

TEC2104-4 and TEC2104-4+PIR N2 Networked Multi-Stage Economizer Thermostat Controllers

Installation Instructions

Part No. 24-9890-1230, Rev. —
Issued February 8, 2010

Applications

The TEC2104-4 and TEC2104-4+PIR Thermostat Controllers are N2 networked devices that provide control of single- or multi-stage unitary rooftop units with economizers. The TEC2104-4+PIR Thermostat Controller provides advanced active occupancy logic that automatically switches occupancy from Occupied to Unoccupied as required by the presence of local activity. See the *Occupancy Sensor Operation – TEC2104-4+PIR Thermostat Controller* section for more information.

The technologically advanced TEC2104-4 and TEC2104-4+PIR Thermostat Controllers feature a Building Automation System (BAS) N2 Bus communication capability that enables remote monitoring and programming for efficient space temperature control.

The TEC2104-4 and TEC2104-4+PIR Thermostat Controllers feature an intuitive User Interface (UI) with backlit display that makes setup and operation quick and easy. The thermostat controller also employs a unique, Proportional-Integral (PI) time-proportioning algorithm that virtually eliminates temperature offset associated with traditional, differential-based thermostat controller controllers.

IMPORTANT: The TEC2104-4 and TEC2104-4+PIR Thermostat Controllers are intended to provide an input to equipment under normal operating conditions. Where failure or malfunction of the thermostat controller 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 controller.

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 TEC2104-4 or TEC2104-4+PIR Thermostat Controller:

- 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

For integrated Passive Infrared (PIR) models, make sure the thermostat controller is located centrally, where occupant movement is frequent.

Note: Allow for vertical air circulation to the TEC2104-4 and TEC2104-4+PIR Thermostat Controllers.

To install the thermostat controller:

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

Note: Normally, the security screw is packaged separately in a plastic bag with the thermostat controller. Skip this step if the screw is not installed on the bottom of the cover.

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

Note: PIR Models have a wiring connection between the cover and the Printed Circuit Board (PCB). This connection allows for proper wiring of the occupancy sensor. Carefully remove the wiring connection from the PCB by pulling up on the connector block. **Do not attempt to remove the connector block by pulling on the wires.**

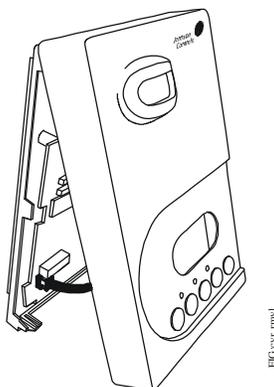


Figure 1: Removing the Thermostat Cover (TEC2104-4+PIR Model Shown)

3. Carefully pull the locking tabs on the right side of the thermostat controller mounting base and unlock the PCB. Open the PCB to the left as illustrated in Figure 2.
4. Pull approximately 6 in. (152 mm) of wire from the wall and insert the wire through the hole in the thermostat controller mounting base.
5. Align the thermostat controller mounting base on the wall and use the base as a template to mark the two mounting hole locations.

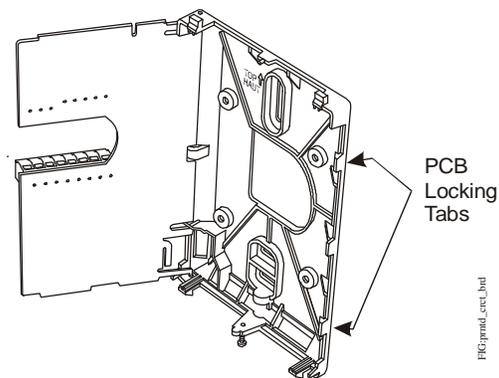


Figure 2: Opening the Thermostat PCB

6. Position the thermostat controller mounting base so that the arrow on the base points upward to indicate the top of the thermostat controller.

Note: 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) or 3 x 2 in. (76 x 51 mm) square boxes. This procedure ensures that you have enough space for cabling and end-of-line devices, if needed.

Note: For surface-mount applications, use durable mounting hardware such as Molly bolt anchors that cannot be easily pulled out of the mounting surface.

7. Secure the base to the wall surface using two mounting screws as illustrated in Figure 3.

Note: Be careful not to overtighten the mounting screws.

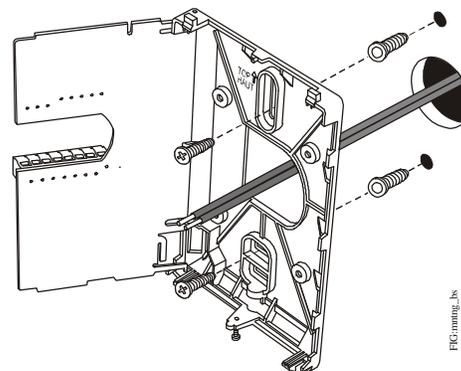


Figure 3: Securing the Thermostat Mounting Base to the Wall

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

- Remove the screw terminal blocks that are attached to a disposable adhesive. Figure 4 illustrates the locations of the screw terminal blocks on the thermostat controller.

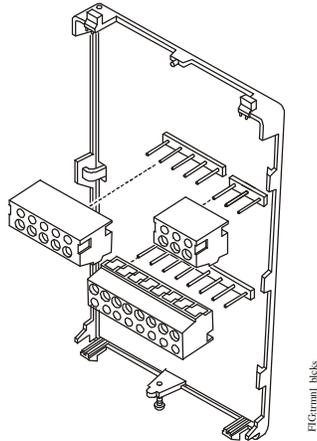


Figure 4: Removing the Screw Terminal Blocks

Wiring

When an existing thermostat controller is replaced, remove and label the wires to identify the terminal functions. When a TEC2104-4 or TEC2104-4+PIR Thermostat Controller is replaced, simply remove the old screw terminal blocks and reinsert them onto the PCB of the replacement thermostat controller.



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 TEC2104-4 and TEC2104-4+PIR Thermostat Controller.

To wire the thermostat controller:

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

- 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.

- Reinsert the screw terminal blocks onto the PCB.
- Reattach the thermostat controller cover to the mounting base (top side first).
- Use a Phillips-head screwdriver to reinstall the security screw on the bottom of the thermostat controller cover.

