PowerPac™ Universal Power Supply

Instruction Manual

Catalog Number
164-5070

BIO·RAD

Table of Contents

List of Figures

1. Front View.

2. Rear View.

3. Front View with Legs in Lowered Position.

4. Front Panel.

5. Power Leads Connected Correctly.

6. Power Leads Connected Incorrectly.

7. Rear View Showing Fuse Drawer with Notches.

Safety

Caution/Warning

PowerPac power supplies use high output voltages that are electrically isolated from earth ground to minimize the risk of electrical shock to the user. The following guidelines should be observed and followed when using a PowerPac power supply.

PowerPac power supplies have been tested for operation at temperatures between 0° and 40°C, with relative humidity between 0 and 95% non-condensing. Operating the power supply outside these conditions is not recommended by Bio-Rad and will void the warranty.

1. To ensure adequate cooling of the power supply, be sure that there is at least 6 cm clearance around the power supply. Do not block the fan vent at the rear of the unit.

2. Always connect the power supply to a 3-prong, grounded AC outlet, using the 3-prong AC power cord provided with the power supply.

3. Bio-Rad electrophoresis cells have molded two-prong plugs that are inserted into the power supply's high voltage output jacks. These plugs have been EN 61010* certified for safety compliance for use with PowerPac power supplies. Use of other plugs or banana jacks is done at the user's own risk and is not recommended by Bio-Rad. When inserting and removing the molded two-prong plug, always grasp the plug by the molded support at the rear of the plug. Do not grasp the individual prong ends.

4. Do not operate the power supply in extreme humidity (>95%) or where condensation can short the internal electrical circuits of the power supply.

5. When taking the power supply into a cold room, the unit can be operated immediately. However, when removing the power supply from the cold room, let the unit equilibrate to room temperature for a minimum of 2 hours before using it.

6. Never connect a high voltage output lead to earth ground. This defeats the floating electrical isolation of the power supply and exposes the user to potentially lethal high voltages.

Important

This instrument is intended for laboratory use only.

This product conforms to the class A standards for Electromagnetic Emissions, intended for laboratory equipment applications. It is possible that emissions from this product may interfere with some sensitive appliances when placed nearby or on the same circuit as those appliances. The user should be aware of this potential and take appropriate measures to avoid interference.

Bio-Rad's PowerPac power supplies are designed and certified to meet EN 61010* safety standards. Certified products are safe to use when operated in accordance with the instruction manual. This safety certification does not extend to electrophoresis cells or accessories that are not EN 61010 certified, even when connected to this power supply.

This instrument should not be modified or altered in any way. Alteration of this instrument will void the manufacturer's warranty, void the EN 61010 certification, and create a potential safety hazard for the user. Bio-Rad is not responsible for any injury or damage caused by the use of this instrument for purposes other than those for which it is intended, or by modifications of the instrument not performed by Bio-Rad or an authorized agent.

*EN 61010 is an internationally accepted electrical safety standard for laboratory instruments.

Section 1
Introduction

1.1 Overview

The PowerPac Universal power supply is designed to provide constant voltage, current or power for a wide range of electrophoresis applications, including high throughput electrophoresis with the Dodeca cells and electrophoretic blotting.

Output specifications:

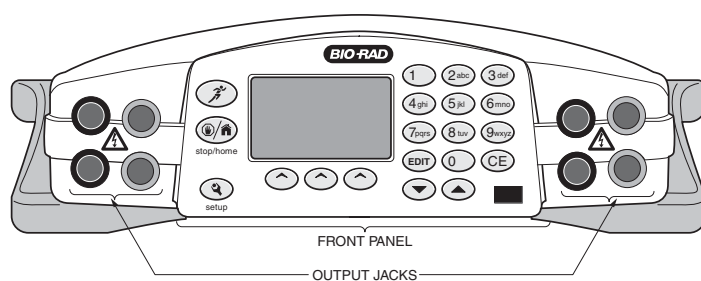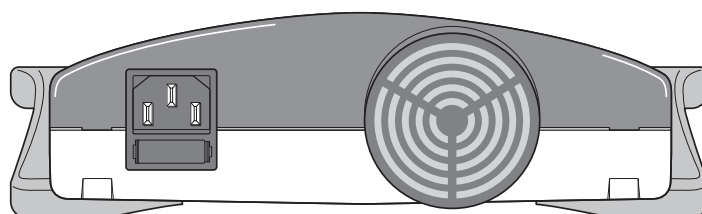|	
Voltage:	Adjustable from 10 to 500 volts (V) in 1 V increments
Current:	Adjustable from 10 to 2500 mA in 1 mA increments.
Power:	Adjustable from 1 to 500 Watts (W) in 1 W increments.
Output jacks:	Four sets of output jacks are provided to facilitate connection of up to 4 identical electrophoresis cells simultaneously.

Fig. 1. Front view.

Fig. 2. Rear view.

The PowerPac Universal has the following features:

- Constant voltage, constant current, or constant power operation with automatic crossover

- LCD screen displays all run parameters at once

- Programmable methods with up to nine steps

- Storage capacity for up to nine user defined methods

- Continuous, hour and volt-hour time modes

- Paused run editing

- Safety features: no-load, short circuit, rapid resistance change, ground leak, and internal thermal protection

- User optional run completion after an AC power failure

- Adjustable LCD display contrast

- EN61010 international safety certification

- Input power 100-120/220-240 VAC, 50/60 Hz, auto-switching

- Four output terminals

- Stackable case with adjustable viewing angle via flip down legs (See Figure 3)

- Infrared port, for transmitting data to a personal computer or PDA

Optional:

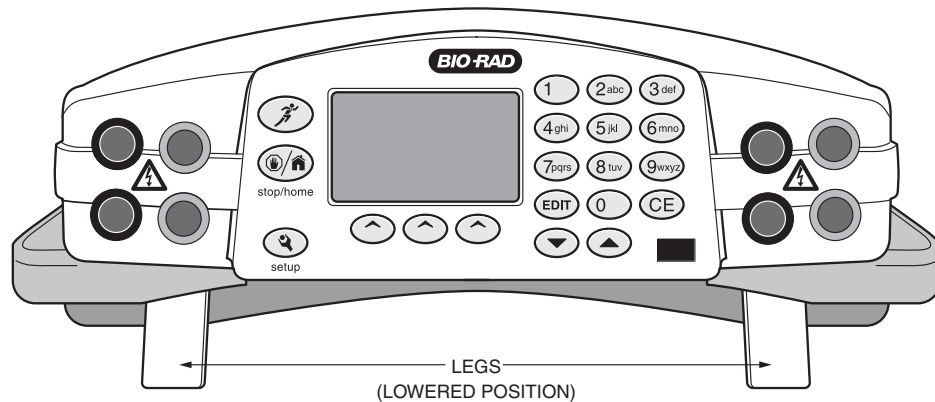- Data transfer software (DTS) for data file management on a PDA and PC

Fig. 3. **Front view with legs in lowered position.**

1.2 Unpacking

When you receive your power supply, carefully inspect the container for any damage which may have occurred in shipping. Severe damage to the container may indicate damage to the power supply itself. If you suspect damage to the unit, immediately file a claim with the carrier in accordance with their instructions before contacting Bio-Rad Laboratories.

