PCA2513 Advanced Application Programmable Controller Installation Instructions

Application

The PCA2513 Controller run pre-engineered and user-programmed applications and provides the inputs and outputs required to monitor and control a wide variety of HVAC and other facility equipment.

PCA controllers operate on an RS-485 BACnet® MS/TP Bus as BACnet Application Specific Controllers (B-AACs) and integrate into Johnson Controls and third-party BACnet systems.

Communications protocols

The PCA2513 controller can communicate using BACnet MS/TP or N2. By default, the PCA2513 controller communicates using the standard BACnet MS/TP protocol based on the ANSI/ASHRAE 135-2012. The BACnet protocol is a standard for ANSI, ASHRAE, and the International Standards Organization (ISO) for building controls.

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 may cause harmful interference, in which case the users will be required to correct the interference at their 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

Observe the following guidelines when installing a PCA controller:

- To minimize vibration and shock damage, transport the controller in the original container.
- Verify that all parts shipped with the controller.
- Do not drop the controller or subject it to physical shock.test

Parts included

- One PCA controller with removable terminal blocks (Power, SA bus, and FC bus are removable)

Part No. 24-10143-1167 Rev B

2019-03-22

- One installation instructions sheet

Materials and special tools needed

- Three fasteners appropriate for the mounting surface (M4 screws or #8 screws)
- One 20 cm (8 in.) or longer piece of 35 mm DIN rail and appropriate hardware for DIN rail mount (only)
- Small straight-blade screwdriver for securing wires in the terminal blocks

Mounting

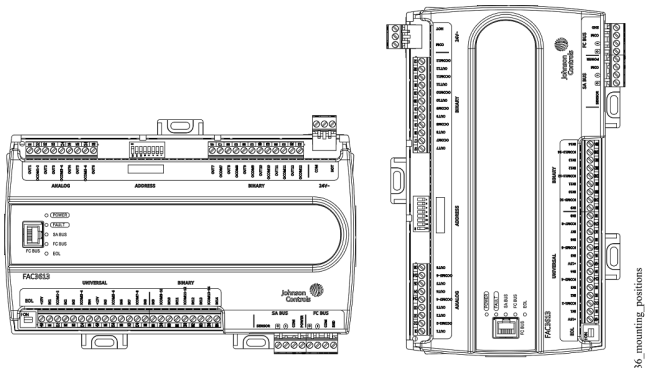
Observe the following guidelines when mounting a PCA controller:

- Ensure the mounting surface can support the controller, DIN rail, and any user-supplied enclosure.
- Mount the controller horizontally on 35 mm DIN rail whenever possible.
- Mount the controller in the proper mounting position (Figure 1).
- Mount the controller on a hard, even surface whenever possible in wall-mount applications.
- Use shims or washers to mount the controller securely and evenly on the mounting surface.
- Mount the controller in an area free of corrosive vapors and observe the Ambient Conditions requirements in Technical specifications.
- Provide for sufficient space around the controller for cable and wire connections for easy cover removal and good ventilation through the controller (50 mm [2 in.] minimum on the top, bottom, and front of the controller).
- Do not mount the controller on surfaces prone to vibration, such as duct work.
- Do not mount the controller in areas where electromagnetic emissions from other devices or wiring can interfere with controller communication.

Observe these additional guidelines when mounting a PCA controller in a panel or enclosure:

- Mount the controller so that the enclosure walls do not obstruct cover removal or ventilation through the controller.
- Mount the controller so that the power transformer and other devices do not radiate excessive heat to the controller.
- Do not install the controller in an airtight enclosure.

Figure 1: Mounting positions



Horizontal Mount Position
Preferred for Wall Mounting
Required for DIN Rail Mounting

Vertical Mount Position
Acceptable for Wall Mounting

DIN rail mount applications

Mounting the PCA horizontally on 35 mm DIN rail is the preferred mounting method.

To mount a controller on 35 mm DIN rail, complete the following steps:

1. Securely mount a 20 cm (8 in.) or longer section of 35 mm DIN rail horizontal and centered in the appropriate location so that the controller mounts in the horizontal position shown in Figure 1.
2. Pull the two bottom mounting clips outward from the controller to the extended position (Figure 2).
3. Hang the controller on the DIN rail by the hooks at the top of the (DIN rail) channel on the back of the controller, and position the controller snugly against the DIN rail.
4. Push the bottom mounting clips inward (up) to secure the controller on the DIN rail.
   To remove the controller from the DIN rail, pull the bottom mounting clips out to the extended position and carefully lift the controller off the DIN rail.

Wall mount applications

To mount a PCA directly on a wall or other flat vertical surface, complete the following steps:

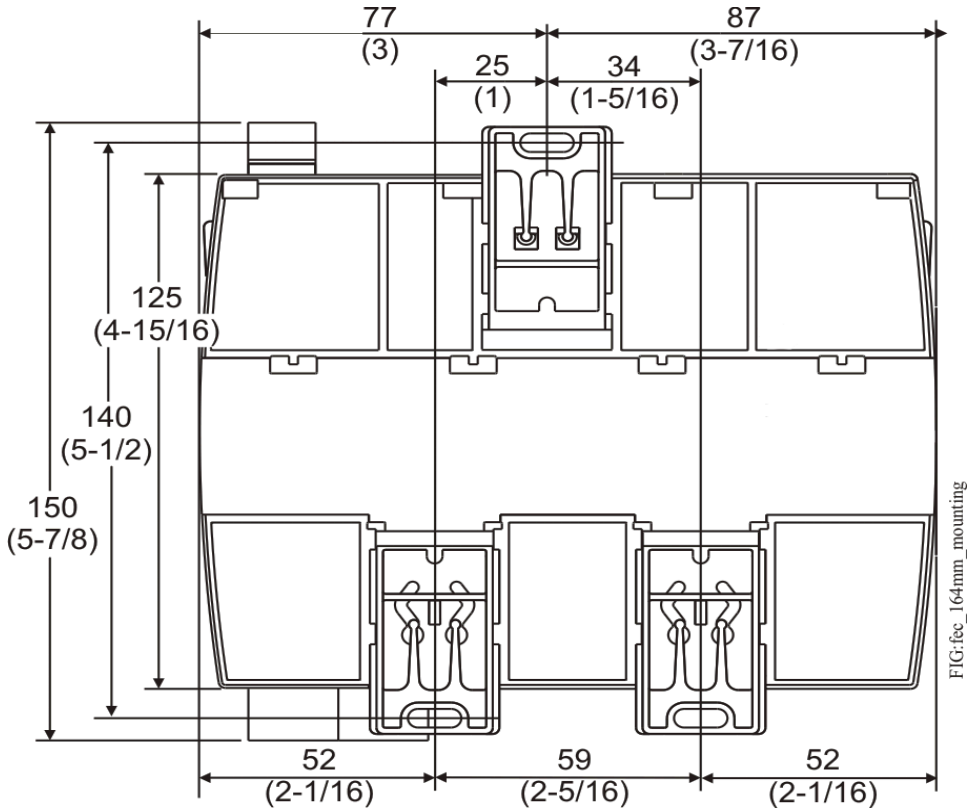
1. Pull the two bottom mounting clips outward and ensure they are locked in the extended position as shown in Figure 2.
2. Mark the mounting hole locations on the wall using the dimensions in Figure 2 and one of the mount positions shown in Figure 1. Or hold the controller up to the wall or surface in a proper mount position and mark the hole locations through the mounting clips.
3. Drill holes in the wall or surface at the marked locations, and insert appropriate wall anchors in the holes (if necessary).
4. Hold the controller in place, and insert the screws through the mounting clips and into the holes (or anchors). Carefully tighten all of the screws.

