UNIPOWER
Powering Technology

OPERATING MANUAL
SLIMLINE760 SERIES
FRONT-ENDS

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OPERATING MANUAL
SLIMLINE760 SERIES FRONT-ENDS

1.0 INTRODUCTION

This Operating Manual should be read through carefully before installing and operating the Slimline760 Series Front-Ends.

UNIPOWER's Slimline760 Series are new generation high density hot-swap Front-Ends for Networking and DataCom applications that utilize 12V Bus Architecture. With a power density of 17.5W/in3 and efficiency of Up to 92%, these "GREEN" power solutions help system designers satisfy increasing demands for reduced energy consumption, smaller size and reduced costs.

Operating from either a Universal 90-264VAC input, 36-75VDC input or high voltage DC input up to 400VDC, these 760 Watt Power Modules feature both Analogue and PMBus communications for status and control of each power module. Front panel LED indicators communicate status or fault conditions for easy identification in any environment. N+N Redundant operation is achieved with active load sharing and ORing protection circuits.

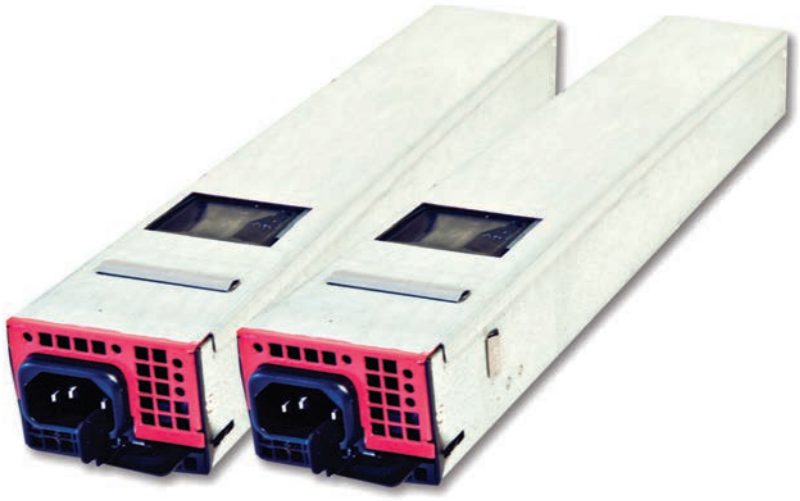

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Figure 1 - Slimline760 Modules

2.0 STANDARD FEATURES

- ◆ Up to 92% Efficiency
- ◆ 1U High: 1.57”
- ◆ -20°C to +50°C Operation
- ◆ Universal AC or HVDC Input or 48VDC Input
- ◆ >0.95 Power Factor (minimum)
- ◆ Output Voltages: 12 VDC & 5VSB
- ◆ Power Density to 17.5W/Cu. Inch
- ◆ Hot Swappable
- ◆ Integral Active Output ORing Circuit
- ◆ Class A EMI Filter
- ◆ LED Indicators
- ◆ PMBus Serial Communications
- ◆ Variable Speed Cooling Fan
- ◆ Reverse Airflow Models

3.0 SUMMARY OF PRODUCT LINE

3.1 Standard Modules

POWER [1]	12VOUT	5VOUT	INPUT	MODEL [6]
760W	62.5A	2A	115/230VAC [3]	SGL3000
760W	62.5A [4]	2A	115/230VAC [3]	SGL3000-R [2]
760W	62.5A	2A	48VDC	SGLQ3000
760W	62.5A [5]	2A	48VDC	SGLQ3000-R [2]

Notes:
1. Total combined power output may not exceed 760 Watts.
2. **-R** denotes reverse airflow option (exit through front plate).
3. Input can be either AC or HVDC.
4. Reverse air @ 50C and <100V derates 6W/Vin to 90V.
5. Reverse air @ 50C and <44V derates to 660W.
6. For ‘common ground’ option where chassis ground is connected to output return add ‘**-C**’ to the model number.

3.2 Accessories

DESCRIPTION	PART NUMBER	
	UNIPOWER	MANUFACTURER
Mating Connector (Output)	354-1755-0000	**Molex:** 45984-4343
Mating Connector (DC Input)	775-1510-0000	**AllTop:** C99622-903G8-W
Evaluation Board	009-4167-0000	

The above referenced AllTop connector kit consists of a housing and three pins with solder buckets. The recommended wire size for these connections is #12AWG.

