SIEMENS

TEC Controller

Heat Pump Single Stage

Owner's Manual

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Building Technologies

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How To Use This Manual

This manual is written for the owner and user of the Siemens TEC Heat Pump Controller Single Stage. 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 Heat Pump Controller Single Stage, 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 Heat Pump Controller Single Stage is used in single-stage heat pump applications. It provides Direct Digital Control (DDC) for three 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 (See Figure Siemens TEC Heat Pump Controller Single Stage).

The following applications are covered:

- Slave Mode (Application 2090)
- Single Compressor Heat Pump with Reversing Valve (Application 2070)
- Two Compressor Heat Pump with Reversing Valve and Mixed Air Control (Application 2071)
- Heating and Cooling Heat Pump with Internal Reversing Valve and Mixed Air Control (Application 2072)

Hardware Inputs

Analog

Room temperature sensor	Application 2070 Application 2071 Application 2072
Room temperature setpoint dial (optional)	Application 2070 Application 2071 Application 2072
Mixed air temperature sensor (optional)	Application 2071 Application 2072
Aux temperature sensor	Application 2070

Digital

Night mode override (optional)	Application 2070 Application 2071 Application 2072
Wall switch (optional)	Application 2070 Application 2071 Application 2072

Hardware Outputs

Analog

None

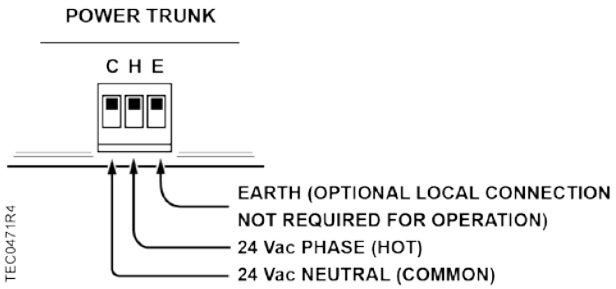
Digital

Compressor	Application 2070
Electric heat (optional)	Application 2070
Reversing valve	Application 2070 Application 2071
Damper actuator (floating control) (optional)	Application 2070 Application 2071 Application 2072
Fan	Application 2070 Application 2071 Application 2072
Compressor 1	Application 2071
Compressor 2 (optional); or stage 1 electric heat (optional)	Application 2072
Stage 1 electric heat (optional)	Application 2072
Stage 1 heating compressor	Application 2072
Stage 1 cooling compressor	Application 2072

Ordering Notes

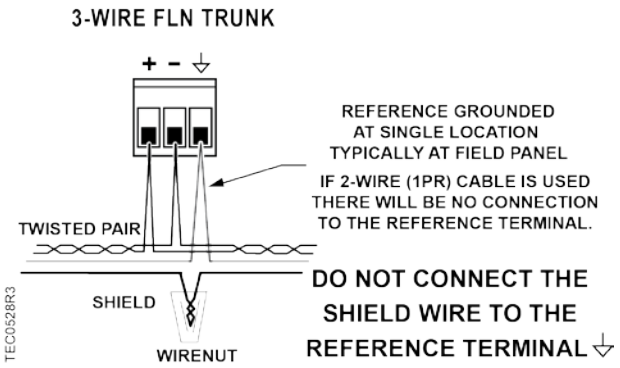
Siemens TEC Heat Pump Controller Single Stage	540-105N

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 Heat Pump Controller Single Stage include an electronic room temperature sensor or an optional auxiliary 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.

