

PRICE: \$25.00

**UNIMOD U SERIES
800 WATT
USER-CONFIGURABLE
POWER SYSTEM**

Manual No. U-793-1

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UNIPOWER
CORPORATION

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UNIMOD U SERIES OPERATING MANUAL

1.0 INTRODUCTION

- 1.1 This Operating Manual should be read through carefully before installing and using the UNIMOD U Series Power System.
- 1.2 The U Series Power System is modular and configurable, with 15 different DC Power Modules available. See Fig. 1. With 7 module slots, it permits the user to quickly obtain a power supply configured to a specific requirement. The U Series provides up to 800 watts continuous output power and is safety agency approved by UL, CSA, and TUV. The case is low profile at 3.75 inches (95.3mm) high; it is 8 inches (203mm) wide and 11 inches (279mm) deep.

The power system AC input incorporates EMI filtering and autoranging. The DC Power Modules employ 100kHz MOSFET switching and use surface-mount technology. Both the power chassis and power modules have control and supervisory signal inputs and outputs for electronic systems applications. These signals include output inhibit, AC power fail and thermal warning, power supply fault, output undervoltage, current share and current monitor. For a complete description and specifications, see the U Series product data information in the Appendix.

2.0 SAFETY WARNINGS

- 2.1 This switching power supply has dangerous 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 dangerous 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 assure low EMI (electromagnetic interference).
- 2.4 The internal 300 VDC power bus is at a dangerous potential. The power system cover should not be removed. There are no user-serviceable components in this unit.

3.0 WARRANTY POLICY

- 3.1 UNIPOWER Corporation warrants its power supplies for two (2) years from date of shipment against defects in materials and workmanship. UNIPOWER's liability under this warranty is limited to the satisfactory repair or replacement, at its option, of the defective product which has not been damaged through accident, misapplication, negligence, or unauthorized repair. UNIPOWER will in no case be liable for special or consequential damages of any nature. This warranty is extended directly by the manufacturer to the buyer and is the sole warranty applicable.

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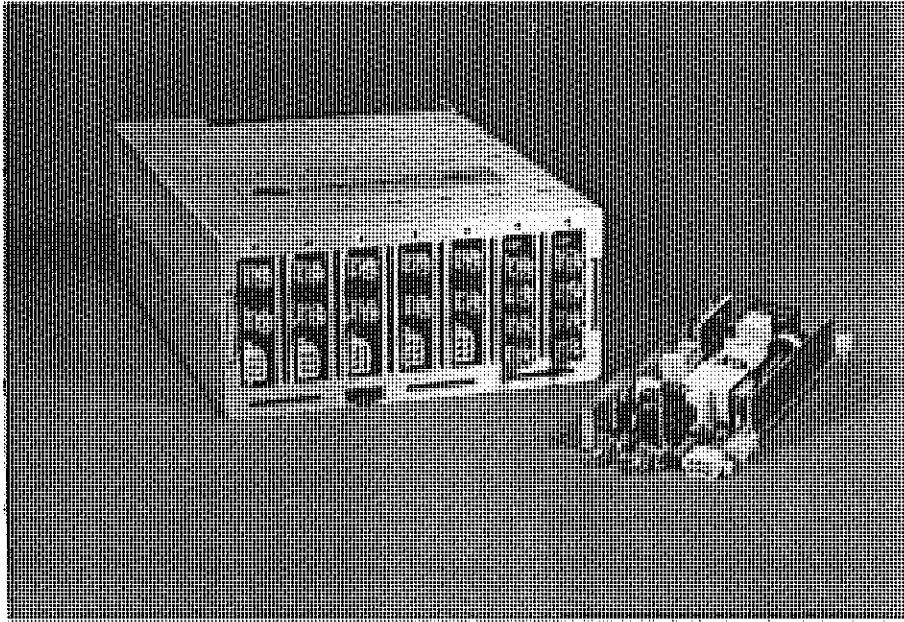


Figure 1. UNIMOD U Series Power System.

