

## Description

### Introduction

The QPS, quad power supply is a dc-to-dc converter that generates four independent, 24V, 25mA (maximum) outputs. Mounted on a single printed circuit board, the QPS provides power for four, 4-20mA current compliance loops in applications that require loop isolation.

The QPS offers four independent regulators, short circuit overload protection, current limiting, and transient voltage suppression on a high density, plug-in unit. The unit has two input versions, a 24V and 45V.

With four, fully-isolated and independent outputs, a failure in one power supply or compliance loop does not necessarily affect the other power supplies in the unit. Current limiting prevents damage to other units in the control loop, while the fuse (FU) option provides added protection to the power supply. The full isolation of the outputs also prevents ground loops.

The QPS operates over a wide range of temperatures and features derated components for added dependability.

The QPS unit includes the following design features:

- Four independent power supplies
- Output current limiting
- High density plug-in unit

## Installation

### Introduction

This section provides information for mechanical installation, electrical connections for the plug-in [PC] QPS unit. Observe applicable notes and cautions given with the illustrations and text. Check the input and output values for each unit on site before the unit is placed into service (see Calibration).

### Mechanical Installation

Figure 1 illustrates the physical outline and dimensions of the QPS. The power supply can mount in SMR and RMR card racks. The QPS unit can also be mounted independently. The SMR and RMR module rack may contain multiple QPS units. The SMR surface mounted card rack is shown in figure 2. The front view of the SMR shows the location for plug-in units and the location of the nine-connector terminal block. The RMR rack mounted card rack is illustrated in figure 3.

### Electrical Connections

All electrical connections are made to the PCB edge connector located on the rack where the unit is mounted. See figure 4 and table 1.

For individually mounted units, the terminal connections are the same. The mating connector is MII Part Number 800-896-27.

