eco-Air Series

EVAPCO Controller User's Manual – Addendum
Communications Guide AC Motor Edition

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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 forms of communication are Modbus RTU, Modbus TCP/IP, BACnet MS/TP, & BACnet IP. The serial connection for Modbus RTU and BACnet MS/TP is shown in Detail A. The two connections will allow for easier termination of a daisy-chain network. The serial network will only be able to communicate with either Modbus RTU or BACnet MS/TP. Both means of communication cannot function at the same time. The selection for which form of serial communication is enabled will be made on the control panel HMI screen. Connections for Modbus TCP/IP or BACnet IP will be made to the Ethernet port shown in Detail B. Both forms of communication are active on the Ethernet network.

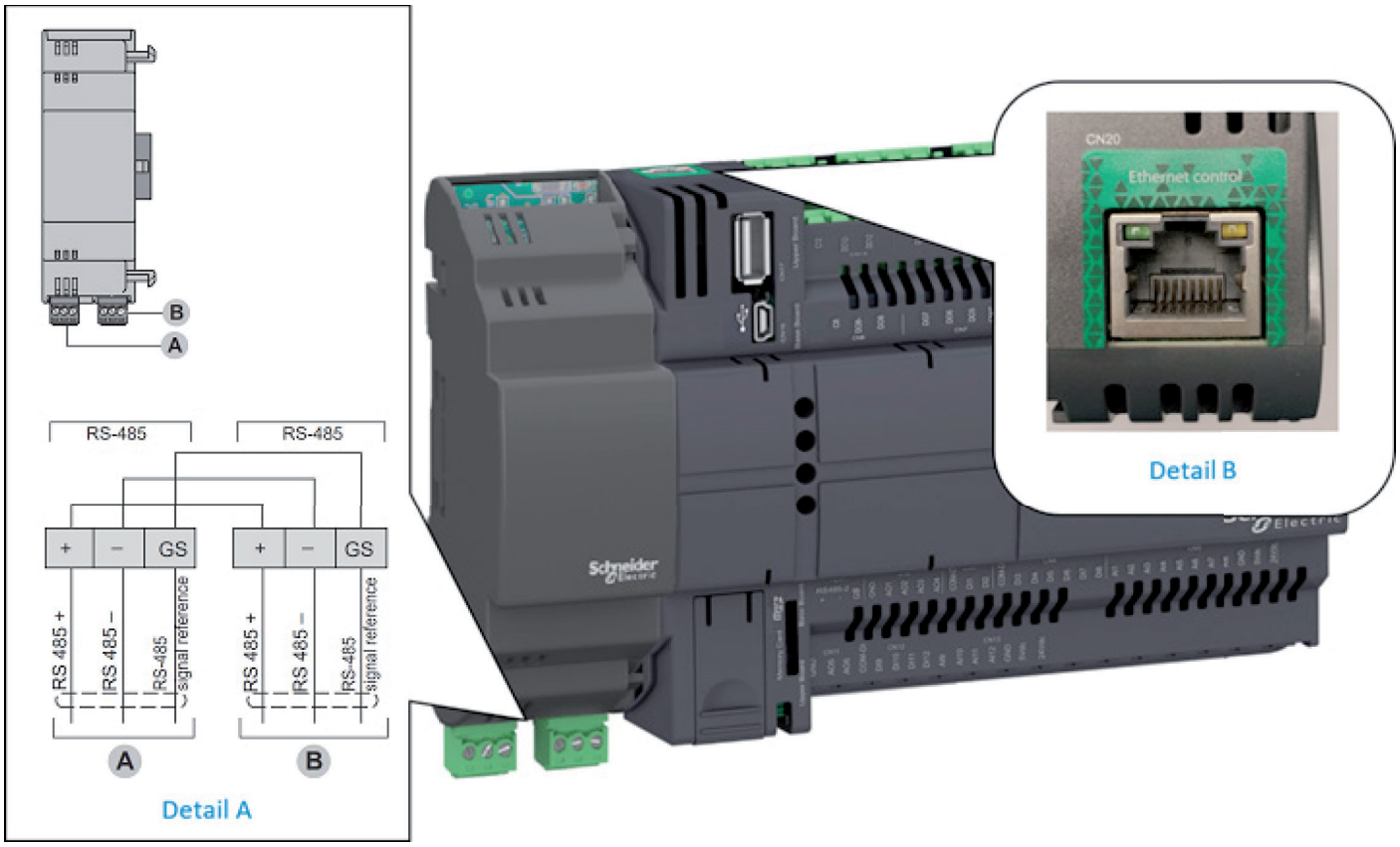

Figure 1 - Controller Layout with Communication Details

MODBUS RTU OR BACNET MS/TP:

Serial connections for either Modbus RTU or BACnet MS/TP are made directly to the set of terminals on the PLC. It is recommended to use RS485 approved twisted pair, shielded cable. The cable shielding should be terminated at only one end of the cable run. Only one protocol can be active at a time on the serial network. This selection is made within the Service menu of the HMI.

