TEC210x-4 and TEC210x-4+PIR Series N2 Networked Thermostat Controllers

Product Bulletin

TEC2101-4, TEC2101-4+PIR, TEC2102-4, TEC2102-4+PIR,
TEC2103-4, TEC2103-4+PIR, TEC2104-4, TEC2104-4+PIR

The TEC210x-4 and TEC210x-4+PIR Series Thermostat Controllers are N2 networked devices that provide control of rooftop units (with and without economizers), heat pumps, and single- and multi-stage heating/cooling equipment. The TEC210x-4+PIR Series Thermostat Controllers have occupancy sensing capability built into the device. These devices provide energy savings in high-energy usage light commercial buildings such as schools and hotels. The devices maximize these energy savings by using additional setpoint strategies during occupied times.

The TEC210x-4 and TEC210x-4+PIR Series Thermostat Controllers feature Building Automation System (BAS) N2 Bus communication capability that enables remote monitoring and programming for efficient space temperature control.

The TEC210x-4 and TEC210x-4+PIR Thermostat Controllers use an intuitive, plain text, menu-driven, backlit display that makes setup and operation quick and easy.

Figure 1: TEC210x-4+PIR Series Thermostat Controller

The TEC210x-4(+PIR) Series includes four models, each include the option of a PIR occupancy sensing cover:

- Single-stage (TEC2101-4 and TEC2101-4+PIR)

- Heat Pump (TEC2102-4 and TEC2102-4+PIR)

- Multi-stage (TEC2103-4 and TEC2103-4+PIR)

- Economizer (TEC2104-4 and TEC2104-4+PIR).

All thermostat controllers use a unique Proportional-Integral (PI) time-proportioning control algorithm that virtually eliminates temperature offset associated with traditional differential-based thermostat controllers.

Table 1: Features and Benefits (Part 1 of 2)

Features	Benefits
BAS N2 Open Communication	Provides compatibility with a proven communication network; N2 Bus is widely accepted by Heating, Ventilating, and Air Conditioning (HVAC) control suppliers.
Onboard Occupancy Sensor (Passive Infrared [PIR] Models)	Provides energy savings without additional installation time and cost.
Password Protection Option	Protects against unwanted thermostat controller tampering.
Backlit Liquid Crystal Display (LCD)	Offers real-time control status of the environment in easy-to-read, English text messages with constant backlight that brightens during user interaction.
Simplified Setpoint Adjustment	Enables the user to change the setpoint by simply pressing the **UP/DOWN** arrow keys.
Five Easy-to-Use Interface Keys	Allow for easy commissioning of the thermostat, and eliminate the need for DIP switches.
Two Configurable Digital Inputs	Provide additional inputs for advanced functions such as remote night setback, occupancy override, and service or filter alarms.

Table 1: Features and Benefits (Part 2 of 2)

Features	Benefits
Over 20 Configurable Parameters	Enable the thermostat to adapt to any application, allowing installer parameter access without opening the thermostat cover.
Optional Discharge Air Sensor	Monitors unit efficiency.
Economizer Output (TEC2104-4 and TEC2104-4+PIR Models)	Provides control of economizer operation for single- and multi-stage unitary rooftop equipment.
Configurable Auxiliary Output	Provides 24 VAC control for lighting, exhaust fans, and other auxiliary functions.

Product Overview

The TEC210x-4 and TEC210x-4+PIR Series Thermostat Controllers are specifically designed for networked control of the most common commercial heating and cooling equipment. The TEC210x-4+PIR Series Thermostat Controllers include an additional occupancy sensing capability that provides energy savings in high-energy usage light commercial buildings. In addition to superior temperature control, occupancy sensing capabilities, and application flexibility, the TEC210x-4 and TEC210x-4+PIR Series Thermostat Controllers feature Metasys system N2 Network communication capability allowing the user to view operation or make adjustments at the thermostat or from a remote workstation. Plain text menus, backlit display, and five interface keys make setup and operation quick and easy.

> **IMPORTANT:** Use these TEC210x-4 and TEC210x-4+PIR Series Thermostat Controllers only as an operating control. Where failure or malfunction of these thermostats could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the 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.

Additional Features

The TEC210x-4 and TEC210x-4+PIR Series Thermostat Controllers also offer many other features, including:

- **Stationary or Scrolling Display**
  Offers the option of having the display continuously scroll the parameters.

- **Three Levels of Keypad Lockout**
  Provide three levels of keypad lockout that can be set up through the Installer Configuration Menu.

