

# I & II Power Supply Power Factor Corrected AC-DC Switcher



## Operator's Manual and "Quick Install" Instructions



[www.mpwrs.com](http://www.mpwrs.com)

# Javelin I & II Power Supply

## Power Factor Corrected AC-DC Switcher

### Javelin I & II Power Supply “Quick Install” Instructions

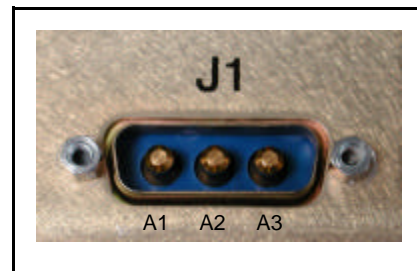
#### Mounting the Javelin Power Supply

- The Javelin can be mounted at either of two sides (top or bottom).
- Use #8-32 mounting screws. Maximum penetration should not exceed 0.21" (5,33mm).
- Maintain 2" (50,8mm) clearance at either end for airflow.

#### Input Connections

##### Input Connector (J1)

- Input AC or DC power is applied to connector J1 using a 3W3 Power Connector (Table 1).
- To connect, use ITT/Cannon mating receptacle P/N DAM3W3SA197 with pins, P/N DM53744-6.
- **A fault-clearing device, such as a fuse or circuit breaker, with maximum 15A rating at the power supply input is required for safety agency compliance.**



Single Phase		DC	
A1	L1	A1	+
A2	L2/N	A2	-
A3	Earth Gnd	A3	Earth Gnd

Table 1. AC and DC Input Connections

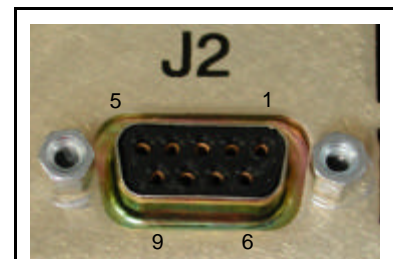
##### Status/Control Connector (J2)

- J2-1 and J2-9 are spare pins and are not used.
- J2-2 and J2-4 are Signal Return pins.
- J2-3 is +12V fan power.
- J2-5 is VCC +5V @ 300mA.
- J2-6 is AC Power OK (+5V = true).
- J2-7 and J2-8 are used in conjunction according to the following table:

J2-8 INHIBIT'	J2-7 ENABLE'	POWER SUPPLY STATE
1	X	ON
0	0	ON
0	1	OFF

Table 2. Inhibit/Enable Logic Table

- Use ITT/Cannon mating connector P/N DE9PK87 with Amp cover shell P/N 205729-1.
- Use 20-24 AWG stranded wire.



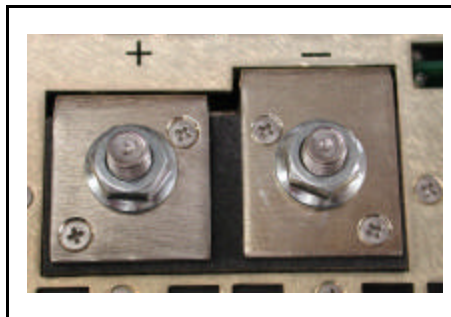
##### J2 Interface Pin Out

J2-1	Spare
J2-2	Signal Return
J2-3	Fan Power
J2-4	Signal Return
J2-5	VCC +5V @ 300mA
J2-6	AC Power OK
J2-7	PS Enable
J2-8	PS Inhibit
J2-9	Spare

## Output Connections

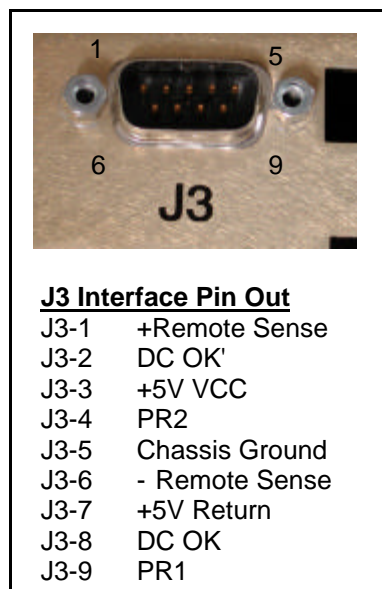
*Installing ring lugs on output studs:*

- When viewed from the rear, the left stud is Positive and the right stud is Return.
- Remove the nut and place .312" ID ring lug over output stud.
- Replace and tighten the nut to a torque of **130 in/lbs. Do Not Over-Tighten Nuts.**



## **DC OK/Sense Connector (J3)**

- The Javelin is equipped with Auto-Sense (load sensed at output studs if remote sense is not connected).
- Connector pin J3-1 is the +Remote Sense and J3-6 is the -Remote Sense.
- If Remote Sense is desired, connect pin J3-1 to the positive load connection and pin J3-6 to the negative load connection. Attach load end of sense lines at the point where regulation is desired.
- J3-2 and J3-8 provide DC OK' and DC OK signals.
- J3-3 and J3-7 provide +5V VCC and +5V Return.
- J3-4 and J3-9 provide paralleling signals PR1 and PR2.
- J3-5 is Chassis Ground.
- Use ITT/Cannon mating receptacle P/N DE9FK87 with Amp cover shell P/N 205729-1.
- Attach terminals to 20-24 AWG stranded wire.
- Use 20-24 AWG stranded, twisted pair wire for sense connections.
- **Verify that sense lines are not cross-connected.**



