

# YCCS Universal Rooftop Unit (RTU) Controller

YK-PEC1001-0. YK-PEC1002-0

## Installation Instructions

### Applications

The RTU controllers are application specific digital controllers that communicate to a York Commercial Comfort System (YCCS) System Manager (SM) or Zone Coordinator (ZC). The controllers feature preconfigured applications for constant volume single zone and constant volume change-over bypass rooftop units manufactured by other Heating, Ventilating, and Air Conditioning (HVAC) zoning application suppliers.

The YK-PEC100x-0 controller is a member of the YCCS equipment controller family.

The RTU controller consists of two models. The Change-Over Bypass (COBP) controller, YK-PEC1002-0, is configured to control the unit based on discharge air temperature in constant volume zoning systems. The Single Zone (SZ) controller, YK-PEC1001-0, is configured to control the unit based on zone temperature in constant volume single zone systems.

### 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

#### Materials and Special Tools Needed

- Three fasteners appropriate for the mounting surface (#8 screws or M4 screws)
- Small straight head screwdriver to secure communication wires in the terminal blocks

### Accessories

Table 1 lists the RTU controller accessories.

**Table 1: RTU Controller Accessories**

Product Code Number	Description
TE-68NT-0NN0S	Zone temperature sensor, 1k ohm, nickel with temporary occupancy button
TE-68NT-1NN0S	Zone temperature sensor, 1k ohm, nickel with Warmer/Cooler (W/C) adjust and temporary occupancy push button
TE-631GM-1	Duct mount 1,000 ohm nickel temperature sensor
TE-6313P-1	Outdoor mount 1,000 ohm nickel temperature sensor
CSD-CA1G0-1	Current switch, split core, 0.15 adj switch setpoint 1.25A-200 A range
P32AC-2C	Pressure switch, differential, Single-Pole, Double-Throw (SPDT), 0.05 to 5 in. w.c.

## Mounting

Follow these guidelines when mounting an RTU controller:

- Do not mount the RTU controller on surfaces that are prone to vibration, such as duct work, or in areas where electromagnetic emissions from other devices or wiring can interfere with RTU controller communication
- Mount the RTU controller in areas free of corrosive vapors and observe the environmental limitations listed in the *Technical Specifications* section.
- Mount the RTU controller in a convenient location using the predrilled mounting holes. The controller must be mounted vertically on a wall or panel where it can be easily wired through the enclosure cover.

To mount the RTU controller:

1. Place the RTU in the proper mounting position so the wiring connections are easily accessible.
2. Attach the RTU controller to the mounting surface using a small straight head screwdriver and mounting screws.

**Note:** Overtightening can strip the screw threads. Make sure screws do not interfere with wiring or access.

**Note:** The required application for the RTU controllers are factory configured and ready for operation.

## Wiring

### Field Wiring Connections

The following connections are required for the RTU Controller:

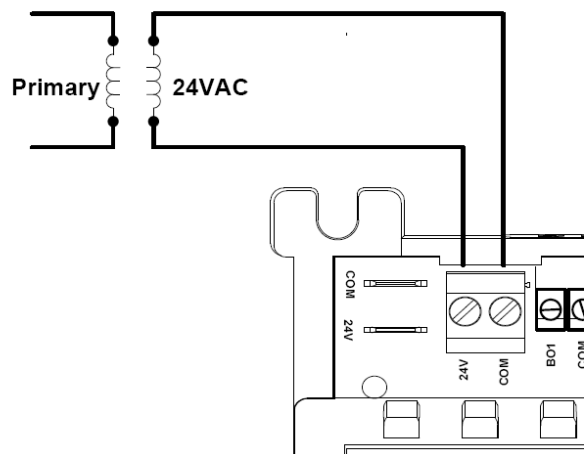
1. The communication bus connection and address selection are required for networking with a YCCS Building Automation System (BAS), with or without a zone temperature sensor.
2. A zone temperature sensor is required for the single zone units. Two models are supported: TE-68NT-1NN0S (sensor with Warmer/Cooler adjust) and TE-68NT-0NN0S (sensor only). See Figure 4 and Figure 5.

