

Cylinder Head/Valve Train D16Y5, D16Y7, D16Y8 engines

Special Tools	6-2
VTEC Control System	
Troubleshooting Flowchart	6-3
VTEC Solenoid Valve	
Inspection	6-6
VTEC Rocker Arms	
Manual Inspection	
(D16Y5 engine)	6-7
Manual Inspection	
(D16Y8 engine)	6-7
Inspection Using Special Tools	
(D16Y5 engine)	6-8
Inspection Using Special Tools	
(D16Y8 engine)	6-10
Valve Clearance	
Adjustment	6-12
Valve Seals	
Replacement (Cylinder head removal	
not required)	6-14
Crankshaft Pulley and Pulley Bolt	
Replacement	6-16
Timing Belt	
Illustrated Index	6-17
Inspection	6-18
Tension Adjustment	6-18
Removal	6-19
Installation	6-20
Crankshaft Speed Fluctuation (CKF) Sensor	
Replacement	6-22

Cylinder Head	
Illustrated Index	6-23
Removal	6-27
Warpage	6-40
Installation	6-45
Rocker Arms	
Removal	6-30
Disassembly/Reassembly	6-31
Rocker Arms and Lost Motion Assemblies	
Inspection (D16Y5, D16Y8	
engines)	6-34
Rocker Arms and Shafts	
Clearance Inspection	6-35
Camshaft	
Inspection	6-36
Valves, Valve Springs and Valve Seals	
Removal	6-38
Valve Guides	
Valve Movement	6-39
Replacement	6-41
Reaming	6-43
Valve Seats	
Reconditioning	6-40
Valves	
Installation	6-43
Camshaft/Rocker Arms and	
Camshaft Seal/Pulley	
Installation	6-44

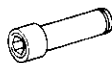


Special Tools

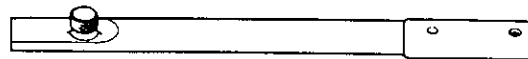
Ref. No.	Tool Number	Description	Qty	Page Reference
①	07HAH - PJ7010B	Valve Guide Reamer, 5.5 mm	1	6-43
②	07JAA - 001010A	Socket, 17 mm	1	6-16
③	07JAB - 001020A	Holder Handle	1	6-16
④	07LAJ - PR3020B	Air Stopper	1	6-8, 10
⑤	07NAB - 001040A	Holder Attachment, 50 mm	1	6-16
⑥	07NAJ - P07010A	Pressure Gauge Adapter	1	6-4
⑦	07406 - 0020201	A/T Pressure Hose	1	6-4
or ⑦ - 1	07MAJ - PY4011A	A/T Pressure Hose, 2,210 mm	1	6-4
and ⑦ - 2	07MAJ - PY40120	A/T Pressure Adapter	1	6-4
⑧	07406 - 0070300	A/T Low Pressure Gauge W/Panel	1	6-4
⑨	07742 - 0010100	Valve Guide Driver, 5.5 mm	1	6-41, 42



①



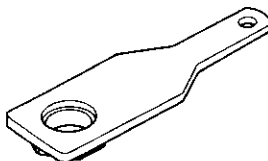
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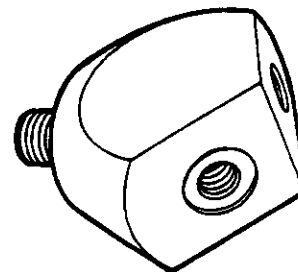
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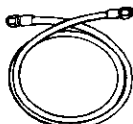
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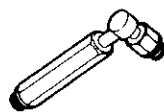
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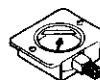
⑥



⑦
⑦ - 1



⑦ - 2



⑧



⑨



Troubleshooting Flowchart

P1259

The scan tool indicates Diagnostic Trouble Code (DTC) P1259: A problem in the VTEC Pressure Switch circuit or VTEC Solenoid Valve circuit.

Refer to page 11-38 through 11-55 before troubleshooting.

- The MIL has been reported on.
- DTC P1259 is stored.

Check the VTEC Control System:

1. Do the engine control module (ECM)/powertrain control module (PCM) Reset Procedure (see section 11).
2. Start the engine.
3. Warm up the 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 (D16Y5 engine) or 6,000 rpm (D16Y8 engine). Hold that engine speed for at least two seconds. If DTC P1259 is not repeated during the first road test, repeat this test two more times.

Is DTC P1259 indicated?

NO

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

YES

Test the VTEC Pressure Switch:

1. Turn the ignition switch OFF.
2. Disconnect the VTEC Pressure switch 2P connector.
3. Check for continuity between VTEC pressure switch 2P connector terminal No. 1 and No. 2.

Is there continuity?

NO

Replace the VTEC pressure switch.

YES

Test the VTEC Pressure Switch Wire:

1. Turn the ignition switch ON (II).
2. Measure the voltage between VTEC pressure switch 2P connector No. 1 and body ground.

Is there battery voltage?

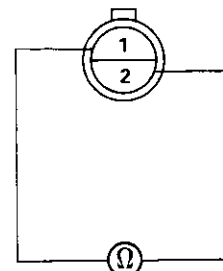
NO

Inspect for an open or short to ground in the wire between the VTEC pressure switch and ECM/PCM ('96 - '98: C15, '99 - '00: C10). If the wire is OK, substitute a known-good ECM/PCM and recheck.

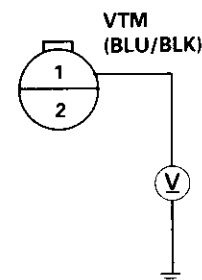
YES

(To page 6-4)

VTEC PRESSURE SWITCH 2P CONNECTOR



Terminal side of male terminals



Wire side of female terminals

(cont'd)

VTEC Control System

Troubleshooting Flowchart (cont'd)

(From page 6-3)

Test the VTEC Pressure Switch Wire:
Measure voltage across the VTEC pressure switch 2P connector.

Is there battery voltage?

NO

- Repair open in the wire between VTEC pressure switch and G101.
- If the wire is OK, substitute a known-good ECM/PCM and recheck.

YES

Test the VTEC Solenoid Valve:
1. Turn the ignition switch OFF.
2. Disconnect the VTEC solenoid valve 1P connector.
3. Check for continuity between the VTEC solenoid valve 1P connector terminal No. 1 and body ground.

Is there 14 - 30 Ω?

NO

Replace VTEC solenoid valve.

YES

Test the VTEC Solenoid Valve:
1. Remove the VTEC pressure switch and install the special tool as shown, then reinstall the VTEC pressure switch.
2. Reconnect the VTEC solenoid valve 1P connector and VTEC pressure switch 2P connector.
3. Connect the 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 D16Y5 engine: 1,000 and 3,000 rpm, D16Y8 engine: 1,000, 3,000 and 5,000 rpm.

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

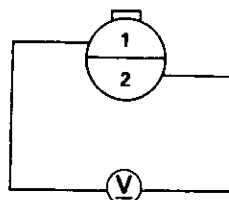
NO

Inspect the VTEC solenoid valve (see page 6-6).

YES

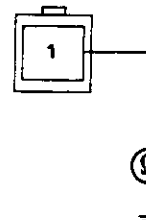
(To page 6-5)

VTEC PRESSURE SWITCH 2P CONNECTOR



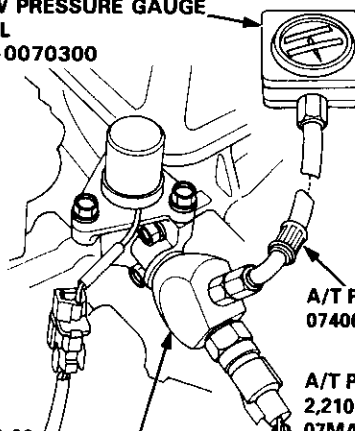
Wire side of female terminals

VTEC SOLENOID VALVE 1P CONNECTOR



Terminal side of male terminal

A/T LOW PRESSURE GAUGE W/PANEL
07406-0070300



A/T PRESSURE HOSE
07406-0020201

or

A/T PRESSURE HOSE, 2,210 mm
07MAJ-PY4011A and
A/T PRESSURE ADAPTER
07MAJ-PY40120

PRESSURE GAUGE ADAPTER
07NAJ-P07010A

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



(From page 6-4)

Test the VTEC Solenoid Valve:

1. Turn the ignition switch OFF.
2. Disconnect the VTEC solenoid valve 1P connector.
3. Attach the battery positive terminal to the VTEC solenoid valve terminal.
4. Start the engine and check the oil pressure at engine speed of 5,000 rpm.

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

NO

Inspect the VTEC solenoid valve (see page 6-6).

YES

Test the VTEC Pressure Switch:

With the battery positive terminal connected to the VTEC solenoid valve, measure voltage between the ECM/PCM connector terminal '96 - 98: C15, '99 - 00: C10 and body ground.

Is there battery voltage above 5,000 rpm?

NO

Replace the VTEC pressure switch.

YES

Test the VTEC Solenoid Valve Wire:

1. Turn the ignition switch OFF.
2. Check for continuity between the VTEC solenoid valve 1P connector terminal and the ECM/PCM connector terminal '96 - 98: A8, '99 - 00: B12.

Is there continuity?

NO

Repair open in the wire between the ECM/PCM ('96 - 98: A8, '99 - 00: B12) and VTEC solenoid valve connector.

YES

Test the VTEC Solenoid Valve Wire:

Check for continuity between the VTEC solenoid valve 1P connector terminal and body ground.

Is there continuity?

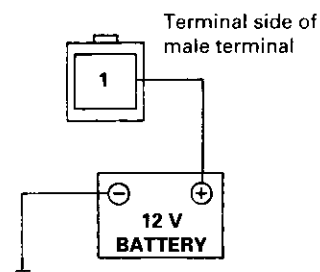
YES

Repair short in the wire between the ECM/PCM ('96 - 98: A8, '99 - 00: B12) and VTEC solenoid valve connector.

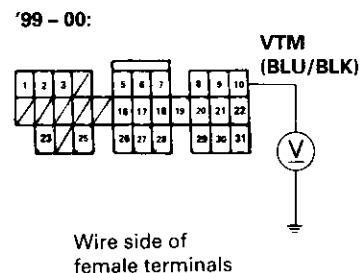
NO

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

VTEC SOLENOID VALVE 1P CONNECTOR



ECM/PCM CONNECTOR C (31P)



'99 - 00:

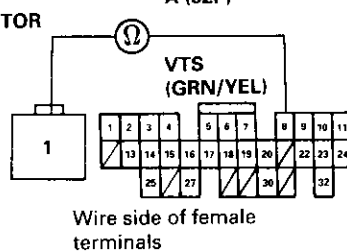
VTEC SOLENOID VALVE 1P CONNECTOR

ECM/PCM CONNECTOR B (25P)

'96 - 98:

VTEC SOLENOID VALVE CONNECTOR

ECM/PCM CONNECTOR A (32P)



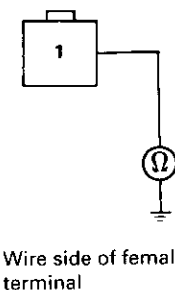
'99 - 00:

VTEC SOLENOID VALVE 1P CONNECTOR

VTS (GRN/YEL)



VTEC SOLENOID VALVE 1P CONNECTOR

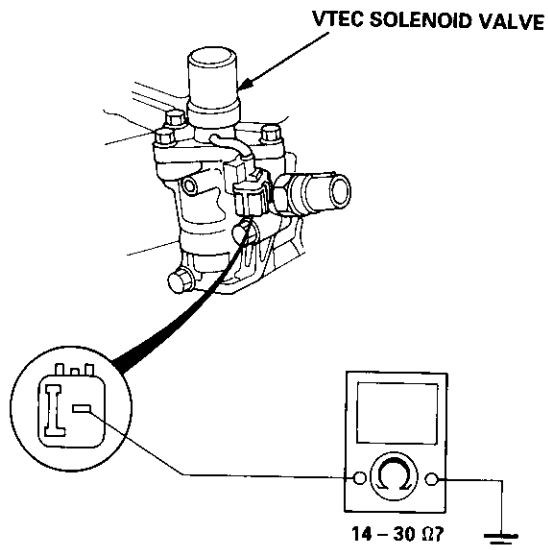


VTEC Solenoid Valve

Inspection

1. Disconnect the 1P connector from the VTEC solenoid valve.
2. Measure resistance between the terminal and body ground.

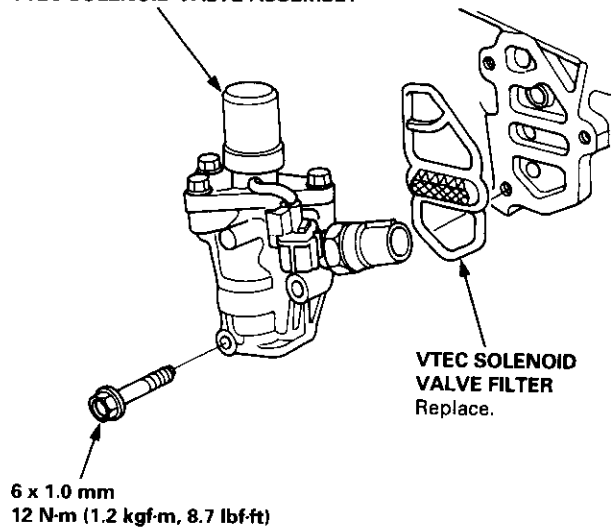
Resistance: 14 – 30 Ω



3. If the resistance is within specifications, remove the VTEC solenoid valve assembly from the cylinder head, and check the VTEC solenoid valve filter for clogging.

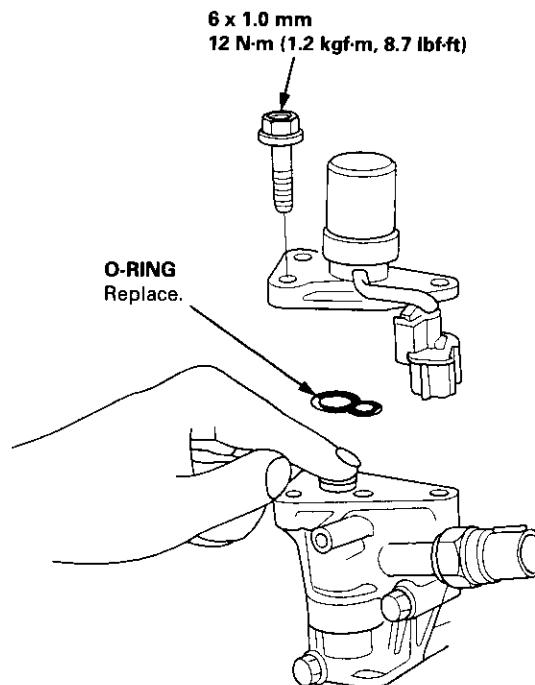
- If there is clogging, replace the engine oil filter and the engine oil.

VTEC SOLENOID VALVE ASSEMBLY



4. 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.

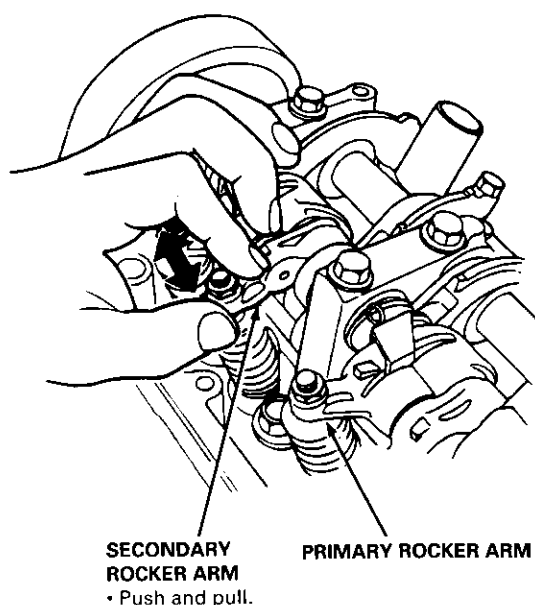




Manual Inspection (D16Y5 engine)

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

NOTE: Refer to page 6-46 when installing the 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.

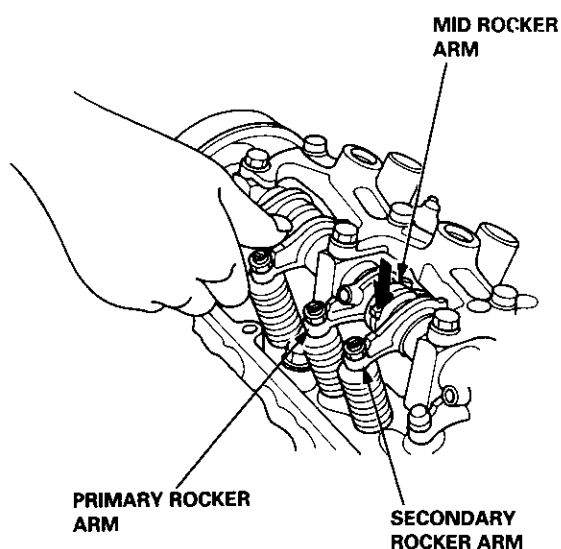


5. Check the intake secondary rocker arm of each cylinder at TDC.
 - If the intake secondary rocker arm does not move, remove the primary and secondary intake rocker arms as an assembly and check that the pistons in the secondary and primary rocker arms move smoothly.
 - If any rocker arm needs replacing, replace the primary and secondary rocker arms as an assembly.

Manual Inspection (D16Y8 engine)

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

NOTE: Refer to page 6-46 when installing the cylinder head cover.
3. Push the intake mid rocker arm on the No. 1 cylinder manually.
4. Check that the intake mid rocker arm moves independently of the primary and secondary intake rocker arms.



5. Check the intake mid rocker arm of each cylinder at TDC.
 - If the intake mid rocker arm does not move, remove the mid, primary and secondary intake 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.

VTEC Rocker Arms

Inspection Using Special Tools (D16Y5 engine)

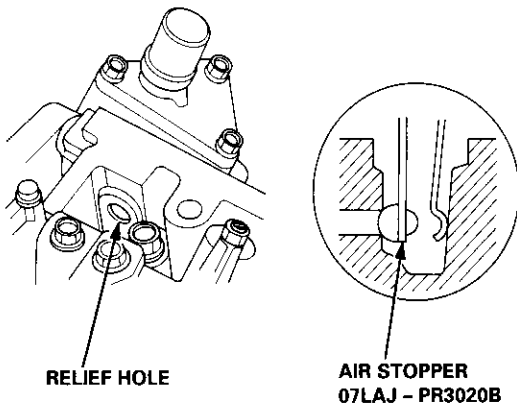
CAUTION:

- 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 primary rocker arm of each cylinder at TDC.

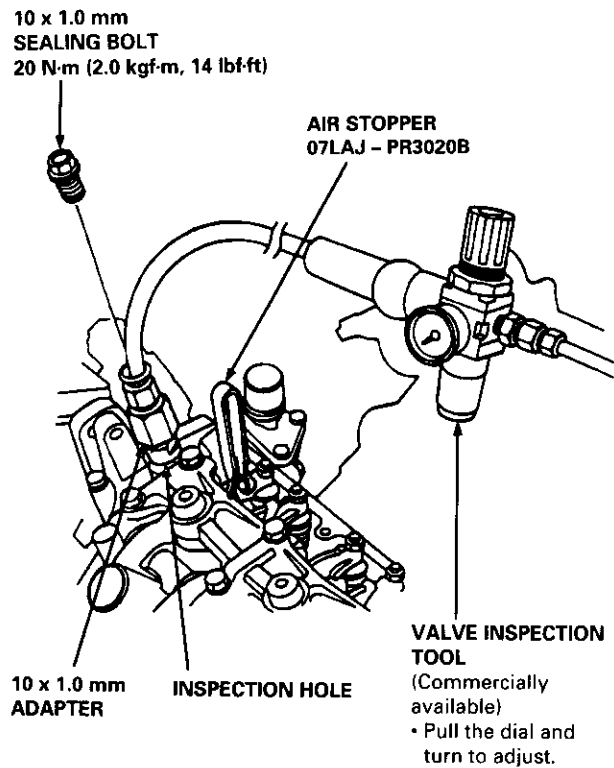
1. Remove the cylinder head cover.

NOTE: Refer to page 6-46 when installing the cylinder head cover.

2. Plug the relief hole with the special tool.



3. Remove the sealing bolt from the inspection hole and connect the an air pressure regulator with a 0 - 100 psi gauge.



4. Loosen the regulator valve on the valve inspection tool and apply the specified air pressure.

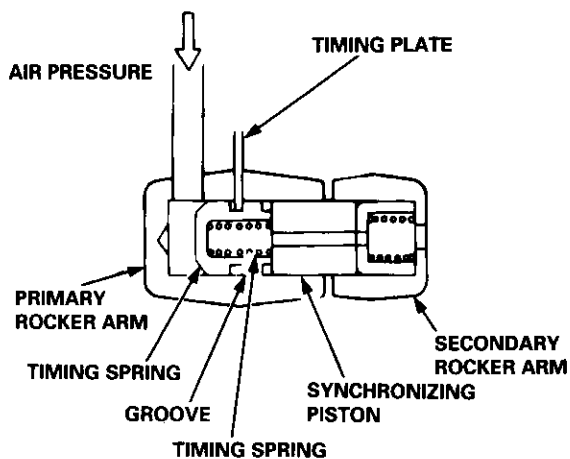
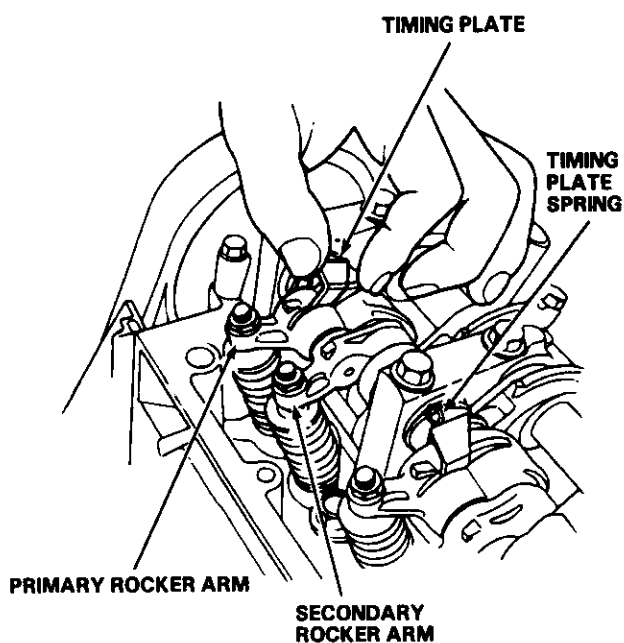
Specified Air Pressure:
250 kPa (2.5 kgf/cm², 36 psi)



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:

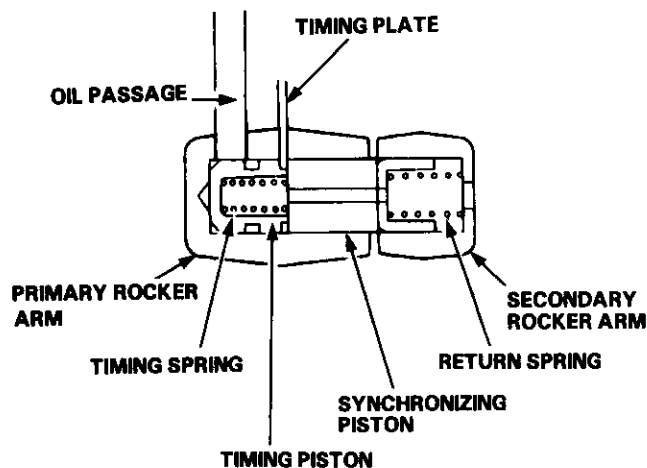
- The synchronizing piston can be seen in the gap between the secondary and primary rocker arms.
- With the timing plate engaged in the groove on the timing piston, the piston is locked in the pushed out position.



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

NOTE:

- When the timing plate is pushed up, it releases the timing piston, letting the return spring move the synchronizing piston to its original position.
7. Replace the intake rocker arms as an assembly if either does not work correctly.



8. Remove the special tools.
9. After inspection, check that the malfunction indicator lamp (MIL) does not come on.

VTEC Rocker Arms

Inspection Using Special Tools (D16Y8 engine)

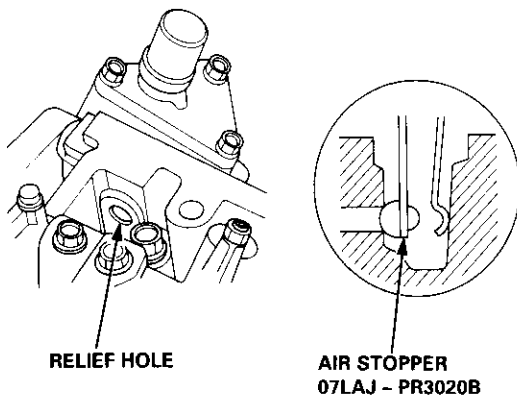
CAUTION:

- 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 primary rocker arm of each cylinder at TDC.

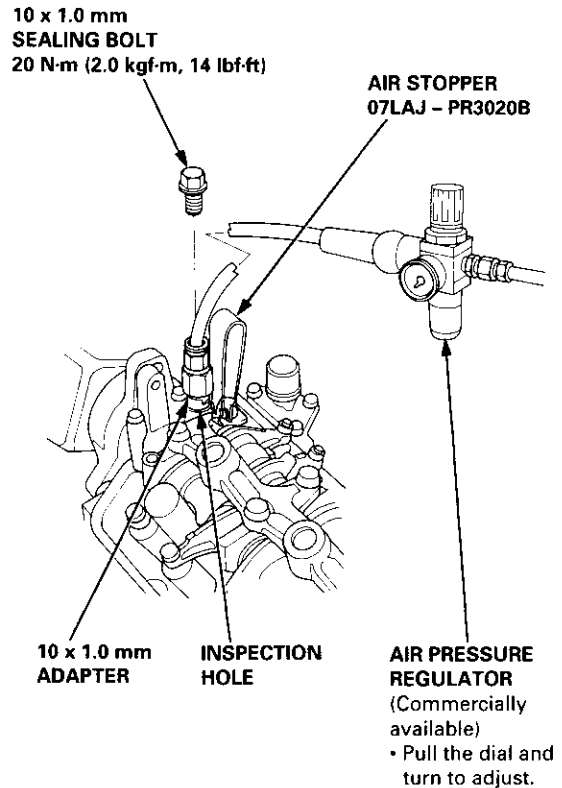
1. Remove the cylinder head cover.

NOTE: Refer to page 6-46 when installing the cylinder head cover.

2. Plug the relief hole with the special tool.



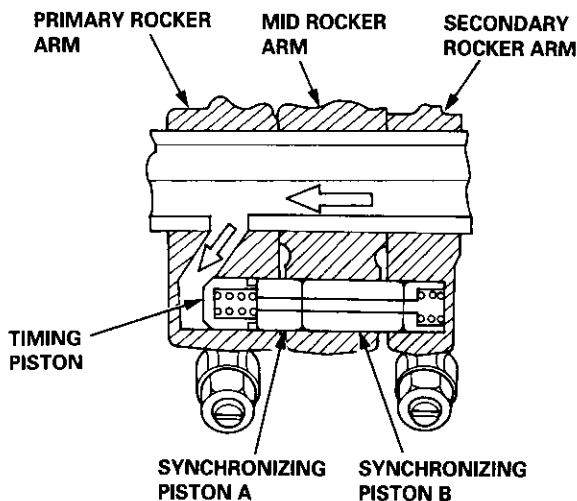
3. Remove the sealing bolt from the inspection hole and connect an air pressure regulator with a 0 - 100 psi gauge.



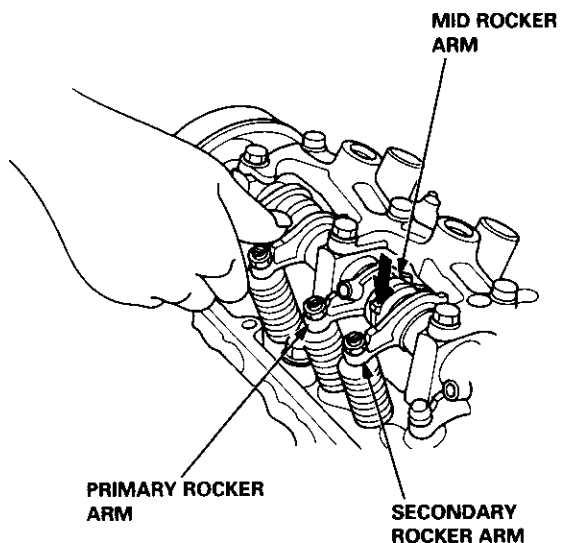


4. Loosen the regulator valve on the valve inspection tool and apply the specified air pressure.

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

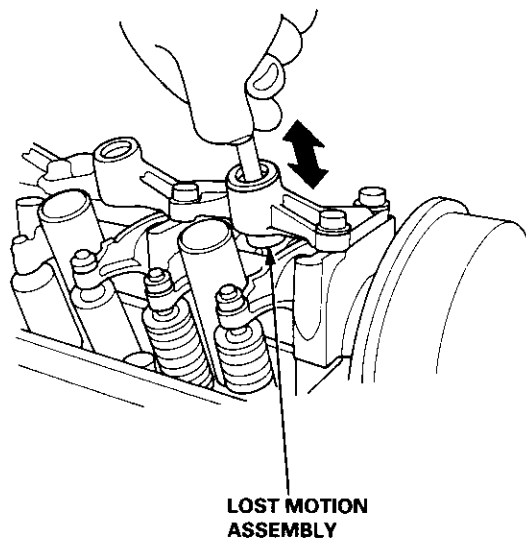


5. Make sure that the intake primary and secondary rocker arms are mechanically connected by the piston and that the mid rocker arm does not move when pushed manually.



6. If any intake mid rocker arm moves independently of the primary and secondary rocker arms, replace the rocker arms as a set.

7. Remove the special tools.
8. Use a 10 mm diameter rod to depress each lost motion assembly through its full movement. Replace any lost motion assembly that does not move smoothly.



9. After inspection, check that the MIL does not come on.

Valve Clearance

Adjustment

NOTE:

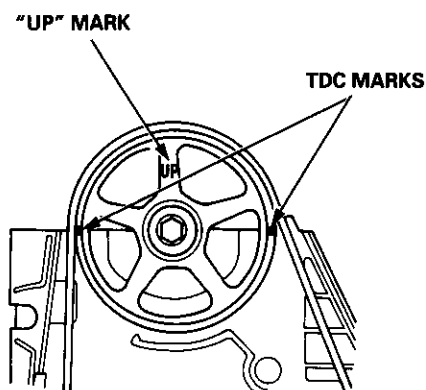
- Valves should be adjusted only when the cylinder head temperature is less than 100°F (38°C).
- After adjusting, retorque the crankshaft pulley bolt (see page 6-16).

1. Remove the cylinder head cover.

NOTE: Refer to page 6-46 when installing the cylinder head cover.

2. Remove the upper cover (see page 6-19).

3. Set the No. 1 piston at TDC. The "UP" mark on the cam-shaft pulley should be at top, and the TDC marks should align with the cylinder head 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)

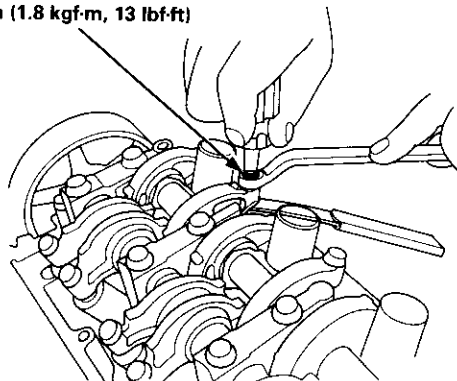
5. Loosen the locknut, and turn the adjustment screw until the feeler gauge slides back and forth with a slight amount of drag.

D16Y7 engine:

CAUTION: Do not overtighten the locknuts; the rocker arms are made of aluminum.

INTAKE and EXHAUST VALVE LOCKNUTS

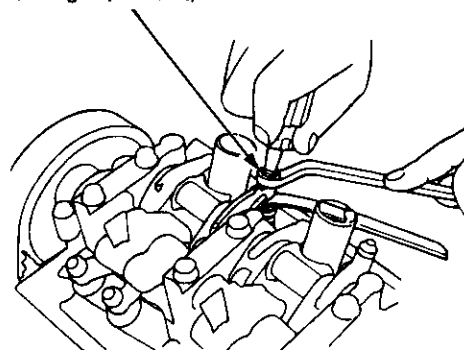
18 N·m (1.8 kgf·m, 13 lbf·ft)



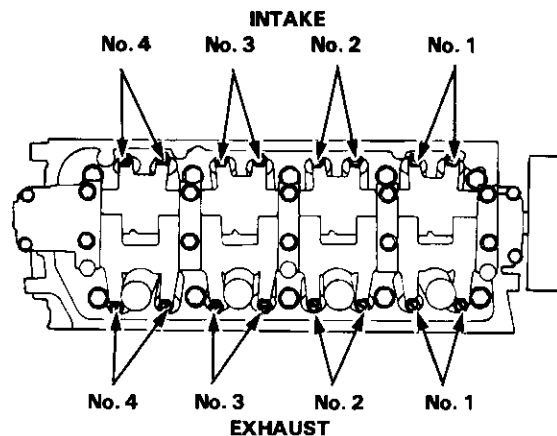
D16Y5, D16Y8 engines:

INTAKE and EXHAUST VALVE LOCKNUTS

20 N·m (2.0 kgf·m, 14 lbf·ft)

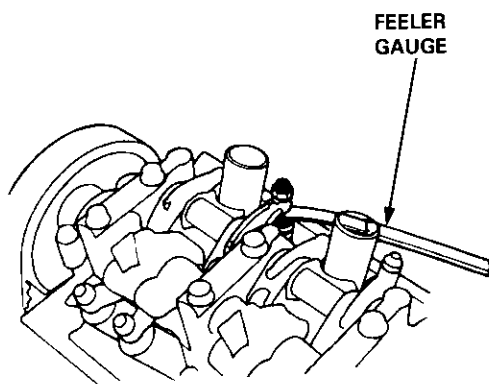


Adjusting screw locations:

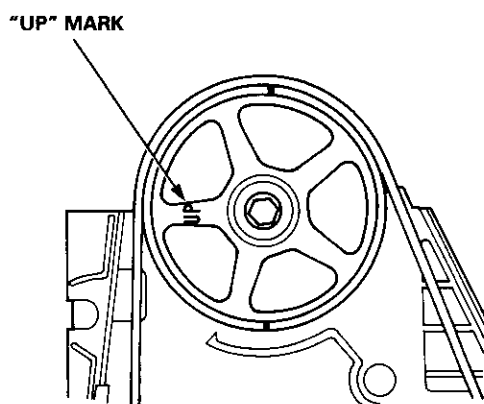




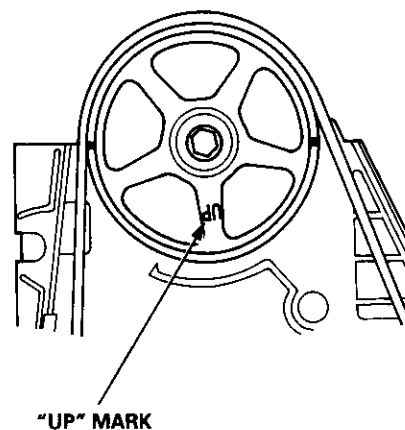
6. Tighten the locknut, and check the clearance again. Repeat the adjustment if necessary.



