

PM Series Power Module Power Supply/Battery Charger

INSTALLATION / OPERATION MANUAL



MODELS: PM-24-80, PM-48-50

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M-PM-24/48-80/50
As of August 2006

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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 (2500W models)

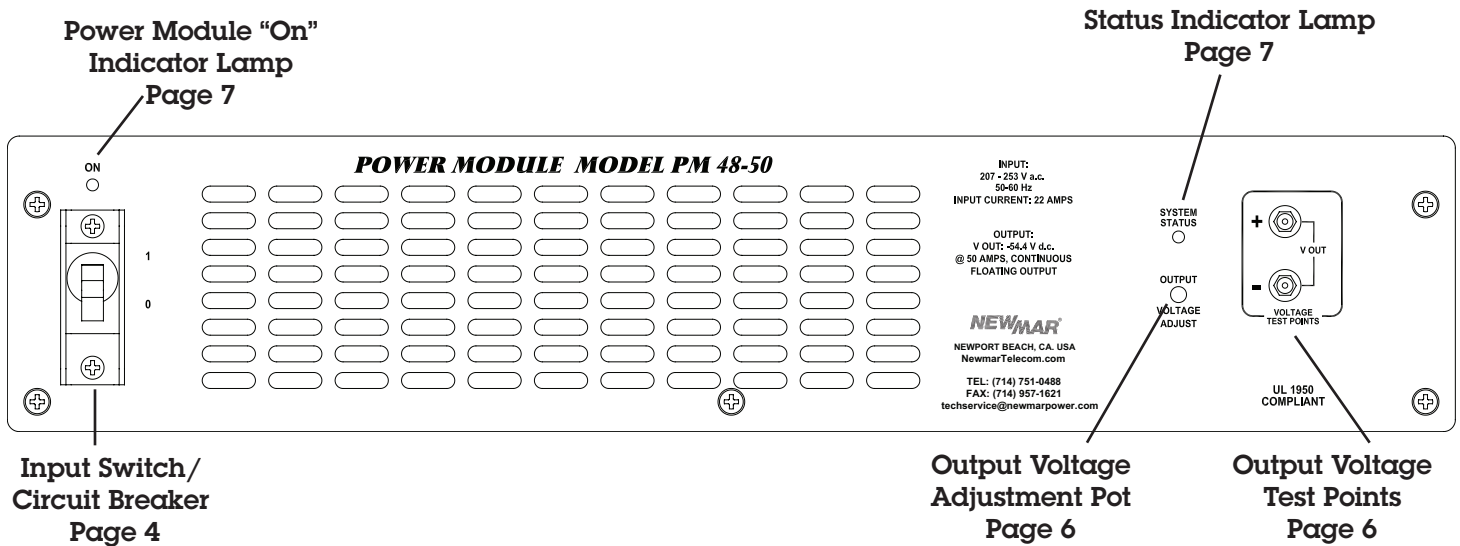
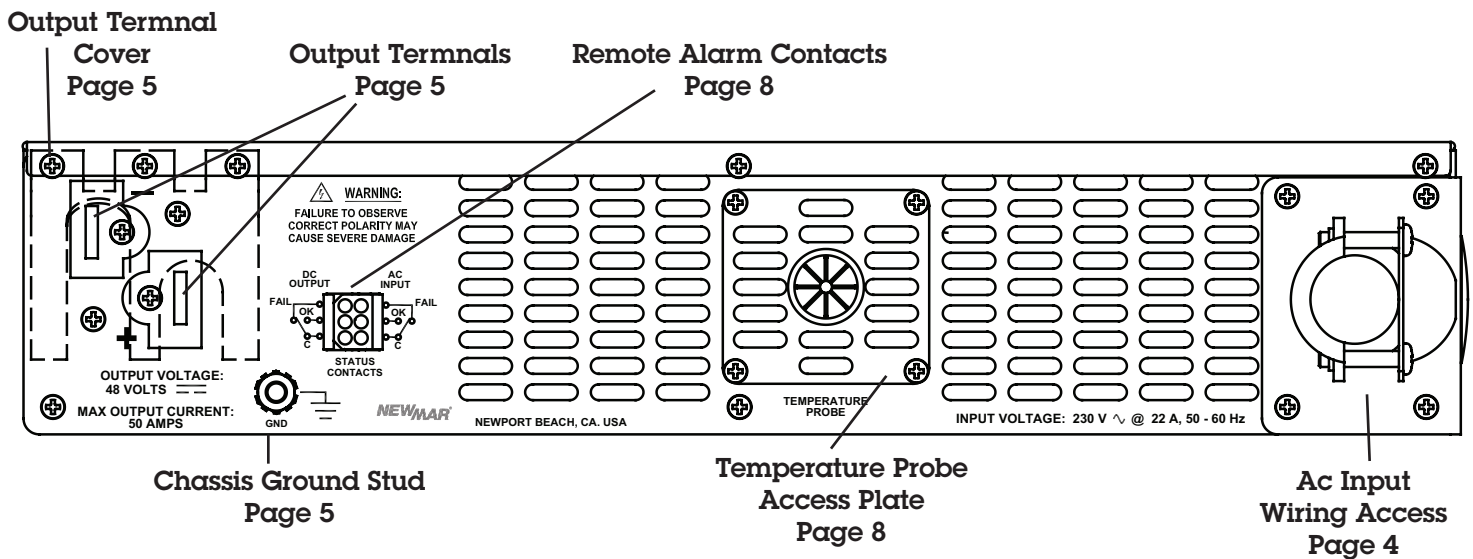


