

## BACnet Modular Equipment Controller



Figure 1. Power BACnet Modular Equipment Controller in small enclosure with service box.

- Remote mounted external analog and digital point blocks for added point expansion.
- Proven program sequences to match equipment control applications.
- Advanced Proportional Integral Derivative (PID) loop tuning algorithm for HVAC control minimize oscillations and guarantee precise control.
- Built-in energy management applications and DDC programs for complete facility management.
- Comprehensive alarm management, historical data trend collection, operator control and monitoring functions.
- Remote interaction hub for printers, pagers, and workstations.
- Option with Hands Off Auto (HOA) switches.

### Description

The Power BACnet MEC is an integral part of the APOGEE® Automation System. The product is a high performance, modular Direct Digital Control (DDC) supervisory equipment controller. The Power BACnet MEC (BMEC) operates stand-alone or networked to perform complex control, monitoring and energy management functions without relying on a higher-level processor. Power BMECs communicate on 10/100 MB Ethernet BACnet/IP networks. The BMEC can optionally provide central monitoring and control for distributed Floor Level Network (FLN) devices or BACnet MS/TP devices.

### Features

- Fast and efficient 10/100 MB Ethernet network based on BACnet/IP protocol for open communications to BACnet/IP network controllers.
- Several levels of controller to match application requirements.

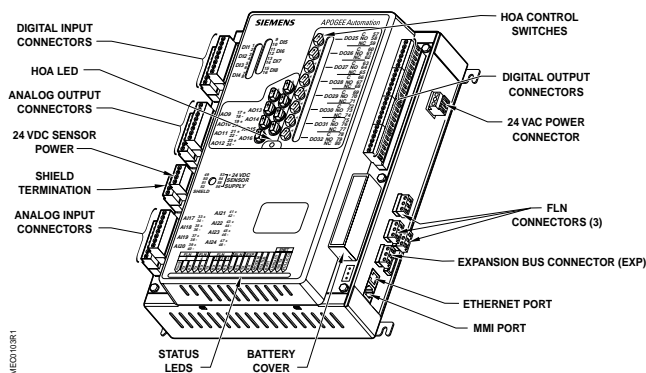


Figure 2. Power BACnet Modular Equipment Controller components and key features.

## Hardware

### Controllers

Several styles of controllers provide flexibility and expansion to meet application needs.

#### Power BMEC Series Controller – 11XXEB

In addition to building and system management functions, this controller provides control of the 32 points contained on the input/output point board.

#### Power BMEC Controller – 12XXEB

In addition to control of the 32 points on the input/output point board, this controller supports analog and digital point blocks, which can be mounted remotely from the controller. This capability expands the point capacity of the BMEC and provides for cost-effective placement of the point terminations close to the load.

#### Power BMEC Controller – 12XXEFB

The “EFB” version supplies three connections to the Floor Level Network (FLN), for a total of 96 application specific control devices.

#### Power BMEC Controller – 12XXEBB

The “EBB” version supplies one connection to the BACnet MS/TP network, supporting a total of 254 application specific control devices.

The BMEC consists of the following three major components:

#### Input/Output Point Board

The input/output point board contains 32 points that perform A/D or D/A conversion, signal processing, point command output, and communication with the controller board. The terminal blocks are removable for easy termination of field wiring. The analog input points are selectable to be 0 to 10V, 4 to 20 mA, or 1K RTD inputs. The analog output points are also selectable to be either 0 to 10V, or 4 to 20 mA. The digital inputs are dry contact, with four being pulse accumulator inputs. The digital outputs are 110/220V Form C rated relays.

#### Power Supply

The power supply provides regulated power to the input/output point board and active sensors. The power supply is internal to the Power MEC housing, simplifying installation and troubleshooting.

The power supply works with the controller board to ensure smooth power up and down sequences for the equipment controlled by the I/O point board and analog and digital point blocks, even through brownout conditions.

Status LEDs indicate 24 Vac supplied from the power supply and 24 Vdc supplied to the input/output point board.

#### Controller Board

The controller board is a microprocessor-based multi-tasking platform for program execution and communications with the I/O point board and with other BMECs over the BACnet/IP network.

