always in effect. So, if the starting ma = 4.10ma the boiler will start when the control current applied achieves this value of 4.10ma. The boiler must drop .1ma below this to turn OFF, in this example 4.00ma. This hysteresis value is not adjustable.

When using the 4-20ma setpoint control, a band may now be set at which the 4-20ma signal will operate over. The lower setpoint is defined as 4ma SETPOINT and the upper setpoint is defined as 20ma SETPOINT. The 4ma SETPOINT is linked to the BOILER START x.xxma where this starting current is the lower setpoint. So, if we set the 4ma SETPOINT to 130F and the 20ma SETPOINT at 180F we will have established the band. Once a starting control current of BOILER START 4.1mA is applied, and the 4-20 REMOTE ENABLE INPUT is closed, the boiler will start and the setpoint will be set to 130F. If a control current of 10ma is applied the boiler will track on a linear slope towards the 20ma SETPOINT settling at a SETPOINT of ~149F. As the current increases to 20ma, the SETPOINT will indicate 180F. The Default setting is 4ma SETPOINT: 50F, and 20ma SETPOINT 220F for backwards compatibility with the older version. NOTE: anytime a new firmware version is uploaded to the control, these values return these defaults.

NOTICE Anytime a new firmware version is uploaded to the control, these values return to these defaults.

If using the direct modulation mode by applying a 4-20ma current, only the BOILER START x.xx setting applies.

The 4-20 mA input can be set to HIGH PRIORITY. This is done in menu: **ADVANCED SETUP:4-20mA INPUT:CHANNEL MODE**. This allows a member boiler to be taken offline and directly modulated by an external control. If the Master is using it for heating and the 4-20mA is set to HIGH PRIORITY, an external control can now output a 4-20mA signal which will take over the boiler's fire rate. This is typically used for DHW control.

Setpoint Priorities

Changing the setpoint can be done in many ways. If a higher level setpoint control is lost, the next level setpoint control is used until the System Setpoint is loaded. The setpoints are prioritized in the following order:

1. 0-10V, 4-20Ma setpoint Control
2. BMS, Modbus Setpoint
3. Outdoor Reset Setpoint
4. Menu's System Setpoint

Any Setbacks that are active are then applied.

Circulator Pump Options

There are provisions for 2 system pump(s) and a local pump. This is to allow for primary/secondary loop configurations. The system circulator pump is implemented using the K4, K13 RELAY and normally open contacts at J13 SYSTEM PUMP 1 and SYSTEM PUMP 2.

NOTICE The pumps require motor contactors to isolate the on-board relay contacts. The on-board relays should never be used to energize large pumps directly. **Figure 25** illustrates the connections without contactors for illustrative purpose.

Figure 26 System Pump connections

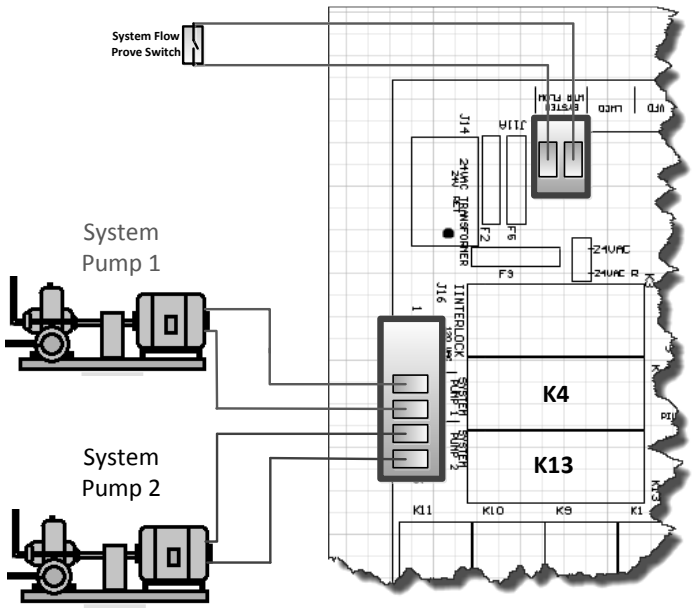
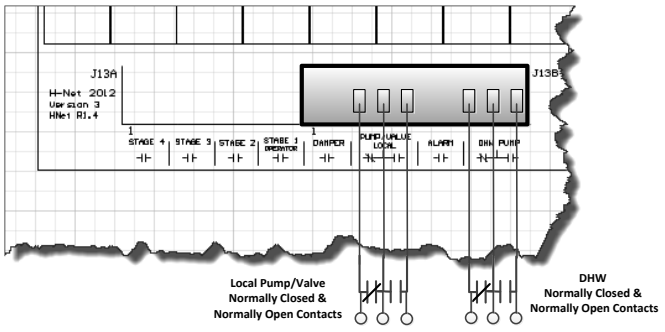


Figure 27 Local & DHW Pump connections



The **system circulator pump** is supported by (2) modes and special features.

