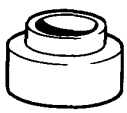
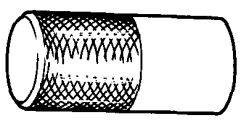
Cylinder Heads Removal/Installation

Special Tools

Ref. No.	Tool Number	Description	Q'ty	Remarks
①	07746–0030400	Attachment, 35 mm	1	Camshaft oil seal
②	07746–0030100	Driver	1	



①



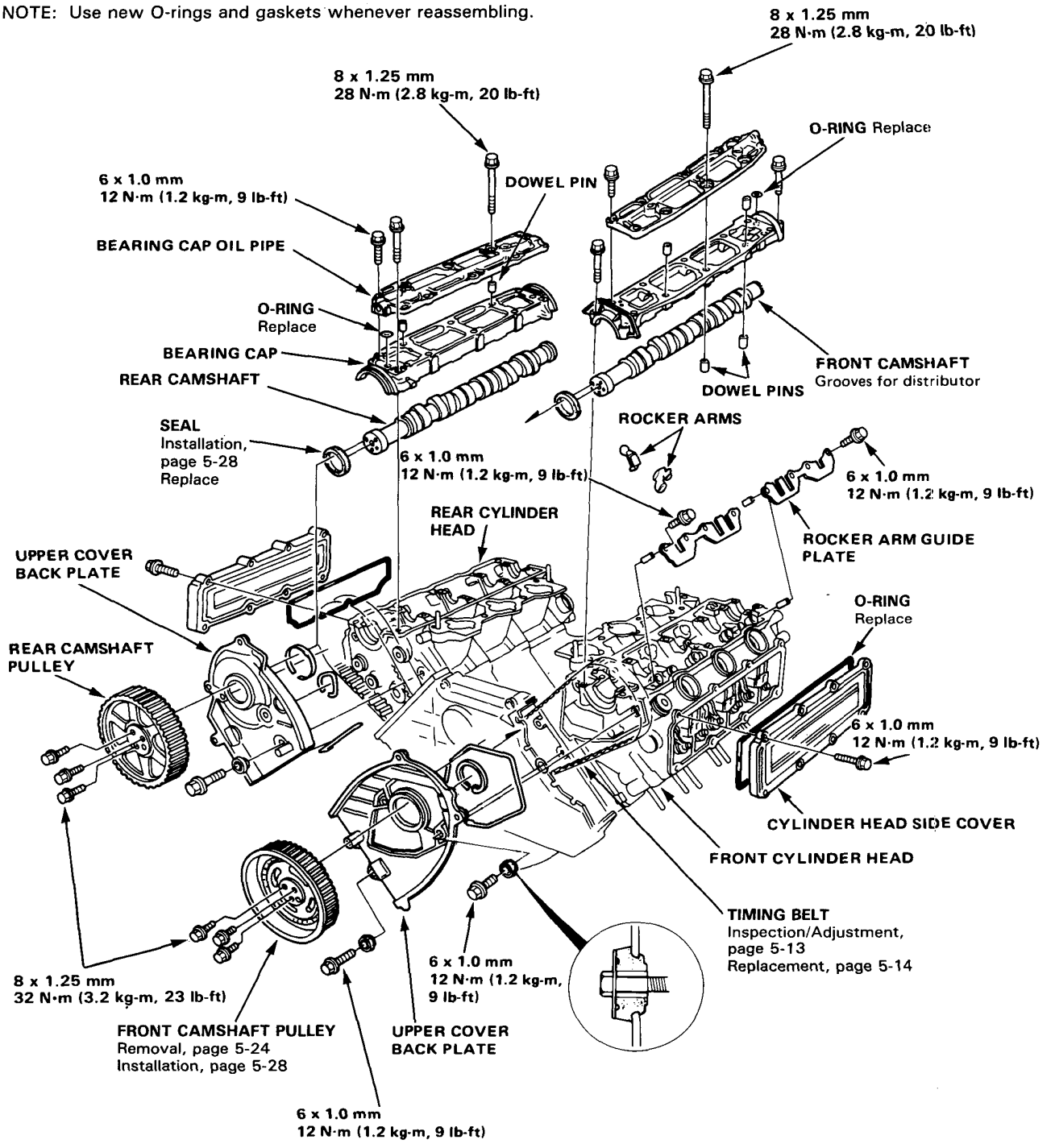
②

