AMERICAN HIGH VOLTAGE
POWER SUPPLIES FOR THE WORLD

D Series

Capacitor Charging
High Voltage Power Supply

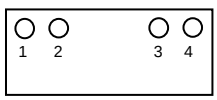
General Description

The D Series high voltage power supplies are regulated high voltage power supplies designed to capacitor charging applications. They provide outputs of up 1kV and power levels to 20 Watts. The output of each power supply is floating with respect to the input line. This allows either polarity to be configured. The output voltage of the D may be varied either with the unit trimpot, an external trimpot, or via an external control signal. The output ripple is typically less than 1% at full power. Each power supply may be programmed down to 0% of the maximum output voltage. All D models offer 0.01% line regulation and 3% maximum no load to full load regulation. All D's are reverse input voltage and short circuit protected.

Features

Regulated Output
Encapsulated
100 VDC to 1,000 VDC models available
20 Watt power
28 VDC input
Trimpot, Resistance or Voltage program

Connection Diagram

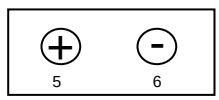


INPUT SIDE SHOWN

Pins:

1. **Ground**
2. **+5.0V Reference**
3. **Vcontrol**
4. **+28 VDC input**

INPUT SIDE SHOWN



OUTPUT SIDE SHOWN

Pins:

5. **+ HV output**
6. **- HV output**

Available Models: (Vin = 28 VDC standard (other input voltages available12, 15, 24, and 48V)):

20 Watt Models:

Name	Maximum Output Voltage	Maximum Output Current	1st Year
D - 1	100	200 mA	1986
D - 2	200	100 mA	1997
D - 3	300	70 mA	1991
D - 5	500	40 mA	1988
D - 10	1,000	20 mA	1989

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Electrical Characteristics

(at 25 degrees C unless otherwise specified)

Parameter	Conditions		Min	Value Typical	Max	Units
Supply Voltage*:	(all power models)		25VDC	28VDC	31 VDC	VDC
Input Current:	No Load: (20 W models)		150	160	175	mA
	Full Load: (20 W models)		0.98	1.0	1.1	A
Output Ripple:	No Load (all models): Full Load (all models):		0.4% 0.8%	0.5 % 0.9%	0.7% 1%	Vpp Vpp
Load Regulation:	No Load to Full Load Half Load to Full Load				3% 2%	V_{NL}/V_L VNL/VL
Output Linearity	No Load			1%		$\frac{\Delta V_{OUT}}{\Delta V_{OUT\ (ideal)}}$
Output Linearity	Full Load (all models):			1%		$\frac{\Delta V_{OUT}}{\Delta V_{OUT\ (Ideal)}}$
Short Circuit Current:	20 Watt Models:			Try-again		after 1 sec
Power Efficiency:	Full Load (20 W)		70%	72 %	75%	P_{OUT}/P_{in}
Reverse Input Polarity	Protected to 50 VDC					
Temperature Drift:	No Load Full Load				200 200	ppm/DegC ppm/Deg C
Thermal Rise:	No Load (case) Full Load (case)				25 45	degrees C degrees C
Slew Rate (10% - 90%)	No Load Full Load				100 120	mS mS
Slew Rate (90% - 10%)	No Load Full Load				300 200	mS mS
Drain Out Time	No Load (5 TC)				150	mS

* Other input voltages available: 15VDC, 24VDC, 28VDC and 48VDC

Physical Characteristics

(at 25 degrees C unless otherwise specified)

Parameter	Conditions	Value	Units
Dimensions	MKS	50.8 W x 101.6L x 20.6 H	mm
	English	2.0 W x 4.0 L x 0.81 H	inches
Volume:	MKS	105	cm^3
	English	6.4	$inch^3$
Mass:	MKS	156	grams
	English	5.6	oz
Packaging:	Black anodized aluminum case with RTV elastomer encapsulation		
Finish	Smooth arushed aluminum		
Terminations:	Input and control: Teflon terminals (4)		
	HV Output: Teflon terminals (2)		

Environmental Characteristics

(at 25 degrees C unless otherwise specified)

Parameter	Conditions	Value	Units
Temperature Range	case temperature	-40 degrees to + 71 degrees	Celsius
	case temperature	-40 degrees to + 160 degrees	Fahrenheit
Shock:	MIL-STD-810 Method 516	40 g's	Proc IV
Altitude:	pins sealed against corona	-350 to + 16,700	meters
	pins sealed against corona	-1,000 to +55,000	feet
Vibrations:	MIL-STD-810 Method 514	20 g's	Curve E
Thermal Shock	MIL-STD-810 Method 504	-40 deg C to + 71 deg C	Class 2

