



# PVM-1001

Pulsed Voltage Module

## Operation Manual



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# Safety

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- Always refer to the Safe Operating Area (SOA) graphs located below.
- Do not open the cover of the PVM-1001. There are no user-serviceable parts inside. Opening the cover exposes you to shock and voids the factory warranty.
- Do not install, handle, or remove the output cables or load while the PVM-1001 is operating. Allow at least 10 minutes after powering down before handling the output cable.
- Do not use this device in a manner not specified by the manufacturer.
- Allow sufficient space around this device for air circulation.
- Do not use where liquids are present or in corrosive environments. Clean this instrument by wiping with a dry or damp cloth.



## WARNING

**Risk of lethal electric shock. Do not open the chassis of this device. Do not touch the output or load while it is operating. Ensure that all instrument connections, load wiring and load connections are either insulated or covered so that no accidental contact with lethal output voltages occur. This device produces LETHAL levels of electric current, both inside its cabinet and at its output.**

DO NOT OPERATE THIS DEVICE UNLESS ANOTHER PERSON, CAPABLE OF RENDERING FIRST AID OR RESUSCITATION, IS PRESENT.

SAFE AND PROPER OPERATION OF THIS DEVICE IS THE RESPONSIBILITY OF THE USER.

IXYS Colorado provides information on its products and associated hazards, but it assumes no responsibility for after-sale operation and safety practices.

# Introduction

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## ❖ Description

The PVM-1001 can achieve zero to 950 V in less than 10 ns rise time or zero to negative 950 V in less than 10 ns fall time. This adjustable pulsed voltage source is capable of providing pulse widths from 55 ns to 10,000 ns with a standard frequency range up to 1 MHz. The PVM-1001 can also provide a 5 MHz burst. This PVM-1001 module is designed for a 50 ohm resistive load. Typical applications are instrument calibration, component testing, beam steering and gating Photomultiplier Tubes (PMTs) and Microchannel Plate (MCPs).

The output pulse width and frequency of the PVM-1001 are controlled by an external trigger source. There are two models available, one for positive and another for negative output. The PVM-1001 requires an external positive or negative high voltage supply.

The rear panel of the PVM-1001 has MHV connectors for high voltage input and pulsed high voltage output. The front panel has an SMB connector for triggering the instrument.

## ❖ PVM-1001 Box Contents

Qty	Part Number	Description
1	PVM-1001	PVM-1001 Serialized Unit
1	Operating Manual	Operating Manual for PVM-1001
1	AC/DC Plug	Plug AC Interchange All Countries
1	AC/DC Wall Mount	AC/DC Wall Mount Adapter 12V 12W

Accessories available for the PVM-1001 module:

- PVA-1001 Input and output cables

# ❖ Accessories: Input and Output Cable Drawings

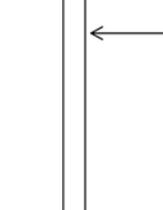
Ref Desl	Qty	Description	Vendor	Vendor p/n	Mfr	Mfr p/n	EQUIVALENT OKAY?
1		CONN MHV male crimp style	Pasternack	PE4083	Pasternack	PE4083	YES
As Required		RG 58C/U Coax cable	Newark	87X1570	Beiden	8262 010U500	YES

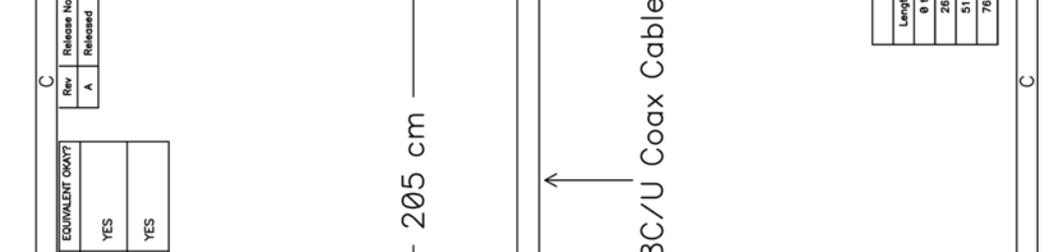
Rev	Release Notes	Date	By
A	Released	17 MARCH 2015	AKS

