TEC Zoning Control System for Stand-Alone and BACnet® MS/TP Networked Applications

Product Bulletin

TEC2647Z-3, TEC2647Z-3+PIR, TEC2664Z-3

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The technologically advanced TEC Zoning Control System provides efficient space temperature control for constant volume zoning systems in multi-zone heating and cooling applications. This cost-effective zoning control system can operate as a stand-alone system, or it can be mapped into a supervisory controller via a BACnet® MS/TP Bus to enable remote monitoring and programming within a Building Automation System (BAS). Typical applications include banks, retail facilities, churches, restaurants, office buildings, and other multi-tenant facilities.

A single TEC Zoning Control System comprises a TEC2664Z-3 Rooftop Controller and multiple TEC2647Z-3 and TEC2647Z-3+PIR Zone Controllers. The zone controller provides proportional 0 to 10 VDC control of pressure dependent Variable Air Volume (VAV) equipment with or without local reheat. The TEC2647Z-3+PIR Zone Controllers have the occupancy sensing capability built into the device for additional energy savings. The rooftop controller provides a proportional 0 to 10 VDC control output to the bypass damper of a rooftop unit based on the sensed pressure in the duct, and controls up to two stages of heating and two stages of cooling.

Figure 1: TEC2664Z-3 Rooftop Controller (Left) and TEC2647Z-3+PIR Zone Controller (Right) for Stand-Alone and BACnet MS/TP Networked Applications

Both the zone controller and the rooftop controller feature an intuitive user interface with backlit display that makes setup and operation quick and easy. These controllers also employ a unique, Proportional-Integral (PI) time-proportioning algorithm that virtually eliminates temperature offset associated with traditional, differential-based controllers.

Table 1: Features and Benefits

Features	Benefits
Fully Scalable Zoning Control System	Meets the requirements of small and large zoning control systems.
BACnet MS/TP Communication	Provides compatibility with a proven communication network; BACnet MS/TP is widely accepted by Heating, Ventilating, and Air Conditioning (HVAC) control suppliers.
True Stand-Alone Zoning Control System	Offers additional application flexibility.
Onboard Occupancy Sensor (Passive Infrared [PIR] Model)	Provides energy savings without additional installation time or cost.
PI Time-Proportioning Algorithm	Increases comfort, accuracy, and energy savings.
Backlit Liquid Crystal Display (LCD)	Offers real-time control status of the environment in easy-to-read, English plain 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.
Configurable Inputs	Provide additional inputs for advanced functions, such as remote night setback, service or filter alarms, and motion detector.
Over 20 Configurable Parameters	Enable the zoning control system to adapt to applications with varying requirements, allowing the installer to access parameters without opening the controller cover.

