

BACnet Fan Coil/Unit Conditioner Controller — Electronic Output Owner's Manual

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WARNING

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case users at their own expense will be required to take whatever measures may be required to correct the interference.

SERVICE STATEMENT

Control devices are combined to make a system. Each control device is mechanical in nature and all mechanical components must be regularly serviced to optimize their operation. All Siemens Building Technologies branch offices and authorized distributors offer Technical Support Programs that will ensure your continuous, trouble-free system performance.

For further information, contact your nearest Siemens Building Technologies, Inc. representative.

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TO THE READER

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Country of Origin: US

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How To Use This Manual

This section covers manual organization, conventions, and symbols used in the manual, and other information that will help you understand and use a Unit Conditioner Controller — Electronic Output.

Manual Organization

This manual contains the following sections:

- *Chapter 1 Product Overview* describes the hardware components and the accessories that are 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 address and applications.
- The *Glossary* describes terms and acronyms.
- The *Index* helps you find 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 <i>control program</i> .

Manual Symbols

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

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

Getting Help

If at any time you find that you need help with a BACnet Fan Coil/Unit Conditioner controller issue not covered in this manual, contact your local Siemens Building Technologies, Inc. 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.

1

Product Overview

Introduction

The Fan Coil/Unit Conditioner Controller — Electronic Output is the Siemens Building Technologies, Inc. FLN controller used in pressure dependent box, fan coil unit, and induction unit applications (Figure 1-1). It provides Direct Digital Control (DDC) for seven applications. 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.

Table 1 -1. Unit Conditioner Controller—Electronic Output Applications.

Application Number	Application Description
2540	Variable Air Volume Pressure Dependent Cooling or Heating
2541	Variable Air Volume Pressure Dependent with Hot Water Reheat
2550	Two-Pipe Fan Coil Unit Cooling or Heating
2551	Fan Coil Unit Cooling and Heating
2552	Fan Coil Unit Cooling and Electric Heat
2553	Fan Coil Unit 2-Stage Cooling and Hot Water Heat
2554	Fan Coil Unit Cooling and Electric Heat
2591	Slave Mode

NOTE: Application 2554 can also control a Variable Air Volume pressure dependent terminal box with electric heat. See the application description for Application 2554.

Ordering Notes

Unit Conditioner Controller – Electronic Output

550-789A

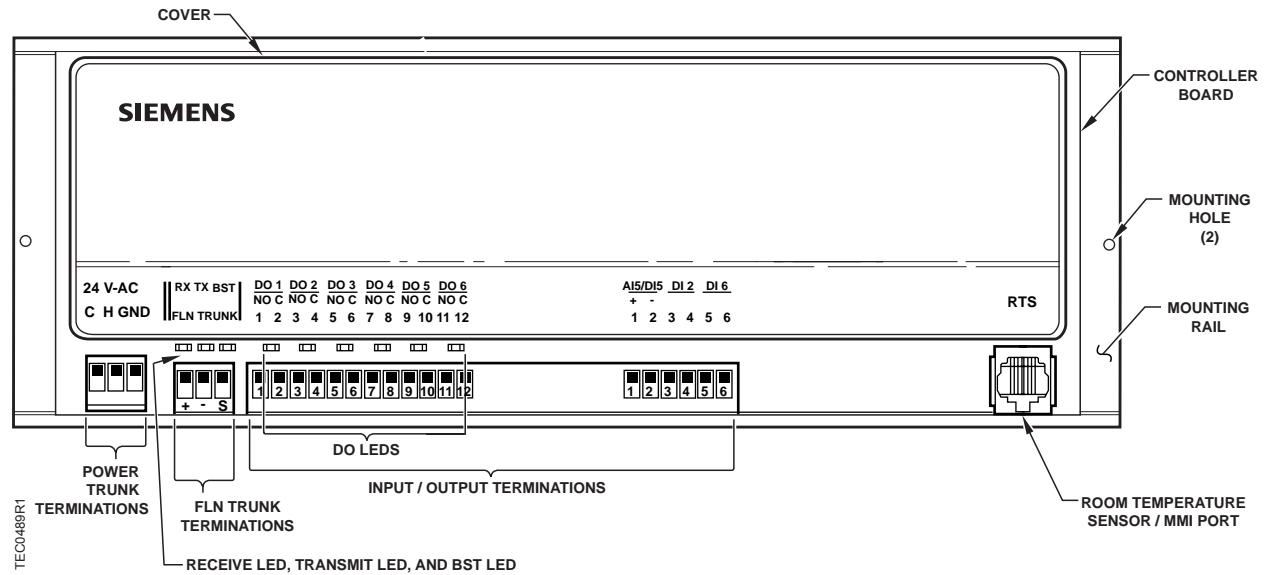


Figure 1-1. Unit Conditioner Controller — Electronic Output.

Hardware Inputs

Analog

- Room temperature sensor (RTS) (10K Ω thermistor)
- Room temperature setpoint dial (optional)
- Duct temperature sensor (optional) (100K Ω thermistor) Application 2540
- Pipe temperature sensor (optional) (100K Ω thermistor) Application 2550

Digital

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

Hardware Outputs

Analog

- None

Digital

	Application
• Damper actuator	2540, 2541
• Valve actuator; or, damper actuator	2554
• First valve actuator (required)	2541, 2550, 2150
• Second valve actuator (optional)	2541, 2550
• Second Cooling valve actuator	2551
• Heating valve actuator	2551, 2553
• Fan (switched 24 Vac, pilot duty)	2550, 2150, 2551, 2552, 2553, 2554
• Stage 1 cooling (2-position valve actuator, or cooling compressor)	2552, 2553
• Stage 2 cooling (2-position valve actuator, or cooling compressor)	2552, 2553
• Stage 1 electric heat	2552, 2554
• Stage 2 electric heat	2552, 2554
• Stage 3 electric heat	2552, 2554

Power Wiring

The controller is powered by 24 Vac. Power wiring 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 1-2).

Communication Wiring

The controller connects to the field panel by means of a Field Level (FLN) trunk. Communication wiring connects to the three screw terminals on the controller labeled "+" (positive), "-" (negative), and "S" (Shield) (Figure 1-3).

