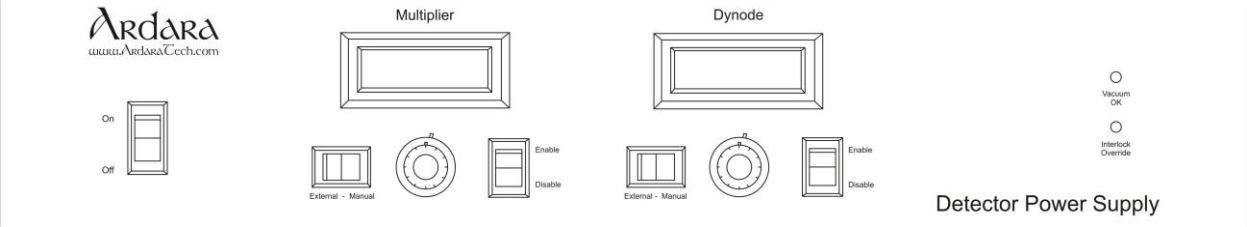
Model 103 Detector Power Supply Manual



Manual M103

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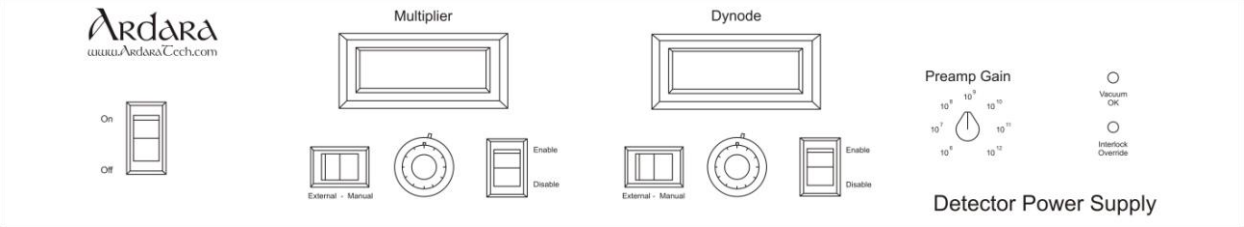

Manual M103

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1.0 Packing List

1.1 Packing List for Detector Power Supply

The Detector Power Supply is shipped with the following items:

Table 1. Detector Power Supply

Quantity	Part Number	Description
1	PS_MULTDYN_02	Detector Power Supply with 2 outputs
1	M103_DETECTOR_PS	Detector Power Supply Operators Manual
1	CABL_POW_110AC_10FT	Universal AC power cable for US use, 10 feet long
1	CABL_MULT(-)	MHV 10 feet long
1	CABL_DYNODE	MHV 10 feet long
1	ASSY_CABL_INTERLOCK_Y_01	Vacuum Interlock DB-9 Cable

2.0 Product Identification

In all communication with Ardara Technologies, please specify the Ardara Technologies Model Number 103, along with the serial number of the unit.

3.0 Scope of Manual

This manual applies to the Ardara Technologies Detector Power Supplies Identified as MODEL 103 in the upper right hand corner of the box's rear panel.

This document is valid as of the date of publication. We reserve the right to make technical changes to the design.

4.0 Intended Use

The Ardara Technologies Detector Power Supply was designed to provide stable high voltages suitable for supplying power to both a Multiplier and Dynode of an electron multiplier detector. An optional input/output for a preamplifier is provided to power a preamp and Preamp Gain selection.

The system also features an available vacuum interlock input on its back panel, which is designed to disable the voltage output under conditions where the vacuum pressure is too high for safe operation.

5.0 Safety

This Detector Power Supply is capable of generating lethal voltages. Care must be taken to ensure safety in use.

5.1 Input Power

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This Detector Power Supply is equipped with a universal input AC power connection, which requires that the power cord ground connection be connected to earth ground through a properly wired AC outlet to ensure safe operation. The use of a 'ground isolator' or similar device is prohibited for safe operation.

The AC power input is compatible with worldwide AC power, from 100 to 240 VAC and 50-60 Hz.

5.2 Custom Output Connections

Use only approved high voltage cables and connectors, which are rated to the voltages in use.

It is often the case that this Detector Power Supply is used to replace another in an existing application. Be sure to review the voltage ratings of the cables and vacuum feedthrus in use to verify compatibility with high voltages possible from this Detector supply.

