

4BD1-TRBG LIGHT REPAIR

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Engine Front Mounting

19. Remove the engine front mounting as follows (Figure 3):

NOTE

The following procedure is applicable to both left-hand and right-hand mountings.

- a. Place a suitable block of wood on a jack.
- b. Position the jack under the sump.
- c. Remove the bolts, nuts and washers securing the mounting and the earth strap (left-hand side only) to the mounting brackets. Discard the washers.

CAUTION

When raising the engine using the jack, extreme care must be taken to prevent damage to any pipes, hoses, wiring harnesses and the front exhaust pipe.

- d. Raise the engine enough to enable the mounting to be removed and remove the mounting.

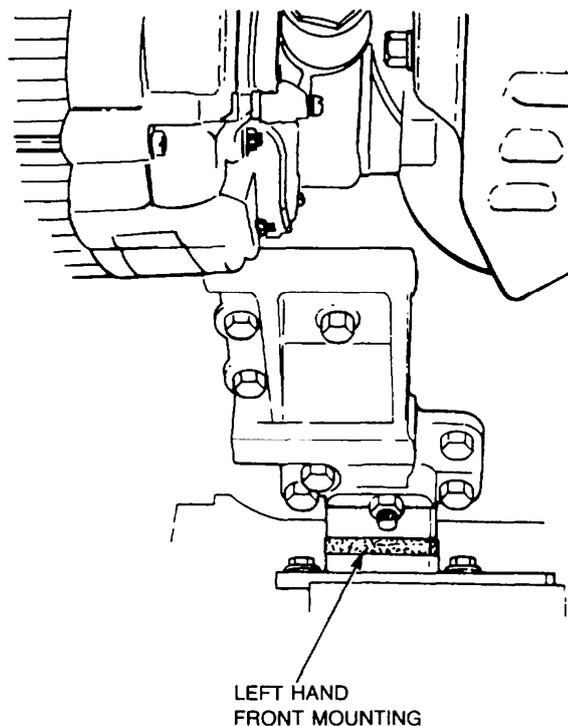


Figure 3 Engine Front Mounting (Left)

- 20. Installation.** Install the engine front mounting as follows:

NOTE

The following procedure is applicable to both the left-hand and right-hand mountings.

- a. Position the new engine mounting between the two brackets.
- b. Install the bolts and the earth strap (left-hand side only) to the chassis bracket.
- c. Install the nuts and new washers to secure the mounting to the engine.
- d. Carefully lower the jack and remove it from under the vehicle.
- e. Securely tighten the mounting nuts and bolts.

Exhaust Manifold

- 21. Removal.** Remove the exhaust manifold as follows:

- a. Remove the turbocharger (Para 73).
- b. Remove the nuts and bolts securing the exhaust manifold to the cylinder head.
- c. Remove the exhaust manifold.

- 22. Cleaning and Inspection.** Clean and inspect the exhaust manifold as follows:

- a. Remove all trace of gasket material from the manifold and the cylinder head.
- b. Inspect the exhaust manifold for cracks and/or damage (replace as necessary).
- c. Ensure that the machined faces are flat and smooth with no burn tracks or warping of the manifold. Replace the manifold if necessary.
- d. Ensure that the cylinder head studs and manifold studs are not bent or damaged. Replace the studs as necessary (Figure 4).

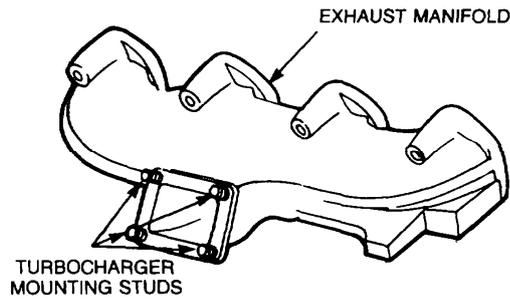


Figure 4 Exhaust Inspection

23. Installation. Install the exhaust manifold as follows:

- a. Position two new exhaust manifold gaskets on the cylinder head so that the word 'TOP' is toward the manifold (Figure 5).

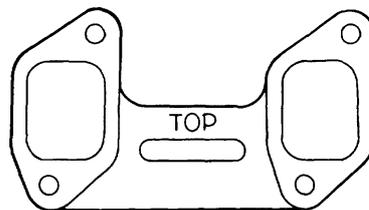


Figure 5 Exhaust Manifold Gasket Installation

- b. Place the exhaust manifold over the gaskets, aligning the studs with the corresponding holes in the manifold.
- c. Secure the manifold in position with the nuts, flat washers, new lock washers and bolts and tighten them finger-tight.
- d. Check that each gasket is correctly positioned and not distorted.
- e. Tighten the manifold retaining nuts and bolts to 16–25 N.m (12–19 lbf.ft) using the tightening sequence as shown in Figure 6.

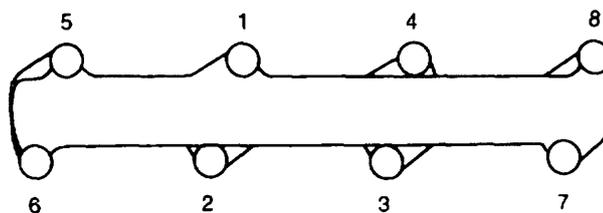


Figure 6 Exhaust Manifold Tightening Sequence

- f. Install the turbocharger and related parts (Para 75).

Air Inlet Manifold

24. Removal. Remove the air inlet manifold as follows:

- a. Clean the area around the inlet manifold using a suitable cleaning agent and blow it dry with compressed air.
- b. Remove the high pressure fuel lines (Para 53).
- c. Disconnect and plug the fuel return line at the fuel filter.
- d. Remove the main fuel lines from the fuel filter to the injection and transfer pump (Figure 7).

NOTE

Plug all openings in the injection pump and filter adapter following the removal of the fuel lines to prevent the ingress of dirt.

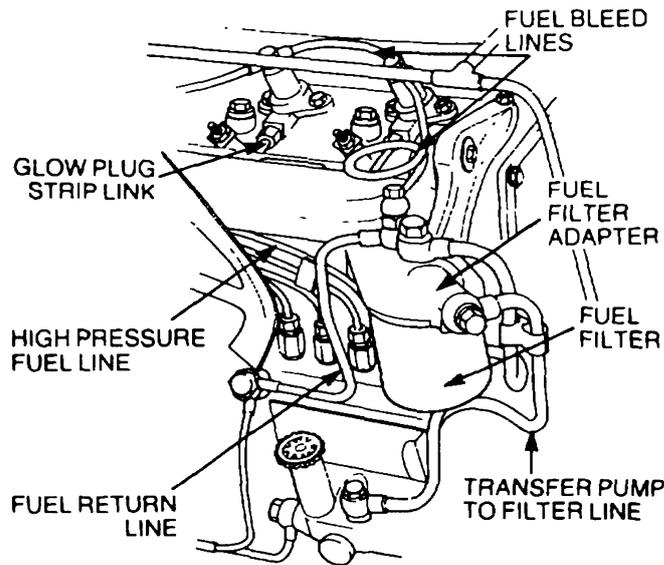


Figure 7 Air Inlet Manifold Removal

- e. Remove the stop cable mounting bracket from the inlet manifold.
 - f. Remove the two bolts securing the fuel filter assembly to the support bracket.
 - g. Remove the filter assembly from the vehicle.
 - h. Remove the two bolts securing the inlet pipe to the inlet pipe mounting bracket.
 - i. Remove the two bolts securing the air inlet pipe to the inlet manifold and cylinder head.
 - j. Loosen the two hose clamps securing the air inlet pipe to the turbocharger.
 - k. Remove the air inlet pipe. Plug the turbocharger.
 - l. Remove the nuts, washers and springs securing the inlet manifold to the engine and remove the manifold.
 - m. Remove and discard the gasket.
- 25. Cleaning and Inspection.** Clean and inspect the air inlet manifold as follows:
- a. Remove all trace of gasket material from the manifold and cylinder head. Inspect the manifold for cracks or damage. Replace the manifold if necessary.
 - b. Ensure that the machined face is flat and smooth with no warping or burn tracks. Replace the manifold if necessary.
- 26. Installation.** Install the air inlet manifold as follows:
- a. Position a new manifold gasket on the cylinder head with the projection uppermost and toward the rear of the engine (Figure 8).
 - b. Place the inlet manifold over the gasket.
 - c. Secure the manifold in position with the nuts, washers and spring. Tighten the nuts finger-tight.
 - d. Check that the gasket is correctly positioned and not distorted.
 - e. Tighten the nuts and bolts to 16–25 N.m (12–19 lbf.ft).
 - f. Install the air inlet tube and tighten the hose clamps.
 - g. Secure the tube to the inlet manifold and cylinder head with the two bolts.

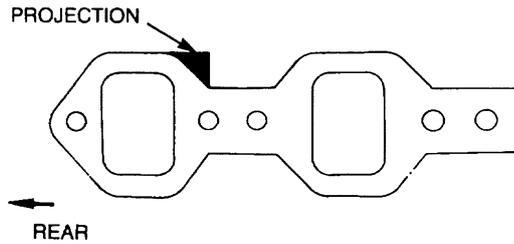


Figure 8 Air Inlet Manifold Gasket Installation

- h. Install the two bolts securing the inlet pipe to the inlet pipe mounting bracket.
- i. Tighten the bolts securely.
- j. Position the fuel filter assembly on the support bracket.
- k. Install the two retaining bolts and tighten them securely.
- l. Using new sealing washers, install the main fuel lines between the transfer pump, fuel filter and injection pump.
- m. Install the high pressure fuel lines (Para 54).
- n. Install the stop cable bracket on the inlet manifold and adjust the cable (Para 66).
- o. Using new sealing washers; connect the fuel return line to the fuel filter and tighten the banjo bolt securely.
- p. Bleed the fuel system (Para 76).

Valve Clearance

27. **Adjustment.** Adjust the valve clearance as follows:

WARNING

To avoid the possibility of the engine firing, ensure that the stop control is operated (ignition turned off).

- a. Wash the area around the valve cover using a recommended cleaning agent and blow it dry with compressed air.
- b. Remove the three nuts securing the valve cover to the cylinder head and remove the cover.
- c. Rotate the crankshaft by hand in the direction of rotation until the number four cylinder valves are on the rock.
- d. Align the timing mark on the crankshaft pulley with the calibration mark on the timing cover.
- e. Number one cylinder is now on top dead centre (TDC) compression stroke (Figure 9).