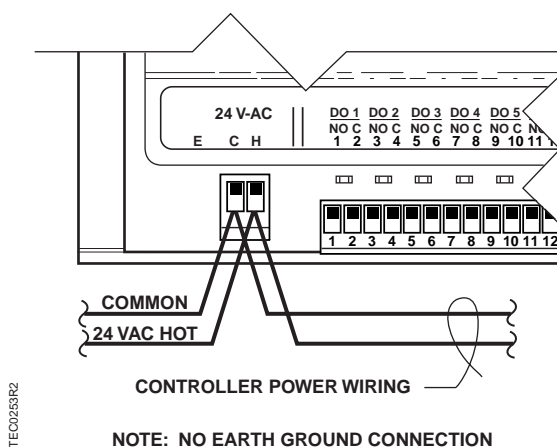


Figure 1-2. Power Wiring.

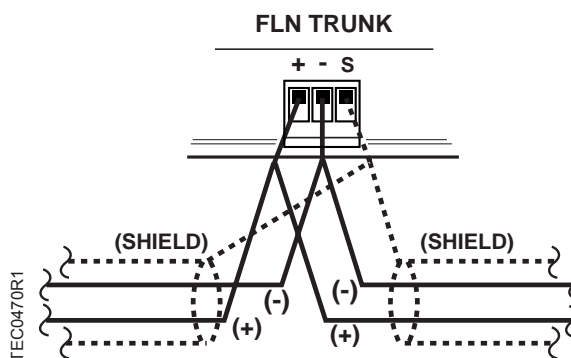


Figure 1-3. Communication Wiring.

Controller LED Indicators

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

Table 1-1. Controller LEDs.

LED Type	Label (if present)*	LED Number	Indication
DO	LED 1 - LED 6	1-6	Indicates the ON/OFF status of the DO associated with it. A glowing LED indicates that the DO is energized.
Transmit	TX	7	Indicates, when flashing, that the controller is transmitting information to the field panel.
Receive	RX	8	Indicates, when flashing, that the controller is receiving information from the field panel.
BST "Basic Sanity Test"	BST	9	Indicates, when flashing ON and OFF once per second, that the controller is functioning properly.

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

Temperature Sensors

Temperature sensors used with the BACnet Unit Conditioner Controller — Electronic Output include an electronic room temperature sensor and an optional duct temperature sensor.

Room Temperature Sensor

The controller room temperature sensor connects to the controller by means of a cable terminated at both ends with a 6-conductor RJ-11 plug-in connector. See Figure 1-1 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 input to the controller.

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

Actuators

Actuators used with the BACnet Unit Conditioner Controller — Electronic Output include electronic damper motors, electronic valve motors, and electronic valve assemblies. These actuators are powered through the controller to position reheat valves or supply air dampers.

Related Equipment

- Pipe Temperature Sensor (optional)
- Damper actuator(s)
- Valve actuator(s)
- Duct Temperature Sensor (100K Ω) (optional)
- Room Temperature Sensor

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

2

Applications

Basic Operation

The Unit Conditioner Controller — Electronic Output provides Direct Digital Control (DDC) technology for pressure dependent Variable Air Volume (VAV), fan coil, and induction unit applications. The pressure dependent VAV applications control space temperature by directly driving the damper. There is no airflow measurement and no explicit flow control. The fan coil and induction applications control temperature with hot water or up to three stages of electric reheat, chilled water, or up to two stages of direct expansion cooling.

Control Temperature Setpoints

The controller maintains a specified temperature based on Day/Night 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.

Night Mode Override Switch

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

Control Loops

Temperature Loop – Heating Loop – Cooling Loop – maintains temperature setpoint by modulating the heating source, cooling source, or damper.

Calibration

Calibration may be set to take place automatically or manually.

Valve – Calibration of a hot water valve (if used) is done by briefly commanding the valve closed. .

Fail-safe Operation

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

Heating and Cooling Switchover

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).

Hot Water Reheat When the controller is in cooling mode, the heating valve(s) are closed.

The heating loop modulates the heating valve(s) to warm up the room. In cooling mode, the heating valve is closed.

If more than one valve is present, the two valves can be sequenced in series or parallel.

Electric Reheat



CAUTION:

Verify that the equipment is supplied with safeties by others to ensure that there is airflow across the heating coils when they are to be energized.

The heating loop controls up to three stages of electric reheat to warm up the room. The electric reheat is time modulated using a duty cycle. When the controller is in cooling mode, the electric heat is OFF at all times.

Staged Cooling

When the controller is in cooling mode, up to two stages of cooling can be cycled to maintain temperature. In heating mode, the cooling stages are off.

Fan Operation

In day mode, the fan can be set to be ON all the time or cycle on when heating or cooling is needed.

In night mode, the fan cycles ON when heating or cooling is needed.

Notes

1. If the temperature swings in the room are excessive, or if there is trouble in maintaining the setpoint, contact your local Siemens Building Technologies, Inc. representative for more information.
2. The Unit Conditioner Controller — Electronic Output, as shipped from the factory, keeps all associated equipment OFF. The controller and its equipment are released to application control at start-up.

Application 2540 Variable Air Volume Pressure Dependent Cooling or Heating.

Overview

In Application 2540, the controller modulates the supply air damper of the terminal box for cooling and heating. In order for it to work properly, the central air-handling unit must provide cool supply air in the cooling mode and warm supply air in the heating mode. See Figure 2-1.

