

# PM Series 1kW Power Module Power Supply/Battery Charger

Models:  
PM-12-80, PM-24-40 & PM-48-20

## INSTALLATION/OPERATION INSTRUCTIONS



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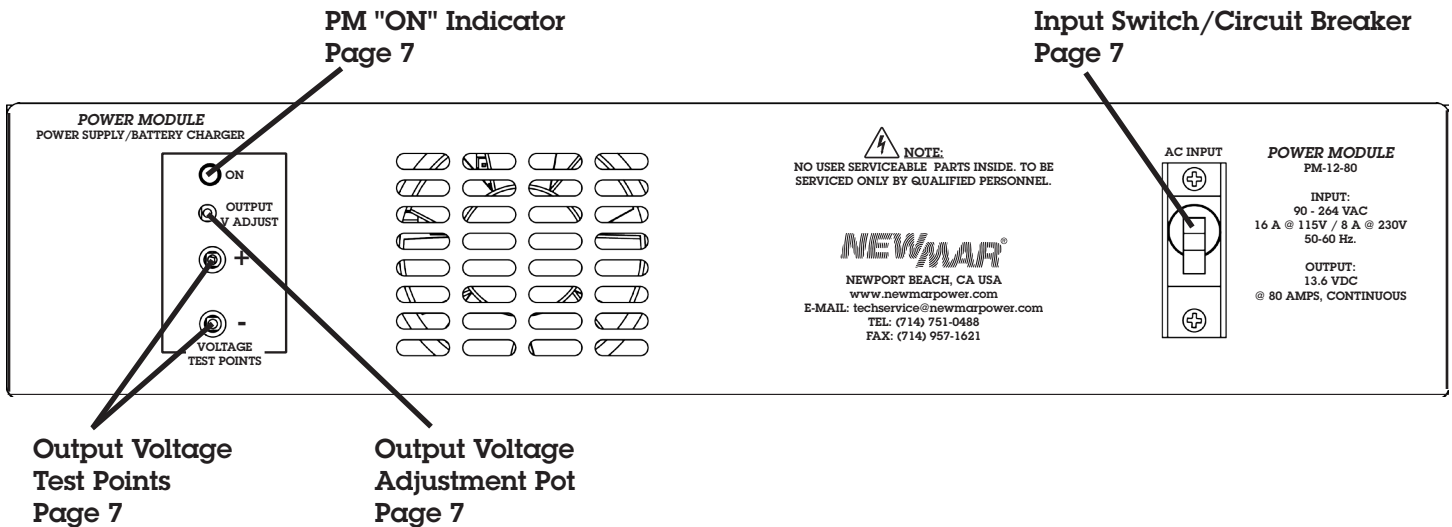
M-PM1KW  
As Of June 2012

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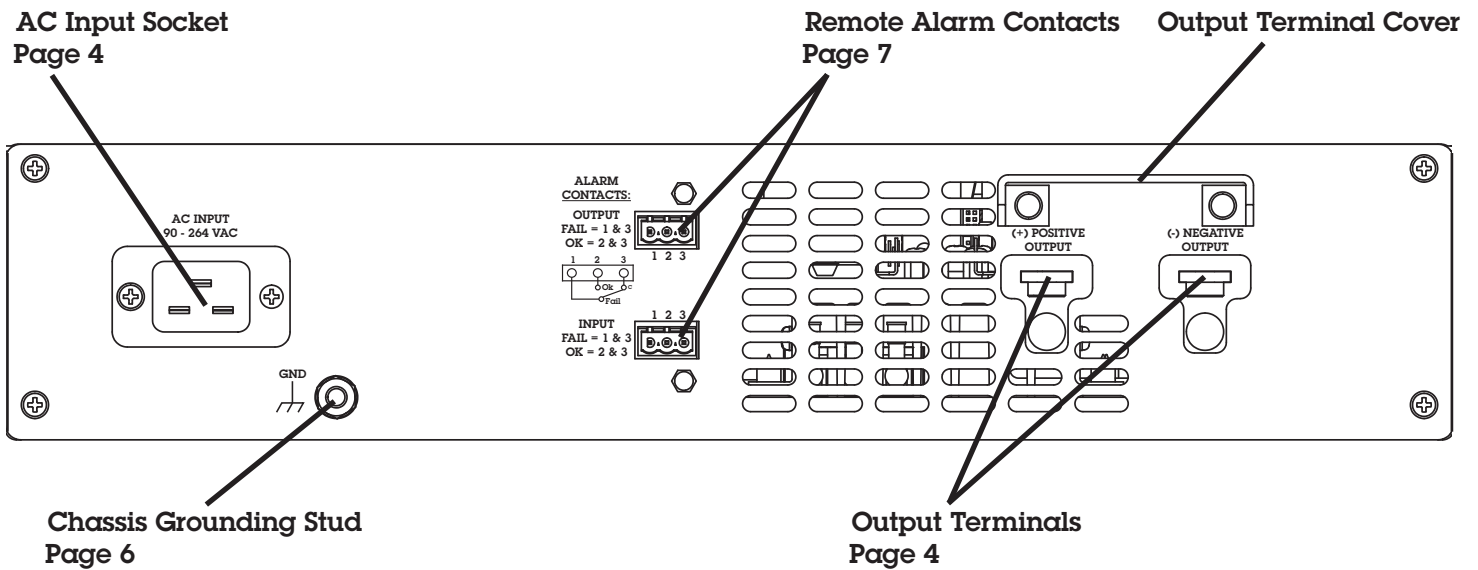
## Quick Reference