The 12XX family of controllers can also support analog or digital point expansion modules, which provide for point expansion capability to match the application requirements. The controller board scans field data, optimizes control parameters, and manages operator requests for data.

An RS-232 operator terminal port with a quick connect phone jack (RJ-11) is included with each controller board for operator devices such as a Local User Interface (LUI), simple CRT terminal, laptop computer, or printer.

The 12XXEFB controllers support three FLN trunks for communications with a total of 96 FLN devices.

The 12XXEBB controllers support one BACnet MS/TP network with a total of 254 BACnet MS/TP devices.

The program and database information stored in the BMEC RAM is battery-backed. This eliminates the need for time-consuming program and database re-entry in the event of an extended power failure. The battery is field replaceable. When battery replacement is necessary, the controller board illuminates a “battery low” status LED and can send an alarm message to selected printers or terminals.

The firmware including the operating system is stored in non-volatile flash ROM. Flash ROM is easily upgradeable at the job site. This provides for ease of upgrade, as new firmware updates are made available.

Brownout protection and power recovery circuitry protect the controller board from power fluctuations.

#### Enclosure Assemblies

The enclosure assembly houses both electronic and pneumatic components. The locking enclosure

includes a perforated panel for mounting of the Power BMEC, Point Expansion Module, and other electronic or pneumatic components. The enclosure is available in two sizes to allow the enclosure to match the requirements of the installation:

- Small – to house a controller *or* two point expansion modules
- Large – to house a controller *and* two point expansion modules *or* four point expansion modules

The enclosures are constructed of metal to accommodate secure conduit fittings and protect components against electrical transients. The enclosure allows space for easy wire routing and terminations.



Figure 3. Two sizes of Power BACnet Modular Equipment Controller enclosures.

### Service Box

Two optional service boxes are available for mounting in the enclosure. One service box provides step down power from 115V to 24V, two Class 2 24 Vac power terminations (100 VA for Power BMEC and Point Expansion Modules, and 60 VA for actuators), and two unswitched 115 Vac outlets to power accessory devices such as modems and Portable Operator's Terminals. A second service box provides step down power from 230V to 24V and Class 2 24 Vac power terminations.



Figure 4. Power BACnet Modular Equipment Controller service box.

### Analog and Digital Point Expansion Modules

In addition to the points on the input/output board, the 12XX family of Power BMECs support analog and digital Point Expansion Modules. The controller can support a maximum of any combination of eight devices. They can be mounted next to or remotely from the controller depending upon the job requirements. The total length of the wiring run for Point Expansion Modules is a maximum of 200 feet (61 meters) on the BMEC expansion bus. Point Expansion Modules are also compatible with the APOGEE P1 FLN.

Point Expansion Module details are:

- Analog Point Expansion Module – 4AI, 4AO
- Analog Point Expansion Module – 8AI
- Digital Point Expansion Module – 4DI, 4DO
- Digital Point Expansion Module – 8DI, 4DO

The analog input points are user configurable and can be 0 to 10V, 4 to 20 mA, or 1K RTD input. The analog output points are also user configurable and can be 0 to 10V, or 0 to 20 mA.

The digital inputs are dry contact with four of the inputs being pulse accumulator points. The relayed digital output points support 110/220V Form C relays.



Figure 5. Analog and Digital Point Expansion Modules.

## Power BACnet Modular Equipment Control with Application Flexibility

The Power BACnet MECs are high performance controllers with complete flexibility to allow the owner to customize each controller with the exact program for the application. In addition, each controller can be sized to meet the hardware requirements for the application.

The control program for each 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 control equipment precisely and optimize energy usage.

## Global Information Access

Each Power BMEC is equipped with one RS-232 operator terminal port. This port supports the connection of a Local User Interface (LUI), simple CRT terminal, laptop computer, or printer. Devices connected to the terminal port gain global information access.

## Multiple Operator Access

Multiple operators can access the network simultaneously. This is useful if a local operator is accessing the system while a remote operator is accessing the system via a modem. Multiple operator access ensures that alarms are reported to an alarm printer while an operator accesses information from a local terminal.