MHV Connector



205 cm



RG 58C/U Coax Cable

Length (cm)	Tolerance (cm)
0 to 25	1
26 to 50	3
51 to 75	3
76 to 210	5

Color	Code
Black	BL
White	WH
Red	RD
Orange	OR
Yellow	YL
Green	GN
Blue	BLU
Violet	VL
White	WH
Green w/ Yellow Stripe	GY

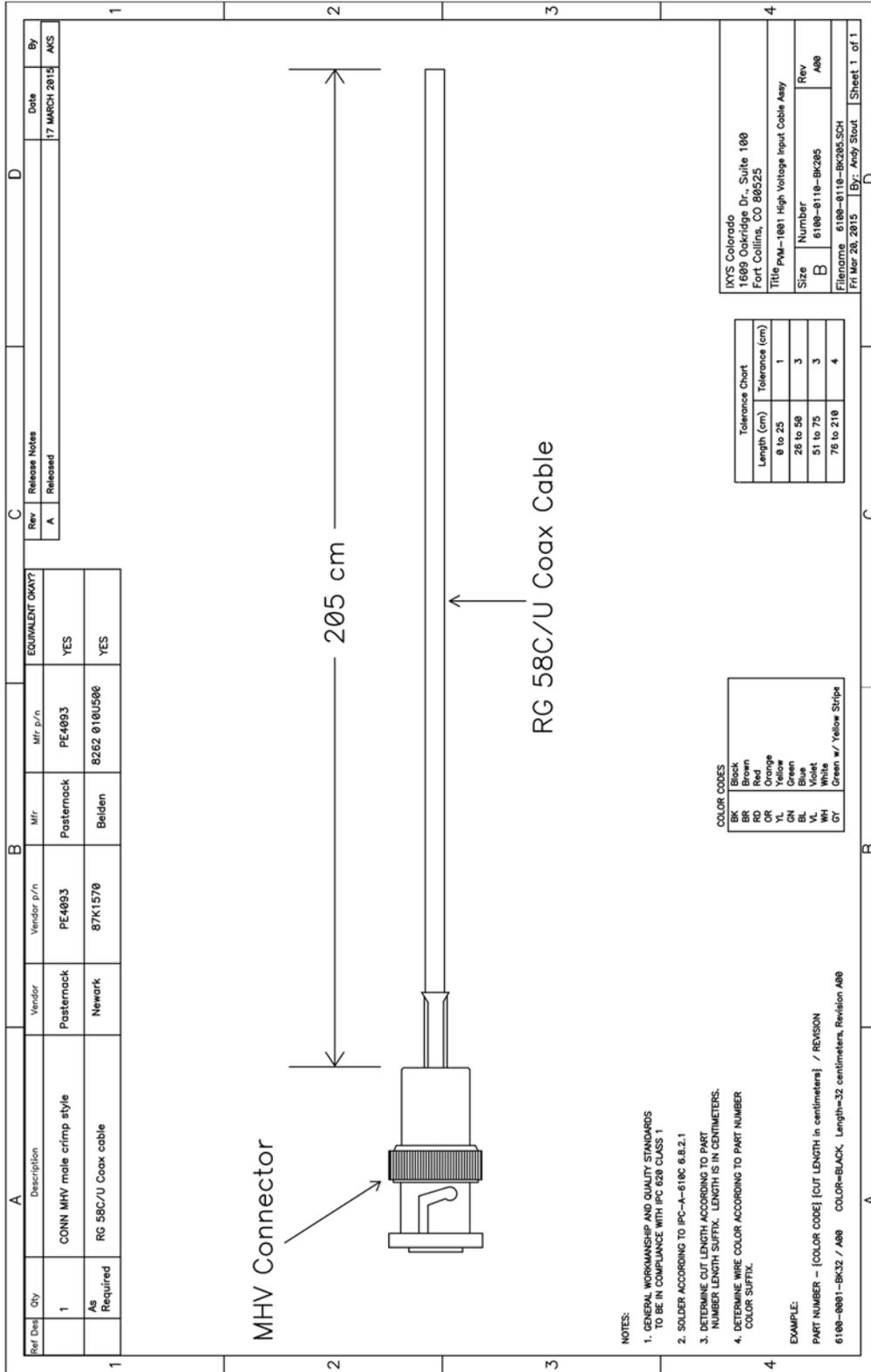
**NOTES:**

- GENERAL WORKMANSHIP AND QUALITY STANDARDS TO BE IN COMPLIANCE WITH IPC 620 CLASS 1
- SOLDER ACCORDING TO IPC-A-610C 6.8.2.1
- DETERMINE CUT LENGTH ACCORDING TO PART NUMBER LENGTH SUFFIX. LENGTH IS IN CENTIMETERS.
- DETERMINE WIRE COLOR ACCORDING TO PART NUMBER COLOR SUFFIX.

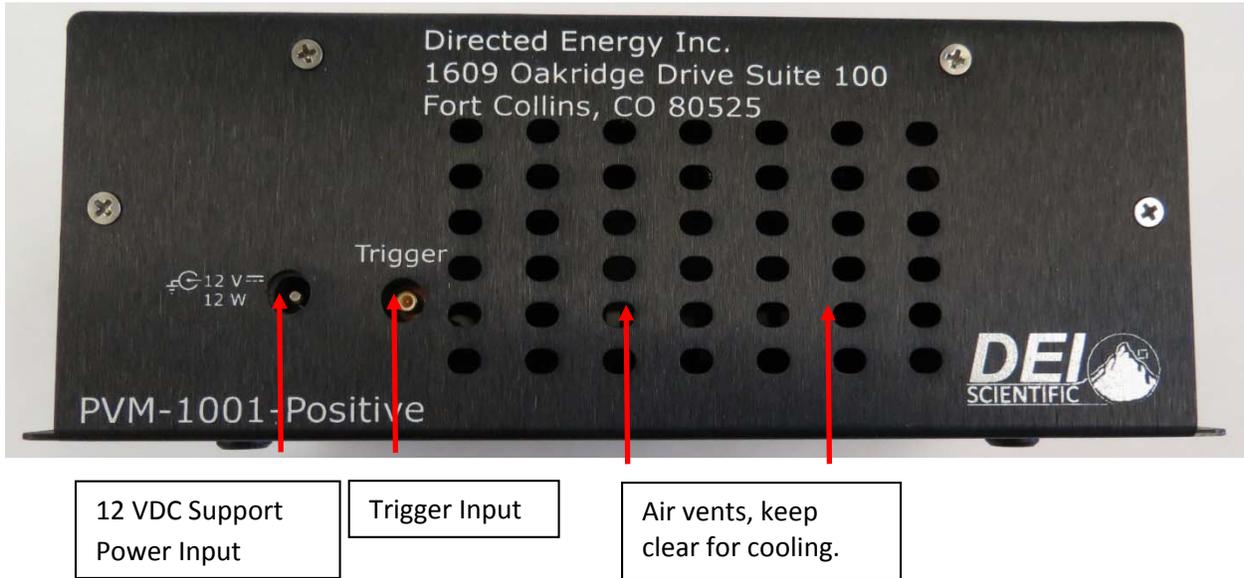
**EXAMPLE:**  
 PART NUMBER - [COLOR CODE] [CUT LENGTH in centimeters] / REVISION  
 6100-0001-BK32 / A00 COLOR-BLACK, Length=32 centimeters, Revision A00

IXYS Colorado 1609 Oakridge Dr., Suite 100 Fort Collins, CO 80525	
Title	PMM-1001 Output Cable ASSY
Size	Number
B	0100-0100-BK205
Rev	A00
Filename	6100-0100-BK205.SCH
Fri Mar 20, 2015	By: Andy Stout
	Sheet 1 of 1



## ❖ Front Panel Features



### **Support Power Input**

Support power input using the 12 VDC adapter, which is provided with the module.

### **Trigger Input**

Use the SMB connector with 50  $\Omega$  termination for the External trigger input.

