Programmable Controllers and Related Products for the BCPro System Product Bulletin

CH-PCA2513-0, CH-PCA3613-0, CH-PCA4911-0, CH-PCX2723-0, CH-PCX3723-0, CH-PCX3733-0, CH-PCV1617-0, CH-PCV1632-0, CH-PCV1930-0

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Contents

Overview

The PC Series Programmable Controller family comprises a group of versatile field controllers, including the PCA Advanced Application Programmable Controller, and accessories designed to monitor, control, and integrate a wide variety of HVAC and other building equipment.

Modular add-on accessories, such as the PCX Expansion Input/Output (I/O) Modules and NS Series Network Sensors, extend the capabilities of the PC controllers by providing additional I/O interfaces.

The PCA and PCX feature an advanced design that provides optimum performance and easy access to power, network, and field terminations.

A wide variety of network sensor models provides options for measuring and displaying zone temperature, duct temperature, zone humidity, carbon dioxide level, setpoint adjustments, fan speed control, and discharge air temperatures.

Figure 1: PC Series Programmable Controllers

➤ **Important:** Some CH-PC controllers are also compatible with the Facility Explorer® (FX) system. Refer to *PC Series Programmable Controllers and Related Products for use with FX in the Asia Region Product Bulletin (LIT-12013279)* for further details.

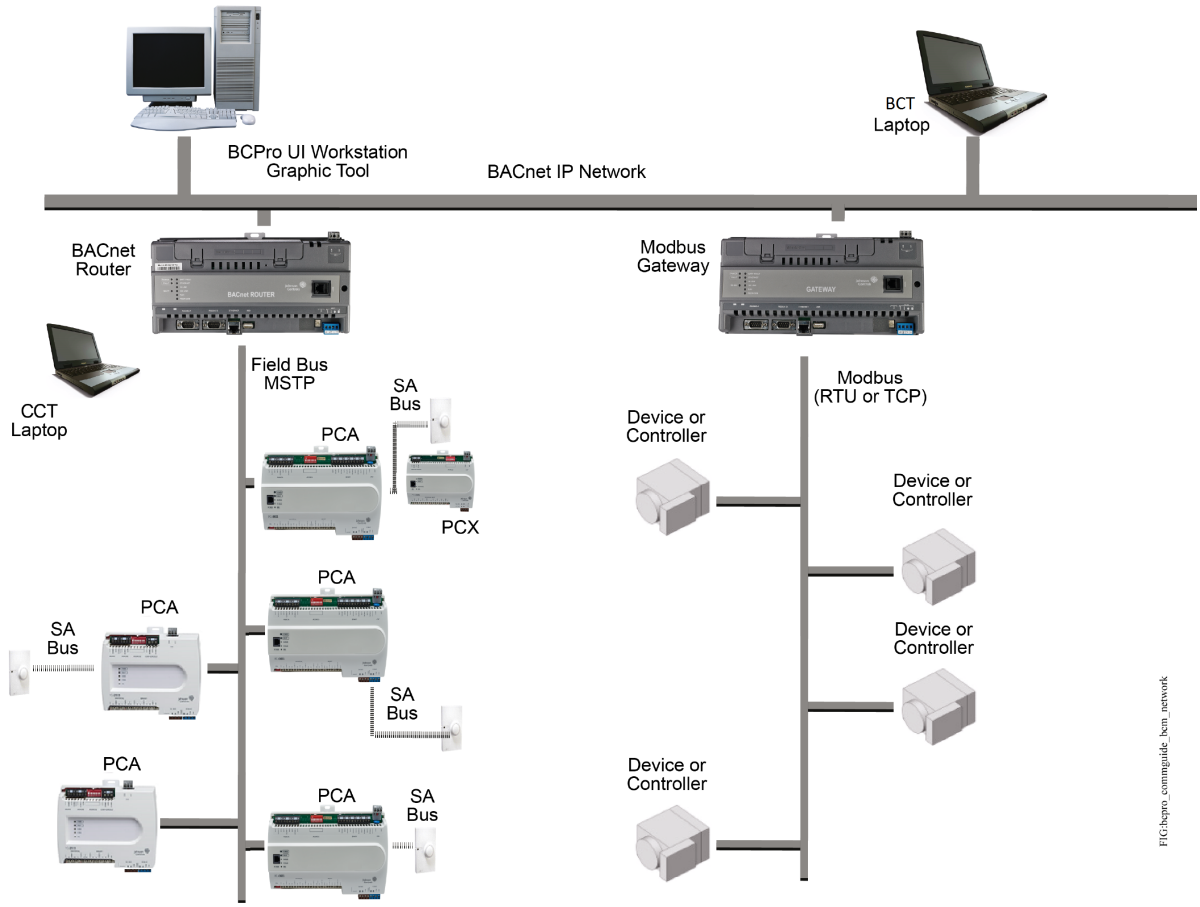
Features and Benefits

- **Standard BACnet® Protocol** — Provides interoperability with Johnson Controls® and third-party BAS products that use the widely accepted BACnet standard.
- **Standard Hardware and Software Platform** — Uses a common hardware design throughout the family line to support standardized wiring practices and installation workflows. Also uses a common software design to support use of a single tool for control applications, commissioning, and troubleshooting to minimize technical training.
- **Auto-Tuned Control Loops** — Reduce commissioning time, eliminate change-of-season re-commissioning, and reduce wear and tear on mechanical devices.

- **Universal Inputs** — Allow multiple signal options per channel to provide input flexibility.
- **Complete Product Family with Modular Components** — Meets any HVAC equipment or building system control requirement using only the needed components.
- **BACnet Testing Laboratories™ (BTL) Listing** — Ensures interoperability with other BTL-listed devices. BTL is a third-party agency that ensures BAS vendor products meet the BACnet industry-standard protocol.

Network Diagram with Field Controllers

Figure 2: BCPro System with PC Controllers



Integration to BACnet Routers

The PC family is designed to integrate seamlessly into the BCPro system by connecting and communicating to the BCPro Workstation through BACnet Routers. This seamless integration enables building operators to monitor and adjust PC controllers directly from the BCPro system UI.

