

GROUP 10

10

FE DOHC ENGINE

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GENERAL DESCRIPTION

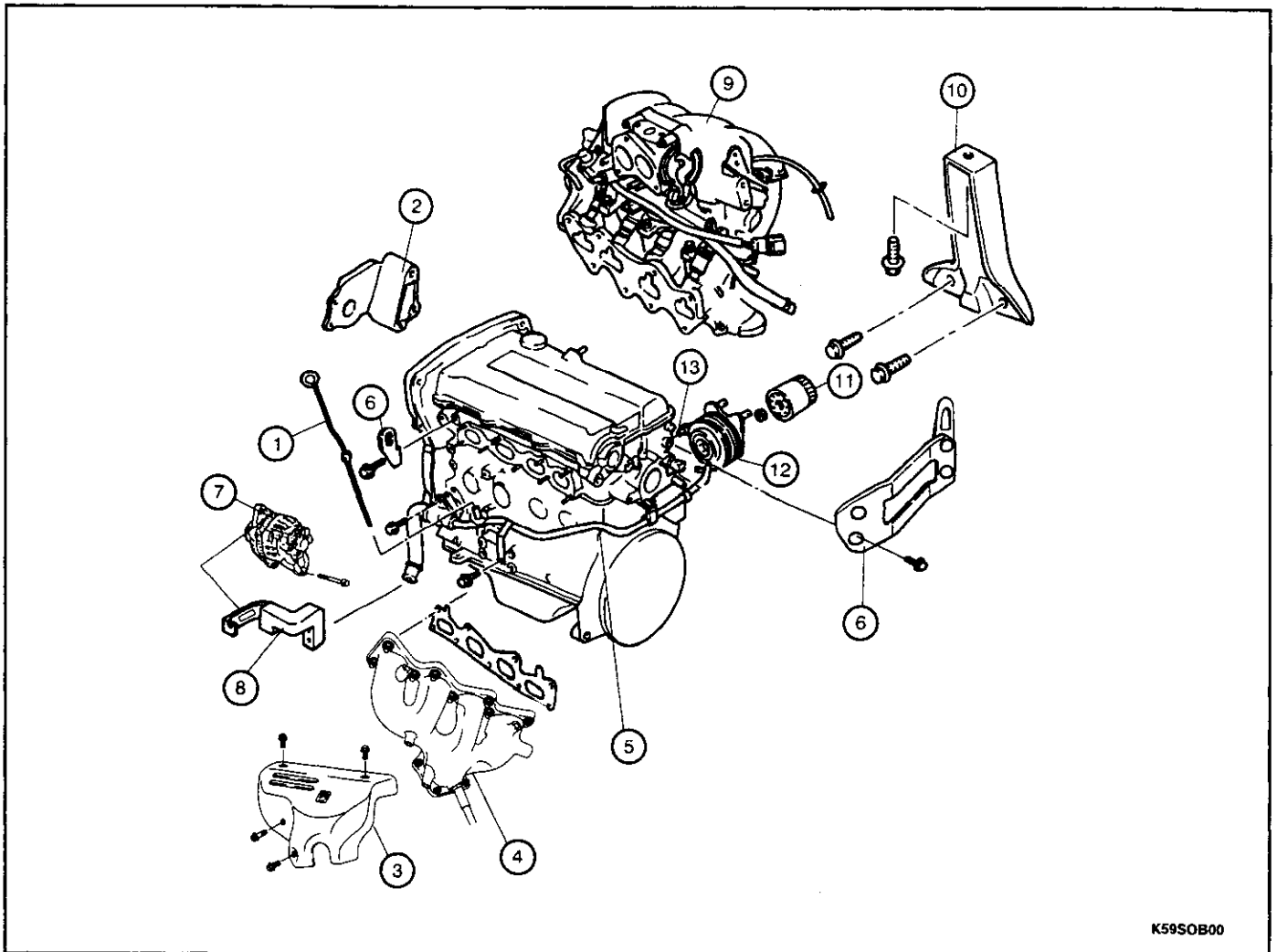
FE DOHC ENGINE

The 2.0L FE DOHC fuel-injected engine is a four-cylinder dual overhead camshaft design with a 9.2:1 compression ratio. The fuel-injected engine incorporates a cast iron block/aluminum head combination that provides superior heat conductivity and heat resistance. The combustion chamber of the cylinder head contains four valves (two intake and two exhaust) per cylinder. The engine has a Sequential Multiport Fuel Injection (SFI) system and uses hydraulic lash adjusters (HLAs) to reduce engine noise.

The cast-iron cylinder block has five main bearing supports for the crankshaft. The front and rear crankshaft seals are one piece. The large rod ends use a replaceable bearing insert. Grooves on the connecting rod and rod cap provide lubrication to the cylinder walls and cool the pistons. In addition, piston cooling jets (threaded into the main oil galley of the cylinder block) provide additional cooling to the pistons and additional lubrication to the piston pins whenever oil pressure rises above 25 psi.

The lubrication system is a wet sump type that distributes pressurized oil throughout the engine from the oil pan. The oil travels from the oil pump throughout the engine, including the crankshaft main bearings, the connecting rod bearings and the camshaft bearings.

The engine cooling system includes a forward-mounted water pump, a thermostat and a thermostatically operated cooling fan. The thermostat controls coolant temperature, and is located within the water outlet housing at the front of the cylinder block. The cooling fan is mounted on the front side of the engine at the radiator, and is controlled by a bimetal device.



- | | | |
|---------------------------------------|--------------------------------|-------------------------|
| 1. Oil Level Gauge | 6. Engine Hanger | 11. Oil Filter |
| 2. Thermo-Modulated Fan Bracket | 7. Generator | 12. Oil Cooler |
| 3. Exhaust Manifold Heat Shield | 8. Generator Strap and Bracket | 13. Oil Pressure Switch |
| 4. Exhaust Manifold | 9. Intake Manifold Assembly | |
| 5. Coolant Inlet Pipe and Bypass Pipe | 10. Intake Support Bracket | |

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DIAGNOSIS

FE DOHC ENGINE

Problem	Possible Cause	Action
Engine will not crank	Battery, starting system or other electrical problems Liquid in combustion chamber Seized engine	Refer to <i>Starting System</i> , Section 31, <i>Charging System</i> , Section 32, or the <i>Electrical Troubleshooting Manual</i> Remove with suction gun, then crank engine over with spark plugs removed Repair
Engine cranks normally, but does not start	Malfunction of fuel system Malfunction of ignition system Improper valve clearance Restricted exhaust system Timing belt and/or related parts Low compression due to: stuck or burned valves; worn piston, piston ring or cylinder; failed cylinder head gasket Camshaft worn	Refer to <i>Fuel System</i> , Section 22 Refer to <i>Ignition System</i> , Section 30 Check HLAs Refer to <i>Exhaust System</i> , Section 20 Inspect timing belt and related parts; replace if necessary Perform a compression test, as outlined in this section; repair engine as necessary Replace
Poor idling	Malfunction of fuel system Malfunction of emission system Malfunction of ignition system Improper valve clearance Uneven cylinder compression Poor valve-to-valve seat contact Broken valve spring Failed cylinder head gasket	Refer to <i>Fuel System</i> , Section 22 Refer to <i>Emission Control System</i> , Section 21 Refer to <i>Ignition System</i> , Section 30 Check HLAs Perform a compression test, as outlined in this section; repair engine as necessary Repair or replace Repair Replace
White smoke out of exhaust	Usually caused by water vapor, which is a normal by-product of combustion on cold days Excessive white smoke with engine warmed up could be caused by a failed cylinder head or intake gasket. Could also be a cracked block, cylinder head or intake manifold	None required Repair or replace
Black smoke out of exhaust	Malfunction of fuel system Malfunction of emission system	Refer to <i>Fuel System</i> , Section 22 Refer to <i>Emission Control System</i> , Section 21
Blue smoke out of exhaust	Usually caused by oil burning in the combustion chambers from: worn rings, worn valve guides, worn valve seals or failed cylinder head gasket	Replace
Valve train noise	Worn valve guides	Repair

Problem	Possible Cause	Action
Valve train noise	Low oil pressure Improper valve clearance Broken valve spring Sticking valves Camshaft worn or faulty	Refer to <i>Lubrication System</i> , Section 11 Check HLAs Replace Free valves Replace
Insufficient power	Insufficient compression caused by: <ol style="list-style-type: none"> 1. improper valve clearance 2. leakage from valve seat 3. seized valve stem 4. weak or broken valve spring 5. failed cylinder head gasket 6. cracked or distorted cylinder head 7. sticking, damaged or worn piston ring 8. cracked or worn piston Malfunction of fuel system Slipping clutch Dragging brakes Wrong tire size Restricted exhaust system	Check HLAs Repair or replace Replace Replace Replace Repair or replace Replace Replace Refer to <i>Fuel System</i> , Section 22 Refer to <i>Clutch</i> , Section 40 Refer to <i>Brake System</i> , Section 52 Refer to <i>Wheels and Tires</i> , Section 53 Refer to <i>Exhaust System</i> , Section 20
Abnormal combustion	Improper valve clearance Sticking or burned valve Weak or broken valve spring Carbon accumulation in combustion chamber	Check HLAs Replace Replace Eliminate carbon
Engine knocks when hot and at idle	Loose or worn accessory drive belt/tensioner A/C compressor or generator bearing Improper oil viscosity Excessive piston pin clearance Connecting rod alignment Insufficient piston to bore clearance Faulty timing belt tensioner or guide Loose damper pulley	Check belts and tensioners Replace if necessary Replace Install proper oil viscosity for expected temperatures Install new piston, pin and/or connecting rod Check and replace rods if necessary Hone and fit new pistons if required Replace Tighten or replace if necessary
Slight noise at idle, becomes louder as engine speed is increased	Valve spring clicking on cap, off square or broken Excessive stem to guide clearance Excessive valve seat runout	Repair or replace Repair Repair
Engine knocks when cold	Excessive piston to wall clearance Loose or broken damper pulley	Replace pistons Tighten or replace
Knock increases with torque	Excessive piston to bore clearance Bent connecting rod	Replace piston Replace

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Problem	Possible Cause	Action
Engine has heavy knock when hot and torque is applied	Broken damper pulley Accessory belts too tight or damaged Belt tensioner damaged Flywheel cracked or loose clutch plate Excessive main bearing clearance Excessive rod bearing clearance	Replace Adjust or replace belt Replace Replace flywheel or clutch plate Repair Repair
Engine has light knock when hot and under light load conditions	Improper timing Piston pin and/or connecting rod Poor quality fuel Exhaust leak at manifold Excessive rod bearing clearance	Check timing Replace piston pin and/or rod Use recommended or higher grade fuel Tighten bolts and/or replace exhaust manifold gaskets if necessary Repair
Engine knocks on initial start up and knock lasts only a few seconds	Improper oil viscosity	Install proper oil viscosity for expected temperatures

TIMING BELT

Problem	Possible Cause	Action
Tooth is broken or cracked	Camshaft jamming	Inspect camshaft by removing cylinder head cover Repair or replace if necessary
Back surface is cracked and/or worn	Tensioner jamming Overheating engine Interference with timing belt cover	Remove tensioner and inspect Replace if necessary Inspect cooling system Refer to <i>Engine Cooling System</i> , Section 12 Remove timing belt cover and inspect Replace if necessary
Side surface is worn and/or frayed	Improper installation of timing belt Malfunction of timing belt guide plate	Remove timing belt and reinstall Remove timing belt and inspect guide plate
Teeth are worn	Poor belt cover sealing Coolant leakage at water pump Camshaft not functioning properly Excessive belt tension	Remove timing belt cover and inspect Replace if necessary Inspect water pump Replace if necessary Inspect camshaft by removing the cylinder head cover Repair or replace if necessary Remove tensioner spring and inspect Replace if necessary
Oil or coolant is stuck to belt	Poor oil sealing Coolant leakage at water pump Poor belt cover sealing	Inspect front oil seals Replace if necessary Inspect water pump Replace if necessary Remove timing belt cover and inspect Replace if necessary

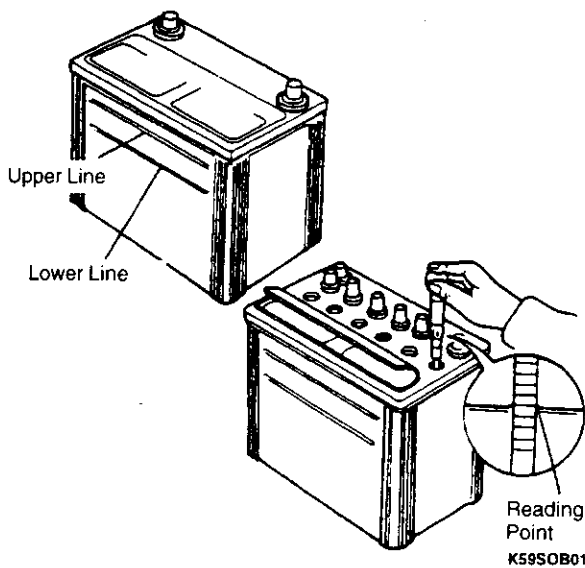
ON-VEHICLE SERVICE

TUNE-UP PROCEDURE

Battery

Inspection

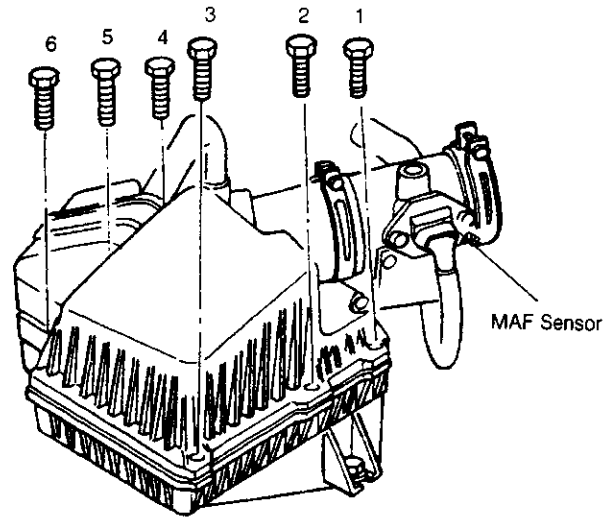
1. Check for corrosion on the terminals or loose cable connections.
2. If necessary, clean the clamps and tighten firmly.
3. Check that the electrolyte level is between the UPPER and LOWER marks.
4. Add distilled water if necessary.
5. Check the specific gravity by using a hydrometer.
6. If the specific gravity reading is 1.200 or less, recharge the battery.



Air Cleaner Element

Removal

1. Disconnect the negative battery cable.
2. Disconnect the wire harness from the mass air flow (MAF) sensor by pushing on the wire clip.
3. Slide the data link connector (DLC) off the holder on the air intake housing.
4. Remove the six upper air intake housing bolts.



- * **Notice**
Lift the upper air intake housing carefully so that the air intake hose does not bend too much.

5. Remove the air cleaner element.

Inspection

1. Visually check the air cleaner element for excessive dirt, damage or oil.
- * **Notice**
Do not use compressed air to clean the air cleaner element.
2. If necessary, clean or replace the air cleaner element.

Installation

1. Install the air cleaner element into the lower air intake housing with the rubber edge facing upward.
2. Place the upper air intake housing on top of the lower housing.
3. Install the six upper air intake housing bolts and tighten to specification.

Tightening torque:

38 - 56 lb-in (4 - 6 N·m)

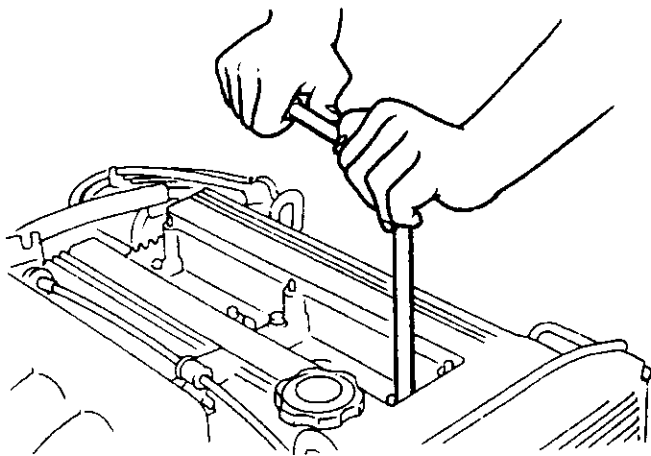
4. Slide the DLC back onto the holder located on the air intake housing.
5. Reconnect the wire harness to the MAF connector.
6. Reconnect the negative battery cable.

Spark Plug

Removal

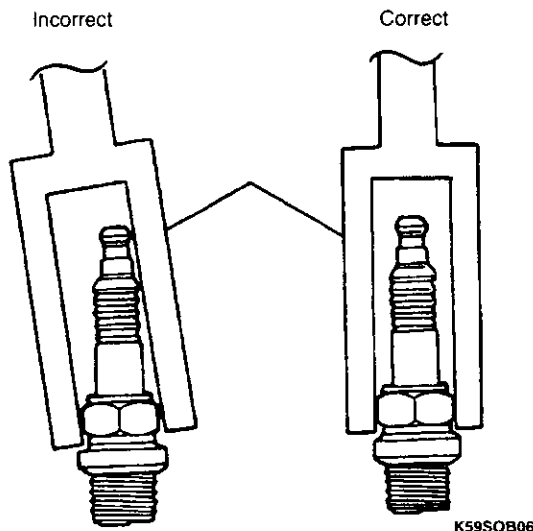
1. Disconnect the negative battery cable.
2. Remove air intake assembly. Refer to *Engine Removal*, page 10-33.
3. Remove accelerator cable bracket. Refer to *Engine Removal*, page 10-33.
4. Remove six bolts and coil cover from cylinder head cover.
5. Remove four bolts and the two coils from the cover.

6. Disconnect the high tension leads from the spark plugs by twisting the boot and removing.
7. Use compressed air to remove any dirt from around the spark plug hole.



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8. Make sure the spark plug socket fits squarely on the spark plug, then remove.



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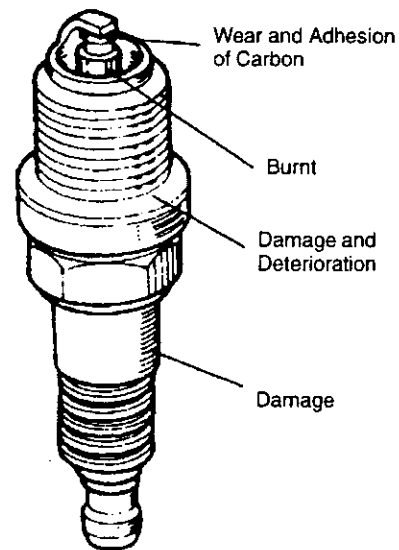
Inspection

1. Check for the following:
 - a. Damaged insulation
 - b. Worn electrodes
 - c. Carbon deposits
 - d. Damaged gaskets
 - e. Burnt spark insulator
 - f. Plug gap

Plug gap:

0.039 - 0.043 inch (1.0-1.1 mm)

2. Clean or replace if necessary.



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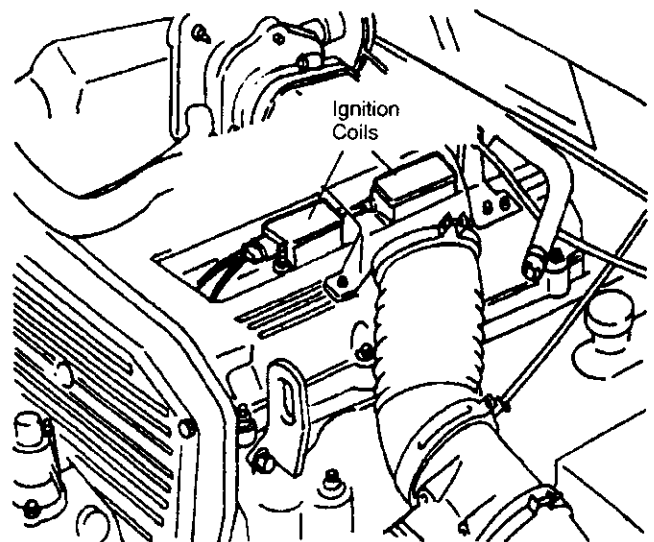
Installation

1. Apply anti-seize compound to the spark plug threads.
2. Install the spark plugs into the cylinder head and tighten to specification.

Tightening torque:

11 -17 lb-ft (15 - 23 N·m)

3. Reconnect high tension leads.
4. Install the two coils and secure with four bolts.
5. Install the coil cover and secure with six bolts.
6. Install the accelerator cable bracket. Refer to *Engine Installation*, page 10-82.
7. Install air intake assembly. Refer to *Engine Installation*, page 10-82.
8. Reconnect the negative battery cable.



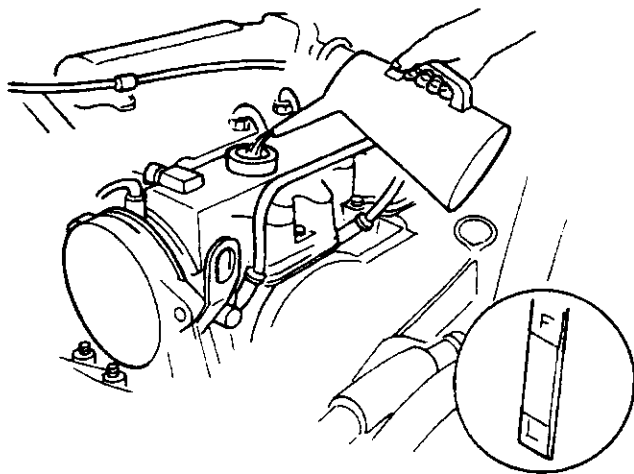
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Engine Oil

Inspection

1. Make sure that the vehicle is on level ground.
2. Start the engine and let it warm up to normal operating temperature.
3. Turn the engine off. Wait for 5 minutes.

*** Notice**
If you do not wait, the engine oil dipstick might not show the actual level.



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4. Remove the engine oil dipstick and clean it with a shop rag.
5. Fully insert the engine oil dipstick and remove it again, keeping the tip pointed down.

*** Notice**
Do not add too much oil. If the oil level is above the "F" line, the engine could be damaged.

6. If the oil level is at or below the L line, add enough oil to bring it up to the F line.

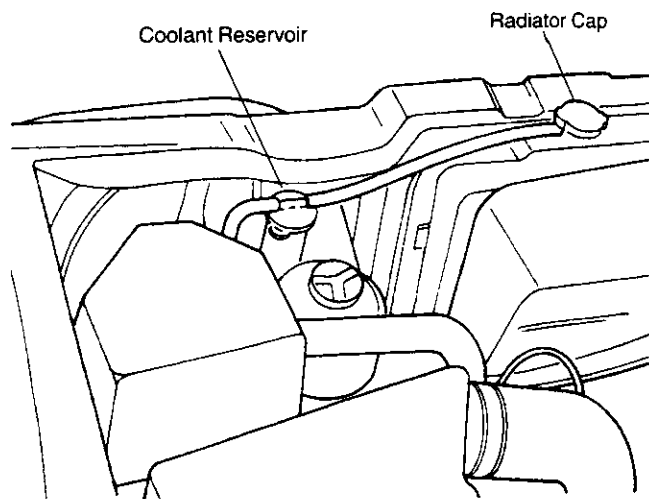
Engine Coolant

Inspection

1. Make sure that the engine is cold.

⚡ Caution
Never remove the radiator cap when the engine is hot.

2. Remove the radiator cap and verify that the coolant level is near the radiator filler neck.



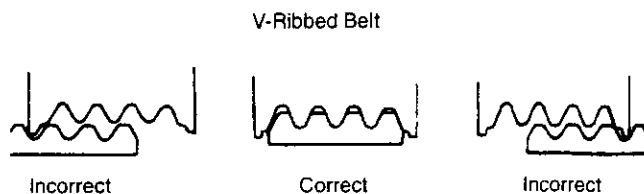
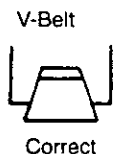
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3. If the coolant level is below the radiator filler neck, add enough coolant to bring the level up to the filler neck.
4. Install the radiator cap. Make sure it is seated firmly.
5. Verify that the coolant level is near the F line on the coolant fluid reservoir (engine at operating temperature).
6. If the coolant level is below the F line, then remove the coolant fluid reservoir cap and add enough coolant to bring the level up to the F line.
7. Re-install the coolant fluid reservoir cap.

Drive Belts

Inspection

1. Check the drive belts for wear, cracks or fraying.
2. Replace if necessary.
3. Verify that the drive belts are correctly mounted on the pulleys.

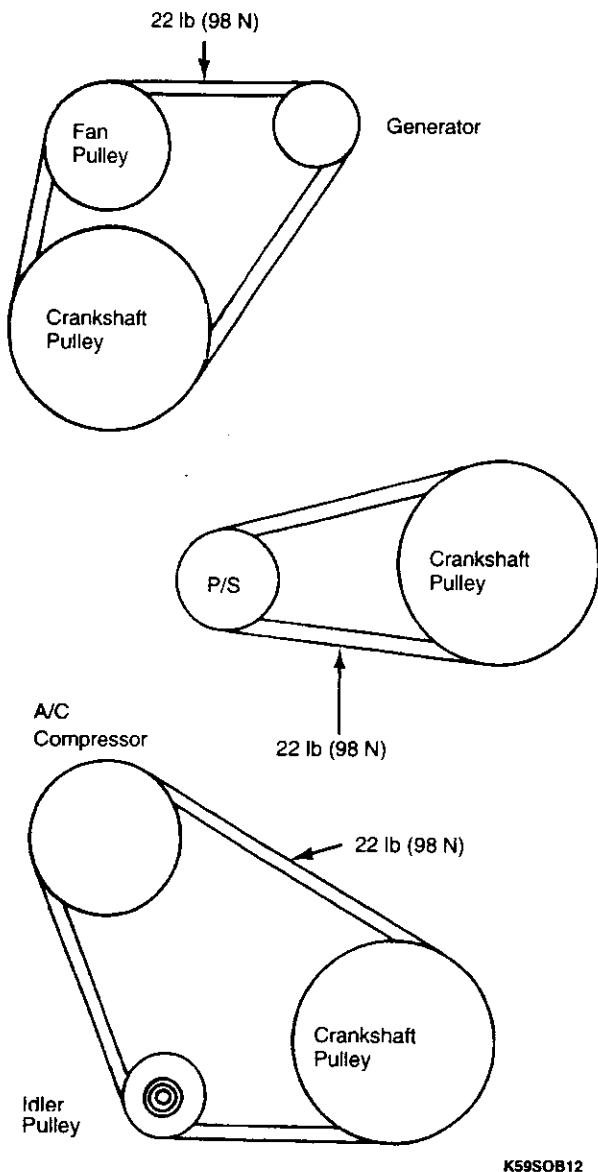


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4. Check the drive belt deflection by applying moderate pressure (22 lb [98 N]) midway between the pulleys.
 - a. Measure the belt deflection between the specified pulleys.
 - b. A belt is considered "new" if it has been used on a running engine for less than five minutes.

- c. Check the belt deflection when the engine is cold or at least 30 minutes after the engine has stopped.

BELT	NEW inch (mm)	USED inch (mm)
Generator	0.24 - 0.31 (6 - 8)	0.27 - 0.35 (7 - 9)
P/S	0.31 - 0.39 (8 - 10)	0.35 - 0.43 (9 - 11)
A/C	0.27 - 0.35 (7 - 9)	0.31 - 0.39 (8 - 10)

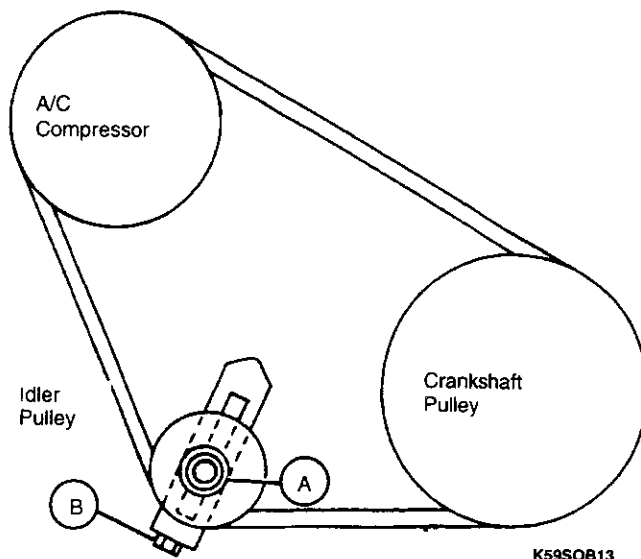


5. If the deflection is not correct, adjust the belt.

Air Conditioning Drive Belt

1. If adjustment or removal is necessary, loosen the locknut (A) and adjust the deflection by turning the adjusting bolt (B).
2. After making the adjustment, tighten the locknut (A) to specification.

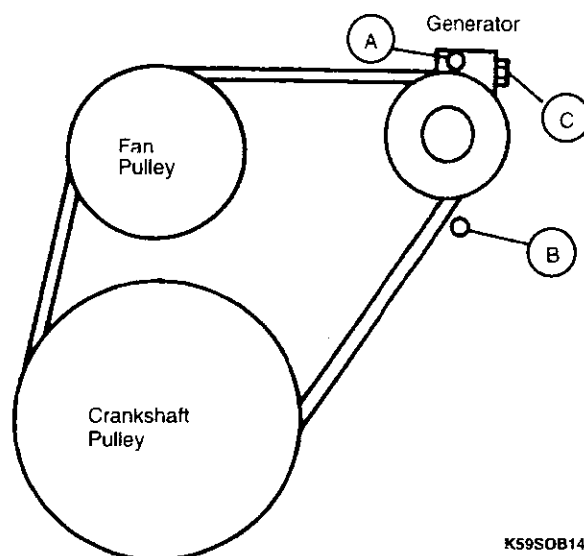
Tightening torque:
23 - 25 lb-ft (31 - 34 N·m)



Generator Drive Belt

1. To remove the generator drive belt, remove the air conditioning drive belt first. Refer to *Air Conditioning Drive Belt*, page 10-9.
2. If adjustment or removal is necessary, loosen the mounting bolts (A and B) from the back side of the generator and adjust the deflection by turning the adjusting bolt (C).
3. After making the adjustment, tighten the mounting bolts (A and B) to specification.

Tightening torque:
A: 16 lb-ft (22 N·m)
B: 32 lb-ft (45 N·m)



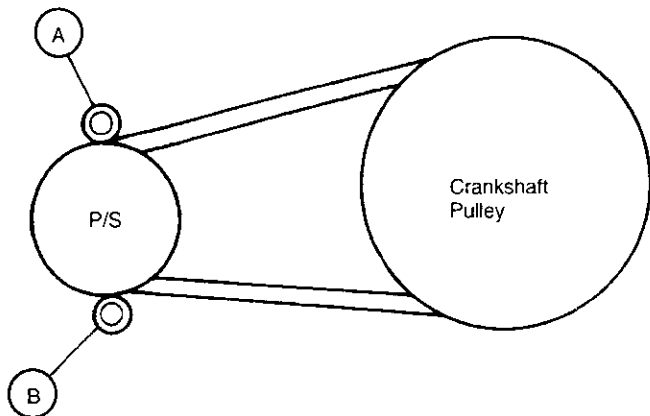
Power Steering Drive Belt

1. To remove the power steering drive belt, the air conditioning and generator drive belts must be removed first. Refer to *Air Conditioning Drive Belt*, page 10-10, and *Generator Drive Belt*, page 10-11.
2. If adjustment or removal is necessary, loosen the lock bolt (A) and mounting bolt (B) and adjust the deflection by prying on the power steering pump with a suitable lever.

3. After making the adjustment, tighten the lock bolt (A) and mounting bolt (B) to specification.

Tightening torque:

27 - 34 lb-ft (37 - 46 N·m)

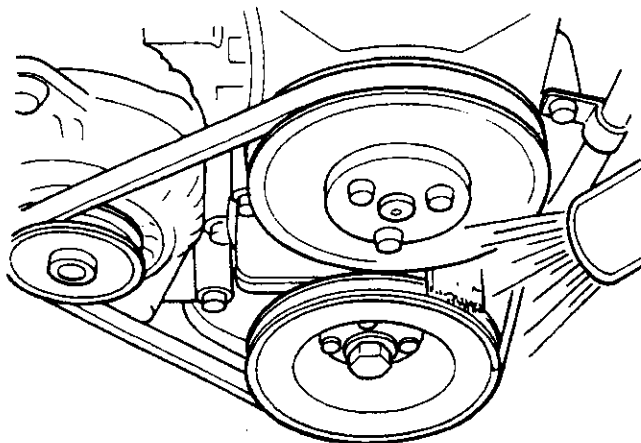


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- * *Notice*
Ignition timing cannot be adjusted.

Ignition timing:

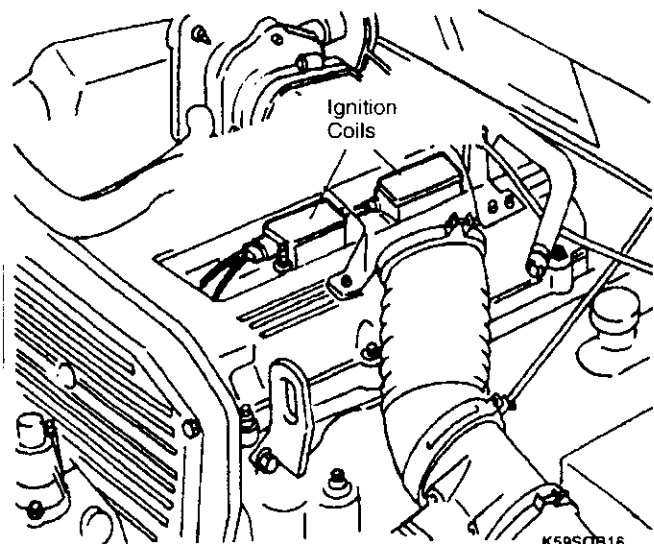
4 ± 6 degrees (at idle speed)



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High-Tension Lead Inspection

1. Check for the following:
 - a. Damaged lead
 - b. Carbon deposits
2. Clean or replace if necessary.



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5. Remove the timing light from the engine and re-install access cover on coil cover.
6. Turn the engine off.

Idle Speed Inspection

1. Apply the parking brake.
2. Start the engine and let it warm up to normal operating temperature.
3. Turn off all electrical loads.
4. Open the cover to the data link connector (DLC) located on the air intake housing.
5. Connect a tachometer to the IG-terminal of the DLC.

- * *Notice*
The idle speed is controlled automatically by the engine control module through the idle air control (IAC) valve, therefore the idle speed cannot be adjusted.

6. Check that the idle speed is within the specified range.

Idle speed (transmission in neutral):

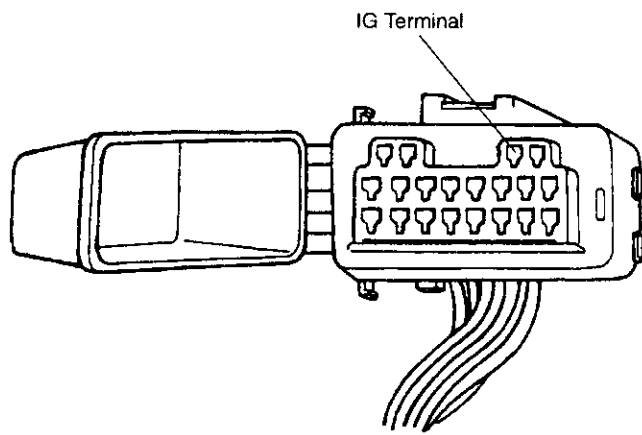
800 ± 50 RPM

7. Remove the tachometer from the DLC IG-terminal.
8. Close the cover to the DLC.
9. Turn off the engine.

Ignition Timing Inspection

1. Start the engine and let it warm up to normal operating temperature.
2. Turn off all electrical loads.
3. Remove the access cover on the coil cover and connect the timing light to No. 1 high tension wire.
4. Verify that the ignition timing is within specification.

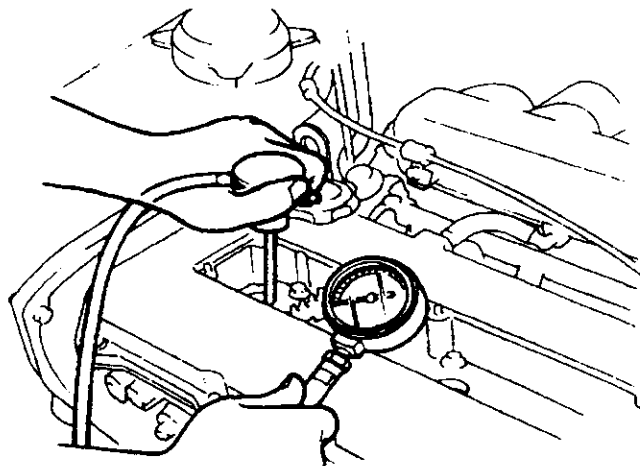
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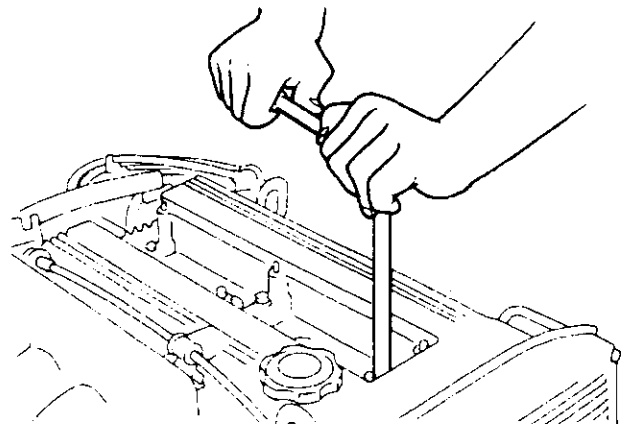
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Compression Inspection

1. Check that the battery is fully charged.
 2. Recharge if necessary.
 3. Start the engine and allow it to reach normal operating temperature.
 4. Turn the engine off and wait about 10 minutes to allow the exhaust manifold to cool.
 5. Remove the spark plugs and inspect. Refer to *Spark Plug*, page 10-6.
 6. Connect a compression gauge to the No. 1 spark plug hole.
 7. Starting with the compression gauge at zero, fully depress the accelerator pedal and crank the engine for about 10 seconds.
 8. Record the maximum gauge reading.
 9. Check the compression at each cylinder.
- * Notice**
The maximum difference in compression between cylinders should be 26 psi (196 kPa).
- Normal compression:**
164 psi (1,128 kPa)
- Minimum compression:**
114 psi (790 kPa)
10. If the compression in one or more cylinders is low, pour a small amount (about one tablespoon) of engine oil into the cylinder and recheck the compression.
 - a. If the compression increases, the piston, the piston rings or the cylinder wall may be worn.
 - b. If the compression remains low, a valve may be stuck or seated improperly.
 - c. If the compression in adjacent cylinders remains low, the cylinder head gasket may be defective or the cylinder head distorted.
 11. Re-install the spark plugs, refer to *Spark Plug Installation*, page 10-7.

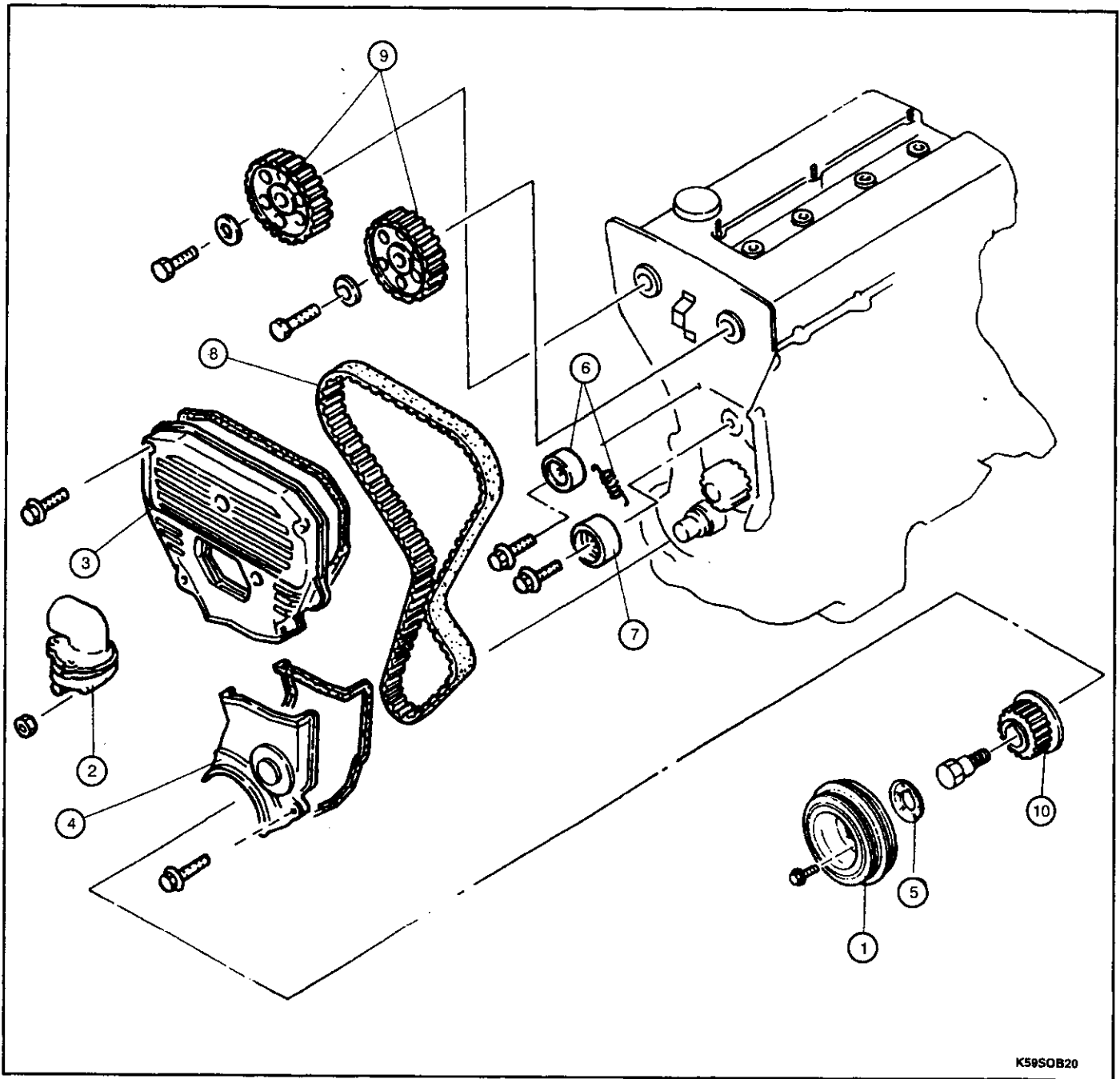


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TIMING BELT



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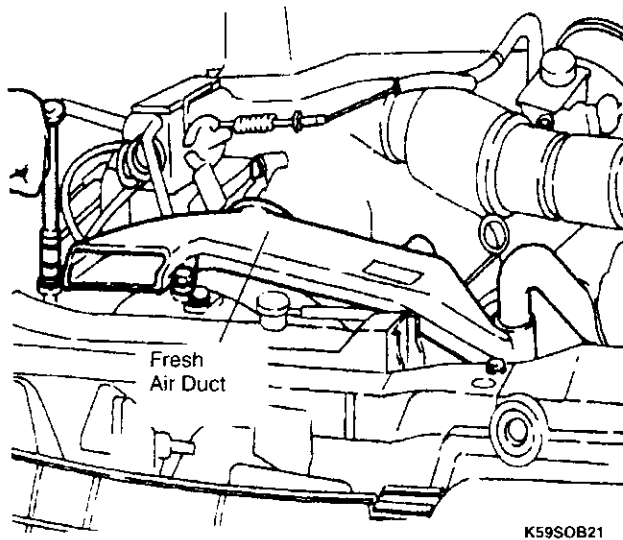
- 1. Crankshaft Pulley
- 2. Thermostat Assembly
- 3. Upper Timing Belt Cover
- 4. Lower Timing Belt Cover
- 5. Timing Belt Guide Plate
- 6. Timing Belt Tensioner Pulley and Spring
- 7. Timing Belt Idler Pulley
- 8. Timing Belt
- 9. Camshaft Pulleys
- 10. Timing Belt Pulley

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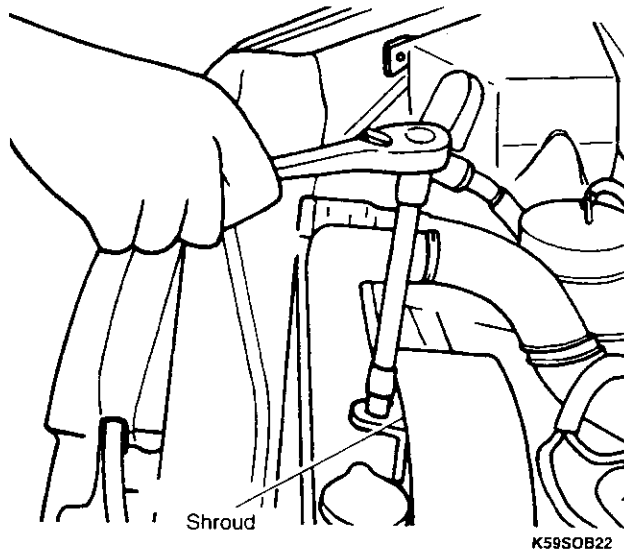
Timing Belt

Removal

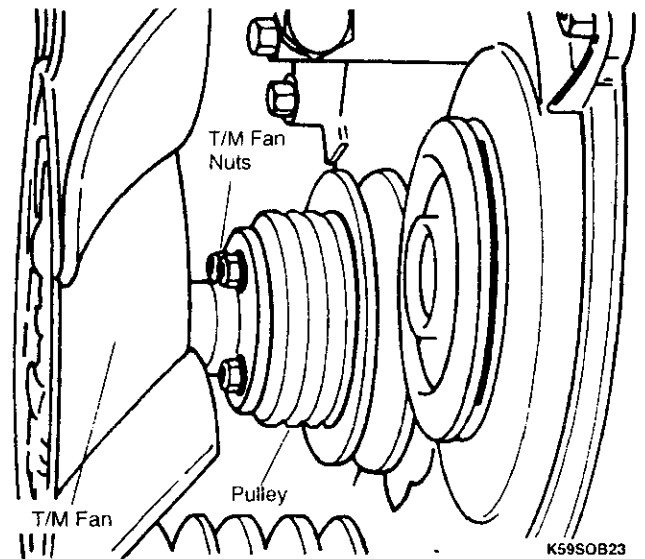
1. Disconnect the negative battery cable.
2. Remove the two fresh air duct mounting bolts on the radiator.
3. Loosen the fresh air duct clamp at the intake housing.
4. Remove the hose at the resonance chamber.
5. Remove the fresh air duct.



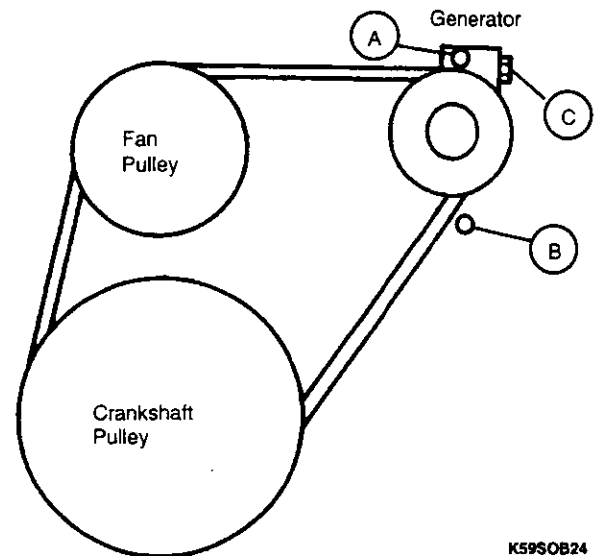
6. Remove the five cooling fan shroud bolts.



7. Remove the four thermo-modulated fan nuts.
8. Remove the thermo-modulated fan and cooling fan shroud at the same time.

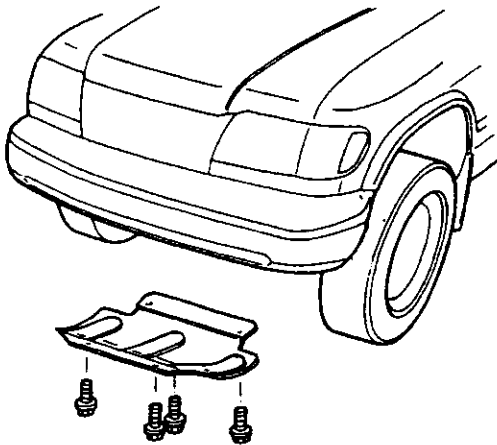


9. Loosen the two generator mounting bolts (A and B).



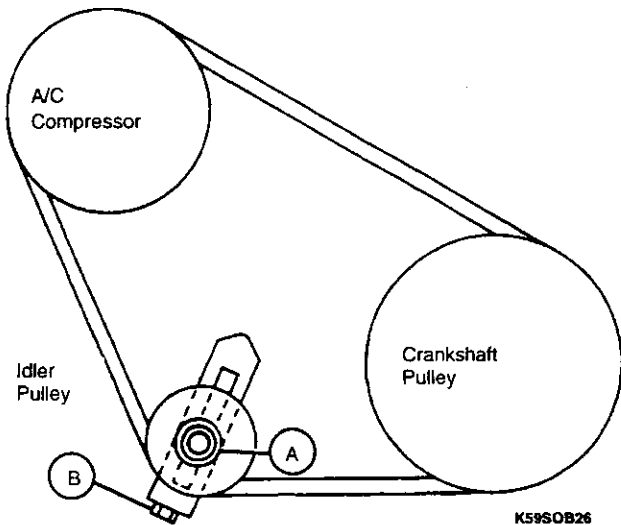
10. Loosen the generator drive belt from the generator by loosening the adjusting bolt (C).
11. Remove the generator drive belt.
12. Remove the fan pulley.

