EVAPCO Controller User's Manual – Addendum

Communications Guide NEMA Fan Edition

For eco-Air™ Air Cooled and Adiabatic Fluid Coolers and Condensers

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Connecting to the Controller

CONTROLLER LAYOUT:

The eco-Air PLC controller is equipped with the means for communicating to building management systems. The default form of communication is Modbus RTU. The serial connection for Modbus RTU is shown in Detail A. The wiring has been routed to the customer terminal rail for easier installation. Optional expansion cards may be installed to provide a serial connection for BACnet MS/TP or Ethernet for Modbus TCP or BACnet IP. The connections will be made directly to the optional expansion card shown in Detail B.

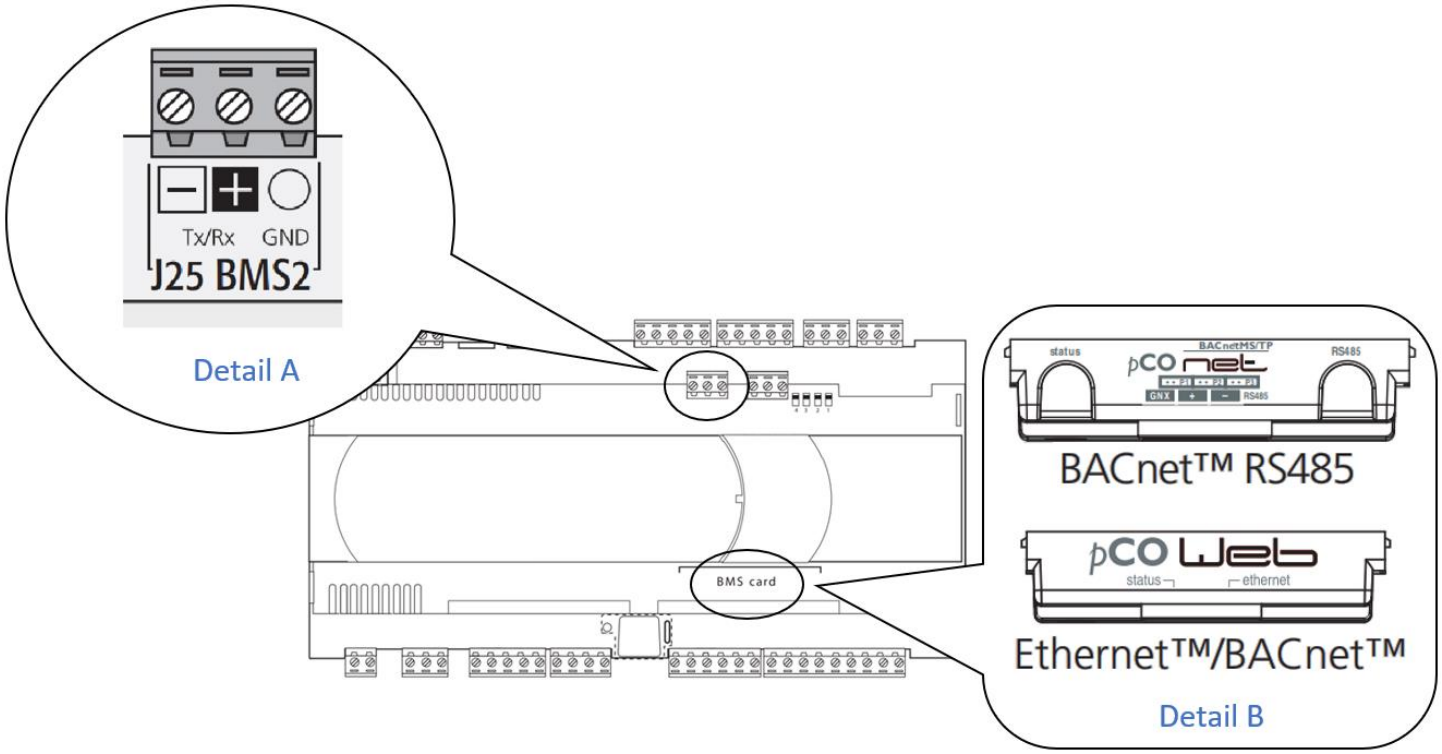

Figure 1 - Controller Layout with Communication Details

MODBUS RTU:

Connections for Modbus RTU are made to the set of terminals labeled J25T, J25R, and J25G. This form of communication is always available, regardless of any additional expansion cards. It is recommended to use RS-485 approved twisted pair, shielded cable. The cable shielding should be terminated at only one end of the cable run.

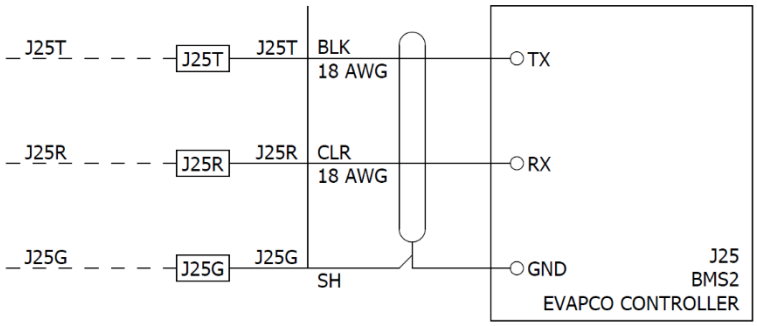

Figure 2 - Modbus RTU Wiring Diagram

BACNET MS/TP:

Connections for BACnet MS/TP will be made directly to the BACnet RS485 interface card. It is recommended to use RS-485 approved twisted pair, shielded cable. The cable shielding should be terminated at only one end of the cable run.

