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Powering Technology

OPERATING MANUAL
PCHS/TPCHS SERIES
Quick-Set PowerCassette®
ADVANCED MULTI-OUTPUT
SWITCHER AND RACKS

www.unipowerco.com

Manual No. TPCHS-2
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OPERATING MANUAL
PCHS/TPCHS QUICK-SET PowerCassette®
ADVANCED, MULTI-OUTPUT SWITCHER

1.0 INTRODUCTION

This operating manual should be read through carefully before installing and operating the PCHS/TPCHS Quick-Set PowerCassette®.

The Quick-Set PowerCassette is an advanced-design, multi-output switching power supply that employs a unique, new cellular architecture which permits quick factory programming of its outputs by means of internal DIP switches to meet virtually any requirement. There are up to six outputs, including a 5VDC 250 mA independent standby output. Maximum continuous output power is 600 watts, and available voltages are from 1.2VDC to 12VDC.

The PowerCassette is ultra-compact, only 1.6 inches high, 5 inches wide and 11 inches deep, giving 6.8 watts per cubic inch power density. The unit comes in two versions: the PCHS model which is the standard, non-hot-swap version; and the TPCHS model, which is the hot-swap version with a handle and mounting bracket with jackscrews. See Figure 1. There are also both AC and DC input models available.

PowerCassette incorporates control and monitoring features including enable and inhibit inputs, input power fail and output power good signals, overtemperature warning and remote sensing on V1, V2 and V3. The front panel has two LED status indicators: one for Input Power Good and the other for Output Power Good. The V1, V2 and V3 outputs have single-wire, current sharing capability.

19-inch, 1U-high racks are available to hold either two or three PowerCassette units connected in parallel to give 600 or 1200 watts with redundancy or 1200 watts with non-redundant operation. The racks feature a number of input connection options.

There is also an I²C serial bus interface option which gives the status of system critical operating parameters..

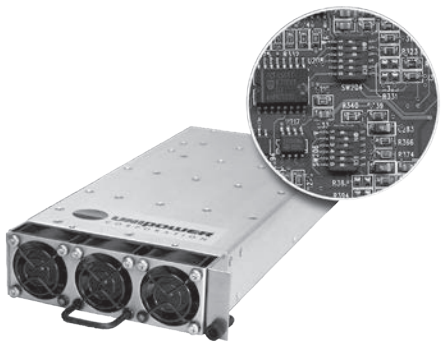


Figure 1 - Quick-Set PowerCassette Models (hot-swap model shown)

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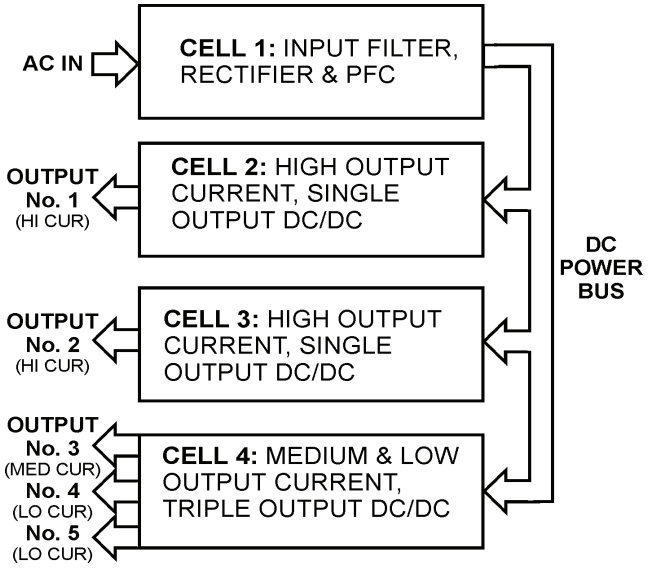


Figure 2 - PowerCassette Simplified Block Diagram (AC Input)

2.0 QUICK-SET POWERCASSETTE FEATURES

The following is a summary of the important features of the Quick-Set PowerCassette

- ◆ Outputs Set by Internal DIP Switches
- ◆ Advanced "Cellular Power"™ Architecture
- ◆ Up to 5 Outputs Plus 5V 250 mA Standby
- ◆ 508 Different Models
- ◆ Hot-Swap or Chassis Mount Versions
- ◆ Compatible 19-Inch Racks Available
- ◆ Integral LED Status Indicators
- ◆ AC or DC Input
- ◆ I²C Serial Data Bus Option
- ◆ 6.8 Watts/Cubic Inch Power Density
- ◆ Power Factor Corrected (AC Version)
- ◆ Low Profile: 1.6 Inches High (1U)
- ◆ Hot-Swappable Connector
- ◆ Staged Pin Lengths
- ◆ Output ORing Diodes on All Outputs
- ◆ Active, Single-Wire Current Sharing on V1, V2 & V3
- ◆ Universal 85-264 VAC Input
- ◆ Wide Range 36-72 VDC Input
- ◆ DC Input Reverse Polarity Protected
- ◆ Class B EMI Input Filter (AC Version)
- ◆ No Minimum Load on Any Output
- ◆ Control and Monitoring Signals
- ◆ Optimized Thermal Management

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3.0 SUMMARY OF PRODUCT LINE

3.1 The Quick-Set PowerCassette product line consists of 254 AC input models and 254 DC input models, or 508 different models total. There is a choice of five outputs plus a 5V, 250 mA standby output, giving a total of up to six outputs.

3.2 The following Ordering Guide with examples gives the configuration of model numbering.

ORDERING GUIDE

SERIES	AC or DC INPUT	V1 OUTPUT	I²C OUTPUT	V1 to V5 OUTPUTS
PCH = Chassis Mount TPCH = Hot Swap	Q = DC B* = AC	29332-S = 1.8-5V Out 32332-S = 12V Out	Z = I²C B* = No I²C	Use 5 Letters From Tables: -XXXXX (Appendix 1)

*NOTE: B means “leave blank” (no letter)

Examples: Model **TPCH29332-S-DBFGE** is a Hot-Swap version with AC input, no I²C,
V1 = 5V/70A, V2 = 2.5V/50A, V3 = 12V/10A, V4 = -12V/3A and V5 = -5V/3A

Model **PCHQ32332-SZ-FCOGE** is a Chassis Mount version with DC input, I²C output,
V1 = 12V/35A, V2 = 3.3V/50A, V3 = No Output, V4 = -12V/3A and V5 = -5V/3A

3.3 The outputs are designated by five suffix letters taken from the tables in Appendix 1.

3.4 The 19-Inch compatible racks are designated as follows:

Two-Unit Rack:	TPCHR1U2 for AC input
	TPCHQR1U2 for DC input
Three-Unit Rack:	TPCHR1U3 for AC input
	TPCHQR1U3 for DC input

4.0 SAFETY WARNINGS

4.1 These power supplies have hazardous external and internal voltages. They should be handled, tested and installed only by qualified technical persons who are trained in the use of power systems and are well aware of the hazards involved.

4.2 The input terminals are at hazardous voltage potentials. Do not touch this area when power is applied.

4.3 When operating this power supply, the chassis ground terminal must be connected to safety ground by means of a three-wire AC power line to minimize electrical shock hazard and to ensure low EMI (electromagnetic interference).

4.4 The internal voltages are at hazardous potentials. The power supply cover should not be removed. There are no user-serviceable components in these units. Removing the cover of the power supply will void the warranty.

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5.0 WARRANTY (summary)

PowerCassette Series are warranted 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.

For a complete text of UNIPOWER's warranty conditions please request a copy from your local Sales Office.

6.0 UNPACKING AND INSPECTION

6.1 This unit was carefully tested, inspected and packaged for shipment from our factory. Upon receipt the unit should be carefully unpacked and inspected for any damage in shipment.

6.2 If there is evidence of damage, **do not attempt to install the unit**. The freight carrier should be notified immediately and a claim for the cost of the unit 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 material as evidence of damage for the freight carrier's inspection.

6.3 UNIPOWER LLC will cooperate fully in case of any shipping damage investigation.

6.4 Always save the packing materials for later use in shipping the unit. Never ship this unit without proper packing.

7.0 DESCRIPTION OF OPERATION

7.1 A simplified block diagram of a Quick-Set PowerCassette unit with AC input is shown in Figure 2. PowerCassette employs a new, advanced CellularPower™ architecture onsisting of standardized power cells. The diagram shows that there are four power cells employed.

7.2 The first cell contains (for the AC input version shown) an input EMI filter, rectifier and power factor converter. Cells two and three each have a preconfigured, high-current, single-output DC-to-DC converter. Cell four has a pre-configured triple output DC-to-DC converter; this cell produces one medium current output and two low current outputs. The individual DC-to-DC converter cells are quickly and simply programmed at the factory to the required output voltages by means of internal DIP switches on the circuit board. The result is five DC outputs plus a 5V 250 mA standby output, giving up to six outputs in total.

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8.0 FRONT PANEL DESCRIPTION

The front panel of the Quick-Set PowerCassette is shown in Figure 3. On the left bottom of the panel is the Input Power Good LED (green) and on the right bottom is the Output Power Good LED (green). For the TPCHS and TPCHQS models there is a handle between the two LEDs. Also for these models there is a mounting bracket on the right side of the front panel. This has a jackscrew (Allen bolt) for securing the unit.

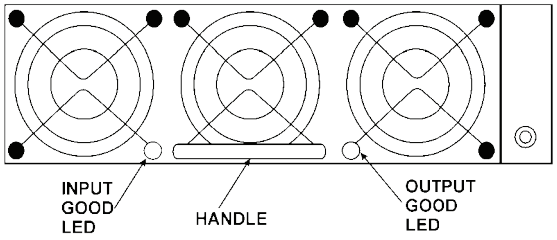


Figure 3 - Front Panel of the Quick-Set PowerCassette

9.0 MODULE SPECIFICATIONS

OUTPUT SPECIFICATIONS

Total Output Power, Continuous, Max ..... 600 Watts
Voltage Adjustment Range, Min ..... ±5%
Total Regulation[1], V1, V2, V3 ..... 2.0%
Total Regulation[1], V4, V5 ..... 3.0%
Ripple & Noise, Pk-Pk[2] ..... 1% or 50mV
Holdup Time 20mS
Dynamic Response[3] 300µS
Temperature Coefficient ..... ±0.02%/°C
Minimum Load, Any Output 0A
Overload Protection ..... Auto Recovery
Overvoltage Protection, V1, V2, V3 ..... Latched Shutdown
Remote Sense, V1, V2, V3 ..... Up to 0.25V Per Wire
Current Share, V1, V2, V3 ..... ±10% Full Load Rating
Standby Output ..... +5V, 250mA
Output Power Good Signal ..... Logic High
Input Power Fail Signal ..... Logic High
Global Inhibit ..... Logic Low
Enable ..... Logic Low
Thermal Warning ..... Logic Low