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)

Slimline760 Series Front-Ends 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 MODULE SPECIFICATIONS

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

INPUT
SGL3000, SGL3000-R
Voltage Range 90-264VAC
90-420VDC[1]
Power Factor ..... >0.95
Total Harmonic Distortion, Max. 5%
Frequency 47-63Hz
Inrush Current Limiting, Max. ..... 15/30A Peak @ 115/230 VAC
Input Protection ..... Internal Fuse, 15A

SGLQ3000, SGLQ3000-R
Voltage Range 36-75VDC
Inrush Current Limiting, Max. ..... 50A Peak
Input Protection ..... Internal Fuse, 30A

INPUT EMI
Line Conducted Emissions ..... FCC20780 pt. 15J Curve A
EN55022 Curve A
Fast Transients Immunity EN61000-4-4
Surges Immunity EN61000-4-5

OUTPUT
Current & Voltage ..... See Model Table
Remote Sense Compensation 200mV
Output Power 760W
Ripple / Noise, max ..... 12V = 120mV | 5V = 100mV
Line Regulation ..... Max ±0.5%
Load Regulation ..... Max ±1%
Transient Load / Slew Rate 0.5A/µs
Holdup Time ..... 12msec @ Full load
Overvoltage Protection (12V Only) ..... 14.5V Max (Latch Off)
Current Limit ..... >105%
Efficiency[2]
20% Load ..... >88%
50% Load ..... >92%
Full Load ..... >90%

STATUS INDICATORS
IPOK (Green) ..... Indicates Input within operating range
DCOK (Green) ..... Indicates 12V DC Output within normal limits
STATUS (Yellow/Red) ..... Indicates various fault conditions

ALARM SIGNALS (open drain, TTL compatible)
PSON ..... Remote ON Off (LOW=ON)
PSKILL ..... Enable 12V (Short)
PWOK ..... Power Good (HIGH)
Present ..... Indicates Power Module is present
ACOK ..... Input OK (LOW)
EEPROM-WP ..... Write Protect, LOW to write

PMBus
Version Compliance 1.2

ENVIRONMENTAL
Operating Temp. Range ..... -20°C to +50°C (Full Load)
Output Current Derating ..... 2.5%/°C, 50°C to 70°C
Storage Temp. Range ..... -40°C to 85°C
Altitude Derating at 50°C ambient[3]
>100V input ..... 2%/1,000ft above 10,000ft
<100V input ..... 2%/1,000ft above 3,000ft
Environment ..... Pollution Degree 2
Humidity ..... 0% to 95%, Non-Condensing
ESD ..... Bellcore GR-1089-Core and EN61000-4-2
MTBF, 25°C (Telcordia SR-332 issue 2) ..... 700,000 Hours
Cooling ..... Integral Ball Bearing Fan
Acoustic Noise @ 1m (module) ..... 55dB Typ., 70dB Max.

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

PHYSICAL SPECIFICATIONS
Case Material ..... Steel
Case Dimensions, Inches (mm) ..12.68”(L) x 2.15”(W) x 1.57”(H)
(322 x 54.6 x 40mm)
Weight ..... 2.2 lbs. (1.0 kg.)

Notes:
1. Requires external DC protection.
2. AC Input Models.
3. Absolute maximum altitude is 15,000ft.

8.0 FRONT PANEL DESCRIPTION

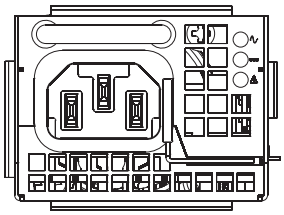

Figure 2 - Front Panel View AC & HVDC Input

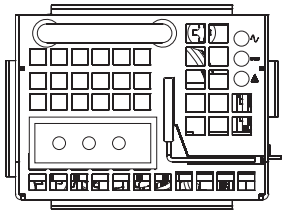

Figure 2b - Front Panel View 48VDC Input

8.1 INPUT CONNECTIONS

Slimline760 can accept Mains AC & High Voltage DC input as well as a nominal 48VDC input.

Models SGL3000 and SGL3000-R accept Mains AC and High Voltage DC and incorporate a front panel mounted IEC60320-C13 inlet connector while models SGLQ3000 and SGLQ3000-R accept 48VDC input via an AllTop locking connector.

Please consult sale for AC inlet cords that are available from UNIPOWER. Details of the mating connector for the 48VDC input units are shown in section 3.2.

8.2 FRONT PANEL INDICATORS

The three front panel indicators together indicate the status of the power module according to the table below.

LED	State	Condition
IPOK (top)	Solid GREEN	Input Voltage within operating range
	OFF	Input Voltage over or under operating range
DCOK (middle)	Solid GREEN	DC Output within normal range
	OFF	DC Output Inhibited
STATUS (bottom)	OFF	No Fault, Outputs On or Standby Mode
	Solid YELLOW	+12V in Current Limit Over or Under Temperature Warning Minor Fan Fault 5VSB Out of Limits AC Input Low
	Solid RED	Over or Under Temperature Shutdown Overvoltage Shutdown Major Fan Fault IPOK and DCOK LEDs Both Off

Table 1 - LED Indicators

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 programming with the PMBus. Note that all of the power pins must be used for correct operation and to avoid overheating of the edge connector. The power output terminals are isolated from chassis ground to a maximum voltage of 50Vdc. (not -C option.)

9.2 I/O Signals

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

9.2.1 12V Sense +Ve (S1), 12V Sense –Ve (S2)

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 0.1V 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.

9.2.2 12V Current Share (S3)

This signal is connected between all modules required to share a load. This signal is capable of driving up to 8 modules. The return path for this signal is Signal Ground and that signal should also be connected between all modules for correct sharing operation.

