

## PXC Modular Series for BACnet Networks



Figure 1. PXC Modular.

### Description

The PXC Modular for BACnet Networks is an integral part of the APOGEE® Automation System. It is a high performance, modular Direct Digital Control (DDC) supervisory field panel. The controller is classified as a BACnet Building Controller (B-BC) and utilizes the BACnet/IP protocol and BACnet MS/TP.

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

- Up to 1000 modular field panels communicate on a peer-to-peer network.
- With the addition of TX-I/O modules and a TX-I/O Power Supply on a self-forming bus, the PXC Modular can directly control up to 500 points.

With the addition of an Expansion Module, the PXC Modular also provides central monitoring and control for distributed wireless or wired Field Level Network (FLN) devices.

### Features

- Classified as BACnet Building Controller (B-BC) using BACnet/IP protocol and BACnet MS/TP.
- Modular hardware components match initial control requirements while providing for future expansion.
- DIN rail mounting and removable terminal blocks simplify installation and servicing.
- Proven program sequences to match equipment control applications.
- Sophisticated Adaptive Control, a closed loop control algorithm that auto-adjusts to compensate for load/seasonal changes.
- Built-in energy management applications and DDC programs for complete facility management.
- Comprehensive alarm management, historical data trend collection, operator control and monitoring functions.
- HMI RS-232 and USB ports provide connectivity to a laptop computer for local operation and engineering.
- Support for peer-to-peer communications over industry-standard 10Base-T/100Base-TX Ethernet networks.
- Persistent database back-up and restore within controller.
- Back-up battery protection eliminating the need for time-consuming program and database re-entry in the event of an extended power failure.
- The PXC Modular illuminates a “battery low” status LED and can send an alarm message to selected printers or terminals.
- Optional wireless FLN support.

## Hardware

### PXC Modular

- The PXC Modular is a microprocessor-based multi-tasking platform for program execution and communication with other field panels. It scans field data, optimizes control parameters, and manages operator requests for data in seconds.
- The program and database information stored in the PXC Modular memory is protected with a battery backup. This eliminates the need for time-consuming program and database re-entry in the event of an extended power failure. When battery replacement is necessary, the PXC Modular illuminates a “battery low” status LED and can send an alarm message to selected printers or terminals.
- The PXC Modular firmware, including the operating system, is stored in non-volatile flash memory.
- The PXC Modular provides both an Ethernet port as well as an RS-485 port for communication on Automation Level Networks supporting either BACnet/IP or BACnet MS/TP.
- HMI RS-232 and USB ports provide connectivity to a laptop computer for local operation and engineering.
- LEDs provide instant visual indication of overall operation, network communication, and battery status.
- Two self-forming buses are an integral part of the flexibility of the PXC Modular. A self-forming bus to the right of the controller (see Figure 3) supports up to 500 points through TX-I/O™ modules. Another self-forming bus to the left of the controller (see Figure 5) supports hardware connection to subsystems through Expansion Modules.

### TX-I/O Modules

TX-I/O Modules are modular expansion I/O consisting of an electronics module and terminal base. The electronics modules perform A/D or D/A conversion, signal processing, and point monitoring and command output through communication with the PXC Modular. The terminal bases provide for termination of field wiring and connection of a self-forming bus. For more information, see *TX-I/O* (149-476).

### TX-I/O Power Supply

The TX-I/O Power Supply provides power for TX-I/O modules and peripheral devices. Multiple Power Modules can be used in parallel to meet the power needs of large concentrations of I/O points (see Figure 2 and Figure 3). For more information, see *TX-I/O (Power Supply)* (149-476).

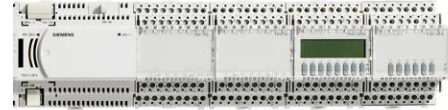


Figure 2. TX-I/O Power Supply and TX-I/O Modules.



Figure 3. PXC Modular, TX-I/O Power Supply, and TX-I/O Modules.

### PXC Modular Expansion Module

The PXC Modular Expansion Module (see Figure 4) provides the hardware connection for Field Level Network (FLN) devices. Using the Triple RS-485 Expansion Module, the PXC Modular supports up to three RS-485 networks of P1 Field Level Network devices, or one RS-485 network of BACnet MS/TP devices (see Figure 5). With the Expansion Module the PXC Modular can also provide wireless FLN support.



Figure 4. RS-485 Expansion Module.



Figure 5. RS-485 Expansion Module and PXC Modular.

## Modular Control Panels with Application Flexibility

The PXC Modular is a high performance controller with extensive flexibility. It can be customized with the exact hardware and program for the application. As a result, the user only purchases what is needed.