AC INPUT SPECIFICATIONS

Input Voltage Range 85-264VAC
Power Factor 0.99
Input Frequency 47-63Hz
Inrush Current Limiting ..... 30A Peak
Input EMI Filter[6] ..... EN55022 Curve B
FCC20780 pt. 15J Curve B
Harmonic Distortion EN61000-3-2
Input Immunity, Conducted
Fast Transients, Line-Line ..... ±2kV (EN61000-4-4 Level 3)
Surges, Line-Line ..... ±2kV (EN61000-4-5 Level 3)
Surges, Line-Ground ..... ±4kV (EN61000-4-5 Level 4)
Input Protection ..... Internal Fuse, 15A

DC INPUT SPECIFICATIONS

Input Voltage Range 36-72VDC
Inrush Current Limiting ..... 10A Peak
Input EMI Filter ..... Standard
Input Immunity, Conducted
Fast Transients, Line-Line ..... ±2kV (EN61000-4-4 Level 3)
Surges, Line-Line ..... ±500V (EN61000-4-5 Level 1)
Surges, Line-Ground ..... ±500V (EN61000-4-5 Level 1)
Input Protection ..... Internal Fuse, 25A

GENERAL SPECIFICATIONS

Efficiency[4] ..... 75% at Full Load
Switching Frequency
PFC Converter (AC Input) 48-110kHz
Output Converters ..... 275kHz Nominal
Isolation, Class I, min.[5]
Input-Output (AC Input/DC Input) 3000VAC/1500VDC
Input-Ground (AC Input/DC Input) 1500VAC/1500VDC
Output-Ground (AC Input/DC Input) 50VDC/50VDC
MTBF (Bellcore ..... 200,000 HoursSafety Standards
EN60950, UL1950, CSA22.2 No.950

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature ..... 0°C to 70°C Ambient
Derating ..... 2.5%/°C, 50°C to 70°C
Storage Temperature ..... -40°C to +85°C
Cooling ..... Integral Ball Bearing Fans

PHYSICAL SPECIFICATIONS

Case Material ..... Aluminum
Dimensions, Inches(mm) ..... 1.6 H x 5.0 W x 11.0 D
(40.6 x 127 x 279)
Weight ..... 3.3 lbs. (1.5 kg.)

NOTES:
1. No load to full load, including line regulation and load regulation.
2. Whichever is greater. 20MHz bandwidth. Measure with 0.1µFceramic and 10µF tantalum capacitors in parallel across the output. For outputsof 2.5V or lower, the figure is 2% maximum.
3. <4% deviation recovering to within 1% for 25% load change.
4. Typical efficiency for 4 output unit with one high-current output of 5V or lower. Efficiency can vary 5% or more depending on combination of outputs.
5. Input-output isolation figure is for isolation components only. 100% production Hipot tested.
6. When installed in compatible rack. Consult factory.

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10.0 DESCRIPTION OF FEATURES & OPTIONS

FEATURE / OPTION	DESCRIPTION
Power Factor Correction	The input current is a sine wave in-phase with the input voltage to give a power factor of 0.99. Input current total harmonic distortion meets EN61000-3-2. This is for AC input models.
Wide Range AC Input	The AC input range is continuous from 85 to 265VAC, 47-63Hz, for worldwide operation.
EMI Input Filter	This filter suppresses conducted noise from the supply back onto the AC line. The filter meets FCC20780 part 15J Curve B and EN55022 Curve B when the PowerCassette is installed in a compatible rack.
Wide Range DC Input	The DC input range is 36 to 72VDC with 48VDC as the nominal input. The DC input also has an EMI input filter.
Reverse Polarity Protection	The DC input models are reverse polarity protected by means of an input diode.
Inrush Current Limiting	When the unit is turned on, the initial input current is limited to a peak value of 30 amperes (AC input) or 10 amperes (DC input). This is accomplished by an active current limiting circuit (not a thermistor).
Thermal Protection	If the PowerCassette overheats internally, it will automatically shut down. The Output Good LED turns off. The Overtemperature Warning and Output Power Good signals both go LO. After a few minutes the unit will cool down and automatically start up again.
Current Sharing	The PowerCassette will automatically current share with another identical PowerCassette. A single-wire connection for V1, V2, and V3 provides this. The outputs actively current share with an accuracy of 10% of their full load output current for total loads of 50% to 100%. V4 and V5 also current share but employ the droop method.
ORing Diodes	A diode in series with each output protects the outputs of parallel connected PowerCassettes. If one output fails to a short or to a lower than normal output voltage, the other output is not affected. Also when hot-swapping units in the rack, the diode prevents a glitch in the output voltage while the output is still rising on the inserted supply. The 5V, 1A standby output also has an ORing diode.
5V, ¼A Standby Output	This is an independent output which is not controlled by the Enable or Inhibit inputs. The output also has an ORing diode and can be paralled with another PowerCassette Standby Output.
Overvoltage Protection	V1, V2 and V3 outputs are protected from overvoltage due to fault conditions in the supply. Overvoltage protection is set at approximately 10% above the nominal output voltage level. The result is a latched shutdown of the supply. It is reset by cycling the input off and then back on.

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FEATURE / OPTION	DESCRIPTION
No Load Operation	All PowerCassette outputs can be operated down to zero load while maintaining output regulation.
Hot-Swap Connectors	The hot-swap connectors used in both the PowerCassette and rack are specifically designed for hot-swap applications. They have staged pin lengths for safety and optimum peration. The ground (common) and AC pins make first contact and the enable pin makes last contact, turning the unit on (provided it is not “inhibited”).
Hot-Swap Operation	Hot-swap operation means that a PowerCassette can be removed and replaced while the rack is powering the load. If the rack is operated in an N+1 redundant mode, hot-swap replacement will not affect the output voltage.
Output Protection	Output current limiting protects the output of the PowerCassette from damage due to an overload or short circuit condition. This protection is continuous, without damage, and recovery is automatic when the overload is removed. Current limiting begins at about 105% of rated output current.
LED Indicators	The Input Power Good indicator is a green LED, showing that input power is present. The Output Power Good indicator is a green LED showing that the output voltage is present and within operating range.
I^2C Serial Data Bus	This data bus provides output data on V1, V2 and V3 voltages; V1, V2 and V3 currents; internal temperature; fan speed; and part number, serial number and date code of the PowerCassette. For further details on this Option, see the Appendix A1 and A2.
Rack Input Options	There are two input versions: An IEC320 connector (for AC) or a terminal block connector (for AC or DC).
Control and Monitoring Signals	For detailed descriptions of Enable/Inhibit, Current Share, Remote Sense, Input Fail and Output Good signals, see Section 16, Description of Control and Supervisory Signals.

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11.0 MECHANICAL SPECIFICATIONS

The mechanical dimensions of the Quick-Set PowerCassette are shown in Figure 4.

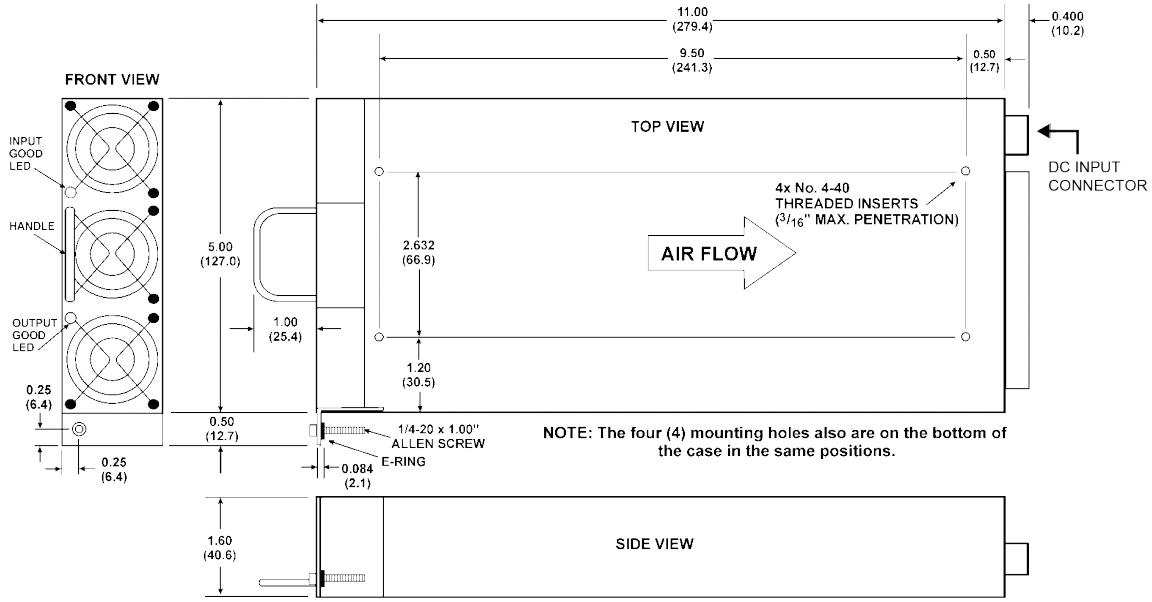


Figure 4 - Mechanical Dimensions of PowerCassette

12.0 SAFETY AND INDUSTRY STANDARDS

12.1 The Quick-Set PowerCassette meets the following safety certifications:

STANDARD	AGENCY
UL1950	UL
CSA22.2 No.950	CUL
EN60950	DEMKO

12.2 The PowerCassette is CE marked to indicate conformance to the European Union's Low Voltage Directive.

12.3 Input conducted EMI meets FCC20780 part 15J Curve B and EN55022 Curve B when the unit is installed in either of the compatible 19-inch racks.

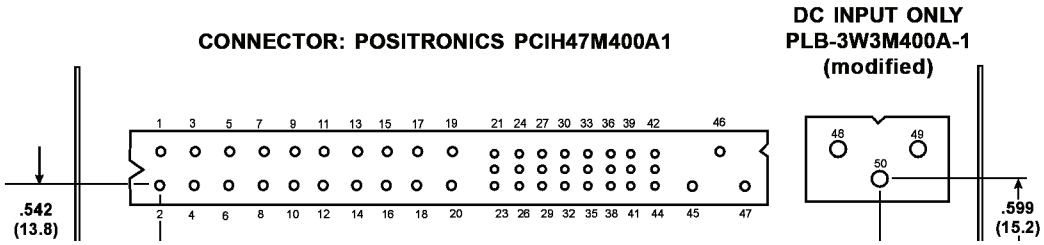
12.4 For the AC input models, input fast transients, line-to-line, meet EN61000-4-4 Level 3; input surges, line-to-line, meet EN61000-4-5 Level 3; and input surges, line-to-ground, meet EN61000-4-5 Level 4. For the DC input models, input fast transients, line-to-line, meet EN61000-4-4 Level 3; input surges, line-to-line, meet EN61000-4-5 Level 1; and input surges, line-to-ground, meet EN61000-4-5 Level 1

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13.0 OPERATING INFORMATION

13.1 Input Voltage and Connection. The AC version of the PowerCassette operates off worldwide AC input voltages in the range of 85 to 264 VAC at 47 to 63 Hz. The three-wire AC connection is made to pins 45-47 on the large Positronics connector. Mating connector kits for both AC and DC inputs are available. See the connector diagram and Pin Connections table in Figure 5. Also available is a Mating Interface Board with screw terminal connections. See Appendix A5. The DC version of PowerCassette operates from a wide range 36 to 72 VDC input. The three-wire DC connection is made to pins 48 to 50 of the small, separate DC input connector shown in Figure 5.

