HIGH VOLTAGE POWER SUPPLY

Model 812

Operating Manual

4/09

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1.0 INTRODUCTION

The study of electrostatic phenomena, the simulation of electrostatic discharge (ESD) and the evaluation of the behavior of electronic components frequently require the use of a precision high voltage source. The high voltage is generally used to place a charge on a surface or a device, charge a capacitor or probe, calibrate electrostatic instrumentation or charge a person to a given potential to simulate an actual human body discharge.

The Model 812 High Voltage Power Supply is a precision, fully adjustable, dual polarity high voltage power source specifically designed to perform the above or similar functions requiring a maximum output current of 100 microamps at 10,000 Volts.

2.0 DESCRIPTION

The Model 812 High Voltage Power Supply, shown in Figure 2.0-1, is a self-contained unit that produces a variable high voltage output at low current levels. It can operate from line voltages of 90 to 240 V, 50/60 Hz. The maximum output is approximately ±10,000 Volts D.C. OUTPUT current is limited to 100 microamperes by an internal 100 MegOhm high voltage resistor.

Figure 2.0-1: Model 812 High Voltage Power Supply

A calibrated 4½-digit, ½" (12.4mm) LED numeric readout plus a 10-turn analog voltage control enables the user to precisely and accurately set the high voltage output to any desired level from ±5 to ±10,000V with 1V resolution. Accuracy is ±1% of reading above 500V and 2% below 500V, ±1digit. LED status indicators display the polarity selected and the presence or absence of high voltage at the output terminal.

2.1 Controls

All controls for operating the High Voltage Power Supply are located on the front panel of the unit. The IEC AC input connector, fuse and an additional ground jack are located on the rear panel. Figures 2.1-1 and 2 show the front and rear panels respectively.

Figure 2.1-2: Model 812 Rear Panel

2.1.1 Main AC Power ON/OFF

This self-latching (push-on-push-off) switch located in the right hand lower corner of the front panel controls the AC power to the unit. The switching power supplies used enable the Model 812 to operate from line (mains) voltages of 90-240 VAC, 50/60 Hz. When depressed, the AC power will be ON and the front panel indicator lamp and display will be illuminated. The system is protected with a 3AG ½ Amp/250V Slo Blo fuse.

2.1.2 High Voltage Controls

This group of controls selects the output polarity, High Voltage ON/OFF and adjusts the output voltage level.

2.1.2.1 High Voltage Polarity and ON/OFF Select Controls

This group of three (3) interlocked, self-latching buttons turns the High Voltage ON or OFF and selects the output voltage polarity.

The polarity pushbuttons are dual function. They select both the output voltage polarity and turn the High Voltage on. The High Voltage is turned off when the center OFF pushbutton is depressed. Since these three (3) buttons are interlocked, depressing any one (1) button will release the one (1) that was previously depressed. Further, **only one (1) button** should be depressed at a time.

2.1.2.2 HV Adjust

This 10-turn control adjusts the voltage output level. The voltage will be approximately zero (0) when the control is turned fully counterclockwise and increases as the control is rotated clockwise

2.2 Indicators

The Power Supply contains three (3) LED's that indicate the polarity and High Voltage ON/OFF status. It also contains a 4½-digit LED numeric readout to display the actual output voltage level and polarity.

2.2.1 OFF

This single RED LED alerts the user that voltages above 100V are present at the output and appropriate care should be taken. The voltage level displayed on the meter indicates the actual voltage and polarity at the output.

2.2.2 Polarity

Two (2) indicators are provided to show which polarity has been selected. The YELLOW LED indicates that the output will be Positive relative to system ground while the GREEN LED indicates that the output will be Negative.

2.3 Digital Display

This readout is a 4½-digit, LED display with ½" (12.4mm) digits that provides and easy to read direct indication of the high voltage output level and polarity with 1 Volt resolution over the entire 10,000V output range.

3.0 OPERATION

Before turning the AC power on, turn off the high voltage by depressing the HV OFF button.

3.1 Power ON

Turn on the AC power by pushing the AC POWER ON button. When initially turned ON the numeric readout should indicate 00.00±.01 The LED indicators should be off.