   ➤ **Important:** Do not overtighten the mounting screws. Overtightening the screws may damage the mounting clips.

Mounting features and dimensions

See Figure 2 for mounting dimensions in millimeters and inches. Inches are listed in parenthesis. Figure 2 also illustrates the DIN rail channel and the mounting clips in an extended position.

Figure 2: Back of PCA2513 Controller



PCA2513 physical features

Figure 3: PCA2513 physical features

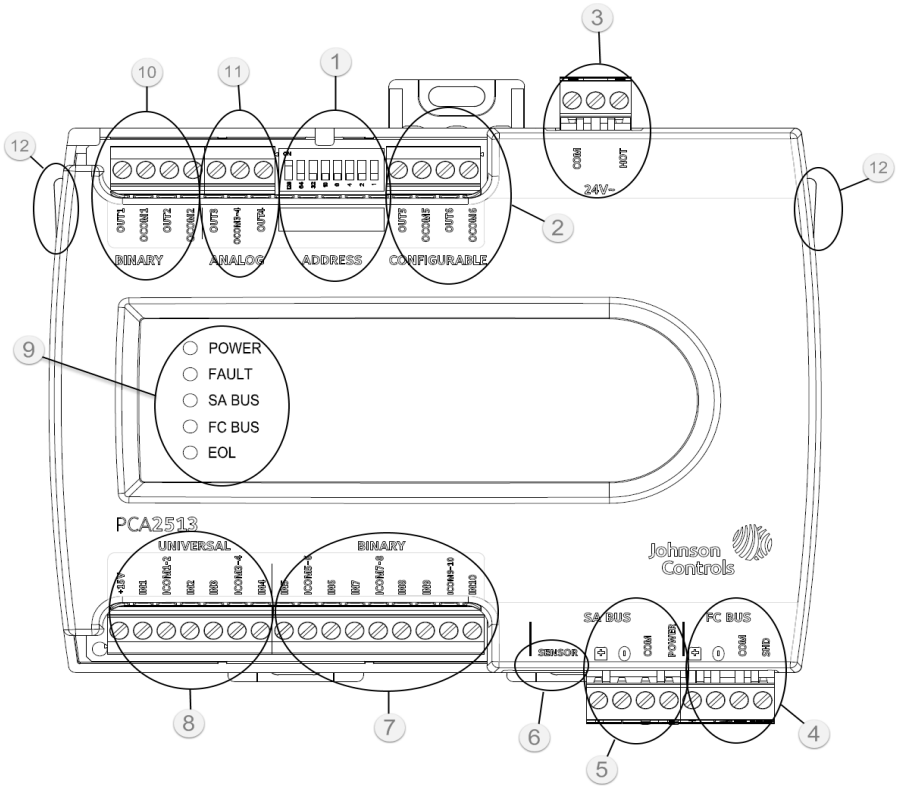


Table 1: Physical features

Callout	Physical features: description and references
1	Device Address Dip Switch Block (see Setting the device address)
2	Configurable Output (CO) Terminal Block (see Table 3)
3	24 VAC, Class 2 Supply Power Terminal Block (see Supply power terminal block)
4	Field Controller (FC) Bus Terminal Block (see FC bus terminal Bblock)
5	Sensor Actuator (SA) Bus Terminal Block (see SA bus terminal block)
6	Sensor Actuator (SA) Bus (RJ-12 6-pin Modular Jack) (see Sensor port)
7	Binary Input (BI) Terminal Block (see Table 3)
8	Universal Inputs (UI) Terminal Block (see Table 3)
9	LED Status Indicators (see Table 8)
10	Binary Output (BO) Terminal Block (see Table 3)
11	Analog Outputs (AO) Terminal Block (see Table 3)
12	Cover lift tabs

Wiring

⚠ CAUTION

Risk of Electric Shock
Disconnect the power supply before making electrical connections to avoid electric shock.

⚠ CAUTION

Risque de décharge électrique
Débrancher l'alimentation avant de réaliser tout raccordement électrique afin d'éviter tout risque de décharge électrique.

⚠ 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.

⚠ CAUTION

Mise En Garde: Risque de dégâts matériels
Ne pas mettre le système sous tension avant d'avoir vérifié tous les raccords de câblage. Des fils formant un court-circuit ou connectés de façon incorrecte risquent d'endommager irrémédiablement l'équipement.

- **Important:** Do not exceed the controller electrical ratings. Exceeding controller electrical ratings can result in permanent damage to the controller and void any warranty.
- **Important:** Use copper conductors only. Make all wiring in accordance with local, national, and regional regulations.
- **Important:** Electrostatic discharge can damage controller components. Use proper electrostatic discharge precautions during installation, setup, and servicing to avoid damaging the controller.

For detailed information on configuring and wiring an MS/TP Bus, FC bus, and SA bus, refer to the following documents depending on your system (FX or BCPro): *FX-PC Series Controllers MS/TP Communications Bus Technical Bulletin (LIT-12011670* or *MS/TP Communications Bus for BCPro™ System Technical Bulletin (LIT-12011908)*.

Terminal blocks and bus ports

See Figure 3 for a terminal block and bus port locations on the controller. Observe the following guidelines for terminal blocks and bus ports when you wire a controller.

Input and Output terminal blocks

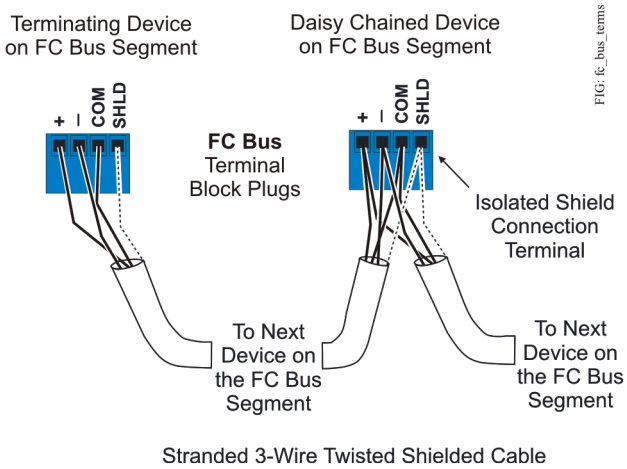
The fixed input terminal blocks are mounted on the bottom of the controller and the output terminal blocks are mounted on the top of the controller. See Figure 3 for more information about I/O terminal functions, requirements, and ratings.

FC bus terminal Bblock

The FC Bus terminal block is a blue, removable, 4-terminal plug that fits into a board-mounted jack.

Wire the removable FC bus terminal block plugs on the controller, and other controllers in a daisy-chain configuration using 3-wire twisted, shielded cable as shown below. See Table 6 for more information.

Figure 4: FC bus terminal block wiring



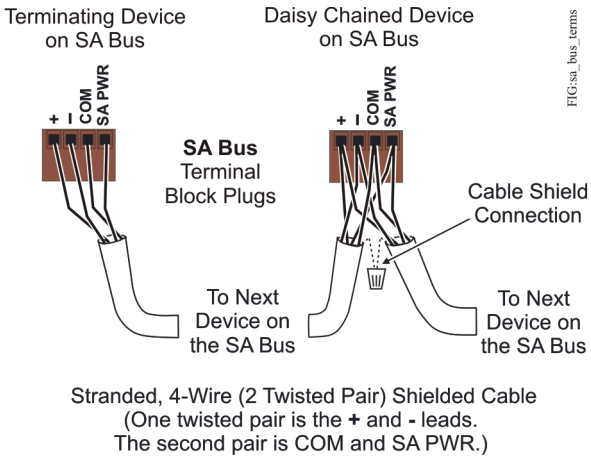
Note: The FC bus Shield (SHLD) terminal is isolated and can be used to connect (daisy chain) the shields for FC bus wiring.

