TEC2645-2 BACnet® MS/TP Networked Thermostat with Single Proportional Output and One-Speed Fan Control

Installation Instructions

Applications

The TEC2645-2 Thermostat is a BACnet® Master-Slave/Token-Passing (MS/TP) networked device that provides control of two-pipe fan coils, cabinet unit heaters, or other equipment using a proportional 0 to 10 VDC control input and one-speed fan control. The technologically advanced TEC2645-2 Thermostat features a Building Automation System (BAS) BACnet MS/TP communication capability that enables remote monitoring and programmability for efficient space temperature control.

The TEC2645-2 Thermostat features an intuitive user interface with backlit display that makes setup and operation quick and easy. The thermostat also employs a unique, Proportional-Integral (PI) time-proportioning algorithm that virtually eliminates temperature offset associated with traditional, differential-based thermostats.

IMPORTANT: The TEC2645-2 Thermostat is intended to provide an input to equipment under normal operating conditions. Where failure or malfunction of the thermostat could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the control system. Incorporate and maintain other devices such as supervisory or alarm systems or safety or limit controls intended to warn of, or protect against, failure or malfunction of the thermostat.

North American Emissions Compliance

United States

This equipment 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 harmful interference when this equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his/her own expense.

Canada

This Class (A) digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Classe (A) respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Installation

Location Considerations

Locate the TEC2645-2 Thermostat:

- on a partitioning wall, approximately 5 ft (1.5 m) above the floor in a location of average temperature

- away from direct sunlight, radiant heat, outside walls, behind doors, air discharge grills, stairwells, or outside doors

- away from steam or water pipes, warm air stacks, unconditioned areas (not heated or cooled), or sources of electrical interference

Note: Allow for vertical air circulation to the TEC2645-2 Thermostat.

To install the thermostat:

1. Use a Phillips-head screwdriver to remove the security screw on the bottom of the thermostat cover.

2. Pull the bottom edge of the thermostat cover and open the thermostat as illustrated in Figure 1.
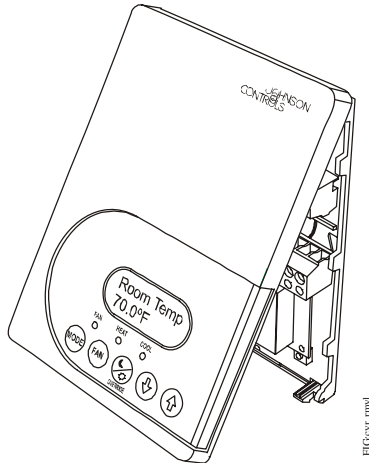

Figure 1: Removing the Thermostat Cover

3. Carefully pull the locking tabs on the right side of the thermostat mounting base and unlock the Printed Circuit Board (PCB). Open the PCB to the left as illustrated in Figure 2.
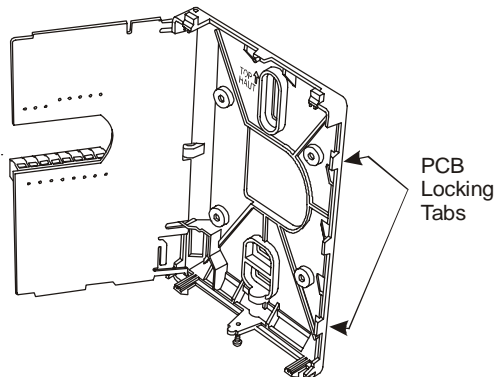

Figure 2: Opening the Thermostat PCB

4. Pull approximately 6 in. (152 mm) of wire from the wall and insert the wire through the hole in the thermostat mounting base.

5. Align the thermostat mounting base on the wall and use the base as a template to mark the two mounting hole locations.

Note: Be sure to position the thermostat mounting base so that the arrow on the base points upward to indicate the top of the thermostat.

6. Drill a 3/16 in. (5 mm) hole at each of the two marked locations and tap nylon anchors (included with the thermostat) flush to the wall surface.

7. Position the thermostat mounting base on the wall and use the two mounting screws (included with the thermostat) to secure the base to the surface as illustrated in Figure 3.

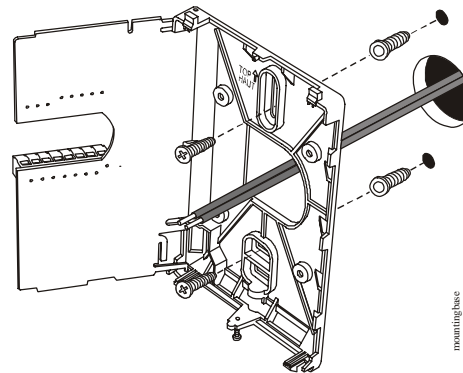**Note:** Be careful not to overtighten the mounting screws.

Figure 3: Securing the Thermostat Mounting Base to the Wall

8. Swing the PCB back to the right and carefully snap it into the locking tabs on the thermostat mounting base.

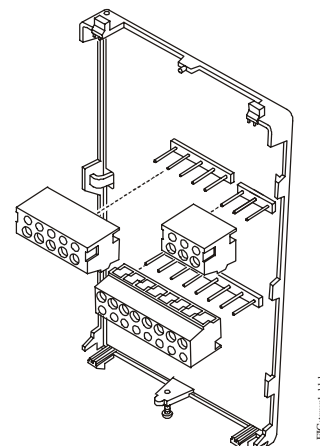9. Remove the screw terminal blocks as illustrated in Figure 4.

Figure 4: Removing the Screw Terminal Blocks

Wiring

When an existing thermostat is replaced, remove and label the wires to identify the terminal functions. When a TEC2645-2 Thermostat is replaced, simply remove the old screw terminal blocks and reinsert them onto the PCB of the replacement thermostat.

⚠	**CAUTION: Risk of Electric Shock.** Disconnect the power supply before making electrical connections to avoid electric shock.

⚠	**CAUTION: Risk of Property Damage.** Do not apply power to the system before checking all wiring connections. Short circuited or improperly connected wires may result in permanent damage to the equipment.