After unpacking the PowerPac Universal, remove the plastic film from the translucent green top case. The plastic film may leave a residue. If so, clean with a soft, damp cloth. Also remove the die-cut plastic film covering the display window.

Contents include:

- PowerPac Universal power supply
- Power cord
- Instruction manual
- Warranty card
- Declaration of conformity

  If any part is missing or damaged, contact Bio-Rad Laboratories immediately.
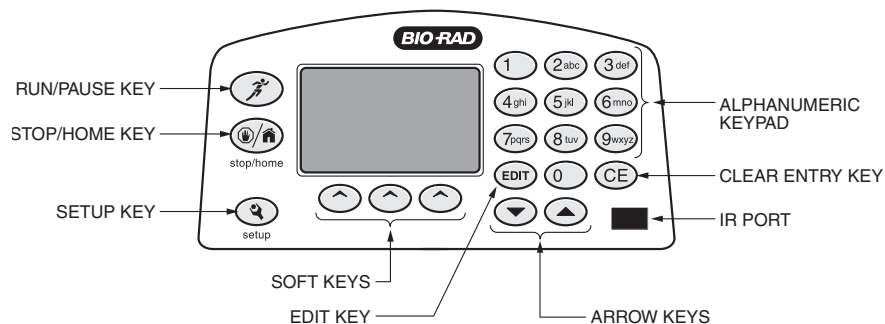
Section 2
Control features

Fig. 4. Front Panel.

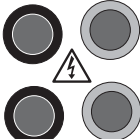| Key	Description
Run/Pause	Starts or pauses a run. When paused, the run parameters for the current or subsequent step(s) may be edited. The modified method may be stored to permanent memory by pressing **SAVE** at the end of the run.
Stop/Home	Terminates the run in progress and displays the final run parameters, or if no run is active, changes the display to the Home screen.
	Note: If a method has been edited during a run, **SAVE** must be pressed at the end of the run to save the changes.
Setup	Used to set the PowerPac Universal default settings such as: power failure detection, rapid resistance change detection, no load detection as well as clock, contrast and key chirp settings (see Section 3.1).
EDIT	Toggles soft key assignments between those used to set the run mode (constant voltage, constant current or constant power), run limits (voltage, current or power) and time mode (hours, volt-hours or untimed).
Arrow Keys	Used to scroll through method list or method protocol. An asterisk (*) is used to identify the selected method or step.
CE	Deletes alphanumeric characters from a parameter value or method name, or restores previous numeric value.
Alpha-numeric keypad	Used to enter parameter values and method names. When method names are entered, the manner in which keys are pressed determines the characters entered and their placement. Rapid repetitive strokes on a single key cause the character displayed at the cursor position to toggle between those associated with the key (i.e. a®b®c®2®A®B®C®2). The cursor position advances each time a different key is pressed or when there is a pause between strokes of a single key.
Soft Keys	The commands on the LCD screen immediately above the soft keys assign their functionality.

4

Section 3
Setup and Operation

3.1 SET UP

This section describes how the PowerPac Universal power supply is set up and connects to an electrophoresis cell(s).

Step	Procedure	Description
1.	Connect Cells	Insert power leads into one of the output terminals located on the front of the power supply (shown to the left). Note that the ⚠ symbol indicates high voltages and that the power leads must be inserted perpendicular to the curve of the case (see Figure 5).
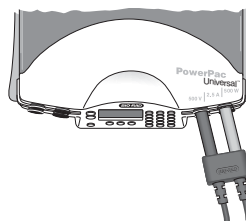
Fig. 5. Power Lead Connected Correctly

Fig. 6. Power Leads Connected Incorrectly
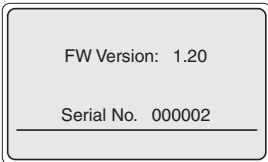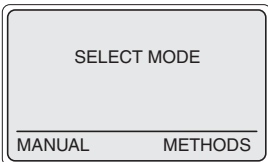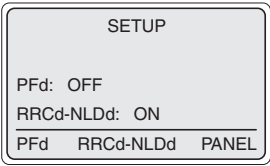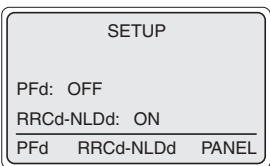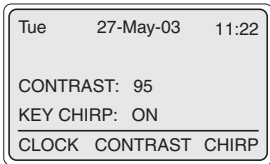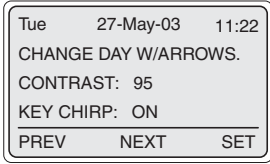
Step	Procedure	Description
2.	Turn power on	Use the switch located on the right side of the power supply to turn the power on. When turned on, the unit briefly displays the firmware version and serial number and then goes to the Home screen. The Home screen soft keys are used to operate the power supply in manual (Section 3.2) or method mode (Section 3.3).
	FW Version: 1.20	
	Serial No. 000002	
	SELECT MODE	MANUAL mode: Program and run a single step method without storing into memory.
	MANUAL METHODS	METHODS mode: Program, store, and run single or multistep methods.
3.	Open the setup editor	Press **SETUP** to start the setup editor. **SETUP** can be pressed from any screen except the run screen.
	setup	
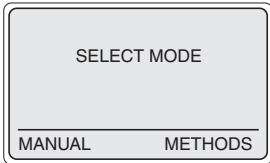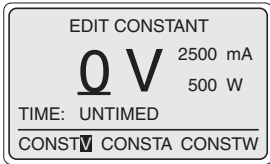
Step	Procedure	Description
4.	Set the Power Failure detection mode	Use the **PFd** soft key to set the Power Failure detection mode:

```
        SETUP


PFd:  OFF
RRCd-NLDd:  ON
PFd     RRCd-NLDd    PANEL
```

PFd = OFF: Turns power failure detection off. In this mode, the run is terminated if a power failure occurs.

PFd = ON NEXT RUN ONLY: Turns power failure detection on for a single run.

PFd = ON: Turns power failure detection mode on. If there is a power failure in this mode, then the run will resume when the power is restored after single or mulitple power failures.

Warning: Turning the power supply off to stop a run in progress is regarded as a power failure and the interrupted run (when **PFd = ON**) will resume the next time the power supply is turned ON.