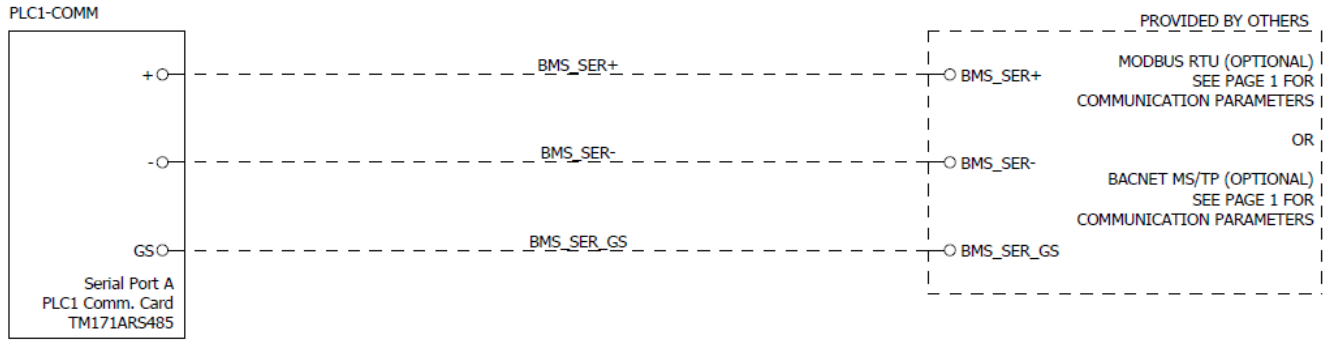

Figure 2 - Modbus RTU OR BACnet MS/TP Wiring Diagram

MODBUS TCP/IP & BACNET IP:

Connections for either Modbus TCP/IP or BACnet IP will be made directly to the RJ45 port of the PLC (see **Error! Reference source not found.** Detail B).

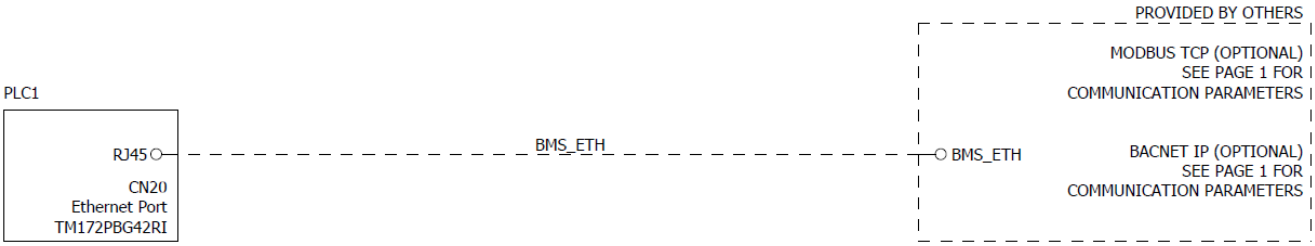

Figure 3 - Ethernet Wiring Diagram

Communication Parameters

DEFAULT COMMUNICATION PARAMETERS:

The controller is setup with default communication parameters detailed on the first page of the control panel wiring diagram.

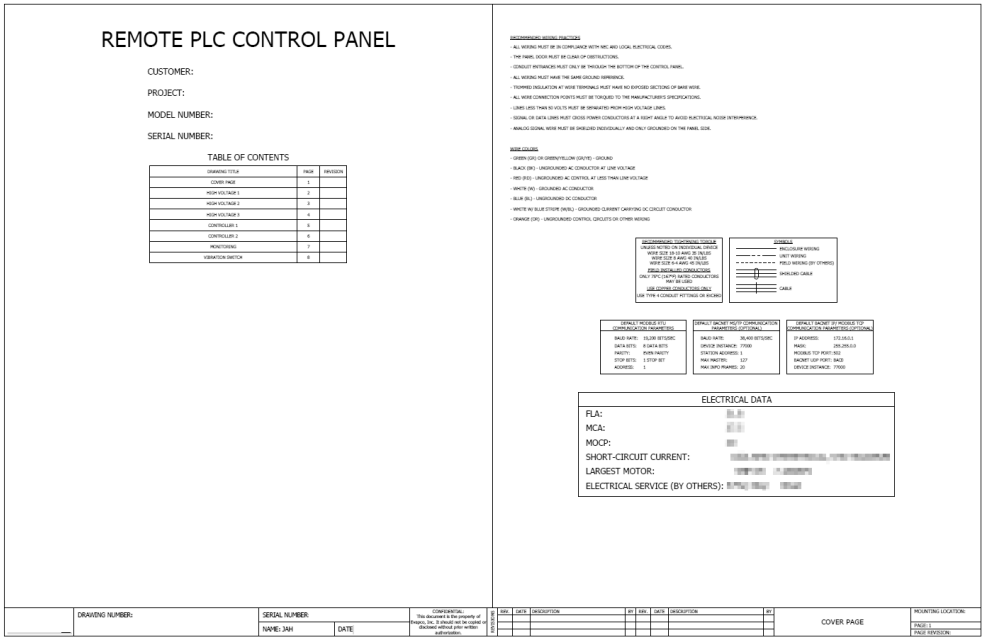

Figure 4 - Communication Parameters

HOW TO CHANGE THE COMMUNICATION PARAMETERS:

Note: the unit must be turned off before changes can be made to the communication parameters. This is easily achieved via the On/Off Control section of the main menu. From the main menu, log in at the Service level (password: 1234) and enter the Service submenu. Select the BMS & Network button menu (Figure 6). After changing any parameter, the Update button must be pressed and held for three seconds to set the value. **This will cause the HMI and PLC to restart.**