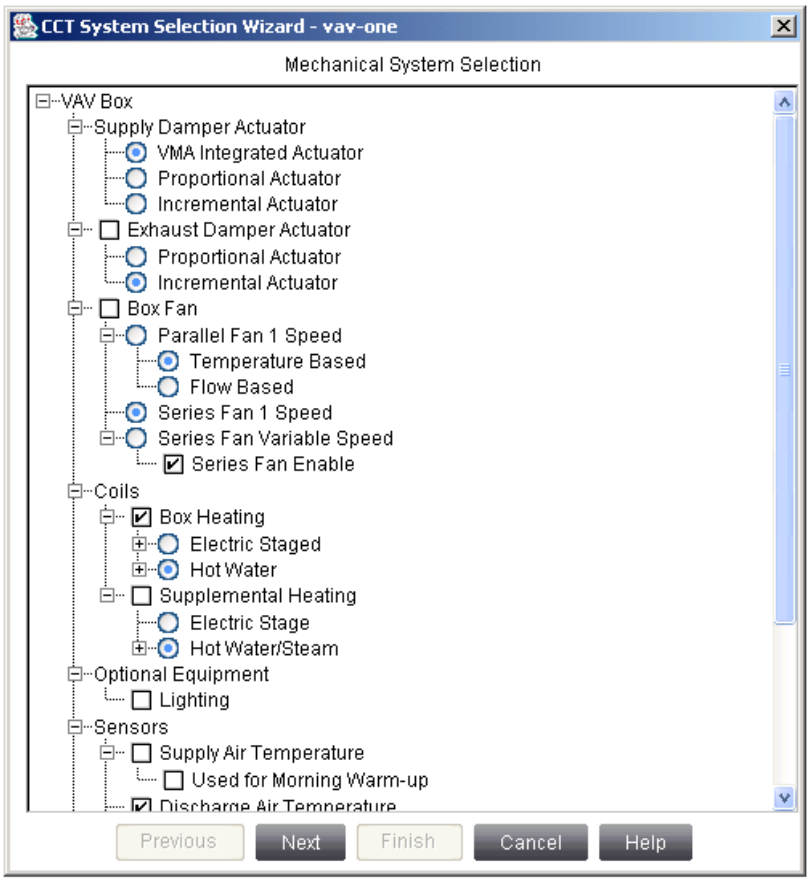
In addition, service personnel can view PC controller information locally through the local controller display (FX-DIS1710-0) available for field controllers or through the optional Mobile Access Portal (MAP) Gateway.

Controller Configuration Tool (CCT)

The CCT is used in conjunction with the Facility Explorer system to configure, simulate, and commission the PCA family of controllers.

Configuration mode allows you to select a number of mechanical and control logic options through System Selection Trees for typical air handling, terminal unit, VAV box, and central plant mechanical systems. When required, you can customize the standard logic provided by the system selection process to meet your specialized control logic requirements. Configuration mode also allows you to customize certain display options available to PC Controllers that use a local controller display.

Figure 3: Mechanical Selection in CCT



Simulation mode allows you to review, run, or simulate the application logic as if you were commissioning a live system. You can make adjustments to setpoints, inputs, or sensors during a simulation session to validate the logic before assigning the configuration to a specific controller.

Commissioning mode manages the downloading of files to the field equipment controllers through multiple network connection points. You can connect using the MAP Gateway, the BTCVT between your laptop and the MS/TP or N2 Field Bus, or using the Ethernet Passthru mode in conjunction with the SCT through a FX Supervisory Controller.

ⓘ **Note:** Ethernet Passthru is not available on controllers configured for N2 communications.

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

After downloading the controllers, you can use the CCT Commissioning mode to validate the sensor and control point interfaces and adjust key setpoints and setup parameters (Figure 4).

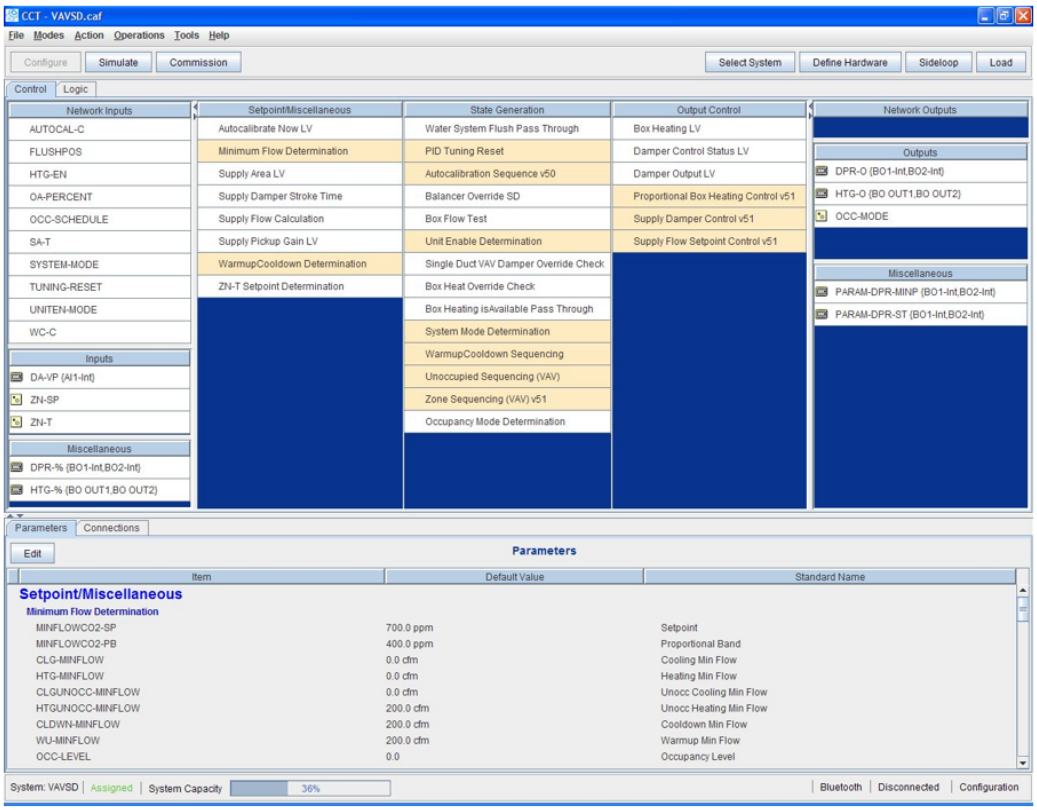
CCT includes integrated productivity features with utilities to facilitate mass application uploads and downloads, including upgrades of entire trunks of controllers with just a few mouse clicks. Template files provide an intuitive method of reading and writing configuration parameters to multiple controllers, reducing the time it takes to commission your field controller networks.

