

Modular Building Controller



Figure 1. Modular Building Controller.

Description

The Modular Building Controller (MBC) is an integral part of the APOGEE® Building Automation System. It is a high performance, modular Direct Digital Control (DDC) supervisory field panel. The field panel operates stand-alone or networked to perform complex control, monitoring and energy management functions without relying on a higher level processor.

The MBC provides central monitoring and control for distributed Floor Level Network (FLN) devices and other building systems (e.g., chiller, boiler, fire/life

safety, security, and lighting). Up to 100 modular field panels communicate on a peer-to-peer network.

Features

- Modular hardware components to match equipment to initial control requirements while providing for future expansion
- Modular, snap-in design simplifies installation and servicing
- Transparent viewing panels on the enclosure door to view the status indicator LEDs and override switch positions
- Integration platform for communications and interoperability with other systems and devices
- Proven program sequences to match equipment control applications
- Advanced Proportional Integral Derivative (PID) loop tuning algorithm for HVAC control to 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
- Support for peer-to-peer communications over Industry standard 10/100 Base-T TCP/IP networks.

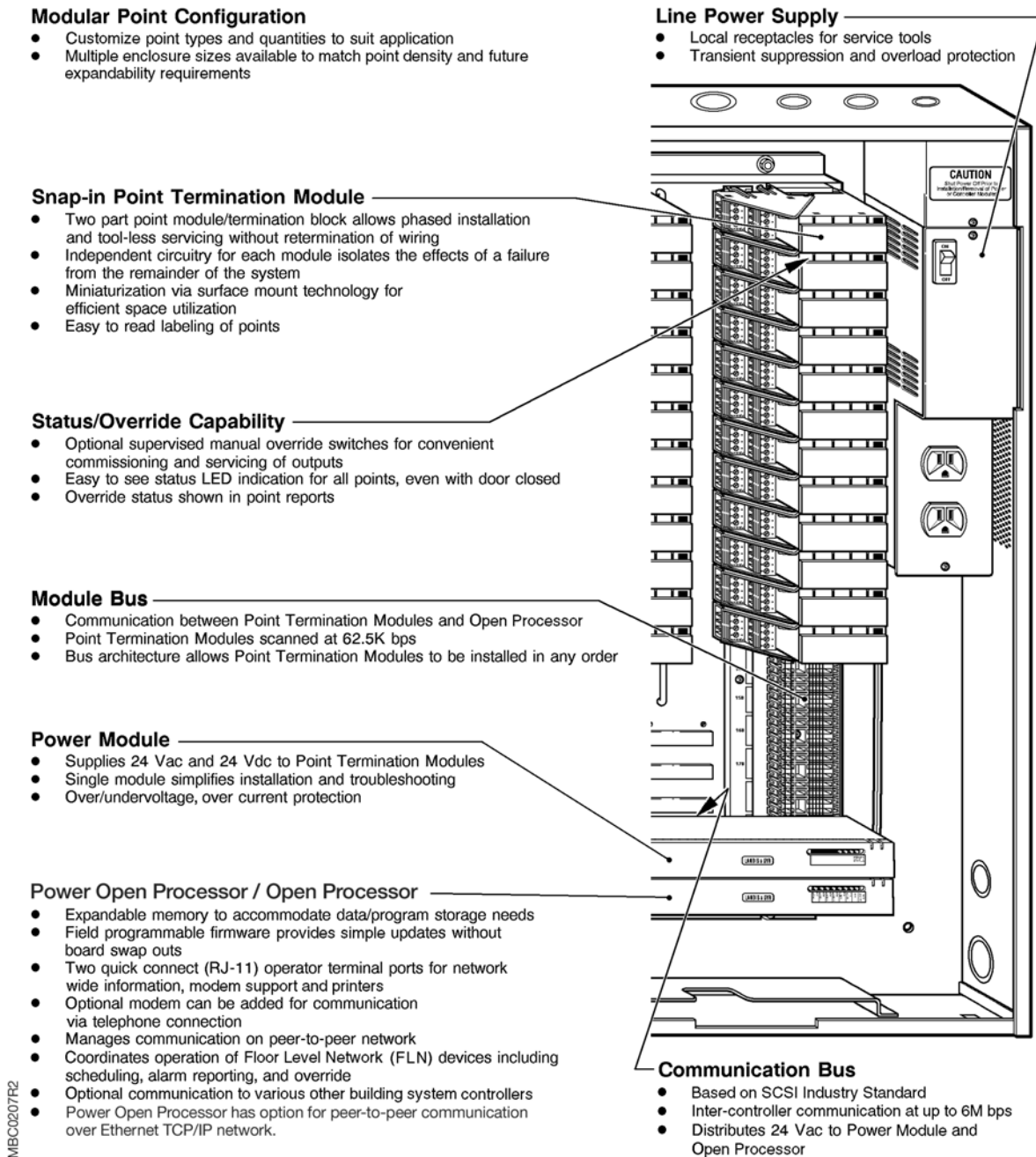


Figure 2. MBC components and key features.

Hardware

The MBC consists of the following 4 major components:

- Enclosure Assembly - two sizes available to house internal components.
- Power Module - supplies 24 Vdc and 24 Vac to Point Termination Modules.
- Power Open Processor/Open Processor - contains the main processor and communications and is available with numerous communications options. Select the appropriate communications protocol from our list of over 150 systems and devices.
- Point Termination Modules - consist of an electronic point module that performs A/D or D/A conversion, signal processing, point command output and communication with the

Power Open Processor/Open Processor and a termination block for termination of field wiring or tubing.



Figure 3. Two sizes of enclosure assemblies.

Enclosure Assembly

The enclosure assembly includes a backplane, rails to which the Power Open Processor or Open Processor, Power Module, and Point Termination Modules snap on, a duplex receptacle and a step-down isolation transformer.

The enclosure assembly houses both electronic and pneumatic components. The enclosure is available in the following two sizes to allow the enclosure size to match the point density of the application:

- 24 module size
- 40 module size

The enclosure is constructed of metal to accommodate secure conduit fittings and protect components against electrical transients.

The removable front door has see-through view panels to allow the user to see the status of inputs, outputs and override switches. The door is UL 94-5VA rated for fire and smoke control applications.