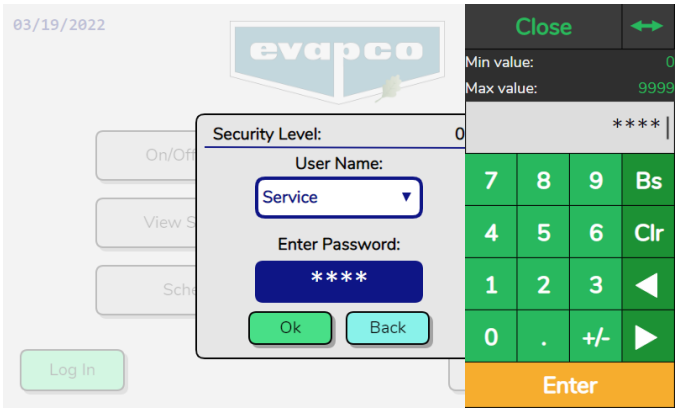

Figure 5 – Service level log in

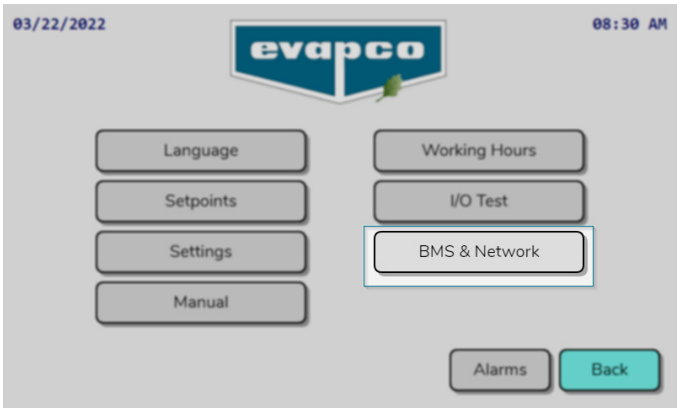

Figure 6 - Service Menu, BMS & Network

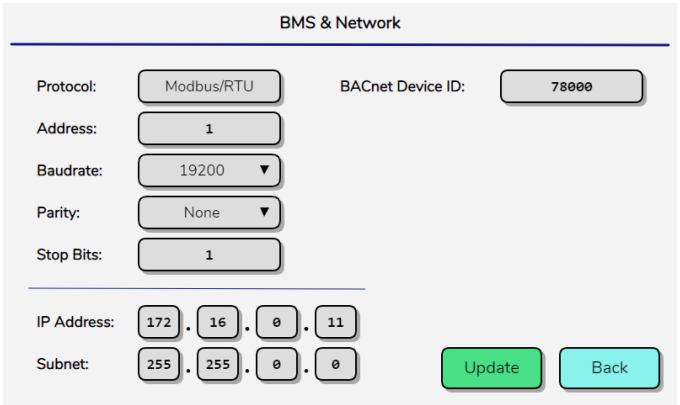

Figure 7 – BMS & Network parameter options

MODBUS Communication Points

In the tables below, the adiabatic application column indicates addresses that only apply to units with adiabatic controls e.g., holding register 416595,00 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.

The Holding Registers are separated into two sections. The non-volatile memory section contains equipment parameters that are retained, in the event of a power cycling of the PLC. The volatile memory consists of status variables for PLC IO, calculations, or alarm conditions that are not retained with a loss of power to the PLC.

The non-volatile memory is specified for a life cycle of 100,000 writes (minimum).

Using the non-volatile memory for a cyclic write operation may result in quickly exceeding its life cycle limits resulting in an inoperative memory.

NOTICE

Do not use non-volatile memory registers for cyclic write operations.

Failure to follow these instructions can result in equipment damage.

DANGER

Holding Registers that are not published below are factory reserved.

Modification of any register not listed below can result in rendering the unit non-operational, equipment damage, and possible severe personal injury and or death.

Register	Name	Units	Type	Access	Range	Description	Adiabatic Application
NON-VOLATILE MEMORY							
416384	Setpoint #1 Temperature	0°	REAL	RW	-999.9 to 999.9	The primary process temperature setpoint used when all other alternate setpoints are not active.	
416386	Setpoint #2 Temperature	0°	REAL	RW	-999.9 to 999.9	An alternate process temperature setpoint that may be activated via the scheduler, ambient temperature, or digital input.	
416388	Maximum Allowed Fan Speed	0%	INT	RW	0 to 100	The maximum allowable fan speed.	
416389	Quiet Operation Maximum Fan Speed	0%	INT	RW	0 to 100	The maximum allowable fan speed in quiet operation	
416390	Energy Savings Fan Speed	0%	INT	RW	0 to 100	The fan speed, above which the pre-cooling system will activate.	✓
416391	Minimum Allowed Fan Speed	0%	INT	RW	0 to 100	The minimum allowable fan speed	
416392,00	PID vs P Fan Speed Regulation	-	BOOL	RW	BINARY 0 to 1	Determines whether fan speed control is based on a PID controller or a Proportional calculation.	
416393	Proportional Temperature Regulation Band	0°	REAL	RW	0.0 to 30.0	The temperature band between the minimum and maximum fan speed for P fan speed control.	
416395	PID Controller Gain	0g	REAL	RW	0.0 to 10.0	The proportional gain constant used for PID Controller.	
416397	PID Controller Ti Term	0 sec	INT	RW	0 to 999	PID integral term.	
416398	PID Controller Td Term	0 sec	INT	RW	0 to 999	PID derivative term.	
416399	Setpoint #2 Ambient Temperature Trigger	0°	REAL	RW	-100.0 to 200.0	The setpoint that when the ambient temperature falls below, will switch the control to setpoint 2. (Feature must be enabled in the service setpoints section).	
416401	Setpoint #2 Ambient Temperature Trigger Differential	0°	REAL	RW	0.0 to 20.0	The temperature differential added to the ambient temperature setpoint 2 trigger. This will switch the control setpoint back to setpoint 1.	
416403,00	Manual Force Fan Run At Max Speed	-	BOOL	RW	BINARY 0 to 1	0 = Not enabled 1 = Forces fans to run at 100 percent fan speed	
416404	Total Fan Runtime Hours	0 hours	UDINT	RW	0 to 4,294,967,295	The number of hours the fans have been operational.	
416406	Valve #1 Total Runtime Hours	0 hours	UDINT	RW	0 to 4,294,967,295	The number of hours the first valve has been operational.	✓
416408	Valve #2 Total Runtime Hours	0 hours	UDINT	RW	0 to 4,294,967,295	The number of hours the second valve has been operational.	✓
416410	Valve #3 Total Runtime Hours	0 hours	UDINT	RW	0 to 4,294,967,295	The number of hours the third valve has been operational.	✓