For VAV applications, CCT features an optional box flow test to automatically exercise all the VAV boxes to ensure correct mechanical installation and proper configuration of the key flow setup parameters. Additionally, the Facility Explorer system provides multiple configurations of room network sensors and a handheld VAV balancing tool that can be used to perform VAV balancing tasks.

In addition, the Commissioning wizard has a Balancer tab for VAV applications to easily auto-calibrate VAV boxes and set flow constants in one location.

A Commissioning-mode-only version of the CCT software is available to the Johnson Controls branch offices for jobs or individuals that require only commissioning tasks (for example, balancing contractors). The Configuration and Simulation modes are disabled in the CCT Commissioning software.

Figure 4: CCT User Interface



Features

- Capability to customize standard control system logic that is created from simple system selection trees.
- Consistent user interface across the Configuration, Simulation, and Commissioning modes.

- Flexible connection capabilities for loading and commissioning controllers.

PC Programmable Controller Family

All PC Controllers run pre-engineered or user-programmed applications and provide the I/O required to monitor and control a wide variety of HVAC equipment.

This family of programmable controllers is designed to install easily and communicate through standard BACnet MS/TP enabling you to build an almost endless variety of field controller network applications, ranging from simple fan coil, heat pump, or VAV control applications to very advanced central plant management and stand-alone applications.

➽ **Important:** Some CH-PC controllers are also compatible with the FX system. Refer to *PC Series Programmable Controllers and Related Products for use with FX in the Asia Region Product Bulletin (LIT-12013279)* for further details.

PC Series Controller Features

Features and benefits common to the PCA and PCX Series controllers include the following:

- 32-bit microprocessor ensures optimum performance and meets industry specifications.
- BACnet MS/TP Protocol supports seamless integration into Johnson Controls and third-party BACnet devices.
- MS/TP Field Controllers have an integral end-of-line (EOL) switch that enables field controllers to be terminating devices on the communications bus.
- Pluggable communications bus and supply power terminal blocks expedite installation and troubleshooting.

Additional features and benefits common to the PCA controllers include the following:

- Patented technologies including Proportional Varying Deadzone Control (PVDC), Pattern Recognition Adaptive Control (PRAC+), and Pulse Modulation Adaptive Control (PMAC) provide continuous loop tuning.
- Writable flash memory allows standard or customized applications to be downloaded from the CCT and enables persistent application data.
- Product family provides a range of point mix to meet application requirements and allows for the addition of one or more PCXs or NS Series Network Sensors to provide even more I/O capacity.

Communications Protocol

The PC Series Family Controllers and network sensors communicate using the standard BACnet protocol, based on the ANSI/ASHRAE 135-2008. The BACnet protocol is a standard for ANSI, ASHRAE, and the International Standards Organization (ISO) for building controls.

PCXand PCV controllers are BTL-listed as BACnet Application Specific Controllers (B-ASCs). PCAcontrollers are BTL-listed as BACnet Advanced Application Controllers (B-AACs).

Hardware and Installation

PC Series controllers are encased in a durable, plenum-rated, plastic housing. The plastic housing may eliminate the need for a separate enclosure for plenum-rated construction. Check regional, national, and local code requirements for appropriate applications.

An integral EOL switch on each MS/TP PC Series controller allows you to enable the controller as a bus terminating device, which when properly configured, reduces reflected noise on the bus and improves bus communication.

Each MS/TP PC Series controller has an easily accessible, eight-position DIP switch that allows you to set a valid and unique device address for each controller on the bus. A blank space is included on the controller cover for recording the device address.

The BACnet/IP field controllers feature rotary switches to give each controller a unique number on the subnet where it resides, to identify it in CCT for uploading, downloading, and commissioning.

PC Series controllers feature removable, color-coded, keyed, and labelled terminal block plugs for the supply power and communications bus terminations. Most models have fixed, color-coded, and labelled terminal blocks for the input and output terminations, which facilitate installing and servicing the controllers.

On PCA and PCX Series Controllers, integral mounting clips and a DIN rail track on the controller back-plate allow you to easily mount the controller either on a horizontal section of 35 mm DIN rail or directly to a wall or flat vertical surface.

PCA Programmable Controllers

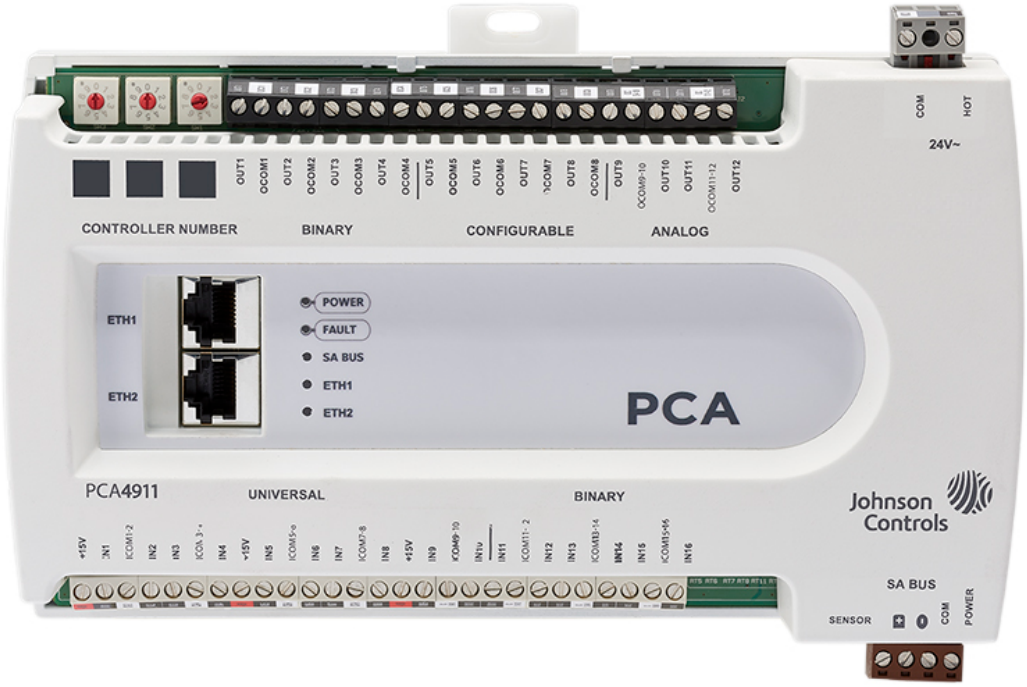
PCA Series Controllers are programmable controllers that can communicate using BACnet. The PCA2513, PCA3613, and PCA4911 Programmable Controllers offers more advanced features than the other PC Controllers. PCA features an integral real-time clock and support time-based tasks, which together enable these field controllers to monitor and control schedules, calendars, alarms, and trends. PCAs can continue time-based control and monitoring when offline for extended periods of time from a system network. The PCAs include RS-485 field bus networking with BACnet MS/TP protocols.

