

# TEC2664Z-2 BACnet® MS/TP Rooftop Controller for Stand-Alone and Networked Zoning Systems

## Installation Instructions

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### Applications

The TEC2664Z-2 Rooftop Controller is a BACnet® Master-Slave/Token-Passing (MS/TP) device that operates with a Johnson Controls® TEC2647Z-2 or TEC2647Z-2+PIR (occupancy sensor version) Zone Controller to provide efficient space temperature control in constant volume zoning systems. This technologically advanced 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.

The TEC2664Z-2, TEC2647Z-2+PIR, and TEC2647Z-2 controller combination can operate as a stand-alone zoning system or it can operate with a Building Automation System (BAS) that enables remote monitoring and programmability in networked zoning systems.

The TEC2664Z-2 Rooftop Controller features an intuitive user interface with backlit display that makes setup and operation quick and easy. The rooftop controller also employs a unique, Proportional-Integral (PI) time-proportioning algorithm that virtually eliminates temperature offset associated with traditional, differential-based rooftop controllers.

**IMPORTANT:** The TEC2664Z-2 Rooftop Controller is intended to provide an input to equipment under normal operating conditions. Where failure or malfunction of the rooftop 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 rooftop controller.

### North American Emissions Compliance

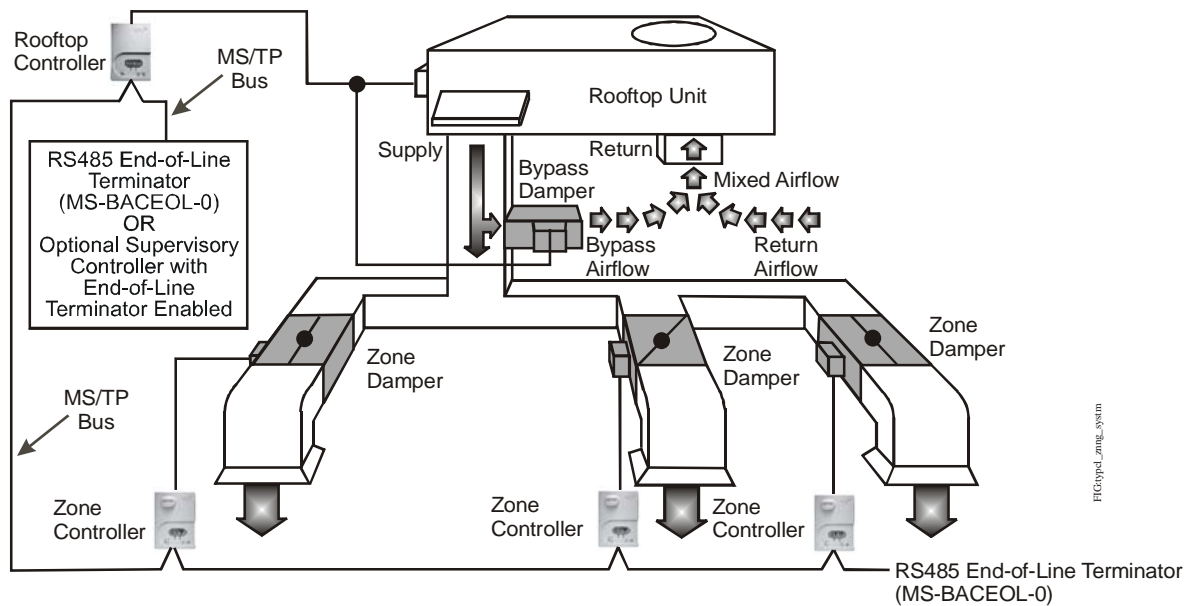
#### United States

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.



**Figure 1: Typical Zoning Control System Installed on a Single MS/TP Bus**

## Mounting

Figure 1 illustrates a typical zoning control system installed on a single MS/TP Bus. This installation consists of a TEC2664Z-2 Rooftop Controller controlling a rooftop unit; and multiple Zone Controllers, each controlling a single zone damper. The TEC2664Z-2 Rooftop Controller can be wired to an optional supervisory controller.

### Location Considerations

Follow these guidelines for locating the TEC2664Z-2 Rooftop Controller.

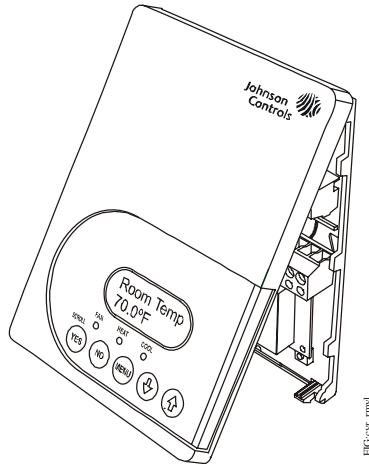
- Observe all environmental limits, and be sure that the rooftop controller mounting location maintains the ambient operating conditions as described in the [Technical Specifications](#) on page 25.
- Mount the rooftop controller indoors or in an approved enclosure, where the ambient operating conditions are always maintained. Do not mount the rooftop controller where it may be exposed to water, condensation, other liquids, or corrosive or flammable vapors of any kind.

**IMPORTANT:** Before specifying the TEC2664Z-2 Rooftop Controller for plenum applications, verify acceptance of exposed plastic materials in plenum areas with the local building authority. Building codes vary by location. Some local building authorities accept compliance to UL 1995, Heating and Cooling Equipment, while others use different acceptance criteria.

- Mount the rooftop controller in an accessible location to allow for easy access to the user interface keys.
- Do not mount the rooftop controller on surfaces that are prone to vibration, or in areas where electromagnetic emissions, inductive interference, or radio frequency signals from other devices or wiring can interfere with operation or Field Bus communication.

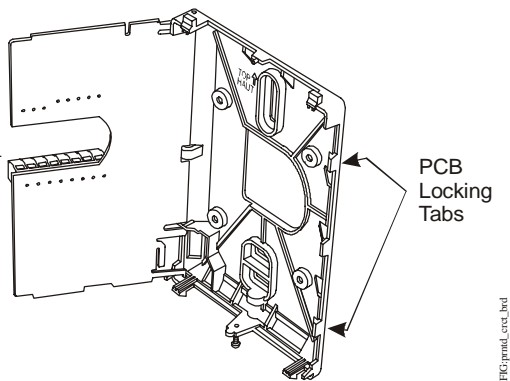
To install the rooftop controller:

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



**Figure 2: Removing the Rooftop Controller Cover**

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



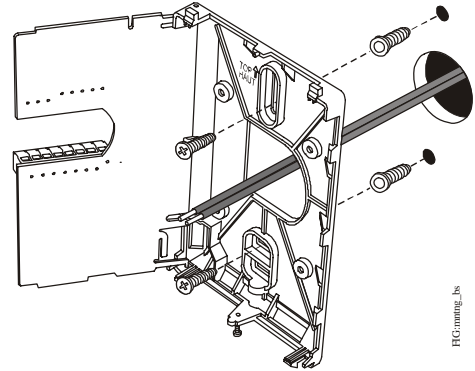
**Figure 3: Opening the Rooftop Controller PCB**

3. Pull approximately 6 in. (152 mm) of wire from the wall, and insert the wire through the hole in the rooftop controller mounting base.
4. Align the rooftop controller mounting base on the wall, and use the base as a template to mark the two mounting hole locations.

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

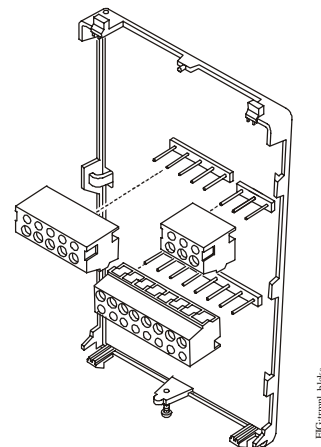
5. Drill a 3/16 in. (5 mm) hole at each of the two marked locations, and tap nylon anchors (included with the rooftop controller) flush to the wall surface.
6. Position the rooftop controller mounting base on the wall, and use the two mounting screws (included with the rooftop controller) to secure the base to the surface as illustrated in Figure 4.

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



**Figure 4: Securing the Rooftop Controller Mounting Base to the Wall**

7. Swing the PCB back to the right and carefully snap it into the locking tabs on the rooftop controller mounting base.
8. Remove the screw terminal blocks that are attached to a disposable adhesive to the display. Figure 5 illustrates the locations of the screw terminal blocks on the rooftop controller.



**Figure 5: Removing the Screw Terminal Blocks**

## Wiring

When an existing rooftop controller is replaced, remove and label the wires to identify the terminal functions. When a TEC2664Z-2 Rooftop Controller is replaced, simply remove the old screw terminal blocks and reinsert them onto the PCB of the replacement rooftop controller.



