

MODULAR 24V DC POWER SUPPLY



SAMLEX AMERICA

N+1 DC Power System with Battery Backup / Charging Function

MODEL : SPS-2450B



SAMLEX AMERICA

Thank you for purchasing a Samlex power supply product !

Samlex America Inc.
110 –17 Fawcett Road
Coquitlam, B.C. V3K 6V2
Canada

Ver.c(021902)

INSTALLATION & OPERATING MANUAL

Please read this manual before operating your power supply.



- PROVIDES N + 1 REDUNDANCY
- ALLOWS CONNECTION OF EXTERNAL BATTERIES FOR BACKUP
- 50 AMPS CONTINUOUS POWER
- FAN FAILURE ALARM
- REMOTE MONITORING AND INDICATION
- VERTICAL BULK-HEAD MOUNTING
- 1 YEAR WARRANTY / TOLL FREE TECHNICAL SUPPORT

Notes :

Attach your original bill of sale here.

Date purchased : _____

Place of purchase : _____

Purchase price : _____

Serial number : _____

Limited Warranty

The equipment manufactured by Samlex America, Inc. (the “ Warrantor “) is warranted to be free from defects in workmanship and materials under normal use and service. This warranty is in effect for 1 year from the date of purchase by the user (the “ Purchaser “)

In any case part of the equipment proves to be defective, the purchaser should do the following :

1. Prepare a written statement of the nature of the defect to the best of the Purchaser's knowledge, and include the date of purchase, the place of purchase, and the Purchasers name, address and telephone number.
2. Call Samlex America, Inc. 1-800-561-5885 or 1 (604) 525-3836 and request a returning merchandise authorization number (RMA).
3. Return the defective part or unit along with the statement at the Purchaser's expense to the Warrantor ; Samlex America Inc., #110 - 17 Fawcett Road, Coquitlam, B.C. V3K 6V2 Canada. The RMA number must be marked clearly on the outside of the packaging.

If upon the Warrantor's examination the defect proves to be the result of defective material or workmanship, the equipment will be repaired or replaced at the Warrantor's option without charge, and returned to the Purchaser at the Warrantor's expense.

No refund of the purchase price will be granted to the Purchaser, unless the Warrantor is unable to remedy the defect after having a reasonable number of opportunities to do so.

Warranty service shall be performed only by the Warrantor. Any attempt to remedy the defect by anyone other than the Warrantor shall render this warranty void.

There shall be no warranty for defects or damages caused by faulty installation or hook-up, abuse or misuse of the equipment including exposure to excessive heat, salt or fresh water spray, or water immersion.

No other express warranty is hereby given and there are no warranties which extend beyond those described herein. This warranty is expressly in lieu of any other expressed or implied warranties, including any implied warranty of merchantability, fitness for the ordinary purposes for which such goods are used, or fitness for a particular purpose, or any other obligations on the part of the Warrantor or its employees and representatives.

There shall be no responsibility or liability whatsoever on the part of the Warrantor or its employees and representatives for injury to any persons, or damage to person or persons, or damage to property, or loss of income or profit, or any other consequential or resulting damage which may be claimed to have been incurred through the use or sale of the equipment, including any possible failure of malfunction of the equipment, or part thereof.

The Warrantor assumes no liability for incidental or consequential damages of any kind.

TABLE OF CONTENTS

Topic	Page
Important safety instructions	1,2
Description and application	3
Design and principle of operation	3
Cooling and warning for fan failure	3
Front Panel controls and indicators	4
Rear Panel controls	4,5
Protections	5
Installation and operation	6
Operation of battery back-up	7
Installation and removal of modules	8,9,10
Trouble shooting	10,11
Specifications	12
Appendix : Figures 1 to 3	13,14
Warranty information	15
Notes :	16

IMPORTANT SAFETY INSTRUCTIONS

Please read before using your power supply.

CAUTION !