The front and rear panel features of the 1 kW Power Modules are illustrated below, along with the page number where information on each particular feature is located.

**FIGURE 1: Front Panel (all models):**



**FIGURE 2: Rear Panel (all models):**



## **I) Overview**

The PM Series Power Module is a uniquely adaptable communication equipment power source which functions as either power supply or battery charger for 12, 24 or 48 volt d.c. systems positive, negative or floating ground. Power Modules may be employed singly or in combination, enabling the installer to scale the system output from 1000 to 6,000 watts per rack. Units may be paralleled for N + 1 redundancy and alarm contacts allow local or remote monitoring. An optional d.c. wiring quick connect kit allows easy replacement of modules while the system as a whole remains up and running (see section V-A).

Power Modules may be used separately as a power source, or they may be integrated with NEWMAR's Power Function Manager (model PFM-400; rated to 400 amps maximum) to greatly expand the system capability with other functions such as digital output monitoring, multiple load distribution and low voltage disconnect. (Contact the factory for complete information regarding the PFM-400.) Note: If the Power Module is being installed as part of an integrated system with the PFM-400 refer to the manual which comes with that unit for all d.c. wiring instructions and functional descriptions.

## **II) AC Power Quality and EMI Compatibility**

### **A) AC Power Quality**

Reliability is of prime concern when designing an AC-DC power system for communication sites. Poor AC input power quality can seriously impede system reliability. In particular, transient disturbances on the power lines can severely weaken or cause failure of semi-conductors in power supplies and communication gear. It is important that you know the input power quality when installing the PM. Following is some basic information on the subject:

#### **Causes**

Transients are characterized as a voltage pulse of high energy and very short duration impressed upon the AC wave form. These over voltage pulses can range from 1 to 100 times the normal AC voltage level and can last for a fraction of a cycle to a few cycles.

Transient disturbances can be placed into two categories:

- Lightning generated
- Equipment generated

A direct lightning hit on a utility power line will cause a high energy voltage transient to travel in both directions along the power line. This disturbance can

affect equipment hundreds of miles from the strike point.

Equipment generated transient sources include utility fault conditions and load switching as well as on-site equipment such as pumps and air conditioning loads, motors, phase control equipment.

### **Recommendations**

All PM models requirements for transient withstand capability. The AC power source should conform to this specification to ensure reliable power supply operation.

If the power source quality is suspect or unknown, it is recommended that an AC power quality survey be conducted by a power quality consultant or power conditioning firm. Corrective measures may include lightning suppressors, line conditioners and filters.

An AC transient suppressor is recommended for installations in third world countries and sites that are subject to nearby lightning strikes or transients caused by nearby motor contactors, air conditioning compressors, etc.

### **B) EMI (Electro-Magnetic Interference) Considerations**

The PM Series Power Modules employ switch-mode technology to convert AC to DC. They are designed to produce minimal EMI levels when operating (compliant to International Standards EN55022 (CISPR22) EN61000-3-2,3. Although the level of EMI produced may be acceptable for most radio applications, some installations may not even tolerate what little EMI is produced.

Analog microwave and other extremely sensitive radio sites may require additional input/output filtering and careful installation. In some cases linear power supplies (also available from NEWMAR) should be considered, as they emit lower EMI (although they are more susceptible to "brown-outs" or voltage sags and high input voltage).

