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## Introduction

Moore Industries' Power Module, Rack-mounted (PMR) is a precision regulated, dc power source intended primarily for mounting in standard 19-inch racks. The PMR is ideal for powering instruments requiring a single, a dual, or a redundant dc power source.

This manual contains descriptive, adjustment, and installation information for the PMR. The Notes, Cautions, and Warnings contained in this manual are provided to help you avoid minor inconveniences, equipment damage, and personal injury while adjusting or installing the PMR.

## Description

The PMR is packaged in an aluminum case that can be mounted in an instrument rack or on a sturdy flat surface. The position of the left and right side mounting brackets is reversible to accommodate these two mounting options.

The PMR is available as a single output/single supply (SOS), dual output/dual supply (DOS), or a dual output/switched supply (DSS) device. The SOS unit has only one power supply with a single dc output. The DOS unit has two power supplies with two separate dc outputs. The DSS unit has two power supplies whose outputs are diode-switched to provide a single dc output in case one of the supplies fail (total redundancy).

The input and output are factory-set to user specifications. The ac input is set for one-of-five international voltages. One-of-four dc outputs is available for each power supply of the PMR. The ac and dc voltages available for the PMR are listed in table 1 along with other important product specifications.

Standard features of the PMR include short circuit and overload protection, a fused ac input, and one green LED for each power supply. A lit green LED indicates that the respective power supply is producing a dc output. These LED's are marked "PS1" and "PS2", as applicable.

The power supply(s) of the basic PMR is covered with an aluminum safety cover, which is perforated to allow for heat dissipation. When operated in enclosed spaces or areas of unusually high ambient temperature, the PMR should be equipped with a cooling fan (the FMC Option). This option reduces the PMR's operating temperature approximately 25 °C (45 °F).

An Over-voltage Protection (OVP) Option is available for the PMR. Power supplies equipped with the OVP Option self-monitor the output to ensure that it does not exceed a predetermined level. Should the output exceed this predetermined level, it is clamped to approximately 1 volt to prevent damage to the PMR or its load.

**The Fault Relay and Alarm LED.** Along with the two green LED's described previously, DSS units are also equipped with a red Alarm LED and a Fault Relay. When one of the power supplies fail, the dc power output is provided by the operating power supply through internal switching circuitry. When switching occurs, the Alarm LED illuminates and the Fault Relay de-energizes. With both power supplies operating properly, the Alarm LED will be extinguished and the Fault Relay will be energized. The normally-open (NO) contacts of the relay are closed when the relay is energized, and the normally-closed (NC) contacts are opened. When the relay is de-energized, the NO contacts are opened and the NC contacts are closed.

**Serial/Model Number.** A historical record is kept at the factory for every PMR Moore Industries sells and services. This information is keyed to each product's serial number. Every product we sell is serialized and labeled with a descriptive model number. If historical information, or technical assistance, is required for a particular product, you must provide the factory with the unit's serial and model numbers.

The model number identifies the features the PMR was configured with when it was shipped from the factory. If no field modifications have been made to the PMR, the model number is a reliable way of determining the operating configuration of the unit.

The serial and model numbers are printed on a label that is affixed to the inside of the left-side panel of the PMR.

