APOGEE Unit Vent Controller — 0 to 10V Output Owner's Manual

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Siemens Building Technologies, Inc.

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How To Use This Manual

This manual is written for the owner and user of the Siemens Building Technologies, Inc. Unit Vent Controller – 0 to 10V, often referred to as *controller* for the remainder of this manual. This manual is designed to help you become familiar with the controller and its applications.

This chapter covers manual organization, manual symbols and conventions used and how to access help.

Manual Organization

This manual contains the following chapters:

- *Chapter 1 Product Overview*, describes the hardware components and accessories used with the controller.

- *Chapter 2 Applications*, describes the control applications available in the controller.

- *Chapter 3 Point Database*, defines the point database descriptors and includes addresses and applications.

- *Chapter 4 Troubleshooting*, describes basic corrective measures to take should you encounter a problem when using this controller. For issues not covered in this chapter, contact your local Siemens Building Technologies representative.

- A *Glossary* describes the terms and acronyms used in this manual.

- An *Index* is provided to assist you in finding information.

Manual Conventions

The following table lists conventions used in this manual.

Convention	Example
Actions that you should perform 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` appears in the status bar.
New terms appearing for the first time are italicized.	The Open Processor continuously executes a user-defined set of instructions called the *control program*.

Manual Symbols

The following table lists symbols that used to draw your attention to important information.

Notation	Symbol	Meaning
CAUTION:	⚠	Indicates that equipment damage or loss of data may occur, if a procedure is not performed as specified.
WARNING:	⚠	Indicates that personal injury or loss of life may occur to the user, if a procedure is not performed as specified.

Datamate Software

Datamate is a customer software tool for all controller communications. There are two versions: *Datamate Base,* and *Datamate Advanced*. Datamate Base works on an IBM-compatible Personal Computer (PC), or a Handheld PC or Pocket PC™ running Windows CE. Datamate Advanced works only on an IBM-compatible Personal Computer.

With Datamate, you can back up, restore and edit any APOGEE® database (but only Datamate Advanced allows you to edit points offline). Backing up and restoring a database is accomplished while connected to any APOGEE® field panel, or to the Automation Level Network (ALN) or Field Level Network (FLN) device in question. A modem and telephone lines can also be used. Databases can be saved for permanent storage or used as backup.

For more information on Datamate software, refer to the appropriate user guide for the version of Datamate you are using (Base or Advanced), or contact your local Siemens Building Technologies, Inc. representative.

Getting Help

For more information about the Unit Vent Controller, contact your local Siemens Building Technologies 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

Siemens Building Technologies. Inc.

1

Product Overview

Introduction

The Unit Vent Controller—0 to 10V Output is the Siemens Building Technologies, Inc. Terminal Equipment Controller (TEC) used in unit ventilator applications. See Figure 1. It provides Direct Digital Control (DDC) for five applications. The controller can operate as an independent, stand-alone, DDC room controller or be networked with an APOGEE field panel.

The controller provides all termination, input/output, system and local communication connections. See Figure 1. The controller hardware consists of the controller with cover and mounting bracket.

Table 1. Unit Vent Controller – 0 to 10 V Output Applications.

Standard Applications
2281 Heating and/or Chilled Water Cooling, ASHRAE Cycles I and II
2283 Heating and/or Chilled Water Cooling, ASHRAE Cycle III
2284 Heating and DX Cooling, ASHRAE Cycles I and II
2286 Heating and DX Cooling, ASHRAE Cycle III
2287 Nesbitt Cycle W
2299Slave Mode (no control; available for set up, and point extension device)

Ordering Notes

Unit Vent Controller – 0 to 10 Volt Output   540-509
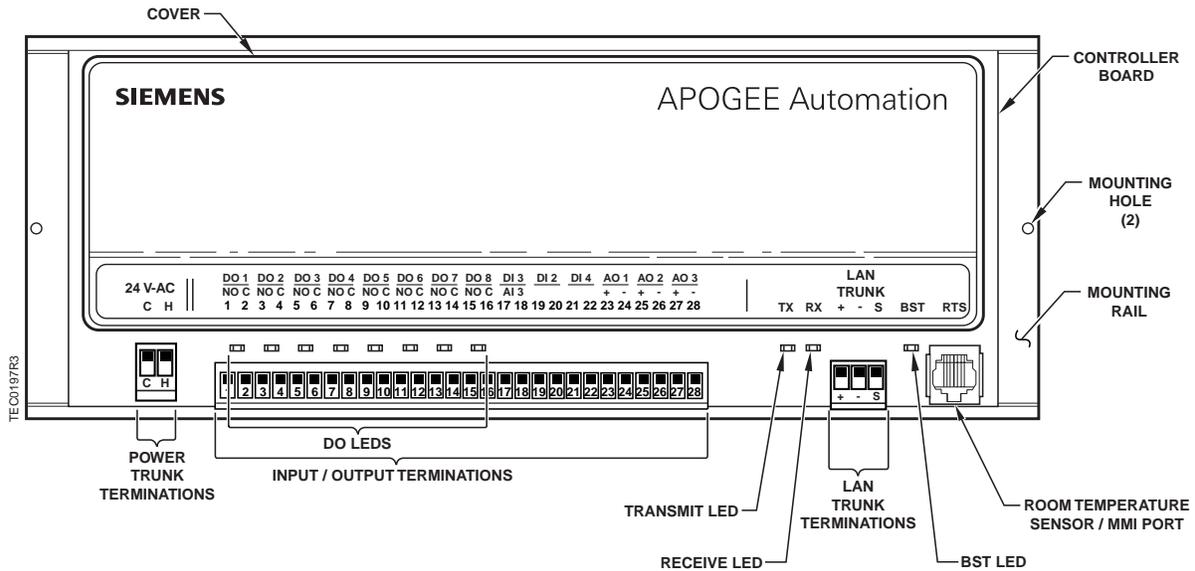
Figure 1. Unit Vent Controller - 0 to 10V Output.

Hardware Inputs

Analog

- Averaging air temperature sensor

- Room temperature sensor

- Room temperature setpoint dial (optional)

Digital

- Low Temperature Detection Thermostat (LTDT)

- Night mode override (optional)

- Wall switch (optional)

Hardware Outputs

Analog (0 to 10V)

	Application
• Cooling valve actuator	2281, 2283, 2287
• Face-bypass damper actuator	2281, 2283, 2284, 2286
• Heating valve actuator	2281, 2283, 2284, 2286, 2287
• Outdoor air damper actuator	2281, 2283, 2284, 2286

Digital

	Application
• Auxiliary radiation electric coil contact; or, auxiliary radiation two-position valve actuator	2281, 2283, 2284, 2286
• Unit fan	2281, 2283, 2284, 2286, 2287
• First stage electric heat	2281, 2283, 2284, 2286
• Second stage electric heat	2281, 2283, 2284, 2286
• Third stage electric heat	2281, 2283, 2284, 2286
• Two-position cooling valve actuator	2281, 2283, 2284, 2286
• Two-position heating valve actuator	2281, 2283, 2284, 2286
• DX coil	2284, 2286, 2287

Power Wiring

The controller is powered by 24 Vac and connects to the two screw terminals on the controller. Labeled "C" (Common) and "H" (Hot) on the terminal block labeled "24 VAC". No earth-ground connection is required (Figure 2).

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 "S" (Shield) (Figure 3).
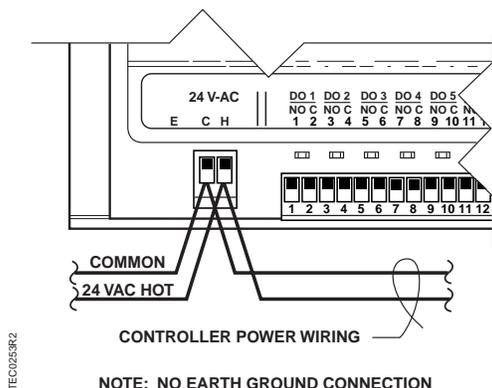
Figure 2. Power Wiring.
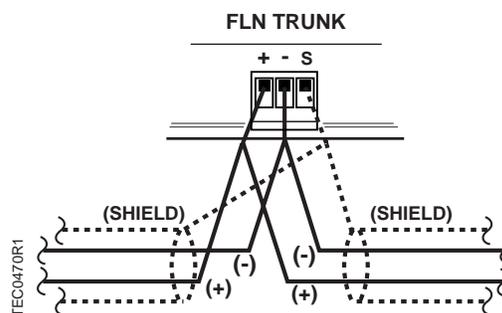
Figure 3. Communication Wiring.

Controller LED Indicators

The controller has eleven Light Emitting Diode (LED) indicators. See Figure 1. Table 2 lists the type, the abbreviation on the controller, and the indication of each LED.

Table 2. Controller LEDS.

LED Type	Label (if present)*	LED Number	Indication
DO	LED 1 to LED 8	1 to 8	Indicates the ON/OFF status of the DO associated with it. A glowing LED indicates that the DO is energized.
Receive	RX	9	Indicates, when flashing, that the controller is receiving information from the field panel.
Transmit	TX	10	Indicates, when flashing, that the controller is transmitting information to the field panel.
Basic Sanity Test	BST	11	Indicates, when flashing ON and OFF once per second, that the controller is functioning property.

*Some LED labels and numerals may be hidden by the controller cover.

Temperature Sensors

Temperature sensors used with the Unit Vent Controller—0 to 10V Output include an electronic room, mixed air or discharge air temperature sensor.

Room Temperature Sensor

The Terminal Equipment Controller room temperature sensor connects to the controller by means of a cable pre-terminated at both ends with a 6-conductor RJ-11 plug-in connector. See Figure 1 for the location of the room temperature sensor/Man-Machine Interface (MMI) port.

Mixed Air/Discharge Air Temperature Sensor

The mixed air/discharge air temperature sensor is a 100K ohm thermistor that connects to the controller at the screw terminals for AI 3.