Enclosure assemblies allow space for easy wire terminations. Two unswitched 115 Vac outlets are included in each enclosure to power accessory devices such as modems and portable operator's terminals.

The NEMA 12 MBC-24 and MBC-40 UL listed panel assemblies provide control in areas requiring air-tight

protection against lint, dust, dirt, water seepage and dripping and external condensation of non-corrosive liquids.

Power Module

The Power Module provides regulated power to the Point Termination Modules and active sensors. Only one Power Module is needed per enclosure assembly, simplifying installation and troubleshooting.

An on-board microprocessor controls its operation and works with the Power Open Processor or Open Processor to ensure smooth power up and down sequences of equipment controlled by the point modules, even through brown-out conditions.

The Power Module contains status LEDs to indicate 24 Vac supplied from the line power supply, 24 Vdc supplied to point modules and over voltage/under voltage condition.

Open Processors

The Open Processor is a microprocessor-based multitasking platform for program execution and communications with other field panels, FLN devices, point modules and third-party equipment/systems (optional). The Open Processor scans field data, optimizes control parameters and manages operator requests for data in seconds.

The Open Processor is an open communications platform providing control of an extensive number of building systems including:

- Siemens Building Technologies, Inc. FLN. Each Open Processor supports up to 3 trunks for a total of 96 application specific control devices.
- Communications drivers to non-Siemens networks. As an option, an Open Processor can communicate to related building system controllers such as boilers, chillers, rooftop units, PLCs, power meters, lighting panels, fire alarm and life safety systems and access control systems.

Multiple Open Processors can co-exist in a single enclosure, providing flexibility in configuration and architecture. Up to 480 FLN devices can be supervised from one MBC with five Open Processors installed.

Two RS-232 operator terminal ports with quick connect phone jacks are included with each Open Processor for operator devices such as a simple CRT terminal, laptop PC, printer or modem.

The program and database information stored in the Open Processor 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. When battery replacement is necessary, the Open Processor 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 memory. Flash is easily updateable at the job site. This provides for ease of upgrade as new firmware updates are made available.

Brownout protection and power recovery circuitry protects the Open Processor from power fluctuations.

Power Open Processors

The Power Open Processor is an updated version of the Open Processor. It employs state-of-the-art technology to offer exceptional performance and memory capacity. It has support for peer-to-peer communications over industry standard TCP/IP networks through a direct connection to 10/100 BaseT.

