

Instruction Manual

CZE 1000R

High Voltage Power Supply

MODEL :
SERIAL# :
DATE :

**SPELLMAN
HIGH VOLTAGE ELECTRONICS
CORPORATION**

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Spellman's CZE1000R is a full feature rack mountable high voltage power supply ideal for laboratory usage. It's designed to meet the needs of applications requiring a hot switched reversible output voltage. The output polarity can be quickly and safely reversed via a front panel switch.

Both the output voltage and current are fully adjustable from 0 to 30kV and 0 to 300uA via front panel ten turn locking counting dials. Remote control operation is done by 0 to +10Vdc programming signals; either user generated or using the provided +10 Vdc reference and external potentiometers.

Front panel voltage and current meters provide local monitoring. Voltage and current test points are provided such that 0 to 10Vdc corresponds to 0 to 100% rated output.

A two position, normally closed, external interlock is provided for protection of external high voltage accessible areas. If the interlock is opened the high voltage will shut off and fall to zero in less than one second and not be able to be re-energized until the interlock is closed.

Excellent load and line regulation specifications along with outstanding stability and low ripple of the CZE1000R assure a stable high voltage output for consistent process results.

TYPICAL APPLICATIONS

Electrospinning
Mass Spectrometry
Capillary Electrophoresis
Electrostatic Research

OPTIONS

220 220Vac Input Voltage
RPO Rear Panel HV Output

SPECIFICATIONS

Input Voltage:

115Vac, $\pm 10\%$, 50/60Hz

Input Current:

Less than 1 amp

Efficiency:

75% typical

Output Voltage:

0 to 30kV

Polarity:

Auto reversible via front panel switch

- **IDEAL FOR ELECTROSPINNING**
- **0-30KV LOCAL OR REMOTE PROGRAMMING**
- **0-300 μ A LOCAL OR REMOTE PROGRAMMING**
- **POLARITY REVERSIBLE UPON COMMAND IN <1 SEC AT NO LOAD**
- **LOW STORED ENERGY, CURRENT LIMITED OUTPUT**
- **FULL FEATURE FRONT PANEL, IDEAL FOR LABORATORY USEAGE**

www.spellmanhv.com/manuals/CZE1000R

Output Current:

0 to 300 μ A

Power:

9 watts, maximum

Line Regulation:

0.01% for a 10% input voltage change

Load Regulation:

0.01% for a full load change

Ripple:

0.1% Vp-p

Stability:

0.02% per 8 hours (after 1/2 hr warmup)

NL Time Constant:

100ms

Stored Energy:

0.2 Joules at 30kV

Temperature Coefficient:

100ppm/ $^{\circ}$ C

Operating Temperature:

0 $^{\circ}$ C to 40 $^{\circ}$ C

Storage Temperature:

-40 $^{\circ}$ C to 85 $^{\circ}$ C

Humidity:

10% to 85% RH, non condensing

Cooling:

Convection cooled

Dimensions:

5.25"H x 19"W x 17"D (13.3cm x 48.3cm x 43.2cm).

Weight:

22lbs. (10kg)

Interface Connector:

14 pin terminal block

AC Input Connector:

IEC320 connector with 6' (1.83m) cord

HV Output Connector:

Detachable 36" (0.91m) cable provided

Regulatory Approvals:

Compliant to 2004/108/EC, The EMC Directive and 2006/95/EC, The Low Voltage Directive

DIMENSIONS: in.[mm]

