

YCCS Rooftop Unit Controller (RTU)

LC-RTU100x-0

Installation Instructions

Applications

The LC-RTU100x-0 controller is a member of the York Commercial Comfort System (YCCS) equipment controller family. The controller is designed to run a pre-engineered Heating, Ventilating, and Air Conditioning (HVAC) zoning application and provide the inputs/outputs required for this application.

The LC-RTU100x-0 controller consists of two models. The Change-Over Bypass (COBP) controller, LC-RTU1002-0 (Source 1 Part# S1-03109191000), is configured to control the unit based on discharge air temperature in constant volume zoning systems. The Single Zone (SZ) controller, LC-RTU1001-0 (Source 1 Part# S1-03109190000), is configured to control the unit based on zone temperature in 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

- Wire Strippers

- Phillips head screwdriver
- Small straight head screwdriver
- 22 gauge 3 conductor twisted shielded wire with a drain wire, electricians tape, and wire nuts for 22 gauge drain wire.

Note: This drain wire is only used to group the shielded cable. Do not use this drain wire as a connection to the board.

Factory Mounting and Wiring

The manufacturing facility mounts the controller. All the required power wiring, internal unit sensor wiring, and output wiring is completed and tested at the factory. The control application required for the specific single packaged unit is factory configured and ready for operation.

Field Wiring Connections

In addition to the high voltage connections, the YCCS RTU requires the following connections:

1. The communication bus connection and address selection are required for networking with a YCCS Building Automation System (BAS).
2. A zone temperature sensor is required for single zone units. Two models are supported: TE-68NT-1NN0S (sensor with warmer/cooler adjust) and TE-68NT-0NN0S (sensor only).

Accessories

Table 1 lists the RTU controller accessories.

Table 1: RTU Controller Accessories

Product Code Number	Description
TE-68NT-0NN0S	Wall Temperature Sensor, 1 k ohm, Nickel with Temperature Occupancy Button
TE-68NT-1NN0S	Wall Temperature Sensor, 1 k ohm, Nickel with Warmer/Cooler Temperature Adjust and Temporary Occupancy Button

Wiring

Power Wiring

The YCCS RTU controller is factory wired for 24 VAC power. The controller does not require an earth ground connection.

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

Wire Gauges and Lengths

Table 2 outlines the 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
Analog Input	AI-1 AI Com	Provides analog input connection for space temperature	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 space 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
	AI-4 AI Com	Provides analog input connection for relative humidity (optional) - 0 to 10 VDC input	0.6 mm (22 AWG) stranded, 3-wire twisted cable recommended for runs of < 30 m (99 ft)
	AI-5 AI Com	Provides analog input connection for CO2 sensor (optional) - 0 to 10 VDC input	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 - 10 K ohm Type 3 thermistor	Factory Wired
	AI-7 AI Com	Provides analog input connection for return temperature sensor - 10 K ohm Type 3 thermistor	Factory Wired
	AI-8 AI Com	Provides analog input connection for outdoor temperature sensor - 10 K ohm Type 3 thermistor	Factory Wired
Binary Input	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)

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 1st stage electric heat	Factory Wired
	BO-2 BO Com	Provides binary output connection for 2nd stage electric heat	Factory Wired
	BO-3 BO Com	Provides binary output connection for occupancy command	Factory Wired
	BO-4 BO Com	Provides binary output connection for 1st stage cooling	Factory Wired
Comm Bus Terminal Block	+ - Com	Provides communication network	0.6 mm (22 AWG) stranded, 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 ² (20 to 16 AWG) 2-wire
	Com	24 VAC power common	

Setup and Adjustments

To quickly set up your YCCS network:

1. 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 inches.

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 2). 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. **This is the only location where the shield is grounded.**

2. Daisy chain the three-conductor wire between the remaining Rooftop Units. Connect the drain wires together with the wire nuts (Figure 2). Follow the stripping and connecting procedure in Step 1.

3. Run the cable from the last unit to the location of the System Manager (SM) or Zone Coordinator (ZC). Follow the connection instructions for the SM or ZC. Figure 5 displays a typical communication riser.
4. Make sure all the Rooftop Units are powered and operating properly (Figure 1).