**Table 1. PMR Operational and Performance Specifications**

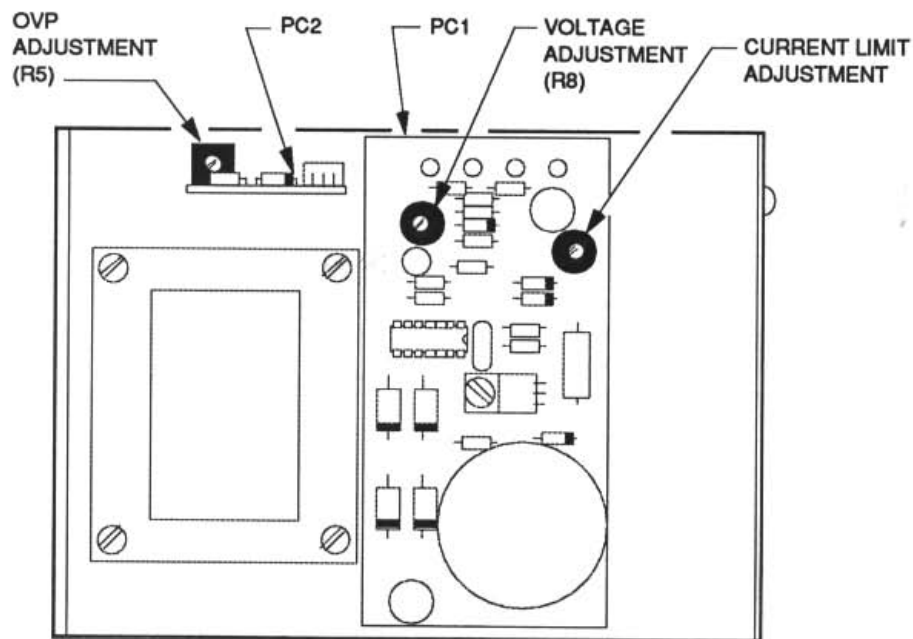
Characteristic	Specification
<b>Input</b>	<i>Each supply factory-configured for (one only):</i> <b>100 Vac, +10%/-13%</b> <b>117 Vac, +10%/-13%</b> <b>220 Vac, +10%/-13%</b> <b>230 Vac, +15%/-10%</b> <b>240 Vac, +10%/-13%</b> (output de-rated 10% for 50 Hz operation)
<b>Output</b>	<i>Each supply factory-configured for (one only):</i> <b>5 Vdc, 6 A</b> <b>12 Vdc, 3.4 A</b> <b>15 Vdc, 3 A</b> <b>24 Vdc, 2.4 A</b> (output ratings with 60 Hz input)
<b>Adjustments</b>	Output adjustable to $\pm 5\%$ of output rating, minimum (each power supply) OVP adjustment, optional
<b>Performance</b>	<b>Stability:</b> $\pm 0.3\%$ over 24 hours after warm-up <b>Line Regulation:</b> $\pm 0.05\%$ for a 10% input change <b>Load:</b> $\pm 0.1\%$ for a 50% load change <b>Output Ripple:</b> 5 mV P/P, maximum <b>Short Circuit/Overload Protection:</b> Auto-limiting <b>Temperature Coefficient:</b> $\pm 0.03\%/^{\circ}\text{C}$ ( $\pm 0.017\%/^{\circ}\text{F}$ ), maximum <b>Redundant Mode Switching Effect (with DSS Option):</b> Output voltage change of $\leq 0.36$ V when switching
<b>Environmental Rating</b>	<b>Ambient Operating Temperature:</b> 0 to 50 °C (32 to 122 °F) <i>With FMC Option:</i> 0 to 70 °C (32 to 158 °F)
<b>Weight</b>	<b>SOS Unit:</b> 3.85 kg (8.5 lbs) <b>DOS and DSS Units:</b> 5.66 kg (12.5 lbs) Add 0.90 kg (2 lbs) for FMC Option
<b>NOTE:</b> Refer to the Installation Section for outline dimensions.	