ALL ELECTRICAL INSTALLATIONS MUST MEET LOCAL AND NATIONAL WIRING CODES AND SHOULD BE PERFORMED BY A QUALIFIED ELECTRICIAN.

OPERATION OF COOLING FAN

THE HEAT PRODUCED IS EXTRACTED BY FORCED AIR COOLING. IN CASE ANY OF THE FANS FAILS, LIGHT AND SOUND ALARMS WILL BE ACTIVATED. IMMEDIATELY **SWITCH OFF** THE POWER TO THE UNIT TO PREVENT DAMAGE DUE TO OVER HEATING

CONNECTION TO A.C. OUTLET

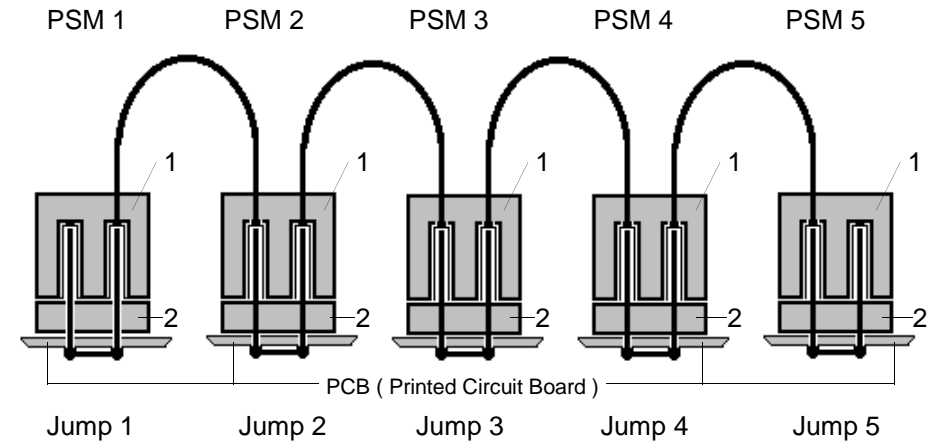
THE POWER SUPPLY SHOULD BE OPERATED ONLY FROM A STANDARD 3 PIN 120 V AC/ 60 HZ OUTLET WITH PROPER GROUNDING CONNECTION. IT MUST BE POWERED FROM A 20A CIRCUIT AND MUST BE PLUGGED INTO A 20A AC OUTLET WHICH WILL ACCEPT THE 20A MOULDED PLUG PROVIDED WITH THE POWER CORD. DO NOT USE EXTENSION CORD UNLESS ABSOLUTELY NECESSARY. IF AN EXTENSION CORD MUST BE USED , MAKE SURE :

1) THE PINS ON THE EXTENSION CORD'S PLUG ARE OF THE SAME NUMBER, SIZE AND SHAPE AS THOSE OF THE PLUG OF THE POWER SUPPLY CORD. NEVER USE AN EXTENSION CORD WITH A 2 PIN PLUG (THERE WILL BE NO GROUNDING CONNECTION IN THIS TYPE OF PLUG WHICH IS A SHOCK AND FIRE HAZARD)

2) THE EXTENSION CORD WIRE SIZE SHOULD BE MINIMUM 12 AWG, 20 A.

Figure 2.

“ Daisy Chaining “ of “Share BUS “ jumpers (Jump 1)



1. Female socket terminal of the daisy chain.
2. Male 2 pin terminal marked “Jump 1” on the Power Supply Module.

CONTINUITY OF “ DAISY CHAIN “ CONNECTIONS

When the Power System does not have all 5 power supply modules installed, continuity of the daisy chain is achieved by shorting the unused female socket for terminal “ Jump 1 “

When not connected to “ Jump 1 “, the female sockets are shorted by inserting a “ Shorting Link “ which ensures that the remaining “ Jump 1 “ terminals in the “ Daisy Chain “ are interconnected. (See figure 3. Below)