PCA controllers can be combined with PCX Expansion I/O Modules to gain more I/O interfaces, if needed. PCAs and their advanced features make them well suited for monitoring and controlling a wide range of more complex equipment (such as airhandlers and central plants).

The PCA Series Controllers can also operate as stand-alone controllers in applications that do not require a networked supervisory device or for network applications where it is preferred to have the scheduling, alarming, and/or trending performed locally in the field controllers.

The PCA2513 and PCA3613 are programmable controllers. They are BACnet Application Specific Controllers (B-ASC) with integral MS/TP communications. These controllers run pre-engineered and user-programmed applications and provide the inputs and outputs required to monitor and control a wide variety of HVAC equipment. A PCA2513 or PCA3613 controller combined with the PCX models can be applied to a wide variety of building applications ranging from simple fan coil or heat pump control to advanced central plant management.

Figure 5: PCA4911 General Purpose Programmable Controller



PCA Series Point Type Counts Per Model

Table 1: PCA Series Point Type Counts per Model

Product Code Number	Description	PCA2513	PCA3613	PCA4911
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	8	10
Binary Input (BI)	Dry Contact Maintained Mode Pulse Counter/Accumulator Mode (High Speed), 100 Hz	6	6	6
Analog Output (AO)	Analog Output, Voltage Mode, 0–10 VDC Analog Current Mode, 4–20 mA	2	6	4

Table 1: PCA Series Point Type Counts per Model

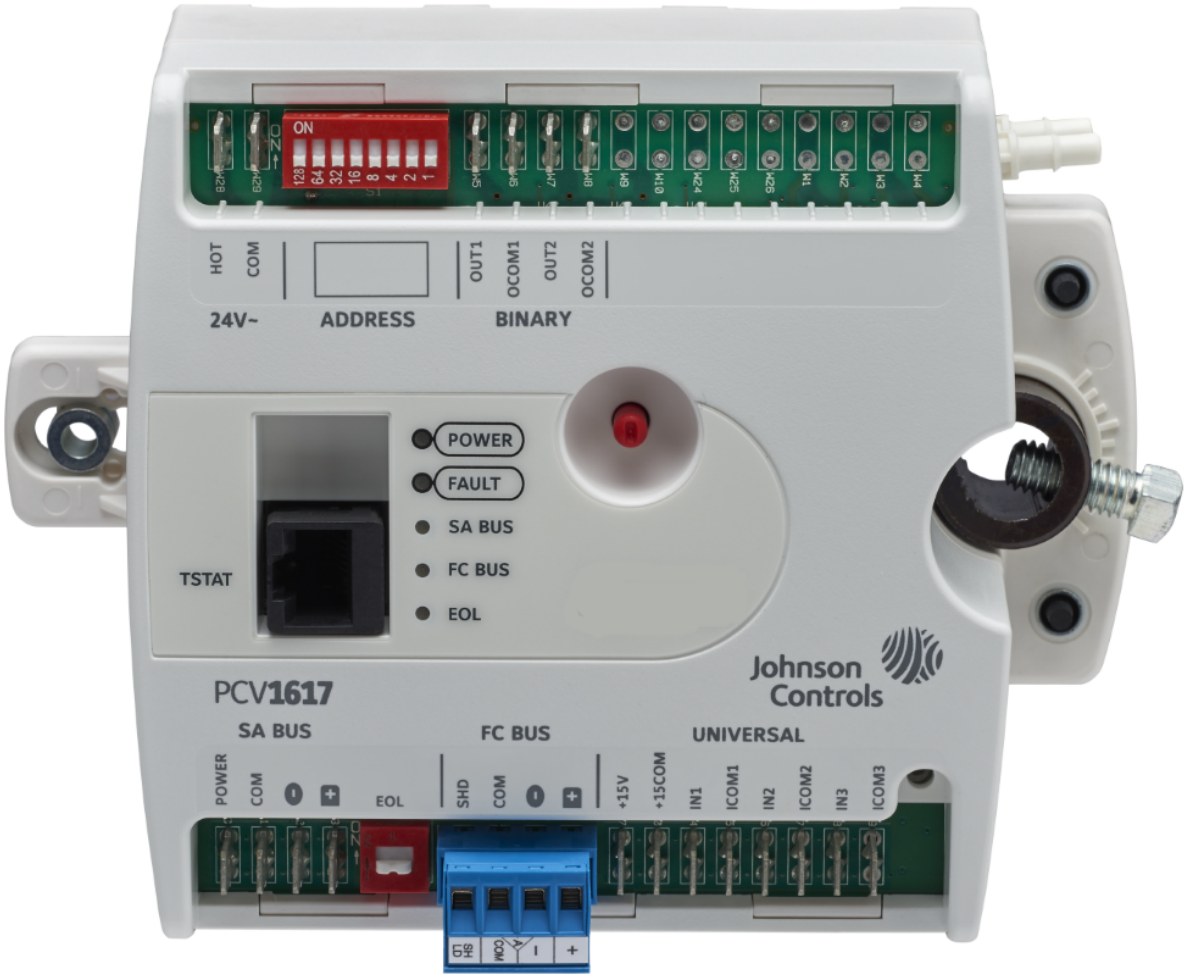
Binary Output (BO)	24 VAC Triac	2 (Ext Power Only)	6	4
Configurable Output	Analog Output, Voltage Mode 0–10 VDC 4 Binary Output Mode, 24 VAC Triac	2		4

PCV Programmable VAV Box Controller series

The PCV1632 and PCV1617 controllers feature an integral digital differential pressure transducer (DPT), an integral damper actuator, and a 32-bit microprocessor. The controllers' small package size facilitates quick field installation and efficient use of space, while not compromising high-tech control performance. These controllers easily adapt NS Series Network Sensors for zone and discharge air temperature sensing.

