PXC Compact Series Unitary Equipment Controller

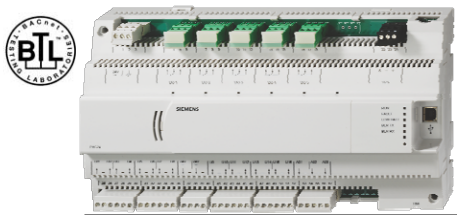

Figure 1. PXC Compact Series Controllers (PXC-24).

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 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 PXC Compact operates stand-alone or networked to perform complex control, monitoring, and energy management functions without relying on a higher-level processor.

The PXC Compact Series 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 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.

Universal I/O (X), 3 Analog Output (AOV), 5 Digital Output (DO).

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

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
  - 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)

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 PXC Compact Series includes a microprocessor-based multi-tasking platform for program execution and communications with the I/O points and with other PXC Compacts 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 Human Machine Interface (HMI) port, with a quick-connect Ethernet port for program and database editing tools.
- A USB Device port supports a generic serial interface for an HMI or Tool connection. The USB 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 PXC Compact 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

Menu Prompted, English Language Operator Interface

The PXC Compact 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 PXC Compact 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,

- Logical sequencing.
- Alarm detection and reporting.
- Reset schedules.

Built-in Energy Management Applications

The following applications are programmed in the PXC Compact Series 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

Memory	24 MB (16 MB SDRAM, 8 MB Flash ROM)
Battery backup of SDRAM (field replaceable)	AA (LR6) 1.5 Volt Alkaline (non-rechargeable) 60 days (accumulated)
Battery backup of Real Time Clock	10 years (32°F to 122°F (0°C to 50°C)) Coin cell (BR2032) 3 Volt lithium

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
Human-Machine Interface (HMI)	Ethernet, 10/100 MB
USB Device port (for non-smoke	Standard 1.1 and 2.0 USB device port, Type B female connector.

Communication and all other I/O		NEC Class 2
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** Voltage (0-10 Vdc) Current (4-20 mA) 1K Ni RTD @ 32°F (Siemens, JCI, DIN Ni 1K) 1K Pt RTD (375 or 385 alpha) @ 32°F 10K NTC Type 2 or Type 3 Thermistor 100K NTC Type 2 Thermistor **Analog Outputs** 0 to 10 Vdc @ 1 mA max	**Digital Inputs** Pulse Accumulator Contact Closure Sensing Dry Contact/Potential Free inputs only Digital Input (10 ms settling time) Supports counter inputs up to 20 Hz, minimum pulse duration 20 ms (open or closed)
Super Universal (X)	**Analog Inputs**	**Digital Inputs**

	0 to 20 mA @ 650 Ω max.
	0 to 24 Vdc, 22 mA max. (using external relay)

Operating Environment	
Ambient operating temperature	32°F to 122°F (0°C to 50°C)
Relative Humidity	95%, non-condensing
Mounting Surface	Direct equipment mount, building wall, or structural member
	CE Compliance
	Must be installed inside a metal enclosure rated at IP20 minimum

Agency Listings	
UL	UL916 PAZX (all models)
	UL916 PAZX7 (all models)
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

LSM-24.A	License to upgrade the UEC to a PXC Compact

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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Product Description

An integral member of the APOGEE product family, the PXC Compact Unitary Equipment Controller for BACnet Networks is a high performance, Direct Digital Control (DDC) unitary equipment controller. The PXC Compact operates stand-alone or networked to perform complex control, monitoring and energy management functions without relying on a higher-level processor. The PXC Compact communicates on a BACnet MS/TP.

BACnet Standardized Device Profile (Annex L)

Supported	Device Profile
	BACnet Operator Workstation (B-OWS)
	BACnet Building Controller (B-BC)
•	BACnet Advanced Application Controller (B-AAC)
	BACnet Application Specific Controller (B-ASC)

DS-RPM-A	Data Sharing-ReadPropertyMultiple-A	•	
DS-RPM-B	Data Sharing-ReadPropertyMultiple-B		•
DS-WP-A	Data Sharing-WriteProperty-A	•	
DS-WP-B	Data Sharing-WriteProperty-B		•
DS-WPM-B	Data Sharing-WritePropertyMultiple-B		•
DS-COV-A	Data Sharing-COV-A	•	
DS-COV-B	Data Sharing-COV-B		•
DS-COVU-A	Data Sharing-COV-Unsolicited-A	•	
DS-COVU-B	Data Sharing-COV-Unsolicited-B		•

Scheduling			
SCHED-I-B	Scheduling-Internal-B		•

Alarm and Event Management			
AE-N-A	Alarm and Event-Notification-A	•	
AE-N-I-B	Alarm and Event-Notification Internal-B		•
AE-ACK-A	Alarm and Event-ACK-A	•	
AE-ACK-B	Alarm and Event-ACK-B		•

T-VMT-I-B	Trending-Viewing and Modifying Trends-Internal-B		•
T-ATR-B	Trending-Automated Trend Retrieval-B		•