Note: Ensure you observe polarity of 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 18-41 for Single Zone RTU controllers on the YCCS system bus. Use sequential addressing with no gaps in the device address range to ensure best bus performance. Set address 4 for change over bypass RTU controllers on the YCCS Zone Bus. Table 3, Figure 3, and Figure 4 show RTU controller address switch settings.

Table 3: RTU Controller Bus Address Summary

Address	Description
4	COBP RTU controller (LC-RTU1002-0) on Zone Bus
18-41	Single Zone RTU controller (LC-RTU1001-0) on System Bus

Operation

The YCCS RTU controllers are supplied in a pre-configured format where different operating sequences are obtained by selecting the part number (for example, selecting LC-RTU1001-0 for single zone application or LC-RTU1002-0 for change-over bypass applications). You do not need to configure the controller.

Table 4: Change-Over Bypass Application Operating Modes

Mode	Description
Off	You can turn the unit off in two different ways: Instant Shutdown: the application performs an Instant shutdown on all heating or cooling stages and the fan when the input is set to Shutdown. Minimum On times are ignored in this mode. Control Mode: the application performs a shutdown on all heating and cooling stages and the fan when the Control Mode input is Off. Minimum On times are observed in this mode.
Occupied	When the unit is occupied, the supply fan runs continuously. The Zone Coordinator (ZC) determines if the system requires Heating or Cooling (based on zone votes) and passes this information to the rooftop. Based on this determination, the unit controls the Discharge Air Temperature (DAT) 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 DAT brings on additional cooling stages (Y2-Y4), if equipped. Cooling stages operate with minimum OFF and ON times. As the DAT falls below the Discharge Air Cooling setpoint, the stages of cooling de-energize in reverse order. If the DAT drops below the Discharge Air Heating setpoint, the first stage (W1) of heating energizes. A further drop in DAT brings on additional heating stages (W2-W3), if equipped. Heating stages operate with minimum OFF and ON times. As the DAT rises above the Discharge Air Heating setpoint, stages of Heating de-energize in reverse order.
Unoccupied	Operation is identical to Occupied mode, except the fan does not run unless there is a call for Heating or Cooling.
Balancer	When the system is in Balancer Mode, the Supply Fan runs regardless of Occupancy.

Table 5: Single Zone Application Operating Modes

Mode	Description
Off	You can turn the unit off in two different ways: Instant Shutdown: the application performs an Instant shutdown on all heating or cooling stages and the fan when the Instant Shutdown input is set to Shutdown. Minimum On times are ignored in this mode. Control Mode: the application performs a shutdown on all heating and cooling stages and the fan when the Control Mode input is Off. Minimum On times are observed in this mode.
Occupied	When the unit is Occupied, the Supply Fan runs continuously. Cooling: When the zone temperature is below the Occupied Cooling setpoint, all cooling is off. As zone temperatures rise above the Occupied Cooling setpoint, cooling is energized, the first stage (Y1) of cooling is energized. A further rise in zone temperature brings on additional cooling stages (Y2-Y4), 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. Heating: When zone temperature is above the Occupied Heating setpoint, all heating is off. As zone temperature drops below the Occupied Heating setpoint, heating is energized, the first stage (W1) of Heating is energized. A further drop in zone temperature brings on additional heating stages (W2-W3), 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.
Unoccupied	Operation is identical to Occupied mode, 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.
Balancer	When the system is in Balancer Mode, the Supply Fan runs regardless of Occupancy.

Troubleshooting

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. For example, duplicate addresses on the bus can degrade performance, make the device go offline, or stop communication completely.

Incomplete Address

LC-RTU1001 Single Zone RTU controller must have the address switch set to a range between 18 - 41 on the System Communication bus. LC-RTU1002 Change-over Bypass RTU controller must have the address switch set to 4 on the Zone Communication bus. Other settings prevent the RTU from communicating on the System Communication bus.

Duplicate Addresses

Two or more devices on a communication bus cannot have the same address. For example, two RTUs on the System Communication bus cannot both have the address 18. 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 if 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 SM and ZC controllers.

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

Table 6 list the RTU controller Status LED information.

Table 6: RTU Controller Bus Address Summary

Name	Color	Normal	Descriptions
Power (PWR)	Green	On Steady	Off Steady = No Power On Steady = Power is supplied by Primary Voltage

Repair Information

If the RTU controller fails to operate within its specifications, replace the unit. For a replacement controller, contact the nearest Source 1 representative.

