

PREVOST

ENREGISTRÉ - REGISTERED
ISO 9001 & ISO 14001

**MAINTENANCE
INFORMATION**

Mi04-06



DATE : June 2004	SECTION : 05 - Cooling
SUBJECT : DETROIT DIESEL ENGINE COOLANT CHANGE	

Important Notice: This modification is recommended by Prevost Car to increase your vehicle's performance. Note that no reimbursement will be awarded for carrying out this modification.

APPLICATION

Model	VIN
All XL2 vehicles Model Year : 2004	From 2PCY3349741028165 up to now
All H3 vehicles Model Year : 2004	From 2PCV3349441014758 up to now

DESCRIPTION

Starting with the above-mentioned vehicles, all Prevost vehicles equipped with cooling 2002 EGR engines must use a phosphorous and nitrates free coolant in order to meet Detroit Diesel specification 7SE298 or TMC RP-329 "Type A" formulation. Former coolant color was **green**, new engine coolant color is **fuchsia (purplish red)**. If the color of your engine coolant is green, Prevost strongly suggests that you change it as soon as possible for the new fuchsia coolant in order to meet Detroit Diesel specification.

Coolant requirements and recommendations as well as draining, filling and flushing instructions are supplied in Section 05 of Maintenance Manual and are included here as a reminder.

⚠ CAUTION ⚠
Do not use former engine coolant (green) on engines equipped with EGR 2002-2004, however new DDC (Power Cool) or Prestone (Heavy Duty) coolant (fuchsia) can be used on pre-EGR engines.

MATERIAL

COOLANT

Part No	Description
685125	Prevost Number
23512138	DDC (Power Cool)
AF977 (bulk), 72702 (3.78L), 70119 (205L), 70102 (4L)	Prestone (Heavy Duty)

NOTE

Material can be obtained through regular channels.

PROCEDURE

△ WARNING △

Park vehicle safely, apply parking brake, stop engine and set battery master switch(es) to the OFF position prior to working on the vehicle.

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. Coolant must therefore be carefully selected and properly maintained.

Select and maintain coolant in order to meet the following basic requirements:

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

Combining suitable water with reliable inhibitors satisfies the first five requirements. When freeze protection is required, a solution of suitable water and antifreeze containing adequate inhibitors will provide a satisfactory coolant fluid. 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 "Coolant Selections" For Engine Cooling Systems Guide (#7se298).

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.

Recommended phosphate free coolants: Detroit Diesel "DDC Power Cool" (P/N 23512138) or Prestone AF977 (bulk) Prevest #685125, 72702 (3.78 L), 70119 (205L), 70102 (4L).

INHIBITORS

A coolant solution, which has insufficient inhibitors or no inhibitors at all, invites the formation of rust, scale, sludge and mineral deposits within the cooling system. These deposits can cause water pump seal wear and coat the interior of coolant system passages. Heat transfer is reduced as deposits build up,

leading to an overheating condition. Continued operation with this condition can lead to serious engine damage: liner scuffing, scoring, piston seizure and cylinder head cracking. These damages can occur quickly or over a longer period of time, depending of location and amount of deposits. Improperly inhibited coolants can become corrosive enough to "eat away" coolant passages and seal ring grooves and cause leaks to develop. Hydrostatic lock can occur if leak is internal and accumulates on top of a piston. The result may be a bent connecting rod. Cavitation erosion may occur in improperly inhibited coolants. Cavitation erosion is caused by the implosion of tiny bubbles against localized surfaces of the system. Such implosion causes pinpoint pressures high enough to erode pump impellers, cylinder liners and cylinder blocks. In extreme cases, their surfaces are so deeply pitted that they appear to be spongy, and holes can develop completely through them.

Inhibitor Test Procedures

Test Kits are commercially available to check engine coolant for nitrite concentration. Nitrite concentration is an indication of Supplemental Coolant Additive (SCA) level. Nitrite must be maintained within recommended levels. Coolant must be tested at each oil change to insure that inhibitor levels are maintained within the ranges shown below:

DDC Fully Formulated Glycol Coolant Limits	
-30 -- 50(°F)	Freeze Point (°F)
125 -- 500 ppm	Boron (ppm)
800 -- 3200 ppm	Nitrite (ppm)
200 -- 750 ppm	Nitrate (ppm)
50 -- 250 ppm	Silicon (ppm)
0 ppm MAX	Phosphorus (ppm)
8.0 -- 11.0	pH
40 ppm MAX	Chlorides (ppm)
100 ppm MAX	Sulfates (ppm)

NOTE

Above SCA values with Detroit Diesel #7se298 or TMC RP-329 "Type A". Use Nalco Chemical Company nitrite test kits (CO-318). A factory coolant analysis program is available through Detroit Diesel distributors under part number 23508774.