For example, in monitoring applications, the control panel can be customized with the number and type of points to match the sensor devices. For monitoring and controlling a large number of (on-off) fans or motors, more digital points can be added (see Figure 6).



Figure 6. PXC Modular, TX-I/O Power Supply, and TX-I/O Modules.

Alternately, if no local point control is required, the PXC Modular can be used to monitor and control Field Level Network devices using the Expansion Modules (see Figure 7).



Figure 7. RS-485 Expansion Module and PXC Modular.

Of course, the PXC Modular can be used for both direct point monitoring and control and as a system controller for Field Level Network devices (see Figure 8).



Figure 8. RS-485 Expansion Module, PXC Modular, TX-I/O Power Supply, and TX-I/O Modules.

The control program for each field panel is customized to exactly match the application. Proven Powers Process Control Language (PPCL), a “BASIC” type programming language, provides direct digital control and energy management sequences to precisely control equipment and optimize energy usage.

In a stand-alone configuration, the PXC Modular can fulfill all requirements of a supervisory network coordinator by managing operation schedules and alarms and communicating for the connected devices.

## Global Information Access

Each PXC Modular is equipped with an RS-232 port. This port supports the connection of a computer. Devices connected to the terminal port gain global information access.

## Multiple Operator Access

Multiple operators can access the network simultaneously. When using the Ethernet ALN option, multiple operators may access the controller through concurrent Telnet sessions and/or local operator terminal ports.

## Menu Prompted, English Language Operator Interface

The PXC Modular field panel 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 Modular 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 PXC Modular:

- Adaptive Control, an auto-adjusting closed loop control algorithm. Adaptive Control provides more efficient, adaptive, robust, fast, and stable control than the traditional PID control algorithm. It is superior in terms of response time, holding steady state, and 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 PXC Modular and require simple parameter input for implementation:

- Peak demand limiting
- Start-Stop time optimization
- Equipment scheduling, optimization and sequencing
- Duty cycling
- Economizer control

# Specifications

## Dimensions

PXC Modular Series	7.56" L × 3.54" W × 2.76" D (192 mm L × 90 mm W × 70 mm D)
Expansion Module with three RS-485 FLN connections	1.26" L × 3.54" W × 2.76" D (32 mm L × 90 mm W × 70 mm D)

## Electrical, Processor, Battery, and Memory

Power Consumption	24 VA @ 24 Vac
Processor	MPC885 (PowerPC®)
Processor Clock Speed	133 MHz
Memory	72 MB (64 MB SDRAM, 8 MB Flash ROM)
Secure Digital Input/Output (SDIO) card	Expandable or removable non-volatile memory
Battery backup of SDRAM	30 days (accumulated) AA (LR6) 1.5 Volt Alkaline (non-rechargeable)
Battery backup of Real Time Clock	12 months (accumulated) Cell coin 3 Volt lithium

## Communication

BACnet/IP Automation Level Network (ALN) Ethernet TCP/IP Automation Level Network (EALN)	10Base-T or 100Base-TX compliant
RS-485 BACnet MS/TP Automation Level Network (ALN)	9600 bps to 115.2 Kbps
RS-485 P1 Field Level Network (FLN) on the Expansion Module	4800 bps to 38400 bps
RS-485 BACnet MS/TP Field Level Network (FLN)	9600 bps to 76800 bps
TX-I/O Self forming bus connection	115.2 Kbps
Human-Machine Interface (HMI) port	RS-232 compliant, 1200 bps to 115.2 Kbps
USB Device Port	Standard 1.1 and 2.0 USB device port, full speed 12 Mbps, low speed 1.5 Mbps Type B female connector
USB Host port	Standard 1.1 and 2.0 USB host port, full speed 12 Mbps, low speed 1.5 Mbps Type A female connector

## Electrical Rating

Power Requirements	24 Vac +/-20% input @ 50 or 60 Hz
Power Consumption	24 VA @ 24 Vac
AC Power	NEC Class 2
Communication	NEC Class 2

## Operating Environment

Ambient operating temperature	32°F to 122°F (0°C to 50°C), <93% rh, non-condensing
Ambient operating environment	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.
Shipping and Storage environment	-13°F to 158°F (-25°C to 70°C), 5% to 95% rh, non-condensing
Mounting Surface	Building wall or structural member

## Agency Listings

UL	UL 864 UUKL Smoke Control Equipment UL 864 UUKL7 Smoke Control Equipment CAN/ULC-S527-M8 UL 916 PAZX UL 916 PAZX7
Agency Compliance	FCC Compliance Australian EMC Framework European EMC Directive (CE) – with enclosure