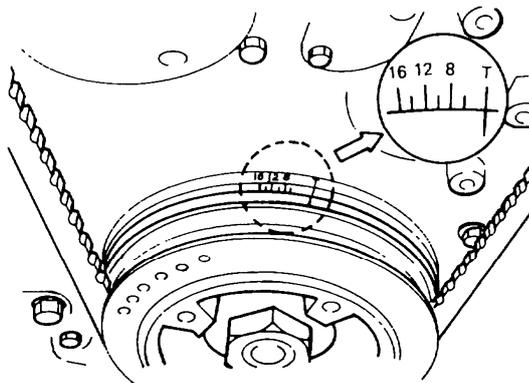


Figure 9 Timing Mark Alignment

- f. Check that the valve clearances for the valves are 0.4 mm (0.016 in) and adjust the clearances as necessary (Figure 10).

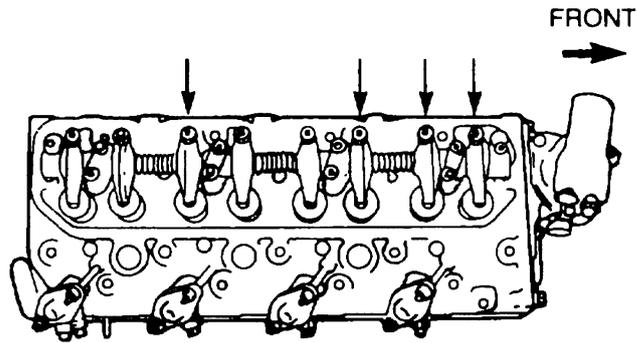


Figure 10 Valve Adjustment First Sequence

- g. To adjust the remaining valves, rotate the crankshaft by hand in the direction of rotation for one complete revolution until the timing mark is aligned (Figure 9).
- h. Check that the valve clearances for the valves are 0.4 mm (0.016 in) and adjust the clearances as necessary (Figure 11).

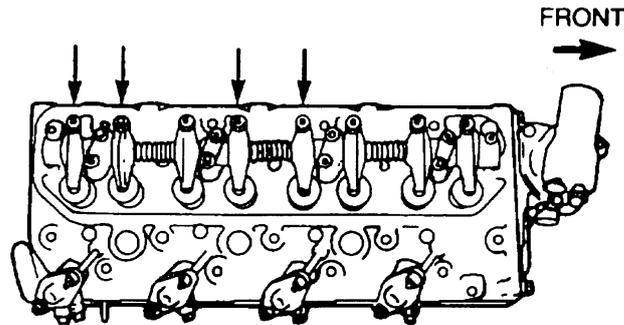


Figure 11 Valve Adjustment Second Sequence

28. **Reassembly.** Reassemble the valve cover as follows:
- Using a new valve cover gasket and retaining nut seals, install the cover.
 - Tighten the three nuts to 19 N.m (14 lbf.ft).

Engine Sump

29. **Removal.** Remove the engine sump as follows:
- Clean the area around the sump using a suitable cleaning agent and blow it dry with compressed air.
 - Remove the sump drain plug and drain the oil into a suitable container.
 - Install the drain plug with a new sealing washer and tighten it securely.
 - Remove the bolts and nuts securing the sump to the engine block.
 - Remove the sump and the supporting plates (Figure 12).
 - Remove all trace of gasket material from the engine block and the sump.
 - Clean the sump thoroughly.
30. **Installation.** Install the sump as follows:
- Position a new gasket on the sump.
 - Position a new gasket and the supporting plates over the rim of the sump.
 - Position the sump complete with the gaskets and supporting plate on the engine block.
 - Install the retaining bolts and nuts and tighten them to 10–20 N.m (8–15 lbf.ft).

- e. Fill the engine with clean engine oil to the correct level.

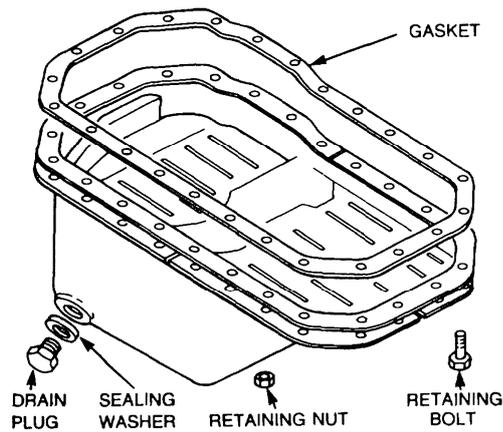


Figure 12 Engine Sump Removal

Engine Side Cover Plate Gaskets

- 31. Rear Cover Plate Replacement.** Replace the rear cover plate as follows:

- a. Clean the area around the rear cover plate using a suitable cleaning agent and blow it dry with compressed air.
- b. Remove the two bolts and packing washers securing the rear cover to the engine block and remove the rear cover (Figure 13). Discard the sealing washers.

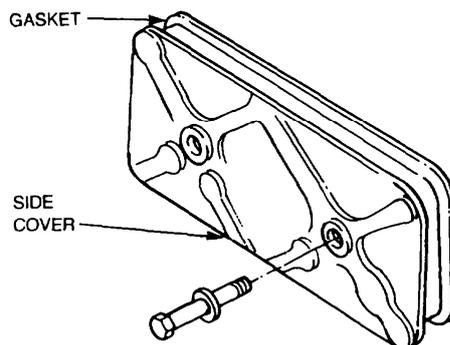


Figure 13 Rear Side Cover Plate Gasket Replacement

- c. Remove and discard the gasket.
 - d. Remove all trace of gasket material from the engine block and the rear cover.
 - e. Position a new gasket on the rear cover and new packing washers on the retaining bolts.
 - f. Install the rear cover and tighten the retaining bolts to 16–27 N.m (12–20 lbf.ft).
- 32. Front Cover Plate Replacement.** Replace the front cover plate as follows:
- a. Loosen the alternator mounting bolts and remove the adjusting bolt (Figure 14).
 - b. Remove the fanbelt from the alternator drive pulley.
 - c. Swing the alternator away from the engine.
 - d. Remove the two bolts securing the front cover to the engine block.
 - e. Remove the front cover.
 - f. Remove and discard the gasket.
 - g. Remove all trace of gasket material from the engine block and the front cover.

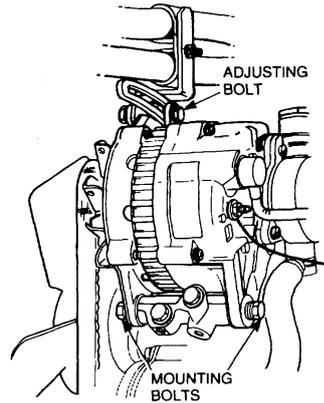


Figure 14 Alternator Adjusting Bolt

- h. Discard the packing washers fitted to the bolts.
- i. Position a new gasket on the front cover and new packing washers on the retaining bolts.
- j. Install the front cover and tighten the retaining bolts to 16–27 N.m (12–20 lbf.ft).
- k. Install the fanbelt on the alternator drive pulley and adjust it (Para 36).

Compression Test

33. Procedure. Carry out the compression test as follows:

- a. Apply the handbrake.
- b. Start the engine.
- c. Stop the engine when it reaches normal operating temperature.
- d. Remove the in-line fuse located in the stop motor wiring harness, adjacent to the brake master cylinder.

WARNING

Operate the ignition switch prior to continuing to ensure that the vehicle will not start.

- e. Disconnect the wiring harness connected to the glow plug link strip.
- f. Remove the nuts and washers securing the link strip to the glow plugs.
- g. Using a 12 mm deep socket, remove the glow plugs.
- h. Install the adapter (Table 3, Serial 1) into the first cylinder by using a 17 mm deep socket and fit the compression gauge (Table 3, Serial 1).
- i. Using the starter, crank the engine four to five revolutions and note the reading on the compression gauge.
- j. Note the reading and repeat the procedure for the remaining cylinders.
- k. The compression pressure for each cylinder must be between 22 kg/cm² (313 psi) and 30 kg/cm² (441 psi) with a maximum variation of 5 kg/cm² (71 psi) between cylinders.
- l. Remove the compression gauge and adapter from the cylinder head.
- m. Install the glow plugs and torque them to 22–27 N.m (16–20 lbf.ft).
- n. Position the electrical strip link on the glow plugs and tighten the retaining nuts securely.
- o. Connect the wiring harness to the glow-plug link strip.
- p. Install the in-line fuse adjacent to the brake master cylinder.
- q. Ensure the engine starts.

Engine System Specifications

34. The engine system specifications are listed in Table 5.

Table 5 Engine System Specifications

Serial	Specification	Measurement
1	Air inlet manifold to cylinder head tightening torque	16–25 N.m (12–19 lbf.ft)
2	Exhaust manifold to cylinder head tightening torque	16–25 N.m (12–19 lbf.ft)
3	Rocker shaft tightening torque	20–30 N.m (15–22 lbf.ft)
4	Valve clearance inlet and exhaust	0.4 mm (0.016 in.)
5	Valve cover tightening torque	19 N.m (14 lbf.ft)
6	Engine oil pan (sump) tightening torque	10–20 N.m (8–15 lbf.ft)
7	Engine side covers tightening torque	16–27 N.m (12–20 lbf.ft)
8	Fanbelt deflection	10–15 mm
9	Transfer pump fuel delivery pressure	176–245 kPa
10	Compression pressure	22–30 kg/cm ² (313–441 psi) [maximum variation 5 kg/cm ² (71 psi)]
11	Glow plug torque	22–27 N.m (16–20 lbf.ft)