## PMR Adjustments

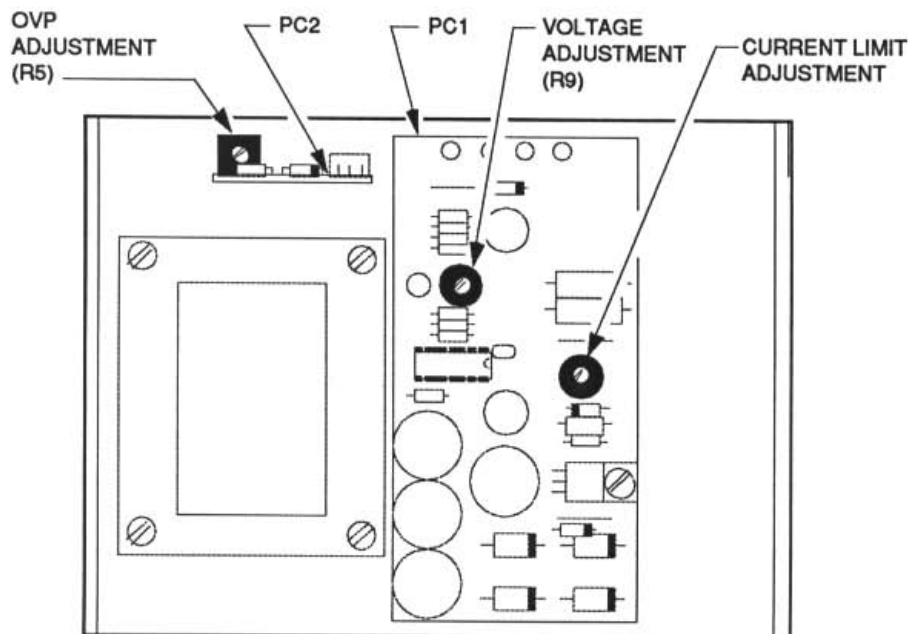
Each power supply of the PMR has two internal adjustments; the Current Limit Adjustment and Voltage Adjustment. The Current Limit Adjustment is factory-set and requires no field adjustment. The Voltage Adjustment, however, is field adjustable.

Two versions of the power supply board (PC1) exist. The specifications are identical for both versions.

The physical location of each adjustment and the board layout are different, however. To access these adjustments, the safety cover or the fan assembly (for units with the FMC Option) must be removed. Either of these covers is removed by loosening two slotted-head, thumb screws on the right-side of the cover and pulling it up, or out, from right to left. Figures 1 and 2 show the locations of the adjustments for both versions of PC1. Check your unit and use the matching illustration as appropriate.



**Figure 1.** PMR Adjustment Locations (Version A), A Single Power Supply



**Figure 2.** PMR Adjustment Locations (Version B), A Single Power Supply

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The Voltage Adjustment (R8 or R9) provides adjustability of the output voltage to within  $\pm 5$  percent of the rated output of the unit. The model number on the PMR contains the power supply(s) dc output rating.

To perform the voltage adjustment under 100-percent load, a load resistor and dc voltmeter are required. Table 2 contains the load resistor values, with power ratings, required to check each power supply for output at 100-percent load.

**Table 2. Output Load (100%)**

Supply Output	Load Resistance
5 V (6 A)	0.84 $\Omega$ , 40 W
12 v (3.4 A)	3.5 $\Omega$ , 50 W
15 V (3 A)	5 $\Omega$ , 50 W
24 V (2.4)	10 $\Omega$ , 60 W

To make the necessary electrical connections, the terminal-strip safety cover must be removed. A slotted-tip screwdriver is required to loosen the two screws holding the cover in place.

Figure 3 shows the equipment setup required to perform the voltage adjustment on EACH power supply of the PMR. Figure 4 shows the various terminal designations for the PMR.

## Voltage Adjustment Procedure

Check the unit's model number for its input and output configuration. Refer to table 2 and figure 3 before attempting this procedure.

### **WARNING**

*With power applied and the power supply and terminal-strip covers removed, an ac voltage is exposed. Use caution when handling the PMR in this condition and avoid contact with any electrical connections.*

1. Using a slotted-tip screwdriver, remove power supply cover and terminal-strip safety cover.
2. Connect voltmeter, load resistor, and ac power cord as shown in figure 3 (also see figure 4).
3. Apply ac power.
4. While monitoring output, adjust Voltage Adjustment, R8 or R9 (see figure 1 or 2) on PC1 until output is at appropriate level.
5. Remove ac power.
6. Disconnect voltmeter, load resistor and ac power cord.
7. Replace power supply cover and secure with slotted-tip screwdriver. If PMR is not being placed into service immediately, secure terminal-strip safety cover as originally found.

