SIEMENS

BACnet PTEC Controller

VAV Chilled Beam with Demand Control Ventilation (CO2) and Floating or Analog Output

Owner's Manual

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Building Technologies

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How To Use This Manual

This manual is written for the owner and user of the BACnet VAV Chilled Beam with Demand Control Ventilation (CO2) and Floating or Analog Output Controller. It is designed to help you become familiar with the Siemens BACnet PTEC and its applications.

This section covers manual organization, manual conventions, symbols used in the manual, and other information that will help you use this manual.

Manual Organization

This manual contains the following chapters:

- *Chapter 1 - Hardware,* describes the hardware components and the accessories that are used with the BACnet PTEC.
- *Chapter 2 - Applications,* describes the control applications available in the model of the BACnet PTEC that includes a terminal block for wireable input/output connections.
- *Chapter 3 - Point Database,* defines the point database descriptors and includes address and applications.
- *Chapter 4 – Basic Service and Maintenance,* describes basic corrective measures you can take should you encounter a problem when using the BACnet PTEC. For issues not covered in this chapter, consult your local Siemens Industry representative.
- The *Glossary* describes the terms and acronyms used in this manual.
- The *Index* helps you locate information presented in this manual.

Manual Conventions

The following table lists conventions to help you use this manual in a quick and efficient manner.

Convention	Examples
Numbered Lists (1, 2, 3…) indicate a procedure with sequential steps.	1. Turn OFF power to the field panel. 2. Turn ON power to the field panel. 3. Contact the local Siemens Industry representative.
Conditions that must be completed or met before beginning a task are designated with a ▷. Intermediate results (what will happen following the execution of a step), are designated with a ⇨. Results, which inform the user that a task was completed successfully, are designated with a ⇨.	▷Composer software is properly installed. ▷A Valid license is available. 1. Select **Start** > **Programs** > **Siemens** > **GMS** > **Composer**. ⇨The Project Management window displays. 2. Open an existing project or create a new one. ⇨The project window displays.
Actions that should be performed are specified in boldface font.	Type **F** for Field panels. Click **OK** to save changes and close the dialog box.
Error and system messages are displayed in Courier New font.	The message `Report Definition successfully renamed` displays in the status bar.
New terms appearing for the first time are italicized.	The field panel continuously executes a user-defined set of instructions called the *control program*.

Convention	Examples
	This symbol signifies Notes. Notes provide additional information or helpful hints.
Cross references to other information are indicated with an arrow and the page number, enclosed in brackets: [→92]	For more information on creating flowcharts, see Flowcharts [→92].
Placeholders indicate text that can vary based on your selection. Placeholders are specified by italicized letters, and enclosed with brackets [ ].	Type **A C D H** [*username*] [*field panel #*].

Manual Symbols

The following table lists the safety symbols used in this manual to draw attention to important information.

Symbol	Meaning	Description
NOTICE	CAUTION	Equipment damage may occur if a procedure or instruction is not followed as specified. (For online documentation, the NOTICE displays in white with a blue background.)
	CAUTION	Minor or moderate injury may occur if a procedure or instruction is not followed as specified.
	WARNING	Personal injury or property damage may occur if a procedure or instruction is not followed as specified.
	DANGER	Electric shock, death, or severe property damage may occur if a procedure or instruction is not followed as specified.

Getting Help

For more information about the BACnet VAV Chilled Beam with Demand Control Ventilation (CO2) and Floating or Analog Output Controller, contact your local Siemens Industry representative.

Where to Send Comments

Your feedback is important to us. If you have comments about this manual, please submit them to SBT_technical.editor.us.sbt@siemens.com

Chapter 1– Product Overview

The BACnet VAV Chilled Beam with Demand Control Ventilation (CO2) and Floating or Analog Output Controller is the Siemens Industry FLN controller used in pressure independent Variable Air Volume applications. It provides Direct Digital Control (DDC) for an application with a number of options.

- The controller can operate as an independent, stand-alone, DDC room controller or it can be networked with a field panel.
- The controller provides all termination, input/output, system and local communication connections.
- The controller hardware consists of the controller with cover and mounting bracket (See Figure [➙ 7] BACnet VAV Chilled Beam with Demand Control Ventilation (CO2) and Floating or Analog Output Controller).

The following applications are covered:

- VAV with Chilled Beam, Demand Control Ventilation (CO2) and Floating or Analog Output Controller (Application 6659)
- Slave Mode (Application 6692)

Programmability

Standard BACnet TEC applications reside in the PTEC and can run alongside the custom PPCL. It is important that BACnet TEC custom PPCL applications command points at priority 15 or higher.

The custom PPCL can be used one of the following ways:

- With the PTEC in slave mode, it is controlled exclusively by the custom PPCL.
- PPCL can be used to exclusively control spare I/O.
- With a standard PTEC application running, custom PPCL can command points at a higher priority which will override points in the application.

Our workstation and tool view the PTEC as a regular BACnet TEC.

Hardware Inputs

Analog

Air velocity sensor
Room temperature sensor*
Room temperature setpoint dial (optional)
Room unit with Humidity and/or CO2 (optional)
Auxiliary temperature sensor (optional)
Two 0-10V/4-20 mA switch selectable inputs (AI 3/AI 4). Either is configurable for use with a CO2 sensor for ventilation control. If one input is assigned as a CO2 input, there other input is spare. If neither is assigned as a CO2 input both are spare.

