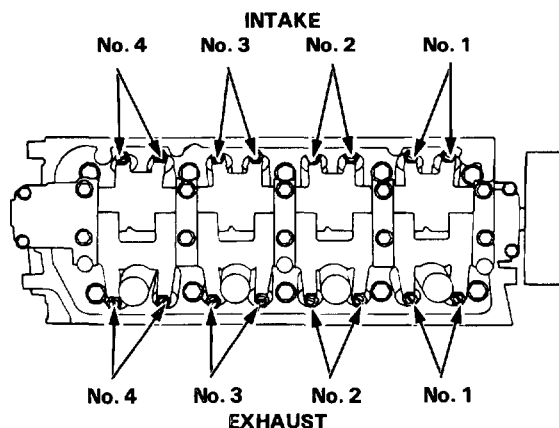
Except D15Z8 engine:

NOTE: Do not overtighten the locknuts, for the rocker arms are made of aluminum.

INTAKE and EXHAUST VALVE
LOCKNUTS
18 N·m (1.8 kgf·m, 13 lbf·ft)

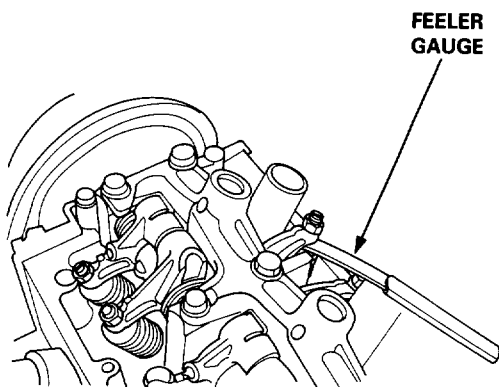


Adjusting screw location:

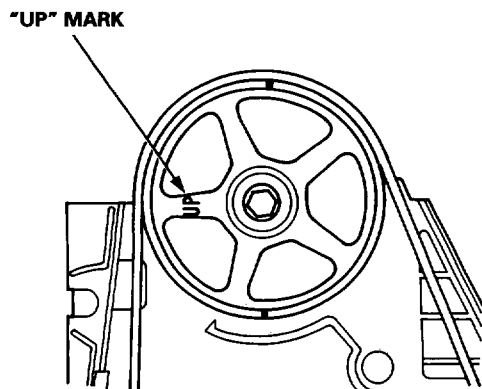




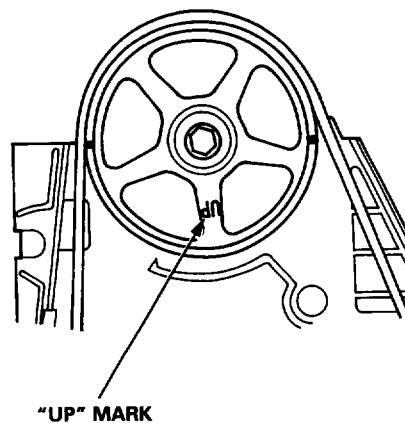
6. Tighten the locknut, and check clearance again. Repeat the adjustment if necessary.



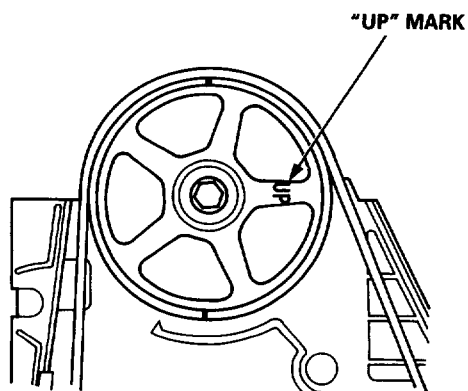
7. Rotate the crankshaft 180° counterclockwise (camshaft pulley turns 90°). The "UP" mark should be on the exhaust side. Adjust valves on No. 3 cylinder.



8. Rotate the crankshaft 180° counterclockwise to bring No. 4 piston to TDC. Both TDC grooves are once again visible. Adjust valves on No. 4 cylinder.



9. Rotate the crankshaft 180° counterclockwise to bring No. 2 piston to TDC. The "UP" mark should be on the intake side. Adjust valves on No. 2 cylinder.

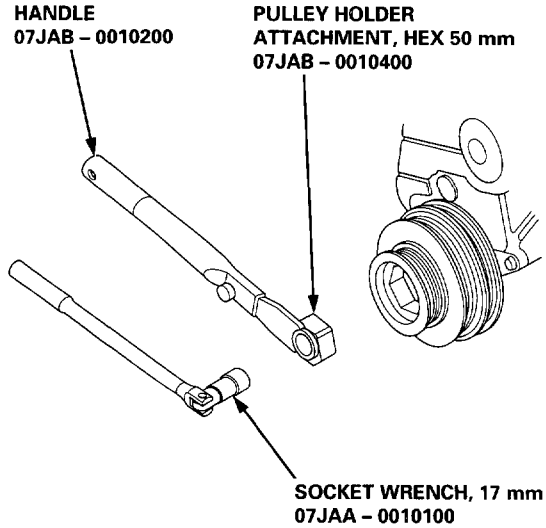


Crakshaft Pulley and Pulley Bolt

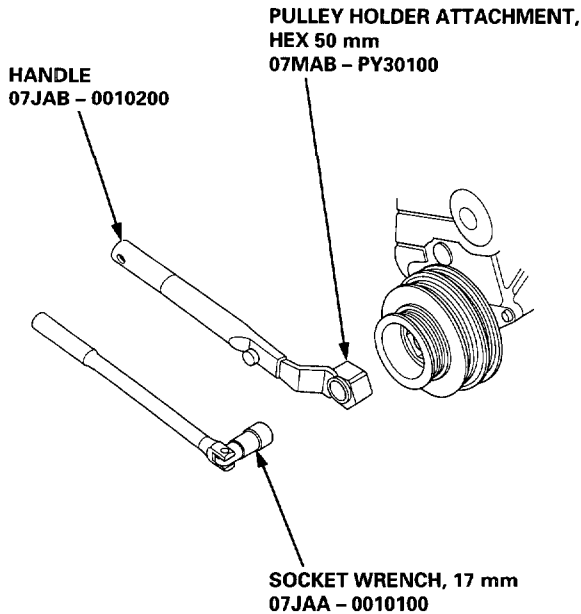
Replacement

1. Hold the pulley with handle and pulley holder attachment, then remove the pulley bolt.

D15Z8, D16B2 engines:



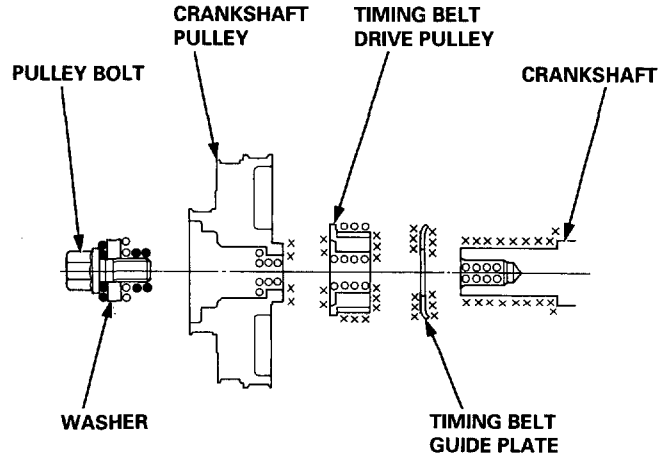
D14A7, D14A8 engines:



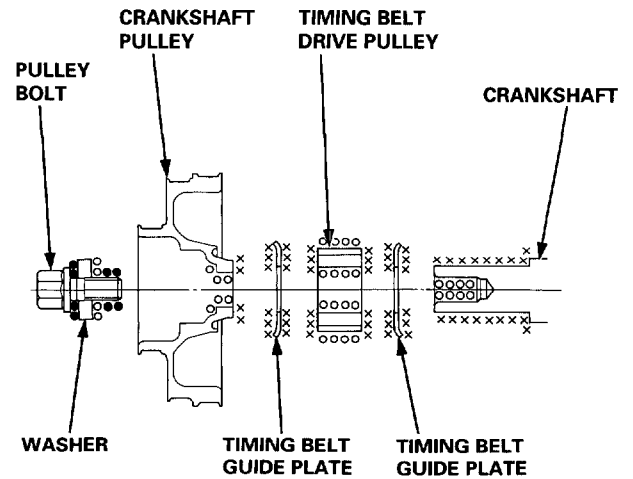
2. Remove any oil from the pulleys, crankshaft, bolt and washer. Clean and lubricate as shown below.

- : Clean
- ×: Remove any oil
- : Lubricate

D15Z8 engine:



Except D15Z8 engine:

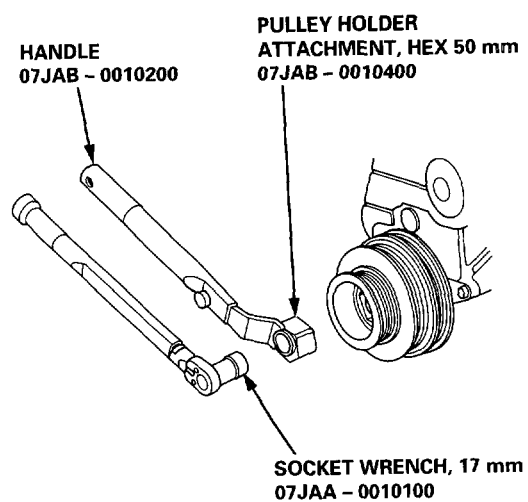




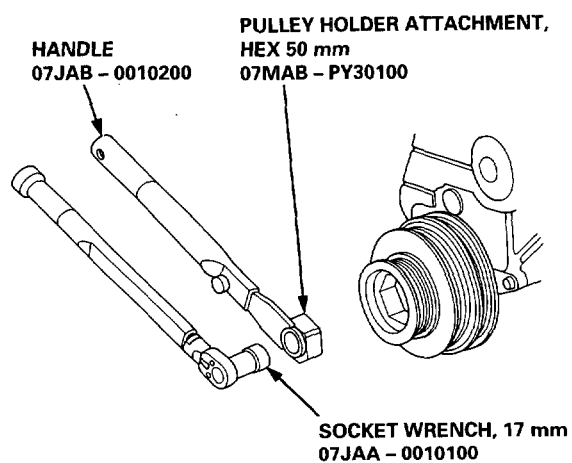
3. Tighten the pulley bolt to the specified torque.

Torque: 20 N-m (2.0 kgf-m, 14 lbf-ft)

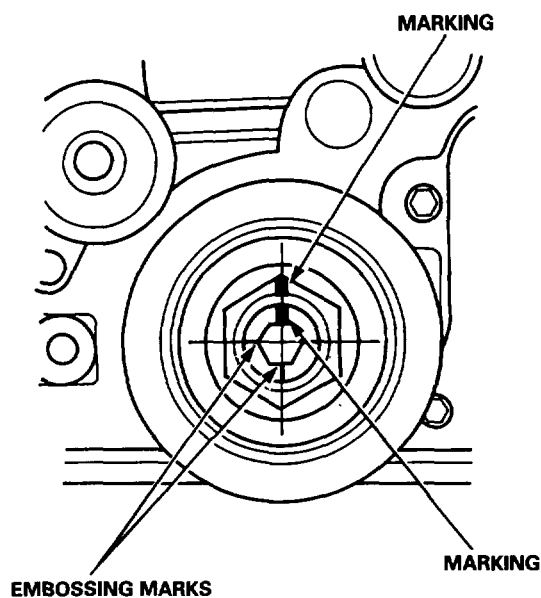
D15Z8, D16B2 engines:



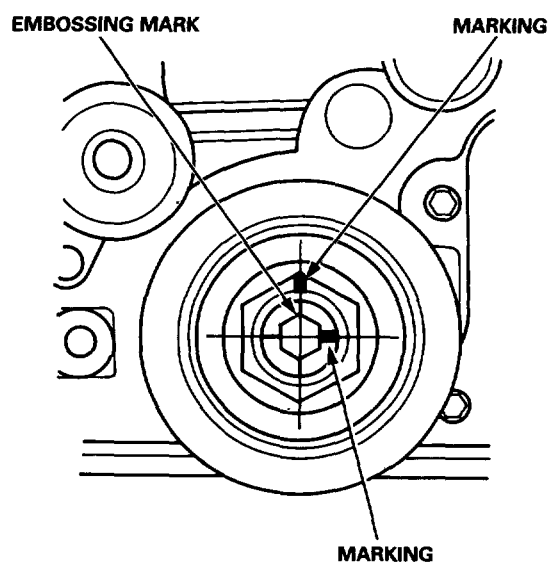
D14A7, D14A8 engines:



4. Use a felt tip pen to mark the pulley bolt head and washer.



5. Tighten the pulley bolt an additional 90°.



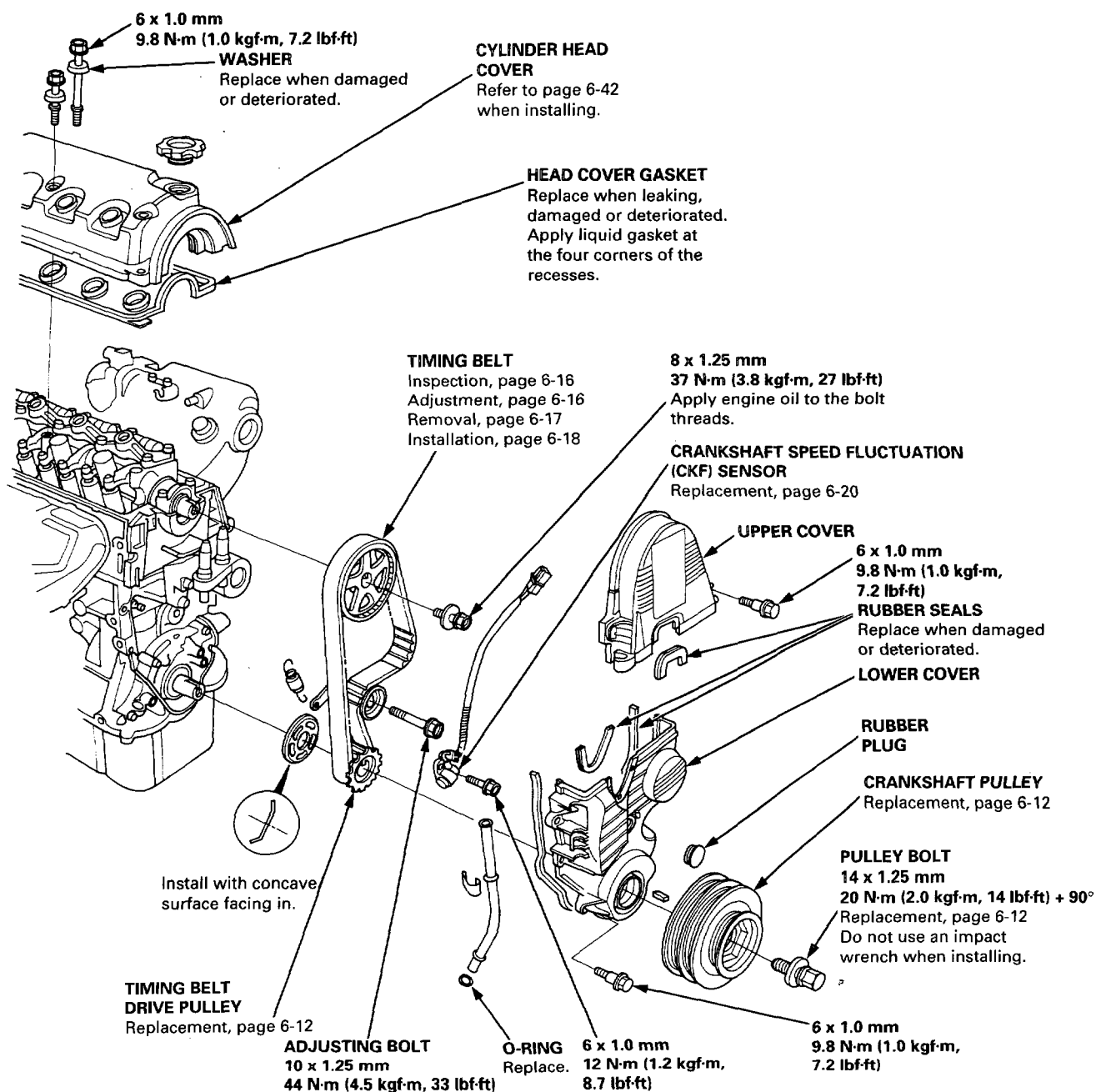
Timing Belt

Illustrated Index

NOTE:

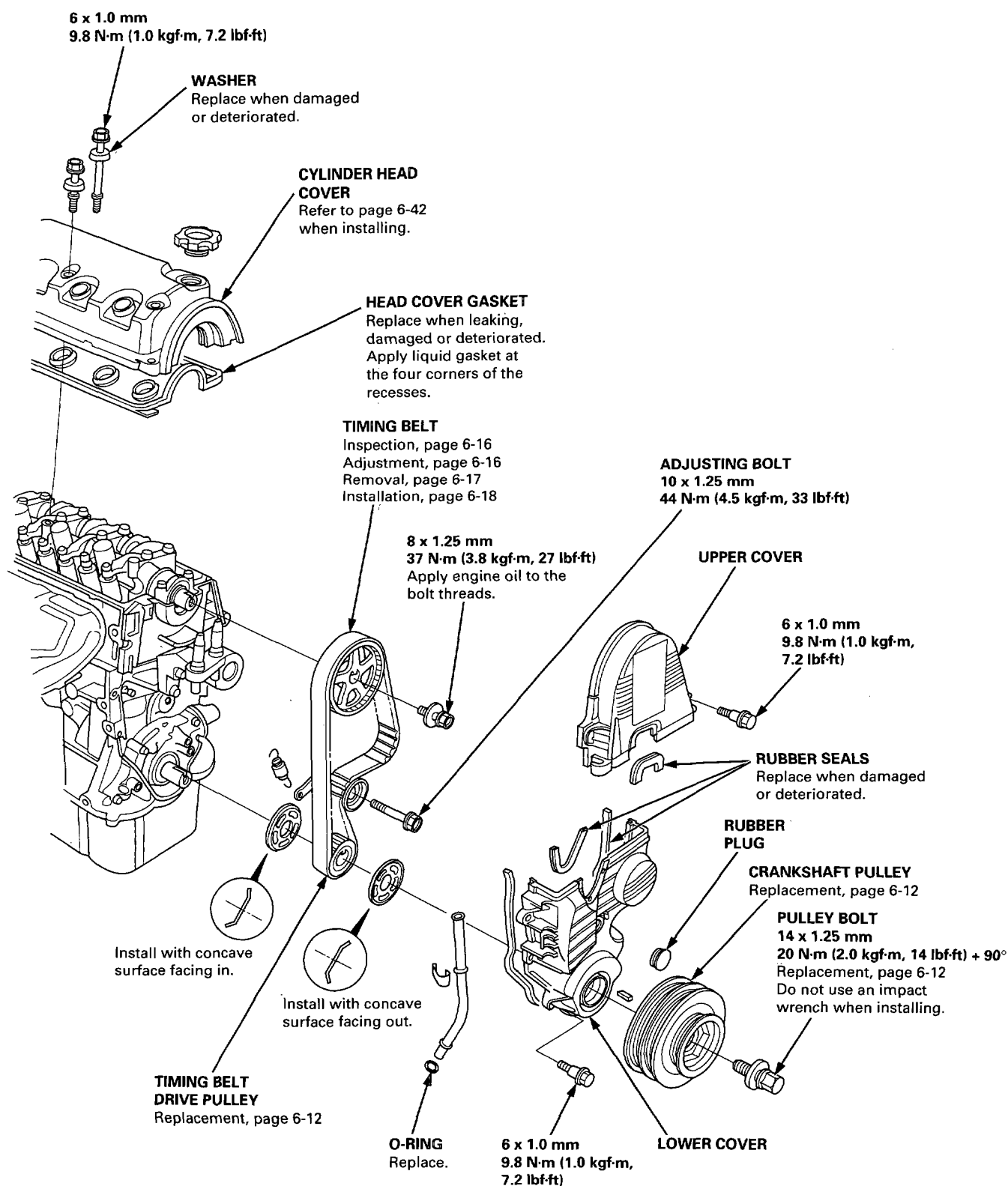
- Refer to page 6-18 for how to position the crankshaft and pulley before installing the belt.
- Mark the direction of rotation on the belt before removing.
- Do not use the upper cover and lower cover for storing removed items.
- Clean the upper cover and lower cover before installing.
- Replace the camshaft seals and crankshaft seals if there is oil leakage.

D15Z8 engine:





Except D15Z8 engine:



Timing Belt

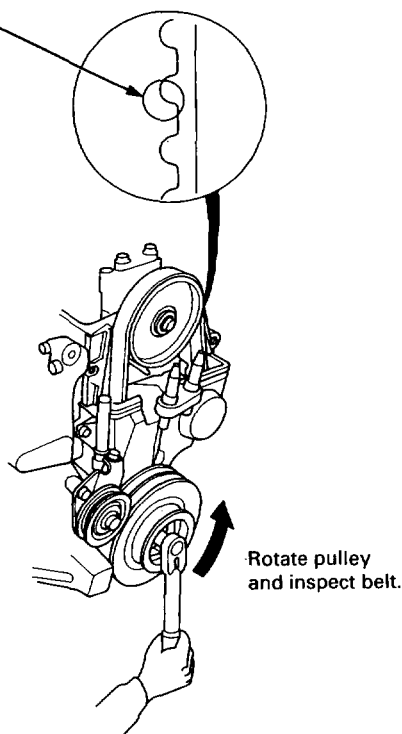
Inspection

1. Remove the cylinder head cover.
 - Refer to page 6-42 when installing.
2. Remove the upper cover (see page 6-17).
3. Inspect the timing belt for cracks and oil or coolant soaking.

NOTE:

- Replace the belt if oil or coolant soaked.
- Remove any oil or solvent that gets on the belt.

Inspect this area for wear.



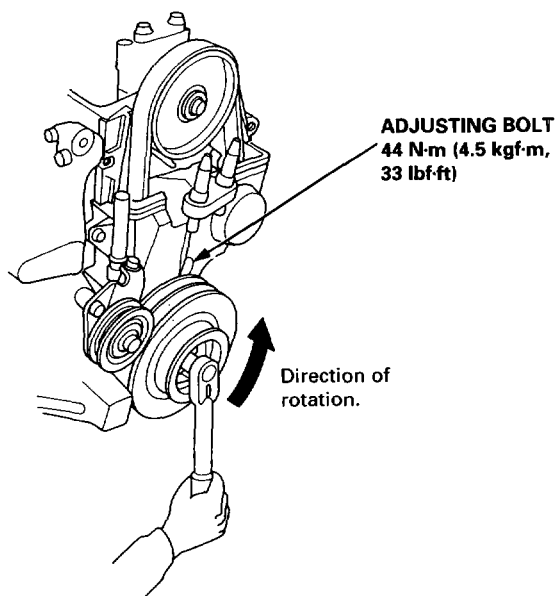
4. After inspecting, loosen the crankshaft pulley bolt, then retorque the crankshaft pulley bolt to 20 N·m (2.0 kgf·m, 14 lbf·ft) + 90°.

Tension Adjustment

NOTE:

- Always adjust the timing belt tension with the engine cold.
- The tensioner is spring-loaded to apply tension to the belt automatically after making the following adjustment.
- Always rotate the crankshaft counterclockwise when viewed from the pulley side. Rotating it clockwise may result in improper adjustment of the belt tension.
- Inspect the timing belt before adjusting the belt tension.

1. Remove the cylinder head cover.
 - Refer to page 6-42 when installing.
2. Remove the upper cover (see page 6-17).
3. Rotate the crankshaft five or six revolutions to set the belt.
4. Set the No. 1 piston at TDC (see page 6-19).
5. Loosen the adjusting bolt 180°.



6. Rotate the crankshaft counterclockwise three teeth on the camshaft pulley.
7. Tighten the adjusting bolt.
8. After inspecting, loosen the crankshaft pulley bolt, then retorque the crankshaft pulley bolt to 20 N·m (2.0 kgf·m, 14 lbf·ft) + 90°.

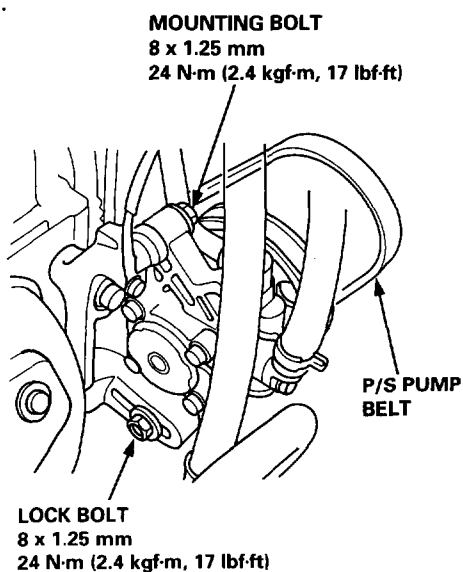


Removal

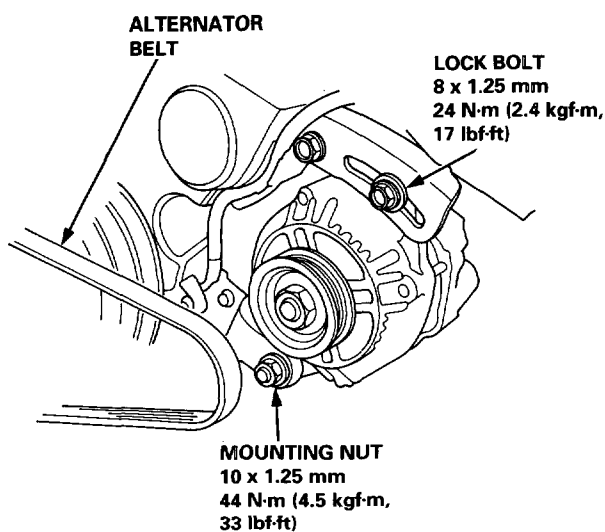
NOTE:

- Turn the crankshaft pulley so the No. 1 piston is at top dead center (TDC) before removing the belt (see page 6-19).
- Inspect the water pump before installing the timing belt (see page 10-14).

1. Remove the splash shield (see page 5-6).
2. Loosen the mounting bolt and lock bolt, then remove the power steering (P/S) pump belt and pump.

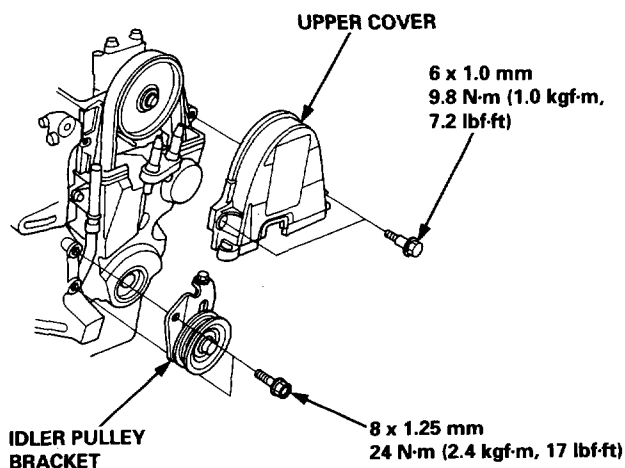


3. Loosen the idler pulley center nut and adjusting bolt, then remove the air conditioning (A/C) compressor belt (see page 5-5).
4. Loosen the mounting nut and lock bolt, then remove the alternator belt.



5. Remove the dipstick, then remove upper cover and idler pulley bracket.

NOTE: Do not use the upper cover for storing removed items.



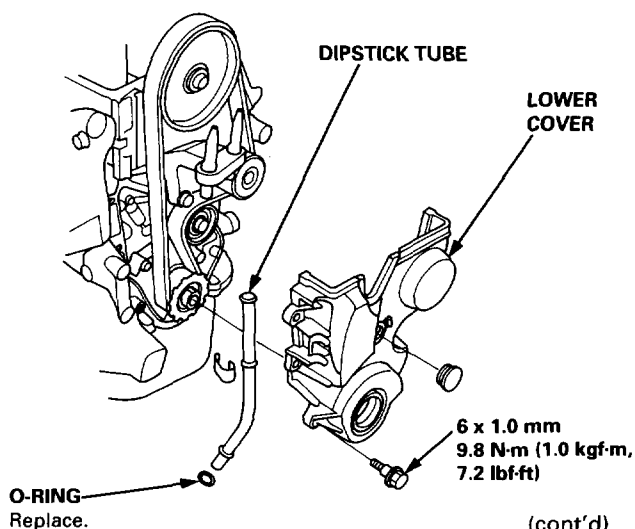
6. Remove the side engine mount (see page 6-26).

NOTE:

- Use the jack to support the engine before the side engine mount is removed.
- Make sure to place a cushion between the oil pan and the jack.

7. Remove the crankshaft pulley (see page 6-12).
8. Remove the lower cover and dipstick tube.

NOTE: Do not use the lower cover for storing removed items.

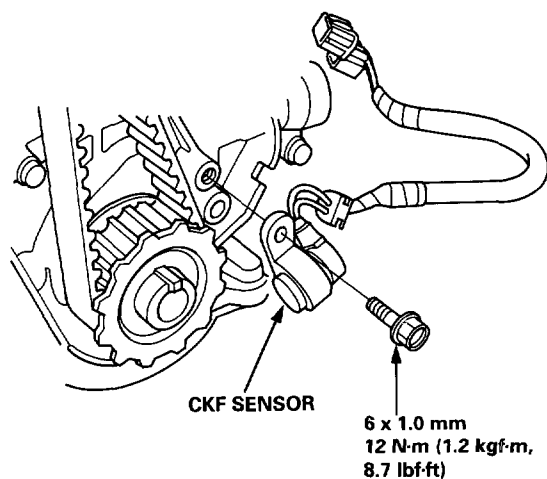


(cont'd)

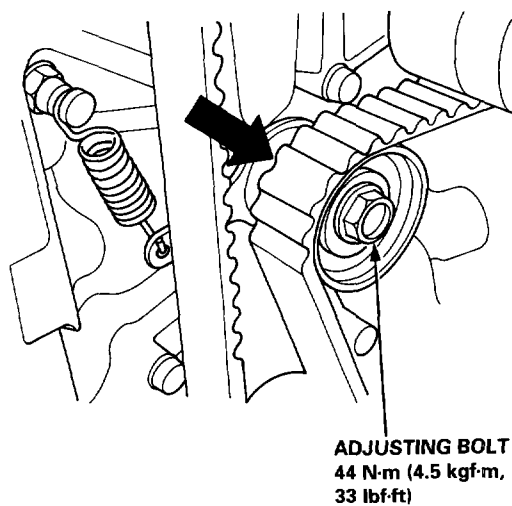
Timing Belt

Removal (cont'd)

9. Remove the crankshaft speed fluctuation (CKF) sensor from the oil pump (D15Z8 engine).



10. Loosen the adjusting bolt 180°. Push the tensioner to remove tension from the timing belt, then retighten the adjusting bolt.

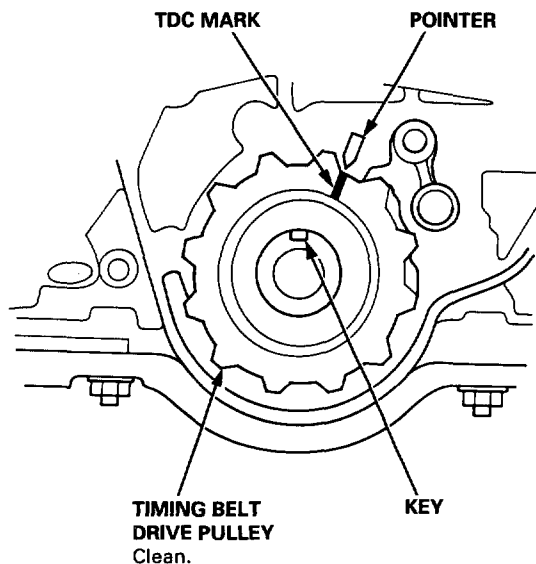


11. Remove the timing belt.

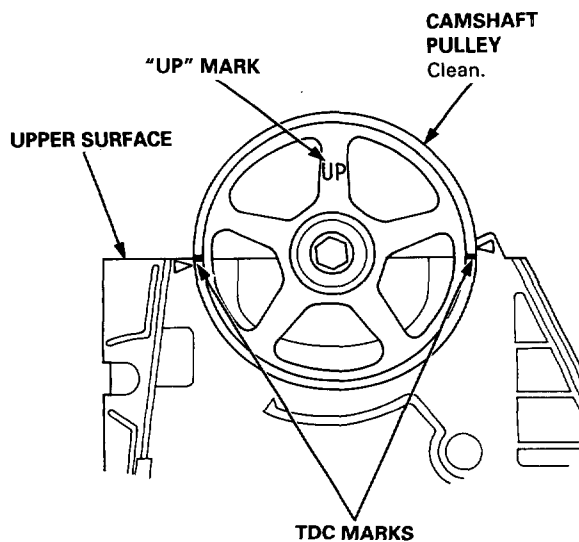
Installation

Install the timing belt in the reverse order of removal; Only key points are described here.

1. Set the timing belt drive pulley so that the No. 1 piston is at top dead center (TDC). Align the groove on the timing belt drive pulley to the pointer on the oil pump.



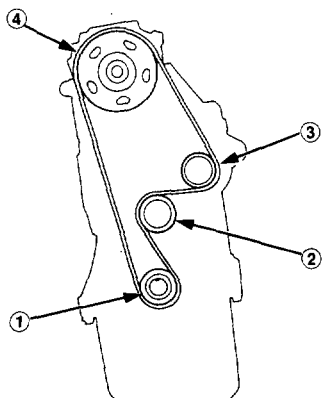
2. Set the camshaft pulley so that the No. 1 piston TDC. Align the TDC marks on the camshaft pulley with the cylinder head upper surface.





3. Install the timing belt tightly in the sequence shown.
①Timing belt drive pulley (crankshaft) →②Adjusting pulley →③Water pump pulley →④Camshaft pulley.

NOTE: Make sure the timing belt drive pulley and camshaft pulley are at TDC.



4. Loosen and retighten the adjusting bolt to tension the timing belt.

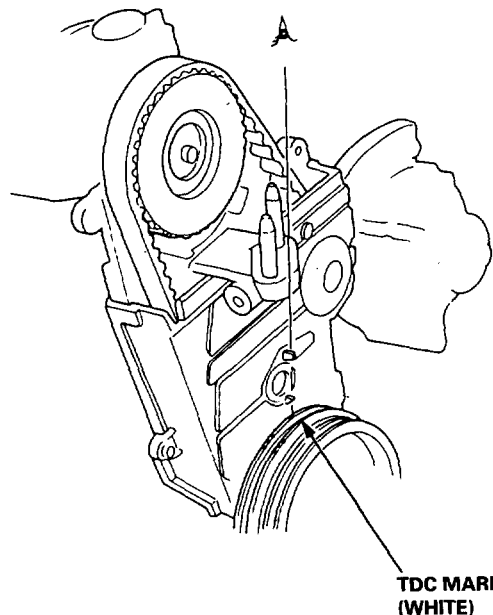
5. Install the lower cover and upper cover.

NOTE: Clean the upper and lower covers before installation.

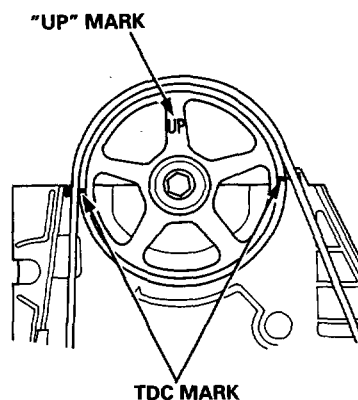
6. Install the crankshaft pulley, then tighten the pulley bolt (see page 6-12).
7. Rotate the crankshaft pulley about five or six turns counterclockwise so that the timing belt positions on the pulleys.
8. Adjust the timing belt tension (see page 6-16).

9. Check that the crankshaft pulley and camshaft pulley are both at TDC.

CRANKSHAFT PULLEY:



CAMSHAFT PULLEY:



10. If the camshaft and crankshaft pulleys are not positioned at TDC remove the timing belt, and adjust the position following the procedure on page 6-18, then reinstall the timing belt.
11. After installation, adjust the tension of each belt.
- See section 4 for alternator belt tension adjustment.
 - See section 22 for A/C compressor belt tension adjustment.
 - See section 17 for P/S pump belt tension adjustment.

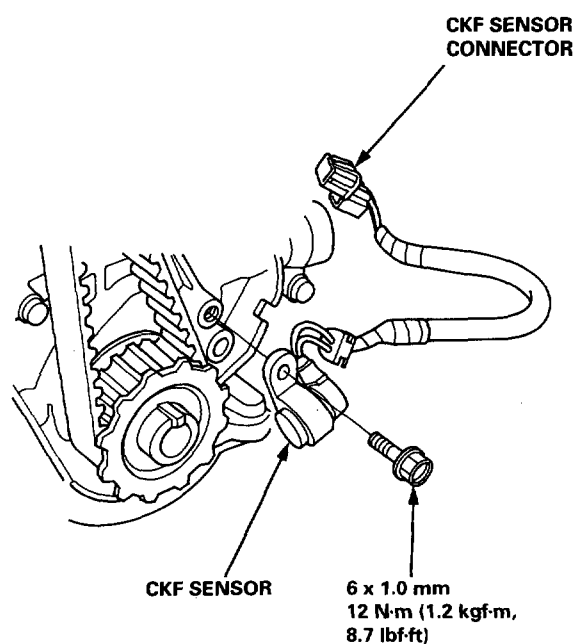
CKF Sensor

Replacement (D15Z8 engine)

1. Remove the cylinder head cover.

NOTE: Refer to page 6-42 when installing.

2. Remove the crankshaft pulley (see page 6-12).
3. Remove the upper cover and idler pulley bracket (see page 6-17).
4. Remove the dipstick tube, then remove lower cover (see page 6-17).
5. Disconnect the CKF sensor connector, then remove the CKF sensor.



6. Install the CKF sensor in reverse order of removal.

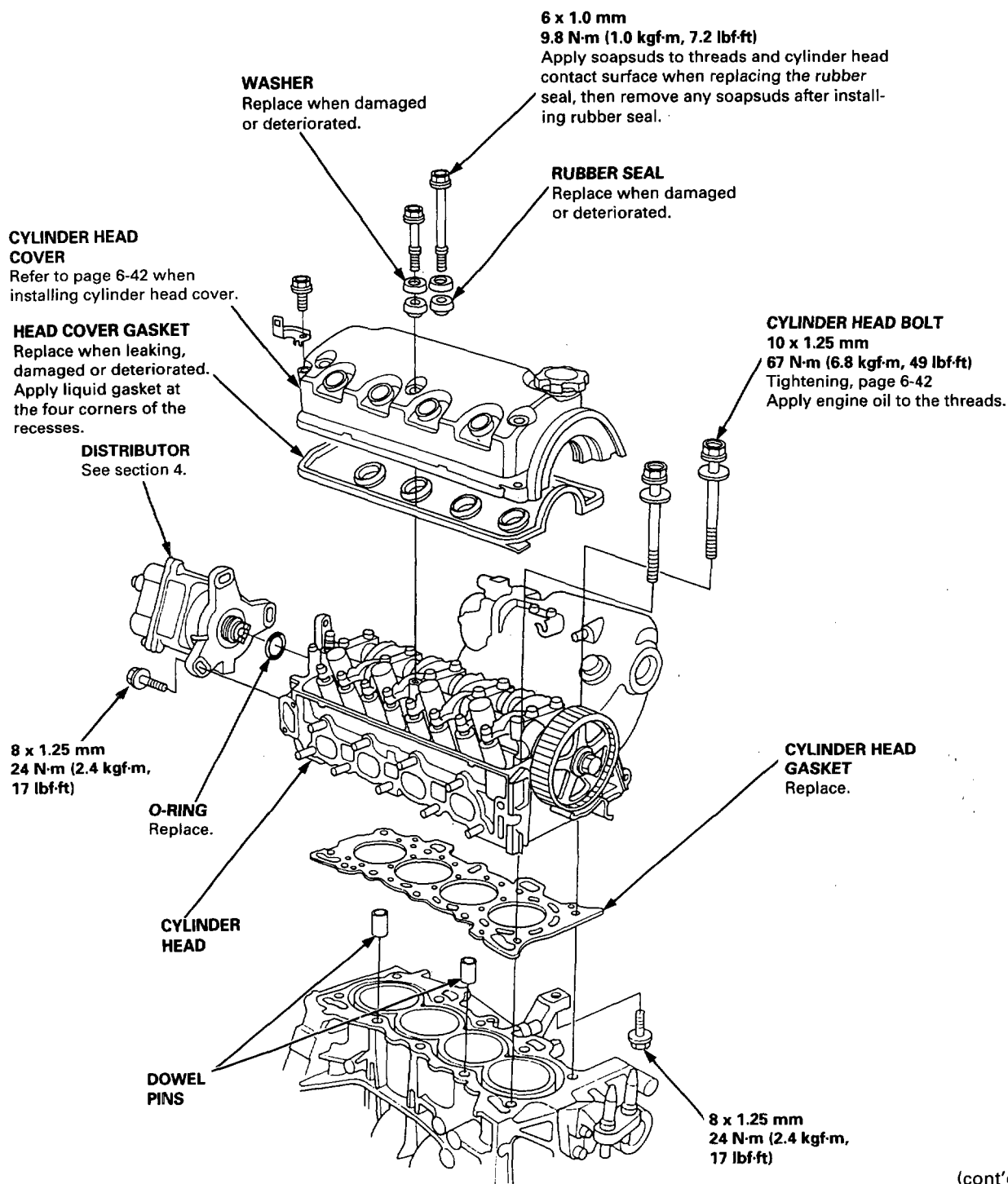
Cylinder Head



Illustrated Index

NOTE:

- To avoid damage, wait until the engine coolant temperature drops below 38°C (100°F) before removing the cylinder head.
- When handling a metal gasket, take care not to fold it or damage the contact surface.
- Use new O-rings and gaskets when reassembling.



(cont'd)

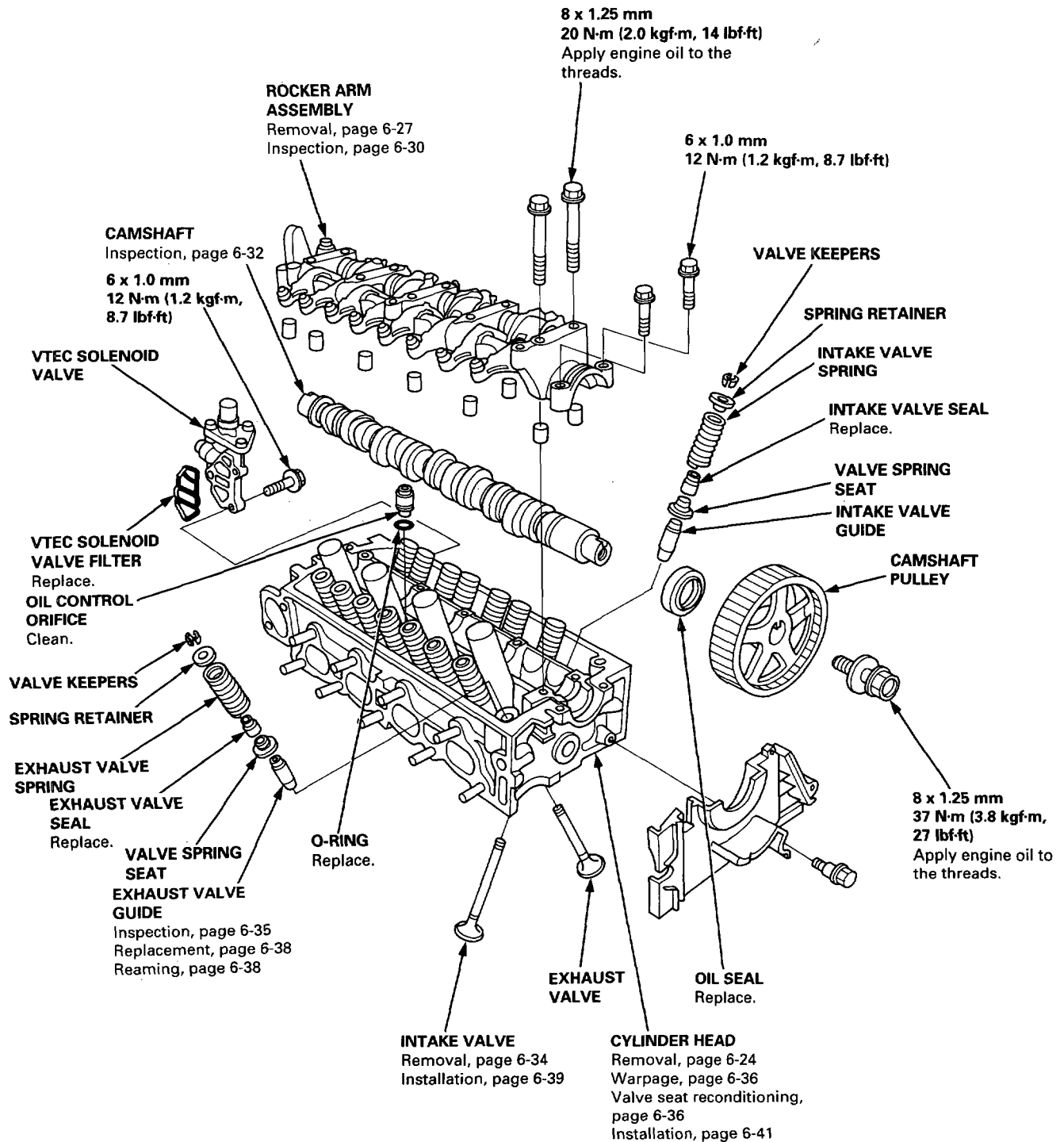
Cylinder Head

Illustrated Index (cont'd)



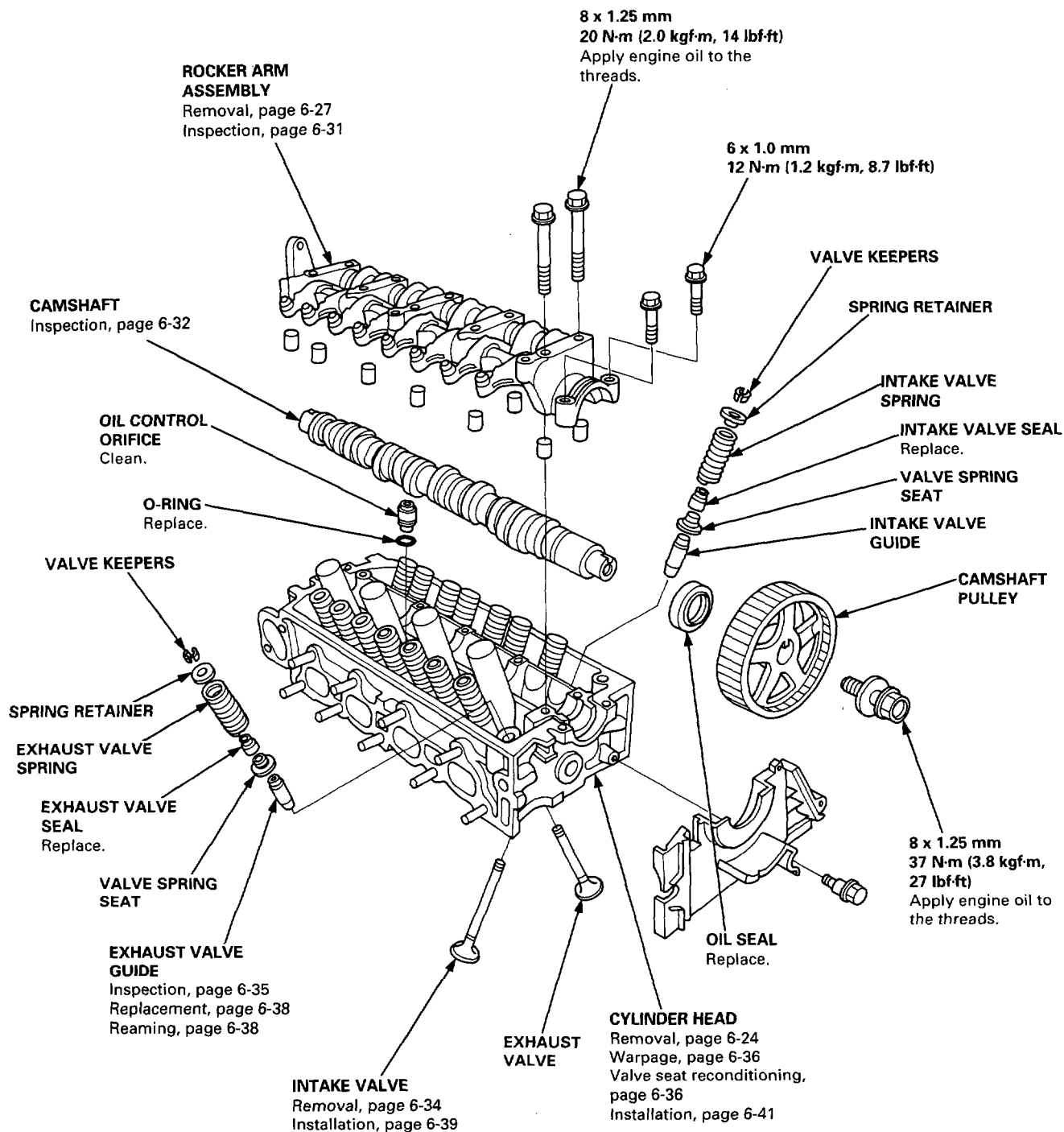
Prior to reassembling, clean all the parts in solvent, dry them, and apply lubricant to any contact parts.

D15Z8 engine:





Except D15Z8 engine:



Cylinder Head

Removal

Engine removal is not required for this procedure.

NOTE:

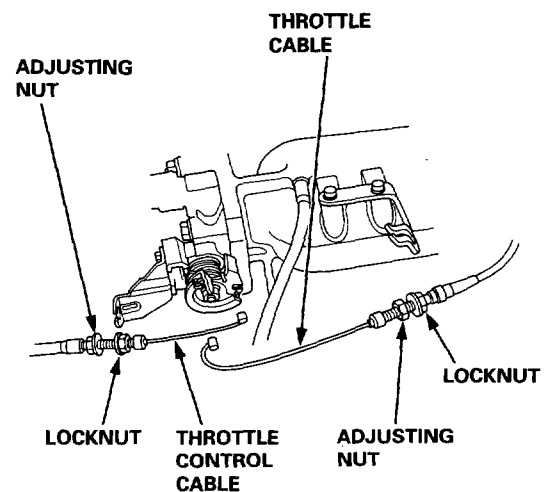
- Use fender covers to avoid damaging painted surfaces.
- Unplug the wiring connectors carefully while holding the connector portion to avoid damage.
- To avoid damaging the cylinder head, wait until the engine coolant temperature drops below 38°C (100°F) before loosening the retaining bolts.
- Mark 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. Disconnect the negative terminal from the battery.
2. Drain the engine coolant (see page 10-7).
 - Remove the radiator cap to speed draining.
3. Remove the intake air duct and air cleaner housing (see page 5-2).
4. Remove the mounting bolt and lock bolt, then remove the power steering (P/S) pump belt and pump (see page 5-5).
5. Loosen the idler pulley center nut and adjusting bolt, then remove the air conditioning (A/C) compressor belt (see page 5-5).
6. Loosen the mounting nut and lock bolt, then remove the alternator belt (see page 6-17).
7. Remove the P/S pump bracket (see page 5-13).

8. Remove the throttle cable and throttle control cable by loosening the locknut, then slip the cable end out of the throttle linkage.