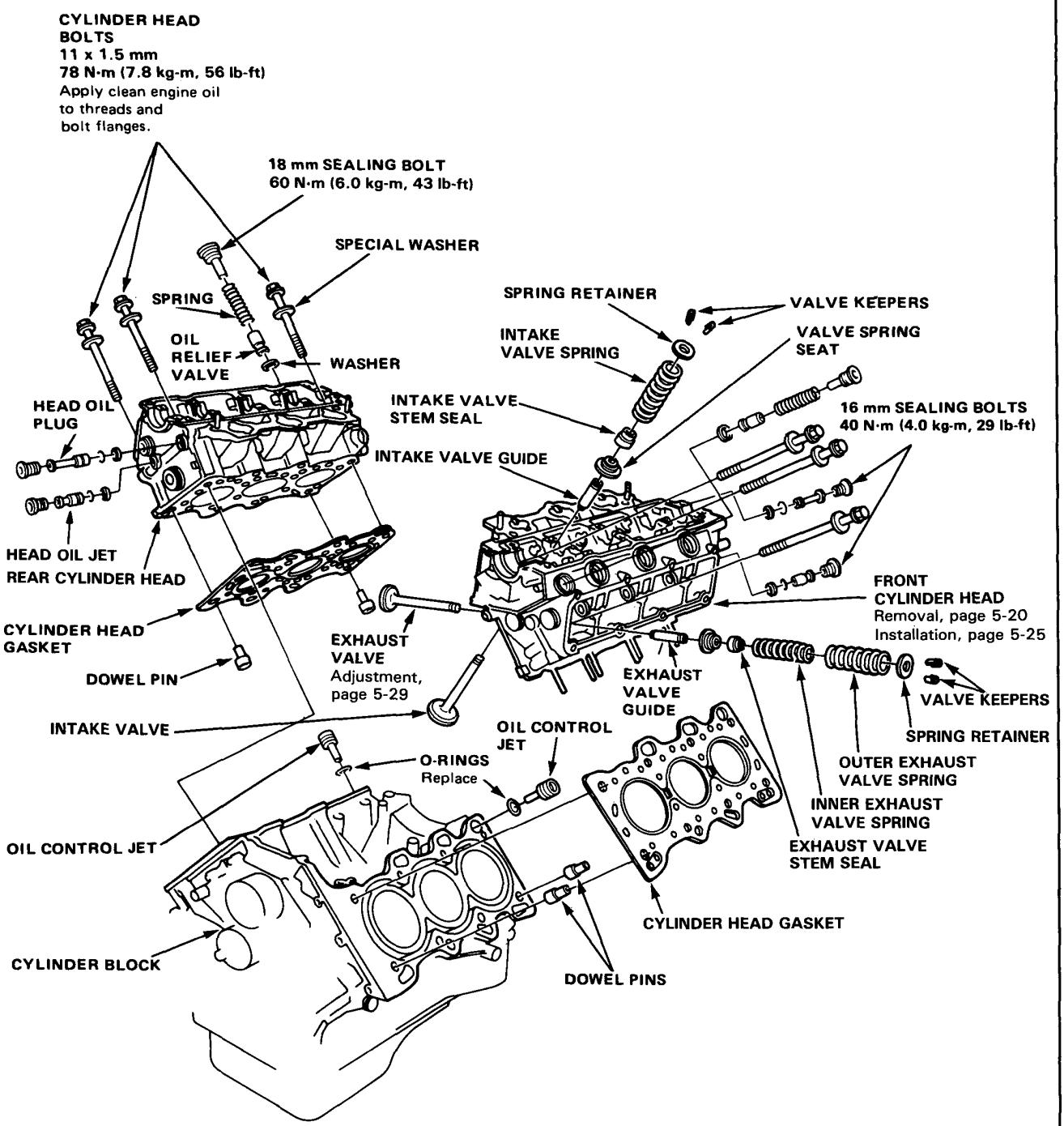
Cylinder Heads

Removal (engine removal not required)

CAUTION: To avoid damaging the cylinder heads, wait until the coolant temperature drops below 38°C (100°F) before loosening the retaining bolts.

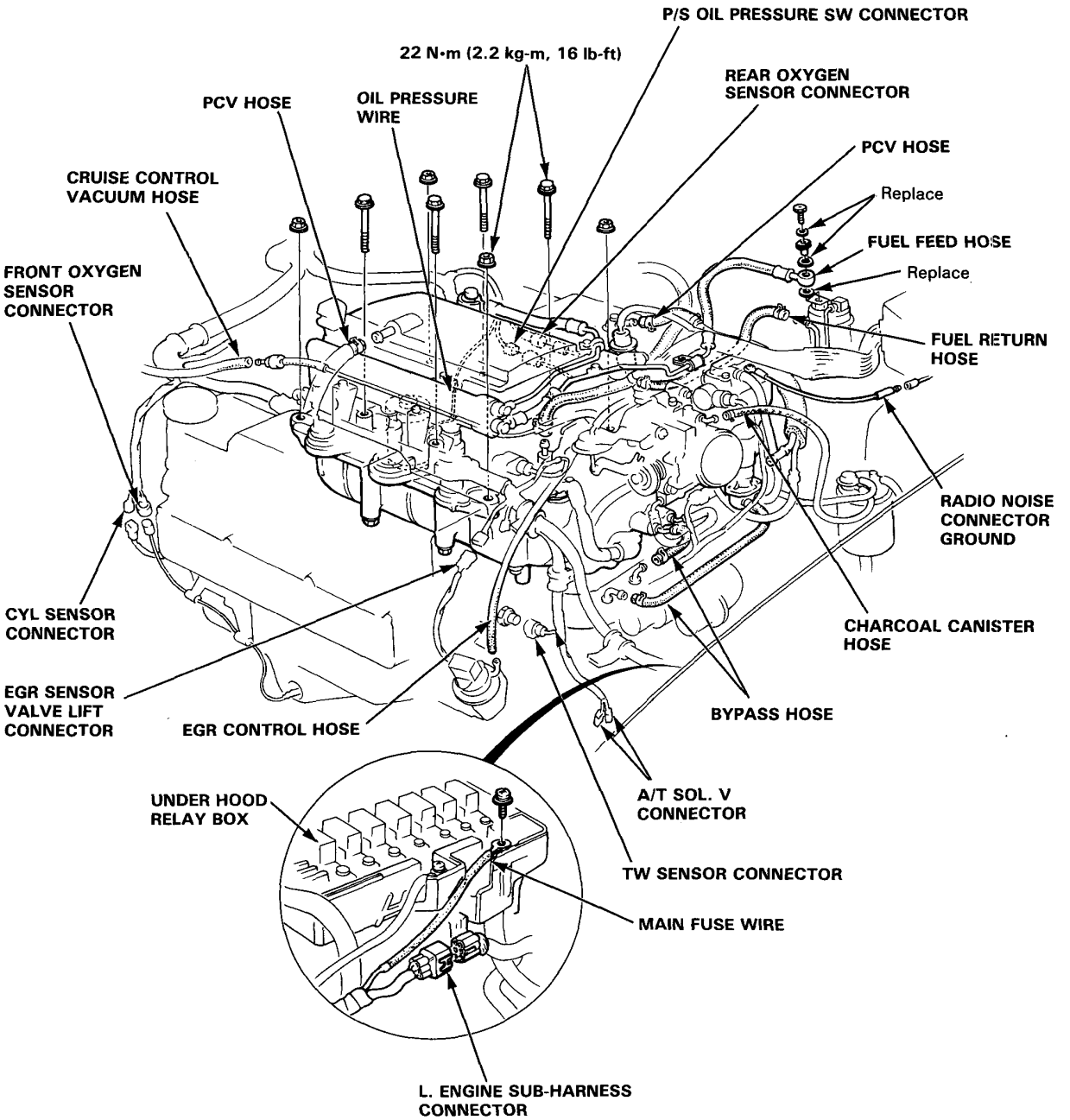
NOTE: Use new O-rings and gaskets whenever reassembling.