Figure 2: Power Module – Rear Panel (2500W models)




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I) OVERVIEW

The **PM 2500 Series Power Module** is a uniquely adaptable communication equipment power source which functions as either power supply or battery charger for 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 2500 to 10,000 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 Model CCK-4 allows easy replacement of modules while the system as a whole remains up and running.

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 voltage/amperage 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 a.c. 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 (EN6100-3-2 and EN55014-1 Level A emissions). 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
- (2) ea. mounting brackets for 23" rack mounting
- (6) ea. 6-32 X 3/8" pan head phillips screws, black
- (1) ea. Molex "pigtail" connector
- (1) ea. Installation/Operation manual
- (1) ea. Customer Satisfaction/Warranty card
- (1) ea. Output Terminal Cover

B) Mounting

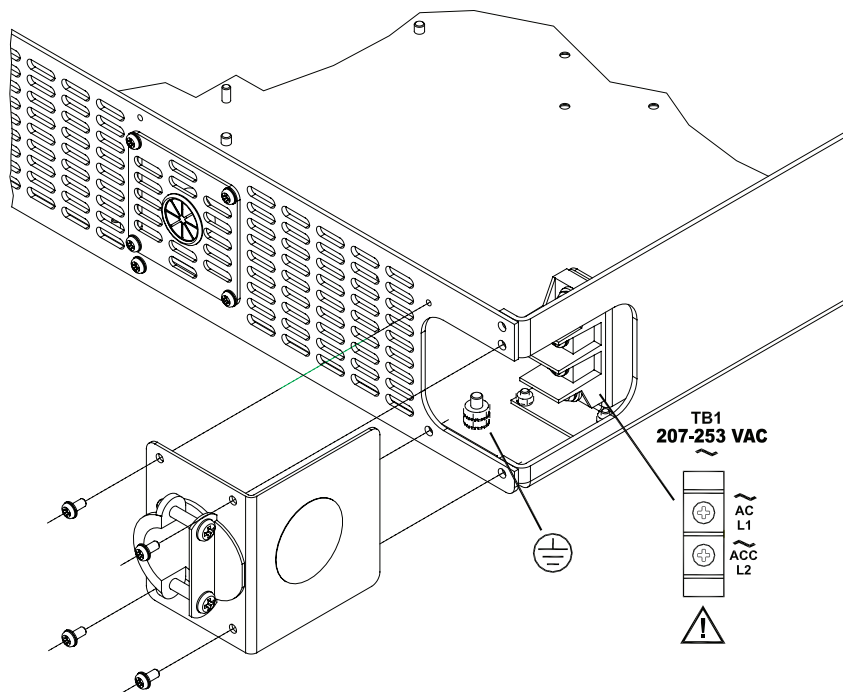
The PM is designed for various mounting options. Hardware for 19" or 23" rack mounting is included

The PM is provided with two sets of mounting brackets and six 6-32 x 3/8" pan head phillips screws for attaching the brackets to the PM chassis. Select the appropriate bracket set for the 19" or 23" rack and fasten to the PM. Bracket attachment holes in the PM chassis are provided to allow for 6" forward mounting only.