Connecting the N2 Bus

To connect the N2 Bus:

- Set the N2 address of the TEC2104-4 or TEC2104-4+PIR Thermostat Controller per the engineering drawings prior to wiring the thermostat controller. (See the **Com addr** parameter in Table 2 to set the N2 address for the thermostat controller.) Also test for N2 voltage, polarity, and isolation prior to wiring the thermostat controller.
- Observe the polarity when connecting the N2 Bus wires to the thermostat controller.
- After the N2 Bus wires are connected to the first thermostat controller, continue in a daisy-chained fashion to the next thermostat controller.

Note: The N2 Bus wiring must be twisted-pair lines. Do not run the N2 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).

For more N2 Bus overview information, refer to the *N2 Communications Bus Technical Bulletin (LIT-636018)* and the *ASC and N2 Bus Networking and Troubleshooting Guide (LIT-6363003)*.

Terminal	Function
Y1	Energizes on a Call for First-Stage Cooling
Y2	Energizes on a Call for Second-Stage Cooling
G	Energizes Fan in Accordance with the Selected Fan Mode
RC	24 VAC from Equipment Transformer
C	24 VAC (Common) from Equipment Transformer
RH	24 VAC for Heating Stages
W1	Energizes on a Call for First-Stage Heating
W2	Energizes on a Call for Second-Stage Heating
Aux	Auxiliary Output
DI1	Configurable Digital Input 1
DI2	Configurable Digital Input 2
RS	Remote Room Sensor
Scom	Sensor Common
OS	Outdoor Air Sensor
MS	Mixed Air or Discharge Air Sensor
EC	0 to 10 VDC Economizer Actuator Output
+, -, REF	N2 Bus

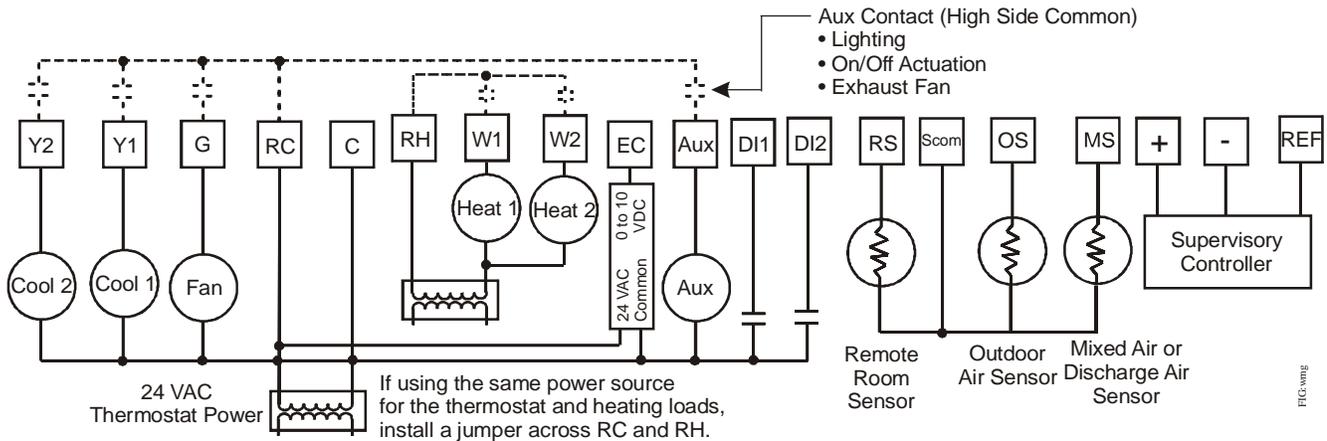
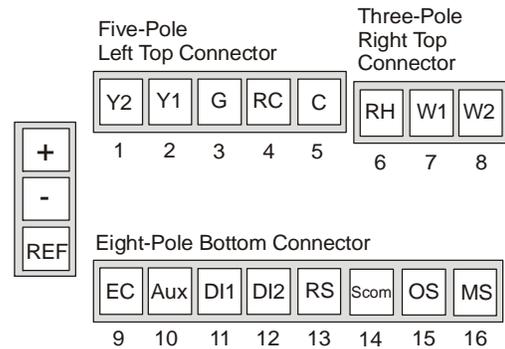


Figure 5: Wiring the TEC2104-4 and TEC2104-4+PIR Thermostat Controllers

N2 Write, Override, and Release Commands

N2 overrides take priority over any local adjustment or command in the thermostat controller until the override is released. For example, if the supervisory controller sends an N2 override message to turn System Mode Off and then the user selects System Mode On at the thermostat controller keypad, the thermostat controller keeps the System Mode Off.

When an N2 override is released, the object may once again be changed through the thermostat controller keypad. The thermostat controller does not retain any data entered at the thermostat controller keypad during the override.

The thermostat controller automatically releases all N2 overrides after 10 minutes of no communications. For example, if the network cable is removed from the thermostat controller or if the supervisory controller goes offline.

The thermostat controller does not maintain an internal command priority table. The most recent command received by any of the Object Types listed in Table 1 controls the thermostat controller.

However, if the Metasys system sends an N2 write command to turn System Mode Off and the user selects System Mode On at the thermostat controller keypad, the thermostat controller keeps the System Mode On.

Handling Setpoints

If a setpoint is overridden, the thermostat controller adjusts the other setpoint to maintain the minimum deadband between the setpoints, if necessary. The setpoints can be spread farther apart but can never be adjusted closer than the current minimum deadband value.

- The value for Heating SP (ADI-3), Unoccupied Heating SP (ADI-5), and Standby Heating SP (ADI-10) must stay within the limits established in the controller by Minimum Heat SP (ADI-7 read-only) and Maximum Heat SP (ADI-8).
- The value for Cooling SP (ADI-4) and Unoccupied Cooling SP (ADI-6) must stay within the limits established in the controller by Minimum Cool SP (ADI-9) and Maximum Cool SP (ADI-10 read-only).

Failure to stay within the limits for a command results in an N2 Negative Acknowledgment (NAK) error from the thermostat controller.

