

**SBS GL-1000**

**1000 WATT ELECTRIC LOAD**

***USERS GUIDE***



# GL 1000

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## 1. Overview

This GL-1000 DC Electronic Load Users Guide is intended to familiarize the end user with the operation and use of the electronic load. It will describe the operation and care of the load.

### *1.1. Introduction*

The GL-1000 Electronic Load is an adjustable 1000 watt load with the following features:

- User Selectable Constant Current or Constant Resistance load characteristic
- User selectable Voltage and current digital readout
- Automatic Over Current limiting
- Automatic Over Power limiting
- Separate high and low current settings
- Separate high and low sensitivity ranges
- Step capability between high and low current settings

### *1.2. Unpacking and Checking*

Unpack and verify that the following items are present:

- One Power Cable (US/Canada)
- This User Guide
- One GL-1000 Load

## 2. Front and Rear Panels

Refer to the following diagrams for a description of front and rear panel controls.

### *2.1. Front Panel*

Front panel controls and readouts are shown below. The callouts list the respective control names.

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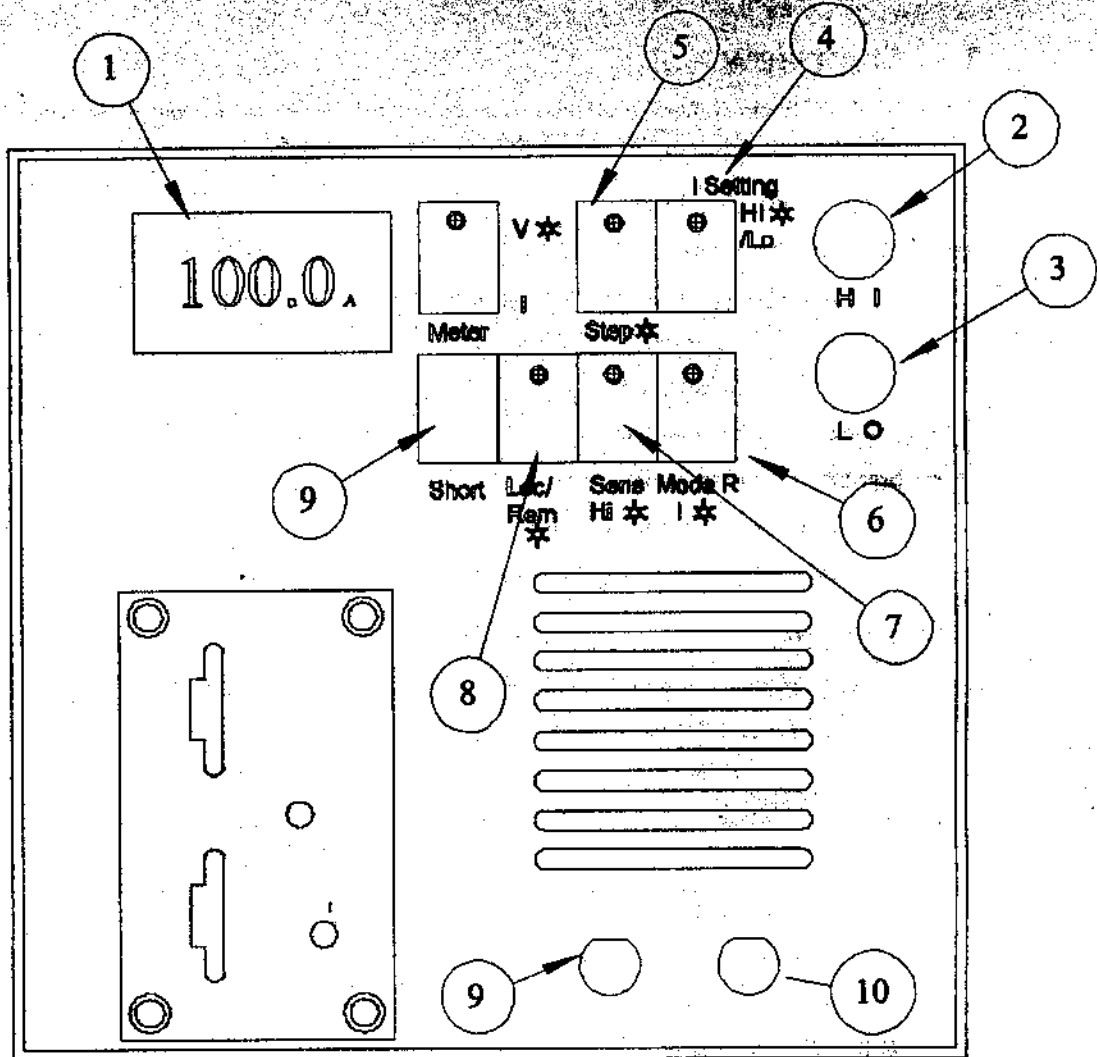


