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Power Modular Equipment Controller



Figure 1. Power Modular Equipment Controller.

Description

The Power Modular Equipment Controller family of field panel and point expansion products is an integral part of the APOGEE® Automation System. They are high performance, modular Direct Digital Control (DDC) supervisory equipment controllers. They operate stand-alone or networked to perform complex control, monitoring and energy management functions without relying on a higher-level processor. Power MECs communicate with other field panels or workstations on a peer-to-peer Automation Level Network (ALN) or with an optional remote connection to a central console. The ALN may either be P2 or optional TCP/IP protocol. The Power MEC can optionally provide central monitoring and control for distributed Field Level Network (FLN) devices. The FLN may either be P1 or LonTalk® protocol.

Features

- Several levels of controllers to match application requirements
- Remote mounted external analog and digital point expansion modules for added point expansion which may be independently operated as FLN devices or directly controlled on an optional point expansion bus
- 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
- Message control for terminals, printers, pagers and workstations
- Option with Hands Off Auto (HOA) switches
- Option for compatibility with LonWorks® networks
- Option for peer-to-peer communications over industry standard 10/100 Base-T TCP/IP networks.

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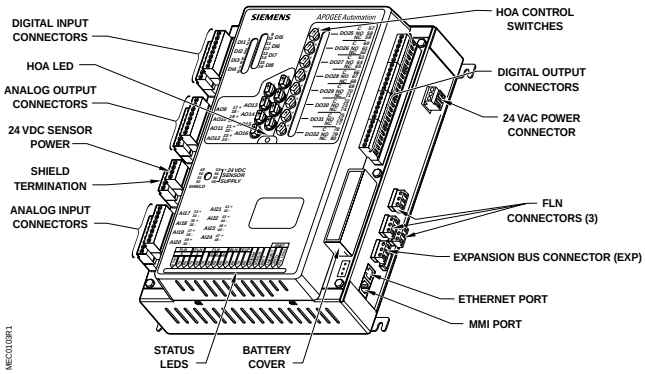


Figure 2. Power Modular Equipment Controller components and key features.

Hardware

Controllers

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

Power MEC Controller – 11xx

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

Power MEC Controller– 12xx

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

Power MEC Controller – 13xx

In addition to building and system management functions and point expansion this controller supports connection to Insight using a dial-up modem or an APOGEE Ethernet Microserver. This allows use of the Power MEC in applications that are remote from the central console.

Power MEC Controller – 1xxxEx

The Power MEC “E” versions support industry standard TCP/IP networks through a direct connection to 10/100 BaseT for ALN communications.

Power MEC Controller – 12xxF, 13xxF

The Power MEC “F” version adds three connections to the Floor Level Network (FLN), for a total of 96 devices.

Power MEC Controller – 12xxL, 13xxL

The Power MEC “L” version adds LonWorks compatibility. It is equipped with a Neuron Microprocessor and FTT-10A Transceiver. Instead of three connections to the APOGEE P1 Floor Level Network, it has a single connection for a LonWorks network.

The “L” versions have a LonWorks network database server embedded. This database maintains a dynamic, real-time representation of the LonWorks network including connections/bindings, node status, and configuration parameters values.

The Power MEC 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 0-10V, 4-20mA, 1K RTD or optional 100K Thermistor. The analog output points are also selectable to be either 0-10V or 4-20mA. The digital inputs are dry contact, with four being pulse accumulator inputs. The digital outputs support 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 brown-out conditions.

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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 Power MECs and field panels over the ALN.

The 12xx and 13xx 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 PC, or printer. In addition, the MEC 13xx controller supports an RS-232 quick connect phone jack (RJ-45) for use with a phone modem for APOGEE autodial stand-alone network capability.

The 12xxF and 13xxF controllers support 3 FLN trunks for communications with a total of 96 FLN devices.

The program and database information stored in the Power MEC 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 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 memory. 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 MEC, 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 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 MEC and Point Expansion Modules, and 60 VA for actuators), and two un-switched 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.

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Figure 4. Power Modular Equipment Controller service box.