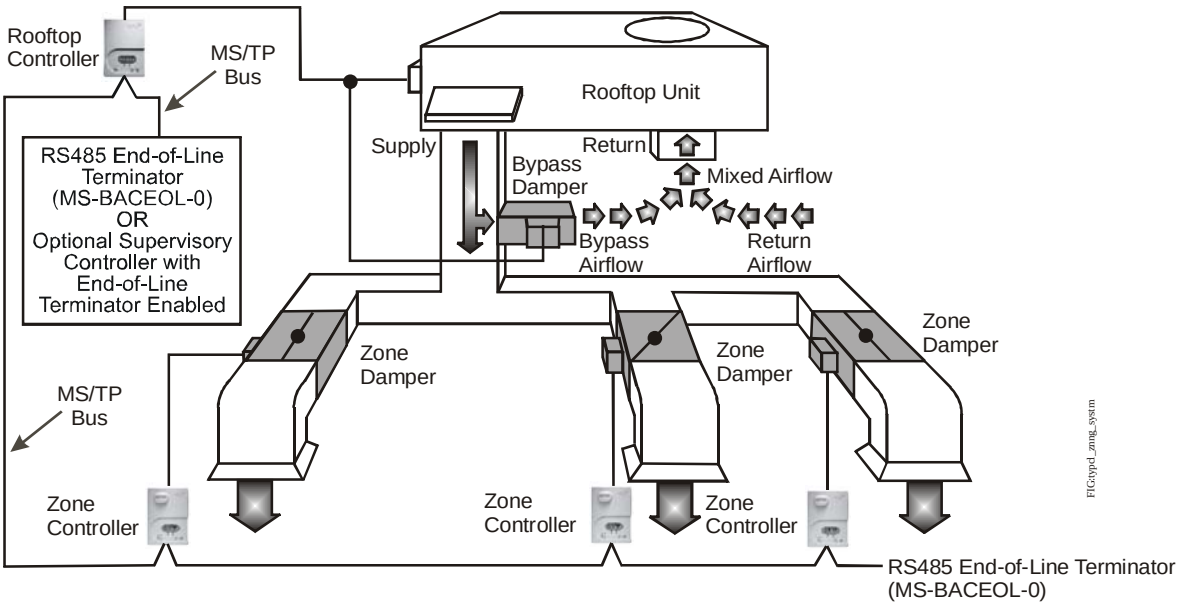

Figure 2: Typical Zoning Control System Installed on a Single MS/TP Bus

Product Overview

The TEC Zoning Control System features a fully scalable network architecture using BACnet MS/TP communication capability, or it can operate as a stand-alone system. This cost-effective zoning control system provides efficient space temperature control for constant volume, pressure dependent systems in multi-zone heating and cooling applications.

The TEC Zoning Control System uses standard BACnet objects for automatic self-binding zone-controller-to-rooftop-controller configuration, communicating in a peer-to-peer manner. Pre-configured sequences reduce the need for programming and eliminate flash downloading. Plain text menus, backlit display, and multiple interface keys make setup and operation quick and easy.

Figure 2 illustrates a typical TEC Zoning Control System installed on a single MS/TP Bus. This installation consists of multiple TEC2647Z-3 or TEC2647Z-3+PIR (onboard occupancy sensor) Zone Controllers, each controlling a single zone damper; and a TEC2664Z-3 Rooftop Controller controlling a rooftop unit. Optionally, the MS/TP Bus can be wired to a supervisory controller to provide centralized monitoring and control of the system.

IMPORTANT: The TEC Zoning Control System is intended to provide an input to equipment under normal operating conditions. Where failure or malfunction of the zoning control system could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the zoning 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 zoning control system.

Additional Features

The TEC Zoning Control System offers many other features, including:

- **Adjustable Heating/Cooling Standby Setpoints (Zone Controllers)**
  Provide an adjustable range of setpoints that can be used to conserve energy.
- **Adjustable Heating/Cooling Deadband**
  Adjusts the minimum heating/cooling deadband from 2.0F°/1.0C° to 5.0F°/2.5C°.
- **Remote Indoor Sensing**
  Accommodates remote indoor sensors. Up to three indoor sensors can be averaged.
- **Easy-to-Use Interface Keys**
  Allow for easy commissioning of the zone controller and rooftop controller, and eliminate the need for DIP switches.

- **Multiple Levels of Keypad Lockout**
  Provide multiple levels of keypad lockout that can be set up through the Installer Configuration Menu.
- **Accessible Configuration Parameters**
  Allow local access to all configurable parameters while limiting unwanted parameter tampering once the controllers are set up.
- **Light-Emitting Diodes (LEDs)**
  Provide fan, heating, and cooling status at a glance.
- **Adjustable Temporary Occupancy Time**
  Adjusts the temporary occupancy time from 0 to 12 hours.
- **Auxiliary Contact**
  Provides 24 VAC control for lighting, on/off actuation, and exhaust fan.
- **Adjustable Heating/Cooling Cycles per Hour**
  Configurable for the maximum number of heating and cooling cycles in a 1-hour period, balancing temperature control and equipment cycling.
- **Nonvolatile Electrically Erasable Programmable Read-Only Memory (EPROM)**
  Prevents loss of adjusted parameters during a power failure.
- **Remote Access**
  Allows the user to read/write and access the parameters of the controllers via a supervisory controller.