Auxiliary or Mixed Air Temperature Sensor

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

Actuators

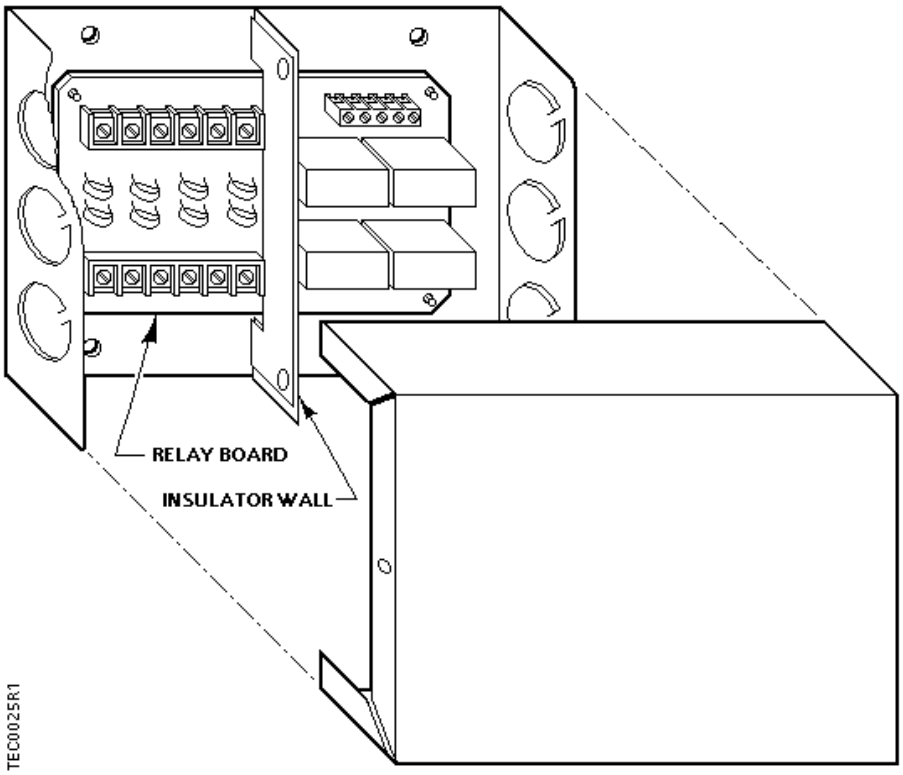
Actuators used with the Siemens TEC Heat Pump Controller Single Stage include an optional floating control (with or without spring return) damper motor. This actuator is powered through the controller to position an outside air damper.

Relay Module

The Equipment controller interposing relay module consists of four high voltage (240 Vac, 1.2A maximum) relay contacts mounted on a printed circuit board. A relay module must be used when one of the following conditions exists:

- The controlled load is high voltage AC (greater than 24 Vac).
- The controlled load is DC.
- The controlled load is powered from a transformer that is separate from the transformer used to power the controller.
- The VA of load exceeds 12 VA on a single DO.

NOTE:
See local codes (National Electrical Code Handbook) when mixing Class I and Class II wiring.



Related Equipment

- Damper Actuator (floating control) (optional)
- Mixed Air or Auxiliary Temperature Sensor (optional)
- Relay Module
- Room Temperature Sensor

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

Chapter 2 – Applications

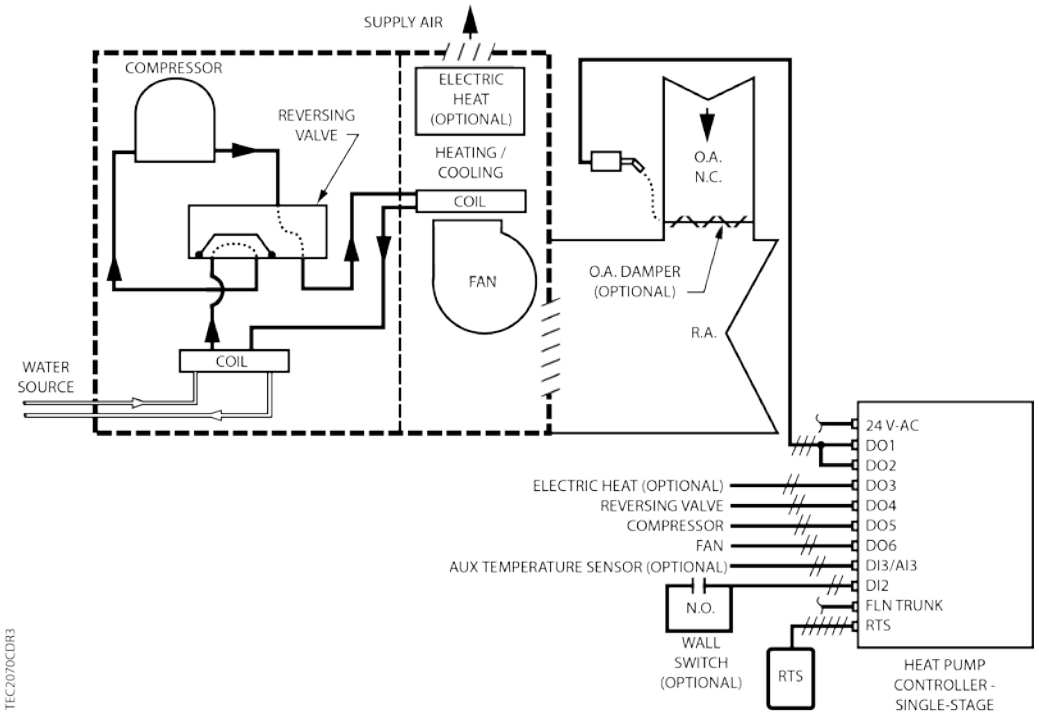
The Siemens TEC Heat Pump Controller Single Stage provides Direct Digital Control (DDC) technology for various compressor heat pump applications. Temperature control varies with the application. If present, mixed air temperature control a stage of electric heat can be provided.

