INSTRUCTION MANUAL

ION PUMP POWER SUPPLIES
[MODELS PS-500]

Version 2

SERIAL # _____

1.2024
231 B Otto Street - Port Townsend, WA 98368 - (360)385-7707

Appendices

- Current vs pressure curves
- Schematic
- PS-350
- PS-350N
- Principles of Ion Pump operation

WARNING

THIS POWER SUPPLY USES AND GENERATES VOLTAGE AND CURRENT CAPABLE OF SERIOUS PERSONAL INJURY AND DEATH.

ALL PERSONNEL INVOLVED IN ITS INSTALLATION AND OPERATION MUST BE QUALIFIED TO WORK ON AND WITH SUCH EQUIPMENT.
ANY USER MUST FIRST BE FAMILIAR WITH THIS MANUAL, ITS SAFETY WARNINGS, AND HIGH VOLTAGE PROCEDURES IN GENERAL.

THIS DEVICE SHOULD BE INSTALLED AND OPERATED ONLY BY PROPERLY QUALIFIED PERSONNEL.

DO NOT TAKE SHORT CUTS. PLEASE DO NOT BE IN A HURRY.

There is no risk that is worth your life. We at Thermionics want you alive and well, using our equipment to achieve your goals. With appropriate care this unit will operate safely and effectively.

EACH and EVERY item in the following safety list must be strictly followed.

1. Unplug this supply from the wall and wait at least 1 minute before working on the pump or supply, including attaching, or removing HV cables. This will allow the High Voltage capacitor to bleed down inside the power supply. Disconnect the HV lead and check for zero potential with a voltmeter before working on the Ion Pump. Attach a safety grounding strap to the exposed high voltage lines.

   Do not remove the strap until all work has been completed.

2. There is a grounding stud on the rear panel which must be hard wired to the pump. A tinned copper braid grounding cable is included with the supply. Make this connection before connecting the HV connector to the HV vacuum feedthrough. Verify this connection with a VOM.

3. The power supply operates on 230 VAC, 50/60 Hz single phase power A 3 prong plug (grounding type) is used. This **must** be connected to a correctly wired receptacle. IF one is not available, one **must** be installed.

4. DO NOT SWITCH ON the high voltage with the HV connector disconnected from the vacuum feedthrough or power supply.

5. Protect the high voltage cable and connector from moisture. Bag and tape the connector when not in use. Dirt or moisture can cause a HV leakage path.

   Care is especially important around liquid nitrogen. Condensation due to LN2 boil-off can cause leakage paths. Thoroughly insulate LN2 lines when they are near the cable. **Do not run the cable on the floor.** Mechanical damage or freezing by LN2 may cause failure of the insulation and thus produce a severe safety hazard.

   Take care to hold the body of the cable connector to stop its' rotation when attaching or removing the cable. This is true for both the SHV and the ion pump connectors. Internal damage will occur to the cable connector if it is rotated with respect to the cable. This will cause malfunction and may create a safety hazard.

   Replace any equipment showing damage or misuse.

6. Replace any items that may be damaged or worn.

Preface

Congratulations! You have purchased a precision vacuum positioning device from Thermionics. This unit is capable of many years of use with minimal care and maintenance. This manual is a tool to aid you in obtaining this service.

Please read the manual thoroughly before attempting unpacking and installation of the unit.

We at Thermionics encourage your comments and suggestions on this manual.

Product Description

The PS-500 Sublimator Pump Power Supply is designed to operate the Thermionics SB-1000 series Titanium Sublimation Pump assemblies. These assemblies consist of four titanium/Molybdenum filaments mounted onto a UHV flange. When properly connected, the operator can switch power to each filament. When adequate current is passed through a filament, titanium is evaporated off onto the surrounding surfaces. This process mechanically buries gas molecules as well as creates chemically active surfaces. These fresh surfaces react with gas molecules in the vacuum to form low vapor pressure compounds. Cooling these surfaces with water or LN2 greatly improve the pumping performance.

These power supplies are built into metal chassis designed to mount into standard 19" electronics racks, provided they are equipped with rack shelves. Front panel controls and indicators allow monitoring of filament current.

The PS-500 Pump Power Supply is equipped with an adjustable timed evaporation circuit. This circuit will allow preset times of evaporation separated by preset wait times. The power supply circuit breaker protects only against electronic component failure in the power supply.

Specifications

INPUT POWER STANDARD CONFIGURATION
120 VAC Single Phase 50/60 Hz
5 Amp service

15' AC cord, attached.

OUTPUT POWER
9 VAC at 50 amperes

15' output power cable with connector included.

Dimensions: 8.75" high, 19" wide, 14" deep

Weight: 85 lbs.

Power Switch: Rocker type, circuit breaker

Meter:
0-75 amperes full scale

Lamps:
Indicates AC on
Indicates power to filament.

Adjustments:
FRONT
Rocker switch, main power
Knob, power output
Switch, manual/automatic
Locking potentiometer, time on
Locking potentiometer, time off
Pushbutton, reset
Switch selects 1-4 filament.

REAR
None

Unpacking

All shipment containers should be visually inspected upon arrival for physical damage. A visual inspection of the product should also be done immediately. Shipping companies often require claims for damage be established upon arrival of goods.