Register	Name	Units	Type	Access	Range	Description	Adiabatic Application
416412	Valve #4 Total Runtime Hours	0 hours	UDINT	RW	0 to 4,294,967,295	The number of hours the fourth valve has been operational.	✓
416414,00	Enable Common Alarm Digital Output	-	BOOL	RW	BINARY 0 to 1	Enables the common alarm for the digital output. 0 = Common alarm not enabled 1 = Common alarm enabled	
416419	Condenser Refrigerant Type	0	INT	RW	1 to 28	For condenser applications 1=R22, 2=R134a, 3=R404A, 4=R407C, 5=R410A, 6=R407A, 7=R407F, 8=R290, 9=R507A, 10=R717 (NH3), 11=R723, 12=R1234ze, 13=R744 (CO2), 14=R448A, 15=R427A, 16=R450A (N13), 17=R513A, 18=R449A, 19=R1234yf, 20=R454B, 21=R454C, 22=R455A, 23=434A, 24=R422A, 25=R32, 26=R452B, 27=R452A, 28=Custom	
416420,00	Enable Precooling System To Operate	-	BOOL	RW	BINARY 0 to 1	0 = Precooling system will not function. 1 = Precooling system will function when needed.	✓
416421	Low Temperature Precooling System Lockout	0°	REAL	RW	-9,999.0 to 9,999.0	The minimum ambient temperature at which the precooling system may operate.	✓
416423	Low Temperature Differential For Precooling System Lockout	0°	REAL	RW	0.0 to 20.0	The ambient temperature offset added to the minimum allowable temperature, at which the precooling system becomes activate.	✓
416425	Stage #1 Increase Time Setpoint	0 sec	INT	RW	0 to 32,767	The number of seconds that must pass with the process temperature above setpoint before the stage activates.	✓
416426	Stage #1 Decrease Time Setpoint	0 sec	INT	RW	0 to 32,767	The number of seconds that must pass with the process temperature below setpoint before the stage deactivates.	✓
416427	Stage #2-4 Increase Time Setpoint	0 sec	INT	RW	0 to 32,767	The number of seconds that must pass with the process temperature above setpoint before the stages activate.	✓
416428	Stage #2-4 Decrease Time Setpoint	0 sec	INT	RW	0 to 32,767	The number of seconds that must pass with the process temperature below setpoint before the stages deactivate.	✓
416429	Stage #1 Ambient Temperature Switch Point	0°	REAL	RW	-999.9 to 999.9	The minimum temperature, above which the precooling stage 1 has permission to operate.	✓
416431	Stage #2 Ambient Temperature Switch Point	0°	REAL	RW	-999.9 to 999.9	The minimum temperature, above which the precooling stage 2 has permission to operate.	✓
416433	Stage #3 Ambient Temperature Switch Point	0°	REAL	RW	-999.9 to 999.9	The minimum temperature, above which the precooling stage 3 has permission to operate.	✓

Register	Name	Units	Type	Access	Range	Description	Adiabatic Application
416435	Stage #4 Ambient Temperature Switch Point	0°	REAL	RW	-999.9 to 999.9	The minimum temperature, above which the precooling stage 4 has permission to operate.	✓
416437,00	Enable Stage Minimum Run Time	-	BOOL	RW	BINARY 0 to 1	0 = Not active 1 = Valve must remain on for the minimum run time	✓
416438	Stage #1 Minimum Run Time	0 sec	INT	RW	0 TO 32,767	The minimum amount of time the precooling stage remains active before being allowed to turn off.	✓
416439	Stage #2 Minimum Run Time	0 sec	INT	RW	0 TO 32,767	The minimum amount of time the precooling stage remains active before being allowed to turn off.	✓
416440	Stage #3 Minimum Run Time	0 sec	INT	RW	0 TO 32,767	The minimum amount of time the precooling stage remains active before being allowed to turn off.	✓
416441	Stage #4 Minimum Run Time	0 sec	INT	RW	0 TO 32,767	The minimum amount of time the precooling stage remains active before being allowed to turn off.	✓
416442,00	Manual Force Precooling System Flush Cycle	-	BOOL	RW	BINARY 0 to 1	Manually starts the precooling flushing cycle. 0 = Not active 1 = Start manual flush	✓
416443	Precooling System Water Flush Period of Time	0 min	INT	RW	0 to 9,999	The number of minutes to perform the flushing routine once initiated.	✓
416444	Precooling System Drying Period of Time	0 min	INT	RW	0 to 9,999	The number of minutes to dry the precooling pads after a flushing routine.	✓
416445	Precooling System Flush Fan Speed	0 %	REAL	RW	0.0 to 100.0	The desired fan speed while performing a flushing cycle.	✓
416447	Remote Fan Speed Control Enable	-	BOOL	RW	BINARY 0 to 1	Enables remote fan speed control, overriding the local fan speed calculation.	
416448	Source for Fan Speed Control	-	INT	RW	1 to 2	Source of the reference fan speed: 1 = Analog Input 2 = Communication see 409158	
416449	Signal Failure Ambient Trigger	0°	REAL	RW	-100.0 to 200.0	When the source is set to Analog Input, the ambient trigger will determine whether the fan speed resorts to the high default speed or low default speed.	
416451	Signal Failure High Default Fan Speed	0 %	INT	RW	0 to 100	The fan(s) will operate at the high default fan speed with a loss of the analog input and the ambient temperature is greater than the trigger setpoint.	
416452	Signal Failure Low Default Fan Speed	0 %	INT	RW	0 to 100	The fan(s) will operate at the low default fan speed with a loss of the analog input and the ambient temperature is less than the trigger setpoint.	