3. A discharge temperature sensor is required for change over bypass units. Connect the discharge temperature sensor to AI-6.
4. A proof-of-flow sensor is required for unit status. A differential pressure switch or current sensing device is acceptable as long as they provide a dry set of contacts. The switch contacts connect to BI-2.
5. Output connections to the unit fan input (G terminal), cooling terminals (Y1, Y2 terminals), and heating terminals (W1, W2 terminals).

### Power Wiring

To wire the RTU controller for power, connect the 24 VAC supply power wires from the transformer to the power terminal (Figure 1). Follow the transformer manufacturer's instructions or the project installation drawings.

**IMPORTANT:** The 24 VAC power should not be shared with other network devices. Sharing power with other network devices may cause noise, interference, and ground loop problems. You may damage the controller by sharing power with other devices.



**Figure 1: 24 VAC Power Supply Wiring**

## Wire Gauges and Lengths

Table 2 outlines the RTU controller wiring details.

**Table 2: YCCS RTU Controller Wiring (Part 1 of 2)**

Terminal	Terminal Labels	Function and Electrical Ratings/ Requirements	Recommended Cable Type and Length
<b>Analog Input</b>	AI-1 AI Com	Provides analog input connection for zone temperature sensor - 1,000 ohm Ni element	0.6 mm (22 AWG) stranded, 2-wire twisted cable recommended for runs of <30 m (99 ft)
	AI-2 AI Com	Provides analog input connection for zone temperature setpoint (optional), 1,500 ohm potentiometer	0.6 mm (22 AWG) stranded, 2-wire twisted cable recommended for runs of <30 m (99 ft)
	AI-3 AI Com	Not Available	Not Available
	A1-4 AI Com	Provides analog input connection for relative humidity sensor - 0 to 10 VDC input, 0 to 100% output	0.6 mm (22 AWG) stranded, 3-wire twisted cable recommended for runs of <30 m (99 ft)
	A1-5 AI Com	Provides analog input connection for CO <sub>2</sub> sensor (optional) - 0 to 10 VDC input, 0 to 100% output	0.6 mm (22 AWG) stranded, 3-wire twisted cable recommended for runs of <30 m (99 ft)
	AI-6 AI Com	Provides analog input connection for discharge temperature sensor - 1,000 ohm Ni element	0.6 mm (22 AWG) stranded, 2-wire twisted cable recommended for runs of <30 m (99 ft)
	AI-7 AI Com	Provides analog input connection for return temperature sensor (optional) - 1,000 ohm Ni element	0.6 mm (22 AWG) stranded, 2-wire twisted cable recommended for runs of <30 m (99 ft)
	AI-8 AI Com	Provides analog input connection for outdoor temperature sensor (optional) - 1000 ohm Ni element	0.6 mm (22 AWG) stranded, 2-wire twisted cable recommended for runs of <30 m (99 ft)
<b>Binary Input</b>	BI-1 BI Com	Not Available	Not Available
	BI-2 BI Com	Provides binary input connection for fan status - dry contact input	0.6 mm (22 AWG) stranded, 2-wire twisted cable recommended for runs of <30 m (99 ft)
	BI-3 BI Com	Not Available	Not Available
	BI-4 BI Com	Not Available	Not Available