N2 Device Mapping

Metasys® System Person-Machine Interface (PMI)

Define the N2 thermostat controller as a Vendor Device (VND) when adding the thermostat controller to the supervisory controller.

Do not direct-map any points; instead, run control of these points through the Control System (CS) object. The supervisory controller Model Point Type is the definition inside the model file. Use a CS object to retrieve the data.

Table 1: N2 Bus Objects (Part 1 of 3)

Point Name	TEC Point Type/Address	N30/NAE Object Type	BAS Model Point Type	Override Range
Room Temp ¹	ADI-1	N2 AI	CSAD	32 to 122°F (0 to 50°C)
Aux Temp/Outdoor Temp ¹	ADI-2	N2 AI	CSAD	-40 to 122°F (-40 to 50°C)
Heating SP ^{1, 2} (Occupied Heating SP)	ADI-3	N2 AO	CSAD	40 to 90°F (4.5 to 32°C)
Cooling SP ^{1, 2} (Occupied Cooling SP)	ADI-4	N2 AO	CSAD	54 to 100°F (12 to 37.5°C)
Setback Heating SP ^{1, 2} (Unoccupied Heating SP)	ADI-5	N2 AO	CSAD	40 to 90°F (4.5 to 32°C)
Setback Cooling SP ^{1, 2} (Unoccupied Cooling SP)	ADI-6	N2 AO	CSAD	54 to 100°F (12 to 37.5°C)
Minimum Heat SP	ADI-7	N2 AI	CSAD	40°F (4.5°C)
Maximum Heat SP ¹	ADI-8	N2 AO	CSAD	40 to 90°F (4.5 to 32°C)
Minimum Cool SP ¹	ADI-9	N2 AO	CSAD	54 to 100°F (12 to 37.5°C)
Maximum Cool SP	ADI-10	N2 AI	CSAD	100°F (37.5°C)

Metasys System Extended Architecture

The Controller Point Type is the fixed-point definition inside the controller. Refer to the *N2 Integration with the NAE Technical Bulletin (LIT-1201683)* for more information on Controller Point Types.

Network Automation Engine (NAE) Setpoint commands translate into N2 Write commands. NAE Operator Override and Release Operator Override translate into N2 Override and Release commands, respectively.

You must not have a Relinquish Default for the setpoints if you want to change them from the thermostat controller display.

If there is a Relinquish Default for the setpoints, the NAE always has an Override for either an adjusted value or the Relinquish Default Value. You should use Operator Override and Release Operator Override if you want to command the setpoint and release it to local control.

Once all the NAE commands are released, the Override Status in the Hardware tab displays False. At that time, the user is can change the setpoint from the local display.

Table 1: N2 Bus Objects (Part 2 of 3)

Point Name	TEC Point Type/Address	N30/NAE Object Type	BAS Model Point Type	Override Range
Mixed Air/Discharge Air Temperature (MS)	ADI-11	N2 AI	CSAD	-40 to 122°F (-40 to 50°C)
Keypad Password¹	ADI-12	N2 AO	CSAD	0 to 1000
PI Heating Demand	ADI-13	N2 AI	CSAD	0 to 100%
PI Cooling Demand	ADI-14	N2 AI	CSAD	0 to 100%
Heating Outdoor Air Temperature Lockout¹	ADI-15	N2 AO	CSAD	-15.0 to 120°F (-26 to 49°C)
Cooling Outdoor Air Temperature Lockout¹	ADI-16	N2 AO	CSAD	-40 to 95°F (-40 to 35°C)
Economizer Output	ADI-17	N2 AI	CSAD	0 to 100%
Economizer Changeover SP¹	ADI-18	N2 AO	CSAD	14.0 to 70.0°F (-10.0 to 21.0°C)
Economizer Minimum Position¹	ADI-19	N2 AO	CSAD	0 to 100%
Economizer Mixed Air SP¹	ADI-20	N2 AO	CSAD	50.0 to 90.0°F (10.0 to 32.0°C)
Fan¹	BD-1	N2 BO	CSBD	0 = Auto 1 = On
Mode¹	BD-2	N2 MSO ^{3,4}	CSMS	0 = Off 1 = Cool 2 = Heat 3 = Auto
Occupancy¹	BD-3	N2 BO	CSBD	0 = Unoccupied 1 = Occupied
W1 State	BD-4	N2 BI	CSBD	0 = Off 1 = On
W2 State	BD-5	N2 BI	CSBD	0 = Off 1 = On
Y1 State	BD-6	N2 BI	CSBD	0 = Off 1 = On
Y2 State	BD-7	N2 BI	CSBD	0 = Off 1 = On
G State - Fan	BD-8	N2 BI	CSBD	0 = Off 1 = On
Temp Units¹ (Local Display Only)	BD-9	N2 BO	CSBD	0 = °C 1 = °F
Occupancy Override	BD-10	N2 BI	CSBD	0 = No Override 1 = Override
Temporary Occupancy Time¹	BD-11	N2-MSO ³	CSMS	0 to 12 Hours in 1-Hour Increments For example: 0 = 0 Hours 1 = 1 Hour 2 = 2 Hours 3 = 3 Hours . . . 12 = 12 Hours

Table 1: N2 Bus Objects (Part 3 of 3)

Point Name	TEC Point Type/Address	N30/NAE Object Type	BAS Model Point Type	Override Range
Unoccupied Time ¹	BD-12	N2 MSO ³	CSMS	0.5 to 24.0 Hours in 0.5-Hour Increments For example: 0 = 0.5 Hours 1 = 1.0 Hour 2 = 1.5 Hours . . . 47 = 24.0 Hours
Effective Occupancy	BD-13	N2 MSI ⁵	CSMS	0 = Occupied 1 = Unoccupied 2 = User Requested Temporary Occupancy
Setpoint Deadband ^{1, 2}	BD-14	N2 MSO ³	CSMS	0 = 2.0F°/1.0C° 1 = 3.0F°/1.5° 2 = 4.0F°/2.0C°
Economizer with Mechanical Cooling Enabled ¹	BD-15	N2 BO	CSBD	0 = Disabled 1 = Enabled
DI1 ^{6, 7}	BI-1	N2 BI	CSBI	0 = Off 1 = On
Temp Alarm ^{6, 8}	BI-2	N2 BI	CSBI	0 = Normal 1 = Alarm
DI2 ^{6, 7}	BI-3	N2 BI	CSBI	0 = Off 1 = On
Fan Lockout Alarm ⁶	BI-4	N2 BI	CSBI	0 = Normal 1 = Alarm
Frost Alarm ⁶	BI-5	N2 BI	CSBI	0 = Normal 1 = Alarm