SA bus terminal block

The SA Bus terminal block is a brown, removable, 4-terminal plug that fits into a board-mounted jack.

Wire the removable SA Bus terminal block plugs on the controller and other SA Bus devices in a daisy-chain configuration using 4-wire twisted, shielded cable as shown in the following figure. See Table 6 for more information.

Figure 5: SA bus terminal block wiring



ⓘ **Note:** The SA PWR terminal supplies 15 VDC. The SA PWR terminal can be used to connect (daisy chain) the 15 VDC power leads on the SA bus.

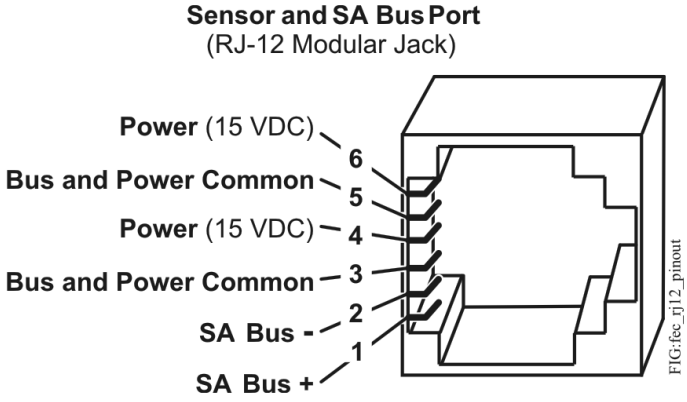
Sensor port

The Sensor (SA Bus) port on the bottom of the controller (Figure 3) is an RJ-12, 6-position modular jack that provides a connection for the Mobile Access Portal (MAP) Gateway, the Bluetooth® Commissioning Converter (BTCVT), the VAV Balancing Tool, specified network sensors, or other SA Bus devices with RJ-12 plugs.

The Sensor port is connected internally to the SA bus terminal block. See Table 6 for more information. The Sensor Port pin assignment is shown in Figure 6.

ⓘ **Note:**
The MAP Gateway serves as a replacement for the BTCVT, which is no longer available for purchase, but continues to be supported.

Figure 6: Pin number assignments for sensor and SA bus ports on Controllers

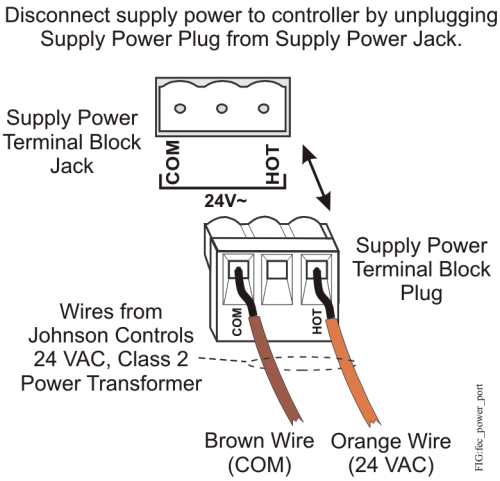


Supply power terminal block

The 24 VAC supply power terminal block is a gray, removable, 3-terminal plug that fits into a board-mounted jack on the top right of the controller.

Wire the 24 VAC supply power wires from the transformer to the HOT and COM terminals on the terminal plug as shown below. Do not use the middle terminal on the supply power terminal block. See Table 6 for more information about the Supply Terminal Block.

Figure 7: 24 VAC supply power terminal block wiring



Note: The supply power wire colors may be different on transformers from other manufacturers. Refer to the transformer manufacturer's instructions and the project installation drawings for wiring details.

Important: Connect 24 VAC supply power to the controller and all other network devices so that transformer phasing is uniform across the network devices. Powering network devices with uniform 24 VAC supply power phasing reduces noise, interference, and ground loop problems. The PCA does not require an earth ground connection.

Termination diagrams

A set of Johnson Controls termination diagrams provides details for wiring inputs and outputs to the controllers. See the figures in this section for the applicable termination diagrams.

Table 2: Termination details

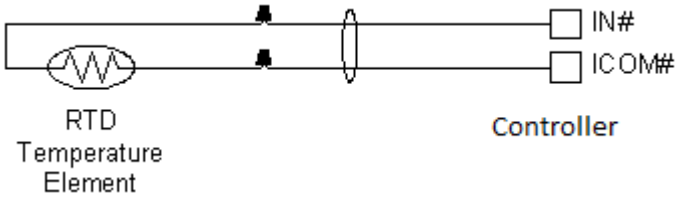
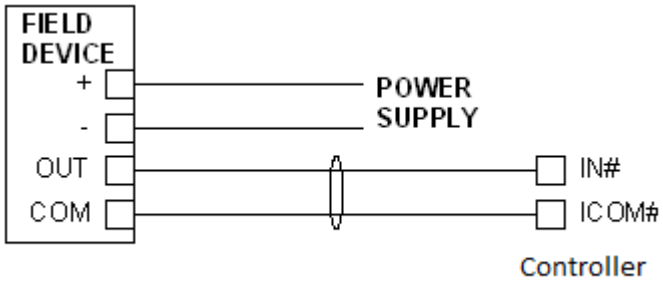
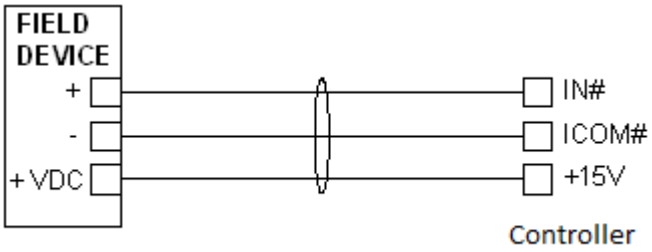
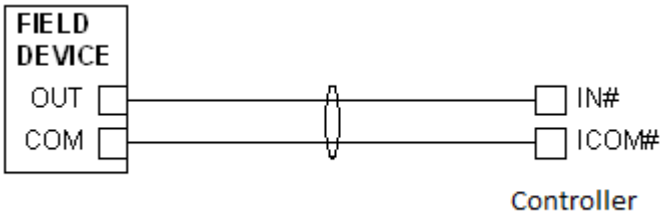
Type of field device	Type of Input/ Output	Termination diagrams
Temperature Sensor	UI	
Voltage Input - External Source	UI	
Voltage Input - Internal Source	UI	
Voltage Input (Self-Powered)	UI	