9.2.3 Signal Ground (S13, 16)

This is the return path for many of the module signals as well as the +5V standby output and is connected to 12V Return (P3, 4).

9.2.4 5VSB (S11, 12, 23, 24)

This is the standby supplies. It is always present when the AC is within the operating range of the module. The maximum available current is 2A. The return for this power rail is Signal Ground (S13 & S16). There is an internal ORing diode so that the output can be connected to the same output of additional units directly on the backplane.

9.2.5 #IPOK (S19)

This signal provides an open drain output that indicates the status of the 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 Signal Ground. The #IPOK signal will give typically 2ms of warning at full load before the output loses regulation when operating the SGL3000 or SGL3000-R from an AC source.

9.2.6 #PWOK (S9)

This signal provides an open drain output which 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 Signal Ground. The #PW OK signal is also available within the status bytes of the PMBus.

9.2.7 #MODULE TYPE (S20)

This signal provides an open drain output that indicates the type of unit. It is Open Circuit for the SGL3000 and SLG3000-R and short circuit for the SGLQ3000 and SGLQ3000-R. 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 Signal Ground.

9.2.8 #PRESENT (S14)

This signal can be used to detect if a module is present. It is connected to Signal Ground when the module is present. This signal can sink up to 30mA. The return path for this signal is Signal Ground.

9.2.9 #PS KILL (S7)

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 the edge connector caused by arcing of high currents. The return path for this signal is Signal Ground. The #PS KILL pin should be connected to Signal Ground on the backplane for correct operation.

9.2.10 PS ON (S8)

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 on. This function can be changed using the PMBus so that either a high signal will turn the main output off or the pin is ignored altogether. This behaviour allows 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 Signal Ground. The driving circuit should be capable of sinking and sourcing at least 0.5mA.

9.2.11 SCL (S6), SDA (S5)

These are the serial data bus (PMBus) signals used for digital communication. This communication bus is similar to the standard I^2C 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 1.2 and the Slimline760 software manual respectively. The PMBus signals are returned to Signal Ground. They require pull-up resistors or active pull-up circuits to 3.3V or 5V.

9.2.12 #SMBALERT (S4)

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 Signal Ground. It requires pull-up resistors or active pull-up circuits to 3.3V or 5V.

9.2.13 A0 (S15), A1 (S10), A2 (S21)

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 (Signal Ground) for '0'. The return path for these lines is standby return.

9.2.14 EEPROM-WP (S18)

This signal is used to protect the internal EEPROM from being inadvertently written to. Connecting this signal to Signal Ground allows PMBus WRITE commands. Connect to 5VSB to prevent writes.

NOTE: Pins S17 and S22 on the connector are reserved for future use. No connection should be made to these pins even though they are internally unconnected.

9.3 Timing

The following table and diagram give details of signal and power timing for the SGL3000 and SGL3000-R during power up and power down cycles.

Value	Min.	Typ.	Max.	Description
TACON_DELAY	1000ms	1800ms	2000ms	Delay from AC input voltage applied to output in regulation.
TVOUT_HOLDUP	12ms	15ms		Time from loss of AC input to DC output voltage falling to 90% of original value. Timing given is for full load.
TVSB_HOLDUP	20ms	80ms		Time from loss of AC input to VSB going out of regulation. Typical timing given is for full load on all outputs.
TVSB_ON	100ms	1000ms	1500ms	Delay from AC input voltage applied to VSB in regulation.
TACOK_ON	1000ms	1700ms	2000ms	Time from AC input voltage applied to ACOK output being low (good).
TACOK_OFF	10ms	12.5ms		Time from loss of AC input to ACOK output being high. Timing given is for full load.
TVOUT_RISE	5ms	10ms	15ms	Time for DC output to rise to final regulated voltage.
TVSB_RISE	5ms	12ms	15ms	Time for VSB to rise to final regulated voltage.
TPSON_DELAY		50ms		Time from PSON going low to main output coming on (default, this is reprogrammable via PMBus)
TPSOFF_DELAY		50ms		Time from PSON going high to main output going off (default, this is reprogrammable via PMBus)
TPWOK_ON	99ms	100ms	1000ms	Time from main output being in regulation to PWOK going high.
TPWOK_FALL	50ns	100ns	1000ns	Time for PWOK signal to transition from high to low*
TPWOK_RISE	1µs	2µs	10µs	Time for PWOK 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*

*PWOK and ACOK signals pulled up to 5V with 10kOhm resistor.