Step	Procedure	Description
5.	Set the Rapid Resistance Change detection/No Load detection mode	Press the **RRCd-NLDd** soft key to change the Rapid Change detection and No Load detection mode.

```
        SETUP


PFd:  OFF
RRCd-NLDd:  ON
PFd     RRCd-NLDd    PANEL
```

RRCd-NLDd = ON: Detection of a load change greater than 20% or 15 mA, or the absence of a load (current is less than 2 mA), will cause an alarm to sound and the run to pause.

RRCd-NLDd = OFF: Does not detect sudden load changes or the absence of a load. When running in this mode, the ⚠ symbol is displayed on the Run screen as a reminder that this safety feature has been turned off.

Note: This mode is used to complete electrophoresis application such as the D-Code that require that Rapid Resistance Change detection be turned off or applications such as isoelectric focusing that require less than 2 mA current.

Step	Procedure	Description
6.	Set the control panel default settings	Press the **PANEL** soft key.

Step	Procedure	Description
7.	Set the default contrast	Press the **CONTRAST** soft key and enter a value from the keypad. The contrast value range is between 80 and 110.

```
Tue       27-May-03      11:22


CONTRAST:  95
KEY CHIRP:  ON
CLOCK  CONTRAST  CHIRP
```

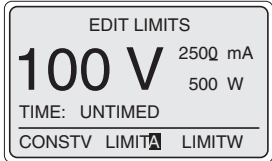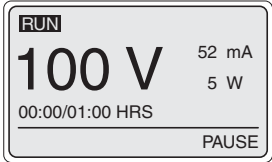| Step	Procedure	Description
8.	Set the key chirp mode Tue 27-May-03 11:22 CONTRAST: 95 KEY CHIRP: ON CLOCK CONTRAST CHIRP	Press the **CHIRP** soft key to turn key chirp on or off. **KEY CHIRP = OFF**: No sound is produced when a key is pressed. This does not affect alarms. **KEY CHIRP = ON**: A chirp noise is heard every time a key is pressed.
9.	Set the clock Tue 27-May-03 11:22 CHANGE DAY W/ARROWS. CONTRAST: 95 KEY CHIRP: ON PREV NEXT SET	Press the **CLOCK** soft key to display the clock settings screen. Use the **PREV** and **NEXT** soft keys to move the cursor between the day, date and time fields. The up and down arrow keys are used to set the day and month and the keypad is used to enter the date and time values. Press the **SET** soft key to accept the new day, date and time values. Press **Setup** once to return to the previous screen or twice to exit setup mode. **Note**: The PowerPac Universal contains an internal battery to maintain the clock settings during power off.

3.2 Manual Mode Operation

This section describes how to program and perform a run in manual mode.

In the Manual mode the user can program and start a single step method with a minimum number of keystrokes. This single step method is not stored in permanent memory; however, the run parameters are kept in the flash memory until the PowerPac is turned off. This allows repeating the same run without having to re-enter the values.

Step	Procedure	Description
1.	Set up the power supply	Refer to Section 3.1 for instrument setup.
2.	Select a run mode SELECT MODE MANUAL METHODS	From the Home screen, press the **MANUAL** soft key to perform a single step run in manual mode or press **METHODS** to run a multi-step method (see Section 3.3).
3.	Select a constant parameter EDIT CONSTANT 0 V 2500 mA 500 W TIME: UNTIMED CONSTV CONSTA CONSTW	Use the soft keys to select the constant parameter and the keypad to enter its value. The constant parameter is displayed in large font. If the run will be performed as an un-timed run at the displayed maximum limit values for the non-constant parameters (shown to the right of the constant parameter) skip to Step 6, otherwise press the **EDIT** key. **ConstV**: Used to run with constant voltage. **ConstA**: Used to run with constant current. **ConstW**: Used to run with constant power.

Step	Procedure	Description
4.	Enter limits for the non-constant parameters EDIT LIMITS **100 V** 2500 mA / 500 W TIME: UNTIMED CONSTV LIMITA LIMITW	Use the soft keys to select a non-constant parameter and the keypad to enter its value. If the run will be performed as an un-timed run, skip to Step 6, otherwise, press the **EDIT** key. Note: to change the constant value, press its soft key and enter a new value. **ConstV**: Used to change the voltage constant value. **LimitA**: Used to change the maximum default value for current limit. **LimitW**: Used to change the maximum default value for power limit.
5.	Select the time mode EDIT TIME **100 V** 2500 mA / 500 W TIME: 00:00 HRS HRS VHOURS UNTIMED	Use the soft keys to select the time mode and the keypad to enter the run time. Press the **EDIT** key to return to Step 3, otherwise, proceed to the next step. **HRS**: Run time is in units of hours. **VHOURS**: Run time is in units of volt-hours. **UNTIMED**: Run is continuous.
6.	Start the run	Press ⟨⚡⟩ to start a run.
7.	Monitor the run RUN **100 V** 52 mA / 5 W 00:00/01:00 HRS PAUSE	The run screen is used to monitor run parameters or to pause a run. The elapsed time versus the programmed time, voltage, current and power values may be viewed from the run screen. Press the **PAUSE** soft key to edit the run parameters (see Section 3.3.3) or to abort the run. Press ⟨⏻/⌂⟩ to terminate the run.
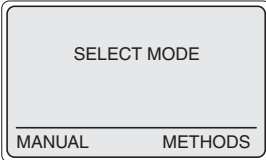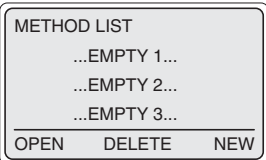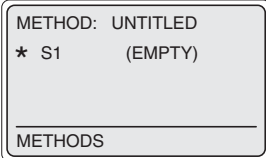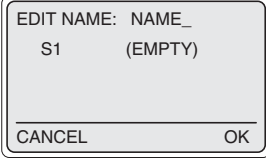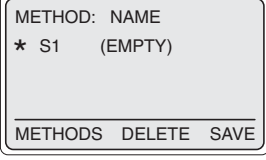
3.3 Method Mode Operation
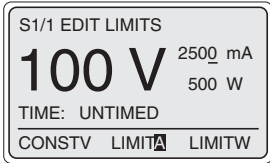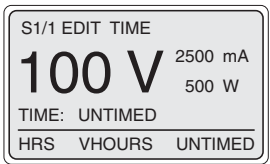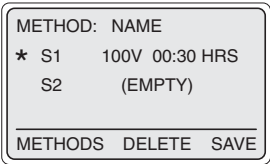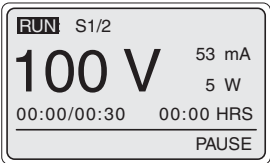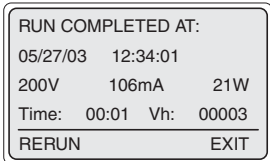
This section describes how to program and perform a run in Method mode. Method mode operation is used to create and run single and multi-step methods. In method mode, up to nine methods, each with up to nine steps may be programmed, stored, or edited. Each of these methods may be transferred to or from a PDA, through the PowerPac Universal IR port as described in Section 4.