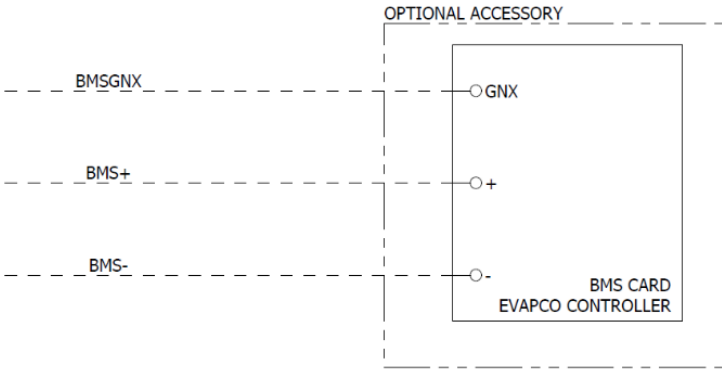

Figure 3 - BACnet MS/TP Wiring Diagram

Figure 4 - BACnet MS/TP Expansion Card

MODBUS TCP & BACNET IP:

Connections for either Modbus TCP or BACnet IP will be made directly to the RJ45 port of the pcoWeb interface card.

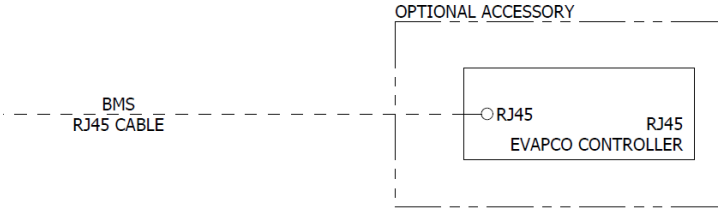

Figure 5 - Ethernet Wiring Diagram

Figure 6 – pcoWeb Expansion Card

Communication Parameters

DEFAULT COMMUNICATION PARAMETERS:

The controller is setup with default communication parameters detailed on the first page of the control panel wiring diagram. The parameters for BACnet MS/TP and BACnet IP/Modbus TCP are only applicable with the addition of an optional expansion card.

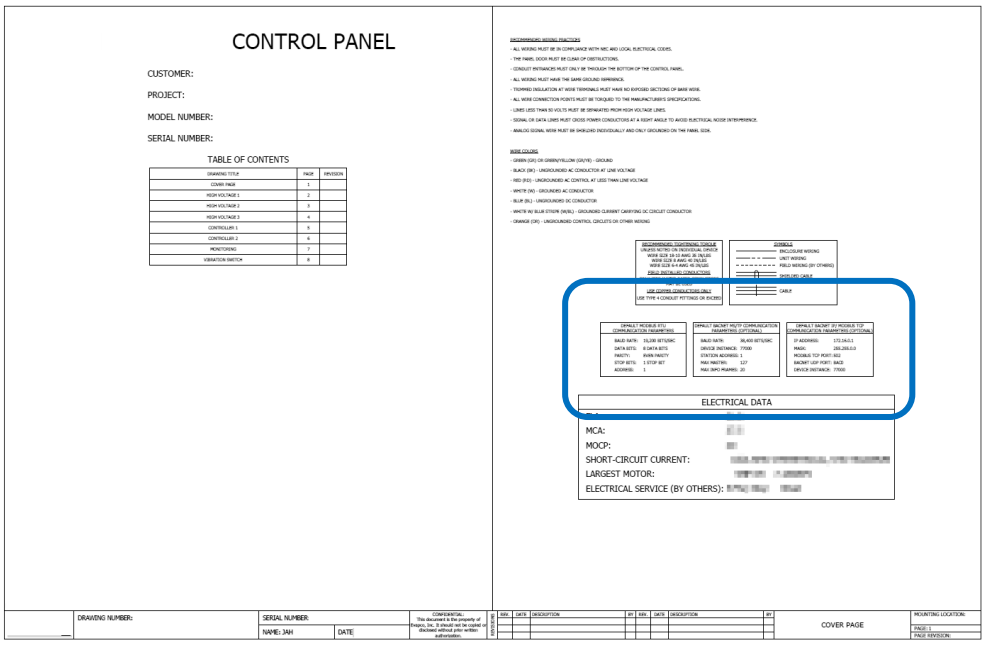

Figure 7 - Communication Parameters

HOW TO CHANGE THE MODBUS RTU COMMUNICATION PARAMETERS:

From the Main menu, enter the Service submenu (Fig. 8). Scroll down to the BMS Config menu (Fig. 9) and press the Enter button. The Baudrate, Node Address, Parity, and Stop bit (Fig. 10) are all modifiable as required to match the supervisory settings. The available baud rates are 1200, 2400, 4800, 9600, 19200, and 38400.