Table 2 - Timing (SGL3000 & SGL3000-R)

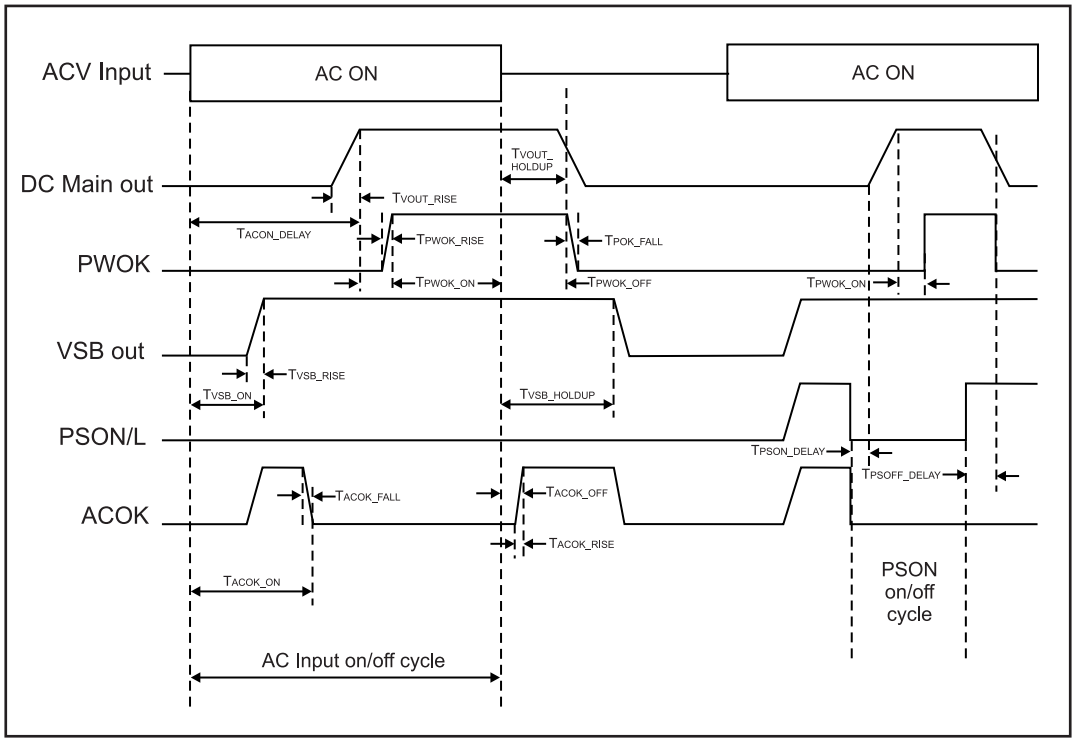

Figure 3 - Timing Diagram (SGL3000 & SGL3000-R)

10.0 MECHANICAL SPECIFICATIONS

The mechanical dimensions of the Slimline760 module are shown.

Note that Slimline760 modules are designed for hot-swap applications only and are not provided with any fixing points.

