

# SIEMENS



## BACnet PTEC Controller

Constant Volume - Cooling Only,  
Application 6660

Application Note



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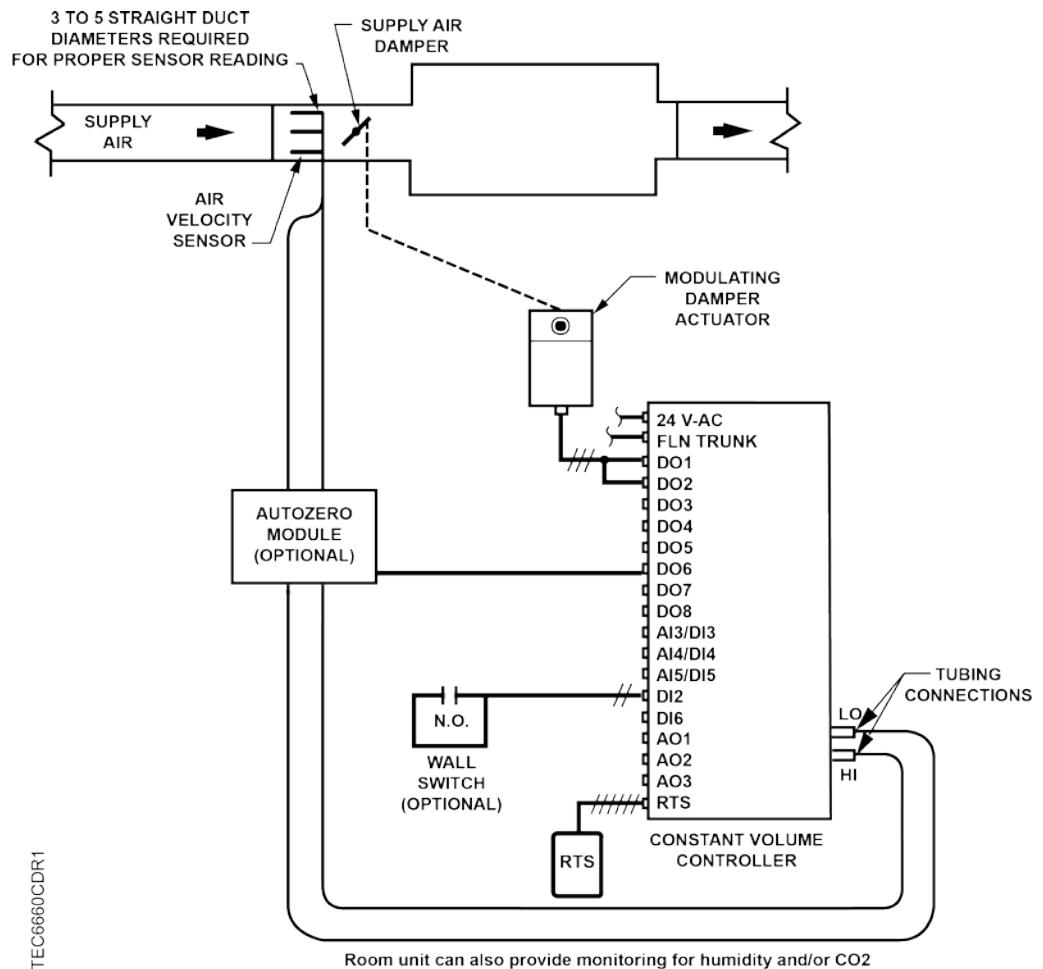
## Overview



### NOTE:

For information on applications with Firmware Revision Bx40 or earlier, see InfoLink and/or Asset Portal for documentation.

In Application 6660, the controller provides a constant volume of air to the room during occupied periods, and a lower constant volume of air to the room during unoccupied periods.



Application 6660 Control Diagram.

CONTROL SCHEDULE		
ROOM TEMPERATURE	-°F (-°C)	+°F (+°C)
OCCUPIED FLOW		
SUPPLY AIR		
UNOCCUPIED FLOW		

Application 6660 Control Schedule.

## BACnet

The controller communicates using BACnet MS/TP protocol for open communications on BACnet MS/TP networks.