Table 2: TEC Zoning Control System

Code Number	Description
TEC2647Z-3	Zone Controller for Proportional Zone Damper, On/Off, or Proportional Reheat Control
TEC2647Z-3+PIR	Zone Controller with Occupancy Sensor for Proportional Zone Damper, On/Off, or Proportional Reheat Control
TEC2664Z-3	Rooftop Controller for Control of Up to Two Stages of Heating and Two Stages of Cooling in Rooftop, Proportional Bypass Damper, Fan, and Zone Demand Strategies

Table 3: Accessories (Order Separately)

Code Number	Description
SEN-600-1	Remote Inside Air Temperature Sensor
TE-6361M-1[1]	Duct Mount Air Temperature Sensor (Metal Enclosure)
TE-6363P-1[1, 2]	Outside Air Temperature Sensor (Plastic Enclosure)
SEN-600-4	Remote Inside Air Temperature Sensor with Occupancy Override and LED
MS-BACEOL-0	RS485 End-of-Line Terminator
DPT2650-005D-AB	Duct Static Pressure Transmitter, 24 VAC Power, 0 in. W.C./0 Pa to 5 in. W.C./1,245 Pa Input, 0 to 5 VDC Output
ZOVSD-wwwXhhh	Rectangular damper with a factory-installed Johnson Controls® M9104-GGA-3S Electric Actuator for proportional zoning applications. Widths (**www**) are available from 8 in./20.3 cm (**008**) to 30 in./76.2 cm (**030**) in 1 in./2.5 cm increments. Heights (**hhh**) are available from 6 in./15.2 cm (**006**) to 30 in./76.2 cm (**030**) in 1 in./2.5 cm increments. Example: To order a rectangular damper assembly measuring 8 in./20.3 cm wide by 6 in./15.2 cm high, use code number **ZOVSD-008X006**.
RZGddPNNO	Round damper with a factory-installed Johnson Controls M9104-GGA-3 Electric Actuator for proportional zoning applications. Diameters (**dd**) are available from 6 in./15.2 cm (**06**) to 18 in./45.7 cm (**18**) in 1 in./2.5 cm increments. Example: To order a round damper assembly measuring 6 in./15.2 cm in diameter, use code number **RZG06PNNO**.
TEC-7-PIR[3]	Zone Controller Cover with Occupancy Sensor

1. Additional TE-63xx-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. An outside air temperature sensor is recommended to allow the **H lock** and **C lock** parameters of the rooftop controller to discontinue heating or cooling operation in response to the outside air temperature. If an outside air temperature sensor is not installed, an ambiguous outside air temperature displays on the zone controller unless its **MenuScro** parameter is set to **off**.