Engine Fault Finding

35. The procedures for engine fault finding are detailed in Table 6.

Table 6 Engine Fault Finding

Serial	Symptom	Probable Cause	Action
1	Engine misfiring	Poor quality fuel, water or dirt in fuel	Drain sedimenter. Drain and flush the fuel tank. Install new filters and fill tank with clean diesel fuel
		Air in fuel system	Check the system for air leaks. Air will generally enter the fuel system on the suction side of the transfer pump
		Broken or leaking high pressure fuel lines	Check for fuel leaks and replace defective parts
		Restriction in fuel lines or return lines	Check for fuel flow. If no flow, replace lines
		Low fuel supply pressure	Check that there is fuel in the fuel tank. Look for leaks, sharp bends or kinks in the fuel line between fuel tank and transfer pump. Check for a clogged or perforated suction pipe in the tank or a blocked fuel suction hose. Look for air in the system. Check fuel pressure, if much less than the specified figure of approx 176–245 kPa change the filter and recheck. If still low, replace the transfer pump. Check that the overflow valve is operating
		Improper valve adjustment	Check valve clearance, adjust to specification
		Defective fuel injection nozzle or fuel injection pump	Run the engine at a speed that gives maximum misfiring or rough running. Loosen the high pressure fuel line nuts, one at a time, on the injection pump cutting the fuel flow to the cylinder. NOTE When fuel is cut from a given cylinder and running speed does not change, it is an indication that the cylinder is not firing. If however, no fuel is evident when the nut is Loosened off, it is an indication that the injection pump is defective
		Engine improperly timed	Check and adjust timing
		Cylinder head gasket leakage	Check for visible signs of leakage e.g. coolant in the engine oil or oil traces in the coolant
2	Engine stalls at low speeds	Idle speed too low	Check the idle setting (650 ±20 rpm) and make the necessary adjustments
		Fuel tank vent blocked or partially blocked	Check the vent and hose, if blocked, replace
		Low fuel supply	Check that there is fuel in the tank. Look for leaks, sharp bends or kinks in the fuel supply lines. Check for air in the fuel system. Drain the sedimenter. Check that fuel pressure is approx 176–245 kPa. If not, replace the fuel filter and recheck the pressure. If still low replace the transfer pump
		Injection pump overflow valve leaking, stuck open or closed	Repair or replace valve
3	Engine will not reach no-load governed speed	Air in fuel system	Check the fuel system for air leaks. Air will generally get into the fuel system on the suction side of the transfer pump
		Accelerator linkage loose or out of adjustment	Check all linkages and make the necessary repairs
		Restricted fuel lines or stuck overflow valve	Check flow in the fuel lines. Check the overflow valve for a defective spring, worn valve, and valve setting or sticking. Make all necessary repairs
		High idle speed incorrect	Replace injection pump
		Blocked in-line filter	Clean or replace filter

Table 6 Engine Fault Finding (Continued)

Serial	Symptom	Probable Cause	Action
4	Erratic engine speed	Air leaks in fuel suction line	Check for air leaks and correct as necessary
		Accelerator linkage loose or out of adjustment	Check all accelerator linkages and make the necessary adjustments
5	<p>Low power</p> <p>NOTE</p> <p>When diagnosing low power complaints, it is possible the trouble can be traced to chassis components, other than the engine. Make sure the vehicle rolls freely when the brakes are released</p>	Restrictions in the air intake system: clogged air filter	Check the air pressure in the air inlet manifold. Replace the air cleaner elements
		Damage or restrictions in the accelerator or stop cable linkage	Check the linkages, adjust to obtain sufficient travel
		Low fuel pressure.	Check the fuel supply lines for leaks, kinks or restrictions. Also check for air in system. Check fuel pressure, if low, replace the fuel filter and recheck the pressure. If still low replace the transfer pump. Also check for sticking, binding or defective fuel overflow valve. Repair or replace as necessary
		Excessive valve clearance	Adjust valve clearance to specification
		Blocked in-line filter	Clean or replace filter
6	Excessive engine vibration	Crankshaft pulley loose	Tighten pulley retaining bolt
		Fan blade not in balance	Loosen or remove fanbelt and operate the engine for a short time at the speed that the vibration was present. If the vibration disappears, replace the fan assembly
		Engine mountings are loose, worn or defective	Tighten all mounting bolts. Install new components as required
		Misfiring or running rough	Refer to Serial 1
7	Excessive black or grey smoke	Insufficient air for combustion	Replace air filter element
		High exhaust back pressure	Check for faulty exhaust piping or muffler obstruction. Repair or replace defective parts
		Faulty injection nozzle	Isolate faulty nozzle and report. Refer Serial 1
		Improper engine timing	Check the timing and make the necessary adjustments
8	Excessive blue or white smoke	Engine lubricating oil level too high	Remove excess lubricating oil. If oil is contaminated with either fuel or coolant, completely drain the system and replace the oil filter. Locate and rectify the source of the leak. Refill with clean engine oil (8.5 litres), then check level with dipstick after running the engine for several minutes. DO NOT overfill
		Engine misfiring or running rough	Refer to Serial 1
		Worn engine components	Report condition
9	Excessive fuel consumption	Restrictions in air induction system	Inspect system and remove restrictions
		External fuel system leakage	Check fuel system piping for signs of fuel leakage. Repair or replace as necessary
		Faulty injection nozzle	Isolate faulty nozzle and report. Refer Serial 1
10	Excessive oil consumption	External oil leaks	Check the engine for visible signs of oil leaks. Check the front and rear crankshaft oil seals, check gaskets and sump drain plug
		Clogged engine breather pipe	Clean the pipe to remove the obstruction
		Excessive exhaust back pressure	Check the exhaust pressure and make necessary corrections
		Worn engine components	Report condition

Table 6 Engine Fault Finding (Continued)

Serial	Symptom	Probable Cause	Action
11	Engine overheats	Coolant level low	Determine the cause. Replace leaking gaskets and hoses. Tighten connections and add coolant
		Loose or worn fanbelt	Adjust or replace
		Air flow through radiator restricted	Remove all obstructions from outer surface or radiator
		Radiator pressure cap defective	Check the pressure release of radiator cap 103 kPa (14 psi). Replace if necessary
		Defective thermostat or temperature gauge	Check the opening temperature and for correct installation of the thermostat. Replace as necessary. Check operation of the temperature gauge. Repair or replace as necessary
		Combustion gases in coolant	Report condition
		Blocked oil cooler	Report condition
		Defective water pump	Replace the pump
		Incorrect driving techniques	Advise driver
12	High exhaust temperature	Operating the vehicle in the wrong gear ratio for load, grade and altitude	Select the appropriate gear ratio
		Restriction in air induction system	Inspect the system and remove restrictions. Replace parts as necessary
		Air leaks in air induction system	Check pressure in the air intake manifold. Check for restrictions at the air cleaner. Make necessary corrections
		Fuel injection timing incorrect	Report condition
		Restriction in the exhaust system	Inspect the system. Repair or replace as necessary
		Incorrect valve clearance	Adjust valves to specified clearance
		Defective injection nozzle	Isolate the defective nozzle assembly and replace
13	Oil in cooling system	Defective oil cooler core	Report condition
		Failed head gasket	Report condition
14	Low lubricating oil pressure	Insufficient oil, oil leaks	Check the oil level: add oil as required. Check for oil leaks, repair or report
		Incorrect engine oil	Drain the lubricating oil. Change the filters and refill with clean engine oil. Check the level on the dipstick. DO NOT overfill
		Defective oil pump	Repair or replace as necessary
		Dirty oil filter	Check the operation of the by-pass valve for the filter. Install new filter element. Drain engine oil and refill with clean engine oil (8.5 litres)
15	Coolant in lubricating oil	Defective oil cooler core	Report condition
		Failed head gasket	Report condition
16	Low compression	Incorrect valve clearance	Adjust valves to specified clearance
		Failed head gasket	Report condition
		Broken or weak valve spring	Report condition
		Burned valves or seals	Report condition

COOLING SYSTEM

Fanbelt

36. **Replacement.** Replace the fanbelt as follows:
- Loosen the alternator mounting bolts and remove the adjusting bolt (Figure 15).
 - Detach the fanbelt from the alternator drive pulley.
 - Remove the fanbelt from the crankshaft and water pump drive pulleys.
 - Install a new fanbelt.

NOTE

Ensure that the fanbelt is located in all three drive pulleys.

- Swing the alternator away from the engine.

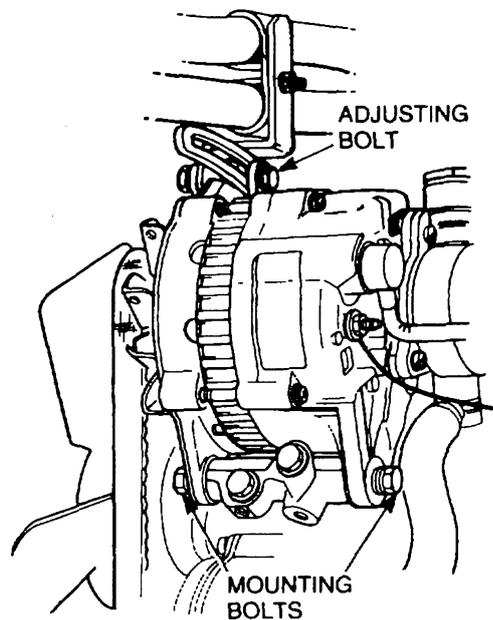


Figure 15 Fanbelt Replacement

- Check the tension of the belt by applying moderate thumb pressure to the longest span of the belt.
- When a belt deflection of 10–15 mm has been obtained, install and tighten the adjusting bolt and the mounting bolts.
- Start and run the engine for approximately 20 minutes.
- Stop the engine and recheck the belt deflection.
- Readjust as necessary.

Thermostat

37. **Removal.** Remove the thermostat as follows:
- Clean the area around the thermostat housing using a suitable cleaning agent and blow it dry with compressed air.
 - Loosen a clamp on the bottom radiator hose.
 - Disconnect the hose and drain approximately four litres of coolant into a suitable clean receptacle.

NOTE

It may be necessary to loosen the expansion tank pressure cap to increase the flow of coolant.

- d. Reconnect the hose and tighten the hose clamp.
- e. Loosen the hose clamp securing the top radiator hose to the thermostat housing.
- f. Remove the hose from the housing.
- g. Remove the three bolts securing the cover to the thermostat housing and remove the cover.
- h. Remove and discard the gasket.
- i. Lift out the thermostat.
- j. Remove all trace of gasket material from the thermostat housing and the cover.
- k. Inspect for corrosion, wear or damage. Repair or replace parts as necessary.

38. Installation. Install the thermostat as follows:

- a. Install a thermostat of the correct temperature range (82°C).
- b. Position a new gasket on the housing.
- c. Position the water outlet on the housing and install the three bolts.
- d. Tighten the bolts securely.
- e. Install the top hose onto the water outlet and tighten the top hose clamp securely.
- f. Refill the cooling system (Para 39).

Coolant

39. Refilling Procedure. Refill the coolant system as follows:

- a. Remove the brass filler plug from the thermostat housing (Figure 16).
- b. Remove the expansion tank pressure cap.
- c. Move the heater controls to the highest temperature position.

