



UNIPOWER
CORPORATION

WORLD CLASS
POWER
SOLUTIONS

PRICE: \$25.00

**UNIMOD K SERIES
1800 WATT
MODULAR-CONFIGURABLE
POWER SYSTEM**

Manual No. K-996-0

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3900 Coral Ridge Drive ■ Coral Springs, FL 33065 ■ 954-346-2442 ■ Fax 954-340-7901

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UNIMOD K SERIES OPERATING MANUAL

1.0 INTRODUCTION

- 1.1 This Operating Manual should be read through carefully before installing and using the UNIMOD K Series Power System.
- 1.2 This power system is modular and configurable with 29 different DC Power Modules available in addition to three case sizes. See Fig. 1. It allows the user to quickly obtain a power supply factory-configured to a specific requirement. The K Series provides up to 1800 watts continuous output power and is safety agency approved by UL, CSA and TUV.

The power system incorporates EMI filtering, input current limiting, universal input or autoranging, and comes with or without power factor correction. The AC Input Module and all single-output DC Power Modules incorporate control and supervisory signal inputs and outputs for integration with host electronic systems. For a complete description and specifications see the K Series product data 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 DC 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

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

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Figure 1. UNIMOD K Series Power System.

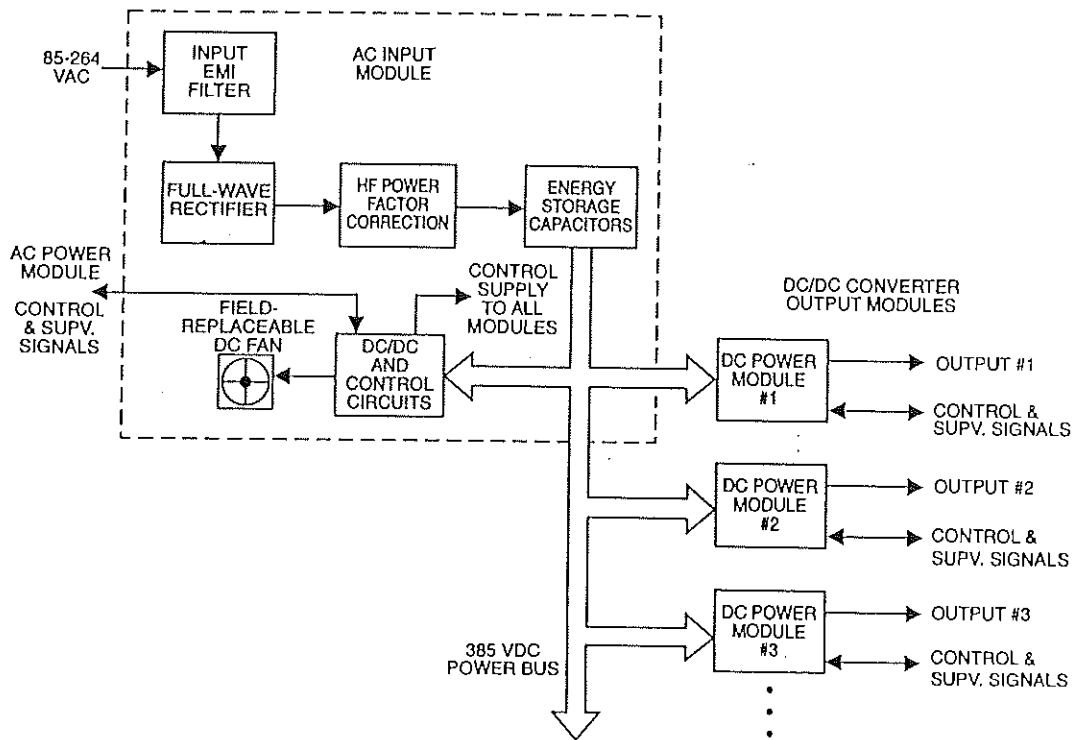


Figure 2. K Series Power System Block Diagram.

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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 K 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 Input Module.** The UNIMOD K 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

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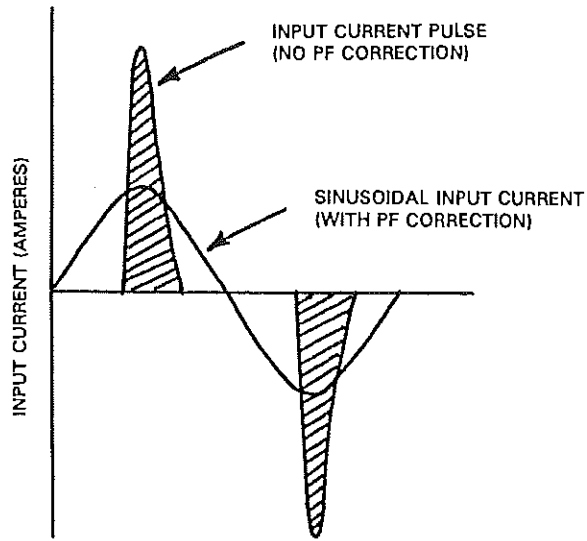
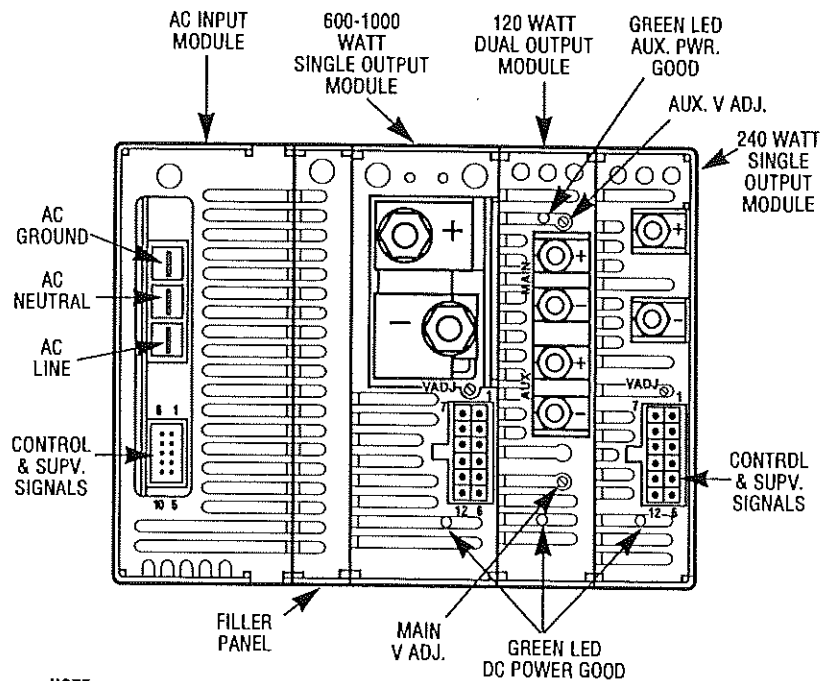


Figure 3. Input Current Waveforms Before and After High Frequency Power Factor Correction



NOTE:
 IN DUAL-OUTPUT MODULES THE UPPER TERMINALS ARE MAIN POWER OUTPUT AND THE LOWER TERMINALS ARE AUXILIARY POWER OUTPUT. THERE ARE NO CONTROL AND SUPERVISORY SIGNALS FOR DUAL OUTPUT MODULES.