3. This cover may replace a non-PIR TEC2647Z-3 cover to use the occupancy sensor capabilities.

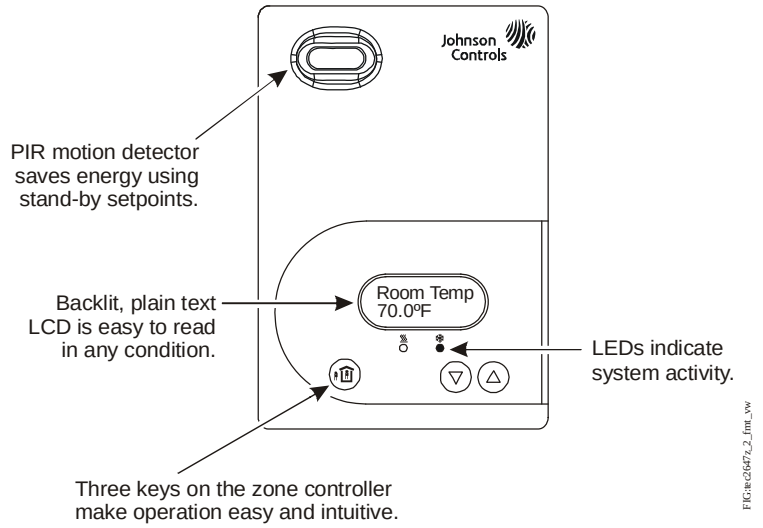

Figure 3: Front Cover of TEC2647Z-3+PIR Zone Controller

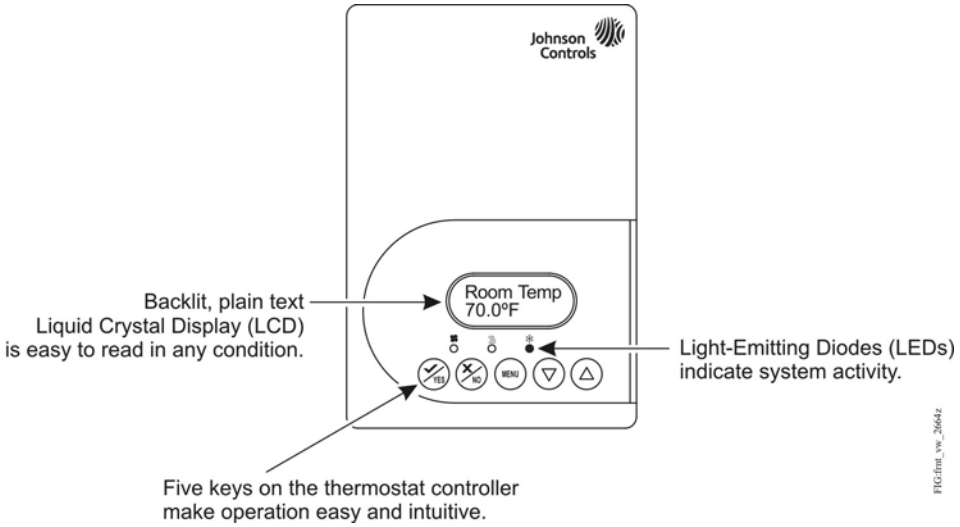

Figure 4: Front Cover of TEC2664Z-3 Rooftop Controller

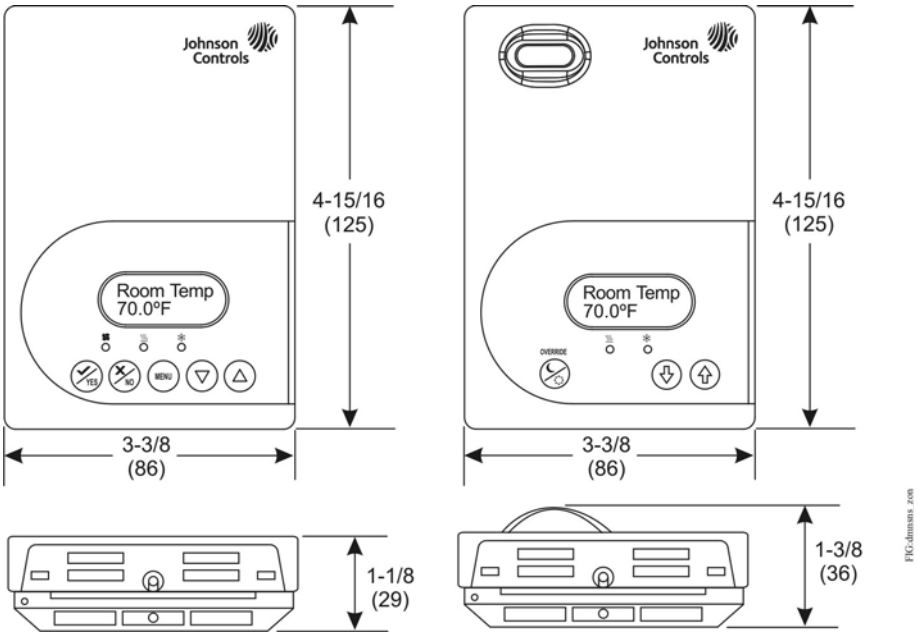

Figure 5: TEC2664Z-3 Rooftop Controller (Left) and TEC2647Z-3+PIR Zone Controller (Right) Dimensions, in. (mm)

User Interface Keys

The TEC Zoning Control System user interface consists of multiple keys on the front cover of the TEC2647Z-3 Zone Controller, TEC2647Z-3+PIR Zone Controller, and TEC2664Z-3 Rooftop Controller (as illustrated in Figure 3 and Figure 4). The function of each key is as follows:

- Use the **OVERRIDE** key (Zone Controller) to override the unoccupied mode to occupied at the local user interface for the specified TOccTime. (TOccTime is defined by selecting the appropriate time period in the Installer Configuration Menu.) The **OVERRIDE** key also allows access to the Installer Configuration Menu.