13. Remove the four splash guard mounting bolts and splash guard.



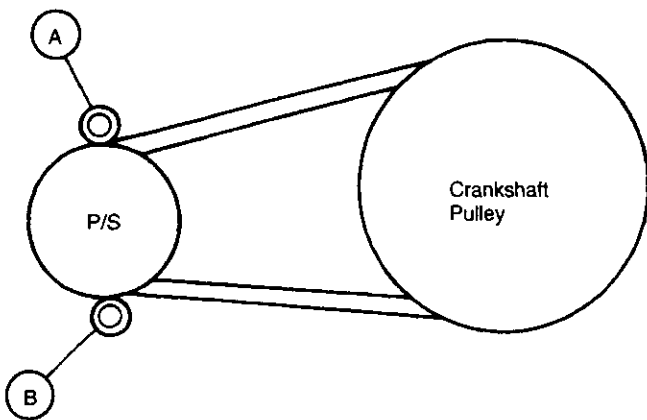
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14. Loosen the A/C idler pulley nut (A).



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15. Remove the A/C drive belt by loosening the adjusting bolt.
16. Loosen the power steering pump lock bolt and mounting bolt.

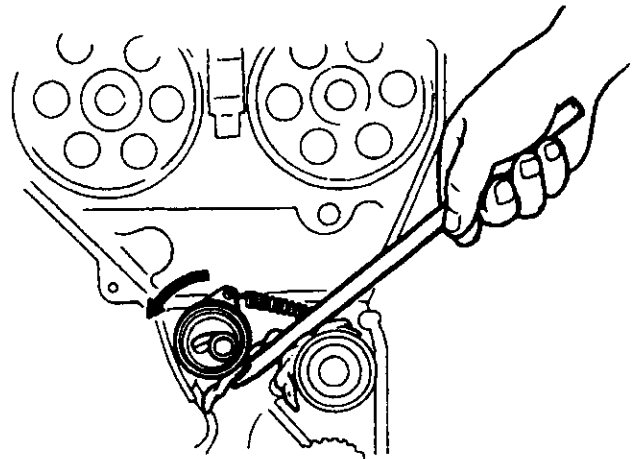


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17. Remove the power steering belt.
18. Remove five bolts and the upper timing belt cover. Refer to *Timing Belt*, page 10-12.
19. Remove two bolts and the lower timing cover. Refer to *Timing Belt*, page 10-12.
20. Loosen the tensioner lock bolt and pivot the tensioner pulley outward to remove the tension from the timing belt, then re-tighten the tensioner lock bolt.

Tightening Torque:

27-38 lb-ft (37-52 N-m)



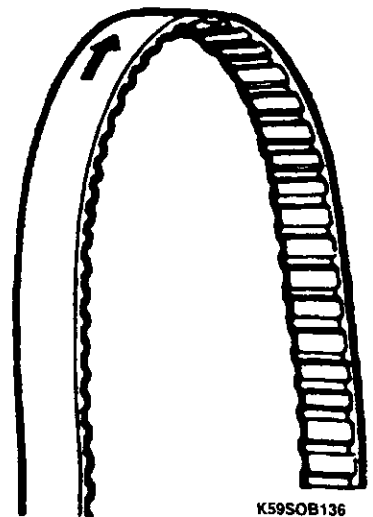
K59SOB135

21. Mark the timing belt rotation for proper reinstallation if it is reused.
22. Remove the timing belt.

Caution

Be careful not to allow oil or grease on the belt.

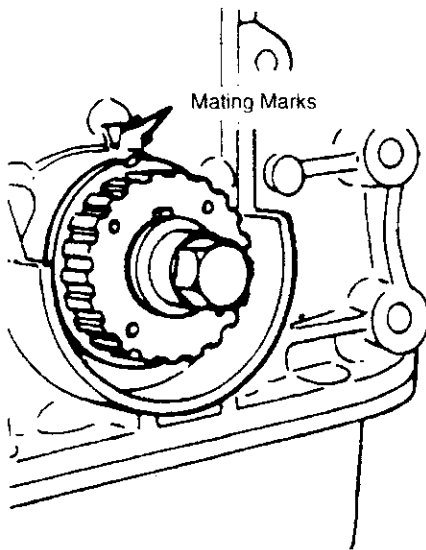
Mark the
Direction of
Rotation



K59SOB136

Installation

1. Align the timing belt pulley and the pump body alignment marks.

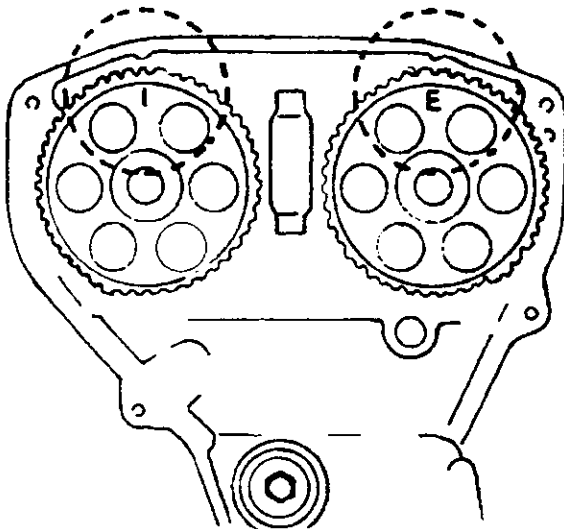


K59SOB260

2. Align the mating marks on the camshaft pulleys with the alignment marks on the seal plate.

*** Notice**

- For intake side camshaft pulley, align I mark.
- For exhaust side camshaft pulley, align E mark.

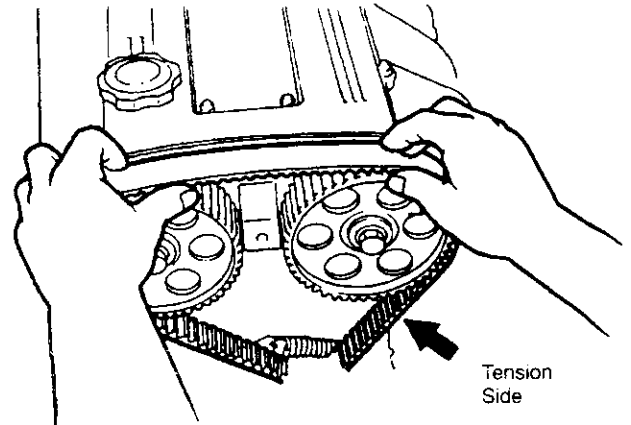


K59SOB259

3. Install the timing belt so that there is no looseness at the tension side, and at the two camshaft pulleys.

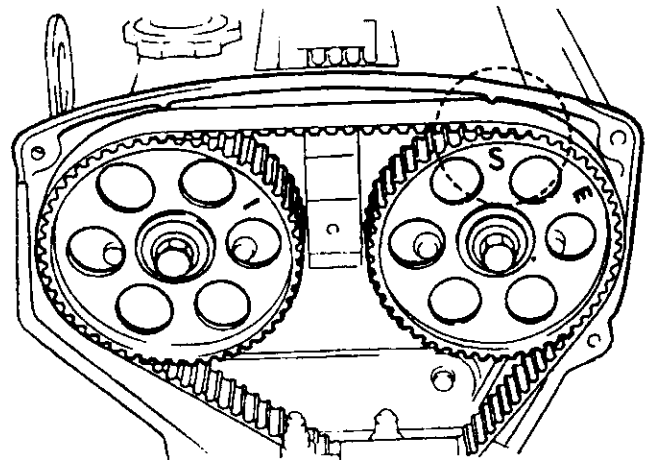
Caution

- If the timing belt is being reused, it must be reinstalled to rotate in the original direction.
- Check that there is no oil, grease, or dirt on the timing belt.



K59SOB262

4. Loosen the tensioner lock bolt.
5. Turn the crankshaft two complete revolutions in the direction of rotation.
6. Check that the mating marks are correctly aligned. If not aligned correctly, remove the timing belt and tensioner, and return to step 1.
7. Turn the crankshaft to align the S mark of the exhaust camshaft pulley with the seal plate mating mark.



K59SOB263

8. Tighten the timing belt tensioner lock bolt.

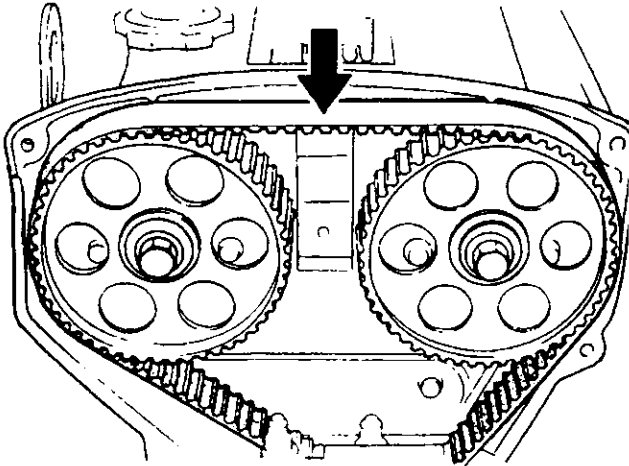
Tightening torque:

27 - 38 lb-ft (37 - 52 N·m, 3.8 - 5.3 kg-m)

9. Check the timing belt deflection. If the deflection is not correct, loosen the tensioner lock bolt and repeat steps 5-7 above. Replace the tensioner spring if necessary.

Belt deflection

0.30 - 0.33 in. (7.5 - 8.5 mm)/22 lb (98 N, 10 kg)



K59SOB264

10. Install the lower timing belt cover and two bolts. Refer to *Timing Belt*, page 10-12.

Tightening torque:

61 - 87 lb-in (7 - 10 N·m)

11. Install the upper timing belt cover and five bolts. Refer to *Timing Belt*, page 10-12.

Tightening torque:

61 - 87 lb-in (7 - 10 N·m)

12. Install the power steering drive belt and set belt deflection.

Power Steering Belt deflection:

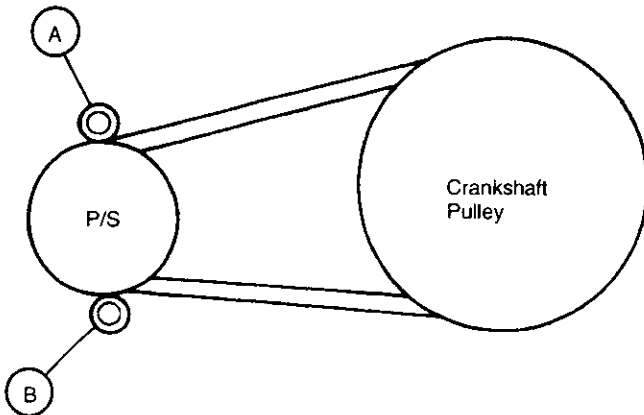
New: 0.31 - 0.39 in. (8 - 10 mm)

Used: 0.35 - 0.43 in. (9 - 11 mm)

13. Tighten the lock bolt (A) and mounting bolt (B).

Tightening torque:

27 - 34 lb-ft (37 - 46 N·m)



K59SOB15

14. Install the fan pulley.

15. Install the generator drive belt and adjust belt deflection by tightening adjusting bolt (C).

Generator Belt deflection:

New: 0.24 - 0.31 in. (6 - 8 mm)

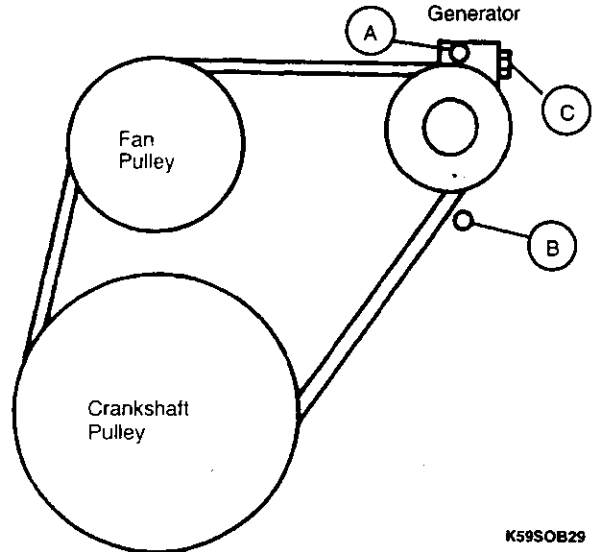
Used: 0.27 - 0.35 in. (7 - 9 mm)

16. Tighten generator mounting bolts (A and B).

Tightening torque:

A: 16 lb-ft (22 N·m)

B: 32 lb-ft (45 N·m)



K59SOB29

17. Install A/C drive belt and set belt deflection by tightening adjusting bolt (B).

A/C Belt deflection:

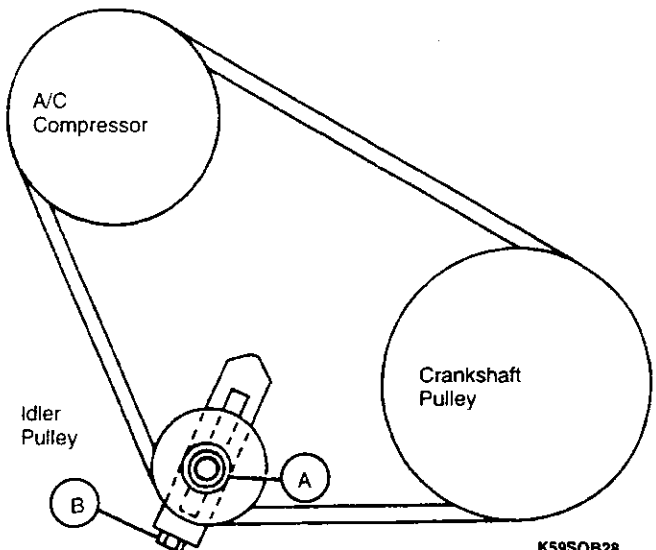
New: 0.27 - 0.35 in. (7 - 9 mm)

Used: 0.31 - 0.39 in. (8 - 10 mm)

18. Tighten the adjusting bolt (B) and idler pulley bolt (A).

Tightening torque:

23 - 25 lb-ft (31 - 34 N·m)

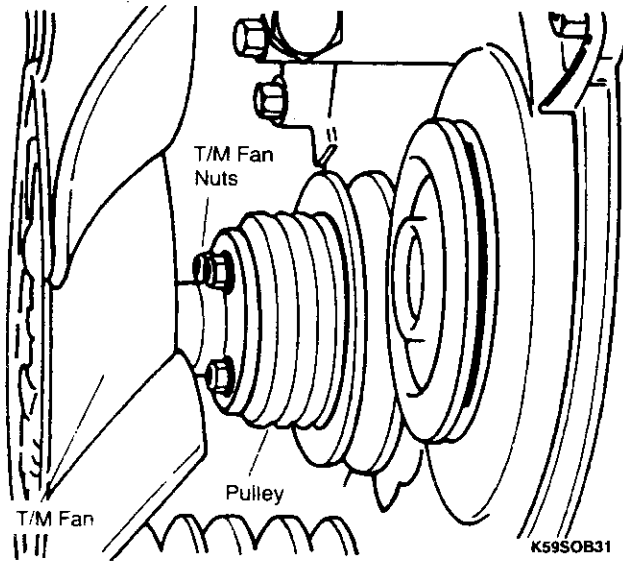


K59SOB28

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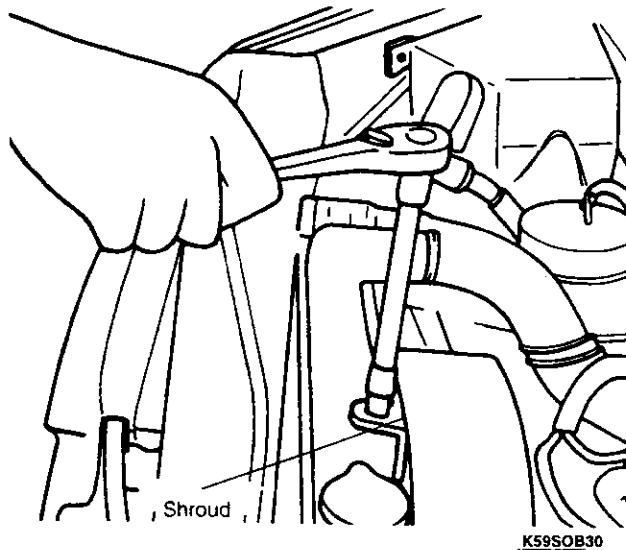
19. Install the splash guard and tighten the four mounting bolts.
20. Install the fan and fan shroud.
21. Install the four fan bolts and tighten.

Tightening Torque:
24 lb-ft (32.6 N·m)



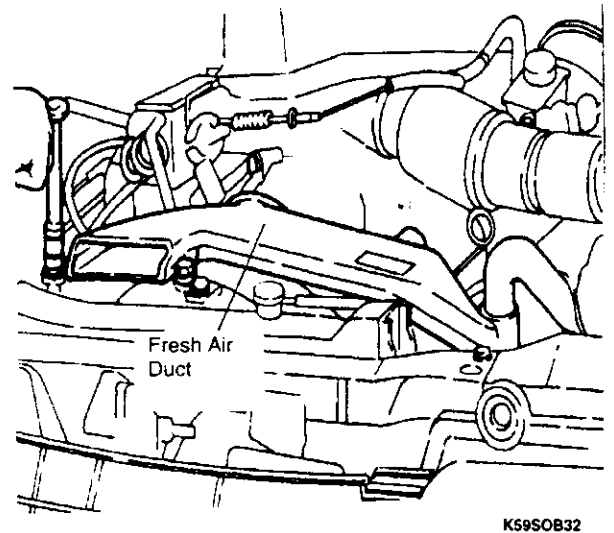
22. Install the five fan shroud mounting bolts.

Tightening torque:
69 - 95 lb-in (7.8 -11 N·m)



23. Install the fresh air duct.
24. Install the hose at the resonance chamber.
25. Install and tighten the clamp at the air intake housing.
26. Install the two fresh air duct mounting bolts and tighten.

Tightening torque:
69 - 95 lb-in (7.8 -11 N·m)



27. Reconnect the negative battery cable.

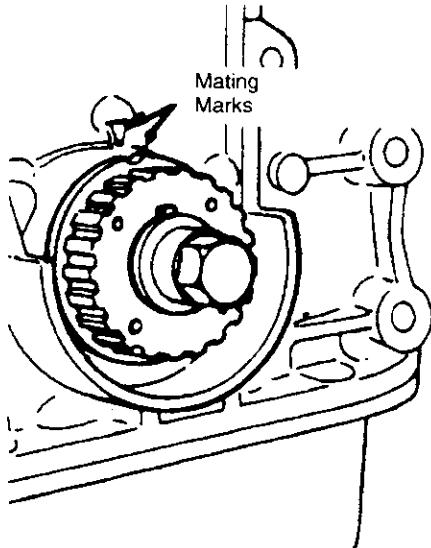
TIMING BELT PULLEY

Removal

1. Refer to *Timing Belt Removal*, page 10-13.
2. Remove the timing belt pulley lock bolt.
3. Remove the timing belt pulley.

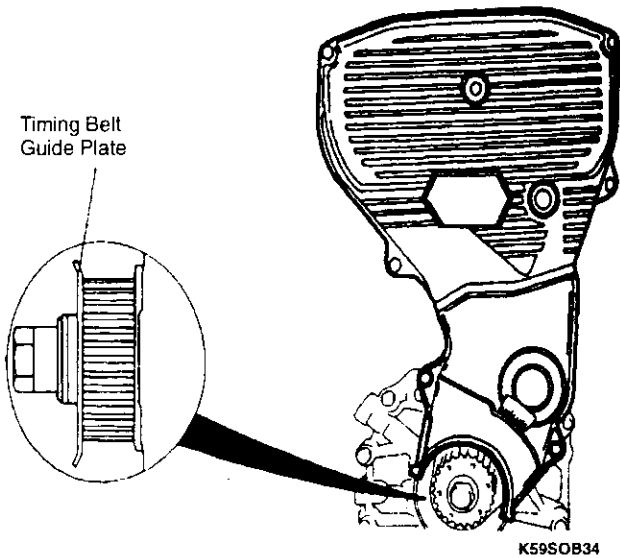
Installation

1. Install the timing belt pulley with the mating marks aligned.



K59SOB33

2. Position the guide plate as shown.



K59SOB34

3. Install the lock bolt and tighten.

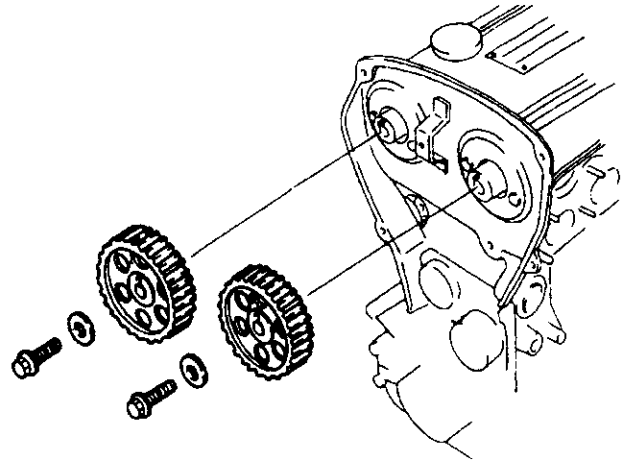
Tightening torque:
120 lb-ft (162 N·m)

4. Install timing belt as described in this section.

CAMSHAFT PULLEYS

Removal

1. Refer to *Timing Belt Removal*, page 10-13.
2. Remove the camshaft pulley lock bolts.
3. Remove the camshaft pulleys.

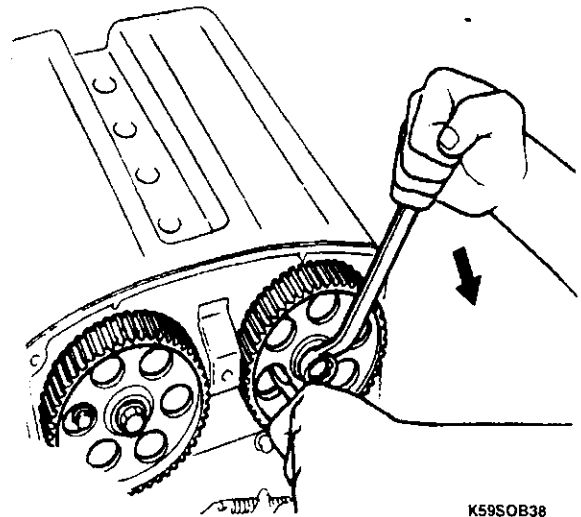


K59SOB37

Installation

1. Install the camshaft pulleys as shown in the illustration, making sure that the dowel pins and I (intake) and E (exhaust) marks are pointing up.
2. Install the camshaft pulley lock bolts and tighten.

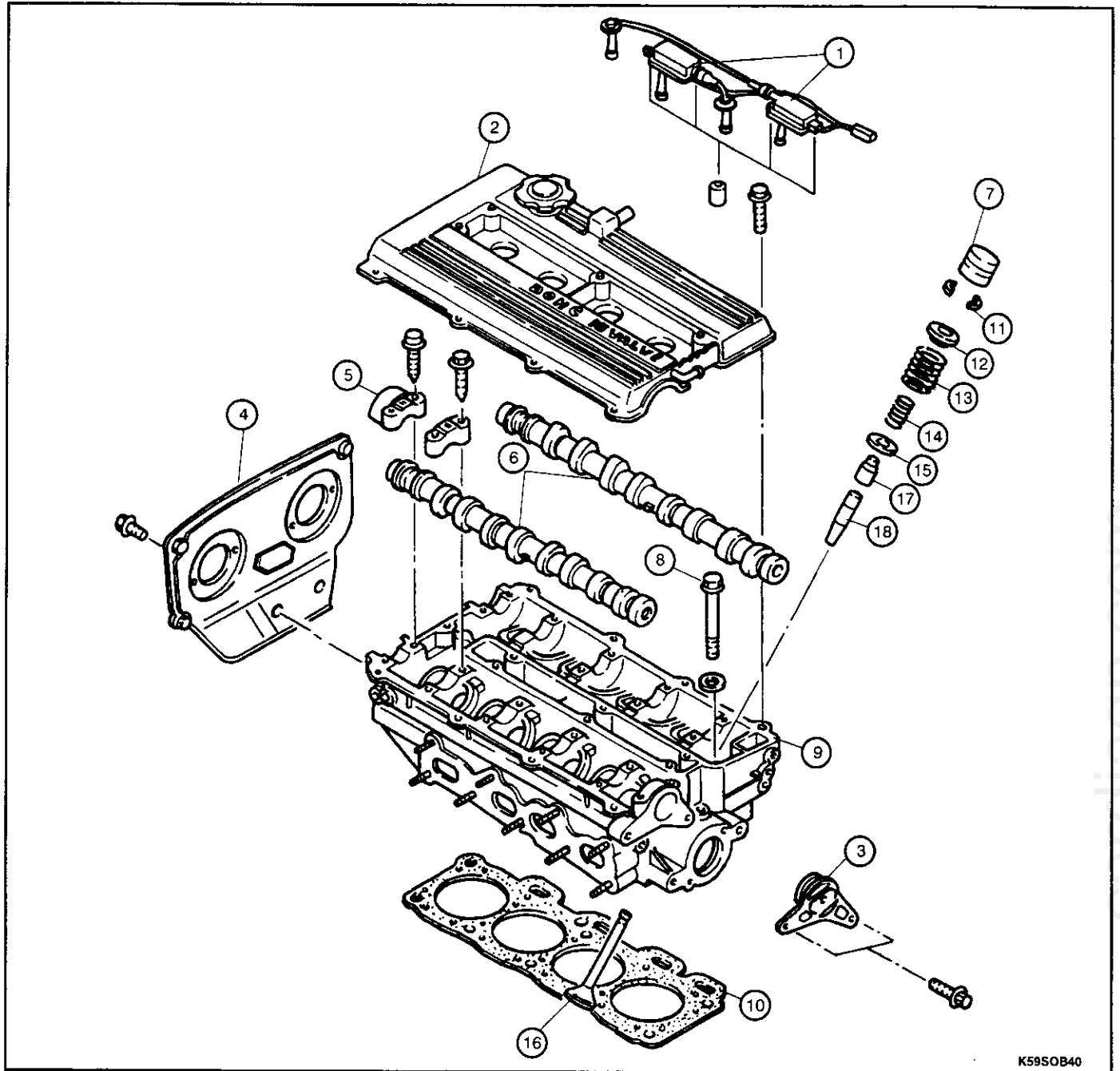
Tightening torque:
35 - 48 lb-ft (47 - 65 N·m)



K59SOB38

3. Refer to *Timing Belt Installation*, page 10-15.

CYLINDER HEAD



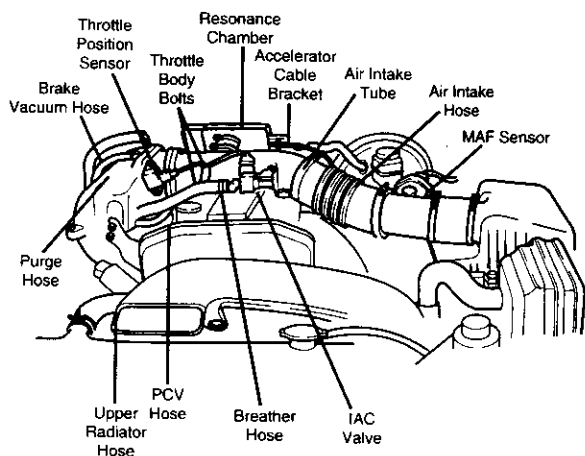
K59SOB40

- | | | |
|------------------------------------------|----------------------------|------------------------|
| 1. Ignition Coils and High Tension Leads | 7. Hydraulic Lash Adjuster | 13. Outer Valve Spring |
| 2. Cylinder Head Cover | 8. Cylinder Head Bolt | 14. Inner Valve Spring |
| 3. Camshaft Position Sensor | 9. Cylinder Head | 15. Lower Spring Seat |
| 4. Seal Plate | 10. Cylinder Head Gasket | 16. Valve |
| 5. Camshaft Caps | 11. Valve Locks | 17. Valve Stem Seal |
| 6. Camshafts | 12. Upper Spring Seat | 18. Valve Guide |

CYLINDER HEAD COVER

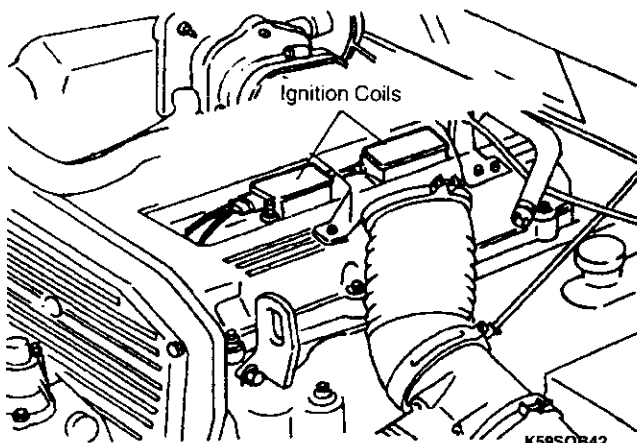
Removal

1. Disconnect the negative battery terminal. Proceed to remove the hose at the resonance chamber.
2. Remove one bolt and the resonance chamber, then remove the two accelerator cable bracket bolts from the cylinder head cover.



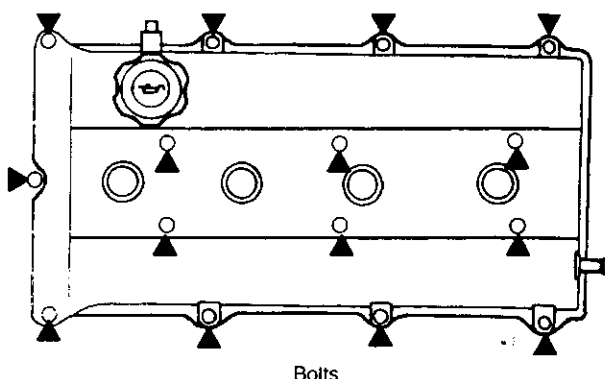
BN7A10001

3. Remove the two air intake tubes-to-cylinder head cover bolts.
4. Disconnect the accelerator cable by pulling back on the throttle shaft and rotating the accelerator cable until it lines up with the slot in the pulley.
5. Loosen the air hose clamp from the air intake hose to the MAF sensor.
6. Remove the IAC and breather hoses, and the vacuum line from the air intake tube.
7. Remove the three bolts from the air intake tube to the throttle body and remove the air intake tube and air intake hose as an assembly.
8. Remove the six coil cover bolts from the top of the cylinder head cover.
9. Disconnect the electrical connectors from the ignition coils.



K59S0B42

10. Remove the four bolts (two each) from the ignition coils to the cylinder head cover.
11. Remove the spark plug wires from the spark plugs.
12. Remove the 15 cylinder head cover bolts.

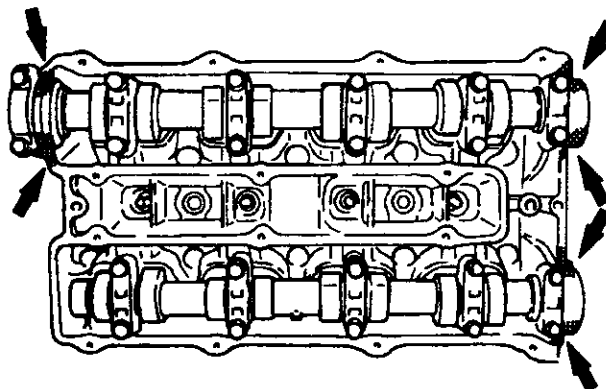


K59S0B95

13. Remove the cylinder head cover.

Installation

1. Place a small amount of sealer at the corners of the float camshaft caps and the distributor mounting cap.



K59S0B44

2. Place cylinder head cover on top of cylinder head.
3. Secure cover with 15 bolts and tighten to specification.
Tightening torque:
35 - 52 lb-in (4 - 6 N·m)
4. Install the ignition coils and connect the spark plug wires to the spark plugs.
5. Fasten the two coils to the cylinder head cover with the four mounting bolts and tighten to specification.
Tightening torque:
60 lb-in (6.8 N·m)
6. Connect the two ignition coil connectors.

- Install coil cover and secure with six bolts. Tighten to specification.

Tightening torque:**30 - 40 lb-in (3 - 5 N·m)**

- Install air intake hose and air intake tube as an assembly. Secure air intake tube to throttle body with three bolts and tighten to specification.

Tightening torque:**18 lb-ft (24 N·m)**

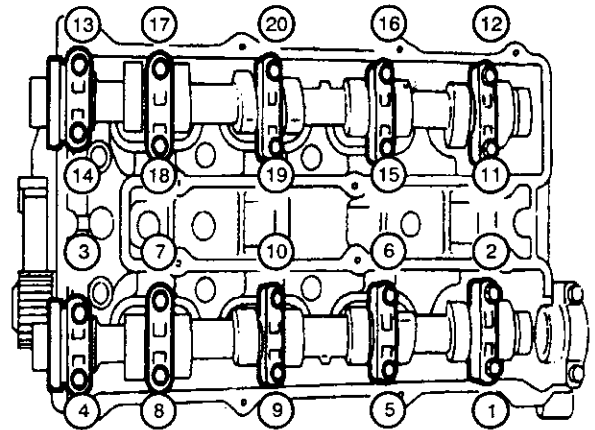
- Install the two air intake tube-to-cylinder head cover bolts and tighten to specification.

Tightening torque:**16 lb-ft (22 N·m)**

- Connect the accelerator cable by pulling back on the throttle shaft pulley and inserting the cable in the slot. Release the throttle to the closed position.
- Install the IAC and breather hoses, and the vacuum line to the air intake tube.
- Connect the air intake hose to the MAF sensor and tighten the clamp.
- Install the resonance chamber and secure with one bolt. Tighten the two clamps.
- Connect the negative battery cable.

CAMSHAFTS**Removal**

- Disconnect negative battery cable.
- Remove five bolts and the upper timing belt cover.
- Remove timing belt from camshaft pulleys. Refer to *Timing Belt Removal*, page 10-13.
- Remove cylinder head cover. Refer to *Cylinder Head Cover Removal*, page 10-20.
- Remove camshaft pulleys. Refer to *Camshaft Pulley Removal*, page 10-18.
- Remove camshaft cap bolts in the order shown.



K59SOB46

- Remove camshaft caps.
- Remove camshafts.

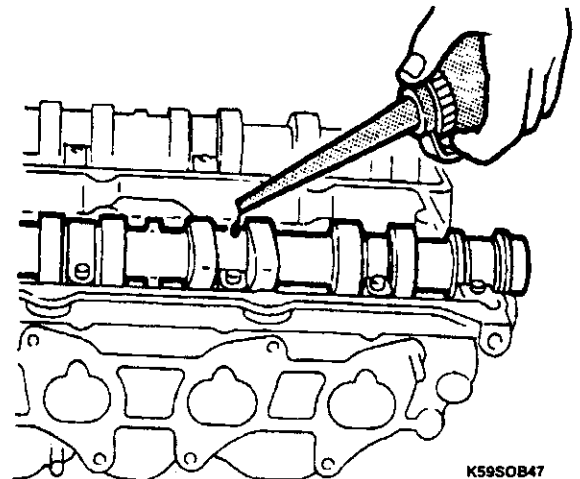
Installation

- Set camshafts in cylinder head. Refer to *Cylinder Head*, page 10-19.

*** Notice**

The exhaust camshaft has a steel dowel pin at the rear for the camshaft position sensor.

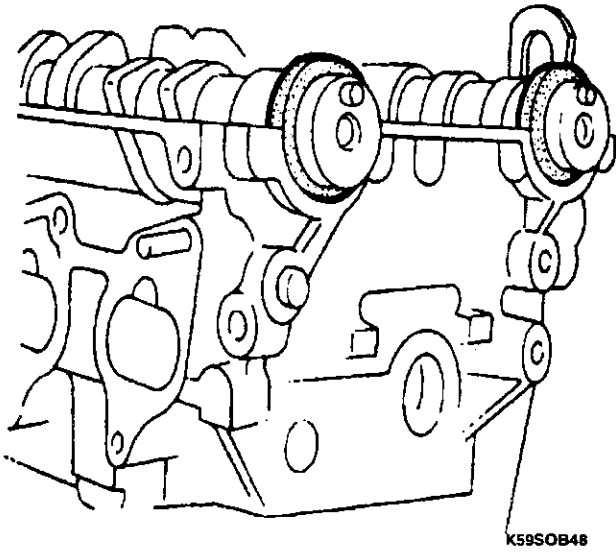
- Apply a liberal amount of engine oil to the journals and bearings.
- Place the camshaft in position with the dowel pin facing straight up.



K59SOB47

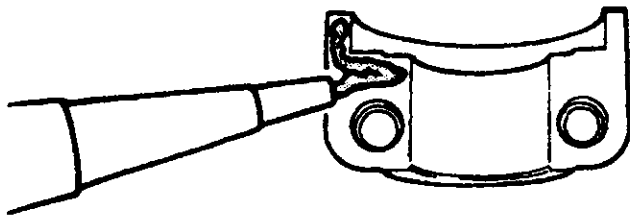
Camshaft Oil Seal

1. Apply a liberal amount of clean engine oil to the camshaft oil seal and cylinder head.
2. Install the camshaft oil seal.



Camshaft Cap

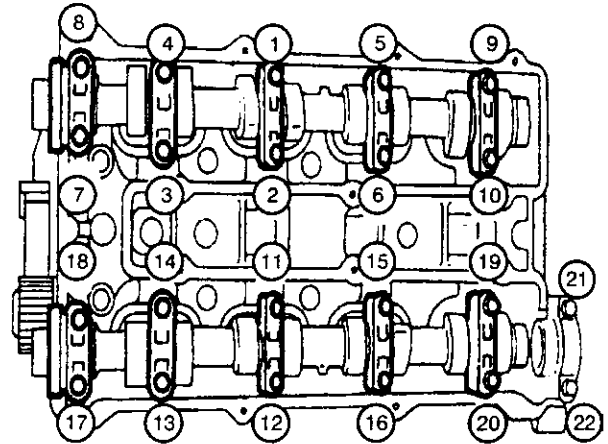
1. Apply a liberal amount of clean engine oil to the camshaft lobes and journals.
2. Apply silicon sealant to both front camshaft cap surfaces and the camshaft position sensor mounting cap.



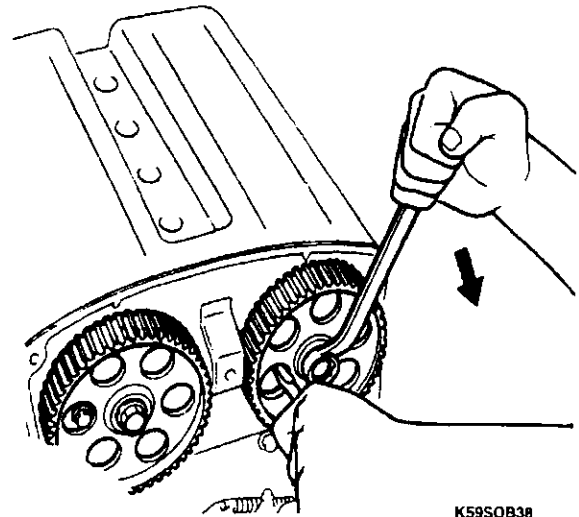
3. Position the camshaft caps according to the cap number with the arrows pointing toward the front of the cylinder head.
4. Install the camshaft caps. Tighten the bolts in two or three steps in the order shown in the figure.

Tightening torque:

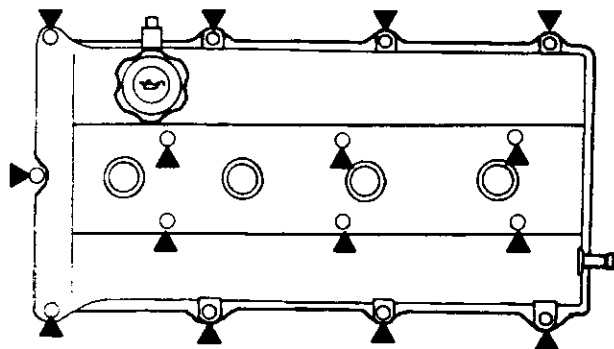
13 - 20 lb-ft (18 - 26 N·m)



5. Install camshaft pulleys. Refer to *Camshaft Pulley Installation*, page 10-18.



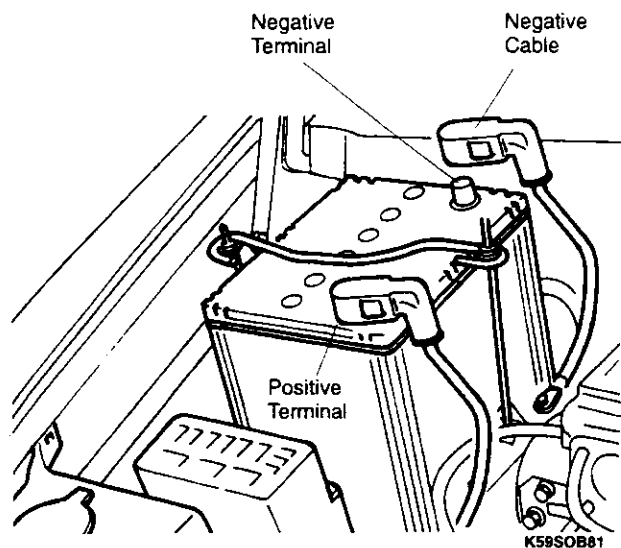
6. Install timing belt. Refer to *Timing Belt Installation*, page 10-15.
7. Install the cylinder head cover. Refer to *Cylinder Head Cover Installation*, page 10-20.



Bolts

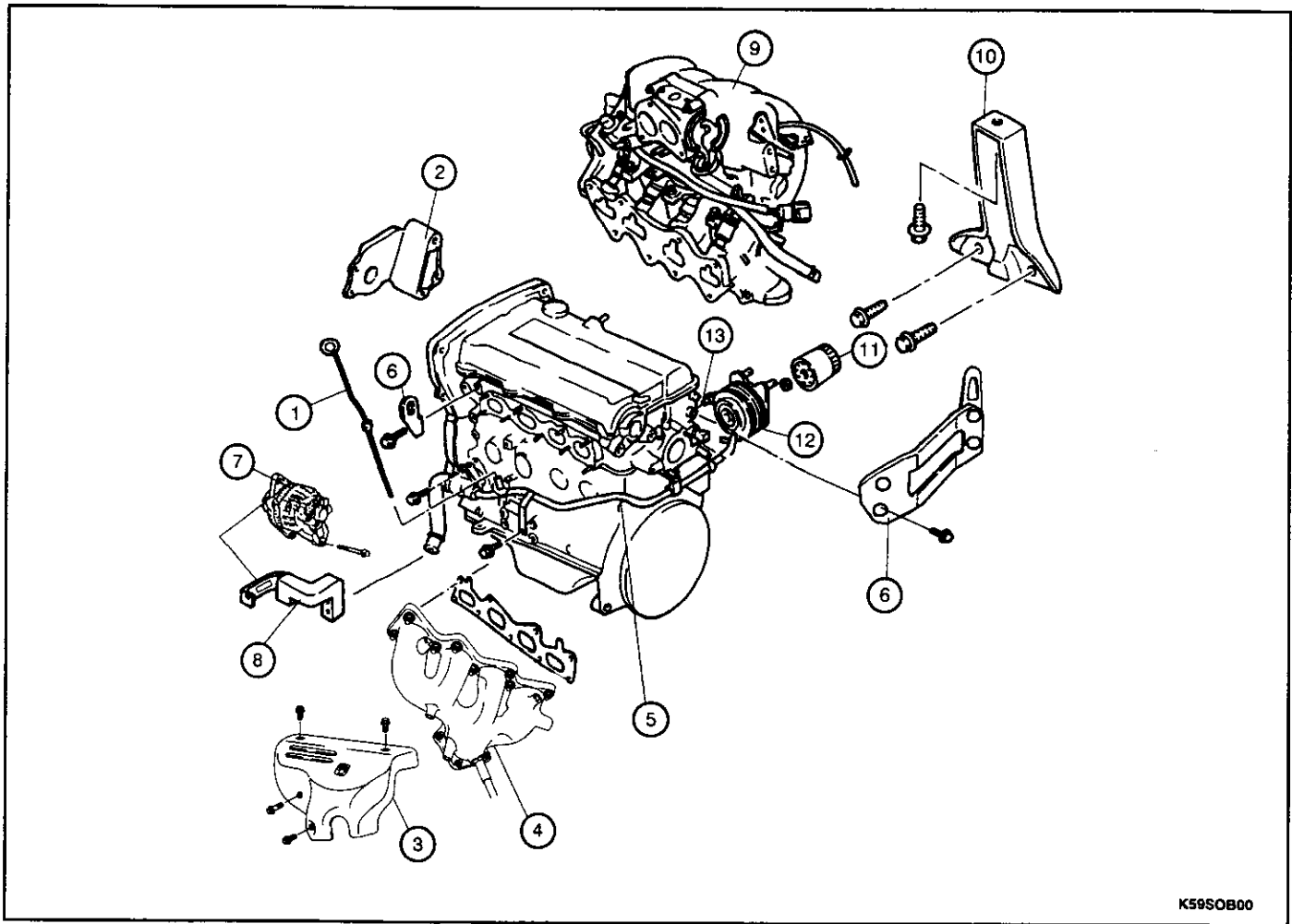
K59SOB95

8. Connect negative battery cable.



K59SOB81

INTAKE AND EXHAUST MANIFOLD



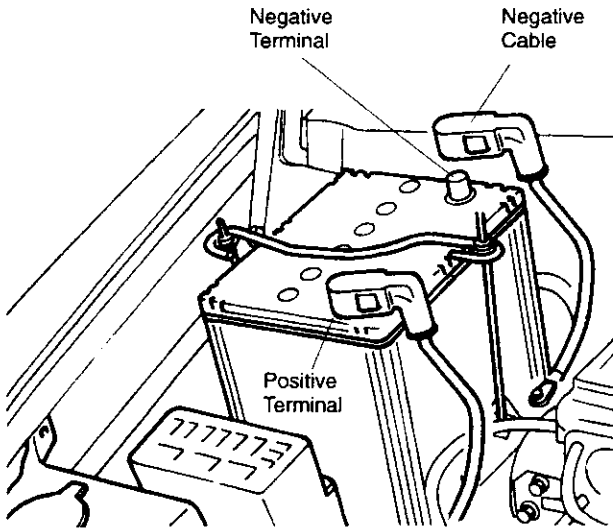
K59SOB00

- | | | |
|---------------------------------------|--------------------------------|-------------------------|
| 1. Oil Level Gauge | 6. Engine Hanger | 11. Oil Filter |
| 2. Thermo-Modulated Fan Bracket | 7. Generator | 12. Oil Cooler |
| 3. Exhaust Manifold Heat Shield | 8. Generator Strap and Bracket | 13. Oil Pressure Switch |
| 4. Exhaust Manifold | 9. Intake Manifold Assembly | |
| 5. Coolant Inlet Pipe and Bypass Pipe | 10. Intake Support Bracket | |

INTAKE MANIFOLD

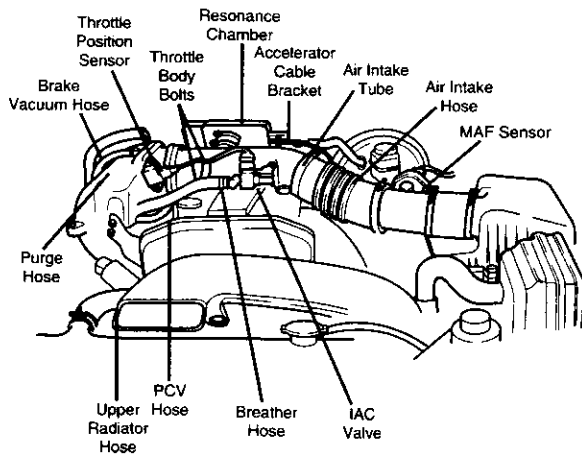
Removal

1. Disconnect negative battery cable.



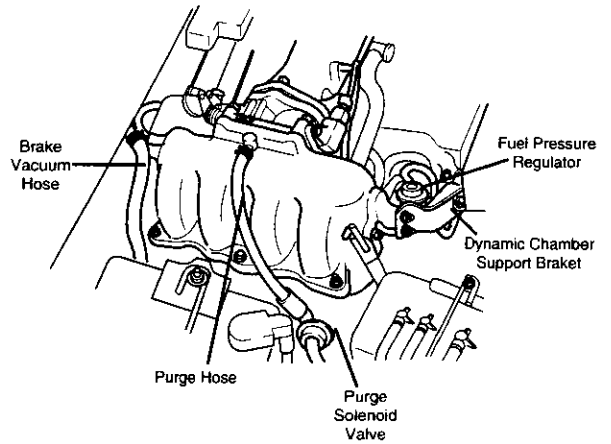
K59S0B53

2. Relieve the fuel system pressure. Refer to *Fuel System*, Section 22.
3. Remove the two accelerator cable bracket-to-cylinder head cover bolts.

