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Installation Instructions

CSM Circulating System

READ CAREFULLY FOR PROPER INSTALLATION & OPERATION

When ordering replacement parts,
be sure to have your specific model number.

System Overview

Shown are standard CSM heating system configurations. This circulating heating system consists of a coolant heating tank, heating element, adjustable thermostatic control, a centrifugal pump, a control box with electro-mechanical controls and a mounting bracket.

Basic System Operation

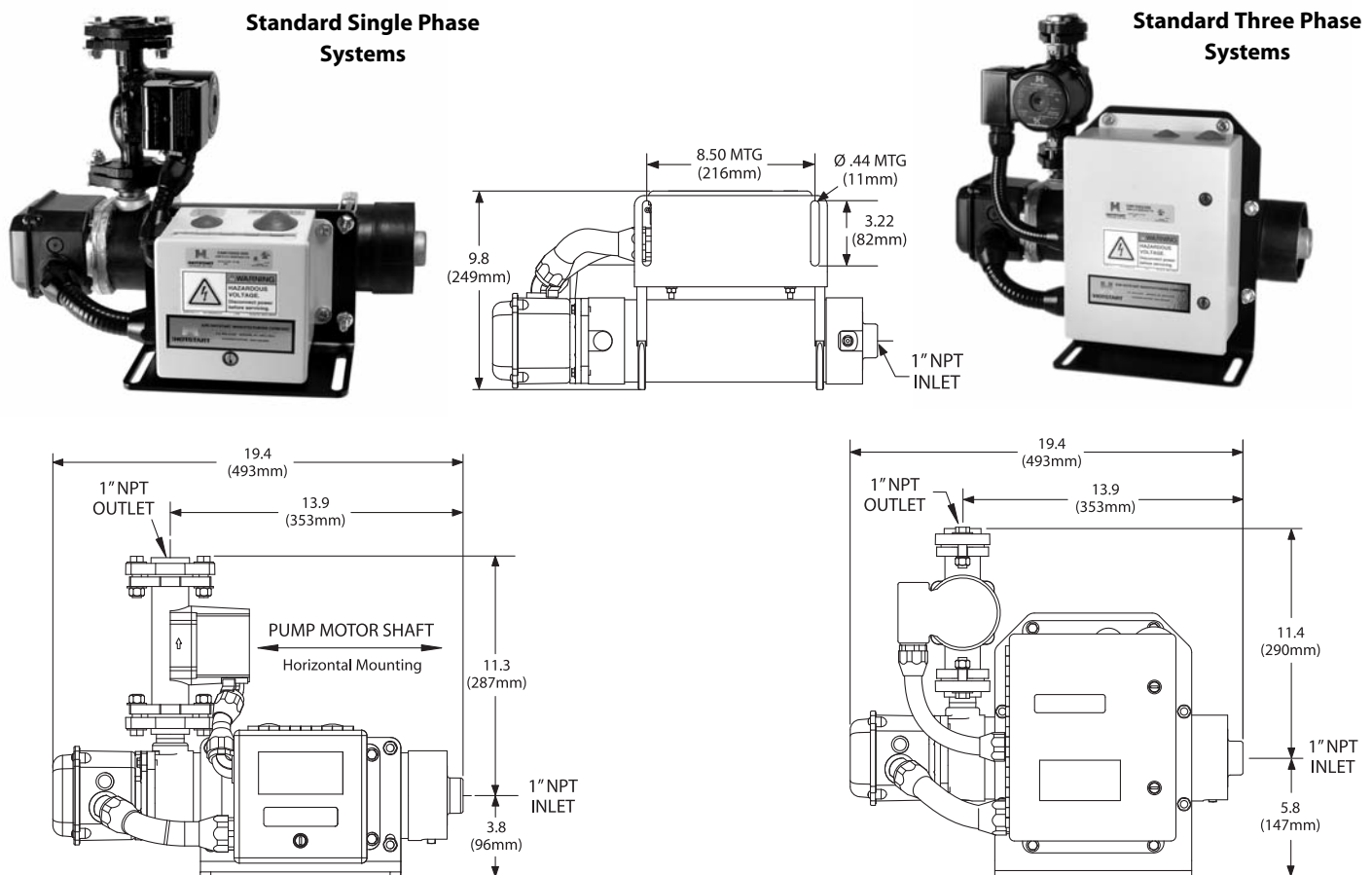
Upon energizing the system, engine coolant is circulated via the centrifugal pump, through the heating tank and back to the engine. The pump stays on and continues this circulation process even when the heating elements are off to ensure uniform engine temperatures. An adjustable thermostat cycles the heating element on and off based on coolant temperature. A 24VDC signal is required to de-energize the system when the engine is running.