CYLINDER HEAD BOLTS
11 x 1.5 mm
78 N·m (7.8 kg-m, 56 lb-ft)
Apply clean engine oil to threads and bolt flanges.
18 mm SEALING BOLT
60 N·m (6.0 kg-m, 43 lb-ft)
SPECIAL WASHER
SPRING
OIL RELIEF VALVE
WASHER
HEAD OIL PLUG
HEAD OIL JET
REAR CYLINDER HEAD
CYLINDER HEAD GASKET
DOWEL PIN
INTAKE VALVE
EXHAUST VALVE
Adjustment, page 5-29
SPRING RETAINER
VALVE KEEPERS
INTAKE VALVE SPRING
VALVE SPRING SEAT
INTAKE VALVE STEM SEAL
INTAKE VALVE GUIDE
16 mm SEALING BOLTS
40 N·m (4.0 kg-m, 29 lb-ft)
FRONT CYLINDER HEAD
Removal, page 5-20
Installation, page 5-25
EXHAUST VALVE GUIDE
VALVE KEEPERS
SPRING RETAINER
OUTER EXHAUST VALVE SPRING
INNER EXHAUST VALVE SPRING
EXHAUST VALVE STEM SEAL
OIL CONTROL JET
O-RINGS
Replace
OIL CONTROL JET
CYLINDER BLOCK
CYLINDER HEAD GASKET
DOWEL PINS

(cont'd)

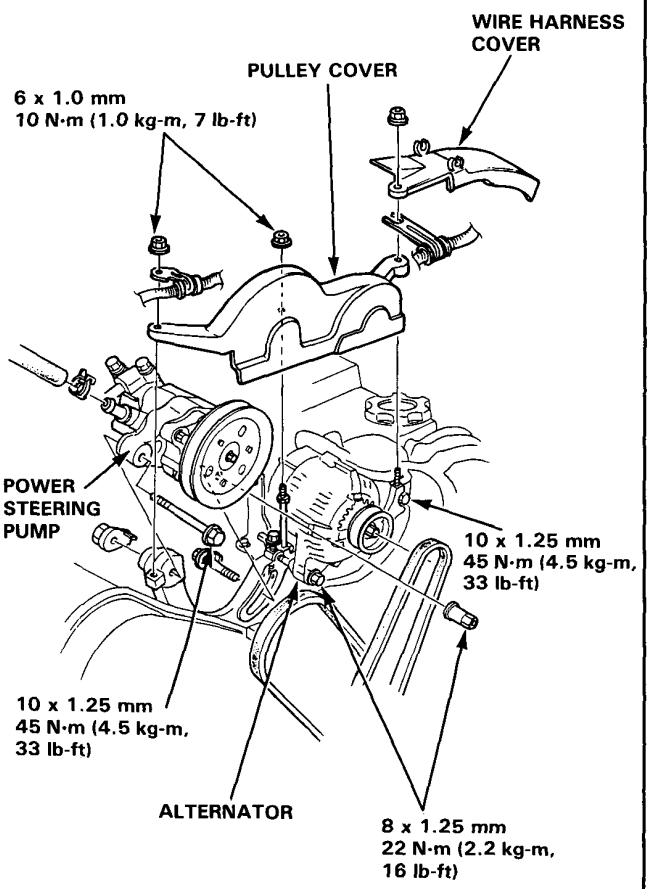
Removal (engine removal not required) (cont'd)



CAUTION: To avoid damaging the cylinder heads, wait until the coolant temperature drops below 38°C (100°F) before loosening the retaining bolts.

NOTE:
- Inspect the timing belt before removing the cylinder head.
- Turn the flywheel so that the No. 1 cylinder is at top-dead-center (page 5-17).
- Mark all emissions hoses before disconnecting them.

