SECTION 05: COOLING SYSTEM

CONTENTS

LIST OF ILLUSTRATIONS

1. COOLING SYSTEM

1.1 Description

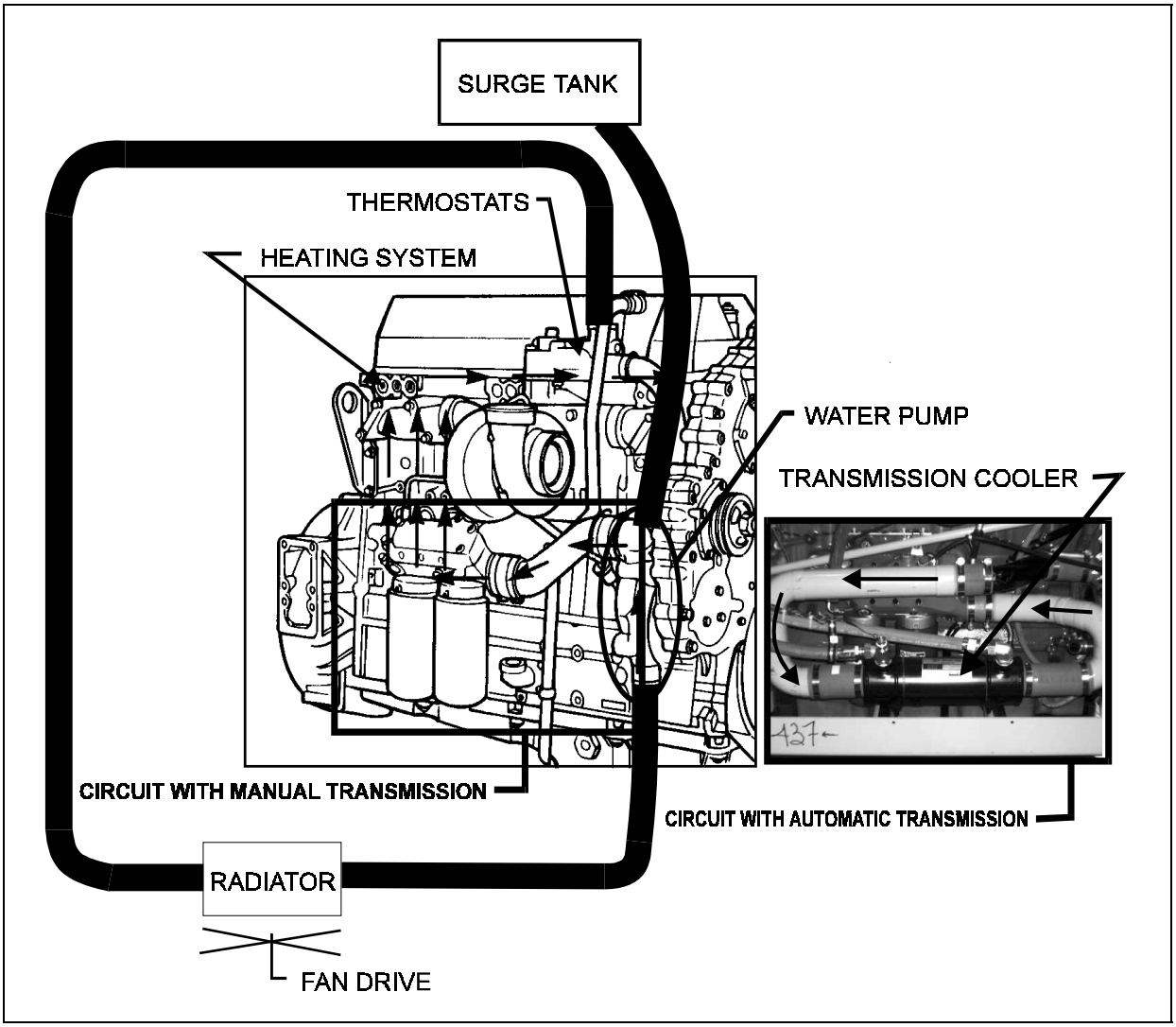

FIGURE 1: COOLING SYSTEM DESCRIPTION 05023

A radiator and thermo-modulated fan are used to effectively dissipate the heat generated by the engine. A centrifugal-type water pump is used to circulate the engine coolant (Fig. 1).

Two full blocking-type thermostats are used in the water outlet passage to control the flow of coolant, providing fast engine warm-up and regulating coolant temperature.

The engine coolant is drawn from the lower portion of the radiator by the water pump and is forced through the oil cooler and into the cylinder block. For vehicles with automatic transmissions the coolant circulates in the transmission cooler before going through the oil cooler and the cylinder block.

From the cylinder block, the coolant passes up through the cylinder head and, when the engine is at normal operating temperature, through the thermostat housing and into the upper portion of the radiator. Then the coolant passes through a series of tubes where the coolant temperature is lowered by air streams created by the revolving fan and the motion of the vehicle.

Upon starting a cold engine or when the coolant is below operating temperature, the closed thermostats direct coolant flow from the thermostat housing through the by-pass tube to the water pump. Coolant is recirculated through the engine to aid engine warm up. When the thermostat opening temperature is reached, coolant flow is divided between the radiator inlet and the by-pass tube. When the thermostats are completely open, all of the coolant flow is to the radiator inlet.

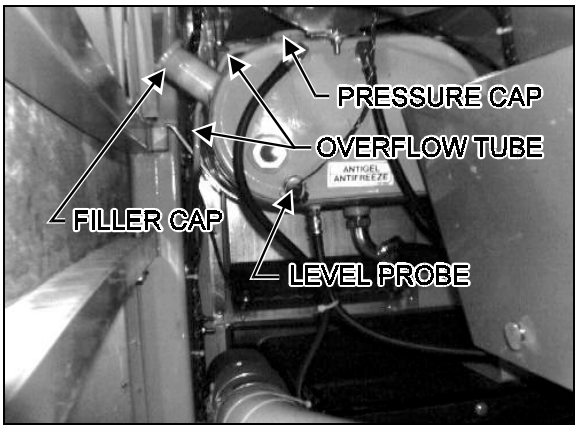

FIGURE 2 : SURGE TANK - ENGINE COMP'T 05036

The cooling system is filled through a filler cap on the surge tank (Fig. 2). A pressure cap on top of surge tank is used to maintain pressure within the system. When system exceeds normal pressure rating (14 psi - 96.53 kPa), the cap releases air and if necessary, coolant through the overflow tube (Fig. 2). Two thermostats are located in the housings attached to the right side of the cylinder head (Fig. 1). Furthermore, a water temperature sensor mounted on the cylinder head (radiator side) is also supplied for engine protection purposes.

