



UNIPOWER
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POWER
SOLUTIONS

PRICE: \$25.00

**ULTIMOD™ S SERIES
1800 WATT
CONFIGURABLE HIGH-DENSITY
POWER SYSTEM**

Manual No. S-0397-0

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ULTIMOD™ S SERIES OPERATING MANUAL

1.0 INTRODUCTION

- 1.1 This Operating Manual should be read through carefully before installing and operating the ULTIMOD S Series Power System.
- 1.2 The ULTIMOD™ S Series is a modular, configurable power system incorporating Vicor high-density DC/DC converters. See Fig. 1. The power system can produce up to 1800 watts output with up to 12 output voltages. The AC input module is available with or without power factor correction and incorporates a Class A input EMI filter with Class B optional.

An ULTIMOD power system can be quickly configured at the factory to meet a customer's required combination of output voltages and power levels.

The S Series comes in three basic cases: 5 x 5 x 11 inches with two output slots, 5 x 6.5 x 11 inches with three output slots, and 5 x 8 x 11 inches with four output slots. Each internal slot accommodates a single-output, dual-output or triple-output module, each with up to 600W output power. There is also a single-output, two-slot module which produces up to 1200W output. Available output voltages are from 2 VDC to 48 VDC. The exceptional choice of S Series outputs results in a total number of combinations that exceeds 3 million. For a complete description and specifications see the S Series product data sheet in the appendix.

2.0 SAFETY WARNINGS

- 2.1 This switching power supply has hazardous external and internal voltages. It should be handled, tested and installed only by qualified technical persons who are trained in the use of power supplies and are well aware of the hazards involved.
- 2.2 The AC input terminals are at hazardous voltage potentials. Do not touch this area when AC power is applied.
- 2.3 When operating this power system, the AC input ground terminal must be connected to safety ground to minimize electrical shock hazard and to ensure low EMI (electromagnetic interference).

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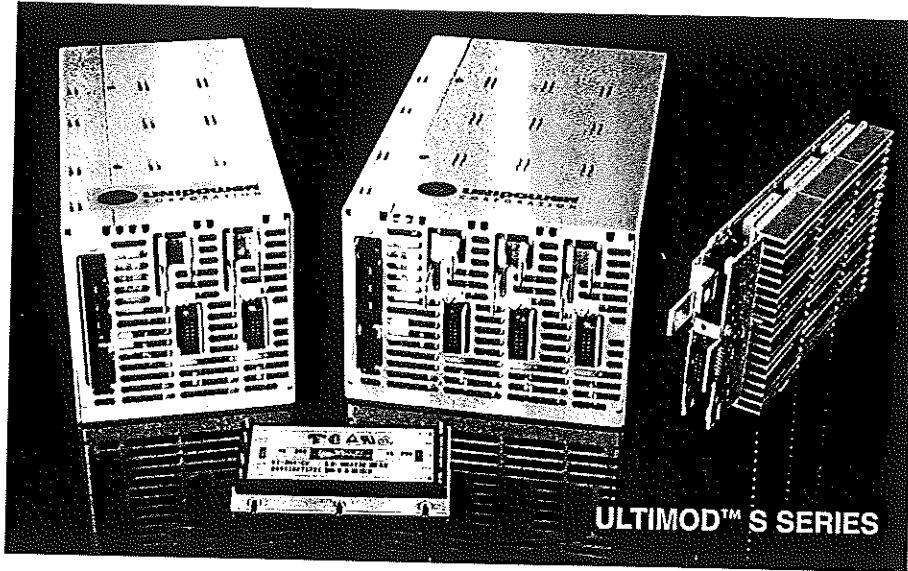
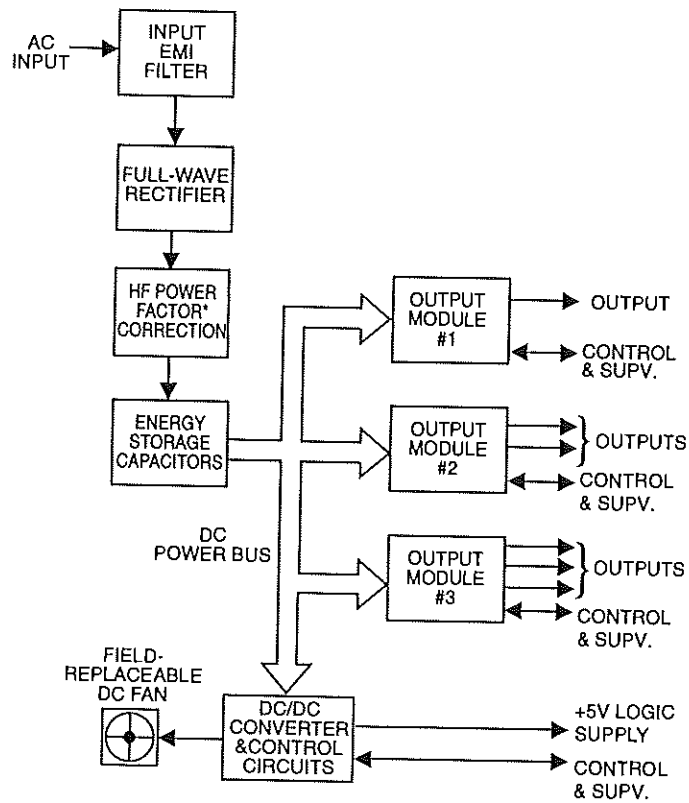


Figure 1. ULTIMOD™ S Series Power System



* On PFC Models

Figure 2. S Series Power System Block Diagram.

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- 2.4 The internal DC power bus is at a dangerous voltage potential. The power system cover should not be removed. There are no user-serviceable components in this unit.

3.0 WARRANTY POLICY

ALL PRODUCTS OF UNIPOWER Corporation are guaranteed for two (2) years from date of shipment against defects in material and workmanship. This warranty does not extend to products which have been opened, altered or repaired by persons other than persons authorized by the manufacturer or to products which become defective due to acts of God, negligence or the failure of customer to fully follow instructions with respect to installation, application or maintenance. This warranty is extended directly by the manufacturer to the buyer and is the sole warranty applicable. EXCEPT FOR THE FOREGOING EXPRESS WARRANTY, THE MANUFACTURER MAKES NO WARRANTY, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. As the sole and exclusive remedy under this warranty, the manufacturer, at its option, may repair or replace the non-conforming product or issue credit, provided the manufacturer's inspection establishes the existence of a defect. To exercise this remedy, the buyer must contact the manufacturer's Customer Service Department to obtain a Return Material Authorization number and shipping instructions. Products returned without prior authorization will be returned to buyer. Freight charges incurred in returning the defective products will be paid by UNIPOWER. Charges incurred in returning the material will be paid by the buyer. If the buyer fails to fully comply with the foregoing, the buyer shall not be entitled to any allowance or claim with respect to such product. The buyer agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property or any other incidental or consequential losses) shall be available to the buyer.

4.0 UNPACKING AND INSPECTION

- 4.1 This S Series Power System was carefully tested, inspected and packaged for shipment from our factory. Upon receipt of the unit it should be carefully unpacked and inspected for any damage in shipment.
- 4.2 If there is evidence of damage, do not attempt to test the unit. The freight carrier should be notified immediately, and a claim for the cost of the power system should be filed with the carrier for direct reimbursement. Be sure to include the model and serial number of the damaged unit in all correspondence with the freight carrier. Also save the shipping carton and packing materials as evidence of damage for the freight carrier's inspection.
- 4.3 UNIPOWER Corporation will cooperate fully in case of any shipping damage investigation.

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- 4.4 Always save the packing materials for later use in shipping the unit. Never ship the power system without proper packing.

5.0 DESCRIPTION OF OPERATION

5.1 **AC Input Module.** The ULTIMOD S Series is designed as a distributed power system. See the block diagram, Fig. 2. The front end (AC Input Module) has an input EMI filter to suppress line noise and high frequency transients both from the AC power line and from the power system to the line. For power factor corrected (PFC) models (SP, SR, ST), the input voltage range is 85 to 264VAC continuous. For non-PFC models (SNP, SNR, SNT), the input is autoranging with 90 to 132 and 180 to 264VAC ranges. For PFC models the power factor correction circuit maintains a high (0.99) input power factor. Inrush current limiting controls the initial AC input current on power-up. The AC Input Module rectifies and filters the AC line current and provides power factor correction. The resultant DC goes to a power bus which distributes the power to each DC Output Module. The AC Input Module has its own internal DC/DC converter which powers the control and supervisory signal circuits and the DC cooling fan.

5.2 **Power Factor Correction.** For power factor corrected models the AC Input Module incorporates a high-frequency, zero-voltage switching power-factor correction circuit to give a 0.99 power factor. This circuit modifies the input current waveform from a series of high amplitude current pulses to a much lower amplitude sine wave. This substantially reduces the harmonic content of the input current to the power supply. See Fig. 3.

Power factor correction results in a much lower RMS input current for a given output power level. This means that higher output power can be realized within the safety limits of a standard 15A or 20A AC outlet.