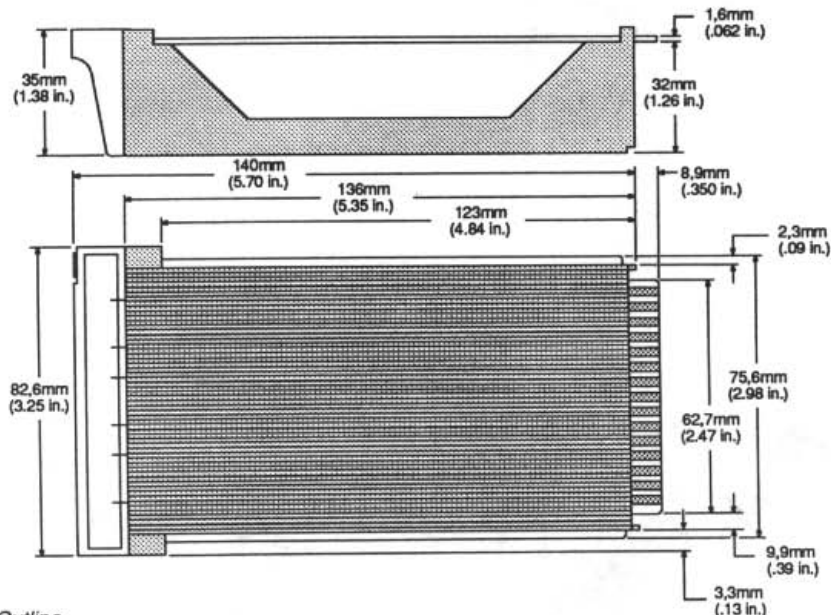
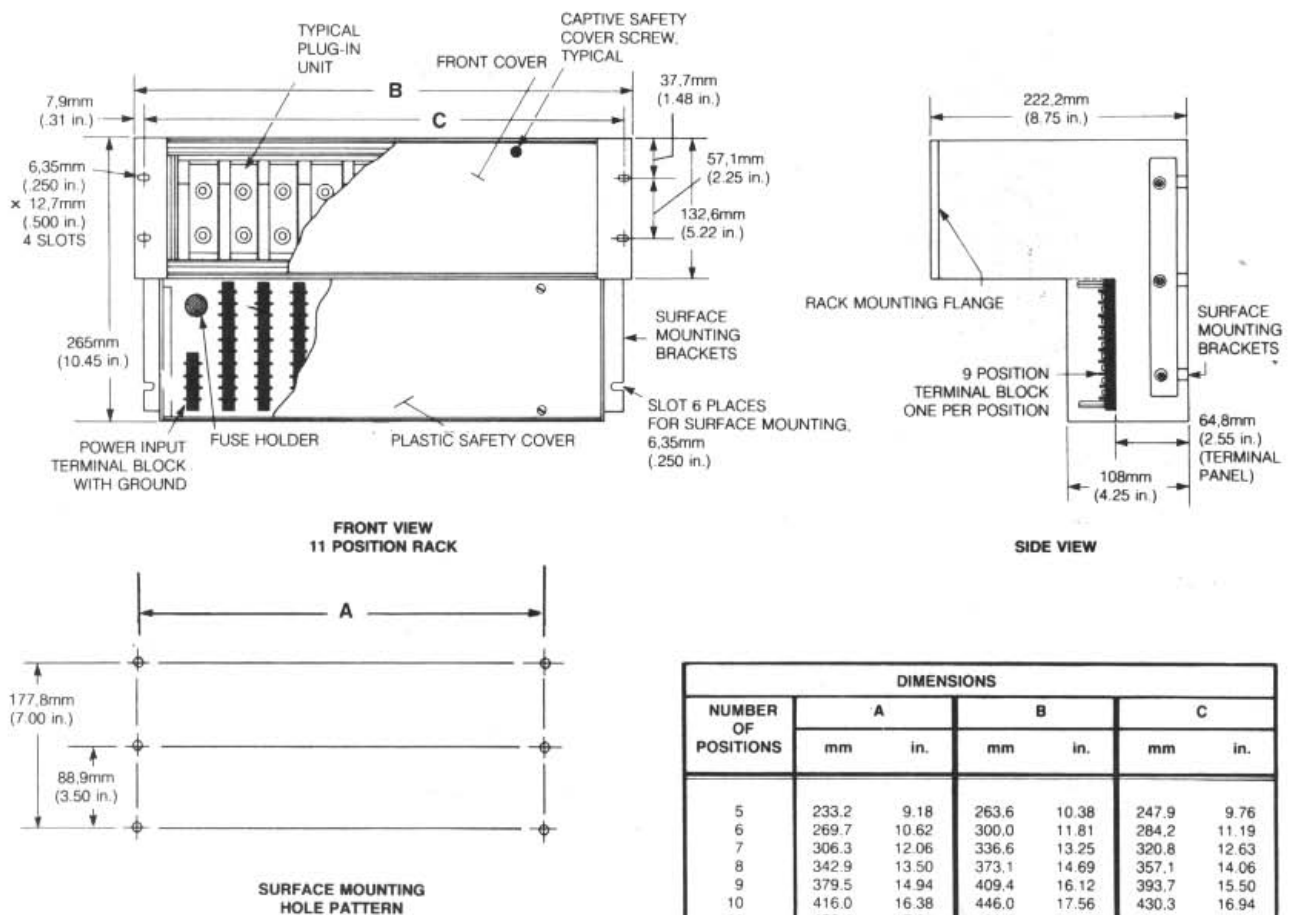


Figure 1. QPS Physical Outline

Important Note: This document is complete as of the printing date; however, subsequent product changes may be reflected in companion documents.