Figure 1-Front Panel Controls

- (1) Voltage and Current digital readout
- (2) Current High setting potentiometer
- (3) Current Low setting potentiometer
- (4) Current Setting Select

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- (5) Step Mode
- (6) Constant I/Constant R select
- (7) Potentiometer sensitivity
- (8) Local/Remote
- (9) Paralleling input/Remote input
- (10) Paralleling Output

## 2.2. Rear Panel

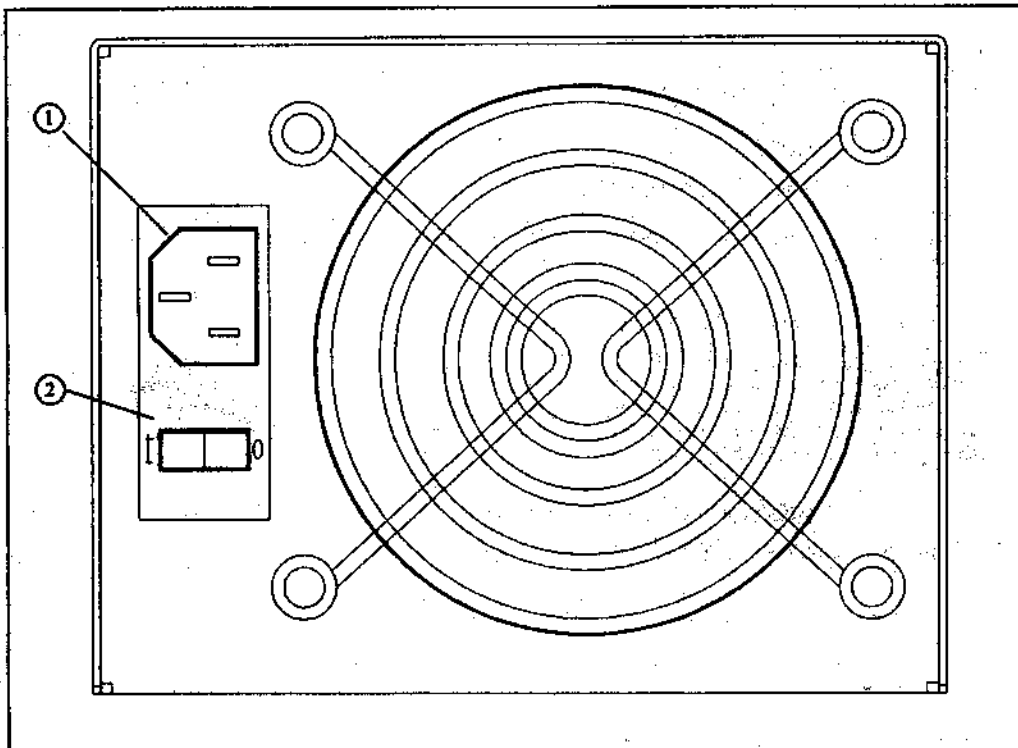


Figure 2-Rear Panel Controls

- (1) IEC 320 AC input Connector
- (2) On/Off switch

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### 3. OPERATION

#### *3.1. Initial Checks*

- Insure that line voltage is correct for your model (120VAC or 220VAC)
- Place this load in a well ventilated area. DO not block or obstruct the ventilation holes.
- Insure the correct rating fuse is installed for your model. Refer to Specifications section (5) for fuse ratings.