**CAUTION: Risk of Electric Shock.**

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

To wire the rooftop controller:

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



**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 TEC2664Z-2 Rooftop Controller.

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

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

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

3. Reinsert the screw terminal blocks onto the PCB.
4. Attach the MS/TP communication wires to the terminal block.

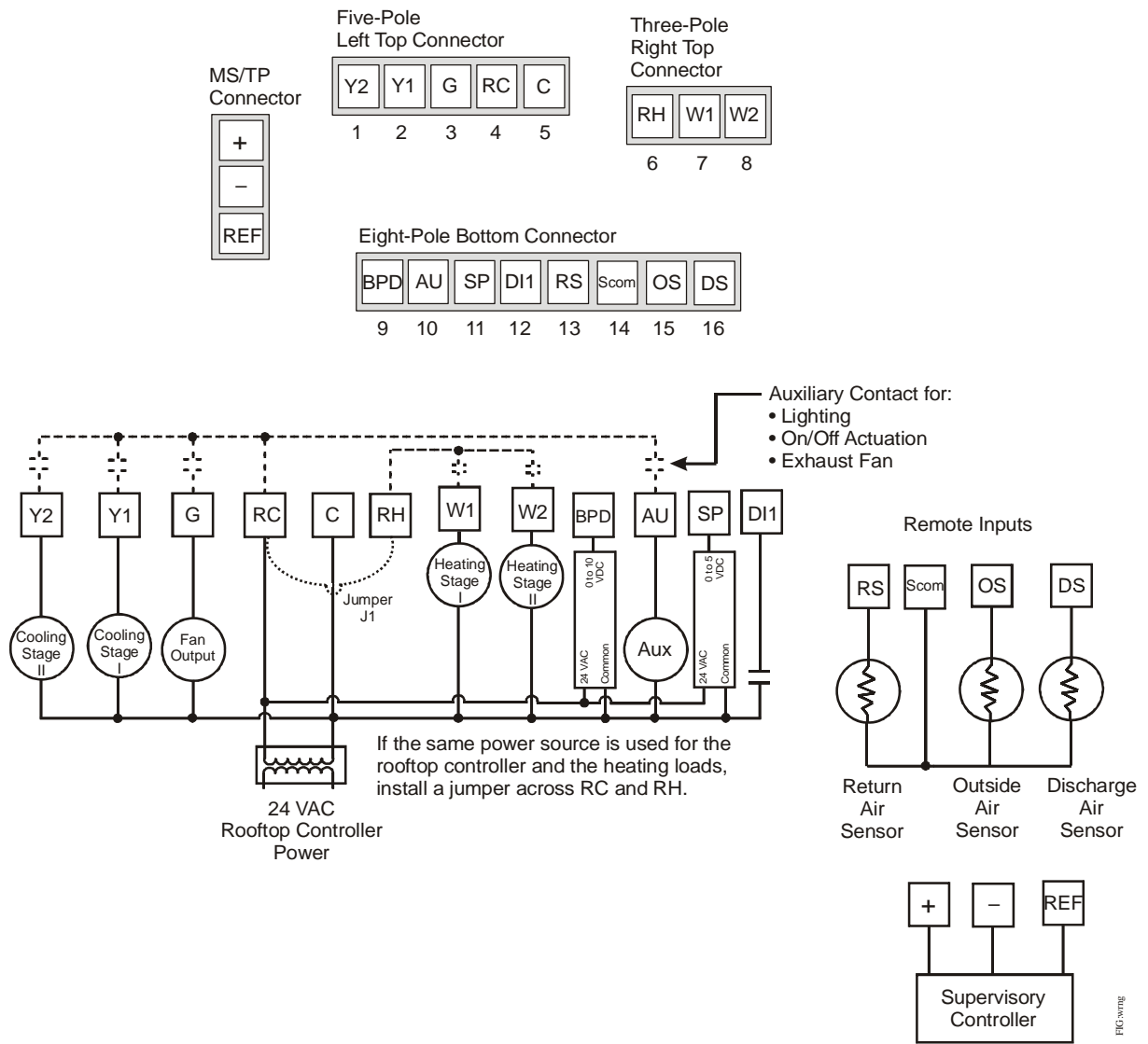
**Note:** If multiple wires are inserted into the terminals, be sure to properly twist the wires together prior to inserting them into the terminal connectors.

5. Reattach the rooftop controller cover to the mounting base (top side first).
6. Use a Phillips-head screwdriver to reinstall the security screw on the bottom of the rooftop controller cover.

**Table 1: Terminal Identification (See Figure 6.)**

Terminal Number	Terminal Label	Function
1	Y2	Cooling Stage II (Energizes on a Call for Second-Stage Cooling)
2	Y1	Cooling Stage I (Energizes on a Call for First-Stage Cooling)
3	G	Fan Output (Energizes the Fan in Accordance with the Selected System Mode)
4	RC	24 VAC from Transformer
5	C	24 VAC (Common) from Transformer
6	RH	24 VAC for Heating Stages
7	W1	Heating Stage I (Energizes on a Call for First-Stage Heating)
8	W2	Heating Stage II (Energizes on a Call for Second-Stage Heating)
9	BPD	Bypass Damper (0 to 10 VDC Actuator Output)
10	AU	Auxiliary Output
11	SP	Static Pressure
12	DI1	Configurable Digital Input 1
13 <sup>1</sup>	RS	Return Air Sensor
14	Scom	Sensor Common
15	OS	Outside Air Sensor
16	DS	Discharge Air Sensor
Blank	+, -, REF	MS/TP Bus

1. If no sensor is connected to this terminal, then the rooftop controller uses the onboard temperature sensor as the return air sensor.



**Figure 6: Wiring the TEC2664Z-2 Rooftop Controller  
(See Table 1.)**

## Connecting the MS/TP Bus

To connect the MS/TP Bus:

1. Set the device address of the TEC2664Z-2 Rooftop Controller per the engineering drawings, and test for bus voltage, polarity, and isolation prior to wiring the MS/TP Bus. (See the **RTC MAC** parameter in Table 2 to set the device address for the rooftop controller.)

**Note:** Pressing and holding the **YES** and **NO** keys simultaneously displays the device address that is assigned.

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

2. Observe the polarity when connecting the bus wires to the rooftop controller.
3. After the bus wires are connected to the first rooftop controller, continue in a daisy-chained fashion to the next device on the MS/TP Bus.

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

The MS/TP Bus requires proper termination and biasing at each end of a segment (a segment is a physically continuous length of wire). Because the rooftop controller is not equipped with end-of-line termination, a Johnson Controls MS-BACEOL-0 End-of-Line Terminator (see Table 6; ordered separately) or similar device is recommended to provide this end-of-line termination. An end-of-line terminator is required if a supervisory controller is not at the end of the segment. If a supervisory controller is at the end of the segment, then the end-of-line terminator switch on the supervisory controller must be set in the ON position.

**Note:** See Table 6 for end-of-line terminator ordering information.

For applications with a supervisory controller on the MS/TP Bus, set the supervisory controller to establish the baud rate, and set the rooftop controller for automatic baud rate detection.

For stand-alone applications where a supervisory controller is not present, at least one device on the MS/TP Bus must be set to establish the baud rate. It is recommended that the baud rate be set at only one rooftop controller, and all other devices be set for automatic baud rate detection. Doing so prevents duplicate devices from having mismatched baud rates. After the baud rate is set, recycle the power to the device that was used to set the baud rate.

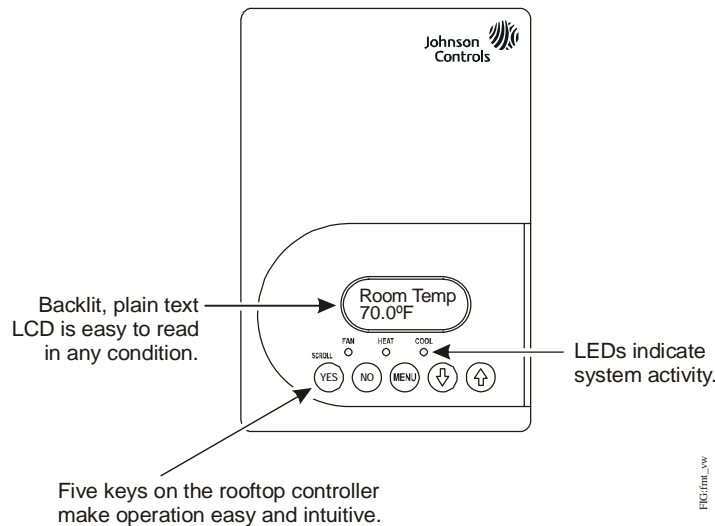
Do not exceed the maximum number of devices allowed on a Field Bus. Be sure that the wiring terminations are set correctly, and that all communication wiring is daisy-chained with no taps.

A small green light under the rooftop controller cover (on the left edge, when facing the rooftop controller) indicates the communications mode when the rooftop controller is operating. The following blink codes may occur:

- Short-Short-Long: Indicates that the baud rate is known and communication is active.
- Short-Short: Indicates that the rooftop controller is scanning for the correct baud rate and there is no communication.
- Off: Indicates that there is no power to the rooftop controller or the MS/TP wiring polarity is reversed.
- Long: Indicates that the MS/TP communication daughter board is the wrong type for the main board.

## Setup and Adjustments

### Rooftop Controller Operation Overview



**Figure 7: Front Cover of Rooftop Controller**

#### Rooftop Controller User Interface Keys

The TEC2664Z-2 Rooftop Controller user interface consists of five keys on the front cover (as illustrated in Figure 7). The function of each key is as follows:

- Use the **YES/SCROLL** key 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 to decline a parameter change and to advance to the next display item.
- Use the **MENU** key to:
  - access the Main User Menu or to exit the menu (See [Main User Menu](#) on page 8.)
  - access the Installer Configuration Menu or to exit the menu (See [Configuring the TEC2664Z-2 Rooftop Controller](#) on page 8.)
- Use the **UP/DOWN** arrow keys to change the configuration parameters and to activate a setpoint adjustment.