5.3 **DC Output Modules.** DC Output Modules are single-, dual-, or triple-output modules. Each module has up to three Vicor converters on it with up to 200 watts output each, or up to 600 watts total per module. There is also a two-slot, single-output module with up to six converters and 1200 watts total output power. All outputs are independent and fully isolated from other outputs, and each output has current limiting, short-circuit protection and overvoltage protection. Each module also incorporates its own control and supervisory input and output signals.

6.0 FRONT PANEL DESCRIPTION

6.1 A typical ULTIMOD S Series front panel configuration is shown in Fig. 4. At the left side is the AC Input Module which has an AMP input connector for the three AC input connections and a 10-pin Molex connector for connecting to the control and supervisory signal inputs and outputs.

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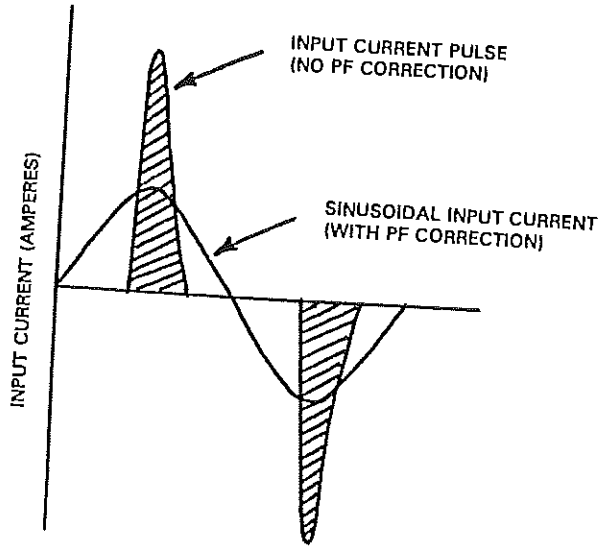


Figure 3. Input Current Waveforms Before and After High Frequency Power Factor Correction.

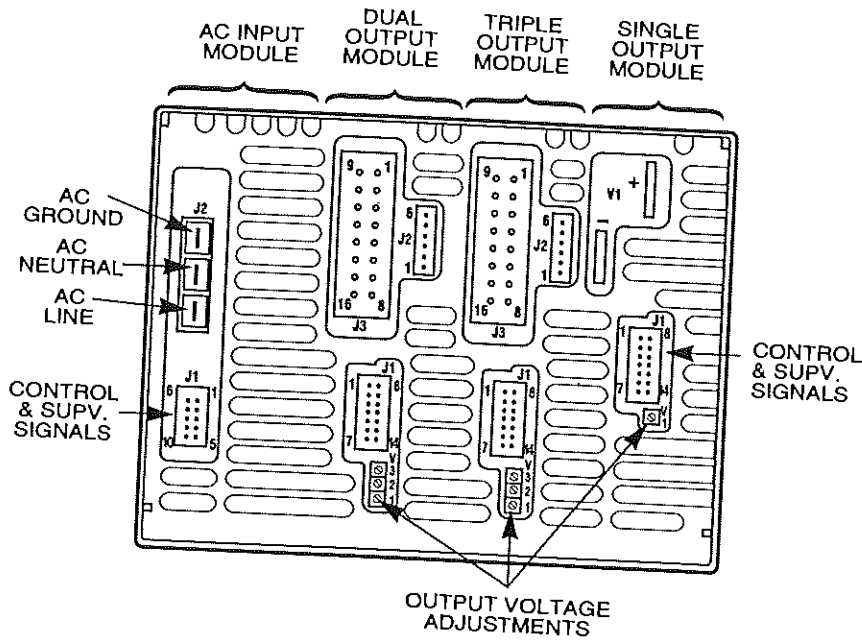


Figure 4. ULTIMOD S Series Front Panel View.

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- 6.2 The next three sections to the right are DC Output Modules: The first is a 600-watt, dual-output module; the second is a 600-watt, triple-output module; the third is a 600-watt single-output module. Each module has output voltage adjustment potentiometers. All DC Output Modules have a 14-pin Molex connector for the control and supervisory signal inputs and outputs. On single-output modules the upper output bus bar is positive and the lower one is negative.

7.0 OUTPUT MODULE SELECTION

SINGLE-OUTPUT MODULES (ONE SLOT)

	200W		400W		600W	
OUTPUT VOLTAGE	OUTPUT CURRENT	OUTPUT CODE	OUTPUT CURRENT	OUTPUT CODE	OUTPUT CURRENT	OUTPUT CODE
2V	40A	1C	80A	1F	120A	1H
3.3V	40A	9C	80A	9F	120A	9H
5V	40V	2C	80A	2F	120A	2H
12V	16.7A	3C	33.3A	3F	50A	3H
15V	13.4A	4C	26.7A	4F	40A	4H
24V	8.3A	5C	16.7A	5F	25A	5H
28V	7.1A	6C	14.3A	6F	21.4A	6H
48V	4.2A	7C	8.3A	7F	12.5A	7H

SINGLE-OUTPUT MODULES (TWO SLOTS)

	800W		1000W		1200W	
OUTPUT VOLTAGE	OUTPUT CURRENT	OUTPUT CODE	OUTPUT CURRENT	OUTPUT CODE	OUTPUT CURRENT	OUTPUT CODE
2V	160A	1M	200A	1N	240A	1P
3.3V	160A	9M	200A	9N	240A	9P
5V	160A	2M	200A	2N	240A	2P
12V	66.7A	3M	83.3A	3N	100A	3P
15V	53.3A	4M	66.7A	4N	80A	4P
24V	33.3A	5M	41.7A	5N	50A	5P
28V	28.6A	6M	35.7A	6N	42.9A	6P
48V	16.7A	7M	20.8A	7N	25A	7P

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DUAL-OUTPUT MODULES (ONE SLOT)

V1 OUTPUT				V2 OUTPUT		
OUTPUT VOLTAGE	POWER	OUTPUT CURRENT	OUTPUT CODE	POWER	OUTPUT CURRENT	OUTPUT CODE
2V	200W	40A	1C	-	-	-
3.3V	200W	40A	9C	-	-	-
5V	200W	40A	2C	75W	15A	2A
12V	200W	16.7A	3C	100W 200W 400W	8.3A 16.7A 33.3A	3A 3C 3F
15V	200W	13.4A	4C	100W 200W 400W	6.7A 13.4A 26.7A	4A 4C 4F
24V	200W	8.3A	5C	100W 200W 400W	4.2 8.3A 16.7A	5A 5C 5F
48V	200W	4.2A	7C	100W 200W 400W	2.1A 4.2A 8.3A	7A 7C 7F

V2 OUTPUT				V3 OUTPUT		
OUTPUT VOLTAGE	POWER	OUTPUT CURRENT	OUTPUT CODE	POWER	OUTPUT CURRENT	OUTPUT CODE
2V	-	-	-	-	-	-
3.3V	-	-	-	-	-	-
5V	75W	15A	2A	75W	15A	2A
12V	100W	8.3A	3A	100W	8.3A	3A
15V	100W	6.7A	4A	100W	6.7A	4A
24V	100W	4.2A	5A	100W	4.2A	5A
48V	100W	2.1A	7A	100W	2.1A	7A

NOTE: Dual outputs can be any V1 and any V2 from top table or any V2 and any V3 from bottom table.

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TRIPLE-OUTPUT MODULES (ONE SLOT)

OUTPUT VOLTAGE	V1 OUTPUT			V2 OUTPUT			V3 OUTPUT		
	POWER	OUTPUT CURRENT	OUTPUT CODE	POWER	OUTPUT CURRENT	OUTPUT CODE	POWER	OUTPUT CURRENT	OUTPUT CODE
2V	200W	40A	1C	-	-	-	-	-	-
3.3V	200W	40A	9C	-	-	-	-	-	-
5V	200W	40A	2C	75W	15A	2A	75W	15A	2A
12V	200W	16.7A	3C	100W 200W	8.3A 16.7A	3A 3C	100W 200W	8.3A 16.7A	3A 3C
15V	200W	13.4A	4C	100W 200W	6.7A 13.4A	4A 4C	100W 200W	6.7A 13.4A	4A 4C
24V	200W	8.3A	5C	100W 200W	4.2A 8.3A	5A 5C	100W 200W	4.2A 8.3A	5A 5C
48V	200W	4.2A	7C	100W 200W	2.1A 4.2A	7A 7C	100W 200W	2.1A 4.2A	7A 7C

8.0 DESCRIPTION OF FEATURES AND OPTIONS

FEATURE/OPTION	DESCRIPTION
AC Undervoltage Protection	Power supply is protected for all conditions below low line voltage.
Safety Agency Approvals	UL1950; CSA22.2 No. 950; EN60950.
Output Current Limiting	Current limiting takes place at 105% to 125% of rated load current.
Short Circuit Current	For 5V outputs at 200W and higher, short circuit current is 20% to 80% of rated load current. Foldback limiting starts at approximately 2V. For all other outputs, short circuit current is 105% to 130% of rated load current.
Overvoltage Protection	OVP operates at 115% to 135% of the nominal output voltage. The output latches off. It is reset by cycling the AC input off and then on.
Reverse Voltage Protection	To 100% of rated output current, maximum

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FEATURE/OPTION	DESCRIPTION
Turn-On Time	One second max. from AC turn-on. The output voltage rise is monotonic with 2% maximum overshoot.
Isolated Outputs	All DC outputs are floating and isolated from all other outputs. They can be connected as either + or - outputs and can be up to $\pm 100V$ from chassis ground.
Overtemperature Protection	The AC Input Module and all output converters are thermally protected. The outputs shut down if the internal temperature reaches an excessive value. They are restored by cycling the AC input off and then on.
EMI Input Filter	Conducted EMI meets FCC and EN level A or EN level B.
+5V @ 50mA Auxiliary Output	This output voltage with up to 50mA output current is isolated from the power system input and outputs. This voltage powers the above control and monitoring circuits and can be used to power external logic circuits.
Current Sharing (Option L)	All outputs can current share with another identical output either from the same or another S Series power system. Current sharing accuracy is within 10% of an output's rated current.