13.2 Output Connections. The output voltages are provided on pins 1 to 24 of the large Positronics connector. V1 and V2, the highest current outputs, use a series of paralleled pins for the currents. All output returns are connected together internally, but each return should be run separately to its respective load.



MATING INTERFACE BOARD
For single PCHS/TPCHS PowerCassette (AC or DC) Order No: 009-3708-0000

MATING CONNECTOR KIT
AC Input: Order Kit No. 775-1429-0000 DC Input: Order Kit No. 775-1445-0000

PIN STAGING	
PINS	LENGTH
1-20	.300”
21-26	.250”
27	.150”
28-44	.250”
45-47	.450”
48-50	.250”

PIN CONNECTIONS									
PIN	FUNCTION	PIN	FUNCTION	PIN	FUNCTION	PIN	FUNCTION	PIN	FUNCTION
1	+V1 Out	11	V1 & V2 Return	21	V4 Out	31	-V1 Sense	41	V2 Current Share
2	+V1 Out	12	V1 & V2 Return	22	Signal Ground	32	V2 External Trim	42	Input Power Fail
3	+V1 Out	13	V1 & V2 Return	23	V5 Out	33	+V2 Sense	43	Spare/Interrupt*
4	+V1 Out	14	+V2 Out	24	V4 & V5 Return	34	-V2 Sense	44	V3 Current Share
5	+V1 Out	15	+V2 Out	25	Spare/ADD GA0*	35	V1 Current Share	45	Chassis Ground
6	+V1 Out	16	+V2 Out	26	+5V, 1A Standby	36	+V3 Sense	46	AC Line
7	V1 & V2 Return	17	+V2 Out	27	Enable*	37	-V3 Sense	47	AC Neutral
8	V1 & V2 Return	18	+V2 Out	28	Spare/ADD GA1*	38	Output Power Good/SDA*	48	+DC Input
9	V1 & V2 Return	19	V3 Return	29	V1 External Trim	39	Global Inhibit	49	-DC Input
10	V1 & V2 Return	20	+V3 Out	30	+V1 Sense	40	Overtemp. Warning/SCLK*	50	Chassis Ground

***NOTES**: For unit to operate, pin 27 must be at logic LO or shorted to pin 22. Pin 39 should be connected through a 10k ohm resistor to Pin 26. Pins 25, 28, 38, 40 and 43 function as I²C outputs when that option is present. All returns and signal ground are connected together.

Figure 5 - Connectors and Pin Connections to PowerCassette

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13.3 Output Voltages. Each output voltage is factory set to its nominal value to an accuracy of ±1%. The V1 and V2 output voltages can be more accurately adjusted to a value within a ±5% range by means of external components as shown in Figure 6. Also be aware of he output voltage polarities as shown in the Model Suffix Selector in Appendix 1.

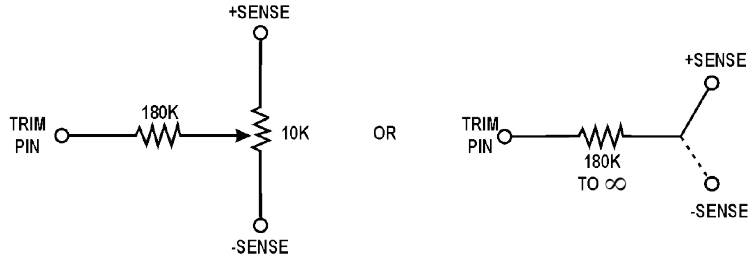


Figure 6 - Output Voltage Adjustment (V1 & V2)

13.4 Output Power. The maximum continuous output power from all outputs is 600 watts. The maximum combined current or power for V1 and V2 on any model must not exceed 120 amperes or 500 watts; for V3, V4 and V5 combined, 171 watts; and for the total unit, 600 watts. The maximum output power of a PowerCassette may be drawn up to 50°C ambient temperature. Above 500C the total output power must be derated by 2.5%/°C. See Figure 7. The maximum operating ambient temperature is 70°C, at which the total output power must be derated by 50%.

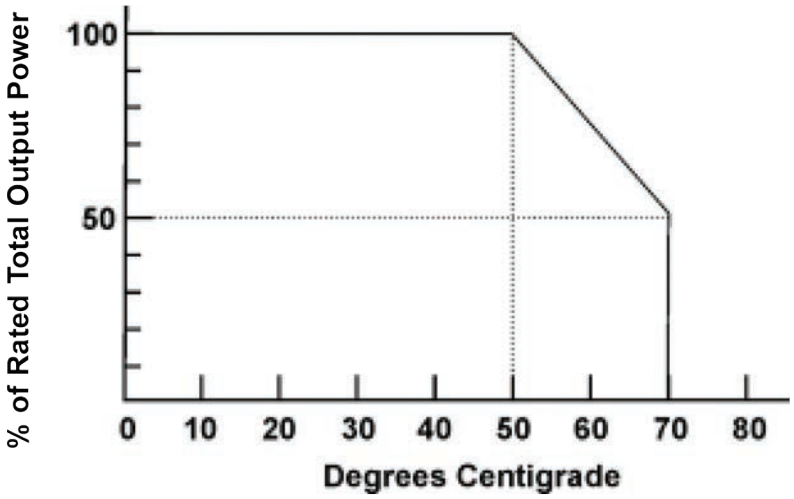


Figure 7 - Rated Total Output Power vs. Ambient Temperature

13.5 Output Overload Protection. PowerCassette outputs are protected from damage due to an overload or short circuit condition. This protection is continuous and without damage; recovery is automatic when the overload or short circuit condition is removed. PowerCassette incorporates a “straight line” method of current limiting. When the output current reaches an overload threshold, the voltage begins to drop sharply so that the current, with a given overload impedance, forces the voltage to a level which maintains the current at an equilibrium point.

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13.6 Remote Sensing. Remote sensing connections for V1, V2 and V3 are made to the designated pins on the large Positronics connector. Remote sensing is not available on the low current V4 and V5 outputs or on the Standby +5V, 250 mA output. Remote sensing is used to regulate the output voltage at the point of load by compensating for the voltage drop in the wires to the load. Each +Sense lead must be connected to the + side of the load and each -Sense lead to the -side of the load. The sense leads should be color-coded, twisted pairs of AWG no. 22 or 24 copper wire. See Figure 8. Remote sensing can compensate for a total voltage drop of 0.5V, or 0.25V per load wire. The sense leads should not exceed 10 feet (3 meters) in length. If remote sensing is not required, the sense leads may be left open for local sensing at the output terminals. Be careful not to reverse the sense lead connections, as this could damage the output.

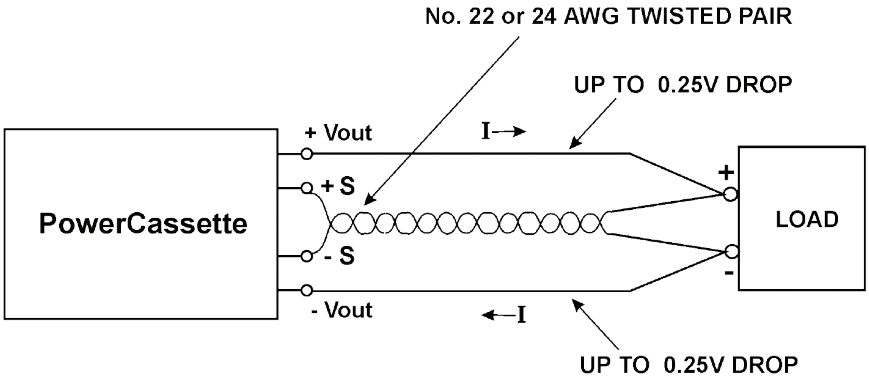


Figure 8 - Remote Sensing Connection for Each V1, V2 or V3 Output

13.7 Control & Supervisory Signals. All control and supervisory signals are accessible at the large Positronics connector on the back of the unit. See Figure 5. The Global Inhibit (Pin 39) should be connected through a 10k ohm resistor to the +5V Standby (Pin 26).See Section 16 for a complete description of these input and output signals.

13.8 Alarm Signals. Among the control and supervisory signals are three logic alarms: Input Power Fail, Output Power Good and Overtemperature Warning. These are logic signals referenced to Signal Ground, Pin 22 on the large Positronics connector. Input Power Fail is a logic LO when AC or DC input power is present. This signal goes to a HI 4 milliseconds before the outputs go out of regulation and stays HI for typically 15 msec. Output Power Good is a HI when V1 to V3 outputs are present and in regulation. Overtemperature Warning is normally a logic HI but goes to a LO when the internal air temperature reaches a critical level just prior to the unit shutting down. These logic signals are provided from transistor interfaces with internal pull-up resistors to an internal +5V level.

13.9 AC and DC Inputs. It should be noted that the AC and DC input pins are mutually exclusive. In other words, an AC input PowerCassette does not have the small Positronic DC input connector (pins 48 to 50). Likewise the DC input PowerCassette has no connections to the AC input terminals on the large Positronics connector (pins 46 and 47).

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13.10 I²C Option. This option provides an industry standard I²C serial data bus interface which provides the status of system-critical operating parameters. This permits the montoring of these parameters on demand by a host system or computer.

Three forms of data are available from the PowerCassette by means of its I²C capability: inventory control information, operating status indication and system load data. Inventory control information consists of model number, manufacturing part number, serial number, etc., to identify the specific PowerCassette. Operating status indicators include input power fail, output power good, temperature warning and alarm, and fan good for each of three cooling fans. System load data includes V1 to V3 output voltages and currents, and internal temperature.

For further details on the I²C serial data bus, see Appendix 2.

14.0 PARALLEL OPERATION

14.1 Parallel Connection. PowerCassettes can be operated in parallel by connecting their outputs in parallel, connecting their V1, V2 and V3 current share terminals, respectively, together (pins 35 together, pins 41 together and pins 44 together) and connecting the Signal Grounds together (pins 22). The PowerCassette racks permit conveniently operating units in parallel in either a redundant or non-redundant mode.

14.2 Redundant Operation. Connecting two PowerCassettes in parallel, with or without the compatible 19-inch rack, so that the full output load current can be carried by one unit results in 1+1 redundant operation. While operating normally, the load current is shared approximately equally between the two units. Should one PowerCasssette fail, or even if one of its outputs fails, the full load is then maintained by the other unit. The failed unit can then be replaced (hot-swap) without affecting the load current. This operation is facilitated by the ORing diode on each output. In similiar fashion three PowerCassettes in parallel with the full output load current carried by two of the units results in 2+1 redundant operation. Redundancy with quick replacement of a failed unit results in virtually infinite MTBF.