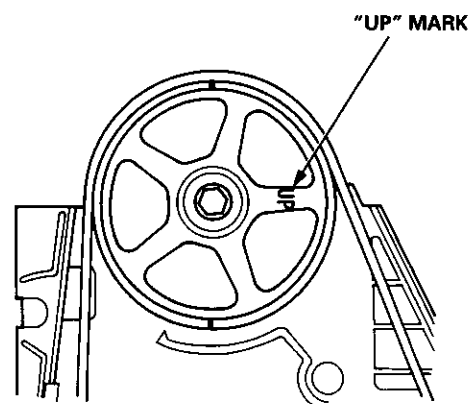
7. Rotate the crankshaft 180° counterclockwise (camshaft pulley turns 90°). The "UP" mark should be on the exhaust side. Adjust valves on No. 3 cylinder.



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.



Valve Seals

Replacement (Cylinder head removal not required)

NOTE: Cylinder head removal is not required in this procedure.

The procedure shown below applies when using the in-car valve spring compressor (Snap-on YA8845 with YA8845 - 2 A 7/8" attachment).

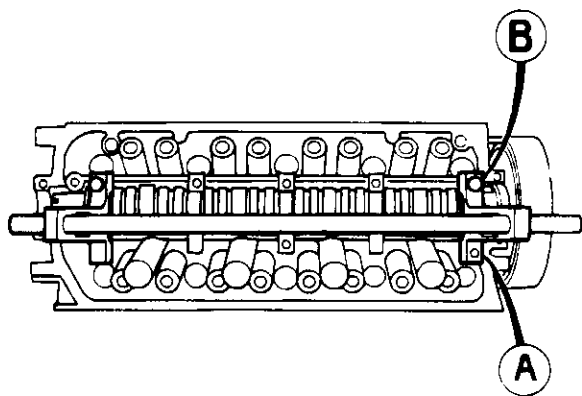
⚠ WARNING Always wear approved eye protection when using the in-car valve spring compressor.

1. Turn the crankshaft so that the No. 1 and the No. 4 pistons are at top dead center (TDC).
2. Remove the cylinder head cover and the rocker arm assembly.

NOTE:

- Refer to page 6-30 for rocker arm assembly removal.
- When removing or installing the rocker arm assembly, do not remove the camshaft holder bolts. The bolts will keep the holders, springs and rocker arms on the shaft.
- Refer to page 6-46 when installing the cylinder head cover.

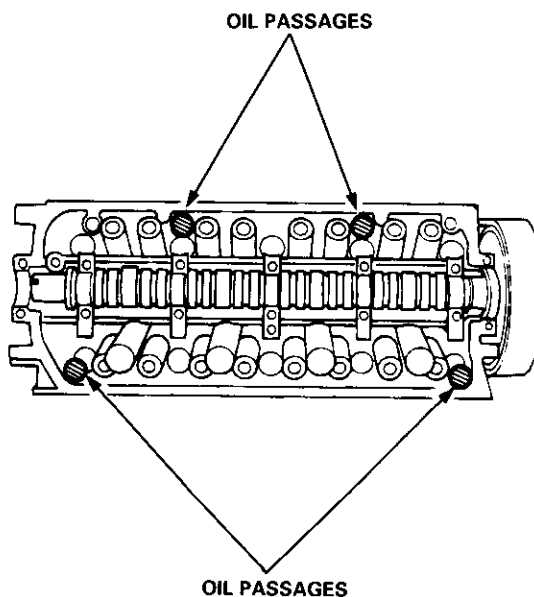
3. Remove the fuel injectors and the wire harness.
4. Using the 8 mm bolts supplied with the tool, mount the two uprights to the cylinder head at the end camshaft holders. The uprights fit over the camshaft as shown.



5. Insert the cross shaft through the top hole of the two uprights.

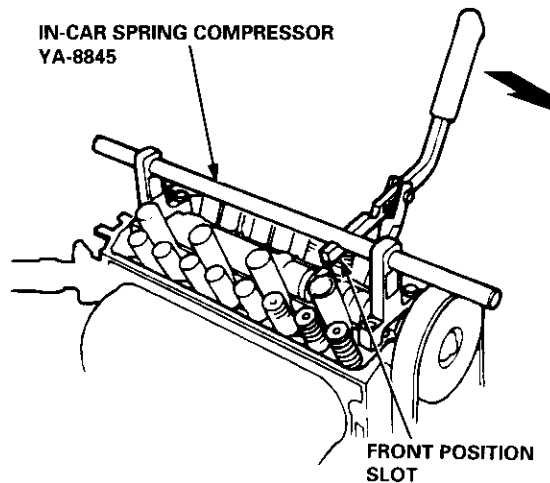
Intake Valve Seals:

6. Select the 7/8 in diameter short compressor attachment, and fasten the attachment to the No. 4 hole of the lever arm with the speed pin supplied.
7. Insert an air adaptor into the spark plug hole. Pump air into the cylinder to keep the valve closed while compressing springs and removing the valve keepers.
8. Put shop towels over the oil passages to prevent the valve keepers from falling into the cylinder head.



9. Position the lever arm under the cross shaft so the lever is perpendicular to the shaft and the compressor attachment rests on top of the retainer for the spring being compressed. Use the front position slot on the lever as shown.

IN-CAR SPRING COMPRESSOR
YA-8845

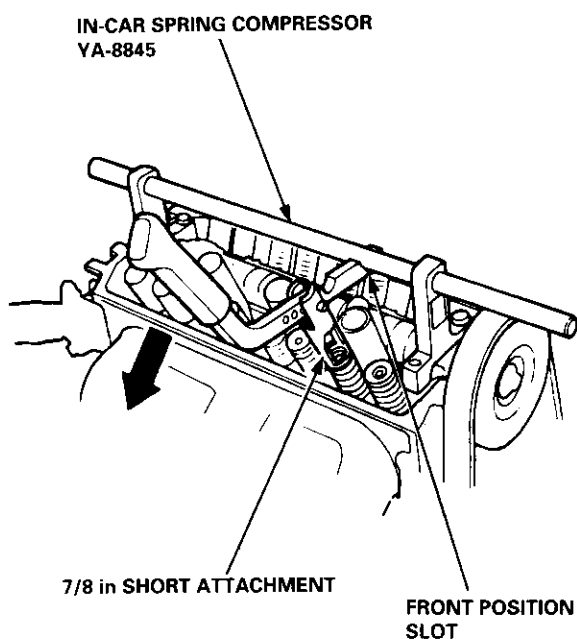




10. Using a downward motion on the lever arm, compress the valve spring and remove the keepers from the valve stem. Slowly release pressure on the spring.
11. Remove the valve seals (see page 6-38).
12. Install the valve seals (see page 6-43).
13. Install the springs, the retainers and the keepers in reverse order of removal.

Exhaust Valve Seals:

14. Select the 7/8 in. diameter short compressor attachment, and fasten the attachment to the No. 2 hole of the lever arm with the speed pin supplied.
15. Position the lever arm under the cross shaft so the lever is perpendicular to the shaft and the compressor attachment rests on top of the retainer for the spring being compressed. Use the front position slot on the lever as shown.



16. Using a downward motion on the lever arm, compress the valve spring and remove the keepers from the valve stem. Slowly release pressure on the spring.
17. Remove the valve seals (see page 6-38).
18. Install the valve seals (see page 6-43).
19. Install the springs, the retainers and the keepers in reverse order of removal.
20. Repeat steps 6 to 19 on the other cylinders.

Crankshaft Pulley and Pulley Bolt

Replacement

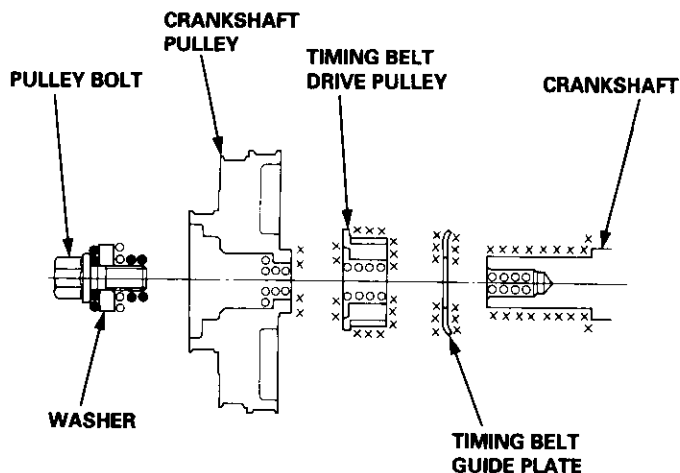
When installing and tightening the pulley, follow the procedure below.

Clean, remove any oil, and lubricate points shown below.

○: Clean

x: Remove any oil

●: Lubricate



Crankshaft pulley bolt size and torque value:

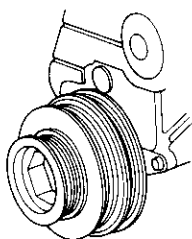
14 x 1.25 mm

20 N·m (2.0 kgf·m, 14 lbf·ft) + 90°

NOTE: Do not use an impact wrench when installing.

HOLDER HANDLE
07JAB - 001020A

HOLDER ATTACHMENT, 50 mm
07NAB - 001040A

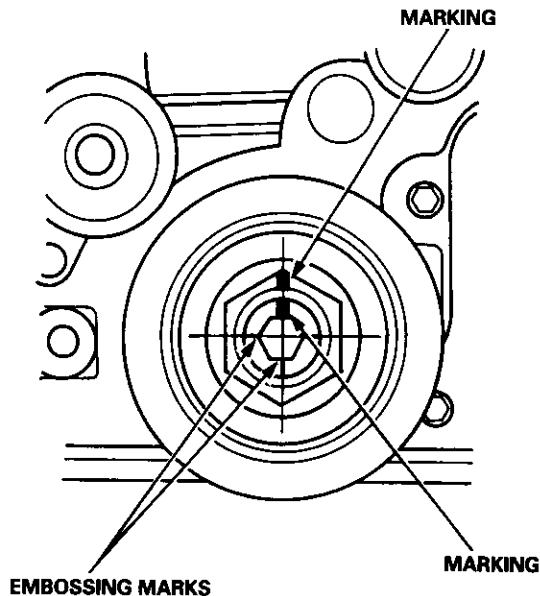


SOCKET, 17 mm
07JAA - 001010A or
(Commercially available)

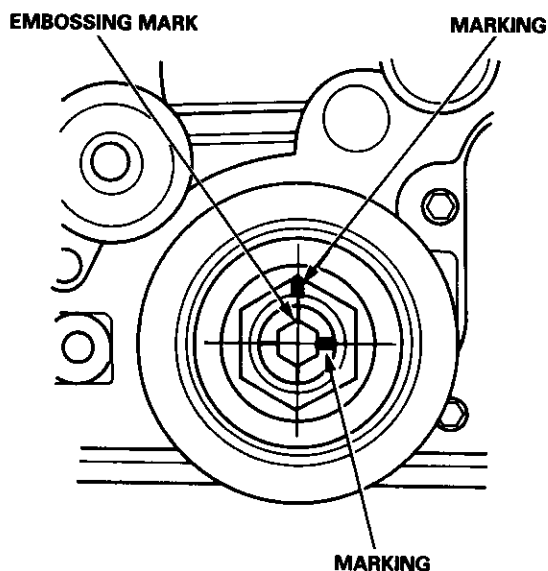
1. Tighten the pulley bolt to the specified torque.

Torque: 20 N·m (2.0 kgf·m, 14 lbf·ft)

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



3. Tighten the pulley bolt an additional 90°.

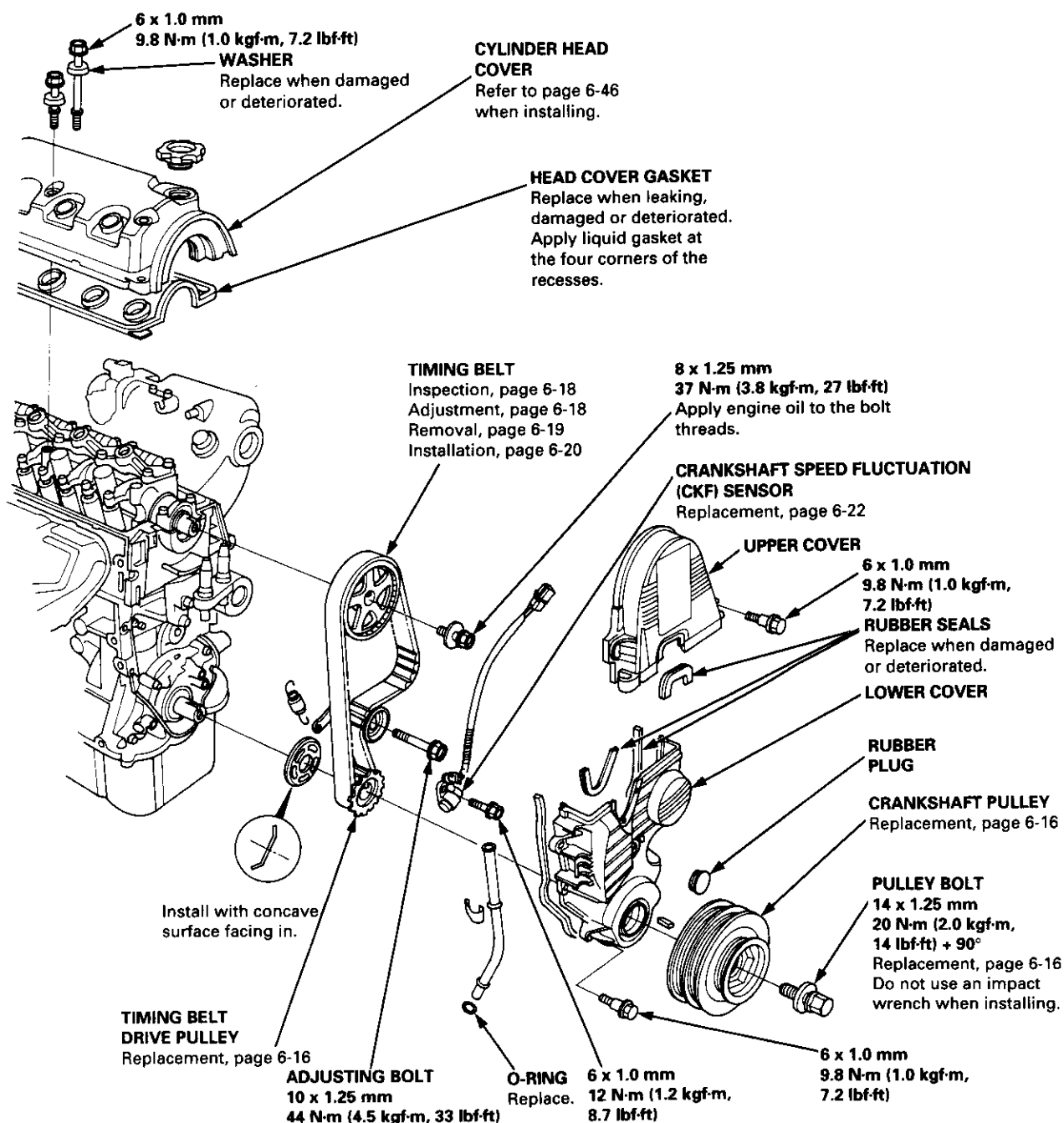




Illustrated Index

NOTE:

- Refer to page 6-20 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.
- Refer to page 6-16 before installing the timing belt.



Timing Belt

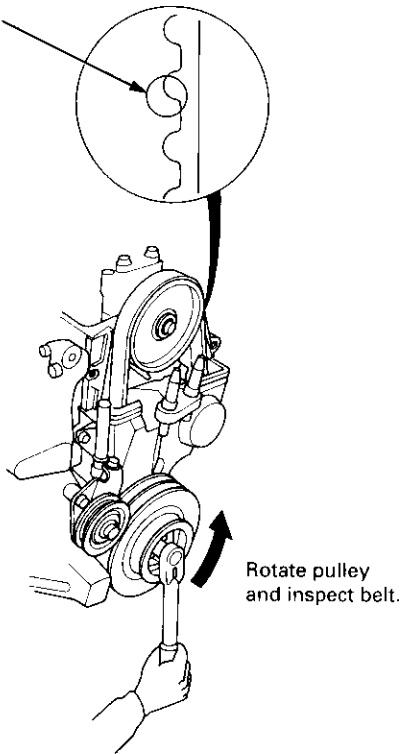
Inspection

1. Remove the cylinder head cover.
 - Refer to page 6-46 when installing.
2. Remove the upper cover (see page 6-19).
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, retorque the crankshaft pulley bolt (see page 6-16).

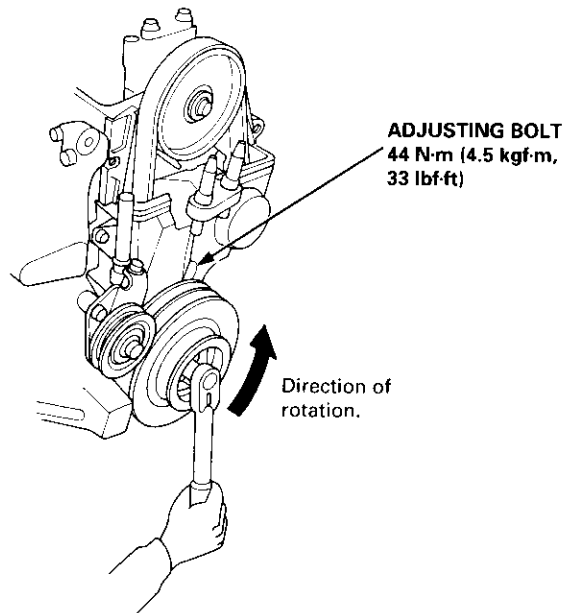
Tension Adjustment

CAUTION: Always adjust the timing belt tension with the engine cold.

NOTE:

- 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 6-46 when installing.
2. Remove the upper cover (see page 6-19).
3. Rotate the crankshaft five or six revolutions to set the belt.
4. Set the No. 1 piston at TDC (see page 6-21).
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, retorque the crankshaft pulley bolt (see page 6-16).

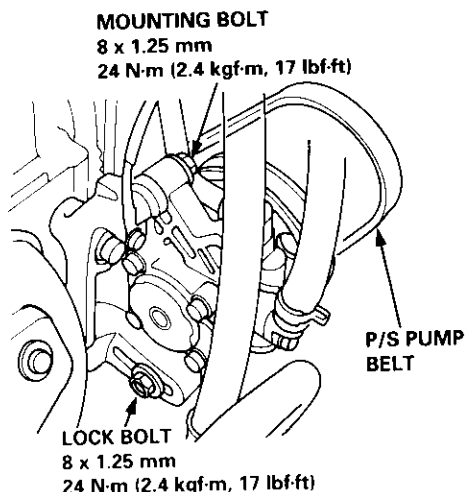


Removal

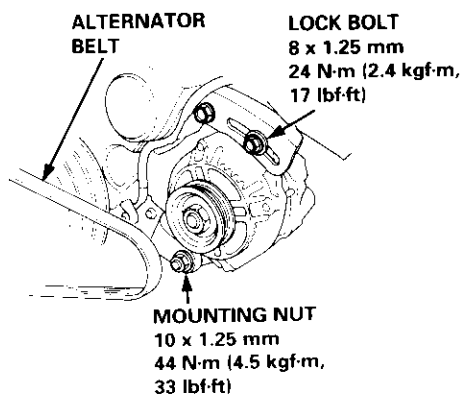
NOTE:

- Replace the timing belt at 105,000 miles (168,000 km) according to the maintenance schedule (normal conditions/severe conditions).
If the vehicle is regularly driven in one or more of the following conditions, replace the timing belt at 60,000 miles (U.S.A.) 100,000 km (Canada).
 - In very high temperatures (over 110°F, 43°C).
 - In very low temperatures (under -20°F, -29°C).
- Turn the crankshaft pulley so the No. 1 piston is at top dead center (TDC) before removing the belt (see page 6-21).
- Inspect the water pump before installing the timing belt (see page 10-14).

1. Remove the splash shield (see page 5-7).
2. Loosen the mounting bolt and lock bolt, then remove the power steering (P/S) pump belt and pump.

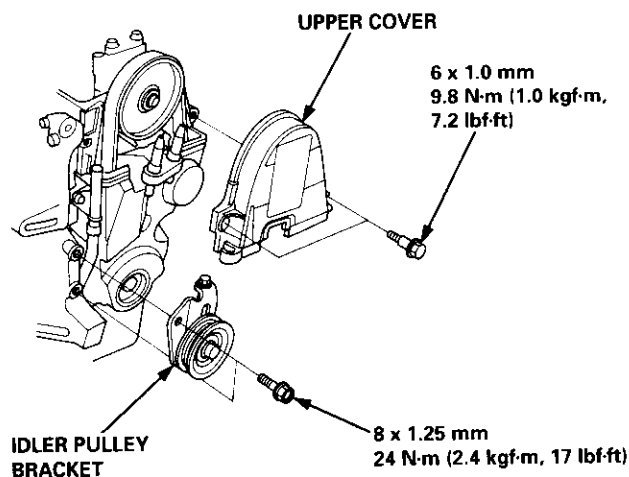


3. Loosen the idler pulley center nut and adjusting bolt, then remove the air conditioning (A/C) compressor belt (see page 5-6).
4. Loosen the mounting nut and lock bolt, then remove the alternator belt.



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

NOTE: Do not use the upper cover to store removed items.



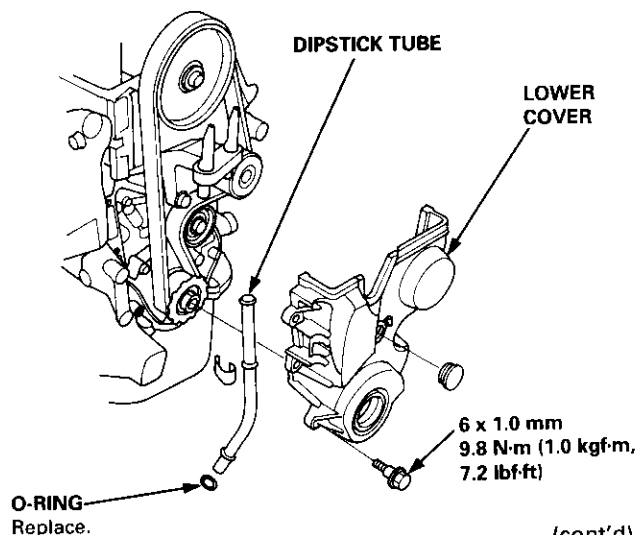
6. Remove the upper bracket (see page 6-29).

NOTE:

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

7. Remove the crankshaft pulley (see page 6-16).
8. Remove the lower cover and dipstick tube.

NOTE: Do not use the lower cover to store removed items.

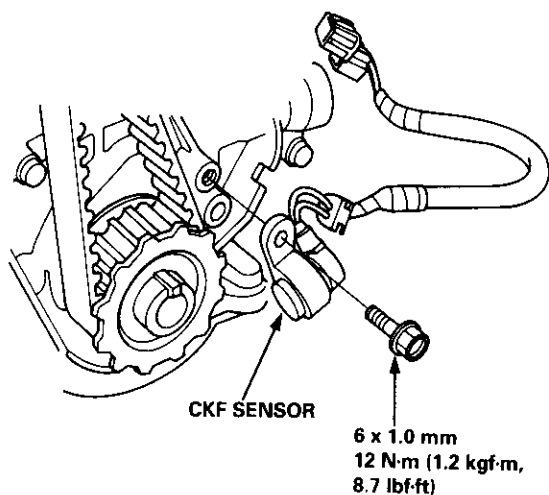


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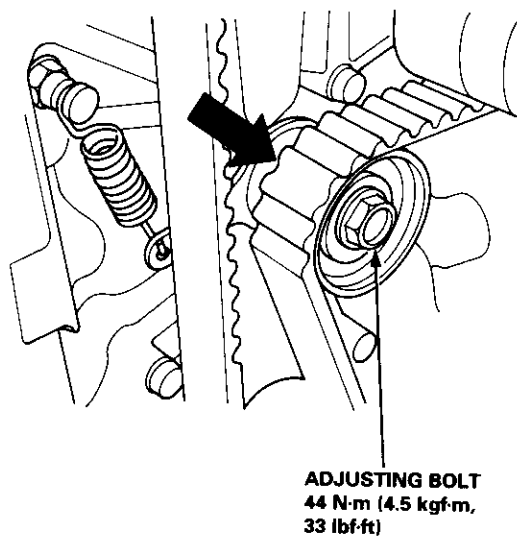
Timing Belt

Removal (cont'd)

9. Remove the CKF sensor from the oil pump.



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

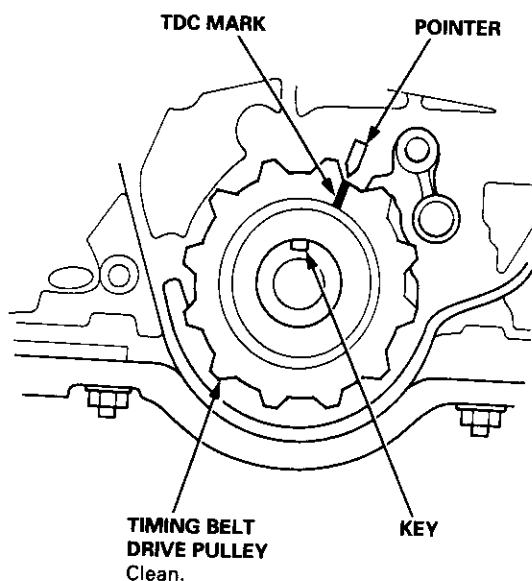


11. Remove the timing belt.

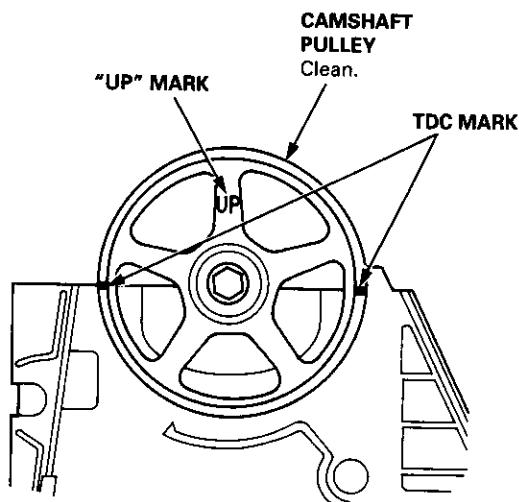
Installation

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.



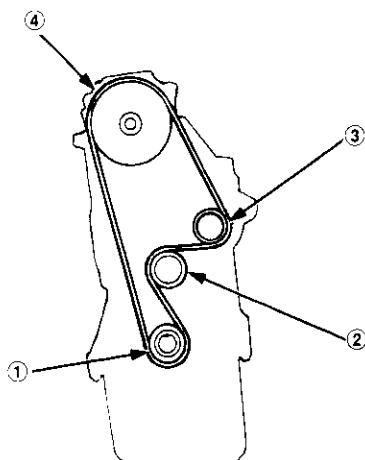
2. Set the camshaft pulley to TDC. Align the TDC marks on the camshaft pulley to the cylinder head surface.





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.



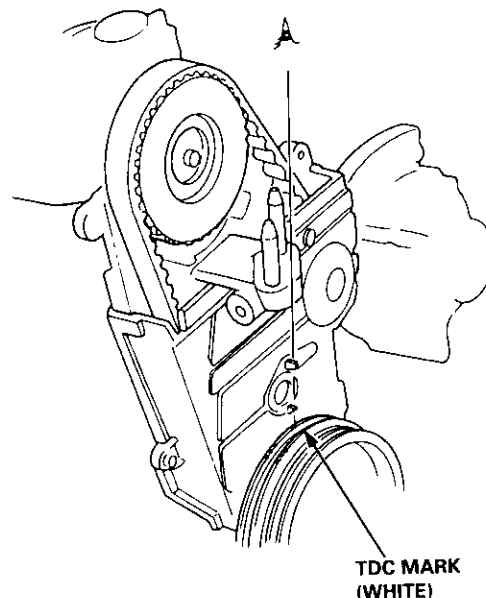
4. Loosen and retighten the adjusting bolt to tension the timing belt.
5. Install the lower cover and upper cover.

NOTE: Clean the upper and lower covers before installation.

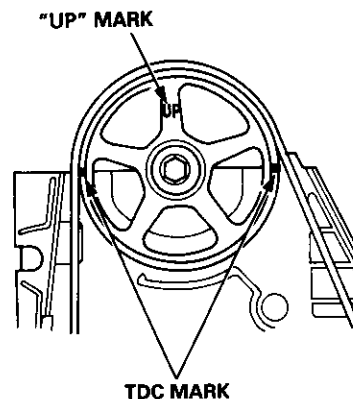
6. Install the crankshaft pulley, then tighten the pulley bolt (see page 6-16).
7. Rotate the crankshaft pulley about five or six turns counterclockwise so that the timing belt positions on the pulleys.
8. Adjust the timing belt tension (see page 6-18).

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 6-20. Then reinstall the timing belt.
11. After installation, adjust the tension of each belt.
- See section 23 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.

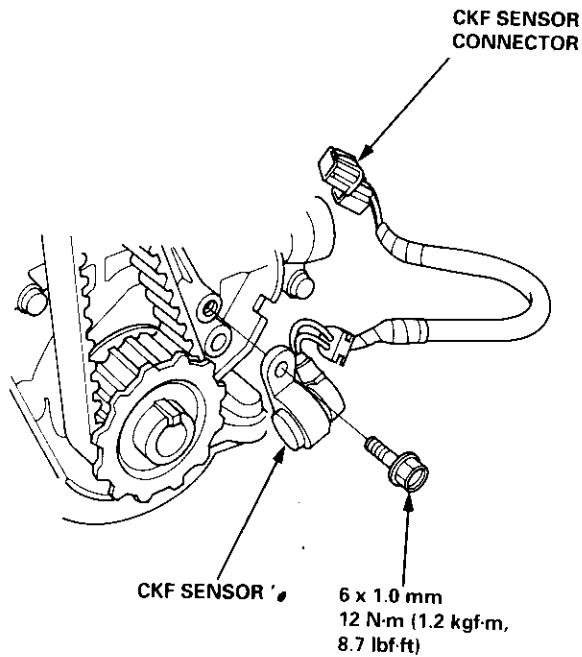
Crankshaft Speed Fluctuation (CKF) Sensor

Replacement

1. Remove the cylinder head cover.

NOTE: Refer to page 6-46 when installing.

2. Remove the crankshaft pulley (see page 6-16).
3. Remove the upper cover and dipstick/tube (see page 6-19).
4. Remove the lower cover and idler pulley bracket (see page 6-19).
5. Disconnect the CKF sensor connector, then remove the CKF sensor.