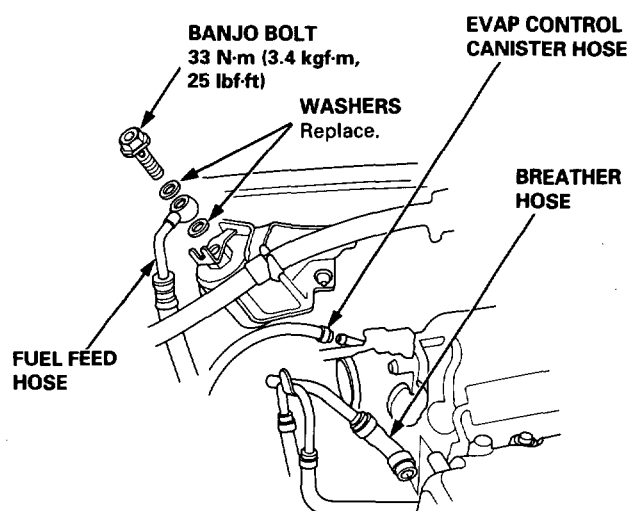
NOTE:

- Take care not to bend the cable when removing it. Always replace any kinked cable with a new one.
- Adjust the throttle cable when installing (see section 11).
- Adjust the throttle control cable when installing (see section 14).

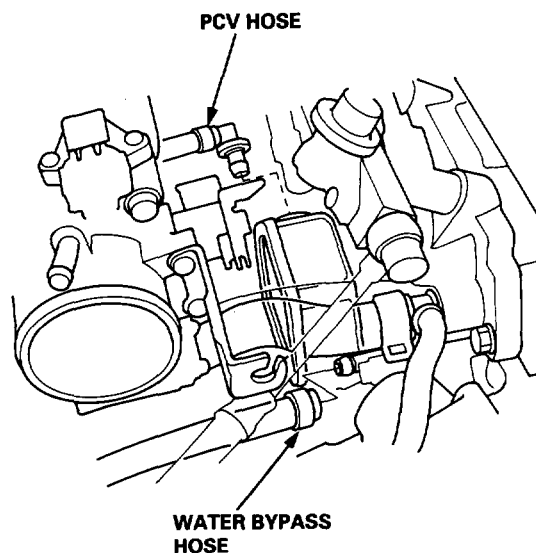




9. Relieve fuel pressure (see section 11).
10. Remove the evaporative emission (EVAP) control canister hose, fuel feed hose and breather hose.



11. Remove the brake booster vacuum hose, fuel return hose and vacuum hose (see page 5-3).
12. Remove the water bypass hose and positive crankcase ventilation (PCV) hose.

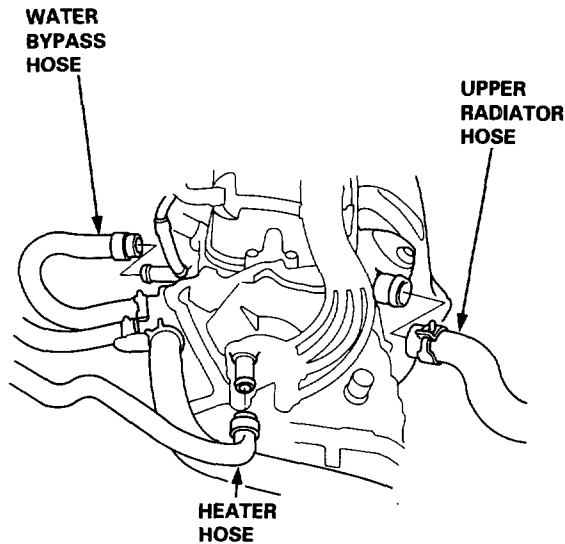


(cont'd)

Cylinder Head

Removal (cont'd)

13. Remove the upper radiator hose, heater hose and water bypass hose.



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

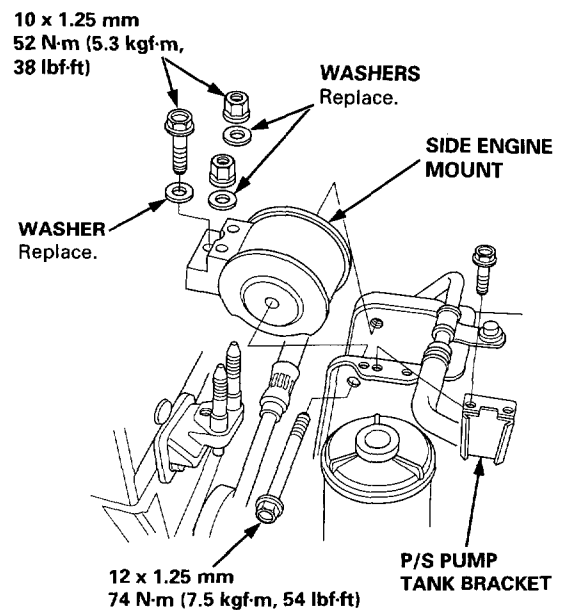
- Four fuel injector connectors
- Engine coolant temperature (ECT) sensor connector
- Radiator fan switch connector
- Coolant temperature gauge sending unit connector
- Throttle position sensor connector
- Manifold absolute pressure (MAP) sensor connector
- Heated oxygen sensor (HO2S) connector
- Exhaust gas recirculation (EGR) valve lift sensor connector (D15Z8 engine)
- VTEC solenoid valve connector (D15Z8 engine)
- Idle air control (IAC) valve connector

15. Remove the spark plug caps and distributor from the cylinder head.

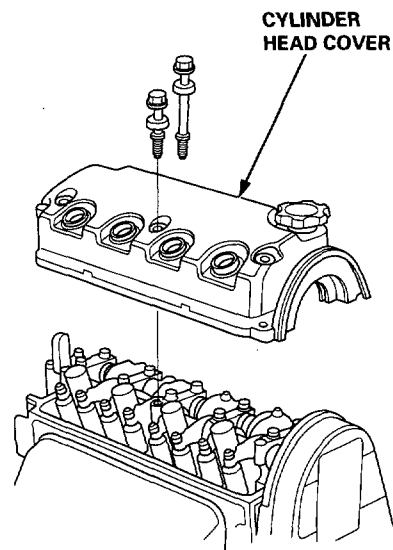
16. Remove the side engine mount and P/S pump tank bracket.

NOTE:

- Use the jack to support the engine before the side engine mount is removed.
- Make sure to place a cushion between the oil pan and the jack.



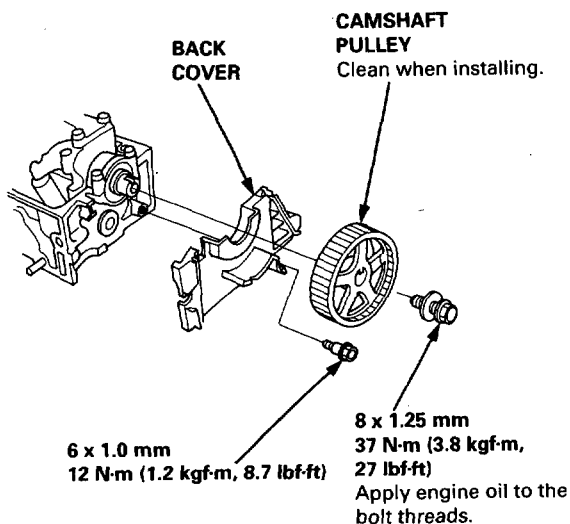
17. Remove the cylinder head cover.





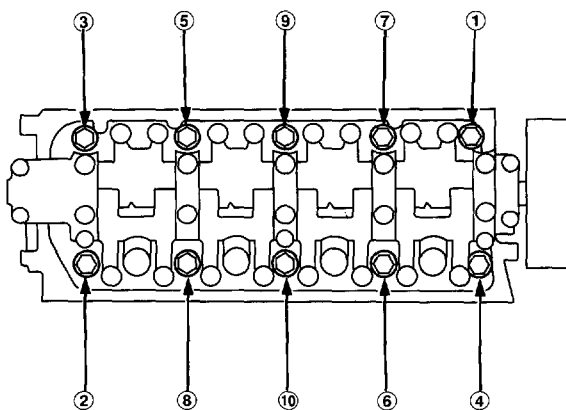
Removal

18. Remove the timing belt (see page 6-17).
19. Remove the camshaft pulley and back cover.



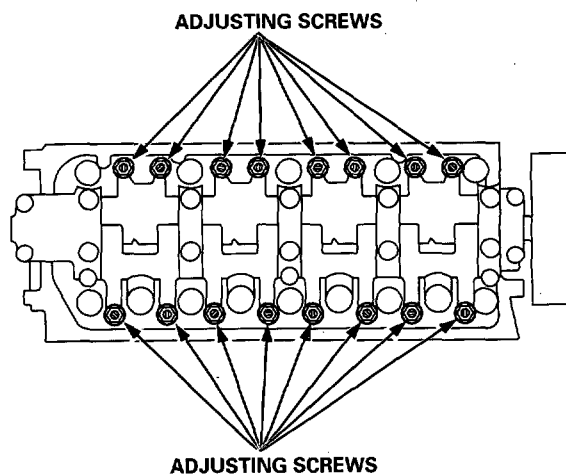
20. Remove the exhaust manifold (see pages 9-6, 7).
21. Remove the intake manifold (see pages 9-3, 4).
22. Remove the cylinder head bolts. To prevent warpage, unscrew the bolts in sequence 1/3 turn at a time; repeat the sequence until all bolts are loosened.

CYLINDER HEAD BOLTS LOOSENING SEQUENCE:



23. Remove the cylinder head.

1. Loosen the adjusting screws.

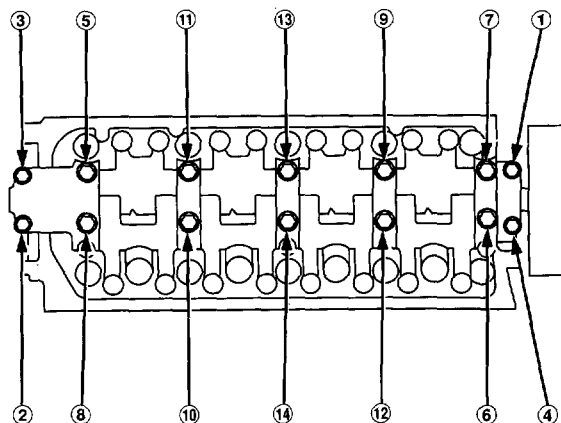


2. Unscrew the camshaft holder bolts, then remove the rocker arm assembly.

NOTE:

- Unscrew the camshaft holder bolts two turns at a time, in a crisscross pattern, to prevent damaging the valves or rocker arm assembly.
- When removing the rocker arm assembly, do not remove the camshaft holder bolts. The bolts will keep the camshaft holders, the springs and the rocker arms on the shaft.

CAMSHAFT HOLDER BOLTS LOOSENING SEQUENCE:



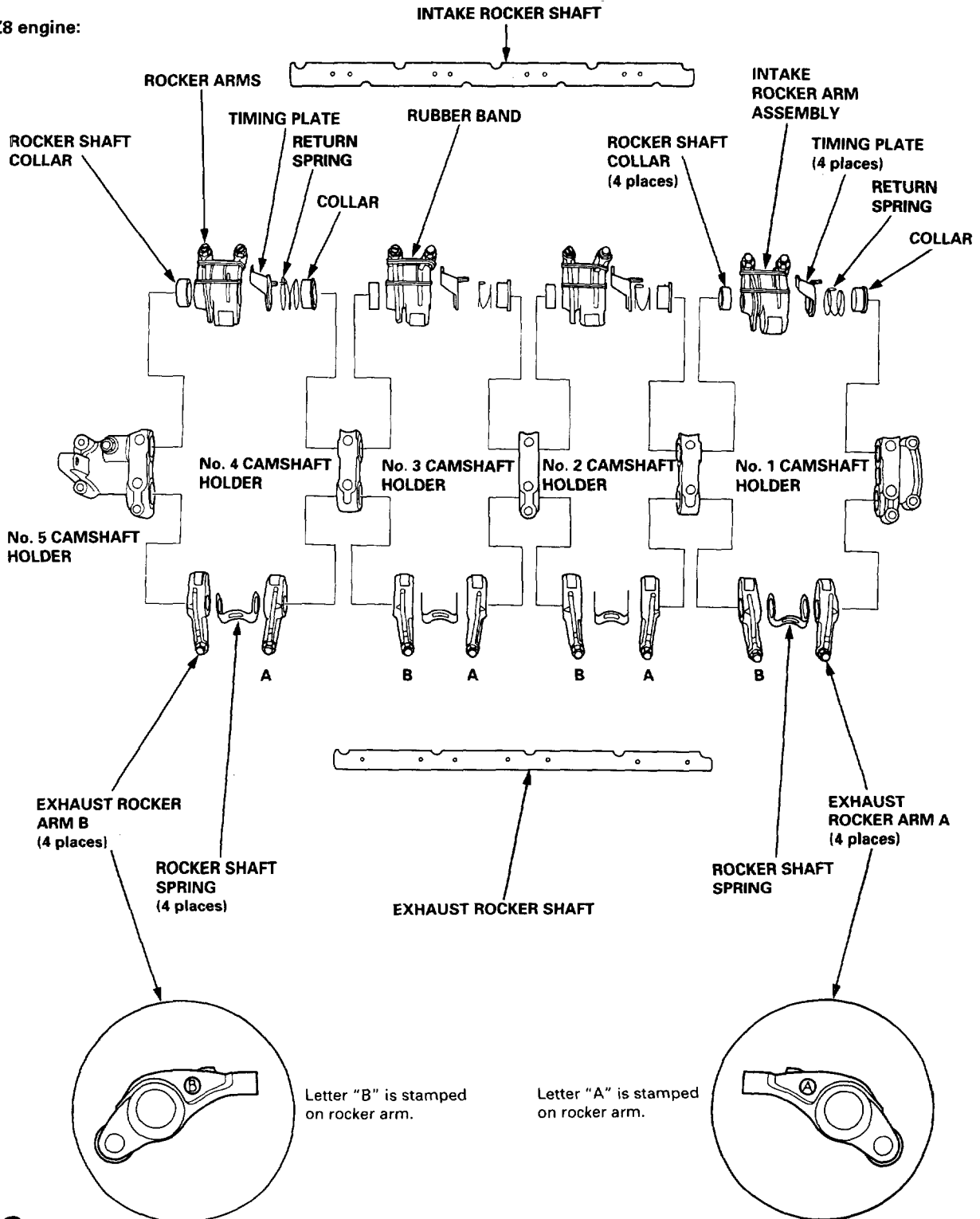
Rocker Arms

Disassembly/Reassembly

NOTE:

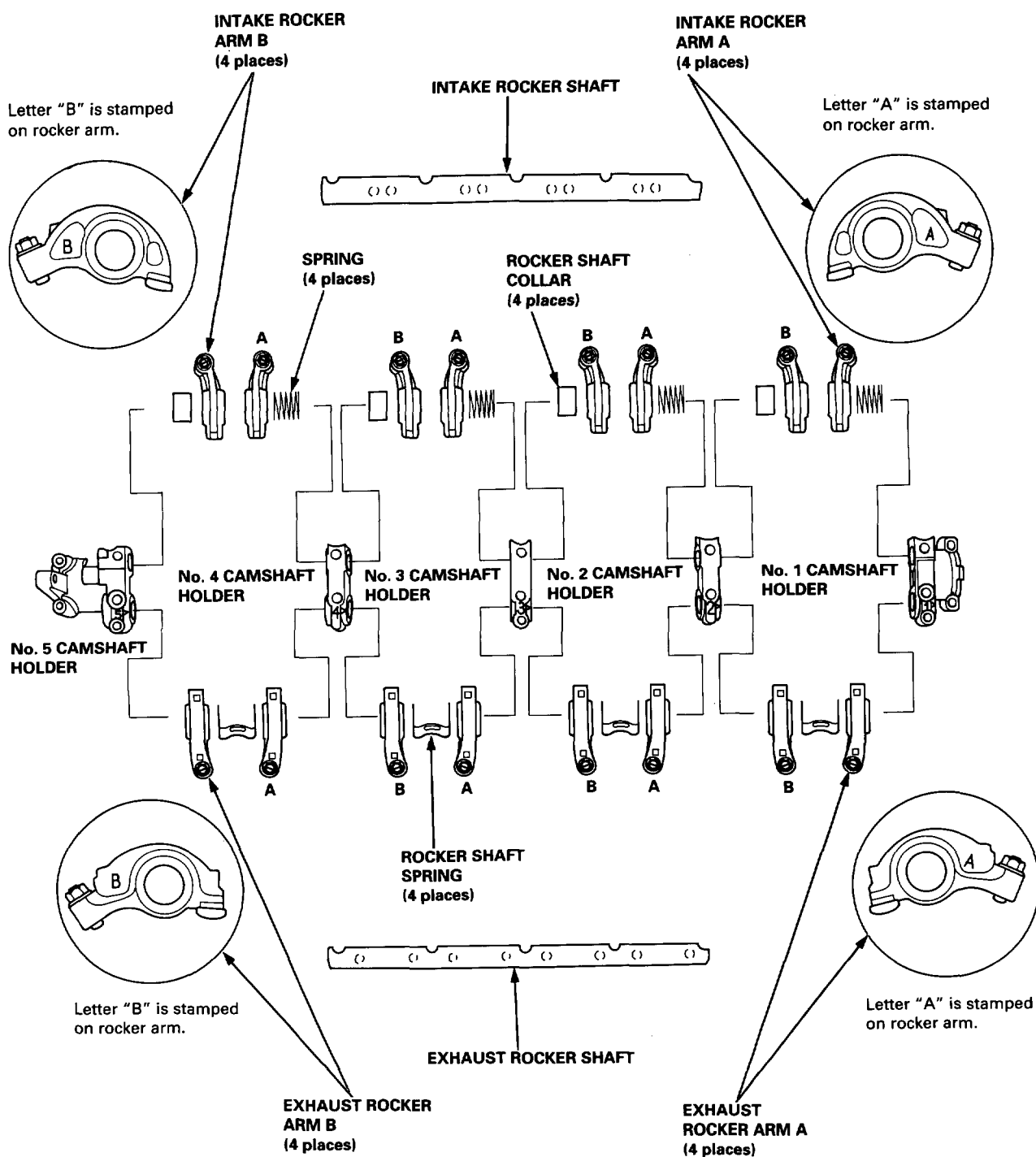
- Identify parts as they are removed to ensure reinstallation in original locations.
- Inspect rocker shafts and rocker arms (see page 6-30).
- Rocker arms must be installed in the same position if reused.
- When removing or installing rocker arm assembly, do not remove the camshaft holder bolts. The bolts will keep the holders, springs and rocker arms on the shaft.

D15Z8 engine:





Except D15Z8 engine:

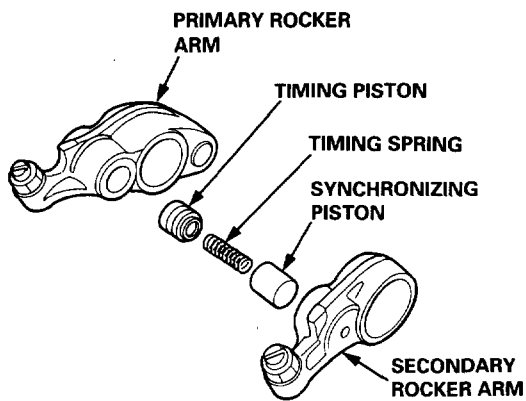


Rocker Arms

Inspection (D15Z8 engine)

NOTE: When reassembling the primary rocker arm, carefully apply air pressure to oil passage of the rocker arm.

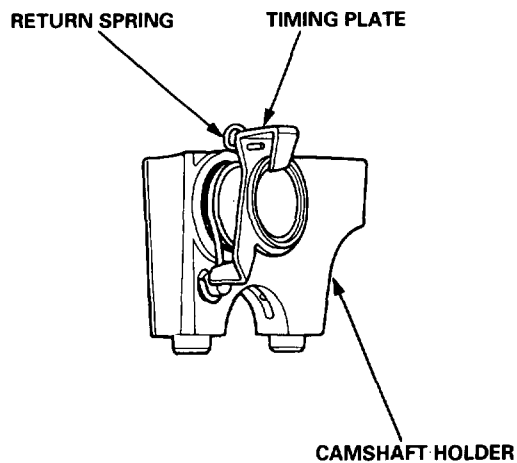
1. Inspect the rocker arm piston. Push it manually.
— If it does not move smoothly, replace the rocker arm assembly.



NOTE:

- Apply oil to the pistons when reassembling.
- Bundle the rocker arms with a band to prevent them from separating.

2. Set the timing plate and return spring as shown below.

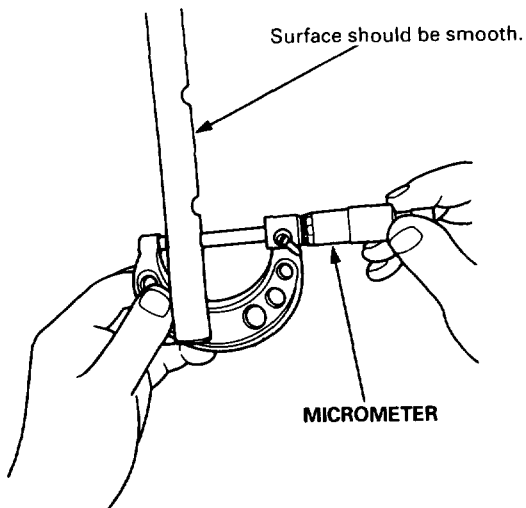




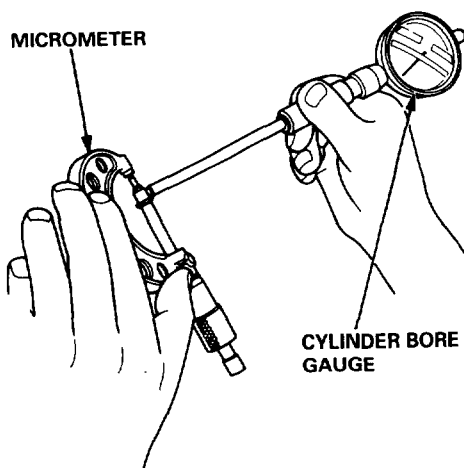
Clearance Inspection

Measure both the intake rocker shaft and exhaust rocker shaft.

1. Measure the diameter of shaft at the first rocker location.



2. Zero the gauge to the shaft diameter.



3. Measure inside diameter of rocker arm and check for out-of-round condition.

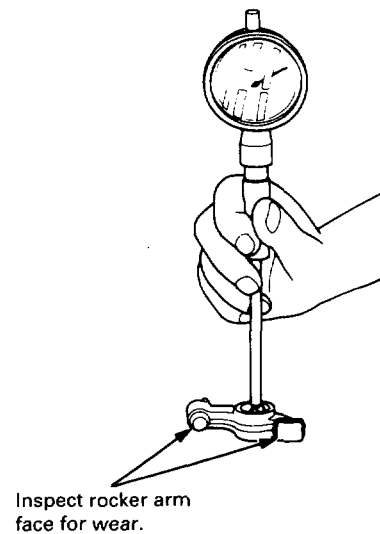
Rocker Arm-to-Shaft Clearance:

Standard (New):

Intake: 0.017 – 0.050 mm
(0.0007 – 0.0020 in)

Exhaust: 0.018 – 0.054 mm
(0.0007 – 0.0021 in)

Service Limit: 0.08 mm (0.003 in)



4. Repeat for all the rockers.
— If the clearance is over the service limit, replace the rocker shaft and all over tolerance rocker arms.

Camshaft

Inspection

NOTE:

- Do not rotate the camshaft during inspection.
- Remove the rocker arms and rocker shafts.

1. Put the camshaft and the camshaft holders on the cylinder head, then tighten the bolts to the specified torque.

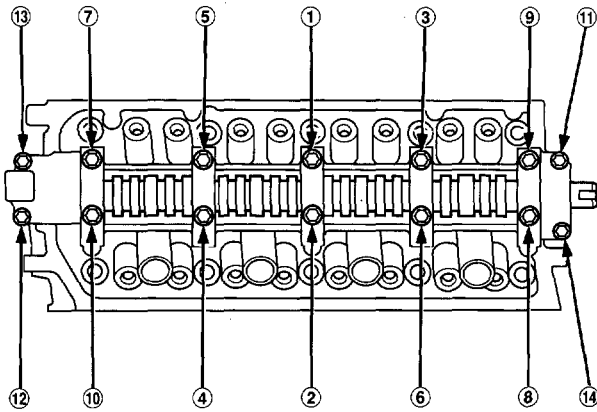
Specified torque:

8 mm bolts: 20 N·m (2.0 kgf·m 14 lbf·ft)

Apply engine oil to the threads.

6 mm bolts: 12 N·m (1.2 kgf·m 8.7 lbf·ft)

6 mm bolts: ⑪, ⑫, ⑬, ⑭



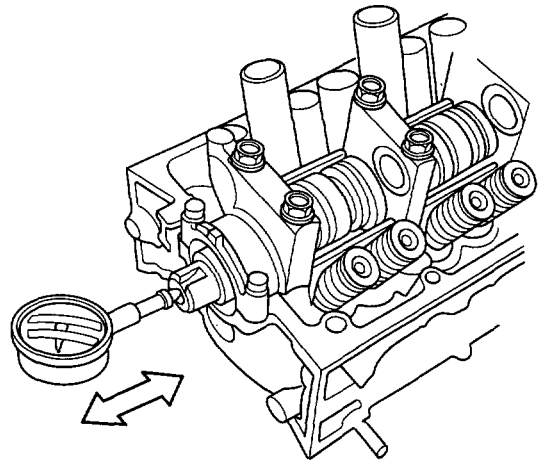
2. Seat the camshaft by pushing it toward the rear of the cylinder head.
3. Zero the dial indicator against the end of the camshaft. Push the camshaft back and forth, and read the end play.

Camshaft End Play:

Standard (New): 0.05 – 0.15 mm

(0.002 – 0.006 in)

Service Limit: 0.5 mm (0.02 in)

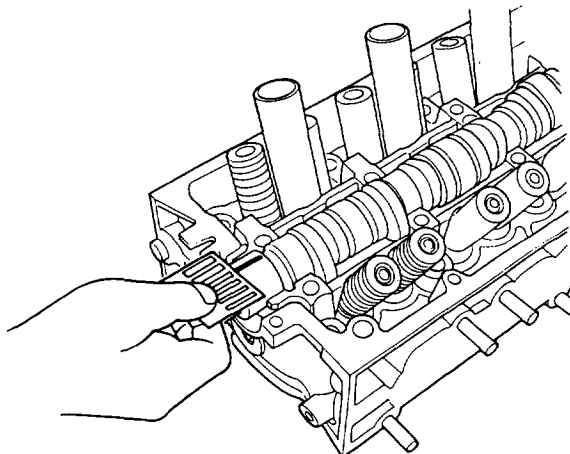


4. Remove the bolts, then remove the camshaft holders from the cylinder head.
 - Lift camshaft out of cylinder head, wipe clean, then inspect lift ramps. Replace camshaft if lobes are pitted, scored, or excessively worn.
 - Clean the camshaft bearing surfaces in the cylinder head, then set camshaft back in place.
 - Insert plastigage strip across each journal.
5. Install the camshaft holders and tighten the bolts to the specified torque.



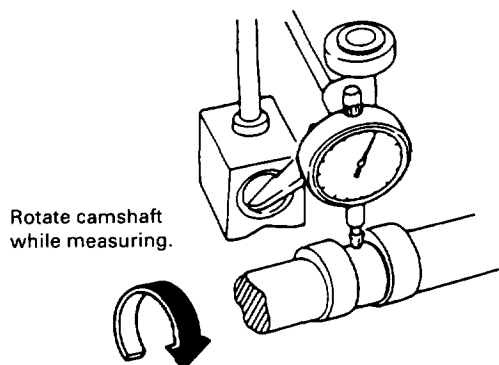
6. Remove the camshaft holders, then measure the widest portion of the plastigage on each journal.

Camshaft-to-Holder Oil Clearance:
Standard (New): 0.050 – 0.089 mm
 (0.002 – 0.004 in)
Service Limit : 0.15 mm (0.006 in)



7. If the camshaft-to-holder oil clearance is out of tolerance:
 — And the camshaft has already been replaced, you must replace the cylinder head.
 — If the camshaft has not been replaced, first check the total runout with the camshaft supported on V-blocks.

Camshaft Total Runout:
Standard (New): 0.03 mm (0.001 in) max.
Service Limit: 0.04 mm (0.002 in)



- If the total runout of the camshaft is within tolerance, replace the cylinder head.
 — If the total runout is out of tolerance, replace the camshaft and recheck. If the bearing clearance is still out of tolerance, replace the cylinder head.

8. Check the cam lobe height wear.

Cam lobe height standard (New)

Unit mm (in)

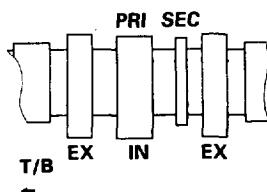
		INTAKE	EXHAUST
D15Z8 engine	PRI	38.427 (1.5129)	38.784 (1.5269)
	SEC	32.292 (1.2713)	
D16B2 engine		A: 35.019 (1.3787) B: 34.734 (1.3675)	37.904 (1.4923)
D14A7, D14A8 engines		A, B: 34.274 (1.3494)	36.594 (1.441)

PRI: Primary SEC: Secondary

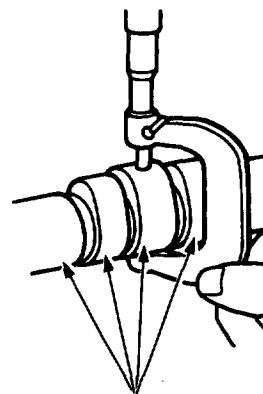
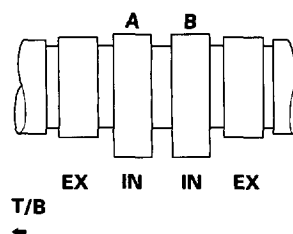
T/B: Timing belt

IN: Intake, EX: Exhaust

D15Z8 engine:



Except D15Z8 engine:



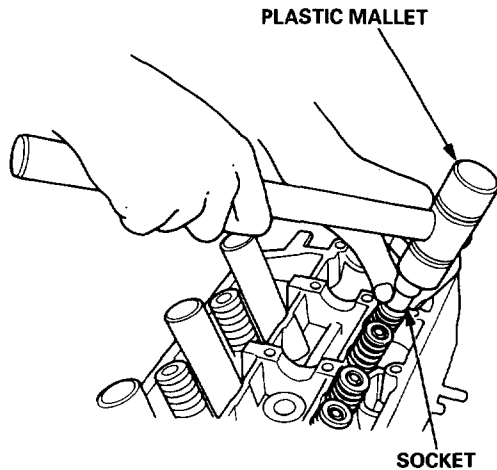
Check this area for wear.

Valves, Valve Springs and Valve Seals

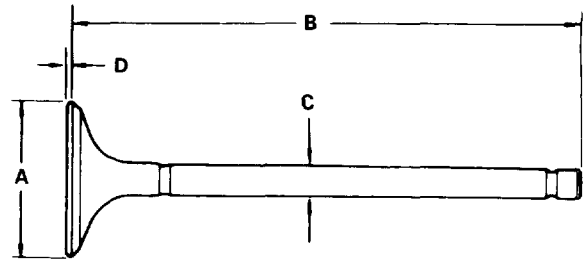
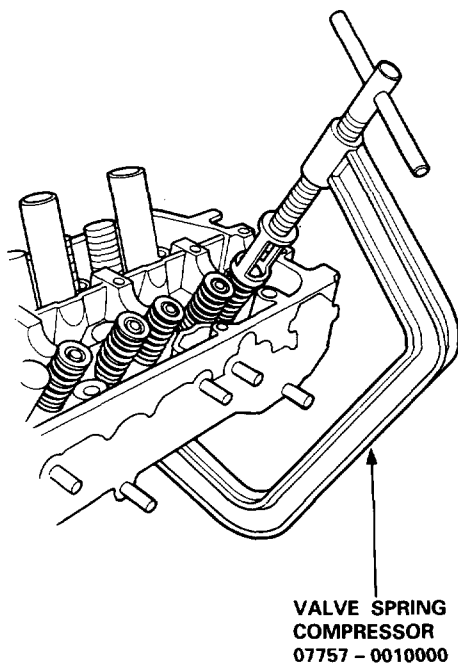
Removal

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

1. Using an appropriate-sized socket and plastic mallet, lightly tap the valve retainer to loosen the valve keepers before installing the valve spring compressor.



2. Install the spring compressor. Compress the spring and remove the valve keeper.



D15Z8 engine:

Intake Valve Dimensions

- | | |
|-------------------|--|
| A Standard (New): | 29.85 – 30.15 mm
(1.175 – 1.187 in) |
| B Standard (New): | 117.42 – 117.72 mm
(4.623 – 4.635 in) |
| C Standard (New): | 5.48 – 5.49 mm
(0.2157 – 0.2161 in) |
| C Service Limit: | 5.45 mm (0.2146 in) |
| D Standard (New): | 0.85 – 1.15 mm
(0.033 – 0.045 in) |
| D Service Limit: | 0.65 mm (0.026 in) |

Exhaust Valve Dimensions

- | | |
|-------------------|--|
| A Standard (New): | 25.85 – 26.15 mm
(1.018 – 1.030 in) |
| B Standard (New): | 114.60 – 114.90 mm
(4.512 – 4.524 in) |
| C Standard (New): | 5.45 – 5.46 mm
(0.2146 – 0.2150 in) |
| C Service Limit: | 5.42 mm (0.2134 in) |
| D Standard (New): | 1.05 – 1.35 mm
(0.041 – 0.053 in) |
| D Service Limit: | 0.95 mm (0.037 in) |



Valve Movement

D14A7, D14A8, D16B2 engines:

Intake Valve Dimensions

- A Standard (New):** 29.9 – 30.1 mm
(1.18 – 1.19 in)
- B Standard (New):** 117.42 – 117.72 mm
(4.623 – 4.635 in)
- C Standard (New):** 5.48 – 5.49 mm
(0.2157 – 0.2161 in)
- C Service Limit:** 5.45 mm (0.2146 in)
- D Standard (New):** 0.75 – 1.25 mm
(0.030 – 0.049 in)
- D Service Limit:** 0.55 mm (0.022 in)

Exhaust Valve Dimensions

- A Standard (New):** 25.9 – 26.1 mm
(1.02 – 1.03 in)
- B Standard (New):** 114.60 – 114.90 mm
(4.512 – 4.524 in)
- C Standard (New):** 5.45 – 5.46 mm
(0.2146 – 0.2150 in)
- C Service Limit:** 5.42 mm (0.2134 in)
- D Standard (New):** 0.95 – 1.45 mm
(0.037 – 0.057 in)
- D Service Limit:** 0.85 mm (0.033 in)

Measure the guide-to-stem clearance with a dial indicator while rocking the stem in the direction of normal thrust (wobble method).

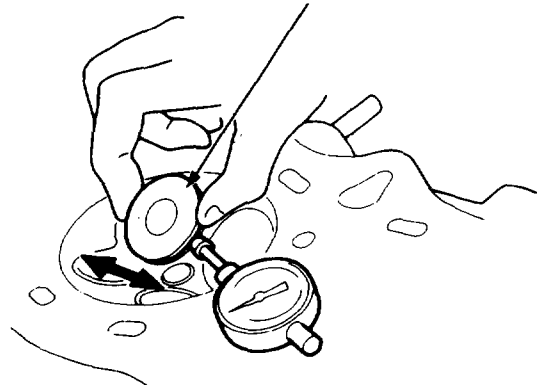
Intake Valve Stem-to-Guide Clearance:

- Standard (New):** 0.04 – 0.10 mm
(0.002 – 0.004 in)
- Service Limit:** 0.16 mm (0.006 in)

Exhaust Valve Stem-to-Guide Clearance:

- Standard (New):** 0.10 – 0.16 mm
(0.004 – 0.006 in)
- Service Limit:** 0.22 mm (0.009 in)

Valve extended 10 mm out from seat.



- If measurement exceeds the service limit, recheck using a new valve.
- If measurement is now within the service limit, reassemble using a new valve.
- If measurement still exceeds limit, recheck using alternate method below, then replace valve and guide, if necessary.

NOTE: An alternate method of checking guide to stem clearance is to 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):** 0.02 – 0.05 mm
(0.001 – 0.002 in)
- Service Limit:** 0.08 mm (0.003 in)

Exhaust Valve Stem-to-Guide Clearance:

- Standard (New):** 0.05 – 0.08 mm
(0.002 – 0.003 in)
- Service Limit:** 0.11 mm (0.004 in)

Cylinder Head

Valve Seats

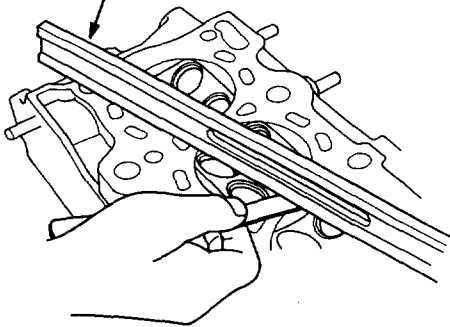
Warpage

NOTE: If the camshaft-to-holder oil clearances (see page 6-32) are not within specification, the cylinder head cannot be resurfaced.

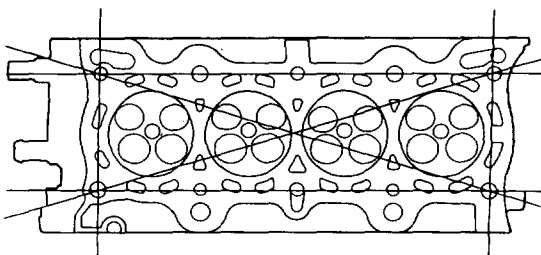
If the camshaft-to-holder oil clearances are within specifications, check the cylinder head for warpage.

- 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 cylinder head.
- Maximum resurface limit is 0.2 mm (0.008 in) based on a height of 93 mm (3.66 in).

PRECISION STRAIGHT EDGE



Measure along edges, and three ways across center.



Cylinder Head Height:
Standard (New): 92.95 – 93.05 mm
(3.659 – 3.663 in)

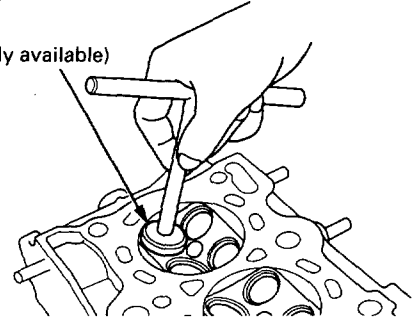
Reconditioning

1. Renew the valve seats in the cylinder head using a valve seat cutter.

NOTE: If the guides are worn (see page 6-35), replace them (see page 6-38) before cutting the valve seats.

VALVE SEAT CUTTER

(Commercially available)



2. Carefully cut a 45° seat, removing only enough material to ensure a smooth and concentric seat.
3. Bevel the upper edge of the seat with the 30° cutter and the lower edge of the seat with the 60° cutter. Check the width of seat and adjust accordingly.
4. 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):

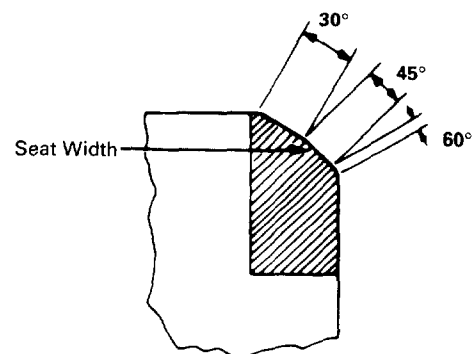
Intake: 0.85 – 1.15 mm (0.033 – 0.045 in)

Exhaust: 1.25 – 1.55 mm (0.049 – 0.061 in)

Service Limit:

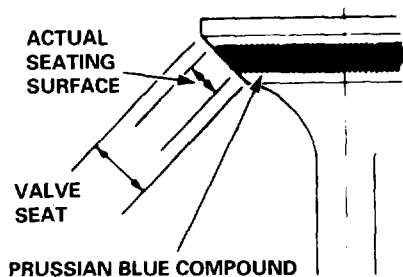
Intake: 1.6 mm (0.063 in)

Exhaust: 2.0 mm (0.079 in)





5. After resurfacing the seat, inspect for even valve seating: Apply Prussian Blue compound to the valve face, and insert the valve in its original location in the head, then lift and snap it closed against the seat several times.



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

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

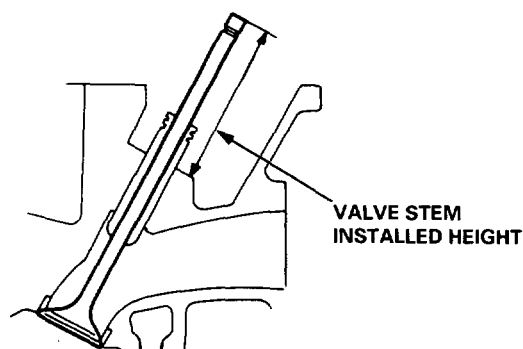
7. Insert the intake and exhaust valves in the head and measure the valve stem installed height.

Intake, Exhaust Stem Installed Height:

Standard (New): 53.17 – 53.64 mm
(2.093 – 2.112 in)

Service Limit: 53.89 mm (2.122 in)

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



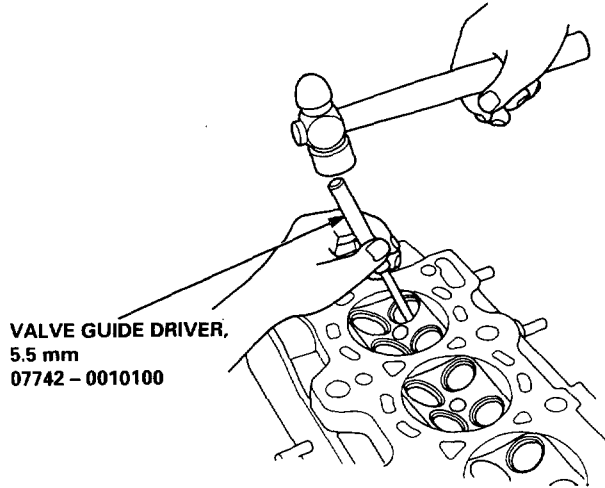
Valve Guides

Replacement

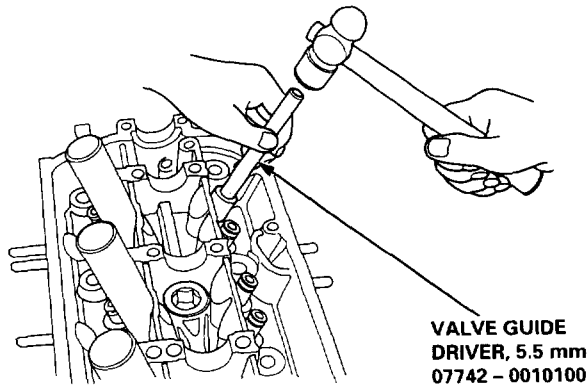
NOTE:

- For best results, heat cylinder head to 150°C (300°F) before removing or installing guides.
- It may be necessary to use an air hammer to remove some valve guides.

1. Drive the valve guide out from the bottom of the cylinder head.



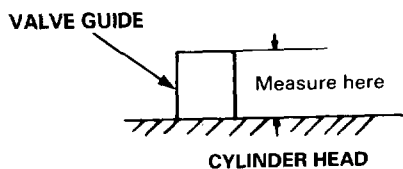
2. Drive in a new valve guide to the specified depth.



Valve Guide Installed Height:

Intake: 17.85 – 18.35 mm (0.703 – 0.722 in)

Exhaust: 18.65 – 19.15 mm (0.734 – 0.754 in)

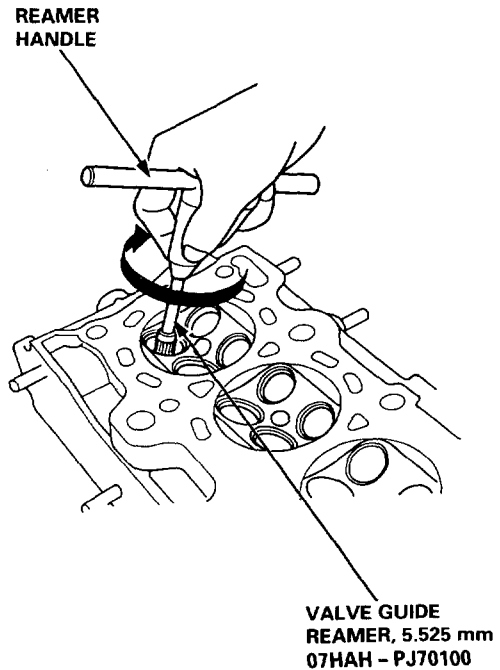


Reaming

NOTE: For new valve guides only.

1. Coat both the reamer and valve guide with cutting oil.
2. Rotate the reamer clockwise the full length of the valve guide bore.
3. Continue to rotate the reamer clockwise while removing it from the bore.
4. Thoroughly wash the guide in detergent and water to remove any cutting residue.
5. Check the clearance with a valve (see page 6-35).
— Verify that the valve slides in the valve guide without exerting pressure.

Turn reamer in clockwise direction only.



Valves, Valve Springs and Valve Seals



Installation

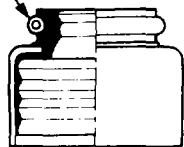
1. Insert the valves into the valve guides, coat the valve stems with engine oil before inserting the valves.

NOTE: Check the valves move up and down smoothly.

2. Install the spring seats on the cylinder head.
3. Install the valve seals using the special tool.

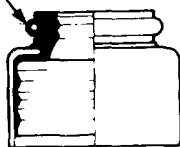
NOTE: Exhaust and intake valve seal are not interchangeable.

WHITE
SPRING



INTAKE VALVE SEAL

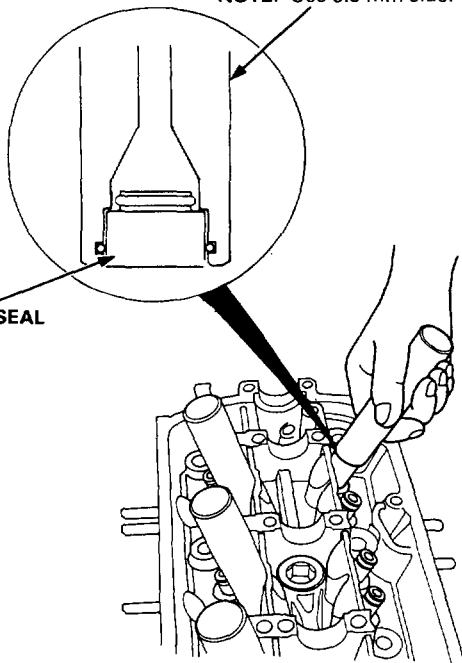
BLACK
SPRING



EXHAUST VALVE SEAL

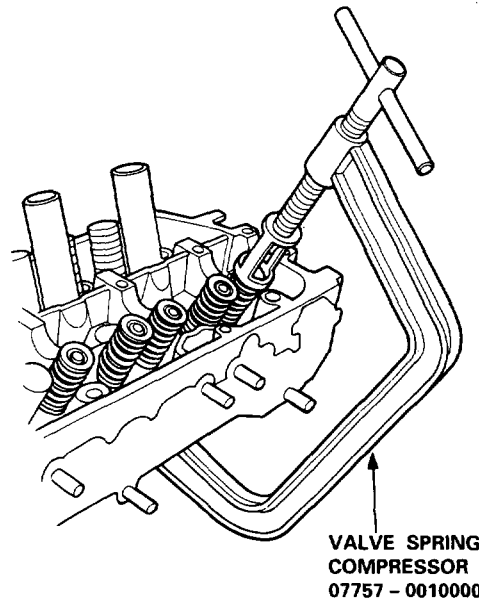
STEM SEAL DRIVER,
07PAD - 0010000
NOTE: Use 5.5 mm side.

VALVE SEAL
Replace.



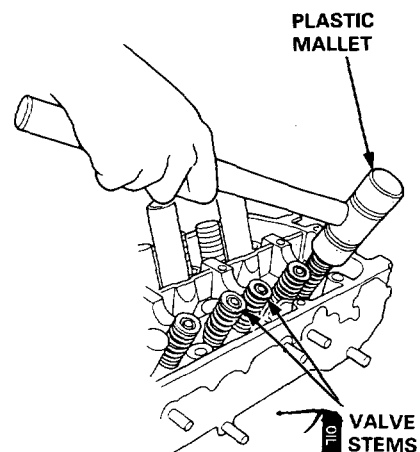
4. Install the valve spring and valve retainer, then install the valve spring compressor. Compress the spring, and install the valve keepers.

NOTE: Place the end of valve spring with closely wound coils toward the cylinder head.



5. Lightly tap the end of each valve stem two or three times with a plastic mallet to ensure proper seating of valve and valve keepers.

NOTE: Tap the valve stem only along its so you do not bend the stem.



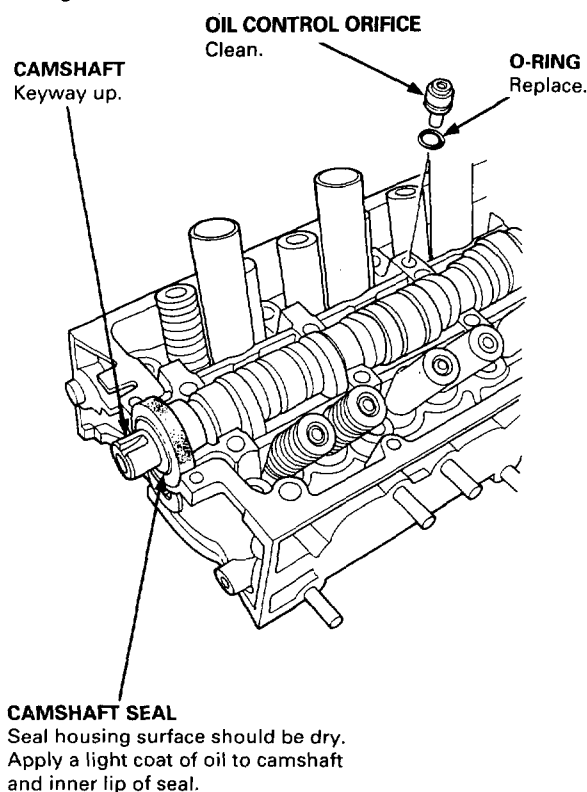
Camshaft/Rocker Arms and Camshaft Seal/Pulley

Installation

NOTE:

- Make sure that all rockers are in alignment with valves when torquing rocker assembly bolts.
- Valve locknuts should be loosened and adjusting screws backed off before installation.
- To prevent rocker arm assembly from coming apart, leave camshaft holder bolts in the holes.

1. After wiping down the camshaft, camshaft seal and journals in the cylinder head, lubricate both surfaces and install the camshaft.
2. Clean and install the oil control orifice with new O-ring.

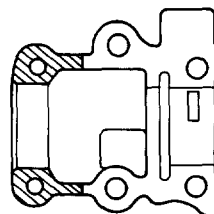


3. Turn the camshaft until its keyway is facing up (No. 1 piston TDC).

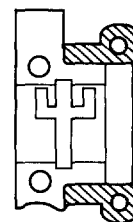
4. Apply liquid gasket (P/N 08C70 – X0134SEB, 08C70 – X0231SEB, 08C70 – K0234MEB or 08C70 – K0334MEB) to the head mating surfaces of the No. 1 and No. 5 camshaft holders.

NOTE: Clean and dry the cylinder head mating surfaces before applying liquid gasket.

— Apply liquid gasket to the shaded areas.



No. 5



No. 1

5. Set the rocker arm assembly in place and loosely install the bolts.

— Make sure that the rocker arms are properly positioned on the valve stems.

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

NOTE: Wipe off the excess of liquid gasket from No. 1 and No. 5 camshaft holders with a shop towel.