Register	Name	Units	Type	Access	Range	Description	Adiabatic Application
VOLATILE MEMORY							
408960,00	Supervisory Unit Enable	-	BOOL	RW	BINARY 0 to 1	Enables the unit if it is configured to be enabled via BMS. 0 = Unit not enabled 1 = Unit enabled	
408961	Actual Unit State	0	INT	R	0 to 32,767	The current state of the EVAPCO Controller. 1 = Unit on and operational 2= Unit is off by an alarm 4 = Unit is off via BMS, Modbus/BACnet 6 = Unit is off via the digital input 7 = Unit is switched off locally 8 = Manual mode enabled for fan speed control	
408962	Process Temperature	0°	REAL	R	-9999.0 to 9999.0	The outlet temperature of the process fluid. For condenser applications, the process temperature is a saturated calculation based on the condensing pressure.	
408964	Ambient Temperature	0°	REAL	R	-9999.0 to 9999.0	The temperature detected by the ambient temperature sensor.	
408966	Reference Fan Speed	0 %	INT	R	0 to 100	The desired fan speed determined by the controller.	
408967	Current Active Temperature Setpoint	0°	REAL	R	-999.9 to 999.9	The active setpoint that the eco-Air unit will maintain.	
408969	Inlet Pressure	0 Psig/ Bar	REAL	R	-9999.0 to 9999.0	Inlet pressure reading via pressure sensor input.	
408971	Elapsed Stage #1 Increase Timer	0 sec	UDINT	R	0 to 4,294,967,295	The number of seconds with the process temperature above the setpoint while the stage is not active.	✓
408973	Elapsed Stage #1 Decrease Timer	0 sec	UDINT	R	0 to 4,294,967,295	The number of seconds with the process temperature below setpoint while the stage is active.	✓
408975	Elapsed Stage #2-4 Increase Timer	0 sec	UDINT	R	0 to 4,294,967,295	The number of seconds with the process temperature above the setpoint while the stages are not active.	✓
408977	Elapsed Stage #2-4 Decrease Timer	0 sec	UDINT	R	0 to 4,294,967,295	The number of seconds with the process temperature below setpoint while the stages are active.	✓
408979	Elapsed Stage #1 Minimum On Timer	0 sec	UDINT	R	0 to 4,294,967,295	An accumulated number of seconds the stage has been running for the minimum on period of time.	✓
408981	Elapsed Stage #2 Minimum On Timer	0 sec	UDINT	R	0 to 4,294,967,295	An accumulated number of seconds the stage has been running for the minimum on period of time.	✓
408983	Elapsed Stage #3 Minimum On Timer	0 sec	UDINT	R	0 to 4,294,967,295	An accumulated number of seconds the stage has been running for the minimum on period of time.	✓

Register	Name	Units	Type	Access	Range	Description	Adiabatic Application
408985	Elapsed Stage #4 Minimum On Timer	0 sec	UDINT	R	0 to 4,294,967,295	An accumulated number of seconds the stage has been running for the minimum on period of time.	✓
408987	Elapsed Flush Cycle Timer	0 sec	UDINT	R	0 to 4,294,967,295	The number of seconds the flushing routine has been active.	✓
408989	Elapsed Flush Drying Timer	0 sec	UDINT	R	0 to 4,294,967,295	The number of seconds the drying routine has been active	✓
408991,00	DI – Setpoint #2 Trigger	-	BOOL	R	BINARY 0 to 1	Digital Input for the Setpoint #2 Trigger	
408992,00	DI – Quiet Mode Trigger	-	BOOL	R	BINARY 0 to 1	Digital Input for the Quiet Mode Trigger	
408993,00	DI – Fan Fault #1 / VFD Fault	-	BOOL	R	BINARY 0 to 1	Digital Input for the Fan Fault #1 or VFD Fault depending on application	
408994,00	DI – Fan Fault #2	-	BOOL	R	BINARY 0 to 1	Digital Input for the Fan Fault #2	
408995,00	DI – Fan Fault #3	-	BOOL	R	BINARY 0 to 1	Digital Input for the Fan Fault #3	
408996,00	DI – Fan Fault #4	-	BOOL	R	BINARY 0 to 1	Digital Input for the Fan Fault #4	
408997,00	DI – Fan Fault #5	-	BOOL	R	BINARY 0 to 1	Digital Input for the Fan Fault #5	
408998,00	DI – Fan Fault #6	-	BOOL	R	BINARY 0 to 1	Digital Input for the Fan Fault #6	
408999,00	DI – Unit On/Off	-	BOOL	R	BINARY 0 to 1	Digital Input for the Unit On/Off	
409000,00	DI – Vibration Switch	-	BOOL	R	BINARY 0 to 1	Digital Input for the Vibrations Switch(s)	
409001,00	DI – Valve Fault	-	BOOL	R	BINARY 0 to 1	Digital Input for the Valve Fault	✓
409002,00	DO – Common Alarm	-	BOOL	R	BINARY 0 to 1	Digital Output for Common Alarm	
409003,00	DO – Unit Operation	-	BOOL	R	BINARY 0 to 1	Digital Output for Unit Operation	
409004,00	DO – Valve #1	-	BOOL	R	BINARY 0 to 1	Digital Output for Valve #1	✓
409005,00	DO – Valve #2	-	BOOL	R	BINARY 0 to 1	Digital Output for Valve #2	✓
409006,00	DO – Valve #3	-	BOOL	R	BINARY 0 to 1	Digital Output for Valve #3	✓
409007,00	DO – Valve #4	-	BOOL	R	BINARY 0 to 1	Digital Output for Valve #4	✓

