INSTALLATION GUIDE

ECO-CMB-BAC

COMMERCIAL MODBUS CONTROLLER WITH BACNET

For more information, please call **1-844-SANDCO2** or email **info@eco2systemsllc.com**

Eco2 Systems LLC
P.O. Box 1358, Walled Lake, MI 48390
Phone : 1-844-726-3262 or 1-844-SANDCO2
E-mail : info@eco2systemsllc.com
Website : www.eco2waterheater.com

Eco2 Dealer

REV: 8/25

WARNING!

Please review the important information below before proceeding with controller installation.

Qualified Personnel Only:

This controller must be installed by licensed professionals in accordance with local building codes.

Electrical Shock Hazard:

- Do not perform work on energized components.
- Prevent unauthorized access to controller by placing a lock on enclosure.

For Domestic Water Heating Control Only:

This controller is programmed for potable domestic hot water heating control only. Any other heating application, such as combined DHW and space heating, requires a different control program.

Setpoint Modifications:

The controller comes set at standard temperature setpoints and sensor configuration to ensure reliable operation of the SanCO2 heat pump water heaters. Changing these setpoints is not recommended unless authorized by SanCO2. Incorrect settings will result in loss of HPWH warranty coverage.

Do Not Energize Heat Pumps:

The heat pumps will attempt to run once power is supplied. Do not energize until installation is complete and startup technician is consulted.

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Always check for the current version of software at:

www.eco2waterheater.com/commercial-controller

Contact Eco2 Systems or their local rep to arrange system startup by a qualified technician.

Improper controller configuration or startup may result in the loss of equipment warranty.

Eco2 Systems Technical Support

844-726-3262

techsupport@eco2systemsllc.com

TABLE OF CONTENTS

This document covers installation of the CMB controller.

- Consult the CMB Programming Guide for properly configuring the controller.
- Consult SanCO2 documentation for heat pump installation instructions.

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CMB CONTROLLER INSTALLATION OVERVIEW

SanCO2 Controller Info Page
To check the current software version and access additional resources, use this QR code or go to **www.eco2waterheater.com/commercial-controller**

Install Heat Pump Resistors.
A pack of heat pump resistors is affixed to the front of the controller. Install one on each heat pump across Thermistor terminals 1&2. See Page 5.

Mount Controller
Mount controller to a solid surface with 36in front clearance. Do not install where the screen will be exposed to excessive moisture or direct sunlight. See Page 5.

Install Temperature Sensors.
Insert temperature probes into tank wells with thermal paste. Included 15 ft leads may be lengthened using 22 AWG wire. See Pages 6-7.

Pull and Connect Control Wiring.
A serial data cable (22-24 AWG, shielded, twisted pair with ground) is required to connect the heat pumps to the controller. See Pages 8-9. Connect BACnet via RS-485 or Ethernet cable. See Page 10.

Connect Supply Power
Connect the transformer leads to incoming power using min. 14 AWG copper wire. A 6A circuit breaker is recommended. See Page 12.

Call for Startup Support
Contact Eco2 to arrange for startup assistance as soon as an estimated completion date is available. Starting the system without proper configuration may result in loss of warranty. See Page 12.

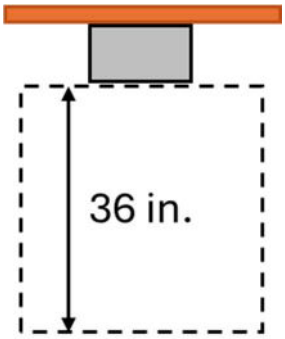
844-726-3262 **techsupport@eco2systemsllc.com**

HEAT PUMP RESISTOR INSTALLATION

Each controller comes with 12 heat pump resistors. For projects with more heat pumps, additional resistors are available in packs of 6. One resistor must be installed across Thermistor Terminals 1 & 2 of every heat pump. The ground terminal is not used. Installation is made easier by bending both resistor leads clockwise into a hook shape first. The leads can then be hung over the terminal screws. Once in place, wrap the leads around the screw and tighten securely.

CONTROLLER MOUNTING

Location: It is recommended to install the controller indoors, ideally where the temperature sensor cables will reach the storage tanks. Do not locate the controller where it will be exposed to direct sunlight or excessive moisture. The controller must be affixed to a solid, permanent surface.



Service Clearance: There must be **36 in**. of open space in front of the controller for service clearance.

Mounting Procedure: Mounting brackets are located on the back of the enclosure. Turn these outward and mark the hole locations on the mounting surface. Secure using the appropriate fasteners (not included) for the mounting surface.

TEMPERATURE SENSOR INSTALLATION

The CMB controller comes standard with three temperature sensors, T1-T3. The sensors have 15 ft leads which can be extended using 22-24 AWG copper wire. If extending, ensure that splice joints are well connected; failure of these two temperature signals is a critical error that will prevent HP operation.

Notes for successful installation:

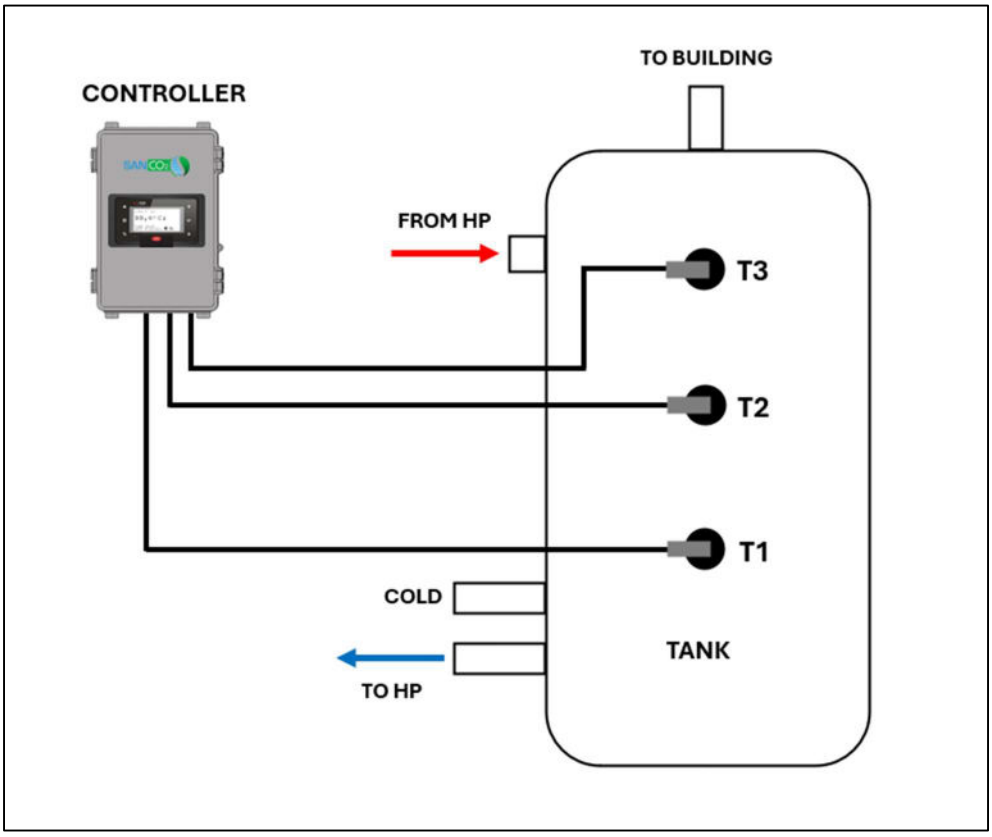
-Coat sensor tips in thermal paste before inserting into tank thermowells.

-Secure sensors in place using clips or a small amount of silicone in well opening.

The default setting is for T2 to be used as the sensor to turn the heat pumps On and T1 to Turn the heat pumps Off. In this case, T3 is for information only and can be installed anywhere in the system that a temperature measurement is desired. The On and Off sensor settings can be changed in the Setup menu. Always install T1 closer to the HP inlet connection than T2. Up to 3 additional sensors can be added to the controller on **Block J2, Terminals U4-U6 and GND.**

ONE TANK SENSOR EXAMPLES

One Tank Example 1: Tank with three sensor wells



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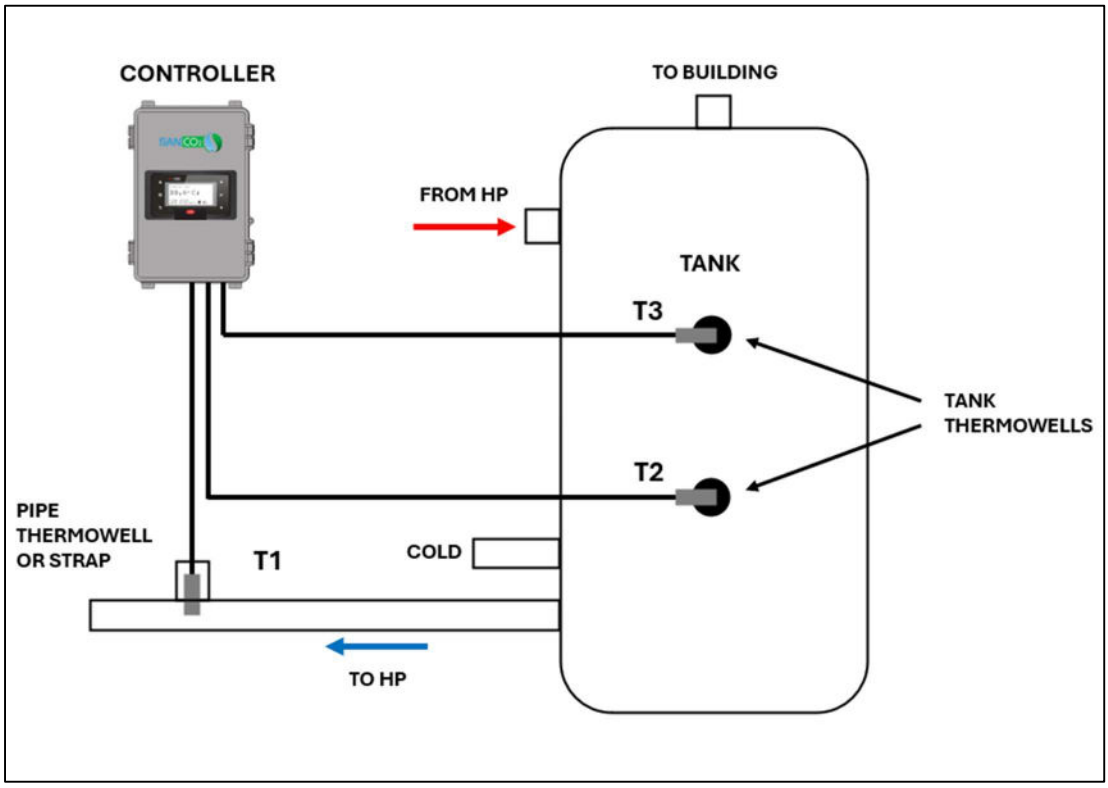
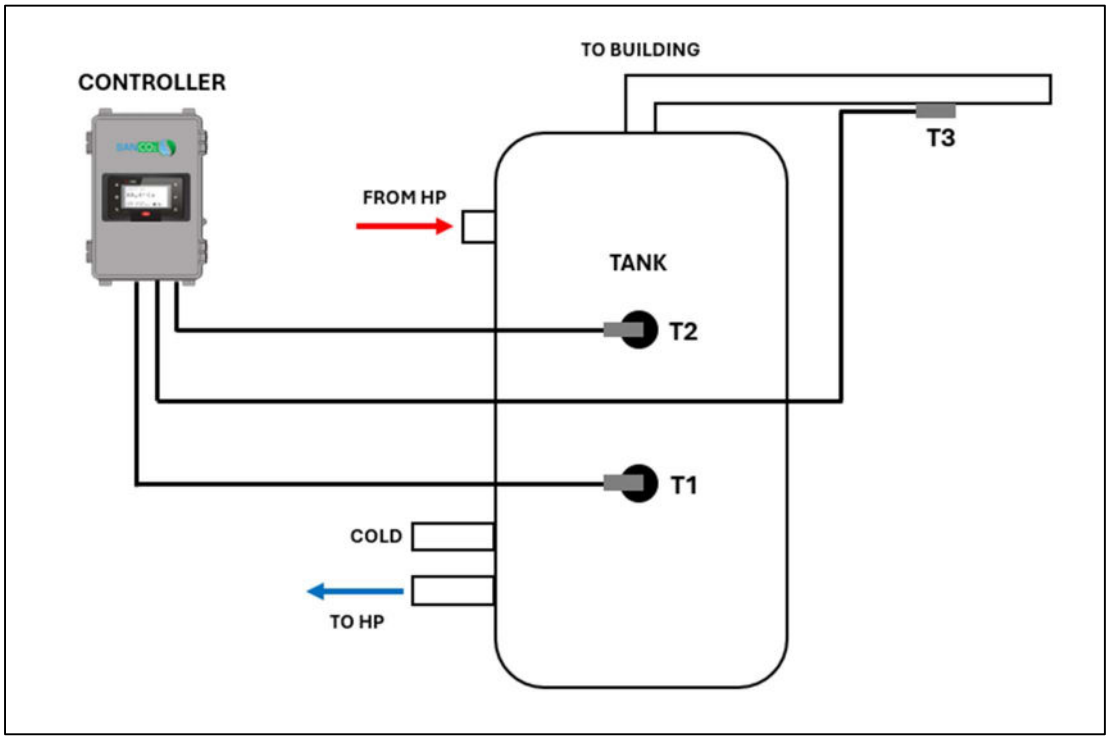
One Tank Example 2: Tank with two sensor wells, T1 on HP Supply pipe