#### Light-Emitting Diodes (LEDs)

Three LEDs are included to indicate the fan status, and to show a call for heating or a 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.

#### Manual Scroll Display

To initiate the Manual Scroll Display, press the **YES** key repeatedly. The last item viewed shows on the display for 30 seconds before Auto Scroll Display resumes. The manual scroll sequence is as follows:

- Clock Status (Day/Time)
- System Mode (Off/Auto)
- Schedule Status (Occupied/Occupied Hold/Unoccupied/Unoccupied Hold/Override)
- Outside Temperature
- Alarms (Service/DAS Alarm/SetClock/Filter/Comm Lost)
- Current Zone Sequence (Off/Cool/Heat)
- Return Air Temp
- Discharge Air Temp
- Current Static Pressure

- Effective PI Heat
- Effective PI Cool
- Highest PI Heat Zone
- Highest PI Cool Zone

### Main User Menu

The Main User Menu is used to access and change the basic operating parameters of the rooftop controller. During normal rooftop 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:

- Schedule Override/Cancel Override
- System Mode
- Set Schedule
- Set Clock

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.

### Configuring the TEC2664Z-2 Rooftop Controller

The TEC2664Z-2 Rooftop Controller comes from the factory with default settings for all configurable parameters. The default settings are shown in Table 2. To reconfigure the parameters via the rooftop controller, follow the steps in this section.

To access the Installer Configuration Menu, press and hold the **MENU** key for approximately 8 seconds. Once the Installer Configuration Menu begins, press the **NO** key to scroll through the parameters listed in Table 2. When the desired parameter is displayed, use the **YES** key to choose the desired selection option. Press the **YES** key and then the **NO** key to continue scrolling through the parameters.

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

Refer to the *TEC Zoning Control System for Stand-Alone and BACnet MS/TP Networked Applications Technical Bulletin (LIT-12011398)* for additional configuring and commissioning details.

### Configuring Input DI1

When DI1 is configured for an alarm condition, an alarm condition is displayed locally when the input is closed. An alarm message is included on the Auto Scroll Display, and when the message is displayed, the backlight momentarily lights up.

The DI1 input can be configured to the selection options included in Table 2.

**Table 2: Installer Configuration Menu (Part 1 of 5)**

Parameter Appearing on Display	Description and Default	Selection Options
<b>RTC MAC<sup>1</sup></b>	Sets a unique device address for the rooftop controller on the MS/TP network. Default: <b>4</b> <b>Note:</b> This parameter setting must be the same as the <b>RTC MAC</b> parameter setting for all zone controllers associated with this rooftop controller.	Range: <b>004</b> to <b>127</b> <b>Note:</b> When setting the device address, press the <b>UP/DOWN</b> arrow keys to change the device address in increments of 1; press and hold the <b>UP/DOWN</b> arrow keys to change the device address in increments of 10.
<b>RTC Baud</b>	Sets the baud rate of the rooftop controller on the MS/TP network. Default: <b>Auto</b>	<b>(9600):</b> 9600 bps <b>(19200):</b> 19200 bps <b>(38400):</b> 38400 bps <b>(76800):</b> 76800 bps <b>(Auto):</b> Auto Baud



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

Parameter Appearing on Display	Description and Default	Selection Options				
<b>Lockout</b>	Selectable Lockout Levels for limiting end user keypad interaction. Default: <b>0</b>	<b>Lockout Level</b>	<b>Function</b>			
			<b>Local Unocc Override<sup>2</sup></b>	<b>System Mode Setting</b>	<b>Schedule Setting</b>	<b>Clock Setting</b>
			<b>(0): Level 1</b>	Access	Access	Access
			<b>(1): Level 2</b>	Access	No Access	Access
<b>(2): Level 3</b>	No Access	No Access	Access			
<b>Pwr del<sup>3</sup></b>	Sets the delay time period at rooftop 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: <b>30.0 sec</b>	Range: <b>10.0 to 120.0 sec</b>				
<b>CntrlTyp</b>	Sets how the rooftop controller is controlled. Default: <b>AV_H3</b>	<b>(Highest):</b> The highest PI Heating or Cooling demand controls the rooftop controller. <b>(AV_H3):</b> The average of the three highest PI Heating or Cooling demands controls the rooftop controller. <b>(AV_H5):</b> The average of the five highest PI Heating or Cooling demands controls the rooftop controller.				
<b>Dis HL<sup>4</sup></b>	Sets the Discharge Air High Limit temperature value at which the heating stages are locked. Default: <b>120.0°F/49.0°C</b>	Range: <b>70.0°F/21.0°C to 150.0°F/65.5°C</b>				
<b>Dis LL<sup>4</sup></b>	Sets the Discharge Air Low Limit temperature value at which the cooling stages are locked. Default: <b>45.0°F/7.0°C</b>	Range: <b>35.0°F/2.0°C to 65.0°F/18.0°C</b>				
<b>Anticycl</b>	Anti-Short Cycle timer sets the minimum on/off times for heating and cooling stages. Default: <b>2.0 min</b>	Range: <b>0.0 to 5.0 min</b> adjustable in 1-minute increments <b>Note:</b> Set the anti-short cycle timer to <b>0.0 min</b> for equipment that already has its own anti-short cycle timer.				
<b>Heat cph</b>	Sets the maximum number of Heating cycles per hour. Default: <b>4.0</b>	Range: <b>3.0 to 8.0</b> cycles per hour				
<b>Cool cph</b>	Sets the maximum number of Cooling cycles per hour. Default: <b>4.0</b>	Range: <b>3.0 or 4.0</b> cycles per hour				
<b>Deadband</b>	Sets the minimum deadband between the heating and cooling setpoints. Default: <b>2.0F°/1.0C°</b>	Range: <b>2.0F°/1.0C° to 4.0F°/2.0C°</b> adjustable in 1.0F°/0.5C° increments				
<b>Units</b>	Sets the display scale of the rooftop controller. Default: <b>Imp</b>	<b>(Si):</b> Celsius/Pa <b>(Imp):</b> Fahrenheit/in. W.C.				

**Table 2: Installer Configuration Menu (Part 3 of 5)**

Parameter Appearing on Display	Description and Default	Selection Options
<b>Fan del</b>	Fan delay extends fan operation after a heating or cooling cycle has ended. Default: <b>off</b>	<b>(on):</b> Extends fan operation by 60 seconds after a heating or cooling cycle has ended. <b>(off):</b> No extension of fan operation after a heating or cooling cycle has ended. <b>Note:</b> The fan delay is only active when the GUI System Mode is set at Auto and the GUI Occupancy is set at Unoccupied.
<b>DI1</b>	Configuration of Digital Input 1. Default: <b>None</b>	<b>(None):</b> No function is associated with an input. <b>(RemNSB):</b> Remote Night Setback (NSB) via a time clock input disables the internal scheduling of the thermostat. The scheduling is now set per the digital input. The time information still displays, but the menu information related to the schedule is disabled and no longer accessible. Contact open = Occupied; contact closed = Unoccupied <b>(RemOVR):</b> 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 capacity of the rooftop controller. <b>(Filter):</b> A Filter alarm is displayed. This alarm can be connected to a differential pressure switch that monitors a filter. <b>(Service):</b> A Service alarm is displayed on the rooftop controller when the input is energized. This input can be tied into the air conditioning unit control card, which provides an alarm should there be a malfunction.
<b>TOccTime</b>	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"> <li>an Override Function enabled in the Main User Menu (when the rooftop controller is in the Unoccupied mode)</li> <li>a temporary heating or cooling setpoint</li> </ul> Default: <b>3.0 hrs</b>	Range: <b>0.0 to 12.0 hrs</b> <b>Note:</b> When adjusting the TOccTime, press the <b>UP/DOWN</b> arrow keys to change the time in 1-hour increments; press and hold the <b>UP/DOWN</b> arrow keys to change the time in 10-hour increments.
<b>Cal RS</b>	Sets the desired Room Air Temperature Sensor Calibration (offset). The offset can be added to or subtracted from the actual displayed room temperature. Default: <b>0.0F°/0.0C°</b>	Range: <b>-5.0F°/-2.5C° to 5.0F°/2.5C°</b> adjustable in 1.0F°/0.5C° increments
<b>Cal OS</b>	Sets the desired Outside Air Temperature Sensor calibration (offset). The offset can be added to or subtracted from the actual displayed outside air temperature. Default: <b>0.0F°/0.0C°</b>	Range: <b>-5.0F°/-2.5C° to 5.0F°/2.5C°</b> adjustable in 1.0F°/0.5C° increments
<b>H stage</b>	Sets the number of Heating stages. Default: <b>2</b>	<b>(1):</b> One stage of heating <b>(2):</b> Two stages of heating <b>Note:</b> Two-stage rooftop controller operation reverts to one-stage operation only when the second heating step is not required.
<b>C stage</b>	Sets the number of Cooling stages. Default: <b>2</b>	<b>(1):</b> One stage of cooling <b>(2):</b> Two stages of cooling <b>Note:</b> Two-stage rooftop controller operation reverts to one-stage operation only when the second cooling step is not required.

