

Power Management Module²

30 - 300kVA

Installation and User Manual



PMM²

30 - 300kVA

Installation and User Manual

Revision History

PMM² 30 - 300 kVA Installation and User Manual 86-505004-00

Revision:	

Initial Release ECN#:003896 ECN#:004156 ECN#:004510 06/2002 06/2004 11/2004 08/2005

Copyright © 2005 MGE UPS SYSTEMS, INC. All rights reserved. Printed in U.S.A.

A00

A01

A02

B00

MGE UPS SYSTEMS, INC.

1660 Scenic Avenue Costa Mesa, CA 92626 (714) 557-1636

Customer Care Center: 1-800-438-7373 (Hours: 24/7)



IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS – This manual contains important instructions for the Power Management Module² that must be followed during operation and maintenance of the equipment.

C	WARNING	Opening enclosures expose hazardous voltages. Always refer service to qualified personnel only.
	ATTENTION	L'ouverture des cabinets expose des tensions dangereuses. Assurez-vous toujours que le service ne soit fait que par des personnes qualifiees.
	WARNUNG!	Das öffnen der Gehäuse legen gefährliche Spannungen bloss. Service sollte immer nur von qualifizierten Personal durchgeführt werden.
0	WARNING	As standards, specifications, and designs are subject to change, please ask for confirma- tion of the information given in this publication.
	ATTENTION	Comme les normes, spécifications et produits peuvent changer, veuillez demander confirmation des informations contenues dans cette publication.
	WARNUNG!	Normen, Spezifizierungen und Pläne unterliegen Anderungen. Bitte verlangen Sie eine Bestätigung über alle Informationen, die in dieser Ausgabe gemacht wurden.
	NOTE	This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.
		This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at user's own expense.
0	WARNING	To reduce the risk of fire or electric shock, install in a controlled indoor environment free of conductive contaminants.
	ATTENTION	This equipment is intended only for installations in a RESTRICTED ACCESS LOCATION. Pour réduire le riske d'inccendie ou d'électrocution, installer dans une enciente intérieure contrôlée en température et humidité et sans contaminants conducteurs.
		Ce matériel est destiné seulement pour des installations dans un EMPLACEMENT RESTREINT D'ACCES.
	WARNUNG!	Um die Gefahr von Feuer und elektrischem Schock zu reduzieren, muss das Gerät in einem temperatur - und feuchtigkeitskontrollierten Raum, frei von leitungsfähigen Verunreinigungen, installiert werden. Dieses Gerät ist nur für die Installation an einem Ort mit qeingeschränkter Zugangserlaubnis vorgesehen.
		Diese Ausrüstung ist nur für Anlagen in einem EINGESCHRäNKTEN ZUGRIFF STANDORT bestimmti.



Certification Standards - Three Phase

- FCC Part 15, Subpart J, Class A.
- UL/cUL 60950 Standard for Safety of Information Technology Equipment.
- ▶ NFPA 70 National Electrical Code.
- ISO 9001.

Product Safety

• A protection circuit breaker must be installed upstream and be easily accessible.

Special Precautions

- The PMM connection instructions and operation described in the manual must be followed in the indicated order.
- Check that the indications on the rating plate correspond to your AC powered system and to the actual electrical consumption of all the equipment to be connected to the PMM².

(This page left blank intentionally)

Contents

	sectio	n	description
			Revision History .i IMPORTANT SAFETY INSTRUCTIONS .ii Certification Standards - Three Phase .iii Product Safety .iii Special Precautions .iii CAUTION: Record All Serial Numbers! .c vi Symbol Usage .c vi Section Descriptions .c vi
Section 1	Syste	em De	scriptions and Specifications
	1.0 1.1 1.2 1.3 1.4 1.5 1.6	1.4.1	Scope $1 - 1$ General Description $1 - 1$ PMM2/Static Transfer Switch Configurations $1 - 2$ System Major Components $1 - 4$ Specifications $1 - 6$ AC Input Ratings $1 - 6$ Model Numbering $1 - 8$ Options $1 - 8$
Section 2	Moni	toring	Systems
	2.0 2.1	2.1.1 2.1.2 2.1.3 2.1.4 2.1.5 2.1.6 2.1.7 2.1.8 2.1.9 2.1.10 2.1.11	Scope.2 — 1PM800 Digital Power Meter.2 — 1Button Operation.2 — 2Status Parameters.2 — 3Display Menu Structure.2 — 4PM800 Alarm History Screen.2 — 5Setup the Power Meter.2 — 6Setup the Date.2 — 6Setup the Time.2 — 6Set the Password.2 — 7Power Meter Diagnostics.2 — 7Check Health Status.2 — 8Min/Max Values for Real-time Readings.2 — 8

	section	descriptionpage
Section 2 Monitoring		J Systems (continued)
	2.2 2.2.1 2.2.2 2.2.3 2.2.3 2.2.4 2.2.5	MCM and Network Display .2 - 9 SMD63M Network Display .2 - 9 Status Parameters .2 - 10 MCM Monitor Options .2 - 11 2.2.3.1 Input/Output Monitoring Option .2 - 11 2.2.3.2 Panelboard Main Circuit Breaker Option/ Main Frame .2 - 11 Distribution Monitoring Option .2 - 11 Branch Current Monitoring .2 - 11 Power Logic Circuit Monitor Series 4000 .2 - 13 2.2.5.1 Ethernet Communications Card (ECC)
	2.2.6	(Optional on CM4000)
Section 3	Installatior	n and Operation
	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Scope .3 – 1 Receiving .3 – 1 Handling .3 – 1 Storage .3 – 2 Prerequisite to Installation .3 – 2 Environmental .3 – 2 Mechanical .3 – 2 3.4.2.1 Cable Landing .3 – 2 3.4.2.1 Cable Landing .3 – 2 3.4.2.2 Junction Box .3 – 2 3.4.2.3 Floor .3 – 2 3.4.2.4 Noise .3 – 2 3.4.2.5 Access .3 – 2 3.4.2.6 Cooling .3 – 3 3.4.2.6 Cooling .3 – 3 3.4.2.6 Cooling .3 – 3 3.4.3.1 Grounding .3 – 3 Installation Procedures .3 – 4 Placement .3 – 4 Connections .3 – 4 AC output .3 – 4 Control Connections (Optional) .3 – 4 Checks Before Startup .3 – 6 Initial Startup .3 – 6 Checks After Startup .3 – 6
Section 4	Maintenan	ce
	4.0 4.1 4.2 4.3	Scope .4 — 1 Preventive Maintenance .4 — 1 Troubleshooting .4 — 2 Replacement Parts .4 — 4
	Appendix /	Α

Figures

figure	description
1-1: 1-2: 1-3: 1-4: 1-5: 1-6: 1-7:	PMM² Cabinet 1 — 1 Single Line Diagram 1 — 2 PMM² Plus 1 — 3 PMM² Ultra 1 — 3 PMM² Major Internal Components 1 — 4 Front Panel 1 — 5 Nomenclature of PMM² 1 — 8
2-1: 2-2: 2-3: 2-4:	PM800 Summary Screen .2 — 1 PM800 Display .2 — 2 Display Menu Structure of Levels 1, 2, and 3 .2 — 4 Alarm History Screen .2 — 5
2-5: 2-6:	Date Setup Screen .2 - 6 Time Setup Screen .2 - 6
2-7: 2-8:	Password Setup Screen
2-9: 2-10 [.]	Health Status Screen
2-11:	Panelboard Main Circuit Breaker/ Main Frame Distribution Circuit Breaker Monitoring 2 — 12
2-12:	Branch Current Monitoring
2-10.	Handling the DMM ² system $2 - 1$
3-1:	Crounding Within The DMM ² Electrical Beth
3-2.	AC Input Connections (Circuit Breakers With Cover Plate) 3 5
3-4:	Control Terminal Block Connection $3 - 5$
4-1:	Transformer Taps, PMM2 (rear view cutaway)
table	description
1-1:	Main Input Circuit Breaker Ratings1 — 5
1-2:	PMM ² Characteristics
2-1:	Display and Alarm Indicator

Tables

MGE Warranty & Proprietary Rights for Three Phase Products

MGE Standard Three Phase Warranty Proprietary Rights Statement

Warranty and Product Registration

User Information Product Information Warranty Extension (Warranty+)

Customer Care Center - Three Phase Products

Technical Support and Product Services Who to Contact Scheduling Field Service Engineer Support Return Policy for Repair of Three Phase Products (RGA)

Glossary

Reorder Form

CAUTION: Record All Serial Numbers!

RECORD ALL SERIAL NUMBERS FOR THE PMM² AND ACCESSORIES. THESE SERIAL NUMBERS WILL BE REQUIRED IF YOUR SYSTEM NEEDS SERVICE. KEEP THIS MANUAL IN A PLACE WHERE YOU CAN REFERENCE THE SERIAL NUMBERS IF SERVICE IS REQUIRED!