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

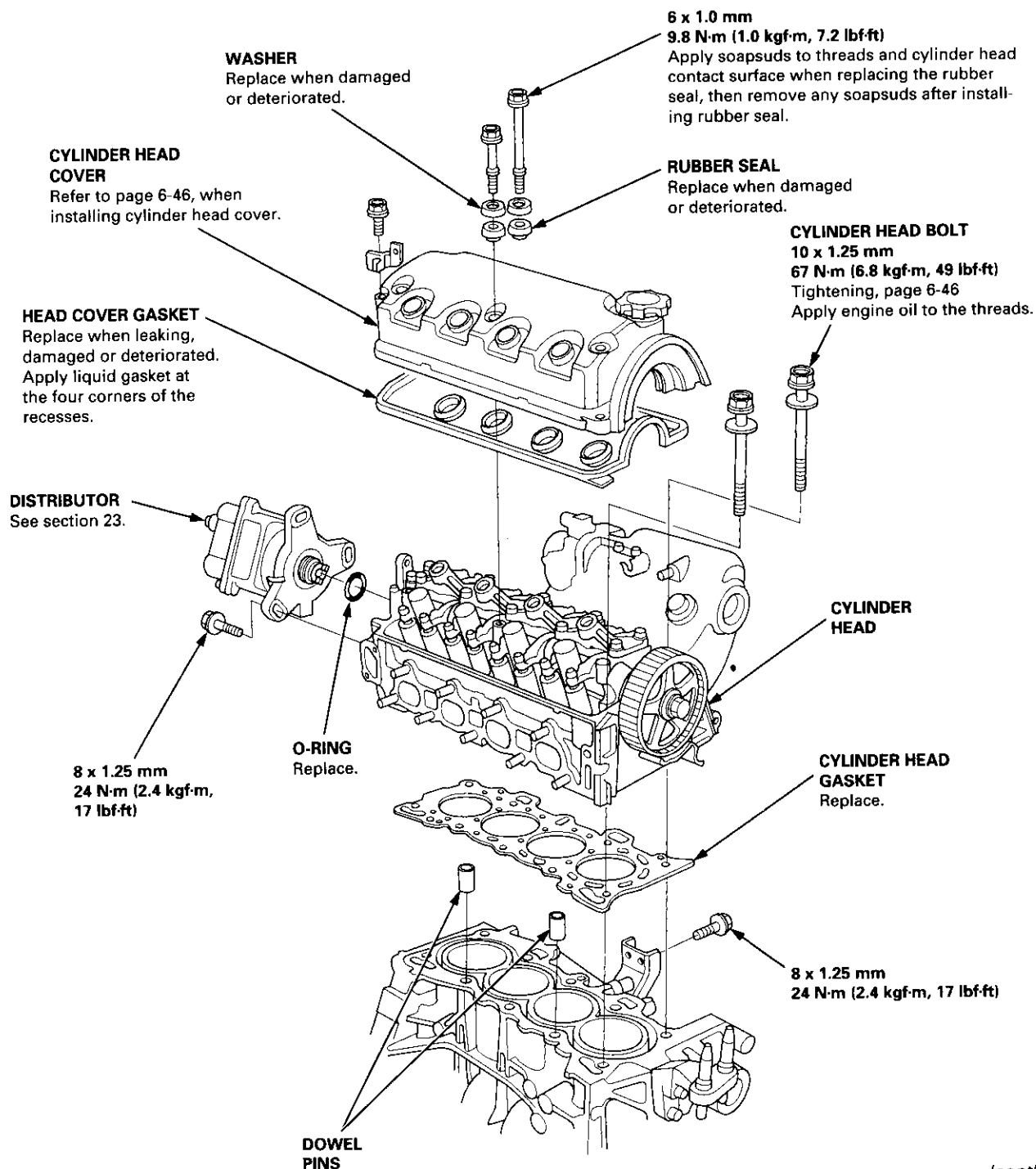


Illustrated Index

CAUTION:

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

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



(cont'd)

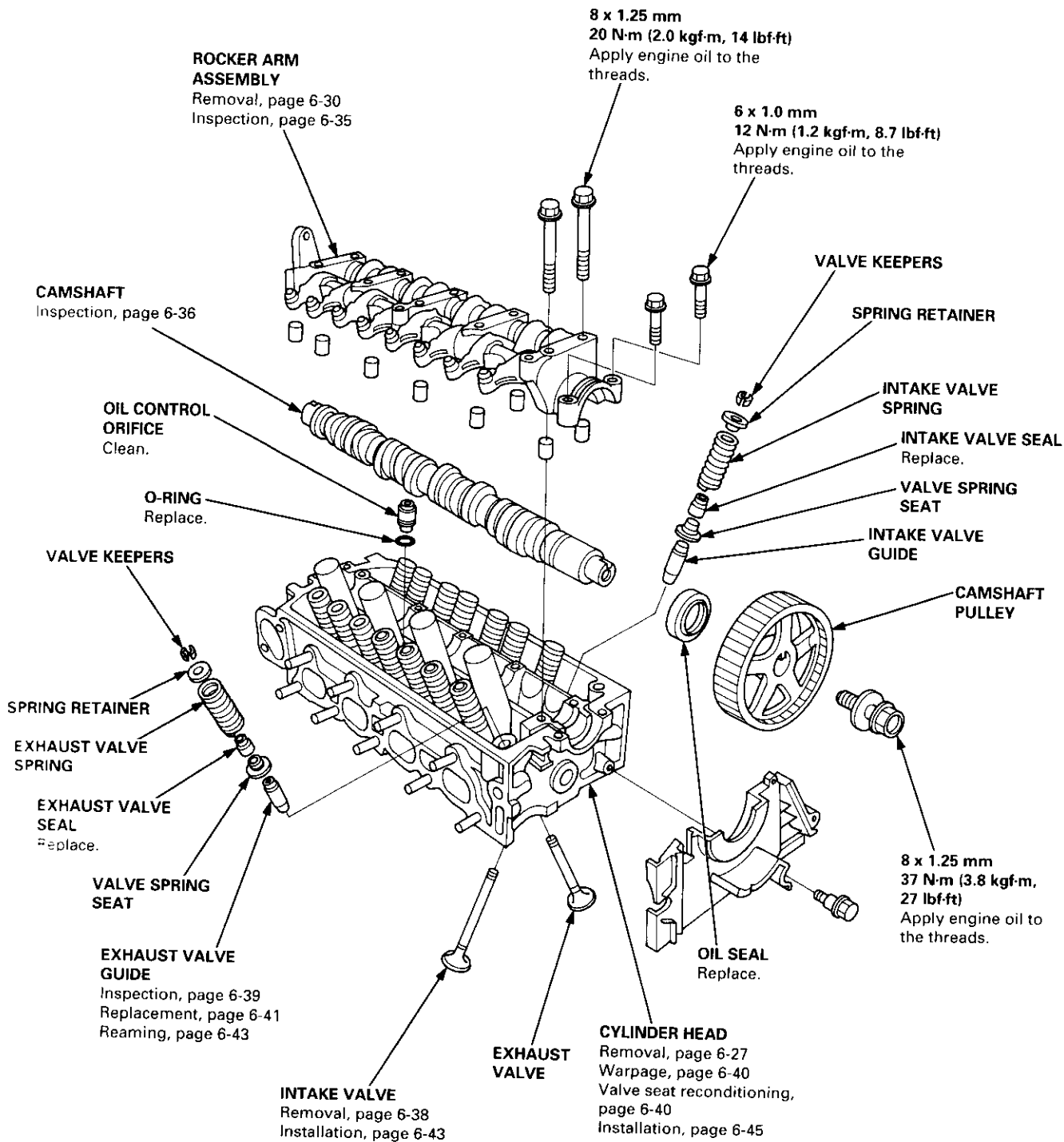
Cylinder Head

Illustrated Index (cont'd)



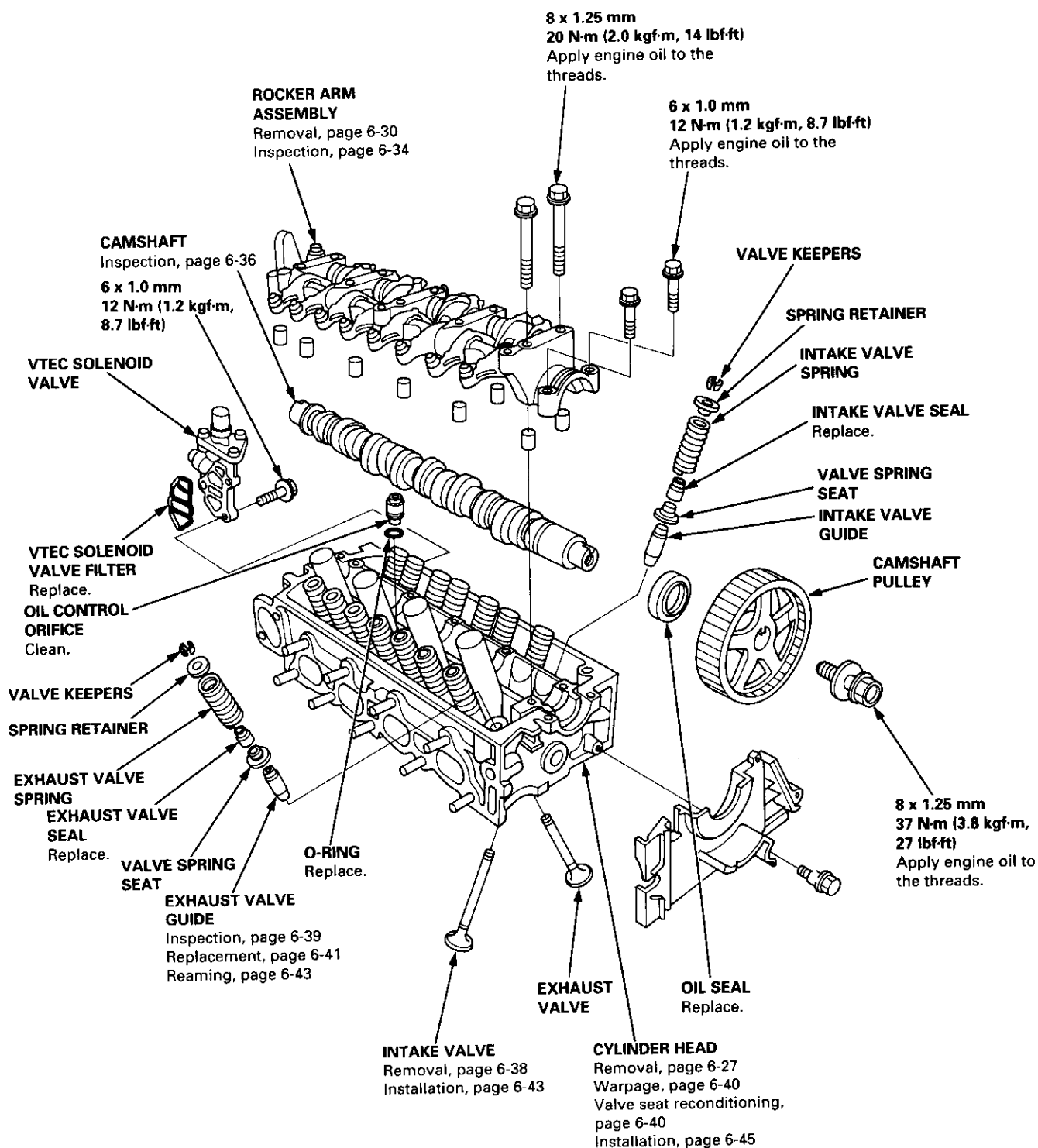
Prior to reassembling, clean all the parts in solvent, dry them and apply lubricant to any contact parts.

D16Y7 engine:





D16Y5 engine:



(cont'd)

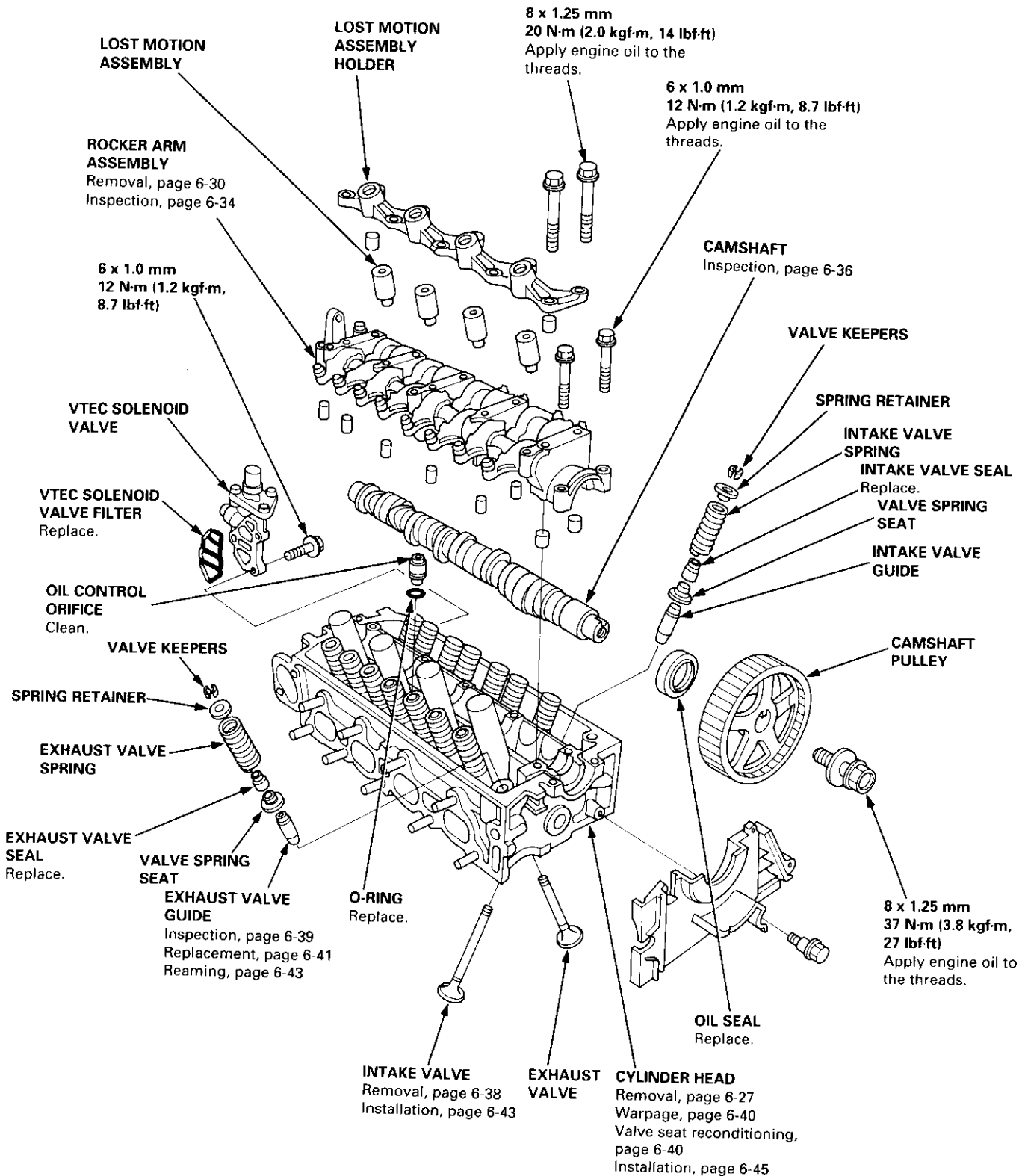
Cylinder Head

Illustrated Index (cont'd)



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

D16Y8 engine:





Removal

Engine removal is not required for this procedure.

⚠ WARNING Make sure jacks and safety stands are placed properly and hoist brackets are attached to the correct positions on the engine.

CAUTION:

- Use fender covers to avoid damaging painted surfaces.
- To avoid damage, 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 100°F (38°C) before loosening the retaining bolts.

NOTE:

- 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.
- Inspect the timing belt before removing the cylinder head.
- Turn the crankshaft pulley so that the No. 1 piston is at top dead center (see page 6-21).

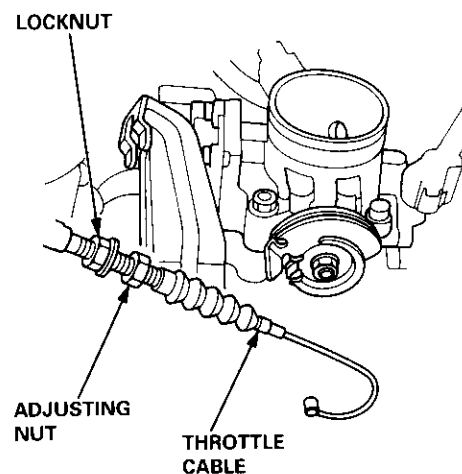
1. Disconnect the negative terminal from the battery.
2. Drain the engine coolant (see page 10-7).
 - Remove the radiator cap to speed draining.
3. Remove the intake air duct and air cleaner housing (see page 5-3).
4. Remove the mounting bolt and lock bolt, then remove the power steering (P/S) pump belt 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 5-6).
6. Loosen the mounting nut and lock bolt, then remove the alternator belt (see page 6-19).
7. Remove the P/S pump bracket (see page 5-12).

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

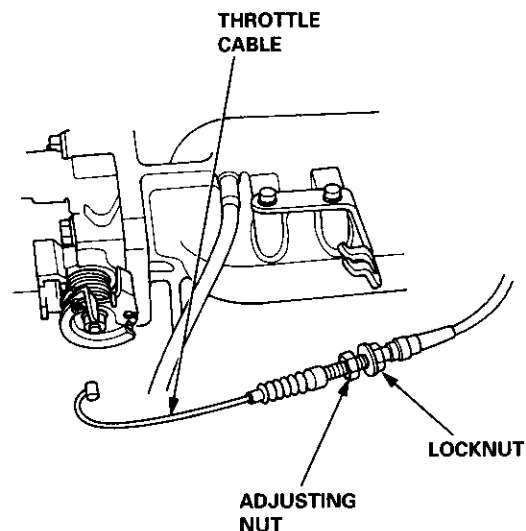
NOTE:

- 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).

D16Y7 engine:



D16Y5, D16Y8 engines:



(cont'd)

Cylinder Head

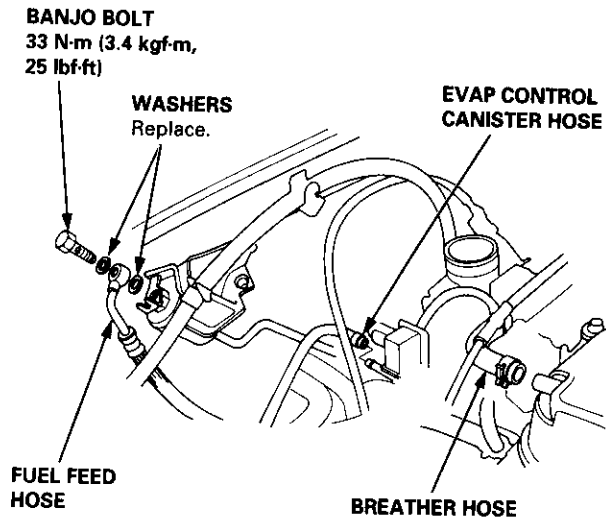
Removal (cont'd)

9. Relieve fuel pressure (see section 11).

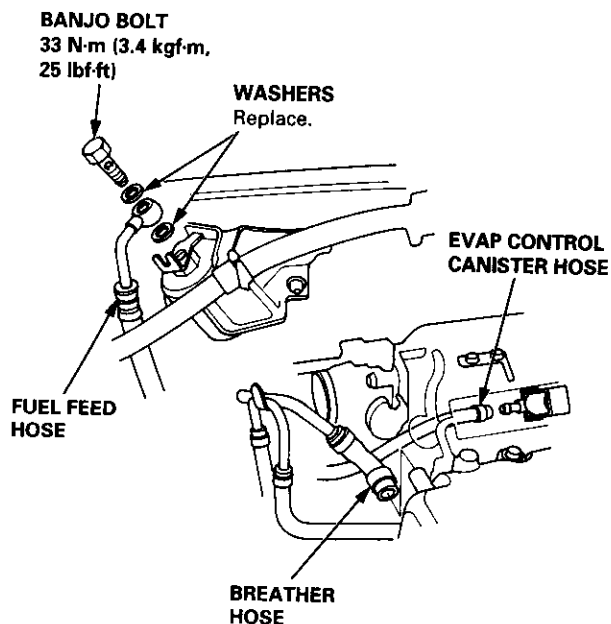
⚠ WARNING Do not smoke while working on the fuel system. Keep open flame or spark away from the work area. Drain fuel only into an approved container.

10. Remove the evaporative emission (EVAP) control canister hose, fuel feed hose and breather hose.

D16Y7 engine:



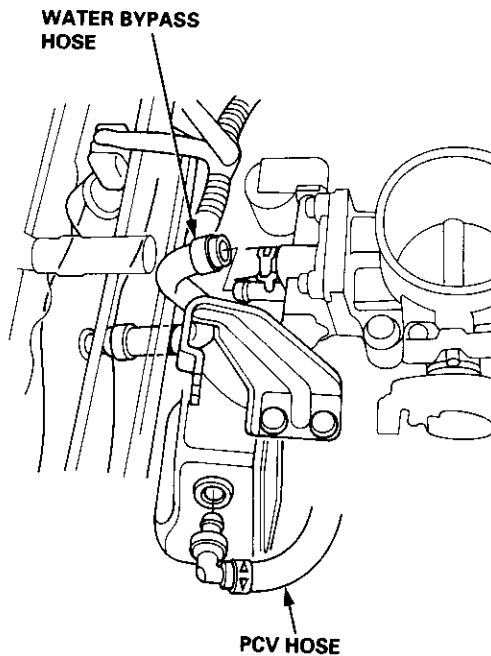
D16Y5, D16Y8 engines:



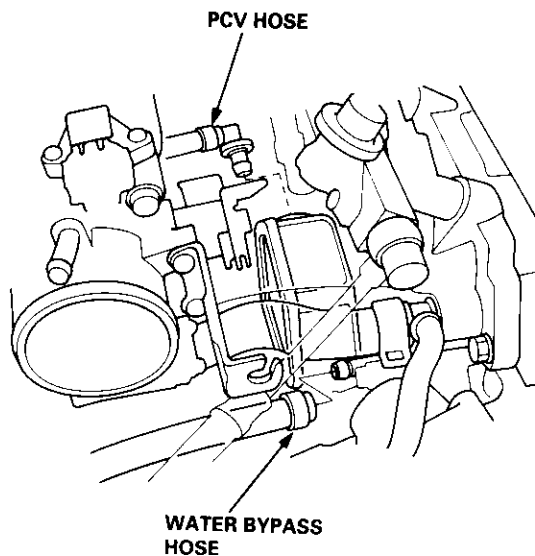
11. Remove the brake booster vacuum hose, fuel return hose and vacuum hose (see page 5-4).

12. Remove the water bypass hose and positive crank-case ventilation (PCV) hose.

D16Y7 engine:

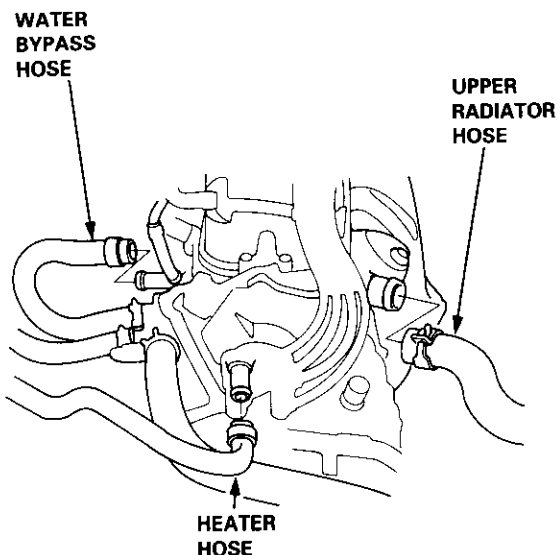


D16Y5, D16Y8 engines:





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.

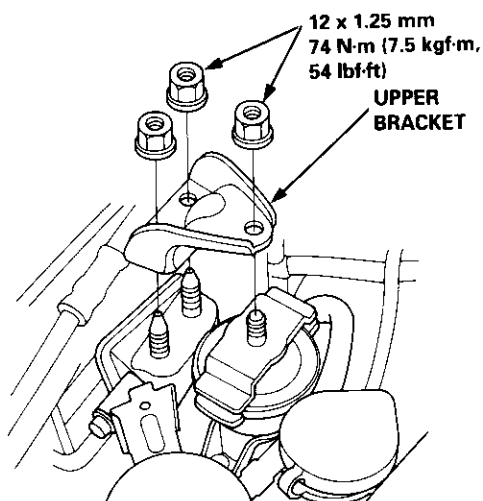
- Four fuel injector connectors
- Engine coolant temperature (ECT) sensor connector
- ECT switch connector
- ECT gauge sending unit connector
- Throttle position sensor connector
- Manifold absolute pressure (MAP) sensor connector
- Primary heated oxygen sensor (primary HO2S) connector
- Secondary heated oxygen sensor (secondary HO2S) connector (D16Y7 engine)
- Exhaust gas recirculation (EGR) valve lift sensor connector (D16Y5 engine)
- VTEC solenoid valve connector (D16Y5, D16Y8 engines)
- VTEC pressure switch connector (D16Y5, D16Y8 engines)
- Idle air control (IAC) valve connector

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

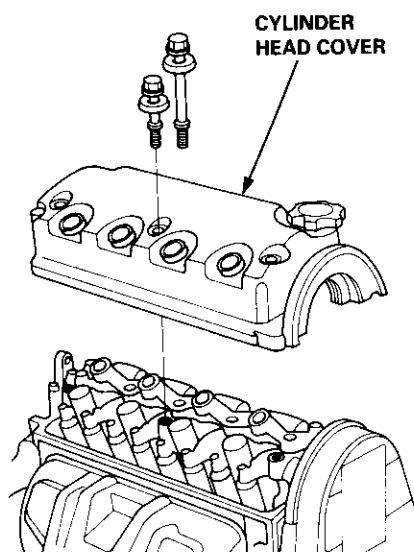
16. Remove the upper bracket.

NOTE:

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



17. Remove the cylinder head cover.



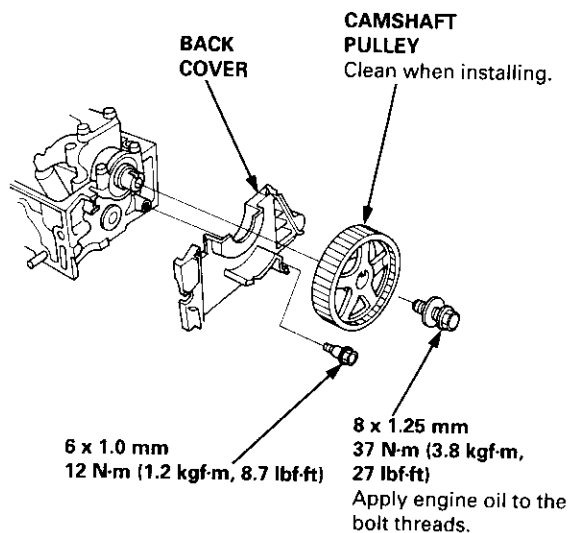
(cont'd)

Cylinder Head

Rocker Arms

Removal (cont'd)

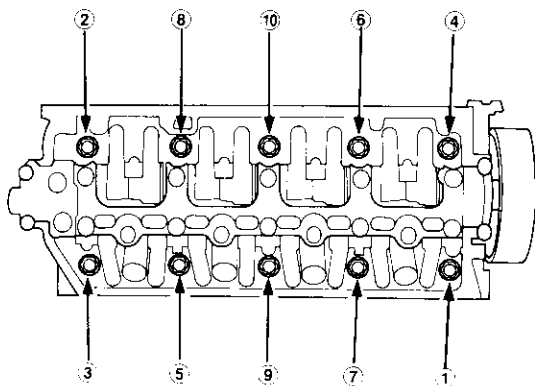
18. Remove the timing belt (see page 6-19).
19. Remove the camshaft pulley and back cover.



20. Remove the exhaust manifold (see pages 9-6 and 9-7).
21. Remove the intake manifold (see pages 9-2 thru 4).
22. Remove the cylinder head bolts, then remove the cylinder head.

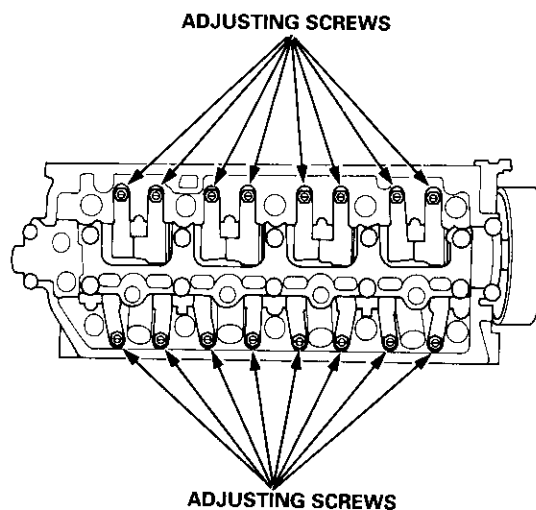
CAUTION: To prevent warpage, unscrew the bolts in sequence 1/3 turn at a time; repeat the sequence until all bolts are loosened.

CYLINDER HEAD BOLTS LOOSENING SEQUENCE:



Removal

1. Loosen the adjusting screws.

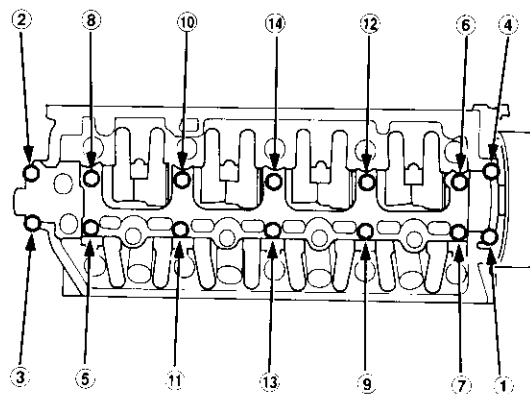


2. Unscrew the camshaft holder bolts, then remove the rocker arm assembly.

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:





Disassembly/Reassembly

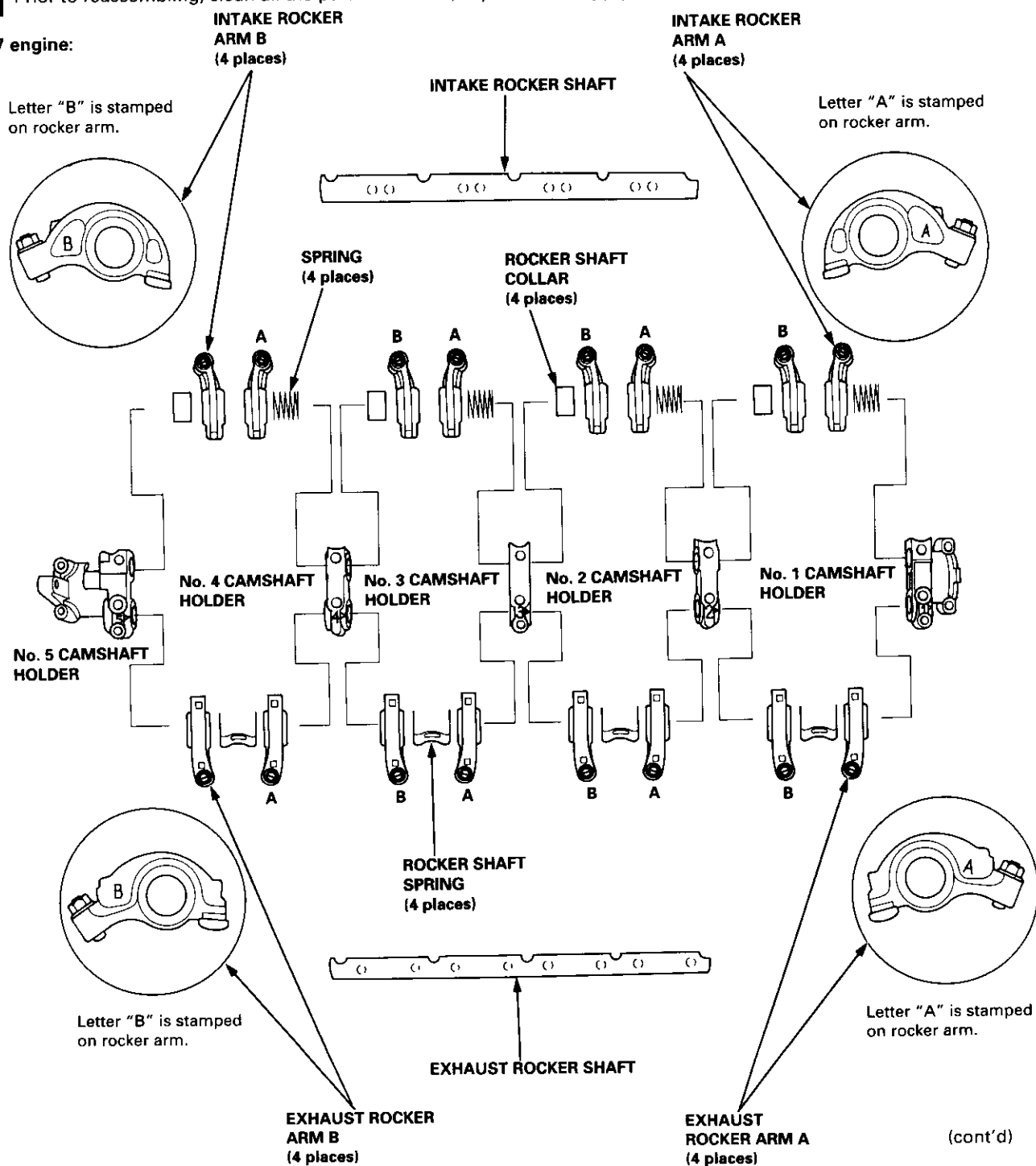
NOTE:

- Identify parts as they are removed to ensure reinstallation in original locations.
- Inspect rocker shafts and rocker arms (see page 6-35).
- Rocker arms must be installed in the same position if reused.
- When removing or installing the rocker arm assembly, do not remove the camshaft holder bolts. The bolts will keep the holders, springs and rocker arms on the shaft.



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

D16Y7 engine:



Rocker Arms

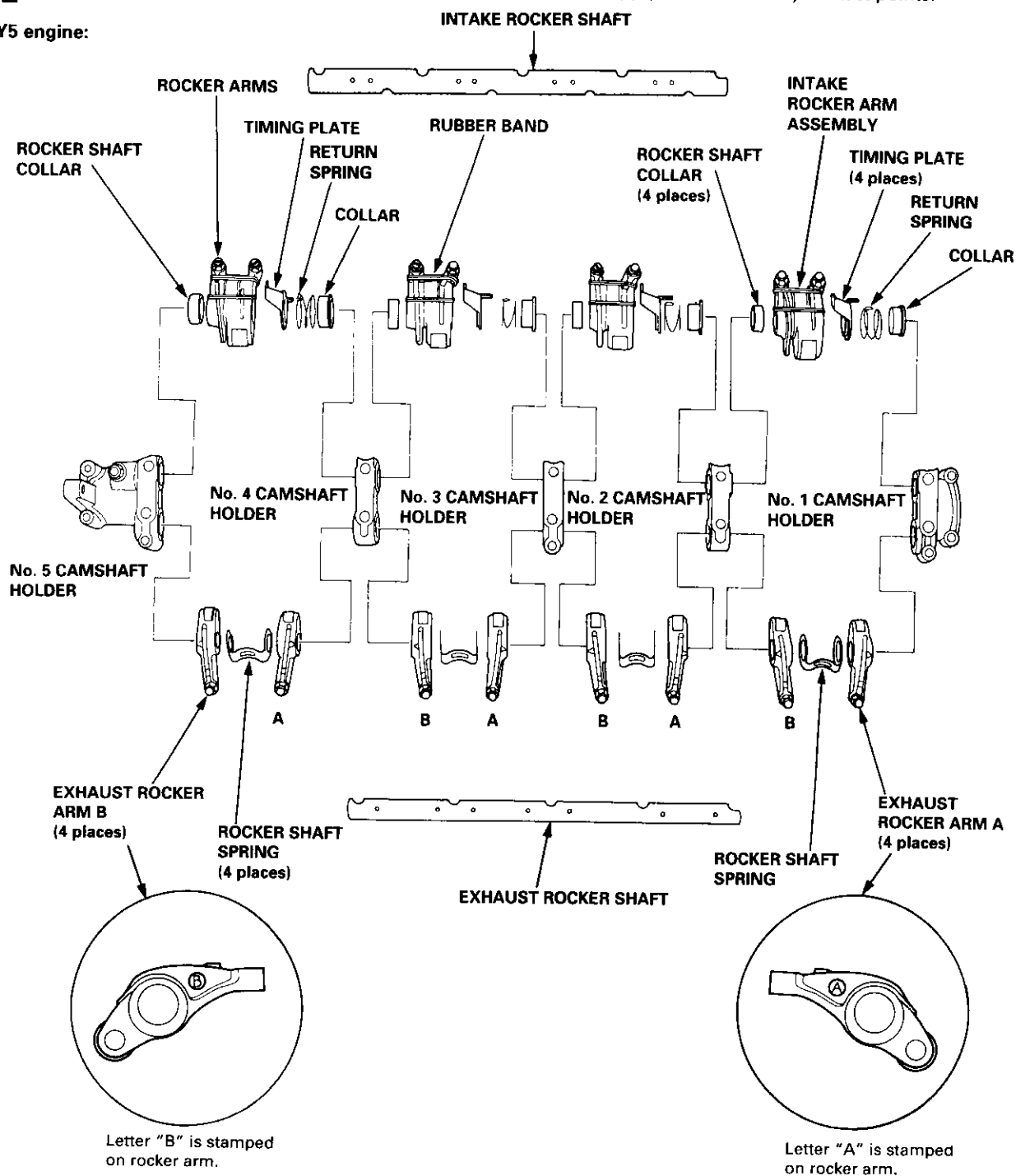
Disassembly/Reassembly (cont'd)

NOTE:

- Identify parts as they are removed to ensure reinstallation in original locations.
- Inspect rocker shafts and rocker arms (see page 6-34).
- Rocker arms must be installed in the same position if reused.
- When removing or installing the rocker arm assembly, do not remove the camshaft holder bolts. The bolts will keep the holders, springs and rocker arms on the shaft.