CZE1000R TERMINAL BLOCK 14 PIN

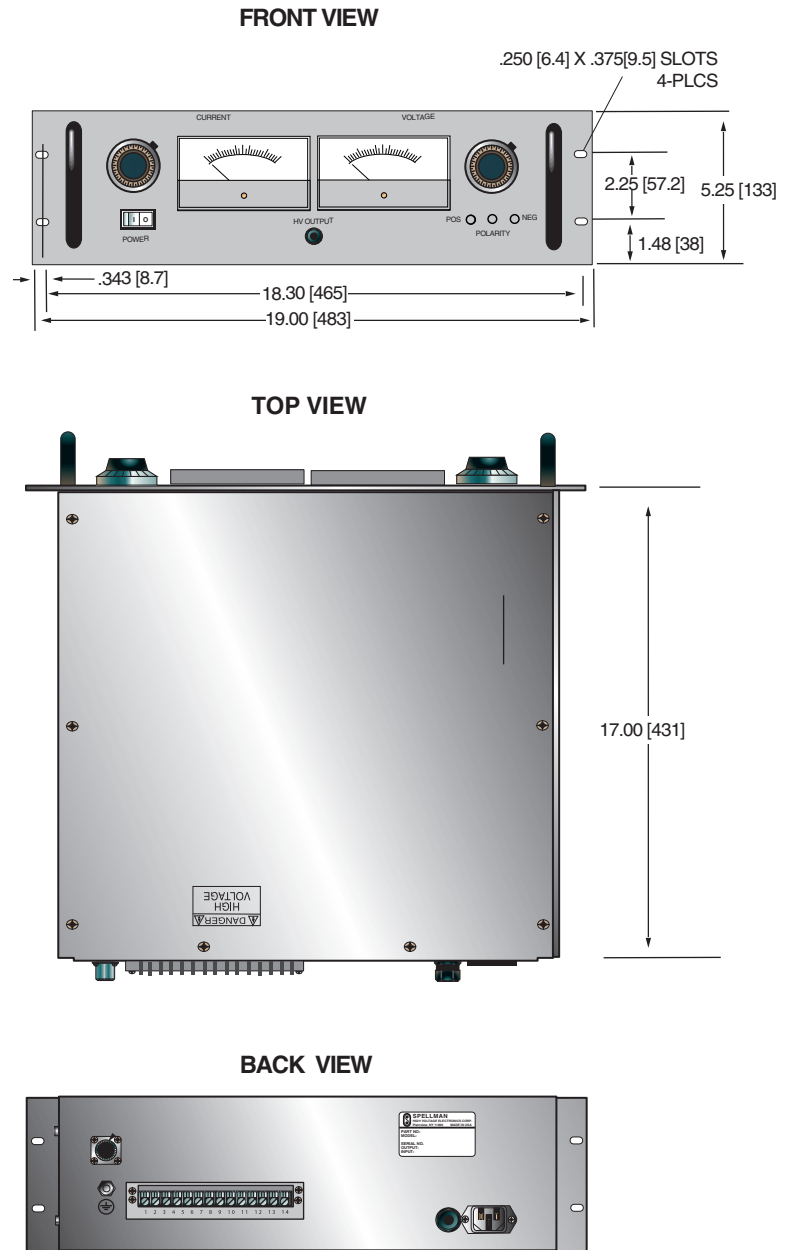
PIN	SIGNAL	PARAMETERS
1	+10Vdc Reference Output	+10Vdc, 4mA maximum
2	Internal Voltage Control	Front Panel Program Voltage (programming potentiometer)
3	Voltage Program Input	0 to 10Vdc = 0 to 100% rated output, Z _{in} = 10MΩ
4	Internal Current Control	Front Panel Current Control (programming potentiometer)
5	Current Program Input	0 to 10Vdc = 0 to 100% rated output, Z _{in} = 10MΩ
6	Signal Common	Ground
7	Voltage Test Point	0 to 10Vdc = 0 to 100% rated output, Z _{out} = 10kΩ, 1%
8	Current Test Point	0 to 10Vdc = 0 to 100% Rated Output, Z _{out} = 10kΩ, 1%
9	External Interlock Out	32Vdc @ 2 amps, max, (connect to pin 10 through safety switch)
10	External Interlock In	Return for interlock (connect to pin 9 through safety switch)
11	+10Vdc Reference Output	+10Vdc, 4mA maximum
12	Enable	Open or ground = HV OFF, >3.4Vdc (up to 15Vdc) = HV ON
13	Spare	No Connection
14	Spare	No Connection

Note:

The unit is shipped with the following pins jumpered for front panel operation: 2-3, 4-5, 9-10, 11-12. It is strongly recommended to remove the 9-10 jumper and use a high voltage safety interlock switch.

High Voltage Cable:

A mating high voltage connector is provide with the unit. Have a spare on hand or replace broken/lost mating high voltage cables by ordering Spellman part number 105719-034



IMPORTANT SAFETY PRECAUTIONS

SAFETY

THIS POWER SUPPLY GENERATES VOLTAGES THAT ARE DANGEROUS AND MAY BE FATAL.
OBSERVE EXTREME CAUTION WHEN WORKING WITH THIS EQUIPMENT.

High voltage power supplies must always be grounded.

Do not touch connections unless the equipment is off and the Capacitance of both the load and power supply is discharged.

Allow five minutes for discharge of internal capacitance of the power supply.

Do not ground yourself or work under wet or damp conditions.

SERVICING SAFETY

Maintenance may require removing the instrument cover with the power on.

Servicing should be done by qualified personnel aware of the electrical hazards.

WARNING note in the text call attention to hazards in operation of these units that could lead to possible injury or death.

CAUTION notes in the text indicate procedures to be followed to avoid possible damage to equipment.

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WICHTIGE SICHERHEITSHINWEISE

SICHERHEIT

DIESES HOCHSPANNUNGSNETZTEIL ERZEUGT LEBENSGEFÄHRLICHE HOCHSPANNUNG.
SEIN SIE SEHR VORSICHTIG BEI DER ARBEIT MIT DIESEM GERÄT.