9.0 OPERATING INFORMATION

9.1 **Input Voltage.** ULTIMOD S Series Power System operates on standard 120 VAC or 220-240 VAC input voltages and automatically adapts to the given input. This is done by means of a universal input (85-264VAC) on power factor corrected models and an autoranging input (90-132 or 180-264VAC) on non-PFC models. A protective 30A fuse is located inside the AC power chassis. This fuse is not user accessible.

9.2 **Outputs.** For single-output modules, output power connections are made to tin-plated copper bus bars. The top bar is positive and the bottom one negative. See Fig. 4. Each bar has a 0.261 inch (6.6mm) diameter hole which accommodates a 1/4-20 bolt for making the connection. The connecting wire or lug should be clean and securely connected to the bus bar to reduce contact resistance.

The outputs of the dual- and triple-output modules are connected to J3 of the corresponding module. The connection is made by means of a mating connector Positronics PBL16F0000 housing with FC112N2 terminals. Note that the V1 outputs have four connector terminals in parallel, and the V2 and V3 outputs each have two terminals in parallel. In the case of a dual-output module either V1 and

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V2 or V2 and V3 outputs are present depending on the outputs selected from the tables.

All connecting wires for the outputs must be sized to carry the rated output current plus 30%. All outputs should have a 0.1 μ F ceramic capacitor and 10 μ F electrolytic capacitor in parallel across each output at the backplane, connection point, or point of load to prevent noise pickup.

- 9.3 **Output Power.** For PFC versions (models SP, SR and ST) the rated continuous output power from all DC Output Modules is 1000 watts for an input range of 85 to 264VAC, 1200 watts for 90 to 264VAC and 1800 watts for 180 to 264VAC. The 1800W rating applies to selected output configurations. Check with the factory for these configurations.

For non-PFC versions (models SNP, SNR and SNT) the rated continuous output power from all DC Output Modules is 1000 watts for an input range of 90 to 132VAC and 1200 watts for an input range of 180 to 264VAC.

In both cases, 100% of rated output power can be drawn at up to 50°C ambient temperature. Above 50°C the output must be derated by 3.3%/°C up to 65°C. See Fig. 5. The maximum operating temperature is 65°C.

Note that the total output power rating of all modules may exceed the maximum rating of the power system but the total power drawn by the loads must not exceed the latter. This is important when an N + 1 redundancy configuration is employed.

- 9.4 **Remote Sensing.** Remote sense connections are made to pins 6 and 7 on the J1 connector of each single-output DC Output Module. On dual- and triple-output modules they are made to pins 9 and 10, 11 and 12, and 13 and 14 of J1. The remote sense feature is used to regulate the output voltage at the point of load. The + sense is connected to the + output at the load, and the - sense is connected to the - output at the load. The sense leads should be a twisted pair to minimize noise pickup. The outputs can compensate for a total voltage drop in the power leads up to 0.5 V, or 0.25 V on each lead. Sense leads can be no. 22 or 24 AWG wire, but should not exceed 10 feet (3 meters) in length. If remote sensing is not required, the sense leads should be connected to the proper output terminals right at the DC Output Module.
- 9.5 **Control and Supervisory Signals.** All control and supervisory signals are accessible at the J1 Molex connector on the front panel of the AC Input Module and on J1 of each DC Output Module. Some of the pins are for control inputs and others are for monitoring outputs. Monitor outputs and control inputs that are used must have an external 0.1 μ F ceramic capacitor connected across them to

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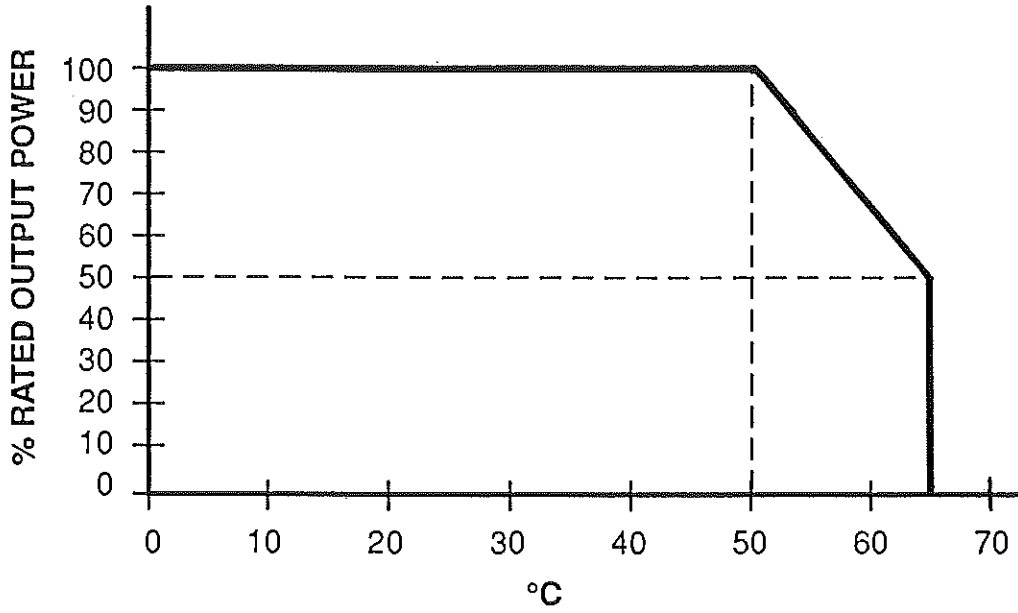


Figure 5. Output Power vs. Ambient Temperature.

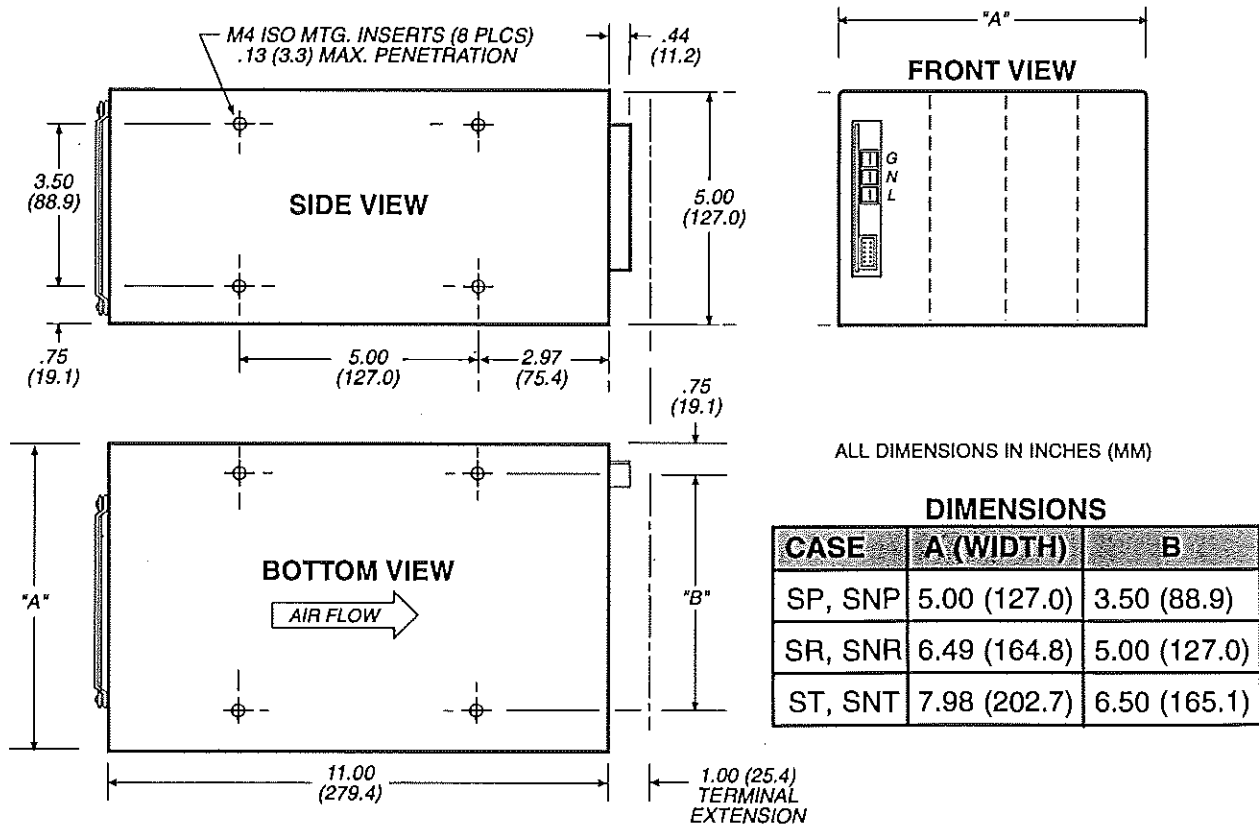


Figure 6. Mechanical Dimensions.