The engine cooling system is also used to provide hot coolant for the vehicle heating system. Refer to *"22. HEATING AND AIR CONDITIONING"* in this manual for information relating to heating system water circulation.

1.2 Maintenance

A systematic routine inspection of cooling system components is essential to ensure maximum engine and heating system efficiency.

- Check coolant level in the surge tank daily, and correct if required. Test antifreeze strength.

- Maintain the prescribed inhibitor strength levels as required. Coolant and inhibitor concentration must be checked at each oil change, every 12,500 miles (20 000 km) or once a year, whichever comes first to ensure inhibitor strength. For vehicles equipped with coolant filters replace precharge element filter with a maintenance element filter as per *"5. COOLANT FILTER"* in this section. If the vehicle is not equipped with a filter, add the recommended inhibitor concentration to the antifreeze/water solution.

- Drain, flush, thoroughly clean and refill the system every two years or every 200,000 miles (320 000 km), whichever comes first. For vehicle equipped with coolant filters, change the precharge element filter or the existing maintenance element filter for a new maintenance element filter. If the vehicle is not equipped with the filter add the recommended inhibitor concentration to the antifreeze/water solution.

Note: ***Do not add inhibitors to the antifreeze/water solution if vehicle is equipped with a coolant filter.***

Note: ***The coolant must be discarded in a environmentally safe manner.***

Vehicles without coolant filters

Refer to Nalcool 3000 with Stabil-Aid bulletin annexed to the end of this section for preventive maintenance (at each oil change) and initial treatment instructions (each time the cooling system is drained, flushed and cleaned).

Vehicles with coolant filters

Change the coolant precharge element filter for a maintenance element filter at initial oil change (see *"11. Specifications"* at the end of this section) and replace existing maintenance element filter with a new one as per *"5. COOLANT FILTER"* in this section. Use a new precharge element filter each time the cooling system is drained, flushed and cleaned.

- Check belts for proper tension; adjust as necessary and replace any frayed or badly worn belts.
- Check radiator cores for leaks and make sure the cores are not clogged with dirt or insects. To avoid damaging the fins, clean cores with a low pressure air hose. Steam clean if required.
- Inspect the water pump operation. A leaky pump sucks in air, increasing corrosion.
- Repair all leaks promptly. Unchecked leaks can lead to trouble. Inspect and tighten radiator mounts periodically. Test and replace thermostats regularly.

Note: ***In order to ensure the integrity of the system, it is recommended that a periodic cooling system pressure check be made. Pressurize the cooling system to 103-138 kPa (15-20 psi) using Radiator and Cooling System Tester, J24460-1. Do not exceed 138 kPa (20 psi). Any measurable drop in pressure may indicate a leak. Whenever the oil pan is removed, the cooling system should be pressure checked as a means of identifying any incipient coolant leaks. Make sure the cause of the internal leak has been corrected before flushing the contaminated system.***

Leaks at the thermostat housing hose connections may be caused by deformation and rough surfaces on the castings of the hose mounting surfaces. It is recommended that *"Dow Corning RTV-102 Compound"* or any equivalent product be applied on cast surfaces prior to hose installation.

Caution: ***Castings should be clean and free of oil and grease before applying compound. No other sealer should be used with RTV-102 compound.***

2. HOSES

2.1 Inspection

Rotten, swollen, and worn out hoses or loose connections are frequent causes of cooling system problems.

Serious overheating is often caused by an old hose collapsing or from rotten rubber shedding from hoses and clogging the coolant passages.

Connections should be inspected periodically and hose clamps tightened. Replace any hose found to be cracked or swollen.

When installing a new hose, clean pipe connections and apply a thin layer of a non-hardening sealing compound. Replace worn out clamps or clamps that pinch hoses.

3. CONSTANT-TORQUE HOSE CLAMPS

3.1 Description

All hose clamps of 1 3/8" ID and over, used on the heating and cooling systems, are of the *"Constant-torque"* type. These clamps are worm-driven, made of stainless steel, and supplied with a series of Belleville spring washers. They also feature an extended integral liner that covers the band slots to protect soft/silicone hoses from damage, and help maintain consistent sealing pressure.

This type of clamp is designed to automatically adjust its diameter to compensate for the normal expansion/contraction of a hose and metal connection that occurs during vehicle operation and shutdown. The constant-torque clamp virtually eliminates coolant losses due to *"Cold flow"* leakage and greatly minimizes clamp maintenance.

3.2 Installation

A torque wrench should be used for proper installation. The recommended torque is 90 to 100 lbf•in. (10 to 11 N•m). The Belleville spring washer stacks should be nearly collapsed flat and the screw tip should extend 1/4" (6 mm) beyond the housing (Fig. 3).

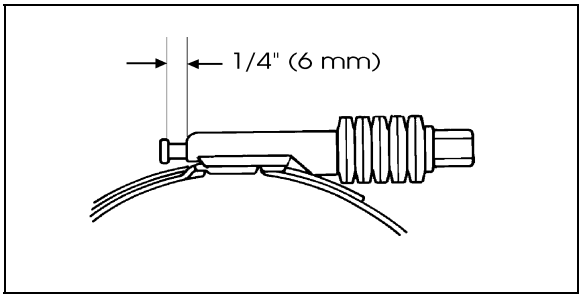

FIGURE 3: CONSTANT-TORQUE CLAMP 05037

Caution: ***The hose clamps will break if over-torqued. Do not overtighten, especially during cold weather when hose has contracted.***

3.3 Maintenance

The constant-torque clamps contain a *"Visual torque check"* feature. When the tip of the screw is extending 1/4" (6 mm) out of the housing, the clamp is properly installed and maintains a leak-proof connection. Since the constant-torque clamp automatically adjusts to keep a consistent sealing pressure, there is no need to retorque hose clamps on a regular basis. During vehicle operation and shutdown, the screw tip will adjust according to the temperature and pressure changes. Proper installation torque should be checked at room temperature.