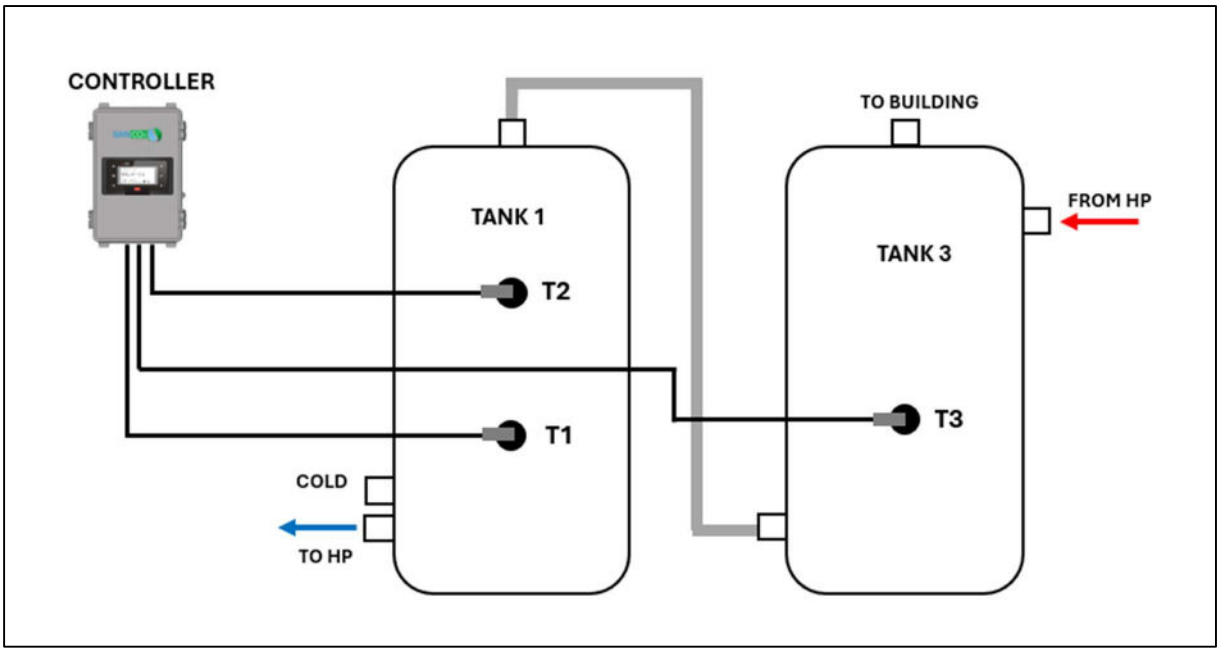


One Tank Example 3: T3 used for other system measurement

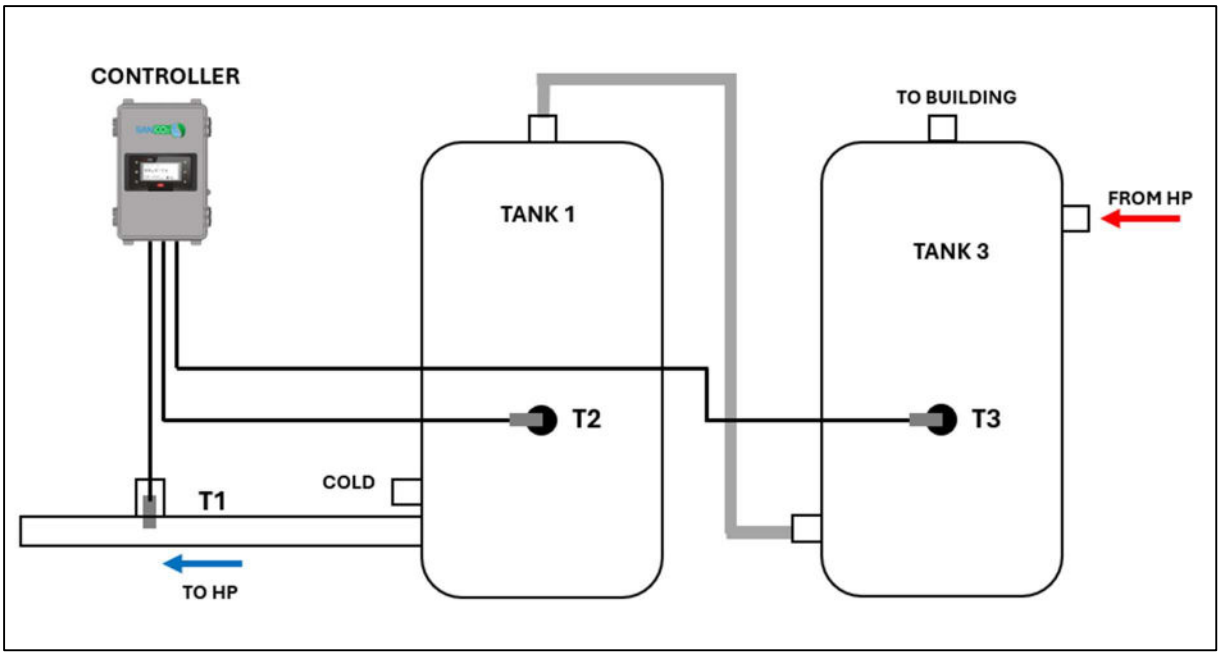


TWO TANKS IN SERIES SENSOR EXAMPLES