Das Hochspannungsnetzteil muß immer geerdet sein.

Berühren Sie die Stecker des Netzteiles nur, wenn das Gerät ausgeschaltet ist und die elektrischen Kapazitäten des Netzteiles und der angeschlossenen Last entladen sind.

Die internen Kapazitäten des Hochspannungsnetzteiles benötigen ca. 5 Minuten, um sich zu entladen.

Erden Sie sich nicht, und arbeiten Sie nicht in feuchter oder nasser Umgebung.

SERVICESICHERHEIT

Notwendige Reparaturen können es erforderlich machen, den Gehäusedeckel während des Betriebes zu entfernen.

Reparaturen dürfen nur von qualifiziertem, eingewiesenem Personal ausgeführt werden.

“WARNING” im folgenden Text weist auf gefährliche Operationen hin, die zu Verletzungen oder zum Tod führen können.

“CAUTION” im folgenden Text weist auf Prozeduren hin, die genauestens befolgt werden müssen, um eventuelle Beschädigungen des Gerätes zu vermeiden.

PRECAUTIONS IMPORTANTES POUR VOTRE SECURITE

CONSIGNES DE SÉCURITÉ

CETTE ALIMENTATION GÉNÈRE DES TENSIONS QUI SONT DANGEUREUSES ET PEUVENT ÊTRE FATALES.
SOYEZ EXTRÊMEMENT VIGILANTS LORSQUE VOUS UTILISEZ CET ÉQUIPEMENT.

Les alimentations haute tension doivent toujours être mises à la masse.

Ne touchez pas les connectiques sans que l'équipement soit éteint et que la capacité à la fois de la charge et de l'alimentation soient déchargées.

Prévoyez 5 minutes pour la décharge de la capacité interne de l'alimentation.

Ne vous mettez pas à la masse, ou ne travaillez pas sous conditions mouillées ou humides.

CONSIGNES DE SÉCURITÉ EN CAS DE REPARATION

La maintenance peut nécessiter l'enlèvement du couvercle lorsque l'alimentation est encore allumée.

Les réparations doivent être effectuées par une personne qualifiée et connaissant les risques électriques.

Dans le manuel, les notes marquées « **WARNING** » attire l'attention sur les risques lors de la manipulation de ces équipements, qui peuvent entraîner de possibles blessures voire la mort.

Dans le manuel, les notes marquées « **CAUTION** » indiquent les procédures qui doivent être suivies afin d'éviter d'éventuels dommages sur l'équipement.

IMPORTANTI PRECAUZIONI DI SICUREZZA

SICUREZZA

QUESTO ALIMENTATORE GENERA TENSIONI CHE SONO PERICOLOSE E POTREBBERO ESSERE MORTALI.
PONI ESTREMA CAUTELA QUANDO OPERI CON QUESTO APPARECCHIO.

- Gli alimentatori ad alta tensione devono sempre essere collegati ad un impianto di terra.
- Non toccare le connessioni a meno che l'apparecchio sia stato spento e la capacità interna del carico e dell'alimentatore stesso siano scariche.
- Attendere cinque minuti per permettere la scarica della capacità interna dell'alimentatore ad alta tensione.
- Non mettere a terra il proprio corpo oppure operare in ambienti bagnati o saturi d'umidità.

SICUREZZA NELLA MANUTENZIONE.

- Manutenzione potrebbe essere richiesta, rimuovendo la copertura con apparecchio acceso.
- La manutenzione deve essere svolta da personale qualificato, coscio dei rischi elettrici.
- Attenzione alle **AVVERTENZE** contenute nel manuale, che richiamano all'attenzione ai rischi quando si opera con tali unità e che potrebbero causare possibili ferite o morte.
- Le note di **CAUTELA** contenute nel manuale, indicano le procedure da seguire per evitare possibili danni all'apparecchio.

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Chapter 1

INTRODUCTION

1.1 Description Of The CZE1000R

The CZE1000R high voltage power supply provides very well regulated, low ripple high voltage in a highly efficient, compact design. The DC output voltage and current are continuously adjustable from 0 to 30kV and 0 to 300uA via two front panel ten-turn locking potentiometers. These high voltage power supplies have 0.01% regulation, and .01% P-P ripple. Output polarity is reversible on the fly via a front panel switch. The supplies operate from a 115 Volt or 220 Volt single phase AC line. Other line voltages are available.

A one-year warranty applies to the standard CZE1000R units.

1.2 CZE1000R Specifications

Output Control: Voltage and current are constantly adjustable over the entire range from 0 to 30kV and 0 to 300uA via ten-turn potentiometers with a lockable counting dial.