  Note: If the **Lockout** parameter is set to **(2): Level 3** or **(3): Level 4**, then the **OVERRIDE** function is disabled.

- Use the **YES/SCROLL** key (Rooftop Controller) to:
  - confirm display selections and to advance to the next display item
  - stop the Auto Scroll Display from automatically scrolling and to manually scroll to the next parameter on the display

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

- Use the **NO** key (Rooftop Controller) to decline a parameter change and to advance to the next display item.

- Use the **MENU** key (Rooftop Controller) to:
  - access the Main User Menu or to exit the menu
  - access the Installer Configuration Menu or to exit the menu

- Use the **UP/DOWN** arrow keys (Zone Controller and Rooftop Controller) to change the configuration parameters and to activate a setpoint adjustment.

Backlit LCD

The zone controllers and rooftop controller 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 unit is left unattended for 45 seconds.

LEDs

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

- The  LED (Rooftop Controller) is on when the fan is on.
- The  LED (Zone Controller and Rooftop Controller) is on when heating or reheat is on.
- The  LED (Zone Controller and Rooftop Controller) is on when cooling is on.

Menu Overview

Two menus are available to view and configure the TEC Zoning Control System:

- Status Display Menu
- Installer Configuration Menu

The following sections outline the functions and contents of each menu.

Status Display Menu

The Status Display Menu is displayed during normal TEC Zoning Control System operation. This menu continuously scrolls through the following parameters:

- Room Temperature (Zone Controller)
- Day and Time (Rooftop Controller)
- System Mode
- Occupancy Status – Occupied/Unoccupied/Override
- Applicable Alarms (Rooftop Controller) – The backlight lights up as an alarm condition is displayed.

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

Installer Configuration Menu

The Installer Configuration Menu is used to set up the TEC Zoning Control System for an application-specific operation. To access the menu for the zone controller, press and hold the **OVERRIDE** key for approximately 8 seconds; to access the menu for the rooftop controller, press and hold the **MENU** key for approximately 8 seconds.

The Installer Configuration Menu for the zone controller includes the following parameters that are accessed by pressing the **OVERRIDE** key:

- Zone Controller MS/TP Communication Address
- Zone Controller Baud Rate
- Get Parameter Values
- Rooftop Controller MS/TP Communication Address
- Menu Scroll
- °F and °C Temperature Scales
- Integrated Passive Infrared (PIR) Function
- Four Keypad Lockout Levels
- BI1 Input Configuration
- Reheat Configuration
- Analog Reheat Output Signal
- Analog Reheat Stage Outside Air Temperature Lockout
- On/Off Reheat Stage Outside Air Temperature Lockout
- Reheat Output Time Base
- BO5 Contact Function
- Unoccupied Heating Setpoint
- Unoccupied Cooling Setpoint
- Standby Heating Setpoint
- Standby Cooling Setpoint
- Setpoint Type
- Temporary Occupancy Time
- Room Air Temperature Sensor Calibration (Offset)
- Deadband
- Maximum Heating Setpoint Value
- Minimum Cooling Setpoint Value
- Zone Damper Minimum Position
- Zone Damper Maximum Position
- Zone Damper Maximum Heating Position
- PI Heating Demand Weight
- PI Cooling Demand Weight

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

- Rooftop Controller MS/TP Communication Address
- Rooftop Controller Baud Rate
- Three Keypad Lockout Levels
- Power Delay
- Control Type
- Discharge Air High Limit Temperature
- Discharge Air Low Limit Temperature
- Anti-Short Cycle Timer
- Heating Cycles per Hour
- Cooling Cycles per Hour
- Deadband
- Imperial and Metric Display Scales
- Fan Delay
- DI1 Input Configuration
- Temporary Occupancy Time
- Room Air Temperature Sensor Calibration (Offset)
- Outside Air Temperature Sensor Calibration (Offset)
- Heating Stages
- Cooling Stages
- Heating Operation Lockout
- Cooling Operation Lockout
- Occupied/Unoccupied Setpoint Events
- Auxiliary Contact
- Progressive Recovery
- Occupied Cooling Setpoint
- Occupied Heating Setpoint
- Unoccupied Cooling Setpoint
- Unoccupied Heating Setpoint
- Static Pressure Transducer Range
- Static Pressure Transducer Setpoint

Note: The occupied and unoccupied cooling and heating setpoints of the rooftop controller are valid only if communication is lost with all zone controllers.