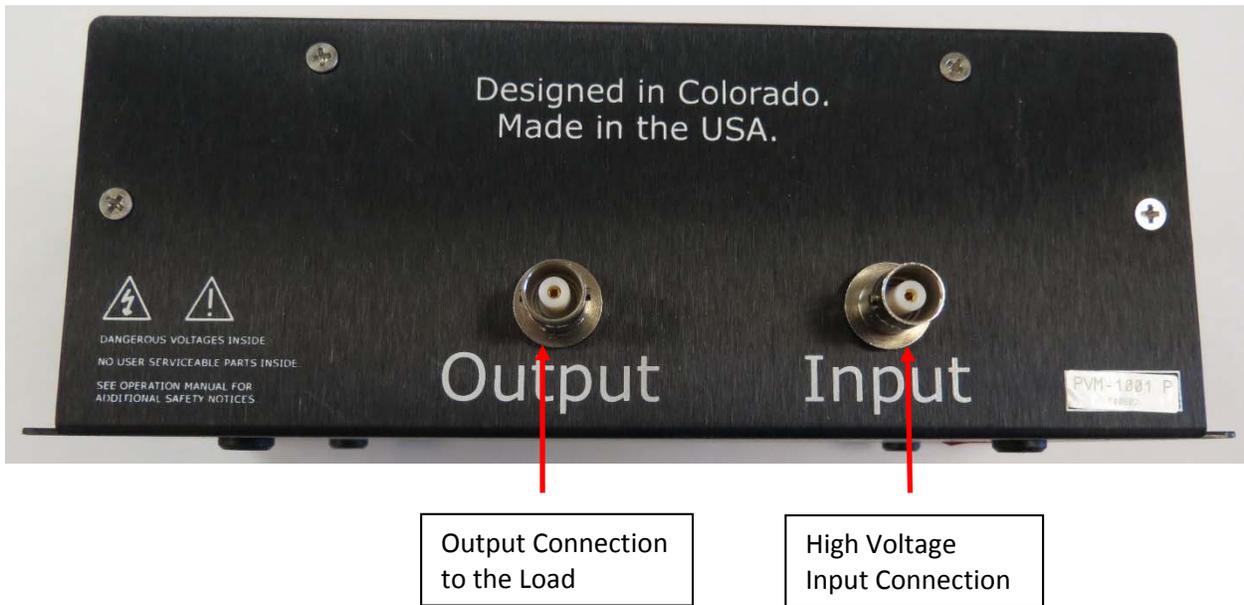
### **Air vents**

Keep the vents clear for cooling.

### **Cooling Fans**

There are cooling fans on the top of the module. Please keep the top of the module clear for cooling.

## ❖ Rear Panel Features



### Positive or Negative Input Connection

High voltage input using an MHV connector. Positive or Negative depends on which module was purchased. Do NOT plug the incorrect polarity into the module.

### Output Connection

Pulsed voltage output using an MHV connector.



# SHOCK HAZARD

**DO NOT TOUCH** any part of the input or output cables while the PVM-1001 is powered up. Please review the Safety section.

# Operating Considerations

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## ❖ High Voltage Input

The PVM-1001 is rated at a maximum input voltage of 1000 VDC. Do NOT exceed the maximum input voltage. The polarity of the DC power supply must be the same as the polarity of the PVM-1001 (i.e. a positive-polarity PVM-1001 requires a positive polarity DC power supply; a negative-polarity PVM-1001 requires a negative polarity DC power supply).

## ❖ Output Cabling

The PVM-1001 is designed to operate into loads with impedances of 50 ohms. An unterminated or improperly-terminated output will cause excessive aberrations on the output waveform and could possibly damage the pulser.

- Use the shortest length of cable possible to ensure the fastest possible rise times and best pulse fidelity.
- Use terminators or impedance-matching devices to avoid reflections.
- Ensure that all external cables and hardware have adequate voltage and power ratings.
- Be extremely careful not to short the output of the pulser to ground as this can damage the pulser.

This unit was tested with a 50 ohm load connected to the output with 3 feet of RG-58 coaxial cable.

## ❖ Pulse Voltages

The PVM-1001 pulser is rated at a maximum pulse output voltage of +950 VDC or -950 VDC. Do not exceed the maximum voltage.