Figure 4. UNIMOD K Series Front Panel View

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from the power system to the line. For power factor corrected (PFC) models (KP, KR, KT) the input voltage range is 85 to 264VAC continuous. For non-PFC models (KNP, KNR, KNT) 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 Power Module. The 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 Power Modules.** Each DC Power Module is a DC/DC converter which converts the unregulated DC from the power bus to a precise, regulated DC output voltage. The converters use power devices switching at 100 kHz in either a half-bridge or full-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.

6.0 FRONT PANEL DESCRIPTION

- 6.1 A typical UNIMOD K 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.
- 6.2 The next section to the right is a filler panel which is provided on all configurations as needed.
- 6.3 The next three sections to the right are DC Power Modules: The first is a 600 to 1000-watt single output module; the second is a 120-watt dual-output module; the third is a 240-watt single-output module. Each module has an output voltage adjustment potentiometer and a green DC Power Good LED. All single-output modules also have a 12-pin Molex connector for the control and supervisory signal inputs and outputs. The

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dual-output module does not have this connector. On all modules the top output terminal lug is positive and the bottom one is negative.

7.0 AVAILABLE DC POWER MODULES

VOLTAGE & CURRENT	OUTPUT POWER	VOLTAGE ADJ. RANGE	SLOT WIDTH	ORDERING CODE
2V @ 40A 2V @ 100A	80W 200W	±10% ±10%	1 1.5	1A 1C
3.3V @ 40A 3.3V @ 100A	132W 330W	±10% ±10%	1 1.5	9B 9E
5V @ 20A 5V @ 40A 5V @ 100A 5V @ 120A	100W 200W 500W 600W	±10% ±10% ±10% ±10%	1 1 1.5 1.5	2A 2C 2G 2GA
12V @ 10A 12V @ 20A 12V @ 50A	120W 240W 600W	±10% ±10% ±10%	1 1 1.5	3A 3D 3H
15V @ 8A 15V @ 16A 15V @ 40A	120W 240W 600W	±10% ±10% ±10%	1 1 1.5	4A 4D 4H
24V @ 5A 24V @ 10A 24V @ 25A 24V @ 33A 24V @ 42A	120W 240W 600W 800W 1000W	±10% ±10% ±10% ±10% ±10%	1 1 1.5 1.5 1.5	5A 5D 5H 5M 5N
28V @ 21A 28V @ 29A 28V @ 36A	600W 800W 1000W	±10% ±10% ±10%	1.5 1.5 1.5	6H 6M 6N
48V @ 5A 48V @ 12.5A 48V @ 17A 48V @ 21A	240W 600W 800W 1000W	±10% ±10% ±10% ±10%	1 1.5 1.5 1.5	7D 7H 7M 7N
5V@5A/12V@5A 12V@5A/12V@5A 12V@4A/15V@4A	85W 120W 120W	±10% ±10% ±10%	1 1 1	23A 33C 44C

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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 135% of rated load. Dual Output Modules: 25A max. on main output, 7A max. on auxiliary output.
Short Circuit Current	Single Output Modules: 10-100% of rated load current. Dual Output Modules: 8A max. on all outputs.
Overvoltage Protection	OVP operates at 120% to 135% of the nominal output voltage (60VDC max). The module 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.
Turn-On Time	One second max. from AC turn-on. For AC turn-on or release of Inhibit control, the output voltage rise is monotonic with 3% maximum overshoot. Rise-time from 5% to 95% of nominal output voltage is 100 msec. maximum.
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 recycling the AC input to off and then on.
EMI Input Filter	Conducted EMI meets FCC and EN level A or EN level B.
+5V @ 50 mA Auxiliary Output	This is an independent, isolated output for powering external control circuits.
Current Sharing (Option H)	All single outputs can current share with the output of another single output module either from the same or another K Series power system. This is done by connecting the current share pins together. Current sharing accuracy is within 10% of a module's rated output current.

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9.0 OPERATING INFORMATION

- 9.1 **Input Voltage.** The UNIMOD K 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.** Output power connections are made to nickel-plated brass studs on output bus bars. See Fig. 4. 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 0.1 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 KP, KR and KT) the rated continuous output power from all DC Power 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 KNP, KNR and KNT) the rated continuous output power from all DC Power 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 up to 50°C ambient temperature. Above 50°C the output must be derated by 2.5%/°C up to 70°C. See Fig. 5. The maximum operating temperature is 70°C.

Note that the total output power rating of all modules may exceed the maximum rating of the power system so long as the total power drawn by the loads does 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 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 - 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 right at the DC Power Module.

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- 9.5 **Control and Supervisory Signals.** All control and supervisory signals are accessible at the Molex receptacles on the front panel of the AC Input Module and on each single-output DC Power Module. Some of the pins are for control inputs and others are for alarm or monitoring outputs. Alarm and monitor outputs and control inputs that are used must have an external 0.1 μ F ceramic capacitor connected across them to 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).** 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 should be adjusted to within 1% 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 as follows:

- 200 W to 1000 W modules (1.5 slot width), $\pm 5\%$ of rated load current.
- 80 W to 240 W modules (1 slot width), $\pm 10\%$ of rated load current.

Current sharing accuracy 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 Remote Margin is used, these control pins must be connected together for all modules in parallel. Likewise, if Module Inhibit is to be used, these control pins must be connected together for all modules in parallel. The remaining functions operate independently for each module and are not connected together: Current Monitor, DC Power Good, Current Share Alarm, and OVP Latch Alarm. Therefore if one of the modules in parallel fails, the current share alarm output will go LO, the DC Power Good alarm of the bad module will go LO, and the DC Power Good green LED will go out.