Table 2: Termination details

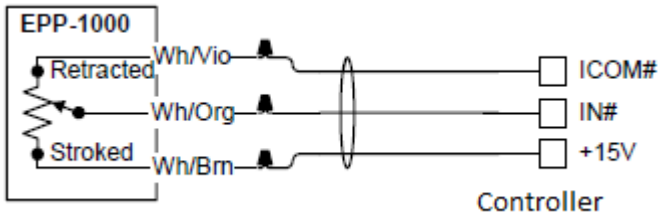
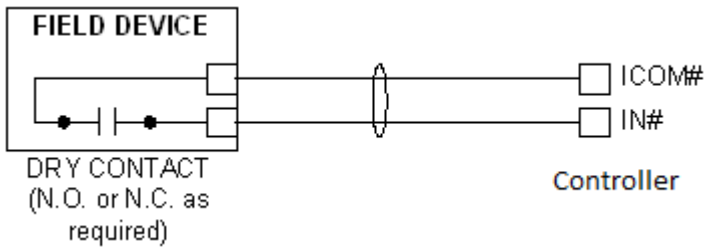
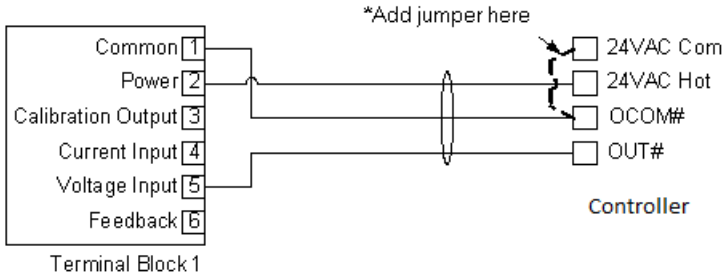
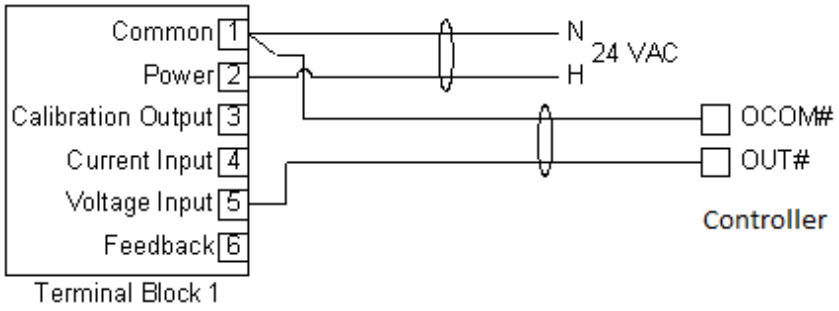
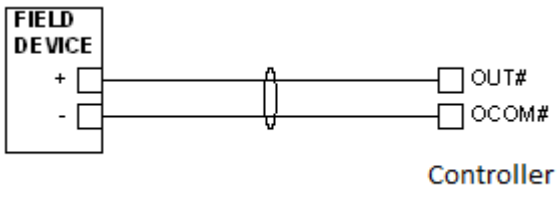
Type of field device	Type of Input/ Output	Termination diagrams
Feedback from EPP-1000	UI	
Dry Contact (Binary Input)	UI or BI	
0–10 VDC Output to Actuator (External Source)	AO	
0–10 VDC Output to Actuator (Internal Source)	AO	
Voltage (Analog Output)	AO	

Table 2: Termination details

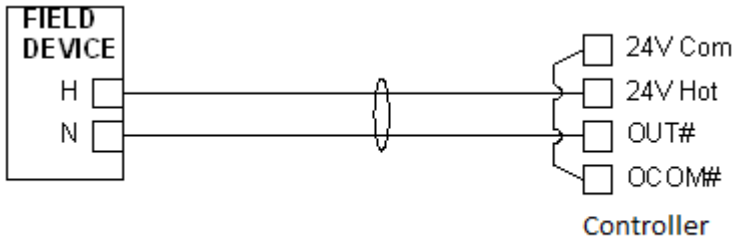
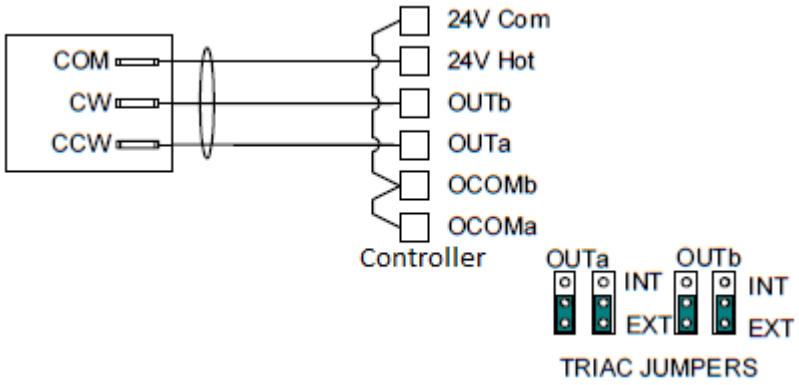
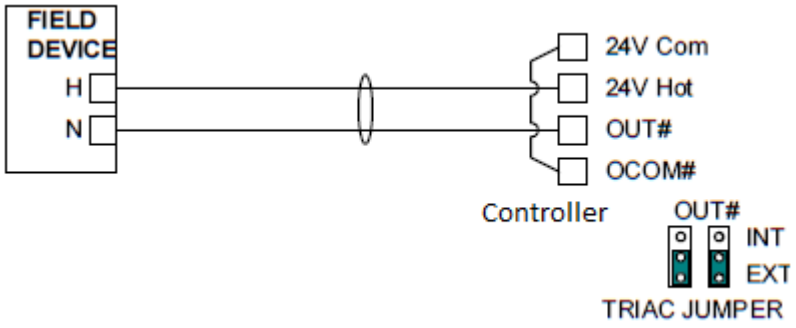
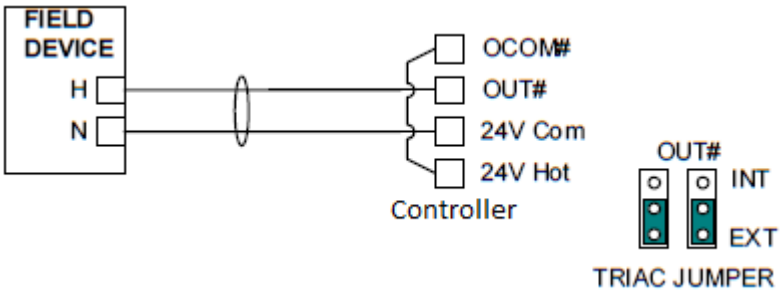
Type of field device	Type of Input/ Output	Termination diagrams
24 VAC Triac Output (Switch Low, External Source)		
Incremental Control to Actuator (Switch Low, Externally Sourced) (Triac Jumpers Where Applicable)	BO	
24 VAC Binary Output (Switch Low, Externally Sourced) (Triac Jumpers Where Applicable)	BO	
24 VAC Binary Output (Switch High, Externally Sourced) (Triac Jumpers Where Applicable)	BO	