4. COOLANT

4.1 Thawing cooling System

If the cooling system becomes frozen solid, place the coach in a warm area until the ice is completely thawed. Under no circumstances should the engine be operated when the cooling system is frozen, as it will result in engine overheating due to insufficient coolant.

4.2 Coolant Level Verification

Coolant level is correct when the cold coolant is visible through the surge tank sight glass (Fig. 4). If coolant level is low, fill cooling system.

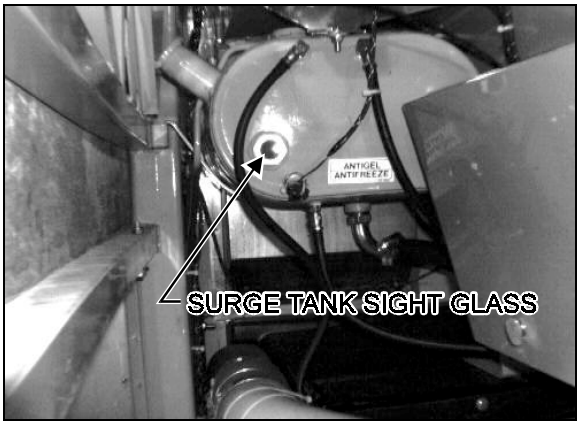

FIGURE 4: SURGE TANK SIGHT GLASS 05038

4.3 Coolant Level Sensor

The loss of coolant warning device, consists of a level probe mounted on the surge tank and a sensor module mounted on the vehicle. The module sends a signal to the ECM to indicate coolant level. If the coolant level drops below the probe, the *"Check Engine"* light flashes and a diagnostic code is registered (see *"01. ENGINE"*).

Caution: ***Do not run engine with the "Check Engine" light flashing.***

The level probe is mounted on the R.H. side of the surge tank while the electronic module is mounted inside the rear electric junction box.

4.4 Coolant Requirements

The coolant provides a medium for heat transfer and controls the internal temperature of the engine during operation. In an engine having proper coolant flow, some of the combustion heat is conveyed through the cylinder walls and the cylinder head into the coolant. Without adequate coolant, normal heat transfer cannot take place within the engine, and engine temperature rapidly rises. Therefore, coolant must be carefully selected and properly maintained.

Coolant solutions must be carefully selected and properly maintained in order to meet the following basic requirements:

1. Provide for adequate heat transfer.
2. Provide protection from cavitation damage.
3. Provide a corrosion/erosion-resistant environment within the cooling system.
4. Prevent formation of scale or sludge deposits in the cooling system.
5. Be compatible with the cooling system hose and seal materials.
6. Provide adequate freeze protection during cold weather operation.

The first five requirements are satisfied by combining suitable water with reliable inhibitors. When freeze protection is required, a solution of suitable water and antifreeze containing adequate inhibitors will provide a satisfactory coolant. Ethylene glycol-based antifreeze is recommended for use in Series 60 engines. The cooling system capacity is 24 US gal (91 liters).

Note: ***In general, antifreeze does not contain adequate inhibitors. For this reason, supplemental coolant additives are required.***

For a complete overview of engine coolants used with Detroit Diesel Engines, refer to Section 13.3 *"Coolant Specification"* in the *"Detroit Diesel Engine Manual"*.

4.5 General Cooling System Recommendations

Always maintain cooling system at the proper coolant level. Check daily.

The cooling system must be pressurized to prevent localized boiling of coolant. The system must be kept clean and leak-free. The filler and pressure caps must be checked periodically for proper operation.

4.6 Coolant Recommendations

1. Always use recommended antifreeze and inhibitor & water at proper concentration levels. A 50% coolant/water solution is normally used as factory fill. Antifreeze concentration over 70% is not recommended because of poor heat transfer capability, adverse freeze protection and silicate dropout. Antifreeze concentration below 30% offers little freeze, boilover or corrosion protection.
2. Use only ethylene glycol antifreeze meeting the GM 6038-M or ASTM D 4985 formulation or an equivalent antifreeze with a 0.15% maximum silicate content meeting GM 1899-M performance specifications.

3. Use an antifreeze solution year-round for freeze and boil-over protection. Seasonal changing of coolant from an antifreeze solution to an inhibitor/water solution is recommended.

4. Pre-mix coolant makeup solutions at proper concentrations before adding to the cooling system.

5. Maintain the prescribed inhibitor strength levels as required.

Vehicles Without Coolant Filters

Refer to Nalcool 3000 with Stabil-Aid bulletin annexed to the end of this section for preventive maintenance (at each oil change) and initial treatment instructions (at each time the cooling system is drained, flushed and cleaned).

Vehicles With Coolant Filters

Change the coolant precharge element filter for a maintenance element filter at initial oil change (see Specifications at the end of this section) and replace existing maintenance element filter with a new one as per *"5. COOLANT FILTER"* in this section. Use a new precharge element filter each time the cooling system is drained, flushed and cleaned.

Note: ***The coolant filter contains inhibitors.***

6. Do not mix different base inhibitor packages.

7. Use only non-chromate inhibitors.

8. DO NOT USE THE FOLLOWING:

- Soluble oil
- Chromate inhibitor
- Methoxy propanol-base antifreeze
- Methyl alcohol-base antifreeze
- Sealer additives or antifreezes containing sealer additives

9. Distilled water is recommended.

10. Always maintain proper coolant level.

Note: ***Always test the solution before adding water or antifreeze.***

11. If not at the proper protection level. Mix coolant/water solution to the proper concentration before adding to the cooling system.

Warning: ***Never remove filler cap while coolant is hot. When coolant is at ambient temperature, release pressure from system by turning the pressure cap counterclockwise, 1/4 turn; then remove filler cap slowly. A sudden release of pressure from the heated cooling system can result in personal injury from the expulsion of hot coolant if these precautions are not followed.***

4.7 Draining Cooling System

The cooling system may be completely or partially drained by using the following procedures.