**Table 2: YCCS RTU Controller Wiring (Part 2 of 2)**

Terminal	Terminal Labels	Function and Electrical Ratings/ Requirements	Recommended Cable Type and Length
Binary Output	BO-1 BO Com	Provides binary output connection for fan enable - 24 VAC triac	1.5 mm <sup>2</sup> (18 AWG) stranded, 2-wire twisted cable recommended for runs of <30 m (99 ft)
	BO-2 BO Com	Provides binary output connection for cooling stage 1 enable - 24 VAC triac	1.5 mm <sup>2</sup> (18 AWG) stranded, 2-wire twisted cable recommended for runs of <30 m (99 ft)
	BO-3 BO Com	Provides binary output connection for cooling stage 2 enable - 24 VAC	1.5 mm <sup>2</sup> (18 AWG) stranded, 2-wire twisted cable recommended for runs of <30 m (99 ft)
	BO-4 BO Com	Provides binary output connection for heating stage 1 enable - 24 VAC triac	1.5 mm <sup>2</sup> (18 AWG) stranded, 2-wire twisted cable recommended for runs of <30 m (99 ft)
	BO-5 BO Com	Provides binary output connection for heating stage 2 enable - 24 VAC triac	1.5 mm <sup>2</sup> (18 AWG) stranded, 2-wire twisted cable recommended for runs of <30 m (99 ft)
	BO-6 BO Com	Not Available	Not Available
	BO-7 BO Com	Not Available	Not Available
Comm Bus Terminal Block	+ - Com	Provides communication network	1.5 mm <sup>2</sup> (18 AWG) stranded, 3-wire twisted shielded cable recommended for runs of 1,000 feet maximum
24 VAC Power	Hot	AC supply input supply 20-30 VAC (Nominal 24 VAC)	0.8 mm to 1.5 mm <sup>2</sup> (20 to 16 AWG) 2-wire
	Com	24 VAC power common	

## Setup and Adjustments

To quickly set up your YCCS network:

- On each end of the three-conductor cable, strip the outside insulation back approximately 2 inches. Tear off excess foil shield, leaving the bare drain wire and the three insulated conductors. On each end of the three insulated conductors in the cable, strip the insulation back approximately 1/8 to 1/4 inch. Pick a color pattern to follow and insert each of the three conductors into one each of the three terminals on the YCCS board communication connector. Tighten each terminal until the wire is secure (Figure 4). Ground the drain wire at one end only of the communication trunk. Do this on the last unit in line. Use an existing hole or drill a hole and insert a sheet metal screw in the back plate below the communication connector.
- Wrap the bare drain wire around the screw and tighten the screw (Figure 5). This is the only location where the shield is grounded.
- Daisy chain the three-conductor wire between the remaining RTU controllers. Connect the drain wires with the wire nuts. Follow the stripping and connecting procedure in Step 1.
- Run the cable from the last unit to the location of the SM or ZC. Follow the connection instructions for the SM or ZC. Figure 5 shows a typical communication riser.
- Make sure all the RTU controllers are powered and operating properly.

**Note:** Ensure you observe polarity with each of the conductors in the communication cable.

## Communication Bus

### Determining the Bus Address

The bus address switch sets a unique address for this controller on the YCCS communication bus. The default address setting is 255 (all ON). You must change the default address.

Set consecutive Addresses 18 through 41 for RTU controllers on the YCCS System Communication Bus. Use sequential addressing with no gaps in the device address range to ensure best bus performance. Set address 4 for change-over bypass single package unit controllers on the YCCS Zone Communication Bus. Figure 2 and Figure 3 show RTU controller address switch settings.



Figure 2: Address Switch Settings for YK-PEC1001-0 Units Connected to System Manager

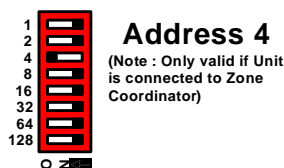


Figure 3: Address Switch Setting for YK-PEC1002-0 Connected to the Zone Coordinator

**Table 3: YCCS RTU Controller Bus Address Summary**

Address	Description
4	Change-over bypass RTU controller (YK-PEC1002-0) on Zone Communication Bus
18-41	Single zone RTU controller (YK-PEC1001-0) on System Communication Bus

**Operation*****Change-Over Bypass Rooftop Unit Controller (YK-PEC1002-0)***

Table 4 details the change-over bypass RTU controller operating modes.

***Change-Over Bypass Rooftop Unit Controller (YK-PEC1001-0)***

Table 5 details the single zone RTU controller operating modes.