Digital

Condensate alarm (DI 6) dry contact
Wall switch (optional)

Hardware Outputs

Analog

AOV 1 - analog cooling. (Spare if DO5, DO6 used for floating control of CHW valve)

AOV 2 - analog heating. (Spare if DO3, DO4 used for floating control of HW valve)

AOV 3 - spare

OR

3 spare 0 to 10V AOVs if floating point control is used for heating and cooling

Digital

DO 1, DO 2 damper actuator

DO 3, DO 4 HW valve (spare if AO 2 used for HW valve)

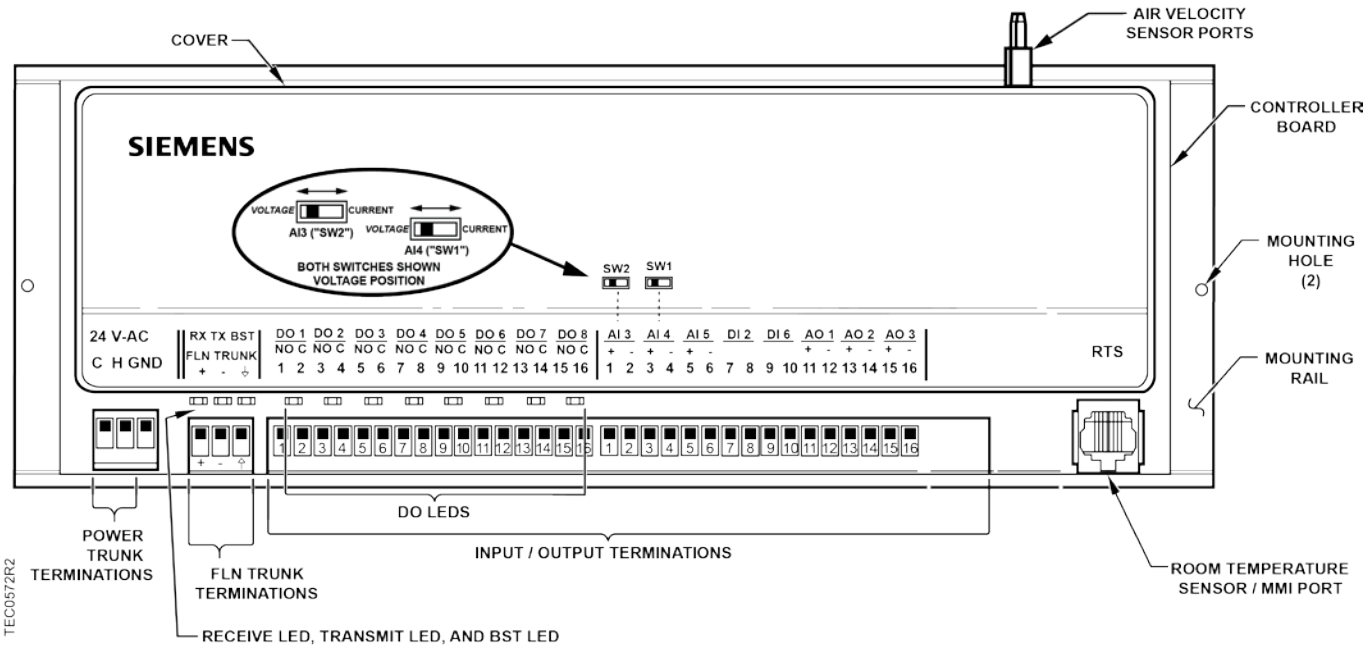
DO 5, DO 6 CHW valve (Spare if AO 1 used for CHW valve)

DO 7 spare

DO 8 Autozero (optional)

Ordering Notes

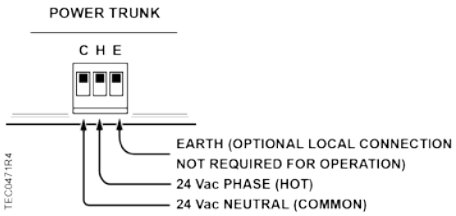
BACnet VAV Chilled Beam with Demand Control Ventilation (CO2) and Floating or Analog Output Controller	550-494PA



Generic Controller I/O Layout. See *Wiring Diagram* for application specific details.

Power Wiring

The controller is powered by 24 Vac. Power wiring connects to the three screw terminals on the controller board labeled “C” (Common), “H” (Hot), and “E” (Earth Ground) on the terminal block labeled “24 Vac”.



Communication Wiring

The controller connects to the field panel by means of a Floor Level Network (FLN) trunk. Communication wiring connects to the three screw terminals on the controller labeled “+” (positive), “-“ (negative), and “⏚” (reference).

Temperature Sensors

Temperature sensors used with the BACnet VAV Chilled Beam with Demand Control Ventilation (CO2) and Floating or Analog Output Controller include an electronic room temperature sensor and an optional duct temperature sensor.

Room Temperature Sensor

The room temperature sensor connects to the controller by means of a cable terminated at both ends with a six-conductor RJ-11 plug-in connector.

See the Ordering Notes [→ 7] section for the location of the room temperature sensor/Human Machine Interface (HMI) port.

Duct Temperature Sensor

An optional duct temperature sensor provides duct air temperature sensing inputs to the controller.

For more information about temperature sensors, contact your local Siemens Industry representative.

Related Equipment

- Autozero Module (optional)
- Damper Actuator(s)
- Room Temperature Sensor
- Valve Actuator(s)

Contact your local Siemens Industry representative for product numbers and more information.

Chapter 2 – Applications

Basic Operation

The BACnet VAV Chilled Beam with Demand Control Ventilation (CO2) and Floating or Analog Output Controller provides Direct Digital Control (DDC) for Variable Air Volume (VAV) terminal box applications. Temperature control varies with the application. If present, heating can be provided by hot water, stages of electric reheat, or optional baseboard radiation.

Control Temperature Setpoints

The controller maintains a specified temperature setpoint based on Day/Night mode, the heating/cooling mode, or the setpoint dial (if used).

This application has a number of different room temperature setpoints (DAY HTG STPT, NGT CLG STPT, RM STPT DIAL, etc.). The application actually controls using the CTL STPT. CTL STPT is set to different values depending on its override status, the time of day, whether or not a temperature deadband (zero energy band) has been configured, and the type of RTS used.

Day/Night Mode

The controller maintains the specified day setpoint temperature during daytime hours and the specified night setpoint at night.

Night Mode Override Switch

If the ROOM TEMPERATURE SENSOR has an override switch, it can be used to command the controller into day mode for an adjustable period of time. This only affects a controller in night mode.

Control Loops

Temperature Loop – Heating Loop

Maintain temperature heating setpoint by modulating (or fixed) airflow setpoint or modulating the hot water valve.

Temperature Loop – Cooling Loop

Maintain temperature cooling setpoint by modulating the supply airflow setpoint or modulating the chilled water valve.