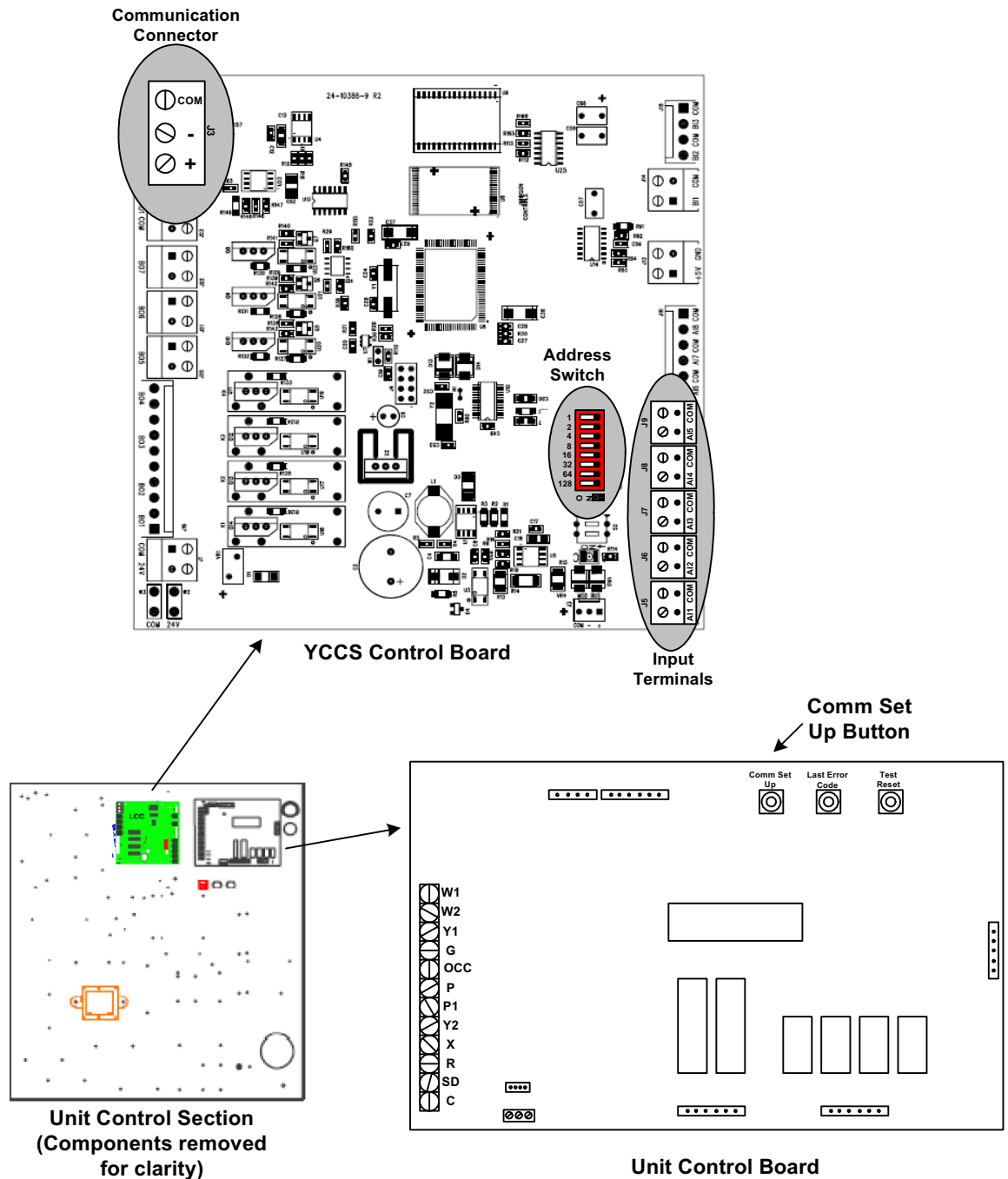


Figure 1: Unit Control Section Components

Figure 2 shows the RTU controller board field terminations.