## Menu Prompted, English Language Operator Interface

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

- Closed Loop Proportional, Integral and Derivative (PID) control
- Advanced loop tuning algorithm for (PID) parameters
- Logical sequencing
- Alarm detection and reporting
- Reset schedules

## Built-in Energy Management Applications

The following applications are programmed in the Power BMEC and require simple parameter input for implementation:

- Peak demand limiting
- Start-Stop time optimization
- Equipment scheduling, optimization, and sequencing
- Temperature compensated duty cycling
- Economizer control
- Night setback control
- Automatic Daylight Savings Time switchover
- Temporary schedule override
- Holiday scheduling
- Calendar-based scheduling
- Event scheduling

# Specifications

<b>BMEC: 1200EFB, 1210EFB, 1100EB, 1110EB, 1200EB, 1210EB, 1200EBB, 1210EBB</b>	
Processor	Motorola MPC 860T
Processor Clock Speed	48 MHz
Memory Size	40 MB for 1100EB, 1110EB, 1200EB, 1210EB 68 MB for 1200EFB, 1210EFB, 1200EBB, 1210EBB
Power Consumption	50 VA
Battery Backup of RAM (field replaceable)	14 days (AA Alkaline)
Network Communication:	
Building Level Network	10/100 Base-T for BACnet/IP
Floor Level Network	4800 bps to 38,400 bps for P1 FLN 4800 bps to 76,800 bps for BACnet MS/TP
A/D Resolution (analog in)	12 bits
D/A Resolution (analog out)	8 bits
Local Communication Interface	RS-232 port
Voltage Requirements	19.2 Vac to 26.4 Vac @ 50/60 Hz
Power Consumption	
Analog Point Expansion Module 4AI/4AO	20 VA @ 24 Vac
Digital Point Expansion Module 4DI/4DO	20 VA @ 24 Vac
Enclosure Type	NEMA 1
Ambient Operating Environment	+32°F to +120°F (0°C to +49°C) 93% rh (Non-condensing)
Agency Listings	UL 864 UUKL, UDTZ, QVAX ULC-C100 UUKL7 UL 916 PAZX
Agency Compliance	FCC Compliance Australian EMC Framework European EMC Directive (CE) European Low Voltage Directive (LVD)
Dimensions:	
BMEC (1100, 1110, 1200, 1210)	11.4" H × 9.5" W × 3.75" D (289 mm × 241 mm × 95 mm)
Analog Point Expansion Module	6" H × 9.5" W × 3.75" D (152 mm × 241 mm × 95 mm)
Digital Point Expansion Module	6" H × 9.5" W × 3.75" D (152 mm × 241 mm × 95 mm)
NEMA 1 Small Enclosure	18.75" H × 20" W × 5" D (475 mm × 508 mm × 127 mm)
NEMA 1 Large Enclosure	34" H × 20" W × 5" D (863.6 mm × 508 mm × 127 mm)
Mounting Surface	Building Wall or Structural Member

