

# SCE Model 410 Power Supply

## J-Lab Supply

The SCE 410 is a bipolar current power supply designed to power particle accelerator corrector magnets in the electrode accelerator at Jefferson National Laboratory, (VA). It is an enhanced derivative of the SCE 450-440-470 series of power supplies built for the Brookhaven (NY) RHIC Accelerator magnets. Over 350 410's were built and installed. Basic topology is offline switcher driving a unique four quadrant regulator to provide fine control. Current feedback is a zero flux DCCT (also an SCE product). The SCE 410 is fully remotely controlled and will hold  $\pm 100\text{Uamps}$  over 8 hours.

### Major Specifications:

**Input Voltage:**  $208/3^{\phi} \pm 10\%$ , 2KVA max (pf>90% Inrush current limited to 20A)

**Output:**  $\pm 75\text{V}$ ,  $\pm 20\text{Amps}$

**Allowable load impedance:** 0.01 to 3.75 Ohm, up to 2 henrys

Will drive without glitching, both conventional and superconducting magnets in ramp up and ramp down conditions. Load compensation achieved by small plug-in circuit card.

**Current Regulation:** Uncertainly envelope less than 100ppm of full scale over input line variation, temperature and load change.

**Efficiency and Power Factor:** Efficiency >75%, power factor > 90% both at nominal load

### Control

This power supply is designed to be completely remotely controlled and monitored thru RS-485 nominal serial interface (76.8KBPS). It is also fully controllable locally for checkout (during accelerator operation, personnel typically not allowed in the accelerator tunnel). Other control communications protocols are possible. The RS-485 protocol was J-Lab's choice.

- 1) On / Standby (power save) / Run / Off
- 2) Remote setting of current from  $\pm 20\text{A}$ , with  $\pm 300\text{Uamp}$  resolution
- 3) Remote setting overvoltage, overcurrent, overtemp shut down conditions, and several other parameters.

### Readback

**Current (16bit) Resolution:** 300uamp, absolute accuracy, .02%

**Voltage:**  $\pm 1\%$

**Status and error conditions:** (24 separate conditions)

### Local Monitoring

Two LCD displays: one for readback status and one to enter data (menu system)

## Isolation

- 1) Output isolated to 500VDC WRT to chassis, AC, control returns
- 2) Control circuitry isolated to 500VDC

## Protection / Safeguards

- 1) AC input surge protection, turn-on inrush current actively limited to 20A
- 2) Current overload, load voltage limits exceeded
- 3) Heatsink over temperature
- 4) Other critical fault conditions will shut down unit
- 5) Magnet (load) ground fault current  
This circuit verifies current entering and returning from the load match within 20mA; i.e. no unintended ground paths exist internal to the driven load.
- 6) Quench protection: to 1000joules; trip level preset on this supply at 100V.
- 7) Ring security / lockout: 4 separate, isolated configurable inputs.
- 8) Rear panel 3 pole circuit breaker removes 100% of power from supply.

## Mechanical

**Dimension:** 19" rack mount, 3U (5 ¼ height), 24" overall depth

**Weight:** 35lbs.

**Cooling:** Air cooled. Two muffin fans-one will adequately cool the unit-airflow inlet rear, exhaust front

**Construction:** Welded aluminum chassis, electrically grounded heatsinks

-Front panel access panel for checkout/troubleshooting

-Modular Subassemblies

**Maintainability:** 20 Minute MTTR. This has been achieved by:

- Diagnostic messages
- On-board led tell-tales
- Regulator PCB and pass transistors, replaceable as a plug-in

**Temperature:** Storage: -20 to +75°C

Operation: 0 to 35°C

Within regulation spec: 20° to 30°C

## Factory Burn-in and Test

24 hour full load cycling with monitored burn-in

Calibrated using a computer-controlled test station. Complete test report furnished.