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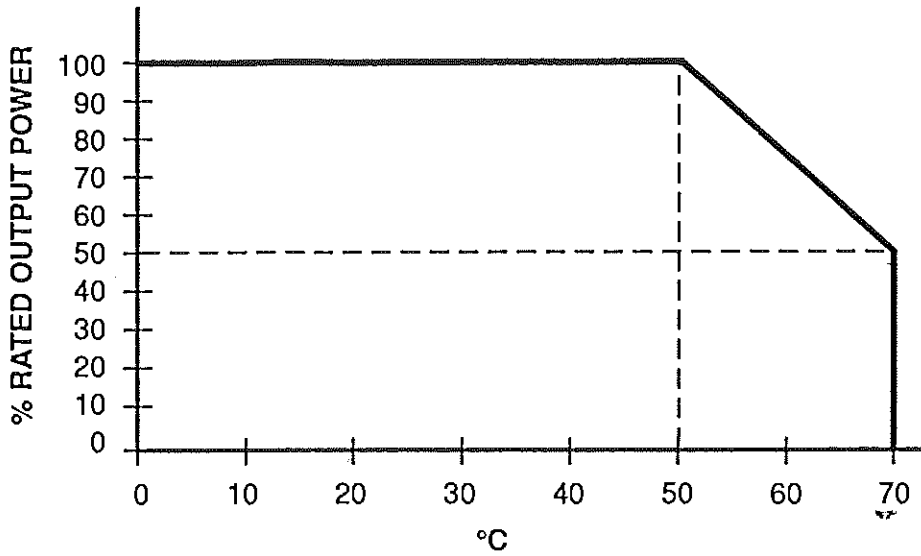


Figure 5. Output Power vs. Ambient Temperature.

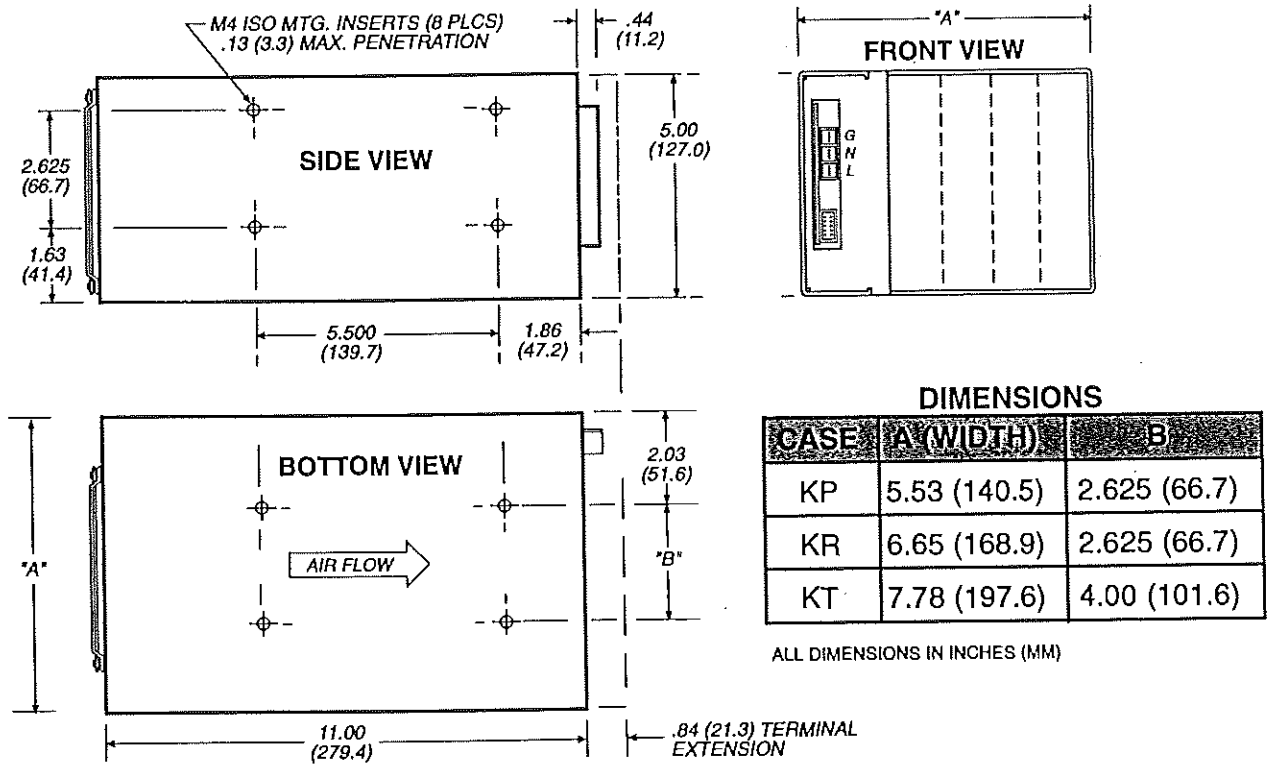


Figure 6. Mechanical Dimensions.

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- 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 green LED going out and its DC Power Good signal going LO.
- 9.8 **+5V @ 50mA Isolated Output.** This feature provides an independent, isolated 5V output for powering external control circuits.

10.0 CONTROL AND SUPERVISORY SIGNAL CONNECTIONS (SEE FIGURE 4)

AC INPUT MODULE RECEPTACLE

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

SINGLE-OUTPUT POWER MODULE RECEPTACLE (80W to 240W, 1 slot width)

PIN	FUNCTION
1	Current Monitor
2	Current Share
3	Module Inhibit
4	DC Power Good
5	+ Sense
6	- Sense
7	NC
8	NC
9	NC
10	NC
11	NC
12	NC

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SINGLE-OUTPUT POWER MODULE RECEPTACLE (200W to 1000W, 1.5 Slot Width)

PIN	FUNCTION	PIN	FUNCTION
1	Current Monitor	7	Remote Margin (RM1), +5%
2	Current Share	8	Remote Margin (RM2), -5%
3	Module Inhibit	9	Remote Margin (RM4), -10%
4	DC Power Good	10	Remote Margin (RM3), +10%
5	+ Sense	11	Current Share Alarm
6	- Sense	12	OVP Latch Alarm

- NOTES:**
1. All DC Power Module control and supervisory signal receptacles are Molex Mini-Fit, Jr. 39-30-0120. Mating plugs are Molex 39-01-2125 with pins 39-00-0039.
 2. Dual output modules do not have supervisory and control signals.
 3. NC = No Connection.