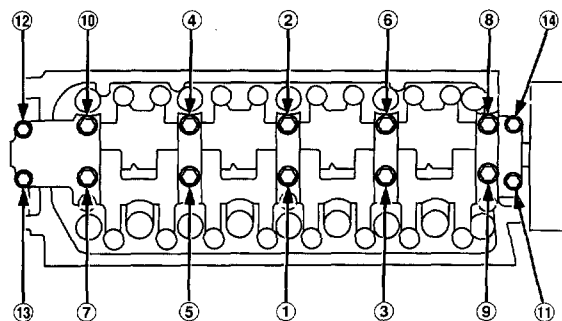
Specified torque:

8 mm bolts: 20 N·m (2.0 kgf·m, 14 lbf·ft)

Apply engine oil to the threads.

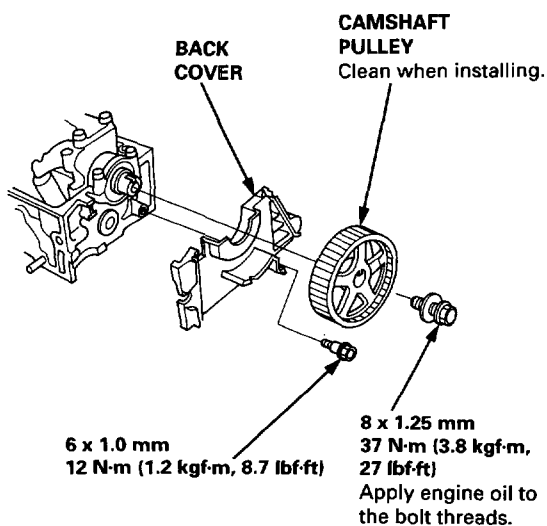
6 mm bolts: 12 N·m (1.2 kgf·m, 8.7 lbf·ft)

6 mm bolts: ⑪, ⑫, ⑬, ⑭





7. Install the back cover, then install the camshaft pulley.



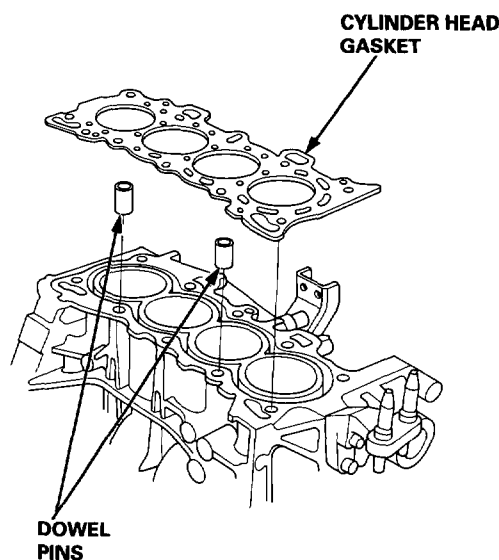
Installation

Install the cylinder head in the reverse order of removal:

NOTE:

- Always use a new head gasket.
- Cylinder head and cylinder block surface must be clean.
- "UP" mark on camshaft pulley should be at the top.
- Turn the crankshaft so the No. 1 piston is at TDC (see page 6-18).
- Clean the oil control orifice before installing.
- Do not use the upper cover and lower cover for storing items disassembled.
- Clean the upper cover and lower cover before installation.

1. Cylinder head dowel pins must be aligned.



(cont'd)

Cylinder Head

Installation (cont'd)

2. Position the camshaft correctly (see page 6-18).
3. Tighten the cylinder head bolts sequentially in four steps.

1st step: ① – ⑩ 20 N·m (2.0 kgf·m, 14 lbf·ft)

2nd step: ① – ⑩ 49 N·m (5.0 kgf·m, 36 lbf·ft)

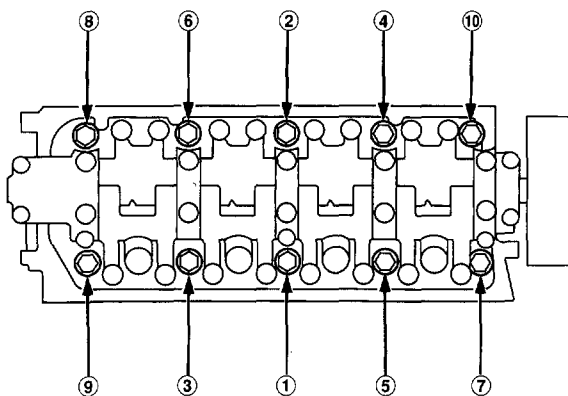
3rd step: ① – ⑩ 67 N·m (6.8 kgf·m, 49 lbf·ft)

4th step: ①, ② 67 N·m (6.8 kgf·m, 49 lbf·ft)

NOTE:

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

CYLINDER HEAD BOLTS TORQUE SEQUENCE:

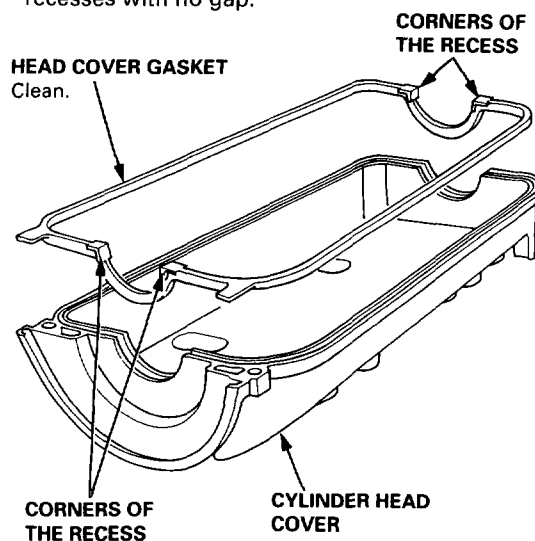


4. Install the intake manifold and tighten the nuts in a crisscross pattern in two or three steps, beginning with the inner nuts (see pages 9-3, 4).
 - Always use a new intake manifold gasket.
5. Install the exhaust manifold and tighten the nuts in a crisscross pattern in two or three steps, beginning with the inner nut (see pages 9-6, 7).
 - Always use a new exhaust manifold gasket.
6. Install the exhaust manifold bracket, then install the exhaust pipe A and the bracket, and then install the cover.

7. Install the timing belt (see page 6-18).
8. Adjust the valve clearance (see page 6-10).
9. Install the head cover gasket in the groove of the cylinder head cover. Seat the recesses for the camshaft first, then work it into the groove around the outside edges.

NOTE:

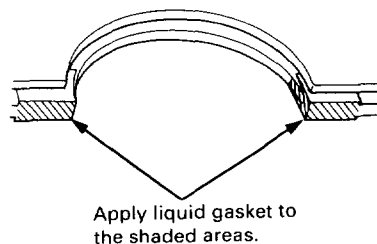
- Before installing the head cover gasket, thoroughly clean the seal and the groove.
- When installing, make sure the head cover gasket is seated securely in the corners of the recesses with no gap.



10. Apply liquid gasket to the head cover gasket at the four corners of the recesses.

NOTE:

- Use liquid gasket, Part No. 08C70 – X0134SEB, 08C70 – X0231SEB, 08C70 – K0234MEB or 08C70 – K0334MEB.
- Check that the mating surfaces are clean and dry before applying liquid gasket.
- Do not install the parts if five minutes or more have elapsed since applying liquid gasket. Instead, reapply liquid gasket after removing old residue.
- After assembly, wait at least 30 minutes before filling the engine with oil.





11. When installing the cylinder head cover, hold the head cover gasket in the groove by placing your fingers on the camshaft holder contacting surfaces (top of the semicircles).

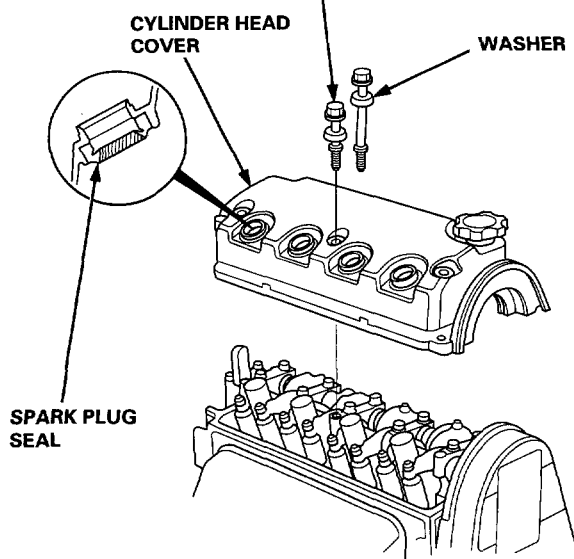
Set the spark plug seal on the spark plug pipe.

Once the cylinder head cover is on the cylinder head, slide the cover slightly back and forth to seat the head cover gasket.

NOTE:

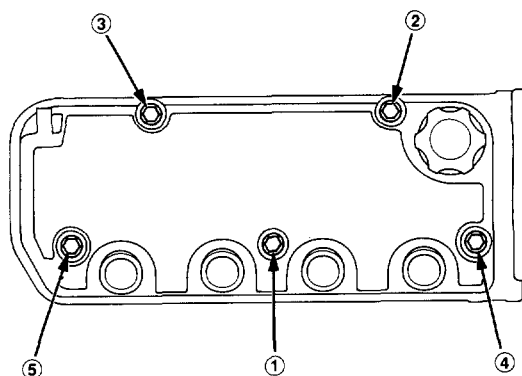
- Before installing the cylinder head cover, clean the cylinder head contacting surfaces with a shop towel.
- Do not touch the parts where liquid gasket was applied.
- Take care not to damage the spark plug seal when installing the cylinder head cover.
- Visually check the spark plug seal for damage.
- Replace the washer when damaged or deteriorated.

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



12. Tighten the nuts in two or three steps. In the final step, tighten all bolts, in sequence, to 9.8 N·m (1.0 kgf·m, 7.2 lbf·ft).

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



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

Cylinder Head/Valve Train B18C4 engine

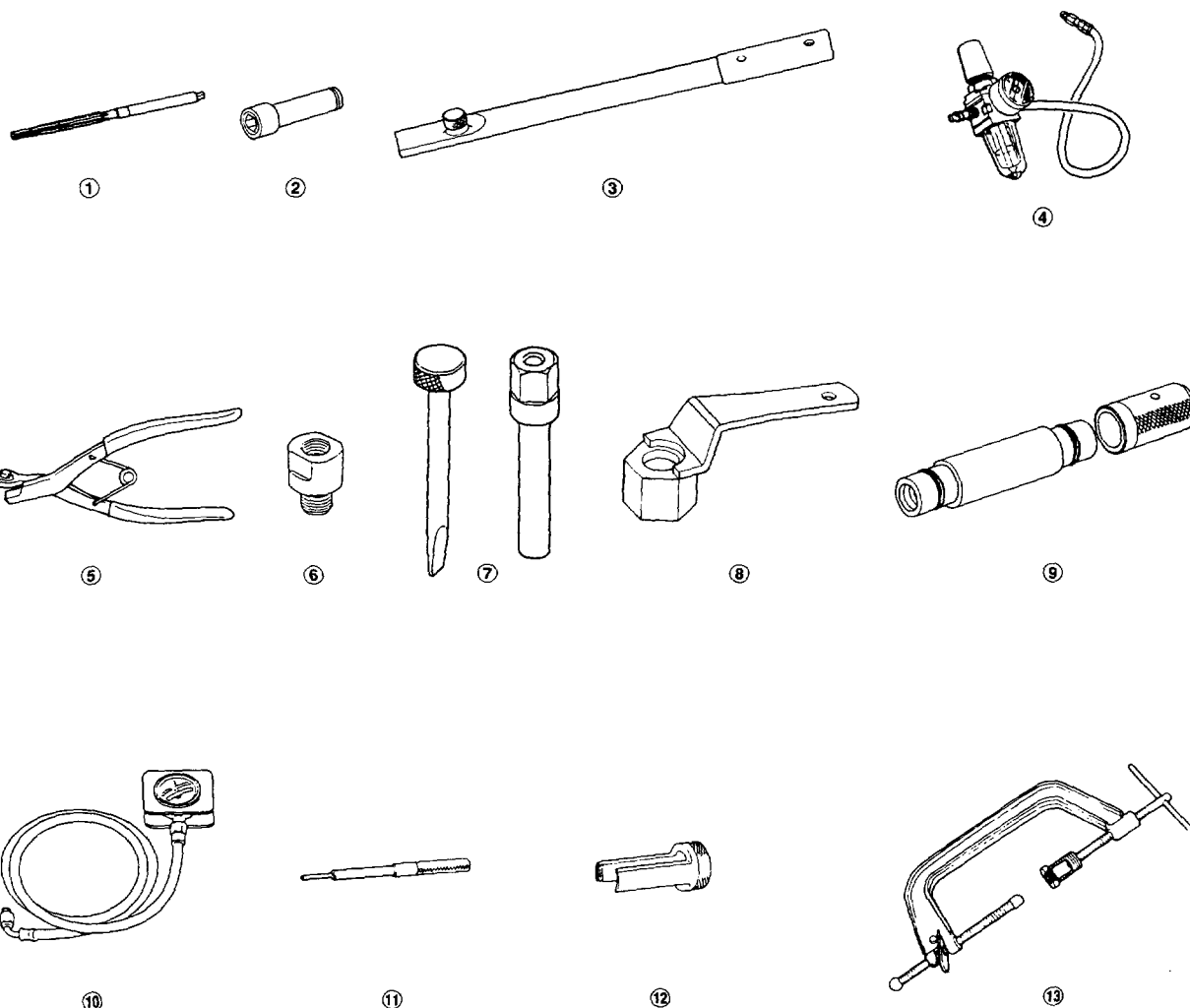
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Special Tools

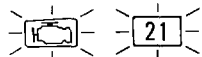
Ref. No.	Tool Number	Description	Qty	Remark
①	07HAH – PJ70100	Valve Guide Reamer, 5.525 mm	1	
②	07JAA – 0010200	Socket Wrench, 19 mm	1	
③	07JAB – 0010200	Handle	1	
④	07LAJ – PR30101	Valve Inspection Set	1	
⑤	07LAJ – PR30201	Air Stopper	1	
⑥	07LAK – PR30100	Oil Pressure Gauge Attachment	1	
⑦	07MAA – PR70100	Tappet Adjuster Wrench Set	1	
⑧	07MAB – PY30100	Pulley Holder Attachment, HEX 50 mm	1	
⑨	07PAD – 0010000	Stem Seal Driver	1	
⑩	07406 – 0070001	Low Pressure Gauge	1	
⑪	07742 – 0010100	Valve Guide Driver, 5.5 mm	1	
⑫	07757 – PJ10100	Valve Spring Compressor Attachment	1	
⑬	07757 – 0010000	Valve Spring Compressor	1	



Variable Valve Timing and Valve Lift Electronic Control (VTEC) Solenoid Valve



Troubleshooting Flowchart



The Malfunction Indicator Lamp (MIL) indicates Diagnostic Trouble Code (DTC) 21: A problem in the VTEC Solenoid Valve circuit.

Refer to page 11-B-14 through 11-B-22 before troubleshooting.

- The MIL has been reported on.
- With the SCS short connector connected, code 21 is indicated.

Check the VTEC Control System:

1. Do the engine control module (ECM) Reset Procedure (see section 11).
2. Start the engine.
3. Warm up engine to normal operating temperature (cooling fan comes on).
4. Do the Road Test.*

* Road Test:

Accelerate in 1st gear to an engine speed over 6,000 rpm (min⁻¹). Hold that engine speed for at least two seconds. If the MIL does not come on during the first road test, repeat this test two more times.

Is MIL on and does it indicate code 21?

NO

Intermittent failure, system is OK at this time.
Check for poor connections or loose wires at VTEC solenoid valve and ECM.

YES

Test the VTEC Solenoid Valve:

1. Turn the ignition switch OFF.
2. Disconnect the VTEC solenoid valve connector.
3. Check for continuity between VTEC solenoid valve connector terminal and body ground.

Is there 14 – 30 Ω?

NO

Replace the VTEC solenoid valve.

YES

Test the VTEC Solenoid Valve Wire:

Check for continuity between VTEC solenoid valve connector terminal and A15 terminal on the ECM connector.

Is there continuity?

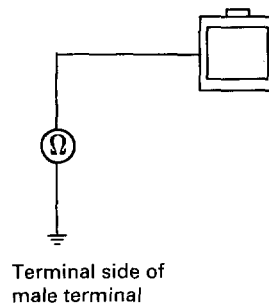
NO

Repair open in the GRN/YEL wire between the ECM (A15) and VTEC solenoid valve connector.

YES

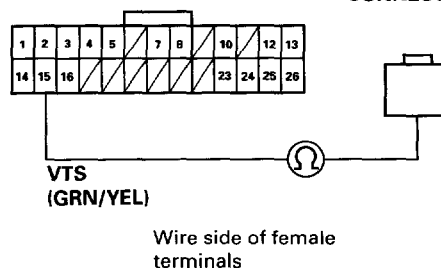
(To page 6-48)

VTEC SOLENOID VALVE CONNECTOR



ECM CONNECTOR A (26 P)

VTEC SOLENOID VALVE CONNECTOR



(cont'd)

VTEC Solenoid Valve

Troubleshooting Flowchart

(From page 6-47)

Test the VTEC Solenoid Valve Wire:
Check for continuity between VTEC solenoid valve connector terminal and body ground.

Is there continuity?

YES

Repair short in the GRN/YEL wire between the ECM (A15) and VTEC solenoid valve connector.

NO

Test the VTEC Solenoid Valve:
1. Connect the VTEC solenoid valve connector.
2. Remove the 10 mm bolt, and install the special tools as shown.
3. Connect a tachometer (see section 11).
4. Start the engine.
5. Warm up engine to normal operating temperature (cooling fan comes on).
6. Check oil pressure at engine speeds of 1,000, 3,000 and 5,000 rpm (min⁻¹).

NOTE: Keep measuring time as short as possible because engine is running with no load (less than one minute).

Is pressure below 49 kPa (0.5 kgf/cm², 7 psi)?

NO

Inspect the VTEC solenoid valve.

YES

Test the VTEC Solenoid Valve:
1. Turn the ignition switch OFF.
2. Disconnect the VTEC solenoid valve connector.
3. Attach the battery positive terminal to the GRE/YEL terminal.
4. Start the engine and check oil pressure at an engine speed of 5,000 rpm (min⁻¹).

Is pressure above 390 kPa (4.0 kgf/cm², 57 psi)?

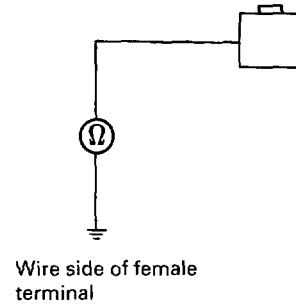
NO

Inspect the VTEC solenoid valve.

YES

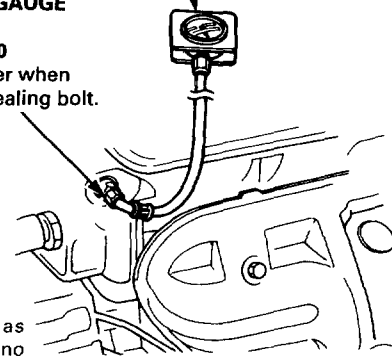
Substitute a known-good ECM and recheck.
If symptom/indication goes away, replace the original ECM.

VTEC SOLENOID VALVE CONNECTOR

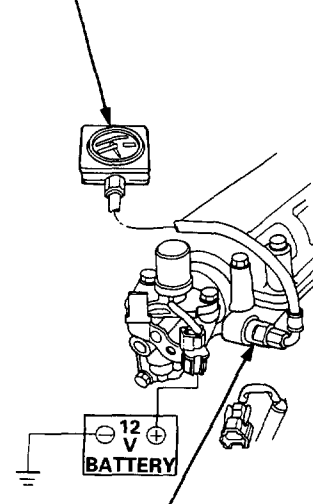


LOW PRESSURE GAUGE
07406 - 0070001

OIL PRESSURE GAUGE ATTACHMENT
07LAK - PR30100
• Use new washer when installing the sealing bolt.



LOW PRESSURE GAUGE
07406 - 0070001



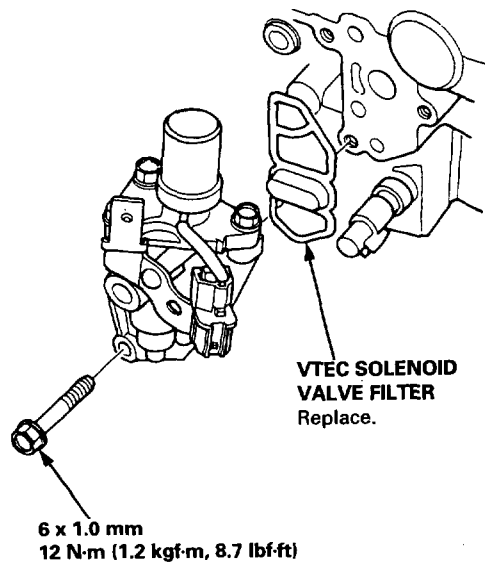
OIL PRESSURE GAUGE ATTACHMENT
07LAK - PR30100
• Use new washer when installing the sealing bolt.



Inspection

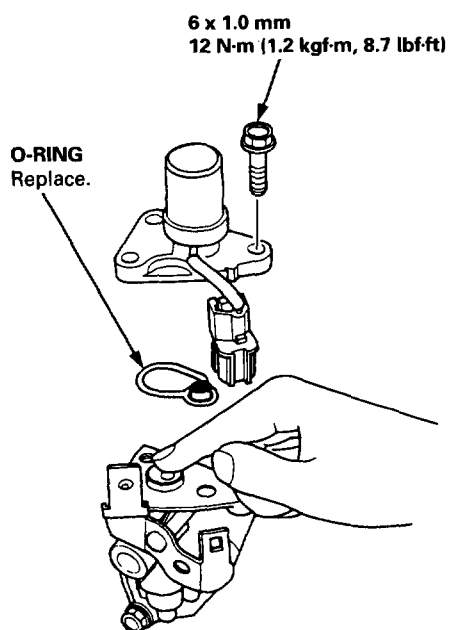
1. Remove the VTEC solenoid valve assembly from the cylinder head, and check the VTEC solenoid valve filter for clogging.

- If there is clogging, replace the engine oil filter and engine oil.



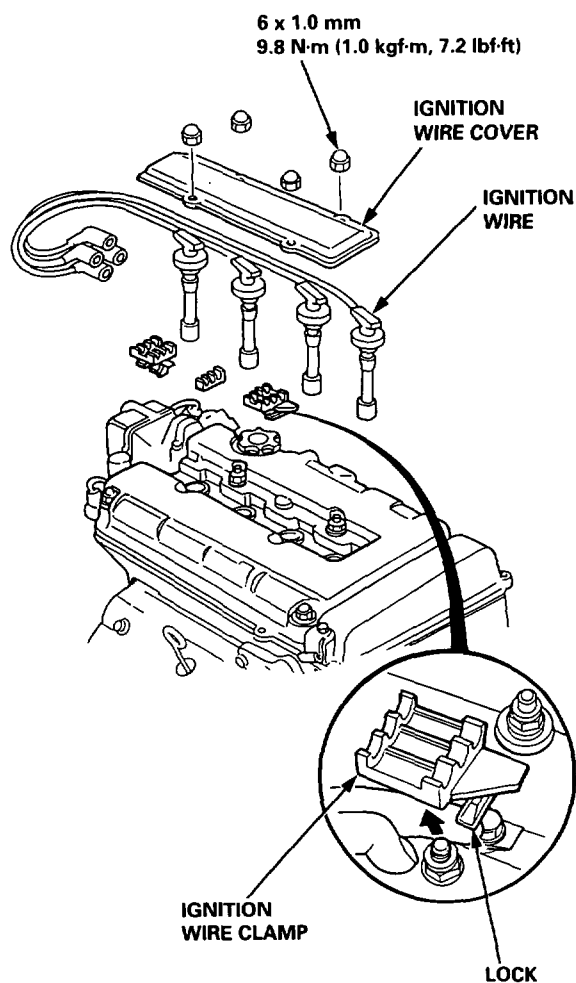
2. If the filter is not clogged, push the VTEC solenoid valve with your finger and check its movement.

- If the VTEC solenoid valve is normal, check the engine oil pressure.



Manual Inspection

1. Set the No. 1 piston at TDC.
2. Remove the ignition wire cover and the wires.
3. Remove the ignition clamps while pulling up on the lock.



(cont'd)

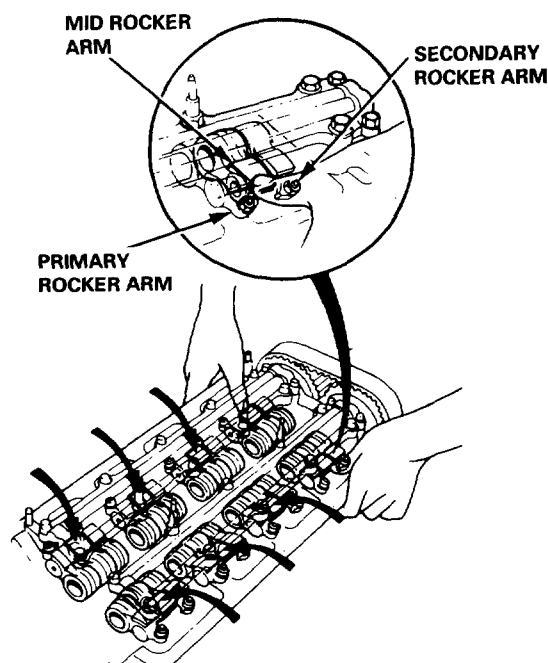
VTEC Rocker Arms

Manual Inspection (cont'd)

4. Remove the cylinder head cover.

NOTE: Refer to page 6-80 when installing the cylinder head cover.

5. Push the mid rocker arm on the No. 1 cylinder manually.
6. Check that the mid rocker arm moves independently of the primary and secondary rocker arms.



7. Check the mid rocker arm of each cylinder at TDC.

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

Inspection Using Special Tools

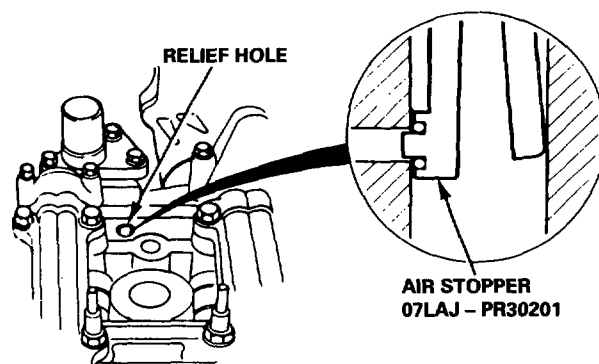
NOTE:

- Before using the valve inspection tool, make sure that the air pressure gauge on the air compressor indicates over 400 kPa (4 kgf/cm², 57 psi)
- Inspect the valve clearance before rocker arm inspection.
- Cover the timing belt with a shop towel to prevent getting oil on the belt.
- Check the mid rocker arm of each cylinder at TDC.

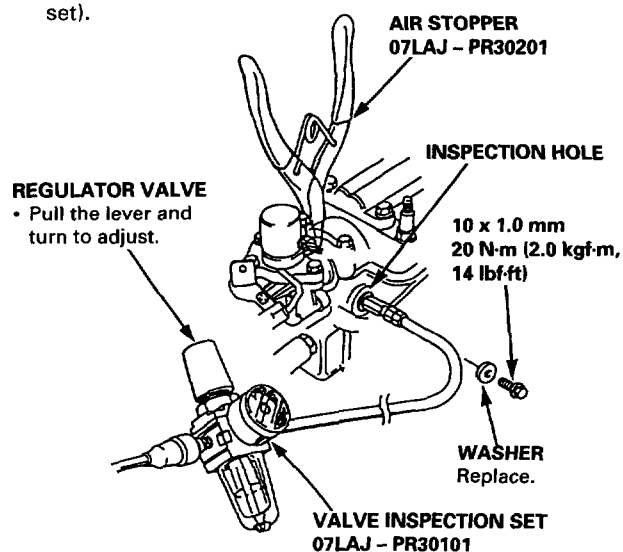
1. Remove the cylinder head cover.

NOTE: Refer to page 6-80 when installing the cylinder head cover.

2. Plug the relief hole with the special tool (Air Stopper).



3. Remove the bolt and washer from the inspection hole and connect the special tool (Valve Inspection set).





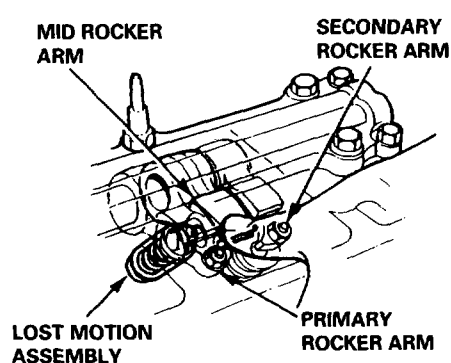
4. Apply specified air pressure to the rocker arm pistons after loosening the regulator valve on the valve inspection set.

Specified Air Pressure:

250 kPa (2.5 kgf/cm², 36 psi)

— 490 kPa (5.0 kgf/cm², 71 psi)

5. Make sure that the primary and secondary rocker arms are mechanically connected by the pistons and that the mid rocker arms do not move when pushed manually.



- If any mid rocker arm moves independently of the primary and secondary rocker arms, replace the rocker arms as a set.
6. Remove the tools.
 7. Check the operation of the lost motion assembly by pushing on the mid rocker arm. The lost motion assembly should compress fully and operate smoothly through its full stroke. Replace the assembly if it does not work smoothly.
 8. After inspection, check that the Malfunction Indicator Lamp (MIL) does not come on.

Valve Clearance

Adjustment

NOTE:

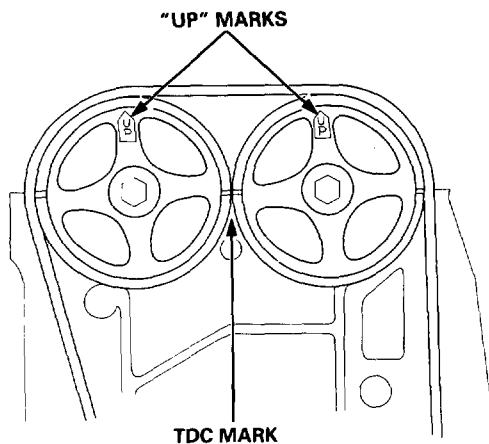
- Valves should be adjusted only when the cylinder head temperature is less than 38°C (100°F).
- After adjusting, retorque the crankshaft pulley bolt to 177 N·m (18.0 kgf·m, 130 lbf·ft)

1. Remove the cylinder head cover.

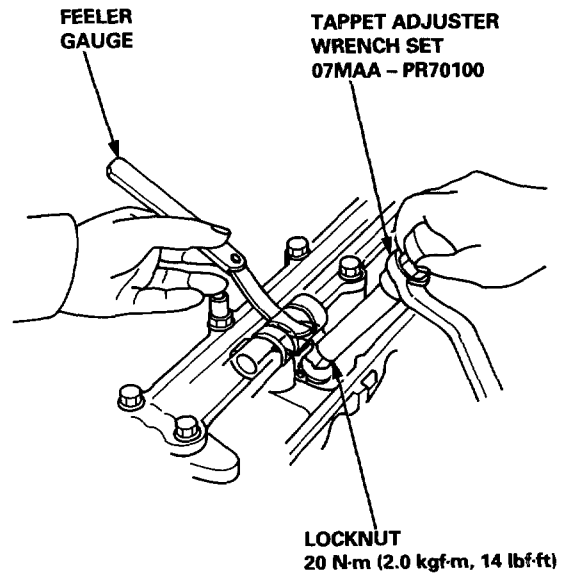
NOTE: Refer to page 6-80 when installing the cylinder head cover.

2. Set No. 1 piston at TDC. "UP" mark on the pulley should be at top, and TDC grooves on the pulley should align with the pointer on back cover. TDC grooves (white paint) on the crankshaft pulley should align with pointer on the timing belt lower cover.

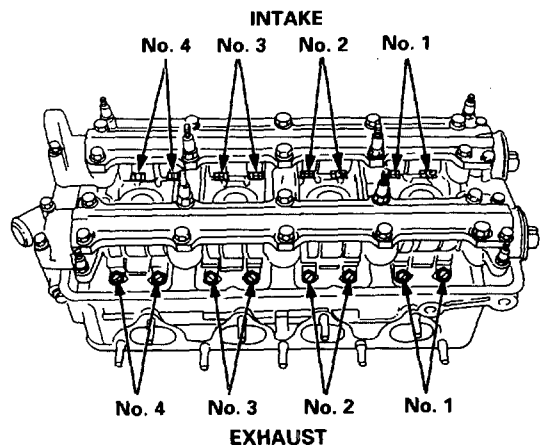
Number 1 piston at TDC:



3. Adjust valves on No. 1 cylinder.
Intake: 0.15 – 0.19 mm (0.006 – 0.007 in)
Exhaust: 0.17 – 0.21 mm (0.007 – 0.008 in)
4. Loosen the locknut, and turn the adjusting screw until the feeler gauge slides back and front with a slight amount of drag.

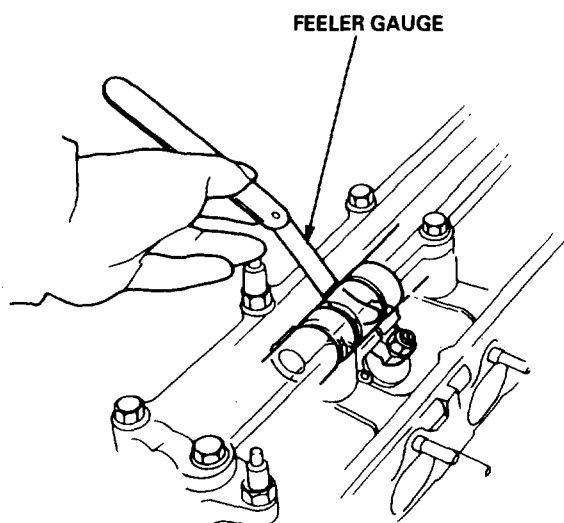


Adjusting screw location:

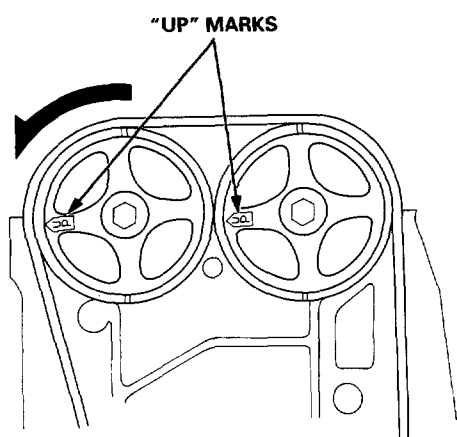




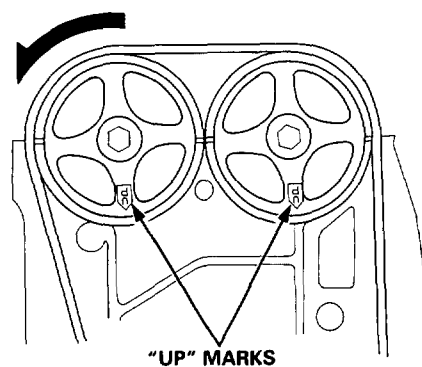
5. Tighten the locknut and recheck clearance again. Repeat adjustment if necessary.



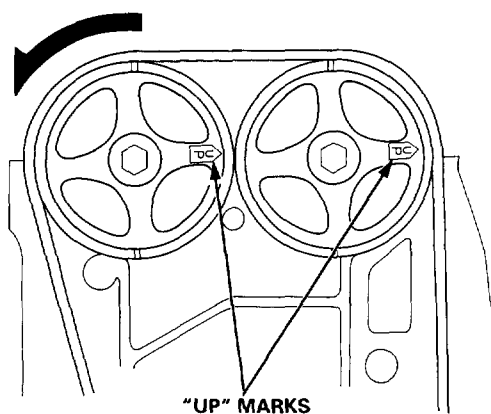
6. Rotate the crankshaft 180° counterclockwise (camshaft pulley turns 90°). The "UP" mark should be on the exhaust side. Adjust valves on No. 3 cylinder.



7. Rotate crankshaft 180° counterclockwise to bring No. 4 piston to TDC. The "UP" mark should be pointing straight down. Adjust valves on No. 4 cylinder.



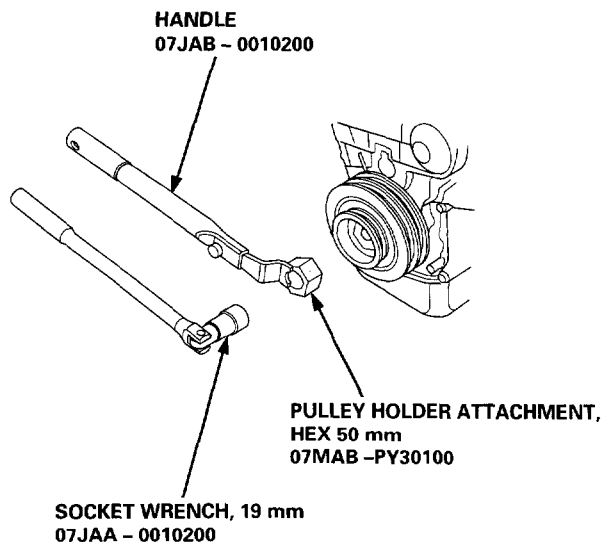
8. Rotate crankshaft 180° counterclockwise to bring No. 2 piston to TDC. The "UP" marks should be on the intake side. Adjust valves on No. 2 cylinder.



Crankshaft Pulley and Pulley Bolt

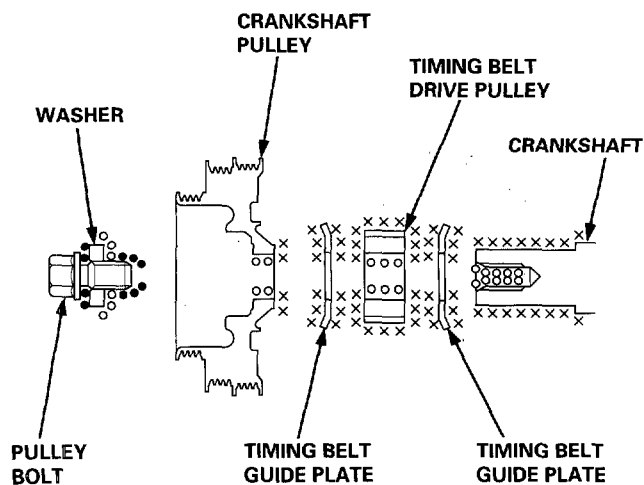
Replacement

1. Hold the pulley with handle and pulley holder attachment, then remove the pulley bolt.



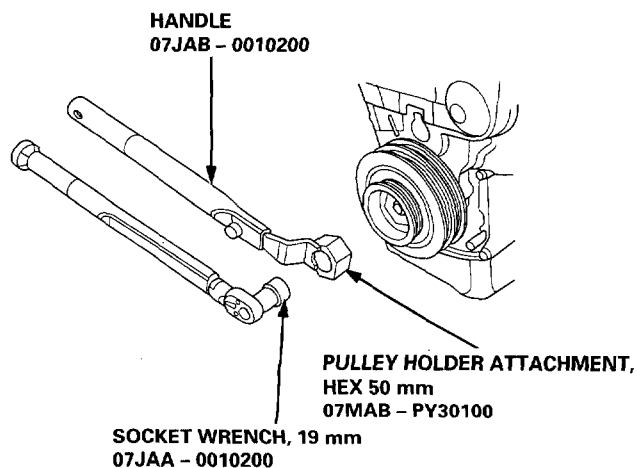
2. Remove any oil from the pulleys, crankshaft, bolt and washer. Clean and lubricate as shown below.

- : Clean
- ×: Remove any oil
- : Lubricate



3. Tighten the pulley bolt to the specified torque.

Torque: 177 N·m (18.0 kgf·m, 130 lbf·ft)

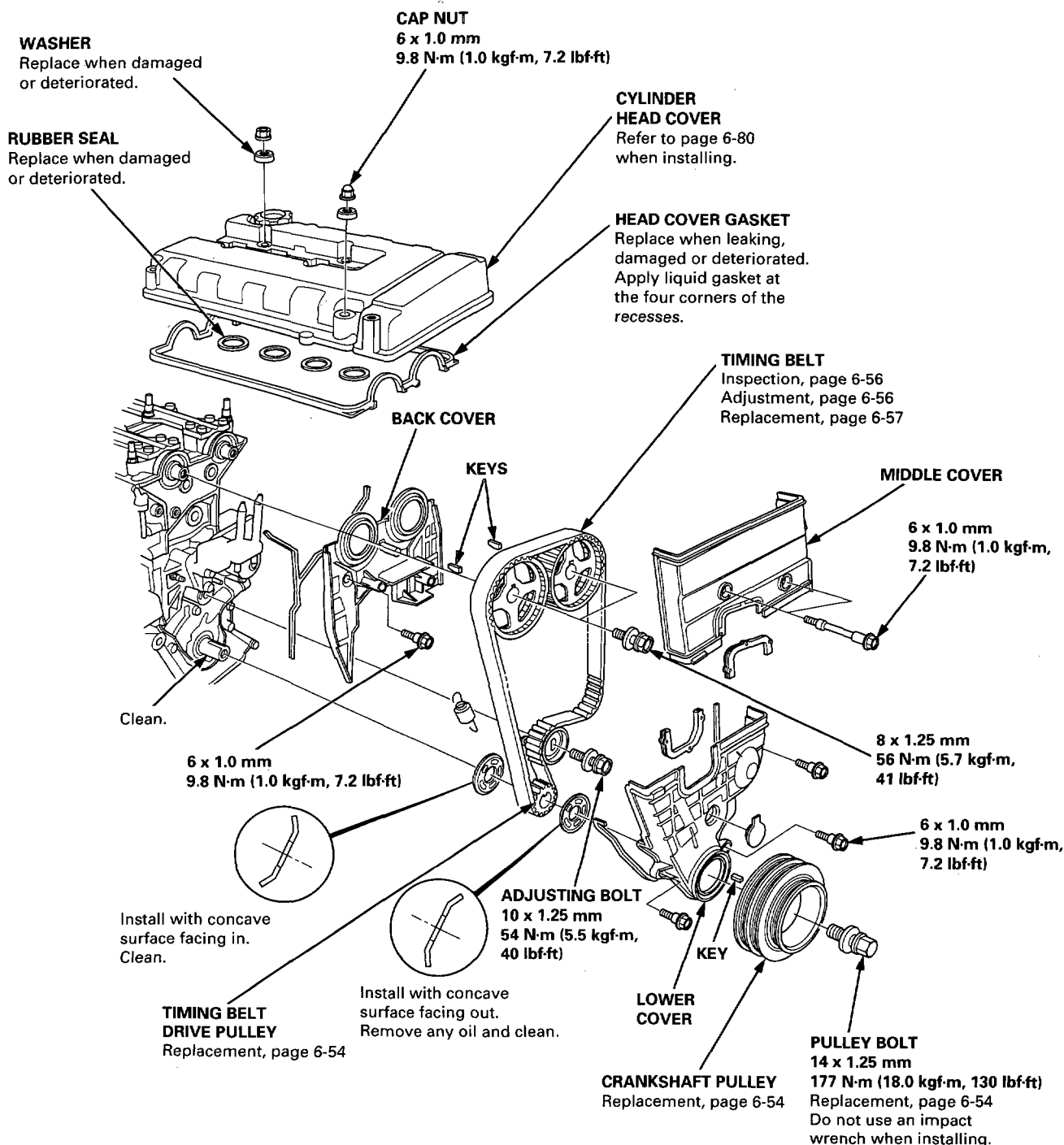




Illustrated Index

NOTE:

- Refer to page 6-58 for positioning crankshaft and pulley before installing belt.
- Mark the direction of rotation on the belt before removing.
- Replace the rubber seals for oil leakage between the cylinder head and cover.
- Do not use the middle cover and lower cover for storing items disassembled.
- Clean the middle cover and lower cover before installation.
- Replace the camshaft and crankshaft seals when oil leakage.



Timing Belt

Inspection

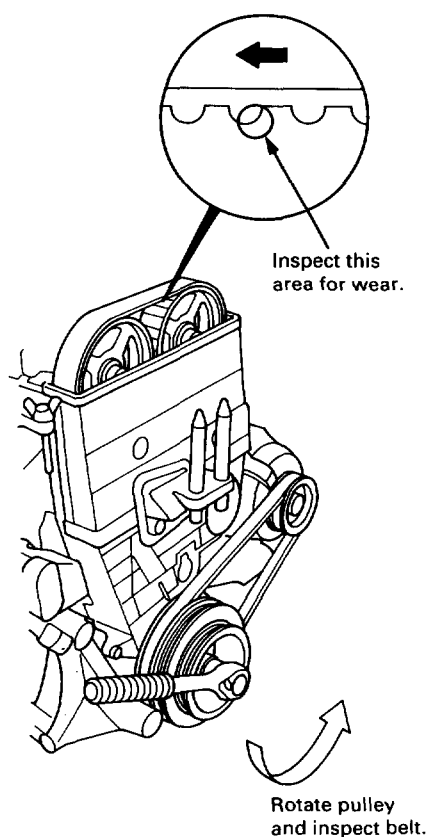
1. Remove the cylinder head cover.

NOTE: Refer to page 6-80 when installing the cylinder head cover.

2. Inspect the timing belt for cracks and oil or coolant soaking.

NOTE:

- Replace the belt if oil or coolant soaked.
- Remove any oil or solvent that gets on the belt.



3. After inspecting, retorque the crankshaft pulley bolt to 177 N·m (18.0 kgf·m, 130 lbf·ft).

Tension Adjustment

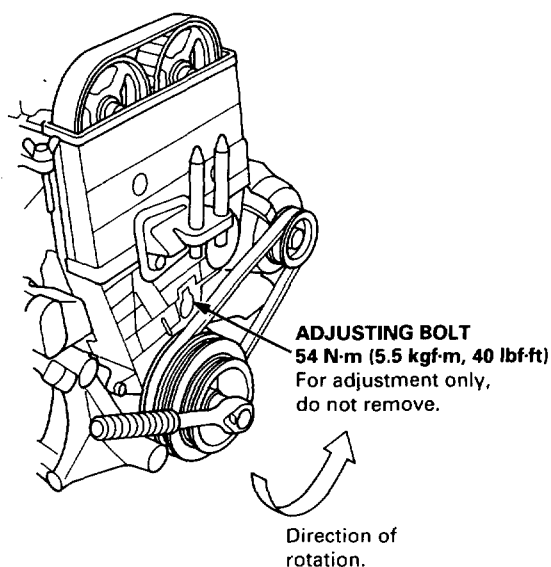
NOTE:

- Always adjust timing belt tension with the engine cold.
- The tensioner is spring-loaded to apply proper tension to the belt automatically after making the following adjustment.
- Always rotate the crankshaft counterclockwise when viewed from the pulley side. Rotating it clockwise may result in improper adjustment of the belt tension.

1. Remove the cylinder head cover.

NOTE: Refer to page 6-80 when installing the cylinder head cover.

2. Set the No. 1 piston at TDC (see page 6-59).
3. Rotate the crankshaft 5-6 revolutions to set the belt.
4. Set the No. 1 piston at TDC.



5. Loosen the adjusting bolt 180°.
6. Rotate the crankshaft counterclockwise three teeth on the camshaft pulley.
7. Tighten the adjusting bolt.
8. After adjusting, retorque the crankshaft pulley bolt to 177 N·m (18.0 kgf·m, 130 lbf·ft).

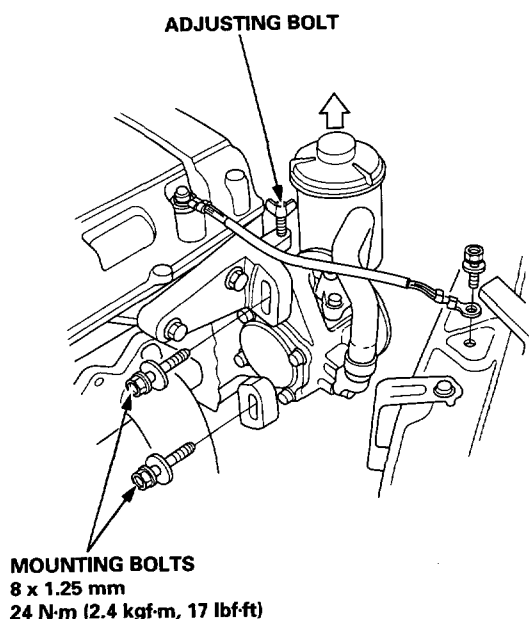


Removal

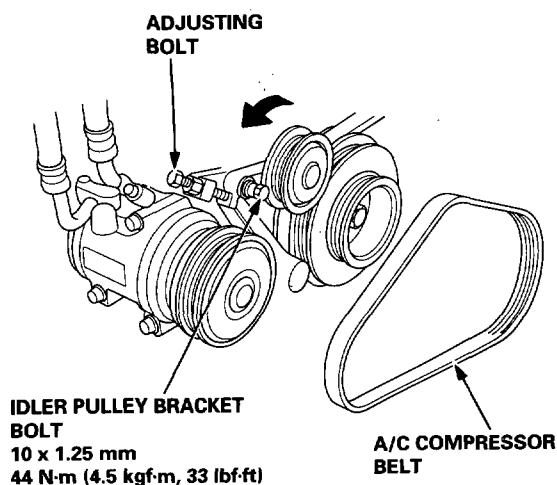
NOTE:

- Turn the crankshaft pulley so the No. 1 piston is at top dead center (TDC) before removing the belt (see page 6-59).
- Inspect the water pump when removed the timing belt (see page 10-14).

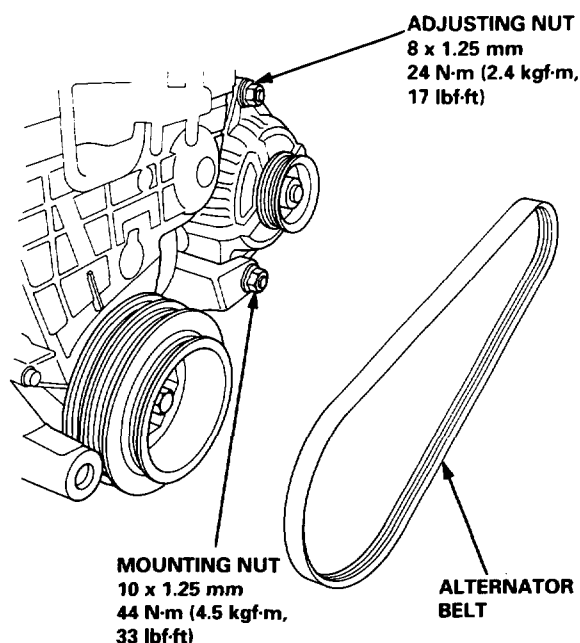
1. Remove the wheel well splash shield (see page 5-6).
2. Loosen the adjusting bolt and mounting bolts, then remove the power steering (P/S) pump belt.



3. Loosen the adjusting bolt and idler pulley bracket bolt, then remove the air conditioning (A/C) compressor belt.



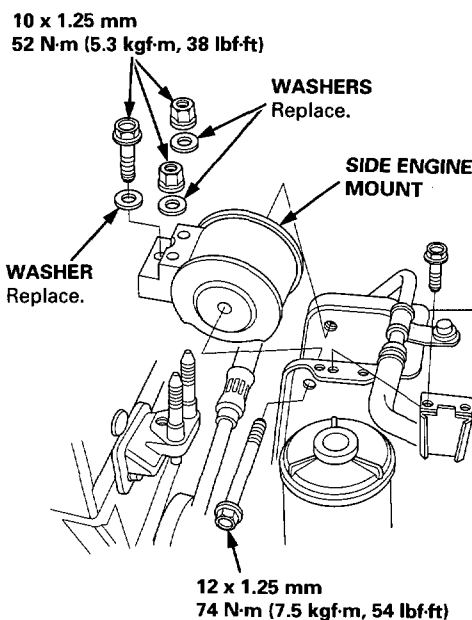
4. Loosen the adjusting nut and mounting nut, then remove the alternator belt.