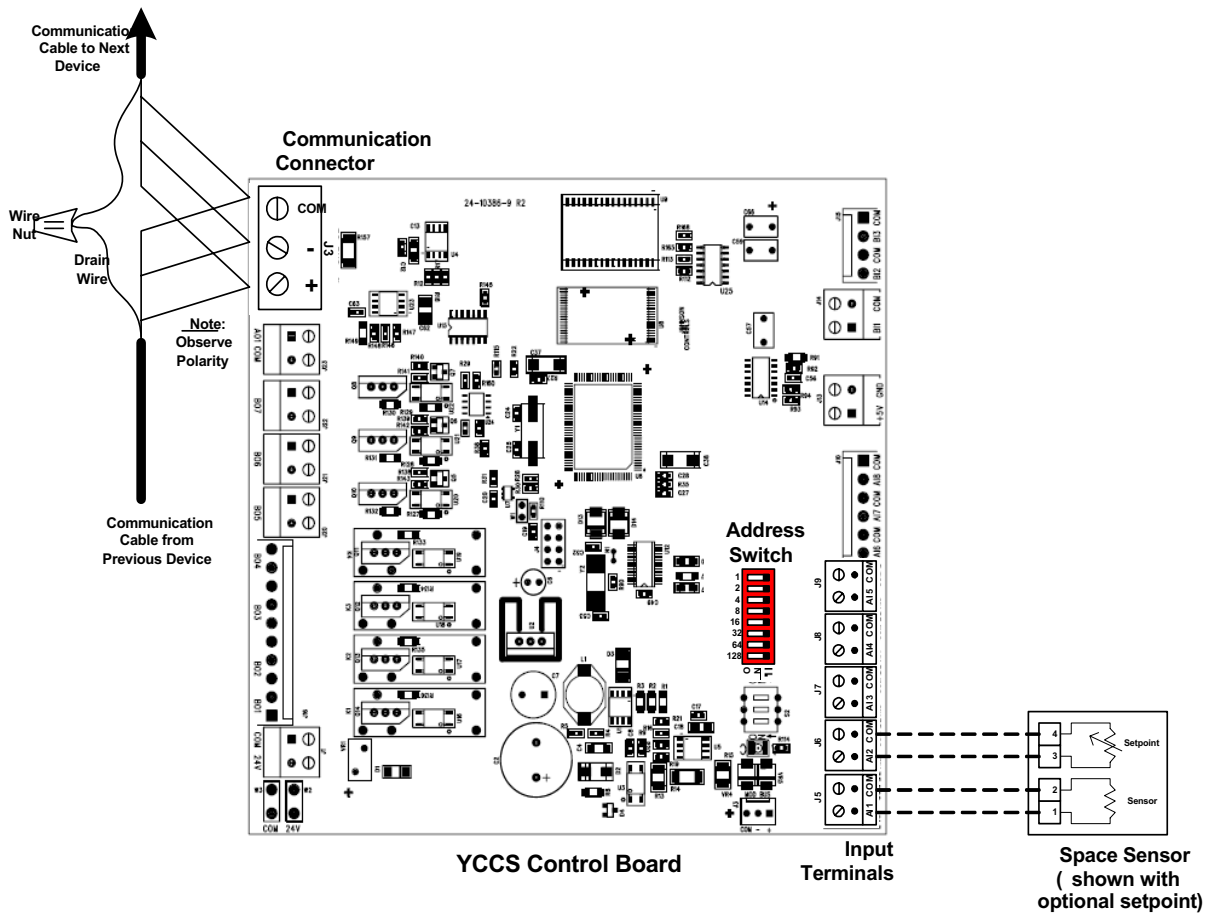


Figure 2: YCCS Control Board Field Terminations

Figure 3 shows the RTU address switches for the System Manager. Figure 4 shows the RTU address switches for the Zone Coordinator.