For more information about Siemens Building Technologies, Inc. temperature sensors, contact your local Siemens Building Technologies, Inc. representative.

Actuators

Damper Actuators

The damper actuator used with the Unit Vent Controller—0 to 10V Output is a 0 to 10V spring return electronic damper motor that positions an outside air damper. A 0 to 10V electronic damper motor can be used to position a face-and-bypass damper.

Valve Actuators

The valve actuators used with the Unit Vent Controller—0 to 10V Output are modulating spring return and non-spring return electronic valve motors that position the valves.

Related Equipment

- Relay Module

- Damper Actuator(s)

- Valve Actuator(s)

- Mixed Air/Discharge Air Temperature Sensor (optional)

- TEC Room Temperature Sensor

Contact your local Siemens Building Technologies, Inc. representative for product numbers and more information.

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Applications

Basic Operation

The Unit Vent Controller—0 to 10V Output provides Direct Digital Control (DDC) technology for unit ventilator applications. The applications available in this controller are as follows:

- Heating and/or Chilled Water Cooling,
  ASHRAE Cycles I and II   Application 2281

- Heating and/or Chilled Water Cooling,
  ASHRAE Cycle III   Application 2283

- Heating and DX Cooling,
  ASHRAE Cycles I and II   Application 2284

- Heating and DX Cooling,
  ASHRAE Cycle III   Application 2286

- Nesbitt Cycle W   Application 2287

- Slave Mode (no control; available for set up,
  and point extension device)   Application 2299

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).

Day/Night Mode

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

Day Heating Operation

The controller maintains the room temperature by resetting the unit ventilator's discharge temperature setpoint (2281/2284), modulating the available coil control device, controlling auxiliary radiation (if provided), positioning the outdoor air or face-bypass damper.

Day Cooling Operation

The controller maintains the room temperature by resetting the unit ventilator's discharge temperature setpoint (2281), running the face-bypass damper at full all the time, modulating or cycling the available coil control device (DX coil – 2284) or positioning the outdoor air damper.

Night Heating Operation

The controller maintains the room temperature turning the fan and heating on and off as required.

Night Cooling Operation

The controller maintains the room temperature by turning the fan and cooling on and off as required.

Night Mode Override Switch

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

Valve Configuration

2-Pipe Heating/Cooling – units with one valve, controlling a coil that may have hot water or chilled water (depending on the season).

4-Pipe Heating or Cooling – units that are heating or cooling only, units with a heating and a cooling coil, units with electric heating, etc.

Heating and Cooling Switchover

NOTE: For 2-pipe heating/cooling (**Application 2281 and 2283**), a field panel must control the switchover between heating and cooling.

The heating/cooling switchover determines whether the controller is in heating or cooling mode by monitoring the room temperature and the demand for heating and cooling (as determined by the temperature control loops).

Control Loops

Room Loop – uses the control setpoint and room temperature to set the discharge setpoint between the minimum and maximum discharge temperature (2281, 2284).

Heating Loop – maintains room temperature setpoint by turning valves and/or electric heat stages on and off.

Cooling Loop – maintains room temperature setpoint by turning valves on and off and using free cooling (mixed air control) when available.

Auxiliary Loop – modulates the auxiliary loop using the auxiliary setpoint and discharge setpoint (2284).

Mixed Air Loop – modulates the mixed air loop using the mixed air setpoint and mixed air temperature (2283).

DX Loop – modulates the cooling loop using the control setpoint and room temperature (2284).

Morning Warm-up/Cool-down

Morning warm-up or cool-down occurs after the controller switches from night mode to day mode, upon power-up, or if the controller is reset. During morning warm-up or cool-down, the controller provides maximum heating or cooling with the outdoor air damper closed until the temperature of the space reaches setpoint.

ON/OFF Coil Valve Control

When a face-bypass configuration is used, the coils may be turned on and off with two-position valves using DOs.

Electric Heat

If electric heat is used, it is controlled as follows:

HTG OUTPUT (Point 60)	Stage 1	Stage 2	Stage 3
0% to 33%	ON	OFF	OFF
34% to 66%	ON	ON	OFF
67% to 100%	ON	ON	ON

In addition, no stage may turn on or off until the time delay has elapsed. Stage one will always be the first stage to turn on and the last stage to turn off.

Fan Operation

Day Mode – The fan is on all the time.

Night Mode – The fan only operates when required for heating or cooling.

Fail-safe Operation

A low temperature detection thermostat (LTDT) can be used to signal the controller when the temperature drops below the low temperature limit.

If the room temperature sensor input to the Unit Vent Controller fails or the LTDT equals ON, the controller goes through the following shutdown sequence:

- Outdoor air damper is closed.

- Heating is full ON (except electric, which is OFF).

- Cooling is full OFF.

- Face-bypass damper is open to face.

- Fan is OFF.

- Auxiliary radiation is OFF.

- Two-position heating valve actuator is open.

- Two -position cooling valve actuator is closed.

NOTE: DO 2 is not commanded by the fail-safe mode; all other DOs can be affected.

If the discharge air temperature sensor fails, the following conditions occur:

- If the last valid value is greater than 150 degrees, the heat is turned off, the outdoor air damper is closed and the fan is turned on.

- If the sensor does not come back within 10 minutes or if the last valid value is less than 150 degrees, the controller shuts down.

If a failed sensor returns or if the LTDT turns off, normal control resumes.

Analog and digital outputs cannot be commanded when the controller is in fail-safe mode; however, failed points may be overridden, allowing the controller to return from fail-safe mode. In this instance, room temperature control is not possible.

Application 2281 – Heating and/or Chilled Water Cooling, ASHRAE Cycles I and II

In Application 2281, the Unit Vent Controller—0 to 10V Output controls a unit ventilator equipped with a chilled water coil for cooling, and/or a heating coil, which may be hot water, steam, or electric, for ASHRAE Cycles I and II. A face-bypass damper can be controlled, replacing both the modulating (0-10V) heating and cooling actuators. If a face-bypass damper is used, the two-position valves on the coils can be controlled. Heating only and cooling only units can also be controlled with this application by overriding HEAT.COOL (Point 5).

Other features available in this application include morning warm-up/cool down, night mode override, free cooling and auxiliary radiation in heating mode.

NOTE: The use of a low temperature detection thermostat (LTDT) is strongly recommended for hot water and steam systems.

This application controls room temperature by resetting the discharge air temperature. It also controls an outdoor air damper according to the schedules as defined by ASHRAE Cycles I and II. The free-cooling/economizer function is turned on and off by the field panel using FREE CLG (Point 23). If free cooling is not available, the outdoor air damper will be kept at minimum position; otherwise, the outdoor air damper will modulate open in sequence with the heating and cooling actuators. The unit ventilator fan is also controlled in this application.
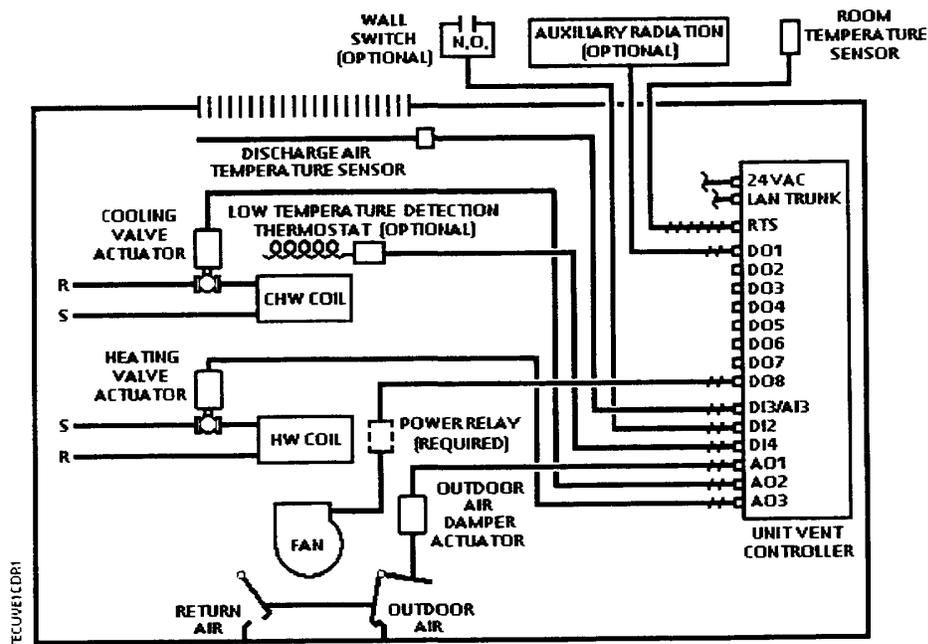

