



INSTALLATION,
SERVICE AND
OWNER'S MANUAL

MODELS: XL900
XL1500

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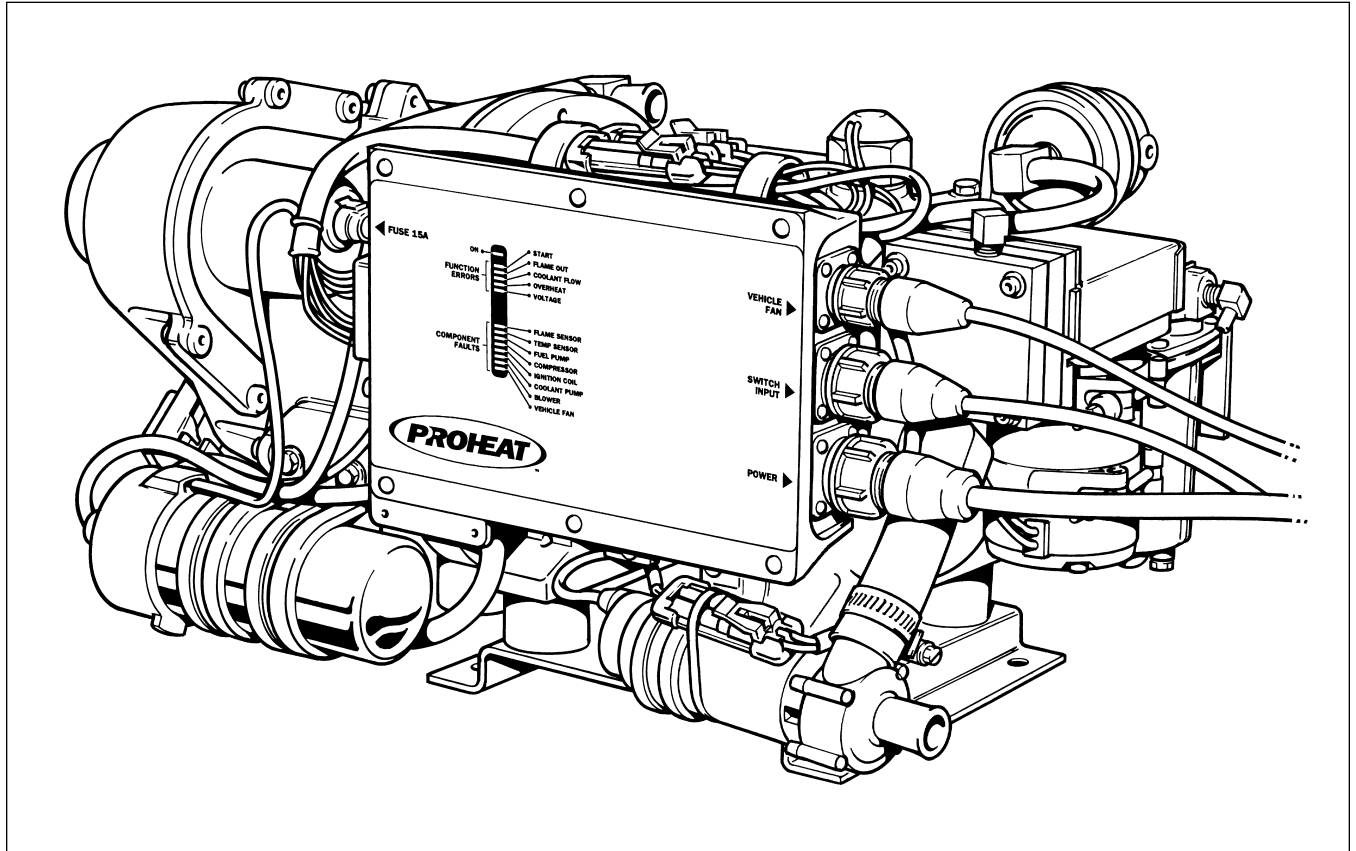
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INTRODUCTION

PROHEAT Model XL-900
XL1500



This manual is provided to assist an authorized PROHEAT dealer to install and service a PROHEAT heater, it is also a detailed owners manual. Although trucks have been used in the examples, applications for PROHEAT are by no means limited to trucks. PROHEAT heaters are designed to be used on any diesel equipped vehicle including: trucks, buses (school, transit and coach), construction equipment, off road equipment, military equipment and cargo.

PROHEAT heaters are used in the following applications:

- (1) Engine Block Heat – PROHEAT will preheat an engine block to ensure reliable starting in cold weather. At the same time it may be used throughout the year to reduce the wear associated with cold starts.
- (2) Cab or Sleeper Heat (engine off) – PROHEAT will supply heat to the cab or sleeper. Drivers can sleep in comfort not only in the cold of winter but also in the spring and fall when the weather is miserable. Substantial savings through reduced fuel consumption and engine wear can be obtained by not idling the engine during these times.
- (3) Supplemental Heat (engine running) – as the efficiency of modern diesel engines are improved there is no longer adequate reject heat available to heat the vehicle's interior. This is particularly true for buses. PROHEAT can be used while the vehicle is operating to provide supplemental heat for the interior.
- (4) Cargo Heat – PROHEAT can be used to provide heat to protect valuable cargo such as produce or beverages from damage due to freezing.
- (5) Marine – Marine applications typically involve the engineering and installation of a complete hot-water heating system of which PROHEAT is only one component. Teleflex recommends that only an expert in marine hot-water heating systems install a PROHEAT on a boat. It is the installer's responsibility to ensure that the installation complies with all applicable Coast Guard regulations.

1.0 OPERATING YOUR PROHEAT HEATER

Note:

Regular use of your PROHEAT throughout the year will improve its reliability. Weekly operation is recommended.

Engine Heat Only

1. Switch the toggle switch located in the vehicle dash to "ON". The switch will light and the heater will fire. It will continue to fire until the coolant reaches 185°F (85°C) at the heater outlet and then cycle off.

When the coolant temperature falls below 150°F (65°C) at the heater inlet, it will refire and repeat the cycle.

It will continue to cycle until:

- a) the heater is switched off,
- b) the heater runs out of fuel,
- c) the vehicle battery voltage drops below 10.5 volts, or
- d) an error occurs and the switch light flashes

(See *Trouble Shooting & Repair, section 5*)

NOTE: The PROHEAT may be operated if the engine is running or not running.

2. When engine preheat is no longer required, switch the PROHEAT heater "OFF".

Engine and Sleeper Heat

1. Switch the toggle switch located in the vehicle dash to "ON".

The switch will light and the heater will fire. It will continue to fire until the coolant reaches 185°F (85°C) at the heater outlet and then cycle "OFF".

When the coolant temperature falls below 150°F (65°C) at the heater inlet, it will fire and repeat the cycle.

It will continue to cycle until:

- a) the heater is switched off,
- b) the heater runs out of fuel,
- c) the vehicle battery voltage drops below 10.5 volts, or
- d) an error occurs and the switch light flashes

(See *Trouble Shooting & Repair, section 5*)

NOTE: The PROHEAT may be operated if the engine is running or not running.

2. For sleeper heat – set the thermostat in the sleeper to the desired temperature. If the set temperature is higher than the temperature in the sleeper the fan will cycle "ON". When the air reaches the set temperature the fan will cycle "OFF". The fan will cycle "ON" and "OFF" to maintain the set temperature.

NOTE: PCMs Serial #C10001 to C12999: sleeper fan output does not turn on until coolant temperature reaches 100°F (38°C).
PCMs Serial #C13000 and greater: sleeper fan turns on when the heater is switched or timed on.

3. When engine and/or sleeper preheat is no longer required, switch the PROHEAT heater off.

2.0 TECHNICAL SPECIFICATIONS

MODEL	HEAT OUTPUT BTU/hr. (kw)	VOLTS Nominal range	CURRENT Amps	FUEL RATE Gal/hr (l/hr)	COOLANT FLOW Gal/min (l/min.)
XL900-12	30,000 (9.0)	12 (10.5 - 15)	6.0	0.27 (1.0)	8.0 (30)
XL900-24	30,000 (9.0)	24 (20 - 30)	3.0	0.27 (1.0)	8.0 (30)
XL1500-12	50,000 (15.0)	12 (10.5 - 15)	10.0	0.45 (1.7)	8.0 (30)
XL1500-24	50,000 (15.0)	24 (20 - 30)	5.0	0.45 (1.7)	8.0 (30)

WARNING

Do not use gasoline

Ignition Type:Electronic spark ignition

Fuel Types:.....Diesel #1, #2, Kerosene

Coolant Temperature:150° to 185°F (65° to 85°C) @ heater

Enclosure Dimensions: **XL900**12 1/2"W x 11"H x 20 1/2"L inches
(318 x 280 x 521 mm)

XL150012 1/2"W x 11"H x 22"L inches
(318 x 280 x 559 mm)

Weight, Heater only: **XL900**40 lbs. (18 kg)

XL150041 lbs. (18.5 kg)

Weight, with Enclosure: **XL900**55 lbs. (25 kg)

XL150056.5 lbs. (26 kg)

Operating Temperature Range:.....-40° to 122°F (-40° to 50°C)

Heat Exchanger Capacity:.....1 quart U.S. (.97 litre)

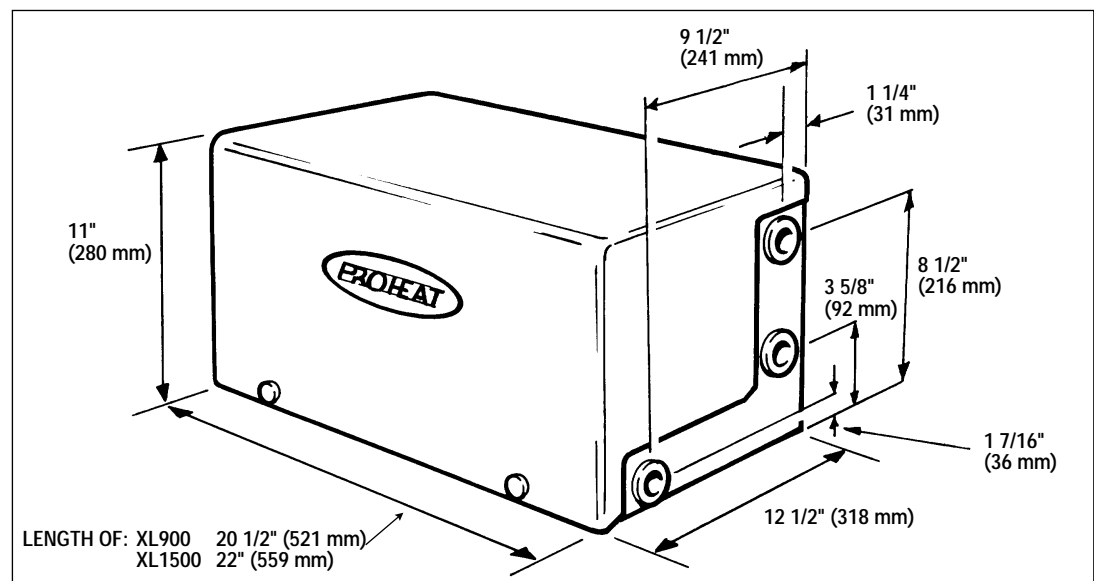


Figure 2-1 Enclosure Dimensions (typical to all models)

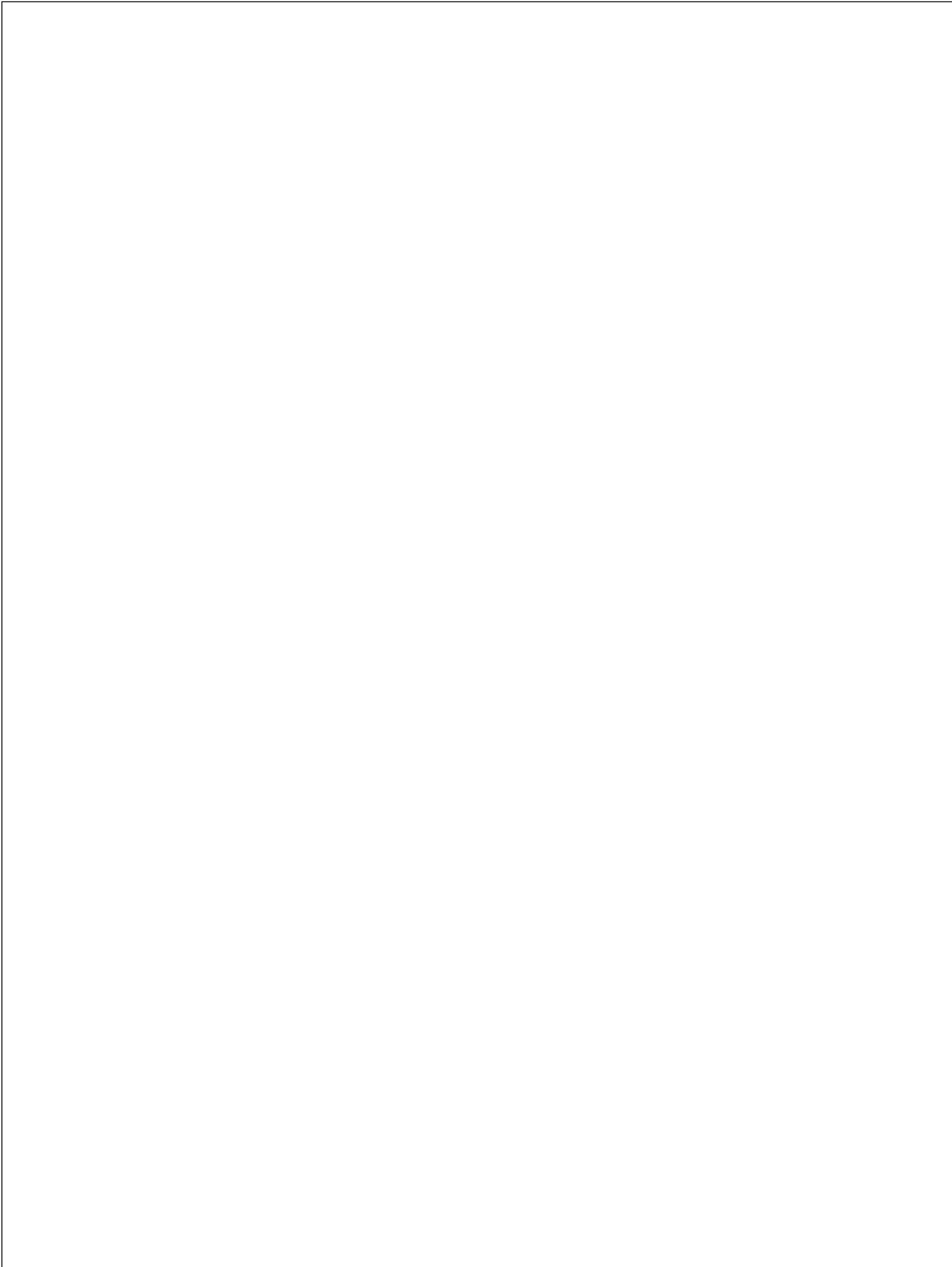


Figure 2-2 Heater Dimensions XL900

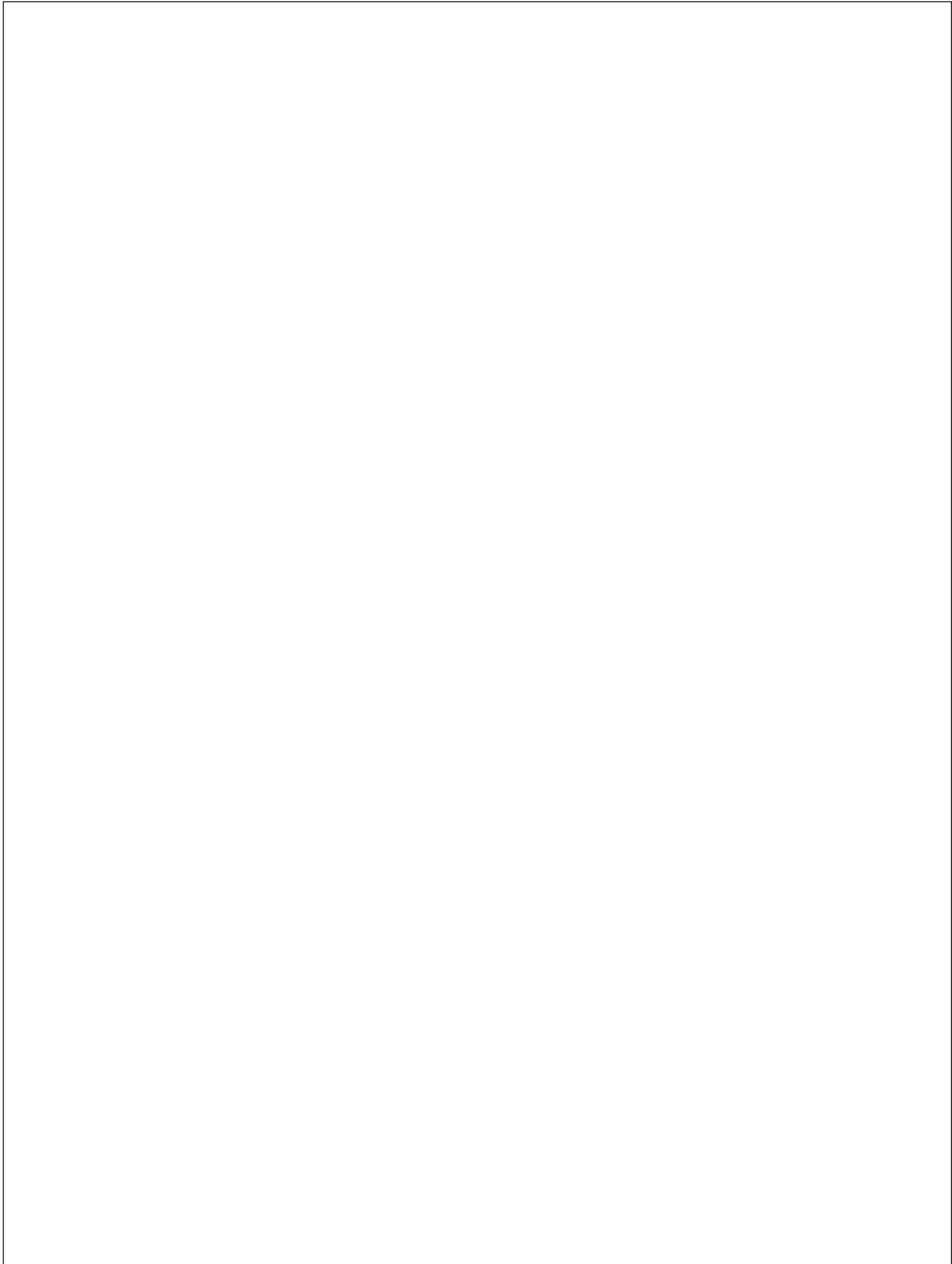


Figure 2-3 Heater Dimensions XL1500

3.0 INSTALLATION

There are seven major steps that must be completed to successfully install the PROHEAT heater.

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2. MOUNTING THE HEATER3-4 to 3-5
3. EXHAUST PIPE CONNECTION.....3-6
4. PLUMBING THE SYSTEM.....3-7 to 3-9
5. WIRING & ELECTRICAL CONNECTIONS3-13 to 3-20
6. FUEL SYSTEM3-21 to 3-24
7. FIRST TIME START UP.....3-25 to 3-26

NOTE: The installation details described in this manual may not cover all of the application possibilities. In these cases this manual should be used as a guideline only. If additional installation information is required please contact your PROHEAT Dealer regarding your specific application.

Prior to the installation of your PROHEAT, consult your engine owner's manual or engine manufacturer for any restrictions that may apply to plumbing into the engine coolant system.

Locating the Heater

Select Your Location

The most suitable location for mounting the heater will vary depending on the type of vehicle. Recommended mounting locations are:

You Choose 

- Behind the cab across the frame rails (1).
- On either side of the frame rails (2).
- In an existing enclosure on the vehicle (step or toolbox) (3).

Caution

Do not weld PROHEAT heater mounting brackets to the vehicle frame.

If repairs to the vehicle require welding, disconnect the Proheat power cable at the PCM. This will prevent damage to the Proheat electronics.

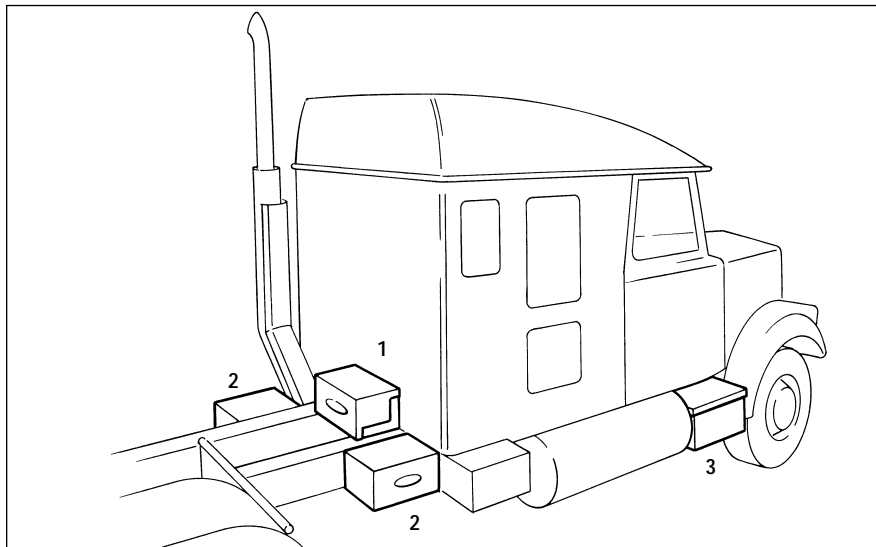


Figure 3-1 Recommended Mounting Positions

GENERAL CONSIDERATIONS

- Never mount the heater to two separate parts of the vehicle.
- Avoid mounting the heater to fenders or areas of excessive vibration.
- Do not mount the heater directly to the engine.

WARNING

Never locate the heater inside the vehicle cab. (See Figure 3-2)

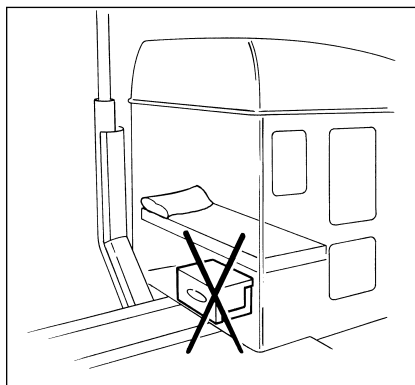


Figure 3-2

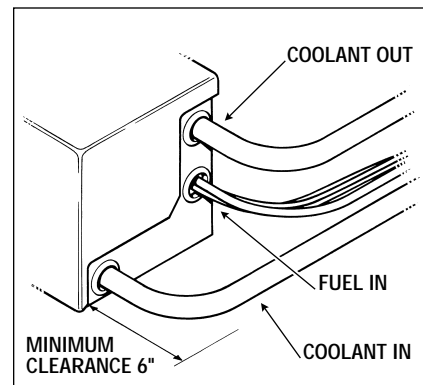


Figure 3-3 Allow minimum 6" clearance for hose connections.

Heater must be mounted below the highest point in the cooling system.

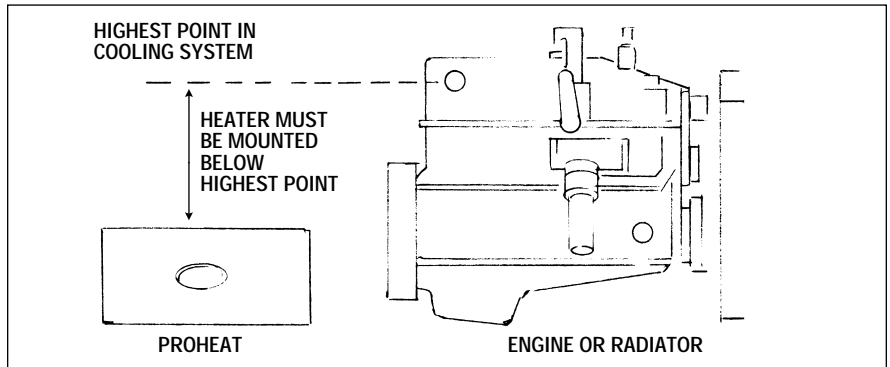
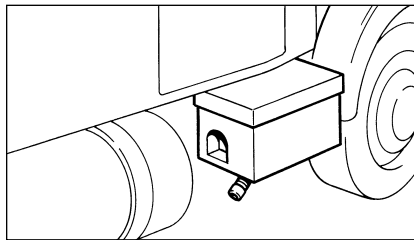


Figure 3-4 Height Requirement

Mounting the PROHEAT heater in an enclosure



Do not locate the heater in an airtight enclosure. If the heater is to be mounted in an enclosure other than the PROHEAT enclosure, adequate air flow must be provided to ensure proper combustion.

Figure 3-5. Adequate Air Flow

Heater must be mounted within 5° of horizontal, as shown.

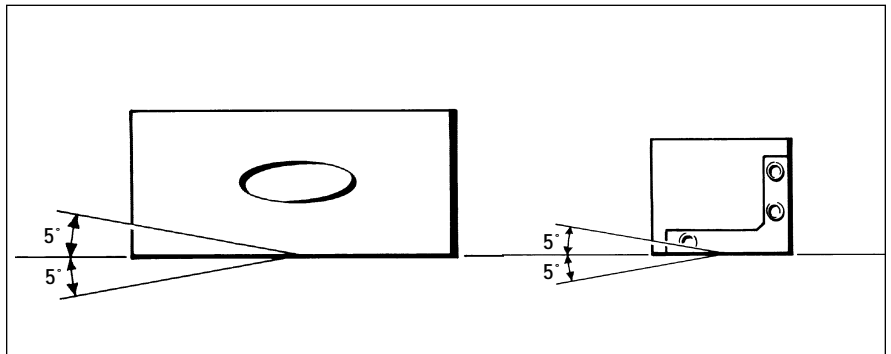


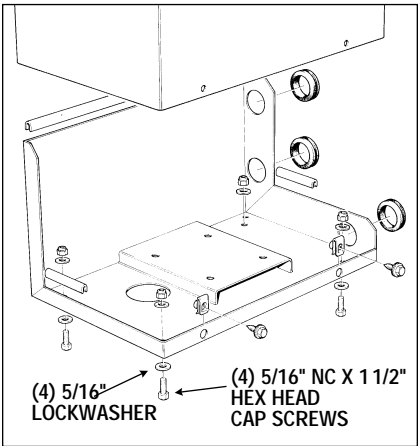
Figure 3-6 Mounting Angle

Mounting the Heater

Select Your Mounting Option

OPTION A:

Heater supplied with an enclosure.



1. Remove the enclosure cover.
2. Drill the (4) mounting holes and exhaust pipe clearance hole.
3. Using the bolts supplied fasten the enclosure to the mounting tray or brackets.
4. **Ensure that the combustion tube can be removed for service. Minimum of 5 1/2" from fan end casting face is required.**

NOTE: Use anti-seize compound on the fasteners to prevent galling and corrosion.

Figure 3-7 Mounting Tray

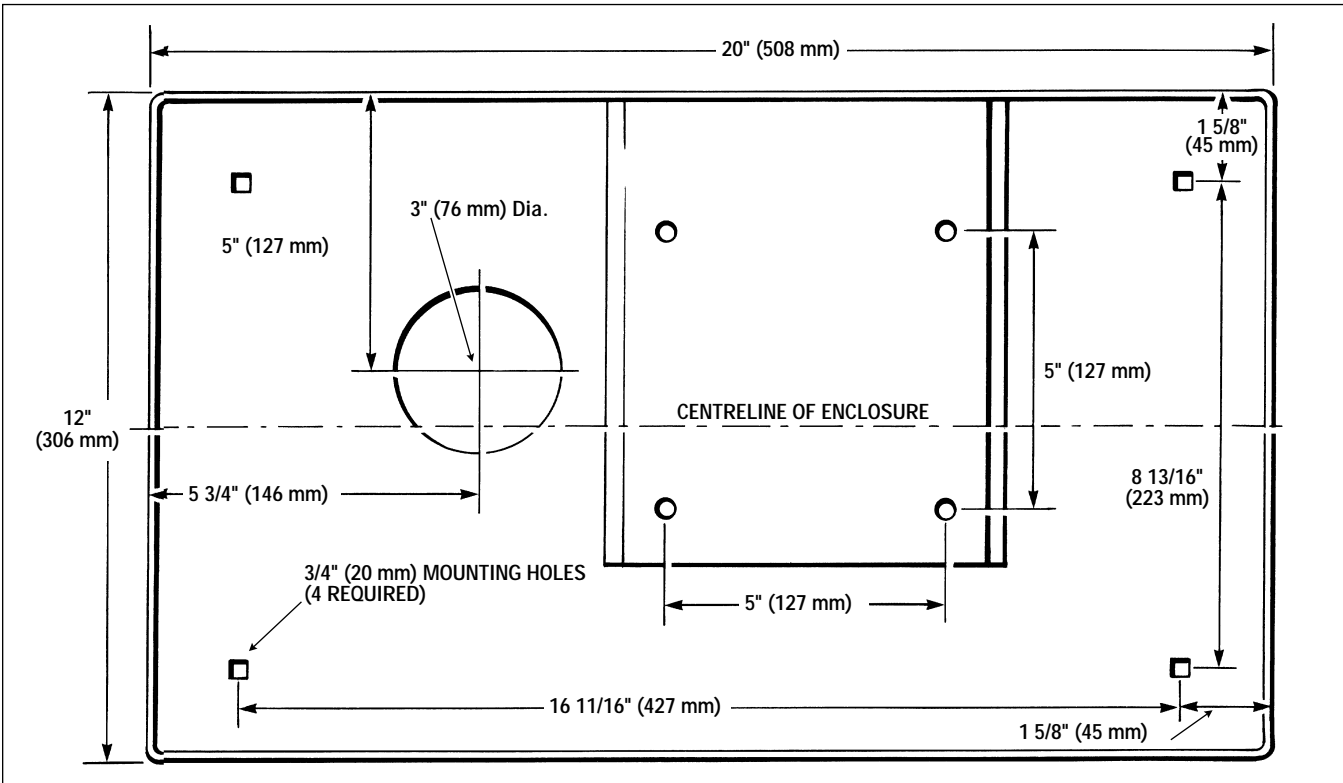


Figure 3-8 XL900 Enclosure Base Dimensions

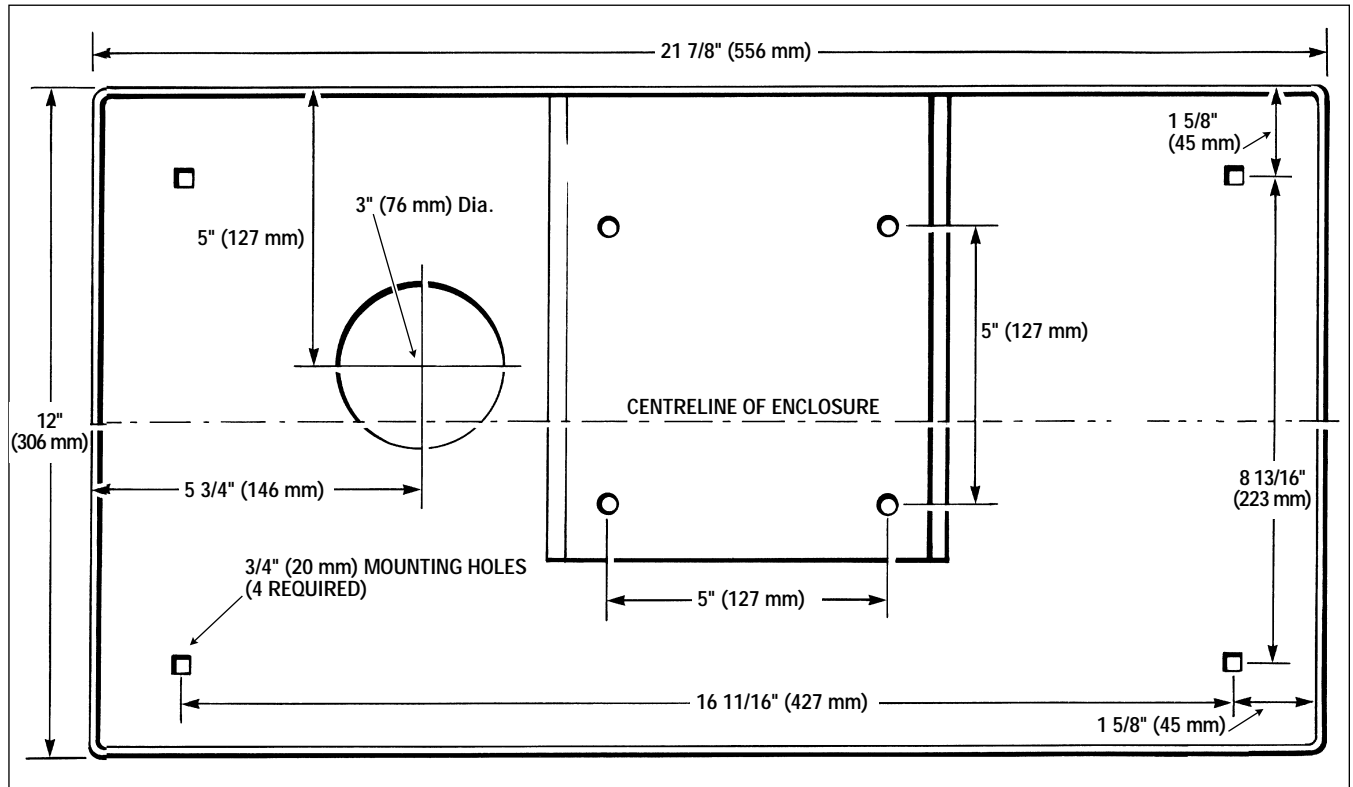


Figure 3-9 XL1500 Enclosure Base Dimensions

OPTION B:

Heater supplied without an enclosure (mount in an existing enclosure on the vehicle ie. tool box). Heater supplied with an auxiliary mounting plate.