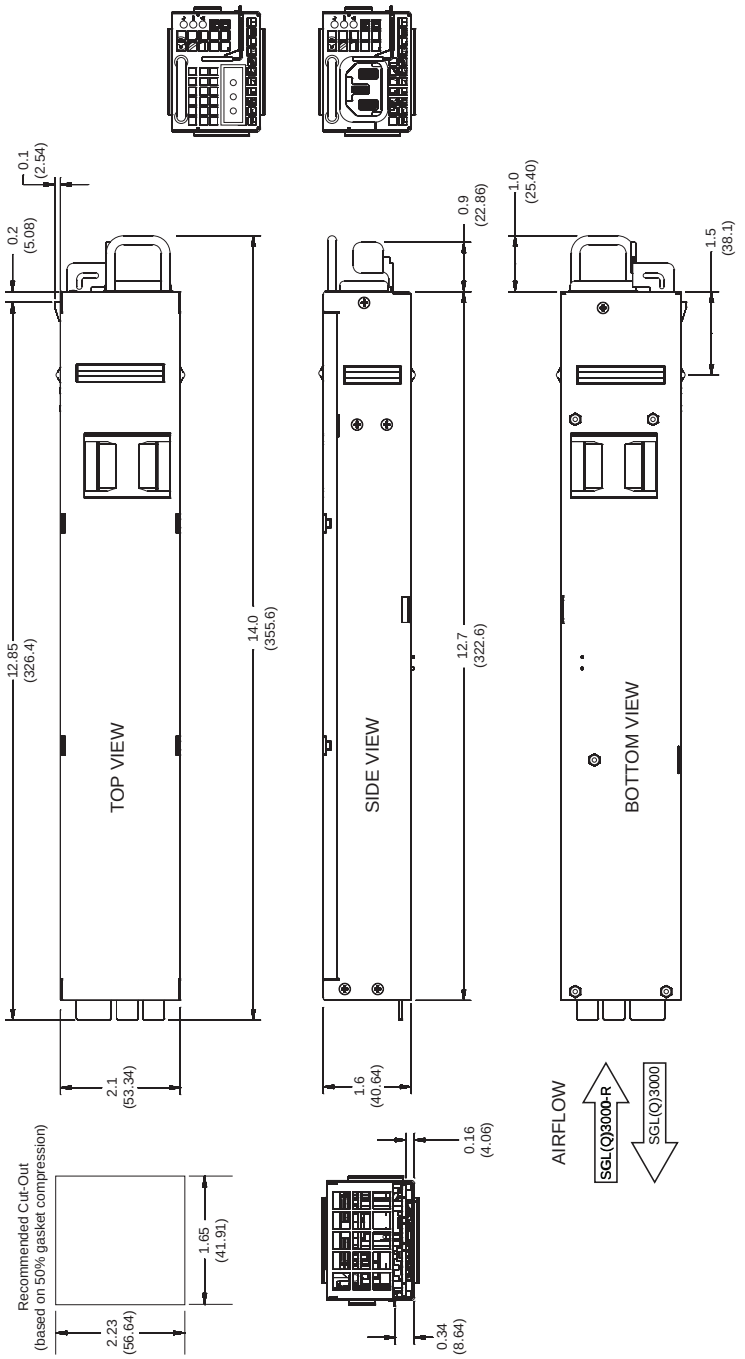

Figure 4 - Module Dimensions

11.0 SAFETY AND INDUSTRY STANDARDS

11.1 Slimline760 modules meet the following safety standards:

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

11.2 Slimline760 modules are CE Marked to indicate conformance with the European Union's Low Voltage Directive.

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

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 AC & HVDC Input Voltage and Connection

The Slimline760 Series models SGL3000 and SGL3000-R operate from worldwide AC input voltages in the range of 85 to 264VAC at 47 to 63Hz. These units will also operate from a DC input voltage in the range 90 to 400VDC. There are restrictions to the available total output power for the SGL3000-R when operating at below 100V input. The three-wire input connection is made via a front panel mounted IEC60320-C13 inlet as shown in figure 2a on page 8 of this manual.

12.2 48VDC Input Voltage and Connections

The Slimline760 Series models SGLQ3000 and SGLQ3000-R operate from a DC input voltage in the range 36-72VDC. There are restrictions to the available total output power for the SGLQ3000-R when operating at below 40V input. The three-wire input connection is made via a front panel mounted lockable Positronic connector as shown in figure 2b on page 8 of this manual.

12.3 Output Connections

The main 12V output is provided on pins P1 to P4 on the edge connector at the rear end of the unit. Pins P1 and P2 are connected together internally for the +V Out; while pins P3 and P4 are connected together internally for the V Return or Ground. The output on standard units is fully floating and may be configured for positive or negative operation.

When option **-C** is selected the output return is connected to chassis ground and the unit may only be used for +12V output.

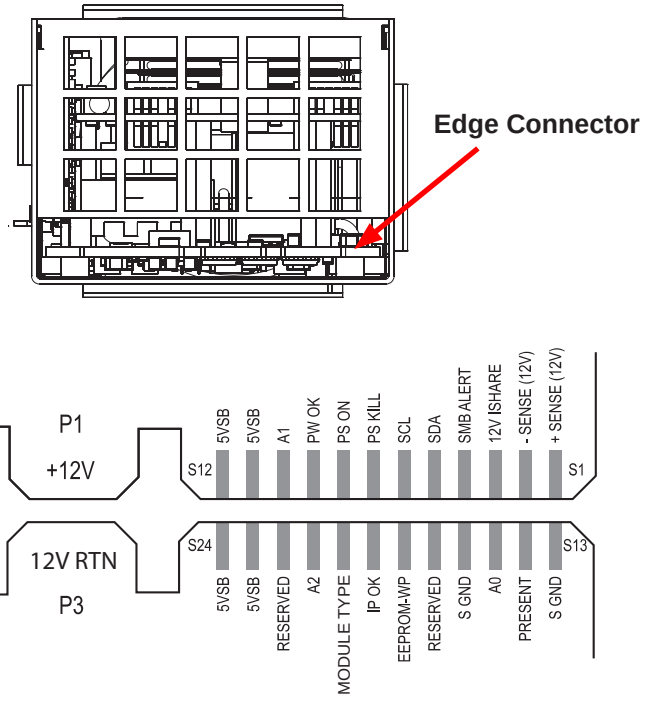

Figure 5 - Module Rear View & Edge Connector Details

Pin	Pin Name	Function
P1,2	+12V	+12V Power Output
P3,4	12V RTN *	+12V Return
S1	+SENSE(12V)	+12V Remote Sense
S2	-SENSE(12V)	+12V Remote Sense Return
S3	12V ISHARE	12V Current Share
S4	SMBALERT	SMBus Interrupt
S5	SDA	SMBus Data
S6	SCL	SMBus Clock
S7	PS KILL	Hot-Plug Enable
S8	PS ON	Remote On/OFF Input (LOW=ON)
S9	PW OK	DC Output OK (HIGH=GOOD)
S10	A1	SMBus Address
S11,12,23,24	5VSB	+5V Standby Output
S13,16	S GND	Signal Ground
S14	PRESENT	Indicates that unit is plugged in
S15	A0	SMBus Address
S17, 22	RESERVED	Not Used
S18	EEPROM-WP	Write Protect (HIGH=PROTECT)
S19	IP OK	Input Power OK (HIGH=GOOD)
S20	MODULE TYPE	O/C for AC Unit or GND for DC Unit
S21	A2	SMBus Address

* Connected to chassis when option **-C** is specified.