The PCV1930 programmable controller uses BACnet/IP networking for higher speed communication with the CCT and improved bandwidth. This gives you more flexibility in choosing controllers for your site's specific needs.

Figure 6: PCV1617 Controller



In addition to the features and benefits listed in PC Series Controller Features, PCVs provide the following:

- Three universal inputs that allow an increased number of low cost sensor options.
- A state-of-the-art, digital non-flow pressure sensor to provide 14-bit resolution with bidirectional flow operation that supports automatic correction for polarity on high- and low-pressure DP tube connections. This pressure sensor eliminates high- and low-pressure connection mistakes.
- A fast response actuator that drives the damper from full open to full closed (90°) in 60 seconds to reduce commissioning time.

PCV Series Point Type Counts Per Model

Table 2: PCV series point type counts per model

Point types	Signals accepted	PCV1617	PCV1632	PCV1930
Modular Jacks		8-pin SA Bus supports analog non-communicating sensor		6-pin SA Bus with four communicating sensors and 6-pin FC Bus for tool supportr
Universal Input (UI)	Analog Input, Voltage Mode, 0–10 VDC Analog Input, Resistive Mode, 0–2k ohm, RTD (1k NI [Johnson Controls], 1k PT, A998 SI), NTC (10k Type L, 2.252k Type 2) Binary Input, Dry Contact Maintained Mode	3	3	3
Binary Output (BO)	24 VAC Triac	2	3	3
Configurable Output (CO)	Analog Output, Voltage Mode, 0–10 VDC Binary Output Mode, 24 VAC Triac		2	2
Integrated Actuator	Internal	1	1	1
Integrated Flow Sensor	Internal	1	1	1
Zone Sensor Input	On SA Bus	Up to 4 NS Series Network Zone Sensors		

PCX Expansion Input/Output Module

The PCXs are expansion I/O modules with integral RS-485 MS/TP communications.

PCXs can serve in one of two capacities, depending on where they are installed in the control system. When installed on the Sensor Actuator (SA) Bus of PCA and PCX controllers, the PCXs expand the I/O interfaces of the controllers. When installed on the Field Controller (FC) Bus, PCXs can be used as I/O point multiplexors to support monitoring and control from a BCPro Workstation.

A full range of PCA models combined with the PCX models can be applied to a wide variety of building applications ranging from simple fan coil or heat pump control to advanced central plant management.

Figure 7: PCX Models

PCX Series Point Type Counts Per Model

Table 3: PCX Series Point Type Counts Per Model

Point Types	Signals Accepted	PCX 2723	PCX 3723	PCX 3733
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	8		
Binary Input (BI)	Dry Contact Maintained Mode Pulse Counter/Accumulator Mode (High Speed), 100 Hz		16	8
Analog Output (AO)	Analog Output, Voltage Mode, 0–10 VDC Analog Output, Current Mode, 4–20 mA	2		
Binary Output (BO)	24 VAC Triac (Ext Power Only)			8

Mobile Access Portal (MAP) Gateway

The MAP Gateway is a pocket-sized web server that provides a wireless mobile user interface to SMART Equipment and Johnson Controls branded system controllers and thermostats. Small, lightweight, and easy to use, the MAP Gateway joins the rapidly expanding list of Johnson Controls products that leverage the power of mobility and smart devices to improve daily operations.

The MAP Gateway can be used to access field bus devices on *Metasys*® systems, BCPro™ systems, Facility Explorer systems, and SMART Equipment rooftop units (RTUs) with unit control boards (UCBs). The MAP Gateway supports Johnson Controls branded Field Controllers, including PCA, PCV and PCX Series devices. It also supports the TEC3000 Series Thermostats. Offering many-to-one,

multi-client connectivity, the MAP Gateway provides access to any SMART Equipment device that is on a connected BACnet MS/TP field bus. The MAP Gateway solution is conveniently sized and has a built-in wireless access point. The MAP Gateway provides an intuitive, browser-based user interface to access advanced features like alarms and point configuration.

For more information on the MAP Gateway, refer to the *Mobile Access Portal Gateway Product Bulletin (LIT-12011884)*.

Figure 8: Mobile Access Portal

Handheld VAV Box Balancing Tool (FX-ATV7003)

The Handheld VAV Box Balancing Tool (FX-ATV7003) lets you set the parameters for VAV box applications that reside on PC Series Controllers.

The VAV box balancing parameters appear on the tool's LCD. A dial and two buttons let you navigate through intuitive menus to balance the VAV box. The menus are customized to the type of application that resides in the controller. The balancing operation features an adjustable time-out parameter that returns the tool and controller to normal operation if you leave the controller in balancing mode.

The Handheld VAV Box Balancing Tool is lightweight and portable. It can plug into any model of network sensor to access the VAV box controller.

The Handheld VAV Box Balancing Tool is compatible with the following PCV Series devices:

- PCV loaded with a VAV application
- NS Series Network Sensor connected to a PCV loaded with a VAV box application
- FX-DIS1700 local controller display

Figure 9: Handheld VAV Box Balancing Tool

Features

The Handheld VAV Box Balancing Tool provides the following features:

- Allows VAV box balancing and commissioning without a laptop.
- Connects directly to the controller or the controller NS Series Network Sensor through standard RJ-12 plug.
- Intuitive, menu-driven operation simplifies balancing tasks.

Network Sensors

The NS Series Network Sensor offering includes NS Series Network Zone Sensors and NS Series Network Discharge Air Sensors, see Figure 10.

Figure 10: Network Zone Sensors and Discharge Air Sensors

The NS Series Network Zone Sensors are designed to function directly with PC Series Controllers. Several models of network zone sensors monitor room temperature. Options are available to also

monitor zone humidity, carbon dioxide (CO_2), occupancy local temperature setpoint adjustments, and other variables. This data is transmitted to a PC controller on the SA Bus.

The NS Series Network Zone Sensors include models with a temperature setpoint dial and LCD that allows occupants to view the zone temperature and view and adjust the zone temperature setpoint. A fan mode pushbutton is included to set the desired fan speed (AUTO-OFF-low-medium-high). An occupancy override function allows the user to signal the controller that the zone is occupied to override the scheduled mode. Some models have DIP switches to set a unique address for applications that require multiple sensors.

For communication wiring flexibility, the wires connecting the network zone sensor to a controller can be terminated using a modular jack or screw terminals.

