

# **Labconco Power Supplies**

Models, 433-3240, 433-3250, 433-3260  
433-3270, 433-3280, 433-3290

## **INSTRUCTION MANUAL**

Product designs are subject to change without notice

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## **INTRODUCTION**

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### **Components Shipped**

Carefully check the contents of the carton for damage that might have occurred in transit. Do not discard the carton or packing material until all components have been checked against the following component list and the equipment has been installed and tested.

As shipped, the carton should contain the following:

<b>CATALOG NUMBER</b>	<b>DESCRIPTION</b>	<b>QTY</b>
433-3240	1000 Volt Single Power Supply (115V/50-60 Hz)	1
	or	
433-3250	1000 Volt Single Power Supply (230 V/50 Hz)	1
	or	
433-3260	3000 Volt Single Power Supply (115 V/50-60 Hz)	1
	or	
433-3270	3000 Volt Single Power Supply (230 V/50 Hz)	1
	or	
433-3280	5000 Volt Single Power Supply (115V/50-60 Hz)	1
	or	
433-3290	5000 Volt Single Power Supply (230V/50 Hz)	1
433-3273	Instruction Manual	

### **Spare Fuses 1000 Volt, 3000 Volt and 5000 Volt**

115V		230V	
531-0013	3AB 15A SB	531-0080	T 8A SB
531-0001	3AB 0.5A SB	531-0086	T0.25A SB

### General Description

The Labconco Power Supplies are microprocessor controlled laboratory high voltage Power Supplies. The Power Supplies can be easily programmed using the key board. Information is displayed on a 24 character by 2 line display.

### Caution

The Labconco Power Supplies are capable of producing potentially dangerous voltages. Please read the operating instructions and cautions carefully before using these products.