Network Management			
NM-CE-A	Network Management-Connection Establishment-A	•	

Device Management			
DM-DDB-A	Device Management-Dynamic Device Binding-A	•	
DM-DDB-B	Device Management-Dynamic Device Binding-B		•
DM-DOB-A	Device Management-Dynamic Object Binding-A	•	
DM-DOB-B	Device Management-Dynamic Object Binding-B		•
DM-DDC-B	Device Management-DeviceCommunicationControl-B		•
DM-PT-A	Device Management-Private Transfer-A	•	
DM-PT-B	Device Management-Private Transfer-B		•
DM-TM-A	Device Management-Text Message-A	•	
DM-TM-B	Device Management-Text Message-B		•

Name	Creatable	Deletable
Analog Input		
Analog Output		
Analog Value		
Binary Inpute		
Binary Output		
Binary Value		
Calendar	•	•
Command	•	•
Device		
Event Enrollment	•	•
File		
Multi-state Output		
Multi-state Value		
Notification Class	•	•
Schedule	•	•
Trend Log		

Object_Name	Yes		R
Object_Type	Yes		R
Present_Value	Yes	Yes	R
Description	Yes	Yes	O
Device_Type	Yes		O
Status_Flags	Yes		R
Event_State	Yes		R
Reliability	Yes		O
Out_Of_Service	Yes	Yes	R
Units	Yes	Yes	R
Resolution	Yes		O
COV_Increment	Yes	Yes	O
Time_Delay	Yes - Alarm		O
Notification Class	Yes - Alarm	Yes	O
High_Limit	Yes - Alarm	Yes	O
Low_Limit	Yes - Alarm	Yes	O
Deadband	Yes - Alarm		O

Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
Present_Value	Yes	Yes	W
Description	Yes	Yes	O
Device_Type	Yes		O
Status_Flags	Yes		R
Event_State	Yes		R
Reliability	Yes		O
Out_Of_Service	Yes		R
Units	Yes		R
Min_Pres_Value	No		O
Max_Pres_Value	No		O
Resolution	Yes		O
Priority_Array	Yes		R
Relinquish_default	Yes		R
COV_Increment	Yes	Yes	O
Time_Delay	Yes - Alarm		O

Event_Time_Stamps	Yes - Alarm		O
Analog Value Object Type			
Property_Identifier	**Supported**	**Writable**	**Required \ Optional**
Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
Present_Value	Yes	Yes	R
Description	Yes	Yes	O
Status_Flags	Yes		R
Event_State	Yes		R
Reliability	Yes		O
Out_Of_Service	Yes		R
Units	Yes		R
Priority_Array	Yes		O
Relinquish_default	Yes		O
COV_Increment	Yes	Yes	O
Time_Delay	Yes - Alarm		O

Event_Time_Stamps	Yes - Alarm		O
Binary Input Object Type			
Property_Identifier	**Supported**	**Writable**	**Required \ Optional**
Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
Present_Value	Yes	Yes	R
Description	Yes	Yes	O
Device_Type	Yes		O
Status_Flags	Yes		R
Event_State	Yes		R
Reliability	Yes		O
Out_Of_Service	Yes	Yes	R
Polarity	Yes		R
Inactive_Text	Yes		O
Active_Text	Yes		O
Elapsed_Active_Time	Yes	Yes	O

Binary Output Object Type			
Property_Identifier	**Supported**	**Writable**	**Required \ Optional**
Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
Present_Value	Yes	Yes	W
Description	Yes	Yes	O
Device_Type	Yes		O
Status_Flags	Yes		R
Event_State	Yes		R
Reliability	Yes		O
Out_Of_Service	Yes		R
Polarity	Yes		R
Inactive_Text	Yes		O
Active_Text	Yes		O
Elapsed_Active_Time	Yes	Yes	O
Time_Of_Active_Time_Reset	Yes		O

Event_Time_Stamps	Yes - Alarm		O
Binary Value Object Type			
Property_Identifier	**Supported**	**Writable**	**Required \ Optional**
Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
Present_Value	Yes	Yes	R
Description	Yes	Yes	O
Status_Flags	Yes		R
Event_State	Yes		R
Reliability	Yes		O
Out_Of_Service	Yes		R
Inactive_Text	Yes		O
Active_Text	Yes		O
Elapsed_Active_Time	Yes	Yes	O
Time_Of_Active_Time_Reset	Yes		O
Priority_Array	Yes		O

Calendar Object Type			
Property_Identifier	**Supported**	**Writable**	**Required \ Optional**
Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
Description	Yes	Yes	O
Present_Value	Yes		R
Date_List	Yes	Yes	R
Command Object Type			
Property_Identifier	**Supported**	**Writable**	**Required \ Optional**
Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
Description	Yes	Yes	O
Present_Value	Yes	Yes	W
In_Process	Yes		R