3.2 Polarity Select

Select the desired polarity by pushing the proper polarity button. The polarity status LED's will indicate the polarity selected. If the polarity is changed when the high voltage output is active, the unit will automatically switch from one polarity to the new one chosen. The H.V. ON indicator will go out for about two (2) seconds while the transition is being made.

When a polarity is chosen, the H.V. OFF button will release automatically. This indicates that the H.V. output has been enabled and that a voltage output will be produced

Allow the Power Supply to warm-up for approximately 10 minutes for it to reach its rated output voltage stability requirements (<0.25% change at 10,000V).

3.3 High Voltage OFF

To disable the High Voltage output, depress the H.V. OFF button. This turns off only the high voltage portion of the supply and reduces the H.V. output to zero (0). The RED High Voltage ON LED will turn off when the H.V. OFF button is depressed.

3.4 HV Adjust

Rotate the 10-turn adjust control to obtain the desired voltage level. Turning the control clockwise will increase the level and counterclockwise will decrease the level. The minimum level is approximately 5V and the maximum level is approximately 10,250V. The voltage control is very sensitive below approximately 20V.

NOTE: A high voltage output and indication will be produced by rotating the HV Adjust control only if a polarity has first been selected. No output will be indicated or produced in the H.V. OFF position.

3.5 Output Connectors

The high voltage OUTPUT connector is located in the upper right hand corner of the front panel. A 5’ (1.5m), high voltage cable with mating high voltage plug is provided with the unit. Other style mating connectors and cables are available from ETS as options. The metal binding post located directly below the high voltage OUTPUT connector is the ground reference for the high voltage output. A duplicate ground terminal is located on the rear panel. Both terminals accept standard .162” (4mm) banana plugs or up to 18 Gage wire. A ground cable with banana plugs on both ends and a removable alligator clip is also included.

3.6 Current Output Limiting Resistor

The current output of the supply is limited to 100 microamperes by an internal 100 MegOhm resistor. This enables the Model 812 to safely charge personnel when performing electrostatic discharge testing (ESD) using an actual person to initiate the discharge. This resistor is connected in series with the output and is located between the internal High Voltage source and the H.V. OUTPUT connector. NFPA safety requirements specify <5milliamps for voltages >100V.

Placing a load resistance of 100 Megohms across the output will reduce the voltage to approximately one-half the value indicated on the meter. One (1) Gigohm will load the output by 10% and 10 Gigohms will load the output by 1%. In other words, a 10 Gigohm load will reduce the output voltage by 1% from that indicated on the meter. For example, a meter reading of 10,000V with a 10 Gigohm load across the output will result in an actual voltage of 9,900V. For most applications resistive loads are generally greater than 10 Gigohm.

NOTE: When trying to measure or verify the output voltage with standard instrumentation the relatively low input resistance of these meters (20 Megohms) will significantly load down the output voltage resulting in a significant difference between the Model 812 meter and the external voltmeter readings.

CAUTION: Although the output current of the Power Supply itself is limited, potentially dangerous conditions can occur if **capacitive loads** are charged using the supply. External high voltage capacitors can store large amounts of energy. This energy can be released at high current levels that can be extremely dangerous. Care should be exercised when the supply is used as a high voltage source to charge such external capacitive loads.

4.0 MAINTENANCE and CALIBRATION

4.1 AC Line Fuse Replacement

Should the AC Fuse fail, replace it with a **½ AMP, 250 VOLT Slo Blo 3AG** type fuse. The cause for the fuse failure should first be determined before replacement.

4.2 Calibration

Each unit is tested and calibrated at the factory and comes with a Certificate of Calibration when shipped.

However, the calibration of the Model 812 should be checked periodically. The unit should be returned to ETS for calibration once a year or performed by the customer if proper calibrated instrumentation is available.

4.2.1 Equipment Required

The following is the recommended calibration procedure. The test instrumentation required is a calibrated high impedance voltmeter (100 Megohms minimum) with a measurement capability of at least 5 kV and an accuracy of at least ±1%. ETS offers the Model 220A High Impedance Voltmeter with a 70 Gigohm input impedance and can measure voltages up to ±5.5 kV.