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prevent noise pickup. For a description of each function see the sections in "Description of Control and Supervisory Signals."

- 9.6 **Paralleled Outputs (Current Sharing).** Current sharing is an option included in the suffix L option level. Two or more outputs of an S Series Power System may be operated in parallel if each is identical with the others in both output voltage and output current. The outputs can be from the same or different S Series power systems. Parallel operation applies to any or all outputs of a power system.

With the current sharing option, each output (from a Vicor converter) has a proprietary, active, current-sharing control circuit which balances the currents between the current-shared converters. This is done by means of a single-wire current-sharing connection.

To operate paralleled outputs, the outputs must be adjusted to within $\pm 1\%$ of each other and the current share pins must be connected together. The sense leads from each output must be connected to the load point.

Current sharing accuracy is within $\pm 10\%$ of rated load current for each output. Current sharing accuracy is defined as:

$$\frac{I_1 - I_2}{I_{\text{RATED}}}$$

where I_1 and I_2 are individual converter output currents and I_{RATED} is the rated output current of a converter.

If Remote Margin is used (on a single-output module), these control pins must be connected together for all modules operating in parallel. If Output Inhibit is used, the control pins must be connected together for all outputs in parallel.

- 9.7 **N + 1 Redundancy.** This method of operation is basically the same as parallel operation. With N + 1 redundancy, two or more power systems are operated in parallel with all of their outputs in parallel. Redundancy is achieved by having one more power system in parallel than needed to supply the loads. Thus if two identical power systems in parallel are needed to provide the total load power, then three power systems are used, each providing about one third of the total load currents. Should one power system fail, the other two automatically pick up the load currents and share them approximately 50/50. The failed power system is then disconnected and replaced.
- 9.8 **+5V @ 50mA Isolated Output.** This feature provides an independent, isolated 5V output for powering external control circuits.

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10.0 CONTROL AND SUPERVISORY SIGNAL CONNECTIONS (SEE FIGURE 4)

AC INPUT MODULE J1 CONNECTOR

PIN	FUNCTION
1	+5V Aux. Output
2	5V Aux. Return
3	NC
4	Global DC Pwr Good*
5	Global Inhibit
6	NC
7	NC
8	5V Aux. Return
9	AC Power Fail
10	NC

*This output is present only on PFC models (SP, SR & ST)

SINGLE-OUTPUT MODULE J1 CONNECTOR (ONE OR TWO SLOTS)

PIN	FUNCTION
1	NC
2	NC
3	Current Share
4	NC
5	Current Monitor
6	+ Sense
7	- Sense
8	NC
9	Output Inhibit
10	+ Margin
11	- Margin
12	DC Power Good
13	5V Aux. Return
14	Remote Volt. Adjust.

DUAL- OR TRIPLE-OUTPUT MODULE J1 CONNECTOR

PIN	FUNCTION
1	Output Inhibit (V1)
2	Output Inhibit (V2)
3	Output Inhibit (V3)
4	Remote Adjust (V1)
5	Remote Adjust (V2)
6	Remote Adjust (V3)
7	5V Aux. Return
8	DC Power Good
9	+ Sense (V1)
10	- Sense (V1)
11	+ Sense (V2)
12	- Sense (V2)
13	+ Sense (V3)
14	- Sense (V3)

DUAL- OR TRIPLE-OUTPUT MODULE J2 CONNECTOR

PIN	FUNCTION
1	Current Share (V1)
2	Current Share (V2)
3	Current Share (V3)
4	Current Monitor (V1)
5	Current Monitor (V2)
6	Current Monitor (V3)

NOTE: For a Dual-Output Module, either V1 and V2 or V2 and V3 control signals are present.

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DUAL- AND TRIPLE-MODULE OUTPUTS J3 CONNECTOR

PIN	OUTPUT	PIN	OUTPUT
1	+V1	9	+V1
2	+V1	10	+V1
3	-V1	11	-V1
4	-V1	12	-V1
5	+V2	13	+V2
6	-V2	14	-V2
7	+V3	15	+V3
8	-V3	16	-V3

Note: For a Dual-Output Module, either V1 and V2 or V2 and V3 outputs are present.

CONNECTORS

AC INPUT MODULE	
J1:	Molex 15-47-6101
Mate:	22-55-2103 housing 15-04-5104 retainer clip 16-02-0103 terminals
J2:	AMP 556882-3
Mate:	556879-3 housing 556880-2 terminals
SINGLE-OUTPUT MODULE	
J1:	Molex 15-47-6141 22-55-2143 housing
Mate:	15-04-5144 retainer clip 16-02-0103 terminals
DUAL- OR TRIPLE OUTPUT MODULE	
J1:	Same as J1 for Single Output Module
J2:	Molex 70553-0005
Mate:	50-57-9406 housing 16-02-0103 terminals
J3:	Positronics PLB16M4BN0A2
Mate:	PLB16F0000 housing FC112N2 terminals

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11.0 DESCRIPTION OF CONTROL AND SUPERVISORY SIGNALS: AC INPUT MODULE, J1

SIGNAL	PIN	DESCRIPTION
+5V Auxiliary Voltage	1	A +5V at 50mA isolated output is for powering external logic circuitry. This output is not affected by the inhibit control.
5V Auxiliary Return (Reference)	2	The return for the above output and also the return for the other AC Input Module signals listed below. This return is isolated from the power supply input or output common.
Global DC Power Good (Output)	4	This TTL output goes LO (sinks 5mA) when any DC output: goes out of specification by more than $\pm 7.5\%$ (typically); goes into current limit; or an output converter stops functioning. A TTL HI (sources 1mA) is normal. This output is present only on PFC models.
Global Inhibit (Input)	5	A TTL LO (sinking 2.2mA) provided at this input inhibits (turns off) the DC outputs of all the DC Power Modules. Normal input is an open circuit or a TTL HI (sourcing 0 mA). This signal is referenced to the 5V Auxiliary Return (Pins 2 or 8).
5V Auxiliary Return (Reference)	8	This pin is physically connected to pin 2 above.
AC Power Fail (Output)	9	A TTL LO (sinks 5mA) occurs when the AC input voltage falls a preset amount below the low line voltage specification. A TTL HI (sources 1mA) is normal. The LO signal occurs at least 5 msec. before the output voltages drop out of regulation. This TTL signal is referenced to the 5V Auxiliary Return (Pins 2 or 8).

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12.0 DESCRIPTION OF CONTROL AND SUPERVISORY SIGNALS: DC OUTPUT MODULES

SINGLE OUTPUT MODULE, J1

SIGNAL	PIN	DESCRIPTION
Current Share	3	The output can current share with an identical output module of another ULTIMOD power supply by connecting the current share terminals together. The output voltages must first be adjusted to within 1% of each other before connecting the outputs in parallel. The worst case difference between load currents of any two modules is 10% of a module's rated load current. This connection is referenced to the - Sense terminal (pin 7).
Current Monitor (Output)	5	This analog output voltage is proportional to the load current. It is referenced to the -Sense terminal pin (pin 7).
+ Sense - Sense	6 7	The remote sense leads provide regulation at the load point. They should be connected to the + and - load points respectively. Total external voltage drop from the DC output to the sense points must not exceed 0.5V, with 0.25V max. in the - Sense lead.
Output Inhibit (Input)	9	A TTL LO (sinking 2.2mA) provided at this input inhibits (turns off) the DC output of the module. A TTL HI (sourcing 0 mA) or open is normal. This input is referenced to the 5V Aux. Return (pin 13).
+ Margin (Input)	10	A TTL LO (sinking 2.2mA) at this input causes a +5% change in the module output voltage. A TTL HI (sourcing 0 mA) or open is normal. This input is referenced to the 5V Aux. Return (pin 13).
- Margin (Input)	11	Same as + Margin above except that a TTL LO causes a -5% change in the output.
DC Power Good (Output)	12	This TTL output goes LO (sinks 1.8mA) when the module DC output: goes out of specification by more than $\pm 7.5\%$ (typically); goes into current limit; or an output converter stops functioning. A TTL HI (sources 1.3mA) is normal. output is referenced to the 5V Aux. Return (pin 13).

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SIGNAL	PIN	DESCRIPTION
5V Auxiliary Return (Reference)	13	This isolated 5V return is common to pins 2 and 8 of the AC Input Module connector.
Remote Voltage Adjust (Input)	14	0V to +5V applied to this high impedance input controls the output voltage by approximately $\pm 30\%$. +2.5V gives nominal output. Care must be taken that the high end of this range does not cause total output power to exceed rating or that it does not cause the OVP circuit to trip. This input is referenced to the - Sense terminal (pin 7).