#### *3.2. LCD Readout*

The LCD digital readout will indicate both the input voltage of the load source and the current being drawn from that source. Readout mode is selectable (voltage/current). A meter annunciator will indicate the mode in addition to the LED on the select switch.

#### *3.3. Load Setting*

There are 3 options for controlling the load current; Low, High, and Step. The low setting enables the load to draw current whose value is determined by the Low current adjust potentiometer. The High setting enables the High current adjust. The step switch will generate a step load between the 2 values set in the Low and High potentiometers.

#### *3.4. Potentiometer Sensitivity*

There are 2 setting for potentiometer sensitivity, Low and High. This setting will vary the sensitivity of the adjustment made on the potentiometers. On low sensitivity, the maximum value which can be obtained is limited but the amps per turn of the potentiometer is lessened making it easier to obtain a precise current setting. This is most useful when setting low current values and high voltage inputs. The High range setting allows the full rated current to be attained.

#### *3.5. Setting the Current Controls*

The GL-1000 is a selectable constant current/constant resistance load.

In constant current, once a current value is set, the load will maintain a current setting over the entire range of input (source) voltage as long as 1) the source can continue to supply said current value, and 2) that the power limit for the load is not reached. There are two separate current control settings for the Load, high and low. The Low control range from 0 amps to 66 amps (low range) or 134 amps (high range). The high current control will adjust current from the value presently set by the low current control to 104 amps (low range) or 200 amps (high range). Note that this means there is an interaction between the low and high current controls. The high setting cannot be set to a lower value than the low control adjustment. The load will automatically limit current to a maximum of  $200 \pm 4a$ . Current limiting will occur sooner if total input power

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exceeds  $1000 \pm 4$  watts. This is because there is a power limiting circuit which will limit current if total input power exceeds 100 watts.

In constant resistance mode, once a current value is set, the load will maintain a resistance setting over the entire range of input (source) voltage as long as 1) the source can continue to supply current, and 2) that the power limit for the load is not reached. There are two separate current control settings for the Load, high and low. The low control will adjust the resistance range from  $\infty$  to  $146\text{m}\Omega$  (low range) or  $\infty$  to  $23\text{m}\Omega$  (high range). The high current control will adjust resistance from the value presently set by the low current control to  $74\text{m}\Omega$  (low range) or  $13\text{m}\Omega$  (high range). Note that this means there is an interaction between the low and high current controls. The high setting current controls. The high setting cannot be set to a lower value than the low control adjustment. The load will automatically limit current to a maximum of  $200 \pm 4\text{a}$ . Current limiting will occur sooner if total input power exceeds  $1000 \pm 4$  watts. This is because there is a power limiting circuit which will limit current if total input power exceeds 1000 watts.

### ***3.6. Step Operation***

The GL-1000 load is able to generate step loads by alternately switching current settings from the value fixed by the Low current control to the value set on the high current control. The step frequency is  $120 \pm 1\text{Khz}$ . The procedure for this operation is as follows:

- Select the desired current range (high or low).
- Select Low current setting.
- Adjust the low current potentiometer to the desired level. This level includes the 0 amp setting.
- Select High current setting.
- Adjust the high current potentiometer to the desired level. This cannot be lower than the low setting.
- Select Step setting.

### ***3.7. Short Circuit Test***

Depressing the momentary SHORT switch on the front panel will cause the load to go into a pseudo short circuit condition. Because of limitations on the internal components, short circuit current is limited to  $\sim 200$  amps or 1000 watts, whichever occurs first. If the source can deliver this current value then the short switch will not be able to drive the source supply into its short circuit foldback mode. Utilizing two loads in parallel can alleviate this condition.