1. Disconnect the negative terminal from the battery.
2. Drain the cooling system (page 5-32).
3. Remove the brake booster vacuum hose from the tubing manifold (page 5-34).
4. Remove the engine secondary ground cable from the cylinder head and transmission housing (pages 5-33 and 34).
5. Disconnect the radio condenser connector, ignition coil wire and ignition primary connector (page 5-34).
6. Remove the air cleaner cover.
7. Relieve fuel pressure.
   WARNING Do not smoke while working on fuel system, keep open flame or spark away from work area. Drain fuel only into an approved container.
8. Disconnect the fuel hose and fuel return hose (page 5-34).
9. Disconnect the throttle cable at the throttle body (page 5-34).
10. Disconnect the charcoal canister hose at the throttle valve.
11. Disconnect the engine sub harness connectors and couplers from the cylinder head and intake manifold.
    - Six injector couplers
    - TA sensor connector
    - Temperature unit connector
    - Ground terminals at the fuel pipe
    - Throttle sensor connector
    - TW sensor connector
    - Crankshaft angle sensor coupler
    - EGR valve connector
    - Four wire harness clamps
12. Disconnect the oxygen sensor coupler.
13. Disconnect the upper radiator hose, heater inlet hose, and bypass inlet hose from the cylinder head (page 5-33).
14. Remove the hose between the water passage and the intake manifold.
15. Disconnect the connecting pipe-to-valve body hose and bypass outlet hose.
16. Disconnect the spark plug caps, then remove the distributor assembly from the cylinder head.
17. Remove the intake manifold cover from intake manifold.
18. Remove the wire harness cover.
19. Remove the alternator pulley cover.
20. Remove the alternator and belt.
21. Remove the power steering oil pump and disconnect the pump hoses.
22. Remove the hose clamp bolt on the body.

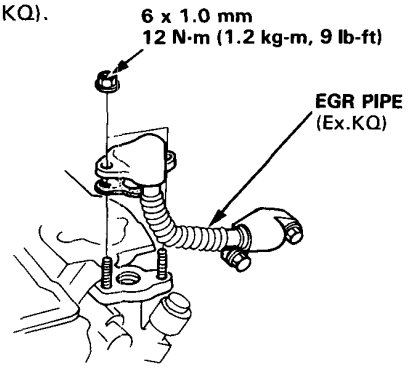


23. Disconnect the idle control solenoid hoses.
24. Remove the cruise control actuator (page 5-33).
25. Remove the exhaust header pipe nuts.
26. Disconnect the exhaust header pipes from manifolds.
27. Remove the air cleaner case mount bolts.
28. Disconnect the hose from the intake manifold to the breather chamber.
29. Remove the air cleaner case and intake hose.

(cont'd)

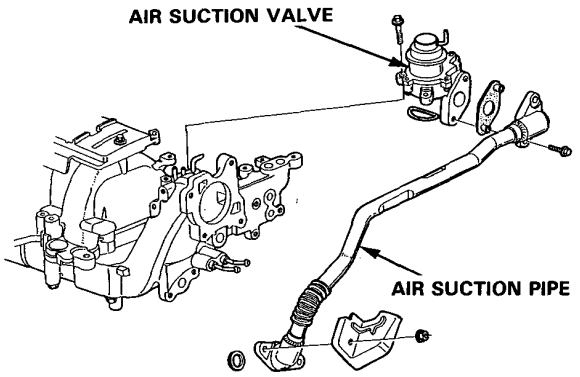
Removal (engine removal not required) (cont'd)

30. Remove the EGR pipe nuts from the cylinder head (Ex.KQ).



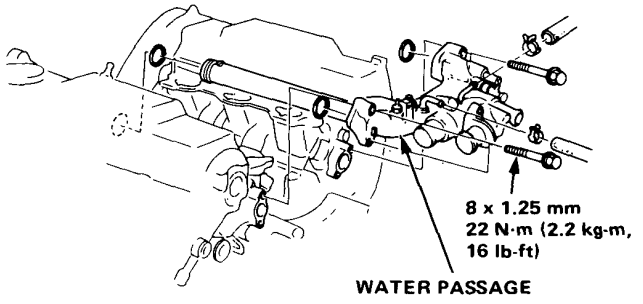
31. Remove the exhaust manifold cover nuts.

32. Remove the air suction pipe fasteners from exhaust manifold and air suction valve. (KG,KX,KS)

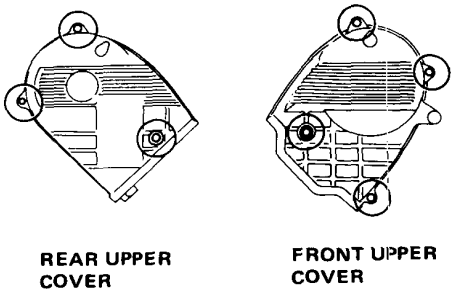


33. Remove the intake manifold assembly from the cylinder head.

34. Remove the water passage assembly from front and rear cylinder heads.



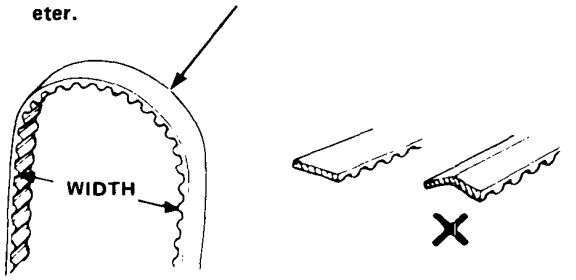
35. Remove the timing belt upper covers.



36. Loosen the tensioner adjustment bolt, then remove the timing belt.

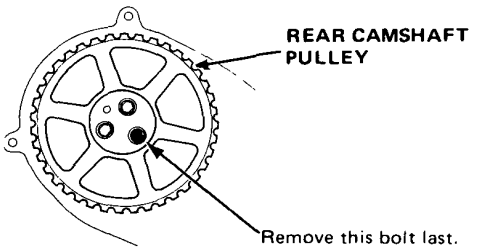
- Advance the crankshaft by about 15° before removing the timing belt to prevent interference between the piston and valve.