Each network zone sensor includes an SA Bus access port to allow accessories to access the SA Bus. This plug allows accessories to service or commission the connected controller or gain access to any other controller on the same FC Bus.

The NS Series Network Discharge Air Sensors are electronic duct sensors designed to function directly with the PC controllers. Models in this series monitor the duct temperature, typically at the discharge of the VAV box, and transmit this data to a PC controller on the SA Bus using the 305 cm (10 ft) wiring lead included with the unit. The 305 cm (10 ft) wiring lead consists of four 22 AWG trade size color-coded wires encased in a plenum-rated jacket. Each of the wires is stripped and tinned for easy connection to the SA Bus screw terminal block.

The NS Series Network Discharge Air Sensors are available with either a 102 or 203 mm (4 or 8 in.) temperature probe. All models include DIP switches for applications requiring multiple discharge air sensors, each with a unique DIP switch address.

Refer to the *NS Series Network Sensors Product Bulletin (LIT-12011574)* for important product application information, ordering information, and technical specifications.

Repair Information

If a PC Series Controller, network sensor, or any related product fails to operate within its specifications, replace the product. For replacement products, contact the nearest Johnson Controls representative.

Ordering Information

PCA Series Ordering Information

Table 4: PCA series ordering information

Product code number	Description
CH-PCA2513-0	16-Point Advanced Application Programmable Controller with 4 UI, 6 BI, 2 AO, 2 BO, and 2 CO; 24 VAC; FC and SA Bus Support; Integral Real-time Clock.
CH-PCA3613-0	26-Point Advanced Application Programmable Controller with 8 UI, 6 BI, 6 BO, and 6 AO; 24 VAC; SA Bus; FC Bus; Integral Real-time Clock; Improved Fast Persistence.
CH-PCA4911-0	28-Point Advanced Application Programmable Controller with 10 UI, 6 BI, 4 AO, 4 BO, and 4 CO; 24 VAC; SA Sensor Port; Integral Real-time Clock; 2 Ethernet Ports for BACnet/IP Communications

PCX Series Ordering Information

Table 5: PCX Series Ordering Information

Product Code Number	Description
CH-PCX2723-0	10-Point Expansion I/O Module with 8 UI, 2 AO, FC, and SA Bus Support.
CH-PCX3723-0	16-Point Expansion I/O Module with 16 BI, FC, and SA Bus Support.
CH-PCX3733-0	16-Point Expansion I/O Module with 8 BI, 8 BO, FC, and SA Bus Support. ⓘ **Note:** BOs on the CH-PCX3733-0 controller do not supply power for the outputs; the BOs require external low-voltage (<30 VAC) power sources.

PCV Series Ordering Information

Table 6: PCV Series Ordering Information

Product code number	Description
CH-PCV1617-0	32-bit, integrated VAV controller/Actuator/DPT, 3 UI and 2 BO; 24 VAC; FC Bus, and SA Bus, includes 8-pin TSTAT Port for use with TE-7xx Series Non-Communicating Sensors.
CH-PCV1632-0	32-bit, Integrated VAV Controller/Actuator/DPT, 3 UI, 3 BO, and 2 CO; 24 VAC; FC Bus, and SA Bus, Includes 8-pin TSTAT Port for use with TE-7xx Series Non-Communicating Sensors.
CH-PCV1930-0	32-bit, Integrated VAV Controller/Actuator/DPT, 3 UI, 3 BO, and 2 CO; 24 VAC; and SA Sensor Port; Integral Real-time Clock; 2 Ethernet Ports for BACnet/IP Network Communications

CH-PC Family Accessories Ordering Info

Table 7: PC Family Accessories (Order Separately)

Product Code Number	Description
TL-MAP 1801-OP	Portable MAP Gateway for US/Canada - includes MAP Gateway, RJ-12 cable, bumper guard, and lanyard
TL-MAP1810-0S	Stationary MAP Gateway for US/Canada - includes MAP Gateway, field bus adapter, mounting bracket, and AC power supply. (Adapters for the power supply may vary by country.)
TL-MAP1810-0PE	Portable MAP Gateway - for Europe (All EU Countries); Middle East (UAE and Qatar)
TL-MAP1810-0PA	Portable MAP Gateway - for Asia (China, Japan, Australia, New Zealand, India, Hong Kong, Singapore, Thailand)
FX-ATV7003-0	Handheld VAV Box Balancing Tool
NS Series Sensors	NS Series Network Sensors: Refer to the *NS Series Network Sensors Product Bulletin (LIT-12011574)* for specific sensor model descriptions.
Y64T15-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 92 VA, Foot Mount, 30 in. Primary Leads and 30 in. Secondary Leads, Class 2

Table 7: PC Family Accessories (Order Separately)

Product Code Number	Description
Y65A13-0	Transformer, 120 VAC Primary to 24 VAC Secondary, 40 VA, Foot Mount (Y65AS), 8 in. Primary Leads and 30 in. Secondary Leads, Class 2
Y65T42-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 40 VA, Hub Mount (Y65SP+), 8 in. Primary Leads and Secondary Screw Terminals, Class 2
Y65T31-0	Transformer, 120/208/240 VAC Primary to 24 VAC Secondary, 40 VA, Foot Mount (Y65AR+), 8 in. Primary Leads and Secondary Screw Terminals, Class 2
AP-TBK4SA-0	Replacement MS/TP SA Bus Terminal, 4-Position Connector, Brown (Bulk Pack of 10)
AP-TBK4FC-0	Replacement MS/TP FC Bus Terminal, 4-Position Connector, Blue (Bulk Pack of 10)
AP-TBK3PW-0	Replacement Power Terminal, 3-Position Connector, Gray (Bulk Pack of 10)
AS-CBLVMA-1	Cable Adapter, 8-Pin Female Socket to 6-Pin Male Jack (Bulk Pack of 10)
AS-CBLVMA-2	Cable Adapter, 8-Pin Female Socket to 8-Pin Male Jack with 6-Pin Female Socket for Wireless Commissioning Converter (Bulk Pack of 10)
MS-TBKLV03-0	Terminal Block Kit - CH-PCA Line Voltage AC Power - 3 Pieces
MS-TBKRO02-0	Terminal Block Kit - CH-PCA 2-Position Relay Output - 9 Pieces
MS-TBKRO03-0	Terminal Block Kit - CH-PCA 3-Position Relay Output - 6 Pieces
MS-TBKCO04-0	Terminal Block Kit - CH-PCA 4-Position Configurable Output - 6 Pieces
MS-TBKUI04-0	Terminal Block Kit - CH-PCA 4-Position Universal Input - 3 Pieces
MS-TBKUI05-0	Terminal Block Kit - CH-PCA 5-Position Universal Input - 3 Pieces
NS-WALLPLATE-0	Network Sensor Wall Plate
FX-DIS1700	Local Controller Display
AS-CBLSTAT-0	Cable adapter for connecting to 8-pin TE-6700Series sensors

Technical Specifications

PCA Series Technical Specifications

Table 8: PCA Technical Specifications

Product Code Numbers	**CH-PCA2513-0** **CH-PCA3613-0** **CH-PCA4911-0**
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 ratings do **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).