11.0 DESCRIPTION OF CONTROL AND SUPERVISORY SIGNALS: AC INPUT MODULE

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 Inhibit (Input)	5	A TTL LO (sinking 0.4mA) 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 0.1mA). 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 8mA) occurs when the AC input voltage falls a preset amount below the low line voltage specification. A TTL HI (sources 0.4mA) 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 POWER MODULES

SIGNAL	PIN	DESCRIPTION
Current Monitor (Output)	1	This analog output voltage is proportional to the load current. 200W-1000W Modules (1.5 slot width): At 100% rated load current the voltage is $+4.0V \pm 0.2V$; at 0% load current the voltage is $+0.5V \pm 0.2V$. This output can drive a 2.5K load. 80W-240W Modules (1 slot width): 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 2.5K 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 1% 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 alarm signals. The Current Share signal is referenced to the negative sense lead (Pin 6).
Module Inhibit (Input)	3	A TTL LO (sinking 0.3 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).
DC Power Good (Output) 80W to 240W (1 slot width) DC Power Modules	4	A TTL LO (sinks 10 mA) occurs when the output voltage goes outside the limits of -5% to -25% from nominal value, or if the module stops functioning. A TTL HI (sources 1.8 mA) is normal. This signal is referenced to the negative sense lead (Pin 6). <i>FS AUX REMAN</i>
DC Power Good (Output) 200W to 1000W (1.5 slot width) DC Power Modules	4	A TTL LO (sinks 10 mA) occurs when: 1) The output voltage at the remote sense leads goes outside the limits of $\pm 5\%$ from nominal value, or 2) The module stops functioning, or 3) The module goes into a current limit condition. A TTL HI (sources 1.8 mA) is normal. This signal is referenced to the negative sense lead (Pin 6).

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SIGNAL	PIN	DESCRIPTION
+ Sense - Sense	5 6	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 more than 2% above nominal value. The modules are protected against reverse sense connection except when operated in parallel.
Remote Margin (RM1), +5% (Input)	7	A TTL LO (sinking 0.2 mA) at this input causes the module DC output voltage to rise to 5% higher than its nominal value. A TTL HI (sourcing 0 mA) is normal. This signal is referenced to the negative sense lead (Pin 6).
Remote Margin (RM2), -5% (Input)	8	Same as RM1 except that a TTL LO causes a -5% change in output voltage.
Remote Margin (RM4), -10% (Input)	9	Same as RM1 except that a TTL LO causes a -10% change in output voltage.
Remote Margin (RM3), +10% (Input)	10	Same as RM1 except that a TTL LO causes a +10% change in output voltage.
Current Share Alarm (Output)	11	A TTL LO (sinks 10 mA) occurs when the current share error exceeds $\pm 20\%$ of rated load. A TTL HI (sources 1.8 mA) is normal. This signal is referenced to the negative sense lead (Pin 6).
OVP Latch Alarm (Output)	12	A TTL LO (sinks 10 mA) occurs when the overvoltage protection circuit is activated and the module output voltage is latched off. A TTL HI (sources 1.8 mA) is normal. This signal is referenced to the negative sense lead (Pin 6).

NOTE: The receptacle on the 80W to 240W (1 slot width) modules has signals specified on pins 1 through 6 only. Pins 7 through 12 are NC (no connection). The receptacle on the 200W to 1000W (1.5 slot width) modules has all 12 signals. Dual output modules do not have control and supervisory signals.

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13.0 INSTALLATION

- 13.1 **Mounting.** See Mechanical Dimensions diagram, Fig. 6. The UNIMOD K 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 K 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 at the studs to reduce contact resistance. Torque on the 1/4-20 output stud nuts of the 200-1000W single output modules (1.5 slot width) must not exceed 50 in.-lbs. Torque on the 10-32 stud nuts of the 80-240W single output modules (1 slot width) 2 and dual output modules must not exceed 22 in.-lbs.
- 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 single-output, DC Power Module control and supervisory signals are made to the Molex 39-30-0120 12-pin connector by means of a mating Molex 39-01-2125 connector with 39-00-0039 contacts.

14.0 MAINTENANCE

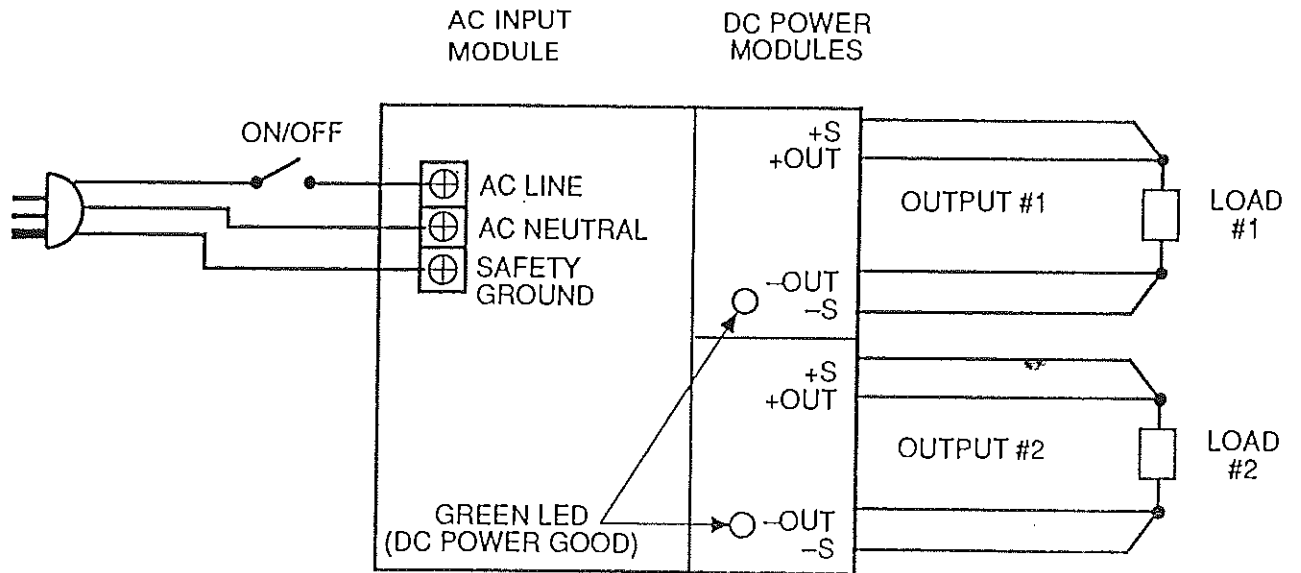
No routine maintenance is required on the K Series Power System except for periodic cleaning of dust and dirt around the fan intake. A small vacuum nozzle should be used for this. The power system cover should not be removed; there are no user-serviceable components in the unit.

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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 (pins 5 and 6) of proper polarity directly to the output terminals of each module. Make sure that the Global Inhibit (pin 5 on AC Input Module) and the Module Inhibit (pin 3 on DC Power Modules) are all open connection. Make sure that the Remote Margin inputs (pins 7, 8, 9 and 10) on the 200W to 1000W, 1.5 slot-width modules are all open connection or logic HI.
- 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 green DC Power Good LED is on for each module. 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 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.

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

Figure 7. K Series Input/Output Connections.