## ❖ Trigger Method

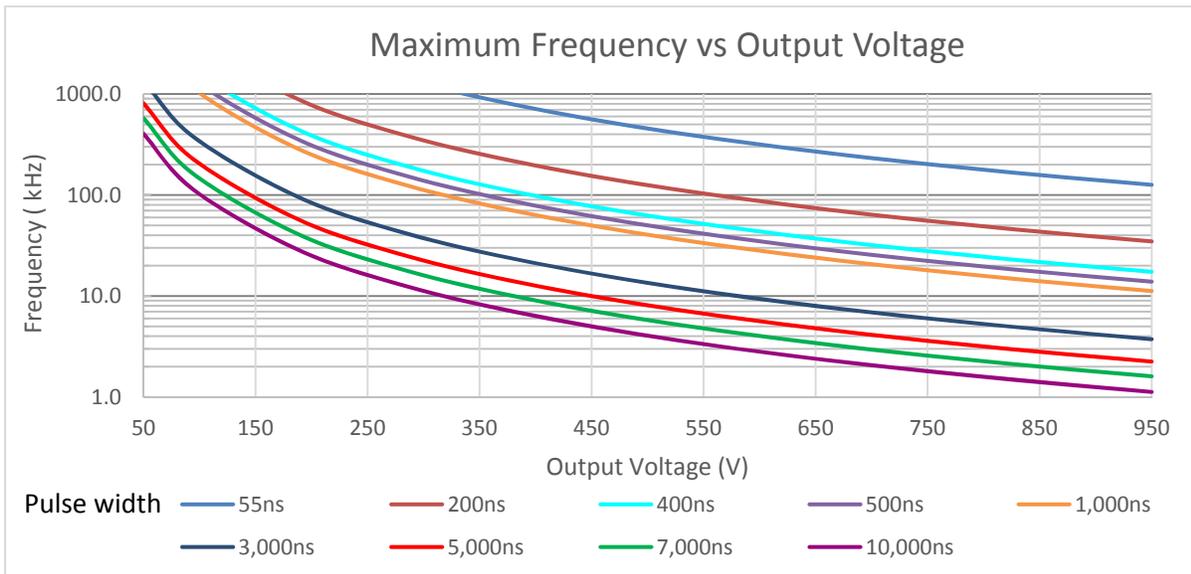
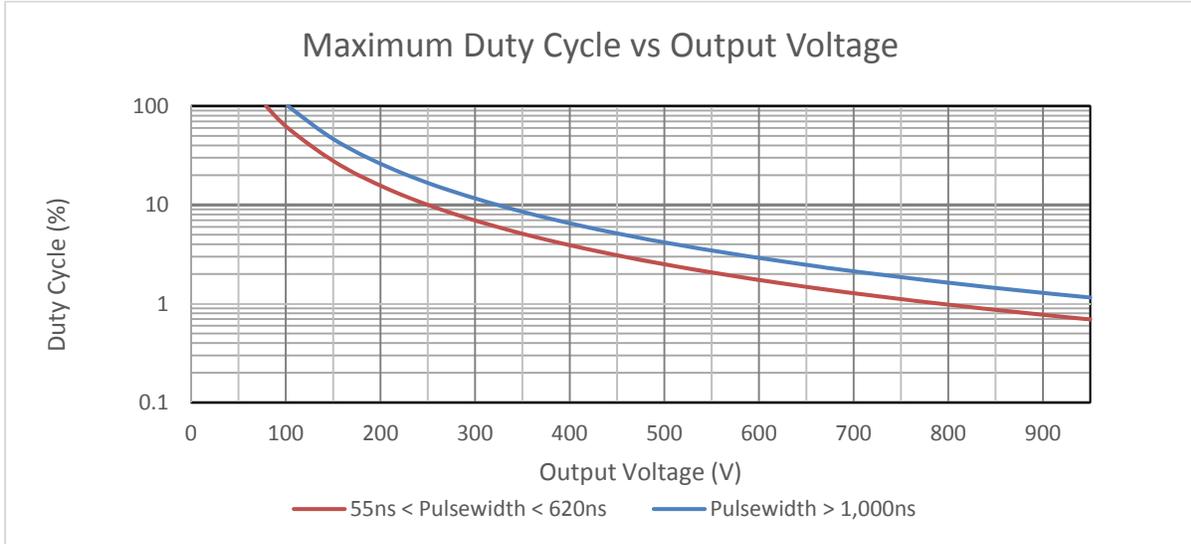
An external trigger of +5 V  $\pm$ 1 V into 50  $\Omega$  is required to gate on the PVM-1001. These trigger requirements are met by any high-quality, low-voltage pulse generator, such as the DEI PDG-2500.