DUAL- OR TRIPLE- OUTPUT MODULE, J1

SIGNAL	PIN	DESCRIPTION
Output Inhibit (V1) (Input)	1	A TTL LO (sinking 2.2mA) provided at this input inhibits (turns off) the referenced DC output of the module. A TTL HI (sourcing 0 mA) or open is normal. This input is referenced to the 5V Aux. Return (pin 7).
Output Inhibit (V1)	2	Same description as pin 1.
Output Inhibit (V3)	3	Same description as pin 1.
Remote Volt. Adj. (V1) (Input)	4	0V to +5V applied to this high impedance input controls its respective output voltage by approximately $\pm 30\%$. +2.5V gives nominal output. Care must be taken that the high end of this range does not cause total output power to exceed rating or does not cause the OVP circuit to trip. This input is referenced to its respective - Sense terminal.
Remote Volt. Adj. (V2) (Input)	5	Same description as pin 4.
Remote Volt. Adj. (V3) (Input)	6	Same description as pin 4.

ULTIMOD S SERIES

SIGNAL	PIN	DESCRIPTION
5V Auxiliary Return (Reference)	7	This isolated 5V return is common to pins 2 and 8 of the AC Input Module connector, J1.
DC Power Good (Output)	8	This TTL output goes LO (sinks 1.8mA) when any module DC output: goes out of specification by more than $\pm 7.5\%$ (typically); goes into current limit; or an output converter stops functioning. A TTL HI (sources 1.3mA) is normal. This output is referenced to the 5V Aux. Return (pin 7).
+Sense (V1) - Sense (V1)	9 10	The remote sense leads provide regulation at the load point. They should be connected to the respective + and - load points. Total external voltage drop from the DC output to the sense points must not exceed 0.5V, with 0.25V max. in the - Sense lead.
+Sense (V1) - Sense (V2)	11 12	Same description as pins 9 & 10.
+ Sense (V3) - Sense (V3)	13 14	Same description as pins 9 & 10.

DUAL- OR TRIPLE-OUTPUT MODULE, J2

SIGNAL	PIN	DESCRIPTION
Current Share (V1)	1	Each output can current share with other identical output modules of another ULTIMOD power supply by connecting the current share terminals together. The voltages must first be adjusted to within 1% of each other before connecting the outputs in parallel. The worst case difference between load currents of any two modules is 10% of a module's rated load current. This connection is referenced to its respective -Sense terminal.
Current Share (V2)	2	Same description as pin 1.

ULTIMOD S SERIES

SIGNAL	PIN	DESCRIPTION
Current Share (V3)	3	Same description as pin 1.
Current Monitor (V1)	4	This analog output voltage is proportional to the referenced load current. It is referenced to its respective -Sense terminal
Current Monitor (V2)	5	Same description as pin 4.
Current Monitor (V3)	6	Same description as pin 4.

Note: For a Dual-Output Module, either V1 and V2 or V2 and V3 control signals are present

13.0 INSTALLATION

- 13.1 **Mounting.** See mechanical dimensions diagram, Fig. 6. The UNIMOD S Series has two mounting surfaces, one on the bottom and the other on the side, with four threaded mounting inserts on each. The inserts accept M4 screws with maximum penetration of 0.13 inch (3.3mm). Maximum torque on the mounting screws is 19 in.-lbs.
- 13.2 **Cooling.** The S Series is cooled by means of a field-replaceable, internal, DC ball bearing fan. To insure proper cooling, the power system requires a clearance of at least one (1) inch (25mm) between all air intakes and outlets and any other surfaces. The fan is easily replaced by removing two screws and snapping the fan out from its socket.
- 13.3 **Input Connections.** AC input connections to the power system are made to the AMP 556882-3 connector by means of a mating connector, AMP556879-3 with 556880-2 terminals. A three-wire AC line and plug must be used for the AC power connection, with the proper connection made to line, neutral and safety ground terminals. See front panel diagram, Fig. 4, for connections. The proper line cord wire size must be used; No. 12 AWG is recommended.
- 13.4 **Output Connections.** Connecting wires to the outputs must be of correct size to carry the rated output current plus 30%. Wires or lugs must be clean and securely connected to reduce contact resistance. See Section 9.2.

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- 13.5 **Control and Supervisory Signals.** Connections to the AC Input Module control and supervisory signals are made to the Molex 15-47-6101 10-pin connector by means of a mating Molex 22-55-2103 housing with 15-04-5104 clips and 16-02-0103 contacts. Connections to the DC Output Module control and supervisory signals are made to the Molex 15-47-6141 14-pin connector by means of a mating Molex 22-55-2143 housing with 15-04-5144 retainer clip and 16-02-0103 terminals.

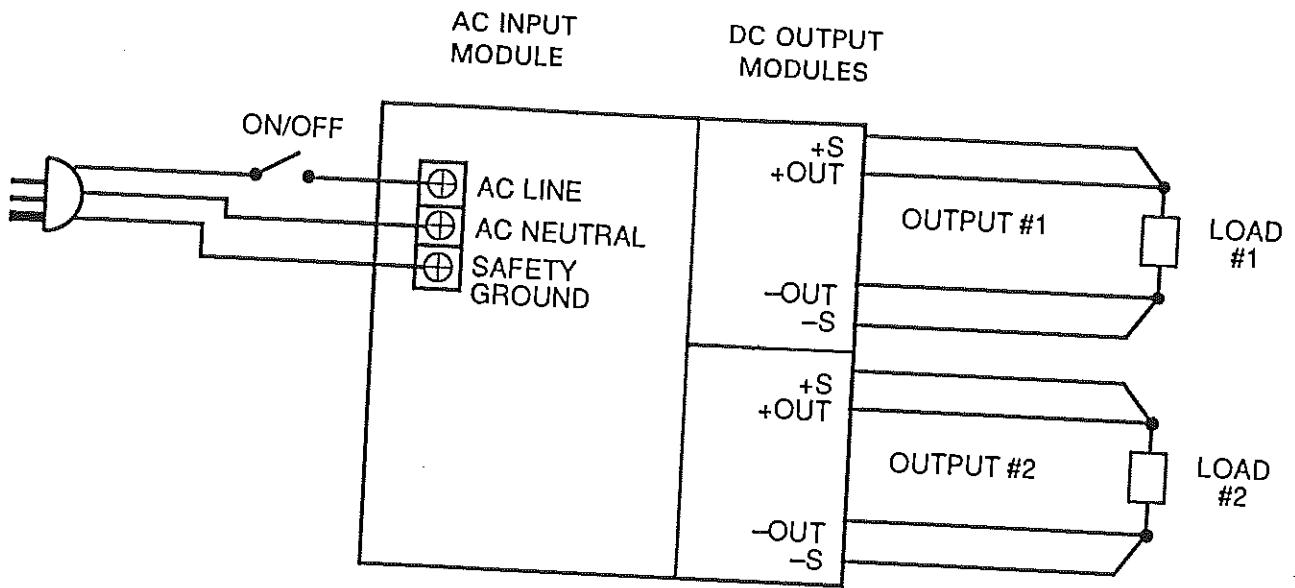
14.0 MAINTENANCE

No routine maintenance is required on the S Series Power System except for periodic cleaning of dust and dirt around the fan intake. A small vacuum nozzle should be used for this. The power system cover should not be removed; there are no user-serviceable components in the unit.

15.0 POWER SYSTEM SETUP AND TESTING

- 15.1 Connect the AC power cord to the power system by means of the mating connectors. (See Figs. 4 and 7). Be sure to use a three-wire power line and plug and make connection to the proper terminals, including safety ground.
- 15.2 Connect remote sense leads of proper polarity directly to the terminals of each output. Make sure that the Global Inhibit (pin 5 on AC Input Module) and all output inhibit inputs are open connection or TTL HI. Make sure that the Margin inputs on all single-output modules (pins 10 and 11) are open connection or TTL HI.
- 15.3 If two or more outputs are connected in parallel, make sure the instructions in Section 9.6 are followed.
- 15.4 Plug the AC power cord into the wall socket. Measure each output voltage with a digital voltmeter to see that it is the correct value. Each voltage should be within 1% of its nominal value. If a more precise value is required, adjust the voltage - adjust potentiometer on the module to give the desired value. A clockwise adjustment increases the voltage. Unplug the AC power cord.
- 15.5 Connect the desired load to each DC output and connect the remote sense leads to the load as described in section 9.4. Plug in the AC power cord and re-check the output voltages at the sense points with a digital voltmeter. These readings can be compared to the data provided with the final acceptance test report included with each power system.

ULTIMOD S SERIES



NOTE: Remote sense leads (+S & -S) should be twisted to minimize noise pickup.

Figure 7. S Series Input/Output Connections.