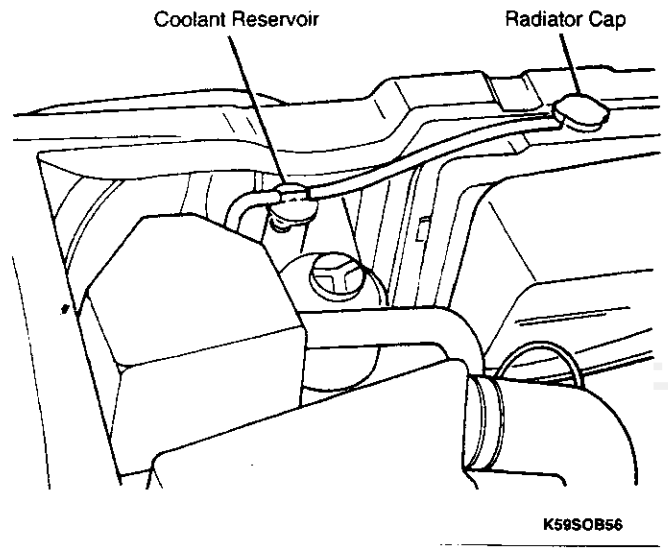


BN7A10001

4. Remove the two air intake tube to cylinder head cover bolts.
5. Remove the three air intake tube to throttle body bolts.
6. Loosen the clamp from the air intake hose to MAF sensor.
7. Remove the idle air control valve hose, the breather hose and the vacuum line from the air intake tube.
8. Remove the air intake tube and air intake hose as an assembly.
9. Remove the PCV hose from the dynamic chamber.

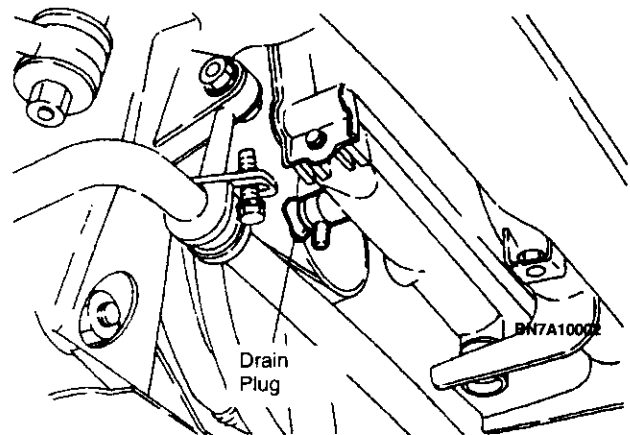


10. Remove the radiator cap.



K59S0B56

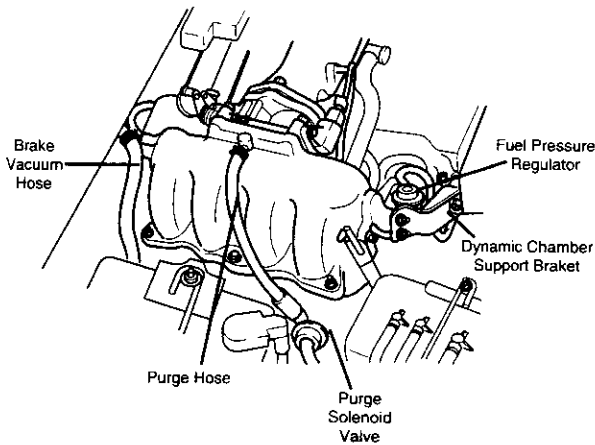
11. Loosen the radiator drain plug and drain the engine coolant into a suitable container.
12. Tighten the radiator drain plug.



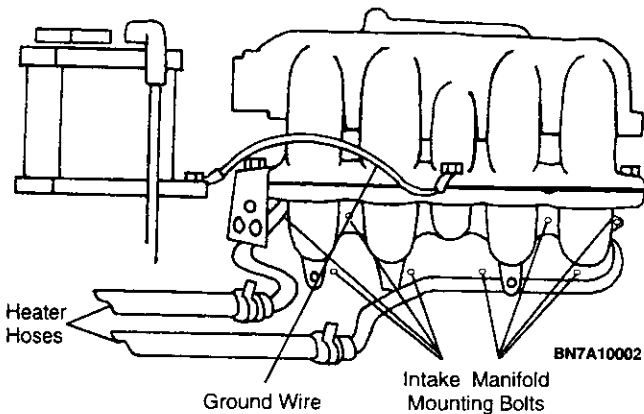
BN7A10002

K59S0B57

- Remove the purge solenoid valve vacuum hose from the dynamic chamber.



- Disconnect the electrical connector from the throttle position sensor.
- Disconnect the electrical connection for the idle air control valve by pulling the wire clip out.
- Remove both heater hoses from the pipes.



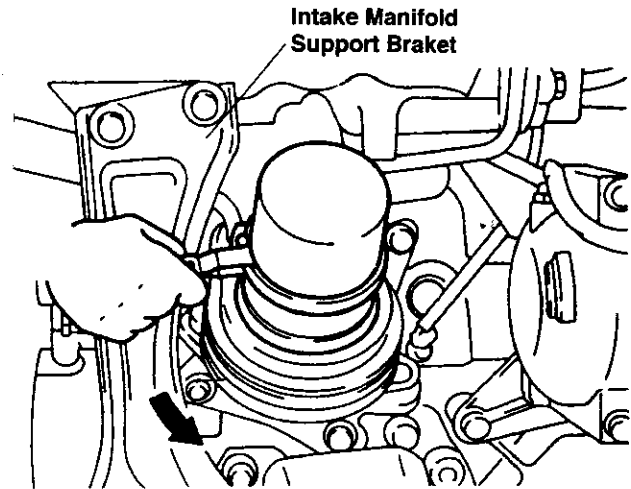
K59SOB59

- Remove the engine-to-body ground bolt attaching the ground wire to the intake manifold assembly.
- Remove the two heater hoses from below the throttle body.
- Remove the brake booster vacuum line.
- Remove the vacuum hose from the fuel pressure regulator.
- Remove the two dynamic chamber support brackets and the bolts.

*** Notice**
There are two (front and rear) dynamic chamber support brackets and one intake manifold support bracket.

- Disconnect the four electrical connectors from the fuel injectors by pushing on the wire clips.

- Relieve fuel system pressure. (Refer to *Fuel System*, Section 22)
- Disconnect the fuel line from the pressure regulator.
- Disconnect the fuel return line from the fuel rail assembly.
- Remove the three intake manifold support bracket bolts and the bracket.
- Remove the oil filter with a suitable wrench.



K59SOB63

- Remove the four bolts and four nuts from the intake manifold.
- Remove the bypass pipe from the heater hose.
- Remove the intake manifold and gasket.

Installation

- Install the intake manifold with a new gasket.
- Install the bypass pipe.
- Install the four bolts and four nuts to the intake manifold. Tighten to specification.

Tightening torque:

14-22 lb-ft (19 - 30 N·m)

- Install a new oil filter. Tighten 1 and 1/6 turns after seal contacts the oil cooler.
- Install the intake manifold support bracket with three bolts and tighten to specification.

Tightening torque:

27-38 lb-ft (37-52 N·m)

- Re-connect the fuel line to the fuel pressure regulator.
- Re-connect the fuel return line to the fuel rail assembly.
- Re-connect the four electrical connectors to the fuel injectors.
- Install the engine-to-body ground wire and bolt, and tighten to specification.

Tightening torque:

14-18 lb-ft (19-25 N·m)

- Install the two dynamic chamber support brackets bolts and tighten to specification.

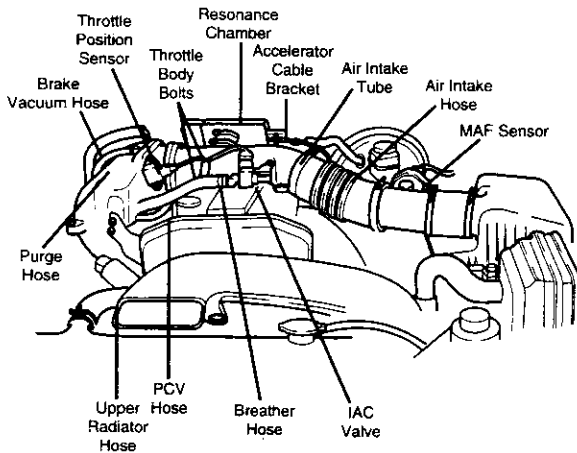
Tightening torque:

14-18 lb-ft (19-25 N·m)

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11. Install the purge solenoid valve vacuum hose to the intake manifold.
12. Install the vacuum hose to the fuel pressure regulator.
13. Install the two coolant hoses under the throttle body.
14. Reconnect the electrical connection to the idle air control valve.
15. Install the brake booster vacuum hose.
16. Install the heater hoses.
17. Reconnect the electrical connector to the throttle position sensor.
18. Install the purge solenoid valve vacuum hose to the dynamic chamber.
19. Install the air intake tube and air intake hose as an assembly to the throttle body with three bolts and tighten to specification.

Tightening torque:
16 lb-ft (22 N·m)



BN7A10001

20. Install the PCV hose to the dynamic chamber.
21. Attach the accelerator cable to the throttle body pulley.
22. Secure the accelerator cable bracket to the cylinder head cover with two bolts and tighten to specification.

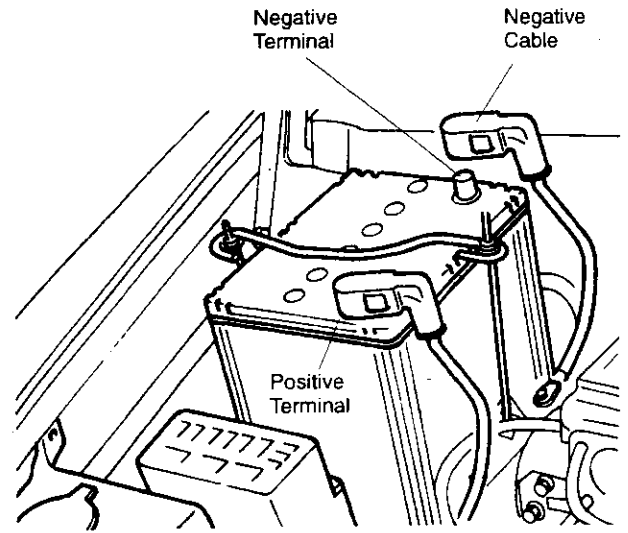
Tightening torque:
10 lb-ft (14 N·m)

23. Attach the air intake hose to the MAF sensor and tighten the clamp.
24. Install the resonance chamber, two clamps and one bolt to the air intake tube.
25. Connect the IAC hose, the breather hose and the vacuum line to the intake manifold assembly.
26. Pressurize the fuel system. Refer to *Fuel System*, Section 22.
27. Refill the radiator.
28. Connect the negative battery cable.

EXHAUST MANIFOLD

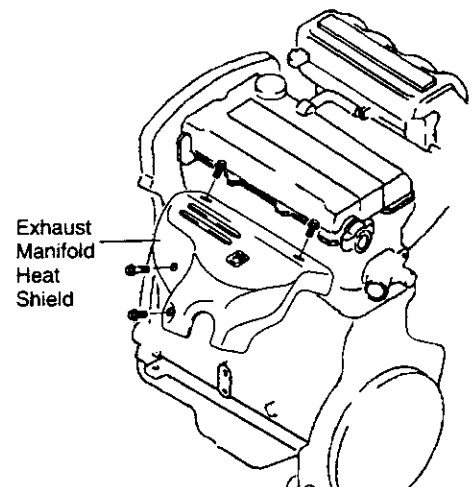
Removal

1. Disconnect the negative battery cable.



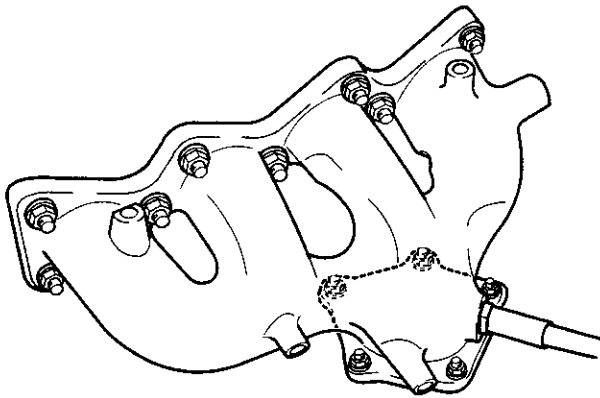
K59SOB73

2. Loosen the two air intake hose clamps and remove the air intake hose.
3. Remove four exhaust manifold heat shield bolts.
4. Remove the exhaust manifold heat shield.



K59SOB75

- Remove five converter inlet pipe flange locknuts.



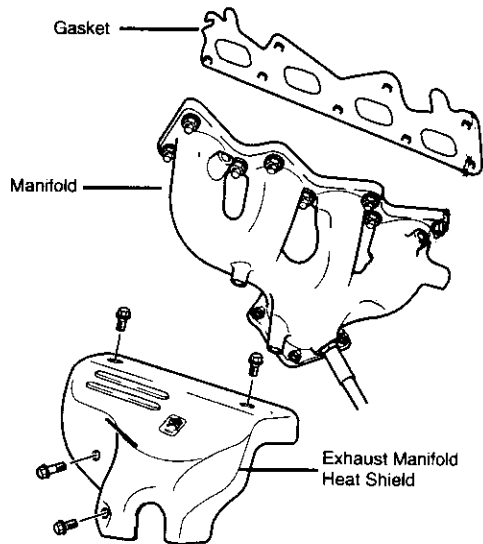
BN7A10002

- Remove nine exhaust manifold bolts.
- Remove exhaust manifold and gasket.

Installation

- Install the exhaust manifold gasket.
- Install the exhaust manifold.
- Install the nine exhaust manifold bolts and tighten to specification.

Tightening torque:
31 lb-ft (42 N-m)



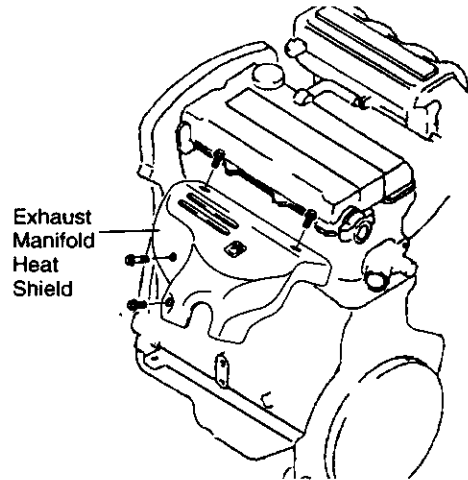
BN7A10006

- Install a new flange gasket and attach the converter inlet pipe.
- Install the five nuts on the exhaust flange and tighten to specification.

Tightening torque:
24 lb-ft (33 N-m)

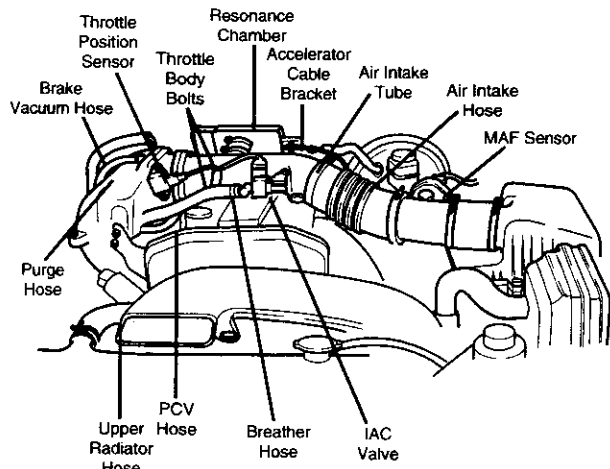
- Install the exhaust manifold heat shield.
- Install the four heat shield bolts and tighten to specification.

Tightening torque:
18 lb-ft (24 N-m)



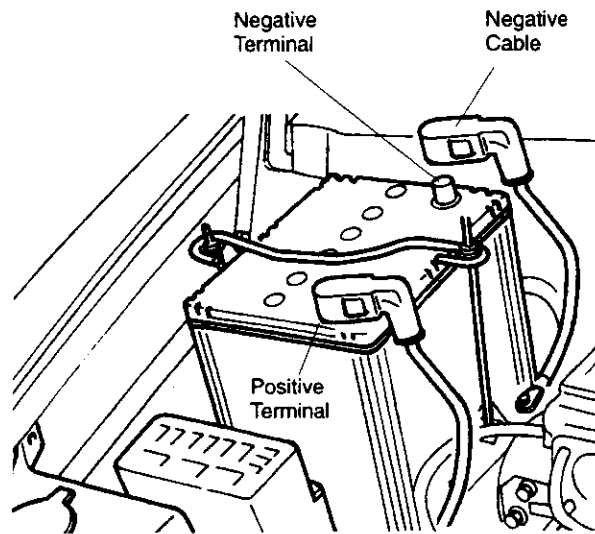
K59SOB75

- Install the air intake hose and tighten the two clamps.



BN7A10001

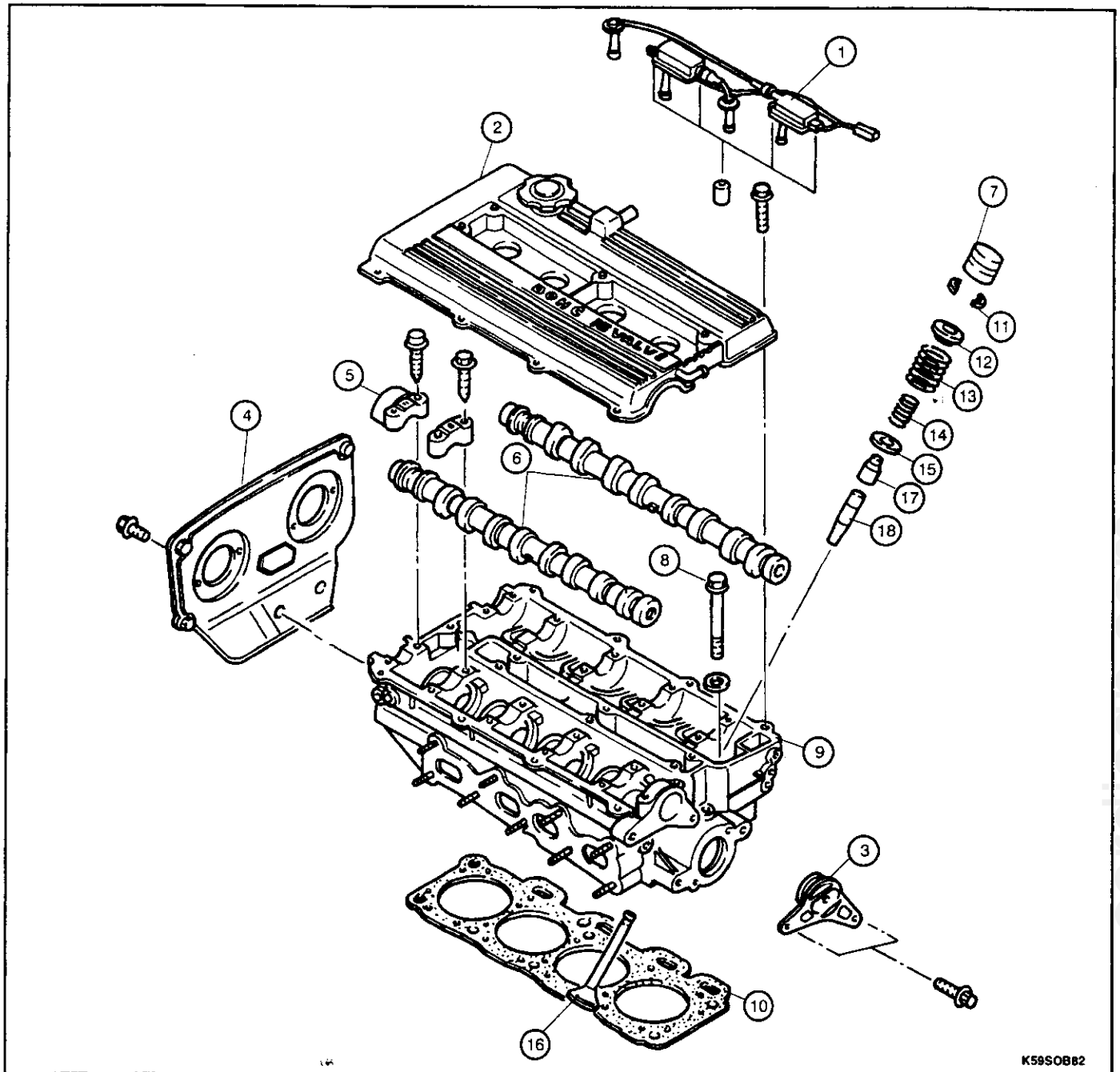
- Connect the negative battery cable.



K59SOB81

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CYLINDER HEAD



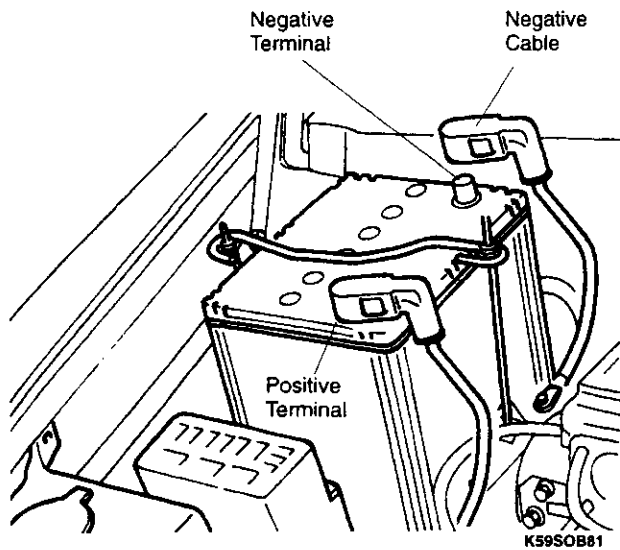
- | | | |
|------------------------------------------|----------------------------|------------------------|
| 1. Ignition Coils and High Tension Leads | 7. Hydraulic Lash Adjuster | 13. Outer Valve Spring |
| 2. Cylinder Head Cover | 8. Cylinder Head Bolt | 14. Inner Valve Spring |
| 3. Camshaft Position Sensor | 9. Cylinder Head | 15. Lower Spring Seat |
| 4. Seal Plate | 10. Cylinder Head Gasket | 16. Valve |
| 5. Camshaft Caps | 11. Valve Locks | 17. Valve Stem Seal |
| 6. Camshafts | 12. Upper Spring Seat | 18. Valve Guide |

K59S0882

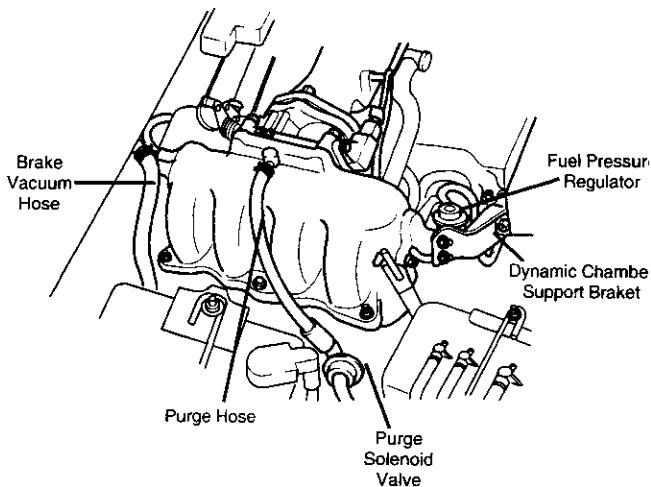
CYLINDER HEAD

Removal

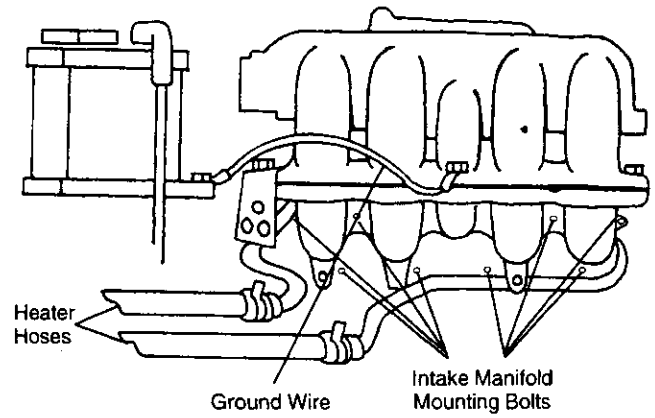
1. Disconnect the negative battery cable.



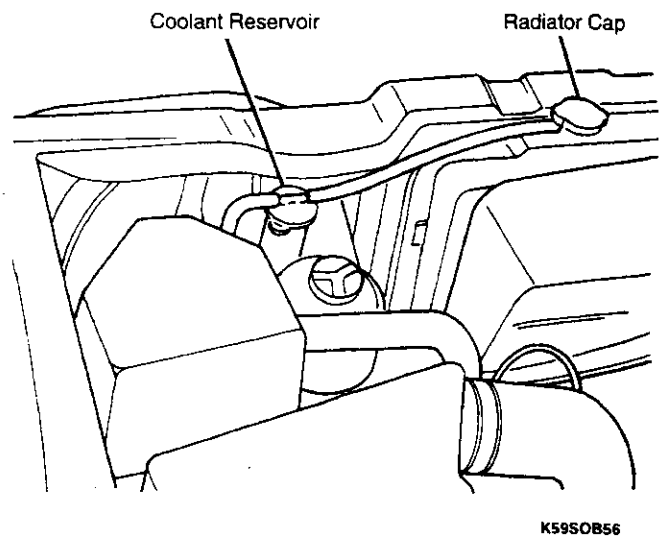
2. Remove the brake booster vacuum hose from the dynamic chamber.
3. Remove the fuel line from the pressure regulator and the return line located at the rear of the dynamic chamber.



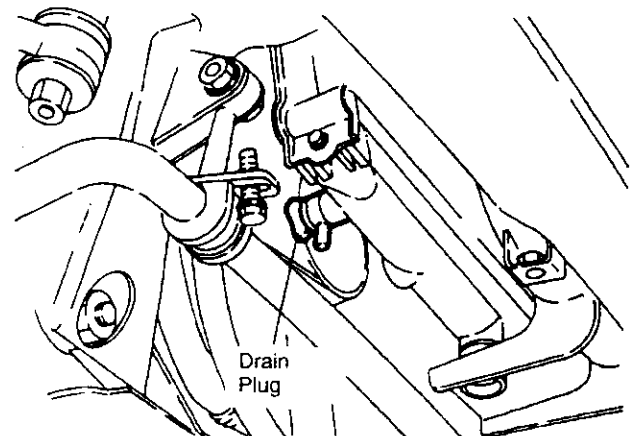
4. Remove the engine-to-body ground wire from the intake manifold and the harness bracket below it.



5. Remove the radiator cap.



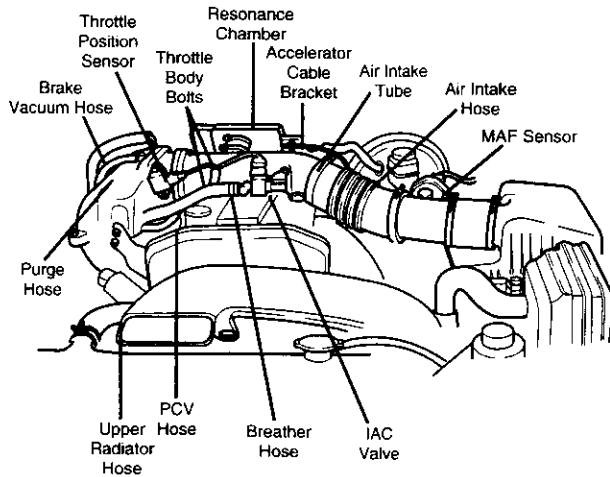
6. Remove the radiator drain plug and drain the engine coolant into a suitable container.
7. Tighten the radiator drain plug.



8. Remove the purge solenoid valve vacuum hose from the dynamic chamber.

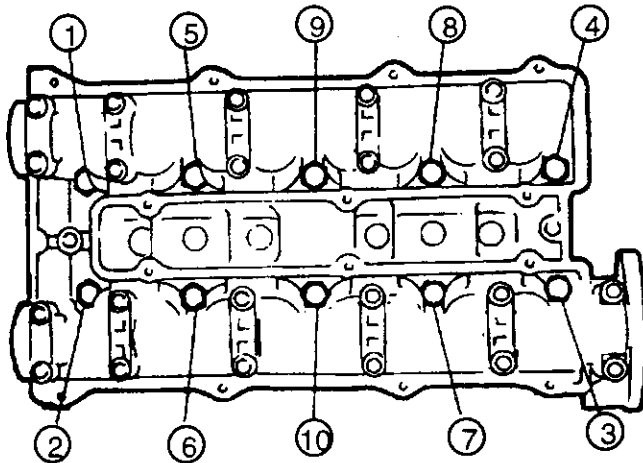
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- Loosen the two clamps and disconnect the upper radiator hose.



BN7A10001

- Remove the three intake manifold support bracket bolts and bracket.
- Remove the three converter inlet pipe flange locknuts.
- Remove the timing belt. Refer to *Timing Belt Removal*, page 10-13.
- Remove cylinder head cover. Refer to *Cylinder Head Cover Removal*, page 10-20.
- Remove the ten cylinder head bolts and carefully lift the cylinder head off the cylinder block with the intake and the exhaust manifolds attached.

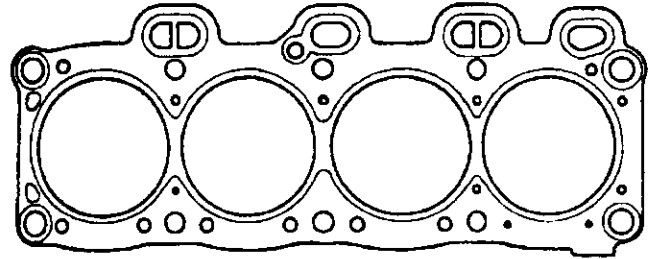


K59SOB92

- Disconnect the three wire harness connectors on the back of the cylinder head and remove the cylinder head assembly from the vehicle.

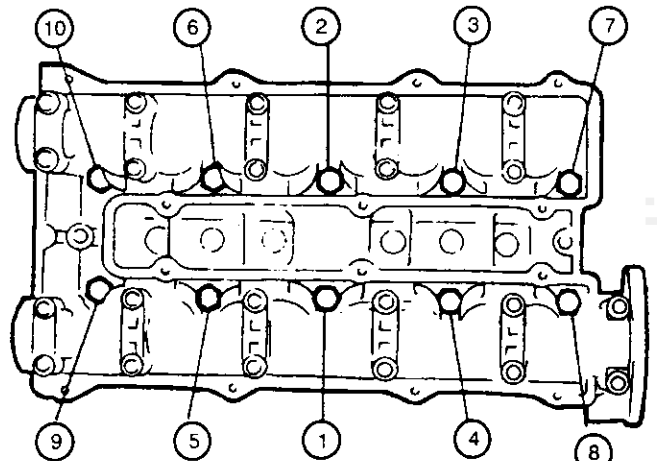
Installation

- Place the new cylinder head gasket in position.
- Place cylinder head with manifolds installed over cylinder block and attach the three wire harness connectors to the back of the head.
- Lower cylinder head onto cylinder block.



K59SOB93

- Install the ten cylinder head bolts.



K59SOB94

- Tighten the cylinder head bolts to specification. Follow the pattern shown, and tighten in 3 equal steps.

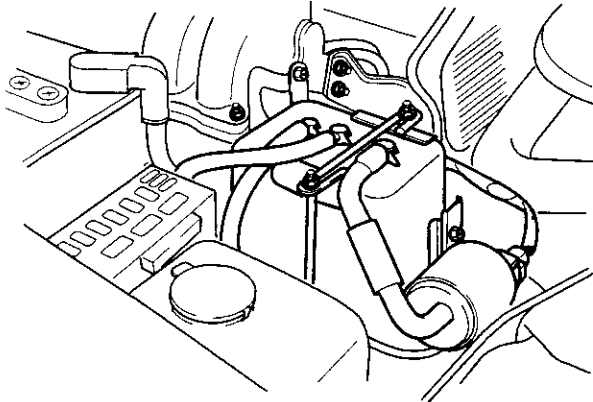
Tightening torque:
59-64 lb-ft (80 - 87 N·m)

- Install cylinder head cover. Refer to *Cylinder Head Cover Installation*, page 10-20.
- Install the timing belt. Refer to *Timing Belt Installation*, page 10-15.
- Install the five converter inlet pipe flange locknuts and tighten to specification.

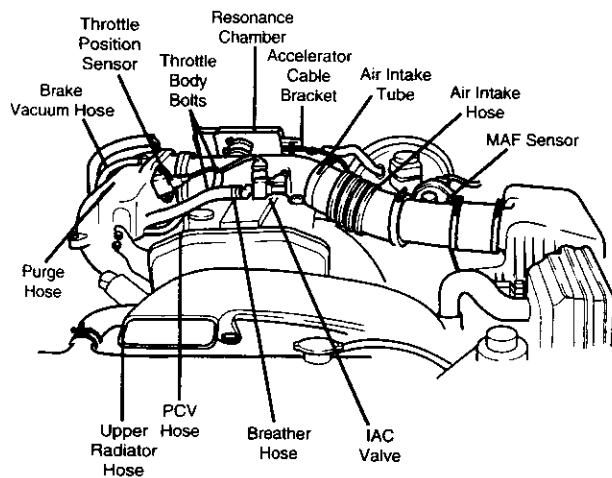
Tightening torque:
24 lb-ft (33 N·m)

- Install the upper radiator hose and tighten the two clamps.
- Fill radiator and install cap.

11. Connect the vacuum hose from the intake manifold to the charcoal canister.



12. Connect the purge solenoid vacuum hose to the dynamic chamber.

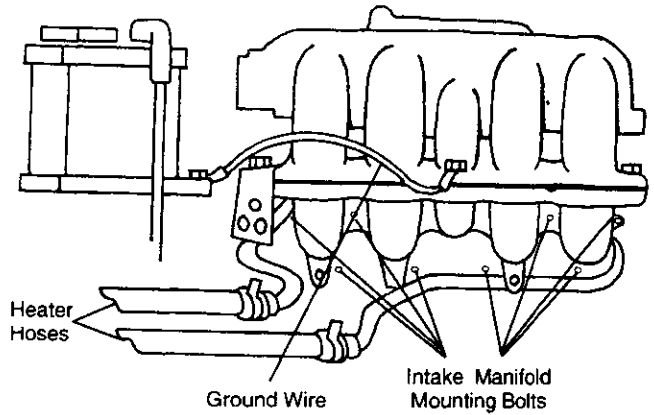


BN7A10001

13. Install the engine-to-body ground wire and the harness bracket to the intake manifold.

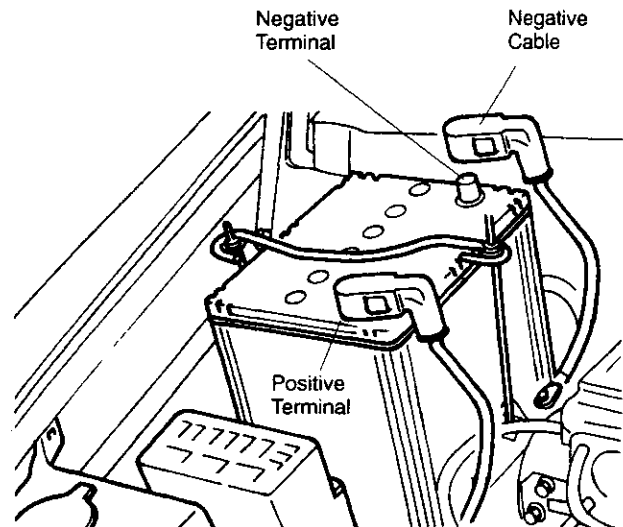
Tightening torque:

14-18 lb-ft (19-25 N·m)



K59SOB99

14. Install the fuel line to the pressure regulator and the return line to the fuel rail located at the rear of the dynamic chamber.
15. Install the brake booster vacuum hose to the dynamic chamber.
16. Reconnect the negative battery cable.

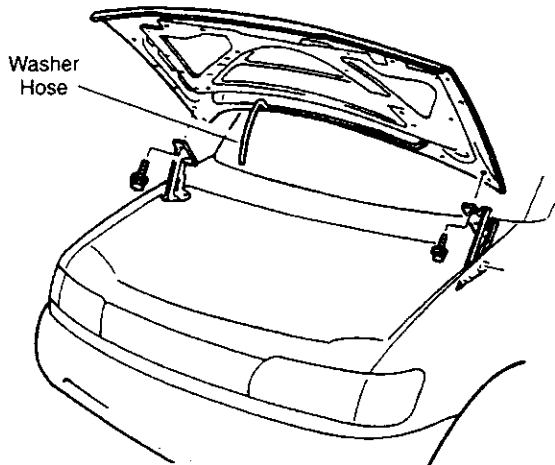


K59SOB102

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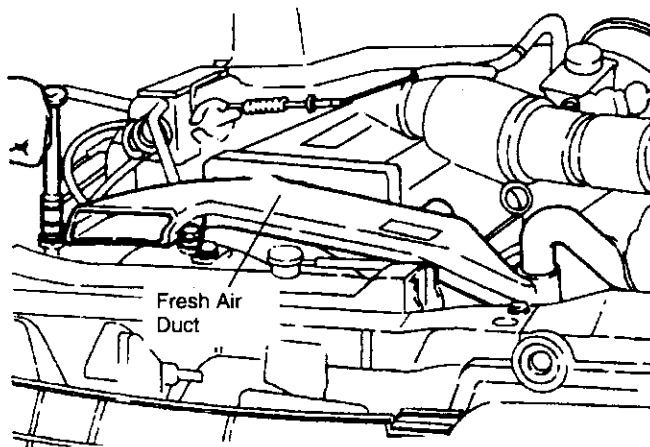
ENGINE REMOVAL

1. Disconnect the negative battery cable.
2. Release the fuel system pressure. Refer to *Fuel System*, Section 22.
3. Remove the windshield washer hose from the hood.
4. Remove the four hood mounting bolts and the hood.



K59SOB103

5. Remove the two fresh air duct mounting bolts on the radiator.
6. Loosen the fresh air duct clamp at the air intake housing.
7. Remove the fresh air duct.



K59SOB104

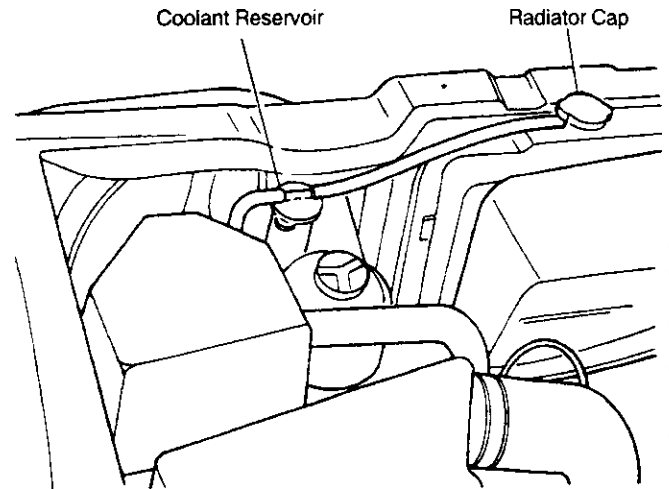
8. Remove the accelerator cable and the transmission control cable (A/T only).
9. Disconnect the accelerator cable by pulling back on the throttle shaft. Rotate the accelerator cable until it aligns with the slot in the pulley.
10. Remove the resonance chamber mounting bolt, chamber bolt and air silencer.
11. Remove the IAC air hose, the breather hose and the vacuum line from the air intake tube.

12. Disconnect the MAF sensor connector by pushing on the wire clip.
13. Loosen the air inlet hose clamp from the MAF sensor.
14. Remove the three bolts from the air intake tube to throttle body.
15. Remove the air intake hose and air intake tube as an assembly.

Caution

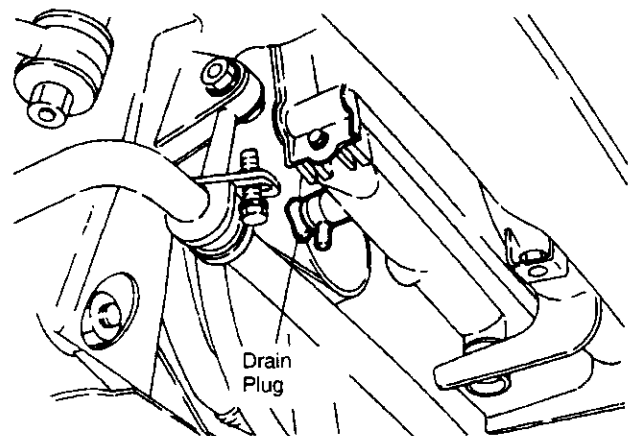
Never remove the radiator cap while the engine is hot.

16. Remove the radiator cap.



K59SOB106

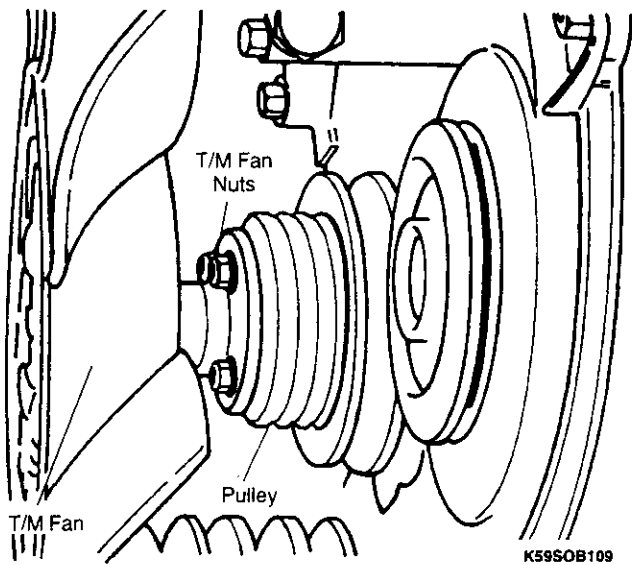
17. Loosen the radiator drain plug and drain the engine coolant into a container.
18. Tighten the radiator drain plug.



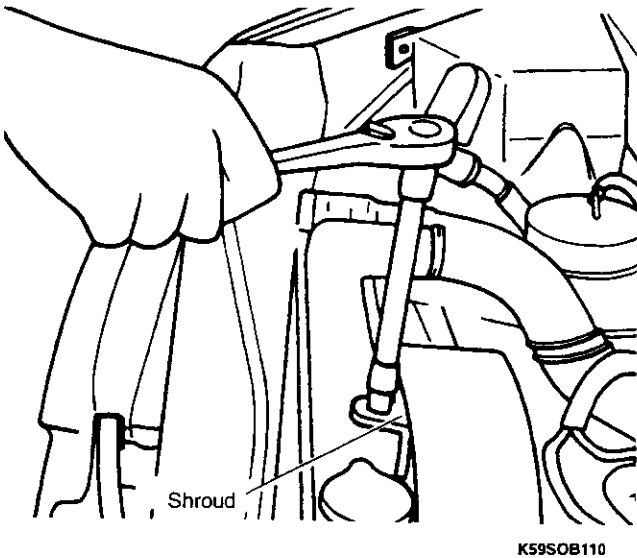
K59SOB107

19. Loosen and remove the upper radiator hose clamps, and remove the upper radiator hose.

20. Remove the four thermo-modulated fan nuts.

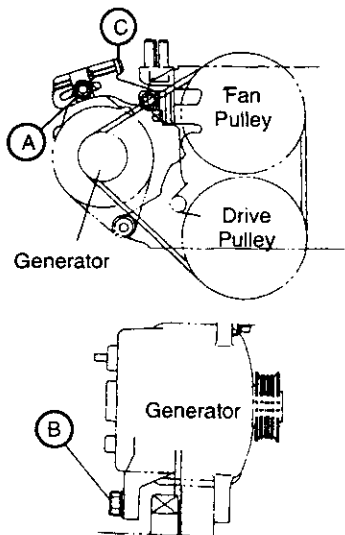


21. Remove the five cooling fan shroud bolts.



22. Remove the thermo-modulated fan and the cooling fan shroud at the same time.

23. Loosen the generator mounting bolts (A and B).

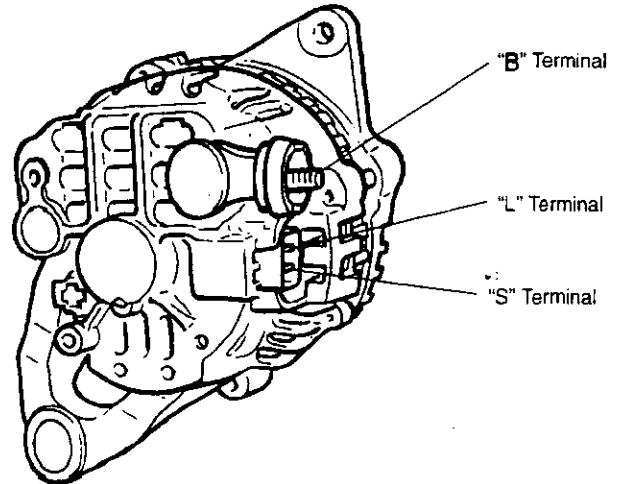


24. Loosen the generator drive belt by loosening the adjusting bolt (C).

25. Remove the generator drive belt.

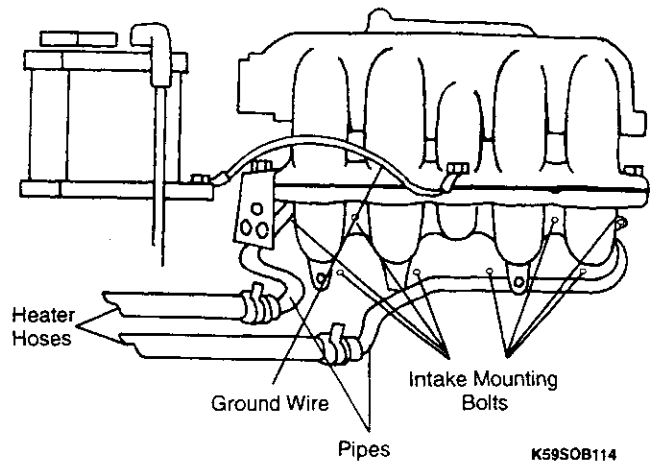
26. Remove the fan pulley.

27. Remove the two electrical connectors (clip type "L" and "S", bolt type "B") from the generator as shown in the figure.



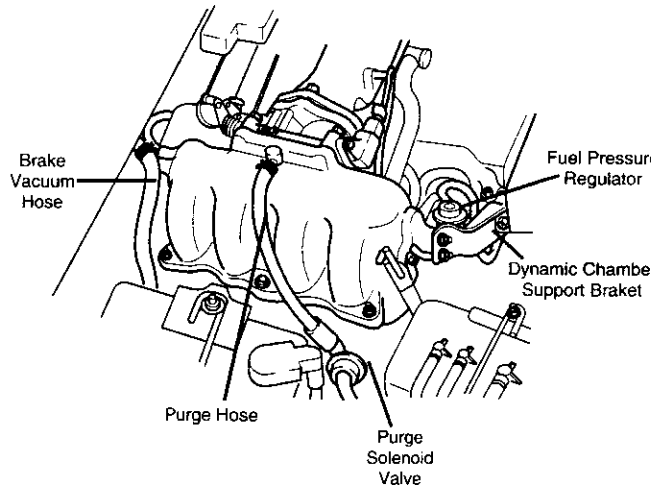
28. Remove both heater hoses from the pipes.

29. Remove the engine-to-body ground wire from the intake manifold and the harness bracket below it.



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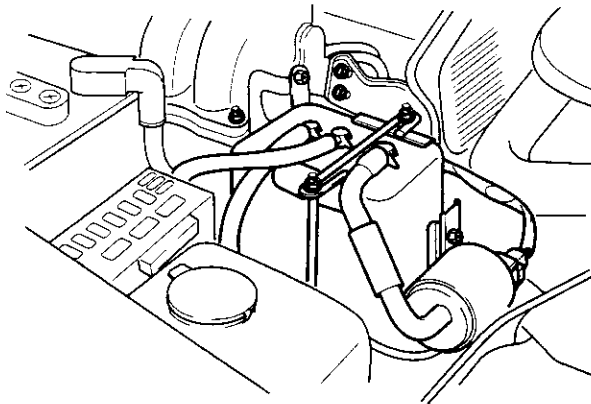
30. Remove the brake booster vacuum hose from the dynamic chamber.



