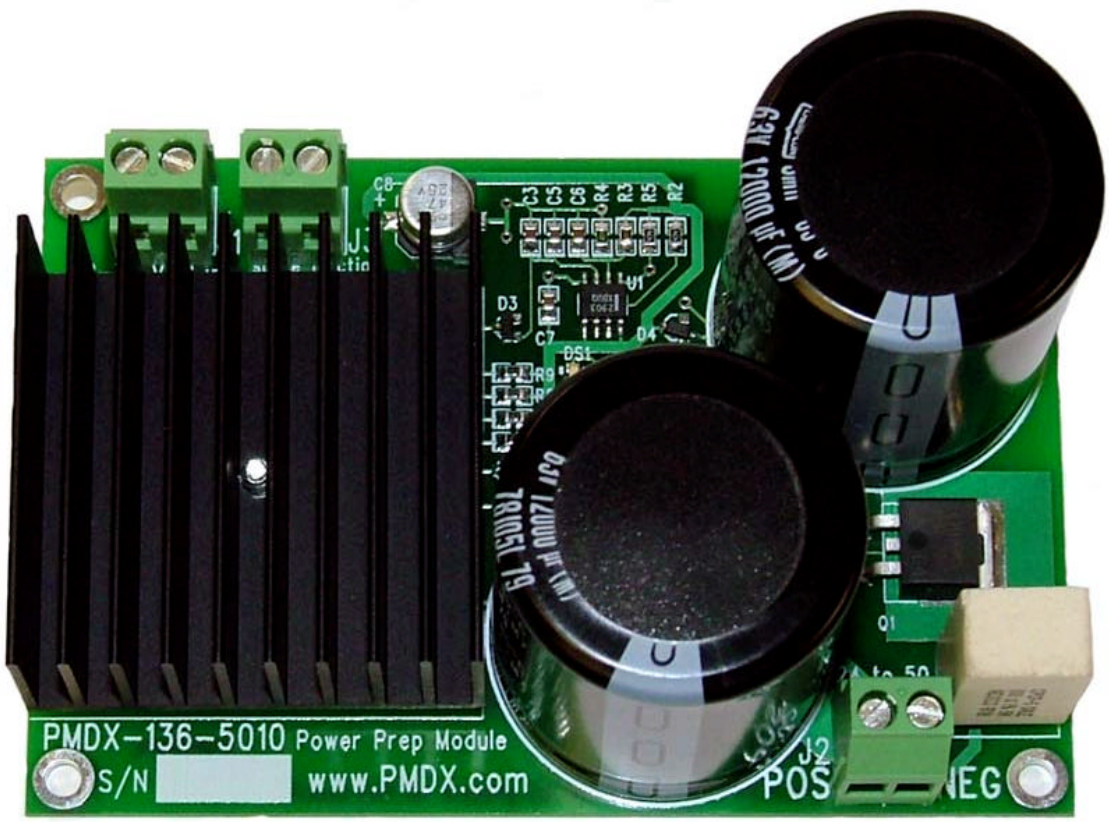
PMDX-136

Power Prep Module



User's Manual

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Table of Contents

1.0 Overview

This document describes the configuration and operation of the PMDX-136 Power Prep Module. This document pertains to the following versions of the PMDX-136:

Circuit Board Revision: PCB-467B (marked on the bottom of the board)

1.1 Ordering Information (part numbers)

The PMDX-136 can be built to support various output voltage and current requirements, as designated by the full part numbers:

Part Number	Output Capacity
PMDX-136-5010	50 VDC, up to 10 Amperes

1.2 Important Safety Information

The PMDX-136 is intended for integration by the purchaser into industrial control systems. It is solely the purchaser's responsibility to assure that the system is configured in a manner consistent with applicable safety requirements. Practical Micro Design, Inc. does not control how this board is integrated into the purchaser's system and cannot be responsible for guaranteeing the safety of your system.

The PMDX-136 is not guaranteed to be fail-safe. The system into which the PMDX-136 is installed should provide fail-safe protection and emergency stop capability.

The PMDX-136 contains circuitry that may be connected to dangerous voltages. Care must be taken that user cannot come in contact with these voltages. An enclosure that allows for adequate ventilation, but prevents intrusion by operator's hands and foreign objects, especially conductive byproducts of machining operations, should be utilized with this board. Interlock switches on power circuits should remove power when the enclosure is opened.