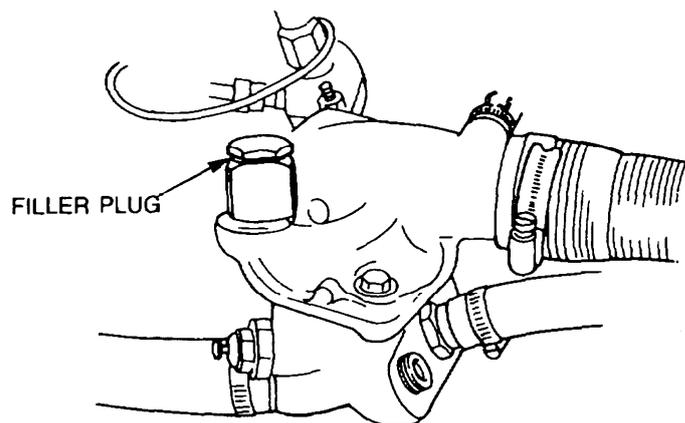


Figure 16 Thermostat Removal

- d. Using coolant with a mixture ratio of 1:12 of Nalcool to water, top up the system through the filler hole, then install the plug.
- e. With the pressure cap removed, run the engine for a minimum of two minutes.
- f. Stop the engine and remove the plug from the thermostat housing.
- g. Top up as required and replace the plug.
- h. Fill the expansion tank to the correct level and replace the cap.
- i. Run the engine and check for leaks.

Water Pump

40. **Removal.** Remove the water pump as follows:

- a. Clean the area around the water pump using a suitable cleaning agent and blow it dry with compressed air.
- b. Loosen the bottom radiator hose securing clamp and drain the coolant into a suitable clean receptacle.
- c. Install the hose and tighten the securing clamp.

NOTE

The water pump must be replaced if any bearing noise is present and there is excessive end float or radial movement.

- d. Loosen the alternator mounting bolts and remove the adjusting bolt (Figure 15).
- e. Detach the fanbelt from the alternator drive pulley.
- f. Remove the screws and washers securing the fan shroud and move the shroud.
- g. Remove the four bolts securing the water pump drive pulley to the water pump.
- h. Remove the fan, spacer and pulley (Figure 17).

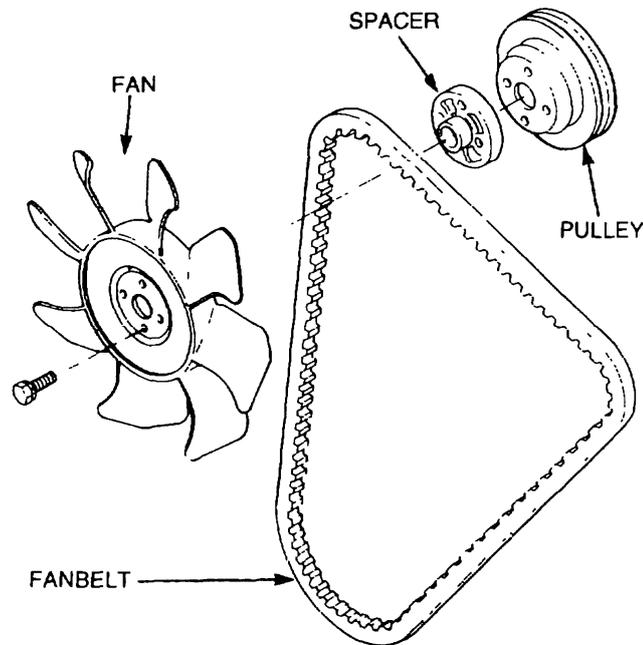


Figure 17 Fan, Spacer and Pulley

- i. Loosen the hose clamps securing the bypass and heater hoses to the water pump.
- j. Remove the hoses (Figure 18).

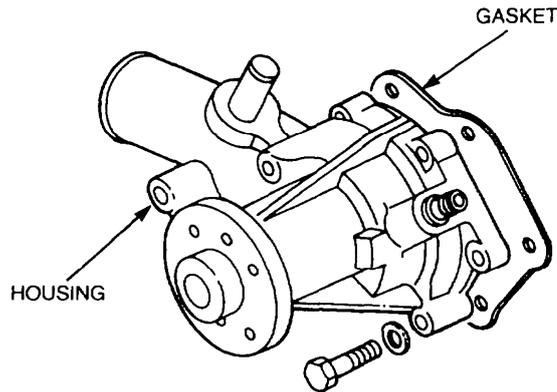


Figure 18 Water Pump Gasket Replacement

NOTE

As the water pump retaining bolts are different lengths, note their respective positions on removal.

- k. Remove the bolts securing the water pump.
 - l. Remove the water pump from the vehicle.
 - m. Remove the screws securing the rear cover to the water pump.
 - n. Remove and discard the gasket.
- 41. Cleaning and Inspection.** Clean and inspect the water pump as follows:
- a. Remove all trace of gasket material from the water pump and engine block surfaces.
 - b. Inspect the water pump cover and housing for cracks, nicks, burrs or damage.
 - c. Inspect the housing for warping and check that the bearings rotate smoothly.
 - d. Replace the water pump as necessary.
- 42. Installation.** Install the water pump as follows:
- a. Using a new gasket and a liquid sealer, secure the rear cover to the water pump.
 - b. Tighten the screws securely.
 - c. Install the water pump retaining bolts in the positions noted on removal.
 - d. Using a new gasket and a suitable sealer, install the water pump and tighten the bolts to 44 N.m (32 lbf.ft).
 - e. Install the drive pulley, spacer and fan, then tighten the four bolts securely.
 - f. Install the fan shroud and secure it with the screws and washers.
 - g. Connect the bypass and heater hoses and tighten the hose clamps securely.
 - h. Install the fan belt (Para 36).
 - i. Fill the cooling system (Para 39).

Cooling System Specifications

46. The cooling system specifications are detailed in Table 7.

Table 7 Cooling System Specifications

Serial	Specification	Measurement
1	Fanbelt deflection	10–15 mm
2	Thermostat opening temperature	82°C
3	Water pump impeller to body clearance	0.3–0.8 mm
4	Water pump tightening torque	44 N.m (32 lbf.ft)
5	Pressure cap opening pressure	103 kPa (14 psi)

Fuel Lines – High Pressure

53. **Removal.** Remove the fuel lines as follows:

- a. Clean the area around the high pressure fuel line that is to be removed and blow it dry with compressed air.
- b. Crack open the nut securing the line to the injector to relieve residual pressure and then loosen the nut completely (Figure 24).

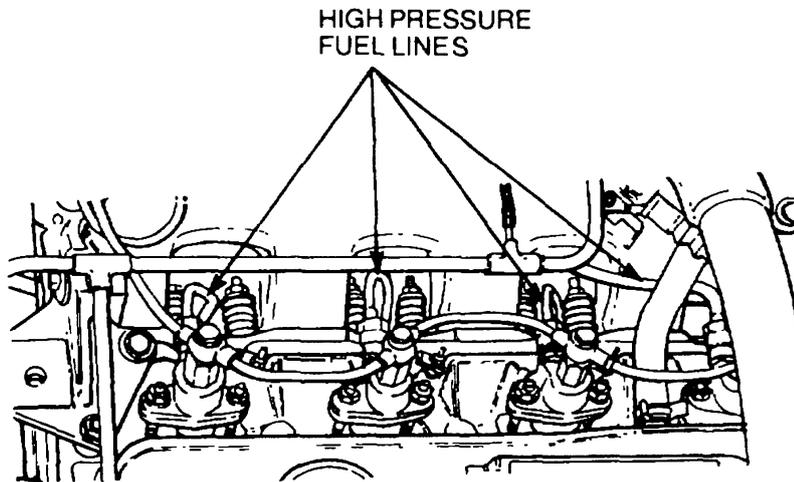


Figure 24 High Pressure Fuel Lines Removal

- c. Loosen the nut securing the fuel line to the injector pump.
- d. Remove the clamp plates retaining the fuel line (Figure 25).
- e. Remove the high pressure fuel line through the inlet manifold.
- f. Install suitable plugs into the injector pump and injectors.

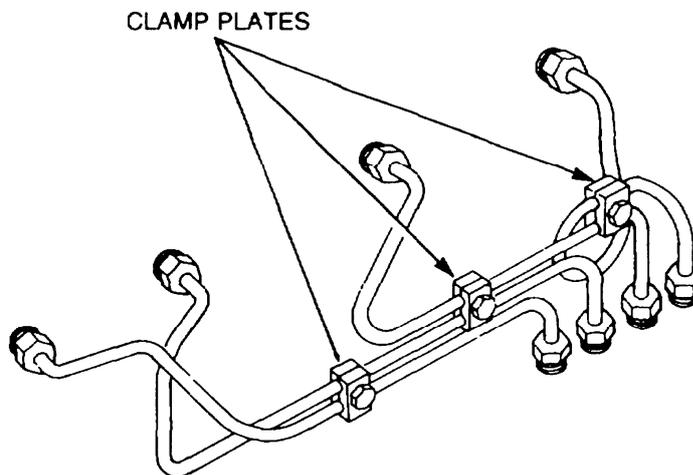


Figure 25 Clamp Plate Location

54. **Installation.** Install the fuel lines as follows:

- a. Install the high pressure fuel line, ensuring the line ends are seated correctly in the injector and the injector pump connectors.
- b. Tighten the fuel line connecting nuts to 28–31 N.m (21–23 lbf.ft).
- c. Install and tighten the clamp plates securely.
- d. Bleed the fuel system (Para 76).

- i. Bleed the fuel system (Para 76).

Fuel Sedimenter

NOTE

The removal and installation procedures apply to both the left and right-hand side fuel sedimenters.

56. Removal. Remove the fuel sedimenter as follows:

- a. Clean the area around the sedimenter using a suitable cleaning agent and blow it dry with compressed air.
- b. Remove and plug the fuel lines from the sedimenter.
- c. Remove the drain plug and drain the contents into a suitable container (Figure 28).