If such a meter is not available, a voltage divider may be constructed using a 100 Megohm, 4 Watt (or larger) resistor and a 10K, 1/2W resistor giving a 10,000:1 ratio. This will allow a calibrated common digital voltmeter to be used to read the output voltage. (1V=10kV when using the voltage divider.)

A small flat blade screwdriver is required for adjusting the pots plus a small Phillips head screwdriver is needed to remove the top cover.

4.2.2 Procedure

NOTE: For calibration requiring data, this procedure must be performed twice: First to record as-received data and then after-calibration data. Do not make **any** adjustments until the as-received data is recorded.

CAUTION:

When servicing this equipment, always start by disconnecting the power cord from the AC line (mains). Further, if the unit is operated with the cover removed (i.e., during servicing), extreme care should be exercised due to the high voltages that may be present.

1. Remove the top cover by unscrewing the 2 #4 black screws securing the cover to the rear panel and slide it rearward.
2. Connect the calibrated voltmeter input lead to the junction of the internal divider and current limit resistors and the ground lead to the GND terminal on the front panel or the ground lug on the chassis as shown in Figure 4.2-1.

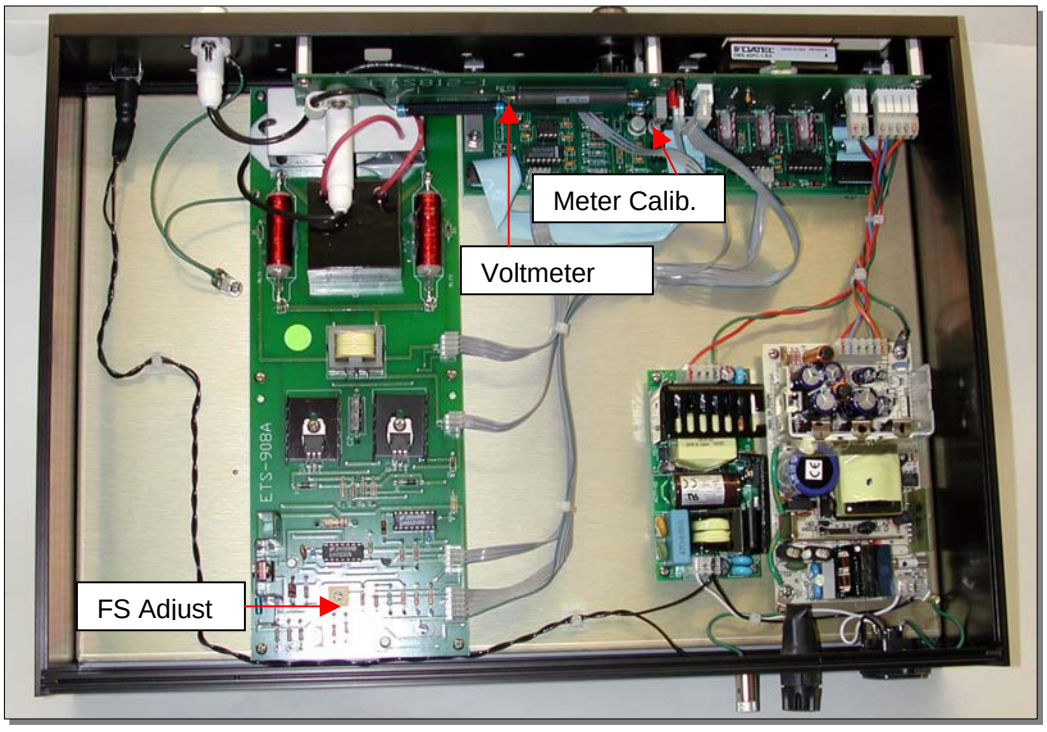

Figure 4.2-1: Location of calibration adjustment pots

3. Turn on the Model 812 and the calibrated voltmeter and allow at least a 10 minute warm-up period. The high voltage should be off.
4. With the high voltage off the display should read 0000 ±1 count.
5. Turn on the high voltage by first depressing the YELLOW + pushbutton. Rotate the 10-turn pot fully counterclockwise. The LED display should read approximately 0 (<5V). If the reading is >10V, contact ETS for service.

