AMERICAN HIGH VOLTAGE

N Series
High Voltage Power Supply

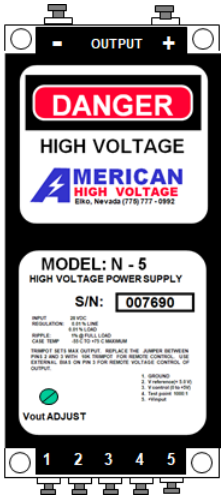
General Description

The N Series high voltage power supplies are regulated modules that provide outputs of up 10kV and power levels to 3 Watts. The output voltage of each power supply is tightly regulated against line and load with changes less than 0.01%. The output voltage of the N may be varied either with the unit trimpot, an external potentiometer, or via an external control signal. The output ripple is typically less than 0.1% at full power. Each power supply may be programmed down to zero output voltage. They also provide a buffered voltage monitor output. All N's are reverse input voltage and short circuit protected.

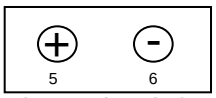
Features

Regulated Output
Buffered voltage monitor
100 VDC to 10,000 VDC models available
3 Watt power
24 VDC input
Trimpot, Resistance or Voltage program

Connection Diagram



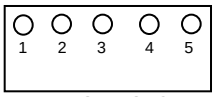
INPUT SIDE SHOWN



OUTPUT SIDE SHOWN

Pins:

5. + HV output
6. - HV output



INPUT SIDE SHOWN

Pins:

1. Ground
2. +5.0V Reference
3. Vcontrol
4. Vmonitor
5. +24 VDC input

AMERICAN HIGH VOLTAGE

Electrical Characteristics

(at 25 degrees C unless otherwise specified)

Parameter	Conditions		Value			Units
			Min	Typical	Max	
Supply Voltage*:	24 Vin models		21	24	27	VDC
Input Current:	No Load:		50	60	75	mA
	Full Load:		250	275	300	mA
Output Ripple:	No Load (all models): Full Load (all models):		0.08% 0.08%	0.09% 0.09%	0.1% 0.1%	Vpp Vpp
Load Regulation:	No Load to Full Load Half Load to Full Load				0.1% 0.1%	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:				250	350	mA
Power Efficiency:	Full Load:		55%	60%	65%	P_{OUT}/P_{in}
Reverse Input Polarity	Protected to 50 VDC					
Temperature Drift:	No Load Full Load				100 100	ppm/DegC ppm/Deg C
Thermal Rise:	No Load (case) (15W) Full Load (case) (15W)				15 25	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, 28VDC and 48VDC**

AMERICAN HIGH VOLTAGE

Physical Characteristics

(at 25 degrees C unless otherwise specified)

Parameter	Conditions	Value	Units
Dimensions	MKS	38.1 W x 76.2L x 20.6 H mm	
	English	1.5 W x 3.0 L x 0.81 H	inches
Volume:	MKS	60	cm^3
	English	3.65	$inch^3$
Mass:	MKS	120	grams
	English	4.3	oz
Packaging:	Black anodized aluminum case with RTV elastomer encapsulation		
Finish	Smooth brushed aluminum		
Terminations:	Input and control: Teflon terminals (4)		
	HV Output: Teflon terminals (2) (AMP LGH-1/2 on N-100)		

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

AMERICAN HIGH VOLTAGE

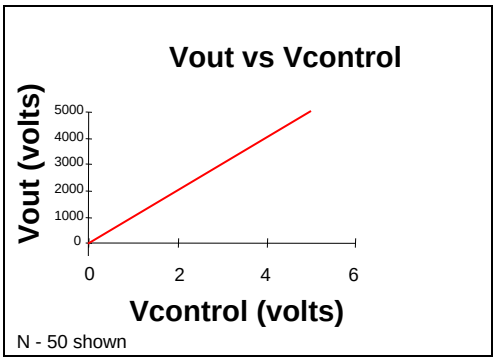
Models Available (as of August 2019):

(Vin = 24 VDC)