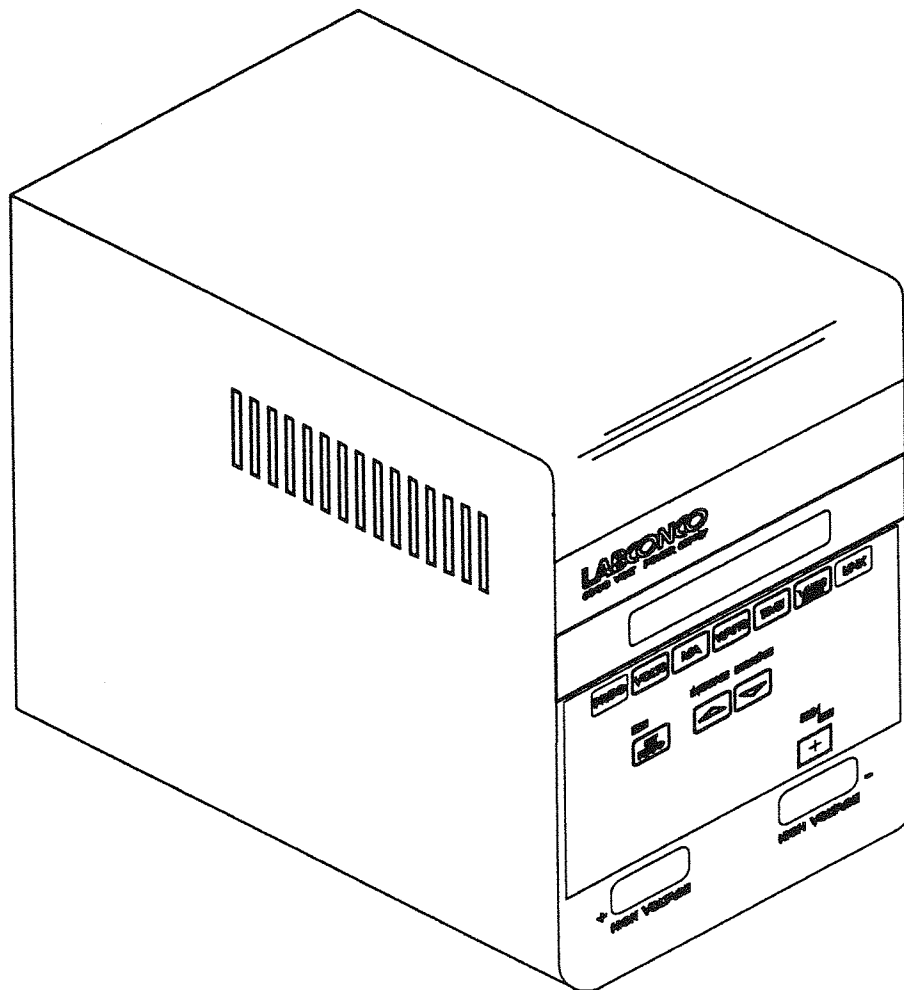


Figure 1

# **INTRODUCTION**

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## **Performance**

Labconco Power Supplies have all the features necessary for complete control of the most sophisticated electrophoresis experiment. These include precise regulation of voltage, current and power output with crossover between regulating modes as well as load and leak protection circuitry for safe operation. The built-in timer and volt hour integrator allow experiments to proceed for either a specified time or number of volt-hours. Since the voltage determines the speed with which molecules move in an electric field, the volt-hour integrator permits reproducible runs to be obtained conveniently when changing voltages or when the voltage changes significantly during an experiment. Added to these features are the advantages of microprocessor based control and, with it, unprecedented operational flexibility.

The Labconco Power Supplies' microprocessor control circuitry allows the user to store up to five sets of running conditions or programs. These parameters may be selected for display on the front panel. Each program consists of six operating parameters. The parameters are volts, current, power, time, volt-hours, and link or stop. Link or stop allows the user to specify either the end of an experiment (stop) or to switch control to another set of operating parameters (link). All programs are preserved by a non-volatile memory.

### Component Identification (See Figure 2)

#### Front Panel

##### Indicators

- (1) **LCD Display** - The display indicates either the setting parameters or the actual operating parameters. It consists of two lines of characters. In the SET mode, the display shows the program Number, Voltage, Current (MA), Watts, Time, Volt-hour Limits and whether or not to tie programs together (LINK or STOP). Limits can only be changed when in the SET mode. In the RUN mode, actual readings are displayed.
- (2) **SET LED** - When lit, indicates that the Power Supply parameters can be adjusted. Actuated by the select buttons directly below.
- (3) **RUN LED** - Indicated High Voltage switch has been depressed. When flashing, it indicates operation in the load defeat mode unless a message is indicated in the display i.e., (LOAD FAULT, PAUSE, LEAK OR TIME).

##### Switches

- (A) **PROG** - Used to select program number from 1 thru 5 when in SET mode. The program number is indicated on the display in the SET mode, and blinks when PROG is depressed.
- (B) **VOLTS** - Used to select voltage limit in the SET mode. The voltage setting blinks when VOLTS is depressed.
- (C) **MA** - Used to elect milliamp limit in the SET mode. The milliamp setting blinks when MA is depressed. The MA button is also used to enable the LOAD DEFEAT mode. See section the LOAD DEFEAT.
- (D) **WATTS** - Selects watt limit in the SET mode. The watt setting blinks when WATTS is depressed.

## **INTRODUCTION**

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### **Component Identification (Con't)**

