


XR SERIES HIGH VOLTAGE POWER SUPPLIES

● POWER FOR
SCIENCE AND
INDUSTRY

LAMBDA
EMI

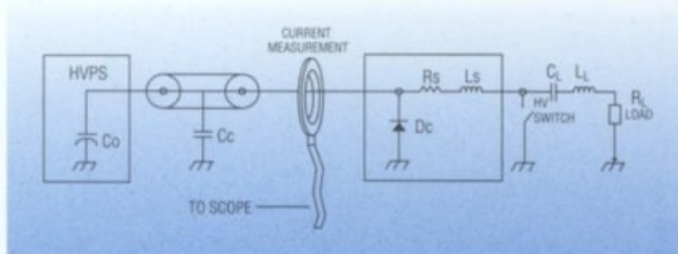


 **a.i.e.**
systems

XR SERIES HIGH VOLTAGE POWER SUPPLIES

CHARGING CAPACITORS WITH XR SERIES POWER SUPPLIES

The figure below represents a typical capacitor charge and discharge schematic. C_o is the output capacitance of the supply; C_c is the HV cable capacitance and C_L is the load capacitor. R_L is the load. Design care must be taken in any circuit which is under-damped since the resultant voltage reversal can damage the power supply. In this event, a series terminating resistor, inductor or even a clamp diode must be added to provide ultimate protection (Refer to APP NOTE 517 for more details).



PARALLELING UNITS

The XR802 power supply is designed for simple parallel operation. Input power and HV output connect directly together and remote connectors can also connect directly together. Each power supply operates at the same time with the total charge rate equal to the sum of each. *Contact the factory for parallel operation in the continuous output mode.*

DETERMINING CAPACITOR CHARGE TIME

For example, the XR802 Series is rated at 9000 J/sec peak and 8000 J/sec average charge rate. Although the measure of Joules per second equates to Watts, Joules per second is a more convenient unit of measurement when working with energy storage capacitors. The peak charge rate determines the capacitor charge time. The average charge rate determines the total power delivered from the power supply. It is possible to charge a capacitor at a rate of 9000 J/sec, but to discharge it at a low rep. rate amounting to only 7000 J/sec. The following formulas can be used to determine the average and peak charge rate.

Output Voltage Waveform

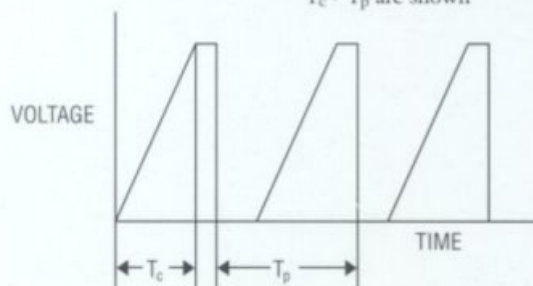
$$\text{Peak Charge Rate} = \frac{1}{2}(CV^2)/T_c$$

C - Output Load Capacitor

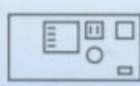
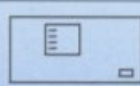
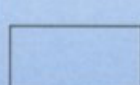
$$\text{Average Charge Rate} = \frac{1}{2}(CV^2)/T_p$$

V - Programmed Output Voltage

T_c - T_p are shown



CHASSIS CONFIGURATIONS

VERSION	MODEL	DESCRIPTION
Instrumented	XR 802L	 <ul style="list-style-type: none"> • Volt, Amp Meters • Voltage Control Pot • Status Indicators • Full Remote Control • AC Line Contactor
System	XR 802S	 <ul style="list-style-type: none"> • Status Indicators • Full Remote Control • AC Line Contactor
Blank	XR 802-OEM	 <ul style="list-style-type: none"> • Blank Front Panel • Full Remote Control • Optional Contactor Circuit Breaker or Straight Wired

Consult factory for other configurations



APP NOTES

APP NOTE 500 Charging Rates

APP NOTE 501 Charging With Current or Voltage

APP NOTE 505 Charging Units as Continuous Output DC Supplies

APP NOTE 509 What is Regulation and Repeatability?