5. Remove the side engine mount.

NOTE:

- Use the jack to support the engine before the side engine mount is removed.
- Make sure to place a cushion between the oil pan and the jack.



(cont'd)

Timing Belt

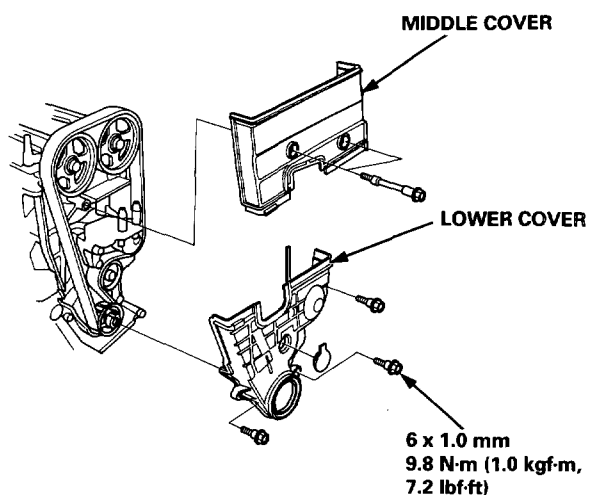
Removal (cont'd)

6. Remove the crankshaft pulley (see page 6-54).
7. Remove the cylinder head cover.

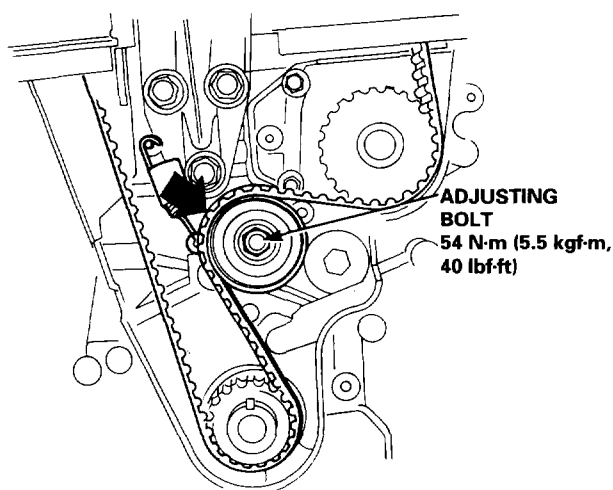
NOTE: Refer to page 6-80 when installing the cylinder head cover.

8. Remove the middle cover and lower cover.

NOTE: Do not use the middle and lower covers for storing removed items.



9. Loosen the adjusting bolt 180°. Push the tensioner to remove tension from the timing belt, then retighten the adjusting bolt.

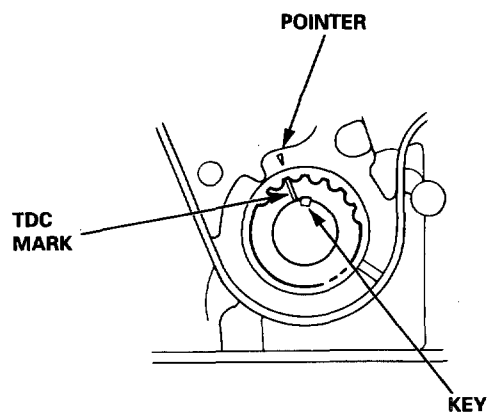


10. Remove the timing belt.

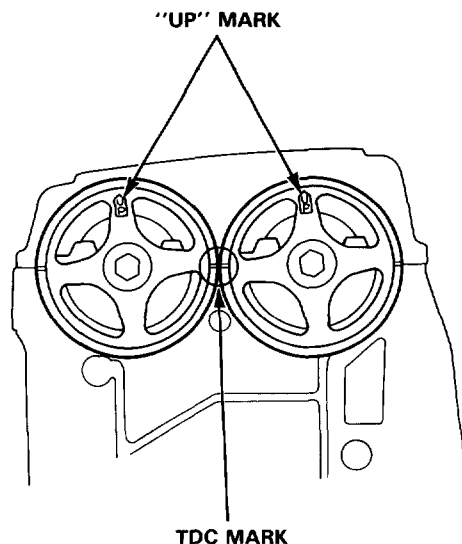
Installation

Install the timing belt in the reverse order of removal; Only key points are described here.

1. Set the timing belt drive pulley so that the No. 1 piston is at top dead center (TDC). Align the groove on the timing belt drive pulley to the ∇ pointer on the oil pump.



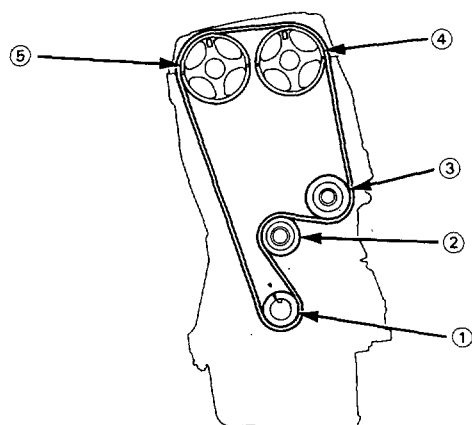
2. Set the camshaft pulleys so that the No. 1 piston TDC. Align the TDC marks of the intake and exhaust camshaft pulleys.





3. Install the timing belt tightly in the sequence shown.
 ① Timing belt drive pulley (crankshaft) → ② Adjusting pulley → ③ Water pump pulley → ④ Intake camshaft pulley → ⑤ Exhaust camshaft pulley.

NOTE: Make sure the timing belt drive pulley and camshaft pulleys are at TDC.



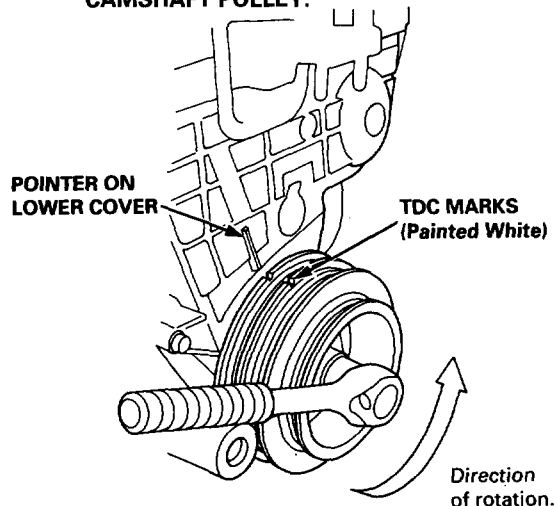
4. Loosen and retighten the adjusting bolt to tension the timing belt.
 5. Install the lower cover and middle cover.

NOTE: Clean the middle and lower covers before installing.

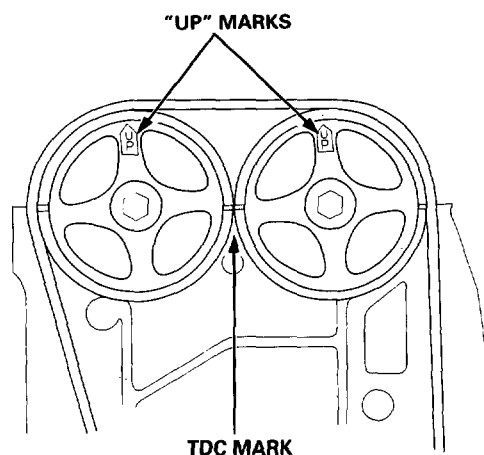
6. Install the crankshaft pulley, then tighten the pulley bolt (see page 6-54).
 7. Rotate the crankshaft pulley about five or six turns counterclockwise so that the timing belt positions on the pulleys.
 8. Adjust the timing belt tension (see page 6-56).

9. Check that the crankshaft pulley and camshaft pulleys are both at TDC.

CAMSHAFT PULLEY:



CAMSHAFT PULLEY:



10. If the camshaft and crankshaft pulleys are not positioned at TDC remove the timing belt, and adjust the position following the procedure on page 6-56, then reinstall the timing belt.
 11. After installation, adjust the tension of each belt.

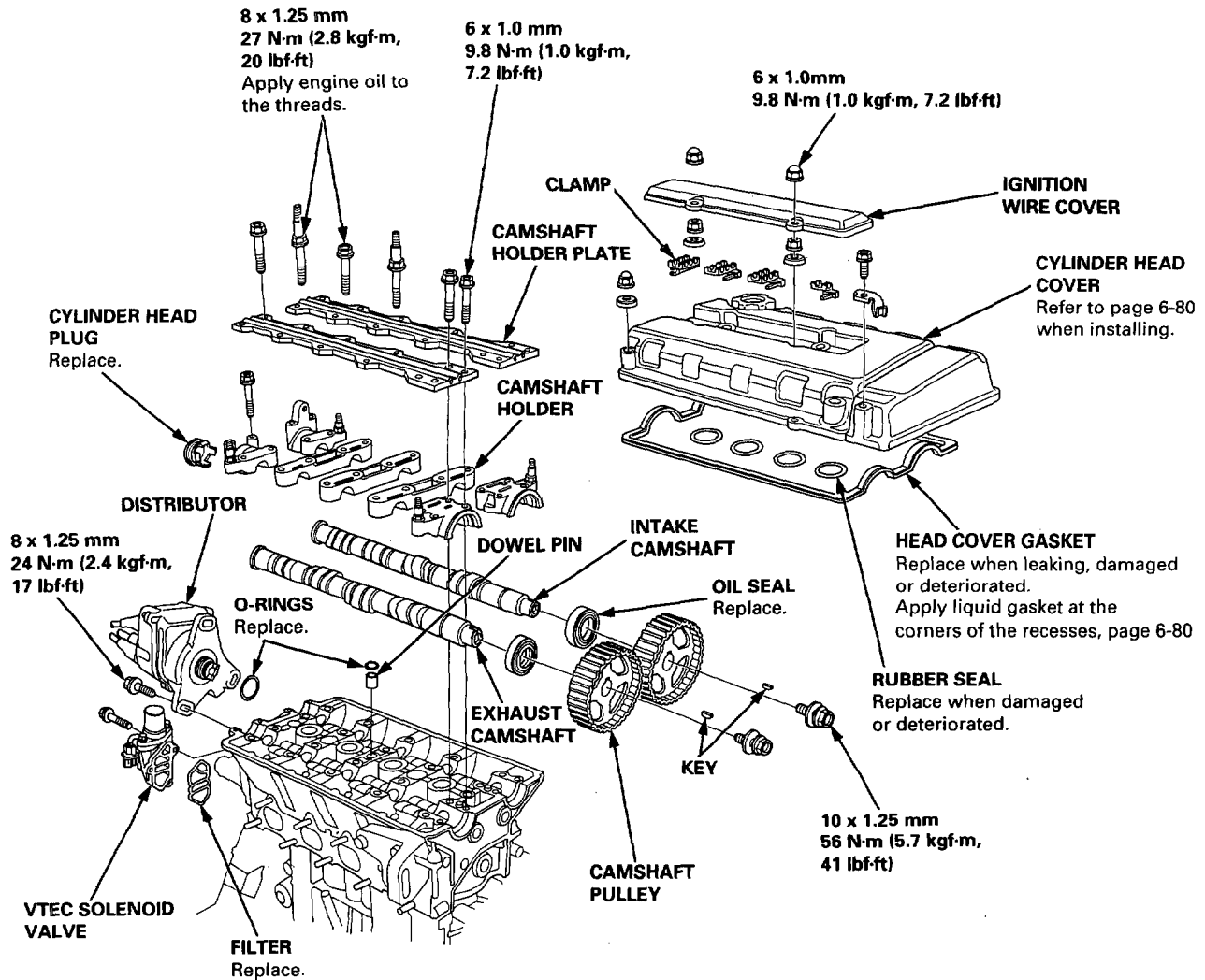
- See section 4 for alternator belt tension adjustment.
- See section 22 for A/C compressor belt tension adjustment.
- See section 17 for P/S pump belt tension adjustment.

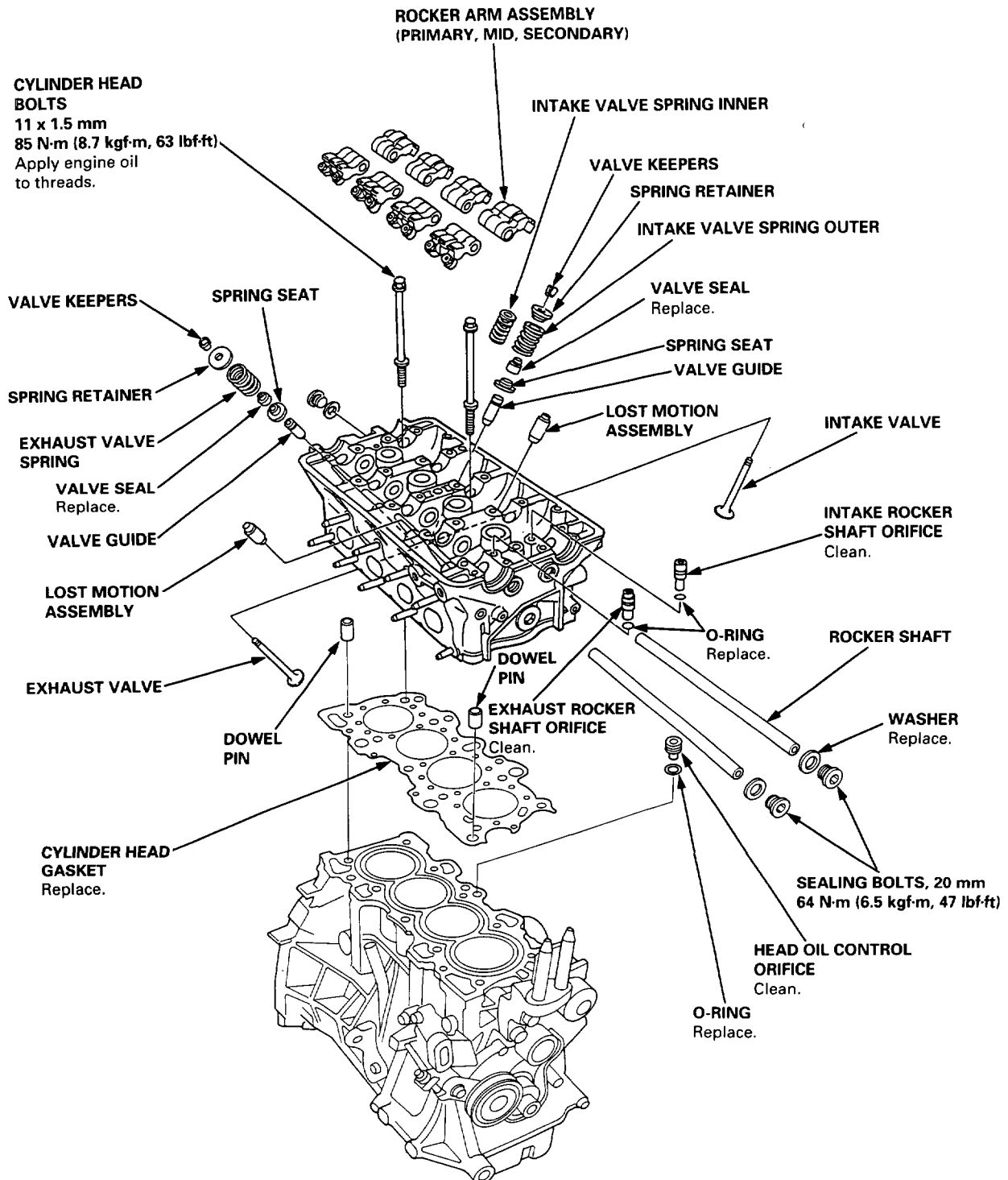
Cylinder Head

Illustrated Index

NOTE:

- To avoid damaging the cylinder head, wait until the engine coolant temperature drops below 38°C (100°F) before removing it.
- In handling a metal gasket, take care not to fold it or damage the contact surface of the gasket.
- Use new O-rings and gaskets when reassembling.





Cylinder Head

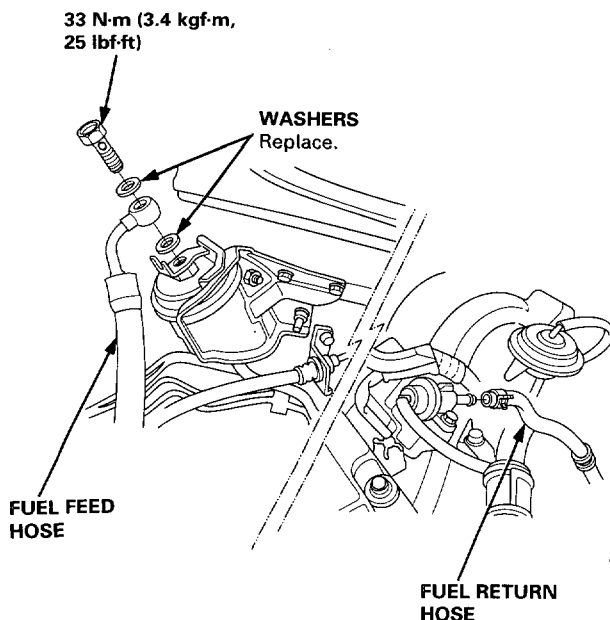
Removal

Engine removal is not required this procedure.

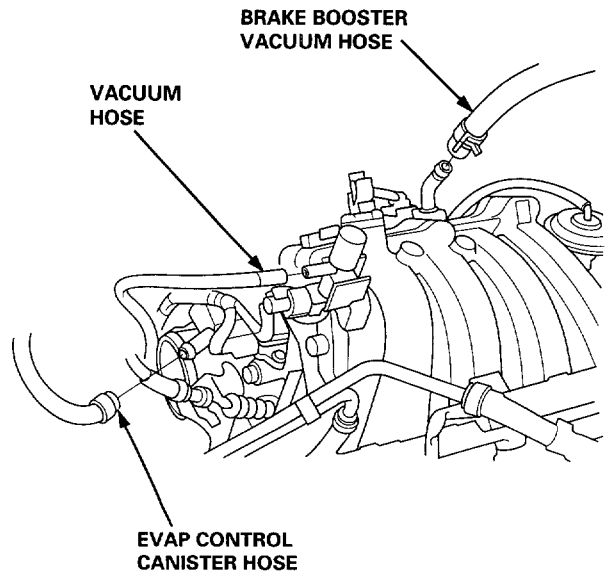
NOTE:

- 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 38°C (100°F) before loosening the retaining 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 part.

1. Disconnect the battery negative terminal.
2. Drain the engine coolant (see page 10-7).
3. Remove the strut brace (see page 5-2).
4. Remove the intake air duct and air cleaner housing assembly (see page 5-2).
5. Remove the adjusting bolt and mounting bolts, then remove the power steering (P/S) pump belt and pump (see page 5-5).
6. Loosen the idler pulley bracket bolt and adjusting bolt, then remove the air conditioning (A/C) compressor belt (see page 5-5).
7. Loosen the mounting nut and locknut, then remove the alternator belt (see page 6-57).
8. Relieve fuel pressure (see section 11).
9. Remove the fuel feed hose and fuel return hose.



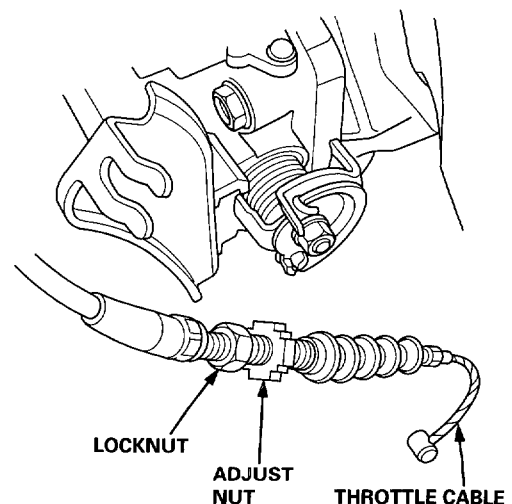
10. Remove the brake booster vacuum hose, evaporative emission (EVAP) control canister hose and vacuum hose.



11. Remove the throttle cable by loosening the locknut then slip the cable end out of the accelerator linkage.

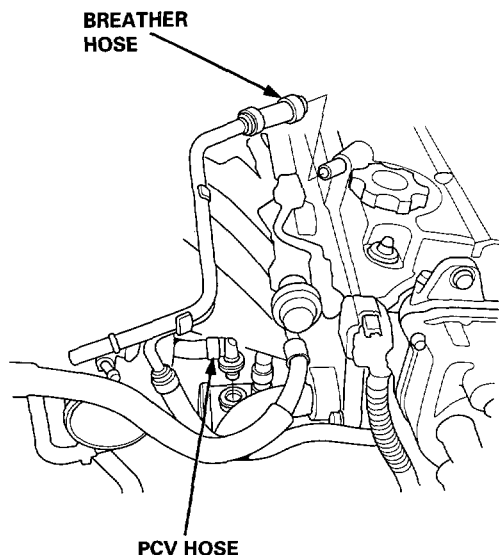
NOTE:

- Take care not to bend the cable when removing it. Always replace any kinked cable with a new one.
- Adjust the throttle cable when installing (see section 11).

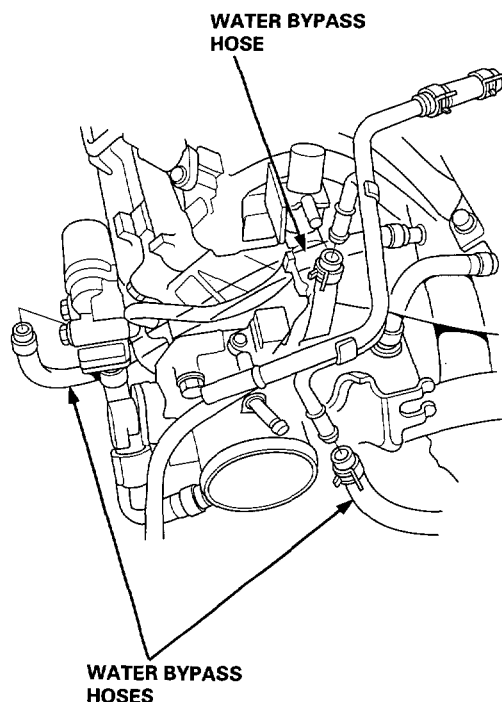




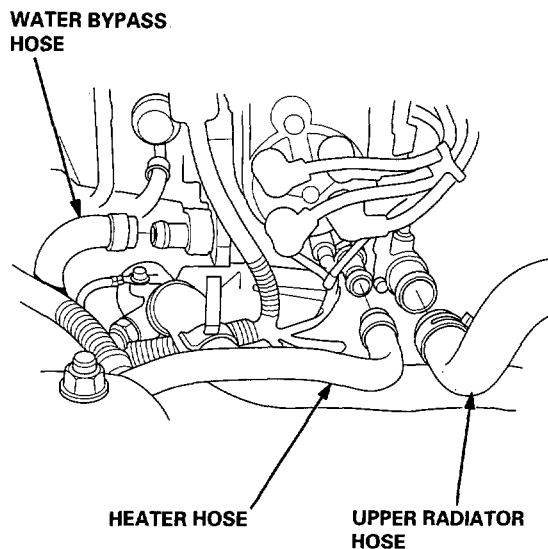
12. Remove the breather hose and positive crankcase ventilation (PCV) hose.



13. Remove the water bypass hoses.



14. Remove the upper radiator hose, heater hose and water bypass hose.



15. Remove the engine wire harness connectors and wire harness clamps from the cylinder head and the intake manifold.

- Four fuel injector connector
- Intake air temperature (IAT) sensor connector
- Engine coolant temperature (ECT) sensor connector
- Radiator fan switch connector
- Coolant temperature gauge sending unit connector
- Idle air control (IAC) valve connector
- Manifold absolute pressure (MAP) sensor connector
- Intake air bypass (IAB) control solenoid valve connector
- Throttle position sensor connector
- Heated oxygen sensor (HO2S) connector
- VTEC solenoid valve connector
- Distributor connector

16. Remove the spark plug caps and distributor from the cylinder head.

17. Remove the side engine mount (see page 5-11).

NOTE:

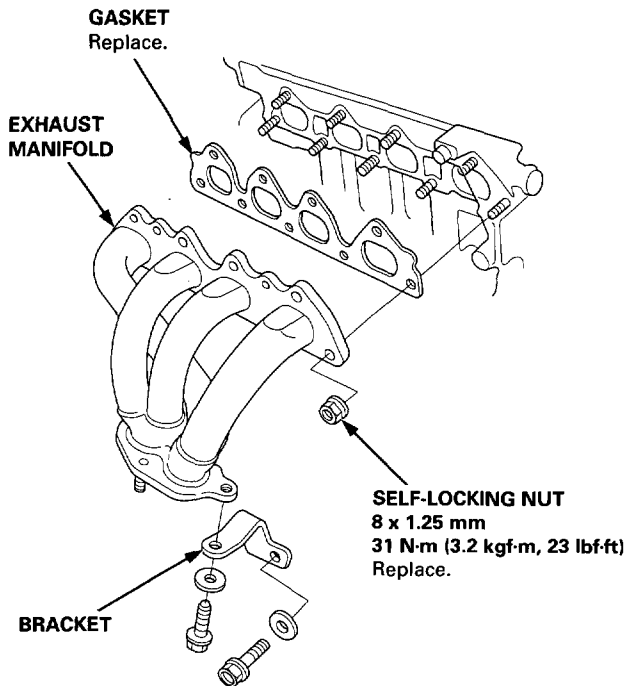
- Use the jack to support the engine before the side engine mount is removed.
- Make sure to place a cushion between the oil pan and the jack.

(cont'd)

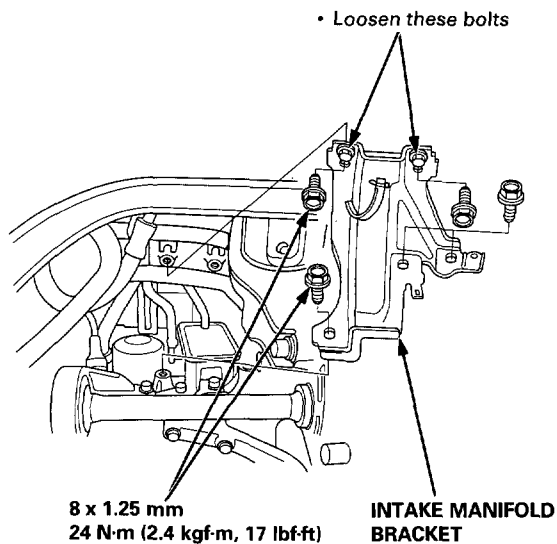
Cylinder Head

Removal (cont'd)

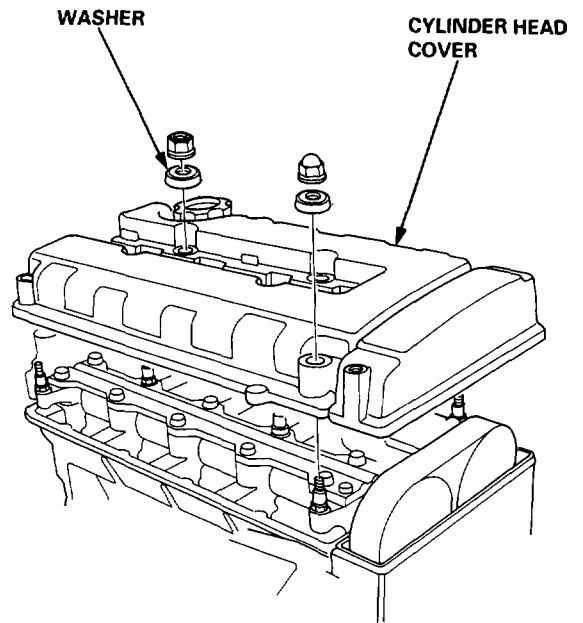
18. Remove the exhaust manifold.



19. Remove the intake manifold bracket.

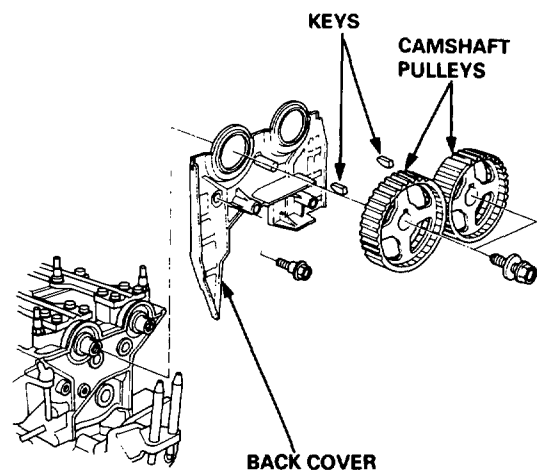


20. Remove the cylinder head cover.



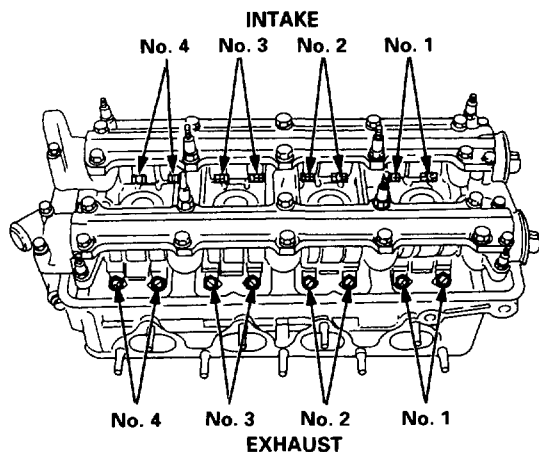
21. Remove the timing belt (see page 6-57).

22. Remove the camshaft pulley and back cover.

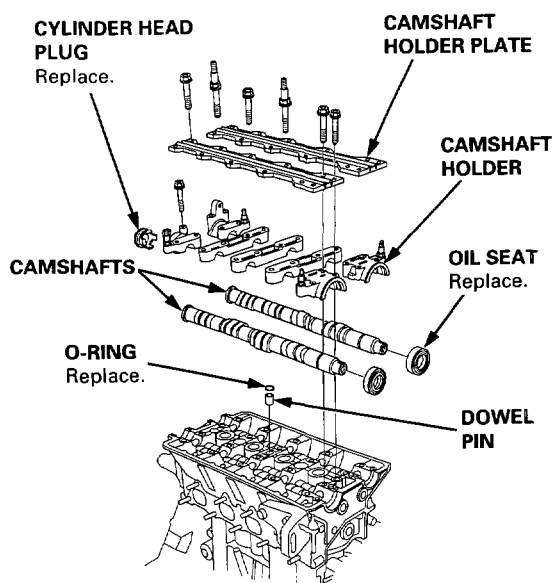




23. Loosen the adjusting screws.

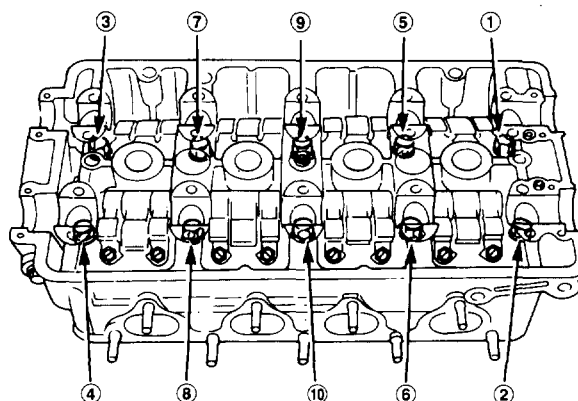


24. Remove the camshaft holder plates, camshaft holders and camshafts.



25. 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.

CYLINDER HEAD BOLT LOOSENING SEQUENCE:



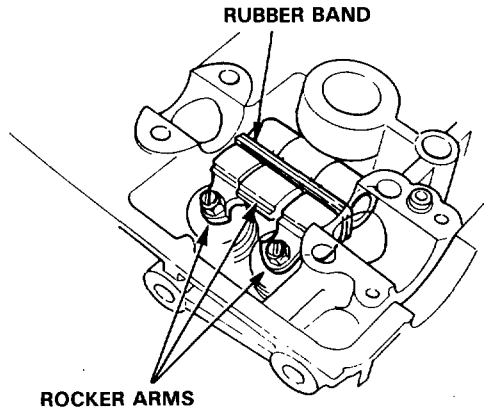
26. Remove the cylinder head.

27. Remove the intake manifold (see page 9-2).

Rocker Arms

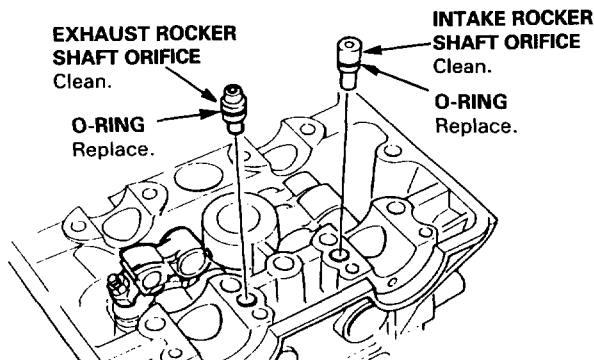
Removal

1. Hold the rocker arms together with a rubber band to prevent them from separating.

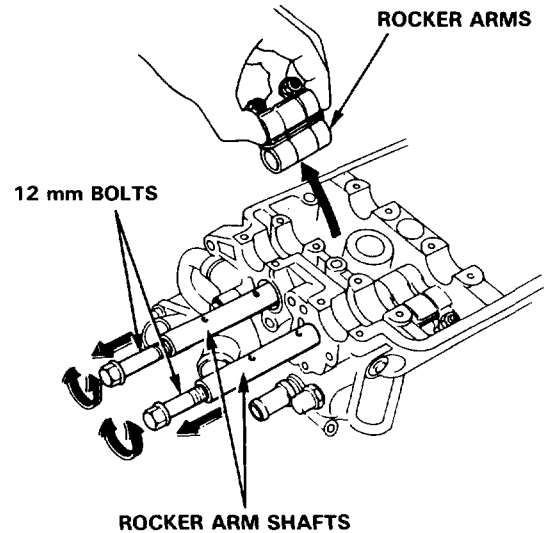


2. Remove the intake and exhaust rocker shaft oil control orifices, then remove the VTEC solenoid valve and the sealing bolts.

NOTE: The shapes of the oil control orifices of the intake and exhaust are different. Identify the parts as they are removed to ensure reinstallation in the original locations.



3. Screw 12 mm bolts into the rocker arm shafts. Remove each rocker arm set while slowly pulling out intake and exhaust rocker arm shafts.



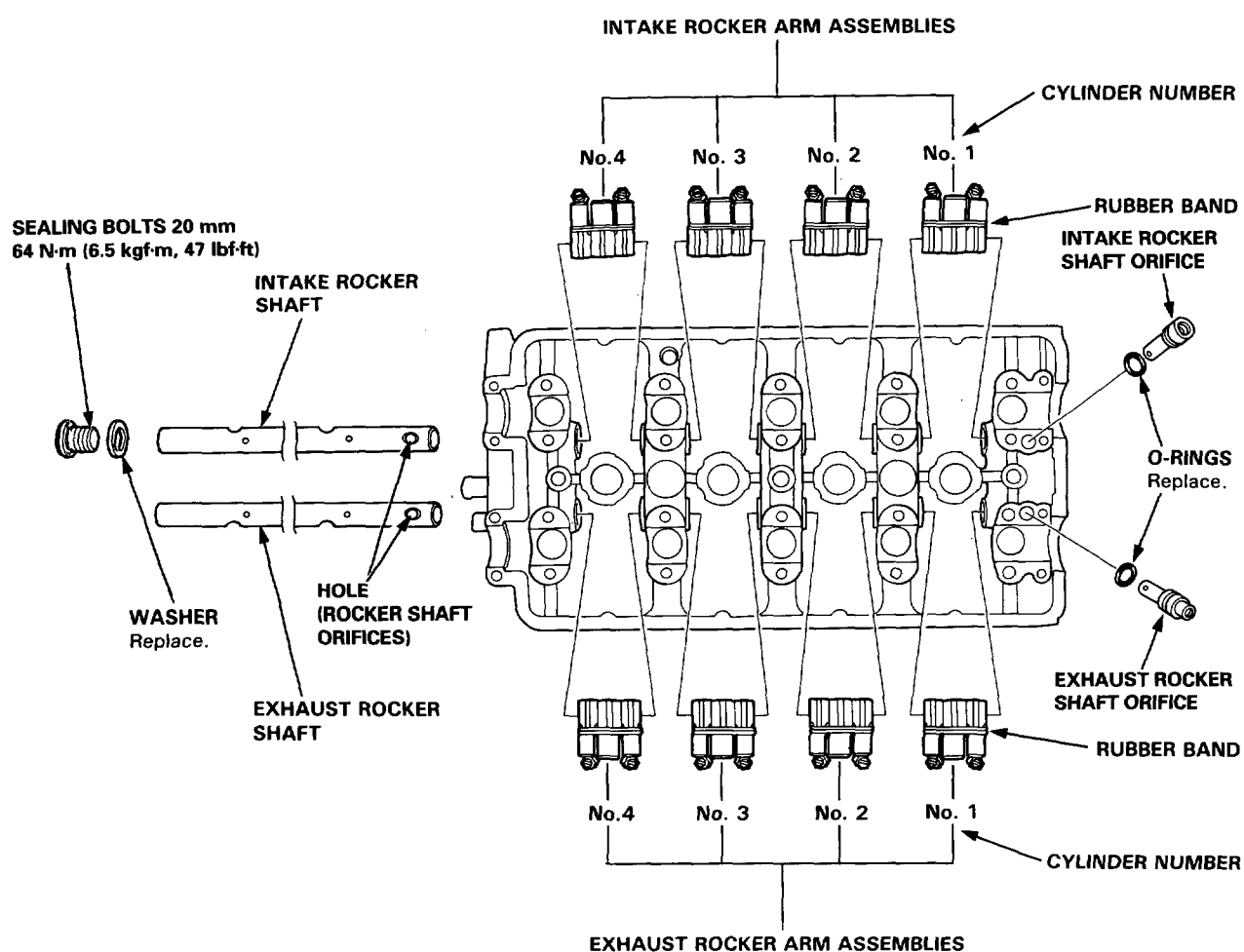


Disassembly/Reassembly

NOTE:

- After installing the rocker shaft orifice, try to turn the rocker shaft to make sure that the orifice is correctly inserted in the hole of rocker shaft. If the orifice is in place, it should not turn.
- Identify parts as they are removed to ensure reinstallation in original locations.
- Inspect rocker shafts and rocker arms (see page 6-68).
- Rocker arms must be installed in the same position if reused.
- Clean the rocker shaft orifices when installing.

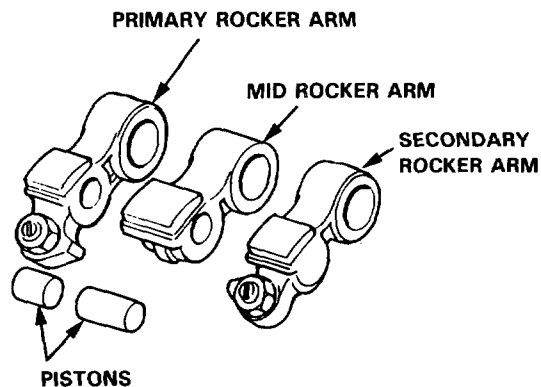
 Prior to reinstalling, clean all the parts in solvent, dry them and apply lubricant to any contact surfaces.



Rocker Arms and Lost Motion Assemblies

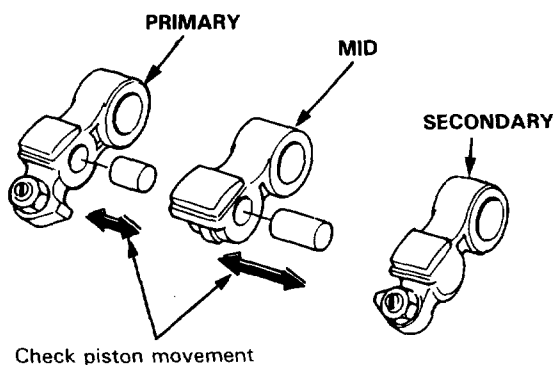
Inspection

NOTE: When reassembling the primary rocker arm, carefully apply air pressure to the oil passage of the rocker arm.



1. Inspect the rocker arm piston. Push it manually.

— If it does not move smoothly, replace the rocker arm assembly.

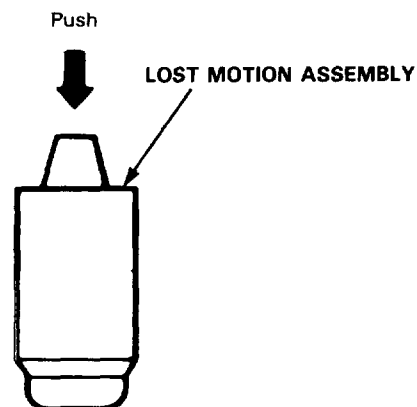


NOTE:

- Apply oil to the pistons when reassembling.
- Bundle the rocker arms with a rubber band to keep them together as a set.

2. Remove the lost motion assembly from the cylinder head and inspect it. Test it by pushing the plunger with your finger.

— If the lost motion assembly does not move smoothly, replace it.

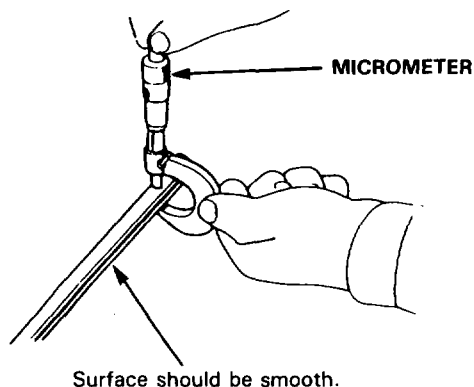




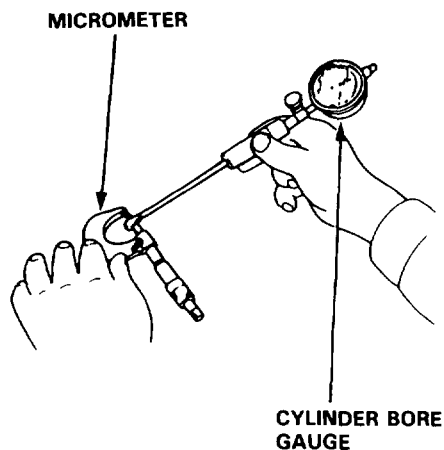
Clearance Inspection

Measure both the intake rocker shaft and exhaust rocker shaft.

1. Measure diameter of shaft at first rocker location.



2. Zero gauge to shaft diameter.



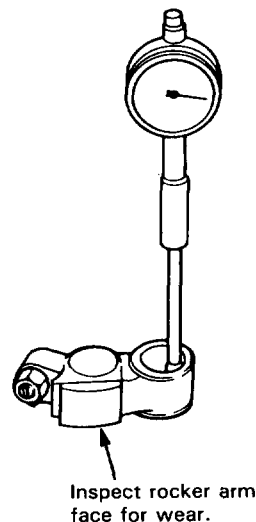
3. Measure inside diameter of rocker arm and check for out-of-round condition.

Rocker Arm-to-Shaft Clearance:

Intake and Exhaust

Standard (New): 0.025 – 0.052 mm
(0.0010 – 0.0020 in)

Service Limit: 0.08 mm (0.003 in)



Repeat for all rockers.

— If over limit, replace rocker shaft and all overtolerance rocker arms.

NOTE: If any rocker arm needs replacement, replace all three rocker arms in that set (primary, mid, and secondary).

Camshafts

Inspection

NOTE:

- Do not rotate the camshaft during inspection.
- Remove the rocker arms and rocker shafts.

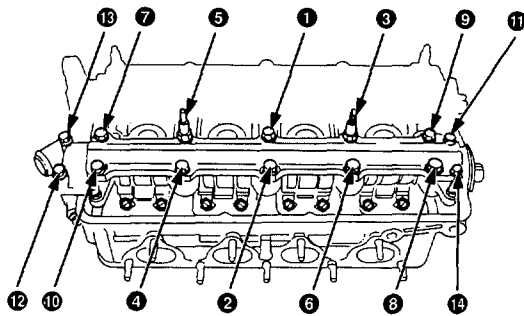
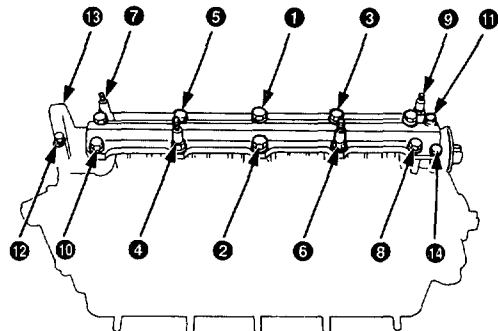
1. Put the camshafts and camshaft holders on the cylinder head, and then tighten the bolts to the specified torque.

Specified Torque:

① - ⑩: 8 mm bolts 27 N·m (2.8 kgf·m, 20 lbf·ft)

Apply engine oil to the threads.

⑪ - ⑭: 6 mm bolts 9.8 N·m (1.0 kgf·m, 7.2 lbf·ft)

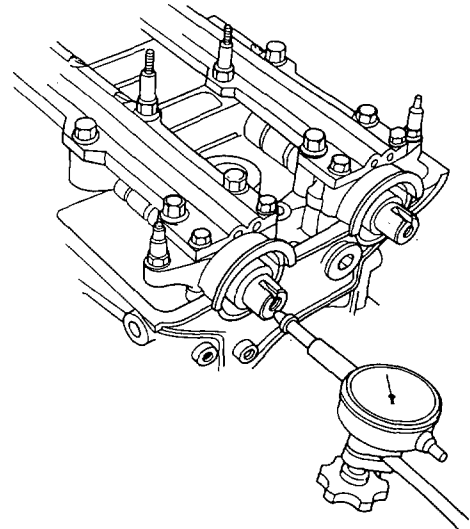


2. Seat the camshaft by pushing it toward distributor end of the cylinder head.
3. Zero the dial indicator against end of distributor drive, then push the camshaft back and forth, and read the end play.

Camshaft End Play:

Standard (New): 0.05 - 0.15 mm
(0.002 - 0.006 in)

Service limit: 0.5 mm (0.02 in)



4. Remove the bolts, then remove the camshaft holders from the cylinder head.

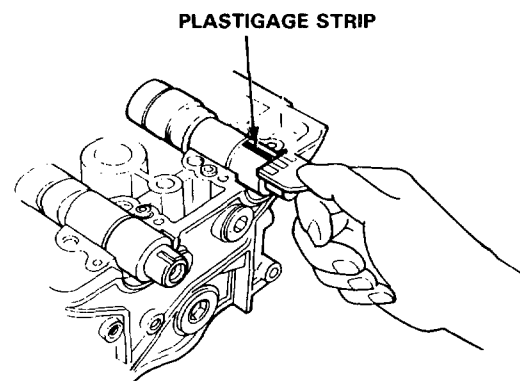
- Lift camshaft out of cylinder head, wipe clean, then inspect lift ramps. Replace camshaft if lobes are pitted, scored, or excessively worn.
- Clean the camshaft bearing surfaces in the cylinder head, then set camshaft back in place.
- Insert plastigage strip across each journal.

5. Put the camshaft on the cylinder head, then install the camshaft holders, and then tighten the bolts to the specified torque, as shown in the left column on this page.
6. Remove the camshaft holders, then measure the widest portion of the plastigage on each journal.

Camshaft-to-Holder Oil Clearance:

Standard (New): 0.050 - 0.089 mm
(0.002 - 0.004 in)

Service Limit: 0.15 mm (0.006 in)





7. If the camshaft-to-holder oil clearance is out of tolerance:

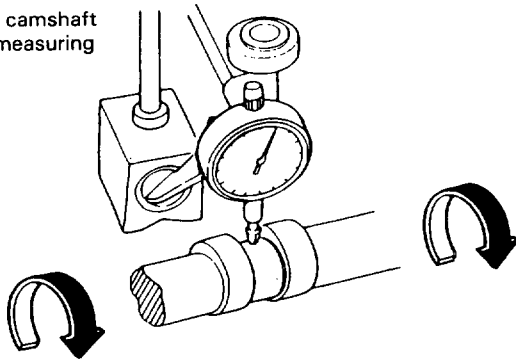
- And the camshaft has already been replaced, you must replace the cylinder head.
- If the camshaft has not been replaced, first check the total runout with the camshaft supported on V-blocks.

Camshaft Total Runout:

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

Service Limit: 0.04 mm (0.002 in)

Rotate camshaft while measuring

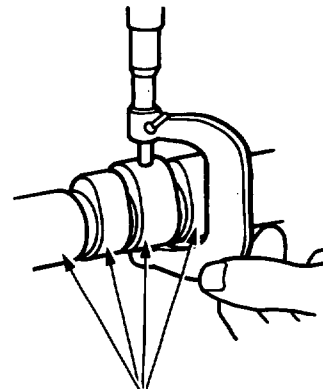


- If the total runout of the camshaft is within tolerance, replace the cylinder head.
- If the total runout is out of tolerance, replace the camshaft and recheck. If the bearing clearance is still out of tolerance, replace the cylinder head.

8. Check the cam lobe height.

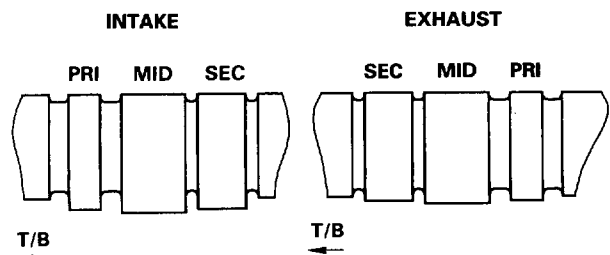
Cam lobe height standard (New):

	INTAKE	EXHAUST
PRIMARY	33.411 mm (1.3154 in)	33.111 mm (1.3036 in)
MID	36.377 mm (1.4322 in)	35.720 mm (1.4063 in)
SECONDARY	34.547 mm (1.3601 in)	34.381 mm (1.3536 in)



Check this area for wear.

Cam Position



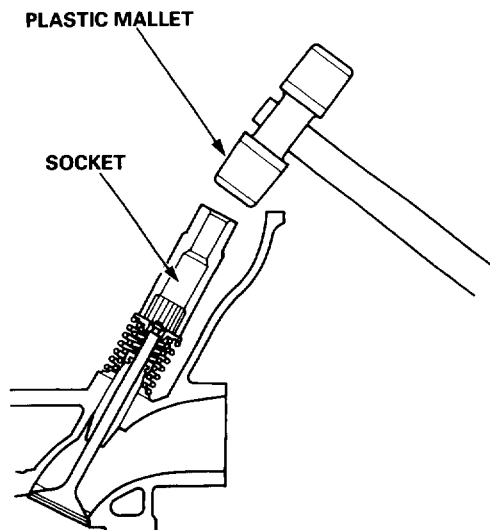
T/B: TIMING BELT
PRI: PRIMARY
MID: MID
SEC: SECONDARY

Valves, Valve Springs and Valve Seals

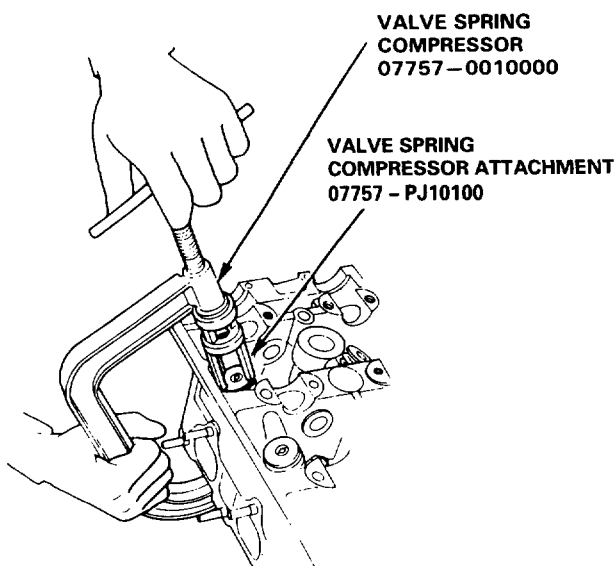
Removal

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

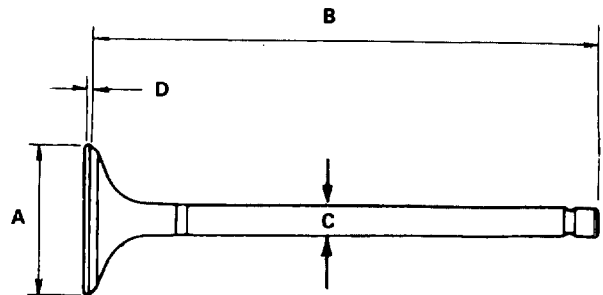
1. Using an appropriate-sized socket and plastic mallet, lightly tap the valve retainer to loosen the valve keepers before installing the valve spring compressor.



