OPERATING MANUAL
BLUESTREAK SERIES
FRONT-ENDS & RECTIFIERS

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OPERATING MANUAL
BLUESTREAK SERIES FRONT-ENDS & RECTIFIERS

1.0 INTRODUCTION

This Operating Manual should be read through carefully before installing and operating the BLUEstreak Series Front-Ends and Rectifiers.

BLUEstreak is a family of high density hot-swappable, modular Front-Ends and Rectifiers producing up to 2000 watts output power. There are 6 standard models with different output voltages and power levels. The modules are ultra-compact with power density up to 24 watts per cubic inch. The modules have automatic load sharing and active output ORing circuit so they can be hot-swapped while the system is operating. Using PMBus compliant serial communications, status and control data can be passed between a host system or power management unit and the module..

Front panel mounted LEDs indicate various status or fault conditions and +5V & 12V standby outputs are included. Operating temperature range is -40°C to +70°C.

BLUEstreak modules can be fully integrated into an OEM host system or alternatively installed into one of 4 different 1U high 19" rack-mount power shelves. These power shelves may be connected in parallel for increased system capacity.

Figure 1 below shows a BLUEstreak module and four modules installed into one of the power shelves.

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Figure 1 - BLUEstreak Module & Power Shelf

2.0 STANDARD FEATURES

- ◆ Up to 92% Efficiency
- ◆ 1U High: 1.6”
- ◆ -40°C to +70°C Operation
- ◆ Wide Range AC Input
- ◆ Up to 2000W Output
- ◆ >0.98 Power Factor
- ◆ Output Voltages: 12 to 54.4VDC
- ◆ Power Density to 24W/Cu. Inch
- ◆ Hot Swappable
- ◆ Integral Active Output ORing Circuit
- ◆ Class B EMI Filter
- ◆ LED Indicators
- ◆ PMBus Serial Communications
- ◆ Variable Speed Cooling Fans

3.0 SUMMARY OF PRODUCT LINE

3.1 Standard Modules

FRONT-END / RECTIFIER MODULES

MAX. POWER	OUTPUT VOLTAGE	OUTPUT CURRENT	INPUT VOLTAGE [1, 2]	INPUT CURRENT [3]	MODEL NO.
2000W 1500W	54.4VDC	37.0A 28.0A	180-264VAC 85-132VAC	10A 14A	RBSR48/37
1500W	54.4VDC	28.0A	85-264VAC	14A/7.5A	RBSR48/28
2000W 1500W	48.0VDC	42.0A 31.0A	180-264VAC 85-132VAC	10A 14A	TBSR7000
1632W 1469W	27.2VDC	60.0A 54.0A	180-264VAC 85-132VAC	8.2A 13.5A	RBSR24/60
1469W	27.2VDC	54.0A	85-264VAC	13.5A/7.6A	RBSR24/54
1440W	24.0VDC	60.0A	85-264VAC	13.3A/7.3A	TBSR5000
1360W	13.6VDC	100.0A	85-264VAC	12.5A/7A	RBSR12/100
1200W	12.0VDC	100.0A	85-264VAC	11.0A/6.5A	TBSR3000

Notes:
1. Models showing two output power levels with dual AC input ranges will operate over the full range from 85VAC to 264VAC, automatically limiting output current according to the actual input voltage range applied.
2. All units also operate from 90-420VDC, taking into account the same conditions as note 1.
3. Input currents shown are nominal values at 120VAC/240VAC as appropriate.

3.2 Power Shelves

4-BAY 19” SHELF SYSTEM ORDERING GUIDE

MAX. POWER	DESCRIPTION	MAX. CURRENT	MODEL NO.
8000W	Single Output Bus IEC60320-C20 Input (AC only)	400A	TBSR1U4A
8000W	Single Output Bus Terminal Block Input (AC or DC)	400A	TBSR1U4B
8000W	Dual Output Bus IEC60320-C20 Input (AC only)	200A/200A	TBSR1U4C
8000W	Dual Output Bus Terminal Block Input (AC or DC)	200A/200A	TBSR1U4D

Blanking kit for unused position, order pt. no. 775-1501-0000.

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.

5.0 WARRANTY (summary)

BLUEstreak Series Front-Ends and Rectifiers are warranted for three (3) 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 MODULE SPECIFICATIONS

The following specifications are typical at 25°C unless otherwise noted.

INPUT
Voltage Range ..... See Model Table
Power Factor ..... >0.98
Total Harmonic Distortion, Max. 5%
Frequency 47-63Hz
Inrush Current Limiting, Max. ..... 50A Peak
EMI Filter, Conducted ..... FCC20780 pt. 15J Curve B
..... EN55022
Curve B
Fast Transients EN61000-4-4
Surges EN61000-4-5
Remote Adjust ..... 0 to +5V
Input Protection 1 ..... Internal Fuse, 25A

OUTPUT
Current & Voltage ..... See Table
Output Power 1200-2000W
Voltage Adjustment Range 2
48V / 54.4V 30-60V
24V / 27.2V 15-30V
12V / 13.6V 7.5-15V
Standby Output 3 ..... +5V@1.8A
.....
+12V@0.8A
Line & Load Regulation, Max. 0.3%
Holdup Time ..... 10msec.
Overvoltage Protection .....
Latch Off
Filtering: Wideband Noise, 20MHz BW 200mV
Current Limit 4 ..... 105-115% Rated Current (Programmable)
Efficiency (54.4VDC @ 2000W rated)
100% Load ..... to 91.6%
75% Load ..... to 92.0%
40% Load ..... to 91.0%

SAFETY CERTIFICATIONS
UL60950-1 2nd Ed., CSA22.2 No. 60950-1 2nd Ed., EN60950-1 2nd Ed.

STATUS INDICATORS
STATUS ..... Green LED
FAULT ..... Red LED

ALARM SIGNALS (open drain, TTL compatible)
ACOK ..... AC present, 5V standby operating
DCOK ..... DC output within -10% of nominal
TEMPOK ..... Internal temperature within limits
FANOK ..... Fans running correctly

PM Bus
Version Compliance 1.1

ENVIRONMENTAL
Operating Temp. Range 5 ..... -20°C to +70°C
Output Current Derating ..... 2.5%/°C, 50°C to 70°C
Storage Temp. Range ..... -40°C to + 85°C
Humidity ..... 0% to 95%, Non-Condensing
ESD ..... Bellcore GR-1089-Core and EN61000-4-2
MTBF, 35oC (Bellcore) ..... 200,000 Hours
Cooling ..... Integral Ball Bearing Fans

PHYSICAL SPECIFICATIONS
Case Material ..... Steel
Case Dimensions, Inches (mm) ..... 1.60 H x 4.00 W x 13.70 D
..... (40.6 x 102 x
347.9)
Weight ..... 4.8 lbs. (2.2 kg.)

Notes:
1. External protection required when operating from HVDC.
2. When programmed via PMbus and may require adjusting DCOK and OVP settings.
3. Total standby power limited to 9.6W.
4. Subject to absolute power limit of 2000W + tolerance.
5. Startup at -40C, but output is not enabled until internal temperature reaches -20C

8.0 FRONT PANEL DESCRIPTION

Figure 2 - Front Panel Detail

8.1 PUSH BUTTONS

The two push buttons located just above the LEDs can be used to adjust the output voltage when the output is enabled. These buttons are labelled V▲ and V▼. Short presses for a fraction of a second adjust the output voltage at the output voltage setting resolution. If the button is held down, the rate of change increases to around 1V/s after 10s. If both buttons are pressed together, the button adjust is cleared to zero. The PMBus can read the button adjust value and also clear the value. The PMBus can also be used to enable or disable the buttons. Note that it may be necessary to adjust the settings of DCOK and OVP using the PMBus in order not to encounter these when adjusting with the push buttons over a wide voltage range.

8.2 FRONT PANEL INDICATORS

The two front panel indicators together indicate the status of the power module.

Green LED (top)

LED Status	Condition
ON	DCOK is TRUE
FLASHING	DCOK is FALSE - unit inhibited
OFF	DCOK is FALSE - unit not inhibited

Red LED (bottom)

LED Status	Condition	Possible causes
ON	DC output OFF	Temperature above/below allowed limits. OVP. Overcurrent or Short Circuit (DCOK goes FALSE). Processor Failure. (Green LED OFF).
FLASHING	DC output ON (warning)	Fans below expected speed. Temperature high/low. Output current close to maximum. Output on but DCOK FALSE. AC input voltage outside range.
OFF	DC output ON	

All posible conditions for the LEDs are shown opposite.

