

Compact Series Unitary Equipment Controller



Figure 1. PXC Compact Series Unitary Equipment Controllers (PXC UEC-16/24).

Description

The PXC Compact Series Unitary Equipment Controller (Programmable Controller–Compact) for BACnet networks is a high-performance Direct Digital Control (DDC) equipment controller, which is an integral part of the APOGEE Automation System. The controllers are classified as a BACnet Advanced Application Controller (B-AAC) with support for BACnet MS/TP protocol.

The PXC Compact UEC Series offers integrated I/O based on state-of-the-art TX-I/O™ Technology, which provides superior flexibility of point and signal types, and makes it an optimal solution for Air Handling Unit (AHU) control.

The Unitary Equipment Controller communicates with other field panels or workstations on a peer-to-peer Automation Level Network (ALN), or on the Field Level Network (FLN), and supports the following communication options:

- Native BACnet MS/TP on RS-485

Features

- BACnet Testing Laboratories (BTL) certified Classified as BACnet Advanced Application Controllers (B-AAC) using the BACnet MS/TP protocol for specific models.
- Sophisticated Adaptive Control, a closed loop control algorithm that auto-adjusts to compensate for load/seasonal changes.
- Message control for terminals, printers, pagers, and workstations.
- HMI RS-232 and USB port, which provides laptop connectivity for local operation and engineering.
- Extended battery backup of Real Time Clock.
- Auto Save and persistent database backup and restore within the controller.
- PXM10T and PXM10S support: Optional LCD Local user interface with HOA (Hand-off-auto) capability and point commanding and monitoring features.
- An extended temperature range for the control of rooftop devices.

Compact Series Unitary Equipment Controller

The PXC Unitary Equipment Controller (UEC) is an MS/TP device, that can be configured as a programmable, stand-alone device or as a networked device on the BACnet MS/TP ALN (Automation Level Network) or FLN (Field Level Network) device.

PXC UEC-16

The PXC UEC-16 provides control for 16 points, including 8 software-configurable universal points.

Point count includes: 3 Universal Input (UI), 5 Universal I/O (U), 2 Digital Input (DI), 3 Analog Output (AOV), and 3 Digital Output (DO).

PXC UEC-24

The PXC UEC-24 provides control for 24 points, including 16 software-configurable universal points.

Point count includes: 3 Universal Input (UI), 9 Universal I/O (U), 4 Super Universal I/O (X), 3 Analog Output (AOV), 5 Digital Output (DO).

Extended Temperature Operation

The PXC Compact UEC "R" models support extended temperature operation, allowing for rooftop installations.

Hardware

The PXC Compact Series consists of the following major components:

- Input/Output Points
- Power Supply
- Controller Processor

Input/Output Points

- The PXC Compact input/output points perform A/D or D/A conversion, signal processing, point command output, and communication with the controller processor. The terminal blocks are removable for easy termination of field wiring.
- The Universal and Super Universal points leverage TX-I/O™ Technology from Siemens Building Technologies to configure an extensive variety of point types.
- Universal Input (UI) and Universal Input/Output (U) points are software-selectable to be:
 - 0-10V input
 - 4-20 mA input
 - Digital Input
 - Pulse Accumulator inputs
 - 1K Ni RTD @ 32°F (Siemens, Johnson Controls, DIN Standard)

- 1K Pt RTD (375 or 385 alpha) @ 32°F
- 10K NTC Thermistor (Type 2 and Type 3) @ 77°F
- 100K NTC Thermistor (Type 2) @ 77°F
- 0-10V Analog Output (Universal Input/Output (U) points only)
- Super Universal (X) points are software-selectable to be:
 - 0-10V input
 - 4-20 mA input
 - Digital Input
 - Pulse Accumulator inputs
 - 1K Ni RTD @ 32°F (Siemens, Johnson Controls, DIN Standard)
 - 1K Pt RTD (375 or 385 alpha) @ 32°F
 - 10K NTC Thermistor (Type 2 and Type 3) @ 77°F
 - 100K NTC Thermistor (Type 2) @ 77°F
 - 0-10V Analog Output
 - 4-20 mA Analog Output
 - Digital Output (using external relay)
- Digital Output (DO) points are 110/220V 4 Amp (resistive) Form C relays; LEDs indicate the status of each point.
- All PXC Compact Series models support 0-10 Vdc Analog Output circuits.
- The Super Universal points may be defined as either 0-10 Vdc or 4-20 mA Analog Output circuits.

Power Supply

- The 24 volt DC power supply provides regulated power to the input/output points and active sensors. The power supply is internal to the PXC Compact housing, eliminating the need for external power supply and simplifying installation and troubleshooting.
- The power supply works with the processor to ensure smooth power up and power down sequences for the equipment controlled by the I/O points, even through brownout conditions.

Controller Processor

- The Unitary Equipment Controller includes a microprocessor-based multi-tasking platform for program execution and communications with the I/O points and with other UECs and field panels.