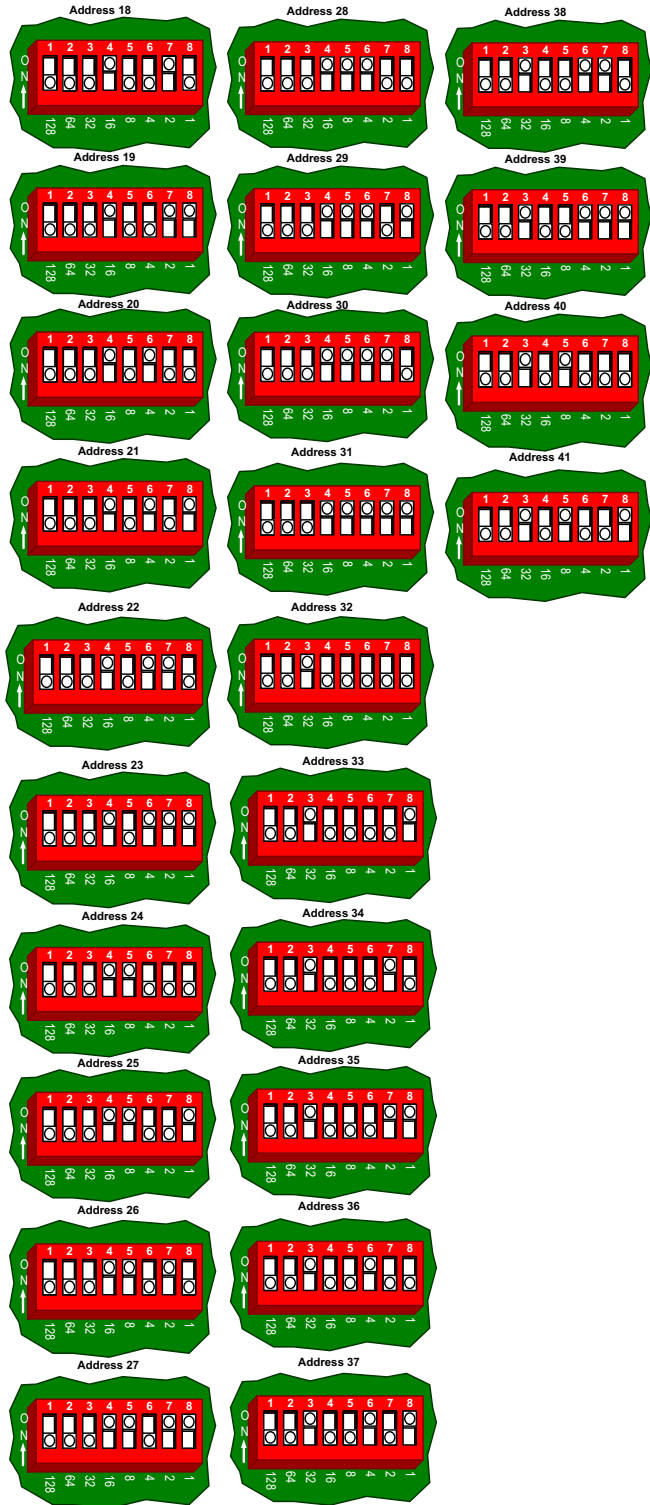


Figure 3: Address Switch Settings for Units Connected to System Manager

Address 4

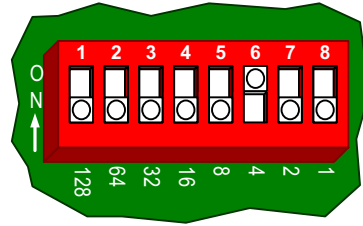


Figure 4: Address Switch Settings for Units Connected to Zone Coordinator

Figure 5 shows the RTU controller communication riser.