14.3 Non-Redundant Operation. Higher output load currents can be realized by operating two units in the non-redundant mode to achieve 1200 watts output power . The units are connected in parallel the same as before. In this case if one unit or one output fails, the load will lose power since only part of the load current can now be supplied by the remaining unit which will go into current limit. The failed unit can be quickly replaced without turning the power off (hot-swap) to restore load current. In the 19-inch compatible racks there is a limit of 1200 watts output for both the two- and three-unit versions. Three units therefore cannot be operated in non-redundant mode.

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15.0 COMPATIBLE 19-INCH RACKS

15.1 Figure 9 shows the two 19-inch compatible racks holding two or three PowerCassette units These racks have the following features:

- Standard 19-Inch Rack-Mounting
- Only 1U High
- Hot-Swap Operation
- Holds 2 or 3 PowerCassette Modules
- AC or DC Input Versions
- Class B EMI Input Filter
- 1200W Non-Redundant
- 600W or 1200W Redundant
- Current-Shared Outputs
- IEC60320 or Terminal Block Inputs
- Front or Rear Inputs
- I²C Serial Data Bus Option
- Optional 23-Inch Mounting (with brackets)
- Optional Rear Plastic Cover
- Module Present Signal

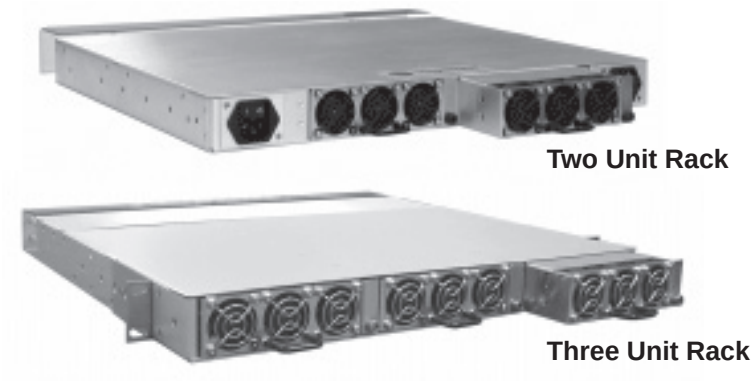


Figure 9 - 19-Inch Racks for Two or Three PowerCassettes

Ordering Guide

MODEL NO.: TPCHR1U2 -
TPCHQR1U2 -
TPCHR1U3 -
*TPCHQR1U3 - □ – □

C: For clear plastic rear safety cover.
Suffix for input connector(s) (See Table).

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15.2 **Two-Unit Rack.** The two-unit, 19-inch rack is shown in Figure 10 with connections and pin designations. There is a choice of single or dual IEC60320 AC input connectors or single or dual terminal block AC or DC input connectors. The various connector versions are summarized in the following table.

Table 15-1. Input Connector Designation

INPUT CONNECTOR	SINGLE/ DUAL CONN.	CONNECTOR POSITION	AC INPUT TPCHR1U2	DC INPUT TPCHQR1U2	MODEL NO. SUFFIX
IEC60320	Dual	Front	✔		A
IEC60320	Dual	Rear	✔		B
IEC60320	Single	Front	✔		C*
IEC60320	Single	Rear	✔		D*
Terminal Block	Dual	Front	✔	✔	E
Terminal Block	Dual	Rear	✔	✔	F
Terminal Block	Single	Front	✔	✔	G
Terminal Block	Single	Rear	✔	✔	H

*See paragraph 15.2.1

15.2.1 Maximum output power rating is 1200 watts for all models except Model Suffixes C and D (for input connector designation). For these two models the maximum output power is 600 watts for 100- 120VAC input or 1000 watts for 200-240VAC input. Thus for 100-120 VAC input the two PowerCassette models can be employed in a 1+1 redundant configuration or for 200-240VAC they can be employed in a non-redundant configuration but only up to 1000 watts output power. There are no limitations for DC input models all of which can produce up to 1200 watts output with 36-72VDC input.

15.2.2 All outputs from the two PowerCassette modules are connected in parallel in the rack except the +5V 250 mA Standby outputs which must be externally paralleled by connecting P2 pins 3 and 11 together.

15.2.3 The rack depth is 14.00 inches (356mm). The clear plastic rear cover (Option C) adds 2.09 inches (53.1mm) to the depth for a total of 16.09 inches (409mm).

15.2.4 The V1 and V2 Returns and V3, V4 and V5 Commons are all connected together in the rack. It is recommended, however, that the Returns and Commons be separately connected to their respective loads.

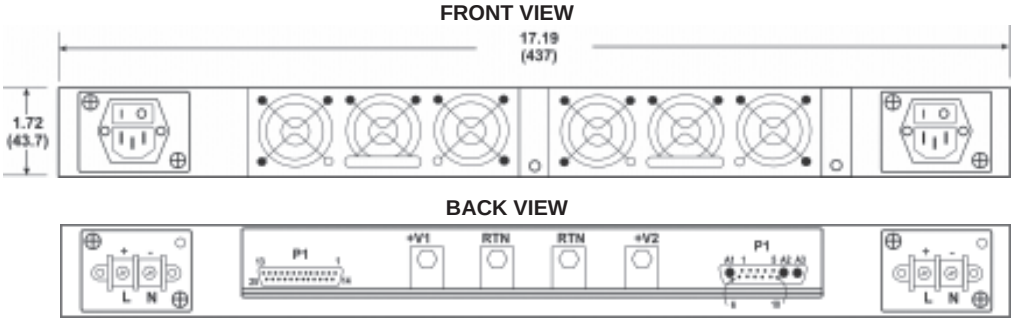
15.2.5 The front view arbitarily shows dual IEC60320 connectors; the back view shows dual terminal block connectors.

15.2.6 Module A is on the left; module B is on the right (as seen from the front).

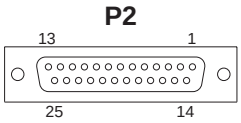
15.2.7 For dual input racks, each input goes separately to the PowerCassette on the same side of the rack.

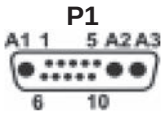
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15.2.8 For details on control signals, see Section 16 and Figure 10.



V1 & V2 Connections are to No. ¼ - 20 bolts





P2 PIN CONNECTIONS			
PIN	FUNCTION	PIN	FUNCTION
1	Inhibit-B	14	Input Power Fail-B
2	Output Good/Data-B	15	Overtemp./Serial Clock-B
3	+5V Standby-B	16	Interrupt-B
4	Module Present-B	17	Common
5	Spare 1	18	+V3 Sense
6	Spare 2	19	-V3 Sense
7	Spare 3	20	+V2 Sense
8	-V1 Sense	21	-V2 Sense
9	+V1 Sense	22	Module Present-A
10	Common	23	Interrupt-A
11	+5V Standby-A	24	Overtemp./Serial Clock-A
12	Output Good/Data-A	25	Input Power Fail-A
13	Inhibit-A		

P1 PIN CONNECTIONS			
PIN	FUNCTION	PIN	FUNCTION
A1	V3 Common	5	V4 Out
A2	+V3 Out	6	-V3 Sense
A3	+V3 Out	7	-V2 Sense
1	+V3 Sense	8	-V1Sense
2	+V2 Sense	9	V5 Common
3	+V1 Sense	10	V5 Out
4	V4 Common		

P2 Note: Inhibits A and B (pins 13 and 1) should each be connected to +5V Standbys A and B, respectively, (Pins 11 and 3) through 10k ohm resistors. Pins 2, 12, 15, 16, 23 and 24 function as I2C outputs when that option is present.

Figure 10 - Two-Unit Rack with Connections

15.2.9 For details on I²C data (P2 pins 2, 12, 15, 16, 23 & 24), see Appendix 2. The module address (A or B) is jumper programmable in the rack.

15.2.10 The module Present outputs (P2 pins 4 & 22) are grounded when the module is plugged in; otherwise they are open circuit.

15.2.11 Dual-feed input isolation diodes can be provided for DC input models. Please contact factory.

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15.3 Three-Unit Rack. The three-unit, 19-inch rack is shown in Figure 11 with connections and pin designations. For AC input there is a choice of an IEC60320 or a terminal block connector. The connector comes only on the rear panel. For information on the DC input connector, contact the factory. The input connector versions are summarized in the following table.

Table 15-3. Input Connector Designation

INPUT CONNECTOR	CONNECTOR POSITION	MAX. POWER	AC INPUT VOLTAGE	MODEL NO. SUFFIX
IEC60320, C14	Rear	1200W	200-240VAC	D
Terminal Block	Rear	1200W	100-240VAC	H

For information on DC input rack, contact factory.

15.3.1 Maximum output power rating is 1200 watts for all AC and DC input, three-unit racks. This means that three modules can operated in a 2+1 redundant configuration to produce 1200 watts output not in non-redundant configuration for more than 1200 watts.

15.3.2 All outputs from the three PowerCassette modules are connected in parallel in the rack except the +5V 1A Standby outputs which must be externally paralleled by connecting P2 pins, 2, 7 and 11 together.

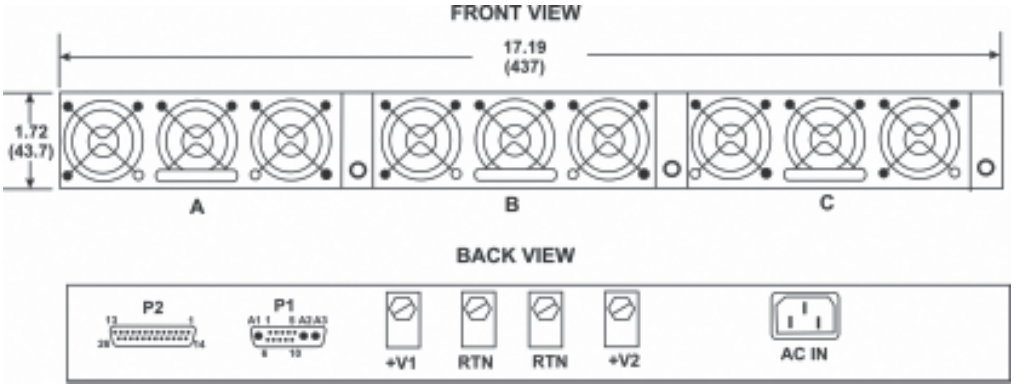
15.3.3 The rack depth is 15.06 inches (384mm). The clear plastic rear cover (Option C) adds 2.09 inches (53.1 mm) to the depth for a total of 17.15 inches (436mm).

15.3.4 The V1 and V2 Returns and V3, V4 and V5 Commons are all connected together in the rack. It is recommended, however, that the Returns and Commons be separately connected to their respective loads.

