

---

# PowerPac Basic Power Supply

## Instruction Manual

For technical support, call your local Bio-Rad office, or in the U.S., call 1-800-424-6723.



**BIO-RAD**



# Notice

No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage or retrieval system, without permission in writing from Bio-Rad.

Bio-Rad reserves the right to modify its products and services at any time. This guide is subject to change without notice. Although prepared to ensure accuracy, Bio-Rad assumes no liability for errors or omissions, or for any damage resulting from the application or use of this information.

Bio-Rad is a trademark of Bio-Rad Laboratories, Inc. in certain jurisdictions.

All trademarks used herein are the property of their respective owner.



# Table of Contents

	Page
Safety.....	iii
Section 1 Introduction .....	1
1.1 Overview .....	1
1.2 Unpacking .....	2
Section 2 Control Features .....	3
Section 3 Setup and Operation.....	5
Section 4 Maintenance and Troubleshooting.....	9
4.1 Maintenance.....	9
4.2 Troubleshooting.....	9
4.3 Replacing a Fuse .....	11
4.4 Firmware Version Number .....	11
Appendix A Specifications .....	13
Appendix B Warranty and Ordering Information .....	15



## 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 passed test for operation at temperatures between 0° and 40° C, with relative humidity between 10 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 vents 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 IEC 61010-1\* 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 IEC 61010-1\* 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 IEC 61010-1 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 IEC 61010-1 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.

\*IEC 61010-1 is an internationally accepted electrical safety standard for laboratory instruments.



# Section 1 Introduction

## 1.1 Overview

The PowerPac Basic provides constant voltage or constant current to instruments used in electrophoresis. The power supply operates at the values specified for the constant parameter. However, to prevent damage to the electrophoresis cell, the PowerPac Basic provides automatic crossover to constant current or constant voltage, depending on which set value is first reached. When the set limit of the non-constant parameter is reached, and the power capability of the unit is not exceeded, the power supply will switch, making the non-constant parameter the new constant parameter.

### Output specifications:

Voltage: Adjustable from 10 to 300 Volts, in 1 volt increments.

Current: Adjustable from 4 to 400 milliamperes (mA) in 1 mA increments.

Power: 75 watts (maximum).

Four output jacks: Up to four identical electrophoresis cells can be connected in parallel to the power supply.

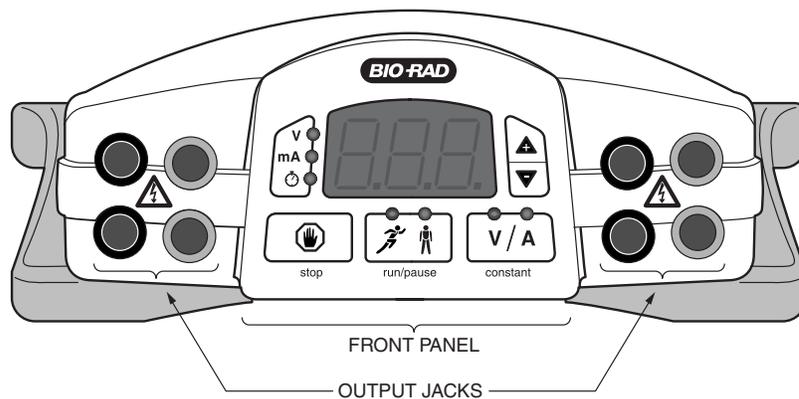


Fig. 1. Front View.

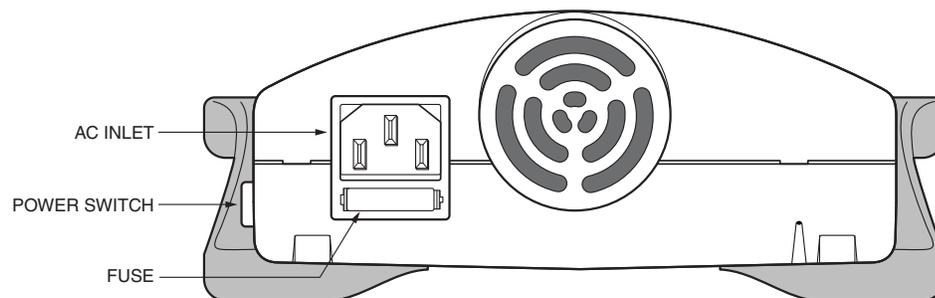


Fig. 2. Rear View.