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16.0 TROUBLE SHOOTING GUIDE

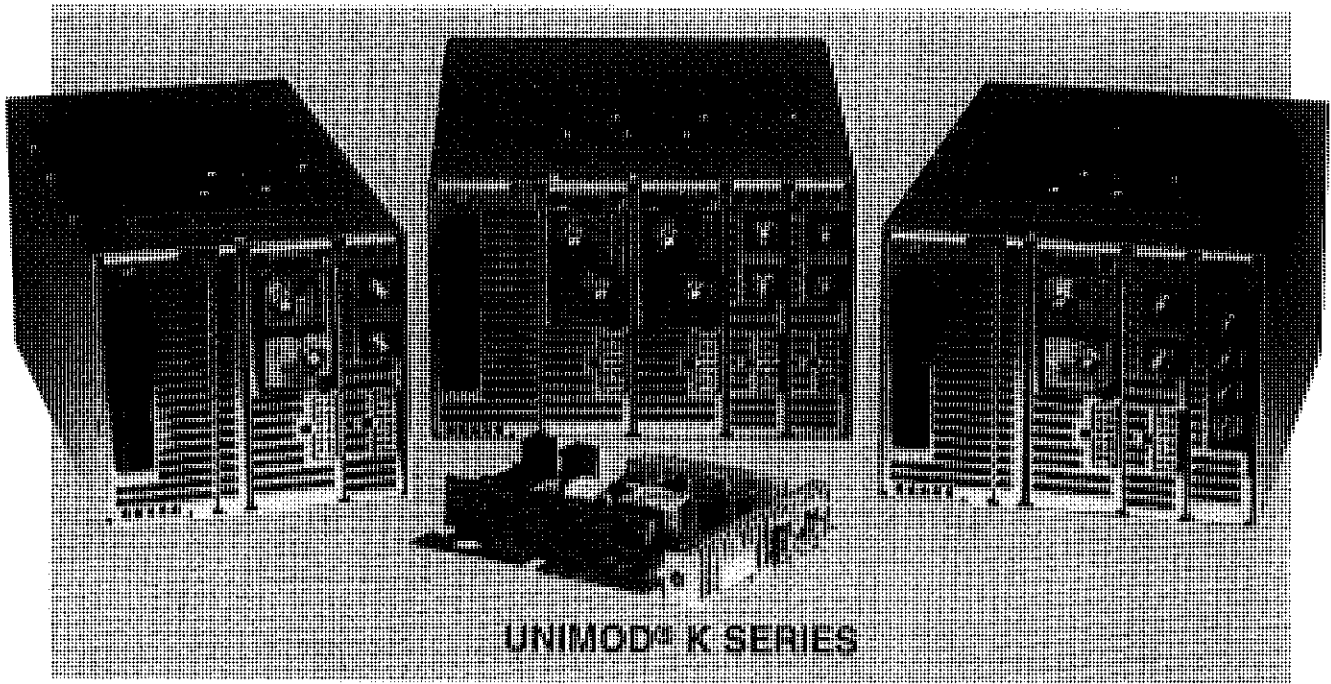
16.1 If you encounter difficulty and do not get output voltages, go through the following trouble shooting guide.

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).	Overtoltage protection (OVP) is engaged on 200W-1000W (1.5 slot width) single-output module.	Check OVP Alarm output (pin 12) for a logic LO. 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 (all outputs).	Output is inhibited by Global Inhibit or Module Inhibit.	Check to see if pin 5 on AC Input Module or pin 3 on a DC Power Module is a logic LO. Both should be logic HI or open.
Output higher than nominal value.	Remote sense leads not connected.	Connect sense leads as instructed in Section 9.4.
Output higher or lower than nominal value (one module).	Remote Margin is activated.	Check pins 7, 8, 9 and 10 on 200W to 1000W, 1.5 slot-width modules to make sure they are all logic 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.

MODULAR POWER WITH PFC POWER TO 1800 WATTS

- ▲ Modular, Configurable Design
- ▲ 0.99 Power Factor
- ▲ Power Density to 5.9W/In.³



FEATURES

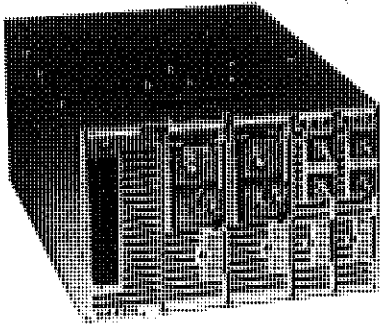
- ▶ Three Case Sizes
- ▶ 29 Standard Modules
- ▶ Field-Replaceable Fan
- ▶ Up to 10 Outputs
- ▶ Universal Input, 85-264 VAC
- ▶ Class A or B EMI Filter
- ▶ Control & Supervisory Signals
- ▶ PowerSpeed 5-Day Delivery



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UNIMOD® K SERIES



GENERAL DESCRIPTION

The UNIMOD K Series switchers represent a new advance in size, performance and cost for modular/configurable power supplies. With up to 1800 watts total output, it is one of industry's smallest units which incorporate power factor correction.

The chassis comes in three different widths, 5.53, 6.65 and 7.78 inches with 3, 4, or 5 output module slots, respectively. The slots accept a combination of output modules selected from 29 standard units with output voltages from 2 to 48VDC. Both single and dual-output modules are available; the modules take up 1 or 1½ chassis slots, depending on output power level. The K Series is cooled by a field-replaceable, DC ball-bearing fan. A complete power system is quickly configured at the factory to a customer's specific requirement.

The AC input module incorporates an input EMI filter and high-frequency, zero-voltage switching power factor correction to 0.99. The EMI input filter meets either FCC and EN level A or EN level B. The universal input voltage range is 85 to 264VAC. A unique feature is an independent isolated 5V, 50mA output for powering external control circuits.

The output power modules are DC/DC converters which operate off an internal 385VDC power bus to produce regulated output voltages. The modules have output power from 80 to 1000 watts, with each module output independent and fully isolated. They switch at 70 to 100kHz in either a half-bridge or full-bridge configuration. Single-output modules incorporate important control and supervisory functions such as output inhibit, DC power good, current sharing and current monitor. The active current-sharing option permits like-module outputs to be connected in parallel for higher current capability and N + 1 redundancy applications. All single-output modules have remote sensing, and 600 to 1000W modules have remote margining. Other important features include output current limiting and short circuit protection, overvoltage and reverse voltage protection, and over-temperature shut-down. The AC power module has a global inhibit input and AC power fail output.

SPECIFICATIONS

Typical at nominal line, full load and 25°C unless otherwise noted.

OUTPUT MODULE SPECIFICATIONS

Total Output Power, max.	1800W
Output Voltage Set Tolerance, max.	±1.0%
Output Voltage Adj. Range, min.	±10%
Line Regulation ¹ , max.	0.2% or 10mV
Load Regulation ² , max.	
Single Output Modules	0.2% or 10 mV
Dual Output Modules	0.5% or 25 mV
Cross Regulation ³ , max.	
Single Output Modules	0.2% or 10mV
Dual Output Modules	0.5% or 25mV
Ripple and Noise ³ , P-P max.	1% or 100 mV
Holdup Time, min.	20 msec.
Temperature Coefficient, max.	0.02%/°C
Transient Response ⁴ , max.	500 µsec.
Minimum Load, any output	0 Amperes
Turn-On Time, max.	1.0 sec.