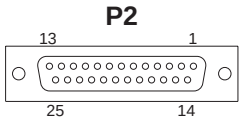
15.3.5 Module A is on the left and module C is on the right as seen from front.

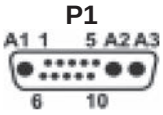
15.3.6 For details on control signals, see Section 16 and Figure 11.

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V1 & V2 Connections are to No. ¼ - 20 bolts





P2 PIN CONNECTIONS			
PIN	FUNCTION	PIN	FUNCTION
1	Output Good/ Data-A	14	Input Power Fail-A
2	+5V Standby-A	15	Inhibit-A
3	Overtemp./Ser.Clock-A	16	Module Present-A
4	Interrupt-A	17	N.C.
5	N.C.	18	N.C.
6	Output Good/Data-B	19	Input Power Fail-B
7	+5V Standby-B	20	Inhibit-B
8	Overtemp./Ser.Clock-B	21	Module Present-B
9	Interrupt-B	22	N.C.
10	Output Good/Data-C	23	Input Power Fail-C
11	+5V Standby-C	24	Inhibit-C
12	Overtemp./Ser.Clock-C	25	Module Present-C
13	Interrupt-C		

P1 PIN CONNECTIONS			
PIN	FUNCTION	PIN	FUNCTION
A1	V3 Common	5	V4 Out
A2	+V3 Out	6	-V3 Sense
A3	+V3 Out	7	-V2 Sense
1	+V3 Sense	8	-V1Sense
2	+V2 Sense	9	V5 Common
3	+V1 Sense	10	V5 Out
4	V4 Common		

P2 Note: Inhibits A, B and C (Pins 15, 20 and 24) should each be connected to +5V Standbys A, B and C, respectively (Pins 2, 7 and 11), through 10k ohm resistors. Pins 1, 3, 4, 6, 8, 9, 10, 12 and 13 function as I²C outputs when that function is present.

Figure 11 - Three-Unit Rack with Connections

15.3.7 For details on I²C data (Pins 1, 3, 4, 6, 8, 9, 10, 12 and 13), see Appendix 2. This module addresses are pre-programmed in the rack: A is 00, B is 01 and C is 10.

15.3.8 The Module Present outputs (P2 pins 16, 21 and 25) are grounded when the module is plugged in; otherwise they are open circuit.

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16.0 DESCRIPTION OF CONTROL AND SUPERVISORY SIGNALS

The pin numbers shown below refer to the Positronics connector on the PCHS or TPCHS unit. For the corresponding rack pin numbers, see Section 15 and Figures 10 and 11.

SIGNAL	PINS	DESCRIPTION
Signal Ground	22	This is the reference common for the Enable, Global Inhibit, Input Power Fail, Output Power Good and Current Share signals.
Standby Supply	26	This is a +5VDC auxiliary output at 250 mA for powering external control or other circuits. The return is the Signal Ground, Pin 22. This output is not controlled by the Enable or Global Inhibit inputs.
Enable	27	A logic LO or short to Pin 22 enables (turns on) the unit. A HI or open inhibits (turns off) the unit. This input is referenced to Signal Ground, Pin 22. **This pin must be activated to a logic LO or short for the PowerCassette to operate.** This input is the inverse of the Global Inhibit pin.
External Trim	29 & 32	These are the connections for V1 and V2 external trims, respectively. The voltages can be adjusted over a ±5% range from nominal using the external ciruits shown in Figure 6.
± Sense	30 & 31 33 & 34 36 & 37	These remote sense leads for V1, V2 and V3, respectively, should be connected as twisted pairs to the respective +Ve and -Ve load points to provide regulation at the points of load. The correct polarities must be maintained.
Current Share	35 41 44	These are analog control signs for V1, V2 and V3, respectively. They are used to connect to the same pins of another identical PowerCassette to share output currents. Output currents between units are shared within an accuracy of 10% of full load current over a 50% to 100% load range. This signal is referenced to Signal Ground, Pin 22.
Output Power Good	38	A logic HI indicates that the unit is operating properly with output voltages in their controllable ranges. A logic LO indicates output failure. This signal monitors the V1, V2 and V3 outputs only. The equivalent circuit is an NPN transistor collector with a 10K ohm resistor to +5V. This signal is referenced to Signal Ground, Pin 22.
Global Inhibit	39	A logic LO or short to Pin 22 turns off all outputs but not the 5V standby supply or the fans; a logic HI or open at this pin turns on all outputs. A 10k ohm resistor should be connected from this pin to the +5V Standby output, Pin 26.This is the inverse of the Enable pin.

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SIGNAL	PINS	DESCRIPTION
Overtemperature Warning	40	A logic LO at this output indicates an overtemperature condition inside the unit. The LO occurs a few milliseconds before the unit shuts down. The equivalent circuit is an NPN transistor collector with a 10k ohm resistor to +5V. This signal is referenced to Signal Ground, Pin 22.
Input Power Fail	42	A logic LO indicates the input power is present; a logic HI indicates input power failure. The signal goes HI a minimum of 4 msec. before the outputs go out of regulation and stays HI for 4 msec. up to tens of msecs. The equivalent circuit is an NPN transistor collector with a 10K ohm resistor to +5V. This signal is referenced to Signal Ground, Pin 22.

17.0 INSTALLATION

17.1 **Mounting.** The Quick-Set PowerCassette can either be mounted in the 19- inch rack (model TPCHS) and secured by means of the jack screw or it can be mounted (model PCHS) on another metal chassis by means of no. 4-40 screws into the four threaded inserts on either the top or bottom of the unit. Maximum penetration is 3/16-inch. See Figure 4.

17.2 **Input Power Connections.** AC input power connections are made to pins 45, 46 and 47 of the large Positronics connector. A three-wire AC line cord should be used with the safety ground connected to pin 45. DC input power connections are made to pins 48, 49 and 50 of the small Positronics connector. Again, a three-wire connection should be made with the safety ground connection to pin 50. See Figure 5. When using a rack, AC connections are made to either IEC60320 connectors or to terminal block connectors. DC rack connections are made to terminal blocks. See Figures 10 and 11.

17.3 **DC Output Connections.** The DC output connections for the PowerCassette are shown in Figure 5. V1 and V2 outputs use multiple, paralleled pins on the Positronics connector, namely pins 1 to 18. V3, V4 and V5 have a single pin for each output except that V4 and V5 returns are both on one pin. The returns should be separately run to their respective loads. For the racks, V1 and V2 and their returns are to copper bus bars with no. 1/4-20 bolts for connections. V3 output is to A1, A2 and A3 pins of P1, V4 is to pins 4 and 5 of P1 and V5 is to pins 9 and 10 of P1.

17.4 **High Current V1 Output.** For units with V1 over 70 amps, that output actually consists of the V1 and V2 outputs in parallel. In this mode the V1 and V2 output pins must be connected to one another and the V1 and V2 current share pins must be connected to each other. The V1 plus sense and minus sense pins must be connected to the V2 plus sense and minus sense pins, respectively. All connections are external to unit.

17.5 **Contact Resistance.** The connecting wires or lugs to the rack V1 and V2 bus bars should be clean, and a tight, firm connection should be made with the bolts to minimize contact resistance.

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17.6 **Control and Supervisory Signal Connections.** These connections are made to various pins on the large Positronic connector on the PowerCassette. See Figure 5. For the racks they are made to various pins on the P2 connector. See Figures 10 and 11. Details for these functions are given in Section 16.

17.7 **Rack Connection of Warning Signals.** Normally signals are used for identifying the status of each module in paralleled unit configuration. If it is desired to connect all the signals together to treat the complete rack as a single power supply, the following (or equivalent) must be done. The input Power Fail, Output Power Good and Overtemp. Warning signals of each module are each connected to the anode of a BAV99 diode, the other side of which goes to the base of a 2N2222A transistor. The collectors of all the Input Power Fail transistors are then connected to form a single Input Power Fail chassis signal. The same is done for the Output Power Good and Overtemp. Warning signals. The resultant system warning signals then give a Logic Low for Input Power Fail and a Logic High for Output Power Good and Overtemperature Warning.

17.8 **Cooling.** Each PowerCassette is cooled by three 40mm DC ball bearing fans. For proper cooling, the area in front of the fans and the back of the unit should be kept clear for unimpeded air flow.

18.0 MAINTENANCE

No routine maintenance is required on the Quick-Set PowerCassette Series except for periodic cleaning of dust and dirt around the fans. A small vacuum nozzle should be used for this.

19.0 SETUP AND TESTING

19.1 The Quick-Set PowerCassette can be initially tested mounted in a compatible rack or on a test bench. If two units are to be tested in a rack, they should first be individually tested in Position A (left side) of the rack.

19.2 With the input power source turned off, connect input power wires to the PowerCassette mating connector or in case of the rack, to the input connector of the rack. If the rack has dual input connectors, connect the power wires to the “A” (left) side of the rack. Make sure that the safety ground wire is connected.

19.3 Connect resistive power loads across the output pins or connections for each of the outputs. The loads should be 20% to 50% of full load values and can be either power resistors or electronic loads set to the resistive modes. Make sure that the power resistors have adequate heat sinking and cooling.

19.4 Connect color-coded, twisted pairs (no. 22 or 24 AWG) for each set of remote sense pins (V1, V2 & V3) on the mating connector to each respective load. **The +Sense pin must go to the positive side of the load and the -Sense pin to the negative side of the load. Also connect the Enable pin, pin 27 of the large Positronics mating connector of the**

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PowerCassette, to Signal Ground, pin 22. This must be done for the unit to operate. When using the rack, the Enable pin is automatically connected to Signal Ground in the rack. The units are then controlled by the Inhibit inputs, P2 pins 1 and 13 of the two-unit rack or pins 15, 20 and 24 of the three-unit rack. Connect the Global Inhibit, Pin 39, through a 10k ohm resistor to +5V Standby, Pin 26. The same must be done for the Inhibit pins for each module in the rack.

19.5 **Checking Front Panel LEDs.** With the PowerCassette on the bench or in Position A of the rack, turn on (or plug in) the power source. The Input Power Good (bottom left) green LED should be on and the Output Power Good (bottom right) green LED should also be on.

19.6 **Checking Output Voltages.** Measure each output voltage at its load with a digital voltmeter. Each voltage should be within ±1% of its nominal value.

19.7 **Checking the Inhibit Input.** Turn the input power source off. Connect a wire from the Global Inhibit input (pin 39 on the PowerCassette large Positronics connector, pin 13 of P2 on the two-unit rack or pin 15 of P2 on the three-unit rack) to Signal Ground (pin 22 of the PowerCassette large Positronics connector, pin 10 of P2 on the two-unit rack or pin 8 of P1 on the three-unit rack).

Turn the input power source back on. The Input Power OK green LED should turn on but the Output Power Good green LED should remain off. Check the output voltages with a digital voltmeter. They should read zero volts.