Figure 4. Application 2281 Control Drawing.
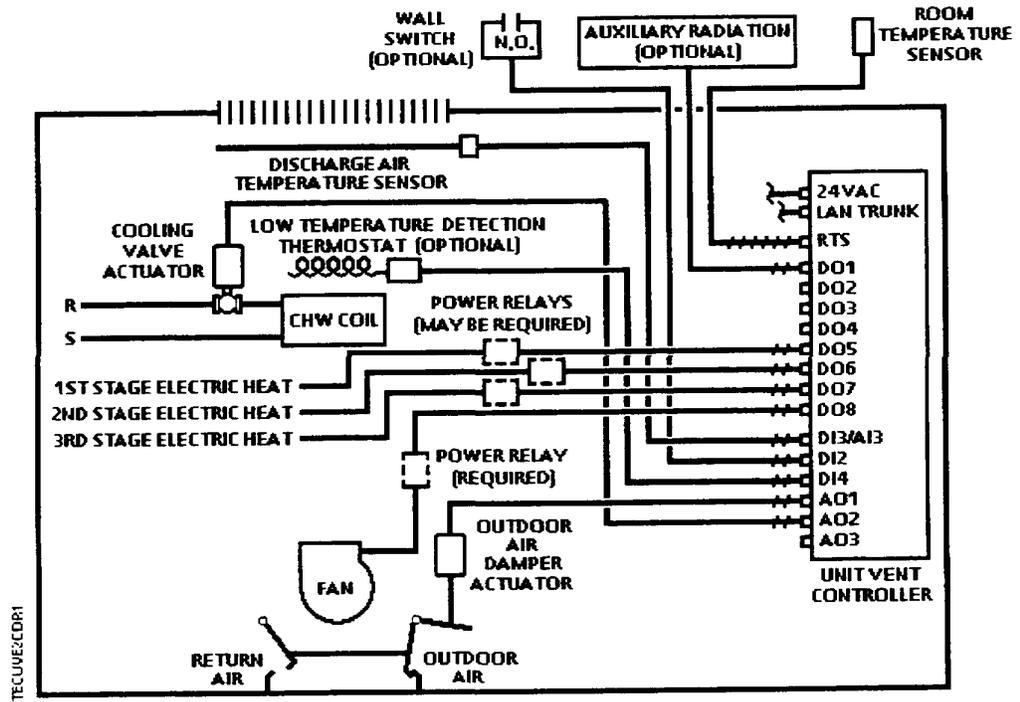
Figure 5. Application 2281 Control Drawing.
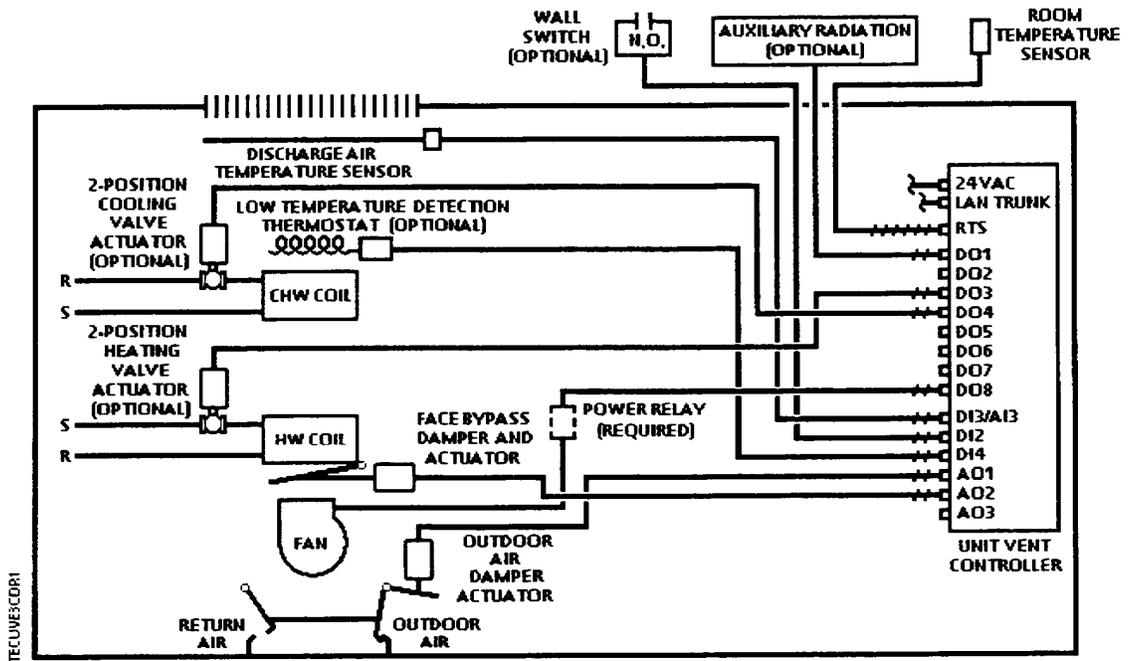
Figure 6. Application 2281 Control Drawing.
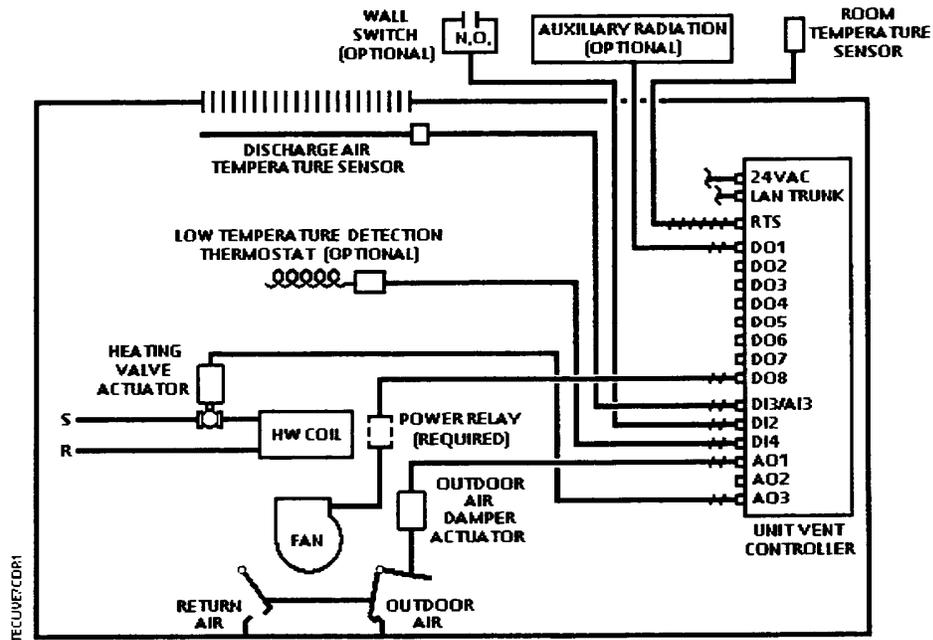
Figure 7. Application 2281 Control Drawing.
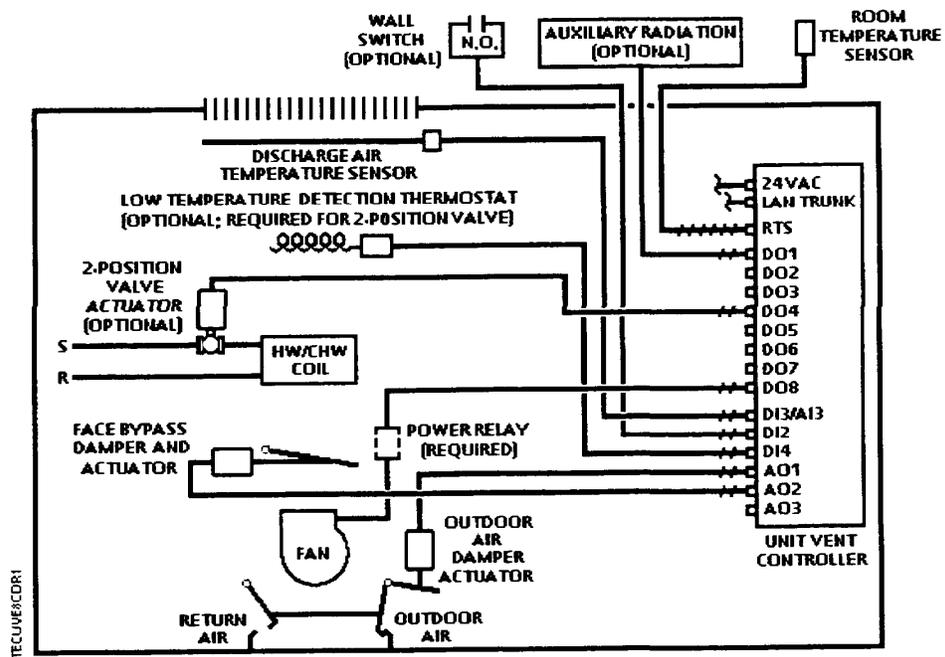
Figure 8. Application 2281 Control Drawing.

NOTE: The auxiliary radiation is an independent loop and is not sequenced with the other control loops.

Application 2283 – Heating and/or Chilled Water Cooling, ASHRAE Cycle III

In Application 2283, the Unit Vent Controller—0 to 10V Output controls a unit ventilator equipped with a chilled water coil for cooling, and/or a heating coil, which may be hot water, steam or electric, for ASHRAE Cycle III. A face-bypass damper can be controlled, replacing both the modulating (0-10V) heating and cooling actuators. If a face-bypass damper is used, two -position valves on the coils may be controlled. Heating only and cooling only units can also be controlled with this application by overriding HEAT.COOL (Point 5).

Other features available in this application include morning warm-up/cool-down, night mode override, free cooling, and auxiliary radiation in heating mode.

NOTE: The use of a low temperature detection thermostat (LTDT) is strongly recommended for hot water and steam systems.

This application controls room temperature by directly modulating the coil control devices. This application also controls an outdoor air damper according to the schedule as defined by ASHRAE Cycle III, to maintain a given mixed air temperature setpoint. The free cooling/economizer function is turned on and off by the field panel using FREE CLG (Point 23). If free cooling is not available, the outdoor air damper will be kept at minimum position; otherwise, the outdoor air damper will modulate to maintain the mixed air temperature setpoint. The unit ventilator fan is also controlled in this application.