COOLANT RECOMMENDATIONS

1. Always use recommended antifreeze, inhibitor and 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 Detroit Diesel #7se298 or TMC RP-329 "Type A" formulation.
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.
6. Do not mix different base inhibitor packages.
7. Always maintain proper coolant level.

⚠ CAUTION ⚠

Always test the solution before adding water or antifreeze.

8. If cooling system is not at the proper protection level. Mix coolant/water solution to the proper concentration before adding to the cooling system
9. Use only non-chromate inhibitors.
10. Distilled water is recommended.

Coolant Not Recommended

- All antifreeze and coolant containing phosphorous;
- Automotive type coolants;
- Methoxy propanol-base antifreeze;
- Methyl alcohol-base antifreeze;
- Sealer additives or antifreezes containing sealer additives;

Additives Not Recommended

- Soluble Oils;
- Chromates.

⚠ 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 ¼ turn; then remove filler cap slowly. A sudden release of pressure from the heated cooling system can result in severe burns from the expulsion of hot coolant fluid.

Vehicles Without Coolant Filters

Refer to Nalcool 3000 with Stabil-Aid bulletin annexed to the end of section 05 of Maintenance Manual for preventive maintenance (at each oil change) and initial treatment instructions (each time the cooling system is drained and flushed).

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 section 05 of Maintenance Manual) and replace existing maintenance element filter with a new one as per "COOLANT FILTER" in section 05 of Maintenance Manual. A precharge element filter must be installed each time the cooling system is drained and flushed before installing a maintenance element filter.

NOTE

The precharge coolant filter contains inhibitors.

DRAINING COOLING SYSTEM

Use the following procedures to drain the cooling system partially or completely.

To drain engine and related components:

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

H3 SERIES VEHICLES: One valve is located in the engine compartment under the radiator fan gearbox (Fig. 1). Another valve is located behind the L.H. rear fender near the optional coolant heater.

XL2-40, XL2-45 & 45E MTH: One valve is located in the engine compartment, under the radiator fan gearbox (Fig. 1), another valve is located in the engine compartment behind splash guard panel at rear of vehicle (behind L.H. side tag axle wheel) (Fig. 2).

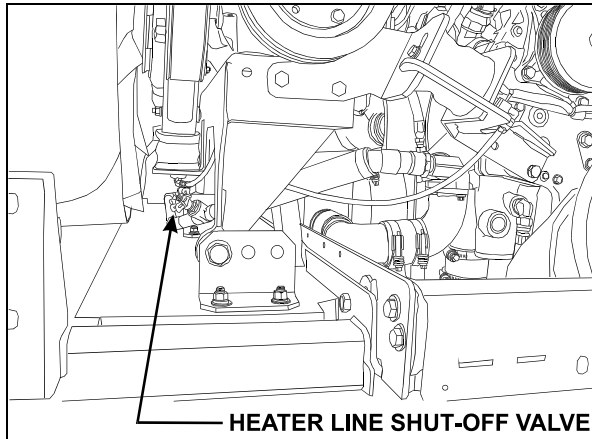


FIGURE 1: ENGINE COMPARTMENT

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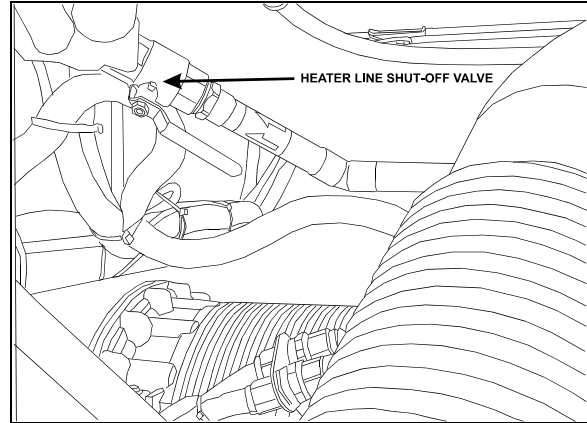


FIGURE 2: HEATER LINE SHUT-OFF VALVES

XL2-45 COACHES: Both valves are located in the engine compartment, behind splash guard panel at rear of vehicle (behind L.H. side tag axle wheel) (Fig. 3).