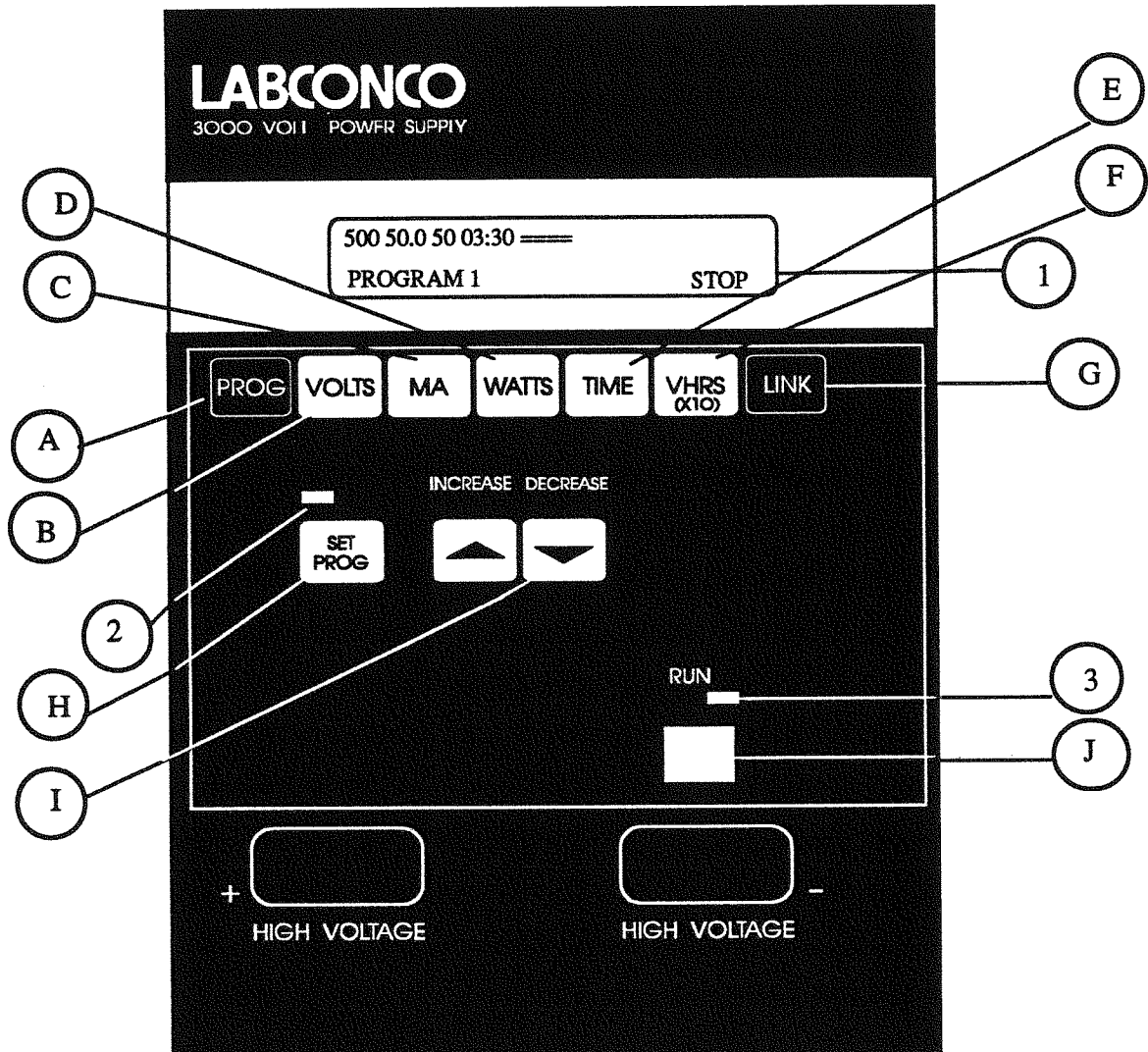
- E) **TIME** - Selects time limit in the SET mode. Time is displayed in hours and minutes (HH:MM) up to a maximum of 99:59. Above this setting, (==:==) appears, which indicates continuous, untimed operation. Time button is also used to enable the PAUSE mode. See section on PAUSE.
- (F) **VHRS** - Selects volt hour limit in the SET mode. Volt-hours are displayed up to a maximum of 9998. Above this setting, (====) appears, which indicates continuous operation. This reading is multiplied by ten.
- (G) **LINK** - Used to select whether or not to tie two or more programs together (LINK or STOP) when in the SET mode. LINK or STOP alternate when the switch is depressed. LINK will automatically transfer to the next program after the pre-set time or volt-hours are attained, while STOP will turn off the high voltage when a limit is reached.
- (H) **SET/PROG** - Alternates between Power Supply SET limits and actual operating values. The LED above the switch indicates when the unit is in the SET mode, and the display will indicate program number with all limiting values selected. The blinking group can be selected by depressing the appropriate switch in the top row.
- (I) **INCREASE/DECREASE** - Used to increase or decrease program number or maximum values of the flashing group in the display when in the SET mode.
- (J) **RUN SWITCH** - When pressed, allows high voltage output at jacks. LED directly above switch will also illuminate. Press switch again to turn off the high voltage.