PMM² SERIAL NUMBER: _____

ADDITIONAL MODULES SERIAL NUMBERS:

NOTES:

86-505004-00 B00

Symbol Usage

This manual uses five icon symbols with text to convey important information and tips.

C	WARNING	Information provided to protect the user and service personnel against safety hazards and/or possible equipment damage.
Â	CAUTION	Information provided to protect the user and service personnel against possible equipment damage.
	ELECTRICAL	Information provided to protect the user and service personnel against possible electrical hazard and equipment damage.
i	IMPORTANT	Information provided as an operating instruction, or as an operating tip.
	NOTE	Information provided as an operating tip or an equipment feature.

Section Descriptions

1 System Description and Specifications

This section provides a general description and specifications for the PMM² system. Included are major internal components, single line diagram and available options.

2 Monitoring Systems

This section describes the four different monitoring systems available for the Power Management Module². These monitoring systems are equipped with serial communication ports.

3 Installation

This section provides instructions for receiving, installation, and startup of the Power Management Module² (PMM²) system.

4 Maintenance

This section describes maintenance of the PMM², preventive maintenance, troubleshooting, and information about replacement parts.

An Appendix provides additional information about the PM800 alarm list.

A Glossary provides definitions of abbreviations and terms used in this manual.



NOTE

This manual provides technical information required for operation and maintenance of the PMM². Please read this manual before operating the PMM equipment. Please retain this manual for future reference.

1.0 Scope

This section provides a general description and specifications for the PMM² system. Included are major internal components, single line diagram and available options.

1.1 General Description

The PMM² is available in power ranges from 30 kVA to 300 kVA, with a wide range of models. For most applications, the PMM² is completely self-contained within a single enclosure. Refer to Figure 1-1. The system may include an optional meter, and up to six 42-pole distribution panelboards (for a total of 252 poles). Panelboards may be substituted by larger molded-case circuit breakers (up to four 225A amps maximum).

The PMM² is capable of serving as a power distribution center for most types of loads. The PMM² takes input power and distributes that power to load devices. The PMM² monitors the supplied power. Models with an isolation transformer electrically isolate the load. A single-line diagram is shown in Figure 1-2.

Figure 1-1: PMM² Cabinet.



Note: Specific models may appear differently than shown.



Figure 1-2: Single Line Diagram.

1.2 PMM²/Static Transfer Switch Configurations

In the PMM² Plus configuration, the input of the PMM² cabinet is supplied by the output of the STS. The dual input distribution system accepts two independent AC input sources feeding to the STS. If the preferred source power is not available, the STS will transfer to the alternate input source, avoiding interruption to the critical load. The output power is conditioned and stepped down to distribution voltage via an isolation transformer, feeding panelboards or main frame circuit breakers. Refer to Figure 1-3 and the Epsilon STS[™] manual 86-504004-00 for more details.

In the PMM² Ultra configuration, an isolation transformer feeds each STS input source upstream of the STS. The transformer secondary output of the PMM²-1 (left cabinet) supplies the Source-1 input and PMM²-2 (right cabinet) supplies Source-2 input of the STS cabinet. If the preferred source power is not available, the STS will transfer to the alternate input source, avoiding interruption to the critical load. The output of the STS connects to the output busbars of the PMM²-1 and PMM²-2 cabinets, feeding panelboards or main frame circuit breakers. Refer to Figure 1-4 and the Epsilon STS[™] manual 86-504004-00 for more details.

Figure 1-3: PMM² Plus.



Figure 1-4: PMM² Ultra.



Refer to the PMM² & STS manuals for operation of the respective components.

1.3 System Major Components

The following is a description of the major components of the PMM² as shown in Figure 1-5.

Main Input Circuit Breaker	Sized according to your PMM ² system. Refer to Table 1-1 for ratings Higher interrupting ratings are optional.
Panelboard Main Circuit Breakers	Rated at 225 amperes with an interrupting rating of 22K amperes.
42-pole Dist. Panelboards	Square D, type NQOM Universal.
Transformer	High efficiency, K20 rating.
Control Terminal Blocks (TB1, TB2)	For remote power off, alarms, and communication.
Meter (optional)	See section 2 Monitoring Systems for details.

Figure 1-5: PMM² Major Internal Components.



Frame Size (Amperes)	Interrupting Rating RMS Symmetrical Amperes at 480V
50	18 KA
70	18 KA
80	18 KA
90	18 KA
110	25 KA
125	25 KA
150	25 KA
175	25 KA
200	25 KA
225	25 KA
300	30 KA
350	30 KA
400	30 KA
450	30 KA
600	30 KA

Table 1-1: Main Input Circuit Breaker Ratings.



Figure 1-6 shows the front panel of the unit with the switches and the LED indicators.

Front panel switches and LED indicators:

- 1. 'EMERGENCY OFF' switch shuts down the PMM² thereby disconnecting all power downstream of the input circuit breaker.
- 2. 'AUDIBLE ALARM TEST/RESET' switch will silence the audible alarm until a new alarm occurs. It also functions as an LED/lamp test.
- 3. 'EPO ACTIVATED/XFMR SHUTDOWN' LED is triggered and latched by pressing the EPO switch or when the transformer temperature reaches 195°C.
- 4. 'TVSS ALARM' is triggered by the optional transient voltage suppression system.
- 5. 'XFMR OVERTEMP' is triggered when the transformer temperature reaches 180°C and latched on when temperature reaches 195°C.
- 6. 'ALARM' LED is triggered by any fault condition from the power monitor or by an external dry contact.

1.4 Specifications

1.4.1 AC Input Ratings

	Voltage	208/120, 208,480,600 VAC (380VAC optional)			
	Current	See Table 1-2			
	Phase	3Ø, 3 wire plus ground (4 wire for 208/120V without transformer)			
	Frequency	60 Hz (50 Hz optional)			
1.4.2	AC Output Ratings				
	Voltage	208/120 VAC (380V optional)			
	Current	See Table 1-2			
	Phase	3Ø, 4 wire plus ground			
	Frequency	60 Hz (50 Hz optional)			
1.4.3	Environmental				
Ten	nperature				
	Operating:	-10°C to 40°C (14°F to 104°F)			
	Non-operating:	-40°C to 60°C (-40°F to 140°F)			
Alti	tude				
	Operating:	152 meters below to 2,134 meters above sea level			
		(500 feet below to 7,000 feet above sea level)			
		without derating.			
	Non-operating:	152 meters below to 7,620 meters above sea level			
		(500 leet below to 25,000 leet above sea level)			
Acc	oustic noise level	45 dB 30 - 50 kVA			
		50 dB 51 - 150 kVA			
		55 dB 151 - 300 kVA			
		(Average level, typical at 3 feet from front of cabinet)			
Rel	ative Humidity				
	Operating:	10 to 90% non-condensing			
	Non-operating	10 to 70% condensing			
		to to to to boliconomy			

1.4.4 Weights

See Table 1-2

Table 1-2: PMM² Characteristics.

kVA	Model	INPUT	INPUT	OUTPUT	BTU		SHIPPI	SHIPPING WEIGHT, LBS			
	Nos.	VOLTAGE	AMPS	AMPS @ 208V	PER HR	PMN084	PMN126	PMN168‡	PMN210	PMN252‡	
030	PMN12-030	120/208V	83A	83A	600	675					
	PMN22-030	208V	83A	83A	3200	1075					
	PMN42-030	480V	38A	83A	3200	1075					
050	PMN12-050	120/208V	139A	139A	600	675					
	PMN22-050	208V	139A	139A	5300	1200	1440	1615			
	PMN42-050	480V	63A	139A	5300	1200	1440	1615			
	PMN62-050	600V	48A	139A	5300	1200	1440	1615			
075	PMN12-075	120/208V	208A	208A	600	675					
	PMN22-075	208V	208A	208A	8000	1325	1565	1740			
	PMN33-075	380V	114A	114A	8000	1525	1765	1940			
	PMN42-075	480V	94A	208A	8000	1525	1765	1940			
	PMN62-075	600V	72A	208A	8000	1525	1765	1940			
100	PMN12-100	120/208V	278A	278A	600	675					
	PMN42-100	480V	126A	278A	8800	1575	1815	1990	2230	2405	
125	PMN42-125	480V	157A	347A	10900	1825	2075	2260	2510	2695	
	PMN62-125	600V	120A	347A	10900	1825	2075	2260	2510	2695	
150	PMN33-150	380V	228A	228A	13100	2075	2325	2510	2760	2945	
	PMN42-150	480V	188A	416A	13100	1900	2150	2335	2585	2770	
	PMN62-150	600V	144A	416A	13100	1900	2150	2335	2585	2770	
200	PMN42-200	480V	251A	555A	13900	2250	2500	2685	2935	3120	
225	PMN33-225	380V	342A	342A	15700	2450	2700	2885	3135	3320	
	PMN42-225	480V	282A	625A	15700	2325	2575	2760	3010	3195	
	PMN62-225	600V	217A	625A	15700	2325	2575	2760	3010	3195	
300	PMN42-300	480V	377A	833A	20900			3365		3800	

Front facing cabinet weights provided. For PMN168 with side cabinet subtract 200 lbs. For PMN252 subtract 300 lbs.

