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ULTRAVOLT'S HV RACK®

Power Supply



INSTALLATION INSTRUCTIONS AND OPERATOR'S MANUAL

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PART 1

SAFETY AND WARRANTY INFORMATION

GENERAL SAFETY SUMMARY

Read all installation, operation, and safety instructions	Prior to operation, thoroughly review all safety, installation, and operating instructions accompanying this equipment. All instructions must be followed.
Use supplied power cord	To avoid electrical or fire hazard, use only the power cord specified for this product.
Use a properly wired electrical service outlet	Connect the power cord only to a properly wired and grounded outlet.
Do not use AC power extension cord	Do not use an extension cord when connecting this equipment to an AC power source. An outlet socket must be located near the equipment and must be easily accessible.
This equipment must be connected to an earth safety ground	This product is grounded through the grounding conductor of the power cord. To avoid fire and electrical hazard, the grounding conductor must be connected to protective earth ground. Before making connections to the input or output terminals of this product, ensure the product is properly grounded.
Use UltraVolt-approved connectors and/or cable assemblies	When configuring external cable assemblies, it is strongly recommended end users use only those connectors and/or cable assemblies approved by UltraVolt.
Connect external system grounds	All external system device chassis should be connected to the HV Rack system's rear-panel system grounding stud.
Do not operate without protective covers in place	To avoid electric shock or fire hazard, do not operate this product with covers or panels removed.
Do not modify the unit	Do not make any external or internal modifications to this unit.
Use properly rated fuse	To avoid fire hazard, use only the fuse type and rating specified for this product.
Do not operate in wet/damp conditions	To avoid electric shock hazard, do not operate this product in wet or damp conditions.
Avoid exposed connections	Do not touch exposed connections when power is present.
Service is to be performed by factory-qualified service persons only	All servicing on this equipment must be carried out by factory-qualified service personnel only.
Disconnect power before servicing	To avoid electric shock hazard, disconnect the main power by means of the power switch and power cord prior to servicing.
Installation shall be by a qualified high-voltage equipment technician	This product must only be installed by a qualified high-voltage equipment technician.
May be rack mounted	Rack mounting of this equipment must conform to the manufacturer's recommendations.
Do not block chassis ventilation openings	Slots and openings in the chassis are provided for ventilation purposes to prevent overheating of the equipment and must not be restricted.
Check for signs of visible damage each time before operating	If any external physical damage is observed to the equipment or interconnecting cables, do not operate.

PART 1

SAFETY TERMS AND SYMBOLS

CAUTION:	Caution statements identify conditions or practices that, if not avoided, can result in personal injury and/or damage to the equipment or other property.
WARNING:	Warning statements identify conditions or practices that, if not avoided, can result in personal injury or loss of life, and/or damage to equipment or other property.
DANGER:	Danger statements identify conditions or practices that present an immediate danger and, if not avoided, will result in personal injury or loss of life.
	Attention symbol: Indicates important installation, operating, and/or maintenance instructions.
	Shock Hazard symbol: Indicates risk of electric shock.
	Shock Hazard label. Indicates risk of electric shock and is located on the equipment itself.
	Protective Earth Ground symbol, internal: Indicates primary protective earth ground, internal to the equipment.
	System Earth Ground symbol, external: Indicates system earth ground.

PART 1

ULTRAVOLT INC, BASIC WARRANTY

WARRANTY: The Seller warrants all goods supplied hereunder will conform to any sample approved by the parties and will be the kind described herein or in any specification, performance requirement, or drawing approved by the Seller, and will be of merchantable quality and free from defects in material or workmanship under normal use and prescribed maintenance for a period of one (1) year from the date of shipment. To the extent the Buyer does not furnish the Seller with written specifications, the goods will be manufactured in accordance with industry accepted standards. This warranty shall not apply to any goods delivered hereunder that have been damaged or subjected to alteration, nor shall it apply to negligent treatment after delivery or to any defects attributed to artwork or drawings furnished by the Buyer. Also, unless specifically stated, the warranty does not extend to the electrical performance of any assemblies or subassemblies to which the goods furnished hereunder are affixed, but is restricted to the electrical continuity properties of such goods.

The Seller's only obligation for breach of this warranty shall be the repair or replacement, without charge, of any goods or parts thereof that within such one (1) year period is proven to the Seller's satisfaction to have been defective, provided (1) the Buyer shall have notified the Seller of the defect within such one (1) year period, and (2) the Seller shall have the option of requiring the return of the defective material or goods at the Buyer's expense to establish the claim provided; however, the Seller will bear any transportation costs incurred in repairing or replacing any goods that are shown to be defective during the warranty period. The cost of any repairs made by the Seller to goods no longer covered by this warranty shall be borne by the Buyer. The Buyer must contact the UltraVolt Customer Service Department prior to the return of any material(s) to obtain an RMA number which will be used to track the material. Material found to be out of warranty will be repaired or replaced at the Seller's discretion based on quantity (please contact the Customer Service Department for more information). The Seller shall in no event be liable for the Buyer's manufacturing costs, lost profits, good will, or any other special, consequential, incidental, or other damages resulting from a breach of the foregoing warranty. There are no other warranties expressed or implied (including the warranty of merchantability) that extend beyond the warranty set forth herein or that extend beyond the description of the goods contained herein.

We at UltraVolt know that when developing new high-voltage applications, power supplies may sometimes become unintentionally damaged. We, therefore, offer an enhanced warranty beyond the scope of our basic one-year warranty to support customers' efforts in new-product development. Should a power supply unintentionally fail or become damaged through incorrect application, UltraVolt will repair or replace the first unit at no charge during the Warranty period. Then, if the same unit is unintentionally damaged again while still within the warranty period, UltraVolt will provide another replacement at half price. For any such replacement, UltraVolt Applications Engineering must first review the customer's new product application. This is done to ensure mechanical installation and electrical connections are in accordance with UltraVolt published datasheets and application notes. The combined free replacement and expert UltraVolt engineering review is just one of many ways UltraVolt is ***Making High Voltage Easier!***®

PART 2

GENERAL INFORMATION

PRODUCT INFORMATION

UltraVolt's **HV Rack®** power supply is a fully featured, high-performance, configurable high-voltage chassis, providing an end user with the capability of independently controlling up to four channels of high-voltage outputs. Each channel can be configured to control any of the more than 400 UltraVolt high-voltage power supplies, up to 40kV and 250 watts per channel.

Features Include

- 1 to 4 independently configurable high-voltage output channels
- Voltage ranges from 0 to ±62VDC through ±40kV
- 4 to 250 watts per channel, up to 1000 watts total
- Independent adjustment of each channel, through manipulation of simple front-panel controls
- Independent Voltage and Current meters for each channel
- Independent latching 'enable' illuminated pushbutton switch for each channel
- Preset before and during bias capability
- Constant current/Constant voltage auto-crossover
- PLC Analog/Digital Remote operation capability
- Bench top or rack-mount installation

UltraVolt's **HV Rack** power supply is designed to meet numerous high-tech, high-voltage performance requirements. It is well suited for use within a research and development laboratory environment, and may also be used as an incoming inspection tool, for production test purposes, for new product development, for equipment calibration, or for other engineering and manufacturing related purposes.

The ***Standard Convenience*** of the **UltraVolt *HV Rack* power supply / UltraVolt high-voltage power supply** combination means new product development can move swiftly from prototype to market. When configuring an ***HV Rack*** power supply, an end user can select from any of over 600 ***Standard*** UltraVolt high-voltage power supplies. Once configured, a completely functional high-voltage power supply solution with short lead time is available for development purpose. When the new design is proven and verified through prototype functionality, the exact same high-voltage power supply used in the **UltraVolt *HV Rack* power supply** can be obtained for immediate use in the new product. This makes for unparalleled ***Convenience*** for new-product design through development to finished product.

