INSTALLATION GUIDE

ECO-CMB-BAC

COMMERCIAL MODBUS CONTROLLER WITH BACNET

REV: 6/24

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.

This document covers CMB Controller Installation only. Consult SanCO2 documentation for heat pump installation instructions.

Need Assistance?

Contact Eco2 Systems Technical Support

844-726-3262

techsupport@eco2systemsllc.com

Additional documentation and resources also available online:

www.eco2waterheater.com/commercial-controller

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CMB CONTROLLER QUICK REFERENCE

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 30 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 120v / 1 phase power using 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 to securely clamp down leads.


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.

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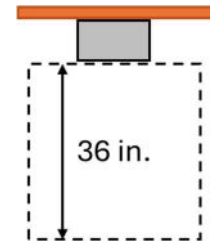
TEMPERATURE SENSOR INSTALLATION

The CMB controller comes standard with two temperature sensors, T1 and T2. The sensors have 15 ft leads which can be extended using 22 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 T1 to be used as the sensor to turn the heat pumps both On and Off. In this case, T2 is for information only. 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 4 additional sensors can be added to the controller on **Block J2, Terminals U3-U6 and GND.** This allows for additional temperature monitoring, but are only used for heat pump staging control on the Demand Response version of the controller.
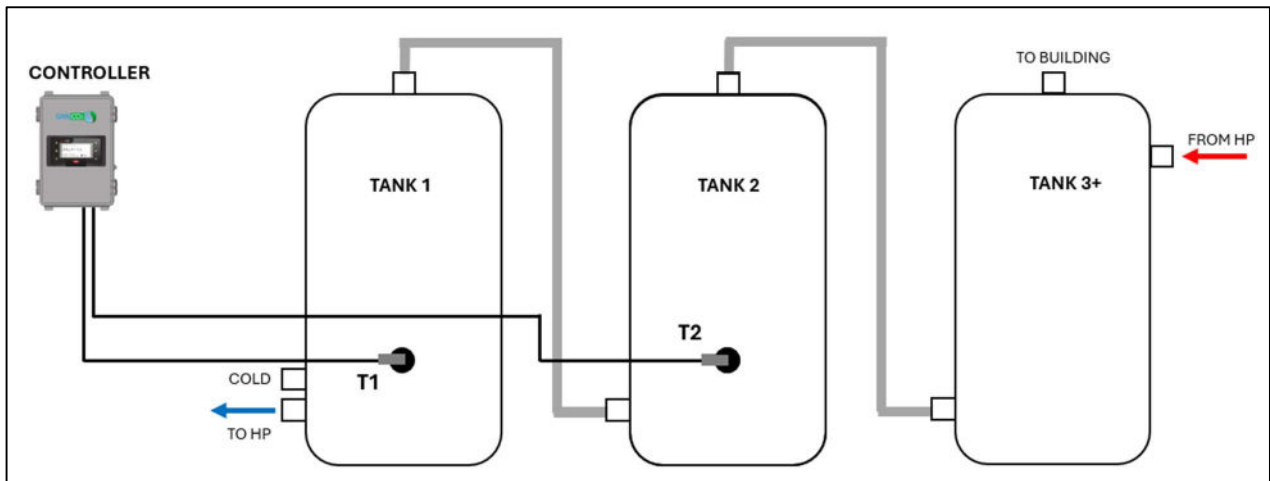
SINGLE TANK SENSOR LOCATIONS

Install T1 above the Cold makeup and HP Supply connections. This will be the location to end the heating cycle. Ensure that T2 is installed above T1.
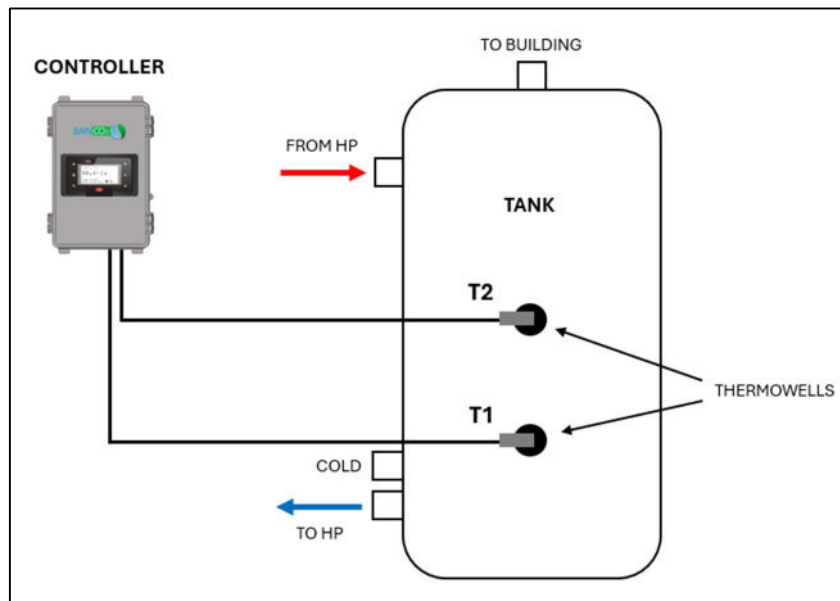
On/Off Sensor Settings: Ensure that the Off Sensor remains set to T1. The On sensor can be set to T2 if desired, to allow for a larger volume of hot water draw before heat pumps are energized.