6. Slowly rotate the Adjust control. The reading on the LED display should increase. Observe the reading on the calibrated voltmeter. It should read the same ±1%. Adjust the voltage for a 5000V reading on the calibrated voltmeter. If necessary adjust the LED Meter Calibration pot located on the Display/HV resistor board that is mounted to the front panel for the same reading of ±5000V. If the initial readings are significantly different (approximately 250V) contact ETS for service.
7. Depress the GREEN "–" pushbutton. The LED display should read -5000±5V. If the difference between + and – readings are >10V contact ETS for service.
8. If the calibrated voltmeter is capable of reading up to 10kV leave it connected. If not, remove it from the Model 812.
9. Rotate the Adjust control fully clockwise. The LED display should read 10,250±100V. If the calibrated voltmeter is still connected both meters should read the same ±100V.
10. If necessary adjust the 1-turn pot (Full Scale Adjust) on the High Voltage Power Supply board for 10.250V. It is R1 located at the rear of the board. Check the reading at the reverse polarity.

This completes the calibration of the Model 812 High Voltage Power Supply.

For service assistance please contact ETS at 215-887-2196. If the equipment has to be returned, first obtain a RMA number by calling the above number.

4/09

5.0 WARRANTY

Electro-Tech Systems, Inc. warrants its equipment, accessories and parts of its manufacture to be and remain free from defects in material and workmanship for a period of one (1) year from date of invoice and will, at the discretion of Seller, either replace or repair without charge, F.O.B. Glenside. Similar equipment or a similar part to replace any equipment or a part of its manufacture which, within the above stated time, is proved to have been defective t the time it was sold. All equipment claimed defective must be returned properly identified to the Seller (or presented to one of its agents for inspection). This warranty only applies to equipment operated in accordance with Seller's operating instructions.

Seller's warranty with respect to those parts of the equipment that are purchased from other manufacturers shall be subject only to that manufacturer's warranty.

The Seller's liability hereunder is expressly limited to repairing or replacing any parts of the equipment manufactured by the manufacturer and found to have been defective. The Seller shall not be liable for damage resulting or claimed to result from any cause whatsoever.

This warranty becomes null and void should the equipment, or any part thereof, be abused or modified by the customer of if used in any application other than that for which it was intended. This warranty to replace or repair is the only warranty, either expressed or implied or provided by law, and is in lieu of all other warranties. The Seller denies any other promise, guarantee, or warranty with respect to the equipment or accessories. In particular, as to its or their suitability for the purposes of the buyer or its or their performance, either quantitatively or qualitatively or as to the products which it may produce and the buyer is expected to expressly waive rights to any warranty other than that stated herein.

ETS must be notified before any equipment is returned for repair. ETS will issue an RMA (Return Material Authorization) number for return of equipment.

Equipment should be shipped prepaid and insured in the original packaging. If the original packaging is not available, the equipment must be packed in a sufficiently large box (or boxes if applicable) of double wall construction with substantial packing around all sides. The RMA number, description of the problem along with the contact name and telephone number must be included in formal paperwork and enclosed with the instrument. Round trip freight and related charges are the owner's responsibility.

WARNING

WOODEN CRATES MUST NOT BE USED. PACKAGING OF DELICATE INSTRUMENTS IN WOODEN CRATES SUBSTANTIALLY INCREASES THE CONTENT'S SUSCEPTIBILITY TO SHOCK DAMAGE. DO NOT PLACE INSTRUMENTS OR ACCESSORIES INSIDE OTHER INSTRUMENTS OR CHAMBERS. ELECTRO-TECH SYSTEMS, INC. WILL NOT ASSUME RESPONSIBILITY FOR ADDITIONAL COST OR REPAIR DUE TO DAMAGE INCURRED DURING SHIPMENT AS A RESULT OF POOR PACKAGING.