PART 3

INSTALLATION

CAUTION: THIS PRODUCT MUST BE INSTALLED BY A QUALIFIED HIGH VOLTAGE TECHNICIAN ONLY

CAUTION: BEFORE ENERGIZING THE ULTRAVOLT **HV RACK®** POWER SUPPLY, THOROUGHLY REVIEW ALL INSTALLATION, OPERATION, AND SAFETY INSTRUCTIONS

WARNING: FAILURE TO INSTALL THE ULTRAVOLT **HV RACK** POWER SUPPLY CORRECTLY AND TO FOLLOW ALL OPERATING INSTRUCTIONS MAY CREATE AN ELECTRICAL SHOCK HAZARD, WHICH CAN RESULT IN PERSONAL INJURY OR LOSS OF LIFE, AND/OR DAMAGE TO EQUIPMENT OR OTHER PROPERTY

UNPACKING

When unpacking the equipment, ensure all packaging materials, tapes, and cartons have been removed. All ventilation openings in the chassis must be free of obstructions. Thoroughly inspect the equipment for damage that may have occurred during shipment. If such damage occurred, further inspection of packaging materials and cartons may be necessary. A claim must be filed immediately.

TABLETOP INSTALLATION

CAUTION: THE ULTRAVOLT ***HV RACK*** POWER SUPPLY MUST ONLY BE PLACED ON A BENCH TOP SURFACE DESIGNED FOR AND STURDY ENOUGH TO SUPPORT ITS WEIGHT.

WARNING: DO NOT OPERATE THE ULTRAVOLT ***HV RACK*** SYSTEM ON A METAL OR CONDUCTIVE BENCH TOP SURFACE. FAILURE TO FOLLOW THIS WARNING CAN RESULT IN PERSONAL INJURY OR LOSS OF LIFE

CAUTION: THE ULTRAVOLT ***HV RACK*** SYSTEM MUST ONLY BE INSTALLED AND OPERATED IN A LOCATION WHERE ADEQUATE VENTILATION IS ASSURED.

Should the end user decide to install the **UltraVolt *HV Rack*** power supply on a bench top surface, it should be located in an area where adequate ventilation is assured and where external cable connections will not be inadvertently disturbed, disconnected, or loosened. Place the unit, conveniently oriented, on a nonconductive bench top surface near a properly wired electrical outlet.

The **UltraVolt *HV Rack*** system has five factory-installed rubber feet mounted to the bottom of the chassis. All five rubber feet must be in place to support the weight of the unit adequately. Also, there are ventilation openings on all sides, the top, and the bottom of the **UltraVolt *HV Rack*** power supply, which must not be obstructed.

CAUTION: ULTRAVOLT'S **HV RACK** POWER SUPPLY CAN BE STACKED UP TO THREE HIGH, PROVIDED THE BOTTOM MOUNTED FACTORY-INSTALLED RUBBER FEET ARE IN PLACE. DO NOT STACK ANY OTHER EQUIPMENT OR PLACE ANY OTHER OBJECT ON TOP OF ULTRAVOLT'S **HV RACK** POWER SUPPLY.

RACK MOUNT INSTALLATION

CAUTION: CHASSIS SLIDE RAILS ARE RECOMMENDED WHEN INSTALLING THE ULTRAVOLT **HV RACK®** SYSTEM IN AN INDUSTRIAL RACK. THE **HV RACK** POWER SUPPLY SHOULD NOT BE MOUNTED OR SUPPORTED BY THE FRONT PANEL ALONE IF SUBJECTED TO HIGH VIBRATION OR SHOCK AS MIGHT OCCUR IN A MOBILE ENVIRONMENT, OR DURING TRANSPORT.

CAUTION: THE SLIDE RAILS AND MOUNTING HARDWARE SHOULD BE OF A TYPE OBTAINED THROUGH OR RECOMMENDED FOR USE BY ULTRAVOLT. USE OF INCORRECT SLIDE RAILS OR HARDWARE CAN RESULT IN PERSONAL INJURY AND/OR DAMAGE TO THE EQUIPMENT OR OTHER PROPERTY.

CAUTION: ULTRAVOLT'S **HV RACK** POWER SUPPLY MUST ONLY BE INSTALLED AND OPERATED IN A LOCATION WHERE ADEQUATE VENTILATION IS ASSURED.

Should the end user decide to install the **UltraVolt *HV Rack*** power supply in an industrial 19" rack, UltraVolt recommends using slide rails. The slide rails and mounting hardware should be of a type obtained through or recommended for use by UltraVolt and correctly sized to support the weight of the **UltraVolt *HV Rack*** power supply. Additionally, the screws used to attach the slide rails to either side of the ***HV Rack*** power supply must be of the correct length to prevent contact with internal components.

Each slide kit contains 1 pair of slides for the left and right side of the chassis. The slides are symmetrical and individual components can be used interchangeably. Each slide kit consists of four brackets, two slide sections (including two chassis inside sections), and hardware (figures 1, 2 and 3).

☐ 1) Fully extend each chassis slide assembly, pulling the chassis inside section (item 1) outwards until the chassis and the intermediate sections (item 2) lock into place.

☐ 2) Remove the chassis section by grasping the slide assembly and pressing the button lock on the outside of the chassis inside section. Pull the chassis inside section free.

☐ 3) UltraVolt's ***HV Rack*** system is equipped with PEM nut-mounting patterns on both sides to mount the rack slides' chassis sections. Mount the chassis inside sections to each side of the **UltraVolt *HV Rack*** power-supply chassis with four (4) each of the supplied 10-32x1/4 pan-head machine screws (item 10). When doing so, ensure the button stop on the end of the chassis inside section is oriented towards the rear of the system (figure 1).

☐ 4) Assemble the front-end brackets (item 4) to the outside of each slide (item 3) with four (4) supplied 10-32x1/2 pan-head machine screws, four (4) flat washers (item 15), and four (4) 10-32 locking nuts (item 21). Before tightening, ensure the two sections are aligned straight with one another and that the distance between the forward end of the front bracket and the forward end of the slide measures 3.89", as indicated (figure 2). Tighten all hardware.

☐ 5) Install the rear-end brackets (item 4) to the outside of each slide (item 3) with four (4) supplied 10-32x1/2 pan-head machine screws, four (4) flat washers (item 15), and four (4) 10-32 locking nuts (item 21). Do not tighten at this time.

☐ 6) Determine the height at which UltraVolt's ***HV Rack*** system is to be positioned in the industrial rack. Position and hold the previously assembled slide section with two attached end brackets in place, with the right angle slotted flange towards the inside edges of the industrial rack. Slip a 10-32x1/2 screw (item 11) through the front of the industrial rack-mounting edge and through the front slotted end flange. Secure with a split ring locking washer (item 16) and a nut (item 20), capturing the slotted flange between the nut and industrial rack-mounting inside edge. Repeat this for the rear bracket. Double up the fasteners on both the front and rear mounting screws; two screws in front and two in back for each side. Tighten all hardware.

☐ 7) Fully extend and lock the slide into place. With the help of an assistant, lift the **UltraVolt *HV Rack*** power supply, aligning the chassis inside sections with the extended slide sections and slip into place. Then, for full engagement, depress and hold the button safety locks on the inside sections and fully collapse the slide sections, easing the **UltraVolt *HV Rack*** power supply into place.

☐ 8) Secure the **UltraVolt *HV Rack*®** power supply front panel to the industrial rack using the supplied decorative head screws (item 12).