1. Ensure that the proposed enclosure is big enough for the heater.
12 1/2"W x 11H x 20 1/2"L inches (318 x 280 x 521 mm)
2. Using the indicated dimensions, drill the (4) mounting holes and exhaust pipe clearance hole.
3. Ensure that the combustion tube can be removed for service.
Minimum of 5 1/2" from fan end casting face is required.

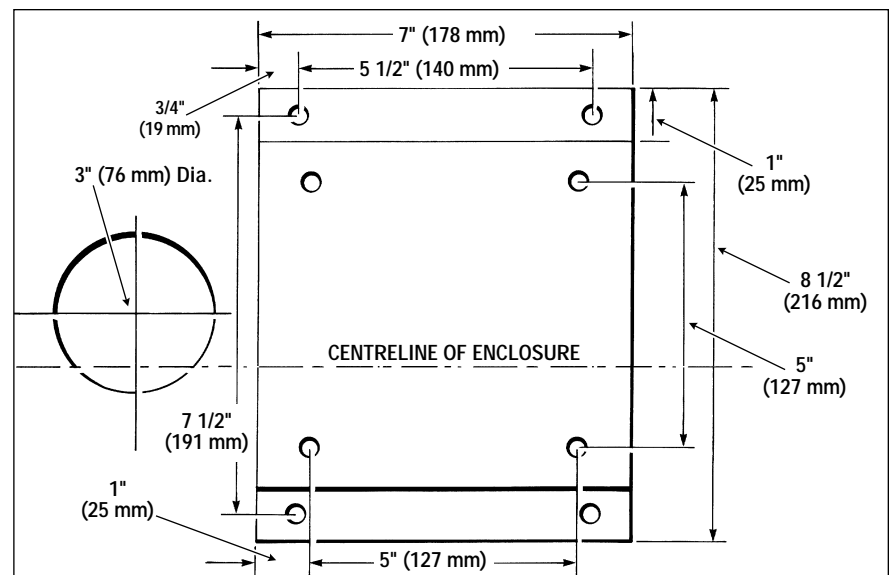


Figure 3-9 XL900 & XL1500 Base Mounting Plate Dimensions

Exhaust Pipe Connection

1. Push the exhaust pipe through the hole in the enclosure and onto the exhaust outlet port of the heater. Ensure that the pipe is pushed onto the spigot at least 1½" (38 mm).
2. Route the exhaust pipe such that:
 - a) It does not rest against or be directed toward any parts of the vehicle that may be damaged by heat (i.e. brake lines, seals, wires, rubber hoses)
 - b) Debris and snow will not plug the outlet.
 - c) Moisture from combustion will drain out of the pipe.
 - d) It does not face forward.
3. Disassemble the exhaust pipe clamp and apply anti-seize compound to the threads.
4. Assemble the exhaust clamp over the exhaust pipe (clamp goes inside the enclosure) and tighten the nuts.

WARNING

Exhaust gases must not enter the vehicle interior. Direct exhaust pipe away from vehicle

NOTE: 1½" exhaust pipe should not exceed 5 ft. and have no more than 180 degrees of bends. The bends must be formed for best results. Do not use 90 degree welded pipe to turn corners.

NOTE: For installations requiring special exhaust systems, consult your PROHEAT Dealer.

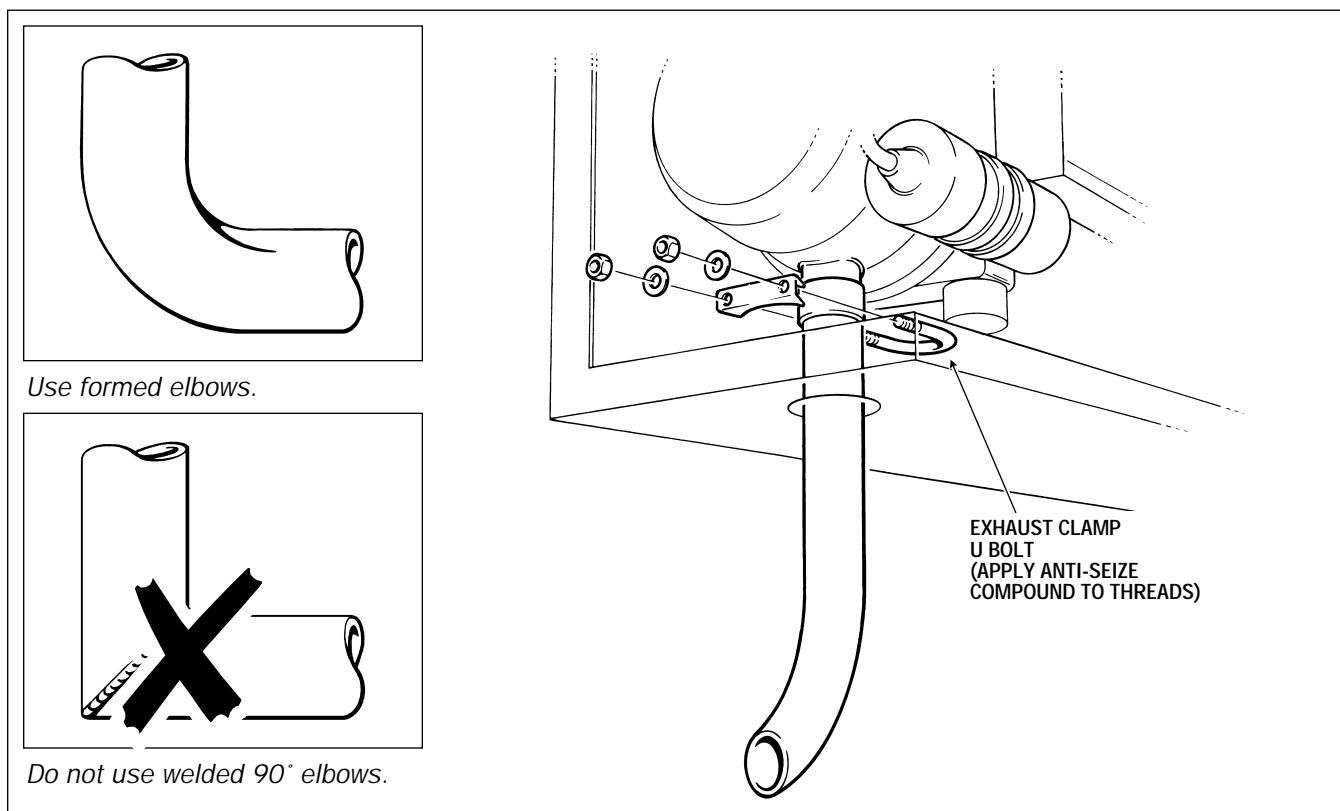


Figure 3-10 Exhaust Pipe

Plumbing the System

GENERAL CONSIDERATIONS

Coolant flow must be maintained, throughout the coolant system, under all conditions.

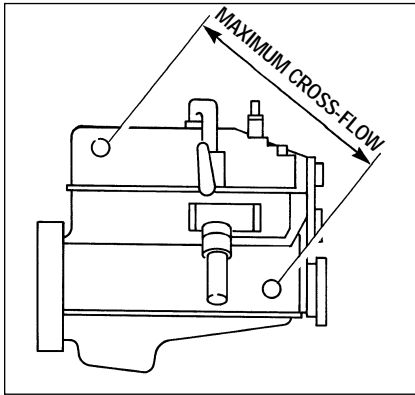


Figure 3-11 Maximize Cross-flow

- Keep the engine inlet and outlet ports as far apart as possible to maximize cross-flow through engine.
- Ensure that no sharp kinks or bends exist in the hoses which may restrict coolant flow.
- Avoid high points in the hose routing to prevent air traps.
- For systems requiring more than 50 feet of coolant line, consult factory for coolant pump recommendations.

For plumbing the system use:

$\frac{1}{2}$ " NPT pipe fittings or bigger

$\frac{3}{4}$ " ID heater hose meeting SAE 30R7 specifications.

NOTE: Use of silicone hose requires special hose clamps.

Shut-off valves are not required at the engine inlet and outlet connections but may be used if desired. They should be left open at all times so that the heater may be operated periodically throughout the year.

You Choose 

Select Your Plumbing Option

OPTION A: Engine heat or supplemental heat.

The PROHEAT heats the engine block only.

NOTE: When the engine block is preheated you will have nearly instant heat from the dash heat exchanger.

OPTION B: Engine and sleeper heat.

The PROHEAT heats the engine block and the sleeper.

NOTE: Plumbing the PROHEAT through the dash fan is not recommended.

WARNING

Allow the engine to cool down prior to opening the radiator cap. Opening the radiator cap when the engine is hot may cause serious injury.

Instructions for Options A and B

1. Remove the radiator cap to release the system pressure.
2. Drain the coolant system.
3. Plumb the system as per *Figure 3-12* (engine or supplemental heat) or *Figure 3-14* (engine or sleeper heat)
4. Add engine coolant to the system as per the specific engine manufacturer's recommendations and re-install the radiator cap.

NOTE: Plumbing the PROHEAT through the dash fan is not recommended.

OPTION A: Engine Heat or Supplemental Heat

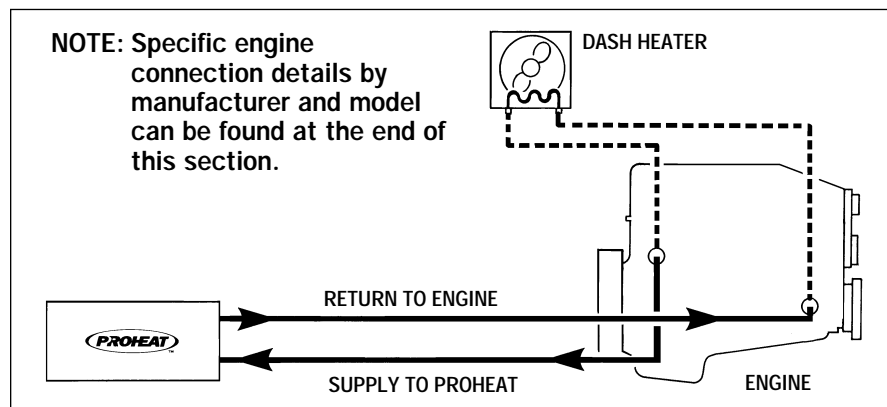


Figure 3-12 Engine Heat or Supplemental Heat

NOTE: On coolant systems where the return from the Proheat is plumbed to the bottom of the main coolant supply line from the radiator to engine pump, the return line must be moved to avoid loss of heat through the radiator.

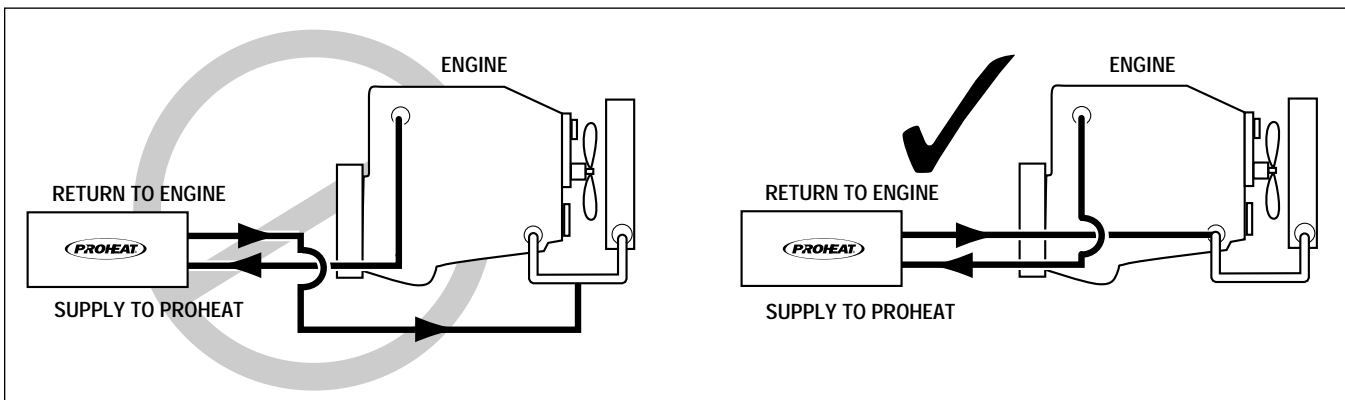


Figure 3-13 Correct Return Line Plumbing

OPTION B: Engine and Sleeper

For best results these vehicles should use an auxiliary heater. See Service Bulletin #951321 for details.

International with single heater

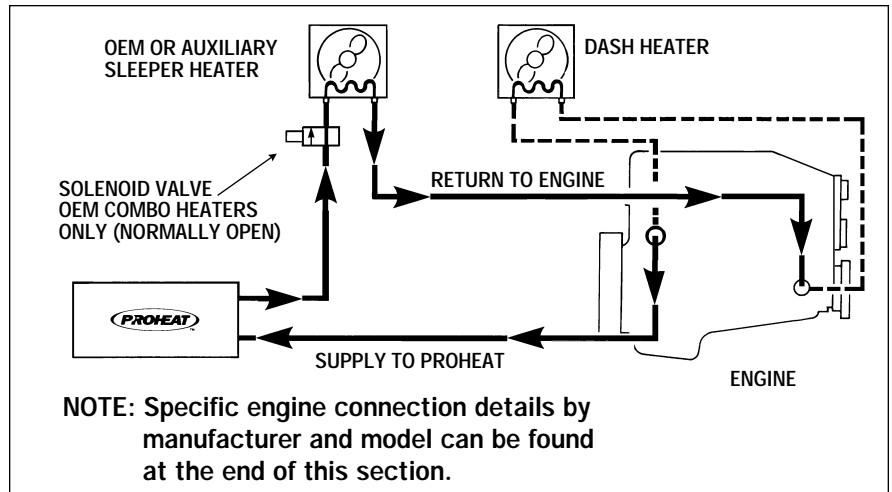


Figure 3-14 Engine and Sleeper Heat

NOTE: Vehicles equipped with a combination heater/air-conditioner, the heater unit will have a solenoid operated shut-off valve. Typically this valve is normally open with the truck engine turned off and the key removed. (See Figure 3-15 for plumbing)

Due to the many options available in vehicle heating and air conditioning systems, the installer should be looking for any restrictions that may affect coolant flow, with vehicle ignition in the "OFF" position.

For vehicles with solenoid valves in the normally closed position.

Western Star

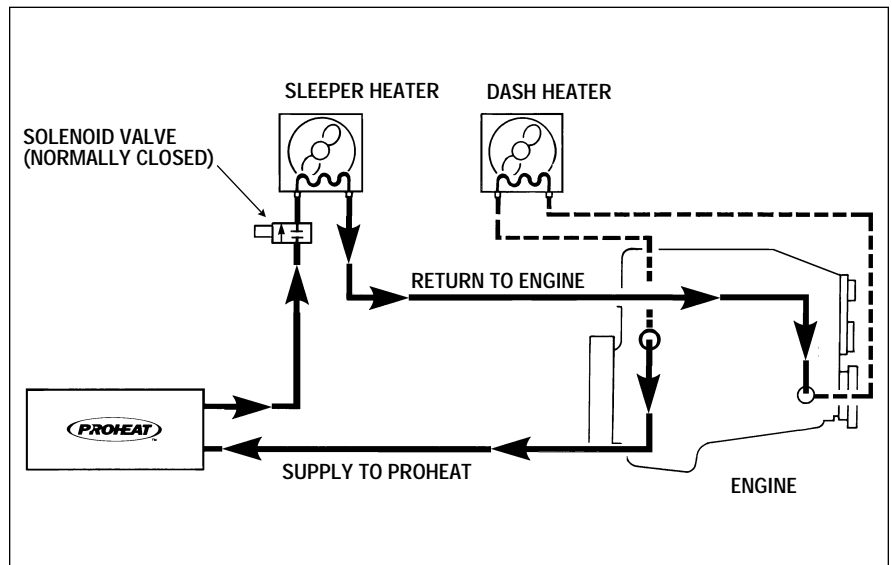


Figure 3-15

Engine Connection Details

CATERPILLAR

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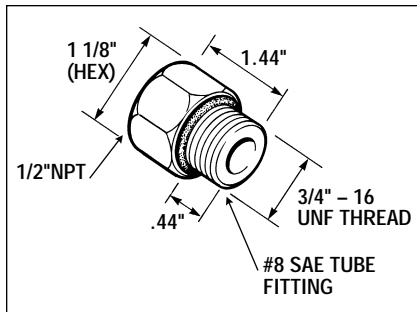
DETROIT DIESEL

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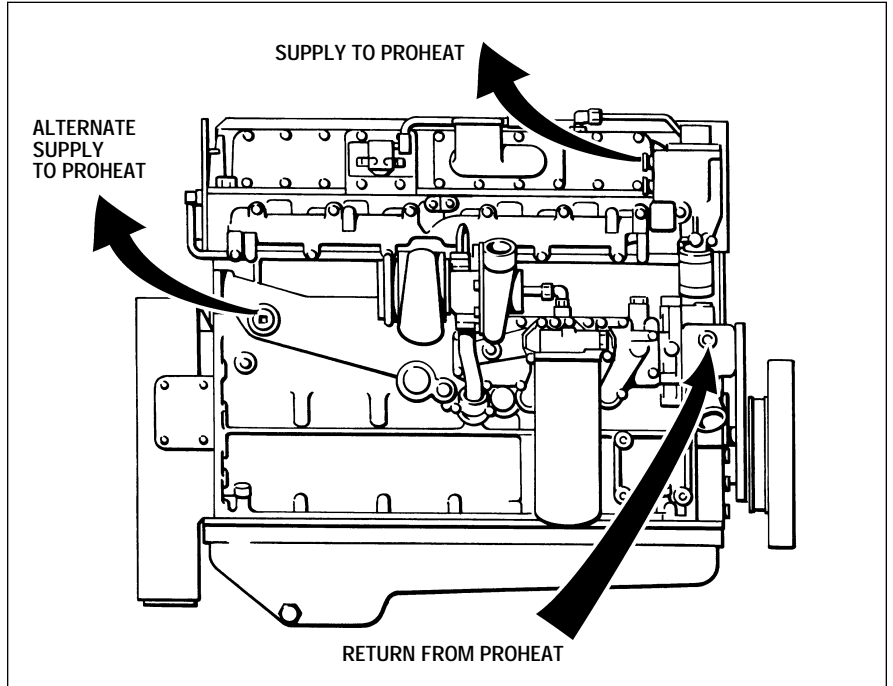
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E6 + E7.....	3-ix
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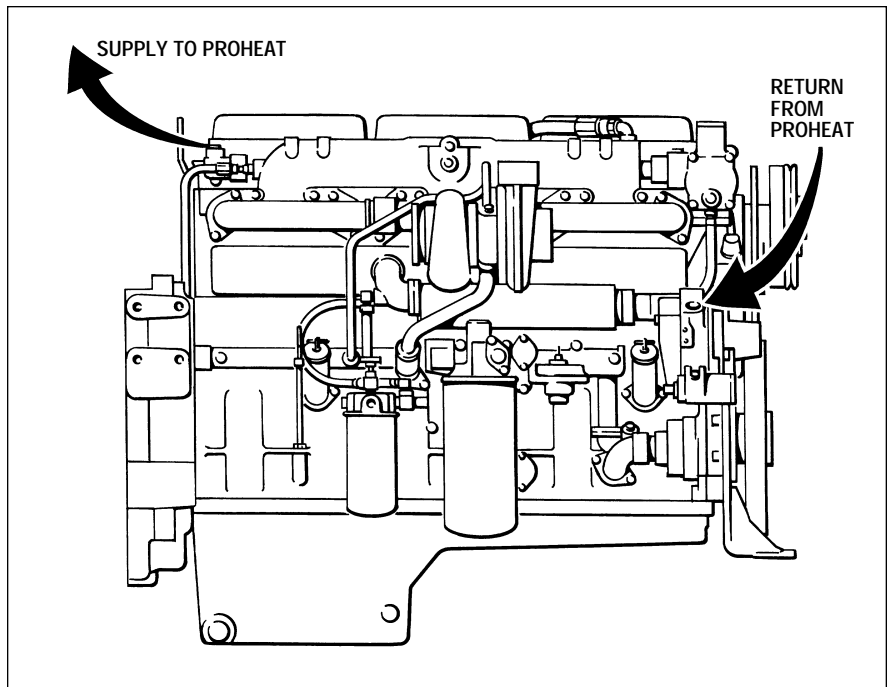
CATERPILLAR



NOTE: The Caterpillar #3116 requires this fitting to connect the PROHEAT supply and return lines to the engine ports.