- A Human Machine Interface (HMI) port, with a quick-connect phone jack (RJ-45), uses RS-232 protocol to support operator devices (such as a local user interface or simple CRT terminal), and a phone modem for dial-in service capability.
- A USB Device port supports a generic serial interface for an HMI or Tool connection. The USB Device port does not support firmware flash upgrades.
- The program and database information stored in the UEC RAM memory is battery-backed. This eliminates the need for time-consuming program and database re-entry in the event of an extended power failure.
- The firmware, which includes the operating system, is stored in non-volatile flash ROM memory; this enables firmware upgrades in the field.
- Brownout protection and power recovery circuitry protect the controller board from power fluctuations.
- LEDs provide instant visual indication of overall operation, network communication, and low battery warning.

Programmable Control with Application Flexibility

The PXC Compact Series of high performance controllers provides complete flexibility, which allows the owner to customize each controller with the exact program for the application.

The control program for each UEC is customized to exactly match the application. Proven Powers Process Control Language (PPCL), a text-based programming structure like BASIC, provides direct digital control and energy management sequences to precisely control equipment and optimize energy usage.

Global Information Access

The HMI port supports operator devices, such as a local user interface or simple CRT terminal. Devices connected to the operator terminal port gain global information access.

Multiple Operator Access

Multiple operators can access the network simultaneously. Multiple operator access ensures that alarms are reported to an alarm printer while an operator accesses information from a local terminal. Multiple operators may also access the controller

through concurrent Telnet sessions and/or local operator terminal ports.

Menu Prompted, English Language Operator Interface

The UEC includes a simple, yet powerful, menu-driven English Language Operator Interface that provides, among other things:

- Point monitoring and display
- Point commanding
- Historical trend collection and display for multiple points
- Event scheduling
- Program editing and modification via Powers Process Control Language (PPCL)
- Alarm reporting and acknowledgment
- Continual display of dynamic information

Built-in Direct Digital Control Routines

The UEC provides stand-alone Direct Digital Control (DDC) to deliver precise HVAC control and comprehensive information about system operation. It receives information from sensors in the building, processes the information, and directly controls the equipment. The following functions are available in the UEC:

- Adaptive Control, an auto-adjusting closed loop control algorithm, which provides more efficient, adaptive, robust, fast, and stable control than the traditional PID control algorithm. It is superior in terms of response time and holding steady state, and at minimizing error, oscillations, and actuator repositioning.
- Closed Loop Proportional, Integral and Derivative (PID) control.
- Logical sequencing.
- Alarm detection and reporting.
- Reset schedules.

Built-in Energy Management Applications

The following applications are programmed in the Unitary Equipment Controller and require simple parameter input for implementation:

- Automatic Daylight Saving Time switchover

- Calendar-based scheduling
- Duty cycling
- Economizer control
- Equipment scheduling, optimization and sequencing
- Event scheduling
- Holiday scheduling
- Night setback control
- Peak Demand Limiting (PDL)
- Temperature-compensated duty cycling
- Temporary schedule override

BACnet UEC Specifications

Dimensions (L × W × D)

PXC Unitary Equipment Controller, 16 point, BACnet MS/TP	10.7" × 5.9" × 2.45" (272 mm × 150 mm × 62 mm)
PXC Unitary Equipment Controller, 24 point, BACnet MS/TP	10.7" × 5.9" × 2.45" (272 mm × 150 mm × 62 mm)

Processor, Battery, and Memory

Processor and Clock Speed	Freescale MPC852T, 100 MHz
Memory	24 MB (16 MB SDRAM, 8 MB Flash ROM)
Battery backup of SDRAM (field replaceable)	AA (LR6) 1.5 Volt Alkaline (non-rechargeable) 180 days (accumulated) <i>Rooftop (Extended Temperature) Models: 330 days (accumulated)</i> AA (LR6) 3.6 Volt Lithium (non-rechargeable)
Battery backup of Real Time Clock	10 years (32°F to 122°F (0°C to 50°C)) Coin cell (BR2032) 3 Volt lithium Rooftop (Extended Temperature) Models 18 months

Communication

A/D Resolution (analog in)	16 bits
D/A Resolution (analog out)	10 bits
BACnet MS/TP Automation Level Network (ALN)	9600 bps to 115.2 Kbps, up to 10 nodes per MS/TP ALN
BACnet MS/TP Field Level Network (FLN)	9600 bps to 115.2 Kbps
Human-Machine Interface (HMI)	RS-232 compliant, 1200 bps to 115.2 Kbps
USB Device port (for non-smoke control applications only)	USB 1.1 (12 Mbps) and 2.0 (480 Mbps), Type B female connector. Self-powered, does not use or supply USB power.
Prior to June 2013	USB 1.0 (1.5 Mbps) and 1.1 (12 Mbps)