System Mounting Requirements

The CSM heating system must be mounted in the horizontal position. *The pump shaft must be in the horizontal position at all times for proper lubrication and cooling of shaft end bearing.* Refer to drawing on page 2.

Be sure to mount the system as low as possible in reference to the engine coolant level.

DO NOT mount the heating system directly to the engine (the system must be isolated from engine vibration). **DO NOT mount directly to the skid if the engine is not isolated from the skid.**



System Installation

— Coolant Supply Line —

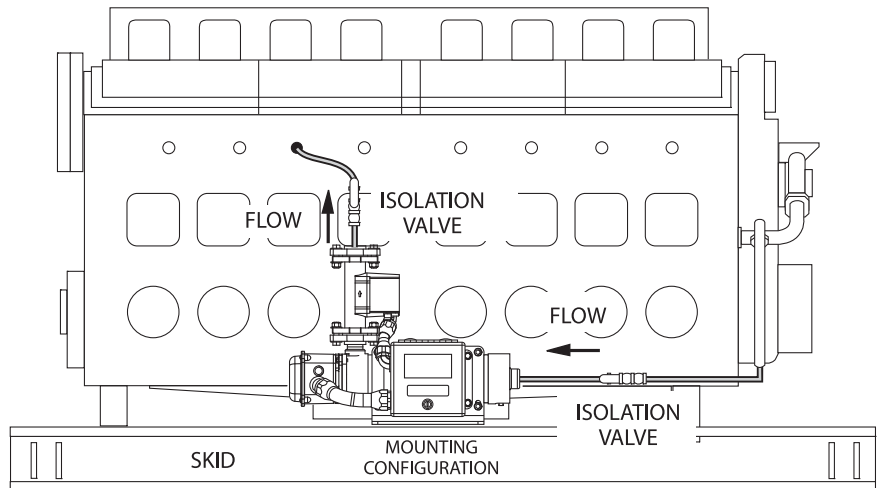
Connect a **MINIMUM** 1-inch N.P.T. coolant supply hose or pipe from the main coolant drain of the engine to the inlet of the heating system. Drawing coolant from a location low in the coolant system will ensure head pressure to the pump. The supply line must remain level or angle downward to eliminate air pockets. When approaching a plumbing obstacle, go around the obstacle instead of over it.

— Coolant Discharge Line —

Connect a **MINIMUM** 1-inch N.P.T. coolant return hose or pipe from the outlet of the CSM to the highest possible location on the engine coolant system at the furthest possible location from the suction line.

This connection enables heated coolant to be circulated through the entire engine.

Typical CSM installation



NOTE: Your system may be configured with optional, non-restrictive shut-off valves in the coolant lines allowing maintenance on the heating system without draining the engine coolant. **Isolation Valves - PRP203011-000**

NOTE: If the heating system is plumbed with rigid pipe, use flexible lines near the heating system long enough to provide freedom from vibration in all directions.

Coolant Requirements

The heating system is designed for use with a 50/50 mixture of low-silicate antifreeze and distilled water. Pre-mixed products are recommended. If not using a pre-mixed solution, ensure that the liquids are well mixed prior to filling the engine's cooling system. Do not exceed a concentration of more than 60% antifreeze as element failure can result.