Point Termination Modules

The Point Termination Modules (refer to table) support one, two, or four points. Modules are available for analog input or output and digital input or output point types. Any custom mixture of the Point Termination Modules can be installed in the enclosures.

The Point Termination Module consists of two pieces: the electronic point module and the termination block, which provides wire or pneumatic tubing connections. Designed for phased installation, the electrician wires to all the termination blocks. The system technician installs the module electronics during start-up, thereby protecting electronics from harsh job site conditions. These modules quickly and easily snap into place without tools, and without having to re-terminate wires for fast servicing. Modules can be snapped in and out without powering down the field panel to minimize any system downtime.

Each module is supplied with a label insert that is customized to reflect the actual device connected to the module. Address keys provide addressing of the Point Termination Module to the processor and corresponds to the point address in the database.



Figure 4. Point Termination Modules.



Figure 5. Snap-in Modules for easy replacement.

Point Module Product Numbers

Description	# of Points/ Module	Part Number
Analog Input		
1000 Ω Platinum RTD, Industry Standard	2	PTM6.2P1K rd
100K Ω Thermistor	2	PTM6.2N100K
0-10 Vdc, Industry Standard	2	PTM6.2U10
4-20 mA, 2-Wire, 3-Wire, Industry Standard	2	PTM6.2I420
Digital Input		
Dry Contact, Potential Free, LED Indication of Input (On/Off)	2	PTM6.2D20
Dry Contact, Potential Free, LED Indication of Input (On/Off)	4	PTM6.4D20
Pulse Accumulator, up to 25Hz, LED Indication of Input (On/Off)	2	PTM6.2C
Voltage Sensing, 250 Vac Max. Wired Parallel in Circuit, LED Indication of Input (On/Off)	2	PTM6.2D250
Analog Output		
0-10 Vdc, LED Indication of Output (Brightness), Industry Standard	2	PTM6.2Y10S
0-10 Vdc with Supervised Auto/Manual Switch per AO, Manual Gradual Switch Made Active In Manual Mode. LED Indication of Output (Brightness), Industry Standard	2	PTM6.2Y10S-M
4-20 mA, LED Indication of Output (Brightness), 2-Wire, 3-Wire, Industry Standard	2	PTM6.2Y420
0-20 PSI (0-138 Kpa) Pneumatic Output with Supervised Auto/Manual Switch, LED Indication of Output (9 segment LED bar)	1	PTM6.1PSI20-M
Digital Output		
Contact Closure, 240 Vac, 4A, LED Indication (On/Off)	2	PTM6.2Q250
Contact Closure, 240 Vac, 4A, LED Indication (On/Off), Supervised Hand-Off-Auto Switch per DO	2	PTM6.2Q250-M

Optional Manual Override Simplifies Troubleshooting

Manual override is available on digital and analog outputs to allow the user to manually control the position of the end device. This aids in system start-up and troubleshooting to test the equipment operation such as stroking valves and dampers. The manual override is supervised so the central operator is informed that an output is in the override position. A point log report indicates override position status. In addition, an alarm can be sent when the point module is placed in override.

Digital output provides the following manual override positions; on, off and automatic. Analog outputs provide two positions; automatic and manual. In

manual override the operator can adjust the output proportionally between full, open, and closed.

Snap-In Hardware Simplifies Service

All hardware components snap into mounting rails to allow replacement of modules without re-terminating wires or pneumatic tubing in the unlikely event of failure. Individual Point Termination Modules can be replaced without interrupting the control process for any other modules; the Open Processor continues to function and control the other modules. The Point Termination Module, once replaced, is automatically re-addressed by inserting the appropriate address key into its slot.

Modular Control Panels with Application Flexibility

The MBCs are high performance controllers with complete flexibility to allow the owner to customize each control panel with the exact hardware and program for the application.

The facility manager only purchases what is needed. For example, for monitoring applications, the control panel can be customized with the exact number and type of analog inputs to match the sensor devices. For monitoring and controlling a large number of (on-off) fans or motors, digital input and output Point Termination Modules are added.

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.

For interaction between events and data on separate systems, Open Processors equipped with various communication drivers are utilized.

Integrated Building Block Architecture

Every MBC is capable of communications with multiple systems. Each Power Open Processor or Open Processor provides stand-alone control for a family of up to 96 FLN devices. A total of 5 processors, potentially communicating with 5 other building systems, can reside in a single MBC panel. Powerful flexibility provides an unlimited number of configuration possibilities. For example, two Open Processors communicate with 192 FLN devices while a third processor controls lighting panels and a fourth processor communicates with a fire system or even a network of devices utilizing a standard protocol.