Product	Supported BIBBs	BIBB Name
BTEC/PTEC	DS-RP-B B	Data Sharing-Read Property-B
	DS-RPM-B	Data Sharing-Read Property Multiple-B
	DS-WP-B	Data Sharing-Write Property-B
	DM-DDB-B	Device Management-Dynamic Device Binding-B
	DM-DOB-B	Device Management-Dynamic Object Binding-B
	DM-DCC-B	Device Management-Device Communication Control-B
	DM-RD-B	Device Management-Reinitialize Device-B
	DM-BR-B	Device Management-Backup and Restore-B
	DM-OCD-B	Device Management-Object Creation and Deletion-B

## Hardware Inputs

### Analog

- Air velocity sensor
- Room temperature sensor
- Spare temperature sensor (two) (10K or 100K thermistor)
- Spare voltage/current input (0-10V or 4–20 mA)

Application 6660 supports a room temperature sensor for monitoring purposes only.

## Digital

- Night mode override (optional)
- Wall switch (optional)
- Spare DI



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### NOTE:

Digital Room Units (Firmware Revision 26 and later) will update their controlled inputs without putting them Out Of Service. However, a command from an external source through the digital room unit will put the associated BACnet Input point Out Of Service.

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## Room Unit Identification

- For Analog Room Units – The revision number is visually identified by its case.
- For Digital Room Units (Firmware Revision 25 or earlier) – The revision number displays for 5 seconds when the room unit is first powered up. These room units will display `laptop` when a laptop is connected and will no longer update room temperature sensor values.
- For Digital Room Units (Firmware Revision 26 and later) – The revision number displays for 5 seconds when the room unit is first powered up or when a laptop is disconnected. These room units will continue to display and update the room temperature sensor values when a laptop is connected.

## Hardware Outputs

### Analog

- Spare AO 1, AO 2, and AO 3 (0-10V)

### Digital

- Autozero Module (optional)
- Damper actuator
- Spare DO (up to 5) (optional)

## Ordering Notes

550-498PA      Siemens BACnet PTEC Constant Volume Controller

## Sequence of Operation

The following paragraphs present the sequence of operation for Application 6660 -- Constant Volume Cooling Only.

## Control Temperature

This application is constant volume cooling only without any heating components. The room unit temperature input is for monitoring purposes only. An optional room unit setpoint can be configured, but will not affect temperature or flow control.

## Occupied and Unoccupied Modes

The occupied/unoccupied status of the space is determined by the status of OCC.UNOCC. The control of this point differs depending on whether the controller is monitoring the status of a wall switch or if the controller is connected to a field panel.

When a wall switch is physically connected to the termination strip on the controller at DI 2 and WALL SWITCH = YES, the controller monitors the status of DI 2. When the status of DI 2 is ON (the switch is closed), OCC.UNOCC will be set to OCC indicating that the controller is in occupied mode. When the status of DI 2 is OFF (the switch is open), OCC.UNOCC will be set to UNOCC indicating that the controller is in unoccupied mode.

When WALL SWITCH = NO, the controller does not monitor the status of the wall switch, even if one is connected to it. In this case, if the controller is operating stand-alone, the controller stays in occupied mode all the time. If the controller is operating with centralized control (connected to a field panel), the field panel can send an operator or PPCL command to override the status of OCC.UNOCC. See the APOGEE Powers Process Control Language (PPCL) User's Manual (125-1896) and the APOGEE P2 ALN Field Panel User's Manual (125-3019) or the APOGEE BACnet ALN Field Panel User's Manual (125-3020) (125-3019 or 125-3020) for more information.

## Unoccupied Mode Override Switch

If an override switch is present on the room temperature sensor and a value (in hours) other than zero has been entered into OVRD TIME, then by pressing the override switch, a room occupant can reset the controller to occupied mode for the length of time set in OVRD TIME. The status of UNOCC OVRD changes to OCC and remains there until OVRD TIME elapses, at which point UNOCC OVRD changes back to UNOCC and the controller returns to unoccupied mode.



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**NOTE:**

Only during unoccupied mode (MODE = Unoccupied) can a room sensor's override switch set the controller to occupied mode; if MODE equals anything other than Unoccupied, UNOCC OVRD will equal UNOCC.

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## Control Loops

**Flow Loop** – maintains the point FLOW STPT by modulating the supply air damper point, DMPR COMD. The flow loop maintains the airflow at either OCC FLOW or UNOCC FLOW depending on the value of OCC.UNOCC.

FLOW is the input value for the flow loop. It is calculated as a percentage based on where AIR VOLUME is between 0 cfm (LPS) and OCC FLOW. In the following text, this percentage is referred to as % flow.

