

MGE UPS SYSTEMS, INC.

REMOTE POWER MANAGEMENT MODULE (RPMM)

GUIDE SPECIFICATIONS

1.0 GENERAL

1.1 SUMMARY

This specification covers the electrical characteristics and general requirements for computer power distribution equipment, hereafter referred to as the RPMM. The RPMM is designed primarily for distribution of electrical power in a computer room; however its design shall also permit its use in office, factory, and other applications as well. The RPMM provides distribution, control and optional monitoring of AC power, and will properly interface the building's AC power source with sensitive electronic loads.

1.2 STANDARDS

The following standards and documents apply to the specified equipment to the extent defined herein:

- A. UL Certification
- B. CSA Standard 950
- C. NEMA AB1 - Molded Case Circuit Breakers
- D. NEMA PB1 – Panelboards
- E. NFPA 70 - National Electric Code
- F. ISO 9000 - International Organization for Standardization

1.3 SUBMITTALS

Submittals shall contain the following documentation:

- A. **Installation Package:** Complete electrical characteristics and connection requirements. Provide detailed equipment outlines with cabinet dimensions and spacing requirements; location of conduit entry/exit paths; location of floor/seismic mounting; all cabinet weights; heat rejection and air flow requirements; single-line diagram; control and external wiring.
- B. **Product Data:** Provide catalog sheets and technical data sheets to indicate physical data and electrical performance, electrical characteristics, and connection requirements.
- C. **Manufacturer's Installation Instructions:** Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product. Include equipment installation outline, connection diagram for external cabling, internal wiring diagram, and written instruction for installation.

1.4 FINAL SUBMITTALS

Upon delivery of the RPMM, the following submittals shall be included:

- A. A complete set of installation drawings showing all the information stated in section 1.3.
- B. An owner's manual showing safe and correct operation of all RPMM functions.

1.5 QUALIFICATIONS & QUALITY ASSURANCE

- A. **Manufacturer's Certification:** The manufacturer shall specialize in manufacturing of Remote Power Management Modules (RPMM) specified in this document, with a nationwide first party service organization. The manufacturer shall be ISO 9001 certified and shall design to internationally accepted standards.
- B. **Factory Testing:** Prior to shipment the manufacturer shall complete a documented test procedure to test all functions of the RPMM, and guarantee compliance with the specification. The factory test shall be performed in the presence of the customer providing the manufacturer receives adequate prior notice. The manufacturer shall provide a copy of the test report upon request.
- C. **Materials and Assemblies:** All materials and parts comprising the RPMM shall be new, of current manufacture, and shall not have been in prior service, except as required during factory testing. All active electronic devices shall be solid state and not exceed the manufacturer's recommended tolerances for temperature or current to ensure maximum reliability. All semiconductor devices shall be sealed. All relays shall be provided with dust covers. The manufacturer shall conduct inspections on incoming parts, modular assemblies, and final products.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. All products shall be packaged in a manner to prevent penetration by debris and to allow safe delivery by all modes of ground transportation and air transportation where specified.
- B. Prior to shipping all products shall be inspected at the factory for damage.
- C. Equipment shall be protected against extreme temperature and humidity and shall be stored in a conditioned or protected environment.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. **Temperature:**
 - Operating:** -10°C to +40°C (14°F to 104°F)
 - Non-operating:** -40°C to +60°C (-40°F to 140°F)
- B. **Relative Humidity:**
 - Operating:** 10% to 90% non-condensing
 - Non-operating:** 10% to 70% condensing
- C. **Altitude:**
 - Operating:** 500 feet below to 7,000 feet above sea level
 - Non-operating:** 500 feet below to 25,000 feet above sea level

1.8 WARRANTY

The RPMM shall be covered by a full parts and labor warranty from the manufacturer. The warranty period shall be for twelve (12) months from date of installation and start-up or eighteen (18) months from date of shipment from the manufacturer, whichever occurs first.