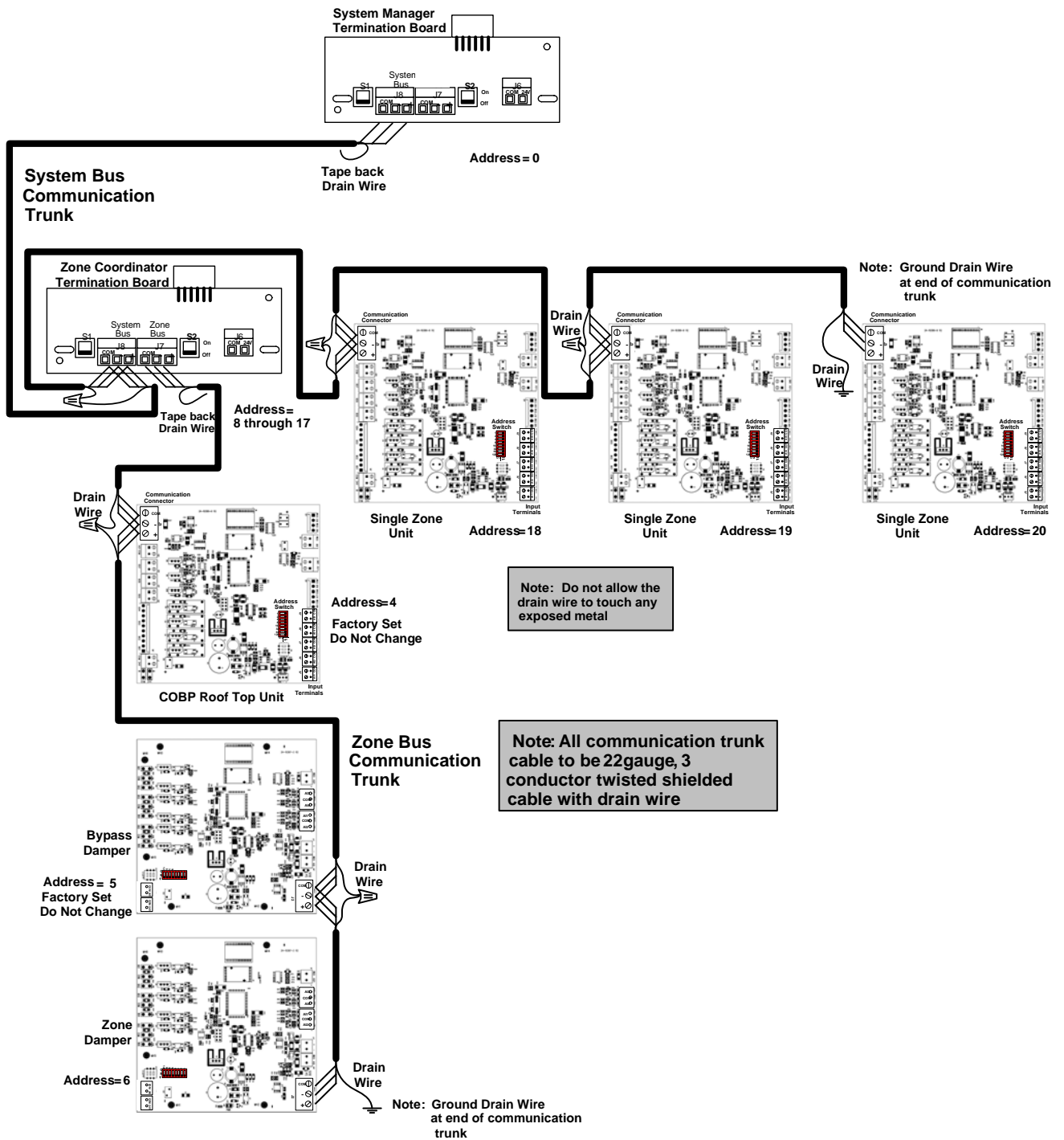


Figure 5: RTU Controller - Typical System Communication Riser

Technical Specifications

YCCS RTU Controller

Product Code Number	York Commercial Comfort System (YCCS): Single Zone single packaged Unit Controller: LC-RTU1001-0 Changeover Bypass single packaged unit controller: LC-RTU1002-0
Power Supply Requirement	20- 30 VAC @ 50 to 60 Hz, Class 2 power supply or Safety Extra Low Voltage (SEV) at 50/60 Hz (20 VAC minimum)
Power Consumption	3 VA (not including external load)
Ambient Conditions	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
Processor	20 MHz Renesas H8S2398 processor
Memory	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
Housing	Plastic housing material: ABS + polycarbonate UL94-5VB Protection: IP20 (IEC 60529)
Mounting	On a flat surface with screws
Dimensions (Height x Width x Depth)	140 x 140 x 25 mm (5.5 x 5.5 x 1.0 in.)
Shipping Weight	approximately 0.3 lb
Compliance	United States UL Listed, File E107041, CCN PAZX, UL 916 FCC Compliant to CFR47, Part 15, Subpart B, Class A Canada UL Listed, File E107041, CCN PAZX7, CAN/CSA C22.2 No. 205, Signal Equipment Industry Canada Compliant, ICES-003 European Union 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 Australia and New Zealand C-Tick Mark, Australia/NZ Emissions Compliant