CAUTION: Do not crimp or bend timing belt more than 90° or less than 25 mm (1 in.) in diameter.



37. Remove the front and rear camshaft pulleys.

- Before removing the rear pulley, adjust the cam position so that no valve is fully open.
- Remove the pulley mounting bolts with a pulley holder and double-end wrench. For the rear pulley, remove the lower bolt last.

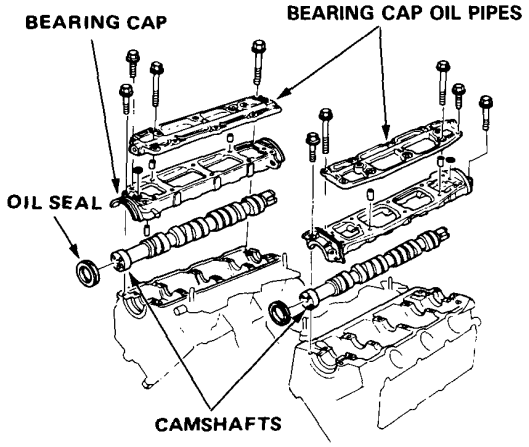


38. Remove the upper cover back plates.

39. Remove the valve covers.

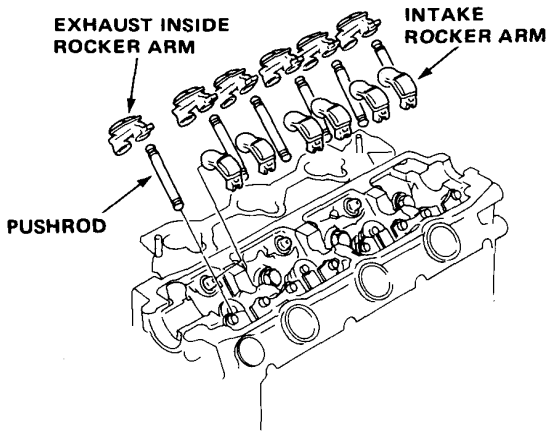
40. Remove the head side covers.

41. Remove the bearing cap oil pipes and bearing caps, then remove the camshaft.



42. Remove the intake and exhaust inside rocker arms and pushrods.

CAUTION: Identify the parts as they are removed to ensure reinstallation in the proper locations.



43. Remove the cylinder head bolts, then remove the cylinder head.

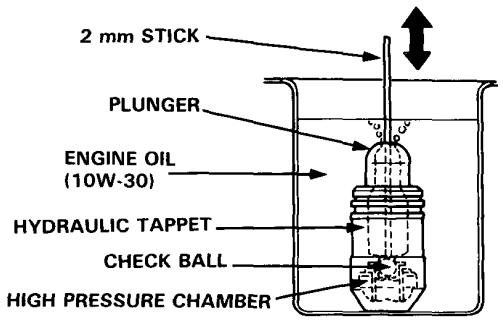
CAUTION: To prevent warpage, unscrew bolts 1/3 turn each time and repeat sequence until loose.

Inspection

1. Inspect the hydraulic tappet for wear or damage or for a clogged oil hole.

   CAUTION: Never attempt to disassemble the tappets.

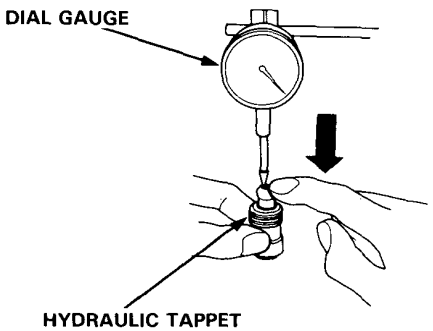
2. Bleed the hydraulic tappet as follows:
   - Keep the hydraulic tappet upright into the oil.
   - While pushing the check ball with a 2 mm stick, move the plunger up and down slowly until no air bubbles appear from the hydraulic tappet.
   - Quickly push the plunger and check if it is locked.



3. Remove the hydraulic tappet and try to compress it quickly by hand. Measure the compression stroke with a dial gauge on a surface plate.

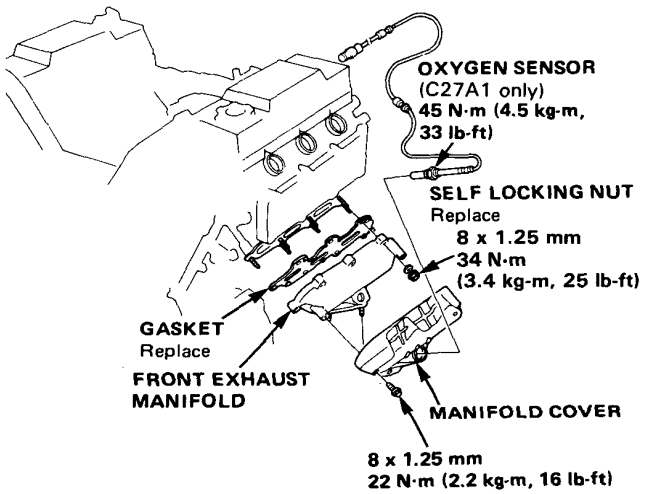
   NOTE: Slow pushing does not cause close contact of the check ball, resulting in increased sink.

