SIEMENS

TEC Controller

Unit Conditioner - Electronic Output

Owner's Manual

125-5076
2014-05-01

Building Technologies

Table of Contents

How To Use This Manual

This manual is written for the owner and user of the Siemens TEC Unit Conditioner Controller. It is designed to help you become familiar with the Siemens TEC and its applications.

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

Manual Organization

This manual contains the following chapters:

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

Manual Conventions

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

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

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

Manual Symbols

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

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

Getting Help

For more information about the Siemens TEC Unit Conditioner Controller, contact your local Siemens Industry representative.

Where to Send Comments

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

Chapter 1 – Product Overview

The Siemens TEC Unit Conditioner Controller is used in pressure dependent terminal box, fan coil unit, and unit conditioner applications. It provides Direct Digital Control (DDC) for seven applications and is available in both short and long board hardware assemblies.

- The controller can operate as an independent, stand-alone, DDC room controller or it can be networked with a field panel.
- The controller provides all termination, input/output, system and local communication connections.
- The controller hardware consists of the controller with cover and mounting bracket (See Figure Siemens TEC Unit Conditioner Controller).

The following applications are covered:

Pressure Dependent Terminal Boxes

- Cooling or Heating (Application 2040)
- Cooling and Hot Water Heat (Application 2041)

Fan Coil / Unit Conditioners

- Two-pipe Cooling or Heating with additional Hot Water Coil (Application 2050)
- Cooling and Heating (Application 2051)
- Two-stage Cooling and Electric Heat (Application 2052)
- Two-stage Cooling and Hot Water Heat (Application 2053)
- Cooling and Electric Heat or VAV Pressure Dependent with Electric Heat (Application 2054)
- Slave Mode (Application 2090)
- Slave Mode (No control; available for set up and point extension device) (Application 2090)

NOTE:
Application 2054 can also control a Variable Air Volume pressure dependent terminal box with electric heat. See the application description for Application 2054.

Hardware Inputs

Analog

Duct temperature sensor (optional)	Application 2040
Room temperature sensor	Application 2040 Application 2041 Application 2050 Application 2051 Application 2052 Application 2053 Application 2054
Room temperature setpoint dial (optional)	Application 2040 Application 2041 Application 2050 Application 2051 Application 2052 Application 2053 Application 2054
Pipe temperature sensor (optional)	Application 2050

Digital

Night mode override (optional)	Application 2040 Application 2041 Application 2050 Application 2051 Application 2052 Application 2053 Application 2054
Wall switch (optional)	Application 2040 Application 2041 Application 2050 Application 2051 Application 2052 Application 2053 Application 2054

Hardware Outputs

Analog

None

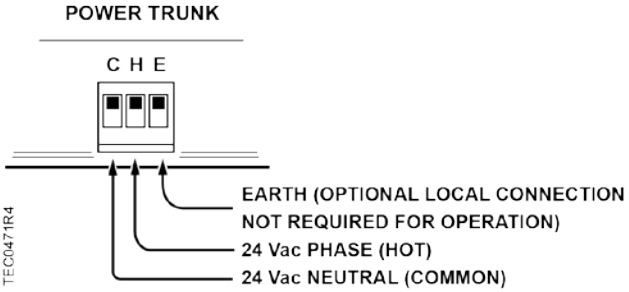
Digital

Damper actuator	Application 2040 Application 2041
1st valve actuator (required)	Application 2041 Application 2050
2nd valve actuator (optional)	Application 2041 Application 2050
Fan (switched 24 Vac, pilot duty)	Application 2050 Application 2051 Application 2052 Application 2053 Application 2054
Cooling valve actuator	Application 2051
Heating valve actuator	Application 2051 Application 2053
Stage 1 cooling (2-position valve actuator or cooling compressor)	Application 2051 Application 2052
Stage 2 cooling (2-position valve actuator or cooling compressor)	Application 2051 Application 2052
Stage 1 electric heat	Application 2052 Application 2054
Stage 2 electric heat	Application 2052 Application 2054
Stage 3 electric heat	Application 2052 Application 2054
Valve actuator or damper actuator	Application 2054

Ordering Notes

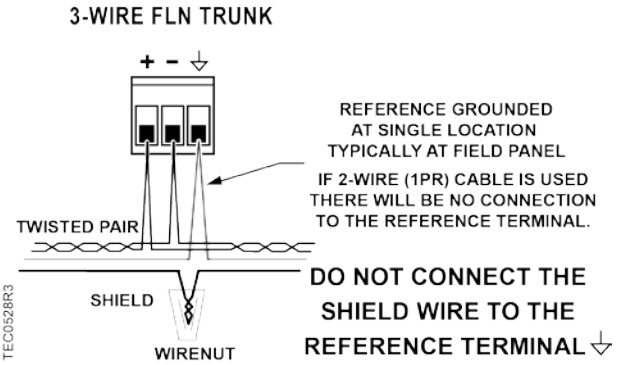
Siemens TEC Unit Conditioner Controller	540-110N

Power Wiring



Communication Wiring

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



Controller LED Indicators

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

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 has nine Light Emitting Diode (LED) indicators (see Figure Siemens BACnet VAV Controller).