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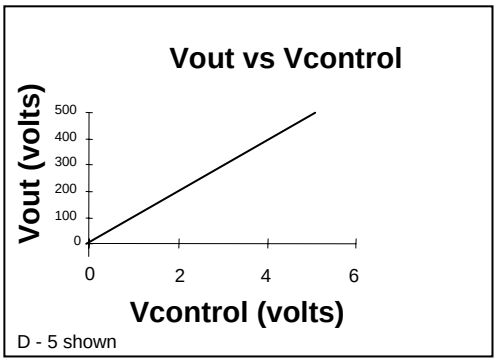
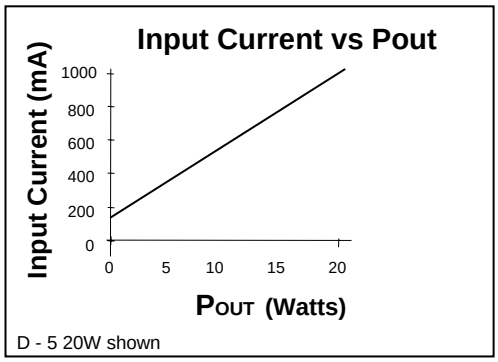
D Series Performance Charts



D - 5 shown



D - 5 20W shown

D Series Application Notes

The D Series high voltage power supplies are powered by an input voltage of 28 VDC. They can be adjusted to provide a set output voltage or they can be controlled either by an external resistance or an external voltage. Figure 1 below shows the basic hookup using the internal reference as the source of the control voltage. By connecting the Vcontrol pin to the +5.0 volt reference pin the maximum output voltage of the power supply is obtained and is adjustable via the trimpot located on the top of the power supply. The maximum voltage is fixed by the model and is a regulated output. In this configuration, the output voltage will not vary with input line fluctuations or output load changes up to the maximum power rating for the power supply. For standard 28 VDC input models, the input line may vary from 25 VDC to 31 VDC and the output voltage will remain regulated. Standard output loads may be as high as 20 Watts of power. As shown in Figure 1 below, the simple connection of a D unit to a DC source of voltage will provide a high voltage stepped-up output. The input AC bypass capacitor C1 is optional and is utilized to prevent switching spikes from riding back on the input power lines. Values of 0.1 uF to 10 uF are commonly used.

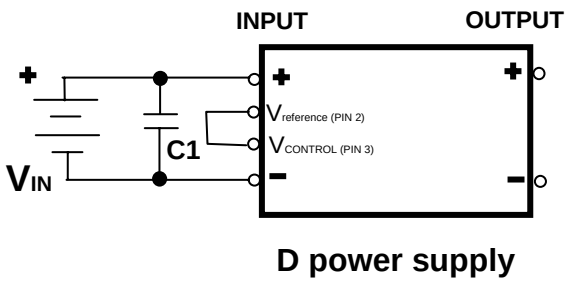


Figure 1: Basic D hookup schematic for maximum output

The output voltage of the D unit may be reduced in value by placing a voltage lower than the +5.0 volt reference voltage onto the Vcontrol pin (Pin 3). By placing a voltage of +2.5 VDC onto the control voltage pin the output will be reduced in half. Figure 2 details a simple method of using an external voltage source to vary the output voltage of the D power supply. Typical values of input impedance for the D are 5K Ohms. This makes programming via a DAC or operational amplifier an easy chore for the D power supply. The control voltage is referenced to the input ground. There is no connection between the input ground and output HV return in all D power supplies.

D Series Application Notes (continued)

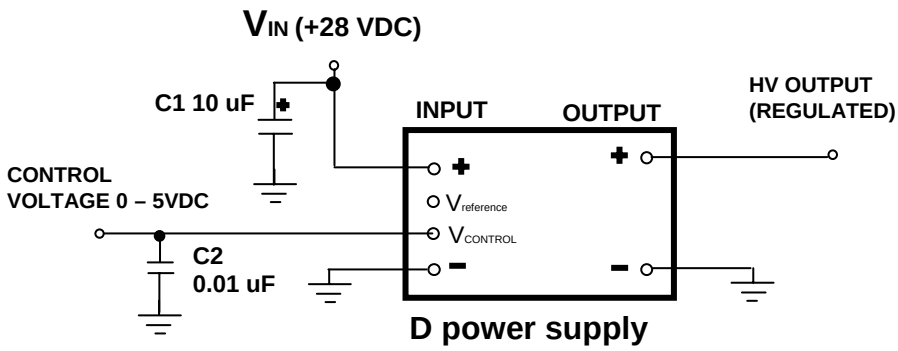
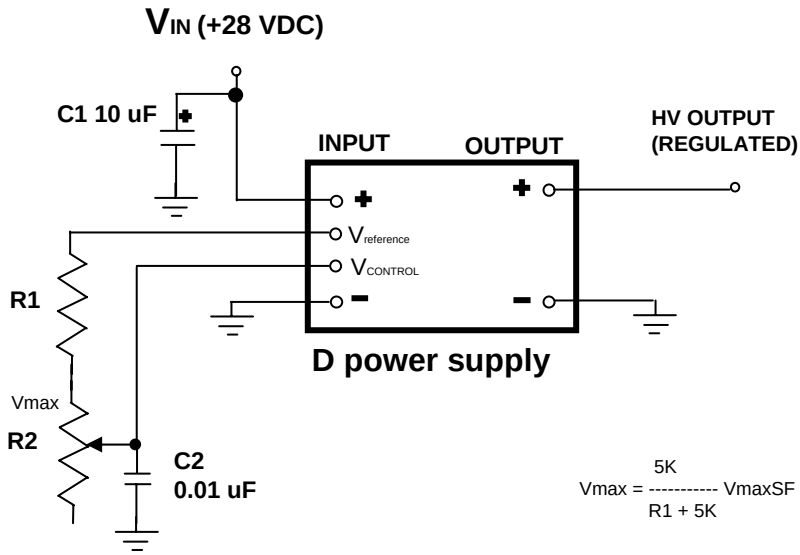