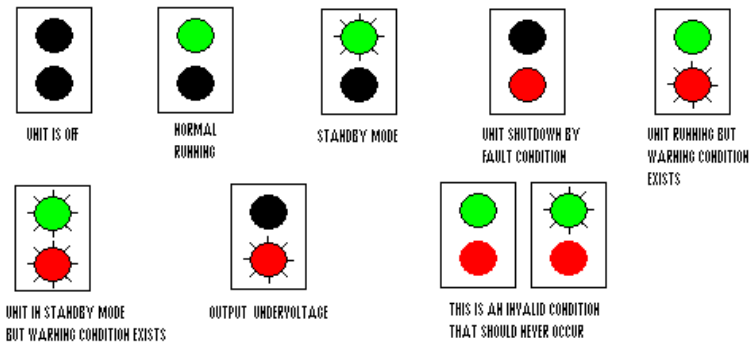


Figure 3 - Possible LED Combinations

9.0 DESCRIPTION OF OPERATION

9.1 Power Outputs

The power output terminals provide the main output power of the unit. The output voltage is adjustable by means of the front panel recessed push buttons or by programming with the PMBus or by using the analogue remote adjust pin. Note that all of the power pins must be used for correct operation and to avoid overheating of the connector. The power output terminals are isolated from chassis ground to a maximum voltage of 2000Vdc.

9.2 I/O Signals

The # symbol in the following text is used to denote an active low signal.

9.2.1 Sense +Ve, Sense –Ve

The sense signals are intended to be connected to the point of load so that voltage drop in the load cables can be compensated for. The amount of compensation is limited to 0.25V per wire. Care must be taken when using the sense signals as if the power connections to the load are interrupted by disconnection or circuit breaker with the senses still connected then damage may occur to the power supply and sense wiring. Sense +Ve and Sense -Ve are internally connected to the module output power terminals using 10 Ohm resistors so that if the senses are not connected the output will still be regulated.

Sense -Ve is also used as the return path for some of the other I/O signals.

9.2.2 Current Share

This signal is connected between all modules required to share a load. This signal is capable of driving up to 16 modules. The return path for this signal is Sense -Ve and that signal should also be connected between all modules for correct sharing operation.

9.2.3 Current Monitor

This analogue signal provides a voltage proportional to the output load current of the module. The return path for this signal is Sense -Ve. The full scale voltage for nominal full load current is 3.0V.

9.2.4 Standby Return

This is the return path for many of the module signals. It and the associated signals are isolated from the main power outputs with isolation voltage of up to 100Vdc. It is also isolated from chassis ground up to 2000Vdc.

9.2.5 Remote Adjust

This signal can be used to adjust the output voltage. The return path for this signal is Sense -Ve.

The characteristic of remote adjust varies for different BLUEstreak models. The table below shows the typical characteristic for a TBSR7000 model which has its default output set to 48.00V.

Remote Adjust Voltage	Output Voltage		
	48VDC	24VDC	12VDC
0	24.0	11.82	6
0.5	29.0	14.35	7.25
1.0	34.2	16.84	8.5
1.5	39.4	19.35	9.75
2.0	44.2	21.9	11.01
2.5	49.1	24.3	12.2
3.0	54.2	26.82	13.5
3.5	OVP Operation	29.32	14.7
V/V slope	10V/V	5V/V	2.5V/V

9.2.6 5VSB, 12VSB

These are the standby supplies. The 5V and 12V supplies are always present when the AC is within the operating range of the module. The maximum current available from 5VSB pin is 1.8A and from 12VSB is 0.8A. However these maximum currents are not available simultaneously and a maximum of 9.6 Watts is available from the two outputs combined. The return for these power rails is standby return. Both of these standby supplies have internal ORing diodes so that they may be connected to the same outputs of additional units directly on the backplane.

9.2.7 #ACOK

This signal provides an open drain output that indicates the status of the AC input. The signal is normally low for the OK state but is programmable to be normally high using the PMBus. The output is capable of supporting voltages of up to 30V and will sink current up to 30mA. The return path for this signal is standby return. The #ACOK signal is also available within the status bytes of the PMBus. The #ACOK signal will give typically 2ms of warning at full load (TBSR7000 2000W) before the output loses regulation.

9.2.8 #DCOK

This signal provides an open drain output that indicates that the DC output voltage is below a defined threshold. The default level is 90% of the nominal output voltage but is programmable to other levels by the PMBus. The signal is normally low for the OK state but is programmable to be normally high using the PMBus. The output is capable of supporting voltages of up to 30V and will sink current up to 30mA. The return path for this signal is standby return. The #DCOK signal is also available within the status bytes of the PMBus.

9.2.9 #TEMPOK

This signal provides an open drain output that indicates that the power supply internal temperature is within a safe operating range. The default levels are greater than -20°C and less than 95°C but are programmable to other temperatures by the PMBus. The signal is normally low for the OK state but is programmable to be normally high using the PMBus. The output is capable of supporting voltages of up to 30V and will sink current up to 30mA. The return path for this signal is standby return. The #TEMPOK signal is also available within the status bytes of the PMBus.

9.2.10 #FANOK

This signal provides an open drain output that indicates that the fans speeds are more than 80% of the required speed. The signal is normally low for the OK state but is programmable to be normally high using the PMBus. The output is capable of supporting voltages of up to 30V and will sink current up to 30mA. The return path for this signal is standby return. The #FANOK signal is also available within the status bytes of the PMBus.

9.2.11 #Module Present

This signal can be used to detect if a module is present. It is connected to standby return when the module is present. This signal can sink up to 30mA.

9.2.12 #Enable

This signal is used to enable the power supply. This pin engages after the power terminals when plugging in the module and disengages before the power terminals when unplugging the module. It is intended to control hot-plugging to avoid burning connector pins caused by arcing of high currents. The return path for this signal is Sense –Ve. The #Enable pin should be connected to Sense -Ve on the backplane for correct operation.

9.2.13 Control

This signal can be used to control the main output of the power supply in order to turn it on and off. The default is that a low signal on this pin will turn the main output off. This function can be changed using PMBus so that either a high signal will turn the main output off or the pin is ignored altogether. This behaviour can allow a system to be setup so that the main output will not come on until commanded by a supervisory circuit. The control pin is returned to standby return. The driving circuit should be capable of sinking and sourcing at least 0.5mA.

9.2.14 SCL, SDA

These are the serial data bus (PMBus) signals used for digital communication. This communication bus is similar to the standard I²C bus but does vary in some ways. The voltage levels and timing behaviour are consistent with the SMBus standard revision 1.0. Please refer to this standard for details. For details of the PMBus protocol and commands implemented, please refer to the PMBus standard revision 1.1 and the BLUEstreak software manual respectively. The PMBus signals are returned to standby return. They require pull-up resistors or active pull-up circuits to 3.3V or 5V.

9.2.15 #SMBAlert

This signal can be used in conjunction with the SCL and SDA serial bus signals to determine when a fault or warning condition exists. The signal is latching so that if a warning or fault condition disappears the signal will not be cleared. To clear the signal the PMBus master must respond to the alert as detailed in the PMBus specification. Using this method provides for a more efficient way of detecting faults than polling but polling the PMBus registers can still be done. The #SMBAlert signal is returned to standby return. It requires pull-up resistors or active pull-up circuits to 3.3V or 5V.

9.2.16 GA0, GA1, GA2, GA3, GA6

These are the PMBus interface address lines. They are used to set the hardware address of each module on the backplane. Each module should have a unique address when connected using the same serial bus.

The address lines should either be tied high (to 5VSB) for '1' or low (standby return) for '0'. The return path for these lines is standby return.

9.3 Timing

The following table and diagram give details of signal and power timing during power up and power down cycles.

Value	Min.	Typ.	Max.	Description
TACON_DELAY	500ms	550ms	1000ms	Delay from AC input voltage applied to output in regulation
TVOUT_HOLDUP	10ms	12ms	-	Time from loss of AC input to DC output voltage falling to 90% of original value. Timing given is for 2000Watt load on 48V model.
TVSB_HOLDUP	20ms	30ms	-	Time from loss of AC input to VSB going out of regulation. Typical timing for full load on all outputs.
TVSB_ON	50ms	70ms	200ms	Delay from AC input voltage applied to VSB in regulation.
TACOK_ON	50ms	70ms	200ms	Time from AC input voltage applied to ACOK being low (good)
TACOK_OFF	9ms	10ms	11ms	Time from loss of AC input to ACOK output being high. Timing given is for 2000Watt load on 48V model.
TON_RISE		50ms		Time for DC output to rise to final regulated value. This is reprogrammable with PMBus.
T5VSB_RISE	3ms	5ms	10ms	Time for 5VSB to rise to final regulated voltage.
T12VSB_RISE	3ms	5ms	10ms	Time for 12VSB to rise to final regulated voltage.
TCONTROL_DELAY_ON		0ms		Time from CONTROL pin going high to main output coming on. (Default, reprogrammable with PMBus).
TCONTROL_DELAY_OFF		0ms		Time from CONTROL pin going low to main output going off. (Default, reprogrammable with PMBus).
TDCOK_ON	40ms	45ms	48ms	Time from main output beginning to rise and DCOK going low (with default 50ms rise time of main output).
TDCOK_OFF	2ms	4ms	6ms	Time from main output going out of regulation to DCOK going high (typical at 2000Watt load on 48V model).
TDCOK_FALL	50ns	100ns	1000ns	Time for DCOK signal to transition from high to low*
TDCOK_RISE	1µs	2µs	10µs	Time for DCOK signal to transition from low to high*
TACOK_FALL	50ns	100ns	1000ns	Time for ACOK signal to transition from high to low*
TACOK_RISE	1µs	2µs	10µs	Time for ACOK signal to transition from low to high*
TTEMPOK_FALL	50ns	100ns	1000ns	Time for TEMPOK signal to transition from high to low*
TTEMPOK_RISE	1µs	2µs	10µs	Time for TEMPOK signal to transition from low to high*
TFANOK_FALL	50ns	100ns	1000ns	Time for FANOK signal to transition from high to low*
TFANOK_RISE	1µs	2µs	10µs	Time for FANOK signal to transition from low to high*

*ACOK, DCOK, TEMPOK & FANOK pulled up to 5V with 10kOhm resistor.