31. Remove the fuel line from the fuel pressure regulator and the return line located at the rear of the dynamic chamber.

*** Notice**
Remove the cruise control actuator vacuum hose from the dynamic chamber, if necessary.

32. Remove the purge solenoid valve vacuum hose from the dynamic chamber.
33. Remove the three vacuum hoses from the top of the charcoal canister.

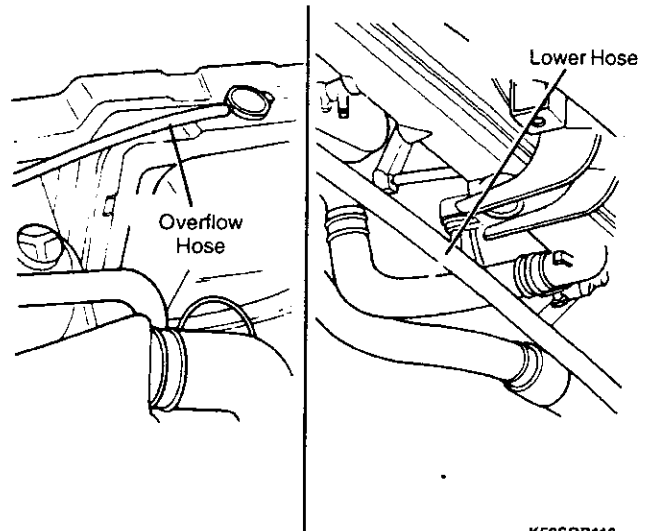


34. Remove the charcoal canister by sliding it up out of the holder. Place it out of the way to gain access to the A/C compressor.

35. Loosen the two lower radiator hose clamps.

*** Notice**
There will be coolant left in this hose. Place the coolant drain pan under this connection prior to breaking the connection.

36. Remove the lower radiator hose.

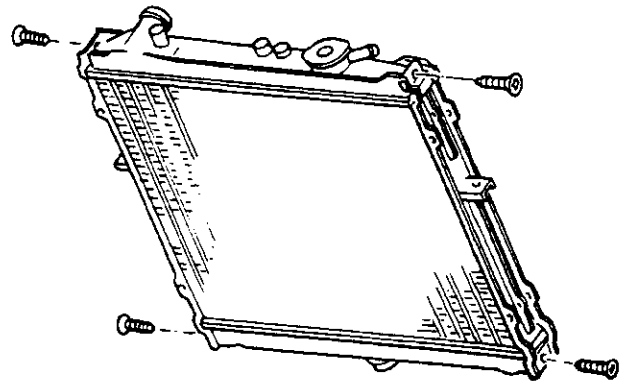


K59SOB118

37. Loosen the two lower ATF cooler line clamps.

*** Notice**
There will be ATF fluid in these lines. Place an ATF coolant drain pan under these connections prior to breaking the connections.

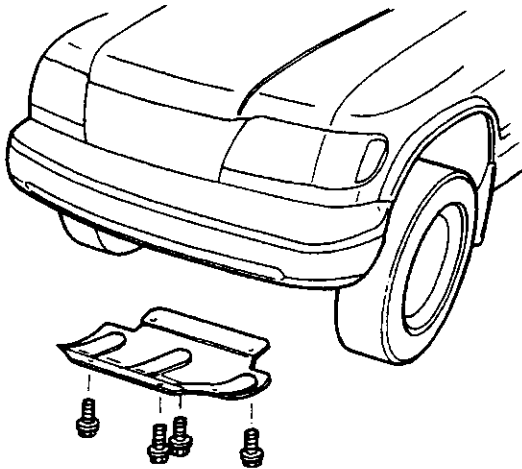
38. Remove the lower ATF cooler lines.
39. Remove the four radiator mounting nuts located on the sides, top and bottom.
40. Remove the coolant overflow hose.
41. Remove the radiator.



K59SOB119

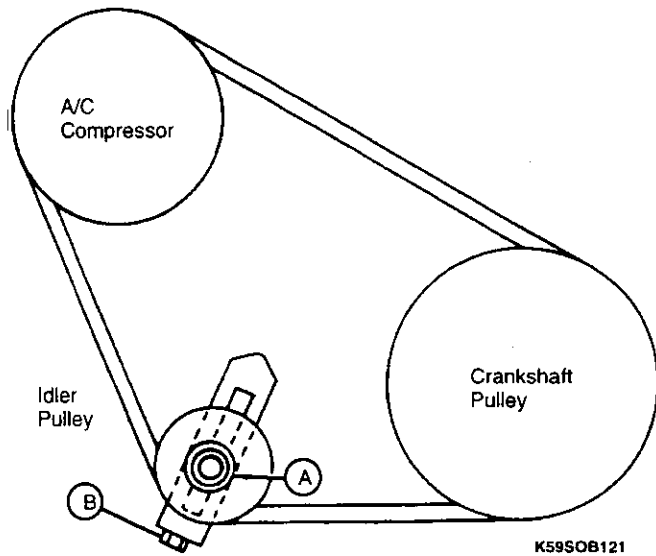
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42. Raise and properly support the vehicle.
43. Remove the four undercover (lower splash guard) mounting bolts and the undercover.



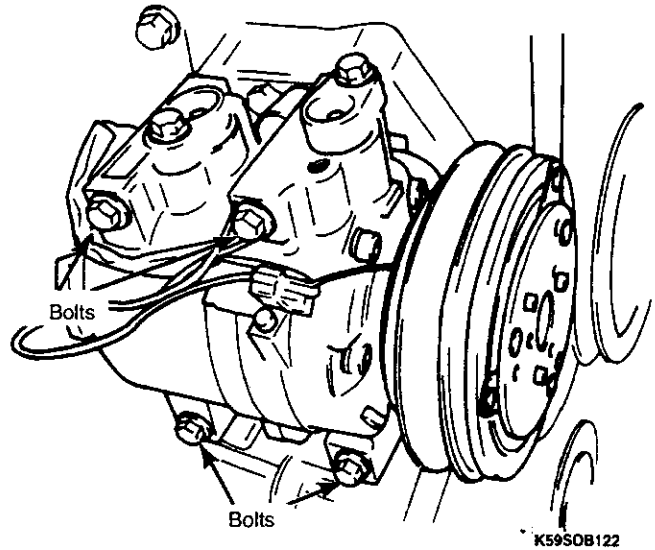
K59SOB120

44. Loosen the A/C idler pulley locknut (A).



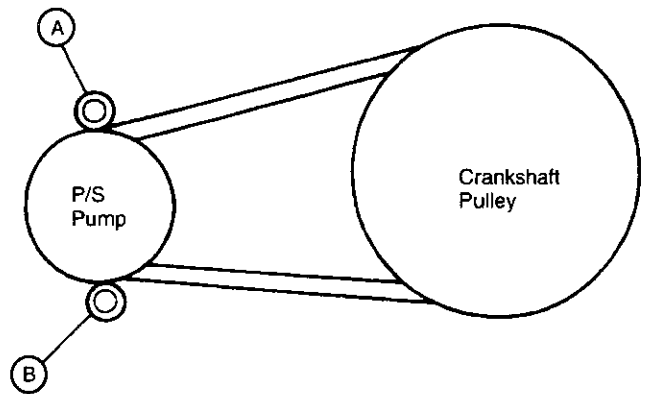
K59SOB121

45. Remove the A/C drive belt by loosening the adjusting bolt (B).
46. Remove the two A/C belt idler pulley bracket mounting bolts and the A/C idler pulley bracket.
- * **Notice**
Be careful not to damage the A/C compressor or power steering hoses when moving them.
47. Remove the four A/C compressor mounting bolts and the A/C compressor. Position the A/C compressor away from the engine.



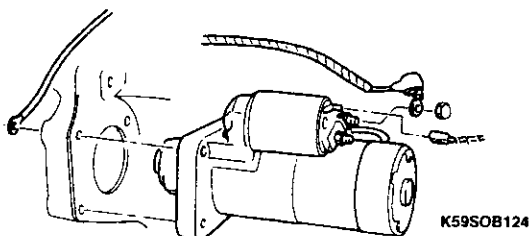
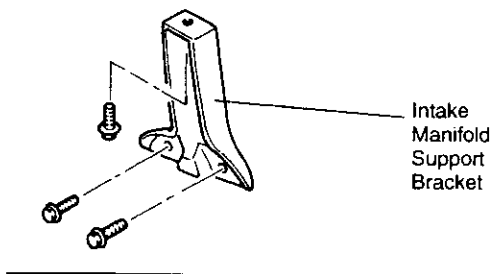
K59SOB122

48. Loosen the power steering pump lock bolt (A) and mounting bolt (B).

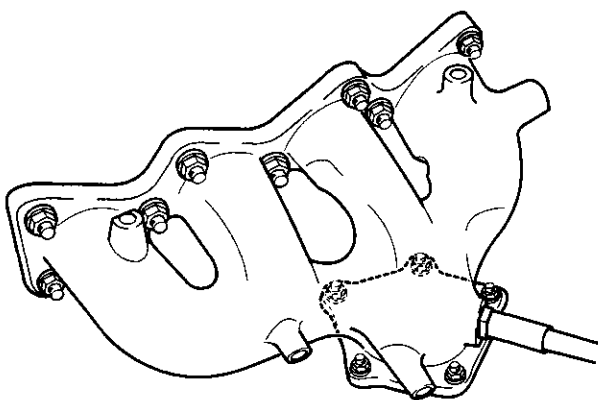


K59SOB123

49. Remove the power steering drive belt.
50. Remove the power steering pump lock bolt (A) and mounting bolt (B) and position the power steering pump away from the engine.
51. Remove the three intake manifold support bracket bolts and the bracket.
52. Remove the three starter bolts.
53. Remove the starter and position it away from the engine.
- * **Notice**
Suspend the starter so there is no tension on the wire harness.

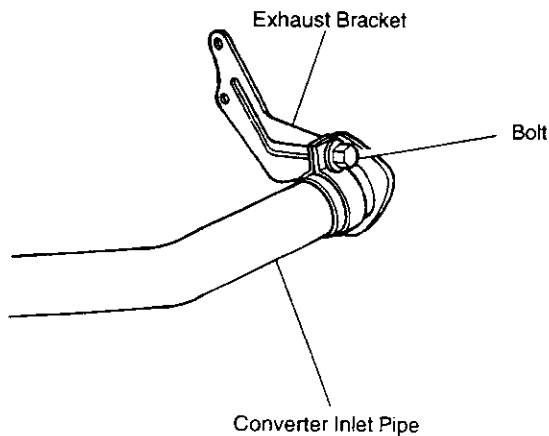


54. Remove the five converter inlet pipe flange locknuts.



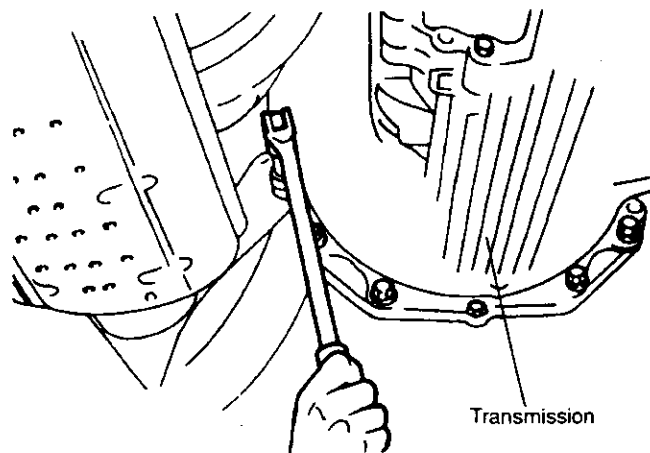
55. Remove the front exhaust bracket bolt.

56. Remove the two exhaust bracket-to-clutch (M/T)/converter (A/T) housing mounting bolts and the bracket.



K59SOB126

57. Remove the clutch (M/T)/converter (A/T) housing-to-engine mounting bolts.



K59SOB127

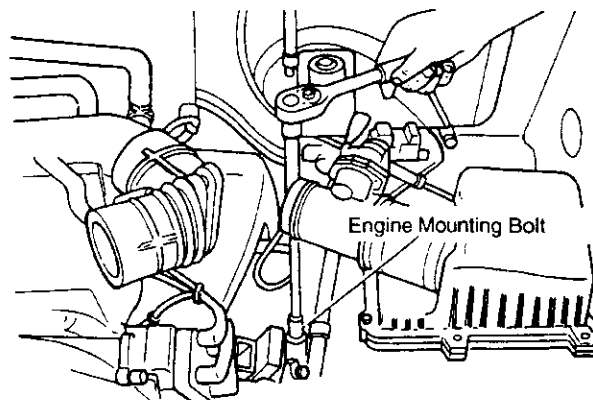
58. Lower the vehicle.

59. Remove six drive plate-to-torque converter bolts (A/T only).

60. Suitably support the transmission from underneath.

61. Connect an engine hoist to the engine.

62. Remove the three left side engine mounting bolts.



K59SOB129

63. Remove the three right side engine mounting bolts.

64. Lift the engine up and move forward slightly to provide access to the three electrical connectors at the rear of the engine cylinder head.

65. Disconnect the three electrical connectors at the rear of the engine compartment (camshaft position sensor, ignition coils, and condenser).

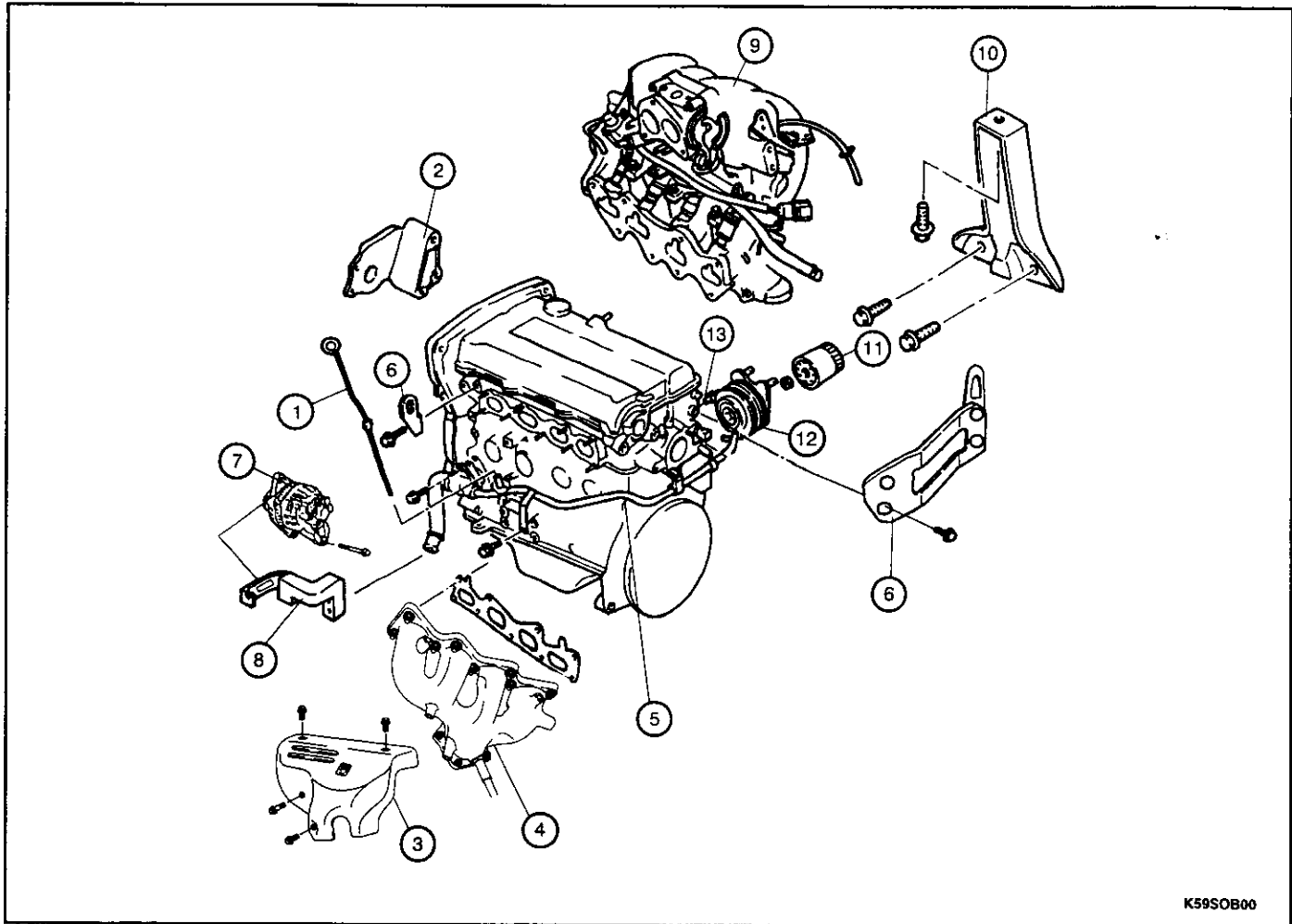
66. Slowly remove the engine from the vehicle, checking for any unconnected connectors, or mechanical "hang-ups". Disconnect any connectors, and free any mechanical "hang-ups" prior to continuing.

DISASSEMBLY

1. Remove in the sequence shown in the figure below.
2. Mark all identical parts (such as pistons, piston rings, connecting rods, and valve springs) so that they can be reinstalled in the cylinder from which they were removed.
3. Clean the parts with steam and blow off any remaining water with compressed air.

Caution

Wear eye protection when drying parts with compressed air.

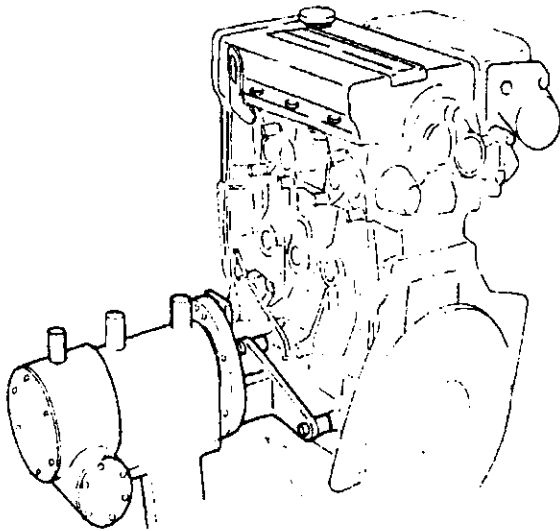


K59SOB00

- | | | |
|---------------------------------------|-------------------------------------|-------------------------|
| 1. Oil Level Gauge | 6. Engine Hanger | 11. Oil Filter |
| 2. Thermo-Modulated Fan Bracket | 7. Generator | 12. Oil Cooler |
| 3. Exhaust Manifold Heat Shield | 8. Generator Strap and Bracket | 13. Oil Pressure Switch |
| 4. Exhaust Manifold | 9. Intake Manifold Assembly | |
| 5. Coolant Inlet Pipe and Bypass Pipe | 10. Intake Manifold Support Bracket | |

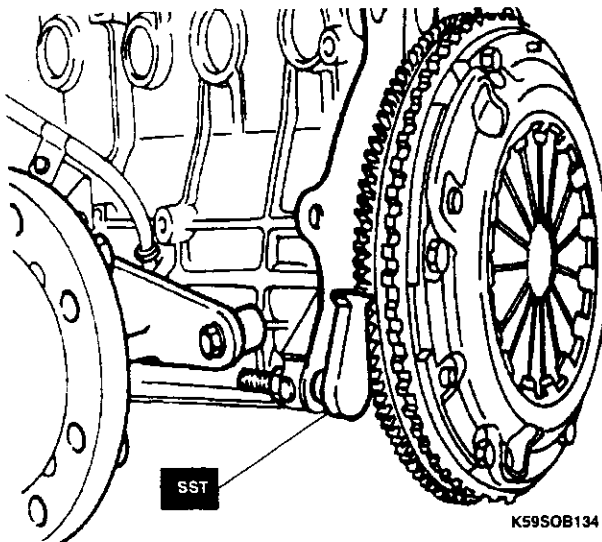
SUPPORT ENGINE

1. Mount the engine on an engine stand.



K59SOB132

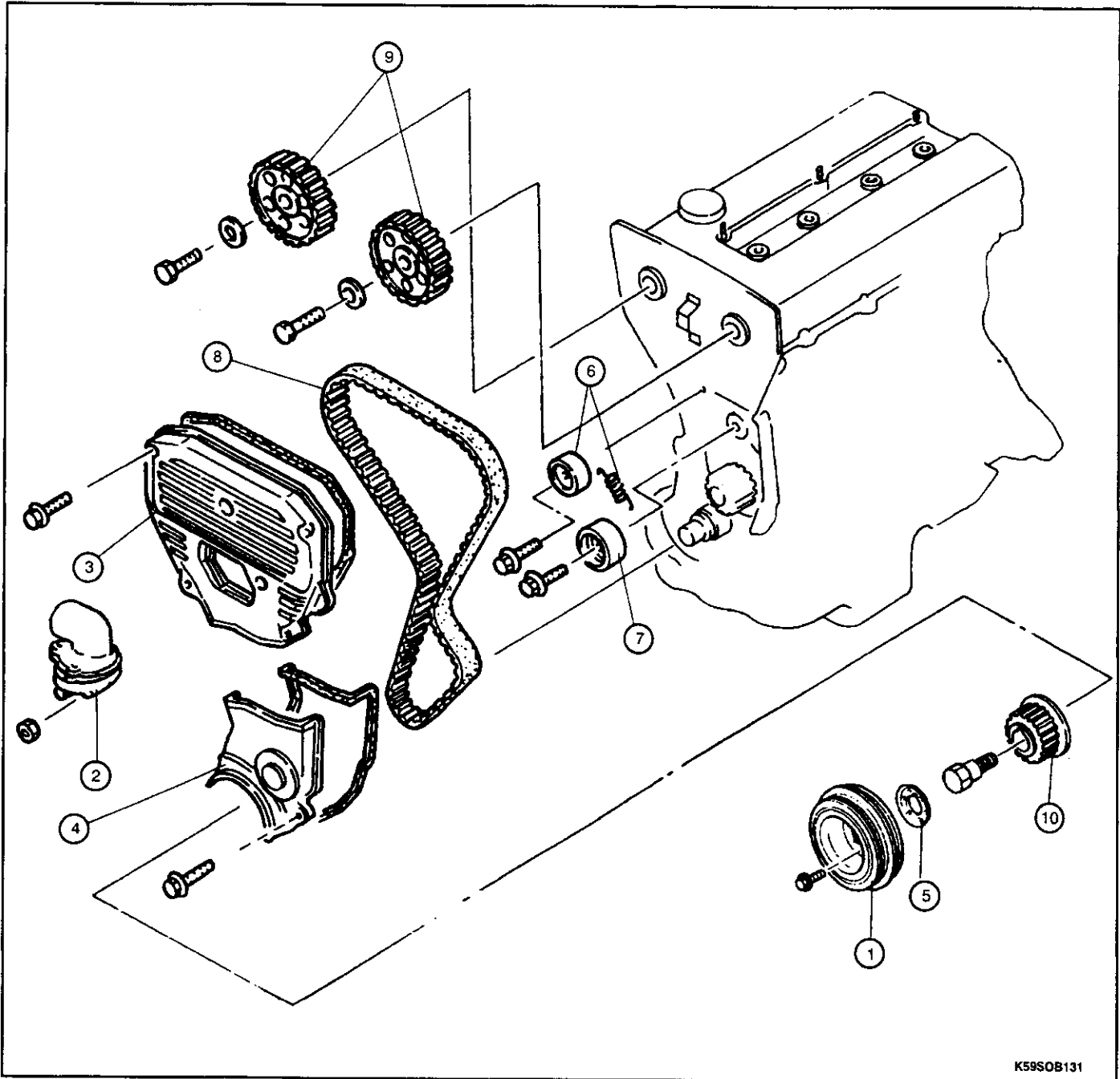
2. Use a tool to prevent the flywheel from turning when loosening the crankshaft pulley bolt.



K59SOB134

TIMING BELT

1. Remove in the sequence shown in the figure below. Refer to *Timing Belt*, page 10-41.



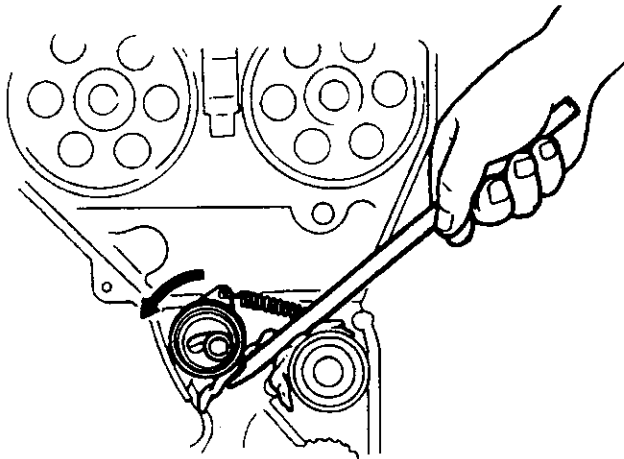
K59SOB131

- | | |
|----------------------------|--------------------------------------------|
| 1. Crankshaft Pulley | 6. Timing Belt Tensioner Pulley and Spring |
| 2. Thermostat Assembly | 7. Timing Belt Idler Pulley |
| 3. Upper Timing Belt Cover | 8. Timing Belt |
| 4. Lower Timing Belt Cover | 9. Camshaft Pulleys |
| 5. Timing Belt Guide Plate | 10. Timing Belt Pulley |

TIMING BELT

1. Loosen the tensioner lock bolt, and pivot the tensioner pulley outward, removing the tension from the timing belt and tighten the tensioner lock bolt.

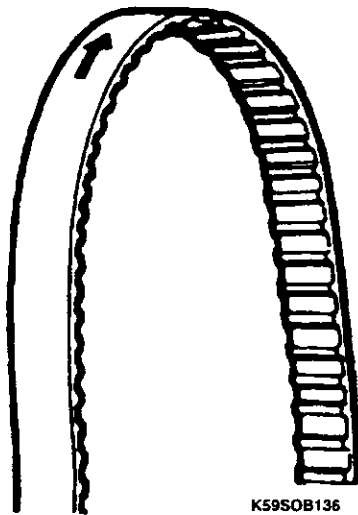
Tightening torque:
27 - 38 lb-ft (37- 52 N·m)



K59SOB135

2. Mark the timing belt rotation for proper reinstallation if it is reused.

Mark the
Direction of
Rotation



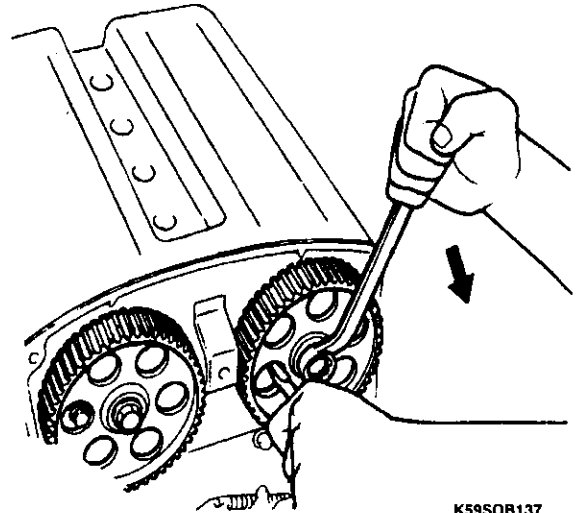
K59SOB136

3. Remove the timing belt.

Caution
Be careful not to allow oil or grease on the belt.

CAMSHAFT PULLEYS

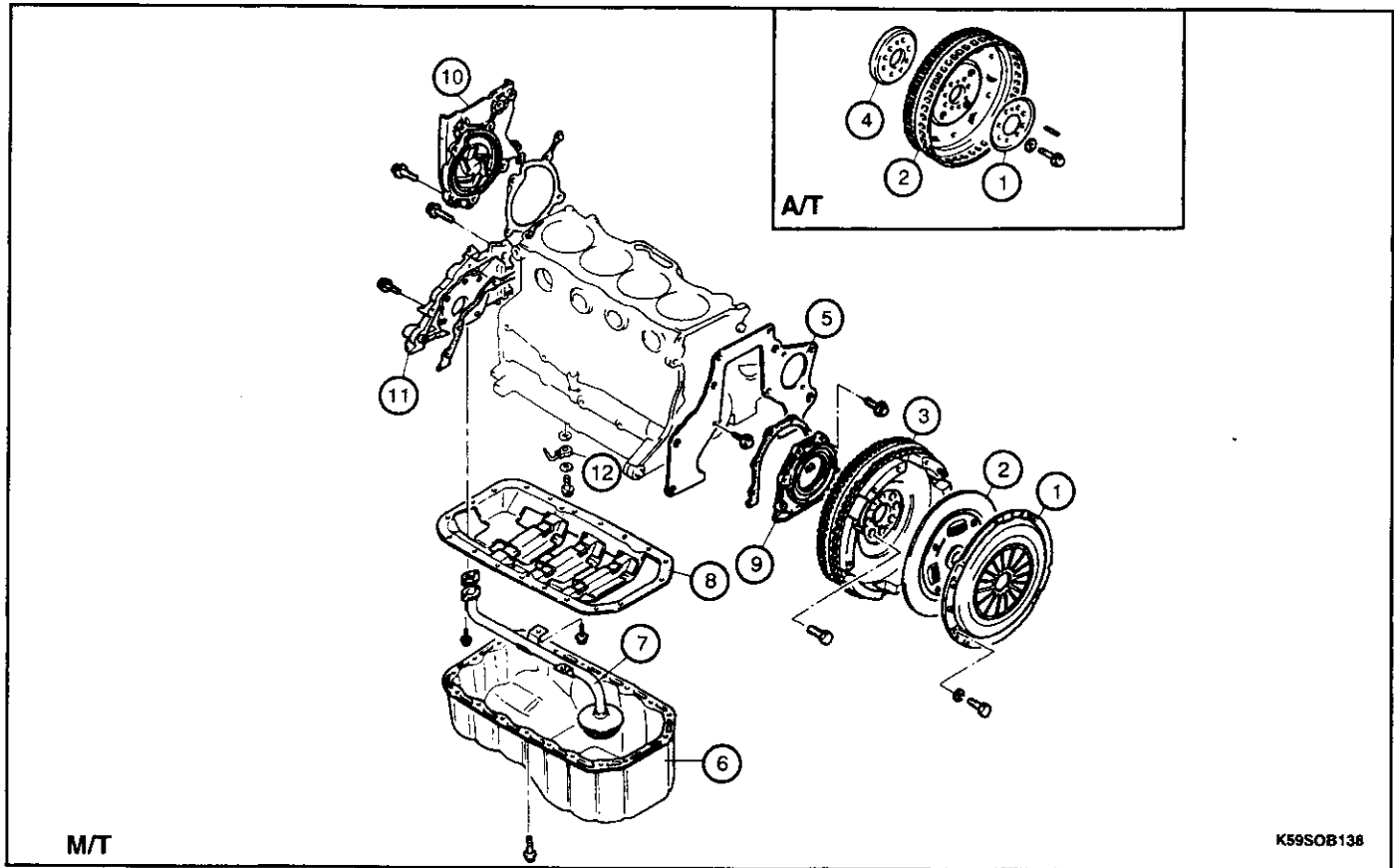
1. Hold the camshafts with a wrench.
2. Remove the camshaft pulley lock bolts and the camshaft pulleys.



K59SOB137

CYLINDER BLOCK (EXTERNAL PARTS) DISASSEMBLY

1. Remove external engine parts in the sequence shown below.

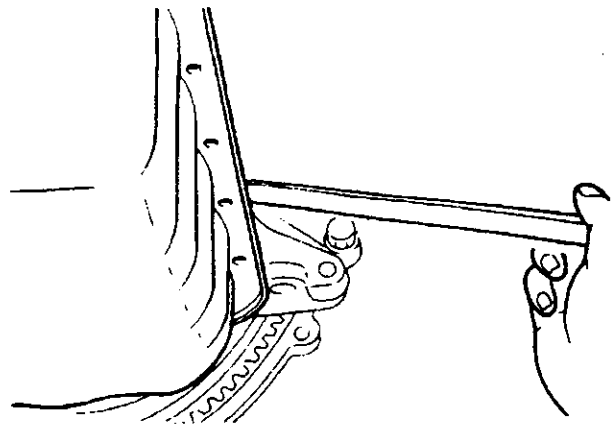


- | | |
|--------------------------------------------|-------------------------|
| 1. Clutch Cover (M/T), Backing Plate (A/T) | 7. Oil Strainer |
| 2. Clutch Disk (M/T), Drive Plate (A/T) | 8. Stiffener Plate |
| 3. Flywheel (M/T) | 9. Rear Cover |
| 4. Drive Plate Adapter (A/T) | 10. Water Pump Assembly |
| 5. Separator Plate | 11. Oil Pump Assembly |
| 6. Oil Pan | 12. Piston Cooling Jet |

Oil Pan

1. Remove the oil pan mounting bolts.
2. Insert a scraper or a tool between the oil pan and the stiffener or cylinder block to separate them.
3. Remove the oil pan.

Caution
 Do not damage or scratch the contact surface when removing the oil sealant.

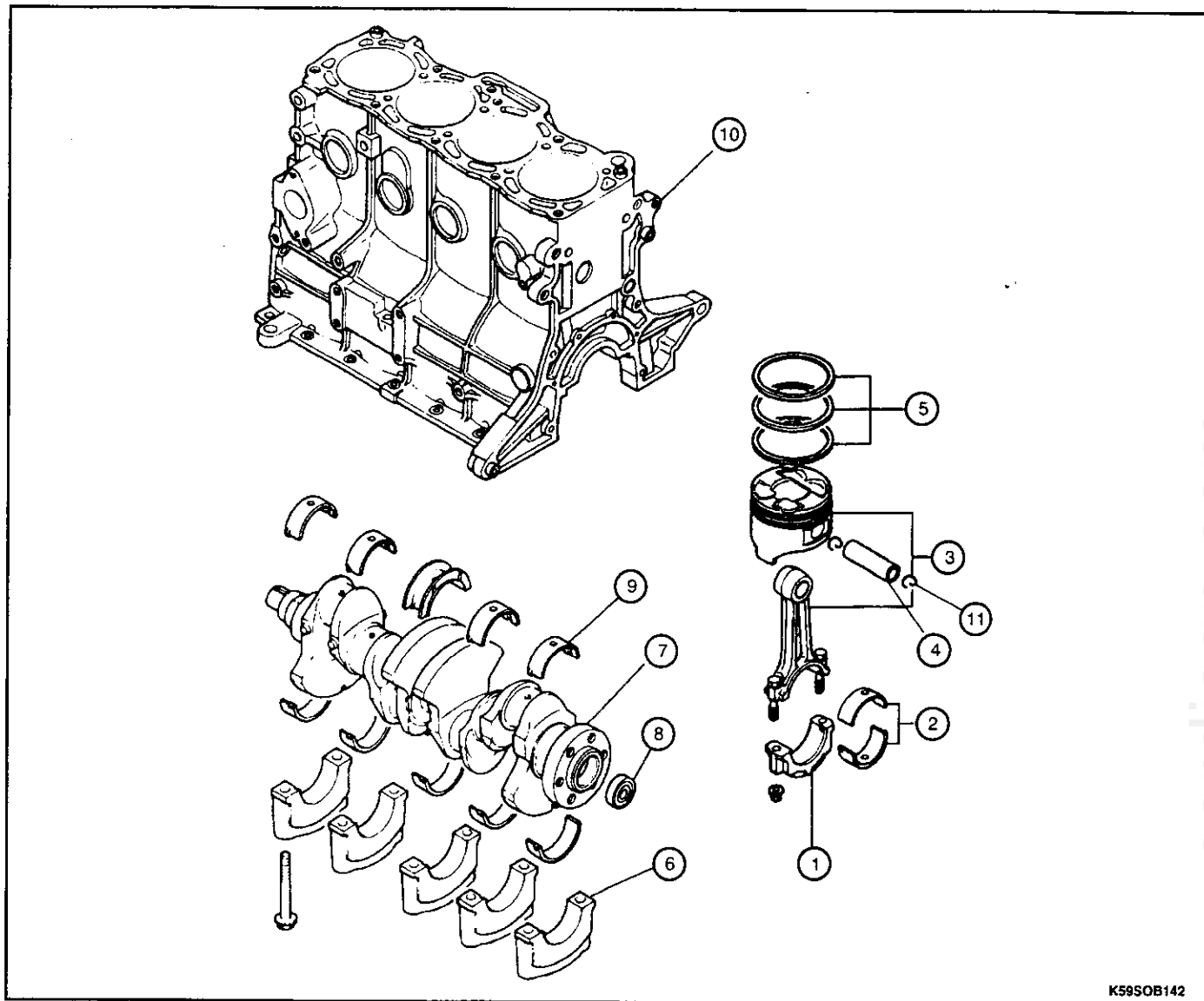


K59SOB141

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CYLINDER BLOCK (INTERNAL PARTS) DISASSEMBLY

1. Remove the internal parts shown below.
2. Refer to *Connecting Rod and Cap* and *Main Bearing Cap*, page 10-44, before removing connecting rod or main bearing caps.
3. Clean and inspect all parts for wear and damage. Replace or repair as necessary.

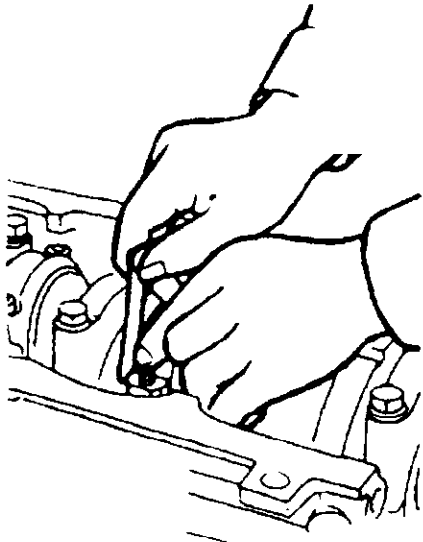


K59SOB142

- | | |
|------------------------------|---------------------------------|
| 1. Connecting Rod Cap | 7. Crankshaft |
| 2. Connecting Rod Bearing | 8. Pilot Bearing (M/T) |
| 3. Connecting Rod and Piston | 9. Main Bearing |
| 4. Piston Pin | 10. Cylinder Block |
| 5. Piston Rings | 11. Piston Pin Clip (Snap Ring) |
| 6. Main Bearing Cap | |

Connecting Rod and Cap

1. Before removing the connecting rod cap, measure the connecting rod side clearance. Refer to *Connecting Rod and Cap*, page 10-64. If the connecting rod side clearance exceeds the maximum, the connecting rod must be replaced.

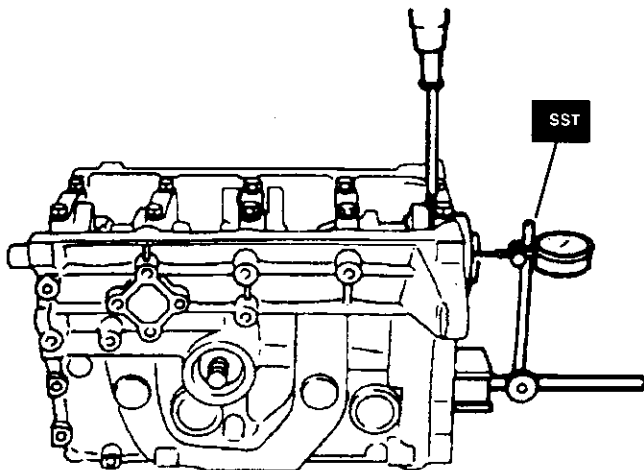


K59SOB143

2. Mark connecting rods and cap to ensure proper location during reassembly.
3. Remove connecting rod nuts and caps.
4. Cover connecting rod bolt threads with protectors such as short lengths of rubber tubing.
5. Remove piston and rod assemblies.

Main Bearing Cap

1. Before removing the main bearing caps, measure crankshaft end play. Refer to *Camshaft*, page 10-51. If crankshaft end play exceeds the maximum, the crankshaft must be reground and oversize thrust bearings used.

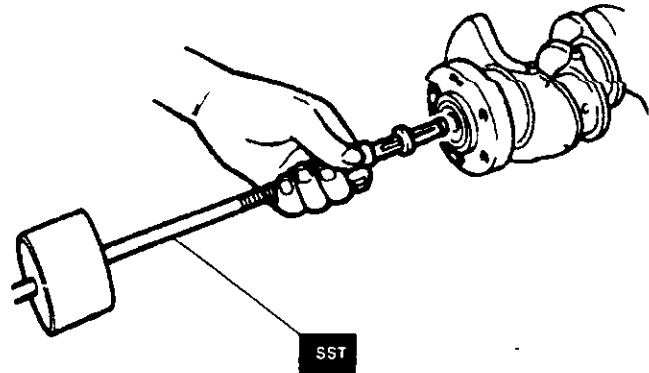


K59SOB145

2. Mark main bearing caps to ensure proper location for reassembly.
3. Remove the main bearing cap bolts and the caps.
4. Protect the crankshaft journals from damage by wrapping a shop rag around each one and securing with tape.

Pilot Bearing (M/T Only)

1. Remove the pilot bearing from the crankshaft with the proper seal remover.



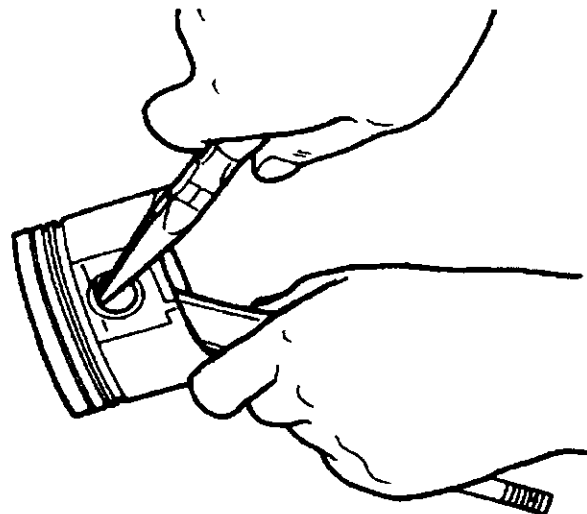
K59SOB144

Piston and Connecting Rod

1. Before disassembling the piston and connecting rod, re-install the connecting rod bearings, cap and cap nuts.
2. Inspect all parts for damage and wear. Replace or machine as necessary.

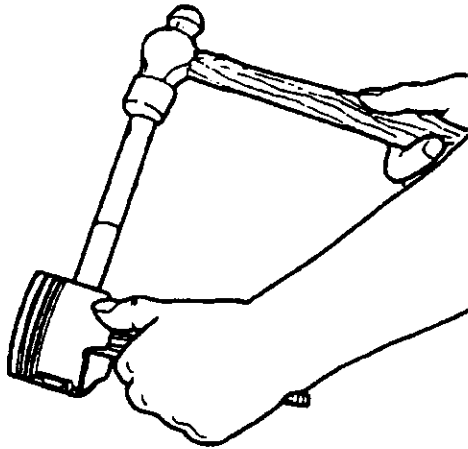
* **Notice**
If the large end does not drop by its own weight, replace the piston, piston pin, or bushing.

3. Remove the piston pin clips.



K59SOB205

4. Remove the piston pin.



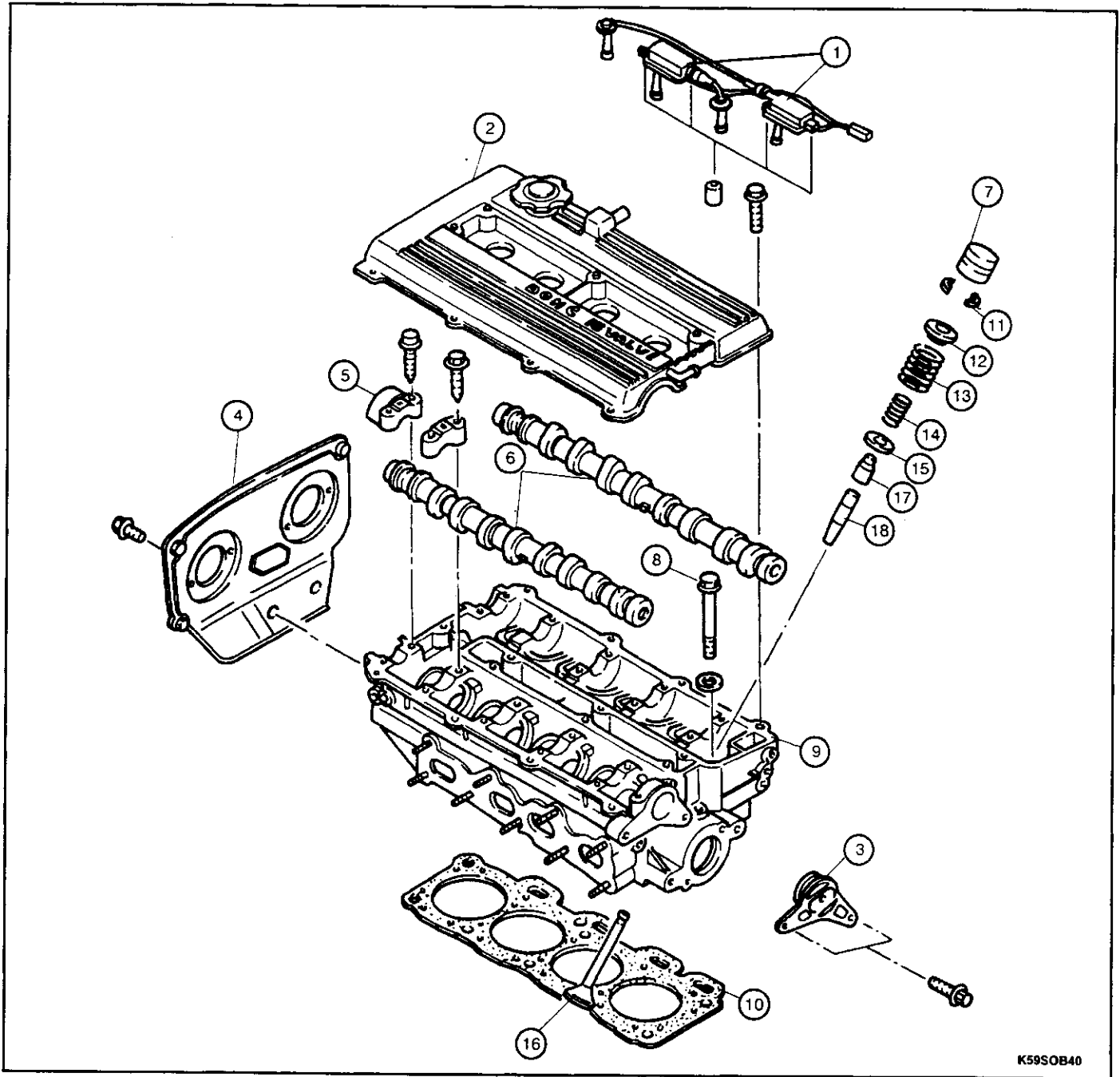
K59SOB147

INSPECTION AND REPAIR

1. Clean all parts, taking care to remove any gasket fragments, dirt, oil or grease, carbon, moisture residue or other foreign materials.
2. Inspect all parts for damage and wear. Replace or machine as necessary.

CYLINDER HEAD DISASSEMBLY

1. Disconnect and remove the ignition coils and high tension leads. Remove the cylinder head cover, camshaft position sensor, and seal plate as shown.
2. Loosen and remove the cylinder head bolts and remove the cylinder head.



1. Ignition Coils and High Tension Leads
2. Cylinder Head Cover
3. Camshaft Position Sensor
4. Seal Plate
5. Camshaft Caps
6. Camshafts

7. Hydraulic Lash Adjuster
8. Cylinder Head Bolt
9. Cylinder Head
10. Cylinder Head Gasket
11. Valve Locks
12. Upper Spring Seat

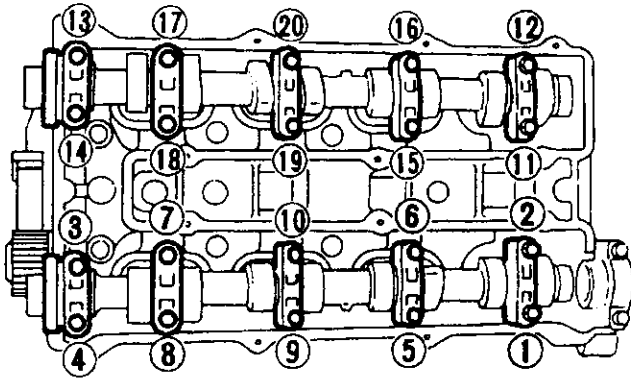
13. Outer Valve Spring
14. Inner Valve Spring
15. Lower Spring Seat
16. Valve
17. Valve Stem Seal
18. Valve Guide

K59SOB40

CYLINDER HEAD

Disassemble Cylinder Head

- Loosen the camshaft cap bolts in the order shown in the illustration.



K59SOB172

- Carefully remove the camshaft caps.
- Remove the camshafts.
- Remove the HLAs.

* *Notice*
Keep the HLAs in proper order if they are to be reused.