Automated machine tools, into which the PMDX-136 may be integrated, can cause injury. Precautions should be taken to assure that operators are trained in their proper operation and safety procedures, and that they are protected from moving parts that may be under remote control and may move unexpectedly.

This product may not be used in life support or other critical safety applications.

1.3 Warranty Summary

The PMDX-136 is warranted against failure due to defective parts or workmanship for 90 days from the date of sale. Refer to Appendix A for complete warranty details.

If you have an item requiring service, please see the support page on the PMDX web site (http://www.pmdx.com) for return instructions.

The purchaser must pay shipping to return the unit to PMDX. We will ship the repaired unit back to you via ground transportation at our expense. Repairs are normally completed within 10 business days. See Appendix A for our complete warranty details.

1.4 Features

The PMDX-136 has the following features:

Designed for True 10 Amp Performance:

- Multiple filter capacitors to reduce heating caused by high ripple current
- Heatsink on bridge rectifier
- Extra large copper areas on PCB in high-current areas.

AC Input Power:

- 18 to 35 volts AC for the PMDX-136-5010

DC Output Power:

- 24 to 50 volts DC for the PMDX-136-5010
- Supports up to 10 Amperes

Dump Circuit:

- Electronic "back EMF" dump circuit to shunt excess power returned by motors to help prevent over-voltage on the DC output.
- Rapid discharge circuit to remove charge from filter capacitors within 5 seconds or removal of input power.

1.5 Updates to this Manual

Check the PMDX web site for revisions or updates to this manual (http://www.pmdx.com). The latest revision of this manual is available on the PMDX-136 page (follow the links from the main page).

2.0 Sample Input Wiring Diagram

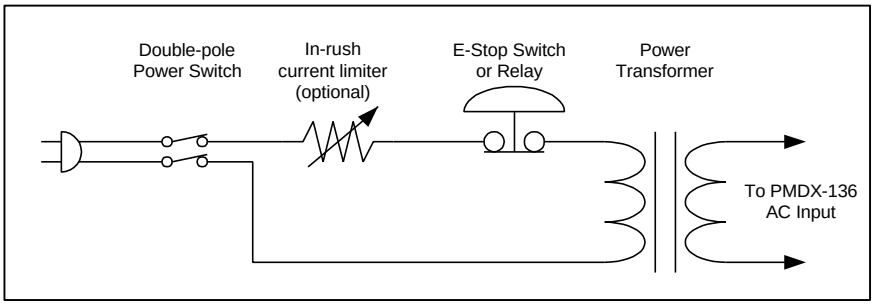

Figure 1 – Sample input wiring diagram

WARNING: ***The AC input must be transformer-isolated from the mains input. Auto-transformers and variable (Variac) transformers DO NOT provide suitable isolation.***

WARNING: Forced-air cooling is required for moderate to heavy loads.

3.0 Connectors

The following sections describe the pin-out and functionality of each of the PMDX-136 connectors. For all connectors, pin "1" is the pin closest to the reference designator (i.e. J1 pin 1 is the pin closest to the "J1" text on the circuit board). In addition, all connectors have square pads on pin 1 (look on the bottom of the circuit board).

Connector	Description
J1	AC Power Input
J2	DC Power Output
J3	Spare Junction

Table 1 - Summary of PMDX-136 Connectors

3.1 AC Power Input Connector (J1)

Connector J1 provides connections for the input AC power.

Pin	Label	Description
1	none	AC input
2	none	AC input

Table 2 –AC Power Input Connector Pin-Out (J1)

WARNING: ***The AC input <u>must</u> be transformer-isolated from the mains input. Auto-transformers and variable (Variac) transformers <u>DO NOT</u> provide suitable isolation.***

3.2 DC Power Output Connector (J2)

Connector J2 provides the unregulated DC output power.

Pin	Label	Description
1	POS	Positive DC output
2	NEG	Negative DC output

Table 3 – DC Ouput Power Connector Pin-Out (J2)

3.3 Spare Junction Connector (J3)

Connector J3 provides a convenient place to connect transformer leads when using a dual-winding transformer with the two windings in series (to get a higher voltage). The two terminals of this connector are shorted together on the PMDX-136. See Figure 2 for an example use of this connector.