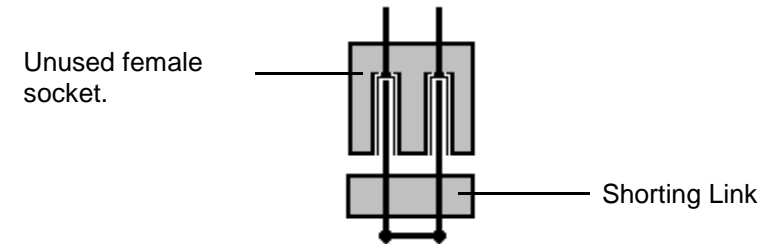


Figure 3.

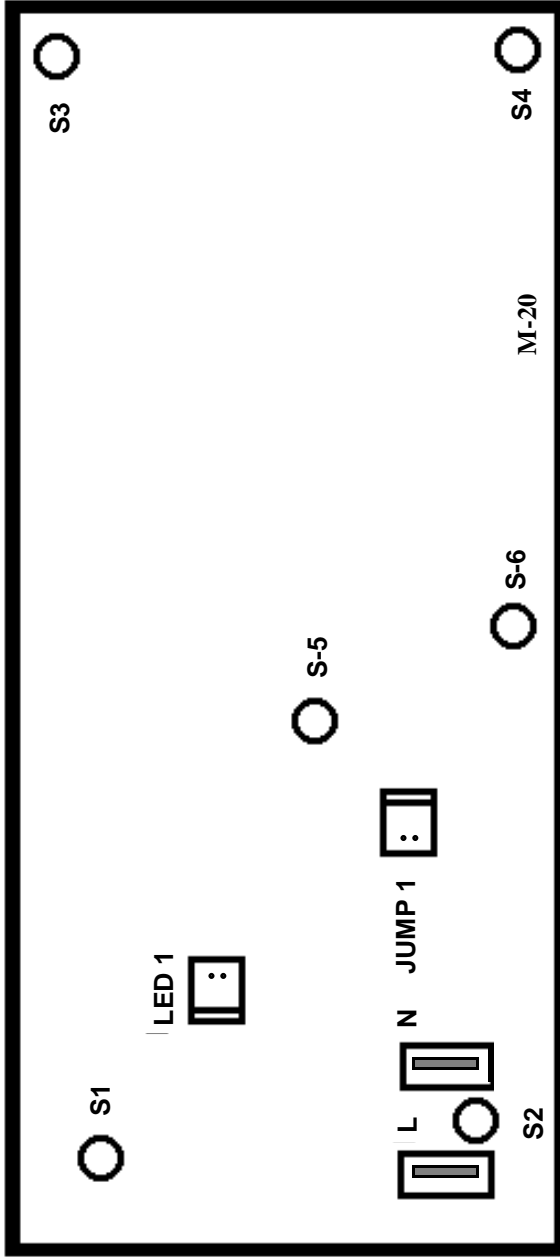


Figure 1.

Figure 1 - Layout of Power Supply Module

S1 to S4
S5 & S6
L & N
LED 1
JUMP 1

Holes for 4 screws to fasten the module to the chassis
Holes for 2 screw to connect to the Positive and Negative output BUS Bars.
L (live) and N (neutral) terminals for 120V, 60 Hz input power supply wires
Terminal for connecting remote " PCB Power LED "
Jumper terminal for connecting share BUS wire

LOAD AND BATTERY CONNECTIONS

ALWAYS ENSURE THAT THE POSITIVE AND NEGATIVE CONNECTIONS ARE SECURE AND THE SCREWS ARE TIGHTENED PROPERLY. **LOOSELY TIGHTENED CONNECTIONS RESULT IN EXCESSIVE VOLTAGE DROP AND MAY CAUSE OVERHEATED WIRES AND MELTED INSULATION.**

USE # 6 SIZE OF WIRE TO CONNECT ANY DEVICE TO THE POWER SUPPLY. THIS WIRE SIZE IS VALID WHEN THE DEVICE IS WITHIN 4 FT. DISTANCE FROM THE POWER SUPPLY. THICKER WIRING WILL BE REQUIRED FOR LONGER DISTANCES.