Demand Control Ventilation (DCV) Loop –

Maintain ventilation demand via CO2 sensors by controlling the supply airflow setpoint

Flow Loop

Maintains flow setpoint by modulating the damper actuator.

Calibration

Air Velocity Sensor

Calibration of the controller's internal air velocity sensor is periodically required to maintain accurate air velocity readings. Calibration may be set to take place automatically or manually.

Additional calibration is provided by driving the valve or damper fully closed or open, whenever they are commanded to 0 or 100 percent.

Fail-Mode Operation

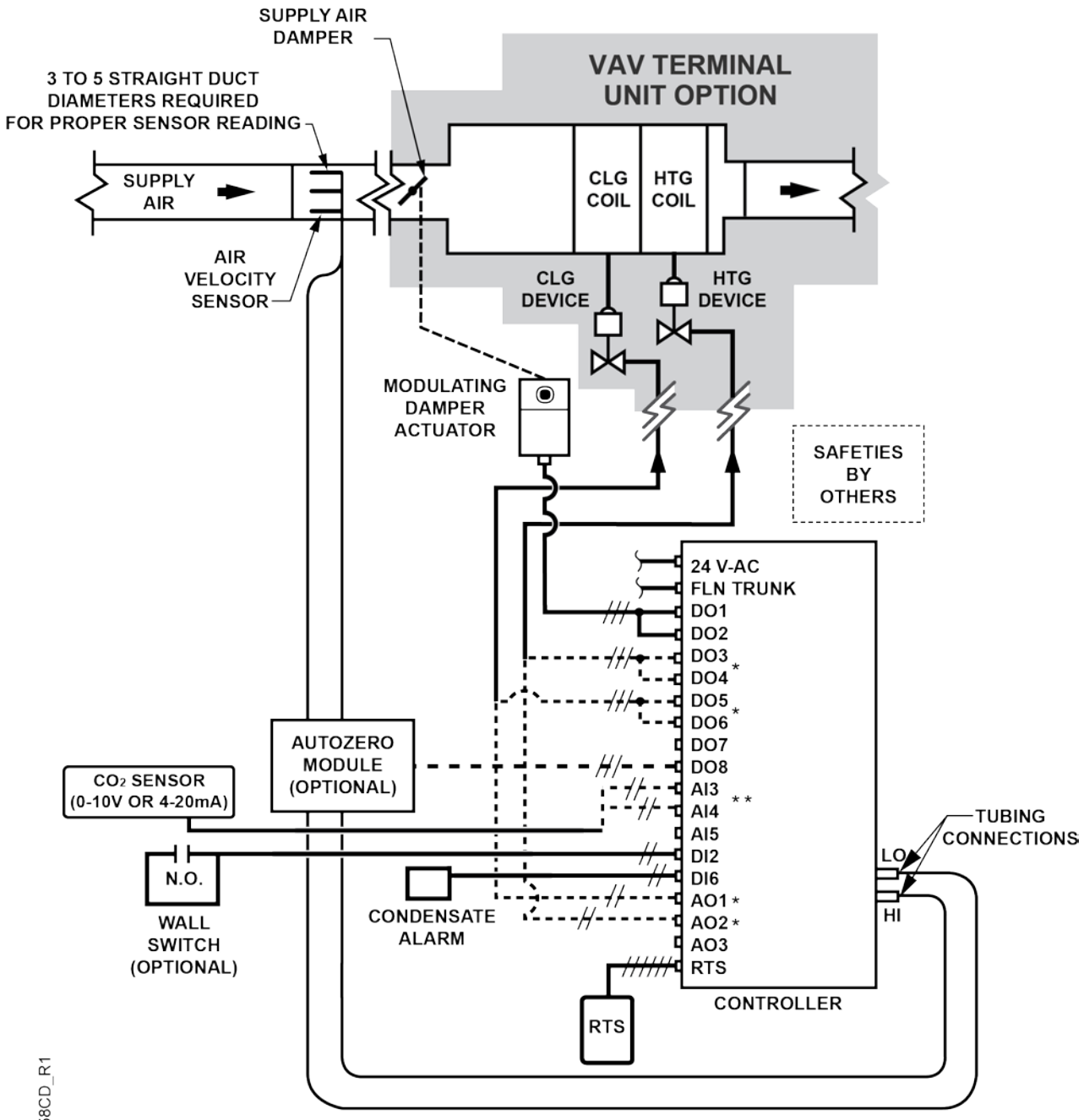
If the RTS or the setpoint dial fails, then the controller operates using the last known temperature value.

Notes

1. If the temperature swings in the room are excessive, or if there is trouble in maintaining the setpoint, contact your local Siemens Industry representative for more information.
2. The BACnet VAV Chilled Beam with Demand Control Ventilation (CO2) and Floating or Analog Output Controller, as shipped from the factory, keeps all associated equipment OFF. The controller and its equipment are released to application control at start up.

Application 6659 VAV Chilled Beam with Demand Control Ventilation (CO2)

Application 6659 is a VAV controller used for temperature and ventilation control. This application is suitable for conventional VAV as well as chilled beam applications. In the cooling mode, the airflow and a chilled water valve can be modulated in series, in parallel or overlapped. If the VAV box airflow is to be modulated in heating mode, the airflow and the heating valve can be modulated in series, in parallel or overlapped. The heating coil and cooling coil valves can each be independently configured to be either floating control or analog control. This application also includes a Demand Control Ventilation (DCV) sequence that monitors CO2 levels within the space. If additional ventilation is required based on CO2 levels, the airflow setpoint for temperature control is temporarily overridden and is instead controlled to assure adequate ventilation. While in the ventilation mode, the temperature control is maintained using increased airflow, as well as by the heating and cooling coils.