IMPORTANT: Make all wiring connections in accordance with local, national, and regional regulations. Do not exceed the electrical ratings of the TEC2645-2 Thermostat.

To wire the thermostat:

1. Strip the ends of each wire 1/4 in. (6 mm) and connect them to the appropriate screw terminals as indicated in Figure 5.

Note: For more details on wiring the MS/TP Communications Bus, refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034).*

2. Carefully push any excess wire back into the wall.

Note: Seal the hole in the wall with fireproof material to prevent drafts from affecting the ambient temperature readings.

3. Reinsert the screw terminal blocks onto the PCB.

4. Reattach the MS/TP communication wires to the terminal block.

Note: If multiple wires are inserted into the terminals, be sure to properly twist the wires together prior to inserting them into the terminal connectors.

5. Reattach the thermostat cover to the mounting base (top side first).

6. Use a Phillips-head screwdriver to reinstall the security screw on the bottom of the thermostat cover.

| Terminal Number	Terminal Label	Function	
3	Fan	Fan On	
4	24 V~ Hot	24 VAC from Transformer	
5	24 V~ Com	24 VAC (Common) from Transformer	
6	BO5 Aux	Aux BO	Auxiliary
7	BO5 Aux	Aux BO	Output
10	AO1	Analog Output 0 to 10 VDC	
11	Blank	Blank	
12	BI1	Configurable Binary Input 1	
14	Scom	Sensor Common	
15	BI2	Configurable Binary Input 2	
16	UI3	Configurable Universal Input 3	
Blank	+, -, REF	MS/TP Bus	
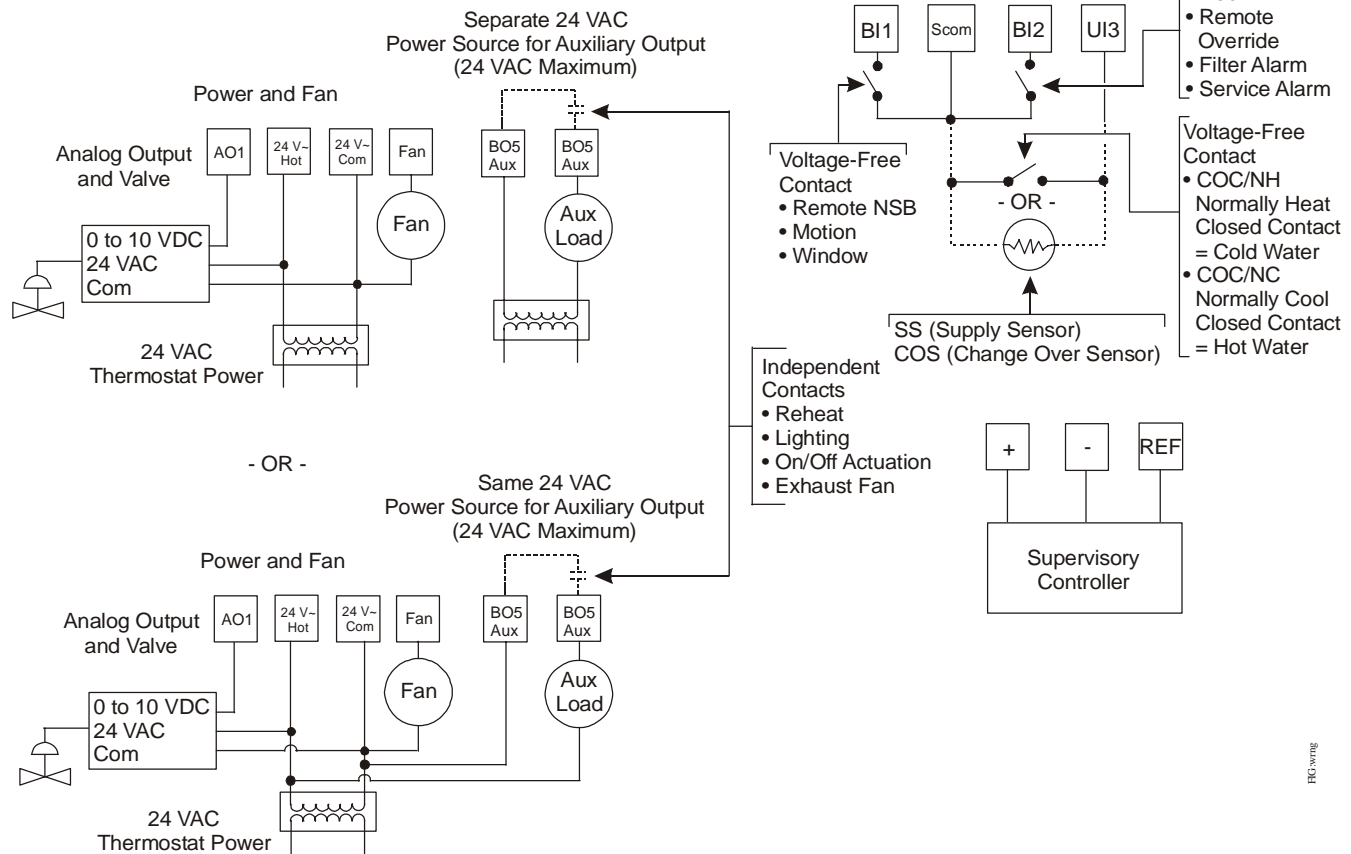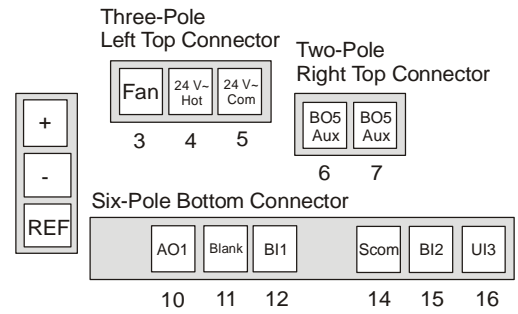
Figure 5: Wiring the TEC2645-2 Thermostat