- If AIR VOLUME equals 0 cfm (LPS), then FLOW is 0% flow.
- If AIR VOLUME equals OCC FLOW, then FLOW is 100% flow.

The FLOW STPT percentage that corresponds to UNOCC FLOW is calculated as:  
 $(\text{UNOCC FLOW} \div \text{OCC FLOW}) \times 100\% \text{ flow.}$

### Example

If UNOCC FLOW = 250 cfm, and if OCC FLOW = 1000 cfm  
then, in unoccupied mode the FLOW STPT

$$\begin{aligned} &= (250 \text{ cfm} \div 1000 \text{ cfm}) \times 100\% \text{ flow} \\ &= 0.25 \times 100\% \text{ flow} \\ &= 25\% \text{ flow} \end{aligned}$$

Since 25% of 1000 cfm equals 250 cfm, the flow setpoint in unoccupied mode will be 25%.

UNOCC FLOW can be set less than or equal to, but not greater than OCC FLOW.

## Calibration

Calibration of the controller's internal air velocity sensor(s) is periodically required to maintain accurate air velocity readings. CAL SETUP is set with the desired calibration option during controller startup.

Depending on the value of CAL SETUP, calibration may be set to take place automatically or manually. If CAL AIR = YES, calibration is in progress.

- For a controller used without an Autozero Module (CAL MODULE, = NO), the damper is commanded closed to get a zero airflow reading during calibration.
- For a controller used with an Autozero Module (CAL MODULE = YES), calibration occurs without closing the damper.



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### NOTE:

The first time after startup or initialization, the controller will calibrate the dampers as if not using Autozero Modules, although the Autozero Modules will be activated. All subsequent calibrations will use the Autozero Modules only.

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At the end of a calibration sequence, CAL AIR automatically returns to NO. A status of NO indicates that the controller is not in a calibration sequence.

The Autozero Module is enabled when it is wired to DO 6 and CAL MODULE is set to YES.



## Floating Control Actuation Auto-correct

In addition to the existing options for floating control actuator full stroke actions, all floating control actuators are provided with additional logic to fully drive open or closed when commanded to 100% or 0%.

## Room Unit Operation

### Sensor Select

SENSOR SEL is a configurable, enumerated point (values are additive). This point tells the controller what type of room unit is being used and how to handle loss of data. It also provides the ability to enable the optional RH, and CO2 sensors and which thermistor type is connected.

### Room Temperature, Setpoint, RH and CO2

- When the digital room unit (Series 2200/2300) is used, SENSOR SEL selects the source temperature and setpoint and enables a loss of communications indication:
  - Temperature/Setpoint enable and supervision for fail communications (temperature) with a value of 1.
  - Relative humidity enable and supervision for fail communications with a value of 2.
  - CO2 enable and supervision for fail communications with a value of 4.
- When the analog room unit (Series 1000/2000) is used, default temperature sensing (0) from an analog room unit is enabled (relative humidity and CO2 sensing are not available and should not be selected).

### Thermistor Inputs

- Default for either input is 10K.
- To enable 100K thermistor on input, see the following table for additive values of 8 or 16.

### Other Inputs (only available on Digital Room Unit)

- Use the following table to select and enable communications supervision of room temperature/setpoint dial, relative humidity or CO2 for additive values of 1, 2 and 4.

SENSOR SEL Value * (additive)	Description (include values to enable feature)
1	Select Digital Room Unit (for temperature sensing and setpoint dial)
2	Relative Humidity (RH) sensing
4	CO <sub>2</sub> sensing
8	If short board: 100K $\Omega$ thermistor on AI 3 (else input is 10K $\Omega$ ) If long board: 100K $\Omega$ thermistor on AI 5 (else input is 10K $\Omega$ )
16	Long board only: 100K $\Omega$ thermistor on AI 4 (else input is 10K $\Omega$ )

## Room CO2

RM CO2 displays the CO<sub>2</sub> value in units of parts-per-million (PPM). RM CO2 (from the digital 2200/2300 room units) can be used with PPCL in the PTEC controller or unbundled for control or monitoring purposes.

## Room RH

RM RH displays the relative humidity value in percent. RM RH can be used for PPCL in the PTEC or unbundled for control or monitoring purposes.

## Room DEW POINT

The controller provides a calculation for DEW POINT temperature in Fahrenheit degrees (or Celsius degrees) using room temperature (using CLT TEMP) and room humidity (using RM RH). This calculation is valid for ranges of 55°F (12.8°C) to 95°F (35°C) and 20 to 100% relative humidity.