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### ***3.8. Paralleling Operation***

Up to 4 GL-1000 loads can be paralleled to increase the current and /or power handling capability of the system. The settings selected on the master load will be utilized by all the slaves. The exceptions to this rule are:

- All slave loads must NOT have local selected.
- Individual load safety lockouts (over-current, over-power, over-temperature) are not overridden.

The procedure for setting up parallel operation is as follows:

- Place the desired number of loads close together as possible.
- Designate one load as the master. This is the load which will be controlled by the operator (manually or remotely)
- Connect the source positive to the positive lead of the master load.
- Connect the positive leads of all slaves together and to the master load positive. It is imperative that the wires making these connections are capable of handling the entire source current value, not just the current drawn by an individual load.
- In the same way, connect the source negative to the loads.
- Connect a BNC cable from the paralleling out of the master load to the paralleling IN of the first slave.
- If there is more than 1 slave, continue daisy chaining each slaves paralleling out to the next slaves paralleling IN until the last load is reached.
- Set the master load to Local operation.
- Set all slave loads to Remote operation.
- Turn on each load and the source.
- Operate the master load as defined previously, each slave will mimic the masters settings.

The meter value of each load will display the current drawn by that load. The meters do not totalize the current loads of the master and slaves.

### ***3.9. Remote Operation***

GL-1000's can be controlled by a remote control voltage. Whenever the load is in the Remote mode, the current settings can be controlled by an external voltage source. The load current characteristic is approximately 50 mV/amp. For example, if one wishes to remotely command a 10 amp current setting, a voltage of 500mV would be applied to the Parallel IN/REM BNC input. Note that loads can still be paralleled as described in 3.8 while using remote control operation. The voltage return of this remote input is connected to the GL-1000 internal grounds, which are in turn referenced to the UUT return.

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Normally, the UUT can be a floating source because none of these grounds are connected to chassis. **THE USER MUST KEEP IN MIND THAT THE CONTROL VOLTAGE RETURN AND THE UUT RETURN WILL BE COMMONED** when in remote control mode.

### 4. Maintenance/Troubleshooting

#### 4.1. Changing the Fuse

The fuse is located inside the power entry module on the back panel.

**NOTE: BE SURE THAT THE INPUT POWER CORD IS UNPLUGGED BEFORE CHANGING FUSE!**

- Depress the latch on the fuse holder enclosure and remove the fuse block on the IEC connector. (You must remove the power cord from the input module.)
- Replace with a fuse of identical Current and Voltage rating.

#### 4.2. Problem Resolution

PROBLEM	CHECK
Load does not turn on	Input AC Fuse
Load will not draw current (Master or Slave)	Remote Mode selected Load overtemp switch activated (allow 10 min to cool) No input voltage
Load will not draw rated current	Power limited reached before current limit reached Input voltage below 2.4v Try selecting high sensitivity
No Step Operation	Insure HI/LO current settings not identical
Interaction between remote control operation and current being drawn	Remote control voltage return is connected to load source return.

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### 5. SPECIFICATIONS

#### *5.1. Electrical*

**5.1.1. Input Source Voltage**

1.8-64 volts DC for Full rated input current, Constant Current mode

3.3-64 volts DC for Full rated input current, Constant Resistance mode

**5.1.2. Max Input Current**

200 amps

**5.1.3. Max Input Power**

1000 watts

**5.1.4. Current Readout Accuracy**

$\pm 2\%$  or 2% of readings, whichever is higher

**5.1.5. Voltage Readout Accuracy**

2%

**5.1.6. Step Frequency**

120Hz $\pm$ 10Hz

**5.1.7. AC Input Current**

.25 amp @ 120Vac

.125 amp @ 240Vac

#### *5.2. Mechanical*

**5.2.1. Dimensions**

6" high x 6" wide x 14.5" long

## 6. CALIBRATION

The electronic Load does not require calibration, but some users may wish to do so. As such, the following procedure is presented. Note: doing so will void warranty.