1.5 Model Numbering

The model number of the unit, located on the inside of the main cabinet door, can be parsed to indicate important parameters of the PMM². Possible values are shown in Figure 1-7.

Figure 1-7: Nomenclature of PMM².



1.6 Options

Most options must be specified at the time of the original order for factory installation. Some options can be field installed; contact your MGE Sales Representative for further information.

Junction Box (J-Box)	Junction box (J-Box) provides power connection points for the input of the PMM ² . A lightning surge arrestor is installed in a power junction box. It is used to protect the PMM ² and the transformer primary against extremely high-and short-duration voltage spikes impressed on the utility power by lightning strikes or similar abnormalities. The lightning arrestor conducts surges to ground and away from the PMM ² . The lightning surge arrestor can discharge 20,000 amperes up to eight times for 20 µseconds for each discharge.
Distribution Circuit Breakers	Distribution circuit breakers can be factory installed. Up to 125 ampere pole circuit breakers can be installed on panelboards.
Main Frame Circuit Breakers	Main Frame circuit breakers can be installed in place of panelboards. Up to four 225 ampere mainframe circuit breakers can be installed per panel board.
Higher Interrupting Input Circuit Breaker	Higher interrupting input circuit breaker can be installed in place of the standard interrupting breaker rating.

Output Isolated Ground Bus	Output isolated ground bus provides a termination point for the second ground wire from isolated ground receptacles. Option is installed internally in the PMM ² .
Branch Current Monitoring	Branch Current Monitoring provides individual currents for each of the poles of a SquareD panelboard. Each current sensor can monitor conductors carrying up to a maximum of 50 amperes. The maximum wire size capacity is #6 THHN, 0.35" diameter.
Panelboard Main Circuit Breaker Monitoring	Panelboard main circuit breaker monitoring provides the phase currents of the breaker.
Input Cable Entry	Input cable entry can be selected for either bottom or top.
Seismic Bracing	Seismic bracing is available to secure the frame of the PMM^2 to the floor for installations where such strengthening is required.
Remote Emergency Power Off (REPO)	Remote emergency power off (REPO) makes it possible to disconnect output- power at the PMM ² from a remote location in an emergency. When the REPO is activated, it trips the main input circuit breaker. The PMM ² shuts down, along with all connected loads. Any number of REPO stations can be connected as re- quired.
Manual Restart	The manual restart can be enabled by closing the switch located on the fuse panel. See Figure 1-5. If the manual restart is enabled (switch closed / vertical position) and if the input power to PMM ² is removed for more than two seconds, then the main input breaker of the PMM ² will open automatically. If the manual restart is disabled (switch open / horizontal position), then the main input breaker of the PMM ² will remain closed after the input power is removed.
Transient Voltage Suppression System (TVSS)	Transient voltage suppression system (TVSS), which is connected to the output (secondary) side of the main isolation transformer, is used to clip voltage transients. Provides 100,000 amperes of surge protection per phase or 50,000 amperes line to ground, line to neutral or neutral to ground. Option is installed internally in the PMM ² .
Transient Suppression Plate	Transient suppression plate is used to minimize the effects of high frequency electrical noise. The plate, ten square feet (one square meter), is mounted in direct contact with the masonry floor. The transient suppression plate and the reinforcement bars (rebars) of the masonry form a capacitor, shunting high frequency electrical noise, through the rebar, to earth ground.
Distribution Cables	Distribution cables include an appropriately sized circuit breaker (bolt-on or plug-in, as specified); phase, neutral and ground conductors, as required; receptacle(s) as specified; and sealed, liquid-tight flexible conduit in the length specified. Cables are colored blue and are UL listed for use per the National Electrical Code (ANSI/NFPA 70, latest issue).
Floor Stand	Floor stands are used in applications where a raised floor installation is not possible and top or side conduit landings cannot be used.
Monitoring Systems	See Section 2 Monitoring Systems for details.

(This page left blank intentionally)

Monitoring Systems

2.0 Scope

This section describes the four different monitoring systems available for the Power Management Module². These monitoring systems are equipped with serial communication ports.

- PM800 Digital Power Meter (optional)
- Multi Circuit Monitor (MCM) (optional)
- Powerlogic CM4000 (optional)
- DMMS-300 (optional)

For a summary of the monitoring system parameters see Table 2-1 at the end of the section.

Additional details can be found in the manuals for the respective meters.

2.1 PM800 Digital Power Meter

NOTE

The MGE PM800 is a digital power meter that provides true RMS measurements and highly accurate readings for nonlinear loads. Metered values plus minimum and maximum data can be viewed from the display or from the RS485 port.

When power is applied, the meter will display a three phase summary screen. Four values of information (V, A, KWTOT, KWH) are shown in Figure 2-1.

The power meter is equipped with a large, back-lit LCD display. It can display up to five lines of information plus a sixth row of menu options. The RS485 port is used for communications with a monitoring and control system. This port can be daisy-chained to multiple devices.

Figure 2-1: PM800 Summary Screen.



NOTE

For additional information, download the reference manual at powerlogic.com. Select your country > Literature > Meters > Series 800 Power Meter > Instructional > Reference Manual (select appropriate meter type).

2.1.1 Button Operation

NOTE

The buttons are used to select menu items, display more menu items in a menu list, and return to previous menus. Refer to Figure 2-2 for the PM800 display screen and button details. A menu item appears over one of the four buttons. Pressing a button selects the menu item and displays the menu item's screen. When you have reached the highest menu level, a black triangle appears beneath the selected menu item. To return to the previous menu level, press button under item 11. To cycle through the menu items in a menu list press button under item 7.



Each time you read "press" in this section, press and release the appropriate button beneath the screen menu item. For example, if you are asked to "Press PHASE", you would press the button below the display PHASE menu.



2.1.2 Status Parameters

The following status and alarm parameters are available from the PM800 meter.

Real-time Readings

- Current (per phase, residual, 3-Phase)
- ▶ Voltage (L-L, L-N, 3-Phase)
- Real Power (per phase, 3-Phase)
- Reactive Power (per phase, 3-Phase)
- Apparent Power (per phase, 3-Phase)
- Power Factor (per phase, 3-Phase)
- Frequency
- THD (current and voltage)

Energy Readings

- Accumulated Energy, Real
- Accumulated Energy, Reactive
- Accumulated Energy, Apparent
- Bidirectional Readings
- Reactive Energy by Quadrant
- Incremental Energy
- Conditional Energy

Alarm Points

- Over Voltage
- Under Voltage
- Over Current
- Over kVA
- Phase Loss

Power Analysis

- Displacement Power Factor (per phase, 3-Phase)
- Fundamental Voltages (per phase)
- Fundamental Currents (per phase)
- Fundamental Real Power (per phase)
- Fundamental Reactive Power (per phase)
- Unbalance (current and voltage)
- Phase Rotation
- Harmonic Magnitudes
- Sequence Components

Demand Readings

- Demand Current (per phase, 3-Phase avg.)
- Average Power Factor (3-Phase total)
- Demand Real Power (per phase present, peak)
- Demand Reactive Power (per phase present, peak)
- Demand Apparent Power (per phase present, peak)
- Coincident Readings
- Predicted Power Demands

2.1.3 Display Menu Structure

Figure 2-3 shows the menu structure of the first three levels of the power meter. Selecting an item from one level takes you to the next levels menu items.

Figure 2-3: Display Menu Structure of Levels 1, 2, and 3.



NOTE

The arrow icon ("---- ϑ ") is used to scroll through all menu items on a level.

2.1.4 PM800 Alarm History Screen

The PM800 meter is set in the factory to detect five alarm conditions, including over or under voltage, over current, phase loss conditions, and over kVA. It also maintains a counter for each alarm to keep track of the total number of occurrences. Alarms have a factory setting of one second detection rate. See Figure 2-4 for example of an undervoltage alarm, where this is the fourth alarm in the alarm history log.

The power meter stores alarm log data in nonvolatile memory. The size of the alarm log is fixed at 100 records. For a complete list of the available alarm configurations, see Appendix A.

When one or more alarm conditions occur, this " \triangle " icon appears in the upper-right corner of the PM800 meter display, indicating that an alarm is active. If multiple alarms with different priorities are active at the same time, the display shows the alarm message for the last alarm that occurred.