## Auto Discovery

Auto Discovery allows you to automatically discover and identify PTEC controller devices on the BACnet MS/TP Network. There are two basic configurations:

- Devices not configured with an address. (Devices are discovered by their unique serial number.)
- Devices configured with an address and available for modification.

## Auto Addressing

Auto Addressing allows you to automatically assign device addresses to a PTEC controller on the BACnet MS/TP Network. If a controller is not configured with a MAC address, you have the option to auto-address or manually address the controller. During this time the baud rate is automatically detected by the controller.

Controller(s) must be connected on the BACnet/IP network in order for automatic addressing to occur.

## PPCL STATUS

PPCL STATUS displays LOADED or EMPTY.

- LOADED = PPCL programming is present in the controller. A new application number must be assigned (12000 through 12999).
- EMPTY = NO PPCL programming is present.

The maximum number of PPCL dynamic points is 15.

## Fail Mode Operation

If the air velocity sensor fails, the controller determines the status of FAIL MODE and positions the damper accordingly. If FAIL MODE = OPEN and the velocity sensor fails, the damper will open. If FAIL MODE = CLOSED (the default) and the velocity sensor fails, the damper will close.

If the room temperature sensor fails, the controller holds the last known temperature value.

In this application, the room temperature is not controlled, it is for monitoring purposes only.

## Application Notes

- If FLOW is oscillating while FLOW STPT is constant, then the flow loop requires tuning.
- The controller as shipped from the factory keeps all associated equipment OFF. See the *Start-up* document for how to release the controller and its equipment to application control.
- Spare DOs can be used as auxiliary points that are controlled by the field panel after being defined in the field panel's database. The combination of DO 3 and DO 4 may be used as auxiliary motor points. If using a pair of spare DOs to control a motor, you must unbundle the corresponding motor command point.

For more information, contact your nearest Siemens Industry, Inc. representative.

## Wiring Diagrams



### ⚠ CAUTION

The controller's DOs control 24 Vac loads only. The maximum rating is 12 VA for each DO. An external interposing relay is required for any of the following:

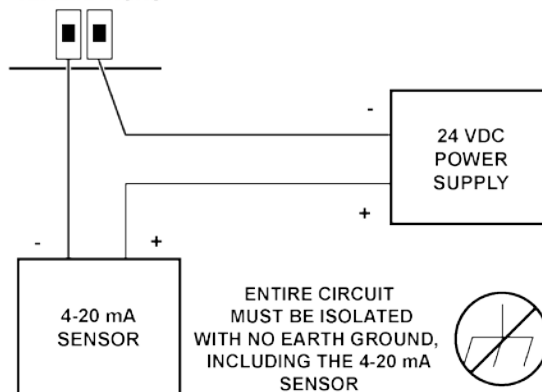
- VA requirements higher than the maximum
- 110 or 220 Vac requirements
- DC power requirements
- Separate transformers used to power the load  
(for example part number 540-147, Terminal Equipment Controller Relay Module)



### NOTE:

Thermistor inputs are 10K (default) or 100K software selectable (AUX TEMP AI X).

ANALOG INPUT  
TERMINATIONS



### CAUTION:

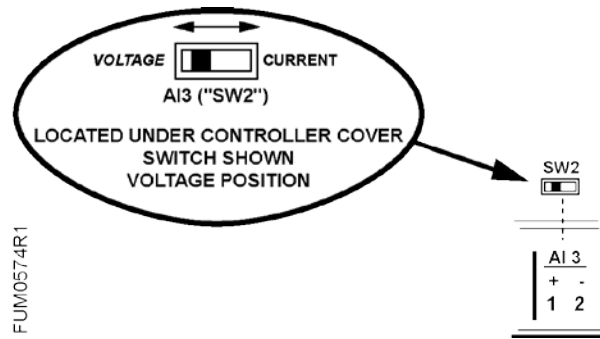
Each 4-20 mA sensor requires a SEPARATE, dedicated power limited 24 VDC power supply. DO NOT use the same transformer to power both the sensor and controller.