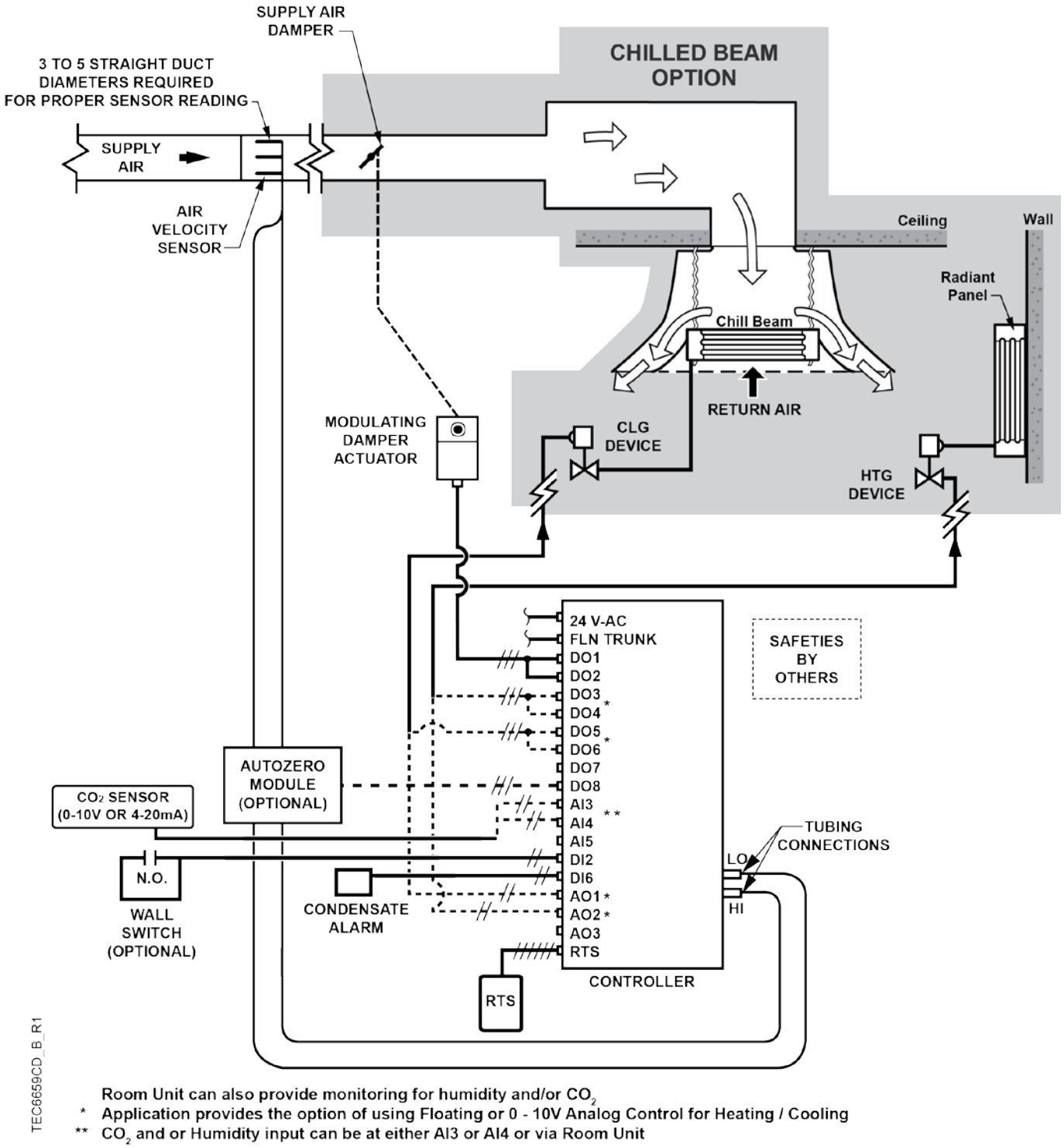


Room Unit can also provide monitoring for humidity and/or CO_2

* Application provides the option of using Floating or 0 - 10V Analog Control for Heating / Cooling

** CO_2 and/or Humidity input can be at either AI3 or AI4 or via Room Unit

Control Diagram - VAV with Demand Control Ventilation.



Room Unit can also provide monitoring for humidity and/or CO_2

* Application provides the option of using Floating or 0 - 10V Analog Control for Heating / Cooling

** CO_2 and or Humidity input can be at either AI3 or AI4 or via Room Unit

Control Diagram - Chilled Beam with Demand Control Ventilation.

Chapter 3 – Point Database

This chapter presents a description of the BACnet VAV Chilled Beam with Demand Control Ventilation (CO2) and Floating or Analog Output Controller database including point descriptors, point addresses, and a listing of applications where each point is found.

Descriptor	Address[1]	Application	Description
CTLR ADDRESS	01	All (includes slave mode)	Identifies the controller on the FLN trunk.
APPLICATION	02	All	The identification number of the program running in the controller.
RM CO2	{03}	All	This point can be unbundled in the controller for monitoring purposes. This point may be used in a control strategy as occupancy increases (CO2 levels increase) in the room being controlled.
ROOM TEMP	{04}[2]	All	Actual reading from the room temperature sensor.
HEAT.COOL	{05}	6659	Current mode of operation for applications that can be in either a heating mode or a cooling mode.
DAY CLG STPT	06	6659	The temperature setpoint, in degrees, that the controller maintains during day periods in cooling mode if a room temperature sensor setpoint dial is not present or is not used. See *STPT DIAL*.
DAY HTG STPT	07	6659	The temperature setpoint, in degrees, that the controller maintains during day periods in heating mode if a room temperature sensor setpoint dial is not present or is not used. See *STPT DIAL*.
NGT CLG STPT	08	6659	The temperature setpoint, in degrees, that the controller maintains during night periods in cooling mode.
NGT HTG STPT	09	6659	The temperature setpoint, in degrees, that the controller maintains during night periods in heating mode.
CO2 SCALE	10	6659	The value, in part per million (PPM), represented by a sensor reading of 10 V or 20 mA connected and enabled on AI 3 or AI 4. (Default is 2000).
RM STPT MIN	11	6659	The minimum temperature setpoint, in degrees, that the controller can use from the setpoint dial. This overrides any temperature setpoint from the setpoint dial that falls below this minimum.
RM STPT MAX	12	6659	The maximum temperature setpoint, in degrees, that the controller can use from the setpoint dial. This overrides any temperature setpoint from the setpoint dial that falls above this maximum.
RM STPT DIAL	{13}[2]	All	The temperature setpoint, in degrees, from the room temperature sensor (not available on all temperature sensor models). This setpoint will be used for control in day mode (heating or cooling) when enabled by STPT DIAL.
STPT DIAL	14	6659	YES indicates that there is a room setpoint dial on the room temperature sensor and it is to be used as the temperature setpoint for control in day mode. NO indicates that the appropriate preset setpoint (Point 6) will be used as the temperature setpoint for control in day heating mode or