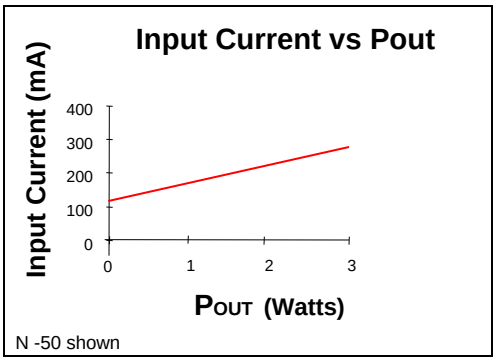
Model	Output Voltage Range	Polarity	Ripple (max)
N-1P	0 – 100 VDC	Positive	0.1 Vpp
N-3P	0 – 300 VDC	Positive	0.3 Vpp
N-5P	0 – 500 VDC	Positive	0.5 Vpp
N-10P	0 – 1,000 VDC	Positive	1 Vpp
N-25P	0 – 2,500 VDC	Positive	2.5 Vpp
N-50P	0 – 5,000 VDC	Positive	5 Vpp
N-100P	0 – 10,000 VDC	Positive	10 Vpp
N-1N	0 – 100 VDC	Negative	0.1 Vpp
N-3N	0 – 300 VDC	Negative	0.3 Vpp
N-5N	0 – 500 VDC	Negative	0.5 Vpp
N-10N	0 – 1,000 VDC	Negative	1 Vpp
N-25N	0 – 2,500 VDC	Negative	2.5 Vpp
N-50N	0 – 5,000 VDC	Negative	5 Vpp
N-100N	0 – 10,000 VDC	Negative	10 Vpp

AMERICAN HIGH VOLTAGE

N Series Performance Charts



N - 50 shown



N -50 shown

N Series Application Notes

The N Series high voltage power supplies utilize an input voltage of 24 VDC. They can be adjusted to provide a fixed output voltage or they can be controlled by either 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 3) to the +5.0 volt reference (Pin 2) the maximum output voltage of the power supply is obtained and is adjustable via the trimpot located on the top surface 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 24 VDC input models, the input line may vary from 21.6 VDC to 26.4 VDC and the output voltage will remain regulated. Standard output loads may be as high as 3 Watts of power. As shown in Figure 1 below, the simple connection of a N 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.

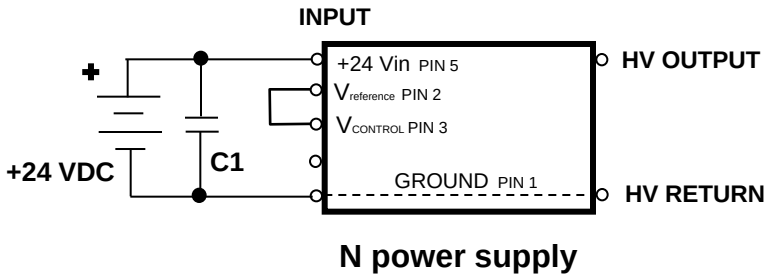


Figure 1: Basic N hookup schematic for maximum output

The output voltage of the N unit may be programmed from an external voltage. It may be reduced in magnitude 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 N power supply. Typical values of input impedance for the N are 5K Ohms. This makes programming via a DAC or operational amplifier an easy chore for the N power supply. The control voltage is referenced to the input ground. The input ground and output grounds are internally connected together in the N series.

AMERICAN HIGH VOLTAGE

N Series Application Notes (continued)

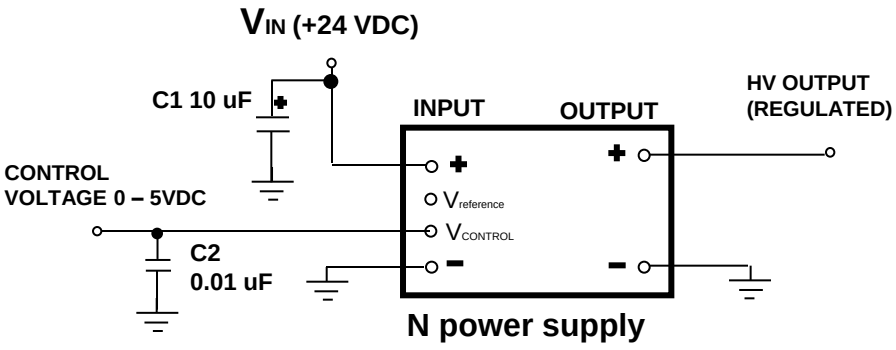
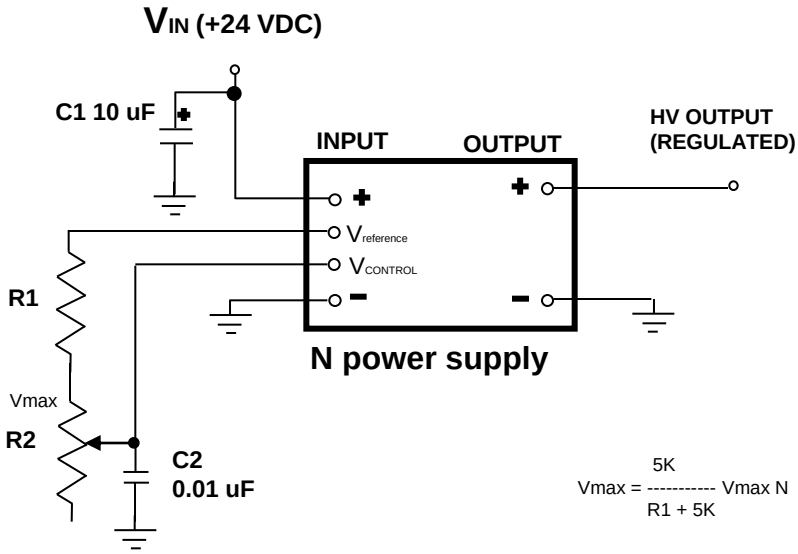


Figure 2: Voltage programming

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

The N 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 N 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.