The PowerPac Basic has the following features:

- Programmable constant voltage or constant current with automatic crossover
- Timer control from 0 to 999 minutes
- 3-digit LED display
- Pause mode for editing running parameters
- Automatic detection of no load conditions and rapid changes in resistance
- Power Failure Detection in timed modes allowing completion of run
- Stackable case with adjustable viewing angle via flip down legs (see Figure 3)

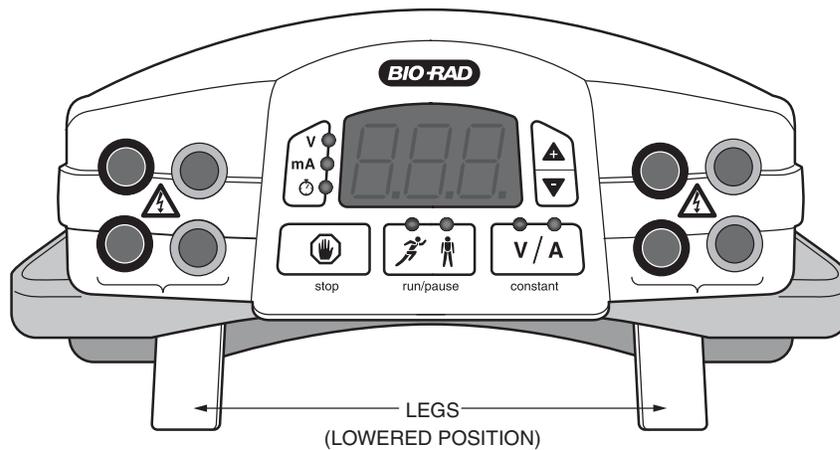


Fig. 3. Front View with Legs in Lowered Position.

## 1.2 Unpacking

When you receive the 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 Basic, 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.

Contents include:

- PowerPac Basic 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

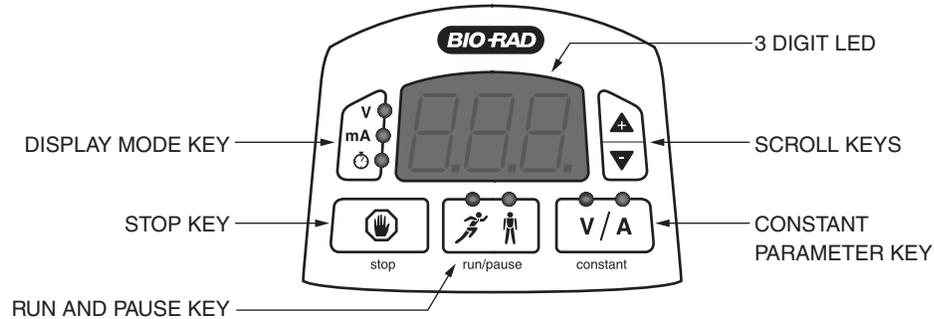
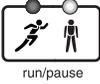
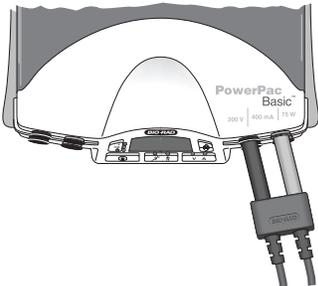
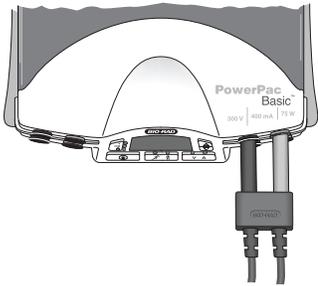
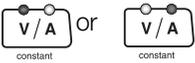


Fig. 3. Front Panel.

