



AMERICAN HIGH VOLTAGE
POWER SUPPLIES FOR THE WORLD

FCCT Series High Voltage Power Supply

General Description

The FCCT Series high voltage power supplies are regulated high voltage power supplies which provide a center-tapped high voltage output. This allows the user to have both positive and negative polarities available at the same time. Models in this series provide outputs of up 5kV and power levels to 10 Watts. The output of each power supply is floating with respect to the input line. This allows a multitude of output configurations. The output voltage of the FCCT may be varied either with the unit trimpot, an external trimpot, or via an external control signal. The output ripple is typically less than 0.1% at full power. The FCCT provides a voltage and current monitor. All FCCT models are reverse input voltage and short circuit protected.



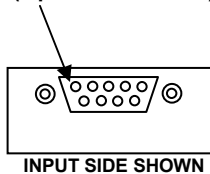
Features

- Center-tapped output
- Regulated
- 100 VDC to 5,000 VDC models available
- 10 Watt power
- Trimpot, Resistance or Voltage program

FCCT Series

Connection Diagram

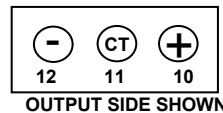
Pins 1: (9 pin sub – D male)



Pins:

1. Chassis
2. Power Ground
3. +24Vinput
4. Enable (high = on)
5. Analog ground
6. Current monitor
7. +5.0 V reference
8. Vcontrol
9. Voltage monitor

Pins:



10. + HV output
11. Centertap
12. - HV output

Available Models: (Vin = 24 VDC standard (other input voltages available 12,15,28, and 48V)):

10 Watt Models:

Name	Maximum Output Voltage	Maximum Output Current	1st Year
FCCT - 1	100	100 mA	2005
FCCT - 2	200	50 mA	2004
FCCT - 3	300	33.33 mA	2006
FCCT - 6	600	16.67 mA	2007
FCCT - 12	1,250	8 mA	2003
FCCT - 25	2,500	4 mA	2005
FCCT - 50	5,000	2 mA	2006



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Electrical Characteristics

(at 25 degrees C unless otherwise specified)

Parameter	Conditions	Value			Units
		Min	Typical	Max	
Supply Voltage*:	All voltage models:	22.0	24	26.0	VDC
Input Current:	No Load: (10 W models)	195	200	250	mA
	Full Load: (10 W models)	650	700	750	mA
Output Ripple:	No Load (all models):	0.07%	0.07%	0.1%	Vpp
	Full Load (all models):	0.08%	0.08%	0.1%	Vpp
Load Regulation:	No Load to Full Load			10%	V _{NL} /V _L
	Half Load to Full Load			3%	V _{NL} /V _L
Output Linearity	No Load		1%		$\frac{\Delta V_{OUT}}{\Delta V_{OUT} (ideal)}$
Output Linearity	Full Load (all models):		1%		$\frac{\Delta V_{OUT}}{\Delta V_{OUT} (ideal)}$
Tracking:	Worst case (one polarity max I) (other polarity NL)		15%	20%	difference
Short Circuit Current:	“try – again”:		250	350	mA
Power Efficiency:	Full Load (10 W)	55%	60%	65%	P _{OUT} / P _{in}
Voltage Monitor:	FCCT 1 to FCCT 6:		100:1		V _{out} /V _{mon}
	FCCT 12 to FCCT 50:		1000:1		V _{out} /V _{mon}
V monitor accuracy:			10%		V _{out} /V _{mon}
Current Monitor:	all models		10V		mon/I _{max}
I monitor accuracy:	all models:		10%		I _{out} /mon
Enable:	Must sink for OFF			1 mA	
Reverse Input Polarity	Protected to 50 VDC				
Pin 2 to Pin 5 max:	(Internal 10 Ohm resistor)			+/- 1	VDC
Temperature Drift:	No Load			300	ppm/DegC
	Full Load			300	ppm/Deg C
Thermal Rise:	No Load (case) (15W)			15	degrees C
	Full Load (case) (15W)			25	degrees C
Slew Rate (10% - 90%)	No Load			100	mS
	Full Load			120	mS
Slew Rate (90% - 10%)	No Load			300	mS
	Full Load			200	mS
Drain Out Time	No Load (5 TC)			150	mS