Figure 9. Application 2283 Control Drawing.
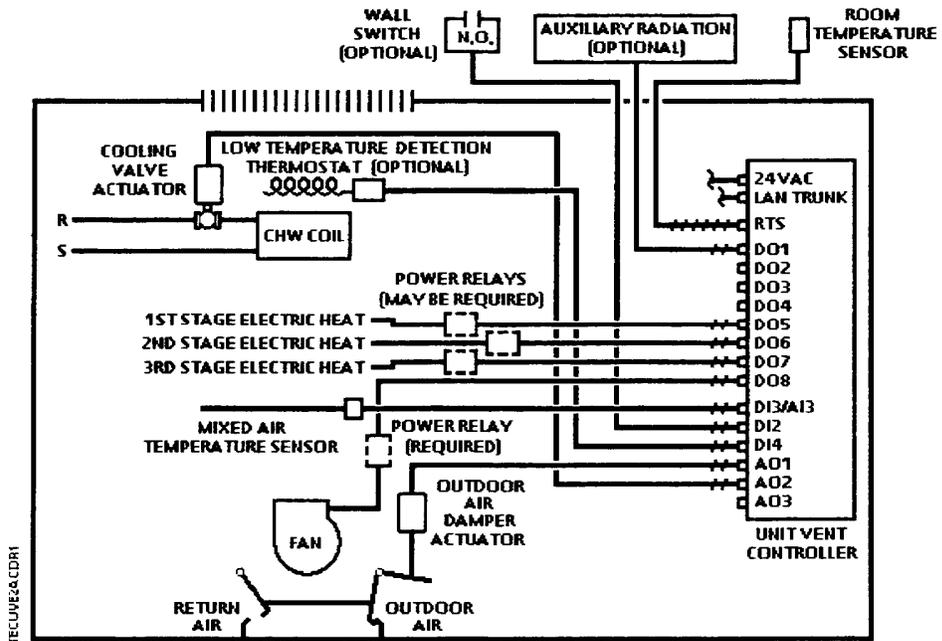
**Figure 10. Application 2283 Control Drawing.**
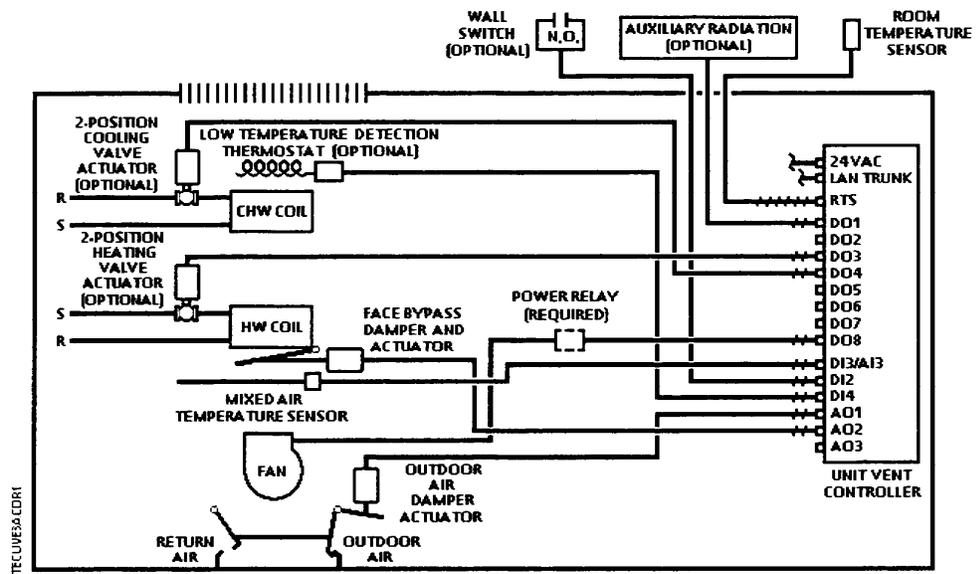
Figure 11. Application 2283 Control Drawing.
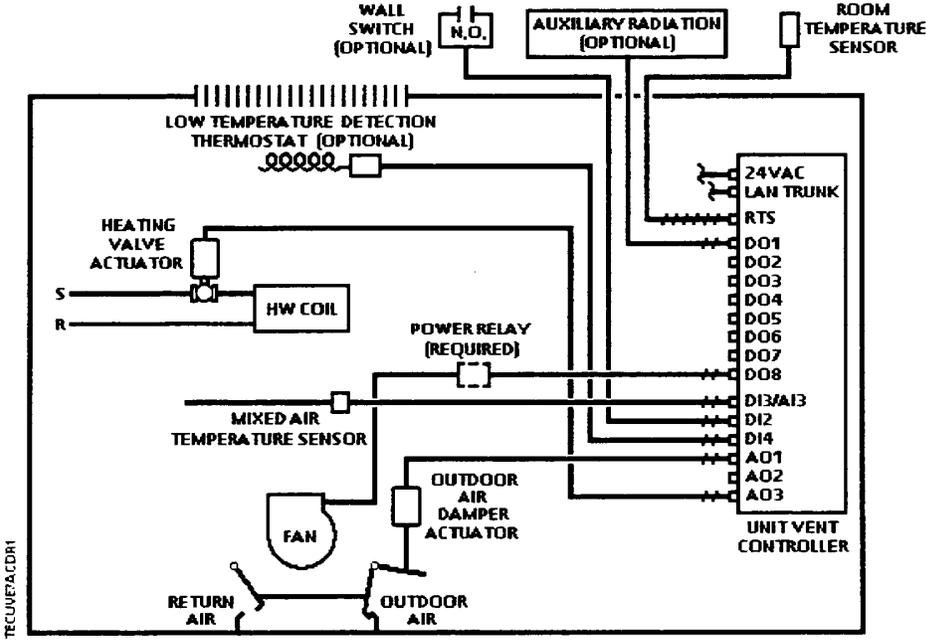
Figure 12. Application 2283 Control Drawing.
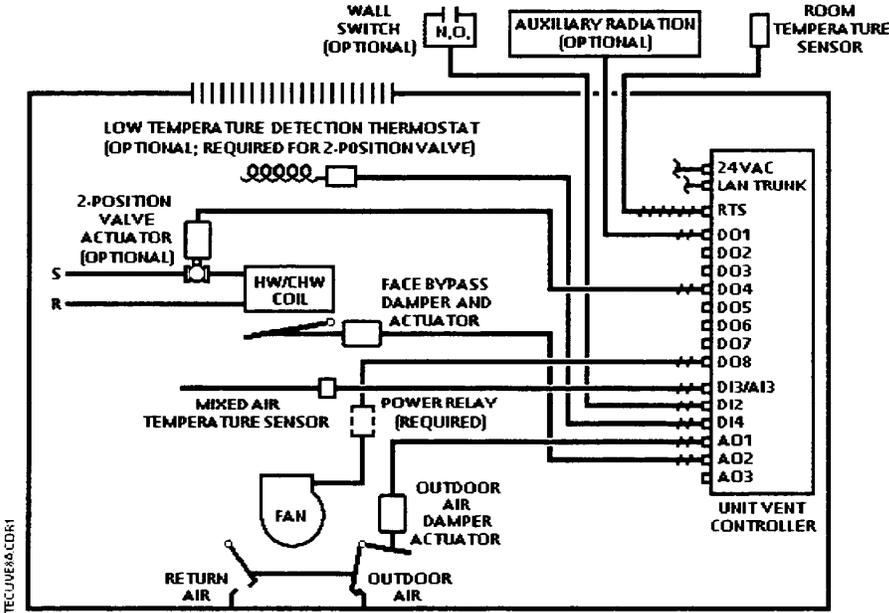
Figure 13. Application 2283 Control Drawing.

Application 2284 – Heating and DX Cooling, ASHRAE Cycles I and II

In Application 2284, the Unit Vent Controller—0 to 10V output controls a unit ventilator equipped with a DX coil for cooling, and/or a heating coil, which may be hot water, steam, or electric, for ASHRAE Cycles I and II. A face-bypass damper can be controlled, replacing the modulating (0-10V) heating actuator, but will modulate only in heating mode. If a face-bypass damper is used, two-position valves on the coils may be controlled. Cooling only units can also be controlled with this application by overriding HEAT.COOL (Point 5) to COOL.

Other features available in this application include morning warm-up/cool-down, night mode override, free cooling and auxiliary radiation in heating mode.

NOTE: The use of a low temperature detection thermostat (LTDT) is strongly recommended for hot water and steam systems.