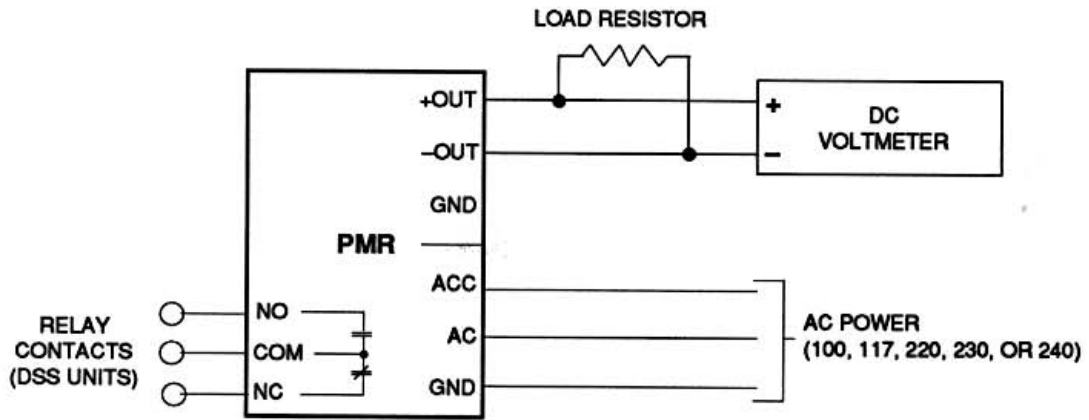
## Adjusting the OVP Option

Units equipped with the Over-voltage Protection (OVP) Option are factory-set to predetermined over-voltage levels. After the voltage is set to the optimum level, the potentiometer is sealed. However, should you need to verify or re-adjust this setting, use the procedure given later in this subsection.

The OVP Option causes the output of each power supply to clamp to approximately 1 volt should the output rise above a predetermined voltage. Table 3 contains the factory-set, over-voltage settings for each of the power output ratings. This setting is

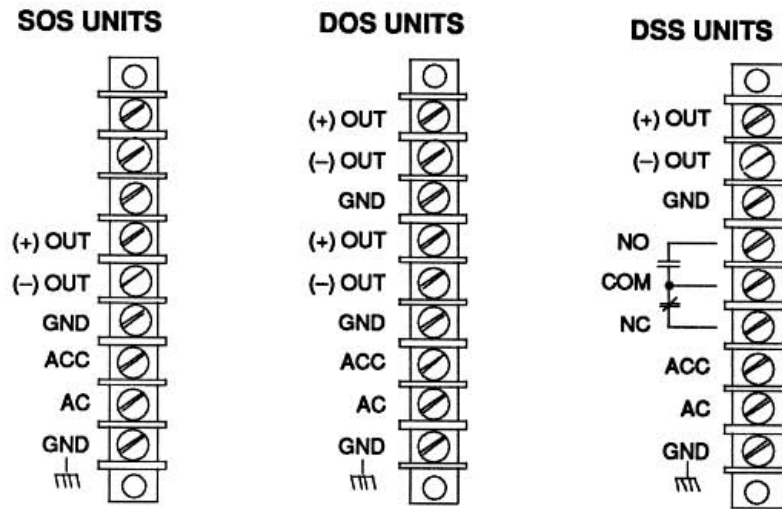
**Table 3. Factory Over-voltage Settings**

Output Rating	OVP Setting
5 Vdc	6.0 Vdc
12 Vdc	13.2 Vdc
15 VDC	16.5 Vdc
24 Vdc	26.4 Vdc



NOTE: Connect resistor and voltmeter to each power supply separately.

**Figure 3. Output Check/Adjustment Setup**



**Figure 4. PMR Terminal Designations**

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adjustable with the OVP Adjustment, R5 on PC2. See figures 1 and 2 for the location of PC2 and the OVP Adjustment, R5.

To perform the OVP adjustment, an adjustable power supply with an adjustable current limiting feature and a DC voltmeter are required. The adjustable supply must be capable of exceeding the factory over-voltage settings shown in table 3 for the particular voltage rating. For instance, a 0-30 Vdc adjustable power supply could be used to trigger the over-voltage protection in any PMR power supply, including the 24-Vdc version.

The following procedure is to be followed when checking or adjusting the OVP Option. Figure 5 shows the setup required to perform the OVP adjustment.