ULTIMOD S SERIES

16.0 TROUBLE SHOOTING GUIDE

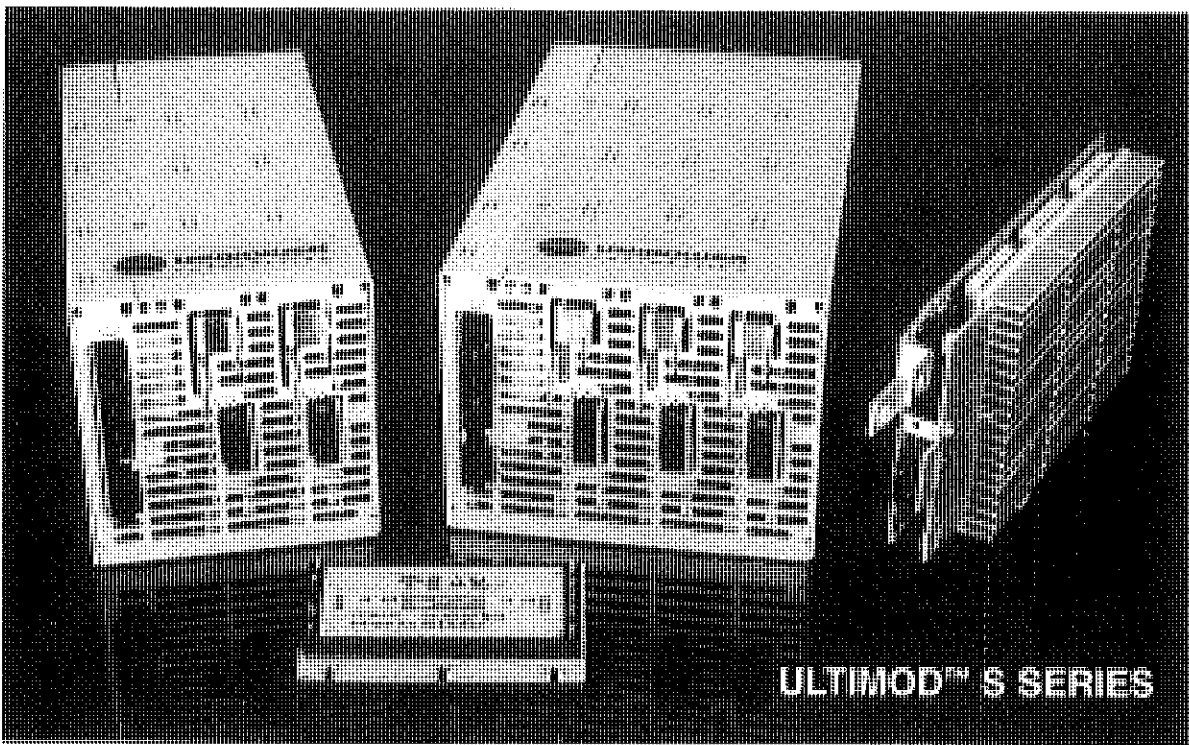
16.1 If you encounter difficulty and do not get output voltages, go through the following trouble shooting guide.

SYMPTOM	POSSIBLE CAUSE	ACTION TO TAKE
No output (all outputs).	No AC input.	Check connection to AC power.
No output (one module).	Shorted output.	Remove short.
No output (one or more outputs).	Overvoltage protection (OVP) is engaged on one or more outputs.	Recycle AC input off and then on.
No output (all outputs).	Overtemperature protection is activated.	Check to see that fan is operating. Recycle AC input off and then on.
No output (one or more outputs).	Output is inhibited by Global Inhibit or Module Inhibits.	Check to see if Global Inhibit input or any Output Inhibit inputs are TTL LO. All should be TTL HI or open.
Output higher than nominal value (one or more outputs).	Remote sense leads not connected.	Connect sense leads as instructed in Section 9.4.
Single module output higher or lower than nominal value.	Margin Input is activated.	Check pins 10 and 11 on Single-Output Modules to make sure they are all TTL HI or open.
Noisy output voltages.	External pickup in sense leads.	Twist or shield sense leads and re-route away from noise source. Connect capacitors as instructed in Section 9.2.

16.2 If none of these actions solves the problem, call the UNIPOWER factory for help, then request an RMA (Return Material Authorization) number and return the power system to UNIPOWER. Be sure to pack the unit carefully in the original packing material, if possible. UNIPOWER will fax a form to be filled out and returned with the unit.

CONFIGURABLE, HIGH DENSITY POWER TO 1800 WATTS

- ▲ Incorporates Vicor Converters
- ▲ 3 Million Output Configurations
- ▲ Quick, Customized Power



FEATURES

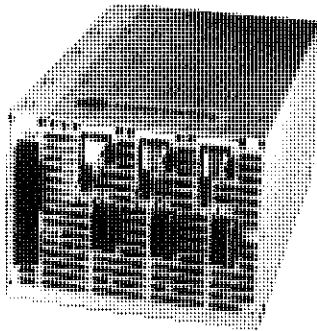
- ▶ With or Without PFC
- ▶ Three Case Widths
- ▶ Up to 5W/Cu. Inch
- ▶ Contr. & Supv. Signals
- ▶ Universal or Autorange Input
- ▶ Class A or B EMI Filter
- ▶ Single, Dual & Triple Modules
- ▶ PowerSpeed 5-Day Delivery



UNIPOWER
CORPORATION

WORLD CLASS
POWER
SOLUTIONS

ULTIMOD™ S SERIES



GENERAL DESCRIPTION

The ULTIMOD™ S Series is a new modular, configurable power system incorporating Vicor high-density DC/DC converter modules. The power system can produce up to 1800 watts output with up to 12 output voltages. The AC input module is available with or without power factor correction and incorporates a Class A input EMI filter with Class B optional. The PFC version employs high-frequency, zero-voltage switching with a universal input range of 85 to 264VAC. The non-PFC version has an autoranging input circuit with input ranges of 90 to 132 and 180 to 264VAC. An ULTIMOD power system can be quickly configured at the factory to meet a customer's required combination of output voltages and power levels.

The S Series consists of three basic cases: 5 x 5 x 11 inches with two output slots, 5 x 6.5 x 11 inches with three output slots, and 5 x 8 x 11 inches with four output slots. Each internal slot accommodates a single-output, dual-output or triple-output module, each with up to 600W output power. There is also a single-output, two-slot module which produces up to 1200W output. Available output voltages are from 2 VDC to 48 VDC. The exceptional variability of the S Series outputs results in a total number of combinations that exceeds 3 million.

Each single-slot module has up to three high-density DC/DC converters producing up to 600W total power; the two-slot module has up to six converters. The high power-density converters operate off a DC power bus produced by the AC input module. The Vicor converters use variable-frequency, zero-current switching at up to 2 MHz to produce the DC outputs. All converters have integral heat sinks and are cooled by a DC ball-bearing fan which is field-replaceable by removing two screws.

Active, single-wire current sharing is accomplished by proprietary control circuitry external to the high-density converters. The S Series features many control and monitoring functions such as global and modular inhibit, AC power fail, remote margin, DC power good, current monitor and remote output adjust. All alarm signals are floating with respect to the input and outputs of the power system. These control features are available in two standard option levels. A 5 VDC, 50mA isolated logic supply is provided for powering external logic control circuits.

SPECIFICATIONS

Typical at 120 or 230 VAC, full load and 25°C unless otherwise noted.

OUTPUT MODULE SPECIFICATIONS

Total Output Power ¹ , 180-264 VAC, max.	1800W
90-264 VAC, max.	1200W
85-264 VAC, max.	1000W
Output Voltage Set Toler., max.	±0.5%
Output Voltage Adj. Range, min.	±10%
Remote Adjust. Range ² , min.	±30%
Line & Load Regulation ³ , 10% to FL, max.	0.4% or 20mV
0% to FL, max.	1.0% or 50mV
Cross Regulation, max.	0.1% or 5mV
Ripple and Noise ⁴ , P-P max.	
5V Out, 25% to FL	100 mV
5V Out, 10% to 25% FL	200mV
12V-48V Out, 25% to FL	1.0%
12V-48V Out, 10% to 25% FL	2.0%
Holdup Time ⁵ , min.	20 msec.
Temp. Coefficient	±0.02%/°C
Transient Response ⁶ , max.	500 µsec.
Minimum Load, Any Output	0 A
Turn-On Time, max.	1.0 sec.
Turn-On Overshoot, max.	2.0%

AC INPUT SPECIFICATIONS

Universal Input Voltage Range, PFC Models	
<1000W Load	85 to 264 VAC
1000-1200W Load	90 to 264 VAC
1200-1800W Load	180 to 264 VAC
Autorange Input, Non-PFC Models	
<1000W Load	90 to 132 VAC
1000-1200W Load	180 to 264 VAC
Input Frequency	47 to 63 Hz
Input Current, PFC Models	
1200W Load, 120 VAC In	14.0A RMS
1200W Load, 230 VAC In	7.3A RMS
1800W Load, 230 VAC In	11.0A RMS
Input Current, non-PFC Models	
1000W Load, 120 VAC In	17.8A RMS
1200W Load, 230 VAC In	11.1A RMS
Input Power Factor, PFC Models	0.99
Harmonic Input Currents, 230 VAC, PFC	Meet EN61000-3-2
EMI, Conducted	FCC 20780, Level A; EN 55022 Level A
Conducted, Optional Filter	EN 55022 Level B
Inrush Current, Hot or Cold Start, max.	80 A Peak
Input Protection, Internal	30 A Fuse

GENERAL SPECIFICATIONS

Efficiency, 5V-48V Out	72% to 85%
Switching Frequency	Variable to 2 MHz
Isolation, min., Output to Chassis Ground	±100 VDC
Leakage Current to Ground, max.	3.5mA

ENVIRONMENTAL SPECIFICATIONS

Operating Temp. Range	0°C to 50°C
Derating, 50°C to 65°C	3.3%/°C
Storage Temp. Range	-20°C to +85°C
Cooling	Field-Replaceable, DC Ball Bearing Fan
Vibration	Per MIL-STD 810D, Method 514-3, Cat-I, Proc. I
Shock	Per MIL-STD 810D, Method 516-3, Proc. II, IV, VI