## Product Ordering Information

Product Number	Description
PXC00-E96.A	PXC MOD, BACnet, 96 NODE, APOGEE
PXC100-E96.A	PXC MOD, BACnet, TX-I/O, 96 NODE, APOGEE
PXX-485.3	Expansion Module, three RS-485 connections
PXF-TXIO.A	License enable for TX-I/O (Not required for PXC100-E96.A)
LSM-FPGO	License to enable Field Panel GO

### Service Boxes and Enclosures

549-506	Service Box, 115V to 24 Vac – <i>until existing stock is depleted</i>
549-507	Service Box, 230V to 24 Vac – <i>until existing stock is depleted</i>
PXA-SB115V192VA	PX Series Service Box — <i>available by 2009</i> — 115V, 24 Vac, 50/60 Hz, 192 VA
PXA-SB115V384VA	PX Series Service Box — <i>available by 2009</i> — 115V, 24 Vac, 50/60 Hz, 384 VA
PXA-SB230V192VA	PX Series Service Box — <i>available by 2009</i> — 230V, 24 Vac, 50/60 Hz, 192 VA
PXA-SB230V384VA	PX Series Service Box — <i>available by 2009</i> — 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)

## Document Ordering Information

Document Number	Description
125-3582	PXC Modular Series Owner's Manual
125-1896	Powers Process Control Language (PPCL) User's Manual

# BACnet Protocol Implementation Conformance Statement

## Products

Product	Model Number	Protocol Revision	Software Version	Firmware Version
BACnet PXC Modular Series	PXC00-E96.A PXC100-E96.A	135-2004	N/A	3.1

## Vendor Information

Siemens Building Technologies 1000 Deerfield Parkway Buffalo Grove, IL 60089  www.sbt.siemens.com
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## Product Description

An integral member of the APOGEE product family, the PXC Modular for BACnet Networks is a high performance, modular Direct Digital Control (DDC) supervisory equipment and primary building controller. The PXC Modular operates stand-alone or networked to perform complex control, monitoring and energy management functions without relying on a higher-level processor. The PXC Modular communicates on a 10/100 MB Ethernet BACnet/IP or BACnet MS/TP network and optionally supervises BACnet MS/TP devices.
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## 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)
	BACnet Smart Actuator (B-SA)
	BACnet Smart Sensor (B-SS)

## Supported BACnet Interoperability Building Blocks (BIBBs)

BIBB	Name	Initiate	Execute
<b>Data Sharing</b>			
DS-RP-A	Data Sharing-ReadProperty-A	•	
DS-RP-B	Data Sharing-ReadProperty-B		•
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		•
<b>Scheduling</b>			
SCHEM-I-B	Scheduling-Internal-B		•
SCHEM-E-B	Scheduling-External-B		•
<b>Alarm and Event Management</b>			
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		•
AE-ASUM-B	Alarm and Event-Alarm Summary-B		•
AE-ESUM-A	Alarm and Event-Enrollment Summary-A	•	
AE-ESUM-B	Alarm and Event-Enrollment Summary-B		•
AE-INFO-A	Alarm and Event-Information-A	•	
AE-INFO-B	Alarm and Event-Information-B		•
<b>Trending</b>			
T-VMT-A	Trending-Viewing and Modifying Trends-A	•	
T-VMT-I-B	Trending-Viewing and Modifying Trends-Internal-B		•
T-VMT-E-B	Trending-Viewing and Modifying Trends-External-B		•



T-ATR-B	Trending-Automated Trend Retrieval-B		•
<b>Network Management</b>			
NM-CE-A	Network Management-Connection Establishment-A	•	
<b>Device Management</b>			
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-DCC-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		•
DM-TS-B	Device Management-TimeSynchronization-B		•
DM-RD-B	Device Management-ReinitializeDevice-B		•
DM-BR-B	Device Management-Backup and Restore-B		•
DM-LM-B	Device Management-List Manipulation-B		•
DM-OCD-B	Device Management-Object Creation and Deletion-B		•

## Standard Object Types Supported

Name	Creatable	Deletable
Analog Input		
Analog Output		
Analog Value		
Binary Input		
Binary Output		
Binary Value		
Calendar	•	•
Command	•	•
Device		
File		
Multi-state Output		

Multi-state Value		
Notification Class	•	•
Schedule	•	•
Trend Log		

**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: _____
	Other: _____

**Segmentation Capability**

Able to transmit segmented messages	Yes	Window Size: 32
Able to receive segmented messages	Yes	Window Size: 32

**Device Address Binding**

Is Static Device Binding supported?	Yes
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## 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)
Yes	Does the BBMD support registrations by Foreign Devices?

## Character Sets

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

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