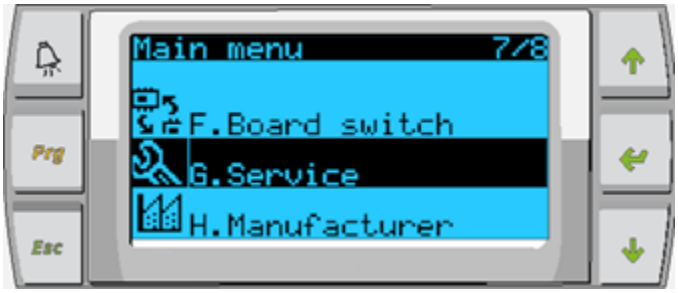

Figure 8 - Main Menu

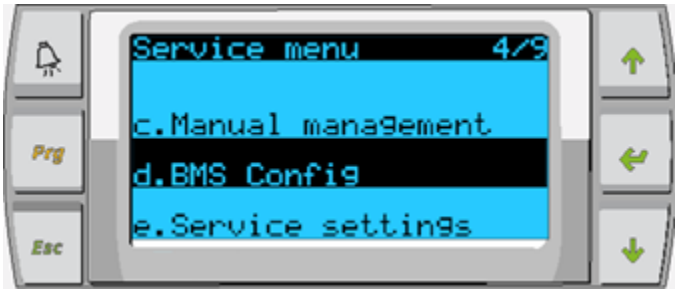

Figure 9 - Service Menu

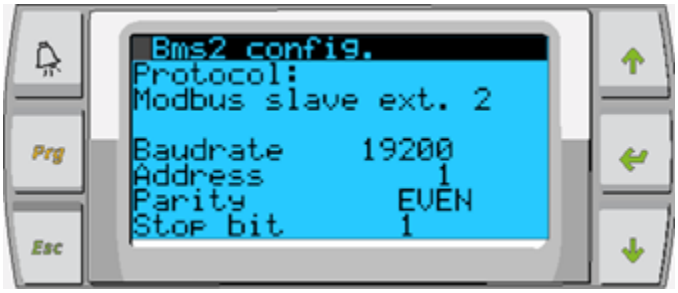

Figure 10 - BMS2 Configuration

HOW TO CHANGE THE BMS EXPANSION CARD PARAMETERS:

The ability to change the parameters of either controller expansion card is through the BIOS menu. Follow the list of instructions below:

1) To access the BIOS menu, press the ALARM and ENTER buttons together for 3 seconds. The following screen will appear.

```
>SYSTEM INFORMATION
 LOG DATA
 OTHER INFORMATION
 FLASH/USB MEMORY
```

2) Scroll to the 'Other Information', and press Enter. The following screen will appear.

```
>ID NUMBER INFO
 PCOWEB/NET CONFIG
 MEMORIES STATUS
```

3) Select the 'pcoWeb/Net Config' and press Enter. The following screen will appear.

```
>PCOWEB settings
 PCONET settings
```

***Note: For the pcoNet card (BACnet MS/TP), skip to step 6.**

4) Select the 'pCOWeb settings' and press Enter. The following screen will appear.

```
DHCP: ---
IP ADDRESS
---.---.---.---
```

5) After a short delay, the fields will populate with the current parameters. If the DHCP option is set to ON, the IP address and Netmask fields cannot be changed. Both BACnet and Modbus communication parameters are available to change by continuously pressing the Enter button to cycle through the rest of the screens.

```
Netmask:
---.---.---.---
Gateway
---.---.---.---
```

```
DNS1:
---.---.---.---
DNS2:
---.---.---.---
```

```
BACnet ID:
-------
BACnet Type:
-------
```

***Note: When the parameters have been changed; skip to step 8.**

6) Select 'pCONet settings' and press Enter. The following screen will appear.

```
BACnet ID:
-------
BACnet baud:
--------
```

7) After a short delay, the fields will populate with the current parameters. Continuously pressing the Enter button will cycle through the rest of the screens.

```
BACnet MAC: ---
Max Masters: ---
Max Frames: -----
```

8) Once the parameters have been set, press Enter to scroll to the confirmation screen, change the 'NO' to 'YES' and press Enter. (The screens will read pCONet whenever that expansion card is being updated.)

```
PCOWEB CONFIG ENABLE
Update pCOWeb? NO
```

9) While the parameters are being updated, the following message is will be displayed:

```
PCOWEB CONFIG ENABLE
Please wait for
end of update
```

10) The following screen will be shown upon completion of the update. Power cycle the panel to apply new settings.

```
PCOWEB CONFIG ENABLE
Update complete
Reboot pCOWeb to
apply new setting
```

MODBUS Communication Points

In the tables below, the adiabatic application column indicates addresses that only apply to units with adiabatic controls. Holding register 4005011 can be referenced to determine whether the adiabatic system has been enabled for the unit. The data points, indicated with the check mark, can be ignored if the unit is not equipped with the adiabatic water valves.