### **J3 Interface Pin Out**

J3-1	+Remote Sense
J3-2	DC OK'
J3-3	+5V VCC
J3-4	PR2
J3-5	Chassis Ground
J3-6	- Remote Sense
J3-7	+5V Return
J3-8	DC OK
J3-9	PR1



# I & II Power Supply

## Power Factor Corrected AC-DC Switcher

### Overview

The Javelin is a ruggedized, switching power supply that combines the advantages of power factor correction and power density with user-selectable output voltage and power. Accepting input voltages of 85 to 254 Vac and 85 to 380 Vdc, the Javelin can provide up to 1800 watts in a 4.9" H x 7.0" W x 10.75" L (9.5" L for Javelin II) package. Its inherent flexibility comes from its use of Vicor 2<sup>nd</sup> Generation DC-DC converters. Javelin I has a 100 CFM fan installed, while Javelin II utilizes customer-provided forced-air cooling.

### Standard Features

- Power Factor Correction: .99 at 115 Vac; .95 at 230 Vac.
- Universal Input: 85-254 Vac, 47-500 Hz, or 85-380 Vdc.
- Power Output: 1800W at 230 Vac for selected outputs; 1200W at 220 Vac; 800W at 115 Vac (See chart, Pg 12, for breakdown of input voltage vs. output power).
- Full power to 55°C; half power at 70°C.
- Soft start for limiting inrush current.
- EMI Compliance: FCC Class A; EN 55022 Class A & B; MIL-STD-461E.
- Transient Protection: MIL-STD-704E.
- Environmental: MIL-STD-810E.
- MIL-STD-1399 (300A); 115Vac, 60Hz, single phase;  $\geq 1\text{KVA} < 5\text{KVA}$ .
- Harmonic Distortion to EN61000-3-2.
- AC Power OK status signal.
- Fan cooled (Javelin I only, Javelin II requires 100 CFM to be provided by customer).
- Equipped with Auto-Sense.
- Output overcurrent, overvoltage and overtemperature protection.
- Ride-through (holdup) time: >20 ms at 1200W load.
- Size: 4.9" H x 7.0" W x 10.75" L (9.5" L for Javelin II).
- Heavy-duty "ruggedized" enclosure designed for a high shock and vibration environment.
- Extra cooling provided for higher output with increased altitude capability.
- "D" shell connectors for input and interface connections.
- Optional conformal coating for PCBs.

### Technical Description

The Javelin consists of a DC or off-line single phase power-factor-corrected front end, with an EMI filter, cooling fan (Javelin I), customer interface, associated housekeeping circuits, and a selection of Vicor's DC-DC converters.

Input DC or AC mains voltage is applied to a 3-pin power connector. The input current is passed through an EMI filter designed to meet conducted noise limit specification EN55022, level A and B.

At start-up, inrush current is limited by a PTC thermistor. The PTC is shunted out shortly after initial power-up by a DC bus voltage sense circuit driving a thyristor. After rectification, the input voltage is put through a boost converter that keeps the AC input current sinusoidal and synchronized with the input AC voltage (in compliance with EN61000-3-2). The boost converter delivers a regulated input to the hold-up capacitors and a high voltage backplane. The backplane supplies power to the DC-DC converters that provide the desired low voltage, regulated output.

Voltage conversion is achieved by Vicor's family of Zero-Current-Switching (ZCS) DC-DC converters. These are forward converters in which the main switching element switches at zero current. This patented topology has a number of unique attributes: low switching losses, high frequency operation (resulting in reduced size for magnetics and capacitors), excellent line and load regulation, wide output adjustment range, low EMI/RFI emission, and high efficiency.

At initial power-up, the Javelin output is disabled to limit the inrush current and to allow the DC bus potential to settle out to the correct operating level. A low-power flyback converter operating with PWM current-mode control converts the high voltage DC bus into regulated low voltage to power the internal housekeeping circuits and DC cooling fans.

The internal housekeeping Vcc comes up within 1 second after the application of input power. Once the high voltage bus is within operating limits, the AC Power OK signal changes its output to a TTL "1," indicating the input power is OK, and allows the power output to come up 15-30 ms later. An auxiliary Vcc output of 5 Vdc capable of sourcing up to 300mA is provided for peripheral use.

An output Inhibit/Enable function is provided by using an optocoupler to control Vicor's DC-DC converters. If the Inhibit control pin is pulled low and the Enable pin is high or open, the optocoupler will turn on and disable the output. The delay for an output to come up when measured from release of the Enable pin is 5-10 ms.