**Table 4: Change-over Bypass RTU Controller Operating Modes (YK-PEC1002-0)**

Mode	Description
<b>Off</b>	Allows you to turn off the RTU controller by: <b>Instant Shutdown:</b> Performs an instant shutdown on all Heating and Cooling stages and the Fan when the Instant Shutdown input is set to Shutdown. Minimum YCCS On times are ignored. <b>Control Mode:</b> Performs a Shutdown on all Heating and Cooling stages and the Fan when the Control Mode input is Off. Minimum On times are not ignored.
<b>Occupied</b>	Runs the supply fan continuously when the unit is Occupied. The Zone Coordinator determines if the system requires Heating or Cooling (based on zone votes) and passes this information to the RTU. Based on this determination, the unit controls the Discharge Air Temperature to either the Discharge Air Heating Setpoint or the Discharge Air Cooling Setpoint. If the Discharge Air Temperature rises above the Discharge Air Cooling Setpoint, the first stage (Y1) of cooling is energized. A further rise in Discharge Air Temperature brings on an additional cooling stage (Y2), if equipped. Cooling stages operate with minimum OFF and ON times. As the Discharge Air Temperature falls below the Discharge Air Cooling Setpoint, stages of cooling de-energize in reverse order. If the Discharge Air Temperature drops below the Discharge Air Heating Setpoint, the first stage (W1) of heating is energized. A further drop in Discharge Air Temperature brings on an additional heating stage (W2), if equipped. Heating stages operate with minimum OFF and ON times. As the Discharge Air Temperature moves above the Discharge Air Heating Setpoint, stages of heating de-energize in reverse order.
<b>Unoccupied</b>	Mimics the Occupied operating mode except the Fan does not run unless there is a call for Heating or Cooling.
<b>Balancer Mode</b>	Runs the supply fan with no heating or cooling when in the balancer mode regardless of occupancy.

**Table 5: Single Zone RTU Controller Operating Modes (YK-PEC1001-0)**

Mode	Description
<b>Off</b>	Allows you to turn off the RTU controller by: <b>Instant Shutdown:</b> Performs an instant shutdown on all Heating and Cooling stages and the Fan when the Instant Shutdown input is set to Shutdown. Minimum On times are ignored. <b>Control Mode:</b> Performs a Shutdown on all Heating and Cooling stages and the Fan when the Control Mode input is Off. Minimum YCCS On times are not ignored.
<b>Occupied</b>	Runs the supply fan continuously for: <b>Cooling:</b> When the Zone temperature is below the Occupied Cooling setpoint, all cooling is off. As the zone temperature rises above the Occupied Cooling setpoint, the first stage of cooling (Y1) is energized. A further rise in zone temperature brings on additional cooling stage (Y2), if equipped. Cooling Stages operate with minimum OFF and ON times. As the zone temperature falls below the Occupied Cooling setpoint, stages of cooling de-energize in reverse order. <b>Heating:</b> When the Zone temperature is above the Occupied Heating setpoint, all heating is off. As the zone temperature drops below the Occupied Heating setpoint, the first stage of heating (W1) is energized. A further drop in zone temperature brings on an additional heating stage (W2), if equipped. Heating Stages operate with minimum OFF and ON times. As the zone temperature rises above the Occupied Heating setpoint, stages of heating de-energize in reverse order.
<b>Unoccupied</b>	Unoccupied operation is identical to Occupied except the unit controls to the Unoccupied Heating and Cooling setpoints. The Fan does not run unless there is a call for Heating or Cooling.

## Troubleshooting

Table 6 helps you troubleshoot potential RTU controller issues.

**Table 6: Status LEDs**

Name	Color	Normal	Description
<b>Power/PWR</b>	Green	On Steady	Off Steady: No Power On Steady: Power is supplied by Primary Voltage

Use the following information to troubleshoot the YK-PEC1001-0 and YK-PEC1002-0 controllers.

### Communication Problems

Several factors may influence the behavior of the Communication bus. In addition, certain problems can affect the bus in multiple ways and have multiple symptoms, which makes the exact diagnosis difficult. Duplicate addresses on the bus can degrade performance, make the device go offline, or stop communication completely, for example.