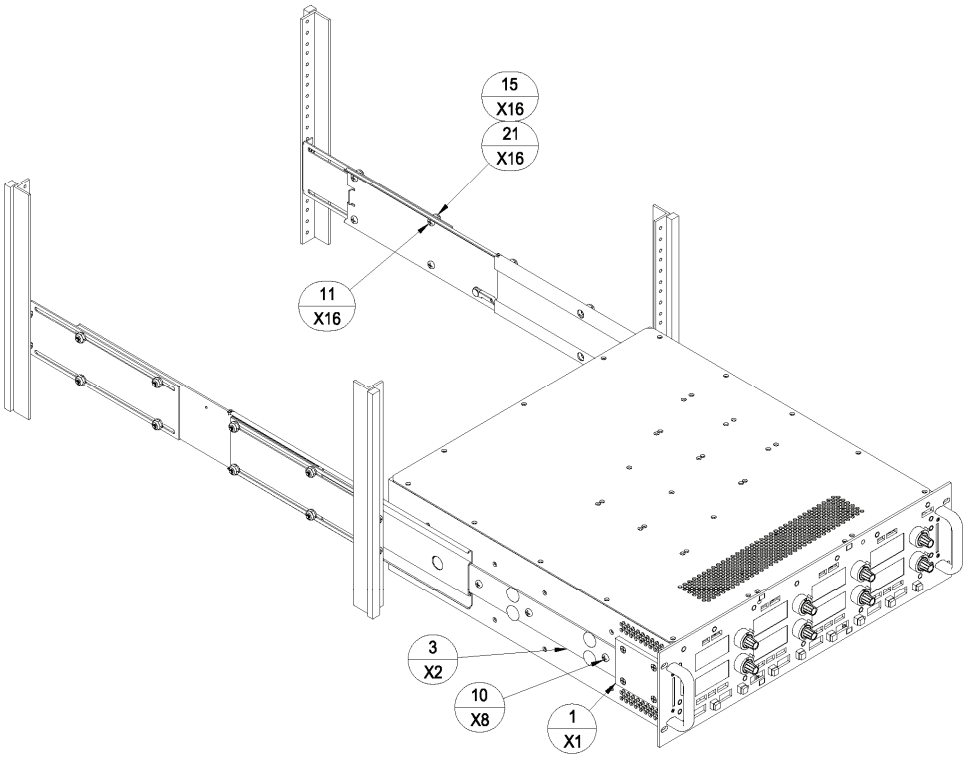


Figure 1

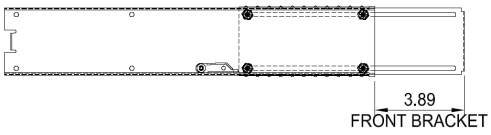


Figure 2

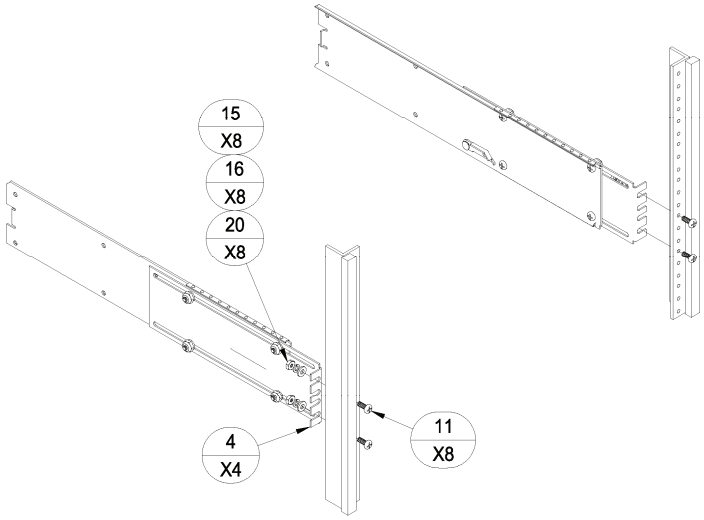


Figure 3

PART 4

ELECTRICAL CONNECTIONS



WARNING: THIS UNIT IS EQUIPPED WITH A THREE CONDUCTOR GROUNDED LINE CORD. THIS LINE CORD MUST BE USED WITH A PROPERLY WIRED GROUNDED RECEPTACLE, WHERE THE GROUNDING WIRE IS CONNECTED TO PROTECTIVE EARTH GROUND. FAILURE TO GROUND PROPERLY CAN RESULT IN PERSONAL INJURY OR LOSS OF LIFE AND/OR DAMAGE TO EQUIPMENT OR OTHER PROPERTY.



CAUTION: PRIOR TO MAKING ANY ELECTRICAL CONNECTIONS TO THE ULTRAVOLT **HV RACK®** POWER SUPPLY, ENSURE THE FRONT AND REAR PANEL POWER SWITCHES ARE IN THE OFF POSITION. FAILURE TO DO SO CAN RESULT IN PERSONAL INJURY AND/OR DAMAGE TO THE EQUIPMENT OR OTHER PROPERTY.

CABLES AND INTERCONNECTS

Prior to making any electrical connections, ensure that the **UltraVolt *HV Rack*** system is configured as follows:

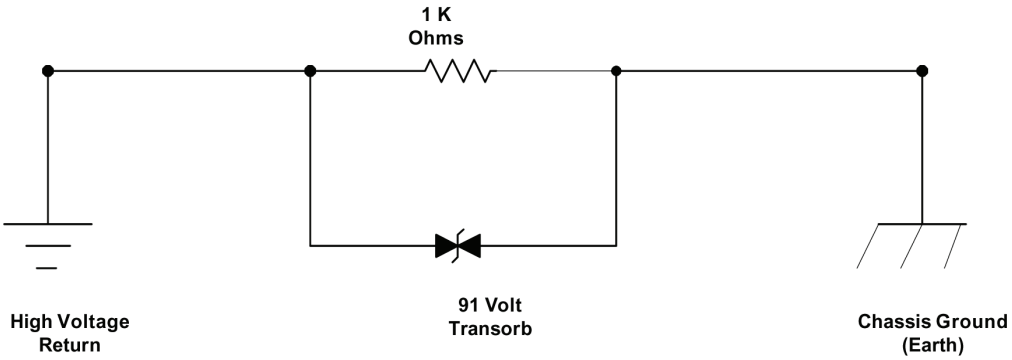
- ☐ Set the front panel power switch to OFF (zero)
- ☐ Set the rear panel power switch to OFF (zero)
- ☐ Set the front panel controls for all channels:
  - Voltage Programming Dial – Set to 0
  - Current Programming Dial – Set to 0
  - Channel Enable Button, *HV ON* – Set to OFF (out)

Connect external cable assemblies as required, depending upon the specific application. While doing so, ensure correct polarity is observed. Cable assemblies should only be of a type approved for use by Ultravolt.