THINNER WIRES WILL CAUSE OVERHEATING AND EXCESSIVE VOLTAGE DROP :

ENSURE THAT THE AC POWER IS SWITCHED OFF WHEN ANY DEVICE IS BEING CONNECTED TO THE POWER SUPPLY.

DO NOT ALLOW THE ENDS OF THE POSITIVE AND NEGATIVE WIRES TO TOUCH EACH OTHER.

FUSE REPLACEMENT

ENSURE PROPERLY RATED FUSE (125 V, 4A) IS USED IN EACH OF THE MODULES.

ENVIRONMENT

DO NOT EXPOSE POWER SUPPLY TO RAIN, SNOW OR WATER SPRAY

DIS-ASSEMBLY AND REPAIR

THE POWER SUPPLY SHOULD BE DISASSEMBLED OR REPAIRED BY A QUALIFIED TECHNICIAN. INCORRECT REASSEMBLY OR REPAIR MAY RESULT IN A RISK OF ELECTRIC SHOCK OR FIRE WHICH MAY RESULT IN PERSONAL INJURY AND PROPERTY DAMAGE.

DESCRIPTION

This power supply converts 120 V , 60 Hz. AC power into regulated 28.0 V DC , +/- 1% (At module output*) delivering up to a maximum of 50 A continuous (up to 57.5 A surge) with 5 Base Level PCB Modules. There is provision to connect the power supply to an external battery for backup power in the case of an AC power failure and re-charge the battery when AC power resumes.

*Voltage at output terminals L1 & L2 will be 27.6V minus 15mV per Ampere (Please see page 7 for explanation.)

APPLICATIONS

The unit is designed for the following applications :

1. N+1 redundant systems
2. Future power level expansion
3. Uninterrupted DC output when used in conjunction with an external battery backup .

DESIGN AND PRINCIPLE OF OPERATION

The unit is designed using advanced switch mode technology and load share circuitry for high reliability, high efficiency and minimum size and weight. It is modular in construction consisting of up to 5 Base Level PCB Modules (referred to as PSM "POWER SUPPLY **MODULES**") that are connected for parallel operation with true current sharing . Each module is a stand alone power supply which delivers up to a maximum of 10 A continuous (11.5A surge) . By equalizing the output currents, uniform thermal stress of the individual modules is also ensured which has utmost importance for long term reliability of electronic components. The operating principle of the load share mechanism is to measure the output current of each individual module and to be able to modify the output voltage of the units until all the participating modules deliver equal output currents. Each module is required to be inter-connected with each other to a common "**SHARE BUS**" through a pair of parallel pins marked "**JUMP1**" and jumper wires. Typically, the output currents for the paralleled units will be within 10% of each other at full output current. The output is delivered through schottky isolating diodes to enable connection of external battery for uninterrupted back-up power.

COOLING AND WARNING FOR FAN FAILURE

The heat generated due to internal power dissipation is removed by forced cooling through two high power D.C. fans mounted at the back of the unit which blow air from the outside into the unit. The forced air is exhausted out through the vent holes provided on the two sides of the unit.