Descriptor	Address[1]	Application	Description
			cooling mode. Valid input. YES or NO.
AI 3	{15}	All	Analog input, percent.
H FLOW START	16	6659	The value of HTG LOOPOUT (0 through 100) at which the flow will begin to modulate up from HTG FLOW MIN.
H FLOW END	17	6659	The value of HTG LOOPOUT (0 through 100) at which the flow will reach HTG FLOW MAX.
WALL SWITCH	18	6659	YES indicates that the controller is to monitor the status of a wall switch that is connected to DI 2. NO indicates that the controller will not monitor the status of a wall switch, even if one is connected. Valid input: YES or NO.
DI OVRD SW	{19}[2]	6659	Actual indication of the status of the override switch (not physically available on all temperature sensor models) at the room temperature sensor. ON indicates that the switch is being pressed. OFF indicates that the switch is released. Valid input: ON or OFF.
OVRD TIME	20	6659	The amount of time, in hours, that the controller will operate in day mode when the override switch is pressed while the controller is in night mode.
NGT OVRD	{21}	6659	Indicates the mode that the controller is operating in with respect to the override switch. NIGHT indicates that the switch has not been pressed and the override timer is not active. DAY indicates that the switch has been pressed and the override timer is active. The controller then uses a day mode temperature setpoint. This point is only in effect when DAY.NGT indicates night mode.
REHEAT START	22	6659	Determines how the reheat modulation will be sequenced while in heating mode. When HTG LOOPOUT is above this value, then the reheat modulates upward.
REHEAT END	23	6659	Determines how the reheat modulation will be sequenced while in heating mode. When HTG LOOPOUT is below this value, then the reheat modulates downward.
DI 2	{24}	All	Actual status of a contact connected to the controller at DI 2. ON indicates that the contact is closed; OFF indicates that the contact is open. If a wall switch is used, then it is connected to DI 2. See *WALL SWITCH*.
DI 3	{25}[2]	All	Actual status of a contact connected to the controller at DI 3/AI 3. ON indicates that the contact is closed; OFF indicates that the contact is open. When a contact is connected at DI 3, AI 3 is not available. See *AUX TEMP*.
DI 4	{26}	All	Spare digital input. Actual status of a contact connected to the controller. ON indicates that the contact is closed; OFF indicates that the contact is open. Point is not available if AI 4 is in use.
DI 5	{27}	All	Actual status of a contact connected to the controller at AI 5/DI 5. ON indicates that the contact is closed; OFF indicates that the contact is open. When a contact is connected at DI 5, AI 5 is not available. See *AUX TEMP*.
DI 6	{28}	All	Actual status of a contact connected to the controller. ON indicates that the contact is closed; OFF indicates that the contact is open.
DAY.NGT	{29}	All	Indicates the mode in which the controller is operating. Day

Descriptor	Address[1]	Application	Description
			temperature setpoints will be used in day mode. Night temperature setpoints will be used in night mode. This point is normally set by the field panel.
FLO CTL MODE	{30}	6659	Indicates the current flow control mode, ventilation or temperature. Controlled by the application based on DCV setpoints.
CLG FLOW MIN	31	6659	The minimum amount of air in CFM (LPS) to be supplied to the space in cooling mode.
CLG FLOW MAX	32	6659	The maximum amount of air in CFM (LPS) to be supplied to the space in cooling mode.
HTG FLOW MIN	33	6659	The minimum amount of air in CFM (LPS) to be supplied to the space in heating mode.
HTG FLOW MAX	34	6659	The maximum amount of air in CFM (LPS) to be supplied to the space in heating mode.
AIR VOLUME	{35}	All	Actual amount of air in CFM (LPS) currently passing through the air velocity sensor.
FLOW COEFF	36	All	Calibration factor for the airflow sensor.
CHW DISABLE	{37}	6659	When CHW DISABLE = YES, the chill water valve command, C VLV CMD will be set to 0. CHW DISABLE can be controlled by a field panel, PPCL or by a condensate sensor connected to D I6.
AOV2	{38}	All	Displays the voltage signal to AO2.
C VLV POS	{39}	All	The current position of the chill water motor in percent of full travel. This value is calculated based on motor run time.
H VLV POS	{40}	All	The current position of the hot water motor in percent of full travel. This value is calculated based on motor run time.
DO 1	{41}	All	Digital output 1 controls a 24 Vac load with an ON or OFF status. If Motor 1 is enabled, then DO 1 is coupled with DO 2 to control an actuator.
DO 2	{42}[2]	All	Digital output 2 controls a 24 Vac load with an ON or OFF status. If Motor 1 is enabled, then DO 2 is coupled with DO 1 to control an actuator.
DO 3	{43}	All	Digital output 3 controls a 24 Vac load with an ON or OFF status. If Motor 2 is enabled, then DO 3 is coupled with DO 4 to control an actuator.
DO 4	{44}	All	Digital output 4 controls a 24 Vac load with an ON or OFF status. If Motor 2 is enabled, then DO 4 is coupled with DO 3 to control an actuator.
DO 5	{45}	All	Digital output 5 controls a 24 Vac load with an ON or OFF status. If Motor 3 is enabled, then DO 5 is coupled with DO 6 to control an actuator.
DO 6	{46}	All	Digital output 6 controls a 24 Vac load with an ON or OFF status. If Motor 3 is enabled, then DO 6 is coupled with DO 5 to control an actuator.
AI 4	{47}	All	Spare analog input (10K Ω thermistor). Point is not available if DI 4 is in use.
DMPR COMD	{48}	All	The value to which the damper motor is commanded in percent of full travel.
DMPR POS	{49}	All	The current position of the damper motor in percent of full