Figure 2: Voltage programming

Capacitor C1 removes switching spikes from the input line and C2 is an AC bypass to insure smooth voltage control levels.

The D power supply may also be programmed by using a simple trimpot and the internal +5.0 volt reference. Figure 3 shows this topology. Because the input impedance of the control voltage pin is 5K Ohms, the output of the D may be controlled between minimum and maximum values using the formulas given. The output in both configurations can always be lowered or adjusted via the internal trimpot located on the top surface of the power supply.



$$V_{max} = \frac{5K}{R1 + 5K} \times V_{maxSF}$$

$$V_{min} = \frac{5K}{R1 + R2 + 5K} \times V_{maxSF}$$

Figure 3: Resistance Programming

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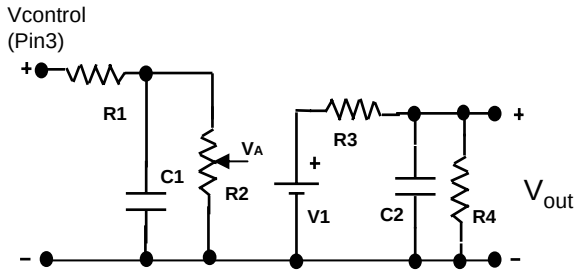
Note: R2 is internal trimpot accessible via top of power supply

Equivalent D Circuit Model



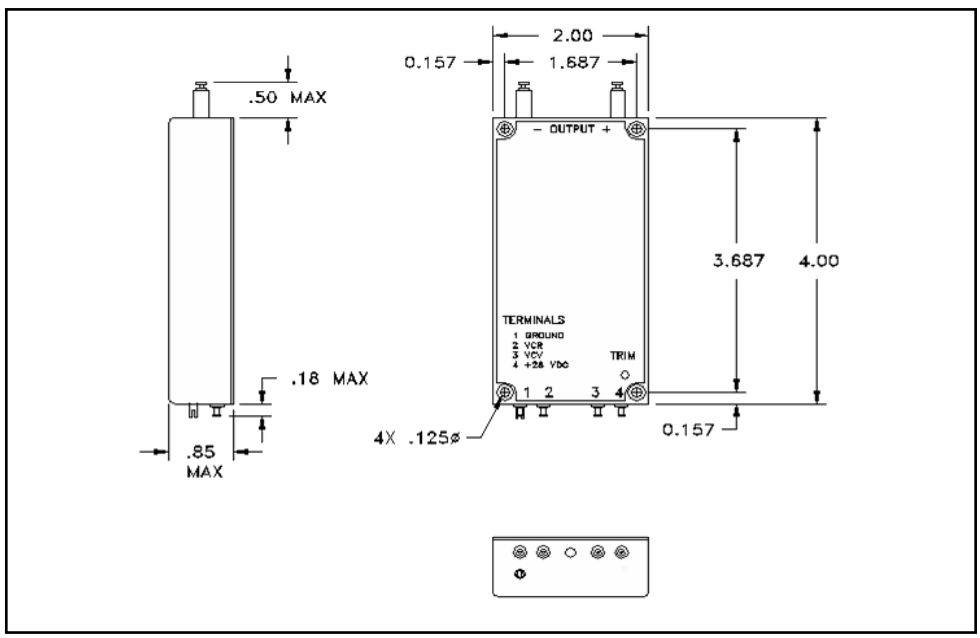
Equivalent D HVPS Circuit Model

R1 = 100 *Ohms*
R2 = 5K *Ohms (timpot)*
R3 = (3.0 x Vout $_{max}$) *Ohms*
R4 = (2.6 x Vout $_{max}^{2}$) *Ohms*
C1 = (0.01 x 10^{-6}) *Farads*
C2 = (0.004 x Iout$_{max}$ / Vout$_{max}$) *Farads*
V1 = (V_A x Vout$_{max}$ / 5.0) *Volts*

For example, for an D – 3 20W:

Vout**max** = 300 V
Pout**max** = 20 W
Iout**max** = 0.007 A
R1 = 100 Ohms
R2 = 5K Ohms
R3 = 900 Ohms
R4 = 240k Megohm
C1 = 0.01 uF
C2 = 0.94 uF

Outline Drawing: (inches)



Ordering Information:

D – XX / Y

XX = Output voltage
Y = Input voltage (blank if 28VDC)

Example:

D – 5 Maximum output = 500 V 20 Watts 28 VDC input