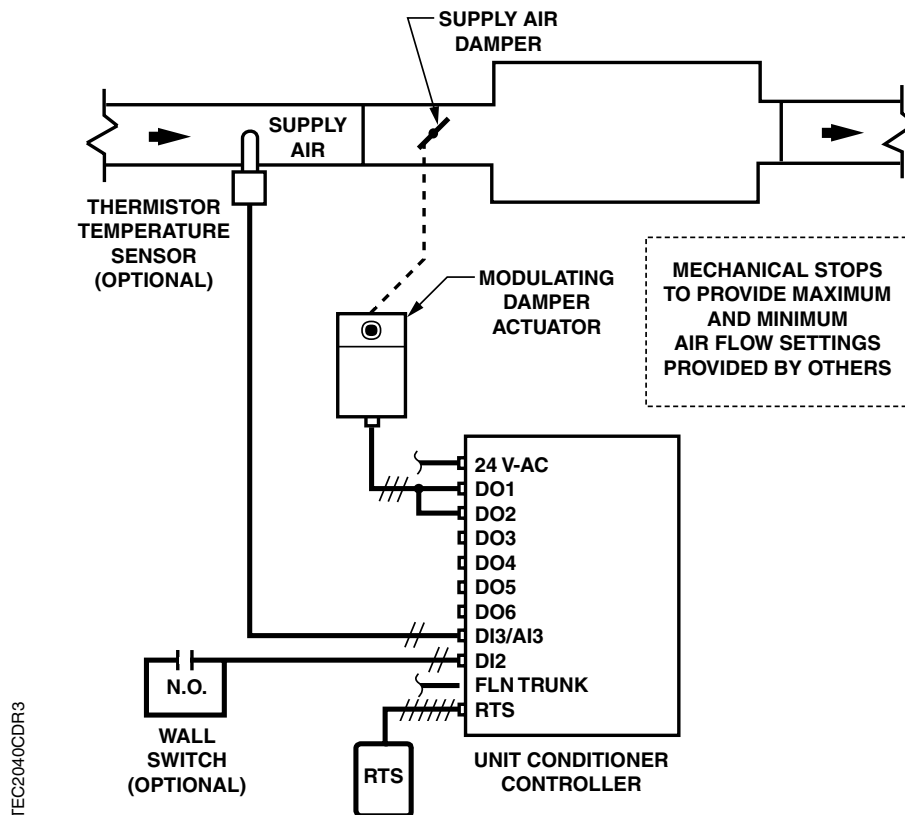


Figure 2-1. Application 2540 Control Drawing.

Application 2541 Variable Air Volume Pressure Dependent with Hot Water Reheat

Overview

In Application 2541, the controller modulates the supply air damper of the terminal box for cooling and modulates a reheat valve(s) for heating. When heating, a minimum airflow (limited by a mechanical stop on the terminal box) is provided to the room. In order for the terminal box to work properly, the central air-handling unit must provide cool supply air. See Figure 2-2.

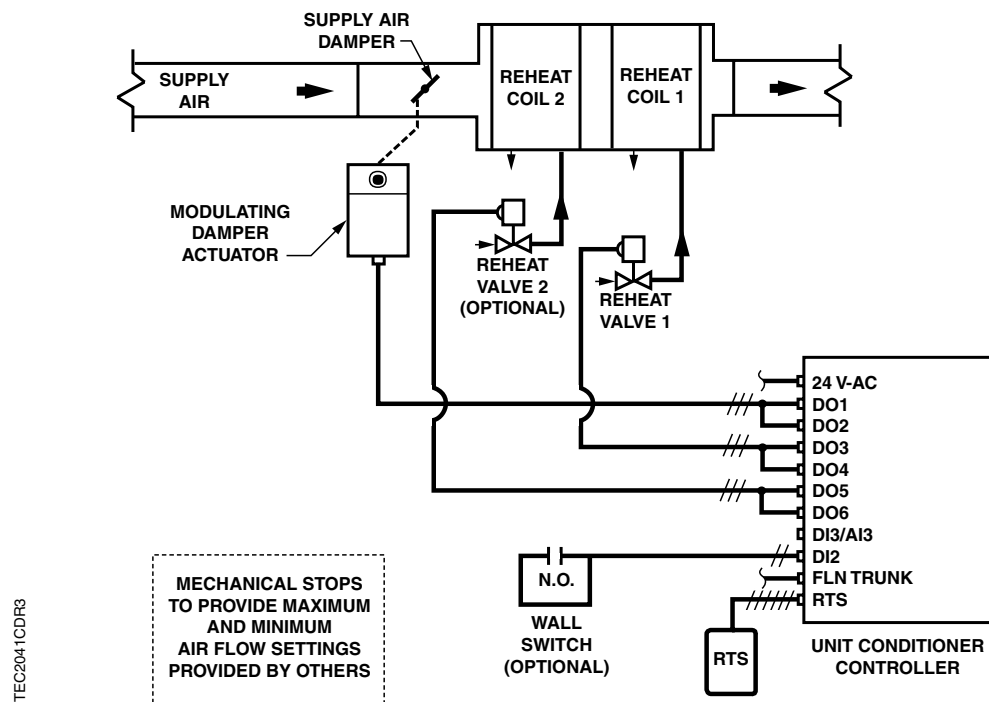


Figure 2-2. Application 2541 Control Drawing.

Application 2550 Two-Pipe Fan Coil Unit Cooling or Heating

Overview

In Application 2550, the controller modulates a valve in the fan coil unit for heating or cooling mode. It can also control an optional second valve for heating. The fan coil unit also has a fan to circulate room air. In order for the fan coil unit to work properly, the central plant must provide chilled water in the cooling mode and hot water in the heating mode. See Figure 2-3.

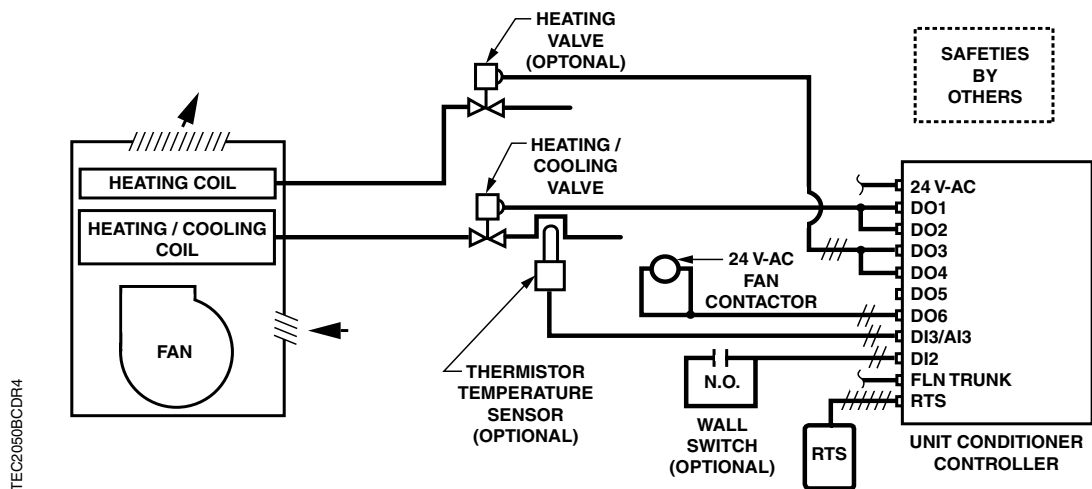


Figure 2-3. Application 2550 Control Drawing.

