

## SECTION 1 INTRODUCTION

### 1.1 INTRODUCTION

This manual contains operation and maintenance data on the 1000 watt units of the DCR-B series Sorensen Power Supplies. It is intended to familiarize the user with the functioning of the unit, to introduce the varied applications to which the unit may be adapted, and to furnish sufficient maintenance data to assure long operating life.

Six major sections form the manual divisions. Section 1 contains a brief functional description of the DCR-B series power supplies. Initial inspection and checkout procedures are outlined in section 2. Operating instructions, including methods for adapting units to various applications, comprise section 3. Sections 4 and 5 provide the principles of operation and maintenance procedures respectively. System drawings and the replacement parts list are provided in section 6.

### 1.2 DESCRIPTION

#### 1.2.1 General

Designed for either bench or rack use, the typical DCR-B power supply provides a highly regulated, precise dc output, adjustable over a wide range. It operates from a nominal 115 Vac (208/220/230 Vac inputs are available as options) and exhibits a rapid response to transients, both load and line.

DCR-B series supplies are phase controlled type with SCR's (Silicon Controlled Rectifiers) or Triacs at the input to the transformer, followed by a passive LC filter. This design allows for a wide range of output voltages, simplicity of design, and offers large amounts of regulated power at relatively high efficiencies compared to linear regulators.

Silicon type semiconductors are used extensively in DCR-B circuitry, and contribute significantly to the units' wide ambient temperature range characteristic. Low dissipation transistors and diodes are located on a single printed circuit board while high dissipation devices are heat sunked to aluminum brackets and heatsinks.

All controls used during normal operation, except the OVP control, are mounted on the front panel. These include a power circuit breaker, FINE and COARSE VOLTAGE adjust potentiometers, and FINE and COARSE CURRENT adjust potentiometers. The system output is taken across a terminal pair at rear terminal strip TB2.

A variety of Sorensen power supply application notes are available through your Sorensen Service Representative. These notes detail many hook-up configurations and special usages available to meet most power supply applications.

#### 1.2.2 Automatic Crossover

There are two basic operating modes, voltage and current. In the voltage mode, the voltage is held constant while the current varies with the load. In the cur-

rent mode, the voltage varies, and current is held constant. The automatic crossover feature enables the unit to switch operating modes as a function of load requirements. If, for example, load current attempts to increase above a preset current limit, the unit will switch operation automatically from the voltage to the current mode. In this mode, the current will be regulated at the value preset on the front panel. If load requirements are lowered, return to the voltage regulating mode will occur automatically. Two red panel lamps indicate whether operating in the voltage or current mode.

#### 1.2.3 Remote Sensing

Terminals located on rear-mounted terminal board TB3 offer a means of extending a unit's regulating point from the output terminals to the load. This effectively compensates for variations in the load lead voltage drop. Section 3 outlines the connections for remote sensing.

#### 1.2.4 Series Operation

For applications requiring output voltages higher than a single unit can provide, DCR-B power supplies may be connected in series (See Section 3). Regulation in series operation is the sum of the regulations for all units.

#### 1.2.5 Parallel Operation

Parallel operation may be used to service those applications requiring an output current higher than a single supply can provide. Using a master/slave approach, a maximum of four units can be connected in parallel. An alternate method is direct paralleling. With this approach, there is no limit to the number of units which can be paralleled. The regulation will deteriorate, and will be the sum of the regulations for the individual settings plus the output voltage differences between units at no load.

#### 1.2.6 Remote Programming

Output voltage or current of DCR-B power supplies may be remotely programmed in either the voltage or current mode by resistance or voltage signal. Details and considerations are given in Section 3.

#### 1.2.7 Unit Shutdown Circuit

In the DCR-B line, application of the plus (+) sense (terminal 1 of TB3) to the shutdown terminal (terminal 11 of TB3) instantly shuts down the supply. This function can provide unit protection by connecting a temperature or voltage sensitive switch (or transistor) in this line to shut the system down under specified conditions. An example is in the master/slave connection of two DCR-B power supplies (refer to section 3, Operating Instructions). If the shutdown function is adapted to the master unit, the system output goes to zero; if applied to the slave unit, only that unit is affected and the system output is reduced accordingly.