Register	Name	Units	Access	Range	Description	Adiabatic Application
COIL ADDRESSES						
5	Digital Input 3 State	-	R	BINARY 0 to 1	Displays the input status of the vibration switch. 0 = Vibration Switch Contact(s) are open. 1 = Vibration Switch Contact(s) are closed.	
9	Enable Unit	-	RW	BINARY 0 to 1	Enables the unit if it is configured to be enabled via BMS. 0 = Unit not enabled 1 = Unit enabled	
11	Remote Digital Input State	-	R	BINARY 0 to 1	The state of the remote digital input. 0 = No voltage present 1 = Voltage present	
16	Process Sensor Alarm	-	R	BINARY 0 to 1	Fault for either the outlet temperature sensor or the inlet pressure depending on the application. 0 = Normal 1 = Process sensor is not detected	
19	Pre-cooling Valve 1 Status	-	R	BINARY 0 to 1	The state of the first adiabatic pre-cooling valve. 0 = Valve off (water not flowing) 1 = Valve on (water flowing)	✓
20	Pre-cooling Valve 2 Status	-	R	BINARY 0 to 1	The state of the second adiabatic pre-cooling valve. 0 = Valve off (water not flowing) 1 = Valve on (water flowing)	✓
21	Pre-cooling Valve 3 Status	-	R	BINARY 0 to 1	The state of the third adiabatic pre-cooling valve. 0 = Valve off (water not flowing) 1 = Valve on (water flowing)	✓
22	Pre-cooling Valve 4 Status	-	R	BINARY 0 to 1	The state of the fourth adiabatic pre-cooling valve. 0 = Valve off (water not flowing) 1 = Valve on (water flowing)	✓
23	Activate Manual Flush	-	RW	BINARY 0 to 1	Manually starts the flushing cycle of the adiabatic system. 0 = Not active 1 = Start manual flush	✓
24	Release Pre-cooling System	-	RW	BINARY 0 to 1	0 = Pre-cooling system will not function 1 = Pre-cooling system will function when needed	✓

Register	Name	Units	Access	Range	Description	Adiabatic Application
25	Enable Common Alarm	-	RW	BINARY 0 to 1	Enables the common alarm for the digital output. 0 = Common alarm not enabled 1 = Common alarm enabled	
26	Common Alarm Digital Output Status	-	R	BINARY 0 to 1	Status of the alarm digital output. 0 = No alarm/not active 1 = Alarm/active	
27	Vibration Switch Trip	-	R	BINARY 0 to 1	The fault indicator of the vibration switches 0 = No alarm 1 = Alarm	
35	Force Fans to Run at Full Speed	-	RW	BINARY 0 to 1	0 = Not enabled 1 = Forces fans to run at 100 percent fan speed	
37	Enable Stage Ontime	-	RW	BINARY 0 to 1	When active, the pre-cooling system will honor the minimum on time. 0 = Not active 1 = Active	✓

Register	Name	Units	Access	Range	Description	Adiabatic Application
HOLDING REGISTERS						
1	Outlet Temperature	0.1°	R	-999.9 to 999.9	The outlet temperature of the process fluid. For condenser applications, the outlet temperature is a saturated calculation based on the condensing pressure.	
2	Ambient Temperature	0.1°	R	-999.9 to 999.9	The temperature detected by the ambient temperature sensor.	
3	Active Set Point	0.1°	R	0.0 to 999.9	The active set point that the eco-Air unit will maintain.	
4	Set Point 1 Temperature	0.1°	RW	0.0 to 999.9	The primary process temperature setpoint used when all other alternate setpoints are not active.	
5	Set Point 2 Ambient Temperature Trigger	0.1°	RW	-100.0 to 100.0	The set point that when the ambient temperature falls below, will switch the control to set point 2.	
6	Temperature Regulation Band	0.1°	RW	0.0 to 15.0	The temperature band between the minimum and maximum fan speed for P fan speed control mode.	
7	Set Point 2 Ambient Temperature Trigger Differential	0.1°	RW	0.0 to 10.0	The temperature differential added to the ambient temperature set point 2 trigger. This will switch the control set point back to set point 1.	
8	Pre-cooling Minimum Allowable Temperature Set Point	0.1°	RW	0.0 to 50.0	The minimum ambient temperature at which the pre-cooling system may operate.	✓
9	Pre-cooling Minimum Allowable Temperature Difference	0.1°	RW	0.0 to 20.0	The ambient temperature offset added to the minimum allowable temperature, at which the pre-cooling system becomes activate.	✓
10	Proportional Gain	0.1	RW	0.0 to 15.0	The proportional gain constant used for the PID controller.	
17	Switch Point #1 Temperature	0.1°	R	0.0 to 999.9	The minimum temperature above which pre-cooling stage 1 will activate.	✓
18	Switch Point #2 Temperature	0.1°	R	0.0 to 999.9	The minimum temperature above which pre-cooling stage 2 will activate.	✓
19	Switch Point #3 Temperature	0.1°	R	0.0 to 999.9	The minimum temperature above which pre-cooling stage 3 will activate.	✓
20	Switch Point #4 Temperature	0.1°	R	0.0 to 999.9	The minimum temperature above which pre-cooling stage 4 will activate.	✓
22	Flushing Fan Speed	%	RW	0 to 100	The desired fan speed while performing a flushing cycle.	✓
23	Set Point 2 Temperature	0.1°	RW	0 to 999.9	An alternate process temperature set point that may be activated via the scheduler, ambient temperature, or digital input.	