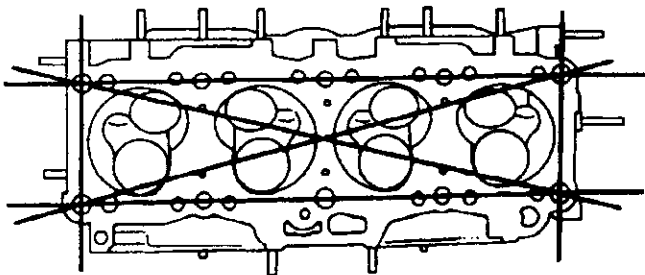
- Remove the valves from the cylinder head .

* *Notice*
Install HLA protector, SST K95A-1001-E, to protect the HLA bores from damage.

Inspect Cylinder Head

- Inspect the cylinder head for damage, cracks, and leakage of water or oil. Replace if necessary.
- Measure the cylinder head surface for distortion in the six directions shown in the figure.

Maximum Distortion:
0.006 in (0.15 mm) max.



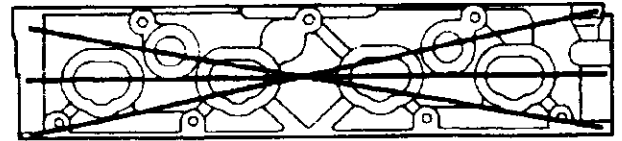
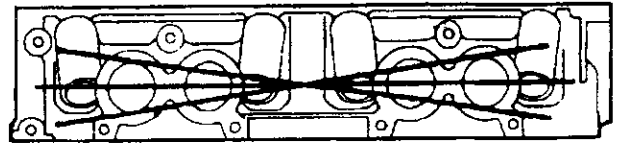
K59SOB148

- If the cylinder head distortion exceeds specification, grind the cylinder head surface.
- Before grinding the cylinder head, check the following. Replace if necessary.
 - Sinking of valve seat.
 - Damage of manifold contact surface.
 - Camshaft oil clearance and end play.

Grinding Limit: 0.008 in (0.20 mm) max.

- Measure the intake and exhaust manifold side contact surface distortion in the six directions shown in the figure.

Distortion: 0.006 in (0.15 mm) max.



K59SOB150

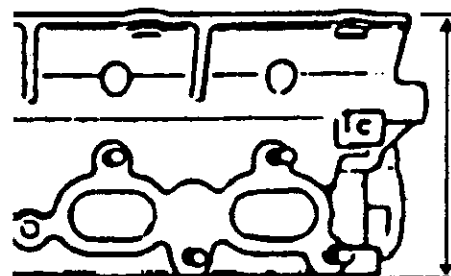
- If the distortion exceeds specification, grind the surface or replace the cylinder head.

Grinding Limit: 0.008 in (0.20 mm) max.

- Measure cylinder head height.

Cylinder Head Height:
5.274 - 5.278 in (133.95 - 134.05 mm)

* *Notice*
If the cylinder head height is not within specification, the cylinder head must be replaced.



Cylinder Head Height
5.274 - 5.278 in
(133.95 - 134.05 mm)

Valve and Valve Guide

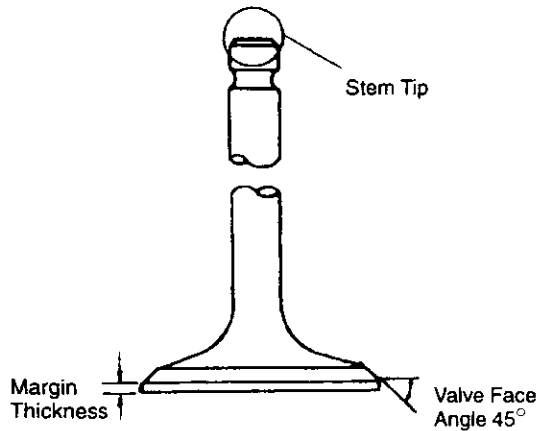
1. Inspect each valve for the following:
 - a. Damaged or bent stem.
 - b. Roughness or damage to face.
 - c. Damage or uneven wear of stem tip.

Replace or resurface if necessary.

2. Check the valve head margin thickness and replace if necessary.

Margin thickness

- IN: 0.033 in (0.85 mm) min.
- EX: 0.035 in (0.9 mm) min.



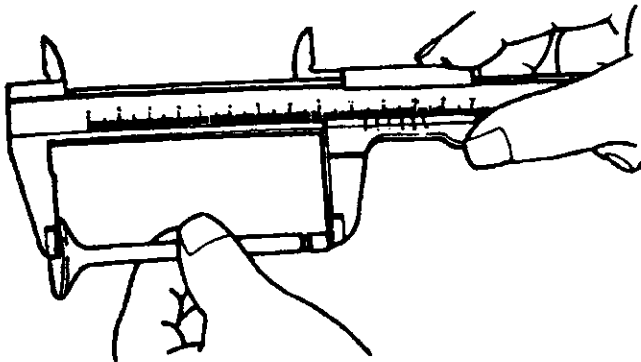
K59SOB151

3. Measure the valve length.

Length

- IN: 4.0622 in (103.18 mm) min.
- EX: 4.0921 in (103.94 mm) min.

4. If not within specification, replace the valve.

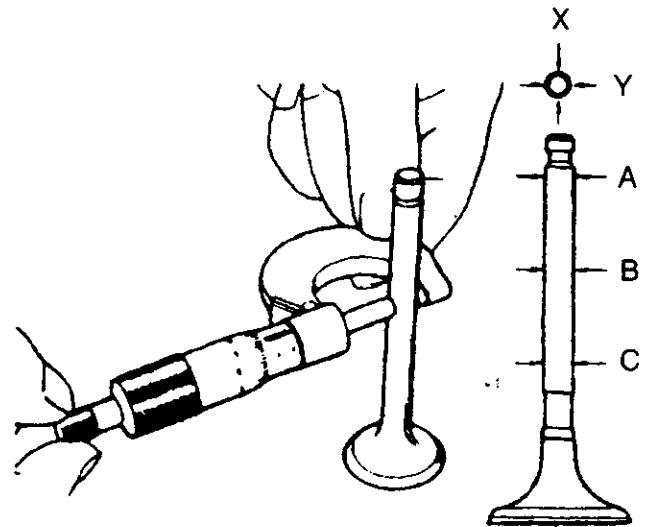


K59SOB152

5. Measure the valve stem diameter in the directions and locations shown.

Diameter

- IN: 0.2350 - 0.2356 in (5.970 - 5.985 mm)
- EX: 0.2348 - 0.2354 in (5.965 - 5.980 mm)

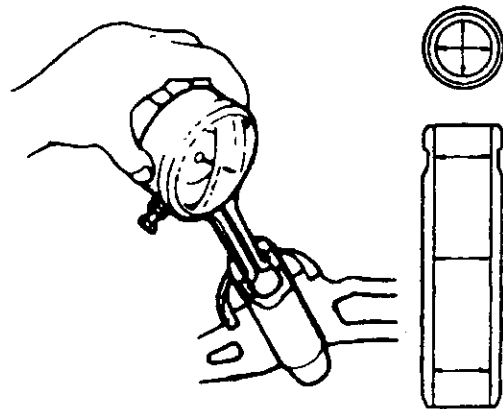


K59SOB153

6. If not within specifications, replace the valve.

7. Measure the valve guide inner diameter.

- IN: 0.2366 - 0.2374 in (6.01 to 6.03 mm)
- EX: 0.2366 - 0.2374 in (6.01 to 6.03 mm)



K59SOB154

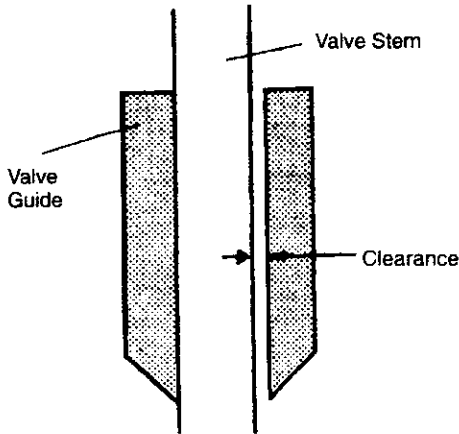
8. If not within specifications, replace the valve guide.

9. Measure the valve stem to guide clearance by subtracting the outer diameter of the valve stem from the inner diameter of the corresponding valve guide.

Clearance

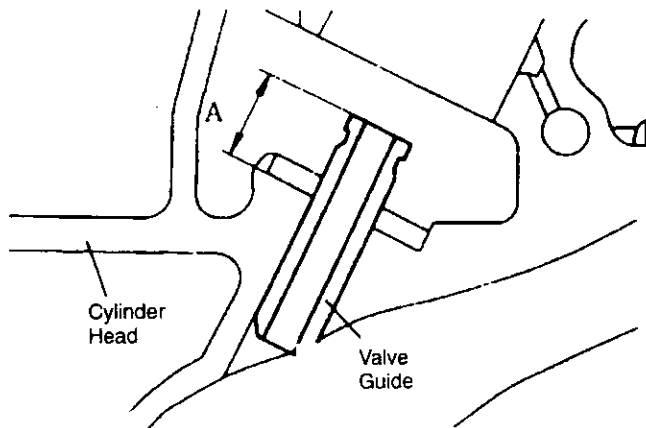
- IN: 0.0010 - 0.0024 in (0.025 to 0.060 mm)
- EX: 0.0012 - 0.0026 in (0.030 to 0.065 mm)

Maximum: 0.0079 in (0.20 mm)



K59SOB155

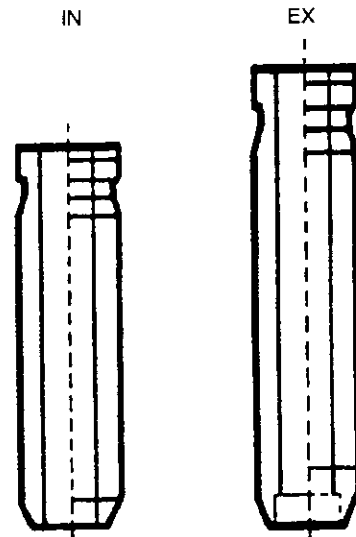
10. If the clearance exceeds the maximum, replace the valve and/or valve guide.
11. Check the valve guide projection height (dimension A in the figure).
Height: 0.449 - 0.469 in (11.4 to 11.9 mm)



K59SOB156

Replacement of Valve Guides

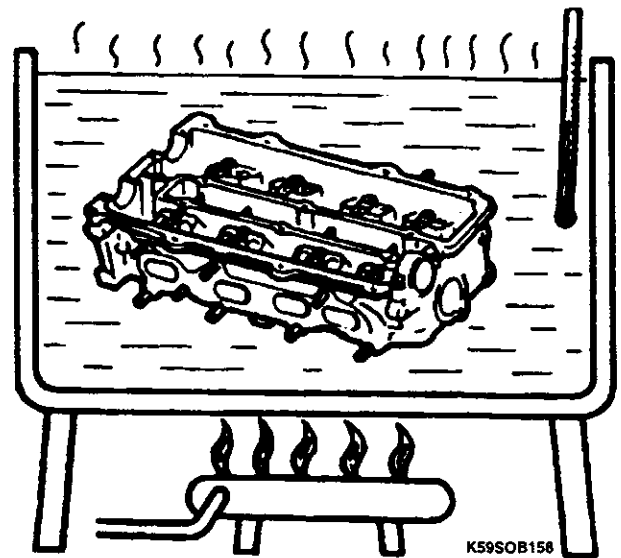
- * **Notice**
The shapes AND LENGTHS of the intake and exhaust valve guides are different.



K59SOB157

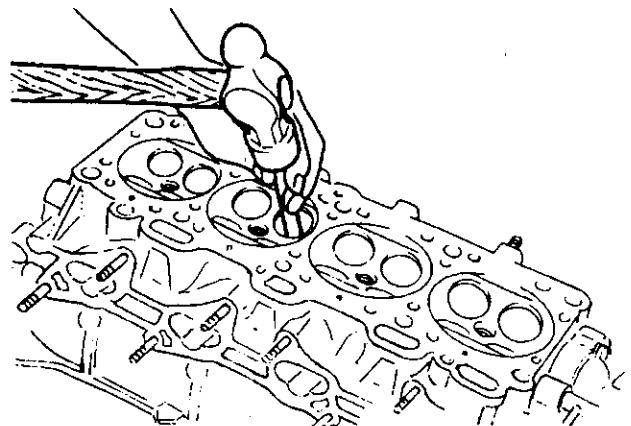
Removal

1. Gradually heat the cylinder head in water to approximately 194°F (90°C).



K59SOB158

2. Remove the valve guide from the combustion chamber side.

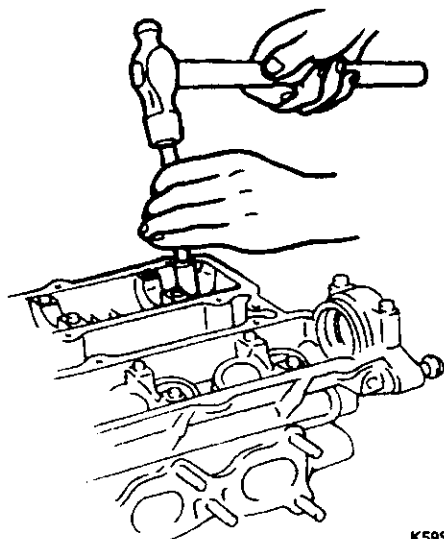


K59SOB159

Installation

1. Gradually heat the cylinder head in water to approximately 194°F (90°C).
2. Tap the valve guide in from the side opposite the combustion chamber until the projection height is as specified.

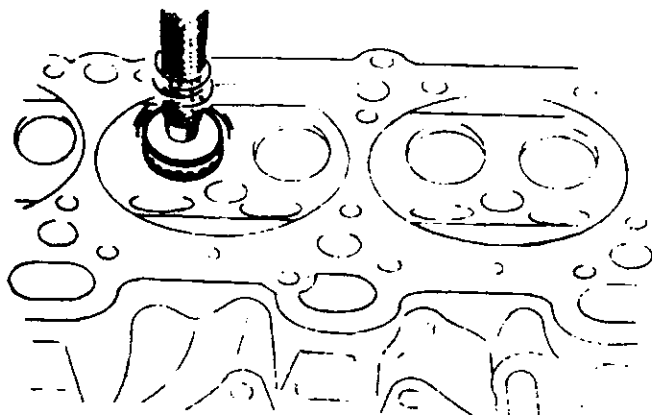
Projection Height: 0.449 - 0.469 in (11.4 to 11.9 mm)



K59SOB160

Valve Seat

1. Inspect the contact surface of the valve seat and valve face for the following:
 - a. Roughness
 - b. Damage
2. If necessary, resurface the valve seat with a 45° valve seat cutter and/or resurface the valve face.



K59SOB161

3. Apply a thin coat of Dychem blue to the valve face and valve seat.

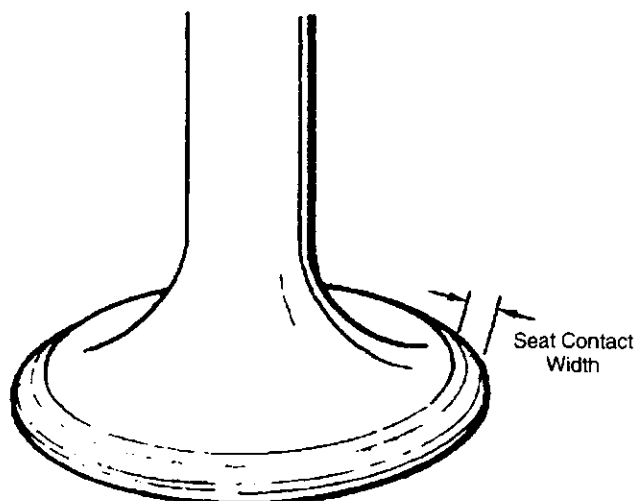
4. Check the valve seating by rotating the valve against the seat.
 - a. If contact is not apparent 360° around the valve face, replace the valve.
 - b. If contact is not apparent 360° around the valve seat, resurface the seat.



K59SOB162

5. Check the seat contact width.

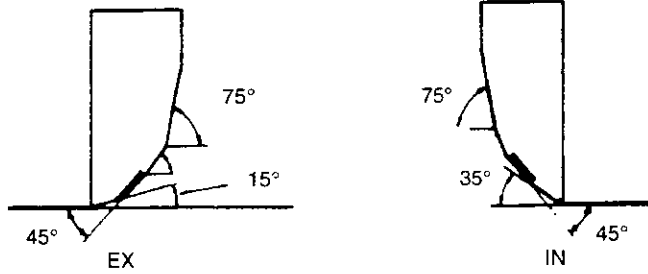
Width: 0.047 - 0.063 in (1.2 -1.6 mm)



K59SOB163

6. Check that the valve seating position is at the center of the valve face.
 - a. If the seating position is too high, correct the valve seat, with a 60° cutter and a 45° cutter.
 - b. If the seating position is too low, correct the valve seat with a 35° (IN) or 15° (EX) cutter and a 45° cutter.
7. Seat the valve to the valve seat with a lapping compound.

*** Notice**
 Be sure to clean the valve and valve seat thoroughly after lapping.



K59SOB164

8. Check the sinking of the valve seat. Measure the protruding length (dimension L) of each valve stem.

Dimension L: 1.449 in (36.8 mm)

- a. If L is as below it can be used as it is.

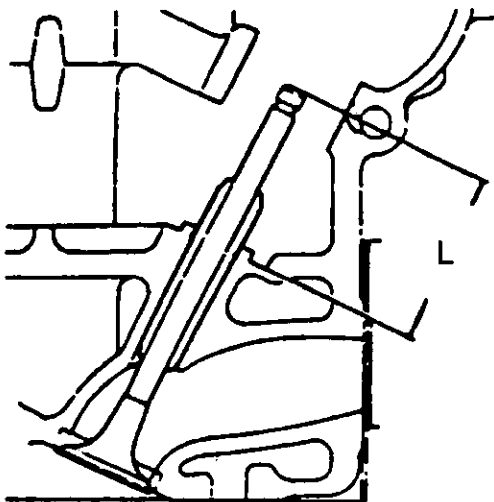
IN: 1.432 - 1.467 in (36.37 - 37.27 mm)
EX: 1.467 - 1.494 in (36.36 - 37.96 mm)

- b. If L is below, insert a spacer between the spring seat and cylinder head to adjust.

IN: 1.467 - 1.495 in (37.27 - 37.97 mm)
EX: 1.467 - 1.494 in (37.26 - 37.96 mm)

- c. If L is more than as below, replace the cylinder head.

IN: 1.494 in (37.97 mm)
EX: 1.494 in (37.96 mm)



10B-221

Valve Spring

1. Inspect each valve spring for cracks or damage.
2. Check the free length and angle. Replace if necessary.

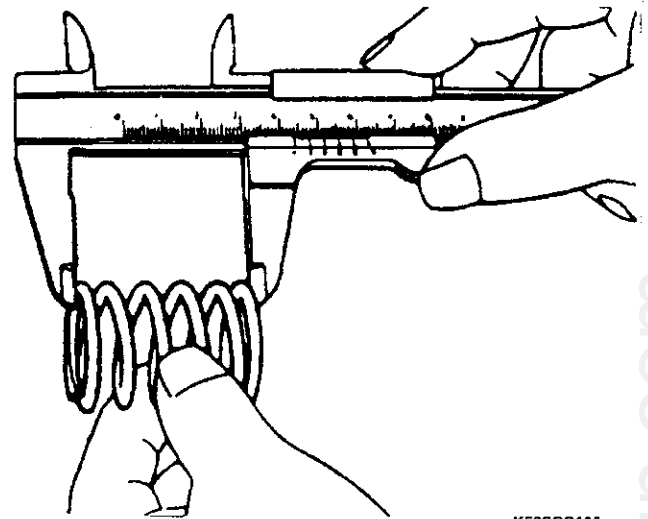
Free Length:

Outer Standard: 1.539 in (39.1 mm)

Minimum: 1.524 in (38.7 mm)

Inner Standard: 1.496 in (38.0 mm)

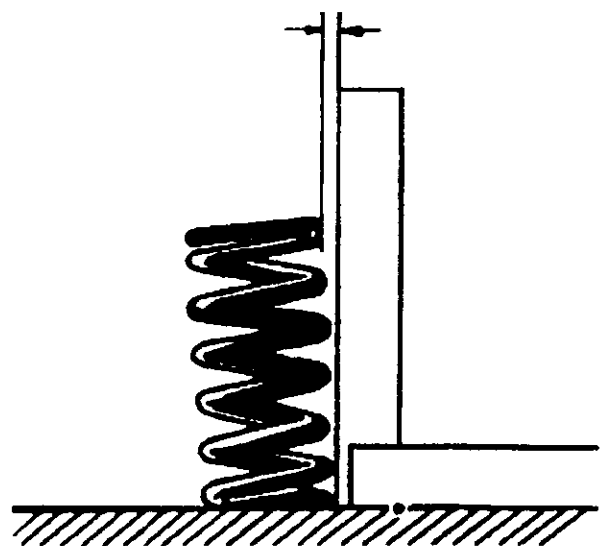
Minimum: 1.484 in (37.7 mm)



K59SOB166

Angle:

Outer: 0.053 in (1.36 mm) max.

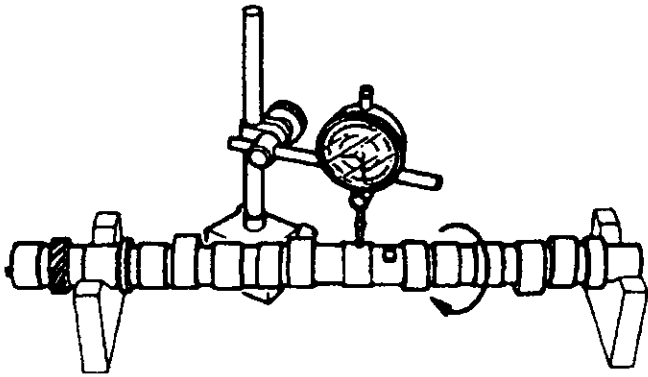


K59SOB167

Camshaft

1. Set the front and rear journals on V-blocks. Check the camshaft runout on each journal by turning the camshaft in clockwise direction. Replace if necessary.

Runout: 0.0012 in (0.03 mm) max.

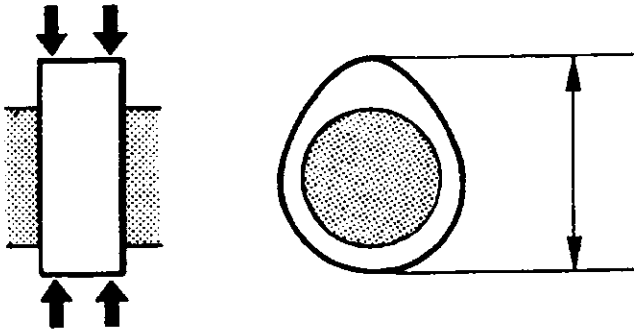


K59SOB168

2. Check the cam for wear or damage. Replace if necessary.
3. Check the cam lobe height at the two points as shown in the figure.

Height: 1.7737 in (45.052 mm)

Minimum: 1.7658 in (44.852 mm)

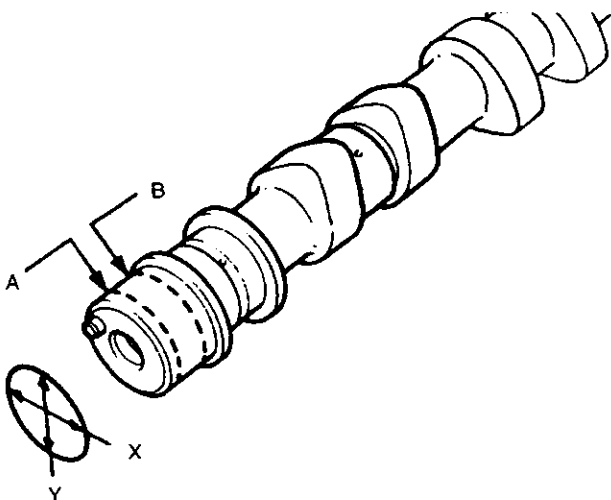


K59SOB169

4. Measure wear of the journals in X and Y directions at the two points as shown in the figure.

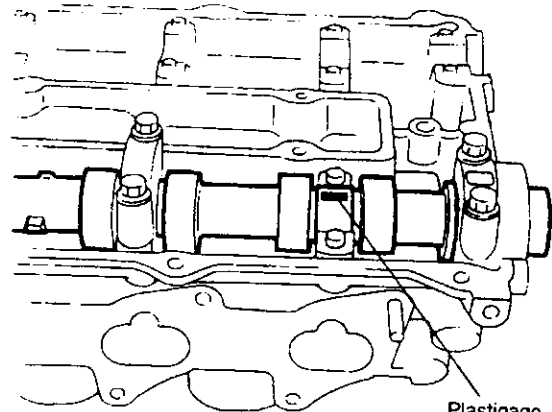
Diameter: 1.1787- 1.1797 in (29.940 - 29.965 mm)

Out-of-round: 0.002 in (0.05 mm)



K59SOB170

5. Measure the oil clearance of the camshaft and camshaft caps.
 - a. Remove any oil or dirt from the journals and bearing surface.
 - b. Set the camshaft onto the cylinder head.
 - c. Position Plastigage on top of the journals of all cam caps in the axial direction.



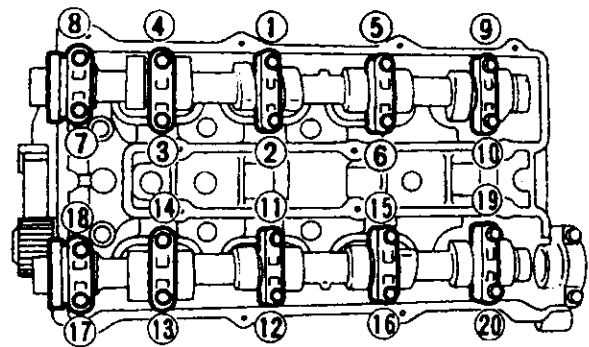
Plastigage

K59SOB171

- d. Place camshaft caps according to the cap number and arrow, and tighten them to specification in the order shown in the figure.

Tightening torque:

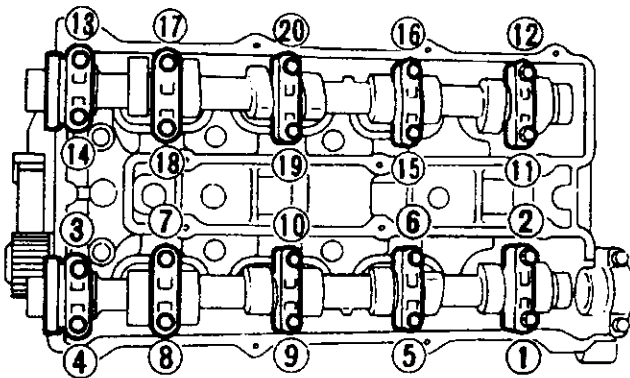
13 - 20 lb-ft (18 - 26 N·m)



K59SOB172

cardiagn.com

- e. Loosen the camshaft cap bolts in the order shown in the figure.



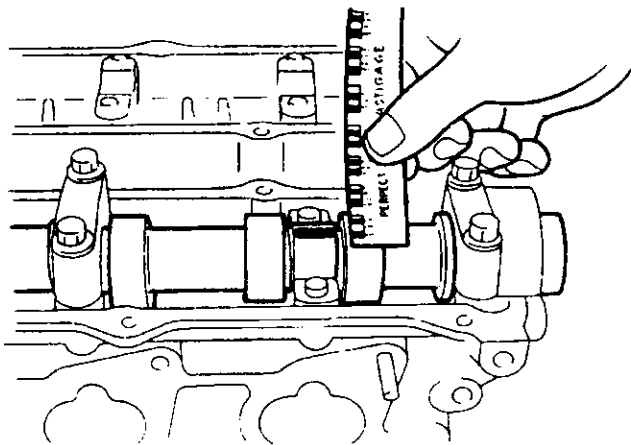
K59SOB173

- f. Carefully remove the camshaft caps.
g. Measure the oil clearance at each cap.

Oil clearance:

0.0014 - 0.0033 in (0.035 - 0.085 mm)

Maximum: 0.0059 in (0.15 mm)



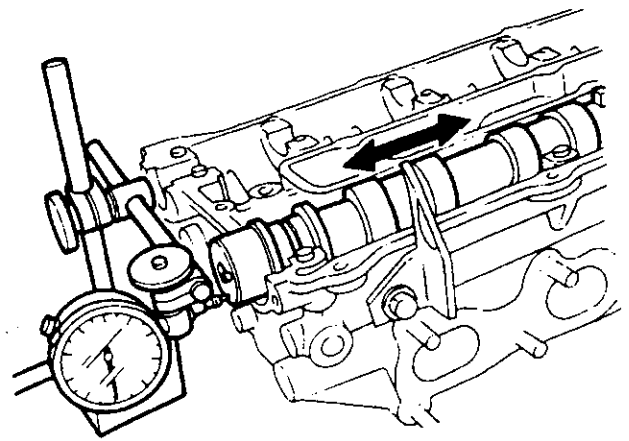
K59SOB174

- h. If the oil clearance indicated by plastigage measuring exceeds the maximum, spec., replace the camshaft and/or the cylinder head.

6. Using a special tool (dial indicator) to measure the camshaft end play. If it exceeds the maximum, replace the camshaft and/or the cylinder head.

End play: 0.003 - 0.004 in (0.08 - 0.10 mm)

Maximum: 0.008 in (0.20 mm)



K59SOB175

Hydraulic Lash Adjuster (HLA)

1. Check the HLA face for wear or damage.
2. Hold the HLA between your fingers and press it. If the HLA moves, replace it.

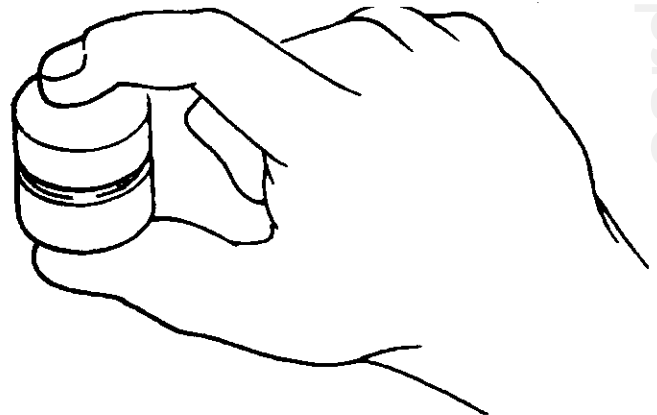
Caution

Do not disassemble the HLA.

On the SOHC engines a pattern resembling a figure "8" indicates normal HLA wear.

On the DOHC engines a pattern resembling a straight horizontal bar indicates normal wear.

An even oval-ing pattern on the HLA surface on both engines indicates un-even wear, and the HLA should be replaced.

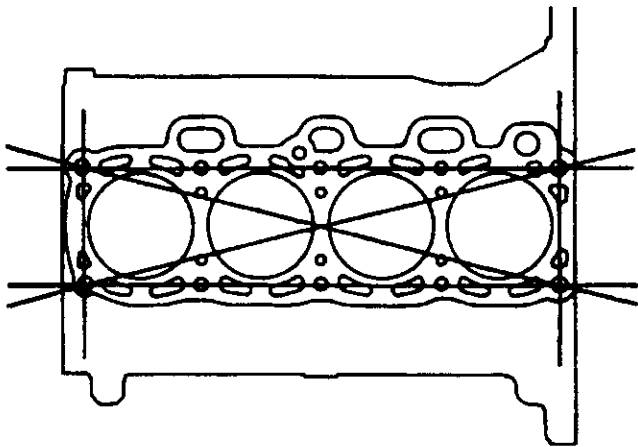


K59SOB176

Cylinder Block

1. Check the cylinder block for the following:
 - a. Leakage damage
 - b. Cracks
 - c. Scoring of cylinder walls
 Replace or resurface if necessary.
2. Measure the distortion of the top surface of the cylinder block in the six directions as shown in the figure.

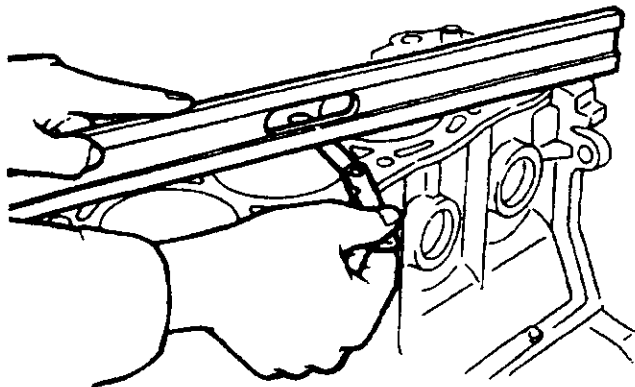
Distortion: 0.006 in (0.15 mm) max.



K59SOB177

3. If the distortion exceeds the maximum, repair by grinding, or replace the cylinder block.

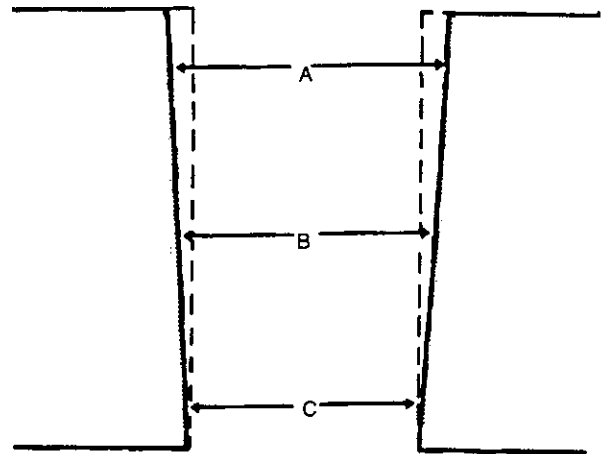
Grinding limit: 0.008 in (0.20 mm) max.



K59SOB178

4. Measure the cylinder bore in directions X and Y at three levels in each cylinder as shown.

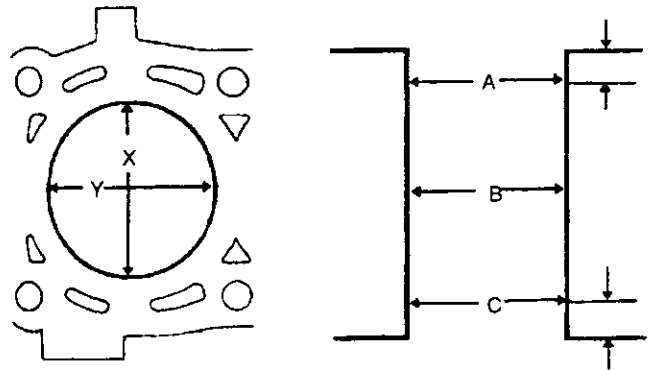
Size	Bore
Standard	3.3858-3.3866 in (86.000 - 86.019 mm)
0.010 in (0.25 mm) oversize	3.3957- 3.3964 in (86.250 - 86.269 mm)
0.020 in (0.50mm) oversize	3.4005 - 3.4062 in (86.500 - 86.519 mm)



K59SOB180

- a. If the difference between any two measurements exceeds the maximum taper, rebore the cylinder to oversize.

Taper: 0.0007 in (0.019 mm) max.

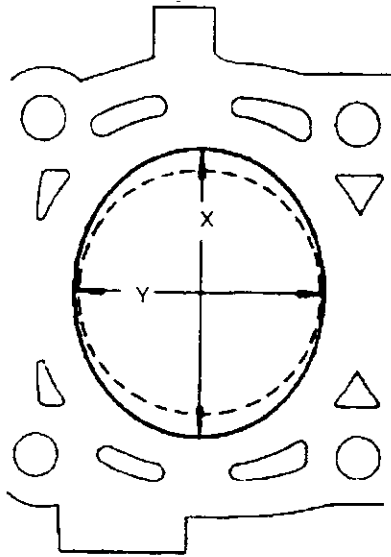


K59SOB179

- b. Out of round or "ovaling" of the liners in determined by measuring the difference between the measurement X and Y. If this measurement exceeds the maximum out-of-round, rebore the cylinder to oversize.

Out of round: 0.0007 in (0.019 mm) max.

*** Notice**
The size of the bore should be based on the size of an oversize piston and be the same for all cylinders.

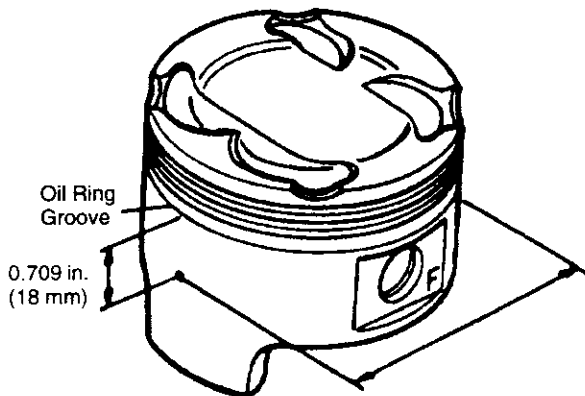


K59SOB181

Piston

1. Inspect the outer circumferences of all pistons for seizure or scoring. Replace if necessary.
2. Measure the outer diameter of each piston at a right angle (90°) to the piston pin, 0.709 in (18 mm) below the oil ring land lower edge.

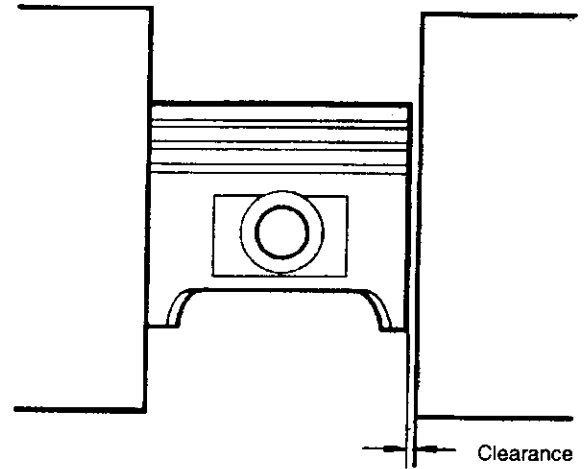
Size	Bore
Standard	3.3836 - 3.3844 in (86.944 - 86.964 mm)
0.010 in (0.25 mm) oversize	3.3935 - 3.3942 in (86.194 - 86.214mm)
0.020 in (0.50 mm) oversize	3.4033 - 3.4041 in (86.444 - 86.464 mm)



K59SOB183

3. Check the piston-to-cylinder bore clearance.
Clearance: 0.0019 - 0.0024 in (0.049 - 0.062 mm)
Maximum: 0.0059 in (0.15 mm)
4. If the clearance exceeds the maximum, replace the piston or rebore the cylinders to fit oversize pistons.

*** Notice**
If the pistons are replaced, the piston rings must also be replaced.



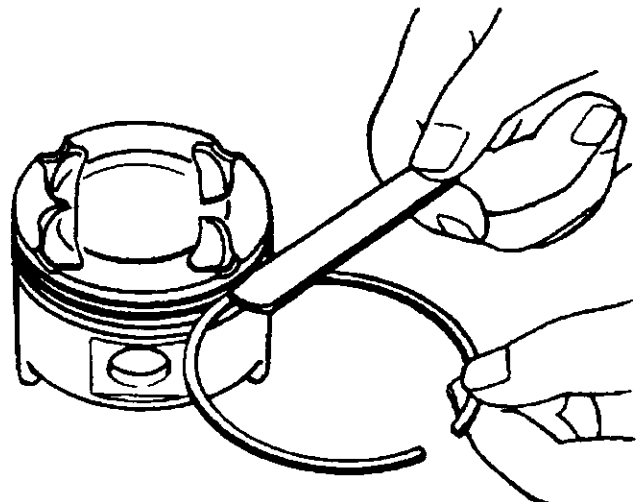
K59SOB184

Piston and Piston Ring

1. Measure the piston ring to ring land clearance around the entire circumference using a new piston ring.

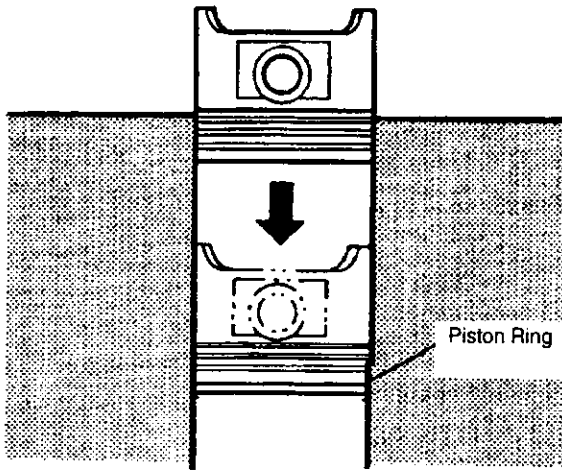
Clearance (top and second):
0.001 - 0.003 in (0.03 - 0.07 mm)

Maximum: 0.006 in (0.15 mm)



K59SOB185

2. If the clearance exceeds the maximum, replace the piston.
3. Inspect the piston rings for damage, abnormal wear, or breakage. Replace if necessary.
4. Insert the piston ring into the cylinder by hand and push it to the bottom of the ring travel in using the piston.



K59SOB186

5. Measure each piston ring end gap with a feeler gauge. Replace if necessary.

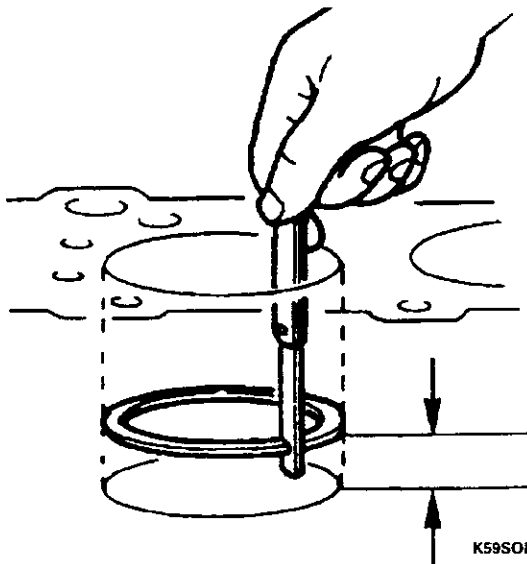
End gap:

Top: 0.006 - 0.012 in (0.15 - 0.30 mm)

Second: 0.008 - 0.014 in (0.20 - 0.35 mm)

Oil rail: 0.008 - 0.028 in (0.20 - 0.70 mm)

Maximum: 0.039 in (1.0 mm)



K59SOB187

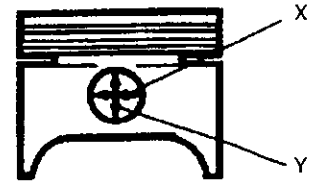
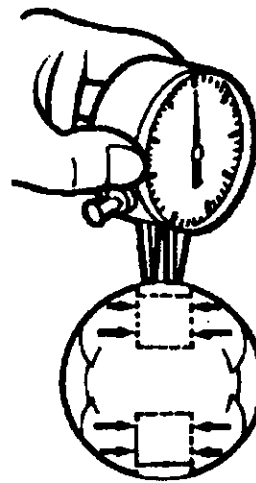
Piston and Piston Pin

1. Measure the piston pin hole diameter in X and Y directions at four points.

Diameter:

0.8657 - 0.8661 in (21.988 - 21.998 mm)

2. If diameter exceeds specification, replace the piston.

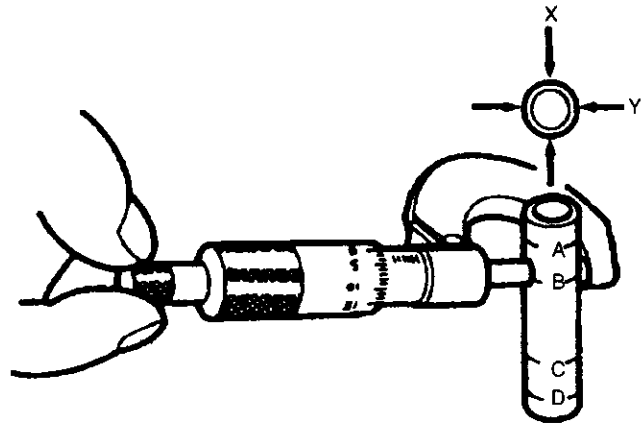


K59SOB188

3. Measure the piston pin diameter at points A, B, C and D, in both the X and Y directions.

Diameter:

0.8656 - 0.8661 in (21.987 - 21.993 mm)



K59SOB189

4. Measure the piston pin-to-piston clearance by subtracting the piston pin outside diameter from the piston pin hole diameter.

Clearance:

0.0002 - 0.0004 in (0.005 - 0.011 mm)

5. If the clearance exceeds the specification, replace the piston and/or piston pin.

Connecting Rod

1. Measure the connecting rod bushing inner diameter.

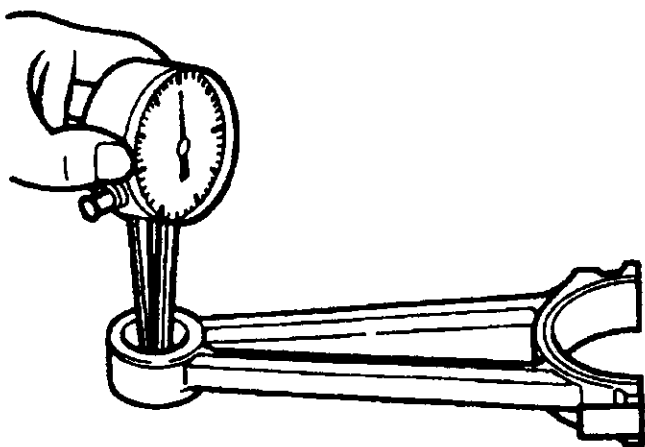
Diameter:

0.8663 - 0.8667 in (22.003 - 22.014 mm)

2. Subtract the piston pin diameter from the bushing diameter to obtain the clearance measurement. If not within specifications, replace the bushing.

Clearance:

0.004 0.00011 in (0.010 - 0.027 mm)



K59SOB190

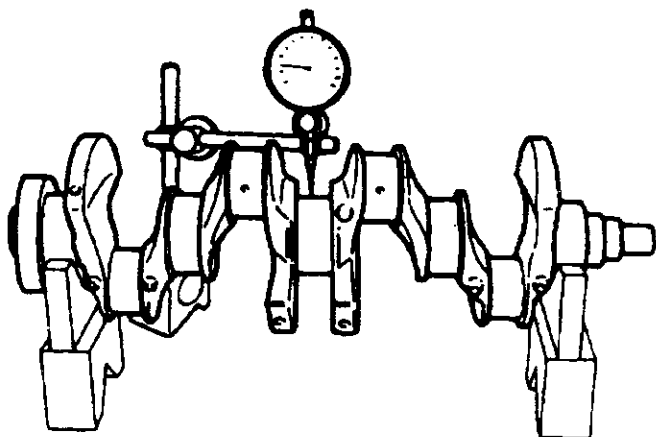
3. Check each connecting rod for bending or twisting. Repair or replace as necessary.

Bend: 0.0029 in (0.075 mm) per 1.97 in (50 mm)

Twist: 0.0070 in (0.180 mm) per 1.97 in (50 mm)

Crankshaft

1. Check the journals and pins for damage, scoring, or oil hole clogging.
2. Set the crankshaft on V-blocks.
3. Check the crankshaft runout at the center journal.
Runout: 0.0012 in (0.03 mm) max.



K59SOB192

4. If crankshaft runout exceeds the maximum tolerance, replace the crankshaft.

Crankshaft Journals

1. Measure each journal diameter in X and Y directions at two points.

Main Journals:

Diameter: 2.3597 - 2.3604 in (59.937 - 59.955 mm)

Out-of-round: 0.0002 in (0.005 mm) max.

Crankpin Journals:

Diameter: 2.0055 - 2.0061 in (50.940 - 50.955 mm)

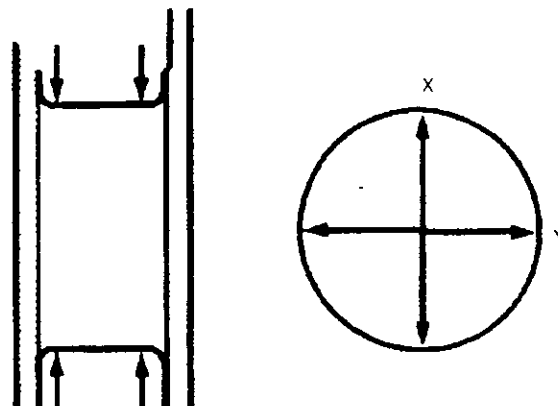
Out-of-round: 0.0002 in (0.005 mm) max.