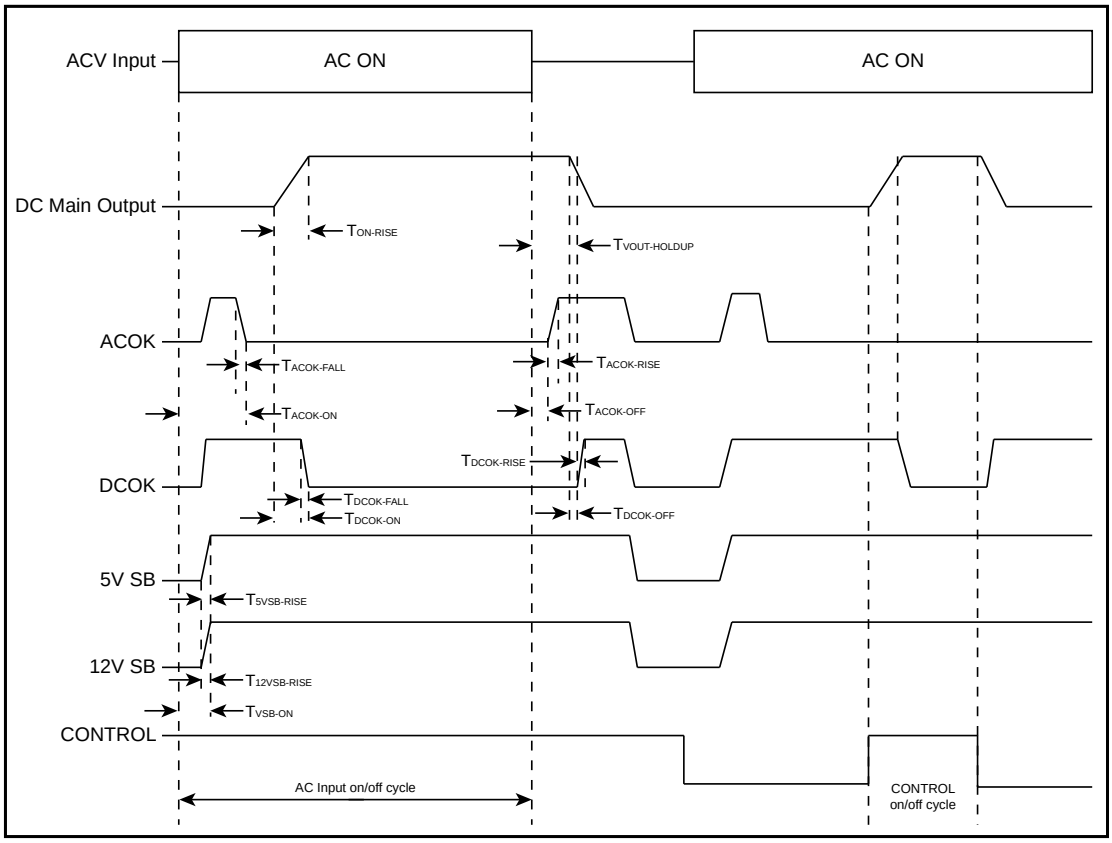


Figure 4 - Timing Diagram

10.0 MECHANICAL SPECIFICATIONS

The mechanical dimensions of the BLUEstreak module are shown.

Note that BLUEstreak modules are designed for hot-swap applications only and are not provided with any fixing points.

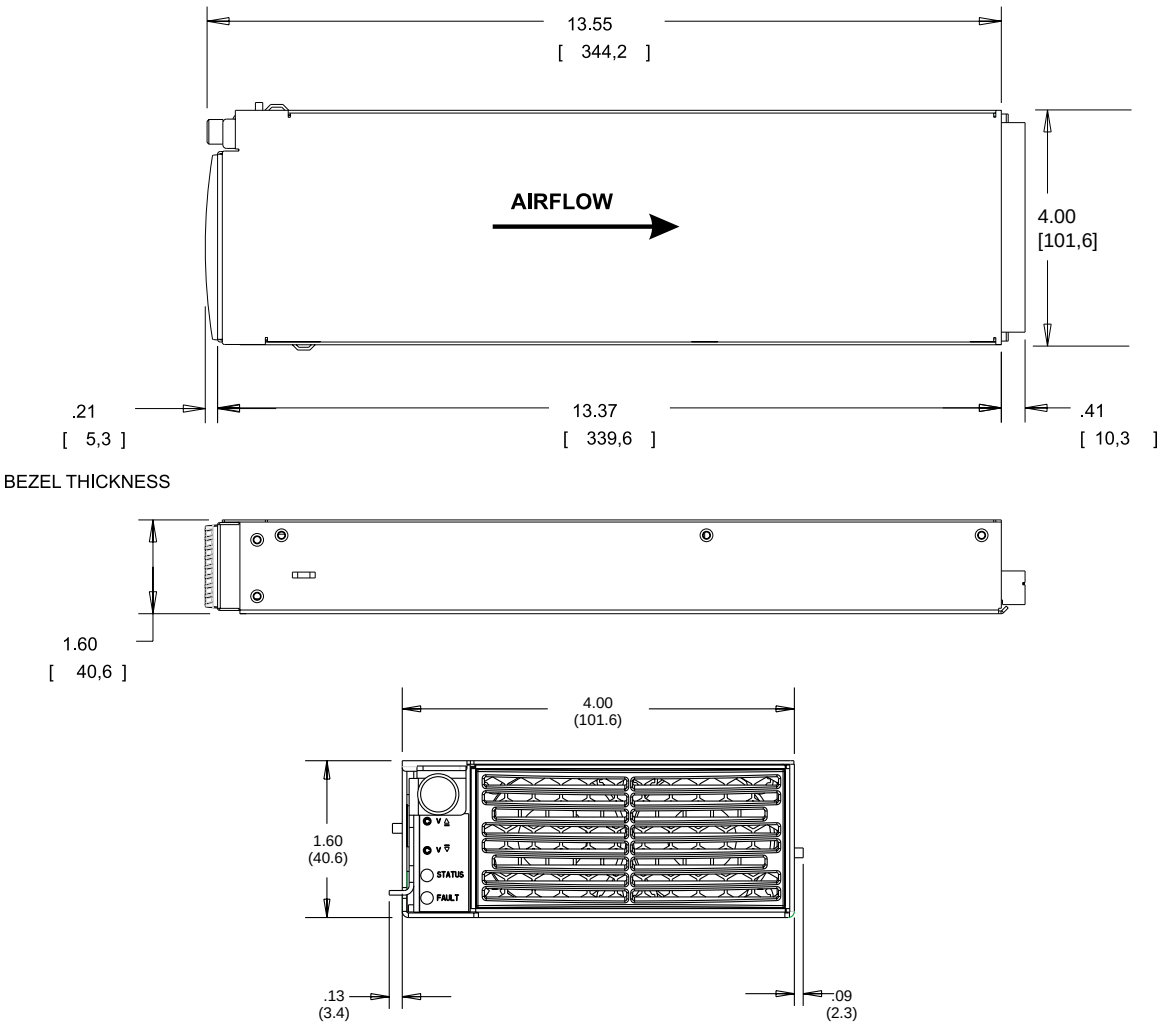


Figure 5 - Module Dimensions

11.0 SAFETY AND INDUSTRY STANDARDS

11.1 BLUEstreak modules and power shelves meet the following safety standards:

UL60950-1, 2nd Edition
CSA22.2 No. 60950-1, 2nd Edition
EN60950-1, 2nd Edition

11.2 BLUEstreak modules and power shelves are CE Marked to indicate conformance with the European Union's Low Voltage Directive.

11.3 Input conducted EMI meets FCC20780 part 15J Curve B and EN55022 Curve B.

11.4 Input harmonics, meets EN61000-3-2 Class D

11.5 Immunity, meets the following:

Input fast transients, line to line – EN61000-4-4, level 3, criteria A
Input surges, line to line – EN61000-4-5, level 3, criteria A
Input surges, line to ground – EN61000-4-5, level 4, criteria A
ESD – EN61000-4-2, level 4, criteria A
Radiated – EN61000-4-3, criteria A (10V/m)
Dips, Interruptions & Variations – EN61000-4-11, criteria B/C

12.0 OPERATING INFORMATION

12.1 **Input Voltage and Connection** - The BLUEstreak Series operates from worldwide AC input voltages in the range of 85 to 264 VAC at 47 to 63 Hz. There are restrictions to the available total output power when operating at low line, 85-132VAC. The three-wire AC connection is made to pins P1, P2 & P3 on the rear mounted connector. See the connector diagram and Pin Connections table in Figure 5.