1. Commandable.
2. If a heating (cooling) setpoint is overridden, the TEC2104-4 or TEC2104-4+PIR Series Thermostat Controller may automatically override the corresponding cooling (heating) setpoint to maintain the setpoint deadband between the two setpoints.
3. The Multiple Command Output (MCO) object is used to schedule multiple Multi-State Objects (MSOs).
4. When defining the N2 MSO, select TEC Mode from the States Text Menu. Type 4 for the TEC2104-4 and TEC2104-4+PIR Thermostat Controllers.
5. If downloading via a PRN file, it is necessary to change the object type to Multi-State Input (MSI) to view the multiple inputs.
6. Can be a Change-of-State (COS) alarm to the BAS or N2 Dialer Module (NDM) to initiate a dial-out.
7. The state of DI1 and DI2 is communicated over the N2 network even if the digital inputs are configured as **None** through the local interface at the thermostat controller.
8. **TEMP_ALARM BI2 = 1** if the room temperature does not move within 1°F of the setpoint within 45 minutes of entering its present mode. Network Alarm only - not visible on the TEC2104-4 or TEC2104-4+PIR Thermostat Controller LCD display.

Setup and Adjustments

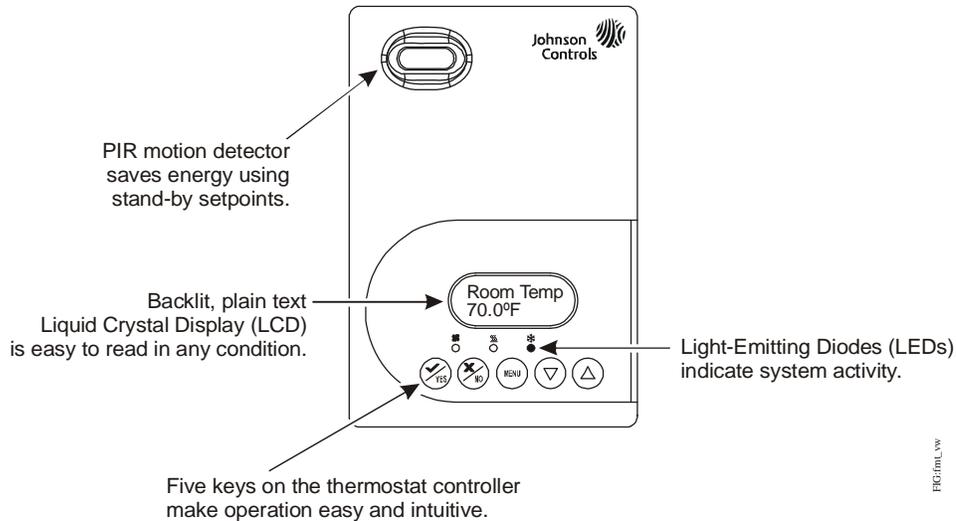


Figure 6: Front Cover of Thermostat Controller (TEC2104-4+PIR Model Shown)

Thermostat Controller User Interface Keys

The TEC2104-4 and TEC2104-4+PIR Thermostat Controller UI consists of five keys on the front cover (Figure 6). The function of each key is as follows:

- Use the **YES** key to:
 - confirm menu selections and to advance to the next menu item
 - stop the Status Display Menu from scrolling and to manually scroll to the next parameter on the menu

Note: When the thermostat controller is left unattended for 45 seconds, the thermostat controller display resumes scrolling.

- Use the **NO** key to decline a parameter change and to advance to the next menu item.
- Use the **MENU** key to:
 - access the Main User Menu or to exit the menu (See the [Main User Menu](#) section.)
 - access the Installer Configuration Menu or to exit the menu (See the [Configuring the TEC2104-4 and TEC2104-4+PIR Thermostat Controllers](#) section.)
- Use the **UP/DOWN** arrow keys to change the configuration parameters and to activate a setpoint adjustment.

Backlit Liquid Crystal Display (LCD)

The TEC2104-4 and TEC2104-4+PIR Thermostat Controller 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 controller 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 is on.
- The cool LED  is on when cooling is on.

Integrated PIR Sensor – TEC2104-4+PIR Thermostat Controller

The integrated PIR sensor allows for automatic switching between fully adjustable Occupied and Unoccupied temperature setpoints without user interaction. This feature generates incremental energy savings during scheduled occupied periods while the space is unoccupied.

Programming Overview

Three menus are used to view, program, and configure the TEC2104-4 and TEC2104-4+PIR Thermostat Controllers: the Status Display Menu, the Main User Menu, and the Installer Configuration Menu.

Status Display Menu

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

- Room Temperature
- System Mode
- Occupancy Status (Occupied/Unoccupied/Override)
- Outdoor Temperature – An outdoor air temperature sensor must be connected.
- Applicable Alarms – The backlight lights up as an alarm condition is displayed.

Note: Press the **YES** key to temporarily stop this menu from scrolling.

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

Main User Menu

The Main User Menu is used to access and change the basic operating parameters of the thermostat controller. During normal thermostat controller operation, press the **MENU** key once to access the Main User Menu. This menu is most commonly used by the zone occupant, and includes the following parameters:

- Temperature Setpoints
- System Mode
- Fan Mode

The Main User Menu uses Auto Help. Auto Help is displayed automatically in the main User Menu when there is a pause in programming activity.

Installer Configuration Menu

The Installer Configuration Menu is used to set up the thermostat controller for application-specific operation. To access this menu, press and hold the **MENU** key for approximately 8 seconds.