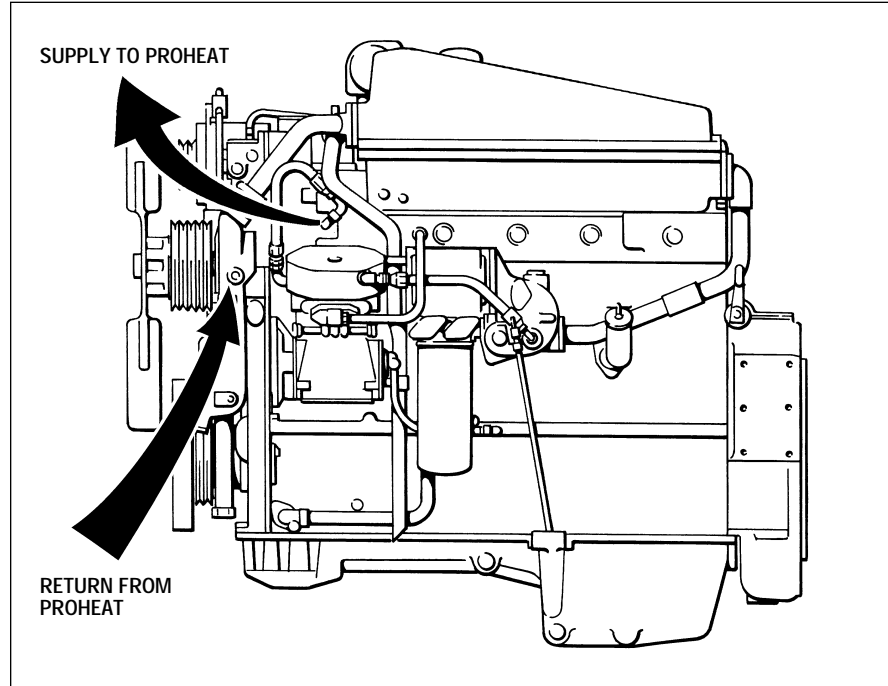


Caterpillar #3116

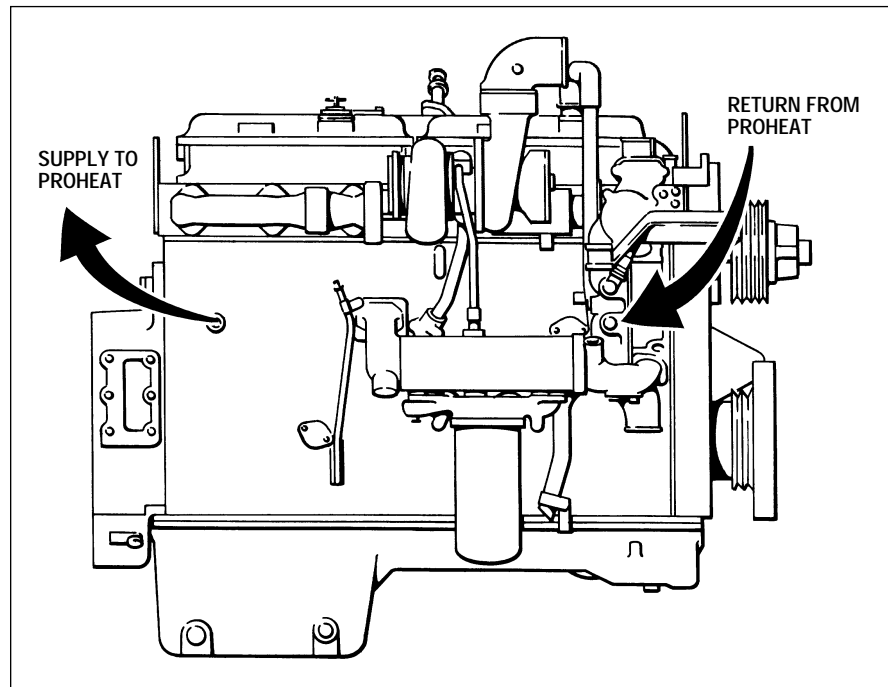


Caterpillar #3176

CATERPILLAR

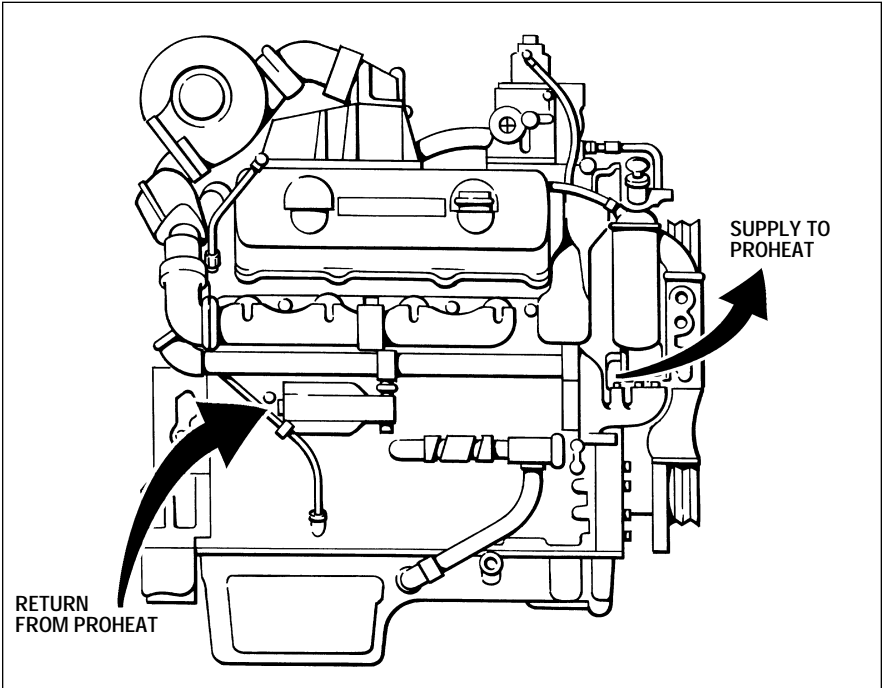


Caterpillar #3306



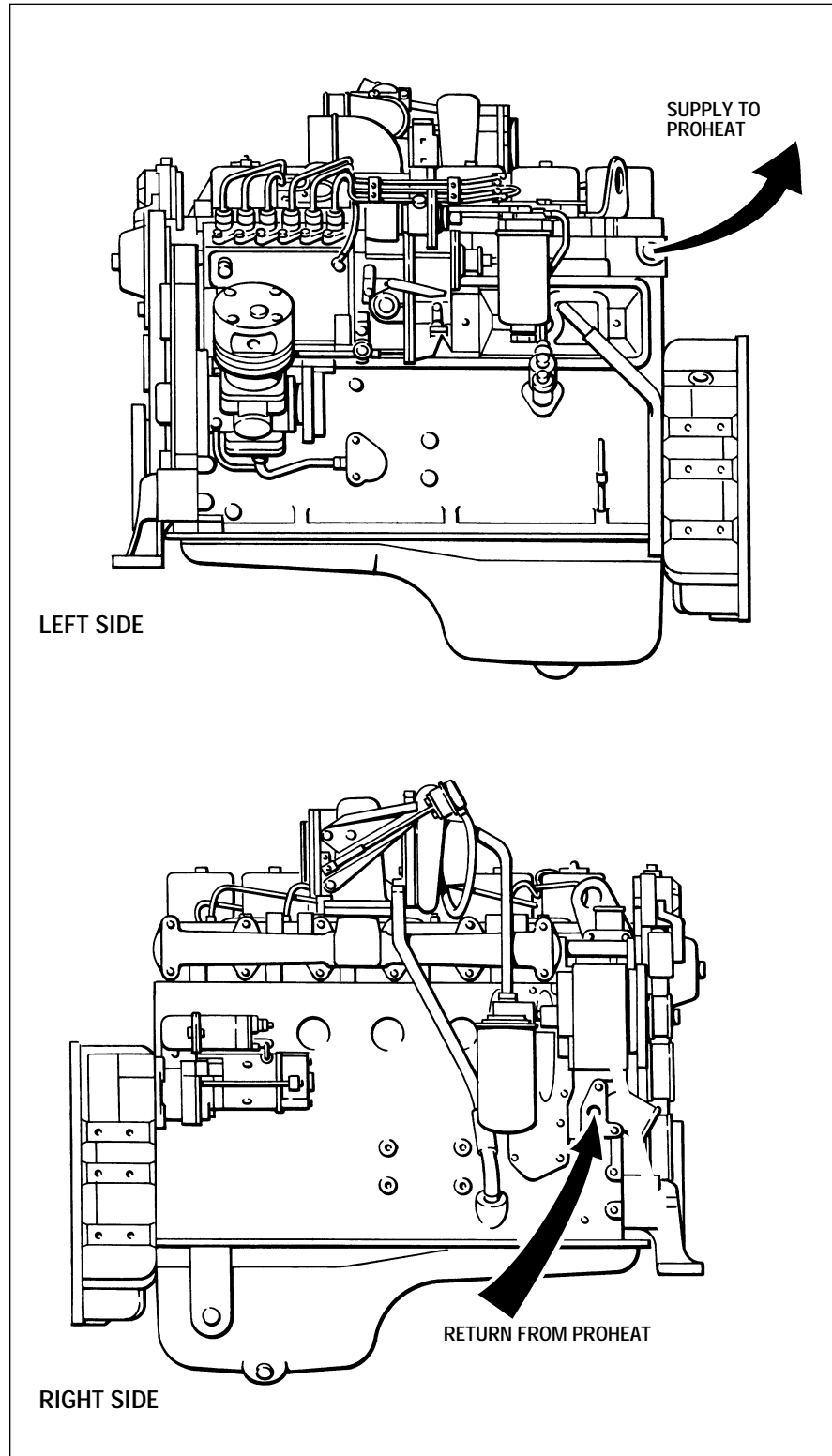
Caterpillar #3406

CATERPILLAR



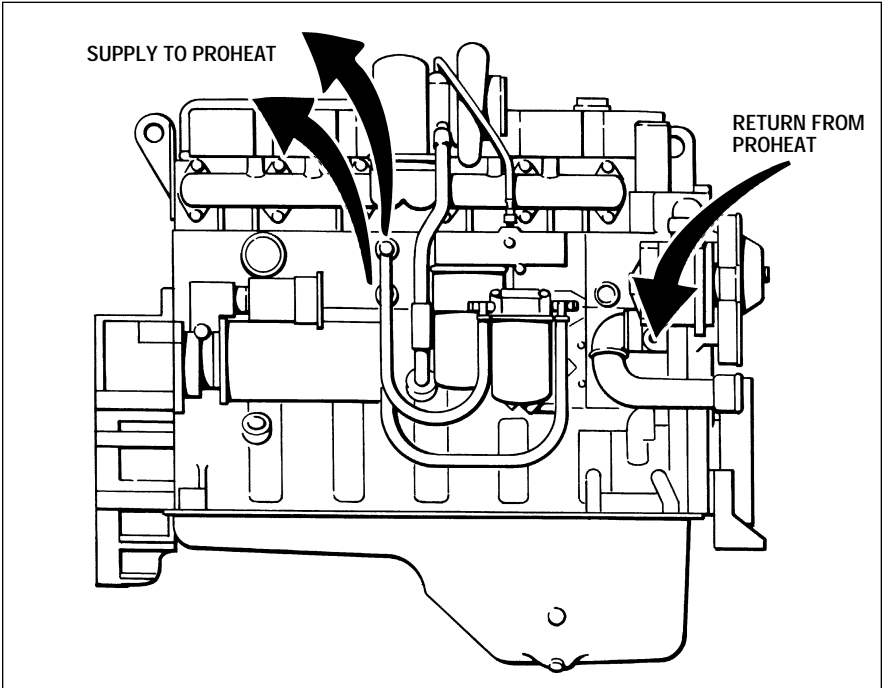
Caterpillar #3408

CUMMINS

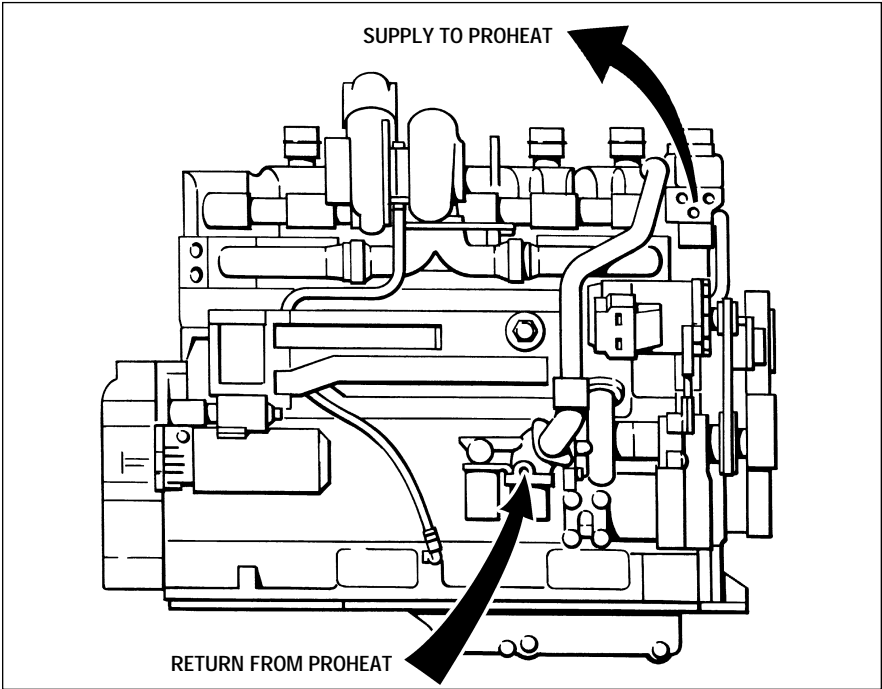


Cummins #B SERIES

CUMMINS

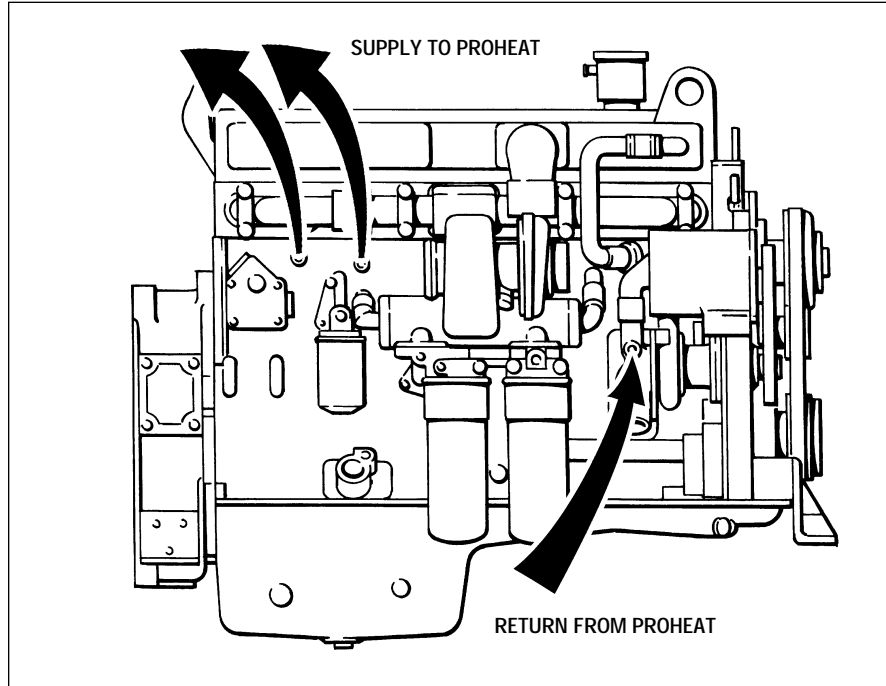


Cummins #C SERIES

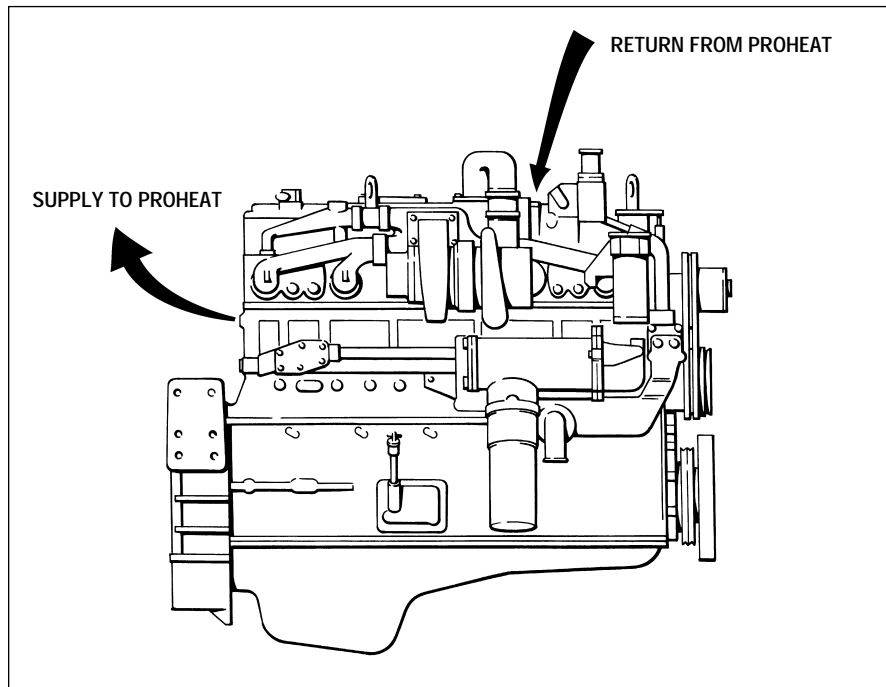


Cummins #KTA1150

CUMMINS

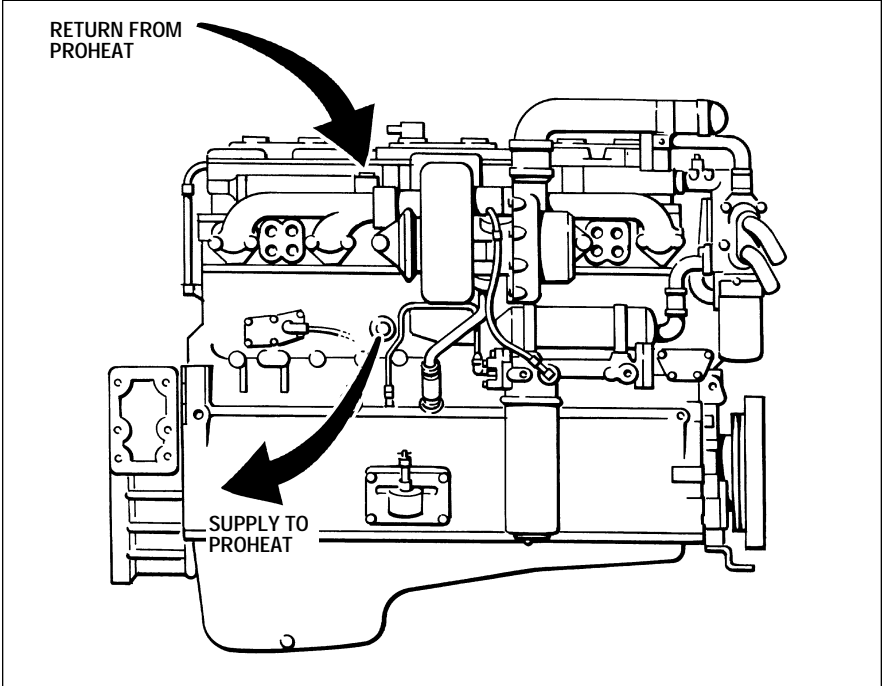


Cummins #L10



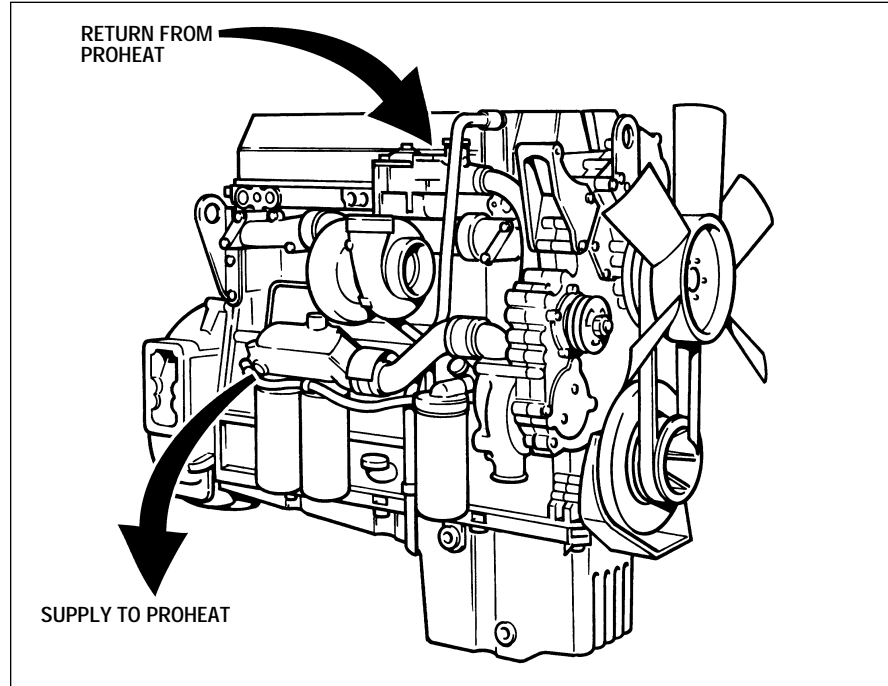
Cummins #NT, BIG CAM II

CUMMINS

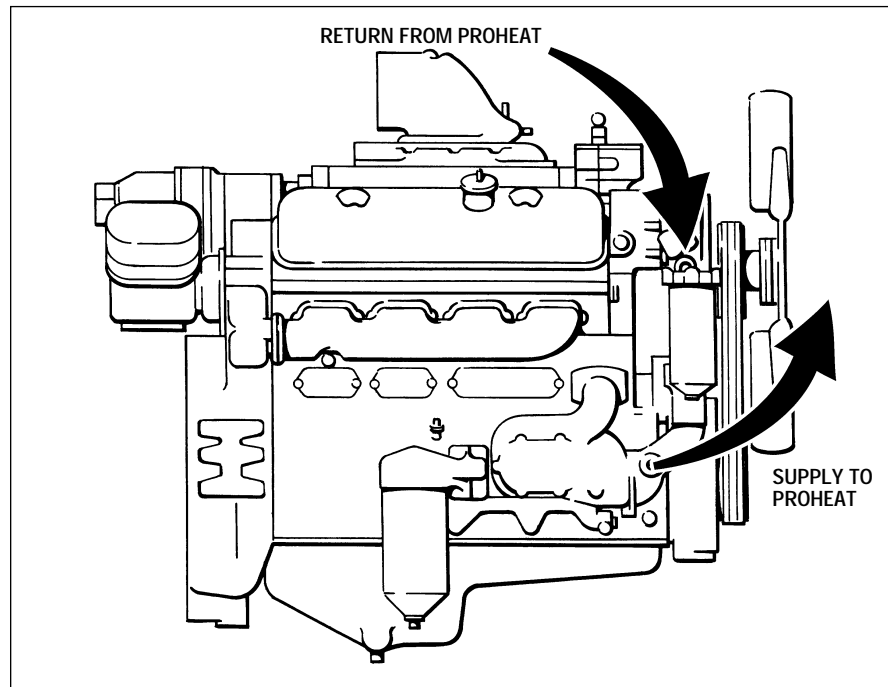


Cummins #NT, BIG CAM IV, N14

DETROIT DIESEL

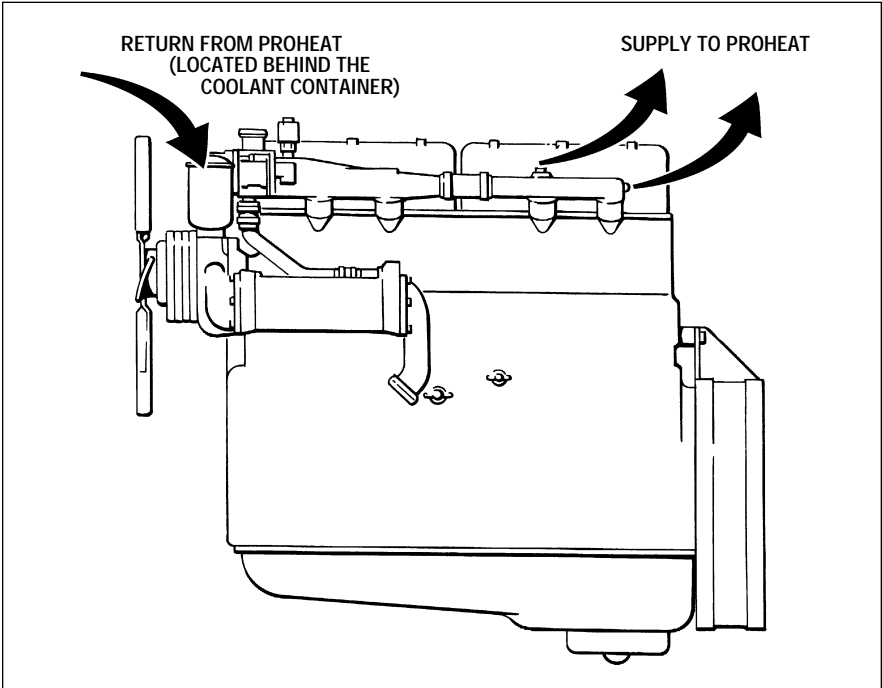


Detroit Diesel SERIES 60



Detroit Diesel #6V92, 8V92

MACK



Mack #E6 & #E7

NOTE: It will be necessary to move the supply line for Proheat toward the back of the engine on the coolant manifold to ensure full engine heating.

Wiring & Electrical Connections

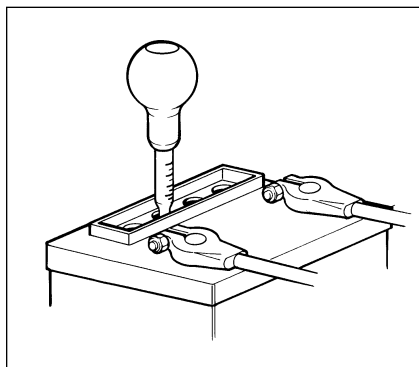


Figure 3-16 Test Battery

WARNING

Do not use on positive ground vehicles.

Caution

If repairs to the vehicle require welding, disconnect the Proheat power cable at the PCM. This will prevent damage to the Proheat electronics.

Caution

Vehicles using ground side battery disconnect switches must install an in-line 10 amp fuse on the internal harness Teleflex part #PK 0310. This will prevent damage to the harness and PCM, refer to service bulletin SB 0003.

GENERAL CONSIDERATIONS

- Prior to installation of the PROHEAT Heater system, ensure that the vehicle batteries are in good condition. The system will not provide satisfactory performance with weak batteries.
- Do not kink or abrade wires when routing them through the vehicle during installation.
- Ensure wires are well supported and secured with tie-wraps.
- Do not use acid core solder when making solder connections.

Major Electrical Connections Required

- a) Power connection to batteries.....page 3-14
- b) Timer Connection.....page 3-15
- c) Sleeper heater connections (optional).....page 3-17 to 3-19

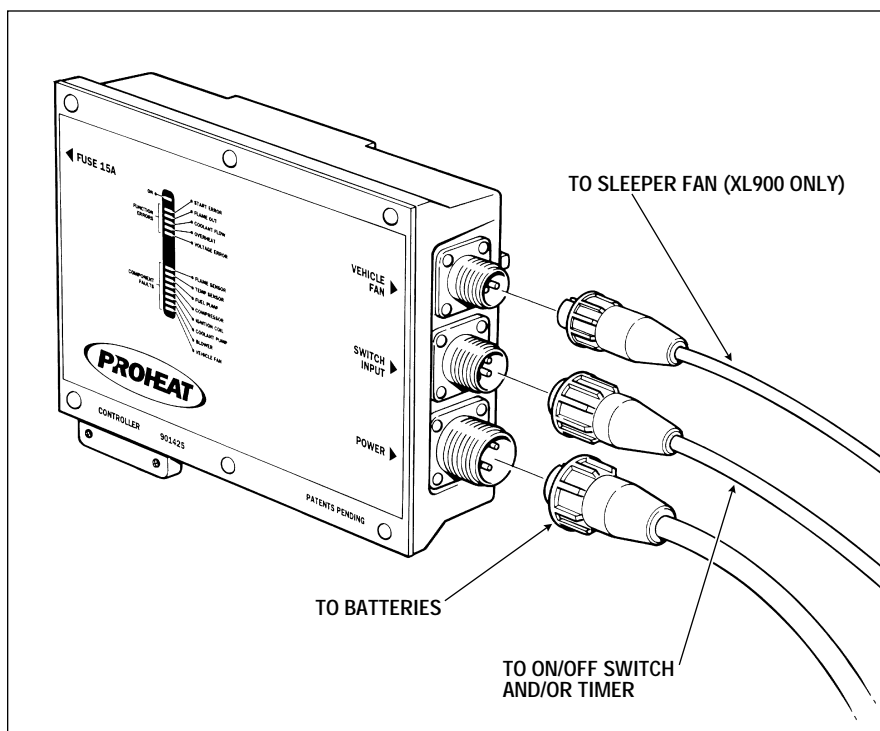


Figure 3-17 Major Electrical Connections

Caution

PROHEAT 12 volt systems should **not** use power split from a 24 volt system. This will cause uneven charging of the batteries.

Power Connection to Batteries

1. Route wire harness from PCM to the battery. Cut the harness to length as required.
2. Strip outer wire jacket of harness back to expose the positive (red) and negative (black) leads. Strip the leads as shown and crimp the ring tongue terminals supplied to the wires. Connect the leads to the battery terminals. (See Figure 3-17)
3. Leave power harness disconnected. (See Figure 3-17)
Do not install until coolant pump system has been purged of air. (See *First Time Start-up*, page 3-25)

NOTE: If power is connected to the PCM with the fuse in place, the light on the PCM function display panel will light for 1 second and then go out. This is normal.

NOTE: Ensure the battery terminals are clean and free of corrosion. If they are not, remove and clean them. Prior to re-attachment grease them with electrically conductive grease.

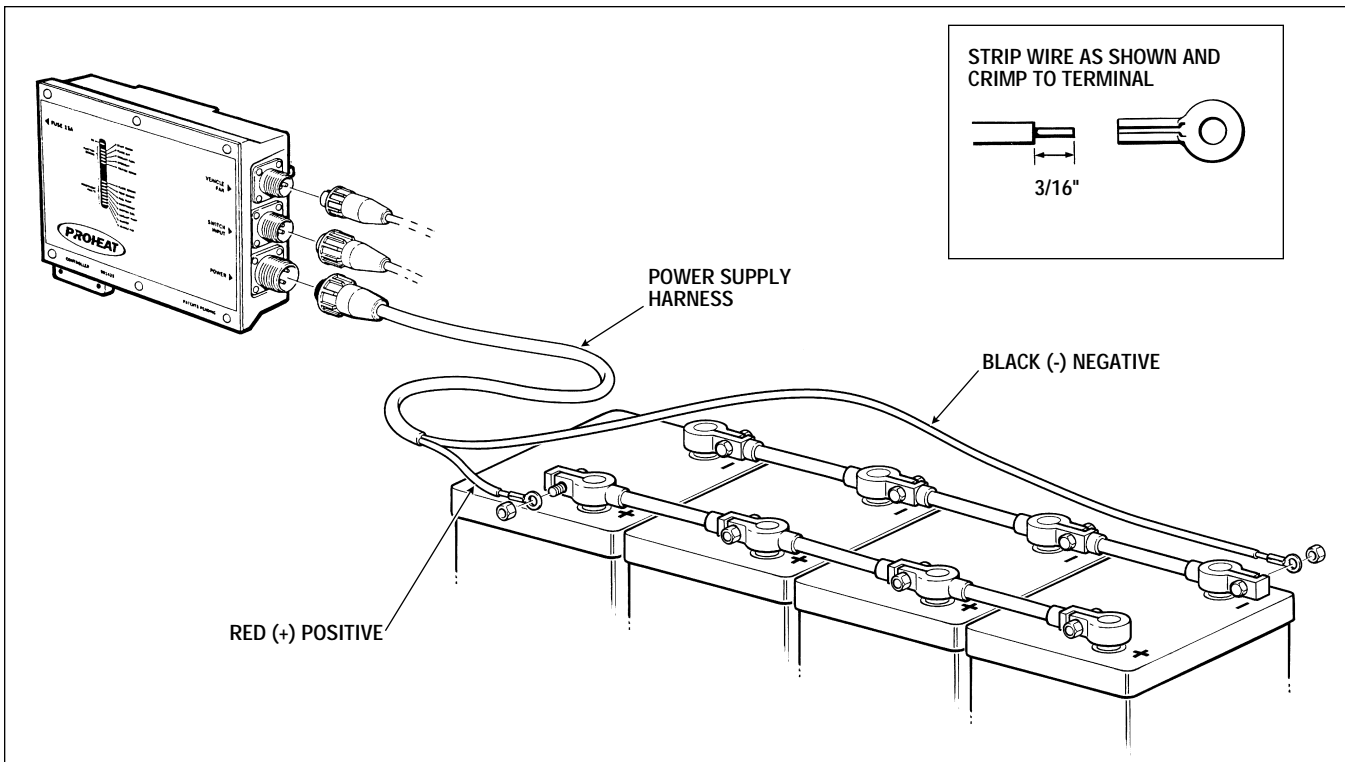


Figure 3-18 Power Connection to Battery

Timer Connections

Caution

The switch input circuit should only be used to supply power to the ON/OFF switch and the TIMER, or as a signal to trip a relay. Failure to follow this installation practice will result in damage to the PCM.

NOTE:

The PCM must be reset (power disconnected and reconnected) when changing from a timer to a switch or from a switch to a timer.

Connecting a switch and a timer in the same circuit will cause the indicator light to flash incorrectly.

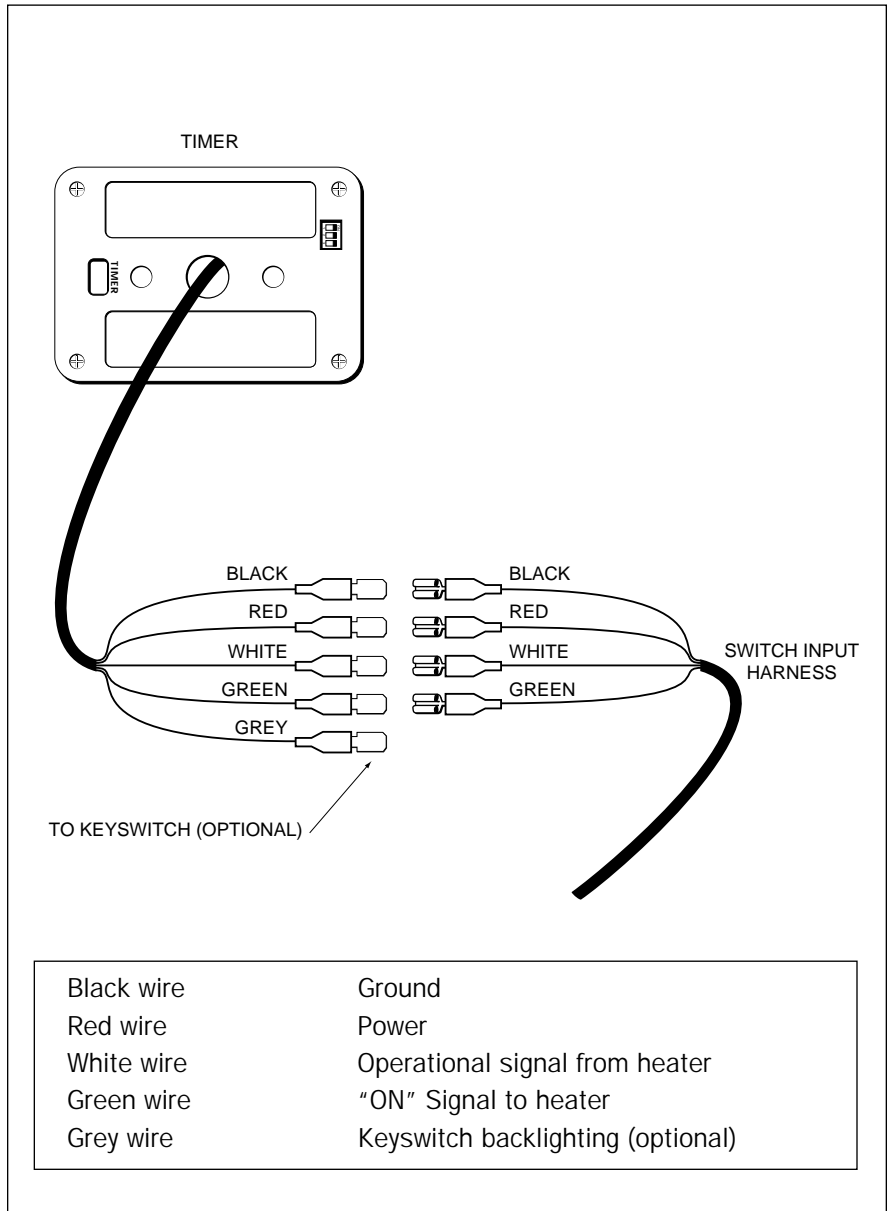


Figure 3-19 Timer Connections

Caution

The switch input circuit should only be used to supply power to the ON/OFF switch and the TIMER, or as a signal to trip a relay. Failure to follow this installation practice will result in damage to the PCM.

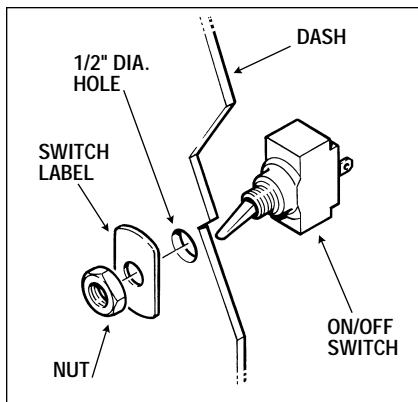


Figure 3-20 ON/OFF Switch Assembly

ON/OFF Switch Connections

1. Select a suitable location in the vehicle dash for the ON/OFF switch.

NOTE: Many dash panels have switches which are not utilized. It may be convenient to remove one and replace it with the PROHEAT switch.

2. Drill a 1/2" diameter hole through the dash for the switch. Make sure you have clearance behind the dash for the switch wires and connections. Install the switch as per the diagram. (See Figure 3-20)

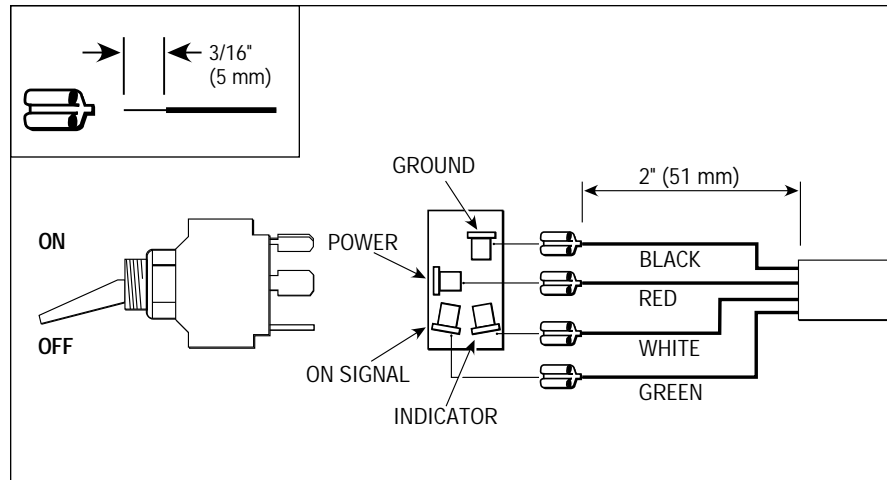


Figure 3-21 ON/OFF Switch Connections

3. Route the switch wire harness from the PCM to the dash panel. You will have to pass the wire harness through the vehicle firewall. If possible use an existing hole. If not you will have to make one. Use a grommet to prevent the wire from being damaged when it is passed through the hole.
4. Cut the harness to length.
5. Strip outer wire jacket of harness back to expose the 4 wires. Strip the wires as shown and crimp the supplied 1/4" spade terminals.
6. Connect the terminals to the switch as shown. (See Figure 3-21)

NOTE: The PCM must be reset (power disconnected and reconnected) when changing from a timer to a switch or from a switch to a timer.

Connecting a switch and a timer in the same circuit will cause the indicator light to flash incorrectly.

Sleeper Heater Wiring Details

These installation options allow the operator to:

- 1 Run the Proheat with the ignition key in the OFF position.
- 2 Return full control to the OEM system in normal operation mode.

You Choose 

Select One of the Following Wiring Options

OPTION A: Limits the power provided to the sleeper fan motor to 3 AMPS. With this system the total electrical draw is controlled by Proheat.

Note: For larger systems in the latest model trucks this may not provide enough fan speed and therefore Option B, C or D should be used.

OPTION B: Used in larger sleepers requiring greater fan speed to provide sufficient air movement to the sleeper. This allows the driver to select the fan speed.

OPTION C: Used when a dedicated auxiliary heater is required.

OPTION D: **Wiring schematics of specific trucks may be available in service bulletins. Contact your dealer or Proheat Technical Department for information.**

Used when climate control systems in sleepers require one or more of the following features to be controlled.

- 1 Higher fan speed for greater air movement.
- 2 A separate thermostat is required to turn the sleeper fan motor ON and OFF because the OEM system uses a constantly running fan.
- 3 A valve in the sleeper heater coolant line regulates the flow and must be fully opened when the Proheat is running.
- 4 Prevent possible backfeeding on ground side switched systems.

NOTE: TELEFLEX IS NOT RESPONSIBLE FOR CHANGES IN SLEEPER FAN SYSTEMS BY ORIGINAL EQUIPMENT MANUFACTURING COMPANIES.

OPTION A:

1. Make sure the vehicle ignition is switched **OFF**.
2. Mount the isolator in the sleeper fan motor area to a solid surface with the screw provided. Cut OEM wire to sleeper fan motor and connect isolator in series. Connect using 1/4 inch spade connectors provided. (See Figure 3-23) Wire end from resistor pack connected to isolator terminal marked "ignition". Wire end from sleeper fan motor connected to isolator terminal marked "fan".
3. Locate Proheat thermostat in central area of sleeper, approximately 12" above the bunk. Avoid direct air flow from sleeper fan ducts. (See Figure 3-22)
4. Remove the adjusting knob and face cover. Mark and drill mounting holes. Mount thermostat using the screws provided. (See Figure 3-24)
5. Route sleeper fan harness from PCM to Proheat thermostat. Cut to length. Connect white wire to terminal 1 of the thermostat. Use fork terminal provided. Black wire not used.
6. Route a wire from terminal 2 of the thermostat to the isolator terminal marked "Heater". Connect using fork and spade terminal provided. (Can be cut from left over wire harness.)

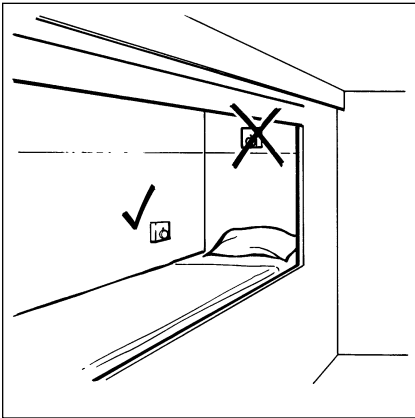


Figure 3-22 Thermostat Location

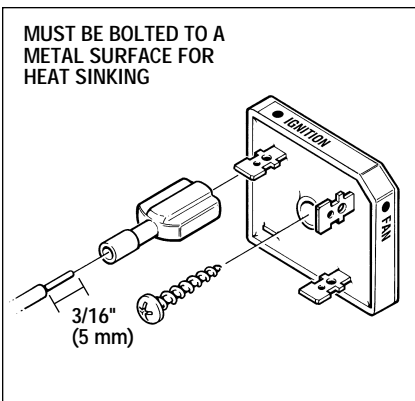


Figure 3-23 Isolator Detail

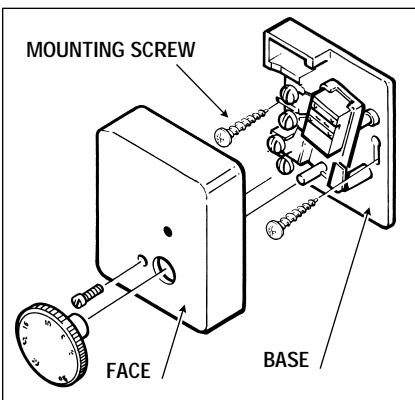


Figure 3-24 Thermostat Installation

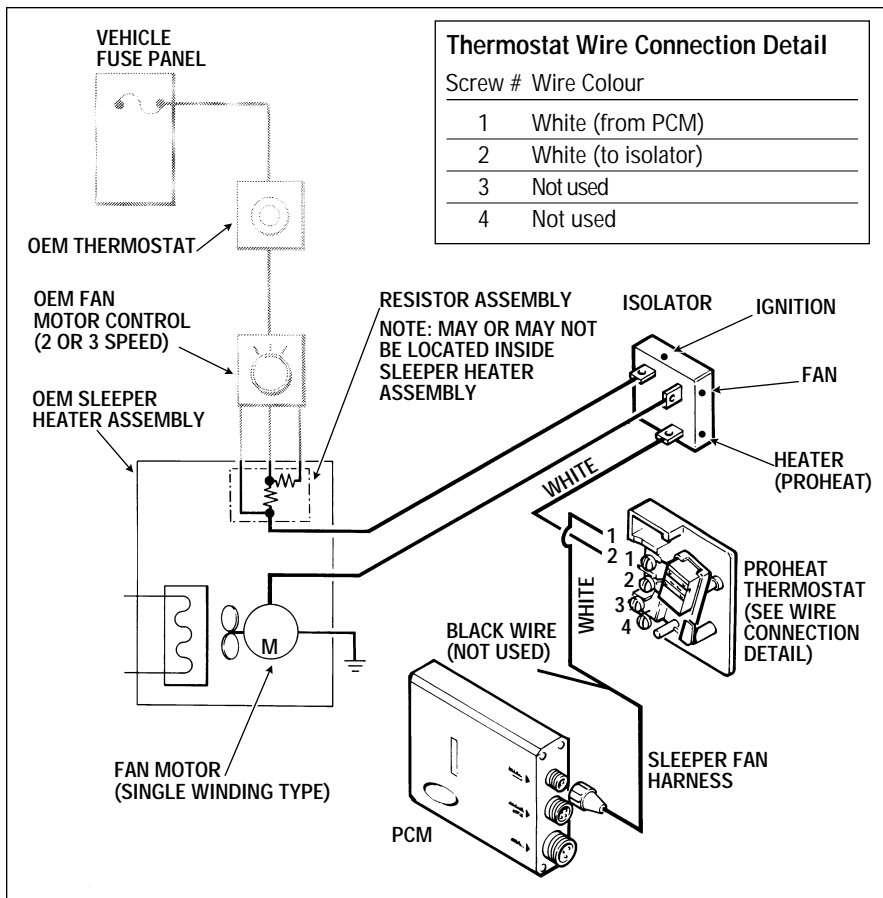


Figure 3-25 Sleeper Heater Wiring Detail (Option A)

OPTION B:

1. Make sure the vehicle ignition is switched **OFF**.
2. Locate the Proheat thermostat in a central area of the sleeper, approximately 12" above the bunk . Avoid direct air flow from sleeper fan ducts. (See Figure 3-22)
3. Remove the adjusting knob and face cover. Mark and drill mounting holes. Mount thermostat using the screws provided. (See Figure 3-24)
4. Install relay 1, always between OEM sleeper fan control and OEM thermostat.
Note: The constant power supply wire must be of sufficient size to handle sleeper fan motor electrical current draw.
5. Route sleeper fan harness from PCM to Proheat thermostat. Cut to length. Connect white wire to terminal 1 of the thermostat.
6. Route a wire from terminal 2 of the thermostat to relay 1 (can be cut from left over wire harness). Ground the relay using Proheat sleeper fan ground wire (black).