Register	Name	Units	Type	Access	Range	Description	Adiabatic Application
409008,00	DO – VFD Enable	-	BOOL	R	BINARY 0 to 1	Digital Output for VFD Enable	
409009,00	Alarm – Valve Fault	-	BOOL	R	BINARY 0 to 1	Active alarm for valve fault	✓
409010,00	Alarm – VFD Fault	-	BOOL	R	BINARY 0 to 1	Active alarm for VFD fault	
409011,00	Alarm – Vibration Switch Triggered	-	BOOL	R	BINARY 0 to 1	Active alarm for the vibration switch(s)	
409012,00	Alarm – Fan Fault #1	-	BOOL	R	BINARY 0 to 1	Active alarm for fan fault #1	
409013,00	Alarm – Fan Fault #2	-	BOOL	R	BINARY 0 to 1	Active alarm for fan fault #2	
409014,00	Alarm – Fan Fault #3	-	BOOL	R	BINARY 0 to 1	Active alarm for fan fault #3	
409015,00	Alarm – Fan Fault #4	-	BOOL	R	BINARY 0 to 1	Active alarm for fan fault #4	
409016,00	Alarm – Fan Fault #5	-	BOOL	R	BINARY 0 to 1	Active alarm for fan fault #5	
409017,00	Alarm – Fan Fault #6	-	BOOL	R	BINARY 0 to 1	Active alarm for fan fault #6	
409018,00	Alarm – Analog Input #1	-	BOOL	R	BINARY 0 to 1	Active alarm for analog input #1	
409019,00	Alarm – Analog Input #2	-	BOOL	R	BINARY 0 to 1	Active alarm for analog input #2	
409020,00	Alarm – Analog Input #3	-	BOOL	R	BINARY 0 to 1	Active alarm for analog input #3	
409021,00	Alarm – Analog Input #4	-	BOOL	R	BINARY 0 to 1	Active alarm for analog input #4	
409022,00	Alarm – Analog Input #5	-	BOOL	R	BINARY 0 to 1	Active alarm for analog input #5	
409023,00	Alarm – Analog Input #6	-	BOOL	R	BINARY 0 to 1	Active alarm for analog input #6	
409024,00	Alarm – Analog Input #7	-	BOOL	R	BINARY 0 to 1	Active alarm for analog input #7	
409025,00	Alarm – Analog Input #8	-	BOOL	R	BINARY 0 to 1	Active alarm for analog input #8	
409026,00	Alarm – Analog Input #9	-	BOOL	R	BINARY 0 to 1	Active alarm for analog input #9	
409027,00	Alarm – Analog Input #10	-	BOOL	R	BINARY 0 to 1	Active alarm for analog input #10	

Register	Name	Units	Type	Access	Range	Description	Adiabatic Application
409028,00	Alarm – Analog Input #11	-	BOOL	R	BINARY 0 to 1	Active alarm for analog input #11	
409029,00	Alarm – Analog Input #12	-	BOOL	R	BINARY 0 to 1	Active alarm for analog input #12	
409158	Remote Fan Speed Reference Communication	0%	INT	RW	0 to 1000	With remote fan speed enabled and the source set to Communications, the fan(s) will operate based on the value passed to this register. The register is x10, 1000 equal to 100.0%	
409159	Remote Fan Speed Analog Input	0%	REAL	R	0.0 to 100.0	The reference speed for the fan(s) based on the analog input.	

BACNET Communication Points

In the tables below, the adiabatic application column indicates addresses that only apply to units with adiabatic controls e.g., variable BINARY_VALUE:8 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.

The column of the table titled ***Non-Volatile Memory*** indicates a data point for equipment parameters that are retained, in the event of a power cycling of the PLC. The non-volatile memory is specified for a life cycle of 100,000 writes (minimum). Using the non-volatile memory for a cyclic write operation may result in quickly exceeding its life cycle limits resulting in an inoperative memory.

NOTICE

Do not use non-volatile memory registers for cyclic write operations.

Failure to follow these instructions can result in equipment damage.

Object Identifier	Object Name	Units	Access	Range	Description	Non-Volatile Memory	Adiabatic Application
BINARY_VALUE:0	bnEnableUnit	-	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: 1	bnRemoteDigital	-	R	0 to 1	The state of the remote digital input. 0 = No voltage present 1 = Voltage present		
BINARY_VALUE:2	bnProcessAlarm	-	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		

Object Identifier	Object Name	Units	Access	Range	Description	Non-Volatile Memory	Adiabatic Application
BINARY_VALUE:3	bnValveStatus1	-	R	0 to 1	The state of the first adiabatic precooling valve. 0 = Valve off (water not flowing) 1 = Valve on (water flowing)		✓
BINARY_VALUE:4	bnValveStatus2	-	R	0 to 1	The state of the second adiabatic precooling valve. 0 = Valve off (water not flowing) 1 = Valve on (water flowing)		✓
BINARY_VALUE:5	bnValveStatus3	-	R	0 to 1	The state of the third adiabatic precooling valve. 0 = Valve off (water not flowing) 1 = Valve on (water flowing)		✓
BINARY_VALUE:6	bnValveStatus4	-	R	0 to 1	The state of the fourth adiabatic precooling valve. 0 = Valve off (water not flowing) 1 = Valve on (water flowing)		✓
BINARY_VALUE:7	bnManualFlush	-	RW	0 to 1	Manually starts the precooling flushing cycle. 0 = Not active 1 = Start manual flush	✓	✓
BINARY_VALUE:8	bnReleasePrecool	-	RW	0 to 1	0 = Precooling system will not function 1 = Precooling system will function when needed	✓	✓
BINARY_VALUE:9	bnEnableCommonAlarm	-	RW	0 to 1	Enables the common alarm for the digital output. 0 = Common alarm not enabled 1 = Common alarm enabled	✓	
BINARY_VALUE:10	bnCommonAlarmStatus	-	R	0 to 1	Status of the alarm digital output. 0 = No alarm/not active 1 = Alarm/active		