In a stand-alone configuration, the MBC can fulfill all requirements of a BMS supervisory network coordinator, managing operation schedules, alarms, dialing out to other building systems, printers and pagers, and communicating for the connected devices.

Global Information Access

Each MBC is equipped with two RS-232 operator terminal ports. These ports support the connection of a modem, simple CRT terminal, laptop PC, or printer. Devices connected to the 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 Ethernet BLN 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 MBC field panel 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,
- Equipment scheduling,
- Program editing and modification via Powers Process Control Language (PPCL),
- Alarm reporting and acknowledgment, and
- Continual display of dynamic information.

Built-in Direct Digital Control Routines

The MBC provides stand-alone DDC to deliver precise HVAC control, and comprehensive information about system operation. The Open Processor receives information from sensors in the building, processes the information, and directly controls the equipment. The following functions are available in the MBC:

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

Built-in Energy Management Applications

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

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

Specifications

Controller Type:	Open Processor, FW Rev 1.x	Power Open Processor, FW Rev 2.x
Processor Type	Motorola 68302	Motorola MPC 862T
Processor Clock Speed	16.67 MHz	48MHz
Memory Size:	3 MB (Protocol 2 or Standalone)	72 MB
Battery Backup of RAM	60 days (field replaceable, lithium)	20 days (field replaceable, AA Alkaline)
A/D Resolution (analog in)	12 bits	12 bits
D/A Resolution (analog out)	10 bits	10 bits
Local Communication Interface	Dual RS-232 ports	Dual RS-232 ports
Network Communication Speed	RS-485 BLN: 300 bps to 115.2K bps Ethernet BLN: not available	RS-485 BLN: 300 bps to 115.2K bps Ethernet BLN: 10/100 BaseT
Voltage Requirements	115 Vac @ 60 Hz or 230 Vac @ 50/60 Hz	115 Vac @ 60 Hz or 230 Vac @ 50/60 Hz
Enclosure Type	NEMA 1 or NEMA 12 (optional)	NEMA 1 or NEMA 12 (optional)
Ambient Operating Environment	+32°F to +120°F (0°C to +49°C) 5% to 95% RH (Non-condensing)	+32°F to +120°F (0°C to +49°C) 5% to 95% RH (Non-condensing)
Agency Listings	UL 864 UUKL ULC-C100 UUKL 7 UL 864 UDTZ UL 864 QVAX UL 916 PAZX CSA 22.2 No. 0, 0.4, and 205	UL 864 UUKL ULC-C100 UUKL 7 UL 864 UDTZ UL 864 QVAX UL 916 PAZX CSA 22.2 No. 0, 0.4, and 205
Agency Compliance	FCC, Part 15 Subpart B, Class A CISPR 22 Class A European EMC Directive (CE): Industrial Levels European Low Voltage Directive (LVD) Australian Compatibility Framework	FCC, Part 15 Subpart B, Class A CISPR 22 Class A European EMC Directive (CE): Industrial Levels European Low Voltage Directive (LVD) Australian Compatibility Framework
Dimensions:		
MBC-24	24" H x 20" W x 7" D (863.6 mm x 508.0 mm x 177.8 mm)	24" H x 20" W x 7" D (863.6 mm x 508.0 mm x 177.8 mm)
MBC-40	34" H x 20" W x 7" D (863.6 mm x 508.0 mm x 177.8 mm)	34" H x 20" W x 7" D (863.6 mm x 508.0 mm x 177.8 mm)
NEMA 12 MBC-24	36" H x 30" W x 10" D (914.4 mm x 762.0 mm x 254.0 mm)	36" H x 30" W x 10" D (914.4 mm x 762.0 mm x 254.0 mm)
NEMA 12 MBC-40	48" H x 30" W x 10" D (1219.2 mm x 762.0 mm x 254.0 mm)	48" H x 30" W x 10" D (1219.2 mm x 762.0 mm x 254.0 mm)
Mounting Surface	Building Wall or Structural Member	Building Wall or Structural Member