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5.3 Vacuum Pressure Considerations

The Ardara Detector Power Supply should be used to power detectors at high vacuum pressure only. One challenge to operating high voltage devices is the impact of gas pressure on the voltage discharge limit.

At high vacuum (10^{-5} torr and below) and at atmospheric pressure and above, devices can tolerate quite high voltage gradients with very small electrode gaps.

However, for intermediate pressures (10^{-2} torr to 1 torr), the tolerance to high voltage gradients is dramatically reduced, resulting in discharges (i.e. glow discharge), which can damage the device as well as the power supplies driving it. This phenomenon is described in the literature using the Paschen Curve.

The vacuum interlock feature of this Detector Power Supply was designed to be utilized in conjunction with a vacuum gauge that features a contact closure output when the measured pressure is below a given set point. It is recommended that this feature of the Detector Power Supply be implemented to ensure safe operation.

6.0 Liability and Warranty

Ardara Technologies assumes no liability and the warranty becomes null and void if the end user or third parties:

- Disregard the information in this manual
- Use the product in a non-conforming manner
- Make any kind of changes (modifications, alterations, etc.) to the Detector Power Supply.
- Use the product with accessories not listed in the corresponding product documentation

7.0 Product Overview

7.1 Summary

The Ardara Technologies Detector Power Supply was developed to provide users with a stable high voltage source for various detector. Ardara's Detector Power Supply is conveniently designed to install into a standard 19-inch (48.25 cm) instrument rack, allowing for adequate ventilation.

The design incorporates Multiplier output ranging from 0 to -3 kV and a Dynode output ranging from -5 kV to +5 kV and preamplifier control ranging from 10^6 to 10^{12} gain, standard.

The front panel displays allow direct measurement of each individual output voltage using the two front panel digital voltmeters. The front panel features 2 ten-turn potentiometers for fine control of both Multiplier and Dynode voltages. Combined, these offer an easy, fast, and efficient voltage adjustment. A selector switch is available to designate the preamplifier gain control. The unit automatically switches between front panel control and external command if the control switches on the front and back panels are enabled to external controls. Also the Enable/Disable command can be controlled either by the front panel switch or an external command.

External command inputs can be implemented through the use of the DB9 connector, featured on the back panel. A +/-5 V command yields +/-5 kV output on the Dynode supply; with a 1 M Ohm input impedance. A 0 to -5 V command yields a 0 to -3 kV output to the Multiplier supply. The Enable/Disable command requires a 5V/0V respectively.

Lastly the unit has a vacuum interlock connector on the back panel, which allows an external contact closure to enable or disable the high voltage optics. This feature is compatible with ionization gauge pressure transducers with vacuum interlock contact closure outputs, and allows the Detector Power Supply to be put into a safe state if there is not adequate vacuum. This feature can also be used to turn voltages on and off remotely, by applying a 5-volt signal to pin 2 of this connector.