3.3.1 Create and Run a New Method

This section describes how to create and run a new method.
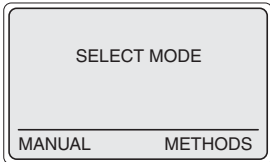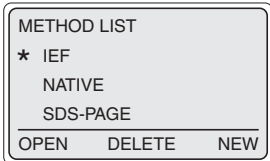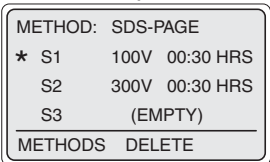
Step	Procedure	Description
1.	Setup the power supply	Refer to Section 3.1 for instrument setup.
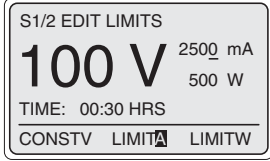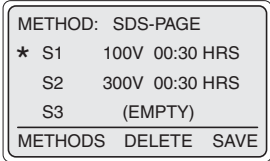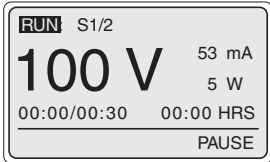
Step	Procedure	Description
2.	Select the programming mode	On the Home screen, press the **METHODS** soft key to display the Method List screen.
	SELECT MODE MANUAL METHODS	
3.	Create a new method	Press the **NEW** soft key on the Methods List screen to create a new method. Note that if there are already nine methods defined in the list, an existing method will need to be deleted before a new method can be added to the list. To delete a method use the up and down arrow keys to select a method (identified by *) and then press the **DELETE** soft key. Press the **OPEN** soft key to open the selected, stored method and display the method.
	METHOD LIST ...EMPTY 1... ...EMPTY 2... ...EMPTY 3... OPEN DELETE NEW	
4.	Name the new run	Press the up arrow key to select the method name field. Note that the soft keys have now changed to **CANCEL** and **OK**. Use the CE button to delete the default name and the keypad to enter a method name. Refer to Section 2 for help using the keypad. Press the **CANCEL** soft key to abort naming the method or the **OK** soft key to accept the new name. Note that OK accepts the name but is not stored into memory until the method is saved.
	METHOD: UNTITLED ★ S1 (EMPTY) METHODS	
	EDIT NAME: NAME_ S1 (EMPTY) CANCEL OK	
5.	Select a step to edit	Press the **EDIT** key to open the selected empty step (identified by *).
	METHOD: NAME ★ S1 (EMPTY) METHODS DELETE SAVE	
6.	Set the constant parameter for the current step	Use the soft keys to select the constant parameter and the keypad to enter its value. If the method is complete go to Step 10, otherwise, press the **EDIT** key. Note that the maximum default values for the non-constant parameters are listed on the right side of the screen and the time mode at the bottom.
	S1/1 EDIT CONSTANT <u>0</u> V 2500 mA 500 W TIME: UNTIMED CONSTV CONSTA CONSTW	**ConstV**: Used to run with constant voltage. **ConstA**: Used to run with constant current. **ConstW**: Used to run with constant power.

9

Step	Procedure	Description
7.	Enter non-constant parameter limits for the current step ``` S1/1 EDIT LIMITS 100 V 2500 mA 500 W TIME: UNTIMED CONSTV LIMITA LIMITW ```	Use the soft keys to select a non-constant parameter and the keypad to enter its value. If the method is complete and will be run un-timed go to Step 10, otherwise, press the **EDIT** key. Note: to change the constant value, press its soft key and enter a new value. **ConstV**: Used to change the voltage constant value. **LimitA**: Used to change the maximum default value for current limit. **LimitW**: Used to change the maximum default value for power limit.
8.	Select the time mode ``` S1/1 EDIT TIME 100 V 2500 mA 500 W TIME: UNTIMED HRS VHOURS UNTIMED ```	Use the soft keys to select a time mode and the keypad to enter the run time. Press **EDIT**. **HRS**: Run time is in units of hours. **VHOURS**: Run time is in units of volt-hours. **UNTIMED**: Run is continuous. Note that steps programmed after an un-timed step are ignored.
9.	Add a new step or save the method ``` METHOD: NAME ★ S1 100V 00:30 HRS S2 (EMPTY) METHODS DELETE SAVE ```	To program additional steps press the down arrow key to select the empty step and repeat steps 5–8. If the method will not be saved, go directly to Step 10, otherwise press the **SAVE** soft key and then go to Step 10. Press the **DELETE** soft key to delete the selected step. Press the **METHODS** soft key to return to the Method List screen.
10.	Start the run	Press ⌐ to start a run.
11.	Monitor the run ``` RUN S1/2 100 V 53 mA 5 W 00:00/00:30 00:00 HRS PAUSE ```	The run screen is used to monitor run parameters or to pause a run. The current step versus total steps programmed, voltage, current and power values, elapsed time versus the programmed time, and total elapsed time of the method are displayed on the run screen. Press the **PAUSE** soft key to edit the run parameters (see Section 3.3.3). Press ⌐ to terminate the run. Note that any edits made during the run will not be saved unless **SAVE** is pressed at the end of the run.
12.	View the run information ``` RUN COMPLETED AT: 05/27/03 12:34:01 200V 106mA 21W Time: 00:01 Vh: 00003 RERUN EXIT ```	The "Run Completed" or "Run Terminated" screen is displayed at the end of a run. The date and time, the final running parameter values, the total elapsed time in hours and volt-hours are displayed on the screen. Press the **RERUN** soft key to repeat the run or the **EXIT** soft key to display the Method Step List. After the run is finished, the run data may be transmitted to a PDA or PC (see Section 4.2.2).

3.3.2 Edit (or View) and Run a Saved Method

This section describes how to edit, view and run a saved method.

Step	Procedure	Description
1.	Set up the power supply	Refer to sections 3.1 for instrument setup.
2.	Select the programming mode	On the Home screen, press the **METHODS** soft key to view the method list.