Key	Description
	<p><u>Constant Parameter Key:</u></p> <ul style="list-style-type: none"> <li>• Selects either constant voltage or current.</li> <li>• The LED indicates the selected parameter. During a run, maximum power is indicated when both LED's are lit.</li> </ul>
	<p><u>Display Mode Key:</u></p> <ul style="list-style-type: none"> <li>• Selects the parameter to be displayed (volts, milliamperes or minutes). The LED displays the value of the indicated parameter.</li> </ul>
	<p><u>Scroll Keys:</u></p> <ul style="list-style-type: none"> <li>• Changes the value of the selected parameter. If the Scroll Key is pressed constantly for more than 5 units in either direction, +/-, the values will increase/decrease in increments of 10 to reach the desired value faster.</li> </ul>
	<p><u>Run &amp; Pause Key:</u></p> <ul style="list-style-type: none"> <li>• Starts and pauses a run. Pausing allows editing of the constant parameter and the parameter values.</li> <li>• Corresponding LED indicates the status of the power supply.</li> </ul>
	<p><u>Stop key:</u></p> <ul style="list-style-type: none"> <li>• Stops run. Constant parameter and limit parameter values are preserved. Timer is reset to zero.</li> </ul>



## Section 3 Setup and Operation

STEP	PROCEDURE	DESCRIPTION
1.	Turn power on.	<p>Press the power switch located on the right side of the unit to the on position.</p> <p>The default setting is constant V, and the LED display shows zero value.</p> <p>To display firmware version number, hold down constant parameter key while turning the power switch to the on position.</p>
2.	<p>Connect the electrophoresis cell(s) to the power supply.</p> 	<p>The power leads are color coordinated to the output terminals in red and black.</p> <p> indicates high voltages.</p> <p><b>Note:</b> Power leads must be inserted perpendicular to the curve of the case.</p>
		
	<p><b>Fig. 5. Power leads connected correctly.</b></p>	<p><b>Fig. 6. Power leads connected incorrectly.</b></p>
3.	<p>Select the constant parameter</p>  	<p>Press the Constant key to select the constant parameter, either voltage or current. The LED on the parameter key corresponding to the selected constant parameter will light up. The display shows the zero value for the constant parameter.</p>
4.	<p>Enter a value for the constant parameter using the scroll key.</p> 	<p>Use the scroll key to enter the desired value. Voltage: 10–300V adjustable in 1V increments. Current: 4–400 mA adjustable in 1 mA increments.</p> <p><b>Note:</b> If the scroll key is pressed constantly for more than 5 units in either direction, +/-, the values will increase/decrease in increments of 10 to reach the desired value faster.</p>
5.	<p>Enter value for limit parameter.</p> <p>For volts  </p> <p>For milliamperes  </p>	<p>Use the parameter key to select the limit parameter. The maximum default value, 300V or 400mA, is displayed. Select a suitable limit value to avoid excessive power conditions for the application.</p>

STEP	PROCEDURE	DESCRIPTION
6.	Programming a timed run  	Use the parameter key to select time. The display will show a zero value. Use the scroll key to enter the desired time up to 999 min..  If no time is entered the run will continue until the run is terminated by pressing the stop key. When 999 minutes is reached, the clock resets to zero and the run continues.  <b>Note:</b> <ul style="list-style-type: none"> <li>In a timed run the displayed time is the remaining time. Pressing the pause key will keep the remaining time. Pressing the stop key will reset the time to zero.</li> <li>In an untimed run the displayed time is the elapsed time. Pressing the pause key will retain the elapsed time.</li> </ul>
7.	<i>Optional; available only when a timed run is programmed.</i> Power Failure detection.   	Activating the Power failure detection mode is possible for timed runs only. <ul style="list-style-type: none"> <li>Make sure the parameter key is in time mode (time LED is lit)</li> <li>Enter the desired time if not previously entered</li> <li>Hold down the stop key for ~2 seconds until the display shows Pfd. This indicates the Power Failure Detection is activated.</li> </ul> <b>Note:</b> After completion or termination of a run, the Power Failure Detect mode is automatically de-activated. See Section 4.2, Troubleshooting, for details on Power Failure Detect error messages.
8.	<i>Optional</i> De-activation of change in resistance feature.   	Certain applications exhibit fluctuations in resistance that can trigger the change in resistance error codes. If this is the case, the change in resistance feature can be de-activated to allow un-interrupted completion of a run. <ul style="list-style-type: none"> <li>Make sure the parameter key is in current mode (current LED is lit)</li> <li>Hold down the stop key for ~2 sec until the display shows dE9</li> </ul> <b>Note:</b> After completion or termination of a run the Change in Resistance Detection is automatically activated. <b>Caution:</b> De-activating this safety feature increases the chance of electrical hazard.