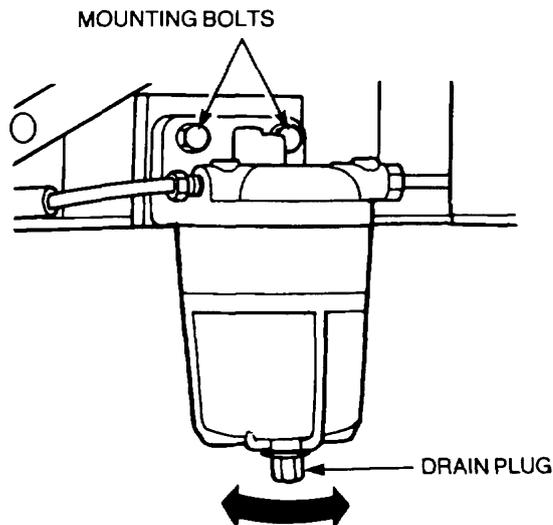


Figure 28 Fuel Sedimenter Removal

- d. Remove the two bolts securing the sedimenter to the chassis bracket.
 - e. Remove the sedimenter.
- 57. Installation.** Install the fuel sedimenter as follows:
- a. Position the sedimenter on the chassis bracket and secure it with the two bolts.
 - b. Remove the plugs and install the supply and return lines and tighten them securely.
 - c. Tighten the drain plug.
 - d. Bleed the fuel system (Para 76).

Fuel Transfer Pump

58. Test Procedure. Test the fuel transfer pump as follows:

- a. Prior to disconnecting any fuel pipes, clean the area around the transfer pump using a suitable cleaning agent and blow it dry with compressed air.
- b. Disconnect the fuel outlet pipe from the fuel transfer pump.
- c. Connect a T-connector between the transfer pump and the fuel outlet pipe.
- d. Connect the pressure gauge.
- e. Bleed the air from the fuel system (Para 76).
- f. Start the engine and check that the fuel pressure indicated is 175–245 kPa (25–35 psi).
- g. Stop the engine.

- h. If the pressure is less than specified, remove the in-line fuse located in the stop motor wiring harness adjacent to the brake master cylinder.

WARNING

Removal of the in-line fuse may not prevent the engine from starting. Ensure an operator has full control of the vehicle before proceeding to the next step to prevent injury to personnel and damage to the vehicle and / or the facility.

- i. Using the ignition switch, crank the engine to check that it does not start.
- j. Remove the T-connector and connect the pressure gauge directly to the transfer pump outlet.
- k. Crank the engine for four to five turns and check the pressure on the gauge.
- l. If the pressure shown is 333–412 kPa (48–60 psi), the pump is functioning correctly, indicating that the overflow valve is the cause of the initial low pressure and requires replacement.
- m. Crack loose the gauge connection at the transfer pump to allow the fuel (under pressure) to bleed off.
- n. Remove the gauge and using new sealing washers, install the pipe on the transfer pump outlet.
- o. Tighten the banjo bolt securely.
- p. Bleed the fuel system (Para 76).
- q. Connect the in-line fuse to the stop motor.

59. Removal Remove the fuel transfer pump as follows:

- a. Loosen the fuel line from the filter cover to the pump at the filter.
- b. Loosen the clamp securing the two lines (Figure 29).

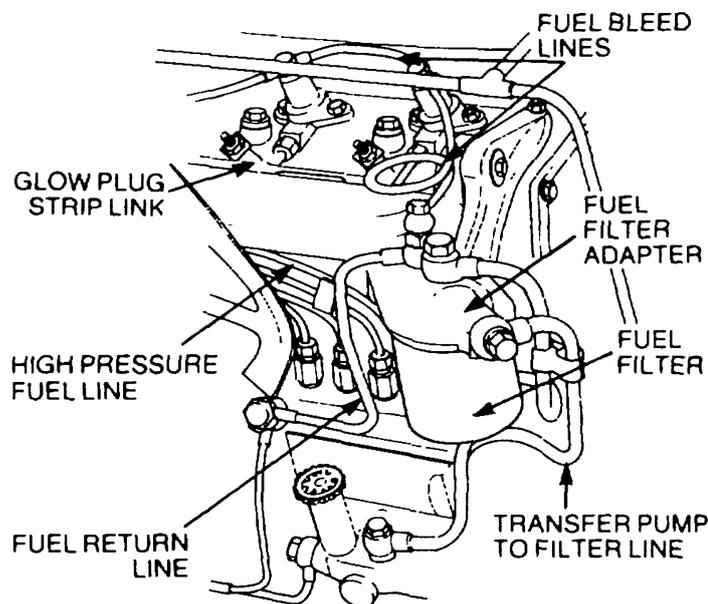


Figure 29 Fuel Transfer Pump Removal

- c. Remove the two fuel lines from the pump and plug them with suitable plugs. Discard the sealing washers.
- d. Remove the three nuts and spring washers securing the transfer pump to the injection pump. Discard the spring washers.
- e. Remove the pump.
- f. Remove and discard the O ring.

- 60. Installation.** Install the fuel transfer pump as follows:
- Using a new O ring, install the transfer pump on the injection pump.
 - Secure the transfer pump with the three nuts and new spring washers. Tighten the nuts evenly.

NOTE

An in-line filter is fitted to the inlet line banjo bolt on the transfer pump. The bolt head is marked with an arrow. Ensure the filter is clean and the arrow aligns with the fuel line on installation.

- Remove the plugs from the fuel lines.
- Using new sealing washers, install the two banjo bolts and tighten them securely.
- Tighten the banjo bolt securing the fuel line to the filter adapter and tighten the pipe clamp.
- Bleed the fuel system (Para 76).

Fuel Injection Pump

- 61. Removal.** Remove the fuel injection pump as follows:
- Disconnect the battery.
 - Wash the area around the injection pump using a suitable cleaning agent and blow dry with compressed air.
 - Disconnect the crankcase breather pipe connected to the air inlet tube.
 - Remove the inlet manifold (Para 24).
 - Disconnect the accelerator cable from the pump control lever.
 - Remove the four nuts and eight washers securing the oil filter housing and remove the oil filter housing complete with the filters. Discard the spring washers.
 - Disconnect and plug the fuel supply and return lines.
 - Remove and plug the oil feed pipe from the injection pump.
 - Remove the injection pump rear mounting bracket.
 - Rotate the crankshaft by hand in a clockwise direction, to align the crankshaft pulley and the TDC mark on the timing cover (Figure 30) with the number one cylinder at TDC.

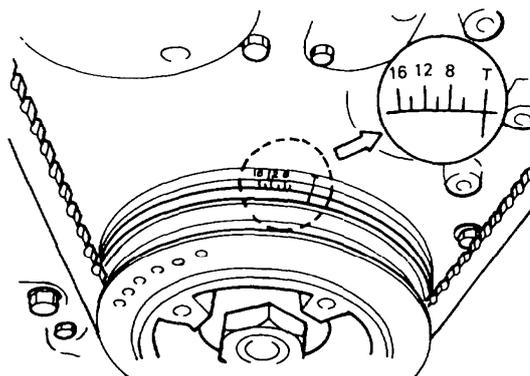


Figure 30 Timing Mark Alignment

- With the TDC mark aligned, remove the inspection plate on the timing cover and ensure that the notched line is aligned with the arrow mark (Figure 31).

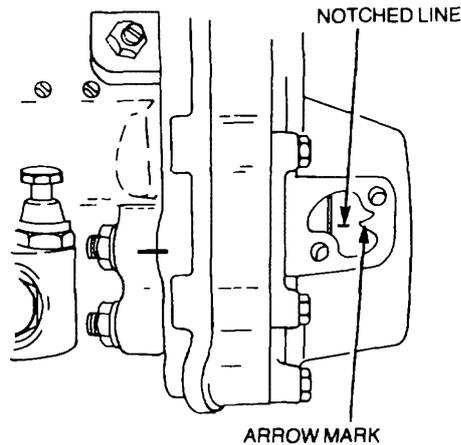


Figure 31 Injection Pump Timing Mark

- l. If the arrow mark does not align with the notched line, rotate the crankshaft a further 360 degrees.

NOTE

Do not rotate the engine once the timing mark is aligned.

- m. Remove the timing cover plug.
- n. Remove the seven injection pump mounting bolts (Figure 32).
- o. Withdraw the injection pump.

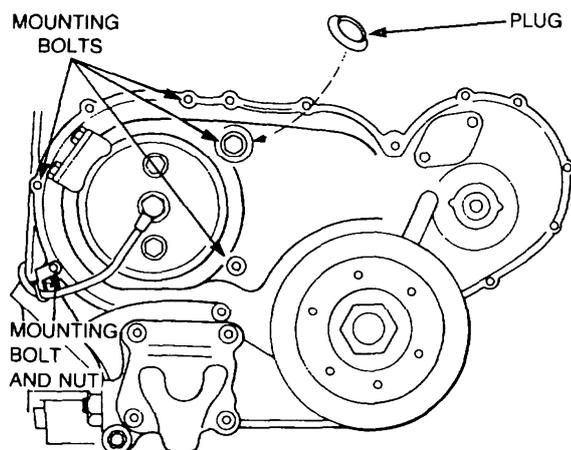


Figure 32 Injection Pump Removal

62. Installation. Install the fuel injection pump as follows:

- a. Remove the valve cover.
- b. Rotate the crankshaft by hand in the direction of rotation, until the number one cylinder is approaching TDC on the compression stroke and the number four cylinder valves are on the rock.
- c. Continue to turn the crankshaft until the notched line on the crankshaft pulley is aligned with the 12 degree mark on the timing case.

NOTE

This is only a reference setting as the timing is set at TDC.

- d. Align the pump advance notched line towards the mounting flange notched line; then rotate the pump clockwise until spring tension is felt.
- e. Install a new flange gasket and the pump; then check that the advance line is approximately 5 mm below the pointer on the timing case aperture (Figure 33).

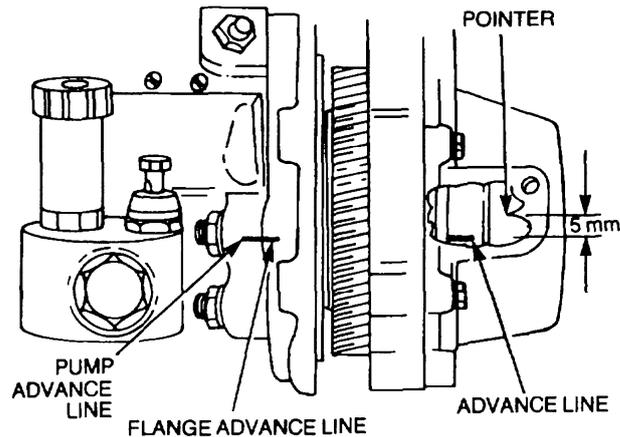


Figure 33 Injection Pump Installation

- f. Align the notched line on the pump with the notched line on the mounting flange.
- g. Secure the pump with one bolt to prevent radial movement.
- h. Rotate the crankshaft by hand in the direction of rotation, until the TDC mark on the crankshaft pulley aligns with the timing mark on the timing case. The advance line should now be in line with the pointer (Figure 30).
- i. Install the remaining bolts and tighten them securely.
- j. Install the valve cover and tighten the retaining bolts securely.
- k. Install the plug and inspection cover onto the timing case.
- l. Using new sealing washers, install the oil feed pipe onto the injection pump and tighten the banjo bolt securely.
- m. Connect the fuel supply and return lines (Para 52).
- n. Install the oil filter housing complete with the filters and secure it with the four nuts, flat washers and new spring washers.
- o. Connect the accelerator cable from the pump control lever.
- p. Install the inlet manifold (Para 26).
- q. Connect the crankcase breather pipe to the air inlet tube.
- r. Connect the accelerator cable and adjust it (Para 70).
- s. Bleed the fuel system (Para 76).
- t. Reconnect the battery.