# Ordering Information

## Controller Range

Description	Product Number
BMEC 1100EB, 8DI, 8DO, 8AI, 8AO, HOA-ready, BACnet BLN	986-90360W
BMEC 1110EB, 8DI, 8DO, 8AI, 8AO, with HOA, BACnet BLN	986-90360X
BMEC 1200EB, 8DI, 8DO, 8AI, 8AO, point expansion support, HOA-ready, BACnet BLN	986-90360Y
BMEC 1210EB, 8DI, 8DO, 8AI, 8AO, point expansion support, with HOA, BACnet BLN	986-90360Z
BMEC 1200EFB, 8DI, 8DO, 8AI, 8AO, point expansion support, P1 FLN support, HOA-ready, BACnet BLN	986-90360L
BMEC 1210EFB, 8DI, 8DO, 8AI, 8AO, point expansion support, P1 FLN support, with HOA, BACnet BLN	986-90360M
BMEC 1200EBB, 8DI, 8DO, 8AI, 8AO, point expansion support, BACnet MS/TP support, HOA-ready, BACnet BLN	986-90361L
BMEC 1210EBB, 8DI, 8DO, 8AI, 8AO, point expansion support, BACnet MS/TP support, with HOA, BACnet BLN	986-90361M
Analog Point Expansion Module, 4AI/4AO 24V HOA-ready - for MEC Expansion or FLN	549-214
Analog Point Expansion Module, 4AI/4AO 24V with HOA - for MEC Expansion or FLN	549-215
Digital Point Expansion Module, 4DI/4DO 24V HOA-ready - for MEC Expansion or FLN	549-212
Digital Point Expansion Module, 4DI/4DO 24V with HOA - for MEC Expansion or FLN	549-213
Analog Point Expansion Module, 8AI 24V – for MEC Expansion or FLN	549-209
Digital Point Expansion Module, 8DI/4DO 24V HOA-ready – for MEC Expansion or FLN	549-210
Digital Point Expansion Module, 8DI/4DO 24V with HOA – for MEC Expansion or FLN	549-211
MEC NEMA 1 Small Enclosure	549-504
MEC NEMA 1 Large Enclosure	549-505
MEC Service Box, 115V to 24 Vac	549-506
MEC Service Box, 230V to 24 Vac	549-507

## HOA Upgrade-Kits

Description	Product Number
HOA Upgrade Kit for BMEC 1100, 1110, 1200, 1210	549-517
HOA Upgrade Kit Analog Point Block 4AI/4AO	549-520
HOA Upgrade Kit Digital Point Block 4DI/4DO	549-518
HOA Upgrade Kit Digital Point Block 8DI/4DO	549-519

## Accessories

Description	Product Number
Cable, MMI Extension	545-712
Cable, 9-pin (female to RJ-11)	540-143

## Documentation

Description	Document Number
Modular Equipment Controller Owner's Manual	125-2183
Powers Process Control Language (PPCL) User's Manual	125-1896



BACnet Protocol  
**Implementation Conformance Statement**

**Products**

Product	Model Number	Protocol Revision	Software Version	Firmware Version
Power BACnet Modular Equipment Controller (BMEC) for APOGEE	1200-EFB 1210-EFB 1200-EBB 1210-EBB 1100-EB 1110-EB 1200-EB 1210-EB	135-2004	N/A	2.6

Date Tested: Not Tested

**Vendor Information**

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**Product Description**

An integral member of the APOGEE<sup>®</sup> product family, the Power BACnet MEC (BMEC) is a high performance, modular Direct Digital Control (DDC) supervisory equipment and primary building controller. The BMEC operates stand-alone or networked to perform complex control, monitoring and energy management functions without relying on a higher-level processor. BMECs communicate on a 10/100 MB Ethernet BACnet/IP network. The BMEC can optionally provide central monitoring and control for distributed Floor Level Network (FLN) devices or BACnet MS/TP network devices.

**BACnet Standardized Device Profile**

Product	Device Profile
BMEC	BACnet Building Controller (B-BC)

**Supported BIBBs**

Product	Supported BIBBs	BIBB Name
All products	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-B	Data Sharing-COV-Unsolicited-B
	AE-N-B	Alarm and Event-Notification-B

Product	Supported BIBBs	BIBB Name
	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-LM-B	Device Management-List Manipulation-B

### Standard Object Types Supported

Product	Object Type	Creatable	Deletable
All products	Analog Input	No	No
	Analog Output	No	No
	Analog Value	No	No
	Binary Input	No	No
	Binary Output	No	No
	Binary Value	No	No
	Device	No	No
	Multi-state Output	No	No
	Notification Class	No	No

### Data Link Layer Options

Product	Data Link	Options
BMEC	BACnet/IP (Annex J)	

### Segmentation Capability

Product	Segmentation Type	Supported	Window Size (MS/TP product limited to 1)
BMEC	Able to transmit segmented messages	Yes	16
	Able to receive segmented messages	Yes	16

### Device Address Binding

Product	Static Binding Supported
BMEC	Yes

### Networking Options

Product	Router Option	Options
BMEC	No	BACnet/IP

### Character Sets

Product	Character Sets supported
BMEC	ANSI X3.4

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