Occupancy Sensor Operation – TEC2104-4+PIR Thermostat Controller

A TEC2104-4+PIR Thermostat Controller (or a TEC2104-4 Thermostat Controller equipped with a PIR accessory cover) provides advanced occupancy logic.

Note: The PIR strategy is an occupied strategy. If the thermostat controller is programmed to be Unoccupied, the PIR function does not have an effect on the occupancy strategy.

The thermostat controller automatically switches the occupancy level between Occupied and Unoccupied as required, when local movement is sensed. In the Occupied mode, if no movement is detected beyond the **Unocc TM** parameter setting, the mode changes to Unoccupied. Once movement is detected, the mode changes back to Occupied.

Occupancy sensing is enabled only if a PIR cover is installed. The PIR cover, when installed, is auto detected.

PIR Diagnostic LEDs

The diagnostic LEDs inside the PIR lens brighten when movement is detected within the first 30 minutes after powerup. The LEDs do not light up or brighten after the initial 30-minute period.

Setpoints

The installer must be certain that the difference between the Occupied and Unoccupied setpoints can be recovered within a timely fashion to ensure occupancy comfort. In addition, the difference between the two setpoints must be large enough to warrant maximum energy savings.

These setpoints and Unoccupied time are adjustable to allow for customization, as dictated by the individual space requirements. See Figure 7 for an example of increasing room temperature setpoints.

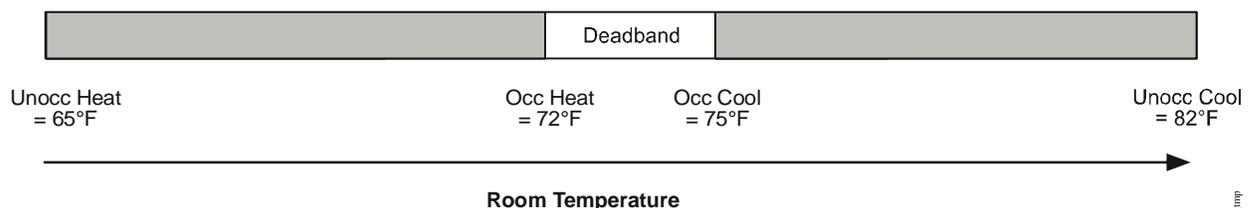


Figure 7: Increasing Room Temperature Setpoints

Configuring the TEC2104-4 and TEC2104-4+PIR Thermostat Controllers

The TEC2104-4 and TEC2104-4+PIR Thermostat Controllers ship from the factory with default settings for all configurable parameters. The default settings are shown in Table 2. To reconfigure the parameters via the thermostat controller, follow these steps:

1. To access the Installer Configuration Menu, press and hold the **MENU** key for approximately 8 seconds.

Note: If the **Password** parameter is configured, Password 0 appears on the thermostat controller display indicating that the configured password is required to proceed. Use the **UP/DOWN** arrow keys to indicate the configured password, then press the **MENU** key to proceed through the Installer Configuration Menu parameters.

2. Once the Installer Configuration Menu begins, press the **NO** key to scroll through the parameters listed in Table 2.

3. When the desired parameter is displayed, use the **YES** key to choose the desired selection option.
4. Press the **YES** key and then the **NO** key to continue scrolling through the parameters.

To exit the Installer Configuration Menu at any time, press the **MENU** key and press the **YES** key at the exit prompt. To pass over a parameter without changing it, press the **NO** key.

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

Configuring Inputs DI1 and DI2

When DI1 and DI2 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.

Both inputs can be configured to the Selection Options included in Table 2.

Table 2: Installer Configuration Menu (Part 1 of 6)

Parameter Appearing on Display	Description and Default	Selection Options
Pswrd	Sets the protective access password to prevent unauthorized access to the Installer Configuration Menu. Default: 0 Note: The default setting does not lock out access to the Installer Configuration Menu.	Range: 0 to 1,000
Com addr	MS/TP address at the thermostat controller; coincides with the address assigned at the supervisory controller. Default: 254	Range: 000 to 254

Table 2: Installer Configuration Menu (Part 2 of 6)

Parameter Appearing on Display	Description and Default	Selection Options
DI1	Configuration of Digital Input 1. Default: None	<p>(None): No function is associated with an input.</p> <p>(RemNSB): Remote Night Setback (NSB) via a time clock input, an occupancy sensor, or from a voltage-free contact. Contact open = Occupied; contact closed = Unoccupied.</p> <p>(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 controller.</p> <p>(Filter): A Filter alarm is displayed. This alarm can be connected to a differential pressure switch that monitors a filter.</p> <p>(Service): A Service alarm is displayed on the thermostat controller when the input is energized. Tie this input into the air conditioning unit control card, which provides an alarm if a malfunction occurs.</p> <p>(Fan lock): A backlit flashing Fan lock alarm is displayed on the thermostat controller when the input is not energized. This alarm is used in conjunction with a local airflow sensor connected to the input. The thermostat controller heating or cooling action is locked out if no airflow is detected 10 seconds after the fan (Terminal G) is energized. Contact open = no airflow; contact closed = airflow present.</p>
DI2	Configuration of Digital Input 2. Default: None	<p>(None): No function is associated with an input.</p> <p>(RemNSB): Remote Night Setback (NSB) via a time clock input, an occupancy sensor, or from a voltage-free contact. Contact open = Occupied; contact closed = Unoccupied.</p> <p>(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 controller.</p> <p>(Filter): A Filter alarm is displayed. This alarm can be connected to a differential pressure switch that monitors a filter.</p> <p>(Service): A Service alarm is displayed on the thermostat controller when the input is energized. Tie this input into the air conditioning unit control card, which provides an alarm if a malfunction occurs.</p> <p>(Fan lock): A backlit flashing Fan lock alarm is displayed on the thermostat controller when the input is not energized. This alarm is used in conjunction with a local airflow sensor connected to the input. The thermostat controller heating or cooling action is locked out if no airflow is detected 10 seconds after the fan (Terminal G) is energized. Contact open = no airflow; contact closed = airflow present.</p>
MenuScro	Gives the option of having the display continuously scroll the parameters. Default: on	<p>(off): The scroll is inactive.</p> <p>(on): The scroll is active.</p>