This power supply is heavy, but it is still a delicate electronic instrument. Any suspected damage must be investigated by a properly qualified HV technician. Care must be used when handling to properly support this unit at all times. Do not to allow its' weight to cause injury.

All PS models are shipped with custom foam-in-place packing. The foam is separated approximately halfway inside the box with thin blue plastic. We recommend the packing box with packing be saved for possible future shipment or equipment storage.

Installation

The PS series power supplies are manufactured in standard 19" relay rack chassis. The following points should be considered when choosing a suitable rack position.

1. Shelf supports MUST be utilized to handle the chassis weight....and thus not cantilever the weight off the front panel. Failure to do so will void the warranty.

2. Ventilation must be adequate to provide cooling for the power supply. Under heavy load, the power supply chassis will dissipate over 250 watts of power. The temperature around the supply must be under 40°C (104°F).

3. The unit should be mounted so that the operator can observe the front panel information and conveniently reach the front panel controls.

4. The rear panel must be accessible.

5. The power supply must have the correct power service and MUST BE properly grounded.

6. The power supply is supplied with a 15-foot output cable. If possible, the supply should be mounted within this distance of the connector on the pump. Custom length cables can be supplied on special order if

needed.

7. The cable paths between the power supply and the pump and the power supply to the AC supply are important. Care is especially important around liquid nitrogen. Condensation due to LN2 boil-off can cause leakage paths. Mechanical damage or freezing by LN2 may cause failure of the electrical insulation and thus produce a severe safety hazard. Thoroughly insulate LN2 lines when they are near the cable. Do not run the cable on the floor.

Connections

The following connections are made on the back panel and must be attached to the appropriate circuits prior to operation.

Perform these connections in the following order:

A) Power output cable:

Connect the output cable to the pump assembly and connect the green return cable to the 10-32 tapped hole in the Sublimation pump mounting flange.

Replace any equipment showing damage or misuse.

B) Connect the AC power cable to a properly grounded AC supply.

**** Be sure the main AC power switch is off before making this connection. **

Operation

STARTING

NOTE: See "outgassing filaments", below.

Select a filament to energize.

Switch the manual/automatic switch to manual.

Turn the output knob to "0" (minimum).

Chill the reaction surface if so equipped. Allow approximately 10 minutes for LN2 cooled cryoshrouds to come to thermal equilibrium.

Rough vacuum should be established in the chamber. This pressure should be below 10 microns. At the lower starting pressures, faster pumping and longer filament life will be observed. Pressure should be monitored by suitable vacuum gauge or gauges.

Turn on supply and increase output. Depending upon age, condition and manufacturing uniformity of the titanium filament, evaporation will begin between 35 to 40 amperes. The heating filament will cause an increase in pressure due to outgassing, followed by a reduction in pressure due to pumping. For first time filament use, see "Outgassing Filaments" below.

NOTE:

The rate of increasing the current should not exceed 10 amperes/20 seconds. If significant outgassing is observed, reduce this rate.

The power supply is capable of current outputs that will burn out the filaments. Adjust carefully to obtain the desired performance. Filaments may burn out as low as 45 to 50 amperes.

OUTGASSING FILAMENTS

All newly installed filaments should be outgassed when operating conditions permit. This procedure generally needs to be performed once in the lifetime of the filament.

a) Pumping should be on and pressure lower than 2 x 10-6 Torr.

b) Power each filament, bringing up the current slowly until outgassing has ceased and pumping is observed. Be certain not to overload chamber pumping.

ADJUSTMENTS

To maximize useful filament life, use the minimum output current necessary to obtain desired evaporation levels. Continuous evaporation may supply peak pumping speeds, but at the cost of high filament consumption and increased reaction surface temperature. Optimum performance is normally found by repeatedly turning off evaporation and allowing time for the chemical reactions to occur.

If automatic operation is desired, switch the manual/automatic switch to automatic and set the on and off cycle times. The reset button will restart the cycle sequence.

Once all four filaments are burned out, the pump assembly must be removed from the vacuum system and the filaments replaced. Disconnect the power supply from the 120 VAC before proceeding.

Warranty

This unit is covered under the Thermionics standard warranty. Please refer to the beginning of our current catalog for the exact terms of the warranty, and how to implement warranty service if needed.

Maintenance

CLEANING SUBLIMATOR AND CRYOSHROUD

After extended periods of operation, the surfaces in the immediate vicinity of the sublimator will experience a buildup of evaporated metal. All metal surfaces should be mechanically cleaned, and all loose metal removed from the vacuum system. Clean the surfaces with suitable solvent.

Inspect the sublimator for broken, warped or shorted filaments. Ceramic insulators can be cleaned by very fine bead blasting.

NOTE:

Take special care not to touch the filaments when installing or inspecting.

POWER SUPPLY

There are no user serviceable components inside the power supply. The chassis circuit breaker is integral with the power on/off rocker switch and is thus reset whenever the unit is turned off.

We recommend the user utilize the factory for service of this supply if such is ever needed. We maintain a supply of components and the testing and calibration facilities. We offer fast and efficient service.

We at Thermionics have a large stake in your new equipment operating up to your expectations. If you experience difficulty with this unit, or any other aspect of your endeavor where our experience might be of value, we want to hear from you. We want to be part of your success.

END