### Incomplete Address

The single zone RTU controller must have the address switch set to a range between 18 - 41. The Change-over Bypass RTU Controller must have the address switch set to 4. Other settings prevent the RTU controllers from communicating on the network.

### Duplicate Addresses

Two or more devices on a communication bus cannot have the same address. Two RTU controllers on the Zone Communication bus cannot both have an address of 18, for example. If two devices on the same bus have the same address, performance can degrade or serious communication problems may occur. This includes the devices not coming online and all communication stopping completely.

Check for duplicate addresses in the following ways, depending on the severity of the situation:

- If the bus performance is degraded, check the address switch settings at the devices with unreliable communications.
- If the bus communication problems are severe and no communication is present, or you cannot determine where communication is unreliable, partition (disconnect and isolate a portion of the bus for testing purposes) and test the bus portion connected to the System Manager or Zone Coordinator.

### **Correcting Physical Communication Bus Problems**

The communication bus is subject to a number of physical factors that can affect performance. Consider the following list of common physical attributes:

- Check wires
- Verify proper wire gauge, connections, polarity, and lengths
- Look for opens and shorts
- Check terminations
- Check addresses
- Check for duplicate addresses

- Verify the address range is sequential
- Check for and eliminate T-Taps (wire configurations that create a T shape) and star configurations.
- Check for sources of interference
- Verify power at the controller

### **Repair Information**

If the RTU controllers fail to operate within their specifications, replace the units. For replacement controllers, contact the nearest Source 1 representative at 1-800-536-6112.

Figure 4 shows the RTU controller board terminations.