12.2 **Output Connections** - The main output is provided on pins P4 to P9 on the connector. Three pins (P4 to P6) are connected together internally for the +V Out; three other pins (P7 to P9) are connected together internally for the V Return. The output is fully floating and may be configured for positive or negative operation.

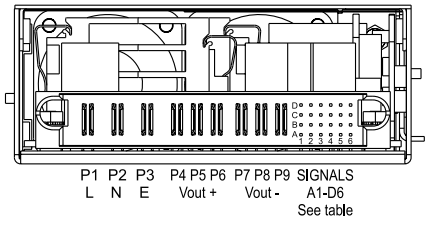


Figure 6 - Module Rear View showing connection details

SIGNAL PIN CONNECTIONS			
PIN	**FUNCTION**	**PIN**	**FUNCTION**
A1	#MODULE PRESENT	C1	Sense +Ve [4]
A2	GA6	C2	Current Monitor [4]
A3	GA3	C3	GA1
A4	Standby Return	C4	5V Standby [1, 3]
A5	#FANOK	C5	#DCOK
A6	#SMBALERT	C6	SCL
B1	Sense -Ve	D1	Remote Adjust [4]
B2	Control	D2	Current Share [4]
B3	GA2	D3	GA0
B4	Standby Return	D4	12V Standby [2, 3]
B5	#TEMPOK	D5	#ACOK
B6	SDA	D6	#ENABLE

Notes:
1. Current rating of +5V standby is 1.8A.
2. Current rating of +12V standby is 0.8A.
3. Total standby consumption limited to 9.6W.
4. Referenced to -Ve Sense.

12.3 **Mating Interface Board** - Figure 7 shows a mating interface board which is available for simplifying the testing of a BLUEstreak module. As shown in the photograph, provision is made for input and output connections as well as the control and monitoring signals and PMBus interface.

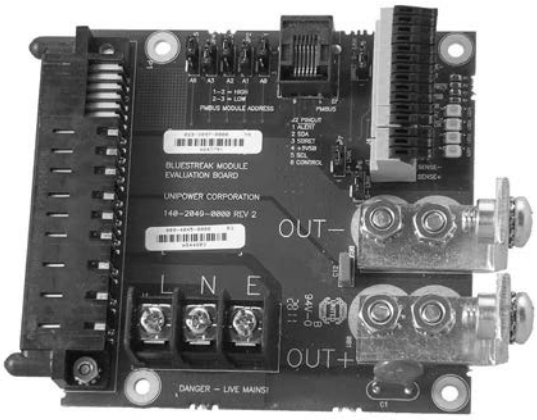


Figure 7 - Mating Interface Board

12.4 **Output Voltage** - The output voltage is factory set to its nominal value to an accuracy of ±1%. The voltage can be adjusted to any value within the range given in the table below using the PMBus interface.

MODEL	ADJUSTMENT RANGE
TBSR3000, RBSR12/100	7.5-15V
TBSR5000, RBSR24/54, RBSR24/60	15-30V
TBSR7000, RBSR28/28, RBSR48/37	30-60V

12.5 **Output Power & Current** - The following table shows the maximum output power and current ratings for the various models:

MAX. POWER	OUTPUT VOLTAGE	OUTPUT CURRENT	INPUT VOLTAGE	INPUT CURRENT	MODEL NO.
2000W 1500W	54.4VDC	37.0A 28.0A	180-264VAC 85-132VAC	10A 14A	RBSR48/37
1500W	54.4VDC	28.0A	85-264VAC	14A/7.5A	RBSR48/28
2000W 1500W	48.0VDC	42.0A 31.0A	180-264VAC 85-132VAC	10A 14A	TBSR7000
1632W 1469W	27.2VDC	60.0A 54.0A	180-264VAC 85-132VAC	8.2A 13.5A	RBSR24/60
1469W	27.2VDC	54.0A	85-264VAC	13.5A/7.6A	RBSR24/54
1440W	24.0VDC	60.0A	85-264VAC	13.3A/7.3A	TBSR5000
1360W	13.6VDC	100.0A	85-264VAC	12.5A/7A	RBSR12/100
1200W	12.0VDC	100.0A	85-264VAC	11.0A/6.5A	TBSR3000

Models showing two output power levels with dual AC input ranges automatically limit the output current according to the actual input voltage present.

When the output voltage is adjusted below the nominal voltage shown in the table the maximum current indicated will apply. Conversely, when the output voltage is adjusted above the nominal voltage shown the maximum power indicated will apply.

The maximum output power may be drawn up to +50°C air inlet temperature. Above +50°C the total output power must be derated by 2.5%/°C, up to an absolute maximum air inlet temperature of +70°C. Note that dependent on actual airflow through the unit output power may be further limited or a temperature alarm indicated at lower temperatures.

The two standby outputs of +5V @ 1.8A and +12V @ 0.8A are limited to a combined output power of 9.6W.

12.6 Overvoltage Protection - The power supply has two internal O.V.P. protection circuits. One operates at a fixed voltage level and the other is programmable by the PMBus. The fixed O.V.P. levels are defined below:

MODEL	FIXED OVP POINT (nominal)
TBSR3000, RBSR12/100	21.1V
TBSR5000, RBSR24/54, RBSR24/60	31.9V
TBSR7000, RBSR28/28, RBSR48/37	59.4V

The default values for the programmable O.V.P. circuit can be found in the BLUEstreak software manual. In order to reset the O.V.P. latch, the AC input must be cycled off for at least 5 seconds before turning back on.

The O.V.P. latch is not resettable by PMBus command.

12.7 Overcurrent and short circuit protection - The power supply will provide a constant current limit in the event of an overload on the output. If the output voltage of the power supply falls below a certain level, the power supply will enter a 'hiccup' mode of operation. Removing the overload or short circuit will allow normal operation to resume. The voltage at which the 'hiccup' mode of operation occurs is programmable down to the minimum default setting.

12.8 Remote Sensing - Remote sensing connections are made to pins B1 and C1 on the connector. Remote sensing is not available on the +5V or +12V Standby outputs. 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. The +Sense lead (pin C1) must be connected to the +Ve side of the load and the - Sense lead (pin B1) to the –Ve side of the load. The sense leads should be a color-coded, twisted pair of AWG no. 22 or 24 copper wire.

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 unit.**

12.9 Alarm, Control & Supervisory Signals - All alarm, control and supervisory signals are available on the connector at the rear of the unit. See section 9.2 for a complete description.

All logic signals are TTL level compatible are referenced to Standby Return and are isolated from the main DC output.

12.10 PMBus - The PMBus is available on the connector at the rear of the unit. BLUEstreak modules can be addressed in the ranges 0x20 to 0x3E and 0xA0 to 0xBE.

13.0 PARALLEL OPERATION

13.1 Parallel Connection - Two or more BLUEstreak modules can be operated in parallel by connecting their outputs in parallel and connecting their current sense terminals together (pin D2). The BLUEstreak 19-inch rack power shelves permit conveniently operating two, three or four units in parallel in either redundant mode or non-redundant mode.

13.2 Redundant Operation - Connecting two BLUEstreak modules 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 BLUEstreak module fail, 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 an active ORing circuit built into the module. 1+1 redundancy with quick replacement of a failed unit results in virtually infinite MTBF. 2+1 or 3+1 redundancy works the same way except that the full load is carried by two out of three or three out of four units respectively.

13.3 Non-Redundant Operation - Higher output load currents can be realized by operating two or three or four modules in the non-redundant mode to achieve up to 4000 watts for two modules, 6000 watts for three modules or 8000 watts for four modules. The units are connected in parallel the same as before. In this case if one unit fails, the load will lose power since only part of the load current can now be supplied by the remaining module(s), which will go into current limit. The failed unit can be quickly replaced, however, without turning the power off (hot-swap) to restore load current.

The number of BLUEstreak modules that can be operated in parallel is 16. The most convenient way to parallel large numbers of units is to connect multiple BLUEstreak 19-inch rack power shelves in parallel.

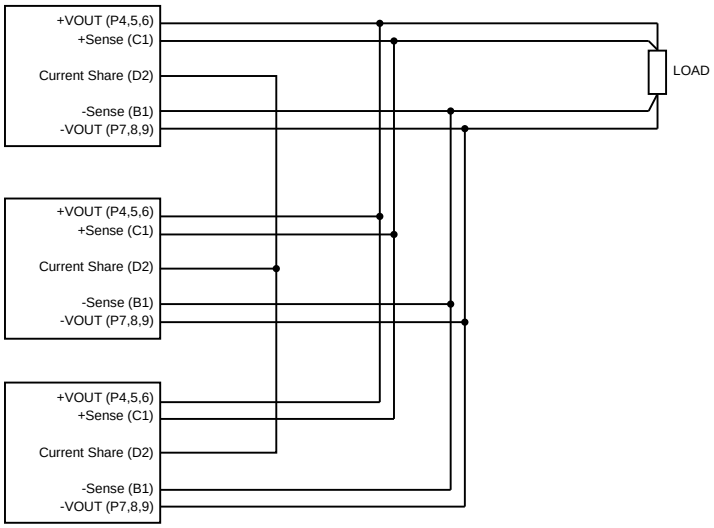


Figure 8 - Connection Diagram for Parallel Operation

14.0 MODULE INSTALLATION

BLUEstreak Series modules are designed for mounting into the BLUEstreak Series power shelves or similar OEM housing. Fixing in place is achieved by means of a latching mechanism that is also used to push the module home into the mating connector.