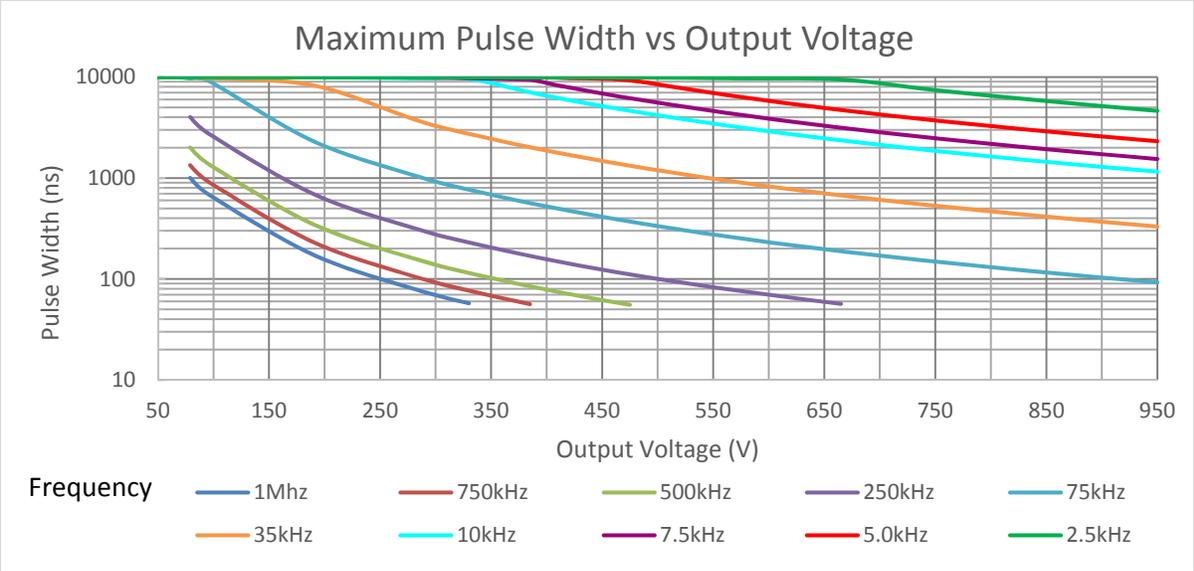
## ❖ Output Pulse Considerations

The PVM-1001 Pulser can generate single-ended output pulses from ground to +950 VDC or from ground to -950 VDC.

The duty cycle percentages shown in Safe Operating Area (SOA) graphs are below) are limited by the cooling capabilities of the PVM-1001.

## ❖ Safe Operating Area Graphs (SOA)





# Operation

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## ❖ Safety

- Follow safety guidelines below. DO NOT PROCEED WITHOUT UNDERSTANDING AND OBSERVING THESE GUIDELINES.
- Make sure the PVM-1001 has been OFF for at least ten minutes when connecting or disconnecting the voltage input and output connectors.
- Make all connections prior to turning ON the module or high voltage power.
- Make sure the load is connected with the correct polarity. If necessary, review the output cable for polarity specifications.
- Do not remove the input or output cables while the pulser is in operation.
- Never short-circuit the high voltage output of the pulse generator.
- Failure to observe these precautions can result in electric shock to personnel, arcing, and damage to the connectors and system.
- Always use proper cables and termination impedance.