Product Ordering Information

Description	Product Number
MBC-24 Enclosure Assembly with Styled Door, 115V	545-141
MBC-24 Enclosure Assembly with Metal Door, 115V	545-146
MBC-40 Enclosure Assembly with Styled Door, 115V	545-142
MBC-40 Enclosure Assembly with Metal Door, 115V	545-147
MBC-24 NEMA 12 Enclosure Assembly, 115V	545-371
MBC-40 NEMA 12 Enclosure Assembly, 115V	545-372
MBC-24 Enclosure Assembly with Styled Door, 230V	545-114
MBC-24 Enclosure Assembly with Metal Door, 230V	545-116
MBC-40 Enclosure Assembly with Styled Door, 230V	545-115
MBC-40 Enclosure Assembly with Metal Door, 230V	545-117
MBC-24 NEMA 12 Enclosure Assembly, 230V	545-373
MBC-40 NEMA 12 Enclosure Assembly, 230V	545-374
Power Open Processor with RS-485 BLN and P1 FLN drivers with Revision 2.x Firmware	562-001
Power Open Processor with Ethernet BLN and P1 FLN drivers with Revision 2.x Firmware	562-002
Open Processor with Protocol 2 and P1 FLN drivers - 3 MB Memory (1 Mb RAM) with Revision 1.x English Firmware	545-716
Open Processor with Protocol 2 and P1 FLN drivers – 3 MB Memory (1 MB RAM) with Revision 1.x French Firmware	555-601
Open Processor Stand-alone and P1 FLN drivers - 3 MB Memory (1 MB RAM) with Revision 1.x English Firmware	545-717
Power Module	545-714
Memory Board Upgrade P2 - 8MB Memory (4 MB RAM) with Revision 2.x English Firmware	545-731
Memory Board Upgrade Stand-alone - 6MB Memory (2 MB RAM) with Revision 2.x English Firmware	545-727
Address Keys, (#1-16) used with System 600 APOGEE Revision 2.x firmware	545-825
Address Keys, (#17-32) used with System 600 APOGEE Revision 2.x Firmware	545-826
Address Keys, (#33-48) used with System 600 APOGEE Revision 2.x Firmware	545-827
Address Keys, (#49-64) used with System 600 APOGEE Revision 2.x Firmware	545-828
Address Keys, (#65-80) used with System 600 APOGEE Revision 2.x Firmware	545-829
Address Keys, (#4-64) used with Revision 1.x Firmware	545-040
Address Keys, (#68-128) used with Revision 1.x Firmware	545-041
Address Keys, (#132-192) used with Revision 1.x Firmware	545-042
Address Keys, (#196-256) used with Revision 1.x Firmware	545-043
Address Keys, (#260-296) used with Revision 1.x Firmware	545-044

Accessories Ordering Information

Description	Part Number
MBC-24 Replacement Steel Door with Siemens and APOGEE Automation System logos	545-105
MBC-24 Replacement Styled Door with Siemens and APOGEE Automation System logos	545-060
MBC-40 Replacement Steel Door Siemens and APOGEE Automation System logos	545-106
MBC-40 Replacement Styled Door Siemens and APOGEE Automation System logos	545-065
MBC Replacement Transformer Kit	545-555
MBC-24 Replacement Window Kit	545-074
MBC-24 Backplane Replacement Kit	545-077
MBC-40 Backplane Replacement Kit	545-078
MBC-24 and MBC-40 Service Box Kit, 115 Vac	545-508
MBC-24 and MBC-40 Service Box Kit, 230 Vac	545-509
Cable, MMI Extension	545-712
Lithium Battery (10/pkg.)	545-710
Cable, 9-pin (female to RJ-11)	540-143
PTM Label Paper (250 sheets/pkg.)	545-053
Modem to RJ-45 Cable	549-510
U.S. Robotics Sportster 56K bps, Dial-up, Fax, V.90 modem with RJ-11 cable and telephone transient surge suppressor	538-860
High/Low Voltage Wire Barrier	545-603

Document Ordering Information

Description	Document Number
Modular Building Controller and Remote Building Controller Owner's Manual	125-1992
Powers Process Control Language (PPCL) User's Manual	125-1896
System 600 APOGEE Field Panel User's Manual	125-3000
System 600 Field Panel User's Manual	125-1895

Information in this document is based on specifications believed correct at the time of publication. The right is reserved to make changes as design improvements are introduced. APOGEE is a registered trademark of Siemens Building Technologies, Inc. © 2003 Siemens Building Technologies, Inc.