Table 8: PCA Technical Specifications

Ambient Conditions	**Operating:** 0°C to 50°C (32°F to 122°F); 10% to 90% RH noncondensing; Pollution Degree 2 **Storage:** -40°C to 80°C (-40°F to 176°F); 5% to 95% RH noncondensing
Controller 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 CH-PC controllers 4-wire SA Bus between CH-PC controller, NS Series Network Sensors, and other sensor/actuator devices, includes a lead to source 15 VDC supply power (from CH-PC 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. Enable monitoring and controlling schedules, calendars, alarms, and trends.
Processor	RX630 32-Bit Renesas® microcontroller
Memory	16 MB Flash Memory and 8 MB SDRAM
Input and Output Capabilities	**CH-PCA2513-0:** 4 - Universal Inputs: Defined as 0–10 VDC, 0–600k ohm, or Binary Dry Contact 6 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/ Accumulator Mode 2 - Binary Outputs: Does not have internal 24 VAC source, external power is required 2 - Configurable Outputs: Defined as 0–10 VDC or 24 VAC Triac BO 2 - Analog Outputs: Defined as 0–10 VDC
	CH-PCA3613-0: 8 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0-600k ohms, or Binary Dry Contact 6 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/ Accumulator Mode 6 - Binary Outputs: Defined as 24 VAC Triac (external power source only) 6 - Analog Outputs: Defined as 0–10 VDC or 4–20 mA
	CH-PCA4911-0: 10 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0-600k ohms, or Binary Dry Contact 6 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/ Accumulator Mode 4 - Analog Outputs: Defined as 0–10 VDC or 4–20 mA 4 - Binary Outputs: Defined as 24 VAC Triac (external power source only) 4 - Configurable Outputs: Defined as AO mode, 0-10 VDC or BO mode, 24VAC
Analog Input/ Analog Output Resolution and Accuracy	**Analog Input:** 15-bit resolution **Analog Output:** 15-bit resolution and ±200 mV in 0–10 VDC applications

Table 8: PCA Technical Specifications

Terminations	**Input/Output:** Fixed Screw Terminal Blocks **FC Bus, SA Bus, and Supply Power:** 3-wire and 4-wire Pluggable Screw Terminal Blocks **FC Bus and SA Bus:** RJ-12 6-pin Modular Jacks
Mounting	Horizontal on single 35 mm DIN rain mount (preferred), or screw mount on flat surface with three integral mounting clips on controller
Housing	Plenum-rated Protection Class: IP20 (IEC529) **CH-PCA2513**: Enclosure material: ABS and polycarbonate; Rating V0 minimum **CH-PCA3616 and CH-PCA4911**: Enclosure material: ABS and polycarbonate UL94 5VB; self-extinguishing
Dimensions (Height x Width x Depth)	150 mm x 224 mm x 57.5 mm (5-7/8 in. x 8-3/4 in. x 2-1/4 in.) including terminals and mounting clips
Weight	0.5 kg (1.1 lb)
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: CE Mark – 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:CH-PCA3616 and CH-PCA2513 - BACnet Testing Laboratories™ Protocol Revision 12 Advanced Application Controller (B-AAC) **CH-PCA4911** - BACnet Testing Laboratories™ (BTL) Protocol Revision 15 Listed and Certified BACnet Advanced Application Controller (B-AAC), based on the ANSI/ASHRAE 135-2016

PCX Series Technical Specifications

Table 9: PCX Series Technical Specifications

Product Code Numbers	**CH-PCX2723-0** - 10-Point Expansion Input/Output Module with 8 UI, 2 AO, FC and SA Bus Support **CH-PCX3723-0** - 16-Point Expansion Input/Output Module with 16 BI, FC and SA Bus Support **CH-PCX3733-0** - 16-Point Expansion Input/Output Module with 8 BI, 8 BO, FC and SA Bus Support
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

Table 9: PCX Series Technical Specifications

Power Consumption	14 VA maximum ⓘ **Note:** VA ratings do 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), depending on the CH-PCX model.
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
BACnet/MS/TP Addressing	DIP switch set; valid controller device addresses 4–127 (Device addresses 0–3 and 128–255 are reserved and not valid CH-PCX addresses).
Communications Bus	BACnet MS/TP, RS-485 3-wire FC Bus between the supervisory controllers and CH-PC controllers 4-wire SA Bus between CH-PC controller, NS Series Network Sensors, and other sensor/actuator devices. Includes a lead source 15 VDC supply power (from CH-PC controller) to bus devices.
Processor	RX631 Renesas® 32-bit microcontroller
Memory	4 MB External Serial Flash Memory
Input and Output Capabilities	**CH-PCX2723:** 8 - Universal Inputs: Defined as 0–10 VDC, 4–20 mA, 0–600k ohm, or Binary Dry Contact 2 - Analog Outputs: Defined as 0–10 VDC or 4–20 mA
	CH-PCX3723: 16 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/ Accumulator Mode
	CH-PCX3733: 8 - Binary Inputs: Defined as Dry Contact Maintained or Pulse Counter/ Accumulator Mode 8 - Binary Outputs: Defined as 24 VAC Triac (Require external low-voltage power source) ⓘ **Note:** Binary Outputs (BOs) on CH-PCX3733 controllers do not supply power for the outputs; the BOs require external low-voltage (< 30 VAC) power sources
Analog Input/ Analog Output Resolution and Accuracy	**Analog Input:** 15-bit resolution **Analog Output:** 15-bit resolution and ±200 mV in 0–10 VDC applications
Terminations	**Input/Output:** Fixed Screw Terminal Blocks ⓘ **Note:** There are no labels on I/O terminal blocks. The labels are above/ below the terminal blocks on the PCX packaging. SA/FC Bus and Supply Power: 4-wire and 3-wire Pluggable Screw Terminal Blocks SA/FC Bus Port: RJ-12 6-Pin Modular Jacks
Mounting	Horizontal on single 35 mm DIN rail mount (preferred), or screw mount on flat surface with three integral mounting clips on controller