Descriptor	Address[1]	Application	Description
			travel. This value is calculated based on motor run time.
OUTDOOR CO2	{50}	6659	The value of OUTDOOR CO2 is reported to the controller using the field panel and PPCL or manually set, since there is no outdoor CO2 sensor connected to the controller.
DMPR TIMING	51	All	The time, in seconds, required for the damper motor to travel from full closed to the full open position.
H VLV COMD	{52}	All	The value to which the valve actuator is commanded in percent of full travel for applications using a water valve.
C VLV COMD	{53}	All	The value to which the chill water valve actuator is commanded in percent of full travel for applications using a chill water valve.
AOV3	{54}	All	Displays the voltage signal to AO3.
CO2 RST DLY	55	6659	The threshold for exiting the ventilation mode is set via CO2DIFF LLIM and the time delay is set via CO2 RST DLY.
AIR VOL STPT	{56}	6659	Current flow volume, in cfm (Lps), calculated by the application for the higher of the temperature or ventilation flow requirements.
CO2 CONFIG	57	6659	Value indicating configuration and sensor source of the CO2 demand control feature. (See *Ventilation Control* section.)
MTR SETUP	58	All	The configuration setup code for Motors 1 and 2. This enables the motors individually and sets each motor to be either direct or reverse acting. **Note:** When a motor is enabled, its associated DOs are enabled.
DO DIR.REV	59	All	The configuration setup code for DOs. Allows the DOs to be direct or reverse acting (enabled equals energized or disabled equals de-energized).
AOV1	{60}	All	Displays the voltage signal to AO1.
CO2DIFF LLIM	61	6659	When the differential CO2 level has been at or below CO2DIF LLIM limit for a specified number of minutes (CO2 RST DLY), the application returns to normal temperature control.
CO2DIFF HLIM	62	6659	The ventilation mode is entered whenever CO2DIFF (the difference between RM CO2 and OUTDOOR CO2) is greater than CO2DIFF HLIM.
CLG P GAIN	63	6659	The proportional gain value for the cooling temperature control loop.
CLG I GAIN	64	6659	The integral gain value for the cooling temperature control loop.
CO2 ALARM	{65}	6659	CO2 ALARM will be set to ALARM if the CO2 concentration differential (CO2DIFF) between RM CO2 and OUTDOOR CO2 is greater than CO2DIFF HLIM for more than CO2 ALM DLY minutes.
TEMP OFFSET	66	All	Room temperature offset is a user-adjustable offset that will compensate for deviations between ROOM TMP and CTL TEMP.
HTG P GAIN	67	6659	The proportional gain value for the heating temperature control loop.
HTG I GAIN	68	6659	The integral gain value for the heating temperature control loop.

Descriptor	Address[1]	Application	Description
COND ALARM	{69}	6659	COND ALARM will be ALARM depending on the status of DI 6 and the type of condensate sensor as configured in point DI 6 TYPE.
COND ALM DLY	70	6659	The abnormal condensate condition must persist for the number of seconds in COND ALM DLY before the alarm activates and the valve closes (COND ALM DLY = 0 disables application response to DI6 status.)
VENT FLOW MAX	71	6659	The maximum amount of air in CFM (LPS) to be supplied to the space in ventilation mode.
FLOW I GAIN	72	6659	The integral gain value for the flow control loop.
CO2 P GAIN	73	6659	The proportional gain value for the DCV CO2 control loop.
CO2DIFF	{74}	6659	The difference between the OUTDOOR CO2 and the RM CO2.
FLOW	{75}	6659	Indicates the amount of air currently passing the air velocity sensor. The value is calculated as a percentage based on where the value of AIR VOLUME is in the range between 0 and CTL FLOW MAX.
CLT FLOW MIN	{76}	6659	The active minimum flow used as a limit for the flow control loop. This value is the larger of CLG FLOW MIN and VENT DMD MIN if the controller is in day cooling mode, or is the larger of HTG FLOW MIN and VENT DMD MIN if the day controller is in heating mode, unless it is overridden. In the night mode, CTL FLOW MIN is set to NGT FLOW MIN.
CTL FLOW MAX	{77}	6659	The active maximum flow used as a limit for the flow control loop. This value is the same as CLG FLOW MAX if the controller is in cooling mode, or is the same as HTG FLOW MAX if the controller is in heating mode or set to VENT FLOW MAX in ventilation mode.
CTL TEMP	{78}[2]	All	The temperature used as input for the temperature control loops. This value will be the same as the value in ROOM TEMP + RMTMP OFFSET unless it is overridden.
CLG LOOPOUT	{79}	6659	The cooling temperature control loop output value, in percent.
HTG LOOPOUT	{80}	6659	The heating temperature control loop output value, in percent.
DO 7	{81}	All	Digital output 7 controls a 24 Vac load with an ON or OFF status.
AUX TEMP AI 5	{82}	All	Actual reading from a 10K or 100K Ω thermistor connected to the controller's AI 5 input.
CLG STG DLY	83	6659	When there are two cooling source configured (cold air and chill water), set the number of minutes delay required before the configured second source can be enabled.
NGT FLOW MIN	84	6659	Optional airflow setpoint to be used for CTL FLOW MIN in NIGHT mode.
SWITCH LIMIT	85	6659	The active temperature control loop output must be less than this value to switch between cooling mode and heating mode. Actual switchover depends on SWITCH DBAND being exceeded and is subject to SWITCH TIME being expired.
SWITCH TIME	86	6659	The time, in minutes, before the heat/cool mode can change over when the other parameters are appropriate.
CAL MODULE	87	All	YES indicates that the Autozero Modules are enabled to calibrate the air velocity transducers. The dampers will not be