**Table 2: Installer Configuration Menu (Part 4 of 5)**

Parameter Appearing on Display	Description and Default	Selection Options
<b>H lock<sup>5</sup></b>	Discontinues Heating operation in response to the outside air temperature. Requires that an outside air temperature sensor be installed and connected. Default: <b>120.0°F/49.0°C</b>	Range: <b>-15.0°F/-26.0°C to 120.0°F/49.0°C</b>
<b>C lock<sup>5</sup></b>	Discontinues Cooling operation in response to the outside air temperature. Requires that an outside air temperature sensor be installed and connected. Default: <b>-40.0°F/-40.0°C</b>	Range: <b>-40.0°F/-40.0°C to 95.0°F/35.0°C</b>
<b>2/4event</b>	Sets the number and configuration of events. Default: <b>2 events</b>	<b>(2 events):</b> Sets up programming for the following: Event 1 is for Occupied setpoints. Event 2 is for Unoccupied setpoints. <b>(4 events):</b> Sets up programming for the following: Event 1 is for Occupied setpoints. Event 2 is for Unoccupied setpoints. Event 3 is for Occupied setpoints. Event 4 is for Unoccupied setpoints.
<b>Aux cont</b>	Energizes peripheral devices (lighting equipment, exhaust fans, and economizers). Default: <b>n.o.</b>	<b>(n.c.):</b> Contact open = Occupied; contact closed = Unoccupied <b>(n.o.):</b> Contact closed = Occupied; contact open = Unoccupied <b>Note:</b> The contact toggles with the internal Occupied/Unoccupied schedule (or the remote NSB contact if DI1 is used).
<b>Prog rec</b>	Enables Progressive recovery. Default: <b>off</b> <b>Note:</b> Progressive recovery is automatically disabled if DI1 is configured for remote NSB.	<b>(on):</b> Progressive recovery enabled <b>Note:</b> The programmed Occupied schedule time is the time at which the desired Occupied temperature is attained. The rooftop controller automatically optimizes the equipment start time. <b>(off):</b> Progressive recovery disabled <b>Note:</b> The programmed Occupied schedule time is the time at which the system restarts.
<b>Occ CL<sup>4</sup></b>	If network communication is lost with the zone controller(s), the return air sensor controls the rooftop controller to maintain this Cooling setpoint. Default: <b>72.0°F/22.0°C</b>	Range: <b>54.0°F/12.0°C to 100.0°F/37.5°C</b>
<b>Occ HT<sup>4</sup></b>	If network communication is lost with the zone controller(s), the return air sensor controls the rooftop controller to maintain this Heating setpoint. Default: <b>70.0°F/21.0°C</b>	Range: <b>40.0°F/4.5°C to 90.0°F/32.0°C</b>
<b>Unocc CL<sup>4</sup></b>	If network communication is lost with the zone controller(s), the return air sensor controls the rooftop controller to maintain this Unoccupied Cooling setpoint. Default: <b>82.0°F/28.0°C</b>	Range: <b>54.0°F/12.0°C to 100.0°F/37.5°C</b>

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

Parameter Appearing on Display	Description and Default	Selection Options
<b>Unocc HT<sup>4</sup></b>	If network communication is lost with the zone controller(s), the return air sensor controls the rooftop controller to maintain this Unoccupied Heating setpoint. Default: <b>62.0°F/17.0°C</b>	Range: <b>40.0°F/4.5°C to 90.0°F/32.0°C</b>
<b>Sp range<sup>6</sup></b>	Sets the static pressure transducer range. Default: <b>0</b>	<b>(0):</b> 0 in. W.C./0 Pa to 1.5 in. W.C./375 Pa <b>(1):</b> 0 in. W.C./0 Pa to 2 in. W.C./500 Pa <b>(2):</b> 0 in. W.C./0 Pa to 3 in. W.C./750 Pa <b>(3):</b> 0 in. W.C./0 Pa to 4 in. W.C./1,000 Pa <b>(4):</b> 0 in. W.C./0 Pa to 5 in. W.C./1,250 Pa
<b>Pressure<sup>6</sup></b>	Sets the static pressure transducer setpoint maintained by the bypass damper. Default: <b>0.8 in. W.C./200 Pa</b>	Range: <b>0 in. W.C./0 Pa to 2 in. W.C./500 Pa</b>

1. **RTC MAC** is the unique device address of the rooftop controller (from **004** to **127**) on the MS/TP network.
2. **Local Unocc Override** appears only when in the **Unoccupied** mode.
3. 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.
4. 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.
5. When adjusting the temperature, press the **UP** or **DOWN** arrow key to change the value in 5.0F°/5.0C° increments; press and hold the **UP** or **DOWN** arrow key to change the value in 50.0F°/50.0C° increments.
6. This value is adjustable in 0.1 in. W.C./25 Pa increments.

### Sequence of Operation

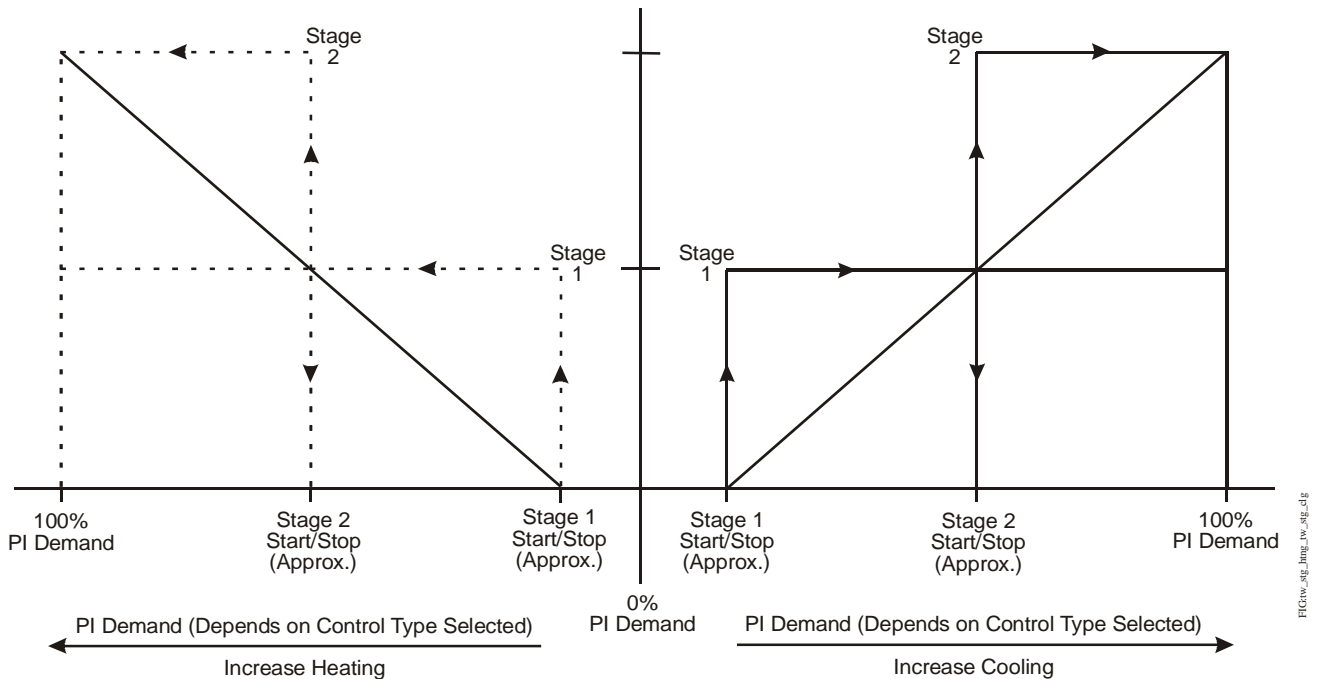
The sequence of operation of the zones is commanded from the TEC2664Z-2 Rooftop Controller on a Change of Value (COV) basis. The rooftop controller transmits its current sequence mode to the zones, depending on the highest or highest average PI demand. The available sequence values at the zones are heating and cooling. There is a 2-minute delay when toggling between the heating and cooling modes. This delay only applies when the system is switching over from the network demand; the delay is not active when working with Comm Lost using the return air temperature sensor or the room air temperature sensor. If the system mode of the rooftop controller is set to off, the sequence value at the zone is cooling by default.

**Note:** If no return air sensor is installed and loss of communication occurs, control of the rooftop unit is based on the onboard sensor readings of the rooftop controller.