Repair Information

If the TEC2647Z-3 Zone Controller, TEC2647Z-3+PIR Zone Controller, or TEC2664Z-3 Rooftop Controller fails to operate within its specifications, contact the nearest Johnson Controls representative.

Technical Specifications

TEC Zoning Control System for Stand-Alone and BACnet MS/TP Networked Applications (Part 1 of 2)

Product Codes		**TEC2647Z-3 Zone Controller** for Proportional Zone Damper, On/Off, or Proportional Reheat Control **TEC2647Z-3+PIR Zone Controller** with Occupancy Sensor for Proportional Zone Damper, On/Off, or Proportional Reheat Control **TEC2664Z-3 Rooftop Controller** for Control of Up to Two Stages of Heating and Two Stages of Cooling in Rooftop, Proportional Bypass Damper, Fan, and Zone Demand Strategies
Power Requirements		19 to 30 VAC, 50/60 Hz, 2 VA (Terminals 4 and 5) at 24 VAC Nominal, Class 2 or Safety Extra-Low Voltage (SELV)
Analog Output Rating		0 to 10 VDC into 2k ohm Resistance (Minimum)
Auxiliary Output Rating	**Triac Output**	19 to 30 VAC, 15 mA to 1 A Continuous Current, 3 A Peak In-Rush Current
Binary Inputs	**TEC2647Z-3**	Voltage-Free Contacts across Terminal Scom to Terminals BI1 and BI2
Digital Inputs	**TEC2664Z-3**	Voltage-Free Contact across Terminal C to Terminal DI1
Analog Inputs	**TEC2647Z-3**	Resistive Inputs (RS and UI3) for 10k ohm Johnson Controls Type II Negative Temperature Coefficient (NTC) Thermistor Sensors
	TEC2664Z-3	Resistive Inputs (RS, OS, and DS) for 10k ohm Johnson Controls Type II NTC Thermistor Sensors
		Static Pressure: 0 to 5 VDC for Full Static Pressure Range Selected
Temperature Sensor Type		Local 10k ohm NTC Thermistor
Wire Size		18 AWG (1.0 mm Diameter) Maximum, 22 AWG (0.6 mm Diameter) Recommended
TEC Zoning Control System Guidelines		31 Zones Maximum per 1 Rooftop Controller
MS/TP Network Guidelines		32 Devices Maximum; 4,000 ft (1,219 m) Maximum Cable Length
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/37.5°C
Accuracy		±0.9F°/±0.5C° at 70.0°F/21.0°C Typical Calibrated
Minimum Deadband		2F°/1C° between Heating and Cooling
Ambient Conditions	**Operating**	32 to 122°F (0 to 50°C); 95% RH Maximum, Noncondensing
	Storage	-22 to 122°F (-30 to 50°C); 95% RH Maximum, Noncondensing

TEC Zoning Control System for Stand-Alone and BACnet MS/TP Networked Applications (Part 2 of 2)

Compliance	**BACnet International**	BACnet Testing Laboratories™ (BTL) 135-2001 Listed BACnet Application Specific Controller (B-ASC)
	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
CE	**Europe**	CE Mark – Johnson Controls, Inc., declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive 2004/108/EC.
	Australia and New Zealand	C-Tick Mark, AS/NZS CISPR 22 Compliant Supplier Code Number N10696
Shipping Weight		**TEC2647Z-3 Zone Controller:** 0.75 lb (0.34 kg) **TEC2647Z-3+PIR Zone Controller:** 0.77 lb (0.35 kg) **TEC2664Z-3 Rooftop Controller:** 0.75 lb (0.34 kg)

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Controls office. 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 brouiller du Canada.

Building Efficiency
507 E. Michigan Street, Milwaukee, WI 53202

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