19.8 **Checking the Input Power Fail and Output Power Good Signals.** Next check the voltage on the Input Power Fail pin (pin 42 on the PowerCassette large Positronics connector , pin 25 of P2 on the two-unit rack or pin 14 of P2 on the three-unit rack) with respect to Signal Ground (pin 22 of the PowerCassette large Positronics connector, pin 10 of P2 on the two-unit rack or pin 8 of P1 on the three-unit rack). The voltage should be a logic LO, +0.5V or less. Finally, check the voltage on the Output Power Good pin (pin 38 on the PowerCassette large Positronics connector, pin 12 of P2 on the two-unit rack or pin 1 of P2 on the three-unit rack) with respect to Signal Ground (pin 22 of the PowerCasssette large Positronics connector, pin 10 of P2 on the two-unit rack or pin 8 of P1 on the three-unit rack). The voltage should be a logic LO, +0.5V or less.

Disconnect the wire from the Global Inhibit to Signal Ground. The Output Power Good green LED should turn on. Check the output voltage on the Output Power Good pin as described above. The voltage should be a logic HI, or about +5V.

19.9 **Testing the Other Power Cassette.** For a rack with two or three PowerCassettes, the other PowerCassettes should be plugged into Position A in the rack and tested in the same manner as above in Sections 19.2 to 19.8.

19.10 **Testing the Complete Power Cassette Rack.** With the input power source off or disconnected, insert all PowerCassettes into the rack. For a two-unit rack, connect resistive power loads of approximately 80% of full load value for a single PowerCassette across the outputs. For a three-unit rack connect resistive power loads of about 160% of full load value

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for a single PowerCassette across the outputs Connect a color-coded, twisted pair of remote sense leads to each respective load, being careful to connect the correct polarity.

Turn on or plug in the input power source. Check the voltage across each load with a digital voltmeter. Each voltage should be within about ± 1% of its nominal value. The Input Power Good and Output Power Good green LEDS should be on for both units.

While the rack is operating, disengage PowerCassette A (left one) and check the output voltages. They should be very close to the previous values and the DC Power Good green LED(s) should remain on for the other PowerCassette(s) which are now carrying the full power load. Re-insert PowerCassette A and repeat the procedure by disengaging PowerCassette B. Repeat this for PowerCassette C of the three-unit rack. The complete rack has now been shown to operate properly in the redundant mode with hot swapping. Disconnect the input power source.

20.0 TROUBLESHOOTING GUIDE

If you encounter difficulties in getting the Quick-Set PowerCassettes or the complete rack to operate properly, go through the following troubleshooting guide.

Symptom	Possible Cause	Action to Take
No output, Input Good and Output Good LEDs off.	No input power.	Check connection to input power source.
No output, Output Good LED off, Input Good LED on.	Remote Enable in OFF mode.	Check source circuit breakers.
No output, Output Good LED off, Input Good LED on.	Shorted output.	Make sure Pin 27 (Enable) is at logic LO or connected to Signal Ground, Pin 22, of the large Positronics connector.
No output, Output Good LED off, Input Good LED on.	Overvoltage protection (OVP) has latched.	Check for short and remove.
No output, Output Good LED off, Input Good LED on.	Overtemperature protection is activated.	Reset output by cycling the input power OFF for 10 seconds and then back ON.
No output, Output Good LED off, Input Good LED on.	Total output load is too large for the PowerCassette capacity.	Allow PowerCassette to cool down for about 10 minutes. It will then start up automatically. Check to see if the cooling fans are operating. Reduce loads to proper levels.

owerCassette®
IX SELECTOR

If you are still unable to resolve any problem call your nearest UNIPOWER sales office for support:
US +1 954 346 2442 UK +44 (0)1903 768200

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APPENDIX 1

QUICK-SET PowerCassette® MODEL SUFFIX SELECTOR

V1	V2	V3	V4	V5	MODEL SUFFIX
12V/35A	2.5V/50A		-12V/3A	-5V/3A	FBOGE
12V/35A	2.5V/50A		-12V/3A	5V/3A	FBOGD
12V/35A	2.5V/50A			-5V/3A	FBOOE
12V/35A	2.5V/50A		-12V/3A	-5.2V/3A	FBOGK
12V/35A	2.5V/50A	5V/10A		1.8V/3A	FBJOA
12V/35A	2.5V/50A	5V/10A			FBJOO
12V/35A	3.3V/50A		-12V/3A	-5V/3A	FCOGE
12V/35A	3.3V/50A		-12V/3A	5V/3A	FCOGD
5V/70A	3.3V/50A	12V/10A	-12V/3A	-5V/3A	DCFGE
5V/70A	3.3V/50A	12V/10A	-12V/3A		DCFGO
5V/70A	3.3V/50A	12V/10A		2.5V/3A	DCFOB
5V/70A	3.3V/50A		-12V/3A	1.8V/3A	DCOGA
5V/70A	3.3V/50A		-12V/3A	-5V/3A	DCOGE
5V/70A	3.3V/50A	12V/10A	-12V/3A	2.5V/3A	DCFGB
5V/70A	3.3V/50A				DCOOO
5V/70A	3.3V/50A	12V/10A		-5V/3A	DCFOE
5V/70A	3.3V/50A		12V/3A	-5V/3A	DCOFE
5V/70A	3.3V/50A		12V/3A	2.5V/3A	DCOFB
5V/70A	3.3V/50A			2.5V/3A	DCOOB
5V/70A	3.3V/50A	12V/10A		-5.2V/3A	DCFOK
5V/70A		12V/10A	-12V/3A	-5V/3A	DOFGE
5V/70A		12V/10A	-12V/3A	3.3V/3A	DOFGC
5V/70A		12V/10A		2.5V/3A	DOFOB
5V/70A		12V/10A		3.3V/3A	DOFOC
5V/70A		12V/10A			DOFOO
5V/70A			-12V/3A	2.5V/3A	DOOGB
5V/70A		12V/10A	-12V/3A		DOFGO
5V/70A		12V/10A		-5V/3A	DOFOE
5V/70A			-12V/3A	1.8V/3A	DOOGA
5V/70A			-12V/3A	3.3V/3A	DOOGC
5V/100A		12V/10A	-12V/3A	-5V/3A	LDFGE
5V/100A		12V/10A	-12V/3A	3.3V/3A	LDFGC
5V/100A		12V/10A		2.5V/3A	LDFOB
5V/100A			12V/3A	-5V/3A	LDOFE
5V/100A			-12V/3A	2.5V/3A	LDOGB
5V/100A		12V/10A	-12V/3A		LDFGO
5V/100A		12V/10A		-5V/3A	LDFOE
5V/100A			-12V/3A	3.3V/3A	LDOGC
5V/100A			-12V/3A	-5V/3A	LDOGE
5V/100A		12V/10A		3.3V/3A	LDFOC
5V/100A		12V/10A		-5.2V/3A	LDFOK
3.3V/70A	2.5V/50A	12V/10A	-12V/3A	-5V/3A	CBFGE
3.3V/70A	2.5V/50A	12V/10A	-12V/3A		CBFGO
3.3V/70A	2.5V/50A	12V/10A		-5V/3A	CBFOE
3.3V/70A	2.5V/50A			-5V/3A	CBOOE
3.3V/70A	2.5V/50A		12V/3A	-5V/3A	CBOFE
3.3V/70A	2.5V/50A		12V/3A	5V/3A	CBOFD
3.3V/70A	2.5V/50A	12V/10A		5V/3A	CBFOD
3.3V/70A	2.5V/50A	5V/10A		-5.2V/3A	CBJOO
3.3V/70A	2.5V/50A	12V/10A		-12V/3A	CBFGK
3.3V/70A	2.5V/50A	5V/10A		1.8V/3A	CBJOA
3.3V/70A	2.5V/50A		12V/3A	1.8V/3A	CBOFA
3.3V/70A	2.5V/50A	12V/10A	-12V/3A	1.8V/3A	CBFGA
2.5V/70A	5V/50A	12V/10A	-12V/3A	-5V/3A	BDFGE
2.5V/70A	5V/50A	12V/10A	-12V/3A	3.3V/3A	BDFGC
2.5V/70A	5V/50A	12V/10A		2.5V/3A	BDFOB
2.5V/70A	5V/50A		12V/3A	-5V/3A	BDOFE
2.5V/70A	5V/50A		-12V/3A	3.3V/3A	BDOGC
2.5V/70A	5V/50A		12V/3A	1.8V/3A	BDOFA
2.5V/70A	5V/50A		-12V/3A	1.8V/3A	BDOGA
2.5V/70A	5V/50A		-12V/3A		BDOGO
2.5V/70A	5V/50A	12V/10A			BDFOO
2.5V/70A	5V/50A	12V/10A		-5V/3A	BDFOE
2.5V/70A	5V/50A	12V/10A		3.3V/3A	BDFOC
2.5V/70A	5V/50A			3.3V/3A	BDOOC