Electrical

Power Requirements	24 Vac ±20% input @ 50/60 Hz
Power Consumption (Maximum)	20 VA @ 24 Vac
A/D Resolution (analog in)	16 bits
D/A Resolution (analog out)	10 bits
AC Power and Digital Outputs	NEC Class 1 Power Limited
Communication and all other I/O	NEC Class 2

Electrical

Digital Output		Class 1 Relay, Form C (NO and NC contacts)
Analog Outputs		Voltage (0-10 Vdc)
Universal Inputs (UI) and Universal Inputs/Outputs (U)	Analog Inputs	Digital Inputs
	Voltage (0-10 Vdc)	Pulse Accumulator
	Current (4-20 mA)	Contact Closure Sensing
	1K Ni RTD @ 32°F (Siemens, JCI, DIN Ni 1K)	Dry Contact/Potential Free inputs only
	1K Pt RTD (375 or 385 alpha) @ 32°F	Digital Input (10 ms settling time)
	10K NTC Type 2 or Type 3 Thermistor	Supports counter inputs up to 20 Hz, minimum pulse duration 20 ms (open or closed)
	100K NTC Type 2 Thermistor	
	Analog Outputs	
	0 to 10 Vdc @ 1 mA max	
Super Universal (X)	Analog Inputs	Digital Inputs
	Voltage (0-10 Vdc)	Pulse Accumulator
	Current (4-20 mA)	Contact Closure Sensing
	1K Ni RTD @ 32°F (Siemens, JCI, DIN Ni 1K)	Dry Contact/Potential Free inputs only
	1K Pt RTD (375 or 385 alpha) @ 32°F	Digital Input (10 ms settling time)
	10K NTC Type 2 or Type 3 Thermistor	Supports counter inputs up to 20 Hz, minimum pulse duration 20 ms (open or closed)
	100K NTC Type 2 Thermistor	
	Analog Outputs	Digital Output
	0 to 10 Vdc @ 1 mA max	0 to 24 Vdc, 22 mA max.
	0 to 20 mA @ 650 Ω max	(using external relay)

Ambient Conditions

Shipping & Storage	-13°F to 158°F (-25°C to 70°C)
Operating Temperature	32°F to 122°F (0°C to 50°C)
	Operate in a dry location, which is protected from exposure to salt spray or other corrosive elements. Exposure to flammable or explosive vapors must be prevented.
Operating temperature <i>with rooftop (extended temperature) option</i>	-40°F to 158°F (-40°C to 70°C)
Relative Humidity	5 to 95% rh non-condensing
Mounting Surface	Direct equipment mount, building wall, or structural member
	<i>CE Compliance</i> Must be installed inside a metal enclosure rated at IP20 minimum

Agency Listings

UL	UL916 PAZX UL916 PAZX7
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Agency Listings

Agency Compliance

FCC Compliance CFR47 Part 15, Subpart B, Class B
Australian EMC Framework
European EMC Directive (CE)
European Low Voltage Directive (LVD)
BACnet Testing Laboratories (BTL) Certified
RoHS Compliant

OSHPD Seismic
Certification

Product meets OSHPD Special Seismic Preapproval certification (OSH-0217-10) under California Building Code 2010 (CBC2010) and International Building Code 2009 (IBC2009) when installed within the following Siemens enclosure part numbers: PXA-ENC18, PXA-ENC19, or PXA-ENC34.

Ordering Information

PXC Compact Series

Part Number	Description
PXC16.3-UCM.A	PXC Unitary Equipment Controller, 16 point, BACnet MS/TP
PXC16.3-UCMR.A	PXC Unitary Equipment Controller, 16 point, BACnet MS/TP, Rooftop Model
PXC24.3-UCM.A	PXC Unitary Equipment Controller, 24 point, BACnet MS/TP
PXC24.3-UCMR.A	PXC Unitary Equipment Controller, 24 point, BACnet MS/TP, Rooftop Model

Accessories

Product Number	Description
PXM10S	Controller mounted Operator Display module with point monitor and optional blue backlight
PXM10T	Controller mounted Operator Display module
PXA-HMI.CABLEP5	Serial cable required for PXM10T/S connection to non-rooftop variants of the 16-point and 24-point Compact Series (pack of 5)

Service Boxes and Enclosures

Product Number	Description
PXA-SB115V192VA	PX Series Service Box—115V, 24 Vac, 50/60 Hz, 192 VA
PXA-SB115V384VA	PX Series Service Box—115V, 24 Vac, 50/60 Hz, 384 VA
PXA-SB230V192VA	PX Series Service Box—230V, 24 Vac, 50/60 Hz, 192 VA
PXA-SB230V384VA	PX Series Service Box—230V, 24 Vac, 50/60 Hz, 384 VA
PXA-ENC18	18" Enclosure (Utility Cabinet) (UL Listed NEMA Type 1 Enclosure)
PXA-ENC19	19" Enclosure (UL Listed NEMA Type 1 Enclosure)
PXA-ENC34	34" Enclosure (UL Listed NEMA Type 1 Enclosure)

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