AC INPUT SPECIFICATIONS

Universal Input Voltage Range	
1000W Load	85 to 264 VAC
1200W Load	90 to 264 VAC
1800W Load	180 to 264 VAC
Input Frequency	47 to 63 Hz
Input Current	
1200W Load, 120 VAC In	14.4A RMS
1200W Load, 230 VAC In	7.5A RMS
1800W Load, 230 VAC In	11.3A RMS
Input Power Factor	0.99
Harmonic Input Currents, 230 VAC	meet EN60555-2
EMI, conducted	FCC 20780, Level A; EN 55022 Level A
conducted, optional filter	EN 55022 Level B
Inrush Current, hot or cold start, max.	40 A Peak
Input Protection, internal	30 A Fuse

GENERAL SPECIFICATIONS

Efficiency, 5V & greater outputs	70% to 85%
Switching Frequency	70 to 100 kHz
Isolation, min., output to chassis ground	±100 VDC
Leakage Current to Ground, max.	3.5mA

ENVIRONMENTAL SPECIFICATIONS

Operating Temp. Range, rated load.	0°C to 50°C
Derating, 50°C to 70°C	2.5%/°C
Storage Temperature Range	-40°C to +85°C
Cooling	Field-Replaceable DC 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, KP Case	5" H x 5.53" W x 11" D
KR Case	5" H x 6.65" W x 11" D
KT Case	5" H x 7.78" W x 11" D

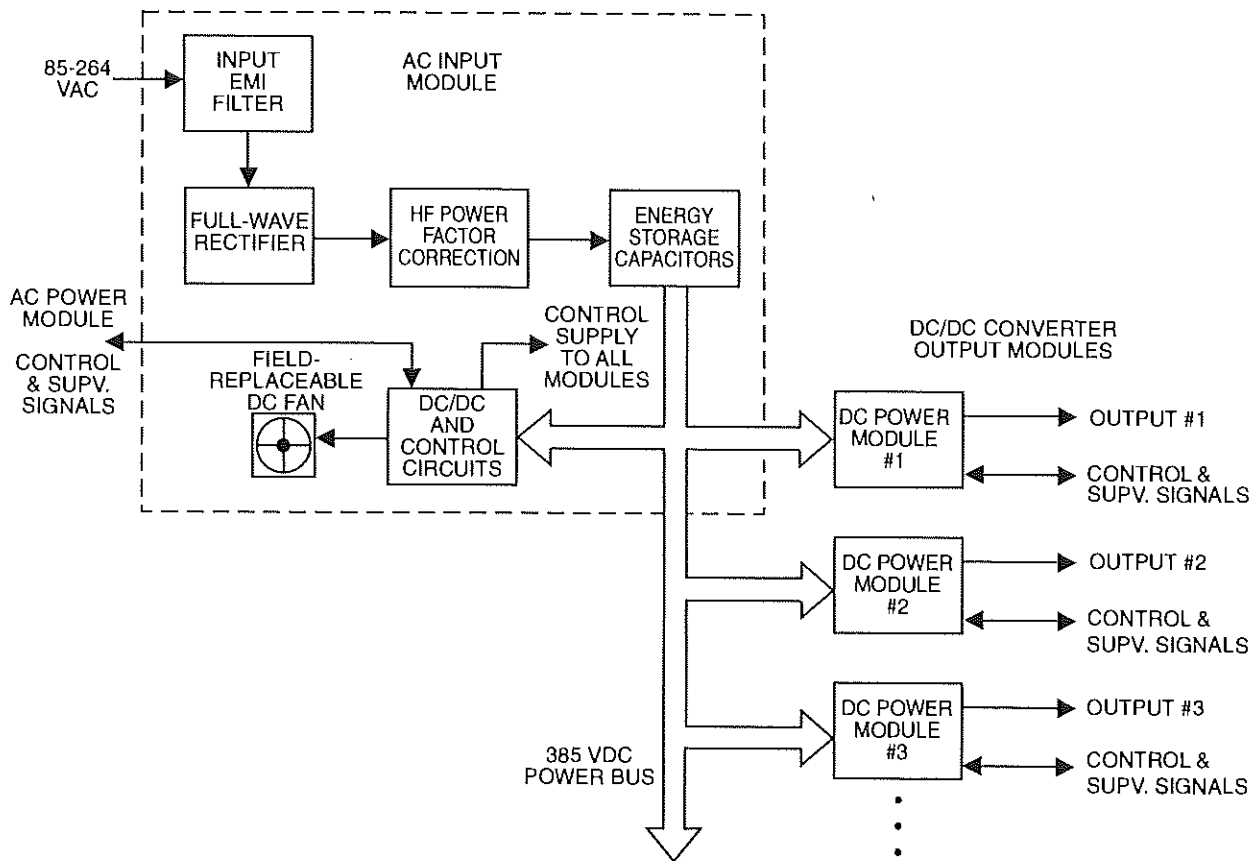
NOTES:

1. Whichever is greater; over AC input range.
2. Whichever is greater. Remote sense must be connected on single-output modules.
3. Whichever is greater. 20MHz bandwidth.
4. For 25% load step change at 75% rated load; 4% max. deviation with recovery to within 1%, at 1.0A/µsec.