- **Adjustable Power Delay on Startup**
  Enables a delay before authorizing any operation after powering-up the thermostat. You can also use this delay to sequence startup of multiple units in one location.

- **Frost Protection Enable/Disable**
  Provides a minimum heating setpoint of 42.0°F/5.5°C to prevent freezing in the zone controlled by the thermostat, regardless of its mode.

- **Adjustable Maximum Heating/Minimum Cooling Setpoints**
  Establish the maximum heating setpoint and minimum cooling setpoint that can be entered through the user interface.

- **Adjustable Anti-Short Cycle Timer**
  Adjusts the minimum on/off times for heating and cooling stages from 0 to 5 minutes.

- **Adjustable Heating/Cooling Cycles per Hour (On/Off Control)**
  Provides configurable settings for 3 to 8 heating cycles and 3 or 4 cooling cycles in a 1-hour period, balancing temperature control and equipment cycling.

- **Adjustable Heating/Cooling Deadband**
  Adjusts the minimum cooling/heating deadband from 2.0F°/1.0C° to 4.0F°/2.0C°.

- **Fan Control**
  Provides option for equipment fan control.

- **Fan Delay Control**
  Enables the user to select how the fan operates on a call for heating and the delay at the end of the heating or cooling cycle.

- **Adjustable Temporary Occupancy Time**
  Adjusts the temporary occupancy time from 0 to 12 hours.

- **Sensor Offset Adjustments**
  Set desired room or outside air temperature calibration (offset).

- **System Mode Lockout**
  Allows the heating and cooling modes to be locked out based on the outdoor air temperature when an outdoor air sensor is connected.

- **Unoccupied Timer**
  Sets the time delay between Occupied mode to Unoccupied mode after air movement is detected (PIR models only.)

- **Progressive Recovery**
  Ensures the correct temperature is reached at the programmed occupied time.

- **Smart Fan**
  Enables the fan to operate continuously during the occupied times and cycle with the equipment during unoccupied times.

- **Remote Indoor and Outdoor Sensing**
  Accommodates remote indoor and outdoor sensors; can average up to three indoor sensors.

- **Nonvolatile Electrically Erasable Programmable Read-Only Memory (EEPROM)**
  Prevents loss of adjusted parameters during a power failure.

- **High and Low Balance Point Adjustments (TEC2102-4 and TEC2102-4+PIR Models)**
  Allow more precise control of heat pump operation based on the outdoor air temperature.

- **Heating and Cooling Stage Enable/Disable (TEC2102-4, TEC2102-4+PIR, TEC2103-4, TEC2103-4+PIR, TEC2104-4, and TEC2104-4+PIR Models)**
  Reverts the operation of two-stage thermostats to a single-stage thermostat when the second heating or cooling stage is not needed.

- **Heat Pump Compressor Stage Enable/Disable (TEC2102-4 and TEC2102-4+PIR Models)**
  Allows operation of the second-stage compressor to be disabled, reverting the thermostat controller to single-stage compressor operation on heat pump thermostats.

- **Three Light-Emitting Diodes (LEDs)**
  Provide fan, heating, and cooling status at a glance.

- **Auxiliary Contact**
  Provides 24 VAC control for exhaust fans, lighting, and other auxiliary functions.

- **Network Addressing and Viewing**
  Allows network addressing via the menu-driven user interface.

- **Remote Access**
  Allows user to read/write and access parameters of the thermostat via a supervisory controller.

- **Accessible Configuration Parameters**
  Allow local access to all configurable parameters while limiting unwanted parameter tampering once the thermostat is set up.
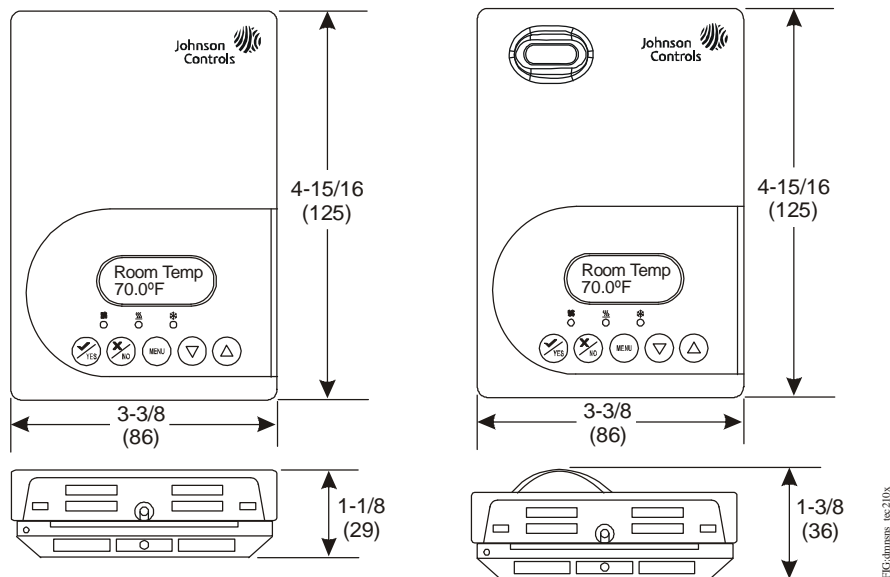