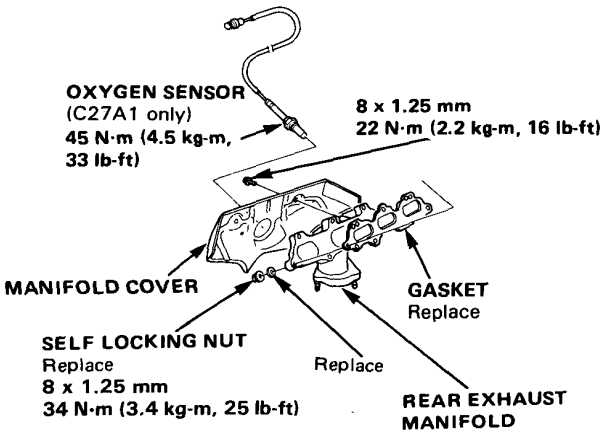
   Compression Stroke: 0.01—0.08 mm (0.0004—0.003 in.)



Installation

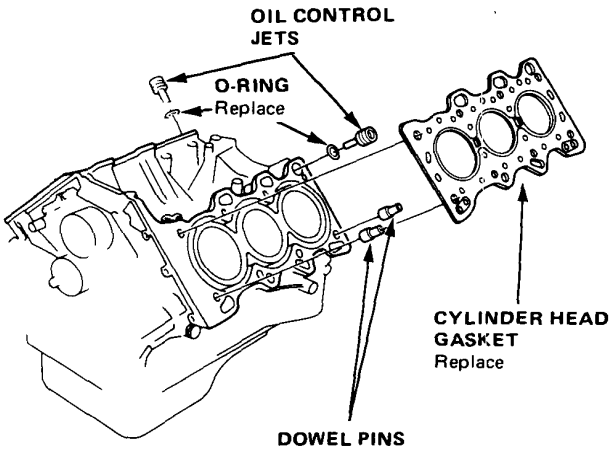
1. Install the cylinder head in reverse order of removal:
   - Always use a new head gasket.
   - Cylinder head and engine block surface must be clean.
   - Turn the crankshaft so the No. 1 piston is at TDC.
2. Install the exhaust manifolds and tighten the nuts in a criss-cross pattern in 2 or 3 steps, beginning with the inner nuts.
3. Install the exhaust manifold covers.





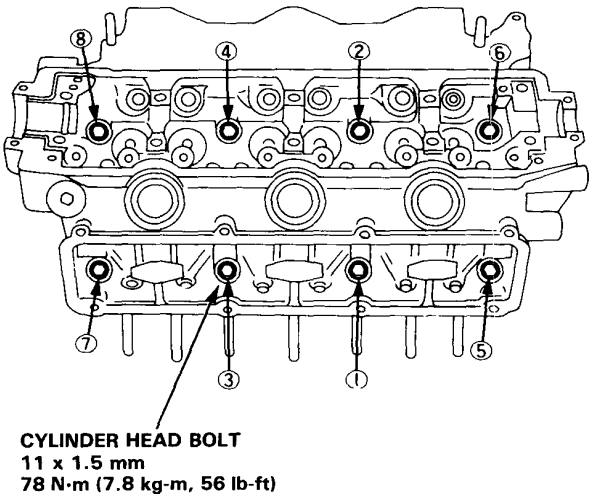
CAUTION: Do not touch or get dirt on the probe ends of the Oxygen Sensors. Any contamination will affect their performance.

4. Cylinder head dowel pins and oil control jets must be aligned.



5. Tighten cylinder head bolts in two steps.
   In the first step tighten all bolts and nuts, in sequence, to about 40 N·m (4.0 kg-m, 29 lb-ft); in the final step tighten, in same sequence, to 78 N·m (7.8 kg-m, 56 lb-ft).

CYLINDER HEAD TORQUE SEQUENCE



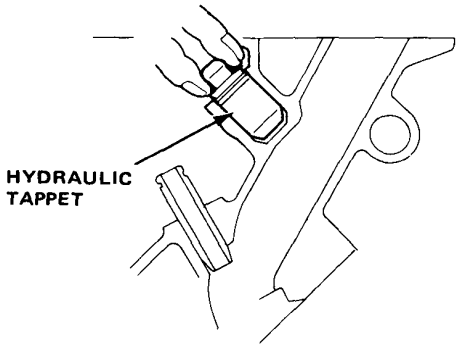
CAUTION: If you suspect the condition or performance of any of the tappets, follow the Inspection/ Bleeding procedure (page 5-25) before reassembly.

6. Pour engine oil into the cylinder head hydraulic tappet mounting hole, up to the level of the oil path.

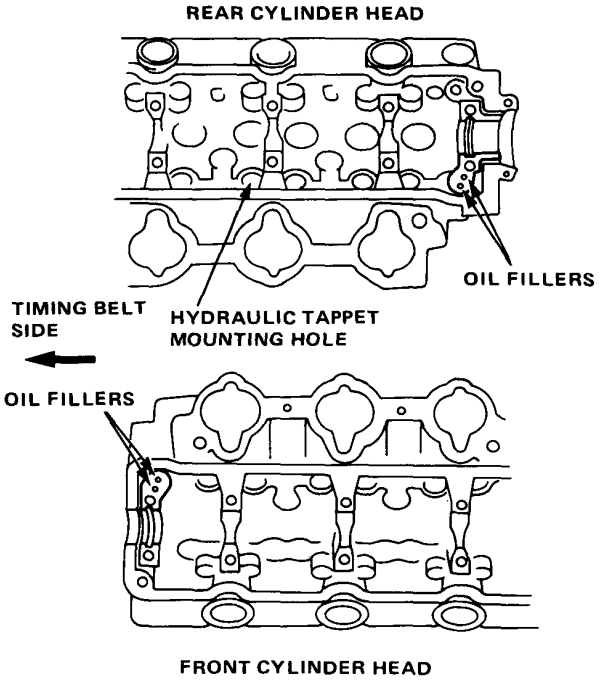
7. Install the hydraulic tappet in the cylinder head.