*Wiring for AI with a 4 to 20 mA Sensor.*

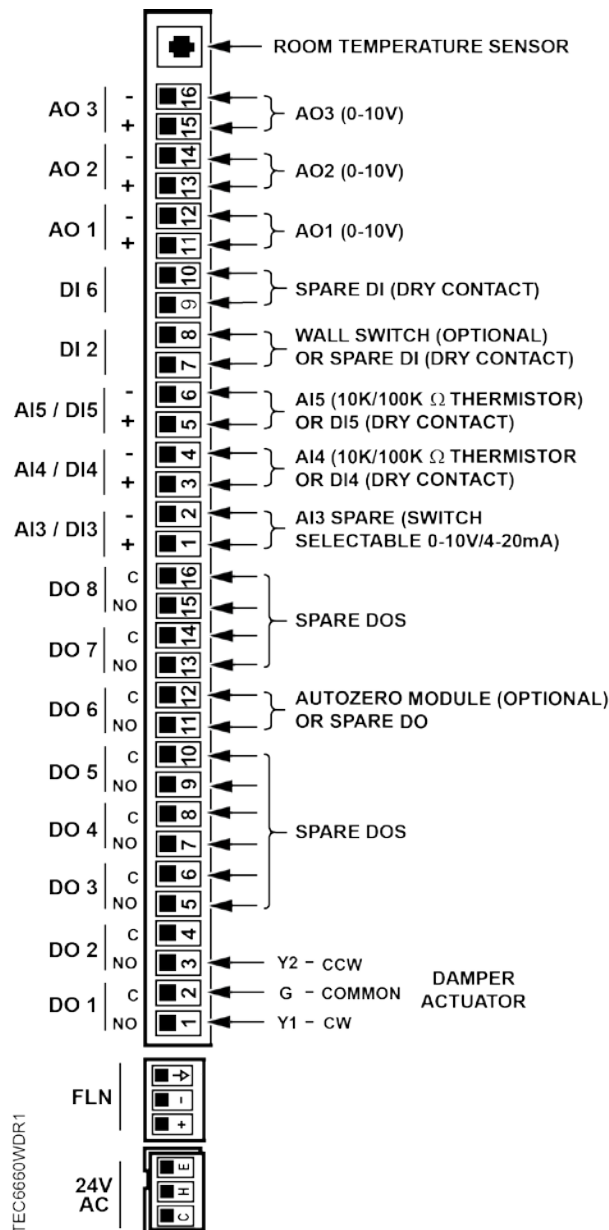


### NOTE:

If the voltage/current switch is set to current and a 4 to 20 mA sensor is connected to an AI, then special wiring requirements must be followed.



FUM0574R1



TEC6660WDR1

Application 6660 – Constant Volume Cooling Only.

## Application 6660 Point Database

Object Type <sup>1</sup>	Object Instance (Point Number)	Object Name (Descriptor)	Factory Default (SI Units) <sup>2</sup>	Eng Units (SI Units)	Range	Active Text	Inactive Text
AO	1	CTLR ADDRESS	255	--	0-255	--	--
AO	2	APPLICATION	6694	--	0-32767	--	--
AI	{04}	ROOM TEMP	74.0 (23.44888)	DEG F (DEG C)	48-111.75	--	--
AI	{13}	RM STPT DIAL	74.0 (23.44888)	DEG F (DEG C)	48-111.75	--	--
AI	{15}	AUX TEMP AI5	74.0 (23.495556)	DEG F (DEG C)	37.5-165	--	--
BO	18	WALL SWITCH	NO	--	Binary	YES	NO
BI	{19}	DI OVRD SW	OFF	--	Binary	ON	OFF
AO	20	OVRD TIME	0	HRS	0-255	--	--
BO	{21}	UNOCC OVRD	UNOCC	--	Binary	UNOCC	OCC
BI	{24}	DI 2	OFF	--	Binary	ON	OFF
BI	{25}	DI 3	OFF	--	Binary	ON	OFF
BO	{29}	OCC.UNOCC	OCC	--	Binary	UNOCC	OCC
AO	{31}	UNOCC FLOW	220 (103.818)	CFM ( LPS)	0-131068	--	--
AO	{32}	OCC FLOW	2200 (1038.18)	CFM ( LPS)	0-131068	--	--
AI	{35}	AIR VOLUME	0 (0.0)	CFM ( LPS)	0-131068	--	--
AO	36	FLOW COEFF	1	--	0-2.55	--	--
BO	40	FAIL MODE	OPEN	--	Binary	CLOSED	OPEN
BO	{41}	DO 1	OFF	--	Binary	ON	OFF
BO	{42}	DO 2	OFF	--	Binary	ON	OFF
BO	{43}	DO 3	OFF	--	Binary	ON	OFF
BO	{44}	DO 4	OFF	--	Binary	ON	OFF
BO	{45}	DO 5	OFF	--	Binary	ON	OFF
BO	{46}	DO 6	OFF	--	Binary	ON	OFF
BO	{47}	DO 7	OFF	--	Binary	ON	OFF
AO	{48}	DMPR COMD	0	PCT	0-102	--	--
AO	{49}	DMPR POS	0	PCT	0-102	--	--
BO	{50}	DO 8	OFF	--	Binary	ON	OFF
AO	51	MTR1 TIMING	95	SEC	0-511	--	--
AO	{52}	MTR2 COMD	0	PCT	0-102	--	--
AO	{53}	MTR2 POS	0	PCT	0-102	--	--