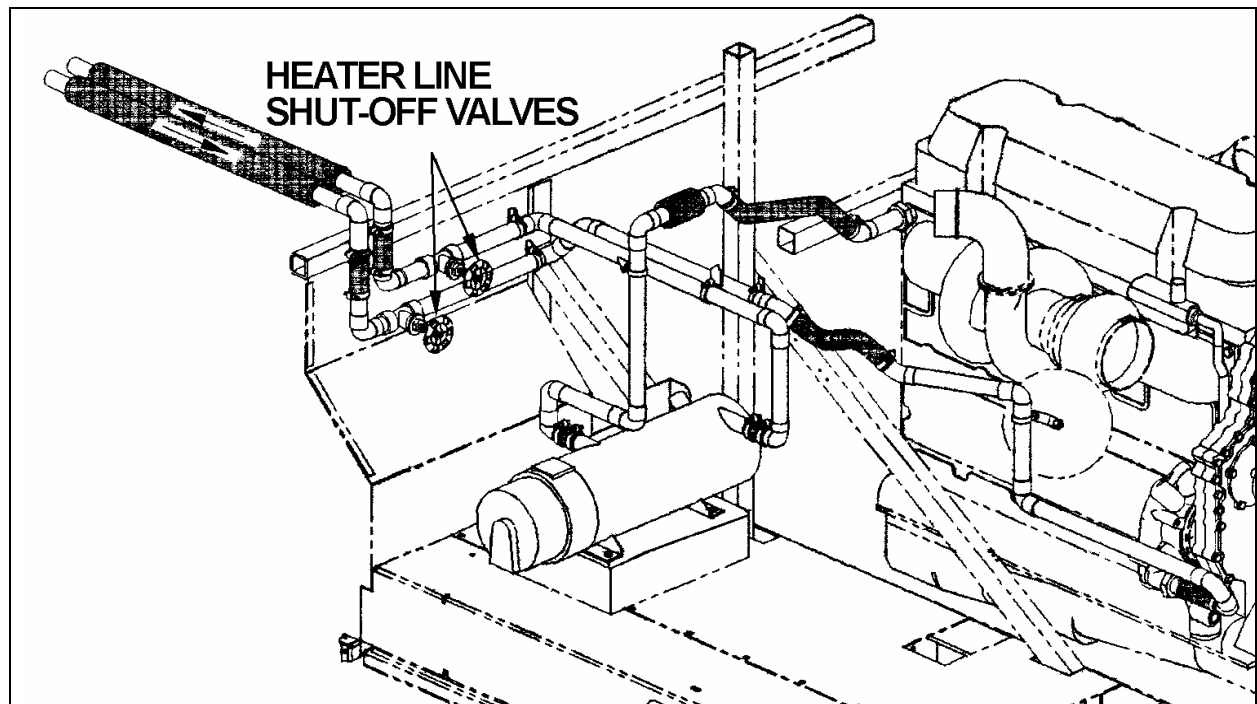


FIGURE 3: COACHES SHUT-OFF VALVES (TYP.)

NOTE

Refer to section 22 of Maintenance Manual under "Preheating System" for information about preheater access and heater line shutoff valve.

△ **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 surge tank pressure cap counterclockwise, ¼ turn to let air enter the system and permit the coolant to drain completely from system.
3. Open the water pump housing inlet line drain plug (Fig. 5).
4. To drain the driver's heater core:
 - Locate the normally open water solenoid valve located on the ceiling of the spare wheel compartment, disconnect its wiring connector, and then connect a 24-volt external power source, using jumper cables, to close the valve.
 - Loosen hose clamp, install an appropriate container to recover coolant, and disconnect silicone hose from water solenoid valve.
 - From inside of vehicle, remove the finishing panels. Open the purge valve located inside the HVAC unit, on the driver's side to ensure an efficient draining.
5. To drain the central heating system:
 - Open the last L.H. side baggage compartment door, and then pull the black release button located on the L.H. side in order to unlock and open the evaporator compartment door.
 - Open drain cock in bottom of heater core, and then open purge valve located on top of heater core in order to allow air to enter while draining.
 - Clean filter.
6. Open drain cock at bottom of thermostat housing to drain the coolant trapped above the thermostats (1, Fig. 4).
7. Open the radiator drain cock.
8. Open engine drain cock (2, Fig. 4).
9. Remove the transmission oil cooler. Drain, flush and inspect. Refer to Section 7, "TRANSMISSION" for oil cooler maintenance or preventive replacement.