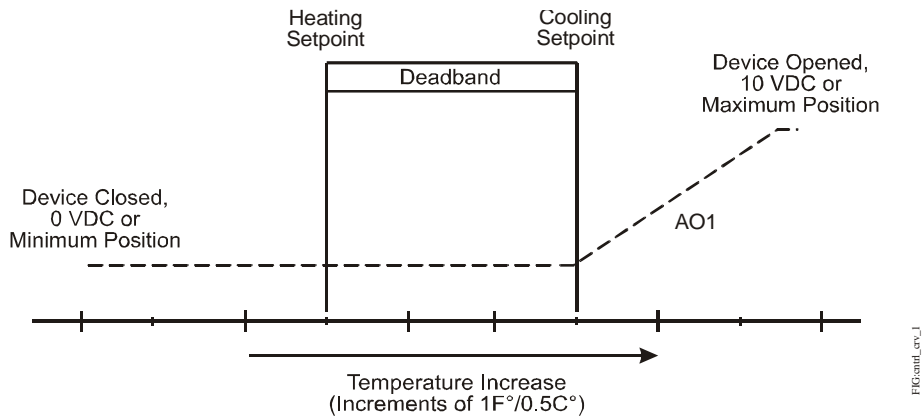
The user can choose between a single highest PI demand, an average of the three highest PI demands, or an average of the five highest PI demands.

Using the five highest PI demands as an example, five buffers are required in the BACnet module of the rooftop controller for the PI heating demand and five additional buffers are required for the PI cooling demand. Each time a new zone sends its PI cooling demand, the rooftop controller compares it to the lowest of the five values already stored and buffers it (if required). The rooftop controller averages these five values, and the PI heating demand or PI cooling demand controls the rooftop controller.

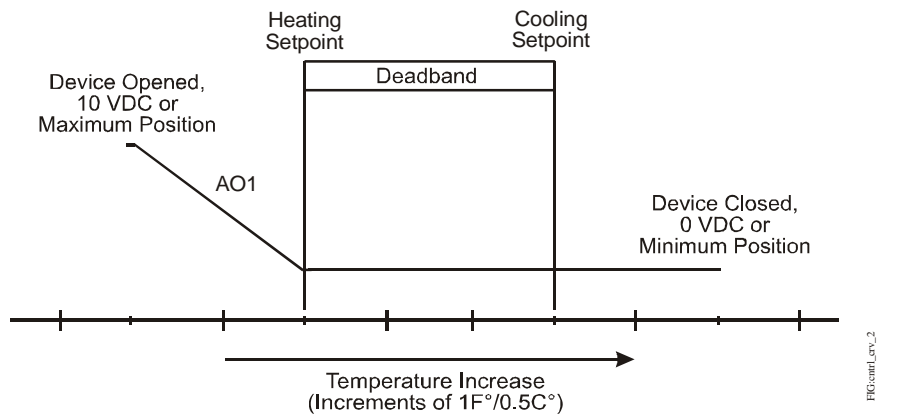
See Figure 8 through Figure 18 for sequence of operation examples.



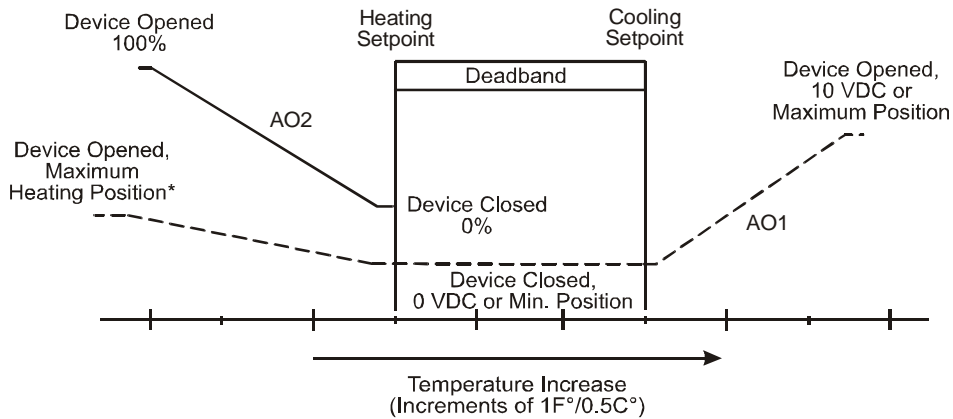
**Figure 8: Rooftop Controller Sequence of Operation for Two-Stage Heating and Two-Stage Cooling**



**Figure 9: Zone Controller Set for No Reheat, AO2 = 0 VDC and BO5 = Off (Rooftop Controller in Cooling Mode)**

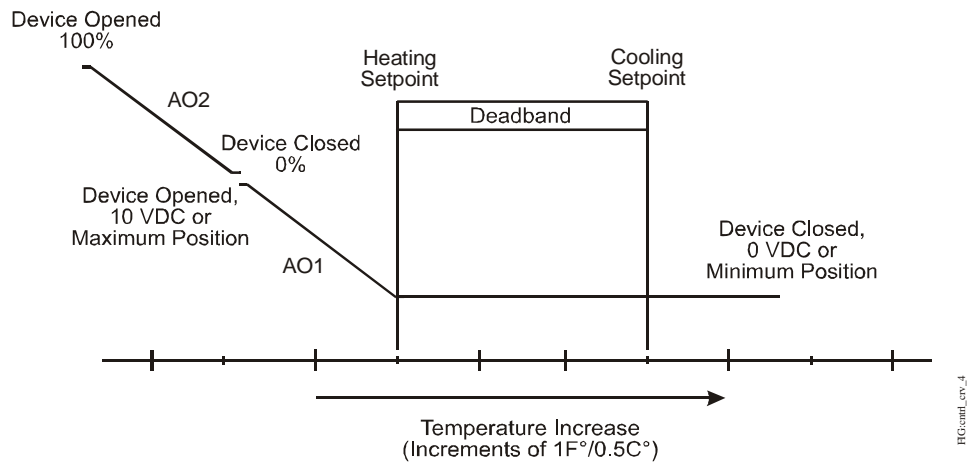


**Figure 10: Zone Controller Set for No Reheat, AO2 = 0 VDC and BO5 = Off (Rooftop Controller in Heating Mode)**

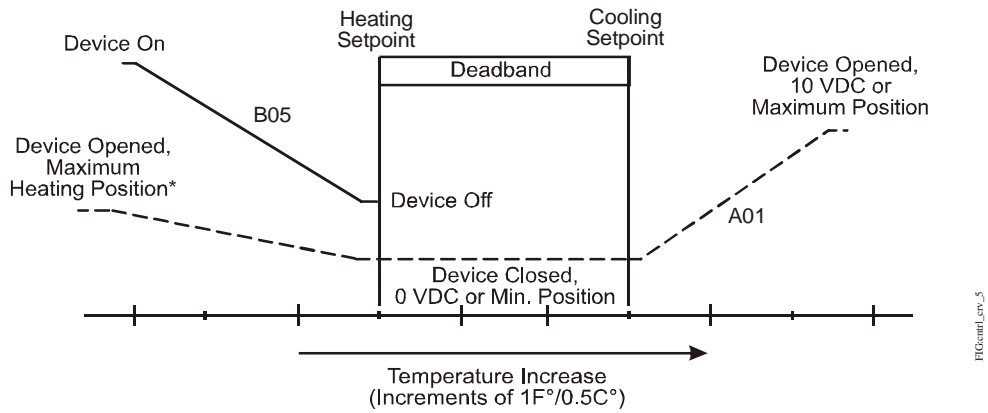


\* If AO2 stage is locked, then AO1 = minimum position.

**Figure 11: Zone Controller Set for Analog Duct Reheat Only, BO5 = Off (Rooftop Controller in Cooling Mode)**

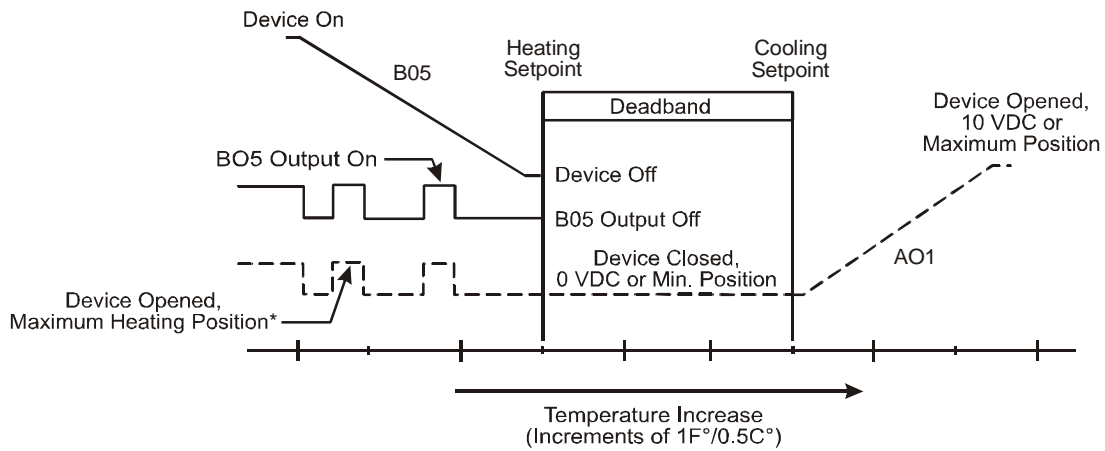


**Figure 12: Zone Controller Set for Analog Duct Reheat Only, BO5 = Off (Rooftop Controller in Heating Mode)**



\* If BO5 stage is locked, then AO1 = minimum position. When BO5 = 0%, AO1 = minimum position; when BO5 = 100%, AO1 = maximum position. Otherwise, AO1 output is proportional to BO5 output.