The MGE factory default alarm settings have a low priority level. If a low priority alarm occurs, the alarm icon blinks only while the alarm is active. Once the alarm becomes inactive, the alarm icon disappears from the display.

Figure 2-4: Alarm History Screen.



NOTE

Pressing any button will stop the alarm icon from blinking.

2.1.5 Setup the Power Meter

To begin power meter setup, do the following:

- 1. Scroll through the Level 1 menu list until you see MAINT.
- 2. Press "MAINT".
- 3. Press "SETUP".
- 4. Enter your password.

(NOTE: The default password is 0000.)

5. To save the changes, press " 1 " until the "SAVE CHANGES?" prompt appears, then press "YES".

2.1.6 Setup the Date

- 1. Press "----->" until DATE is visible.
- 2. Press "DATE".
- 3. Enter the MONTH number.
- 4. Press "OK".
- 5. Enter the DATE number.
- 6. Press "OK".
- 7. Enter the YEAR number.
- 8. Press "OK".
- Select how the date is displayed: M/D/Y, D/M/Y, or Y/M/D.
- 10. Press " 1 " to return to the SETUP screen.

2.1.7 Setup the Time

- 1. Press "-----∳" until SETUP is visible.
- 2. Press "TIME".
- 3. Enter the HOUR.
- 4. Press "OK".
- 5. Enter the MIN (minutes).
- 6. Press "OK".
- 7. Enter the SEC (seconds).
- 8. Press "OK".
- 9. Select how the time is displayed: 24H or AM/PM.
- 10. Press " 1 " to return to the SETUP screen.



Figure 2-5: Date Setup Screen.





2.1.8 Set the Password

- 1. Press " ---- " until PASSW (password) is visible.
- 2. Press "PASSW".
- 3. Enter the SETUP password.
- 4. Press "OK".
- 5. Enter the DIAG (diagnostics) password.
- 6. Press "OK".
- 7. Enter the ENERG (energy reset) password.
- 8. Press "OK".
- 9. Enter the MINMX (minimum/maximum reset) password.
- 10. Press "OK".
- 11. Press " 1 " to return to the SETUP screen.



NOTE

To recover a lost password, contact PowerLogic Technical Support at: 615-287-3400. Technical Support will require the meter's serial number.

2.1.9 Power Meter Diagnostics

To view the power meter's model, firmware version, serial number, do the following:

- 1. Press "MAINT".
- 2. The health status is displayed on the screen.
- 3. Press "DIAG".
- Enter your password. (NOTE: The default password is 0000.)
- 5. Press "METER" (meter info).
- 6. View the meter information (shown here).
- 7. Press " **4**----" to view more meter information.
- 8. Press " 1 " to return to the DIAG screen.



Figure 2-7: Password Setup Screen.



Figure 2-8: View Meter Info Screen.

2.1.10 Check Health Status

To view error codes, do the following:

- 1. Press "MAINT" (maintenance).
- 2. Press "DIAG".
- 3. The health status is displayed on the screen.
- 4. Press " 1 " to return to the MAINT screen.



Figure 2-9: Health Status Screen.

NOTE

The wrench icon and the health status code displays when a health problem is detected. Error codes appear as shown above. For example; code 3 is to set up the Date/Time. For other codes, contact PowerLogic Technical Support at 615-287-3400.

2.1.11 Min/Max Values for Real-time Readings

When certain one-second real-time readings reach their highest or lowest value, the PM800 saves the values in its nonvolatile memory. These values are called the minimum and maximum (min/max) values.

The PM800 stores the min/max values for the current month and previous month. After the end of each month, the meter moves the current month's min/max values into the previous month's register space and resets the current month's min/max values.

The real-time readings evaluated are:

- Min/Max Voltage L-L
- Min/Max Voltage L-N
- Min/Max Current
- Min/Max Voltage L-L, Unbalance
- Min/Max Voltage L-N, Unbalance
- Min/Max Total True Power Factor
- Min/Max Total Displacement Power Factor
- Min/Max Real Power Total
- Min/Max Reactive Power Total
- Min/Max Apparent Power Total
- Min/Max THD/THD Voltage L-L
- Min/Max THD/THD Voltage L-N
- Min/Max THD/THD Current
- Min/Max Frequency

Monitoring Systems

2.2 MCM and Network Display

The MGE Multi Circuit Monitor (MCM) consists of two parts – the Multi-Circuit Meter and Network Display. The Multi-Circuit meter monitors all of the standard measurements and this data is presented on the Network Display. The MCM is equipped with serial RS232/RS485 and Infrared communications and is designed to accommodate optional features such as Input and Output Monitoring, Panelboard Main Circuit Breaker Monitoring, Main Frame CB Current Monitoring, and Branch Current Monitoring.

2.2.1 SMD63M Network Display

The SMD63M Network Display provides local indication of all power system parameters of a Power Management Module. To report critical alarm data the SMD63M is equipped with one relay output, and local alarm annunciation. All system variables and alarms can be passed to the network operations center by means of a Modbus RTU protocol. See Figure 2-10.





Serial Communications	The Display provides ModBus RTU communications via standard RS232 and RS485 ports, allowing the transfer of data and alarm points. Up to 30 displays can be addressed on the same ModBus network. The external serial ports are disabled when the infrared data port is enabled. The RS232 and RS485 ports are located on the back of the Display. For details on accessing the serial port refer to the SMD63M Network Display Manual.
Dry Contact Communications	The Display for the MCM is equipped with one relay output, (activated upon any alarm condition) located behind the display board. Refer to the SMD63M Network Display Manual for connection details.
Infrared Communications	The display console is also equipped with an infrared display port for down- loading monitor values to a Palm OS [™] PDA. The infrared communication port will be disabled if the serial port is enabled. For PDA software consult MGE Sales.
Display	All metered values of the Remote PMM are presented on the front of the LCD. The SMD63M network display meter will also display all branch circuit currents when the optional Branch Current Monitor (BCM) is installed.
	A detailed explanation of display operation can be found in the SMD63M Network Display Manual.

2.2.2 Status Parameters

The following status and alarm parameters are available from the MCM meter.

- kWh Energy Consumption
- kW Real Power
- kVAR Reactive Power D
- kVA Apparent Power
- Power Factor Total
- Voltage, L-L, ave. of 3 phases
- Voltage, L-N, ave. of 3 phases
- Current, average of 3 phases
- kW Real Power, phase A
- kW Real Power, phase B
- kW Real Power, phase C
- Power Factor, phase A
- Power Factor, phase B
- Power Factor, phase C

Alarm Points (also available via serial output)

- Over Voltage
- Under Voltage
- b Over Current
- Over kVA

- 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
- kW Average
- kW Minimum
- Frequency (measured from phase A)

Monitoring Systems

- - Phase Loss A
 - Phase Loss B
 - Phase Loss C

- Current, phase B Current, phase C

- D

2.2.3 MCM Monitor Options

2.2.3.1 Input/Output Monitoring Option

The PMM² can be ordered with the MCM present to monitor the power both on the input and output side of the transformer. Output monitoring is standard and input monitoring is optional. Note that when the PMM² is used with the STS (PMM² Plus configuration) the STS monitoring will provide input power monitoring via it's local display. For a PMM² Ultra configuration, input monitoring is standard and output monitoring is optional. Refer to the MCM8364 manual for operating and monitoring details.

2.2.3.2 Panelboard Main Circuit Breaker Option/ Main Frame Distribution Monitoring Option

The optional MCM breaker monitoring displays the current only of the Panelboard Main Circuit Breakers or Main Frame Distribution breakers. In the event that the current approaches the trip rating (factory set current limit @ 80% of the CB's of 225A rating of the breaker), the monitor will alarm via the LED on the Network Display. Panelboard Main Circuit Breaker Monitoring or Main Frame Monitoring can warn the user when too much current is being drawn, helping to avoid overloading the circuits and causing accidental tripping. See Figure 2-11.

2.2.4 Branch Current Monitoring

The MGE Branch Current Monitoring System monitors individual currents for each of the 42 branch circuits on the standard SQ-D panelboard. Each current sensor can monitor conductors carrying up to a maximum of 50 amperes. The maximum wire size capacity is #6 THHN, 0.35" diameter. In the event that current on any branch circuit exceeds a threshold, an alarm will be activated. See Figure 2-12.

There are two thresholds which are factory set.

- ▶ The first threshold is a warning alarm that will activate a yellow LED on the Network Display to indicate current is approaching high levels; this is factory set at 75% of 20A.
- The second threshold is factory set at 80% of 20A and will activate a red LED on the Network Display.