Pin	Label	Description
1	none	Connected to pin 2
2	none	Connected to pin 1

Table 4 – Spare Junction Connector Pin-Out (J3)

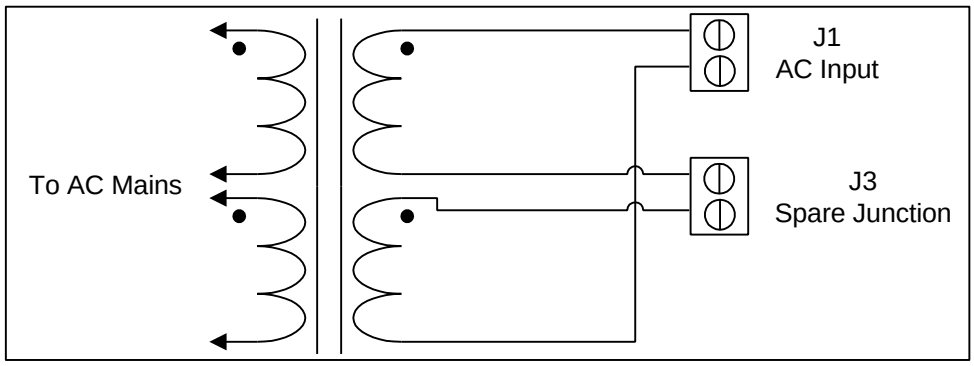

Figure 2 – Sample series secondary wiring diagram

Figure 2 shows an example of wiring the transformer's two secondary windings in series in order to get a higher output voltage. For example, if you have a transformer with two 15V secondary windings, you can wire them in series to get a 30V output.

4.0 LED Indicators

The PMDX-136 provides two LED indicators.

DS1, labeled "DC ON", indicates the presence of DC voltage on the output connector.

DS2, labeled "DUMP", indicates that the circuit is "dumping" excessive charge from the filter capacitors.

5.0 Dump Circuit

The dump circuit works by placing a heavy resistor load on the DC output whenever the output rises above the internally-generated voltage. This helps prevent damage to motor drivers when the back EMF from decelerating motors causes current to flow back into the power supply and thereby trying to raise the output voltage. When the PMDX-136 senses this voltage surge, the resistive load is applied to help absorb the excess voltage. The "DUMP" LED indicates when this is occurring.

The dump circuit resistors are intended for short bursts of operation. If the dump circuit is active more than 10% of the time the resistors may overheat.

The dump circuit also acts to rapidly discharge the main filter capacitors when the input power is removed.

6.0 Voltage and Transformer Selection

There are several factors to consider when choosing input and output voltages for the PMDX-136, as described in the following sections.

6.1 Selecting AC Input and DC Output Voltages

The PMDX-136's output voltage is specified by the following equation:

DC output voltage = [(AC input voltage) * 1.414] – 1.5 volts

For example, 35 volts AC input yields 48 volts DC on the output.

Input voltage should be selected to allow some safety margin in the output voltage. Some transformer output voltages may be several percent higher than specified by the manufacturer when lightly loaded. This property is sometimes specified as "percent regulation" by the transformer manufactures. Toroid

transformers typically have better regulation than conventional transformers. Additionally, the AC mains voltages can often be 10% higher than nominal. Therefore, use the following equation to calculate the worst-case output voltage:

[(high line) * (regulation factor) * (nominal voltage * 1.414)] – 1.5V

In this case, our 35 volt transformer could yield a worst-case output voltage of:

[(110%) * (108%) * (35 * 1.414)] – 1.5 which equals 57.3 volts DC

Note that for this example, the worst-case voltage exceeds the rating of the PMDX-136

For this reason, if you intend to power your stepper or servo divers near their maximum rated input voltage, PMDX recommends that the supply be limited to transformers that will not cause an output voltage that exceeds the driver's voltage rating when all factors are worst case.

Choosing a different transformer with a 30V output rating yields:

[(110%) * (108%) * (30 * 1.414)] – 1.5 which equals 48.9 volts DC (worse case)

[(100%) * (100%) * (30 * 1.414)] – 1.5 which equals 40.9 volts DC (nominal case)

This transformer should not exceed the ratings of the PMDX-136 and should work with stepper drivers rated at 50 volts DC.

6.2 Selecting Transformer Current Rating

Transformers are most often rated in RMS output current. The input of a bridge rectifier/capacitor filter power supply is ***not*** an RMS load. Indeed, it has a much worse load factor. Conservative design recommendations for transformer manufactures may specify that the transformer be RMS rated for as much as 1.8 times the DC output current of the bridge rectifier/capacitor filter power supply.

One exception to this may be transformers that are specified for "rectifier duty".