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.

The TEC will automatically detect the MS/TP baud rate at start up and will communicate with other devices when configured as a master MS/TP device (address 1 through 127). The TX LED will start flashing as it attempts to communicate with other devices.

Temperature Sensors

Temperature sensors used with the Siemens TEC Unit Conditioner Controller include an electronic room temperature sensor and an optional duct temperature sensor.

Room Temperature Sensor

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

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

Duct Temperature Sensor

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

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

Actuators

Actuators used with the Siemens TEC Unit Conditioner Controller include electronic damper motors, electronic valve motors, and electronic valve assemblies. These actuators are powered through the controller to position cooling and/or reheat valves or supply air dampers.

Related Equipment

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

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

Chapter 2 – Applications

Basic Operation

The Siemens TEC Unit Conditioner Controller 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 setpoint based on Day/Night mode, the heating/cooling mode, or the setpoint dial (if used).

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

Day/Night Mode

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

Night Mode Override Switch

If the Room Temperature Sensor (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.

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 and Damper

During normal operation: To ensure that the damper and valves opens and closes fully, the controller will provide additional opening and closing time when they are commanded to 100 % or 0 %.

Fail-Mode Operation

If the RTS or the setpoint dial 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).

Heating/cooling switchover for applications that utilize a supply (air or water) sensor is determined by the status of available heating or cooling media.

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 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

Day Mode

The fan can be set to be ON all the time or cycle on when heating or cooling is needed. Up to three stages of fan may be controlled, or alternatively, a variable speed fan can be controlled.

Night Mode

The fan cycles ON when heating or cooling is needed.

Notes

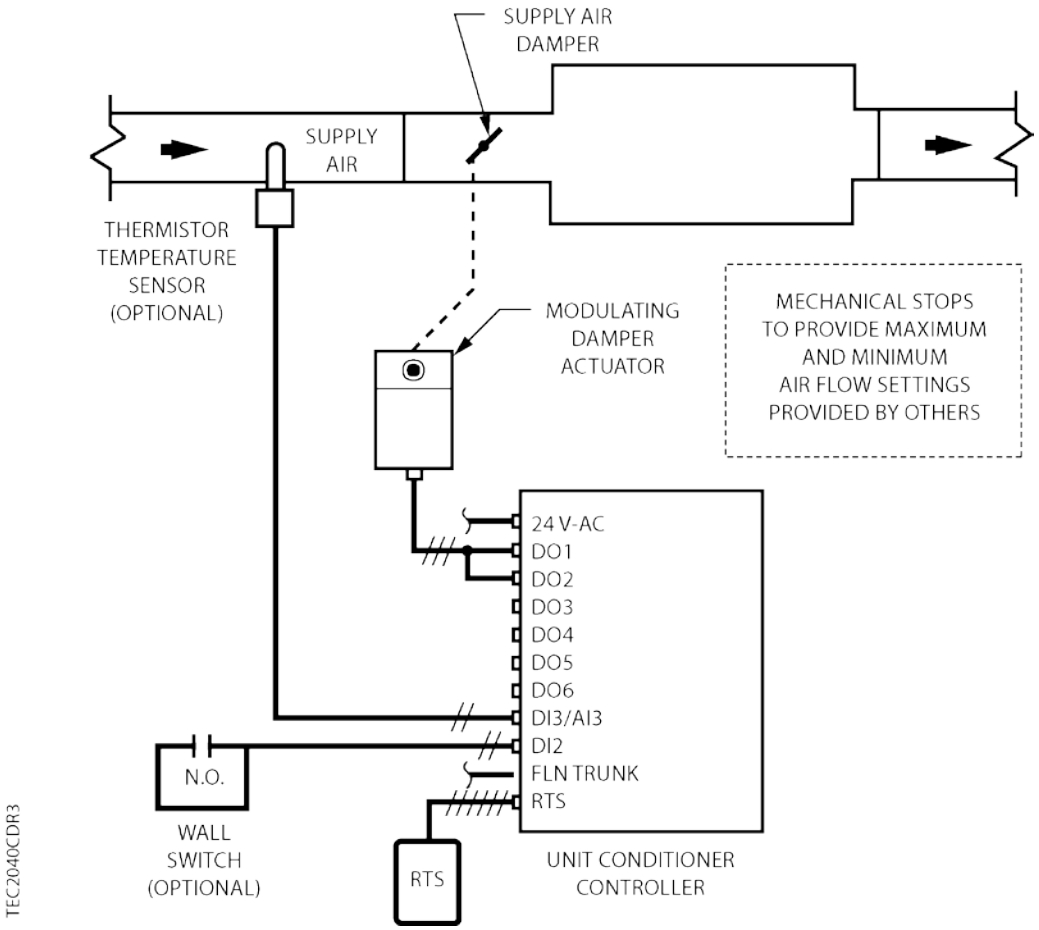
1. If the temperature swings in the room are excessive, or if there is trouble in maintaining the setpoint, contact your local Siemens Industry representative for more information.

2. The Siemens TEC Unit Conditioner Controller, as shipped from the factory, keeps all associated equipment OFF. The controller and its equipment are released to application control at start-up.