Descriptor	Address[1]	Application	Description
			used for calibration. NO indicates that Autozero Modules are disabled and that the air velocity transducers will be calibrated by closing the dampers. Valid input: YES or NO.
CO2DIFF STPT	88	6659	When the controller is in the ventilation mode (FLO CTL MODE = VENT), set theCO2DIFF STPT to establish a desired CO2 Steady state level.
DO 8	{89}	All	Digital output 8 controls a 24 Vac load with an ON or OFF status.
SWITCH DBAND	90	6659	The temperature range, in degrees, which is compared to the difference between CTL TEMP and CTL STPT. The difference must exceed this value for temperature control mode to change over. Changeover is also subject to SWITCH TIME being expired.
HC.ENDNIS	91	6659	The setup point to either enable or disable heating and/or cooling modes.
CTL STPT	{92}[2]	6659	The actual setpoint value being used as input for the active temperature control loop.
FLOW STPT	{93}	6659	The setpoint of the flow control loop.
CAL AIR	{94}	All	YES commands the controller to go through calibration sequence for the air velocity transducers. YES also displays when the calibration sequence is started automatically. CAL AIR automatically returns to NO after the calibration sequence is completed. Valid input: YES or NO.
CAL SETUP	95	All	The configuration setup code for the calibration sequence options.
CAL TIMER	96	All	Time interval, in hours, between the calibration sequences.
DUCT AREA	97	All	Area, in square feet (square meters), of the duct where the air velocity sensor is located. This is a calculated value (calculated by the field panel or computer being used) that depends on duct shape and size. It is used in calculating all points in units of CFM, CF, LPS and L. Valid input: .025 ft2 (.002 m2) through 6.375 ft2 (.5923 m2).
LOOP TIME	98	6659	The time, in seconds, between control loop calculations.
ERROR STATUS	{99}[2]	All	The status code indicating any errors detected during controller power up. A status of 0 indicates there are no problems.
H VLV TIMING	102	All	The time, in seconds, required for the hot water valve actuator to travel from full closed to the full open position.
C VLV TIMING	103	All	The time, in seconds, required for the chill water valve actuator to travel from full closed to the full open position.
CHW START	104	6659	The value of CLG LOOPOUT (0 through 100) at which the chilled water valve will begin to modulate open from fully closed.
CHW END	105	6659	The value of CLG LOOPOUT (0 through 100) at which the chilled water valve will be fully open.
C FLOW START	106	6659	The value of CLG LOOPOUT (0 through 100) at which the flow will begin to modulate up from CLG FLOW MIN.
C FLOW END	107	6659	The value of CLG LOOPOUT (0 through 100) at which the flow will reach CLG FLOW MAX.

Descriptor	Address[1]	Application	Description
CLG D GAIN	108	6659	Derivative gain value for the cooling temperature control loop.
CO2 D GAIN	109	6659	Derivative gain value for the DCV CO2 control loop.
STPT SPAN	109	6659	The configuration value for room units to function in warmer/cooler adjustments. A value of 0 allows room units to function in standard/absolute temperature setpoint mode.
DMPR ROT ANG	110	All	Number of degrees the damper is free to travel.
CO2 LOOPOUT	{111}	6659	The DCV CO2 control loop output value, in percent.
AOV1 OPEN	112	6659	The voltage signal to AO1 = OPEN.
AOV1 CLOSE	113	6659	The voltage signal to AO1 = CLOSED.
AOV2 OPEN	114	6659	The voltage signal to AO2 = OPEN.
AOV2 CLOSE	115	6659	The voltage signal to AO2 = CLOSED.
CO2 ALM DLY	116	6659	Delay, in minutes, before theCO2 ALARM will be set to ALARM if the CO2 concentration differential (CO2DIFF) between RM CO2 and OUTDOOR CO2 is greater than CO2DIFF HLIM.
DI6 TYPE	117	6659	Configuration for normally open or normally closed condensate alarm sensor.
HTG D GAIN	118	6659	Derivative gain value for the heating temperature control loop.
CO2 I GAIN	119	6659	The integral gain value for the DCV CO2 control loop.
MOD HTG FLOW	120	6659	The minimum flow in feet per minute needed for safety purposes when using electric reheat.
DEW POINT	{121}	6659	Dew point temperature calculation using room temperature (CTL TEMP) and room humidity (RM RH).
ENTHALPY	{122}	6659	Enthalpy point temperature calculation using room temperature (CLT TEMP) and room humidity (RM RH). Valid for ranges of 55 F to 95 F and 20% to 100% relative humidity.
VENT DMD MIN	{123}	6659	Optional airflow setpoint (commandable) to be used with the larger of CLG FLOW MIN in cooling or HTG FLOW MIN in heating for CTL FLOW MIN in DAY mode.
SENSOR SEL	{124}	All	Used to determine which version of room unit is connected and how the SENSOR SEL point responds to a possible communication loss between the controller and the room unit. The different versions of room units (legacy Series 1000 and 2000 stats; and the Series 2200 and 2300 stats) display the communication failure uniquely. This is an indicator for the occupant to know that there is a communication problem between the controller and room unit.
RH CONFIG	125	6659	Relative Humidity sensor in the room unit in units of percentage. This point can be used in the PTEC with PPCL or unbundled in the field panel for control or for monitoring purposes. This point may be used in a control strategy as humidity levels varies in the room being controlled
RM RH	{126}	All	This point can be unbundled in the controller for monitoring purposes. This point may be used in a control strategy as humidity levels varies in the room being controlled.
PPCL STATE	{127}	All	This point indicates that customized programming has been added in addition to the normal control strategy of the application being used. This point is read as LOADED or

Descriptor	Address[1]	Application	Description
			EMPTY. A status of LOADED indicates that there is PPCL programming in the controller, and it is providing unique control to meet a customer's job specification. A status of EMPTY indicates that no unique programming is present.

1) Points not listed are not used in this application.

2) Point numbers that appear in brackets { } may be unbundled at the field panel.

Chapter 4 – Basic Service and Maintenance

This chapter describes basic service and maintenance measures you can take when using a BACnet PTEC.

You may want to contact your local Siemens Industry representative if a problem occurs or you have any questions about the controller.

NOTE:
When troubleshooting, record the problem and what actions were performed immediately before the problem occurred. Being able to describe the problem in detail is important should you need assistance from your local Siemens Industry representative.

Basic Service Information

Always remove power to the BACnet PTEC when installing or replacing it. Since the controller does not have a power switch, the recommended method of removing power to a locally powered controller is to turn OFF the power to the 24 Vac transformer. The recommended method of removing power to a controller on a power cable (even to service a single controller) is to turn OFF the power at the transformer.

NOTE:
When removing power to a controller to perform maintenance or service, make sure that the person in charge of the facility is aware of this and that appropriate steps are taken to keep the building in control.