Two Tank Example 1:

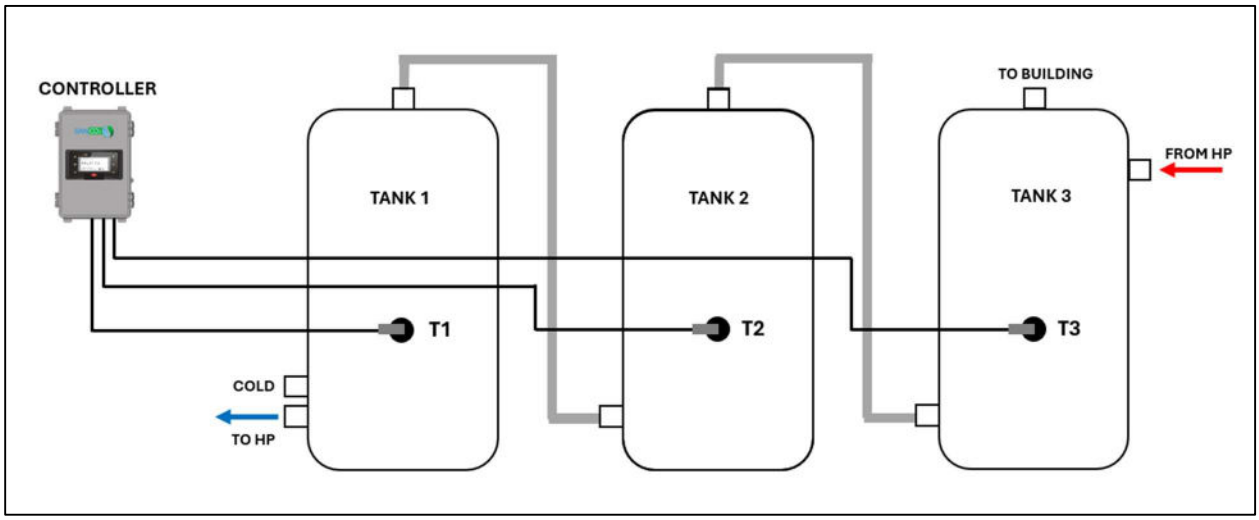


Two Tank Example 2:



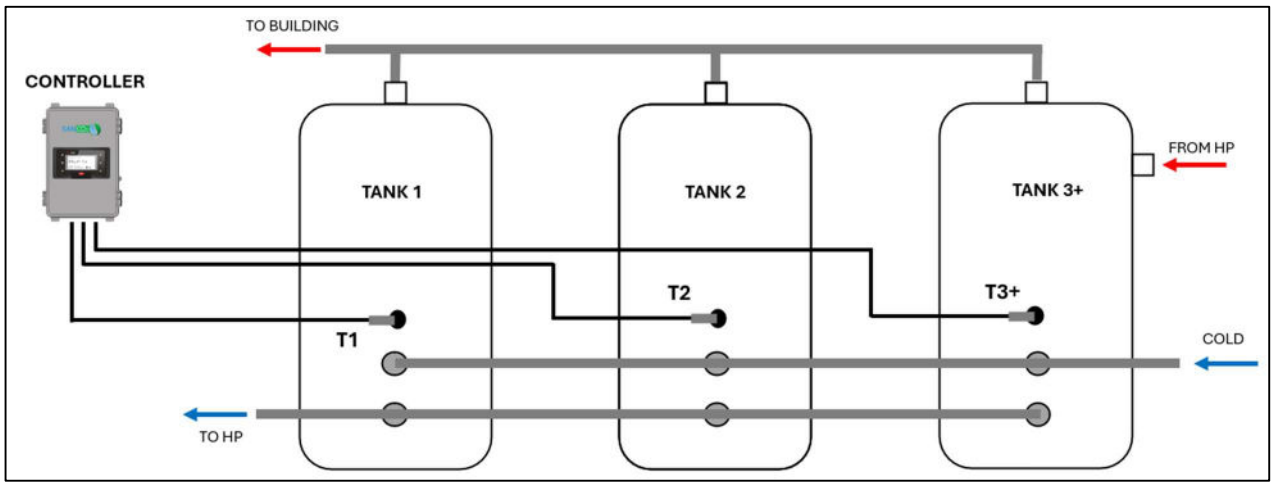
THREE OR MORE TANKS IN SERIES SENSOR EXAMPLE

Two Tank Example 2:



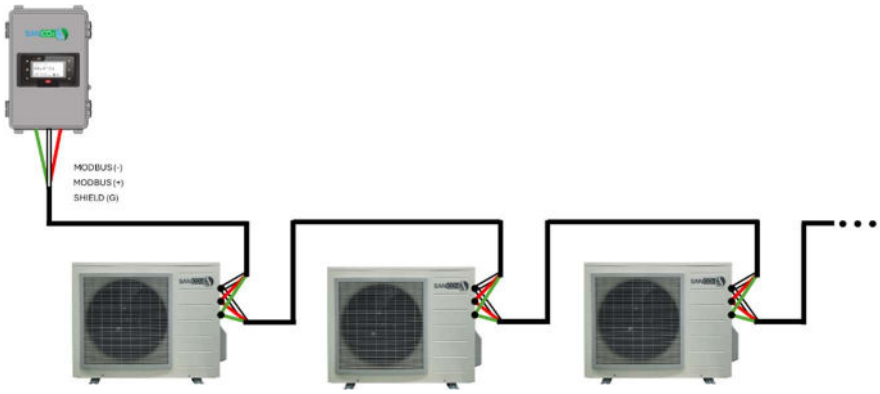
MULTIPLE PARALLEL TANK SENSOR LOCATIONS

Parallel tank arrangement control only works if the flows through all tanks are equally balanced. Install sensors above the Cold makeup and HP Supply connections at the desired location to Start and Stop the heat pumps. If more than two tanks are present, additional sensors should be installed for each tank. Only T1 will be used for control, the other sensors are to verify equal heating and draw. If there is a large difference in tank temperatures the system must be re-balanced.



HEAT PUMP MODBUS WIRING

Data Cable: The controller communicates with the heat pumps via a Modbus RS-485 network. For this, pull a single serial data cable (18-20 AWG, 2 conductors plus ground, shielded) from the controller to the heat pumps in a daisy-chain pattern.



The network wiring must comply with Modbus RTURs-485 best practices, including:

- Wiring must be completed in daisy-chain pattern.
- If the total network cable distance is more than 300 ft, install a 120Ω 1/2W resistor across the +/- terminals of the controller and also across the +/- terminals of the last heat pump on the other end of the chain.
- A Modbus repeater must be installed after every 30 heat pumps or every 2,100 ft of data cable length.
- Earth the cable shield at only one point.

Dedicated Network: No other building equipment or controllers should be connected to this network unless directed so by Eco2 Systems. A separate BACnet communication link is available for the controller to communicate with the building BMS and other devices.

Controller Terminals: Connect the data cable to the "+", "-", and "O" terminals on block "J4 FBus" of the controller.

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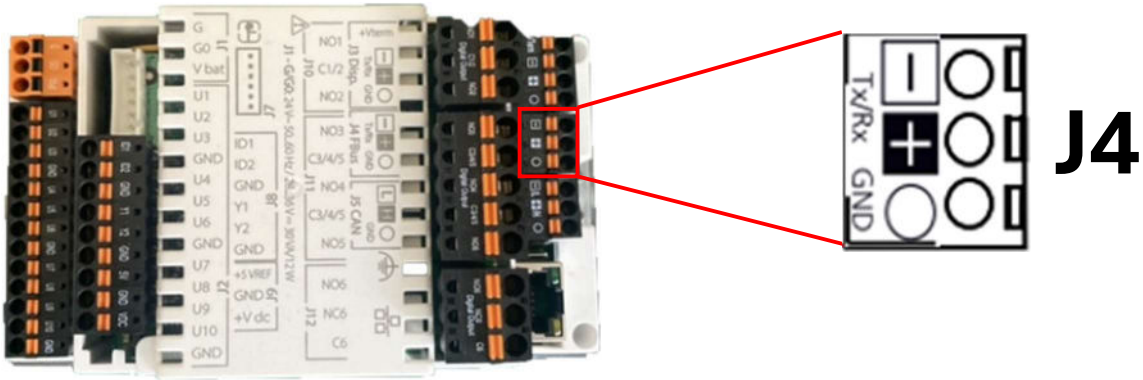
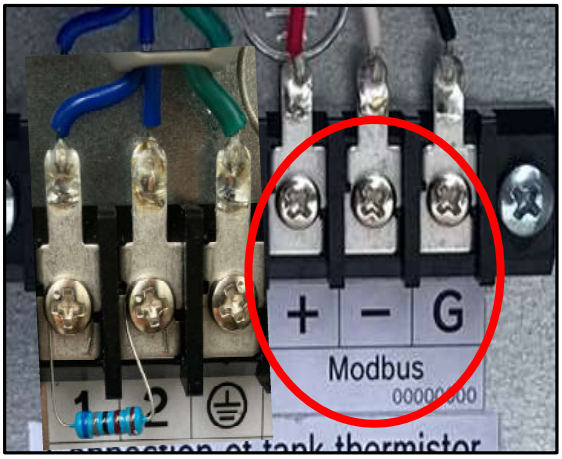
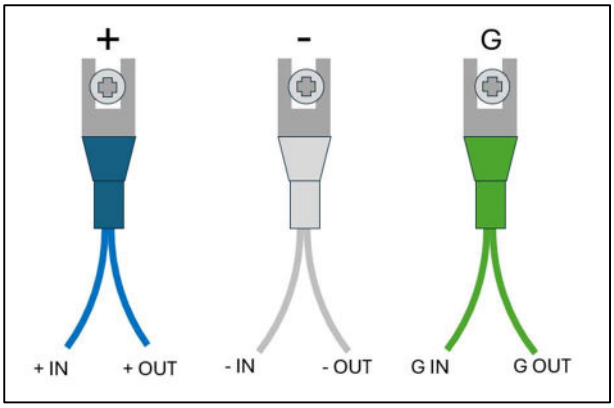


Heat Pump Terminals: Land the network cable on the Modbus terminals of each heat pump. These are located next to the Tank Thermistor terminals.