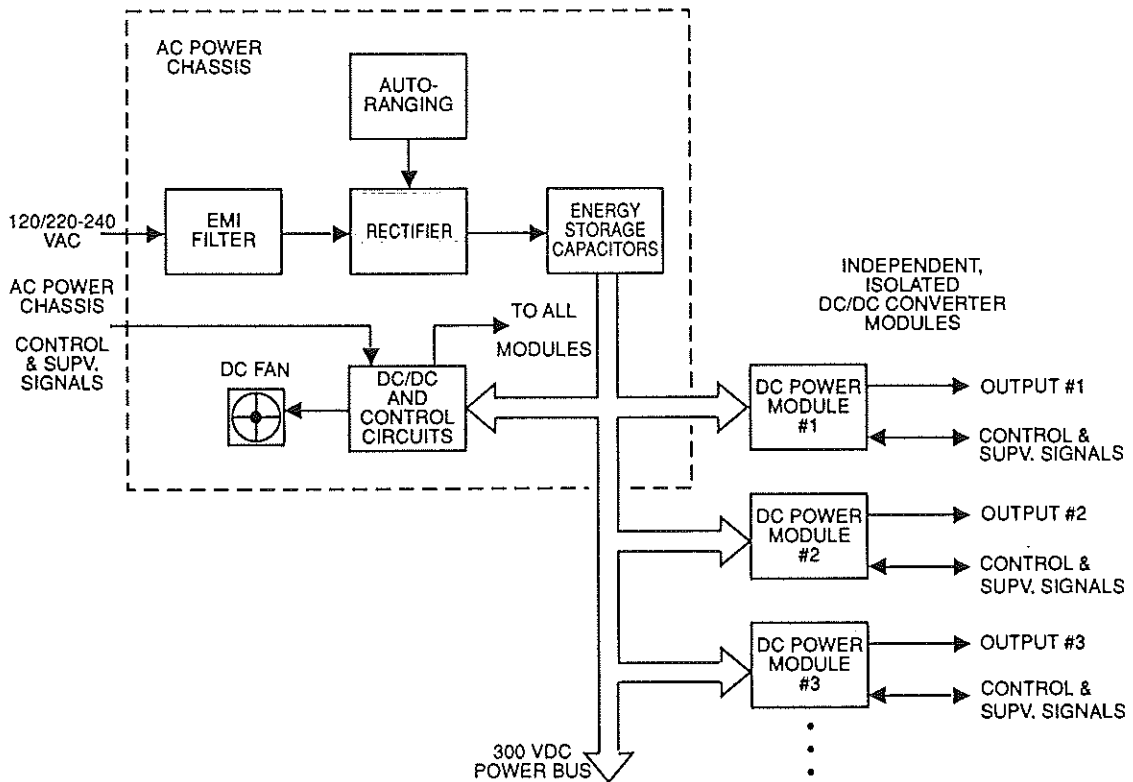


Figure 2. U Series Power System Block Diagram.

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To exercise this warranty, the buyer must contact our factory (or one of our authorized service centers throughout the world) to obtain a Return Material Authorization (RMA) number and shipping instructions. Products returned under this warranty must be shipped freight prepaid and include the RMA number.

4.0 UNPACKING AND INSPECTION

- 4.1 This U 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.
- 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 Power Chassis.** The UNIMOD U Series is designed as a distributed power system. See the block diagram, Fig. 2. The front end (AC Power Chassis) 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. An autoranging circuit automatically selects the correct range for either 120 VAC or 220 to 240 VAC input voltages. Electronic inrush current limiting controls the initial AC input current on power up.

The AC Power Chassis rectifies and filters the AC line current. The resultant 300 VDC goes to a power bus which distributes the power to each DC Power Module. The chassis has its own internal DC/DC converter which powers the three control and supervisory signal circuits and the DC cooling fan.