Input Voltage: 115 VAC or 220VAC \pm 10%, 50/60Hz, single phase. Other input voltages are available. Other input values are available as options.

Load Regulation: \pm 0.01% for a no load to full load.

Line Regulation: \pm 0.01% for a 10% line change.

Ripple: 0.1% Peak-to-Peak.

Polarity: Reversible polarity with respect to ground.

Metering: Analog voltage and current meters are accurate to \pm 2%.

Controls: AC ON toggle switch, AC On indicator, Voltage Control Potentiometer, Current Control Potentiometer, Polarity Reversing Switch, Polarity Indicators.

Physical: 5 1/4" H x 19" W x 17" D rack mount.

1.3 Standard Features

The CZE1000R incorporates several standard features designed to optimize user satisfaction and safety.

Remote Control: Allows remote adjustment of the output voltage and current via an external voltage source.

Test Points: Allows remote monitoring of output voltage and current.

External Interlock: Interlock connections are provided on the terminal block on the rear of the chassis for connection to a safety switch. The unit will not operate unless the interlock circuit is closed. During high voltage operation, opening the interlock circuit will cause the unit to shut off.

Output Cable: The unit is provided with a three foot high voltage output cable. The cable is designed with a plug arrangement so it can be easily removed from the mating receptacle located on the front panel of the chassis.

The unit is also available with a shielded high voltage cable located in the rear of the unit. This cable is ten feet long but may be ordered in other lengths

Chapter 2

Inspection and Installation

Initial inspection and preliminary checkout procedures are recommended. For safe operation, please follow the step-by-step procedures described in this chapter and Chapter 3, Operating Instructions.

2.1 Initial Inspection

Inspect the package exterior for evidence of damage due to handling in transit. Notify the carrier and Spellman immediately if damage is evident. Do not destroy or remove any of the packing material used in a damaged shipment.

After unpacking, inspect the panel and chassis for visible damage.

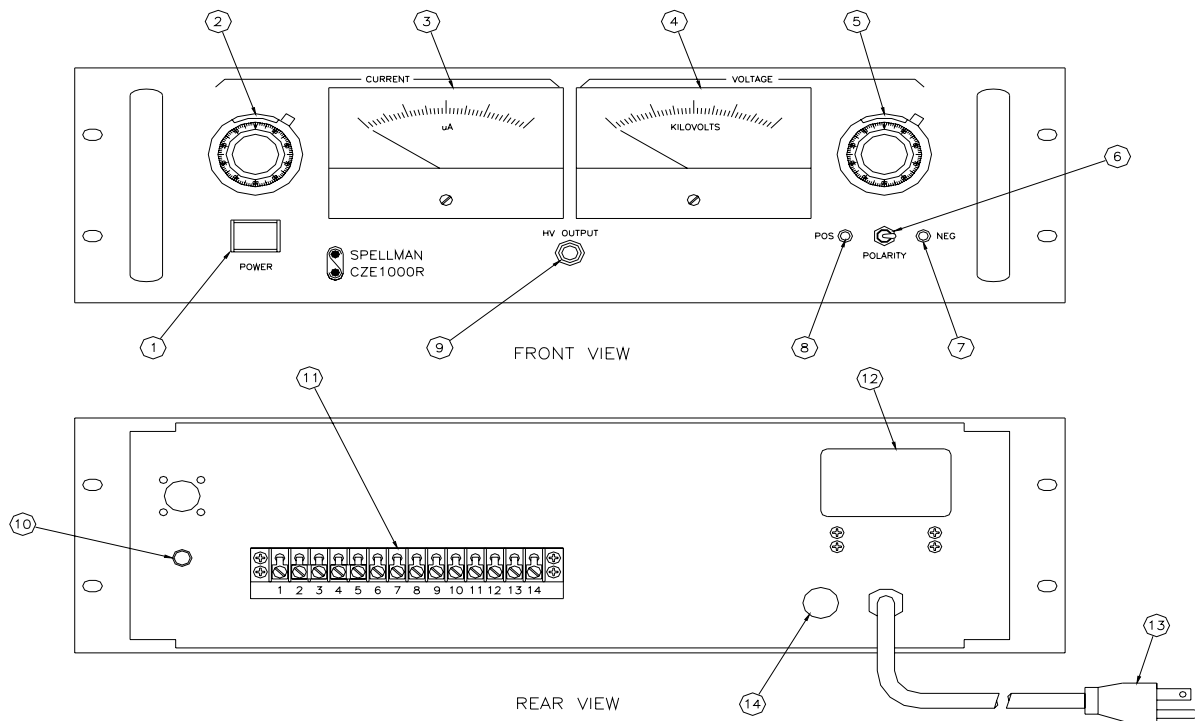
Fill out and mail the Warranty Registration card accompanying the unit. Standard CZE1000R high voltage power supplies and components are covered by a one year warranty.