3. “Safeties by Others”: This note implies that the associated equipment has safety features installed; for example, adding mechanical stops to the dampers.

Application 2040 Variable Air Volume Pressure Dependent Cooling or Heating

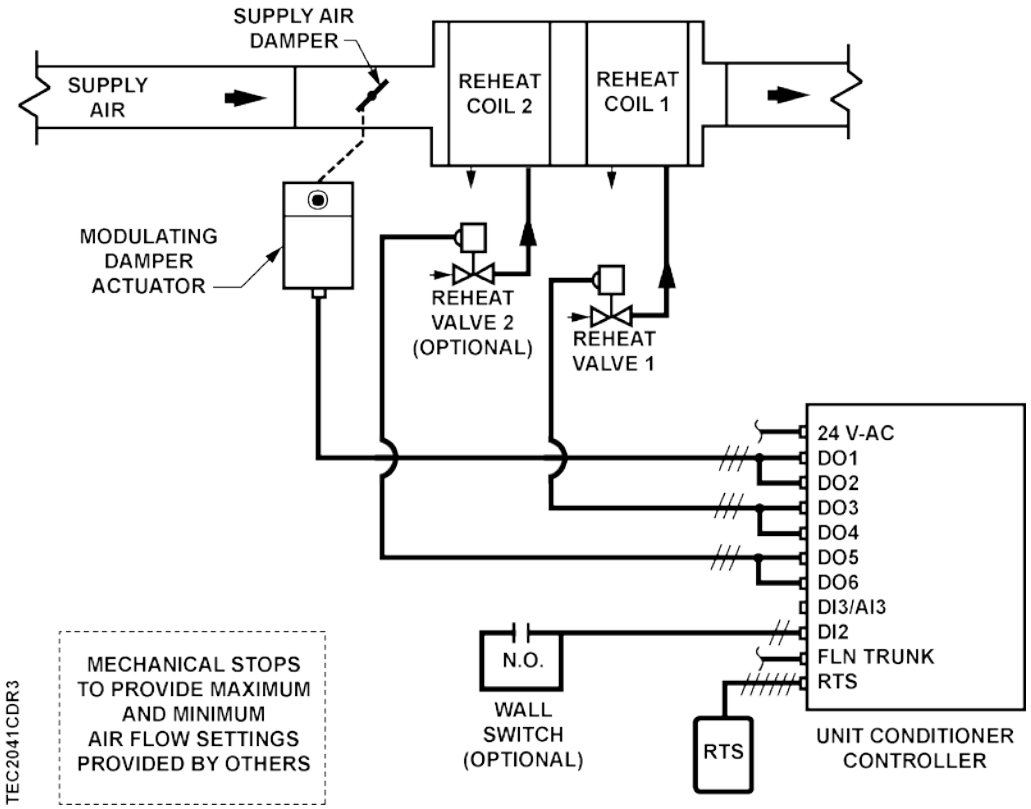
In Application 2040, the controller modulates the supply air damper of the terminal box for cooling and heating. In order for it to work properly, the central air-handling unit must provide cool supply air in the cooling mode and warm supply air in the heating mode.



Application 2040 – VAV Pressure Dependent Cooling or Heating Control Diagram.

Application 2041 Variable Air Volume Pressure Dependent with Hot Water Heat

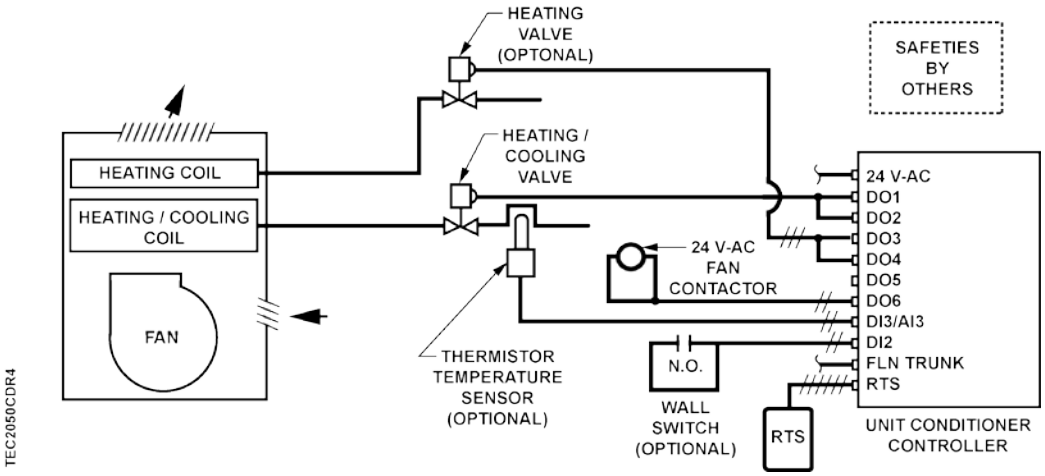
In Application 2041, the controller modulates the supply air damper of the terminal box for cooling and modulates a reheat valve(s) for heating. When in heating, minimum airflow (limited by a mechanical stop on the terminal box) is provided to the room. In order for the terminal box to work properly, the central air-handling unit must provide cool supply air.