- 5.2 **DC Power Modules.** Each DC Power Module is a DC/DC converter which converts the raw, unregulated 300 VDC from the power bus to a specific regulated DC output voltage. The converters use power MOSFETS, switching at 100 kHz, in a half-bridge configuration. Each module is independent and fully isolated from the other modules, and each has output overvoltage protection and output current limiting. Each module, except for dual output modules, incorporates its own control and supervisory input and output signals.

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6.0 FRONT AND REAR PANEL DESCRIPTIONS

- 6.1 The UNIMOD U Series front and rear panel configurations are shown in Fig. 3. There are seven module slots in the front of the AC Power Chassis. The control and supervisory signals are accessed through J1, a 6-pin AMP connector on the front panel. The front panel also has a green LED to the left of J1. This LED indicates that there is a faulty DC output if it is off. See description for Power Supply Fault (pin 2) in Section 11.0. In the rear are the DC cooling fan and barrier terminal strip for the three AC input connections.
- 6.2 The configuration shown in Fig. 3 consists of five single output modules on the left and two dual output modules on the right. All modules are the same width. Filler panels are provided for any module slots not used. Each module has an output voltage adjustment potentiometer, and all single output modules have a 6-pin Molex connector for the control and supervisory signal inputs and outputs. Dual output modules do not have this connector. On all modules the top output terminal lug is positive and the bottom one negative.

7.0 AVAILABLE OPTIONS

VOLTAGE & CURRENT	OUTPUT POWER	VOLTAGE ADJ. RANGE	ORDERING CODE
2V @ 40A	80W	±10%	B
3.3V @ 40A	132W	±10%	C
5V @ 20A	100W	4.5 - 6.5	F
5V @ 40A	200W	4.5 - 6.5	G
12V @ 10A	120W	10.8 - 16.5	H
12V @ 20A	240W	10.8 - 16.5	J
15V @ 8A	120W	10.8 - 16.5	K
15V @ 16A	240W	10.8 - 16.5	L
24V @ 5A	120W	20 - 30	M
24V @ 10A	240W	20 - 30	N
48V @ 2.5A	120W	±10%	P
48V @ 5A	240W	±10%	Q
5V@5A/12V@5A	85W	±10%	R
12V@5A/12V@5A	120W	±10%	S
15V@4A/15V@4A	120W	±10%	T