STEP	PROCEDURE	DESCRIPTION
9.	Start the run 	Press the run/pause key to start the run. The run LED is lit.
10.	Viewing and editing options during a run.	<ul style="list-style-type: none"> <li>Viewing: Press the parameter key to view the corresponding value on the display</li> <li>Editing: Edit the constant parameter value and the time value for timed runs</li> </ul> <p><b>Note:</b>            Editing the limit value is possible in the pause mode. To change from an un-timed to a timed run, stop the run and re-program.</p>
11.	Pause mode 	Press run/pause key during a run to enter the pause mode. When the pause LED is lit it is possible to: <ul style="list-style-type: none"> <li>Safely make adjustments to the instrument connected to the power supply</li> <li>Edit the values for all parameters</li> <li>Change the constant parameter</li> </ul> <p><b>Note:</b>            To change from an un-timed to a timed run, stop the run and re-program.</p>
12.	End of run.	When a run is completed, i.e., a timed run has ended or an untimed run is stopped, the constant parameter value and limit parameter value are preserved. The timer is reset to zero. Neither the run nor the pause LED is lit, indicating that no power is supplied to the output jacks.
13.	Terminating a timed run in progress	Press the stop key to terminate a timed run. The constant parameter value and limit parameter value are preserved. The timer is reset to zero. Neither the run nor the pause LED is lit indicating that no power is supplied to the output jacks.
14.	Powering down	Press the stop key before turning the power switch to the off position. If this is not done, a power failure will be detected causing an automatic restart if the Power Failure Detection is enabled.



## Section 4 Maintenance and Troubleshooting

### 4.1 Maintenance

The PowerPac Basic 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.

### 4.2 Troubleshooting

Problem	Cause	Solution
No display/lights/fan	<ol style="list-style-type: none"> <li>No AC power.</li> <li>Blown fuse.</li> <li>Power switch exercised rapidly to the on and off positions.</li> </ol>	<ol style="list-style-type: none"> <li>Check if PowerPac Basic is unplugged, or problem with AC power source, or power switch is in off position.</li> <li>Replace fuse. See section 4.3 for details.</li> <li>The unit needs to be reset. Turn power switch to the off position, wait 5–10 seconds, then turn power switch to the on position to resume normal operation.</li> </ol>
Repeated blown fuses	Hardware failure	Contact Bio-Rad Technical Resources.
Leads from cell are not long enough to fit output jacks	Output terminals for the PowerPac Basic are recessed 16 mm to meet safety regulations. Some leads are not long enough to make electrical connection.	<p>Use the PowerPac Adaptor, which accommodates most standard 4 mm banana plugs, to make a secure electrical connection.</p> <p><b>Note:</b> Use of the PowerPac Adaptor voids IEC 61010-1 safety provisions.</p>
E1 error code	<p>No load detected</p> <ul style="list-style-type: none"> <li>Instrument not connected to PS</li> <li>The current load is below 4mA</li> </ul>	<p>Verify all electrical connections.</p> <p>Verify buffer levels where appropriate.</p>
E2 error code	Over current (load current greater than 400 mA)	<p>Check for and correct any short circuit or excessive load problem. Excessive load due to high buffer concentration will require the buffer be remade.</p> <p>Then,</p> <ul style="list-style-type: none"> <li>Press  key to resume the run or,</li> <li>To clear the error code, press any key (other than  key).</li> </ul>
E3 error code	Over voltage (load voltage over 300 V)	Turn power supply off, then on to reset. If problems persists, contact Bio-Rad Technical Resources.
E5 error code	A power failure occurred during a timed run with Power Fail Detection (PFd) activated, and run is completed. Power Fail detection (Pfd) is de-activated after completion or termination of each run.	
E6 error code	A power failure occurred during a timed run without Power Fail Detection (PFd) activated, and run is not completed.	
E7 error code	Power Failure occurred during an untimed run or the power switch was turned off before pressing stop, and run is not completed. Power Fail detect (Pfd) cannot be activated for untimed runs.	