Table 2: Termination details

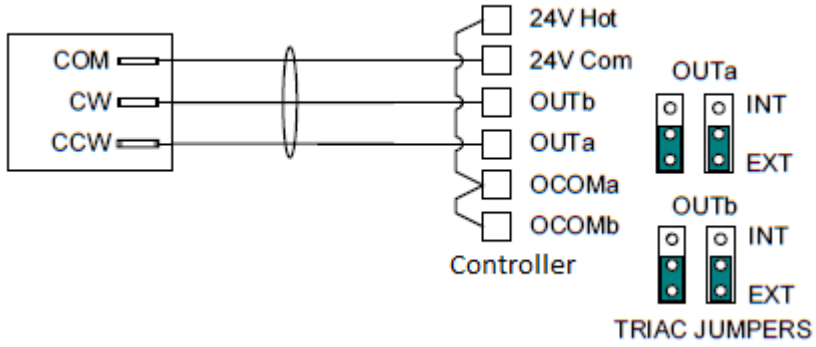
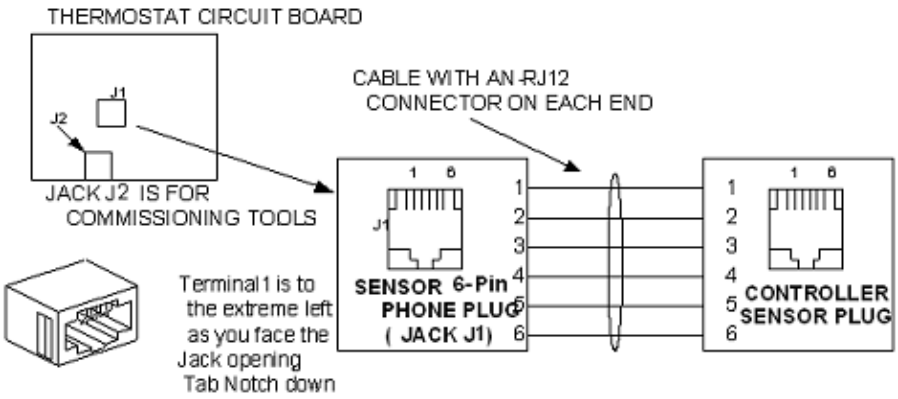
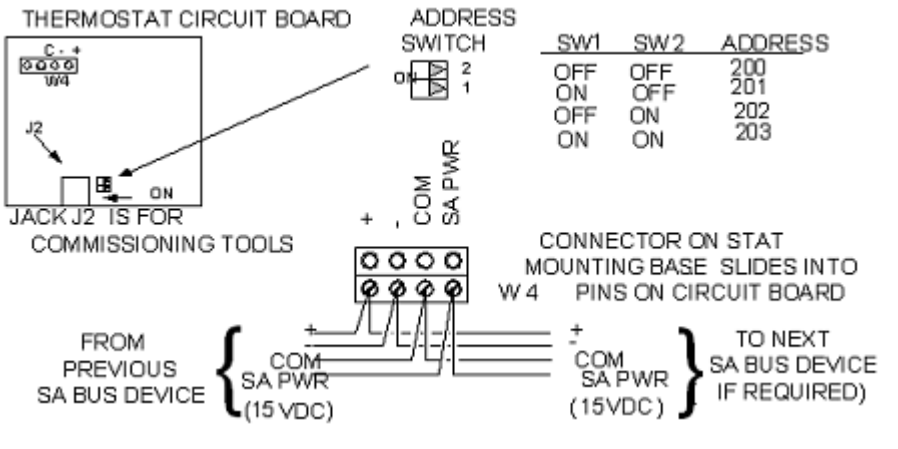
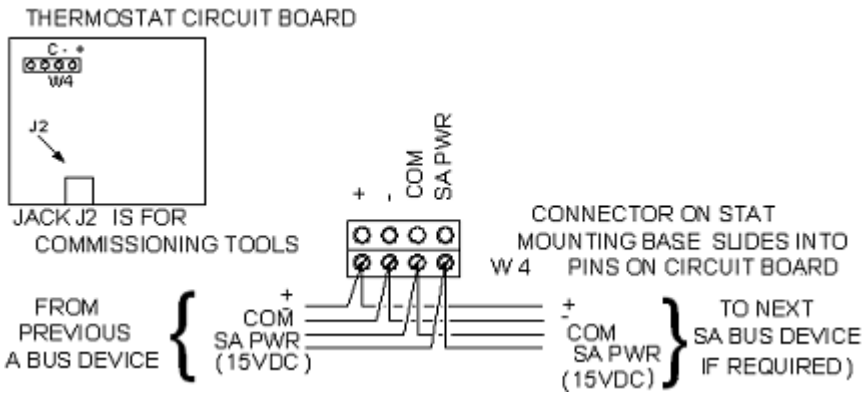
Type of field device	Type of Input/ Output	Termination diagrams
Incremental Control to Actuator (Switch High, Externally Sourced) (Triac Jumpers Where Applicable)	BO	
Network Stat with Phone Jack (Fixed Address = 199)	SA Bus	 ⓘ **Note:** The bottom jack (J2) on the TE-700 and TE-6x00 Series Sensors is not usable as a zone bus or an SAB connection.
Network Stat with Terminals Addressable	SA Bus	

Table 2: Termination details

Type of field device	Type of Input/ Output	Termination diagrams
Network Stat with Terminals (Fixed Address = 199)	SA Bus	

Terminal wiring guidelines, functions, ratings, and requirements

Input and Output wiring guidelines

Table 3 provides information and guidelines about the functions, ratings, and requirements for the controller input and output terminals. This table also references guidelines for determining proper wire sizes and cable lengths.

In addition to the wiring guidelines in the table, observe the following guidelines when you wire controller inputs and outputs:

- Run all low-voltage wiring and cables separate from high-voltage wiring.
- All input and output cables, regardless of wire size or number of wires, should consist of stranded, insulated, and twisted copper wires.
- Shielded cable is not required for input or output cables.
- Shielded cable is recommended for input and output cables that are exposed to high electromagnetic or radio frequency noise.
- Inputs/outputs with cables less than 30 m (100 ft) typically do not require an offset in the software setup. Cable runs over 30 m (100 ft) may require an offset in the input/output software setup.

Input and Output wiring guidelines table

Table 3: I/O Terminal Blocks, Functions, Ratings, Requirements, and Cables

Terminal block label	Terminal label	Function, ratings, requirements	Determine wire size and maximum cable length
UNIVERSAL (Inputs)	**+15 V**	**15 VDC Power Source** for active (3-wire) input devices connected to the Universal IN*n* terminals. Provides 100 mA total current	Same as (Universal) **IN*n*** ⓘ **Note:** Use 3-wire cable for devices that source power from the +15 V terminal.
	IN*n*	**Analog Input - Voltage Mode (0–10 VDC)** 10 VDC maximum input voltage Internal 75k ohms pull-down	See Guideline **A** in Table 5. See Guideline **B** in Table 5.
		Analog Input - Resistive Mode (0–600k ohms) Internal 12 V 15k ohms pull up Qualified Sensors: 0–2k ohms potentiometer, RTD (1k Nickel [Johnson Controls sensor], 1k Platinum, and A99B Silicon Temperature Sensor) Negative Temperature Coefficient (NTC) Sensor (10k Type L, 10k JCI Type II, 2.252k Type II)	See Guideline **A** in Table 5.
		Binary Input - Dry Contact Maintained Mode 1 second minimum pulse width Internal 12 V 15k ohms pull up	See Guideline **A** in Table 5.
	ICOM*n*	**Universal Input Common** for all Universal Input terminals ⓘ **Note:** All Universal ICOM*n* terminals share a common, which is isolated from all other commons, except the SA bus common.	Same as (Universal) **IN*n***
BINARY (Inputs)	**IN*n***	**Binary Input - Dry Contact Maintained Mode** 0.01 second minimum pulse width Internal 18 V 3k ohms pull up	See Guideline **A** in Table 5.

Table 3: I/O Terminal Blocks, Functions, Ratings, Requirements, and Cables

Terminal block label	Terminal label	Function, ratings, requirements	Determine wire size and maximum cable length
		Binary Input - Pulse Counter/ Accumulator Mode 0.01 second minimum pulse width (50 Hz at 50% duty cycle) Internal 18 V 3k ohms pull up	
	ICOM*n*	**Binary Input Common** for all Binary Input (IN) terminals ⓘ **Note:** All Binary ICOM*n* terminals share a common, which is isolated from all other commons, except the Configurable Output (CO) common (OCOM*n*) when the CO is defined as an Analog Output.	
ANALOG (Outputs)	**OUT***n*	**Analog Output - Voltage Mode (0–10 VDC)** 10 VDC maximum output voltage 10 mA maximum output current Required an external load of 1,000 ohms or more. ⓘ **Note:** The Analog Output (AO) operates in the Voltage Mode when connected to devices with impedances greater than 1,000 ohms. Devices that drop below 1,000 ohms may not operate as intended for Voltage Mode applications.	See Guideline **C** in Table 5.
	OCOM*n*	**Analog Output Signal Common** for all Analog OUT terminals. ⓘ **Note:** All Analog Output Common terminals (OCOM*n*) share a common, which is isolated from all other commons.	
BINARY (Output)	**OUT***n*	**Binary Output - 24 VAC Triac** (Internal Power Source) Sources internal 24 VAC power (24~ HOT).	See Guideline **C** in Table 5.