SELECT MODE

MANUAL   METHODS

| 3. | Open an existing method | Use the up and down arrow keys to select a method to edit (identified by *) and then press **OPEN** to open the Method screen. Press ⬨ to run the opened method or go to Step 4 to view and edit the method. |

METHOD LIST

★ IEF

NATIVE

SDS-PAGE

OPEN   DELETE   NEW

| 4. | Select a step to edit | Press the up and down arrow keys to select a step. An asterisk (*) indicates the selected step. Press **EDIT** to view or edit. Note: to edit the method name, use the up arrow key to move to the method name and activate the name field. Use the keypad to change the name. |

METHOD: SDS-PAGE

★ S1   100V 00:30 HRS

S2   300V 00:30 HRS

S3   (EMPTY)

METHODS   DELETE

| 5. | Set the constant parameter for the current step | Use the soft keys to select the constant parameter and the keypad to enter its value. If the method is complete skip to Step 9, otherwise, press the **EDIT** key. Note that the non-constant parameter values are listed on the right side of the screen and the time mode at the bottom.
ConstV: Used to run with constant voltage.
ConstA: Used to run with constant current.
ConstW: Used to run with constant power. |

S1/2 EDIT CONSTANT

100 V   2500 mA
              500 W

TIME: 00:30 HRS

CONSTV CONSTA CONSTW

Step	Procedure	Description
6.	Set the non-constant parameter limits for the current step S1/2 EDIT LIMITS **100 V** 2500 mA / 500 W TIME: 00:30 HRS CONSTV LIMITA LIMITW	Use the soft keys to select a non-constant parameter and the keypad to enter its value. If the method is complete skip to Step 9, otherwise, press the **EDIT** key. Note: to change the constant value, press its soft key and enter a new value. **ConstV**: Used to change the voltage constant value. **LimitA**: Used to change the current limit value. **LimitW**: Used to change the power limit value.
7.	Select the time mode S1/2 EDIT TIME **100 V** 2500 mA / 500 W TIME: 00:30 HRS HRS VHOURS UNTIMED	Use the soft keys to select a time mode and the keypad to enter the run time. Press the **EDIT** key. **HRS**: Run time is in units of hours. **VHOURS**: Run time is in units of volt-hours. **UNTIMED**: Run is continuous. Note that steps programmed after an un-timed step are ignored.
8.	Add a new step or save the method METHOD: SDS-PAGE ★ S1 100V 00:30 HRS S2 300V 00:30 HRS S3 (EMPTY) METHODS DELETE SAVE	If more steps are to be added to the method, use the down arrow key to move to the empty step, press the **EDIT** key and repeat steps 5–8 to add a new step. If the method will not be saved, go to Step 9, otherwise press the **SAVE** soft key and then go to Step 9.
9.	Start the run	Press ⬧ to start a run.
10.	Monitor the run RUN: S1/2 **100 V** 53 mA / 5 W 00:00/00:30 00:00 HRS PAUSE	The run screen is used to monitor run parameters or to pause a run. The current step versus total steps programmed, voltage, current and power values, elapsed time versus the programmed time, and total elapsed time of the method are displayed on the run screen. Press the **PAUSE** soft key to edit the run parameters (see Section 3.3.3). Press ⬧ to terminate the run. Note that any edits made during the run will not be saved unless **SAVE** is pressed at the end of the run.
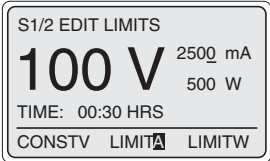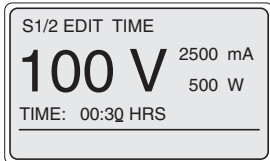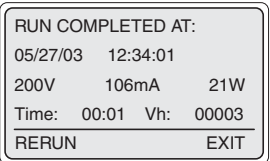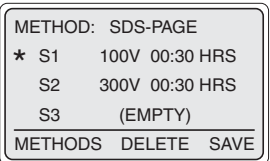
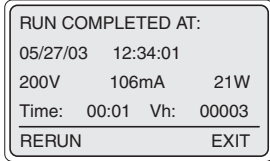| Step	Procedure	Description
11.	View the run information	The "Run Completed" or "Run Terminated" screen is displayed at the end of a run. The date and time, the final running parameter values, the total elapsed time in hours and volt-hours are displayed on the screen. Press the **RERUN** soft key to repeat the run or the **EXIT** soft key to display the Method Step List. After the run is finished, the run data may be transmitted to a PDA or PC (see Section 4.2.2).

RUN COMPLETED AT:

05/27/03   12:34:01

200V   106mA   21W

Time: 00:01   Vh: 00003

RERUN   EXIT

3.3.3 Edit a Paused Run

This section describes how to edit a paused run.

Step	Procedure	Description
1.	Pause the run	Press the **PAUSE** soft key or ⌀ to pause a run that is in progress.

RUN: S1/2

100 V   53 mA
                5 W
00:00/00:30   00:00 HRS
                    PAUSE

Step	Procedure	Description
2.	Edit the method	The pause window displays the current run parameters as well as the date and time that the run was paused. Press the **EDIT** soft key or the **EDIT** key to modify the method. The **CONTINUE** soft key or ⌀ button can be used to resume the run.

RUN PAUSED AT:

05/27/03   12:29:00

100V   53mA   5W

Time: 00:00   Vh: 00000

EDIT   CONTINUE

Step	Procedure	Description
3.	Select a method step	Press the up and down arrow keys to select the step to edit or add. An asterisk (*) indicates the selected step. Press the **EDIT** key to modify the selected step. Press the **CONTINUE** soft key or ⌀ to resume the run when finished editing the method.

METHOD: SDS-PAGE

* S1   100V   00:30 HRS
   S2   300V   00:30 HRS
   S3   (EMPTY)
                    CONTINUE

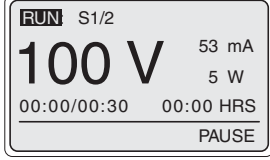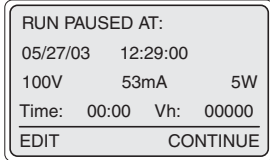| Step	Procedure	Description
4.	Set the constant parameter for the current step	Use the soft keys to select the constant parameter and the keypad to enter its value. Press the **EDIT** key when finished. The ⌀ key can be pressed at any time to resume the run. Note that the non-constant parameter values are listed on the right side of the screen and the time mode at the bottom. **ConstV**: Used to run with constant voltage. **ConstA**: Used to run with constant current. **ConstW**: Used to run with constant power.

S1/2 EDIT CONSTANT

100 V   2500 mA
              500 W
TIME: 00:30 HRS
CONSTV CONSTA CONSTW

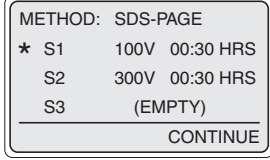| Step	Procedure	Description
5.	Set the non-constant parameter limits for the current step	Use the soft keys to select a non-constant parameter and the keypad to enter its value. Press the **EDIT** key when finished. The ⚡ key can be pressed at any time to resume the run. Note: to change the constant value, press its soft key and enter a new value.

S1/2 EDIT LIMITS

100 V 2500 mA
500 W
TIME: 00:30 HRS

CONSTV   LIMITA   LIMITW

		ConstV: Used to change the voltage constant value.
		LimitA: Used to change the current limit value.
		LimitW: Used to change the power limit value.

