PXC Modular Series for BACnet Networks

Figure 1. PXC Modular.

Description

The PXC Modular Series for BACnet networks is a high-performance modular Direct Digital Control (DDC) supervisory equipment controller, which is an integral part of the APOGEE Automation System. It is classified as a BACnet Building Controller (B-BC) and supports BACnet/IP and BACnet MS/TP protocols.

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 100 PXC 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.

> See the *APOGEE Wiring Guidelines for Field Panels and Equipment Controllers (125-3002)* for information on setting up this configuration.

- 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

- BACnet Testing Laboratories (BTL) certified Classified as BACnet Building Controllers (B-BC) using the BACnet/IP protocol and/or BACnet MS/TP, or BACnet Advanced Application Controllers (B-AAC) using the BACnet MS/TP protocol for specific models.
- Modular hardware components match initial control requirements while providing for future expansion.
- DIN rail mounted device with removable terminal blocks simplifies installation and servicing.
- Proven program sequences to match equipment control applications.
- Built-in energy management applications and DDC programs for complete facility management.
- Comprehensive alarm management, historical data trend collection, operator control, and monitoring functions.
- Sophisticated Adaptive Control, a closed loop control algorithm that auto-adjusts to compensate for load/seasonal changes (License required with Firmware revision 3.5.1 and higher).
- HMI RS-232 and USB ports, which provide laptop connectivity for local operation and engineering.
- Extended battery backup of Real Time Clock.
- 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 support for MS/TP or P1 FLN devices.
- Optional support for P1 Wireless FLN.
- Optional operation as a MS/TP or P1 device with default applications.

- PPCL performance during an internal database backup has been significantly improved. PPCL will consistently execute during the backup cycle.
- Unused Ethernet ports are now disabled and do not require the field panel to cold start.
- The handling of COV subscriptions for large databases has been improved.
- The HMI prompt was changed from A, N, **M** (Application/flNdevice/Mstp) to A, N, **B (Application/flNdevice/Bacnet)**; allowing the configuration of routed FLN types and clarifying that any BACnet device (MS/TP or IP) can be added to the BACnet ALN.
- The Available memory report has been extended to show installed Memory (physical memory installed in hardware), in addition to the existing metrics already provided:
  - Available RAM left
  - Number of Fragments of memory
  - Largest Contiguous memory
- Auto Save allows the database to be backed up to flash memory automatically whenever the database is changed, instead of being an operator-selected function. It does not provide any safeguard or protection against power loss.
- PXM10T and PXM10S support: Optional LCD Local user interface with HOA (Hand-off-auto) capability and point commanding and monitoring features.
- MS/TP Point Pickup Module (PPM) support: Universal Inputs can be configured for analog or digital input. Input/Output type is configured by writing to BACnet object properties.

The Simple Network Management Protocol (SNMP) Agent allows points in the field panel to communicate with an SNMP manager over Ethernet.

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.
- 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 the *TX-I/O Product Range Technical Specification Sheet* (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 the *TX I/O Product Range Technical Specification Sheet* (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 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 Module (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.

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.

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.