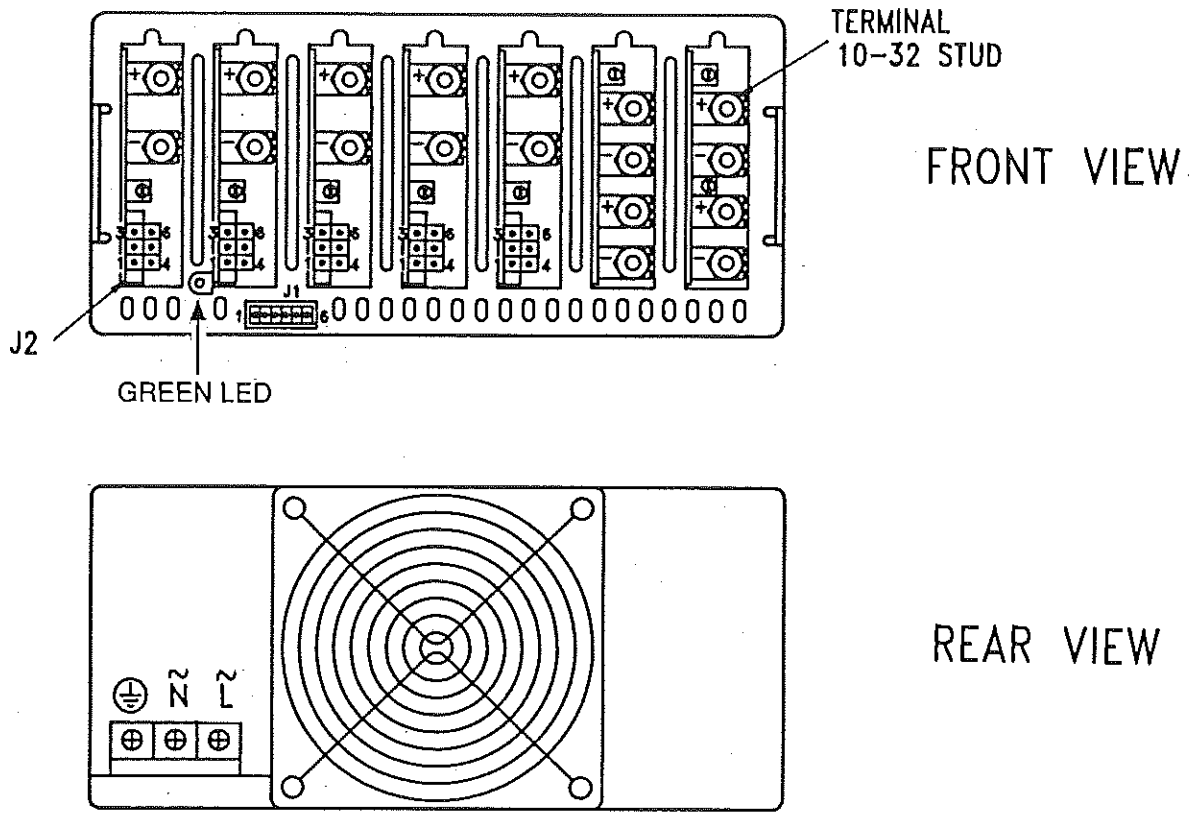


Figure 3. UNIMOD U Series Front and Rear Panel Diagrams.

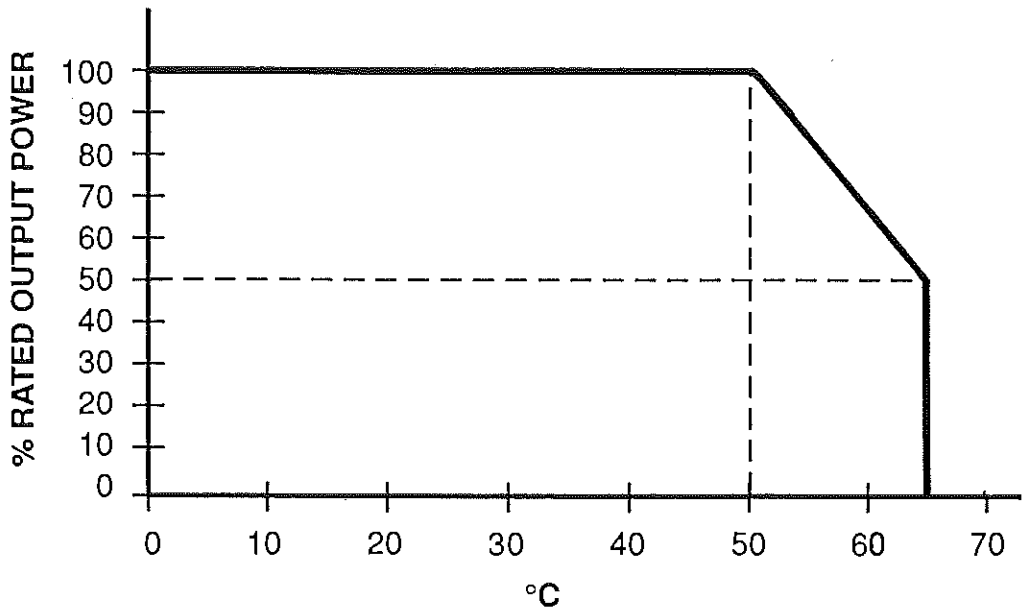


Figure 4. Output Power vs. Ambient Temperature.