For changes to the default settings, this can be accomplished by three methods. First, use the System Management Software (SMS) provided by SquareD. Second, use the P-node software available through MGE Sales. Third, contact the MGE Field Service Technician for site assistance.

Individual branch circuit currents are displayed on the LCD of the Network Display. Current data can also be polled via the serial port of the Branch Current Monitor or downloaded onto a PDA via the infrared port of the face of the Network Display. For PDA software contact MGE Sales.



NOTE

For details on the operation of the monitoring system refer to the following manuals:

- SMD63M Network Display with MCM8364 Multi-Circuit Meter
- Branch Current Monitor (BCM42) (For Branch Current Monitor option only)

For the SMS software refer to www.powerlogic.com/software.cfm

Figure 2-11: Panelboard Main Circuit Breaker/ Main Frame Distribution Circuit Breaker Monitoring.







2.2.5 Power Logic Circuit Monitor Series 4000

The CM4000 is intended for customers seeking a premium monitoring solution with virtually every feature including waveform capture. The CM4000 can also be web enabled serving web pages directly off the monitor (no server or PC required) using the optional Ethernet Gateway Card and Ethernet Gateway (EGX) device. See Figure 2-13.

The CM4000 can be used in conjunction with the Branch Circuit Monitor (BCM) option, however it will not be possible to receive local BCM alarms or locally view branch breaker current. This information can be made available remotely via the BCM's serial interface, or by integrating the BCM's serial output onto the CM4000 network. Both CM4000 and BCM data can be placed on an Ethernet network (see ECC for details). Consult the CM4000 manual for details.

Figure 2-13: CM4000 Monitor.



2.2.5.1 Ethernet Communications Card (ECC) (Optional on CM4000)

Based on plug and play technology, the ECC plugs into an expansion slot on the circuit monitor providing direct connection to the Ethernet network using either UTP or fiber cabling. An RS-485 MODBUS master port on the ECC supports a daisy-chain of up to 31 additional devices without a repeater, allowing the CM4000 with ECC to act as an ethernet gateway for the devices. The ECC supports MODBUS/TCP protocol. Embedded HTML pages allow for easy device setup and supply real-time power system information from the CM4000 circuit monitor through a standard web browser. Additionally, similar information can be viewed for devices daisy-chained to the ECC's on board RS-485 port. Consult ECC Manual for details.

2.2.6 DMMS-300 Monitor

The Electro Industries DMMS-300 is an option that can be used on the standard PMM² offering.

Table 2-1: Display and Alarm Indicators.

DICATOR/ ANNUNCIATION	No meter	PM800	МСМ	DMMS-300	PowerLogic CM4000
Buzzer Horn	Std	Std	Std	Std	Std
Alarm Silence	Std	Std	Std	Std	Std
Illuminated EPO Button	Std	Std	Std	Std	Std
Transformer High Temperature Alarm	Std	Std	Std	Std	Std
Transformer Over Temperature Alarm and Shutdown	Std	Std	Std	Std	Std
OWER MONITOR DISPLAY					
Voltage Line to Line	N/A	Std	Std	Std	Std
Voltage Line to Neutral	N/A	Std	Std	Std	Std
Current	N/A	Std	Std	Std	Std
Neutral current	N/A	N/A	N/A	N/A	Std
kVA	N/A	Std	Std	Std	Std
kW	N/A	Std	Std	Std	Std
Frequency	N/A	Std	Std	Std	Std
Voltage, Amps, KWH Max/Min Demand	N/A	Std	N/A	Std	Std
Power Factor	N/A	Std	Std	Std	Std
KVA H	N/A	Std	N/A	Std	Std
KVAR H Consumption	N/A	Std	N/A	N/A	Std
KW H Consumption	N/A	Std-13	Std	Std	Std
Harmonics to the 31st order	N/A	Std-13	N/A	Opt	Std
NTROL					
Emergency Power Off (EPO)	Std	Std	Std	Std	Std
Remote Emergency Power Off (REPO) Terminals	Std	Std	Std	Std	Std
WER ALARMS AND/OR SHUTDOWN					
Overvoltage alarm	N/A	Std	Std	Std	Std
Undervoltage alarm	N/A	Std	Std	Std	Std
Phase Loss alarm	N/A	Std	Std	Std	Std
Unbalance voltage	N/A	N/A	N/A	Std	Std
Over Current Alarm	N/A	Std	Std	Std	Std
Neutral Over/Under Current Alarm	N/A	N/A	N/A	N/A	Std
Over/Under Frequency Alarm	N/A	N/A	N/A	Std	Std
Phase Rotation Alarm	N/A	N/A	N/A	Std	Std
Over KVA	N/A	Std	Std	Std	Std
Over % THD	N/A	N/A	N/A	Std	Std
Over/Under Power Factor/KVAR Lag or Lead	N/A	N/A	N/A	Std	Std
DMMUNICATION:					
Auxiliary form C contacts for external shutdown or alarr	n Std	Std	Std	Std	Std
RS-232 and/or RS-485 Remote Communication (Mod Bus protocol)	N/A	Std	Std	Opt	Std

3.0 Scope

This section provides instructions for receiving, installation, and startup of the Power Management Module² (PMM²) system.



Scheduling of the MGE Field Service Engineers typically should be done 7 to 10 days before they are required on-site. If the startup of the product is critical to maintaining your schedule, please call the MGE toll free telephone number at 1-800-438-7373 for assistance.

3.1 Receiving

Before accepting the shipment from the freight carrier, inspect the exterior surfaces of shipping container(s), packaging, and equipment for damage that may have occurred during transit. If the shipping containers or equipment show evidence of damage, note the damage on the receiving document (bill of lading) prior to signing for receipt of equipment.

The equipment should be unpacked immediately after receipt, and inspected again for damage to external painted panels and doors and to determine if any internal damage (broken components, disconnected wiring, loose connections, etc.) has occurred. Verify that the equipment nameplate corresponds with the equipment ordered.

Damage claims should be filed directly with the carrier. Replacements for damaged components can be ordered by calling 1-800-438-7373.

3.2 Handling

The PMM² has heavy-duty casters to allow the equipment to be moved easily into position once it has been removed from the shipping truck.

The main cabinet can be moved only from the rear, using a pallet jack or fork lift truck (see Figure 3-1). Adjust the forks to avoid the casters and levelers. Once the PMM² is in its final position, the leveling jacks on all four corners should be lowered to keep the PMM² in place.

Figure 3-1: Handling the PMM² system.



3.3 Storage

If the equipment is to be stored prior to installation, it should be stored in a cool, dry, well-ventilated location that is protected against rain, splashing water, chemical agents, etc. The equipment should be covered with a tarpaulin or plastic wrapper to protect it against dust, dirt, paint, or other foreign materials.

3.4 Prerequisite to Installation

Installation drawings are provided with each PMM². This section provides more information for a successful and efficient installation of the PMM². Installation of equipment must be handled by skilled technicians and electrician's familiar with the requirements of high energy electrical equipment. The installation must comply with the requirements of the National Electrical Code (NEC, ANSI/NFPA 70, latest issue) and with local codes and requirements as applicable. We strongly recommend contracting MGE Customer Support Services for startup. Do not allow unqualified personnel to handle or operate the equipment.

3.4.1 Environmental

The PMM² is intended for use in an environment where control of temperature and humidity is provided. Information on the maximum operating and recommended environmental parameters is given in Section 1.4.

The PMM² generates heat and exhaust air through the top and rear of the enclosure. This added heat load may increase the ambient temperature of the room and this temperature should not exceed the specification in Section 1.4. The facility air conditioning system will need to be sized for handling this additional heat, to maintain the room temperature within specification. Heat load and heat loss data is given in Table 1-2.

3.4.2 Mechanical

3.4.2.1 Cable Landing

PMM² dimensions are provided on the installation drawings. The PMM² can be mounted on a raised or solid floor. Conduit landings are provided for bottom cable entry (top cable entry is an available option). A floor stand option is offered for solid floor installations if bottom cable entry is not possible.

3.4.2.2 Junction Box

When the junction box (J-Box) option is ordered, it is normally shipped in advance of the PMM², and may be installed prior to the arrival of the PMM². The J-Box must be placed within eight feet of the PMM², since the length of the optional supply cable is only ten feet.

3.4.2.3 Floor

The PMM² is suitable for mounting on concrete or other non-combustible surfaces only. For installations on a raised floor, a floor tile cut-out is required for passage of cables. Floor loading must be considered when installing on a raised floor or on an upper story of a multiple-story building. The floor loading data is provided on the installation drawings supplied with your equipment. Consult a structural engineer while planning your PMM² installation. Place the PMM² so the leveling jacks are as close as possible to the corners of the tiles.

3.4.2.4 Noise

Consideration should be given to the specific location of the PMM² cabinet to minimize the potential for sound transmission to surrounding structures and sound reflection. It is suggested that the following installation methods be included.