**Figure 13: Zone Controller Set for On/Off Duct Reheat Only, AO2 = 0% and On/Off Reheat Time Base = 10 Seconds (Rooftop Controller in Cooling Mode)**



\* If BO5 stage is locked, then AO1 = minimum position. When BO5 = off, AO1 = minimum position; when BO5 = on, AO1 = maximum position.

FIG:amLrvy\_6

**Figure 14: Zone Controller Set for On/Off Duct Reheat Only, AO2 = 0% and On/Off Reheat Time Base = 15 Minutes (Rooftop Controller in Cooling Mode)**

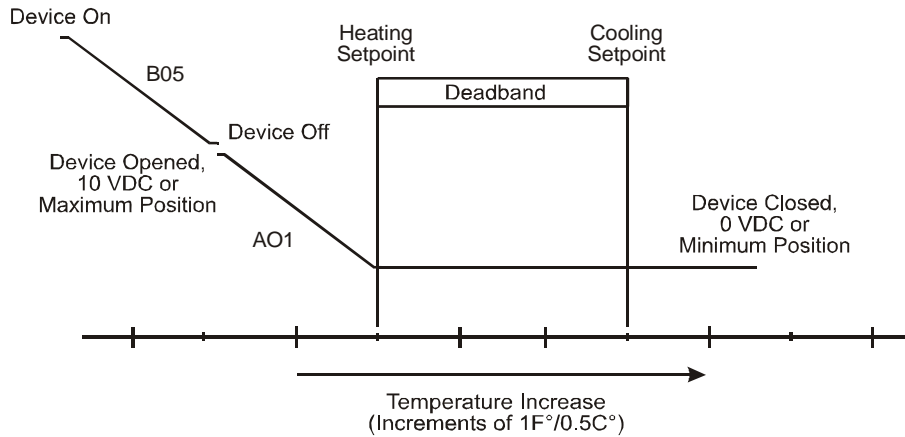


FIG:amLrvy\_7

**Figure 15: Zone Controller Set for On/Off Duct Reheat Only, AO2 = Off (Rooftop Controller in Heating Mode)**



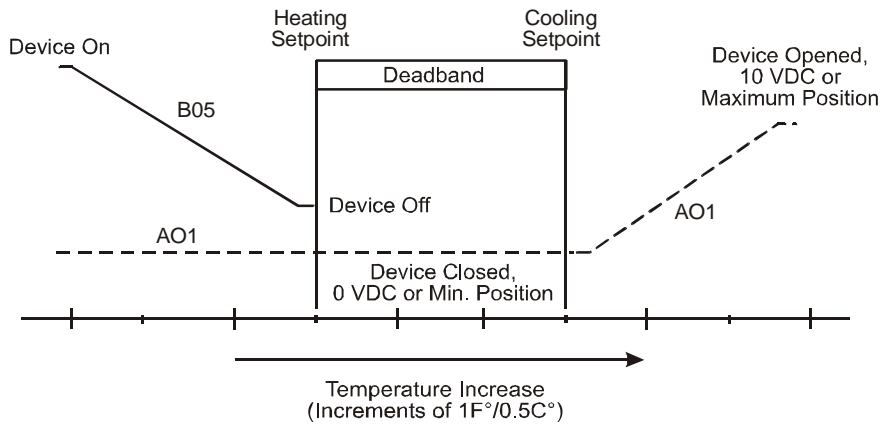


FIG.contr.Levr.8

**Figure 16: Zone Controller Set for On/Off Peripheral Reheat Only, AO2 = 0% (Rooftop Controller in Cooling Mode)**

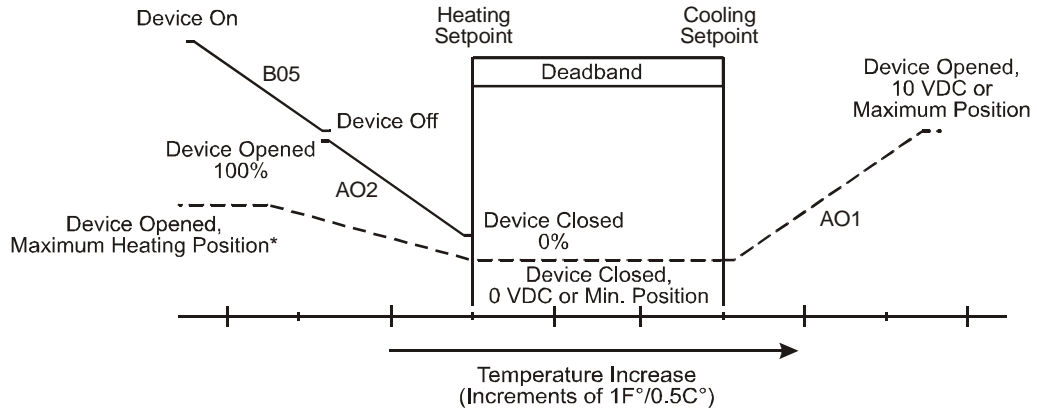


FIG.contr.Levr.9

\* If AO2 stage is locked, then AO1 = minimum position.

**Figure 17: Zone Controller Set for Terminal Reheat on AO2 and Peripheral Heating on B05 (Rooftop Controller in Cooling Mode)**

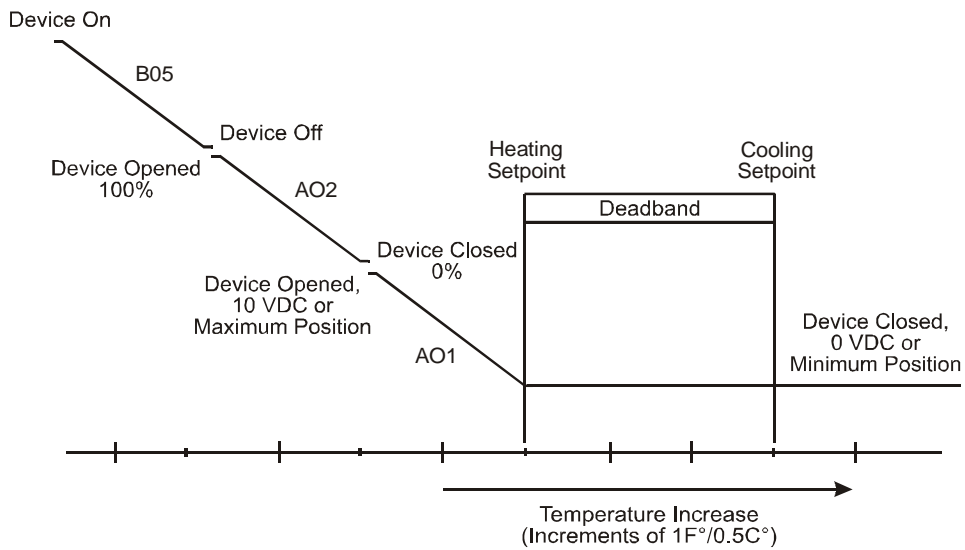


FIG0001\_crv\_110

**Figure 18: Zone Controller Set for Terminal Reheat on AO2 and Peripheral Heating on BO5 (Rooftop Controller in Heating Mode)**

## Operation

### Main User Menu Access Modifications

Each of the sections in the Main User Menu are accessed and programmed using the five keys on the cover of the TEC2664Z-2 Rooftop Controller. See *Rooftop Controller User Interface Keys* on page 7 for a description of the five user interface keys. Figure 19 charts the flow of the Main User Menu.

The system mode can be set to either Off or Auto. The Auto mode allows the rooftop controller to determine, from the average PI demand (if a network is detected) or from the return air sensor PI demands (if a network is not detected), if the rooftop unit is in heating mode or cooling mode.