Application 2041 - VAV Pressure Dependent with Hot Water Reheat Control Diagram.

Application 2050 Two-Pipe Fan Coil Unit Cooling or Heating

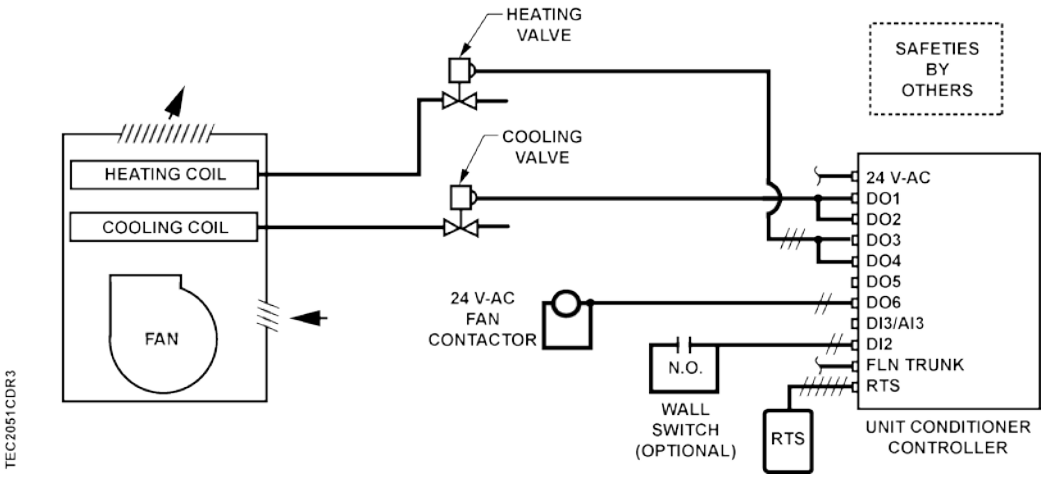
In Application 2050, the controller modulates a valve in the fan coil unit for heating or cooling mode. It can also control an optional second valve for heating. The fan coil unit also has a fan to circulate room air. In order for the fan coil unit to work properly, the central plant must provide chilled water in the cooling mode and hot water in the heating mode.



Application 2050 -- Two-Pipe Fan Coil Unit Cooling or Heating Control Diagram.

Application 2051 Fan Coil Unit Cooling and Heating

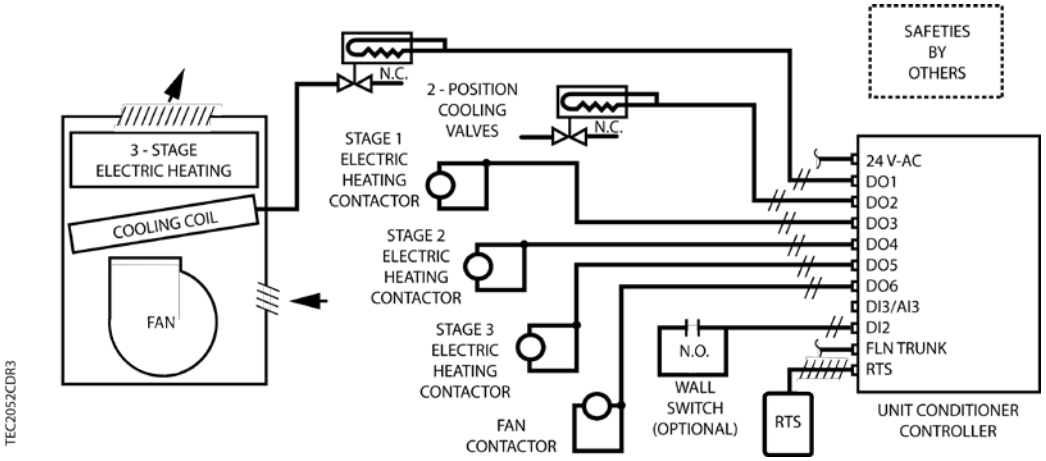
In Application 2051, the controller modulates separate valves in the fan coil unit for cooling and heating. The fan coil unit also has a fan to circulate room air. In order for the fan coil unit to work properly, the central plant must provide chilled and hot water.



Application 2051 -- Fan Coil Unit Cooling and Heating Control Diagram.