CAUTION:

- **Do not rotate the hydraulic tappet while inserting it.**
- **Carefully follow the special start-up procedure after the head is reassembled (page 5-29) to allow the tappets to fill with oil.**



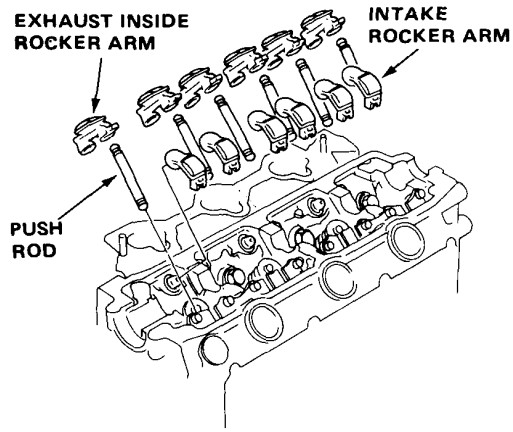
8. Pour engine oil into the oil fillers on the cylinder head.



9. Install the push rods and rocker arms.

CAUTION:

- ***Install each part in its original position.***
- **Loosen the rocker arm adjusting screws and locknuts before installation.**



10. Install the camshafts and camshaft oil seals.

CAUTION: Note the locations of the camshafts; the front camshaft has a groove for driving the distributor.

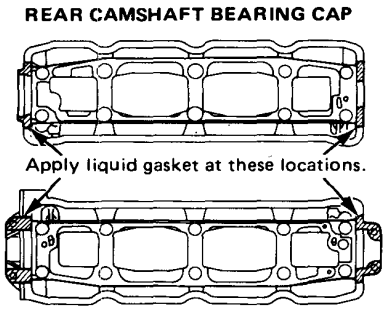
NOTE:

- Make sure that the camshaft is mounted parallel with the rocker arm slipper surface.
- Advance the crankshaft by 15° from No. 1 cylinder TDC of compression stroke to prevent interference between the piston and valve.
- Place the rear camshaft on the cylinder head at the position where the cam is not pushing the valve.
- Preset the oil seal, with its spring side facing inward.
- Install the rear camshaft sealing rubber.
- Do not apply oil to the cam holder side of the oil seal.

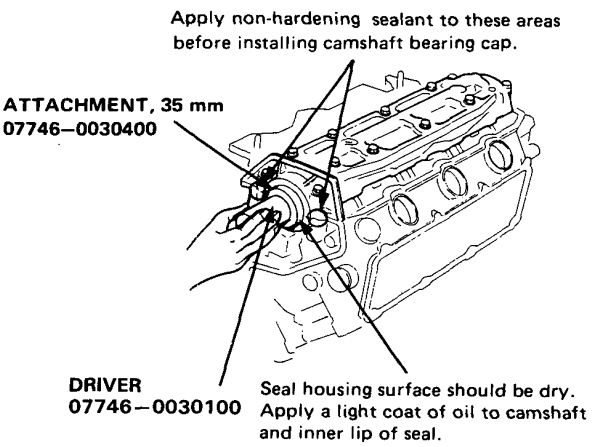
(cont'd)

Installation (cont'd)

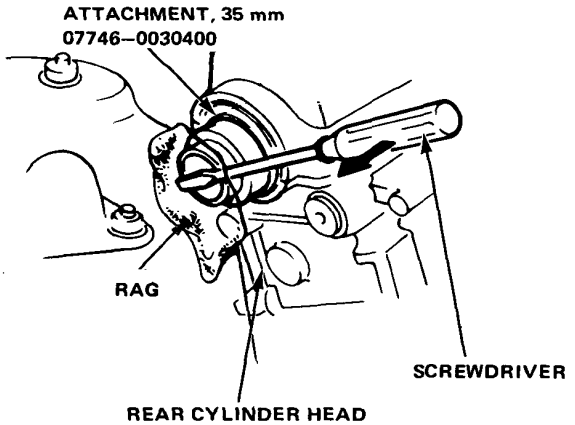
11. Apply liquid gasket to the camshaft oil seal mounting surface and on the head contact surface. Temporarily tighten the bearing caps. See the tightening sequence step 8.



- The camshaft seal can be installed without removing the camshaft bearing caps. The following tools can be used for seal installation if the engine is out of the car.



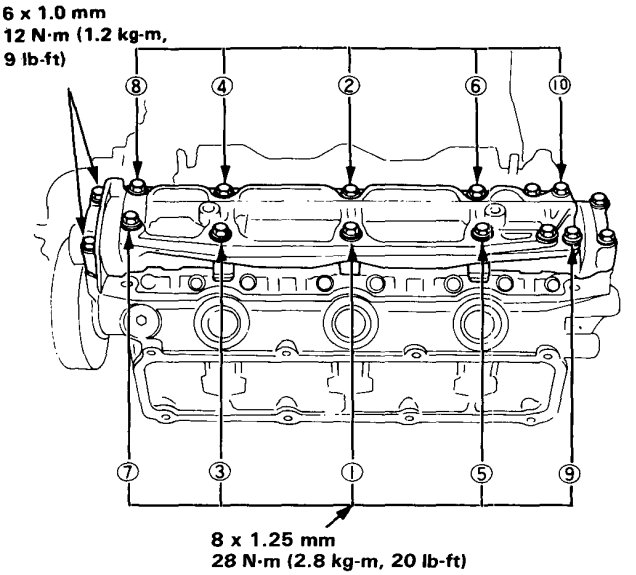
- If the engine is installed in the car, camshaft seal can be installed as shown below.



