

## Colmac Heat Pump Water Heater Controls

### Call-for-Heat

To function as intended, Colmac heat pumps must incorporate some type of control. The heat pumps provide three independent methods of input to trigger a call-for-heat, turning the unit/s on: *Direct tank temperature monitoring, Building Management/Automation System (BMS/BAS), or digital aquastat.*

### *Direct tank temperature monitoring*

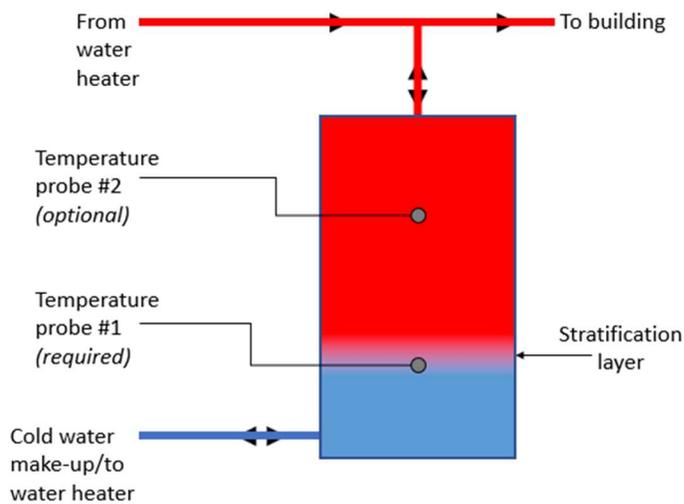
Two temperature probes are included with each heat pump water heater. These probes are landed as analog inputs to the unit's PLC and provide a direct temperature measurement.

The probe/s are intended to be landed in the water storage tank thermowell and provide temperature feedback to the PLC. Probe #1 should be located in the lower half of the storage tank, above the cold-water inlet line (*see Fig. 1*). If multiple tanks are used, Probe #1 should be located in the tank closest to the cold-water inlet line (*see Fig. 2*).

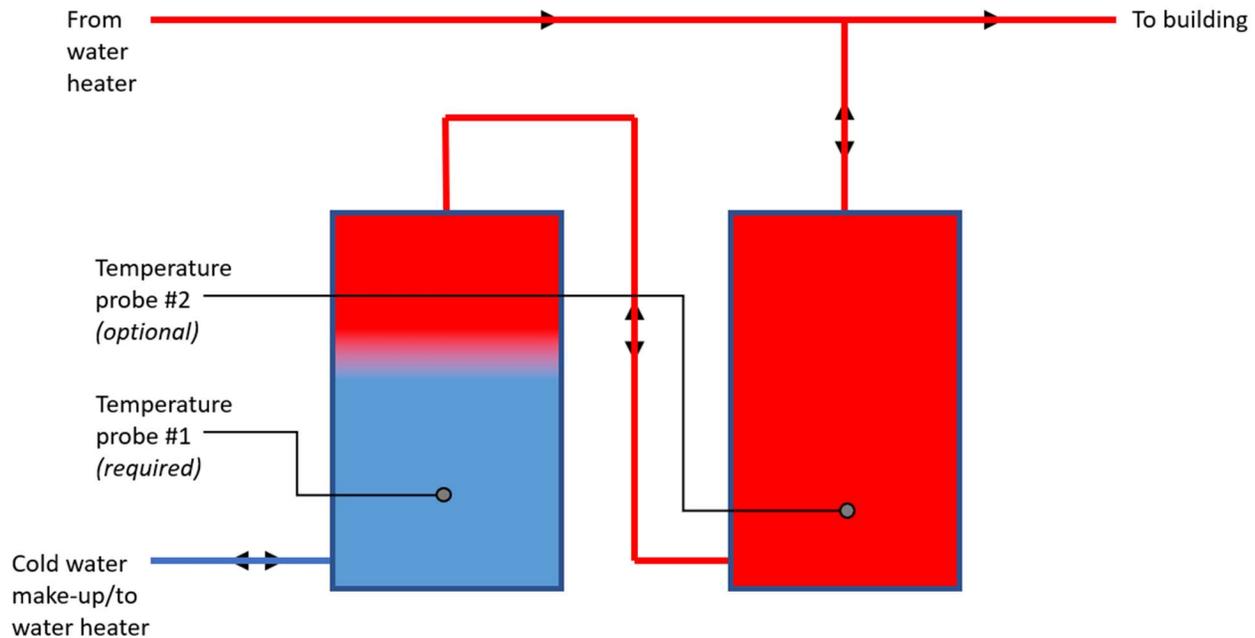
Probe #2 is not required for operation but may be used to refine lead/lag staging of multiple water heaters.