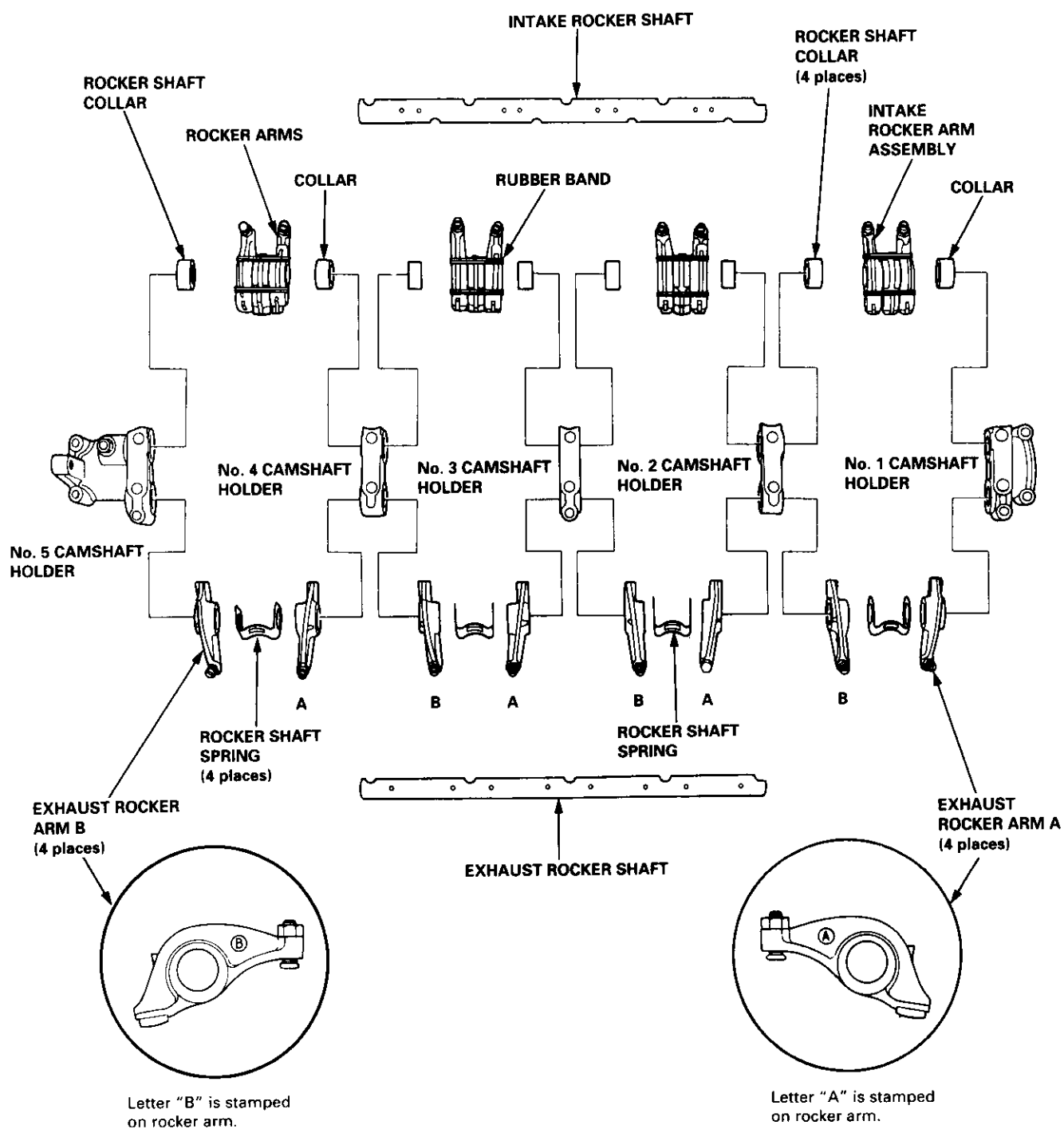
 Prior to reassembling, clean all the parts in solvent, dry them and apply lubricant to any contact points.

D16Y5 engine:





D16Y8 engine:



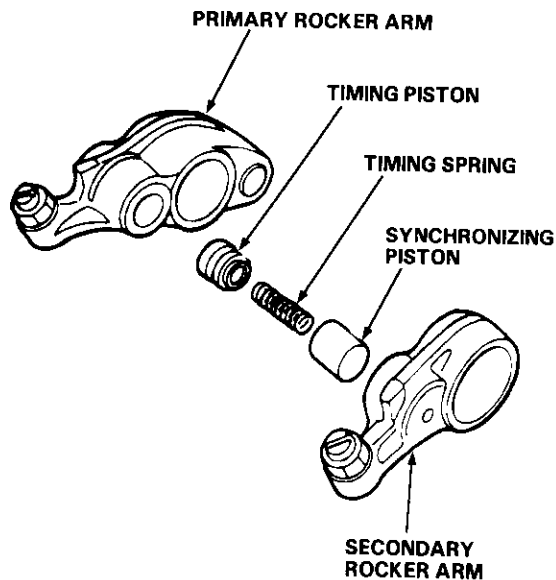
Rocker Arms and Lost Motion Assemblies

Inspection (D16Y5, D16Y8 engines)

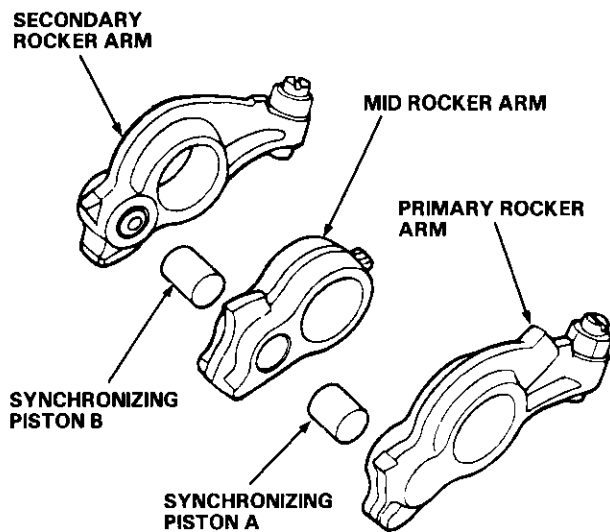
NOTE: When reassembling the primary rocker arm, carefully apply air pressure to the oil passage of the rocker arm.

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

D16Y5 engine:



D16Y8 engine:

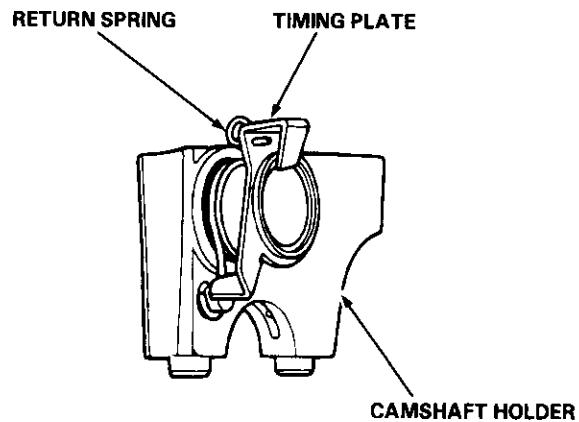


NOTE:

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

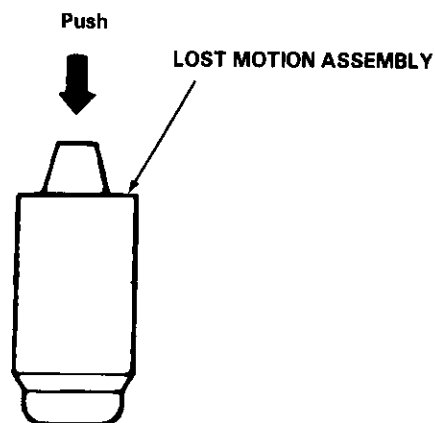
D16Y5 engine:

NOTE: Set the timing plate and return spring as shown below.



D16Y8 engine:

2. Remove the lost motion assembly from the holder and inspect it. Test it by pushing the plunger with your finger.
— If the lost motion assembly plunger does not move smoothly, replace it.

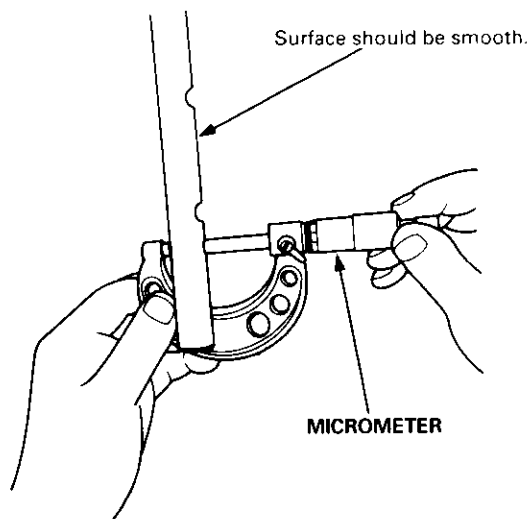




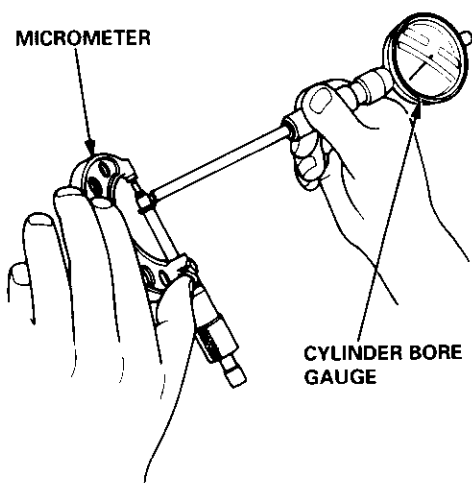
Clearance Inspection

Measure both the intake rocker shaft and exhaust rocker shaft.

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



2. Zero the gauge to the shaft diameter.



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

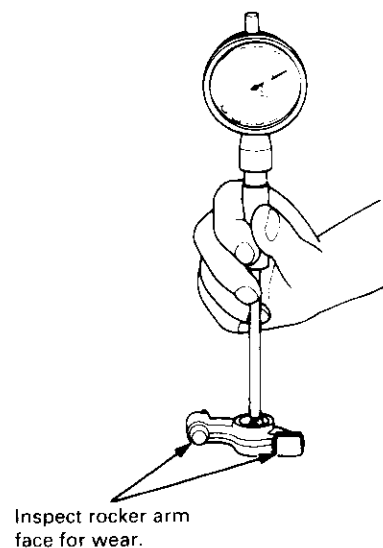
Rocker Arm-to-Shaft Clearance:

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 these measurements on 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:

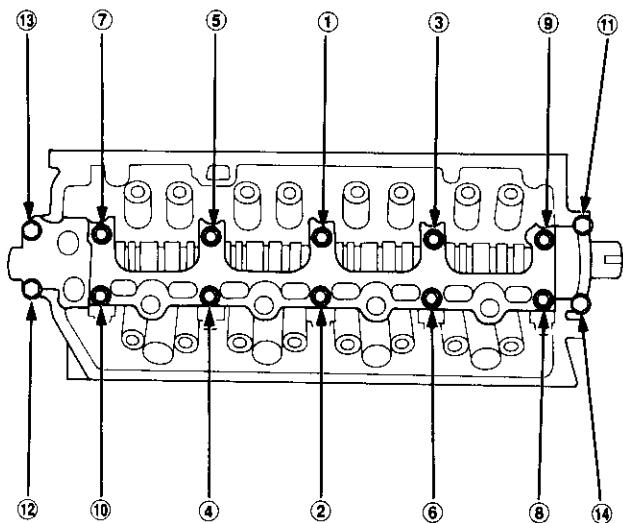
8 mm bolts: 20 N·m (2.0 kgf·m 14 lbf·ft)

Apply engine oil to the threads.

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

Apply engine oil to the threads.

6 mm bolts: ⑪, ⑫, ⑬, ⑭



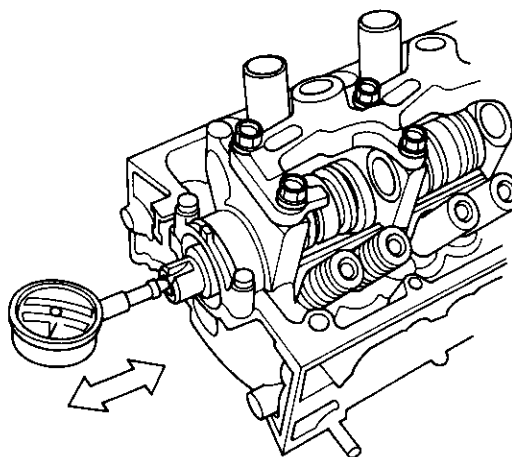
2. Seat the camshaft by pushing it toward the rear of the cylinder head.
3. Zero the dial indicator against the end of the camshaft. Push the camshaft back and forth, and read the end play.

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

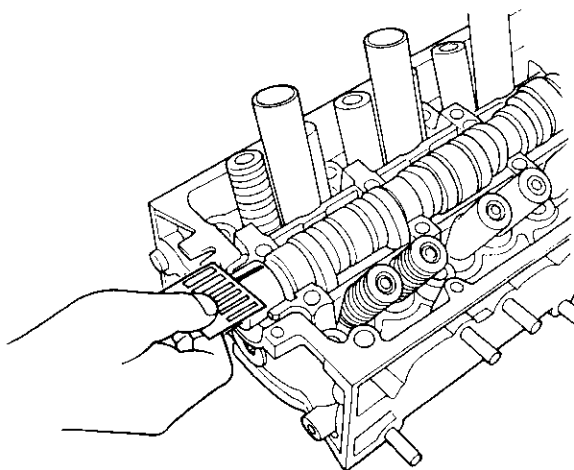


6. Remove the camshaft holders, then measure the widest portion of the plastigage on each journal.

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)

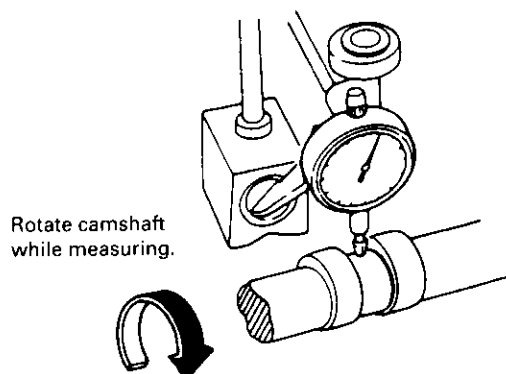


7. If the camshaft-to-holder oil clearance is out of tolerance:
 - And the camshaft has already been replaced, you must replace the cylinder head.
 - If the camshaft has not been replaced, first check the total runout with the camshaft supported on V-blocks.

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 the camshaft-to-holder oil clearance. If the oil clearance is still out of tolerance, replace the cylinder head.

8. Check the cam lobe height wear.

Cam lobe height standard (New)

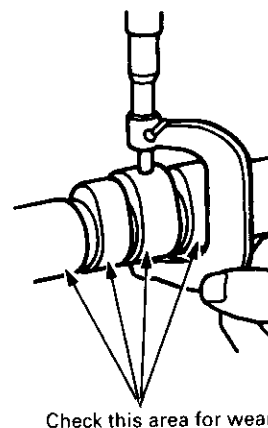
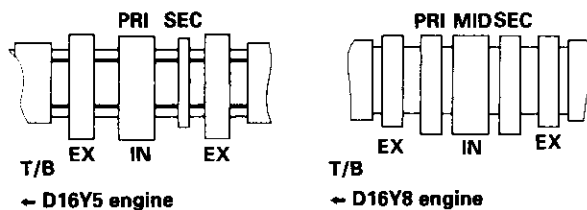
Unit mm (in)

		INTAKE	EXHAUST
D16Y7 engine		35.299 (1.3897)	37.281 (1.4678)
D16Y5 engine	PRI	38.427 (1.5129)	38.784 (1.5269)
	SEC	32.193 (1.2674)	
D16Y8 engine	PRI	36.778 (1.4479)	38.008 (1.4964)
	MID	38.274 (1.5068)	
	SEC	37.065 (1.4592)	

PRI: Primary cam lobe, SEC: Secondary cam lobe

MID: Mid cam lobe, T/B: Timing belt

IN: Intake, EX: Exhaust

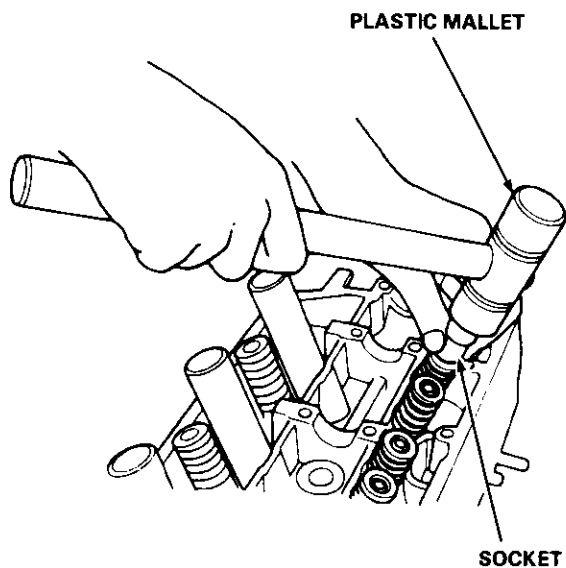


Valves, Valve Springs and Valve Seals

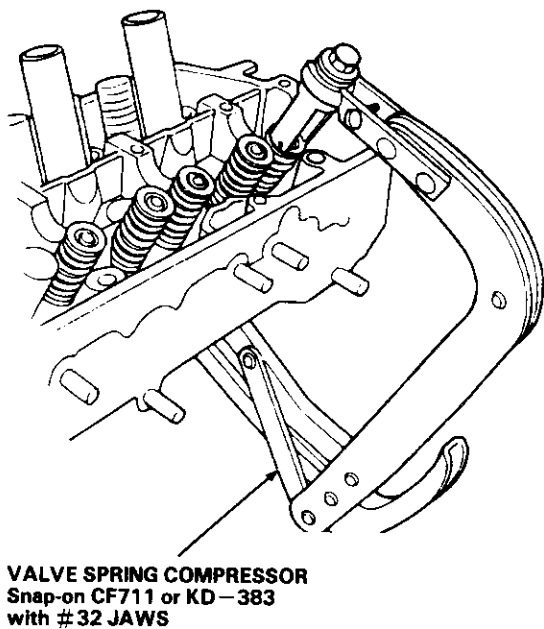
Removal

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

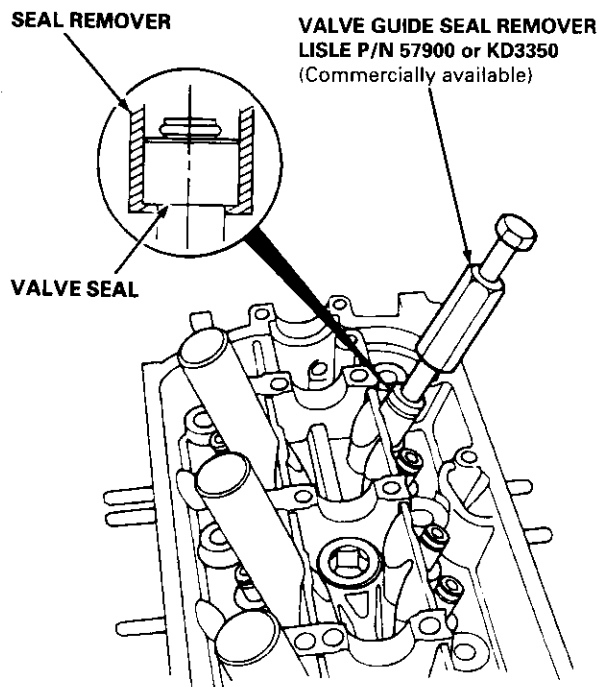
1. Using an appropriate-sized socket and plastic mallet, lightly tap the valve retainer to loosen the valve keepers before installing the valve spring compressor.



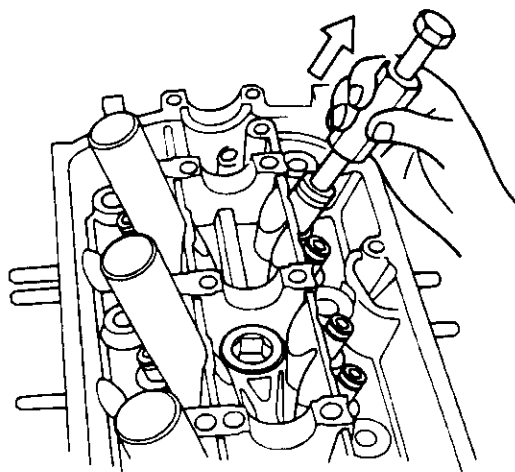
2. Install the spring compressor. Compress the spring and remove the valve keeper.



3. Install the valve guide seal remover.



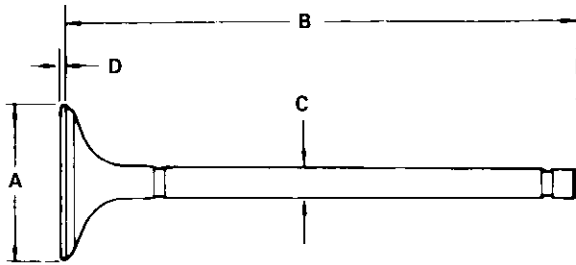
4. Remove the valve seal.





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 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):** 0.85 – 1.15 mm
(0.033 – 0.045 in)
- D Service Limit:** 0.65 mm (0.026 in)

Exhaust Valve Dimensions

- A Standard (New):** 25.9 – 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):** 1.05 – 1.35 mm
(0.041 – 0.053 in)
- D Service Limit:** 0.95 mm (0.037 in)

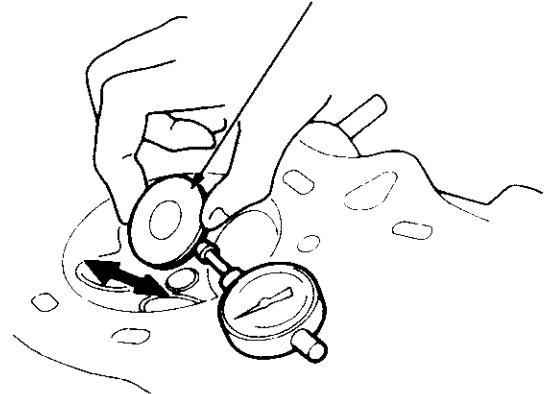
Intake Valve Stem-to-Guide Clearance:

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

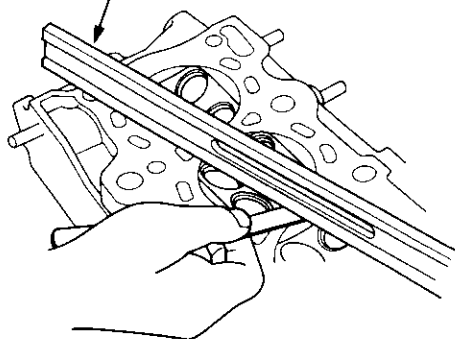
Warpage

NOTE: If the camshaft-to-holder oil clearances (see page 6-36) are not within specification, the cylinder head cannot be resurfaced.

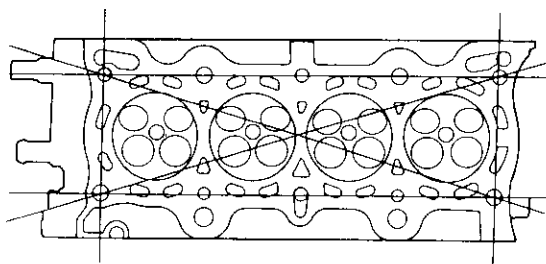
If the camshaft-to-holder oil clearances are within specifications, check the cylinder head for warpage.

- 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 the 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)

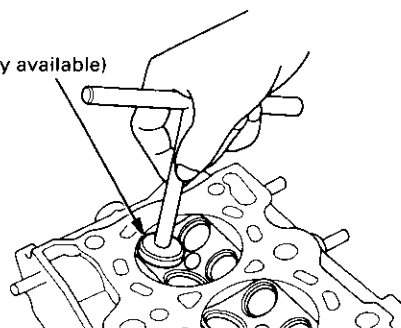
Reconditioning

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

NOTE: If the guides are worn (see page 6-39), replace them (see page 6-41) 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 the 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):

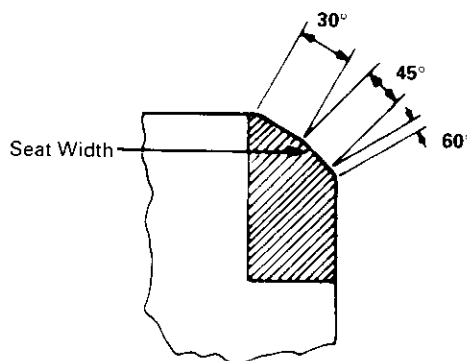
Intake: 0.85 – 1.15 mm (0.033 – 0.045 in)

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

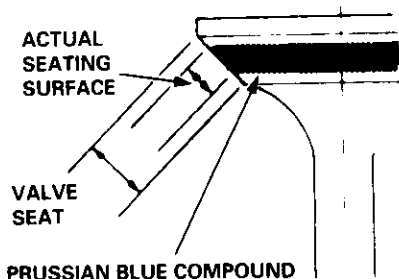
Service Limit:

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.

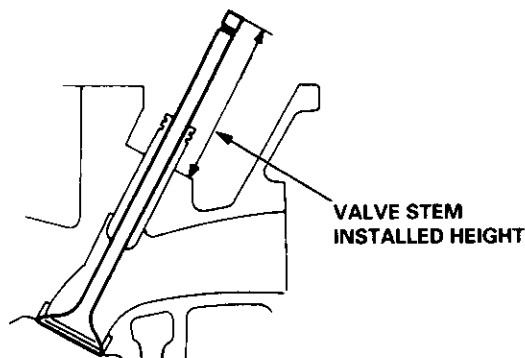
7. Insert the intake and exhaust valves in the head and measure the valve stem installed height.

Intake, Exhaust Stem Installed Height:

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

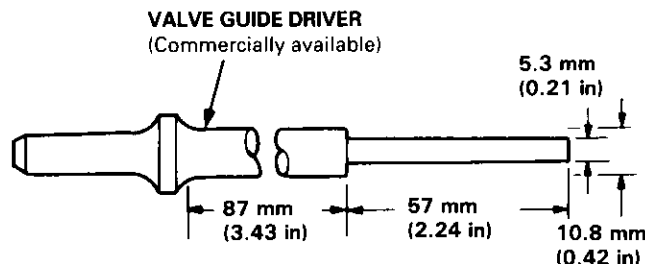
Service Limit: 53.89 mm (2.122 in)

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.



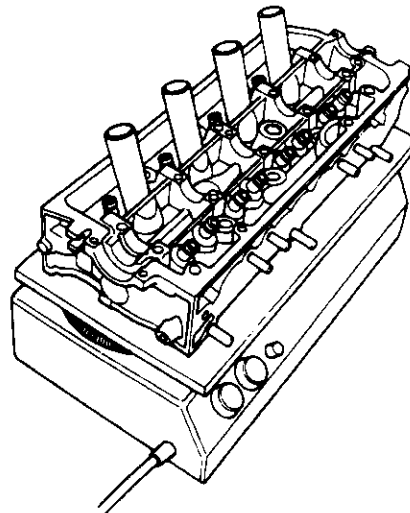
Replacement

1. As illustrated below, use a commercially-available air-impact valve guide driver attachment modified to fit the diameter of the valve guides. In most cases, the same procedure can be done using the special tool and a conventional hammer.



or
VALVE GUIDE DRIVER, 5.5 mm
07742 – 0010100

2. Select the proper replacement guides, and chill them in the freezer section of a refrigerator for about an hour.
3. Use a hot plate or oven to evenly heat the cylinder head to 300°F (150°C). Monitor the temperature with a cooking thermometer.



CAUTION:

- Do not use a torch; it may warp the head.
- Do not get the head hotter than 300°F (150°C); excessive heat may loosen the valve seats.
- To avoid burns, use heavy gloves when handling the heated cylinder head.

(cont'd)

Valve Guides

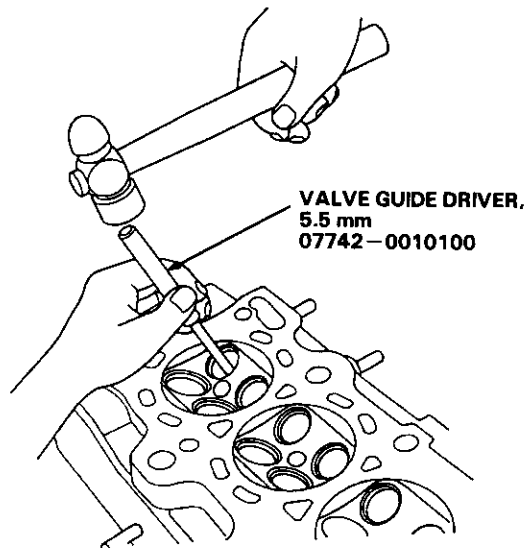
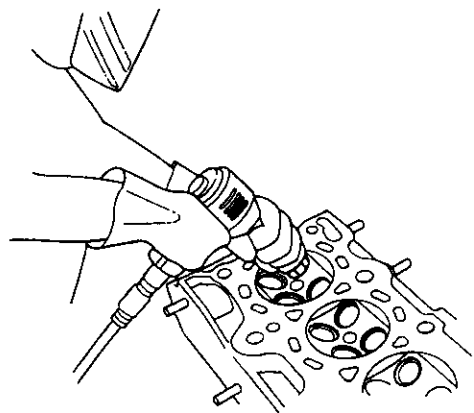
Replacement (cont'd)

- Working from the camshaft side, use the driver and an air hammer to drive the guide about 2 mm (0.1 in) towards the combustion chamber. This will knock off some of the carbon and make removal easier.

CAUTION:

- Always wear safety goggles or a face shield when driving valve guides.
- Hold the air hammer directly in line with the valve guide to prevent damaging the driver.

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



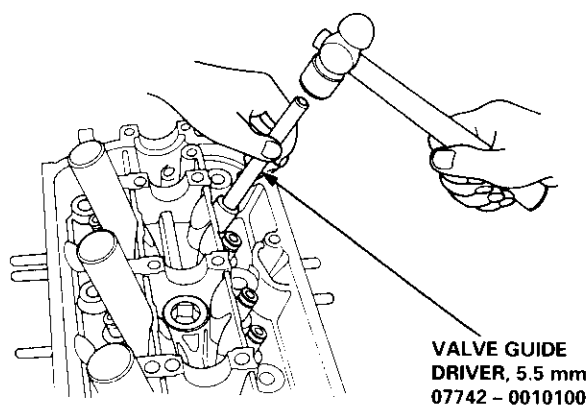
VALVE GUIDE DRIVER,
5.5 mm
07742-0010100

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

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

- Remove the new guides from the freezer, one at a time, as you need them.

- Apply a thin coat of clean engine oil to the outside of the new valve guide. Install the guide from the camshaft side of the head; use the special tool to drive the guide in to the specified installed height. If you have all 16 guides to do, you may have to reheat the head.

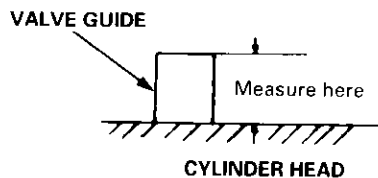


VALVE GUIDE
DRIVER, 5.5 mm
07742-0010100

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)



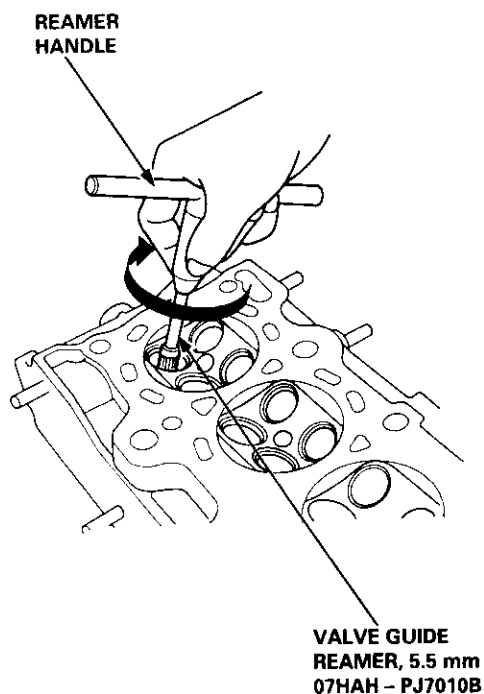


Reaming

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 6-39). Verify that the valve slides in the valve guide without exerting pressure.

Turn reamer in clockwise direction only.



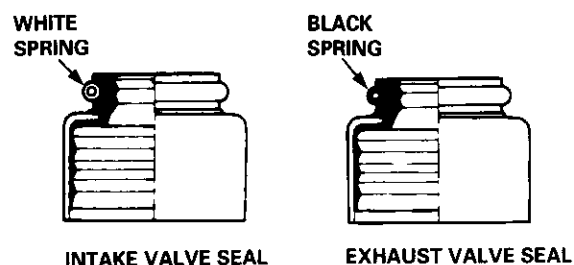
Installation

1. Coat valve stems with engine oil. Insert the valves in the valve guides.

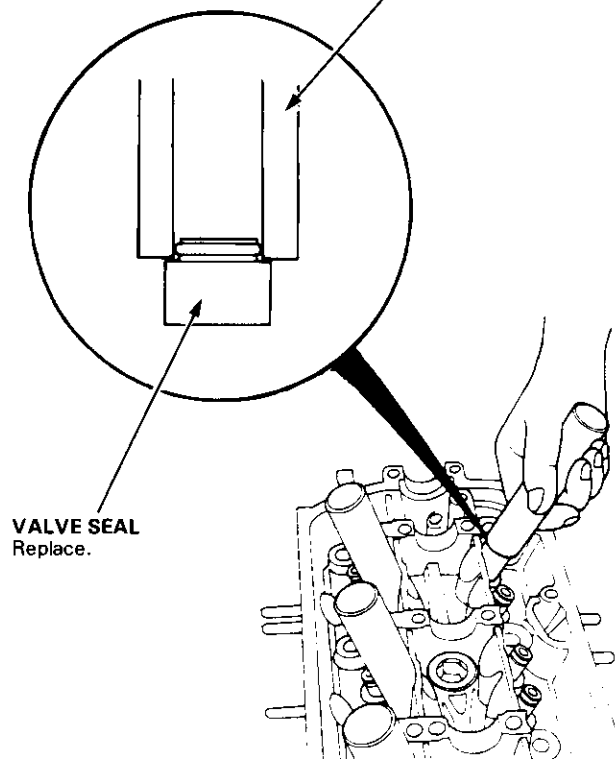
NOTE: Make sure the valves move up and down smoothly.

2. Install the spring seats on the cylinder head.
3. Install the valve seals using the valve guide seal installer.

NOTE: Exhaust and intake valve seals are not interchangeable.



VALVE GUIDE SEAL INSTALLER
KD2899 (Commercially available)
NOTE: Use small ID end of tool.