2.2 Mechanical Installation

The CZE1000R units have front panel holes for standard EIA rack mounting. The rack must allow rear access for cable connections. Units are fully enclosed and are suitable for bench or table top operation.

2.3 Controls and Connectors

Standard front and rear controls are connectors are shown in Figures 2.1 and 2.2



Front Panel

Rear Panel

1. On/Off Switch
2. Current Control Knob
3. Ammeter
4. Voltmeter
5. High Voltage Control Knob
6. Polarity Select Switch
7. Negative Polarity Indicator
8. Positive Polarity Indicator
9. High Voltage Output Connector

10. Ground Binding Post
11. Terminal Block TB1
12. Model and Serial Number Name Plate
13. AC Line Cord
14. Fuse

Figure 2.1

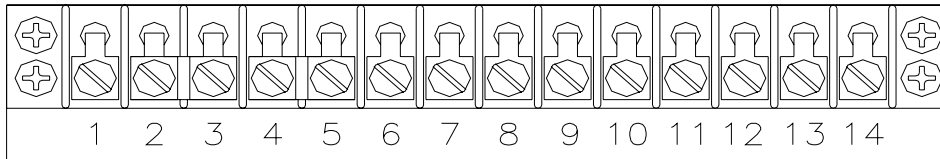


Figure 2.2

Interface:

- 1 10V Reference**
- 2 } Internal Voltage Control**
- 3 } Voltage Program Input**
- 4 } Internal Current Control**
- 5 } Current Program Input**
- 6 Signal Common**
- 7 Voltage Test Point**
- 8 Current Test Point**
- 9 } External Interlock**
- 10 } External Interlock**
- 11 } 10V Reference**
- 12 } Enable**
- 13 Spare**
- 14 Spare**

Chapter 3

Operating Instructions

3.1 Operation

WARNING

THIS EQUIPMENT GENERATES DANGEROUS VOLTAGES THAT MAY BE FATAL. PROPER GROUNDING OF ALL HIGH VOLTAGE EQUIPMENT IS ESSENTIAL.

IMPORTANT:

Before plugging in the power supply, follow this step-by-step procedure.

Do not connect the power supply to the AC line until Step H is reached.

Failure to follow these procedures may void the warranty.

- A) Set the POWER switch to the OFF position.
- B) Check the input voltage rating on the nameplate of the supply and make certain that this is the rating of the available power source. Spellman CZE1000R units operate on 115VAC unless ordered with a different input voltage option.
- C) **PROPER GROUNDING TECHNIQUE:** The chassis of high voltage power supplies must be grounded, preferably to a water system ground using copper pipe or other earth ground using the ground binding post at the rear of the unit. See Figure 3.1 for a typical operating setup.
- The return line from the load should be connected to the ground binding post at the rear of the power supply. Using a separate external ground at the load is not recommended.
- A three prong grounded wire is provided for connecting to the AC supply. If a grounded receptacle is not available, use an adapter and connect the third wire to a good ground.
- D) Attach the output cable to the load.
- E) Plug the high-voltage output cable provided with the unit into the rear of the supply.

F) For initial turn-on, rotate the OUTPUT VOLTAGE control fully counter-clockwise to the zero position and rotate the OUTPUT CURRENT control fully clockwise to the maximum current limit position. Select desired polarity using the front panel switch.

G) The input power cable may now be plugged into the AC power line.

H) Turn POWER switch ON. The pilot light should light up.

I) Rotate the OUTPUT VOLTAGE control clockwise until the voltmeter indicates the desired output voltage.

J) To limit the output current, rotate the OUTPUT CURRENT control to the desired level.

K) To terminate the generation of high voltage output, turn the POWER switch off.

WARNING

AFTER TURNOFF, DO NOT HANDLE THE LOAD UNTIL THE CAPACITANCE HAS BEEN DISCHARGED! LOAD CAPACITANCE MAY BE DISCHARGED BY SHORTING TO GROUND.

WARNING

THE VOLTMETER ON THE POWER SUPPLY FRONT PANEL DOES NOT READ THE OUTPUT VOLTAGE WHEN THE POWER IS TURNED OFF, EVEN IF A CHARGE STILL EXISTS ON THE LOAD.

3.2 Standard Features

REMOTE PROGRAMMING OF OUTPUT VOLTAGE: Allows remote adjustment of the output voltage and current via an external voltage source or remote potentiometer. In local control (front panel control), jumpers are installed on the terminal block TB1 in the rear of the chassis between block TB1 in the rear of the chassis between TB1-2 and TB1-3 for voltage control.

1. Programming with a potentiometer: Disconnect jumpers between TB1-2 and TB1-3. Connect a 10K

potentiometer between TB1-1 and TB1-6 with the wiper to TB1-3.