While in heating, this application controls room temperature by resetting the discharge air temperature. While in cooling, this application controls room temperature by cycling the DX unit. This application also controls an outdoor air damper according to the schedules as defined by ASHRAE Cycles I and II. The free-cooling/economizer function is turned on and off by the field panel using FREE CLG (Point 23). If free cooling is not available, the outdoor air damper will be kept at minimum position; otherwise, the outdoor air damper will modulate open in sequence with the heating actuator or the DX. The unit ventilator fan is also controlled in this application.
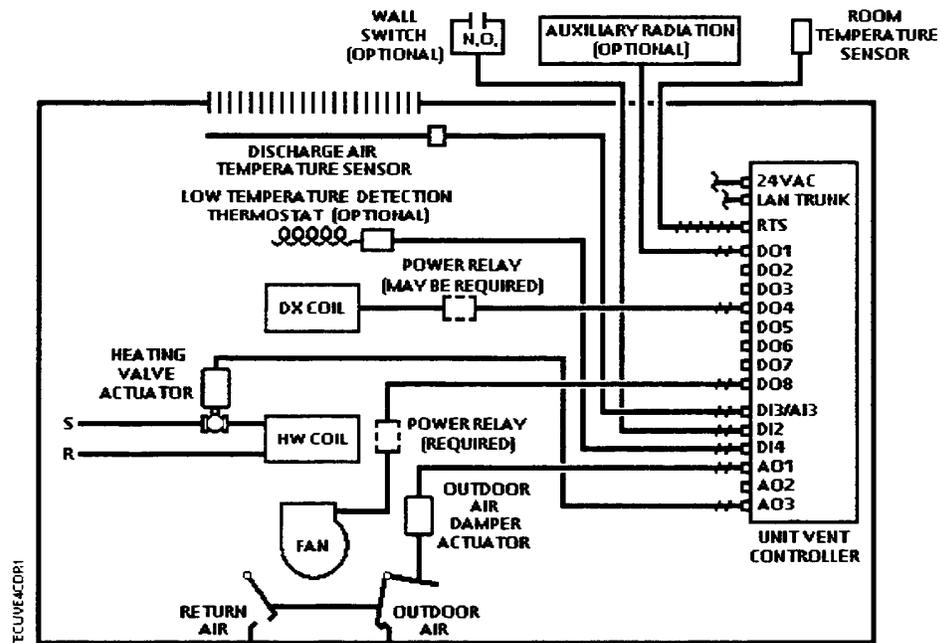
Figure 14. Application 2284 Control Drawing.
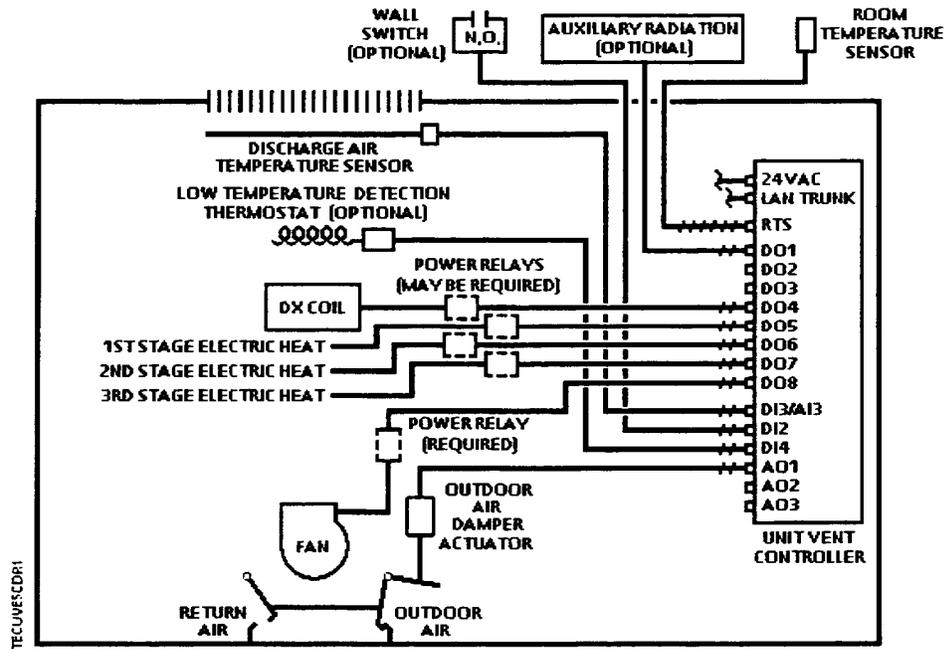
Figure 15. Application 2284 Control Drawing.
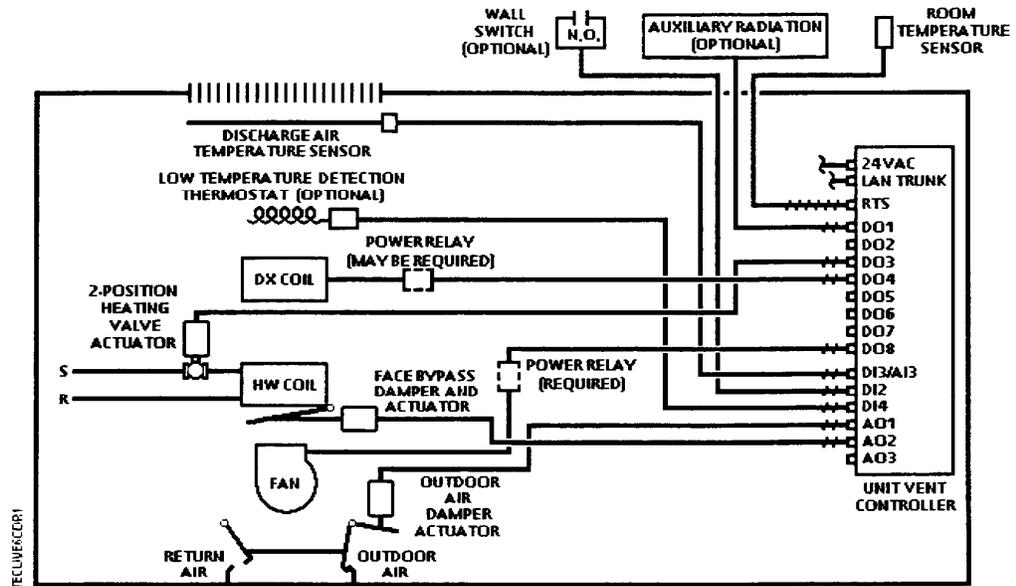

Figure 16. Application 2284 Control Drawing.

NOTE: The auxiliary radiation is an independent loop and is not sequenced with the other control loops.

Application 2286 - Heating and DX Cooling, ASHRAE Cycle III

In Application 2286, the Unit Vent Controller—0 - 10V Output controls a unit ventilator equipped with a DX coil for cooling, and/or a heating coil, which may be hot water, steam, or electric, for ASHRAE Cycle III. A face-bypass damper can be controlled, replacing the modulating (0-10V) heating actuator, but will modulate only in heating mode. If a face-bypass damper is used, two -position valves on the coils may be controlled. Cooling only units can also be controlled with this application by overriding HEAT.COOL (Point 5) to COOL.

Other features available in this application include morning warm-up/cool-down, night mode override, free-cooling, and auxiliary radiation in heating mode.

NOTE: The use of a low temperature detection thermostat (LTDT) is strongly recommended for hot water and steam systems.

This application controls room temperature by directly modulating the coil control devices. This application also controls an outdoor air damper according to the schedule as defined by ASHRAE Cycle III, to maintain a given mixed air temperature setpoint. The free-cooling/economizer function is turned on and off by the field panel using FREE CLG (Point 23). If free cooling is not available, the outdoor air damper will be kept at minimum position; otherwise, the outdoor air damper will modulate to maintain the mixed air temperature setpoint. The unit ventilator fan is also controlled in this application.


Figure 17. Application 2286 Control Drawing.
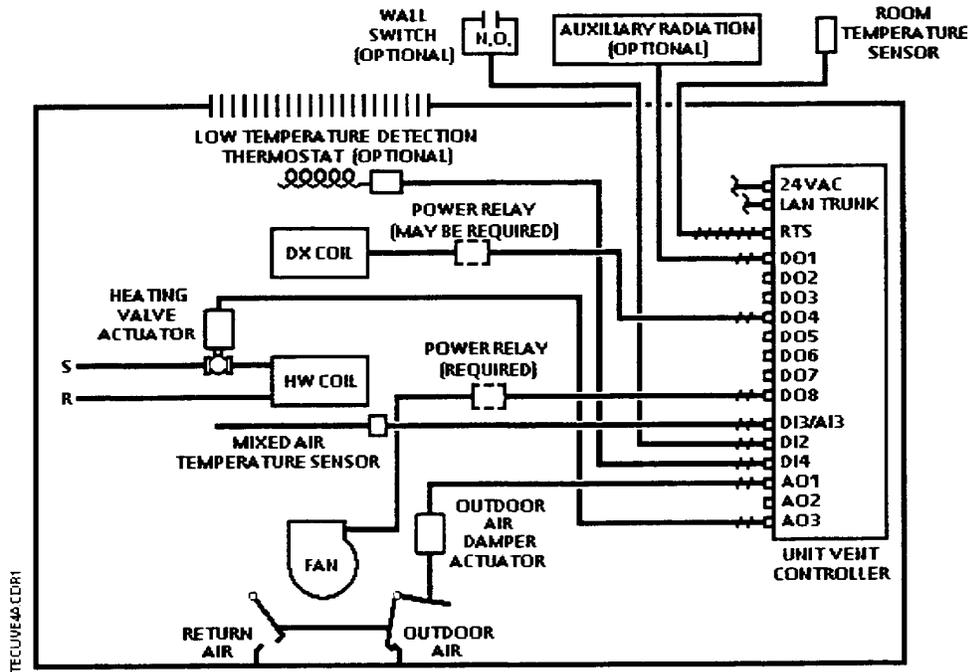
**Figure 18. Application 2286 Control Drawing.**
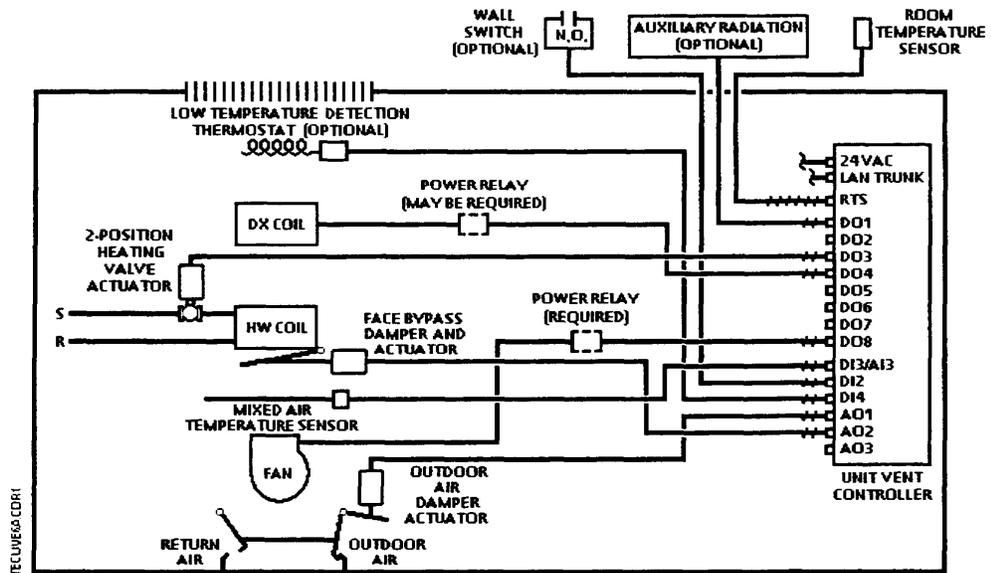
Figure 19. Application 2286 Control Drawing.

Application 2287 – Heating and Cooling, Nesbitt Cycle W

Overview

In Application 2287, the Unit Vent Controller—0-10V Output controls a unit ventilator equipped with a heating coil, which may be hot water or steam, for Nesbitt Cycle W. Auxiliary radiation coils are piped parallel to the heating coil and are not controlled separately by the application. A chilled water coil or a DX cooling coil may be controlled. Heating only units can also be controlled with this application by overriding HEAT.COOL (Point 5) to HEAT.