Application 2052 Fan Coil Unit 2-Stage Cooling and Electric Heat

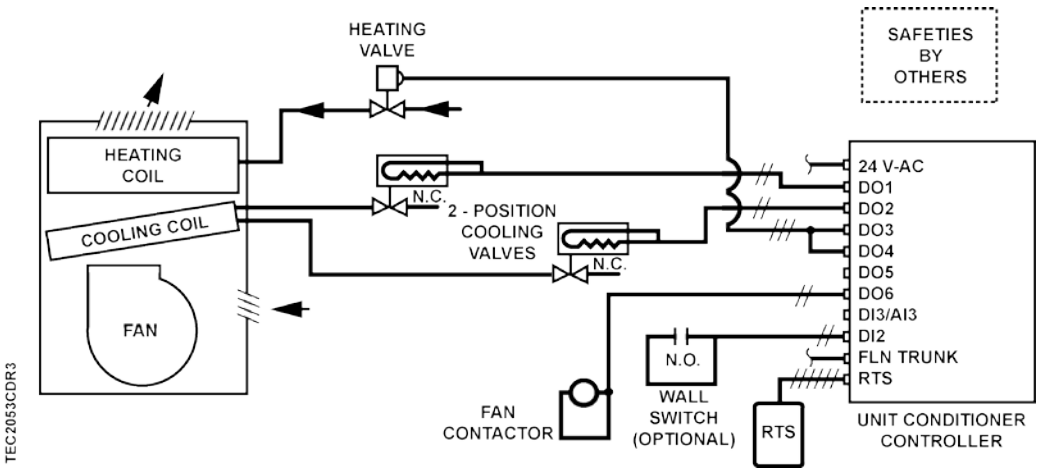
In Application 2052, the controller energizes a maximum of two stages of cooling and a maximum of three stages of electric heat in the fan coil unit. The fan coil unit also has a fan to circulate room air.



Application 2052 -- Fan Coil Unit - Two-Stage Cooling and Electric Heat Control Diagram.

Application 2053 Fan Coil Unit 2-Stage Cooling and Hot Water Heat

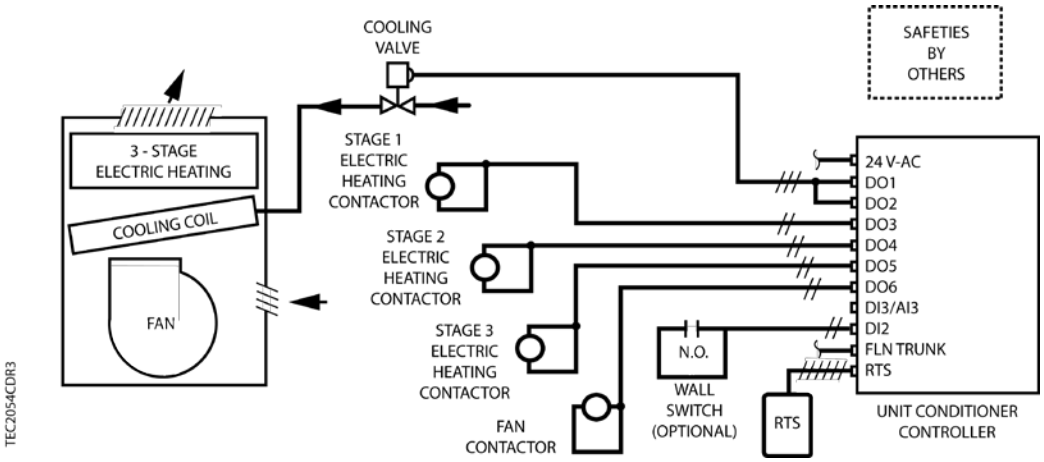
In Application 2053, the controller energizes a maximum of two stages of cooling and a hot water valve for heating in the fan coil unit. The fan coil unit also has a fan to circulate room air. In order for the fan coil unit to work properly, the central plant must provide hot water for heating and cold water or DX for cooling.



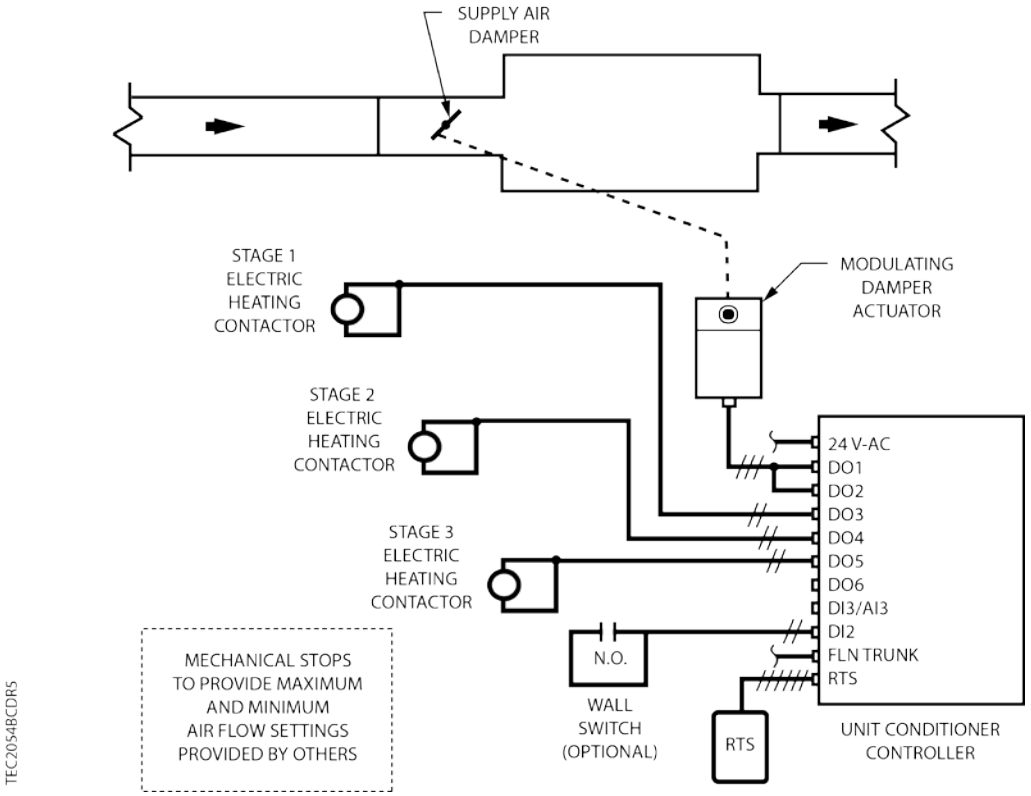
Application 2053 -- Fan Coil Unit – Two Stage Cooling and Hot Water Heating Control Diagram.