Step	Procedure	Description
6.	Select the time mode	Use the soft keys to select a time mode and the keypad to enter the run time. Press the **EDIT** key when finished and go to Step 3. The ⚡ key can be pressed at any time to resume the run. Note that the time mode cannot be changed for the step in progress.

S1/2 EDIT TIME

100 V 2500 mA
500 W
TIME: 00:30 HRS

		HRS: Run time is in units of hours.
		VHOURS: Run time is in units of volt-hours.
		UNTIMED: Run is continuous. Note that steps programmed after an un-timed step are ignored.

Step	Procedure	Description
7.	Exit the run completed screen	After the run is finished the "Run Terminated" or "Run Completed" screen is displayed. At this point the run data may be transmitted to a PDA or PC, if desired (see Section 4.2.2). Press the **RERUN** soft key to repeat the run or the **EXIT** soft key to return to the Method Step List screen.

RUN COMPLETED AT:

05/27/03   12:34:01

200V   106mA   21W

Time: 00:01   Vh: 00003

RERUN   EXIT

Step	Procedure	Description
8.	Save the changes	From the Method Step List screen, press the **SAVE** soft key to save the changes made during the run. Note that pressing **SAVE** will overwrite the original method.

METHOD: SDS-PAGE

★ S1   100V 00:30 HRS
   S2   300V 00:30 HRS
   S3   (EMPTY)

METHODS   DELETE   SAVE

Section 4
Operation with a Personal Computer and PDA

The PowerPac Universal is capable of transmitting methods to and from a PDA, and transmitting run data to a personal computer (PC) or PDA through the IR port located on the front of the power supply.

4.1 Operation with a Personal Computer

Communication between a PowerPac Universal power supply and a PC requires that the PowerPac data transfer software (Catalog Number 164-5067, includes PowerPac remote software also) be installed on a compatible PC. The PowerPac data transfer software for the PC is compatible with computers that run the Windows 2000™ or Windows XP™ operating system and that include an IrDA port. The PowerPac data transfer software is used to transmit run data from the PowerPac Universal or PDA, to a PC. PowerPac data transfer software instructions are contained within the help file of the software itself and will not be discussed here.

4.2 Operation with a PDA

Communication between a PowerPac Universal power supply and a PDA requires that the PowerPac remote software (Catalog Number 164-5067, includes PC software also) be installed on a compatible PDA. The PowerPac remote software is compatible with any PDA that runs Palm OS version 4.0 or above. With the PowerPac remote software the PDA can perform the following functions:
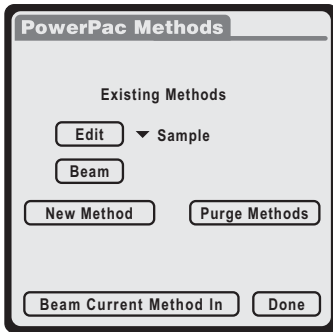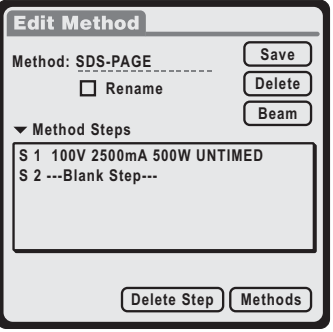
*   Transmit methods to and from the PowerPac Universal.
*   Receive data from the PowerPac Universal
*   Transmit data to a PC
*   Create and store up to 20 methods
*   Store up to 20 data files
*   Provide unique data file identification
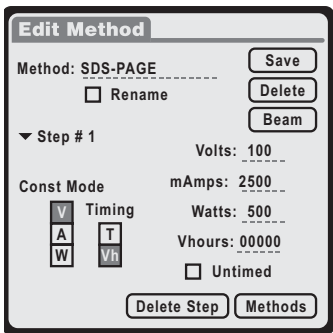
Instructions for the PowerPac remote software for PDA operation are given in the following two sections.

4.2.1 Create, Edit and Transmit Methods
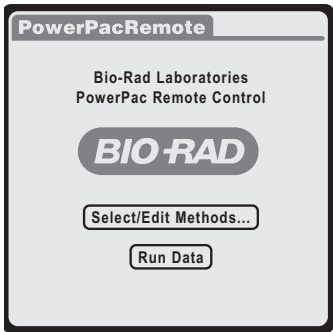
Step	Procedure	Description
1.	Start the software	Start the PowerPac Remote software and press **Select/Edit Methods….**

Step	Procedure	Description
2.	Open a method	There are three ways to open a method:

2. Open a method

PowerPac Methods

Existing Methods

[Edit] ▼ Sample
[Beam]

[New Method]   [Purge Methods]

[Beam Current Method In]   [Done]

There are three ways to open a method:

a. Press **New Method** to create and open a new method.

b. Select a method from the drop-down method list and press **Edit**. Note that the **Edit** and **Beam** buttons appear only if a method from the method list has been selected.

c. Press **Beam Current Method In** to retrieve a method from the PowerPac Universal and store it in the method list. Note: the method in the PowerPac Universal has to be opened before transmission.

Other Buttons

Purge Methods: Used to delete **ALL** methods stored on the PDA

Beam: Transmits the currently selected method to the PowerPac Universal

Done: Returns to the start-up screen.

---

3. Edit the method

Edit Method

Method: SDS-PAGE   [Save]
        ☐ Rename   [Delete]
                           [Beam]
▼ Method Steps

S 1 100V 2500mA 500W UNTIMED
S 2 ---Blank Step---

[Delete Step] [Methods]

Press **Select/Edit Methods...**, select the method from the drop-down method list and press **Edit**.

Select a step to edit from the **Method Steps** drop-down menu.

Step	Procedure	Description
4.	Edit a step	a. Set the Constant mode: voltage (V), current (A) or power (W).
		b. Enter the constant and non-constant values in the Volts, mAmps and Watts fields.
		c. Select whether the run will be timed (Untimed box is not checked) or un-timed (the Untimed box is checked).
		d. Change the method name as needed. Check the Rename box to rename the method or leave it un-checked to save the edited method with the new name.
		e. Select another step to edit from the "Step" drop-down list and edit the step.
		f. Press **Save** to save the method.
		Other Buttons
		Delete: Deletes the entire method.
		Delete Step: Deletes the current step.
		Methods: Returns to Method List screen.
5.	Transmit the method	Press **Beam** to transmit the method to the PowerPac Universal. Note that if nine methods already exist on the PowerPac Universal that the new method will be transmitted to flash memory so it can be run, but it will not be saved to the method list.