Figure 2: Thermostat Controller Dimensions, in. (mm) (TEC210x-4 and TEC210x-4+PIR Models Shown)
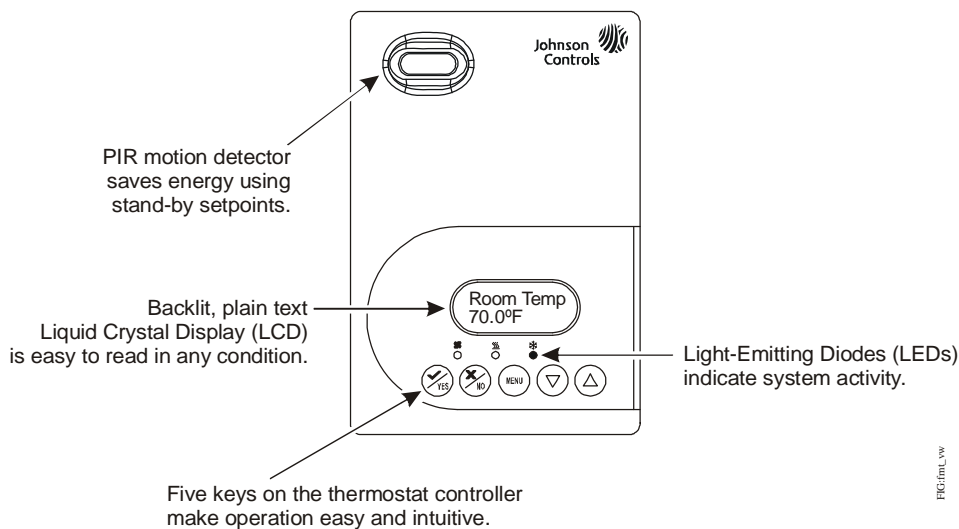
PIR motion detector saves energy using stand-by setpoints.

Backlit, plain text Liquid Crystal Display (LCD) is easy to read in any condition.

Room Temp
70.0ºF

Light-Emitting Diodes (LEDs) indicate system activity.

Five keys on the thermostat controller make operation easy and intuitive.

Figure 3: Front Cover of Thermostat Controller (TEC210x-4+PIR Model Shown)

Thermostat Controller User Interface Keys

The TEC210x-4 and TEC210x-4+PIR Series Thermostat Controllers UI consists of five keys on the front cover (Figure 3). 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 is left unattended for 45 seconds, the thermostat 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 *Installer Configuration Menu* section.)

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

Backlit LCD

The TEC210x-4 and TEC210x-4+PIR Series Thermostat Controllers include a 2-line, 8-character backlit display. Low-level backlighting is present during normal operation, and it brightens when any user interface key is pressed. The backlight returns to low level when the thermostat is left unattended for 45 seconds.

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 – TEC210x-4+PIR Series Thermostat Controllers

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

There are three menus available to view, program, and configure the TEC210x-4 and TEC210x-4+PIR Series Thermostat Controllers:

Status Display Menu

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

- Room Temperature
- System Mode
- Occupancy Status – Occupied/Unoccupied/Override
- 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. During normal thermostat 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:

- Schedule Override/Resume (if schedule provided by supervisory controller)
- 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 for an application-specific operation. To access the menu, press and hold the **MENU** key for approximately 8 seconds.