APP NOTE 513 Power Factor Correction

APP NOTE 517 Protection Against Voltage Reversal

ORDERING INFORMATION

Model Number Example:

XR802L - 40KV - POS - 5V


 Series Version Voltage Polarity Option

XR SERIES HIGH VOLTAGE POWER SUPPLIES



A HISTORY OF INNOVATION AND LEADERSHIP

The High Voltage Products Division of Lambda EMI has been making quality High Voltage DC Power Supplies and Capacitor Charging Units since 1982. ALE Systems Inc., was conceived and formed to fill the need for a quality supplier of switched mode HVDC supplies for the laser market. In 1993, when ALE was acquired by Lambda EMI, the company was already the world leader in its field.

APPLICATIONS

Lambda EMI puts great emphasis on full application support, both before you decide to buy and after you receive the product. You will find the most critical information on this data sheet. If you need more information, you can request any of our High Voltage APP NOTES. Of course for assistance in solving a problem at any time, you can call, fax or E-mail our team of Application Engineers for prompt and accurate service. Our supplies are used in such applications as:

- ▶ Lasers
- ▶ Modulators
- ▶ Electron Beam
- ▶ X-Ray
- ▶ NMR
- ▶ Lithotripters
- ▶ Ion Implantation
- ▶ Sputtering

DESCRIPTION

The XR802, XR802 DC Series High Voltage Power Supplies are designed to operate in two modes. The most common format for the XR802 is a constant current Capacitor Charging Supply which will reliably charge HV capacitors and Pulse Forming Networks (PFNs). The XR802 DC can also operate as a constant voltage, continuous output DC Power Supply.

Features include:

- ▶ Reduced Package size
- ▶ Designed for 0.1% Repeatability at 1kHz Repetition Rate
- ▶ Remote Controls including HV enable/reset, Vprogram, Vmonitor, I Monitor, Inhibit, Reference, System Status and Faults
- ▶ Pin to pin Remote Control Compatibility with old Series' 802 and 402
- ▶ High EMI-RFI Immunity for operation near laser discharge
- ▶ CE Mark Pending

FEATURES

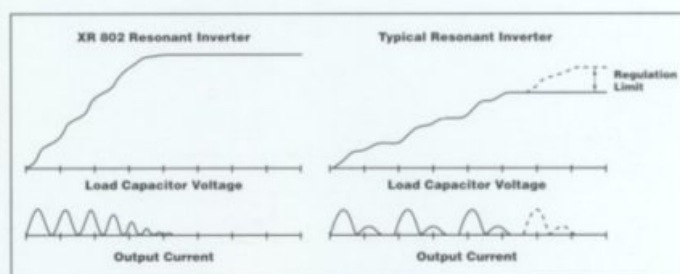
- ▶ High repeatability to better than 0.1% at repetition rates up to 1 kHz
- ▶ Air insulated output assemblies - models 1 kV to 6 kV
- ▶ Minimum stored energy
- ▶ Ultra fast command charge timing cycle
- ▶ Unlimited parallel capability for higher power
- ▶ Eliminates need for D-Qing
- ▶ On board external divider port for high accuracy
- ▶ New high reliability cable and connector minimizes corona effects at high repetition rate

CONTINUOUS OUTPUT DC OPERATION

The XR802 DC supply can be used as a constant voltage supply by the addition of an external filter capacitor or CLC network for low ripple, low stored energy. The value of this capacitor will determine the ripple voltage on the DC output. *Please consult our Applications Department if this type of operation is required.*

REPEATABILITY

Most commercially available High Voltage Capacitor Charging Units utilize a Series Resonant topology which was the most reliable and efficient means by which a capacitive load may be charged. However, they are not the ideal source for maintaining extremely low levels of pulse to pulse repeatability on small capacitors used at high repetition rates such as those found in Excimer lasers. Lambda EMI's new Phase Shifted Parallel Resonant Inverter* provides repeatability to better than 0.1% at frequencies up to 1 kHz.