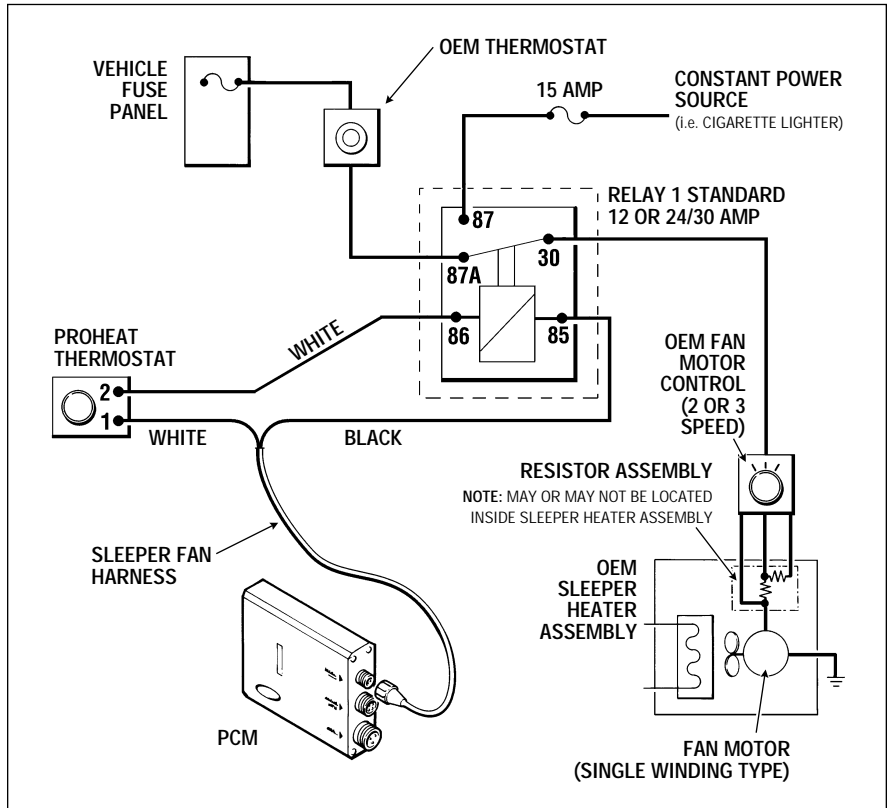


Figure 3-26 (Option B)

OPTION C:

1. Make sure the vehicle ignition is switched **OFF**.
2. Locate the auxiliary heater in a suitable area of the vehicle. Install plumbing and air duct connections as per the manufacturer's recommendations.
3. Locate the Proheat thermostat in a central area of the sleeper, approximately 12" above the bunk. Avoid direct air flow from sleeper fan ducts. (See Figure 3-22)
4. Remove the adjusting knob and face cover. Mark and drill mounting holes. Mount thermostat using the screws provided. (See Figure 3-24)
5. Route sleeper fan harness from PCM to Proheat thermostat. Cut to length. Connect white wire to terminal 1 of the thermostat using the fork terminal provided. Black wire is not used.
6. Route a wire from terminal 2 of the thermostat to an appropriate wire on the sleeper fan motor. Make a splice connection and seal the splice with tape or heat shrink.

Note: The electrical power and operation in this option is controlled by the Proheat. See Option B should a relay be required to provide more electrical power.

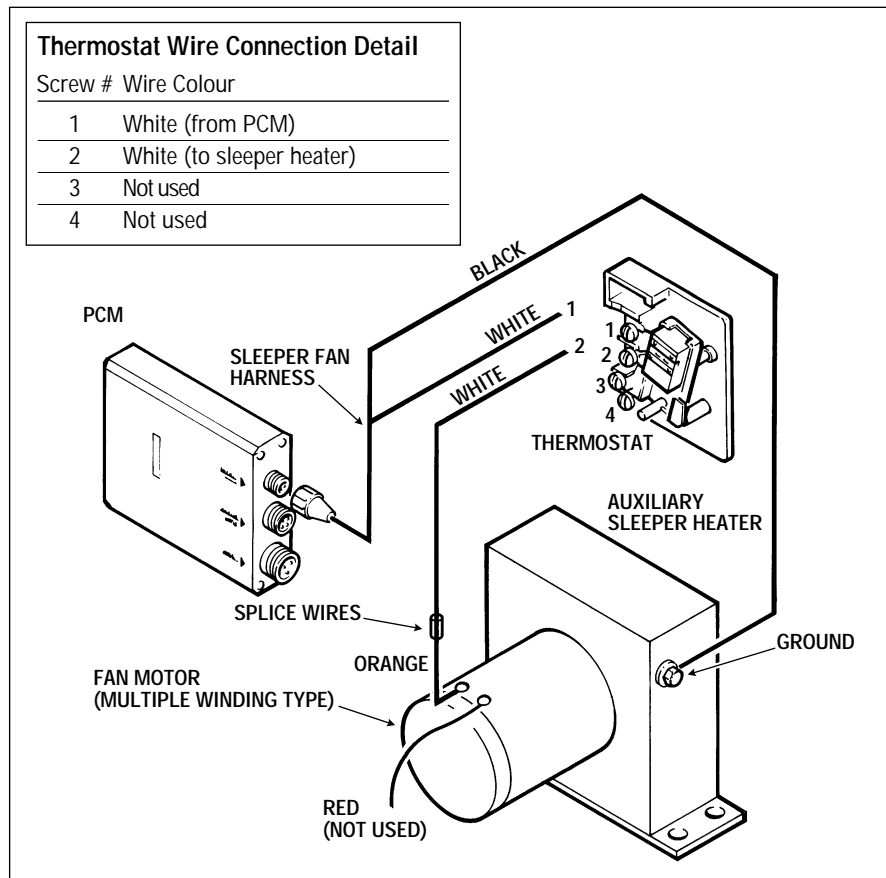


Figure 3-27 (Option C)

Fuel System

Caution

Do not use fuel lines and pick-up tubes less than 1/8" ID or greater than 3/16" ID. Failure to use the correct line size may result in heater malfunction.

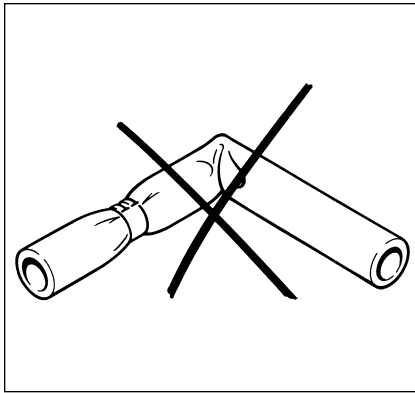


Figure 3-28 Do not kink or pinch fuel line when routing lines.

GENERAL CONSIDERATIONS

- Use 3/16" ID fuel line between the fuel tank and heater meeting SAE 30R7 (supplied with kit)
- Ensure fuel lines are well secured and will not abrade.
- Ensure clamps are secure at fuel pump and fuel pick-up.

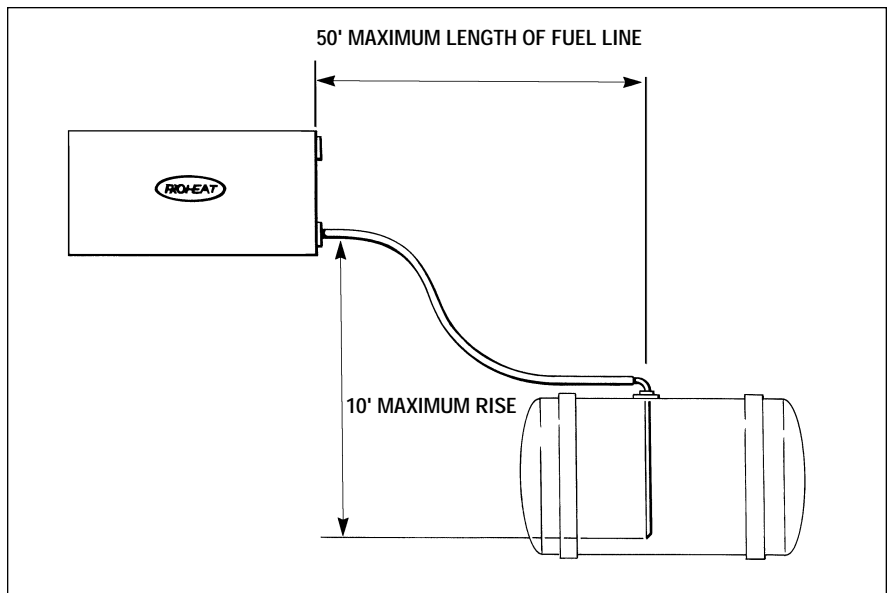


Figure 3-29 Fuel Supply Height Requirement

You Choose 

Select Your Fuel Pick-up Installation Option

OPTION A: Fuel pick-up to be installed in an existing 1/4" or 1/2" NPT port in fuel tank.

OPTION B: Fuel pick-up to be installed in an existing blank fuel sender cover plate.

OPTION C: Fuel pick-up to be installed in a hole drilled into the fuel tank.

OPTION A:

Locate an existing pipe thread port in the vehicle fuel tank and select the $\frac{1}{4}$ " or $\frac{1}{2}$ " NPT portion of the fuel pick-up that fits into that port. Apply a pipe sealant paste to the fuel pick-up pipe threads prior to installation.

Caution

Do not use teflon tape as this will contaminate the heater and engine fuel system.

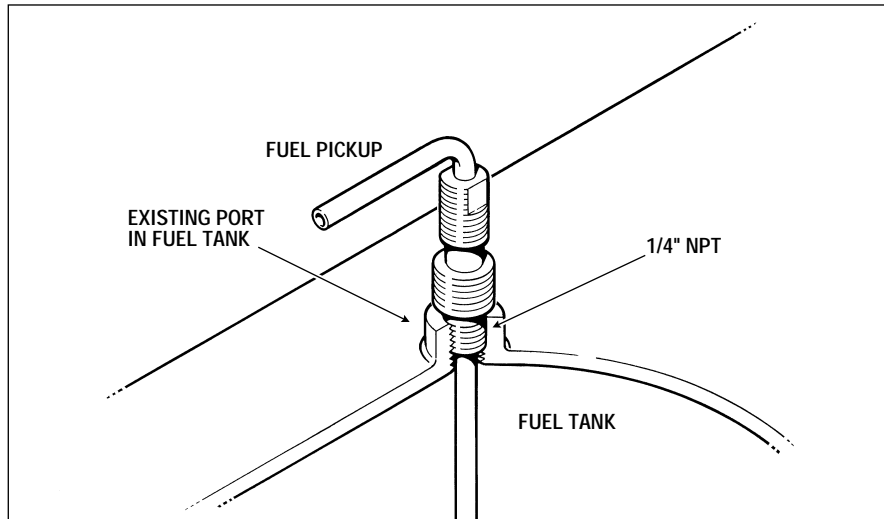


Figure 3-30 $\frac{1}{4}$ " NPT Port

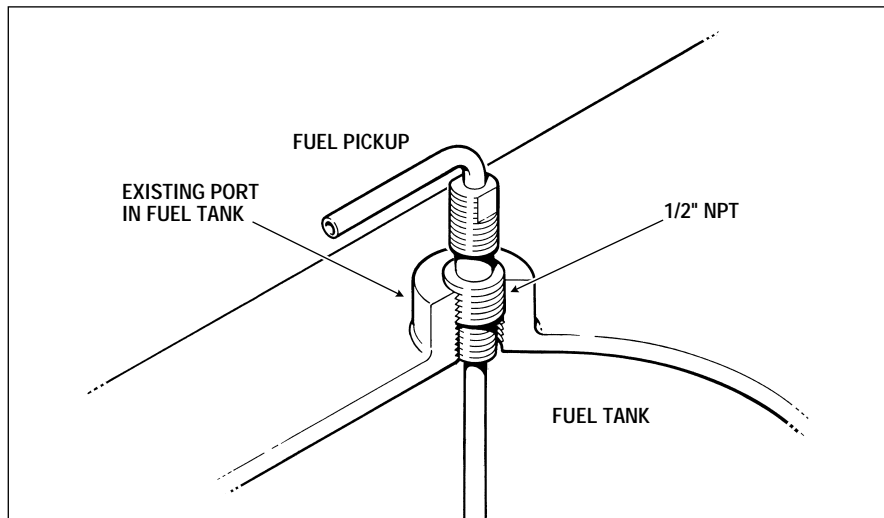


Figure 3-31 $\frac{1}{2}$ " NPT Port

OPTION B:

Locate an existing, blank fuel sender port in the vehicle fuel tank. Remove the cover plate, drill a 1" diameter hole and install the fuel pick-up as shown.

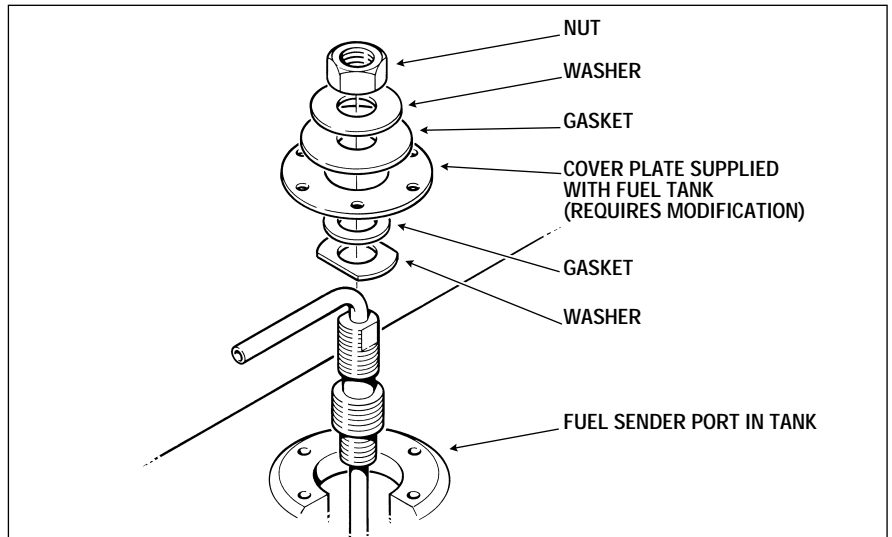


Figure 3-32

OPTION C:

This option requires a permanent modification to the fuel tank.

Select the location for the fuel pick-up in the vehicle fuel tank. Ensure sufficient clearance above the tank to get the fuel pick-up into the tank. Drill a 1" diameter hole in the tank.

Caution

To prevent fuel system contamination do not allow drill chips to fall into the fuel tank when drilling the hole.

WARNING

Drilling the fuel tank may not be acceptable in some jurisdictions. **Do not** drill the fuel tank on passenger carrying vehicles such as school buses.

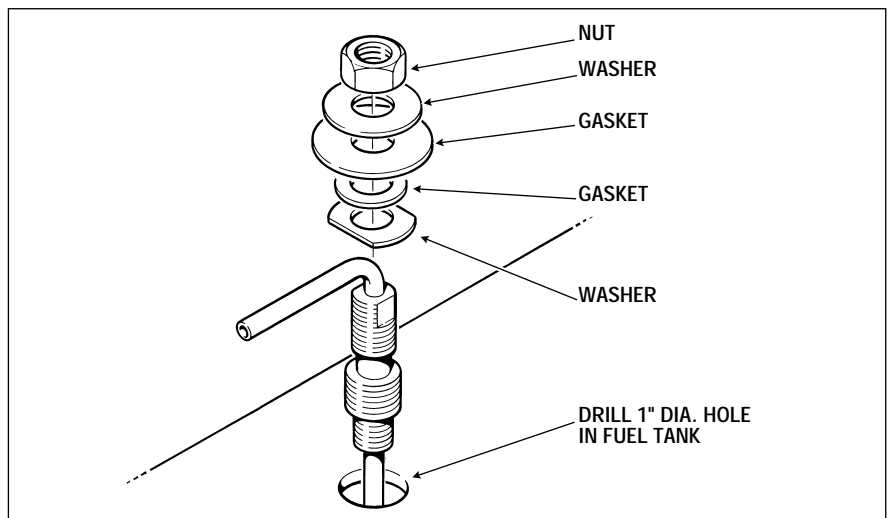


Figure 3-33

Installation

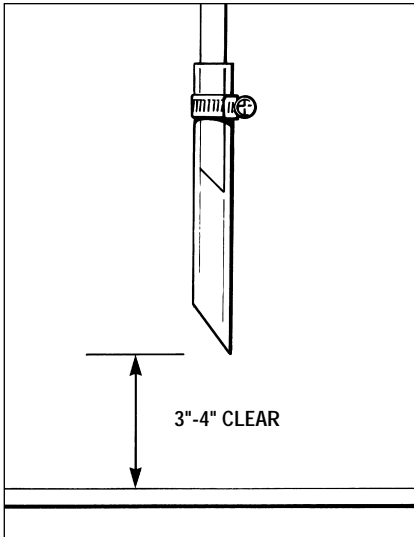


Figure 3-34 For some situations where the fuel pick-up is too far from the bottom of the tank, an extension from left over fuel line can be added.

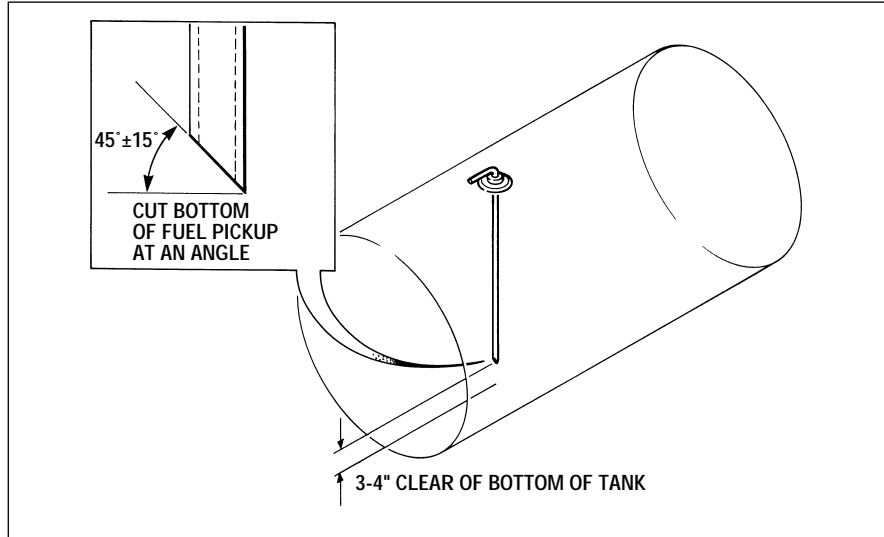


Figure 3-35 Fuel Pick-up Depth

1. Determine the depth of the fuel tank at the desired fuel pick-up location. Cut the fuel-pick up 3 to 4 inches shorter as shown in Figure 3-35.
2. Install the pick-up into the fuel tank as per selected option.
3. Route the fuel line from the heater to the fuel pick-up. Ensure the fuel line is well secured and will not abrade.
4. Attach the fuel line to the heater fuel pump fitting and the fuel pick-up with hose clamps. Lubricating the fittings with fuel may ease the installation effort.

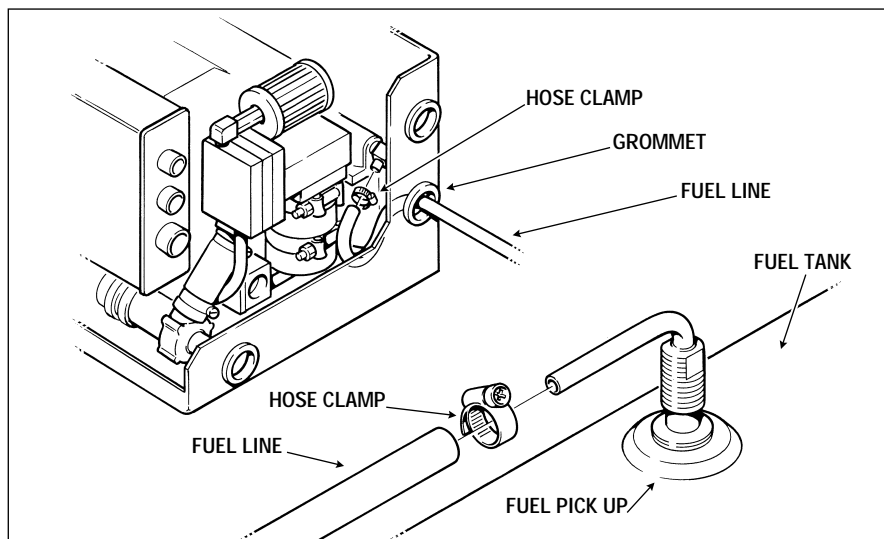


Figure 3-36 Fuel Line Connection Detail

First Time Start Up

1. Inspect the entire installation for:
 - a) loose bolts,
 - b) loose hoses and hose clamps,
 - c) loose wires and wire connections,
 - d) kinked or pinched hoses or wires,
 - e) battery connection for correct polarity, and
 - f) coolant supply and return location on the engine.
2. Fill the vehicle cooling system with coolant as per owner's manual or engine manufacturer's recommendations.
3. Place dash heater control in the full hot position. Turn air conditioning off.

NOTE: If shut-off valves are installed make sure they are fully open.

4. Start the vehicle engine and run it at a fast idle for 5 to 10 minutes to purge air from the heater and coolant system. While the engine is running:
 - a) make sure the coolant is flowing freely,
 - b) inspect hoses and fittings for leaks,
 - c) check the coolant level in the radiator and add coolant as necessary.
5. Shut the engine off.
6. Connect the power harness. The "ON" light on the PCM function display will light for one second and then go out.
7. Start the PROHEAT heater using the On/Off switch. The indicator lamp should be lit with a solid red light. Go to the heater and observe its operation.

Sequence of Events:

- a) Coolant temperature must be less than 150° (65°C).
- b) "ON" light on PCM should be lit.
- c) You should hear the blower, compressor and fuel pump start. Looking through the inspection port you should see a spark and flames.
- d) The spark will stop after 5 to 60 seconds and the heater will continue to run.

NOTE: If the indicator lamp in the ON/OFF switch flashes upon initial start up – wait. The heater will attempt a re-start in 3 minutes. In some cases it takes longer for the fuel pump to prime the empty fuel lines during the initial start. This is usually the case if the fuel lines are long. If the light continues to flash after the re-start, then there is a problem. The Trouble Shooting & Repair section of this manual will assist you in correcting the problem.

8. Once the heater is started it will continue to run until the coolant temperature reaches 185°F (85°C) at heater outlet, then it will shut off.

NOTE: The vehicle dash temperature gauge may read significantly less depending on the location of the sender unit on the engine.

Sequence of Events for Shut Down

- a) Fuel pump and compressor shut off.
- b) The blower will run for 3 minutes on purge cycle then shut off.
- c) The water pump will continue to run.

9. The heater will restart when the coolant temperature falls below 150°F (65°C) at heater inlet, as long as the on/off switch is left "on".

10. If the vehicle has been equipped with the sleeper heat option then:
 - a) Adjust the PROHEAT sleeper thermostat to highest heat position.
 - b) The sleeper heat exchanger fan will start blowing warm air.

NOTE: PCMs Serial #C10001 to C12999: sleeper fan output does not turn on until coolant temperature reaches 100°F (38°C).
PCMs Serial #C13000 and greater: sleeper fan turns on when the heater is switched or timed on.

11. Switch the ON/OFF switch to "OFF". The red light will go out and the heater will purge for three minutes.

12. Inspect the installation again for leaks.

13. Install the enclosure cover.

14. **TO ENSURE FULL WARRANTY COVERAGE
COMPLETE THE WARRANTY CARD
AND MAIL TO TELEFLEX (CANADA) LTD.**

4.0 PRINCIPLE OF OPERATION

GENERAL DESCRIPTION

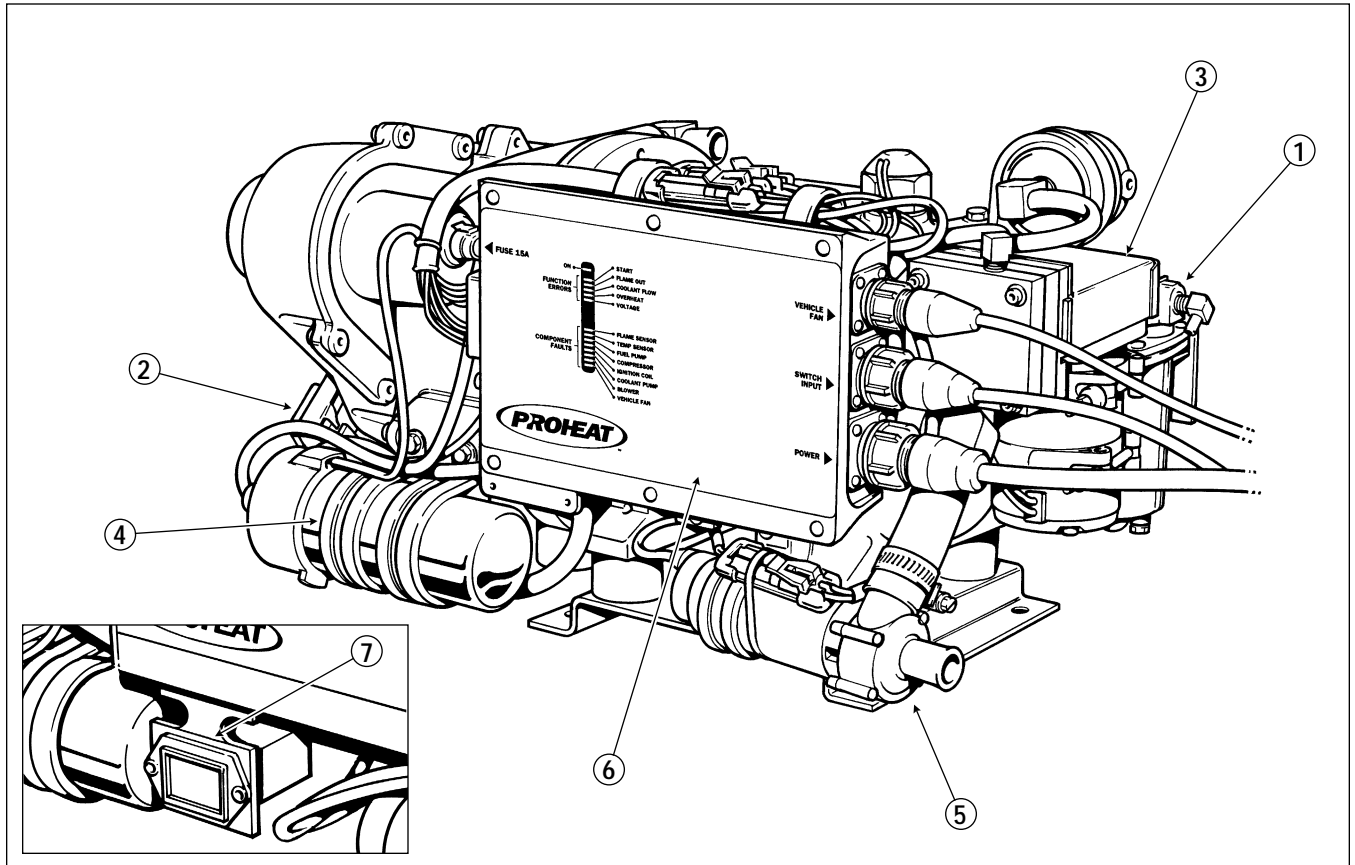


Figure 4-1

1. Fuel Pump

A constant pressure-variable flow pump supplies fuel at 5 psi to the fuel regulator. Under normal conditions it will pulse approximately 1 to 2 times per second. On initial start-up with a dry fuel line it will pulse rapidly until fuel pressure reaches 5 psi, it will then slow to its normal rate.

2. Fuel Regulator

Reduces fuel to atmospheric pressure. Siphoning action from the nozzle draws fuel from the regulator. Without this siphoning there is no fuel flow.

3. Air Compressor

A diaphragm type compressor supplies air to the fuel nozzle.

4. Ignition Coil

An automotive type ignition coil supplies high voltage to the ignition electrode, sparking to the combustion tube.

5. Coolant Pump

Circulates the engine coolant. An impeller style pump is used because of its low current draw and free flow during engine operation.

IT IS NOT SELF PRIMING. The pump must be flooded and the system must be purged of all air for it to operate. (Do not run dry.)

6. PCM

Utilizes a microprocessor to monitor operating conditions and control outputs to the motors and fuel pump. It has powerful diagnostics to assist in trouble shooting. One of the key features is the PCM Function Display on the front of the PCM which has LEDs to indicate function errors or component faults. The "Sleeper Fan" output has a special current limiting feature which, if used, limits the current draw of the sleeper heater fan to 3 amps. This is done to control the total current draw on the vehicles batteries. PCMs Serial #C10001 to C12999: sleeper fan output does not turn on until coolant temperature reaches 100°F (38°C). PCMs Serial #C13000 and greater: sleeper fan turns on when the heater is switched or timed on. The PCM "reads" supply voltage and internally adjusts for 12 or 24 volt systems.

NOTE: The PROHEAT PCM is unique in that it uses "ground-side" switching for the blower, compressor, coolant pump and ignition coil. The positive wire to the motors and ignition coil will show voltage even when the heater is switched off.

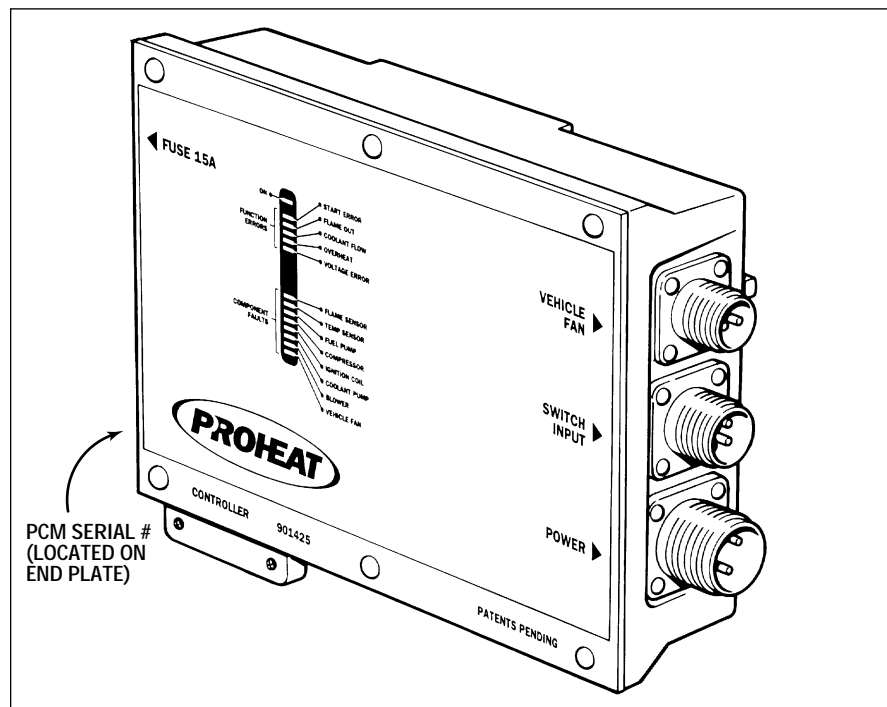


Figure 4-2 LEDs will light to indicate error. Switch or Timer "ON" light in dash will flash to indicate error also. (See page 6-6)

7. Hour Meter

Optional hour meter used to log running time. (Teleflex part #PK0051)

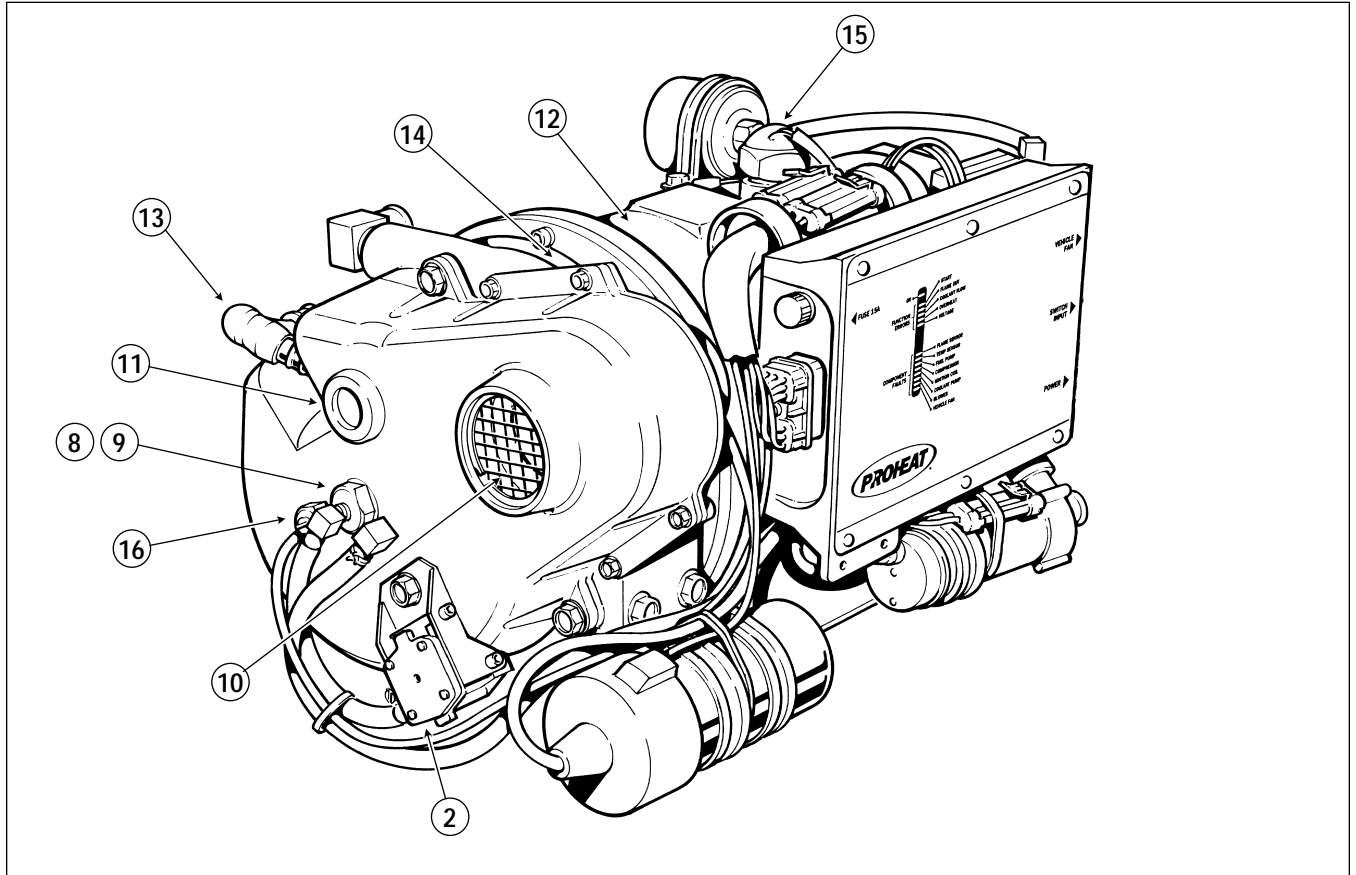


Figure 4-3

8. Nozzle

An air-fuel aspirating type spray nozzle. The compressed air flows through the nozzle at high speed creating a venturi effect. This siphons fuel from the regulator and combines it with the air creating an extremely fine mist which is sprayed out the nozzle into the combustion chamber. The nozzle determines the air- fuel ratio.