The Installer Configuration Menu includes the following parameters that are accessed by pressing the same **MENU** key:

- Password Setting
- N2 Network Communication Address
- DI1 and DI2 Input Configuration
- Menu Scroll
- Three Keypad Lockout Levels
- Power Delay on Power Up
- Frost Protection
- Maximum Heating Setpoint/Minimum Cooling Setpoint
- Proportional Band
- Anti-Short Cycle Times
- Heating Stage Cycles per Hour
- Cooling Stage Cycles per Hour
- Heating/Cooling Minimum Deadband
- Heating/Cooling Fan Control
- End-of-Cycle Fan Delay
- Temporary Occupancy Time
- Room Air Sensor Calibration
- Outdoor Air Sensor Calibration
- Number of Heating Stages (TEC2103-4, TEC2103-4+PIR, TEC2104-4, and TEC2104-4+PIR Models)
- Number of Cooling Stages (TEC2103-4, TEC2103-4+PIR, TEC2104-4, and TEC2104-4+PIR Models)
- Number of Heat Pump Compressor Stages (TEC2102-4 and TEC2102-4+PIR Models)
- Outdoor Air Temperature Heating Lockout
- Outdoor Air Temperature Cooling Lockout
- Unoccupied Timer Value (when occupancy sensor is used)
- Auxiliary Configuration

The following parameters are for the **TEC2102-4 and TEC2102-4+PIR models only:**

- High Balance Point
- Low Balance Point
- Comfort/Economy Auxiliary Heat
- Reversing Valve Operation
- Heat Pump Compressor/Auxiliary Heat Interlock

The following parameters are for the **TEC2104-4 and TEC2104-4+PIR models only:**

- Outdoor Air Temperature Changeover Setpoint
- Outdoor Air Damper Minimum Position
- Mechanical Cooling On/Off during Economizer Operation
- Mixed Air Temperature Setpoint
- Mixed Air Temperature Display

Ordering Information

Table 2: N2 Networked Thermostat Controller Models

Code Number	Description	Applications
TEC2101-4	Single-Stage	Unit Heaters and Single-Stage Packaged Heating/Cooling Equipment
TEC2101-4+PIR	Single-Stage with Onboard Occupancy Sensor	
TEC2102-4	Heat Pump	Heat Pumps with up to 3 Heating/2 Cooling Stages
TEC2102-4+PIR	Heat Pump with Onboard Occupancy Sensor	
TEC2103-4	Multi-Stage	Multi-Staged Packaged Heating/Cooling Equipment
TEC2103-4+PIR	Multi-Stage with Onboard Occupancy Sensor	
TEC2104-4	Multi-Stage, Economizer	Economizer Operation for Single- and Multi-Stage Unitary Rooftop Equipment
TEC2104-4+PIR	Multi-Stage, Economizer with Onboard Occupancy Sensor	

Table 3: Accessories (Order Separately)

Code Number	Description
SEN-600-1	Remote Indoor Temperature Sensor
SEN-600-4	Remote Indoor Temperature Sensor with Occupancy Override Button and LED
TE-6361M-1[1]	Duct Mount Air Temperature Sensor
TE-636S-1[1]	Strap-Mount 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 replace the existing cover on a non-PIR TEC210x-4 Series Thermostat Controller to provide occupancy sensing.

Repair Information

If a TEC210x-4 or TEC210x-4+PIR Series Thermostat Controller fails to operate within its specifications, replace the unit. For a replacement thermostat, contact the nearest Johnson Controls® representative.

Technical Specifications

TEC210x-4 and TEC210x-4+PIR Series N2 Networked 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		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 Rating (TEC2104-4 and TEC2104-4+PIR Models)	Rating	0 to 10 VDC into 2k ohm resistance minimum
	Accuracy	±3%
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	±0.9F°/±0.5C° at 70.0°F/21.0°C Typical Calibrated
Minimum Deadband		2F°/1C° between Heating and Cooling
Ambient Conditions	Operating	32 to 122°F (0 to 50°C); 95% RH Maximum, Noncondensing
	Storage	-22 to 122°F (-30 to 50°C); 95% RH Maximum, Noncondensing
Compliance	United States	UL Listed, File E27734, CCN XAPX, Under UL 873, Temperature Indicating and Regulating Equipment
		FCC Compliant to CFR 47, Part 15, Subpart B, Class A
	Canada	UL Listed, File E27734, CCN XAPX7, Under CAN/CSA C22.2 No. 24, Temperature Indicating and Regulating Equipment
		Industry Canada, ICES-003
	Europe	CE Mark, EMC Directive 2004/108/EC
	Australia and New Zealand	C-Tick Mark, Australia/NZ Emissions Compliant
Shipping Weight		**TEC210x-4 Models:** 0.75 lb (0.34 kg) **TEC210x-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.

United States Emissions Compliance:

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.

Canadian Emissions Compliance:

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

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