Other features available in this application include morning warm-up/cool-down, night mode override and free cooling.

NOTE: The use of a low temperature detection thermostat (LTDT) is strongly recommended for hot water and steam systems.

This application controls room temperature by directly modulating the coil control device(s) and the outdoor air damper according to the schedule defined by Nesbitt Cycle W. The free-cooling/economizer function is turned on and off by the field panel using FREE CLG (Point 23). The unit ventilator fan is also controlled in this application.
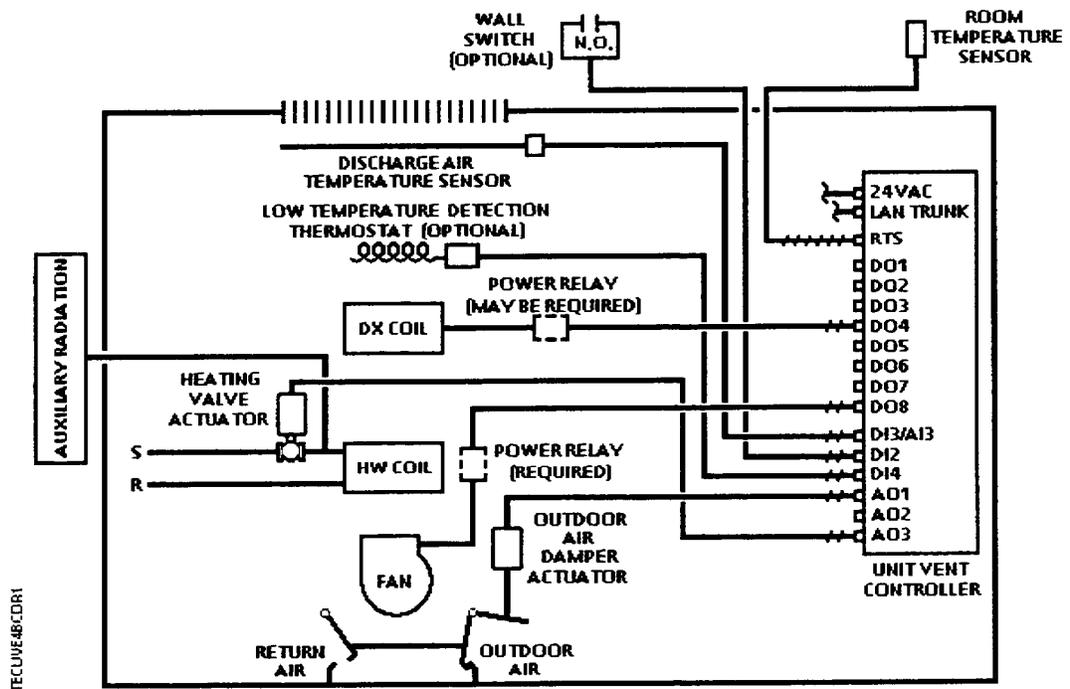

Figure 20. Application 2287 Control Drawing.
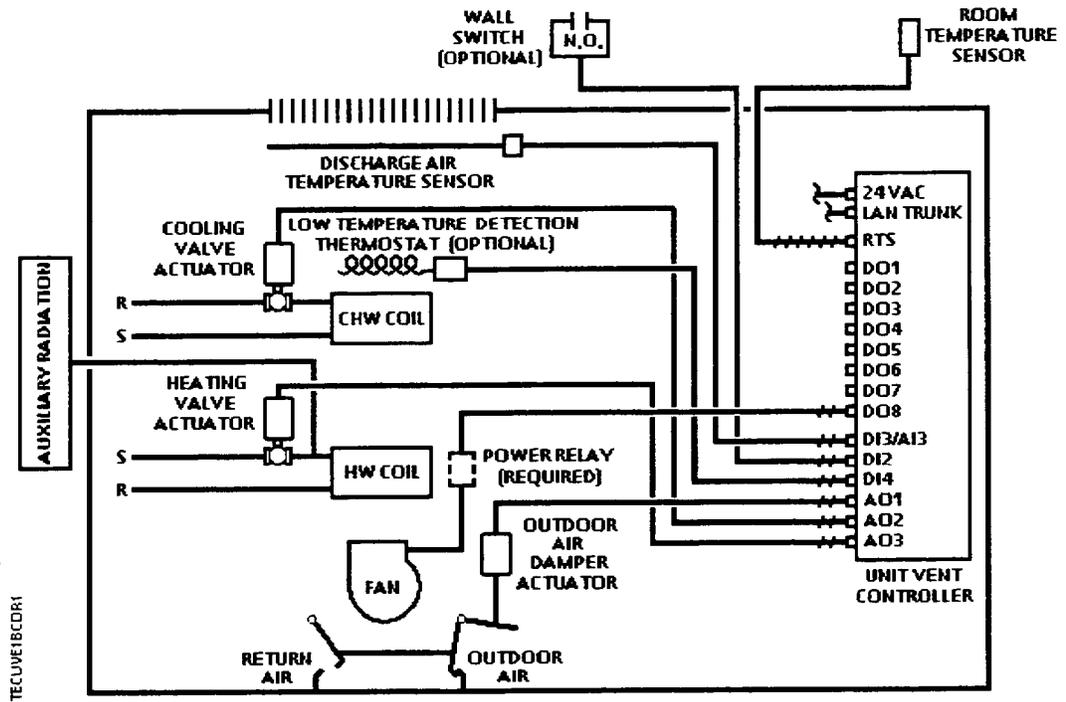
Figure 21. Application 2287 Control Drawing.
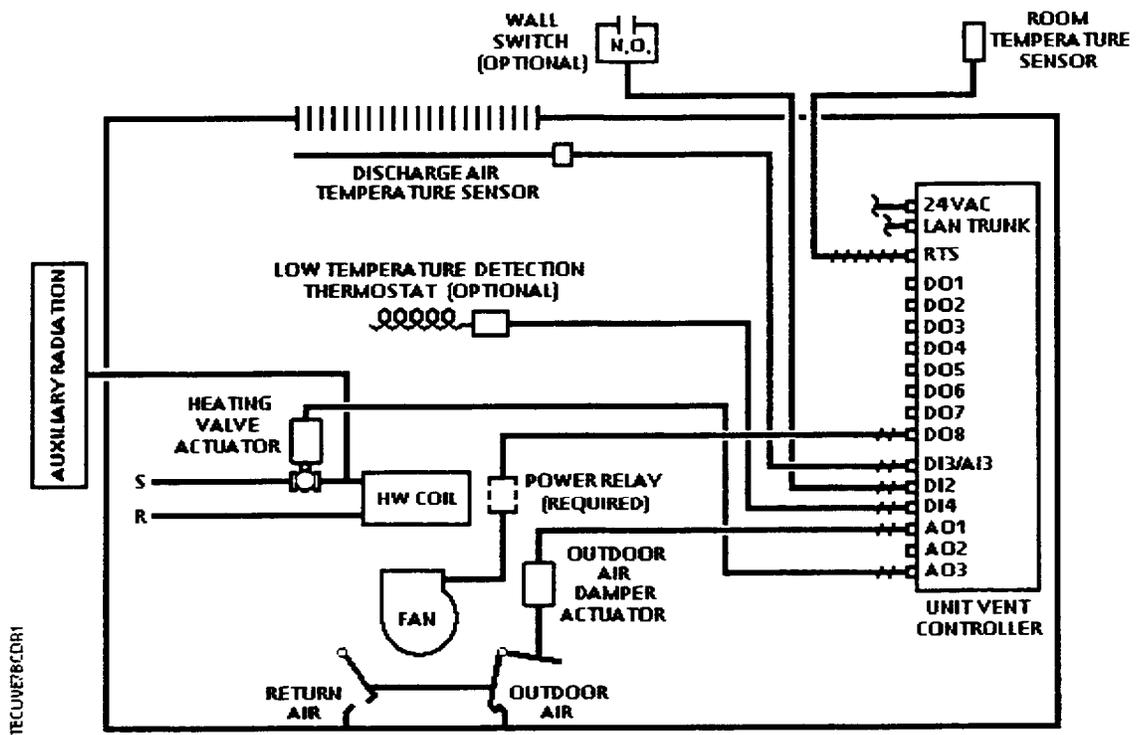
Figure 22. Application 2287 Control Drawing.

Application 2299 – Slave Mode

Overview

Application 2299 is the slave mode application for the Unit Vent Controller—0 - 10V Output (P/N 540-509). Slave mode is the default application that comes up when power is first applied to the controller. Slave mode provides no control. Its purpose is to allow the operator to perform equipment checkout before a control application is put into effect and to set some basic controller parameters (CTLR ADDRESS, APPLICATION, etc.).

NOTE: Slave mode provides no control.

The input labeled "DI3/AI3" on the controller can be used either as a DI point or as an Analog Input (AI) point, but not both at the same time.

3

Point Database

This chapter presents a description of the Unit Vent Controller database including point descriptors, point addresses, and a listing of applications in which each point is found.

Table 3. Point Database.

Descriptor	Address	Application	Description
CTLR ADDRESS	01	2281, 2283, 2284, 2286, 2287, 2299	Identifies the controller on the FLN trunk.
APPLICATION	02	2281, 2283, 2284, 2286, 2287, 2299	The identification number of the program running in the controller. Valid entries: 2281, 2283, 2284, 2286, 2287, 2299
ROOM TEMP	04	2281, 2283, 2284, 2286, 2287, 2299	Actual reading from the room temperature sensor.
HEAT.COOL	05	2281, 2283, 2284, 2286, 2287	Current mode of operation for applications that can be either a heating mode or a cooling mode.
DAY CLG STPT	06	2281, 2283, 2284, 2286, 2287	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. Refer to STPT DIAL (Point 14). Valid entry range: 48° to 95°F (9°- 35°C)
DAY HTG STPT	07	2281, 2283, 2284, 2286, 2287	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. Refer to STPT DIAL (Point 14). Valid entry range: 48° to 95°F (9° to 35° C)
NGT CLG STPT	08	2281, 2283, 2284, 2286, 2287	The temperature setpoint in degrees that the controller maintains during night periods in cooling mode. Valid entry range: 48° to 95°F (9° to 35°C)
NGT HTG STPT	09	2281, 2283, 2284, 2286, 2287	The temperature setpoint in degrees that the controller maintains during night periods in heating mode. Valid entry range: 48° to 95°F (9°to 35°C)
OADPR MINPOS	10	2281, 2283, 2284, 2286, 2287	The minimum position the damper will be commanded to during day mode.