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7.2 Front Panel Display

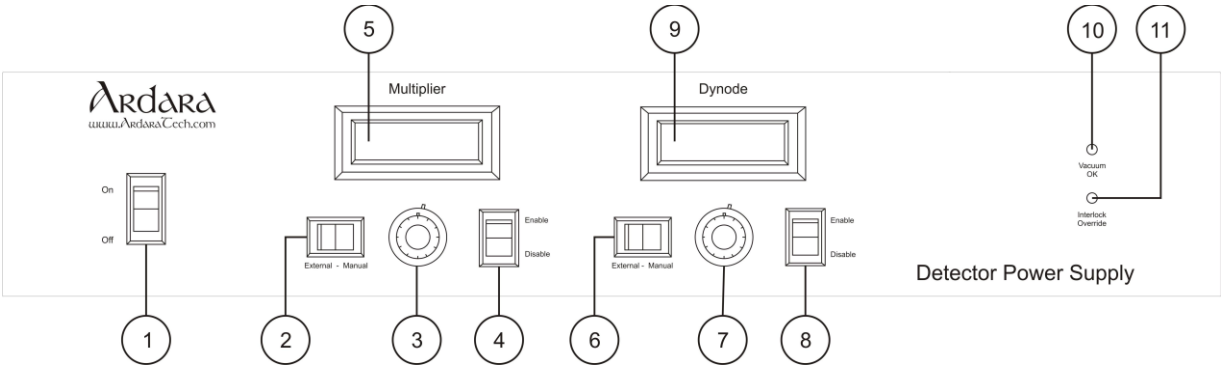

Figure 1. Front Panel Controls for Detector Power Supply

Table 3. Detector Power Supply Front Panel Controls

Balloon Number	Function	Description
1	On / Off Power Switch	Lighted power switch that enables AC power for the Optics power supply and also serves as a circuit breaker.
2	External / Manual Switch	Switches control of Multiplier between front panel potentiometer and external control.
3	Manual Voltage Adjustments	Ten turn potentiometer, which control, the Multiplier voltage.
4	Multiplier Enable Switch	Enables power to the multiplier output.
5	Voltage Display	Displays actual output voltage of the Multiplier
6	External / Manual Switch	Switches control of Dynode between front panel potentiometer and external control.
7	Manual Voltage Adjustments	Ten turn potentiometer, which controls the Dynode voltage.
8	Dynode Enable Switch	Enables power to the dynode output.
9	Voltage Display	Displays actual output voltage of the Dynode.
10	Vacuum Indicator	LED light when vacuum pressure of the system is OK.
11	Override Indicator	LED lights when vacuum interlock switch is set to ‘Override’

7.3 Rear Panel Display

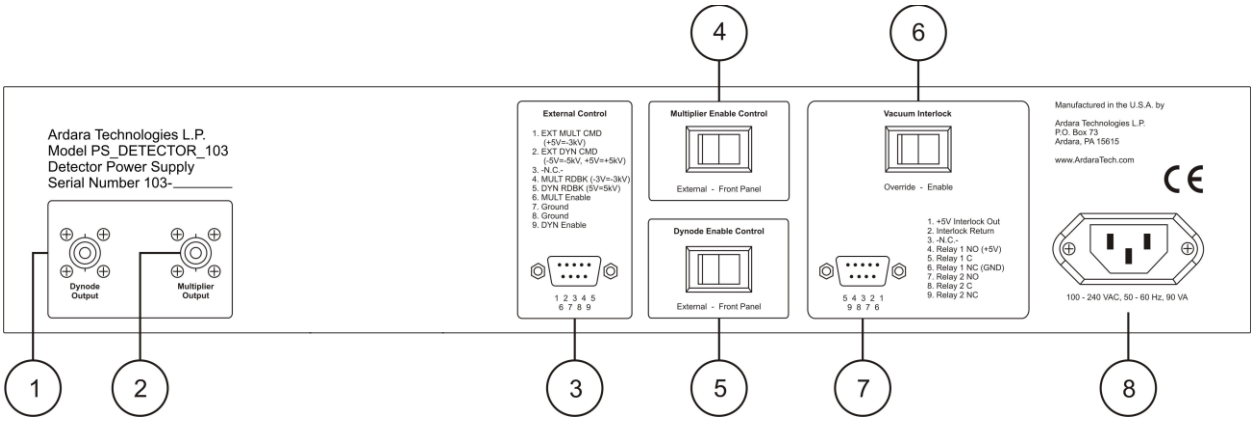

Figure 2. Rear Panel Controls for Detector Power Supply

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Table 4. Detector Power Supply Front Panel Controls

Balloon Number	Function	Description
1	Dynode Output	SHV output to Dynode
2	Multiplier Output	SHV output to Multiplier
3	External Control Input	Male DB9 input that allows the control of Multiplier voltages by applying a 0 to -5 V command, which is scaled to 0 to -3 kV. Applying +/- 5 V, yielding +/- 5 kV, controls dynode. Both enable commands require 5V.
4	Dynode Enable Control	Enables either External or Front Panel control of the Dynode
5	Multiplier Enable Control	Enables either External or Front Panel control of the Multiplier
6	Vacuum Interlock Connector	Female DB9 input that allows external enabling and disabling of the high voltage output. Enables or disables the high voltage output depending on whether there is +5 volts presented to pin 2 from an outside source. For convenience, a +5 volt source is provided on pin 1, suitable for use with an ion gauge controller which has a contact closure output when a suitable pressure is established. A +5V signal present at pin 2 energizes two relays (#1, and #2) The Optics supply utilizes relay #1 internally, with pins 4, 5, and 6 available for diagnostics purposes. Relay #2 is available to echo the contact closure status, allowing the unit to daisy chain the vacuum interlock contact closure to other devices. The vacuum interlock relays used in this device support DC operation to 24 volts.
7	Vacuum Interlock Enable	Controls whether the vacuum interlock feature is enabled. When set to 'Override', the high voltage output is always enabled when AC power is turned on. When set to 'Enable', the high voltage output is enabled only when +5 interlock voltage is presented to pin 2 of the Vacuum Interlock Connector via contact closure on an ion gauge.
8	Universal AC Power Input	100 to 240 VAC, 60 Hz universal power input.

