PM Series Power Module
Power Supply/Battery Charger

INSTALLATION / OPERATION MANUAL

MODELS

PM-12-40A

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M-PM1240A
As of July 2010

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Quick Reference Contents

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

Figure 1: Power Module Front Panel

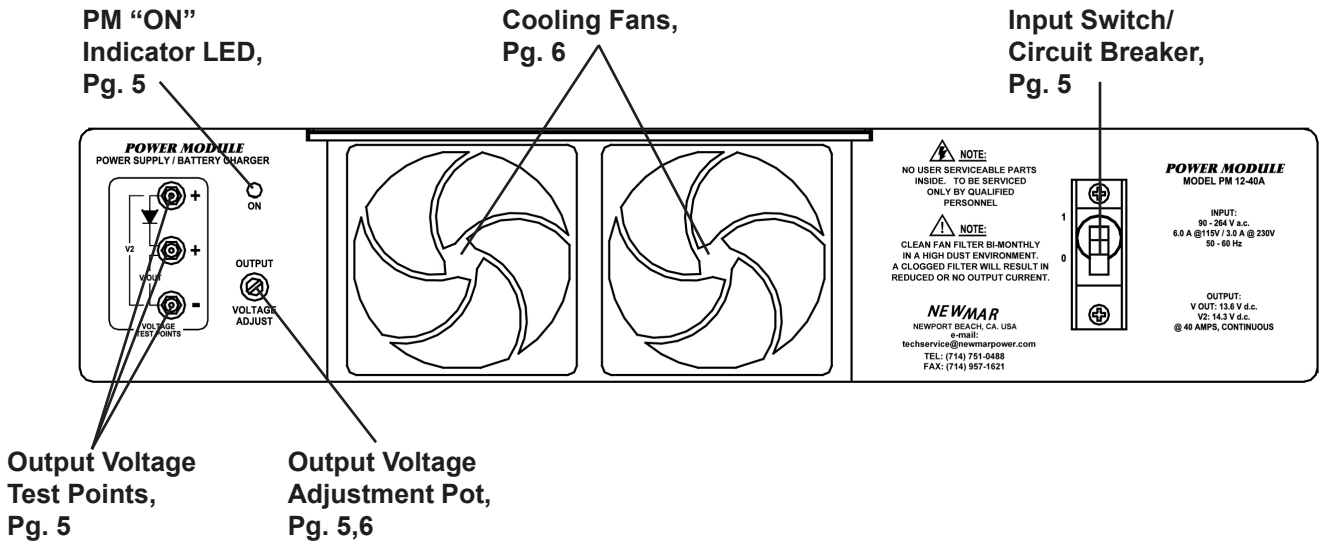
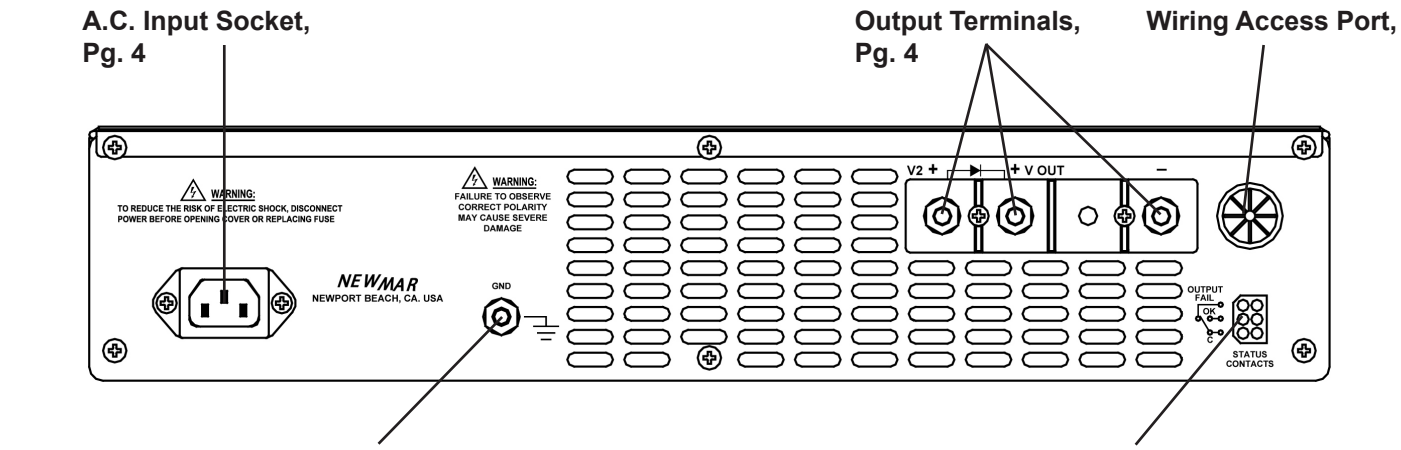