Descriptor	Address	Application	Description
RM STPT MIN	11	2281, 2283, 2284, 2286, 2287	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. Valid entry range: 48° to 95°F (9° to 35°C)
RM STPT MAX	12	2281, 2283, 2284, 2286, 2287	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 rises above this maximum. Valid entry range: 48° to 95°F (9° to 35°C)
RM STPT DIAL	13	2281, 2283, 2284, 2286, 2287, 2299	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 (Point 14). Valid entry range: 48° to 95°F (9° to 35°C)
STPT DIAL	14	2281, 2283, 2284, 2286, 2287	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 (Points 6, 7, 8 or 9) will be used as the temperature setpoint for control in day heating or cooling mode. Valid input: YES or NO
AUX TEMP	15	2299	Actual reading from a 100K ohm thermistor connected to the controller's AI 3 input. When a thermistor is connected at AI 3, DI 3 is not available. Refer to DI 3 (Point 25).
DISCH TEMP	15	2281, 2284, 2287	Actual reading from a 100K ohm thermistor connected to the controller's AI 3 input. When a thermistor is connected at AI 3, DI 3 is not available. Refer to DI 3 (Point 25).
MA TEMP	15	2283, 2286	Actual reading from a 100K ohm thermistor connected to the controller's AI 3 input. When a thermistor is connected at AI 3, DI 3 is not available. Refer to DI 3 (Point 25).
1 VLV HTGCLG	16	2281, 2283	YES indicates that there is one valve controlling one coil which may have hot or chilled water in it. (2-pipe heat/cool). NO indicates any other hardware setup. Valid input: YES or NO
FBP.MODVALVE	17	2281, 2283, 2284, 2286	FBP indicates that both heating and cooling will be modulated with a face-bypass damper. VALVE indicates all other configurations. Valid input: FBP or VALVE
WALL SWITCH	18	2281, 2283, 2284, 2286, 2287, 2299	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	2281, 2283, 2284, 2286, 2287, 2299	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

Descriptor	Address	Application	Description
OVRD TIME	20	2281, 2283, 2284, 2286, 2287	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	2281, 2283, 2284, 2286, 2287	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 (Point 29) indicates night mode.
AUX.NOAUX	22	2281, 2283, 2284, 2286	AUX indicates that auxiliary radiation is available. NOAUX indicates that auxiliary radiation is not available. Valid input: AUX or NOAUX
FREE CLG	23	2281, 2283, 2284, 2286, 2287	Point commanded by the field panel PPCL to enable or disable mixed air damper modulation (free cooling).
DI 2	24	2281, 2283, 2284, 2286, 2287, 2299	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, it is connected to DI 2. Refer to WALL SWITCH (Point 18).
DI 3	25	2281, 2283, 2284, 2286, 2287, 2299	Actual status of a contact connected to the controller at AI 3/DI 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. Refer to AUX TEMP (Point15).
DI 4	26	2299	Actual status of a contact connected to the controller. ON indicates that the contact is closed; OFF indicates that the contact is open.
LOW TEMP DET	26	2281, 2283, 2284, 2286, 2287	Actual status of the low temperature alarm, which is determined, by the current status of the low temperature detection thermostat. ON indicates that a low temperature has been detected. OFF indicates a normal condition.
DX COOLING	27	2287	YES indicates a DX coil is used in cooling mode. NO indicates a chilled water valve is used in cooling mode. Valid input: YES or NO
ELEC.NOELEC	27	2281, 2283, 2284, 2286	Indicates whether electric heating is being used. Valid input: ELEC or NOELEC
FBP.2PSVCTL	28	2281, 2283, 2284, 2286	ENABLE allows two-position valves to close when the face-bypass damper has been closed (to full-bypass) for 2 minutes. DISABL disables the feature. Valid input: ENABLE or DISABL
DAY.NGT	29	2281, 2283, 2284, 2286, 2287, 2299	Indicates the mode in which the controller is operating. Day 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.
WRMUP.COOLDN	30	2281, 2283, 2284, 2286, 2287	This point indicates whether or not the unit is currently in warm-up/cool-down. ON indicates the unit is in warm-up/cool down. OFF indicates the unit is not in warm-up/cool-down.

Descriptor	Address	Application	Description
AOV1SPAN	31	2281, 2283, 2284, 2286, 2287	Indicates the width of the voltage range where the actuator, controlled by AO1, moves.
AOV1START	32	2281, 2283, 2284, 2286, 2287	Indicates the lower end of the voltage range where the actuator, controlled by AO1, moves.
AOV2 SPAN	33	2281, 2283, 2284, 2286, 2287	Indicates the width of the voltage range where the actuator, controlled by AO2, moves.
AOV2 START	34	2281, 2283, 2284, 2286, 2287	Indicates the lower end of the voltage range where the actuator, controlled by AO2, moves.
AOV3 SPAN	35	2281, 2283, 2284, 2286, 2287	Indicates the width of the voltage range where the actuator, controlled by AO3, moves.
AOV3 START	36	2281, 2283, 2284, 2286, 2287	Indicates the lower end of the voltage range where the actuator, controlled by AO3, moves.
AO DIR.REV	37	2281, 2283, 2284, 2286, 2287	Masking point used to determine NO/NC status of actuators attached to analog outputs.
AOV1	38	2281, 2283, 2284, 2286, 2287, 2299	Displays the voltage signal to AO1.
AOV2	39	2281, 2283, 2284, 2286, 2287, 2299	Displays the voltage signal to AO2.
AOV3	40	2281, 2283, 2284, 2286, 2287, 2299	Displays the voltage signal to AO3.
DO 1	41	2287, 2299	Digital output 1 controls a 24 Vac load with an ON or OFF status.
AUX RAD	41	2281, 2283, 2284, 2286	The actual status of auxiliary radiation two-position actuator.
DO 2	42	2281, 2283, 2284, 2286, 2287, 2299	Digital output 2 controls a 24 Vac load with an ON or OFF status.
DO 3	43	2287, 2299	Digital output 3 controls a 24 Vac load with an ON or OFF status.
HTG 2POS VLV	43	2281, 2283, 2284, 2286	The actual status of the two -position heating valve.
DO 4	44	2299	Digital output 4 controls a 24 Vac load with an ON or OFF status.
CLG 2POS VLV	44	2281, 2283	The actual status of the two -position cooling valve.

Descriptor	Address	Application	Description
DX	44	2284, 2286, 2287	The actual status of the DX cooling compressor.
DO 5	45	2287, 2299	Digital output 5 controls a 24 Vac load with an ON or OFF status.
EHEAT 1	45	2281, 2283, 2284, 2286	The actual status of the first stage of electric heat.
DO 6	46	2287, 2299	Digital output 6 controls a 24 Vac load with an ON or OFF status.
EHEA T 2	46	2281, 2283, 2284, 2286	The actual status of the second stage of electric heat.
DO 7	47	2287, 2299	Digital output 7 controls a 24 Vac load with an ON or OFF status.
EHEAT 3	47	2281, 2283, 2284, 2286	The actual status of the third stage of electric heat.
DO 8	50	2299	Digital output 8 controls a 24 Vac load with an ON or OFF status.
FAN	50	2281, 2283, 2284, 2286, 2287	This point is a digital output used to control the fan. ON indicates that the DO is energized; OFF indicates that the DO is de-energized.
NGT HW HTG	53	2281, 2283, 2284, 2286, 2287	YES indicates that the heating valve will be kept open in night mode in both heating and cooling modes (recommended for systems with hot water). NO indicates heating valve will be controlled normally. Valid input: YES or NO
NGT CLG MODE	54	2281, 2283, 2284, 2286, 2287	YES indicates that night cooling is available. NO indicates that night cooling is not available. Valid input: YES or NO
AUX OUTPUT	55	2281, 2283, 2284, 2286	Indicates the percentage of time the auxiliary radiation will be ON. Valid values: 0 to 100%
AUX HTG TIME	57	2281, 2283, 2284, 2286	The period of the auxiliary radiation pulse-width modulation algorithm. Valid values: 0 to 255 minutes
EHT STG DELY	58	2281, 2283, 2284, 2286	Delay between a stage of electric heat changing state and the next change of state of any stage. Valid input: 0 to 255 seconds
DO DIR.REV	59	2281, 2283, 2284, 2286, 2287, 2299,	The configuration setup code for DOs. Allows the DOs to be direct or reverse acting (enabled equals energized or enabled equals de-energized).
HTG OUTPUT	60	2281, 2283, 2284, 2286, 2287	If the heating control device is a valve or face-bypass damper, then the value of this point indicates the position of the heating actuator. If electric heat is used, then the value of this point determines how many stages are ON. Valid values: 0 to 100%