Analog and Digital Point Expansion Modules

In addition to the points on the input/output board, the 12xx and 13xx Power MECs support analog and digital Point Expansion Modules. The controller can support a maximum of any combination of eight modules. They can be mounted next to or remote 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 MEC 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 selectable to be 0-10V, 4-20mA, 1K RTD or optional 100K Thermistor input. The analog output points are also user configurable to be 0-10V or 0-20ma.

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.

Modular Equipment Control with Application Flexibility

The Power 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.

In a stand-alone configuration, the MEC 13xx controller can fulfill all requirements of a Building Management System (BMS) supervisory system; managing operation schedules, alarms and dialing out to other building systems, printers and pagers.

Global Information Access

Each Power MEC is equipped with one RS-232 operator terminal port. This port supports the connection of a Local User Interface (LUI), simple CRT terminal, laptop PC, or printer. Devices connected to the terminal port gain global information access. The MEC 13xx supports a second RS-232 port for use with a modem.

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 ALN option, multiple

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operators may also access the controller through concurrent Telnet sessions and/or local operator terminal ports.

Menu Prompted, English Language Operator Interface

The Power MEC 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, and
- Continual display of dynamic information.

Built-in Direct Digital Control Routines

The Power MEC 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:

- Adaptive control, auto adjusting closed loop control. Provides more efficient, adaptive, robust, fast, and stable control than the traditional PID control algorithm. 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, and
- Reset schedules.

Built-in Energy Management Applications

The following applications are programmed in the Power MEC 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, and
- Event scheduling.

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Specifications

Processor – Motorola MPC	
1xxx, 1xxxE	857T
1xxxF, 1xxxEF, 1xxxL, 1xxxEL	860T
Processor Clock Speed	48 MHz
Memory 1xxx, 1xxxE, 1xxxF, 1xxxL	32mb RAM / 8mb FLASH (40mb Total)
1xxxEF, 1xxxEL	64mb RAM / 8mb FLASH (72mb Total)
Battery Backup of RAM (field Replaceable) AA Alkaline	14 days typical
Network Communication:	
Automation Level Network	300 bps to 115.2K bps for RS-485 ALN 10/100 BaseT for Ethernet ALN
Field Level Network	78K bps for LonWorks FLN 4800 bps to 38.4 bps for P1 FLN
Point Expansion Bus	38.4 bps
A/D Resolution (analog in)	12 bits
D/A Resolution (analog out)	8 bits
Local Communication Interface	RS-232 port
Voltage Requirements	
Service Box, 115V	115Vac +/- 15% @ 60 Hz +/- 5%
Service Box, 230V	230Vac +/- 15% @ 50/60 Hz +/- 5%
Controller or Expansion Module	20 Vac to 30 Vac @ 47 Hz to 63 Hz
Power Consumption	
Power Modular Equipment Controllers	50 VA
Analog Point Expansion module 8AI	17 VA @ 24 Vac
Analog Point Expansion module 4AI/4AO	14 VA @ 24 Vac
Digital Point Expansion module 8DI/4DO	20 VA @ 24 Vac
Digital Point Expansion module 4DI/4DO	17 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 ULC-C100 UUKL7 UL 916 PAZX
Agency Compliance	FCC Compliance Australian EMC Framework European EMC Directive (CE) European Low Voltage Directive (LVD)
Dimensions:	
Modular Equipment Controller	11.4" H x9.5" W x 3.75" D (289 mm x 241 mm x 95 mm)
Analog Point Expansion Module	6" H x 9.5" W x 3.75" D (152 mm x 241mm x 95mm)
Digital Point Expansion Module	6" H x 9.5" W x 3.75" D (152 mm x 241mm x 95mm)
NEMA Type 1 Small Enclosure	18.75" H x 20" W x 5" D (475 mm x 508 mm x 127 mm)
NEMA Type 1 Large Enclosure	34" H x 20" W x 5" D (863.6 mm x 508 mm x 127 mm)
Mounting Surface	Building Wall or Structural Member