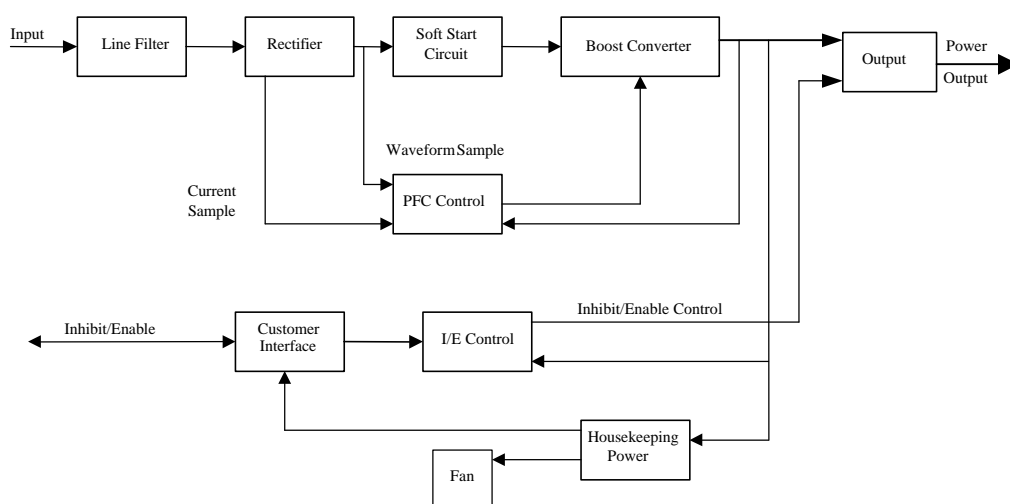


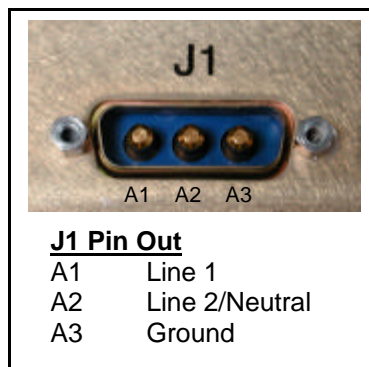
Figure 1. Javelin Architecture

## Interface Connections

### Input Power Terminal (J1)

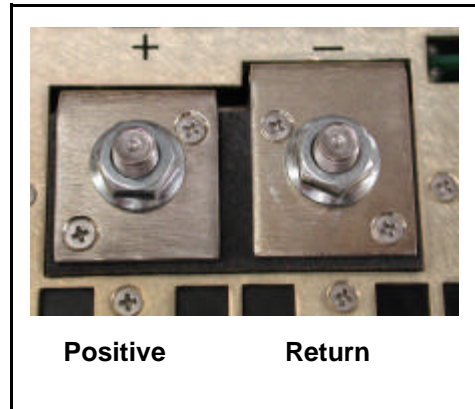
Input AC (and DC) Power is applied to connector J1 using a 3W3 power connector. J1-A1 is Line (L1), J1-A2 is Line 2/Neutral (L2/N), and J1-A3 is Earth Ground (G) for safety.

A fault-clearing device, such as a fuse or circuit breaker, with a maximum 15A rating at the power supply input is required for safety agency compliance. It should be sized to handle the start-up inrush current of 30A at 115 Vac and 60A at 230 Vac.



### Output Power Connections

The output power terminals available on the Javelin are 5/16–18 studs with flanged nuts. The positive polarity of the output is the left stud when viewed from the output end. In order to minimize parasitic cable inductance and reduce EMI, the output power cables should be routed in close proximity to one another, and large current loops should be avoided. To avoid excessive voltage drop, do not undersize power cables, especially for high current outputs. Excessive cable inductance, coupled with large capacitive loading, can introduce instability in switching power supplies. This problem can be avoided with proper system design. Consult Mission Power Solutions' Engineering Department for assistance with applications that use long cable lengths and excessive load capacitance.



### Signal Return (J2-4)

Signal Return on J2-4 is an isolated secondary ground reference for all J2 interfacing signals. This is **not** the same as Earth Ground on input power connector J1.

### Inhibit/Enable (J2-7 to J2-8)

The Inhibit/Enable control pins allow the output to be controlled with either “inhibit” or “enable” logic. Connecting Inhibit (J2-8) and Enable (J2-7) to ground causes the Javelin to operate. With Inhibit (J2-8) open the Javelin will operate, and the Enable pin has no effect. Connecting Inhibit to ground and leaving Enable open will disable the output of the Javelin. Refer to Table 2 (Pg. 2).

### AC OK (J2-6)

AC OK is an active high TTL-compatible signal and provides a status indication of the AC input power. It is on pin J2-6 and is capable of sinking 16 mA maximum. This signal switches to a TTL “1” when the high voltage bus exceeds low-line condition during turn-on. Upon loss of input power, the bus voltage will drop, causing the AC OK signal to go low. A minimum of 3 ms holdup time is provided for a 1200W load following the loss of the AC OK signal.

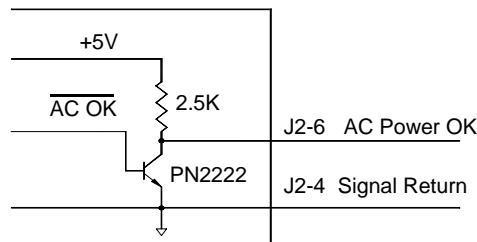


Figure 2. AC OK Output Circuit

### Auxiliary Vcc +5V/0.3A (J2-5)

The Vcc on J2-5 is an auxiliary 5V regulated power source. It is +5Vdc  $\pm$  5% with respect to Signal Ground (J2-4 and J2-2) and can supply 300mA maximum. It is short-circuit proof, but if shorted, all outputs will be shut down through the Inhibit/Enable circuitry.

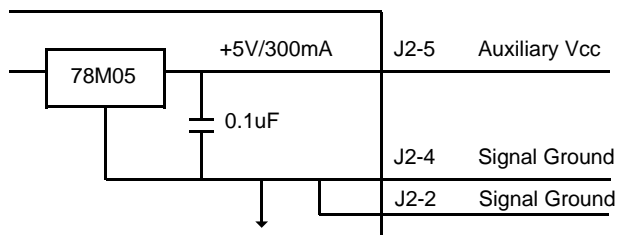


Figure 3. Auxiliary Vcc Circuit

### Remote Sense Connections

The Javelin is shipped from the factory with Auto-Sense installed. If Remote Sense is desired, sense leads must be connected from J3-1 (+Remote Sense) and J3-6 (- Remote Sense) to the load point where regulation is required.