C) A.C. Input Wiring

Input Voltage: the PM is designed to accept 207-253 VAC, 50/60 HZ, single phase input.

FIGURE 3: a.c. Input Wiring Compartment (PM rear view; 2,500 watt series)



1) Replace the input wiring cover.

Important: Although the internal a.c. wiring is protected by the front panel mounted circuit breaker, the wiring to the PM must also be protected by wiring to an appropriate circuit breaker (30 Amp double pole recommended for Line-Line AC sources).

D) D.C. Output Wiring

Important: Ensure that a.c. input to the PM is switched off before working with d.c. wiring. The output terminals are "hot" whenever the unit is switched on.

1) Output bus 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. (Note: Output bus will accommodate 2 hole lugs, 3/4" or 1" hole centers)

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 d.c. wire gauges).

D.C. Wire Size Table:

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

PM-48-50 #8 (10 mm)

PM-24-80 #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. Positive and negative ground applications (with battery) – follow wiring diagrams in Figures 4 & 5.
Note: Install output terminal cover.

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

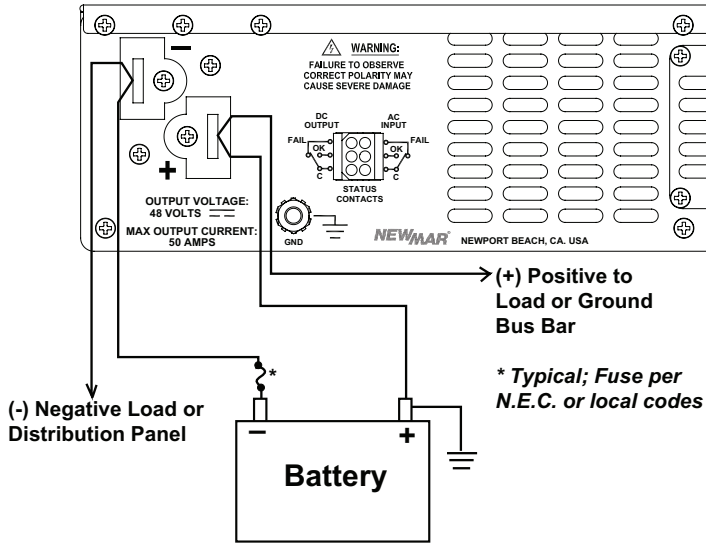
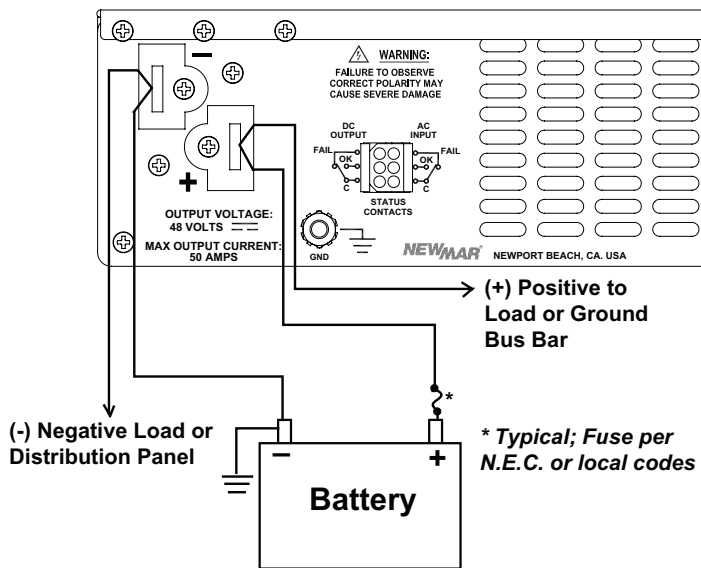


FIGURE 5: Single Power Module, negative ground, with battery:



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 6-7 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-48-50 apply a 25 amp load).
- 2) Connect a digital voltmeter to the test points on the front of the power module.
- 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 output voltage.