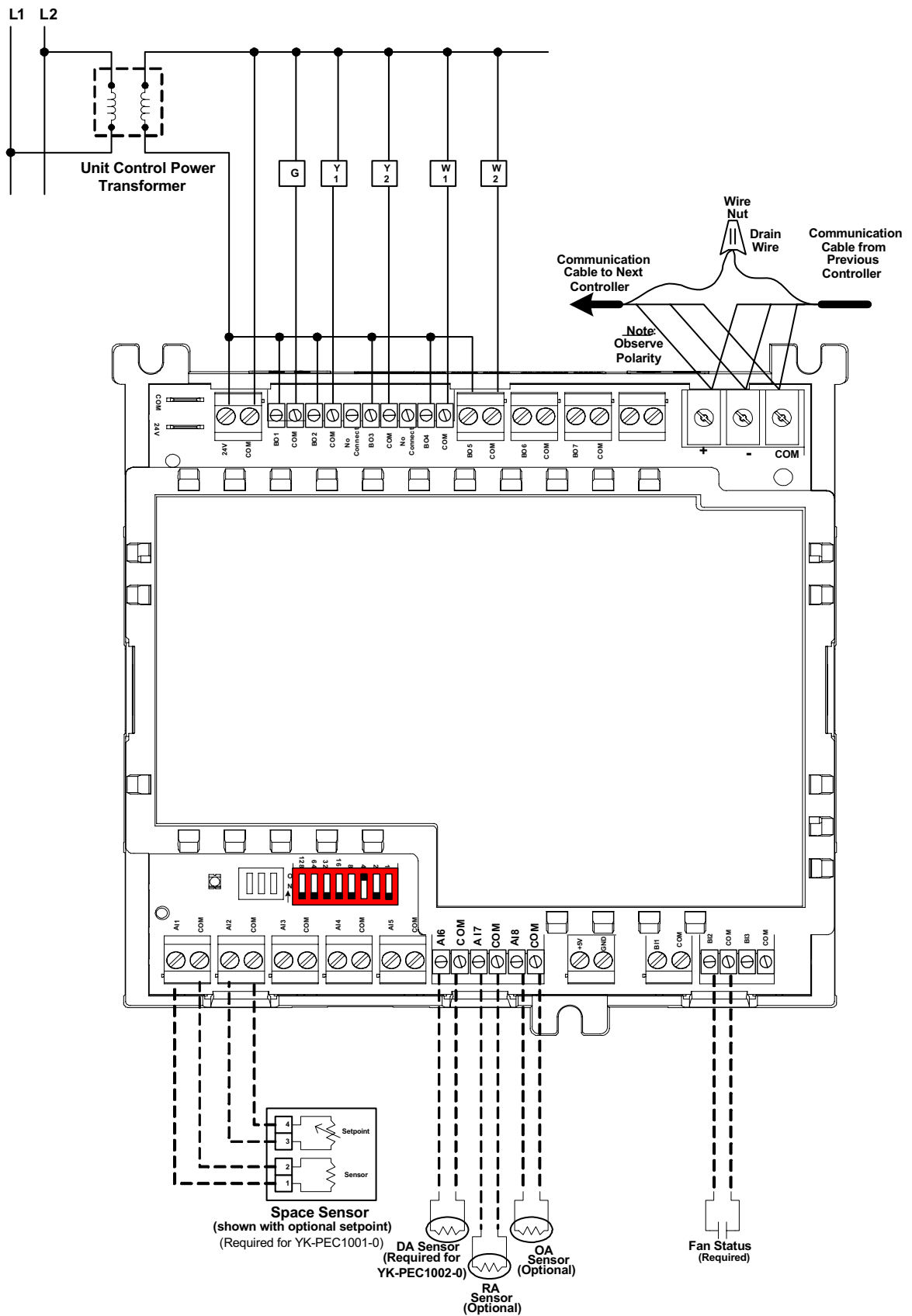


Figure 4: RTU Controller Board Terminations

Figure 5 shows the back communication riser.