Table 2: Installer Configuration Menu (Part 3 of 6)

Parameter Appearing on Display	Description and Default	Selection Options			
Lockout	Selectable Lockout Levels for limiting end-user keypad interaction. Default: 0	Function	Level		
			(0)	(1)	(2)
		Resume/Occupancy Override Scheduling	Access	Access	No Access
		Permanent Temperature Setpoints	Access	No Access	No Access
		Temporary Temperature Setpoints	Access	Access	No Access
		System Mode Setting	Access	No Access	No Access
Pwr del¹	Sets the delay time period at thermostat controller powerup, or at each time power is removed and reapplied, before any operation (fan, heating, or cooling) is authorized. Also can be used to sequence the startup of multiple units in one location. Default: 10.0 sec	Range: 10.0 to 120.0 sec			
Frost pr	Provides a minimum heating setpoint of 42.0°F/5.5°C to prevent freezing in the zone controlled by the thermostat controller. Default: off	(on): Enabled (off): Disabled			
Heat max²	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 min²	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			
Pband	Proportional Band used by the PI temperature control loop of the thermostat controller. Pband is not converted with C or F scale and is always shown with a range of 2 to 8. Default: 2 (2.0F°/1.1C°)	Value	F Scale Pband/C Scale Pband		
		2	2.0F°/1.1C°		
		3	3.0F°/1.7C°		
		4	4.0F°/2.2C°		
		5	5.0F°/2.8C°		
		6	6.0F°/3.3C°		
		7	7.0F°/3.9C°		
		8	8.0F°/4.4C°		
Anticycl	Anti-Short Cycle timer sets the minimum on/off times for heating and cooling stages. Default: 2.0 min	Range: 0.0 to 5.0 min adjustable in 1-minute increments Set the anti-short cycle timer to 0.0 min for equipment that already has its own anti-short cycle timer.			

Table 2: Installer Configuration Menu (Part 4 of 6)

Parameter Appearing on Display	Description and Default	Selection Options
Heat cph	Sets the maximum number of Heating cycles per hour. Default: 4.0	Range: 3.0 to 8.0 cycles per hour
Cool cph	Sets the maximum number of Cooling cycles per hour. Default: 4.0	Range: 3.0 or 4.0 cycles per hour
Deadband	Sets the minimum deadband between the heating and cooling setpoints. Default: 2.0F°/1.0C°	Range: 2.0F°/1.0C° to 4.0F°/2.0C° adjustable in 1.0F°/0.5C° increments
Fan cont	Determines how the fan is activated in response to a call for heating or cooling. Default: on	(off) : Enables the thermostat controller to activate the fan in response to a call for cooling only. (on) : Enables the thermostat controller to activate the fan in response to a call for heating or cooling. When there is a call for auxiliary heating, the fan is activated by the equipment fan and limit control.
Fan del	Fan delay extends fan operation after a heating or cooling cycle has ended. Default off	(on) : Extends fan operation by 60 seconds after a heating or cooling cycle has ended. (off) : No extension of fan operation after a heating or cooling cycle has ended. The fan delay is only active when the fan is in the Auto mode.
TOccTime	Sets the duration of the Temporary Occupancy Time when the heating or cooling setpoints in the Occupied mode are established by: <ul style="list-style-type: none"> • an Override Function enabled in the Main User Menu (when the thermostat controller is in the Unoccupied mode) • a temporary heating or cooling setpoint Default: 3.0 hrs	Range: 0.0 to 12.0 hrs adjustable in 1-hour increments
Cal RS	Sets the desired room air temperature 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
Cal OS	Sets the desired outdoor air temperature 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
H stage	Reverts the operation of a two-stage thermostat controller to a single-stage thermostat controller when the second heating stage is not needed. Default: 2.0	(1.0) : One Stage (2.0) : Two Stages

Table 2: Installer Configuration Menu (Part 5 of 6)

Parameter Appearing on Display	Description and Default	Selection Options
C stage	Reverts the operation of a two-stage thermostat controller to a single-stage thermostat controller when the second cooling stage is not needed. Default: 2.0	(1.0): One Stage (2.0): Two Stages
H lock	Discontinues heating operation in response to the outdoor air temperature. Requires that an outdoor air temperature sensor be installed and connected. Default: 120°F/49°C	Range: -15°F/-26°C to 120°F/49°C adjustable in 5F°/5C° increments
C lock	Discontinues cooling operation in response to the outdoor air temperature. Requires that an outdoor air temperature sensor be installed and connected. C lock does not disable economizer free cooling operation. Default: -40°F/-40°C	Range: -40°F/-40°C to 95°F/35°C adjustable in 5F°/5C° increments
Unocc TM	Sets the time delay between the moment when the thermostat controller toggles from the Occupied mode to the Unoccupied mode after the last motion is detected by the occupancy sensor. Default: 0.5 hours	Range: 0.5 hours to 24.0 hours adjustable in 0.5 hour increments
Aux cont	Energizes peripheral devices (lighting equipment, exhaust fans, and economizers). Default: n.o.	(n.c.): Contact open = Occupied; contact closed = Unoccupied. (n.o.): Contact closed = Occupied; contact open = Unoccupied. The contact toggles with the internal Occupied/Unoccupied schedule (or the NSB contact on one of the digital inputs, if used).
Chngstpt²	Sets the economizer changeover strategy, based on the outdoor air temperature. Requires that an outdoor air temperature sensor be installed and connected. When the OA temperature is below the changeover setpoint, free cooling is used (economizer operation). When the OA temperature is above the setpoint, mechanical cooling is used (compressor operation). Default: 55.0°F/13.0°C	Range: 14.0°F/-10.0°C to 70.0°F/21.0°C

Table 2: Installer Configuration Menu (Part 6 of 6)