PHYSICAL SPECIFICATIONS

Case Material	Aluminum
Dimensions, Case SP, SNP	5 x 5 x 11 inches (127 x 127 x 279 mm)
Case SR, SNR	5 x 6.5 x 11 inches (127 x 165 x 279 mm)
Case ST, SNT	5 x 8 x 11 inches (127 x 203 x 279 mm)

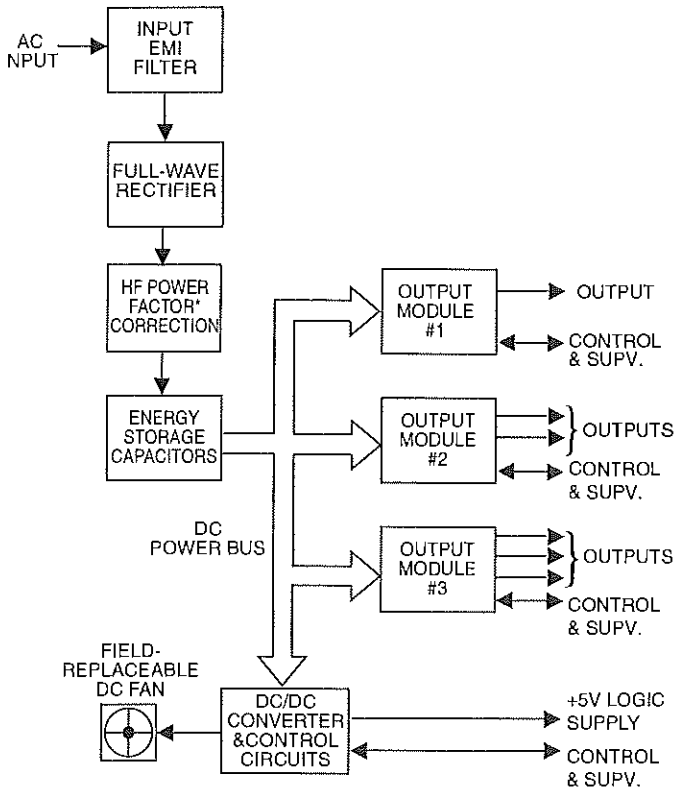
NOTES:

- For PFC models. 1800W output is for selected output configurations. Check with factory.
- Useful upper limit depends on line voltage, load and OVP setting.
- Whichever is greater; over AC line range with remote sense leads connected.
- Measured with 20MHz bandwidth.
- Over AC line range and rated load
- For ±25% load change at 75% rated load; 4% max. deviation with recovery to within 1% at a slew rate of 1.0A/µsec

TWO-YEAR WARRANTY

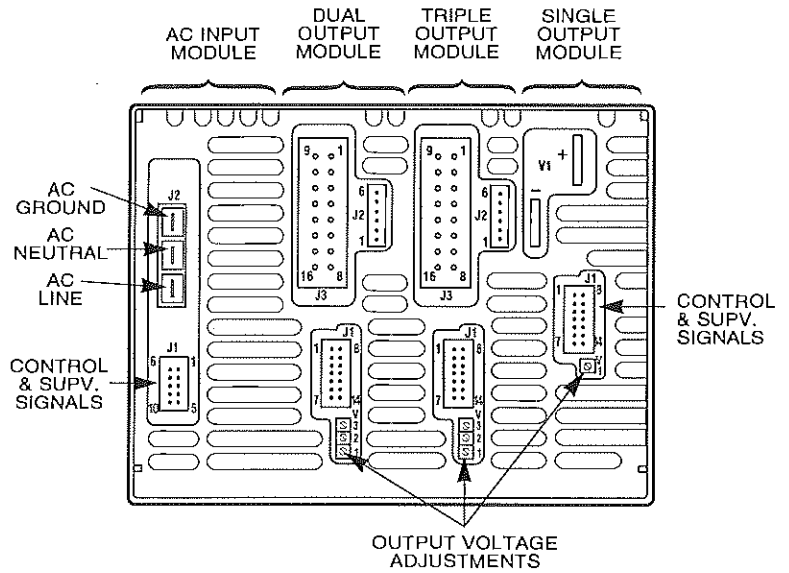


S SERIES BLOCK DIAGRAM



* On PFC Models

TYPICAL CONFIGURATION



CONNECTORS

AC INPUT MODULE	DUAL- OR TRIPLE-OUTPUT MODULE
J1: Molex 15-47-6101 Mate: 22-55-2103 housing 15-04-5104 retainer clip 16-02-0103 terminals	J1: Same as J1 for Single Output Module
J2: AMP 556882-3 Mate: 556879-3 housing 556880-2 terminals	J2: Molex 70553-0005 Mate: 50-57-9406 housing 16-02-0103 terminals
SINGLE-OUTPUT MODULE	J3: Positronics PLB16M4BN0A2 Mate: PLB16F0000 housing FC112N2 terminals
J1: Molex 15-47-6141 Mate: 22-55-2143 housing 15-04-5144 retainer clip 16-02-0103 terminals	

S SERIES FEATURE DESCRIPTIONS

FEATURE	DESCRIPTION	FEATURE	DESCRIPTION
Output Current Limiting	Current limiting takes place at 105% to 125% of rated load current.	Isolated Outputs	All DC outputs are floating and isolated from all other outputs. They can be connected as either + or - outputs and can be up to ±100V from chassis ground.
Short Circuit Current	For 5V outputs at 200W and higher, short circuit current is 20% to 80% of rated load current. Foldback limiting starts at approximately 2V. For all other outputs, short circuit current is 105% to 130% of rated load current.	AC Undervoltage Protection	The AC input is protected for all conditions below low line voltage.
Oversvoltage Protection	OVP operates at 115% to 135% of nominal output voltage. The output latches off. It is reset by cycling the AC input off and then on.	Overtemperature Protection	The AC Input Module and all output converters are thermally protected. The outputs shut down if the internal temperature reaches an excessive value. They are restored by cycling the AC input off and then on.
Turn-On Time	Turn-on time is 1.0 second max. from AC turn-on. The output voltage rise is monolithic with 2% max. overshoot.	Control and Monitoring Signals	The DC Power Good, Inhibit, AC Power Fail, and Margin signals are all electrically isolated from the power system input and outputs and may therefore be referenced to an external common.
EMI Input Filter	Conducted emissions meet FCC 207880 level A and EN55022 level A. An optional EMI filter meets EN55022 level B.	+5V Auxiliary Output With 5V Auxiliary Return	This output voltage with up to 50mA output current is isolated from the power system input and outputs. This voltage powers the above control and monitoring circuits and can be used to power external logic circuits.
Safety Agency Approvals	UL1950, CSA22.2 No. 950, and EN60950.		
Harmonic Input Currents	5% max. total harmonic distortion. Meets EN 61000-3-2.		

SELECTION TABLES

SINGLE-OUTPUT MODULES (ONE SLOT)

OUTPUT VOLTAGE	200W		400W		600W	
	OUTPUT CURRENT	OUTPUT CODE	OUTPUT CURRENT	OUTPUT CODE	OUTPUT CURRENT	OUTPUT CODE
2V	40A	1C	80A	1F	120A	1H
3.3V	40A	9C	80A	9F	120A	9H
5V	40V	2C	80A	2F	120A	2H
12V	16.7V	3C	33.3A	3F	50A	3H
15V	13.4A	4C	26.7A	4F	40A	4H
24V	8.3A	5C	16.7A	5F	25A	5H
28V	7.1A	6C	14.3A	6F	21.4A	6H
48V	4.2A	7C	8.3A	7F	12.5A	7H

DUAL-OUTPUT MODULES (ONE SLOT)

OUTPUT VOLTAGE	V1 OUTPUT			V2 OUTPUT		
	POWER	OUTPUT CURRENT	OUTPUT CODE	POWER	OUTPUT CURRENT	OUTPUT CODE
2V	200W	40A	1C	-	-	-
3.3V	200W	40A	9C	-	-	-
5V	200W	40A	2C	75W	15A	2A
12V	200W	16.7A	3C	100W 200W 400W	8.3A 16.7A 33.3A	3A 3C 3F
15V	200W	13.4A	4C	100W 200W 400W	6.7A 13.4A 26.7A	4A 4C 4F
24V	200W	8.3A	5C	100W 200W 400W	4.2A 8.3A 16.7A	5A 5C 5F
48V	200W	4.2A	7C	100W 200W 400W	2.1A 4.2A 8.3A	7A 7C 7F

SINGLE-OUTPUT MODULES (TWO SLOTS)

OUTPUT VOLTAGE	800W		1000W		1200W	
	OUTPUT CURRENT	OUTPUT CODE	OUTPUT CURRENT	OUTPUT CODE	OUTPUT CURRENT	OUTPUT CODE
2V	160A	1M	200A	1N	240A	1P
3.3V	160A	9M	200A	9N	240A	9P
5V	160A	2M	200A	2N	240A	2P
12V	66.7A	3M	83.3A	3N	100A	3P
15V	53.3A	4M	66.7A	4N	80A	4P
24V	33.3A	5M	41.7A	5N	50A	5P
28V	28.6A	6M	35.7A	6N	42.9A	6P
48V	16.7A	7M	20.8A	7N	25A	7P

OUTPUT VOLTAGE	V2 OUTPUT			V3 OUTPUT		
	POWER	OUTPUT CURRENT	OUTPUT CODE	POWER	OUTPUT CURRENT	OUTPUT CODE
2V	-	-	-	-	-	-
3.3V	-	-	-	-	-	-
5V	75W	15A	2A	75W	15A	2A
12V	100W	8.3A	3A	100W	8.3A	3A
15V	100W	6.7A	4A	100W	6.7A	4A
24V	100W	4.2A	5A	100W	4.2A	5A
48V	100W	2.1A	7A	100W	2.1A	7A

NOTE: Dual outputs can be any V1 and any V2 from top table or any V2 and any V3 from bottom table.