The engine and related components may be drained as follows:

1. Stop engine and allow engine time to cool. Close both heater line shutoff valves.

On XL-40 & 45E vehicles, the valves are located in engine compartment. One is on the R.H. side of compartment and is accessible through engine compartment R.H. side door (Fig. 5).

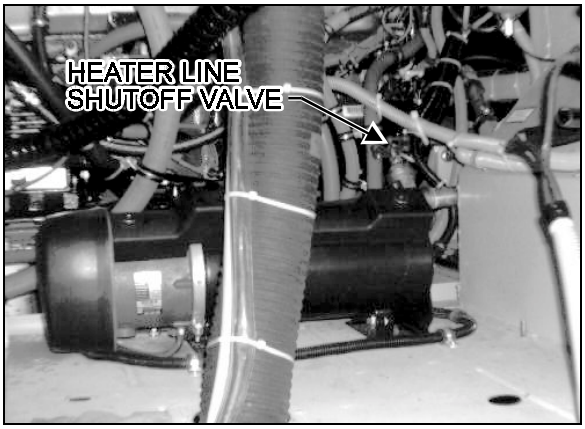

FIGURE 5: HEATER LINE SHUTOFF VALVE 05039

The other is located on the L.H. side of engine underneath fan gearbox and is accessible through engine compartment rear doors (Fig. 6).

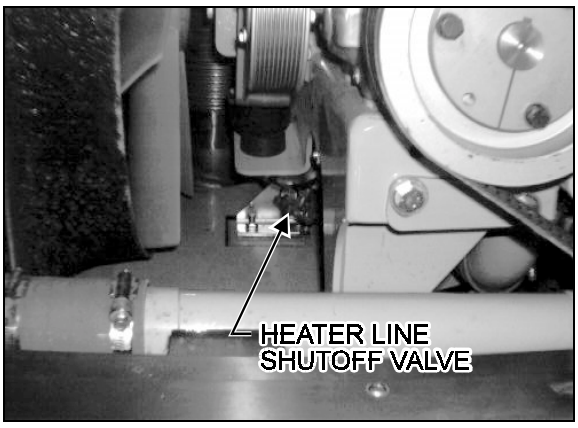

FIGURE 6: HEATER LINE SHUTOFF VALVE 05040

On XL-45 vehicles, the valves are located in engine compartment, on the L.H. side of engine and are accessible through L.H. side rear service compartment (Fig. 7).

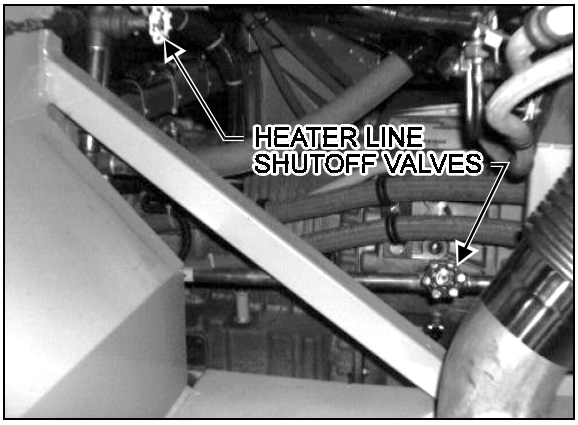

FIGURE 7: HEATER LINE SHUTOFF VALVES 05041

Warning: ***Before proceeding with the following steps, make sure the coolant has cooled down. The sudden release of pressure from a heated cooling system can result in loss of coolant and possible personal injury (scalding) from the hot liquid.***

2. Unscrew the pressure cap counterclockwise, 1/4 turn to release pressure from system and permit the coolant to drain completely from system.

3. Open the drain cock (1) located at rear corner of the engine (radiator side) (Fig. 8).

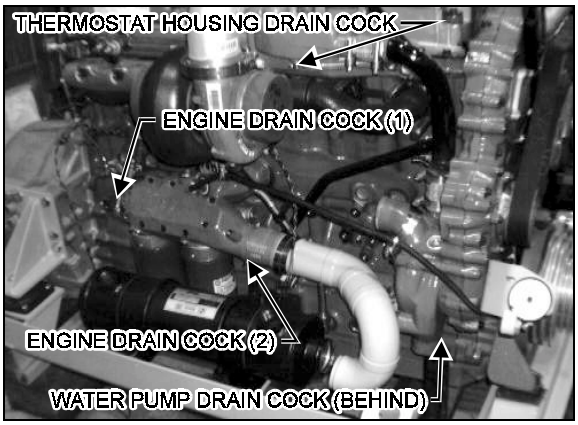

FIGURE 8: ENGINE COOLANT DRAIN COCKS 05042

4. Open the water pump housing inlet line drain cock (Fig. 9).

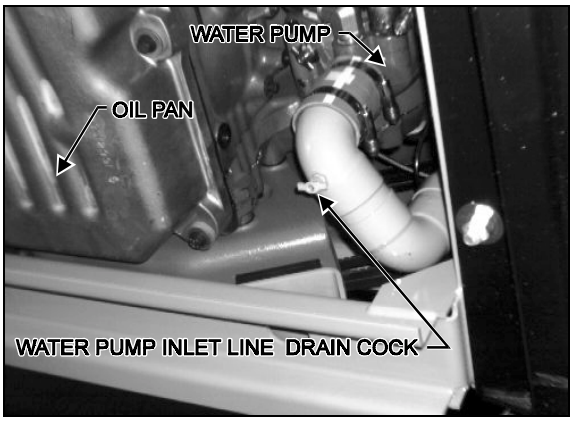

FIGURE 9: WATER PUMP DRAIN COCK (VIEWED FROM UNDERNEATH VEHICLE) 05028

5. Open drain cock at bottom of thermostat housing to drain the coolant trapped above the thermostats (Fig. 8).

6. Open the water pump drain cock (Fig. 8) (if applicable).

7. Open the radiator drain cock (Fig. 10).

8. Open engine drain cock (2) (Fig. 8).

Caution: ***if freezing weather is anticipated and the engine is not protected with antifreeze, drain the cooling system completely. Trapped water in the cylinder***

block, radiator or other engine parts may freeze and expand resulting in damage to the engine. Leave the drain plugs open until the cooling system can be refilled with antifreeze.