### **C) Other Factors**

Some of the various factors which must be considered when discussing electrical interference include the following:

- RF Signal strength
- Ground loops
- Power and signal cable routing proximity
- Power supply and radio mounting locations
- Antenna, signal, and power grounds



### III) Installation

#### A) Materials Provided

Prior to installation, check to ensure that each of the following items have been included with the packaging. For any missing items please contact the factory or warehouse.

- (2) ea. Mounting brackets for 19" rack mounting (# 13917-0)
- (6) ea. 6-32 X 3/8" pan head Phillips screws
- (2) ea. 3 position pluggable connector (Alarm Contacts) - installed on rear panel
- (1) ea. 115V NEMA 5-20P AC input power cord
- (1) ea. Installation/Operation manual
- (1) ea. Plastic output terminal guard (#15645-0)
- (2) ea. 6-32 x 7/16" pan head Phillips screws (mount guard)

#### B) Mounting

The PM is provided with one set of mounting ears for 19" rack mounting (# 13917-0). Six # 6-32 x 3/8" pan head Phillips screws are provided for attaching the ears to the PM chassis. Note: For 23" rack mounting, please contact Newmar and request a pair of P/N: 699-3918-0, 23" rack ears.

Note there are three sets of a triangular pattern of 6-32 tapped holes on each side of the PM. When rack mounting (two posts) the PM it is recommended that the 'center mount' holes (6" set back from the PM's front panel) be used. The set of holes nearest the front panel and the set nearest the rear panel are normally used when installing the optional Universal Mounting Bracket (UMB).

For four post mounting, please contact the factory for a second set of ears (specify 19" or 23" and the model no.), mount one pair of ears to the front holes and the second pair of ears to the center or rear most tapped holes. Adjust your cabinet rail front to back distance so it matches the mounting holes on the PM.

Note: Due to the weight of the Power Module, we do not recommend flush mounting the PM with the mounting ears attached to the forward most mounting holes unless rear support is provided.

#### C) AC Input Voltage, Current, and Wiring

1) Input Voltage: These Power Modules operate from 90 to 264 VAC, universal input. No switch position changes or jumpers needed. They will operate from 115 or 230 VAC on initial start-up without any adjustments.

2) Input Currents @ Full Load:

- 115 VAC = 13 Amps
- 230 VAC = 7 Amps

3) Input Wiring: These models are provided with an IEC power cord (in the installation kit) with a NEMA 5-20 plug (115 VAC, 20 Amp) attached for use with a 115 VAC, 20 amp outlet and one end with a molded socket that mates with the chassis mount IEC C-19 connector on the rear of the PM. If the 5-20 plug is not suitable for the available AC outlet at site, two choices are available:

- A) Obtain an IEC cord with appropriate plug and IEC C-19 mating socket or
- B) Cut off the 5-20 plug, obtain correct plug for the available outlet and attach to the provided IEC power cord (plug should be rated at 20 Amps). When replacing the plug, pay careful attention to the AC plug terminal wiring as follows:  
BLACK.....AC Hot (over-current protected/ Line 1 (230 VAC split phase i.e. North America)  
WHITE.....AC Neutral/Line 1 (115 VAC North America) or AC Hot/Line 2 (230 VAC split phase i.e. North America)  
GREEN or GREEN w/YELLOW stripe.....Ground (safety, earth)

**Important:** Although the internal AC wiring is protected by the front panel mounted double pole circuit breaker, the wiring to the PM must also be protected by plugging into an appropriate over-current protected three prong outlet or routed through a separate dedicated fuse or circuit breaker on an AC distribution panel with proper safety/earth chassis ground in accordance with all applicable codes and ordinances.

#### Distribution Panel AC Fuse/Circuit Breaker Values

- 115 VAC = 20 amp
- 230 VAC = 10 amp

#### D) DC Output Wiring

**IMPORTANT:** Ensure that AC input to the PM is switched off before working with DC wiring. The output terminals are "hot" whenever the unit is switched on.

1) 1/4"-20 thread output terminals and washers for hard-wiring of DC output are located on the rear panel of the PM. Terminate wires with 1/4" ring lug connectors and use the provided 1/4" hardware for a secure installation.