For OEMs wishing to install the BLUEstreak modules in their own system enclosure detailed dimension information is available as a 3D CAD model. Please consult your nearest sales office.

A mating interface board is available for module evaluation or testing, see section 12.3 on page 16 of this manual.

15.0 COMPATIBLE 19-INCH POWER SHELVES

There are four 19-inch compatible power shelves with single and dual bus configurations being available. These power shelves have the following features:

- Standard 19-Inch Rack-Mounting
- Only 1U High
- Hot-Swap Operation
- Holds up to Four BLUEstreak Modules
- Single or Dual Output Bus
- Terminal Block or IEC Connectors for AC Input

15.1 Ordering Guide

4-BAY 19" SHELF SYSTEM ORDERING GUIDE

MAX. POWER	DESCRIPTION	MAX. CURRENT	MODEL NO.
8000W	Single Output Bus - IEC60320-C20 Input (AC only)	400A	TBSR1U4A
8000W	Single Output Bus - Terminal Block Input (AC or DC)	400A	TBSR1U4B
8000W	Dual Output Bus - IEC60320-C20 Input (AC only)	200A/200A	TBSR1U4C
8000W	Dual Output Bus - Terminal Block Input (AC or DC)	200A/200A	TBSR1U4D

Blanking kit for unused position, order pt. no. 775-1501-0000.

15.2 Single Bus Power Shelves – Rear views of the single bus types are shown in figure 9 below.

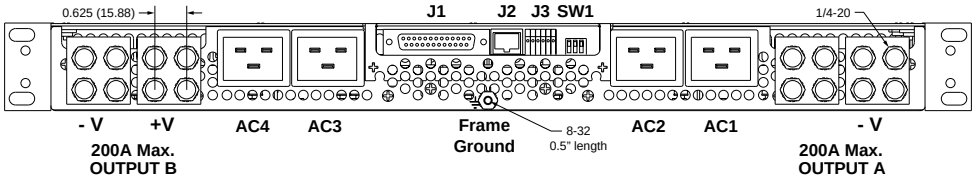


Figure 9a - Model TBSR1U4A with IEC Connectors

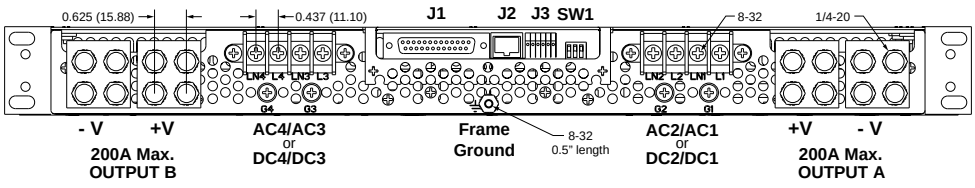


Figure 9b - Model TBSR1U4B with Terminal Block Connections

AC inputs are supplied separately to each module either via IEC60320-C20 connectors or terminal block connections. The terminal block connections are #8-32 threaded screws with a 0.437" spacing, see figure 9b above.

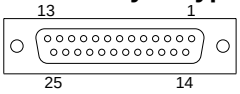
The DC output is supplied on two pairs of internally connected bus bars with four 1/4-20 threaded bolts for each bar spaced 0.625" apart. Each pair has a maximum current capacity of 200A. Various pre-made cables suitable for connection to these bus bars are detailed on the BLUEstreak datasheet and must be ordered separetely if required.

Note that for installations where greater than 200A output current is required it is necessary to use both pairs of bus bars for connection to the load.

J1 is a 25-way D-type socket providing the alarm, control and supervisory signals. J2 is an RJ25 socket providing connections for the PMBus. J3 is a spring clamp terminal block providing two connections each for +Ve Sense, -Ve Sense and Current Share. This facilitates easy daisy-chaining of these connections where two or more power shelves are being connected in parallel. These terminals accept wire sizes in the range #28 to #20 AWG. The following tables and figures show the pinout for these connectors. Details of each pin function can be found in section 9.2.

SIGNAL CONNECTOR - J1			
PIN	**FUNCTION**	**PIN**	**FUNCTION**
1	Control	14	#ACOK - 1
2	12V Standby [2, 3]	15	#DCOK - 1
3	#TEMPOK - 1	16	#ACOK - 2
4	#TEMPOK - 2	17	#DCOK - 2
5	#TEMPOK - 3	18	#ACOK - 3
6	#TEMPOK - 4	19	#DCOK - 3
7	Remote Adjust [4] - 4	20	#ACOK - 4
8	5V Standby [1, 3]	21	#DCOK - 4
9	#MODULE PRESENT - 1	22	Sense –Ve
10	#MODULE PRESENT - 2	23	Standby Return
11	#MODULE PRESENT - 3	24	Remote Adjust [4] - 1
12	Remote Adjust [4] - 2	25	Remote Adjust [4] - 3
13	#MODULE PRESENT - 4		

J1 - 25-Way D-Type



NOTES: 1. Current rating of +5V standby is 1.8A per module.
2. Current rating of +12V standby is 0.8A per module.
3. Total standby consumption limited to 9.6W per module.
4. Referenced to -Ve Sense.

SIGNAL CONNECTOR - J2			
PIN	**FUNCTION**	**PIN**	**FUNCTION**
1	#SMBALERT	4	5V Standby
2	SDA	5	SCL
3	Standby Return	6	Control

J2 - RJ45

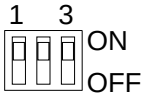
SIGNAL CONNECTOR - J3			
PIN	FUNCTION	PIN	FUNCTION
1	Sense +Ve	4	Sense +Ve
2	Sense -Ve	5	Sense -Ve
3	Current Share	6	Current Share

J3 - Spring Clamp

SW1 provides a facility to alter the PMBus address of the power shelf in two ranges of 16 addresses: 0x20 to 0x3E and 0xA0 to 0xBE. The follow table defines the switch settings.

S1-1 GA6	S1-2 GA3	S1-3 GA2	MODULE ADDRESS			
			1	2	3	4
OFF	OFF	OFF	0xB8	0xBA	0xBC	0xBE
OFF	OFF	ON	0xB0	0xB2	0xB4	0xB6
OFF	ON	OFF	0xA8	0xAA	0xAC	0xAE
OFF	ON	ON	0xA0	0xA2	0xA4	0xA6
ON	OFF	OFF	0x38	0x3A	0x3C	0x3E
ON	OFF	ON	0x30	0x32	0x34	0x36
ON	ON	OFF	0x28	0x2A	0x2C	0x2E
ON	ON	ON	0x20	0x22	0x24	0x26

SW1



Note: Module numbers 1 to 4 are left to right when viewed from the front (fan grille) end.

15.3 Dual Bus Power Shelves - Rear views of the dual bus types are shown in figure 10 below.

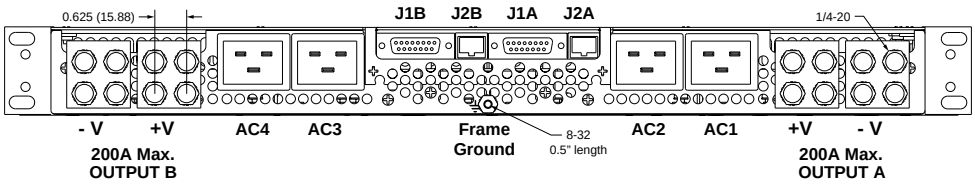


Figure 10a - Model TBSR1UC with IEC Connectors

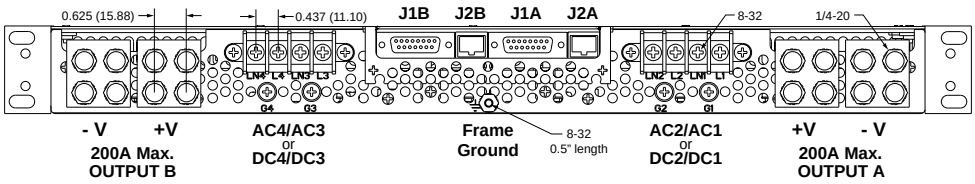


Figure 10b - Model TBSR1U4D with Terminal Block Connections

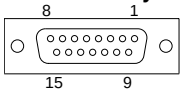
AC inputs are supplied separately to each module either via IEC60320-C20 connectors or terminal block connections. The terminal block connections are #8-32 threaded screws with a 0.437" spacing, see figure 9b above.

The DC output is supplied on two pairs of bus bars with four 1/4-20 threaded bolts for each bar spaced 0.625" apart. One pair for the A Bus one pair for the B Bus. The A Bus is fed from modules installed in positions A1 and A2 while the B Bus is fed from modules installed in positions B1 and B2. Each pair has a maximum current capacity of 200A. The two buses are fully isolated from each other and may be configured for different combinations of output voltage and/or polarity.