Table 1:   MS/TP Bus Objects (Part 1 of 3)

Point Name	Thermostat Point (Type/Address)	Range
Room Temp[1, 2]	AV 6	-40.0°F/-40.0°C to 122.0°F/50.0°C
Room Temp Override[3]	BV 7	0 = Normal 1 = Override
Outdoor Temperature[3, 4]	AV 8	-40.0°F/-40.0°C to 122.0°F/50.0°C
Sequence of Operation[3]	MSV 39	0 = Cooling Only 1 = Heating Only 2 = Cooling and Reheat 3 = Heating and Reheat
System Mode[3]	MSV 13	1 = Off 2 = Auto 3 = Cool 4 = Heat
Fan Mode[3]	MSV 14	1 = On 2 = Auto
Occupancy[3]	MSV 12	1 = Resume Schedule 2 = Occupied 3 = Unoccupied 4 = Temporary Occupied
PI Heating Demand[5]	AV 54	0 to 100%
PI Cooling Demand[5]	AV 55	0 to 100%
Supply Temperature[5]	AI 11	-40.0°F/-40.0°C to 122.0°F/50.0°C
AUX (BO5) Status[5]	BI 65	0 = Off 1 = On
AUX (BO5) Output[3]	BV 47	0 = Off 1 = On
Fan Status[2, 5]	MSV 68	1 = Off 4 = High
BI1 Status[5, 6]	BI 62	0 = Deactivated 1 = Activated
BI2 Status[5, 6]	BI 63	0 = Deactivated 1 = Activated
UI3 Status[5, 6]	BI 64	0 = Deactivated 1 = Activated
Window Alarm[5]	BI 58	0 = Off 1 = On
Filter Alarm[5]	BI 59	0 = Off 1 = On
Service Alarm[5]	BI 60	0 = Off 1 = On
Occupied Heat Setpoint[3, 7]	AV 49	40.0°F/4.5°C to 90.0°F/32.0°C
Occupied Cool Setpoint[3, 7]	AV 50	54.0°F/12.0°C to 100.0°F/37.5°C
Unoccupied Heat Setpoint[3, 7]	AV 51	40.0°F/4.5°C to 90.0°F/32.0°C
Unoccupied Cool Setpoint[3, 7]	AV 52	54.0°F/12.0°C to 100.0°F/37.5°C

Table 1: MS/TP Bus Objects (Part 2 of 3)

Point Name	Thermostat Point (Type/Address)	Range
Keypad Lockout[3]	MSV 40	1 = Level 0 2 = Level 1 3 = Level 2 4 = Level 3 5 = Level 4 6 = Level 5
BI1 Configuration[3]	MSV 16	1 = None 2 = Rem NSB 3 = Motion NO 4 = Motion NC 5 = Window
BI2 Configuration[3]	MSV 17	1 = None 2 = Door Dry 3 = Override 4 = Filter 5 = Service
UI3 Configuration[3]	MSV 18	1 = None 2 = COC/NH 3 = COC/NC 4 = COS 5 = SS
Menu Scroll[3]	BV 19	0 = No Scroll 1 = Scroll Active
Auto Mode Enable[3]	BV 20	0 = Disabled 1 = Enabled
Temperature Scale[3]	BV 21	0 = °C 1 = °F
AUX (BO5) Configuration[3]	MSV 24	1 = Not Used 2 = NO with Occ 3 = NC with Occ 4 = NO with Occ and Fan 5 = NC with Occ and Fan 6 = Network Controlled
Heating Setpoint Limit[3]	AV 27	40.0°F/4.5°C to 90.0°F/32.0°C
Cooling Setpoint Limit[3]	AV 28	54.0°F/12.0°C to 100.0°F/37.5°C
Setpoint Type[3]	BV 29	0 = Permanent 1 = Temporary

Table 1: MS/TP Bus Objects (Part 3 of 3)

Point Name	Thermostat Point (Type/Address)	Range
Temporary Occupancy Time[3]	MSV 30	1 = 0 Hours 2 = 1 Hour 3 = 2 Hours 4 = 3 Hours 5 = 4 Hours 6 = 5 Hours 7 = 6 Hours 8 = 7 Hours 9 = 8 Hours 10 = 9 Hours 11 = 10 Hours 12 = 11 Hours 13 = 12 Hours 14 = 13 Hours 15 = 14 Hours 16 = 15 Hours 17 = 16 Hours 18 = 17 Hours 19 = 18 Hours 20 = 19 Hours 21 = 20 Hours 22 = 21 Hours 23 = 22 Hours 24 = 23 Hours 25 = 24 Hours
Door Time[3]	MSV 31	1 = 1 Minute 2 = 2 Minutes 3 = 3 Minutes 4 = 4 Minutes 5 = 5 Minutes 6 = 6 Minutes 7 = 7 Minutes 8 = 8 Minutes 9 = 9 Minutes 10 = 10 Minutes
Deadband[3]	AV 32	2F°/1C° to 5F°/3C°
Reheat Time Base (BO5)[3]	BV 33	0 = 15 Minutes 1 = 10 Seconds
Direct/Reverse Acting[3]	BV 38	0 = Direct Acting 1 = Reverse Acting
TEC2645-aaa[8, 9]	Device 73aaa	N/A
Digital Outputs	BV 70 to BV 77	N/A (Future Use)

1. This MS/TP Bus object is readable and only writable if the corresponding override object is set. (For example, **Room Temp** has a corresponding override object of **Room Temp Override**. This corresponding override object needs to be set to *1 = Override* to be able to write **Room Temp** to a different value.)
2. This MS/TP Bus object may automatically release after 10 minutes with no BACnet traffic.
3. This MS/TP Bus object is readable and writable.
4. This MS/TP Bus object is valid only if it is written via the network.
5. This MS/TP Bus object is readable only.
6. The BI object type status is available even if the configuration is set to **None**.
7. If one setpoint of a pair of heating and cooling setpoints (for example, **Occupied Heat Setpoint** and **Occupied Cool Setpoint**) is overridden, the other setpoint of the pair may be automatically adjusted by the thermostat to maintain the minimum deadband between the two setpoints.
8. The designation **aaa** is the address of the device (from **004** to **127**) on the MS/TP network.
9. Max_Master is writable.

Connecting the MS/TP Bus

To connect the MS/TP Bus:

1. Set the MS/TP address of the TEC2645-2 Thermostat per the engineering drawings and test for bus voltage, polarity, and isolation prior to wiring the MS/TP Bus. (See the *Com addr* parameter in Table 3 to set the MS/TP address for the thermostat.)

Note: Pressing and holding the **UP/DOWN** arrow keys simultaneously displays the assigned MS/TP address.

Note: The wiring rules for the MS/TP Bus differ from the wiring rules for the N2 Bus. For more details on wiring the MS/TP Communications Bus, refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034)*.

2. Observe the polarity when connecting the bus wires to the thermostat.

3. After the bus wires are connected to the first thermostat, continue in a daisy-chained fashion to the next thermostat.

Note: The bus wiring must be twisted-pair lines. Do not run the bus wiring in the same conduit as line voltage wiring (30 VAC or above) or other wiring that switches power to highly inductive loads (such as contactors, coils, motors, or generators).

The MS/TP Bus requires proper termination and biasing at each end of a segment (a segment is a physically continuous length of wire). The thermostat is not equipped with the ability to provide this termination; therefore, it is not recommended that it be located at the physical ends of a bus segment.

Note: See Table 4 for end-of-line terminator ordering information.

It is recommended that the thermostat be configured for automatic baud rate detection. Do not exceed the maximum number of devices allowed on a Field Bus. Be sure that the wiring terminations are set correctly, and that all communication wiring is daisy-chained with no taps.

A small green light under the thermostat cover (on the left edge when facing the thermostat) indicates the communications mode when the thermostat is operating. The following blink codes may be seen:

- Short-Short-Long: Indicates that the baud rate is known and that communication is active.

- Short-Short: Indicates that the thermostat is scanning for the correct baud rate and that there is no communication.

- Off: Indicates that there is no power to the thermostat or that the MS/TP wiring polarity is reversed.

- Long: Indicates that the MS/TP communication daughter board is the wrong type for the main board.

MS/TP Thermostat Mapping

Preparation

Before mapping a TEC2645-2 Thermostat into a Network Automation Engine (NAE):

1. Decide which point objects within the thermostat need to be mapped. Only map the point objects that need to be viewed on a regular basis, since excessive mapping lowers system performance. Suggested point objects for mapping include: Room Temp, System Mode, Fan Status, Occupied Heat Setpoint, Occupied Cool Setpoint, Unoccupied Heat Setpoint, and Unoccupied Cool Setpoint. In addition, alarm points may be mapped if they are used, and other point objects may be mapped if required. Use the Engineering view to examine infrequently used point objects.

Note: It is recommended that all thermostat configuration parameters be set as desired prior to mapping the objects into the controller. If any thermostat configuration parameters are altered after the objects are mapped into the controller, it is recommended that all objects be re-mapped.

2. Verify that a Field Bus is defined in the NAE. BACnet MS/TP devices attach to a Field Bus. Refer to the *BACnet MS/TP Integration with the NAE Technical Bulletin (LIT-12011013)* for instructions on how to define a Field Bus.

3. Verify that a BACnet Integration is defined for the Field Bus. The thermostat is mapped as a BACnet device under a Field Bus BACnet Integration. Refer to the *BACnet System Integration with NAE Technical Bulletin (LIT-1201531)* for instructions on how to define a BACnet Integration.

At this point, the thermostat and the required point objects inside the thermostat can be mapped.

Adding a Thermostat

A thermostat must be added before its points can be mapped. To do this, select the BACnet Integration under the Field Bus (refresh the tree view if required to see a newly added BACnet Integration) and choose Field Device from the Insert menu. Assisted Definition using Auto Discovery is the easiest way to add a new thermostat online; however, this requires that the thermostat that is to be added is connected and ready to communicate.

Device object names used with BACnet Communication must be unique to fully satisfy the requirements of BACnet. The thermostat automatically selects a device object name for itself using the format **TEC2645-aaa**, where **aaa** designates the address selected (from **004** to **127**) on the MS/TP network. If this name needs to be changed by writing a new one into the thermostat device object, that should be done before any point objects are mapped. Be sure that the name of the new thermostat being added to the NAE matches that of the thermostat itself. This name goes into the Name field, Object section, Configuration tab of the Configure step in the Insert Field Device Wizard.

Device object IDs used with BACnet communications must be unique to fully satisfy the requirements of BACnet. The thermostat automatically selects a device object ID for itself using the format **73aaa**, where **aaa** designates the address selected (from **004** to **127**) on the MS/TP network (for example, **73004**, **73005**). If this ID needs to be changed by writing a new one into the thermostat device object, that should be done before any point objects are mapped. Be sure that the ID of the new thermostat being added to the NAE matches that of the thermostat itself. This number goes into the Instance Number field, Network section, Hardware tab of the Configure step in the Insert Field Device Wizard.

Adding Point Objects

The required point objects must be mapped under the thermostat device. To accomplish this, select the thermostat device under the BACnet Integration (refresh the tree view if required to see a newly added thermostat device) and choose Field Point from the Insert menu. Assisted Definition using Auto Discovery is the easiest way to add new point objects online; however, this requires that the thermostat that is to be mapped is connected and ready to communicate.

When mapping point objects, the point type must match the BACnet object type (for example, AV, MV, BI), and the point instance number must match the point BACnet instance number.

Overriding via the NAE

The last override command to any point object is used or saved.

One override can be used at a time at each point object (for example, if an override from the network is active, the local adjustment and internal control are disabled).

If a setpoint is overridden, the thermostat adjusts the other setpoint, if necessary, to maintain the minimum deadband between the two setpoints. The setpoints can be spread further apart, but can never be adjusted closer than 2F°/1C° or the Deadband parameter selection.

All network overrides are released automatically after 10 minutes of no communication to any other device (for example, if the network cable is removed from the thermostat). Other devices can be the NAE, another thermostat, or a VAV Modular Assembly (VMA).

Setup and Adjustments
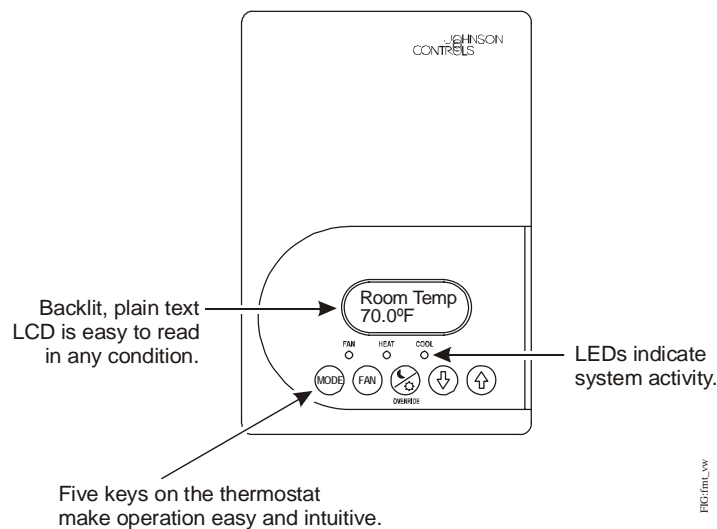
Thermostat Operation Overview

Figure 6: Front Cover of Thermostat

Thermostat User Interface Keys

The TEC2645-2 Thermostat user interface consists of five keys on the front cover (as illustrated in Figure 6). The function of each key is as follows:

- **MODE** key toggles among the system modes available, as defined by selecting the appropriate operation sequence in the Installer Configuration Menu (for example Off, Heat, Cool, Auto).

- **FAN** key toggles between ON and AUTO for fan control. ON energizes the fan all the time and AUTO operates the fan only on a call for heating or cooling, for both occupied and unoccupied periods.

- **OVERRIDE** key overrides the unoccupied mode to occupied at the local user interface for the specified TOccTime. (TOccTime is defined by selecting the appropriate time period in the Installer Configuration Menu.) The **OVERRIDE** key also allows access to the Installer Configuration Menu. See the *Configuring the TEC2645-2 Thermostat* section.

Note: If one of the binary inputs is configured to operate as a remote override contact, this **OVERRIDE** key is disabled.

- **UP/DOWN** arrow keys change the configuration parameters and activate a setpoint adjustment.

Backlit Liquid Crystal Display (LCD)

The TEC2645-2 Thermostat includes a 2-line, 8-character backlit display. Low-level backlighting is present during normal operation, and it brightens when any user interface key is pressed. The backlight returns to low level when the thermostat is left unattended for 45 seconds.

Light-Emitting Diodes (LEDs)

Three LEDs are included to indicate the fan status, call for heat, or call for cooling:

- The **FAN** LED is on when the fan is on.

- The **HEAT** LED is on when heating or reheat is on.

- The **COOL** LED is on when cooling is on.

Status Display Menu

The Status Display Menu is displayed during normal thermostat operation. This menu continuously scrolls through the following parameters:

- Room Temperature

- System Mode

- Occupancy Status (Occupied/Unoccupied/Override)

- Applicable Alarms – The backlight lights up as an alarm condition is displayed.

Note: An option is available within the Installer Configuration Menu to lock out the scrolling display and show only the Room Temperature parameter.

Configuring the TEC2645-2 Thermostat

The TEC2645-2 Thermostat comes from the factory with default settings for all configurable parameters. The default settings are shown in Table 3. To reconfigure the parameters via the thermostat, follow the steps in this section.

To access the Installer Configuration Menu, press and hold the **OVERRIDE** key for approximately 8 seconds. Once the Installer Configuration Menu begins, release and press the **OVERRIDE** key to scroll through the parameters listed in Table 3. When the desired parameter is displayed, use the **UP/DOWN** arrow keys to choose the desired selection option. Then press and release the **OVERRIDE** key to continue scrolling through the parameters.

Note: Pressing the **FAN** key during configuration restarts the list of displayed parameters at the first parameter listed in Table 3.

When the thermostat is in the Installer Configuration Menu and left unattended for approximately 8 seconds, the thermostat reverts to the Status Display Menu.

Configuring Inputs BI1, BI2, and UI3

When BI1 and BI2 are configured for an alarm condition, an alarm condition is displayed locally when the input is closed. An alarm message is included on the scrolling Status Display Menu and when the message is displayed, the backlight momentarily lights up.

The UI3 input provides changeover of hot/cold water switching, or supply air temperature monitoring at the thermostat.

Each input can be configured to the Selection Options included in Table 3.

Configuring the Sequence of Operation (SeqOpera)

Choose the appropriate sequence of operation. The modes presented are user-dependent on the sequence of operation selected. For applications using a changeover sensor, choose the selection option **(0): Cooling Only**. Changeover occurs between **Cooling Only** and **Heating Only**. See Figure 7 through Figure 10 for sequence of operation examples.

Table 2: Selection Options for Sequence of Operation

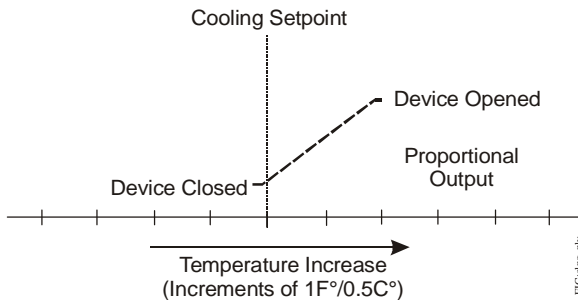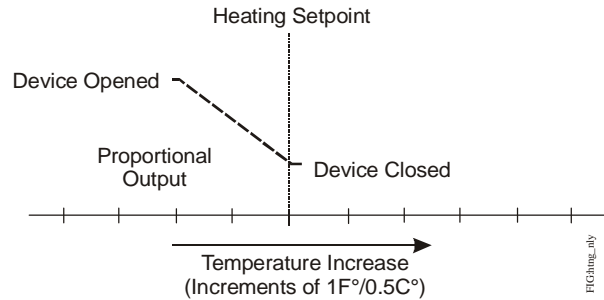| Selection Option	Control Curve	Terminal Numbers Used (See Figure 5)
0: Cooling Only	See Figure 7.	**10:** Proportional Cooling
1: Heating Only	See Figure 8.	**10:** Proportional Heating
2: Cooling and Reheat	See Figure 9.	**6 and 7:** Reheat **10:** Proportional Cooling
3: Heating and Reheat	See Figure 10.	**6 and 7:** Reheat **10:** Proportional Heating

Figure 7: Cooling Only
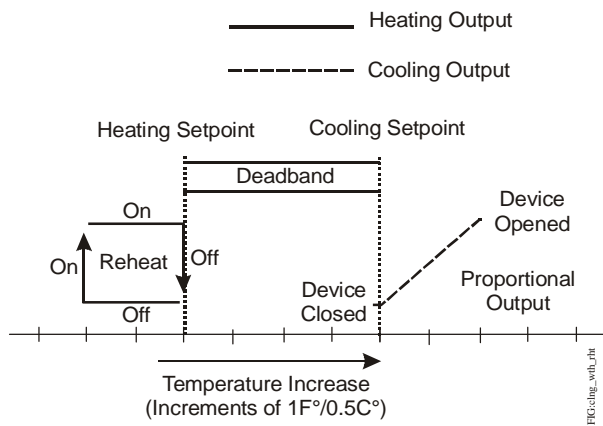

Figure 8: Heating Only
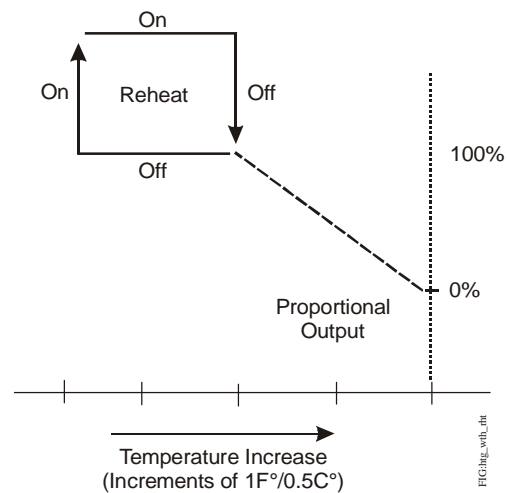
Figure 9: Cooling with Reheat

Figure 10: Heating with Reheat

Table 3: Installer Configuration Menu (Part 1 of 4)

Parameter Appearing on Display	Description and Default	Selection Options
Com addr	MS/TP address at the thermostat; coincides with the address assigned at the supervisory controller. Default: **4**	Range: **004** to **127**
BI1	Configuration of Binary Input 1. Default: **None**	**(None):** No function is associated with an input. **(Rem NSB):** Remote Night Setback (NSB) via a time clock input, an occupancy sensor, or from a voltage-free contact. Contact open = Occupied; contact closed = Unoccupied. **(MotionNO*):** Temporary occupancy request via a motion detector input. Contact open = Unoccupied. When the contact closes, the thermostat goes into the occupied mode for a specified TOccTime. Once the TOccTime begins, the thermostat remains in the occupied mode if the contact is open, until the TOccTime expires. **(MotionNC*):** Temporary occupancy request via a motion detector input. Contact closed = Unoccupied. When the contact opens, the thermostat goes into the occupied mode for a specified TOccTime. Once the TOccTime begins, the thermostat remains in the occupied mode if the contact is closed, until the TOccTime expires. **(Window**):** Cancels the thermostat heating or cooling action when a window is open. A Window alarm is displayed indicating that the window needs to be closed to resume heating or cooling. * These settings disable any local override function. **When this setting is selected, the heating and/or cooling outputs are enabled only when the contact is closed.

Table 3: Installer Configuration Menu (Part 2 of 4)

Parameter Appearing on Display	Description and Default	Selection Options
BI2	Configuration of Binary Input 2. Default: **None**	**(None):** No function is associated with an input. **(Door Dry):** Door contact only has an effect if BI1 is set to MotionNO or MotionNC. (See the *BI1* parameter earlier in this table.) The occupancy is now dictated via BI1 and BI2. Any motion detected sets the zone to Occupied status. The thermostat remains in the occupied mode until a DoorOpen is detected, at which point the thermostat goes to the unoccupied mode. If the door stays open more than the specified door time, the thermostat will remain unoccupied. (See the *DoorTime* parameter later in this table.) **(RemOVR):** Temporary occupancy request via a remote input. This override function is controlled by a manual remote occupancy override. When enabled, this condition disables the override capability of the thermostat. **(Filter):** A Filter alarm is displayed. This alarm can be connected to a differential pressure switch that monitors a filter. **(Service):** A Service alarm is displayed on the thermostat when the input is energized. This input can be tied into the air conditioning unit control card, which provides an alarm should there be a malfunction.
UI3	Configuration of Universal Input 3. Default: **None**	**(None):** No function is associated with an input. **(COC/NH):** Changeover Contact/Normally Heat: A dry contact input is used to signal seasonal hot/cold water changeover. The contact closes when cold water is present. Valid only for two-pipe systems. **(COC/NC):** Changeover Contact/Normally Cool: A dry contact input is used to signal seasonal hot/cold water changeover. The contact closes when hot water is present. Valid only for two-pipe systems. **(COS):** Changeover analog Sensor: Used for hot/cold water changeover switching. Valid only for two-pipe systems. **Note:** Choose the selection option **(0): Cooling Only** for the *SeqOpera* parameter to allow changeover to occur between **Cooling Only** and **Heating Only**. Choose the selection option **(2): Cooling and Reheat** to allow changeover to occur between **Cooling and Reheat** and **Heating and Reheat**. **(SS):** Supply Air Sensor Monitoring
MenuScro	Gives the option of having the display continuously scroll the parameters. Default: **on**	**(off):** The scroll is inactive. **(on):** The scroll is active.
AutoMode	Enables the Auto function (if Option 2 is chosen in the SeqOpera parameter) to be visible within the **MODE** key menu. (The **MODE** key is the key at the far left of the thermostat cover.) Default: **off**	**(on):** The Auto function is active (Off-Auto-Heat-Cool). Provides automatic changeover between heating and cooling. **(off):** The auto function is inactive (Off-Heat-Cool).
C or F	Provides temperature scale options for display. Default: **°F**	**(°C):** Celsius scale **(°F):** Fahrenheit scale

Table 3: Installer Configuration Menu (Part 3 of 4)

Parameter Appearing on Display	Description and Default	Selection Options			
Lockout	Selectable Lockout Levels for limiting end user keypad interaction. Default: **0**	**Lockout Level**	**Function**		
			Mode Setting	**Fan Setting**	**Local Override**	**Occupied Temperature Setpoints**
		(0)	Access	Access	Access	Access
		(1)	Access	Access	No Access	Access
		(2)	No Access	No Access	Access	Access
		(3)	No Access	No Access	No Access	Access
		(4)	No Access	No Access	Access	No Access
		(5)	No Access	No Access	No Access	No Access
SeqOpera	Determines the sequence of operation. Default: **1**	**(0):** Cooling Only (Off-Cool). The default is **Cool**. **(1):** Heating Only (Off-Heat). The default is **Heat**. **(2):** Cooling and Reheat (Off-Auto*-Heat-Cool). The default is **Heat**. **(3):** Heating and Reheat (Off-Heat). The default is **Heat**. * Auto can be disabled with the AutoMode parameter. **Note:** Choose the selection option **(0): Cooling Only** when using a changeover sensor to allow changeover to occur between **Cooling Only** and **Heating Only**.			
Unocc HT	Sets the Unoccupied Heating setpoint value. Default: **62.0°F/16.5°C**	Range: **40.0°F/4.5°C** to **90.0°F/32.0°C**	**Note:** When adjusting the temperature, press the **UP/DOWN** arrow keys to change the temperature in 0.5F°/0.5C° increments; press and hold the **UP/DOWN** arrow keys to change the temperature in 5.0F°/5.0C° increments.		
Unocc CL	Sets the Unoccupied Cooling setpoint value. Default: **80.0°F/26.5°C**	Range: **54.0°F/12.0°C** to **100.0°F/37.5°C**			
Heat max	Sets the Occupied and Unoccupied maximum Heating setpoint values. Default: **90.0°F/32.0°C**	Range: **40.0°F/4.5°C** to **90.0°F/32.0°C**			
Cool min	Sets the Occupied and Unoccupied minimum Cooling setpoint values. Default: **54.0°F/12.0°C**	Range: **54.0°F/12.0°C** to **100.0°F/37.5°C**			
Set type	Provides the option of temporarily changing the heating or cooling setpoint by pressing the **UP/DOWN** arrow keys. Default: **permnent**	**(temporar):** Local changes to the heating or cooling setpoints are temporary, and remain effective for the specified TOccTime. **(permnent):** Local changes to the heating or cooling setpoints are permanently stored in the thermostat memory.			
TOccTime	Sets the duration of the Temporary Occupancy Time when the heating or cooling setpoints in the Occupied mode are established by: • an Override Function enabled in the Main User Menu (when the thermostat is in the Unoccupied mode) • a temporary heating or cooling setpoint Default: **2.0 hrs**	Range: **0.0** to **24.0 hrs** in 1-hour increments			
DoorTime	Engages the Unoccupied mode if the door stays open minimally for the time specified. Default: **2.0 min**	Range: **1.0** to **10.0 min**			

Table 3:   Installer Configuration Menu (Part 4 of 4)

Parameter Appearing on Display	Description and Default	Selection Options			
Deadband	Sets the minimum deadband between the heating and cooling setpoints. Default: **2.0F°/1.0C°**	Range: **2.0F°/1.0C°** to **5.0F°/2.5C°** (adjustable in 1.0F°/0.5C° increments)			
Cal RS	Sets the desired room air sensor calibration (offset). The offset can be added to or subtracted from the actual displayed room temperature. Default: **0.0F°/0.0C°**	Range: **-5.0F°/-2.5C°** to **5.0F°/2.5C°** (adjustable in 1.0F°/0.5C° increments)			
Aux cont	Determines the auxiliary contact function and configuration. Default: **0**	**(0)**	Not used, or used for reheat	If the Sequence of Operation is set to reheat (2 or 3), ignore this parameter.	
		(1)	Auxiliary N.O.	Occupied = contact closed Unoccupied = contact open	The output aligns with occupancy.
		(2)	Auxiliary N.C.	Occupied = contact open Unoccupied = contact closed	
		(3)	Auxiliary N.O.	Occupied and fan On = contact closed Unoccupied and fan On or Off = contact open	The output aligns with occupancy and the fan on command.
		(4)	Auxiliary N.C.	Occupied and fan On = contact open Unoccupied and fan On or Off = contact closed	
		(5)	Auxiliary On/Off control through the auxiliary network command. The output can be commanded through the network for any required auxiliary functions via a separate and dedicated network variable.		The output aligns with the secondary network occupancy command.
DA/RA	Choice of direct or reverse acting analog output signal. Default: **DA**	**(RA):** Reverse acting, 0 to 100% = 10 to 0 VDC **(DA):** Direct acting, 0 to 100% = 0 to 10 VDC			
Reheat	Sets the duty cycle time for reheat output (if Option 2, 3, or 5 is chosen in the *SeqOpera* parameter). Default: **0**	**(1):** 10 seconds (six cycles per minute), for various equipment with solid-state relays that withstand short duty cycles such as electric heat. **(0):** 15 minutes (four cycles per hour), for various equipment with mechanical relays or contactors controlling mechanical reheat systems.			
UI3 dis	Displays the supply or changeover temperature when UI3 is configured as an analog input (supply sensor or changeover sensor). Used as a diagnostic/service help, to troubleshoot and diagnose sensor operation. Default: **-40°F/-40°C**	Used as a diagnostic/service help, to troubleshoot and diagnose sensor operation.			

Accessories

All the accessories in Table 4 include mounting hardware; contact the nearest Johnson Controls® representative to order any of these parts.

Note: Review the technical specifications of the accessories prior to their use in an application.

Repair Information

If the TEC2645-2 Thermostat fails to operate within its specifications, see Table 5 for troubleshooting details and Table 6 for display messaging. For a replacement thermostat, contact the nearest Johnson Controls® representative.

Table 4: Accessories (Order Separately)

Code Number	Description
TE-6361M-1[1]	Duct Mount Air Temperature Sensor
SEN-600-4[2]	Remote Indoor Air Temperature Sensor with Occupancy Override and LED
TE-636S-1	Strap-Mount Temperature Sensor
MS-BACEOL-0	RS485 End-of-Line Terminator

1. Additional TE-636xx-x Series 10k ohm Johnson Controls Type II Thermistor Sensors are available; refer to the *TE-6300 Series Temperature Sensors Product Bulletin (LIT-216320)* for more details.
2. Only the occupancy override function can be accomplished using the SEN-600-4 with the TEC2645-2.

Table 5: Troubleshooting Details[1]

Symptom	Probable Causes
Multiple Symptoms	Excessive bus errors may be occurring.
	A device may have been added or changed with a duplicate address (may not be the same address as some devices having problems, and may have happened sometime before the problem was noticed).
	Wiring errors or wire problems may exist.
	The baud rate may have been changed on some devices on the network, but not all devices.
	Max_Master may have been changed incorrectly (may have happened sometime before the problem was noticed).
	A download may be in progress.
	There may be a fault at a device.
	A repeater may be needed or may be configured incorrectly.
	There may be a duplicate device object name or instance.
Poor Performance	See the probable causes listed in the *Multiple Symptoms* section earlier in this table.
	Excessive bus traffic may exist (bus overload).
	The baud rate may be set too low.
	There may be too many devices on the network.
	There may be unaccounted devices on the network (not mapped to the NAE).
	There may be unusually slow devices on the network or devices that are slow to respond.
Thermostat Goes Offline	See the probable causes listed in the *Multiple Symptoms* section earlier in this table.
	A power failure or other failure may have occurred at the thermostat.
	Communication may have been disabled at the thermostat.
Thermostat Will Not Come Online	See the probable causes listed in the *Multiple Symptoms* section earlier in this table.
	A thermostat may be connected to the wrong bus.
	A baud rate may be specified in the new thermostat that is incompatible with the running network.
	No device on the network is configured to use a specific baud rate (normally the NAE), but all devices are set to use auto baud. At least one device, typically the bus supervisor (NAE), must have an assigned baud rate. Set the baud rate in the bus supervisor and set all other devices to auto baud.

1. For common MS/TP troubleshooting information, refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034).*

Table 6: Display Messages

Display	Function
Service	Indicates that there is a service alarm in accordance with the programmable Binary Input (BI2).
Filter	Indicates that the filter(s) is dirty in accordance with the programmable Binary Input (BI2).
Window	Indicates that an outside window or door is open and has cancelled the thermostat heating or cooling action in accordance with the programmable Binary Input (BI1).

Technical Specifications

TEC2645-2 BACnet MS/TP Networked Thermostat with Single Proportional Output and One-Speed Fan Control

Power Requirements		19 to 30 VAC, 50/60 Hz, 2 VA (Terminals 4 and 5) at 24 VAC Nominal, Class 2 or Safety Extra-Low Voltage (SELV)
Analog Output Rating		0 to 10 VDC into 2k ohm Resistance (Minimum)
Fan Relay Output Rating		30 VAC, 1.0 A Maximum, 15 mA Minimum, 3.0 A In-Rush, Class 2 or SELV
Auxiliary Output Rating	**Triac Output**	30 VAC, 1.0 A Maximum, 3.0 A In-Rush
Digital Inputs		Voltage-Free Contacts across Terminal Scom to Terminals BI1, BI2, or UI3
Temperature Sensor Type		Local 10k ohm Negative Temperature Coefficient (NTC) Thermistor
Wire Size		18 AWG (1.0 mm Diameter) Maximum, 22 AWG (0.6 mm Diameter) Recommended
MS/TP Network Guidelines		32 Devices Maximum; 4,000 ft (1,219 m) Maximum Cable Length
Resolution		±0.2F°/±0.1C°
Temperature Range	**Backlit Display**	-40.0°F/-40.0°C to 122.0°F/50.0°C in 0.5° increments
	Heating Control	40.0°F/4.5°C to 90.0°F/32.0°C
	Cooling Control	54.0°F/12.0°C to 100.0°F/38.0°C
Accuracy		±0.9F°/±0.5C° at 70.0°F/21.0°C Typical Calibrated
Minimum Deadband		2F°/1C° between Heating and Cooling
Ambient Conditions	**Operating**	32 to 122°F (0 to 50°C); 95% RH Maximum, Noncondensing
	Storage	-22 to 122°F (-30 to 50°C); 95% RH Maximum, Noncondensing
Compliance	**United States**	UL Listed, File E27734, CCN XAPX, Under UL 873, Temperature Indicating and Regulating Equipment
		FCC Compliant to CFR 47, Part 15, Subpart B, Class A
	Canada	UL Listed, File E27734, CCN XAPX7, Under CAN/CSA C22.2 No. 24, Temperature Indicating and Regulating Equipment
		Industry Canada, ICES-003
	Europe	CE Mark, EMC Directive 89/336/EEC
	Australia and New Zealand	C-Tick Mark, Australia/NZ Emissions Compliant
Shipping Weight		0.75 lb (0.34 kg)

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

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     Control Installation Instructions