### **Rear Panel**

- (4) AC Power Switch
- (5) Fuses: F1, F2, F3
- (6) Power Cord Receptacle



FIG 2 - FRONT PANEL



## ***SAFETY PRECAUTIONS***

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- . ALWAYS be sure the AC power is off before connecting the electrophoresis cell.
- . ALWAYS disconnect electrophoresis cells from the Power Supply when not in use.
- . ALWAYS turn the high voltage OFF and disconnect the leads before opening an electrophoresis cell.
- . ALWAYS use extra caution when operating in the LOAD FAULT DEFEAT mode indicated by the flashing RUN LED. This mode of operating disables an important safety feature of the Power Supply and allows high voltage to be applied to an open circuit such as an electrophoresis cell with no gel in it, to electrical leads left carelessly on the laboratory bench or to other potentially dangerous situations. Use this feature ONLY for operation at low current (<2mA). **LABCONCO ASSUMES NO RESPONSIBILITY OF ANY KIND FROM THE IMPROPER USE OF THE LOAD FAULT DEFEAT FUNCTION.**
- . NEVER turn the high voltage ON when no electrophoresis cell is connected to the Power Supply.
- . NEVER place electrophoresis cells or any other liquid container on top of the Power Supply.
- . NEVER operate a Power Supply known to be faulty or damaged.
- . NEVER OPEN THE POWER SUPPLY CABINET. **NO USER SERVICEABLE PARTS ARE CONTAINED INSIDE THE POWER SUPPLY.**
- . NEVER attempt to operate the Power Supplies in series or parallel arrangements or connected to the same load.
- . Always replace fuses with the proper ratings.

### Use Of The Power Supply

#### Parameters

Labconco Power Supplies are capable of storing up to five sets of running conditions or PROGRAMS which operate independently of each other. Each PROGRAM consists of six PARAMETERS: volts, milliamps, watts, time, volt-hours and link or stop. Link or stop is a parameter which will cause the microprocessor to either stop at the end of a program or step to the next program. The key parameters which define the end of a program are either TIME or VOLT-HOURS, whichever comes first. At the end of PROGRAM 5 the Power Supply will STOP. It is not possible to step backwards between programs or to skip programs in series.

#### An Important Note About Digital vs. Analog Control

Note the following important difference between LABCONCO Power Supplies with digital control and one with analog control circuits (i.e., power supply with knobs). With analog control it is possible to SET but not necessarily READ on a digital display, a voltage of 500.4876 volts (this would read 500). This is not possible on a microprocessor based power supply (only 500 or 501 volts may be set). Therefore you may encounter some small changes in the observed values for the uncontrolled parameters when comparing this Power Supply to the more common analog type. This is not a malfunction or indication of inaccurate control.

#### Crossover Regulation

The crossover circuitry on Labconco Power Supplies allows a set "CONSTANT" output in any one mode (such as VOLTAGE) unless the setting corresponds to an output which exceeds limits set in another mode (i.e., milliamps or watts). In the latter case, the power supply circuitry will automatically crossover to regulating the limiting mode and thereby provide "CONSTANT" current (milliamps) or power (watts). The basis of the limit and crossover features of Labconco Power Supplies lies in Ohm's Law (Equation 1) which states:

$$(Eq.1) E = I \times R \text{ (Volts = Amps} \times \text{Ohms)}$$

A useful derivation of Eq. 1 which illustrates the power (watts) generated by an applied voltage in a system which draws a given current is:

$$(Eq.2) P = I \times E \text{ (Watts = Amps} \times \text{Volts)}$$

## ***NORMAL OPERATION***

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### **Crossover Regulation (Con't)**

These relationships define how the actual output of the Power Supply will relate to the operating parameters programmed into the microprocessor. For example, consider using a gel that has a resistance of about 1500 ohms. Thus if a Power Supply is programmed for 200 volts, 50 watts and 150MA, the actual operating condition will be:

$$\begin{aligned} \text{(Eq. 1)} \quad & 200 \text{ Volts} = \text{AMPS} \times 1500 \text{ Ohms} \\ & \text{AMPS} = 200 \text{ Volts} / 1500 \text{ Ohms} \\ & = 133 \text{ MA} \end{aligned}$$

$$\begin{aligned} \text{(Eq. 2)} \quad & \text{Watts} = .133 \text{ AMPS} \times 200 \text{ Volts} \\ & = 26 \text{ Watts} \end{aligned}$$

At the start of the experiment the voltage (200) will be "limiting" (i.e., controlling) then during the experiment, the gel's resistance will fall and both the current and wattage will rise. Eventually the current will reach the programmed value of 150MA, at which point the Power Supply will CROSSOVER and control the experiment at 150MA.

### **Operation At Constant Volts, MA or Watts**

For most applications, only a single parameter (volts, milliamps or watts) is selected to control the experiment. In that case, the operation of the Power Supply is simply as a CONSTANT parameter Power Supply. To accomplish this, it is necessary to set the other output parameters to their maximum values. For example, to operate in a CONSTANT VOLTAGE MODE, program the desired voltage, then program the milliamps and watts to their maximum values. Unless the maximum capacity of the Power Supply is exceeded for current or power, the Power Supply will provide the desired constant voltage. The output curves for the Power Supply are shown on Page 19.