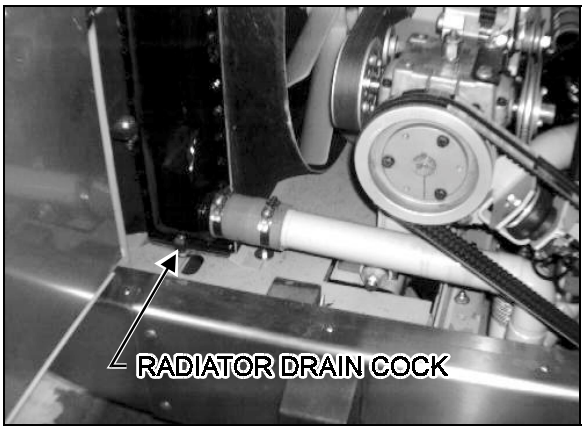

FIGURE 10: RADIATOR DRAIN COCK 05043

To drain the entire system (including heating units), redo the previous steps while maintaining the shutoff valves in their open position; then follow the procedure under *"9.2 Draining Heating System"* in Section 22.

4.8 Refilling Cooling system

If only the engine and related components have been drained, maintain the two heater line shutoff valves in their closed position, then proceed as follows.

1. Close all drain cocks (refer to *"4.7 Draining Cooling System"* for the location of draining points.

2. From the surge tank filler cap inlet, refill cooling system with a recommended ethylene glycol-base antifreeze and water solution with the required concentration. Add required Detroit Diesel selected product cooling system inhibitors (if required).

Note: ***The coolant level should remain within two inches of the surge tank filler neck.***

Note: ***Make sure the vent line at top of thermostat housing is properly connected and not obstructed. The vent line (thermostat housing dome to radiator top tank) is required to ensure complete engine fill and proper venting of air in the system.***

3. Install the filler and pressure caps, then start the engine and run it at fast idle until normal operating temperature is reached. Check for leaks.

Note: ***If for any reason, the coolant level drops below the surge tank level probe, the Check Engine light will flash.***

4. Stop engine and allow it to cool.

5. Open the two heater line shutoff valves, check the coolant level in the surge tank, then add as required.

Caution: ***Never pour cold coolant into a hot engine. The sudden change in temperature may crack the cylinder heads or block.***

If the entire system has been drained, redo the previous steps while maintaining the two heater line shutoff valves in the "Open" position. With engine running, activate the driver's and central heating systems to permit coolant circulation, then complete the procedure by bleeding the heater cores as explained in Section 22, under *"9.4 Bleeding Heating System".*

4.9 Flushing

If the cooling system is contaminated, flush the cooling system as follows:

1. Drain the coolant from the engine.

2. Refill with soft clean water.

Caution: ***If the engine is hot, fill slowly to prevent rapid cooling and distortion of the engine castings.***

3. To thoroughly circulate the water, start the engine and run for 15 minutes after the thermostats have opened.

4. Fully drain system.

5. Refill with clean water and operate for 15 minutes after the thermostats have opened.

6. Fully drain system.

7. Fill with a 50/50 antifreeze/water solution and add required inhibitors (if applicable). Replace the coolant filter (if applicable) with a precharge element filter; in this case do not mix inhibitors with antifreeze/water solution.

4.10 Cooling System Cleaners

If the engine overheats, and the fan belt tension, coolant level, and thermostat operation have been found to be satisfactory, it may be necessary to clean and flush the entire cooling system.

Remove scale formation by using a reputable and safe descaling solvent. Immediately after using the descaling solvent, neutralize the system with a neutralizer, It is important that the directions printed on the container of the descaler be thoroughly read and followed.

After the solvent and neutralizer have been used, fully drain system, then reverse flush the engine and radiator (see *"4.11 Reverse Flushing")* before refilling the system with coolant solution.

4.11 Reverse Flushing

After the engine and radiator have been thoroughly cleaned, they should be reverse flushed. The water pump should be removed and the radiator and engine reverse flushed separately to prevent dirt and scale deposits from clogging the radiator tubes or being forced through the pump. Reverse flushing is accomplished by hot water, under pressure, being forced through the cooling system in a direction opposite to the normal flow of coolant, loosening and forcing deposits out.

The radiator is reverse flushed as follows:

1. Remove the radiator inlet and outlet hoses and replace existing radiator cap with a new one.

2. Attach a hose to the top of the radiator to lead water away from the engine.

3. Attach a hose at the bottom of the radiator and insert a flushing gun in the hose.

4. Connect the water hose of the gun to the water outlet and the air hose to the compressed air outlet.

5. Turn on the water and when the radiator is full, turn on the air in short blasts, allowing the radiator to fill between blasts.

Note: ***Apply air gradually. Do not exert more than 138 kPa (20 psi) air pressure. Too great a pressure may rupture a radiator tube.***

6. Continue flushing until only clean water is expelled from the radiator.

The cylinder block and cylinder head water passages are reverse flushed as follows:

1. Remove the thermostats and the water pump.

2. Attach a hose to the water inlet of oil cooler housing to drain water away from engine.

3. Attach a hose to the water outlet at the top of the cylinder head (thermostat housing) and insert the flushing gun in the hose.

4. Turn on the water and when the jackets are filled, turn on the air in short blasts, allowing the engine to fill with water between air blasts.

5. Continue flushing until the water from the engine runs clean.

If scale deposits in the radiator cannot be removed by chemical cleaners or reverse flushing as outlined above, it may be necessary to remove the upper tank and rod out the individual radiator

tubes with flat steel rods. Circulate the water through the radiator core from the bottom to the top during this operation.

5. COOLANT FILTER (if applicable)

5.1 Description

The engine cooling system filter is used to filter out impurities such as scale or sand from the coolant and it also eliminates the process of adding inhibitors to the antifreeze/water solution. The filter is available as optional equipment and is mounted to the engine cradle (Fig. 11).

The precharge element filter lasts for 12,500 miles (20 000 km) or a year, whichever comes first. Replace the precharge element filter with a maintenance element filter, which lasts for 200,000 miles (320 000 km) or two years, whichever comes first. Every time the cooling system is flushed, drained and cleaned, you must first install a precharge element filter for its required lifespan; then install a maintenance element filter.