The temperature probes are used to sense movement of the stratification layer upwards in the tank, indicating hot water draw to the building. This registered decrease in temperature will be used by the heat pump to stage unit/s on, depending on temperature setpoints and time delay.

Standard probe wire length is 20 ft. but may be extended using shielded twisted pair wire. For wire runs less than 150 ft, 20 AWG (*minimum*) is recommended. For wire runs up to 300 ft, 16 AWG (*minimum*) is recommended.



**Figure 1:** Single-tank temperature probe configuration



**Figure 2:** Multi-tank temperature probe configuration

### *Building Management/Automation System (BMS/BAS)*

Cx- series units may incorporate BMS interface capabilities, allowing for a centralized, integrated control system to provide a *Run* signal to the water heaters. Communication protocol must be specified upon ordering of the machines, although retrofitting on existing units is possible. Standard protocols available:

- BACnet MS/TP
- BACnet TCP/IP
- Modbus MS/TP
- Modbus TCP/IP

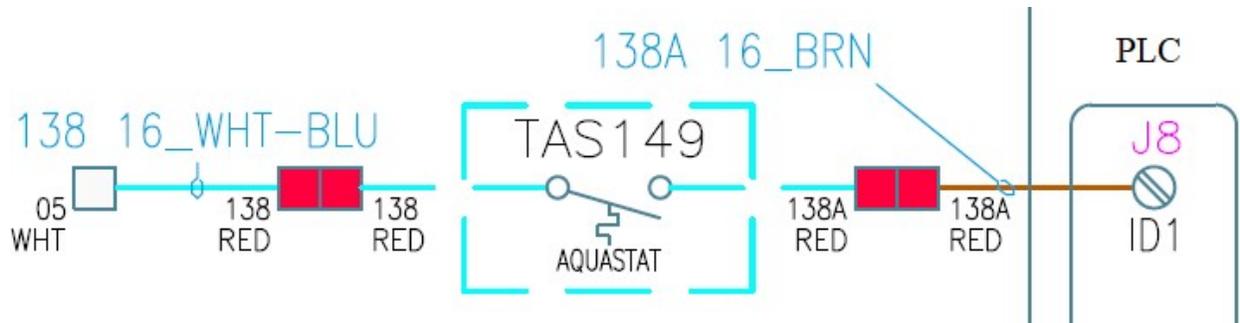
Non-standard protocols available:

- LonWorks
- Contact Factory for others

Please see Colmac manual *BACnet and BMS Manual Cx-Series (940410-0007)* for details on configuration, control, and read/write points list.

### Digital aquastat

An external aquastat may be used to provide a contact closure, indicating a call-for-heat to the water heater. Aquastat terminals will be landed into *Terminal Blocks 138* and *138A* (see Fig. 3). Aquastat placement should be in the lower half of the storage tank, above the cold-water inlet line.



**Figure 3:** Aquastat landing to unit

### End of call-for-heat

Cx-units will end their call for heat once a preset inlet water temperature to the water heater has been reached. Typically, this temperature is set to target migration of the stratification layer into the water heater (for applications with 140°F storage, 125°F would be the target cut-off temperature).

### Intra-array communication

When multiple water heaters are to operate in an array, communication between the units is required for staging, unless independent aquastats are being used.

A single water heater will be assigned a Leader role with subsequent water heaters being assigned Follower roles.

Cat 5e (ethernet) cable must be run from the Leader unit to each individual Follower unit. All units have ethernet switches located in the control panel where ethernet cables may be terminated. Units also have ethernet bulkhead passthroughs on the top and side of the electrical panel for easy, external access.