IT IS EXTREMELY IMPORTANT THAT THE SUCTION SIDE OF THE FANS AND THE DISCHARGE SIDES OF THE VENT HOLES ARE NOT BLOCKED. "

SPECIFICATIONS

NO. OF MODULES	5
INPUT VOLTAGE RANGE	120 TO 125 V AC, 60 HZ
INPUT CURRENT	25 A MAX
INPUT POWER FACTOR	0.62
OUTPUT VOLTAGE	-NO LOAD 28.0V DC -LOAD<1A 27.6V DC -LOAD>1A 27.6V DC minus 15mV/A
OUTPUT REGULATION (At module output)	1%
OUTPUT CURRENT CONTINUOUS SURGE	50A 57.5A
OUTPUT CURRENT LIMIT	60A
OUTPUT RIPPLE	LESS THAN 150mV PEAK TO PEAK
OUTPUT NOISE	< 2 V PEAK TO PEAK
COOLING	FORCED AIR, 2 FANS
OPERATING TEMPERATURE	0 TO 40 C
PROTECTIONS	
- SHORT CIRCUIT	YES
- CURRENT LIMIT	YES
- FAN FAILURE	BUZZER, SIGNAL FOR REMOTE LED
- INPUT SURGE SUPPRESSION	YES
- FUSE	MODULE FUSE – 125V 4 A UNIT HAS SWITCH / BREAKER 125 V, 20 A
DIMENSIONS W X L X H	19.5" X 14" X 3.5"
WEIGHT, LBS	29

REMOTE “ PCB POWER LED(S)” DOES NOT LIGHT UP

- The associated module has become defective. The unit will still operate normally as the remaining working modules will share a higher load. The unit will go into current limit and the output voltage will drop if the load drawn is more than the combined maximum rated output of the remaining modules. Reduce the load so that the maximum load drawn is less than the combined maximum rated output of the working modules.

OUTPUT VOLTAGE DROPS

- The unit has gone into current limit as the load being drawn is more than the combined maximum rating of the working modules. This may also result if one or more modules has failed . Check that all the modules are operating properly. If a module has failed, its remote “PCB Power L.E.D.” will extinguish. Reduce the load drawn to a value less than the combined maximum rated output of the working modules. If the voltage does not rise to the rated voltage, then switch off all the loads. If the voltage in this condition is also low, switch off the unit and contact technical support

NO OUTPUT VOLTAGE, REMOTE “ PCB POWER LED” ARE FLASHING

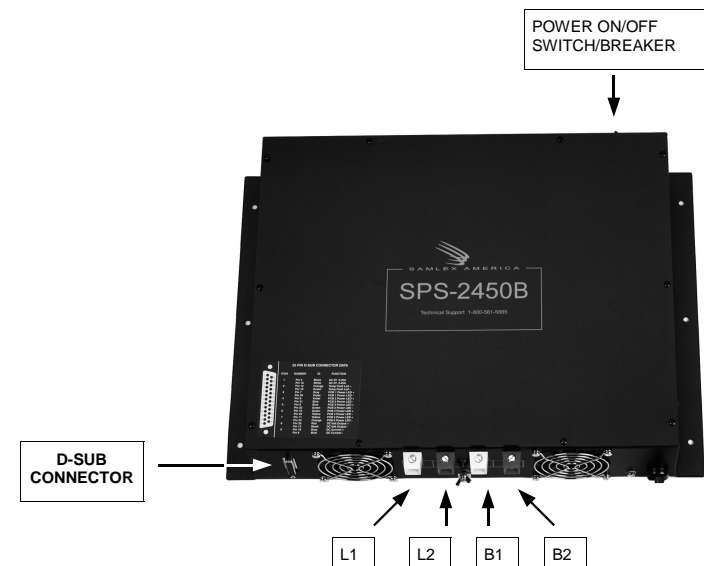
- There is a short circuit on the output side
- Switch off the unit. Disconnect the load from the output terminals. Switch on the unit. If the unit now operates normally, there is a short circuit in the external load circuit and should be removed .
- If short circuit condition persists even after removal of external load, switch off the unit and contact technical support

A warning circuit monitors the operational condition of the fans. In case of a fan failure, a buzzer will sound and “Temperature Fault” signal for remote LED indication will be generated. The unit should be switched off immediately and the defective fan should be replaced. **NEVER LOAD THE UNIT WHEN THERE IS AN AUDIBLE ALARM AND THE TEMP. FAULT LED IS ILLUMINATED.**