2 Programming with an external voltage: Disconnect jumpers between TB1-2 and TB1-3. Connect 0-10V signal between TB1-3 and TB1-6 (common).

CAUTION

Allowing the program voltage to exceed 10 volts can cause DAMAGE to the equipment.

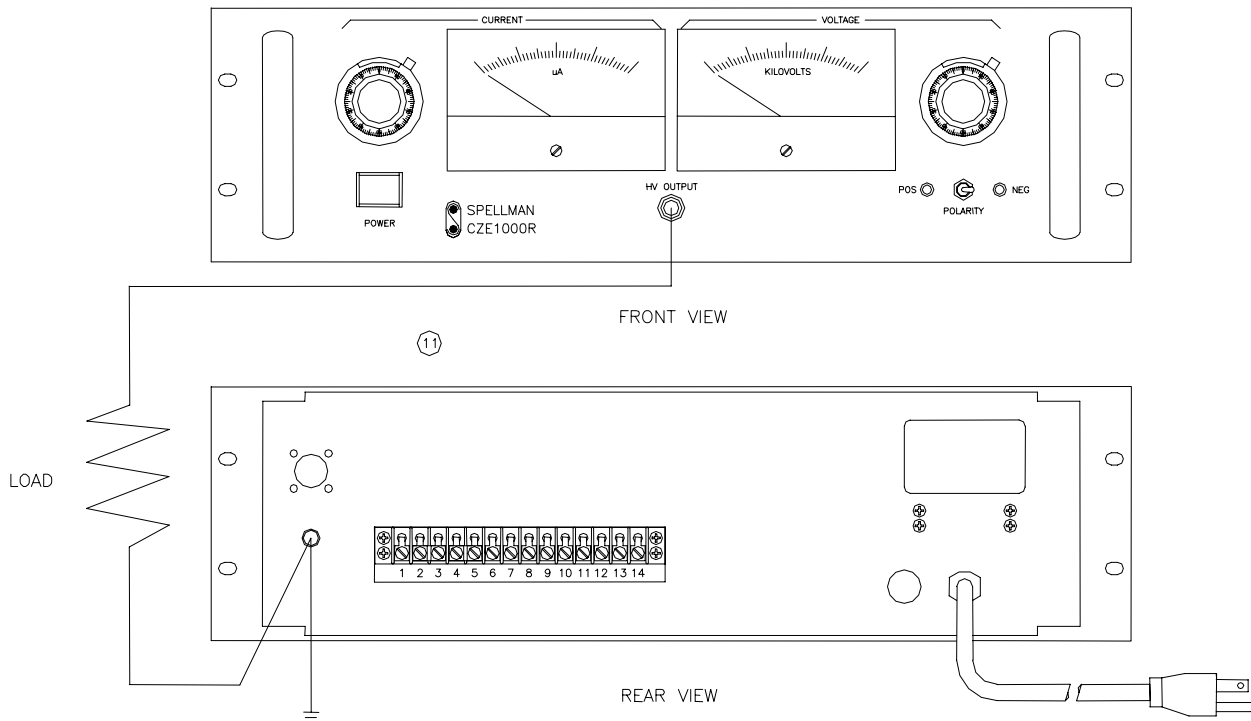


Figure 3.1

REMOTE PROGRAMMING OF OUTPUT CURRENT: Allows remote adjustment of the output current via an external voltage source or a remote potentiometer. In local control (front panel control), jumpers are installed on the terminal block TB1 in the rear of the chassis between block TB1 in the rear of the chassis between TB1-4 and TB1-5 for current control.

1. Programming with a potentiometer: Disconnect jumpers between TB1-4 and TB1-5. Connect a 10K

potentiometer between TB1-1 and TB1-6 with the wiper to TB1-5.

2 Programming with an external voltage: Disconnect jumpers between TB1-4 and TB1-5. Connect 0-10V signal between TB1-5 and TB1-6 (common).

CAUTION

Allowing the program voltage to exceed 10 volts can cause DAMAGE to the equipment.

REVERSABLE POLARITY A toggle switch mounted on the front panel will change the polarity of the output without power being disabled. When the switch is toggled, the inverter is instantaneously disabled and the output begins to decay from its set point. At approximately 3kV, the logic circuitry will switch the primary and secondary relays and re-enable the inverter. The output then slews up to its set value. The maximum switch time for set points above 3kV occurs at no load and 30kV. Under this condition, the switch time is 1.5

seconds. At set points below 3kV, the switch time is 3 seconds.

POLARITY INDICATORS: Two LED lamps are provided on the front panel to indicate polarity of the output.