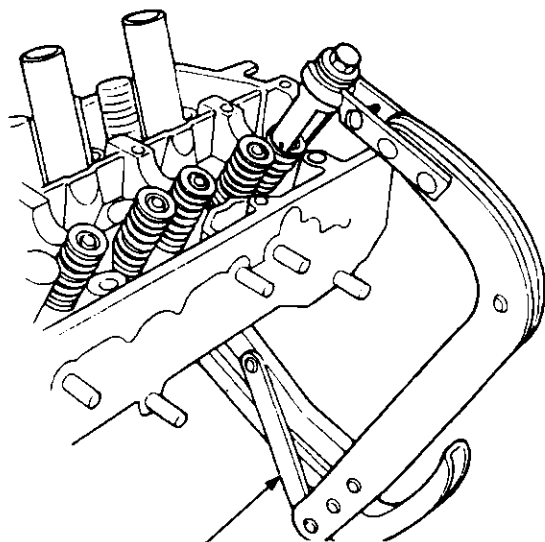


(cont'd)

Installation (cont'd)

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

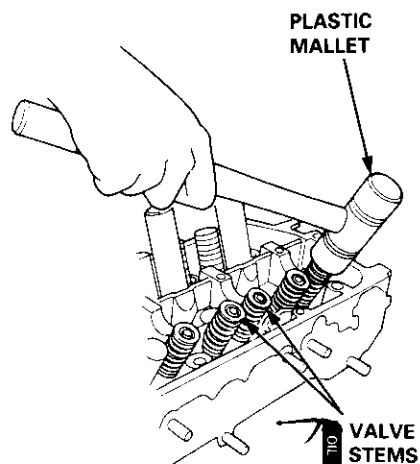
NOTE: Place the end of the valve spring with closely wound coils toward the cylinder head.



VALVE SPRING COMPRESSOR
(Commercially available)
Snap-on CF711 or KD - 383
with #32 JAWS

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

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

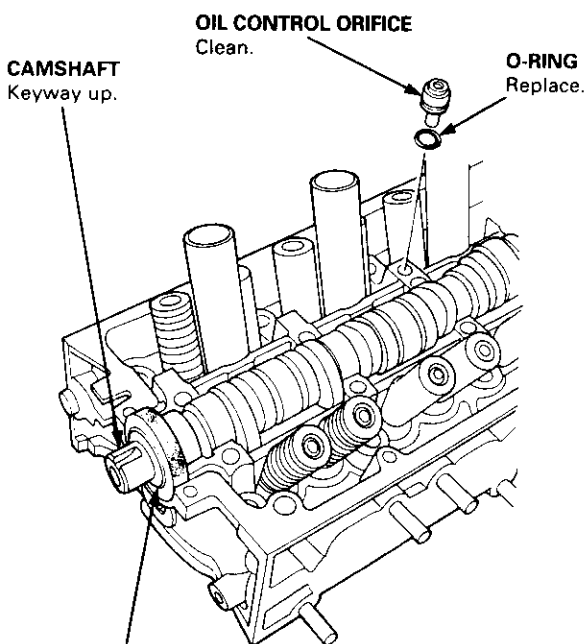


Installation

CAUTION:

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

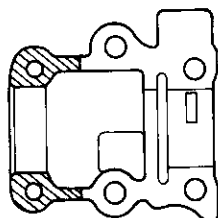
1. After wiping down the camshaft, camshaft seal and journals in the cylinder head, lubricate both surfaces and install the camshaft.
2. Clean and install the oil control orifice with a new O-ring.



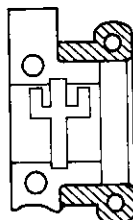
3. Turn the camshaft until its keyway is facing up (No. 1 piston TDC).



4. Apply liquid gasket (Part No. 08718 - 0001 or 08718 - 0003) to the head mating surfaces of the No. 1 and No. 5 camshaft holders.
— 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.

Specified torque:

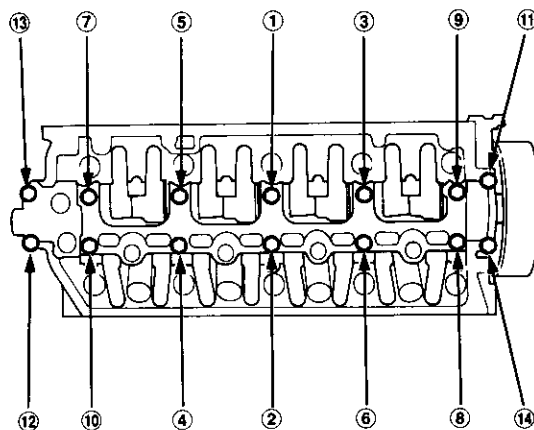
8 mm bolts: 20 N·m (2.0 kgf·m, 14 lbf·ft)

Apply engine oil to the threads.

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

Apply engine oil to the threads.

6 mm bolts: ⑪, ⑫, ⑬, ⑭



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

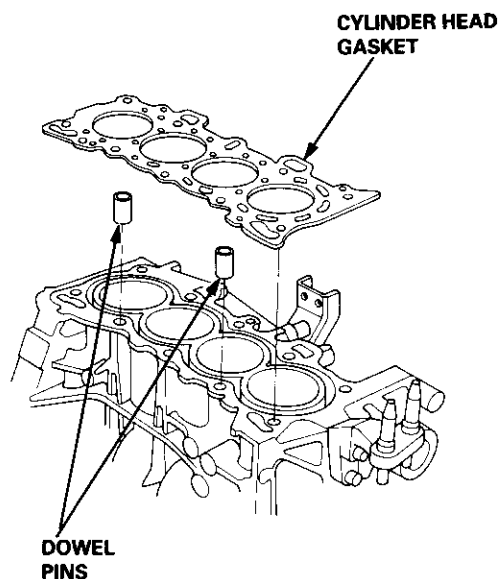
Installation

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 the camshaft pulley should be at the top.
- Turn the crankshaft so the No. 1 piston is at TDC (see page 6-20).
- Clean the oil control orifice before installing.
- Do not use the upper cover and lower cover to store removed items.
- 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 6-20).
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)

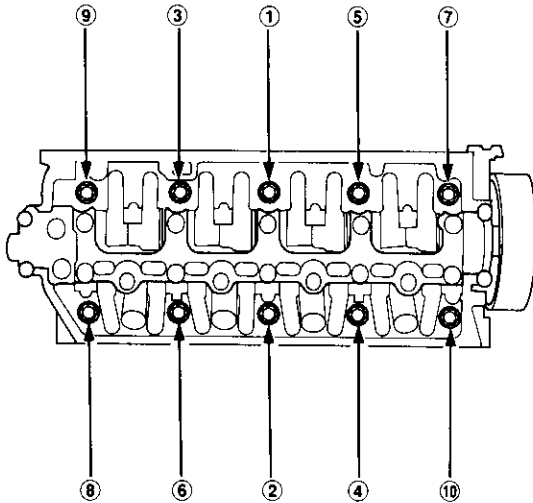
3rd step: ① – ⑩ 67 N·m (6.8 kgf·m, 49 lbf·ft)

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 9-2 thru 9-4).

- 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 and 9-7).

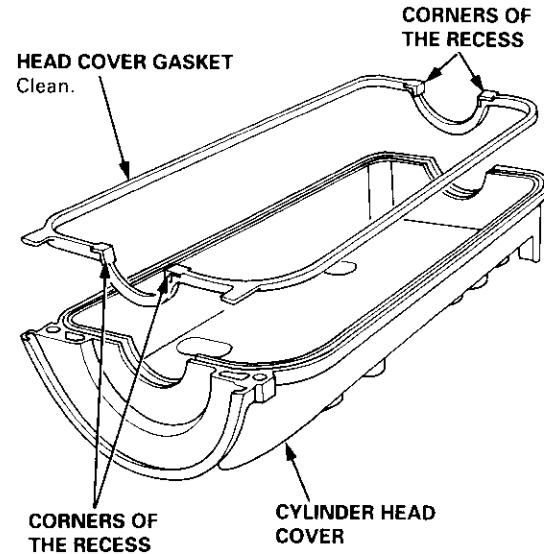
- Always use a new exhaust manifold gasket.

6. Install the exhaust manifold bracket. Install the exhaust pipe A and the bracket, then install the cover.

7. Install the timing belt (see page 6-20).
8. Adjust the valve clearance (see page 6-12).
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:

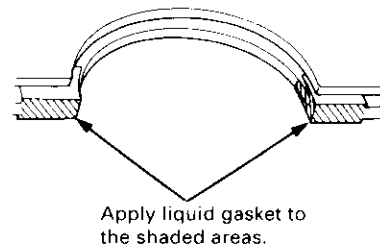
- Before installing the head cover gasket, thoroughly clean the seal and the groove.
- When installing, make sure the head cover gasket is seated securely in the corners of the recesses with no gap.



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

NOTE:

- Use liquid gasket, Part No. 08718 – 0001 or 08718 – 0003.
- 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.

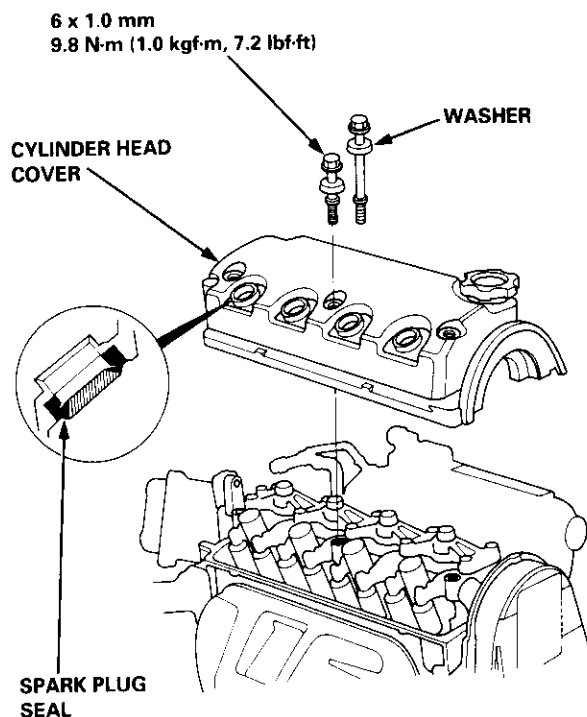




11. When installing the cylinder head cover, hold the head cover gasket in the groove by placing your fingers on the camshaft holder contacting surfaces (top of the semicircles).
Set the spark plug seal on the spark plug tube.
Once the cylinder head cover is on the cylinder head, slide the cover slightly back and forth to seat the head cover gasket.

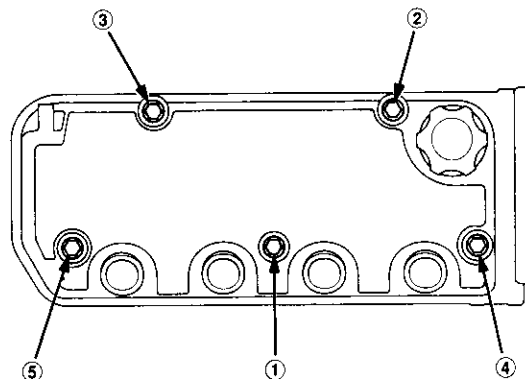
NOTE:

- 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 seals when installing the cylinder head cover.
- Visually check the spark plug seals for damage.
- Replace any washer that is damaged or deteriorated.



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 B16A2 engine

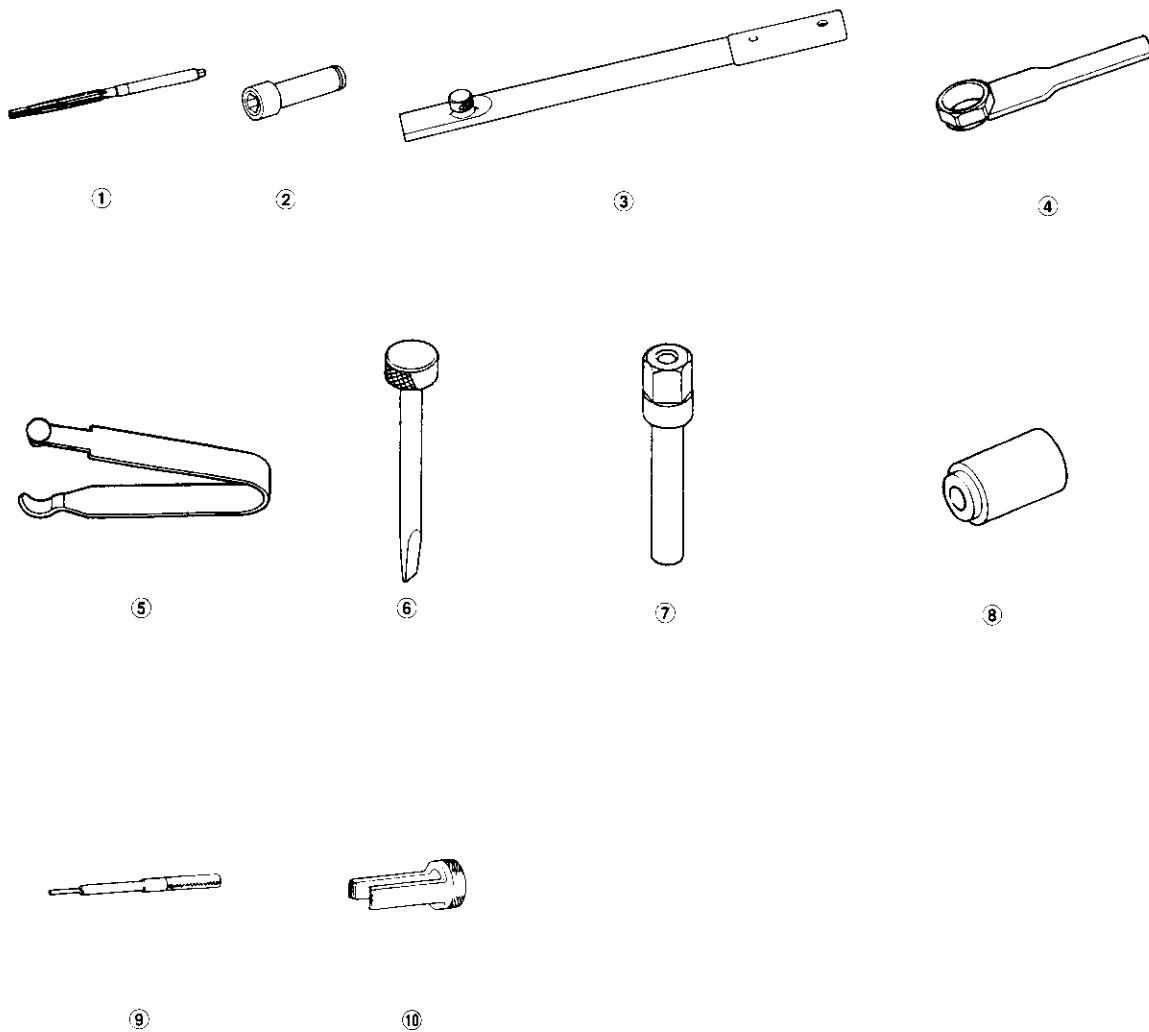
Special Tools	6-50
VTEC Control System	
Troubleshooting Flowchart	6-51
VTEC Solenoid Valve	
Inspection	6-54
VTEC Rocker Arms	
Manual Inspection	6-54
Inspection Using Special Tools	6-55
Valve Clearance	
Adjustment	6-57
Crankshaft Pulley and Pulley Bolt	
Replacement	6-59
Timing Belt	
Illustrated Index	6-60
Inspection	6-61
Tension Adjustment	6-61
Removal	6-62
Installation	6-63
Cylinder Head	
Illustrated Index	6-65
Removal	6-67
Warpage	6-79
Installation	6-84

Rocker Arms	
Removal	6-71
Disassembly/Reassembly	6-72
Rocker Arms and Lost Motion Assemblies	
Inspection	6-73
Rocker Arms and Shafts	
Clearance Inspection	6-74
Camshafts	
Inspection	6-75
Valves, Valve Springs and Valve Seals	
Removal	6-77
Valve Seats	
Reconditioning	6-78
Valve Guides	
Valve Movement	6-79
Replacement	6-80
Reaming	6-81
Valves	
Installation	6-82
Rocker Arms	
Installation	6-83



Special Tools

Ref. No.	Tool Number	Description	Qty	Page Reference
①	07HAH - PJ7010B	Valve Guide Reamer, 5.5 mm	1	6-81
②	07JAA - 001020A	Socket, 19 mm	1	6-59
③	07JAB - 001020A	Holder Handle	1	6-59
④	07JAB - 001040A	Pulley Holder Attachment, 50 mm	1	6-59
⑤	07LAJ - PR3020A	Air Stopper	1	6-55
⑥	07MAA - PR70100	Tappet Adjuster	1	6-57
⑦	07MAA - PR70120	Tappet Locknut Wrench	1	6-57
⑧	07MAF - PR9010A	Valve Spring Compressor Attachment Extension	1	6-77
⑨	07742 - 0010100	Valve Guide Driver, 5.5 mm	1	6-80, 81
⑩	07757 - PJ1010A	Valve Spring Compressor Attachment	1	6-77



VTEC Control System



Troubleshooting Flowchart

P1259

The scan tool indicates Diagnostic Trouble Code (DTC) P1259: A problem in the VTEC Pressure Switch circuit or VTEC Solenoid Valve circuit.

Refer to page 11-38 through 11-55 before troubleshooting.

- The MIL has been reported on.
- DTC P1259 is stored.

Check the VTEC Control System:

1. Do the engine control module (ECM) Reset Procedure (see section 11).
2. Start the engine.
3. Warm up the 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.

Hold that engine speed for at least two seconds.

If the DTC P1259 is not repeated during the first road test, repeat this test two more times.

Is DTC P1259 indicated?

NO

Intermittent failure, system is OK at this time.

Check for poor connections or loose wires at VTEC pressure switch, VTEC solenoid valve and ECM.

YES

Test the VTEC Pressure Switch:

1. Turn the ignition switch OFF.
2. Disconnect the VTEC Pressure switch 2P connector.
3. Check for continuity between VTEC pressure switch 2P connector terminal No. 1 and No. 2.

Is there continuity?

NO

Replace the VTEC pressure switch.

YES

Test the VTEC Pressure Switch Wire:

1. Turn the ignition switch ON (II).
2. Measure the voltage between VTEC pressure switch 2P connector No. 1 and body ground.

Is there battery voltage?

NO

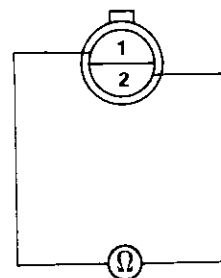
Inspect for an open or short to ground in the wire between the VTEC pressure switch and ECM (C10).

If the wire is OK, substitute a known-good ECM and recheck.

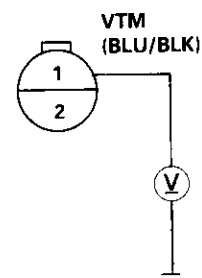
YES

(To page 6-52)

VTEC PRESSURE SWITCH 2P CONNECTOR



Terminal side of male terminals



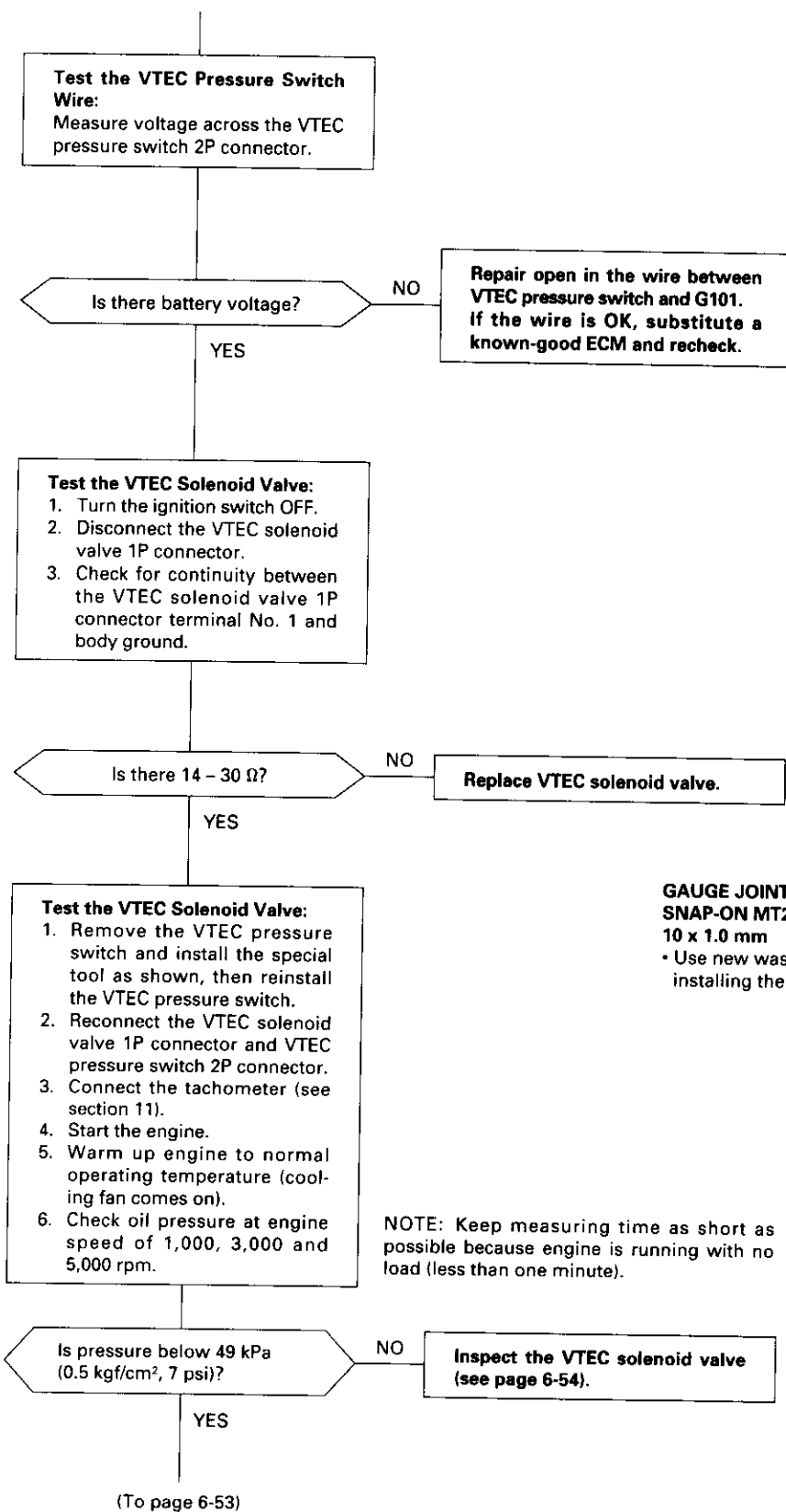
Wire side of female terminals

(cont'd)

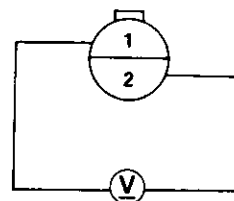
VTEC Control System

Troubleshooting Flowchart (cont'd)

(From page 6-51)

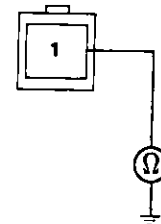


VTEC PRESSURE SWITCH 2P CONNECTOR



Wire side of female terminals

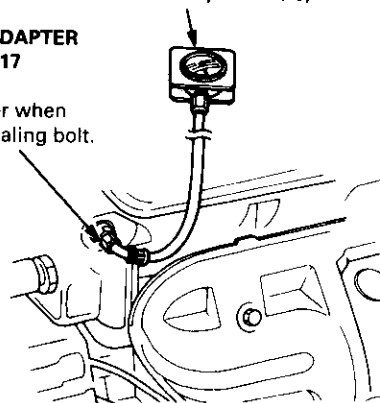
VTEC SOLENOID VALVE 1P CONNECTOR



Terminal side of male terminal

OIL PRESSURE GAUGE
(Commercially available)

**GAUGE JOINT ADAPTER
SNAP-ON MT26-17
10 x 1.0 mm**
• Use new washer when installing the sealing bolt.



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



(From page 6-52)

Test the VTEC Solenoid Valve:

1. Turn the ignition switch OFF.
2. Disconnect the VTEC solenoid valve 1P connector.
3. Attach the battery positive terminal to the VTEC solenoid valve terminal.
4. Start the engine and check the oil pressure at engine speed of 5,000 rpm.

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

NO

Inspect the VTEC solenoid valve (see page 6-54).

YES

Test the VTEC Pressure Switch:

With the battery positive terminal connected to the VTEC solenoid valve, measure voltage between the ECM connector terminal C10 and body ground.

Is there battery voltage above 5,000 rpm?

NO

Replace the VTEC pressure switch.

YES

Test the VTEC Solenoid Valve Wire:

1. Turn the ignition switch OFF.
2. Check for continuity between the VTEC solenoid valve 1P connector terminal and the ECM connector terminal B12.

Is there continuity?

NO

Repair open in the wire between the ECM (B12) and VTEC solenoid valve connector.

YES

Test the VTEC Solenoid Valve Wire:

Check for continuity between the VTEC solenoid valve 1P connector terminal and body ground.

Is there continuity?

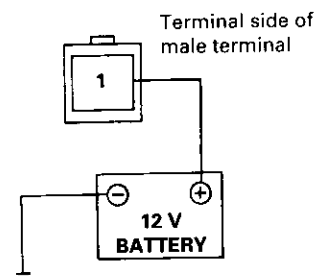
YES

Repair short in the wire between the ECM (B12) and VTEC solenoid valve connector.

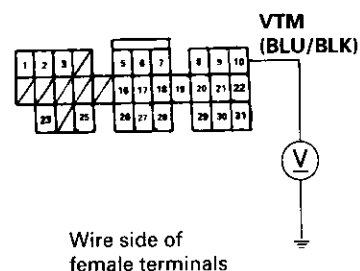
NO

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

VTEC SOLENOID VALVE 1P CONNECTOR

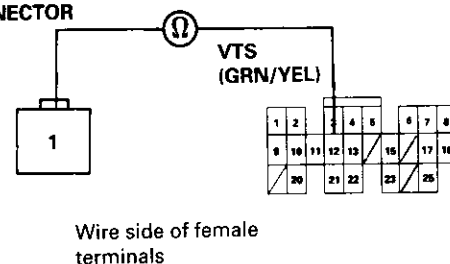


ECM CONNECTOR C (31P)

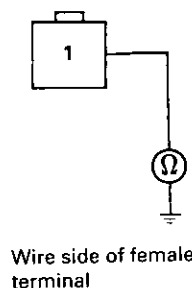


VTEC SOLENOID VALVE 1P CONNECTOR

ECM CONNECTOR B (25P)



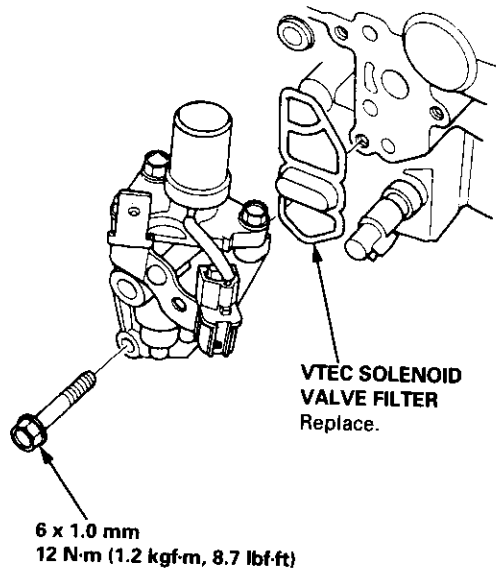
VTEC SOLENOID VALVE 1P CONNECTOR



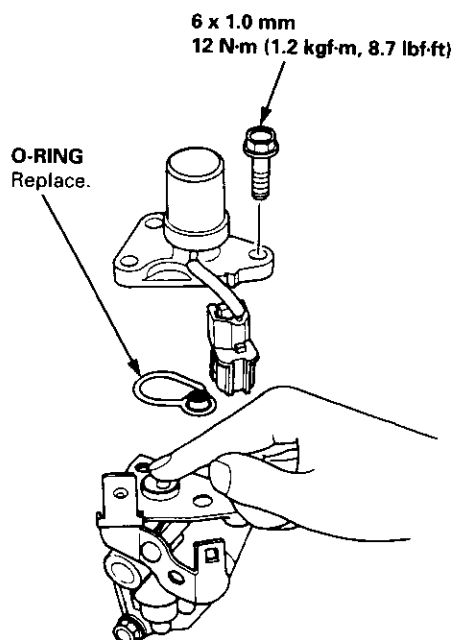
VTEC Solenoid Valve

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.



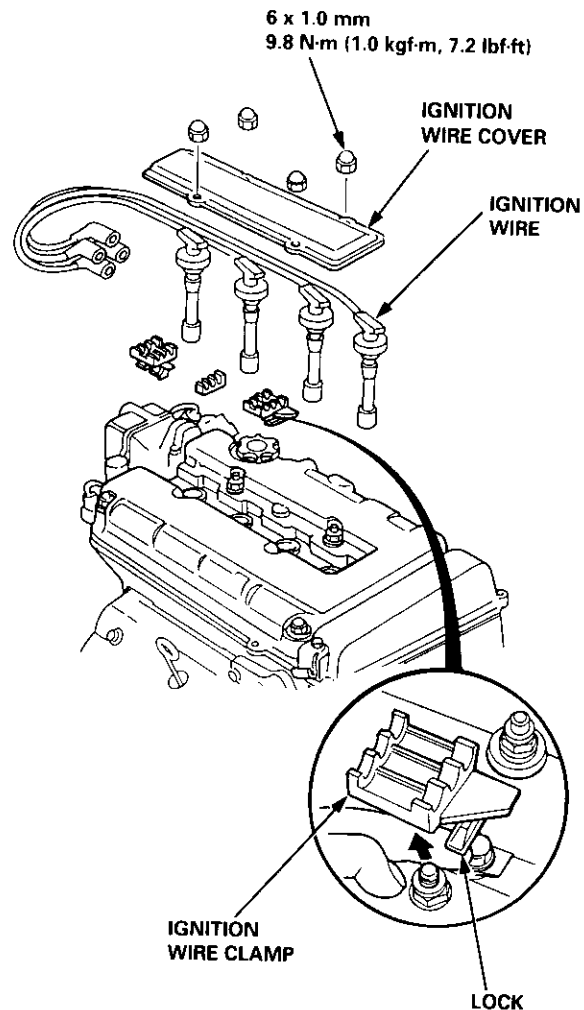
2. If the filter is not clogged, push the VTEC solenoid valve with your finger and check its movement.
 - If the VTEC solenoid valve is normal, check the engine oil pressure.



VTEC Rocker Arms

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.



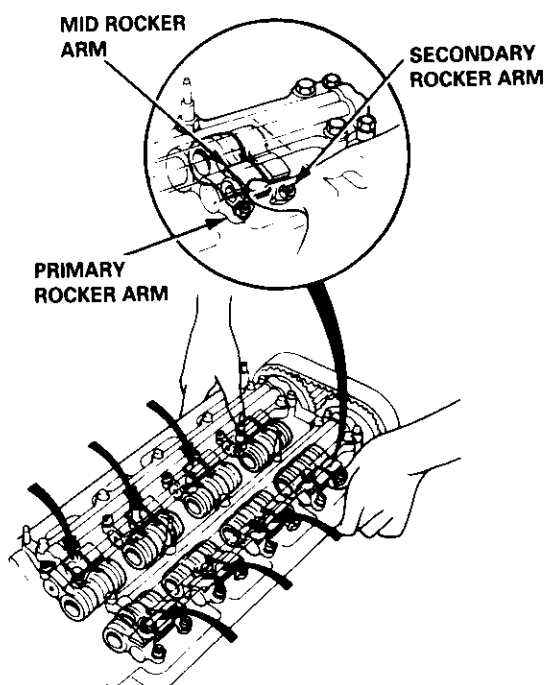


Inspection Using Special Tools

4. Remove the cylinder head cover.

NOTE: Refer to page 6-88 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.

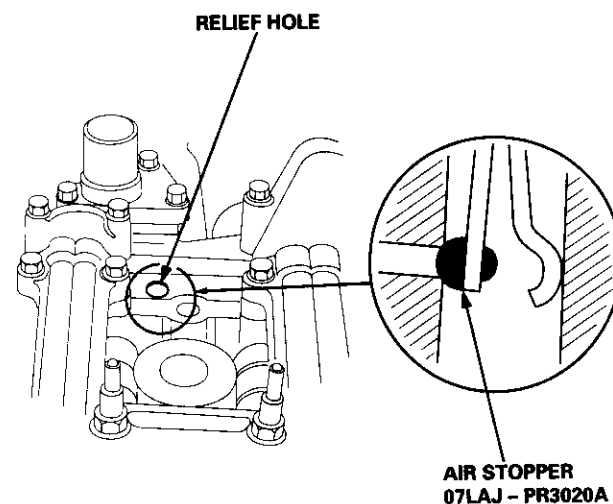
CAUTION:

- 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.

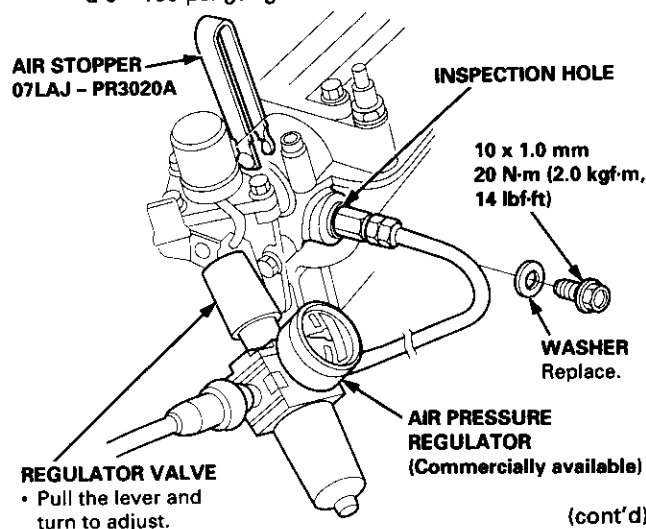
1. Remove the cylinder head cover.

NOTE: Refer to page 6-86 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 an air pressure regulator with a 0 - 100 psi gauge.



(cont'd)

VTEC Rocker Arms

Inspection Using Special Tools (cont'd)

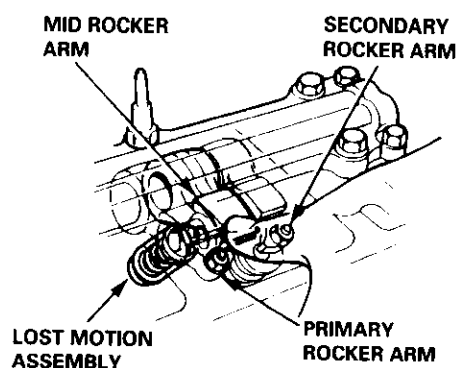
4. Loosen the valve on the regulator and apply the specified air pressure.