## ❖ Connect the PVM-1001

1. Ensure that the high voltage power supply is turned off and that all controls are set to zero volts.
2. Before connecting the external pulse generator to the PVM-1001 Trigger SMB connector:
  - Refer to the Safe Operating Area graphs (located above in the operation considerations) for the proper settings to use on the PVM-1001.
  - Set the pulse generator output to deliver a 5 V pulse into 50 ohms
  - Using the SOA graphs set the pulse generator output for a pulse width from 55 ns to 10,000 ns
  - Using the SOA graphs set the pulse generator output for a frequency range up to 1 MHz
  - Plug the pulse generator into the Trigger SMB connector on the front panel of the system.
3. Verify the high voltage polarity matches the polarity of the PVM-1001. Connect a cable from the high voltage power supply to the rear panel MHV Input connector of the PVM-1001.
4. Connect an appropriate load to the MHV Output connector of the PVM-1001.
5. The module does not have a power switch. Do not plug the AC-DC power adapter into AC until you are ready to apply power to the module.

6. Plug the AC-DC power adapter into DC power input connector on the front panel of the module.

## ❖ Turn ON the PVM-1001

1. Plug the 12 VDC power adapter into AC power, 100-240 VAC. This will turn ON the power to the PVM-1001 module.
2. Set the high voltage power supply to the required voltage for the load. Use the Safe Operating Area data from the datasheet to determine a safe setting for the load and trigger information. Turn ON or enable the high voltage power supply output.
3. Turn ON or enable the Trigger input for the PVM-1001.
  - The PVM-1001 will produce an output pulse with a pulse width and pulse frequency identical to the incoming trigger.

## ❖ Turn OFF the PVM-1001



# SHOCK HAZARD

**Do NOT disconnect the output device or cable for 10 minutes after the high voltage and PVM-1001 has been turned OFF.**

1. Turn off or disable the trigger input to the PVM-1001.
2. Set the output voltage of the high voltage power supply to zero.
3. Turn OFF or disable the high voltage power supply.
4. Turn off the PVM-1001 12 VDC power adapter, disconnect the adapter from the AC connection.
5. Do not disconnect any connections for approximately ten (10) minutes to bleed off the stored energy.

## ❖ Troubleshoot the PVM-1001

1. There are no serviceable components inside the PVM-1001.
2. No output pulse
  - No input trigger; supply an input trigger pulse.

- Input trigger voltage is too low; increase voltage. The PVM-1001 module requires a trigger amplitude of 0 to 5 V.
- Input trigger pulse width too short; increase pulse width. Review Safe Operating Area in the datasheet.
- Input trigger frequency too high; reduce frequency.
- No input high voltage; check HV supply and connections.
- Output not connected correctly; check all cables and connections.

# Warranty and Service

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## ❖ Warranty

IXYS Colorado / DEI Scientific (DEI) warrants equipment it manufactures to be free from defects in materials and factory workmanship under conditions of normal use, and agrees to repair or replace any standard product that fails to perform as specified within one year after date of shipment to the original owner. OEM, modified, and custom products are warranted, as stated above, for ninety (90) days from date of shipment to original owner. This Warranty shall not apply to any product that has been:

- I. Repaired, worked on, or altered by persons unauthorized by DEI in such a manner as to injure, in DEI's sole judgment, the performance, stability, or reliability of the product;
- II. Subjected the product to misuse, neglect, or accident; or
- III. Connected, installed, adjusted, or used otherwise than in accordance with instructions furnished by DEI.

DEI reserves the right to make any changes in the design or construction of its products at any time, without incurring any obligation to make any change whatever in units previously delivered.

DEI's sole obligation, and buyer's sole remedies, under this agreement shall be limited to a refund of the purchase price, or at DEI's sole discretion, to the repair or replacement of products in kind that prove, to DEI's satisfaction, to be defective, when returned to the DEI factory, transportation prepaid by the buyer, within the warranty period. DEI shall in no way be liable for damages consequential or incidental to defects in its products, for failure of delivery in whole or in part, for injuries resulting from its use, or for any other cause.

Returns must be preauthorized and accompanied by a DEI return authorization number.

The foregoing states the entire warranty extended by DEI, and is given and accepted in lieu of 1) any and all other warranties, expressed or implied, including but not limited to the implied warranties of merchantability and fitness for any particular purpose and 2) any obligation, liability, right, claim or remedy in contract or tort.

## ❖ **Factory Service and Support**

For more information about your instrument or for an operation problem, please contact the factory:

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