Object Identifier	Object Name	Units	Access	Range	Description	Non-Volatile Memory	Adiabatic Application
BINARY_VALUE:11	bnForceFullSpeed	-	RW	0 to 1	0 = Not enabled 1 = Forces fans to run at 100 percent fan speed	✓	
BINARY_VALUE:12	bnEnableStageOntime	-	RW	0 to 1	0 = Not active 1 = Valve must remain on for the minimum run time	✓	✓
BINARY_VALUE:13 Thru BINARY_VALUE:76	N/A	-	-	-	Binary Values 13 thru 76 are intended for units equipped with EC Type fans. For units with AC style motors, the following data points are irrelevant.		
BINARY_VALUE:77	bnRemoteEnable	-	RW	0 to 1	0 = Not enabled 1 = Fan speed is controlled either by analog input or communication.	✓	
ANALOG_VALUE:0	bnOutletTemp	Deg.	R	-9999.0 to 9999.0	The outlet temperature of the process fluid. For condenser applications, the process temperature is a saturated calculation based on the condensing pressure.		
ANALOG_VALUE:1	bnAmbientTemp	Deg.	R	-999.9 to 999.9	The temperature detected by the ambient temperature sensor.		
ANALOG_VALUE:2	bnActiveSetpoint	Deg.	R	-999.9 to 999.9	The active set point that the eco-Air unit will maintain.		
ANALOG_VALUE:3	bnSetpointTemp	Deg.	RW	-999.9 to 999.9	The primary process temperature setpoint used when all other alternate setpoints are not active.	✓	
ANALOG_VALUE:4	bnSetpoint2TempTrig	Deg.	RW	-100.0 to 200.0	The setpoint that when the ambient temperature falls below, will switch the control to setpoint 2. (Feature must be enabled in the service setpoints section).	✓	
ANALOG_VALUE:5	bnTempRegulationBand	Deg.	RW	0.0 to 30.0	The temperature band between the minimum and maximum fan speed for P fan speed control.	✓	

Object Identifier	Object Name	Units	Access	Range	Description	Non-Volatile Memory	Adiabatic Application
ANALOG_VALUE:6	bnSetpoint2TempTrigDiff	Deg.	RW	0.0 to 20.0	The temperature differential added to the ambient temperature setpoint 2 trigger. This will switch the control setpoint back to setpoint 1.	✓	
ANALOG_VALUE:7	bnPrecoolMinTemp	Deg.	RW	-9,999.0 to 9,999.0	The minimum ambient temperature at which the precooling system may operate.	✓	✓
ANALOG_VALUE:8	bnPrecoolMinTempDiff	Deg.	RW	0.0 to 20.0	The ambient temperature offset added to the minimum allowable temperature, at which the precooling system becomes activate.	✓	✓
ANALOG_VALUE:9	bnProportionalGain	Units	RW	0.0 to 10.0	The proportional gain constant used for the PID controller.	✓	
ANALOG_VALUE:10	bnSwitchTemp1	Deg.	R	-999.9 to 999.9	The minimum temperature, above which the precooling stage 1 has permission to operate.	✓	✓
ANALOG_VALUE:11	bnSwitchTemp2	Deg.	R	-999.9 to 999.9	The minimum temperature, above which the precooling stage 2 has permission to operate.	✓	✓
ANALOG_VALUE:12	bnSwitchTemp3	Deg.	R	-999.9 to 999.9	The minimum temperature, above which the precooling stage 3 has permission to operate.	✓	✓
ANALOG_VALUE:13	bnSwitchTemp4	Deg.	R	-999.9 to 999.9	The minimum temperature, above which the precooling stage 4 has permission to operate.	✓	✓
ANALOG_VALUE:14	bnFlushFanSpeed	%	RW	0 to 100	The desired fan speed while performing a flushing cycle.	✓	✓
ANALOG_VALUE:15	bnSetpoint2Temp	Deg.	RW	-999.9 to 999.9	An alternate process temperature set point that may be activated via the scheduler, ambient temperature, or digital input.	✓	

Object Identifier	Object Name	Units	Access	Range	Description	Non-Volatile Memory	Adiabatic Application
ANALOG_VALUE:16	bnUnitState	-	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 BMS, Modbus/ BACnet 6 = Unit is off via the digital input 7 = Unit is switched off locally 8 = Manual mode enabled for fan speed control		
ANALOG_VALUE:17	bnMinFanSpeed	%	RW	0 to 100	The minimum allowable fan speed.	✓	
ANALOG_VALUE:18	bnMaxFanSpeed	%	RW	0 to 100	The maximum allowable fan speed.	✓	
ANALOG_VALUE:19	bnEnergySaveFanSpeed	%	RW	0 to 100	The fan speed, above which the precooling system will activate.	✓	
ANALOG_VALUE:20	bnQuietMaxFanSpeed	%	RW	0 to 100	The maximum allowable fan speed in quiet operation.	✓	
ANALOG_VALUE:21	bnPID_Integral	Sec.	RW	0 to 999	PID integral term.	✓	
ANALOG_VALUE:22	bnPID_Derivative	Sec.	RW	0 to 999	PID derivative term.	✓	
ANALOG_VALUE:23	bnNumWetStages	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:24	bnPrecoolStage1_Increase	Sec.	RW	0 to 32,767	The number of seconds that must pass with the process temperature above set point before the stage activates.	✓	✓
ANALOG_VALUE:25	bnPrecoolStage1_Decrease	Sec.	RW	0 to 32,767	The number of seconds that must pass with the process temperature below set point before the stage deactivates.	✓	✓