Figure 2: Power Module Rear Panel



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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 volt d.c. systems positive, negative or floating ground. Power Modules may be employed singly or in combination. 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-B).

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 are designed to meet IEEE 587/ANSI C62.41 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 optional AC transient suppressor (see OPTIONS section) 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 [conducted] and EN50082 [immunity]). 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)
(2) ea. mounting brackets for 23" rack mounting (# 13918-0)
(6) ea. 6-32 X 3/8" pan head phillips screws
(1) ea. Molex "pigtail" connector
(1) ea. IEC 115V NEMA 5-15P AC input power cord
(1) ea. Installation/Operation manual
(1) ea. Output terminal cover

B) Mounting

The PM is provided with two pairs of mounting ears: one for 19" rack mounting (# 13917-0) and one for 23" rack mounting (# 13918-0). Six # 6-32 x 3/8" pan head Phillips screws are provided for attaching the ears to the PM chassis. Select the appropriate set of ears and fasten to the PM sides.

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.

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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 Wiring

Input Wiring: PM-12-40A is provided with an IEC power cord (in the installation kit) with a NEMA 5-15 plug for a 115V AC outlet on one end and a molded socket at the other which fits the entry module at the rear of the PM. If the 5-15 plug is not suited to the available AC outlet, 1) obtain an IEC cord with appropriate plug or 2) cut off the 5-15 plug, obtain the correct plug for the outlet and attach it to the provided IEC cord. (Plug should be rated at 15 amps minimum). When replacing the plug, pay careful attention to the pin wiring as follows:

Brown.....AC Hot (over-current protected)
Blue.....AC Neutral
Green*.....AC Ground (safety, earth)
* may be Green with Yellow Stripe

Input Voltage Selection: The PM-12-40A is universal input. No switch required and will accept input of 90-264 VAC, 47-63 Hz.

Important: Although the internal AC wiring is protected by the front panel mounted 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
15 amp

CAUTION (230 V a.c applications only): If AC input is derived from a source consisting of two HOT leads (phase-to-phase 230V AC input voltage), an external fuse or circuit breaker (double pole) must be used to protect the unfused (formerly NEUTRAL, now HOT) lead.

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) Output terminals for hard-wiring of DC output are located on the rear panel of the PM. Terminate wires with 1/4" ring lug connectors 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 bus (or refer to N.E.C or local codes for any questions regarding proper DC wire gauges):

DC Wire Size Table:

Model Minimum Wire Size per N.E.C. AWG (mm)
PM-12-40A: #8 (10 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.

3) Two separate (+) output terminals are provided. Connection of d.c. wiring is typically made to the (-) output and the **"V OUT"** (+) output terminal, though **"V2"** (+) may be used instead if the application requires it (see "V2" below).

"V OUT" (+) Terminal: This output is routed through an internal "oring"/isolation diode. This terminal should be used for most installations. Use of this terminal is mandatory when the PM is wired for parallel n+1 redundant operation, or when it is used as a battery charger. Regulation at this terminal is 2 % line/load. 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).

"V2" (+) Terminal: This is a direct output without the internal oring/ isolation diode in line. 1 % regulation is available at this terminal and it should only be used in installations where only a single PM is used, 1 % regulation is required and the PM will not be wired to a battery. Output voltage measured at this terminal is approximately 0.7V d.c. higher than at the "V OUT" terminal.

Typical single PM wiring schemes are illustrated in **Figures 5-6**.