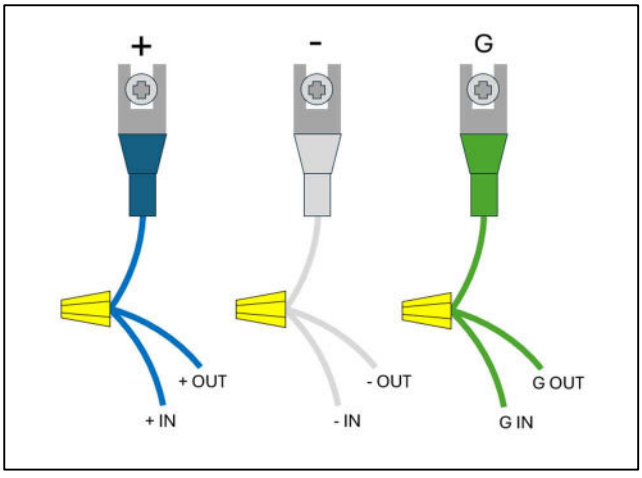


Connections can be made in one of two ways:

1. Land data cable wires directly on the HP's Modbus terminals.



2. Connect a jumper wire (branch connection) to the HP's Modbus terminal. It is recommended to keep wires shorter than 3 ft.

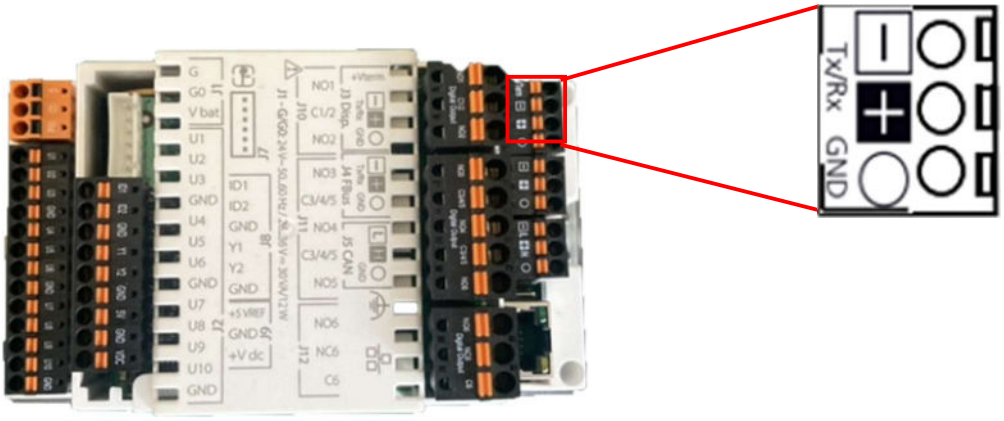


BACNET BMS CONNECTION

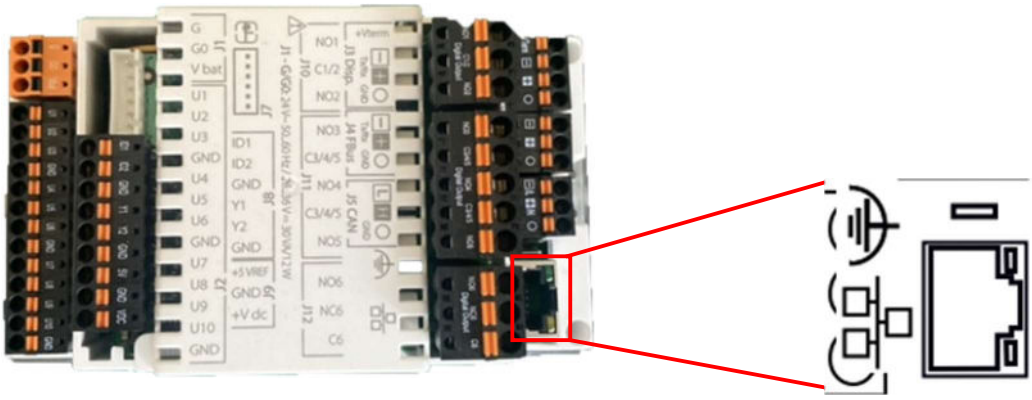
Contact Eco2 Systems to obtain your free BACnet license.

The CMB controller can communicate over BACnet MS/TP or UDP protocols. Only one or the other can be used at a time.

MSTP Serial Connection: The MS/TP data cable is connected to the Rx/Tx/GND terminals on **Block J3 Disp. The Vterm pin is not used.**

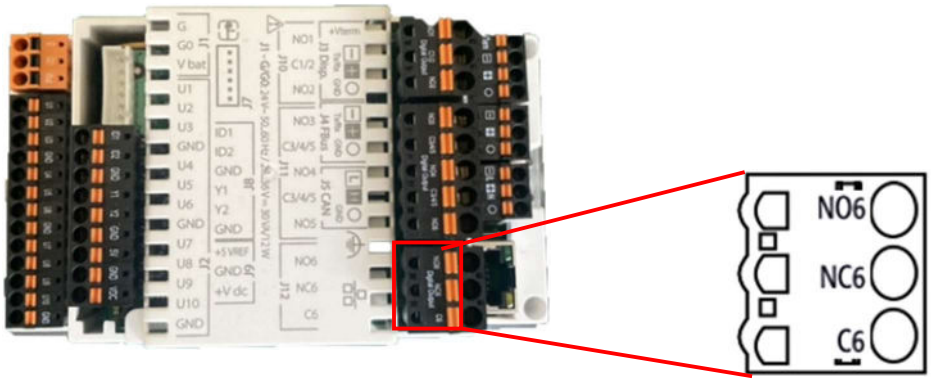


UDP Ethernet Connection: The ethernet cable is plugged into the RJ-45 port. There is also a spade connection for a shield grounding connection. This should be used to prevent network interference.