2. Install spring compressor. Compress spring and remove valve keeper.



Valve Dimensions



Intake Valve

A Standard (New):	32.90 – 33.10 mm (1.295 – 1.303 in)
B Standard (New):	101.00 – 101.30 mm (3.976 – 3.988 in)
C Standard (New):	5.475 – 5.485 mm (0.2156 – 0.2159 in)
C Service Limit:	5.445 (0.2144 in)
D Standard (New):	1.05 – 1.35 mm (0.041 – 0.053 in)
D Service Limit:	0.85 mm (0.033 in)

Exhaust Valve

A Standard (New):	27.90 – 28.10 mm (1.098 – 1.106 in)
B Standard (New):	100.60 – 100.90 mm (3.961 – 3.972 in)
C Standard (New):	5.450 – 5.460 mm (0.2146 – 0.2150 in)
C Service Limit:	5.420 (0.2134 in)
D Standard (New):	1.65 – 1.95 mm (0.065 – 0.077 in)
D Service Limit:	1.45 mm (0.057 in)



Reconditioning

1. Renew the valve seats in the cylinder head using a valve seat cutters.

NOTE: If guides are worn, replace them before cutting the valve seats.

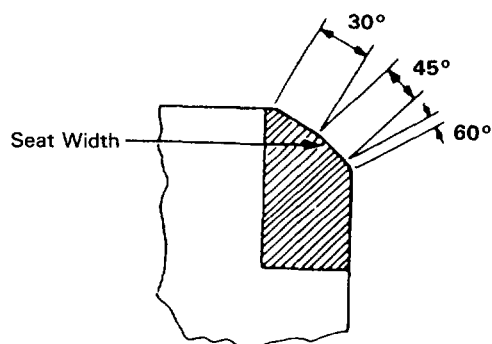


2. Carefully cut a 45° seat, removing only enough material to ensure a smooth and concentric seat.
3. Bevel the upper edge of the seat with the 30° cutter and the lower edge of the seat with the 60° cutter. Check width of seat and adjust accordingly.
4. Make one more very light pass with the 45° cutter to remove any possible burrs caused by the other cutters.

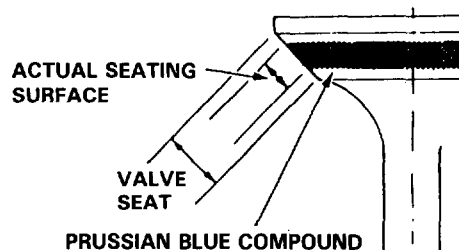
Valve Seat Width:

Standard (New): 1.25 – 1.55 mm (0.049 – 0.061 in)

Service Limit: 2.0 mm (0.08 in)



5. After resurfacing the seat, inspect for even valve seating: Apply Prussian Blue Compound to the valve face, and insert valve in original location in the head, then lift it and snap it closed against the seat several times.



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

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

7. Insert intake and exhaust valves in the head and measure valve stem installed height.

Intake Valve Stem Installed Height:

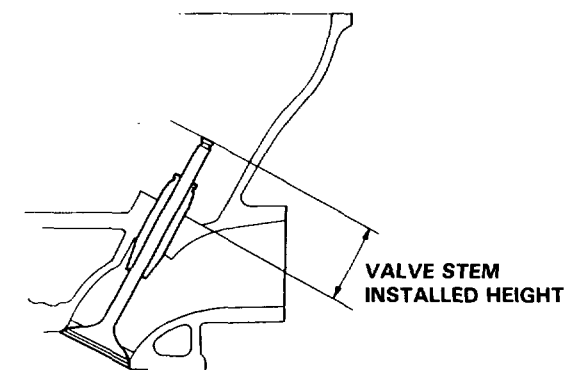
Standard (New): 37.465 – 37.935 mm
(1.4750 – 1.4935 in)

Service Limit: 38.185 mm (1.5033 in)

Exhaust Valve Stem Installed Height:

Standard (New): 37.165 – 37.635 mm
(1.4632 – 1.4817 in)

Service Limit: 37.885 (1.4915 in)



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

Cylinder Head

Valve Guides

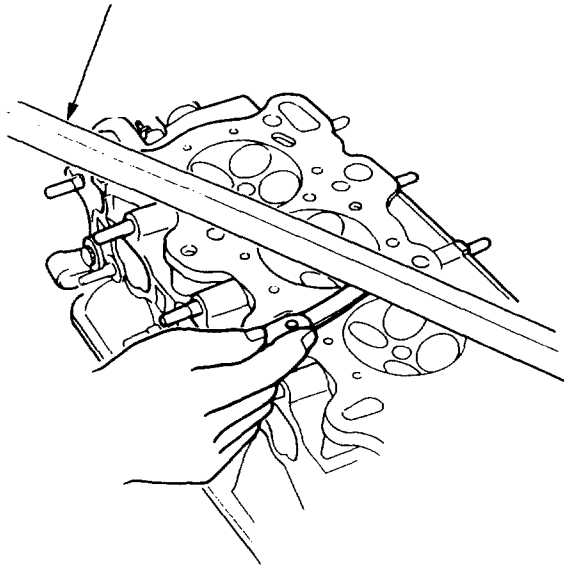
Warpage

NOTE: If camshaft-to-holder oil clearances (see page 6-70) are not within specification, the head cannot be resurfaced.

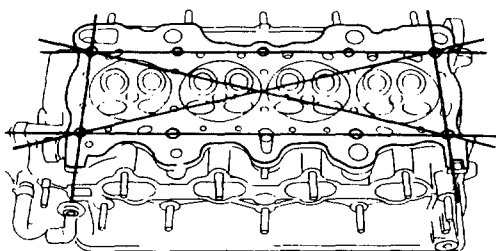
If camshaft-to-holder oil clearance are within specifications, check the head for warpage.

- 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 cylinder head.
- Maximum resurface limit is 0.2 mm (0.008 in) based on a height of 142 mm (5.59 in).

PRECISION STRAIGHT EDGE



Measure along edges, and three ways across center.



Cylinder Head Height:
Standard (New): 141.95 – 142.05 mm
(5.589 – 5.593 in)

Valve Movement

Measure the guide-to-stem clearance with a dial indicator while rocking the stem in the direction of normal thrust (wobble method).

Intake Valve Stem-to-Guide Clearance:

Standard (New): 0.05 – 0.11 mm
(0.0020 – 0.0043 in)

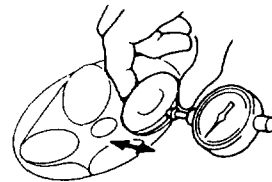
Service Limit: 0.15 mm (0.0059 in)

Exhaust Valve Stem-to-Guide Clearance:

Standard (New): 0.10 – 0.16 mm
(0.0039 – 0.0063 in)

Service Limit: 0.24 (0.0094 in)

Valve extended 10 mm out from seat.



- If measurement exceeds the service limit, recheck using a new valve.
- If measurement is now within the service limit, reassemble using a new valve.
- If measurement still exceeds limit, recheck using alternate method below, then replace valve and guide, if necessary.

NOTE: An alternate method of checking guide to stem clearance is to 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): 0.025 – 0.055 mm
(0.0010 – 0.0022 in)

Service Limit: 0.08 mm (0.003 in)

Exhaust Valve Stem-to Guide Clearance:

Standard (New): 0.050 – 0.080 mm
(0.0020 – 0.0031 in)

Service Limit: 0.11 mm (0.004 in)

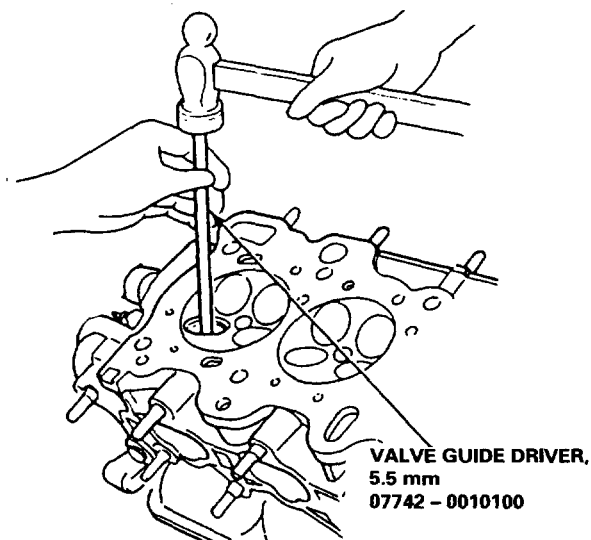


Replacement

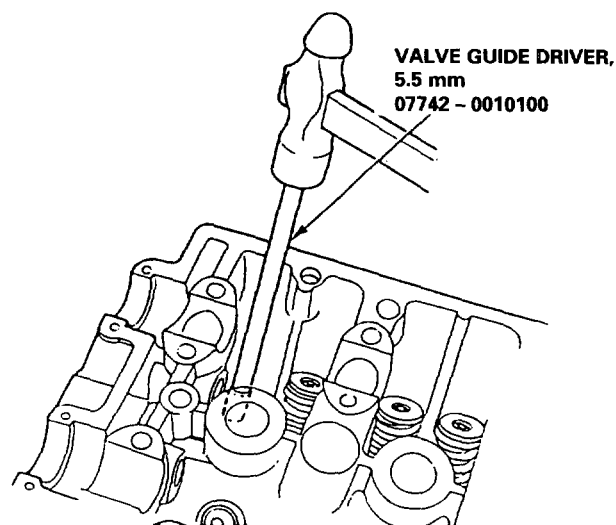
NOTE:

- For best results, heat cylinder head to 150°C (300°F) before removing or installing guides.
- It may be necessary to use an air hammer to remove some valve guides.

1. Drive the valve guide out from the bottom of the cylinder head.



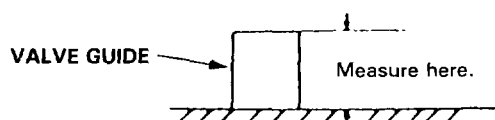
2. Drive in a new valve guide to the specified depth.



Valve Guide Installed Height:

Intake: 12.55 - 13.05 mm (0.494 - 0.514 in)

Exhaust: 12.55 - 13.05 mm (0.494 - 0.514 in)



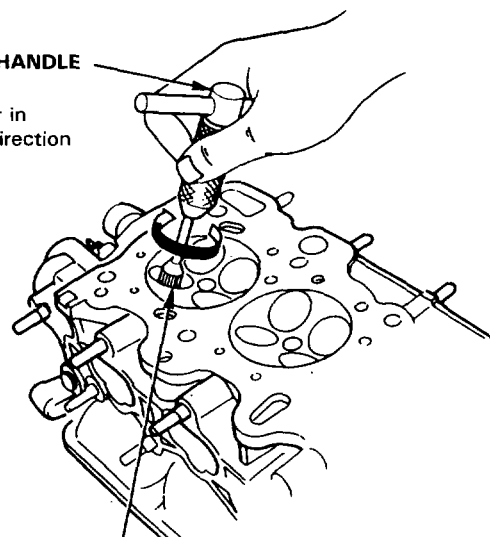
Reaming

NOTE: For new valve guides only.

1. Coat both reamer and valve guide with cutting oil.
 2. Rotate the reamer clockwise the full length of the valve guide bore.
 3. Continue to rotate the reamer clockwise while removing it from the bore.
 4. Thoroughly wash the guide in detergent and water to remove any cutting residue.
 5. Check clearance with a valve (see page 6-74).
- Verify that the valve slides in the intake and exhaust valve guides without exerting pressure.

REAMER HANDLE

Turn reamer in
clockwise direction
only.



Valves, Valve Springs and Valve Seals

Installation

1. Insert valves in to valve guides, coat valve stems with engine oil before inserting the valves.

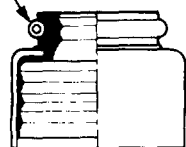
NOTE: Check valves move up and down smoothly.

2. Install the spring seats on the cylinder head.

3. Install the valve seals using the special tool.

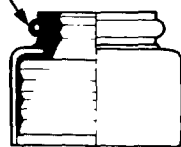
NOTE: Exhaust and intake valve seal are not interchangeable.

WHITE
SPRING

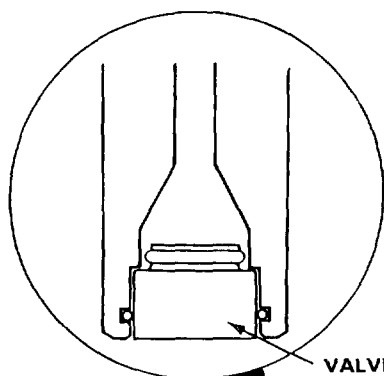


INTAKE VALVE SEAL

BLACK
SPRING

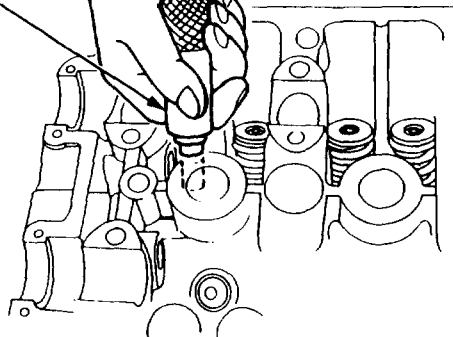


EXHAUST VALVE SEAL



VALVE SEAL
Replace.

STEM SEAL DRIVER,
07PAD - 0010000
NOTE: Use 5.5 mm side.

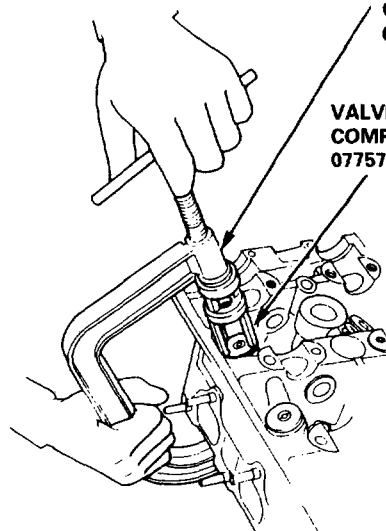


4. Install the valve spring and valve retainer, then install the valve spring compressor. Compress the spring, and install the valve keepers.

NOTE: Place the end of valve spring with closely wound coils toward the cylinder head.

VALVE SPRING
COMPRESSOR
07757 - 0010000

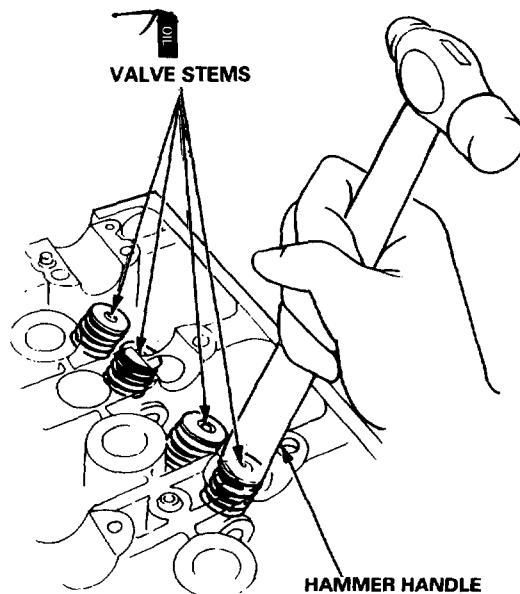
VALVE SPRING
COMPRESSOR ATTACHMENT
07757 - PJ10100



5. Lightly tap the end of each valve stem two or three times with the wooden handle of a hammer to ensure proper seating of valve and valve keepers.

NOTE: Tap the valve stem only along its so you do not bend the stem.

VALVE STEMS



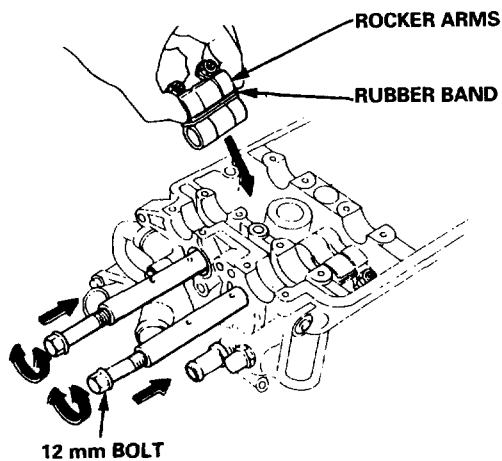
HAMMER HANDLE



Installation

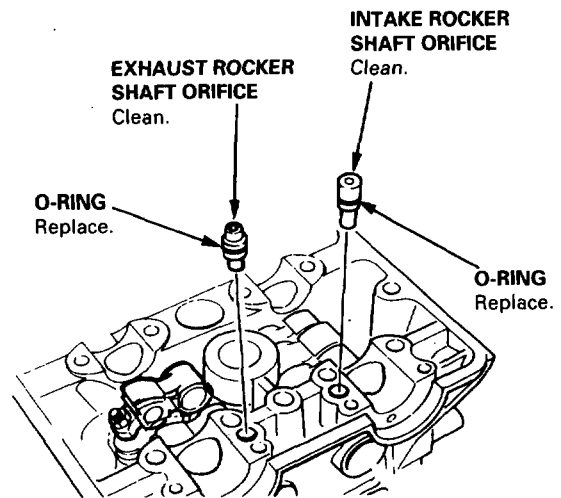
1. Install the rocker arms in the reverse order of removal:
 - Valve adjusting locknuts should be loosened and adjusting screw backed off before installation.
 - The component parts must be reinstalled in the original locations.
2. Install the lost motion assemblies.
3. Install the rocker arms while inserting the rocker arm shaft into the cylinder head.

NOTE: Remove the rubber band after installing the rocker arms.



4. Clean and install the rocker shaft orifices with new O-rings. If the holes in the rocker arm shaft and cylinder head are not in line with each other, screw a 12 mm bolt into the rocker arm shaft and rotate the shaft.

NOTE: The shapes of the rocker shaft orifices for the intake and exhaust are different. The orifices must be installed in the original locations.



Cylinder Head

Installation

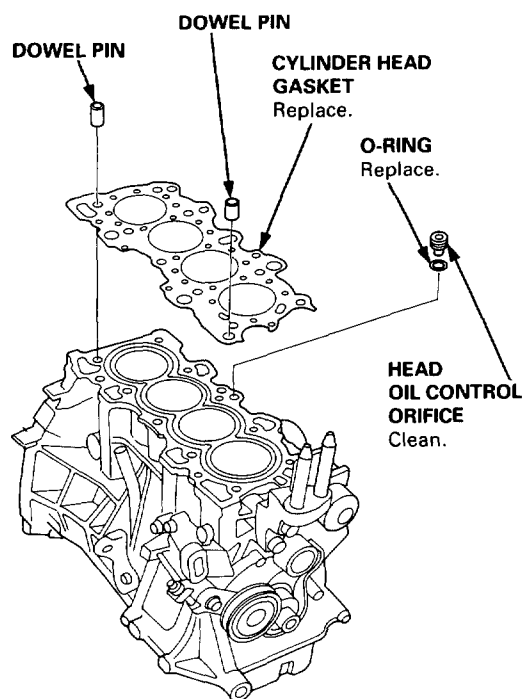
Install the cylinder head in the reverse order of removal:

NOTE:

- Always use a new head and manifold gasket.
- The cylinder head gasket is a metal gasket. Take care not to bend it.
- Rotate the crankshaft, set the No. 1 piston at TDC (see page 6-58).
- Do not use the middle cover and lower cover for storing items disassembled.
- Clean the middle cover and lower cover before installation.
- Replace the washer when damaged or deteriorated.

1. Install the cylinder head gasket, dowel pins and the head oil control orifice on the cylinder head.

NOTE: Clean the oil control orifice when installing.



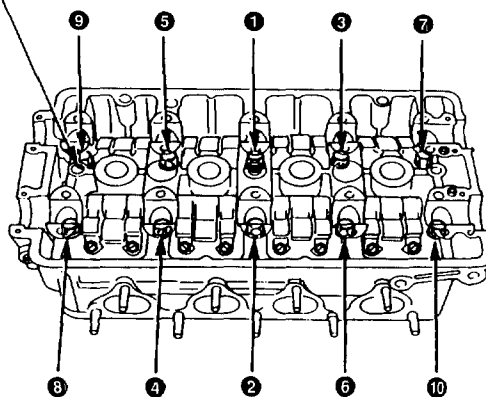
2. Tighten cylinder head bolts in two steps. In the first step, tighten all bolts in sequence to about 29 N·m (3.0 kgf·m, 22 lbf·ft). In the final step, tighten in same sequence to 85 N·m (8.7 kgf·m, 63 lbf·ft).

NOTE:

- Apply clean engine oil to the bolt threads and under the bolt head.
- We recommend using a beam-type torque wrench. When using a preset-type torque wrench, be sure to tighten slowly and not to overtighten.
- If a bolt makes any noise while you are torquing it, loosen the bolt, and retighten it from the 1st step.

CYLINDER HEAD BOLT TORQUE SEQUENCE

11 x 1.5 mm
83 N·m (8.5 kgf·m, 61 lbf·ft)



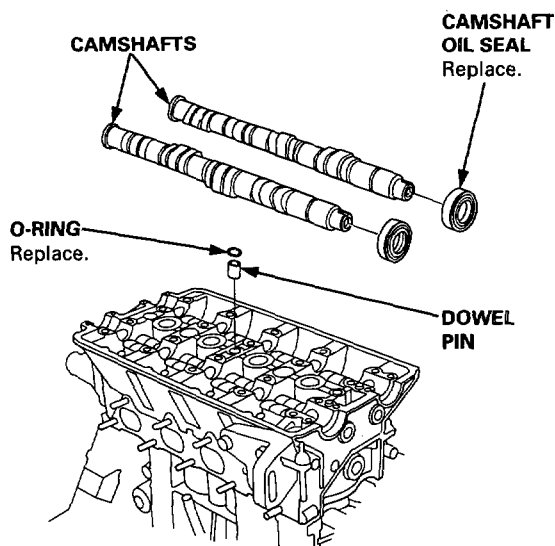
3. Install the intake manifold and tighten the nuts in a crisscross pattern in two or three steps, beginning with the inner nuts.
 - Always use a new intake manifold gasket.
4. Install the exhaust manifold and tighten the new self-locking nuts in a crisscross pattern in two or three steps, beginning with the inner nuts.
 - Always use a new exhaust manifold gasket.



5. Install the camshaft and camshaft oil seals.

NOTE:

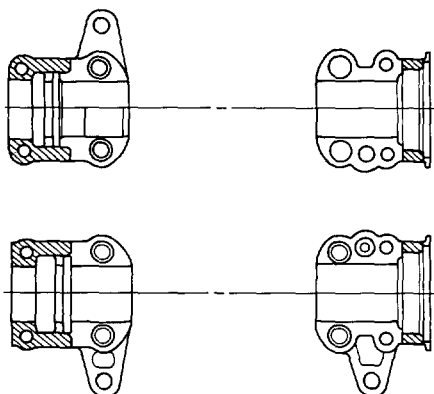
- Install the camshafts with keyway facing up.
- Install the oil seal with the spring side facing in.
- The oil seal housing surface should be dry.
- Set the O-ring and dowel pin in the oil passage of the No. 3 camshaft holder.



6. Apply liquid gasket (P/N 08C70 - X0134SEB, 08C70 - X0231SEB, 08C70 - K0234MEB or 08C70 - K0334MEB) to the head mating surfaces of the No. 1 and No. 5 camshaft holders on both the intake and exhaust side.

NOTE: Clean and dry the cylinder head mating surfaces before applying liquid gasket.

— Apply liquid gasket to the shaded areas.

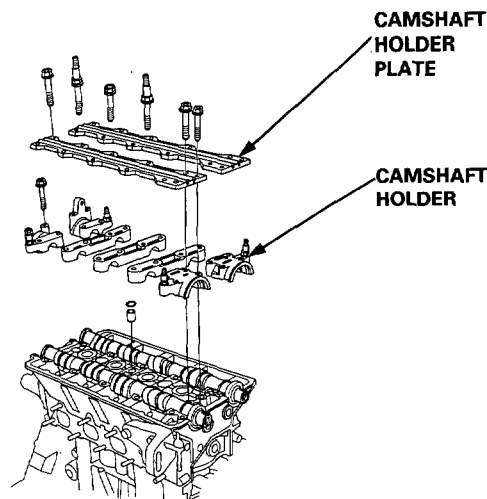


No. 5

No. 1

7. Install the camshaft holders and camshaft holder plate.

NOTE: The arrows marked on the camshaft holders should point to the timing belt.



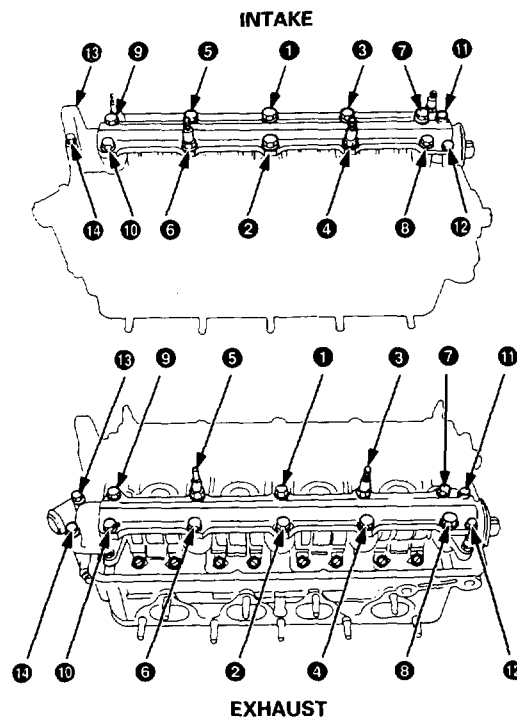
8. Tighten each bolt two turns at a time in the sequence shown below.

NOTE: Wipe off the excess of liquid gasket from No. 1 and No. 5 camshaft holders with a shop towel.

① - ⑩: 8 x 1.25 mm 27 N·m (2.8 kgf·m, 20 lbf·ft)

Apply engine oil to the threads.

⑪ - ⑭: 6 x 1.0 mm 9.8 N·m (1.0 kgf·m, 7.2 lbf·ft)



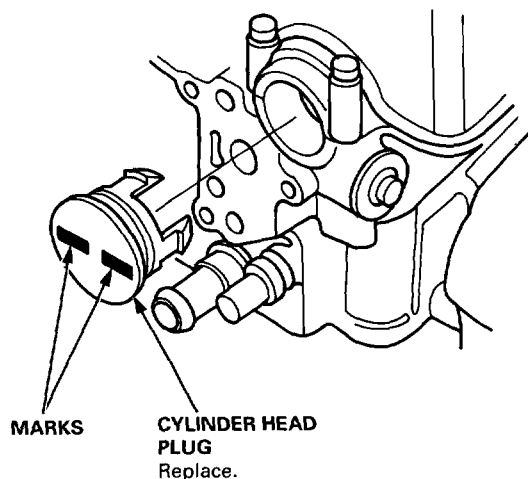
9. Install the back cover and camshaft pulleys.

(cont'd)

Cylinder Head

Installation (cont'd)

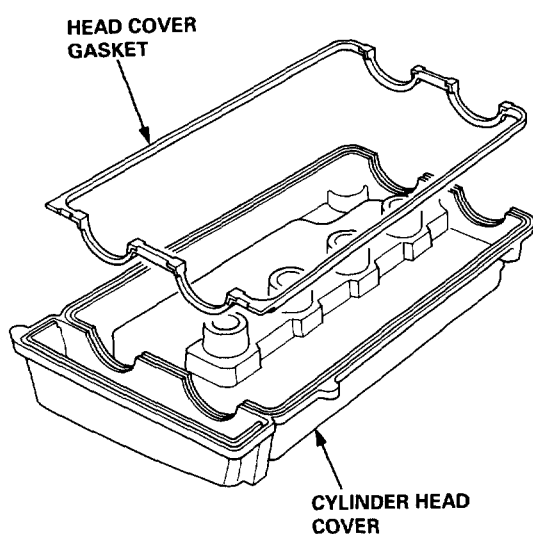
10. Align the marks on the cylinder head plug to the cylinder head upper surface, then install the cylinder head plug in the cylinder head to the end.



11. Install the timing belt (see page 6-58).
12. Adjust the valve clearance (see page 6-52).
13. Install the head cover gasket in the groove of the cylinder head cover. Seat the recesses for the camshaft first, then work it into the groove around the outside edges.

NOTE:

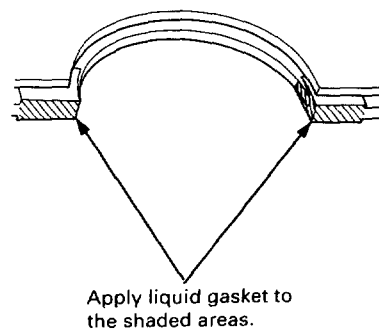
- Before installing the head cover gasket, thoroughly clean the head cover gasket and the groove.
- When installing, make sure the head cover gasket is seated securely in the corners of the recesses with no gap.



14. Apply liquid gasket to the head cover gasket at the eight corners of the recesses.

NOTE:

- Use liquid gasket, Part No. 08C70 - X0134SEB, 08C70 - X0231SEB, 08C70 - K0234MEB or 08C70 - M0334MEB.
- Check that the mating surfaces are clean and dry before applying liquid gasket.
- Do not install the parts if five minutes or more have elapsed since applying liquid gasket. Instead, reapply liquid gasket after removing old residue.
- After assembly, wait at least 30 minutes before filling the engine with oil.



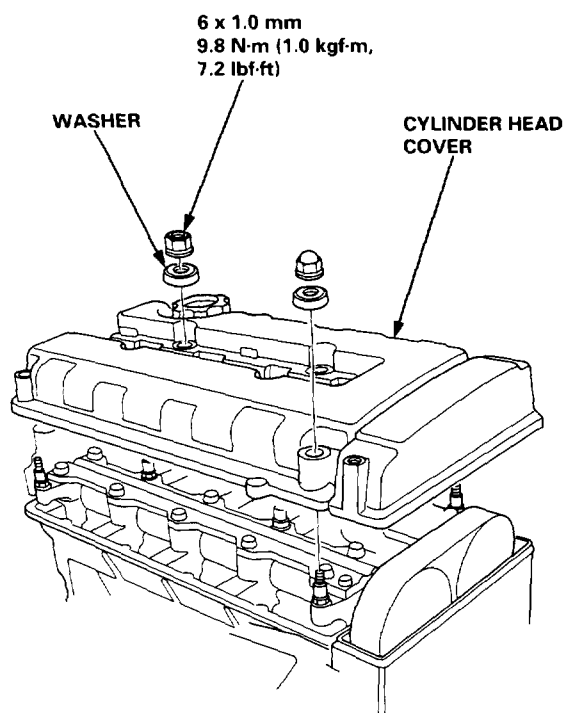


15. When installing the cylinder head cover, hold the head cover gasket in the groove by placing your fingers on the camshaft holder contacting surfaces (top of the semicircles).

Once the cylinder head cover is on the cylinder head, slide the cover slightly back and forth to seat the head cover gasket.

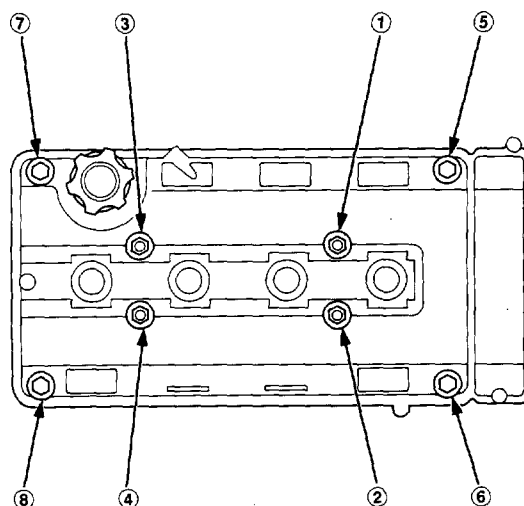
NOTE:

- Before installing the cylinder head cover, clean the cylinder head contacting surfaces using a shop towel.
- Do not touch the parts where liquid gasket was applied.
- Replace the washer when damaged or deteriorated.



16. Tighten the nuts in two or three steps. In the final step, tighten all nuts, in sequence, to 9.8 N·m (1.0 kgf·m, 7.2 lbf·ft).

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



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

Engine Block

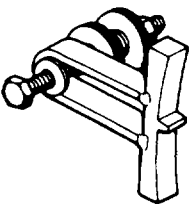
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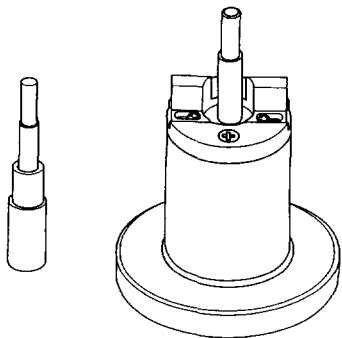


Special Tools

Ref. No.	Tool Number	Description	Qty	Remark
①	07LAB – PV00100	Ring Gear Holder	1	
②	07PAF – 0010000	Piston Pin Assembly Tool Set	1	
②-1	07PAF – 0010650	Pilot Collar, O.D. 19 mm	1	
②-2	07PAF – 0010670	Pilot Collar, O.D. 21 mm	1	
③	07749 – 0010000	Handle Driver	1	
④	07948 – SB00101	Driver Attachment, 96 mm	1	



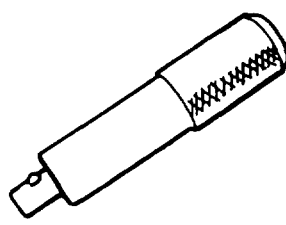
①



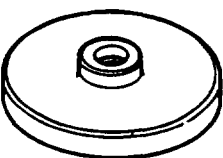
②



②-1, ②-2



③



④



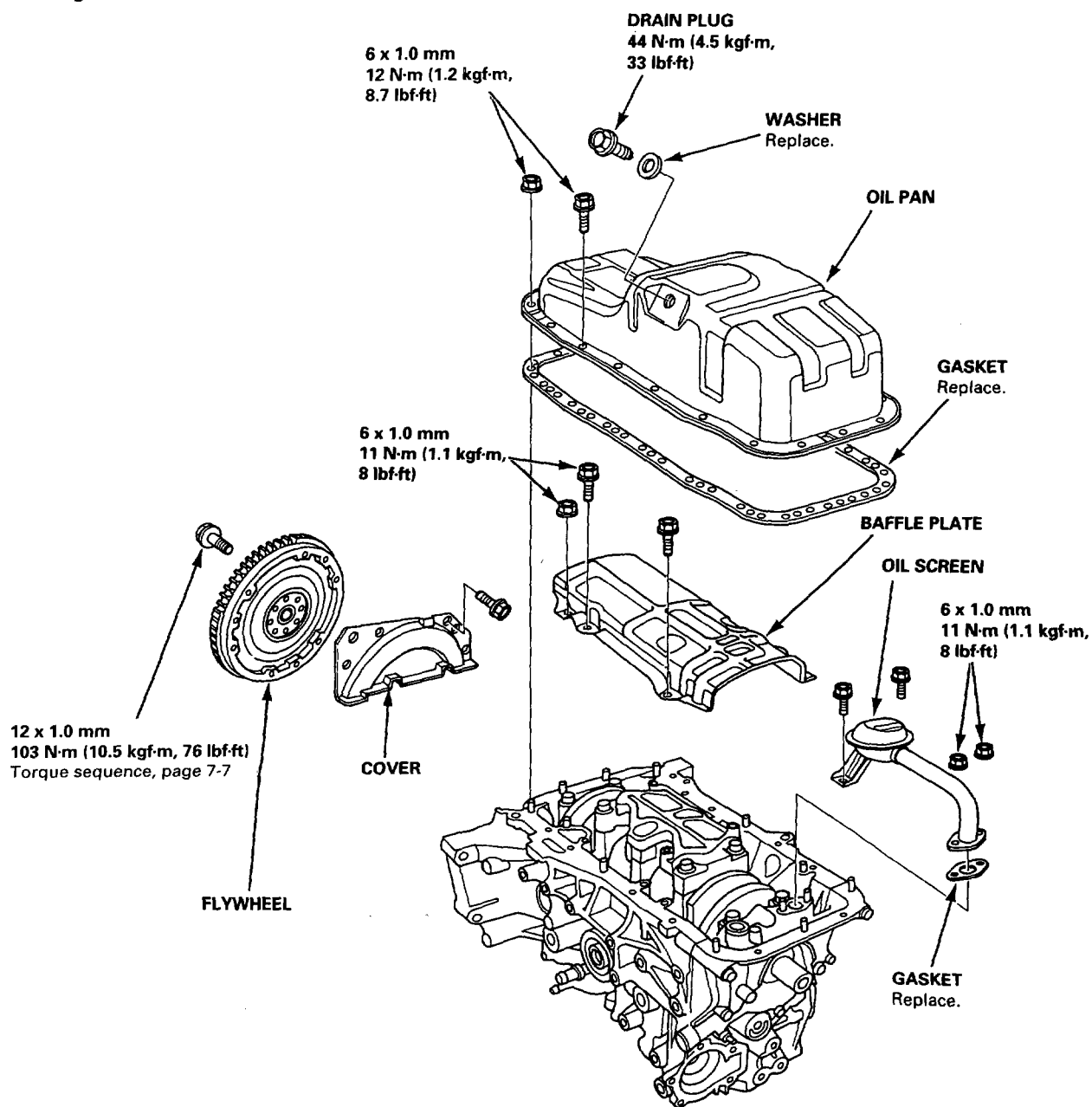
NOTE:

- Apply liquid gasket to the mating surfaces of the right side cover and oil pump housing before installing them.
- Use liquid gasket, part No. 08C70 – X0134SEB, 08C70 – X0231SEB, 08C70 – K0234MEB or 08C70 – K0334MEB.
- Clean the oil pan gasket mating surfaces before installing it.



Lubricate all internal parts with engine oil during reassembly.

B18C4 engine:

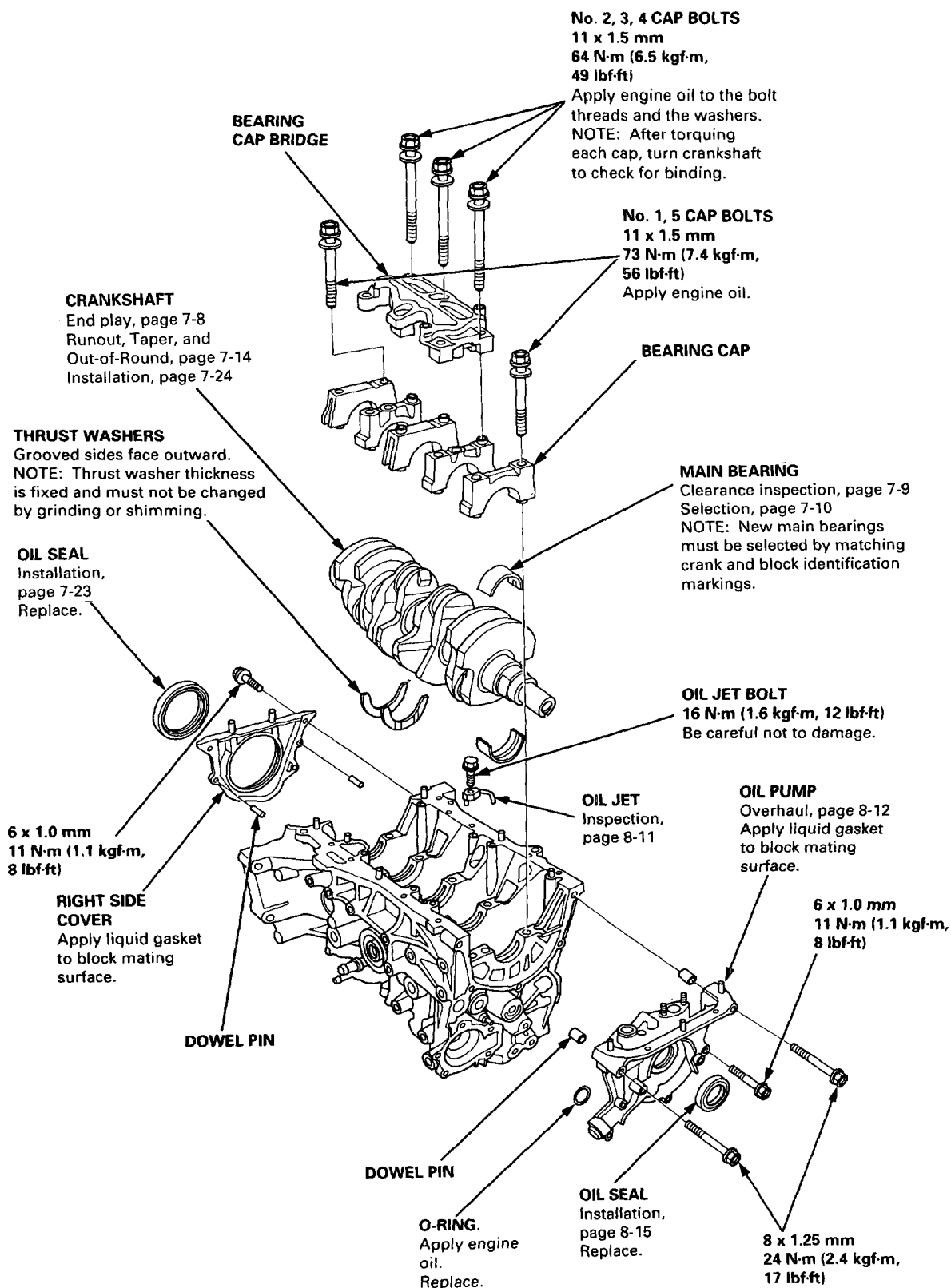


(cont'd)

Illustrated Index

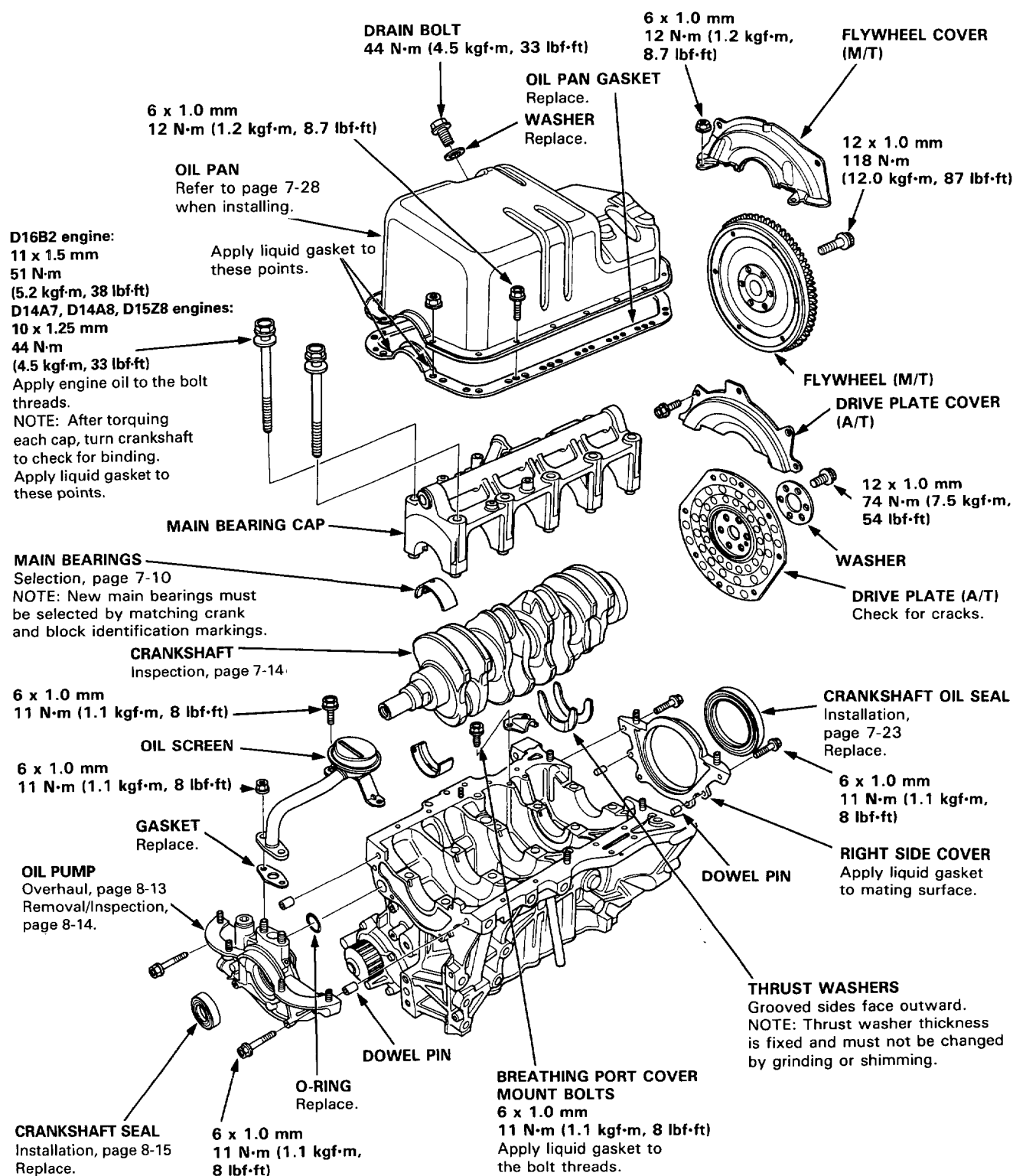
(cont'd)

B18C4 engine:





Except B18C4 engine:



(cont'd)

Illustrated Index

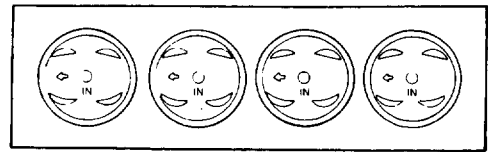
(cont'd)

NOTE: New rod bearings must be selected by matching connecting rod assembly and crankshaft identification markings (see page 7-11).

 Lubricate all internal parts with engine oil during reassembly.

PISTON INSTALLATION DIRECTION:

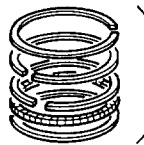
EXHAUST



INTAKE

PISTON PIN

Removal, page 7-17
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PISTON RINGS

Replacement, page 7-21
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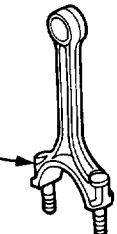
PISTON

Inspection, page 7-15

NOTE: Before removing piston, inspect the top of the cylinder bore for carbon build-up or ridge. Remove ridge if necessary, page 7-13

CONNECTING ROD

End play, page 7-8
Selection, page 7-18

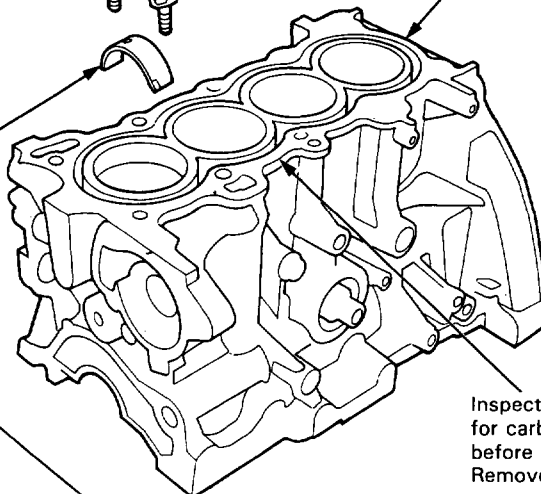


ENGINE BLOCK

Cylinder bore inspection, page 7-16
Warpage inspection, page 7-16
Cylinder bore honing, page 7-17

CONNECTING ROD BEARINGS

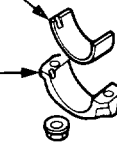
Clearance, page 7-11
Selection, page 7-11



Inspect top of each cylinder bore for carbon build-up or ridge before removing piston.
Remove ridge if necessary, page 7-13

CONNECTING ROD BEARING CAP

Installation, page 7-24
NOTE: Install caps so the bearing recess is on the same side as the recess in the rod.



CONNECTING ROD CAP NUT

B18C4 engine:
9 x 0.75 mm
44 N·m (4.5 kgf·m, 33 lbf·ft)

Except B18C4 engine:
8 x 0.75 mm
31 N·m (3.2 kgf·m, 23 lbf·ft)

Apply engine oil to the bolt threads.
NOTE: After torquing each bearing cap, rotate crankshaft to check for binding.

Flywheel and Drive Plate

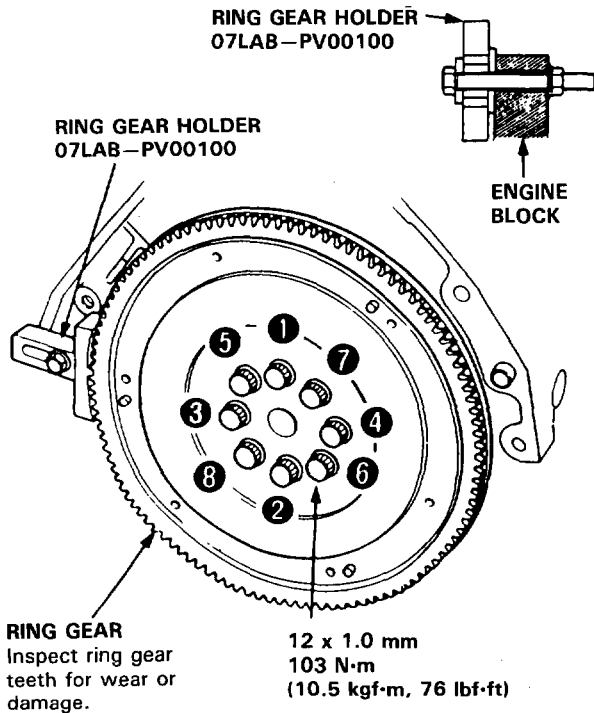


Replacement

Manual Transmission:

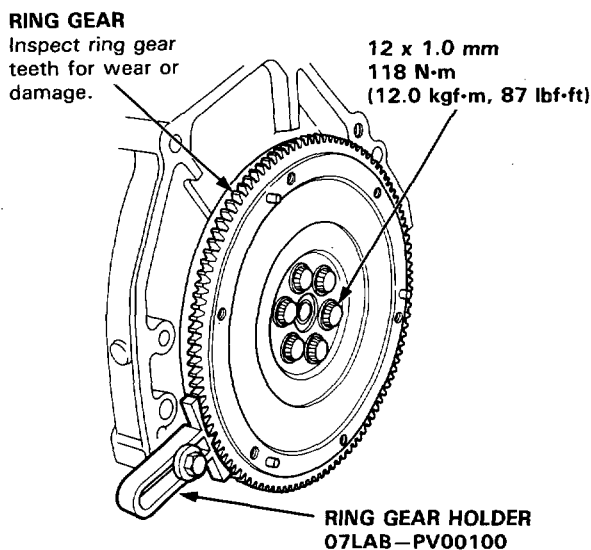
B18C4 engine:

Remove the eight flywheel bolts, then separate the flywheel from the crankshaft flange. After installation, tighten the bolts in the sequence shown.