Object Type <sup>1</sup>	Object Instance (Point Number)	Object Name (Descriptor)	Factory Default (SI Units) <sup>2</sup>	Eng Units (SI Units)	Range	Active Text	Inactive Text
AO	55	MTR2 TIMING	130	SEC	0-511	--	--
AO	56	DPR1 ROT ANG	90	--	0-255	--	--
AO	57	DPR2 ROT ANG	90	--	0-255	--	--
AO	58	MTR SETUP	0	--	0-255	--	--
AO	59	DO DIR. REV	0	--	0-255	--	--
AO	71	FLOW P GAIN	0.25	--	0-51.15	--	--
AO	72	FLOW I GAIN	0.018	--	0-1.023	--	--
AO	73	FLOW D GAIN	0	--	0-510	--	--
AO	74	FLOW BIAS	50	PCT	0-102	--	--
AO	{75}	FLOW	0	PCT	0-1023.75	--	--
AO	{78}	CTL TEMP	74.0 (23.44888)	DEG F (DEG C)	48-111.75	--	--
BO	87	CAL MODULE	NO	--	Binary	YES	NO
AO	{91}	TOTAL VOLUME	0 (0)	CF ( L )	0-131068	--	--
AO	{93}	FLOW STPT	0	PCT	0-255.75	--	--
BO	{94}	CAL AIR	NO	--	Binary	YES	NO
AO	95	CAL SETUP	4	--	0-255	--	--
AO	96	CAL TIMER	12	HRS	0-255	--	--
AO	97	DUCT AREA	1.0 (0.09292)	SQ. FT (SQ M)	0-6.375	--	--
AO	98	LOOP TIME	5	SEC	0-255	--	--
AO	{99}	ERROR STATUS	0	--	0-255	--	--
AO	{102}	AOV 1	0	VOLTS	0-10.23	--	--
AO	{103}	AOV 2	0	VOLTS	0-10.23	--	--
AO	{104}	AOV 3	0	VOLTS	0-10.23	--	--
AI	{105}	AI 3	0	PCT	0-102	--	--
AI	{106}	AI 4	74.0 (23.495556)	DEG F (DEG C)	37.5-165	--	--
AO	107	RMTMP OFFSET	0.0 (0.0)	DEG F (DEG C)	-31.75-32	--	--
BI	{108}	DI 4	OFF	--	Binary	ON	OFF
BI	{109}	DI 5	OFF	--	Binary	ON	OFF
BI	{110}	DI 6	OFF	--	Binary	ON	OFF
AO	111	STPT SPAN	0.0 (0.0)	DEG F (DEG C)	0-63.75	--	--
AO	{121}	DEW POINT	-40.0 (-40.0)	DEG F (DEG C)	-40-1598.35	--	--
AO	124	SENSOR SEL	0	--	0-255	--	--

Object Type <sup>1</sup>	Object Instance (Point Number)	Object Name (Descriptor)	Factory Default (SI Units) <sup>2</sup>	Eng Units (SI Units)	Range	Active Text	Inactive Text
AI	{125}	RM CO2	1000	PPM	0-8191	--	--
AI	{126}	RM RH	50	PCT	0-102	--	--
BO	{127}	PPCL STATE	EMPTY	--	Binary	LOADED	EMPTY

<sup>1)</sup> Object Types are; Analog Input (AI), Analog Output (AO), Binary Input (BI) and Binary Output (BO).

<sup>2)</sup> A single value in a column means that the value is the same in English units and in SI units.

<sup>3)</sup> Point numbers that appear in brackets { } may be unbundled at the field panel.



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