### **WARNING**

*DO NOT apply ac power to the PMR when checking or adjusting the OVP setting.*

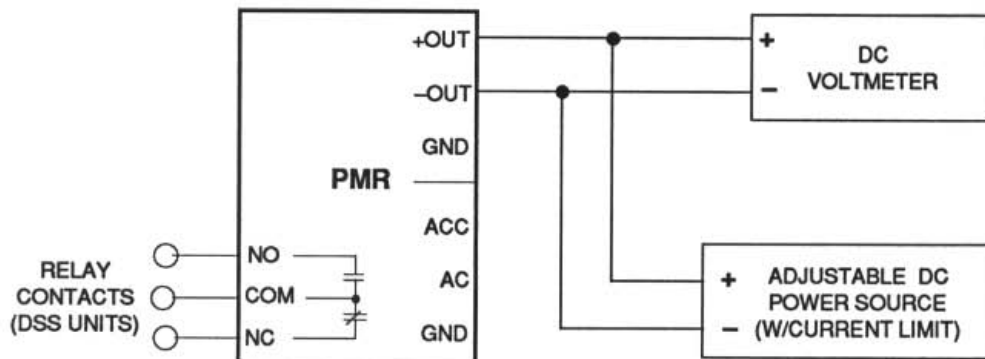
1. Using a slotted-tip screwdriver, remove power supply cover and terminal-strip safety cover.
2. Locate OVP Adjustment, R5 (see figure 1 or 2), and set it fully clockwise.

### **NOTE**

*The OVP Adjustment is sealed with an enamel-based, air-drying liquid to prevent*

*inadvertent movement of the setting. This seal can be overcome by using slightly more turning force than is normally used. Re-seal this pot after the procedure is complete.*

3. Set external power supply to applicable voltage shown in table 3 and limit the output current to 1 A (for all voltage outputs).
4. Connect dc voltmeter and external power supply to PMR as shown in figure 5.
5. Note dc reading at output terminals of PMR (refer to table 3 for factory settings).
6. Slowly turn OVP Adjustment, R5, of selected power supply counterclockwise until output drops to approximately 1 volt.
7. To change OVP setting, remove external power supply and set it to desired OVP voltage. Set OVP Adjustment, R5 of PMR supply, fully clockwise and repeat steps 4 through 6.
8. Disconnect dc voltmeter and external power supply from PMR.
9. Replace power supply cover and secure with slotted-tip screwdriver. If PMR is not being placed into service immediately, secure terminal-strip safety cover as originally found.



**NOTE:** Connect adjustable dc power source to each power supply separately.

**Figure 5.** OVP Adjustment Setup



## Installation

Installing the PMR consists of physically mounting the unit and completing the electrical connections. Both of these tasks are discussed separately in the following subsections. Installation is typically easier when the unit is mounted before making the final electrical connections.

## Mounting the PMR

The PMR is primarily intended for mounting in standard 19-inch instrument racks, but it can be field-fitted for flat surface mounting. The two cutouts in

each side mounting bracket are used to secure the PMR to a rack or other surface.

Figure 6 contains the outline dimensions of the PMR. The two side mounting brackets are identified in this illustration. By removing the two screws securing each bracket to the housing, the brackets can be rotated 180° and re-secured with the same screws. With the flange of both brackets to the rear of the unit, it can be surface mounted. With the flanges to the front, it can rack mounted.

The PMR will operate reliably in environments with high ambient temperatures (see table 1 for specifications). However, the unit should be installed in an