When Auto-Sense is used, the power supply will regulate the output at the output terminals. The voltage appearing at the load may drop slightly due to voltage drop in the power cables. If it is necessary to compensate for voltage drop along the output power cables, the output can be trimmed up or configured for Remote Sense. Use stranded, twisted pair 20-24 AWG wire for the Remote Sense lines. Remote Sense can compensate for a voltage drop of up to 0.5V, or 0.25V on each leg.

### DC OK/DC OK' (J3-8 and J3-2)

DC OK and DC OK' are logic signals provided to indicate with either TTL logic "1" or "0" that the correct output voltage is available. DC OK (J3-8) is a logic "1" when output voltage is within specification and a logic "0" when output is out of tolerance. A logic "0" is capable of sinking 16 mA in either circuit. The inverse signal, DC OK', is available at J3-2. The circuit is operated with a +5Vcc provided by either the customer or taken from connector J2-5 (+5V Vcc) and J2-2 (+5V Return).

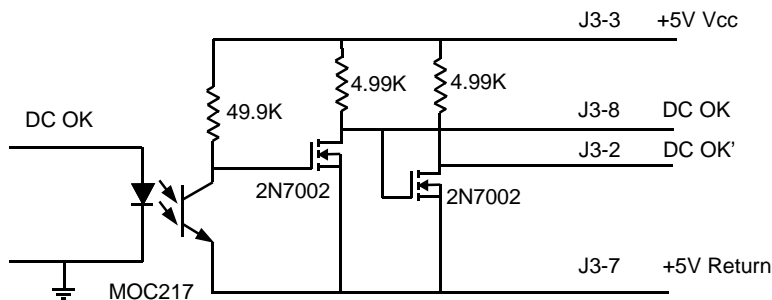


Figure 4. DC OK Circuit

## Connecting Javelin I & II Power Supplies in Parallel

To connect up to three Javelin Power Supplies in parallel, connect PR1 (J3-9) to corresponding PR1(s) (J3-9) and PR2 (J3-4) to corresponding PR2(s) (J3-4). Use 20-24 AWG twisted pair, shielded hook-up cable with the shield connected to each unit's chassis ground (J3-9). All units must use equivalent power sources, and all outputs must be connected to a common bus with equal impedance connections. Output voltage can be adjusted on one power supply provided the other unit(s) is/are adjusted completely counterclockwise. If Remote Sense is used, all units must have a connection to the point of regulation using 20-24 AWG twisted pair wires.

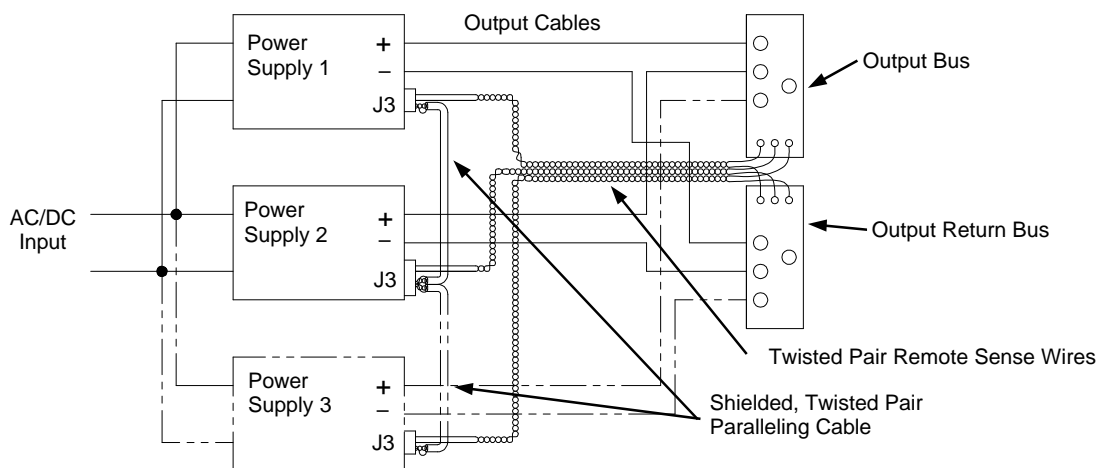


Figure 5. Paralleling Javelin I and II Power Supplies

## Mechanical Considerations

The Javelin can be mounted on either of two surfaces (top or bottom) using standard 8-32 size screws. Maximum allowable torque is 20 in/lbs., and the maximum penetration is 0.21" (5,33mm).