FIGURE 5: Single Power Module, negative ground, with battery:

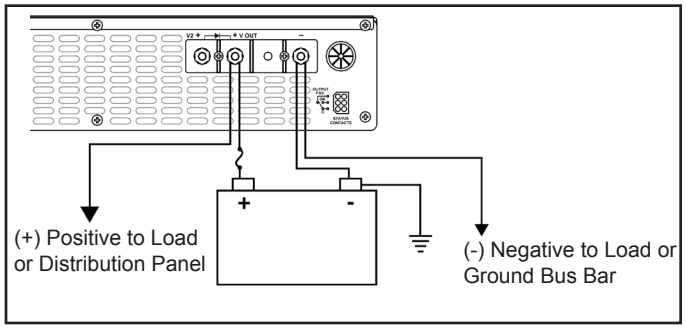
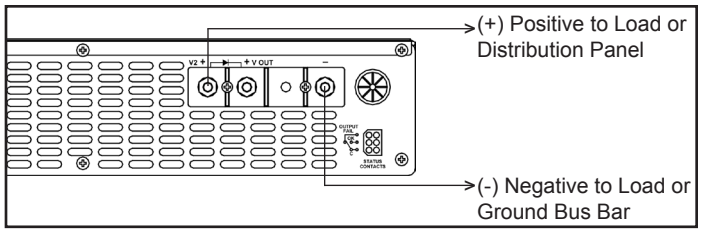


Figure 6: Single Power Module, negative ground, no battery, 1% regulation required:



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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. Figure 9 on the following page 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-12-40A apply a 20 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 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 d.c. system load.

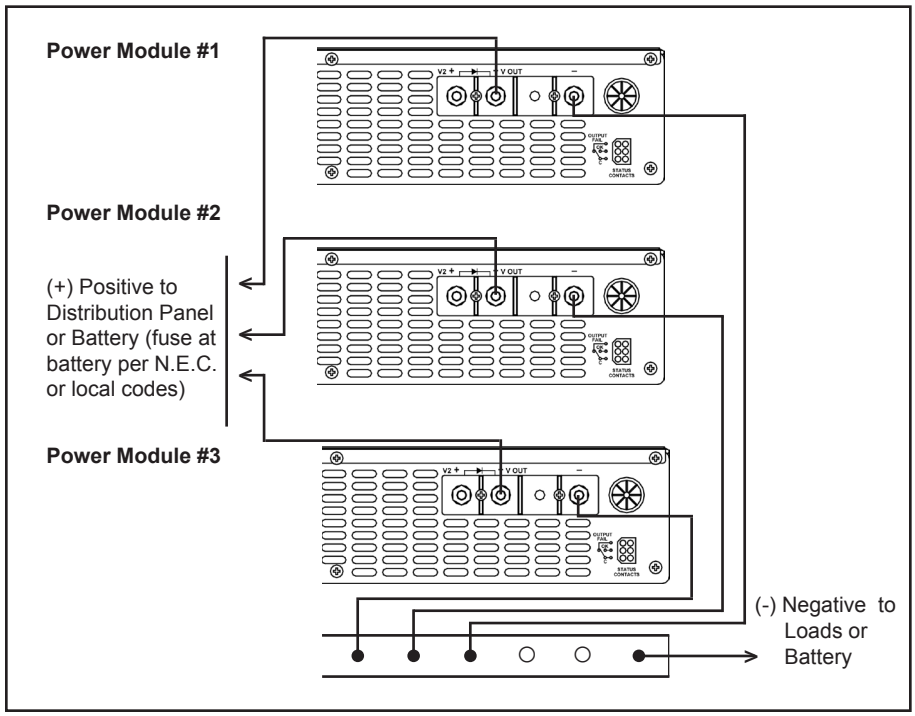
2) Using a clamp-on ammeter, measure the output current of each PM in the system. If there is an output current differential of greater than 5 % between any two PM's, attach the ammeter to the PM with the highest output current and turn the "OUTPUT VOLTAGE ADJUST" potentiometer on that unit slowly counterclockwise, 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 or 3).