V1	V2	V3	V4	V5	MODEL SUFFIX
12V/35A	3.3V/50A			-5V/3A	FCOOE
12V/35A	3.3V/50A		-12V/3A	-5.2V/3A	FCOGK
12V/35A	3.3V/50A	5V/10A		1.8V/3A	FCJOA
12V/35A	3.3V/50A	5V/10A			FCJOO
12V/35A	5V/50A		-12V/3A	-5V/3A	FDOGE
12V/35A	5V/50A		-12V/3A	3.3V/3A	FDOGC
12V/35A	5V/50A		-12V/3A	2.5V/3A	FDOGB
12V/35A	5V/50A		-12V/3A	-5.2V/3A	FDOGK
12V/35A	5V/50A		-12V/3A		FDOGO
12V/35A	5V/50A				FDOOO
5V/70A	2.5V/50A	12V/10A	-12V/3A	-5V/3A	DBFGE
5V/70A	2.5V/50A		-12V/3A	3.3V/3A	DBOGC
5V/70A	2.5V/50A	12V/10A		2.5V/3A	DBFOB
5V/70A	2.5V/50A	12V/10A		-5V/3A	DBFOE
5V/70A	2.5V/50A		-12V/3A		DBOGO
5V/70A	2.5V/50A		-5V/3A		DBOOE
5V/70A	2.5V/50A		12V/3A	3.3V/3A	DBOFC
5V/70A	2.5V/50A	12V/10A	-12V/3A	2.5V/3A	DBFGB
5V/70A	2.5V/50A		-12V/3A	-5V/3A	DBOGE
5V/70A	2.5V/50A		12V/3A	1.8V/3A	DBOFA
5V/70A	2.5V/50A		-12V/3A	1.8V/3A	DBOGA
5V/70A			-12V/3A	-5V/3A	DOOGE
5V/70A				3.3V/3A	DOOOC
5V/70A				2.5V/3A	DOOOB
5V/70A				1.8V/3A	DOOOA
5V/70A			12V/3A	1.8V/3A	DOOFA
5V/70A			12V/3A	2.5V/3A	DOOFB
5V/70A			12V/3A	3.3V/3A	DOOFC
5V/70A			12V/3A		DOOFO
5V/70A				-5.2V/3A	DOOOK
5V/70A				-5V/3A	DOOOE
3.3V/70A	5V/50A	12V/10A	-12V/3A	-5V/3A	CDFGE
3.3V/70A		12V/10A	-12V/3A	5V/3A	COFGD
3.3V/70A	5V/50A	12V/10A	-12V/3A		CDFGO
3.3V/70A	5V/50A			-5V/3A	CDOOE
3.3V/70A	5V/50A		-12V/3A	1.8V/3A	CDOGA
3.3V/70A		12V/10A		2.5V/3A	COFOB
3.3V/70A	5V/50A	12V/10A	-12V/3A	2.5V/3A	CDFGB
3.3V/70A	5V/50A			2.5V/3A	CDOOB
3.3V/70A	5V/50A		12V/3A	2.5V/3A	CDOFB
3.3V/70A			-12V/3A	2.5V/3A	COOGB
3.3V/70A		12V/10A	-12V/3A	-5V/3A	COFGE
3.3V/70A		12V/10A	-12V/3A		COFGO
3.3V/70A		12V/10A		-5V/3A	COFOE
3.3V/70A		12V/10A		5V/3A	COFOD
3.3V/70A		12V/10A		1.8V/3A	COFOA
3.3V/70A				2.5V/3A	COOOB
3.3V/70A		12V/10A	-12V/3A	-5.2V/3A	COFGK
3.3V/70A		12V/10A	-12V/3A	2.5V/3A	COFGB
3.3V/70A		12V/10A			COFOO
3.3V/70A		5V/10A			COJOO
3.3V/70A		5V/10A		1.8V/3A	COJOA
3.3V/70A		12V/10A		-5.2V/3A	COFOK
2.5V/70A	3.3V/50A	12V/10A	-12V/3A	5V/3A	BCFGD
2.5V/70A	3.3V/50A	12V/10A	-12V/3A	3.3V/3A	BCFGC
2.5V/70A	3.3V/50A	12V/10A		2.5V/3A	BCFOB
2.5V/70A	3.3V/50A		12V/3A	-5V/3A	BCOFE
2.5V/70A	3.3V/50A		12V/3A	5V/3A	BCOFD
2.5V/70A	3.3V/50A	12V/10A	-12V/3A	-5.2V/3A	BCFGK
2.5V/70A	3.3V/50A	5V/10A		1.8V/3A	BCJOA
2.5V/70A	3.3V/50A			-5V/3A	BCOOE
2.5V/70A	3.3V/50A		-12V/3A	1.8V/3A	BCOGA
2.5V/70A	3.3V/50A		-12V/3A	-5V/3A	BCOGE
2.5V/70A	3.3V/50A	12V/10A	-12V/3A	-5V/3A	BCFGE
2.5V/70A	3.3V/50A	12V/10A	-12V/3A		BCFGO

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QUICK-SET PowerCassette® MODEL SUFFIX SELECTOR (CONTINUED)

V1	V2	V3	V4	V5	MODEL SUFFIX
2.5V/70A			-12V/3A	-5V/3A	BOOGE
2.5V/70A			12V/3A	3.3V/3A	BOOFC
2.5V/70A			-12V/3A	5V/3A	BOOGD
2.5V/70A			12V/3A		BOOFO
2.5V/70A			-12V/3A	3.3V/3A	BOOGC
2.5V/70A			12V/3A	5V/3A	BOOFD
2.5V/70A			12V/3A	1.8V/3A	BOOFA
2.5V/70A			-12V/3A	1.8V/3A	BOOGA
2.5V/70A				1.8V/3A	BOOOA
2.5V/70A			-12V/3A		BOOGO
2.5V/70A			12V/3A	-5V/3A	BOOFE
2.5V/70A				-5V/3A	BOOOE
2.5V/70A				5V/3A	BOOOD
1.8V/70A	3.3V/50A	12V/10A	-12V/3A	-5V/3A	ACFGE
1.8V/70A	3.3V/50A	12V/10A	-12V/3A	3.3V/3A	ACFGC
1.8V/70A	3.3V/50A	12V/10A		2.5V/3A	ACFOB
1.8V/70A	3.3V/50A		12V/3A	-5V/3A	ACOFE
1.8V/70A	3.3V/50A		12V/3A	3.3V/3A	ACOFC
1.8V/70A	3.3V/50A			5V/3A	ACOOD
1.8V/70A	3.3V/50A		-12V/3A		ACOGO
1.8V/70A	3.3V/50A		12V/3A	2.5V/3A	ACOFB
1.8V/70A	3.3V/50A		12V/3A	5V/3A	ACOFD
1.8V/70A	3.3V/50A	12V/10A	-12V/3A	-5.2V/3A	ACFGK
1.8V/70A	3.3V/50A		12V/3A		ACOFO
1.8V/70A	3.3V/50A	5V/10A			ACJOO
1.8V/70A	3.3V/50A			2.5V/3A	ACOOB
1.8V/70A	3.3V/50A		-12V/3A	2.5V/3A	ACOGB
3.3V/70A			12V/3A	5V/3A	COOFD
3.3V/70A			-12V/3A	-5V/3A	COOGE
3.3V/70A			-12V/3A	5V/3A	COOGD
3.3V/70A			12V/3A	-5V/3A	COOFE
3.3V/70A				5V/3A	COOOD
3.3V/70A			12V/3A		COOFO
3.3V/70A				-5.2V/3A	COOOK
3.3V/70A			12V/3A	2.5V/3A	COOFB
3.3V/70A			-12V/3A	-5.2V/3A	COOGK
3.3V/70A			12V/3A	1.8V/3A	COOFA
3.3V/70A			-12V/3A	1.8V/3A	COOGA
2.5V/100A		12V/10A	-12V/3A	5V/3A	NBFGD
2.5V/100A		12V/10A			NBFOO
2.5V/100A		12V/10A		-5V/3A	NBFOE
2.5V/100A		12V/10A	-12V/3A	3.3V/3A	NBFGC
2.5V/100A			-12V/3A	3.3V/3A	NBOGC
2.5V/100A		12V/10A	-12V/3A		NBFGO
2.5V/100A			-12V/3A	1.8V/3A	NBOGA
2.5V/100A			12V/3A	1.8V/3A	NBOFA
2.5V/100A			12V/3A	3.3V/3A	NBOFC
2.5V/100A		5V/10A			NBJOO
2.5V/100A		5V/10A		1.8V/3A	NBJOA
2.5V/100A			12V/3A		NBOFO
2.5V/100A		12V/10A	-12V/3A	-5.2V/3A	NBFGK
2.5V/100A		12V/10A		5V/3A	NBFOD
1.8V/70A			-12V/3A	-5V/3A	AOOGE
1.8V/70A			-12V/3A	2.5V/3A	AOOGB
1.8V/70A			12V/3A	2.5V/3A	AOOFB
1.8V/70A			-12V/3A	3.3V/3A	AOOGC
1.8V/70A			12V/3A	-5V/3A	AOOFE
1.8V/70A			-12V/3A	5V/3A	AOOGD
1.8V/70A		5V/10A			AOJOO
1.8V/70A			12V/3A	3.3V/3A	AOOFC
1.8V/70A			12V/3A		AOOFO
1.8V/70A			-12V/3A	-5.2V/3A	AOOGK

V1	V2	V3	V4	V5	MODEL SUFFIX
1.8V/70A	5V/50A	12/10A	-12V/3A	-5V/3A	ADFGE
1.8V/70A	5V/50A	12/10A	-12V/3A		ADFGO
1.8V/70A	5V/50A	12/10A		-5V/3A	ADFOE
1.8V/70A	5V/50A	12/10A			ADFOO
1.8V/70A	5V/50A	12/10A		2.5V/3A	ADFOB
1.8V/70A	5V/50A	12/10A	-12V/3A	3.3V/3A	ADFGC
1.8V/70A	5V/50A		-12V/3A	2.5V/3A	ADOGB
1.8V/70A	5V/50A	12/10A	-12V/3A	2.5V/3A	ADFGB
1.8V/70A	5V/50A		12V/3A	3.3V/3A	ADOFC
1.8V/70A	5V/50A				ADOOO
1.8V/70A	5V/50A			3.3V/3A	ADOOC
1.8V/70A	5V/50A			2.5V/3A	ADOOB
1.8V/70A	5V/50A			-5V/3A	ADOOE
1.8V/70A	2.5V/50A	12V/10A	-12V/3A	-5V/3A	ABFGE
1.8V/70A	2.5V/50A	12V/10A	-12V/3A		ABFGO
1.8V/70A	2.5V/50A	12V/10A			ABFOO
1.8V/70A	2.5V/50A	12V/10A		5V/3A	ABFOD
1.8V/70A	2.5V/50A	12V/10A		-5V/3A	ABFOE
1.8V/70A	2.5V/50A		-12V/3A	-5V/3A	ABOGE
1.8V/70A	2.5V/50A	12V/10A		3.3V/3A	ABFOC
1.8V/70A	2.5V/50A	12V/10A	-12V/3A	3.3V/3A	ABFGC
1.8V/70A	2.5V/50A		12V/3A	3.3V/3A	ABOFC
1.8V/70A	2.5V/50A	5V/10A			ABJOO
1.8V/70A	2.5V/50A		12V/3A	5V/3A	ABOFD
1.8V/70A	2.5V/50A			3.3V/3A	ABOOC
1.8V/70A	2.5V/50A	12V/10A	-12V/3A	-5.2V/3A	ABFGK
1.8V/70A	2.5V/50A			5V/3A	ABOOD
3.3V/100A		12V/10A	-12V/3A	-5V/3A	MCFGE
3.3V/100A		12V/10A	-12V/3A		MCFGO
3.3V/100A		12V/10A		-5V/3A	MCFOE
3.3V/100A		12V/10A			MCFOO
3.3V/100A		12V/10A	-12V/3A	-5.2V/3A	MCFGK
3.3V/100A		12V/10A	-12V/3A	2.5V/3A	MCFGB
3.3V/100A			-12V/3A	1.8V/3A	MCOGA
3.3V/100A			12V/3A	1.8V/3A	MCOFA
3.3V/100A			-12V/3A	-5V/3A	MCOGE
3.3V/100A			-12V/3A	2.5V/3A	MCOGB
3.3V/100A			12V/3A	2.5V/3A	MCOFB
2.5V/70A		12V/10A	-12V/3A	-5V/3A	BOFGE
2.5V/70A		12V/10A	-12V/3A		BOFGO
2.5V/70A		12V/10A		-5V/3A	BOFOE
2.5V/70A		12V/10A	-12V/3A	5V/3A	BOFGD
2.5V/70A		12V/10A	-12V/3A	3.3V/3A	BOFGC
2.5V/70A		12V/10A			BOFOO
2.5V/70A		12V/10A		1.8V/3A	BOFOA
2.5V/70A			12V/3A	-5.2V/3A	BOOFK
2.5V/70A			-12V/3A	-5.2V/3A	BOOGK
2.5V/70A		12V/10A		3.3V/3A	BOFOC
2.5V/70A		5V/10A			BOJOO
2.5V/70A		12V/10A	-12V/3A	-5.2V/3A	BOFGK
2.5V/70A		5V/10A		1.8V/3A	BOJOA
2.5V/70A				-5.2V/3A	BOOOK
1.8V/70A		12V/10A	-12V/3A	-5V/3A	AOFGE
1.8V/70A		12V/10A	-12V/3A		AOFGO
1.8V/70A		12V/10A		-5V/3A	AOFOE
1.8V/70A		12V/10A			AOFOO
1.8V/70A		12V/10A		3.3V/3A	AOFOC
1.8V/70A				5V/3A	AOOOD
1.8V/70A		12V/10A		-5.2V/3A	AOFOK
1.8V/70A		12V/10A		2.5V/3A	AOFOB
1.8V/70A		12V/10A	-12V/3A	3.3V/3A	AOFGC
1.8V/70A				3.3V/3A	AOOOC

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APPENDIX 2

PowerCassette®: I²C SERIAL BUS INTERFACE
Status Indication of system critical power supply parameters

DESCRIPTION

The I²C interface that is incorporated into the PowerCassette includes facilities to monitor various operating parameters within the unit and transmit these to a host computer on demand over an industry standard I²C Serial bus.