2. If the diameter is less than the minimum, grind the journals to match undersize bearings.

Undersize bearing: 0.010 in (0.25 mm)

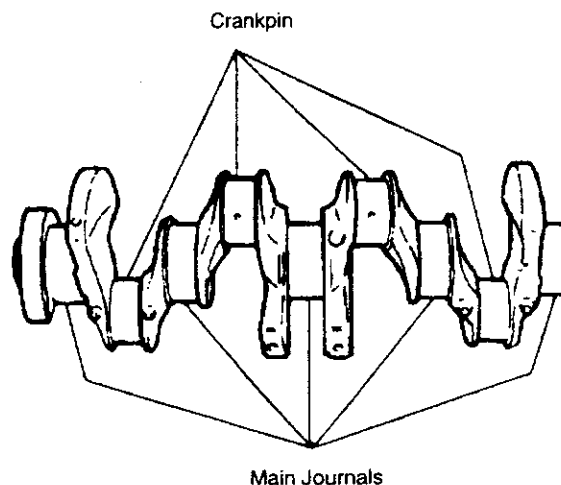
0.020 in (0.50 mm)

0.030 in (0.75 mm)



Main Journal Diameter Undersize

Bearing Size		Journal Diameter
0.010 in (0.25 mm) Undersize	No. 1,2,4,5	2.3501 - 2.3508 in (59.693-59.711 mm)
	No. 3	2.3499 - 2.350 in (59.687 - 59.705 mm)
0.020 in (0.50 mm) Undersize	No. 1,2,4,5	2.3403 - 2.3410 in (59.443 - 59.461 mm)
	No. 3	2.3400 - 2.3407 in (59.437- 59.455 mm)
0.030 in (0.75 mm) Undersize	No. 1,2,4,5	2.3304-2.3311 in (59.193-59.211 mm)
	No. 3	2.3302 - 2.3309 in (59.187 - 59.205 mm)

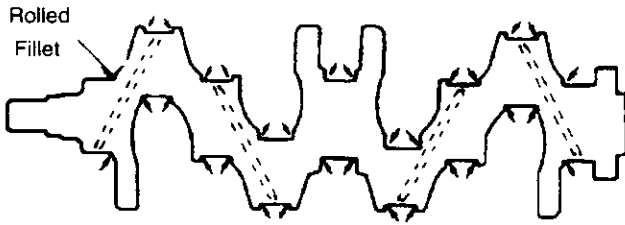


K59SOB194

Crankpin Journal Diameter Undersize

Bearing Size	Journal Diameter
0.010 in (0.25 mm) Undersize	1.9957- 1.9963 in (50.690 - 50.705 mm)
0.020 in (0.50 mm) Undersize	1.9858- 1.9864 in (50.440 - 50.455 mm)
0.030 in (0.75 mm) Undersize	1.9760 - 1.9766 in (50.190 - 50.205 mm)

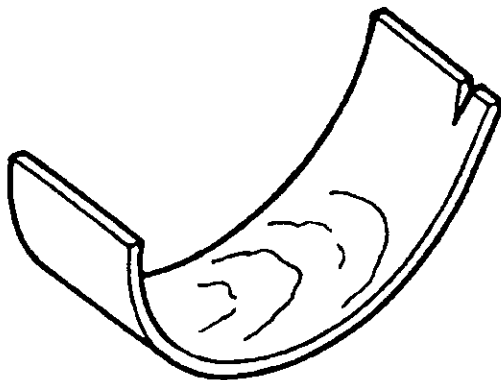
* **Notice**
Do not grind the rolled fillet area.



K59SOB195

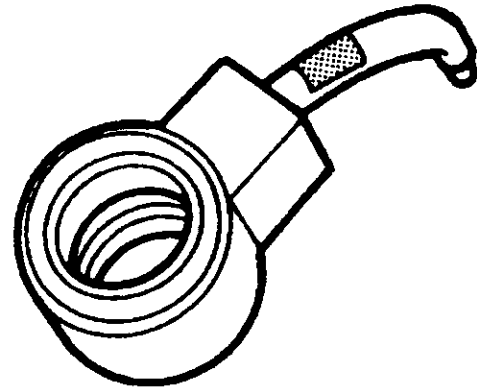
Main Bearing and Connecting Rod Bearing

1. Check the main bearings and the connecting rod bearings for peeling, scoring, or other damage.



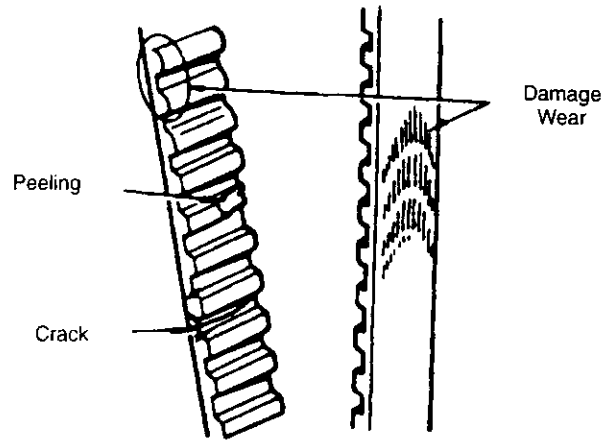
Piston Cooling Jets

1. Check that the oil passage is not clogged.
2. Check that the check ball is not stuck.



Timing Belt

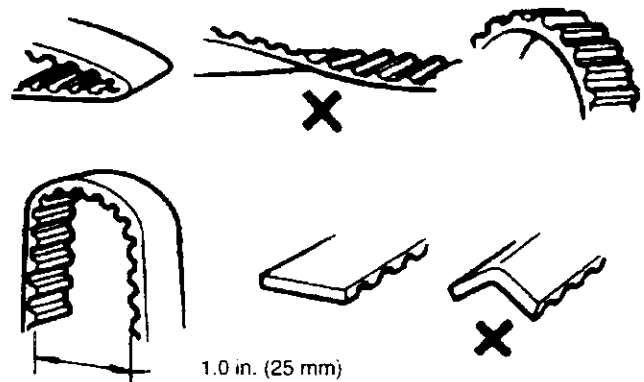
1. Replace the timing belt if there is any oil or grease on it.
2. Check the timing belt for damage, wear, peeling, cracks, or hardening. Replace if necessary.



K59SOB198

* **Notice**

- Never forcefully twist, turn inside out, or bend the timing belt.
- Be careful not to allow oil or grease on the belt.



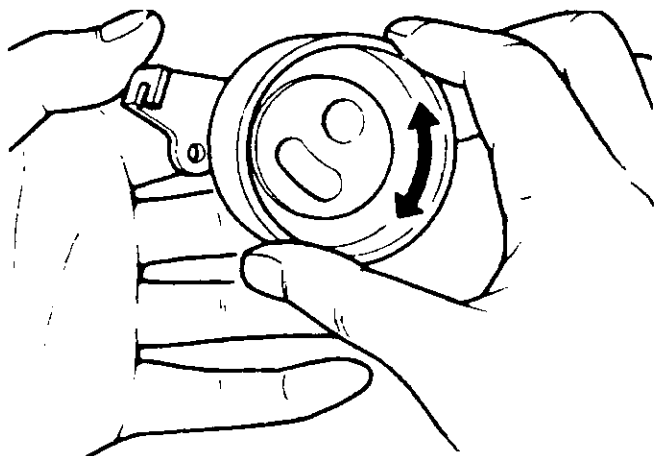
K59SOB199

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Timing Belt Tensioner and Idler Pulley

1. Check the timing belt tensioner and idler pulleys for smooth rotation and abnormal noise. Replace if necessary.

*** Notice**
Do not clean the tensioner pulley with cleaning fluids. If necessary, use a soft rag to wipe it clean, and avoid scratching it.

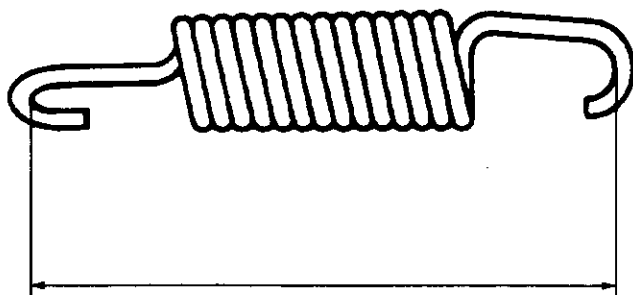


K59SOB200

Timing Belt Tensioner Spring

1. Check the free length of the tensioner spring. Replace if necessary.

Free length: 2.189 in (55.6 mm) max.

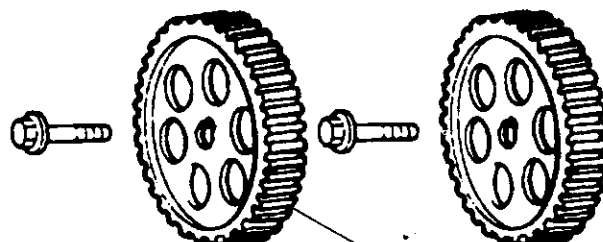


K59SOB201

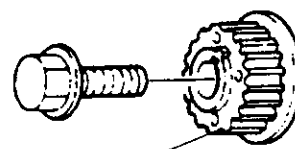
Timing Belt Pulley and Camshaft Pulleys

1. Inspect the pulley teeth for wear, deformation, or other damage. Replace if necessary.

*** Notice**
Do not clean the pulley with cleaning fluids. If necessary use a rag to wipe it clean.



Camshaft Pulleys



Timing Belt Pulley

K59SOB202

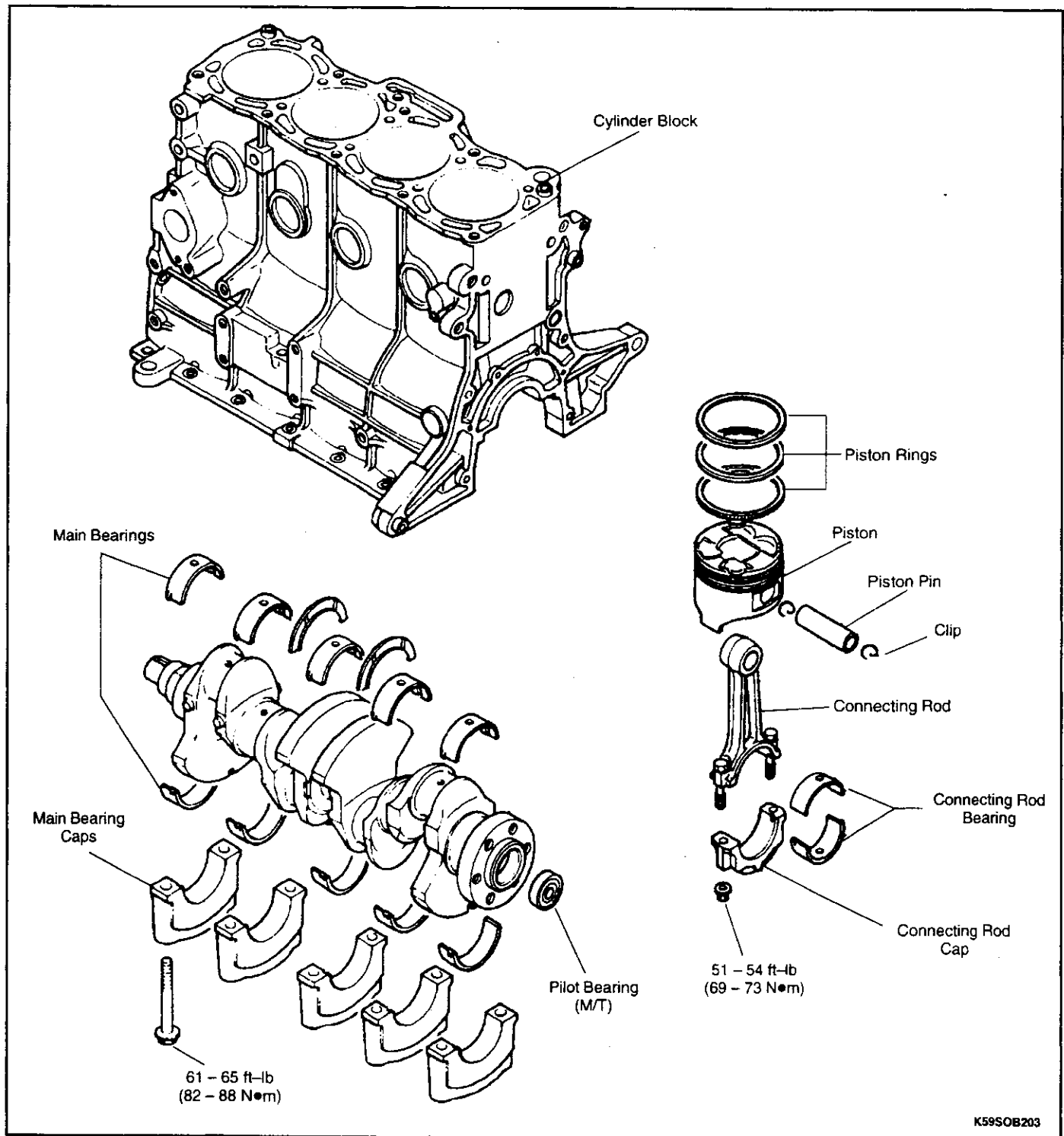
Timing Belt Cover (Lower And Upper)

1. Inspect the timing belt covers for damage or cracks. Replace if necessary.

ASSEMBLY

1. Clean all parts before reinstallation.
2. Apply new engine oil to all sliding and rotating parts.
3. Tighten all bolts and nuts to the specified torques.
4. Replace plain bearings if they are peeling, burned or otherwise damaged.

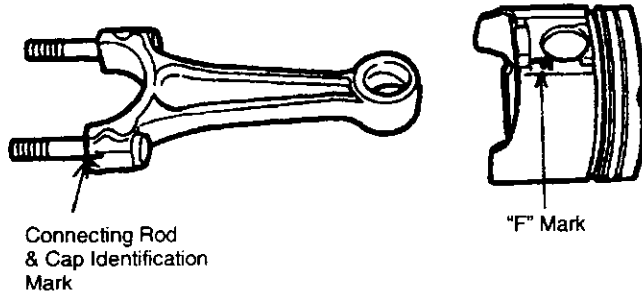
* **Notice**
Do not reuse gaskets or oil seals.



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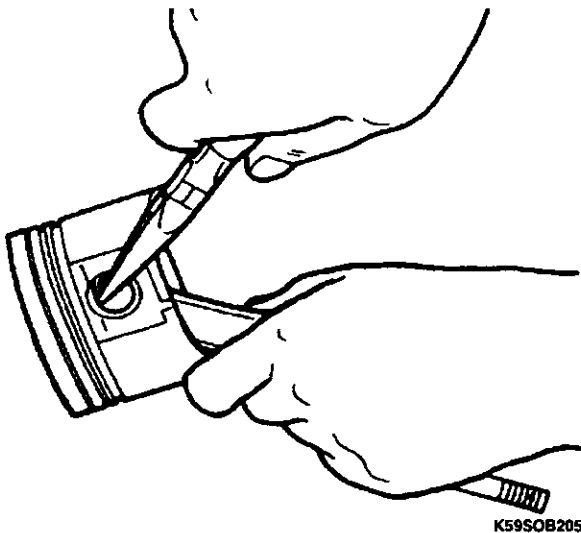
Connecting Rod

- Align the identification mark on the base of the connecting rod and the F mark on the piston as shown in the figure.

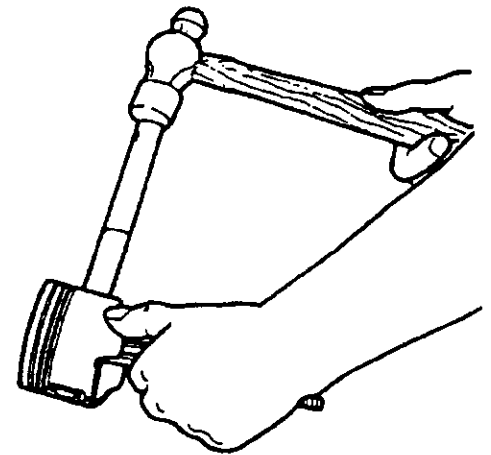


K59SOB204

- Apply a coat of engine oil to the circumference of each piston pin and to the small end of each connecting rod.
- Set a clip into the clip groove in one side of the piston.



- Insert the piston pin into the piston and connecting rod from the opposite side of the piston as shown.



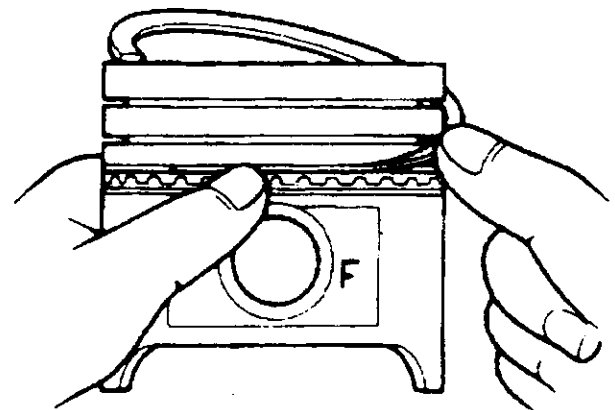
- Tap the piston pin in until it touches the clip. Install the other clip into the groove in the piston.
- Check the oscillation torque of the connecting rod.

Piston Ring

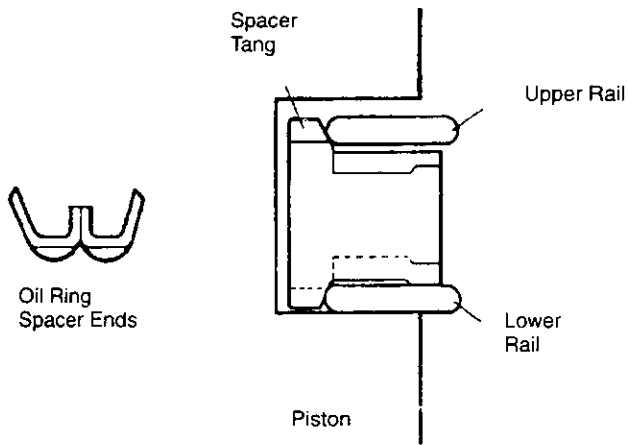
- Install the three-piece oil rings onto the pistons.
 - Apply engine oil to the oil ring spacer and rails.
 - Install the oil ring spacer so that the opening faces upward.
 - Install the upper rail and lower rail.

* Notice

- The upper rail and lower rail are the same.
- The rail can be installed with either face upward.



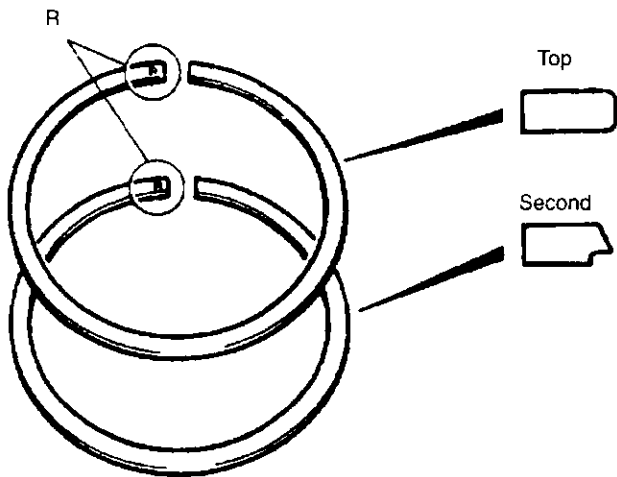
- Check that both rails are expanded by the spacer tangs as shown in the figure by checking that both rails turn smoothly in both directions.



K59SOB208

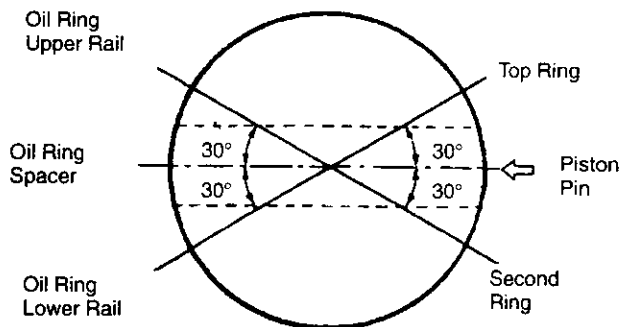
3. Install the second ring to the piston first, then install the top ring. Use a piston ring expander.

* **Notice**
The rings must be installed with the R marks facing upward.



K59SOB209

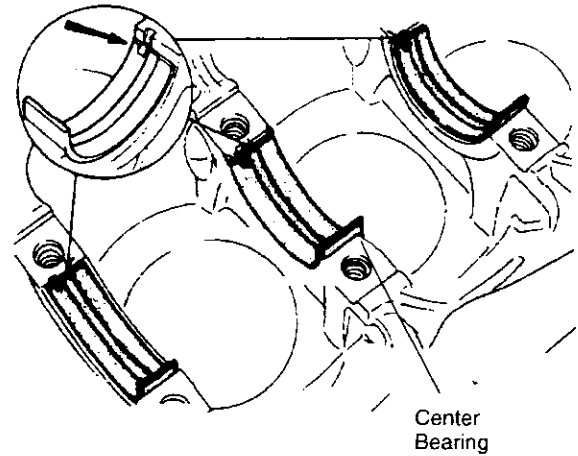
4. Apply a liberal amount of clean engine oil to the second and top piston rings.
5. Position the opening of each ring as shown in the figure.



K59SOB210

Crankshaft

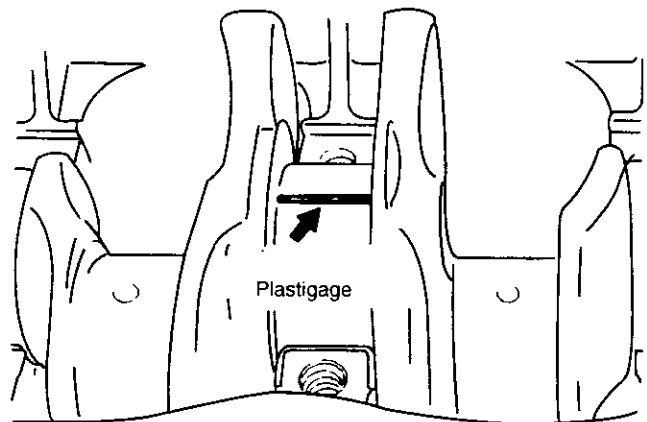
1. Before installing the crankshaft, inspect the main bearing oil clearances as described.



K59SOB211

Oil Clearance Inspection

- a. Remove any foreign material and oil from the journals and bearings.
- b. Install the upper main bearings in the cylinder block.
- c. Set the crankshaft into the cylinder block.
- d. Position the Plastigage on top of the journals in the axial direction.



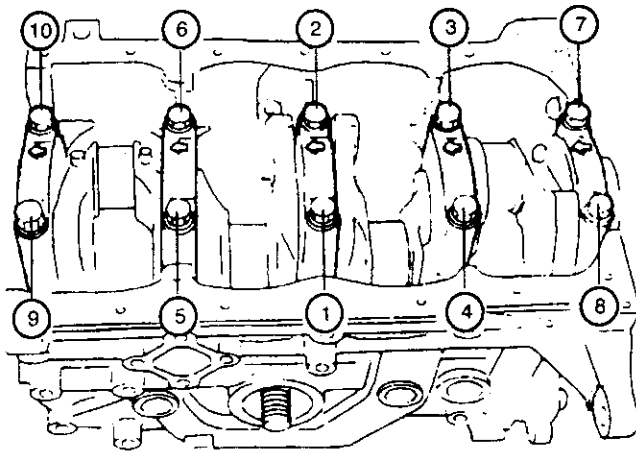
K59SOB212

- e. Install the main bearing caps along with the lower main bearings according to the cap number and arrow mark.
- f. Tighten the caps in two or three steps in the order shown in the figure.

Tightening Torque:
61 - 65 lb-ft (82 - 88 N·m)

* **Notice**
Do not rotate the crankshaft when measuring the oil clearances.

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K59SOB213

- g. Remove the main bearing caps, and measure the Plastigage at each journal at the widest point for the smallest clearance, and at the narrowest point for the largest clearance.

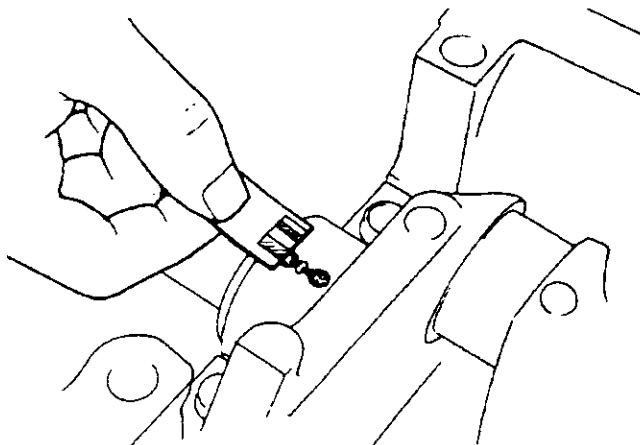
*** Notice**
If the oil clearance exceeds specification, grind the crankshaft and use undersize main bearings.

Oil Clearance:

No. 1, 2, 3, 4: 0.0010 - 0.0017 in (0.025 - 0.043 mm)

No. 3: 0.0012 - 0.0019 in (0.031 - 0.049 mm)

Maximum: 0.0031 in (0.08 mm)

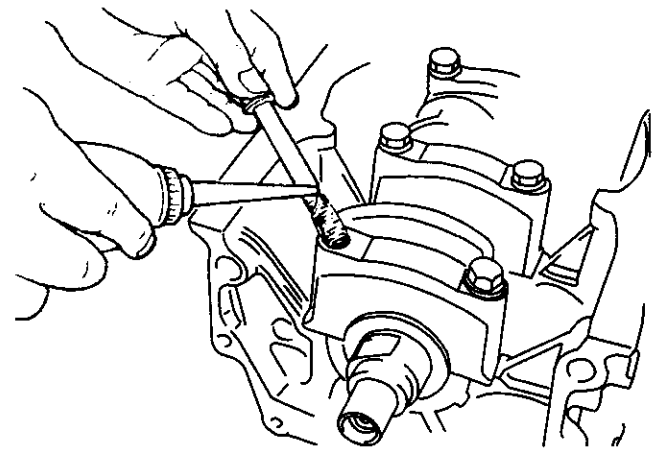


K59SOB214

2. Remove Plastigage from bearing and journal.
3. Apply a liberal amount of engine oil to the main bearings and main journals.
4. Install the crankshaft and the main bearing caps according to the cap number and the arrow mark per step 1.e. and f. above.

Tightening Torque:

61 - 65 lb-ft (82 - 88 N·m)

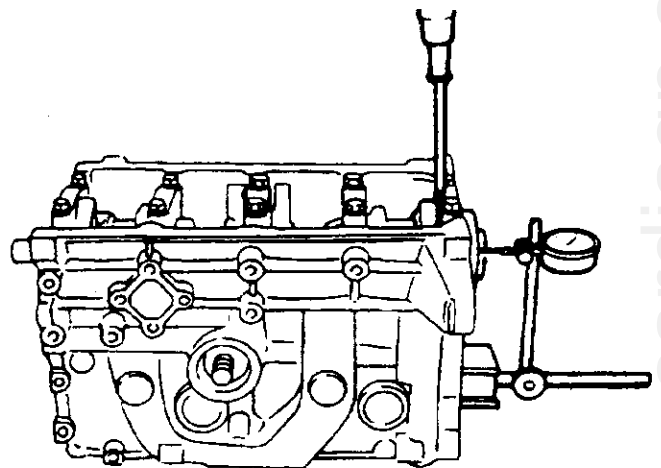


K59SOB215

5. Using a dial indicator check the crankshaft end play.

End play: 0.0031 - 0.0071 in (0.08 - 0.18 mm)

Maximum: 0.012 in (0.30 mm)



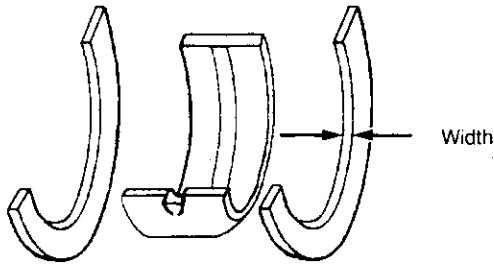
K59SOB216

6. If the end play exceeds specification, grind the crankshaft and use oversize thrust bearings.

Thrust Bearings

Undersize
0.010 in (0.25 mm)
0.020 in (0.50 mm)
0.030 in (0.75 mm)

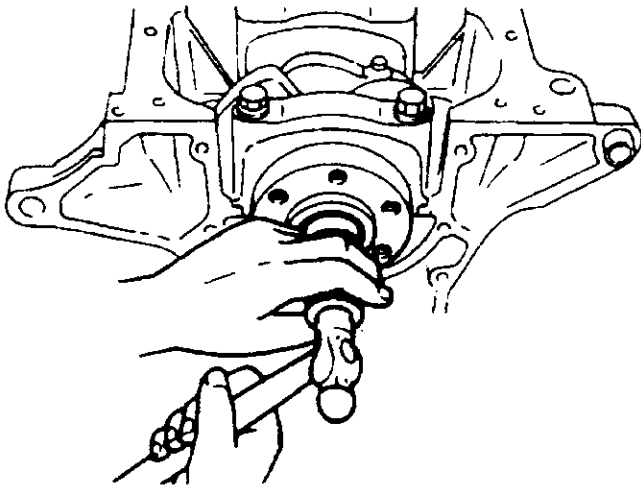
*** Notice**
Wider thrust width is available only in undersize center main bearings.



K59SOB217

Pilot Bearing (M/T Only)

1. Apply engine oil to the outer circumference of the bearing.
2. Using the proper installer, press the bearing evenly into the crankshaft.

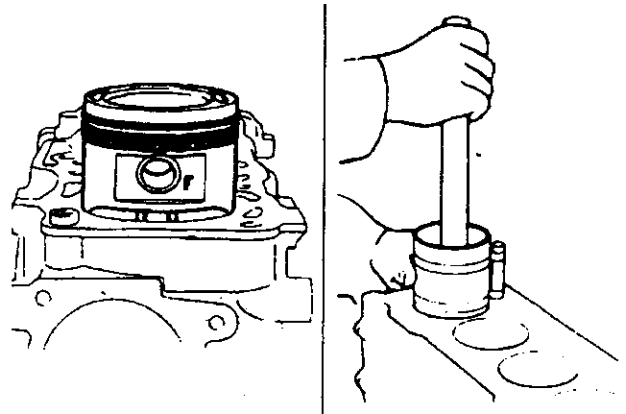


K59SOB218

3. Lubricate the bearing with grease.

Piston And Connecting Rod Assembly

1. Apply a liberal amount of clean engine oil to the cylinder walls, piston and rings.
2. Check the piston rings for the end gap alignment.
3. Insert each piston assembly into the cylinder block with the F mark facing the front of the engine. Use a piston ring compressor tool (commercially available).



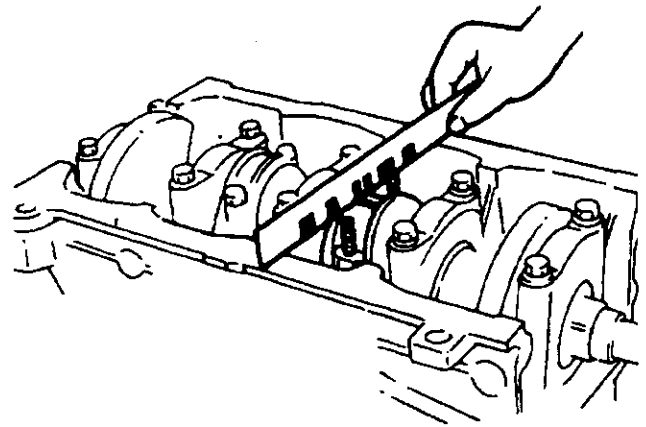
K59SOB219

Connecting Rod and Cap

1. Check the connecting rod bearing clearances using the same procedure as used for the main bearing oil clearance. Refer to *Oil Clearance Inspection*, page 10-62.

Connecting rod tightening torque:
51 - 54 lb-ft (69 - 73 N·m)

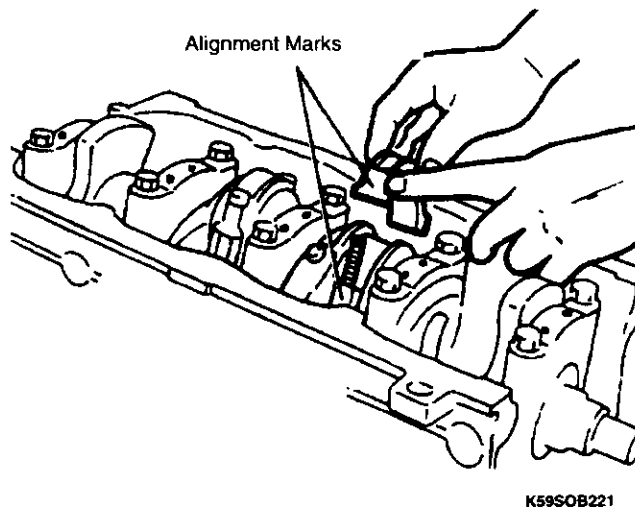
Oil clearance:
0.009 - 0.0021 in (0.023 - 0.053 mm)



K59SOB220

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- * **Notice**
Align the alignment marks on the cap and on the connecting rod when installing the connecting rod cap.



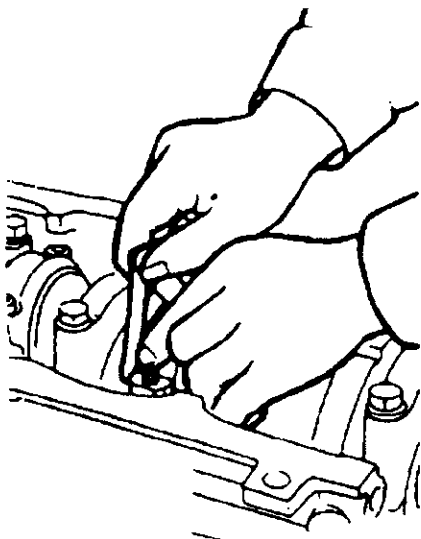
2. Remove connecting rod cap and lower connecting rod bearing.
3. If the oil clearance exceeds specification, grind the crankshaft and use undersize connecting rod bearings.
4. Remove Plastigage from bearing and journal.
5. Check the side clearance of each connecting rod without the cap installed.

Side clearance:

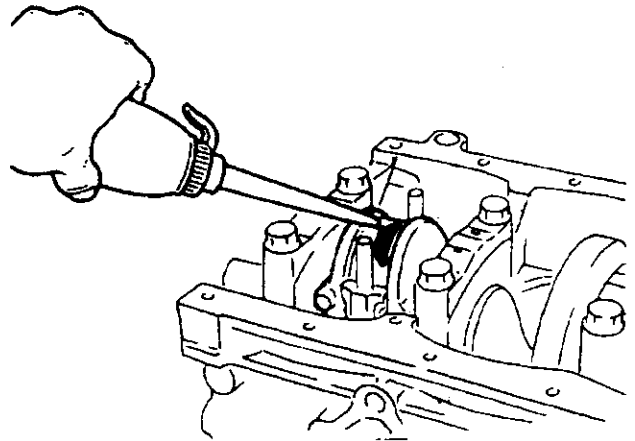
0.004 - 0.0103 in (0.110 - 0.262 mm)

Maximum: 0.012 in (0.30 mm)

- * **Notice**
If the clearance exceeds the maximum, replace the connecting rod.



6. Apply a liberal amount of engine oil to the crankpin journal and connecting rod bearing.

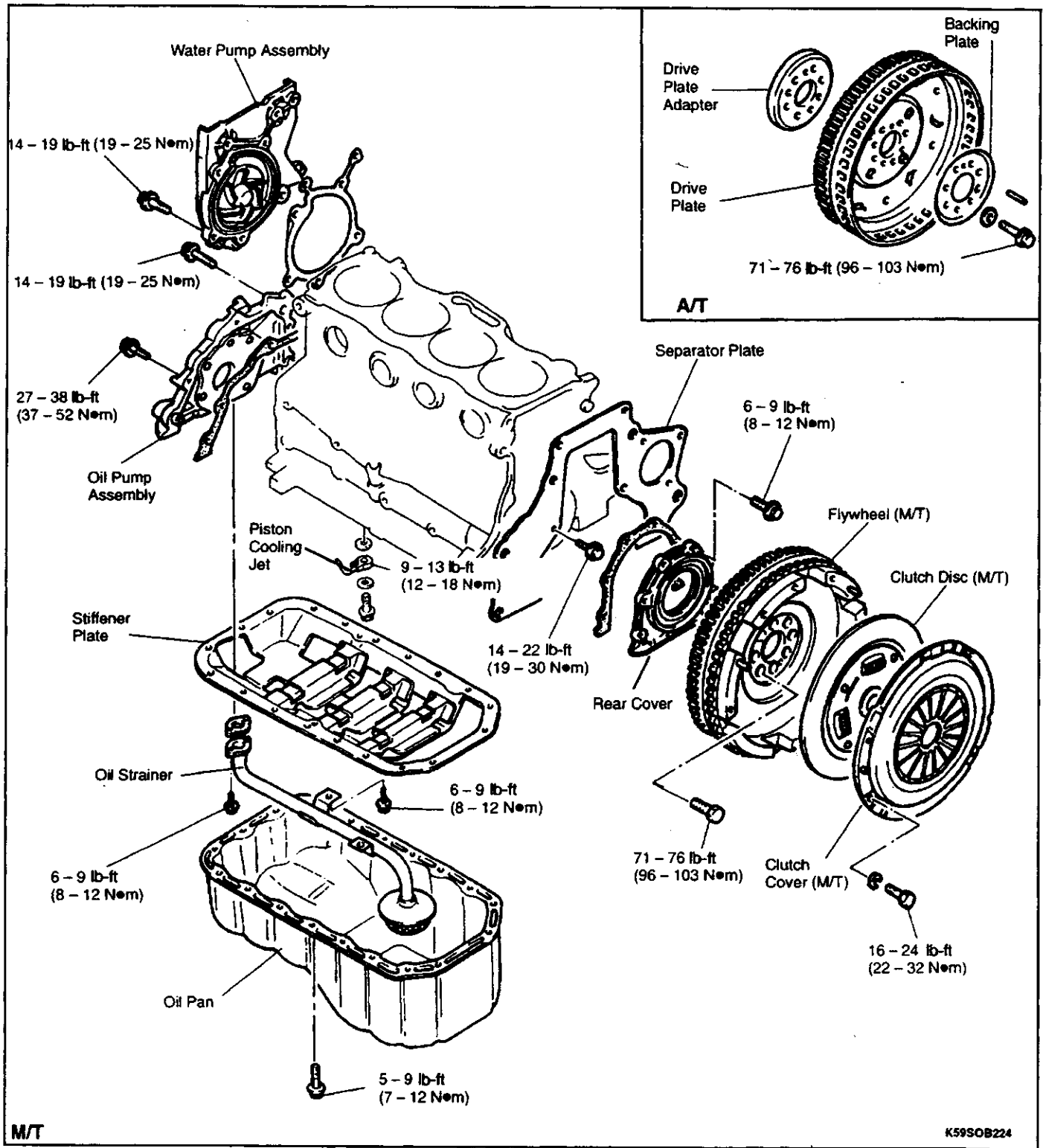


7. Install the connecting rod cap with the alignment marks aligned.

Tightening torque:

51 - 54 lb-ft (69 - 73 N·m)

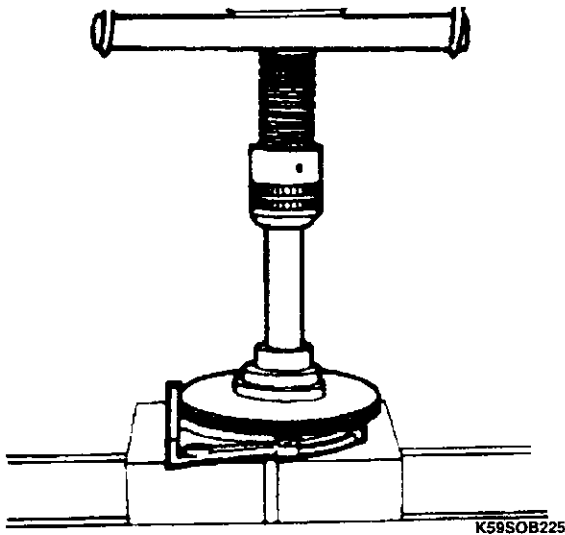
CYLINDER BLOCK TORQUE



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Rear Cover

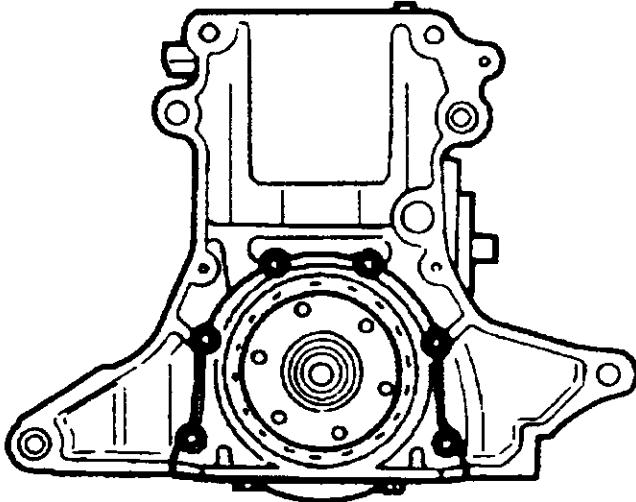
1. Apply engine oil to the rear cover, oil seal and oil seal lip.
2. Press the oil seal into the rear cover.



K59SOB225

3. Install the rear cover and a new gasket.

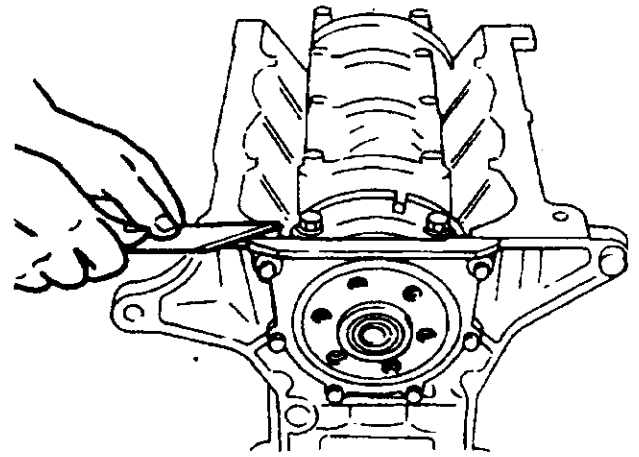
Tightening torque:
69-104 lb-in (8-12 N·m)



K59SOB226

4. Cut away the portion of the gasket that projects out from the rear cover assembly toward the oil pan side.

* **Notice**
Do not scratch the rear cover assembly.

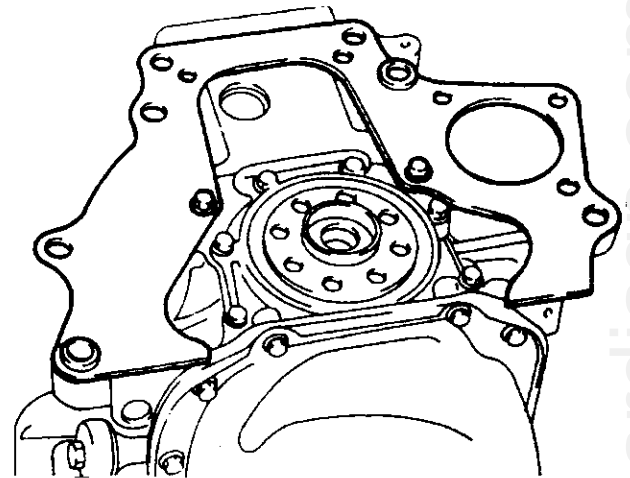


K59SOB227

Separator Plate

1. Install the separator plate.

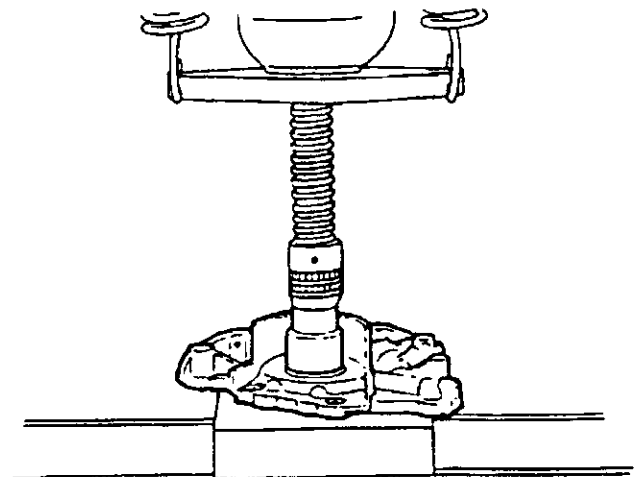
Tightening torque:
14 - 22 lb-ft (9 - 30 N·m)



K59SOB228

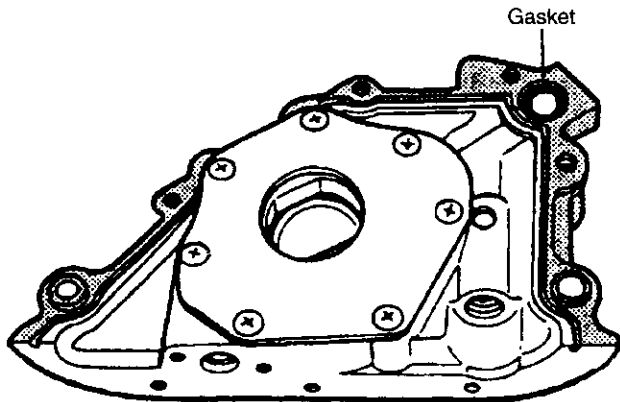
Oil Pump

1. Apply engine oil to a new oil pump, oil seal and the oil pump body.
2. Press the oil seal into the oil pump body.



K59SOB229

3. Apply engine oil to the oil seal lip.
4. Remove any dirt or other material from the contact surfaces.
5. Place a new gasket on the oil pump.

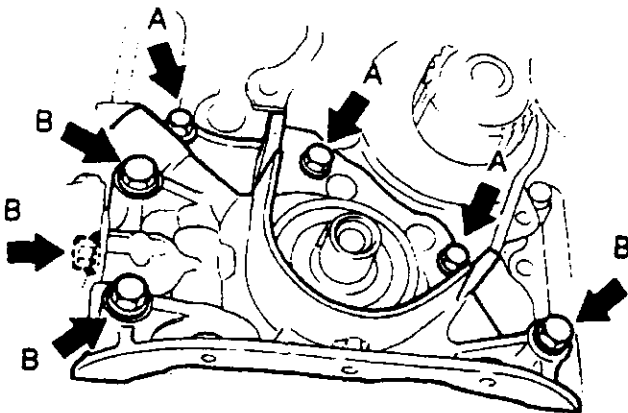


K59SOB230

6. Install a new O-ring into the pump body.
7. Install the oil pump.

Tightening torque:

- A: 14 - 19 lb-ft (19 - 25 N·m)
- B: 27 - 38 lb-ft (37 - 52 N·m)



K59SOB231

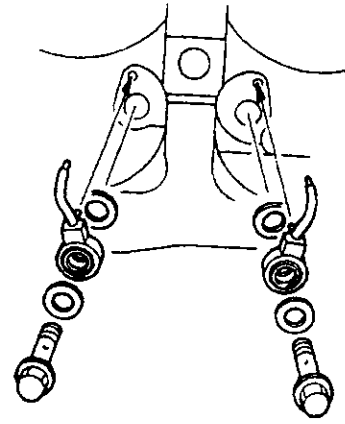
Piston Cooling Jets

1. Install the piston cooling jets as shown in the figure.

Tightening torque:

- 9-15 lb-ft (12-18 N·m)

* **Notice**
 The shapes of the No. 1, 3 cylinders piston cooling jets and No. 2, 4 piston cooling jets are different, and must be installed aligned properly (see diagram).



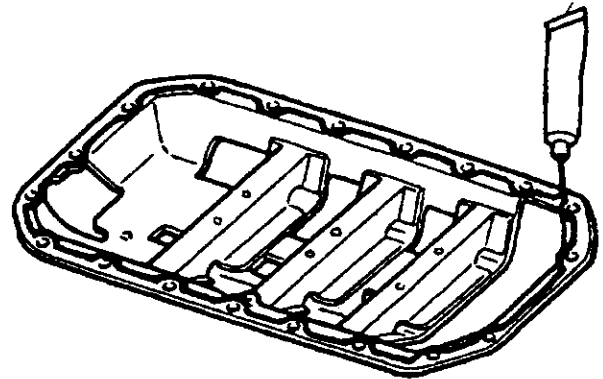
Cylinder No. 1 and 3

Cylinder No. 2 and 4

K59SOB232

Stiffener

1. Remove any dirt or other material from the contact surface.
2. Apply a continuous bead of silicon sealant (LOCTITE ULTRA BLACK 598 or equivalent) to the stiffener along the inside of the bolt holes, and overlap the ends.