J1A and J1B are 15-way D-type sockets providing the alarm, control and supervisory signals for modules installed in the A and B side respectively. J2A and J2B are RJ25 sockets providing PMBus for modules installed in the A and B side respectively. The following tables and figures show the pinout for these connectors. Details of each pin function can be found in section 9.2.

SIGNAL CONNECTORS - J1A & J1B			
J1A		J1B	
PIN	FUNCTION	PIN	FUNCTION
1	Control - A	1	Control - B
2	12V Standby [2, 3] - A	2	12V Standby [2, 3] - B
3	#TEMPOK - 2	3	#TEMPOK - 4
4	#TEMPOK - 1	4	#TEMPOK - 3
5	5V Standby [1, 3] - A	5	5V Standby [1, 3] - B
6	Remote Adjust [4] - 2	6	Remote Adjust [4] - 2
7	Remote Adjust [4] - 1	7	Remote Adjust [4] - 1
8	#ACOK - 2	8	#ACOK - 4
9	#DCOK - 2	9	#DCOK - 4
10	#ACOK - 1	10	#ACOK - 3
11	#DCOK - 1	11	#DCOK - 3
12	Sense -Ve - A	12	Sense -Ve - B
13	Standby Return - A	13	Standby Return - B
14	Sense +Ve [4] - A	14	Sense +Ve [4] - B
15	Current Share [4] - A	15	Current Share [4] - B

J1A & J1B – 15-Way D-Type



NOTES: 1. Current rating of +5V standby is 1.8A per module.
2. Current rating of +12V standby is 0.8A per module.
3. Total standby consumption limited to 9.6W per module.
4. Referenced to -Ve Sense.

SIGNAL CONNECTORS - J2A & J2B			
J2A		J2B	
PIN	FUNCTION	PIN	FUNCTION
1	#SMBALERT - A	1	#SMBALERT - B
2	SDA - A	2	SDA - B
3	Standby Return - A	3	Standby Return - B
4	5V Standby [1, 3] - A	4	5V Standby [1, 3] - B
5	SCL - A	5	SCL - B
6	Control - A	6	Control - B

J2A & J2B - RJ45

Dual bus shelves have fixed PMBus addresses as follows:

BUS	MODULE ADDRESS			
	1	2	3	4
Side A	0xB8	0xBA	0xBC	0xBE
Side B	0xB8	0xBA	0xBC	0xBE

16.0 MECHANICAL DIMENSIONS

Figure 11 below shows outline dimensions for the BLUEstreak Series Power Shelves.

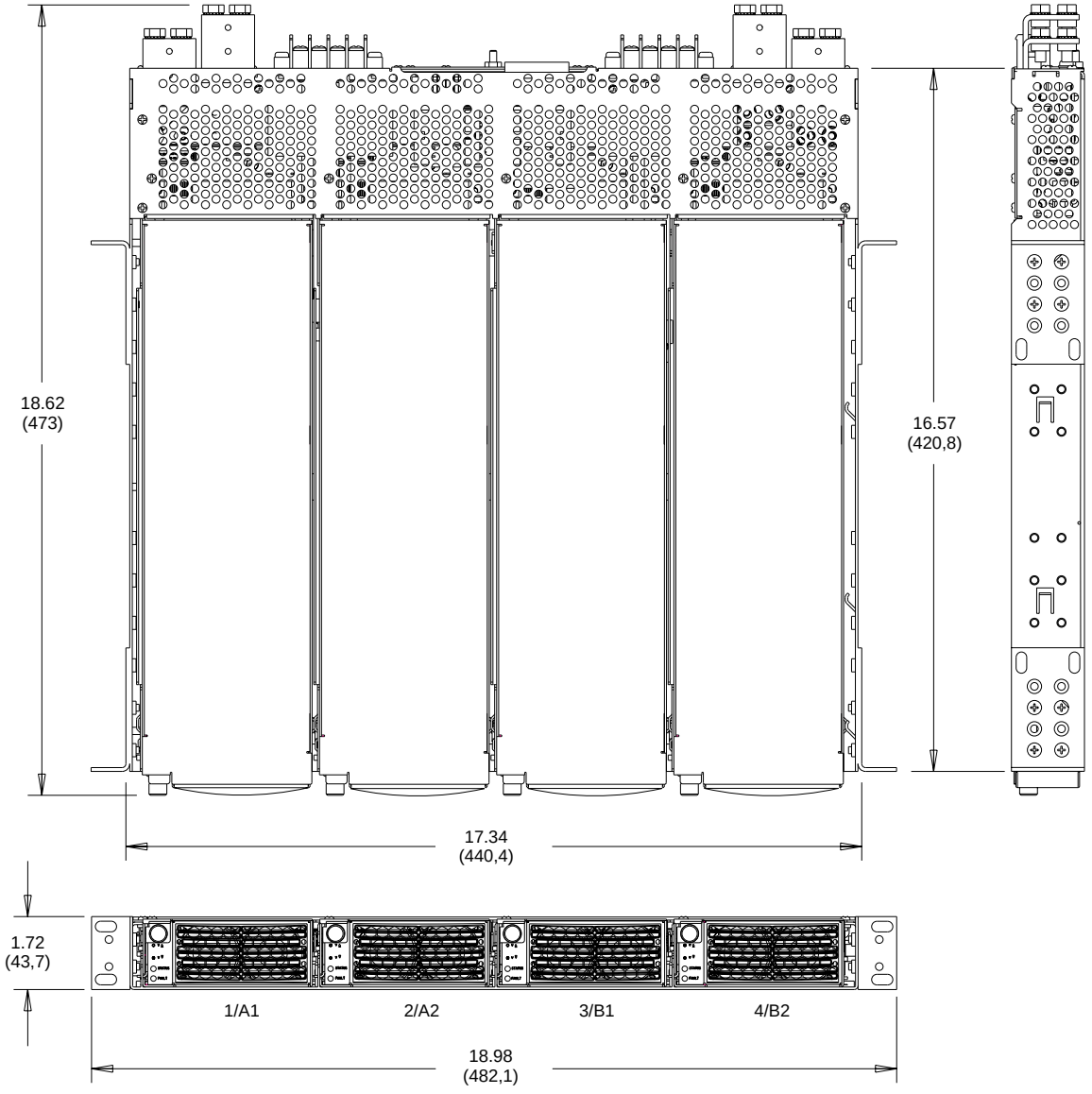


Figure 11 - Power Shelf Outline

17.0 SHELF INSTALLATION

17.1 **Mounting** - BLUEstreak Series 19-inch rack-mount power shelves are provided with universal rack- brackets that allows them to be mounted into a 1U high space in both 19-inch and 23-inch racks. The brackets can be located at various positions in the side of the shelf to allow for offset mounting in the rack.

To minimise obstruction to ventilation UNIPOWER advises that any equipment mounted directly above the BLUEstreak power shelf should be shorter in overall depth.

17.2 **Input Power Connections** - Depending on the exact model AC input power connections are made to the IEC60320-C20 or Terminal Blocks mounted at the rear of the power shelf. Each module position has its own input connector or terminals. For models incorporating IEC60320-C20 connectors UNIPOWER can supply various line cords; see the current datasheet for details. For models with Terminal Block connections a 3-wire connection is required for each module position that is to be used. The minimum suitable cable size for these connections is 14AWG or equivalent. It is recommended that each input feed is protected by its own circuit breaker. When using the version with Terminal Blocks the supplied safety covers should be fitted. The terminal block connections are #8-32 threaded screws with a 0.437” spacing, see figure 12 below.

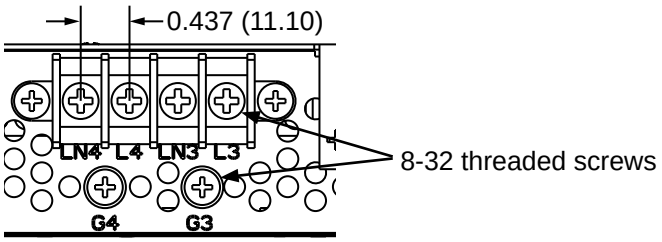


Figure 12 - AC Screw Terminal Detail

17.5 **DC Output Connections** - DC output connections are provided at the rear of the power shelf on two pairs of bus bars. Each pair is rated to carry a maximum of 200A. On single bus power shelves the bus bars are connected internally thus allowing a total output current of 400A maximum when both bars are used. On dual bus power shelves the two pairs of bus bars are isolated from each other and thus allow side A to have different voltage modules installed to side B. In all cases the output polarity can be configured either positive or negative as desired. Dual bus shelves will allow for a true A+B supply to equipment requiring such a facility. The four 1/4-20 threaded bolts on each bar are spaced 0.625” apart. UNIPOWER can supply various pre-made DC load cables; see the current datasheet for available options. Users wishing to fabricate their own DC cables should note that such cables should be rated to handle at least 300A.