Fuel Injectors

63. Removal. Remove the fuel injectors as follows:

- a. Wash the cylinder head area around the injectors and all the pipe connections with a suitable cleaning agent and blow them dry with compressed air.
- b. Remove the fuel return line from the injectors. Remove and discard the sealing washers.
- c. Remove the high pressure fuel lines from the injectors. Plug the fuel lines with suitable plugs.
- d. Remove the injector retaining nuts and spring washers. Discard the spring washers.

CAUTION

Do not strike the injector tip on the cylinder head or on the rack as this can damage the spray holes.

- e. Carefully remove the injectors from the cylinder head and place them in a suitable rack in numerical order, so that the injectors can be installed in the cylinders from which they were removed.

NOTE

To remove a stuck injector, apply penetrating oil around the injector body and gradually extract the injector by inserting a suitable lever between the cylinder head and injector body.

- f. Remove and discard the dust cap and nozzle gasket.
- g. After removing the injectors from the cylinder head, plug the injector cavities with a suitable plug to prevent contaminants from falling into the cylinder.

64. Installation. Install the fuel injectors as follows:

- a. Using a new dust cap and nozzle gasket, install the injectors in the cylinder head.
- b. Install the nuts and new spring washers. Tighten the nuts to 20–30 N.m (15–22 lbf.ft).
- c. Install the fuel return line and new sealing washers. Tighten the five banjo bolts securely.
- d. Connect the high pressure fuel lines to the injectors.
- e. Tighten the retaining nuts and clamps securely.
- f. Bleed the fuel system (Para 76).

Engine Stop Motor

65. Removal. Remove the engine stop motor as follows:

- a. Disconnect the battery.
- b. Disconnect the stop cable end from the injection pump stop lever (Figure 34).
- c. Disconnect the in-line fuse installed in the blue cable.
- d. Disconnect the white multi pin connector from the stop motor.

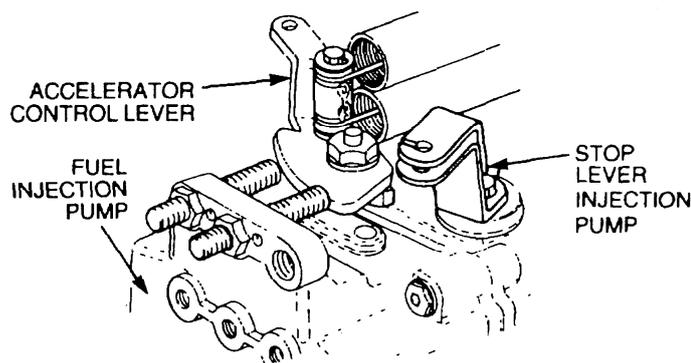


Figure 34 Engine Stop Cable Removal

- e. Remove the cable bracket from the inlet manifold (Figure 35).

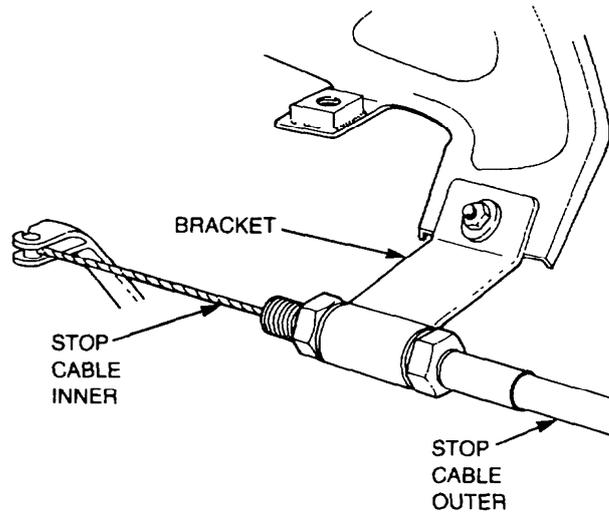


Figure 35 Stop Cable Mounting

- f. Remove the locknuts securing the stop motor to the firewall (Figure 36).

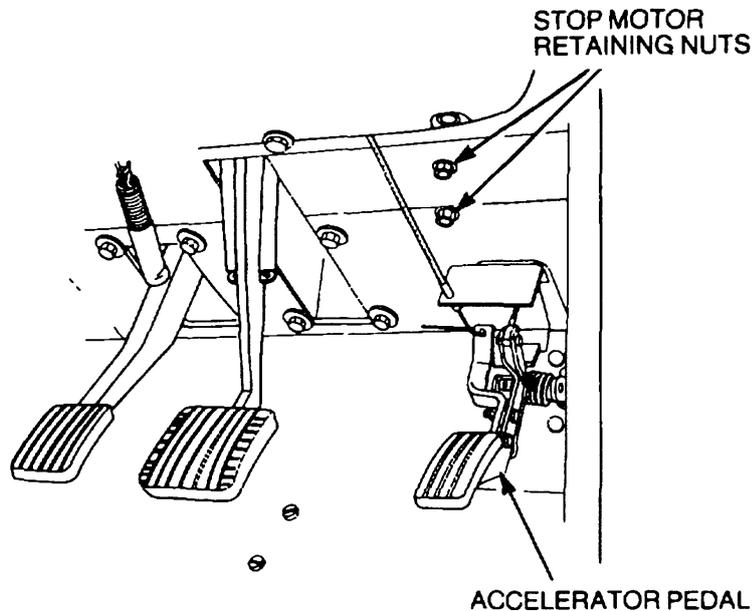


Figure 36 Stop Motor Removal

- g. Remove the stop motor complete with the stop cable from the vehicle.

66. Installation. Install the engine stop motor as follows:

- a. Position the stop motor and cable assembly on the firewall and secure it with the two retaining nuts.
- b. Install the cable bracket on the inlet manifold (Figure 35) and tighten the two bolts securely.
- c. Connect the wiring harness to the motor.
- d. Connect the battery.
- e. Turn the ignition switch 'ON' to obtain the maximum length on the engine stop cable.
- f. Connect the cable end to the stop lever.
- g. Ensuring the stop lever is in the 'ON' position; adjust the stop cable to give approximately 1 mm free play.
- h. Turn the ignition 'OFF'.

Idle Speed and Accelerator Cable Adjustment

71. Adjust the idle speed and accelerator cable as follows:
- a. Start the engine and warm up to normal operating temperature.
 - b. Ensure the control lever is in contact with the idle set bolt when the accelerator pedal is in the 'OFF' position (Figure 40).

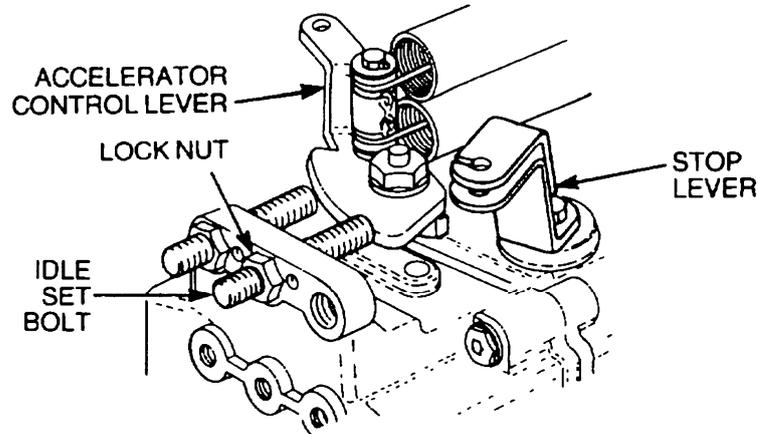


Figure 40 Accelerator Cable and Idle Speed Adjustment

- c. Using a tachometer, check that the idle speed is 650 ± 20 rpm.
- d. Adjust as necessary by turning the stop bolt clockwise to increase engine idle speed and anticlockwise to decrease engine idle speed.
- e. Secure the locknut following the adjustment.
- f. With the accelerator pedal still in the 'OFF' position, adjust the cable length as required to ensure the stop lever is in contact with the stop bolt.
- g. Increase the engine speed by operating the accelerator pedal and return it to the 'OFF' position.
- h. Check that the pedal returns correctly and the engine idle speed remains at 650 ± 20 rpm.
- i. Fit a new split pin to the control lever clevis.

Turbocharger

73. **Removal.** Remove the turbocharger as follows:

- a. Wash the area around the turbocharger and blow it dry with compressed air.
- b. Remove the bolts securing the heat shield to the turbocharger and remove the heat shield (Figure 43).

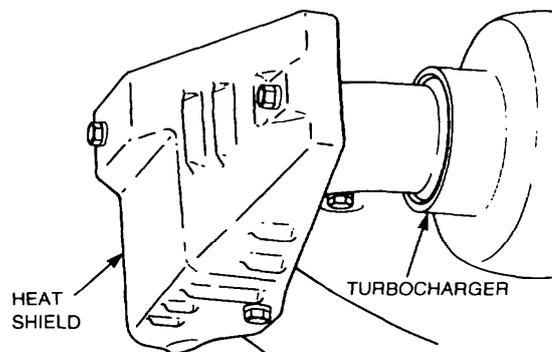


Figure 43 Turbocharger Heat Shield Removal

- c. Disconnect the oil supply line and the oil return line from the turbocharger (Figure 44).