NOTE: After the heating system is mounted and the engine is refilled with coolant, loosen outlet flange at pump to bleed the air out of the system. **DO NOT ENERGIZE THE HEATING SYSTEM AT THIS TIME.** Run the engine until it reaches normal operating temperature to eliminate trapped air that may still be present in the engine.

System Wiring

NOTICE

OPERATION OF THE SYSTEM DURING ENGINE OPERATION MAY CAUSE DAMAGE TO THE HEATER.

NOTICE

THE HEATING ELEMENT PACKAGE IS PRE-WIRED SPECIFIC TO THE SYSTEM WATTAGE AND VOLTAGE. ALTERING THE SUPPLIED WIRING CONFIGURATION CAN RESULT IN HEATER FAILURE.

NOTICE

ALL CONNECTIONS IN THE JUNCTION BOX SHOULD BE CHECKED DURING INSTALLATION. VIBRATION DURING SHIPMENT CAN CAUSE SCREWS TO LOOSEN. ALL CONNECTIONS IN THE JUNCTION BOX SHOULD BE CHECKED AT ENGINE SERVICE INTERVALS. VIBRATION CAN CAUSE CONNECTIONS TO LOOSEN.

CAUTION

WIRING TO HEATING SYSTEM TO BE PERFORMED BY A QUALIFIED ELECTRICIAN AND CONFORM TO ALL NATIONAL, STATE AND LOCAL ELECTRICAL CODES.

CAUTION

DISCONNECT ALL POWER SOURCES PRIOR TO PERFORMING ANY MAINTENANCE ON THE HEATING SYSTEM

Main Power Wiring

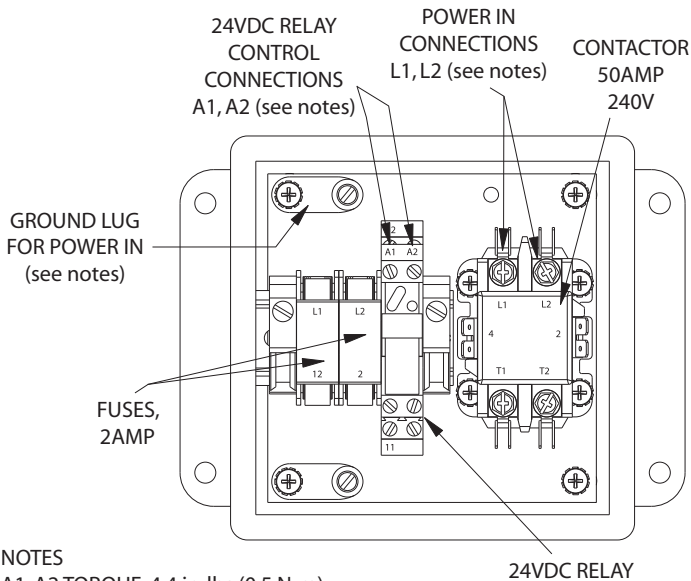
Connect the specified voltage and phase to the terminal blocks located in the main control box of the heating system. A user-supplied circuit breaker (rated at the appropriate amperage) is required for use in the main power feed line. For 3 phase applications, the terminal blocks are labeled L1, L2 and L3. For single phase applications, use terminal blocks labeled L1 and L2 (2-pole contactor, no transformer) or L1 and L3 (3-pole contactor, with transformer).

24 VDC Shutdown

Connect a user-supplied source of 24 VDC electricity to the terminal blocks labeled A1 and A2 in the control box. When present, this 24 VDC shutdown signal will disable the heating system to prevent operation while the engine is running.

The standard heating systems are wired such that the relay is normally closed (a 24 VDC signal when the engine is running disables the heating system).