Table 3 - Edge Connections

12.4 Mating Interface Board

Figure 7 shows a mating interface board which is available for simplifying the testing of a Slimline760 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.

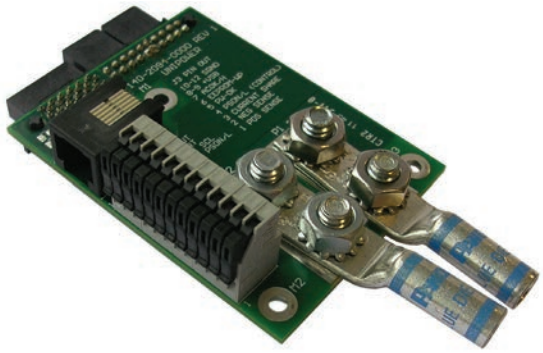

Figure 6 - Mating Interface Board

12.5 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 11.4V – 12.6V using the PMBus interface.

12.6 Output Power & Current

The absolute maximum output power is 760W. This includes both the main 12V output and the 5V Standby Output.

When the output voltage is adjusted below the nominal voltage the maximum current still applies. Conversely, when the output voltage is adjusted above the nominal voltage shown the maximum power still applies.

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 reverse airflow models require additional derating when operating at low input supply voltage. The following table detail this derating dependent on model and input voltage.

Model	Input Voltage	Derating *
SGL3000-R	<100VAC	6W/Vin to 90V
SGLQ3000-R	<44VDC	660W

* Derating effective at 50°C air inlet temperature.

Table 4 - Derating

12.7 Overvoltage Protection

The power supply has an internal O.V.P. protection circuit. It operates at a fixed voltage level of 14.4V.

In order to reset the O.V.P. latch, the input must be cycled off for at least 5 seconds and the red LED goes off before turning back on.

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

12.8 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.

12.9 Remote Sensing

Remote sensing connections are made to pins S1 and S2 on the connector. Remote sensing is not available on the +5V Standby 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. The +Sense lead (pin S1) must be connected to the +Ve side of the load and the - Sense lead (pin S2) 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 0.1V 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.

12.10 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 Signal Ground.

12.11 PMBus

The PMBus is available on the connector at the rear of the unit. Slimline760 modules can be set to addresses 30h, 32h, 34h, 36h, 3Ah, 3Ch or 3Eh.

13.0 PARALLEL OPERATION

13.1 Parallel Connection

Two or more Slimline760 modules can be operated in parallel by connecting their outputs in parallel and connecting their current share pins together (S3).

13.2 Redundant Operation

Connecting two Slimline760 modules in parallel so that the full required 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 Slimline760 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 up multiple modules in the non-redundant mode. 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 Slimline760 modules that can be operated in parallel is limited to 8.

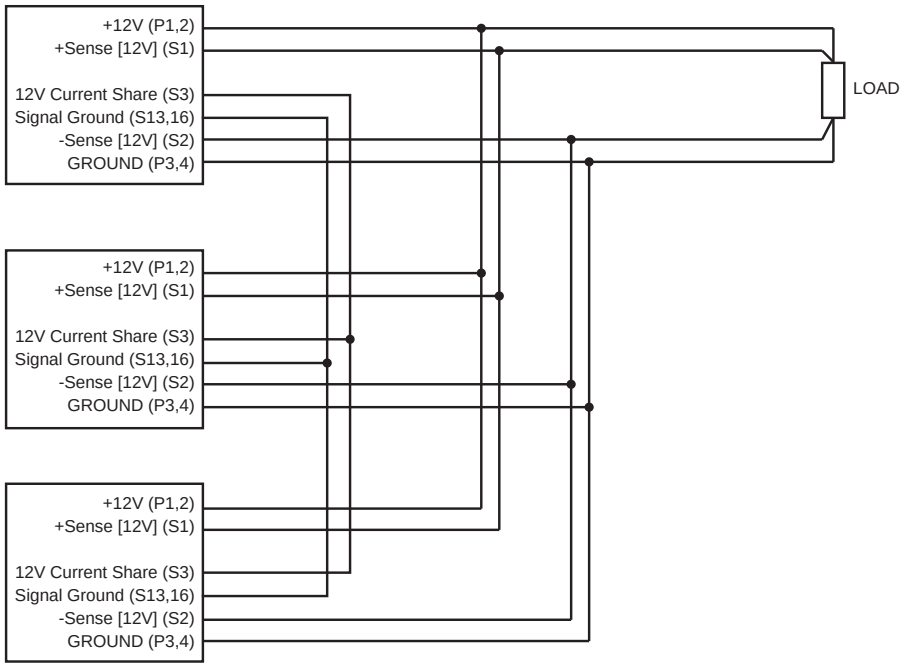

Figure 7 - Connection Diagram for Parallel Operation

14.0 INSTALLATION

Slimline760 Series modules are designed for mounting into the customer's OEM housing. Fixing in place is achieved by means of a latching mechanism.