FIGURE 6: Parallel (two to three Power Modules) and N+1 redundancy, negative ground



V) Operation

A) AC Input

The PM will operate on 90-264 VAC input at 47-63 Hz. No input voltage selection or adjustment is required for 115/230 VAC, 50 or 60 Hz. operation.

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.

B) DC Output

The PM produces 12 VDC nominal output. The ground reference may be positive, negative or floating.

Regulation: Regulation at the "V OUT" output terminal is within ± 2 % of rated voltage, under all line and load conditions. Regulation at the "V2" terminal is ± 1 %. Ripple is within ± 1 % of rated voltage with or without batteries on-line.

Output Voltage Adjust: Factory-set voltages (as measured at the V OUT 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 for both the "V OUT" and "V2" outputs are 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 is disabled.

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Output Voltage Table

Factory Set "V OUT" "V OUT"

Model	Output Voltage	Adjustment Range
PM-12-40A,	13.6V DC	12.2 - 15V DC

Current Limit Circuit: The PM is rated for continuous duty at the current level indicated by model number, e.g., PM-12-40A is rated at 40 amps continuous duty. To prevent overload when recharging severely discharged batteries, current is limited at approximately 105 % of the continuous duty rating by a current fold-back circuit.

DC Fuses: d.c output wiring is protected by internal DC output fuse(s). The current limiting circuit of the PM should prevent these fuses from blowing under normal operating conditions. If the d.c fuse(s) blow, 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 fuses are ATC blade type mounted on the small PCB. 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 fuses 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) Cooling Fans

To maximize the life of the internal components and to allow continuous operation at full rating, the PM employs automatic cooling fans. These fans operate at full speed whenever AC is applied and the unit is producing DC output.

Preventative Maintenance: The fan is a maintenance-free ball-bearing type and does not require lubrication. It is equipped with a filter to keep debris from being sucked into the unit. It is recommended that this filter be removed and rinsed with water occasionally to ensure adequate air flow, particularly if the PM is installed in a dusty or particle-filled environment. Simply pry off the filter retainer with a flat tip screwdriver to clean or replace the filter.

If the fan fails to operate when the PM is turned on and a load is applied, it may need to be replaced. (Replacement fans available from NEWMAR. Specify part number 999-1208-0, Replacement Fan with PCB connector.)

Fan Replacement Procedure

Note: It is recommended that both fans be replaced at the same time, even if only one has failed.

1. Disconnect ac power from PM.
2. Remove the plastic fan filter retainer on each fan. Use a small slotted screwdriver if necessary. Remove filters.
3. Unscrew the four philips head screws that secure the fans to the PM. Remove the four white plastic stand-offs from each fan along with the plastic finger guards. Install the finger guards, stand-offs and screws on to the replacement fans.
4. Un-plug the two 2 conductor fan powerleads from the mating connector. .
5. When installing replacement fan:
   A. Make sure each fans cable passes through the slot in the front panel and does not impede fan blade rotation.
   B. Make sure the fan air flow, which is indcated by an arrow on the top of the fan, points into the Power Module.
6. Attach fans to PM with the eight screws and re-install fan filters (clean first) and filter retainers.
7. Re-connect ac power to PM and confirm fans operate.

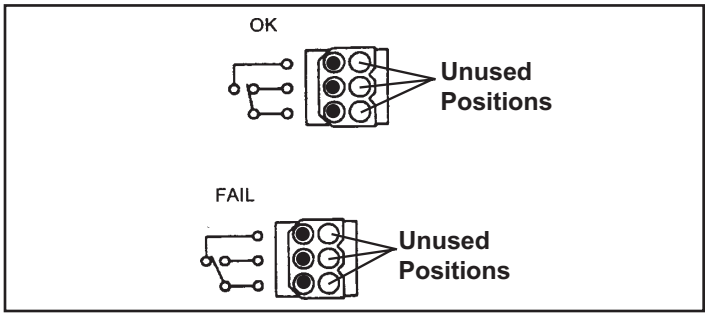
D) Local/Remote Alarm

A loss-of-output relay (form "C") is wired to the output connector 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.

A color-coded wire "pigtail" with keyed plug is provided for wiring convenience and to assure proper connections. The plug holds three wires for the output fail relay.