TRIPLE-OUTPUT MODULES (ONE SLOT)

INPUT VOLTAGE	V1 OUTPUT			V2 OUTPUT			V3 OUTPUT		
	POWER	OUTPUT CURRENT	OUTPUT CODE	POWER	OUTPUT CURRENT	OUTPUT CODE	POWER	OUTPUT CURRENT	OUTPUT CODE
5V	200W	40A	1C	-	-	-	-	-	-
3V	200W	40A	9C	-	-	-	-	-	-
5V	200W	40A	2C	75W	15A	2A	75W	15A	2A
2V	200W	16.7A	3C	100W 200W	8.3A 16.7A	3A 3C	100W 200W	8.3A 16.7A	3A 3C
5V	200W	13.4A	4C	100W 200W	6.7A 13.4A	4A 4C	100W 200W	6.7A 13.4A	4A 4C
4V	200W	8.3A	5C	100W 200W	4.2A 8.3A	5A 5C	100W 200W	4.2A 8.3A	5A 5C
3V	200W	4.2A	7C	100W 200W	2.1A 4.2A	7A 7C	100W 200W	2.1A 4.2A	7A 7C

INPUT EMI FILTER

CODE	TYPE
A	FCC & EN Level A
B	EN Level B

CONTROL FEATURE CODES

MODULE	L	M
AC Input Module	Global DC Power Good Global Inhibit 5V Logic Supply 5V Logic Return	Global DC Power Good Global Inhibit 5V Logic Supply 5V Logic Return
Single Output Module	Remote Sense Remote V Adjust Remote Inhibit DC Power Good Remote Margin Current Share Current Monitor Potentiometer V Adjust	Remote Sense Remote V Adjust Remote Inhibit DC Power Good - - - Potentiometer V Adjust
Dual Output Module (Each Output)	Remote Sense Remote V Adjust Remote Inhibit DC Power Good Current Share Current Monitor Potentiometer V Adjust	Remote Sense Remote V Adjust Remote Inhibit DC Power Good - - Potentiometer V Adjust
Triple Output Module (Each Output)	Remote Sense Remote V Adjust Remote Inhibit DC Power Good Current Share Current Monitor Potentiometer V Adjust	Remote Sense Remote V Adjust Remote Inhibit DC Power Good - - Potentiometer V Adjust

CASE DESIGNATION

CODE	PWR. FACTOR CORRECTION	CASE SIZE	OUTPUT SLOTS
SP	YES	5 x 5 x 11"	2
SR	YES	5 x 6.5 x 11"	3
ST	YES	5 x 8 x 11"	4
SNP	NO	5 x 5 x 11"	2
SNR	NO	5 x 6.5 x 11"	3
SNT	NO	5 x 8 x 11"	4

ORDERING GUIDE

An ULTIMOD S Series power system is completely specified by:

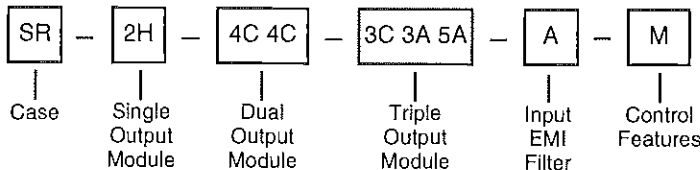
1. Output Module codes (see Single, Dual, & Triple Output Module tables).
2. Case code (see Case Designation table).
3. Input filter code (see Input EMI Filter table).
4. Control Feature code (see Control Feature table).

NOTE: For PFC models, total used output power normally cannot exceed 1200W for 90-264VAC or 1000W for 85-264VAC input. However, for certain output configurations the power can be as high as 1800W for 180-264VAC input. Check with factory on this. For non-PFC models, used output power cannot exceed 1000W for 90-132VAC or 1200W for 180-264VAC input. Slots used cannot exceed the number for the case selected.

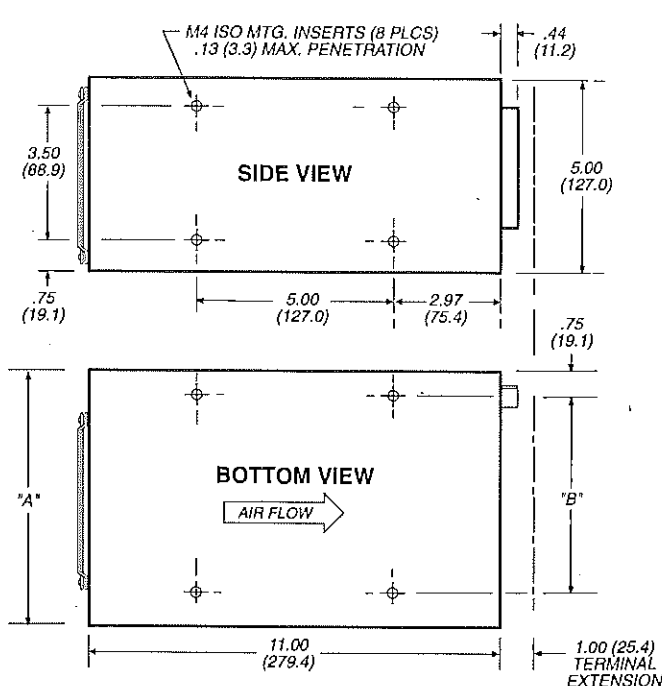
EXAMPLE: A 1200W, six-output power system in a 5 x 6.5 inch case (3 slots) with power factor correction, Level A input filter and Control Feature Code M.

	Module Type	Module Outputs	Output Code	Output Slots	Output Watts	Watts Drawn
1.	Single	5V, 120A	2H	1	600	520
2.	Dual	15V, 13.4A	4C	1	200	175
		15V, 13.4A	4C		200	175
3.	Triple	12V, 16.7A	3C	1	200	170
		12V, 8.3A	3A		100	80
		24V, 4.2A	5A		100	70
Totals				<u>3</u>	<u>1400</u>	<u>1190</u>

Model:



CASE DRAWING



INPUT/OUTPUT CONNECTIONS

AC INPUT MODULE, J1

PIN	FUNCTION
1	+5V Aux. Output
2	5V Aux. Return
3	NC
4	Global DC Pwr Good
5	Global Inhibit
6	NC
7	NC
8	5V Aux. Return
9	AC Power Fail
10	NC

DUAL- OR TRIPLE-OUTPUT MODULE, J1 (One Slot)

PIN	FUNCTION
1	Output Inhibit (V1)
2	Output Inhibit (V2)
3	Output Inhibit (V3)
4	Remote Adjust. (V1)
5	Remote Adjust. (V2)
6	Remote Adjust. (V3)
7	5V Aux. Return
8	DC Power Good
9	+ Sense (V1)
10	- Sense (V1)
11	+ Sense (V2)
12	- Sense (V2)
13	+ Sense (V3)
14	- Sense (V3)

SINGLE-OUTPUT MODULE, J1 (One or Two Slots)

PIN	FUNCTION
1	NC
2	NC
3	Current Share
4	NC
5	Current Monitor
6	+ Sense
7	- Sense
8	NC
9	Output Inhibit
10	+ Margin
11	- Margin
12	DC Power Good
13	5V Aux. Return
14	Remote Volt. Adjust.

DUAL- OR TRIPLE-OUTPUT MODULE, J2

PIN	FUNCTION
1	Current Share (V1)
2	Current Share (V2)
3	Current Share (V3)
4	Current Monitor (V1)
5	Current Monitor (V2)
6	Current Monitor (V3)

NOTE: For a Dual-Output Module, either V1 and V2 or V2 and V3 control signals are present.

POWER SPEED™

5-day delivery on selected configurations.
Check with factory.

DUAL- AND TRIPLE-MODULE OUTPUTS, J3

PIN	OUTPUT	PIN	OUTPUT
1	+ V1	9	+ V1
2	+ V1	10	+ V1
3	- V1	11	- V1
4	- V1	12	- V1
5	+ V2	13	+ V2
6	- V2	14	- V2
7	+ V3	15	+ V3
8	- V3	16	- V3

ALL DIMENSIONS IN INCHES (MM)

DIMENSIONS

CASE	A (WIDTH)	B
SP, SNP	5.00 (127.0)	3.50 (88.9)
SR, SNR	6.49 (164.8)	5.00 (127.0)
ST, SNT	7.98 (202.7)	6.50 (165.1)