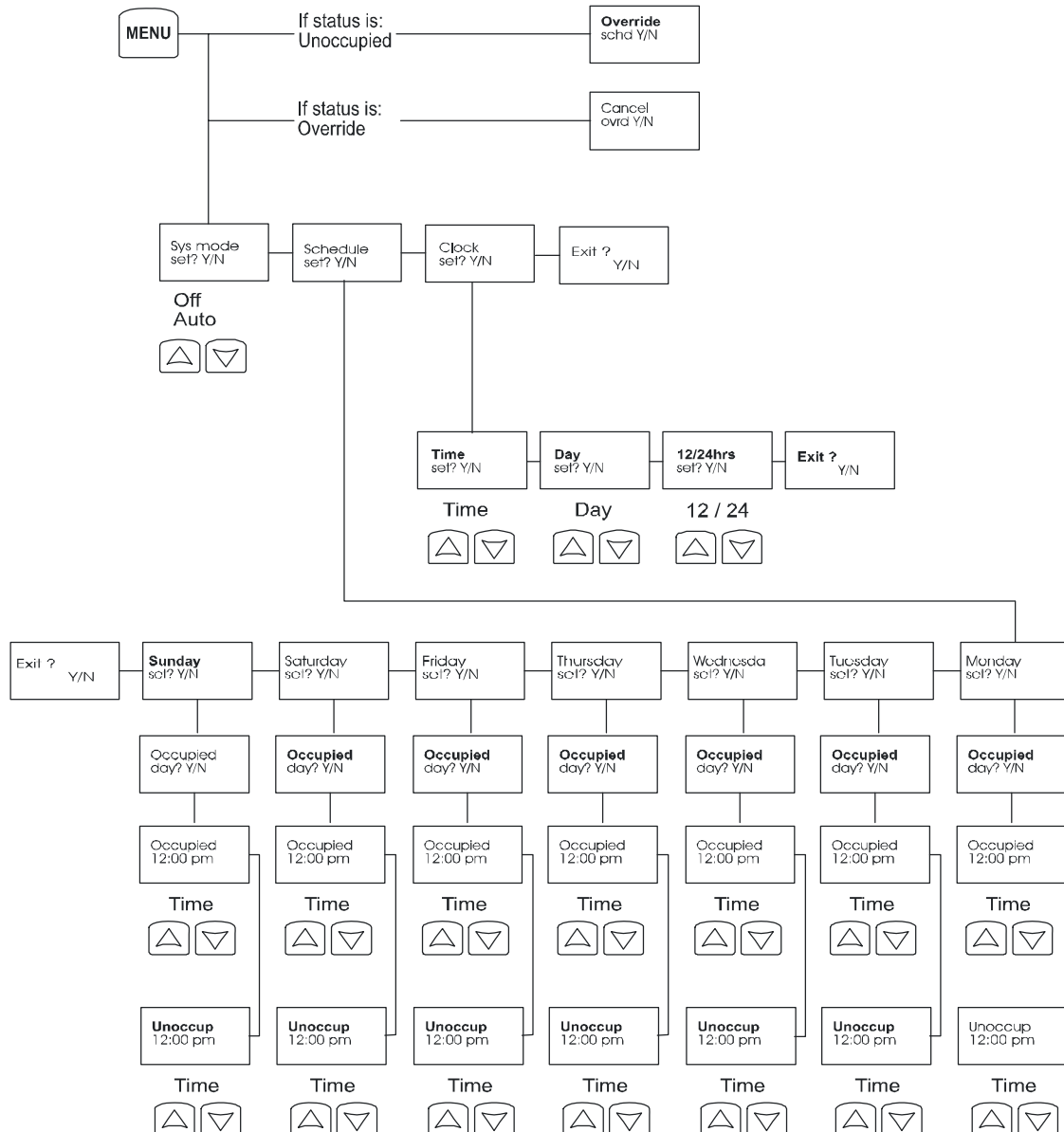


Figure 19: Main User Menu

### Sequence of Auto Status Display Scrolling

The TEC2664Z-2 Rooftop Controller features a two-line, eight-character status display. A low-level, backlight is always active and can only be seen in the dark. When the rooftop controller is left unattended, an auto scroll status display indicates the actual status of the system.

Each item is scrolled one-by-one with the backlight in the low-level mode. Pressing any key causes the low-level backlight to brighten to high-level mode. When left unattended for 30 seconds after changes are made, the display resumes auto status display scrolling.

To brighten the low-level backlight to high-level mode, simply press any key on the face of the rooftop controller. The high-level backlight returns to low-level mode when the rooftop controller is left unattended for 45 seconds.

If alarms are detected, they are automatically displayed at the end of the status display scroll. During an alarm message display, the backlight lights up at the same time as the alarm message and shuts off during the remainder of the status display scroll. Two alarm messages can appear at any given time.

The priority of alarms is as follows:

- **Comm Lost:** This alarm indicates that communication is lost between the rooftop controller and the zone devices on the MS/TP Bus; however, the rooftop controller can remain online with the supervisory controller.
- **SetClock:** This alarm indicates that the clock needs to be reset due to a power failure of more than 6 hours.
- **DAS Alm:** This alarm indicates a high or low alarm at the discharge air sensor. If no discharge air sensor is connected (-40.0°F/-40.0°C reading), the associated functions (such as lockouts and alarms) are disabled. If the discharge air sensor is shorted (122.0°F/50.0°C reading), the associated functions (such as lockouts and alarms) are enabled.
- **Service:** This alarm indicates there is a service alarm, as per the configurable Digital Input DI1.
- **Filter:** This alarm indicates that the filters are dirty and need to be replaced, as per the configurable Digital Input DI1.

See Table 3 for the sequence of auto status display scrolling.

**Table 3: Sequence of Auto Status Display Scrolling**

Clock Status	System Mode	Schedule Status	Outdoor Temperature <sup>1</sup>	Alarms (If Detected)
Monday 12:00 A.M.	Sys Mode Off	Occupied	Outdoor xx.x °C or °F	Service <sup>2</sup>
	Sys Mode Auto	Unoccupied		DAS Alm <sup>3</sup>
		Override		SetClock <sup>4</sup>
				Filter <sup>5</sup>
				Comm Lost <sup>6</sup>

1. The outdoor temperature displays only if an outside air temperature sensor is installed. If an outside air temperature sensor is not installed, an ambiguous outdoor temperature displays on the zone controller indicating that no outside air temperature sensor is installed. If no outside air temperature sensor is installed, the auto status display scrolling skips past the outdoor temperature.
2. This alarm is valid only if the **DI1** parameter is configured and used as a service alarm.
3. This alarm is valid only if the **Dis HL** or **Dis LL** parameter is enabled.
4. This alarm is valid only if the power off clock time retention has expired.
5. This alarm is valid only if the **DI1** parameter is configured and used as a filter alarm.
6. This alarm is valid only if communication is lost to the zones (not necessarily a BACnet communication failure).

## Sequence of Manual Status Display Scrolling

Manual scrolling of each menu item is achieved by pressing the **YES** key repeatedly. The last menu item viewed remains on the display for 30 seconds before auto status display scrolling resumes. The temperature reading is automatically updated when scrolling is held.

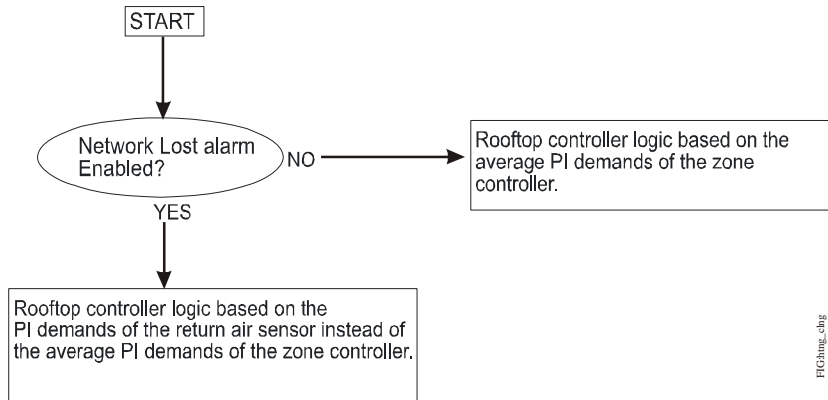
See Table 4 for the sequence of manual status display scrolling.

**Table 4: Sequence of Manual Status Display Scrolling**

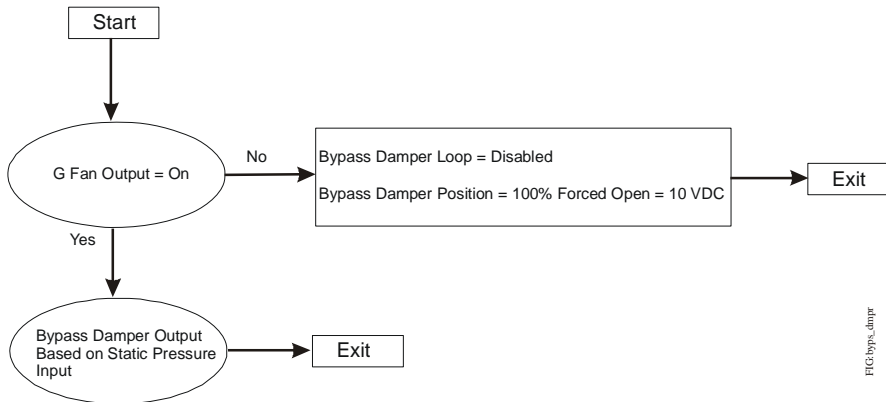
<b>Clock Status</b>	<b>System Mode</b>	<b>Schedule Status</b>	<b>Outdoor Temperature<sup>1</sup></b>	<b>Alarms (If Detected)</b>
Monday 12:00 A.M.	Sys Mode Off	Occupied	Outdoor xx.x °C or °F	Service <sup>2</sup>
	Sys Mode Auto	Unoccupied		DAS Alm <sup>3</sup>
		Override		SetClock <sup>4</sup>
				Filter <sup>5</sup>
				Comm Lost <sup>6</sup>
<b>Current Zone Sequence</b>	<b>Return Air Temperature</b>	<b>Discharge Air Temperature</b>	<b>Current Static Pressure</b>	
Zone Seq Off	RA Temp xx.x°F or °C	DA Temp xx.x°F or °C	Pressure x.x W.C. or Pa	
Zone Seq Cool				
Zone Seq				
Heat				
<b>Effective PI Heat Demand at the Rooftop Unit</b>	<b>Effective PI Cool Demand at the Rooftop Unit</b>	<b>Highest PI Heat Demand Zone Address</b>	<b>Highest PI Cool Demand Zone Address</b>	
Heat Out xxx%	Cool Out xxx%	Heat MAC xxx	Cool MAC xxx	

1. The outdoor temperature displays only if an outside air temperature sensor is installed. If an outside air temperature sensor is not installed, an ambiguous outdoor temperature displays on the zone controller indicating that no outside air temperature sensor is installed. If no outside air temperature sensor is installed, the auto status display scrolling skips past the outdoor temperature.
2. This alarm is valid only if the **DI1** parameter is configured and used as a service alarm.
3. This alarm is valid only if the **Dis HL** or **Dis LL** parameter is enabled.
4. This alarm is valid only if the power off clock time retention has expired.
5. This alarm is valid only if the **DI1** parameter is configured and used as a filter alarm.
6. This alarm is valid only if communication is lost to the zones (not necessarily a BACnet communication failure).