### **Pause Mode**

If it is necessary to stop an electrophoresis experiment in progress, use the PAUSE mode by holding the TIME switch for more than 3 seconds while in the RUN mode until the RUN LED blinks and then simultaneously pressing the RUN switch. The high voltage will be turned off and the RUN LED will flash with the display indicating PAUSE and the accumulated time and volt-hours. To restart the experiment, press the run switch (or hold the MA switch for more than 3 seconds while pressing RUN for the LOAD DEFEAT mode). The high voltage will restart without resetting the elapsed time or volt-hour counters.

**NOTE:** To avoid accidentally resetting a parameter to 0, be sure the SET LED is NOT lit before pressing the TIME switch (refer to Changing Parameters During an Experiment, Page 11). If the high voltage is turned off during an experiment, when power is restarted with the HV key, the elapsed time and volt-hours will reset to zero.

### **Load Defeat Mode**

This feature enables the Power Supply to be operated at very low currents ( $<2\text{mA}$ ). This condition would be found most likely during isoelectric focusing, running the first dimension of O'Farrell two-dimensional gels or when doing isoelectric focusing on immobilized pH gradient gels. This mode is entered by depressing and holding the MA switch (in the non-set mode) and then pressing the RUN switch. Hold the MA switch until RUN LED is flashing (about three seconds). Since operating in this mode disables an important safety feature, extreme caution is important. LABCONCO WILL ACCEPT NO RESPONSIBILITY FOR DAMAGES DUE TO CARELESS OR IMPROPER USE OF THIS FEATURE.

### **Value Limits**

- (1) If a value for any parameter is desired that exceeds the capacity of the Power Supply and the increase key is pressed to enter that value, the display will stop at the maximum value and will flash.
- (2) If the maximum value for the time (99 hr 59 min) or the volt-hours (9998) is entered, untimed operation is assumed and the Power Supply will operate continuously. The display will read "====". If stepping between parameter sets is desired, some value less than maximum MUST be entered for one of these parameters.

### **Changing Parameters During An Experiment**

Parameters may be changed during an electrophoresis run but can only be changed when the SET LED is lit. To change a parameter while the Power Supply is operating, do the following:

- (1) Press the SELECT key to enter the SET mode. SET LED lights.
- (2) Press the appropriate parameter that you wanted to change. Value will flash on display.
- (3) Enter the new value desired with the INCREASE or DECREASE keys.
- (4) When completed, press SELECT key to exit the SET mode which turns off the SET LED. This avoids accidental changes in operating parameters.

## ***NORMAL OPERATION***

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**NOTE:** It is not possible to change parameters in one program while running a different program. It is also not possible to program additional parameter sets while the Power Supply is operating. Therefore it is necessary to set up a number of parameter sets for a single experiment and LINK them. All the parameter sets **MUST** be programmed before beginning the experiment.

### **Display Messages**

Several messages are pre-programmed into the microprocessor control system and will be displayed as follows:

#### **CURRENT OVERLOAD HIGH VOLTAGE IS OFF**

Indicates a low impedance or short circuit was detected by the Supply and the high voltage is off. The run light blinks until the HV switch is released to OFF. Check for shorted wires or improper connections before pressing the HV switch ON again.

#### **LEAK - HV OFF CHECK YOUR SETUP**

Indicates the power supply has been turned OFF because a leakage current was detected by the control circuit. If ON, the RUN LED will blink until the HV switch is released to OFF. Check for any possible leakage paths to earth ground or water leaks in any experiment's cooling system.

#### **TIME EXPIRED HIGH VOLTAGE IS OFF**

Indicates that time or volt-hours have exceeded the pre-set limit and the program mode was set to STOP after the limit was reached. The RUN LED will blink until the HV switch is released to OFF.

#### **LOAD FAULT HIGH VOLTAGE IS OFF**

Indicates that a no-load or open circuit condition was detected by the control circuit and it has shut the Supply OFF. The RUN LED will blink until the HV switch is released. If a low-current operating condition is required, the unit may be operated in the LOAD DEFEAT mode. See section on LOAD DEFEAT operation.

## ***NORMAL OPERATION***

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### **POWER INTERRUPTION HIGH VOLTAGE OFF**

Indicates the input line voltage was OFF for more than approximately 2-1/2 minutes and the unit shut off the high voltage. The RUN LED will blink until the HV switch is released. Power failure of less than 2-1/2 minutes while the high voltage is on, will result in the Power Supply retaining the time and volt-hours, and then restarting when power is re-applied (similar operation to the PAUSE mode).