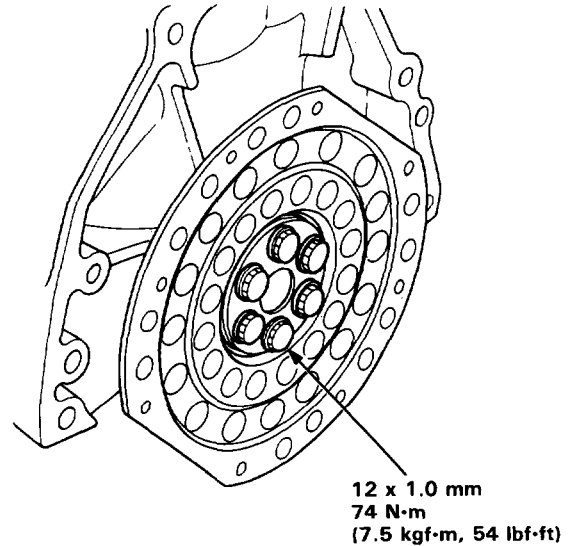
Except B18C4 engine:

Remove the six flywheel bolts, then separate the flywheel from the crankshaft flange. After installation, tighten the bolts in a crisscross pattern.



Automatic Transmission:

Remove the six drive plate bolts, then separate the drive plate from the crankshaft flange. After installation, tighten the bolts in a crisscross pattern.



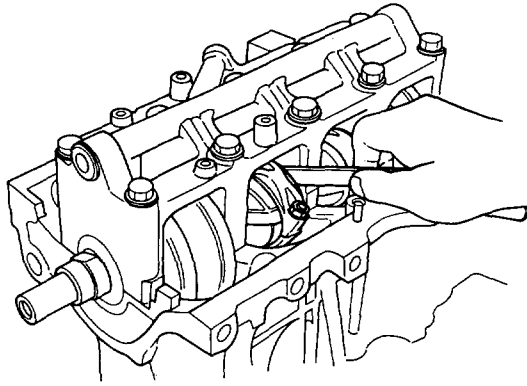
Connecting Rod and Crankshaft

End Play

Connecting Rod End Play:

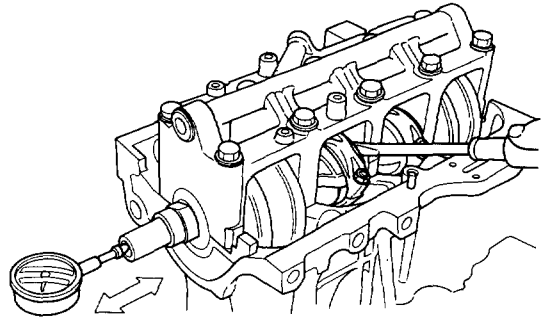
Standard (New): 0.15 – 0.30 mm
(0.006 – 0.012 in)

Service Limit: 0.40 mm (0.016 in)



- If out-of-tolerance, install a new connecting rod.
- If still out-of-tolerance, replace the crankshaft (pages 7-12 and 7-24).

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

- If end play is excessive, inspect the thrust washers and thrust surface on the crankshaft. Replace parts as necessary.

NOTE: Thrust washer thickness is fixed and must not be changed either by grinding or shimming. Thrust washers are installed with grooved sides facing outward.



Clearance

1. To check main bearing-to-journal oil clearance, remove the main caps and bearing halves.
2. Clean each main journal and bearing half with a clean shop towel.
3. Place one strip of plastigage across each main journal.

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

4. Reinstall the bearings and caps, then torque the bolts.

1st step: 25 N·m (2.5 kgf·m, 18 lbf·ft)

Final step:

B18C4 engine:

No. 1, 5 cap bolts 73 N·m (7.4 kgf·m, 56 lbf·ft)

No. 2, 3, 4 cap bolts 64 N·m (6.5 kgf·m, 49 lbf·ft)

D16B2 engine:

51 N·m (5.2 kgf·m, 38 lbf·ft)

D14A7, D14A8, D15Z8 engines:

44 N·m (4.5 kgf·m, 33 lbf·ft)

NOTE: Do not rotate the crankshaft during inspection.

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

Main Bearing-to-Journal Oil Clearance:

B18C4 engine:

Standard (New):

No. 1, 2, 4, 5 Journals:

0.024 – 0.042 mm (0.0009 – 0.0017 in)

No. 3 Journal:

0.030 – 0.048 mm (0.0012 – 0.0019 in)

Service Limit: 0.06 mm (0.002 in)

D16B2 engine:

Standard (New):

No. 1, 5 Journals:

0.018 – 0.036 mm (0.0007 – 0.0014 in)

No. 2, 3, 4 Journals:

0.024 – 0.042 mm (0.0009 – 0.0017 in)

Service Limit: 0.05 mm (0.002 in)

D14A7, D14A8, D15Z8 engines:

Standard (New):

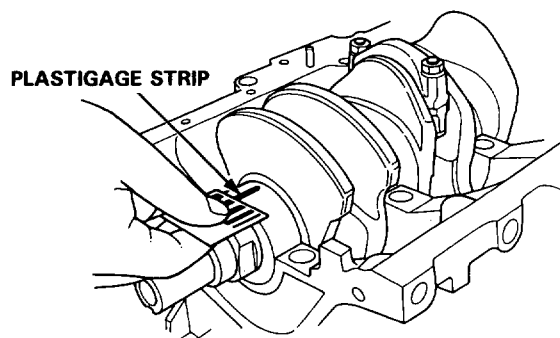
No. 1, 5 Journals:

0.018 – 0.036 mm (0.0007 – 0.0014 in)

No. 2, 3, 4 Journals:

0.020 – 0.038 mm (0.0008 – 0.0015 in)

Service Limit: 0.05 mm (0.002 in)



6. If the plastigage measures too wide or too narrow, (remove the engine if it's still in the car), remove the crankshaft, and remove the upper half of the bearing. Install a new, complete bearing with the same color code (select the color as shown on the next page), and recheck the clearance.
7. If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below that one), and check again.

NOTE: If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over.

Main Bearing

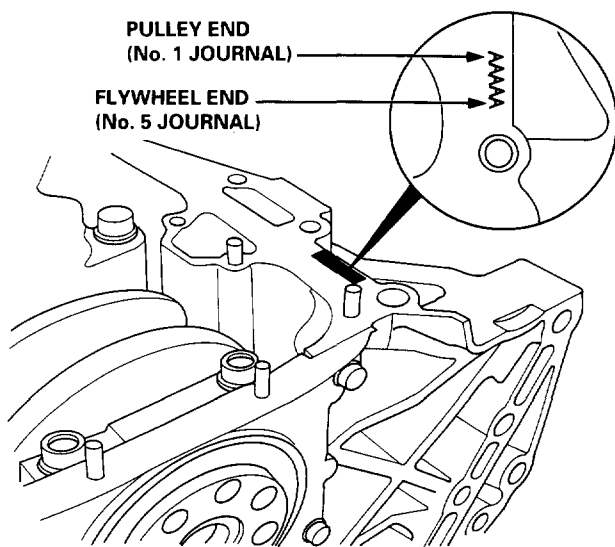
Selection

NOTE: If the codes are indecipherable because of an accumulation of dirt and dust, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.

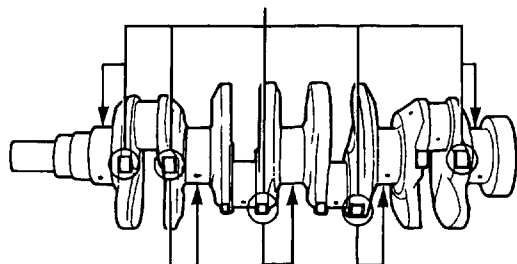
Crankshaft Bore Code Location

B18C4 engine:

Letters have been stamped on the end of the block as a code for the size of each of the 5 main journal bores. Use them, and the numbers or bars stamped on the crank (codes for main journal size), to choose the correct bearings.



Main Journal Code Locations (Numbers or Bars)



Bearing Identification

Color code is on the edge of the bearing.

→ Larger crank bore

A	B	C	D
---	---	---	---

→ Smaller bearing (thicker)

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

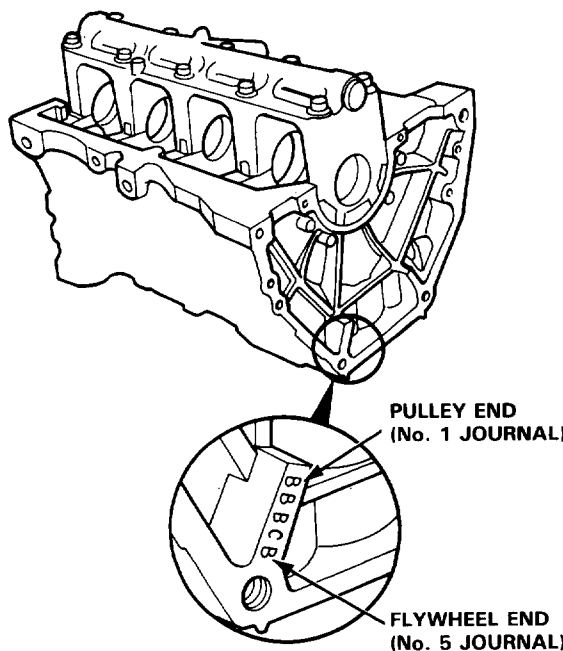
Smaller main journal

Smaller bearing (thicker)

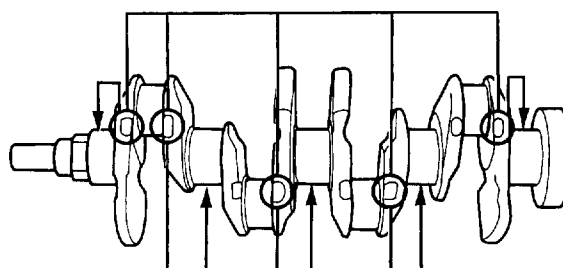
Red	Pink	Yellow	Green
Pink	Yellow	Green	Brown
Yellow	Green	Brown	Black
Green	Brown	Black	Blue

Except B18C4 engine:

Letters have been stamped on the end of the block as a code for the size of each of the 5 main journal bores. Use them, and the numbers stamped on the crankshaft (codes for main journal size), to choose the correct bearings.



Main Journal Code Location (Numbers)



Bearing Identification

Color code is → Larger crank bore on the edge of the bearing.

A	B	C	D
---	---	---	---

→ Smaller bearing (thicker)

1
2
3
4

Smaller main journal

Smaller bearing (thicker)

Red	Pink	Yellow	Green
Pink	Yellow	Green	Brown
Yellow	Green	Brown	Black
Green	Brown	Black	Blue

Connecting Rod Bearings



Clearance

1. Remove the connecting rod cap and bearing half.
2. Clean the crankshaft rod journal and bearing half with a clean shop towel.
3. Place the plastigage across the rod journal.
4. Reinstall the bearing half and cap, and torque the nuts.

Torque

B18C4 engine: 44 N·m (4.5 kgf·m, 33 lbf·ft)

Except B18C4 engine: 31 N·m (3.2 kgf·m, 23 lbf·ft)

NOTE: Do not rotate the crankshaft during inspection.

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

Connecting Rod Bearing-to-Journal Oil Clearance:

B18C4 engine:

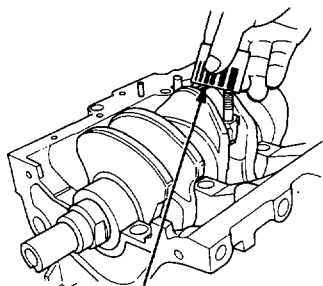
Standard (New): 0.032 – 0.050 mm
(0.0013 – 0.0020 in)

Service Limit: 0.06 mm (0.002 in)

Except B18C4 engine:

Standard (New): 0.020 – 0.038 mm
(0.0008 – 0.0015 in)

Service Limit: 0.05 mm (0.002 in)



PLASTIGAGE STRIP

6. If the plastigage measures too wide or too narrow, remove the upper half of the bearing, install a new, complete bearing with the same color code (select the color as shown in the right column), and recheck the clearance.
7. If the plastigage shows the clearance is still incorrect, try the next larger or smaller bearing (the color listed above or below that one), and check clearance again.

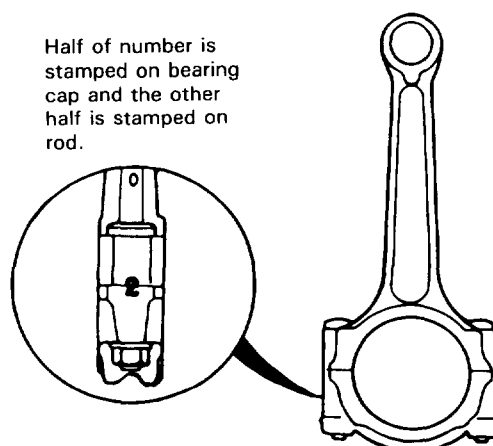
NOTE: If the proper clearance cannot be obtained by using the appropriate larger or smaller bearings, replace the crankshaft and start over.

Selection

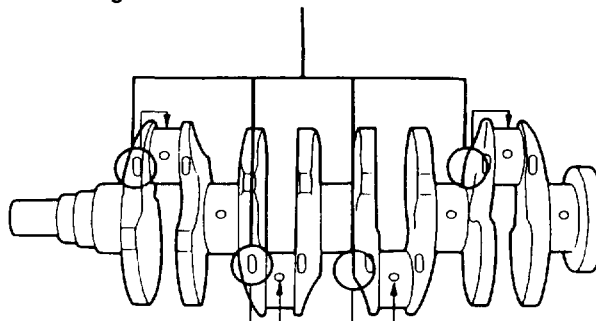
NOTE: If the codes are indecipherable because of an accumulation of dirt and dust, do not scrub them with a wire brush or scraper. Clean them only with solvent or detergent.

Connecting Rod Code Location

Numbers have been stamped on the side of each connecting rod as a code for the size of the big end. Use them, and the letters stamped on the crankshaft (codes for rod journal size), to choose the correct bearings.



Connecting Rod Journal Code Locations (Letters)



Bearing Identification

Color code is on the _____ Larger big end bore edge of the bearing.

1	2	3	4
---	---	---	---

_____ Smaller bearing (thicker)

A or I
B or II
C or III
D or IIII

Smaller rod journal

Smaller bearing (thicker)

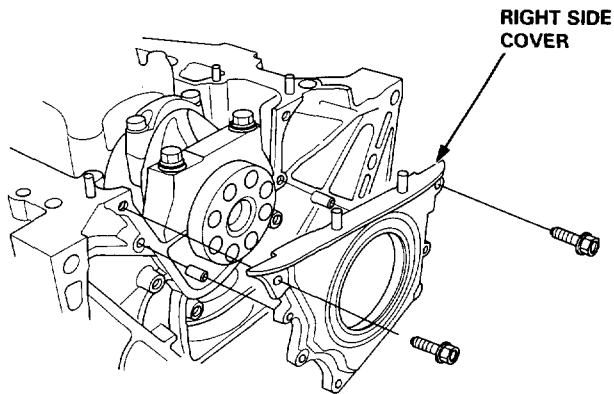
Red	Pink	Yellow	Green
Pink	Yellow	Green	Brown
Yellow	Green	Brown	Black
Green	Brown	Black	Blue

Pistons and Crankshaft

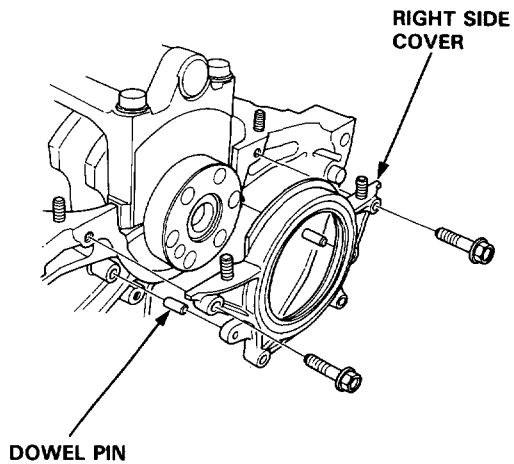
Removal

1. Remove the oil pan assembly.
2. Remove the right side cover.

B18C4 engine:

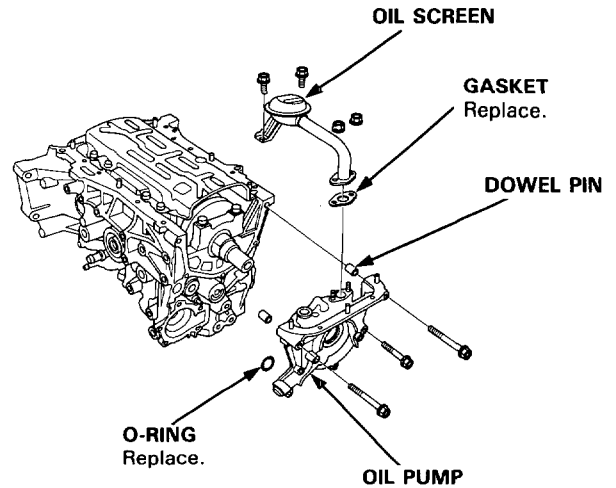


Except B18C4 engine:

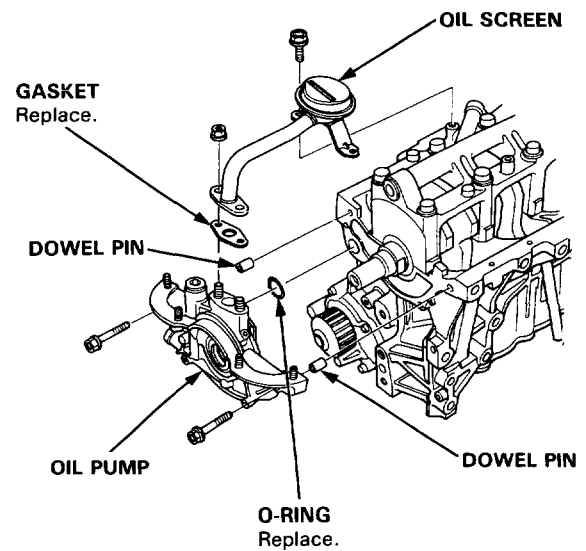


3. Remove the oil screen.
4. Remove the oil pump.

B18C4 engine:



Except B18C4 engine:

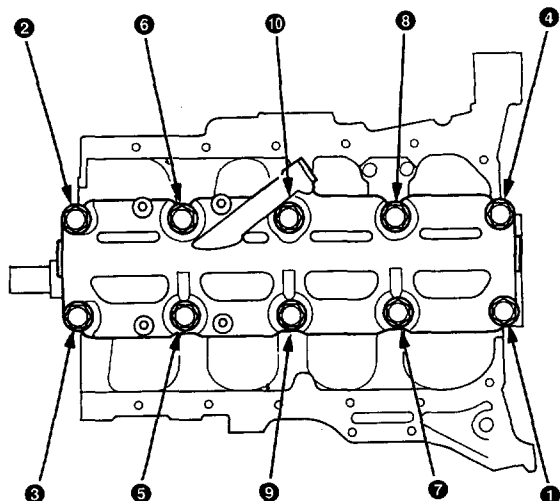


5. Remove the baffle plate (B18C4 engine).

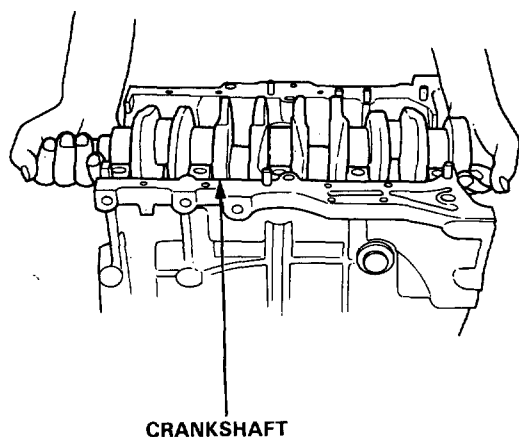


6. Remove the bolts. To prevent warpage, unscrew the bolts in sequence 1/3 turn at a time; repeat the sequence until all bolts are loosened, then remove the bearing cap.

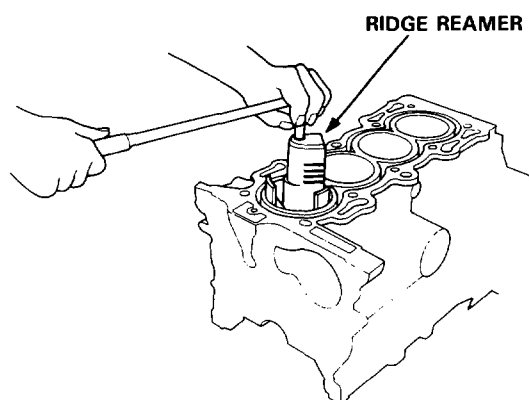
MAIN BEARING CAP BOLTS LOOSENING SEQUENCE



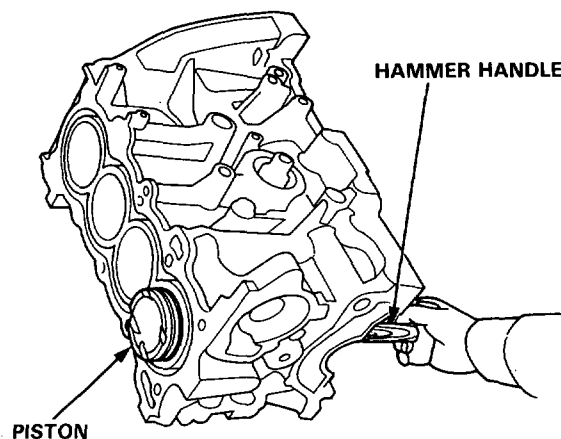
7. Remove the rod caps/bearings and main caps/bearings. Keep all caps/bearings in order.
8. Lift the crankshaft out of the engine, being careful not to damage journals.



9. Remove the upper bearing halves from the connecting rods and set them aside with their respective caps.
10. Reinstall the main caps and bearings on the engine in proper order.
11. If you can feel a ridge of metal or hard carbon around the top of each cylinder, remove it with a ridge reamer. Follow the reamer manufacturer's instructions. If the ridge is not removed, it may damage the pistons as they are pushed out.



12. Use the wooden handle of a hammer to drive the pistons out.



13. Reinstall the connecting rod bearings and caps after removing each piston/connecting rod assembly.
14. Mark each piston/connecting rod assembly with its cylinder number to avoid mixup on reassembly.

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

Crankshaft

Inspection

- Clean the crankshaft oil passages with pipe cleaners or a suitable brush.
- Check the keyway and threads.

Alignment

- Measure runout on all main journals to make sure the crank is not bent.
- The difference between measurements on each journal must not be more than the service limit.

Crankshaft Total Indicated Runout:

B18C4 engine:

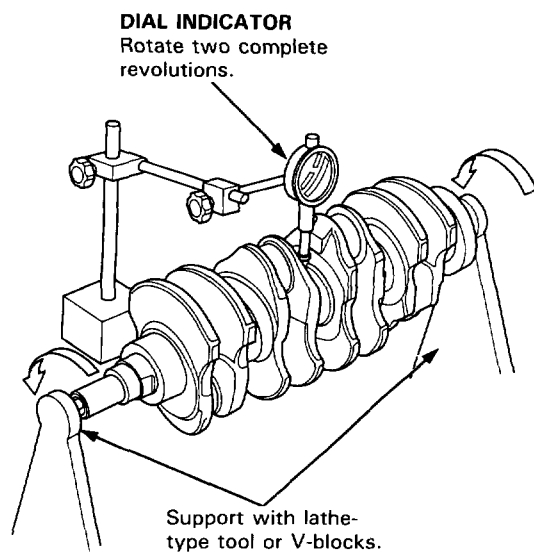
Standard (New): 0.020 mm (0.0008 in) max.

Service Limit: 0.030 mm (0.0012 in)

Except B18C4 engine:

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

Service Limit: 0.04 mm (0.002 in)



Out-of-Round and Taper

- Measure out-of-round at the middle of each rod and main journal in two places.
- The difference between measurements on each journal must not be more than the service limit.

Journal Out-of-Round:

B18C4 engine:

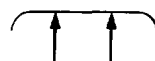
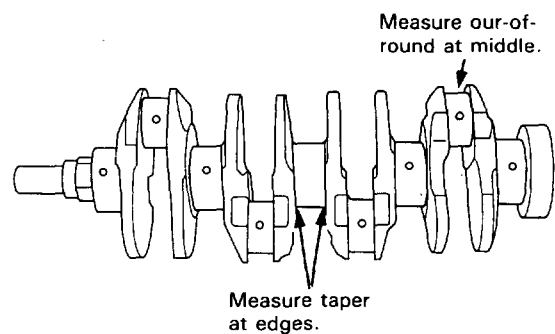
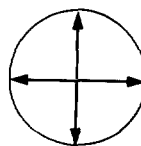
Standard (New): 0.0004 mm (0.0002 in) max.

Service Limit: 0.006 mm (0.0002 in)

Except B18C4 engine:

Standard (New): 0.0025 mm (0.0001 in) max.

Service Limit: 0.005 mm (0.0002 in)



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

Journal Taper:

B18C4 engine:

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

Service Limit: 0.010 mm (0.004 in)

Except B18C4 engine:

Standard (New): 0.0025 mm (0.0001 in) max.

Service Limit: 0.005 mm (0.0002 in)



Inspection

1. Check the piston for distortion or cracks.

NOTE: If cylinder is bored, an oversized piston must be used.

2. Measure piston diameter at a point A from bottom of skirt.

B18C4 engine:

A: 15 mm (0.6 in)

Except B18C4 engine:

A: 5 mm (0.2 in)

Piston Diameter:

B18C4 engine:

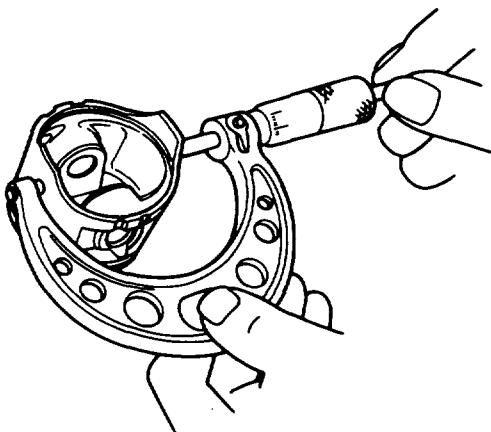
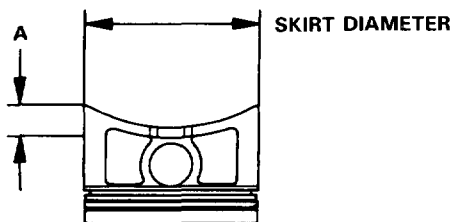
Standard (New): 80.980 – 80.990 mm
(3.1882 – 3.1886 in)

Service Limit: 80.970 mm (3.1878 in)

Except B18C4 engine:

Standard (New): 74.980 – 74.990 mm
(2.9520 – 2.9524 in)

Service Limit: 74.970 mm (2.9516 in)

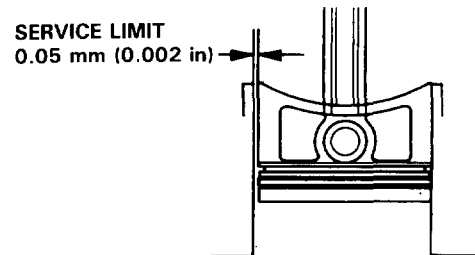


3. Calculate difference between cylinder bore diameter (see page 7-16) and piston diameter.

Piston-to-Cylinder Clearance

Standard (New): 0.010 – 0.040 mm
(0.0004 – 0.0016 in)

Service Limit: 0.05 mm (0.002 in)



If the clearance is near or exceeds the service limit, inspect the piston and cylinder block for excessive wear.

Oversize Piston Diameter

B18C4 engine:

0.25: 81.23 – 81.24 mm (3.1980 – 3.1984 in)

Except B18C4 engine:

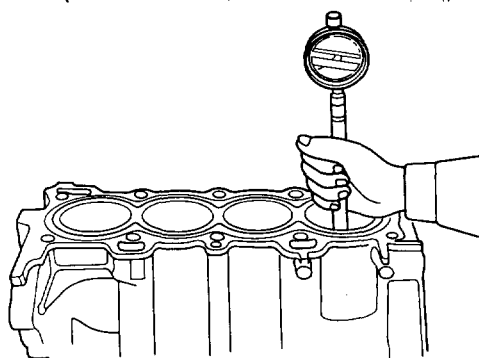
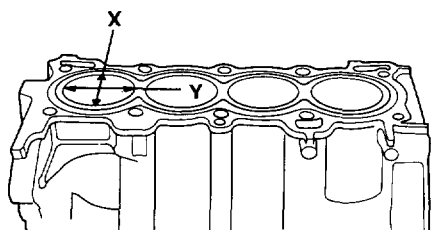
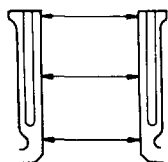
0.25: 75.23 – 75.24 mm (2.9618 – 2.9622 in)

0.50: 75.48 – 75.49 mm (2.9716 – 2.9720 in)

Cylinder Block

Inspection

1. Measure wear and taper in directions X and Y at three levels in each cylinder as shown.



Cylinder Bore Size:

B18C4 engine:

Standard (New): 81.00 – 81.02 mm
(3.189 – 3.190 in)

Service Limit: 81.07 mm (3.192 in)

Except B18C4 engine:

Standard (New): 75.00 – 75.02 mm
(2.953 – 2.954 in)

Service Limit: 75.07 mm (2.956 in)

Oversize

B18C4 engine:

0.25: 81.25 – 81.27 mm (3.199 – 3.200 in)

Except B18C4 engine:

0.25: 75.25 – 75.27 mm (2.9626 – 2.9634 in)

0.50: 75.50 – 75.52 mm (2.9724 – 2.9732 in)

Bore Taper

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

- If measurements in any cylinder are beyond Oversize Bore Service Limit, replace the block.

- If block is to be rebored, refer to Piston Clearance Inspection (see page 7-15) after reboring.

NOTE: Scored or scratched cylinder bores must be honed.

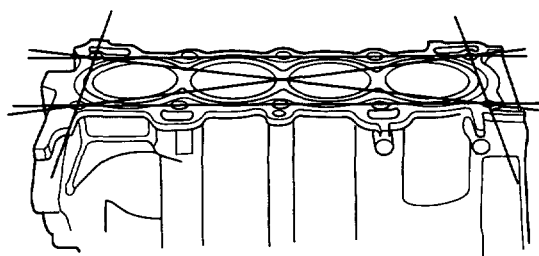
Reboring Limit:

B18C4 engine: 0.25 mm (0.01 in)

Except B18C4 engine: 0.50 mm (0.02 in)

2. Check the top of the block for warpage. Measure along the edges and across the center as shown.

SURFACES TO BE MEASURED



Engine Block Warpage:

B18C4 engine:

Standard (New): 0.05 mm (0.002 in) max.

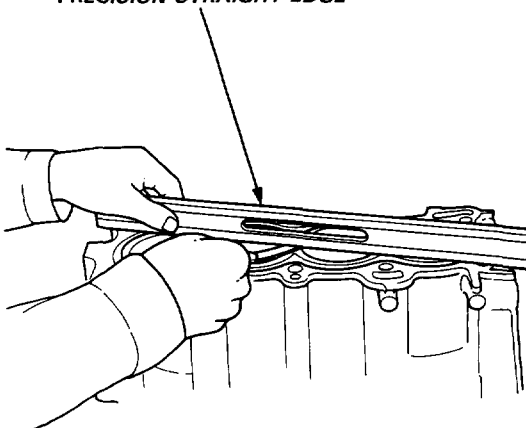
Service Limit: 0.08 mm (0.003 in)

Except B18C4 engine:

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

Service Limit: 0.10 mm (0.004 in)

PRECISION STRAIGHT EDGE



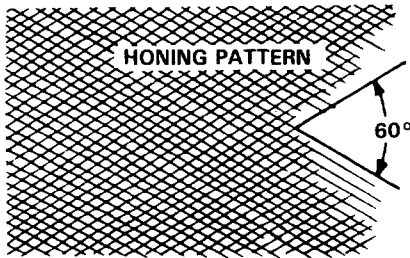


Bore Honing

1. Measure cylinder bores as shown on page 7-16. If the block is to be reused, hone the cylinders and remeasure the bores.
2. Hone cylinder bores with honing oil and a fine (400 grit) stone in a 60 degree cross-hatch pattern.

NOTE:

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

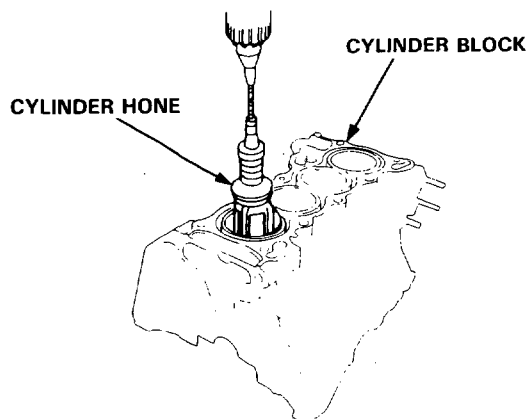


3. When honing is complete, thoroughly clean the engine block of all metal particles. Wash the cylinder bores with hot soapy water, then dry and oil immediately to prevent rusting.

NOTE: Never use solvent, it will only redistribute the grit on the cylinder walls.

4. If scoring or scratches are still present in cylinder bores after honing to the service limit, rebore the cylinder block.

NOTE: 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.



NOTE:

- After honing, clean the cylinder thoroughly with soapy water.
- Only a scored or scratched cylinder bore must be honed.

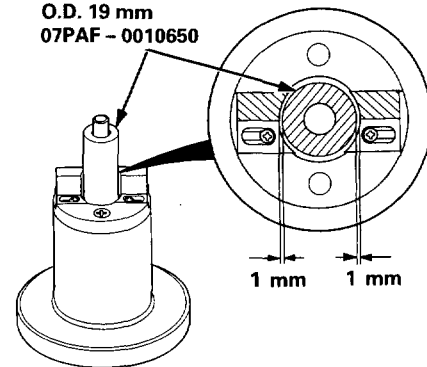
Removal

NOTE:

- Use the piston pin assembly tool set (No. 07PAF – 0010000) for removal of piston pins.
- Be sure to use the pilot collar of correct No. as designated.

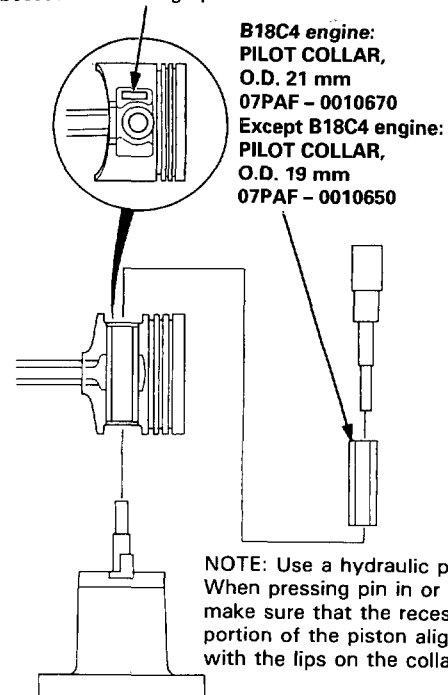
1. Set the special tools as shown.

B18C4 engine:
PILOT COLLAR,
O.D. 21 mm
07PAF – 0010670
Except B18C4 engine:
PILOT COLLAR,
O.D. 19 mm
07PAF – 0010650



2. Place the piston on the special tools and press the pin out using a hydraulic press.

Embossed mark facing up.



NOTE: Use a hydraulic press. When pressing pin in or out, make sure that the recessed portion of the piston aligns with the lips on the collar.

Connecting Rods

Selection

Each rod falls into one of four tolerance ranges (from 0 to + 0.024 mm (0 to + 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 (1, 2, 3, or 4) indicating the range.

You may find any combination of 1, 2, 3, or 4 in any engine.

Normal Bore Size:

D14A7, D14A8 engines:

43.0 mm (1.69 in)

D15Z8 engine:

45.0 mm (1.77 in)

Except D14A7, D14A8, D15Z8 engines:

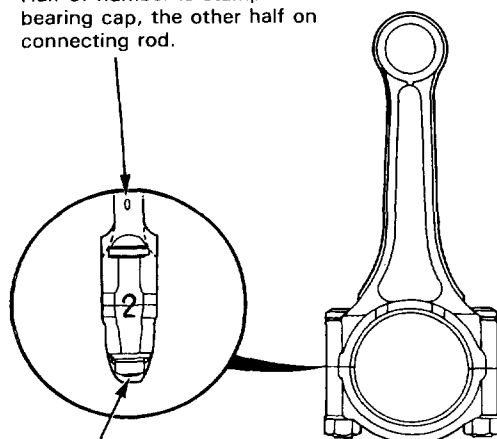
48.0 mm (1.89 in)

NOTE:

- Reference numbers are for big end bore size and do NOT indicate the position of the rod in the engine.
- Inspect connecting rod for cracks and heat damage.

CONNECTING ROD BORE REFERENCE NUMBER

Half of number is stamped on bearing cap, the other half on connecting rod.



Inspect bolts
and nuts for
stress cracks.

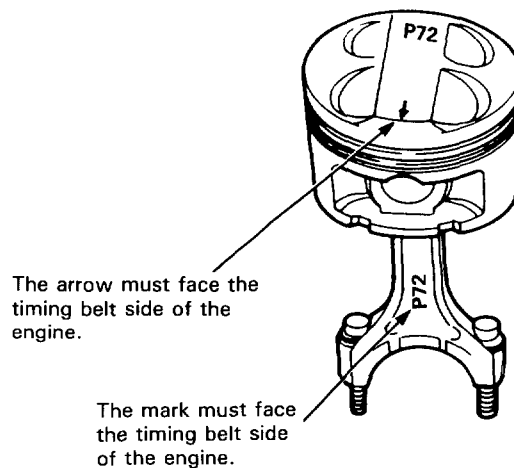
Piston Pins

Installation

B18C4 engine:

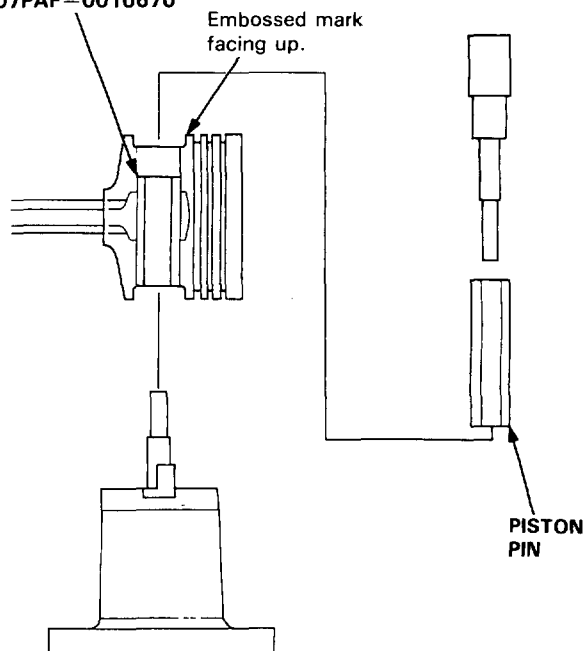
NOTE:

- Use the piston pin assembly tool set (No. 07PAF – 0010000) with a hydraulic press.
- Be sure to use the pilot collar of correct No. as designated.



1. Install the piston pin as shown.

**PILOT COLLAR,
O.D. 21 mm
07PAF—0010670**





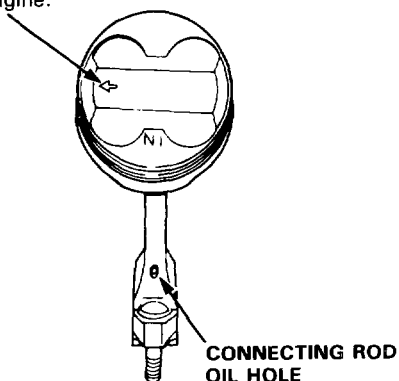
Inspection

Except B18C4 engine:

NOTE:

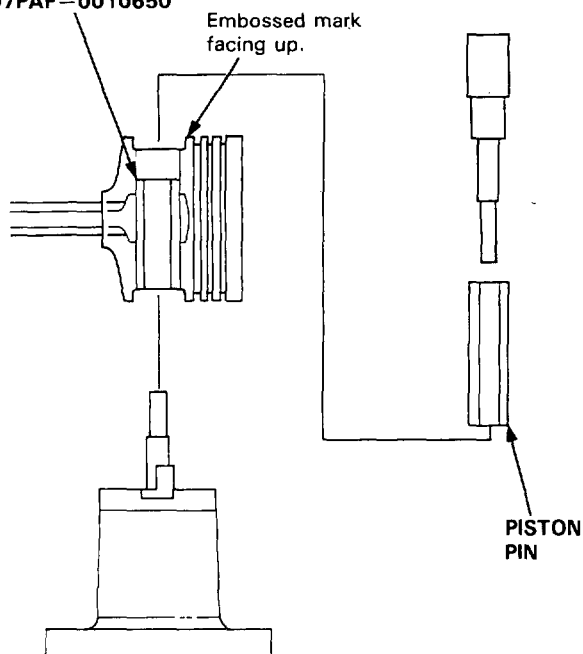
- Use the piston pin assembly tool set (No. 07PAF – 0010000) with a hydraulic press.
- Be sure to use the pilot collar of correct No. as designated.

The arrow must face the timing belt side of the engine and the connecting rod oil hole must face the rear of the engine.



1. Install the piston pin as shown.

PILOT COLLAR,
O.D. 19 mm
07PAF-0010650



NOTE: Install the assembled piston and rod with the oil hole facing the intake manifold.

1. Measure the diameter of the piston pin.

B18C4 engine:

Piston Pin Diameter:

Standard (New): 20.994 – 21.000 mm
(0.8265 – 0.8268 in)

Over size: 20.997 – 21.003 mm
(0.8267 – 0.8269 in)

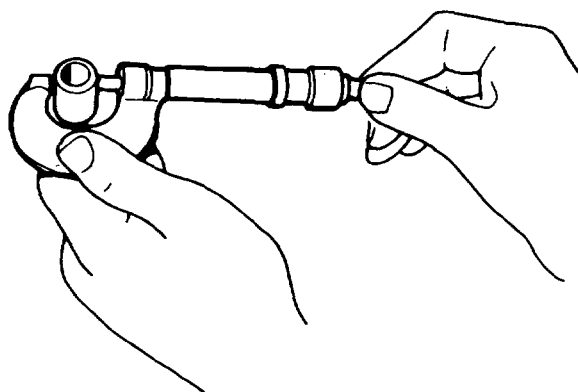
Except B18C4 engine:

Piston Pin Diameter:

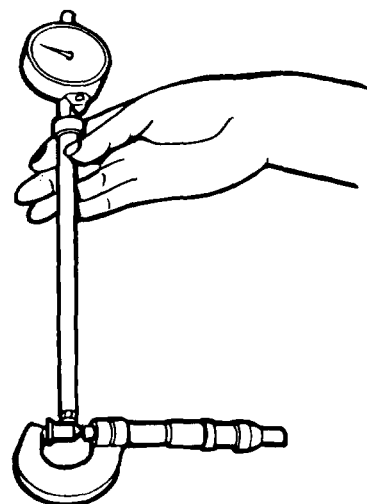
Standard (New): 18.994 – 19.000 mm
(0.7478 – 0.7480 in)

Over size: 18.997 – 19.003 mm
(0.7479 – 0.7481 in)

NOTE: All replacement piston pins are oversize.



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



(cont'd)

Piston Pins

Inspection (cont'd)

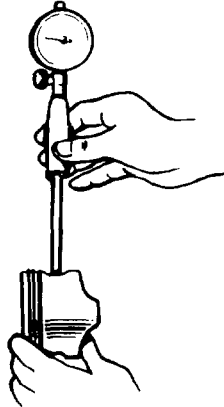
3. Measure the piston pin-to-piston clearance.

NOTE: Check the piston for distortion or cracks.

If the piston pin clearance is greater than 0.024 mm (0.0009 in), remeasure using an oversized piston pin.

Piston Pin-to-Piston Clearance:

Standard (New): 0.010 – 0.022 mm
(0.0004 – 0.0009 in)



4. Check the difference between piston pin diameter and connecting rod small end diameter.

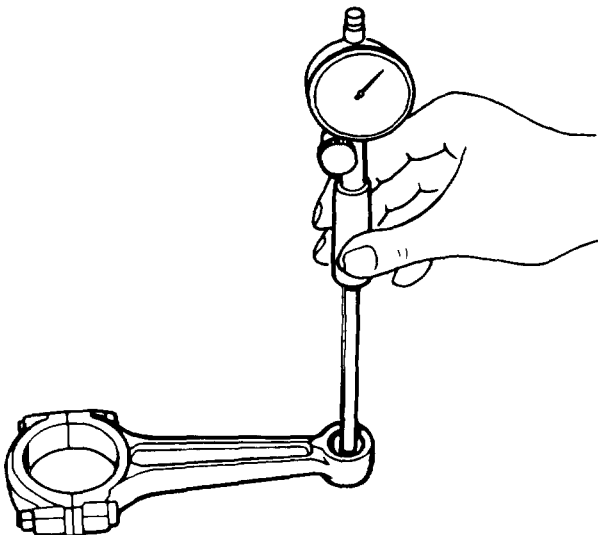
Piston Pin-to-Connecting Rod Interference:

B18C4 engine:

Standard (New): 0.017 – 0.032 mm
(0.0007 – 0.0013 in)

Except B18C4 engine:

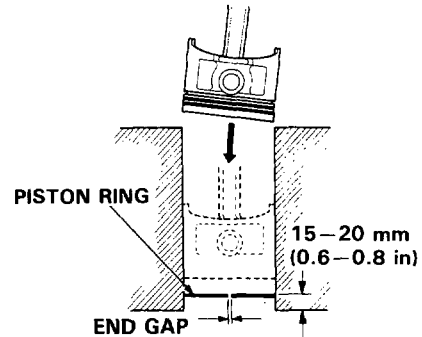
Standard (New): 0.014 – 0.040 mm
(0.0006 – 0.0016 in)



Piston Rings

End Gap

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



2. Measure the piston ring end-gap with a feeler gauge:

- If the gap is too small, check to see if you have the proper rings for your engine.
- If the gap is too large, recheck the cylinder bore diameter against the wear limits on page 7-15. If the bore is over the service limit, the cylinder block must be rebored.

Piston Ring End-Gap:

Top Ring

B18C4 engine:

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

Service Limit: 0.60 mm (0.024 in)

Except B18C4 engine:

Standard (New): 0.15 – 0.30 mm
(0.006 – 0.012 in)

Service Limit: 0.60 mm (0.024 in)

Second Ring

B18C4 engine:

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

Service Limit: 0.70 mm (0.028 in)

Except B18C4 engine:

Standard (New): 0.30 – 0.45 mm
(0.012 – 0.018 in)

Service Limit: 0.70 mm (0.028 in)



Replacement

Oil Ring

B18C4 engine:

Standard (New): 0.20 – 0.50 mm
(0.008 – 0.020 in)

Service Limit: 0.70 mm (0.028 in)

D15Z8, D16B2 engines:

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

Service Limit: 0.80 mm (0.031 in)

D14A7, D14A8 engines:

Standard (New): 0.20 – 0.80 mm
(0.008 – 0.031 in)

Service Limit: 0.90 mm (0.035 in)

1. Using a ring expander, remove the old piston rings.
2. Clean all ring grooves thoroughly.

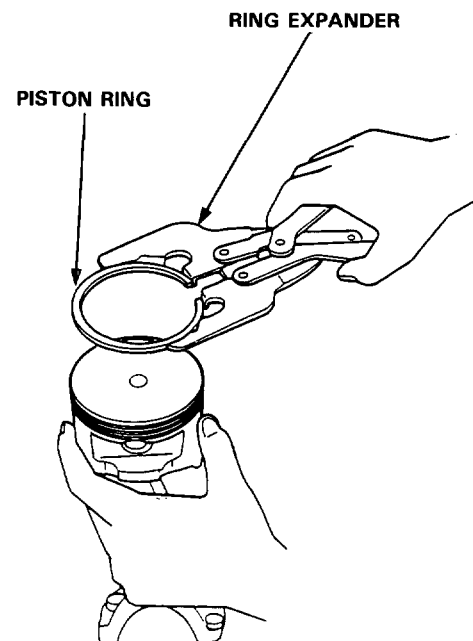
NOTE:

- Use a squared-off broken ring or ring groove cleaner with blade to fit piston grooves.
- Top ring groove is 1.2 mm (0.047 in) wide (D14A7, D14A8 engines) or 1.0 mm (0.039 in) wide (except D14A7, D14A8 engines).
- Second ring groove is 1.5 mm (0.059 in) wide (D14A7, D14A8 engines) or 1.2 mm (0.047 in) wide (except D14A7, D14A8 engines).
- Oil ring groove is 2.8 mm (0.11 in) wide.
- File down blade if necessary.
- Do not use a wire brush to clean ring lands, or cut ring lands deeper with cleaning tool.

3. Install new rings in proper sequence and position (see page 7-23).

NOTE:

- Do not reuse old piston rings.
- If piston is to be separated from connecting rod, do not install new rings yet.



Piston Rings

Ring-to-Groove Clearance

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

Top Ring Clearance

Standard (New):

B18C4 engine:

0.045 – 0.070 mm (0.0018 – 0.0028 in)

D15Z8, D16B2 engines:

0.035 – 0.060 mm (0.0014 – 0.0024 in)

D14A7, D14A8 engines:

0.030 – 0.060 mm (0.0012 – 0.0024 in)

Service Limit: 0.13 mm (0.005 in)

Second Ring Clearance

Standard (New):

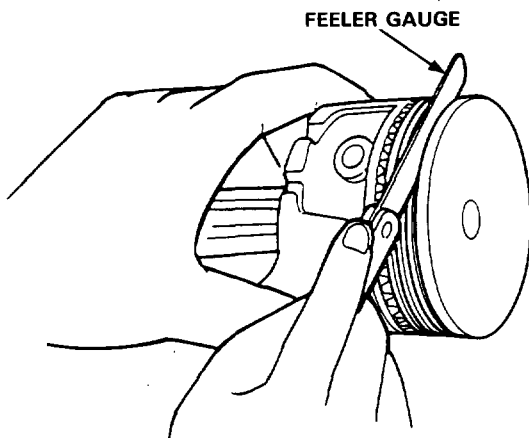
B18C4 engine:

0.040 – 0.065 mm (0.0016 – 0.0026 in)

Except B18C4 engine:

0.030 – 0.055 mm (0.0012 – 0.0022 in)

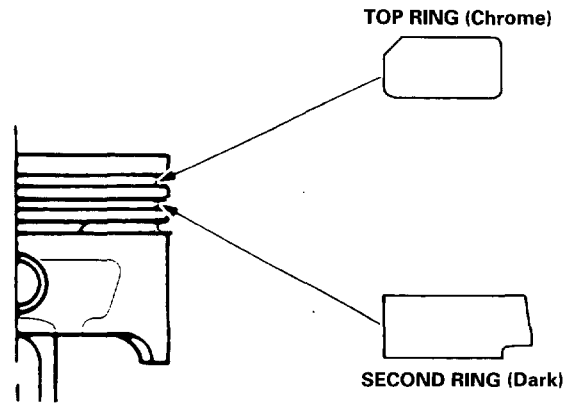
Service Limit: 0.13 mm (0.005 in)



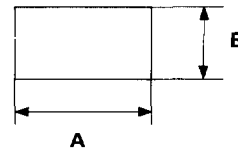
Alignment

1. Install the rings as shown.

NOTE: The manufacturing marks must be facing upward.