2) Use the chart below to determine minimum gauge for wires depending on the particular model and the length of the run from the PM to the load or distribution

**DC Wire Size Table:**

**Model Minimum Wire Size per N.E.C. AWG (mm)**

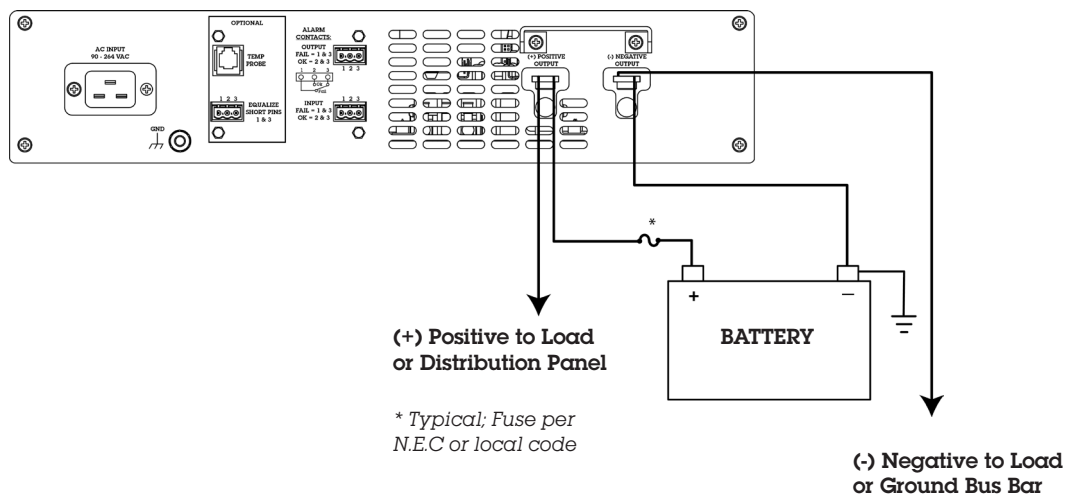
- PM-48-20 #14 (2.5 mm)
- PM-24-40 #8 (10 mm)
- PM-12-80 #4 (25 mm)

To minimize line loss at lengths greater than 5 feet, it is recommended to increase wire size one gauge for each additional 5 feet of cable run.

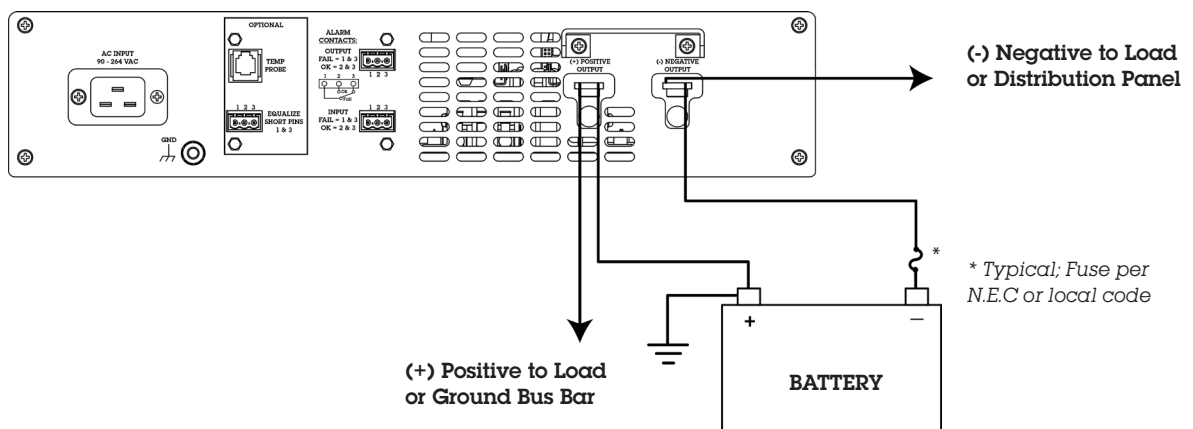
Note: When the PM is used in a parallel n+1 redundant configuration, output current is derated by 10 % due to current sharing tolerances (see SPECIFICATIONS section).

Typical single PM wiring schemes are illustrated in Figures 3-4.

**FIGURE 3: Single Power Module, negative ground, with battery**



**FIGURE 4: Single Power Module, positive ground, with battery**



## E) Parallel Wiring

The internal oring/isolation diode of the PM allows parallel n+1 redundant wiring with no modification or other external isolation devices required. Figures 5-6 illustrate some typical parallel wiring schemes.