### **Alternating Display Messages**

#### **MAX/VALUE**

Indicates that this parameter is the limiting value when the power supply is operating in the RUN mode. The Supply, when initially started, will increase the voltage, current and wattage output until one of the limiting values is reached. This cannot be detected in the SET mode where the limits are preset, but is seen in the RUN mode when the value is within one digit of the present maximum. It may limit just below and not display maximum.



**Application (Example)**

The ability to program multiple steps in an electrophoresis experiment serves to automate some applications which otherwise require constant attention and adjustment. A typical example is the protocol for two-dimensional gels as described by O'Farrell. The first IEF dimension in this protocol has the following schedule:

**Pre-Focus**

200 Volts	15 Min.
300 Volts	30 Min.
400 Volts	30 Min.

**Load Samples and Focus**

400 Volts	18 Hr.
800 Volts	1 Hr.

The schedule is easily programmed in two groups of parameter sets. The first for the pre-focusing would use P1, P2, and P3 programmed for 200, 300 and 400 volts respectively with the appropriate times. P1 and P2 would be programmed for LINK and P3 for STOP. P4 and P5 could be used for the remaining two steps with the appropriate parameters, thus eliminating the bother of manually changing voltage.

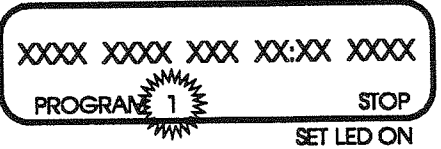
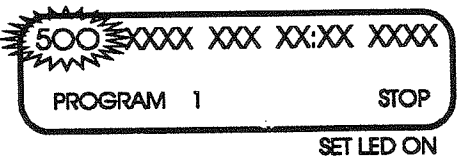
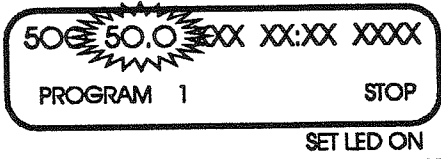
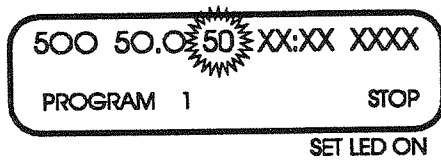
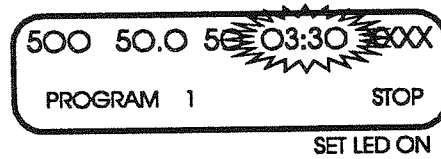
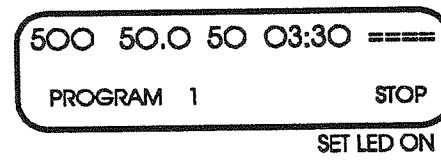
## NORMAL OPERATION

### Set Up (Example)

The example below will show the steps involved to program and run a single program with the following parameter values:

VOLTS: 500  
PROGRAM NUMBER: 1  
MILLIAMPS: 50.0

WATTS: 50  
TIME: 3HR 30MIN  
VOLT-HOURS: UNTIMED  
LINK / STOP: LINK

ACTION	DISPLAY
POWER ON	
Press volts switch to flash volts setting and increase or decrease switch to obtain 500. NOTE: Holding increase or decrease switch will cause values to change by 1's for about 10 volts, then by 10's for about 100 volts, then change by 100's.	
Press MA switch to flash MA setting and increase or decrease switch to obtain 50.0. NOTE: MA are displayed in whole units above 100 and to .1 increments below 100.	
Press WATTS switch to flash watts setting and increase or decrease switch to obtain 50.	
Press TIME switch to flash time setting and increase or decrease switch to obtain 3:30.	
Press VHRS switch to flash volt-hour setting and increase switch to obtain ==, which indicates untimed setting.	