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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. 234-M90; IEC950; EN60950.
Output Current Limiting	Single Output Modules: Current limiting takes place at 110% to 130% of rated load. Dual Output Modules: Main output (top terminals), 110% to 130% of rated load with auxiliary output at full load. Auxiliary output (bottom terminals), 5.5A to 7.5A with main output at full load.
Short Circuit Current	Single Output Modules: 60% max. of rated load current. Dual Output Modules: Main output (top terminals), 60% max. of rated load current. Auxiliary output (bottom terminals), 7.5A max.
Oversvoltage Protection	OVP operates at 115% to 130% of nominal output voltage, except for 2V output which is 120% to 150%. The module output latches off. It is reset by cycling the AC input off and then on.
Reverse Voltage Protection	To 75% of rated output current, maximum.
Turn-On Time	500msec. max. from AC turn-on, with 1% maximum overshoot.
Isolated Outputs	All DC Power Module outputs are floating and isolated from all other module outputs. They can be connected as either + or - outputs and may be referenced up to $\pm 100V$ from chassis ground.
Overtemperature Protection	The power supply latches off when the internal temperature reaches excessive value. It must be reset by cycling the AC input to off and then on.
EMI Input Filter	Meets FCC and VDE level A requirements.

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FEATURE/OPTION	DESCRIPTION
Reverse Air Flow (Option R)	Standard air flow is from fan to front panel of power supply. Reverse air flow can be ordered as an option.
Redundant N + 1 Outputs (Option H)	Redundant N + 1 operation is achieved by paralleling two or more identical single outputs and connecting the current share terminals together. If one of the outputs should fail, the others continue to operate. The failed module is indicated by <0.5V on the Undervoltage output.

9.0 OPERATING INFORMATION

- 9.1 **Input Voltages.** The UNIMOD U Series Power System operates on standard 120 VAC (90 to 132 VAC) or 220-240 VAC (180 to 264 VAC) input voltages and automatically adapts to the given input. This is the input autoranging feature. A protective 30A fuse is located inside the AC power chassis. This fuse is not user accessible.
- 9.2 **Outputs.** Output power connections are made to nickel-plated brass studs on output bus bars. See Fig. 3. The top stud is positive and the bottom stud is negative on each DC Power Module. Dual-output modules have two sets of studs, the top set for the main output and the bottom set for the auxiliary output. All connecting wires for the outputs must be sized to carry the rated output current plus 30%. Connecting wires or lugs must be clean and securely connected at the studs to reduce contact resistance. See section 13.4 for maximum torque on stud nuts. All outputs should have a 0.1uF ceramic capacitor and 10uF electrolytic capacitor in parallel across each output at the backplane, connection point, or point of load to minimize noise pickup.
- 9.3 **Output Power.** Rated continuous output power from all DC Power Modules in a given configuration is 800 watts maximum. 100% of rated output power can be drawn up to 50°C ambient temperature. Above 50°C the output must be derated at 3.3%/°C up to 65°C. See Fig. 4. The maximum operating temperature is 65°C.

Note that the total output power rating of all modules may exceed 800 watts so long as the total power drawn by the loads does not exceed this value. This is important when an N + 1 redundancy configuration is employed.

- 9.4 **Remote Sensing.** Remote sense connections are made to pins 5 and 6 on the receptacle of each single output DC Power Module (dual output modules do not have remote sense). 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

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– 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 #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 on the DC Power Module.

- 9.5 **Control and Supervisory Signals.** All control and supervisory signals are accessible at the 6-pin receptacles on the front panel of the AC Power Chassis, and on each single-output DC Power Module. Some of the pins are for control inputs and others are for alarm or monitor outputs. Alarm and monitor outputs and control inputs that are used must have an external 0.1uF ceramic capacitor connected across them to prevent noise pickup. For a description of each function see the sections on "Description of Control and Supervisory Signals".
- 9.6 **Paralleled Outputs (Current Sharing).** Two or more DC Power Modules may be operated in parallel if they are identical modules in both output power and voltage. The output voltages must be adjusted to within 2% of each other and the current share pins (pin 2) must be connected together. Sense leads for each module must be connected to the load point. Current sharing accuracy is $\pm 10\%$ of the rated output current of one module and is defined as:

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

where I_1 and I_2 are individual module output currents and I_{Rated} is the rated output current of one module.