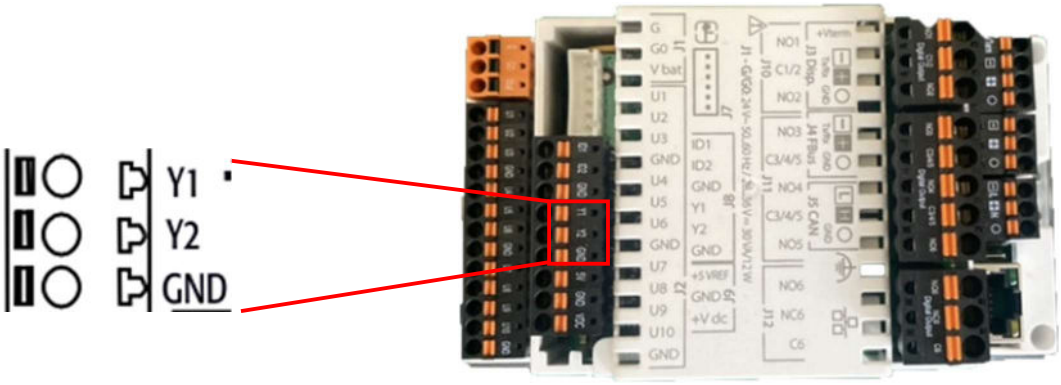
AUXILARY CONTROL RELAY

A dry contact relay is provided on **Block J12** to control auxiliary equipment, such as a booster pump or circulation fan. There are both Normally Open and Normally Closed terminal that activate whenever any heat pumps are signaled to run. The relay is designed to accept signal voltage (< 30V) do not connect to equipment line voltage.



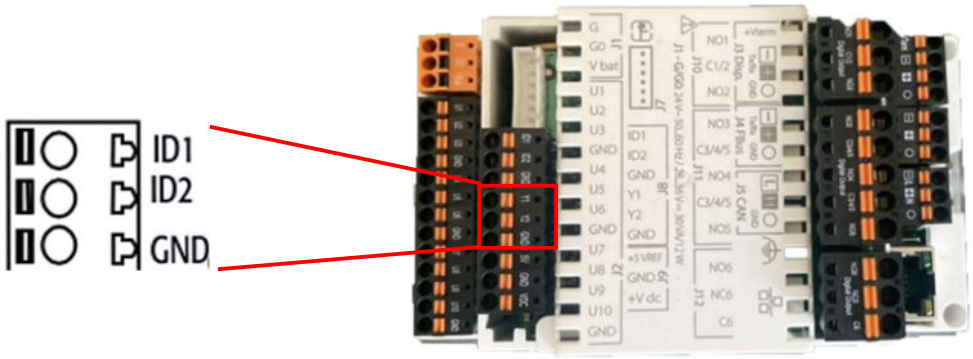
AUXILARY 0-10V ANALOG OUTPUT

A 0-10v DC analog signal is provided on **Block J8, Terminals Y1 and GND** to control auxiliary equipment, such as a booster pump or circulation fan. This signal adjusts linearly based on the number of heat pumps that are signaled to run. Do not connect external power to these terminals.



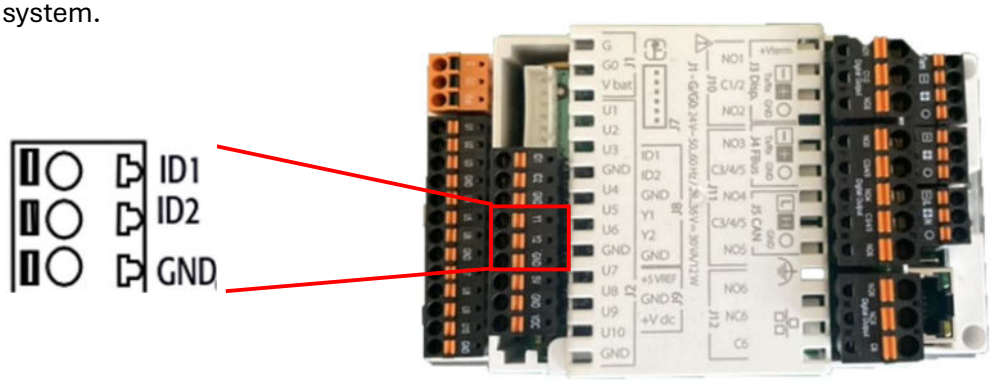
AUXILARY ALARM INPUT

A powered (24V DC) digital input is provided on **Block J8, Terminals ID1 and GND** to connect a 3rd party device's dry-contact alarm signal, such as a leak sensor. Do not attempt to connect powered signals to these terminals. This input can be configured in the system menus to be normally open or normally closed. If an alarm is received, it is reported to the BMS system and noted in the controllers Alarm History. No action is taken related to heat pump operation.



EMERGENCY STOP INPUT

A powered (24V DC) digital input is provided on **Block J8, Terminals ID2 and GND** to connect an Emergency Stop signal device (button or switch). Do not attempt to connect powered signals to these terminals. This is configured for Normally Open signals only. If the relay is closed, the controller's program will be set to OFF mode and no heat pumps will be run. This is also reported to the BMS system.