* Other input voltages available: 12VDC, 15VDC, 28VDC and 48VDC



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Physical Characteristics

(at 25 degrees C unless otherwise specified)

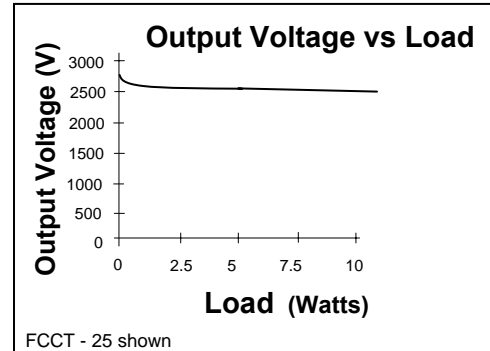
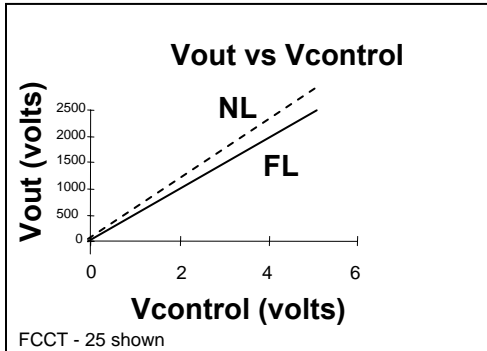
Parameter	Conditions	Value	Units
Dimensions	MKS	50.8 W x 126L x 20.6 H	mm
	English	2.0 W x 5.0 L x 0.81 H	inches
Volume:	MKS	132	cm ³
	English	8.0	inch ³
Mass:	MKS	197	grams
	English	7.3	oz
Packaging:	Black anodized aluminum case with RTV elastomer encapsulation		
Finish	Smooth brushed aluminum		
Terminations:	Input and control: 9 pin Sub-D connector Male HV Output: Teflon terminals (3)		

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

FCCT Series Performance Charts



FCCT Series Application Notes

The FCCT Series high voltage power supplies are powered by an input voltage of 24 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 (Pin 8) to the +5.0 volt internal reference pin (Pin 7) the maximum output voltage of the power supply is obtained and is adjustable down 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 regulation rating for the power supply. For standard 24 VDC input models, the input line may vary from 22 VDC to 26 VDC and the output voltage will remain regulated. Standard output loads may be as high as 10 Watts of power. The maximum output power is limited by the maximum output current that the power supply can produce. As shown in Figure 1 below, the simple connection of an FCCT 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. The analog ground (Pin 5) can be connected directly to the input power return line or it may be floated +/- 1 VDC. The Vcontrol (Pin 8) and both monitors are referenced to analog ground (Pin 5).

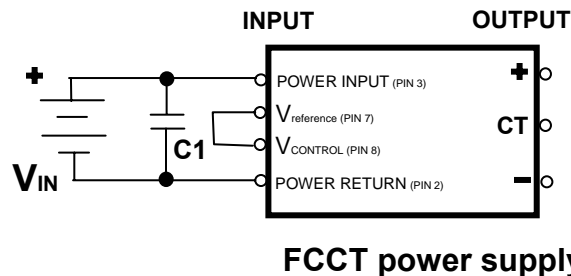


Figure 1: Basic FCCT hookup schematic for maximum output

The output voltage of the FCCT unit may be reduced in value by placing a voltage lower than the +5.0 volt reference voltage onto the Vcontrol pin (Pin 8). 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 power supply. Typical values of input impedance are 5K Ohms. This makes programming via a DAC or operational amplifier an easy chore for the FCCT power supply. The control voltage is referenced to the input analog ground (Pin 5). There is no connection between the input ground and output HV pins in the FCCT power supply.