If Module Inhibit is to be used, these control pins must be connected together for all modules in parallel. If one of the modules in parallel fails, the Undervoltage output will go to $<0.5\text{V}$ and the Current Monitor output voltage will decrease.

- 9.7 **N + 1 Redundancy.** This feature is basically the same as parallel operation. Redundancy, however, is achieved by having one more DC Power Module in parallel operation than is needed to supply the load power. Thus, if two identical modules in parallel can provide the total load power, then three modules are used in parallel, each providing approximately one third of the total current. If one module fails, the other two automatically take up the total load current, sharing it approximately 50/50. The failed module is determined by its Undervoltage output signal going $<0.5\text{V}$.

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10.0 CONTROL AND SUPERVISORY SIGNAL CONNECTIONS (SEE FIGURE 3)

AC POWER CHASSIS RECEPTACLE, J1

PIN	FUNCTION
1	No Connection
2	Power Supply Fault
3	Global Inhibit
4	Common
5	AC Power Fail and Thermal Warning
6	No Connection

SINGLE-OUTPUT POWER MODULE RECEPTACLE, J2

PIN	FUNCTION
1	Current Monitor
2	Current Share
3	Module Inhibit
4	Undervoltage
5	+ Sense
6	- Sense

- Notes: 1. J1 mating plug is AMP102-241-4 female pins 1-87756-6.
 2. J2 mating plugs are Molex 39-01-2065 with female pins 39-00-0078.

11.0 DESCRIPTION OF CONTROL AND SUPERVISORY SIGNALS: AC POWER CHASSIS

SIGNAL	PIN	DESCRIPTION
Power Supply Fault (Output)	2	A TTL LO (sinks 2 mA) occurs when any DC output falls to 75% to 90% of its nominal value. Normal output is a TTL HI (sources 0.5 mA). This signal is referenced to common (Pin 4). A green LED also indicates a faulty output when it is off.
Global Inhibit (Input)	3	A TTL LO (sinking 1.5 mA) provided at this input inhibits (turns off) the DC outputs of all DC Modules. Normal input is an open circuit or a TTL HI (sourcing 1.0 mA). This signal is referenced to common (Pin 4).
Common	4	This is the common, or return, for the AC Power Chassis control and supervisory signals.

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AC Power Fail and Thermal Warning (Output)	5	A TTL LO (sinks 2 mA) occurs when either the AC input voltage falls a preset amount below the low line voltage specification (86 VAC min. @ full load) or the internal temperature exceeds a preset limit. A TTL HI (sources 0.5 mA) is normal. The LO signal occurs at least 2 msec. before the DC outputs drop out of regulation. This signal is referenced to common (Pin 4).
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12.0 DESCRIPTION OF CONTROL AND SUPERVISORY SIGNALS: DC POWER MODULES

SIGNAL	PIN	DESCRIPTION
Current Monitor (Output)	1	This analog output voltage is proportional to the load current. At 100% rated current the voltage is $+3.0V \pm 0.15V$; at 0% load current the voltage is $+0.4V \pm 0.2V$. The output can drive a 100K (for 1% error) or higher impedance load. This signal is referenced to the negative sense lead (Pin 6).
Current Share	2	Each single-output DC Power Module, with current sharing option, will share load current with identical modules when the output voltages are adjusted within 2% of each other and the modules are connected together by means of the current share pins. The modules will operate down to zero load without giving an undervoltage signal. The Current Share signal is referenced to the negative sense lead (Pin 6).
Module Inhibit (Input)	3	A TTL LO (sinking 0.5 mA) provided at this input inhibits (turns off) the DC Power Module output. A TTL HI (sourcing 0 mA) turns on the DC output. This signal is referenced to the negative sense lead (Pin 6).
Undervoltage (Output)	4	This is a high impedance output which is $> 1.0V$ for normal output voltage and $< 0.5V$ if the output voltage drops to 75% to 90% of nominal value. This signal is referenced to the negative sense lead (Pin 6).