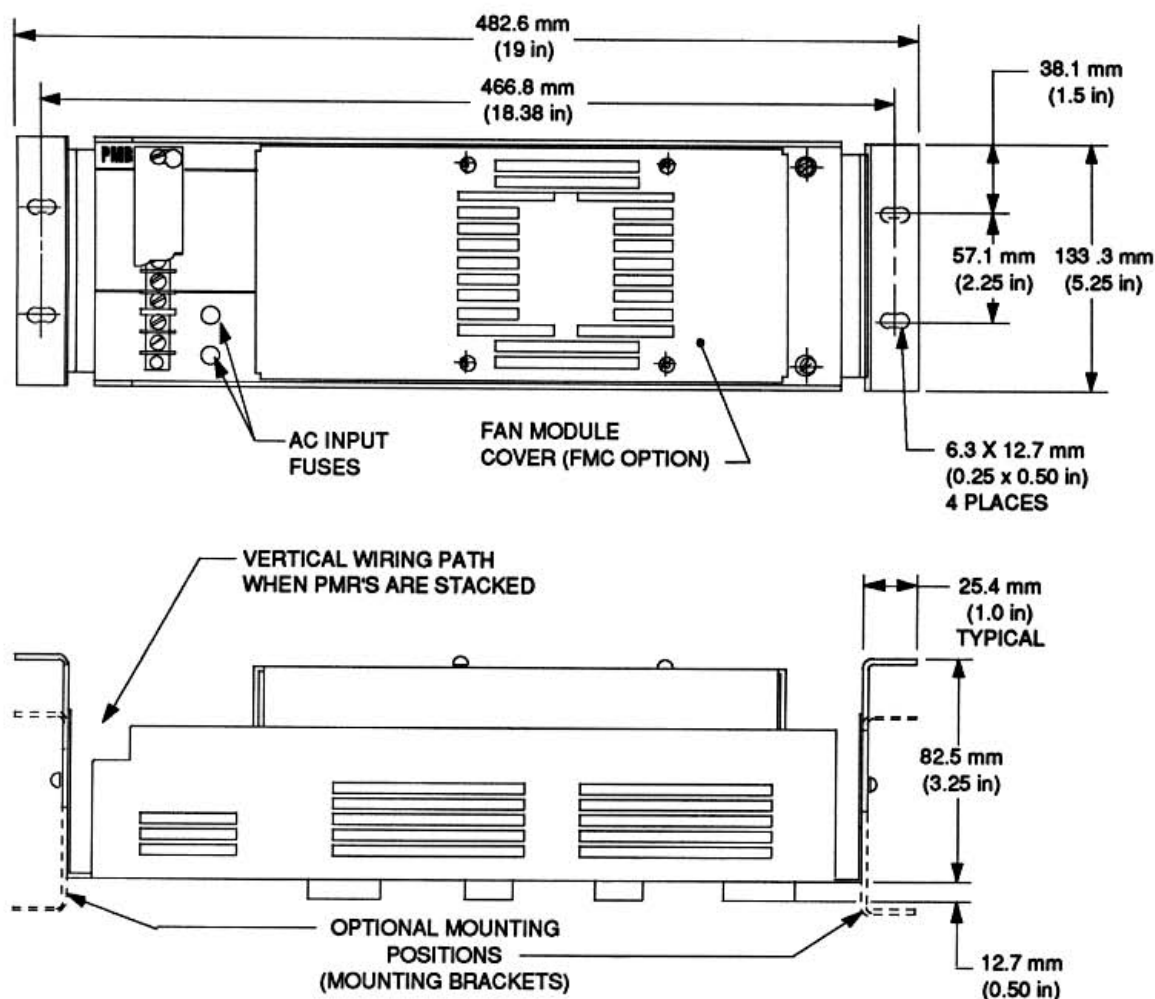


Figure 6. PMR Outline Dimensions

# PMR

area free of excessive moisture and corrosive elements, and one that provides some form of ventilation.

## Electrical Connections

All electrical connections for the PMR are made at the terminal strip on the front, left-side of the unit. These terminals are used to connect the ac input, dc output, and the alarm relay contacts (for DSS units).

To access the terminals, the safety cover must be removed. A slotted-tip screwdriver is needed to loosen the two screws holding the safety cover to the terminal strip. After the screws are loosened, the safety cover can be slid away.

The ac input terminals are labeled ACC, AC and GND. This grouping of terminals is used for the ac input only.

### **CAUTION**

*Before applying ac power, check the model number of the unit to ensure it is configured for the ac power that you intend to apply.*

The dc output terminals are labeled +OUT, -OUT and GND, for each power supply. This grouping of terminals is used for the dc output only. SOS units have one set of dc terminals. DOS units have two

sets of dc terminals. DSS units have a single set of dc terminals.