FRONT PANEL CONTROLS AND INDICATORS

The following control is provided on the front panel :

1. **POWER ON/OFF SWITCH / BREAKER.** The rocker switch will illuminate when switched on. A 20A circuit breaker is built in to provide protection on the input side against overload

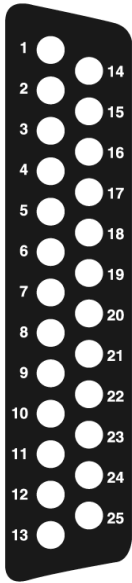


REAR PANEL CONNECTORS

The following output connectors have been provided.

1. L1 (Red positive), L (white negative) LOAD CONNECTORS. For connecting to the D.C. Load
2. B1 (Red positive), B2 (white negative) BATTERY CONNECTORS. For connecting external battery for un-interrupted D.C. power to the load.

3. REMOTE MONITORING AND INDICATIONS . A 25 pin D-sub connector has been provided for remote monitoring and indication. Pin connections are given below. Pins 2 and 16 are meant to indicate availability of input AC power. Pins 18 & 6 are for remote ammeter (25mV/1mA for full scale deflection of 50A).



ITEM	NUMBER	ID	FUNCTION
1	Pin 2	Black	AC 5V 0.25A
	Pin 16	White	AC 5V 0.25A
2	Pin 12	Orange	Temp Fault Led +
	Pin 19	Green	Temp Fault Led -
3	Pin 7	Gray	PCB 1 Power LED+
	Pin 20	Violet	PCB 1 Power LED-
4	Pin 8	Violet	PCB 2 Power LED+
	Pin 21	Blue	PCB 2 Power LED-
5	Pin 9	Blue	PCB 3 Power LED+
	Pin 22	Green	PCB 3 Power LED-
6	Pin 10	Green	PCB 4 Power LED+
	Pin 23	Yellow	PCB 4 Power LED-
7	Pin 11	Yellow	PCB 5 Power LED+
	Pin 24	Orange	PCB 5 Power LED-
8	Pin 25	Red	DC Volt Output +
	Pin 13	Black	DC Volt Output -
9	Pin 18	Gray	DC Current +
	Pin 6	Blue	DC Current -

PROTECTIONS

SHORT CIRCUIT PROTECTION : In the event of a short circuit, the PWM controller will be shut down and the output will drop to near 0 V. Remote “PCB Power LED” will flash. The unit will reset automatically once the short circuit condition is removed

CURRENT LIMITING : The unit will enter this mode when the load tries to draw more than the limiting values of currents as shown in the specifications. Under this condition, there will be loss of voltage regulation and the output voltage will drop. The remote “PCB Power LED” will, however, remain illuminated . **The unit will reset automatically as soon as the overload condition is removed .**

INPUT SURGE PROTECTION : The unit is protected against input voltage surges.

REMOVING A DEFECTIVE MODULE

1. Remove the top cover plate by unscrewing the 10 screws.
2. Locate defective module. Remove the 6 screws from S1 to S6.
3. Remove the input power supply wires from terminals “L” and “N”.
4. Remove the LED wire connection from terminal “LED 1” .
5. Remove the “SHARE BUS” wire female socket connector from the terminal “JUMP1”. If the defective module is not being replaced immediately and if the unit is required to be operated without this defective module, **IT IS MANDATORY TO SHORT THE TWO FEMALE SOCKETS ON THIS UNUSED FEMALE CONNECTOR WITH A SHORTING LINK. (SEE FIG. 3) THIS WILL ENSURE THAT THERE IS NO BREAK IN THE “SHARE BUS” DAISY CHAIN AND THAT ALL THE “JUMP1” TERMINALS ARE INTERCONNECTED.**
6. The module can now be removed.