Application 2551 Fan Coil Unit Cooling and Heating

Overview

In Application 2551, the controller modulates separate valves in the fan coil unit for cooling and heating. The fan coil unit also has a fan to circulate room air. In order for the fan coil unit to work properly, the central plant must provide chilled and hot water. See Figure 2-4.

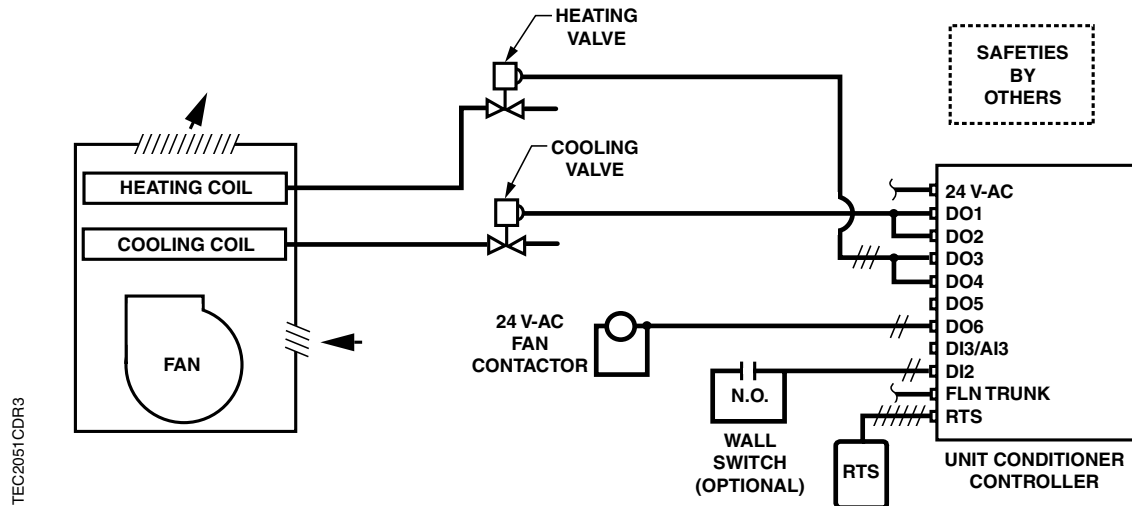


Figure 2-4. Application 2551 Control Drawing.

Application 2552 Fan Coil Unit Cooling and Electric Heat

Overview

In Application 2552, the controller energizes a maximum of two stages of cooling and a maximum of three stages of electric heat in the fan coil unit. The fan coil unit also has a fan to circulate room air. See Figure 2-5.

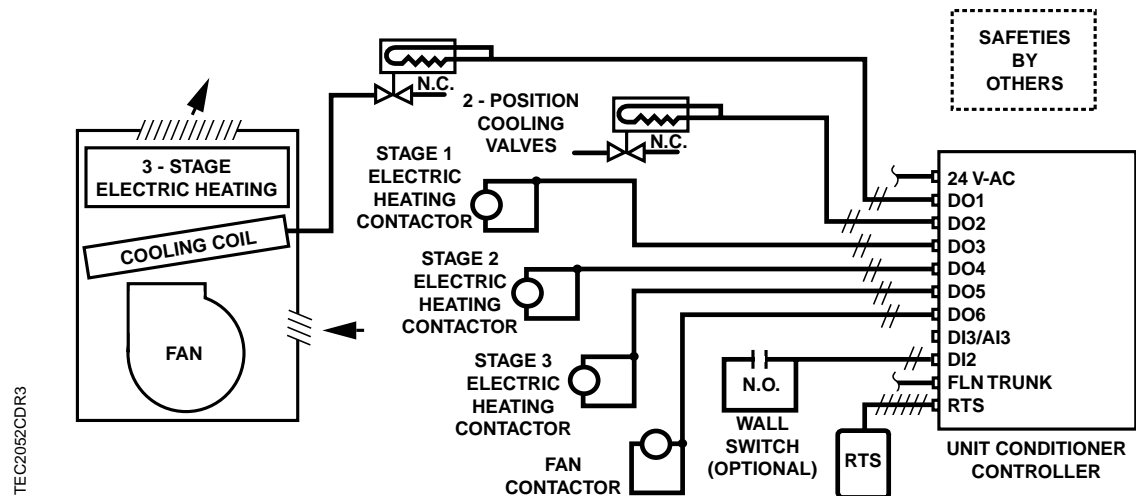


Figure 2-5. Application 2552 Control Drawing.

Application 2553 Fan Coil Unit 2-Stage Cooling and Hot Water Heat

Overview

In Application 2553, the controller energizes a maximum of two stages of cooling and a hot water valve for heating in the fan coil unit. The fan coil unit also has a fan to circulate room air. In order for the fan coil unit to work properly, the central plant must provide hot water in the heating season. See Figure 2-6.

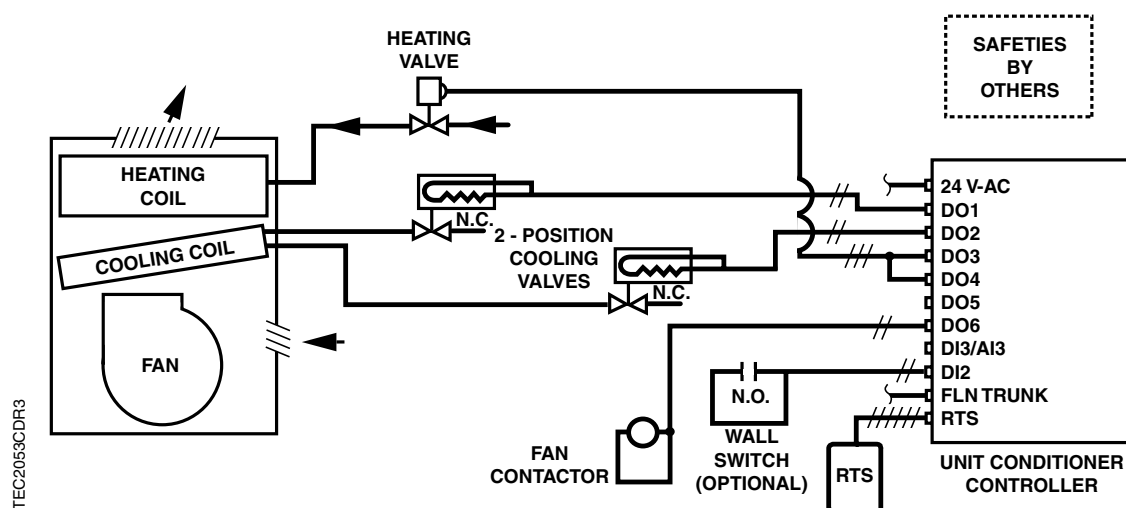


Figure 2-6. Application 2553 Control Drawing.