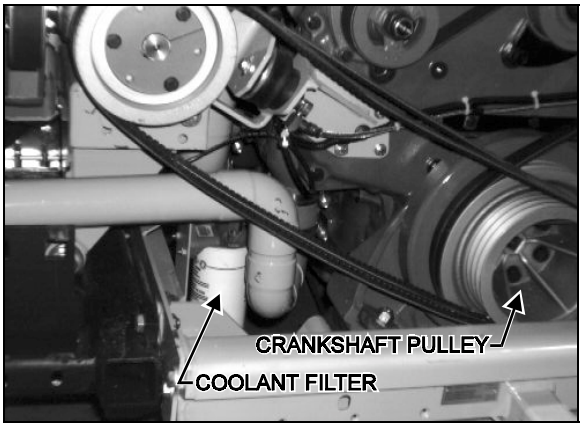

FIGURE 11: COOLANT FILTER 05032

Note: ***If a coolant filter is to be installed on an engine already in service, drain and flush the cooling system prior to the installation of the filter.***

To replace a filter:

1. Close the two shutoff cocks at the filter mounting heads and unscrew the old filter from mounting.

Warning: ***Failure to relieve cooling system pressure may result in personal injury.***

2. Remove and discard the filter.

3. Clean the filter adapter with a clean, lint-free cloth.

4. Coat surface of gasket with oil, tighten 2/3 to 1 turn after gasket contacts base.

5. Open the two shutoff cocks at filter.

6. Start engine and check for leaks.

Caution: ***Do not exceed recommended service intervals.***

6. RADIATOR

The radiator is mounted at the L.H. side of engine compartment. It is designed to reduce the temperature of the coolant under all operating conditions. It is essential that the radiator core be kept free from corrosion and scale at all times.

6.1 Maintenance

Inspect the exterior of the radiator core every 25,000 miles (40 000 km) or once a year, whichever comes first. Clean with a quality grease solvent, such as a mineral spirits and dry with compressed air. Do not use fuel oil, kerosene or gasoline. It may be necessary to clean the radiator more frequently if the engine is being operated in extremely dusty or dirty areas.

7. RADIATOR VARIABLE SPEED FAN

7.1 Description

The radiator speed fan is thermostatic. The two speeds are controlled by the engine temperature (coolant temperature and air inlet temperature). The fan drive clutch is electromagnetic. An electric current regulates speeds by activating one magnetic coil for the first speed and two magnetic coils for the second speed.

The settings are:

For Series 60 engines with motor serial numbers up to 06R0194000 inclusively

- 204°F (96°C) First speed
- 208°F (98°C) Second speed

For Series 50 & 60 engines with motor serial numbers from 06R0194000

- 196°F (91°C) First speed
- 203°F (95°C) Second speed

Caution: ***Mechanical locking device***
In case of an electrical power failure: unscrew the bolt from the end of the shaft and screw it into the locking plate. This procedure will prevent engine from overheating (Fig. 12).

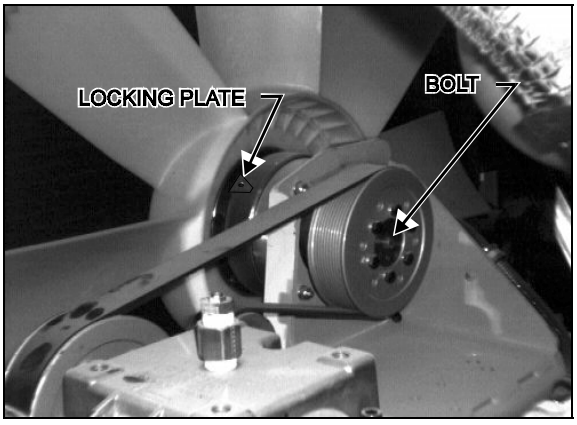

FIGURE 12: FAN-MECHANICAL LOCKING DEVICE 05033

7.2 Maintenance

1. Clean the fan and related parts with clean fuel oil and dry them with compressed air. Do not clean with steam or high pressure jet.
2. Check the fan blades for cracks or other damage. Replace the fan if the blades are cracked or deformed.
3. Remove any rust or rough spots in the grooves of the fan pulley. If the grooves are damaged or severely worn, replace the pulleys.
4. Do not add any fluids or lubricants to the fan drive.
5. Do not restrict fan rotation during engine operation for any reason.
6. Do not operate fan drive with a damaged fan assembly. Replace a damaged fan as soon as the fault is noted.
7. Immediately investigate and correct any operator complaint involving drive or cooling system performance.
8. When questions arise, obtain answers before proceeding. Assistance is available through the authorized Field Sales distributor serving your area.

7.3 Inspection

Warning: ***Set the starter selector switch in engine compartment to the "Off" position to prevent accidental starting of the engine.***

- Check security of fasteners holding fan blade assembly to fan drive.
- Check coupling installation to gearbox.
- Visually inspect fan drive, fan blade assembly, shroud, radiator, and surrounding area for evidence of contact between rotating and non-rotating parts.

- Check fan transfer belt for fraying, cracking, and proper tension.

- Turn fan through at least 360° of rotation. It should turn smoothly with no resistance.

7.4 Thermostat Operation

The temperature of the engine coolant is controlled by two blocking-type thermostats located in a housing attached to the right side of the cylinder head (Fig. 13).