*Patent applied for



SPECIFICATIONS

Average Charging Rate	6000 J/s at 100% of rated Output Voltage				
Peak Charging Rate	7000 J/s at 100% of rated Output Voltage				
DC Power Rating	8 kW at 100% of rated Output Voltage				
Standard Voltage Ranges	1 kV, 2 kV, 4 kV, 5 kV, 10 kV, 20 kV, 30 kV All models continuously variable from 0 to 100% of rated voltage output. Linear to within 1% of full scale. Accuracy 1% of rated.				
Polarity	Available as fixed Positive or Negative. Please specify.				
High Voltage Assembly	<table border="1"> <tr> <th>Voltage</th> <th>Medium</th> </tr> <tr> <td>1 kV to 30 kV</td> <td>Oil</td> </tr> </table>	Voltage	Medium	1 kV to 30 kV	Oil
Voltage	Medium				
1 kV to 30 kV	Oil				
Input Connector	VDE, UL, CSA approved. Euroblock 5 position				
Input Voltage/Current	<u>208 V Configuration:</u> 180-264 V, 3 Phase, 50/60 Hz, 40A max <u>400 V Configuration:</u> 340-460 V, 3 Phase, 50/60 Hz, 20A max				
Power Factor	Passive PFC. 85% minimum at full power and nominal line input.				
Efficiency	Better than 85%.				
Stored Energy	Less than 0.3 Joules all models				
Stability	0.2% per hour after 1 hour warm-up				
Pulse to Pulse Repeatability	0.1% to 250 Hz 0.3% to 1 kHz 0.1% to 1 kHz available.				
Temperature Coefficient	100 ppm per °C				
Ambient Temperature	Storage: -40 to +85 °C Operating: -20 to +45 °C				

Humidity 90% non-condensing

HV Output Connector and Cable

Output Voltage	Connector	Cable
<=6.0 kV	Amphenol 'HN'	RG-8/U
> 6 kV	Proprietary	Dielectric Sciences 2214 80 kV

10' coaxial HV cable with grounded shield standard. Other lengths available

Protection Features

- Output short circuit and HV arc-to-ground any time during operation
- Open circuit at turn-on, will not damage power supply
- Remote HV Safety Interlock loop
- AC input power contactor (Standard on 'L' and 'S'; Optional for 'OEM')
- Shutdown on over-temperature, over voltage and open interlock
- Highly buffered I/O for noise immunity in severe electrical environments

Agency Approvals

EN61010 (IEC1010) (Pending)

Transient Line Protection

Complies with requirements of IEC 801-41,801-5

ESD

All Remote Control Functions comply with requirements of IEC 801-2

Accessories

- Detachable 10 feet HV Cable
- Operating manual

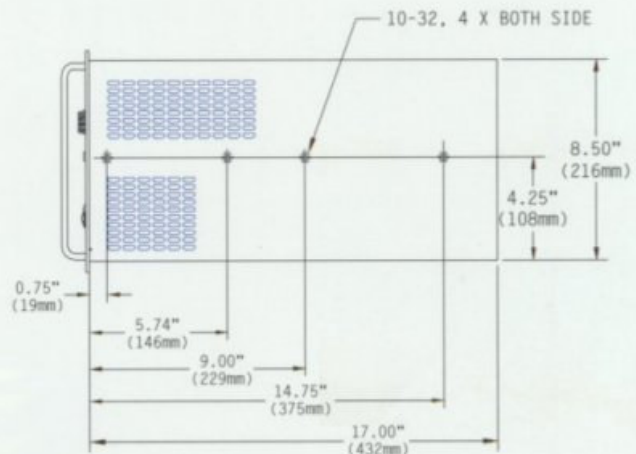
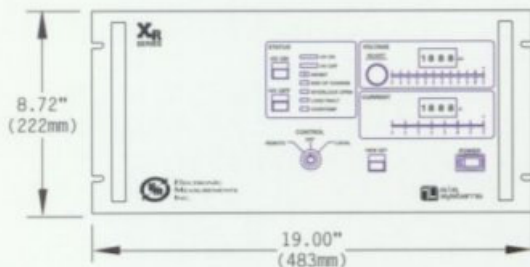
Options

All Models

- Custom output voltages
- 0-5 VDC Programming
- ±0.1% regulation to 1kHz
- Remote output voltage sensing
- Rack mount slides
- External EMI line filter
- Custom length HV cable

XR802 OEM

- Front panel circuit breaker
- Internal AC contactor



98H/3U/2E