REMOTE MONITOR: Test points are made available at the terminal block on the rear of the chassis for monitoring the voltage and current output. The voltage monitor is on TB1-7 and the current monitor is on TB1-8. The test points are always positive regardless of the output polarity where 10 volt corresponds to full output. Both test points have an output impedance of 1K ohms.

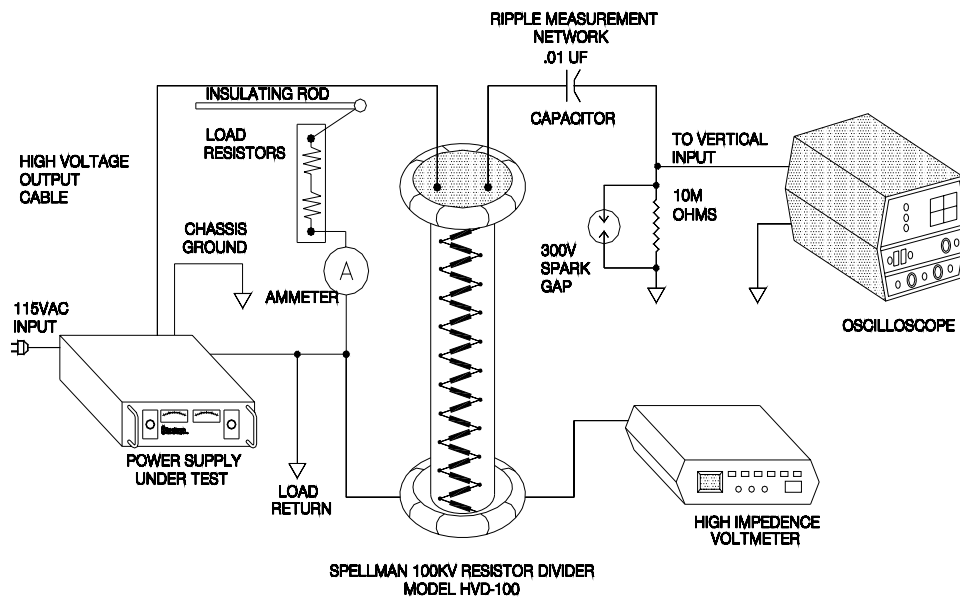


Figure 3.2

Typical Test Set up Diagram

EXTERNAL INTERLOCK: Interlock connections are provided on the terminal block TB1-9 and TB1-10, on the rear of the chassis for connection to a safety switch. The maximum open contact voltage is $29v \pm 3v$ and the maximum closed contact current is 2A. The unit will not operate unless the interlock circuit is closed. A dry contact switch remotely located on a twisted pair of wires is recommended to close the circuit. If the interlock is not being used, the jumper installed on the terminals before shipping must be in place. If the jumper is missing, or there is an open between the interlock terminals the unit's main power will be disabled. During high voltage operation, opening the interlock circuit will cause the unit to shut off. Subsequent closing of the interlock circuit WILL RETURN the unit to High Voltage ON Mode.

REMOTE ENABLE: A TTL compatible enable circuit is provided on TB1-12. The unit is shipped from the factory with this terminal jumped to TB1-11 (10V reference). For remote enable, disconnect the jumper between TB1-11 and TB1-12 and apply a signal greater than 3.4V to TB1-12. Less than 1V or open on TB1-12 turns the high voltage off.

WARNING

IT IS EXTREMELY DANGEROUS TO USE THIS INPUT TO INHIBIT THE HIGH VOLTAGE OUTPUT FOR THE PURPOSE OF SERVICING KOR APPROACHING ANY AREA OR LOAD CONSIDEREN UNSAFE DURING NORMAL OPERATION

3.3 Performance Test

WARNING

**HIGH VOLTAGE IS DANGEROUS.
ONLY QUALIFIED PERSONNEL SHOULD
PERFORM THESE TESTS.**

The test setup for checking the performance of your high voltage power supply is shown in Figure 3.2. High voltage test procedures are described in Bulletin STP-783, Standard Test Procedures for High Voltage Power Supplies. Copies can be obtained from the Spellman Customer Service Department.

Test equipment, including an oscilloscope, a high impedance voltmeter, and a high voltage divider such as the Spellman HVD-100 or HVD-200, is needed for performance tests. Be sure the power switch is OFF. Hook up the circuit as shown in Figure 3.2. Check the power supply parameters to ensure satisfactory operation.

Note: All test components must be rated for operating voltage.

3.4 High Voltage Dividers

High voltage dividers for precise measurements of output voltage with an accuracy up to 0.1% are available from Spellman. The HVD-100 is used for voltages up to 100KV. The HVD-200 measures up to 200KV. The Spellman divider is designed for use with differential voltmeters or high impedance digital voltmeters.