ACTION	DISPLAY
<p>Press LINK switch to alternate between LINK &amp; STOP.</p> <p>NOTE: If LINK is chosen, program will transfer to 2 at the end of 3 hours and 30 minutes. Verify that program 2 is correct for this procedure or experiment may be damaged.</p>	<div style="border: 1px solid black; border-radius: 10px; padding: 5px; text-align: center;"> 500 50.0 50 03:30 ==  PROGRAM 1 LINK </div> <p style="text-align: right;">SET LED ON</p>
<p>To start the power supply, press RUN switch. Limits will be shown until the SELECT switch is pressed, which turns off the SET LED and displays actual values. When a limit is reached (VOLTS, MA OR WATTS) the value will alternate with MAX on the display.</p>	<div style="border: 1px solid black; border-radius: 10px; padding: 5px; text-align: center;"> 500 25.5 13 00:00 0000  MAX  HIGH VOLTAGE IS ON </div> <p style="text-align: right;">SET LED OFF</p>

## **SPECIFICATIONS**

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Single Power Supply	1000	3000	5000
Voltage:	1000V	3000V	5000V
Current:	400mA	200mA	200mA
Power:	400W	600W	500W
Readout:	LCD □	LCD □	LCD □
Regulation (V):	±0.5%	±0.5%	±0.5%
Regulation (mA):	±1.0%	±1.0%	±1.0%
Regulation (W):	±2.0%	±2.0%	±2.0%
Ripple:	±1.0%	±1.0%	±1.0%
Output Terminals:	2	2	2
Load Detector:	Yes	Yes	Yes
Load Indicator:	Yes	Yes	Yes
Leak Detector:	Yes	Yes	Yes
Leak Indicator	Yes	Yes	Yes
Crossover:	Yes	Yes	Yes
Time:	Yes	Yes	Yes

### **Programmable Parameters:**

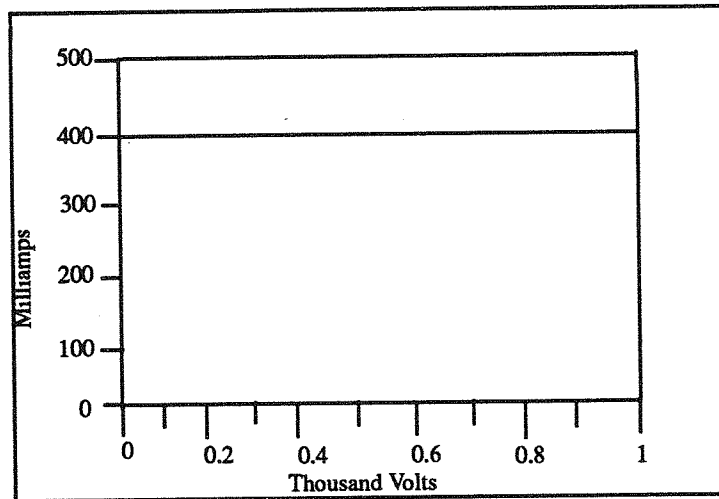
Volts (0-max in 1V increments)	Yes	Yes	Yes
Current (0-max in 0.1mA increments)	Yes	Yes	Yes
Watts (0-max in 1 W increments)	Yes	Yes	Yes
Volt-Hours (0-999 in 1 V/Hr. increments)	Yes	Yes	Yes
time (0-100 hrs. in 1 min increments)	Yes	Yes	Yes

□2x24 backlighted LCD display

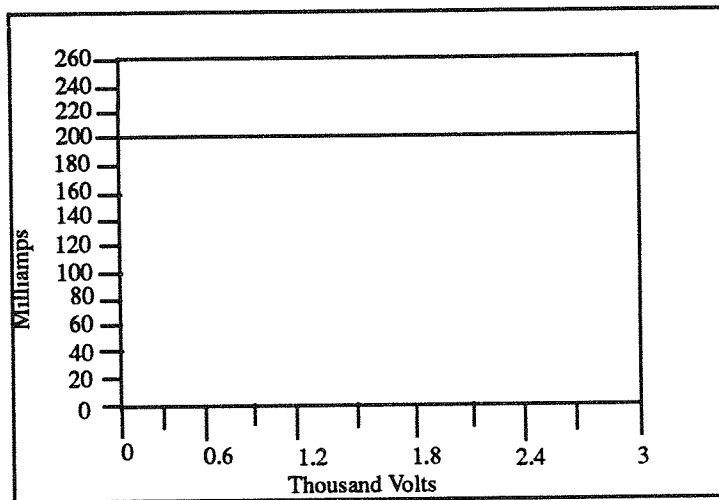
**OUTPUT CURVES**

(Subject to total wattage output previously listed)