## Specifications

<b>Characteristics</b>		<b>Load:</b> $\pm 0.25\%$ for 0 to 100% load <b>Ripple:</b> 50mV rms maximum	<b>Voltage:</b> 24V adjustable $\pm 5\%$ <b>Current:</b> 0-20mA, limited at 25mA nominal
<b>Front Panel Adjustments</b>	Four independently adjustable multitrn potentiometers		
<b>Performance</b>	<b>Temperature:</b> 0°C to +70°C (+32°F to +158°F) <b>Temperature Effect:</b> $\pm 0.01\%/^{\circ}\text{F}$	<b>Weight</b> Approximately 2 lbs. (908 grams)	<b>Power</b> <b>Two versions:</b> 24Vdc $\pm 10\%$ at 220mA nominal, or 45Vdc $\pm 10\%$ at 120mA nominal
<b>Regulation</b>	<b>Line:</b> $\pm 0.25\%$ for $\pm 10\%$ input change		
<b>Ordering Specifications</b>		<b>Unit Output</b> QPS Four outputs with identical specifications	<b>Option Housing</b> -FU Fused input PC Plug-in only*
<b>Model number description:</b> Unit / Output Voltage / Output Current / Power / Options [Housing]			



NUMBER OF POSITIONS	DIMENSIONS					
	A		B		C	
	mm	in.	mm	in.	mm	in.
5	233.2	9.18	263.6	10.38	247.9	9.76
6	269.7	10.62	300.0	11.81	284.2	11.19
7	306.3	12.06	336.6	13.25	320.8	12.63
8	342.9	13.50	373.1	14.69	357.1	14.06
9	379.5	14.94	409.4	16.12	393.7	15.50
10	416.0	16.38	446.0	17.56	430.3	16.94
11	452.4	17.81	482.6	19.00	466.8	18.38
12	489.0	19.25	519.2	20.44	503.4	19.82
13	525.3	20.68	555.8	21.88	540.0	21.26
14	561.8	22.12	592.1	23.21	576.3	22.69
15	598.4	23.56	628.7	24.75	612.9	24.13

Figure 2. SMR Installation

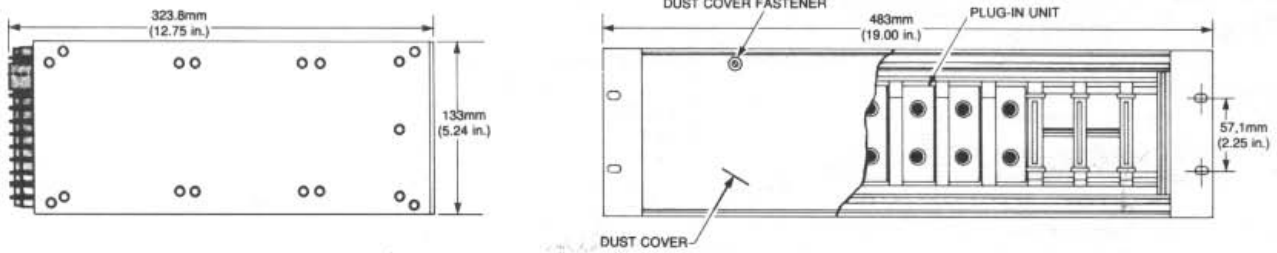


Figure 3. RMR Installation

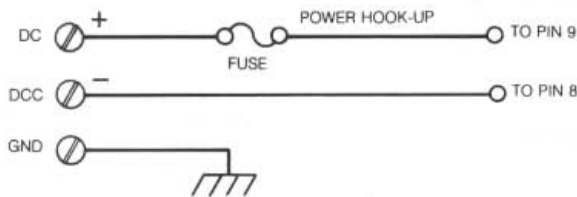
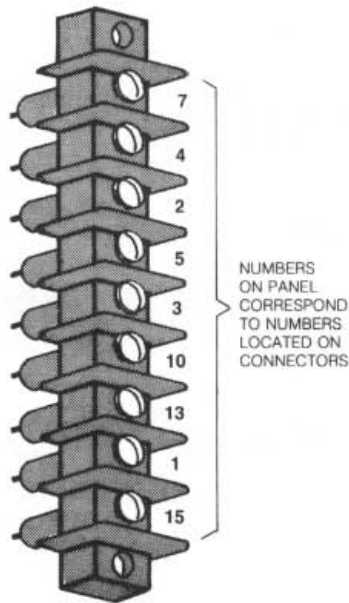