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+ Sense	5	These remote sense leads are provided on all single output modules and should be connected to the load point by means of a twisted pair. They provide regulation to the point of load. Total external voltage drop from the DC output to the sense points is 0.5V min. Open sense leads will not cause the output to rise by more than 1.0V above nominal value. Reversed sense leads will cause output shutdown.
- Sense	6	

13.0 INSTALLATION

- 13.1 **Mounting.** See mechanical dimensions diagram, Fig. 5. The UNIMOD U Series has a bottom mounting surface, with four threaded mounting inserts. The inserts accept #8-32 screws with maximum penetration of 0.25 inch (6.4 mm). Maximum torque on the mounting screws is 19 in.-lbs.
- 13.2 **Cooling.** The U Series is cooled by means of an internal DC ball-bearing fan. To insure proper cooling, the power system requires air to flow freely in direction of fan. Both standard and optional reverse air cooling are available.
- 13.3 **Input Connections.** AC input connections to the power system are made on a three-terminal barrier strip on the rear panel. The barrier strip uses #6-32 screws and maximum torque is 9 in.-lbs. 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 rear panel diagram, Fig. 3, 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 at the studs to reduce contact resistance. Torque on the 10-32 stud nuts of the DC Power Modules must not exceed 22 in.-lbs.

14.0 MAINTENANCE

- 14.0 No routine maintenance is required on the U 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.