9. Fuel Strainer

Filters the fuel prior to entering the nozzle, reducing nozzle blockage.

10. Blower

Uses an impeller type fan to supply approximately 90% of the combustion air at low pressure. It is also used to cool and purge the combustion chamber during the 3 minute shut-down sequence.

11. Inspection Port

Allows visual inspection of the combustion process and is invaluable for reducing time spent on troubleshooting and servicing the heater.

12. Heat Exchanger

A two part cast aluminum housing. Coolant will typically rise 10° to 15°F (6° to 8°C) in temperature as it passes through the heat exchanger, depending on the flow rate.

- 13. Ignition Electrode** The electrode is located near the nozzle just out of the air-fuel mixture path. During the ignition sequence the spark jumps the gap between the electrode and the combustion tube, igniting the air-fuel mixture. Spark duration varies from 5 to 60 seconds depending on conditions.
- 14. Coolant Temperature Sensor** Measures coolant temperature at the outlet port of the heat exchanger.
- 15. Over Heat Breaker** Protects the heater from damage should it be operated without coolant. The overheat breaker monitors the surface temperature of the heat exchanger casting. When the temperature reaches 286°F (141°C) the breaker “kicks out”. This shuts off the power to the fuel pump and air compressor – stopping the heater. The breaker can be reset by pushing down on the red button (located under the rubber cap).
- 16. Flame Sensor** Photo-electrically measures the intensity of the flame. It is the flame sensor that signals to the PCM that the heater is burning properly.
- 17. ON/OFF Switch**
(not shown) Is used to switch the heater on and off. It has an indicator lamp that displays a red light when switched on. A flashing red light indicates an error and one of the LEDs on the PCM function display will be lit. *(See page 6-6 for details)*
- 18. 7 Day Timer**
(not shown) Is used to switch the heater on and off. It can do this manually or by a preset time and day. It has an indicator lamp that displays a red light when switched or timed on. A flashing red light indicates an error and one of the LEDs on the PCM function display will be lit. *(See page 6-6 for details)*

Normal Operating Sequence

Switch On	The switch (or timer) lamp and the PCM "ON" LED will light. The PROHEAT goes to Precheck.
Precheck	The PCM performs a short self diagnostics cycle. This takes several seconds, checking components for proper ranges, short circuits and open circuits. If there are no errors indicated, the PROHEAT goes to Start.
Ignition	The blower starts first, followed by the coolant pump, ignition spark, air compressor and fuel pump. The ignition electrode sparks until the flame sensor "sees" a flame; 5 seconds minimum to 60 seconds maximum. Once the flame sensor "sees" a flame, the PROHEAT goes to Full Output.
Full Output	The PROHEAT runs at Full Output until the coolant temperature reaches 185°F (85°C) at the PROHEAT outlet. At this time, the PROHEAT shuts the flame off and goes to Purge.
Purge	The air compressor and fuel pump shut off immediately. The blower and coolant pump continue to run. After 3 minutes, the blower stops and the PROHEAT goes to Standby.
Standby	The coolant pump circulates the coolant through the system until the temperature drops to 150°F (65°C) at the PROHEAT inlet; then it will enter Precheck and repeat steps 2-5. The PROHEAT will continue to repeat steps 2-5 until it is Switched "OFF".
Switch Off	If PROHEAT is in Full Output, it will Purge first, then shut "OFF". If PROHEAT is in Standby, it will shut "OFF" immediately.

Note:The PROHEAT will Purge for 3 reasons:

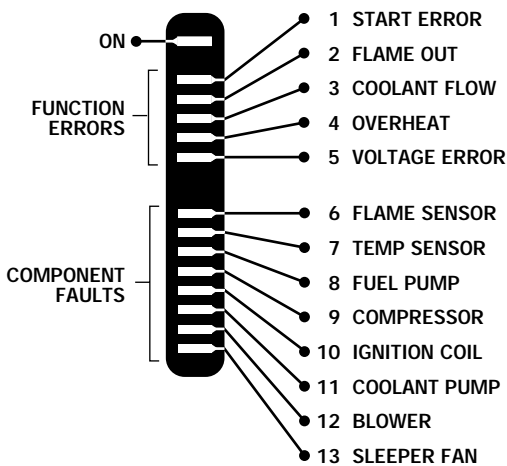
- the coolant reaches 185°F (85°C)
- there is a function error or component fault
(See *Troubleshooting & Repair* page 5-1)
- the PROHEAT is operating at Full Output when it is shut "OFF"

Function and Component Errors

The microprocessor in the PCM continually monitors all the PROHEAT systems. If the internal diagnostics discover a problem, an error message will be displayed on the PCM function display. The remote 'on/off' switch or timer red 'on' light will also flash an error code followed by a pause and then repeated, the number of flashes correspond to the numbered error code eg. 5 flashes indicates a VOLTAGE ERROR.

(See diagram below for a complete list of error flash codes)

If this occurs, refer to the troubleshooting section to assist in problem diagnosis.

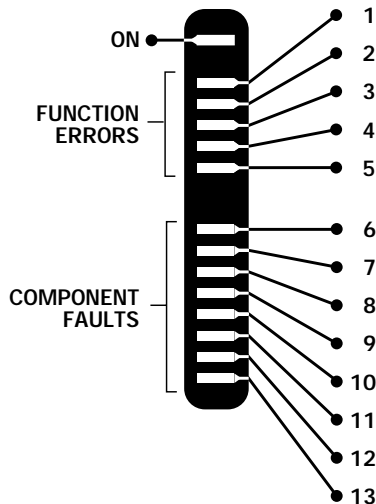


ERROR NO.	TYPE OF ERROR	NO. OF FLASHES
1	Start	1
2	Flame Out	2
3	Coolant Flow	3
4	Coolant Overheat	4
5	Voltage (High/Low)	5
6	Flame Sensor	6
7	Temperature Sensor	7
8	Fuel Pump	8
9	Compressor	9
10	Ignition Coil	10
11	Coolant Pump	11
12	Blower (Combustion)	12
13	Sleeper Fan	13

Function Display Panel Detail & Error Flash Codes

5.0 TROUBLE SHOOTING & REPAIR

The trouble shooting guide is divided into four sections:



Function Errors:

Errors displayed on the PCM function display will cause the heater to shut down. These errors are usually the result of a component problem.

It is possible to have two or more errors displayed at the same time. A function error may be displayed in conjunction with a component error.

Component Faults:

This section covers the individual heater components. In many cases there is a corresponding indicator light on the PCM function display. The indicator light only indicates an electrical problem, NOT a mechanical failure. Component problems can also cause Function Errors.

NOTE: A sleeper fan error (13) will not shut the PROHEAT down and heat to the engine will be maintained.

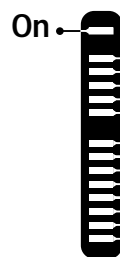
Components:

This section includes the electrode gap, fuse, nozzle and fuel regulator.

Operational Problems:

Problems that are not specifically described in the Function or Component errors sections.

NOTE: Always let the heater run through two cycles when trouble shooting. The heater will attempt one restart after any function or component error. The heater will not start if it is in a purge cycle or if the coolant temperature is above 150°F (65°C)



A CONTINUOUSLY FLASHING "ON" INDICATOR indicates a problem in the PCM.

Check: Heater PCM function

- a) Switch the heater ON/OFF switch in the dash to "OFF". Reset the PCM by removing the power connection for 10 seconds and then re-installing it. If the "ON" light continues to flash, replace the PCM.

Function Errors



1 Start Error

A START ERROR Indicates that the flame sensor did not see a flame during the 60 second ignition period.

If the Start Error is displayed, switch the heater to "OFF" and then "ON" to restart. Observe the heater operation through the inspection window.

Symptom: A flame is visible

The heater shuts down after the 60 second ignition period.

Check: Flame Sensor

- a) Inspect for an open circuit in the wiring.
- b) Inspect the lens for cleanliness. *(page 5-8)*

Check: Fuel System

- c) Is there a restriction in the fuel system?
 - d) Is the nozzle or filter screen plugged?
 - e) Is the fuel pump operating? *(page 5-12)*
 - f) For a defective pressure regulator. *(page 5-27)*
 - g) Is the compressor functioning? *(page 5-14)*
 - h) What type of fuel is being used?
-

Symptom: No flame visible

The spark continues for the 60 second ignition period.
The heater shuts down after the 60 second ignition period.

Check: Fuel System

- a) Is there a restriction in the fuel system?
- b) Is the nozzle or filter screen plugged?
- c) Is the fuel pump operating? *(page 5-12)*
- d) For a defective pressure regulator. *(page 5-27)*
- e) Is the compressor functioning? *(page 5-14)*
- f) For carbon bridging from the ignition electrode to the combustion tube.

NOTE: A spark should be visible across the gap between the ignition electrode and the combustion tube.

Symptom: Heater is Backfiring

Backfiring is usually caused by a severe restriction of combustion air or air in the fuel line.

Check: Inlet Air Flow

- a) Is a blower error displayed? *(page 5-20)*
- b) The blower operation
 - is it turning?
 - is it turning slowly?
- c) For restrictions at the fan inlet port and in the exhaust system.

- Check: Fuel System**
- a) Is fuel level low?
 - b) Air leaking into fuel system?

Symptom: No visible flame
No spark
The heater shuts down after the 60 second ignition period.

- Check: Ignition System**
- a) Check for a poor electrical connection between the ignition coil and the high tension lead.
 - b) Check for a poor electrical connection between the electrode and the high tension lead.
 - c) Inspect the electrode gap. Check for carbon bridging from the ignition electrode to the combustion tube.
 - d) Inspect the primary electrical connections to ignition coil and coil function. *(page 5-16)*
 - e) Is the heater chassis ground wire attached?
The ground is connected to the boss located near the fuel pump. *(Figure 5-7)*



2 Flame Out

A FLAME OUT Error occurs when the heater has started successfully but is unable to maintain a steady flame.

If during the run mode the flame sensor does not see a flame, the ignition is switched on immediately. If the flame is not re-established within 10 seconds the heater will shut down and the FLAME OUT ERROR will be displayed. The heater will go into the purge mode and attempt to re-start in 3 minutes.

If the flame fails to re-ignite on the second attempt, a START ERROR will be displayed on the function control panel. If, however, the flame sensor senses enough of a flame during the ignition mode, it will enter the run mode. During the run mode, if the flame sensor fails to see a flame then the FLAME OUT ERROR will be displayed.

- Check: Fuel System**
- a) Is there a restriction in the fuel system?
 - b) Is the nozzle or filter screen plugged?
 - c) Is the fuel pump operating? *(page 5-12)*
 - d) For a defective pressure regulator. *(page 5-27)*
 - e) Is the compressor functioning? *(page 5-14)*
 - f) What type of fuel is being used?



3 Coolant Flow

A COOLANT FLOW ERROR is displayed when the coolant temperature reaches 185°F (85°C) in less than one minute after ignition. This indicates that the coolant flow is severely restricted or blocked. This feature aids in detecting coolant flow problems that can degrade the PROHEAT performance.

An in line flow indicator is a valuable troubleshooting tool used to: (Figure 5-1)

- a) Check the coolant flow and direction.
- b) Check for air in the system.
- c) Check for restrictions caused by the truck systems ie. Shuttle valves, manual valves, air operated valves.

Check: Coolant Flow

- a) **Coolant Lines:** For restrictions and blockages
Are clamps tight.
- b) **Shut-off Valves:** Ensure that shut-off valves are open and functioning properly.
- c) **Fittings:** Fittings must be at least 1/2" NPT or larger.
Avoid using 90° fittings where possible.
- d) **Coolant Flow Direction:** The PROHEAT **must** be plumbed so that the PROHEAT coolant pump is pumping the coolant in the same direction as the engine coolant pump. PROHEAT can be used when the engine is running.
- e) **Coolant Pump:** Does the pump function properly? (page 5-18)
- f) **Coolant System Capacity:** The coolant system must contain at least 3 gallons (11 litres) of coolant. If the system contains less it may heat up in less than 1 minute causing a COOLANT FLOW ERROR.
- g) **Sleeper Heater:** Many OEM sleeper heaters are combined with an air conditioning system. The solenoid shut-off valve used to cut off coolant flow during the air conditioning mode, must be open when using the PROHEAT. (Refer to section 3-9)

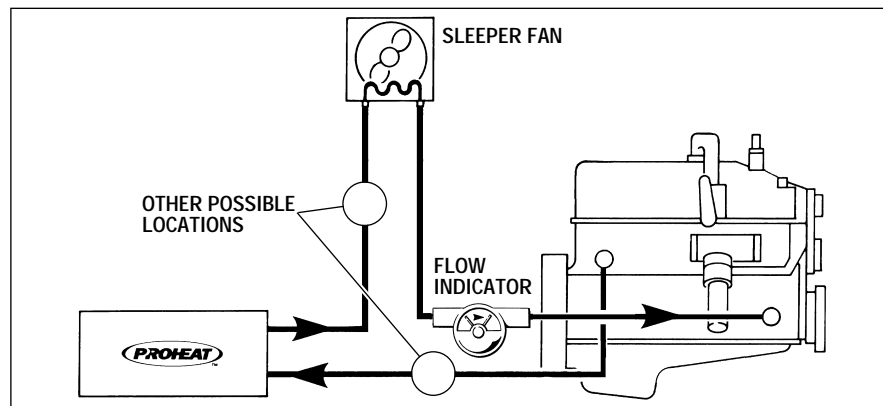


Figure 5-1 Flow Indicator – TK9002



4 Overheat

An OVERHEAT ERROR is displayed when the overheat breaker has tripped, shutting the heater down. This occurs if the heater has been started with little or no coolant in the heat exchanger.

Check: Coolant Flow

- a) Is there coolant in the system?
- b) Determine if there is a blockage or air in the plumbing.

The compressor and fuel pump are wired in series with the overheat breaker. The breaker contains a normally closed thermo switch. When the thermostat reaches the preset temperature, the contacts open shutting the compressor and fuel pump off and instantly shutting the heater down. It can not be restarted until the breaker is manually reset.

Caution

Do not reset the Overheat breaker until the cause of the overheat condition has been determined.

To reset the breaker, remove the rubber cap on the top of the overheat breaker and press the red reset button underneath. If the breaker will not reset, allow the heater to cool. Breaker trips at 286°F (141°C).

Test Procedure:

- a) Connect a multimeter (adjusted to measure resistance) to the overheat breaker connector. (See Figure 5-2) The sensor should be normally closed. Only if the sensor has tripped should it be open circuit.

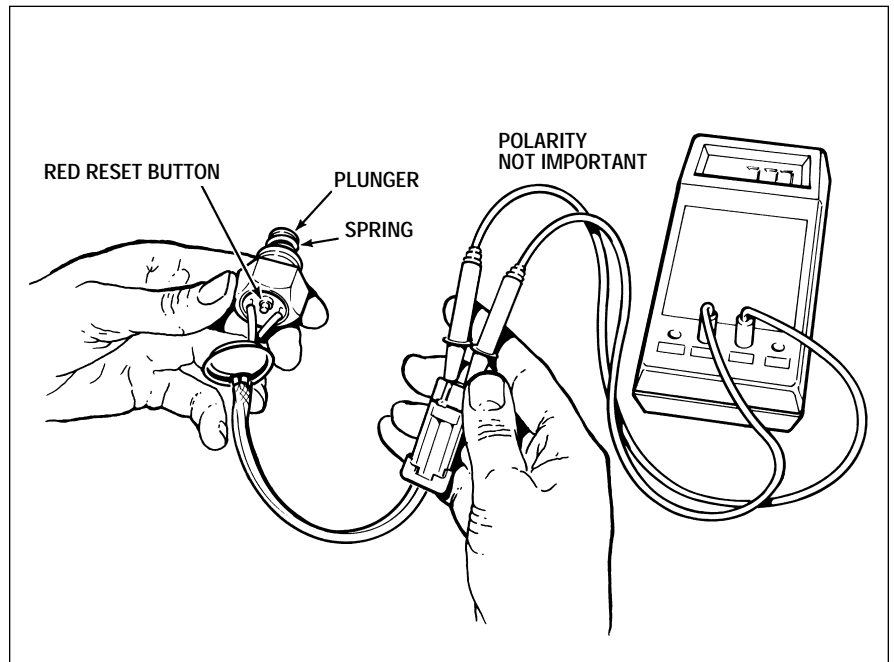


Figure 5-2 Overheat Sensor Test



5 Voltage Error

A VOLTAGE ERROR indicates that the supply voltage to the heater is out of the normal operating range.

Voltage ranges:

12 volt heater – 10.5 to 15.0 volts

24 volt heater – 20.0 to 30.0 volts

Check: **Vehicle Voltage**

- a) Heater voltage must be within the specified range. See following page for procedure to measure heater voltage.

Note: Bad connections may show full voltage under no load conditions but not under full load. With the heater off, measure the voltage. Then switch the heater on and measure the voltage again. If the voltage drop is more than one volt, check the vehicle battery connections and the power connection at the PCM.

- b) If the measured voltage is higher than the specified range then check the voltage regulator on the vehicle.

Note: If the vehicle batteries are marginal, starting the vehicle while the heater is running may:

- a) Drop the voltage enough to cause a voltage error.
- b) Cause random component errors (brown out).

To re-set the PCM, switch the heater to "OFF" and then back "ON" at the dash toggle switch. If the problem continues, load test the batteries to confirm their condition.

Heater Voltage Measurement

The positive terminal of the ignition coil is always hot relative to the heater chassis ground as long as power is connected to the heater. This is the supply voltage to the heater.

Test Procedure:

- a) Locate the rubber boot on the end of the ignition coil and peel it back to expose the positive and negative terminals.
- b) Select the DC volts range of a multimeter and connect as per *Figure 5-3*. The positive lead of the multimeter should be attached to the positive coil lead. The negative lead of the multimeter should be attached to the heater chassis at the PROHEAT ground boss. (*Figure 5-7*)
- c) Read the voltage with heater running or trying to run.

NORMAL VOLTAGE RANGES

12 volt heater – 10.5 to 15.0 volts

24 volt heater – 20.0 to 30.0 volts

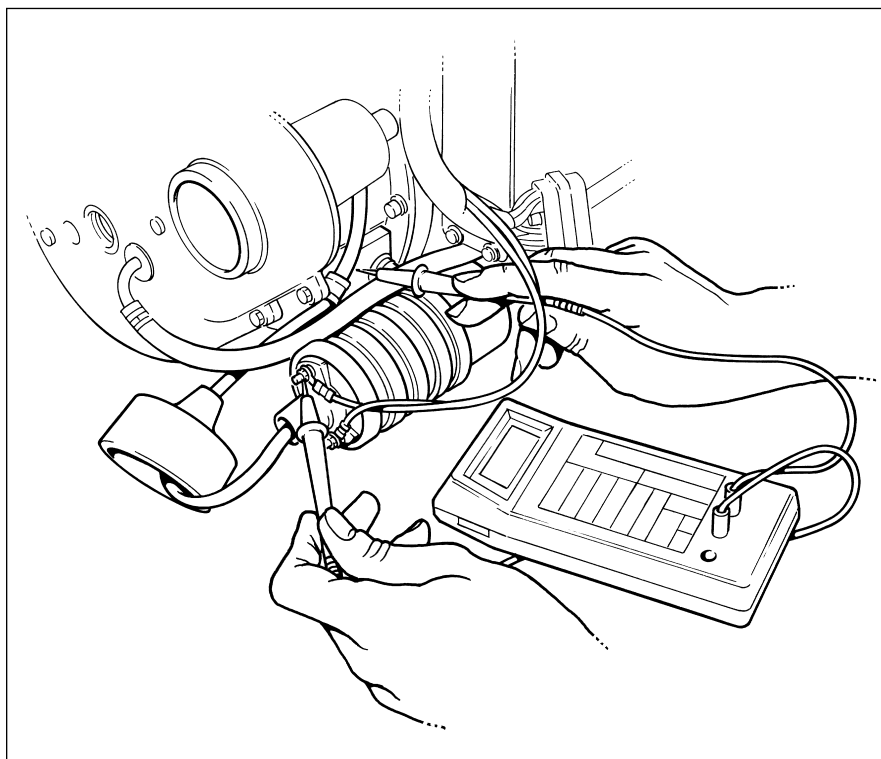


Figure 5-3 Heater Voltage Measurement

Component Faults



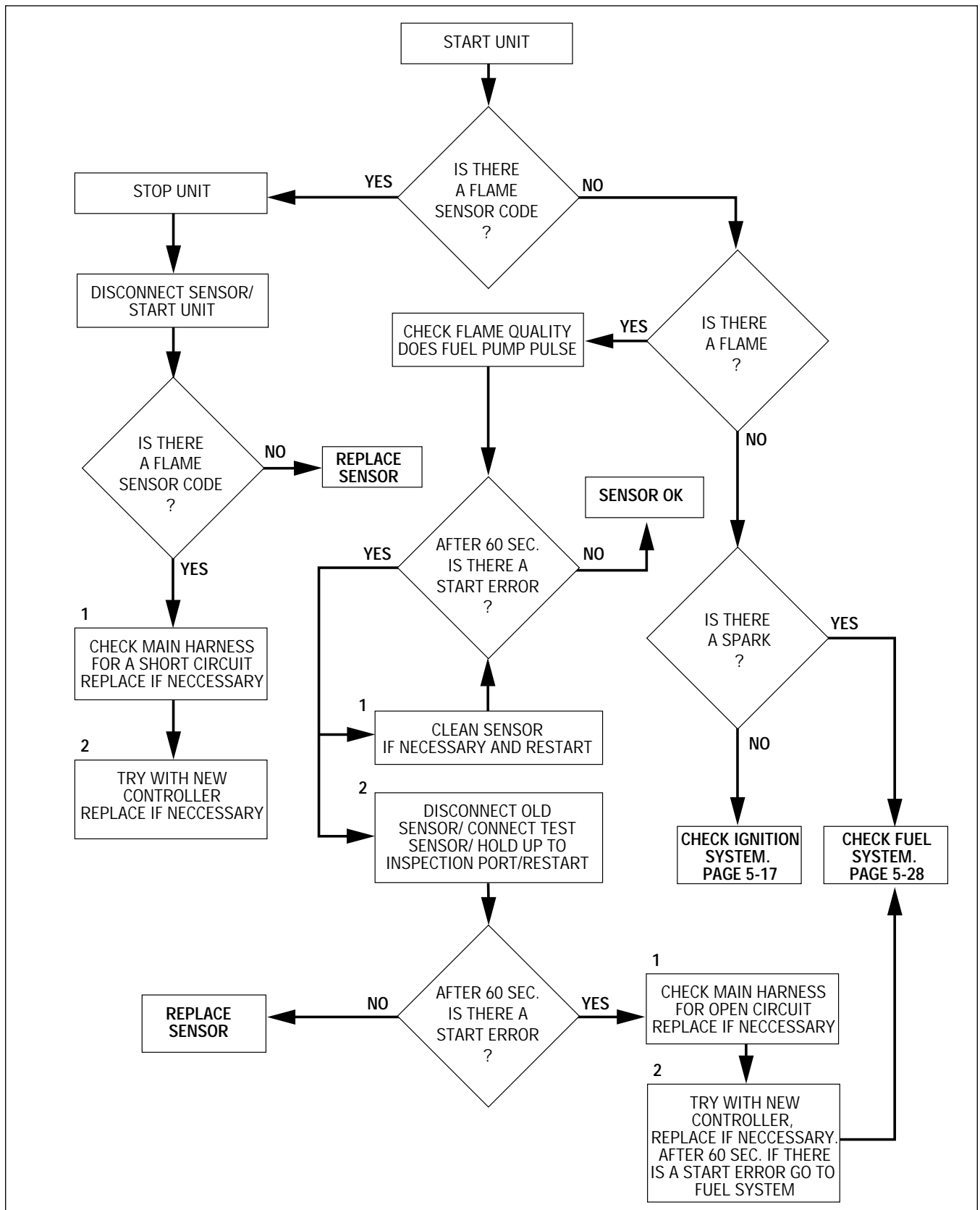
6 Flame Sensor

A FLAME SENSOR ERROR indicates an electrical short circuit in the flame sensor wiring or a flame sensor failure. It will not indicate an open circuit. The flame sensor is an optical device which “sees” the flame. If the sensor lens is dirty or has an open circuit, it can not “see” the flame and results in either a START ERROR or a FLAME OUT.

Check: Flame Sensor

- a) Inspect the flame sensor wiring for a short circuit.
- b) Inspect the flame sensor lens for cleanliness.
- c) Test the flame sensor. (*See opposite page*)

Flame Sensor Test Procedure





7 Temp Sensor

A TEMP (TEMPERATURE) SENSOR ERROR indicates a short or open circuit in the temperature sensor wiring or the coolant temperature is out of range – below -58°F (-50°C) or above 266°F (130°C). The resistance of the temperature sensor is proportional to temperature.

Check: Temperature Sensor (ERROR INDICATED)

- a) Inspect wiring for short or open circuits.
- b) Test the sensor to see if it is defective.

Test Procedure:

- a) Connect a multimeter adjusted to measure resistance to the temperature sensor as per *Figure 5-4*. The polarity of the sensor connections to the multimeter is not important.
- b) Measure the sensor resistance versus temperature under the following conditions:
 - at room temperature
 - in a freezer
 - in boiling water.
- c) Compare the measured values against the graph (*Figure 5-5*). If values do not approximately match, then the sensor is defective and must be replaced.

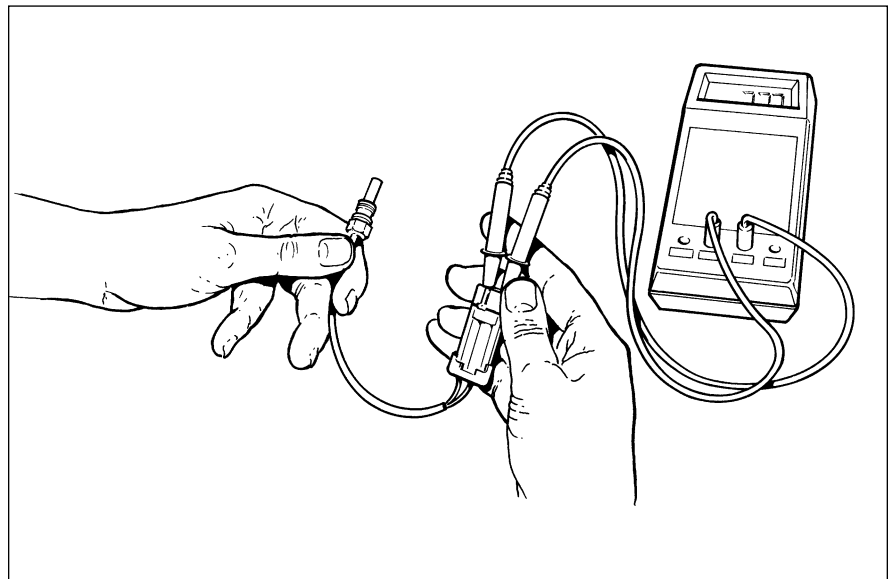


Figure 5-4 Temperature Sensor Test

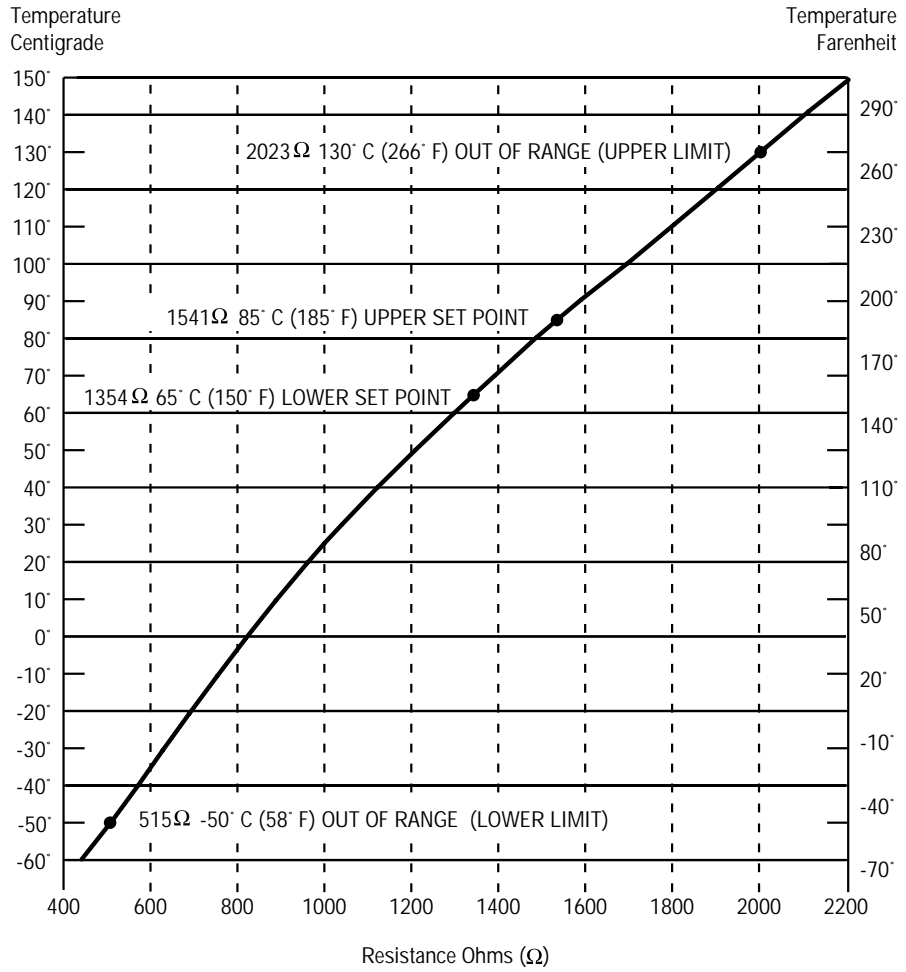


Figure 5-5 Coolant Temperature Sensor Graph

NOTE:

Room temperature	70°F (20°C)	Resistance 950Ω
Boiling water	212°F (100°C)	Resistance 1700Ω



8 Fuel Pump

A FUEL PUMP ERROR indicates an electrical short circuit between the positive wire to the pump and the chassis ground. The PCM will NOT detect an open circuit. When the fuel pump is operating properly you can feel it pulse, approximately 1-2 pulses per second. This indicates that the other components in the system (ie: compressor, fuel regulator and nozzle) are functioning.

NOTE: The body of the fuel pump is grounded to the PROHEAT chassis. The PROHEAT chassis is grounded through the PCM by a black-green wire attached to the PROHEAT ground boss. (See Figure 5-7)

Symptom: Fuel pump is not pumping (PUMP NOT PULSING) (ERROR INDICATED)

Check: Fuel pump wiring (See PROHEAT wiring diagram page 6-8)

- a) Is the fuel pump wire shorted to ground? Check wire harness from pump connection back to the PCM for pinched or abraded wire touching the PROHEAT chassis.
- b) For defective pump. (See Test Procedure Figure 5-6)
If the pump tests OK, replace the PCM.

Symptom: Fuel pump pulsing rapidly (NO ERROR INDICATED)

NOTE: Rapid pulsing indicates air in system/lack of fuel.

Check: Fuel flow

- a) The fuel level. Is the PROHEAT pickup below fuel level?
- b) For a blocked or pinched fuel line.
- c) For air leaks. (suction and pressure lines)
- d) For gelling fuel.

Symptom: Fuel pump not pumping (PUMP NOT PULSING) (NO ERROR INDICATED)

Check: Fuel System

- a) For restrictions in fuel lines.
- b) Nozzle and fuel strainer for blockage. (See page 5-26)
- c) For defective pump. (See Test Procedure Figure 5-6)
- d) For defective regulator. (See page 5-27)
- e) That the PCM functions. (See page 5-14)

Check: Electrical connections to Fuel Pump

- a) That the fuel pump body is grounded to PROHEAT chassis.
- b) That ground wire is connected. (See Figure 5-7)
- c) The voltage at the fuel pump positive (+) terminal, nominally 12 or 24 volts. Power will be present ONLY during Start or Full Output mode. (See Figure 5-6)

Test procedure: Indicates if there is flow to regulator inlet.