Application 2054 Fan Coil Unit Cooling and Electric Heat or VAV Pressure Dependent with Electric Heat

In Application 2054, 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, the central plant must supply chilled air in order for the terminal box to work properly.



Application 2054 -- Fan Coil Unit Cooling and Electric Heating Control Diagram.



Application 2054 -- VAV Pressure Dependent Cooling and Electric Heating Control Drawing.

Application 2090 Slave Mode

Application 2090 is the slave mode application for the TEC (see Ordering Notes for product numbers). 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.).

Using Auxiliary Points

It is possible to have extra points available on a Siemens TEC Unit Conditioner Controller in addition to the ones used by the current application that is running in the controller. If these extra points will be controlled by a field panel, they must be unbundled at the field panel. See Chapter 3 for point database information.

Using the Controller as a Point Extension Device

A controller in default state can also be used as a point extension device by unbundling spare I/O points at the field panel.

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. Unbundling points at the field panel allows you to use these available points.

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 to the correct value. See the following table. If using a pair of DOs to control a motor, then the DOs cannot be unbundled or commanded separately. Only MTR 1 COMD, MTR 2 COMD and MTR3 COMD can be unbundled to control the motors.

Table. Motor Enable/Reverse Values for MTR SETUP.

	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 Industry representative for other combinations of DOs and motors.

Chapter 3 – Point Database

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

Descriptor	Address[2]	Application	Description
CTLR ADDRESS	01	All	Identifies the controller on the FLN trunk.
APPLICATION	02	All	The identification number of the program running in the controller.
ROOM TEMP	{04}[2]	All	Actual reading from the room temperature sensor.
HEAT.COOL	{05}	All *except* 2090	Current mode of operation for applications that can be in either a heating mode or a cooling mode.
DAY CLG STPT	06	All *except* 2090	The temperature setpoint, in degrees, that the controller maintains during day periods in cooling mode if a room temperature sensor setpoint dial is not present or is not used. See *STPT DIAL*.
DAY HTG STPT	07	All *except* 2090	The temperature setpoint, in degrees, that the controller maintains during day periods in heating mode if a room temperature sensor setpoint dial is not present or is not used. See *STPT DIAL*.
NGT CLG STPT	08	All *except* 2090	The temperature setpoint, in degrees, that the controller maintains during night periods in cooling mode.
NGT HTG STPT	09	All *except* 2090	The temperature setpoint, in degrees, that the controller maintains during night periods in heating mode.
RM STPT MIN	11	All *except* 2090	The minimum temperature setpoint, in degrees, that the controller can use from the setpoint dial. This overrides any temperature setpoint from the setpoint dial that falls below this minimum.
RM STPT MAX	12	All *except* 2090	The maximum temperature setpoint, in degrees, that the controller can use from the setpoint dial. This overrides any temperature setpoint from the setpoint dial that falls above this maximum.
RM STPT DIAL	{13}	All	The temperature setpoint, in degrees, from the room temperature sensor (not available on all temperature sensor models). This setpoint will be used for control in day mode (heating or cooling) when enabled by STPT DIAL.
STPT DIAL	14	All *except* 2090	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 will be used as the temperature setpoint for control in day heating mode or cooling mode. Valid input. YES or NO.
MA TEMP	{15}	2090	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*.
AUX TEMP	{15}	All *except* 2040, 2050	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*.
SUPPLY TEMP	{15}	2040, 2050	Actual reading from a 100K Ω thermistor connected to the

Descriptor	Address[2]	Application	Description
			controller's AI 3 input. The controller uses this value to determine whether it is in heating mode or cooling mode. When a thermistor is connected at AI 3, DI 3 is not available. See *DI 3*.
VLV 1 START	16	2050	When HTG LOOPOUT is above this value, Valve 1 starts to open.
VLV 1 END	17	2041, 2050	When HTG LOOPOUT is below this value, valve 1 is at the end of its stroke.
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. Valid input: YES or NO.
DI OVRD SW	{19}	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. Valid input: ON or OFF.
OVRD TIME	20	All *except* 2090	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}	All *except* 2090	Indicates the mode that the controller is operating in with respect to the override switch. NIGHT indicates that the switch has not been pressed and the override timer is not active. DAY indicates that the switch has been pressed and the override timer is active. The controller then uses a day mode temperature setpoint. This point is only in effect when DAY.NGT indicates night mode.
VLV 2 START	22	2041, 2050	When HTG LOOPOUT is above this value, Valve 2 starts to open.
VLV 2 END	23	2041, 2050	When HTG LOOPOUT is below this value, valve 2 is at the end of its stroke.
DI 2	{24}	All	Actual status of a contact connected to the controller at DI 2. ON indicates that the contact is closed; OFF indicates that the contact is open. If a wall switch is used, then it is connected to DI 2. See *WALL SWITCH*.
DI 3	{25}	All *except* 2040, 2050	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*.
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}	2040	The value to which the Motor 3 actuator is commanded in percent of full value.
VLV 2 COMD	{37}	2041	The value to which the Valve 2 actuator is commanded in percent of full travel for applications using a second water valve.
MTR 3 POS	{38}	2040	The current position of the Motor 3 actuator in percent of full travel. This value is calculated based on motor run time.
VLV 2 POS	{38}	2041	The current position of Valve 2 in percent of full travel. This value is calculated based on valve run time.