Figure 7 illustrates a typical installation hookup. The ac power required to safely and properly operate the PMR depends on the unit's configuration. The input and output configurations of a unit are contained in its model number.

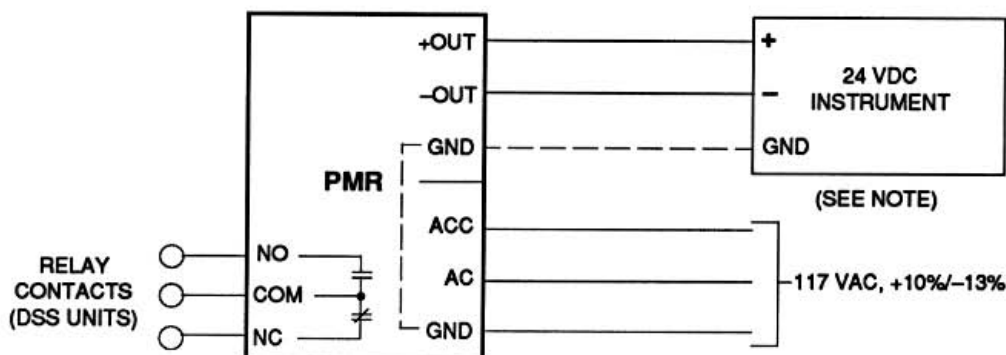
## Maintenance

The PMR is a highly reliable power source requiring minimal user maintenance. Once the PMR is placed into service, it will operate maintenance-free for extended periods of time.

Periodically, the PMR should be visually inspected to check its external condition. The electrical connections should be kept especially clean and free of oxidation. If operated in moderate environments, a visual inspection should be performed at least once every six months.

At your discretion, the adjustments described in the PMR Adjustment Section of this manual may be performed. However, if there is no indication of malfunction of equipment powered by the PMR, then adjustment is probably not necessary.

If you have questions regarding the PMR, or any of our products, contact Moore Industries' Customer Service Department at 1-800-999-2900.



NOTE: Other voltages also available.

**Figure 7.** Typical Installation Hookup Diagram

## RETURN PROCEDURES

### To return equipment to Moore Industries for repair, follow these four steps:

1. Call Moore Industries and request a Returned Material Authorization (RMA) number.

#### Warranty Repair –

If you are unsure if your unit is still under warranty, we can use the unit's serial number to verify the warranty status for you over the phone. Be sure to include the RMA number on all documentation.

#### Non-Warranty Repair –

If your unit is out of warranty, be prepared to give us a Purchase Order number when you call. In most cases, we will be able to quote you the repair costs at that time. The repair price you are quoted will be a "Not To Exceed" price, which means that the actual repair costs may be less than the quote. Be sure to include the RMA number on all documentation.

2. Provide us with the following documentation:
  - a) A note listing the symptoms that indicate the unit needs repair
  - b) Complete shipping information for return of the equipment after repair
  - c) The name and phone number of the person to contact if questions arise at the factory
3. Use sufficient packing material and carefully pack the equipment in a sturdy shipping container.
4. Ship the equipment to the Moore Industries location nearest you.

The returned equipment will be inspected and tested at the factory. A Moore Industries representative will contact the person designated on your documentation if more information is needed. The repaired equipment, or its replacement, will be returned to you in accordance with the shipping instructions furnished in your documentation.

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For a period of thirty-six (36) months from the date of shipment, and under normal conditions of use and service, Moore Industries ("The Company") will at its option replace, repair or refund the purchase price for any of its manufactured products found, upon return to the Company (transportation charges prepaid and otherwise in accordance with the return procedures established by The Company), to be defective in material or workmanship. This policy extends to the original Buyer only and not to Buyer's customers or the users of Buyer's products, unless Buyer is an engineering contractor in which case the policy shall extend to Buyer's immediate customer only. This policy shall not apply if the product has been subject to alteration, misuse, accident, neglect or improper application, installation, or operation. THE COMPANY SHALL IN NO EVENT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.



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