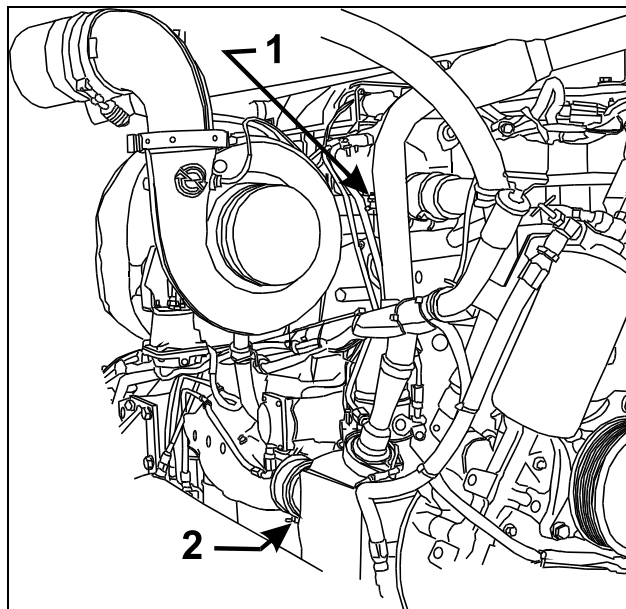


FIGURE 4: ENGINE COOLANT DRAIN COCKS

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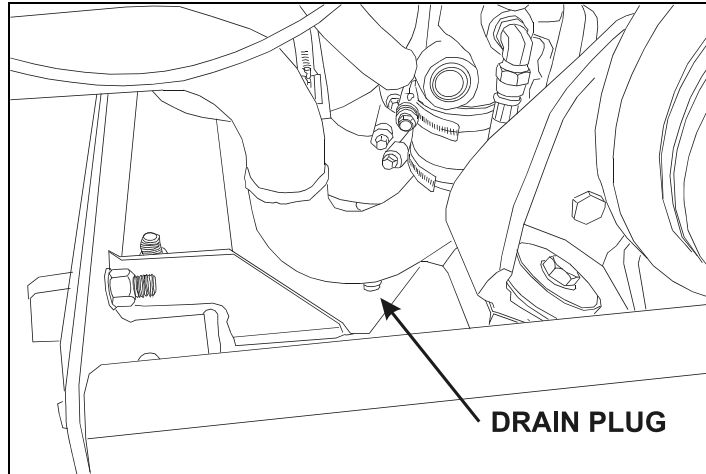


FIGURE 5: WATER PUMP DRAIN PLUG 05072

⚠ CAUTION ⚠

If freezing weather is anticipated and the engine is not protected with antifreeze, drain the cooling system completely when vehicle is not in use. Trapped water in the cylinder block, radiator or other components may freeze and expand resulting in damages. Leave the drain plugs open until the cooling system can be filled with coolant fluid. Do not run engine with cooling system empty.

To drain the entire system, do the previous steps while maintaining the shutoff valves in the open position; then follow the procedure under “*Draining Heating System*” in Section 22.

FILLING COOLING SYSTEM

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

1. Close all drain cocks. Refer to draining procedure for the location of draining points.
2. Refill cooling system from the surge tank filler cap inlet with a recommended ethylene glycol-based antifreeze and water solution of the required concentration. Add 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 purge line at top of thermostat housing is properly connected and not obstructed. The purge line (thermostat housing dome to radiator top tank) is required to ensure complete engine fill and proper purging of air in the system.

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

NOTE

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

5. Stop engine and allow cooling.
6. Open the two heater line shutoff valves, check the coolant level in the surge tank, and then add as required.

⚠ CAUTION ⚠

Never pour cold coolant into a hot engine. The sudden change in temperature may crack the cylinder head 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. If the vehicle is equipped with a windshield upper section defroster, momentarily pinch the hose located between the recirculating pump suction and the defroster outlet connector to ensure windshield upper section defroster complete filling. Complete the procedure by bleeding the heater cores as explained in Section 22, under "9.4 Bleeding Heating System".

FLUSHING

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

1. Drain the coolant from the engine.
2. Refill with clean water the first time.

⚠ 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 and run the engine for 15 minutes after the thermostats have opened.
4. Fully drain system.
5. Refill with clean water a second time and operate for 15 minutes after the thermostats have opened.
6. Stop engine and allow cooling.
7. Fully drain system.

Vehicles without coolant filters:

Fill with a 50/50-antifreeze/water solution and add required inhibitors.

Vehicles with coolant filters:

Replace the coolant filter with a precharge element filter; in this case do not mix inhibitors with antifreeze/water solution.

Dispose of spent fluids in an environmentally responsible manner according to regulations in effect in your area.

Cooling System Descalers

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 de-scale and flush the entire cooling system.

Remove scale formation by using a reputable and safe de-scaling solvent. Immediately after using the de-scaling solvent, neutralize with a neutralizing agent. It is important that product directions be thoroughly read and followed.

After using the solvent and neutralizer, fully drain the system, and then reverse flush the engine and radiator (see "Reverse Flushing" hereafter) before filling the system with coolant solution.

Reverse Flushing

After the engine and radiator have been thoroughly de-scaled, 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 high 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 until the jackets are filled, and then turn on the air in short blasts. Allow jackets 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.

Waste disposal:

Discard according to applicable environmental regulations (Municipal/State[Prov.]/ Federal)