Figure 4. Terminal Block and Wiring Connections

Table 1. Terminal Nomenclature

Prime Power Input	Regulator Number	Terminal PM Numbers
+Dc		9
-Dc		8
	Positive output 1 (channel)	4
	Negative output 1 (channel)	7
	Positive output 2 (channel)	2
	Negative output 2 (channel)	5
	Positive output 3 (channel)	3
	Negative output 3 (channel)	10
	Positive output 4 (channel)	13
	Negative output 4 (channel)	1

## Calibration

### Introduction

This section provides information for unit adjustment and calibration. Each unit is adjusted and checked at the factory for proper performance before shipping.

### Control Description And Location

The QPS has potentiometer controls for each of the four power supplies. The voltage adjust controls are located on the front panel of the QPS. See figure 1 (front view). The controls have multiturn potentiometers that are adjustable with a blade screwdriver.

#### Caution

In making calibration adjustments, screwdriver blade should not be more than 0.1 inch (2.54mm) wide. A wider blade may permanently damage the potentiometer mounting.

The potentiometers are equipped with a slip clutch at each end to prevent damage if the control is turned beyond the wiper stop. Turning the control clockwise makes the output voltage more positive, for less positive, turn it counterclockwise.

### Adjustment

The only equipment required to adjust the QPS unit is a voltmeter. The precision of the voltmeter determines the precision of the adjustment. The power supply can be adjusted on the bench, before installation, under full or no load on each supply. The unit should be checked after installation.

Place the voltmeter across each output and adjust the corresponding potentiometer until 24 volts is indicated. See figure 5.

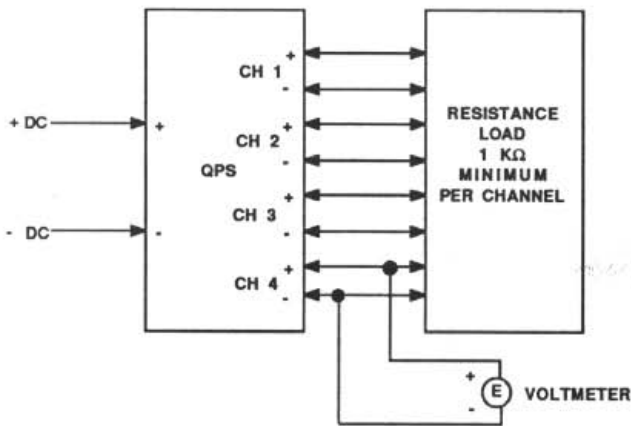


Figure 5. QPS Adjustment

## Theory Of Operation

### Introduction

This section briefly describes how the QPS operates. A simplified block diagram of the QPS unit is provided to help understand the circuit description. See figure 6. A detailed schematic is included in figure 7.

### Operation

The QPS accepts unregulated input between the +DC and -DC terminals. The input passes through an input filter, that reduces AC components in the input circuit. The input is then sent to an isolation transformer driven by a cross-coupled multivibrator square-wave drive circuit. The square-wave is carried across the isolation transformer to four bridge rectifier circuits.

The transformer coupled square waves are rectified to four independent, unregulated dc sources. These sources have independent linear regulators, which provide independent 24V, 20mA outputs.

## Maintenance

### Introduction

This section contains maintenance and troubleshooting information. The only maintenance required for the QPS is to keep the PCB and connector mating surface clean and tightly fitted. It is recommended that the user check the termination leads periodically to verify that the leads are fitted tightly and are free from oxidation.

### Troubleshooting

To troubleshoot the QPS, trace the signals with an oscilloscope and voltmeter and refer to the schematic diagram to determine what component or device might be causing an abnormal indication.