TWO-YEAR WARRANTY



K SERIES POWER SYSTEM BLOCK DIAGRAM



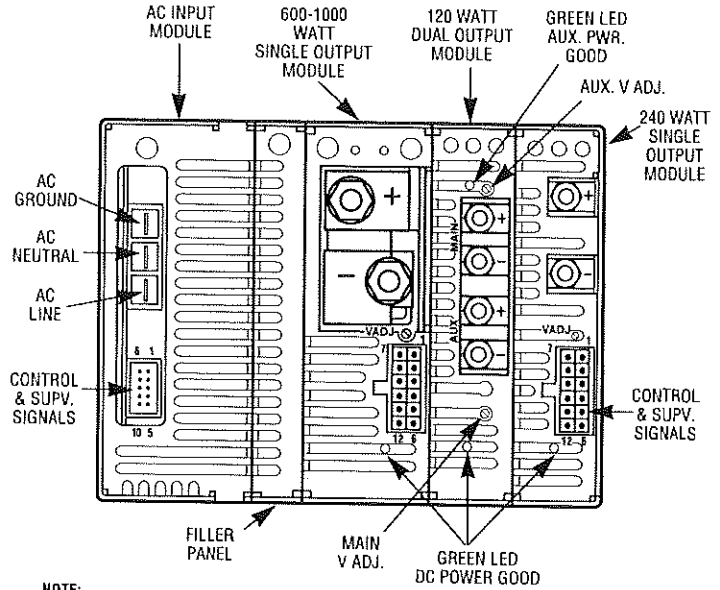
K SERIES FEATURE & OPTION DESCRIPTIONS

FEATURE/OPTION	DESCRIPTION	FEATURE/OPTION	DESCRIPTION
AC Undervoltage Protection	Power supply is protected for all conditions below low line voltage.	Turn-On Time	One second max. from AC turn-on. For AC turn-on or release of inhibit control, the output voltage rise is monotonic with 3% maximum overshoot. Rise time from 5% to 95% of nominal output voltage is 100 msec. maximum.
Safety Agency Approvals	UL1950; CSA22.2 No. 234-M90; IEC950; EN60950.	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 ±100V from chassis ground.
Output Current Limiting	Single Output Modules: Current limiting takes place at 110% to 135% of rated load. Dual Output Modules: 25A on main output, 7A on auxiliary output.	Overtemperature Protection	The power supply latches off when the internal temperature reaches excessive value. It must be reset by cycling the AC input off and then on.
Short Circuit Current	Single Output Modules: 10-100% of rated load current. Dual Output Modules: 8A max. on all outputs.	EMI Input Filter	Conducted EMI meets FCC and EN level A or EN level B.
Overvoltage Protection	OVP operates at 120% to 135% of the nominal output voltage (60 VDC max.). The module output latches off. It is reset by cycling the AC input off and then on.	Current Sharing (Option H)	All single outputs can current share with the output of another single output module either from the same or another K Series power system. This is done by connecting the current share pins together. Current sharing accuracy is within 10% of a module's rated output current.
Reverse Voltage	To 100% of rated output current, maximum.		

STANDARD OUTPUT MODULES

TYPICAL FRONT PANEL CONFIGURATION

VOLTAGE & CURRENT	OUTPUT POWER	VOLTAGE ADJ. RANGE	SLOT WIDTH	MODULE CODE
V @ 40A	80W	±10%	1	1A
2V @100A	200W	±10%	1.5	1C
3V @ 40A	132W	±10%	1	9B
V @100A	330W	±10%	1.5	9E
5V @ 20A	100W	±10%	1	■2A
5V @ 40A	200W	±10%	1	■2C
V @100A	500W	±10%	1.5	■2G
V @120A	600W	±10%	1.5	2GA
12V @ 10A	120W	±10%	1	■3A
V @ 20A	240W	±10%	1	■3D
V @ 50A	600W	±10%	1.5	■3H
15V @ 8A	120W	±10%	1	■4A
15V @ 16A	240W	±10%	1	■4D
V @ 40A	600W	±10%	1.5	■4H
24V @ 5A	120W	±10%	1	■5A
24V @ 10A	240W	±10%	1	■5D
V @ 25A	600W	±10%	1.5	■5H
V @ 33A	800W	±10%	1.5	5M
24V @ 42A	1000W	±10%	1.5	5N
V @ 21A	600W	±10%	1.5	■6H
V @ 29A	800W	±10%	1.5	6M
28V @ 36A	1000W	±10%	1.5	6N
48V @ 5A	240W	±10%	1	■7D
V @12.5A	600W	±10%	1.5	■7H
48V @ 17A	800W	±10%	1.5	7M
48V @ 21A	1000W	±10%	1.5	7N
V @5A/12V @5A	85W	±10%	1	23A
V @5A/12V @5A	120W	±10%	1	33C
15V @4A/15V @4A	120W	±10%	1	44C



NOTE:
IN DUAL-OUTPUT MODULES THE UPPER TERMINALS ARE MAIN POWER OUTPUT AND THE LOWER TERMINALS ARE AUXILIARY POWER OUTPUT. THERE ARE NO CONTROL AND SUPERVISORY SIGNALS FOR DUAL OUTPUT MODULES.

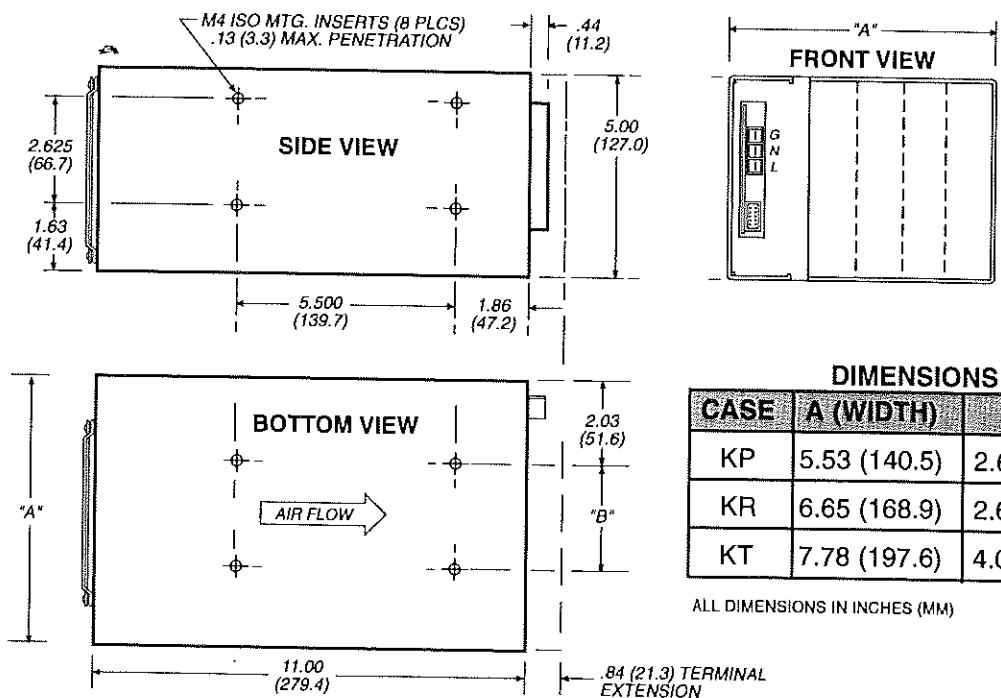
CONNECTORS

AC INPUT POWER
AMP 556882-3; MATE: 556879-3 with 556880-2 terminals
AC MODULE CONTROL & SUPERVISORY
MOLEX 15-47-6101; MATE: 22-55-2103 housing with 15-04-5104 clips and 16-02-0103 contacts
OUTPUT MODULE CONTROL & SUPERVISORY
MOLEX 39-30-0120; MATE: 39-01-2125 with 39-00-0039 contacts

POWERSPEED™ 5 Day Delivery

all models and options shown in bold and color with symbol ■

CASE DRAWING



DIMENSIONS		
CASE	A (WIDTH)	B
KP	5.53 (140.5)	2.625 (66.7)
KR	6.65 (168.9)	2.625 (66.7)
KT	7.78 (197.6)	4.00 (101.6)

ALL DIMENSIONS IN INCHES (MM)

ORDERING GUIDE

The UNIMOD K Series power system lets the user choose up to 5 out of 29 available output modules. Normally the maximum continuous output power cannot exceed 1200W for 90-264 VAC input or 1000W for 85-264 VAC input. For certain output configurations the power can be up to 1800W for 180-264 VAC input. Check with the factory on this.