Register	Name	Units	Access	Range	Description	Adiabatic Application
5002	Actual Unit State	-	R	0 to 13	The current state of the EVAPCO Controller. 1 = Unit on and operational 2= Unit is off by an alarm 4 = Unit is off via Modbus/BACnet 5 = Unit is off via the scheduler 6 = Unit is off via the digital input 7 = Unit is switched off locally	
5003	Minimum Allowed Fan Speed	%	RW	0 to 100	The minimum allowable fan speed.	
5004	Maximum Allowed Fan Speed	%	RW	0 to 100	The maximum allowable fan speed.	
5005	Energy Savings Fan Speed	%	RW	0 to 100	The fan speed above which the pre-cooling system will activate.	
5006	Quiet Operation Maximum Fan Speed	%	RW	0 to 100	The maximum allowable fan speed in quiet operation.	
5007	PID Integral Term	Seconds	RW	0 to 1000	PID integral term.	
5008	PID Differential Term	Seconds	RW	0 to 1000	PID differential term.	
5009	Fan Operating Hours (Thousands)	1000 Hours	R	0 to 999	The number of hours the fan(s) have been operational × 1000.	
5011	Number of wet stages	Units	R	0 to 4	The number of stages that have been enabled for the adiabatic system. The number of stages is equal to the number of solenoid valves on the unit.	✓
5012	Pre-cooling Stage 1 Increase Delay Set Point	Seconds	RW	0 to 32767	The number of seconds that must pass with the process temperature above set point before the stage activates.	✓
5013	Pre-cooling Stage 1 Decrease Delay Set point	Seconds	RW	0 to 32767	The number of seconds that must pass with the process temperature below set point before the stage deactivates.	✓
5014	Pre-cooling Stage 2 Operating Hours (Thousands)	1000 Hours	R	0 to 999	The number of hours the pre-cooling stage has been operational × 1000.	✓
5015	Refrigerant	-	RW	0 to 30	For condenser applications 0=R22, 1=R134a, 2=R404A, 3=R407C, 4=R410A, 5=R507, 6=R290, 7=R600, 8=R600a, 9=R717, 10=R744, 11=R728, 12=R1270, 13=R417A, 14=R422d, 15=R413A, 16=R422A, 17=R423A, 18=R407A, 19=R427A, 20=R245Fa, 21=R407F	
5016	Pre-cooling Stage 3 Operating Hours (Thousands)	1000 Hours	R	0 to 999	The number of hours the pre-cooling stage has been operational × 1000.	✓

Register	Name	Units	Access	Range	Description	Adiabatic Application
5017	Pre-cooling Stage 1 Minimum On Time	Seconds	RW	0 to 32767	The minimum amount of time the pre-cooling stage remains active before turning off.	✓
5018	Pre-cooling Stage 2 Minimum On Time	Seconds	RW	0 to 32767	The minimum amount of time the pre-cooling stage remains active before turning off.	✓
5019	Pre-cooling Stage 3 Minimum On Time	Seconds	RW	0 to 32767	The minimum amount of time the pre-cooling stage remains active before turning off.	✓
5020	Pre-cooling Stage 4 Minimum On Time	Seconds	RW	0 to 32767	The minimum amount of time the pre-cooling stage remains active before turning off.	✓
5029	Inlet Pressure	0.1	R	-32767 to 32767	Inlet pressure reading via pressure sensor input. X10	
5030	Reference Fan Speed	%	R	0 to 100	The desired fan speed determined by the controller.	
5031	Flushing Time	Minutes	RW	0 to 9999	The number of minutes to perform the flushing routine once initiated.	✓
5034	Vibration Switch Alarm Delay	Seconds	RW	0 to 32767	The number of seconds for the fault state to remain active before generating an alarm.	
5037	Flushing Time Accumulator	Seconds	R	0 to 32767	The number of seconds the flushing routine has been active.	✓
5038	Drying Time	Minutes	RW	0 to 9999	The number of minutes to dry the pre-cooling pads after a flushing routine.	✓
5039	Drying Time Accumulator	Seconds	R	0 to 32767	The number of seconds the drying routine has been active	✓
5040	Pre-cooling Stage 4 Operating Hours (Thousands)	1000 Hours	R	0 to 999	The number of hours the pre-cooling stage has been operational × 1000.	✓
5041	Pre-cooling Stage 1 Operating Hours (Thousands)	1000 Hours	R	0 to 999	The number of hours the pre-cooling stage has been operational × 1000.	✓
5042	Fan Operating Hours	Hours	R	0 to 999	The number of hours the fan(s) have been operational x 1.	
5043	Pre-cooling Stage 1 Operating Hours	Hours	R	0 to 999	The number of hours the pre-cooling stage has been operational × 1.	✓
5044	Pre-cooling Stage 2 Operating Hours	Hours	R	0 to 999	The number of hours the pre-cooling stage has been operational × 1.	✓
5045	Pre-cooling Stage 3 Operating Hours	Hours	R	0 to 999	The number of hours the pre-cooling stage has been operational × 1.	✓
5046	Pre-cooling Stage 4 Operating Hours	Hours	R	0 to 999	The number of hours the pre-cooling stage has been operational × 1.	✓
5050	Pre-cooling Stage 2-4 Increase Delay Set Point	Seconds	RW	0 to 32767	The number of seconds that must pass with the process fluid temperature above set point before the stages activate.	✓