- a) Remove fuel supply line at the regulator.
Place this end into a container.
- b) Start the PROHEAT. (Pump will operate at full output.)
- c) Measure the fuel flow. Flow should be greater than 0.13 US GPM (0.5 l/min).at 12 Volts.

The fuel pump can be operated remotely by disconnecting the PROHEAT power supply and connecting the pump directly to 12 volts. (See Figure 5-6)

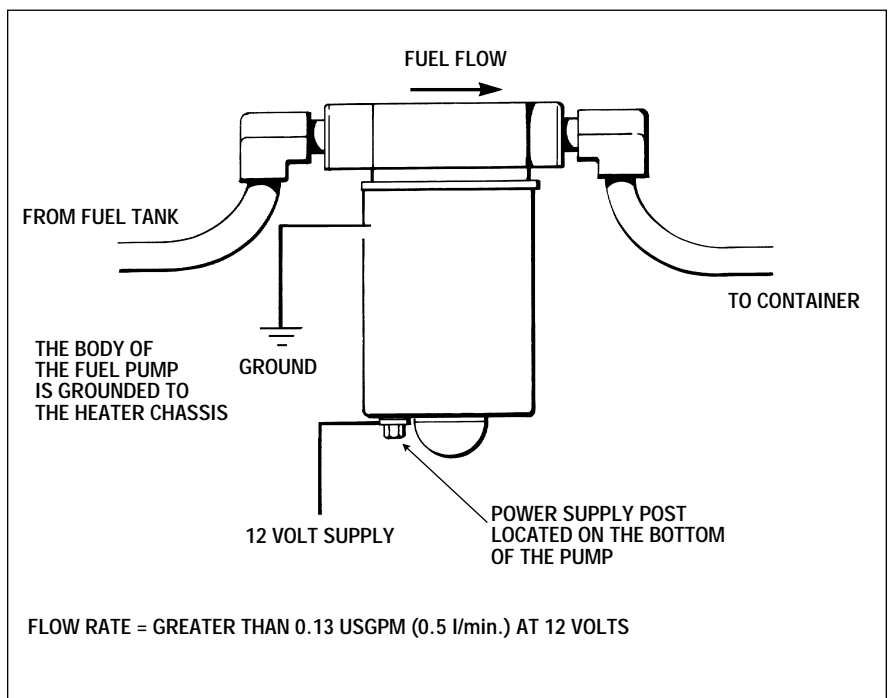


Figure 5-6 Fuel Pump Test

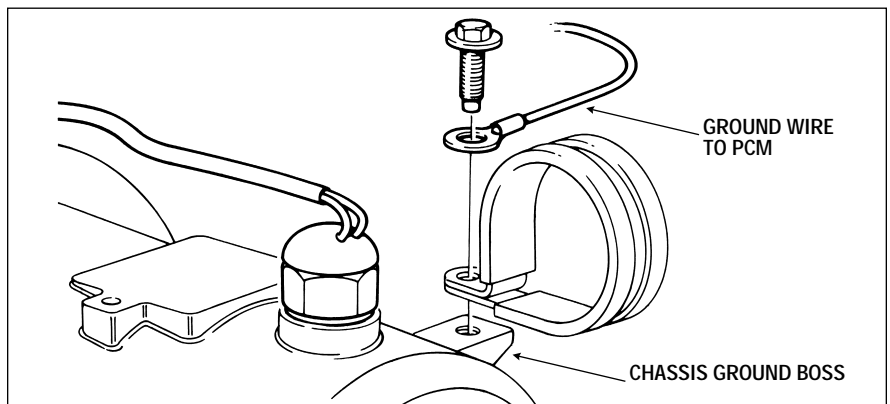


Figure 5-7 PROHEAT Ground Boss



9 Compressor

An AIR COMPRESSOR ERROR indicates an open circuit in the wire harness, a short in the wire harness between the positive and negative leads or an internal short in the motor. This component is ground side switched in the PCM.

Symptom: Air Compressor not running (ERROR INDICATED)

Check: Air Compressor wiring & function

- a) That compressor is connected to harness correctly.
(See *PROHEAT wiring diagram page 6-8*)
- b) Check the connector pins for damage or corrosion.
- c) Harness for pinched or abraded wires.
- d) Test compressor. If it tests OK replace PCM.
(See *Figure 5-8 and Test Procedure*)

**Symptom: Air Compressor not running (NO ERROR INDICATED)
Fuse blown in PCM**

Check: Air Compressor function

- a) Harness for pinched or abraded wires.
Positive lead must not short to ground.
- b) Motor for internal short.
(See *Figure 5-8 and Test Procedure*)

**Symptom: Air Compressor running (NO ERROR INDICATED)
No/low air flow**

Check: Air flow

- a) Air filter for cleanliness.
- b) For blocked air line to nozzle inlet.
- c) For blocked nozzle. (See *Nozzle page 5-26*)
- d) Air compressor as described in Service Bulletin #969023 in Appendix. Perform this with filter in place and then without filter.

Test procedure:

- a) Connect air compressor directly to a power source of the rated voltage (12/24 volts) and see if the motor runs. If not, replace the compressor.
- b) Measure air compressor motor resistance. Use a multimeter to measure the resistance across the compressor assembly connector pins. If resistance shows an open circuit or an internal short circuit, replace the compressor assembly.
- c) Measure air compressor current. Use test lead part #967921, as described on Service Bulletin #967329 in Appendix.

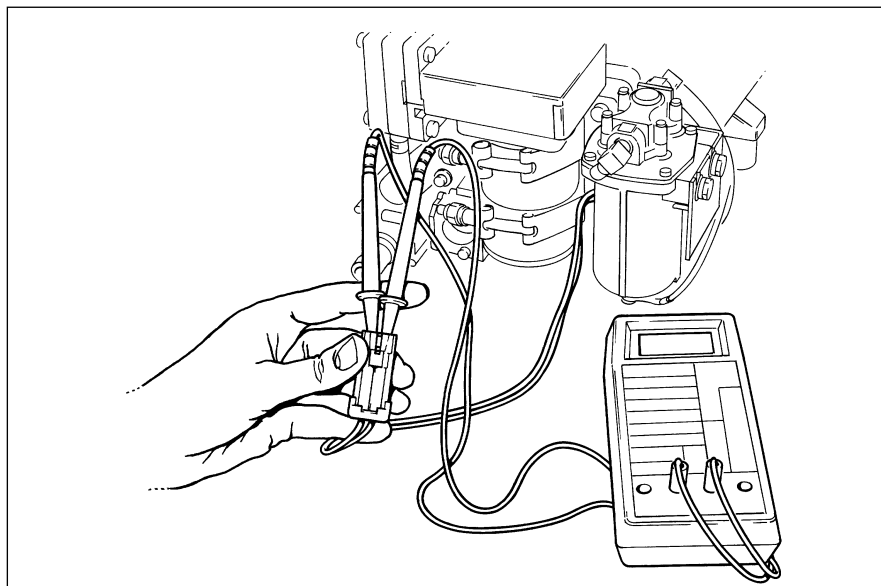


Figure 5-8 Compressor Test

MODEL	CURRENT DRAW
XL900-12	3.50 - 5.00 @ 12 volts
XL900-24	1.50 - 3.00 @ 24volts
XL1500-12	5.50 - 7.00 @ 12 volts
XL1500-24	3.00 - 4.50 @ 24volts



10 Ignition Coil

WARNING

The PROHEAT chassis is grounded from the PCM as shown in *Figure 5-10*. Ensure the ground is securely connected. Failure to ensure a proper ground may result in electrical shock.

An IGNITION COIL ERROR indicates an open circuit in the wire harness, a short in the wire harness between the positive and negative leads or an internal short in the coil. The fuse will blow if there is a short to ground in the positive lead or the coil. This will not cause an ignition coil error. The ignition coil is the easiest place to measure the voltage on the heater. This component is ground side switched in the PCM.

Symptom: No spark at the electrode (ERROR INDICATED)

Check: Coil wiring

- a) Inspect the wiring harness to ensure the ring terminals are secured to the coil. Make sure the polarity is correct.
- b) Inspect for broken or abraded wires in the wire harness.
- c) Test coil. (See *Figure 5-10*)

Symptom: No spark at the electrode (NO ERROR INDICATED)

Check: High tension wires and electrode

- a) Inspect the high tension lead between the coil and the electrode.
- b) Inspect the ground lead between the second electrode and the heater chassis.
- c) Is the electrode gap adjusted correctly? (See *page 5-23 for Electrode Gap Detail*)

NOTE: If a coil error occurs and no fault is found in the coil and wiring, then the PCM must be checked.

Test procedure:

- a) Measure ignition coil resistance. Use a multimeter to measure the resistance across the positive and negative terminals. The resistance should be less than 1 ohm. If resistance is "open circuit" or 0 ohms (short circuit) then replace the ignition coil.

Note: Remove positive and negative wires from the coil when testing.

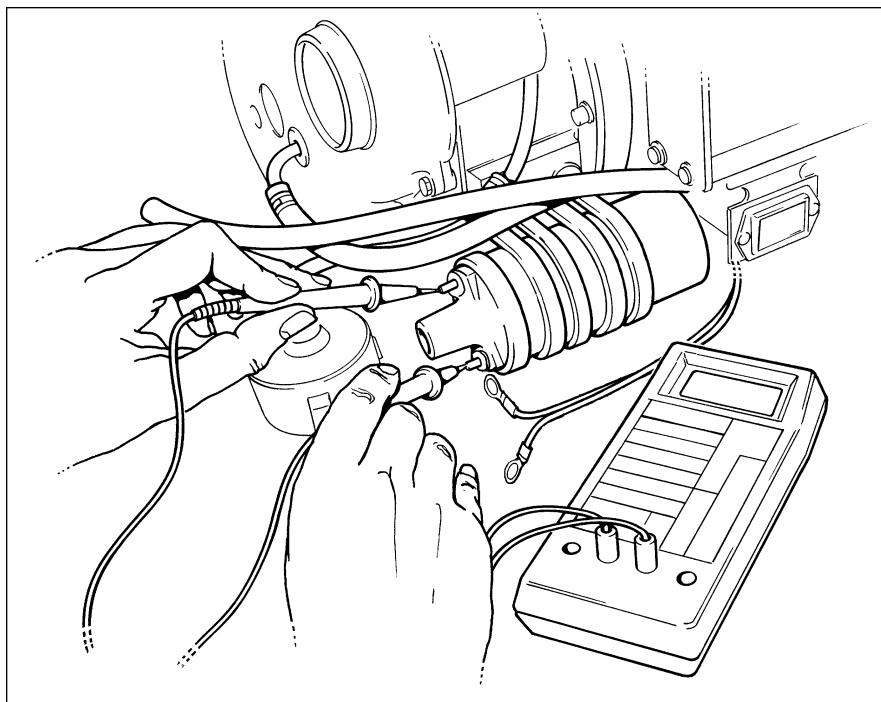


Figure 5-9 Ignition Coil Test

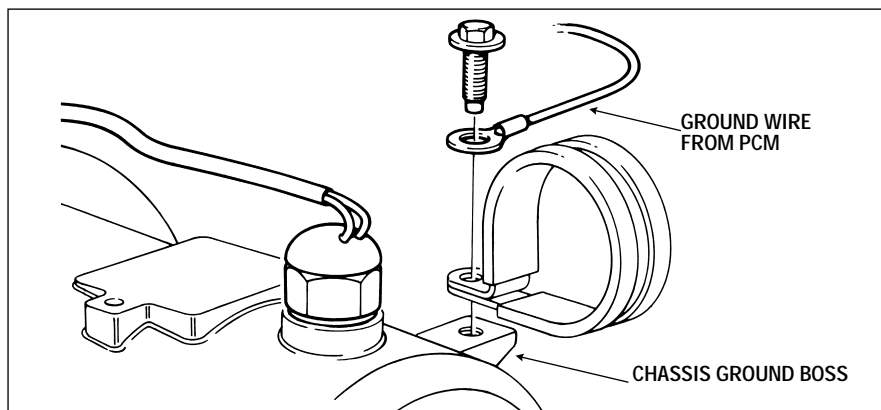


Figure 5-10 PROHEAT Ground Boss



11 Coolant Pump

A COOLANT PUMP ERROR indicates an open circuit in the wire harness, a short in the wire harness between the positive and negative leads or an internal short in the motor.

This component is ground side switched in the PCM.

The coolant pump is not self-priming. Ensure that the coolant system has been purged of air by running the vehicle engine for at least ten minutes following installation or service. (Do not run dry.)

Symptom: Coolant pump not running (ERROR INDICATED)

Check: Coolant Pump wiring & function

- a) That coolant pump is connected to harness correctly.
(See *PROHEAT wiring diagram page 6-8*)
- b) The connector pins for damage or corrosion.
- c) Harness for pinched or abraded wires.
- d) Test pump. If it tests OK replace PCM.
(See *Figure 5-11 and Test Procedure*)

**Symptom: Coolant pump not running (NO ERROR INDICATED)
Fuse blown in PCM**

Check: Coolant Pump function

- a) Harness for pinched or abraded wires.
Positive lead must not short to ground.
- b) Check motor for internal short.
(See *Figure 5-11 and Test Procedure*)

Symptom: Coolant pump not pumping (NO ERROR INDICATED)

Check: Coolant Pump function

- a) If the impeller is turning freely. If not, replace pump.

Symptom: Coolant pump turning slowly (NO ERROR INDICATED)

Check: Heater operation

- a) If the heater is switched on but the coolant is between 150°F (65°C) and 185°F (85°C) at the heater outlet, then, for models Serial #C10001 – C12900, the pump runs at 50% current draw. Models Serial #C13000 and greater, will be running at full current draw under the same conditions.

Symptom: Coolant pump leaking

Check: Leak location

- a) Hose clamps. Tighten if necessary.
- b) Pump housing seal. Replace pump if required.

Test procedure:

- a) Connect coolant pump directly to the rated voltage (12/24 volts) and see if it runs. If not replace the pump.
- b) Measure coolant pump motor resistance.
Using a multimeter, measure the resistance across the coolant pump connector pins.
If resistance shows an open circuit or an internal short circuit, replace the coolant pump.
- c) Measure coolant pump current. Use test lead part #967921 as described on Service Bulletin #967329 in Appendix.

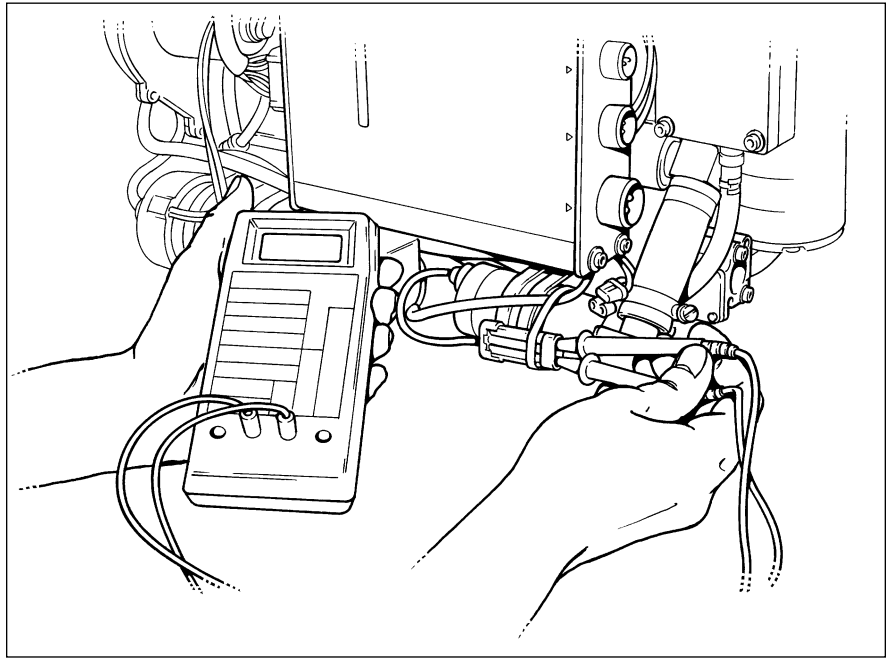


Figure 5-11 Coolant Pump Test

MODEL	CURRENT DRAW	PUMP TYPE
XL900-12	1.50 - 4.00 amps. @ 12 volts	Teleflex
XL900-24	0.75 - 2.00 amps. @ 24volts	Teleflex
XL1500-12	1.50 - 4.00 amps. @ 12 volts	Teleflex
XL1500-24	0.75 - 2.00 amps. @ 24volts	Teleflex
XL900-12	1.00 - 2.50 amps. @ 12 volts	Johnson
XL900-24	0.50 - 1.25 amps. @ 24 volts	Johnson



12 Blower

CAUTION

When a blower fails, the combustion chamber must be checked for carbon build up and cleaned as necessary.

A BLOWER ERROR indicates an open circuit in the wire harness, a short in the wire harness between the positive and negative leads or an internal short in the motor. This component is ground side switched in the PCM.

NOTE: An RPM check was added to the PCM for Serial #C13000 and greater. This feature is constantly measuring the blower RPM and will give an error should it fall below the necessary RPM to maintain sufficient combustion air.

Symptom: Blower not running (ERROR INDICATED)

Check: Blower wiring & function

- a) That blower is connected to harness correctly.
(See *PROHEAT wiring diagram page 6-8*)
- b) The connector pins for damage or corrosion.
- c) Harness for pinched or abraded wires.
- d) Test blower. If it tests OK replace PCM.
(See *Figure 5-12 and Test Procedure*)

**Symptom: Blower not running (NO ERROR INDICATED)
Fuse blown in PCM**

Check: Blower function

- a) Harness for pinched or abraded wires.
Positive lead must not short to ground.
- b) Check motor for internal short.
(See *Figure 5-12 and Test Procedure*)

Symptom: Blower turning slowly (NO ERROR INDICATED)

Check: Blower function

- a) For fan blade rubbing on housing.
- b) For fan blade slipping on motor shaft.

Test Procedure:

- a) Connect the blower to a power supply of the rated voltage. Does it turn? If not, replace the blower.
- b) Measure the blower motor resistance. Using a multimeter, measure the resistance across the blower connector pins. If resistance shows an open circuit or an internal short circuit, then replace the blower assembly.
- c) Measure blower current. Use test lead part #967422 as described on Service Bulletin #967329 in Appendix.

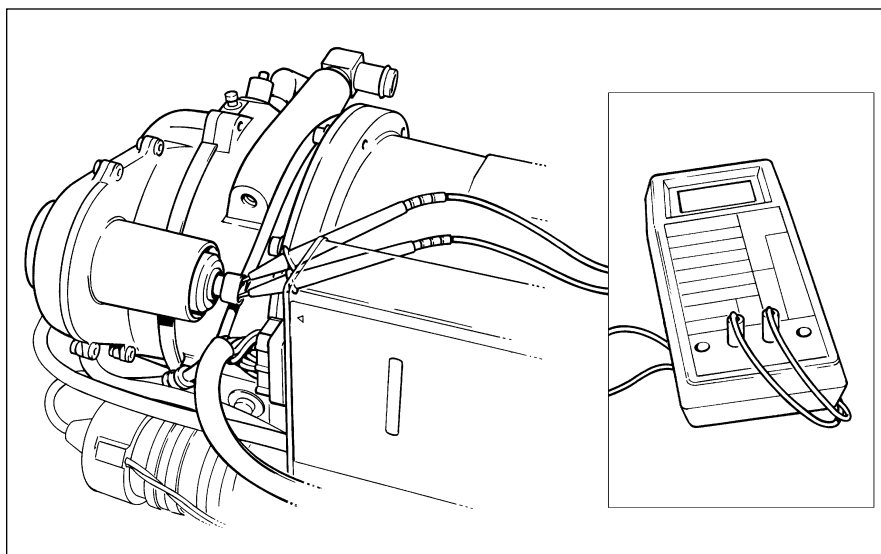


Figure 5-12 Blower Test

MODEL	CURRENT DRAW
XL900-12	.25 - 0.75 amps. @ 12 volts
XL900-24	.10 - 0.25 amps. @ 24 volts
XL1500-12	.90 - 1.50 amps. @ 12 volts
XL1500-24	.40 - 0.75 amps. @ 24 volts



13 Sleeper Fan

A SLEEPER FAN ERROR indicates an electrical short in the sleeper fan wiring harness, electrical connections or fan motor. This error will not shut the heater down and heat to the engine will be maintained. An open circuit will not display an error.

Symptom: Sleeper Heater fan not turning (ERROR INDICATED)

Check: Sleeper Heater system

- a) The wiring connections and polarity.
- b) For an electrical short from the positive wire to the negative wire.
For an electrical short from the positive wire to the chassis. Test sleeper heater fan.
(See Test Procedure)

Symptom: Sleeper Heater fan not turning (NO ERROR INDICATED)

Check: Sleeper Heater system

- a) The wiring connections and polarity.
- b) Test sleeper heater fan.
(See Test Procedure)

Symptom: Sleeper Heater system has low air flow (NO ERROR INDICATED)

Check: Sleeper Heater system

- a) Air ducting.
- b) Use Test Procedure items e and f to determine if PROHEAT is supplying enough power to drive the sleeper fan.

Test Procedure:

- a) Disconnect sleeper fan harness.
- b) Restart the PROHEAT, If there is still an error, replace the PCM.
- c) Check for correct voltage at the sleeper fan output on the PCM. (See page 6-7)
- d) Reconnect sleeper fan harness. Start the PROHEAT.
- e) Check for voltage at the thermostat, isolator (if used) and the sleeper fan motor. The power to the sleeper heater fan is regulated by voltage in the PCM. It will read low when trying to drive the sleeper fan.
- f) Connect sleeper heater fan motor directly to a remote power source of the rated voltage (12/24 volts). Does the motor run?

Components

Electrode Gap MARK II only

The electrode gap is factory set and should not require adjustment.

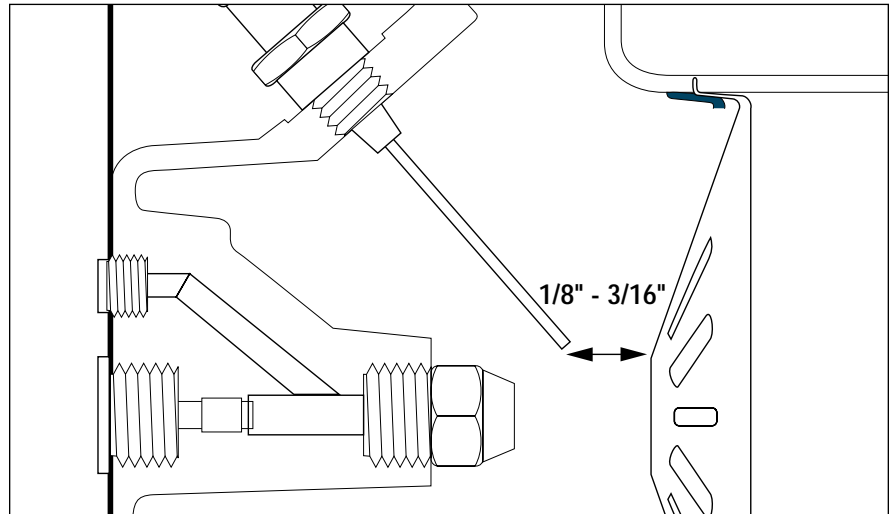


Figure 5-13 Electrode Gap Detail

Fuse

If, when the heater is switched on, the heater does not run and the "ON" light does not light, check the fuse in the PCM. The fuse will blow if there is a short to ground in a positive lead or internally for the following components:

- ON/OFF switch
- Coolant Pump
- Air Compressor
- Blower
- Ignition Coil

Reversing polarity at the battery will also cause the fuse to blow. This will not harm the PCM.

Check: Heater wiring.

- a) Check polarity of battery connections.
- b) Test the internal wire harness for short circuits.

Caution

Repeated replacement of the fuse or using incorrectly rated fuses without correcting the problem, can damage the PCM.

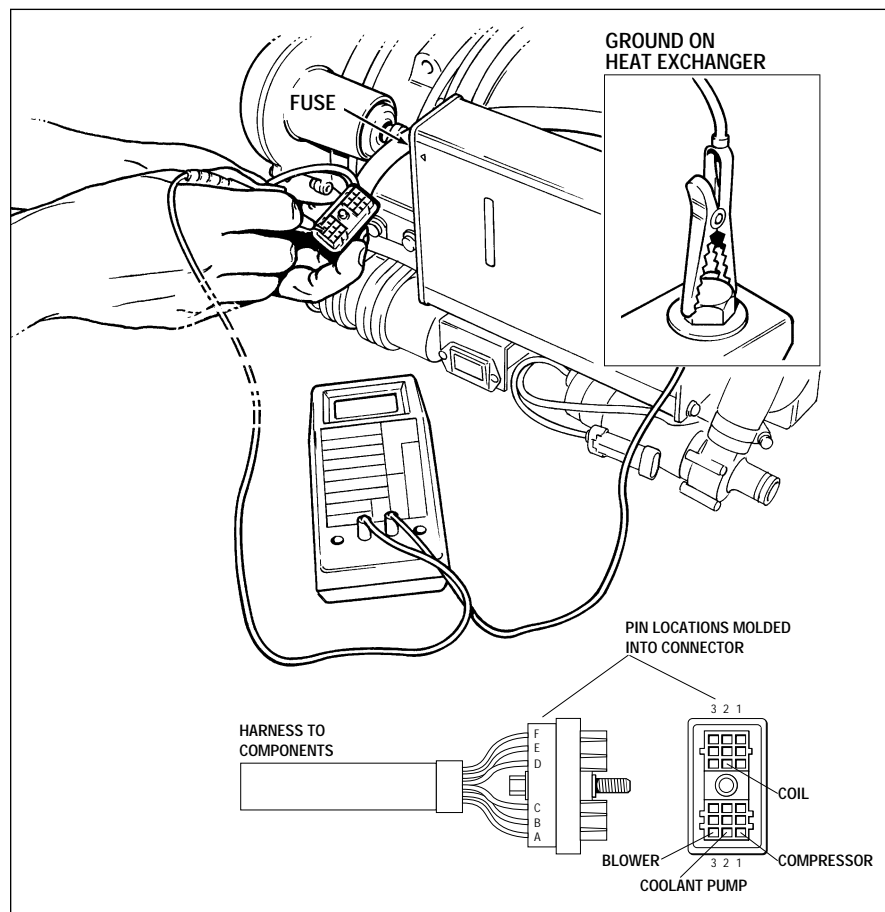
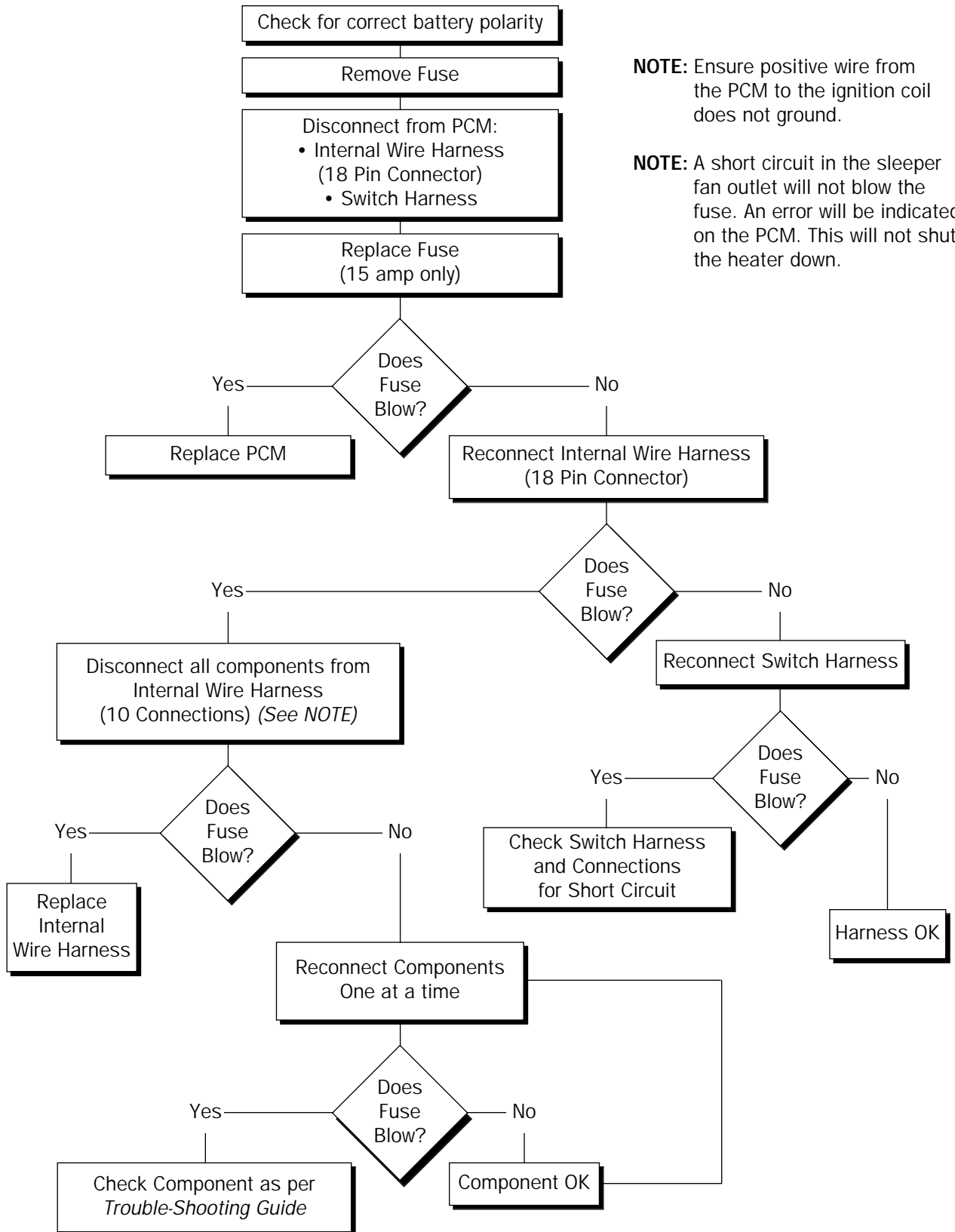


Figure 5-14 Internal Wire Harness Test

The opposite page describes the test procedure for a blown fuse with power connected and the PROHEAT switched off.

Fuse Blown Test Procedure with Power Connected and Proheat Switched Off



Nozzle

The nozzle (and the compressor) regulate the fuel air mixture. A set orifice size allows a certain amount of fuel and air to flow through the distributor. (See Figure 5-12) Problems in the nozzle can cause poor burning. This will be indicated by START ERRORS or FLAME OUT ERRORS on the PCM function display.

Check: Nozzle

- Inspect the wire mesh filter located in the fuel inlet fitting for blockage or debris.
- Inspect the nozzle for blockage.
- Clean or replace nozzle as necessary.

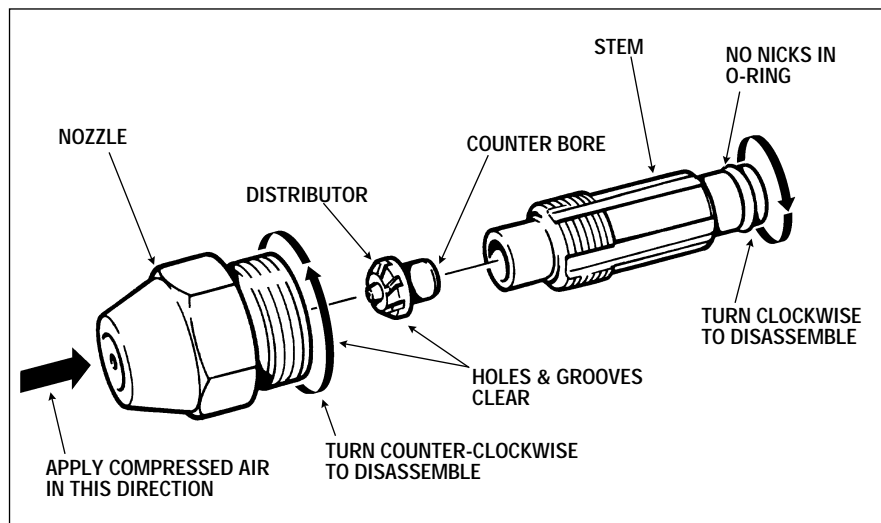


Figure 5-15 Fuel Nozzle Detail

Nozzle Cleaning Procedure:

- Remove nozzle from fan end.
- Disassemble nozzle as shown in figure 5-15.
- Use a cleaner/degreaser to thoroughly wash the separate parts.
- Dislodging contaminants in the distributor counterbore can be done by **lightly** hand spinning a drill bit (0.060" dia.) and then washing. See figure 5-16. DO NOT use a tip cleaner in the fuel orifice.
- Reassemble nozzle and torque to 30 inch pounds.
- Using compressed air for cleaning should only be applied in the direction indicated. See figure 5-15.
- Lubricate "O" ring with diesel fuel and re-install nozzle in fan end.

NOTE: See step 6 of Fuel Troubleshooting section page 5-29 to confirm that the nozzle is functioning correctly.
All nozzles' parts are matched, do not interchange.

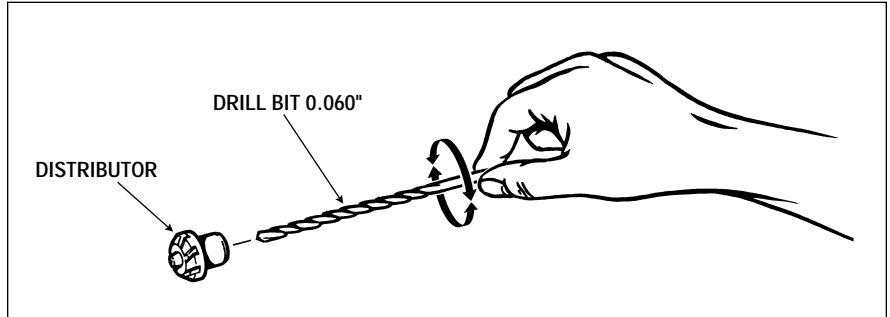


Figure 5-16 Fuel Nozzle Distributor Cleaning

Fuel Regulator

The fuel regulator reduces the fuel pressure supplied by the fuel pump from 5 psi (0.34 Bar) down to atmospheric pressure. Compressed air flowing through the nozzle creates a venturi effect which siphons fuel from the regulator. If the compressed air flow through the nozzle stops, the regulator closes, shutting off the fuel flow.