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:

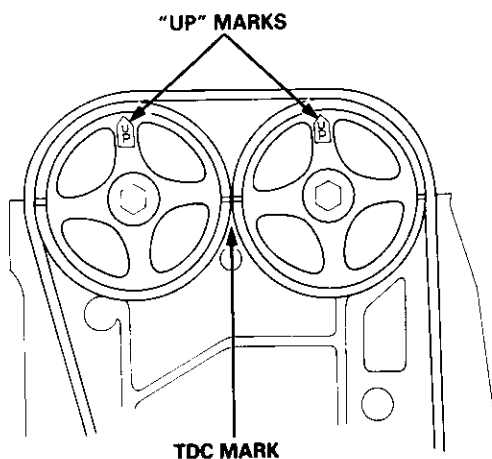
- Valves should be adjusted only when the cylinder head temperature is less than 100°F (38°C).
- After adjusting, retorque the crankshaft pulley bolt to 177 N·m (18.0 kgf·m, 130 lbf·ft)

1. Remove the cylinder head cover.

NOTE: Refer to page 6-86 when installing the cylinder head cover.

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

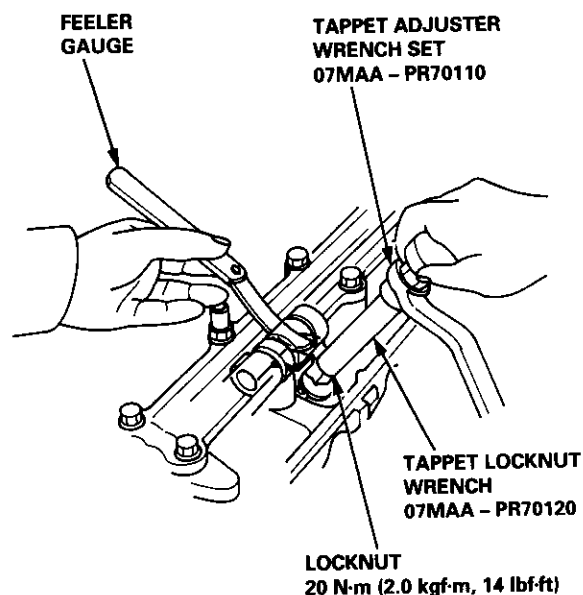
Number 1 piston at TDC:



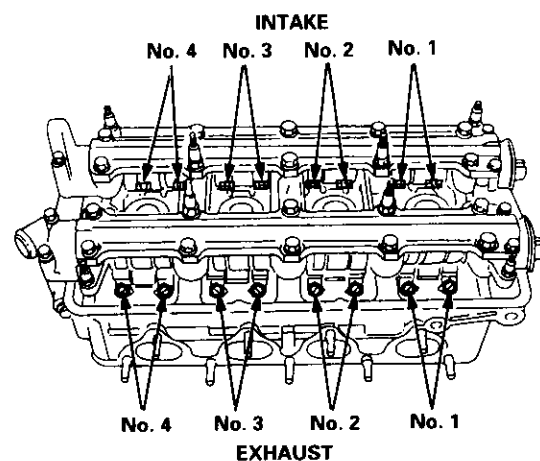
3. Adjust valves on No. 1 cylinder.

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 forth with a slight amount of drag.



Adjusting screw location:

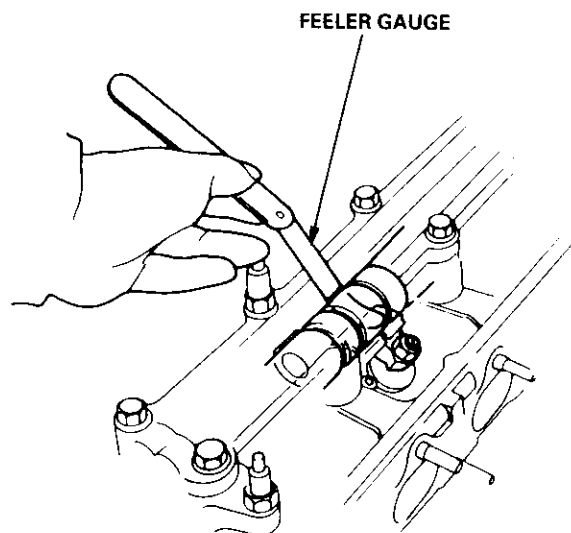


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Valve Clearance

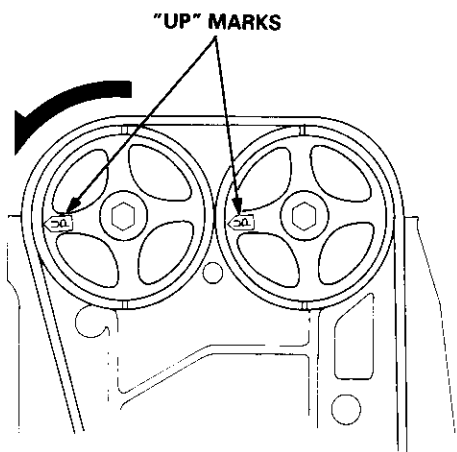
Adjustment (cont'd)

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



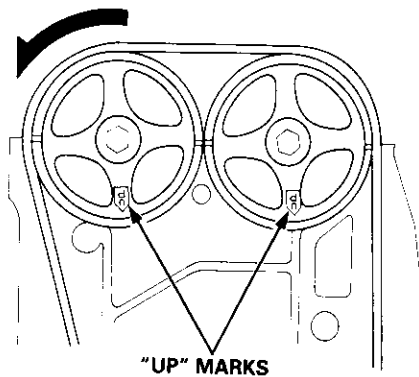
6. Rotate the crankshaft 180° counterclockwise (camshaft pulley turns 90°). The "UP" mark should be on the exhaust side. Adjust valves on No. 3 cylinder.

Number 3 piston at TDC:



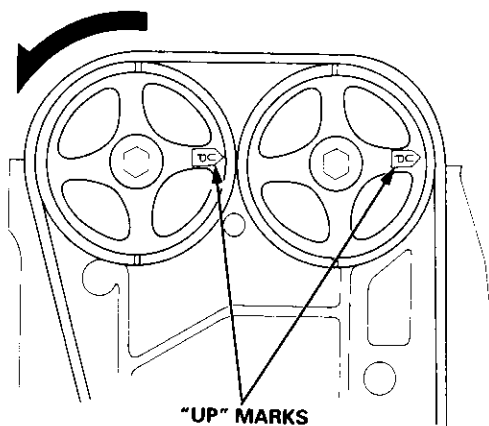
7. Rotate the crankshaft 180° counterclockwise to bring No. 4 piston to TDC. The "UP" mark should be pointing straight down. Adjust valves on No. 4 cylinder.

Number 4 piston at TDC:



8. Rotate the 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.

Number 2 piston at TDC:





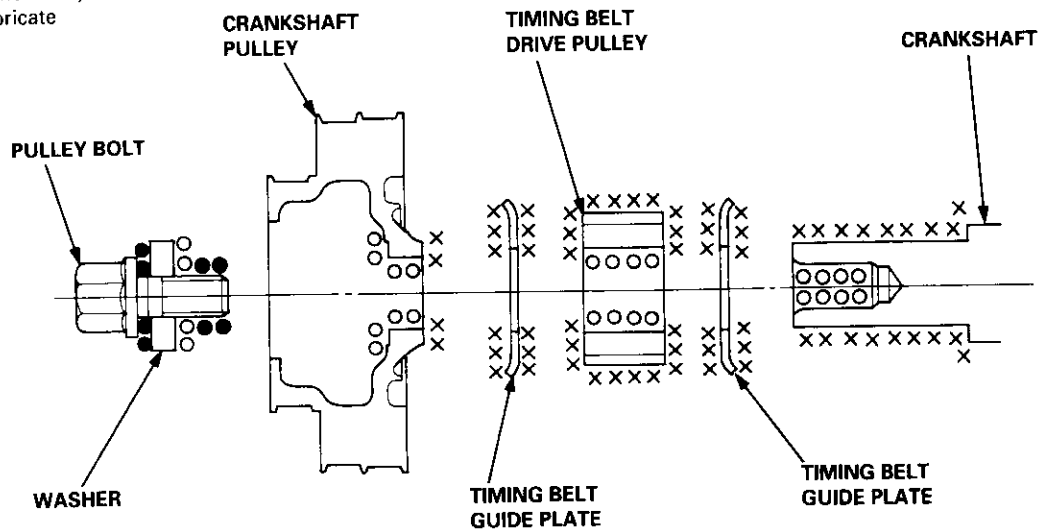
Crankshaft Pulley and Pulley Bolt

Replacement

When installing and tightening the pulley, follow the procedure below.

Clean, remove any oil, and lubricate points shown below.

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

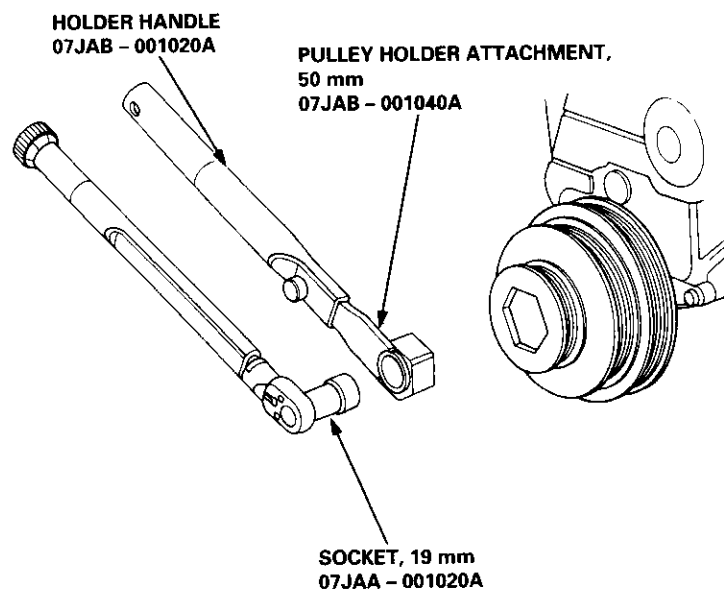


Crankshaft pulley bolt size and torque value:

14 x 1.25 mm

177 N·m (18.0 kgf·m, 130 lbf·ft)

NOTE: Do not use an impact wrench when installing.



Timing Belt

Illustrated Index

NOTE:

- Refer to page 6-59 for positioning crankshaft and pulley before installing belt.
- Mark the direction of rotation on the belt before removing.
- Do not use the middle cover and lower cover for storing removed items.
- Clean the middle cover and lower cover before installation.

WASHER

Replace when damaged or deteriorated.

RUBBER SEAL

Replace when damaged or deteriorated.

CAP NUT

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

CYLINDER HEAD COVER

Refer to page 6-86 when installing.

HEAD COVER GASKET

Replace when leaking, damaged or deteriorated.
Apply liquid gasket at the four corners of the recesses.

BACK COVER

KEYS

TIMING BELT

Inspection, page 6-61
Adjustment, page 6-61
Replacement, page 6-62

MIDDLE COVER

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

8 x 1.25 mm
56 N-m (5.7 kgf-m, 41 lbf-ft)

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

ADJUSTING BOLT
10 x 1.25 mm
54 N-m (5.5 kgf-m, 40 lbf-ft)

LOWER COVER

PULLEY BOLT

14 x 1.25 mm
177 N-m (18.0 kgf-m, 130 lbf-ft)
Replacement, page 6-59
Do not use an impact wrench when installing.

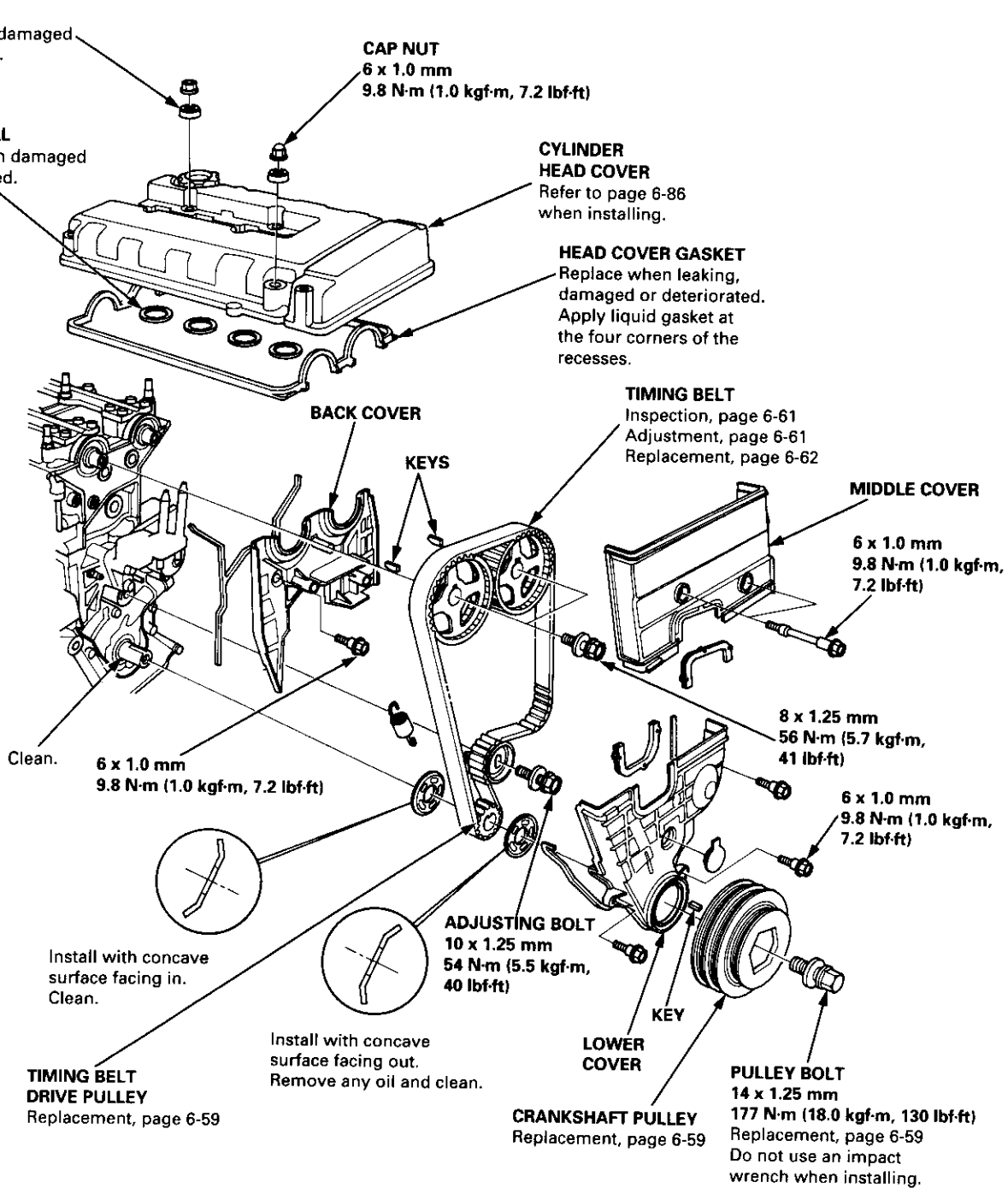
CRANKSHAFT PULLEY
Replacement, page 6-59

TIMING BELT DRIVE PULLEY

Replacement, page 6-59

Install with concave surface facing in.
Clean.

Install with concave surface facing out.
Remove any oil and clean.





Inspection

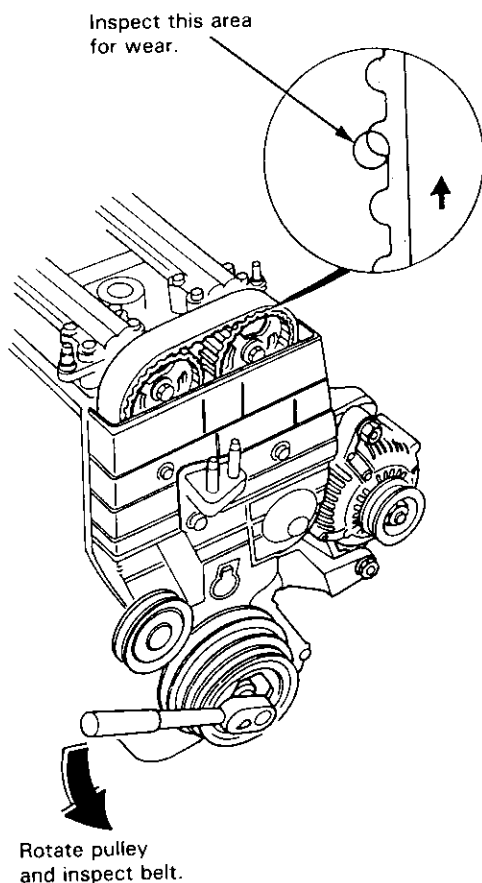
1. Remove the cylinder head cover.

NOTE: Refer to page 6-86 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.



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

Tension Adjustment

CAUTION: Always adjust timing belt tension with the engine cold.

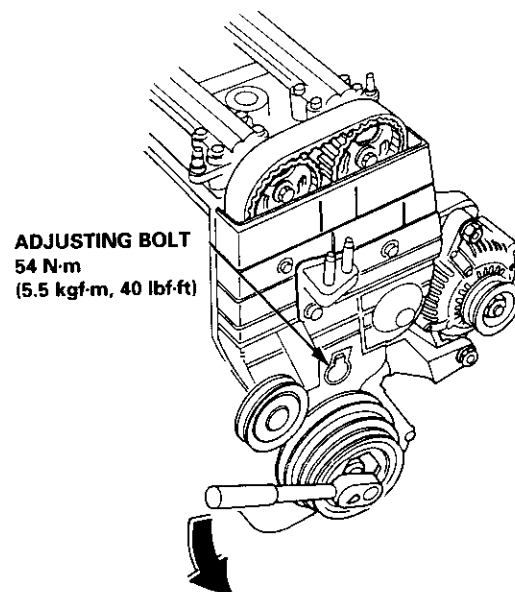
NOTE:

- 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 6-86 when installing the cylinder head cover.

2. Set the No. 1 piston at TDC (see page 6-64).
3. Rotate the crankshaft five or six 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).

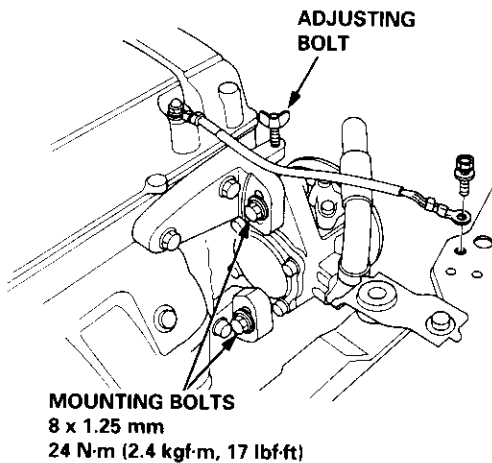
Timing Belt

Removal

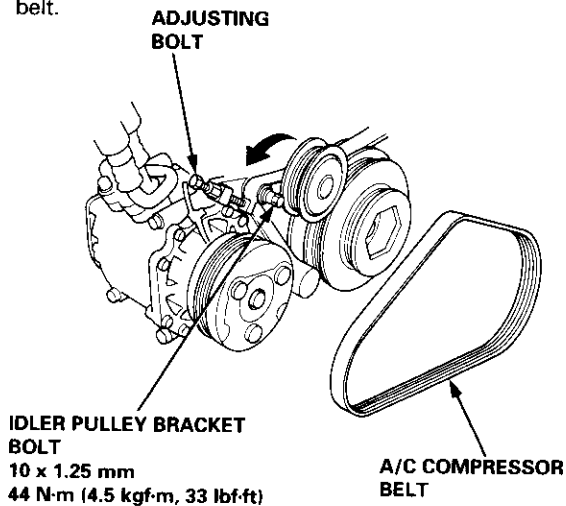
NOTE:

- Replace the timing belt at 105,000 miles (168,000 km) according to the maintenance schedule (normal conditions/severe conditions).
If the vehicle is regularly driven in one or more of the following conditions, replace the timing belt at 60,000 miles (U.S.A.) 100,000 km (Canada).
 - In very high temperatures (over 110°F, 43°C).
 - In very low temperatures (under -20°F, -29°C).
- Turn the crankshaft pulley so the No. 1 piston is at top dead center (TDC) before removing the belt (see page 6-57).
- Inspect the water pump before installing the timing belt (see page 10-14).

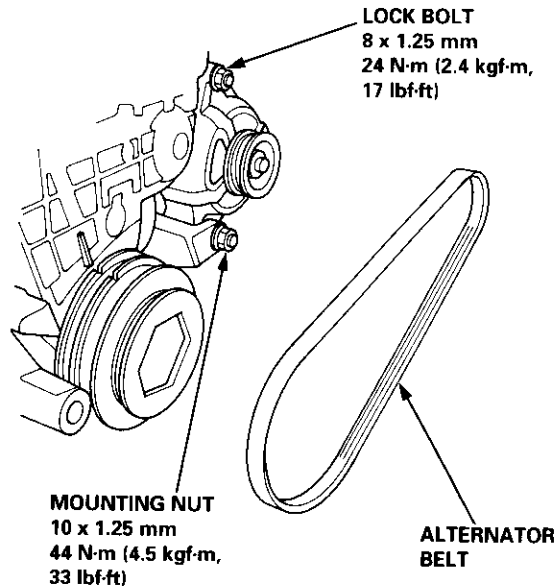
1. Remove the splash shield (see page 5-9).
2. Remove the adjusting bolt and mounting bolts, then remove the power steering (P/S) pump belt and pump.



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



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

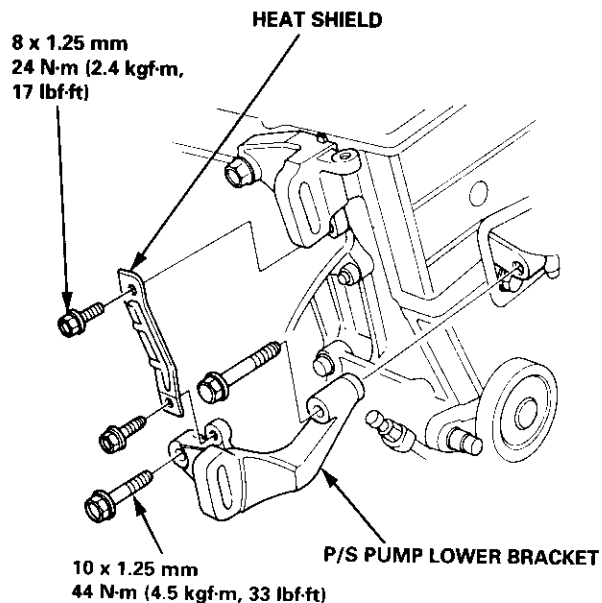


5. Remove the upper bracket (see page 6-69).

NOTE:

- Use a jack to support the engine before removing the upper bracket.
- Place a cushion between the oil pan and the jack.

6. Remove the P/S pump lower bracket.





Installation

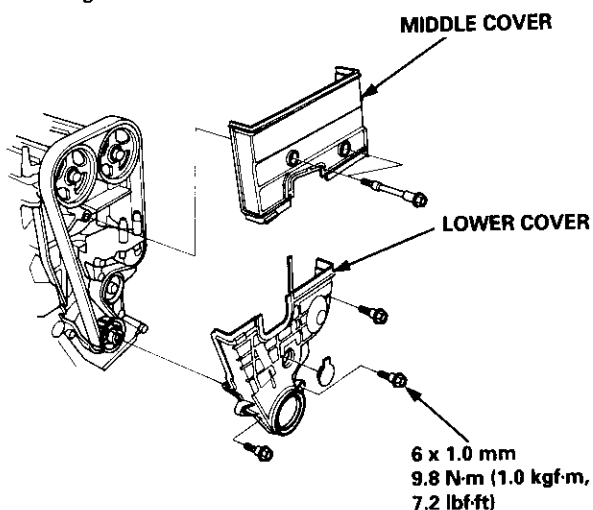
7. Remove the crankshaft pulley (see page 6-59).

8. Remove the cylinder head cover.

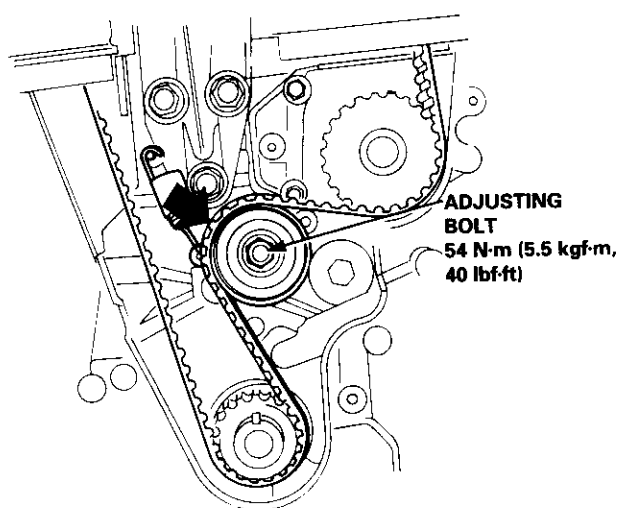
NOTE: Refer to page 6-86 when installing the cylinder head cover.

9. Remove the middle cover and lower cover.

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



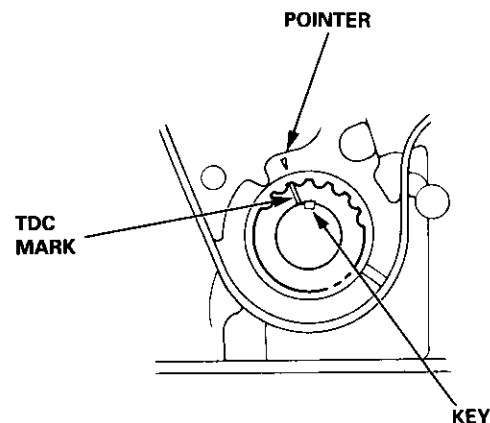
10. Loosen the adjusting bolt 180°. Push the tensioner to remove tension from the timing belt, then retighten the adjusting bolt.



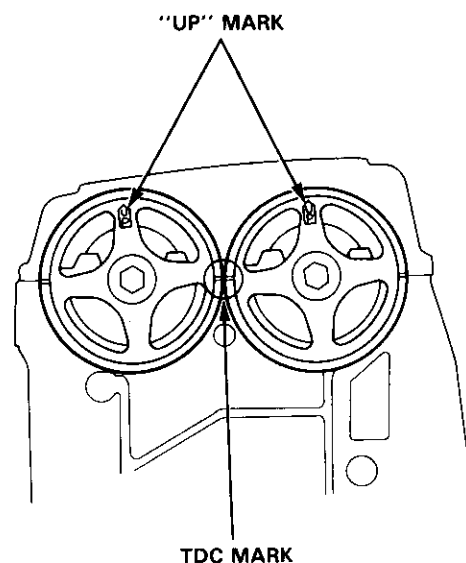
11. Remove the timing belt.

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 is at TDC. Align the TDC marks on the intake and exhaust camshaft pulleys.



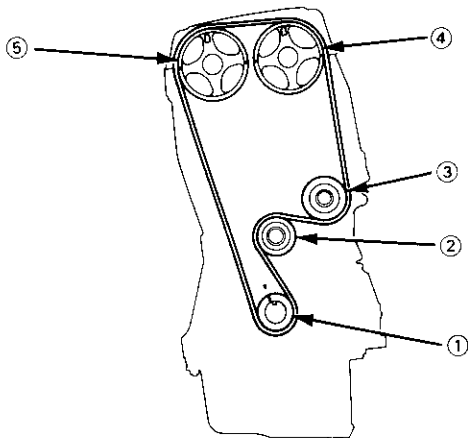
(cont'd)

Timing Belt

Installation (cont'd)

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.



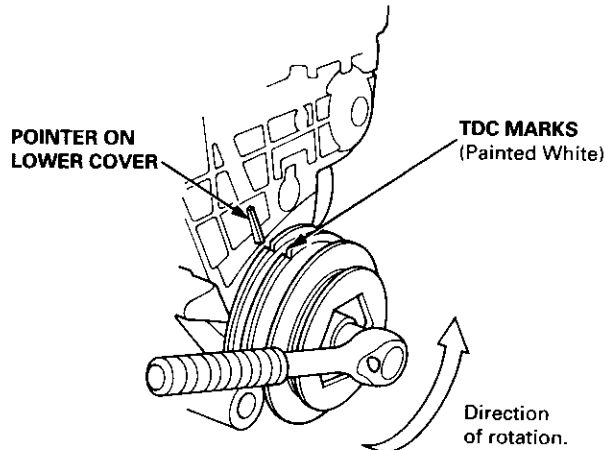
4. Loosen and retighten the adjusting bolt to tension the timing belt.
5. Install the lower cover and middle cover.

NOTE: Clean the middle and lower covers before installing.

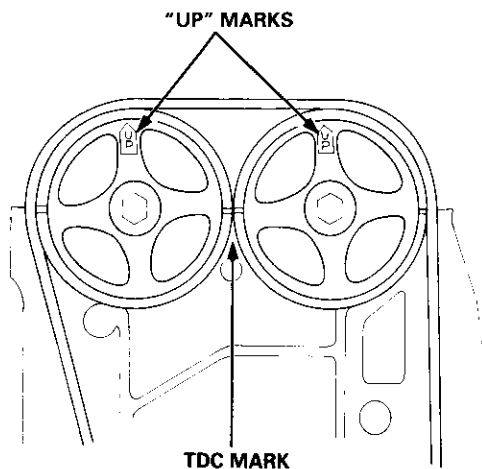
6. Install the crankshaft pulley, then tighten the pulley bolt (see page 6-59).
7. Rotate the crankshaft pulley about five or six turns counterclockwise so that the timing belt positions on the pulleys.
8. Adjust the timing belt tension (see page 6-61).

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

CRANKSHAFT PULLEY



CAMSHAFT PULLEY:



10. If the camshaft and crankshaft pulleys are not positioned at TDC, remove the timing belt, adjust the position following the procedure on page 6-63, then reinstall the timing belt.
11. After installation, adjust the tension of each belt.
- See section 23 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.

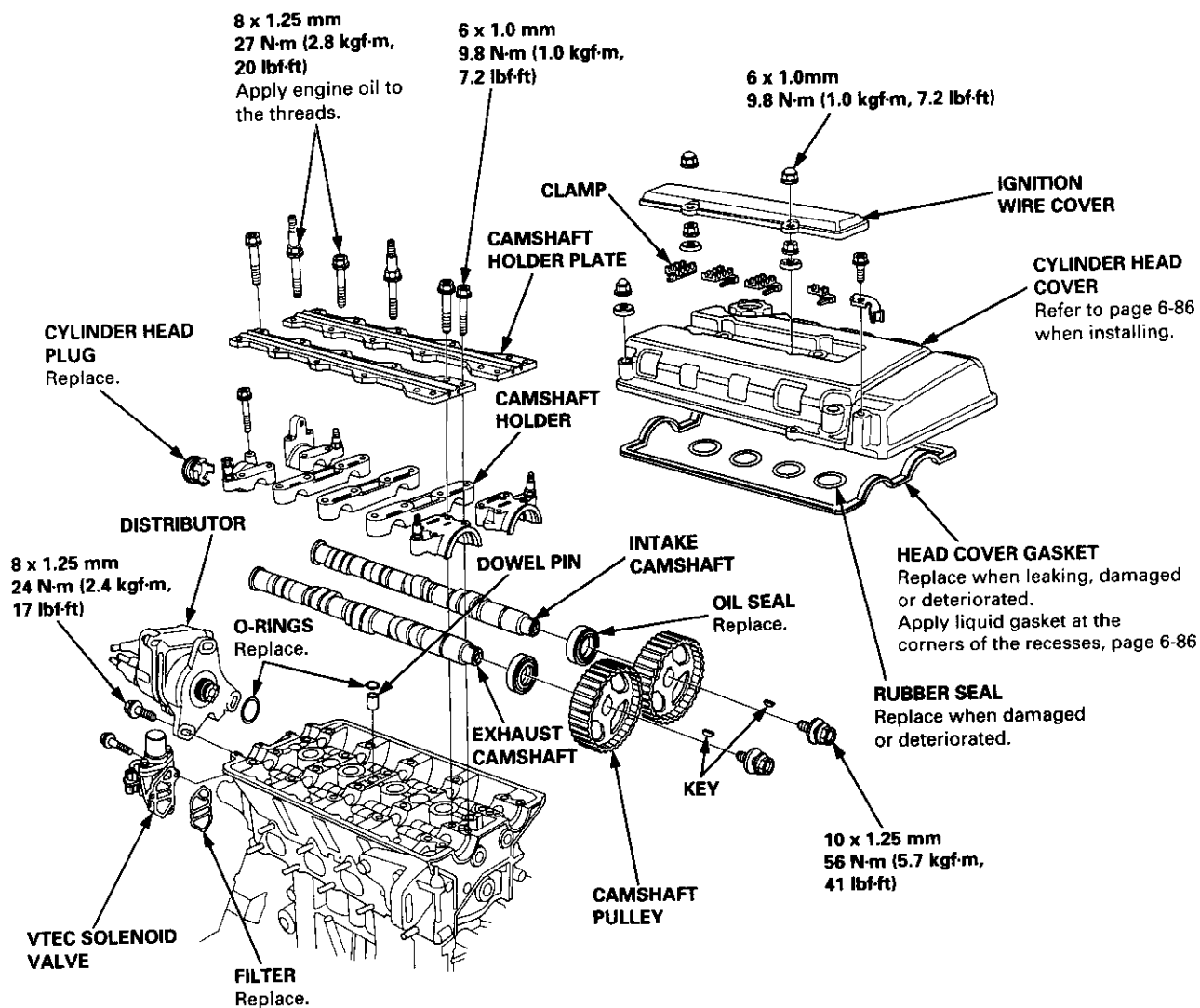


Illustrated Index

CAUTION:

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

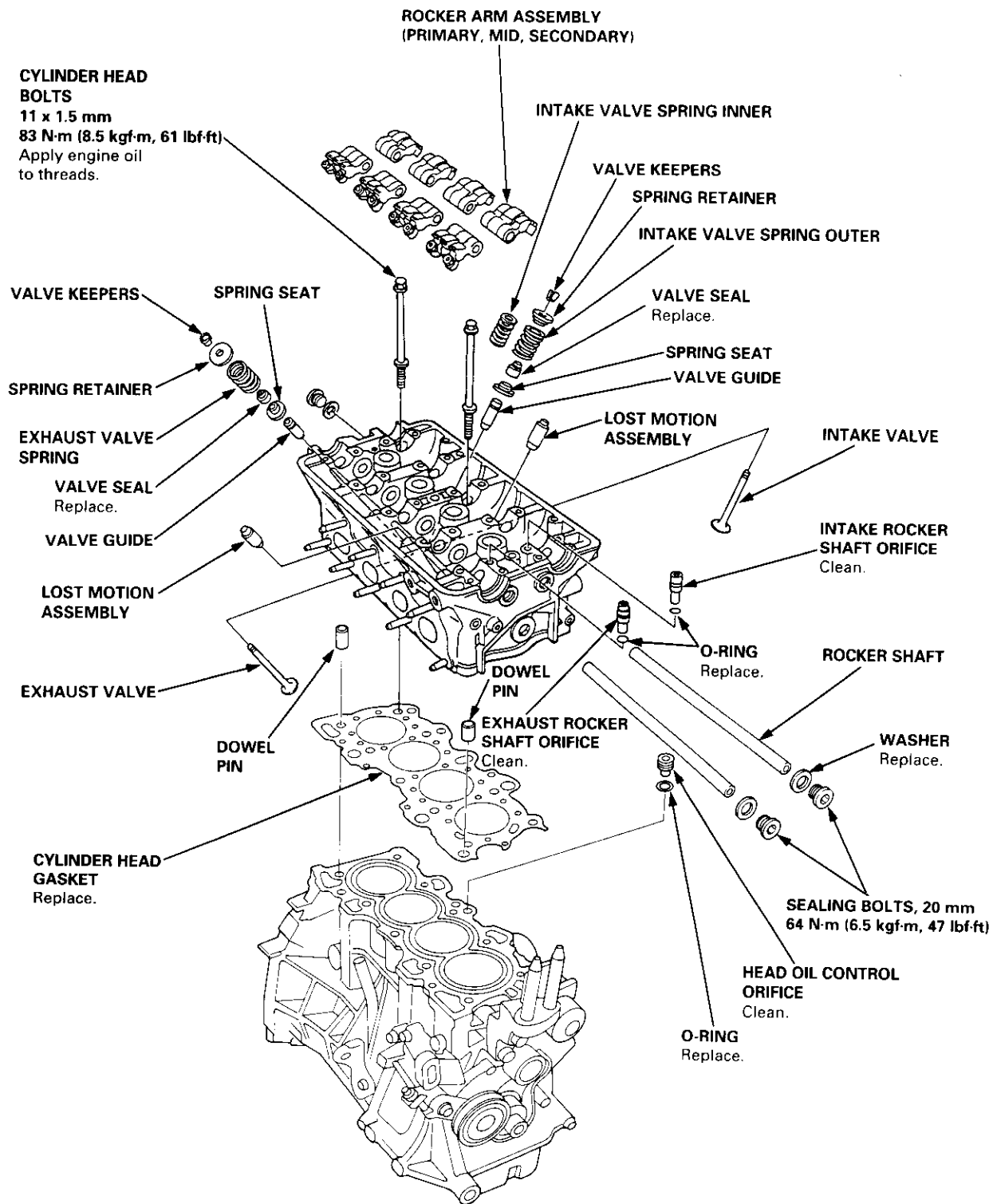
NOTE: Use new O-rings and gaskets when reassembling.