Table 9: PCX Series Technical Specifications

Housing	**Enclosure material:** ABS and polycarbonate UL94 5VB; self-extinguishing, Plenum-rated protection class: IP20 (IEC529)
Dimensions (Height x Width x Depth)	150 mm x 164 mm x 53 mm (5-7/8 in. x 6-7/16 in. x 2-1/8 in.) including terminals and mounting clips ⓘ **Note:** Mounting space for all controllers requires an additional 50 mm (2 in.) space on top, bottom, and front face of controller for easy cover removal, ventilation, and wire terminations.
Weight	0.5 kg (1.1 lb) maximum
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: CE Mark – 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™ Protocol Revision 12 Listed BACnet Advanced Application Controller (B-AAC)

PCV Series Technical Specifications

Table 10: PCV series technical specifications

Product Code Numbers	**CH-PCV1617-0:** 32-bit, Integrated VAV Controller, Actuator, Pressure Sensor, 3 UI and 2 BO, 24 VAC; FC and SA Bus; also includes 8-pin TSTAT Port for use with TE-7xx Series Non-Communicating Sensors **CH-PCV1632-0:** 32-bit, Integrated VAV Controller, Actuator, DPT, 3 UI, 3 BO, 2 CO, 24 VAC; FC and SA Bus; also includes 8-pin TSTAT Port for use with TE-7xx Series Non-Communicating Sensors **CH-PCV1930-0**: 32-bit, Integrated VAV Controller/Actuator/DPT, 3 UI, 3 BO, and 2 CO; 24 VAC; and SA Sensor Port; Integral Real-Time Clock; 2 Ethernet Ports for BACnet/IP Network Communications
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	10 VA typical, 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 60 VA (maximum).
Ambient Conditions	**Operating:** 0°C to 50°C (32°F to 122°F) **Storage:** -40°C to 70°C (-40°F to 158°F)

Table 10: PCV series technical specifications

Terminations	**CH-PCV1617 and CH-PCV1632:** Inputs/Outputs, SA Bus, and Supply Power: 6.3 mm (1/4 in.) Spade Lugs FC Bus Pluggable Screw Terminal Block TSTAT Modular Port: RJ-45 8-Pin Modular Jack **CH-PCV1930:** Inputs/Outputs: 6.3 mm (1/4 in.) Spade Lugs SA Bus and Supply Power: 4-Wire and 2-Wire Pluggable Screw Terminal Blocks SA Bus Modular Ports: RJ-12 6-Pin Modular Jacks
Controller 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	**CH-PCV1617 and CH-PCV1632:** **RS-485**- 3-wire FC Bus between the supervisory controller and CH-PC 4-wire SA Bus from the CH-PCV controller, NS Series Network Sensors, and other sensor/actuator devices, includes a terminal to source 15 VDC supply power from CH-PCV to SA Bus devices. **CH-PCV1930:BACnet/IP**- Two Ethernet ports; 10/100 Mbps; 8-pin RJ-45 connector
Processor	**CH-PCV1617 and CH-PCV1632**: RX630 32-bit Renesas microcontroller **CH-PCV1930**: RX63N 32-bit Renesas microcontroller
Memory	**CH-PCV1617 and CH-PCV1632**:1 MB Flash Memory and 512 KB RAM **CH-PCV1930**: 16 MB serial flash memory and 8 MB of SDRAM
Analog Input/ Analog Output Accuracy	**Analog Input:** 15-bit resolution on UIs **Analog Output:** 0–10 VDC ± 200 mV
Air Pressure Differential Sensor	Range: -1.5 in. to 1.5 in. W.C. **Performance Characteristics:** Accuracy: ±0.75% Full Span Maximum (±0.0225 in. W.C.) Typical accuracy at zero (null) pressure is ±0.003 in. W.C.
Mounting	Mounts to damper shaft using single set screw and to duct with single mounting screw.
Actuator Rating	4 N•m (35 lb•in.) minimum shaft length = 44 mm (1-3/4 in.)

Table 10: PCV series technical specifications

Dimensions	**(Height x Width x Depth):** 165 mm x 125 mm x 73 mm (6.5 in. x 4.92in. x 2.9 in.) **Center of Output Hub to Center of Captive Spacer:** 135 mm (5-5/16 in.)
Weight	0.65 kg (1.45 lb)
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: CE Mark – 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: **CH-PCV1617 and CH-PCV1632**: BACnet Testing Laboratories (BTL) Protocol Revision 7 Listed BACnet Application Specific Controller (B-ASC) **CH-PCV1930**: BACnet Testing Laboratories (BTL) Protocol Revision 15 Listed BACnet Advanced Application Controller (B-AAC)

Handheld VAV Box Balancing Tool Technical Specifications

Table 11: Handheld VAV Box Balancing Tool Technical Specifications

Product Code	FX-ATV7003-0
Supply Voltage	9.8 to 16.5 VDC; 15 VDC Nominal, supplied by the Sensor Actuator (SA) Bus Port
Current Consumption	90 mA maximum
Terminations	RJ-12, 6-Position Modular Jack
Transmission Speed	**Serial Communication (SA Bus)** 9600, 19.2k, 38.4k, or 76.8k bps
Sensor Addressing	Fixed address of 198
Ambient Conditions	**Operating:** 0°C to 50°C (32°F to 122°F); 5% to 95% RH, Noncondensing; 30°C (86°F) Maximum Dew Point **Storage:** -40°C to 85°C (-40°F to 185°F); 5% to 95% RH, Noncondensing
Dimensions	80 mm x 80 mm x 25 mm (3.2 in. x 3.2 in. x 1.0 in.)
Weight	0.165 kg (0.365 lb)
Compliance	**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, ICES-003

Table 11: Handheld VAV Box Balancing Tool Technical Specifications

CE	**Europe:** CE Mark – 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) 135-2004 Listed BACnet Smart Sensor (B-SS)

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 shall not be liable for damages resulting from misapplication or misuse of its products.