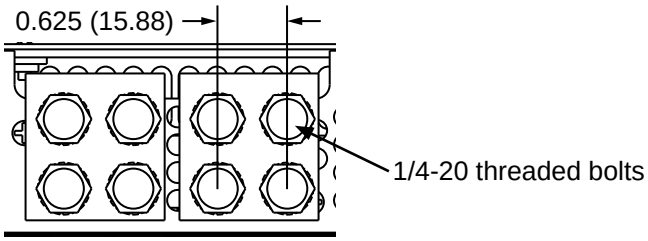
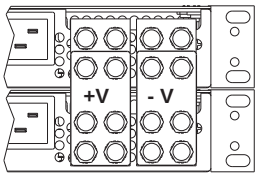


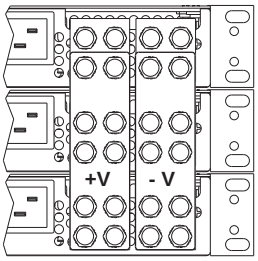
Figure 13 - DC Bus Bar Terminal Detail

17.5.1 Connecting Multiple Shelves in Parallel - Up to four power shelves can be connected together to create higher capacity power systems than can be achieved with a single shelf. UNIPOWER offers bus bar linking kits as follows:

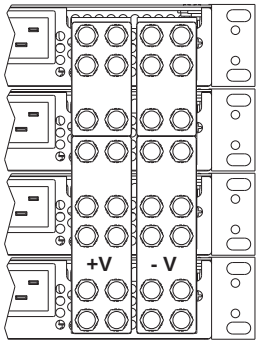
2 shelf kit, part number 775-1509-0020. Contains two short link bars, one for connecting the two positive bus bars together and one for connecting the two negative bus bars together. The two link bars are identical and interchangeable.



3 shelf kit, part number 775-1509-0030. Contains two long link bars, one for connecting the three positive bus bars together and one for connecting the three negative bus bars together. The two link bars are identical and interchangeable.



4 shelf kit, part number 775-1509-0040. Contains two short link bars and two long link bars. One short link bar and one long link bar are required for connecting the four positive bus bars together and similarly for connecting the four negative bus bars together. In each case the long bar is used to connect the bus bars from three of the shelves and the short link bar is used to connect the fourth shelf.



Note that each bus bar pair has a maximum current capacity of 200A. For systems where the total possible current capacity exceeds 200A it is necessary to fit link bars kits to both pairs of bus bars on the power shelves. It is also necessary to ensure that the equipment being powered is connected to the system in such a way that no more than 200A can be taken from each bus bar pair.

On dual bus shelves the A and B sides are galvanically isolated and one link bars kit is required for each side.

17.6 Signal Connections - These connections are made to the D-type and spring clamp terminal connectors described in section 15. Wire size for all signal connections should be 22-24AWG.

17.6.1 Connecting Multiple Shelves in Parallel - To ensure proper power sharing between parallel connected power shelves it is important to make sure that current share and –Ve Sense are connected between each shelf. See sections 15.2 and 15.3 for details on single and dual bus shelves respectively.

17.7 Cooling - The BLUEstreak power modules incorporate two DC ball bearing fans that are speed controlled according to the internal temperature of the unit. Airflow is from the front to rear with exhaust ventilation holes at the rear of the power shelf. To minimise obstruction to ventilation there should be a minimum of 3 inches (76mm) free space behind and in front of the power shelf when it is installed in the rack. UNIPOWER also recommends that any equipment mounted directly above the BLUEstreak power shelf should be shorter in overall depth so as to not obstruct any ventilation holes in the top surface.

18.0 MAINTENANCE

No routine maintenance is required on the BLUEstreak series except for periodic cleaning of dust and dirt around the front ventilation grill. A small vacuum nozzle should be used for this purpose.

19.0 SETUP AND TESTING

19.1 The BLUEstreak can be initially tested mounted in a rack or on a test bench. If two or more units are to be tested in a rack, they should first be individually tested in Position 1 (left side) of the rack.

19.2 With the input power source turned off, connect input power wires to the AC input terminals of the mating interface board, the BLUEstreak mating connector or in the case of a power shelf the input connector or terminal block on the A side of the rack. Make sure that the safety ground wire is connected. Do not touch the output terminals when AC input power is present.

19.3 Connect a resistive power load across the proper output pins, terminals or bus bars. The load should be 20% to 50% of the full load value and can be either a power resistor or electronic load set to the resistive mode. Make sure that the power resistor has adequate heat sinking and cooling.

19.4 Connect a color-coded, twisted pair (22 or 24AWG) from the remote sense pins to the load. The +Ve Sense must go to the positive side of the load and the –Ve Sense to the negative side of the load. Also connect the Enable pin to the -Ve Sense. This must be done for the unit to operate. When using the mating interface board or a power shelf, the Enable pin is automatically connected to -Ve Sense. The units are then controlled by the Control inputs.

19.5 **Checking Front Panel LEDs** - With the BLUEstreak module on the bench or in Position A of the power shelf, turn on (or plug in) the power source. The (top) green LED should be on and the (bottom) red LED should be off. If either is not the case or one of the LEDs is flashing see section 8.2 on page 8 of this manual to determine a possible cause.

19.6 **Checking the Output Voltage** - Measure the output voltage at its load with a digital voltmeter. The voltage should be within ±1% of its nominal value.

19.7 **Checking the Control Input** - Unplug the input power source. Connect a wire from the Control input to Standby Return. Turn the input power source back on. The green LED should be flashing and the red LED should remain off. Check the output voltage with a digital voltmeter. It should read zero volts.

19.8 **Checking the AC OK and DC OK Signals** - Next check the voltage on the AC OK pin with respect to Standby Return. The voltage should be a logic LO, +0.5V or less. Finally, check the voltage on the DC OK pin with respect to Standby Return. The voltage should be a logic HI, approximately +5V. These signals need pull-up resistors to 5VSB using 10K Ohm resistors.

Disconnect the wire from the Inhibit Standby return. The green LED should turn on. Check the output voltage on the DC OK pin as described above. The voltage should be a logic LO, +0.5V or less. Note that when using a mating interface board this may have LEDs connected to these signals.

19.9 **Testing other BLUEstreak modules** - For a power shelf with two, three or four BLUEstreak modules, the other modules should be plugged into Position 1 in the rack and tested in the same manner as above in Sections 19.2 to 19.8.

19.10 **Testing the Complete Power System** - With the input power source off or disconnected, insert all BLUEstreak modules into the power shelf. Connect a resistive power load of approximately 80% of full load value for a single BLUEstreak across the output. Connect a color-coded, twisted pair of remote sense leads to the load, being careful to connect the correct polarity.

Note the comments in section 9.2.1 regarding circuit breakers or fuses in the output power feed.

19.11 Turn on or plug in the input power source. Check the voltage across the load with a digital voltmeter. The voltage should be within about ± 1% of its nominal value. The green LED should be on and the red LED should be off for all units.

19.12 While the rack is operating, disengage module 1 (left one) and check the output voltage. It should be very close to the previous value and the green LED should remain on for module 2 (and 3 and 4) which are now carrying the load. Re-insert module 1 and repeat the procedure by disengaging and re-engaging modules 2, 3 and 4 in turn. The complete power shelf has now been shown to operate properly in the redundant mode with hot swapping. Disconnect the input power source.

20.0 PMBUS DEMONSTRATION PROGRAM

A Windows based program is available, enabling customers evaluating BLUEstreak to test the PMBus functionality of individual modules or complete power systems.
This program is text based and runs on Windows 98 / XP/ Vista / 7. Figure 14 below shows a typical screen shot.

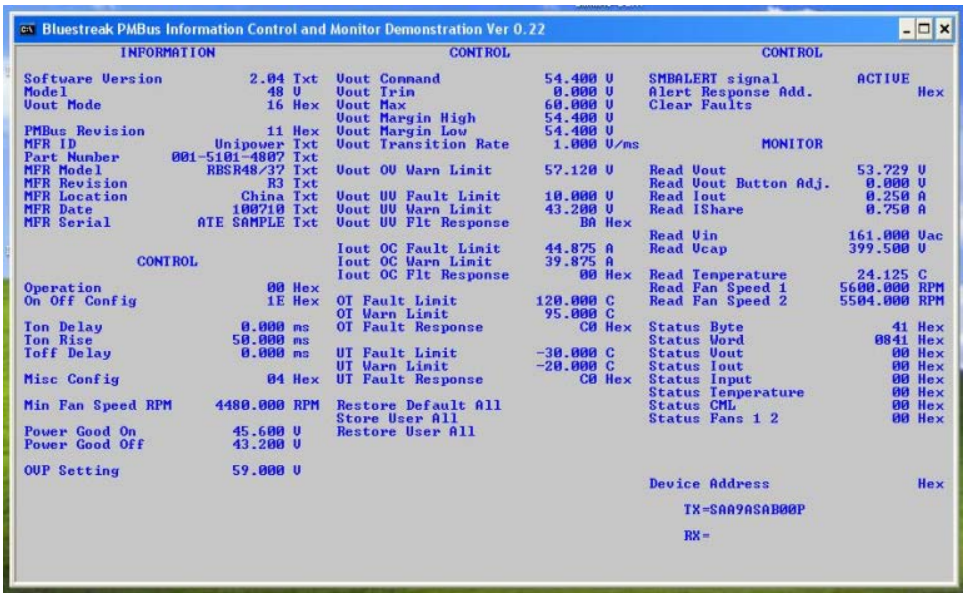


Figure 14 - PMBus Demonstration Program Screen Shot

To use this program a PC to I²C Adaptor is required and UNIPOWER recommends and can supply the I2C2PC Adaptor detailed at www.i2cchip.com/pdfs/i2c2pc.pdf.