- 1) Turn all front panel adjust pots to 0 current
- 2) Set all front panel switches to "OFF" or unlatched position
- 3) place 5v on input
- 4) Set sw S7 to Voltage (latched) position. Insure LED in switch is on.
- 5) Adjust pot R114 until meter reading agrees with voltage input. Check that "V" annunciator in meter is on.
- 6) Turn R9 fully CW
- 7) Depress and latch Sensitivity sw (S2). Verify LED is on.
- 8) Turn up low adjust pot until load draws 50a as measured on input shunt
- 9) Set sw S7 to current position, Insure LED extinguished, and "A" annunciator in meter is on.
- 10) Adjust R111 until meter reading agrees with current shunt  $\pm .1a$
- 11) Using Low current adjust pot, adjust low pot until Rem In. voltage =  $1.0v \pm 10mv$ . Adjust R11 until current reading =  $20 \pm .2a$ . Note: If cannot get to 1v using lo pot, depress Hi/lo switch and use "hi" pot
- 12) Measure voltage at Rem Out connector, adjust R18 until voltage = Rem in voltage  $\pm 10mV$  (1v)
- 13) Depress and hold short circuit button, S5. Adjust R13 until meter read  $198 \pm 2a$ . Release S5
- 14) Turn Low adjust pot full CW. Adjust pot R207 (on front panel PCB) until current read  $125a \pm 5a$
- 15) Depress Hi/Lo button S4, verify current can be adjusted via Hi pot to  $198 \pm 2a$ . Verify LED in switch is on
- 16) Unlatch Hi/Low switch
- 17) Set current reading to 50a
- 18) Adjust 5v source supply to 2.5v, verify current drop to  $25a \pm .2a$
- 19) Place load in constant current mode by depressing S1. Verify that switch LED illuminated.
- 20) Set load current to 50a
- 21) Turn up load voltage to 5.0 v. Verify current reading remains at  $50 \pm .2a$
- 22) Remove 5v load, turn current adjust pots fully CCW (off). Unlatch all switches
- 23) Place Hi voltage source on Load. Adjust to 50v.
- 24) Turn up load current via Low pot to 21a.
- 25) Adjust pot R9 until load current drop to  $20 \pm .2a$  (Note: Insure voltage at Load input = 50v DO NOT MESURE AT VOLTAGE SOURCE)
- 26) Lower voltage to 40v, verify can adjust current up to  $25 \pm .3a$ .
- 27) Turn lower pot to 5a.
- 28) Depress hi/low button s4, adjust hi pot to 15a
- 29) Depress step button S3, verify that switch LED illuminates.
- 30) Verify current reading =  $10 \pm .5a$ .
- 31) With oscilloscope, monitor voltage waveform on input. Measure step frequency =  $120 \pm 10hz$ . Duty cycle  $50 \pm 5\%$ .
- 32) Unlatch step button.

- 33) Depress Loc/Rem (S6). Verify LED illuminates. Verify current drops to 0a
- 34) Unlatch all switches, turn pots fully CCW, remove voltage source.

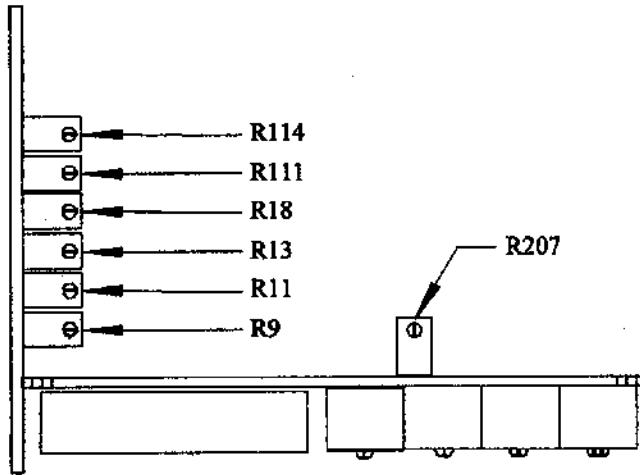


Figure 3-Adjustment Pot Locations

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