Descriptor	Address[2]	Application	Description
MTR 3 TIMING	39	2040, 2041	The time, in seconds, required for the Motor 3 actuator to travel from the full closed position to the full open position.
CLG STG 1	{41}	2052, 2053	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* 2052, 2053	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}	2052, 2053	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}	All *except* 2052, 2053	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* 2052, 2054, 2090	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.
ELEC HEAT	{43}	2090	This point is DO 3 and has a status of ON or OFF.
HTG STG 1	{43}	2052, 2054	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* 2052, 2054	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.
HTG STG 2	{44}	2052, 2054	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* 2052, 2054	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}	2052, 2054	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}	2040, 2041	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* 2040, 2041	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}	2040, 2041, 2090	The value to which the damper motor is commanded in percent of full travel.
VLV 1 COMD	{48}	2050, 2051, 2054	The value to which the Valve 1 actuator is commanded in percent of full travel for applications using a water valve.
DMPR POS	{49}	2040, 2041, 2090	The current position of the damper motor in percent of full travel. This value is calculated based on motor run time.
VLV POS	{49}	2050, 2051, 2054	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.
MTR1 TIMING	51	All *except* 2052, 2053	The time, in seconds, required for the Motor 1 actuator to travel from full closed to the full open position.

Descriptor	Address[2]	Application	Description
MTR 2 COMD	{52}	2040, 2090	The value to which the Motor 2 actuator is commanded in percent of full travel (for use as an auxiliary slave point).
VLV COMD	{52}	2053	The value to which the valve actuator is commanded in percent of full travel for applications using a water valve.
VLV 1 COMD	{52}	2041	The value to which the Valve 1 actuator is commanded in percent of full travel for applications using a water valve.
VLV 2 COMD	{52}	2050, 2051	The value to which the Valve 2 actuator is commanded in percent of full travel for applications using a water valve.
MTR 2 POS	{53}	2040, 2090	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*.
VLV POS	{53}	2053	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.
VLV 1 POS	{53}	2041	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.
VLV 2 POS	{53}	2050, 2051	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.
MTR2 TIMING	55	All *except* 2052, 2054	The time, in seconds, required for the Motor 2 actuator to travel from full closed to the full open position.
DMPR1 ROT ANG	56	2090	The number of degrees that Motor 1 is free to travel.
MTR1 ROT ANG	56	All *except* 2052, 2053	The number of degrees that Motor 1 is free to travel.
DMPR2 ROT ANG	57	2090	The number of degrees that Motor 2 is free to travel.
MTR2 ROT ANG	57	All *except* 2052, 2054, 2090	The number of degrees that Motor 2 is free to travel.
MTR SETUP	58	All	The configuration setup code for Motors 1 and 2. This enables the motors individually and sets each motor to be either direct or reverse acting. **Note:** When a motor is enabled, its associated DOs are enabled.
DO DIR.REV	59	All	The configuration setup code for DOs. Allows the DOs to be direct or reverse acting (enabled equals energized or disabled equals de-energized).
CYCLE FAN	60	All *except* 2040, 2041, 2090	ON indicates the fan will cycle during day mode. OFF indicates the fan is on all the time in day mode.
COOL TEMP	61	2040, 2050	The discharge air temperature where the controller will switch from heating mode to cooling mode. Used only in applications with SUPPLY TEMP.
HEAT TEMP	62	2040, 2050	The discharge air temperature where the controller will switch from cooling mode to heating mode. Used only in applications with SUPPLY TEMP.
CLG P GAIN	63	All *except* 2090	The proportional gain value for the cooling temperature control loop.
CLG I GAIN	64	All *except* 2090	The integral gain value for the cooling temperature control loop.
CLG D GAIN	65	All *except*	The derivative gain value for the cooling temperature control