Available Options

Launch Pad

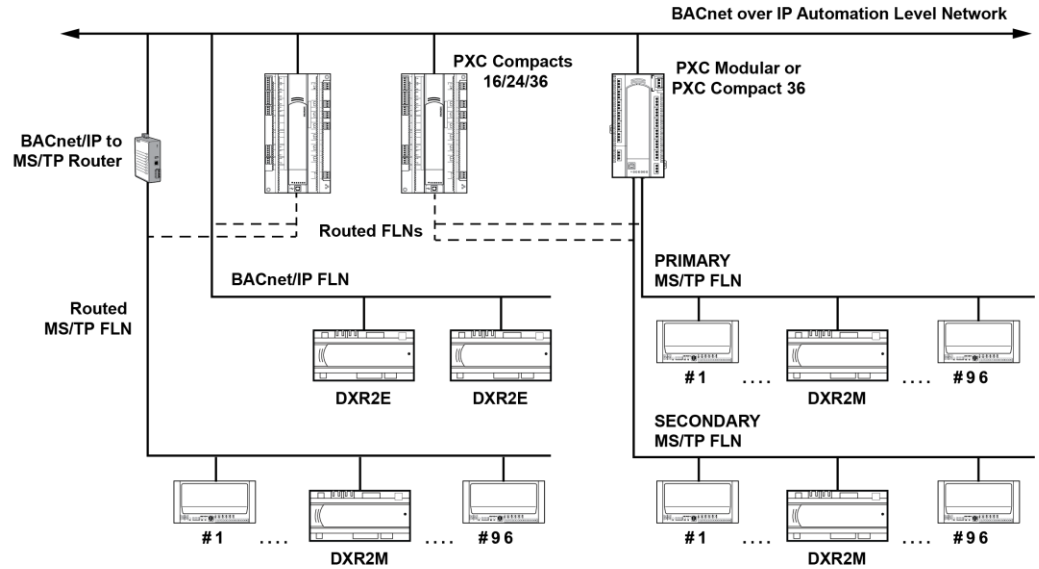
Siemens Launch Pad provides easy access to the applications required for configuring, monitoring, and controlling the Building Automation System. It allows you to deploy the Application MC tool to a field panel, load licenses, add shortcuts to other applications, and access user documentation.

The Launch Pad is an Adobe AIR-based application that allows you to do the following:

- Launch Adobe AIR-based UI that allows you to interact with Siemens Ethernet BACnet Field Panels and provides a more intuitive user interface for database interaction in comparison to line-by-line command prompts.
- Deploy browser-based Application MC to field panels.
- Deploy licenses to field panels.
- Add shortcut buttons so that other commonly-used Building Automation System applications are easily accessible and can be launched from Launch Pad.
- A shortcut button is automatically added, if WCIS has been installed along with Launch Pad.

Routed FLNs

A Routed FLN is a software configured network that allows you to group BACnet IP or MS/TP devices by network number. A network that resides in a field panel but does not have a physical connection to a piece of equipment.



Global Information Access

The HMI port supports operator devices, such as a local user interface or simple CRT terminal, and a phone modem for dial-in service capability. 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. When using the BACnet/IP ALN option, multiple operators may also access the controller through concurrent Telnet sessions and/or local operator terminal ports.

Menu Prompted, English Language Operator Interface

The PXC Modular 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, 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 PXC Modular 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

Modular Series Specifications

Dimensions (L × W × D)	
PXC Modular	7.56" × 3.54" × 2.76" (192 mm × 90 mm × 70 mm)
FLN Expansion Module	1.26" × 3.54" × 2.76" (32 mm × 90 mm × 70 mm)
DIN rail (EN 60715 TH 35-7.5, steel)	1.38" × 0.30" × 0.04" (35 mm × 7.5 mm × 1 mm)

Processor, Battery, and Memory	
Processor	MPC885 (PowerPC)
Processor Clock Speed	133 MHz
Memory	80 MB (64 MB SDRAM, 16 MB Flash ROM)
Serial EEPROM	4 KB
Secure Digital (SD) memory card (for future use)	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), Coin cell (BR2032) 3 Volt lithium
Real Time Clock Initial Accuracy	±30 seconds/month typical @ 77°F (25°C)

Communication	
BACnet/IP Automation Level Network (ALN)	10Base-T or 100Base-TX compilant
BACnet MS/TP Automation Level Network (ALN) or Secondary BACnet MS/TP Field Level Network (FLN)	RS-485, 9600 bps to 115.2 Kbps, 1/8 Load
BACnet MS/TP Field Level Network (FLN) on PXX-485.3 Expansion Module	RS-485, 9600 bps to 115.2 Kbps, 1/8 Load
P1 Wired/Wireless Field Level Network (FLN) on PXX-485.3 Expansion Module	RS-485 x 3, 4800 bps to 38.4 Kbps, 1/8 load
TX-I/O self-forming bus connection	115.2 Kbps, 5 pin connector (middle pin is not connected)
Human-Machine Interface (HMI) Advanced User Mode	RS-232 compliant, 1200 bps to 115.2 Kbps (default)
USB Device port (for non-smoke control applications only)	Standard 1.1 and 2.0 USB device port, Type B female connector
USB Host port on selected models (for ancillary smoke control applications only).	Standard 1.1 and 2.0 USB host port, Type A female connector