CONTROLLER SUPPLY POWER WIRING

Building Side:

Use 14 AWG copper wire with 75C insulation. The controller is supplied with a transformer that accepts 120, 208 or 240V supply power [60 hz / 1 phase.] Connect the building wires to the appropriate colored wires for the voltage used:

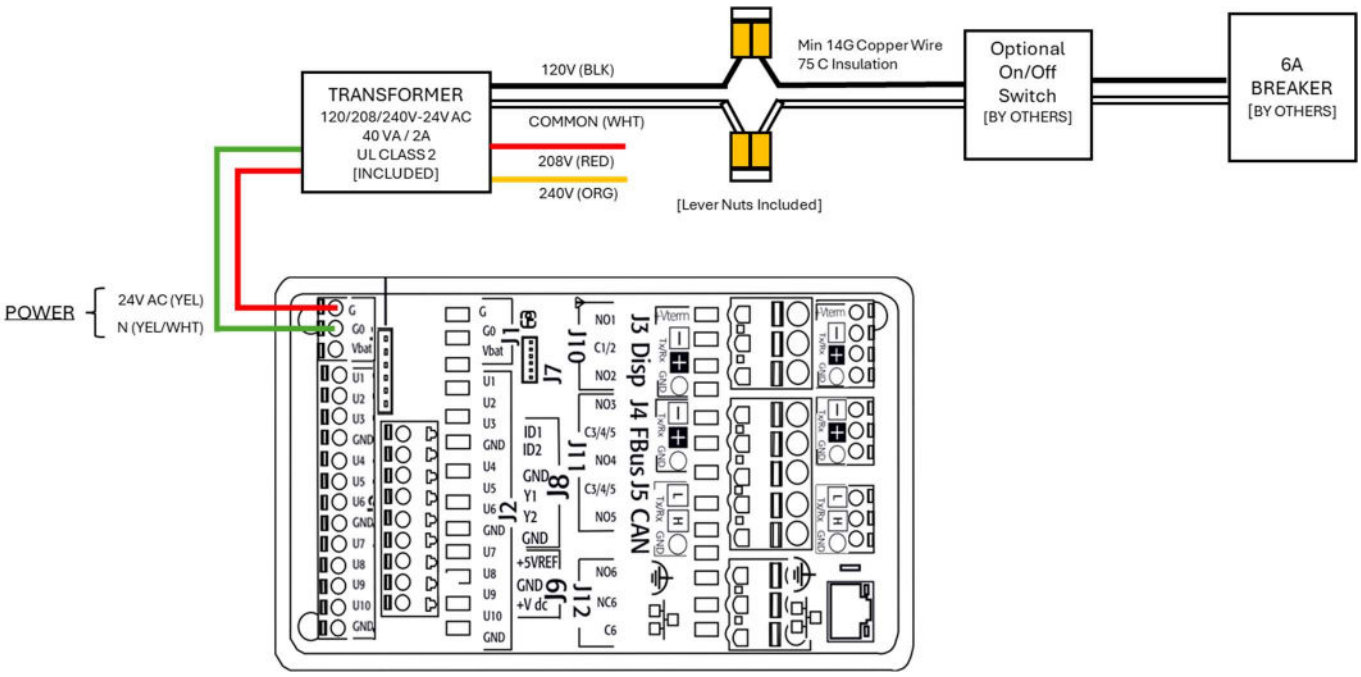
Common: White 120V: Black 208V: Red 240V: Orange

Ensure that unused wires have wire nuts to prevent accidental shock.

- A 6A circuit breaker is recommended for circuit protection of the transformer.
- If it is desired to disconnect power locally, an On/Off switch can also be wired into the supply power.

Controller Side:

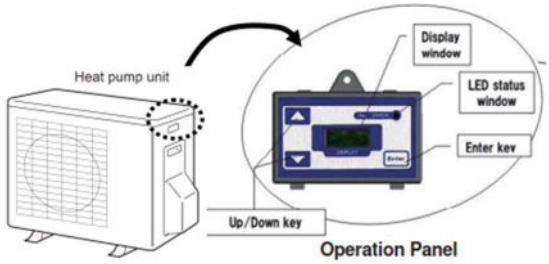
The 24V AC wires are connected to the PLC's orange **Block J1, Terminals G and G0**. Red is connected to G, Green to G0. The **VBat** terminal is not used.



CONFIGURING HEAT PUMPS FOR COMMERCIAL OPERATION

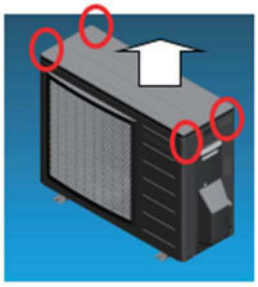
Each heat pump must be put into commercial mode and properly addressed in order for it to function properly with the CMB controller. If not placed in commercial mode the heat pumps will continuously cycle on/off in residential mode. If all units are not properly addressed the Modbus communications network will not operate properly.

These settings are changed using the interface module located inside the top cover of the unit. It is visible through the clear window on the connection end.

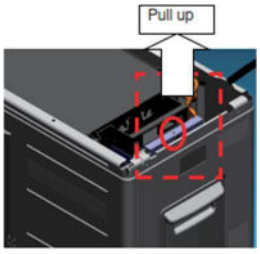


Configure each heat pump as follows:

1. Using a Philips screwdriver, remove the four screws holding the top cover on the unit and lift the top off.



2. Remove the screw holding the module in the unit and lift out the module to access the buttons.



3. Press the Enter button so the screen lights up.
4. Press and hold down the ↑ and ↓ arrow buttons at the same time until the screen enters configuration mode. The display will begin flashing “H_SE” in this mode.

5. Use the arrows to cycle through the options until “”C_SE” is flashing.
6. Press Enter and “off” will be shown.
7. Change this to “on” using the arrows and press Enter again.
8. Use the arrows to cycle through until “id” is shown.
9. Press Enter and “1” will be shown. Change this to the desired address for that heat pump and press Enter.
   ***Each heat pump must have a different address.**
   ***Addresses must begin at 1 and not skip any numbers up to the total heat pump count.**
10. Place the module back inside the heat pump. The screen will timeout on its own.
11. Replace the cover and screws with a screwdriver. Do not tighten with a drill or screws will break.