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Ordering Information

Controller Range

Description	Product Number
Power MEC 1100, 8DI, 8DO, 8AI, 8AO, HOA-ready	549-610
Power MEC 1101, 16DI, 4DO, 8AI, 4AO	549-611
Power MEC 1110, 8DI, 8DO, 8AI, 8AO with HOA	549-612
Power MEC 1200, 8DI, 8DO, 8AI, 8AO, point expansion support, HOA-ready	549-613
Power MEC 1201, 16DI, 4DO, 8AI, 4AO	549-614
Power MEC 1210, 8DI, 8DO, 8AI, 8AO, point expansion support, with HOA	549-615
Power MEC 1300, 8DI, 8DO, 8AI, 8AO, point expansion support, modem, HOA-ready	549-616
Power MEC 1310, 8DI, 8DO, 8AI, 8AO, point expansion support, modem, with HOA	549-617
Power MEC 1200F, 8DI, 8DO, 8AI, 8AO, point expansion support, P1 FLN support, HOA-ready	549-620
Power MEC 1210F, 8DI, 8DO, 8AI, 8AO, point expansion support, P1 FLN support, with HOA	549-621
Power MEC 1300F, 8DI, 8DO, 8AI, 8AO, point expansion support, modem, P1 FLN support, HOA-ready	549-622
Power MEC 1310F, 8DI, 8DO, 8AI, 8AO, point expansion support, modem, P1 FLN support with HOA	549-623
Power MEC 1200L, 8DI, 8DO, 8AI, 8AO, point expansion support, LonWorks network, HOA-ready	549-640
Power MEC 1210L, 8DI, 8DO, 8AI, 8AO, point expansion support, LonWorks network, with HOA	549-641
Power MEC 1300L, 8DI, 8DO, 8AI, 8AO, point expansion support, modem, LonWorks network, HOA-ready	549-642
Power MEC 1310L, 8DI, 8DO, 8AI, 8AO, point expansion support, modem, LonWorks network with HOA	549-643
Power MEC 1200EL, 8DI, 8DO, 8AI, 8AO, point expansion support, LonWorks network, HOA-ready, Ethernet ALN	549-644
Power MEC 1210EL, 8DI, 8DO, 8AI, 8AO, point expansion support, LonWorks network, with HOA, Ethernet ALN	549-645
Power MEC 1100E, 8DI, 8DO, 8AI, 8AO, HOA-ready, Ethernet ALN	549-624
Power MEC 1110E, 8DI, 8DO, 8AI, 8AO, with HOA, Ethernet ALN	549-625
Power MEC 1200E, 8DI, 8DO, 8AI, 8AO, point expansion support, HOA-ready, Ethernet ALN	549-626
Power MEC 1210E, 8DI, 8DO, 8AI, 8AO, point expansion support, with HOA, Ethernet ALN	549-627
Power MEC 1200EF, 8DI, 8DO, 8AI, 8AO, point expansion support, P1 FLN support, HOA-ready, Ethernet ALN	549-628
Power MEC 1210EF, 8DI, 8DO, 8AI, 8AO, point expansion support, P1 FLN support, with HOA, Ethernet ALN	549-629
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 MEC 100, 200, 300 (68302 processor - non-Power)	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

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Accessories

Description	Product Number
Modem Cable (DB25 male to RJ-45 8-pin) for hardware flow control of autodial (Dial-up) modem	549-510
MMI Extension Cable, (RJ-11 male to female) for printers or terminals outside of enclosure	545-712
Lithium Battery (10/pkg.) for Models 100, 101, 110, 200, 201, 210, 300, 310	545-710
MMI Cable (DB9 female to RJ-11 6-pin) for no flow control operator interface connections	540-143
U.S. Robotics Sportster 56K bps, Dial-up, Fax, V.92 modem with RJ-45 cable and telephone transient surge suppressor for Smoke Control Application	549-511
APOGEE Ethernet Microserver 200, 115V with two serial cables (DB9 female to RJ-11 6-pin) used with MEC 13xx Modem and MMI ports	538-920
APOGEE Ethernet Microserver 200, 100V to 240V with two serial cables (DB9 female to RJ-11 6-pin) used with MEC 13xx Modem and MMI ports	538-922
Ethernet transient surge suppressor for AEM200 Smoke Control Application	538-923

Documentation

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

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