Basic Operation

The Siemens TEC Heat Pump Controller Single Stage provides Direct Digital Control (DDC) technology for various compressor heat pump applications.

Application 2070 Single Compressor Heat Pump with Reversing Valve

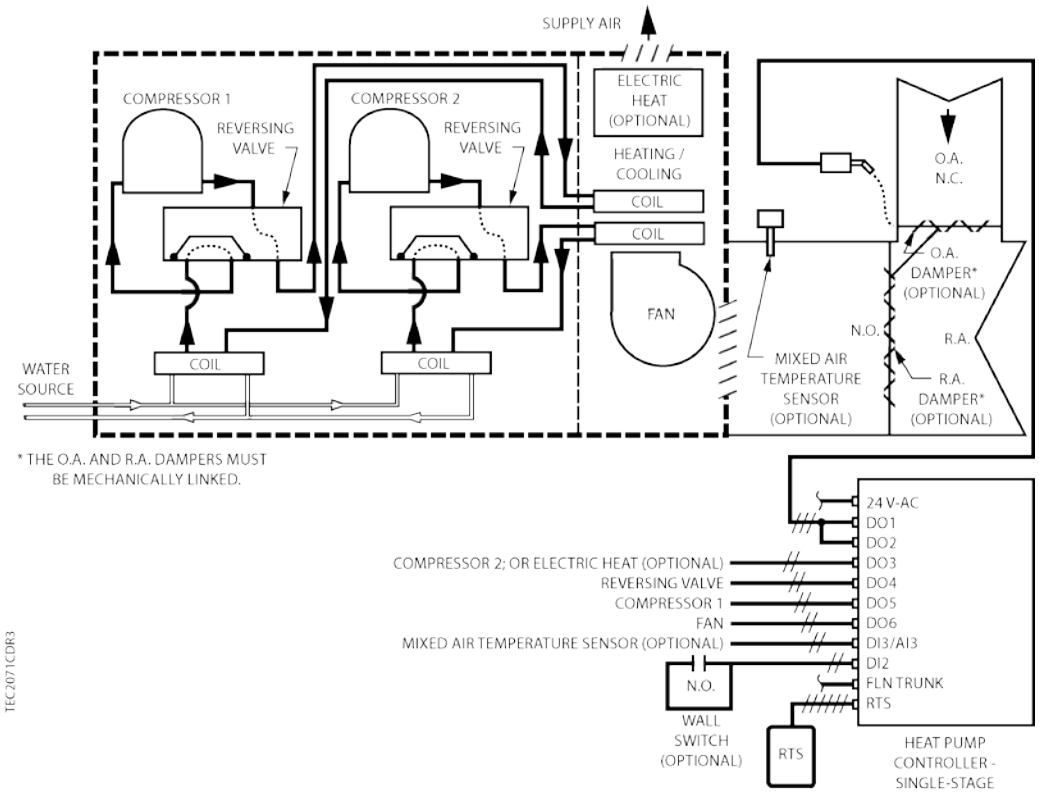
In Application 2070, the controller controls a single stage compressor heat pump with a reversing valve. In addition to a compressor, this heat pump may also be equipped with electric heat for auxiliary heat and optional outdoor air damper can be provided for ventilation air.



Application 2070 Control Diagram.