Parameter Appearing on Display	Description and Default	Selection Options		
Min pos	Sets the minimum position for the OA dampers on the economizer. These dampers are energized to minimum position when the fan (Terminal G) is energized and the thermostat controller is in the Occupied mode. When the schedule is in the Unoccupied mode, the minimum position is 0%. Default: 0.0%	Range: 0.0 to 100.0% equals 0 to 10 VDC output range		
		% OA	Setting for 0 to 10 VDC Actuator	Setting for 2 to 10 VDC Actuator
		(0.0%)	0%	0 to 20%
		(5.0%)	5%	24%
		(10.0%)	10%	28%
		(15.0%)	15%	32%
		(20.0%)	20%	36%
		(25.0%)	25%	40%
(30.0%)	30%	44%		
C mech	Determines whether to allow mechanical cooling (compressor operation) if free cooling (economizer operation) cannot maintain the cooling setpoint. Default: off	(on): Typically applies when the Mixed air Sensor (MS) is installed before the mechanical cooling refrigeration coils in the mixing plenum. In this scenario, mechanical cooling is allowed when free cooling cannot maintain the cooling setpoint. (off): Typically applies when the remote MS is installed after the mechanical cooling refrigeration coils. In this scenario, mechanical cooling will never operate at the same time as free cooling.		
Mix stpt²	Establishes the mixed air temperature when operating in the economizer mode. Default: 55.0°F/13.0°C	Range: 50.0°F/10.0°C to 90.0°/32.0°C		
MS temp	Displays the mixed air temperature. Requires that an MS be installed and connected. Default: N/A	The mixed air temperature can be used to help service and troubleshoot the equipment and the economizer operation.		

1. When adjusting the numeric value, press the **UP** or **DOWN** arrow key to change the value by single increments; press and hold the **UP** or **DOWN** arrow key to change the numeric value in increments of ten.
2. When adjusting the temperature, press the **UP** or **DOWN** arrow key to change the value in 0.5F°/0.5C° increments; press and hold the **UP** or **DOWN** arrow key to change the value in 5.0F°/5.0C° increments.

Operation

Programming/Operating the TEC2104-4 and TEC2104-4+PIR Thermostat Controller

Once the thermostat controller is configured via the Installer Configuration Menu, its operating parameters can be programmed via the Main User Menu. Access this menu by pressing the **MENU** key during normal thermostat controller operation. The Main User Menu contains the basic operating features of the thermostat controller.

The Main User Menu also uses Auto Help, which is displayed automatically in the menu when there is a pause in programming activity. To exit Auto Help, continue with the programming selection. When the thermostat controller is in the Main User Menu and is left unattended for 45 seconds, the menu reverts to the Status Display Menu.

Enabling Override Schedule

Note: Enabling Override Schedule only appears when in the Unoccupied Mode.

The override schedule prompt only appears when the thermostat controller is in the unoccupied state. This menu selection gives the user the option of overriding the unoccupied setpoints with the occupied setpoints for the amount of time specified under the **TOccTime** parameter. See the [Configuring the TEC2104-4 and TEC2104-4+PIR Thermostat Controllers](#) section.

Note: If one of the digital inputs is configured to operate as a remote override contact, this menu is disabled.

To override the unoccupied state while in the Main User Menu:

1. Press the **NO** key to all prompts until the Cancel ovrd prompt appears. If the thermostat controller is in the unoccupied state, this is the first prompt.
2. Press the **YES** key to enable the temporary override. The thermostat controller returns to the Status Display Menu.

When scrolling through the Status Display Menu, Override now appears for the occupancy status parameter.

Resuming the Programmed Schedule

This menu only appears when the thermostat controller is in the unoccupied override mode.

To resume the schedule while in the Main User Menu:

1. Press the **NO** key to all prompts until the Cancel ovrd Y/N prompt appears. If the thermostat controller is in the unoccupied override state, this is the first prompt.
2. Press the **YES** key to resume the programmed schedule.

The thermostat controller returns to the Status Display Menu.

Entering Permanent Temperature Setpoints

The first prompt appearing in the Main User Menu of the thermostat controller when in the occupied state is to set the permanent temperature setpoint.

To enter the permanent heating and cooling setpoints for the Occupied and Unoccupied Modes, follow the steps in Table 3. When changing the temperatures, press the keys once to change the temperature in 0.5F°/0.5C° increments; press and hold down the keys to change the temperature in 5.0F°/5.0C° increments.

Table 3: Entering Permanent Temperature Setpoints (Part 1 of 2)

Thermostat Controller Display	Description
RoomTemp 75.0°F	Press the MENU key while in the Status Display Menu to enter the Main User Menu.
Temperat set? Y/N	Press the NO key to all prompts until the temperature setpoint prompt appears on the display (it may be the first prompt). Press the YES key to enter the temperature setting menu.

Table 3: Entering Permanent Temperature Setpoints (Part 2 of 2)

Thermostat Controller Display	Description
Cooling set? Y/N	Press the YES key to change the occupied cooling setpoint. Press the NO key to advance to the occupied heating setpoint menu.
Cooling 75.0°F	Press the UP/DOWN arrow keys to set the temperature. Press the YES key to store the value and advance to the next menu.
Heating set? Y/N	Press the YES key to change the occupied heating setpoint. Press the NO key to advance to the unoccupied cooling setpoint menu.
Heating 68.0°F	Press the UP/DOWN arrow keys to set the temperature. Press the YES key to store the value and advance to the next menu.
Unocc CL set? Y/N	Press the YES key to change the unoccupied cooling setpoint. Press the NO key to advance to the unoccupied heating setpoint.
Unocc CL 80.0°F	Press the UP/DOWN arrow keys to set the temperature. Press the YES key to store the value and advance to the next menu.
Unocc HT set? Y/N	Press the YES key to change the unoccupied heating setpoint. Press the NO key to advance to the temperature display units.
Unocc HT 62.0°F	Press the UP/DOWN arrow keys to set the temperature. Press the YES key to store the value and advance to the next menu.
°F/°C set? Y/N	Press the YES key to set the display units to °F or °C. Press the NO key to advance to the temperature setpoint type menu.
Exit? Y/N	Press the YES key to return to the Status Display Menu or press the NO key to reenter the temperature setting menu.

Entering Temporary Temperature Setpoints

To temporarily change the setpoint, press the **UP/DOWN** arrow keys to change the temporary setpoint for the current mode of operation.