(cont'd)

Cylinder Head

Illustrated Index (cont'd)





Removal

Engine removal is not required for this procedure.

▲ WARNING Make sure jacks and safety stands are placed properly and hoist brackets are attached to correct position on the engine.

CAUTION:

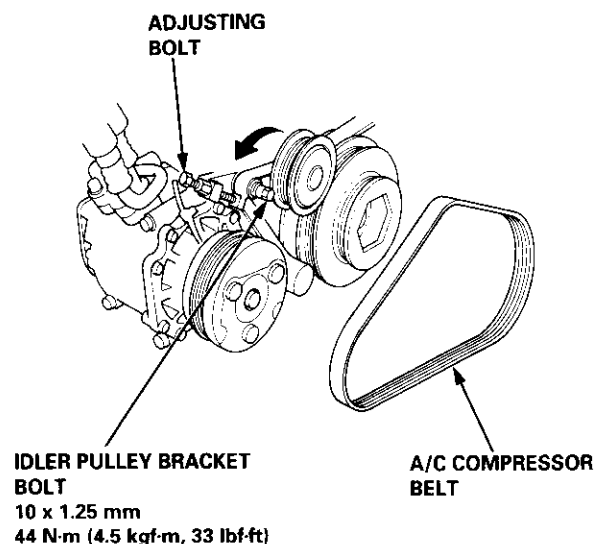
- Use fender covers to avoid damaging painted surfaces.
- To avoid damage, unplug the wiring connectors carefully while holding the connector portion.
- To avoid damaging the cylinder head, wait until the engine coolant temperature drops below 100°F (38°C) before loosening the retaining bolt.

NOTE:

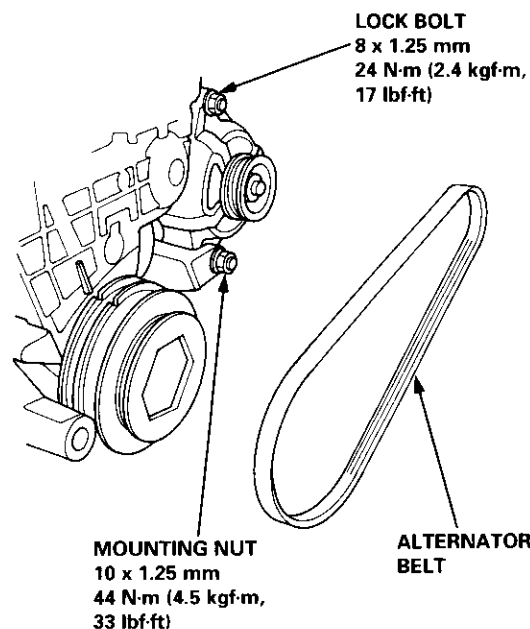
- Unspecified items are common.
- Mark all wiring and hoses to avoid misconnection. Also, be sure that they do not contact other wiring or hoses or interfere with other parts.
- Inspect the timing belt before removing the cylinder head.
- Turn the crankshaft pulley so that the No. 1 piston is at top dead center (see page 6-64).

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 strut brace (see page 5-2).
4. Remove the intake air duct and air cleaner housing (see page 5-3).
5. Remove the adjusting bolt and mounting bolt, 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.



7. Loosen the mounting nut and lock bolt, then remove the alternator belt.

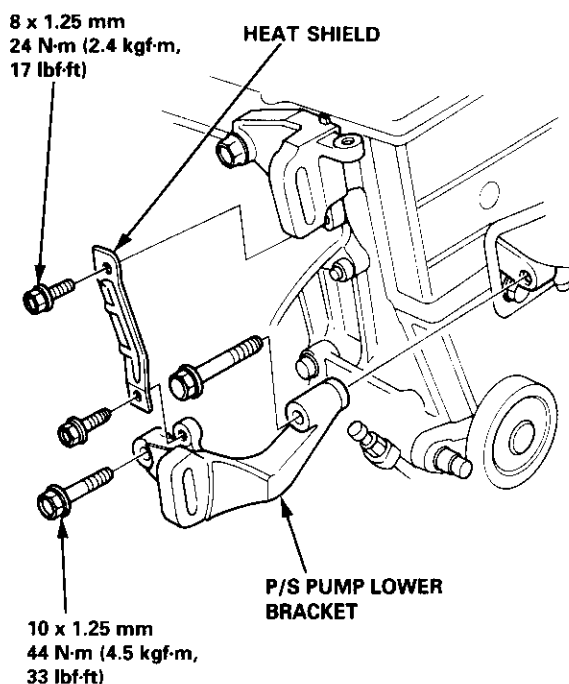


(cont'd)

Cylinder Head

Removal (cont'd)

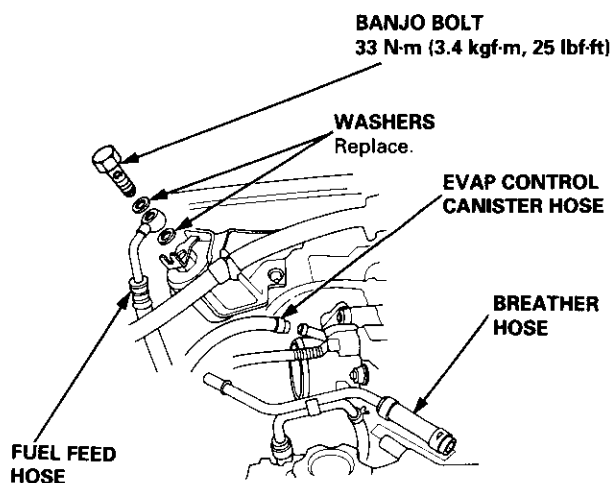
8. Remove the P/S pump lower bracket.



9. Relieve fuel pressure (see section 11).

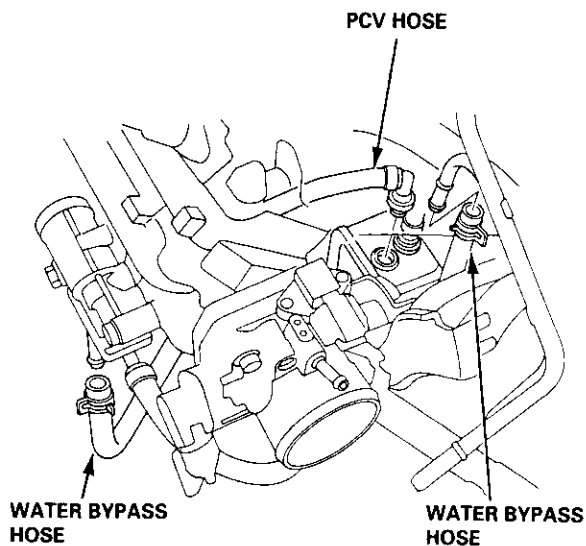
⚠ WARNING Do not smoke while working on fuel system, keep open flame or spark away from work area. Drain fuel only into an approved container.

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 5-4).

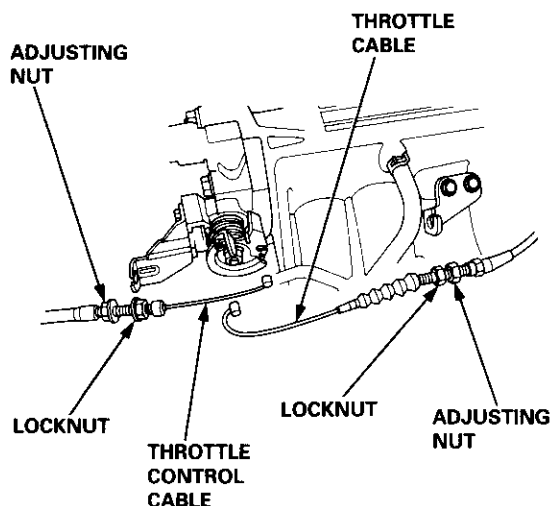
12. Remove the water bypass hose and positive crankcase ventilation (PCV) hose.



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

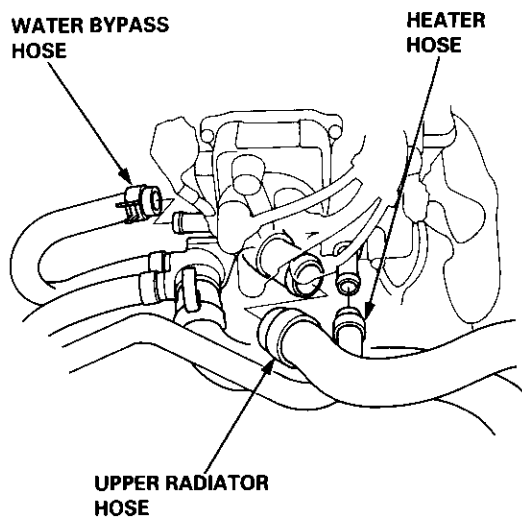
NOTE:

- Take care not to bend the cables when removing them. 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).





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
- Engine coolant temperature (ECT) sensor connector
- ECT gauge sending unit connector
- ECT switch connector
- Idle air control (IAC) valve connector
- Manifold absolute pressure (MAP) sensor connector
- Throttle position sensor connector
- Primary Heated oxygen sensor (Primary HO2S) connector
- VTEC solenoid valve connector

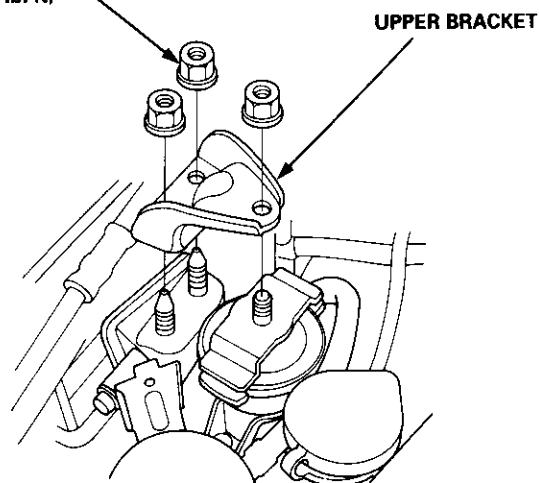
16. Remove the spark plug caps and distributor from the cylinder head.

17. Remove the upper bracket.

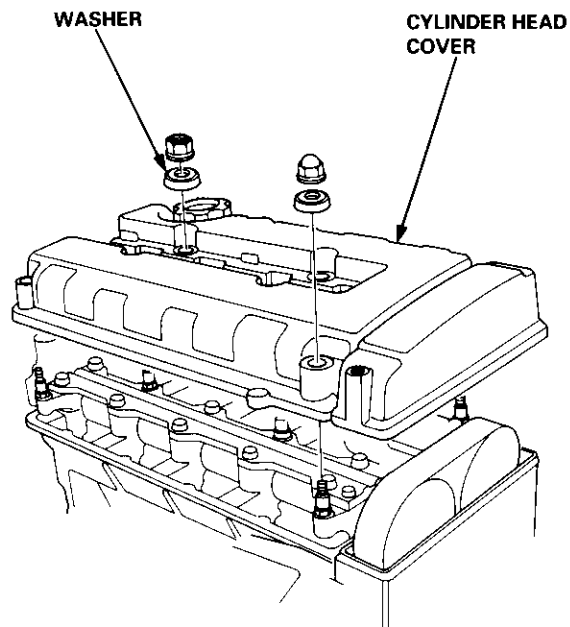
NOTE:

- Use a jack to support the engine before removing the upper bracket is removed.
- Place a cushion between the oil pan and the jack.

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



18. Remove the cylinder head cover.

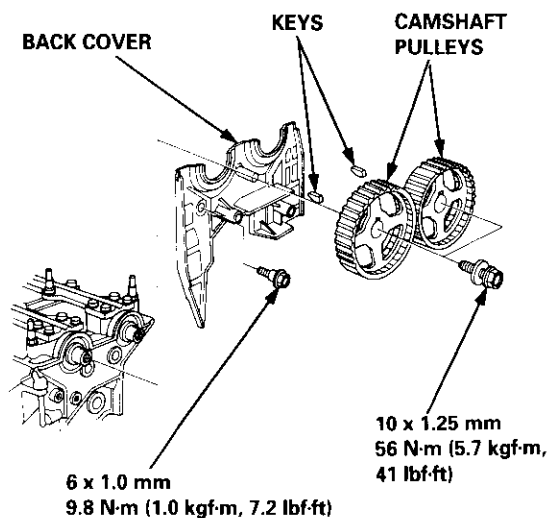


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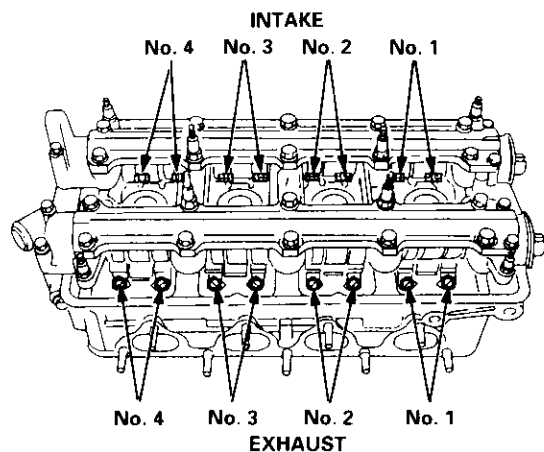
Cylinder Head

Removal (cont'd)

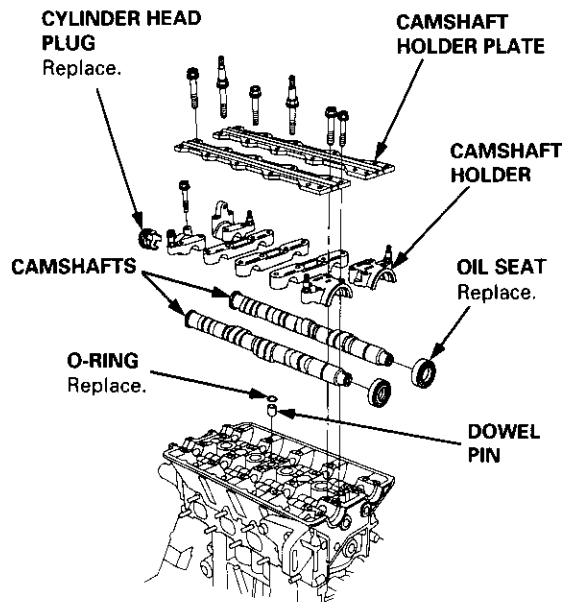
19. Remove the timing belt (see page 6-62).
20. Remove the back cover and camshaft pulleys.



21. Remove the exhaust manifold (see page 9-8).
22. Remove the intake manifold (see page 9-5).
23. Loosen the adjusting screws.



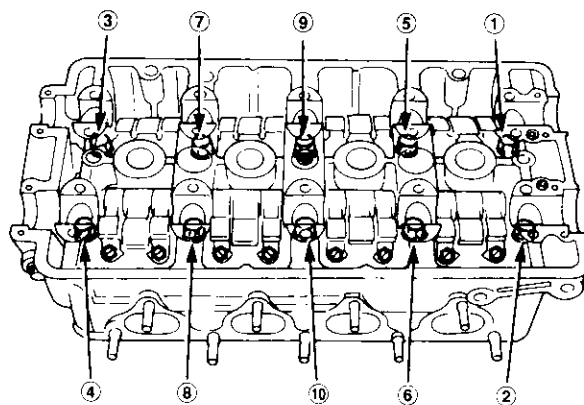
24. Remove the camshaft holder plates, camshaft holders and camshafts.



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

CAUTION: 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:

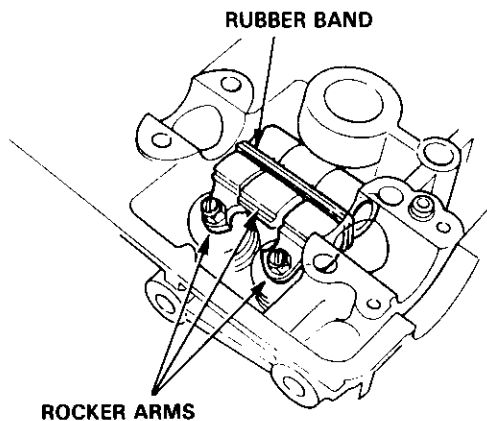


Rocker Arms



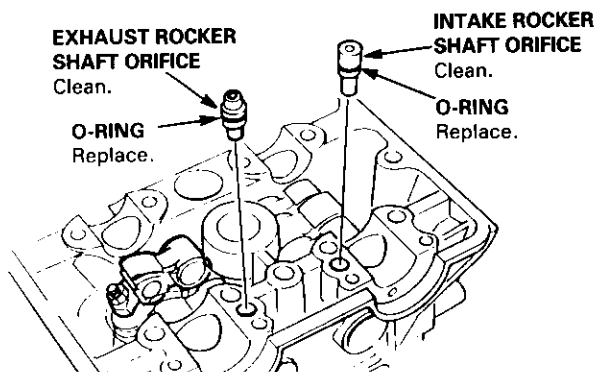
Removal

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

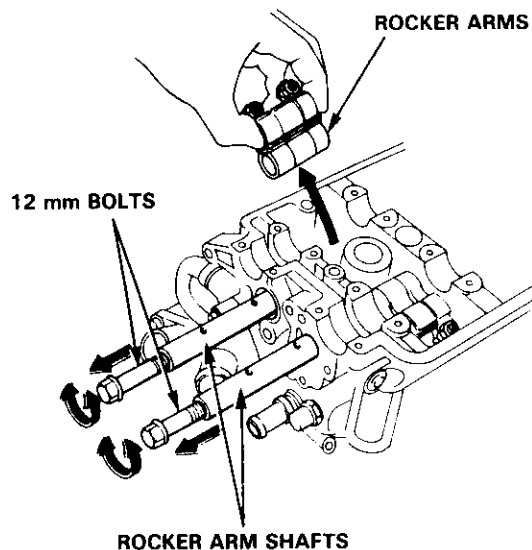


2. Remove the intake and exhaust rocker shaft oil control orifices, then remove the VTEC solenoid valve and the sealing bolts.

NOTE: The shapes of the intake and exhaust oil control orifices 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 the intake and exhaust rocker arm shafts.




Rocker Arms

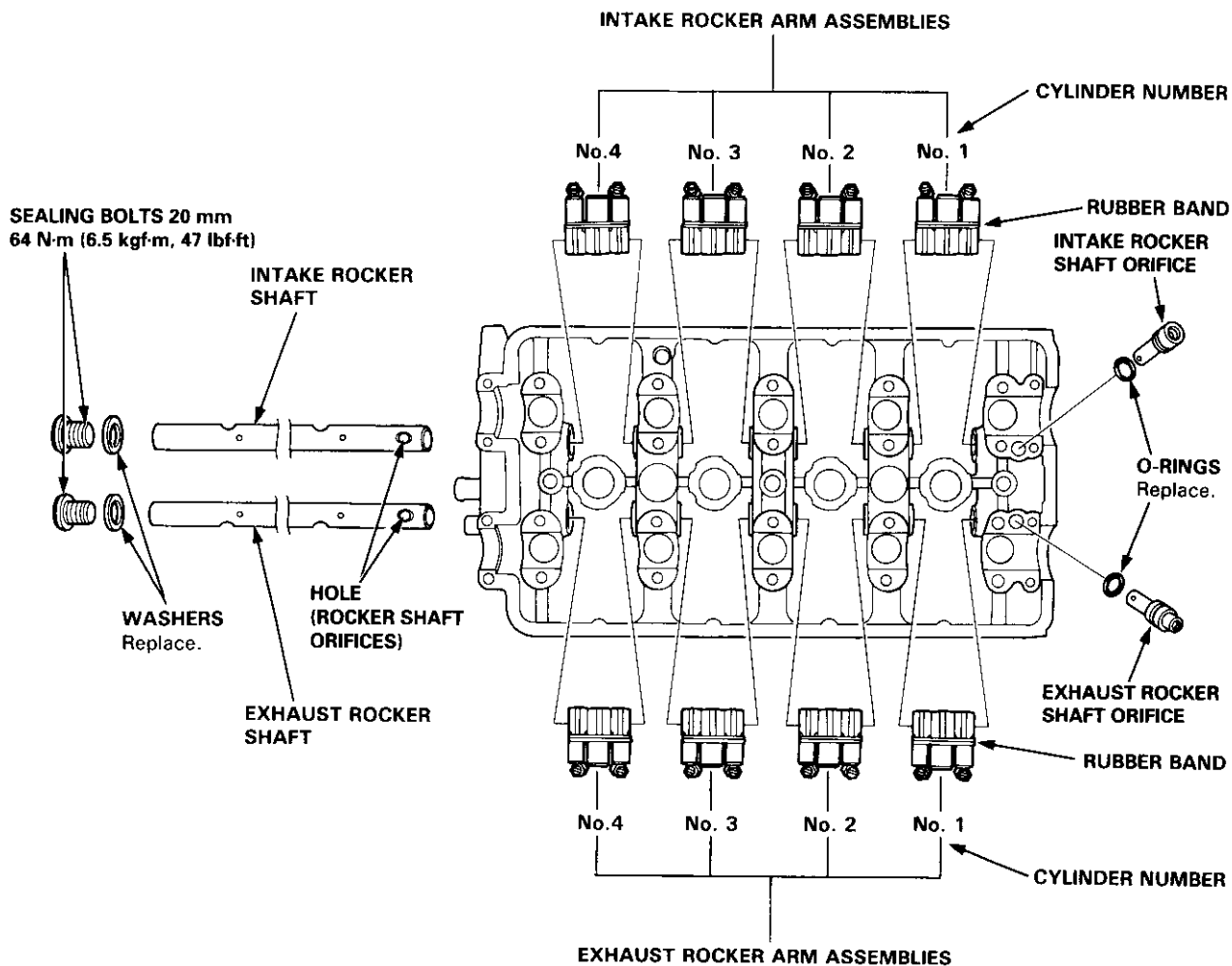
Disassembly/Reassembly

CAUTION: After installing the rocker shaft orifice, make sure that the orifice is correctly installed in the hole of rocker shaft by trying to turn the rocker shaft. If the orifice is in place, it should not turn.

NOTE:

- Identify parts as they are removed to ensure reinstallation in original locations.
- Inspect rocker shafts and rocker arms (see page 6-73).
- 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.

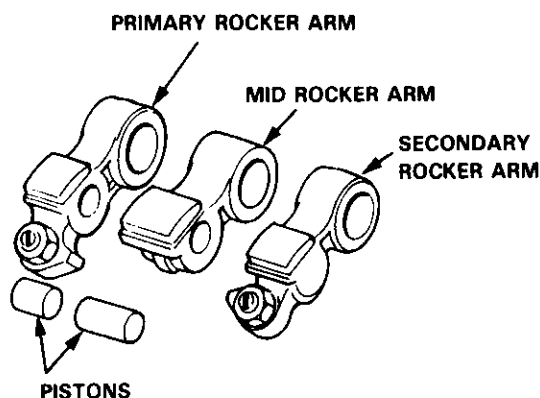


Rocker Arms and Lost Motion Assemblies

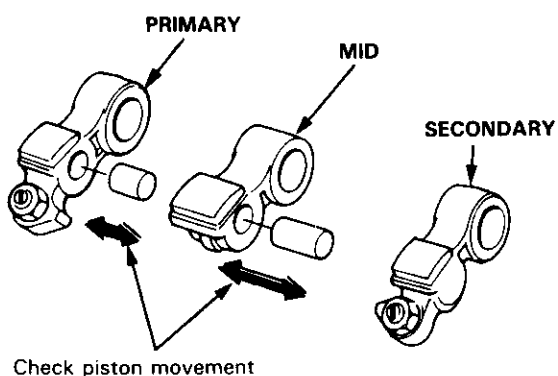


Inspection

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



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

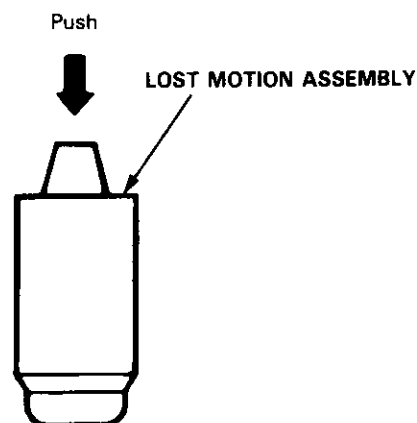


NOTE:

- 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.

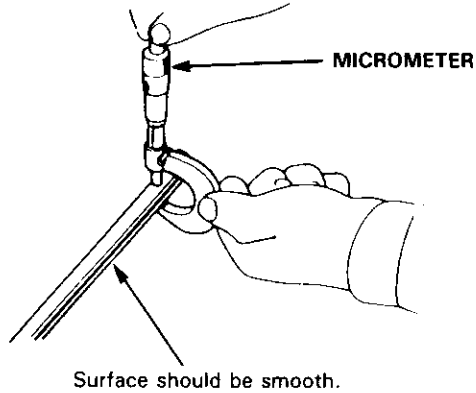


Rocker Arms and Shafts

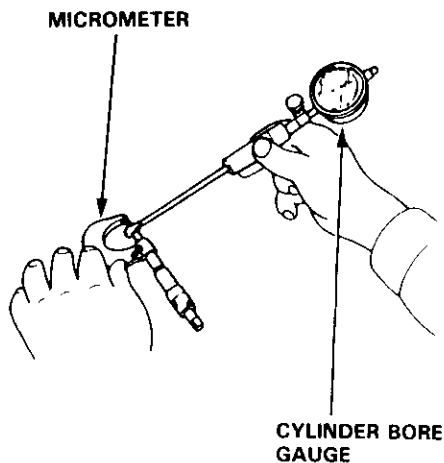
Clearance Inspection

Measure both the intake rocker shaft and exhaust rocker shaft.

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



2. Zero gauge to shaft diameter.



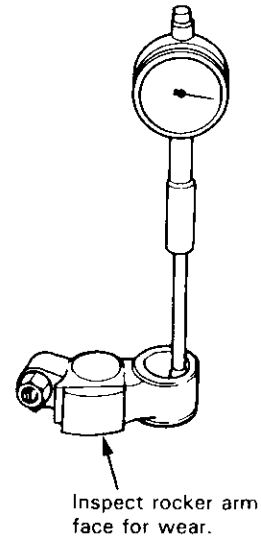
3. Measure the inside diameter of each rocker arm and check for out-of-round condition.

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).



Inspection

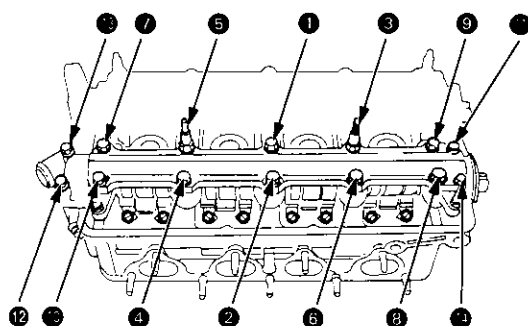
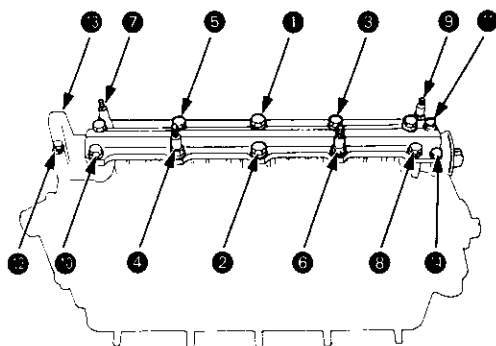
NOTE:

- 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:

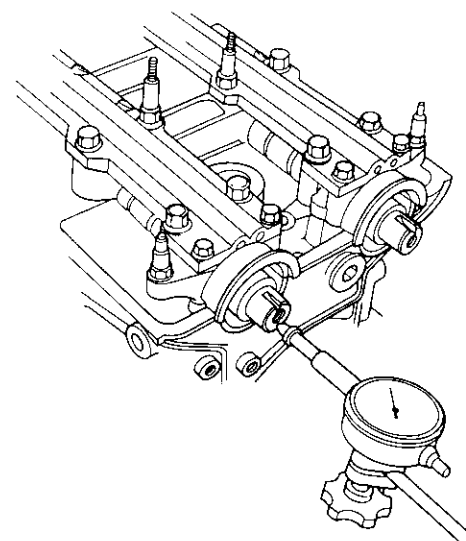
- ① - ⑩: 8 mm bolts 27 N·m (2.8 kgf·m, 20 lbf·ft)
Apply engine oil to the threads.
- ⑪ - ⑫: 6 mm bolts 9.8 N·m (1.0 kgf·m, 7.2 lbf·ft)



2. Seat the camshaft by pushing it toward the distributor end of the cylinder head.
3. Zero the dial indicator against the end of the 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.

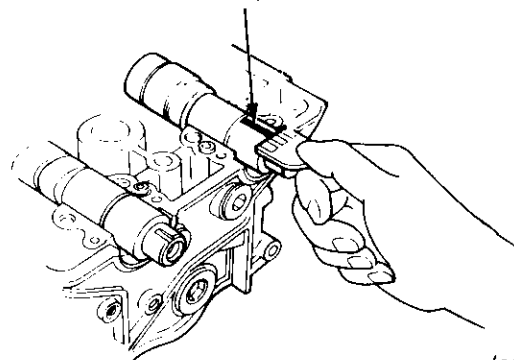
- Lift the camshaft out of the cylinder head, wipe clean, then inspect the lift ramps. Replace the camshaft if lobes are pitted, scored, or excessively worn.
- Clean the camshaft bearing surfaces in the cylinder head, then set the camshaft back in place.
- Insert a plastigage strip across each journal.

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)

PLASTIGAGE STRIP



(cont'd)

Camshafts

Inspection (cont'd)

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

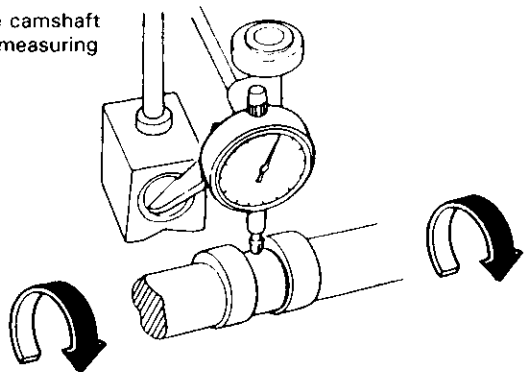
- And the camshaft has already been replaced, you must replace the cylinder head.
- If the camshaft has not been replaced, first check the total runout with the camshaft supported on V-blocks.

Camshaft Total Runout:

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

Service Limit: 0.04 mm (0.002 in)

Rotate camshaft while measuring

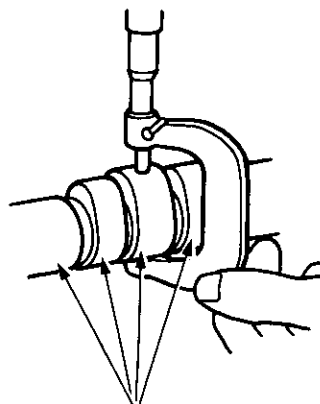


- If the total runout of the camshaft is within tolerance, replace the cylinder head.
- If the total runout is out of tolerance, replace the camshaft and recheck the camshaft-to-holder oil clearance. If the oil clearance is still out of tolerance, replace the cylinder head.

8. Check the cam lobe height.

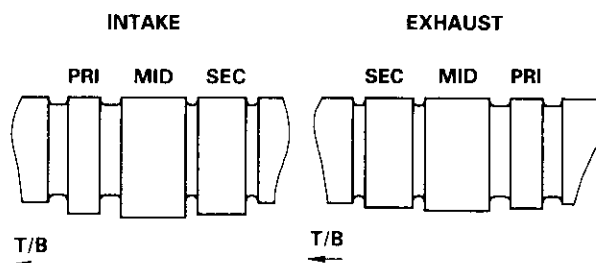
Cam lobe height standard (New):

	INTAKE	EXHAUST
PRIMARY	33.088 mm (1.3027 in)	32.785 mm (1.2907 in)
MID	36.267 mm (1.4278 in)	35.720 mm (1.4063 in)
SECONDARY	34.978 mm (1.3771 in)	34.691 mm (1.3658 in)



Check this area for wear.