- 1. If possible, mount the PMM² away from corners of walls or ceilings. For installations which must be near a corner, use sound absorbing materials on the walls and ceilings, if necessary, to eliminate reflection.
- 2. Provide a solid foundation for mounting the PMM².
- 3. Provide flexible conduit to make the connections to the PMM².
- 4. Locate the PMM² as far as practically possible from areas where high sound levels are undesirable.

3.4.2.5 Access

The PMM² requires a minimum of 36 inches front clearance for normal maintenance. Side facing cabinets require 36 inches side clearance for normal maintenance. A minimum of six inches rear clearance access is required for transformer ventilation. Refer to installation drawings for details on your configuration.

3.4.2.6 Cooling

The PMM² is convection cooled. Cooling air is drawn through the bottom section of the enclosure and exhausted through the top. The PMM² does not use forced air or air filters. Care should be taken to ensure that the air intake and exhaust areas are not obstructed for air flow.

3.4.3 Electrical

3.4.3.1 Grounding

An insulated grounding conductor; must be installed as a part of the input branch circuit supplying the PMM². Per the National Electrical Code, article 250, the grounding conductor is to have green insulation, with or without yellow stripes and be grounded to the utility service safety grounding point (or other acceptable building ground, such as the building frame in the case of a steel frame structure), at the service equipment entrance.

All attached plug receptacles in the vicinity of the PMM² must be grounded in the same way. The conductors for those receptacle grounds are grounded to the safety ground (or other acceptable building ground, such as the building frame in the case of a steel frame structure), at the service equipment entrance. See Figure 3-2 for the grounding path.

Wiring for power and control cables is routed through the bottom of the enclosure (with an option for the top). This is shown in detail on the installation drawing for your configuration.

Figure 3-2: Grounding Within The PMM² Electrical Path.



3.5 Installation Procedures

Installation procedures describe the general requirements for the PMM² installation. Specific requirements are described in the installation drawings shipped with your configuration.

The steps to be followed are:

- Placement
- Output circuit breaker installation
- Connection of input power, output power, and control cables
- Startup of the system

Installation of the PMM² equipment must be handled by skilled technicians and electrician's familiar with the special requirements of high-energy electrical equipment. The installation must comply with the requirements of the National Electrical Code (NEC, ANSI/NFPA 70, latest issue) and with local codes and requirements as applicable.

We strongly recommend contracting MGE for startup of the PMM². Do not allow unqualified personnel to handle or operate the equipment.

3.5.1 Placement

Using the mechanical prerequisite information, determine the final location for the PMM² and any applicable options, and move them into place. For Plus and Ultra configurations, the cabinets must be arranged in the required positions to insure proper connections. When facing the PMM² from the front, the PMM² Plus standard arrangement provides for the STS cabinet to be located on the left hand side. For the Ultra, the STS cabinet is located between the PMM² cabinets. The interconnect cables, and side barrier(s) are supplied with the PMM² cabinet. The interconnect brackets are supplied with the STS. Lower the leveling jacks on all four corners of the enclosure, to ensure proper stability. The load must be on the leveling jacks instead of the casters.

3.6 Connections

Make all connections in accordance with the "Cable preparation for field wiring" guide (MGE Part Number 9-00038-00). Make certain that all connections are properly torqued.

3.6.1 AC input

The AC input connections are made through the bottom, to the main circuit breaker, CB1. For optional top cable access refer to the installation drawing. Some main circuit breakers include a cover plate protecting the compression connectors; refer to Figure 3-3 during the following procedure. To make the connections:

- Remove the cover plate from the bottom of the main circuit breaker CB1 and install input conduit.
- Make connections to the compression connectors. Phase sequence must be A, B, C.
- Install the cover plate at the bottom of the main input circuit breaker CB1.

3.6.2 AC output

Conduit landing are located below each panelboard with appropriate 1/2 and 3/4" knock-outs. The load connections are made to the circuit breaker configuration which has been designed, installed, and identified by you to meet the requirements of your installation. The connections to be made are either 2-, 3-, or 4-wires and ground and are made in compression type connectors. Make the connections as required for the one, two, or three phase power. Connectors are marked on the circuit breaker and the phase sequence for all 3-phase power is A, B, C.

3.6.3 Control Connections (Optional)

Control connections are made at the terminal blocks located on the left side of the main cabinet near the main input circuit breaker. Refer to Figure 3-4 for details.



Figure 3-3: AC Input Connections (Circuit Breakers With Cover Plate).

Figure 3-4: Control Terminal Block Connection.

Notes:



3.7 Startup Procedures

This section presents the procedures to be used for initial startup of the PMM², and the sequence to be followed any time that the system is restarted after having been shut completely down with no power applied to the system.

3.7.1 Checks Before Startup

Before starting the PMM², read this PMM² Manual thoroughly. Be certain that you fully understand the operation of the indicators, controls, and operational sequences. Before starting the PMM², verify the following:

- 1. Upstream power circuit breaker is open.
- 2. Power cables have been properly connected to the input circuit breaker, or the Junction Box, if installed.
- 3. Voltage connected to the PMM² matches the PMM² nameplate and model number.
- 4. Equipment has been properly grounded.
- 5. All power and control connections are properly made and are tight.
- 6. Intake and exhaust ventilation areas have no obstructions that might impair proper air flow.

3.7.2 Initial Startup

After verifying the information presented in Section 3.7.1 proceed as follows:

- 1. Close the upstream circuit breaker.
- 2. Close the main circuit breaker CB1 and verify the monitor has the proper operation as described in Section 2 of this manual.
- 3. Close the main panelboard circuit breakers.
- 4. Close individual output circuit breakers as required.

3.7.3 Checks After Startup

Normal operation of the PMM² should be verified immediately after the initial startup has been performed.

At the minimum, use the monitor, if installed, to verify proper readings from all circuits.

4.0 Scope

This section describes maintenance of the PMM², preventive maintenance, troubleshooting, and information about replacement parts.

4.1 **Preventive Maintenance**

ELECTRICAL

IMPORTANT

The following preventive maintenance routines should be considered the minimum requirements that your installation and site may require additional preventive maintenance to assure optimal performance from PMM² and associated equipment. These routines should be performed twice a year.

The technician or electrician performing preventive maintenance on the PMM² must read this manual thoroughly and be familiar with the indicators, controls, and operation of the equipment.

Risk of Electrical Shock! For Plus and Ultra configurations, the PMM² equipment receives power from more than one source. Disconnect all sources to this equipment before servicing.



IMPORTANT Isolate and de-energize the equipment for all maintenance operations.

- a. Ensure that the equipment is clean and free of loose dust, dirt, and debris. The exterior of the enclosures can be cleaned with a mild solution of soap and water, lightly applied with a lint-free cloth.
- b. Inspect the air intake and exhaust plates and clean as required. Verify that air flows freely through the equipment. Clean the air intake and exhaust plates, and the enclosure interior, with a vacuum cleaner.



Operation of the upstream circuit breaker(s) will cause power to be removed if it is present and will cause power to be applied if it is not. Make sure that all loads are prepared to have power removed (all critical circuits have been shut down), or circuits are safe for power application (no maintenance procedures are being conducted and downstream circuit breaker(s) are open and tagged) before upstream operation of the circuit breaker(s).

- c. Operate all circuit breaker(s) to verify that circuit breaker(s) function properly.
- d. Verify that all system monitoring functions operate properly.

4.2 Troubleshooting

The following is a list of the most frequent problems, their most likely cause, and the possible solutions in the form of actions to be taken. In the event that the suggested solution does not solve the problem, call MGE UPS SYSTEMS Customer Support Services for assistance.

A. PMM² has no input power.

- Cause #1: No building power to the PMM².
- Action: Restore building power. Have a qualified technician check the wiring continuity between the PMM² input J-Box option and building input power panel. Refer to Section 3 for connections.
- Cause #2: The PMM² is not properly connected to the optional J-Box.
- Action: Have a qualified technician check the wiring continuity between the PMM² input J-Box option and the building input power panel. Refer to Section 3 for connections.

B. Specific output circuit(s) have no power.

- Cause #1: Associated output circuit breaker(s) are OFF.
- Action: Reset the circuit breaker(s).
- Cause #2: The wiring between the circuit breaker(s) and the equipment(s) is faulty.
- Action: Have a qualified technician check for wiring continuity and correct phase sequence between the circuit breaker(s) and the equipment(s).
- Cause #3: The equipment associated with the circuit breaker is operating above the rated load.
- Action: Schedule a load check of the equipment with a qualified technician; adjust for load balance if possible.
- Cause #4: Defective circuit breaker.
- Action: Replace defective circuit breaker.