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

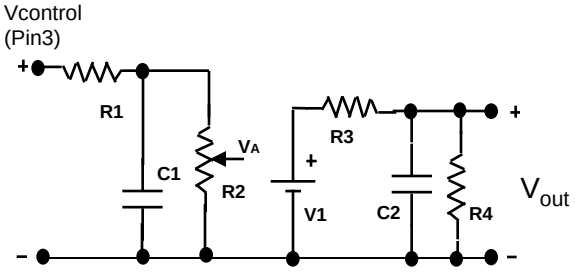
$$V_{min} = \frac{5K}{R1 + R2 + 5K} V_{max\ N}$$

Figure 3: Resistance Programming

AMERICAN HIGH VOLTAGE

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

Equivalent N Circuit Model



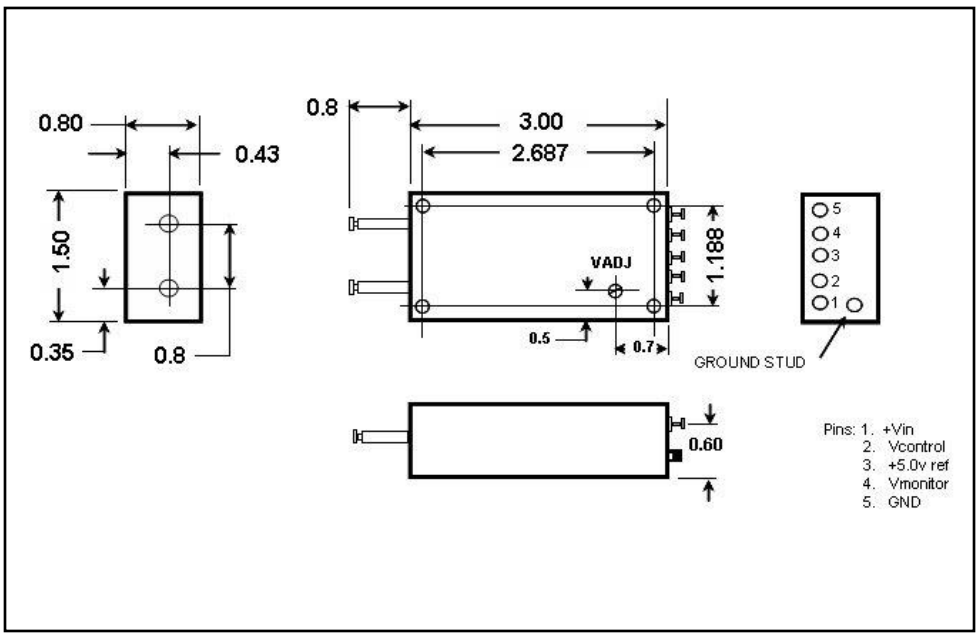
Equivalent N HVPS Circuit Model

R1 = 100 *Ohms*
R2 = 5K *Ohms (timpot)*
R3 = (5 x $Vout_{max}$) *Ohms*
R4 = (0.15 x $Vout_{max}^2$) *Ohms*
C1 = (0.01 x 10^{-6}) *Farads*
C2 = (0.008 x $Iout_{max}$ / $Vout_{max}$) *Farads*
V1 = (V_A x $Vout_{max}$ / 5.0) *Volts*

For example, for an N – 50P :

Vout**max** = 5,000 V
Pout**max** = 3 W
Iout**max** = 0.0006 A
R1 = 100 Ohms
R2 = 5K Ohms
R3 = 750 Ohms
R4 = 250 Megohm
C1 = 0.01 uF
C2 = 960 pF

Outline Drawing: (inches (millimeters))



Ordering Information:

N – XY

X = Output voltage

1 = 100v
2 = 200v
6 = 600v
12 = 1,250v
25 = 2,500v
50 = 5,000v
100 = 10,000v

Example:

N – 6P Maximum output = 600 V 3 Watts Positive
N – 12N Maximum output = 1,200 V 3 Watts Negative

Y = Polarity (P or N)