**IMPORTANT:** When wiring two or more units in parallel d.c. wires for all units should be identical in gauge and length and the output voltage of each module should be adjusted (as outlined below) in order to facilitate droop load sharing.

### Parallel Load Sharing Adjustment Procedures

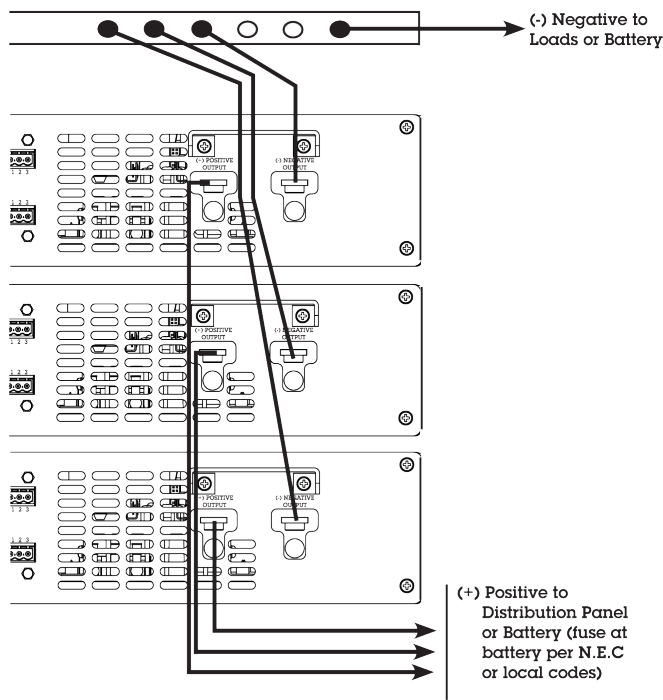
#### Method 1:

1) Shut off all but one of the Power Modules and apply a load equivalent to 1/2 of the rating for that unit (e.g., for model PM-12-80 apply a 40 amp load).

2) Connect a digital voltmeter to the test points on the front of the power module at the "V OUT" and (+) and (-) positions.

3) Verify that the output voltage is at the correct factory setting (see Specifications section) or at the desired system voltage. If adjustment is necessary, use a small flat tip screwdriver to turn the "OUTPUT VOLTAGE ADJUST" potentiometer on the front panel until the

**FIGURE 5: Parallel (two to six Power Modules) and N+1 redundancy, negative ground**



voltmeter reads the desired system output voltage.

4) Shut off the PM, turn on the next unit in the system, and repeat steps 2 through 4 until all PM's in the system have the identical "V OUT" output voltage.

#### Method 2:

1) With all Power Modules powered up, apply the typical operational DC system load.

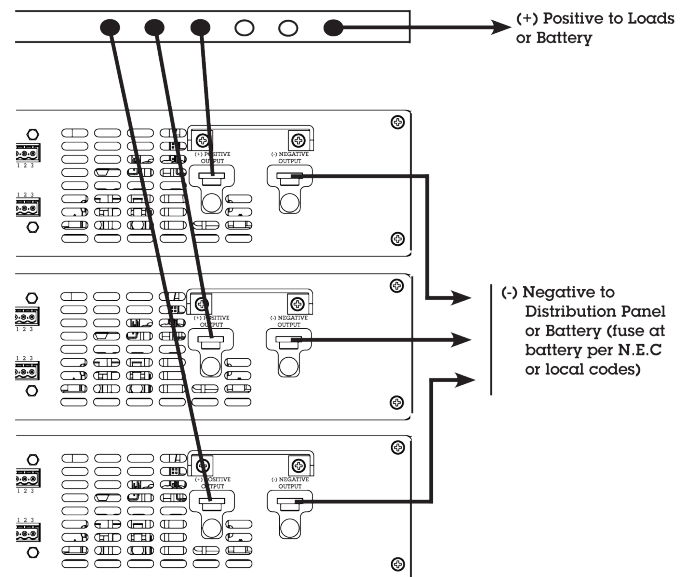
2) Using a clamp-on ammeter, measure the output current of each PM in the system. If there is an output current differential of greater than 5 % between any two PM's, attach the ammeter to the PM with the highest output current and turn the "OUTPUT VOLTAGE ADJUST" potentiometer on that unit slowly counterclockwise, until the output current of that unit reduces slightly.