Application 2071 Two Compressor Heat Pump with Reversing Valve and Mixed Air Control

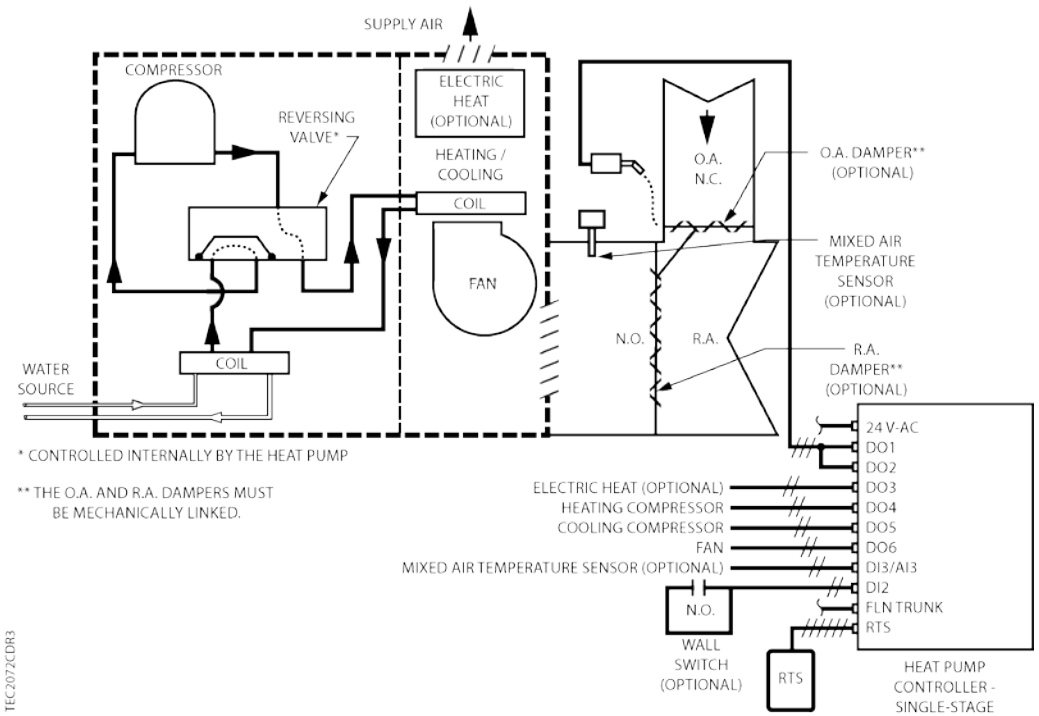
In Application 2071, the controller controls a two compressor heat pump with a reversing valve. In place of the second compressor, this heat pump may also be equipped with electric heat for auxiliary heat. Mixed air control for ventilation and free cooling is also available.



Application 2071 Control Diagram.

Application 2072 Heating and Cooling Heat Pump with Internal Reversing Valve and Mixed Air Control

In Application 2072, the controller controls a heating compressor for heating and a cooling compressor for cooling. The reversing valve is controlled internally by the heat pump. In addition to compressors, this heat pump may also be equipped with electric heat for auxiliary heat, mixed air control for free cooling, and ventilation air. This application also controls small air handling units with two position heating and cooling control.



Application 2072 Control Diagram.

Application 2090 Heat Pump Slave Mode

Using Auxiliary Points

It is possible to have extra points available on a Siemens TEC Heat Pump Controller Single Stage 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.