Register	Name	Units	Access	Range	Description	Adiabatic Application
5051	Pre-cooling Stage 2-4 Decrease Delay Set Point	Seconds	RW	0 to 32767	The number of seconds that must pass with the process fluid temperature below set point before the stages deactivate.	✓
5052	Pre-cooling Stage 2-4 Decrease Delay Accumulator	Seconds	R	0 to 32767	The number of seconds with the process fluid below set point while the stages are active.	✓
5053	Pre-cooling Stage 1 Decrease Delay Accumulator	Seconds	R	0 to 32767	The number of seconds with the process fluid below set point while the stage is active.	✓
5054	Pre-cooling Stage 2-4 Increase Delay Accumulator	Seconds	R	0 to 32767	The number of seconds with the process fluid above set point while the stages are not active.	✓
5055	Pre-cooling Stage 1 Increase Delay Accumulator	Seconds	R	0 to 32767	The number of seconds with the process fluid above set point while the stage is not active.	✓

BACNET Communication Points

In the tables below, the adiabatic application column indicates addresses that only apply to units with adiabatic controls. Variable 200010 can be referenced to determine whether the adiabatic system has been enabled for the unit. The data points, indicated with the check mark, can be ignored if the unit is not equipped with the adiabatic water valves.

Register	Name	Units	Access	Range	Description	Adiabatic Application
DIGITAL VARIABLES						
BINARY_VALUE:100005	Digital Input 3 State	-	R	0 to 1	Displays the input status of the vibration switch. 0 = Vibration Switch Contact(s) are open. 1 = Vibration Switch Contact(s) are closed.	
BINARY_VALUE:100009	Enable Unit	-	RW	0 to 1	Enables the unit if it is configured to be enabled via BMS. 0 = Unit not enabled 1 = Unit enabled	
BINARY_VALUE:100011	Remote Digital Input State	-	R	0 to 1	The state of the remote digital input. 0 = No voltage present 1 = Voltage present	
BINARY_VALUE:100016	Process Sensor Alarm	-	R	0 to 1	Fault for either the outlet temperature sensor or the inlet pressure depending on the application. 0 = Normal 1 = Process sensor is not detected	
BINARY_VALUE:100019	Pre-cooling Valve 1 Status	-	R	0 to 1	The state of the first adiabatic pre-cooling valve. 0 = Valve off (water not flowing) 1 = Valve on (water flowing)	✓
BINARY_VALUE:100020	Pre-cooling Valve 2 Status	-	R	0 to 1	The state of the second adiabatic pre-cooling valve. 0 = Valve off (water not flowing) 1 = Valve on (water flowing)	✓
BINARY_VALUE:100021	Pre-cooling Valve 3 Status	-	R	0 to 1	The state of the third adiabatic pre-cooling valve. 0 = Valve off (water not flowing) 1 = Valve on (water flowing)	✓
BINARY_VALUE:100022	Pre-cooling Valve 4 Status	-	R	0 to 1	The state of the fourth adiabatic pre-cooling valve. 0 = Valve off (water not flowing) 1 = Valve on (water flowing)	✓
BINARY_VALUE:100023	Activate Manual Flush	-	RW	0 to 1	Manually starts the flushing cycle of the adiabatic system. 0 = Not active 1 = Start manual flush	✓
BINARY_VALUE:100024	Release Pre-cooling System	-	RW	0 to 1	0 = Pre-cooling system will not function 1 = Pre-cooling system will function when needed	✓

Register	Name	Units	Access	Range	Description	Adiabatic Application
BINARY_VALUE:100025	Enable Common Alarm	-	RW	0 to 1	Enables the common alarm for the digital output. 0 = Common alarm not enabled 1 = Common alarm enabled	
BINARY_VALUE:100026	Common Alarm Digital Output Status	-	R	0 to 1	Status of the alarm digital output. 0 = No alarm/not active 1 = Alarm/active	
BINARY_VALUE: 100027	Vibration Switch Trip	-	R	0 to 1	The fault indicator of the vibration switches 0 = No alarm 1 = Alarm	
BINARY_VALUE:100035	Force Fans to Run at Full Speed	-	RW	0 to 1	0 = Not enabled 1 = Forces fans to run at 100 percent fan speed	
BINARY_VALUE:100037	Enable Stage Ontime	-	RW	0 to 1	When active, the pre-cooling system will honor the minimum on time. 0 = Not active 1 = Active	✓