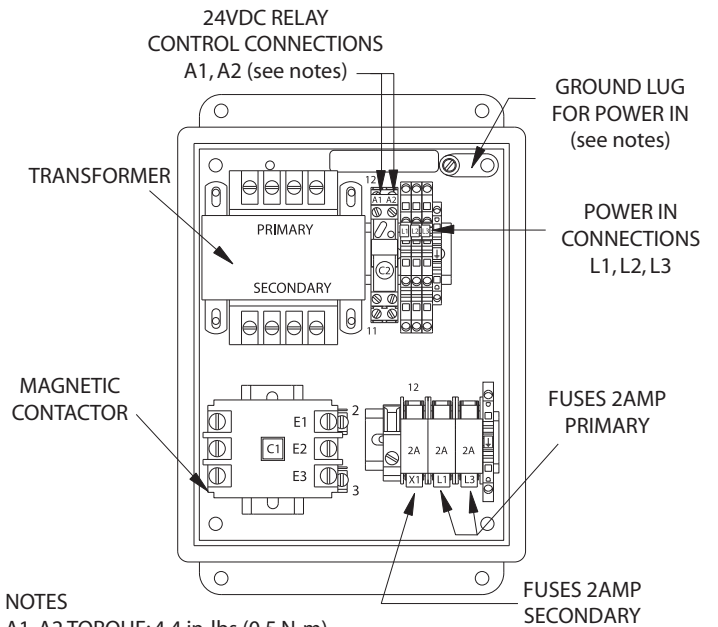
Standard Single Phase Systems



NOTES

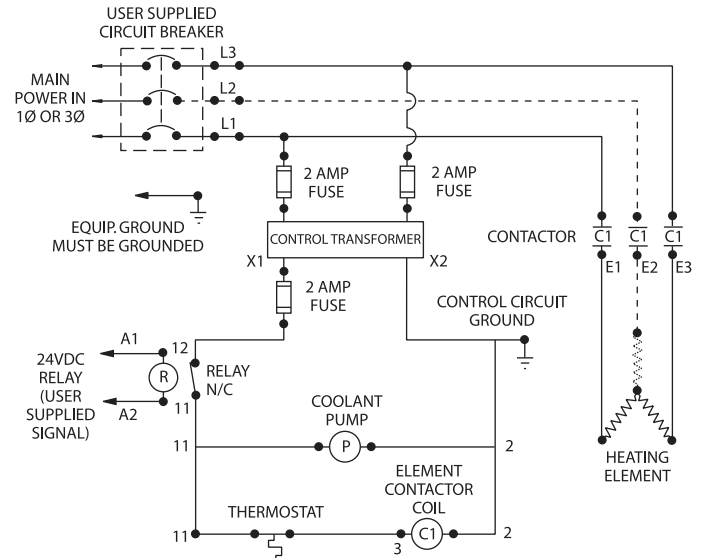
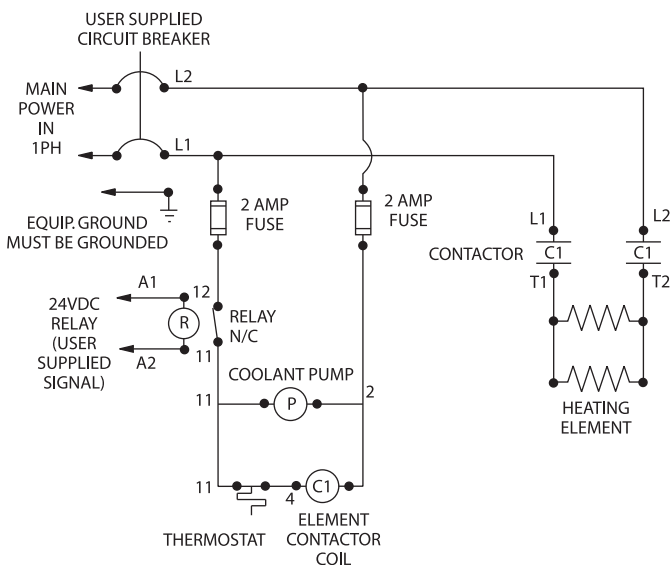
- A1, A2 TORQUE: 4.4 in-lbs (0.5 N-m)
- L1, L2 TORQUE IF BINDING SCREW: 20 in-lbs (2.3 N-m)
- L1, L2 TORQUE IF LUG: 40 in-lbs (4.5 N-m)
- GROUND LUG TORQUE: 6.4 in-lbs (0.7 N-m)