Check: Fuel Regulator.

- a) Ensure that the vent hole in the regulator is not plugged.
- b) Ensure that all fuel line connections are tight. Check the clamps.

Test Procedure:

- a) Disconnect the fuel line at the nozzle fuel inlet fitting and place it in a container.
- b) Start the heater. Insert a small blunt pin in the regulator vent hole and **GENTLY** depress the diaphragm inside.
- c) Fuel should flow out of the fuel line. If there is no fuel flow, the regulator is plugged.

NOTE: Should a fuel regulator fail, the combustion chamber must be checked for carbon build up and cleaned as necessary.

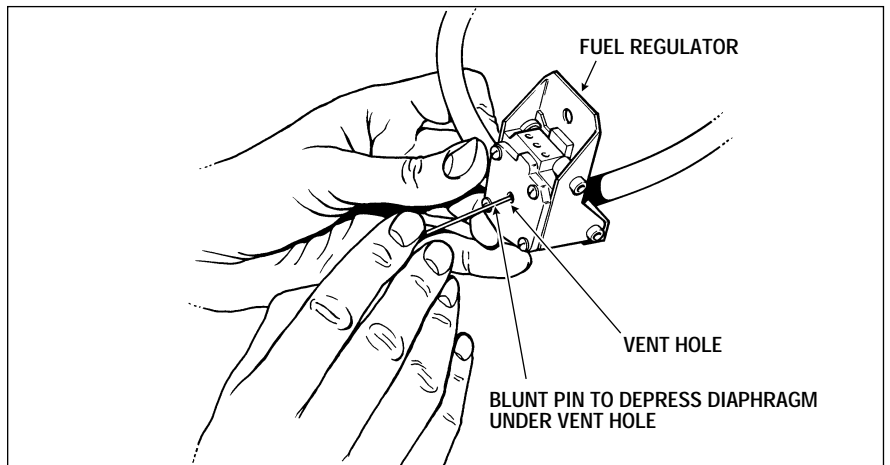


Figure 5-17 Fuel Regulator Test

Fuel System

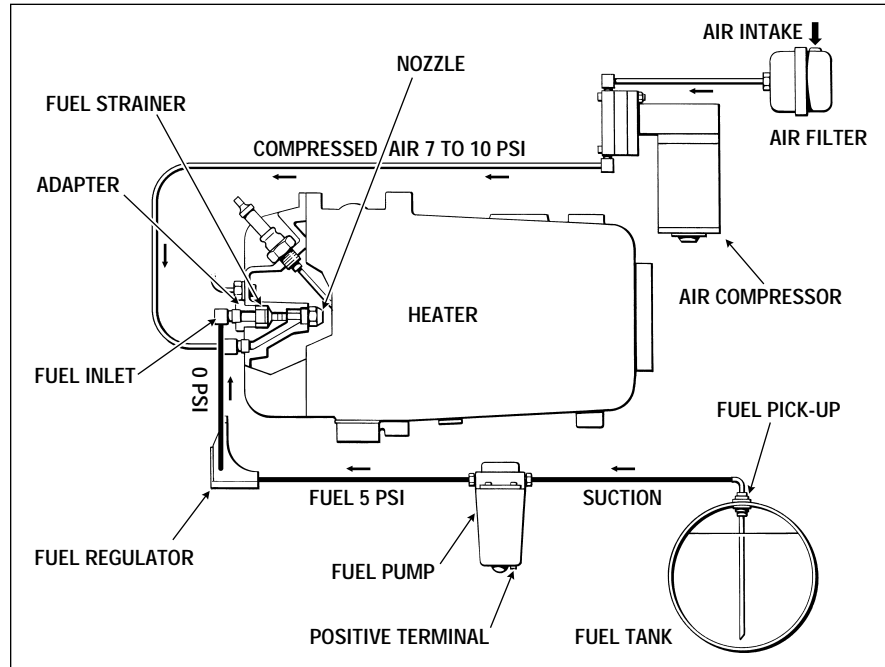


Figure 5-18 Fuel System Schematic

- Step 1** Is there fuel in the tank?
- Step 2** Start the Proheat. The heater will try to start twice. Wait until it has gone through two cycles (approx. 10 minutes). The Proheat diagnostic system will tell you what it thinks is wrong. While it is running observe for:
- Is there a flame?
Yes, means there is ignition and fuel. See "Is the ignition turning off".
No, go to step 3.
 - Is the ignition light turning off?
Yes, then the Flame Sensor sees a flame.
No, then the flame is either too weak or the Flame Sensor and/or circuit is faulty. See Flame Sensor page 5-9 in the Service Manual.
- Step 3** Does the Fuel Pump work?
This component must be tested before proceeding with further troubleshooting.
- While running the Proheat, check for a pulsing fuel pump by feel or sound.
 - Check for power to the fuel pump positive terminal. See figure 5-18.
 - Disconnect the fuel line at the inlet to the regulator. Start the Proheat. Check fuel flow. Approx. 1/2 litre in 60 seconds.
 - Run the fuel pump using remote electrical power, (take power from the ignition coil positive post).
 - Check the Proheat internal harness ground wire for open circuit. See wiring diagram page 6-7 of Service Manual.

Step 4 Does the Regulator work?

- Disconnect the fuel line at the fuel inlet fitting, hold the line at the same level as the inlet. Start the heater, there should be no fuel flow. This indicates that the regulator is holding the fuel pressure.
- Lightly push on the regulator diaphragm (use a blunt tool), fuel should flow from the line.

NOTE: A regulator that is stuck open will produce a rich flame.
Blockage in the regulator needle valve seat will produce a lean flame.

Step 5 Does the Compressor work?

- Check the pressure output as described in the Service Manual page 5-14.

Step 6 Isolate the Nozzle and Compressor.

- Split the fuel system by drawing fuel from a remote source. To do this disconnect the fuel line at the outlet of the fuel regulator, put this end into a small container of fuel that is about the same level as the regulator centre. This will eliminate the fuel pump and the regulator from the system. Start the heater and if there is still a fuel problem then it has to be in the Compressor or Nozzle.

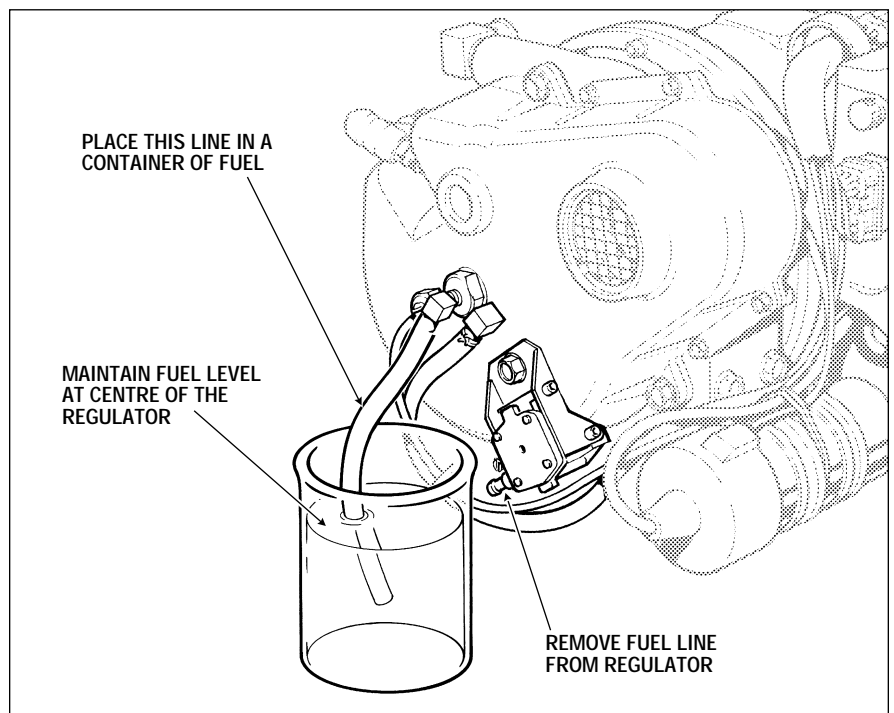


Figure 5-19 Eliminating Fuel Pump and Regulator from system.

Step 7 Is the Fuel Nozzle contaminated? (See Nozzle page 5-26)

- Clean the nozzle with a cleaner/degreaser, which will wash contamination out the back end of the nozzle.

OPERATIONAL PROBLEMS

Heater Operational Problems that are not specifically described in the function or component errors section.

COMPLAINT

Smoking exhaust Smelly exhaust fumes

These symptoms are usually an indication of an extremely rich air/fuel mixture.

Check:

- a) Is the PROHEAT connected to the correct voltage?
(See page 5-6)
- b) Is the blower functioning? Is the air inlet restricted?
- c) Is the compressor functioning? (See page 5-14)
- d) Is the exhaust restricted?
- e) Is it a new heater? New heaters may smoke for 15 minutes as oil is burned off the exhaust pipe. This is normal.

Low heat output

If the heater appears to be functioning properly but the driver complains of low heat this is often indicative of a coolant flow restriction.
(See section on Coolant Flow Error page 5-4)

Engine temperature gauge reads low

Depending on its location, the engine temperature sensor may not be directly in the path of coolant flow from the heater. In these cases the gauge may read significantly lower than actual coolant temperature.

Backfiring

Backfiring occurs when there is air in the fuel supply lines.

Check:

- a) Fuel level in tank – is the pick-up submerged?
- b) Air leaks – are all the fuel line clamps tight?
- c) For severely restricted combustion air blockage at the blower inlet, in the combustion chamber, or in the exhaust system.

6.0 MAINTENANCE

ANNUAL MAINTENANCE

Your PROHEAT heater has been designed to operate with a minimum of maintenance. Check the system annually before each heating season. There are several maintenance procedures you can perform to keep your heater in service. Read this section of the manual carefully.

Always return to your authorized PROHEAT dealer for major maintenance. Your PROHEAT dealer has the specialized equipment necessary to keep your PROHEAT in new condition.

Clean Heater Enclosure

Remove the heater enclosure cover and blow out the compartment with compressed air. Clean any accumulated debris or dust from the components. Make sure the opening around the exhaust pipe is clear. Visually inspect all the components for wear or damage.

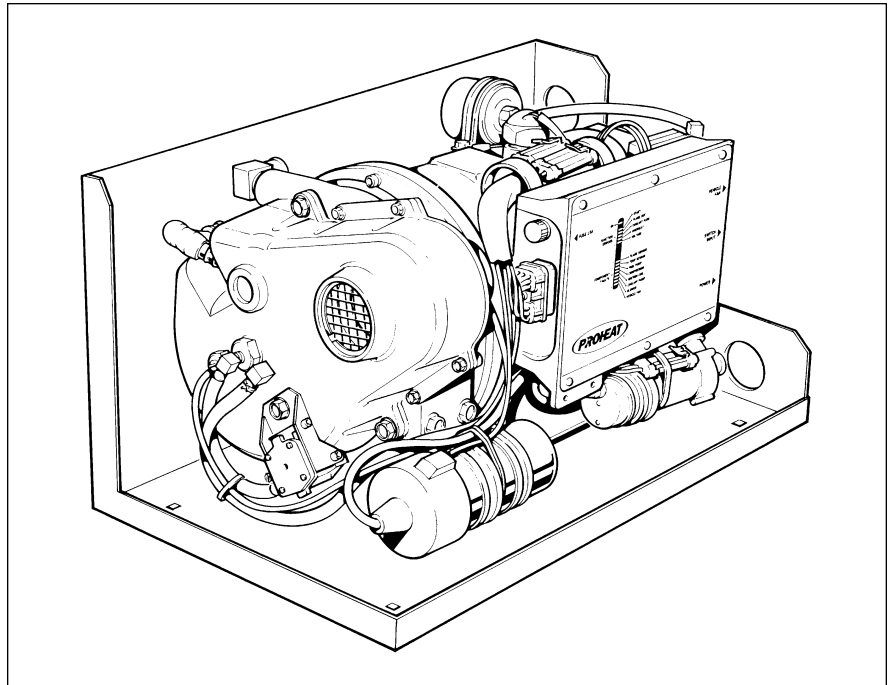


Figure 6-1 PROHEAT Heater & Enclosure

NOTE: Running the heater year round is a good maintenance practice.

Heat Exchanger

To maintain optimum heat output, clean any combustion deposits that may have accumulated on the heat exchanger fins.

Remove ignition lead from ignition electrode.

Remove blower connector.

Remove the 3 bolts securing the fan end assembly.

Remove the fan end assembly and combustion tube to access the inside of the heat exchanger. Use a wire brush to loosen the deposits and an air hose to blow them out.

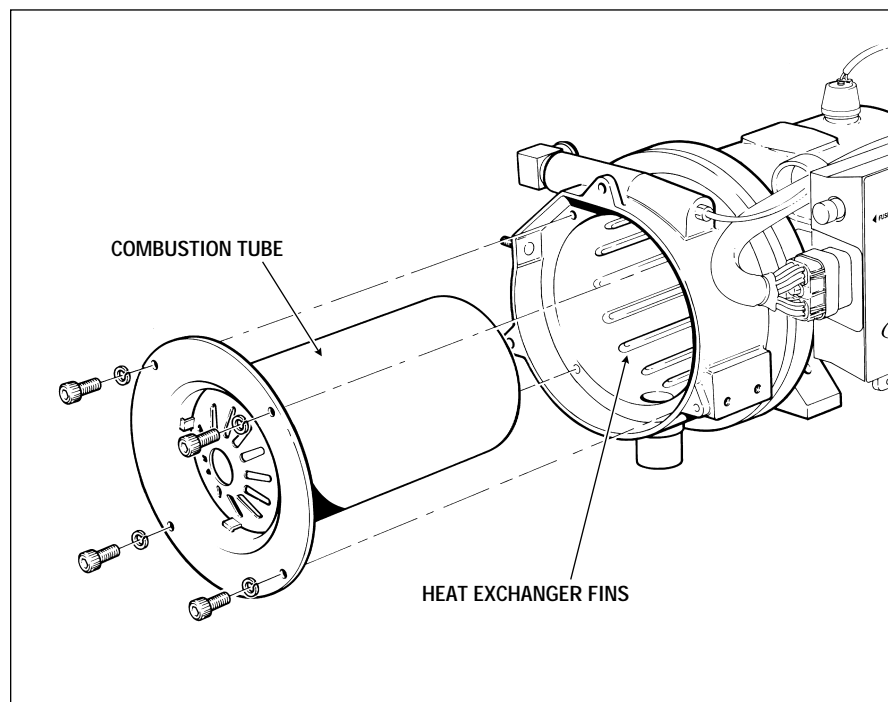


Figure 6-2 Heat Exchanger Fins Access.

Exhaust System

Check the exhaust system carefully. Make sure the exhaust pipe is vented safely away from the vehicle cab. Check the pipe for dents, restrictions or severely corroded areas. Replace the exhaust pipe and clamps if necessary. Ensure the exhaust pipe clamp is tight.

Electrical System

Check the internal and the external wire harnesses for damage. Replace if required.

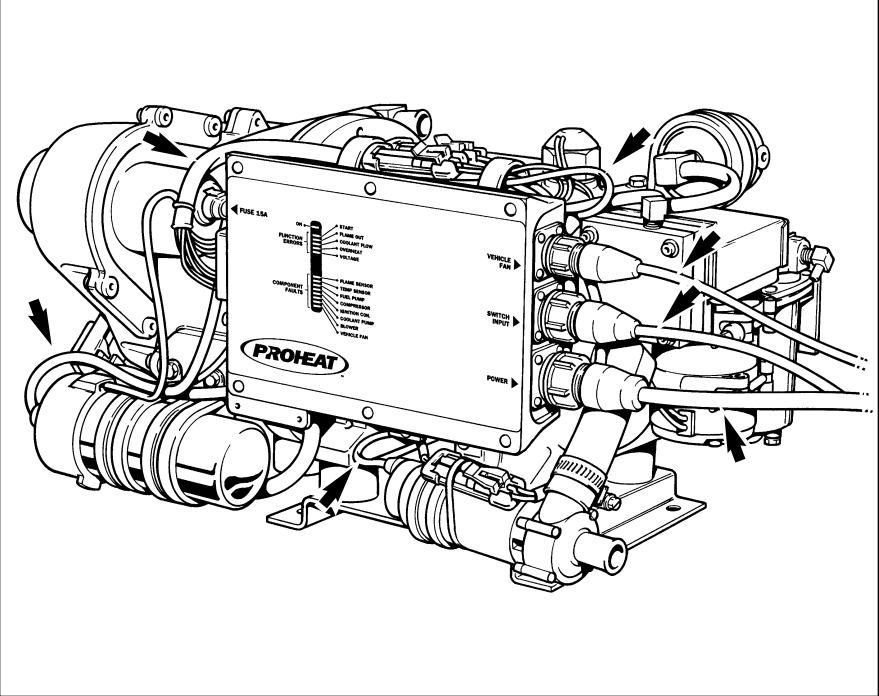


Figure 6-3 Wire Harnesses

Fuel Strainer

Remove and inspect strainer. Clean or replace as necessary.

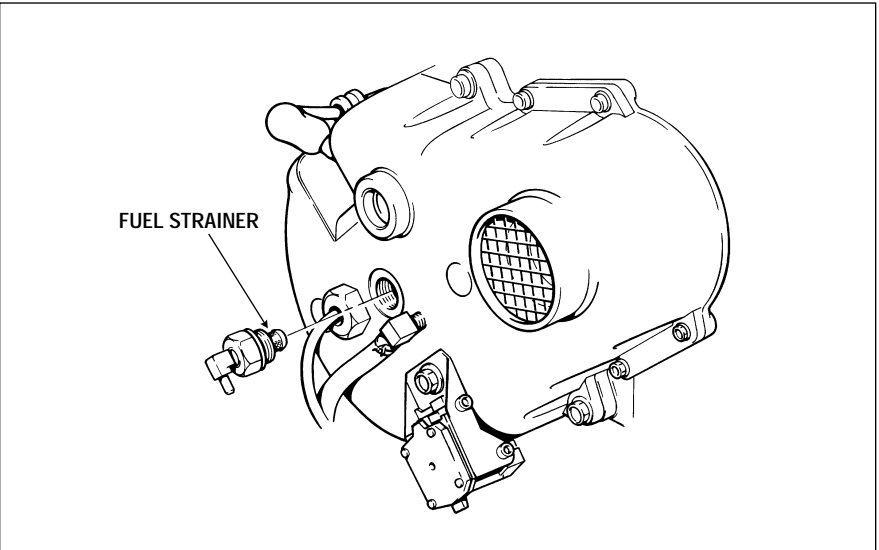


Figure 6-4 Fuel Strainer

Clean Air Intake

Check the combustion air inlet screen for restrictions. Clean as required.

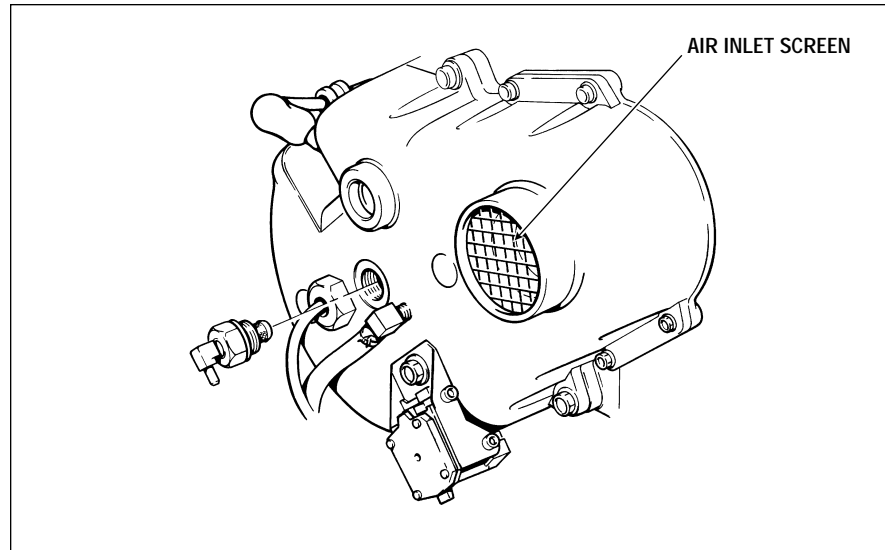


Figure 6-5 Air Intake

Compressor Air Filter

The air compressor is fitted with an inlet air filter to ensure clean air is supplied to the nozzle. Replace annually or more often if dusty conditions are encountered.

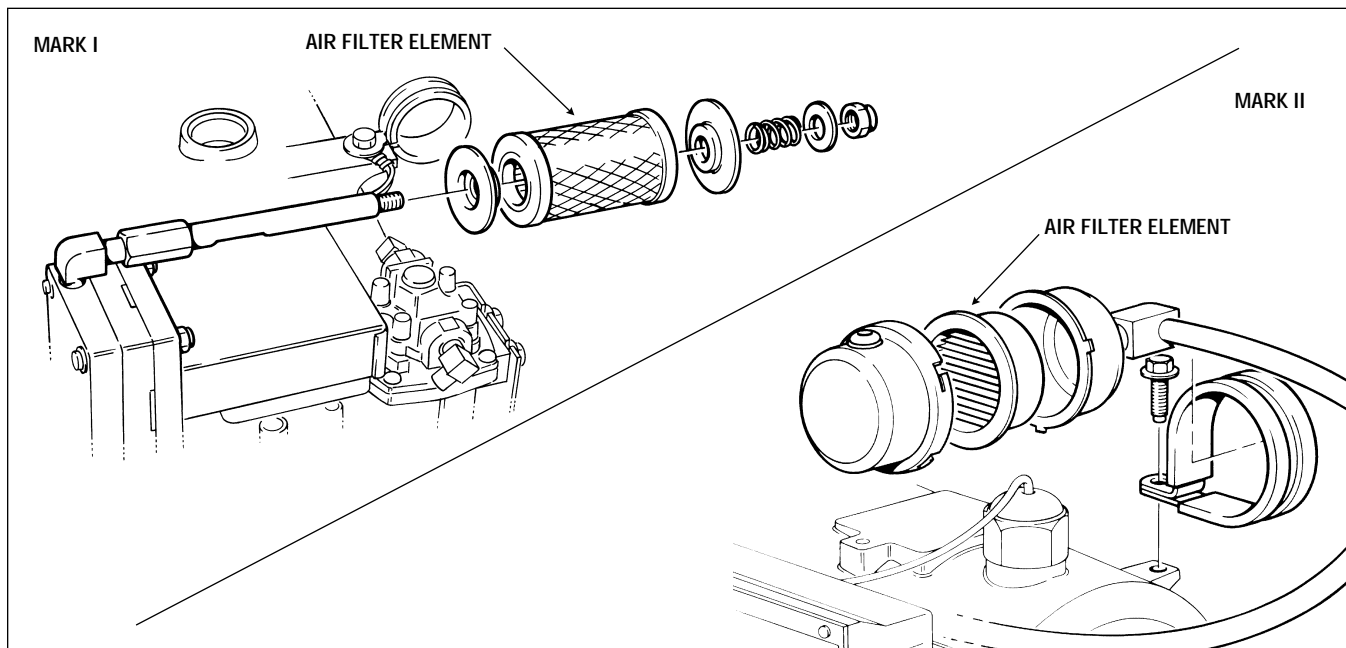


Figure 6-6 Air Filter/Compressor

Cooling System

Check all heater hoses and connections for signs of leakage or damage. Repair or replace as required.

Fuel System

Check the fuel system for damaged fuel lines or leakage. Make sure the clamps on the fuel lines are secure.

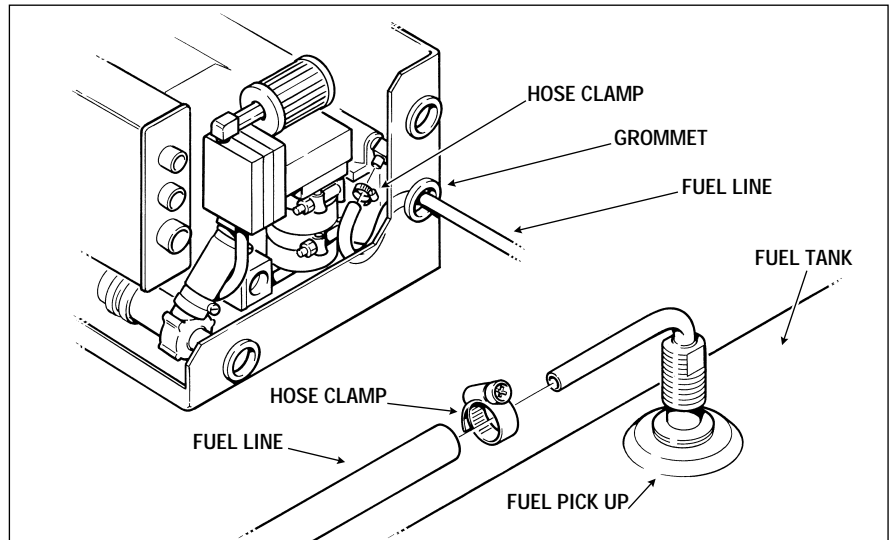


Figure 6-7 Fuel Line Clamp

Vehicle Batteries

Check the condition of the batteries and the power connections. The heater will not function properly with weak batteries or corroded connections. If you are unsure of their condition load test them and replace them as required. Clean terminals to remove all corrosion.

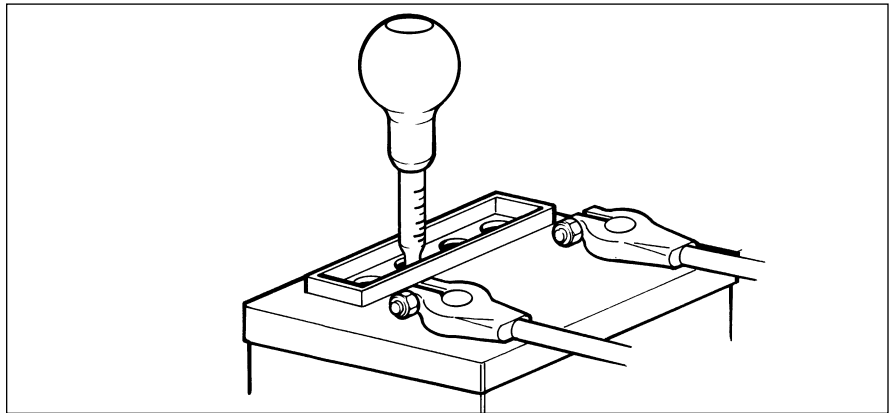


Figure 6-8 Test Battery

Operation Test

Run the system for at least 15 minutes or until the heater cycles off and then on again. Alternate the thermostat for the sleeper heater (if connected) between the lowest and highest settings to ensure that the sleeper heater fan cycles "ON" and "OFF".

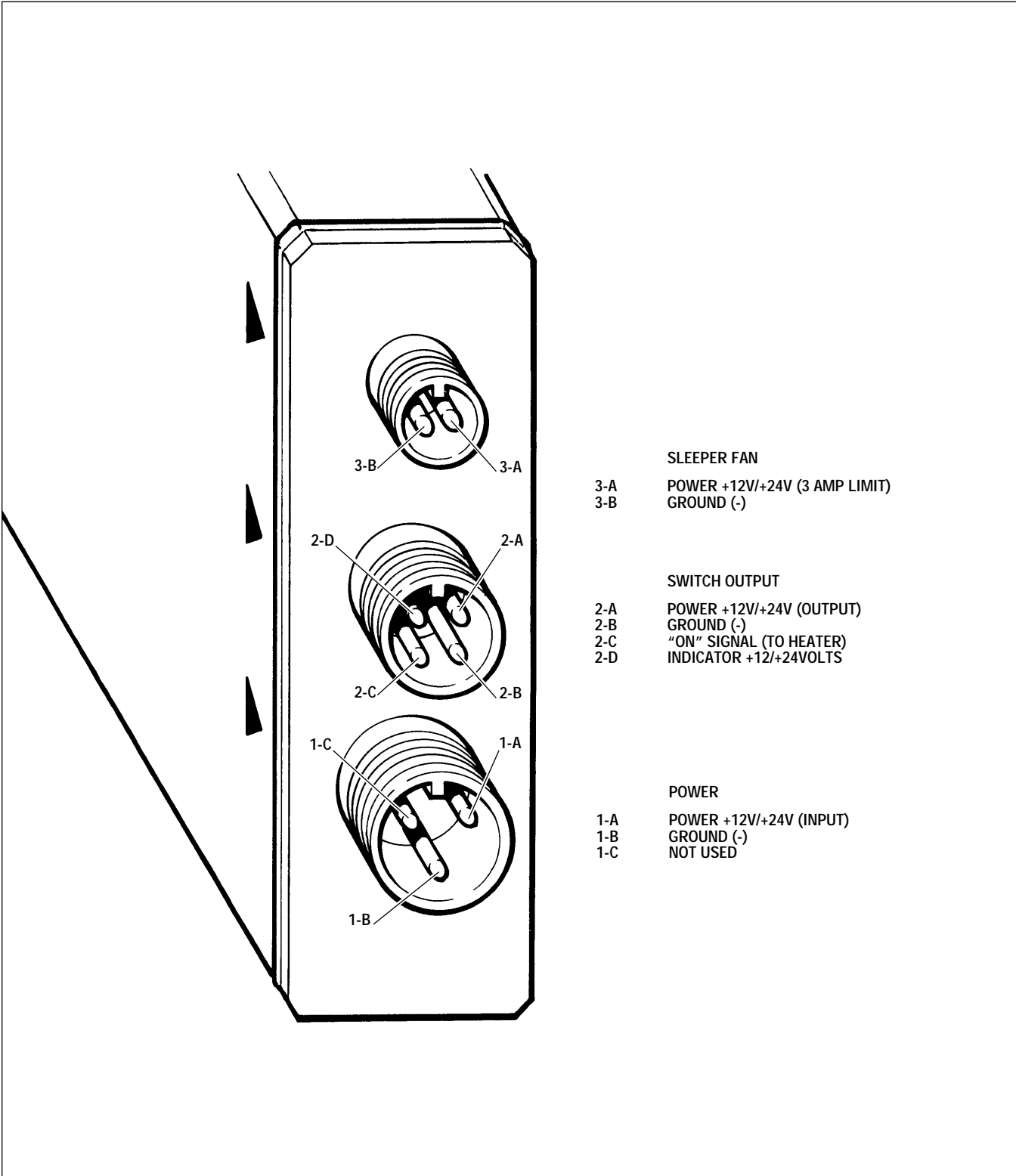


Figure 6-9 PCM: Pin-out Diagram

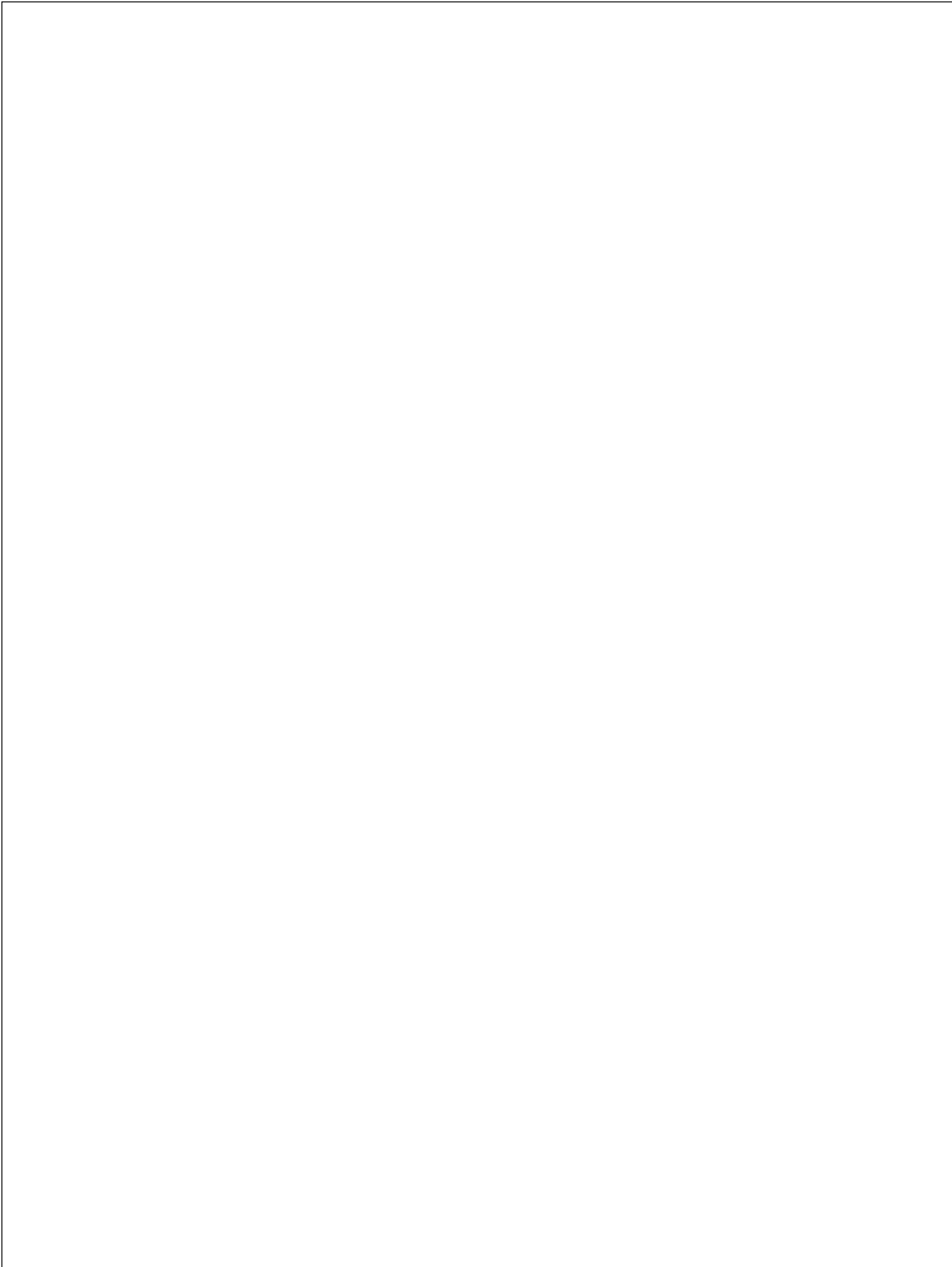


Figure 6-10 PROHEAT Wiring Diagram



PROHEAT WARRANTY

Teleflex warrants the PROHEAT Heater to be free of defects in material and workmanship under design usage and service conditions for two (2) years on parts and one (1) year on labour from the date of first installation. Replacement parts are covered for the remainder of the heater's warranty or ninety (90) days, whichever is greater.