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8.0 Installation

8.1 Installing the Detector Power Supply

Installation of the Detector Power Supply onto a detection system requires the following:

- Do not obstruct the airflow around the Detector Power Supply.
- Do not operate the Detector Power Supply in an environment that is subject to dust, high humidity, or mechanical vibrations.
- The Detector Power Supply is designed to be mounting onto a 19-inch instrument rack, with adequate ventilation to the rear. The chassis of the controller must be properly connected to the mains ground, through mechanical fasteners.

8.2 Electrical Connections

8.2.1 AC Power Input

The Detector Power Supply box is connected to ground via the ground connection in the three-pronged AC power cable.

- It is not safe to operate the Optics power supply using a 'ground isolator' or three-prong to two-prong converter.
- Use only approved high voltage cables and connectors, which are rated to the maximum output voltage of the Optics power supply.
- Make all Optics connections with the Optics power supply turned off

8.2.2 External Detector Output

Standard Multiplier output is 0 to -3 kV, Dynode output ranges +/- 5 kV.

8.2.2 External Control Input

The Detector outputs can be controlled via external inputs through the DB9 connector.

8.2.4 Vacuum Interlock Input

The vacuum interlock feature of this power supply should be implemented by constructing a cable that brings the +5 V command from pin 1 of the back panel female DB9 vacuum interlock connector out to the vacuum interlock contact closure from an ionization gauge controller, bringing the contact closure output back to pin 2 of the back panel vacuum interlock connector.

9.0 Commissioning

9.1 Initial Operation

- Set control to the front panel potentiometers by switching the Front panel switches to Manual and the Back Panel switches to Front Panel.

- Remove back panel detector output connections, if present, so that the Detector Power Supply is not connected to any other device.
- Set the back panel Vacuum Interlock switch to override.
- Adjust potentiometer for the Multiplier between low and high voltage limits. Unit should display 0V to -3 kV.
- Repeat for Dynode, adjusting potentiometer should yield a voltage display from -5 kV to +5 kV.
- As the front panel command voltages are increased, verify that the resulting output voltage indicated on the front panel meter increases linearly.
- If using an external voltage source to control the unit, plug in DB9 input in rear panel DB9 connection and switch the Front Panel switches to External. Adjusting the front panel potentiometer should have no affect on displayed voltage.
- Apply a range of voltages from -0 V to -5 V to the Multiplier and ensure voltage low and high limit reaches from 0 V to -3 kV.
- Apply a range of voltage from -5 V to +5 V to the Dynode and ensure voltage low and high limit reaches from -5 kV to +5 kV.
- If using an external enable/disable control, plug in DB-9 input in rear panel DB-9 connection and switch the Back Panel switches to External. The Front Panel enable/disable switches will have no effect.
- Apply 5 V to the Multiplier and/or Dynode enable command and ensure that the respective power turns on.
- Contact the Ardara Technologies Technical Support if the power supply fails to reach the appropriate maximum voltage.
- If the displayed power supply output voltage appears erratic at higher voltage commands, then there may be some discharging happening external to the power supply, likely due to operation at too high a pressure, at too high a voltage for electrodes that are too close to each other or to ground. Verify that the Detector Power supply can reach its full voltage stably with no connection to the vacuum flange.

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10.0 Maintenance and Care

Under normal operating conditions, the Detector Power Supply does not require maintenance.

10.1 External Cleaning

Use a slightly moist cloth to clean the outside of the Detector power supply. Aggressive scouring or cleaning agents might damage the painted surfaces.

10.2 Internal Cleaning

Under normal operating conditions, there should be no need to clean the inside of the Detector power supply.

11.0 Dimensions

Table 5. PS_MULTDYN_02 Dimensions

Description	Dimension
Box dimensions (WxHxD)	Rack mount front panel 19 x 3.5 x 15 inches
Power Cable length	10 feet (removable)
Detector Cables	10 feet (removable)
Weight (with cables)	15 pounds
Shipping Weight	17 pounds

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