If the original symptom was a "complete failure of the unit to operate", the most logical components to suspect are those associated with the filter and multivibrator.

If the unit is producing an incorrect (but not zero) output, check the components in the corresponding output circuit and trace the resulting signal through the regulators.

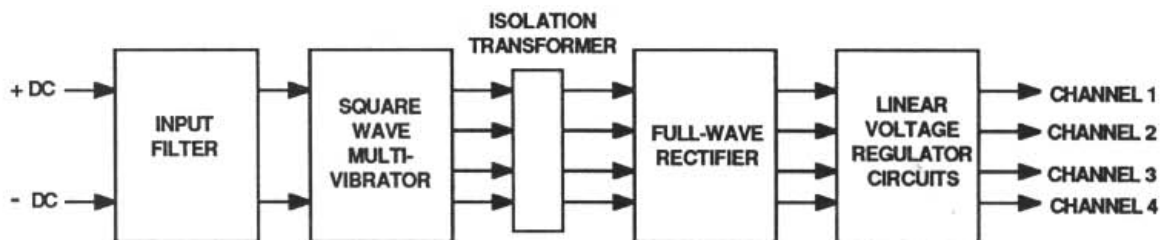


Figure 6. QPS Simplified Block Diagram

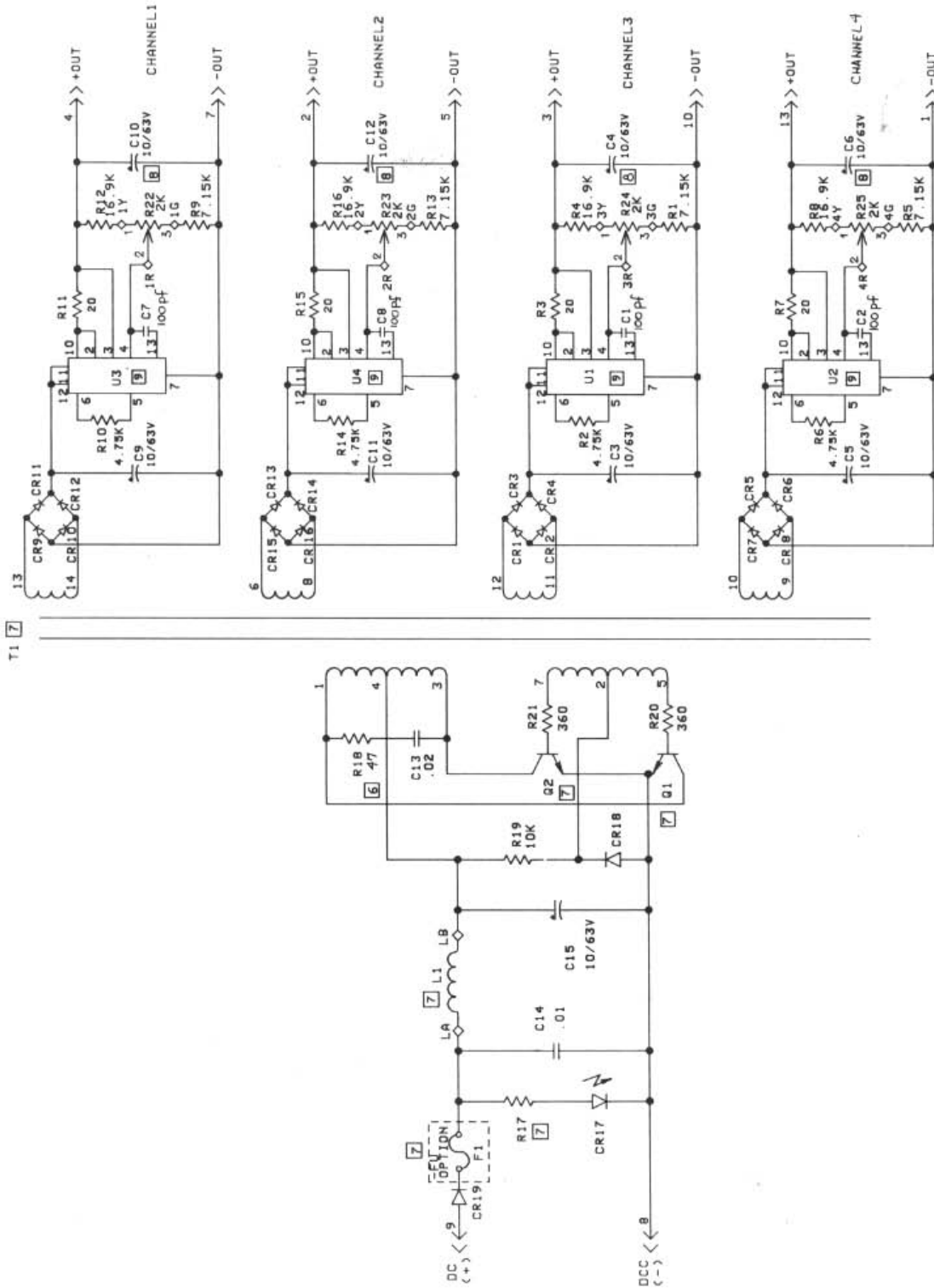


Figure 7. QPS Schematic

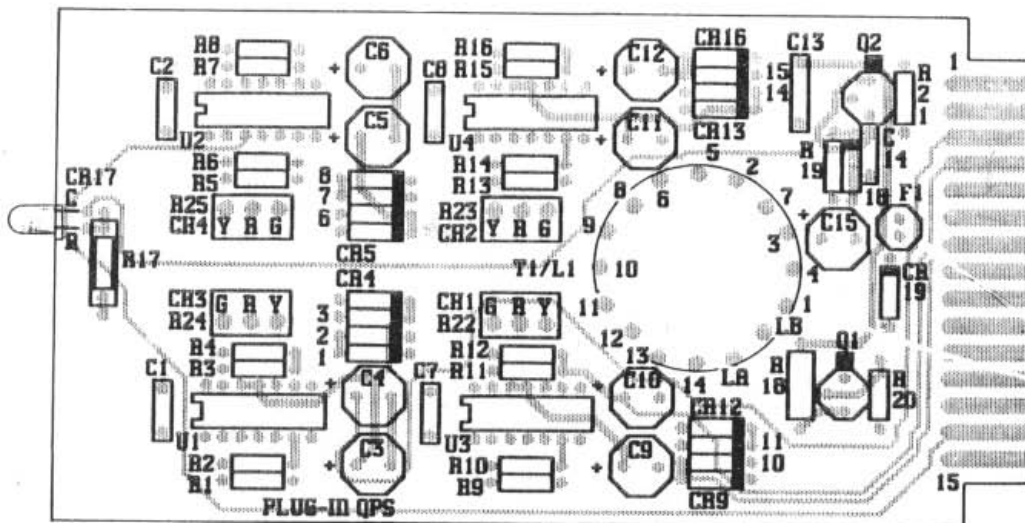


Figure 8. QPS PC Assembly



## 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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ANY CAUSE OF ACTION FOR BREACH OF ANY WARRANTY BY THE COMPANY SHALL BE BARRED UNLESS THE COMPANY RECEIVES FROM THE BUYER A WRITTEN NOTICE OF THE ALLEGED DEFECT OR BREACH WITHIN TEN DAYS FROM THE EARLIEST DATE ON WHICH THE BUYER COULD REASONABLY HAVE DISCOVERED THE ALLEGED DEFECT OR BREACH, AND NO ACTION FOR THE BREACH OF ANY WARRANTY SHALL BE COMMENCED BY THE BUYER ANY LATER THAN TWELVE MONTHS FROM THE EARLIEST DATE ON WHICH THE BUYER COULD REASONABLY HAVE DISCOVERED THE ALLEGED DEFECT OR BREACH.

#### RETURN POLICY

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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