Three forms of data are available. These allow the user to monitor the actual status of an individual unit, manage system loading through measurement of the actual load on each output and also control inventory through an inbuilt EEPROM containing specific data about each individual unit.

The implementation of I²C that has been utilized in PowerCassette is a subset of more complete implementations such as IPMI. This data-sheet is intended as a supplement to the data sheet for the *PowerCassette* family itself and should provide enough information for the system designer to make decisions on how to utilize the available information within his overall system philosophy.

I²C DEVICES EMPLOYED

PCF8574
This device is an 8-bit digital register manufactured by Philips.

PCF8591
This device is a Quad A/D converter manufactured by Philips.

24C02
This device is a 256 byte EEPROM manufactured by Atmel or ST

MAX6633
This is a 12-bit temperature measurement device manufactured by Maxim.

For detailed information about the operation of these devices please consult the original manufacturers' data-sheets.

ELECTRICAL INTERFACE

Addressing (GA0 and GA1)
Two external address lines are employed allowing up to four PowerCassette modules to be addressed on a single I²C bus.
Module addressing is achieved through hard-wiring the address lines to 0V or the 5V auxiliary supply via a 100R resistor on the system back-plane. In this way it is the location or position of the module rather than any particular module that is identified by an individual address.

Serial Clock (SCLK)
This line is clocked by the processor which controls the I²C serial bus. It
should be tied to +5V via a pull-up resistor in the range 3k to 10k.

Serial Data (SDA)
This line is a bidirectional data line. It should be tied to +5V via a pull-up resistor in the range 3k to 10k.

Interrupt
This line provides an interrupt to the processor in the event of a change of status of the digital register.

BUS speed
The I²C interface as used in PowerCassette is designed to run with a serial clock speed 100kHz.

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OPERATION AND FUNCTIONS

Digital Functions

Digital status functions are provided by a PCF8574 8-bit I/O port device. When this device is read by the serial bus controller a single 8-bit word provides the following information:

BIT	FUNCTION	GOOD STATE	MEANING
0	Input Power Fail	0	Provides 10ms warning of input supply failure. [1]
1	Output Power Good	1	V1, 2 and 3 are within specified limits.
2	Temperature Warning	1	Internal temperature exceeds 60°C.
3	Fan #1 Good	1	Fan running at >80% nominal speed.
4	Fan #2 Good	1	Fan running at >80% nominal speed.
5	Fan #3 Good	1	Fan running at >80% nominal speed.
6	-	-	-
7	Temperature Alarm	1	Internal temperature exceeds 70°C, unit switched off.

Note 1: AC input versions only. Requires use of Interrupt line to provide warning time specified.

PCF8574 slave address

BIT	7	6	5	4	3	2	1	0
VALUE	0	1	0	0	0	A1	A0	R/W

Note: The PCF8574 must only be used in the READ mode.

EEPROM Functions

The EEPROM is a 2048 bit (256 byte) device which is preprogrammed at the factory with the following data:

ADDRESS RANGE	DATA
0-15	Model Number
16-31	Manufacturing Part Number
32-47	Serial Number
48-63	Modification Level
64-79	Manufacturer
80-95	Country of Manufacture
96-102	Switch Setting
103-255	Not Used

Note:
Data is organized such that each field of data can be accessed by a page read (16 bytes).

EEPROM slave address

BIT	7	6	5	4	3	2	1	0
VALUE	1	0	1	0	0	A1	A0	R/W

Note: Customers may specify to special order other data which they may require.

Analogue Functions

Analogue status functions are provided by two PCF8591 4-channel 8-bit A/D converter devices. When these devices are read by the serial bus controller a single 8-bit word provides the following information:

Device: U208				Device: U215			
A/D	FUNCTION	A/D	FUNCTION	A/D	FUNCTION	A/D	FUNCTION
1	V1 voltage	3	V3 voltage	1	V1 current	3	V3 current
2	V2 voltage	4	Not Used	2	V2 current	4	Not Used

slave address

BIT	7	6	5	4	3	2	1	0	DEVICE
VALUE	1	0	0	1	1	A1	A0	R/W	U208
VALUE	1	0	0	1	0	A1	A0	R/W	U209

The PCF8591 devices initially require a control byte (04 Hex) to be written to the configuration register. This control byte sets the device so that on each successive read the data from the next A/D is read. Note that on each read a conversion is started for a particular channel and the result will be read from the previous channel, thus the first result from a sequence of reads should always be discarded.

A/D converter scaling

To obtain a correct voltage or current measurement it is necessary to employ both scaling and offset factors in the controlling software. Note that all voltage measurements are made inside the PSU module, before the 'ORing' diodes, and are typically 0.5V higher than the actual module output voltage.
The following calculation should be employed:
Value = (byte read x scaling factor) + offset

Output Voltage	Scaling	Tolerance	Offset	
1.8/2.5V	0.012	±2%	0	V1, V2 Voltage (U208 A/D 1 & 2)
3.3V	0.015	±2%	0	
5.0V	0.023	±2%	0	
12.0V	0.0547	±2%	0	V3 Voltage (U208 A/D 3)
15.0V	0.0686	±2%	0	
1.8/2.5/3.3/5.0V	0.37	±10%	0	V1 Current (U215 A/D 1)
1.8/2.5/3.3/5.0V	0.43	±10%	0	V2 Current (U215 A/D 2)
12.0/15.0V	0.068	±5%	0	V3 Current (U215 A/D 3)

Temperature Measurement Functions

The internal temperature of the unit is measured using a MAX6633. This device provides a 12-bit measurement at a resolution of 0.0625°C.

MAX6633 slave address

BIT	7	6	5	4	3	2	1	0
VALUE	1	0	0	0	0	A1	A0	0

Note: The MAX6633 must only be used in the READ mode.

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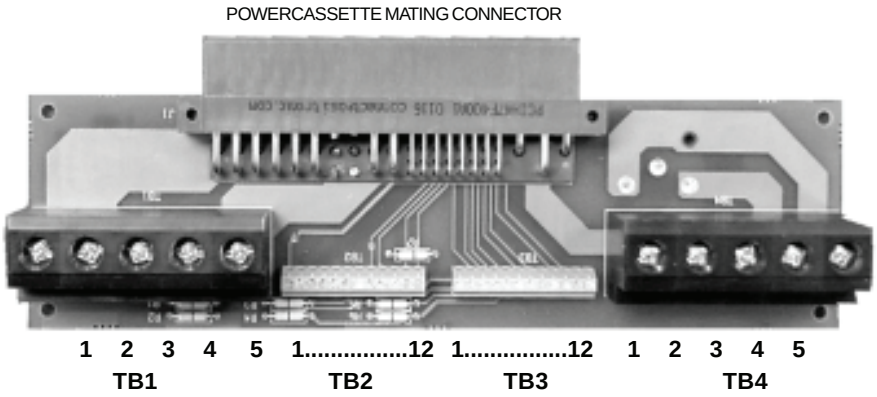
APPENDIX 3

PowerCassette® QUICK CONNECT INSTRUCTIONS

A guide for customer checkout of a PowerCassette for prototyping

Single module: Using either a mating connector with wires or Unipower's PCB single interface board, make the appropriate connections for Input Power and Output Power, referring to the Connection Chart shown below. Pay particular attention to the pin designations for the input. Also assure that the chassis ground connection is tied to the appropriate safety ground when using either AC or DC input. **Ensure that pin 27 and pin 22 are connected together** so that the power supply will be enabled when the Input Power is applied. This is already connected on the UNIPOWER PCB Interface Board but will need to be connected if using a wired mating connector. If additional details about the signals and/or connections are needed, please refer to the Operating Manual for the PCHS/TPCHS Series. For testing a single module, it is not necessary to connect to the three current share signals. It is recommended to connect the appropriate remote sense lines to the corresponding outputs. This is done via zero-ohm links on the single interface board. Be sure to observe polarity. Note that V1, V2, and V3 all share the same electrical return line, and all three are 'positive' outputs. In order to get the best load regulation and minimize cross-talk between the outputs, it is suggested that the return lines to each of the loads be connected such that the different outputs are returned to separate returns at the power supply. Note that V4 and V5 have the option of being either positive or negative polarity, as determined by the module's model number.

Single Power Cassette Interface Board (Part No. 009-3708-0000)



Pin Connections for Single PowerCassette Interface Board (AC or DC)

TB1	
1	V1 Out
2	V1 Out
3	Output Return
4	Output Return
5	V2 Out

TB2	
1	V3 Out
2	V5 Out
3	Signal Return
4	V4 Out
5	V3 Out
6	5V Standby
7	V1 External Trim
8	V3 Out
9	Enable (Tied to Return)
10	V2 External Trim
11	V1 -Sense (Tied to Return)
12	V1 +Sense (Tied to V1 Out)

TB4	
1	Chassis/Ground
2	AC Line
3	AC Neutral
4	DC In (-)
5	DC In (+)

TB3	
1	V2 +Sense (Tied to V2 Out)
2	V2 - Sense (Tied to Return)
3	V1 Current Share
4	V3 +Sense (Tied to V3 Out)
5	V3 - Sense (Tied to V3 Return)
6	Output Power Good
7	Global Inhibit
8	Overtemp. Warning
9	V2 Current Share
10	Input Power Fail
11	Spare
12	V3 Current Share

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