12. Carefully fit the camshaft oil seal until it contacts the bearing cap.

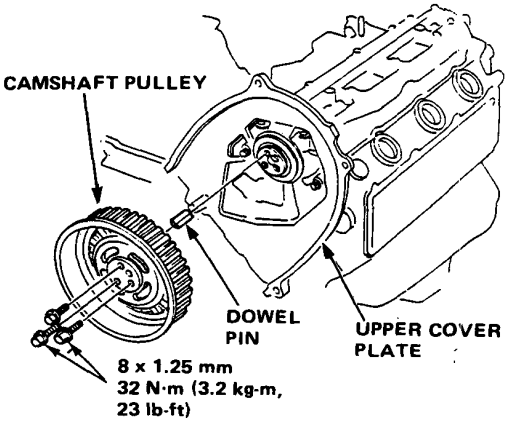
13. Tighten the bolts of the camshaft bearing cap diagonally from the center.

NOTE:
- Tighten the 6 mm bolts last.
- Make sure that the oil seal is properly positioned.



14. Install the timing belt upper cover plate.

15. Install the camshaft pulley.



16. Install the timing belt.

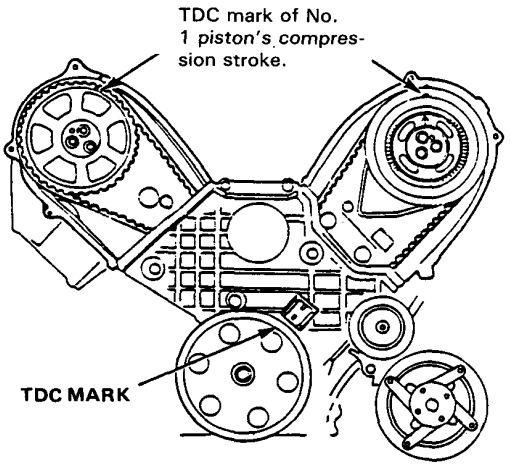
17. Adjust the valve timing (page 5-17).

18. Adjust the timing belt tension (page 5-13).

19. Adjust the exhaust rocker arm adjusting screws.

–1. Adjust the front and rear camshafts at the TDC of No. 1 piston's compression stroke.

- No. 1, No. 2 and No. 4 cylinders now have the exhaust valves closed.

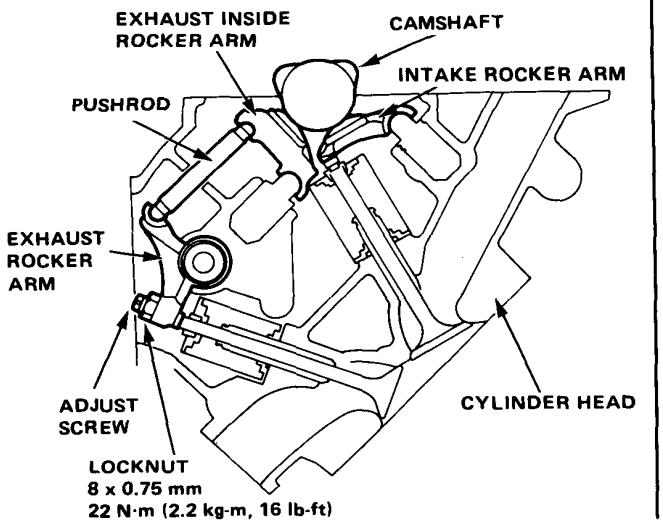


–2. Tighten the adjusting screw for No. 1 cylinder.

NOTE: When you feel the screw contact the valve, tighten the screw 1.5 turns.

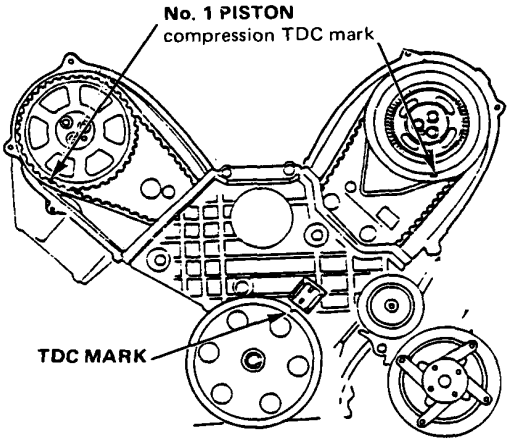
- Tighten the locknut firmly.

–3. Set the adjusting screws for No. 2 and No. 4 cylinders in the same way.



–4. Rotate the crankshaft pulley one turn clockwise (as viewed from the pulley side) to adjust to the TDC of No. 5 piston's compression stroke.

- The exhaust valves of cylinders No. 3, No. 5 and No. 6 are now closed.



–5. Set the adjusting screws for No. 3, No. 5 and No. 6 cylinders in the same way as in step –2 above.

20. Install the valve covers and head side covers.

- Replace the O-rings for the head side covers.

SPECIAL START-UP PROCEDURE:

21. After the heads are reassembled, make sure the engine sits for at least five minutes to allow the hydraulic tappets to reach proper oil level.

22. Remove the spark plugs. Have someone crank the engine; feel for compression from each cylinder at the spark plug holes. It may be necessary to crank the engine through several cycles to confirm compression.

- If any cylinder does not have compression, it may be necessary to disassemble that head and check the suspected tappet (page 5-25).

- If all cylinders have compression, reinstall the plugs and start the engine.