Chapter 3 – Point Database

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

Descriptor	Address[1]	Application	Description
CTLR ADDRESS	01	2070, 2071, 2072, 2090	Identifies the controller on the LAN trunk.
APPLICATION	02	2070, 2071, 2072, 2090	Identification number of the program running in the controller. Valid input: **2070, 2071, 2072, 2090**
RETURN DELAY	03	2070, 2071, 2072	Amount of time, in minutes, the heat pump will remain off after a return from power failure.
ROOM TEMP	{04}	2070, 2071, 2072, 2090	Actual reading from the room temperature sensor.
HEAT.COOL	{05}	2070, 2071, 2072	Current mode of operation for applications that can be either a heating mode or a cooling mode.
DAY CLG STPT	06	2070, 2071, 2072	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*. Valid entry range: 48° to 95°F (9°to 35°C)
DAY HTG STPT	07	2070, 2071, 2072	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*. Valid entry range: 48° to 95°F (9° to 35°C)
NGT CLG STPT	08	2070, 2071, 2072	Temperature setpoint in degrees that the controller maintains during night periods in cooling mode. Valid entry range: 48° to 95°F (9° to 35°C)
NGT HTG STPT	09	2070, 2071, 2072	Temperature setpoint in degrees that the controller maintains during night periods in heating mode. Valid entry range: 48° to 95°F (9° to 35°C)
RM STPT MIN	11	2070, 2071, 2072	Minimum temperature setpoint in degrees that the controller can use from the setpoint dial. This overrides any temperature setpoint from the setpoint dial that falls below this minimum. Valid entry range: 48° to 95°F (9° to 35°C)
RM STPT MAX	12	2070, 2071, 2072	Maximum temperature setpoint in degrees that the controller can use from the setpoint dial. This overrides any temperature setpoint from the setpoint dial that raises above this maximum. Valid entry range: 48° to 95°F (9° to 35°C)
RM STPT DIAL	13	2070, 2071, 2072, 2090	Temperature setpoint in degrees from the room temperature sensor (not available on all temperature sensor models). This setpoint will be used for control in day mode (heating or cooling) when enabled by STPT DIAL (Point 14). Valid entry range: 48° to 95°F (9° to 35°C)
STPT DIAL	14	2070, 2071, 2072	YES indicates that there is a room setpoint dial on the room temperature sensor and must be used as the temperature setpoint for control in day/occupied mode. NO indicates that the appropriate preset setpoint will be used as the temperature setpoint for control in day/occupied heating or cooling mode.

Descriptor	Address[1]	Application	Description
			Valid input: **YES** or **NO**
AUX TEMP	15	2070, 2071, 2072, 2090	Actual reading from a 100K Ω thermistor connected to the controller's AI 3 input. When a thermistor is connected at AI 3, DI 3 is not available. See *DI 3*. The physical input can not be used for both analog and digital input at the same time.
WALL SWITCH	18	2070, 2071, 2072, 2090	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	2070, 2071, 2072, 2090	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	2070, 2071, 2072, 2090	Amount of time, in hours, that the controller will operate in day/occupied mode when the override switch is pressed while the controller is in night/ unoccupied mode.
NGT OVRD	21	2070, 2071, 2072	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.
FREE CLG	23	2071, 2072	Point commanded by the field panel PPCL to enable or disable mixed air control (free cooling).
DI 2	24	2070, 2071, 2072, 2090	Actual status of a contact connected to the controller at DI 2. ON indicates that the contact is closed; OFF indicates that the contact is open. If a wall switch is used, it is connected to DI 2. See *WALL SWITCH*.
DI 3	25	2070, 2071, 2072, 2090	Actual status of a contact connected to the controller at AI 3/DI 3. ON indicates that the contact is closed; OFF indicates that the contact is open. When a contact is connected at DI 3, AI 3 is not available. See Point number 15. The physical input can not be used for both analog and digital input at the same time.
DAY.NGT	29	2070, 2071, 2072, 2090	Indicates the mode in which the controller is operating. Day temperature setpoints are used in day mode. Night temperature setpoints are used in night mode. This point is normally set by the field panel.
DO 1	41	2070, 2071, 2072, 2090	Digital output 1 controls a 24 Vac load with an ON or OFF status. If Motor 1 is enabled, DO 1 is coupled with DO 2 to control an actuator.
DO 2	{42}	2070, 2071, 2072, 2090	Digital output 2 controls a 24 Vac load with an ON or OFF status. If Motor 1 is enabled, DO 2 is coupled with DO 1 to control an actuator.
DO 3	{43}	2090	Digital output 3 controls a 24 Vac load with an ON or OFF status. If Motor 2 is enabled, DO 3 is coupled with DO 4 to control an actuator.
ELEC HEAT	43	2070, 2072	This output controls the contact for the first stage of electric heat and has a status of ON or OFF.
EHEAT1.CMP2	43	2071	This output controls the contact for the first stage of electric