7.0 Mechanical Specifications

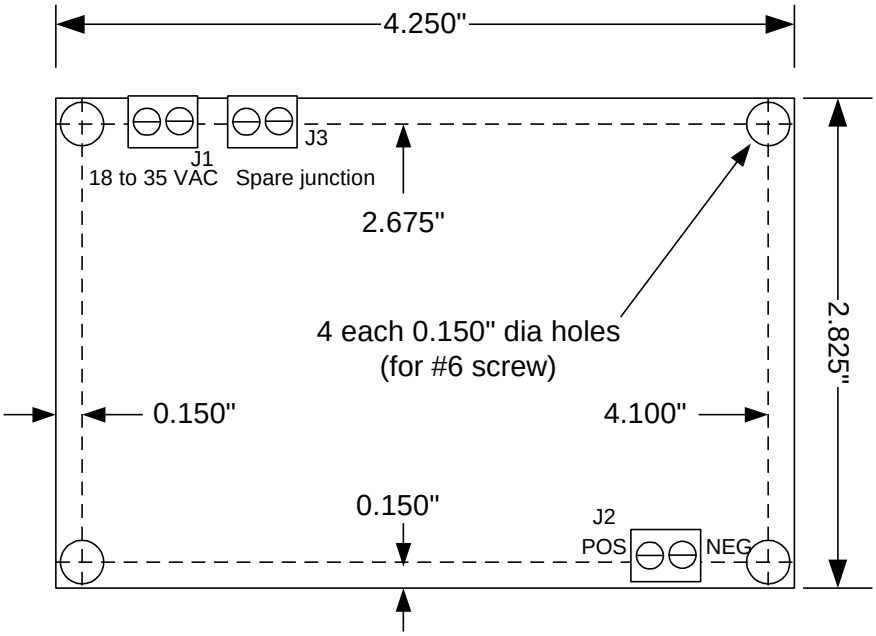

Figure 3 - PMDX-136 Dimensions and Mounting Holes

The maximum clearance height above the PMDX-136 circuit board is 2.175 inches, and beneath the circuit board is 0.125 inches.

WARNING: ***The PMDX-136 should be protected from liquids, dirt, or chips (especially metal chips which can cause shorts) coming in contact with the board.***

8.0 Electrical and Environmental Specifications

Power:

Power In: PMDX-136-5010 – 18 to 35 volts AC
(note that the exact input voltage depends on your desired DC output voltage)

Power Out: PMDX-136-5010 – 24 to 50 volts DC, unregulated with a minimum of 24,000 µF filter
(note that the exact output voltage depends on AC input voltage)

Dump Circuit
Duty Cycle: 10% maximum

Environmental: Temperature: 0° to +55° C
Relative Humidity: 20% to 80% relative humidity, non-condensing

WARNING: Forced-air cooling is required for moderate to heavy loads.

Appendix A – Warranty

Statement

Practical Micro Design, Inc. (PMD) warrants that this hardware product is in good working condition, according to its specifications at the time of shipment, for a period of 90 days from the date it was shipped from PMD. Should the product, in PMD's opinion, malfunction within the warranty period, PMD will repair or replace the product without charge. Any replaced parts become the property of PMD. This warranty does not apply to the software component of a product or to a product which has been damaged due to accident, misuse, abuse, improper installation, usage not in accordance with product specifications and instructions, natural or personal disaster or unauthorized alterations, repairs or modifications.

Limitations

All warranties for this product, expressed or implied, are limited to 90 days from the date of purchase and no warranties, expressed or implied, will apply after that period.

All warranties for this product, expressed or implied, shall extend only to the original purchaser.

The liability of Practical Micro Design, Inc. in respect of any defective product will be limited to the repair or replacement of such product. Practical Micro Design, Inc. may use new or equivalent to new replacement parts.

Practical Micro Design, Inc. makes no other representations or warranties as to fitness for purpose, merchantability or otherwise in respect of the product. No other representations, warranties or conditions, shall be implied by statute or otherwise.

In no event shall Practical Micro Design, Inc. be responsible or liable for any damages arising
(a) from the use of the product;
(b) from the loss of use of the product;
(c) from the loss of revenue or profit resulting from the use of the product; or
(d) as a result of any event, circumstance, action or abuse beyond the control of Practical Micro Design, Inc.

whether such damages be direct, indirect, consequential, special or otherwise and whether such damages are incurred by the person to whom this warranty extends or a third party.