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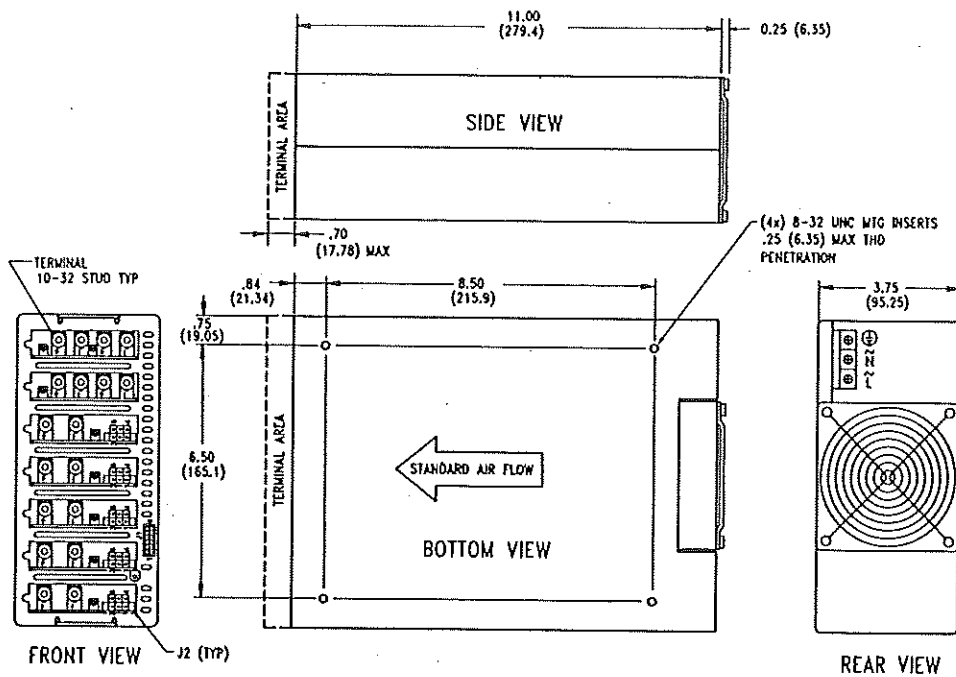
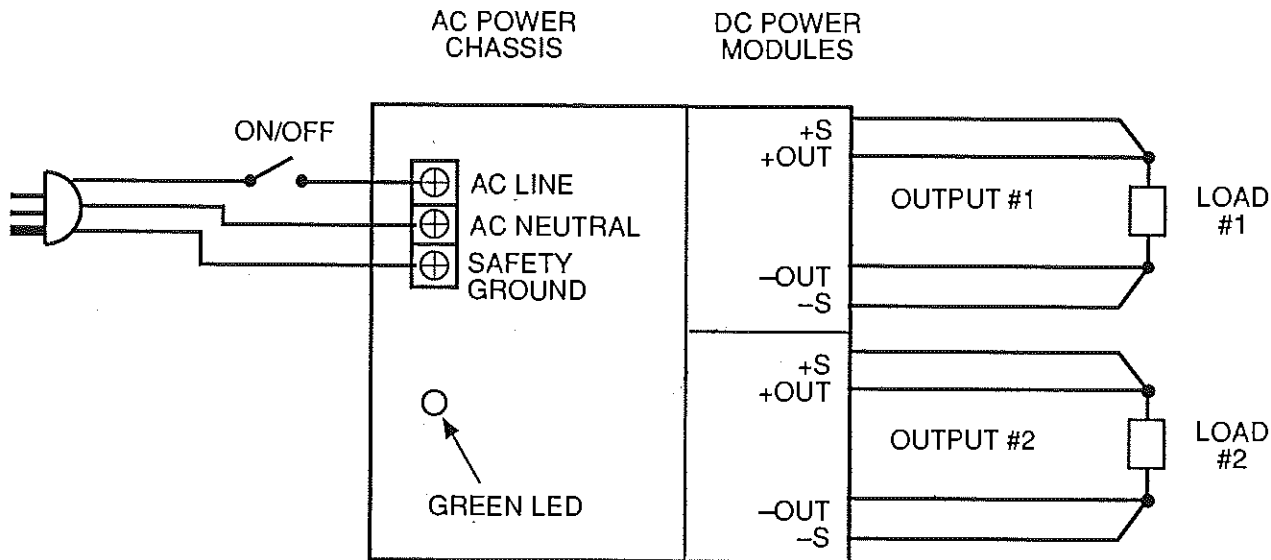


Figure 5. Mechanical Dimensions.



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

Figure 6. U Series Input/Output Connections.

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15.0 POWER SYSTEM SETUP AND TESTING

- 15.1 Connect the AC power cord to the barrier terminal strip on the rear panel (See Figs. 3 and 6). 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 (pins 5 and 6) of proper polarity directly to the output terminals of each module. Make sure that the Global Inhibit (pin 3 on AC Power Chassis) and the Module Inhibit (pin 3 on DC Power Modules) are all open connection.
- 15.3 If two or more DC Power Modules 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 and check to see that the Undervoltage output is $> 1.0V$ for each module. Measure each output voltage with a digital voltmeter to see that it is the correct value. Each voltage should be within $\pm 1\%$ 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 Power Module 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.

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 module)	Overvoltage protection (OVP) is engaged on single output module.	Recycle AC input off and then on.
No output (all outputs)	Overtemperature protection is activated.	Check pin 5 output for a logic LO. Check to see that fan is operating. Recycle AC input off and then on.

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No output (all outputs)	Output is inhibited by Global Inhibit or Module Inhibit.	Check to see if pin 3 on AC Power Chassis or pin 3 on a DC Power Module is a logic LO. Both should be logic HI, or open.
No output (one module)	Reversed sense leads.	Connect sense leads to correct load points.
Output higher than nominal value	Remote sense leads not connected.	Connect sense leads as instructed in Section 9.4.
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 solve 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.