Descriptor	Address[1]	Application	Description
			heat or for compressor 2. If used for compressor 2, then CMP TOTL must be set to 2.
DO 4	44	2090	Digital output 4 controls a 24 Vac load with an ON or OFF status. If Motor 2 is enabled, DO 3 is coupled with DO 4 to control an actuator.
HTG CMP 1	44	2072	Digital output used to control the heating compressor 1.
REV VALVE	44	2070, 2071	Digital output used to control the reversing valve. COOL and HEAT status is indicated for the 24 Vac valve or relay. The default configuration is energized for HEAT. The configuration may be reversed in DO DIR.REV.
CLG CMP 1	45	2072	Digital output used to control cooling compressor 1.
COMPRESSOR	45	2070	Digital output used to control the compressor. ON or OFF status is indicated for the 24 Vac relay.
COMPRESSOR 1	45	2071	Digital output used to control compressor 1. ON or OFF status is indicated for the 24 Vac relay.
DO 5	45	2090	Digital output 5 controls a 24 Vac load with an ON or OFF status. If Motor 3 is enabled, DO 5 is coupled with DO 6 to control and actuator.
DO 6	46	2090	Digital output 6 controls a 24 Vac load with an ON or OFF status. If Motor 3 is enabled, DO 6 is coupled with DO 5 to control and actuator.
FAN	46	2070, 2071, 2072	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	2070, 2071, 2072	Value to which the damper motor is commanded in percent of full travel.
MTR1 COMD	48	2090	Value to which the Motor 1 actuator is commanded in percent of full travel.
DMPR POS	49	2070, 2071, 2072	Current position of the damper motor in percent of full travel. This value is calculated based on motor run time.
MTR1 POS	49	2090	Current position of the damper motor in percent of full travel. This value is calculated based on motor run time. See *MTR1 TIMING*.
MTR TIMING	51	2070, 2071, 2072	The time, in seconds, required for the damper actuator to travel from full closed to the full open position.
MTR1 TIMING	51	2090	The time, in seconds, required for the Motor 1 actuator to travel from full closed to the full open position.
MTR2 POS	53	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 to *MTR2 TIMING*.
MR2 TIMING	55	2090	The time, in seconds, required for the Motor 2 actuator to travel from full closed to the full open position.
DMPR ROT ANG	56	2070, 2071, 2072	Number of degrees the damper is free to travel.
DPR1 ROT ANG	56	2090	Number of degrees that damper 2 is free to travel.
DPR2 ROT ANG	57	2090	Number of degrees that damper 2 is free to travel.
MTR SETUP	58	2070, 2071, 2072, 2090	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

Descriptor	Address[1]	Application	Description
			enabled.
DO DIR.REV	59	2070, 2071, 2072, 2090	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	2070, 2071, 2072	YES indicates that the fan should cycle ON and OFF with the compressor during day mode. NO indicates that the fan should remain ON constantly in day mode. Valid input: **YES** or **NO** **NOTE:** In either case, the fan will cycle during night mode.
FREE CLG ON	61	2071, 2072	Value, in percent, that the cooling loopout must exceed for free cooling to turn ON.
FREE CLG OFF	62	2071, 2072	Value, in percent, that the cooling loopout must exceed for free cooling to turn OFF.
CLG P GAIN	63	2070, 2071, 2072	Proportional gain value for the cooling temperature control loop.
CLG I GAIN	64	2070, 2071, 2072	Integral gain value for the cooling temperature control loop.
CLG D GAIN	66	2070, 2071, 2072	Derivative gain value for the cooling temperature control loop.
CLG BIAS	66	2070, 2071, 2072	Biasing of the cooling temperature control loop. See *CLGLOOPOUT*.
HTG P GAIN	67	2070, 2071, 2072	Proportional gain value for the heating temperature control loop.
HTG I GAIN	68	2070, 2071, 2072	Integral gain value for the heating temperature control loop.
HTG D GAIN	69	2070, 2071, 2072	Derivative gain value for the heating temperature control loop.
HTG BIAS	70	2070, 2071, 2072	Biasing of the heating temperature control loop. See *HTG LOOPOUT*.
MA P GAIN	71	2071, 2072	Proportional gain value for the mixed air control loop.
MA I GAIN	72	2071, 2072	Integral gain value for the mixed air control loop.
MA D GAIN	73	2071, 2072	Derivative gain value for the mixed air control loop.
MA BIAS	74	2071, 2072	Biasing of the mixed air control loop.
CMP TOTL	75	2071	Number of compressors used by the application. Valid values: **0, 1, 2**
HTG CMP TOTL	75	2072	Number of heating compressors used by the application. Valid values: **0, 1**
EHTG STG CNT	76	2071, 2072	Number of electric heating stages used by the application. Valid values: **0, 1**
CLG CMP TOTL	77	2072	Number of cooling compressors used by the application. Valid values: **0, 1**
CTL TEMP	78	2070, 2071, 2072	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	2070, 2071, 2072	Cooling temperature control loop output value in percent.
HTG LOOPOUT	80	2070, 2071, 2072	Heating temperature control loop output value in percent.
EHEAT 1 ON	81	2071	Value, in percent, that the heating loopout must exceed for the first stage of electric heat to turn ON.
ELEC HEAT ON	81	2070, 2072	Value, in percent, that the heating loopout must exceed for the

Descriptor	Address[1]	Application	Description
			electric heat to turn ON.
CMP ON	82	2070	Value, in percent, which the active temperature control loop output must exceed for the compressor to turn ON. Actual turn on is subject to the CMP1 MIN OFF time being expired. It is also the value, in percent, which HTG LOOPOUT must go below for the electric heat (ELEC HEAT) to turn OFF.
CMP1 ON	82	2071	Value, in percent, that the active temperature control loop output must exceed for compressor 1 to turn ON. Actual turn on is subject to the CMP MIN OFF time being expired. It is also the value, in percent, which HTG LOOPOUT must go below for the electric heat (ELEC HEAT 1) to turn OFF when only one compressor is used.
HTG CMP1 ON	82	2072	Value, in percent, that the heating temperature control loop output must exceed for heating compressor 1 to turn ON. Actual turn on is subject to the HTG1 MIN OFF time being expired.
CMP OFF	83	2070	Value, in percent, which the active temperature control loop output must go below for the compressor to turn OFF. Actual turn off is subject to the CMP1 MIN ON time being expired.
CMP1 OFF	83	2071	Value, in percent, that the active temperature control loop output must go below for compressor 1 to turn OFF. Actual turn off is subject to the CMP1 MIN ON time being expired.
HTG CMP1 OFF	83	2072	Value, in percent, that the heating temperature control loop output must go below for heating compressor 1 to turn OFF. Actual turn off is subject to the HTG1 MIN ON time being expired.
RVAL SWITCH	84	2070, 2071	Value, in percent, that the active temperature control loop output must go above for the reversing valve to switch. Actual switchover is subject to the status of HEAT.COOL, RVAL SW TIME, and HTG LOOPOUT or CLG LOOPOUT.
SWITCH LIMIT	85	2070, 2071, 2072	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	2070, 2071, 2072	Time, in minutes, that must expire to switch between cooling mode and heating mode. Actual switchover depends on the active temperature control loop being below the value of SWITCH LIMIT and exceeding the value of SWITCH DBAND.
CMP MIN OFF	87	2070	Minimum time, in minutes, which the compressor will remain OFF before turning ON.
CMP1 MIN OFF	87	2071	Minimum time, in minutes, that compressor 1 will remain OFF before turning ON.
HTG1 MIN OFF	87	2072	Minimum time, in minutes, that heating compressor 1 will remain OFF before turning ON.
CMP MIN ON	88	2070	Minimum time, in minutes, which the compressor will remain ON before turning OFF.
CMP1 MIN ON	88	2071	Minimum time, in minutes, that compressor 1 will remain ON before turning OFF.
HTG1 MIN ON	88	2072	Minimum time, in minutes, that heating compressor 1 will remain ON before turning OFF.
RVAL SW TIME	89	2070, 2071	Length of time the compressor must be OFF before the

Descriptor	Address[1]	Application	Description
			reversing valve can switch modes.
SWITCH DBAND	90	2070, 2071, 2072	Temperature range in degrees that 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 the active temperature control loop output being below SWITCH LIMIT and SWITCH TIME being expired.
NGT MA CTL	91	2071, 2072	YES indicates that mixed air control should occur during night mode. NO indicates that mixed air control will not occur during night mode. Valid input: **YES** or **NO**.
CTL STPT	92	2070, 2071, 2072	Actual setpoint value being used as input for the active temperature control loop.
MA STPT	93	2071, 2072	Setpoint of the mixed air control loop.
CAL TIMER	96	2070, 2071, 2072, 2090	Time interval, in hours, between the calibration sequence.
LOOP TIME	98	2070, 2071, 2072	Time, in seconds, between control loop calculations.
ERROR STATUS	99	2070, 2071, 2072, 2090	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) 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 Heat Pump Controller Single Stage) that house the applications software used to control terminal units, such as heat pumps, VAV terminal boxes, fan coil units, unit ventilators, etc.

UI

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

unbundle

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

VAV

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

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