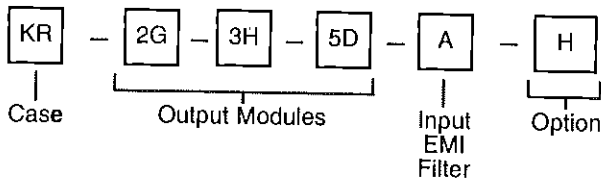
A K Series power system is completely specified by:

1. Case code (see Case Designation table).
2. Output module codes (see Standard Output Modules table).
3. Option code (see Option table).
4. Input filter code (see Input EMI Filter table).

EXAMPLE: An 1180W, three-output power system with Class A EMI input filter and current share option. Input voltage will be 90-264 VAC.

Qty	Output Module	Module Code	Slots Req'd	Module Watts	Watts Drawn
1	5V, 100A	2G	1.5	500	420
1	12V, 50A	3H	1.5	600	550
1	24V, 10A	5D	1	240	210
Totals			<u>4</u>	<u>1340</u>	<u>1180</u>

Model Designation:



NOTE: The position of the modules is determined by the factory. Filler panels are provided for empty slots.

POWERSPEED™ 5 Day Delivery

On all models and options shown in bold and color with symbol ■

CASE DESIGNATION

CODE	CASE SIZE	OUTPUT SLOTS
■ KP	5 x 5.53 x 11"	3
■ KR	5 x 6.65 x 11"	4
■ KT	5 x 7.78 x 11"	5

OPTION

CODE	OPTION
■ H	Current Share (All Single Output Modules)

CONTROL AND SUPERVISORY SIGNAL CONNECTIONS

AC INPUT MODULE CONNECTOR

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

SINGLE OUTPUT POWER MODULE CONNECTOR 1 Slot Width (80W to 240W)

PIN	FUNCTION
1	Current Monitor
2	Current Share
3	Module Inhibit
4	DC Power Good
5	+ Sense
6	- Sense
7	NC
8	NC
9	NC
10	NC
11	NC
12	NC

SINGLE OUTPUT POWER MODULE CONNECTOR 1.5 Slot Width (200W to 1000W)

PIN	FUNCTION
1	Current Monitor
2	Current Share
3	Module Inhibit
4	DC Power Good
5	+ Sense
6	- Sense
7	Remote Margin (RM1), +5%
8	Remote Margin (RM2), -5%
9	Remote Margin (RM4), -10%
10	Remote Margin (RM3), +10%
11	Current Share Alarm
12	OVP Alarm

- NOTES:** 1. Dual output modules do not have supervisory and control signals.
2. NC = No Connection.

INPUT EMI FILTER

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

MATING CONNECTOR KITS

CASE CODE	KIT NO.
KP	019-1453
KR	019-1454
KT	019-1455

NOTE: The above kits contain all mating input and output connectors with contacts and attached leads.

CONTROL AND SUPERVISORY SIGNAL DESCRIPTIONS

AC INPUT MODULE CONNECTOR

SIGNAL	PIN	DESCRIPTION
+5V Auxilliary Voltage (Output)	1	A +5V at 50mA isolated output for powering external logic circuitry. This output is not affected by the inhibit control.
5V Auxilliary 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 Inhibit (Input)	5	An input TTL LO inhibits all DC outputs. An open or TTL HI is normal. This input is isolated and should be driven from an open collector TTL.
5V Auxilliary Return (Reference)	8	This pin is physically connected to pin 2 above.
AC Power Fail (Output)	9	This TTL output is normally HI. A TTL LO indicates loss of AC power and occurs at least 5 msec. before the DC outputs go out of regulation. This is an isolated output.

DC OUTPUT POWER MODULE CONNECTOR*

SIGNAL	PIN	DESCRIPTION	SIGNAL	PIN	DESCRIPTION
Current Monitor (Output)	1	This + analog output voltage is proportional to the load current.	+ Sense	5	These remote sense leads are provided on all single-output modules and should be connected to the load point. They provide regulation to the point of load. Total external voltage drop from the DC output to the sense points is 0.5V max. Open sense leads will not cause the output to rise more than 2% above nominal value. The modules are protected against reverse sense connection except when operated in parallel.
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 1% of each other and the modules are connected together by means of the current share pins. Current Share Accuracy: 10% of rated load current for all DC Power Modules.	- Sense	6	
Module Inhibit (Input)	3	A TTL LO provided at this input inhibits (turns off) the DC Power Module output.	Remote Margin (RM1) +5% (Input)	7	A TTL LO at this input causes the DC Power Module output voltage to rise to 5% higher than its nominal value.
DC Power Good 80W-240W (Output)	4	A TTL LO occurs when the output voltage goes outside the limit of -5% to -25% from nominal value or if the module stops functioning. This is for 80W to 240W (1 slot width) single-output DC Power Modules.	Remote Margin (RM2) -5% (Input)	8	Same as RM1 above except that a TTL LO causes a -5% change in output voltage.
DC Power Good 200W-1000W (Output)	4	A TTL LO occurs when: 1) The output voltage at the remote sense leads goes outside the limits of ±5% from nominal value, or 2) The module stops functioning. This is for 200W to 1000W (1.5 slot width) DC Power Modules.	Remote Margin (RM4) -10% (Input)	9	Same as RM1 above except that a TTL LO causes a -10% change in output voltage.
			Remote Margin (RM3) +10% (Input)	10	Same as RM1 above except that a TTL LO causes a +10% change in output voltage.
			Current Share Alarm (Output)	11	A TTL LO occurs when the current share error between modules exceeds 20% of rated load.
			OVP Alarm (Output)	12	A TTL LO occurs when the overvoltage protection circuit is activated and the DC Power Module output voltage is latched off. To reset, cycle the AC input off and then on.

*NOTE: The connector on the 1 slot width single output modules (80W to 240W) has signals specified on pins 1 through 6 only. Pins 7 through 12 are NC (no connection). The connector on the 1.5 slot width modules (200W to 1000W) has all 12 signals. Dual output modules do not have control and supervisory signals.



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 UNIPOWER EUROPE • Foredown Drive • Portslade, Brighton, East Sussex BN41 2BB, England • Phone (01273) 420196 • Fax: (01273) 417140