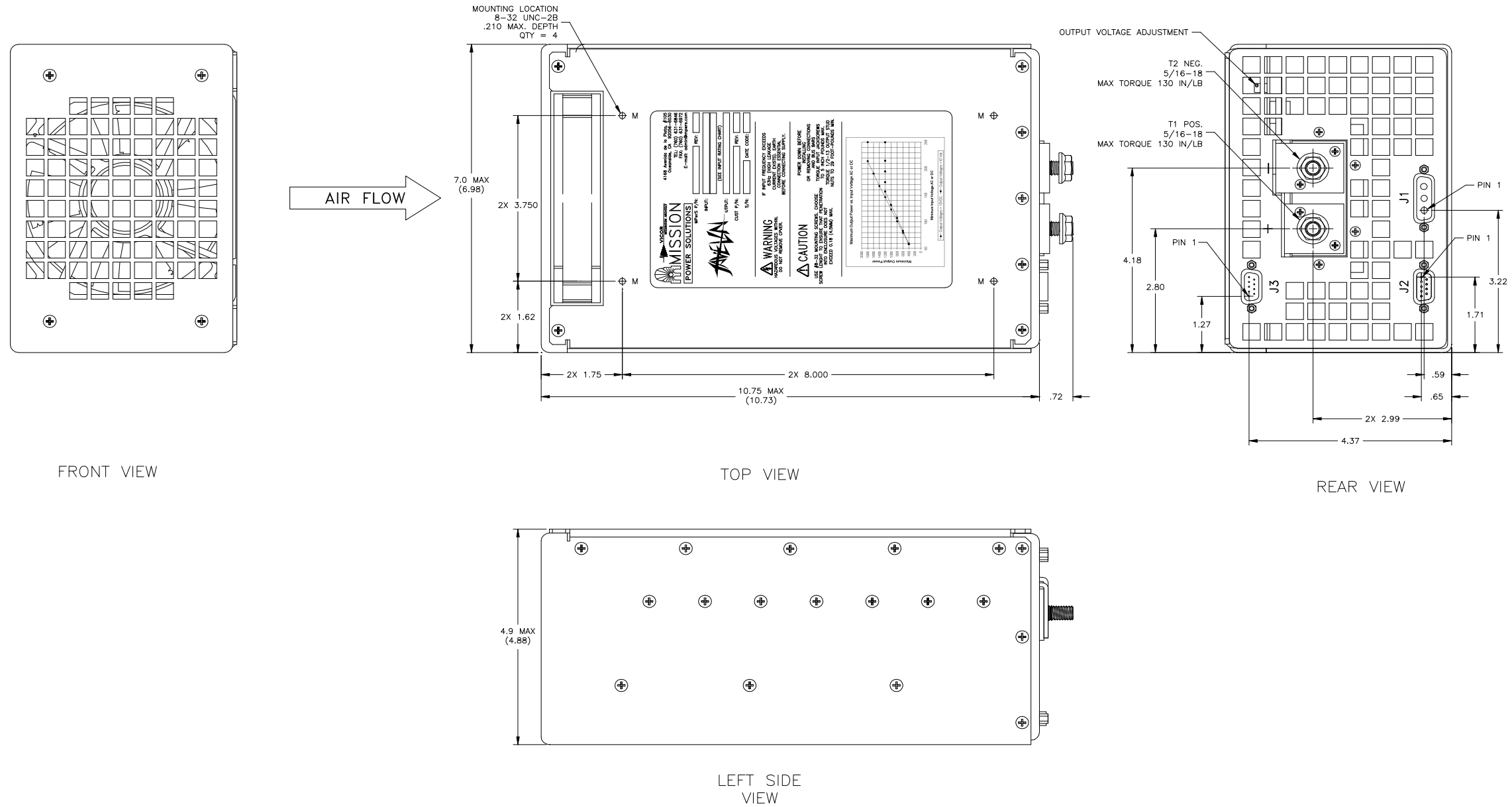
When selecting a mounting location and orientation, the unit should be positioned so that airflow is not restricted. Maintain a 2" (50,8mm) minimum clearance at both ends of the Javelin, and route all cables so airflow is not obstructed. The power supply draws air in at the front side and exhausts air out the load/input side. If airflow ducting is used, avoid sharp turns that could create backpressure. The fan moves approximately 100 CFM of air.

Avoid excessive bending of output power cables after they are connected to the output terminals. For high-current outputs, use cable ties to support heavy cables and minimize mechanical stress on connectors. Be careful to not short out to neighboring outputs. The maximum torque recommended on output nuts is 130 in/lbs.