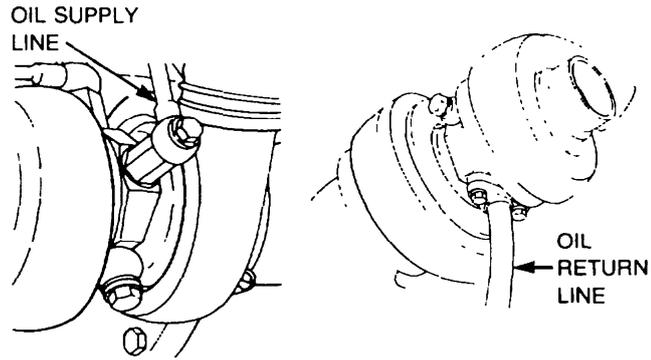


Figure 44 Oil Supply Line and Return Line Removal

- d. Loosen the air intake hose clamp and slide the hose from the turbocharger (Figure 45).

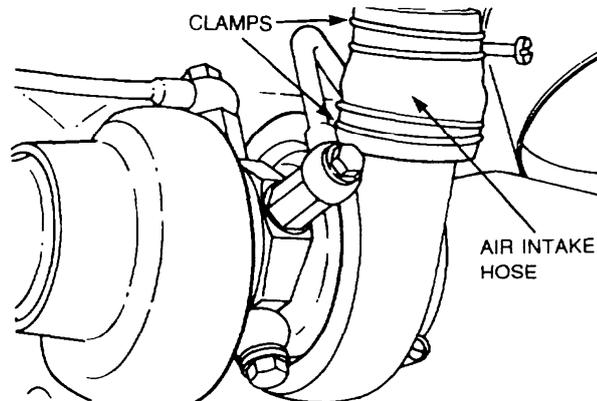


Figure 45 Air Intake Hose Removal

- e. Disconnect the coolant supply line and the coolant return line from the turbocharger (Figure 46).

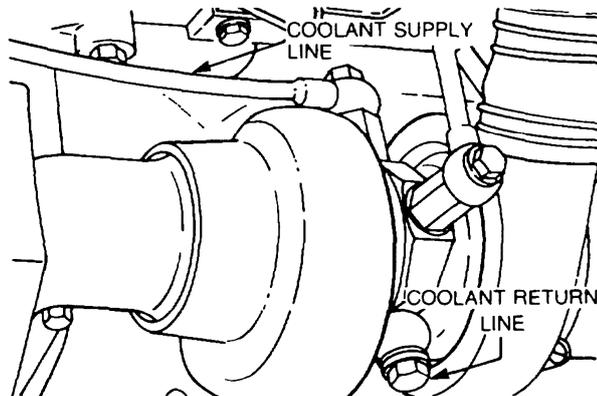


Figure 46 Coolant Supply and Return Lines Removal

- f. Remove the nuts securing the exhaust pipe to the turbocharger exhaust adaptor and remove the exhaust pipe (Figure 47).

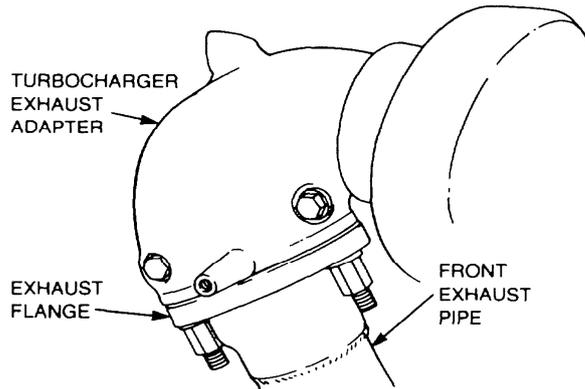


Figure 47 Exhaust Pipe to Turbocharger Removal

- g.** Remove the nuts securing the turbocharger to the exhaust manifold and the two bolts securing the exhaust adapter to the manifold. Carefully remove the turbocharger (Figure 48).

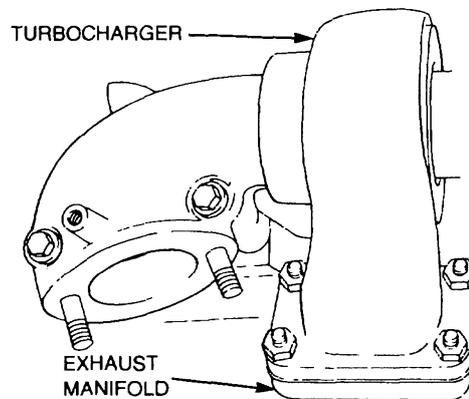


Figure 48 Turbocharger to Manifold Removal

- 74. Cleaning and Inspection.** Clean and inspect the turbocharger as follows:
 - a.** Remove all trace of gasket material from the turbocharger and exhaust manifold mating surfaces.
 - b.** Inspect the turbocharger housing for cracks, burrs or warping and that the bearings rotate smoothly.
 - c.** Replace the turbocharger if necessary.
- 75. Installation.** Install the turbocharger as follows:
 - a.** Position the new gasket and turbocharger on the exhaust manifold and loosely install the retaining nuts.
 - b.** Loosely install the two bolts securing the turbocharger exhaust adapter to the manifold but do not tighten them at this stage.
 - c.** Install the exhaust pipe to turbocharger nuts but do not tighten them at this stage.
 - d.** Connect the oil supply line and tighten it to 12–16 N.m (8.8–11.6 lbf.ft).
 - e.** Connect the oil return line and tighten it to 6–10 N.m (4.4–7 lbf.ft).
 - f.** Connect the coolant supply line and the coolant return line and tighten the connections securely.
 - g.** Tighten the turbocharger to exhaust manifold attaching nuts and the bolts securing the exhaust adapter to 30–34 N.m (22–25 lbf.ft).
 - h.** Install the air intake hose and air cleaner tube. Tighten the clamps securely.
 - i.** Tighten the exhaust pipe to turbocharger nuts securely.
 - j.** Start the engine and check for air and exhaust leaks and rectify as necessary.
 - k.** Install the heat shield on the turbocharger and secure it with the three bolts.

Bleeding the Fuel System

76. **Procedure.** Bleed the fuel system as follows:

- a. Loosen the screw cap on the transfer pump and operate the primer.
- b. Loosen the overflow valve on the fuel filter adaptor and continue operating the primer until a solid stream of fuel flows from the valve (Figure 49)

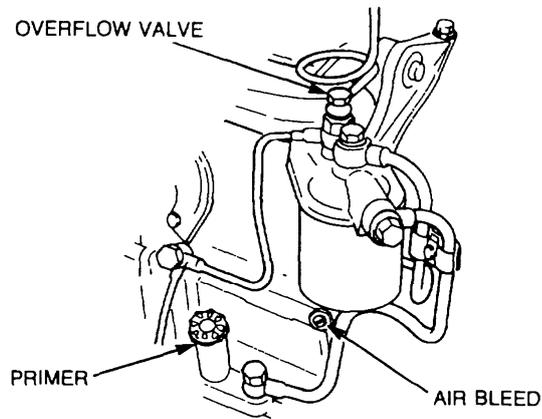


Figure 49 Bleeding the Fuel System

- c. Tighten the overflow valve while operating the primer.
- d. Loosen the air bleed screw and continue operating the primer until a solid stream of fuel flows from the air bleed screw.
- e. Tighten the air bleed screw.
- f. Secure the primer screw cap.
- g. Start the engine.
- h. Ensure that the engine runs smoothly.

Fuel System Specifications

77. The fuel system specifications are detailed in Table 8.

Table 8 Fuel System Specifications

Serial	Specification	Measurement
1	High pressure fuel line nuts tightening torque	28–31 N.m (21–23 lbf.ft)
2	Fuel transfer pump plug tightening torque	78–88 N.m (57–64 lbf.ft)
3	Fuel transfer pump primer tightening torque	40 N.m (28 lbf.ft)
4	Fuel transfer pump adapter tightening torque	12 N.m (10 lbf.ft)
5	Fuel injection pump timing	TDC
6	Fuel injector starting pressure	18 134 kPa (2 630 psi)
7	Fuel injector cap nut tightening torque	58–78 N.m (43–58 lbf.ft)
8	Fuel injector retaining nuts tightening torque	20–30 N.m (15–22 lbf.ft)
9	Engine idle speed	650 ±20 rpm
10	Air inlet manifold to cylinder head tightening torque	16–25 N.m (12–19 lbf.ft)
11	Turbocharger oil supply line tightening torque	12–16 N.m (8.8–11.6 lbf.ft)
12	Turbocharger oil drain pipe tightening torque	6–10 N.m (4.4–7.0 lbf.ft)
13	Turbocharger to exhaust manifold tightening torque	30–34 N.m (22–25 lbf.ft)

Fuel System Fault Finding

78. The procedures for fuel system fault finding are detailed in Table 9.

Table 9 Fuel System Fault Finding

Serial	Symptom	Probable Cause	Action
1	Difficult starting	Lack of fuel	Check tank contents
		Fuel contamination	Check fuel for water, dirt, wax or incorrect fuel
		Stop motor faulty	Check motor and cable adjustment
		Incorrect starting procedure	Check heater plugs, accelerator and stop cable operations
		Air in fuel system	Check all unions, lines and hoses. Bleed system
		Fuel restriction	Check filters and supply lines
		Low cranking speed	Check battery, starter, cables and engine oil type
		Incorrect timing	Check timing
		Fuel return restricted	Check fuel return lines
		Fuel flow incorrect	Check fuel lines not crossed
		Engine condition	Check cylinder compressions, valve timing and clearances and air cleaner condition
		Faulty injectors	Check injectors for correct type, starting pressures and spray patterns
		Fuel tank breather blocked	Check tank breather
		High pressure fuel lines leaking	Check and tighten lines
		Injection pump faulty	Replace injection pump
Fuel transfer pump faulty	Replace transfer pump		
2	Irregular idle	Air in fuel system	Check all unions, lines and hoses. Bleed system
		Fuel restriction	Check filters and supply lines
		Fuel contamination	Check fuel for water, dirt, wax or incorrect fuel
		Incorrect timing	Check timing
		Fuel return restricted	Check fuel return lines
		Fuel flow incorrect	Check fuel lines not crossed
		Engine condition	Check cylinder compressions, valve timing and clearances and air cleaner conditions
		Faulty injectors	Check injectors for correct type, starting pressures and spray patterns
		High pressure fuel lines leaking	Check and tighten lines
		Injection pump faulty	Replace injection pump
		High pressure fuel line restriction	Check for kinks, bore reduction
		Idle speed incorrect	Adjust idle speed
		Incorrect accelerator cable adjustment	Adjust cable
		Engine vibration	Check engine mountings
Injection pump loose	Check and tighten mounting bolts		
3	Insufficient maximum speed	Air in fuel system	Check all unions, lines and hoses. Bleed system
		Fuel restriction	Check filters and supply lines
		Injection pump faulty	Replace injection pump
		Incorrect accelerator cable adjustment	Adjust cable