Piston Ring Dimensions:



Top Ring (Standard)

Unit mm (in)

	A	B
B18C4 engine	2.8 (0.11)	1.0 (0.04)
D15Z8, D16B2 engines	2.6 (0.10)	1.0 (0.04)
D14A7, D14A8 engines	2.8 (0.11)	1.2 (0.05)

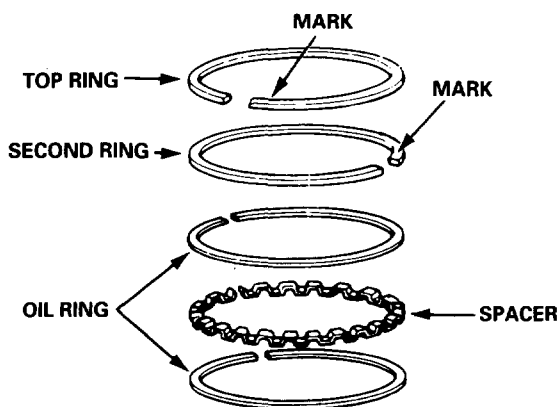
Second Ring (Standard)

Unit mm (in)

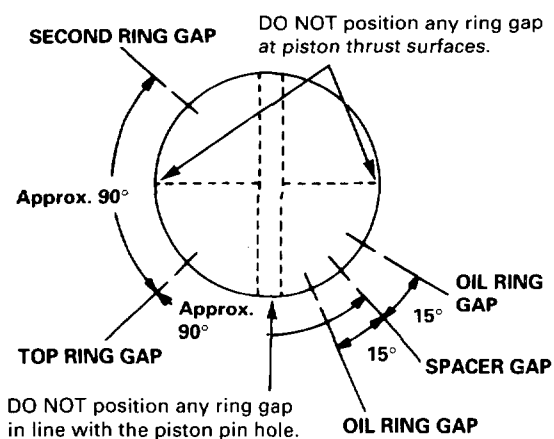
	A	B
B18C4 engine	3.3 (0.13)	1.2 (0.05)
D15Z8, D16B2 engines	3.0 (0.12)	1.2 (0.05)
D14A7, D14A8 engines	3.2 (0.13)	1.5 (0.06)



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



3. Position the ring end gaps as shown:

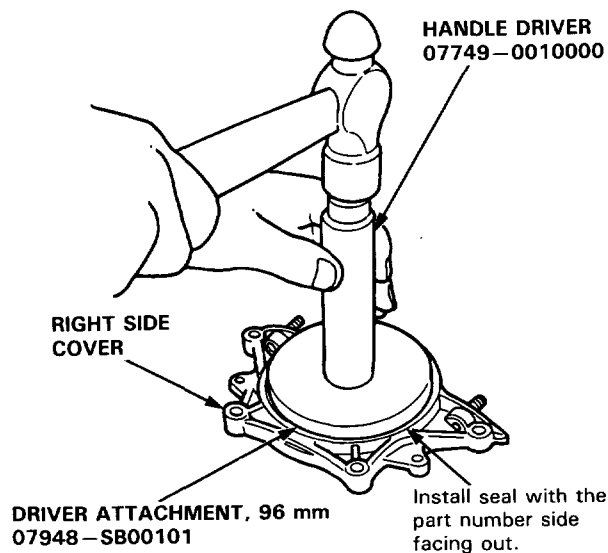


Installation

- The seal surface on the block should be dry. Apply a light coat of oil to the crankshaft and to the lip of the seal.

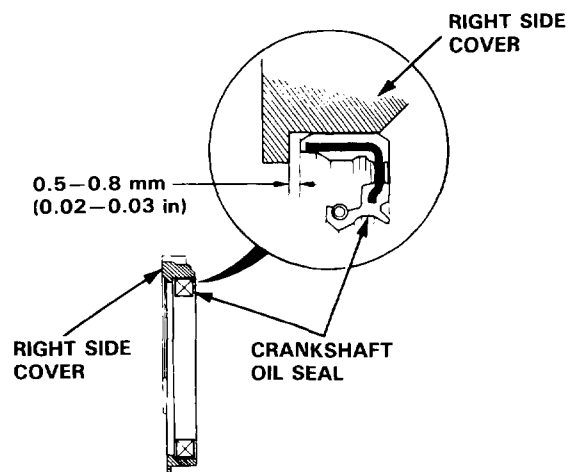
1. Drive in crankshaft oil seal against right side cover.

NOTE: Drive the crankshaft oil seal in squarely.



2. Confirm that the clearance is equal all the way around with a feeler gauge.

Clearance: 0.5 – 0.8 mm (0.02 – 0.03 in)

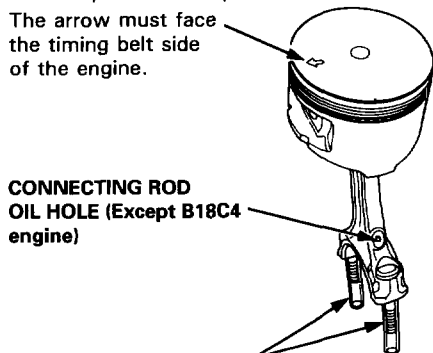


NOTE: Refer to page 8-15 for installation of the oil pump side crankshaft oil seal.

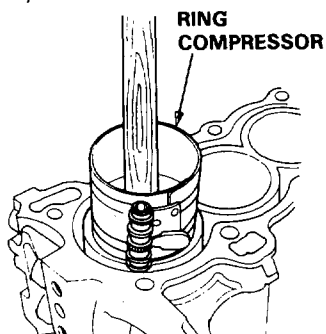
Installation

 Before installing the piston, apply a coat of engine oil to the ring grooves and cylinder bores.

- If the crankshaft is already installed:
 - Set the crankshaft to BDC for each cylinder.
 - Remove the connecting rod caps, and slip short sections of rubber hose over the threaded ends of the connecting rod bolts.
 - Install the ring compressor, check that the bearing is securely in place, then position the piston in the cylinder, and tap it in using the wooden handle of a hammer.
 - Stop after the ring compressor pops free, and check the connecting rod-to-crank journal alignment before pushing piston into place.
 - Install the rod caps with bearings, and torque the nuts to:
 B18C4 engine:
 44 N·m (4.5 kgf·m, 33 lbf·ft)
 Apply engine oil to the bolt threads.
 Except B18C4 engine:
 31 N·m (3.2 kgf·m, 23 lbf·ft)
 Apply engine oil to the bolt threads.
- If the crankshaft is not installed:
 - Remove the rod caps and bearings, install the ring compressor, then position the piston in the cylinder, and tap it in using the wooden handle of a hammer.
 - Position all pistons at top dead center.



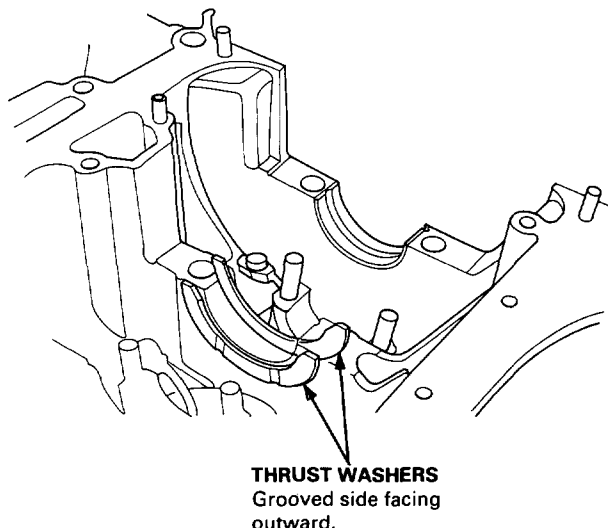
NOTE: Maintain downward force on the ring compressor to prevent rings from expanding before entering the cylinder bore.



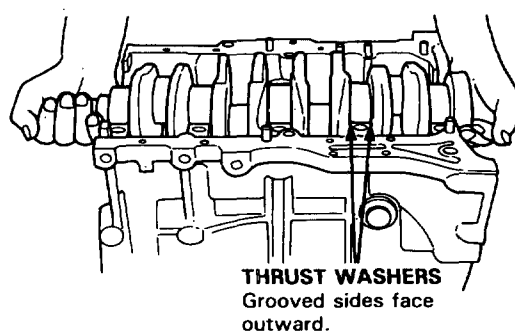
Installation

 Before installing the crankshaft, apply a coat of engine oil to the main bearings and rod bearings.

- Insert the thrust washers in the No. 4 journal of the cylinder block.



- Insert bearing halves in the cylinder block and connecting rods.
- Hold the crankshaft so rod journals for cylinders No. 2 and No. 3 are straight down.
- Lower the crankshaft into the block, seating the rod journals into connecting rods No. 2 and No. 3, and install the rod caps and nuts finger-tight.



- Rotate the crankshaft clockwise, seat journals into connecting rods No. 1 and No. 4, and install the rod caps and nuts finger-tight.

NOTE: Install caps so the bearing recess is on the same side as the recess in the rod.



6. Check rod bearing clearance with plastigage (see page 7-11), then torque the capnuts.

B18C4 engine:

1st step: 20 N·m (2.0 kgf·m, 14 lbf·ft)

2nd step: 44 N·m (4.5 kgf·m, 33 lbf·ft)

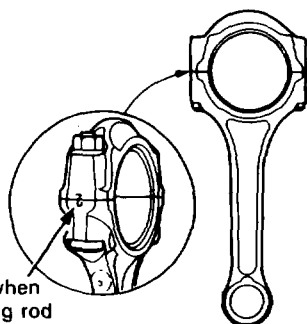
Except B18C4 engine:

31 N·m (3.2 kgf·m, 23 lbf·ft)

Apply engine oil to the bolt threads.

NOTE: Reference numbers on connecting rod are for big-end bore tolerance and do not indicate the position of piston in the engine.

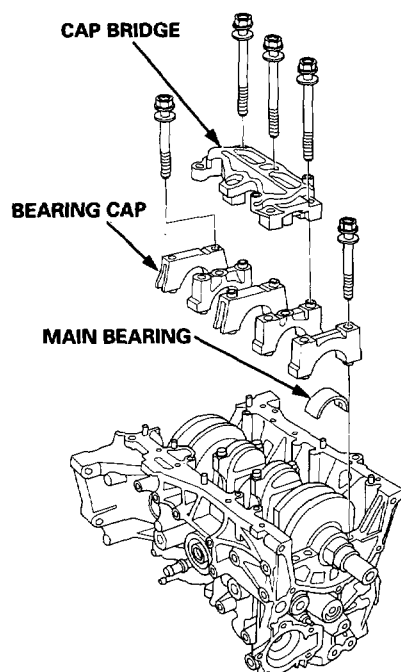
7. Install the thrust washers on the No. 4 journal. Oil the thrust washer surfaces.



Line up the mark when installing connecting rod cap.

8. Install the main bearings/caps and cap bridge (B18C4 engine).

NOTE: Coat the bolt threads with oil.



9. Install the main bearing caps (except B18C4 engine).
10. Check clearance with plastigage (see page 7-9), then tighten the bearing cap bolts in 2 steps.

B18C4 engine:

1st step: 29 N·m (3.0 kgf·m, 22 lbf·ft)

2nd step:

No. 1, 5 cap bolts: 73 N·m (7.4 kgf·m, 56 lbf·ft)

No. 2, 3, 4 cap bolts: 64 N·m (6.5 kgf·m, 49 lbf·ft)

Except B18C4 engine:

1st step: 25 N·m (2.5 kgf·m, 18 lbf·ft)

2nd step:

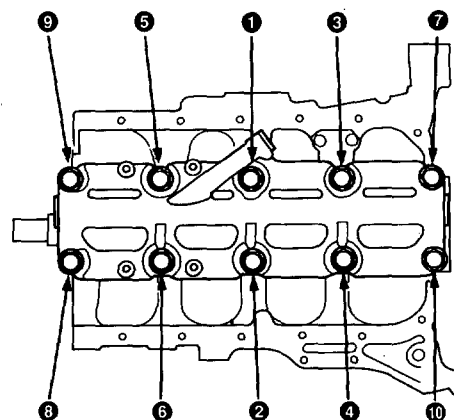
D16B2 engine: 51 N·m (5.2 kgf·m, 38 lbf·ft)

D14A7, D14A8, D15Z8 engines:

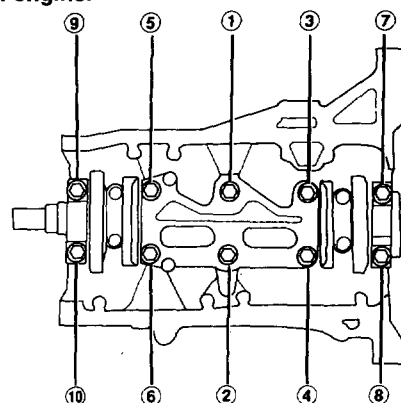
44 N·m (4.5 kgf·m, 33 lbf·ft)

NOTE: Coat the thrust washer surfaces and bolt threads with oil.

MAIN BEARING CAP BOLTS TIGHTENING SEQUENCE
Except B18C4 engine:



B18C4 engine:



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

Crankshaft

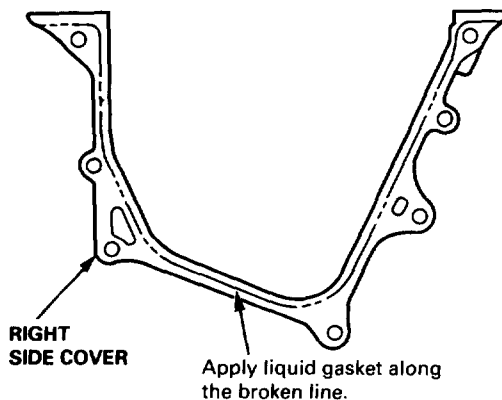
Installation (cont'd)

NOTE:

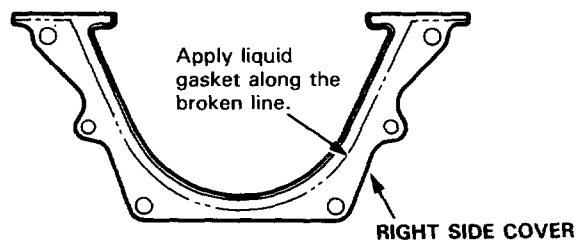
- Use liquid gasket, part No. 08C70 – X0134SEB, 08C70 – X0231SEB, 08C70 – K0234 MEB or 08C70 – K0334MEB.
- Check that the mating surfaces are clean and dry before applying liquid gasket.
- Apply liquid gasket evenly, being careful to cover all the mating surface.
- To prevent leakage of oil, apply liquid gasket to the inner threads of the bolt holes.
- Do not install the parts if five minutes or more have elapsed since applying the liquid gasket. Instead, reapply liquid gasket after removing the old residue.
- After assembly, wait at least 30 minutes before filling the engine with oil.

11. Apply liquid gasket to the block mating surface of the right side cover, then install it on the cylinder block.

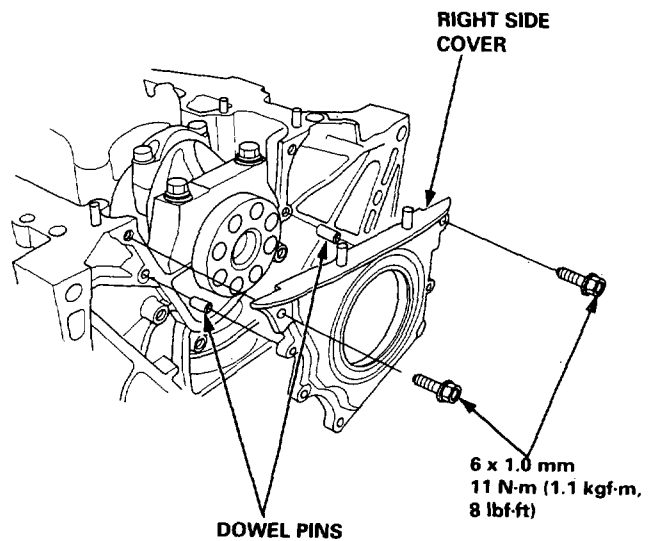
B18C4 engine:



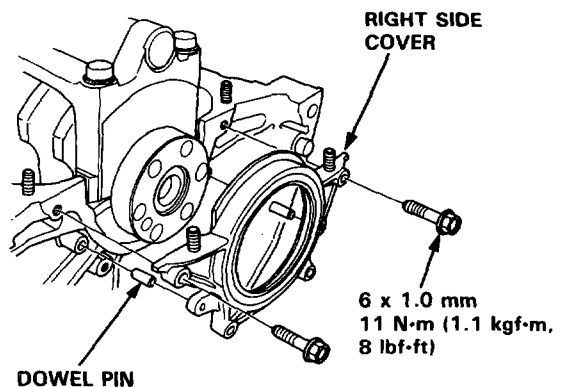
Except B18C4 engine:



B18C4 engine:



Except B18C4 engine:

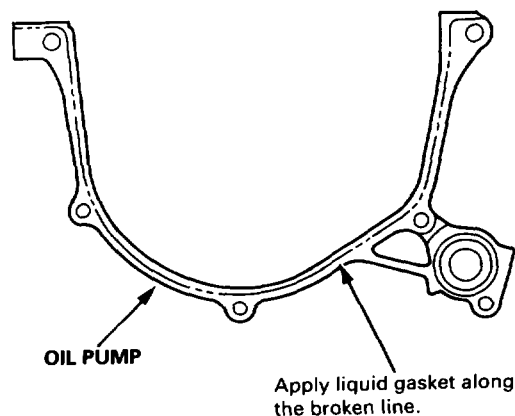




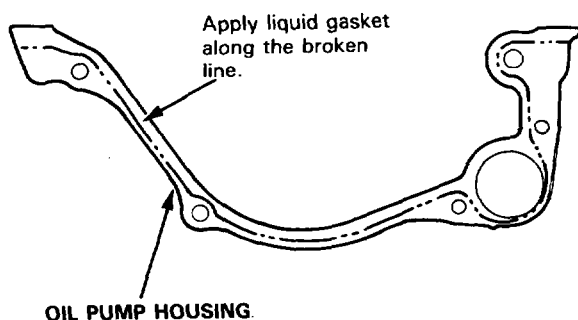
12. Apply liquid gasket to the oil pump mating surface of the block, then install the oil pump on the cylinder block.

- Apply grease to the lips of the oil seals. Then, install the oil pump while aligning the inner rotor with the crankshaft. When the pump is in place, clean any excess grease off the crankshaft, then check that the oil seal lips are not distorted.

B18C4 engine:



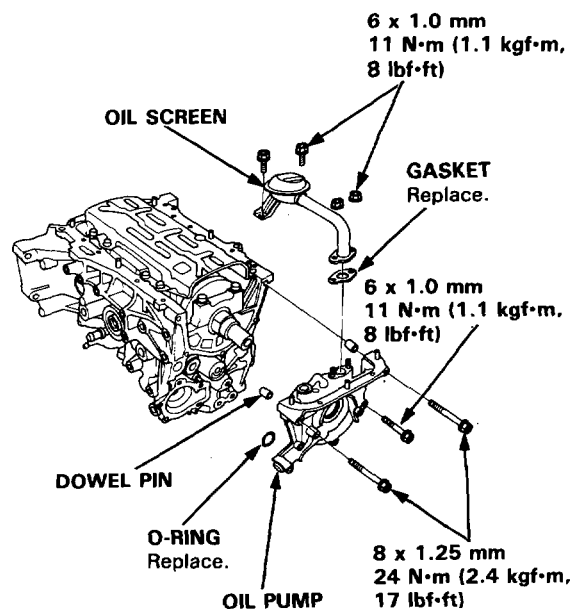
Except B18C4 engine:



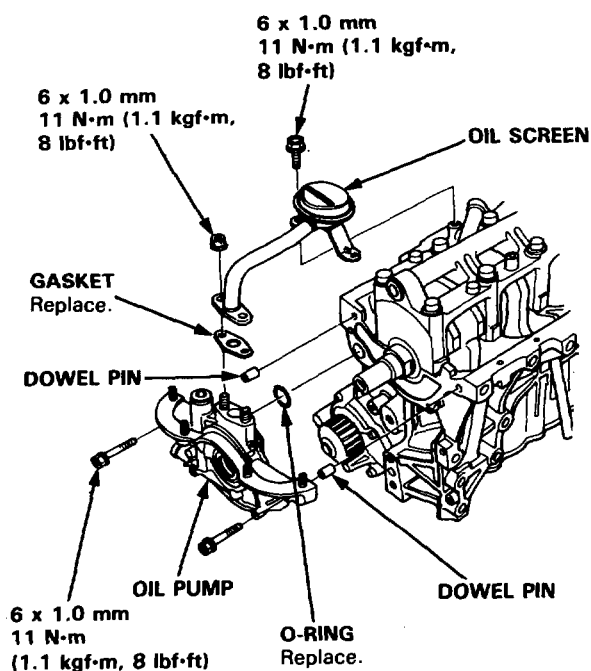
NOTE:

- Apply a light coat of oil to the crankshaft and to the lip of seal.
- Use new O-rings and apply oil when installing them.

B18C4 engine:



Except B18C4 engine:



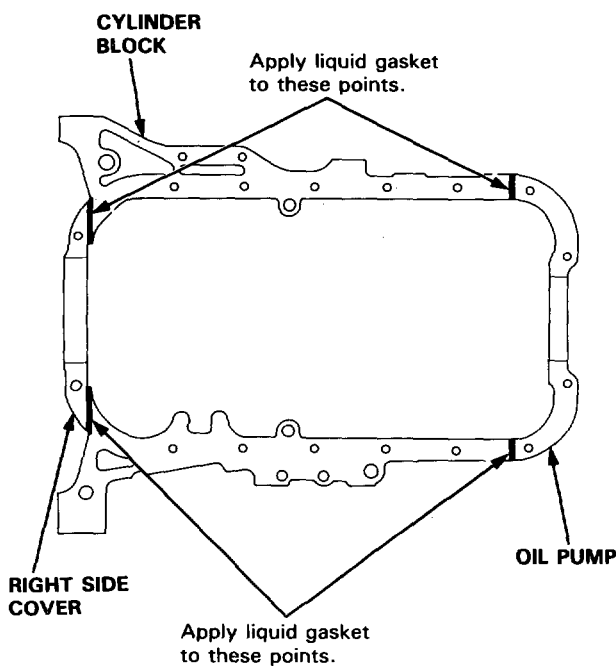
Oil Pan

Installation

NOTE:

- Use liquid gasket, part No. 08C70 – X0134SEB, 08C70 – X0231SEB, 08C70 – K0234MEB or 08C70 – K0334MEB.
- Check that the mating surfaces are clean and dry before applying liquid gasket.
- Apply liquid gasket as an even bead, centered between the edges of the mating surface.
- To prevent leakage of oil, apply liquid gasket to the inner threads of the bolt holes.
- Do not install the parts if five minutes or more have elapsed since applying the liquid gasket. Instead, reapply liquid gasket after removing the old residue.
- After assembly, wait at least 30 minutes before filling the engine with oil.

1. Apply liquid gasket on the oil pump and right side cover mating areas as shown below.

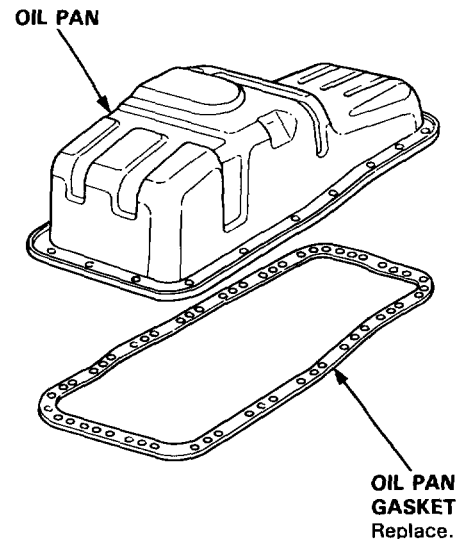


2. Install the oil pan gasket and oil pan.

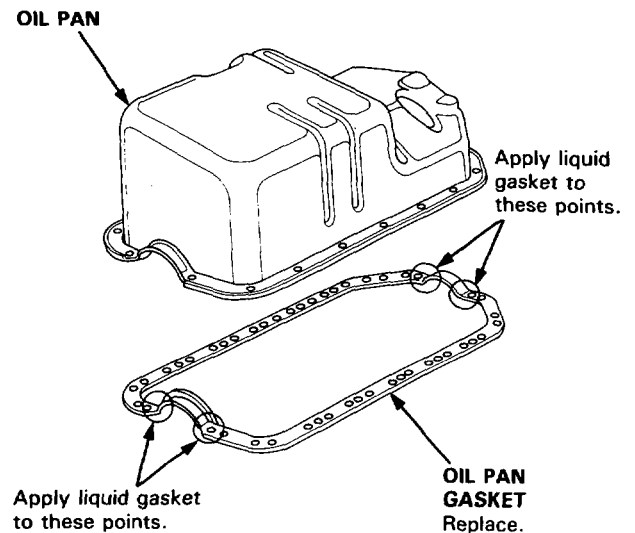
NOTE:

- Use a new oil pan gasket.
- Install oil pan no more than five minutes after liquid gasket applied.

B18C4 engine:

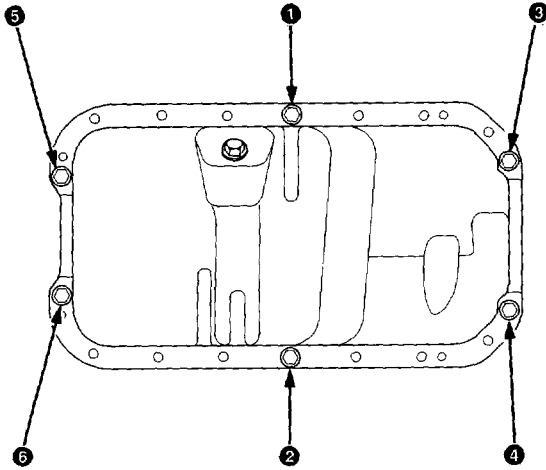


Except B18C4 engine:





3. Tighten bolts and nuts finger tight at six points as shown below.



4. Tighten all bolts and nuts, starting from bolt ①, clockwise in there steps.

NOTE: Excessive tightening can cause distortion of oil pan gasket and oil leakage.

Torque: 12 N·m (1.2 kgf·m, 8.7 lbf·ft)

Engine Lubrication

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Testing	8-10
Oil Jet (B18C4 engine)	
Inspection	8-11
Oil Pump	
Overhaul	8-12
Removal/Inspection/Installation	8-14

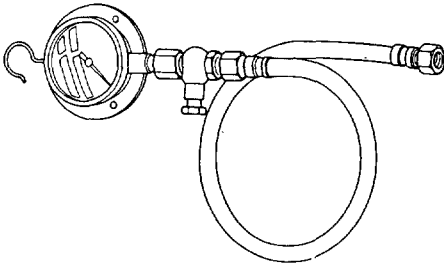


Special Tools

Ref. No.	Tool Number	Description	Qty	Remark
①	07406 – 0030000	Oil Pressure Gauge Attachment	1	
②	07506 – 3000000	Oil Pressure Gauge	1	
③	07746 – 0010400	Driver Attachment, 52 x 55 mm	1	
④	07749 – 0010000	Handle Driver	1	
⑤	07912 – 6110001	Oil Filter Wrench	1	



①



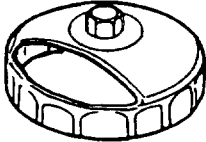
②



③



④



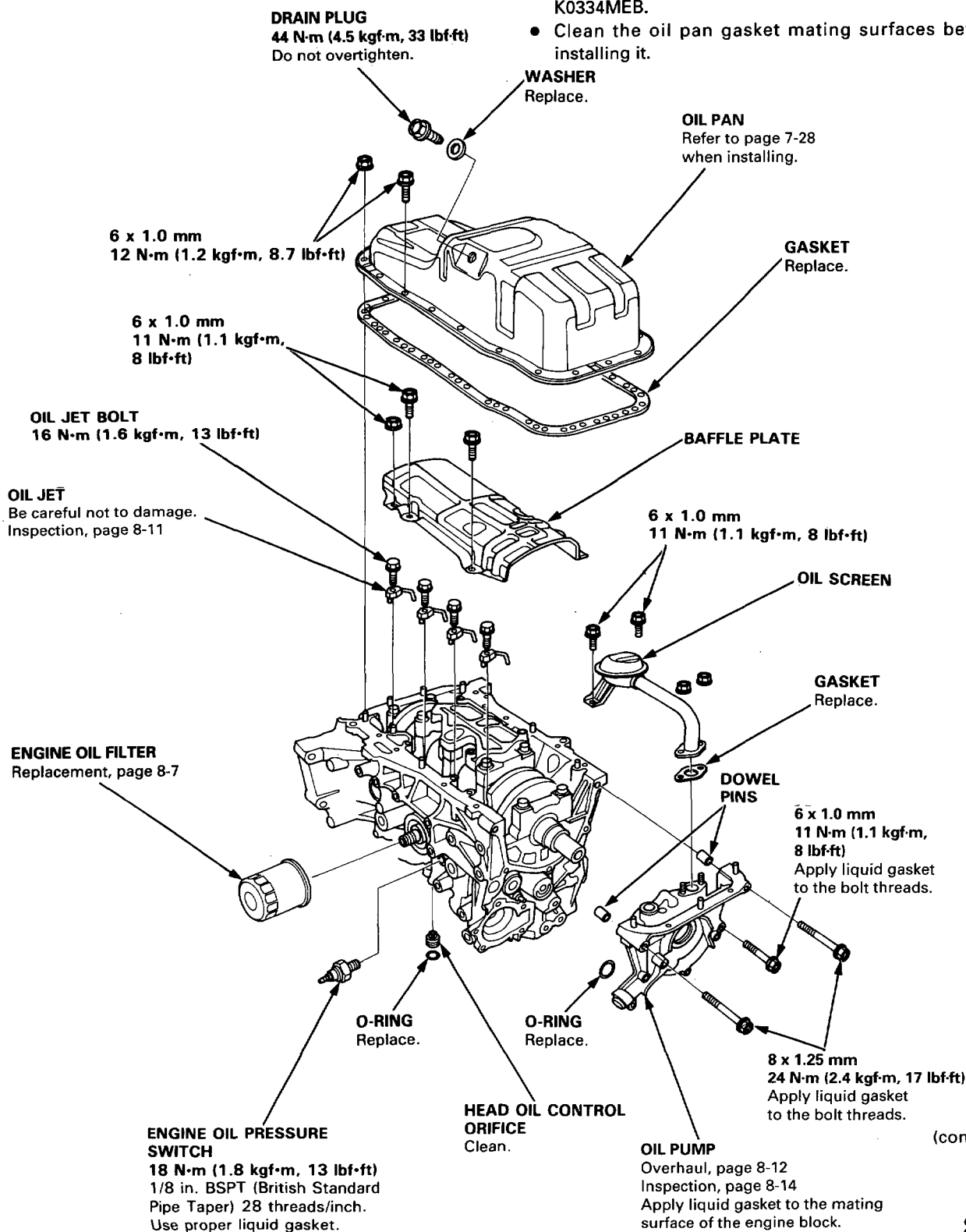
⑤



D18C4 engine:

NOTE:

- Use new O-rings when reassembling.
- Apply oil to O-rings before installation.
- Use liquid gasket, Part No. 08C70 – X0134SEB, 08C70 – X0231SEB, 08C70 – K0234MEB or 08C70 – K0334MEB.
- Clean the oil pan gasket mating surfaces before installing it.



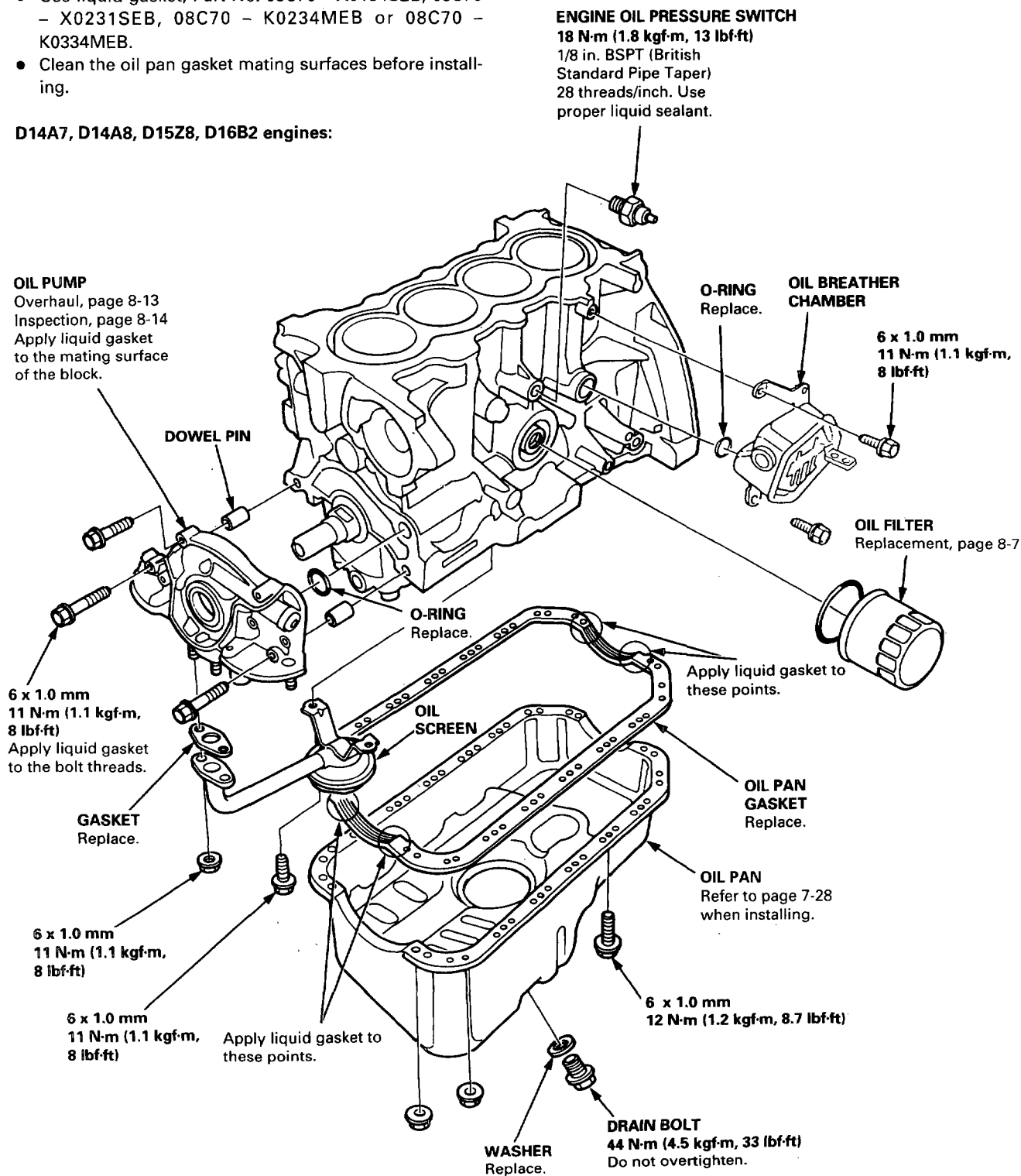
Illustrated Index

(cont'd)

NOTE:

- Use new O-rings when reassembling.
- Apply oil to O-rings before installation.
- Use liquid gasket, Part No. 08C70 – X0134SEB, 08C70 – X0231SEB, 08C70 – K0234MEB or 08C70 – K0334MEB.
- Clean the oil pan gasket mating surfaces before installing.

D14A7, D14A8, D15Z8, D16B2 engines:

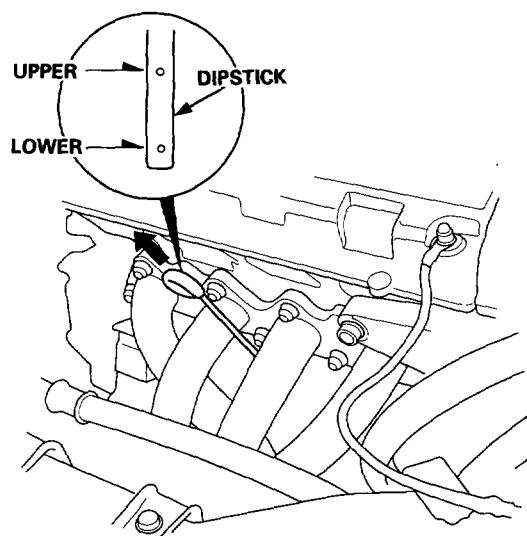




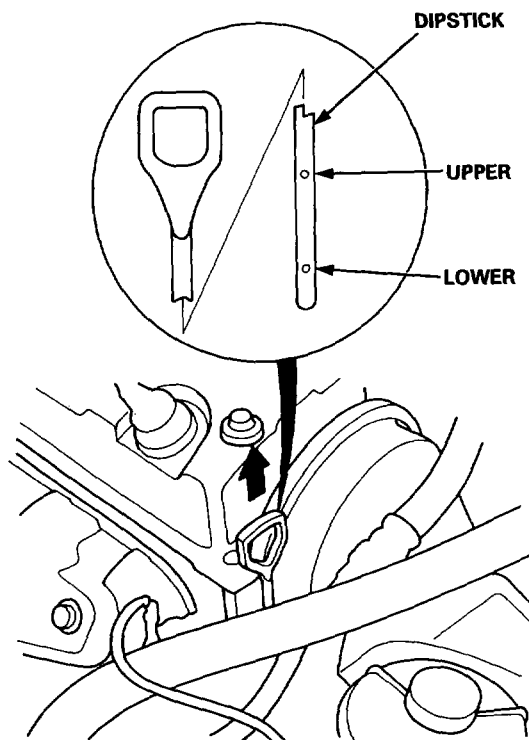
Inspection

1. Park the vehicle on level ground, and turn off the engine. Allow the oil a few minutes to drain back into the oil pan so the dipstick will show the actual level.
2. Make certain that the oil level indicated on the dipstick is between the upper and lower marks.
3. If the level has dropped close to the lower mark, add oil until it reaches the upper mark.

B18C4 engine:



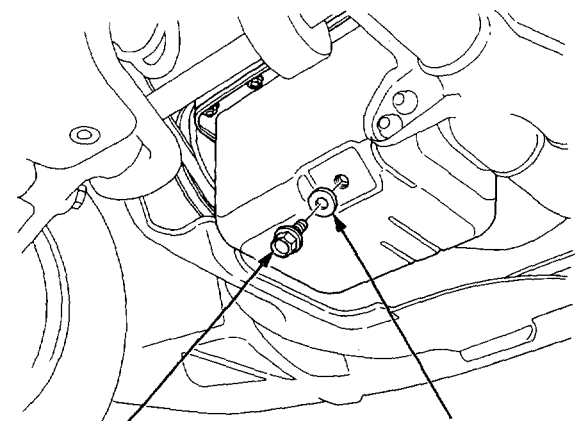
Except B18C4 engine:



Engine Oil

Replacement

- 1. Warm up the engine.
- 2. Drain the engine oil.



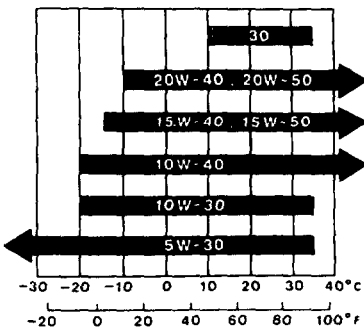
DRAIN BOLT
44 N·m (4.5 kgf·m, 33 lbf·ft)
Do not overtighten.

WASHER
Replace.

- 3. Reinstall the drain plug with a new washer, and refill with the recommended oil.

Requirement	Always use a fuel-efficient oil is that says "API Service SG, SH or SJ". SAE Viscosity: See chart below.
Capacity	B18C4 engine: 3.7 ℓ (3.9 US qt, 3.3 Imp qt) at oil change. 4.0 ℓ (4.2 US qt, 3.5 Imp qt) at oil change, including filter. 4.8 ℓ (5.1 US qt, 4.2 Imp qt) after engine overhaul. Except B18C4 engine: 3.0 ℓ (3.2 US qt, 2.6 Imp qt) at oil change. 3.3 ℓ (3.5 US qt, 2.9 Imp qt) at oil change, including filter. 4.0 ℓ (4.2 US qt, 3.5 Imp qt) after engine overhaul.
Change	Every 15,000 km (9,000 miles) or 12 months (Normal condition). Every 7,500 km (4,500 miles) or 6 months (Severe condition).

Engine Oil SAE Viscosity for Outside Temperature Ranges.



Ambient temperature ranges

- 4. Fill the engine with oil up to the specified level, run the engine for more than three minutes, then check for oil leakage and oil level.

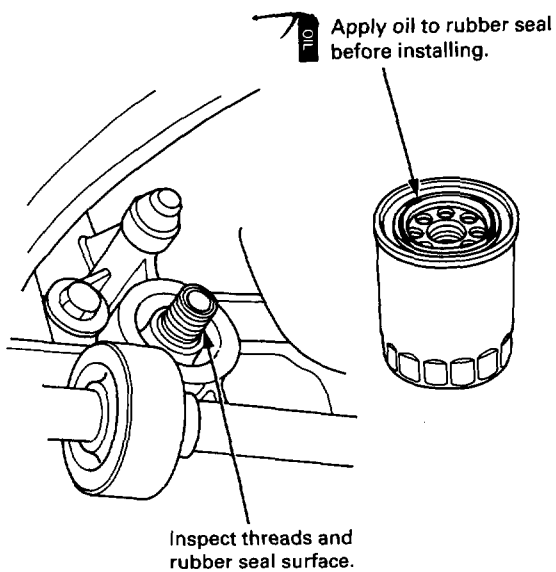


Replacement

A type oil filter:

1. Remove the oil filter with the oil filter wrench.
2. Inspect the threads and rubber seal on the new filter. Wipe off seat on engine block, then apply a light coat of oil to the filter rubber seal.

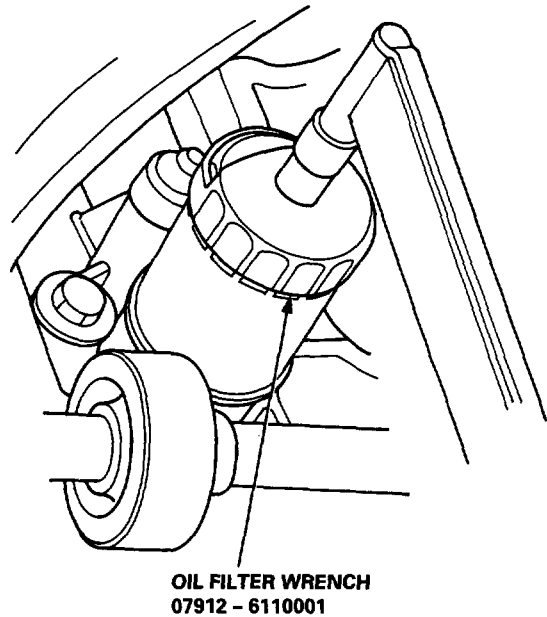
NOTE: Use only filters with a built-in bypass system.



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

Tighten: 7/8 turn clockwise.

Tightening torque: 22 N·m (2.2 kgf·m, 16 lbf·ft)



(cont'd)

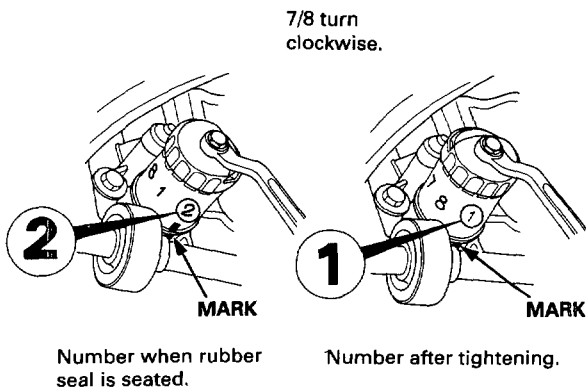
Oil Filter

Replacement (cont'd)

Eight numbers (1 to 8) are printed on the surface of the filter.

The following explains the procedure for tightening filters using these numbers.

- 1) Make a mark on the engine block under the number that shows at the bottom of the filter when the rubber seal is seated.
- 2) Tighten the filter by turning it clockwise seven numbers from the marked point. For example, if a mark is made under the number 2 when the rubber seal is seated, the filter should be tightened until the number 1 comes up to the marked point.



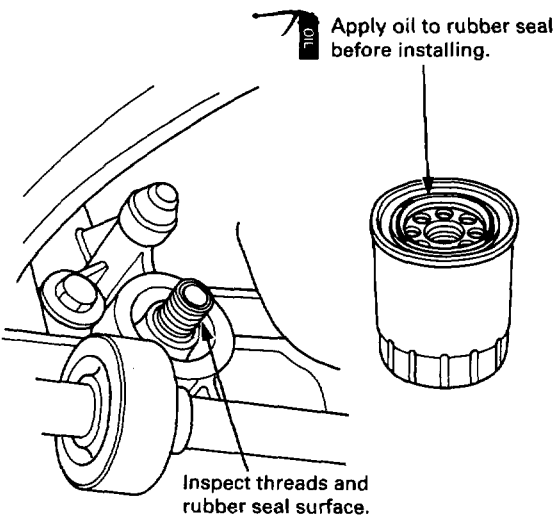
Number when rubber seal is seated	1	2	3	4	5	6	7	8
Number after tightening	8	1	2	3	4	5	6	7

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

B type oil filter:

- 1. Remove the oil filter with the oil filter wrench.
- 2. Inspect the threads and rubber seal on the new filter. Wipe off seat on engine block, then apply a light coat of oil to the filter rubber seal.

NOTE: Use only filters with a built-in bypass system.

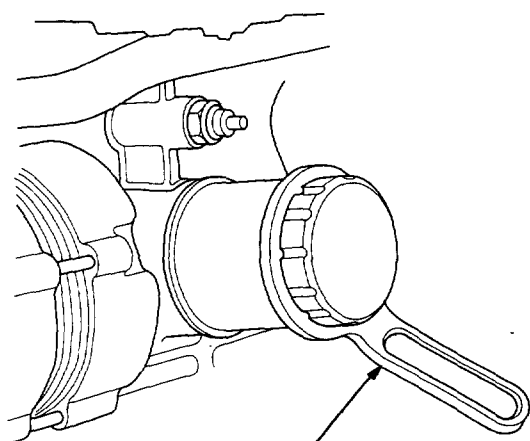




3. Install the oil filter by hand.
4. After the rubber seal seats, tighten the oil filter clockwise with the tool.

Tighten: three quarter turn clockwise.

Tightening torque: 22 N·m (2.2 kgf·m, 16 lbf·ft)

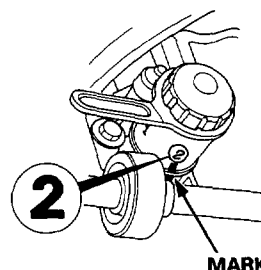


**LABINAL-Purflux 76
COMMERCIALY-AVAILABLE**

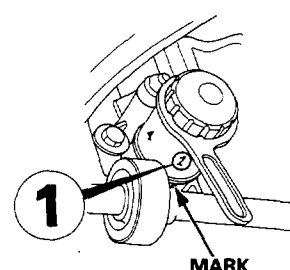
Four numbers (1 to 4) are printed on the surface of the filter.

The following explains the procedure for tightening filters using these numbers.

- 1) Make a mark on the engine block under the number that shows at the bottom of the filter when the rubber seal is seated.
- 2) Tighten the filter by turning it clockwise three numbers from the marked point. For example, if a mark is made under the number 2 when the rubber seal is seated, the filter should be tightened until the number 1 comes up to the marked point.



**Number when rubber
seal is seated.**



Number after tightening.

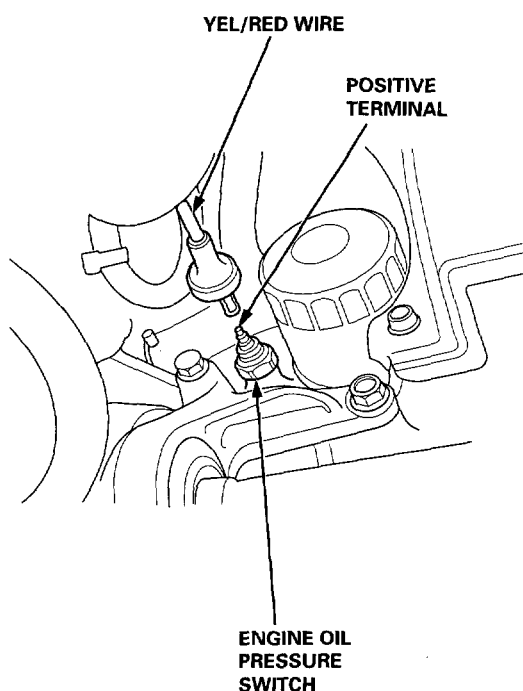
Number when rubber seal is seated	1	2	3	4
Number after tightening	4	1	2	3

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

Oil Pressure Switch

Testing

1. Remove the YEL/RED wire from the engine oil pressure switch.
2. Check for continuity between the positive terminal and the engine (ground).
 - There should be continuity with the engine stopped.
 - There should be no continuity with the engine running.



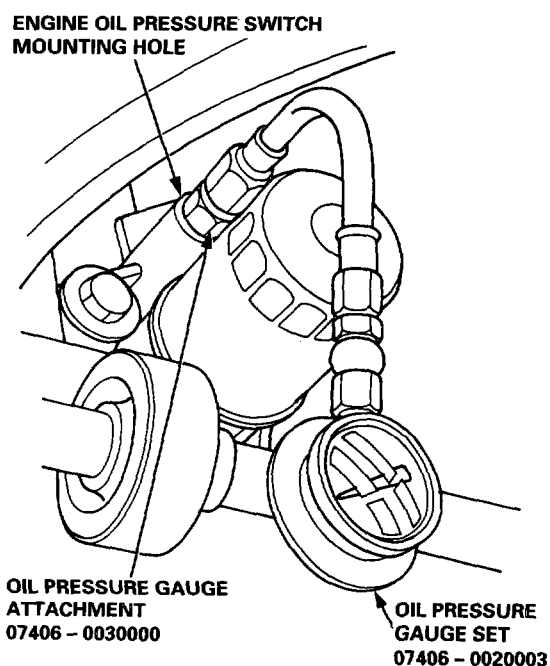
3. If the switch fails to operate, check the engine oil level. If the engine oil level is OK, check the engine oil pressure.

Oil Pressure

Testing

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

1. Connect a tachometer.
2. Remove the engine oil pressure switch and install an oil pressure gauge.



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

Engine Oil Temperature: 80°C (176°F)

Engine Oil Pressure:

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

At 3,000 rpm (mm⁻¹): 340 kPa (3.5 kgf/cm², 50 psi)
minimum

- If oil pressure is NOT within specifications, inspect the oil pump (page 8-14).



Inspection

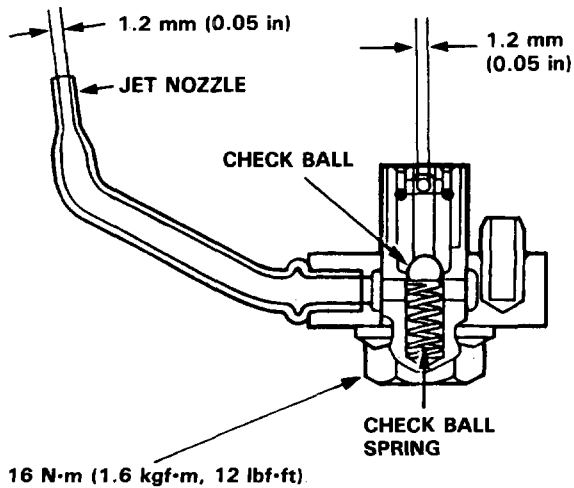
1. Remove the oil jet (see page 8-3) and inspect it as follows.