FCCT Series Application Notes (continued)

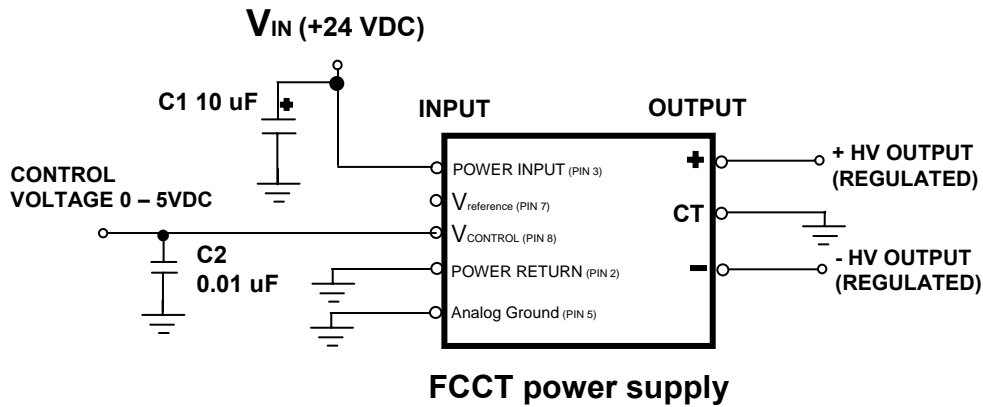


Figure 2: Voltage programming

Capacitor C1 removes switching spikes from the input line and C2 is an AC bypass to insure smooth voltage control levels. Both the input power return and analog ground can be connected to the same point. To reduce noise on analog ground, the input power return may be floated from analog ground by +/- 1 V. There exists an internal 10 Ohm resistor between the power input return (Pin 2) and the analog ground (Pin 5) which keeps both pins coupled together in the event that the analog ground pin is not used.

The FCCT 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 FCCT 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.

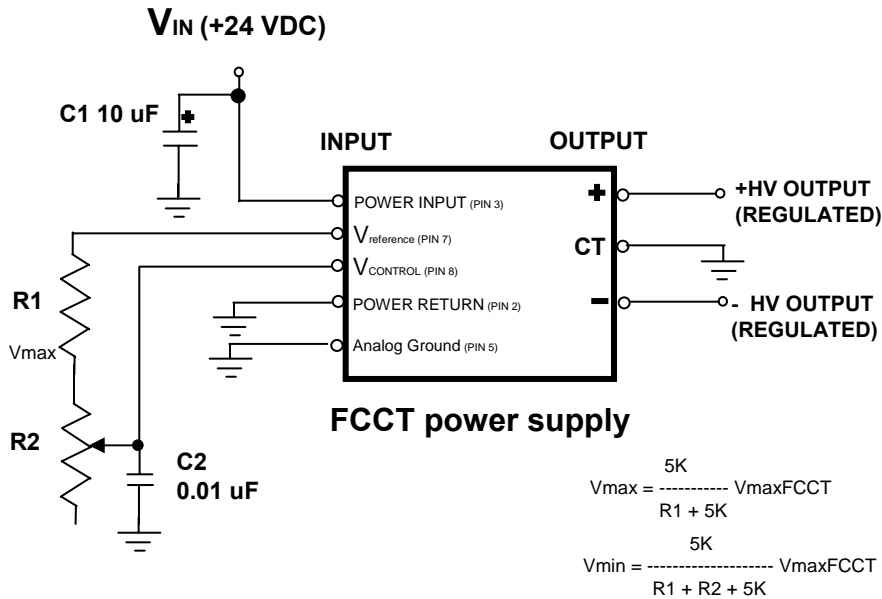
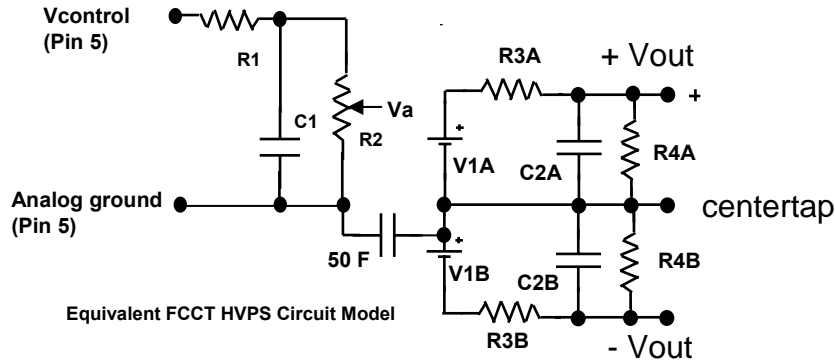