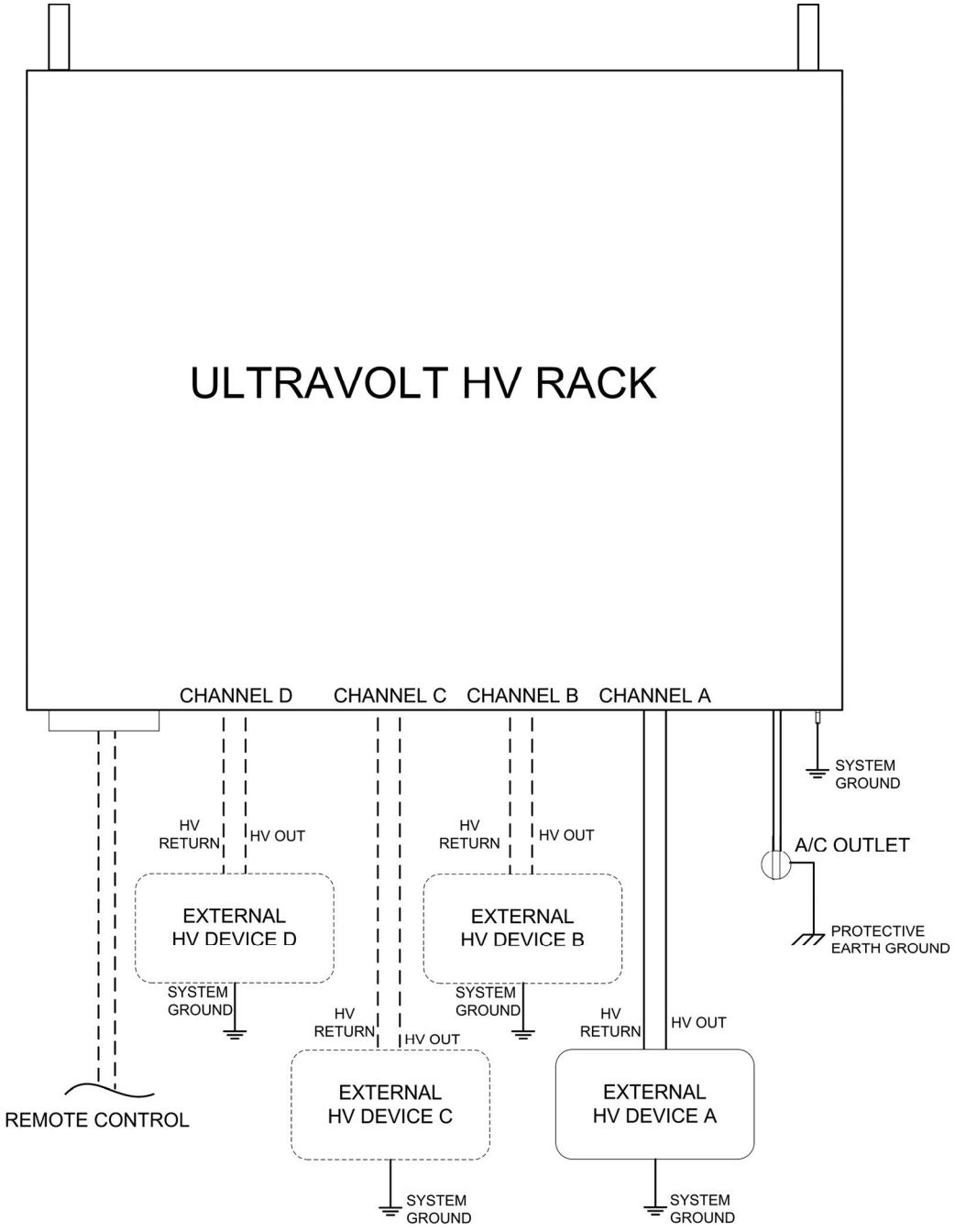
The standard high-voltage-return connection is a 2-way binding post, isolated from the **UltraVolt *HV Rack*** system's protective earth ground. High voltage return is referenced to earth ground through a 1kΩ impedance and clamped for electrical transients exceeding +/-91V. When making this connection, UltraVolt recommends using a ring lug rather than a banana plug to ensure a secure connection.

All external-device chassis grounds should be connected to the **UltraVolt *HV Rack*** power supply's system ground stud located on the rear panel using an appropriately sized and crimped ring lug.

Connect only the supplied line cord to the **UltraVolt *HV Rack*** system's rear-panel AC power entry module. Connect the other end to a properly rated and protected wired AC outlet. Ensure a functional protective earth ground has been established.


1 K
Ohms
High Voltage
Return
91 Volt
Transorb
Chassis Ground
(Earth)

TYPICAL SYSTEM WIRING DIAGRAM



PART 5

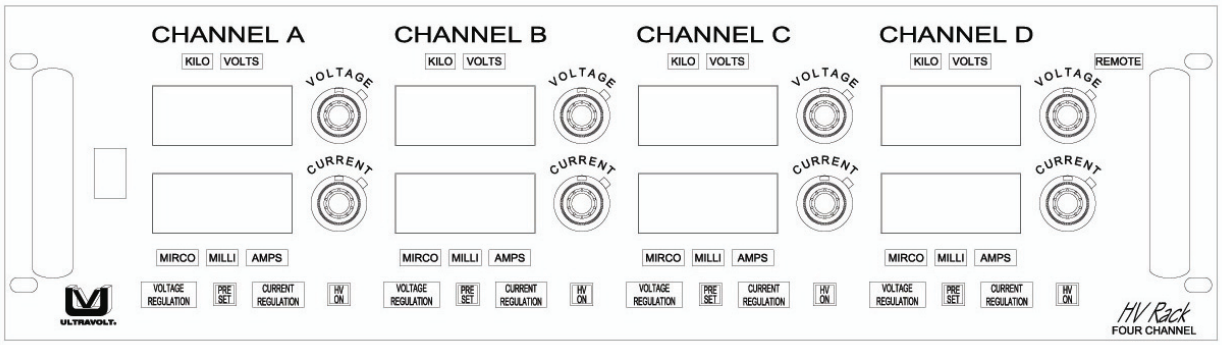
CONTROLS AND INDICATORS

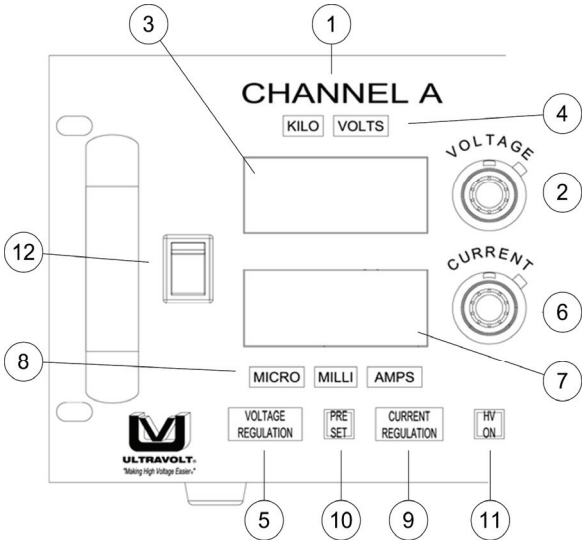
FRONT PANEL CONTROLS AND INDICATORS

UltraVolt's ***HV Rack®*** system can provide up to 4 channels of high-voltage power. The channels are configured at the factory to customer requirements. During operation, the output voltage and current for each channel can be individually set and monitored either through adjustment of the front-panel controls or remotely. Each channel also has an *HV ON* switch, which enables or disables the output. Voltage and current can be preset prior to enabling the output.

In addition to the individual channel controls, there are a *Front Panel AC Power Switch* that will disconnect the AC line and a remote indicator to show when the rear panel *Remote Control Selector DIP Switch* is in the 'remote' position. 'Local' setting enables all front-panel controls; 'remote' setting transfers all operation and programming functions to the rear-panel-mounted 37-pin 'D' connector.

(The following front-panel diagram shows a four-channel, configured **UltraVolt *HV Rack*** power supply and may differ from other configurations.)





1 Channel Identifier
2 Voltage Programming Dial
3 Voltage Monitor/Voltage Preset Meter
4 Voltage Scale Indicator
5 Voltage Regulation Indicator
6 Current Programming Dial
7 Current Monitor/Current Preset Meter
8 Current Scale Indicator
9 Current Regulation Indicator
10 Current/Voltage Preset Switch (momentary)
11 Channel Output Enable Switch, HV ON (latching)
12 Front Panel AC Power Switch

1) Channel Identifier

High-voltage output channels A, B, C, and D (corresponding to rear-panel channel markings A, B, C, and D).