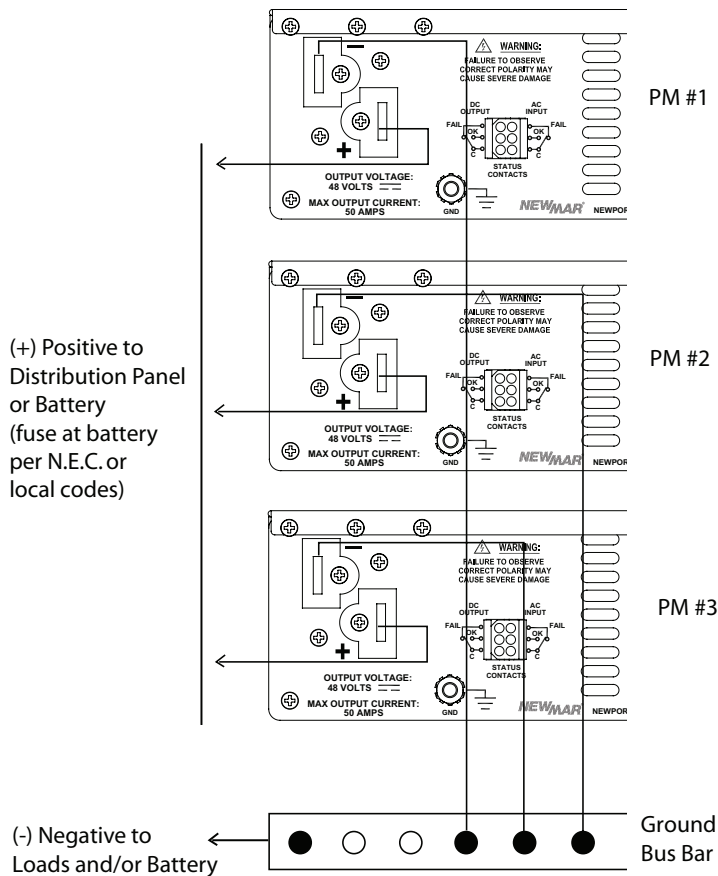
Method 2:

- 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). Note: The PM chassis is floating from DC output but can be grounded positively or negatively

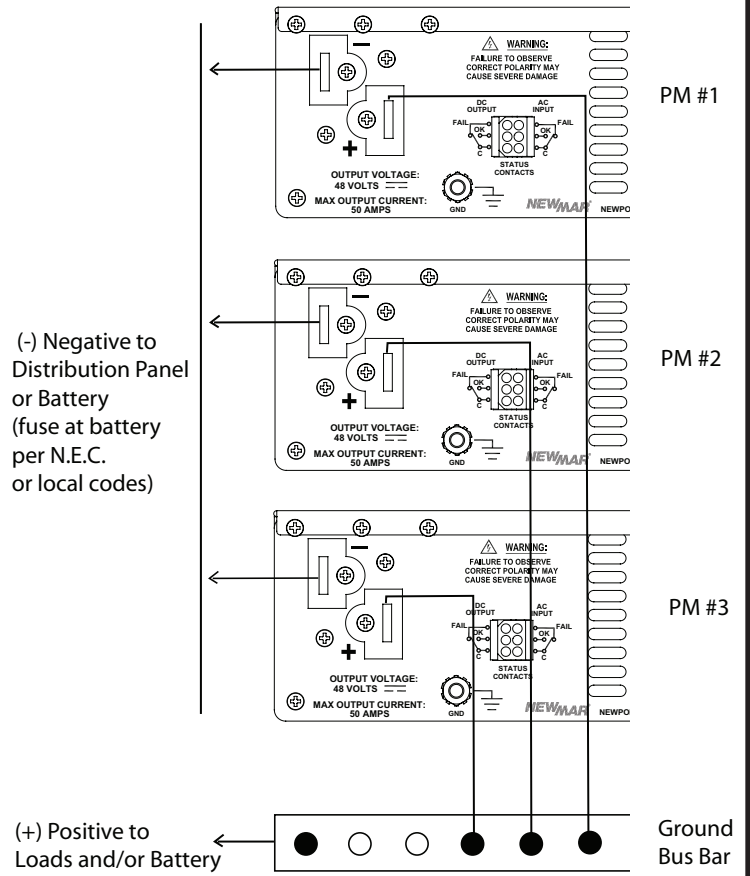
FIGURE 6 Parallel (two to four Power Modules) and N+ 1 redundancy, negative ground



(+) Positive to Distribution Panel or Battery (fuse at battery per N.E.C. or local codes)

(-) Negative to Loads and/or Battery

FIGURE 7 Parallel (two to four Power Modules) and N+ 1 redundancy, positive ground



(-) Negative to Distribution Panel or Battery (fuse at battery per N.E.C. or local codes)

(+) Positive to Loads and/or Battery

IV) OPERATION

A) A.C. Input

The PM will operate on 230 VAC (±10%) single phase input at 50-60 Hz. No adjustment is required for 50 or 60 Hz. operation.