Standard Three Phase Systems



NOTES

- A1, A2 TORQUE: 4.4 in-lbs (0.5 N-m)
- GROUND LUG TORQUE: 6.4 in-lbs (0.7 N-m)



System Start-Up Check List

After system installation has been completed, follow these steps for proper coolant heating system start-up.

Step 1 Check and tighten all electrical and plumbing connections.

! WARNING OPERATION OF HEATING SYSTEM WITH CLOSED ISOLATION VALVES COULD RESULT IN SERIOUS INJURY

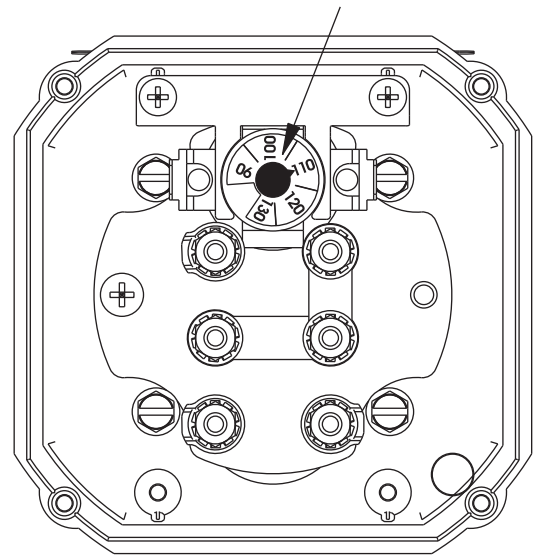
Step 2 Ensure isolation valves are open before starting system.

Step 3 After the heating system is mounted and the engine is refilled with coolant, loosen outlet flange at pump to bleed the air out of the system. DO NOT ENERGIZE THE HEATING SYSTEM AT THIS TIME. Run the engine until it reaches normal operating temperature to eliminate trapped air that may still be present in the engine's cooling system.

Step 4 Standard systems are equipped with an adjustable thermostat that is factory pre-set at 110°F. Verify that the thermostat is set as desired prior to operation. The thermostat is located in the element enclosure shown at right.

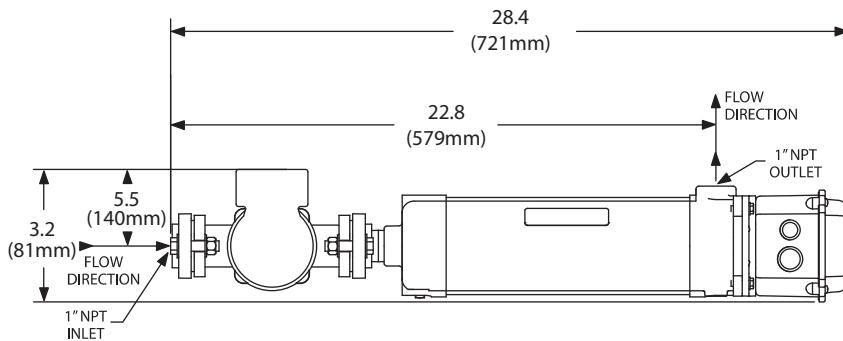
Adjustable
Thermostat
3 Phase

THERMOSTAT SET-POST
ADJUSTMENT



Optional CSM Configurations Without Controls

For these systems, the end user/installer is responsible for providing the necessary controls needed to operate the heaters per the wiring diagrams on page 2. The system thermostat cycles the heating element on and off. When the heating system is energized, the pump should run continuously. An appropriate shut-off device must be in place to de-energize the heating system upon engine start-up.



**CSM without Controls
(Pump at Outlet)**