2) Voltage Programming Dial

This is a ten-turn locking control. When used in conjunction with the *Current/Voltage Preset Switch (momentary)*, it varies and sets the high-voltage output for the associated channel. Output voltage can be set prior to enabling the output, depending on the status of *HV ON* (*HV ON* switch, item 11).

3) Voltage Monitor/Voltage Preset Meter

Each channel has a 4½-digit LED display to indicate either actual output voltage or preset voltage, depending upon the position of the *Current/Voltage Preset Switch (momentary)* (item 10). The indicated output voltage is derived from the high-voltage monitor signal on the UltraVolt power supply and is scaled and calibrated to within 1% of full scale.

4) Voltage Scale Indicator

Each channel has illuminated indicators for voltage scale. The indicators will light with either "VOLTS" or "KILO VOLTS," depending upon channel configuration, which is preset at the factory. The indicators are illuminated whenever the chassis main power is on.

5) Voltage Regulation Indicator

Each channel has an indicator that, when lit, indicates the channel is in voltage regulation mode. Either the *Voltage Regulation Indicator* or the *Current Regulation Indicator* will illuminate, depending upon output load and upon the programmed settings for voltage and current. The status is selected automatically by the ***HV Rack®*** power supply's "automatic-crossover*"* capability. This indicator is inactive when the channel's high-voltage output is disabled.

6) Current Programming Dial

This is a ten-turn locking control. When used in conjunction with the *Current/Voltage Preset Switch (momentary)*, this dial varies and sets the maximum output current for the associated channel. Output current can be set prior to enabling the output, depending on the status of *HV ON* (*HV ON* switch, item 11).

7) Current Monitor/Current Preset Meter:

Each channel has a 4½-digit LED display to indicate either actual output current or preset current, depending upon the position of the *Current/Voltage Preset Switch (momentary)*. The indicated output current is derived from the current monitor on the UltraVolt power supply and is scaled and calibrated to eliminate any offsets.

8) Current Scale Indicator

Each channel has illuminated indicators for current scaling. The indicators will light "AMPS," "MILLI AMPS," or "MICRO AMPS," depending upon channel configuration, which is preset at the factory. The indicators are illuminated whenever the chassis main power is on.

9) Current Regulation Indicator

Each channel has an indicator that, when lit, indicates the channel is in current regulation mode. Either the *Voltage Regulation Indicator* or the *Current Regulation Indicator* will illuminate, depending upon output load and the programmed settings for voltage and current. The status is selected automatically by the **UltraVolt *HV Rack*** power supply's "automatic-crossover*"* capability. This indicator is inactive when the channel's high-voltage output is disabled.

10) Current/Voltage Preset Switch

The *Current/Voltage Preset Switch (momentary)* is used to display or to both display and change the voltage and current program settings for each channel. When pressed and held, voltage and current set points are displayed. When pressed and held while manipulating either the *Voltage* or *Current Programming Dial (items 2 and 6)*, the set points can be adjusted. Releasing the *Current/Voltage Preset Switch (momentary)* returns the voltage and current meters to output monitor. Voltage and current can be adjusted when the output is either enabled or disabled, depending on the status of *HV ON* (*HV ON* switch, item 11).

11) Channel Output Enable Switch, HV ON

When the pushbutton *HV ON* (latching) switch is depressed, the switch illuminates and the high-voltage output for that channel is enabled.

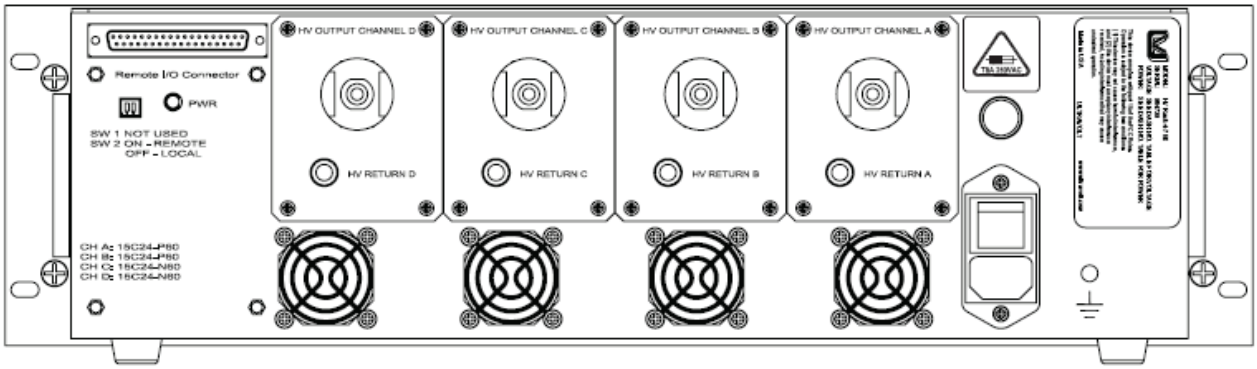
12) Front Panel AC Power Switch

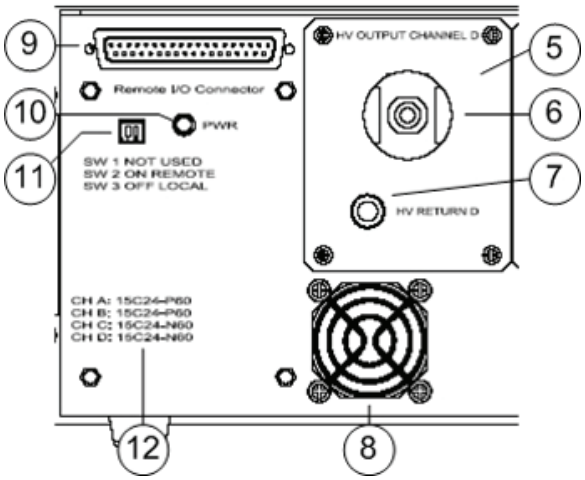
This is the front-panel AC power switch (there is a *Rear Panel Main AC Power Switch* as well). This switch must be "ON" (On = 1) for the **UltraVolt *HV Rack*®** power supply to be functional. (Both rear- and front-panel AC switches must be on).

REAR PANEL CONNECTIONS, CONTROLS AND INDICATORS

The ***HV Rack*** system can provide up to 4 channels of high-voltage power (configurations vary). Each channel has an inline cooling fan and a configurable high-voltage-output connector plate. The plate is used to mount the high-voltage-output and high-voltage-return connectors. The actual connectors can vary and are custom configured for each system. A rear-panel remote/local control DIP switch can be used to enable remote control by transferring front-panel control and programming functions to the 37-pin 'D' connector on the rear panel.

(The following rear-panel diagram shows a four-channel configured **UltraVolt *HV Rack*** system and may differ from other configurations.)





1	Fuse
2	Rear Panel Main AC Power Switch
3	Power Entry Module
4	System Ground
5	Configurable Connector Plate
6	HV Output Connector
7	HV Return Ground Binding Post
8	Cooling Fan
9	Remote Control Connector
10	Remote Control LED indicator
11	Remote Control Selector DIP Switch
12	Rack Configuration Label

1) Fuse

AC protective fuse

2) Rear Panel Main AC Power Switch

This is the rear-panel main AC power switch (there is a second AC power switch located on the front panel as well). This switch must be "ON" (On = 1) for the ***UltraVolt HV Rack*** power supply to be functional (both rear- and front-panel AC switches must be on).

3) Power Entry Module

The ***HV Rack*** system is equipped with a filtered power-entry module, IEC 320/C20 inlet.

4) System Ground

The **UltraVolt *HV Rack*** system is equipped with a ¼" x 20-thread, ½"-long, 18-8, stainless-steel ground stud. This is used for connecting the ***HV Rack*** power supply's chassis to system ground.