Object Identifier	Object Name	Units	Access	Range	Description	Non-Volatile Memory	Adiabatic Application
ANALOG_VALUE:26	bnRefrigerant	-	RW	1 to 28	For condenser applications 1=R22, 2=R134a, 3=R404A, 4=R407C, 5=R410A, 6=R407A, 7=R407F, 8=R290, 9=R507A, 10=R717 (NH3), 11=R723, 12=R1234ze, 13=R744 (CO2), 14=R448A, 15=R427A, 16=R450A (N13), 17=R513A, 18=R449A, 19=R1234yf, 20=R454B, 21=R454C, 22=R455A, 23=434A, 24=R422A, 25=R32, 26=R452B, 27=R452A, 28=Custom	✓	
ANALOG_VALUE:27	bnPrecoolStage1_MinOn	Sec.	RW	0 to 32,767	The minimum amount of time the precooling stage remains active before being allowed to turn off.	✓	✓
ANALOG_VALUE:28	bnPrecoolStage2_MinOn	Sec.	RW	0 to 32,767	The minimum amount of time the precooling stage remains active before being allowed to turn off.	✓	✓
ANALOG_VALUE:29	bnPrecoolStage3_MinOn	Sec.	RW	0 to 32,767	The minimum amount of time the precooling stage remains active before being allowed to turn off.	✓	✓
ANALOG_VALUE:30	bnPrecoolStage4_MinOn	Sec.	RW	0 to 32,767	The minimum amount of time the precooling stage remains active before being allowed to turn off.	✓	✓
ANALOG_VALUE:31	N/A	-	-	-	Analog Value 31 is intended for units equipped with EC Type fans. For units with AC style motors, the data point is irrelevant.	✓	
ANALOG_VALUE:32	bnInletPressure	Press.	R	-32767 to 32767	Inlet pressure reading via pressure sensor input.		
ANALOG_VALUE:33	bnRefFanSpeed	%	R	0 to 100	The desired fan speed determined by the controller.		

Object Identifier	Object Name	Units	Access	Range	Description	Non-Volatile Memory	Adiabatic Application
ANALOG_VALUE:34	bnFlushingTime	Min.	RW	0 to 9,999	The number of minutes to perform the flushing routine once initiated.	✓	✓
ANALOG_VALUE:35	bnFlushTimeAcc	Sec.	R	0 to 2^{32}	The number of seconds the flushing routine has been active.		✓
ANALOG_VALUE:36	bnDryingTime	Min.	RW	0 to 9,999	The number of minutes to dry the pre-cooling pads after a flushing routine.	✓	✓
ANALOG_VALUE:37	bnDryTimeAcc	Sec.	R	0 to 2^{32}	The number of seconds the drying routine has been active		✓
ANALOG_VALUE:38	bnFan_Hours	Hours	R	0 to 2^{32}	The number of hours the fans have been operational.	✓	
ANALOG_VALUE:39	bnPrecoolStage1_Hours	Hours	R	0 to 2^{32}	The number of hours the first valve has been operational.	✓	✓
ANALOG_VALUE:40	bnPrecoolStage2_Hours	Hours	R	0 to 2^{32}	The number of hours the second valve has been operational.	✓	✓
ANALOG_VALUE:41	bnPrecoolStage3_Hours	Hours	R	0 to 2^{32}	The number of hours the third valve has been operational.	✓	✓
ANALOG_VALUE:42	bnPrecoolStage4_Hours	Hours	R	0 to 2^{32}	The number of hours the fourth valve has been operational.	✓	✓
ANALOG_VALUE:43	bnPrecool24_Increase	Sec.	RW	0 to 32,767	The number of seconds that must pass with the process temperature above setpoint before the stages activate.	✓	✓
ANALOG_VALUE:44	bnPrecool24_Decrease	Sec.	RW	0 to 32,767	The number of seconds that must pass with the process temperature below setpoint before the stages deactivate.	✓	✓
ANALOG_VALUE:45	bnPrecool24_DecreaseAcc	Sec.	R	0 to 2^{32}	The number of seconds with the process temperature below setpoint while the stages are active.		✓

Object Identifier	Object Name	Units	Access	Range	Description	Non-Volatile Memory	Adiabatic Application
ANALOG_VALUE:46	bnPrecool1_Decrease-Acc	Sec.	R	0 to 2^{32}	The number of seconds with the process temperature below setpoint while the stage is active.		✓
ANALOG_VALUE:47	bnPrecool24_Increase-Acc	Sec.	R	0 to 2^{32}	The number of seconds with the process temperature above the setpoint while the stages are not active.		✓
ANALOG_VALUE:48	bnPrecool1_IncreaseAcc	Sec.	R	0 to 2^{32}	The number of seconds with the process temperature above the setpoint while the stage is not active.		✓
ANALOG_VALUE:49 Thru ANALOG_VALUE:100	N/A	-	-	-	Analog Values 49 thru 100 are intended for units equipped with EC Type fans. For units with AC style motors, the following data points are irrelevant.		
ANALOG_VALUE:101	bnRemoteSource	-	RW	1 to 2	Source of the reference fan speed: 1 = Analog Input 2 = Communication see ANALOG_VALUE:105	✓	
ANALOG_VALUE:102	bnRemoteAmbTrig	Deg.	RW	-100.0 to 200.0	When the source is set to Analog Input, the ambient trigger will determine whether the fan speed resorts to the high default speed or low default speed.	✓	
ANALOG_VALUE:103	bnRemoteHighFanSpeed	%	RW	0 to 100	The fan(s) will operate at the high default fan speed with a loss of the analog input and the ambient temperature is greater than the trigger setpoint.	✓	
ANALOG_VALUE:104	bnRemoteLowFanSpeed	%	RW	0 to 100	The fan(s) will operate at the low default fan speed with a loss of the analog input and the ambient temperature is less than the trigger setpoint.	✓	

Object Identifier	Object Name	Units	Access	Range	Description	Non-Volatile Memory	Adiabatic Application
ANALOG_VAL-UE:105	bnRemoteFanSpeed	%	RW	0 to 1000	With remote fan speed enabled and the source set to Communica-tions, the fan(s) will operate based on the value set to this object.		
ANALOG_VAL-UE:106	bnFanSpeedAI	%	R	-999.9 to 999.9	The reference speed for the fan(s) based on the ana-log input.		

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