Descriptor	Address	Application	Description
CLG OUTPUT	61	2281, 2283, 2284, 2286, 2287	If the cooling control device is not DX, then the value of this point indicates the position of the cooling actuator. If DX cooling is used, then the value of this point determines whether DX is ON or OFF. Valid values: 0 to 100%
OA DMPR POS	62	2281, 2283, 2284, 2286, 2287	Indicates the position of the outdoor air damper actuator.
CLG P GAIN	63	2281, 2283, 2284, 2286, 2287	The proportional gain value for the cooling temperature control loop.
CLG I GAIN	64	2281, 2283, 2284, 2286, 2287	The integral gain value for the cooling temperature control loop.
CLG D GAIN	65	2281, 2283, 2284, 2286, 2287	The derivative gain value for the cooling temperature control loop.
CLG BIAS	66	2281, 2283, 2284, 2286, 2287	The biasing of the cooling temperature control loop. Refer to CLG LOOPOUT (Point79).
HTG P GAIN	67	2281, 2283, 2284, 2286, 2287	The proportional gain value for the heating temperature control loop.
HTG I GAIN	68	2281, 2283, 2284, 2286, 2287	The integral gain value for the heating temperature control loop.
HTG D GAIN	69	2281, 2283, 2284, 2286, 2287	The derivative gain value for the heating temperature control loop.
HTG BIAS	70	2281, 2283, 2284, 2286, 2287	The biasing of the heating temperature control loop. Refer to HTG LOOPOUT (Point 80).
ROOM P GAIN	71	2281, 2284	The proportional gain value for the room control loop.
ROOM I GAIN	72	2281, 2284	The integral gain value for the room control loop.
ROOM D GAIN	73	2281, 2284	The derivative gain value for the room control loop.
ROOM BIAS	74	2281, 2284	The biasing of the room loop output point, DISCH STPT (Point 93).
CMP MIN OFF	75	2284, 2286, 2287	The minimum time, in minutes, which the unit ventilator's compressor will remain OFF before turning ON again. Valid input: 0 to 255 minutes
CMP MIN ON	76	2284, 2286, 2287	The minimum time, in minutes, which the unit ventilator's compressor will remain ON before turning OFF again. Valid input: 0 - 255 minutes
AUX LOOPOUT	77	2281, 2284	The control loop output value that is used to determine AUX OUTPUT (Point 55).

Descriptor	Address	Application	Description
MA LOOPOUT	77	2283, 2286	The mixed air control loop output value that is used to determine OA DMPR POS (Point 62).
OA LOOPOUT	77	2287	The outdoor air damper control loop output valve that is used to determine OA DMPR POS (Point 62).
CTL TEMP	78	2281, 2283, 2284, 2286, 2287	The temperature used as input for the temperature control loops. This value will be the same as the value in ROOM TEMP (Point 4) unless it is overridden.
CLG LOOPOUT	79	2281, 2283, 2284, 2286, 2287	The cooling temperature control loop output value in percent.
HTG LOOPOUT	80	2281, 2283, 2284, 2286, 2287	The heating temperature control loop output value in percent.
AUX P GAIN	81	2281, 2284	The proportional gain value for the auxiliary control loop.
MA P GAIN	81	2283, 2286	The proportional gain value for the mixed air control loop.
OA P GAIN	81	2287	The proportional gain value for the outdoor air damper control loop.
AUX I GAIN	82	2281, 2284	The integral gain value for the auxiliary control loop.
MA I GAIN	82	2283, 2286	The integral gain value for the mixed air control loop.
OA I GAIN	82	2287	The integral gain value for the outdoor air damper control loop.
AUX D GAIN	83	2281, 2284	The derivative gain value for the auxiliary control loop.
MA D GAIN	83	2283, 2286	The derivative gain value for the mixed air control loop.
OA D GAIN	83	2287	The derivative gain value for the outdoor air damper control loop.
AUX BIAS	84	2281, 2284	The biasing of the auxiliary loopout point, AUX LOOPOUT (Point 77).
MA BIAS	84	2283, 2286	The biasing of the mixed air loopout point, MA LOOPOUT (Point 77).
OA BIAS	84	2287	The biasing of the outdoor air damper loopout point, OA LOOPOUT (Point 77).
SWITCH LIMIT	85	2281, 2283, 2284, 2286, 2287	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 (Point 90) being exceeded and is subject to SWITCH TIME (Point 86) being expired. Valid input: 0 to 100%
SWITCH TIME	86	2281, 2283, 2284, 2286, 2287	The time, in minutes, that must expire to switch between cooling mode and heating mode. Actual switchover depends on the active temperature control loop being below the value of SWITCH LIMIT (Point 85) and exceeding the value of SWITCH DBAND (Point 90). Valid input: 0 to 255 minutes

Descriptor	Address	Application	Description
NGT DBAND	88	2281, 2283, 2284, 2286, 2287	During night mode, this point indicates the number of degrees above or below (depending on heating/cooling mode) the night setpoint that the room temperature can raise or drop before the fan will be turn ON. Valid input: 0 to 255°F
MORN DBAND	89	2281, 2283, 2284, 2286, 2287	The number of degrees of variance from the heating or cooling setpoint at which the controller will terminate morning warm-up or cool-down and begin normal operation. Valid input: 0 to 255'F
SWITCH DBAND	90	2281, 2283, 2284, 2286, 2287	The temperature range in degrees that is compared to the difference between CTL TEMP (Point 78) and CTL STPT (Point 92). The difference exceeding this value is one of the conditions necessary to change modes between heating and cooling. Valid input: 0 to 255°F
AUX DSH STPT	91	2281, 2284	The setpoint of the auxiliary radiation control loop.
CTL STPT	92	2281, 2283, 2284, 2286, 2287	The actual setpoint value being used as input for the active temperature control loop.
DISCH STPT	93	2281, 2284, 2287	The setpoint of the discharge air control loop.
MA STPT	93	2283, 2286	The setpoint of the mixed air control loop.
DSH MIN TEMP	94	2281, 2284	The minimum value to which DISCH STPT (Point 93) can be set by the room control loop.
DSH MAX TEMP	95	2281, 2284	The maximum value to which DISCH STPT (Point 93) can be set by the room control loop.
LOOP TIME	98	2281, 2283, 2284, 2286, 2287	The time, in seconds, between control loop calculations.
ERROR STATUS	99	2281, 2283, 2284, 2286, 2287, 2299	The status code indicating any errors detected during controller power up. A status of 0 indicates there are no problems.

4

Troubleshooting

Overview

This chapter describes corrective measures you can take should you encounter a problem when using a Unit Vent Controller.

You are not required to do any controller troubleshooting. You may want to contact your local Siemens Building Technologies representative if a problem occurs or you have any questions about the controller.

NOTE: When troubleshooting, record what the problem is 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 Building Technologies representative.

Basic Service Information

Always remove power to the controller 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 controller. There are no serviceable parts inside. If a problem is found with a controller, contact your local Siemens Building Technologies representative for replacement. An anti-static wrist strap is recommended when installing or replacing controllers.

Ordering Replacement Parts

If a controller is not operating correctly, order a new controller. The product number for ordering a replacement controller is the controller product number preceded by an "R". The replacement product numbers for accessories are the same as new product numbers:

Unit Vent Controller – 0 to 10V Output	540-509
CE Compliant Unit Vent Controller – 0 to 10V Output	550-509

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 controller's 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.

Controller LEDs

To determine if the controller is powered up and working, verify that the Basic Sanity Test (BST) Light Emitting Diode (LED) is flashing ON/OFF once per second. The controller contains eleven LEDs located on the circuit board. See the *Controller LED indicators* section of *Chapter 1, Product Overview* for more information about LEDs.

NOTE: The TX and RX LEDs indicate communication over the FLN.

Glossary

Overview

The glossary contains terms and acronyms that are used in this manual. For definitions of point database descriptors, see *Chapter 3, Point Database*. For definitions of commonly used terms as well as acronyms and abbreviations associated with the APOGEE Automation System, see the *Siemens Building Technologies Technical Glossary of Building Controls Terminology and Acronyms*, (125-2185). This book is available from your local Siemens Building Technologies representative.

AI

Analog Input. Physical point which accepts a continuous variable signal.

algorithm

Mathematical formula used to calculate an output value using varying inputs.

AO

Analog Output. Physical point that generates a continuous variable signal.

centralized control

Type of control offered by a controller that is connected, by means of a Floor Level Network (FLN), with an APOGEE field panel.

control loop

Proportional Integral Derivative (PID) algorithm that is used to control an output based on a setpoint and an input reading from a sensor.

DDC

Direct Digital Control.

DI

Digital Input. Physical output point that accepts a two-state signal (that is, ON/OFF, OPEN/CLOSED, YES/NO, etc.).

DO

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

English units

Foot-pound-second system of units for weights and measurements.

equipment controller

FLN device which provides additional point capacity to a field panel or provides individual room or mechanical equipment control. The Unit Vent Controller — 0 to 10V Output is an equipment controller.

field panel

Device containing a microprocessor for centralized control of system components and equipment controllers. A field panel samples and processes field data, initiates control actions, communicates with its operators, and generates reports, displays and warnings.

FLN

Field Level Network

intercept

Factor which converts analog values (used by the controller) to a form which the user can understand (engineering units). Slope and intercept constants are determined by the type of field input/output represented by the physical or virtual point.

FLN

Revised acronym for Floor Level Network. The term "Floor" is no longer used and has been replaced with "Field".

loopout

Output of the control loop expressed as a percentage.

OFF text

Text indicating the de-energized state of a digital point (for example, OFF, CLOSED, NO).

ON text

Text indicating the energized state of a digital point (for example, ON, OPEN, YES).

override switch

Button on Room Temperature Sensor that can be pressed by an occupant to change the status of a room from night mode to day mode for a predetermined time.

PID

Proportional, Integral, and Derivative.

RTS

Room Temperature Sensor.

SI units

Systeme International d'Unites. The international metric system.

slave mode

Default application that comes up when power is first applied to a Terminal Equipment Controller.

slope

Factor that converts analog values (used by the controller) to a form the user can understand (engineering units). Slope and intercept constants are determined by the type of field input/output represented by the physical or virtual point.

stand-alone control

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

Terminal Equipment Controller

Siemens Building Technologies product family of equipment controllers (one is the Unit Vent Controller — 0 to 10V Output) that house the applications software used to control terminal units, such as heat pumps, VAV terminal boxes, fan coil units, unit ventilators, etc.

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 at or controlled from the field panel.

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