Problem	Cause	Solution
E8 error code	Regulation error	Turn power supply off, then on to reset If problem persists, contact Bio-Rad Technical Resources
E9 error code	Change in Load Resistance.  The PowerPac  Basic detects drastic changes in resistance which may indicate failure of the cell's power leads or a loose output connection.  <b>Note:</b> Certain applications exhibit fluctuations in resistance that can trigger the change in resistance error code. If this is the case, the change in resistance feature can be deactivated to allow uninterrupted completion of a run. (see Section 3, Step 8)  <b>Caution:</b> Deactivating this safety feature increases the possibility that a failure of the power leads or loose output connection will not be detected.	Check and correct any potential resistance problem then, <ul style="list-style-type: none"> <li>press run/pause key to resume run or,</li> <li>press any key, other than the run/pause key, to clear the error code.</li> </ul>
E10 error code	Unacceptable value(s) entered	Clear the code by pressing any key other than the run/pause key. Then, enter values within range of PowerPac Basic and press the run/pause key
E14 error code	Internal Over Voltage	Possible power supply malfunction. Check for and correct problems such
E15 error code	Internal Short Circuit	as dirty contacts, frayed wires, excessive buffer concentration. Then press any key other than the run/pause key to clear the code.
E17 error code	Hardware failure	Contact Bio-Rad Technical Resources
E18 error code	Hardware failure	
E19 error code	Hardware failure	
E20 error code	Instrument is overheating	Check fan and vents for obstruction.
E21 error code	Regulation error	Turn power supply off, then on to reset
E22 error code	Power fail while running	Press the stop key, then cycle power
E23 error code	Exceeded voltage limit setting	Possible power supply malfunction. Check for and correct problems, such
E24 error code	Exceeded current limit setting	as dirty contacts, frayed wires, excessive buffer concentration. Then press stop
E25 error code	Exceeded wattage limit setting	to clear the error.

### 4.3 Replacing a Fuse

If there is no display, lights, or fan, and the PowerPac Basic is plugged into a working AC power outlet with the power switch in the on position, the fuse may need to be replaced.

1. Disconnect the power cord from the electrical outlet.
2. Insert a flat blade screwdriver into the notches of the power entry module's fuse holder to release it. See Figure 5.
3. Remove the fuse from the fuse holder. Replace with 2.5A, 250V, 5 X 20 mm, fast-blow fuses (Bio-Rad catalog number 12007433).<sup>1</sup>
4. Re-insert the fuse holder into its position. Press the fuse holder gently until it snaps into place.

The unit is now ready for use.

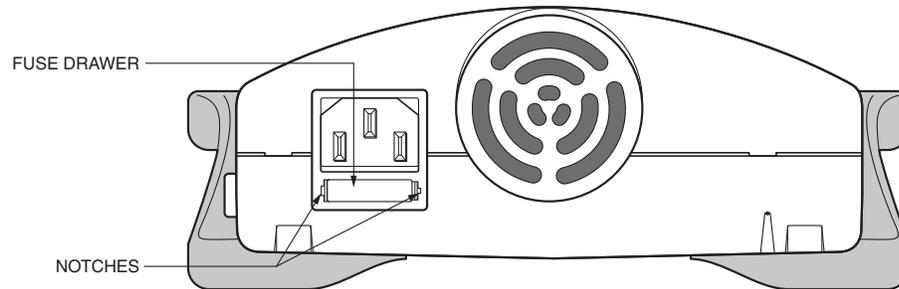


Fig. 5. Rear View Showing Fuse Drawer with Notches.

**Note:** Repeated blowing of the fuse indicates a hardware failure and Bio-Rad should be contacted for repair.

### 4.4 Firmware Version Number

To display the PowerPac Basic's firmware version number while the power supply is off, hold down the constant parameter key and concurrently turn the power switch to the on position. All of the LEDs and segments in the 3 digit LED display will light. Release the constant parameter key and the firmware version number will then appear for a few seconds. The power supply is now ready for operation.

---

<sup>1</sup> Fuse specifications are applicable to products with a serial number of 041BR300000 and higher.