Table 3: I/O Terminal Blocks, Functions, Ratings, Requirements, and Cables

Terminal block label	Terminal label	Function, ratings, requirements	Determine wire size and maximum cable length
	OCOM*n*	**Binary Output - 24 VAC Triac** (Internal Power Source) Connects OCOM*n* to 24~ when activated. Internal Power Source: 30 VAC maximum output voltage 0.5 A maximum output current 1.3 A at 25% duty cycle 40 mA minimum load current	
CONFIGURABLE (Outputs)	**OUT***n*	**Analog Output - Voltage Mode (0–10 VDC)** 10 VDC maximum output voltage 10 mA maximum output current Required an external load of 1,000 ohms or more.	See Guideline **A** in Table 5.
		Binary Output - 24 VAC Triac (External Power Source only) Connects OUT*n* to OCOM*n* when activated. External Power Source Requirements: 30 VAC maximum output voltage 0.5 A maximum output current 1.3 A at 25% duty cycle 40 mA minimum load current	See Guideline **C** in Table 5.
	OCOM*n*	**Analog Output Signal Common** All Configurable Outputs (COs) defined as Analog Outputs (AOs) share a common, which is isolated from all other commons except the Binary Input common.	Same as (Configurable) **OUT***n*.
		Binary Output Signal Common All Configurable Outputs (COs) defined as Binary Outputs are isolated from all other commons, including other CO commons.	

PCA2513 point type counts

The following table shows the different point types and counts available in the PCA2513 Series controllers.

Table 4: PCA2513 point type counts

Point types	Signals accepted	PCA2513
Universal Input (UI)	Analog Input, Voltage Mode, 0–10 VDC Analog Input, Current Mode, 4–20 mA Analog Input, Resistive Mode, 0–2k ohm, RTD (1k NI [Johnson Controls], 1k PT, A99B SI), NTC (10k Type L, 2.252k Type 2) Binary Input, Dry Contact Maintained Mode	4 (Does not support Current Mode)
Binary Input (BI)	Dry Contact Maintained Mode Pulse Counter/Accumulator Mode (High Speed), 100 Hz	6
Analog Output (AO)	Analog Output, Voltage Mode, 0–10 VDC Analog Output, Current Mode, 4–20 mA	2 (Voltage Only)
Binary Output (BO)	24 VAC Triac	2 (Ext Power only)
Configurable Output (CO)	Analog Output, Voltage Mode, 0–10 VDC Binary Output Mode, 24 VAC Triac	2

Cable and wire length guidelines

Table 5 defines cable length guidelines for the various wire sizes that may be used for wiring low-voltage (30V) input and outputs.

Note: The required wire sizes and lengths for high voltage (>30 V) Relay Outputs are determined by the load connected to the relay, and local, national, or regional electrical codes.

Table 5: Cable length guidelines for recommended wire sizes for low-voltage (<30 V) Inputs and Outputs

Guideline	Wire size/Gauge and type	Maximum cable length and type	Assumptions
A	1.0 mm (18 AWG) stranded copper	457 m (1,500 ft) twisted wire	100 mV maximum voltage drop Depending on cable and the connected input or output
	0.8 mm (20 AWG) stranded copper	297 m (975 ft) twisted wire	

Table 5: Cable length guidelines for recommended wire sizes for low-voltage (<30 V) Inputs and Outputs

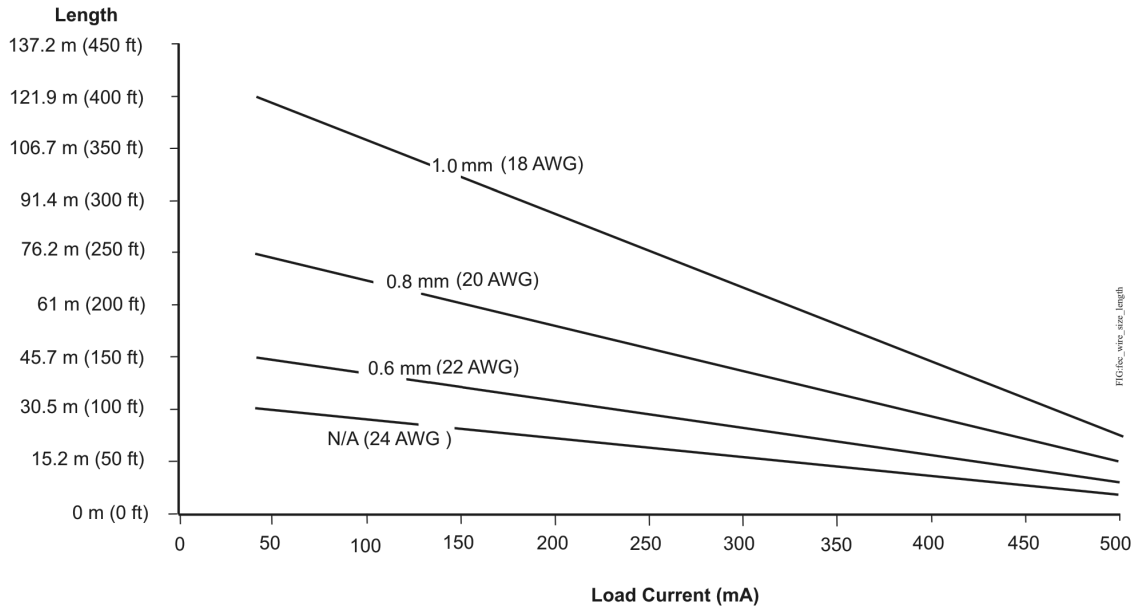
Guideline	Wire size/Gauge and type	Maximum cable length and type	Assumptions
	0.6 mm (22 AWG) stranded copper	183 m (600 ft) twisted wire	device, you may have to define an offset in the setup software for the input or output point.
	N/A (24 AWG) stranded copper	107 m (350 ft) twisted wire	
B	1.0 mm (18 AWG) stranded copper	229 m (750 ft) twisted wire	100 mV maximum voltage drop Depending on cable and the connected input or output device, you may have to define an offset in the setup software for the input or output point.
	0.8 mm (20 AWG) stranded copper	137 m (450 ft) twisted wire	
	0.6 mm (22 AWG) stranded copper	91 m (300 ft) twisted wire	
	N/A (24 AWG) stranded copper	61 m (200 ft) twisted wire	
C	See Figure 8 to select wire size/gauge. Use stranded copper wire	See Figure 8 to determine cable length. Use twisted wire cable.	N/A

Maximum cable length versus load current

Use Figure 8 to estimate the maximum cable length relative to the wire size and the load current (in mA) when you wire inputs and outputs.

ⓘ **Note:** Figure 8 applies to low-voltage (<30 V) inputs and outputs only.

Figure 8: Maximum wire length for low-voltage (<30 V) Inputs and Outputs by current and wire size



Communications bus and supply power wiring guidelines

Table 6 provides information about the functions, ratings, and requirements for the communication bus and supply power terminals. The table also provides guidelines for wire sizes, cable types, and cable lengths for when you wire the controller's communication buses and supply power.

In addition to the guidelines in Table 6, observe the following guidelines when you wire an SA or FC bus and the 24 VAC supply power:

- Run all low-voltage wiring and cables separate from high-voltage wiring.
- All SA and FC bus cables, regardless of wire size, should be twisted, insulated, stranded copper wire.
- Shielded cable is strongly recommended for all SA and FC bus cables.
- Refer to the following documents depending on your system (FX or BCPro): *FX-PC Series Controllers MS/TP Communications Bus Technical Bulletin (LIT-12011670* or *MS/TP Communications Bus for BCPro™ System Technical Bulletin (LIT-12011908)* for detailed information regarding wire size and cable length requirements for the SA and FC buses.

Communications bus and supply power terminal blocks, ratings, and requirements

ⓘ **Note:** The SA Bus and FC bus wiring recommendations in this table are for MS/TP bus communications at 38.4k baud.