The alarm may be wired with the relay "normally open" or "normally closed", as needed. The position of the contacts during DC output failure and normal operating condition is illustrated below:

Figure 12: DC "FAIL" and DC "OK" Relay Contact Positions
Note:
The three right-hand connector positions are unused in this installation



Relay contact rating for all models is 5a @ 30V DC

V) Options (Available from the Factory)

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. Model QCK-3: 1-3 PM's. Model QCK-6: 4-6 PM's.

B) AC Transient Suppressor

For communication sites which are subject to "dirty" AC voltage with line transients or spikes, a commercially available AC transient suppressor may be required.

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The suppressor provides continuous bi-polar, bi-directional, non-interrupting protection for both the PM and load from damaging high voltage transients. It is installed in-line with AC input to the PM. Status indicators verify input and “PROTECTED” conditions and alarm contacts indicate when the unit has tripped and equipment is in the unprotected mode. Two models are available for 115V and 230V applications. Contact the factory for more information on how to obtain this transient suppressor.

VI) SPECIFICATIONS

All Models
Input: 90-264 VAC, 47-63 Hz.
Power Factor: .96-.99
Regulation: ± 2% at V OUT (through “oring” diode)
Ripple P-P: 1%
Efficiency: 80-85% @ full load
Output Voltage Adjustment Range: ± 10 %
Temperature Rating: 0° to +60° C derate linearly from 100% load @ 50° C to 80% load at 60° 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 V OUT	Output V2	Amps Cont.†	Recommended Battery Capacity (Amp/Hours)*	Weight Lbs	Weight Kg.
PM-12-40	8.5/4.3	13.6	14.3	40	80-400	12.2	5.5
PM-12-70	16/8	13.6	14.3	70	140-700	15.2	6.9
PM-24-20	8.5/4.3	27.2	27.9	20	40-200	12.2	5.5
PM-24-35	16/8	27.2	27.9	35	70-350	15.2	6.9
PM-48-10	8.5/4.3	54.4	55.1	10	18-90	12.2	5.5
PM-48-18	16/8	54.4	55.1	18	36-180	14.0	6.4

† For parallel configuration/load sharing derate output 10%

Protection
Output fuse for reverse polarity
Current limit and foldback
Input circuit breaker
Automatic high temperature protection

Case Size:
3.5” H x 17” W* x 20.5” D
* 19” and 23” mounting brackets provided

Certifications
• EN 55022 (Conducted)
• FCC Part 15, Level A (Radiated)

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VII) Troubleshooting

Condition	Solution	Possible Cause
A. No output current	1. PM not receiving AC input voltage or is not receiving correct input voltage	1. Using a voltmeter, confirm AC input voltage. Check input connections.
	2. PM limiting its output due to overload or ambient over temperature condition	2. Reduce DC load and/or determine cause of over temperature condition.
	3. One or both fans not operating properly, or filter clogged, causing over temperature condition and PM power reduction	3. Clear or replace clogged fan filter. Remove fan obstruction, or replace fan if necessary. (See section IV-D, Cooling Fans)
	4. Blown output fuses	4. Replace blown fuse (See section IV-B, DC Output.)
	5. Defective Power Module	5. Return to place of purchase for repair/replacement or contact NEWMAR for return authorization.
B. PM repeatedly trips input circuit breaker with no battery or load connected	Internal short	Return to place of purchase for repair/replacement or contact NEWMAR for return authorization.
C. Reverse polarity battery connection to PM has caused PM to stop charging	DC output fuses and possibly other components blown	Replace output fuses. If fuses blow again, return to place of purchase for repair/replacement or contact NEWMAR for return authorization.
D. High output voltage measured across “V OUT” terminals	Batteries not connected to PM. It is normal to read 1/2 volt higher across “V OUT” terminals with no battery connected	Check for tight connection of charging leads from PM to batteries.
E. Batteries connected to PM overcharging	1. Batteries connected to “V2” output terminals. “V2” output is approximately .7 volt higher than “V OUT” output	1. Move positive output wire from “V2” position to “V OUT” position.
	2. Output voltage adjusted too high	2. Lower output voltage (See section IV-B, DC Output.) to battery manufacturer’s recommended charging voltage

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