TROUBLE SHOOTING

POWER ON/OFF SWITCH DOES NOT LIGHT WHEN SWITCHED ON

- Check that power is available in the AC outlet
- Check that the power cord plug is properly plugged in

POWER SWITCH TRIPS

- The breaker , which is a part of the power on/off switch, has tripped due to abnormal condition . Call technical support

REMOTE “TEMP. FAULT” LED LIGHTS UP AND BUZZER IS SOUNDED

- Forced cooling has failed due to defect in the cooling fan(s). Switch off the unit immediately . Fan(s) needs to be replaced.
DO NOT USE THE UNIT TILL THE DEFECT IS RECTIFIED. IT IS PROHIBITED TO USE THE UNIT WITHOUT FORCED COOLING. Call technical support.
- If both the fans are running, the small fan status monitoring PCB may be defective. Call technical support.

INSTALLING A NEW MODULE

1. Remove the top cover plate by unscrewing the 10 screws.
2. Locate a vacant space for the module and also the 4 stand-offs for holding the module (relative to the holes S1 to S4) and 2 stand-offs on the positive and negative output bus bars (relative to holes S5 and S6) Remove the 6 screws from these 6 stand-offs.
3. Place the module on the stand-offs such that the L and N terminals are towards the front panel. Align holes S1 to S6 with the holes in the stand-offs. Fix the module with the 6 screws. **ENSURE THAT SCREWS S5 AND S6 ARE VERY TIGHT.**
4. Locate the spare pair of input power supply wires (black for live (L) and white for neutral (N)) with female quick connect terminals. Connect the black wire to the “L” terminal and the white wire to the “N” terminal on the module.
5. Remove the plastic cover from the spare hole under “PSM STATUS” on the control panel. Insert the L.E.D. connected to “LED1” terminal on the module into this spare hole. Use a cable tie to properly secure the LED wire to the cable bundle.
6. A “daisy chaining” wire connector with 5 female socket terminals is provided for “daisy chaining” of each “JUMP1” terminal of the 5 modules. In case there are less than 5 modules, the unused female socket terminal(s) is shorted with a shorting link. Locate nearest unused female socket terminal, remove the shorting link and insert the female socket terminal into the male “**JUMP1**” plug terminal of the new module being installed. See Figure 3. On page 14.

IMPORTANT !

THE TWO MALE PINS OF THE “SHARE BUS” TERMINAL “JUMP1” ARE IN PARALLEL (SHORTED ON THE PCB). IT IS MANDATORY THAT ALL THE “JUMP1” CONNECTORS ARE INTER-CONNECTED OR “DAISY-CHAINED” AS REPRESENTED IN FIGURE. 2 . IT IS TO BE ENSURED THAT ALL THE UNUSED FEMALE SOCKET TERMINALS IN THE DAISY CHAIN CONNECTOR WIRE SHOULD BE SHORTED WITH THE SHORTING LINK AS SHOWN IN FIGURE 3 ON PAGE 14.

7. Replace the top cover.
8. Plug the power cord into the power mains outlet.
9. Switch on the unit from the power switch.

FAN FAILURE WARNING INDICATOR AND ALARM : If forced air cooling is stopped due to failure of any one or both the fans, remote “ TEMP. FAULT “ LED will be activated and an alarm buzzer will be sounded. The unit is required to be switched off immediately as loss of forced air cooling may result in major damage to the unit.