Application 2554 Fan Coil Unit Cooling and Electric Heat

Overview

In Application 2554, the controller energizes a valve or damper for cooling and controls a maximum of three stages of electric heat for heating in the fan coil unit. The fan coil unit also has a fan to circulate room air. This application can also be used to control a pressure dependent terminal box with electric heat. If a damper is being controlled, then the central plant must supply chilled air in the cooling mode in order for the terminal box to work properly. See Figure 2-7 and Figure 2-8.

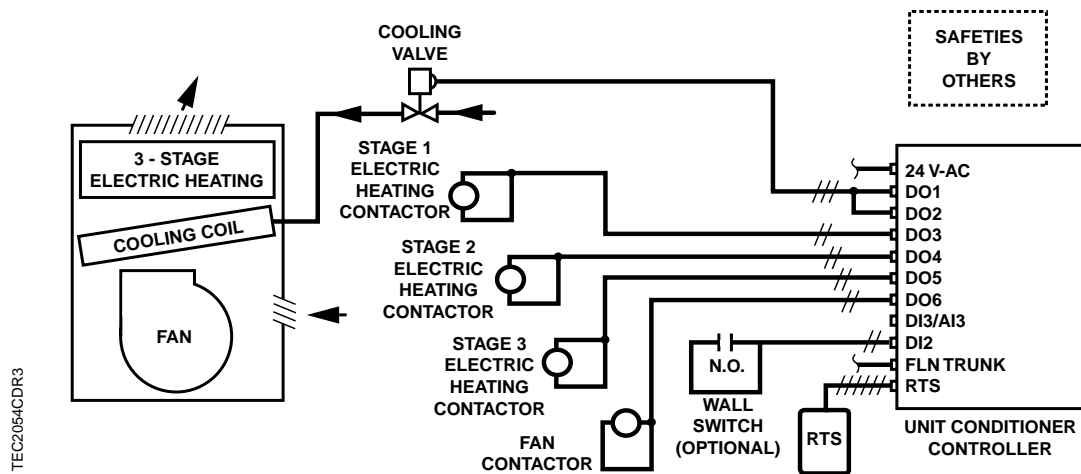


Figure 2-7. Application 2554 with Cooling Valve Control Drawing.

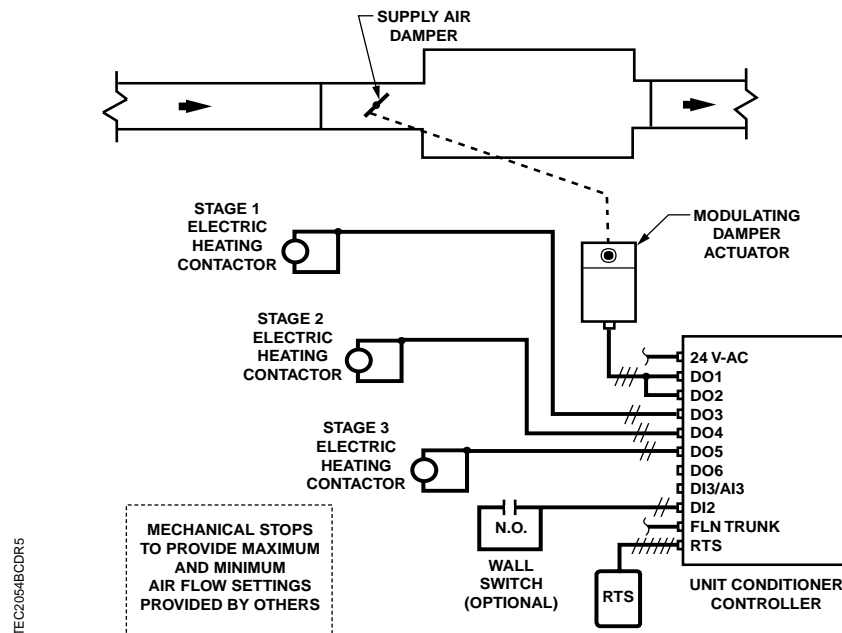


Figure 2-8. Application 2554 with Modulating Damper Control Drawing.

Application 2591 Slave Mode

Overview

Application 2591 is the slave mode application for the Unit Conditioner Controller — Electronic Output (P/N 540-110). Application is the slave mode application with Secure Mode (P/N 540-110C). 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 (CTRL ADDRESS, APPLICATION, etc.).

Using Auxiliary Points

It is possible to have extra points available on a Unit Conditioner Controller — Electronic Output in addition to the ones used by the current application that is running in the controller. If these extra points are to be controlled by a field panel, then they must be unbundled at the field panel.

Using the Controller as a Point Extension Device

If the controller is only used as a point extension device, with no control application in affect, then its application must be set to slave mode and the points must be unbundled at the field panel. All points must be controlled from the field panel in order to be used.

All DOs can be used as separate DOs. They can also be used in pairs, (DO 1 and DO 2), (DO 3 and DO 4), and (DO 5 and DO 6), to control a motor as shown in the example.

NOTE: If using either a motor or DOs as auxiliary points, be sure to set MTR SETUP (Point 58) to the correct value. See Table 2-2. If using a pair of DOs to control a motor, then the DOs can not be unbundled or commanded separately. Only MTR 1 COMD (Point 48), MTR 2 COMD (Point 52), and MTR3 COMD (Point 37) can be unbundled to control the motors.

Table 2-2. Motor Enable/Reverse Values for MTR SETUP (Point 58).

	Motor 1 Enabled			Motor 1 Enabled and Reversed			Motor 1 Not Used		
	Motor 2 Not Used	Motor 2 Enabled	Motor 2 Enabled and Reversed	Motor 2 Not Used	Motor 2 Enabled	Motor 2 Enabled and Reversed	Motor 2 Not Used	Motor 2 Enabled	Motor 2 Enabled and Reversed
Motor 3 Not Used	1	5	13	3	7	15	0	4	12
Motor 3 Enabled	17	21	29	19	23	31	16	20	28
Motor 3 Enabled and Reversed	49	53	61	51	55	63	48	52	60

Example

If using DO 1 and DO 2 as the physical terminations for a direct acting motor, then follow these steps:

1. Set MTR SETUP to **1** to enable the motor.
2. Unbundle MTR 1 COMD at the field panel to command the motor from the field panel.