2.0 PRODUCT DESCRIPTION

2.1 APPROVED MANUFACTURERS & PRODUCT DESCRIPTION

- A. **Approved Manufacturer(s):** The specified equipment shall be manufactured by MGE UPS SYSTEMS or approved equal.

- B. **Product Description:** This specification covers the electrical characteristics and general requirements for computer power distribution equipment, hereafter referred to as the RPMM. The RPMM is designed primarily for distribution of electrical power in a computer room; however its design shall also permit its use in office, factory, and other applications as well. The RPMM provides distribution, control and optional monitoring of AC power, and will properly interface the building's AC power source with sensitive electronic loads.

2.2 SYSTEM DESCRIPTION

- A. **Input Characteristics**
 - 1. Voltage: 208/120 VAC, 3 phase, 4 wire plus ground
 - 2. Frequency: 60 Hz
 - 3. Current: 310A

- B. **Output Characteristics**
 - 1. Voltage: 208/120 VAC, 3 phase, 4 wire plus ground
 - 2. Frequency: 60 Hz
 - 3. Current: 310A

2.3 MODES OF OPERATION

- A. **Normal Operation:** The RPMM shall provide provides distribution, control and monitoring (optional) of AC power. A 208 VAC source is connected to the input terminal block. The terminal block feeds power to each of the two 225A sub main breakers. Each sub main breaker shall feed a 42 pole panelboard. Load circuits can be controlled manually from distribution panelboards.

2.4 COMPONENT DESCRIPTION

- A. The RPMM is provided with output distribution panelboards, each with the following characteristics and/or features (panelboards will be matched with main CB):

1. **Branch Circuit Panelboard**

NEMA PB1, Square D type Universal (Plug-in or Bolt-on)
NQOM442L225CUNLB
panelboard accepting QOB or QOB-VH bolt-on (standard) or plug-in (QO)
circuit breakers.

Pole Capacity: 42 poles, capable of accepting 1, 2, 3-pole circuit breakers
Bus Rating: 225 Amperes
Copper Ground bus: 42 terminals
Copper Neutral Bus: Rated for 200% of nominal phase current (450 Amps)
Circuit Breakers: Up to 150 Amp circuit breakers.

2. **Panelboard Main Breaker**

The RPMM has one panelboard main circuit breaker per 42 pole distribution panelboard (described below). The panelboard main CB provides thermal/magnetic overload and short-circuit protection for each panelboard, and allows manual on/off control.

Rating: 225 Amperes
Interrupting Capacity: 22,000 AIC (10,000 AIC for 380 V models)
Voltage Rating: 240V AC maximum (415V AC maximum for 380V models)
Model Type: Q2 (For 380V: SQL)

Grounding:

A main grounding bus bar is provided and is effectively bonded to the unit frame. The panelboard shall have a ground bus located below (or above for top entry) the panelboard, with wire connections for up to 42 wires. Lug range shall be 4 to 14AWG. The panelboard ground bus shall be mounted in a fashion to allow easy access.

3.0 SYSTEM CONTROLS AND INDICATORS

- A. **Monitoring:** The RPMM shall have no monitoring capability. When advanced monitoring is selected, the RPMM shall be equipped with advanced multi-function meter options that encompass additional metering and monitoring features (see section 4.0.E).

3.1 MECHANICAL DESIGN AND VENTILATION

- A. **Enclosure:** The RPMM shall be housed in a free standing NEMA-1 enclosure with hinged dead front construction and a hinged lockable front door. The RPMM shall accommodate either top or bottom feed cables (specified prior to selection). The system monitor panel (optional), output circuit breakers, and all customer power and control connection points are accessible from the front or side of the RPMM. Rear access shall not be required for "normal" maintenance. All circuit

breakers are protected with “hinged dead front” panels to prevent access without a tool. Doors and outside panel color is light gray, textured, dry epoxy finish, designed to resist scratching. The cabinet is mounted on heavy duty leveling jacks. The cabinet shall be secured to a wall column or bolted to the floor or floor stands by removing the leveling jacks and accessing the threaded holes.