3) Repeat step 2 until there is less than 5% current output differential between all PM's in the system.

## F) Chassis Grounding

If grounding of the PM chassis is required for the installation, use the provided 1/4" grounding stud on the rear panel for this purpose (see Figure 2).

**FIGURE 6: Parallel (two to six Power Modules) and N+1 redundancy, positive ground**



## IV) Operation

### **A) AC Input**

The PM will operate on any AC voltage in the following range: 90-264 VAC, 50-60 Hz.

AC input is protected against over-current and internal short circuit conditions by the circuit breaker/input power switch on the front panel. When this switch is in the on position and DC is available at the output terminal, the "ON" indicator L.E.D. on the left side of the front panel will illuminate green.

If AC power is connected and the input power switch is on but AC Input indicator is red, a fault has occurred within the Power Module.

### **B) DC Output**

The PM produces 12, 24 or 48 VDC nominal output, depending on model. The ground reference may be positive, negative or floating. Chassis is isolated from DC. A 1/4" chassis ground stud is provided for grounding the chassis to DC pos. (+), or neg. (-) if desired

Regulation: Regulation at the output terminal is within  $\pm 2\%$  of rated voltage, under all line and load conditions. Ripple is within  $\pm 1\%$  of rated voltage with or without batteries on-line.

Output Voltage Adjust: Factory-set voltages (as measured at the output terminal) and approximate adjustment ranges are specified below. Adjustment is made at the "OUTPUT VOLTAGE ADJUST" pot on the left side of the front panel using a small flat tip screwdriver (see Figure 1). Output voltage test points provided beside the voltage adjust pot for ease of monitoring while making this adjustment. Use of a digital multimeter is recommended when making this adjustment. If the PM has had the charger function board installed, output voltage adjustments are automatic and this adjustment pot has limited range.

<b>Output Voltage Table Factory Set "V OUT" "V OUT"</b>		
<b>Model</b>	<b>Output Voltage</b>	<b>Adjustment Range</b>
PM-12-80	13.6V DC	12.2 - 15V DC
PM-24-40	27.2V DC	24.4 - 30V DC
PM-48-20	54.4V DC	48.8 - 60V DC

Current Limit Circuit: The PM is rated for continuous duty at the current level indicated by model number, e.g., PM-24-40 is rated at 40 amps continuous duty. To prevent overload when recharging severely discharged batteries, current is limited at approximately 105-115% of the continuous duty rating.

DC Fuses: d.c output wiring is protected by an internal DC output fuse. The current limiting circuit of the PM should prevent this fuse from blowing under normal operating conditions. If the d.c fuse blows, this may indicate a reverse polarity hook-up or an internal short.

Always disconnect AC to the PM before checking fuses. To replace the DC fuse, the cover must be removed. The DC fuse is an HBO type mounted near the rear panel. Be sure to replace with the same type and value as indicated on the fuse.

If the battery is connected to the PM output with backwards polarity, the fuse should blow to protect DC wiring. However damage to internal components may also have occurred. If the replacement fuse blows, return the PM to the factory for a thorough inspection.

### **C) Local/Remote Alarm**

A loss-of-output relay and loss of input relay (both form "C") are wired to the pluggable output connectors on the rear panel. When wired to an external alarm or remote indicator lamp it will alert the operator in the event of any condition which causes a loss of DC output.

The alarms may be wired with the relay "normally open" or "normally closed", as needed. See FIGURE 2 for the contacts position during input or output failure and normal operating condition.

Relay contact rating for all models is 2A @ 30V DC.

## V) Options

### **A) DC Quick Connect Wiring Kit**

**Note: This option is available only for systems which incorporate the NEWMAR Power Function Manager. For complete information on this product, please contact the factory.**

A DC wiring harness quick connect kit is available from NEWMAR which simplifies parallel wiring installation of multiple Power Modules with the Power Function Manager and facilitates "hot change-out" of modules for repair or replacement.



The kit consists of two wiring harness; one for positive and negative DC output wiring, another for alarm contact wiring. Wires are pre-cut to proper length, all necessary connectors are installed and the bundles are neatly tie-wrapped into proper position for a simple and professional installation.

For more information, or to order the quick connect kit, please contact the factory and specify the number of PM's (2-6) in the system being installed.