- Make sure that a 1.1 mm (0.04 in) diameter drill will go through the nozzle hole (1.2 mm (0.05 in) diameter).
- Insert the other end of the same 1.1 mm (0.04 in) drill into the oil intake (1.2 mm (0.05 in) diameter).

Make sure the check ball moves smoothly and has a stroke of approximately 4.0 mm (0.16 in).

- Check the oil jet operation with an air nozzle. It should take at least 200 kPa (2.0 kgf/cm², 28 psi) to unseat the check ball.

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



2. Mounting torque is critical. Be very precise when installing.

Torque: 16 N·m (1.6 kgf·m, 12 lbf·ft)

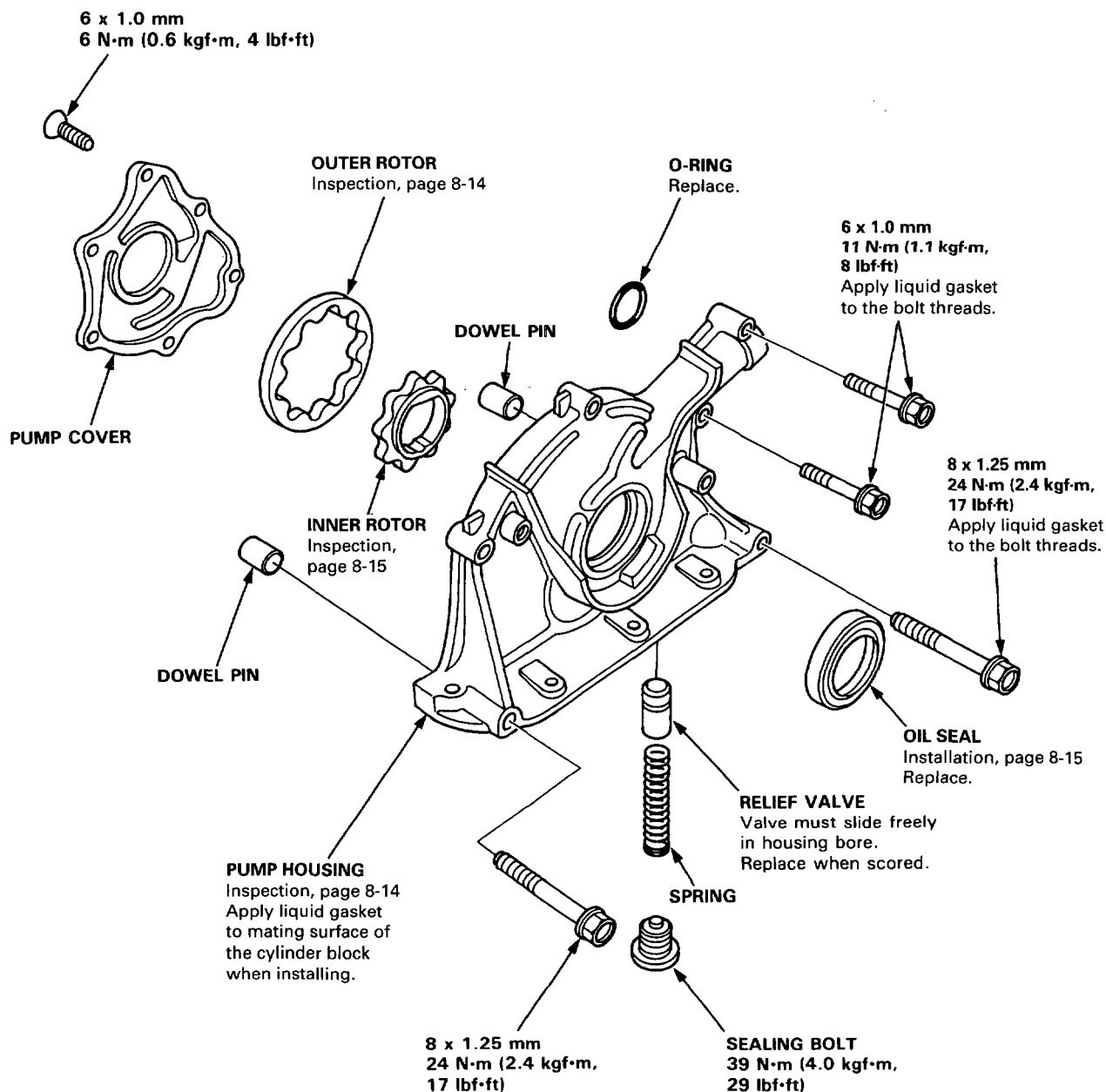
Oil Pump

Overhaul

NOTE:

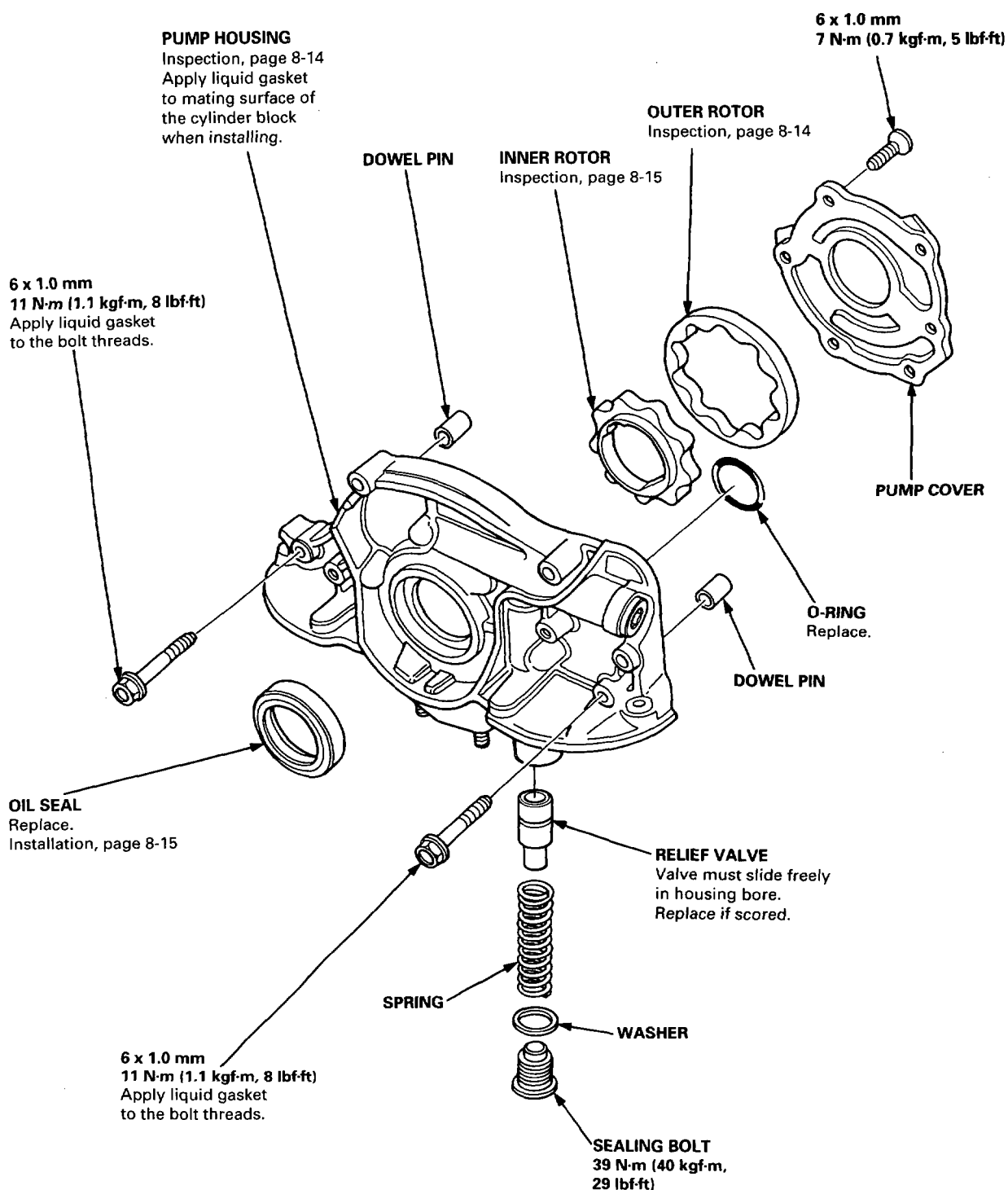
- Use new O-rings when reassembling.
- Apply oil to O-rings before installation.
- Use liquid gasket, Part No. 08C70 – X0134SEB, 08C70 – X0231SEB, 08C70 – K0234MEB or 08C70 – K0334MEB.
- The rotors must be installed to the same direction in order.
- After reassembly, check that the rotors move without binding.

B18C4 engine:





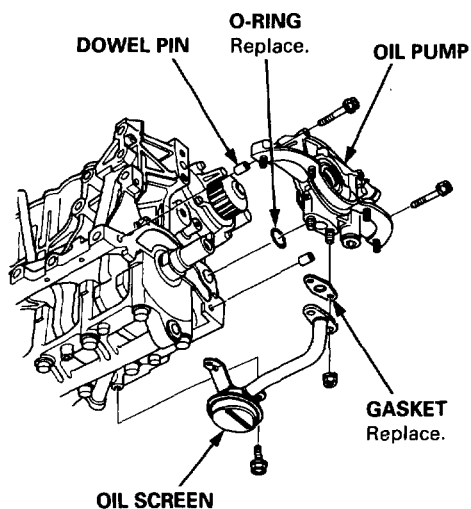
Except B18C4 engine:



Oil Pump

Removal/Inspection/Installation

1. Drain the engine oil.
2. Turn the crankshaft and align the white groove on the crankshaft pulley with the pointer on the lower cover.
3. Remove the cylinder head cover and upper cover.
4. Remove the power steering pump belt, air conditioner belt and the alternator belt.
5. Remove the crankshaft pulley and remove the lower cover.
6. Remove the timing belt.
7. Remove the drive pulley.
8. Remove the oil pan and oil screen.
9. Remove the oil pump.



10. Remove the screws from the pump housing, then separate the housing and cover.
11. Check the inner-to-outer rotor radial clearance on the pump rotor.

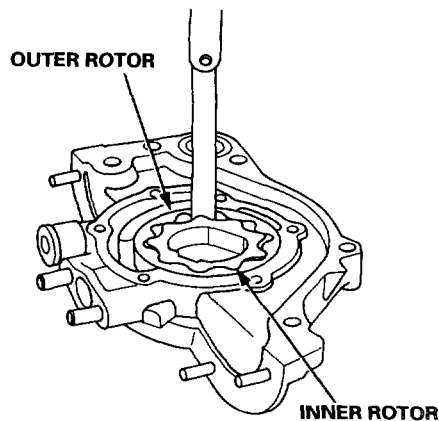
Inner Rotor-to-Outer Rotor Radial Clearance Standard (New):

B18C4 engine: 0.04 – 0.16 mm (0.002 – 0.006 in)

Except B18C4 engine:

0.02 – 0.14 mm (0.001 – 0.006 in)

Service Limit: 0.20 mm (0.008 in)



— If the inner-to-outer rotor clearance exceeds the service limit, replace the inner and outer rotors.

12. Check the housing-to-rotor axial clearance on the pump rotor.

Housing-to-Rotor Axial Clearance

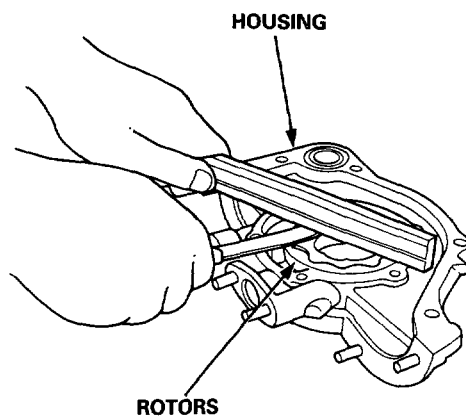
Standard (New):

B18C4 engine: 0.02 – 0.07 mm (0.001 – 0.003 in)

Except B18C4 engine:

0.03 – 0.08 mm (0.001 – 0.003 in)

Service Limit: 0.15 mm (0.006 in)



— If the housing-to-rotor axial clearance exceeds the service limit, replace the set of inner and outer rotors and/or the pump housing.



13. Check the housing-to-outer rotor radial clearance.

Housing-to-Outer Rotor Radial Clearance:

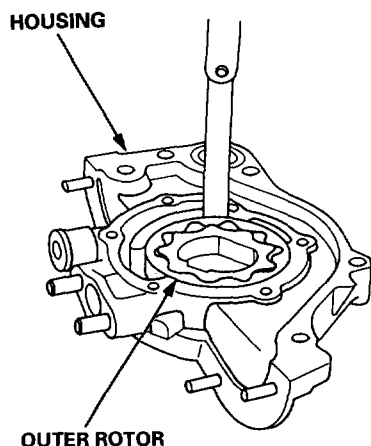
Standard (New):

B18C4 engine: 0.10 – 0.19 mm (0.004 – 0.007 in)

Except B18C4 engine:

0.10 – 0.18 mm (0.004 – 0.007 in)

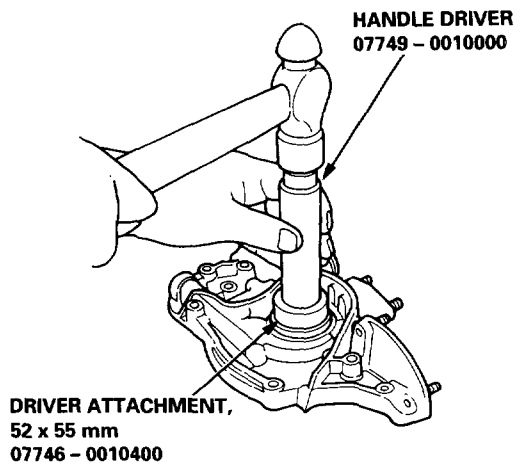
Service Limit: 0.20 mm (0.008 in)



— If the housing-to-outer rotor radial clearance exceeds the service limit, replace the set of inner and outer rotors and/or the pump housing.

14. Inspect both rotors and pump housing for scoring or other damage. Replace parts if necessary.
15. Remove the old oil seal from the oil pump.
16. Using the special tool, gently tap in the new oil seal until the driver bottoms against the pump.

NOTE: The oil seal alone can be replaced without removing the oil pump.

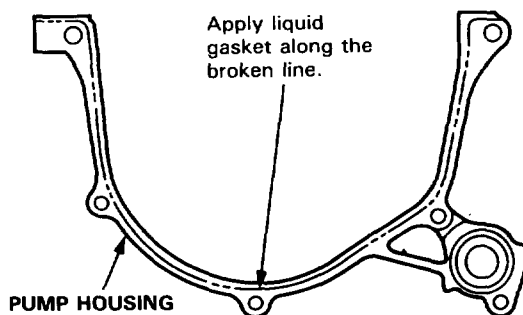


17. Reassemble the oil pump, applying thread lock to the pump housing screws.
18. Check that the oil pump turns freely.
19. Apply a light coat of oil to the seal lip.
20. Install the two dowel pins and new O-ring on the oil pump.
21. Apply liquid gasket to the cylinder block mating surface of the oil pump.

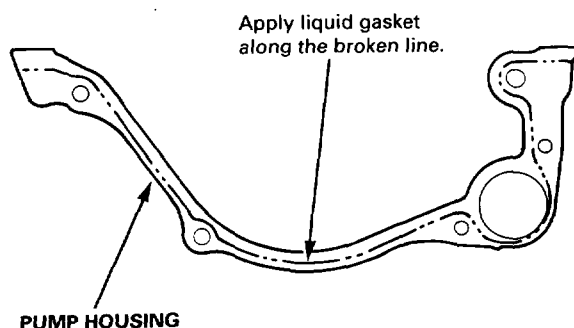
NOTE:

- Use liquid gasket, Part No. 08C70 – X0134SEB, 08C70 – X0231SEB, 08C70 – K0234MEB or 08C70 – K0334MEB.
- Check that the mating surfaces are clean and dry before applying liquid gasket.
- Apply liquid gasket evenly, in a narrow bead centered on the mating surface.
- To prevent leakage of oil, apply liquid gasket to the inner threads of the bolt holes.
- Do not install the parts if five minutes or more have elapsed since applying liquid gasket. Instead, reapply liquid gasket after removing the old residue.
- After assembly, wait at least 30 minutes before filling the engine with oil.

B18C4 engine:



Except B18C4 engine:



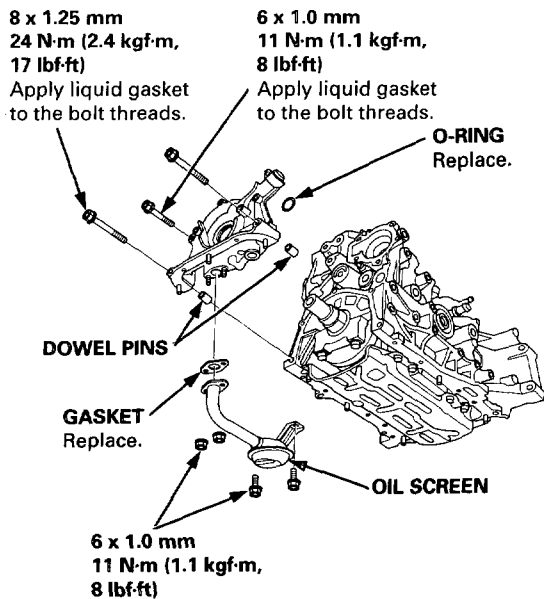
(cont'd)

Oil Pump

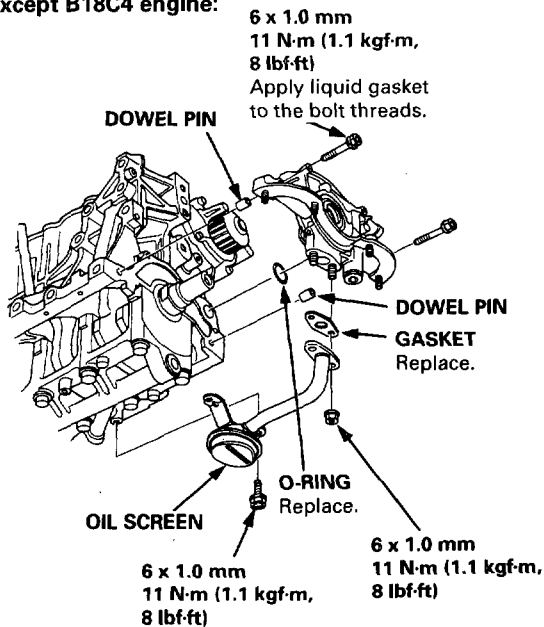
Removal/Inspection/Installation (cont'd)

22. Install the oil pump on the cylinder block.
 - Apply grease to the lip of the oil pump seal. Then, install the oil pump onto the crankshaft. When the pump is in place, clean any excess grease off the crankshaft and check that the oil seal lip is not distorted.
23. Install the oil screen.

B18C4 engine:



Except B18C4 engine:



24. Install the oil pan (see page 7-28).

Intake Manifold/Exhaust System

Intake Manifold

Replacement 9-2

Exhaust Manifold

Replacement 9-5

Exhaust Pipe and Muffler

Replacement 9-8

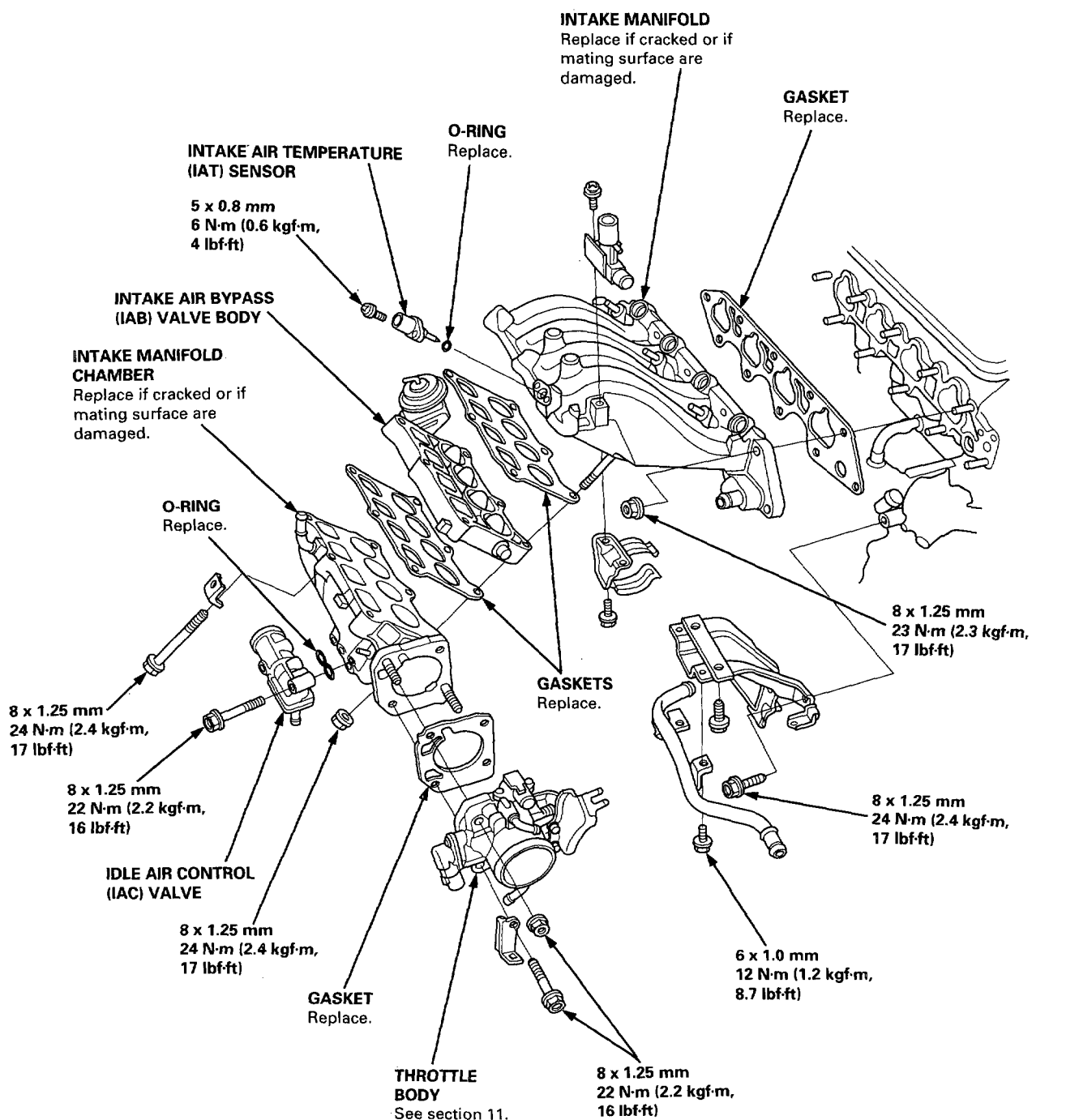


Intake Manifold

Replacement

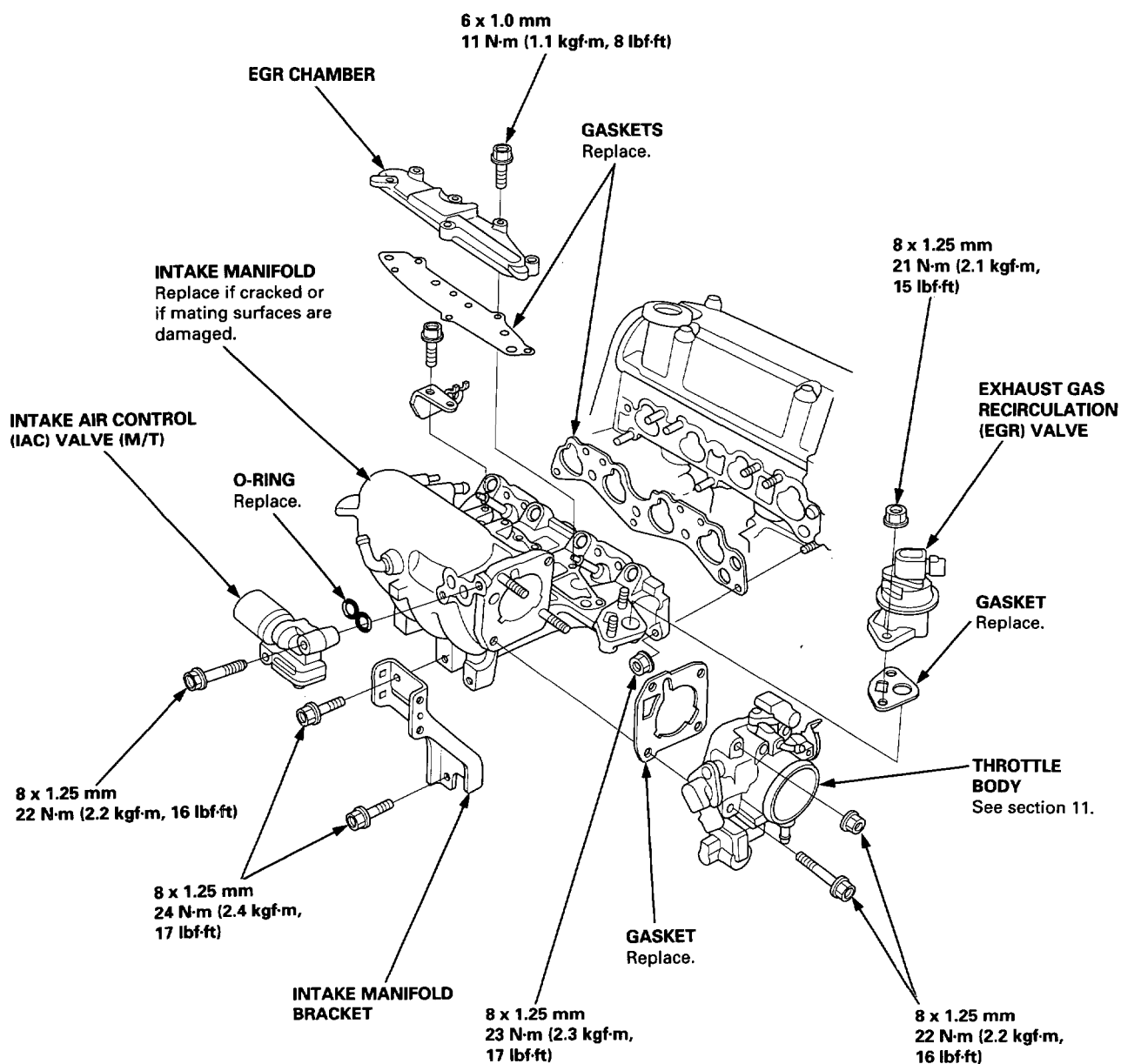
NOTE: Use new O-rings and gaskets when reassembling.

B18C4 engine:





D15Z8 engine:



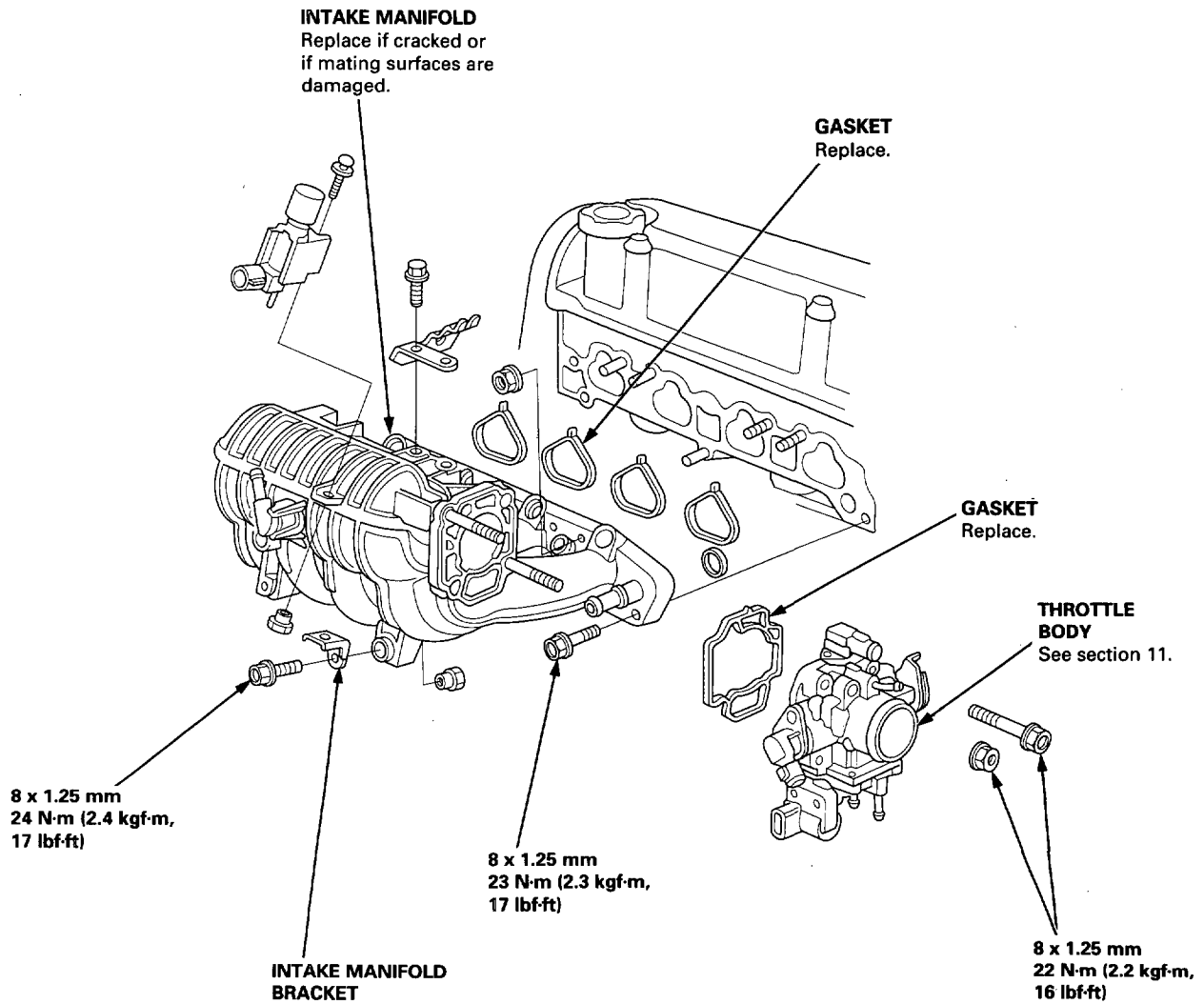
(cont'd)

Intake Manifold

Replacement (cont'd)

NOTE: Use new O-rings and gaskets when reassembling.

D14A7, D14A8, D16B2 engines:



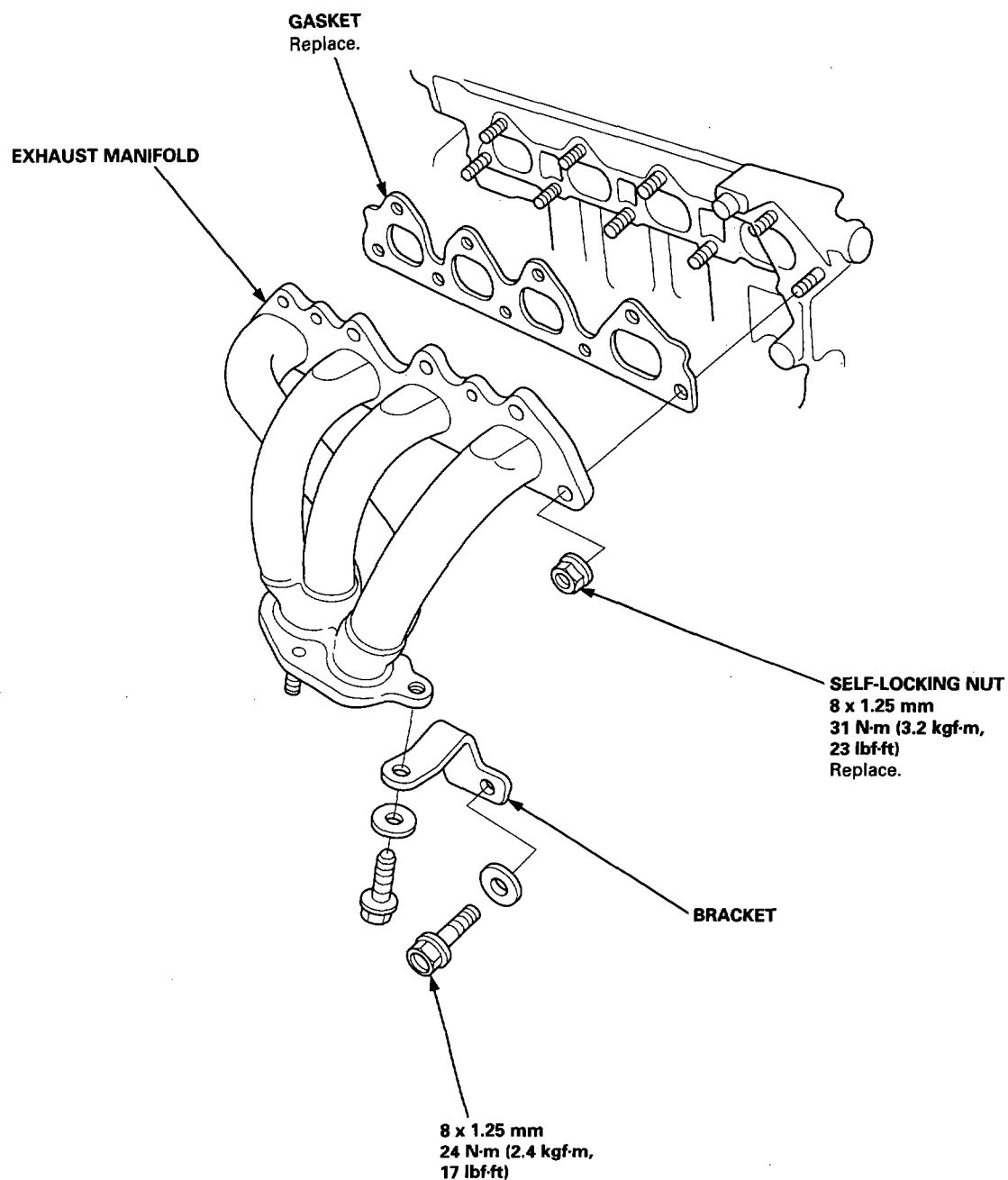
Exhaust Manifold



Replacement

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

B18C4 engine:



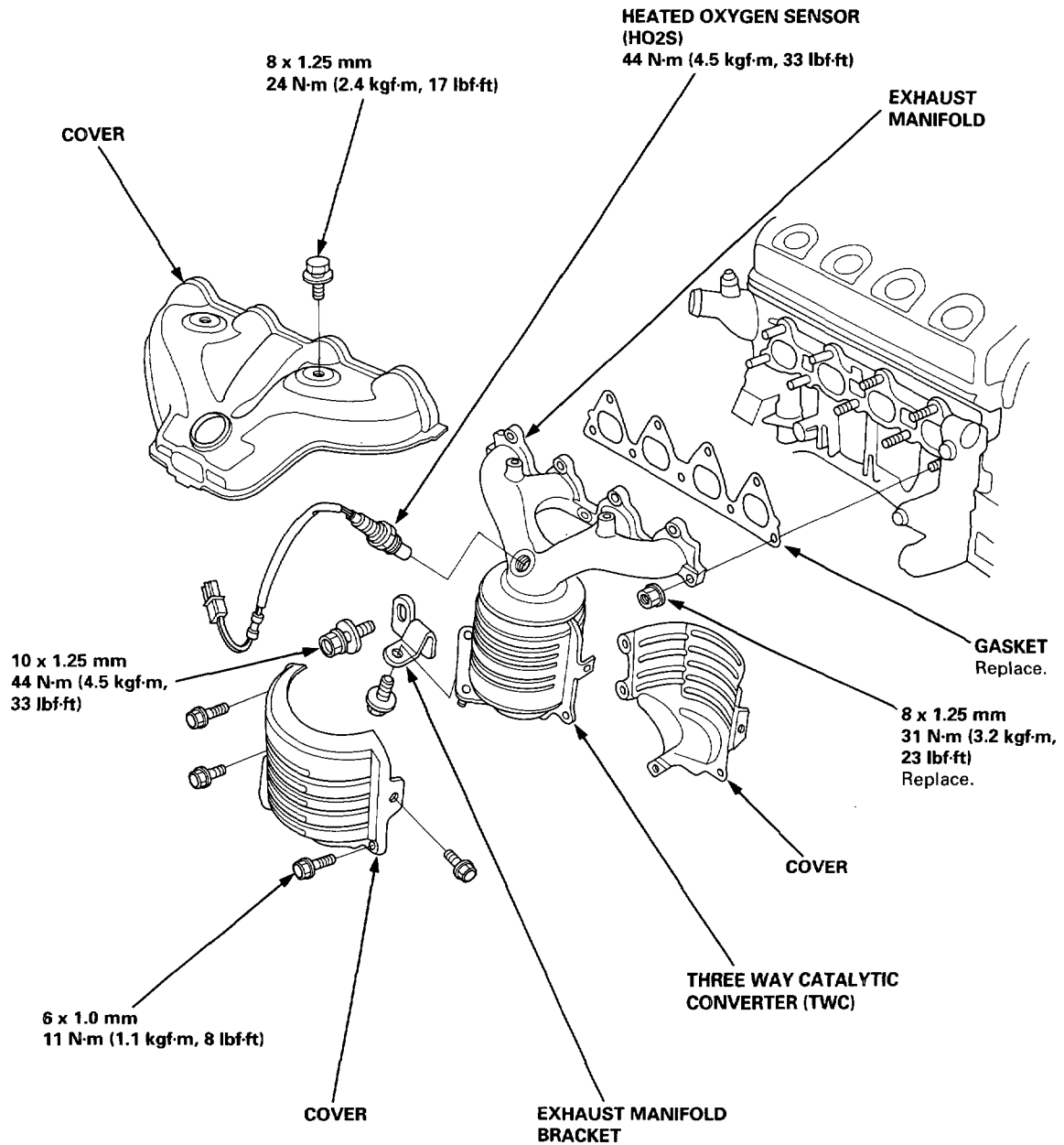
(cont'd)

Exhaust Manifold

Replacement (cont'd)

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

D15Z8 engine:





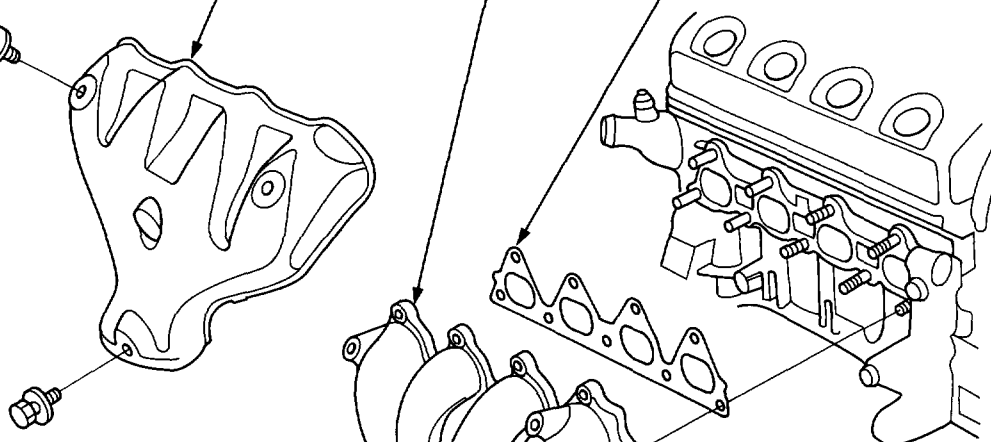
D14A7, D14A8, D16B2 engines:

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

COVER

EXHAUST
MANIFOLD

GASKET
Replace.



HO2S
44 N·m (4.5 kgf·m, 33 lbf·ft)

8 x 1.25 mm
31 N·m (3.2 kgf·m, 23 lbf·ft)
Replace.

EXHAUST MANIFOLD
BRACKET

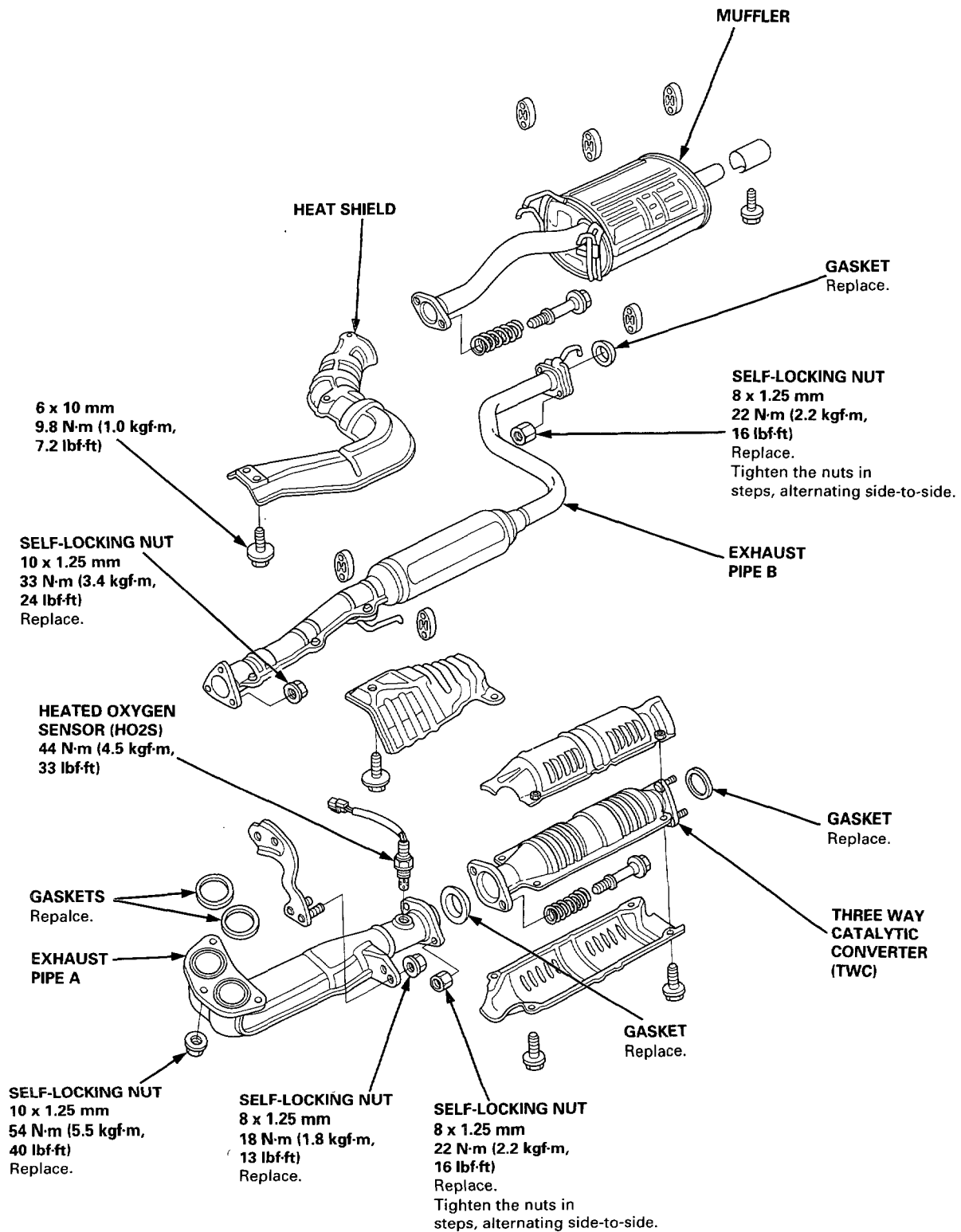
10 x 1.25 mm
44 N·m (4.4 kgf·m, 33 lbf·ft)

Exhaust Pipe and Muffler

Replacement

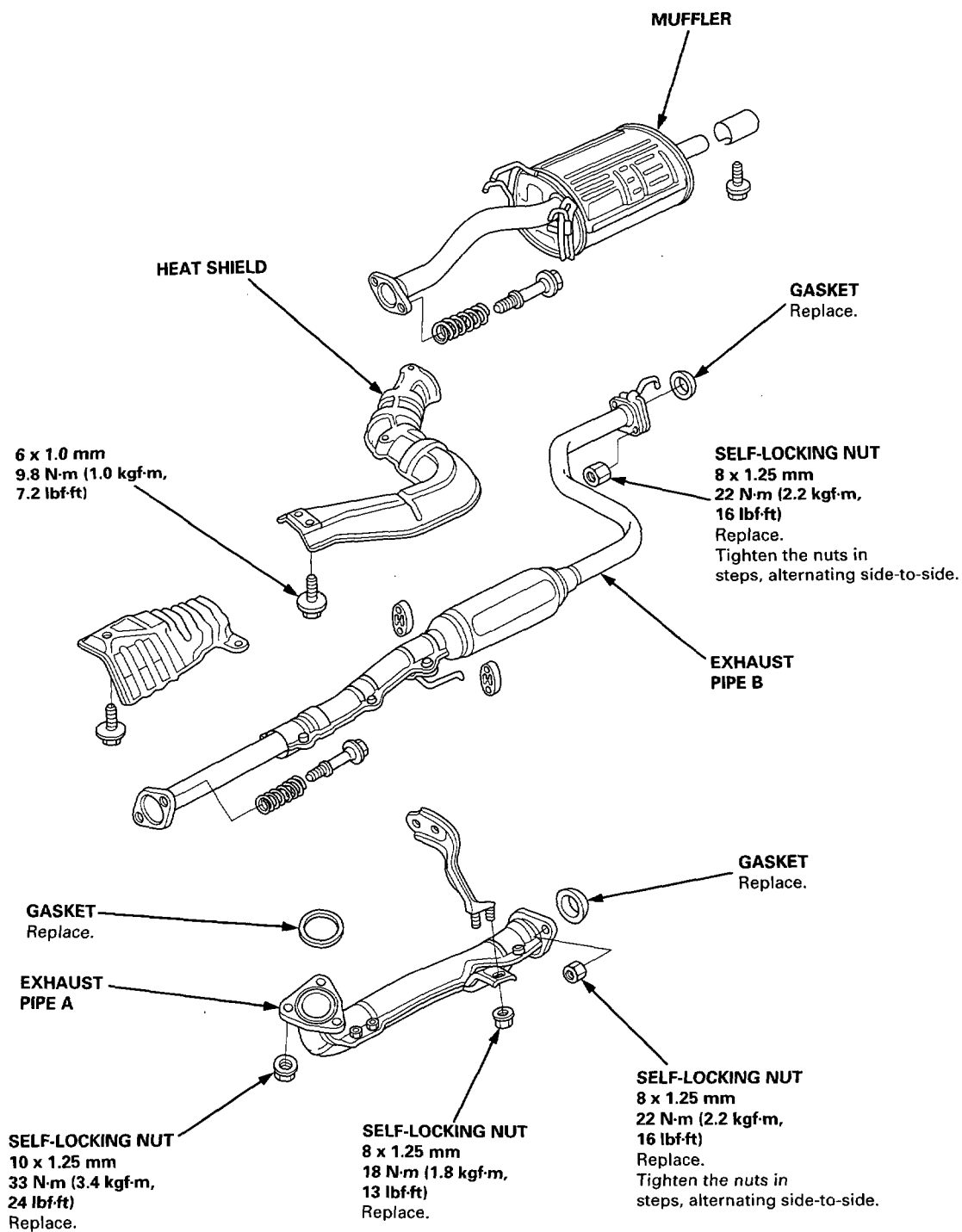
NOTE: Use new gaskets and self-locking nuts when reassembling.

B18C4 engine:





D15Z8 engine:



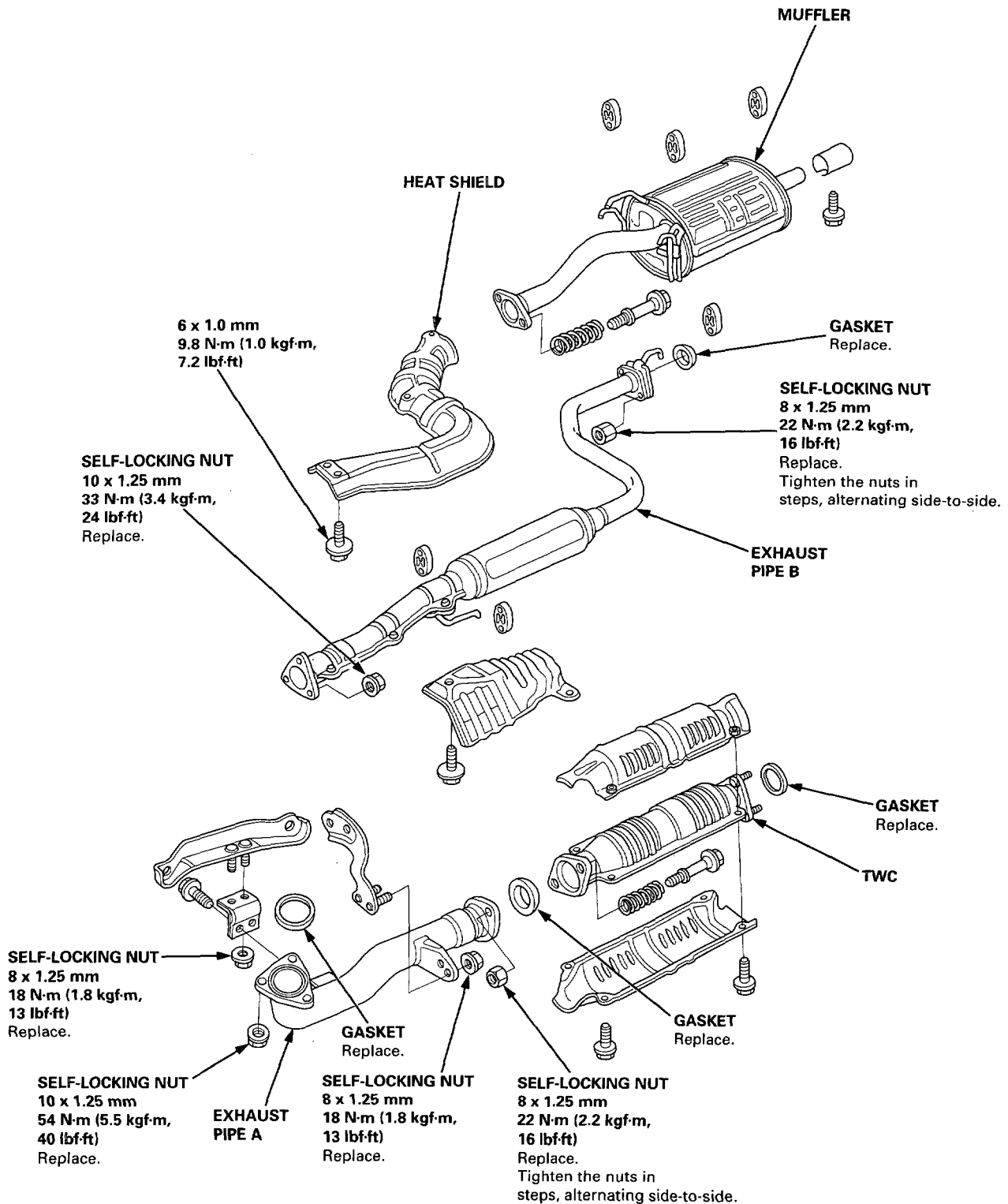
(cont'd)

Exhaust Pipe and Muffler

Replacement (cont'd)

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

D16B2 engine:





D14A7, D14A8 engines:

