



# TEC3000 Series Thermostats for Packaged Rooftop and Heat Pump with Economizer Quick Start Guide

Part No. 24-11353-00036 Rev. F

2022-01-14

## North American emissions compliance

### United States

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

### Canada

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

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

## Installation

The following sections describe how to install the TEC3000 Series Thermostat.

### Parts included

- One TEC3000 Series Thermostat with integral mounting base
- One installation instructions sheet

### Location considerations

For networked models, locate the TEC3000 Series Thermostat:

- On a partitioning wall, approximately 5 ft (1.5 m) above the floor in a location of average temperature, to allow for vertical air circulation to the TEC

- Away from direct sunlight, radiant heat, outside walls, outside doors, air discharge grills, stairwells, and from behind doors
- Away from steam or water pipes, warm air stacks, unconditioned areas (not heated or cooled), or sources of electrical interference
- In a clear path between the integrated passive infrared (PIR) occupancy sensor (if equipped) and the space it monitors

For wireless models, also locate the thermostat:

- Outside of a recessed area, metal enclosure, or shelving unit
- On the same building level as the other wireless devices on the same personal area network (PAN)
- At least 2 in. (51 mm) away from any metal obstruction
- In the direct line of sight to other wireless devices on the same PAN. Signal transmission is best if the path between the TEC3000 and other wireless devices is direct as possible. Line of sight is desirable but not required. See Table 1 and Table 2 for the recommended and maximum distances.
- Away from metal and large solid obstructions, that includes equipment rooms and elevator shafts and concrete or brick walls, between the TEC3000 and the ZFR182x or ZFR183x Router/Repeater or ZFR Pro Coordinator Radio
- Within range of two or more wireless devices on the same PAN. Redundancy in the layout provides the best reliability in wireless installations
- At least 20 ft (6 m) from a microwave oven

For integrated PIR models, make sure that the thermostat is located centrally, where occupant movement is frequent. Ensure that the unit is not blocked by a plastic tamper resistant enclosure (such as the GRD10A-608). The plastic enclosure blocks the occupancy sensing capability.

The use of insulating foam pads is necessary for installations where wiring passes through the wall to the thermostat.

For wireless models, the effective transmission range and distance for indoor applications vary because of wireless signal absorption and reflection due to metal obstructions, walls or floors, and furniture that is found in building interiors.

① **Note:** Allow for sufficient clearance to insert a USB drive into the USB port.

➤ **Important:** Only connect memory devices to the USB port. Do not use it for charging external devices.



(barcode for factory use only)

TEC3330-1x-xxx, TEC3331-1x-xxx, TEC3630-1x-xxx,  
TEC3631-1x-xxx, TEC3030-1x-xxx, TEC3031-1x-xxx,  
TEC313x-14-xxx

**Table 1: Indoor line-of-sight transmission ranges  
ZFR182x**

Range type	Transmission distance	
	WNC Coordinator Router, ZFR Pro Router/Repeater	TEC30xx-1x-000 Wireless Thermostat
Recommended	50 ft (15.2 m)	50 ft (15.2 m)
Line of sight, maximum	250 ft (76.2 m)	100 ft (30 m)

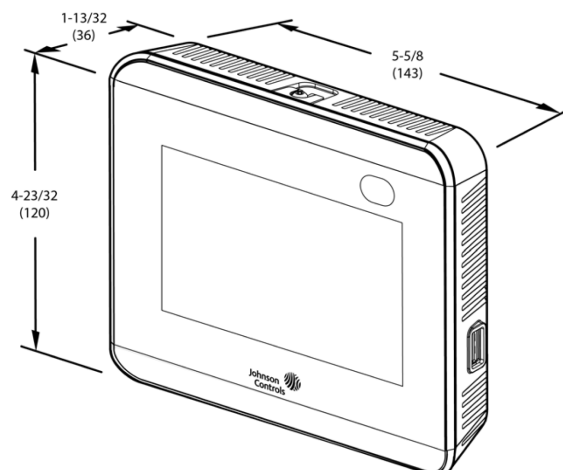
**Note:** For more details on using ZFR Pro Series communication devices, refer to the *WNC1800/ZFR182x Pro Series Wireless Field Bus System Technical Bulletin (LIT-12012356)*.

**Table 2: Indoor line-of-sight transmission ranges  
ZFR183x**

Range type	Transmission distance	
	WRG Coordinator Router, ZFR Pro Router/Repeater	TEC31xx-1x-000 Wireless Thermostat
Recommended	250 ft (76.2 m)	250 ft (76.2 m)
Line of sight, maximum	1000 ft (308.4 m)	1000 ft (308.4 m)

- Note:**
- Actual range depends on the site and installation conditions. See *Technical Documentation* for more information.
  - For more details about using ZFR Pro Series communication devices, refer to the *WRG1800/ZFR183x Pro Series Wireless Field Bus System Technical Bulletin (LIT-12013553)*.
- Important:** ZFR182x Pro Series Wireless System compatible TEC30xx-1x-000 models and ZFR183x Pro Series Wireless System compatible TEC31xx-1x-000 models are not compatible with each other and cannot be used under the same PAN ID (network address).

**Figure 1: Thermostat shown without occupancy sensor, dimensions, in. (mm)**



## Installing the thermostat

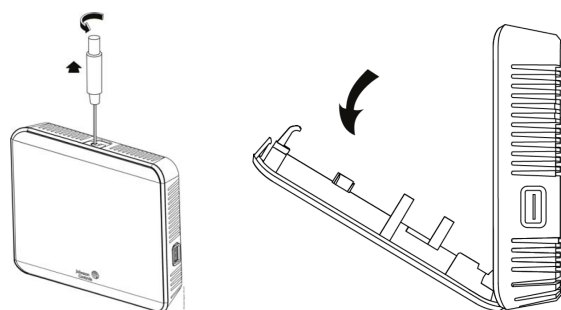
- Use a 1/16 in. (1.5 mm) Allen wrench or Johnson Controls® T-4000-119 Allen-Head Adjustment Tool (order separately) to remove the security screw if it is installed on the top of the thermostat cover as illustrated in Figure 2.
- Pull the top edge of the cover and open the thermostat as illustrated in Figure 2.

**Important:** The cover is not secured on the bottom. Do not drop the cover.

**Important:** If you install more than one thermostat, keep track of which cover attaches to which base. The thermostat version and the base version must match to ensure correct operation.

**Important:** Use correct Electrostatic Discharge (ESD) precautions during installation and servicing to avoid damage to the electronic circuits of the thermostat.

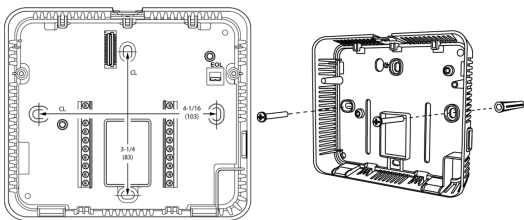
**Figure 2: Removing the security screw from the thermostat cover, shown without occupancy sensor, and removing the thermostat cover**



3. Align the thermostat mounting base on the wall with the security screw on the top and use the base as a template to mark the two mounting hole locations. See Figure 3.
  - If you need to install the thermostat on an electrical junction box, use 2-1/2 x 4 in. (63 x 101 mm) square boxes with mud ring covers and avoid smaller 1-1/2 x 4 in. (38 x 101 mm) square or 3 x 2 in. (76 x 51 mm) boxes. This procedure ensures that you have enough space for cabling, if needed.
  - For surface-mounted applications, use durable mounting hardware, such as wall anchors, that cannot be easily pulled out of the mounting surface.
4. Pull approximately 6 in. (152 mm) of wire from the wall and insert the wire through the center hole in the thermostat mounting base. See Figure 3.
5. Secure the mounting base to the wall surface using two mounting screws (user supplied) as illustrated in Figure 3.

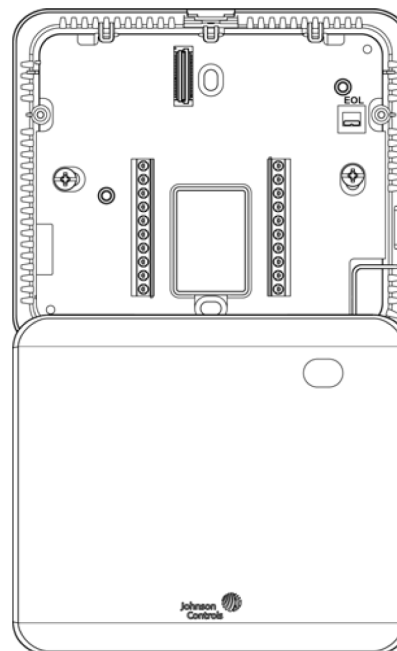
**Note:** Do not overtighten the mounting screws.

**Figure 3: Mounting hole locations, dimensions, in. (mm) (left) and securing the thermostat mounting base to the wall (right)**



**Note:** When you mount the unit on the wall, you can hang the front cover on the end of the back cover as illustrated in Figure 4.

**Figure 4: Hanging the thermostat front cover**



## Wiring

### About this task:

When you replace an existing thermostat, remove and label the wires to identify the terminal functions.

## **WARNING**

### Risk of Electric Shock

Disconnect the power supply before making electrical connections to avoid electric shock.

## **AVERTISSEMENT**

### Risque de décharge électrique

Débrancher l'alimentation avant de réaliser tout raccordement électrique afin d'éviter tout risque de décharge électrique.

## 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.

## ATTENTION

### Risque de dégâts matériels

Ne pas mettre le système sous tension avant d'avoir vérifié tous les raccords de câblage. Des fils formant un court-circuit ou connectés de façon incorrecte risquent d'endommager irrémédiablement l'équipement.

- **Important:** Make all wiring connections in accordance with local, national, and regional regulations. Do not exceed the electrical ratings of the TEC3000 Series Thermostat.
- **Important:** Use correct ESD precautions during installation and servicing to avoid damage to the electronic circuits of the 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 Table 3.
  - ① **Note:** For more details on wiring the MS/TP Communications Bus, refer to the *MS/TP Communications Bus Technical Bulletin (LIT-12011034)*.
2. Attach the communication wires to the terminal block.
  - ① **Note:** If multiple wires are inserted into the terminals, make sure to correctly twist the wires together before inserting them into the terminal connectors.
3. Carefully push any excess wire back into the wall.
  - ① **Note:** Seal the hole in the wall with fireproof material to prevent drafts from affecting the ambient temperature readings.
4. For networked models, set the bus end-of-line (EOL) termination switch to the desired location. You can designate the thermostat as the end of the Field Controller (FC) Bus and N2 Bus through the bus EOL termination switch. The default position is OFF. If the thermostat is at the end of a daisy chain of devices on the FC Bus and N2 Bus, set the EOL switch to the ON position. See Figure 3.

5. Reattach the thermostat cover to the mounting base, bottom side first.
  - **Important:** Make sure you reattach the cover that corresponds to its correct base. The CPU board number needs to match the base board number. Otherwise, an operation error occurs after you reattach a cover and base that do not belong together.
6. Use a 1/16 in. (1.5 mm) Allen wrench or Johnson Controls T-4000-119 Allen-Head Adjustment Tool (order separately) to reinstall the security screw on the top of the thermostat cover. See Figure 2 for security screw placement.
7. Remove the protective plastic cover sheet from the display.
  - **Important:** If the display is dirty, gently wipe it clean with isopropyl alcohol or ethyl alcohol. Do not scrub hard as to avoid damaging the surface. Do not use other cleaners such as water, ketones, and aromatic solvents, since they may damage the polarizer.
  - ① **Note:**
    - For VAV and two-pipe systems, connect the valve to the heating output.
    - Only one transformer is required for each TEC.
    - Power to the AUX contact comes from the reheat coil.

## Terminal identification

**Table 3: Terminal identification (See [Wiring diagrams](#) for details)**

Terminal label	Function		
	TEC3030, TEC3031, TEC313x	TEC3330, TEC3331	TEC3630, TEC3631
24 V	24 VAC hot from the sensor		
Y1	Cooling stage 1		
Y2	Cooling stage 2		
AUX	Auxiliary binary output		
AUX	Auxiliary power input		
W1 OB	Heating 1 (RTU mode)/Reversing valve (O/B) (Heat Pump mode)		
RH <sup>1</sup>	Power for W1 and W2		
W2 SUP	Heating 2 (RTU mode)/Supplemental heat (Heat Pump mode)		
OAD	Outdoor air damper, 0 VDC - 10 VDC		
COM <sup>2</sup>	Common		
COM <sup>2</sup>	Common		
G	Fan		
BI-2	Configurable binary input 2		
BI-1	Configurable binary input 1		
RSEN	Configurable analog input 1		

**Table 3: Terminal identification (See [Wiring diagrams](#) for details)**

Terminal label	Function		
	TEC3030, TEC3031, TEC313x	TEC3330, TEC3331	TEC3630, TEC3631
OAT	Configurable analog input 3		
SAT	Configurable analog input 2		
NET+	n/a	Not connected	Field bus+/N2+
NET-	n/a	Not connected	Field bus-/N2-
NET COM	n/a	Not connected	Isolated common for field bus

- 1 RH needs to be connected for W1 and W2 to energize. For heating systems with an isolated power supply, connect RH to the R terminal of the heating system. For systems that switch the hot supply to the heating commands, connect the jumper to 24 V. For systems that switch the neutral supply to the heating commands, connect the jumper to COM.
- 2 For the networked models, the common terminals, which do not include NET COM, are internally connected and can be used for all inputs and outputs. For the wireless models, the common terminals are connected and can be used for all inputs, outputs, and 24 VAC ground or common.

## Wiring diagrams

See Table 3 for terminal identification.

**Figure 5: Staged wiring diagram - rooftop unit (RTU)**

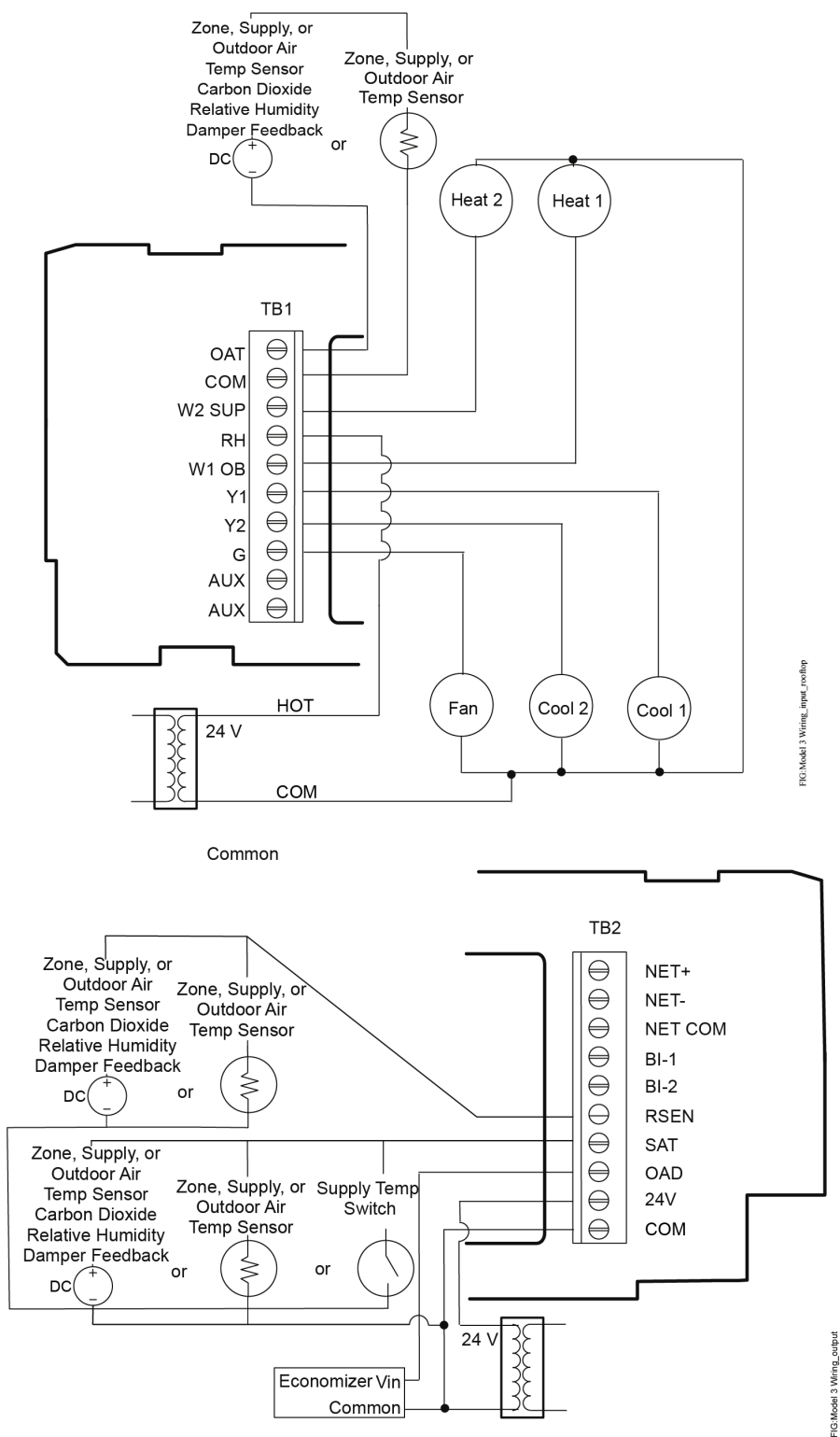
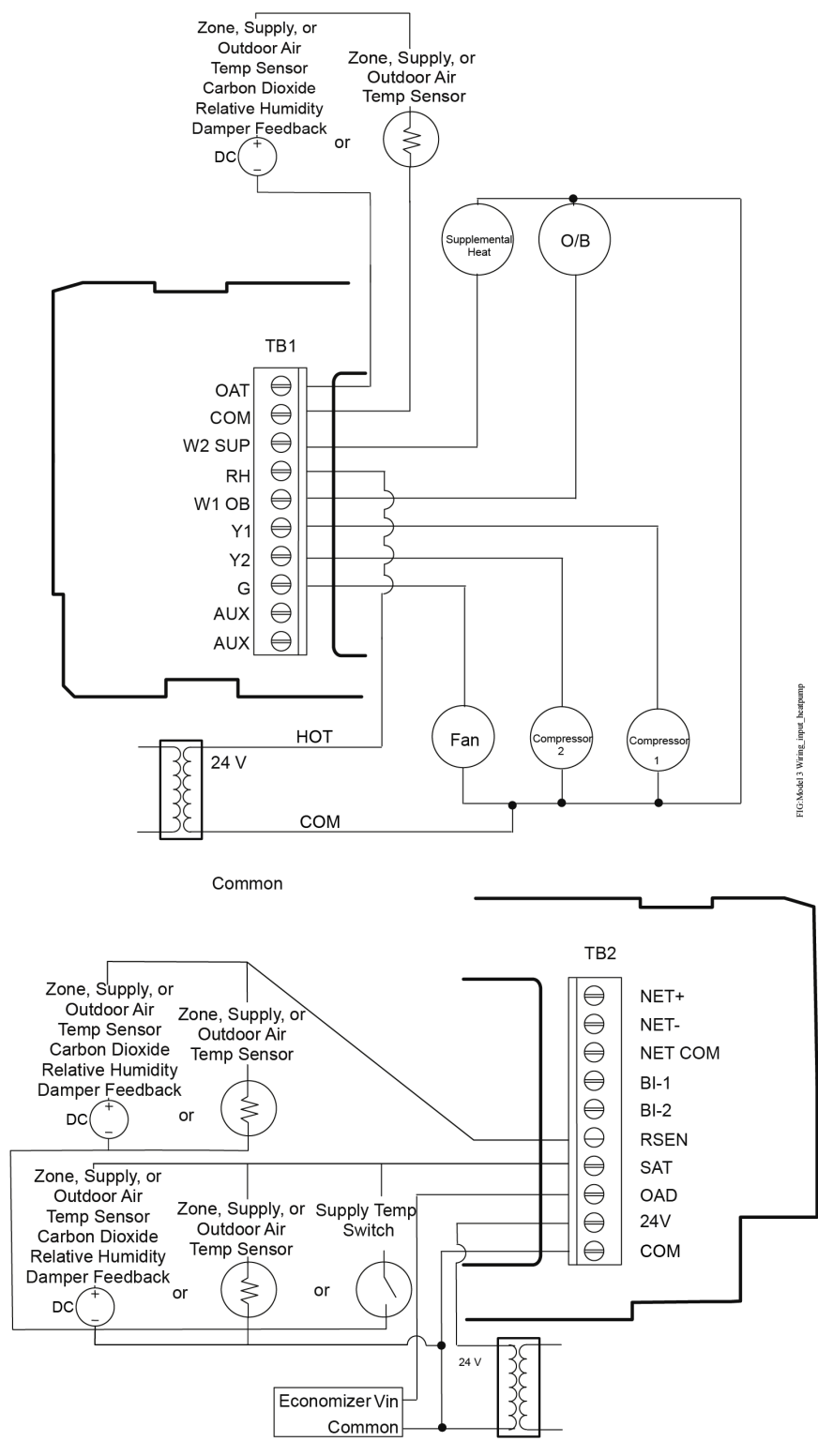
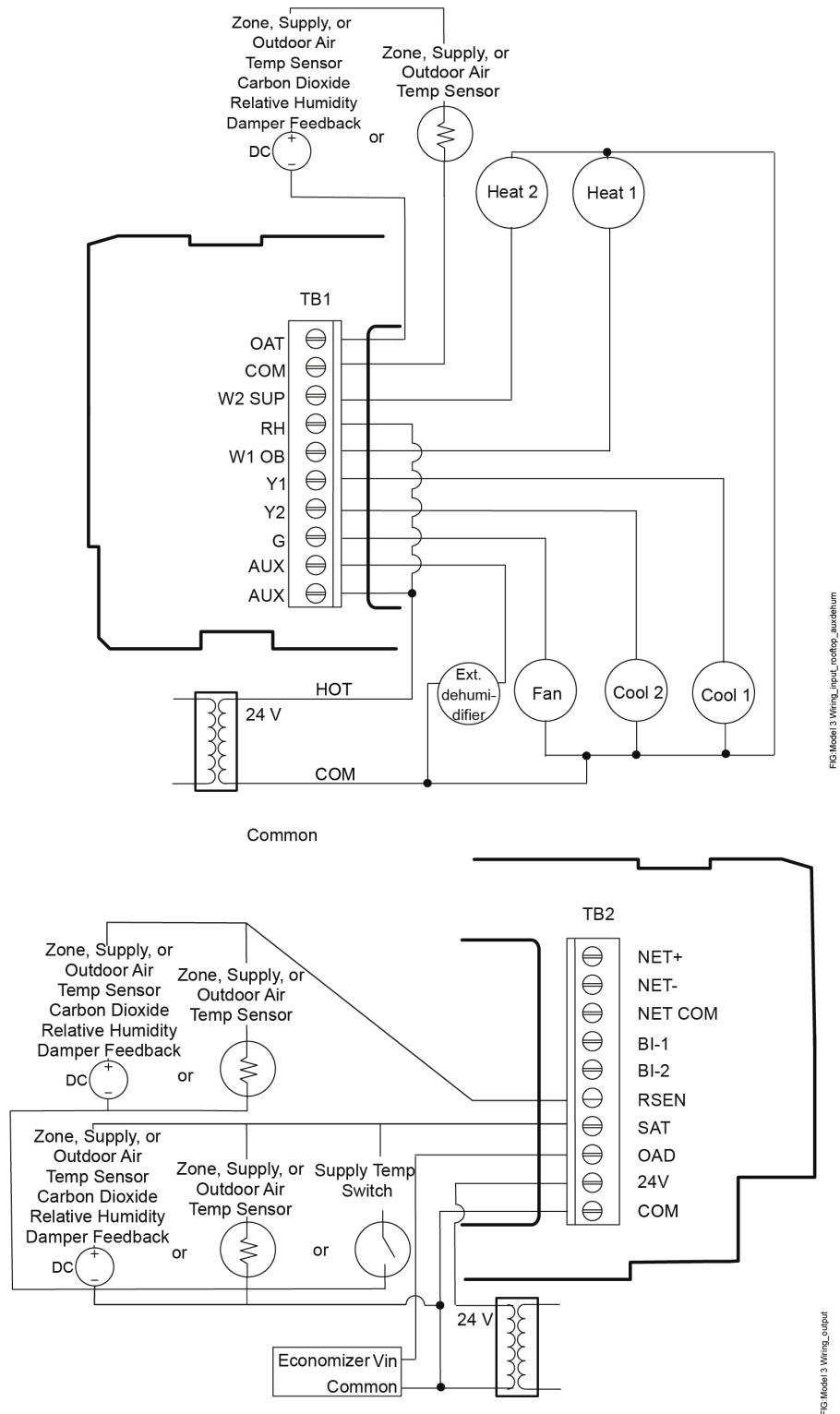


Figure 6: Staged wiring diagram - heat pump



**Figure 7: Staged wiring diagram - Rooftop Unit with Auxiliary Dehumidifier**

**Note:** See Figure 10 for auxiliary contact wiring



**Figure 8: Staged wiring diagram - Heat Pump with Auxiliary Dehumidifier**

**Note:** See Figure 10 for auxiliary contact wiring

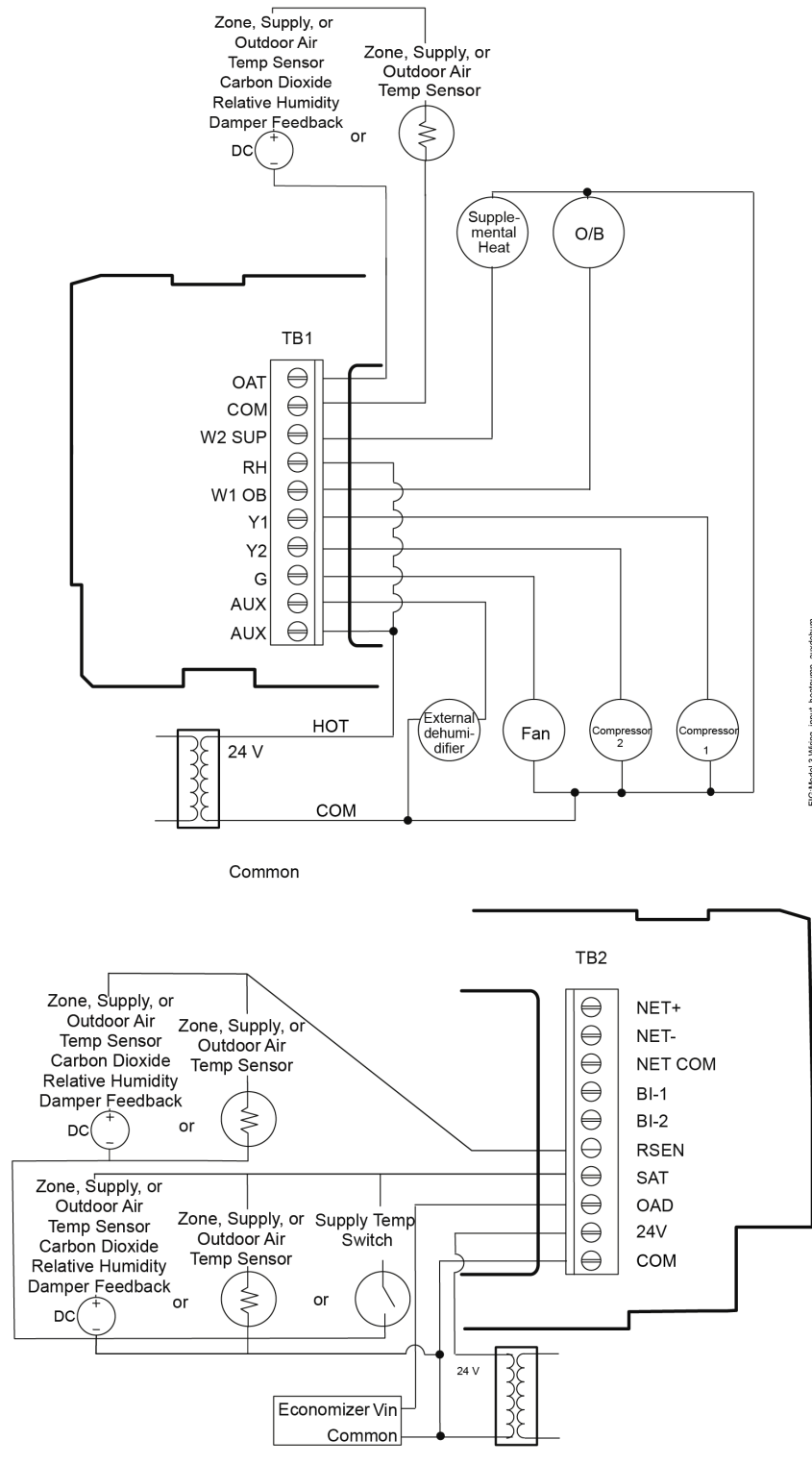
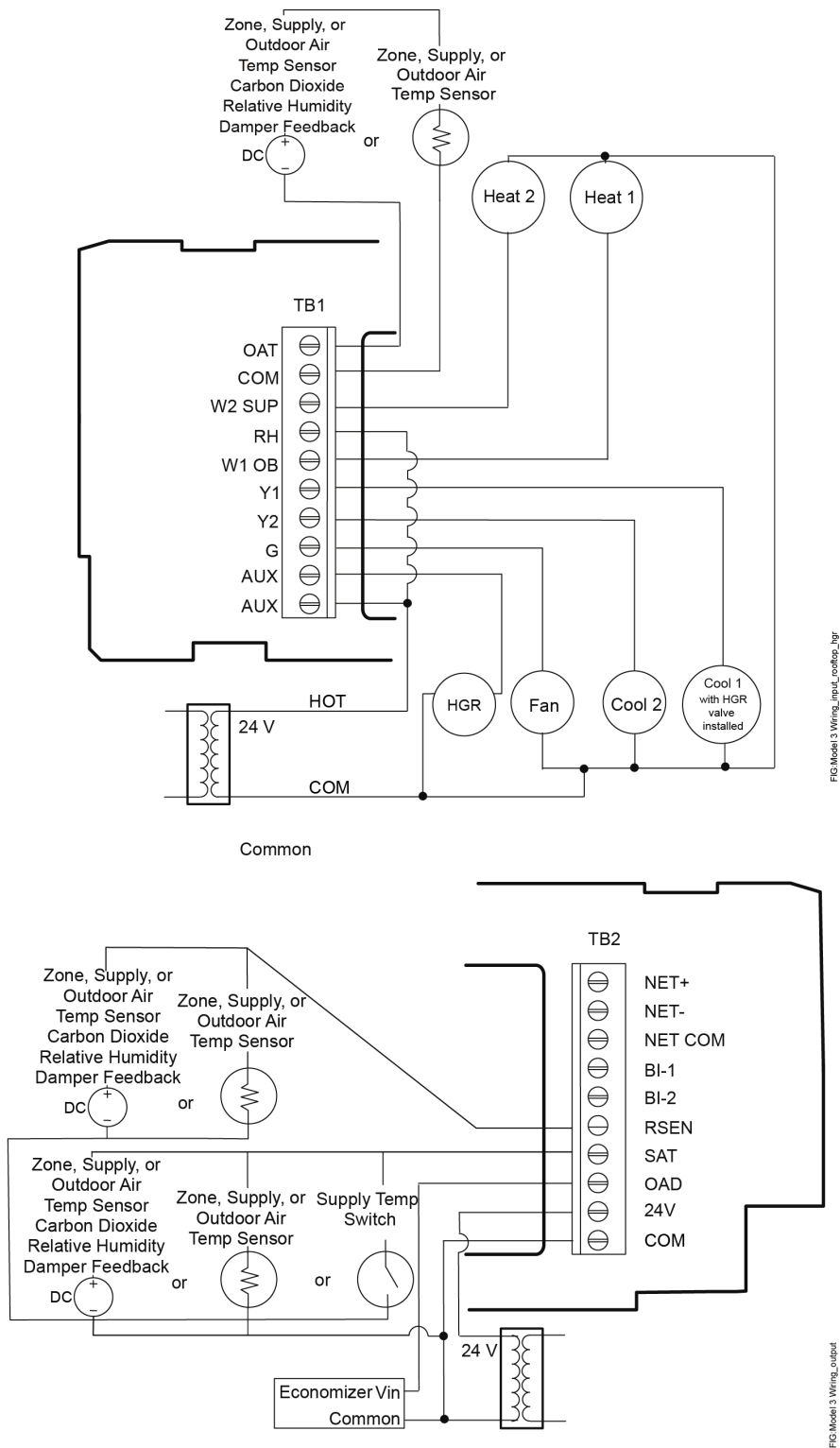
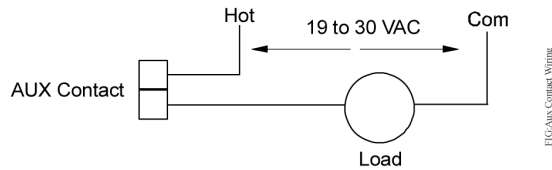


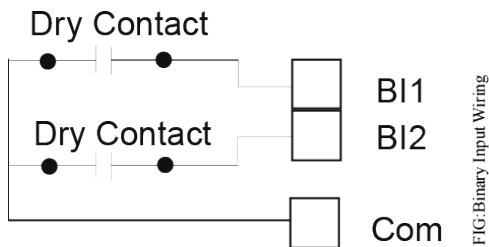
Figure 9: Staged wiring diagram - Rooftop Unit with Hot Gas Reheat



**Figure 10: AUX contact wiring**



**Figure 11: Binary input wiring**



## Setup and adjustments

- **Important:** Table 7 provides a full list of TEC3000 menu settings. Refer to *TEC3000 Series Thermostats for Packaged Rooftop and Heat Pump with Economizer Installation Guide (LIT-12013163)* for step-by-step instructions on how to access and adjust the more commonly used menus.

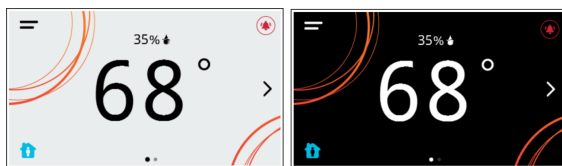
## Overview

### About this task:

Figure 12 shows the thermostat home screen in both the light and dark themes. You can customize it to show or hide various elements from the occupant. See Table 4 for a listing of the touchscreen icons. When screen customization is used in conjunction with a passcode, the building owner can control which options the occupant can access and adjust.

- **Important:** If lockout levels are used, some icons are hidden. Table 5 provides details of these levels.

**Figure 12: Thermostat home screen (shown with light and dark themes)**



To switch between the modern, classic, light, and dark themes, complete the following steps:

1. Press the **Menu** icon.
2. Press **Settings**.
3. Press **Display Settings**.
4. Press **Change Color Theme**.
5. Select one of the four options available.

### Result

Multiple pages are available on the display. The page that you currently view is emphasized with a filled dot. The other available page displays as an empty dot.

In the modern theme, the cooling, or blue, and heating, or orange, circles show whether the cooling or heating mode is active.

**Figure 13: Thermostat home screen in cooling mode (left) and heating mode (right)**



## Customizing the home screen

### About this task:

Customizing the Home screen settings include:

- Brightness
- Enable Backlight
- Units
- Time
- Time Zone
- Time Format
- Date
- Date Format

You can also show or hide these items on the Home screen:

- Fan Button
- Temperature
- Humidity
- Off Button
- Hold Button
- Setpoint
- Alarms
- Occupancy Status
- Unit Status
- Date/Time
- Damper Position
- Zone CO<sub>2</sub>










To customize the Home screen, complete the following steps:

1. Press the **Menu** icon.
2. Press **Display Settings**.
3. Enable or disable elements of the home screen as appropriate for the building owner and occupants.
4. Set the passcode on the thermostat to prevent the occupants from changing settings that they should not have access to change.

















## Touchscreen icons

Table 4 describes the touchscreen icons on the home screen. Press and release a touchscreen icon to activate the TEC. Additional touchscreen icons appear based on the menu, and those icons are also described in Table 4.
















**Table 4: Touchscreen icons**

Icon and icon name	Description
<b>Menu</b> 	Displays the configuration screens where various settings may be adjusted.
<b>Alarm</b> 	Indicates that the thermostat has triggered an alarm.
<b>Unit Power</b>  On  Standby	Powers the thermostat on or off. Notes: <ul style="list-style-type: none"> <li>This icon disables all equipment control but does not physically power down the unit.</li> <li>On the modern home screen, if the Unit Power icon is in standby mode, the temperature and humidity also display in standby mode to indicate that control off or standby mode is active.</li> </ul>
<b>Humidity</b>  On  Standby	Indicates the humidity reading.
<b>Degree</b>  On  Standby	Indicates that the unit is set to degrees.
<b>Network Communication (for Networked Models)</b>  Network communication No Signal	Network Communication icon indicates that the thermostat detected a supervisory controller and both are online. No icon indicates that the thermostat did not detect a supervisory controller.










**Table 4: Touchscreen icons**

Icon and icon name	Description
<b>Radio Signal (For Wireless Models)</b>  No signal  Low signal  Medium signal  High signal	Indicates the strength of the radio signal.
 Arrow Up  Arrow Down	Increases or decreases the cooling value on the home screen.
 Arrow Up  Arrow Down	Increases or decreases the heating value on the home screen.
<b>Cooling Hold</b> 	Indicates that cooling hold mode is enabled. To disable Hold mode, press the button.
<b>Heating Hold</b> 	Indicates that heating hold mode is enabled. To disable Hold mode, press the button.
<b>Cooling Setpoint</b> 	Displays the current cooling setpoint. Indicates that Hold mode is disabled. To enable Hold mode, press the button.
<b>Heating Setpoint</b> 	Displays the current heating setpoint. Indicates that Hold mode is disabled. To enable Hold mode, press the button.
<b>Setpoint Temperature</b> 	Displays the current setpoint temperature. Indicates that the Show Hold button is set to No.
<b>Heating Mode</b> 	Indicates that heating mode is selected.
<b>Cooling Mode</b> 	Indicates that cooling mode is selected.
<b>Auto Mode</b> 	Indicates that Auto mode is selected.

**Table 4: Touchscreen icons**

Icon and icon name	Description
<p>Fan Overrides for Single-speed Fans</p>  On  Auto  Quiet	Adjusts the fan override between On, Auto, and Quiet for single-speed fans.
<p>Occupancy Status</p>  Unoccupied  Occupied  Temporarily occupied  Standby  Override-occupied  Override-unoccupied	Adjusts the occupancy between Unoccupied, Occupied, Temporarily occupied, Standby, Occupancy override, Unoccupancy override.
<p>Back</p> 	Moves the display to the previous screen.
<p>Forward</p> 	Moves the display to the next screen.
<p>Home</p> 	Returns the display to the main home screen.
<p>Save</p> 	Saves the current configuration and parameter settings.
<p>Delete</p> 	Deletes the scheduled event.
<p>Clear</p> 	Clears the password entry on the keypad screen.

**Table 4: Touchscreen icons**

Icon and icon name	Description
<p>Exclamation point</p> 	Indicates that an error has occurred.
<p>CO<sub>2</sub></p>  Error  Poor  Fair  Good	Indicates the CO <sub>2</sub> quality and sensor reliability or failure. Poor = Greater than 1100 ppm Fair = Less than 1100 ppm, greater than 600 ppm Good = Less than 600 ppm
<p>Damper status</p>  Error  Closed  Partially open  Open	Indicates the status and reliability of the damper. Closed = 0% - 25% Partially open = 26% - 74% Open = 75% - 100%

## User lockout

You can select from three different levels of access at the local display to manage functionality through the supervisory controller. This lockout is independent of any display or passcode settings. The existing temporary occupancy capability is unaffected by this feature. User lockout hides the icons that are not operable. The lockout levels are described in Table 5.

**Table 5: User lockout levels**

Lockout level	Capability
State 0	Provides full access to Home Screen Display Adjustments and icons (default).
State 1	Hides the Menu icon.
State 2	Only allows the screen to trigger temporary occupancy. Menu, Unit Power, the Up and Down arrows, and Run/Hold are hidden.

## Using the USB port

Use the USB port to quickly and easily load firmware upgrades, back up the current settings, and restore settings to the TEC3000 by using a USB drive. The TEC3000 can recognize eight configuration files or firmware package files. The USB drive format must be FAT or FAT32. The drive cannot be NTFS format or USB 3.0. If you are

upgrading firmware or copying configuration files, you need the passcode if one has been set up. Do not remove the USB drive until the firmware upgrade is complete. The TEC3000 may restart and go offline to the network engine after a firmware upgrade. The upgrade takes approximately three min.

## Configuring the thermostat

Use the Menu icon on the home screen to access and change the basic operating parameters of the thermostat. During normal operation, press the **Menu** icon once to access the following parameters:

- Fault Status
- Setpoints
- Schedule
- Display Settings
- Setup
- Trend
- Status
- Update

## Installer configuration menu

The thermostat comes from the factory with default settings for all configuration parameters. Before any outputs turn on, the thermostat must be configured for the equipment connected. You need to start from the home screen to perform any of the following tasks.

### Screen reset

The current screen returns to the home screen and turns off if the current screen is not touched for 3 min. Touch the screen to turn it on again. To disable the screensaving option, press **Display Settings** and set **Enable Display Timeout** to **No**.

## Selecting Rooftop or Heat Pump mode

By default, the thermostat is configured for Rooftop mode. This mode is used for up to two discrete stages of heating (W1, W2) and up to two discrete stages of cooling (Y1, Y2). Certain heat pumps do not require an O/B input and instead take standard W and Y commands as heat or cool commands, internally sequencing the equipment. For these type of heat pump units, leave the thermostat in Rooftop mode.

When in heat pump mode, the TEC controls up to two stages of compressors (Y1, Y2) for both heating and cooling. O/B is controlled through the W1/OB output and one stage of supplemental heat is controlled through the W2/SUP output.

## Configuring economizer

The TEC supports three methods of determining economizer availability. These are Dry Bulb, Single Enthalpy, and Dual Enthalpy, in increasing order of accuracy. To run an economizer, outdoor air temperature (OAT) is required to run in Dry Bulb mode. This can be provided by connecting a sensor to the OAT input on the TEC. It also can be provided by writing to NET-OAT from a Building Automation System (BAS), which overrides the internal sensor. If Outdoor Air Humidity (OAH) is also provided by writing to NET-OAH, the single enthalpy method is used to determine if economizer cooling should

be used. If a Zone or Return Humidity is also provided, the dual enthalpy method is used.

All network overrides to the TEC work on a timeout basis. If the value is written to, it remains active as long as the BAS writes a new value within 15 min of the first one. If the 15-minute timeout occurs without getting any data written, the TEC stops using the network data.

When operating in Dry Bulb or Single Enthalpy mode, it is necessary to provide a Dry Bulb Setpoint or an OA Enthalpy Setpoint, respectively. The TEC ships with default values set, but depending on climate it may be necessary to change these.

## Demand control ventilation

The demand control ventilation feature modulates the damper to control the rate of outdoor airflow into the zone in order to maintain the zone CO<sub>2</sub> value at the zone CO<sub>2</sub> setpoint. The typical CO<sub>2</sub> setpoint range in a zone is 800-1000 ppm, see CO<sub>2</sub> in Table 4. The damper remains closed when the zone is in unoccupied mode. To enable the demand control ventilation feature, ensure the following prerequisites are met:

- Economizer installed
- No occupancy sensor installed
- Reliable CO<sub>2</sub> value, either from sensor or NET-point
- Reliable damper feedback value, either from sensor or NET-point
- Reliable OAT value, either from sensor or NET-point
- Reliable SAT (supply air temperature) value, either from sensor or NET-point
- CO<sub>2</sub> setpoint

① **Note:** For the thermostat to consider the value reliable, the value must be written to the NET-Override network point at least every 15 minutes.

## Occupant sensor control ventilation

Occupant sensor control ventilation is a variation of demand control ventilation for zones where the zone occupancy is determined with an occupancy sensor. The occupant sensor control ventilation feature modulates the damper's position to control the rate of outdoor airflow to the zone for ventilation to maintain the zone CO<sub>2</sub> value below the CO<sub>2</sub> setpoint. The standard The damper remains closed when the zone is in unoccupied mode. To enable the occupant sensor control ventilation feature, ensure the following prerequisites are met:

- Economizer installed
- Occupancy sensor installed and active, either on-board or binary input (BI) configured
- Reliable CO<sub>2</sub> value, either from sensor or NET-point
- Reliable damper feedback value, either from sensor or NET-point
- Reliable OAT value, either from sensor or NET-point
- Reliable SAT value, either from sensor or NET-point
- CO<sub>2</sub> setpoint

## Epidemic control ventilation

Epidemic mode removes pathogens from the zone through ventilation. The epidemic control ventilation feature is not dependent on the occupancy sensor

and takes priority over demand control ventilation and occupant sensor control ventilation.

You must install an economizer and set the **Economizer Installed** configuration parameter to **Yes** to enable the epidemic control ventilation feature. You can set the minimum ventilation position for the economizer damper between 0% and 100%. This applies to both occupied mode and unoccupied mode. When the pre-occupancy or post-occupancy purge is activated, the economizer damper ramps up to 100% and stays at that position for the duration that you set in **Inc Ventilation Pre Occ Purge Time** or **Inc Ventilation Post Occ Purge Time**.

Ventilation time and position of the economizer damper can raise or lower the relative humidity in the zone. A zone humidity value less than 40% RH or greater than 60% RH triggers an alarm. The alarm shows on the local screen and on the MV notifications on the BAS. It is not possible to adjust the alarm values.

Other prerequisites to enable epidemic control ventilation are:

- Reliable CO<sub>2</sub> value, either from sensor or NET-point
- Reliable damper feedback value, either from sensor or NET-point
- Reliable OAT value, either from sensor or NET-point
- Reliable SAT value, either from sensor or NET-point
- CO<sub>2</sub> setpoint

When you enable epidemic control ventilation, you can run the RTU in the following three modes:

- Minimum ventilation mode while zone is occupied
- Minimum ventilation mode while zone is unoccupied
- Pre occupancy purge mode, in the zone at the first hour of occupancy if a schedule is set

### Pre-occupancy purge

Pre-occupancy purge ventilates a zone at 100% ventilation for a duration prior to the scheduled occupied period. You can set the purge duration between 0 hour and 10 hours: 0 hour is purge disabled and 10 hours is maximum. The default purge time for demand control ventilation and occupant sensor control ventilation is 1 hour. You can change the purge time for demand control ventilation and occupant sensor control ventilation in the Pre Occupancy Purge Time setting. For epidemic control ventilation the default purge time is 4 hours. You can change the purge time for epidemic control ventilation in the Inc Ventilation Pre Occ Purge Time setting.

If you configure the RTU to perform pre-occupancy purge through demand control ventilation, occupant sensor control ventilation, or epidemic control ventilation, the purge happens based on the occupancy schedule. If no local occupancy schedule is set, an alarm is triggered reading Pre-Occupancy Ventilation Disabled. Only the local schedule is used to determine the pre-occupancy purge timing. In the event of a variable external schedule, configure the local schedule such that the Purge timing works for each variation of the external schedule.

### Post-occupancy purge

When the Epidemic Control Ventilation is enabled and Inc Ventilation Post Occ Purge Time is set to a non-zero value (default 120 minutes), then the RTU economizer damper opens to 100% to purge the zone as the thermostat

internal schedule transitions from Occupied/StandBy/Bypass to Unoccupied. After the Inc Ventilation Post Occ Purge is complete, the system should follow the Unoccupied schedule settings to maintain temperature, humidity and ventilation in the zone.

This feature only applies to the thermostat's local schedule. It does not apply to an external schedule.

## Setting the Control mode

The Control Mode informs the thermostat to run in Cooling only, Heating only, or Automatic mode, based on the temperature in the zone relative to the heating and cooling setpoints. Control Mode does not override equipment lockouts or changeover.

## Setting the Fan mode - fan coil only

The Fan Mode informs the thermostat how to handle the fan. There are two options for fan configuration: a Fan Mode available to the installer through the menu system, and a fan override available as an option to the end user from the Fan icon on the home screen. See [Customizing the home screen](#) for information on enabling and disabling end-user controls. The Fan Mode available to the installer is dependent on the fan type. The following options are provided for single-speed fans:

- On—Fan is continuously on
- Auto—Fan cycles on demand with the thermostat entering cooling, heating, or dehumidification modes
- Smart—Fan cycles on demand with the thermostat entering cooling or heating modes during unoccupied periods but is continuously running during occupied and standby periods

The Fan Override icon on the home screen depends on the fan type. The following options are provided for single-speed fans:

- On—Overrides the fan to be continuously on
- Auto—Follows the behavior set as Fan Mode
- Quiet—Follows the behavior set as Fan Mode, but prevents the fan from ever going above minimum speed. The Quiet option has no effect on equipment with single-speed fans.

## Configuring the zone space or equipment size

With non-binary outputs, the TEC3000 is configured by default to have a slower temperature response for larger zones with normal-sized equipment. In installations with small zones and oversized equipment, set the Equipment Size parameter to Oversized.

## Temperature setpoints

The thermostat provides a flexible setpoint configuration to give power to the building owner while being easy to use by the occupant. In addition to a simple up/down offset adjustment on the home screen for the occupant, there are six temperature setpoints on the TEC. The six temperature setpoints are Cooling and Heating setpoints for Occupied, Unoccupied, and Standby modes.

- ① **Note:** The TEC enforces a 2-degree deadband between heating and cooling setpoints. If a setpoint violates this standard (for example, cooling setpoint is set to 70 with a heating setpoint already set to 70), the opposing setpoint is modified to comply with this deadband (in the previous example, the heating setpoint would automatically change to 68).

The four modes of setpoint operation are described in Table 6.

**Table 6: Setpoint operation**

Mode of setpoint operation	Details
Occ Setpoint Select = Setpoint Offset and Heat Cool Setpoint Mode = Individual Setpoints	<p>This is the default mode and the original mode of operation that the TEC was released with (the next three modes are new). In this mode, the TEC has a heating setpoint and a cooling setpoint. There is a common Setpoint Offset (warmer/cooler adjust) that is applied to each setpoint simultaneously. The range of setpoint adjustment is two-fold:</p> <ul style="list-style-type: none"> <li>• There are large constant ranges bounding the individual heating and cooling setpoints.</li> <li>• There is also a smaller configurable range limit set to the Setpoint Offset point (<b>Control Setup &gt; General &gt; Max Setpoint Offset</b>).</li> </ul>
Occ Setpoint Select = Min and Max Setpoints and Heat Cool Setpoint Mode = Individual Setpoints	<p>In this mode, the TEC has a heating setpoint and a cooling setpoint. Each setpoint has a configurable range (<b>Setpoints &gt; Min Cooling Setpoint, Max Cooling Setpoint, Min Heating Setpoint, and Max Heating Setpoint</b>). The configurable range values are bounded by the larger constant bounds used in Setpoint Offset mode and are constrained in the following manner: Min must be below Max and Heating must be below Cooling, so in order from least to greatest, the values are: Min Heating Setpoint, Max Heating Setpoint, Min Cooling Setpoint, and Max Cooling Setpoint.</p>

**Table 6: Setpoint operation**

Mode of setpoint operation	Details
Occ Setpoint Select = Setpoint Offset and Heat Cool Setpoint Mode = Common Setpoint	In this mode, the TEC has one setpoint, Common Setpoint, for heating and cooling. There is also a common Setpoint Offset (warmer/cooler adjust) that is only applied to Common Setpoint. Otherwise, this setting works the same as when Occ Setpoint Select = Setpoint Offset and Heat Cool Setpoint Mode = Individual Setpoints.
Occ Setpoint Select = Min and Max Setpoints and Heat Cool Setpoint Mode = Common Setpoint	In this mode, the TEC has one setpoint, Common Setpoint, for heating and cooling. There is a configurable range for Common Setpoint, Min Setpoint, and Max Setpoint.

### Scheduling (for all models)

The occupancy schedule comes from either the weekly scheduler built into the TEC or as an input from the BAS. The Schedule Source must be selected to tell the thermostat where to read the occupancy source from.

### Setting the local schedule

A weekly occupancy schedule with up to four occupancy events for each day can be set locally on the TEC and operate independently of a supervisor. See [Scheduling \(for all models\)](#) to ensure the schedule source is set to Local.

- **Important:** Internally, the TEC3000 uses a BACnet schedule where daily schedules are independent of the previous and next days. The default occupancy of the TEC3000 from the factory is set to Occupied. As a result, a daily event at 12:00 AM must be scheduled if you do not want the thermostat to transition to Occupied Mode at midnight.

### Overriding the Occupancy mode

The TEC supports a manual override of all other schedule sources (for example, Schedule, Occupancy BI, and temporary occupancy).

### Enabling optimal start

The TEC supports an advanced optimal start algorithm. The algorithm works in conjunction with a local schedule to heat or cool the zone before the scheduled occupancy periods begin, in order to bring the zone to the required occupied setpoint when the scheduled occupancy period begins. Occupant comfort is ensured while automatically minimizing energy usage. This algorithm creates a model of the zone that is controlled and automatically determines when to start the equipment before the scheduled transition to Occupied. The start

time automatically adjusts daily to minimize the time between reaching setpoint and entering Occupied state. Depending on configuration, demand control ventilation and epidemic control ventilation features may operate at the same time as the optimal start algorithm. When optimal start is engaged and the pre-occupancy purge sequence or the post-occupancy purge sequence is active, the optimal start algorithm still takes all possible control actions to make the zone reach the required setpoints, even if the outdoor damper stays open. This may increase the cost of operation, but that is a choice the owner makes between cost saving versus the occupant's health and safety.

❶ **Note:** Optimal Start does not work when the schedule source is set to External.

## Enabling the motion sensor (TEC3x31 Models)

On models with integral motion sensing capability, the motion sensor is enabled with a default timeout of 15 min from the last detection of motion in the zone. On models without an integrated sensor, the default timeout is still 15 min, but it is only applied when one of the two configurable binary inputs is set to be a motion sensor (see *TEC3000 Series Thermostats for Packaged Rooftop and Heat Pump with Economizer Installation Guide LIT-12013163* for information about configuring the binary inputs). To disable motion sensing capabilities, set the Motion Sensor Timeout to 0 min.

## Dehumidification control

Dehumidification operates when the zone humidity increases above the humidity setpoint and the thermostat is in a satisfied state with no active call for cooling or heating. When dehumidification is active, the cooling device controls to the humidity setpoint, and the heating device reheats the zone in order to keep the temperature at setpoint.

The TEC3000 thermostat supports dehumidification control under the following configurations:

- RTU with an auxiliary dehumidifier wired to Aux output
- Heat pump with an auxiliary dehumidifier wired to Aux output
- RTU with hot gas reheat installed and wired to Aux output

## Aux control

The TEC features an auxiliary output that you can configure to operate in a few different ways. The available Aux Mode options depend on whether the auxiliary output is used for dehumidification control or not.

When Dehumidification is disabled, the Aux Mode supports the following options:

- Not Used—Output is always off
- Occupied NO—Output is normally open, but closes when occupied
- Occupied NC—Output is normally closed, but opens when occupied
- Occupied Fan NO—Output is normally open, but is closed when occupied with the fan running

- Occupied Fan NC—Output is normally closed, but is open when occupied with the fan running
- On—Output is turned on (relay closed), used by a BAS to directly control the AUX output
- Off—Output is turned off (relay open), used by a BAS to directly control the AUX output

When Dehumidification is enabled, the Aux Mode supports the following options:

- Dehumidifier—select when external or auxiliary dehumidifier is connected to Aux BO. See Figure 7 and Figure 8.
- Hot Gas Reheat—select when HGR valve is connected to Aux BO. See Figure 9.

## Scheduled circulation

You can schedule to run your fan for a minimum duration per hour during occupied or unoccupied hours. If the minimum hourly fan runtime is not exceeded, the fan turns on at the end of the hour for the length of time required to fulfill the minimum run time. The fan runtime calculation includes runtime initiated when the Fan Mode is set to On and other overrides. The fan does not turn on if the fan runtime is already longer than the minimum hourly fan runtime. When you enabled the Scheduled Circulation Only When Occupied setting, the fan does not turn on at the end of the hour to fulfill the minimum runtime unless the occupancy state is set to Occupied.

## Menus and submenus

**Table 7: Menus and submenus**

Level 1	Level 2	Level 3	Level 4
Setpoints	Dehumidification	Dehumidification	
	Temperature	Occupied Cooling	
		Occupied Heating	
		Unoccupied Cooling	
		Unoccupied Heating	
		Standby Cooling	
		Standby Heating	
		Occ Setpoint Select	
		Heat Cool Setpoint Mode	
		Max Heating Setpoint*	
		Min Heating Setpoint*	
		Max Cooling Setpoint*	
		Min Cooling Setpoint*	
		Max Setpoint*	
		Min Setpoint*	
	Ventilation*	Zone CO <sub>2</sub> Setpoint	
		Low OA Temperature Setpoint	
		Supply Air Temperature Low Limit	
		Supply Air Temperature High Limit	
Scheduling	Schedule Options	Set Schedule	
		Optimal Start Enable	
		Temp Occ Duration	
		Motion Sensor Timeout	
		Manual Occupancy Mode	
		Schedule Source	
Display Settings	Passcode Enabled		
	Passcode*		
	Brightness Setting		
	Enable Backlight Timeout		
	Units		
	Time		
	Time Zone		
	Set Time Format		
	Date		
	Set Date Format		
	Language		

**Table 7: Menus and submenus**

Level 1	Level 2	Level 3	Level 4
	Show Fan Button on Home		
	Show Temp on Home		
	Show Humidity on Home		
	Show Off Button on Home		
	Show Hold Button		
	Show Setpoint on Home		
	Show Alarms on Home		
	Show Occ Status		
	Show Unit Status		
	Show Date/Time		
	Show Damper Pos on Home*		
	Show CO <sub>2</sub> on Home*		
Setup	General Setup	Control Mode	
		Unit Enable	
		Fan Mode*	
		Max Setpoint Offset	
		Fan On Delay*	
		Fan Off Delay	
		Frost Protection	
		Dehum Enable	
		Unocc Dehum Enable	
		Dehumidification Sequence Mode*	
		Aux Mode	
		Dehumidification Aux Mode*	
		Load Shed Rate Limit	
		Load Shed Adjust	
		Fan Alarm Delay	
		Fan Alarm Action*	
		Fan Alarm Reset*	
		Fan Runtime Limit	
		Fan Runtime Reset*	
		Supply Air Temperature Alarm Offset	
		Supply Air Temperature Alarm Delay*	
		Scheduled Circulation Enable	
		Scheduled Circulation Only when Occupied	
		Minimum Hourly Fan Runtime	
	Input Setup	BI1 Config	

**Table 7: Menus and submenus**

Level 1	Level 2	Level 3	Level 4
		BI2 Config	
		Supply Temp Sensor	
		Supply Temp Offset*	
		Zone Temp Sensor	
		Zone Temp Offset	
		Reset Sensors	
		For networked models: Zone Temp Alarm Enabled	
		For networked models: Zone Temp Low Limit	
		For networked models: Zone Temp High Limit	
Setup (Cont)	Tuning Setup	Temp Control Setup	
		Reset PID Tuning	
		Deadband*	
		Auto Economizer Tuning	
		Heat Prop Band*	
		Heat Integral Time*	
		Heat Process Range*	
		Heat Saturation Time*	
		Heat Time Constant*	
		Heat Process Dead Time*	
		Heat Period*	
		Cool Prop Band*	
		Cool Integral Time*	
		Cool Process Range*	
		Cool Saturation Time*	
		Cool Time Constant*	
		Cool Process Dead Time*	
		Cool Period*	
		Econ Prop Band*	
		Econ Integral Time*	
		Econ Process Range*	
		Econ Saturation Time*	
		Econ Time Constant*	
		Econ Process Dead Time*	
		Econ Period*	
		Equipment Size	
	Network Setup	FC Comm Mode	

**Table 7: Menus and submenus**

Level 1	Level 2	Level 3	Level 4
		BACnet Instance ID*	
		For networked models: N2 Address*	
		BACnet Address*	
		For networked models: MSTP Baud Rate*	
		BACnet Encoding Type	
		BACnet/MSTP Communication Mode	
		For wireless models: Pan ID	
Setup (Cont)	Equipment Setup	General	Number of Compressors
			Lead/Lag Equalize Runtime
			Number of Heating Stages*
			Compressor Min On Time
			Compressor Min Off Time
			Heating Min On Time
			Heating Min Off Time
			Supp Min On Time
			Supp Min Off Time
			Cooling Lockout Temp
			Heating Lockout Temp
			Unoccupied Off Delay
		Economizer	Economizer Installed
			Damper Minimum Position*
			Damper Maximum Position*
			Low OA Damper Position*
			Damper Pos Error*
			Closed Voltage*
			Opened Voltage*
			Dry Bulb Setpoint
			Outdoor Enthalpy Setpoint
			Test Outdoor Air Damper
			Economizer Damper % Command
			Outdoor Air Damper Test Status
		Heat Pump	Heat Pump Supported
			Supp Heating Installed*
			Comp Low Lockout Temp*
			Supp High OA Lockout Temp*
			Reversing Valve Polarity*
	Ventilation Setup*	Demand Control Ventilation*	Demand Control Ventilation Enable
			Occupant Sensor Ventilation Enable
			Pre Occupancy Purge Time
			Post Occupancy Purge Time
			Allow Min Ventilation During Occ
		Epidemic Control Ventilation*	Epidemic Control Ventilation Enable

**Table 7: Menus and submenus**

Level 1	Level 2	Level 3	Level 4
			Enable Minimum Ventilation When Unocc
			Unoccupied Damper Minimum Position
			Inc Ventilation Pre Occ Purge Time
			Inc Ventilation Post Occ Purge Time
			Enable Humidity Alarm
Commissioning	Supply Air Temperature		
	Effective Zone Temperature		
	Heat Stage 1		
	Heat Stage 2		
	Reheat		
	Heat Command		
	Cool Stage 1		
	Cool Stage 2		
	Cool Command		
	Compressor		
	Reversing Valve		
	Supplement Heat		
	Supply Fan Command		
	Supply Fan		
	Econ Command		
	Aux		
	Start Commission		
Trend	EFF-ZNT		
	EFF-SETPOINT		
	EFF-ZNH		
	B1 Status		
	B2 Status		
	EFF-OAT		
	EFF-SAT		
	FANSPD-S		
	CLG1-C		
	CLG2-C		
	HTG1-C		
	HTG2-C		
	OAD-O		
	HTG-O		
	CLG-O		

**Table 7: Menus and submenus**

Level 1	Level 2	Level 3	Level 4
	EFF-IAQ		
	EFF-DPR		
	EFF-CHWST		
	CHWST-SP		
	EFF-OAH		
Status	System Status	Occupancy Source	
		Unit Status	
		Outdoor Air Temperature	
		Outdoor Humidity	
		Supply Air Temperature	
		Chilled Water Supply Temperature	
		Return Air Humidity	
		Indoor Air Humidity	
		Damper Feedback	
		Economizer Available	
		Cooling OAT Lockout	
		Heating OAT Lockout	
		Comp Low OAT Lockout	
		Supp High Lockout Temp	
		Changeover State	
		Zone Temp Source	
		Fan Accumulated Runtime	
		BI1 Status	
		BI2 Status	
		Zone Dew Point Temperature	
		Free Cooling Available*	
	Control Status	Cooling % Command	
		Heating % Command	
		Supplemental % Command	
		Economizer % Command	
		Cool Stage 1	
		Cool Stage 2	
		Heat Stage 1	
		Heat Stage 2	
		Supplemental Heat	
		Fan	
		Dehumidifier Command*	

**Table 7: Menus and submenus**

Level 1	Level 2	Level 3	Level 4
		Hot Gas Reheat Command*	
		Mixed Air Low Limit Cycle	
	Controller Info (Thermostat Info)	Model Name	
		Software Version	
		Unit Name	
		Device Name	
		Device Description	
Status (Cont)	Comms Status	Radio Code Version	
		PAN ID	
		Active Channel	
		Signal Strength	
		Connection Status	
		Network State	
		Supervisor Status	
		IEEE Address	
		Short Address	
	DCV Status*	Not Economizing When Should	
		Economizing When Should Not	
		Damper Not Modulating	
		Excess Outdoor Air	
		Air Temperature Sensor Failure	
		Economizer Enabled for Operation	
		Compressor Enable	
		Heating Enable	
Update	View Version		
	Load Firmware		
	Restore*		
	Backup*		
For wireless models: Network Status	Radio Code Version		
	Radio PAN ID		
	Active Channel		
	Signal Strength		
	Connection Status		
	Network State		
	IEEE Address		
	Short Address		

① **Note:** The \* indicates that the menus depend on your configuration.

## Troubleshooting

**Table 8: Fault list**

Faults	Probable causes	Solutions
Remote Zone Temp Fail	The External Zone Temperature sensor has been disconnected or has failed.	<ol style="list-style-type: none"> <li>1. Check the wiring of the sensor.</li> <li>2. If intentionally disconnected, reset sensors through the menu.</li> <li>3. If the problem persists, order replacement units and return the affected devices to Johnson Controls under the RMA program.</li> </ol>
Supply Temp Fail	The External Supply Temperature sensor has been disconnected or has failed.	<ol style="list-style-type: none"> <li>1. Check the wiring of the sensor.</li> <li>2. If intentionally disconnected, result fault by entering the menu, enter Control Setup, and select Inputs to reset the sensors.</li> <li>3. If the problem persists, order replacement units and return the affected devices to Johnson Controls under the RMA program.</li> </ol>
Outdoor Temp Fail	The External Outdoor Air Temperature sensor has been disconnected or has failed.	<ol style="list-style-type: none"> <li>1. Check the wiring of the sensor.</li> <li>2. If intentionally disconnected, reset sensors through the menu.</li> <li>3. If problems persist, order replacement units and return the affected devices to Johnson Controls under the RMA program.</li> </ol>
Internal Sensor Fail	An internal sensor has failed on the TEC.	Order replacement units and return the affected devices to Johnson Controls under the RMA program.
OA Lockouts Disabled	The Local Outdoor Air Temperature sensor has become disconnected or failed or a network Outdoor Air Temperature sensor has timed out, and the TEC is no longer shutting down equipment based on the OA lockout setpoints.	<ol style="list-style-type: none"> <li>1. If the source of outdoor air temperature was a locally connected sensor, follow the steps for the Outdoor Temp Fail alarm.</li> <li>2. If the source of outdoor air temperature was a BAS, check the BAS to ensure that it is still online and is providing the TEC with the temperature reading. If removal of the BAS mapping was intentional, reset sensors through the menu.</li> </ol>
Econ Unavailable	The Outdoor Air Temperature sensor is not installed, has failed, or has been disconnected and the TEC can no longer control the economizer.	Follow the same steps as Outdoor Temp Fail alarm.
Dehum Unavailable	Dehumidification is unavailable because the zone humidity sensor has failed or the humidity reading is not reliable.	Order replacement units and return the affected devices to Johnson Controls under the RMA program.
Service	Equipment connected to the BI configured for a Service alarm triggers the alarm.	Service the equipment by way of the manufacturer's recommendation.
Dirty Filter	Equipment connected to the BI configured for a Dirty Filter alarm triggers the alarm.	Replace the filter in the equipment as explained in the manufacturer's instructions.
Calibration Corrupt	Factory calibration data is lost or is not installed.	Order replacement units and return the affected devices to Johnson Controls under the RMA program.
Zone Temp Unreliable	All sources of zone temperature are unreliable, including the onboard sensor.	Order replacement units and return the affected devices to Johnson Controls under the RMA program.

**Table 8: Fault list**

<b>Faults</b>	<b>Probable causes</b>	<b>Solutions</b>
Open Window	The switch connected to the BI configured for Open Window senses that the window is opened, and control has shut down.	<ol style="list-style-type: none"> <li>1. Close the window to resume control.</li> <li>2. Check sensor functionality with an ohmmeter, and verify the wiring to the TEC.</li> <li>3. Order replacement units and return the affected devices to Johnson Controls under the RMA program.</li> </ol>
Fan Lock	The switch connected to the BI configured for Fan Lock did not sense airflow within 10 seconds of starting the fan, and control has been shut down.	<ol style="list-style-type: none"> <li>1. Inspect equipment to ensure fan functions.</li> <li>2. Check sensor functionality with an ohmmeter, and verify wiring to the TEC.</li> <li>3. Reset fault by entering the menu, selecting Fault Status, and selecting the Fan Lock.</li> <li>4. Order replacement units and return the affected devices to Johnson Controls under the RMA program.</li> </ol>
Humidity Unreliable	The zone humidity reading was reliable and has now failed.	<ol style="list-style-type: none"> <li>1. If the source of zone humidity was the onboard sensor, contact Johnson Controls product sales and support.</li> <li>2. If the source of zone humidity was a BAS, check the BAS to ensure that it is still online and providing the TEC with the humidity reading. If removal of the BAS mapping was intentional, reset sensors through the menu.</li> </ol>
Controller Fault (Thermostat Fault)	The thermostat has detected an internal fault that it cannot recover.	Order replacement units and return the affected devices to Johnson Controls under the RMA program.
	An unknown error has prevented the thermostat from turning on.	Order replacement units and return the affected devices to Johnson Controls under the RMA program.
Touchscreen Unavailable	The touchscreen components fail to initialize.	<ol style="list-style-type: none"> <li>1. Restart the thermostat.</li> <li>2. If problems persist, order replacement units and return the affected devices to Johnson Controls under the RMA program.</li> </ol>
Board Mismatch	The baseboard and CPU board are paired incorrectly. An error message appears on the TEC indicating the model number of the baseboard and CPU board.	Match the baseboard to its corresponding CPU board.
Firmware Mismatch	The previous upgrade did not complete.	<ol style="list-style-type: none"> <li>1. Upgrade the TEC3000 to the latest released version.</li> <li>2. Upgrade the TEC3000 to the current version again.</li> </ol>
	The previous downgrade has not completed because the previous version is no longer supported.	Restart the TEC3000 to clear the fault.
USB Malfunction	A USB drive has malfunctioned and drawn more than the maximum allowed current.	<ol style="list-style-type: none"> <li>1. Attempt to insert and use the USB drive again.</li> <li>2. Try a new USB drive.</li> <li>3. If problems persist, order replacement units and return the affected devices to Johnson Controls under the RMA program.</li> </ol>
Supply Fan Runtime Limit Extended	The Supply Fan Runtime exceeds the configured Supply Fan Runtime Limit.	<ol style="list-style-type: none"> <li>1. Service the Supply Fan.</li> <li>2. Reset the Supply Fan runtime.</li> </ol>

**Table 8: Fault list**

Faults	Probable causes	Solutions
Heating Ineffective	The Supply Air Temperature has not increased above the configured Supply Air Temperature Alarm Offset while heating has been active for at least the Supply Air Temperature Alarm Delay.	Verify that the heating elements on the rooftop are functioning correctly.
Cooling Ineffective	The Supply Air Temperature has not decreased below the configured Supply Air Temperature Alarm Offset while cooling has been active for at least the Supply Air Temperature Alarm Delay.	Verify that the cooling elements on the rooftop are functioning correctly.
Supply Fan Fault	The Supply Fan Status configured for either BI1 or BI2 has not proved within the configured Fan Alarm Delay.	<ol style="list-style-type: none"> <li>1. Verify that the Supply Fan is operating when turned on.</li> <li>2. Verify that the Supply Fan Status wiring is connected correctly.</li> </ol>
Zone Temperature Too Cold	The Zone Temperature decreased below the configured Zone Temp Low Limit.	Verify that the TEC and the RTU heating are enabled and functioning.
Zone Temperature Too Hot	The Zone Temperature increased above the configured Zone Temp High Limit.	Verify that the TEC and the RTU cooling are enabled and functioning.
Not Economizing When Should	Damper actuator failure, physical blockage of the outdoor air damper, or feedback mismatch.	Verify outdoor air damper functionality and verify the command and feedback signals.
Economizing When Should Not		
Damper Not Modulating		
Excess Outdoor Air		

**Table 9: Troubleshooting details**

Symptom	Probable causes	Solutions
For TEC3x3x models: the controller displays <code>Idle</code> with a Unit Status of <code>Cooling Unavailable</code> due to OA Temp despite being above cooling setpoint, or with a status of <code>Heating Unavailable</code> due to OA Temp despite being below the setpoint.	The outdoor air temperature is too warm for heating or too cold for cooling.	<ol style="list-style-type: none"> <li>1. If Cooling and Heating Lockout Setpoints are inadequate, adjust the setpoints.</li> <li>2. Wait for the outdoor conditions to be favorable for heating or cooling.</li> </ol>
The controller displays <code>Idle</code> with a Unit Status of <code>Cooling Unavailable</code> due to Control Mode despite being above cooling setpoint, or with a status of <code>Heating Unavailable</code> due to Control Mode despite being below the setpoint.	The Control Mode is set to Cooling Mode, but the thermostat requests heating.	Change the Control Mode to Auto or Heating.
	The Control Mode is set to Heating Mode, but the thermostat requests cooling.	Change the Control Mode to Auto or Cooling.
The thermostat displays <code>Idle</code> with a Unit Status of <code>Cooling Unavailable</code> despite being above cooling setpoint, or with a status of <code>Heating Unavailable</code> despite being below the setpoint.	The Number of Compressors set to Not Used and the thermostat is requesting cooling, or Number of Heating Stages is set to Not Used.	Adjust the number of compressors and number of heating stages to match the configuration of the unit.

**Table 9: Troubleshooting details**

Symptom	Probable causes	Solutions
The staged equipment shuts off above the cooling setpoint or below the heating setpoint when the PID is running on the TEC. If the unit is in On/Off Control mode, this does not apply.	The PID control algorithm minimizes overshoot and energy usage for the particular equipment and zone, and may cycle the equipment prior to reaching setpoint.	Expected behavior.
The heat pump does not sequence correctly.	The heat pump requires traditional wiring (Y1, Y2, W1, W2, and G) and handles the reversing valve internally, but Heat Pump Supported is set to Yes.	Consult the equipment documentation to verify wiring configuration, then set Heat Pump Supported to No.
	The heat pump requires thermostat to control the reversing valve (Y1, Y2, O/B, and G) but the Heat Pump Supported is set to No.	Consult the equipment documentation to verify wiring configuration, then set Heat Pump Supported to Yes.
The heat pump heats when it should be cooling, and cools when it should heat.	Reversing Valve polarity is incorrectly set.	Consult the equipment documentation to verify reversing valve polarity, then adjust the Reversing Valve Polarity menu option accordingly.
The staged equipment cycles too rapidly or too slowly when the PID is running on the TEC.	The control band around the setpoint is determined by the minimum on/off times and is set incorrectly for the equipment, zone, or user preference. There is a tradeoff between reduced control band size and increased energy usage and equipment wear from increased cycling.	<ol style="list-style-type: none"> <li>1. Verify that equipment minimum on/off times are set correctly.</li> <li>2. If the default deadband around the setpoint does not provide the required temperature control, set Temp Control Setup to Deadband Override and set the Deadband parameter to the preferred value.</li> </ol>
The thermostat provides an error when trying to upgrade firmware.	The firmware on the USB drive is below the minimum required version. Error code 1025.	Please use firmware version 3.0.2.xxxx (for networked models) or 2.0.2.xxxx (for wireless models) or higher. A restart is required to clear the Firmware Mismatch fault that occurs.
The TEC3000 zone temperature does not change fast enough compared to the measured zone temperature from a verification device, such as a calibrated sensor.	The TEC3000 is configured by default for larger spaces with normal-sized equipment when a proportional device is active.	Select <b>Control Setup&gt;Tuning&gt; Equipment Size&gt; Oversized</b> .
The zone space temperature increases or decreases too much when the unit is active in unoccupied mode.	The heating and cooling equipment are too big for the unoccupied space.	Decrease the Unoccupied Off Delay parameter from 10 min to a more appropriate time for the equipment configuration.
The thermostat provides an error when trying to back up settings.	The USB drive is defective.	Try a different USB drive.

**Table 9: Troubleshooting details**

Symptom	Probable causes	Solutions
The thermostat provides an error when trying to restore settings from a backup.	The USB drive is defective.	Try a different USB drive.
	The Restore file is corrupt.	Try restoring a different backup file.
	The Restore file is from an incompatible model TEC.	Ensure that the backup file being restored was from the same model TEC.
The thermostat is unable to access a USB drive.	The drive is formatted as NTFS or another unsupported format. The TEC supports file allocation table (FAT) (for networked models), FAT16 (for wireless models), and FAT32 (for all models) formats only.	Reformat the USB drive, or try a different USB drive with a supported format.
	The USB drive is defective.	Try a different USB drive.
The thermostat displays Board Mismatch.	The I/O board that the display board is currently attached to does not match the one that initially shipped with the display board.	Attach the display board to the correct I/O board.
	A hardware failure causes the two boards to incorrectly identify themselves.	Order replacement units and return the affected devices to Johnson Controls under the RMA program.
The thermostat displays Controller Fault (Thermostat Fault).	An internal fault was detected and the thermostat was unable to recover.	Order replacement units and return the affected devices to Johnson Controls under the RMA program.
The Bell icon is displayed on the TEC home page.	The fault has been detected on the TEC.	See Table 8 for TEC fault causes and resolution.
Partial Restore Complete is displayed when trying to restore settings from a backup file.	Not all of the items in the backup file have been restored. This error can occur when a value is out of the minimum or maximum range in the backup file. It may also occur if there are inconsistencies in the reliability of a setting in the backup file and on the TEC device.	<ol style="list-style-type: none"> <li>1. Create a Backup file on a USB drive for the TEC that is showing the issue.</li> <li>2. Edit the backup file created in the previous step on a PC to reflect the preferred settings.</li> <li>3. Verify that the modified values are within minimum and maximum range in the backup file.</li> <li>4. Restore the settings from the newly edited backup file on the TEC.</li> </ol>
The temperature displayed is lower than the actual room temperature.	Cold air drafts enter the back of the TEC.	Seal any holes behind the TEC to reduce drafts.
	Air is being forced through the TEC from a nearby vent.	Move the location of the TEC or change the venting to prevent air from being forced through the TEC.
For networked models, the Online icon does not appear for a networked thermostat.	There is incorrect field bus wiring.	Refer to the <i>MS/TP Communications Bus Technical Bulletin (LIT-12011034)</i> .
For wireless models, Supervisory Status = Offline	The supervisory controller is not communicating with the TEC. The TEC is not mapped to a JCI Supervisory System. The WNC or WRG Gateway is not communicating with the TEC.	<ol style="list-style-type: none"> <li>1. Map the TEC into a JCI Supervisory system.</li> <li>2. Verify that the PAN's WNC or WRG Gateway is online.</li> <li>3. Add ZFR182x or ZFR183x Routers/Repeaters into the wireless system.</li> </ol>
Some icons are hidden.	Lockout levels are used or the icons are hidden due to the display settings.	See Table 5 for lockout levels and access details.

**Table 9: Troubleshooting details**

Symptom	Probable causes	Solutions
The touchscreen is unresponsive.	You tap the display or touch the thermostat within 5 mm of the display when power is applied to the thermostat.	Restart the thermostat. Do not interact with the thermostat until the home screen displays.
You do not tap the touchscreen, but the display acts as if it is tapped, which causes the display to blink or toggle between screens.		
You need to tap the display at an offset from a touch point to activate the display.		


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

## TEC3000 Series Thermostats for Packaged Rooftop and Heat Pump with Economizer technical specifications

**Table 10: TEC3000 Series Thermostats for Packaged Rooftop and Heat Pump with Economizer**

Specification		Description
Power requirements		19 VAC to 30 VAC, 50/60 Hz, 4 VA at 24 VAC nominal, Class 2 or safety extra-low voltage (SELV)
USB port power rating		120 mA to 250 mA current draw supported
Relay contact rating		19 VAC to 30 VAC, 1.0 A maximum, 15 mA minimum, 3.0 A in-rush, Class 2 or SELV
Binary inputs		Dry contact across terminal COM to terminals BI1 or BI2
Analog inputs		Nickel, platinum, A99B, 2.25k ohm NTC, 10k ohm NTC, 10k ohm NTC Type 3 across terminal COM to terminals R SEN
Temperature sensor type		Local digital sensor
Wire size		18 AWG (1.0 mm diameter) maximum, 22 AWG (0.6 mm diameter) recommended
MS/TP network guidelines		For wired models: Up to 100 devices maximum for each Metasys Supervisory Engine; 4,000 ft (1,219 m) maximum cable length. Refer to the <i>MS/TP Technical Bulletin</i> for the Metasys, FX, or Verasys® system installed.
		For wireless models: Up to 100 devices maximum for each Metasys Supervisory Engine
Wireless band (for wireless models)		Direct-sequence spread-spectrum 2.4 GHz ISM bands
Transmission power (for wireless models)	TEC30xx-1x-000 compatible with ZFR182x Pro Series	10 mW maximum
	TEC31xx-1x-000 compatible with ZFR183x Pro Series	100 mW maximum
Transmission range (for wireless models)	TEC30xx-1x-000 compatible with ZFR182x Pro Series	50 ft (15.2 m) recommended indoor 250 ft (76.2 m) line of sight, maximum
	TEC31xx-1x-000 compatible with ZFR183x Pro Series	250 ft (76.2 m) recommended indoor 1000 ft (304.8 m) line of sight, maximum
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	Temperature	±0.9°F/±0.5°C at 70.0°F/21.0°C typical calibrated
Minimum deadband		2°F/1°C between heating and cooling
Occupancy sensor motion detection (occupancy sensing models)		Minimum of 94 angular degrees up to a distance of 15 ft (4.6 m); based on a clear line of sight

**Table 10: TEC3000 Series Thermostats for Packaged Rooftop and Heat Pump with Economizer**

Specification		Description
Ambient conditions	Operating	32°F to 122°F (0°C to 50°C); 95% RH maximum, noncondensing
	Storage	-4°F to 122°F (-20°C to 50°C); 95% RH maximum, noncondensing
Compliance	BACnet International	BACnet Testing Laboratories™ (BTL) 135-2001 Listed BACnet Advanced Application Controller (B-AAC)
	United States	UL Listed, File E27734, CCN XAPX, Under UL60730
		Networked models: FCC Compliant to CFR 47, Part 15, Subpart B, Class B
		Wireless models: Transmission complies with FCC Part 15.247 regulations for low power unlicensed transmitters; transmitter identification FCC ID: OEJ-WRZRADIO (ZFR182x), OEJ-ZFRRADIO (ZFR183x)
	Canada	UL Listed, File E27734, CCN XAPX7, Under E60730
		Networked models: Industry Canada, ICES-003
		Wireless models: Industry Canada (IC) RSS-210; Transmitter identification ZFR1810-1: IC ID: 279A-WRZRADIO (ZFR182x), 279A-ZFRRADIO (ZFR183x)
	Europe (for networked models only)	CE Mark – Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive and the RoHS Directive.
	Australia and New Zealand	RCM Mark, Australia/NZ Emissions Compliant
Shipping weight	Models without occupancy sensor	0.75 lb (0.34 kg)
	Models with occupancy sensor	0.77 lb (0.35 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 shall not be liable for damages resulting from misapplication or misuse of its products.

## Repair Information

If the TEC3000 Series Thermostat fails to operate within its specifications, replace the unit. For a replacement thermostat, contact the nearest Johnson Controls representative.

## Patents

Patents: <https://jciapat.com>

## Product warranty

This product is covered by a limited warranty, details of which can be found at [www.johnsoncontrols.com/buildingswarranty](http://www.johnsoncontrols.com/buildingswarranty).

## Software terms

**Use of the software that is in (or constitutes) this product, or access to the cloud, or hosted services applicable to this product, if any, is subject to applicable end-user license, open-source software information, and other terms set forth at [www.johnsoncontrols.com/techterms](http://www.johnsoncontrols.com/techterms).** Your use of this product constitutes an agreement to such terms.

## Single point of contact

APAC	Europe	NA/SA
JOHNSON CONTROLS C/O CONTROLS PRODUCT MANAGEMENT NO. 32 CHANGJIANG RD NEW DISTRICT WUXI JIANGSU PROVINCE 214028 CHINA	JOHNSON CONTROLS VOLTAWEG 20 6101 XK ECHT THE NETHERLANDS	JOHNSON CONTROLS 507 E MICHIGAN ST MILWAUKEE WI 53202 USA

## Contact information

Contact your local branch office:  
[www.johnsoncontrols.com/locations](http://www.johnsoncontrols.com/locations)

Contact Johnson Controls: [www.johnsoncontrols.com/contact-us](http://www.johnsoncontrols.com/contact-us)