## Appendix A

### Specifications

Input Power	
nominal	100–240 VAC, 50/60 Hz
actual	85–264 VAC, 50/60 Hz
Fuses	2.5 A, 250 VAC, 5mm x 20mm, fast-blow <sup>2</sup>
Input Power Cord	3-wire; grounded
Output (Programmable)	
Voltage	10 V to 300 V, fully adjustable in 1 V steps
Voltage Accuracy	± 2% of reading or 3 volts, whichever is more
Current	4 mA to 400 mA, fully adjustable in 1 mA steps
Current Accuracy	± 2% of reading or 3 mA, whichever is more
Power (maximum)	75 W
Terminals	4-pair recessed banana jacks, floating in parallel
Timer Control	001 to 999 minutes, fully adjustable
Ripple	< 1% @ 300 V and 70 W
Line Regulation	< 1% @ 300 V and 70 W, 85–264 VAC
Load Regulation	<1% @ 300 V for a 50% change in output load
Drift	< 1% @ after 15 min warmup at 300 V and 70 W
Noise	55 dBA at 1 meter
Readout Stability	
Volts	±1 V
Current	± 1 mA
Safety Features	
No load detection	Indicated by error message on display
Sudden load change detection	Indicated by error message on display
Overload/short circuit protection	Automatic power limit
Input line protection	Fuse on both hot and neutral
Auto power up after power failure	User-selectable, setup values maintained
Safety Compliance	IEC 61010-1
EMI	Conforms to CE standards for Emissions and Immunity class A, tested only at 230V. See Declaration of Conformity for details. TUV EMC certification
Display Functions	3-digit LED displays voltage, current, or time
Function Modes	Constant voltage, constant current, timer, pause User-selectable automatic power-up after power failure
Environmental	
Operating Temperature	0–40°C
Humidity	10–95%, in the absence of condensation
Dimensions	25 cm (L) x 21 cm (W) x 8 cm (H)
Unit is stackable	
Weight	1.1 kg

---

<sup>2</sup> Fuse specifications are applicable to products with a serial number of 041BR300000 and higher.



## Appendix B Warranty and Ordering Information

### Warranty

The PowerPac Basic 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
164-5050	PowerPac Basic power supply, 100–240 VAC
165-5061	PowerPac Adaptor, qty 1
165-5066	PowerPac Adaptor, qty 2
12007433	Replacement Fuse, 2.5 A, 250 V, 5 x 20 mm, fast-blow, qty 1 <sup>3</sup>

---

<sup>3</sup> Fuse specifications are applicable to products with a serial number of 041BR300000 and higher.







**Bio-Rad  
Laboratories, Inc.**

Life Science  
Group

---

**Web site** [bio-rad.com](http://bio-rad.com) **USA** 1 800 424 6723 **Australia** 61 2 9914 2800 **Austria** 43 01 877 89019 **Belgium** 32 03 710 53 00  
**Brazil** 55 11 3065 7550 **Canada** 1 905 364 3435 **China** 86 21 6169 8500 **Czech Republic** 36 01 459 6192 **Denmark** 45 04 452 10 00  
**Finland** 35 08 980 422 00 **France** 33 01 479 593 00 **Germany** 49 089 3188 4393 **Hong Kong** 852 2789 3300 **Hungary** 36 01 459 6190  
**India** 91 124 4029300 **Israel** 972 03 963 6050 **Italy** 39 02 49486600 **Japan** 81 3 6361 7000 **Korea** 82 2 3473 4460 **Mexico** 52 555 488 7670  
**The Netherlands** 31 0 318 540 666 **New Zealand** 64 9 415 2280 **Norway** 47 0 233 841 30 **Poland** 36 01 459 6191 **Portugal** 351 21 4727717  
**Russia** 7 495 721 14 04 **Singapore** 65 6415 3188 **South Africa** 36 01 459 6193 **Spain** 34 091 49 06 580 **Sweden** 46 08 555 127 00  
**Switzerland** 41 0617 17 9555 **Taiwan** 886 2 2578 7189 **Thailand** 66 2 651 8311 **United Arab Emirates** 971 4 8187300  
**United Kingdom** 44 01923 47 1301

---