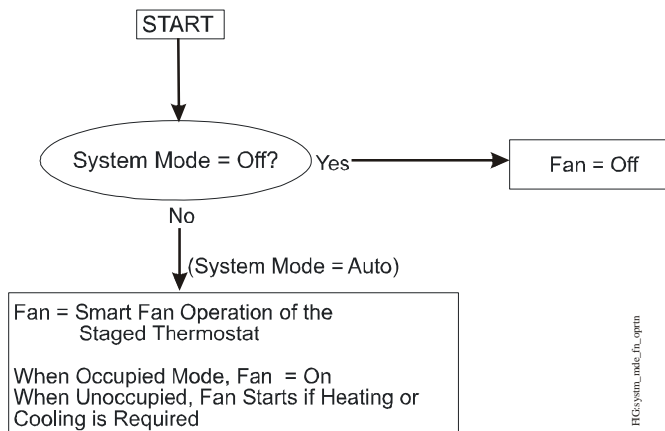
## Sequence of Operation



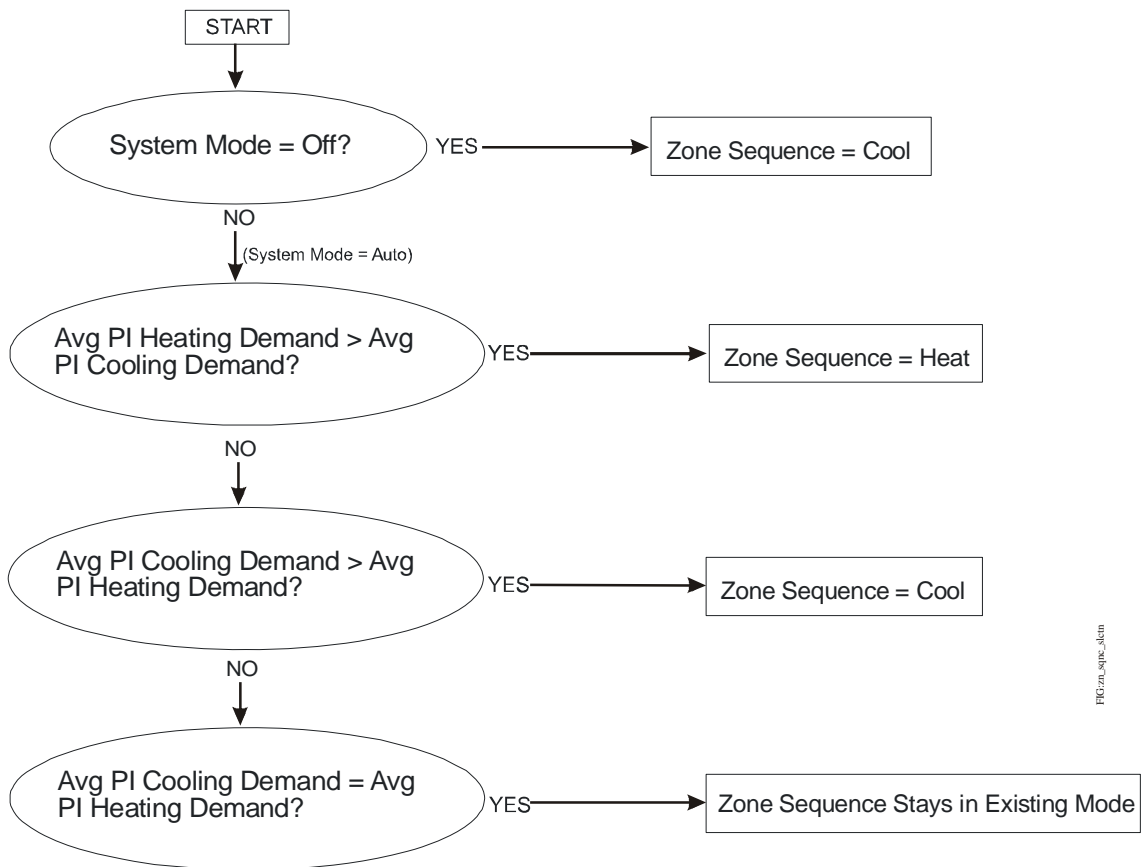
**Figure 20: Heating/Cooling Stages Handling**



**Figure 21: Bypass Damper Sequence**



**Figure 22: System Mode and Fan Operation**



**Figure 23: Zone Sequence Selection**

## Zoning Control System Components

Table 5: TEC Zoning Control System

Code Number	Description
TEC2647Z-2	Zone Controller for Proportional Zone Damper, On/Off, or Proportional Reheat Control
TEC2647Z-2+PIR	Zone Controller with Occupancy Sensor for Proportional Zone Damper, On/Off, or Proportional Reheat Control
TEC2664Z-2	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

### Accessories

All the accessories in Table 6 include mounting hardware; contact the nearest Johnson Controls representative to order any of these parts.

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

### Repair Information

If the TEC2664Z-2 Rooftop Controller fails to operate within its specifications, refer to the *TEC Zoning Control System for Stand-Alone and BACnet MS/TP Networked Applications Technical Bulletin (LIT-12011398)* for troubleshooting details. For a replacement rooftop controller, contact the nearest Johnson Controls representative.

Table 6: Accessories (Order Separately)

Code Number	Description
SEN-600-1	Remote Inside Air Temperature Sensor
TE-6361M-1 <sup>1</sup>	Duct Mount Air Temperature Sensor (Metal Enclosure)
TE-6363P-1 <sup>1, 2</sup>	Outside Air Temperature Sensor (Plastic Enclosure)
SEN-600-4	Remote Inside Air Temperature Sensor with Occupancy Override and LED
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
MS-BACEOL-0	RS485 End-of-Line Terminator

1. Additional TE-636xx-x Series 10k ohm Johnson Controls Type II Thermistor Sensors are available; refer to the *TE-6300 Series Temperature Sensors Product Bulletin (LIT-216320)* for more details.
2. 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**.



## Technical Specifications

### TEC2664Z-2 BACnet MS/TP Rooftop Controller for Stand-Alone and Networked Zoning Systems

<b>Power Requirements</b>		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)	
<b>Analog Output Rating</b>		0 to 10 VDC into 2k ohm Resistance (Minimum)	
<b>Auxiliary Output Rating</b>	<b>Triac Output</b>	19 to 30 VAC, 15 mA to 1 A Continuous Current, 3 A Peak In-Rush Current	
<b>Digital Input</b>		Voltage-Free Contact across Terminal C to Terminal DI1	
<b>Analog Inputs</b>		Resistive Inputs (RS, OS, and DS) for 10k ohm Johnson Controls Type II Negative Temperature Coefficient (NTC) Thermistor Sensors Static Pressure: 0 to 5 VDC for Full Static Pressure Range Selected	
<b>Temperature Sensor Type</b>		Local 10k ohm NTC Thermistor	
<b>Wire Size</b>		18 AWG (1.0 mm Diameter) Maximum, 22 AWG (0.6 mm Diameter) Recommended	
<b>TEC Zoning Control System Guidelines</b>		31 Zones Maximum per 1 Rooftop Controller	
<b>MS/TP Network Guidelines</b>		32 Devices Maximum; 4,000 ft (1,219 m) Maximum Cable Length	
<b>Temperature Range</b>	<b>Backlit Display</b>	-40.0°F/-40.0°C to 122.0°F/50.0°C in 0.5° Increments	
	<b>Heating Control</b>	40.0°F/4.5°C to 90.0°F/32.0°C	
	<b>Cooling Control</b>	54.0°F/12.0°C to 100.0°F/37.5°C	
<b>Accuracy</b>		±0.9°F/±0.5°C at 70.0°F/21.0°C Typical Calibrated	
<b>Minimum Deadband</b>		2°F/1°C between Heating and Cooling	
<b>Ambient Conditions</b>	<b>Operating</b>	32 to 122°F (0 to 50°C); 95% RH Maximum, Noncondensing	
	<b>Storage</b>	-22 to 122°F (-30 to 50°C); 95% RH Maximum, Noncondensing	
<b>Compliance</b>	<b>United States</b>	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	
		<b>Canada</b>	UL Listed, File E27734, CCN XAPX7 Under CAN/CSA C22.2 No. 24, Temperature Indicating and Regulating Equipment Industry Canada, ICES-003
			<b>Europe</b>
	<b>Australia and New Zealand</b>	C-Tick Mark, AS/NZS CISPR 22 Compliant Supplier Code Number N10696	
	<b>Shipping Weight</b>		0.75 lb (0.34 kg)

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



**Building Efficiency**

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