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

B) D.C. Output

The PM produces 24 or 48 VDC nominal output, depending on model. The output of the PM is Or-ring diode isolated. The ground reference may be positive, negative or floating. The DC output is floating from chassis and can be grounded positively or negatively.

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 right side of the front panel using a small flat tip screwdriver (see Figure 1). Output voltage test points 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.

Output Voltage Table

Factory Set Model	Output Voltage	Adjustment Range
PM-24-80	27.2V d.c.	24.4 - 30V d.c.
PM-48-50	54.4V d.c.	48.8 - 60V d.c.

Current Limit Circuit: The PM is rated for continuous duty at the current level indicated by model number, e.g., PM-48-50 is rated at 50 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.

D.C. Fuse: d.c output wiring is protected by an internal d.c. output fuse. The current limiting circuit of the PM should prevent these fuses 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 a.c. to the PM before checking fuses. To replace the d.c. fuse, the top cover must be removed. The d.c. fuse is an 80LET. 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 d.c. 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 a.c. is applied and the unit is producing output current.

Preventative Maintenance: The fan is a maintenance-free ball-bearing type and does not require lubrication.

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. Replacement Fan with inline connector: 999-3148-0Z). Note: We recommend replacing both fans at the same time.

Fan replacement procedure

1. Disconnect ac input power and dc output connections to the PM. If the battery string is connected it's recommended that it be disconnected (via a battery disconnect switch or remove the HOT lead from the battery).
2. Loosen the top five screws on the rear panel which secure the top cover. Remove the two screws on the sides near front which secure top cover.
3. Locate the two fans located on one end of the main circuit board, near the rear of the PM.
4. Remove the two #6-32 s.s. Phillips pan screws with lock washers securing the fan mounting bracket to the long air baffle plates. Do not remove the screws attached directly to the fan.
5. On each fan, carefully lift the fan away from the main circuit board while unplugging the power connector.
6. With the fans removed from the PM loosen the two self tapping screws that attach the fan mounting bracket- do not remove these screws. The fan mounting bracket can now be removed from the old fan and attached to the replacement fan. Important Note: Make sure

System Status/Alarm Condition	AC input Alarm Contacts	DC Output Alarm Contacts	System Status LED	Audible	Results
Over temperature shutdown	OK	Failed	1 red flash	1 beep	PM shuts down at high ambient Temp.
Over temperature recovery	OK	OK	1 yellow flash	None	Auto recovery with 1 yellow Flash
Over voltage shutdown	OK	Failed	2 red flashes	2 beeps	PM shuts down
Loss of temp probe signal	OK	Failed	3 red flashes	3 beeps	PM shuts down and requires the AC input to be recycled
Battery temp too high	OK	Failed	3 red flashes	3 beeps	PM shuts down then automatically recovers with 3 Yellow flashes
Battery over temperature recovery	OK	OK	3 yellow flashes	None	Auto recovery with 3 yellow flashes
Loss of AC input	Failed	Failed	None	None	PM shuts down
AC voltage applied to PM	OK	OK	Green	None	LED will remain green if the DC output is within the Regulation band
DC-FAIL (Low Output Voltage)	OK	Failed	Green	None	Triggers between 35-40VDC
Oring Diode Over Temp Shutdown	Failed	Failed	Yellow	None	PM shuts down.
Oring Diode Over Temp Recovery	OK	OK	Green	None	PM goes though soft start sequence.



the fan air flow is toward the rear of the PM (arrow on body of fan pointing to the rear)

7. Connect the replacement fan's connector to the mating connector on the main circuit board and re-attach the fan mounting plate to the long air baffle plate.

8. Replace the PM's top cover, reconnect ac power and verify replacement fan operates.

D) Indicators and Alarms

"On" Indicator light-Indicates ac input breaker is in the On position and that ac input voltage is present.