Figure 3: Resistance Programming

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

Equivalent FCCT Circuit Model

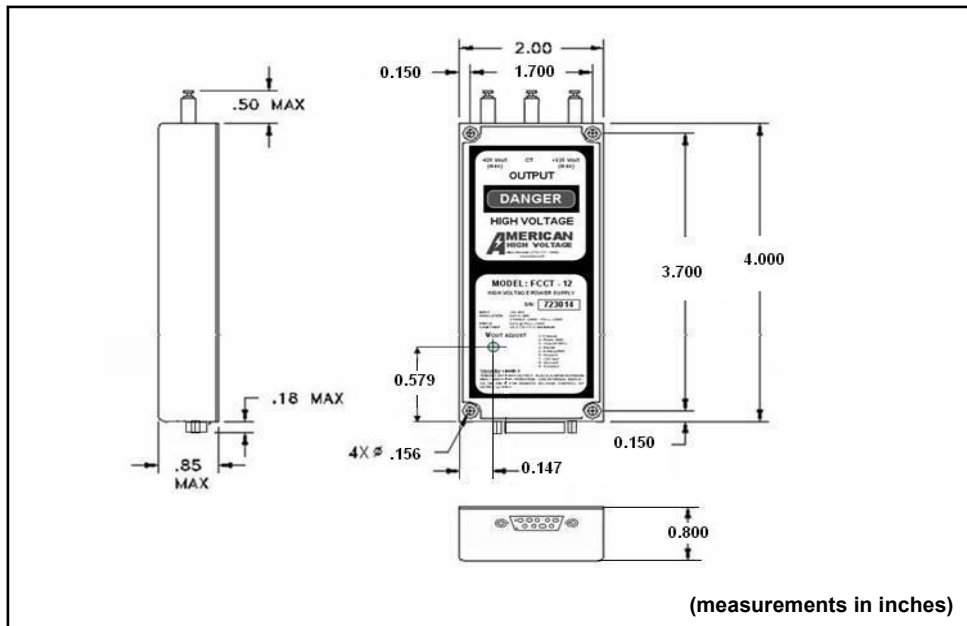


- R1 = 100 Ohms
- R2 = 5K Ohms (trimpot)
- R3A,B = (12.5 x Vout_{max}) Ohms
- R4A,B = (0.25 x Vout_{max}²) Ohms
- C1 = (0.01 x 10⁻⁶) Farads
- C2A,B = (0.012 x Iout_{max} / Vout_{max}) Farads
- V1 = (VA x Vout_{max} / 5.0) Volts

For example, for an FCCT - 25:

- Vout_{max} = 2500 V
- Pout_{max} = 10 W
- Iout_{max} = 0.004 A
- R1 = 100 Ohms
- R2 = 5K Ohms
- R3A,B = 31K Ohms
- R4 = 1.5 Megohm
- C1 = 0.01 uF
- C2 = 0.02 uF

Outline Drawing:



Ordering Information:

FCCT - XX

Example:

FCCT - 6 Maximum output = 600V (+300V / -300V)

- XX = Output voltage: 1 = 100V max
- 2 = 200V max
- 3 = 300V max
- 6 = 600V max
- 12 = 1,250V max
- 25 = 2,500V max
- 50 = 5,000V max