C. No output from the PMM², but the monitor is active.

- Cause #1: Main input circuit breaker CB1 is off.
- Action #1: Record which alarm indications are active.
- Action #2: Reset alarm(s) and clear external signal.
- Action #3: Check the alarm history display for reason the main input circuit breaker tripped:
 - a. Manual trip; due to an Emergency Power Off (EPO) button being pushed.
 - b. An "alarm shut-down" has occurred. Determine the cause and take corrective action before resetting the main input circuit breaker CB1.
 - c. Automatic trip; an external signal was received from the building wiring via the alarm interface instructing the PMM² to shunt-trip.
 - d. Output overload; schedule a load check of the PMM² by a qualified technician.
 - e. Defective circuit breaker; replace the circuit breaker.
 - f. Short circuit internal to the PMM². Troubleshoot the PMM² or call MGE UPS SYSTEMS, INC. Customer Support Services 1-800-438-7373.

D. Output from the PMM², but the monitor is not active.

Cause: Control power fuse(s) blown.

Action: Replace fuse(s)

E. Over/under Voltage.

- Cause #1: Upstream UPS or power conditioner is defective.
- Action: Correct problem at the power source.
- Cause #2: Voltage drop due to distance or excessive load on mains.
- Action: Disconnect power and adjust transformer taps (see Figure 4-1); refer to the tap adjustment table on the transformer's nameplate.

F. ALARM LED illuminated.

Cause #1: A fault condition is present within the PMM².

- Action: Review the operation of the PMM² and the information available from the metering display to determine the specific nature of the alarm.
- Cause #2: The quality of the power into or out of the PMM² unit.
- Action: Review the operation of the PMM² and the information available from the metering display to determine the specific nature of the alarm.

G. TVSS ALARM LED illuminated.

- Cause #1: A fault condition is present with the TVSS Module.
- Action: Call MGE UPS SYSTEMS Customer Care Center 1-800-438-7373 (Hours: 24/7) to arrange for service and repair of the TVSS.

H. XFMR OVERTEMP LED illuminated.

- Cause #1: A high temperature condition is present with the power transformer in the PMM².
- Action #1: Review the operation of the PMM² to ensure the ventilation of the PMM² is not blocked.
- Action #2: Review the information available from the metering display to determine if the unit is overloaded.

I. EPO ACTIVATED/ XFMR SHUTDOWN illuminated.

- Cause #1: The PMM² has received a command to trip the input circuit breaker.
- Action: Check the remote EPO for the room or the fire control panel, or the EMERGENCY OFF button located on the front panel of the PMM².
- Cause #2: The transformer temperature exceeded the 1st stage alert (XFMR OVERTEMP LED), tripping the protective thermostat in the transformer to prevent further heating and damage to the transformer.
- Action: Call MGE UPS SYSTEMS, INC. Customer Care Center at 1-800-438-7373 (Hours: 24/7) to arrange for service.

IMPORTANT

Before changing transformer taps, verify that the over/under voltage condition is constant. Changing transformer taps will increase or decrease the ratio of input voltage to output voltage.

Figure 4-1: Transformer Taps, PMM² (rear view cutaway).



4.3 Replacement Parts

Four levels of replacement parts are available for the PMM². These levels are designated A, B, C or D. The level that you should keep on hand for your installation will vary depending on the type of maintenance planned on site and the configuration of your PMM². Having replacement parts on hand will prevent unacceptable delays due to time involved obtaining spare parts during critical periods, such as system startup. Any items used during startup will be replaced by MGE at no charge. Call MGE UPS SYSTEMS, INC. Customer Care Center 1-800-438-7373 (Hours: 24/7) to arrange for service and specific recommendations.

A description of each level is provided below:

Level Description

- A This level of replacement parts consists of consumable items, specifically power and control fuses. It is recommended to have these items on hand during installation of the system, including startup.
- **B** This level of replacement parts is recommended when the user can tolerate short duration system down-time to obtain replacement parts in the event of a major system failure. This level of replacement parts consists of consumable items, specifically fuses and the most critical printed-circuit assembly (PCA).
- **C** This level of replacement parts is recommended when the user can tolerate only a minimum of downtime in the event of a major system failure. This level of replacement parts consists of consumable items, specifically fuses, and a set of critical printed-circuit assembly (PCA).
- **D** This level of replacement parts is recommended when the user can tolerate only a minimum of downtime in the event of a major system failure. This level of replacement parts consists of consumable items, specifically fuses, and additional printed-circuit assembly (PCA).

Appendix A

Alarm Number	Alarm Description	Abbreviated Display Name	Units
01	Over Current Phase A	Over la	Amperes
02	Over Current Phase B	Over Ib	Amperes
03	Over Current Phase C	Over Ic	Amperes
04	Over Current Neutral	Over In	Amperes
05	Current Unbalance, Max	I Unbal Max	Tenths %
06	Current Loss	Current Loss	Amperes
07	Over Voltage Phase A–N	Over Van	Volts
08	Over Voltage Phase B–N	Over Vbn	Volts
09	Over Voltage Phase C–N	Over Vcn	Volts
10	Over Voltage Phase A–B	Over Vab	Volts
11	Over Voltage Phase B–C	Over Vbc	Volts
12	Over Voltage Phase C–A	Over Vca	Volts
13	Under Voltage Phase A	Under Van	Volts
14	Under Voltage Phase B	Under Vbn	Volts
15	Under Voltage Phase C	Under Vcn	Volts
16	Under Voltage Phase A–B	Under Vab	Volts
17	Under Voltage Phase B–C	Under Vbc	Volts
18	Under Voltage Phase C–A	Under Vca	Volts
19	Voltage Unbalance L–N, Max	V Unbal L-N Max	Tenths %
20	Voltage Unbalance L–L, Max	V Unbal L-L Max	Tenths %
21	Voltage Loss (loss of A,B,C, but not all)	Voltage Loss	Volts
22	Phase Reversal	Phase Rev	_
23	Over kW Demand	Over kW Dmd	kW

PM800 List of Available Alarms by Alarm Number

(continued on next page)

Alarm Number	Alarm Description	Abbreviated Display Name	Units
24	Lagging true power factor	Lag True PF	Thousandths
25	Over THD VAN	Over THD VAN	%
26	Over THD VBN	Over THD VBN	%
27	Over THD VCN	Over THD VCN	%
28	Over THD VAB	Over THD VAB	%
29	Over THD VBC	Over THD VBC	%
30	Over THD VCA	Over THD VCA	%
31	Over KVA Demand	Over KVA DMD	KVA
32-40	Reserved for custom alarms		
53	End Incremental Energy Interval	END INC ENR INT	
54	End Demand Interval	END DMD INT	
55	Power up/Reset	PWR UP/RESET	
56	Digital Input Signal	DIGITAL IN SI	

MGE Warranty & Proprietary Rights Statement for Three Phase Products

(Applicable within the United States, Canada and Mexico)

MGE Standard Three Phase Warranty

MGE UPS SYSTEMS, INC. ("MGE") warrants three phase products it manufactures to be free from defects in materials and workmanship for a period of three hundred sixty five (365) days counting from the date of purchase by or for the first end user ("Purchaser"), or, if applicable, the date of MGE's completion of initial startup of the subject product, provided however said warranty shall not exceed eighteen (18) months from the date of delivery of the subject product to Purchaser (the "Warranty Period"). MGE's liability hereunder is limited to replacing or repairing at MGE's factory or on the job site, at MGE's option, any part or parts that are defective and reported to MGE during the Warranty Period. MGE shall have the sole right to determine if the parts are to be repaired at the job site or whether they are to be returned to the factory for repair or replacement. All items returned to MGE for repair or replacement must be sent freight prepaid to its factory. Purchaser must obtain MGE's warranty to be valid. MGE will not be liable for any damage done by unauthorized repair work, unauthorized replacement parts, from any misapplication of the subject product, for damage due to accident, abuse, or act of God (such as earthquake, flood, inclement weather, rain or fire), or relating to Purchaser's failure to follow proper environmental conditions for the product.

In no event shall MGE be liable for loss, damage, or expense directly or indirectly arising from the use of or any defects in the subject product, or from any other cause, except as expressly stated in this warranty. EXCEPT AS EXPRESSLY STATED IN THIS WARRANTY, MGE UPS SYSTEMS, INC. MAKES NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE OR NON-INFRINGEMENT. MGE is not liable for and Purchaser waives any right of action it has or may have against MGE for any consequential or special damages arising out of any breach of warranty, and for any damages Purchaser may claim for damage to any property or injury or death to any person arising out of its purchase or the use, operation or maintenance of the subject product. The warranty stated herein includes parts and labor; however, MGE will not be liable for any labor subcontracted or performed by Purchaser for preparation of the warranted item for return to MGE's factory or for preparation work for field repair or replacement, and MGE will not be responsible to pay any invoice therefore.