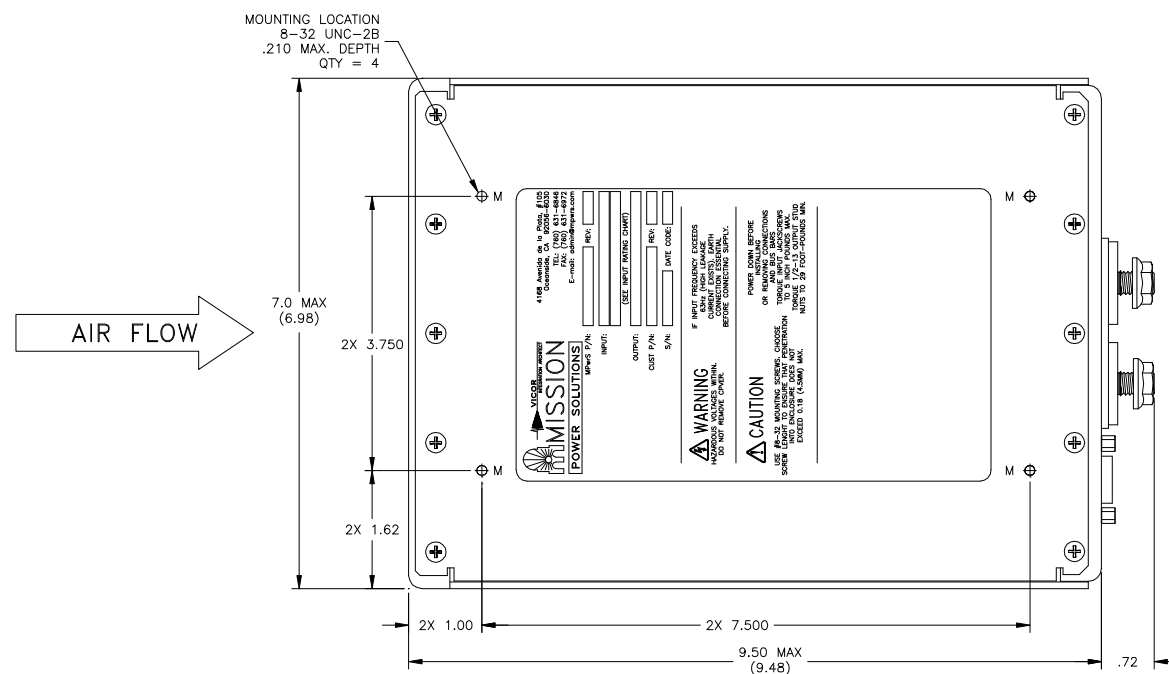
## Javelin Do's and Don'ts

- Run the output (+/-) power cables next to each other to minimize inductance.
- Insert proper fault protection at power supply input terminals (i.e., a fuse).
- Use proper size wires to avoid overheating and excessive voltage drop.
- Do not attempt to repair or modify the power supply in any manner.
- **Do not restrict airflow to the unit.** The cooling fan draws air into the front of the unit and forces it out at the input/output terminal (rear) side. It is necessary to provide at least 100 CFM of cooling airflow for the Javelin II.

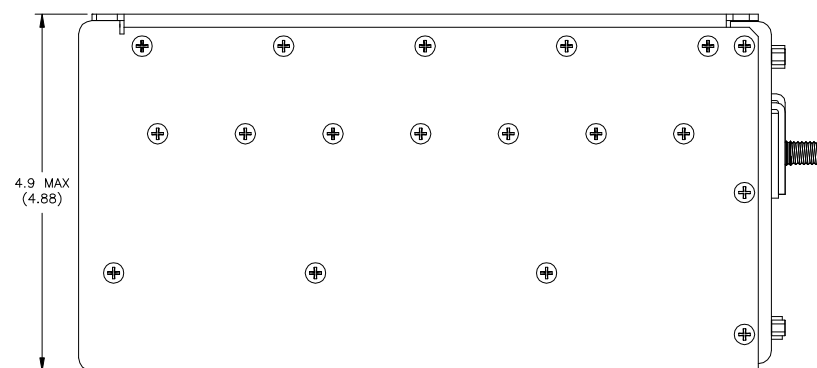
### Mechanical Drawing - Javelin I



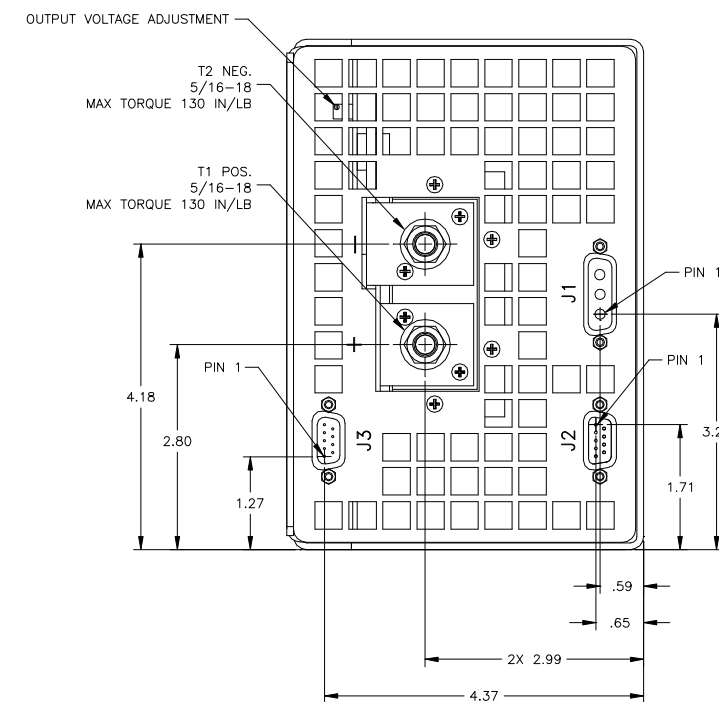
### Mechanical Drawing - Javelin II (page 1)