This adaptor provides both RS232 and USB connections to the host PC and requires an external 9-12VDC power supply when the RS232 interface is utilised.

The part number for the kit that includes this adaptor and the mating interface board detailed on page 16 of this manual is 775-1519-0000. To order please contact Sales.

To download a copy of the program and associated application note go to:

https://www.unipowerco.com/pmbus/bluestreak_pmbus-demo_software.zip

The following relates to utilising the USB interface. Careful setup is required to ensure trouble

free operation.

To run the program, it is necessary create a shortcut on the windows desktop and then add the required com port outside the quote marks in the target box (shortcut properties). It will not run from the command prompt since it relies on Windows libraries to work. E.g. “ICMD24.exe” COM4
If no COM port is specified, the program defaults to COM1.

20.1 Using the USB port on the I2C-2-PC Adaptor

The I2C-2-PC Adaptor has an FTDI USB to Serial interface IC that can be used to provide a USB connection to the adaptor.

The Adaptor data sheet found at www.i2cchip.com/pdfs/i2c2pc.pdf describes how to connect to the adaptor using the USB interface.

20.1.1 Go to the FTDI website www.ftdichip.com/Drivers/VCP.htm and choose the driver for your computer.

20.1.2 Install the driver following the FTDI application note relevant to your computer.

20.1.3 Use Start/Control Panel/System/Hardware/Device Manager/Ports to find the comm port number allocated to the adaptor USB port.

20.1.4 Set the link J3 on the I2C-2-PC Adaptor under the 9 way serial connector, towards the USB connector to select the USB connector.

20.2 How to use the program

If using the program with a BLUEstreak shelf, set all of the address switches to ON. This sets the address bits low and makes the addresses 0x20, 0x22, 0x24, 0x26 from left to right as seen from the front of the shelf. If using an evaluation board with a module, set all address jumpers initially to ‘0’ to set the address to 0x20.

To change the address being scanned, click on the text that says ‘Device Address’. Type in the address of the module you would like to work on. E.g. type ‘20’ for address 0x20.

The program will scan all parameters continuously for the address selected.

To change a parameter, just click on the text for that parameter and then enter the new figure desired.

If the SMBALERT signal is active, the word ‘ACTIVE’ will appear in the top right of the program. Clicking on ‘Clear Faults’ should clear all the faults within the monitored unit unless there is a persistent fault in which case it will immediately become active again. The SMBALERT signal will be active after a unit is powered up until cleared.

The following page shows a summary of the PMBus commands used in the BLUEstreak Series. For full details please refer to the BLUEstreak PMBus Software Command Manual.

CODE	NAME	SHORT DESCRIPTION	CODE	NAME	SHORT DESCRIPTION
01h	OPERATION	Used for on/off and margining	78h	STATUS_BYTE	Reads the status byte
02h	ON_OFF_CONFIG	Used to configure the function of OPERATION	79h	STATUS_WORD	Reads the status word
03h	CLEAR_FAULTS	Clears status bytes and SMBALERT signal	7Ah	STATUS_VOUT	Reads the VOUT status register
12h	RESTORE_DEFAULT_ALL	Restores all user parameters from default store	7Bh	STATUS_IOUT	Reads the IOUT status register
15h	STORE_USER_ALL	Stores all user parameters in the user store	7Ch	STATUS_INPUT	Reads the INPUT status register
16h	RESTORE_USER_ALL	Restores all user parameters from user store	7Dh	STATUS_TEMPERATURE	Reads the TEMPERATURE status register
20h	VOUT_MODE	Reads the data format for VOUT related commands	7Eh	STATUS_CML	Reads the CML status register
21h	VOUT_COMMAND	Sets the output voltage	81h	STATUS_FANS_1_2	Reads the FAN status register
22h	VOUT_TRIM	Trims the output voltage	88h	READ_VIN	Reads the VIN voltage value
24h	VOUT_MAX	Sets the voltage above which an alert will be issued	8Ah	READ_VCAP	Reads the VCAP voltage value
25h	VOUT_MARGIN_HIGH	Sets the output voltage when high margin is set	8Bh	READ_VOUT	Reads the output voltage value
26h	VOUT_MARGIN_LOW	Sets the output voltage when low margin is set	8Ch	READ_IOUT	Reads the output current value
27h	VOUT_TRANSITION_RATE	Sets the rate of change of output voltage	8Dh	READ_TEMPERATURE_1	Reads the internal temperature value
42h	VOUT_OV_WARN_LIMIT	Sets the output over voltage warning limit	90h	READ_FAN_SPEED_1	Reads the speed of fan 1
43h	VOUT_UV_WARN_LIMIT	Sets the output under voltage warning limit	91h	READ_FAN_SPEED_2	Reads the speed of fan 2
44h	VOUT_UV_FAULT_LIMIT	Sets the output under voltage fault limit	98h	PMBUS_REVISION	Reads the revision of the PMBus implementation
45h	VOUT_UV_FAULT_RESPONSE	Sets the output under voltage fault response	99h	MFR_ID	Reads the manufacturer ID
46h	IOUT_OC_FAULT_LIMIT	Sets the output over current fault limit	9Ah	MFR_MODEL	Reads the power supply model number
47h	IOUT_OC_FAULT_RESPONSE	Sets the output over current fault response	9Bh	MFR_REVISION	Reads the power supply hardware revision
4Ah	IOUT_OC_WARN_LIMIT	Sets the output over current warning limit	9Ch	MFR_LOCATION	Reads the power supply manufacturer location
4Fh	OT_FAULT_LIMIT	Sets the over temperature fault limit	9Dh	MFR_DATE	Reads the power supply manufacture date
50h	OT_FAULT_RESPONSE	Sets the over temperature fault response	9Eh	MFR_SERIAL	Reads the power supply serial number
51h	OT_WARN_LIMIT	Sets the over temperature warning limit	D0h	OVP_SETTING	Sets the OVP voltage level
52h	UT_WARN_LIMIT	Sets the under temperature warning limit	D1h	READ_ISHARE	Reads the ISHARE current level
53h	UT_FAULT_LIMIT	Sets the under temperature fault limit	D2h	READ_VOUT_BUTTON_ADJ	Reads the voltage adjustment offset of the buttons
54h	UT_FAULT_RESPONSE	Sets the under temperature fault response	D3h	MINIMUM_FAN_SPEED	Sets the minimum fan speed
5Eh	POWER_GOOD_ON	Sets the output power good turn on voltage level	D4h	MISC_CONFIG	Enables front panel buttons, signal polarity,
5Fh	POWER_GOOD_OFF	Sets the output power good turn off voltage level	D5h	SOFTWARE_REVISION	Reads the software revision
60h	TON_DELAY	Sets the time before the output voltage comes up	D6h	MODEL	Reads the basic hardware model (12,24,48)
61h	TON_RISE	Sets the output voltage rise time.	D7h	PART_NUMBER	Reads the module part number (001-xxxx-xxxx)
64h	TOFF_DELAY	Sets the delay time before the output goes off			

Figure 15 - PMBus Command Summary

21.0 TROUBLESHOOTING GUIDE

If you encounter difficulties in getting a BLUEstreak module or complete power system to operate properly, check all connections carefully and use the following as a troubleshooting guide.

LED	Status	Condition	Possible Cause
GREEN	ON	DCOK is TRUE	-
	Flashing	DCOK is FALSE	Unit is inhibited or not enabled
	OFF	DCOK is FALSE	Unit is not inhibited
RED	ON	DC Output is off (alarm condition)	Temperature above or below allowed limits. OVP latch activated. Overcurrent or short circuit (DCOK is FALSE). Processor Failure (Green LED off).
	Flashing	DC Output is on (warning condition)	Fans below expected speed. Temperature high or low. Output current close to maximum. Output on but DCOK is FALSE. AC supply outside of normal range.
	OFF	DC Output is on	No warning or alarm condition.

Product support can be obtained using the following addresses and telephone numbers.

Corporate office:
UNIPOWER, LLC
210 N University Dr
Coral Springs, FL 33071
United States

Manufacturing facility:
UNIPOWER, LLC
65 Industrial Park Rd
Dunlap, TN 37327
United States

Manufacturing facility:
UNIPOWER Slovakia SRO
ZLATOVSKA 1279
Business Center 22
91105 Trencin, Slovakia

Phone: +1-954-346-2442
Toll Free: 1-800-440-3504
Web site – www.unipowerco.com

When contacting UNIPOWER, please be prepared to provide:

1. The product model number, spec number, S build number, and serial number - see the equipment nameplate on the front panel
2. Your company's name and address
3. Your name and title
4. The reason for the contact
5. If there is a problem with product operation:
    - Is the problem intermittent or continuous?
    - What revision is the firmware?
    - What actions were being performed prior to the appearance of the problem?
    - What actions have been taken since the problem occurred?