Contact your local Siemens Building Technologies, Inc. representative for other combinations of DOs and motors.

3

Point Database

Overview

Chapter 3 presents a description of the Unit Conditioner Controller — Electronic Output point database including point descriptors, point addresses, and a listing of applications in which each point is found.

Descriptor	Address ¹	Application	Description	Slope ² (SI Units)	Intercept (SI Units)
CTLR ADDRESS	01	All	Identifies the controller on the FLN trunk.	1.000	0.000
APPLICATION	02	All	The identification number of the program running in the controller.	1.000	0.000
RMTMP OFFSET	03	All	Compensates for deviations between the value of ROOM TEMP (Point 4) and the actual room temperature. This corrected value is displayed in CTL TEMP (Point 78). RMTMP OFFSET + ROOM TEMP = CTL TEMP	0.250 (0.140)	-31.75 (-17.78)
ROOM TEMP	{04} ³	All	Actual reading from the room temperature sensor.	0.250 (0.140)	48.000 (8.889)
HEAT.COOL	{05}	All <i>except</i> 2591	Current mode of operation for applications that can be in either a heating mode or a cooling mode.	–	–
DAY CLG STPT	06	All <i>except</i> 2591	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 (Point 14).	0.250 (0.140)	48.000 (8.889)
DAY HTG STPT	07	All <i>except</i> 2591	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 (Point 14).	0.250 (0.140)	48.000 (8.889)
NGT CLG STPT	08	All <i>except</i> 2591	The temperature setpoint, in degrees, that the controller maintains during night periods in cooling mode.	0.250 (0.140)	48.000 (8.889)

Descriptor	Address ¹	Application	Description	Slope ² (SI Units)	Intercept (SI Units)
NGT HTG STPT	09	All <i>except</i> 2591	The temperature setpoint, in degrees, that the controller maintains during night periods in heating mode.	0.250 (0.140)	48.000 (8.889)
RM STPT MIN	11	All <i>except</i> 2591	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.	0.250 (0.140)	48.000 (8.889)
RM STPT MAX	12	All <i>except</i> 2591	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.	0.250 (0.140)	48.000 (8.889)
RM STPT DIAL	{13} ³	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 (Point 14).	0.250 (0.140)	48.000 (8.889)
STPT DIAL	14	All <i>except</i> 2591	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 cooling mode. <i>Valid input.</i> YES or NO.	–	–
AUX TEMP	{15}	All <i>except</i> 2540, 2550, 2150	Actual reading from a 100K Ω thermistor connected to the controllers AI 3 input. When a thermistor is connected at AI 3, DI 3 is not available. See DI 3 (Point 25).	0.500 (0.280)	37.500 (3.056)
SUPPLY TEMP	{15}	2540, 2550, 2150	Actual reading from a 100K Ω thermistor connected to the controller's AI 3 input. The controller uses this value to determine whether it is in heating mode or cooling mode.	0.500 (0.280)	37.500 (3.056)
VLV 1 START	16	2541, 2550, 2150	When HTG LOOPOUT (Point 80) is above this value, Valve 1 starts to open.	0.400	0.000
VLV 1 END	17	2541, 2550, 2150	When HTG LOOPOUT (Point 80) is below this value, valve 1 is at the end of its stroke.	0.400	0.000
WALL SWITCH	18	All	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. <i>Valid input:</i> YES or NO.	–	–

Descriptor	Address ¹	Application	Description	Slope ² (SI Units)	Intercept (SI Units)
DI OVRD SW	{19} ³	All	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. <i>Valid input:</i> ON or OFF.	–	–
OVRD TIME	20	All except 2591	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.	1.000	0.000
NGT OVRD	{21}	All except 2591	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.	–	–
VLV 2 START	22	2541, 2550, 2150	When HTG LOOPOUT (Point 80) is above this value, Valve 2 starts to open.	0.400	0.000
VLV 2 END	23	2541, 2550, 2150	When HTG LOOPOUT (Point 80) is below this value, valve 2 is at the end of its stroke.	0.400	0.000
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 (Point 18).	–	–
DI 3	{25} ³	All except 2540, 2550, 2150	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 (Point 15).	–	–
DAY.NGT	{29}	All	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.	–	–
MTR 3 COMD	{37}	2540, 2591	The value to which the Motor 3 actuator is commanded in percent of full value.	0.400	0.000

Descriptor	Address ¹	Application	Description	Slope ² (SI Units)	Intercept (SI Units)
VLV 2 COMD	{37}	2541	The value to which the Valve 2 actuator is commanded in percent of full travel for applications using a second water valve.	0.400	0.000
MTR 3 POS	{38}	2540, 2591	The current position of the Motor 3 actuator in percent of full travel. This value is calculated based on motor run time.	0.400	0.000
VLV 2 POS	{38}	2541	The current position of Valve 2 in percent of full travel. This value is calculated based on valve run time.	0.400	0.000
MTR 3 TIMING	39	2540, 2541, 2591	The time required for the Motor 3 actuator to travel from the full closed position to the full open position.	1.000	0.000
CLG STG 1	{41}	2552, 2553	This point is DO 1 in applications with staged cooling. This digital output controls the contactor for the first cooling stage and has a status of ON or OFF.	–	–
DO 1	{41}	All except 2552, 2553	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.	–	–
CLG STG 2	{42}	2552, 2553	This point is DO 2 in applications with staged cooling. This digital output controls the contactor for the second cooling stage and has a status of ON or OFF.	–	–
DO 2	{42} ³	All except 2552, 2553	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 except 2552, 2554	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.	–	–
HTG STG 1	{43}	2552, 2554	This point is DO 3 in applications with electric reheat. This digital output controls the contact for the first stage of heating and has a status of ON or OFF.	–	–
DO 4	{44}	All except 2552, 2554	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.	–	–