Table 6: Communications Bus and Supply Power Terminal Blocks, Functions, Ratings, Requirements, and Cables

Terminal block/Port label	Terminal labels	Function, electrical ratings/Requirements	Recommended cable type
FC BUS	**+** **-**	FC Bus Communications	0.6 mm (22 AWG) stranded, 3-wire twisted, shielded cable recommended
	COM	Signal Reference (Common) for Bus communications	
	SHLD	Isolated terminal (optional shield drain connection)	
SA BUS	**+** **-**	SA Bus Communications	0.6 mm (22 AWG) stranded, 4-wire (2 twisted-pairs), shielded cable recommended. ⓘ **Note:** The + and - wire are one twisted pair, and the COM and SA PWR are the second twisted pair of wires.
	COM	SA Bus Signal Reference and 15 VDC Common	
	SA PWR	15 VDC Supply Power for Devices on the SA Bus (Maximum total current draw for SA Bus is 240 mA.)	

Table 6: Communications Bus and Supply Power Terminal Blocks, Functions, Ratings, Requirements, and Cables

Terminal block/Port label	Terminal labels	Function, electrical ratings/Requirements	Recommended cable type
Sensor	**Sensor**	RJ-12 6-Position Modular Connector provides: SA Bus Communications SA Bus Signal Reference and 15 VDC Common 15 VDC Power for devices on the SA bus and Wireless Commissioning Converter	24 AWG 3-pair CAT3 cable <30.5 m (100 ft)
24~	**HOT**	**24 VAC Power Supply - Hot** Supplies 20–30 VAC (Nominal 24 VAC)	0.8 mm to 1.0 mm (18 AWG) 2-wire
	COM	**24 VAC Power Supply Common** (Isolated from all other Common terminals on controller) 35 VA	

Setup and Adjustments

Setting the device address

PC Series controllers are master devices on MS/TP (SA or FC) buses. Before you operate PCA controllers on a bus, you **must** set a valid and unique device address for each controller on the bus. You set a controller's device address by setting the positions of the switches on the DIP switch block at the top of the controller. Device addresses 4 through 127 are the valid addresses for these controllers on an MS/TP FC bus.

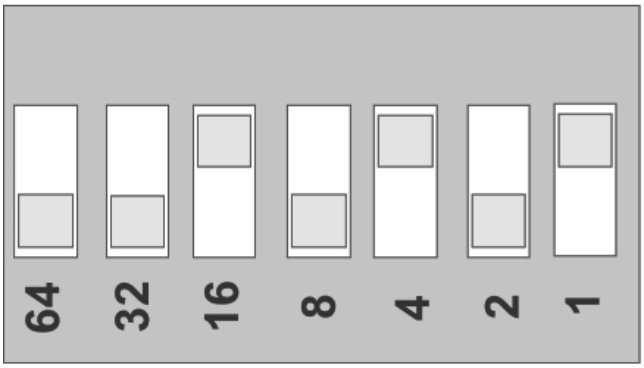
The following table describes the FC bus and SA bus device addresses for Johnson Controls MS/TP communications bus applications.

Table 7: SA/FC bus device address descriptions

Device address	Use on descriptions
0 (Switch 128 Off)	Reserved for FC Bus Supervisory Controller (not for use on controllers or expansion modules).
1-3 (Switch 128 Off)	Reserved for peripheral devices (not for use on controllers or expansion modules).
4-127 (Switch 128 Off)	Used for MSTP master devices (controllers and expansion modules) that are hardwired to an SA bus or FC bus.

The DIP switch block has eight switches numbered 128, 64, 32, 16, 8, 4, 2, and 1 (Figure 9). Switches 64 through to 1 are device address switches. Switch 128 must be set to **OFF** for all hard-wired SA and FC bus applications.

Figure 9: Device Address DIP Switch Block Set to Address 21



To set the device addresses on PCA controllers, complete the following steps:

1. Set **all** of the switches on the address DIP switch block (128 through 1) to OFF.
2. Set one or more of the seven address switches (64 though 1) to ON, so that the sum of the switch numbers set to ON equals the intended device address. Ensure that switch 128 remains set to OFF.

   ⓘ **Note:** Set the highest number switch that is less than or equal to the intended device address to ON. Then continue setting lower numbered switches until the total equals the intended address. For example, if the intended device address is 21, set switch 16 to ON first, then set switch 4 ON, followed by switch 1 (16+4+1= 21). See Figure 9.
3. Set a unique and sequential device address for each of the PCA controllers connected on the SA or FC bus starting with device address 4.

   ⓘ **Note:** To ensure the best bus performance, set sequential device addresses with no gaps in the device address range (4, 5, 6, 7, 8, 9, and so on). The controllers do **not** need to be physically connected on the bus in their numerical device address order.
4. Write each controller's device address on the white label below the DIP switch block on the controller's cover.

Removing the controller cover

➤ **Important:** Electrostatic discharge can damage controller components. Use proper electrostatic discharge precautions during installation, setup, and servicing to avoid damaging the controller.

➤ **Important:** Disconnect all power sources to the controller before you remove the cover and change the position of any jumper or the EOL switch on the controller. Failure to disconnect power before changing a jumper or EOL switch position can result in damage to the controller and void any warranties.

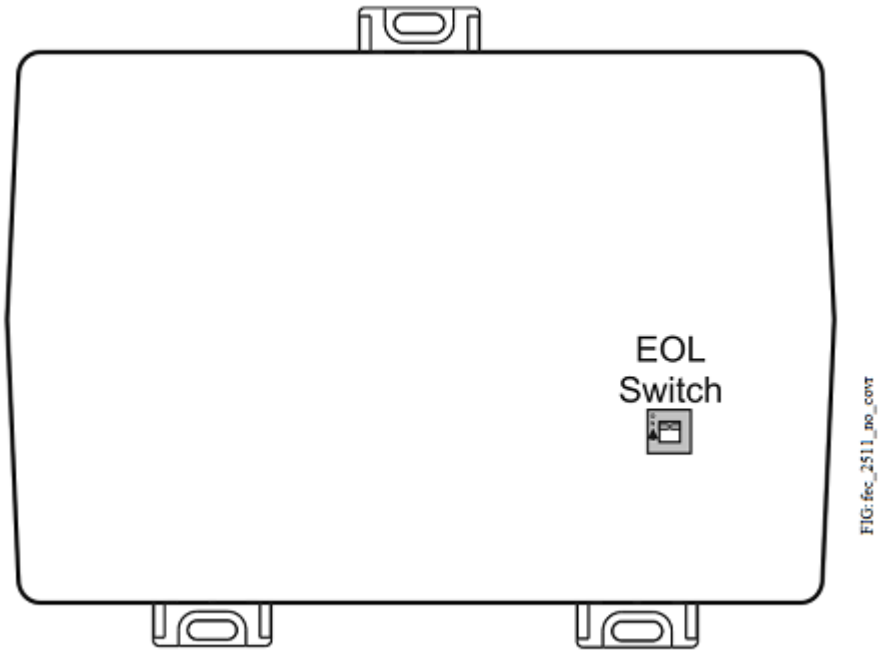
The controller cover is held in place by four plastic latches that extend from the base and snap into slots on the inside of the housing cover.

To remove the controller cover, complete the following steps:

1. Place your fingernails under the two cover lift tabs on the sides of the housing cover and gently pry the top of the cover away from the base to release the cover from the two upper latches.
2. Pivot the top of the cover further to release it from the lower two latches.

3. Replace the cover by placing it squarely over the base, and then gently and evenly push the cover on to the latches until they snap into the latched position.