#### PM DC Quick Connect Wiring Kits Model Numbers

PM Model	2-3 PM Wire Harness	4-6 PM Wire Harness
PM-12-80	QCK-3A	QCK-6A
PM-24-40	QCK-3	QCK-6
PM-48-20	QCK-3	QCK-6

#### B) Charger Function Board

The Charger Function option (model CFCB, works on 12, 24, and 48 VDC models) is available for installation at the factory or purchased later for field installation. The charger function option provides smart three-stage temperature compensated charging of GEL and FLOODED lead acid batteries as well as a manually triggered "Equalize" timer for flooded-lead acid batteries. Contact Newmar or your distributor for more information.

If this option was factory installed, there will be a Temp Probe and Equalize connector installed at the rear panel and you should receive a Charger Function Operation Manual. If you wish to install the charger function option, contact Newmar or your local distributor for ordering information. Installation and operation instructions will be provided.

With the charger function board installed, each of the following installation/performance options are available:

- 1) Three stage "smart" charging: Bulk, Absorption, Float
- 2) Selection of ideal charge regimen for either gel-cell or flooded lead acid batteries
- 3) Installation of an optional temperature compensation sensor for optimal charging in high/low temperature environments
- 4) Installation of an equalize timer for periodic

equalization of battery plates (for use with flooded-type batteries only)

#### VI) Specifications: All Models

**Input:** 90 - 264 VAC (universal), 50 - 60 Hz.

**Power Factor:** 0.95 - 0.98

**Regulation (with internal or-ring diode):**  $\pm 2\%$

**Ripple P-P:** 1%

**Efficiency:** 86% @ full load

**Output Voltage Adjustment Range:**  $\pm 10\%$

**Temperature Rating:** -20° to +70° C derate linearly from 100% load @ 50° C to 50% load at 70° C

**Altitude Operational Rating:** Full output to 5,000 feet; reduce output current 4% per 1,000 feet above 5,000 feet; 10,000 feet maximum

#### Individual Model Specifications

Model	Input Amps @ F.L. 115/230V	Output	
		Voltage Output	Amps Cont.
PM-12-80	16/8	13.6	80
PM-24-40	16/8	27.2	40
PM-48-20	16/8	54.4	20

#### Protection

Output fuse for reverse polarity

Current limit and foldback

Input circuit breaker

Over-temperature shut-down, automatic recovery

Over-voltage protection

#### Case Size (all models):

**Dimensions:** 3.5" H x 17" W\* x 20.5" D

\* 19" mounting brackets provided

**Weight:** 15.2 Lbs.





## VII) Troubleshooting

<u>Condition</u>	<u>Possible Cause</u>	<u>Solution</u>
A. No Output	<ol style="list-style-type: none"><li>1. PM not receiving AC input voltage or is not receiving correct input voltage</li><li>2. PM limiting its output due to overload or high ambient temperature condition.</li><li>3. Blown output fuse possible reverse battery polarity</li><li>4. Defective Power Module</li></ol>	<ol style="list-style-type: none"><li>1. Using a voltmeter, confirm AC input voltage. Check input connections.</li><li>2. Reduce DC load and/or determine cause of over temperature condition.</li><li>3. Clear blown fuse (See section IV-B, DC Output - DC Fuse)</li><li>4. Return to place of purchase for repair/replacement or contact NEWMAR for return authorization</li></ol>
B. PM repeatedly trips input circuit breaker with no battery or load connected	<ol style="list-style-type: none"><li>1. Internal short</li></ol>	<ol style="list-style-type: none"><li>1. Return to place of purchase for repair/replacement or contact NEWMAR for return authorization</li></ol>
C. Reverse polarity battery connection to PM has cause and PM to stop charging	DC output fuse and possibly other components blown	Replace output fuse. If fuse blows again, return to place of purchase for repair/replacement or contact NEWMAR for return authorization
D. Batteries connected to PM overcharging	Output voltage adjusted too high	Lower output voltage (See section IV-B, DC Output - Output Voltage Adjust) to battery manufacturer's recommended charging levels

## VIII) Warranty and Factory Contact Information

Newmar warrants that the Power Module be free from defects in material and workmanship for two years from date of purchase. If you have a problem with your Power Module, or have any questions about the installation and proper operation of the unit, please contact NEWMAR's Technical Services Department:

Phone: 714-751-0488 - From the hours of 7:30 a.m. to 5:00 p.m. weekdays, P.S.T.

Fax: 714-957-1621

E-mail: [techservice@newmarpower.com](mailto:techservice@newmarpower.com)