#### 1.2.8 Protection Features

Protection against the effects of overloads and internal short circuits is provided. Overload protection is inherent in automatic crossover. The main power circuit

components are protected by the unit circuit breaker. Control circuitry is protected by a fuse on the rear.

In the event of an overvoltage condition at the output, such as a failure in the power supply or an externally induced condition, an overvoltage electronic crowbar is actuated by an integral OVP sensing circuit. The crowbar acts to quickly reduce the output voltage to zero. (See details in Section 3).

### 1.3 OPTIONAL MODIFICATIONS

The standard DCR-B unit is designed for operation from a nominal 115 Vac input; however, units may be purchased factory modified to accept inputs of 208, 220 or 230 Vac (modifications M1, M2 or M3 respectively).

The sides of the DCR-B have inserts to allow attachment of slide rails. Consult the factory for information on these optional slide rails.

### 1.4 SPECIFICATIONS

The specifications for the DCR-B 1000 watt series power supplies are given in Table 1-1.

Table 1-1 Specifications

DCR Model	OUTPUT POWER		Constant Voltage Ripple (PARD) (mV rms)	Constant Current Ripple (PARD) (mA rms)	TEHPCO		RENOTE PROGRAMMING (Ohms/V) (Ohms/A)	SIGNAL (Volt In/ Volt Out)	Efficiency (% Typ.)	INPUT POWER		OUTPUT IMPEDANCE (Typical) 120Hz 1kHz 10kHz
	Voltage (Vdc)	Current (Adc) 40°C 71°C			(mV/°C)	(mA/°C)				Range (Vac) Note 3	Current Max (Aac) Note 4 (Typ.)	
10-80B	0-10	80	40	65	1.5	24	1200 5	1/1	62	103-127	16	.01 .009 .025
20-50B	0-20	50	25	65	3.0	15	600 8	1/2	69	103-127	20	.015 .013 .037
40-25B	0-40	25	13	90	6.0	7.5	300 16	1/4	79	103-127	16	.030 .025 .075
60-18B	0-60	18	8.6	125	9.0	5.4	200 22	1/6	81	103-127	19	.045 .040 .112
80-12B	0-80	12	6.6	150	12.0	3.6	150 33	1/8	83	103-127	15	.065 .060 .150
150-6B	0-150	6	3.3	300	22.5	1.8	80 66	1/15	84	103-127	15.5	.327 .30 .360
300-3B	0-300	3	1.65	700	45	.9	40 133	1/30	82	103-127	15.7	1.2 1.1 1.3
600-1.5B	0-600	1.5	.83	1200	90	.45	20 266	1/60	86	103-127	15.2	4.73 4.3 4.8

## NOTES:

1. Overvoltage protector internal.
2. Average weight, 70 lbs.
3. Optional inputs: 208V, 220V, 230V (Options M1, M2, M3 respectively)
4. At 115V input.

## COMMON SPECIFICATIONS

## Voltage Mode:

Regulation: 0.03% with load change (NL-to-FL or FL-to-NL) and a full line-voltage change combined.

Resolution: 0.05% of  $E_o$  max. (typical)

Drift (%  $E_o$  max): 0.1% typical, for 8 hours after 30-minute warmup with constant line, load, and ambient temperature.

Transient Response: 50ms (typical) to return to  $\pm 1\%$  band for a step load change 50%-100% or 100%-50% of full load (10V models  $\pm 3\%$  band, 20V models  $\pm 2\%$ ). Below 60 Hz, ripple and transient response characteristics will deteriorate by a factor of  $(60/f)^2$  where  $f$  is the input frequency.

## Current Mode:

Regulation: 0.25% with 0-95% compliance-voltage change and  $\pm 10\%$  line voltage change combined.

Resolution: 0.05% of  $I_o$  max (typical)

Drift (%  $I_o$  max): 0.15% (typical)

## General:

Series Operation: To 200 Vdc Maximum. (150 and 300 volt models, two in series).

Parallel Operation: By master-slave or straight parallel, four units maximum.

Remote Sensing: See paragraph 3.2.2.

Operating Temperature Range: 0°C to 71°C

Storage Temperature: -40°C to +85°C

Cooling: Convection

Isolation Voltage: 1000 Vdc input to output.

Finish: Bonderize-Black semi-gloss with white lettering

Overload/Short-circuit Protection: Adjustable current limiting with automatic recovery.