Figure 10: PCA2513 with cover removed EOL switch



Setting the End-of-Line (EOL) switch

Each controller has an EOL switch, which, when set to ON, sets the controller as a terminating device on the bus. See Figure for the EOL switch location. The default EOL switch position is OFF.

Figure 11: End-of-Line switch positions

To set the EOL switch on a PCA, complete the following steps:

1. Determine the physical location of the controller on the FC bus.
2. Determine if the controller must be set as a terminating device on the bus.

   Note: Refer to the following documents depending on your system (FX or BCPro): *FX-PC Series Controllers MS/TP Communications Bus Technical Bulletin (LIT-12011670)* or *MS/TP Communications Bus for BCPro™ System Technical Bulletin (LIT-12011908)* for detailed information regarding EOL termination rules and EOL switch settings on FC buses.

3. If the controller is a terminating device on the FC bus, set the EOL switch to ON. If the controller is not a terminating device on the bus, set the EOL switch to OFF.
   When a PCA is connected to power with its EOL switch set to ON, the amber EOL LED on the controller cover is lit.

Commissioning PCA Controllers

You commission controllers with the Controller Configuration Tool (CCT) software, either via a Bluetooth Wireless Commissioning Converter, a ZigBee® wireless dongle, or in BACnet Router mode when connected to a Supervisory Controller. Refer to the *Controller Tool Help (LIT-12011147)* for detailed information about commissioning controllers.

Note:

- The MAP Gateway serves as a replacement for the BTCVT, which is no longer available for purchase, but continues to be supported.

Troubleshooting PCA Controllers

Observe the Status LEDs on the front of the PCA and see the following table to troubleshoot the controller.

LED status and states

Table 8: Status LEDs and description of LED states

LED label	LED color	Normal LED state	Description of LED states
POWER	Green	On Steady	Off Steady = No Supply Power or the controller's polyswitch/resettable fuse is open. Check Output wiring for short circuits and cycle power to controller. On Steady = Power Connected
FAULT	Red	Off Steady	Off Steady = No Faults On Steady = Device Fault Blink - 2 Hz = Download or Startup in progress, not ready for normal operation
SA BUS	Green	Blink - 2 Hz	Blink - 2 Hz = Data Transmission (normal communication) Off Steady = No Data Transmission (N/A - auto baud not supported) On Steady = Communication lost, waiting to join communication ring
FC BUS	Green	Blink - 2 Hz	Blink - 2 Hz = Data Transmission (normal communication) Off Steady = No Data Transmission (auto baud in progress) On Steady = Communication lost, waiting to join communication ring
EOL	Amber	Off (Except on terminating devices)	On Steady = EOL switch in ON position Off Steady = EOL switch in Off position

Repair information

If a controller fails to operate within its specifications, replace the controller. For a replacement controller, contact your Johnson Controls representative.

Accessories

See Table 9 for controller accessories ordering information.

Table 9: Accessories ordering information

Product code number	Description
PCX Series Modules	Depending on your system (FX or BCPro), refer to the *CH-PC Series Programmable Controllers and Related Products for the BCPro System Product Bulletin (LIT-12011914)* or *FX-PC Series Programmable Controllers and Related Products Product Bulletin (LIT-12011657)* for a complete list of available PCX Series Controllers.
Mobile Access Portal (MAP) Gateway	Refer to the *Mobile Access Portal Gateway Catalog Page (LIT-1900869)* to identify the appropriate product for your region. ⓘ **Note:** The MAP Gateway serves as a replacement for the BTCVT, which is no longer available for purchase, but continues to be supported.
NS Series Sensors	Refer to the *NS Series Network Sensors Product Bulletin (LIT-12011574)* for a complete list of available NS Series Sensors.
TL-CCT-0	Controller Configuration Tool (CCT) Software
FX-DIS1710-0	Local Controller Display
TP-2420	Transformer, 120 VAC Primary to 24 VAC secondary, 20 VA, Wall Plug
Y65T31-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 40 VA, Foot Mount, 8 in. (20.32 cm) Primary Leads and Secondary Screw Terminals, Class 2 ⓘ **Note:** Additional Y6x-x Series transformers are also available. Refer to the *Series Y63, Y64, Y65, Y66, and Y69 Transformers Product Bulletin (LIT-125755)* for more information.
AS-XFR050-0	Power transformer (Class 2, 24 VAC, 50 VA maximum output), no enclosure
AS-CBLTSTAT-0	Cable adapter for connecting to 8-pin TE-6700 Series sensors
AP-TBK4SA-0	Replacement SA Bus Terminal Blocks, 4-Position, Brown, Bulk Pack of 10
AP-TBK4FC-0	Replacement FC Bus Terminal Blocks, 4-Position, Blue, Bulk Pack of 10
AP-TBK3PW-0	Replacement Power Terminal Blocks, 3-Position, Gray, Bulk Pack of 10

Technical specifications

Table 10: PCA2513 technical specifications

Product Code Numbers	CH-PCA2513-0 model of the PC programmable controller
Supply Voltage	24 VAC (nominal, 20 VAC minimum/30 VAC maximum), 50/60 Hz, power supply Class 2 (North America), Safety Extra-Low Voltage (SELV) (Europe)
Power Consumption	14 VA maximum ⓘ **Note:** VA rating does **not** include any power supplied to the peripheral devices connected to Binary Outputs (BOs) or Configurable Outputs (COs), which can consume up to 12 VA for each BO or CO; for a possible total consumption of an additional 84 VA (maximum).
Ambient Conditions	**Operating:** 0°C to 50°C (32°F to 122°F); 10 to 90% RH noncondensing **Storage:** -40°C to 80°C (-40°F to 176°F); 5 to 95% RH noncondensing
Addressing	**BACnet® MS/TP:** DIP switch set; valid controller device addresses 4–127 (Device addresses 0–3 and 128–255 are reserved and not valid controller addresses).
Communications Bus	**RS-485: BACnet® MS/TP** 3-wire FC bus between the supervisory controller and other controllers 4-wire SA bus between controller, network sensors and other sensor/actuator devices, includes a lead to source 15 VDC supply power (from controller) to bus devices.
Real-Time Clock Backup Power Supply	Super capacitor maintains power to the onboard real-time clock for a minimum of 72 hours when supply power to the controller is disconnected.
Memory	16 MB flash memory and 8 MB SDRAM
Terminations	**Input/Output:** Fixed Screw Terminal Blocks **SA/FC Bus and Supply Power:** 4-Wire and 3-Wire Pluggable Screw Terminal Blocks **SA Bus Port:** RJ-12 6-Pin Modular Jack
Mounting	Horizontal on single 35 mm DIN rail mount (preferred), or screw mount on flat surface with three integral mounting clips on controller
Housing	**Enclosure material:** ABS and polycarbonate, Rating V0 minimum Protection Class: IP20 (IEC529)
Weight	0.5 kg (1.1 lb)

Table 10: PCA2513 technical specifications

Compliance CE	**United States:** UL Listed, File E107041, CCN PAZX, UL 916, Energy Management Equipment 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
	Europe: Johnson Controls declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive.
	Australia and New Zealand: RCM Mark, Australia/NZ Emissions Compliant
	BACnet International: BACnet Testing Laboratories™ (BTL) Protocol Revision 15 Listed and Certified BACnet Advanced Application Controller (B-AAC)

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

Points of single contact

APAC	Europe	NA/SA
JOHNSON CONTROLS C/O CONTROLS PRODUCT MANAGEMENT NO. 32 CHANGJIJANG RD NEW DISTRICT WUXI JIANGSU PROVINCE 214028 CHINA	JOHNSON CONTROLS WESTENDHOF 3 45143 ESSEN GERMANY	JOHNSON CONTROLS 507 E MICHIGAN ST MILWAUKEE WI 53202 USA