Register	Name	Units	Access	Range	Description	Adiabatic Application
ANALOG VARIABLES						
ANALOG_VALUE:100001	Outlet Temperature	0.1°F	R	-999.9 to 999.9	The outlet temperature of the process fluid. For condenser applications, the outlet temperature is a saturated calculation based on the condensing pressure.	
ANALOG_VALUE:100002	Ambient Temperature	0.1°F	R	-999.9 to 999.9	The temperature detected by the ambient temperature sensor.	
ANALOG_VALUE:100003	Active Set Point	0.1°F	R	0.0 to 999.9	The active set point that the eco-Air unit will maintain.	
ANALOG_VALUE:100004	Set Point 1 Temperature	0.1°F	RW	0.0 to 999.9	The primary process temperature setpoint used when all other alternate setpoints are not active.	
ANALOG_VALUE:100005	Set Point 2 Ambient Temperature Trigger	0.1°F	RW	-100.0 to 100.0	The set point that when the ambient temperature falls below, will switch the control to set point 2.	
ANALOG_VALUE:100006	Temperature Regulation Band	0.1°F	RW	0.0 to 15.0	The temperature band between the minimum and maximum fan speed for P fan speed control mode.	
ANALOG_VALUE:100007	Set Point 2 Ambient Temperature Trigger Differential	0.1°F	RW	0.0 to 10.0	The temperature differential added to the ambient temperature set point 2 trigger. This will switch the control set point back to set point 1.	
ANALOG_VALUE:100008	Pre-cooling Minimum Allowable Temperature Set Point	0.1°F	RW	0.0 to 50.0	The minimum ambient temperature at which the pre-cooling system may operate.	✓
ANALOG_VALUE:100009	Pre-cooling Minimum Allowable Temperature Difference	0.1°F	RW	0.0 to 20.0	The ambient temperature offset added to the minimum allowable temperature, at which the pre-cooling system becomes activate.	✓
ANALOG_VALUE:100010	Proportional Gain	0.1g	RW	0.0 to 15.0	The proportional gain constant used for the PID controller.	
ANALOG_VALUE:100017	Switch Point #1 Temperature	0.1°F	R	0.0 to 999.9	The minimum temperature above which pre-cooling stage 1 will activate.	✓
ANALOG_VALUE:100018	Switch Point #2 Temperature	0.1°F	R	0.0 to 999.9	The minimum temperature above which pre-cooling stage 2 will activate.	✓
ANALOG_VALUE:100019	Switch Point #3 Temperature	0.1°F	R	0.0 to 999.9	The minimum temperature above which pre-cooling stage 3 will activate.	✓
ANALOG_VALUE:100020	Switch Point #4 Temperature	0.1°F	R	0.0 to 999.9	The minimum temperature above which pre-cooling stage 4 will activate.	✓
ANALOG_VALUE:100022	Flushing Fan Speed	%	RW	0 to 100	The desired fan speed while performing a flushing cycle.	✓

Register	Name	Units	Access	Range	Description	Adiabatic Application
ANALOG_VALUE:100023	Set Point 2 Temperature	0.1°F	RW	0 to 999.9	An alternate process temperature set point that may be activated via the scheduler, ambient temperature, or digital input.	
INTEGER VARIABLES						
ANALOG_VALUE:200001	Actual Unit State	-	R	0 to 13	The current state of the EVAPCO Controller. 1 = Unit on and operational 2= Unit is off by an alarm 4 = Unit is off via Modbus/BACnet 5 = Unit is off via the scheduler 6 = Unit is off via the digital input 7 = Unit is switched off locally	
ANALOG_VALUE:200002	Minimum Allowed Fan Speed	%	RW	0 to 100	The minimum allowable fan speed.	
ANALOG_VALUE:200003	Maximum Allowed Fan Speed	%	RW	0 to 100	The maximum allowable fan speed.	
ANALOG_VALUE:200004	Energy Savings Fan Speed	%	RW	0 to 100	The fan speed above which the pre-cooling system will activate.	
ANALOG_VALUE:200005	Quiet Operation Maximum Fan Speed	%	RW	0 to 100	The maximum allowable fan speed in quiet operation.	
ANALOG_VALUE:200006	PID Integral Term	Seconds	RW	0 to 1000	PID integral term.	
ANALOG_VALUE:200007	PID Differential Term	Seconds	RW	0 to 1000	PID differential term.	
ANALOG_VALUE:200008	Fan Operating Hours (Thousands)	1000 Hours	R	0 to 999	The number of hours the fan(s) have been operational × 1000.	
ANALOG_VALUE:200010	Number of wet stages	Units	R	0 to 4	The number of stages that have been enabled for the adiabatic system. The number of stages is equal to the number of solenoid valves on the unit.	✓
ANALOG_VALUE:200011	Pre-cooling Stage 1 Increase Delay Set Point	Seconds	RW	0 to 32767	The number of seconds that must pass with the process temperature above set point before the stage activates.	✓
ANALOG_VALUE:200012	Pre-cooling Stage 1 Decrease Delay Set point	Seconds	RW	0 to 32767	The number of seconds that must pass with the process temperature below set point before the stage deactivates.	✓
ANALOG_VALUE:200013	Pre-cooling Stage 2 Operating Hours (Thousands)	1000 Hours	R	0 to 999	The number of hours the pre-cooling stage has been operational × 1000.	✓