This warranty shall be exclusive of any and all other warranties express or implied and may be modified only by a writing signed by an authorized officer of MGE UPS SYSTEMS, INC. This warranty shall extend to the Purchaser but to no one else. Accessories supplied by MGE, but manufactured by others, carry any warranty the manufacturers have made to MGE, and which can be passed on to Purchaser.

MGE UPS SYSTEMS, INC. makes no warranty with respect to whether the products sold hereunder infringe any patent, U.S. or foreign, and Purchaser represents that any specially ordered products do not infringe any patent. Purchaser agrees to indemnify and hold MGE UPS SYSTEMS, INC. harmless from any liability by virtue of any patent claims where Purchaser has ordered a product conforming to Purchaser's specifications, or conforming to Purchaser's specific design.

Purchaser has not relied and shall not rely on any oral representation regarding any products sold hereunder and any oral representation shall not bind MGE UPS SYSTEMS, INC. and shall not be part of any warranty.

There are no warranties which extend beyond the description on the face hereof. In no event shall MGE UPS SYSTEMS, INC. be responsible for consequential damages or for any other damages except as expressly stated herein.

Proprietary Rights Statement

The information in this manual is the property of MGE UPS SYSTEMS, INC., and represents a proprietary article in which MGE UPS SYSTEMS, INC. retains any and all intellectual property rights, including exclusive rights of use and/or manufacture and/or sale. Possession of this information does not convey any permission to reproduce, print, manufacture or have made the article or articles shown herein. Such permission may be granted only by specific written authorization signed by an authorized officer of MGE UPS SYSTEMS, INC.

IBM, PC-AT, ES/9000, and AS/400 are trademarks of International Business Machines Corporation. MGE and MGE UPS SYSTEMS are trademarks of MGE UPS SYSTEMS, INC. Other trademarks that may be used herein are owned by their respective companies and are referred to in an editorial fashion only.

For Three Phase Warranty outside of the United States, Canada and Mexico, refer to Three Phase International Warranty.

January 2005 Rev C00

Warranty and Product Registration

Thank you for choosing MGE UPS SYSTEMS, INC. for your power protection, distribution, and quality requirements. We are pleased to have you join our increasing family of users.

In order to maximize the value you receive from this product, and to ensure that you are kept informed of product or software updates, we recommend that you take a few minutes to register your new purchase. You may register online at the URL noted below. Should you not have Internet access, you may mail or fax this form back (attn: Warranty Registration) as indicated at the bottom of the page.

Register your product at: http://www.mgeups.com/email/warranty/menu.htm

Please be prepared with the following information to register and validate your product's warranty, keep informed on software and product updates, and register your extension <u>"Warranty+"</u> if purchased with the product.

User Information
Last name
First name
Company name
Address
Zip code
City
State/Province
Country
Tel
Fax
Email
Product Information
Model
Serial Number
Date of purchase
Warranty Extension (Warranty+)
I have purchased a warranty extension (Warranty+)
Reference: Contract Number:
Thank you from all of us at MGE.
MGE UPS SYSTEMS, INC., 1660 Scenic Avenue, Costa Mesa, CA 92626, USA Tel: 714-557-1636

41-000154-53 Rev B02 8/2005

MGE Customer Care Center - Three Phase Products

Technical Support and Product Services

Technical questions? If you encounter a problem while following the instructions in this manual, or have questions about the operation, repair, or servicing of your equipment, please direct calls to MGE UPS SYSTEMS, INC. Customer Care Center or visit our web site www.mgeups.com for complete service information.

To insure that your questions are correctly answered, please obtain the serial number of the unit and include them in any discussions or correspondence.

Serial number:

Who To Contact

Customer Care Center: 1-800-438-7373 (Hours: 24/7)

Customer FAQ or International calls: 1-714-557-1636

Commitment: MGE UPS SYSTEMS, INC. is committed to providing easy to access factory trained experts that will provide responses to any questions that you might have.

Scheduling Field Service Engineer Support

Scheduling of the MGE Field Service Engineers typically should be done 7 to 10 days before they are required on-site. If the startup of the product is critical to maintaining your schedule, please call the MGE toll free telephone number at **1-800-438-7373** for assistance.

Return Policy for Repair of Three Phase Products (RGA)

Should you require factory service for your equipment, contact MGE Customer Care Center and obtain a Return Goods Authorization (RGA) prior to shipping your unit. Never ship equipment to MGE without first obtaining an RGA number.

Date:	
RGA Number:	
Contact Name:	

Rev B00 8/2005

(This page left blank intentionally)

Glossary

Terms Used	Definition/Meaning
1	Used to represent "and/or."
%	Percent; of each hundred.
° F.	Degrees fahrenheit.
°C	Degrees celsius.
@	At.
±	Plus or minus.
#	Number.
Ø	Phase.
ABC	Normal sequence of phases in three-phase power.
AC or ac	Alternating current.
Ambient air temperature	The temperature of the surrounding air.
AWG	American Wire Gauge, a standard unit for measuring wire cross-sectional area.
Carrier	The company or individual responsible for delivering goods from one area to another.
СВ	Circuit breaker.
Conduit	A flexible or rigid tube surrounding electrical conductors.
CSA	Canadian Standards Association.
Current rating	The maximum current that a piece of electrical equipment is designed to carry.
DC or dc	Direct current.
Earth ground	A ground circuit that has contact with the earth.
Electrician	Refers to an installation electrician qualified to install high-energy electrical components in accordance with national and local codes and regulations. Not necessarily qualified to maintain or repair electrical or electronic equipment; compare to Technician.
FCC	Federal Communications Commission.
GND	Electrical ground.
Hz	Hertz, a unit of measure for frequency; one cycle per second equal one Hertz.
Input branch circuit	The input circuit from the building's power panel circuit breaker to the equipment.
kVA	Kilovolt-Amperes; a measure of apparent power.

kVAR	Kilovolt-Amperes reactive.
kW	KiloWatt; a measure of real power.
МСМ	Thousand circular mil; a unit of measure for wire sizes for multiple stranded over 4/0 AWG in diameter. M is from the Roman numeral system symbol for 1,000. Old unit of measure was kcmil.
MGE	MGE UPS SYSTEMS, Inc.
NC	Normally closed.
NEC	National Electrical Code, ANSI/NFPA 70.
NEMA	National Electrical Manufacturers Association.
NFPA	National Fire Protection Association.
NO	Normally-open.
OSHA	Occupational Safety and Health Act.
PCA	Printed circuit assembly; refers to a printed wiring board (PWB) stuffed with electrical components.
P.F.	Power factor.
PMM ²	Power Management Module ² .
Remote Emergency Power Off	A switch used for emergency shutting down electrical equipment.
REPO	Remote Emergency Power Off.
Shipping damage	Any damage done to an article while it is in transit.
Shipping pallet	A platform on which articles are secured to for shipment.
Technician	Refers to an electronic technician qualified to maintain and repair electronic equipment. Not necessarily qualified to install electrical wiring. Compare to Electrician.
TVSS	Transient voltage suppression system.
UL	Underwriter's Laboratories, Inc.
UPS	Uninterruptible Power Supply or Uninterruptible Power System.
Vac	Volts alternating current.
Vdc	Volts direct current.

Reorder Form



1660 Scenic Avenue Costa Mesa, CA 92626

Use this form to report any errors, omissions, or other problems you have experienced, or to order additional hardcopies of this document. A free copy of this document may be downloaded from the proprietary MGE Rep Web site. Please contact your MGE UPS SYSTEMS, INC. Representative for assistance.

STREET ADDRESS		
ITY	STATE	ZIP
would like to order (quar	ntity @ \$75.00 each) additional copies of	the:
	PMM ² 30 - 300kVA	
	Installation and User Manual	
	86-505004-00 B00	
would like to report the following	g problems with this document:	
would like to report the following	g problems with this document:	
would like to report the following	g problems with this document:	
would like to report the following	g problems with this document:	
I would like to report the following	g problems with this document:	
would like to report the following	g problems with this document:	

Contact MGE

United States

MGE UPS SYSTEMS 1660 Scenic Ave. Costa Mesa, CA 92626

Tel: (714) 557-1636 CCC: (800) 438-7373 Fax: (714) 557-9788 email: info@mgeups.com www: mgeups.com

Canada

MGE UPS SYSTEMS #9, 2789 Thamesgate Drive Mississauga, ON L4T 4E8

Tel: (905) 672-0990 (877) 672-0990 Fax: (905) 672-7667 email: info@mgeups.com www: mgeups.com

Latin America and Other International

MGE UPS SYSTEMS

1660 Scenic Ave. Costa Mesa, CA 92626

Tel: (714) 513-7831 Fax: (714) 434-0199 email: info@mgeups.com www: mgeups.com

UPS SYSTEMS