1. The first mode will allow the circulator pump to remain on, unless the control's outside high air temperature setting has been met when using OUTDOOR AIR RESET.
2. The second mode will allow the circulator pump to be turned on whenever there is a call for heat (any control input). This mode will stop the circulator pump when the call for heat is lost and the pump post purge time has been satisfied.

The summer pump jog is a special feature that can be selected when the system is in summer shutdown (OUTDOOR RESET). The jog allows the system circulator pump(s) and the local pump to run for the system pump purge time once a week. It can be set to any day of the week and will occur at 12:01 AM. If (2) system pumps are present, and after the first pump finishes its post purge, the second one will start and the first one will stop.

The system flow proving switch is implemented using SPARE 3/System Water Flow on J11A. If a flow switch is connected to the WTR FLW interlock, the HeatNet control will wait up to 10 seconds to prove flow. If flow is interrupted after it has been established, an error will be displayed and the boiler will cycle OFF. As long as there is a call for heat, every 10 minutes the circulator pump will try to re-establish flow and start the boiler again.

When (2) system pumps are present and flow is not established or is lost (2) things will occur to try and keep heat in the system.

1. **When first starting a system:** If after a 10 second wait to establish flow has failed, the first pump will change to the second pump. The second pump will now try to establish flow for 10 more seconds. If the second pump fails to establish flow, the HeatNet control waits *10 minutes*. After the 10 minutes has expired, the control now starts with the second pump and attempts to prove flow for 10 more seconds. If flow does not prove, the control changes to the first pump and attempts to prove flow. This cycle will continue indefinitely until flow is established. **If flow is lost while running:** this process is also used in an attempt to re-establish flow.

2. If PUMP ROTATION is set to PMP HRS the PUMP ROTATION will be temporarily set to SYS HRS. This is to prevent re-starting the failed pump due to its runtime hours. Setting the PUMP ROTATION to SYS HRS will allow a retry of the failed pump after the rotation hours has expired. Power cycling of the boiler or using the PUMP ROTATION menu will revert back to PUMP ROTATION = PMP HRS if this was the original setting.

For **system pump modulation** a 0-10Vdc control signal output is provided at J4.3 (signal) and J4.7 (ground). This signal is output by the Master boiler as a percent function of the number of boilers running and can be used to set the speed of a System Pump using a Variable Frequency Drive. Two wires are required and need to be inserted into the J4.3 and J4.7 positions to access this signal.

Note: This signal has a step response and is not linear to the system or boiler's input firing rate.

The output signal is proportionally mapped to % using the equation:

%VFD = (boilers running/total boilers)

The %VFD represents the stepped percentage of boilers running where:

0Vdc = 0% (to) 10Vdc = 100%

If there are (6) boilers in a system and (2) are running, the control signal = 33% or 3.3Vdc. This signal could then be applied to a system pump's VFD to control the speed of the pump relative to how many boilers are firing. The VFD would need to be set appropriately to allow the correct flow through each boiler.

In low volume systems sudden temperature changes may occur when the flow is stepped up or down by a large percentage. In these situations the ADAPTIVE MOD may need to be disabled and the ORIGINAL KN method used. Other adjustments may also be required.

Currently, no failsafe mode is available in the event the Master boiler's control fails. If this method is employed, a failsafe boiler could be used to override the control signal and enable the system pump's VFD using some external wiring and an external relay, or have the VFD default to a safe speed on loss of the control signal.

If (2) pumps are available, pump rotation is available. The rotation of the (2) pumps can be controlled using two methods.

3. Pumps are switched based on the system run time

4. Pumps are switched by the difference between each pump's runtime. The HeatNet control keeps a running record of each pump's runtime in hours. If a pump is taken offline or replaced. The runtimes can then be adjusted until they become equal.

These features may be selected in the menu, SETUP:PUMP OPTIONS:SYSTEM PUMP:PUMP ROTATION