Descriptor	Address ¹	Application	Description	Slope ² (SI Units)	Intercept (SI Units)
HTG STG 2	{44}	2552, 2554	This point is DO 4 in applications with electric reheat. This digital output controls the contact for the second stage of heating and has a status of ON or OFF.	–	–
DO 5	{45}	All except 2552, 2554	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.	–	–
HTG STG 3	{45}	2552, 2554	This point is DO 5 in applications with electric reheat. This digital output controls the contact for the third stage of heating and has a status of ON or OFF.	–	–
DO 6	{46}	2540, 2541, 2591	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.	–	–
FAN	{46}	All except 2540, 2541, 2591	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.	–	–
DMPR COMD	{48}	2540, 2541	The value to which the damper motor is commanded in percent of full travel.	0.400	0.000
VLV 1 COMD	{48}	2550, 2551, 2554	The value to which the Valve 1 actuator is commanded in percent of full travel for applications using a water valve.	0.400	0.000
MTR 1 COMD	{48} ³	2591	The value to which the Motor 1 actuator is commanded in percent of full travel.	0.400	0.000
DMPR POS	{49}	2540, 2541, 2142	The current position of the damper motor in percent of full travel. This value is calculated based on motor run time.	0.400	0.000
VLV POS	{49}	2550, 2551, 2554	The current position of Valve 1 in percent of full travel for applications using a water valve. This value is calculated based on motor run time.	0.400	0.000
MTR 1 POS	{49}	2591	The current position of damper Motor 1 in percent of full travel. This value is calculated based on motor run time. See MTR1 TIMING (Point 51).	0.400	0.000
MTR1 TIMING	51	All except 2552, 2553	The time required for the Motor 1 actuator to travel from full closed to the full open position.	1.000	0.000
MTR 2 COMD	{52}	2540, 2591	The value to which the Motor 2 actuator is commanded in percent of full travel (for use as an auxiliary slave point).	0.400	0.000

Descriptor	Address ¹	Application	Description	Slope ² (SI Units)	Intercept (SI Units)
VLV COMD	{52}	2553	The value to which the valve actuator is commanded in percent of full travel for applications using a water valve.	0.400	0.000
VLV 1 COMD	{52}	2541	The value to which the Valve 1 actuator is commanded in percent of full travel for applications using a water valve.	0.400	0.000
VLV 2 COMD	{52}	2550, 2150 2551	The value to which the Valve 2 actuator is commanded in percent of full travel for applications using a water valve.	0.400	0.000
MTR 2 POS	{53}	2540, 2591	The current position of the Motor 2 actuator in percent of full travel (for use as an auxiliary slave point). This value is calculated based on motor run time. See MTR2 TIMING (Point 55).	0.400	0.000
VLV POS	{53}	2553	The current position of the valve in percent of full travel for applications using a water valve. This value is calculated based on motor run time.	0.400	0.000
VLV 1 POS	{53} ³	2541	The current position of Valve 1 in percent of full travel for applications using a water valve. This value is calculated based on motor run time.	0.400	0.000
VLV 2 POS	{53}	2550, 2551	The current position of Valve 2 in percent of full travel for applications using a water valve. This value is calculated based on motor run time.	0.400	0.000
MTR2 TIMING	55	All except 2552, 2554	The time required for the Motor 2 actuator to travel from full closed to the full open position.	1.000	0.000
MTR1 ROT ANG	56	All except 2552, 2553	The number of degrees that Motor 1 is free to travel.	1.000	0.000
MTR2 ROT ANG	57	All except 2552, 2554	The number of degrees that Motor 2 is free to travel.	1.000	0.000
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.	1.000	0.000
DO DIR.REV	59	All	The configuration setup code for DOs. Allows the DOs to be direct or reverse acting (enabled equals energized or enabled equals de-energized).	1.000	0.000

Descriptor	Address ¹	Application	Description	Slope ² (SI Units)	Intercept (SI Units)
CYCLE FAN	60	All <i>except</i> 2540, 2541, 2591	ON indicates the fan will cycle during day mode. OFF indicates the fan is on all the time in day mode.	–	–
COOL TEMP	61	2540, 2550, 2150	The discharge air temperature where the controller will switch from heating mode to cooling mode. Used only in applications with SUPPLY TEMP (Point 15).	0.500 (0.280)	37.500 (3.056)
HEAT TEMP	62	2540, 2550, 2150	The discharge air temperature where the controller will switch from cooling mode to heating mode. Used only in applications with SUPPLY TEMP (Point 15).	0.500 (0.280)	37.500 (3.056)
CLG P GAIN	63	All <i>except</i> 2591	The proportional gain value for the cooling temperature control loop.	0.250 (0.450)	0.000
CLG I GAIN	64	All <i>except</i> 2591	The integral gain value for the cooling temperature control loop.	0.001 (0.002)	0.000
CLG D GAIN	65	All <i>except</i> 2591	The derivative gain value for the cooling temperature control loop.	2.000 (3.600)	0.000
CLG BIAS	66	All <i>except</i> 2591	The biasing of the cooling temperature control loop. See CLG LOOPOUT (Point 79).	0.400	0.000
HTG P GAIN	67	All <i>except</i> 2591	The proportional gain value for the heating temperature control loop.	0.250 (0.450)	0.000
HTG I GAIN	68	All <i>except</i> 2591	The integral gain value for the heating temperature control loop.	0.001 (0.002)	0.000
HTG D GAIN	69	All <i>except</i> 2591	The derivative gain value for the heating temperature control loop.	2.000 (3.600)	0.000
HTG BIAS	70	All <i>except</i> 2591	The biasing of the heating temperature control loop. See HTG LOOPOUT (Point 80).	0.400	0.000
CLG 1 ON	71	2552, 2553	The value, in percent, which the cooling loop (CLG LOOPOUT, Point 79) must exceed for the first stage of cooling to turn ON.	0.400	0.000
CLG 1 OFF	72	2552, 2553	The value, in percent, which the cooling loop (CLG LOOPOUT, Point 79) must go below for the first stage of cooling to turn OFF.	0.400	0.000
CLG 2 ON	73	2552, 2553	The value, in percent, which the cooling loop (CLG LOOPOUT, Point 79) must exceed for the second stage of cooling to turn ON.	0.400	0.000