Edit Method

Method: SDS-PAGE

☐ Rename

▼ Step # 1

Const Mode

Timing

V	
A	T
W	Vh

Volts: 100
mAmps: 2500
Watts: 500
Vhours: 00000

☐ Untimed

Save   Delete   Beam   Delete Step   Methods

4.2.2 Receive and Transmit Data

Step	Procedure	Description
1.	Start the software	Start the PowerPac Remote software and press **Run Data**

PowerPacRemote

Bio-Rad Laboratories
PowerPac Remote Control

BIO·RAD

Select/Edit Methods...
Run Data

Step	Procedure	Description
2.	Receive data from the PowerPac Universal	Press **Get Data From PowerPac** to request and receive the data file from the PowerPac's most recent run.

Recorded Run Data

Collected Run Data

▼ Run Data

[Purge Data]
[Get Data From PowerPac]
[Done]

Other Buttons

Purge Data: Used to delete **ALL** data stored on the PDA

Done: Returns to the start-up screen.

Step	Procedure	Description
3.	Transmit data to a PC	Select a data file from the drop-down **Run Data** list and then press **Beam** to transmit the data to a PC. The warning "This data file has not been beamed to the PC" is displayed for all data files that have not been transmitted to a PC. Note that the **Extract Method**, **Beam** and **Delete** buttons appear only if a run in the **Run Data** list has been selected.

Recorded Run Data

Collected Run Data
This data file has not been beamed to the PC
▼ SN 00002 15:56:05 27-May-03

[Purge Data] [Extract Method]
[Get Data From PowerPac]
[Beam] [Delete] [Done]

Other Buttons

Purge Data: Used to delete **ALL** data stored on the PDA

Extract Method: Displays the method that was used to create the selected run data.

Beam: Transmits data to a PC

Delete: Deletes the currently selected data file.

Done: Returns to the start-up screen.

Section 5
Maintenance and Troubleshooting

5.1 Maintenance

The PowerPac Universal requires little maintenance to assure reliable operation. To clean the case, first unplug the power supply. Use a damp cloth to wipe down the outer case.

5.2 Troubleshooting

5.2.1 Basic Troubleshooting

Problem	Cause	Solution
No display/lights/fan	1. No AC power. 2. Blown fuse	1. Check if the PowerPac Universal is unplugged, or if there is a problem with th AC power source, or if the power switch is in the off position. 2. Replace the fuse. See Section 5.3 for details.
Repeated blown fuses	Hardware failure	Contact Bio-Rad Technical Resources.
Leads from the cell are not long enough to fit the output jacks	Output terminals for the PowerPac Universal are recessed 16 mm to meet safety regulations. Some leads are not long enough to make electrical connection.	Use the PowerPac Adaptor (Catalog number 165-5061), which accommodates most standard 4 mm banana plugs, to make secure electrical connection. **Note**: use of this PowerPac adaptor voids EN61010 safety provisions.
Clock loses settings on Power Off	Onboard battery depleted	Contact Bio-Rad Technical Resources

5.2.2 Power Failure Detection

The Power Failure detection mode (PFd) is used to determine the PowerPac Universal response to power failures and is set as described in Section 3.1. There are three Power Failure detection modes:

OFF: Power Failure detection is disabled. A run will terminate if a power failure occurs and Error code 07 will be displayed (see Section 5.2.4).

ON NEXT RUN ONLY: Power Failure detection is enabled for a single run and is then disabled for all subsequent runs. "PFd" is displayed in the upper right corner of the run screen for the run in which it is active.

ON: Power Failure detection is enabled and "PFd" is displayed in the upper right corner of the run screen. A run will resume when power is restored after single or multiple power failures(s).

If a power failure occurs during a run the following screens will be displayed.

1.
```
RUN COMPLETED AT:
05/27/03   12:35:56
200V        105mA        21W
Time:   00:01   Vh:   00002
RERUN        MORE        EXIT
```

Displayed if PFd = ON

MORE is displayed on the Run Completed screen when a run ends that has had a power failure.

Press the **MORE** soft key to display details about the most recent power outage and when power was restored.

```
AC POWER INTERRUPTED
AT:  05/27/03    12:35:00
RESTARTED RUN
AT:  05/27/03    12:35:07
RERUN        BACK        EXIT
```

Press the **RERUN** soft key to restart the run

Press the **BACK** soft key to return to the Run Completed screen.

Press the **EXIT** soft key to go to the Method List screen

2.
```
ERROR STOP:   CODE 07
RUN POWER FAILURE
RUN TERMINATED.
RESET WHEN READY.
RESET
```

Displayed if PFd = OFF

This error screen is displayed if a run has terminated due to a power failure.

Press **RESET** to return to the Home screen

5.2.3 Rapid Resistance Change Detection/No Load Detection

The Rapid Resistance Change detection/No Load detection (RRCd-NLDd) is used to determine the instruments response due to a large change in resistance or the absence of a load. See Section 3.1 for a description of how to set this parameter.

RRCd-NLDd = ON: Detection of sudden load changes or the absence of a load is enabled. Load changes greater than 20% or 15 mA (whichever is greater), or the absence of a load (current is less than 2 mA), will cause an alarm to sound, and the run to pause (See Section 5.2.4, ERROR STOP 01 and 09).

RRCd-NLDd = OFF: Detection of sudden load changes or the absence of a load is disabled. When running in this mode, the ⚠ symbol is displayed on the Run screen as a reminder that this safety feature has been turned off.

Note: This mode is used to complete electrophoresis application such as the D-Code that require that Rapid Resistance Change detection be turned off (due to possible fluctuations in current during a normal run), or applications such as isoelectric focusing that require less than 2 mA current.

5.2.4 Error Messages

Error Message	Cause	Solution
ERROR STOP **CODE 01** NOLOAD DETECTED CORRECT AND CONTINUE <u>RUN PAUSED</u> CONTINUE CANCEL	1. Electrophoresis cell not connected to the power supply or buffer levels too low.	1. Make sure all electrical connections make good contact and the cables and wire electrodes are in good shape. Verify buffer levels are appropriate.
	2. The current load is less than 2 mA.	2. Verify the electrophoresis application power requirements match PowerPac Universal output range. Note: The No Load detection can be de-activated. (See Sections 3.1 and 5.2.3)
ERROR STOP: **CODE 02** OVER CURRENT CORRECT AND CONTINUE <u>RUN PAUSED</u> CONTINUE CANCEL	1. Accidental shorting of output leads.	1. Make sure all electrical connections make good contact and the cables and wire electrodes are in good shape.
	2. Shorting due to wrong connections.	2. Verify buffer levels are appropriate.
ERROR STOP: **CODE 03** OVER VOLTAGE CORRECT AND CONTINUE <u>RUN PAUSED</u> CONTINUE CANCEL	1. Control circuitry problem	1. Press the **CONTINUE** soft key to continue the run. If the problem continues, cycle power and restart the run. If the problem persists, contact Bio-Rad Technical Support.
ERROR STOP: **CODE 07** RUN POWER FAILURE RUN TERMINATED <u>RESET WHEN READY</u> RESET	AC Power was interrupted during the run and the run was terminated because the Power failure detection is OFF	To continue a run after a power failure, activate the Power Failure Detection mode in the Setup window (See Section 3.1).
ERROR STOP: **CODE 08** REGULATION ERROR RUN TERMINATED <u>RESET WHEN READY</u> RESET	Control circuitry problems.	1. Press the **RESET** soft key to clear the screen, then restart the run. 2. If the problem continues, cycle power and restart the run. If the problem persists, contact Bio-Rad Technical support.