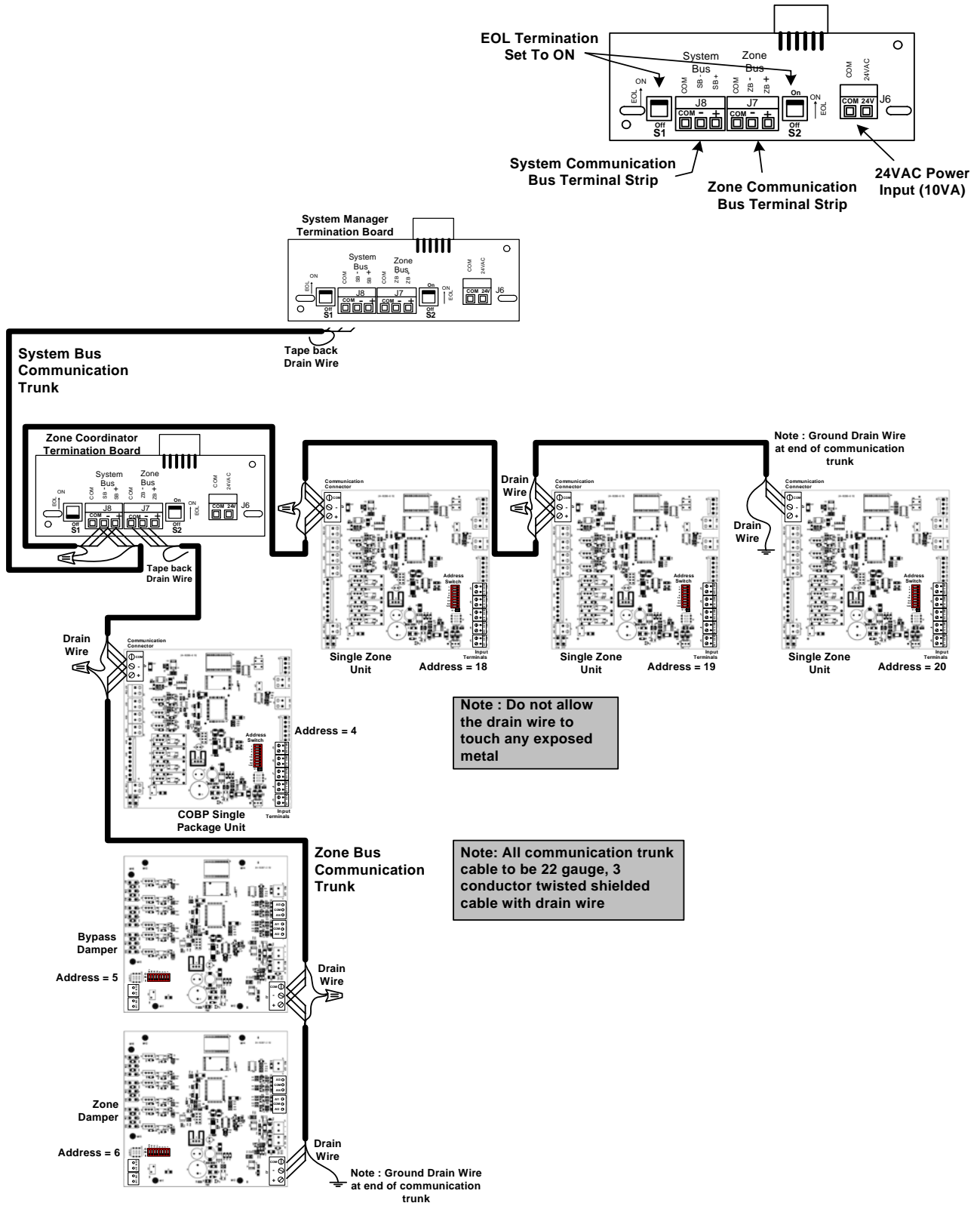


Figure 5: RTU Controller - Typical System Communication Riser

Use the following table to record mapping locations used to build your York Commercial Comfort System (YCCS).

**Table 7: YCCS Zones**

Address	Description	Location/Name	Model Number	Serial Number
1	Reserved	Not Available	Not Available	Not Available
2	Reserved	Not Available	Not Available	Not Available
3	Reserved	Not Available	Not Available	Not Available
4 <sup>1</sup>				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
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32				
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37				
38				
39				
40				
41				

1. Address 4 is valid for a Change-over bypass system single package unit only.

## Technical Specifications

### YCCS RTU Controller

<b>Product Code Number</b>	York Commercial Comfort System (YCCS): Single Zone Rooftop Unit (RTU) Controller: YK-PEC1001-0 Change-over Bypass Rooftop Unit (RTU) Controller: YK-PEC1002-0
<b>Power Supply Requirement</b>	20 - 30 VAC @ 50 to 60 Hz, Class 2 power supply or Safety Extra-Low Voltage (SELV) at 50/60 Hz (20 VAC minimum)
<b>Power Consumption</b>	3 VA (not including external load)
<b>Ambient Conditions</b>	Ambient Operating Conditions: -40 to 70°C (-40 to 158°F); 10 to 90% RH condensing Ambient Storage Conditions: -40 to 85°C (-40 to 185°F); 10 to 90% RH
<b>Processor</b>	20 MHz Renesas H8S2398 processor
<b>Memory</b>	1 MB Flash nonvolatile memory for operating system, configuration data, and operations data storage and backup 512 k Synchronous Random Access Memory (SRAM) for operations data dynamic memory
<b>Housing</b>	Plastic housing material: ABS + polycarbonate UL94-5VB Protection: IP20 (IEC 60529)
<b>Mounting</b>	On a flat surface with screws
<b>Dimensions (Height x Width x Depth)</b>	250 x 190 x 60 mm (9.8 x 7.5 x 2.4 in.)
<b>Shipping Weight</b>	approximately 0.7 lb
<b>Compliance</b>	<b>United States</b> UL Listed, File E107041, CCN PAZX, UL 916 FCC Compliant to CFR47, Part 15, Subpart B, Class A <b>Canada</b> UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada Compliant, ICES-003 <b>Europe</b> CE Mark, EMC Directive 89/336/EEC, in accordance with EN 61000-6-4 (2001) Generic Emission Standard for Heavy Industrial and EN 61000-6-2 (2001) Generic Immunity Standard for Heavy Industrial Environment <b>Australia and New Zealand</b> C-Tick Mark, Australia/NZ Emissions Compliant