Descriptor	Address ¹	Application	Description	Slope ² (SI Units)	Intercept (SI Units)
CLG 2 OFF	74	2552, 2553	The value, in percent, which the cooling loop (CLG LOOPOUT, Point 79) must go below for the second stage of cooling to turn OFF.	0.400	0.000
CLG STG CNT	75	2552, 2553	The number of cooling stages used by the application. DOs associated with unused stages may be used as spare DOs.	1.000	0.000
CLG MIN ON	76	2552, 2553	The minimum time, in minutes, which the cooling stages will remain ON before turning OFF.	1.000	0.000
CLG MIN OFF	77	2552, 2553	The minimum time, in minutes, which the cooling stages will remain OFF before turning ON.	1.000	0.000
CTL TEMP	{78} ³	All except 2591	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.	0.250 (0.140)	48.000 (8.889)
CLG LOOPOUT	{79}	All except 2591	The cooling temperature control loop output value, in percent.	0.400	0.000
HTG LOOPOUT	{80}	All except 2591	The heating temperature control loop output value, in percent.	0.400	0.000
AVG HEAT OUT	{81}	2552, 2554	This value is equal to HTG LOOPOUT x HTG STG CNT in applications with electric heat. It is used to determine what stages of electric heat are used for a given loop output value. The ranges for the value are determined by the number of stages used: 0 to 100 for 1 stage of electric heat, 0 to 200 for 2 stages of electric heat, and 0 to 300 for 3 stages of electric heat.	2.000	0.000
AVG HEAT OUT	{81}	2552, 2554	This value is equal to HTG LOOPOUT x HTG STG CNT in applications with electric heat. It is used to determine what stages of electric heat are used for a given loop output value. The ranges for the value are determined by the number of stages used: 0 to 100 for 1 stage of electric heat, 0 to 200 for 2 stages of electric heat, and 0 to 300 for 3 stages of electric heat.	0.400	0.000
HTG STG MAX	82	2552, 2554	The value, in percent, which the heating loop (HTG LOOPOUT, Point 80) must exceed for the electric heat to be ON for the full duty cycle (HTG STG TIME, Point 89).	0.400	0.000

Descriptor	Address ¹	Application	Description	Slope ² (SI Units)	Intercept (SI Units)
HTG STG MIN	83	2552, 2554	The value, in percent, which the heating loop (HTG LOOPOUT, Point 80) must go below for the electric heat to be OFF for the full duty cycle (HTG STG TIME, Point 89).	0.400	0.000
STAGE FAN	84	All <i>except</i> 2540, 2541, 2591	The value that the output of the current temperature loop must exceed in order for the fan to turn ON in night mode.	0.400	0.000
SWITCH LIMIT	85	All <i>except</i> 2540, 2591	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.	0.400	0.000
SWITCH TIME	86	All <i>except</i> 2540, 2550, 2591	The time, in minutes, before the heat/cool mode can change over when the other parameters are appropriate.	1.000	0.000
HTG STG CNT	88	2552, 2554	The number of electric heating stages used by the application. DOs associated with unused stages may be used as spare DOs.	1.000	0.000
VALVE CNT	88	2541, 2550, 2150	The number of heating valves available.	1.000	0.000
HTG STG TIME	89	2552, 2554	The cycle time, in minutes, for the electric reheat stages. For example, if there are three stages of electric heat and STAGE TIME=10 minutes, HTG STG CNT=3, and AVG HEAT OUT=150% then, Stage 1 will be ON for 10 minutes (100% of the time), Stage 2 will be ON for 5 minutes (50% of 10 minutes) and OFF for 5 minutes, and Stage 3 will be OFF.	1.000	0.000
SWITCH DBAND	90	All <i>except</i> 2540, 2550, 2591	The temperature range, in degrees, which is compared to the difference between CTL TEMP (Point 78) and CTL STPT (Point 92). The difference must exceed this value for temperature control mode to change over. Changeover is also subject to SWITCH TIME (Point 86) being expired.	0.250 (0.140)	0.000
CTL STPT	{92} ³	All <i>except</i> 2591	The actual setpoint value being used as input for the active temperature control loop.	0.250 (0.140)	48.000 (8.889)
CAL TIMER	96	All	Time interval, in hours, between the calibration sequence.	1.000	0.000

Descriptor	Address¹	Application	Description	Slope² (SI Units)	Intercept (SI Units)
LOOP TIME	98	All <i>except</i> 2591	The time, in seconds, between control loop calculations.	1.000	(0.000)
ERROR STATUS	{99} ³	All	The status code indicating any errors detected during controller power up. A status of 0 indicates there are no problems.	–	–

1. Points not listed are not used in this application.
2. A single value in a column means that the value is the same in English units and in SI units.
3. Point numbers that appear in brackets { } may be unbundled at the field panel.

4

Troubleshooting

This chapter describes corrective measures you can take should you encounter a problem when using a BACnet Fan Coil/Unit Conditioner 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.

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

This section contains a glossary of terms and acronyms that are used in this manual. For definitions of point database descriptors, see Section 3, *Point Database*, in this manual.

AI

Analog Input. Point that receives a signal that represents a condition which has more than two states. For example, flow rate sensors (water or air), temperature sensors (room or duct), pressure sensors (static or velocity), and humidity sensors (room, duct, or outdoor).

airflow

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

algorithm

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

AVS

Air Velocity Sensor.

centralized control

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

cfm

Cubic Feet per Minute.

control loop

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 input point that receives a two-state signal (ON/OFF, OPEN/CLOSED, YES/NO).

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 that provides additional point capacity to a field panel or provides individual room or mechanical equipment control.

field panel

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

FLN

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

HMI

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

intercept

Factor that converts analog values (used by the controller) to a form that the user can understand (engineering units).

lps

Liters per Second.

loopout

The output of the control loop expressed as a percentage.

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 independent

Variable Air Volume (VAV) room temperature control system in which the temperature drives an airflow setpoint.

PID

Proportional, Integral, Derivative.

pressure dependent

Variable Air Volume (VAV) room temperature control system in which the temperature directly drives the damper.

RTS

Room Temperature Sensor.

setpoint

Virtual point that stores a point value such as a temperature setting. Points that monitor inputs, such as temperature, report actual values.

SI units

Système International d'Unités. The international metric system.

slave mode

Default application that displays when power is first applied to a Terminal Equipment Controller. No control action is initiated in the slave mode.

slope

Factor that converts analog values (used by the controller) to a form which the user can understand (engineering units).

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, Inc. product family of equipment controllers (one is the BACnet Fan Coil/Unit Conditioner Controller — Electronic 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 controllers database into the field panel's database so that it can be monitored and controlled from the field panel.

Unit Conditioner (Fan Coil)

A controller used in pressure dependent box, fan coil unit, and induction unit applications.

VAV

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

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