5) Configurable Connector Plate

UltraVolt's *HV Rack* power supply is equipped with a configurable output plate for each channel. Each plate is custom configured based upon customer requirement and consists of a high-voltage connector and high-voltage return for each channel. Both connectors are isolated from chassis ground.

6) HV Output Connector

The standard high-voltage connector is an Alden B110YX, rated 40kV (other connectors are available). This connector is internally wired to the UltraVolt high-voltage-power-supply output for the indicated channel.

7) HV Return Ground Binding Post

The standard high-voltage return is a 2-way binding post, isolated from chassis ground. This connector is internally wired to the UltraVolt high-voltage-power-supply return for the indicated channel. High voltage return is referenced to earth ground through a 1kΩ impedance and clamped for electrical transients exceeding +/-91V. UltraVolt recommends using a ring lug to secure the HV return so it cannot inadvertently become disconnected.

8) Cooling Fan

The ***HV Rack*** power supply has four cooling fans mounted on the rear panel. Air is drawn in from the back and is blown through the equipment.

9) Remote Control Connector

The **UltraVolt *HV Rack*** system is equipped with remote control capability via a rear-panel, 37-pin 'D' female connector (Metal shell connected to the chassis). The *Remote/Local Selector DIP Switch*, when correctly set, enables remote control. Active remote control is indicated by a green status LED on the rear panel (and by a remote indicator on the front panel). Through remote control connection, each of up to four channels' signals can be individually controlled and monitored including the following: output enable, voltage programming, current programming, voltage monitor, and current monitor. In addition, there is a 'global output enable' signal, which will enable/disable all channels simultaneously.

10) Remote Control LED indicator

This indicator illuminates when remote control is enabled.

11) Remote Control Selector Switch

When correctly set; this switch enables remote control of the **UltraVolt *HV Rack*** power supply. Switch 2 ON (on = 1), enables remote control. Switch 2 OFF (off = 0) disables remote control. Switch 1 is not currently used.

12) Rack Configuration Label

This label indicates which model of UltraVolt high-voltage power supply is installed in each channel of this **UltraVolt *HV Rack*** system.

PART 6

OPERATION



WARNING: PRIOR TO APPLYING POWER TO THE SYSTEM, ENSURE ALL CONNECTIONS ARE PROPERLY TERMINATED. FAILURE TO WIRE CORRECTLY CAN RESULT IN PERSONAL INJURY OR LOSS OF LIFE, AND/OR DAMAGE TO EQUIPMENT OR OTHER PROPERTY.

OPERATION USING FRONT PANEL CONTROLS

Prior to powering on the ***HV Rack***® power supply, ensure the front panel controls for each channel are set as follows:

Voltage Programming Dial – Set to 0
Current Programming Dial – Set to 0
Channel Output Enable *HV ON* – Set to OFF (off = out)

The **UltraVolt *HV Rack*** system has two AC power switches: one located on the rear panel and one located on the front panel. Both must be ON (on = 1) to enable the internal power supply.

Apply AC power by individually toggling both the front- and rear-panel AC power switches to the ON position. No high-voltage output should be present on any channel at this time, and the *HV ON* latching switch should not be lit. 'Power on' will be indicated by the illumination of both the *Voltage Monitor/Voltage Preset Meter* and the *Current Monitor/Current Preset Meter* for all channels. Each display will typically read 0000 (null). Additionally the *Voltage Scale Indicator* will light with either "VOLTS" or "KILO VOLTS," and the *Current Scale Indicator* will light with any of "AMPS," "MILLI AMPS," or "MICRO AMPS" (ranges are factory preset).

Select a channel to work with, then press and hold the *Current/Voltage Preset Switch (momentary)*. Adjust the *Voltage Programming Dial* until the desired voltage is obtained, as displayed on the *Voltage Monitor/Voltage Preset Meter*. While still holding the *Current/Voltage Preset Switch*, adjust the *Current Programming Dial* until the desired current is obtained, as displayed on the *Current Monitor/Current Preset Meter*. Release the switch; voltage and current values have now been programmed into the **UltraVolt *HV Rack*** system for that channel.



DANGER: PRESSING THE *HV ON* SWITCH AT THIS TIME WILL ACTIVATE AND ENABLE THE HIGH-VOLTAGE OUTPUT FOR THAT CHANNEL. FAILURE TO ADHERE TO ANY PREVIOUS INSTALLATION OR OPERATING INSTRUCTIONS – OR IN ANY WAY ACTING IN AN UNSAFE MANNER WHILE AROUND THE EQUIPMENT – CAN PRESENT AN IMMEDIATE DANGER, WHICH IF NOT AVOIDED CAN RESULT IN PERSONAL INJURY OR LOSS OF LIFE.

Press and release the *HV ON* pushbutton switch for the desired channel. The switch will latch recessed into place and illuminate. The high-voltage output for that channel will now be active and enabled. The *Voltage Monitor/Voltage Preset Meter* will display the actual output voltage, and the *Current Monitor/Current Preset Meter* will display the actual output current.

Either the *Voltage Regulation Indicator* or the *Current Regulation Indicator* will be illuminated. The status is dependent upon output load and voltage/current preset settings and is automatically determined by the ***HV Rack*** power supply's 'automatic-crossover' feature.

Each output can be adjusted in real time simply by manipulating the respective channel's *Voltage Programming Dial* or *Current Programming Dial*. Alternatively, each output can be preset using the *Voltage Programming Dial* or *Current Programming Dial* in conjunction with the *Current/Voltage Preset Switch*. The voltage and current meters will display the actual values as they change.

OPERATION USING REMOTE CONTROL



WARNING: ENABLING REMOTE CONTROL DISABLES FRONT-PANEL CHANNEL CONTROLS: *HV ON, VOLTAGE PROGRAMMING DIAL, CURRENT PROGRAMMING DIAL*, *VOLTAGE/CURRENT PRESET SWITCH*. PRIOR TO APPLYING AC POWER TO THE HV RACK POWER SUPPLY, ENSURE THE EXTERNAL CONTROLLER IS FUNCTIONING AND COMMUNICATING PROPERLY WITH THE HV RACK POWER SUPPLY AND IT IS IN A KNOWN STATE OF OPERATION AND CONTROL. FAILURE TO DO SO MAY CREATE A CONDITION THAT CAN RESULT IN PERSONAL INJURY OR LOSS OF LIFE AND/OR DAMAGE TO EQUIPMENT OR OTHER PROPERTY.

All functions of the **UltraVolt *HV Rack*®** power supply can be controlled remotely through use of the 37-pin *Remote Control Connector* mounted on the rear panel. Remote control is enabled by setting the *Remote Control Selector DIP Switch* (see rear-panel figure for the location of the DIP switch). To enable, set the rear-panel DIP switch 2 to ON (on = 1) prior to applying AC power. When remote is enabled, the status indicator, 'remote,' located on the upper right-hand corner of the front panel will illuminate.

Appendix B of this manual describes the I/O control and status signals accessible on each pin of the 37-pin connector. It is the responsibility of the end user to wire the interface connector correctly and, importantly, to understand the functionality of each I/O control and status signal as it applies to the operation and use of the **UltraVolt *HV Rack*** system in its intended application. The end user is encouraged to consult with an UltraVolt Customer Service Department Applications Engineer. The following is a description of the I/O control and status signals available for each channel:

Remote Enable A {B/C/D}: This is a digital input signal, TTL level, that when asserted True (+5VDC) enables the high voltage output. It performs the same function as the front-panel switch, *HV ON*. When a channel is remotely enabled, the *Channel Output Enable Switch, HV ON* for that channel will illuminate. Output voltage and current can be programmed prior to enabling the high-voltage output remotely. Once the high-voltage channel has been enabled, either the *Voltage Regulation Indicator* or *Current Regulation Indicator* will illuminate on the front panel. Which indicator is illuminated is dependent upon output load and voltage/current preset settings and is automatically determined by the **UltraVolt *HV Rack*** system's '*automatic-crossover'* feature.