System Status LED, Audible alarms and form C alarm contact - See chart on page 7.

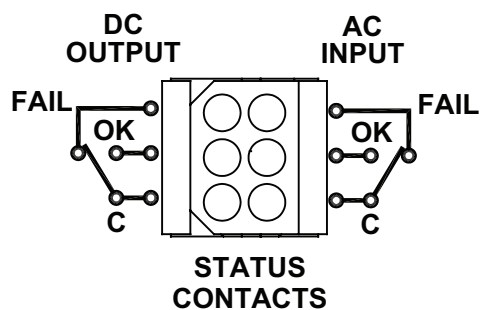
E) Remote Alarm

Form C alarm contacts are provided for AC input and DC output fail.

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

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

FIGURE 8: "FAIL" and "OK" Relay Contact Positions



V) OPTIONS (Available from factory)

A) Temperature Compensation Option

Because low battery temperature increases resistance to charging and high battery temperature reduces impedance, requiring a lower charge voltage, the ideal charging voltage will vary

depending on the temperature of the battery's environment when it is being charged. The remote sensor will signal the PM to fine tune its output voltage so that it is properly matched to the temperature of the battery/battery environment. Specify Model "TP" when ordering.

The PM will compensate PM output voltage up or down from the factory default of 27.2 v (24 v model) or 54.4 v (48 v model) at 30°C by -120mV per °C (48 v model) or -60 mV per °C (24 v model). If the battery reaches +50°C the PM will turn itself off. The PM will automatically restart once the battery temperature drops approximately 5-10°C.

Temperature Probe (model TP) Installation

1. Disconnect ac input power and dc output connections to the PM. If a battery string is connected it is recommended that it be disconnected (via battery disconnect switch or remove the HOT lead from the battery).
2. Remove TP access plate (4 screws). Thread TP sensor end through belly-button grommet.
3. Plug the TP connector into the mating 5 pin connector on the small circuit board directly inside access hole. Replace access panel (4 screws). The connector is keyed and will fit in one direction only.
4. The cylindrical probe sensor end can be placed between battery cases or attached to the top of one of the batteries using some RTV silicone.

B) D.C. Quick Connect Wiring Kit

Note: This option is available only for systems which incorporate the NEWMAR Power Function Manager Model PFM-400. For complete information on this product, please contact the factory.

A d.c. wiring harness quick connect kit model CCK-4 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 d.c. 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.

VI) SPECIFICATIONS

Input: 207-253 VAC, single phase 50/60 Hz.
 Power Factor: 0.7
 Line/Load Regulation: 1% at 10% to 100% load
 Ripple P-P: 1% (Typically)
 Efficiency: 80-85% @ full load
 Output Voltage Adjustment Range: ± 5% @ 50% load
 Temperature Rating: -20°C to 50°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 @ Full Load 230V	VDC V OUT	Amps Cont. +	Battery Capacity	Weight Lbs.	Weight Kg.
PM-24-80	19	27.2	80	160-800	34	15
PM-48-50	22	54.4	50	100-500	34	15

Protection

Output fuse for reverse polarity
 Output current limit
 Input circuit breaker
 Automatic high temperature protection and power reduction starting @ 50° C and full load
 Output Over Voltage Protection

Case Size (all models):

3.5" H x 17" W* x 20.5" D
 * 19" and 23" mounting brackets provided

VII) Troubleshooting

Condition	Possible Cause	Solution
A. No output current	<ol style="list-style-type: none"> 1. PM not receiving AC input voltage or is not receiving correct input voltage 2. PM limiting its output due to overload or ambient over temperature condition 3. One or both fans not operating properly, causing over temperature condition and PM power reduction 4. Blown output fuse 5. Defective Power Module 	<ol style="list-style-type: none"> 1. Using a voltmeter, confirm AC input voltage. Check input connections. 2. Reduce DC load and/or determine cause of over temperature conditions 3. Replace fan if necessary. (See section IV-C, Cooling Fans) 4. Replace blown fuse (See section IV-B, DC fuse) 5. Return entire unit 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 the PM has caused PM to stop charging	DC output fuse and possibly other components blown	Replace output fuse (See Section IV B: "DC Fuse") If fuse blows again, return to place of purchase for repair/replacement or contact NEWMAR for return authorization.