- B. **Conduit Landing:** One conduit plate shall be provided for every two panelboards with each plate having a combination of (60) ½”, (24) concentric ½” & ¾”, and (1) 1-1/2” knockout(s).
- C. **Ventilation & Heat Rejection:** The RPMM shall be convection cooled and have nominal heat rejection.
- D. **Termination:** All power wiring shall be suitably terminated using UL acceptable pressure (crimp) or screw-type lug assemblies. Belleville-type washers and lock washers shall be used on all associated studs or bolt-stacks. Control instrumentation, PC board, and interconnection-wiring terminations shall conform to the UL standard.
- E. **Power Wiring:** All internal wiring shall be stranded copper with PVC, Neoprene or Silicon insulation with a minimum operating voltage of 600 volts RMS. All wires shall be appropriately marked UL and CSA recognized as being suitable for the application. Minimum insulation temperature rating shall be no less than 105°C, and in no case is less than that required by the location/application of the wiring.
- F. **Control Wiring:** All control and instrumentation wiring used in this application shall be tinned, stranded copper with a temperature rating of at least 75°C. Insulation type is to be at least 125% of anticipated continuous load (3 hours or longer). Voltage rating is no less than required per UL and NEC. In areas where either primary or secondary AC voltages are present, PC board wiring and interconnect wiring will conform to the requirements of UL Standard 1950 for the application and location of the wiring.

G. Dimensions and Weights

The standard dimensions of the 84 pole two panelboard system enclosure in inches shall be 14.0” deep x 29.5” wide x 72.2” high. The weight shall not exceed 400 lbs.

The standard dimensions of the 168 pole four panelboard back to back enclosure in inches shall be 27.8” deep x 29.5” wide x 72.2” high. The weight shall not exceed 400 lbs.

The standard dimensions of the 168 pole four panelboard side by side enclosure in inches shall be 57.5” deep x 29.5” wide x 72.2” high. The weight shall not exceed 400 lbs.

4.0 OPTIONAL ACCESSORIES

- A. **Input Power Junction Box with ten (10) feet of cable and Input Surge Suppressor:** An optional metal power junction box is provided for AC power input from a standard NEC-compliant, metallic conduit enclosed, multi-wire branch circuit.

1. **Termination** shall include insulated barrier-type terminal blocks for each phase, plus service ground. The terminal block shall use wrench-tightened, box-style compression terminals that do not require special termination of the branch circuit conductors of either copper or aluminum. Terminals shall be appropriately sized to connect the RPMM's main input power cable. The largest single conductor used shall be 300 MCM per phase. Multiple conductors shall be used when amperage requirements exceed the capacity of 300 MCM per phase. When a neutral conductor is provided (i.e., PMM² without isolation transformer), the neutral conductor(s) amperage rating shall be 200% of one phase conductor.
2. **Construction:** The minimum construction standard shall be NEMA 1. Whenever practical, a water-tight junction box shall be provided. All conduit connectors made to the J-box will use liquid-tight connectors. The power junction box shall be designed for permanent vertical installation on a wall or horizontal installation under a raised floor. The cover is removable by using a tool (screw-driver).
3. **Code Compliance:** The junction box is separately listed by Underwriters Laboratories. It will serve as the demarcation between the premises wiring system and the beginning of the computer system.
4. **Lightning Arrestor:** The Lightning Arrestor is included in the Power Junction Box with details specified in section 4.0.A.
5. **Main Input Power Cable (Part of Junction Box)**
 - a) Conductors shall be UL listed type 1284, rated 105°C @ 600 VAC copper and sized in accordance with the NFPA 70 with all phase conductors and ground conductors the same size. Neutral conductors shall be sized 200% of phase conductors.
 - b) Conduit shall be heavy duty, liquid tight, flexible conduit with a self-extinguishing coating and shall be UL listed. Cable length shall be ten feet (10') from points of termination at the power junction box and at the RPMM conduit landing panel. The input power cable shall be shipped separately from the RPMM main input circuit breaker for installation at the site.
6. **A lightning surge arrestor** is provided on the input power junction box. It shall protect the input of the RPMM from extremely high and short duration voltage spikes impressed on the line by lightning strikes or similar abnormalities. Without any gap, the lightning surge arrest immediately conduct surges to ground and shall prevent lightning-induced surges from reaching the RPMM transformer, monitor and controls. The lightning arrestor shall meet the following electrical specifications:

Maximum voltage:	650 VAC
Equivalent FOW Protective level:	2.2 kV crest
Withstand Capabilities:	10,000 Amperes

IR Discharge Voltage (kV crest) (8 x 20 microsecond current wave):

At 1,500 Amp	1.96
At 5,000 Amp	2.62

At 10,000 Amp	3.40
At 20,000 Amp	4.23

- B. **Shunt Trip Panelboard Main Breakers:** Panelboard main breakers shall be equipped with a 120V UV shunt trip which, when activated, shall cause the breaker to open.
- C. **Branch Circuit Breakers:** Optional molded case Square-D QO type, NEMA AB1 bolt thermal magnetic trip circuit breakers with common trip handle for all poles.
- D. **Panelboard Isolated Ground Bus:** An additional "isolated ground" bus bar shall be provided that is dedicated for termination of "isolated ground" receptacles with connections for up to 42 wires and a lug range of 4 to 14AWG. The isolated ground bus is bonded to the main grounding bus bar.
- E. **Power Monitoring:**
1. **Multi-Circuit Monitor (MCM):** The optional Multi-Circuit Monitor system monitors for metering and display of the RPMM output parameters. The monitor shall display the output / load side voltage, current, kVA, kW and frequency and other parameters defined below. All measured values will be displayed on a large format LCD display mounted on the front of RPMM. The meter shall also be equipped with LED alarm status indication and shall have an RS232 and RS485 serial interface operating on ModBus protocol.

Metering: All metered values will be in "true RMS" values with 0.35% accuracy. The monitor shall include a keypad allowing for the viewing of different selected values. The monitor shall display the following values and alarm conditions:

Data Output

- Kwh Energy Consumption
- KW Real Power
- kVAR Reactive Power
- kVA Apparent Power
- Power Factor Total
- Voltage, L-L, average of 3 phases
- Voltage, L-N, average of 3 phases
- Current, average of 3 phases
- kW Real Power, phase A, B, C
- Power Factor, phase A, B, C
- Line to Line Voltage, phase A-B
- Line to Line Voltage, phase B-C
- Line to Line Voltage, phase A-C
- Line to Neutral Voltage, phase A-N
- Line to Neutral Voltage, phase B-N
- Line to Neutral Voltage, phase C-N
- Current, phase A, B, C
- KW Average
- KW Minimum
- Frequency (measured from phase A)

Modbus Alarms

- Overvoltage
- Undervoltage
- Overcurrent
- Undercurrent
- Over kVA
- Under kVA
- Phase Loss A
- Phase Loss B
- Phase Loss C

Controls and Communications: The user shall be able to control and communicate with the RPMM via the following interfaces:

- a) Emergency Power Off (EPO and REPO) button that when activated shall trip the AC input circuit breaker with shunt trip
 - b) Audible Alarm "Test/Silence" push-button
 - c) Dry contact form C relay located on the MCM monitor and activated by any condition listed in section 3.0.B.
 - d) RS485 serial communications interface
 - e) Infrared communication with a Palm OS PDA (only when serial port is disabled)
2. **PanelSubmain Breaker Monitoring (optional with MCM meter only):** The optional submain breaker monitoring displays the current of the submain breakers (panelboard main breakers or distribution breakers). In the event that the current approaches the trip rating of the breaker (threshold shall be factory set at 80% of breaker trip rating but shall have the ability to be customized) the monitor will alarm via the LCD display. Since the submain breakers are rated at 225A and panelboard breakers can potentially feed in excess of 600, a submain monitoring shall prevent accidental tripping due to overloaded panelboards. The per phase current of each breaker shall also be displayed on the RPMM's local LCD display.
3. **MGE Branch Circuit Current Monitoring (optional with MCM meter only):**
- Monitors current on individual branch circuit breakers
 - Alarms when current exceeds a preset threshold
 - To display on unit, must be used with the MGE Multi-Circuit Meter
 - Optional split core CTs for retrofit applications
- The MGE Branch Multi Circuit Monitor monitors the current individually on all 42 branch circuit breakers on a standard SQ-D NQ panel board. In the event the current exceeds a threshold (custom programmable on every pole for pre-alarm/summary alarm and vital alarm thresholds), the alarm (audible and LED) will be activated to alert the operator to an overcurrent condition. Alarm parameters and currents are available via the MCM LCD display, serial output, or can be downloaded to a PDA via the IR port on the MCM display (serial port is disabled if IR port is enabled).
4. **Power Meter 800 (PM800):** The PM800 is a multifunction, digital instrumentation, data acquisition and control device. The PM800 can be configured to display the output (load side) voltage, current, kVA, kW and

frequency and other parameters defined below. All measured values will be displayed on a large format LCD display mounted on the front of the RPMM. The meter shall also be equipped with alarm status indication.

Metering: All metered values will be in "true RMS" values with 0.075% accuracy. The monitor shall include a keypad allowing for the viewing of different selected values. The monitor shall display the following values and alarm conditions:

Data Output

- Current (per phase)
- Power Factor (per phase)
- Frequency
- THD (current/voltage)
- Voltage, L-L
- Voltage, L-N
- Real Power (per phase)
- Reactive Power (per phase)
- Apparent Power (per phase)
- Min/max values (voltage/current/power factor/real power/reactive power/apparent power/THD/frequency)
- *Plus* Energy Readings (consult PM810 Reference Manual)
- *Plus* Power Analysis (consult PM810 Reference Manual)
- *Plus* Demand Readings (consult PM810 Reference Manual)

Alarms

- Overvoltage
- Undervoltage
- Overcurrent
- Over kVA
- Phase Loss

Controls and Communications: The user shall be able to control and communicate with the RPMM via the following interfaces:

- a) Emergency Power Off (EPO and REPO) button that when activated shall trip the AC input circuit breaker with shunt trip
- b) Audible Alarm "Test/Silence" push-button
- c) Dry contact form C relay located on the monitor and activated by any condition listed in section 3.0.B.
- d) RS485 serial communications interface

5.0 FIELD QUALITY CONTROL & SERVICE ORGANIZATION

5.1 FIELD SERVICE ENGINEER QUALIFICATIONS

The manufacturer must employ a 7 X 24 nation wide (international where applicable) field service organization with rapid access to all regions of the nation. The responding service professionals must be factory-trained engineers with an accredited and proven competence to service RPMM equipment.

5.2 OPTIONAL SPARE PARTS

Spare parts kits are designed to provide replacement spares which will solve: 50% of problems encountered (Level "50"), 75% of problems encountered (Level "75"), or 90% of problems encountered (Level "90").

5.3 MAINTENANCE TRAINING

The manufacturer shall make available to the customer various levels of training ranging from basic RPMM operation to RPMM maintenance.

5.4 MAINTENANCE & SERVICE CONTRACTS

The manufacturer shall offer additional preventative maintenance and service contracts covering the RPMM. Accredited professional service engineers employed exclusively in the field of critical power systems service shall perform all maintenance and service. The manufacturer shall also offer extended warranty contracts.

END OF SECTION