Descriptor	Address[2]	Application	Description
		2090	loop.
CLG BIAS	66	All *except* 2090	The biasing of the cooling temperature control loop. See *CLG LOOPOUT*.
HTG P GAIN	67	All *except* 2090	The proportional gain value for the heating temperature control loop.
HTG I GAIN	68	All *except* 2090	The integral gain value for the heating temperature control loop.
HTG D GAIN	69	All *except* 2090	The derivative gain value for the heating temperature control loop.
HTG BIAS	70	All *except* 2090	The biasing of the heating temperature control loop. See HTG LOOPOUT.
CLG 1 ON	71	2052, 2053	The value, in percent, which the cooling loop (CLG LOOPOUT must exceed for the first stage of cooling to turn ON.
CLG 1 OFF	72	2052, 2053	The value, in percent, which the cooling loop (CLG LOOPOUT) must go below for the first stage of cooling to turn OFF.
CLG 2 ON	73	2052, 2053	The value, in percent, which the cooling loop (CLG LOOPOUT) must exceed for the second stage of cooling to turn ON.
CLG 2 OFF	74	2052, 2053	The value, in percent, which the cooling loop (CLG LOOPOUT) must go below for the second stage of cooling to turn OFF.
CLG STG CNT	75	2052, 2053	The number of cooling stages used by the application. DOs associated with unused stages may be used as spare DOs.
CLG MIN ON	76	2052, 2053	The minimum time, in minutes, which the cooling stages will remain ON before turning OFF.
CLG MIN OFF	77	2052, 2053	The minimum time, in minutes, which the cooling stages will remain OFF before turning ON.
CTL TEMP	{78}	All *except* 2090	The temperature used as input for the temperature control loops. This value will be the same as the value in ROOM TEMP + RMTMP OFFSET unless it is overridden.
CLG LOOPOUT	{79}	All *except* 2090	The cooling temperature control loop output value, in percent.
HTG LOOPOUT	{80}	All *except* 2090	The heating temperature control loop output value, in percent.
AVG HEAT OUT	{81}	2052, 2054	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.
HTG STG MAX	82	2052, 2054	The value, in percent, which the heating loop (HTG LOOPOUT) must exceed for the electric heat to be ON for the full duty cycle (HTG STG TIME).
HTG STG MIN	83	2052, 2054	The value, in percent, which the heating loop (HTG LOOPOUT) must go below for the electric heat to be OFF for the full duty cycle (HTG STG TIME).
STAGE FAN	84	All *except*	The value that the output of the current temperature loop must

Descriptor	Address[2]	Application	Description
		2040, 2041, 2090	exceed in order for the fan to turn ON in night mode.
SWITCH LIMIT	85	All *except* 2040, 2090	The active temperature control loop output must be less than this value to switch between cooling mode and heating mode. Actual switchover depends on SWITCH DBAND being exceeded and is subject to SWITCH TIME being expired.
SWITCH TIME	86	All *except* 2040, 2050, 2090	The time, in minutes, before the heat/cool mode can change over when the other parameters are appropriate.
HTG STG CNT	88	2052, 2054	The number of electric heating stages used by the application. DOs associated with unused stages may be used as spare DOs.
VALVE CNT	88	2041, 2050	The number of heating valves available.
HTG STG TIME	89	2052, 2054	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.
SWITCH DBAND	90	All *except* 2040, 2050, 2090	The temperature range, in degrees, which is compared to the difference between CTL TEMP and CTL STPT. The difference must exceed this value for temperature control mode to change over. Changeover is also subject to SWITCH TIME being expired.
CTL STPT	{92}	All *except* 2090	The actual setpoint value being used as input for the active temperature control loop.
CAL TIMER	96	All	Time interval, in hours, between the calibration sequences.
LOOP TIME	98	All *except* 2090	The time, in seconds, between control loop calculations.
ERROR STATUS	{99}	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 these applications.

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

Chapter 4 – Basic Service and Maintenance

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

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

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

Basic Service Information

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

Preventive Maintenance

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

Safety Features

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

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

Glossary

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

airflow

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

algorithm

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

AVS

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

centralized control

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

cfm

Cubic Feet per Minute.

Chilled Beam

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

control loop

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

CO_2

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

CV

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

Demand Control Ventilation

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

DCV

Demand Control Ventilation.

DDC

Direct Digital Control.

Direct digital control

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

DO

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

English units

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

equipment controller

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

field panel

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

Floating Control

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

FLN

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

lps

Liters per Second.

loopout

Output of the control loop expressed as a percentage.

Heat pump

An HVAC device used for both space heating and space cooling. When a heat pump is used for heating, it employs the same basic refrigeration-type cycle used by an air conditioner but in the opposite direction, releasing heat into the conditioned-space

rather than the surrounding environment. In this use, heat pumps generally draw heat from the cooler external air or from the ground.

HMI

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

Occupancy sensor

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

override switch

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

pressure dependent

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

pressure independent

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

PID

Proportional, Integral, Derivative.

RTS

Room Temperature Sensor.

setpoint

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

SI units

Systeme International d'Unites. The international metric system.

slave mode

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

stand-alone control

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

Terminal Equipment Controller

Siemens Industry, Inc. product family of equipment controllers (one is the Siemens TEC Unit Conditioner Controller) that house the applications software used to control terminal units, such as heat pumps, VAV terminal boxes, fan coil units, unit ventilators, etc.

UI

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

unbundle

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

VAV

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

Index

M

O

P

R

S

T

U

V

Issued by
Siemens Industry, Inc.
Building Technologies Division
1000 Deerfield Pkwy
Buffalo Grove IL 60089
Tel. +1 847-215-1000

Document ID	125-5076	125-5076(AA)
Edition	2014-05-01	