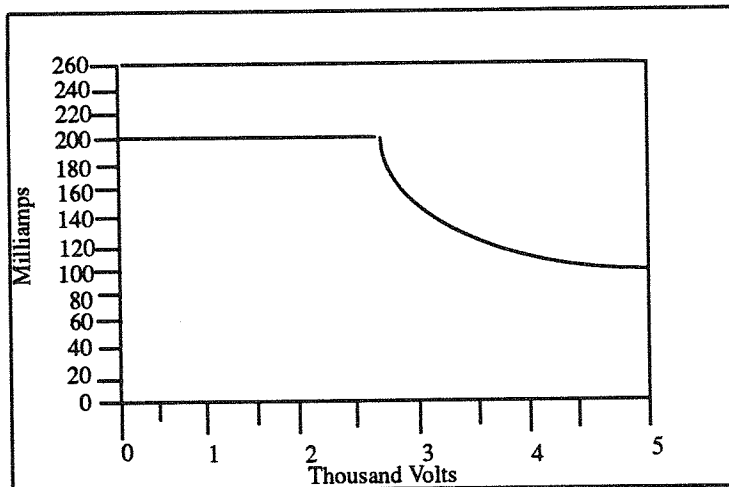
**1000V  
Power  
Supply**



**3000V  
Power  
Supply**



**5000V  
Power  
Supply**



## **TROUBLESHOOTING**

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<b>PROBLEM</b>	<b>CAUSES</b>	<b>CORRECTIVE ACTION</b>
<b>Unit won't turn on</b>	Unit not plugged into outlet	Plug the unit into appropriate electrical outlet
	Blown fuse	Check the three fuses on the back of the unit
<b>Unit operates for about 1 minute then shuts off</b>	Volt or volt hour parameter not programmed	Check program parameters to ensure proper operation
<b>Supply indicates load fault</b>	High resistance load current < 2mA	Check load resistance to ensure programmed parameters are adequate
<b>Program continues beyond set time</b>	Programs linked together when stop is needed	Re-program properly

**CAUTION:** NEVER OPEN THE POWER SUPPLY CABINET. NO USER SERVICE-ABLE PARTS ARE CONTAINED INSIDE THE POWER SUPPLY.

O'Farrell, P. (1975) Journal Of Biological Chemistry. 250, 4007-4021.

## **WARRANTY**

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We are committed to providing our customers with quality equipment and service after the sale. Part of this objective involves keeping you informed of changes and new product additions. We therefore request that you take a moment to fill out the product registration card so we may know your location as well as some of the reasons that prompted you to purchase our products.

**Labconco Corporation warrants products of its manufacture for one year, from receipt of the equipment by the purchaser, against defects in materials and workmanship. This limited warranty covers parts and labor but not transportation and insurance charges. In event of a warranty claim contact the dealer who sold you the product. If the cause is determined to be a manufacturing fault, the dealer or Labconco Corporation will repair or replace all defective parts to restore the unit to operation. Under no circumstances shall Labconco Corporation be liable for indirect, consequential or special damages of any kind. This statement of warranty may be altered by a specific published amendment. No individual has authorization to alter the provisions of this warranty policy or its amendments. Lamps and expendable items such as filters are not covered by this warranty. Damage due to corrosion or accidental breakage are also not covered.**

**WARNING:** The disposal and /or emission of substances used in connection with this equipment may be governed by various federal, state or local regulations. All users of this equipment are urged to become familiar with any regulations that apply in the user's area concerning the dumping of waste materials in or upon water, land or air and to comply with such regulations.



If a shipment is received in visibly damaged condition, be certain to make a notation on the delivery carrier's receipt and have his agent confirm the damage on your receipt. Otherwise, the damage claim may be refused.

If concealed damage or pilferage is discovered, notify the carrier immediately and retain the entire shipment intact for inspection. Interstate Commerce Commission rules require that the claim be filed with the carrier within 15 days after delivery.

**NOTE: Do not return goods.** Goods returned without prior authorization will not be accepted. Labconco and its dealers are not responsible for shipping damage. Claims must be filed directly with the freight carrier by the recipient. If authorization has been received to return this product, by accepting this approval, the user assumes all responsibility and liability for biological and chemical decontamination and cleansing. Labconco reserves the right to refuse delivery of any products which do not appear to have been properly cleaned and/or decontaminated prior to return.

## ***CONTACTING LABCONCO***

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If you have any questions that are not addressed in this manual, or if you need technical assistance, please contact Labconco's Product Service Department at either (800) 821-5525, or (816) 333-8811, between the hours of 8:00 a.m. and 5:00 p.m. Central Standard Time.