INSTALLATION AND OPERATION

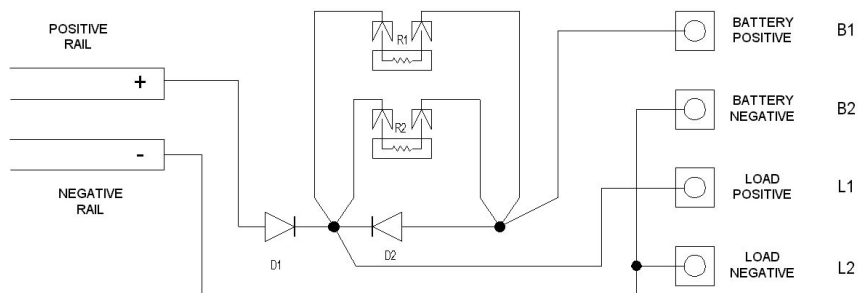
1. Ensure that the space where the unit is to be installed has adequate air supply for cooling. There should be no obstruction on the suction side of the fans at the back or on the discharge side vent holes on the two sides of the unit.
2. Switch off the on/off switch on the front panel.
3. Switch off all the D.C. load(s) to be connected to this unit.
4. Connect the L1 and L2 at the back of the unit to the D.C. load(s) or the DC bus. Ensure the wire or bus bar used to connect the load or the D.C. bus is of proper cross-section to carry the desired load current. Tighten the screws to ensure firm connection.
5. In case external battery is required for battery back-up, connect the positive of the battery to B1 and negative of the battery to B2. (See details under “operation of the battery back-up”)
6. Plug the unit into the 120 V, 60 Hz standard AC outlet . The outlet should be rated for at least 20 A.
7. Switch on the unit by pressing the power on/off switch to on position. The switch will be illuminated confirming that input power is available.
8. A short beep may be generated by the temperature fault alarm circuit on powering on the unit . This is normal. Please disregard.
9. The remote voltmeter should read 28.0V (No Load)
10. Switch on the D.C. loads. The output voltage should be 27.6V minus 15mV per Ampere (please see explanation on Page 7)
11. The remote ammeter will read the load current. Ensure that the load current is within the total rated continuous load of 50A.

OPERATION OF BATTERY BACK-UP

WARNING!



THE BATTERY SHOULD BE LOCATED IN A WELL VENTILATED AREA TO SAFELY DISSIPATE HYDROGEN GAS PRODUCED DURING THE CHARGING PROCESS.



D1,D2 SCHOTTKY DIODE, 175BQG030 BY INTERNATIONAL RECTIFIER
R1,R2 POWER RESISTOR 1R6, 35W

FIGURE A

Please refer to the schematic at fig. A above.

Regulated output voltage of 28.0V from the modules is fed through the positive and negative rails. Isolating schottky diodes D1 & D2 introduce a forward voltage drop of approx. 0.4V on load. Voltage available at output terminals L1 & L2 on no load will be 28.0 V and 27.6V for loads < 1A. On further loading, the output voltage will be will be 27.6V minus 15mV per Ampere of load current due to voltage drop across the rails, schottky diode and internal wiring.

When there is a requirement of un-interrupted D.C. power to the load, an external battery may be connected at the terminals B1(+) and B2(-). When the input A.C. power is available, the load current is supplied by the power supply through isolating schottky diode D1. At the same time, the battery is charged through resistors R1 & R2. (These resistors will limit the maximum charging

current to about 8 Amperes.) If the input A.C. power is interrupted, the external battery feeds the load instantaneously through the schottky diode D2 (D2 will by-pass the resistors R1 & R2). Voltage available to the load will be approximately 0.4V lower than the battery voltage due to forward voltage drop across D2.

When the input A.C. power returns, the battery will be isolated and the load current will once again be supplied by the power supply. The discharged battery will recharge through R1 & R2

NOTE: The value of charge limiting resistors is based on a typical 100AH deep cycle marine battery. If a different type of battery is used, the value of the resistor should be adjusted to meet associated charging requirements.

INSTALLATION AND REMOVAL OF POWER SUPPLY MODULES

NOTE: INSTALLATION AND REMOVAL OF POWER SUPPLY MODULES SHOULD BE PERFORMED ONLY BY QUALIFIED PERSONNEL

CAUTION !

Before removing a defective module or installing a new one, switch off the 120 V , 60 Hz input power and unplug the power cord from the mains outlet.

NOTE :

Please refer to the layout diagram of the module at Figure. 1 located on page 13