Note: Whether the thermostat controller is heating or cooling, the respective setpoint is temporarily adjusted. To toggle between the temporary heating and cooling setpoints, press the **NO** key while changing the temporary setpoints.

Ending Temporary Temperature Setpoints

The temporary setpoints remain in effect for the duration set in the **TOccTime** parameter or until manually released.

To release the temporary setpoint sooner, while in the Main User Menu:

1. Press the **YES** key to the first prompt that appears.
2. If the thermostat controller does not immediately return to the Status Display Menu, press the **MENU** key again and press the **YES** key to exit the Main User Menu.

The setpoint reverts to the Permanent Temperature Setpoint.

Selecting the System Mode

The thermostat controller has four system modes:

- **Automatic Mode (auto):** Automatic changeover between heating and cooling. This is the default setting.
- **Cooling Mode (cool):** Cooling operation only
- **Heating Mode (heat):** Heating operation only
- **Off Mode (off):** The thermostat controller is off; however, when frost protection (**Frost pr** parameter) is enabled, the thermostat controller still calls for heat (if required).

To set the system mode while in the Main User Menu:

1. Press the **NO** key to all prompts until the system mode prompt appears on the display. Press the **YES** key to select the desired system mode.
2. Press the **UP/DOWN** arrow keys to locate the desired system mode. Press the **YES** key to select the desired system mode.
3. Press the **YES** key to return to the Status Display Menu or press the **NO** key to return to the system mode selection menu.

Selecting the Fan Mode

The thermostat controller has three fan mode settings:

- **On Fan Mode (on):** Energizes the fan all the time for both occupied and unoccupied states, even if the system mode is set to off.
- **Automatic Fan Mode (auto):** Energizes the fan only on a call for heating or cooling, for both occupied and unoccupied states.
- **Smart Fan Mode (smart):** Energizes the fan all the time for occupied states, and only on a call for heating or cooling in unoccupied states. This is the default setting.

To select the fan mode while in the Main User Menu:

1. Press the **NO** key to all prompts until the fan mode prompt appears on the display. Press the **YES** key to set the fan mode.
2. Press the **UP/DOWN** arrow keys to locate the desired fan mode. Press the **YES** key to select the desired fan mode.
3. Press the **YES** key to return to the Status Display Menu or press the **NO** key to return to the fan mode selection menu.

Troubleshooting

See Table 5 for display messages. See Table 6 for further troubleshooting details.

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 optional accessories prior to their use in an application

Repair Information

If a TEC2104-4 or TEC2104-4+PIR Thermostat Controller fails to operate within its specifications, replace the unit. For a replacement thermostat controller, contact the nearest Johnson Controls representative.

Table 4: Accessories (Order Separately)

Code Number	Description
SEN-600-1	Remote Indoor Air Temperature Sensor
SEN-600-4	Remote Indoor Air Temperature Sensor with Occupancy Override and LED
TE-6361M-1 ¹	Duct Mount Air Temperature Sensor
TE-6363P-1 ¹	Outdoor Air Temperature Sensor
TEC-3-PIR ²	Cover with Occupancy Sensor

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. The TEC-3-PIR Accessory Cover can be used to replace the existing cover on a non-PIR TEC2104-4 Thermostat Controller to provide occupancy sensing capability.

Table 5: Display Messages

Display	Function
Frost ON	Indicates that heating is energized by the low limit frost protection room temperature setpoint.
Fan Lock	Indicates that the heating and cooling action are locked out due to a defective fan operation.
Service	Indicates that there is a service alarm in accordance with a programmable Digital Input.
Filter	Indicates that the filter(s) is dirty in accordance with a programmable Digital Input.

Table 6: Troubleshooting Details

Error/Trouble Condition	Possible Cause	Solution
Thermostat Controller Cycles Online and Offline	Two or more controllers have the same address.	Change each duplicate address to a unique number.
	There are Y or T taps on the N2 Bus, or the repeater has lost power or is wired incorrectly.	Refer to the <i>N2 Communications Bus Technical Bulletin (LIT-636018)</i> .
Thermostat Controller Does Not Come Online	Two or more controllers have the same address.	Change each duplicate address to a unique number.
	The N2 Bus contains too many devices.	Do not exceed the maximum number of devices allowed on the N2 Bus per supervisory controller limitations.
	The thermostat controller does not have power.	Apply power to the thermostat controller.
	The N2 cable runs are broken.	Locate the break and correct the wiring.
	The thermostat controller device type is incorrect.	Change the thermostat controller device type to VND.
N2 Bus Is Offline	The wiring on the N2 Bus is broken.	Repair the wiring.
	No point mapping has been entered.	Define the BAS dataset.

Technical Specifications

TEC2104-4 and TEC2104-4+PIR N2 Networked Multi-Stage Economizer Thermostat Controllers

Power Requirements		19 to 30 VAC, 50/60 Hz, 2 VA (Terminals RC and C) at 24 VAC Nominal, Class 2 or Safety Extra-Low Voltage (SELV)
Relay Contact Rating (Y1, Y2, G, W1, W2, AUX)		19 to 30 VAC, 1.0 A Maximum, 15 mA Minimum, 3.0 A In-Rush, Class 2 or SELV
Analog Inputs		Resistive Inputs (RS and UI3) for 10k ohm Johnson Controls Type II Negative Temperature Coefficient (NTC) Thermistor Sensors
Digital Inputs		Voltage-Free Contacts across Terminal C to Terminals DI1 and DI2
Economizer Output		0 to 10 VDC into 2k ohm resistance minimum
Wire Size		18 AWG (1.0 mm Diameter) Maximum, 22 AWG (0.6 mm Diameter) Recommended
Temperature Sensor Type		Local 10k ohm Type II Negative Temperature Coefficient (NTC) Thermistor
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
Default Minimum Deadband		2°F/1°C 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 2004/108/EC
Australia and New Zealand	C-Tick Mark, Australia/NZ Emissions Compliant	
Shipping Weight		TEC2104-4 Models: 0.75 lb (0.34 kg) TEC2104-4+PIR Models: 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, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.



Building Efficiency

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