TOP VIEW

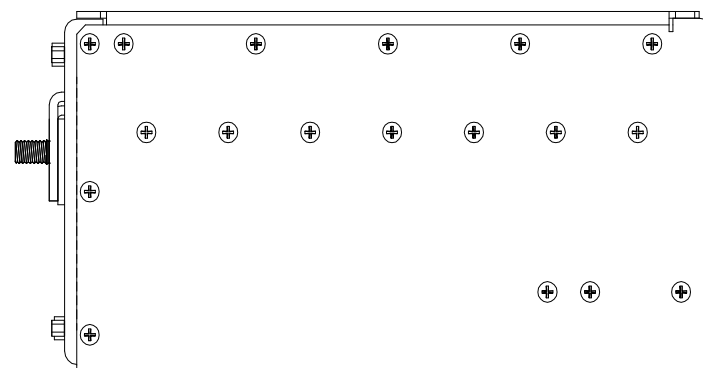


LEFT SIDE VIEW

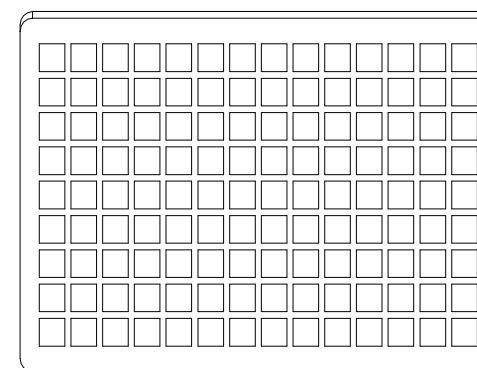


REAR VIEW

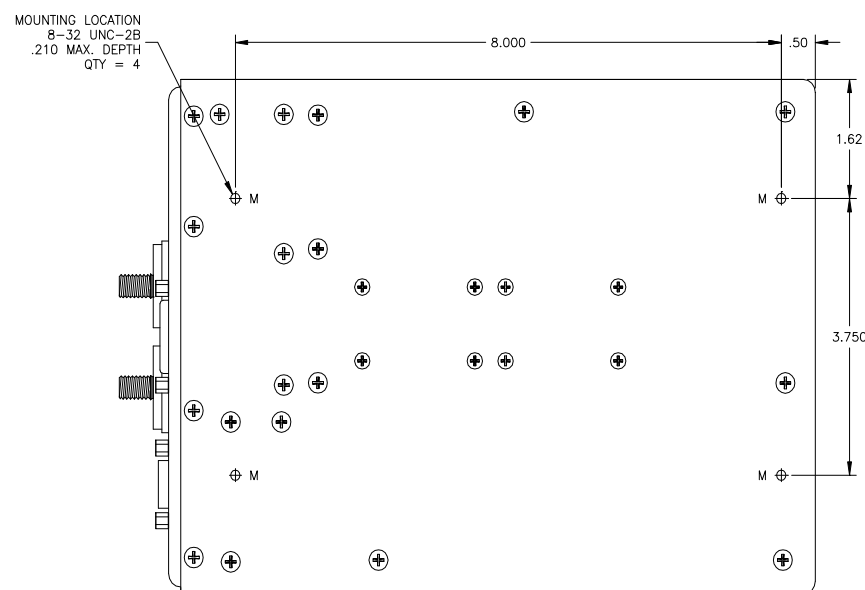
### Mechanical Drawing - Javelin II (page 2)



RIGHT SIDE VIEW



FRONT VIEW



BOTTOM VIEW

## Specifications

(Typical at 25°C, nominal line and 75% load, unless otherwise specified)

### General

<b>Number of Outputs</b>	1
<b>Efficiency</b>	>75%
<b>Safety Approvals</b>	N/A
<b>MIL-STD's</b>	461E; 704E; 810E; 1399
<b>Maximum Output Power</b>	800W, >104 Vac 1200W, >160 Vac 1800W, >212 Vac (Selected Output Voltages)

### Input

<b>Input</b>	85-254 Vac, 47-500Hz 85-380 Vdc
<b>Line Regulation</b>	± 0.2% from 10% load to full load
<b>Inrush Current</b>	30A rms. max. @ 115 Vac 60A rms. max. @ 230 Vac
<b>Ride-Through Time</b>	20 ms at 1200W load
<b>Conducted EMI</b>	FCC Class A, EN 55022 Class B MIL-STD-461E
<b>Power Factor</b>	.99 (115 Vac 800W load) .95 (230 Vac 1200W load)
<b>Transient Surge</b>	IEC 801-5 level 3 (Common Mode & Normal Mode)
<b>Dielectric Withstand</b>	Primary to Chassis GND = 2121 Vac Primary to Secondary = 4242 Vdc Secondary to Chassis GND = 500 Vdc

### Output

<u>Parameter</u>	<u>MIN.</u>	<u>TYP.</u>	<u>MAX.</u>	<u>UNITS</u>	<u>NOTES</u>
<b>Setpoint Accuracy</b>		±0.5	±1	% of V <sub>NOM</sub>	
<b>Load/Line Regulation</b>		±0.02	±0.2	% of V <sub>NOM</sub>	0% to 100%
<b>Temperature Regulation</b>		0.002	0.005	%/°C	-20 to 100°C
<b>Long Term Drift</b>		0.02		%/1K hours	
<b>Output Ripple – pp:</b>					
2V, 3.3V		100		mV	20 MHz bandwidth
5V		2		%	20 MHz bandwidth
12-95V		1		%	20 MHz bandwidth
<b>Trim</b>	90		110	% of V <sub>NOM</sub>	
<b>Total Remote Sense Compensation</b>	0.5			Volts	0.25V max. each leg
<b>OVP Set Point</b>	112		135	% of V <sub>NOM</sub>	Recycle power
<b>Current Limit</b>	102		135	% of I <sub>max</sub>	Automatic restart
<b>Over-Temperature Protection</b>	85>TA<95				Varies according to power level

## Environmental

**MIL-STD** 810E

**Storage Temperature**

C Grade	-40°C to +125°C
T Grade	-40°C to +125°C
H Grade	-55°C to +125°C
M Grade	-65°C to +125°C