K59SOB233

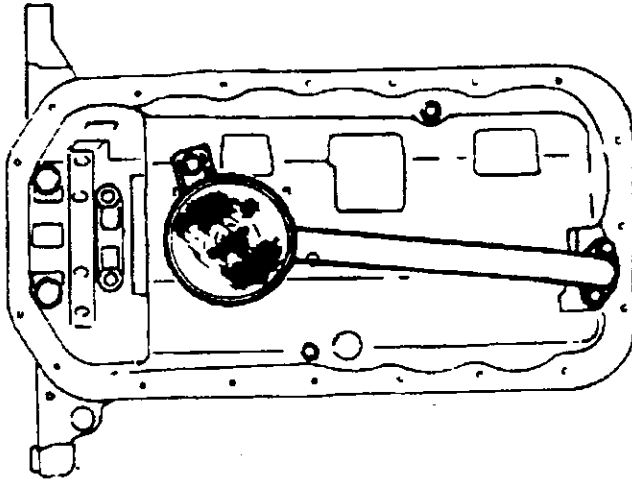
3. Install the stiffener.

Oil Strainer

1. Install the oil strainer and a new gasket.

Tightening torque:

72 - 108 lb-in (8 - 12 N·m)



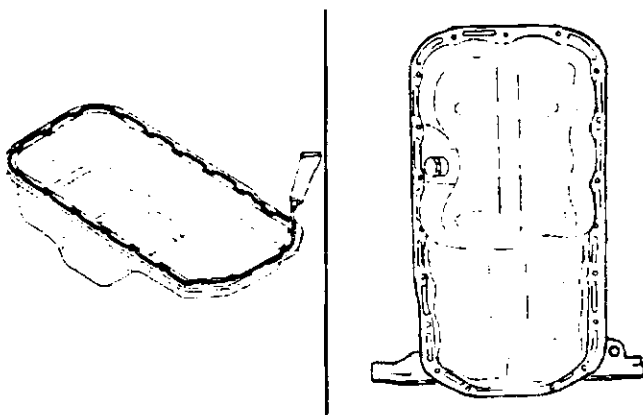
K59SOB234

Oil Pan

1. Apply a continuous bead of silicon sealant (LOCTITE ULTRA BLACK 598 or equivalent) to the stiffener along the inside of the bolt holes, and overlap the ends.
2. Install the oil pan.

Tightening torque:

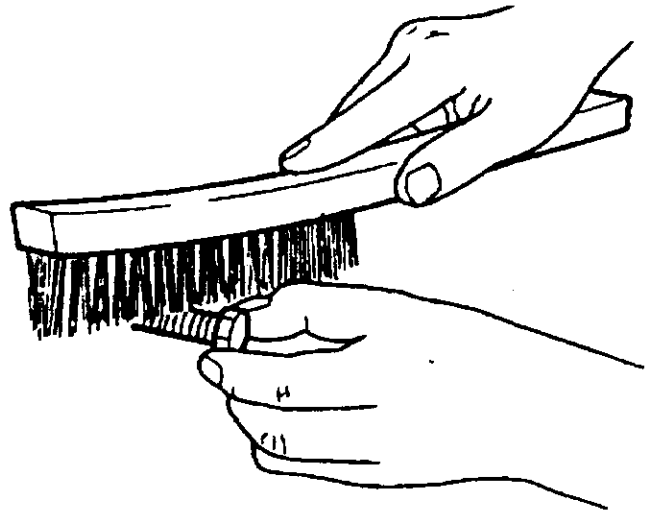
72-108 lb-in (7-12 N·m)



K59SOB235

Flywheel (M/T), Drive Plate (A/T)

1. Remove any old sealant from the bolts and bolt holes. If old sealant can not be removed from the bolt, replace it.



K59SOB236

2. Apply sealant to the bolt threads.
3. Install and tighten the flywheel as shown (M/T).

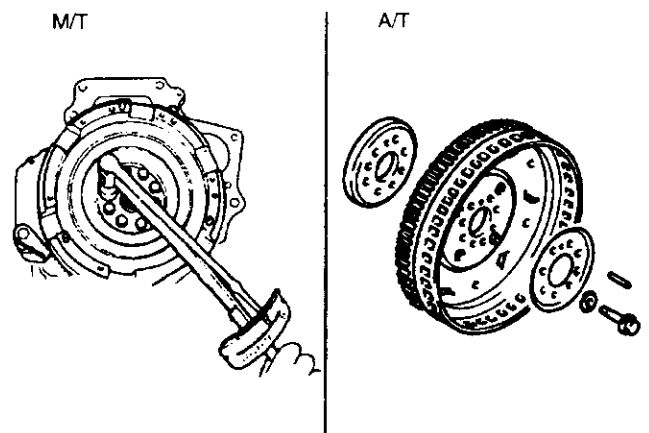
Tightening torque:

71 - 76 lb-ft (96 - 103 N·m)

4. Install and tighten the drive plate adapter, drive plate, and backing plate (A/T).

Tightening torque:

71 - 76 lb-ft (96 - 103 N·m)



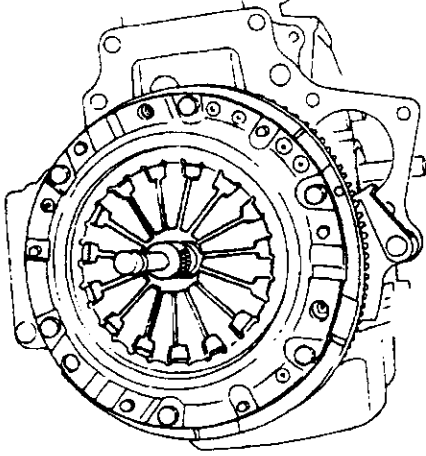
K59SOB237

Clutch Disc and Clutch Cover (M/T)

1. Install the clutch disc and clutch cover as shown. Refer to *Clutch*, Section 40.

Tightening torque:

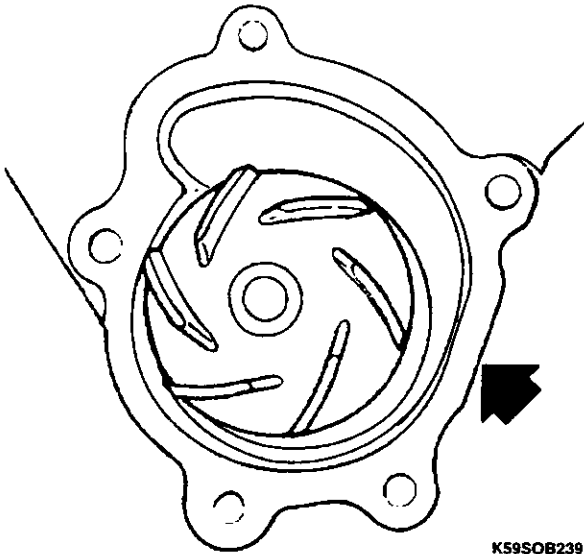
16 - 24 lb-ft (22 - 32 N·m)



K59SOB238

Water Pump

1. Remove all dirt, grease, and other material from the water pump mounting surface.

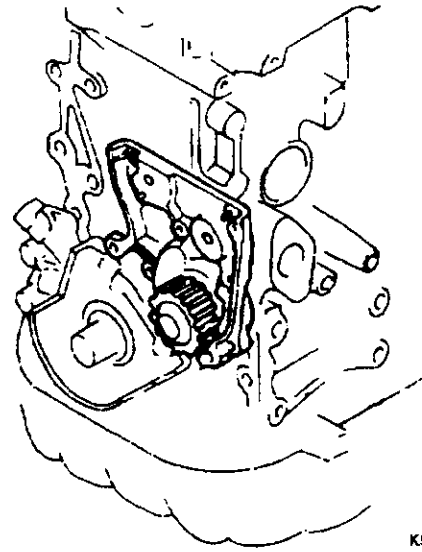


K59SOB239

2. Install the water pump with a new gasket.

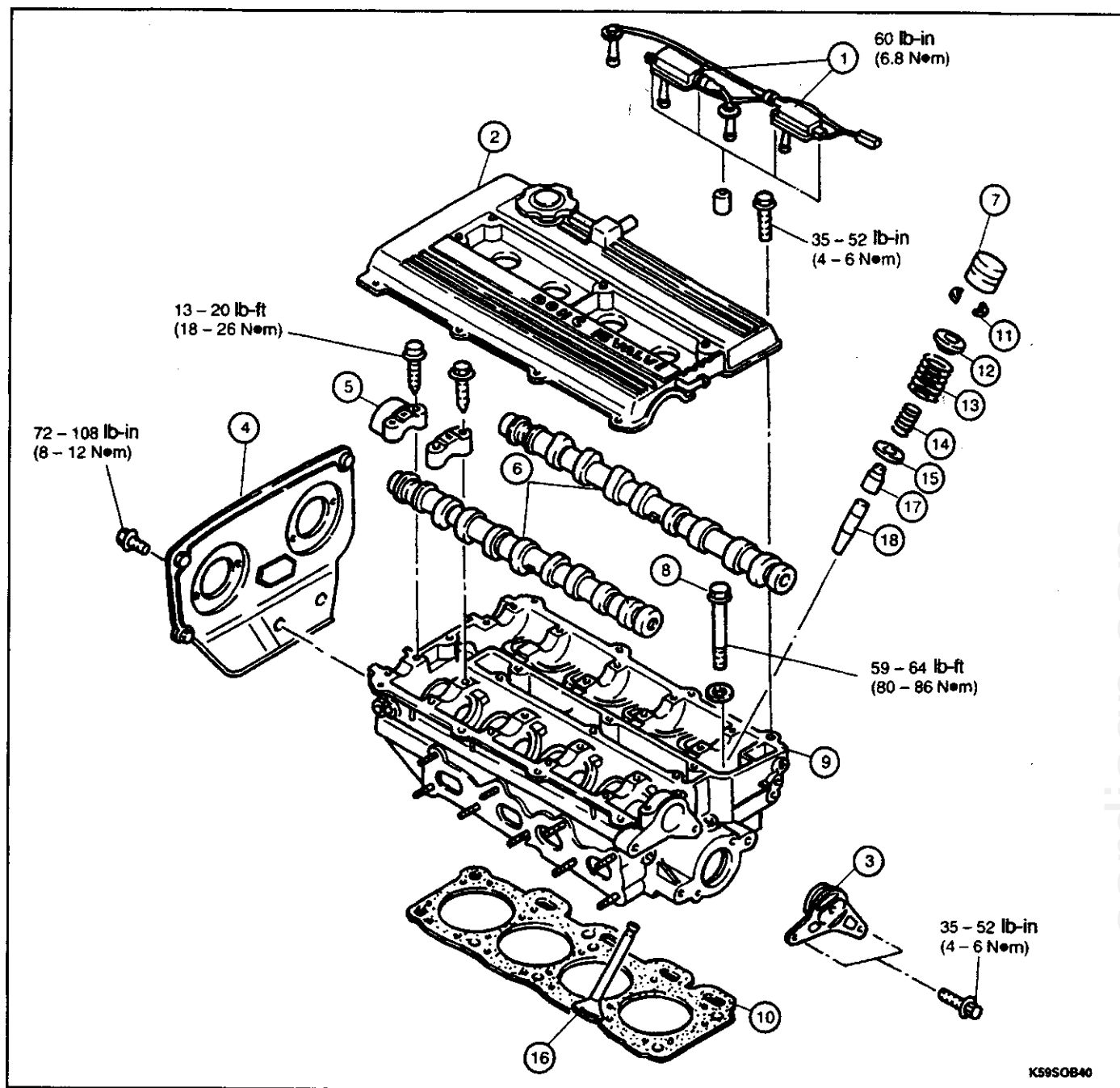
Tightening torque:

14 - 19 lb-ft (19 - 25 N·m)



K59SOB240

CYLINDER HEAD ASSEMBLY

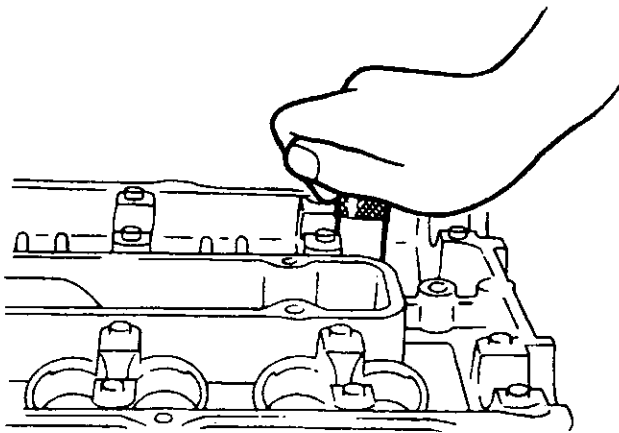


K5950B40

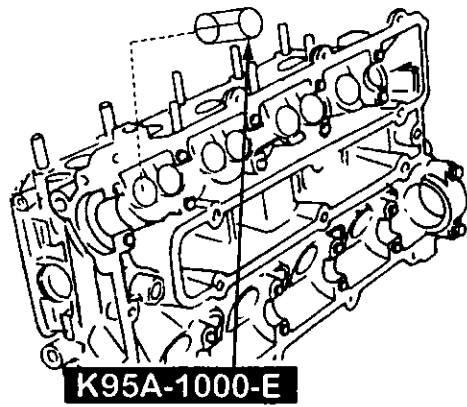
- | | | |
|------------------------------------------|----------------------------|------------------------|
| 1. Ignition Coils and High Tension Leads | 7. Hydraulic Lash Adjuster | 13. Outer Valve Spring |
| 2. Cylinder Head Cover | 8. Cylinder Head Bolt | 14. Inner Valve Spring |
| 3. Camshaft Position Sensor | 9. Cylinder Head | 15. Lower Spring Seat |
| 4. Seal Plate | 10. Cylinder Head Gasket | 16. Valve |
| 5. Camshaft Caps | 11. Valve Locks | 17. Valve Stem Seal |
| 6. Camshafts | 12. Upper Spring Seat | 18. Valve Guide |

Valve Seal

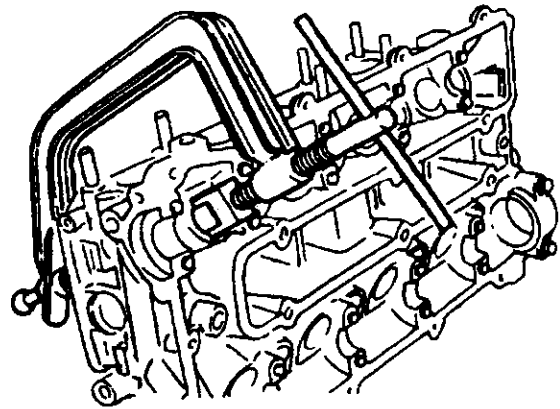
1. Apply engine oil to the inside of the new valve seal.
2. Install the valve seal onto the valve guide.



K59SOB241



5. Compress the valve spring as shown; then install the valve locks.



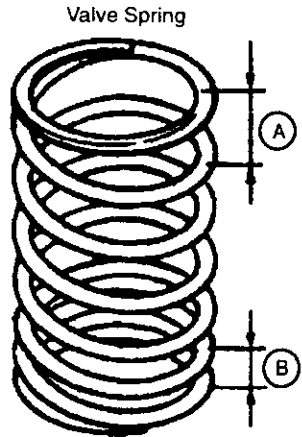
K59SOB243

6. Tap the end of the valve stem lightly two or three times with a plastic hammer to confirm that the locks are all fully seated.

Valve and Valve Spring

1. Install the lower spring seat.
2. Install the valve.
3. Install the valve springs and the upper spring seat.

* **Notice**
Install the outer and inner valve spring with the closer pitch coils toward the cylinder head.



Cylinder Head Side

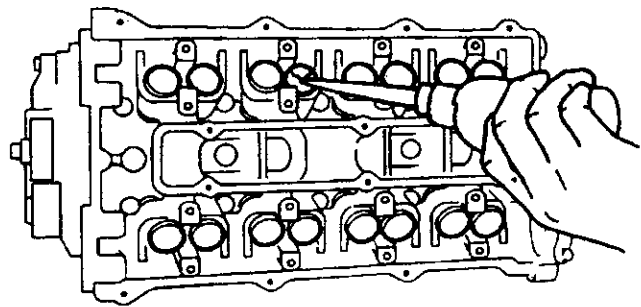
K59SOB242

4. Insert SST K95A-1000-E, into HLA bore.

* **Notice**
HLA protectors must be used to protect the HLA bores from damage.

Hydraulic Lash Adjuster (HLA)

1. Apply engine oil to the sliding surface.



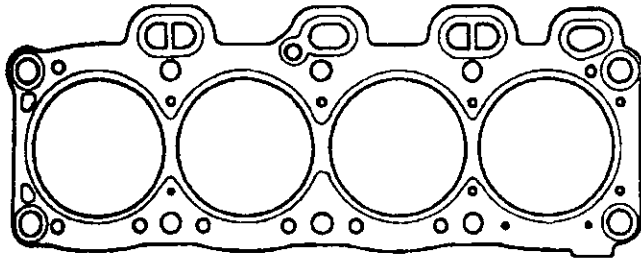
K59SOB245

2. Install the HLAs in the position from which they were removed.
3. Check for free movement.

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Cylinder Head

1. Thoroughly remove all dirt, oil or other material from the cylinder block surface.



K59SOB246

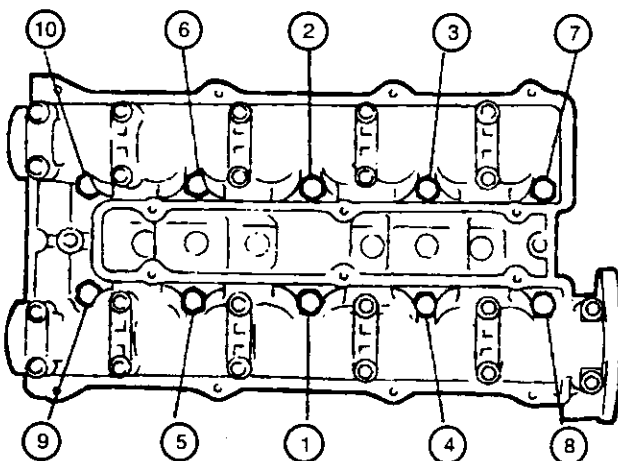
2. Place the new cylinder head gasket in position.
3. Install the cylinder head.
4. Apply engine oil to the bolt threads and seat faces.
5. Tighten the cylinder head bolts in two or three steps in the order shown in the figure.

Tightening torque:

1st step : 20 lb-ft (27 N·m)

2nd step : 40 lb-ft (54N·m)

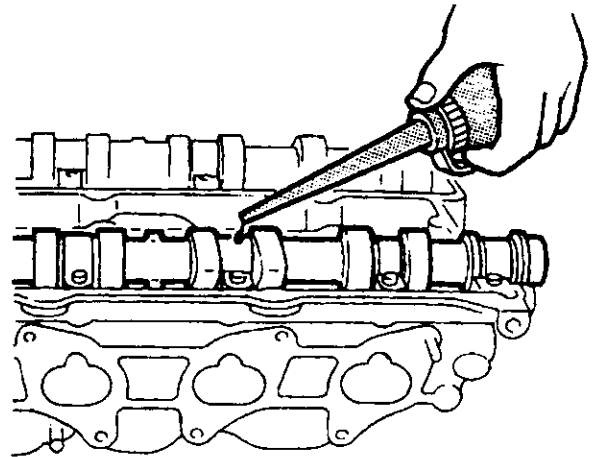
Last step : 59 - 64 lb-ft (80 - 86 N·m)



K59SOB247

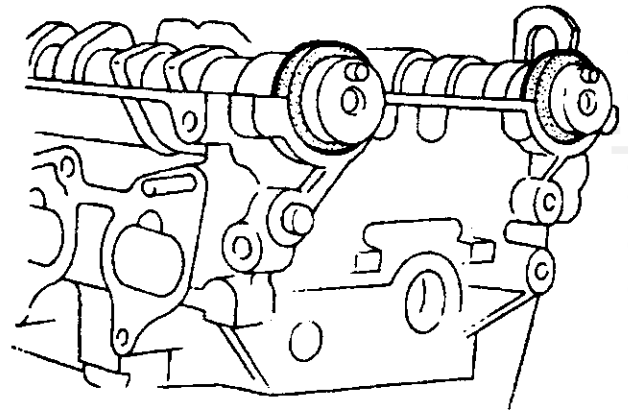
Camshafts

1. Apply a liberal amount of engine oil to the journals.
2. Place the camshafts in position with the dowel pins facing straight up.



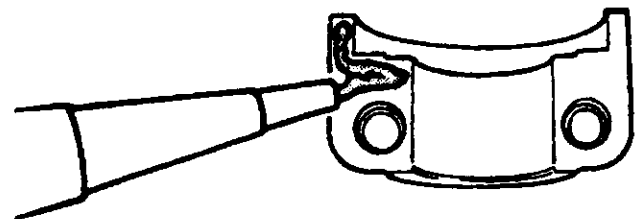
Camshaft Oil Seals

1. Apply liberal amount of clean engine oil to the camshaft oil seals and cylinder head.
2. Install the camshaft oil seals.

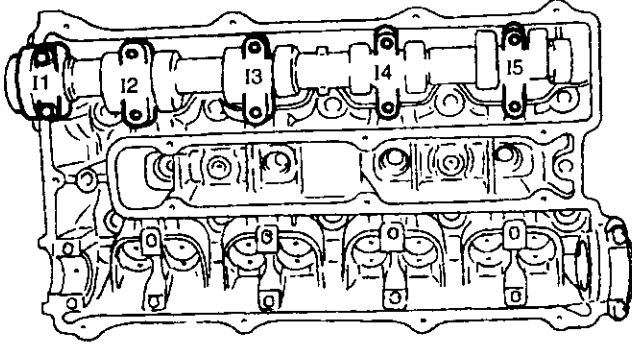


Camshaft Caps

1. Apply liberal amount of clean engine oil to the camshaft lobes and journals.
2. Apply silicon sealant to the front camshaft caps and camshaft position sensor mounting cap surfaces.



- Position the camshaft caps according to the cap number and mark.



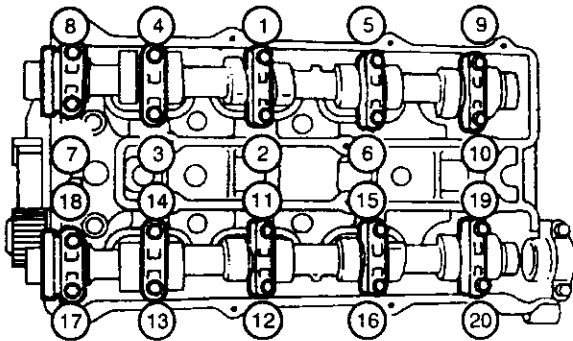
K59SOB251

- Install the camshaft caps. Tighten the bolts in two or three steps in the order shown in the figure.

Tightening torque:

1st step : 6 - 7 lb-ft (8 - 9 N·m)

2nd step : 13 - 20 lb-ft (18 - 26 N·m)

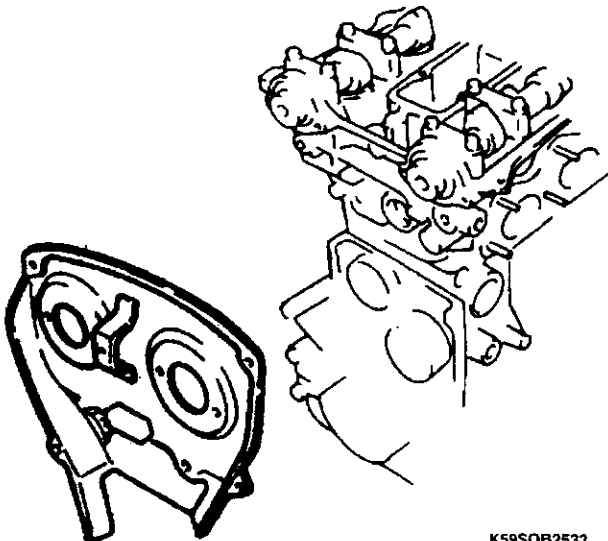


Seal Plate

- Install the seal plate.

Tightening torque:

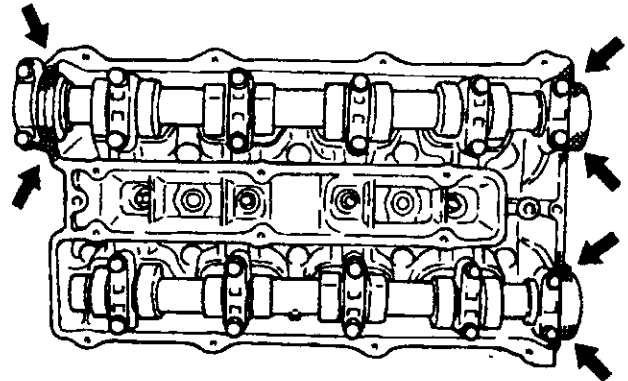
72-108 lb-in (8-12 N·m)



K59SOB2533

Cylinder Head Cover

- Apply silicon sealant to the shaded area shown in the figure.



K59SOB254

- Install the cylinder head cover.

Tightening torque:

35 - 52 lb-in (4 - 6 N·m)

Camshaft Position Sensor

- Remove all dirt, grease, and other material from the camshaft position sensor housing surface.

- Place a new O-ring in position.

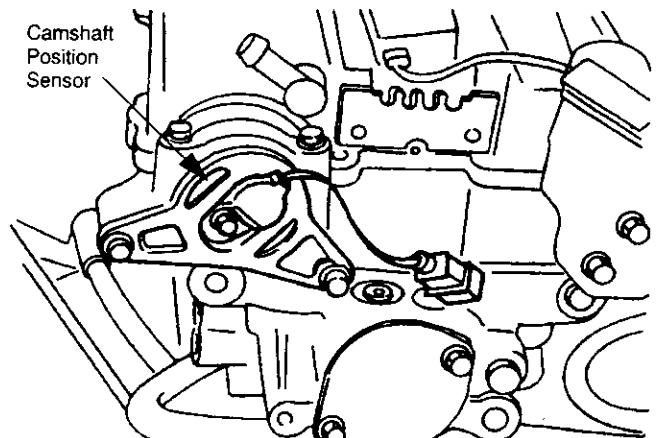
*** Notice**
Do not reuse the original O-ring.

- Install the camshaft position sensor housing.

- Tighten camshaft position sensor mounting cap bolts.

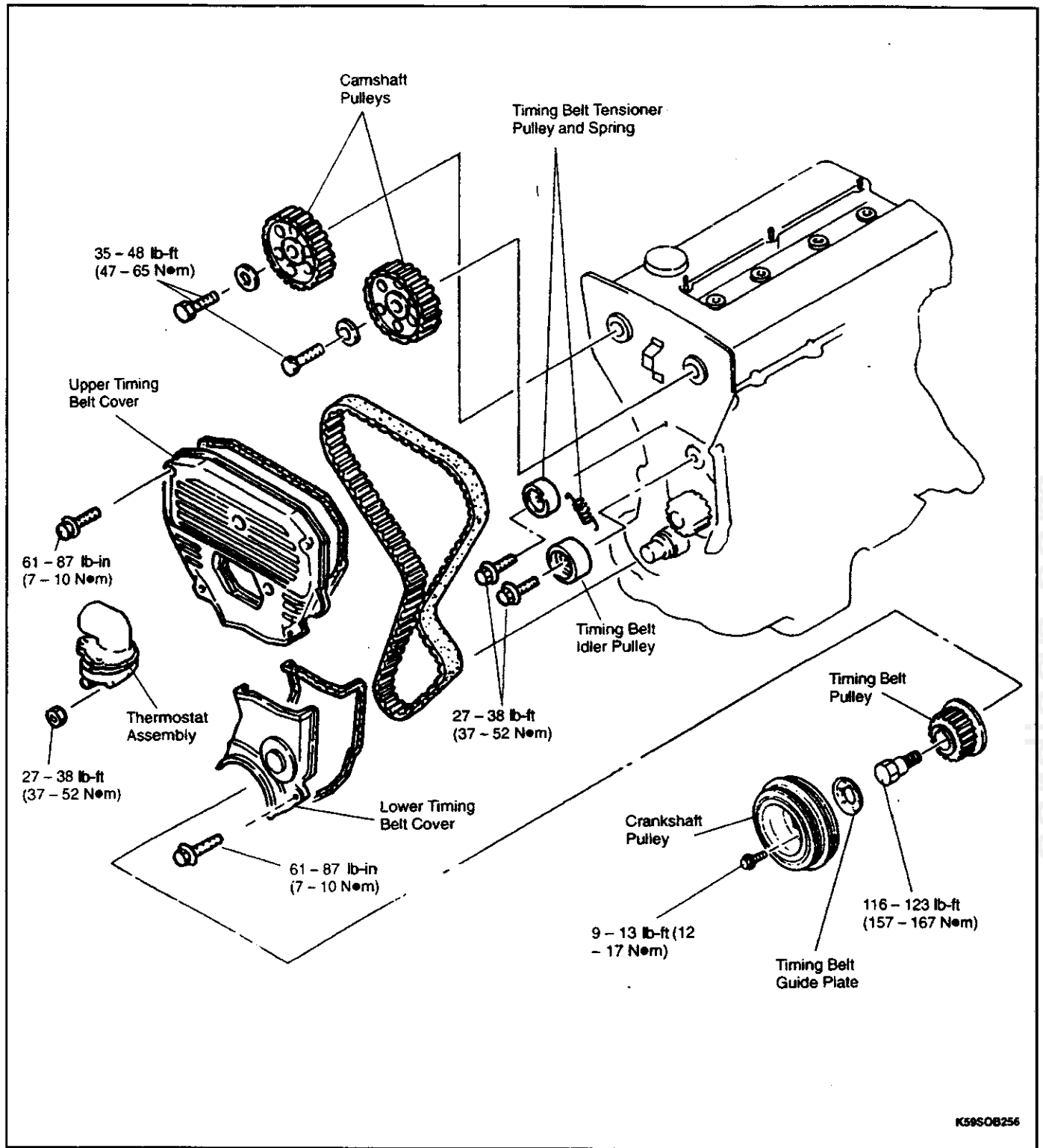
Tightening torque:

19 - 25 lb-in (1.9 - 2.6 N·m)



K59SOB255

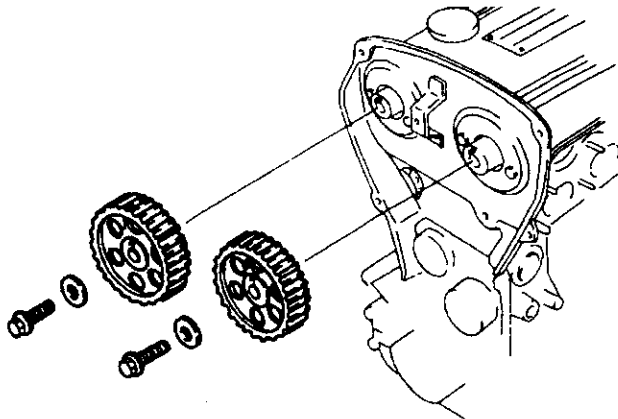
TIMING BELT TORQUE



K59S08256

Camshaft Pulleys

1. Install the camshaft pulleys on the camshafts with the dowel pins fit into the hole at the I mark (intake side) and E mark (exhaust side).

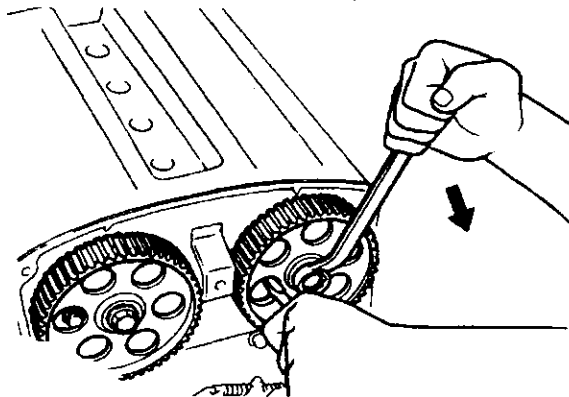


K59SOB257

2. Tighten the camshaft pulley lock bolts.

Tightening torque:

35 - 48 lb-ft (47 - 65 N·m)

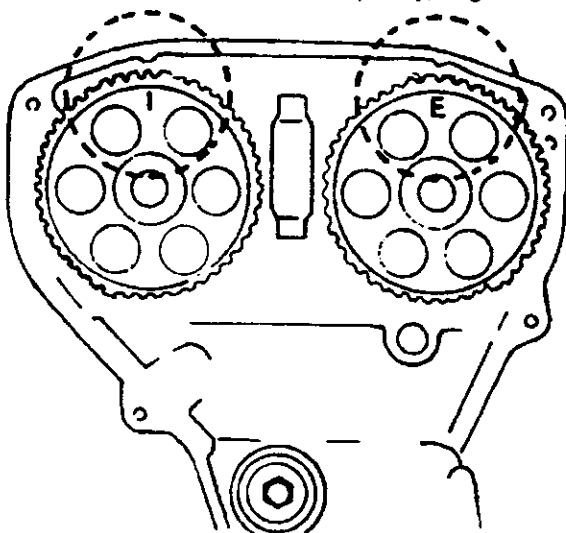


K59SOB258

3. Align the mating marks on the camshaft pulleys with the alignment marks on the seal plate.

*** Notice**

- For intake side camshaft pulley, align I mark
- For exhaust side camshaft pulley, align E mark.



K59SOB259

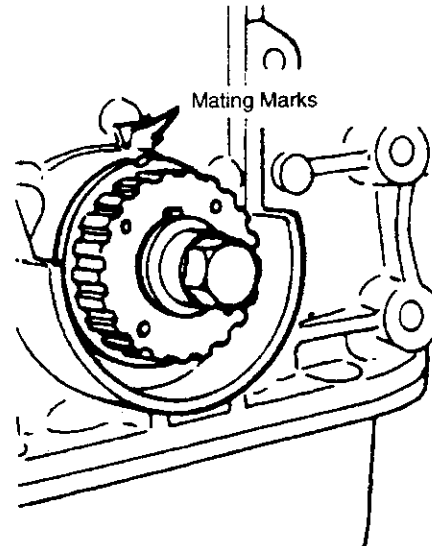
Timing Belt Pulley

1. Reverse the direction of the SST (ring gear brake).
2. Install the crankshaft woodruff key.
3. Install the timing belt pulley onto the crankshaft.

Tightening torque:

116 -123 lb-ft (157 -167 N·m)

4. Release the ring gear brake.
5. Align the timing belt pulley and the pump body alignment marks.



K59SOB260

Timing Belt Idler Pulley

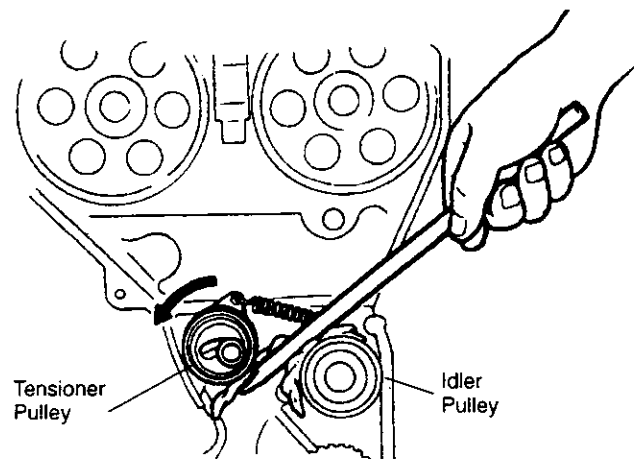
1. Install the timing belt idler pulley.

Tightening torque:

27 - 38 lb-ft (37- 52 N·m)

Timing Belt Tensioner

1. Install the timing belt tensioner pulley and tensioner spring.
2. Temporarily secure the tensioner pulley with the spring fully extended.



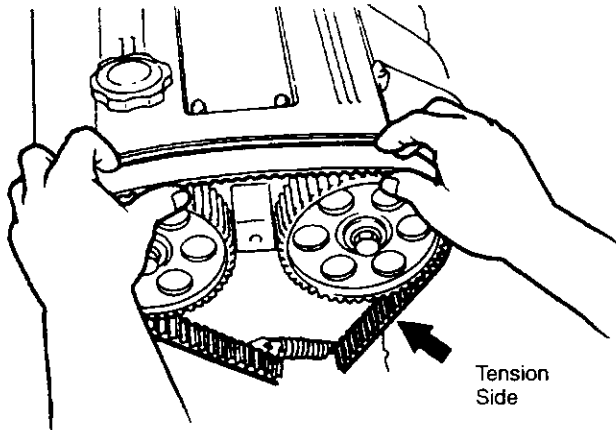
K59SOB261

Timing Belt

1. Install the timing belt so that there is no looseness at the tension side and between the two camshaft pulleys.

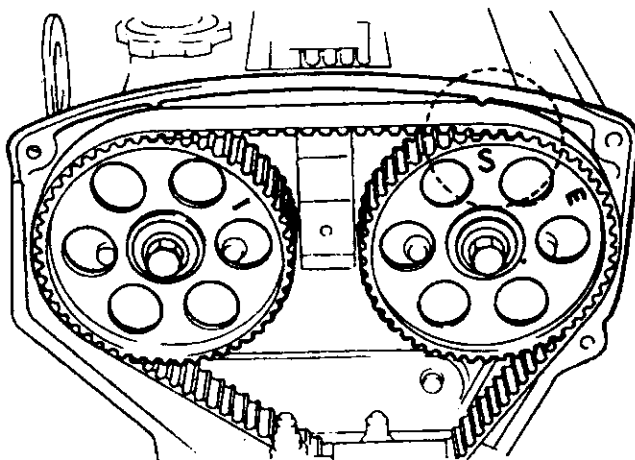
Caution

- If the timing belt is being reused, it must be reinstalled to rotate in the original direction.
- Check that there is no oil, grease, or dirt on the timing belt



K59SOB262

2. Loosen the tensioner lock bolt.
3. Turn the crankshaft twice in the direction of rotation.
4. Check that the mating marks are correctly aligned. If not aligned, remove the timing belt, retract the tensioner, and repeat the timing belt installation procedure.
5. Turn the crankshaft to align the S mark of the exhaust camshaft pulley with seal plate mating mark.



K59SOB263

6. Tighten the timing belt tensioner lock bolt.

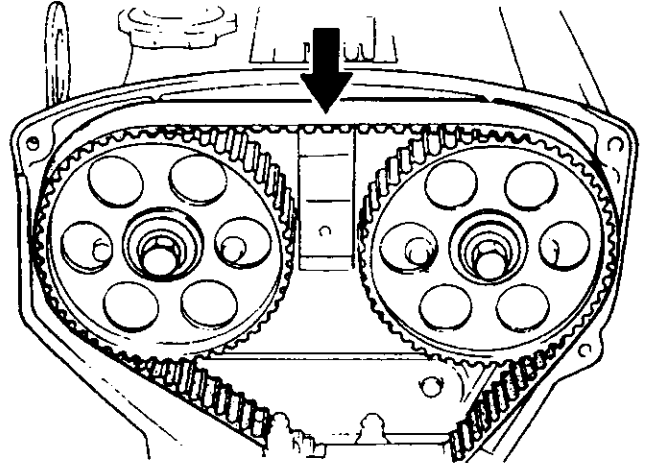
Tightening torque:

27 - 38 lb-ft (37 - 52 N·m)

7. Check the timing belt deflection. If the deflection is not correct, loosen the tensioner lock bolt and repeat steps 3-5 above. Replace the tensioner spring if necessary.

Belt deflection:

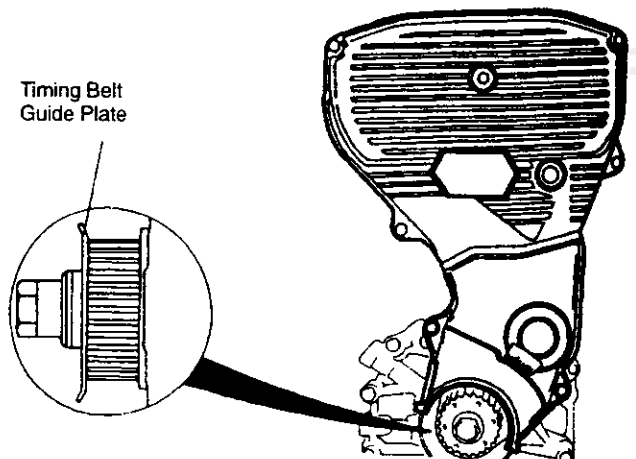
0.30 - 0.33 in (7.5 - 8.5 mm)/ 22 lb (98 N, 10 kg)



K59SOB264

Timing Belt Guide Plate

1. Position the timing belt guide plate on the timing belt pulley.



K59SOB265

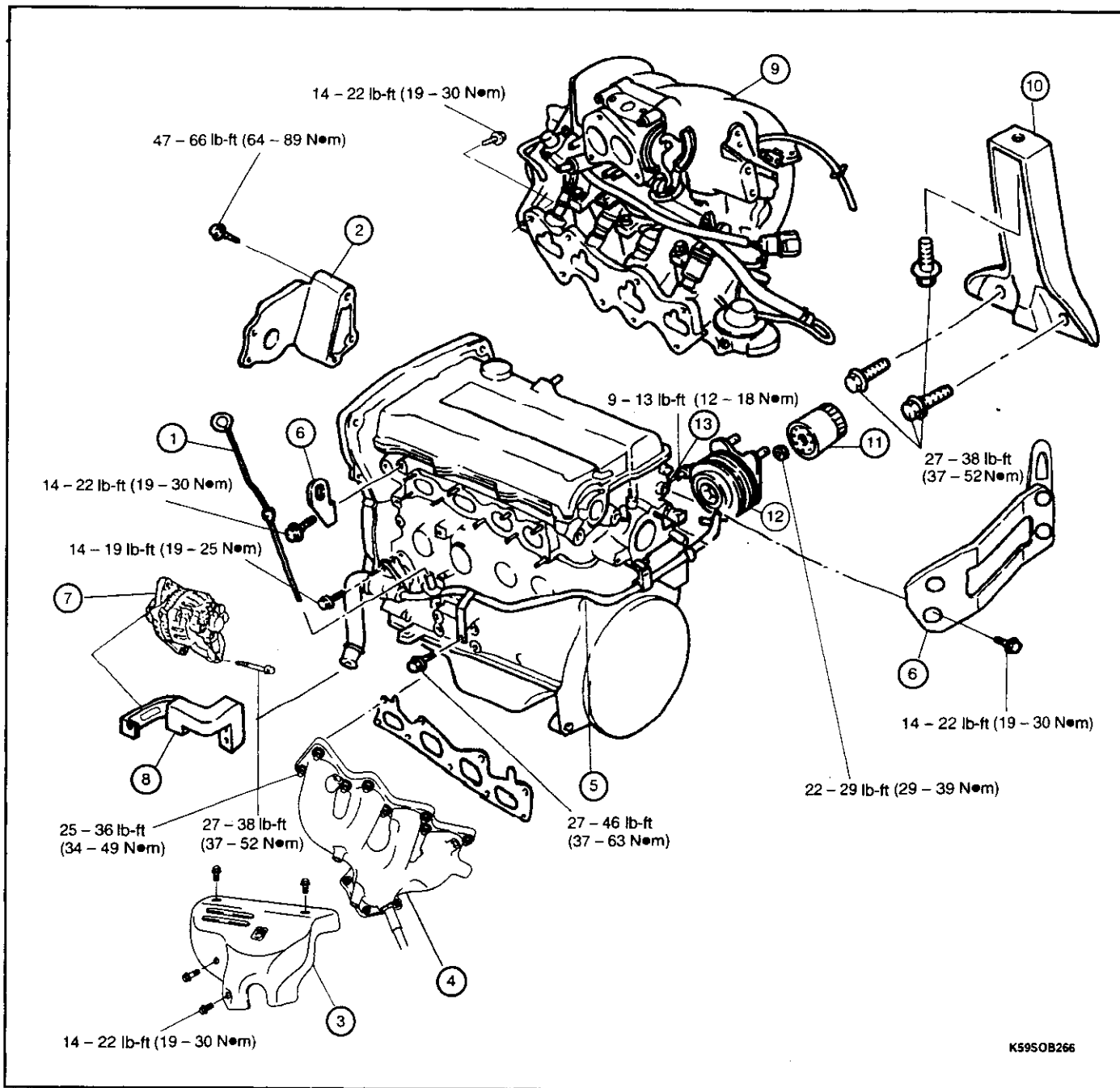
Timing Belt Cover

1. Install the lower timing belt cover, upper timing belt cover, and new gaskets.

Tightening torque:

72 - 84 lb-in (7 - 10 N·m)

AUXILIARY PARTS TORQUE



- 1. Oil Level Gauge
- 2. Thermo-Modulated Fan Bracket
- 3. Exhaust Manifold Heat Shield
- 4. Exhaust Manifold
- 5. Coolant Inlet Pipe and Bypass Pipe

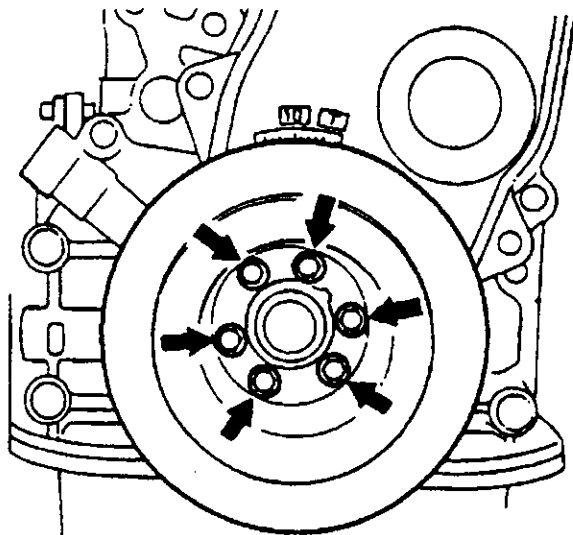
- 6. Engine Hanger
- 7. Generator
- 8. Generator Strap and Bracket
- 9. Intake Manifold Assembly
- 10. Intake Manifold Support Bracket

- 11. Oil Filter
- 12. Oil Cooler
- 13. Oil Pressure Switch

Crankshaft Pulley

1. Install the crankshaft pulley.

Tightening torque
9-13 lb-ft (12-17 N·m)

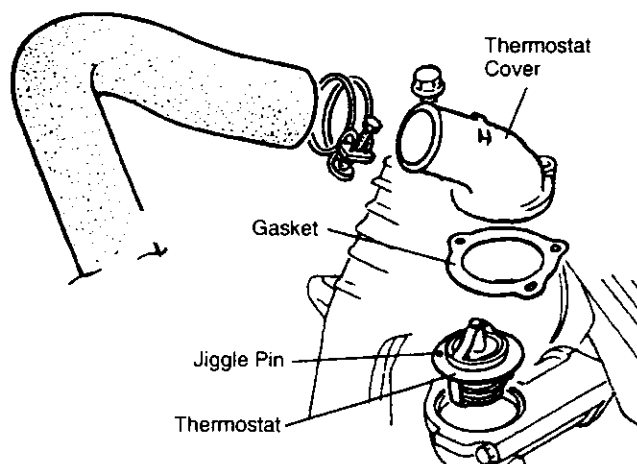


K59SOB267

Thermostat

1. Install the thermostat housing onto the cylinder block.

Tightening torque:
27 - 38 lb-ft (37 - 52 N·m)



K59SOB268

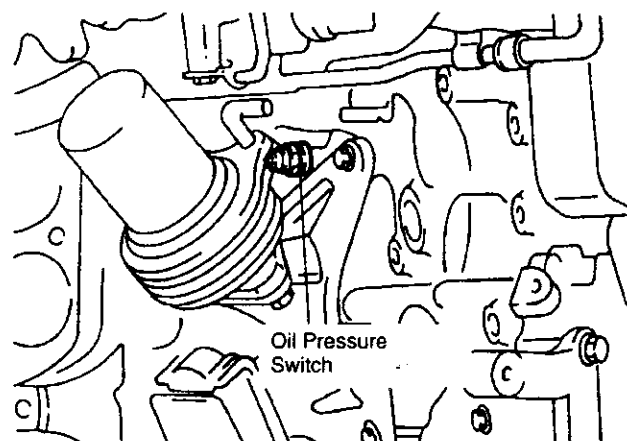
2. Install the thermostat into the thermostat housing with jiggle pin facing forward.
3. Install a new gasket with the seal print side facing the thermostat housing.
4. Install the thermostat cover.