Remote Voltage Adj A {B/C/D}: This is an analog input signal and is used to adjust the high-voltage output voltage. A DC voltage can be applied within the range of 0VDC thru 5VDC, representing a high-voltage output swing of 0% V_{out} thru 108% V_{out} with 4.64VDC input equal to 100% V_{out}. The ***HV Rack*** power supply's front-panel *Voltage Monitor/Voltage Preset Meter* and the *Voltage Scale Indicator* will display the actual voltage.

Remote Current Adj A {B/C/D}: This is an analog input signal and is used to adjust the high-voltage output current. A DC voltage can be applied within the range of 0VDC thru 5VDC, representing an output current swing of 0% I_{out} thru 108% I_{out}, with 4.64VDC input equal to 100% I_{out}. The **UltraVolt *HV Rack*** system's front-panel *Current Monitor/Current Preset Meter* and *Current Scale Indicator* will display the actual current.

Remote Voltage Monitor A {B/C/D}: This is a scaled analog output signal and can be used to monitor the high-voltage output voltage remotely. The signal's range is 0VDC thru 5VDC, representing an output voltage swing of 0% V_{out} thru 108% V_{out} with 4.64VDC output equal to 100% V_{out}.

Remote Current Monitor A {B/C/D}: This is a scaled analog output signal and can be used to monitor the high-voltage output current remotely. The signal's range is 0VDC thru 5VDC, representing an output current swing of 0% I_{out} thru 108% I_{out} with 4.64VDC output equal to 100% I_{out}.

Reference Voltage A {B/C/D}: This is a 5VDC precision output reference and can be used as a source voltage to control the *Remote Voltage Adj A* {B/C/D} and the *Remote Current Adj A* {B/C/D} remote-input signals.

Signal Ground A {B/C/D}: This is signal return ground for Channel A {B/C/D}.

In addition to individual channel I/O control and status signals, there is a *Global Disable* signal:

Global Disable {channels A, B, C, and D}: This is a digital input signal, TTL level, that when asserted True (+5VDC) disables all high-voltage outputs; when asserted False (0VDC), it enables all high-voltage outputs.

A +15VDC, 100mA power tap and return is also available on the remote connector. It can be used to power external circuitry.

PART 7

MAINTENANCE AND CALIBRATION



WARNING: ATTEMPTING TO REPAIR, MODIFY, OR IN ANY WAY TAMPERING WITH THE ULTRAVOLT HV RACK® POWER SUPPLY WILL VOID THE WARRANTY AND CAN CREATE A DANGEROUS CONDITION WHICH CAN RESULT IN PERSONAL INJURY AND/OR DAMAGE TO EQUIPMENT OR OTHER PROPERTY

MAINTENANCE

The **UltraVolt *HV Rack*** system is designed for years of reliable operation. Under normal operating conditions, it should not require any maintenance except for occasional external cleaning. If any question should arise, contact UltraVolt's Customer Service Department to speak with an Applications Engineer.

ROUTINE CLEANING

All ventilation openings – top, bottom, sides, and rear panel – should be checked periodically and kept free of dust and other obstructions. A vacuum may be used to clean these vents when the unit is powered off. Do not use compressed air to clear the vents.

The front panel may be cleaned periodically with a lint-free cloth and mild isopropyl alcohol solution, when the unit is powered off.

CALIBRATION

Under normal operating conditions, the **UltraVolt *HV Rack*** power supply should not require calibration. However, it can be returned to the factory for complete electrical and mechanical inspection. Also, if required, an NIST certificate can be issued for traceability. Contact UltraVolt's Customer Service Department for additional information.

APPENDIX A

SPECIFICATIONS

CAUTION: ALL SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE. CUSTOMERS ARE NOT NOTIFIED WHEN CHANGES OCCUR UNLESS THEY HAVE ARRANGED FOR CONFIGURATION CONTROL WITH ULTRAVOLT'S CUSTOMER SERVICE DEPARTMENT ("CSD") THROUGH THE "-Q" SUFFIX PROGRAM. ONLY THOSE ITEMS OF GREATEST SIGNIFICANCE WILL BE POSTED ON ULTRAVOLT'S WEB SITE, IN THE PRODUCT-CHANGE NOTICE SECTION.

Since each channel of the **UltraVolt *HV Rack*®** system is custom configured with a specific model of ***UltraVolt*®** high-voltage power supply, the end user should refer to UltraVolt's datasheet for the electrical specifications of that model.

Storage Temperature

Storage temperature range is -40C° to +85C°.

Operating Altitude, Humidity & Temperature:

UltraVolt *HV Rack* Series operating performance is guaranteed between sea level and 10,000ft in non-condensing relative humidity up to 95% between temperatures of +10°C and +45°C.

Shock and vibration

TBD

AC Power

The AC operating voltage and power rating is system configuration dependant as indicated in the following table:

System configuration	Voltage	Max rating power	Frequency	Fuse
X-250	115/230 VAC	375W	50/60Hz	T8A 250VAC
X-500	115/230 VAC	750W	50/60Hz	T8A 250VAC
X-750	230 VAC	1125W	50/60Hz	T8A 250VAC
X-1000	230 VAC	1500W	50/60Hz	T8A 250VAC

Fuse

AC power is fused through a 5mm x 20mm, time-delay fuse located on the rear panel. The fuse must always be replaced with the same type and rating, as per the **UltraVolt *HV Rack*** power supply rating label.

HV connectors

The **UltraVolt *HV Rack*** system is equipped with a configurable output plate for each high-voltage output channel. Each rack can have custom-configured high-voltage output and return connectors, according to customer requirement. The basic **UltraVolt *HV Rack*** system includes Alden B110YX 40kV industrial high-voltage output connectors and a two-way binding post return for each channel.

Package

Chassis dimensions: 17.00" wide x 18.50" deep x 5.00" high (431,8 x 469,9 x 127,0mm). Width is measured chassis side to opposite side; depth is measured from the back of the front-panel mounting flange to chassis rear and does not include rear-panel connector protrusion; height is measured chassis top to chassis bottom and does not include the height of rubber feet mounted on the bottom.

Front-panel dimensions: 19.00” wide x 0.125” deep x 5.25” high (3U) (482,60 x 3,18 x 133,35mm). These measurements do not include handles or controls. Front-panel mounting holes are configured for both #10-32 and M6 rack configurations.

Weight: Approximately 30 pounds (11,2kg), configuration dependent; approximately 40 pounds (14,93kg) shipping.