Electrical Rating	
Power Requirements	24 Vac +/-20% input @ 50/60 Hz
Power Consumption (Maximum)	24 VA @ 24 Vac
AC Power	NEC Class 2
Communication	NEC Class 2

Operating Environment	
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.
Ambient operating temperature	32°F to 122°F (0°C to 50°C)
Shipping and storage environment	-13°F to 158°F (-25°C to 70°C)
Relative Humidity	5% to 95% rh, non-condensing
Mounting Surface	Building wall or structural member (Do not mount on HVAC components or any other vibrating surface.) **CE Compliance** Requires installation inside a metal enclosure rated at IP30 minimum. **Smoke Control Applications** Requires installation inside a PX series enclosure
Vibration	Compliance to IEC 60721, 3M2, and 2M2
Protection to EN60529	IP 20

Agency Listings	
UL	UL 864 UUKL Smoke Control Equipment - Conforms to UL864 9th and 10th Edition. UL 864 UUKL7 Smoke Control Equipment - Conforms to UL864 9th and 10th Edition. CAN/ULC-S527-M8 UL 916 PAZX - Conforms to UL916 9th and 10th Edition. UL 916 PAZX7 - Conforms to UL916 9th and 10th Edition.
Agency Compliance	CFR47 Part 15, Class A; CFR47 Part 15, Class B - with metal enclosure, maximum opening Australian EMC Framework - with metal enclosure, maximum opening size is 34" European EMC Directive (CE) - with metal enclosure, maximum opening size is 34" RoHS Compliant UKCA - Electromagnetic Compatibility Regulations (S.I. 2016 No. 1091 / S.I. 2012 No. 3032)
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.
BTL	BACnet Testing Laboratories (BTL) Certified, Firmware Revision 3.0 and later

Electrical Disturbance Testing	
Dips and Interrupts	per EN 61000-4-11
Electrical Fast Transients (EPT)	per EN 61000-4-4, 1 kV signal, 2 kV AC power
Electrical Surge Immunity	per EN 61000-4-5 AC power: 2 kV common mode, 1 kV differential mode Signal lines: 1 kV CM, 5 kV DM
Electrostatic Discharge (ESD)	per EN 61000-4-2, 4 kV contact, 8 kV air discharge
RF Conducted Immunity	per EN 61000-4-6 @ 10V
RF Radiated Immunity	per EN 61000-4-3 @ 10V/m

Ordering Information

PXC Modular Series

Product Number	Description
PXC00-E96.A	PXC Modular, BACnet/IP or MS/TP ALN, P1 or MS/TP FLN. PXX-485.3 is a connection for FLN devices.
PXC100-E96.A	PXC Modular, BACnet/IP or MS/TP ALN, P1 or MS/TP FLN, self-forming TX-I/O Island Bus. PXX-485.3 is also required as the connection to the FLN devices.
PXX-485.3	Provides FLN support for the PXC Modular. Includes three RS-485 P1 FLN connections or one MS/TP FLN connection; maximum of 96 devices supported.

Optional Licenses

Product Number	Description
PXF-TXIO.A	License to enable the Island Bus on PXC00-E96.A and PXC00-PE96.A.
LSM-SNMP	License to enable SNMP Agent on Siemens Modular or Compact hardware with BACnet Firmware Revision 3.2.3
LSM-ADAPT	License to use the Adaptive Control added in FW 3.5.1/2.8.18 and later

*) Field Panel Web Services are no longer available for sale. Launch Pad is a free download available from X:\StdApps\APOGEE_Products_FW_SW\Integrated_Solutions.

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 PXC Series controllers.
PXA-MOD.CON	PXC Modular Connector Kit - Fits one PXC Modular

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)

Documentation

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

Disposal

The device is considered an electronic device for disposal in accordance with the European Guidelines and may not be disposed of as domestic garbage.

- Dispose of the device through channels provided for this purpose.
- Comply with all local and currently applicable laws and regulations.

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