Table 9 Fuel System Fault Finding (Continued)

Serial	Symptom	Probable Cause	Action
		Fuel transfer pump faulty	Replace transfer pump
		Incorrect timing	Check timing
		Faulty injectors	Check injectors for correct type, starting pressure and spray patterns
4	Irregular engine output	Fuel restriction	Check filters and supply lines
		Fuel transfer pump faulty	Replace transfer pump
		Air in fuel system	Check all unions, lines and hoses. Bleed the system
		Fuel contamination	Check fuel for water, dirt, wax or incorrect fuel
		Injection pump faulty	Replace injection pump
		Faulty injector	Check injector for correct type, starting pressure and spray pattern
		Incorrect timing	Check timing
		Faulty advance mechanism	Report
		Incorrect stop and accelerator cable adjustment	Check and adjust
5	Excessive smoke	Fuel contamination	Check fuel for water, dirt, wax or incorrect fuel.
		Incorrect timing	Check timing
		Engine condition	Check cylinder compressions, valve timing and clearances and air cleaner condition
		Injection pump fault	Replace injector pump
		Faulty injector	Replace injector
		Turbocharger wheel rubbing	Replace turbocharger
		Air leak between turbocharger and cylinder head	Check for air leaks and rectify
		Turbocharger turbine seal leaking	Replace turbocharger
6	Excessive knocking (Detonation)	Incorrect starting procedure	Check heater plugs
		Faulty injector	Replace injector
		Lack of coolant in radiator	Check level
		Lack of oil in engine	Check level and top up as necessary
		Incorrect timing	Check timing
		Faulty advance mechanism	Report
7	Maximum speed excessive	Injection pump faulty	Replace injection pump
8	Engine will not shut down	Stop motor or cable faulty	Check motor and cable adjustment
		Injection pump fault	Replace injection pump
9	Low power	Fuel rate low, fuel pressure correct and turbocharger pressure high. Air temperature between 10°C and 38°C	Replace turbocharger
10	Excessive crankcase gases (blow by)	Turbocharger seals leaking	Replace turbocharger

Power Steering Pump

262. Removal. Remove the power steering pump as follows:

- a.** Place a suitable container under the power steering pump.
- b.** Remove the power steering pump reservoir cap.
- c.** Disconnect the low pressure hose from the power steering pump and drain the fluid into the container.
- d.** Disconnect the high pressure hose from the power steering pump.
- e.** Plug the high and low pressure hoses.
- f.** Remove the bolts securing the power steering pump to the timing gear and remove the pump (Figure 171).

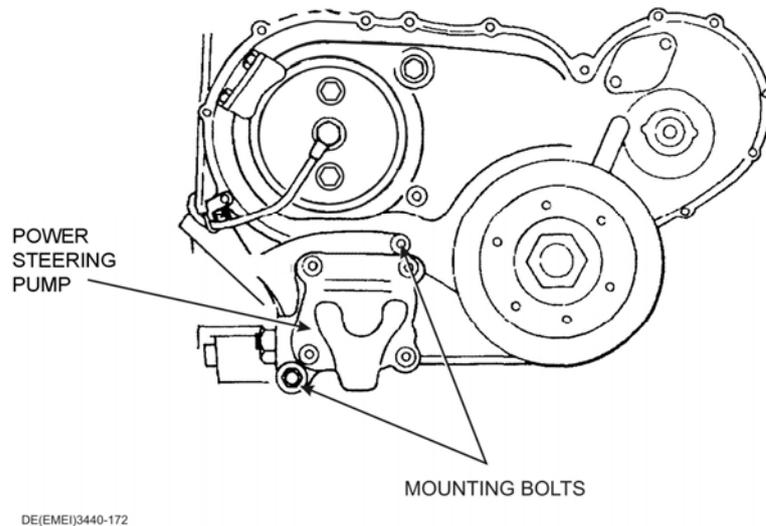


Figure 171 Power Steering Pump Removal

- g.** Remove and discard the O ring and gasket. Plug all apertures on the power steering pump.
- 263. Installation.** Install the power steering pump as follows:
- a.** Remove all trace of gasket from the pump and mating surfaces.
 - b.** Using a new O ring and gasket, install the power steering pump-to-timing gear housing. Tighten the bolts to 64 N.m (48 lbf.ft).
 - c.** Connect the high and low pressure hoses to the power steering pump and tighten them securely.



Do not reuse the fluid drained from the reservoir.

- d.** Fill the power steering fluid reservoir and install the reservoir filler cap.
- e.** Bleed the power steering system.

Glow Plugs

270. Removal. Remove the glow plugs as follows:

- a. Disconnect the battery.
- b. Loosen the nuts securing the electrical strip link to the glow plugs and slide the link away (Figure 176).
- c. Remove the nut from No. 4 cylinder plug and remove the feed wire.
- d. Using a 12 mm deep socket remove the glow plugs from the cylinder head.

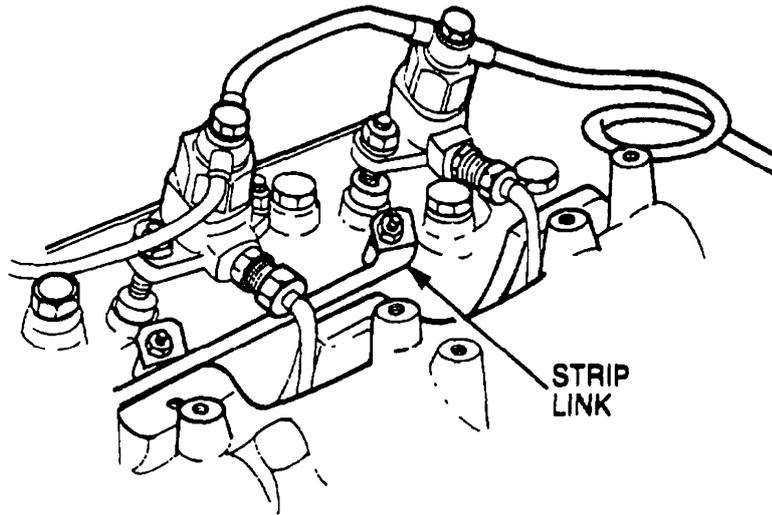


Figure 176 Glow Plug Removal

271. Installation. Install the glow plugs as follows:

- a. Install the glow plugs and torque them to 22–27 N.m (16–20 lbf.ft).
- b. Position the electrical strip link on the glow plugs and secure it with new nuts at cylinders 1, 2 and 3.
- c. Connect the electrical feed wire to cylinder No. 4 glow plug.
- d. Secure the feed wire and strip link to the glow plug with a new nut.
- e. Connect the battery.

Starter Motor

272. Removal. Remove the starter motor as follows:

- a. Disconnect the battery.
- b. Remove the nuts and washers securing the cables to the starter motor and solenoid.
- c. Tag and remove the cables.
- d. Remove the bolt, two nuts and lock washers securing the starter motor to the flywheel housing. Discard the lock washers.
- e. Remove the starter motor.

273. Installation. Install the starter motor as follows:

- a. Install the starter motor and secure it in position with the bolt, two nuts and new lock washers.
- b. Tighten the bolt and two nuts to 40 N.m (30 lbf.ft).
- c. Install the cables and washers and tighten the nuts securely.
- d. Connect the battery.

Alternator and Vacuum Pump

274. Removal. Remove the alternator and vacuum pump as follows:

- a. Disconnect the battery.
- b. Loosen the hose clamp securing the hose to the vacuum pump (Figure 177) and plug the hose with a suitable plug.

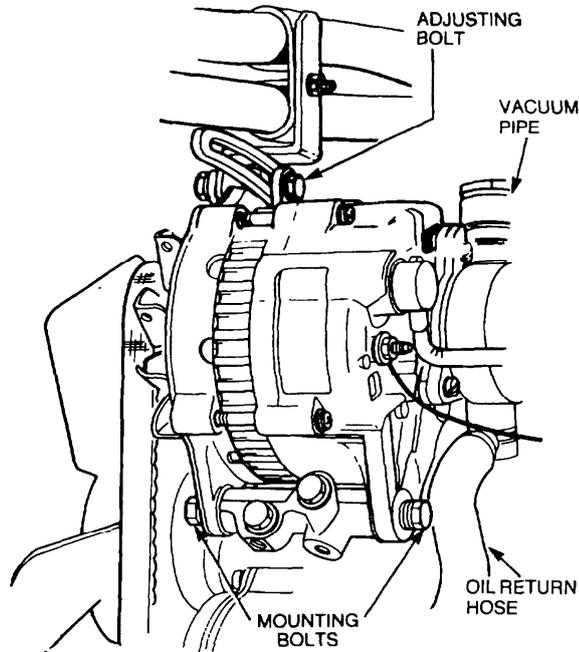


Figure 177 Alternator Removal

- c. Remove the banjo bolt and sealing washers securing the oil feed pipe to the vacuum pump. Discard the sealing washers.
- d. Remove and plug the pipe.
- e. Loosen the hose clamp securing the oil return hose to the vacuum pump.
- f. Remove and plug the hose.
- g. Remove the nut and washer securing the cable to the B-terminal of the alternator.
- h. Remove the field excitation plug from the alternator.
- i. Loosen the alternator mounting bolts and remove the adjusting bolt.
- j. Remove the fanbelt from the alternator drive pulley and swing the alternator away from the engine.
- k. Remove the mounting bolts and remove the alternator.

275. Installation. Install the alternator and vacuum pump as follows:

NOTE

Prior to installation, apply a few drops of engine oil into the oil feed opening. Rotate the alternator pulley to prevent oil starvation on initial starting.

- a. Position the alternator on the mounting bracket and install the two mounting bolts. Do not tighten them at this stage.
- b. Move the alternator towards the engine and install the fanbelt.
- c. Fit the adjusting bolt and move the alternator away from the engine until a belt deflection of 10–15 mm is obtained.
- d. Tighten the adjusting and mounting bolts securely.

- e.** Fit the field excitation plug to the alternator socket and the single cable to the alternator B-terminal.
- f.** Install the oil return hose to the vacuum pump and secure it with the hose clamp.
- g.** Install the pipe, new sealing washers and banjo bolt. Tighten the bolt securely.
- h.** Install the vacuum hose to the alternator and secure it with the hose clamp.
- i.** Connect the battery.