This warranty does not apply to damage or failure of the PROHEAT heater or the vehicle into which it was installed due to improper installation, assembly, maintenance, abuse, neglect, accident, or the use of parts not supplied by Teleflex. Accessories supplied, but not manufactured, by Teleflex shall be covered by the manufacturer's warranty only and not subject to this warranty.

Non-standard installations, that is, those requiring a departure from published installation instructions, should not be undertaken without first having consulted Teleflex.

Coverage for warrantable parts, at the discretion of Teleflex will be made to the claimant in the form of repair, replacement or credit. Warranty labour payments will be made only to Registered Proheat Service Centres in accordance with the Standard Repair Times (SRT's) as published by Teleflex.

MARINE INSTALLATIONS

The purchaser and installer are advised that specific rules and regulations are in effect with respect to the installation of heaters in marine applications. These rules and regulations are enforced by the Department of Transportation and/or other agencies having jurisdiction. It is the installer's responsibility to review and comply with all such rules and regulations.

In addition each marine installation must be inspected and approved by an Authorized PROHEAT Dealer. Only those installations which are approved, and so registered, will be eligible for warranty coverage of one year on parts and labour.

THE WARRANTIES SET FORTH HEREIN ARE THE SOLE WARRANTIES MADE BY TELEFLEX IN REGARD TO THE PROHEAT HEATER SYSTEM. TELEFLEX MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OR OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

OWNER RESPONSIBILITIES

Before the expiration of the warranty, Owner must give notice to a registered PROHEAT dealer of failures, if any, considered to be warrantable and deliver the defective heater system to such dealer. Owner is responsible for the cost of all repairs made to the engine or equipment in which it is installed, other than the PROHEAT Heater system. Owner is responsible for lodging, meals and incidental costs incurred by the Owner as a result of a warrantable failure. Owner is responsible for "down-time" expenses, and all business costs and losses resulting from a warrantable failure. **TELEFLEX IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.**

Items Covered Under This Warranty

1. Basic Heater including combustion chamber components, fuel system components, air compressor, ignition components, coolant pump, air blower.
2. Electrical controls provided by PROHEAT including cab mounted controls and PCM.
3. PROHEAT supplied accessories and mounting hardware.

Items Not Covered Under This Warranty

1. Heaters no longer within the warranty period.
2. Normal wear and maintenance parts, including fuel filter, air filter, nozzle, and lamps.
3. Parts which malfunction due to improper installation, causing inadequacies in: air, fuel or coolant flow; voltage due to wiring; shock or vibration protection.
4. Any progressive damage to the engine or vehicle arising out of failure of the PROHEAT Heater unit.
5. Heaters which have been modified or use of non-standard parts not approved by Teleflex.
6. Heaters that have been abused or damaged.
7. Travel time by a PROHEAT dealer.
8. Diagnosis or repairs when caused by problems not directly related to the heater or due to empty fuel tanks or poor fuel quality.

If you have any questions or concerns about the PROHEAT Warranty, contact your nearest PROHEAT Distributor or Teleflex Canada Ltd. at 1-800-667-4328.

8.0 APPENDICES

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AIR COMPRESSOR PRESSURE TEST	969023
OVER FUELING	SB0001
GROUND SIDE BATTERY DISCONNECT	SB0003
FUSE HOLDER KIT.....	SB0010

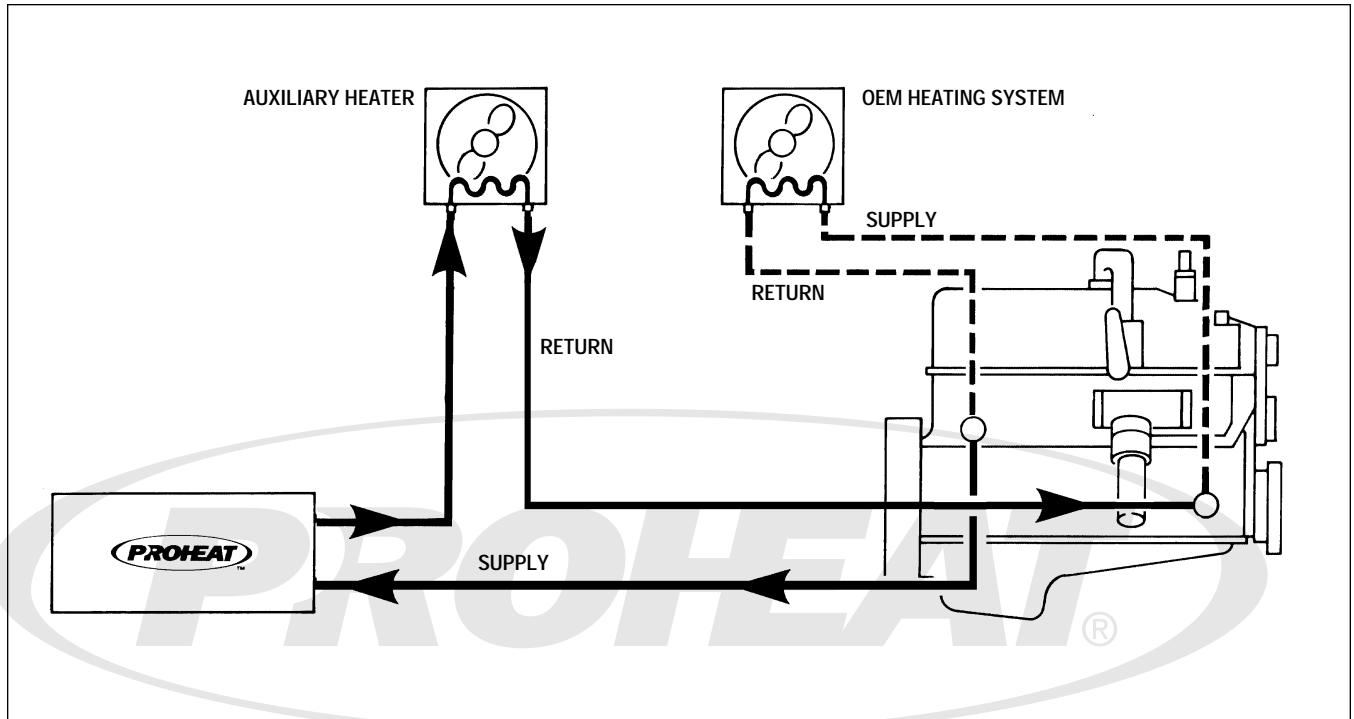


Service Bulletin

951321

October 1993

Description: International Trucks with sleeper under passenger seat – Plumbing



Purpose:

The OEM system is designed for use while the engine is running. For trucks using a PROHEAT or other fuel-powered heater, a low current draw auxiliary heater is recommended for maximum battery life.

NOTE:

Use separate air ducting for auxiliary heater.

DO NOT connect into OEM ducting.



Service Bulletin

951528

October 1993

Description:
Coolant Flow Indicator

Part:

TK9002

Purpose:

The Coolant Flow Indicator is a service tool used to troubleshoot and test for possible flow and air problems in the coolant flow path. Flow direction during heater operation or during engine operation can then be observed.

FLOW INDICATOR
TK9002

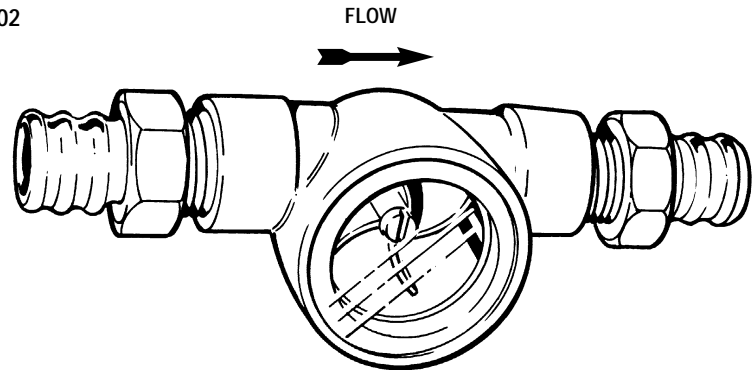


FIGURE 1

FLOW INDICATOR
TK9002

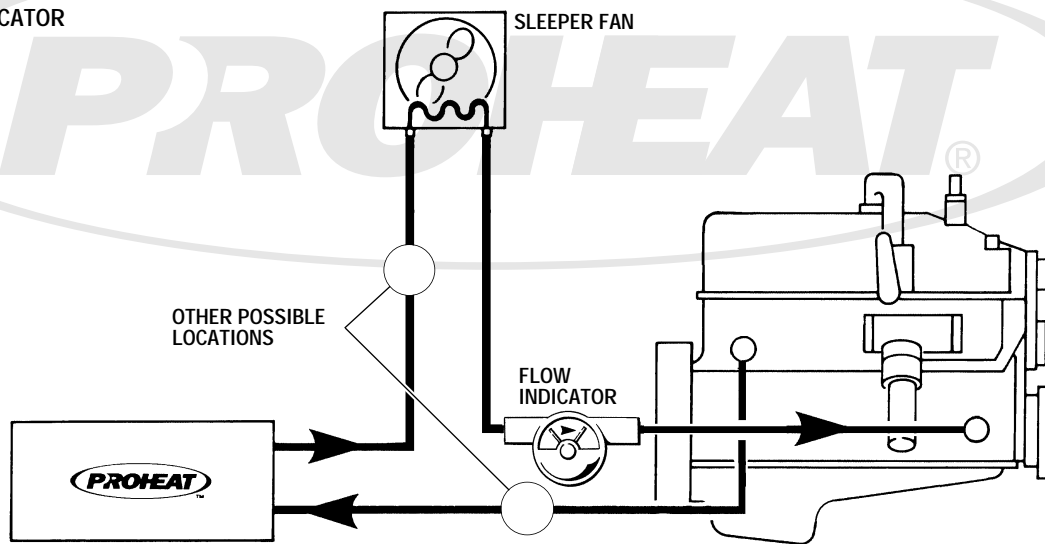


FIGURE 2



Service Bulletin

967121

March 1994

Description: **Blower/Regulator Service Tip**

In the event that either the combustion blower or the fuel regulator should fail it is advisable to check the Heat Exchanger for carbon build up. This will require the removal of the combustion tube as described in the service manual. *(Page 6-2 Heat Exchanger)*

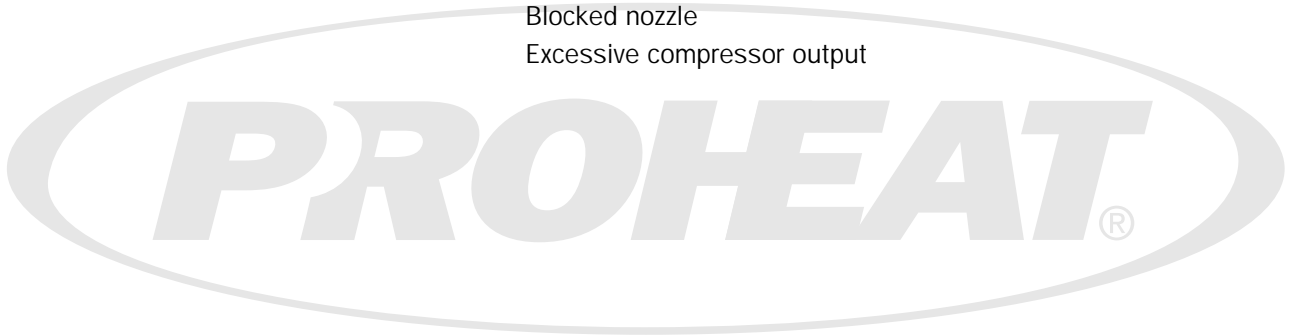
Carbon build up is caused by rich fuel mixture which is symptomatic of:

A: INHIBITED COMBUSTION AIR FLOW

- Combustion blower failure
- Blocked air intake
- Blocked exhaust

B: OVER FUELING

- Pressure regulator failure
- Blocked nozzle
- Excessive compressor output





Service Bulletin

967329

May 1994

Description:

The PROHEAT wiring system uses sealed connectors for resistance to corrosion and greater reliability. The following test leads are required for troubleshooting.

Parts:

- 967921 Test Lead
- 967422 Test Lead
(Blower only)
- 952925 Remote Test Lead

Instructions:

1. Test Lead #967921 is used for measuring voltage, resistance, continuity or amperage and can be used on all components except for the blower. Direct voltage can be applied to the compressor and water pump by wiring from a remote power source to the spade connections.
2. Test Lead #967422 is used for measuring voltage, resistance, continuity or amperage and is used for the blower circuit only. Direct voltage can be applied to the blower by wiring from a remote power source to the connectors.
3. The #952925 Remote On/Off switch allows the service technician to plug into the heater at the switch input of the PCM. This allows the heater to be turned On/Off at the unit.

NOTE:

This Service Bulletin supercedes Service Bulletin #951621.

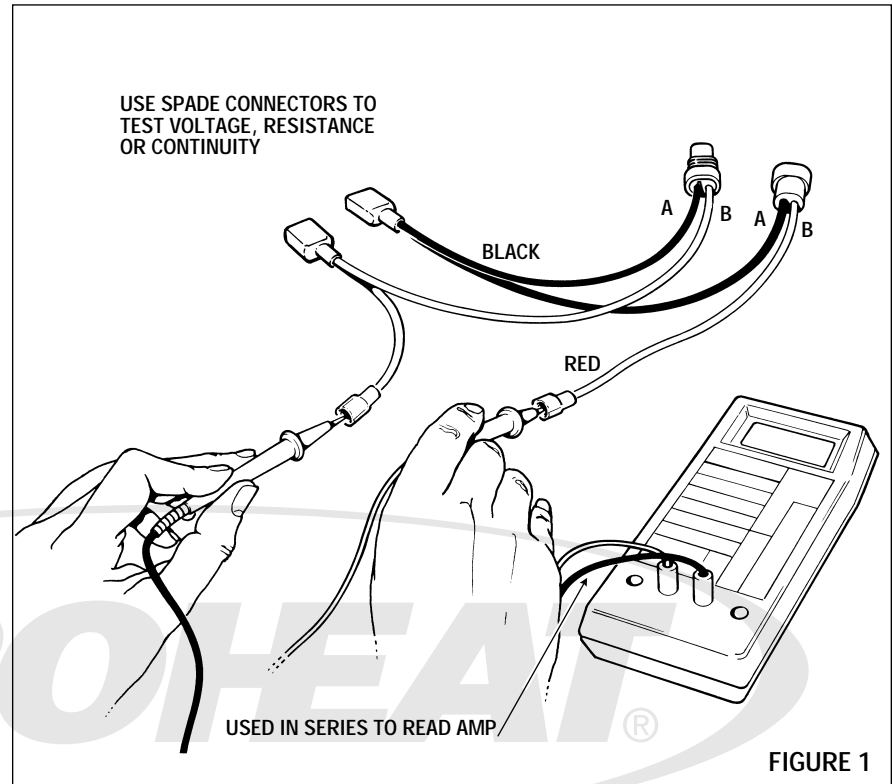


FIGURE 1

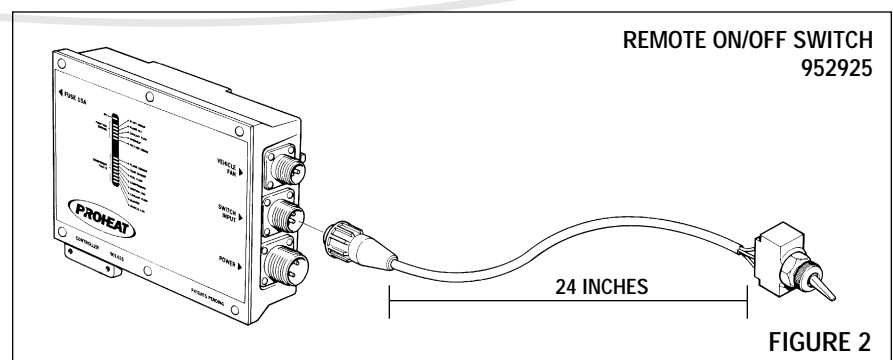


FIGURE 2



Service Bulletin

968228

May 1994

Description: Update Notice for Mark I Air Compressor Filters

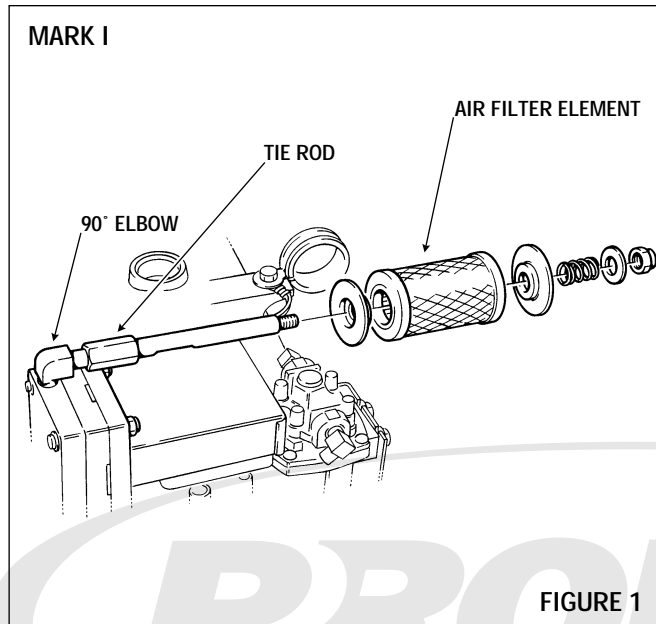


FIGURE 1

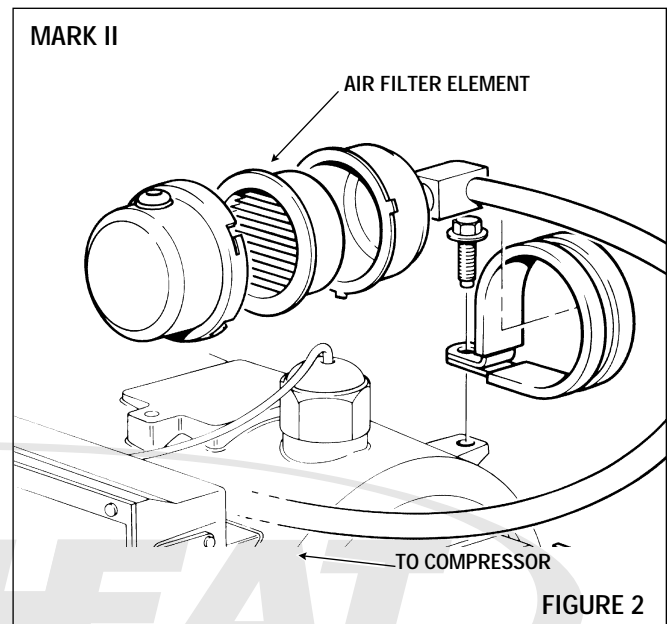


FIGURE 2

Purpose:

Converting Mark I heater air compressor filter configuration to the Mark II air compressor filter configuration. . .
The new configuration provides greater protection for the filter and reduces noise level.
Update configuration requires the following parts.

Parts:

- | | |
|------------|--|
| 1 - 936227 | Filter, Air Assembly, MKII c/w element |
| 1 - 936829 | Clamp, cushioned |
| 1 - 842123 | Elbow, 3/16" hose x 1/8" N.P.T. |
| 1 - 842020 | Hose, Air & Fuel, 3/16" ID 1 ft. |

Instructions:

Remove the old filter assembly by unscrewing the tie rod at the 90° elbow. Replace the 90° elbow with elbow part #842123.

Use part #936829 to attach the filter assembly, part #936227, to the ground stud boss, located at the back of the heater.

Use part #842020 to join the filter assembly to the 90° elbow on the compressor head. Cut the hose to length. Leave some slack in the hose.

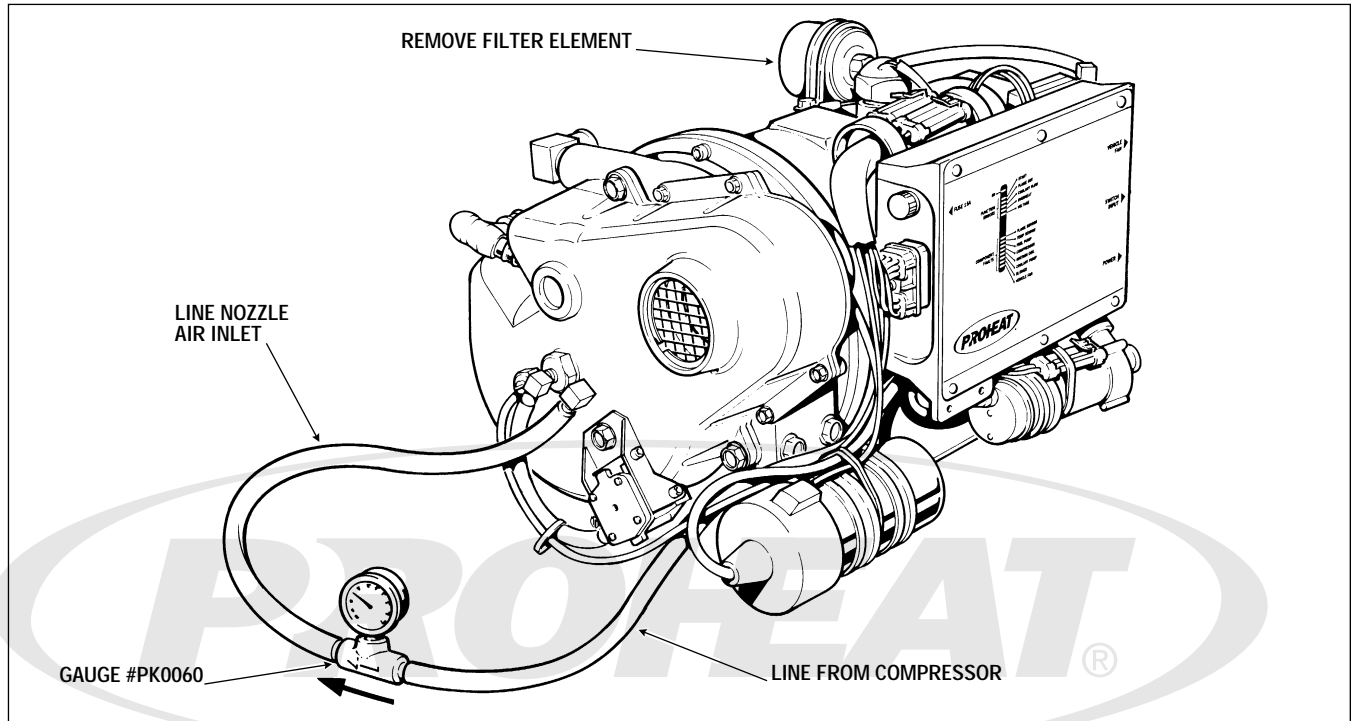


Service Bulletin

969023

March 1996

Description: Air Compressor Pressure Test Kit (Teleflex Part# PK0060)



Purpose:

This tool is used to check for proper air/fuel delivery through the nozzle.

Instructions:

Install the pressure gauge (Teleflex part #PK0060) in line at the air inlet to the nozzle as shown above. Perform this test with the compressor filter installed and removed. This will check the filter for restrictions.

Readings that are above the pressure ratings, indicate a blocked air passage in the nozzle and would show up as a lean flame. If the pressure reads OK and the flame is lean, check the nozzle fuel passage.

(See Nozzle page 5-26 in the PROHEAT Service Manual)

Readings that are below the rated pressure, indicate a problem with the compressed air system.

This would show up as a lean flame or wet carbon build-up in the PROHEAT combustion chamber, due to improper mixing of the fuel.
(See Air Compressor page 5-14 in the PROHEAT Service Manual)

At FULL OUTPUT, the pressure readings should be within the following limits:

XL900 6 - 9 psi @ 12/24 volts
XL1500 8 - 11 psi @ 12/24 volts



Service Bulletin

SB0001

March 1995

Description: OVER FUELING

Production note: Some 1994 production heaters may have this over-fueling condition. Mid February 1995 and forward do not have high pressure compressors and are preset at the factory

Cause: High compressor output, drawing too much fuel into the system.

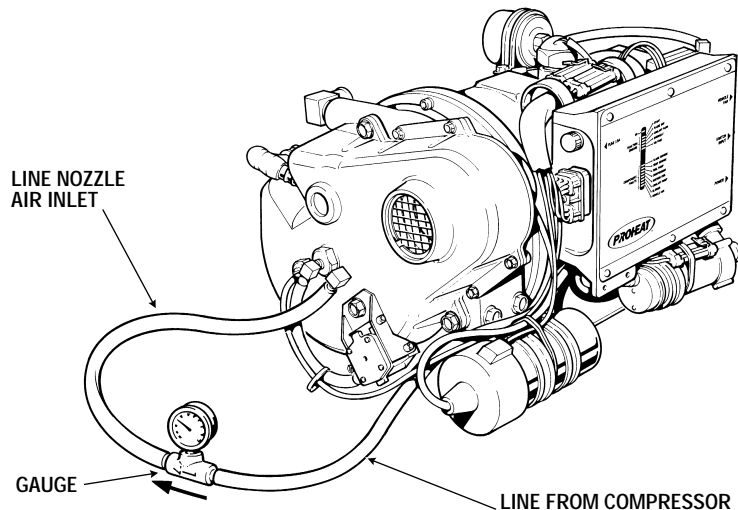
- Symptoms:**
- Discolored and/or distorted flame sensor.
 - Exhaust odor and haze.
 - Fuel combustion sound (uneven flame noise).
 - Normal looking flame.
 - Heavy carbon buildup in the combustion chamber.

Note: A faulty blower may also cause a flame sensor to discolor and/or distort. Other possible symptoms are blower fan distortion, carbon build up in the fan-end casting and combustion chamber and an extremely yellow flame. See Service Manual for further information.

Instructions:

1. Check combustion chamber and clean if necessary.
2. Install a pressure gauge (Teleflex #PK0060) in line as shown.
3. Start Proheat. Air pressure reading should fall within the range listed below, while measuring the voltage at the coil as described in the service manual.
4. If the compressor does not read within the range listed in the chart, replace the compressor.
5. If the compressor reads within the range listed in the chart, check the combustion air blower as noted.

Coil Volts	P.S.I. (Range)
10.5	4.8 – 6.8
11.0	5.0 – 7.0
11.5	5.4 – 7.4
12.0	5.8 – 7.8
12.5	6.1 – 8.1
13.0	6.3 – 8.3
13.5	6.5 – 8.5
14.0	6.6 – 8.6





Service Bulletin

SB0003

June 1995

Description: Ground Side Battery Disconnect

Purpose: This service bulletin includes troubleshooting steps and protection recommendations from damage, that may occur when attempting an engine start while the ground side battery disconnect switch is in the "open" position. A Proheat is typically connected directly to the batteries so that it can be used to preheat the coolant when the ground side battery disconnect switch is "open". If the operator (driver) attempts to start the engine with this switch "open" the entire electrical current from the starter motor attempts to pass through the proheat internal wiring harness. Without adequate fuse protection the Proheat ground circuit in the internal harness and/or controller will be damaged.

Test Procedure: The symptoms may include a START error or FLAME OUT error. The fuel pump will not operate if the Proheat ground circuit has been damaged, resulting in intermittent operation of the Proheat.

1. Start the Proheat. Check that the fuel pump is running. Approximately 20 to 40 pulses per minute can be felt or heard. Check for voltage at the fuel pump power terminal.
2. If the fuel pump does not operate, ground the body of the fuel pump directly to the battery negative post using a wire. Restart the Proheat. If the fuel pump runs and the Proheat starts then the problem is in the ground wire.

Note: It is possible to get a partial ground for the fuel pump if the exhaust pipe is contacting the machine frame and the ground side battery disconnect switch is closed.

3. To locate the fault in the ground circuit, first check the internal harness. The ground wire is black with a green stripe. Remove the 18 pin connector from the controller and check for continuity between the ground pin (Pin C3) and the ring terminal. See Figure 1 (over). If a fault is found replace the harness. Next, check the controller by measuring for continuity between pin C3 on the controller 18 pin connector and pin B at the power harness connector. See Figure 2.
4. If the fuel pump did not run in step 2 refer to Fuel Pump, Start error and Flame Out error in the troubleshooting section of the Service Manual.

Recommended Method of Protection:

1. Install a 10 amp in-line fuse on the ground wire (black with green stripe) of the Proheat harness. Proheat Part# PK0310.
2. Ensure that the Proheat exhaust pipe does not contact vehicle chassis.
3. If possible rewire the disconnect switch to the positive side of the battery.

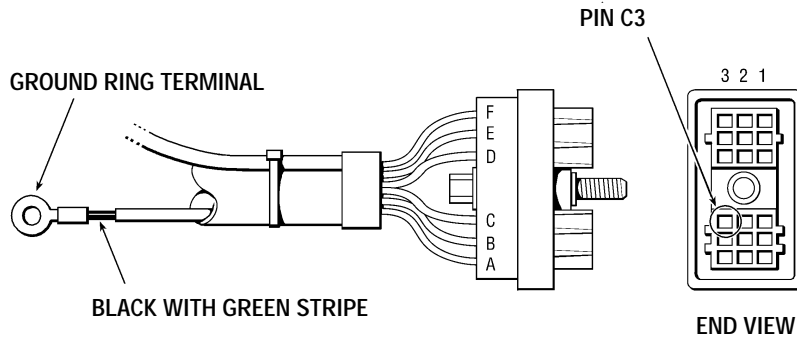


FIGURE 1

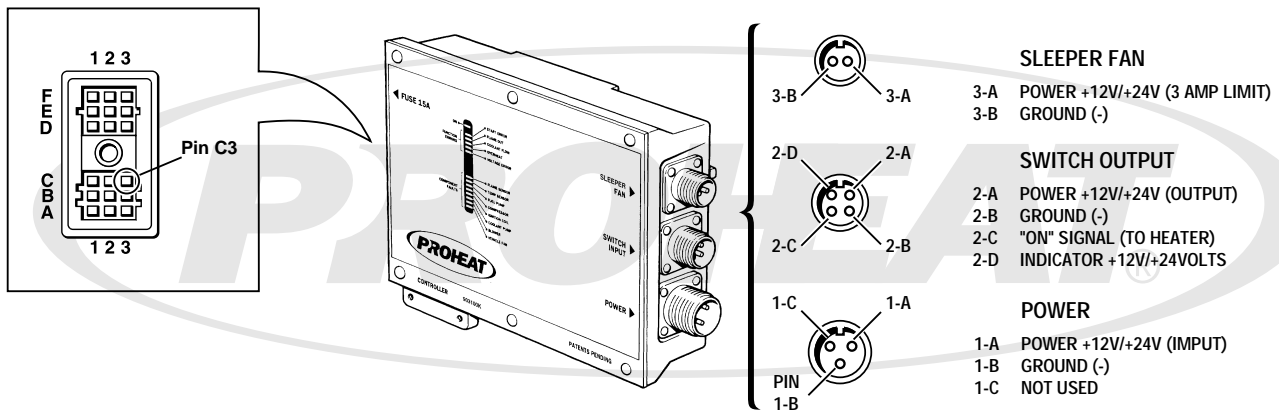


FIGURE 2



Service Bulletin

SB0010

September 1997

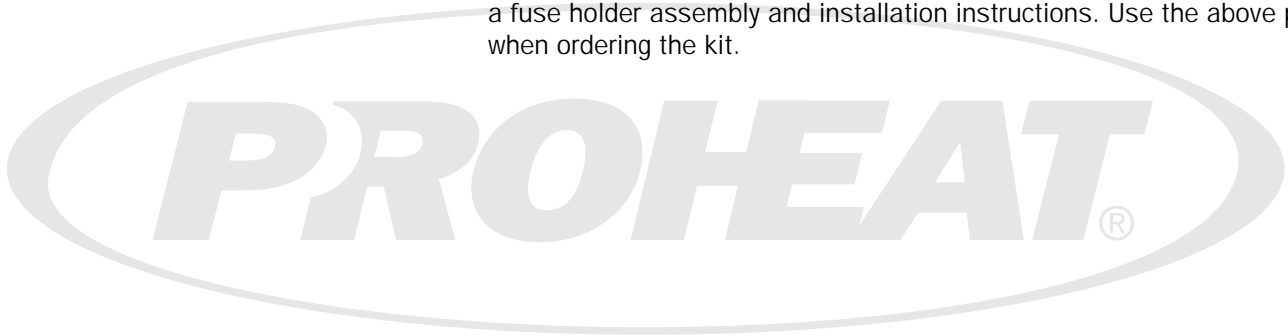
Description: Fuse Holder Kit (Part #90001K)

Purpose: There is now available a replacement fuse holder kit for controllers that have a faulty fuse holder.

Symptoms:

- Timer resetting due to interruption of power. (Flashing 12:00)
- Proheat operating intermittently. Works one day but not the next.
- Fuse holder loose in the controller housing.
- Fuse holder cap not locking in place, falling out.
- Random error codes.

Instructions: Should the Proheat have some of the above symptoms, the fuse holder should be checked and replaced if necessary. This replacement kit include a fuse holder assembly and installation instructions. Use the above part # when ordering the kit.



PROHEAT Serial Number:

Installation Date:

Dealer:



Teleflex Canada

3831 No. 6 Road
Richmond, B.C.
Canada V6V 1P6

Tel: (604) 270-6899
Fax: (604) 270-0137

www.proheat.com



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in North America

Printed in Canada

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