Tightening torque:
14 - 22 lb-ft (19 - 30 N·m)

Oil Pressure Switch

1. Install the oil pressure switch.

Tightening torque:
9-13 lb-ft (12-18 N·m)



K59SOB269

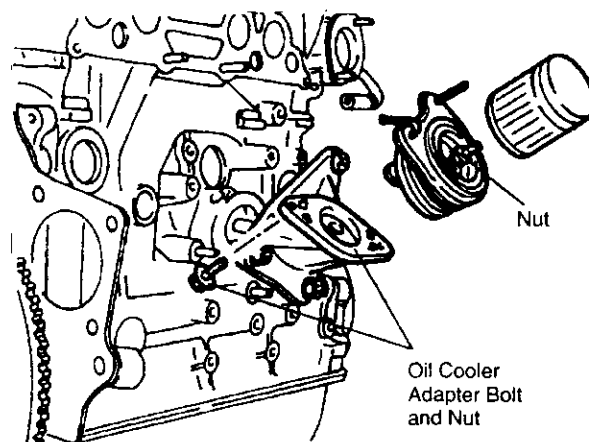
Oil Cooler

1. Install the oil cooler adapter.

Tightening torque :
Bolt and Nut: 70 - 95 lb-in (7.8 - 10.8 N·m)

2. Install the oil cooler with a new O-ring.

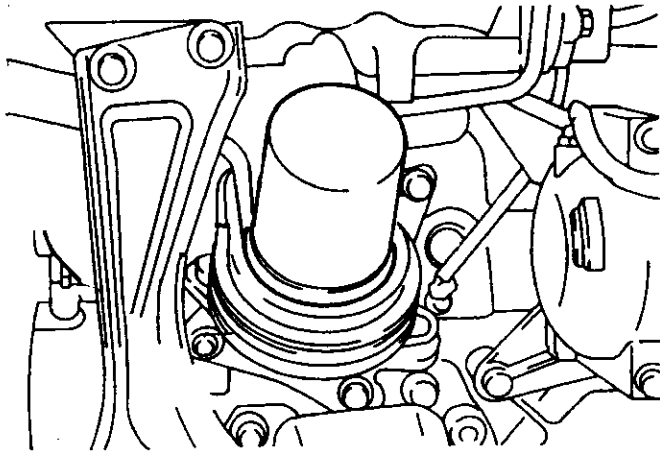
Nut: 22 - 29 lb-ft (29 - 39 N·m)



K59SOB270

Oil Filter

1. Apply a small amount of engine oil to the rubber seal of the new filter.
2. Install the oil filter and tighten it by hand until the rubber seal contacts the base.
3. Then tighten the filter 1 and 1/6 turn.



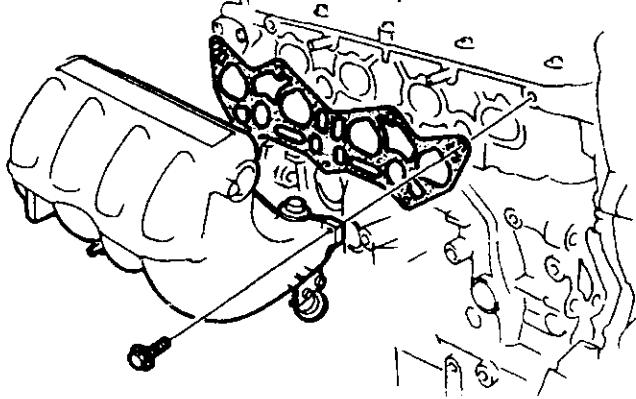
11a-009

Intake Manifold Assembly

1. Place the new gasket in position.
2. Install the intake manifold assembly.
3. Tighten the nuts in two or three steps.

Tightening torque :

14 - 22 lb-ft (19 - 30 N·m)



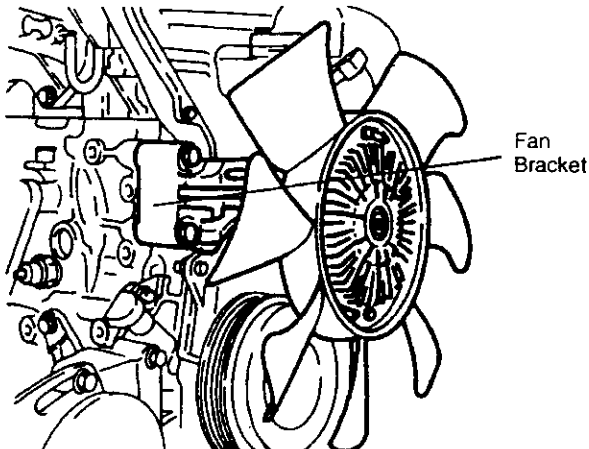
K59SOB271

Thermo-Modulated Fan Assembly

1. Install the thermo-modulated fan on the fan bracket.

Tightening torque:

78-113 lb-in (8.8-12.7 N·m)



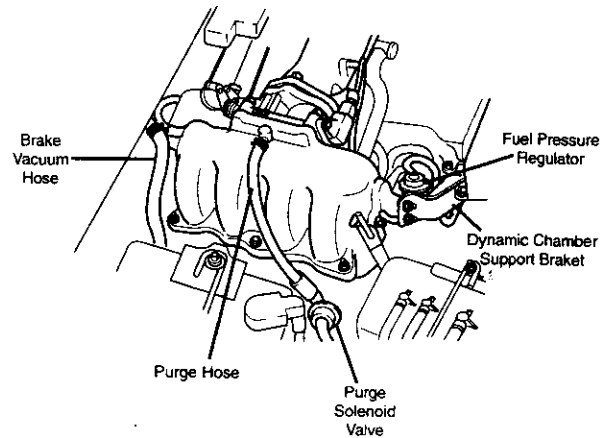
K59SOB272

Dynamic Chamber Support Brackets

1. Install the dynamic chamber support brackets at the front and rear of the intake manifold.

Tightening torque:

14 - 19 lb-ft (19 - 25 N·m)



BN7A10002

Spark Plugs

1. Check spark plugs for the proper gap.

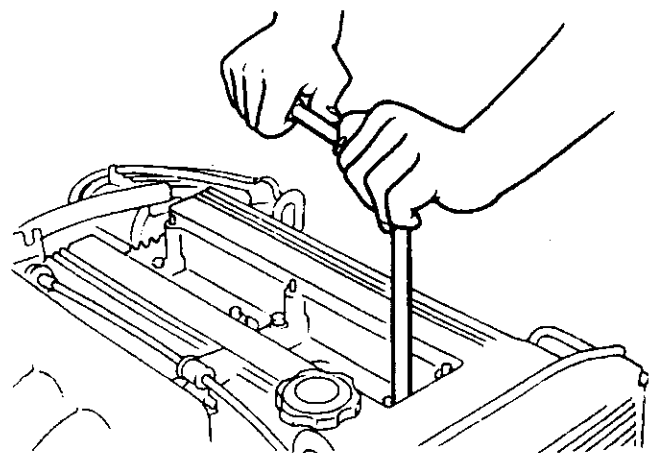
Plug gap :

0.039 - 0.043 in (1.0 - 1.1 mm)

2. Apply anti-seize compound to the spark plug threads.
3. Install the spark plugs.

Tightening torque:

11 - 17 lb-ft (15 - 23 N·m)



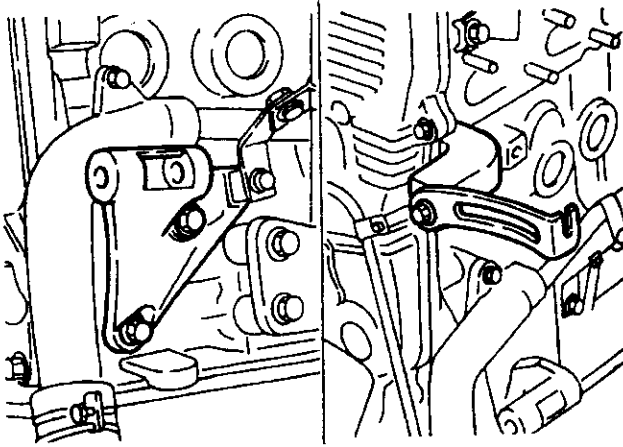
K59SOB274

Generator

1. Install the generator strap and bracket.
2. Install the lower bracket.

Tightening torque:

69 - 83 lb-ft (93 - 113 N·m)



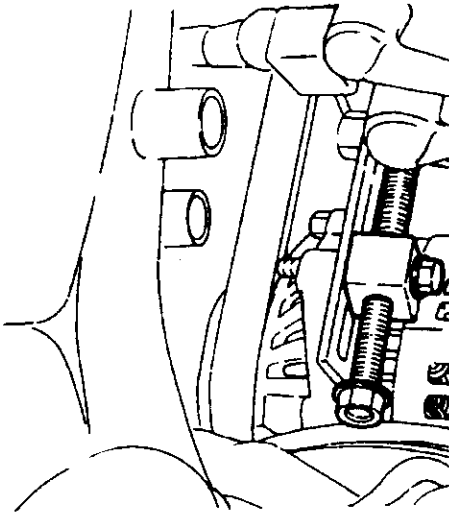
K59SOB275

3. Install the generator.

Tightening torque:

27 - 38 lb-ft (37 - 52 N·m)

4. Install the generator drive belt, and adjust the belt deflection. Refer to *Charging System*, section 32.



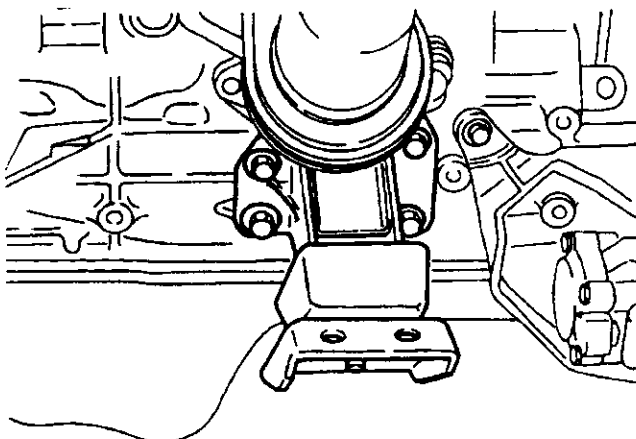
K59SOB276

Engine Mount Bracket

1. Install the engine mount brackets to both sides of the cylinder block.

Tightening torque:

27 - 38 lb-ft (37 - 52 N·m)



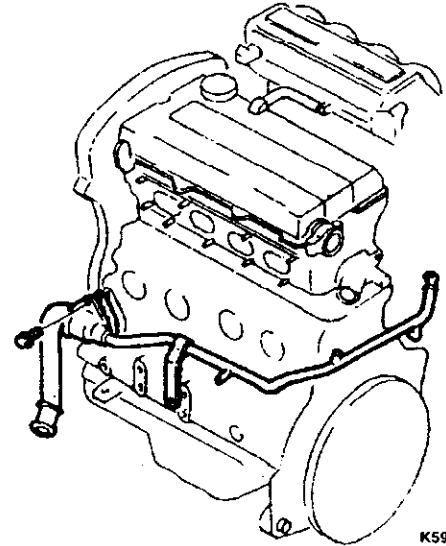
K59SOB277

Coolant Inlet Pipe and Bypass Pipe

1. Install the coolant inlet pipe.
2. Apply lubricant to the O-ring.
3. Install the coolant bypass pipe.

Tightening torque:

14 - 19 lb-ft (19 - 26 N·m)



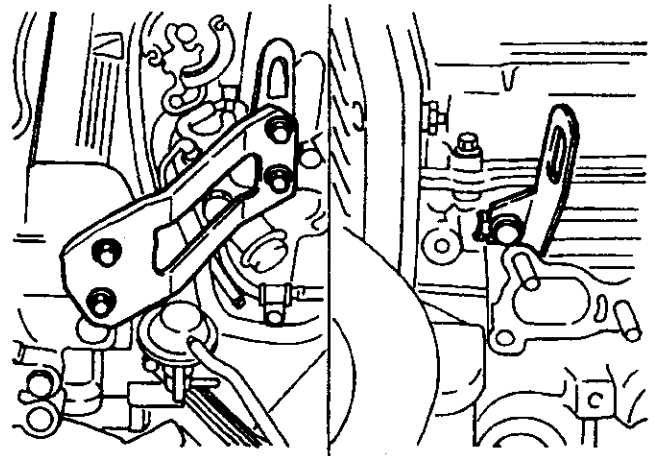
K59SOB278

Engine Hanger

1. Install the front and rear engine hangers.

Tightening torque:

14 - 22 lb-ft (19 - 30 N·m)



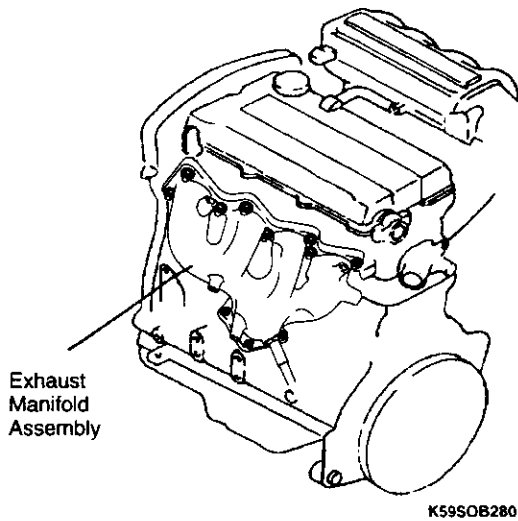
K59SOB279

Exhaust Manifold Assembly

1. Place the new gaskets in position with the ridge facing the cylinder head.
2. Install the exhaust manifold assembly.
3. Tighten the nuts in two or three steps.

Tightening torque:

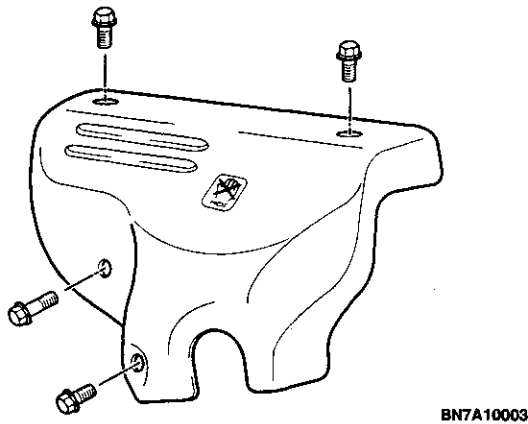
25 - 36 lb-ft (34 - 49 N·m)



Exhaust Manifold Heat Shield

1. Install the exhaust manifold heat shield.

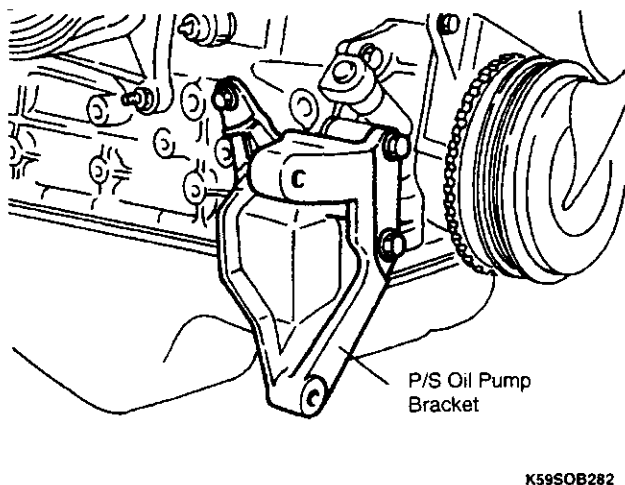
Tightening torque:
 14 - 22 lb-ft (19 - 30 N·m)



P/S Oil Pump Bracket

1. Install the power steering oil pump bracket with three mounting bolts.

Tightening torque:
 27 - 38 lb-ft (37 - 52 N·m)



Engine Installation

1. Slowly lower the engine into the vehicle, checking for "hang-ups" as you go. Free any such "hang-ups" prior to continuing. Lower the engine until the Camshaft Position Sensor, Condenser, and Ignition Coil connectors can be connected at the rear of the engine.
2. Connect the Camshaft Position Sensor, Condenser, and Coil connectors, and secure them in the clamp at the rear of the engine cylinder head.
3. Connect engine to transmission.

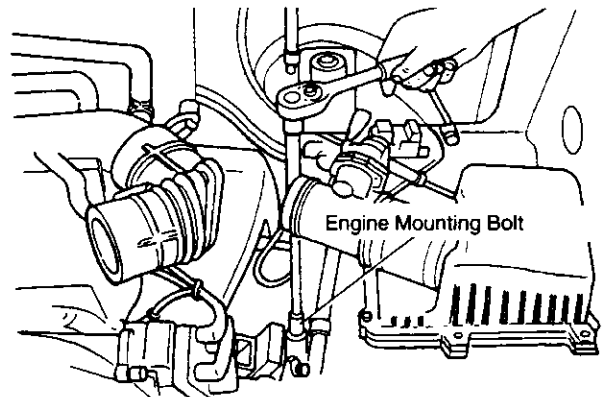
Tightening torque:
Bolts (0.55 in., 14 mm): 80 lb-ft (108 N·m)
Bolts (0.39 in., 10 mm): 28 lb-ft (38 N·m)
Bolts (0.24 in., 6 mm): 5 lb-ft (7 N·m)

4. Install the three right side mounting bolts and tighten to specification.

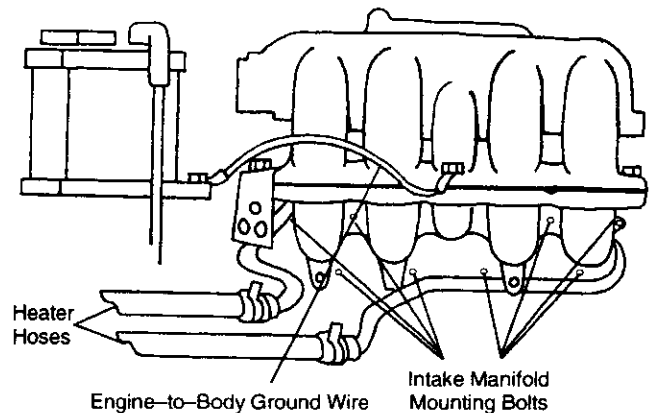
Tightening torque:
 27 - 38 lb-ft (37 - 52 N·m)

5. Install the three left side mounting bolts and tighten to specification.

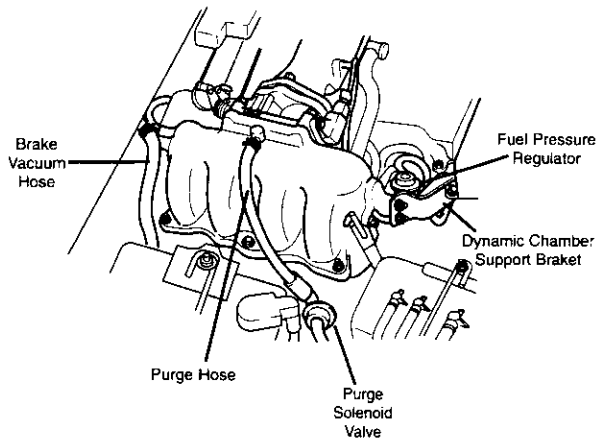
Tightening torque:
 27 - 38 lb-ft (37 - 52 N·m)



6. Disconnect the engine hoist from the engine.
7. Install the engine-to-body ground wire and the bracket below it onto the intake manifold.

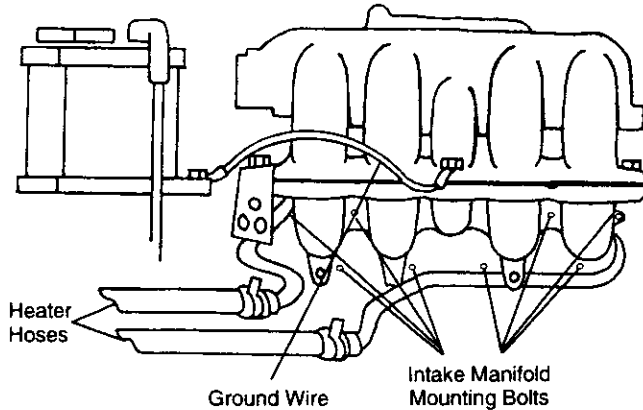


8. Install the fuel line to the fuel pressure regulator and the return line at the rear of the dynamic chamber.
9. Install the brake booster vacuum hose to the dynamic chamber.



BN7A10002

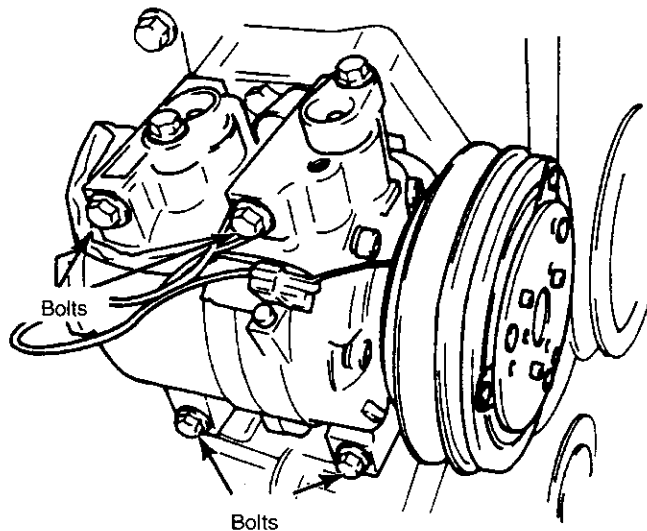
10. Install both heater hoses to the pipes.
11. Install the electrical connectors (two – one clip and one bolted) to the generator.



K59SOB286

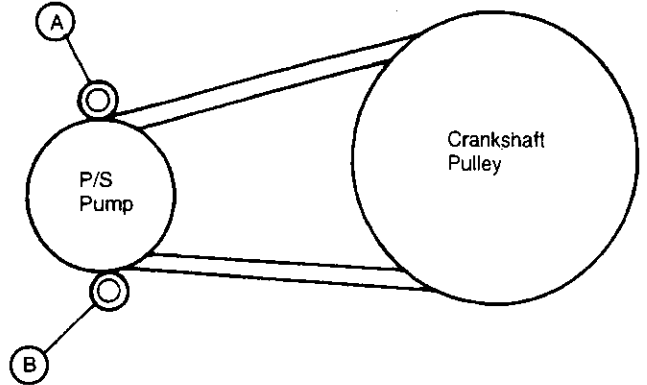
12. Install the A/C compressor and secure with the four mounting bolts. Tighten to specification.

Tightening torque:
18 lb-ft (24 N·m)



K59SOB288

13. Install, but do not tighten, the power steering pump lock bolt (A) and mounting bolt (B).



K59SOB289

14. Install the power steering belt.
15. Adjust the power steering belt, and tighten the power steering pump lock bolt (A) and mounting bolt (B).

P/S Belt Deflection:
0.35 - 0.43 in (9 -11mm) at 22 lb (98 N·m)

Tightening torque:
30 lb-ft (42 N·m)

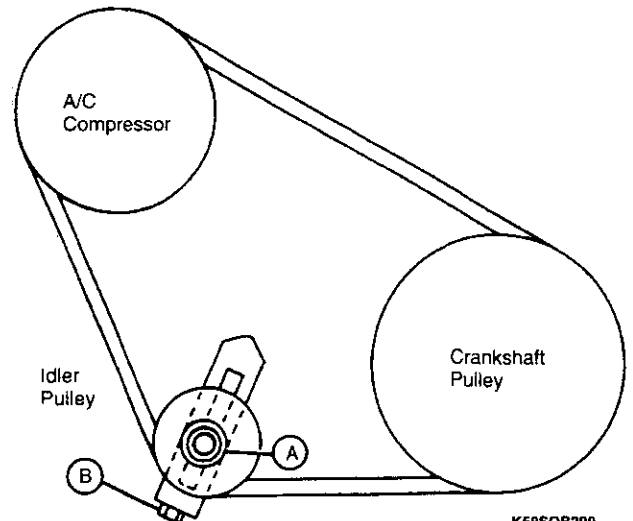
16. Set the fan pulley in place.
17. Temporarily set the generator belt in place on the generator, crankshaft and fan pulleys until the fan is installed. Refer to step 31 in this section.
18. Set the A/C belt in place.
19. Install the A/C tensioner bracket and tighten to specification.

Tightening torque:
18 lb-ft (24 N·m)

20. Adjust the A/C belt tension, and tighten the A/C tensioner pulley bolts.

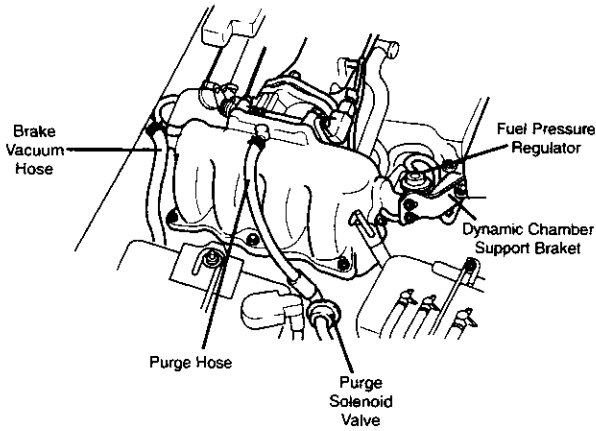
A/C Belt Deflection:
0.35 - 0.43 in (9 -11mm) at 22 lb (98 N·m)

Tightening torque:
24 lb-ft (32 N·m)



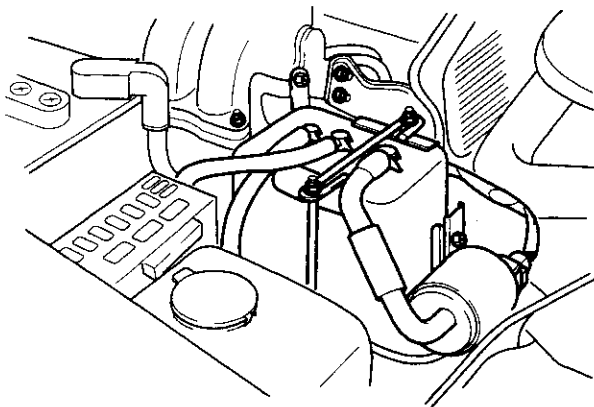
K59SOB290

21. Install the purge solenoid valve vacuum hose to the intake manifold.



BN7A10002

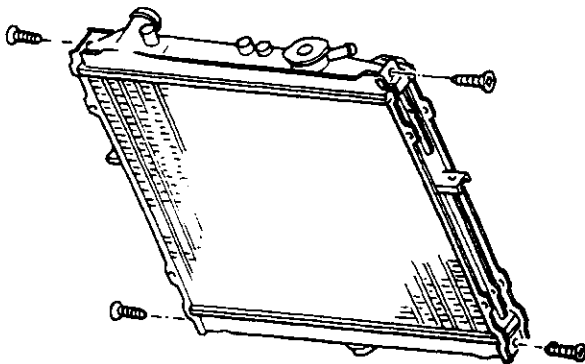
22. Install the charcoal canister by sliding it into the clamp provided for it.
 23. Install the three vacuum hoses to the top of the charcoal canister.



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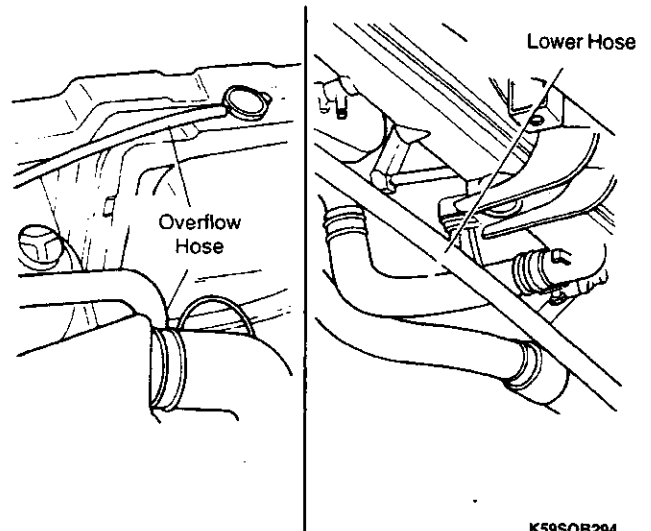
24. Install the radiator with the four radiator mounting bolts.

Tightening torque:
 72 lb-in (8 N·m)



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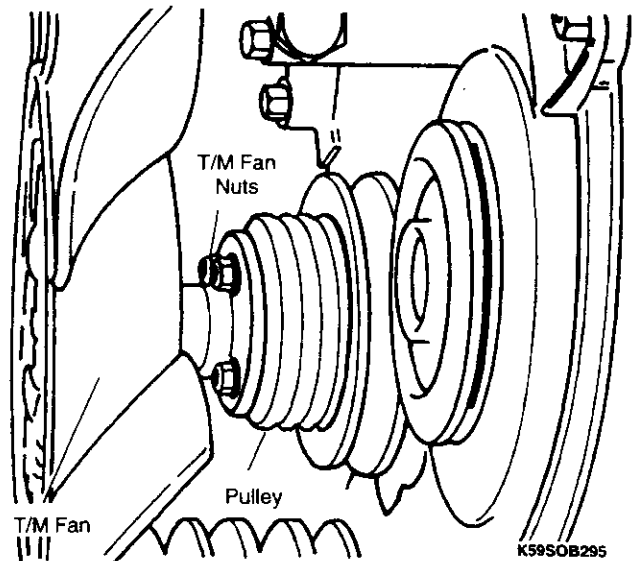
25. Install the coolant overflow hose.



K59SOB294

26. Install the lower radiator hose.
 27. Secure the lower radiator hose clamps.
 28. Install the automatic transmission cooler lines (A/T only).
 29. Install the thermo-modulated fan, and cooling fan shroud at the same time.
 30. Install all four thermo modulated fan nuts, then tighten them.

Tightening torque:
 27 lb-ft (37 N·m)



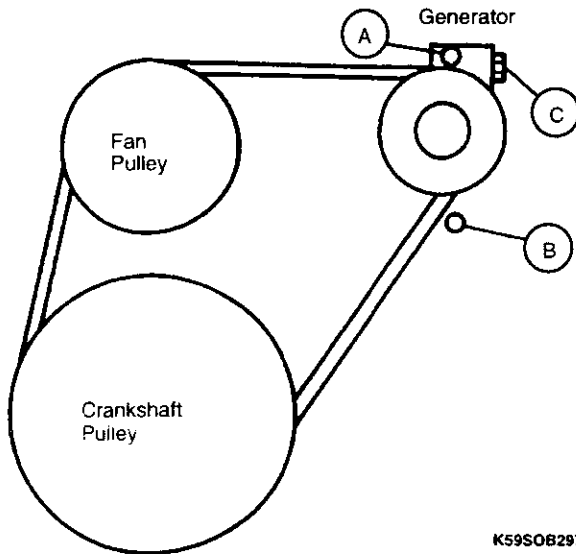
K59SOB295

31. Adjust the tension on the generator belt, and tighten the generator lock bolt.

Deflection:
 0.27 - 0.35 in (7 - 9mm) at 22 lb (98 N·m)

Tightening torque:
 A: 16 lb-ft (22 N·m)
 B: 32 lb-ft (45 N·m)

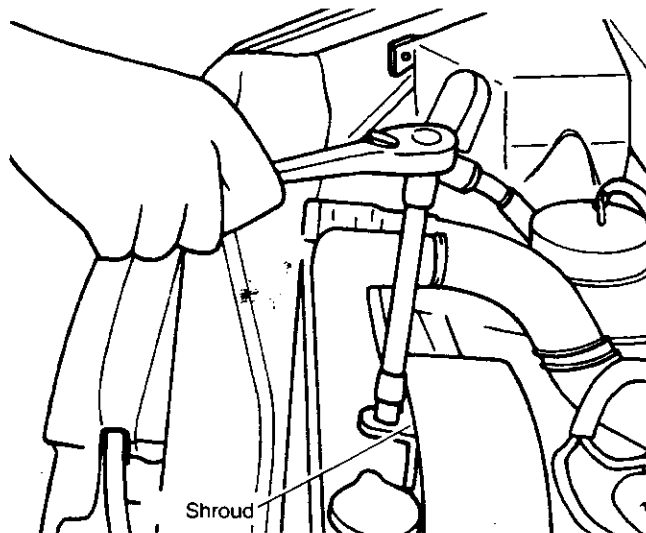
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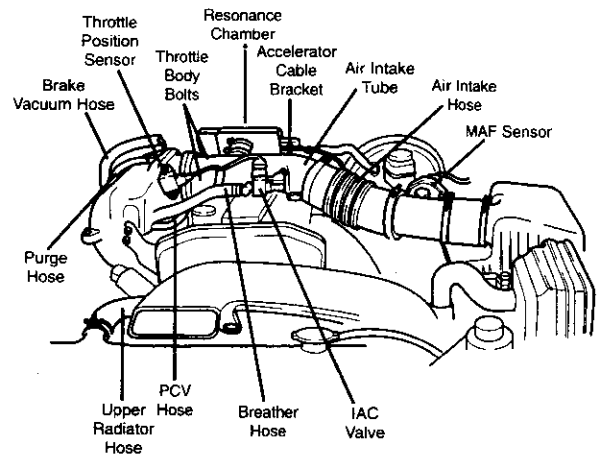
32. Install the five cooling fan shroud bolts and tighten to specification.

Tightening torque:
6.2 lb-ft (8 N·m)



K59SOB296

33. Install the upper radiator hose.
 34. Secure the upper radiator hose clamps.
 35. Install and tighten the radiator drain plug.
 36. Install the air intake hose and air intake tube as an assembly.
 37. Install three bolts from the air intake tube to throttle body.
 38. Secure the air intake tube to the cylinder head cover with two bolts and tighten to specification.
- Tightening torque:**
3.2 - 4.6 lb-ft (4.6 N·m)
39. Install the air hose to the mass air flow (MAF) sensor.
 40. Secure the air hose forward clamp to the MAF sensor.
 41. Connect the MAF sensor harness connector.

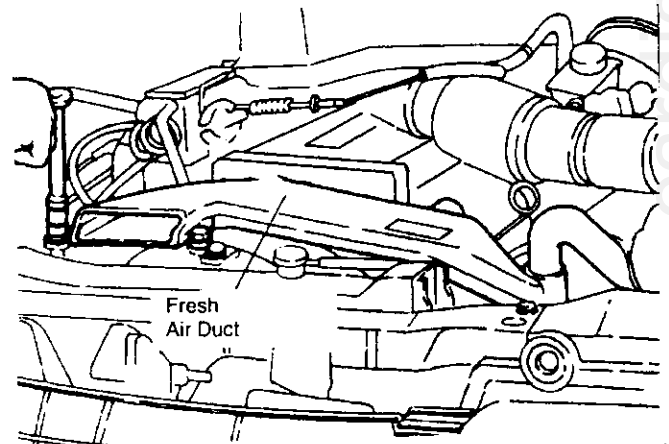


BN7A10001

42. Install the IAC air hose, the breather hose, and the vacuum line to the air intake assembly.
43. Install the resonance chamber, and secure in place with the mounting bolt.
44. Connect the accelerator cable.
45. Connect the A/T control cable.
46. Install the two accelerator cable and air intake hose mounting bolts to the cylinder head cover.

Tightening torque:
60 lb-in (7 N·m)

47. Install the fresh air duct.

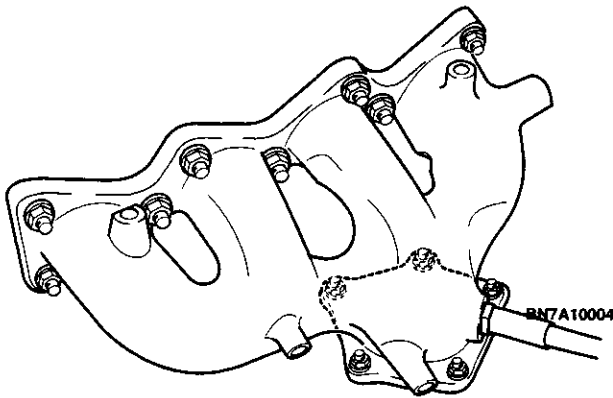


K59SOB301

48. Secure the fresh air duct to the air intake housing.
 49. Install the two fresh air duct mounting bolts to the radiator.
- Tightening torque:**
84 lb-in (10 N·m)
50. Raise and properly support the vehicle.

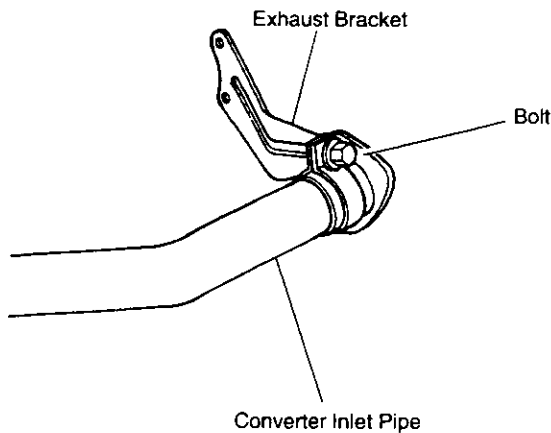
51. Install the five lower exhaust flange lock nuts.

Tightening torque:
24 lb-ft (31 N·m)



52. Install the front exhaust bracket mounting bolt.

Tightening torque:
20 lb-ft (27 N·m)

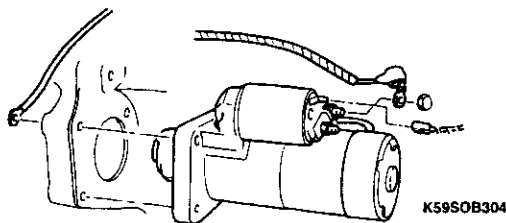
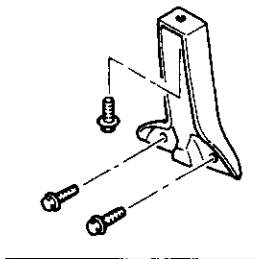


53. Install the two exhaust bracket-to-clutch (M/T)/converter (A/T) housing mounting bolts and the bracket.

Tightening torque:
31 lb-ft (42 N·m)

54. Install the starter and mounting bolts.

Tightening torque:
32 lb-ft (45 N·m)

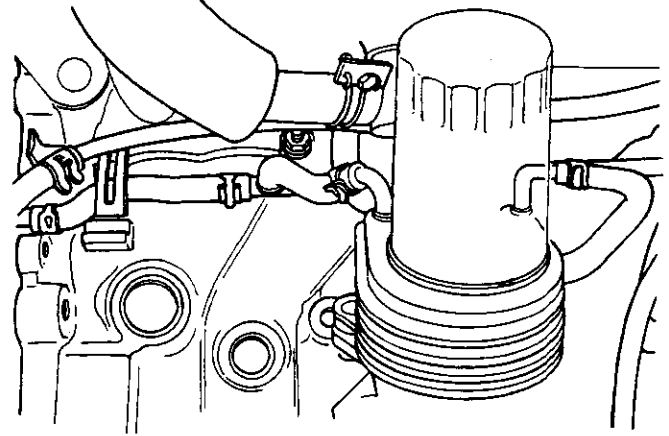


55. Install electrical connectors, if removed.

56. Install the intake manifold bracket and tighten the three bolts to specification.

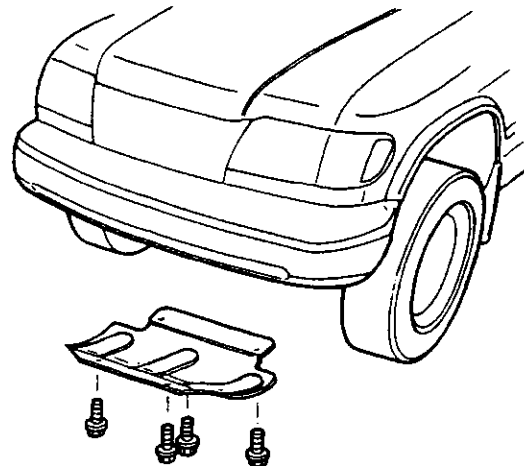
Tightening torque:
32 lb-ft (45 N·m)

57. Install the coolant lines to the oil cooler, and secure the coolant line clamps.



58. Install the undercover (lower splash guard) with the four undercover mounting bolts. Tighten to specification.

Tightening torque:
74 lb-in (8 N·m)

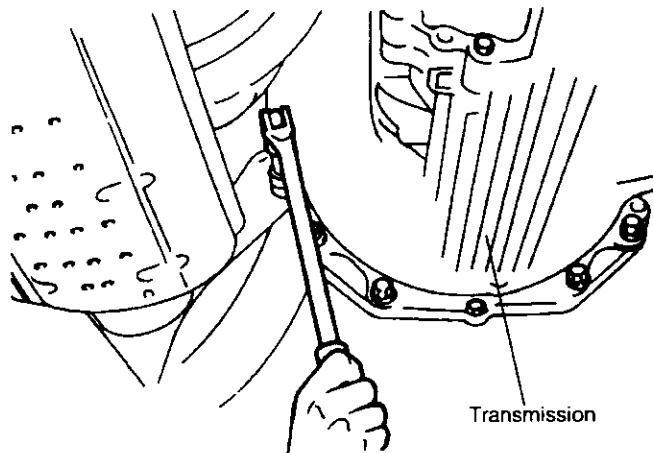


K59SOB306

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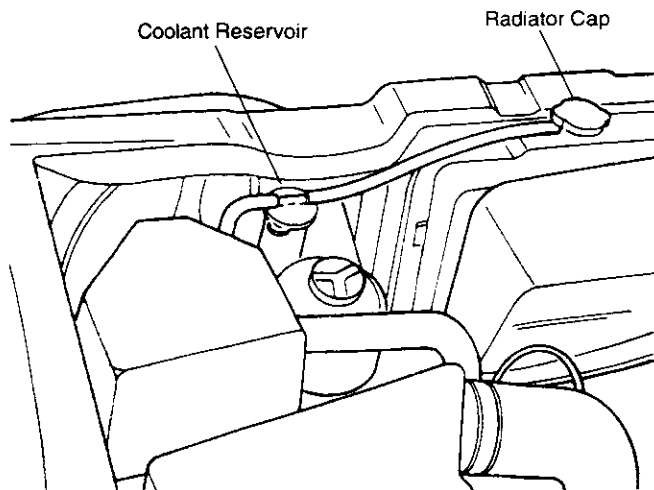
59. Install the six drive plate-to-torque converter bolts and tighten to specification. (A/T only)

Tightening torque:
20 lb-ft (28 N·m)



K59SOB127

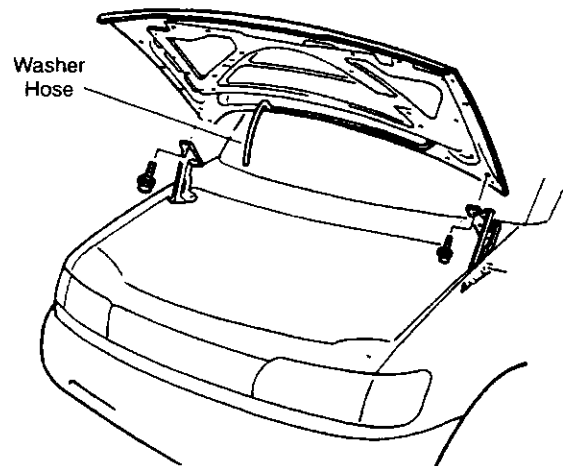
60. Lower the vehicle.
61. Fill the radiator with the proper quantity and mixture of coolant.
62. Install the radiator cap.



K59SOB10

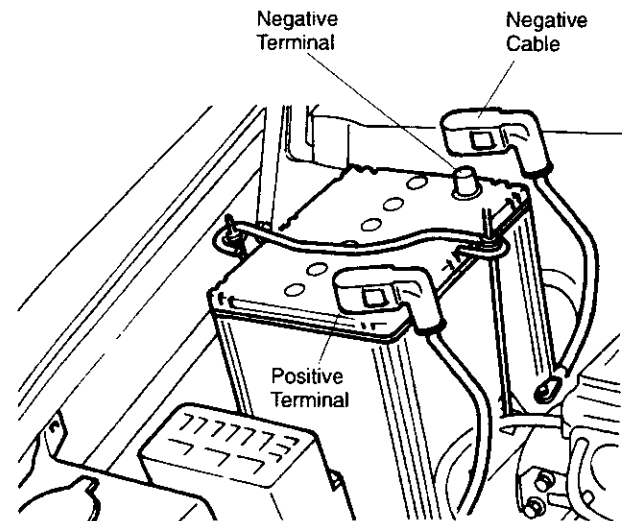
63. Install the hood with the four hood mounting bolts, and tighten to specification.

Tightening torque:
17 lb-ft (22.5 N·m)



K59SOB307

64. Reconnect the windshield washer hose to the hood.
65. Reconnect the negative battery cable.



K59SOB308

66. Check, and fill as necessary, all fluid levels prior to starting the engine or driving the vehicle.

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Accelerator Cable Mounting Bolt	60 lb-in (7 N•m)
A/C Bracket Bolt	32 lb-ft (45 N•m)
A/C Compressor Mounting Bolt	18 lb-ft (25 N•m)
A/C Tensioner Bracket Bolt	18 lb-ft (25 N•m)
A/C Idler Pulley Lock Nut	24 lb-ft (32 N•m)
Air Hose Mounting Bolt	60 lb-in (7 N•m)
Air Intake Housing Bolt	38-56 lb-in (4-6 N•m)
Bypass Pipe Bolt	18 lb-ft (25 N•m)
Camshaft Cap Bolt	16 lb-ft (22 N•m)
Camshaft Pulley Lock Bolt	42 lb-ft (56 N•m)
Clutch (M/T)/Converter (A/T) Housing Bolt	
0.55 inch (14 mm)	80 lb-ft (108 N•m)
0.39 inch (10 mm)	28 lb-ft (38 N•m)
0.24 inch (6 mm)	60 lb-in (7 N•m)
Connecting Rod Nut	50 lb-ft (67 N•m)
Cooling Fan Assembly Bolt	27 lb-ft (37 N•m)
Cooling Fan Nut	16 lb-ft (22 N•m)
Cooling Fan Shroud Bolt	72 lb-in (8 N•m)
Crankshaft Damper Pulley Bolt	11 lb-ft (15 N•m)
Cylinder Head Bolt	62 lb-ft (84 N•m)
Cylinder Head Cover Bolt	60 lb-in (7 N•m)
Dynamic Chamber Bolt/Nut	16 lb-ft (22 N•m)
Dynamic Chamber Support Bracket Bolt	18 lb-ft (25 N•m)
Engine-to-Body Ground Wire Bolt	18 lb-ft (25 N•m)
Engine Bracket Bolt	32 lb-ft (45 N•m)
Engine Hanger Bolt	16 lb-ft (22 N•m)
Engine Mount Nut	28 lb-ft (38 N•m)
Engine Support Bolt	28 lb-ft (38 N•m)
Exhaust Bracket Bolt	20 lb-ft (27 N•m)
Exhaust Flange Lock Nut	24 lb-ft (31 N•m)
Exhaust Manifold Nut	31 lb-ft (42 N•m)
Exhaust Manifold Heat Shield Bolt	18 lb-ft (25 N•m)
Exhaust Protector Nut	35 lb-in (4 N•m)
Fresh Air Duct Bolt	84 lb-in (10 N•m)
Front Axle Housing Mounting Bolt	48 lb-ft (65 N•m)
Generator Bracket Bolt	32 lb-ft (45 N•m)
Generator Mounting Bolt (bottom)	32 lb-ft (45 N•m)
Generator Mounting Bolt (top)	16 lb-ft (22 N•m)
Generator Strap Bolt	32 lb-ft (45 N•m)
Gusset Plate Bolt	32 lb-ft (45 N•m)
Ignition Coil Mounting Bolt	18 lb-ft (25 N•m)
Intake Manifold Bolt/Nut	16 lb-ft (22 N•m)
Intake Manifold Support Bracket Bolt	32 lb-ft (45 N•m)
Main Bearing Cap Bolt	63 lb-ft (85 N•m)
Oil Cooler Adapter Bolt	84 lb-in (10 N•m)
Oil Cooler Nut	26 lb-ft (34 N•m)
Oil Gauge Tube Bolt	60 lb-in (7 N•m)
Oil Pump Bolt	
0.32 inch (8 mm)	16 lb-ft (22 N•m)
0.39 inch (10 mm)	32 lb-ft (45 N•m)
Oil Strainer Mounting Bolt	84 lb-in (9 N•m)
Camshaft Position Sensor Bolt	84 lb-in (10 N•m)
P/S Bracket Bolt	32 lb-ft (45 N•m)
P/S Mounting Bolt	30 lb-ft (42 N•m)
P/S Pump Lock Bolt	30 lb-ft (42 N•m)
Radiator Mounting Bolt	72 lb-in (8 N•m)
Rear Cover Bolt	84 lb-in (10 N•m)

Separator Plate Bolt	18 lb-ft (25 N•m)
Stiffener Plate Mounting Bolt	84 lb-in (9 N•m)
Spark Plug	11-17 lb-ft (15-23 N•m)
Starter Bolt	34 lb-ft (46 N•m)
Timing Belt Cover Bolt	84 lb-in (10 N•m)
Timing Belt Pulley Lock Bolt	120 lb-ft (162 N•m)
Timing Belt Tensioner Lock Bolt	33 lb-ft (45 N•m)
Transmission Undercover Bolt	84 lb-in (9 N•m)
Undercover Mounting Bolt	72 lb-in (8 N•m)
Water Inlet Pipe Bolt	18 lb-ft (25 N•m)
Water Pump Bolt	16 lb-ft (22 N•m)

GENERAL SPECIFICATIONS

Type	Gasoline, 4-cycle
Compression Pressure	In-line, 4-cylinder
Combustion Chamber	Pent Roof
Valve System	DOHC, belt-driven
Displacement	122 cu inch (1998 cc)
Bore and Stroke	3.39 x 3.39 inch (86.0 x 86.0 mm)
Compression Ratio	9.2:1
Compression Pressure	188 psi (13.2 kg/cm ²) (250 rpm)
Valve Timing	
IN	
Open	BTDC 10 degrees
Close	ABDC 55 degrees
EX	
Open	BBDC 55 degrees
Close	ATDC 10 degrees
Valve Clearance	
IN	0
EX	0
Idle Speed	
MTX	800 ± 50 rpm
Ignition Timing	BTDC 4 ± 6 degrees
Firing Order	1 - 3 - 4 - 2