MULTIPLE SERIES TANK SENSOR LOCATIONS

Install T1 above the Cold makeup and HP Supply connections. This will be the location to end the heating cycle. Ensure that T2 is installed closer to the "To Building" connection than T1. Additional sensors can be added to monitor additional tank locations but are not required.


MULTIPLE PARALLEL TANK SENSOR LOCATIONS

Parallel tank arrangement control only works if the flows through all tanks are equally balanced. Install T1 and T2 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.

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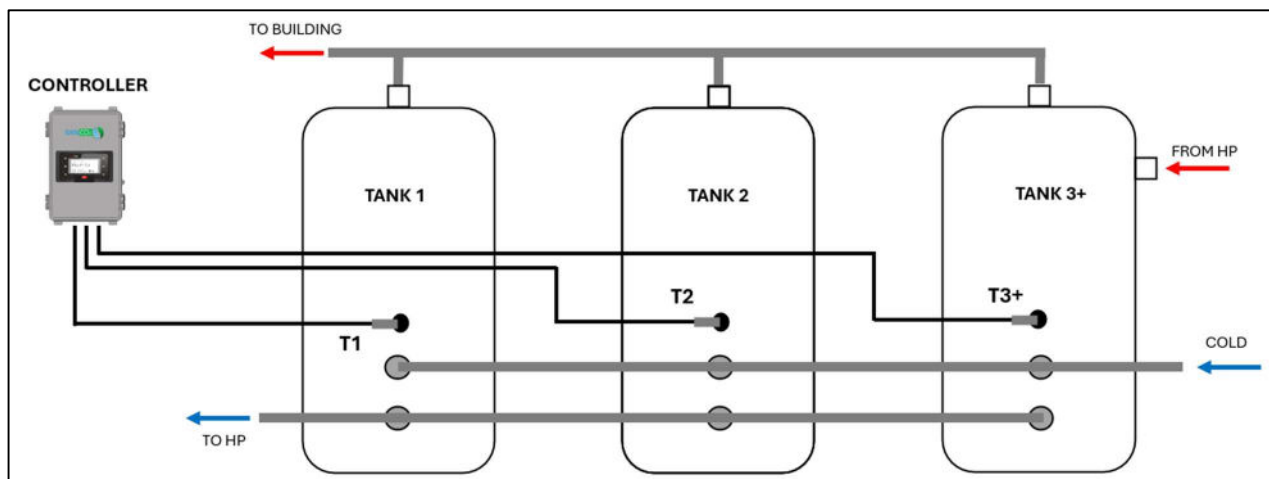
HEAT PUMP MODBUS WIRING

Data Cable: The controller communicates with the heat pumps via a Modbus RS-485 network. For this, pull a single serial data cable (22-24g, shielded, twisted pair with ground) from the controller to the heat pumps in a daisy-chain pattern.
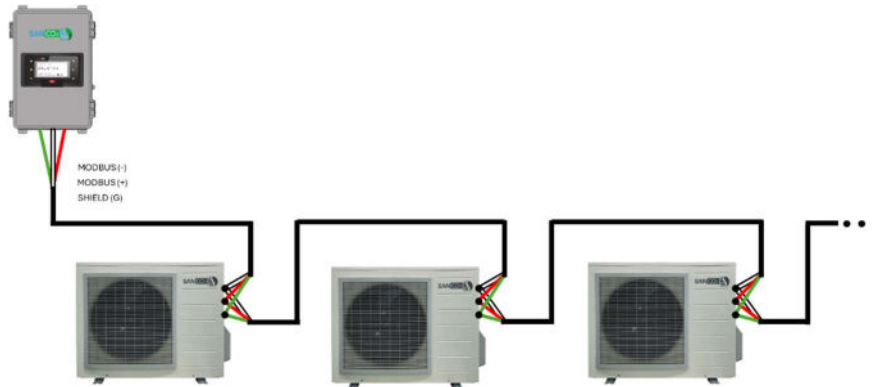

The network wiring must comply with Modbus RTURs-485 best practices, including:

- If the total network cable distance is more than 300 ft, install a 120Ω 1/4W resistor across the Modbus terminals of the last heat pump.
- A Modbus repeater must be installed after every 30 heat pumps or every 2,100 ft of data cable length.
- If used, keep branch connections less than 3 ft.
- 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 "J3 Disp" of the controller.   The "+Vterm" connector is not used.
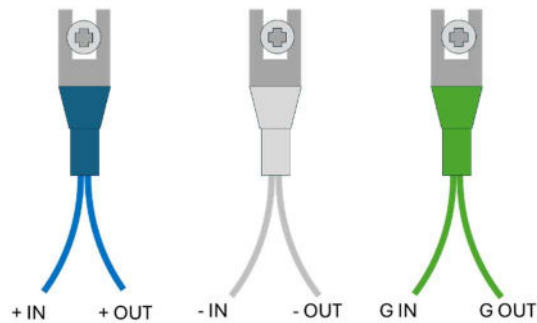

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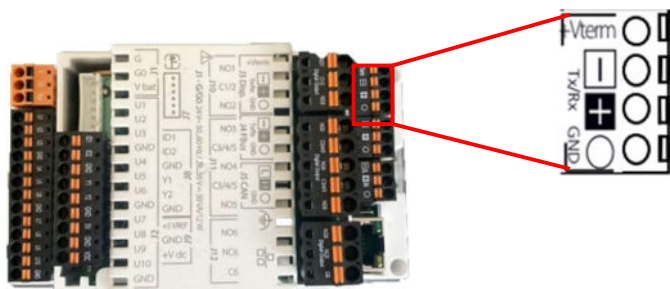
<u>Heat Pump Terminals:</u> Land the network cable on the Modbus terminals of each heat pump. These are located next to the Tank Thermistor terminals.
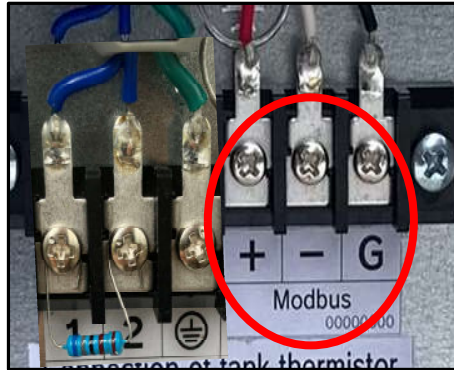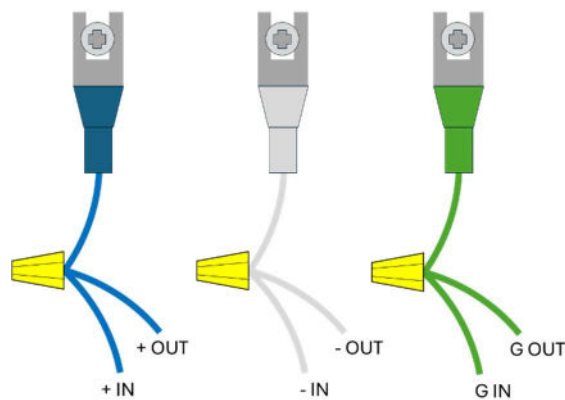

Connections can be made in one of two ways:

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 CONNECTIONS

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

<u>MSTP Serial Connection:</u> The MS/TP data cable is connected to the Rx/Tx/GND terminals on **Block J4 Fbus.**
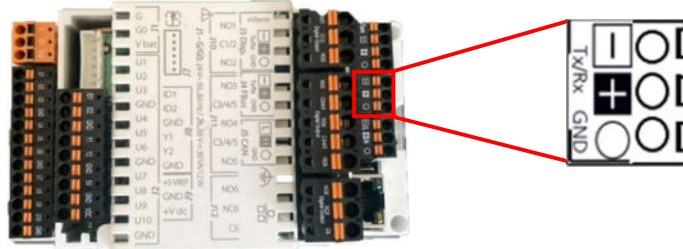

<u>UDP Ethernet Connection:</u> The ethernet cable is plugged into the RJ-45 port. There is also a spade connection for a shield grounding connection. This should be used to prevent network interference.
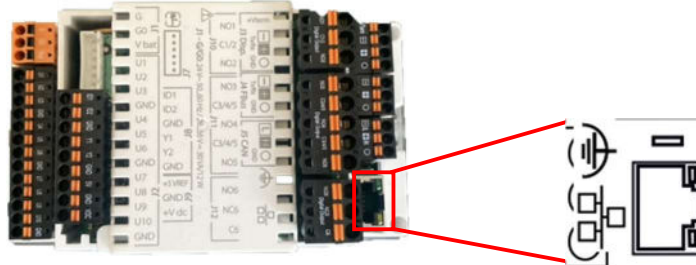