Error Message	Cause	Solution
ERROR STOP: **CODE 09** RAPID CHANGE IN R CORRECT AND CONTINUE <u>RUN PAUSED</u> CONTINUE CANCEL	1. Loose output connections leading to intermittent connection to the loads. 2. Cells added or removed during the run. 3. Change in buffer levels	1. Verify all electrical connections. 2. Pause power supply prior to adding or removing electrophoresis cells 3. Verify buffer levels are appropriate. **Note**: certain applications exhibit intrinsic fluctuations in resistance (e.g. Dcode). If this is the case, the change in resistance detection feature can be disabled to allow uninterrupted completion of the run. (See Sections 3.1 and 5.2.3).
ERROR STOP: **CODE 11** GROUND LEAK CORRECT AND CONTINUE <u>RUN PAUSED</u> CONTINUE CANCEL	Insulation failure in the electrical connections made outside the power supply has caused a current flow that may create an unsafe condition.	1. Check electrical connections, electrophoresis cell, and chiller system for leaks. Verify that the electrophoresis cell rests on an insulated and dry surface. 2. Check Power source connections. Additional capacitance to ground from external EMC filters or a UPS (Uninterruptible Power Supply) can cause excessive ground currents.
ERROR STOP: **CODE 12** REGULATION ERROR RUN TERMINATED <u>RESET WHEN READY</u> RESET	Improper load, or connection to a voltage source	1. Press Reset and restart the run. 2. If the problem continues, cycle power and restart the run. If the problem persists, contact Bio-Rad Technical support.
ERROR STOP: **CODE 13** PERM MEM ERROR	Internal circuitry problems	Cycle power and restart run. If problem persists, contact Bio-Rad Technical support.

5.3 Replacing a Fuse

If the power supply is plugged into a working outlet, with the power switch in the ON position and there is no display, lights or fan operation, a fuse might need to be replaced.

1. Disconnect the power cord from the electrical outlet.

2. Use a fingernail or a flat blade screwdriver to gently press the tabs on the side of the fuse holder toward each other. This will release the fuse holder and the fuses. See Figure 7. Inspect the fuses visually to determine if one or both of the fuses are blown.

3. Remove the blown fuse from the fuse holder. Replace it with a 6.3A, 250VAC 5mm X 20mm fuse (Bio-Rad part number 900-7288).

4. Re-insert the fuse holder into its position. Press the fuse holder gently until it snaps into place on both sides.
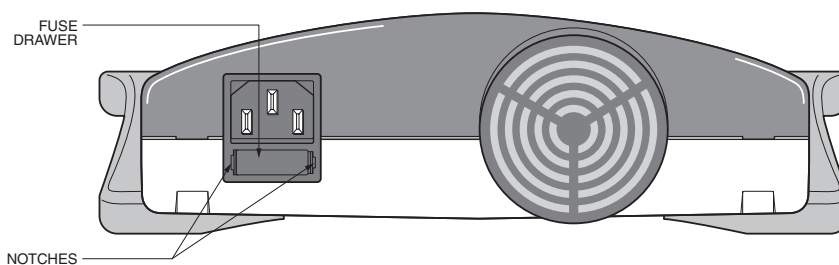
The unit is now ready for use.

Fig. 7. Rear view Showing Fuse Drawer with Notches.

Note: Repeated blowing of the fuse indicates a hardware failure. Contact Bio-Rad Technical Support.

5.4 Expediting Technical Support

Make sure the following information is readily available before contacting Bio-Rad.

Product model no: Located in the sticker on the bottom of the unit (example: PowerPac Universal Power Supply).

Serial number: Located in the sticker on the bottom of the unit

Software version: The PowerPac Universal displays the software version momentarily after switching the power ON (example: Firmware 1.20).

State clearly the error code, error message or anomaly, and the conditions that originated the problem, including run parameters (V, A, and W) as well as the electrophoresis cell and buffer system.

Appendix A
Specifications

Output specifications:	500 V, 2500 mA, 500 W
Output range (programmable):	10–500 V, fully adjustable in 1 V increments
	10–2500 mA, fully adjustable in 1 mA increments
	1–500 W, fully adjustable in 1 W increments
Type of output:	Constant voltage, current, or power with automatic crossover
Output terminals	Four pair of recessed banana jacks in parallel
Timing mode	Continuous, timed to 99:59Hrs, or 99999 volt-hours.
Pause/resume function:	Yes
Display:	128 x 64 Monochrome Backlit LCD
Operating Conditions:	0–40°C; 0–95% humidity in the absence of condensation
Safety compliance:	EN61010
EMI:	Conforms to CE Standards for emissions and immunity class A.
Safety features:	No load detection; sudden load change detection; ground leak detection; overload/short circuit detection; overvoltage protection; overheating protection
Input protection:	Fuse on hot and neutral
Input power(nomial)	100–120/220–240 VAC, 50/60 Hz auto-switching
Dimensions:	27.5cm X 9.8cm X 34.5 cm
Weight:	2.5 kg

Appendix B
Warranty and Ordering Information

Warranty

The PowerPac Universal power supply is covered by a standard Bio-Rad Laboratories warranty. Contact your local Bio-Rad representative for details of the warranty. If any defects should occur during this warranty period, Bio-Rad Laboratories will replace the defective parts without charge. However, the following defects are specifically excluded:

1. Defects caused by improper operation.

2. Repair or modification done by anyone other than Bio-Rad Laboratories or their authorized agent.

3. Use with cables or connectors not specified by Bio-Rad Laboratories for this power supply.

4. Deliberate or accidental misuse.

5. Damage caused by disaster.

For inquiry or request for repair service, contact your local Bio-Rad office.

Warranty Information

Model: _____

Serial Number: _____

Date of Delivery: _____

Warranty Period: _____

Ordering Information

Catalog Number	Description
164-5070	PowerPac Universal power supply, 100–120/220–240V
164-5067	PowerPac Universal power supply data transfer software for a PC and PDA
164-5069	IQ/OQ Protocol and Test Box
165-5061	PowerPac Adaptor, qty 1
165-5066	PowerPac Adaptor, qty 2
900-7288	Replacement Fuse, 6.3 A, 250 VAc, 5 x 20 mm, Type T

BIO·RAD

**Bio-Rad
Laboratories, Inc.**