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 12.4 on page 16 of this manual.

15.0 MAINTENANCE

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

16.0 SETUP AND TESTING

16.1 The Slimline760 can be initially tested on a test bench using the evaluation board.

16.2 With the input power source turned off, connect input power input connector on the front panel of the Slimline760 module. Make sure that the safety ground wire is connected. Do not touch the output terminals when AC input power is present.

16.3 Connect a resistive power load across the proper output pins or terminals. 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.

16.4 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 PSKILL and PSON to Signal Ground. This must be done for the unit to operate. When using the mating interface board the PSKILL pin is automatically connected to Signal Ground. The unit is then controlled by the Control inputs.

16.5 **Checking Front Panel LEDs -** With the Slimline760 module on the bench turn on (or plug in) the power source. The two green LEDs should be on and the red LED should be off. If this is not the case see section 8.2 on page 8 of this manual to determine a possible cause.

16.6 **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.

16.7 Checking the PSON Input - Unplug the input power source. Remove the wire from the PSON input to Signal Ground. Turn the input power source back on. The (middle) green LED should be off. Check the output voltage with a digital voltmeter. It should read zero volts.

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

Connect the wire from PSON and Signal Ground. The middle green LED should turn on. Check the output voltage on the PWOK pin as described above. The voltage should be a logic LO, +0.5V or less.

17.0 PMBUS DEMONSTRATION PROGRAM

A Windows based program is available, enabling customers evaluating Slimline760 to test the PMBus functionality of individual modules or complete power systems.

This program is text based and runs on Windows 98/XP/Vista/7/8. Figure 8 below shows a typical screen shot.

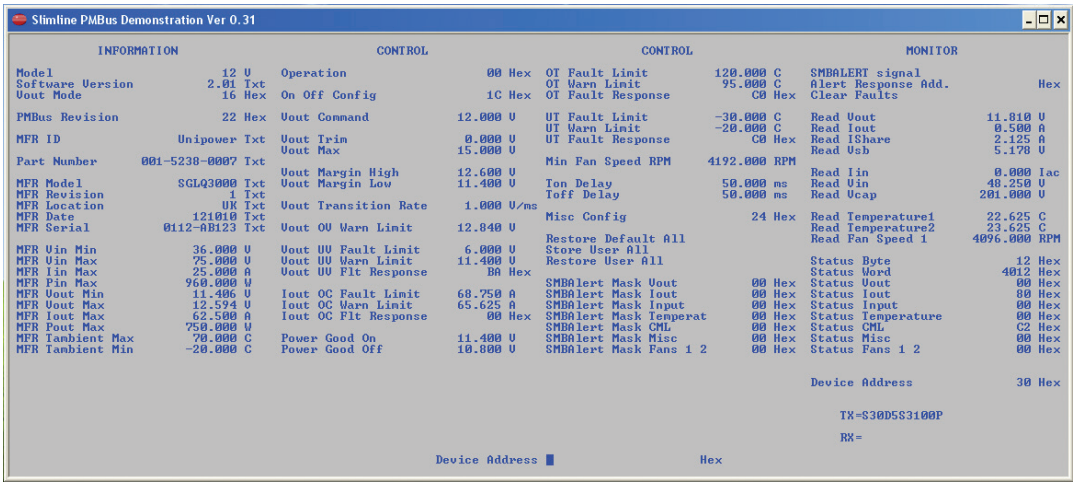

Figure 8 - PMBus Demonstration Program Screen Shot

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 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. "ICMD31.exe" COM4

If no COM port is specified, the program defaults to COM1.

17.1 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.

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

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

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

17.1.4 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.

17.2 How to use the program

If using an evaluation board with a module, the address jumpers are pre-set to '0' to set the address to 0x30.

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 '30' for address 0x30.

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 Slimline760 Series. For full details please refer to the Slimline760 PMBus Software Command Manual.