Register	Name	Units	Access	Range	Description	Adiabatic Application
ANALOG_VALUE:200014	Refrigerant	-	RW	0 to 30	For condenser applications 0=R22, 1=R134a, 2=R404A, 3=R407C, 4=R410A, 5=R507, 6=R290, 7=R600, 8=R600a, 9=R717, 10=R744, 11=R728, 12=R1270, 13=R417A, 14=R422d, 15=R413A, 16=R422A, 17=R423A, 18=R407A, 19=R427A, 20=R245Fa, 21=R407F	
ANALOG_VALUE:200015	Pre-cooling Stage 3 Operating Hours (Thousands)	1000 Hours	R	0 to 999	The number of hours the pre-cooling stage has been operational × 1000.	✓
ANALOG_VALUE:200016	Pre-cooling Stage 1 Minimum On Time	Seconds	RW	0 to 32767	The minimum amount of time the pre-cooling stage remains active before turning off.	✓
ANALOG_VALUE:200017	Pre-cooling Stage 2 Minimum On Time	Seconds	RW	0 to 32767	The minimum amount of time the pre-cooling stage remains active before turning off.	✓
ANALOG_VALUE:200018	Pre-cooling Stage 3 Minimum On Time	Seconds	RW	0 to 32767	The minimum amount of time the pre-cooling stage remains active before turning off.	✓
ANALOG_VALUE:200019	Pre-cooling Stage 4 Minimum On Time	Seconds	RW	0 to 32767	The minimum amount of time the pre-cooling stage remains active before turning off.	✓
ANALOG_VALUE:200028	Inlet Pressure	0.1 psi	R	-32767 to 32767	Inlet pressure reading via pressure sensor input. X10	
ANALOG_VALUE:200029	Reference Fan Speed	%	R	0 to 100	The desired fan speed determined by the controller.	
ANALOG_VALUE:200030	Flushing Time	Minutes	RW	0 to 9999	The number of minutes to perform the flushing routine once initiated.	✓
ANALOG_VALUE:200033	Vibration Switch Alarm Delay	Seconds	RW	0 to 32767	The number of seconds for the fault state to remain active before generating an alarm.	
ANALOG_VALUE:200036	Flushing Time Accumulator	Seconds	R	0 to 32767	The number of seconds the flushing routine has been active.	✓
ANALOG_VALUE:200037	Drying Time	Minutes	RW	0 to 9999	The number of minutes to dry the pre-cooling pads after a flushing routine.	✓
ANALOG_VALUE:200038	Drying Time Accumulator	Seconds	R	0 to 32767	The number of seconds the drying routine has been active	✓
ANALOG_VALUE:200039	Pre-cooling Stage 4 Operating Hours (Thousands)	1000 Hours	R	0 to 999	The number of hours the pre-cooling stage has been operational × 1000.	✓
ANALOG_VALUE:200040	Pre-cooling Stage 1 Operating Hours (Thousands)	1000 Hours	R	0 to 999	The number of hours the pre-cooling stage has been operational × 1000.	✓
ANALOG_VALUE:200041	Fan Operating Hours	Hours	R	0 to 999	The number of hours the fan(s) have been operational x 1.	
ANALOG_VALUE:200042	Pre-cooling Stage 1 Operating Hours	Hours	R	0 to 999	The number of hours the pre-cooling stage has been operational × 1.	✓

Register	Name	Units	Access	Range	Description	Adiabatic Application
ANALOG_VALUE:200043	Pre-cooling Stage 2 Operating Hours	Hours	R	0 to 999	The number of hours the pre-cooling stage has been operational × 1.	✓
ANALOG_VALUE:200044	Pre-cooling Stage 3 Operating Hours	Hours	R	0 to 999	The number of hours the pre-cooling stage has been operational × 1.	✓
ANALOG_VALUE:200045	Pre-cooling Stage 4 Operating Hours	Hours	R	0 to 999	The number of hours the pre-cooling stage has been operational × 1.	✓
ANALOG_VALUE:200049	Pre-cooling Stage 2-4 Increase Delay Set Point	Seconds	RW	0 to 32767	The number of seconds that must pass with the process fluid temperature above set point before the stages activate.	✓
ANALOG_VALUE:200050	Pre-cooling Stage 2-4 Decrease Delay Set Point	Seconds	RW	0 to 32767	The number of seconds that must pass with the process fluid temperature below set point before the stages deactivate.	✓
ANALOG_VALUE:200051	Pre-cooling Stage 2-4 Decrease Delay Accumulator	Seconds	R	0 to 32767	The number of seconds with the process fluid below set point while the stages are active.	✓
ANALOG_VALUE:200052	Pre-cooling Stage 1 Decrease Delay Accumulator	Seconds	R	0 to 32767	The number of seconds with the process fluid below set point while the stage is active.	✓
ANALOG_VALUE:200053	Pre-cooling Stage 2-4 Increase Delay Accumulator	Seconds	R	0 to 32767	The number of seconds with the process fluid above set point while the stages are not active.	✓
ANALOG_VALUE:200054	Pre-cooling Stage 1 Increase Delay Accumulator	Seconds	R	0 to 32767	The number of seconds with the process fluid above set point while the stage is not active.	✓