APPENDIX B

REAR PANEL REMOTE CONTROL INTERFACE CONNECTOR PINOUT

Pin Number	Signal Name	Function	Parameter
1	Remote Enable A	Input, TTL high to enable, low to disable Channel A	Default is disable via internal pull down
2	Remote Voltage Adj A	Input, Voltage Programming for Channel A	0V to 4.64V = 0V to 100% V_{out} (5V = 108% V_{out})
3	Voltage Monitor A	Output, Scaled Voltage Monitor for Channel A	0V to 4.64V = 0V_{out} to 100% V_{out} (5V = 108% V_{out})
4	Remote Current Adj A	Input, Current Programming for Channel A	0V to 4.64V = 0A to 100% I_{out} (5V = 108% I_{out})
5	Current Monitor A	Output, Current Monitor for Channel A	0V to 4.64V = 0A to 100% I_{out} (5V = 108% I_{out})
6	Reference Voltage A	Output, 5V precision voltage reference returned to signal ground A	
7	Signal Ground A	Signal Ground for Channel A	
8	Remote Enable B	Input, TTL high to enable, low to disable Channel B	Default is disable via internal pull down
9	Remote Voltage Adj B	Input, Voltage Programming for Channel B	0V to 4.64V = 0V to 100% V_{out}. (5V = 108% V_{out})
10	Voltage Monitor B	Output, Scaled Voltage Monitor for Channel B	0V to 4.64V = 0V_{out} to 100% V_{out} (5V = 108% V_{out})
11	Remote Current Adj B	Input, Current Programming for Channel B	0V to 4.64V = 0A to 100% I_{out} (5V = 108% I_{out})
12	Current Monitor B	Output, Current Monitor for Channel B	0V to 4.64V = 0A to 100% I_{out} (5V = 108% I_{out})
13	Reference Voltage B	Output, 5V precision voltage reference returned to signal ground B	
14	Signal Ground B	Signal Ground for Channel B	
15	Remote Enable C	Input, TTL high to enable, low to disable Channel C	Default is disable via internal pull down
16	Remote Voltage Adj C	Input, Voltage Programming for Channel C	0V to 4.64V = 0V to 100% V_{out}. (5V = 108% V_{out})
17	Voltage Monitor C	Output, Scaled Voltage Monitor for Channel C	0V to 4.64V = 0Vo to 100% V_{out} (5V = 108% V_{out})
18	Remote Current Adj C	Input, Current Programming for Channel C	0V to 4.64V = 0A to 100% I_{out} (5V = 108% I_{out})
19	Current Monitor C	Output, Current Monitor for Channel C	0V to 4.64V = 0A to 100% I_{out} (5V = 108% I_{out})
20	Reference Voltage C	Output, 5V precision voltage reference returned to signal ground C	
21	Signal Ground C	Signal Ground for Channel C	
22	Remote Enable D	Input, TTL high to enable, low to disable Channel D	Default is disable via internal pull down
23	Remote Voltage Adj D	Input, Voltage Programming for Channel D	0V to 4.64V = 0V to 100% V_{out}. (5V = 108% V_{out})
24	Voltage Monitor D	Output, Scaled Voltage Monitor for Channel D	0V to 4.64V = 0V_{out} to 100% V_{out} (5V = 108% V_{out})
25	Remote Current Adj D	Input, Current Programming for Channel D	0V to 4.64V = 0A to 100% I_{out} (5V = 108% I_{out})
26	Current Monitor D	Output, Current Monitor for Channel D	0V to 4.64V = 0A to 100% I_{out} (5V = 108% I_{out})
27	Reference Voltage D	Output, 5V precision voltage reference returned to signal ground D	
28	Signal Ground D	Signal Ground for Channel D	
29	Not Used		
30	Not Used		
31	Not Used		
32	Not Used		
33	Not Used		
34	Not Used		
35	+15V, 100mA power	Output, Power supply for low power external circuitry	
36	Power Ground	Return for +15V	
37	Global Disable	Input, TTL signal disables all Channels, low to enable, high to disable.	Default is ENABLE.

APPENDIX C

REGULATORY

NRTL: Pending

UL 61010-1, REVISION 4

ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL, AND LABORATORY USE

FCC:

47CFR15 - SUBPART B

UNINTENTIONAL RADIATORS

Compliance Statement:

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

CSA:

CSA C22.2 #61010-1, REVISION 04 – Pending

ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL, AND LABORATORY USE

CSA ICES-003 ISSUE 4

DIGITAL APPARATUS

Compliance Statement:

This Class A digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

EU DIRECTIVES:

93/68/EEC – Pending

CE MARKING DIRECTIVE AMENDMENT

CE

73/23/EEC – Pending

ELECTRICAL EQUIPMENT DESIGNED FOR USE WITHIN CERTAIN VOLTAGE LIMITS (LOW VOLTAGE DIRECTIVE)

2004/108/EC

ELECTROMAGNETIC COMPATIBILITY

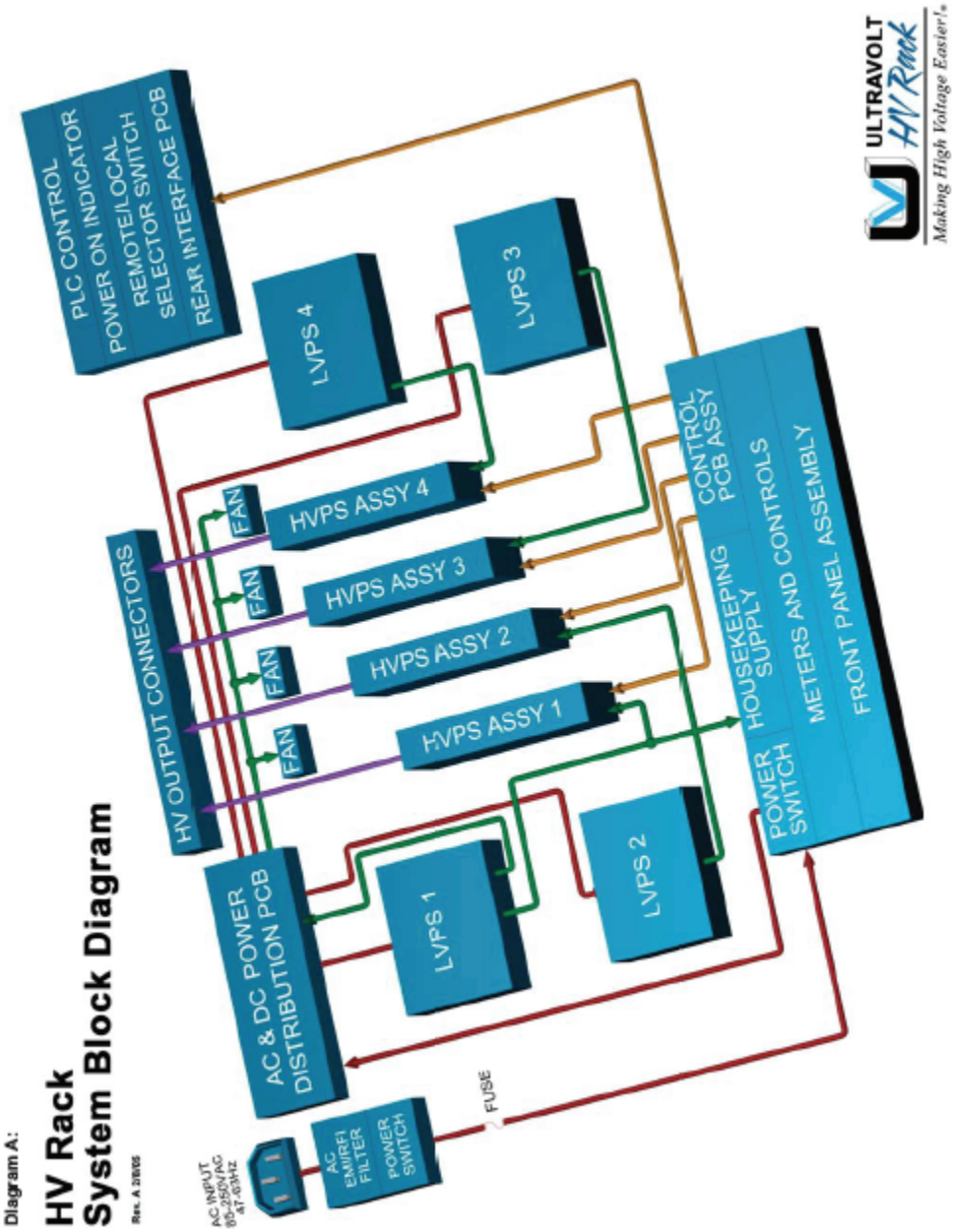
2002/96/EC – Pending

WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE)



APPENDIX D

ULTRAVOLT'S HV RACK® SYSTEM BLOCK DIAGRAM



Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

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