Never remove the cover from the BACnet PTEC. There are no serviceable parts inside. If a problem is found with this device, contact your local Siemens Industry representative for replacement. An anti-static wrist strap is recommended when installing or replacing controllers.

Preventive Maintenance

Most controller components are designed so that, under normal circumstances, they do not require preventive maintenance. Periodic inspections, voltage checks, and point checks are normally not required. The rugged design makes most preventive maintenance unnecessary. However, devices that are exposed to dusty or dirty environments may require periodic cleaning to function properly.

Safety Features

The controller board stores the controller's address, applications, and point values. In the event of a power failure or a reset, these values are retrieved from the controller's permanent memory and are used by the controller unless overridden by a field panel. If one of the following conditions occurs, the controller will activate safety features present in its fail-safe mode.

- Sensor failure.
- Loss of power. Upon controller power loss, communication with the controller is also lost. The controller will appear as failed (*F*) at the field panel.

Glossary

This glossary contains the collected terms and acronyms that are used in Siemens BACnet PTEC and TEC Controllers. For definitions of point database descriptors, see Chapter 3 - Point Database, in this manual.

airflow

Rate at which a volume of air moves through a duct. Usually expressed in cubic feet per minute (cfm) or liters per second (lps).

algorithm

Mathematical formula and control logic that uses varying inputs to calculate an output value.

AVS

Air Velocity Sensor. An electronic device that converts differential pressure from a pilot tube or multi-point pickup to an analog rate of fluid flow (air velocity in fpm, m/s) to provide calculations of air volume rate (cfm, lps) in a duct. The air velocity sensor may be an external device or an internal component of a controller.

centralized control

Type of control offered by a controller that is connected by means of Field Level Network (FLN).

cfm

Cubic Feet per Minute.

Chilled Beam

A cooling device that provides a cooling system by taking care of both the sensible and latent heat gains of a room in a single package by a series of chilled water coils mounted near or in the ceiling. Coupled with a CV or VAV terminal ventilation system, a chilled beam induces air movement over the coil in the way that it discharges fresh air into the room. This allows for both fresh air and cooling to be taken care of at the same time.

control loop

An algorithm, such as PI or PID, that is used to control an output based on a setpoint and an input reading from a sensor.

CO_2

Carbon dioxide, a naturally occurring chemical compound composed of two oxygen atoms and a single carbon atom. Among other production sources, carbon dioxide is produced as the result of breathing of humans and animals and can therefore be an indirect indication of the concentration of humans in a zone.

CV

Constant air volume. Ventilation system that provides a fixed air volume supplied to and exhausted from the rooms served. The fixed volume may be different during occupied and unoccupied times

Demand Control Ventilation

A control algorithm that provides for the control or reduction of outdoor air intake below design rates when the actual occupancy of spaces served by the system is at less than design occupancy.

DCV

Demand Control Ventilation.

DDC

Direct Digital Control.

Direct digital control

The automated control of a condition or process by a digital device (computer).

DO

Digital Output. Physical output point that sends a two-state signal (ON/OFF, OPEN/CLOSED, YES/NO).

English units

The foot-pound-second system of units for weights and measurements.

equipment controller

FLN device, such as a BACnet PTEC or ATEC, that provides individual room or mechanical equipment control or additional point capacity to a field panel.

field panel

A DDC control device containing a microprocessor for centralized control and monitoring of system components and equipment controllers.

Floating Control

The combination of a modulating controlled device with the use of a pair of two position outputs. The control signal will either activate one or the other outputs to drive the controlled device towards its open or closed position. When both outputs are off, the controlled device maintains its last position. Also referred to as tri-state control.

FLN

Field Level Network. Network consisting of equipment controllers, FLN end devices, fume hoods, etc.

lps

Liters per Second.

loopout

Output of the control loop expressed as a percentage.

Heat pump

An HVAC device used for both space heating and space cooling. When a heat pump is used for heating, it employs the same basic refrigeration-type cycle used by an air conditioner but in the opposite direction, releasing heat into the conditioned-space rather than the surrounding environment. In this use, heat pumps generally draw heat from the cooler external air or from the ground.

HMI

Human Machine Interface. Terminal and its interface program that allows you to communicate with a field panel or equipment controller.

Occupancy sensor

A control device that detects presence of people in a space by using infrared or ultrasonic technology. Occupancy sensors are used to save energy by controlling lighting and temperature and, along with CO2 sensors, to provide control input of demand control ventilation (DCV) algorithms.

override switch

Button on a room temperature sensor that an occupant can press to change the status of a room from unoccupied to occupied (or from night to day) for a predetermined time.

pressure dependent

Variable Air Volume (VAV) room temperature control system in which the temperature drives a damper such that the air volume delivered to the space at any damper position is dependent on the duct static pressure.

pressure independent

Variable Air Volume (VAV) room temperature control system in which the temperature drives an airflow setpoint such that the air volume delivered to the space is independent of variations in the duct static pressure.

PID

Proportional, Integral, Derivative.

RTS

Room Temperature Sensor.

setpoint

Data point that stores a value such as a temperature setting. In contrast, points that monitor inputs, such as temperature, report actual values.

SI units

Systeme International d'Unites. The international metric system.

slave mode

Default application that displays when power is first applied to an equipment controller. No control action is initiated in the slave mode. Input and output points in the slave application can be monitored or controlled by a field panel (or by PPCL in a BACnet PTEC controller).

stand-alone control

Type of control offered by a controller that is providing independent DDC control to a space.

Terminal Equipment Controller

Siemens Industry, Inc. product family of equipment controllers (one is the BACnet VAV Chilled Beam with Demand Control Ventilation (CO2) and Floating or Analog Output Controller) that house the applications software used to control terminal units, such as heat pumps, VAV terminal boxes, fan coil units, unit ventilators, etc.

UI

Universal Input. Can be used as an AI or DI. An AI input is a point receiving a signal that represents a condition that has more than two states. A DI input is a physical input point that receives a two-state signal.

unbundle

Term used to describe the entering of a point that resides in a controller's database into the field panel's database so that it can be monitored and controlled from the field panel.

VAV

Variable air volume. Ventilation system that changes the amount of air supplied to and exhausted from the rooms served.

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