AUXILARY CONTROL RELAY

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.
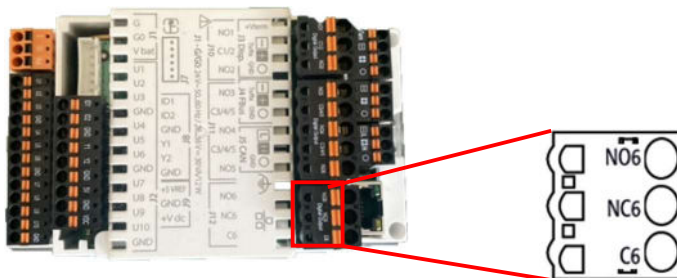
AUXILARY ALARM INPUT

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.
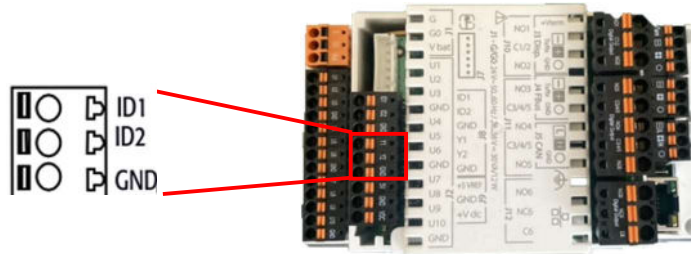
EMERGENCY STOP INPUT

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.
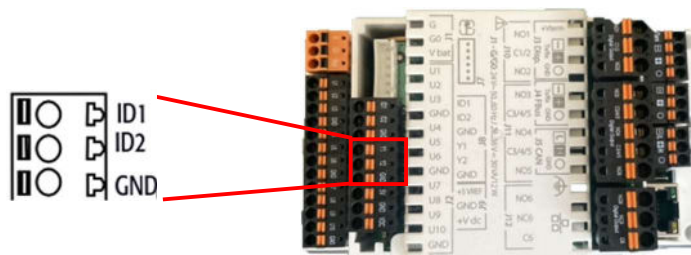
CONTROLLER SUPPLY POWER WIRING

The controller is supplied with a transformer that accepts 120 V / 60 hz / 1 phase supply power. A 6A circuit breaker is recommended for circuit protection of the transformer. The transformer has its own resettable 2A circuit breaker to protect the controller.

Use 14 AWG copper wire with 75C insulation. Connect the incoming power to the transformers Black (L) and White (N) wires using supplied lever nut connectors. The Yellow/White and Yellow wires are connected to the controllers **Block J1, Terminals G and G0**. The **VBat** terminal is not used.

If it is desired to disconnect power locally, a 120V power On/Off switch can also be wired into the supply power.
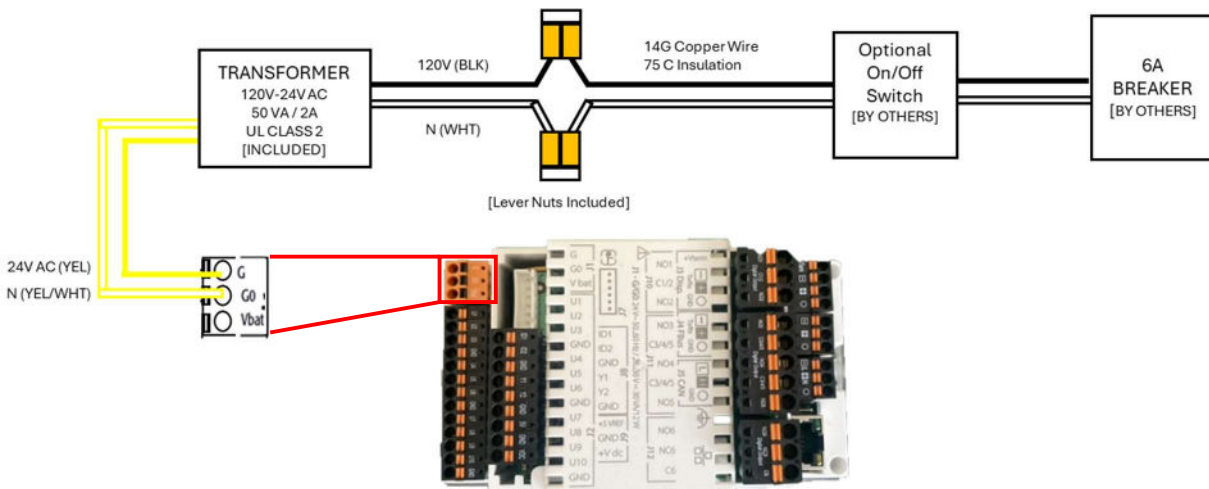
CONTROLLER PROGRAM SETUP AND SYSTEM STARTUP

Consult the CMB Program Guide for instructions on configuring the controller to match the installed system.

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.