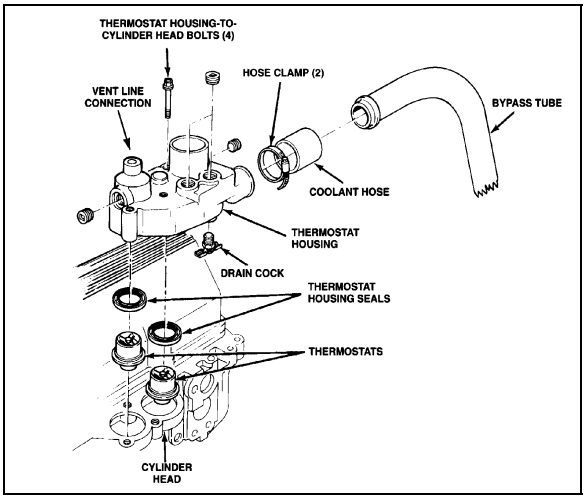

FIGURE 13: THERMOSTAT AND RELATED PARTS 05034

At coolant temperature below approximately 190°F (88°C), the thermostat valves remain closed and block the flow of coolant from the engine to the radiator. During this period, all of the coolant in the system is recirculated through the engine and directed back to the suction side of the water pump via a bypass tube. As the coolant temperature rises above 190°F (88°C) the thermostat valves start to open, restricting the bypass system, and allowing a portion of the coolant to recirculate through the radiator. When the coolant temperature reaches approximately 205-207°F (96-97°C) thermostat valves are fully open, the bypass system is blocked off, and the coolant is directed through the radiator.

8. FAN GEARBOX

8.1 Description

The radiator fan is belt driven from the engine crankshaft pulley through a gearbox standard assembly which is supplied with two output shafts.

8.2 Maintenance

Change the gearbox oil at 3 000 miles (4 800 km) and subsequently every 50,000 miles (80 000 km) or once a year, whichever comes first.

8.3 Oil change

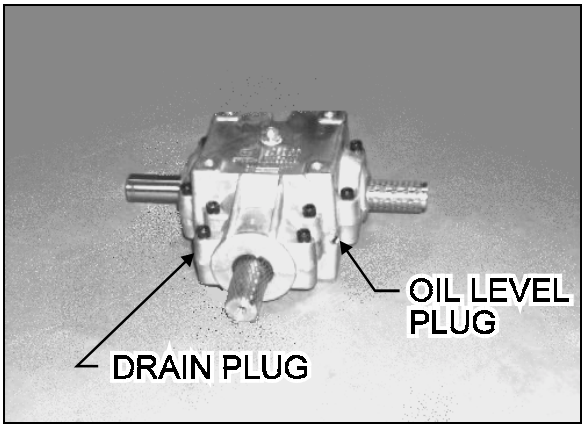

FIGURE 14: FAN GEARBOX 05008

1. Stop engine and make sure that all engine safety precautions have been observed.

2. Unscrew the air vent tube to permit the air to enter and the draining of gearbox (Fig. 14).

3. Remove the drain plug located at the gearbox base.

4. Drain gearbox.

5. Replace drain plug.

6. Remove the oil level plug located on the R.H. side of gearbox (Fig. 14).

7. Fill gearbox with synthetic oil (Esso imperial mobil SHC 630 (180217)) until oil runs out of the level plug.

8. Reinstall the level plug and the air vent tube.

9. RADIATOR FAN BELT REPLACEMENT AND BELT TENSIONERS

1. Locate the belt tensioner two-way control valve (Fig. 15), then turn handle counterclockwise in order to reverse pressure in belt tensioner air bellows, thus releasing tension on belts.

FIGURE 15: ENGINE COMPARTMENT 05044

2. Remove old belts (3 V belts & 1 Poly) from fan assembly and place the new ones on.

3. Turn clockwise the two-way control valve to its initial position to apply tension on the new belt.

4. For proper operation of the belts, adjust the air bellow tensioner pressure regulating valve (located next to control valve) to 50 psi for vehicles with Series 60 engines and to 70 psi for vehicles with Series 50 engines.

10. FAN DRIVE INSTALLATION & ALIGNMENT

1. Install both attachment assembly plates (#48 - P/N 051779) through lower plating and secure them with four spring nuts (#70 - P/N 500666). Then install one spacer (#49 - 050705) on spring nuts at both anchoring locations (Fig. 16).

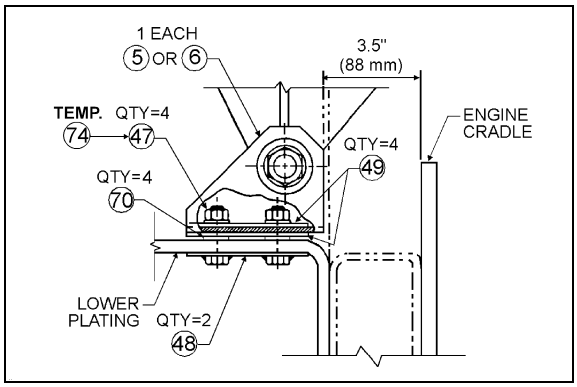

FIGURE 16: ANGLE SUPPORT 05014

2. Center seat assembly in the fan shroud using the horizontal displacement of the fan drive installation : center with the slots in the floor at anchoring angle support (on some vehicles only). The vertical displacement of fan clutch is made possible by slots at the base of the fan clutch (on some vehicles only) or by shimming with additional spacers at anchoring locations. Temporarily secure assembly with two nuts (#74 - P/N 500709) at both anchoring locations.

Caution: ***Tilt fan and check for clearance.***

3. Using a straight edge, align the 3"V" pulley on gearbox central shaft pulley with engine pulley, while taking pulleys outer edge thicknesses under consideration *i.e. 3"V" pulley's outer edge is thicker than that of engine pulley's* (Fig. 17).

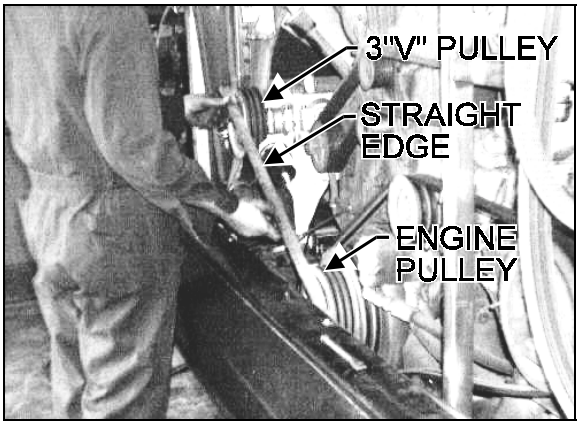

FIGURE 17: PULLEY ALIGNMENT 05015

4. Using a universal protractor, check 3"V" pulley's vertical angle with that of engine pulley's. If angles do not correspond, raise seat assembly by shimming with additional spacers (#49 - P/N 050705).