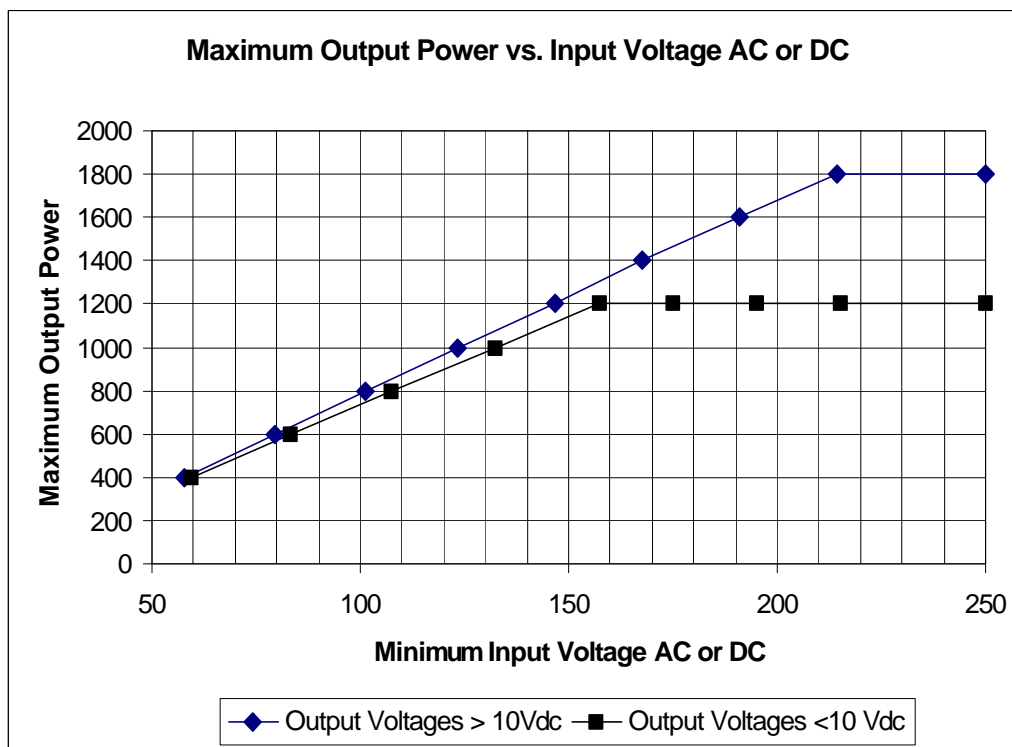
**Operating Temperature**

C Grade, Full Power	-20°C to +55°C
C Grade, Half Power	-20°C to +70°C
T Grade, Full Power	-40°C to +55°C
T Grade, Half Power	-40°C to +70°C
H Grade, Full Power	-40°C to +55°C
H Grade, Half Power	-40°C to +70°C
M Grade, Full Power	-55°C to +55°C
M Grade, Half Power	-55°C to +70°C

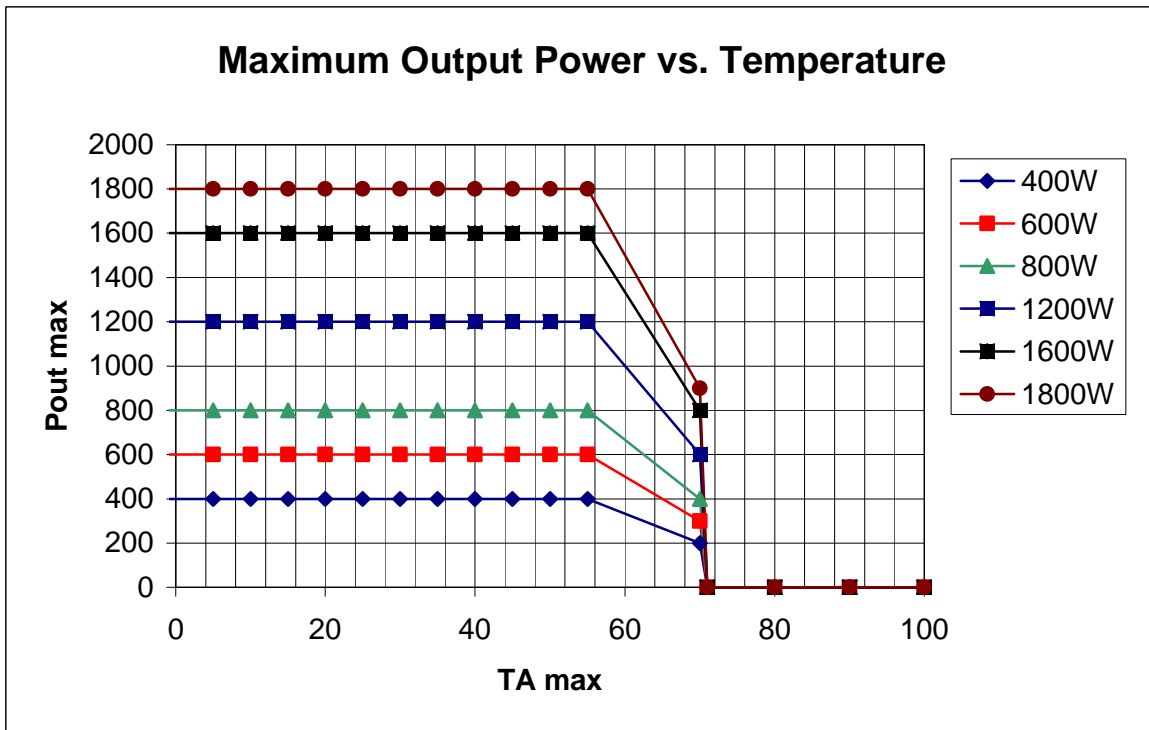
**Product Weight** 11.50 lbs. (11.0 lbs. Javelin II)

**Dimensions** 4.9" H (124,46mm) x 7.0" W (177,8mm) x 10.75" L (273,1mm)  
[9.5" L (241,3mm) for Javelin II]

**Warranty** 1 Year Limited



Graph 1. Maximum Output Power vs. Input Voltage



Graph 2. Maximum Output Power vs. Temperature

# Notes

---