Object_Type	Yes		R
System_Status	Yes		R
Vendor_Name	Yes		R
Vendor_Identifier	Yes		R
Model_Name	Yes		R
Firmware_Revision	Yes		R
Application_Software_Version	Yes		R
Location	Yes		O
Description	Yes		O
Protocol_Version	Yes		R
Protocol_Revision	Yes		R
Protocol_Services_Supported	Yes		R
Protocol_Object_Types_Supported	Yes		R
Object_List	Yes		R
Max_APDU_Lenght_Accepted	Yes		R
Segmentation_Supported	Yes		R
Max_Segments_Supported	Yes		O
Local_Time	Yes		O

Last_Restore_Time	Yes		O
Backup_Failure_Timeout	Yes	Yes	O
Active_COV_Subscriptions	Yes		O
Event Enrollment Object Type			
Property_Identifier	**Supported**	**Writable**	**Required \ Optional**
Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
Description	Yes	Yes	O
Event_Type	Yes		R
Notify_Type	Yes	Yes	R
Event_Parameters	Yes	Yes	R
Object_Property_Ref	Yes		R
Event_State	Yes		R
Event_Enable	Yes	Yes	R
Acked_Transitions	Yes		R
Notification Class	Yes	Yes	R

File_Type	Yes		R
File_Size	Yes	Yes	R
Modification_Date	Yes		R
Archive	Yes	Yes	W
Read_only	Yes		R
File_Access_Method	Yes		R
Multi-state Output Object Type			
Property_Identifier	**Supported**	**Writable**	**Required \ Optional**
Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
Present_Value	Yes	Yes	W
Description	Yes	Yes	O
Device_Type	Yes		O
Status_Flags	Yes		R
Event_State	Yes		R
Reliability	Yes		O

Event_Enable	Yes - Alarm	Yes	O
Acked_Transitions	Yes - Alarm		O
Notify_Type	Yes - Alarm		O
Event_Time_Stamps	Yes - Alarm		O
Multi-state Value Object Type			
Property_Identifier	**Supported**	**Writable**	**Required \ Optional**
Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
Present_Value	Yes	Yes	R
Description	Yes	Yes	O
Status_Flags	Yes		R
Event_State	Yes		R
Reliability	Yes		O
Out_Of_Service	Yes	Yes	R
Number_Of_States	Yes		R
State_Text	Yes		O

Notify_Type	Yes - Alarm		O
Event_Time_Stamps	Yes - Alarm		O
Notification Class Object Type			
Property_Identifier	**Supported**	**Writable**	**Required \ Optional**
Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
Description	Yes	Yes	O
Notification_Class	Yes		R
Priority	Yes	Yes	R
Ack_Required	Yes	Yes	R
Recipient_List	Yes	Yes	R
Schedule Object Type			
Property_Identifier	**Supported**	**Writable**	**Required \ Optional**
Object_Identifier	Yes		R
Object_Name	Yes		R

Priority_For_Writing	Yes	Yes	R
Status_Flags	Yes		R
Reliability	Yes		R
Out_Of_Service	Yes	Yes	R
Trend Log Object Type			
Property_Identifier	**Supported**	**Writable**	**Required \ Optional**
Object_Identifier	Yes		R
Object_Name	Yes		R
Object_Type	Yes		R
Description	Yes	Yes	O
Log_Enable	Yes	Yes	W
Start_Time	Yes	Yes	O
Stop_Time	Yes	Yes	O
Log_DeviceObjectProperty	Yes		O
Log_Interval	Yes		O
Client_COV_Interval	Yes		O
Stop_When_Full	Yes	Yes	R

Notification_Class	Yes - Alarm	Yes	O
Event_Enable	Yes - Alarm		O
Acked_Transitions	Yes - Alarm		O
Notify_Type	Yes - Alarm		O
Event_Time_Stamps	Yes - Alarm		O

Data Link Layer Options

	BACnet IP, (Annex J)
	BACnet IP, (Annex J), Foreign Device
	ISO 8802-3, Ethernet (Clause 7)
	ANSI/ATA 878.1, 2.5 Mb. ARCNET (Clause 8)
	ANSI/ATA 878.1, RS-485 ARCNET (Clause 8), baud rate(s) _____
•	MS/TP master (Clause 9), baud rate(s): 9600 bps, 19200 bps, 38400 bps, 76800 bps
	MS/TP slave (Clause 9), baud rate(s): _____
	Point-To-Point, EIA 232 (Clause 10), baud rate(s): _____
	Point-To-Point, modem, (Clause 10), baud rate(s): _____
	LonTalk, (Clause 11), medium: _____

Networking Options

	Router, Clause 6 BACnet/IP (Annex J) to BACnet MS/TP
	Annex H.3, BACnet Tunneling Router over UDP/IP
	BACnet/IP Broadcast Management Device (BBMD)
	Does the BBMD support registrations by Foreign Devices?

Character Sets

•	ANSI X3.4
	ISO 10646 (USC-2)
	IBM DBCS Microsoft DBCS
	ISO 10646 (ICS-4)
	ISO 8859-1
	JIS C 6226