Chapter 4

FACTORY SERVICE

4.1 Warranty Repairs

During the Warranty period, Spellman will repair all units free of charge. The Warranty is void if the unit is worked on by other than Spellman personnel. See the Warranty in the rear of this manual for more information. Follow the return procedures described in Section 4.2. The customer shall pay for shipping to and from Spellman.

4.2 Factory Service Procedures

Spellman has a well-equipped factory repair department. If a unit is returned to the factory for calibration or repair, a detailed description of the specific problem should be attached.

For all units returned for repair, please obtain an authorization to ship from the Customer Service Department, either by phone or mail prior to shipping. When you call, please state the model and serial numbers, which are on the plate on the rear of the power supply, and the purchase order number for the repair. A Return Material Authorization Code Number (RMA Number) is needed for all returns. This RMA Number should be marked clearly on the outside of the shipping container. Packages received without an RMA Number will be returned to the customer. The Customer shall pay for shipping to and from Spellman.

A preliminary estimate for repairs will be given by phone by Customer Service. A purchase order for this amount is requested upon issuance of the RMA Number. A more detailed estimate will be made when the power supply is received at the Spellman Repair Center. In the event that repair work is extensive, Spellman will call to seek additional authorization from your company before completing the repairs.

4.4 Shipping Instructions

All power supplies returned to Spellman must be sent shipping prepaid. Pack the units carefully and securely in a suitable container, preferably in the original container, if available. The power supply should be surrounded by at least four inches of shock absorbing material. Please return all associated materials, i.e. high voltage output cables, interconnection cables, etc., so that we can examine and test the entire system.

All correspondence and phone calls should be directed to:

Spellman High Voltage Electronics Corp.

475 Wireless Boulevard

Hauppauge, New York 11788

TEL: (631) 630-3000 FAX: (631) 435-1620

E-Mail: sales@Spellmanhv.com

<http://www.spellmanhv.com>

SPELLMAN HIGH VOLTAGE ELECTRONICS

WARRANTY

Spellman High Voltage Electronics ("**Spellman**") warrants that all power supplies it manufactures will be free from defects in materials and factory workmanship, and agrees to repair or replace, without charge, any power supply that under normal use, operating conditions and maintenance reveals during the warranty period a defect in materials or factory workmanship. The warranty period is twelve (12) months from the date of shipment of the power supply. With respect to standard SL power supplies (not customized) the warranty period is thirty-six (36) months from the date of shipment of the power supply.

This warranty does not apply to any power supply that has been:

- Disassembled, altered, tampered, repaired or worked on by persons unauthorized by **Spellman**;
- subjected to misuse, negligent handling, or accident not caused by the power supply;
- installed, connected, adjusted, or used other than in accordance with the original intended application and/or instructions furnished by **Spellman**.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THOSE OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

The buyer's sole remedy for a claimed breach of this warranty, and **Spellman's** sole liability is limited, at **Spellman's** discretion, to a refund of the purchase price or the repair or replacement of the power supply at **Spellman's** cost. The buyer will be responsible for shipping charges to and from **Spellman's** plant. The buyer will not be entitled to make claim for, or recover, any anticipatory profits, or incidental, special or consequential damages resulting from, or in any way relating to, an alleged breach of this warranty.

No modification, amendment, supplement, addition, or other variation of this warranty will be binding unless it is set forth in a written instrument signed by an authorized officer of **Spellman**.

Factory Service Procedures

For an authorization to ship contact **Spellman's** Customer Service Department. Please state the model and serial numbers, which are on the plate on the rear panel of the power supply and the reason for return. A Return Material Authorization Code Number (RMA number) is needed from **Spellman** for all returns. The RMA number should be marked clearly on the outside of the shipping container. Packages received without an RMA Number may delay return of the product. The buyer shall pay shipping costs to and from **Spellman**. Customer Service will provide the Standard Cost for out-of-warranty repairs. A purchase order for this amount is requested upon issuance of the RMA Number (in-warranty returns must also be accompanied by a "zero-value" purchase order). A more detailed estimate may be made when the power supply is received at **Spellman**. In the event that the cost of the actual repair exceeds the estimate, **Spellman** will contact the customer to authorize the repair.

Factory Service Warranty

Spellman will warrant for three (3) months or balance of product warranty, whichever is longer, the repaired assembly/part/unit. If the same problem shall occur within this warranty period **Spellman** shall undertake all the work to rectify the problem with no charge and/or cost to the buyer. Should the cause of the problem be proven to have a source different from the one that has caused the previous problem and/or negligence of the buyer, **Spellman** will be entitled to be paid for the repair.

Spellman Worldwide Service Centers

For a complete listing of **Spellman's** Global Service facilities please go to:
<http://www.spellmanhv.com/customerservice/service.asp>