Cam Position



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

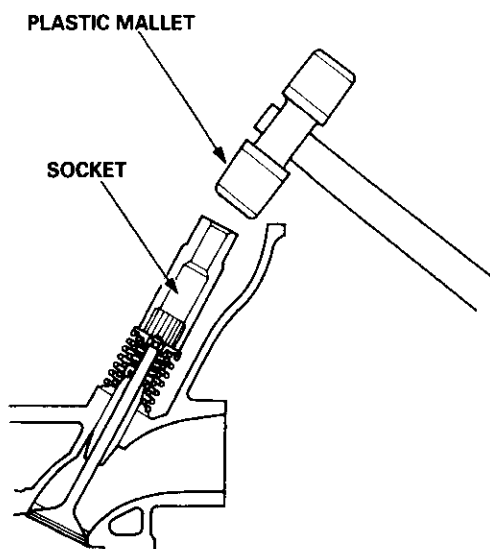
Valves, Valve Springs and Valve Seals



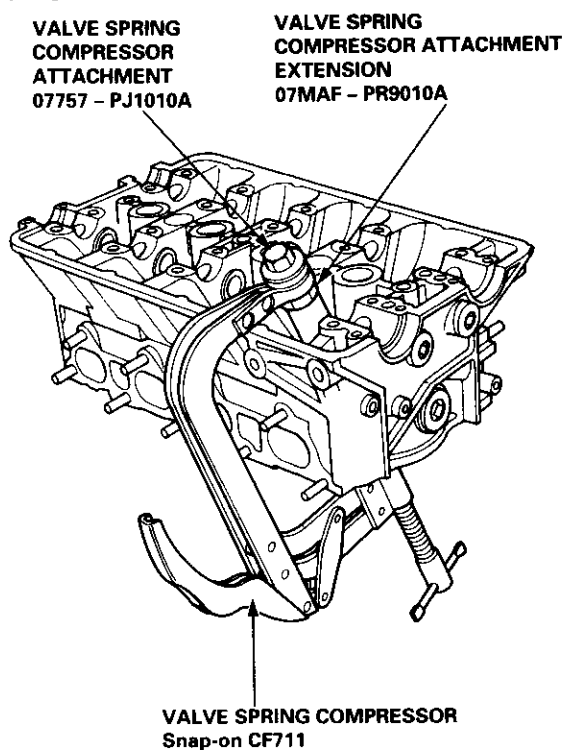
Removal

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

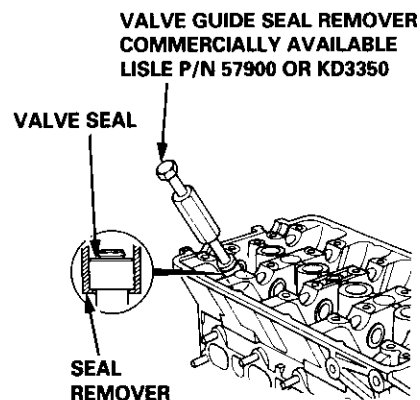
1. Using an appropriate-sized socket and plastic mallet, lightly tap the valve retainer to loosen the valve keepers.



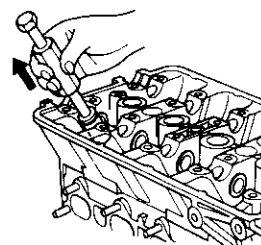
2. Install the valve spring compressor. Compress the spring and remove the valve keepers.



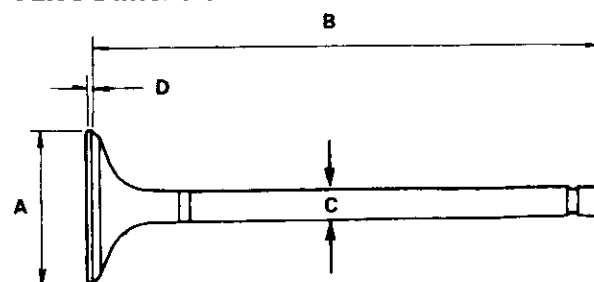
3. Install the valve guide seal remover.



4. Remove the valve guide seal.



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

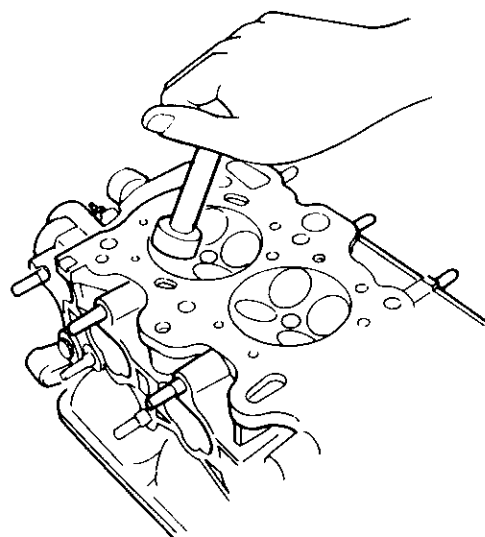
A Standard (New): 27.90 – 28.10 mm (1.098 – 1.106 in)
B Standard (New): 100.60 – 100.90 mm (3.961 – 3.972 in)
C Standard (New): 5.450 – 5.460 mm (0.2146 – 0.2150 in)
C Service Limit: 5.420 (0.2134 in)
D Standard (New): 1.65 – 1.95 mm (0.065 – 0.077 in)
D Service Limit: 1.45 mm (0.057 in)

Valve Seats

Reconditioning

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

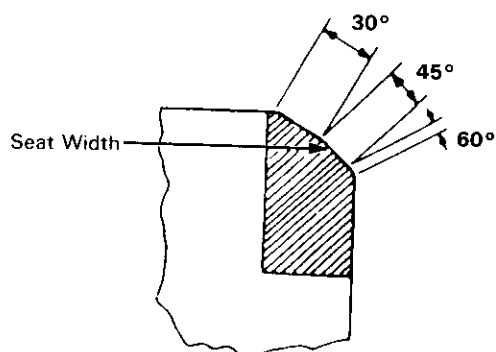
NOTE: If any guides are worn (see page 6-79), replace them (see page 6-80) before cutting the valve seats.



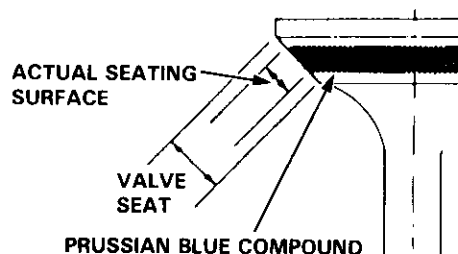
2. Carefully cut a 45° seat, removing only enough material to ensure a smooth and concentric seat.
3. Bevel the upper edge of the seat with the 30° cutter and the lower edge of the seat with the 60° cutter. Check width of seat and adjust accordingly.
4. Make one more very light pass with the 45° cutter 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 the valve in its 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 the intake and exhaust valves in the head and measure valve stem installed height.

Intake Valve Stem Installed Height:

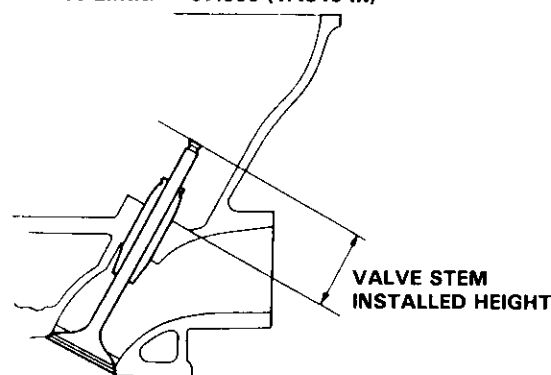
Standard (New): 37.465 – 37.935 mm
(1.4750 – 1.4935 in)

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



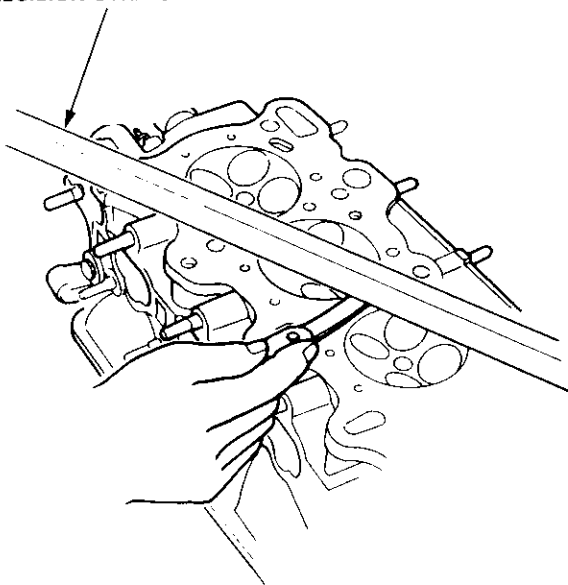
Warpage

NOTE: If camshaft-to-holder oil clearances (see page 6-75) are not within specification, the head cannot be resurfaced.

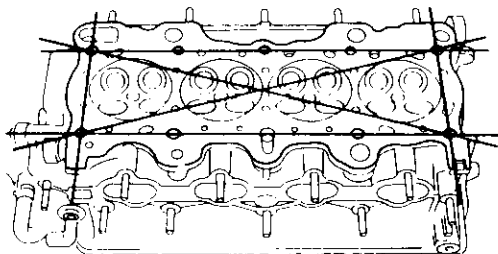
If camshaft-to-holder oil clearances are within specifications, check the head for warpage.

- 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)

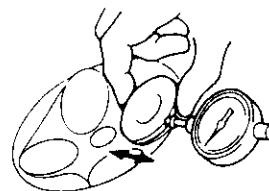
Service Limit: 0.15 mm (0.0059 in)

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

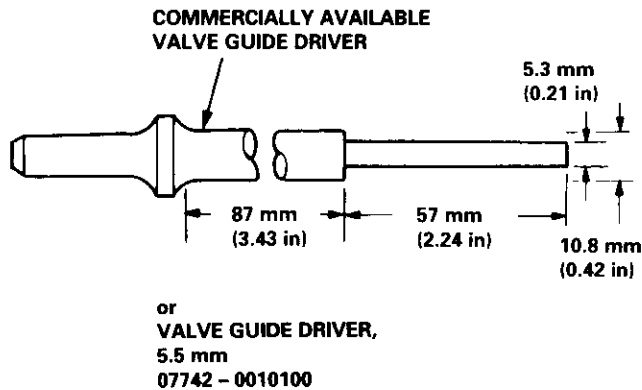
Standard (New): 0.050 – 0.080 mm
 (0.0020 – 0.0031 in)

Service Limit: 0.11 mm (0.004 in)

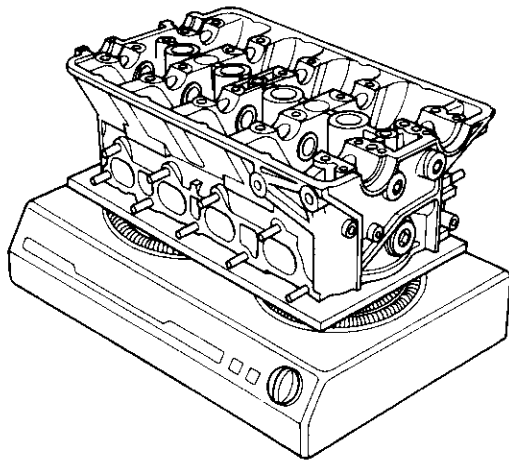
Valve Guides

Replacement

1. As illustrated below, use a commercially available air-impact valve guide driver attachment modified to fit the diameter of the valve guides. In most cases, the same procedure can be done using the special tool and a conventional hammer.



2. Select the proper replacement guides and chill them in the freezer section of a refrigerator for about an hour.
3. Use a hot plate or oven to evenly heat the cylinder head to 300°F (150°C). Monitor the temperature with a cooking thermometer.



CAUTION:

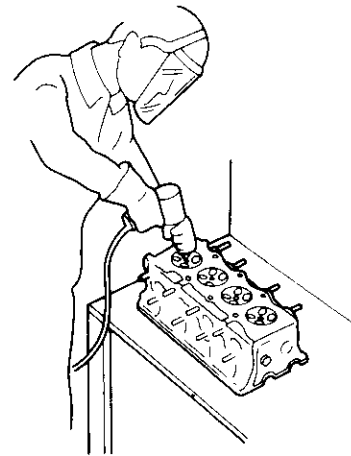
- Do not use a torch; it may warp the head.
- Do not get the head hotter than 300°F (150°C); excessive heat may loosen the valve seats.
- To avoid burns, use heavy gloves when handling the heated cylinder head.

4. Working from the camshaft side, use the driver and an air hammer to drive the guide about 2 mm (0.1 in) towards the combustion chamber. This will knock off some of the carbon and make removal easier.

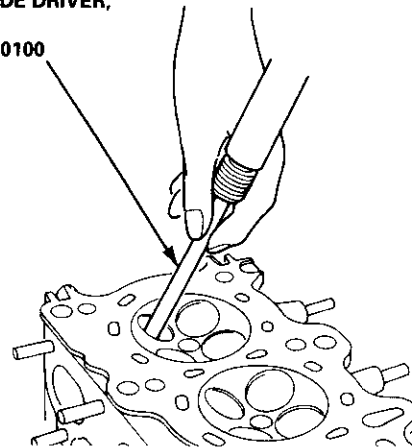
CAUTION:

- Always wear safety goggles or a face shield when driving valve guides.
- Hold the air hammer directly in line with the valve guide to prevent damaging the driver.

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



VALVE GUIDE DRIVER,
5.5 mm
07742 - 0010100



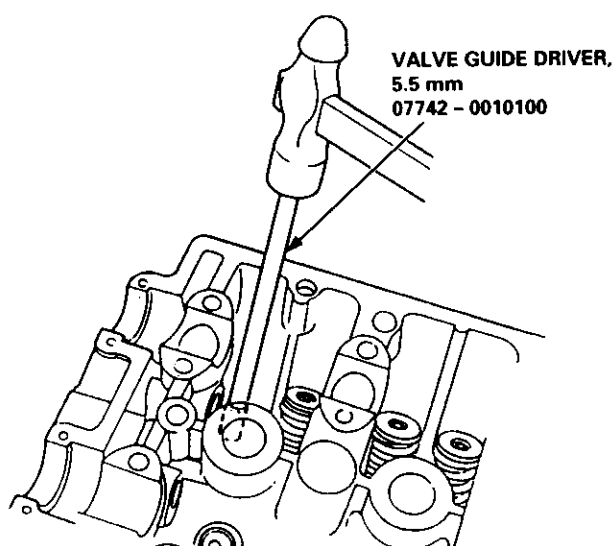
If a valve guide still won't move, drill it out with a 8.0 mm (5/16 in) bit, then try again.

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

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



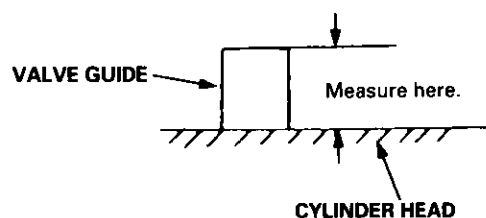
7. Apply a thin coat of clean engine oil to the outside of the new valve guide. Install the guide from the camshaft side of the head; use the special tool to drive the guide in to the specified installed height. If you have all 16 guides to do, you may have to reheat the head.



Valve Guide Installed Height:

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

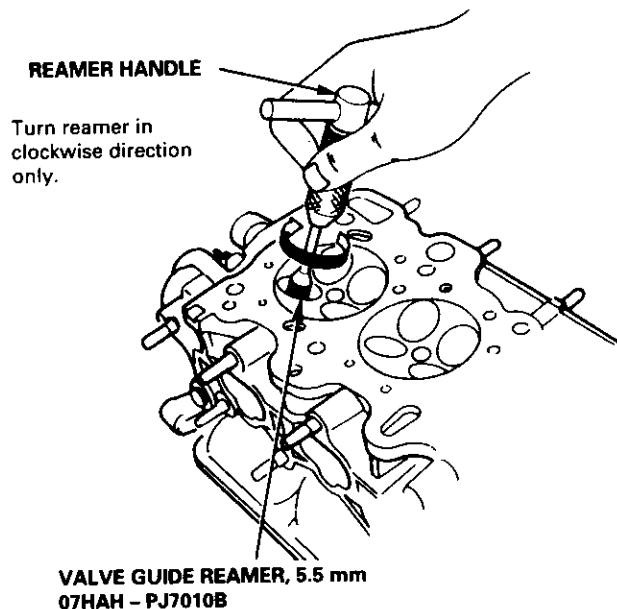
Exhaust: 12.55 - 13.05 mm (0.494 - 0.514 in)



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 6-73).
- Verify that the valve slides in the intake and exhaust valve guides without exerting pressure.



Valves

Installation

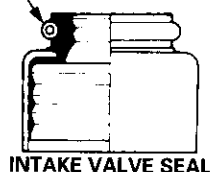
1. Coat the valve stems with oil. Insert the valves into the valve guides.

NOTE: Check that the valves move up and down smoothly.

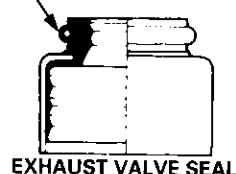
2. Install the spring seats on the cylinder head.
3. Install the valve seals using the special tool.

NOTE: Exhaust and intake valve seals are not interchangeable.

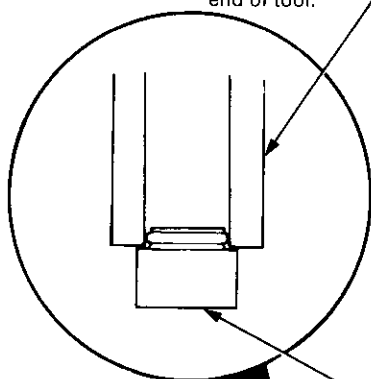
WHITE
SPRING



BLACK
SPRING

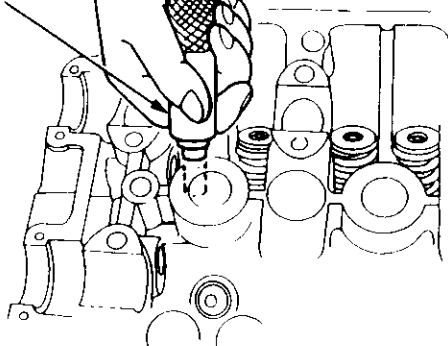


VALVE GUIDE SEAL INSTALLER
KD-2899 (Commercially available)
NOTE: Use small ID
end of tool.



VALVE SEAL
Replace.

VALVE GUIDE SEAL INSTALLER
KD-2899
NOTE: Use small ID
end of tool.

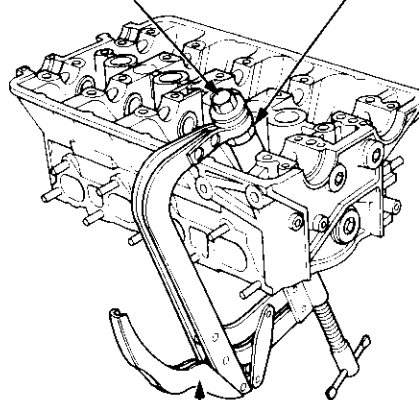


4. Install the valve spring and valve retainer, then install the valve spring compressor. Compress the spring, and install the valve keepers.

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

VALVE SPRING
COMPRESSOR
ATTACHMENT
07757 - PJ1010A

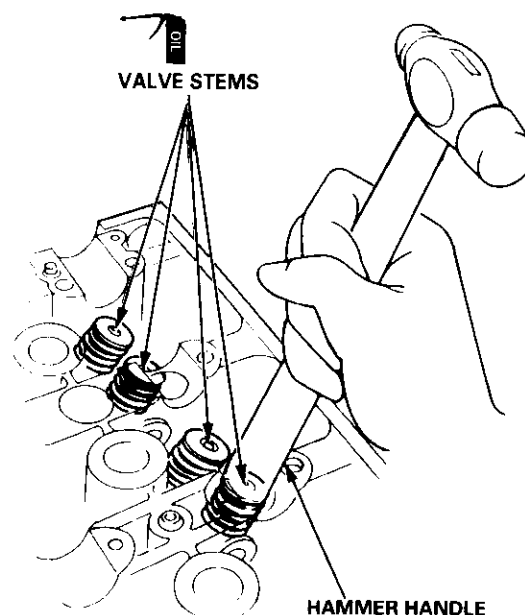
VALVE SPRING
COMPRESSOR ATTACHMENT
EXTENSION
07MAF - PR9010A



VALVE SPRING COMPRESSOR
(Commercially available)
Snap-on CF711 or KD-383
with #32JAWS

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 the valve and valve keepers.

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



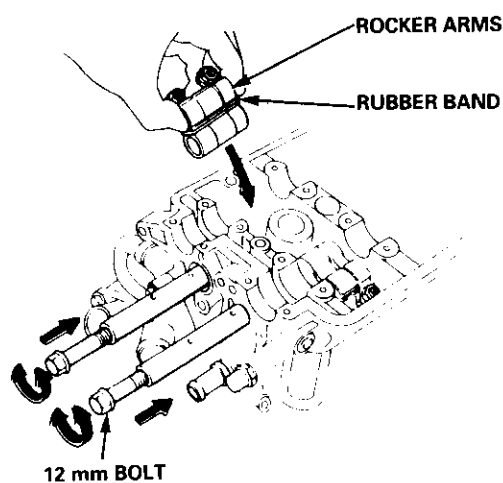
Rocker Arms



Installation

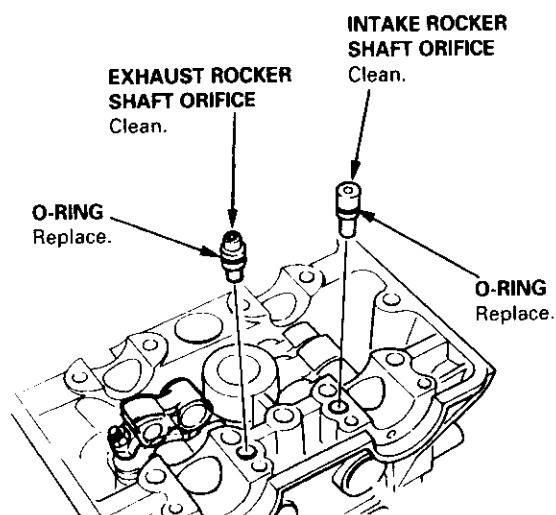
1. Install the rocker arms in the reverse order of removal:
 - Valve adjusting locknuts should be loosened and the adjusting screw, backed off before installation.
 - The component parts must be reinstalled in the original locations.
2. Install the lost motion assemblies.
3. Install the rocker arms while 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 orifice must be installed in the proper locations.



Cylinder Head

Installation

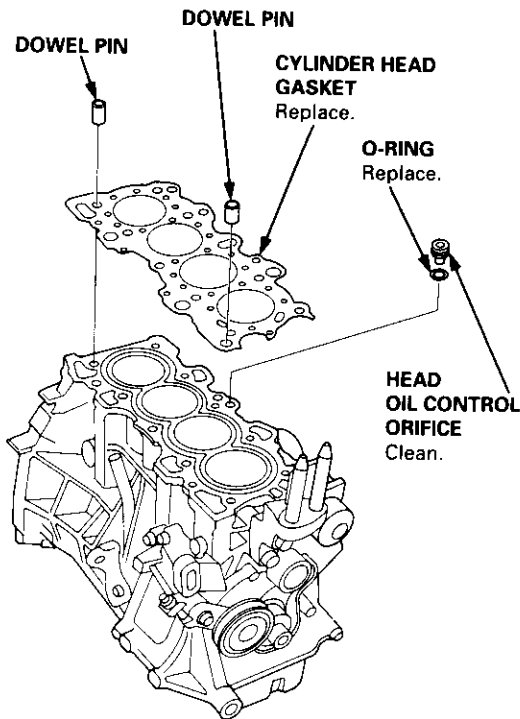
Install the cylinder head in the reverse order of removal:

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 6-63).
- Do not use the middle cover and lower cover for storing removed items.
- Clean the middle cover and lower cover before installation.
- Replace any washers that are 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.



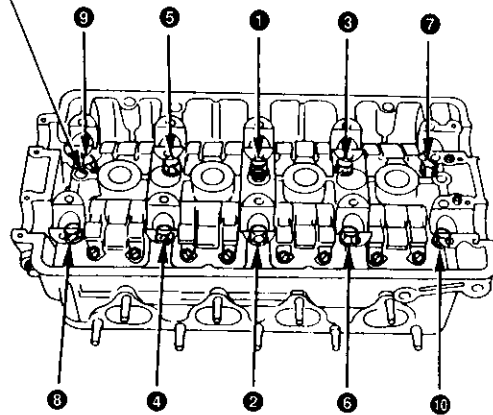
2. Tighten the cylinder head bolts in two steps. In the first step, tighten all bolts in sequence to about 29 N·m (3.0 kgf·m, 22 lbf·ft). In the final step, tighten in the same sequence to 83 N·m (8.5 kgf·m, 61 lbf·ft).

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)



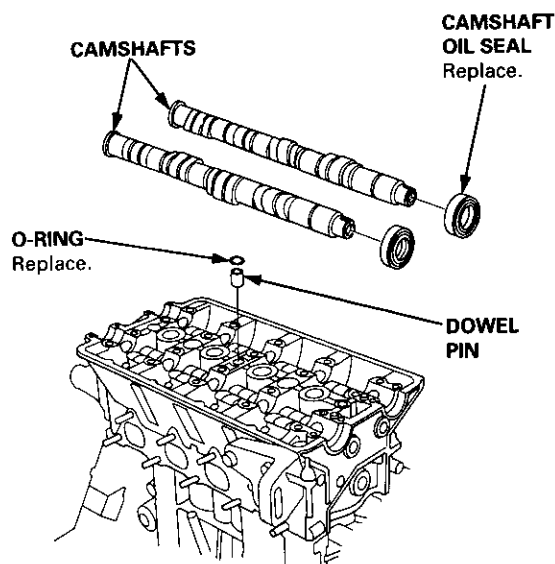
3. Install the intake manifold and tighten the nuts in a crisscross pattern in two or three steps, beginning with the inner nuts.
 - Always use a new intake manifold gasket.
4. Install the exhaust manifold and tighten the new self-locking nuts in a crisscross pattern in two or three steps, beginning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



5. Install the camshafts and camshaft oil seals.

NOTE:

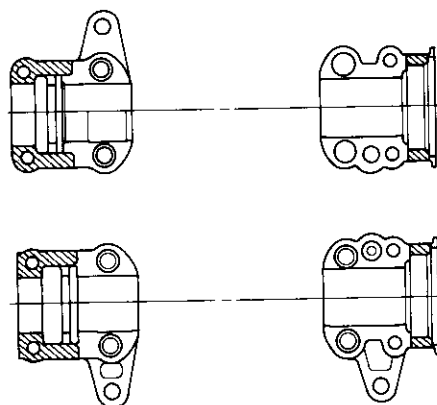
- Install the camshafts with the keyway facing up.
- Install the oil seal with the spring side facing in.
- The oil seal housing surface should be dry.
- Set the O-ring and dowel pin in the oil passage of the No. 3 camshaft holder.



6. Apply liquid gasket (P/N 08718 - 0001 or 08718 - 0003) 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.

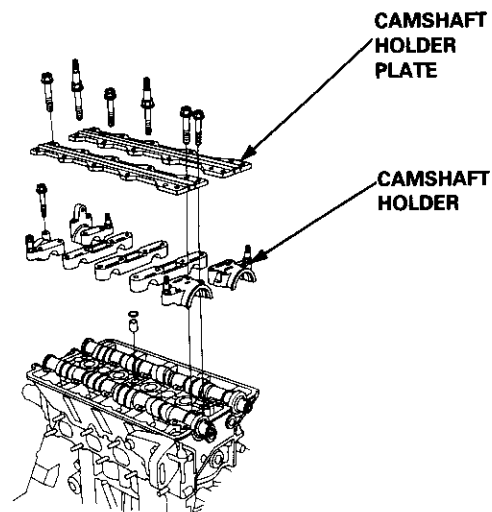


No. 5

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.



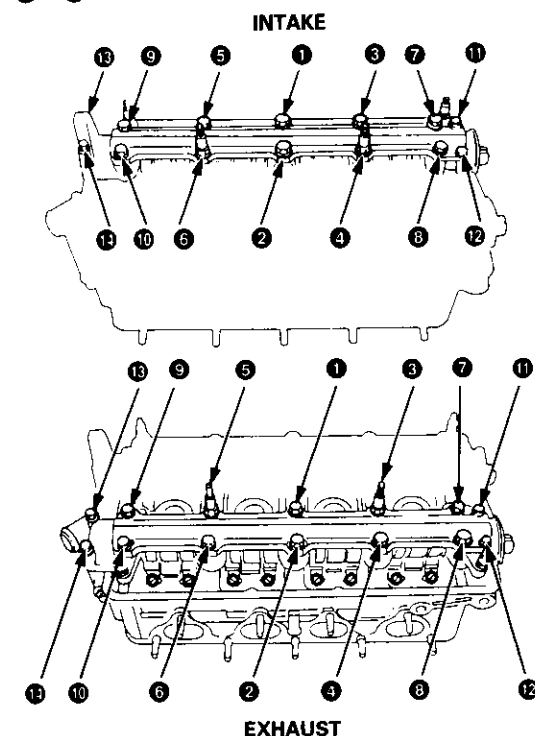
8. Tighten each bolt two turns at a time in the sequence shown below.

NOTE: Wipe off the excess liquid gasket from the 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 - ⑬: 6 x 1.0 mm 9.8 N·m (1.0 kgf·m, 7.2 lbf·ft)



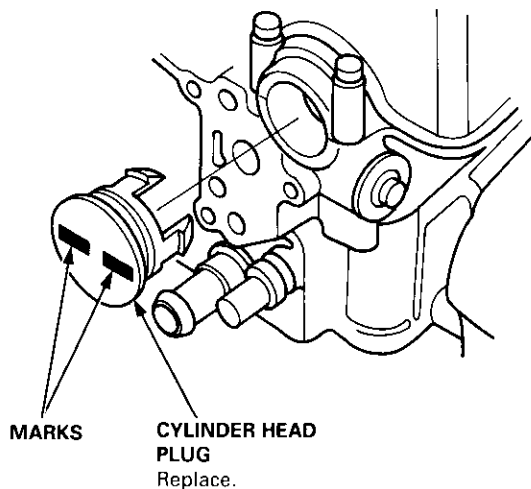
9. Install the back cover and camshaft pulleys.

(cont'd)

Cylinder Head

Installation (cont'd)

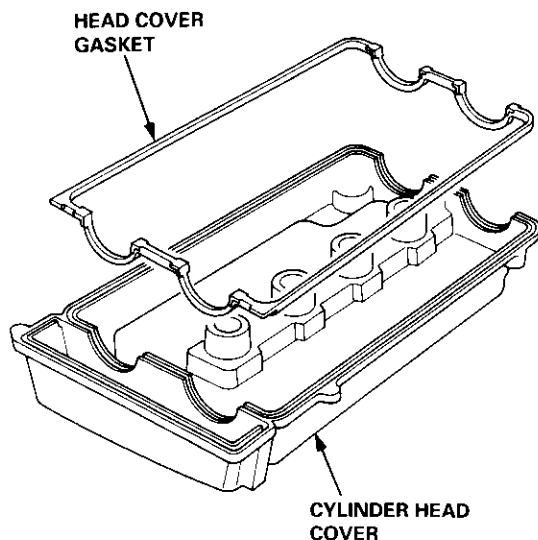
10. Align the marks on the cylinder head plug to the cylinder head upper surface, then install the cylinder head plug in the cylinder head.



11. Install the timing belt (see page 6-63).
12. Adjust the valve clearance (see page 6-61).
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:

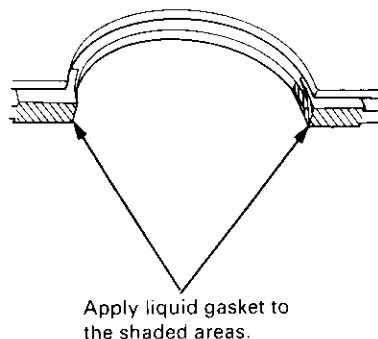
- Before installing the head cover gasket, thoroughly clean the head cover gasket and the groove.
- When installing, make sure the head cover gasket is seated securely in the corners of the recesses with no gap.



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

NOTE:

- Use liquid gasket, Part No. 08718 - 0001 or 08718 - 0003.
- 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.

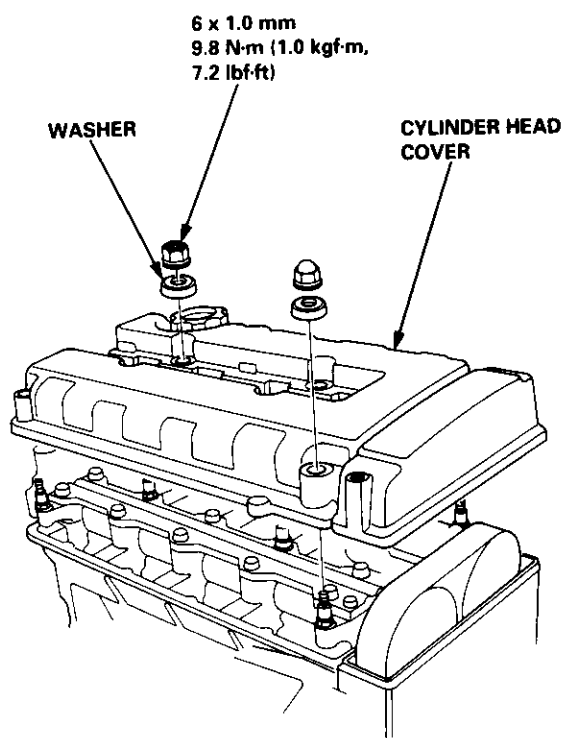




15. When installing the cylinder head cover, hold the head cover gasket in the groove by placing your fingers on the camshaft holder contacting surfaces (top of the semicircles). Once the cylinder head cover is on the cylinder head, slide the cover slightly back and forth to seat the head cover gasket.

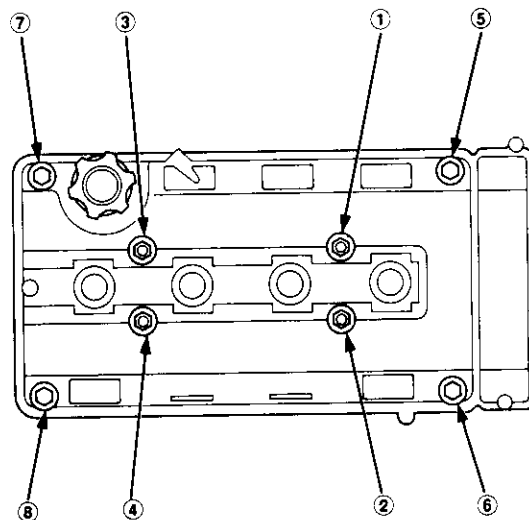
NOTE:

- 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 any washer that is 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.