Note: ***Use a straight edge to measure engine pulley's vertical angle. (Fig. 18)***

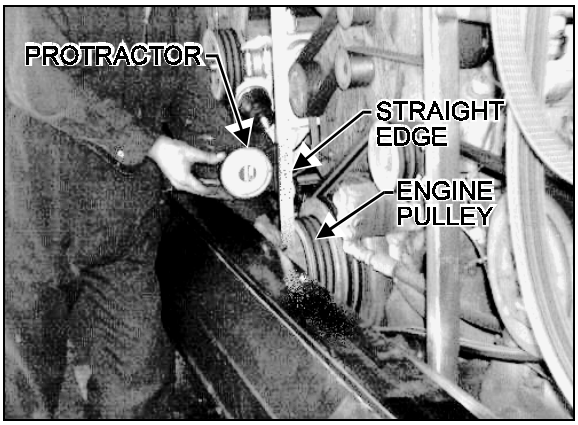

FIGURE 18: PULLEY'S VERTICAL ANGLE 05016

5. Recheck alignments (steps 3, 4 & 5), then replace temporary anchoring nuts (#74 - 500709) with four nuts (#47 - 500714) and tighten with wrench.

6. Align multi"V" pulley with fan pulley. Adjust the depth of the pulley on the gearbox shaft.

Caution: ***In order for tensioning system to work properly, the distance between the inside faces of "Tensioning Arm to Engine" bellow brackets should be between 2 3/8" (60 mm) and 2 1/2" (64 mm); if not, release tension on system and readjust distance using bolts securing upper tensioning bracket (Fig. 19).***

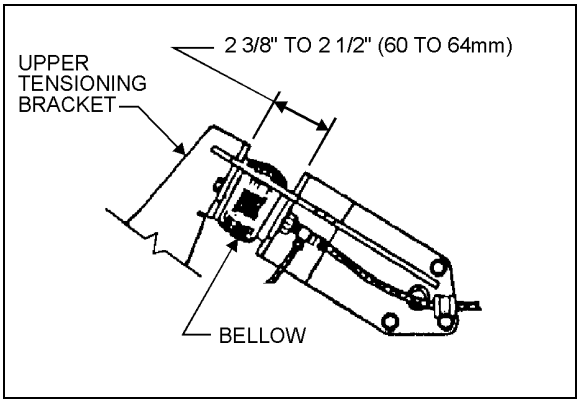

FIGURE 19: BELLOW - DISTANCE CHECK 12017

7. Reset belt tensioning pressure control valve to 50 PSI - 345 kPa (70 psi - 482 kPa for Series 50 engines) as per Section 12, *"BRAKE"* (Fig. 20).

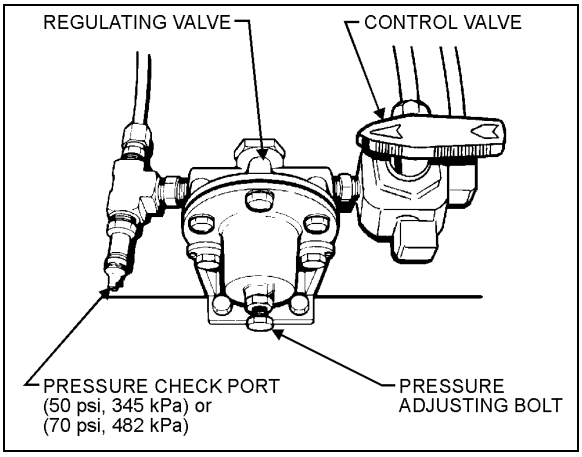

FIGURE 20: VALVES 12018

11. SPECIFICATIONS

Cooling System Capacity (Approx.)
Includes heating system ..... 24 US gal (91 liters)

Thermostat
Number used 2
Start to open..... (186-193 °F) 86-89 °C
Fully open..... 207 °F (97 °C)

Radiator
Make.....Long
Location..... Rear L.H. side

XL Buses
Supplier number.....7601-8317-1
Prevost number..... 550687

XL Shells
Supplier number..... 7601-8336
Prevost number..... 550689

Surge Tank Filler Cap
Make..... Stant
Model.....R3
Prevost number..... 530191

Pressure Cap
Make..... Stant
Pressure setting .....14 psi (96.53 kPa)
Supplier number.....R12
Prevost number..... 550606

Fan Clutch
Make.....Linnig
Type .....3 speeds
Supplier number.....LA1.2.024Y
Prevost number..... 550634
Note: ***The fan clutch is controlled by DDEC (not by thermoswitch).***

Fan Gearbox
Make.....Superior Gearbox
Ratio 1:1
Supplier number.....411ACF-097-6
Prevost number..... 550688

Fan Belt (gearbox-fan)

Make..... Dayco
Type .....Multi-V, Poly rib, 51”
Qty.....1
Supplier number..... 5100495
Prevost number..... 506663

Fan Belt (gearbox-motor)

Make.....Gates
Type ..... V belt
Qty.....3
Series 60 Engines:
Supplier number.....AX74
Prevost number..... 506690
Series 50 Engines:
Supplier number.....AX73
Prevost number..... 506691

Corrosion Inhibitor and Coolant Stabilizer

Supplier number.....Detroit Diesel..... 23507857
Supplier number.....Nalco DD3000-15

Coolant Filter

Number used 1
Make..... Nalco
Type .....Spin-on

MAINTENANCE ELEMENT FILTER

Supplier number. ....Detroit Diesel..... 23507545
Supplier number.....Nalco DDF3000
Prevost number..... 550630

PRECHARGE ELEMENT FILTER

Supplier number. ....Detroit Diesel..... 23507189
Supplier number.....Nalco DDF60
Prevost number..... 550629

Temperature Gauge (in engine compartment)

Make.....VDO Yazaki
Operating range ..... 100-265 °F (40-130 °C)
Supplier number.....1 131 015 015B
Prevost number..... 562331

Temperature Gauge (on instrument panel)

Make.....Datcon
Type .....Electrical
Operating range ..... 100-280 °F (38-138 °C)
Supplier number.....07718-40
Prevost number..... 562214