CODE	NAME	SHORT DESCRIPTION	CODE	NAME	SHORT DESCRIPTION
01h	OPERATION	Used for on/off and margining	7Eh	STATUS_CML	Reads the CML status register
02h	ON_OFF_CONFIG	Used to configure the function of OPERATION	80h	STATUS_MISC	Reads the misc. status register
03h	CLEAR_FAULTS	Clears status bytes and SMBALERT signal	81h	STATUS_FANS_1_2	Reads the FAN status register
12h	RESTORE_DEFAULT_ALL	Restores all user parameters from default store	88h	READ_VIN	Reads the VIN voltage value
15h	STORE_USER_ALL	Stores all user parameters in the user store	89h	READ_IIN	Reads the IIN current value
16h	RESTORE_USER_ALL	Restores all user parameters from user store	8Ah	READ_VCAP	Reads the VCAP voltage value
20h	VOUT_MODE	Reads the data format for VOUT related commands	8Bh	READ_VOUT	Reads the output voltage value
21h	VOUT_COMMAND	Sets the output voltage	8Ch	READ_IOUT	Reads the output current value
22h	VOUT_TRIM	Trims the output voltage	8Dh	READ_TEMPERATURE_1	Reads the internal temperature value
24h	VOUT_MAX	Sets the voltage above which an alert will be issued	8Eh	READ_TEMPERATURE_2	Reads the internal temperature value
25h	VOUT_MARGIN_HIGH	Sets the output voltage when high margin is set	90h	READ_FAN_SPEED_1	Reads the speed of fan 1
26h	VOUT_MARGIN_LOW	Sets the output voltage when low margin is set	98h	PMBUS_REVISION	Reads the revision of the PMBus implementation
27h	VOUT_TRANSITION_RATE	Sets the rate of change of output voltage	99h	MFR_ID	Reads the manufacturer ID
42h	VOUT_OV_WARN_LIMIT	Sets the output over voltage warning limit	9Ah	MFR_MODEL	Reads the power supply model number
43h	VOUT_UV_WARN_LIMIT	Sets the output under voltage warning limit	9Bh	MFR_REVISION	Reads the power supply hardware revision
44h	VOUT_UV_FAULT_LIMIT	Sets the output under voltage fault limit	9Ch	MFR_LOCATION	Reads the power supply manufacturer location
45h	VOUT_UV_FAULT_ RESPONSE	Sets the output under voltage fault response	9Dh	MFR_DATE	Reads the power supply manufacture date
46h	IOUT_OC_FAULT_LIMIT	Sets the output over current fault limit	9Eh	MFR_SERIAL	Reads the power supply serial number
47h	IOUT_OC_FAULT_ RESPONSE	Sets the output over current fault response	D0h	OVP_SETTING	Sets the OVP voltage level
4Ah	IOUT_OC_WARN_LIMIT	Sets the output over current warning limit	D1h	READ_ISHARE	Reads the ISHARE current level
4Fh	OT_FAULT_LIMIT	Sets the over temperature fault limit	D2h	READ_VSB	Reads the standby voltage
50h	OT_FAULT_RESPONSE	Sets the over temperature fault response	D3h	MINIMUM_FAN_SPEED	Sets the minimum fan speed
51h	OT_WARN_LIMIT	Sets the over temperature warning limit	D4h	MISC_CONFIG	Enables front panel buttons, signal polarity
52h	UT_WARN_LIMIT	Sets the under temperature warning limit	D5h	SOFTWARE_REVISION	Reads the software revision
53h	UT_FAULT_LIMIT	Sets the under temperature fault limit	D6h	MODEL	Reads the basic hardware model (12,24,48)
54h	UT_FAULT_RESPONSE	Sets the under temperature fault response	D7h	PART_NUMBER	Reads the module part number (001-xxxx-xxxx)
5Eh	POWER_GOOD_ON	Sets the output power good turn on voltage level	A0h	MFR_VIN_MIN	Returns the minimum input voltage rating
5Fh	POWER_GOOD_OFF	Sets the output power good turn off voltage level	A1h	MFR_VIN_MAX	Returns the maximum input voltage rating
60h	TON_DELAY	Sets the time before the output voltage comes up	A2h	MFR_IN_MAX	Returns the maximum input current rating
64h	TOFF_DELAY	Sets the delay time before the output goes off	A3h	MFR_PIN_MAX	Returns the maximum input power rating
78h	STATUS_BYTE	Reads the status byte	A4h	MFR_VOUT_MIN	Returns the minimum output voltage rating
79h	STATUS_WORD	Reads the status word	A5h	MFR_VOUT_MAX	Returns the maximum output voltage rating
7Ah	STATUS_VOUT	Reads the VOUT status register	A6h	MFR_IOUT_MAX	Returns the maximum output current rating
7Bh	STATUS_IOUT	Reads the IOUT status register	A7h	MFR_POUT_MAX	Returns the maximum output power rating
7Ch	STATUS_INPUT	Reads the INPUT status register	A8h	MFR_TAMBIENT_MAX	Returns the maximum ambient temperature rating
7Dh	STATUS_TEMPERATURE	Reads the TEMPERATURE status register	A9h	MFR_TAMBIENT_MIN	Returns the minimum ambient temperature rating

Table 5 - PMBus Command Summary

18.0 TROUBLESHOOTING GUIDE

If you encounter difficulties in getting a Slimline760 module or complete power system to operate properly, check all connections carefully and use the following as a troubleshooting guide.

LED	State	Condition
IPOK (top)	Solid GREEN	Input Voltage within operating range
	OFF	Input Voltage over or under operating range
DCOK (middle)	Solid GREEN	DC Output within normal range
	OFF	DC Output Inhibited
STATUS (bottom)	OFF	No Fault, Outputs On or Standby Mode
	Solid YELLOW	+12V in Current Limit Over or Under Temperature Warning Minor Fan Fault 5VSB Out of Limits AC Input Low
	Solid RED	Over or Under Temperature Shutdown Overvoltage Shutdown Major Fan Fault IPOK and DCOK LEDs Both Off

Please note that there are no user serviceable parts inside either the modules or the shelves and that opening either will void the warranty.

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